FRED v2026.1 Documentation

Release v2026.1

CZ.NIC, z. s. p. o.

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This documentation aids various user groups of the **Free Registry for ENUM and Domains**, the domain name registry software developed by CZ.NIC as an open-source solution.

Edition

1.2

Source

The source code of this documentation is open and can be found on GitLab.

Contributions may be submitted using the pull-request mechanism.

General

CHAPTER

ONE

RECORD OF CHANGES

Overview of changes in documentation from previous editions. For changes in software see *Release Notes*.

Version	Edition	Segment	Change description
v2026.1	**1.2**	*Source code*	Simplified source code overview into GitLab link
	1.1	*Overview*	Added overview of FRED functions
		Quick Start Guide	Added quick start manual
	1.0	*Installation of FRED*	Update DB node installation
		Administration Manual	Replaced Ubuntu with Debian
		Installation of FRED	Update installation manual - upgrade to Debian 12
		FRED demo	Update demo image for new release 2026.1
v2024.1	**1.6**	/Features/General/ContactVerification	Update Contact verification
	1.5	*Command & response structure*	Remove `FRED-client`, update examples to `FRED-eppic`
		Whole documentation	Remove all mentions of old Technical checks
	1.4	/AdminManual/Installation/InstallUbuntu	Update installation manual – add individual nodes
		FRED demo	Update demo image from VirtualBox to `.qcow2` format
		Domains	Add auctions to domain registration expiration schema
	1.3	*Automated keyset management*	Add section Scan results
		DNScheck (Technical checks)	Replace original Technical checks with DNScheck
	1.2	/AdminManual/Installation/InstallUbuntu *FRED demo*	Separate installation manual to demo and production
	1.1	/AdminManual/Installation/InstallUbuntu	Update demo installation manual to new process using virtual image
		Release Notes	Add release notes for FRED *Release v2024.1*
	1.0	*EPP client workflow*	Replace old `fred-client` with new `eppic`
		Distributed deployment example	Update all packages needed for deployment
		Whole documentation	Other minor changes according to FRED `v2024.1`
		Zone generation	Add concept level info about zone generation
2.50	**1.3**	*Automated keyset management Keysets Periodic tasks*	Changes due to new AKM version
		Top-level components	Update FRED component schema
	1.2	*FERDA webadmin features*	Add Reports section

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Version	Edition	Segment	Change description
	1.1	*Check domain*	Separate `<domain:check>` command to non-auction and auction chapters
	1.0	*Check domain*	Extended command `<domain:check>` supporting domain auctions
2.49	**1.0**	*GlobalBlock*	Added installation manual for BSA – GlobalBlock feature
2.48	**1.0**	Whole documentation	Changes according to FRED 2.48.0
2.47	**1.4**	/AdminManual/Installation/InstallUbuntu	Updated demo installation script
	1.3	`Ferda Administration Manual`	Whole manual dissolved and incorporated into Administration Manual, Architecture and Features
		Administration Manual	Incorporated information from Ferda Administration Manual
		Registry initialization EPP client workflow Info contact Poll message types	Changed all `REG-FRED_X` to `REG-FRED-X`
	1.2	*Installation Dependencies Ubuntu 20.04 LTS*	Discontinued support for Ubuntu 16.04, update to Ubuntu 20.04
	1.1	/AdminManual/Installation/BinsUbuntu	Updated installation script link
		Webwhois Django Templates	Small changes in `server_exception`
	1.0	*Release Notes*	Added release notes for FRED *Release 2.47.0*
		Configuration EPP client workflow Object transfer Info (domain, contact, nsset, keyset) *Create* (domain, contact, nsset, keyset) *Common object attributes*	Added AuthInfo TTL information
2.46	**1.0**	*Release Notes*	Added release notes for FRED 2.46.0
		FERDA webadmin features	New features of FERDA webadmin
2.45	**1.0**	*Release Notes*	Added release notes for FRED 2.45.0
		Send AuthInfo for contact Send AuthInfo for domain Send AuthInfo for nsset Send AuthInfo for keyset	Added AuthInfo sending changes
		Info contact	Changes for AuthInfo generation
2.44	**1.0**	*Release Notes*	Added release notes for FRED 2.44.0
		Contacts Info contact	Added new contact attribute states
2.43	**1.0**	*Release Notes*	Added release notes for FRED 2.43.0
		Configuration AdminManual/ConfigDisclosure	Updated GDPR-compliant configuration
		Contacts	Updated Namespace and Schema
		Info contact	New `info_contact` attribute `authInfo`
2.42	**1.0.2**	*Service discovery*	Fix level of `expiry` item
	1.0.1	Whole documentation	Added new FRED logo
	1.0	*Release Notes*	Added release notes for FRED 2.42.0
		Configuration Rules for setting automatic flags	Domain life cycle paramaters moved to a new `domain_lifecycle_parameters` table Added new variable and commands
		Domains	Some minor rephrasing and minor links changes
2.41	**1.6**	README	Convert README.md to README.rst

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Table 1 – continued from previous page

Version	Edition	Segment	Change description
		Diagram of FRED components Component deployment diagram	Update components and deployment schemas
	1.5	*Clients*	Added description of `fred-registry-services` and `fred-logger-services`
		Servers	Added description of Ferda service
		Top-level components Distributed deployment example	Updated and extended the deployment schema with `Ferda`, `fred-logger-service` and `fred-registry-services`
		/Features/General/Notifications	Added link to poll messages
		/Features/General/RRRModel	Added link to Ferda's manual
	1.4	/FerdaManual/index /FerdaManual/Intro /FerdaManual/Installation /FerdaManual/Configuration /FerdaManual/Localization /FerdaManual/Two-factor Authentication *FERDA webadmin features*	Extended Ferda Administration Manual and Ferda's features section Added Two-factor Authentication section
		Source code	Updated repository paths and added new repositories
		/AdminManual/Installation/BinsUbuntu	Added fingerprint check to the installation process Change in adding required repositories
		Webwhois Django Templates	`webwhois/public_request_form_menu.html` replaced with `webwhois/include/public_request_form_fields.html`
		HTTP Statuses	Added a new section HTTP Statuses
	1.3	*System requirements*, /AdminManual/Installation/BinsFedora	Added support for RHEL/CentOS 8
	1.2	*Release Notes*	Expanded release notes for FRED 2.41.0
		Source code, /AdminManual/Installation/SourceTar	Reorganized source code structure and installation procedure
		Create keyset	Fixed minimum occurences of `<keyset:dnskey>` element in the EPP command
	1.1	/FerdaManual/index	Added Ferda Administration Manual
	1.0	*Release Notes*	Added release notes for FRED 2.41.0
		Top-level components	Replaced the diagram with clickable SVG
		System requirements	Added support for Fedora 31
		Introduction	Added listing of EPP specifications
		RDAP API Reference	Added status mapping reference
2.40	**1.1**	*Installation*	Corrected installation procedures
	1.0	*Release Notes*	Added release notes for FRED 2.40.0
		Legal Notice	Added legal notice for the FRED and the documentation
		Object modif. (Communication), *Object update (Poll message types)*	Added a new communication rule (notify a registrar of a domain about an update in a linked contact of another registrar)
2.39	**1.4**	*Poll message types*	Reworked this chapter a little, added more examples
	1.3	*Release Notes*	Added release notes for FRED 2.39.1 and 2.39.2
		System requirements	Upgraded supported Fedora versions

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Version	Edition	Segment	Change description
	1.2	/AdminManual/Installation/BinsUbuntu, /AdminManual/Installation/BinsFedora	Updated installation procedures - system registrar required for servers to launch
	1.1	*Customizing public web interface*	Added webwhois customization and template reference
	1.0	*Source code*	Added libfred component and updated build groups
		/AdminManual/Installation/SourceTar	Updated installation procedure with new tools
		Objects administration	Contact unblocking together with domain now possible
		Customization	Customization reworked for email templates and state-change notifications
2.38	**1.4**	*Release Notes*	Added release notes for FRED 2.38.{2,3,4,5} and FRED 2.39.0
	1.3	*System requirements*	Updated supported Fedora versions
		/AdminManual/Installation/BinsUbuntu, /AdminManual/Installation/BinsFedora	Updated installation procedures
	1.2	*Release Notes*	Added release notes for FRED 2.38.1
	1.1	*Release Notes*	Corrected the note in 2.38.0 about the `sendauthinfo` bugfix
	1.0	*Release Notes*	Added release notes for FRED 2.38.0, 2.37.3 and 2.37.2
		/ReleaseNotes/Upgrade-2-38	Added considerations before upgrade
		Invoicing and banking CZ-specific, *Billing*, *The Future of Payments & Invoices*, *Blackbox model*, *Top-level components*, *Configuration*, *Import & pairing of payments*, *Assign a payment to a registrar*	Added or changed according to PAIN Phase 1 (see *the release notes*)
		Disclosure of information, *Contact information disclosure*, *Policies & rules of disclosure*	Changed disclosure policies to configurable
		install-dist	Marked more packages as ported to setuptools
		Adding zone name servers	Changed syntax of the command
		Resolve a public request	Changed the name of the status of new public requests
		Life cycle parameters	Revised configuration of basic *db* parameters
		/AdminManual/Extensions, *Clients*	Removed *CZ-specific* front-end extensions, because they are not released to the public
		/AdminManual/Installation/BinsUbuntu	Revised the installation process a tiny bit
2.37	**1.6**	*Audit log feature*, *Audit log concept*	Added the audit log
	1.5	*Users and user interfaces*	Added an introduction to FRED's users and user interfaces
		Communication	Added an overview of FRED's communication (notifications, warnings, etc.)
		Public features	Added a list of Public interface features
	1.4	*EPP client workflow*	Added a description of a general EPP client workflow
		RDAP API Reference	Added an RDAP reference guide

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Version	Edition	Segment	Change description
		Distributed deployment example	Added an example of distributed deployment
	1.3	*Adding a registrar memo to annual reminders*	Added a configurable database table
		Billing	Added a very general description of handling money in the FRED
		Email Parameters Reference	Reviewed mail template parameters
	1.2	*System requirements*	Discontinued support for Ubuntu 14
		/AdminManual/Installation/BinsUbuntu	Updated the installation script and its description
	1.1	*Release Notes*	Added release notes for the version 2.37.1
		/ReleaseNotes/Upgrade-2-37	Added considerations before upgrading
		Contact merger	Corrected the definition of identical contacts
		Automatic contact merger	Added a cronjob
	1.0	*Release Notes*	Added release notes for FRED 2.37.0
		General features	Added GDPR compliance as a new FRED feature
		Policies & rules of disclosure	Added a new chapter
		Create contact, *Update contact*, *Info contact*	Improved explanations about information disclosure
		Object update	Added a poll-message type about contact update
		Objects administration	Added a new public-request type
		Processing public requests	Added a cronjob to process public requests for personal information
		Email Parameters Reference	Added a new email template for sending personal information
2.36	**1.2**	*Release Notes*	Added release notes for the version 2.36.1; upgraded to a newer Sphinx
	1.1	/AdminManual/Installation/SourceTar	Upgraded installation procedure to use source from GitHub, new signing key for secure apt
	1.0	*Release Notes*	Added release notes for FRED 2.36
		Concepts	Extracted to a separate publication
		Life cycle of registrable objects	Added object life cycle
		Contacts	Added contacts
2.35	**1.0**	*Release Notes*	Added release notes for FRED 2.35
		/ReleaseNotes/Upgrade-2-35	An ad-hoc guide to database upgrade specifics in this release
		System requirements	Increased minimum version of PostgreSQL
		Customization, *Email Params*	Changed email template database table name
		Features, *Features*, *Components*, *Components*, *Task*	Generation of historical record statements in Daphne
		Features admin	New administration feature to manage objects
		Source code	Added list of GitHub repositories
		ORB parameters	Added minimum omniORB settings for FRED servers
2.34	**1.1**	*Contact merger* and *Merge contacts*	Criteria of destination contact selection in an automatic merger, some minor rephrasing
		Update domain	Mention of nsset and keyset unlinking with empty elements
	1.0	*Release Notes*	Added release notes
		Diagram of FRED components	Removed dependency on `fred-logd` from `fred-pifd`
		Regular procedure and *Separate object deletion*	Procedures accept object types by name, new argument, removed dependency on `fred-rifd`
2.33	**1.2**	*Managed objects*	Added divergence from the standards of object mapping in FRED EPP
		DNScheck (Technical checks)	Expanded on the concept of technical checks
	1.1	*General features*	Added record statements feature, component and email template
	1.0	*EPP Reference Manual*	Added mailing address extension of contacts

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Version	Edition	Segment	Change description
		Error reasons	New texts of EPP error reasons
2.32		*Handle format validation*	Added configurable handle format validation
		Domain name format validation	Added configurable domain name format validation
2.31		*Automated keyset management*	Added *AKM* concept, components, task and email templates
2.30		*Contact merger*	Added contact merger concept, tasks and email template
		Email Parameters Reference	Added a new CS parameter
older		*Email Parameters Reference*	Added more email templates

CHAPTER

TWO

LEGAL NOTICE

Legal notice overview

- *No liability for CZ.NIC*
- *Data protection notice*
- *Governing law and prorogation of jurisdiction*
- *Terms of use of the FRED logo*

2.1 No liability for CZ.NIC

Except in cases of harm caused by wilful or gross negligence, or harm to a person's natural rights, or to the maximum extent possible by the user's legal order, the CZ.NIC shall not in any event be liable for any direct or indirect harm resulting from the use (including installation) of the FRED, including, but not limited to, harm of reputation or name, the damage caused as a result of the disruption of work, loss or damage to data or any loss of economic nature (eg. loss of profits, turnover, anticipated savings, etc.).

Please note that the information included in this documentation is not of a nature of a guarantee, expressed explicitly or resulting from circumstances (implicitly), in particular guarantees of suitability for a specific purpose or guarantees of applicability in jurisdiction other than that of the Czech Republic.

2.2 Data protection notice

The FRED has been developed in the Czech Republic and its personal data protection policies are in compliance with the personal data protection laws of the Czech Republic, including the opinions of The Office for Personal Data Protection. Before using the FRED outside the Czech Republic, make sure that its privacy policy meets the requirements of the country's legislation.

2.3 Governing law and prorogation of jurisdiction

The FRED documentation (and related documents) shall be governed by and construed in all respects in accordance with Czech law and each of the users using or implementing FRED hereby prorogates the exclusive jurisdiction of the Arbitratiton Court attached to the Czech Chamber of Commerce and the Agricultural Chamber of the Czech Republic („Court“). Any dispute, controversy or claim arising out or relating to using FRED (or this documentation), incl. its interpretation, performance, invalidity, no event etc. shall be finally set by the above mentioned Court by a sole arbitrator appointed by the President of this Court in accordance with the Rules of that Court.

2.4 Terms of use of the FRED logo

The CZ.NIC is the executor of the property copyright of the FRED logo and its derived modalities. The CZ.NIC hereby authorizes the FRED logo and its derived modalities to be used in connection with the implementation, the use of the FRED and its promotion or promotion of the CZ.NIC and its products, in all the usual ways of using a logo. The right to use the FRED logo and its derived modality is free of charge, non-exclusive, unlimited in quantity, territorial unlimited and limited in time in relation to the use of the FRED. The user is not obliged to use the FRED logo and its derived modalities. Without the consent of the CZ.NIC, the right to use the FRED logo and its derived modalities may not be referred to a third party. The FRED logo and its derived modalities may not be misused to damage the reputation of the CZ.NIC or used contrary to the interests of the CZ.NIC. In no way may the FRED logo and its derived modalities be disparaged or used in an used in a undignified manner.

The FRED logo and its modalities must be depicted as indicated in the graphical manual[1] and only be used in this depiction.

[1] See FRED logo guide on the FRED web site.

CHAPTER

THREE

TYPOGRAPHIC CONVENTIONS

3.1 Font styles

italics

- general light in-line emphasis
- labels of elements in user interfaces (button names, form field labels, tab and window titles, menu selections)

bold

- general strong in-line emphasis
- names of executables (programs, scripts)

`monospace`

- file names, directory names, paths
- names of parameters, variables and arguments
- commands and code snippets
- names of modules, libraries and packages
- constant values and other literals

3.2 Links

External and internal links are differentiated with the following styling:

- *internal link*
- external link

3.3 Code snippets

Code snippets are set in a monospace font and they are highlighted according to the language of the snippet. Example:

```
#!/bin/bash
variable="Hello world!"
echo $variable
```

3.4 Special characters

Angle brackets < >

Angle brackets are sometimes used in code illustrations, like this:

```
# Running a program
program-name <arguments>
```

The `<arguments>` part suggests that program arguments should follow. The text inside the brackets gives a hint on the type of arguments, however if you are uncertain, consult the program help.

Concrete arguments are usually entered *without* the brackets!

Square brackets [ ]

Square brackets usually signify something optional, like command arguments that may be used (or not used), unless specified otherwise. Again, if you decide to use an optional argument, enter it *without* the brackets.

3.5 Admonitions

Admonitions are used to highlight a block of text that has special importance. Several types of admonitions are distinguished by their severity/importance:

Warning: advisory information that states that performing some action may lead to serious or dangerous consequences (what the user must not do)

Caution: advisory information that states that performing some action may lead to consequences that are unwanted or undefined, such as loss of data or an equipment problem (what the user should not do)

Important: advisory information that states that a certain action must be performed where inaction may lead to unwanted or undefined consequences (what the user must do)

Note: advisory information in addition to the surrounding text (what the user should know)

Tip: advisory information how to use a product more efficiently or in a way that is not apparent (what the user can do or know)

3.6 Authoring notes

Authoring notes—or TODOs—usually hold suggestions for new topics or notes about pending improvements. The TODOs are visible in the text, if their output is allowed in project configuration.

If you cannot see a green rectangle before this paragraph, the TODO output is disabled.

3.7 Semantic markup overview

This overview exists just for checking that semantic markup has correct styling.

In-line:

- ABBR (explanation) – abbreviation with an explanation (`abbr`)
- `file.txt` – file name (`file`)
- *Cancel* – GUI label (`guilabel`)
- *Menu* ‣ *Submenu* ‣ *Option* – menu selection (`menuselection`)
- **`script.sh`** – program name (`program`)
- *FQDN* – link to a term definition in the glossary (`term`)
- `in-line code` or `in-line code` – in-line code (`code` role or ``literal``)

CHAPTER

FOUR

GLOSSARY OF TERMS

Acquirer
a person or an organization that acquires the system

AKM
automated keyset management, see also the *AKM concept*

CLI
command-line interface

Customer
a registrar or registrant or end user

CZ-specific
This feature, setting or component is specific to the CZ.NIC and may require customization before it can be used in another environment.

db
database

Designated registrar
The registrar who is in management of a registrable object, also called the sponsoring registrar.

DNSSEC
DNS Security Extensions, a suite of specifications for securing certain kinds of information provided by the Domain Name System (DNS) as used on Internet Protocol (IP) networks. See also **RFC 4033**, **RFC 4034**, **RFC 4035**.

Domain owner
See *Registrant*.

Drop catching
The process of acquiring a domain name immediately after it has been deleted from the registry. This is often done by automated systems to target and register domains the moment they become available.

ENUM
electronic mapping of telephone numbers, see also About ENUM (CZ.NIC) or ENUM (ICANNWiki)

EPP
extensible provisioning protocol, see also the *EPP Reference Manual* or **RFC 5730**

Feature
a user-visible aspect, quality or characteristic of software

FQDN
Fully Qualified Domain Name (an absolute domain name) contains labels of all nodes up to a TLD and the root domain.

GDPR
General Data Protection Regulation. Wikipedia, Regulation (EU) 2016/679 (official source)

Gloss
Simple logging backend.

Holder
See *Registrant*.

KEYSET
Key set, a shared object that contains a list of DNSSEC keys and is referenced by domains.

Label
A name of a node in the DNS.

NSSET
Nameserver set, a shared object that contains a list of nameservers and is referenced by domains.

Object owner
A contact which is authorized to request changes of a *registrable object*. These are the technical contacts in nssets and keysets, the contact itself, or the *domain owner*.

PAIN
PAyments and INvoices. See *The Future of Payments & Invoices*.

Public request
This is a request that is submitted directly to the Registry through its public website, see *Public requests*.

RDE
Registry Data Escrow (RDE) is the process by which a registry periodically submits data deposits to a third party called an escrow agent. These deposits comprise the minimum data needed by a third party to resume operations if the registry cannot function and is unable or unwilling to facilitate an orderly transfer of service. See **RFC 8909**

Registrable object
A data object stored in the Registry that can be registered and modified by registrars. There are four types: domains, contacts, nssets, and keysets.

They are also called *managed objects* in the EPP.

Registrant
Registrant is the contact which is assigned as the domain owner; also called the holder.

ROID
Repository object identifier, generated by the Registry during creation of a registrable object.

This identifier should uniquely identify the object world-wide. It is composed of two parts separated with a hyphen, e.g. `D0010123116-CZ`. The first part is unique within the Registry and is defined by the Registry. The second part (Repository id suffix) must be unique world-wide and it is assigned to the Registry by IANA organization.

Sponsoring registrar
See *designated registrar*.

VAT
value-added tax

CHAPTER

FIVE

OVERVIEW

This document provides overview of all major FRED features, which are further explained in the *Features* section.

Target audience

Acquirers, testers, system administrators, developers

Purpose

Determining if the system can satisfy your needs, comparing it with other products, finding advanced or not-so-obvious usage, having a checklist for verification.

FRED (Free Registry for ENUM and Domains) is open-source domain name registry software developed by CZ.NIC, the operator of the `.cz` country-code TLD. It provides the full stack a registry operator needs: an EPP server for registrars, Web whois service, WHOIS & RDAP protocols for the public, a web and CLI administration interface for operators, and a zone generation pipeline – all distributed as packaged software.

The sections below group features by area.

5.1 Deployment & Platform

Plug and play

FRED is distributed as pre-compiled binaries. Installation requires only three steps: installing the package, setting the target domain, and starting the system.

Registry operators who require custom builds or need to target platforms outside the pre-packaged distributions may also compile FRED directly from source.

Reliability

FRED has been in active development since 2006 and has proven itself as a production system behind the .cz TLD, operated by CZ.NIC. For demonstration, registry statistics are published here.

Core registry services are implemented in C, data is stored in PostgreSQL, utilities and external integrations use Python 3. Both are industry-standard choices with well-understood operational characteristics and long-term ecosystem stability.

High performance

FRED is optimised for high throughput at scale. On common server-grade hardware it can process roughly 200 registry-changing operations per second – covering registrations, updates, renewals, and deletions – with databases of up to 20 million domains tested (as per recent benchmarks).

Modularity

FRED consists of many different *modules and components*. One of the advantages of this design is that you can install only the modules you want to use. Different components of FRED can even be installed on different servers, which provides better scalability and the ability to apply different security policies to different parts of the system. FRED is also capable of running in a single-server configuration, which is useful for testing and experimenting.

Open source

FRED is published under the open-source GNU GPL licence, giving registry operators full access to the source code and the freedom to inspect, modify, and redistribute the software. Open access to the codebase also strengthens security and trust because anyone can read and audit the code, vulnerabilities and bugs are more likely to be spotted and reported by the broader community rather than discovered silently by malicious actors.

Online documentation

FRED is documented online at https://fred.nic.cz/documentation, covering installation, configuration, operation, and development.

5.2 Core Registry Operations

Relevant primarily to registry operators.

Zone support

FRED supports a variety of DNS zone types, including country-code top-level domains (ccTLDs), generic top-level domains (gTLDs), and second-level domains (SLDs).

Automated zone generation

FRED includes a registry backend, API, and client for generating *zone files* on either the registry core machine or a hidden master. Generation is configurable per zone and supports post-run script execution. This can be, for example, used to validate output or notify operators of failure. Zone files generated can also be customised with headers and footers.

Configurable domain lifecycle

The duration of specific periods in the *domain lifecycle* – such as registration, renewal, and expiry windows – can be customised per zone.

Domain auto-renewal

FRED supports setting up automatic renewal for domains that expire.

Anti-drop catching

To reduce the incentive for *drop catching*, FRED releases expired domains at randomised intervals rather than at a fixed, predictable time. This makes it significantly harder for automated systems to target and register domains the moment they become available.

Domain auctions

FRED supports an optional domain auction lifecycle for expired and deleted domains. Rather than releasing domains immediately to EPP registrars, eligible domains can be auctioned publicly, giving any interested party the opportunity to acquire them. This broadens access beyond professional domainers and reduces the volume of speculative EPP traffic from registrars monitoring for drops.

Object grouping and shared relation management

Nameservers and DNSSEC keys are represented as shared set objects at the registry level – NS sets (nssets) and key sets (keysets) – rather than being attached to individual domains. This allows multiple domains to reference the same set, reducing duplication and simplifying bulk updates. Registrars can also be assigned to groups for organisational purposes.

Registry object locking

FRED provides a range of *object states* that control permissions for operations such as updates, linking, deletion, and transfer. States can be set by the registry operator; a defined subset can also be requested directly by registrants, giving domain holders some degree of self-service control over their objects.

Registry object name validation

FRED can be configured to enforce *naming rules* for domain objects. The default enforces RFC 1035 preferred syntax, and additional custom rules may be added to meet local policy or regulatory requirements.

Domain blacklist

FRED supports a configurable blacklist that prevents registration of specific domain names. Both exact matches and regular expressions are supported.

DNSSEC

FRED supports *DNS Security Extensions (DNSSEC)* out of the box. The registry manages the creation, storage, and manipulation of DNSSEC keys internally, while the zone-signing process is delegated to external tools. This separation gives operators the flexibility to choose whichever DNSSEC tooling best meets their security and performance requirements.

DNSSEC automation

FRED supports *Automated Key Management (AKM)* as defined by RFC 7344 and RFC 8078, allowing domain holders to delegate DNS key administration to the registry by publishing CDNSKEY records.

Registry superadmin registrar

FRED supports the concept of *system and internal registrars* with elevated privileges. These accounts can view and edit objects belonging to standard registrars through EPP.

Registry data escrow

FRED supports Registry Data Escrow, an ICANN-required feature for compliant registries. It generates periodic exports of registry data in a defined format that can be used to reconstruct the registry on an alternative system in the event of provider failure.

5.3 Registrar Interface

Relevant primarily to registrars and registry operators managing registrar relationships.

EPP server

FRED includes an Apache module that acts as a translation and validation layer between the public *EPP* endpoint and the internal registry. It converts and validates EPP XML requests and responses, and provides an additional security boundary between the registry core and the publicly accessible interface. Granular access controls are supported, including deny lists, IP address ranges, and SSL certificate requirements.

Encryption of registrar communication

SSL encryption can be enforced for all requests to the EPP server.

Registrar session management

The registry can be configured to limit the number of parallel EPP sessions allowed per registrar, helping to prevent resource exhaustion and enforce fair use across registrar accounts.

Poll messages

FRED implements an extension to EPP called *poll messaging*, allowing registrars to receive notifications about registry events that were not triggered by their own actions. This includes time-based events such as domain expiry and deletion of idle objects, as well as events triggered by other registrars (such as transfers) or by the registry itself (such as the results of contact merges).

Registrar credit

FRED includes an optional *credit system* that assigns a configurable cost to EPP operations such as domain creation and renewal.

Pricing customisation

The amount of credit consumed by each EPP request type is configurable, giving registry operators fine-grained control over the cost model applied to registrar operations.

Registrar certification

FRED supports registrar certification management. This certification is an incentive programme designed to encourage best practices across the DNS ecosystem. Certification covers areas such as IPv6, *DNSSEC*, technical support, and security. It gives registrars a structured path to demonstrate competence, motivates full use of registry capabilities, and provides domain registrants with a basis for evaluating registrar quality. Certification can then be issued and displayed, for example, on the registry operator or registrar websites.

CLI EPP client (eppic)

FRED includes *eppic*, a command-line EPP client built on the epplib Python utility library. It is suitable for registrars that lack the resources to develop their own EPP client, and is also useful for registry administrators and internal registrars who need to perform manual or automated tasks against the EPP interface.

5.4 Administration & Monitoring

Relevant primarily to registry operators and system administrators.

GUI administration interface

FRED comes with a plugin-based, extensible web administration interface for registry operators called *FERDA*. It provides access to registry data and audit logs, control over registry processes such as registrant verification, and tools for administering automated reports.

CLI administration interface

FRED includes a command-line administration tool, *fred-admin*, intended for installation procedures and automation tasks. It provides scripting-friendly access to administrative functions.

Two-factor authentication for administration

FERDA supports two-factor authentication (2FA) and can be configured to require hardware security keys in addition to passwords.

Administrator access and permission control

FERDA supports *role-based access control*, allowing different administrator accounts to be granted different combinations of read, write, and execute permissions across FERDA modules.

Audit logging

All registry interactions are extensively logged. Logs are accessible through the *FERDA* graphical administration interface, giving operators a full *audit trail* of activity of each FRED service across the system.

Object history

In addition to audit logging, every change made to an object in the registry creates a snapshot, which can be reviewed in *FERDA*.

Registry reports

FERDA includes a reporting plugin that allows operators to generate on-demand reports from SQL queries against the registry database. Reports can filter data based on input from the user and can be exported as csv.

Registrant verification

A *FERDA* plugin and a companion web portal that allows the registry to request *information verification* from domain owners. For example via EU NIS2-mandated checks or eID authentication in order to detect and address false, incomplete, misleading, or fraudulent registrant data.

Notifications

FRED provides an interface for sending and monitoring outgoing messages to registrants and contacts, supporting email, SMS, and postal letters. Message content is fully customisable through Jinja2 templates, managed via the *Messenger*, *Secretary*, and *File Manager* components.

Message automation

Registry and registrar operations automatically trigger notifications to the relevant object registrants or technical contacts.

5.5 Public Interface

Relevant primarily to registry operators and developers building public-facing clients.

Web WHOIS

FRED provides a two-layer *WHOIS* interface consisting of a basic web frontend and an underlying API. This allows registry operators to integrate WHOIS and public request services into their own websites, or to expose them as standalone services.

Unix WHOIS

FRED supports the traditional *WHOIS* protocol, allowing public information about registry objects to be queried via standard WHOIS clients.

RDAP

FRED supports the *Registration Data Access Protocol (RDAP)*, the modern successor to WHOIS. RDAP provides structured, standardised responses, making it better suited than WHOIS for programmatic access and privacy-aware disclosure policies.

Public interface for registrants

FRED provides a *public-facing API* that allows registrants to request changes to object states directly, without needing to route those requests through their registrar.

Domain browser

FRED includes a publicly accessible web service that allows authenticated domain registrants to view registry information about the objects they own or administer. The Domain Browser supports OIDC (OpenID Connect) authentication and provides an interface for registrants to request object locks directly, without registrar involvement.

5.6 Compliance & Data Protection

Relevant primarily to registry operators operating under GDPR or ICANN obligations.

GDPR compliance and registrant contact disclosure

FRED can be configured to restrict *disclosure of registrant contact information*, both to the general public and to other registrars. Registrars cannot access non-public information about objects they do not administer, supporting compliance with GDPR and similar data protection frameworks.

Registrant deduplication

FRED can automatically detect and *merge* registry contacts that share duplicate information. Manual merging is also supported for cases requiring operator review, accessible via the API or the Domain Browser interface.

5.7 Integration & Extensibility

Relevant primarily to developers and registry operators extending FRED.

Client libraries

CZ.NIC develops and maintains Python utility libraries that provide gRPC clients for FRED services, including the registry core, EPP, public requests, and Messenger components. These libraries are available at /fred/utils/ and are intended to support development, automation, diagnostics, and testing workflows of registry operator or developers building software which interacts with the registry in some way.

Domain delegation diagnostics

FRED can be integrated with Zonemaster via *dnscheck* to continuously monitor the quality of domain delegations based on nameserver data stored in the registry. This helps operators identify and address delegation problems proactively.

Globalblock compatibility

FRED can be integrated with the *Brand Safety Alliance GlobalBlock* service to automatically enforce copyright protections, preventing registration of domain names that infringe on protected marks.

KNOT/BIND compatibility

Zone files generated by FRED are fully compatible with both the KNOT and BIND DNS server platforms, ensuring operators are not locked into a specific DNS server implementation.

BIRD compatibility

FRED is fully compatible with the BIRD internet routing daemon, allowing registry operators to integrate FRED into routing infrastructure that uses BIRD.

Advanced DNS analytics and measurements

CZ.NIC offers contractual access to ADAM (Advanced DNS Analytics and Measurements), a service providing detailed DNS analytics and measurement data. FRED is compatible with ADAM for registry operators who require this level of visibility into DNS traffic patterns.

5.8 Commercial Services

Available from CZ.NIC for operators who require formal support or managed deployment.

Support services

In addition to informal community support, CZ.NIC offers formal software support contracts for FRED deployments. These contracts include defined service level agreements (SLAs) and cover implementation assistance and ongoing operation of domain registry systems.

FRED software as a service

CZ.NIC offers a managed service option in which FRED is installed and operated by CZ.NIC on behalf of the registry operator, under a defined SLA.

Anycast

Registry operators can contract CZ.NIC to utilise its anycast network infrastructure, improving DNS resolution resilience and latency for end users across multiple geographic locations.

On-site support

CZ.NIC offers contractual on-site training for technical staff, covering FRED's capabilities and operation. Training is delivered at the client's premises by CZ.NIC personnel.

Remote support

CZ.NIC offers contractual remote training sessions for technical staff as an alternative to on-site delivery, covering the same subject matter with the convenience of remote access.

Information service

CZ.NIC provides an information service for registry operators, administrators, and developers, covering FRED and its related software components.

Priority development

Clients with contractual agreements are involved in shaping the future development roadmap for FRED, including feature priorities. This gives operators a direct channel to ensure the software evolves in line with their operational needs.

CHAPTER

SIX

QUICK START GUIDE

The main goal of FRED is to administer authoritative information on domains, domain ownership and owners which is then distributed via the DNS (zone file) as well as served in response to public queries (whois, rdap etc.). To accomplish this, the system allows to input the relevant information into its database through the registration process and comprises the means to administrate existing data.

This document is intended for broader audience intending to make first steps in learning about running a domain registry using FRED.

For full overview of FRED capabilities please refer to *Features* and *Concepts*

Target audience

System administrators, developers, testers

Purpose

General knowledge of base concepts required to operate the registry software.

Terms & definitions

Terms and definitions can be found *in the glossary*.

6.1 Core registry concepts

The relevant information obtained by the registration process is grouped into so-called **registrable objects**.

To ensure the authenticity of the data, only authorized entities (**registrars**) can perform registrations and modify existing data in the Registry. FRED is structured according to the *Registry–Registrar–Registrant model*. Registrars communicate with the Registry on behalf of **registrants** (domain owners).

See also:

Concepts – full list of concepts with details

6.1.1 Registry objects

Data stored in the Registry that can be registered and modified by registrars are called objects.

There are four types of objects:

- domains (regular or ENUM)
- contacts – domain owners, administrative contacts or technical contacts. FRED can manage both natural and legal persons.
- nssets – a group of name servers
- keysets – a group of *DNSSEC* keys

Objects can be shared, i.e. one contact can be used multiple times with domains, nssets or keysets. Similarly, one nsset or keyset can be linked to several domains.

While it is common to store information about nameservers as separate entities, it is not the case that a nameserver exists as an individual entity in the domain name system. To reflect this, FRED stores nameservers as sets, in order to better reflect the actual use of nameservers. Same applies for DNSSEC keys.

6.1.2 Registry interfaces

FRED separates access to the registry into three distinct interfaces, each designed for a different group of users with different needs and levels of trust. This separation ensures that registrars, administrators and the general public can only perform the operations appropriate to their role.

Administrator Interface
: Registry staff use the *FERDA web application* and the `fred-admin` *CLI* to search, inspect and manually edit registry objects; all activity is recorded in a searchable *audit log*. They can also annually approve/reject the submitted requests made via the public interface after an identity verification.

Registrar Interface
: Registrars connect over *EPP* to create and manage domains, contacts, nssets and keysets; each registrar authenticates with a client certificate and password.

  For more information see *registrar features*

Public Interface
: Anyone can query public registry information via *Unix WHOIS*, the *Web WHOIS* web application, or the *RDAP*. Registrants (and general public) can use the *Web Whois* applications to request an object's authorization password, *request a block or an unblock* of their object. They can also download a *signed PDF statement* of any registry record.

  For more information see *public interface features*

6.2 Basics of registry operations

6.2.1 Registry Operations

This chapter walks you through the day-to-day operation of a FRED-based registry – from exploring a pre-configured demo environment, through hands-on work with registry objects, to the administrative and periodic tasks that keep the registry running.

- *The demo environment*
- *Hands-on with registry objects*
  - *Creating and managing objects via EPP*
  - *Viewing objects through WHOIS and RDAP*
  - *Administering objects in FERDA*
- *Zone file generation*
- *Registry management*
  - *Creating a new zone*
  - *Creating a registrar*
  - *Managing registrar access*
  - *Preparing billing*
  - *Object states*
  - *Periodic tasks*

The demo environment

FRED ships with a demo installation that lets you explore a fully functional registry without having to configure anything from scratch. The demo is the recommended starting point for new administrators.

You can download the demo image and run it on a local virtual machine from https://fred-demo.nic.cz/.

For comprehensive setup instructions, SSH connection details, and service access information, see the *FRED demo*. Once your environment is running, continue below.

Hands-on with registry objects

Registry objects – domains, contacts, nssets and keysets – are the core data that FRED manages. This section shows how to create and inspect them using each of the available interfaces.

Creating and managing objects via EPP

Registrars interact with FRED exclusively through the EPP (Extensible Provisioning Protocol) interface on TCP port 700 (TLS). The full command reference is in the *EPP Reference Manual*.

A minimal session follows the pattern:

1. **Connect and authenticate** – open a TLS connection, send a `login` command with your handle and password.
2. **Operate** – send `create`, `info`, `update`, `delete` or `renew` commands for the object types you are accredited for.
3. **Log out** – send `logout` to close the session.

Tip: For interactive testing during the demo, use the `eppic` client that is bundled with FRED:

```
fred@localhost:~$ eppic
```

The default configuration connects to the demo registry with the `REG-DEMO` credentials. This can be changed by editing the `/etc/eppic/eppic.conf` file or by passing command-line arguments.

More information about `eppic`, including installation and configuration, is available in EPPIC repository.

FRED-eppic examples

```
create-contact --id=CID-DEMO1 --postal-info.name='Jan Novak' --postal-info.addr.
↪street-1='Milešovská 1136/5' --postal-info.addr.city='Praha' \
 --postal-info.addr.pc='130 00' --postal-info.addr.cc='CZ' --email='jan.novak@example.
↪cz'
```

```
create-domain --name=example-domain.demo --registrant=CID-DEMO1
```

```
create-nsset --id=NSID-DEMO1 --nss-1.name=ns1.test.demo --tech-1=CID-DEMO1
```

```
create-keyset --id=KSID-DEMO1 --dnskeys-1.flags=257 --dnskeys-1.protocol=3 --dnskeys-
↪1.alg=5 --dnskeys-1.pub-key=kfdajdfa --tech-1=CID-DEMO1
```

```
update-domain --name=example-domain.demo --nsset=NSID-DEMO1 --keyset=KSID-DEMO1
```

```
info-domain --name=example-domain.demo
```

Tip: To view all commands and their arguments, or details about a specific command, run:

```
REG-DEMO@localhost > help

REG-DEMO@localhost > help --command=create-domain
```

For a full description of a typical registrar session, see the *EPP client workflow concept*.

Viewing objects through WHOIS and RDAP

FRED exposes every non-restricted registry object through three read-only public interfaces.

Unix WHOIS

A plain-text query/response protocol, is useful for scripting and quick lookups.

```
whois -h localhost example-domain.demo
```

WebWHOIS

A browser-based interface that renders the same data in HTML. You can access it at the location provided in *fred-demo services list* or example below.

```
https://localhost:8444/domain/example-domain.demo/
```

RDAP (Registration Data Access Protocol)

A new protocol that supersedes WHOIS for machine-readable lookups; standard tools like `curl` or `wget` can be used to query it. The output is in JSON format and includes metadata about the objects, such as their state, history, linked objects, etc.

FRED supports domain, nameserver, entity, nsset and keyset queries:

```
curl https://localhost:8446/domain/example-domain.demo --insecure
```

```
curl https://localhost:8446/entity/CID-DEMO1 --insecure
```

```
curl https://localhost:8446/fred_nsset/NSID-DEMO1 --insecure
```

```
curl https://localhost:8446/fred_keyset/KSID-DEMO1 --insecure
```

```
curl https://localhost:8446/entity/REG-DEMO --insecure
```

Note: In case of the demo environment, the `--insecure` flag is required to bypass TLS certificate verification, since the demo uses self-signed certificates.

Full endpoint documentation: *RDAP API Reference*.

Administering objects in FERDA

FERDA is the web-based administration interface used by registry staff running as a Docker container. It connects to FRED's *administration interface (ADIF)* and provides the following modules:

- **Registry – search and inspect all registry objects, their linked objects and history.**
  - **Registrars** – view and edit registrar details, manage their EPP and zone access.
  - **Notifications** – view and manage additional notifications about expiration and deletion of domains.
- **Messages** – view all messages generated by the registry.
- **Reports** – generate custom reports on registry data and activity.
- **Logger** – view the audit log of all operations performed from multiple services
- **Requests** – approve or reject requests from the public interface, such as block/unblock requests or authinfo requests.

Note: All write operations performed in FERDA are recorded in the FRED audit log database and can be reviewed in the *Logger* module of FERDA.

For more reference see *FERDA webadmin features*.

Zone file generation

FRED periodically reads the registry data directly from the database and generates a zone file that contains all domains that are not marked with the `serverOutzoneManual`, `unguarded` or `nssetMissing` flag.

Running the generator

```
sudo /usr/sbin/fred-zone-generator --config /etc/fred/fred-zone-generator.conf
```

The output path and file name are configured in the generator's configuration file (`/etc/fred/fred-zone-generator.conf`).

Displaying the zone file

```
fred@fred-demo:~$ less db.demo

$TTL 18000 ;default TTL for all records in zone

demo.    IN      SOA     some.ns.test.demo.      hostmaster.domain.demo. (1780910078␣
↪900 300 604800 900)
         IN      NS      other.ns.test.demo.

test-domain.demo.        IN      NS      ns1.test-domain.demo.
test-domain.demo.        IN      NS      ns2.test-domain.demo.
ns1.test-domain.demo.    IN      A       111.222.111.222
ns2.test-domain.demo.    IN      A       222.111.222.111
```

Loading the zone into a DNS server

Zone file generation is where FRED's responsibility ends and you have to publish the generated file to the DNS server, such as BIND or KNOT DNS.

For more reference see *Zone generation*.

Registry management

The following section shows an examples of regular tasks during the registry initialization and administration.

Creating a new zone

In order to manage domains in certain zone you must first create it.

```
sudo fred-admin --zone_add \
    --zone_fqdn=example \
    --ex_period_min=12 \
    --ex_period_max=120 \
    --ttl=18000 \
    --hostmaster=hostmaster@mail.example \
    --ns_fqdn=ns.nic.example
```

```
sudo fred-admin --zone_ns_add \
    --zone_fqdn=example \
    --ns_fqdn=ns.nic.example
```

Note: Only one price can be active for a given operation and zone at one time.

Important: Choose `--ex_period_min` carefully: it defines the smallest unit of registration/renewal periods (e.g. `12` means whole years only).

Zone parameters cannot be changed after creation except by direct database intervention.

Note: It is also possible to add a second level domain as a zone, for example `second.example`.

For more reference see *Preparing a zone*.

Creating a registrar

```
sudo fred-admin --registrar_add \
    --handle=REG-EXAMPLE --reg_name="Example Registrar Ltd." \
    --organization="Example Registrar Ltd." \
    --dic="12345678" \
    --street1="Milešovská 1136/5" \
    --city="Praha" \
    --country=CZ \
    --email=support@example-registrar.cz \
    --url=http://www.example-registrar.cz
```

Note: Registrar details (name, address, contact information) can be edited later through the FERDA web interface.

Important: Registrars created with the `--system` flag are designated as **system registrars**. This applies to the demo's `REG-SYSTEM` and `REG-DEMO`, any operations performed through system registrars are **never billed** and bypass the billing subsystem entirely. This ensures that internal registry operations, automated background processes, and administrative actions remain unaffected by credit limits or pricing rules.

Managing registrar access

Each registrar must have a client certificate and a password assigned before they can connect via EPP.

Assigning credentials

```
openssl x509 -noout -fingerprint -md5 \
    -in /usr/share/fred-eppic/ssl/test-cert.pem | cut -d= -f2
```

Note: If you are using a different certificate than the default one for REG-DEMO registrar, make sure to adjust the path accordingly.

```
sudo fred-admin --registrar_acl_add \
    --handle=REG-EXAMPLE \
    --certificate="6A:AC:49:24:F8:32:1E:B7:A1:83:B5:D4:CB:74:29:98" \
    --password=password
```

Warning: Certificate fingerprint must be written in uppercase.

Granting zone access

A registrar must be explicitly permitted to manage objects in given zone:

```
sudo fred-admin --registrar_add_zone \
    --zone_fqdn=example \
    --handle=REG-EXAMPLE \
    --from_date="2026-01-01"
```

For more reference about creating registrar and adding their credentials, see *Preparing registrars*.

Blocking and unblocking a registrar

Registry administrators can suspend a registrar's EPP access at any time via the `fred-admin` CLI.

Preparing billing

The billing subsystem tracks credit, charges registrars for EPP operations and generates invoices. It is disabled by default.

To **enable charging**, set the following in configuration files `/etc/fred/server.conf` ([rifd] section) and `/etc/fred/fred-rifd.conf`:

```
epp_operations_charging = true
```

and restart the services:

```
sudo systemctl restart 'fred-*'
```

When billing is enabled, perform these initialization steps:

1. Create a price list

Prices are defined per operation, per zone, with optional validity periods:

```
sudo fred-admin --price_add --operation='CreateDomain' \
    --zone_fqdn=example \
    --valid_from='2026-01-01 00:00:00' \
    --operation_price=0 --period=1
```

```
sudo fred-admin --price_add --operation='RenewDomain' \
    --zone_fqdn=example \
    --valid_from='2026-01-01 00:00:00' \
    --operation_price=160 --period=1
```

Note: CreateDomain is intentionally set to zero, because the first domain renewal is made upon domain registration, that means that a registration of a new domain is in fact billed as 2 operations: CreateDomain + RenewDomain whereas a renewal of an existing domain is billed only as one operation RenewDomain.

2. Set up invoice numbering

```
sudo fred-admin --add_invoice_number_prefix \
    --prefix=26 --zone_fqdn=example \
    --invoice_type_name=advance
```

```
sudo fred-admin --add_invoice_number_prefix \
    --prefix=25 --zone_fqdn=example \
    --invoice_type_name=account
```

```
sudo fred-admin --create_invoice_prefixes --for_current_year
```

3. Assign initial credit to registrars

```
psql --expanded -U fred -c "SELECT id as registrar_id FROM registrar WHERE handle =
↪'REG-EXAMPLE';"
```

```
psql --expanded -U fred -c "SELECT id as zone_id FROM zone WHERE fqdn = 'example';"
```

```
sudo fred-admin --invoice_credit \
    --zone_id=<zone-id> --registrar_id=<registrar-id> \
    --price=15000
```

For the complete billing reference, including VAT configuration, see *Preparing billing*.

Object states

Every registrable object (domain, contact, nsset, keyset) carries a set of *flags* that together form its current *state*. States determine which operations are allowed for the object and whether it appears in the DNS zone.

Flags fall into two categories:

Automatic flags
Set and cleared by FRED based on time and other conditions, for example:

- `expirationWarning` / `expired` / `unguarded` – domain registration expiry flow
- `deleteCandidate` – object scheduled for removal
- `outzone` – domain excluded from the zone file

Manual flags (prohibitions)
Set by the registrant (user locks) or by the registry administrator (administrative blocks), for example:

- `serverUpdateProhibited` – prevents EPP updates by the registrar
- `serverDeleteProhibited` – prevents deletion
- `serverTransferProhibited` – prevents transfer to another registrar
- `serverInzoneManual` – explicitly allows generation to the zone
- `serverOutzoneManual` – prevents domain to be generated to zone
- `serverBlocked` – prevents public requests for object's update and transfer

Object states can be inspected via *WHOIS, RDAP, WebWHOIS* and *FERDA*.

See also:

Life cycle of registrable objects – full state diagrams, transition rules and prohibitions for each object type.

Periodic tasks

In the demo image, no automatic tasks are configured. You have to either configure them or run each task whenever you need to.

Several registry operations should be scheduled to run automatically. The table below lists the most important ones; all tasks are invoked automatically via cron.

Task	Typical schedule	Purpose
`fred-zone-generator`	every 30 min	Generate a fresh zone file for each configured zone.
`fred-admin --object_regular_procedure`	00:00 and 12:00	Update object states, send expiry notifications and delete objects that have reached `deleteCandidate`.
`fred-notify-object-state-changes`	immediately after above	Dispatch notifications about state changes (required since FRED 2.48.0).
`fred-admin --poll_create_request_fee_messages`	daily (night)	Generate EPP poll messages about request-quota usage.
`fred-notify-contact-data-reminder`	daily	Send annual reminders to contacts to verify their data.
`fred-admin --process_public_requests`	every 5 min	Process requests from the public interface, such as block/unblock requests or authinfo requests.

Important: The `object_regular_procedure` job is critical for registry correctness. If it does not run, object states will not advance and expired domains will not be deleted on schedule.

For the complete cron configuration and all available options, see *Periodic tasks*.

Note: If you are running the demo environment, periodic tasks are not set up by default. You can run them manually as needed, for example:

```
sudo fred-admin --object_regular_procedure
```

6.3 Registry infrastructure basics

A domain name registry must conform to a wide range of requirements. While the decisions in terms of architecture and infrastructure must be subject to a thorough analysis with regards to specific use case, here is a general model of how FRED is intended to be deployed. For full reference visit *Architecture description*

6.3.1 Single instance on single machine

Intended for personal use, primarily for learning and demonstration purposes.

6.3.2 Single instance on multiple nodes

Deploying FRED on multiple servers brings at least two advantages:

- increased performance
- access control on the network level

Deploying on multiple physical servers is not the only distributed solution, deploying on virtual servers or separating tasks on the process level is also possible.

Single instance on multiple nodes setup is usually utilised for internal test, staging and pre-production environments.

6.3.3 Multiple instances of multi-node setup in master-slave configuration

Given that production environments have increased requirements for stability and accessibility, it is sensible to deploy multiple instances, so in case of failure, another instance can step in and keep providing the service without downtime.

See also:

Distributed deployment example

6.4 Next steps

At this point you should be familiar with the core functions of the registry:

- The core model – the Registry–Registrar–Registrant structure and the four object types (domains, contacts, nssets, keysets)
- The three interfaces – EPP for registrars, FERDA for admins, WHOIS/RDAP for the public – and which operations belong to each
- Hands-on basics – how to create and inspect registry objects using each interface
- Registry initialization – how to set up a zone, create a registrar, assign credentials and zone access, and optionally enable billing
- Object states – the difference between automatic and manual flags and what they control
- Operational rhythm – which periodic tasks need to run and what breaks if they don't
- Deployment models – a rough sense of single-node vs. multi-node vs. HA setups

Where you continue from here, depends on your role.

If you're considering adopting and deploying FRED as software for your registry, consider reading the *Features* and *Concepts* chapters for in depth reference about the system functionality.

Once you are familiar with the registry inner workings, the *Architecture Description* provides top level overview of the architecture, which is necessary for planning the layout of your registry deployment. For deployment, you can move onto the *Admin Manual* for information about installing, configuring and running FRED services.

For developers that connect external systems that access the registrar and registrant interfaces, see *RDAP reference* and *EPP reference* documents. If you're interested in either modifying or extending FRED, see the *Source Code* for the location of the project's repositories.

6.4.1 Do you have any questions for us?

Don't hesitate to e-mail us at `fred@nic.cz` or sign up to our mail list.

If you are interested in paid support, please contact us using this form.

CHAPTER

SEVEN

FEATURES

This document describes the features of the FRED (and explains the conception logic behind these features).

Target audience

Acquirers, testers, (system administrators, developers)

Purpose

Provide descriptions and explanations of FRED features.

Terms & definitions

Terms and definitions can be found *in the glossary*.

Chapters

7.1 General features

The main goal of the FRED is to administer authoritative information on domains, domain ownership and owners which is then distributed via the DNS (zone file) as well as served in response to public queries (whois). To accomplish this, the system allows to input the relevant information into its database through the registration process and comprises the means to administrate existing data.

The relevant information obtained by the registration process is grouped into so-called **registrable objects**.

To ensure the authenticity of the data, only authorized entities (registrars) can perform registrations and modify existing data in the Registry.

Chapter TOC

- *Registry–Registrar–Registrant model*
- *Zone file generation*
- *EPP protocol*
- *Whois & RDAP*
- *GDPR compliance*

- *Notifications*
- *Technical checks*
- *Multi-language support & IDN*
- *DNSSEC support*
- *Invoicing and banking* [CZ-specific]
- *ENUM*
- *Contact verification* [CZ-specific]
- *Contact merger*
- *Object locking*
- *Domain name & handle format validation*
- *Automated keyset management*
- *Generation of verified record statements*
- *Audit log*

7.1.1 Registry–Registrar–Registrant model

The most important feature of the FRED is its database structured according to the Registry–Registrar–Registrant model. Registrars communicate with the Registry on behalf of registrants (domain owners).

Strong ownership model ensures that each registrable object in the database is owned by one registrar (called the "designated registrar") and no other registrar[1] may modify it.

A registrant is allowed to change the designated registrar of an object by means of the *transfer process*.

The registrable objects are the following:

- domain (regular or ENUM),
- contact (in roles of domain owners, administrative contacts or technical contacts),
- nsset (a group of name servers), and
- keyset (a group of DNSSEC keys).

All registration requests are resolved immediately if the requested object is free.

The history of all changes regarding any object is accessible through *an administration interface*.

Objects can be shared, i.e. one contact can be used multiple times with domains, nssets or keysets. Similarly, one nsset or keyset can be linked to several domains.

[1] With the exception of the system registrar which is used by the Registry to maintain the objects. The system registrar can modify all objects without limitation.

7.1.2 Zone file generation

The FRED can be used to automate the zone-file generation process.

It is possible to manage multiple different zones of any level. For each zone, the generator will create zone files with SOA, NS, A, AAAA, and DS records as specified in the database.

7.1.3 EPP protocol

The registrars communicate with the Registry using the EPP protocol (**RFC 5730**) with extensions for individual objects. The extensions are slightly modified versions of the standard specifications for domains (**RFC 5731**) and contacts (**RFC 5733**).

The FRED contains unique extensions for nssets and keysets.

Beside the standard commands, there are further auxiliary functions, such as information about credit or bulk list operations.

EPP communication is secured by the standard login-and-password authentication together with the verification of a client SSL certificate.

To ease EPP communication, the FRED distribution contains a Python client library and a command-line client application.

7.1.4 Whois & RDAP

There are two versions of the WHOIS service.

The first version is a classical Unix WHOIS service as specified in **RFC 1834**. This service features recursive results for all associated objects and inverse queries.

The second version is a web WHOIS application. The web version supports hyperlinked and more detailed results. There is even a possibility to enable CAPTCHA protection against robots.

Both versions contain the security feature of hiding personal information of contacts.

Additionally, the FRED contains a prototype implementation of the RDAP protocol which allows client applications to obtain results in a more recent, machine-readable format (JSON).

7.1.5 GDPR compliance

GDPR is an EU regulation, which must be complied with, once the Registry operator deals with personal information of natural persons that are based in the EU.

The FRED has adapted its policies to hide most of the personal information and it does not share personal information with third-party entities (especially the public via FRED's public interfaces) without explicit consent from end users (natural persons), with the exception of name, organization, and, if a contact is not verified, address.

The consent for disclosure of some contact information can be given as disclosure preference flags through the EPP. (See *Policies & rules of disclosure* for details.)

End users (natural persons) may place a *public request* any time to find out what personal information is stored in the Registry about them.

7.1.6 Notifications

The registrars and registrants are notified about important situations in the Registry.

The registrars are notified using the EPP mechanism of *poll messages*.

The registrants are notified using email or printed letters. All mail is constructed from predefined configurable templates. All outgoing mail is stored in a searchable archive. The email messages produced by the system comply with the **RFC 2387** standard.

Notification conditions include domain expiration, domain disabling, domain unregistration or any object modification via EPP.

All time periods for domain disabling and unregistration are configurable.

7.1.7 Technical checks

Technical checks are informative tests performed on registered name servers to diagnose potential domain delegation problems.

The technical checks are invoked regularly in a configurable interval and their results are sent using email to contacts associated with name servers.

They can also be invoked on demand by a registrar using the EPP interface. In this case, results are sent back to the registrar via the EPP poll mechanism.

The tests include existence and reachability of name servers, presence of delegated domains on name servers or the authoritative flag of DNS answers for such domains.

More on the concept of technical checks.

7.1.8 Multi-language support & IDN

The FRED is UTF8-aware within all its subsystems. Supported languages are very easily extensible by means of a standard process of language-catalogues manipulation.

Internationalized Domain Names (IDN) are supported in the system core as a configuration option that can be turned on, so that domains in UTF-8 can be registered and displayed, however there are limitations:

- there is no way of restricting the character set,
- there are no bindings of IDN and non-IDN domains.

7.1.9 DNSSEC support

The DNS Security Extensions are supported by the FRED out-of-the-box.

The software supports creating, storing and manipulating *DNSSEC* keys in the Registry while leaving the zone-signing process to external tools. It gives the Registry operator the flexibility to choose any suitable DNSSEC tools to meet the desired security and performance.

7.1.10 Invoicing and banking CZ-specific

The FRED implements both the prepaid-invoicing and postpaid-invoicing model which can be selected for each billed operation.

Payments collected by an external system can be paired with FRED using the Accounting interface. When a payment is paired, an advance invoice is issued and credit is extended to the matching registrar by a corresponding amount. The credit is then decreased upon each domain registration or renewal. The price of registration and renewal is configurable per zone.

At some point in time, it's possible to create an accounting invoice for a particular registrar containing a list of all its registrations and renewals and the total amount of money subtracted from the credit.

Note: Work with the billing subsystem may be tricky because it is tightly tied to the context of the financial and commercial laws of the Czech Republic (esp. the *VAT* handling and invoice essentials).

Therefore it may not be fully (or at all) suitable for your environment.

More about *billing in FRED*.

There is also a new concept of billing being developed, see *The Future of Payments & Invoices*.

7.1.11 ENUM

A standard protocol for electronic mapping of phone numbers to domains which allows to associate an IP phone with a classic phone number and store these phone number domains in DNS.

In comparison to regular domains, ENUM domains have an additional attribute, the validation expiration date, as a means of verification of number ownership.

ENUM is defined in **RFC 3761**.

More about ENUM in the Czech Registry.

7.1.12 Contact verification CZ-specific

A contact may be subject to verification if the domain holder's contact details contain false, incomplete, or misleading information, or if fraudulent or deceptive content is hosted on the domain.

A request for a contact to be subject to verification can be submitted by anyone, for example, based on a report of deceptive content on the domain, discrepancies in the contact information identified by the helpdesk, or by any user.

- Contacts within the EU/EEA can be verified either via a letter sent to their address or through the Czech e-identity system, MojeID.
- Contacts outside the EU/EEA may either designate a representative within the EU/EEA or use MojeID for verification.

If the domains are transferred to a new contact, a new verification process will begin for that contact.

In case of no response, the contact's domains are outzoned after a given period and it is not possible to register or transfer domains to the affected contact.

If there is still no response, the contact's domains are deleted. This step is still manually reviewed by Registry staff.

7.1.13 Contact merger

There is a method to minimize duplicate contact records in the Registry automatically. However, only contacts which are identical and mergeable by strict rules, are merged.

More about the contact merger.

7.1.14 Object locking

Object locking (also known as Registry lock) stands for enhanced security settings of registrable objects that a registrant can request from the Registry directly.

To submit a request to lock an object, a registrant uses the Public Request website form. However, an extra electronically signed email or an officially signed letter must follow to confirm that the registrant is authorized for such request.

The request is processed manually by Registry staff after verifying the authorization.

To unlock an object, the process is the same.

7.1.15 Domain name & handle format validation

The FRED implements several standard rules for domain name format validation:

- forbid consecutive hyphens,
- forbid empty domain name,
- enforce **RFC 1035** preferred syntax,
- enforce single digit labels (for ENUM domains),
- forbid IDN punycode encoding.

The rules can be *configured per zone*.

If the Registry operator requires additional restrictions, they can be implemented by providing forbidden keywords or patterns in the domain blacklist. The *restrictions can be configured* for any period of time given by a starting and ending date of validity.

The Registry operator can also *configure the format of handles* of contacts, nssets and keysets, and they can do it for each object type separately.

7.1.16 Automated keyset management

In order to simplify introduction and rotation of DNSSEC keys, the FRED implements two standards devised for key management automation: **RFC 7344** and **RFC 8078**. By polling domains' name servers for CDNSKEY records, the Registry can easily link DNSSEC-enabled domains into the global chain of trust and respond to key updates flexibly. This method does not require registrars to be involved in any way because the publishing of the CDNSKEY records relies on DNS operators.

More on the concept of automated keyset management.

7.1.17 Generation of verified record statements

A record statement is a generated confirmation of a state of a registrable object at a given moment. The statement can be used as legal evidence for the police or in court. It is a PDF document signed with an official digital signature.

If a statement is requested through the public interface (web whois), some contact information will be hidden according to disclosure settings of that contact. A statement can be also issued privately through the administration interface (Ferda) or Domain Browser and in those cases all contact information is disclosed in the statement.

7.1.18 Audit log

FRED creates an audit trail of activity of all user services (EPP, WHOIS, RDAP, WebAdmin). Log records include user names and IP addresses, from which service requests come.

An audit trail is required as the basis for information security audits and it can also serve as a supporting mechanism for access control, prevention of criminal activity, evidence in a trial, or just an auxiliary tool in problem solving.

The specialized schema of the log database allows the records to be maintained month by month.

More about the audit log.

7.2 Administration features

This chapter contains lists of FRED's features related to administration.

7.2.1 FERDA webadmin features

See also *Clients*.

General

- Two basic languages (CS, EN)
- Two-factor user authentication via FIDO2 tokens (optional)
- User permissions
- Referenced objects are linked by hypertext (object handles, attached files)
- Logging via gRPC
- **Registry module**
  - Viewing object details
  - Viewing registrar details
  - Basic or detailed view
  - Comparison of two points in history side by side
  - Search in recent data
  - Search in historic data
- Messages module (all e-mails, sms and letters in one place)
- Report module

- Logger module for searching and viewing logs
- List of domains linked to one contact

Configurables

- Django and apps settings
- State flags grouping
- State flags descriptions

In development

- Completely new contact verification process with representatives for non-EU countries
- Attaching files to objects
- Full history summary downloadable as a PDF file

Reports module

The reports module is a feature that provides a front-end for repeatable registry queries (referred to as **reports** for the rest of this section), which are defined via an *administration interface*. Selecting a report triggers the defined database query and the output is displayed in the browser.

Django administration interface

The Django interface allows you to *manage user permissions* to run or modify reports and sync them with the database.

The interface is accessible either from FERDA (select *Admin* in the user menu in the header), or at the path of your FERDA installation configured during deployment (default is `/admin`, e.g. `ferda.example.com/admin`).

Only users with **Staff** or **Superuser** status can log into the administration interface.

Reports section

In this section, you can synchronize reports with the database, modify their permissions and labels, add new reports or modify existing ones using SQL.

The **Manage reports** button allows the user to input an SQL function that creates or modifies reports.

Synchronizing reports

To perform synchronization of reports from individual backends with the main FERDA database, use the **Sync reports** button in the *Django administration interface* to open the synchronization dialog.

Modifying reports

When you select a report, you may change or view the following:

- *Object permissions* (which users and groups can run the report).
- History (view history of report changes).
- Label of the report, its long description, and labels of the input and output parameters.

Creating or modifying report SQL definitions

To create or modify a report:

1. Go to the Django administration interface.
2. Select **Reports**.
3. Select **Manage reports**.
4. Select the service your report will belong to.
5. Input the SQL function that adds or modifies your report.

When modifying a report this way, the function name and parameters must be identical to the already existing function.

Only users with *Can add Report* can create reports.

Example 1: SQL to add a report

The following SQL creates a report that returns a list of domains for a specified holder country code.

```
CREATE OR REPLACE FUNCTION domain_list_by_holder_country(country_code VARCHAR)
RETURNS TABLE (
                  domain VARCHAR,
                  sponsoring_registrar VARCHAR,
                  holder VARCHAR,
                  crdate TIMESTAMP,
                  exdate DATE,
                  zone_status VARCHAR,
                  state_flags TEXT
            )
AS
$$
SELECT d.domain,
      d.sponsoring_registrar,
      d.holder,
      d.crdate,
      d.exdate,
      CASE WHEN d.state_flags @> '{outzone}' THEN 'OUT' ELSE 'IN' END AS zone_status,
      ARRAY_TO_STRING(d.state_flags, ', ') AS state_flags
      FROM (
            SELECT doreg.name AS domain,
                  r.handle AS sponsoring_registrar,
                  coreg.name AS holder,
                  doreg.crdate,
                  d.exdate,
                  ARRAY_AGG(deos.name ORDER BY deos.importance) AS state_flags
```

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```
            FROM public.enum_country ec
            JOIN public.contact c ON c.country = ec.id
            JOIN public.object_registry coreg ON coreg.id = c.id
            JOIN public.domain d ON d.registrant = c.id
            JOIN public.object dobj ON dobj.id = d.id
            JOIN public.registrar r ON r.id = dobj.clid
            JOIN public.object_registry doreg ON doreg.id = d.id
            LEFT JOIN public.object_state dos ON dos.object_id = d.id AND dos.valid_
↪to IS NULL
            LEFT JOIN public.enum_object_states deos ON deos.id = dos.state_id
            WHERE ec.id = UPPER(country_code)
            GROUP BY 1, 2, 3, 4, 5
      ) AS d;
$$
LANGUAGE SQL
STABLE
SECURITY DEFINER;
```

Configuring reports in the registry

To start using reports in FERDA, take the following steps:

1. Configure the database to provide required data in a controlled manner.
2. Configure registry backend to provide a gRPC endpoint for queries from FERDA. This is done by the `fred-dbreport-services` binary provided by the `fred-backend-dbreport\` package.
3. Configure FERDA to send report queries to the configured endpoint.

Configuring database for reports

Reports can be configured to run directly on registry database, however, as an additional step, we recommend to encapsulate reports within their own scheme and set up read-only user for access on target database.

Configuring registry backend for reports

The `fred-backend-dbreport` package is used to provide the gRPC endpoint for FERDA via `/usr/sbin/fred-dbreport-services` binary. By default, the package installs a systemd unit configuration, which creates an instance of `fred-dbreport-services` for each configuration file that matches the following pattern: `/etc/fred/fred-dbreport-[INSTANCE_NAME].conf`. However you can configure your own customised systemd unit as well. An example configuration file can be found in FRED GitLab repository, or you can pass config as parameters directly to the binary (see `--help`).

We recommend to set a new service for each database.

Installing the `fred-backend-dbreport` should configure the basic services for you. (`fredlog`, `messenger` and `registry`).

Configuring reports in FERDA

To know which endpoint to call when running reports, FERDA uses `FERDA_REPORTS` system variable. See the README file. If you run FERDA on docker, to simplify the configuration, you can use the .env file to directly set the configuration values for each service. These will be applied during setup.

Controlling user access to reports

This section describes permissions that control what particular users can do with reports.

The relevant permissions in the **Users** section are marked with the `ferda | Report |` prefix and are as follows:

- Can add Report
- Can change Report
- Can delete Report
- Run report
- Can view Report

Only users with the *permission to change users* can assign permissions.

7.2.2 Daphne webadmin features (OBSOLETE)

> **Warning:** Daphne webadmin is obsolete. Please use *FERDA* webadmin

Webadmin features are divided into feature groups which also constitute the sections of this document.

General

- User authentication on login
- User must be permitted to perform an action (The granularity of permissions corresponds with the atomic operations over objects: read, change, block, unblock, delete, add.)
- Show/hide the history of details (set globally per session)
- Extra confirmation for critical actions (e.g. domain blocking)
- Referenced objects are linked by hypertext (object handles, attached files)

Configurables

- User authentication method
- User authorization method and permissions
- Table page size (number of rows per page)
- Table timeout
- Table maximum row limit (general and object-specific)
- Calendar date format for viewing and editing

- Utility for calculating termination dates of domain blocking and blacklisting
- Lock duration to resolve a verification check
- Limit of the wait for a response to a manual verification check request

Result table properties

- **Result tables paginated**
  - **With page navigation**
    - Go to the first / previous / next / last page
    - Go to a page by number
- Even and odd table rows distinguished (different background color)
- Table row highlighted when hovered over
- Sort table by any column (ascending or descending)
- If the result contains only a single record, view its details directly
- Export results to TXT or CSV

Compose a search filter

- Add a field (logical AND)
- Remove a field
- Add an alternative statement (logical OR)
- Remove an alternative statement
- Negate a field (logical NOT)
- Un-negate a field
- Save the current filter using a custom name
- Use a saved filter
- Show a saved filter

Manage domains

- Search/filter domains
- Select domains
- **Administer blocking of multiple (selected) domains**
  - Block
  - Change blocking
  - Unblock
  - Blacklist and delete
- **View domain details**
  - List emails from the last month where this domain is mentioned

  - View dig details about this domain
  - Include domain in the zone manually
  - View related logs (List logged actions in the last month by various Service types)
  - Block this domain
  - Change blocking of this domain
  - Unblock this domain
  - Blacklist and delete this domain
  - Generate a record statement
- Import emails for out-of-zone notification

Browse contacts

- Search/filter contacts
- **View contact details**
  - List domains where this contact is an owner
  - List domains where this contact is an admin
  - List all domains where this contact appears in any role (owner/admin/temp)
  - List all NSSets where this contact is a technical contact
  - List all KeySets where this contact is a technical contact
  - List emails from the last month where this contact is mentioned
  - List public requests concerning this contact
  - List all messages for this contact
  - List all verification checks of this contact
  - Enqueue contact for automatic verification
  - Enqueue contact for manual verification
  - View related logs (List logged actions in the last month by various Service types)
  - Generate a record statement

Verify contacts

- List contact checks by type (automatic/manual/all)
- View contact check details – Automatic
- **Resolve check**
  - Resolve as failed
  - Invalidate
  - Resolve as OK
- View contact check details – Manual
- **Resolve check**

  - Confirm enqueue
  - Invalidate
  - Resolve as OK

Browse NS sets

- Search/filter NSSets
- **View NSSet details**
  - List domains with this NSSet
  - List emails in the last month where this NSSet is mentioned
  - View related logs (List logged actions in the last month by various Service types)
  - Generate a record statement

Browse key sets

- Search/filter KeySets
- **View KeySet details**
  - List domains with this KeySet
  - List emails from the last month where this KeySet is mentioned
  - View related logs (List logged actions in the last month by various Service types)
  - Generate a record statement

Manage registrars

- List all registrars
- Search/filter registrars
- View registrar details
- Add a new registrar
- **Edit registrar details**
  - Registrar data (contact and billing info)
  - Authentication
  - Zones
  - Groups
  - Certifications
- **Manage registrar groups**
  - Add group
  - Rename group
  - Delete group (only empty)

Browse invoices

- Search/filter invoices
- View invoice details

Browse and assign payments

Changed in version 2.38: The feature has been discontinued. See *The Future of Payments & Invoices*.

Browse audit log

- Search/filter logs (from logger)
- View log details

Browse and resolve public requests

What is a *public request*?

- Search/filter public requests
- View request details
- **Resolve the request**
  - Accept and send
  - Invalidate and close
  - Resend a copy of PIN3 Letter (used in contact verification)
  - Resend a copy of PIN2 SMS (used in contact verification)

Important: Resending of PIN2 and PIN3 was removed in FRED 2.48.0. New request can be created.

Browse sent emails

- Search/filter emails
- View email details

Browse sent messages

- Search/filter messages (emails, letters, sms texts, registered letters)
- View message details

Browse files

- Search/filter files
- (List domain expiration warning letters) (predefined filter)
- Download a file

7.2.3 CLI admin features

Manage zones

- Create a zone
- Assign name servers to a zone
- Generate zone files (periodical)

Manage registrars

- List all registrars
- Add a registrar
- Set registrar's authentication data
- Grant a registrar access to a zone
- Include a registrar in a group of registrars
- Record registrar's certification
- Create a group of registrars
- Block a registrar
- Unblock a registrar
- Block registrars over request-usage limit (periodical)

Manage objects

- Keep object states up-to-date and users notified about important events (periodical)
- Remove expired and inactive objects (periodical)
- Remind contacts to review their contact details (periodical)
- Merge a pair of duplicate contacts (manual)
- Merge a set of duplicate contacts (automatic)
- Update DNSSEC keys from CDNSKEY records (AKM) (periodical)
- Re-register a domain for another owner and force the domain expired

Manage finance

- Set a price for an operation (with temporal validity)
- Set invoice numbering
- Import payments and attempt pairing (periodical)
- Assign credit to a registrar and create an invoice
- Generate poll messages about request usage (periodical)

7.3 Registrar features

These are the features that the FRED EPP server provides to registrars.

They are common to both the FRED-eppic command-line interface and the API library. The FRED-eppic has some *extra features* of its own in addition to the raw EPP service.

7.3.1 General requests

- Discover the service
- Login into a session
- Logout from the session
- Get info about credit
- Read and discard poll notifications
- List objects in management

7.3.2 Manage domains

- Check availability of a domain
- Create a domain
- Get info about a domain
- Delete a domain
- Renew a domain
- Transfer a domain
- Update a domain
- Send authorization information of a domain to emails of the contacts linked with the domain

7.3.3 Manage contacts

- Check availability of a contact
- Create a contact
- Get info about a contact
- Delete a contact
- Transfer a contact
- Update a contact
- Send authorization information of a contact to emails of the contact

7.3.4 Manage nssets

- Check availability of an nsset
- Create an nsset
- Get info about an nsset
- Delete an nsset
- Transfer an nsset
- Update an nsset
- Request a technical check of an nsset
- Send authorization information of an nsset to emails of the contacts linked with the nsset

7.3.5 Manage keysets

- Check availability of a keyset
- Create a keyset
- Get info about a keyset
- Delete a keyset
- Transfer a keyset
- Update a keyset
- Send authorization information of a keyset to emails of the contacts linked with the keyset

7.3.6 FRED-eppic extras

- Command help
- Interactive input of commands
- Session settings (language, poll auto-acknowledgement)
- Debugging tools (verbosity, XML validation)
- Fetch from info

7.4 Public features

These are the features that the FRED public interface provides to the public.

- *Unix WHOIS*
- *Web WHOIS*
- *RDAP*
- *Public requests*
- *Registrar list*

7.4.1 Unix WHOIS

- Domain lookup
- Contact lookup
- Nsset lookup
- Keyset lookup
- Registrar lookup
- **Lookup by inverse keys (supports wildcard characters `*`):**
  - domain:registrant
  - domain:admin-c
  - domain:temp-c
  - domain:nsset
  - domain:keyset
  - nsset:nserver
  - nsset:tech-c
  - keyset:tech-c
- Recursion on/off
- Lookup restriction by object types

7.4.2 Web WHOIS

- Domain lookup
- Contact lookup
- Nsset lookup
- Keyset lookup
- Registrar lookup
- Associated objects are hyper-linked

7.4.3 RDAP

- Domain lookup
- Nameserver lookup
- Entity (contact) lookup
- Nsset lookup
- Keyset lookup

7.4.4 Public requests

- Request for sending authorization information
- Request for blocking object transfer / all changes
- Request for unblocking object transfer / all changes
- Request for sending personal info
- **Requests (all of the above types) fullfilled to:**
  - an email in the Registry are approved immediatelly and automatically
  - **a custom email must be approved manually and accompanied by a confirmation:**
    - Email signed with a digital certificate
    - Letter with a notarized signature

7.4.5 Registrar list

For each registrar:

- name,
- website,
- technologies (by interpreting registrar groups), CZ-specific
- certification, CZ-specific
- evaluation protocol, CZ-specific
- registration guide. CZ-specific

7.5 Extending features CZ-specific

The FRED functionality can be enriched by some extensions.

Note: The following extensions are specific to the Czech Registry and they are not released to the public.

7.5.1 MojeID

MojeID is an implementation of a family of authentication protocols and a register of user identities that together allow the authentication of users for third-party services. The identities are based on FRED contact objects.

7.5.2 Domain Browser

Domain Browser is a web application that allows authenticated users to display data from the domain register to which a user is related as a contact. It uses the MojeID service for user authentication.

7.6 GlobalBlock

GlobalBlock is a unified domain name blocking services created by the Brand Safety Alliance (BSA). It is used for blocking domain registration across many TLDs.

7.6.1 Prerequisites

Before activating GlobalBlock extension, you need to have a valid contract with the BSA.

GlobalBlock extension is available only to users with paid FRED support. If you are interested, please contact us at fred@nic.cz.

Before installing GlobalBlock, make sure you have the following packages in the correct (or newer) versions installed.

Table 1: APP packages

Package	Version
`fred-idl`	2.43.0
`fred-backend-registry`	2.18.0
`fred-bsapp`	0.1.0
`fred-pifd`	2.64.0
`fred-rifd`	2.64.0
`fred-adifd`	2.64.0
`fred-mifd`	2.64.0
`fred-dbifd`	2.64.0
`fred-accifd`	2.64.0
`fred-akmd`	2.64.0
`fred-common`	2.64.0

Table 2: WHOIS packages

Package	Version
`libapache2-mod-whoisd`	3.15.0

7.6.2 Installation steps

This section contains specific steps for installing GlobalBlock extension to the FRED system.

Important: To install GlobalBlock, you need the `fred-bsapp` package. This package is not publicly available, we send it only upon request. Please, contact us at fred-support@nic.cz.

Databases

1. Create `bsapp` schema – user `postgres`, database `fred`

```
-- Create roles
CREATE ROLE bsapp_ro NOLOGIN;
CREATE ROLE bsapp_rw NOLOGIN;
CREATE USER bsapp WITH PASSWORD '...' IN ROLE bsapp_rw;
CREATE USER bsapp_view WITH PASSWORD '...' IN ROLE bsapp_ro;

-- Create schema
CREATE SCHEMA bsapp AUTHORIZATION bsapp_rw;
ALTER USER bsapp SET search_path = 'bsapp';
ALTER USER bsapp_view SET search_path = 'bsapp';

-- Create priviledges
REVOKE ALL ON SCHEMA public FROM bsapp_ro;
REVOKE ALL ON SCHEMA public FROM bsapp_rw;
-- It's needed to provide privileges to schema *and* tables.
GRANT ALL ON SCHEMA bsapp TO bsapp_rw;
GRANT ALL ON ALL TABLES IN SCHEMA bsapp TO bsapp_rw;
GRANT USAGE ON SCHEMA bsapp TO bsapp_ro;
GRANT SELECT ON ALL TABLES IN SCHEMA bsapp TO bsapp_ro;
```

2. Setup `bsapp` schema priviledges – user `bsapp`, database `fred`

```
-- Create default priviledges
-- Must be run as 'bsapp' user!
ALTER DEFAULT PRIVILEGES IN SCHEMA bsapp GRANT ALL ON TABLES TO bsapp_rw;
ALTER DEFAULT PRIVILEGES IN SCHEMA bsapp GRANT SELECT ON TABLES TO bsapp_ro;
```

3. Run `bsapp` migrations from the python virtual environment provided by the `fred-bsapp` package

```
#> app
source /opt/venvs/fred-bsapp/bin/activate
export ALEMBIC_CONFIG=/opt/venvs/fred-bsapp/lib/python3.9/site-packages/bsapp/
↪alembic.ini
echo "Migrations started"
echo "Alembic config: $ALEMBIC_CONFIG"
alembic history -i
echo "Running migrations..."
alembic upgrade head
alembic history -i
deactivate
echo "Migrations completed"
```

4. Verify, that your FRED data model is in version `2.58.0` or newer

```
SELECT val FROM enum_parameters WHERE name = 'model_version';
  val
--------
2.58.0
```

Configuration

1. app@/etc/fred/bsapp.conf

```
api_key: THE_API_KEY
# TEST values:
# api_key: API_KEY_VALUE
# api_url: https://api-ote.bsagateway.co/

# See https://docs.sqlalchemy.org/en/20/core/engines.html#database-urls for␣
↪details
db_connection: postgresql+psycopg://USER:PASS@:6432/fred?host=/var/run/postgresql

# Disable pooling in client, if using pgbouncer.
db_poolclass: sqlalchemy.pool.NullPool

db_schema: bsapp
logging:
    version: 1
    disable_existing_loggers: False
    formatters:
        verbose:
            format: '%(asctime)s %(levelname)-8s [%(process)d:%(thread)d]
↪%(name)s:%(funcName)s:%(lineno)s %(message)s'
    handlers:
        syslog:
            class: logging.handlers.SysLogHandler
            formatter: verbose
            address: '/dev/log'
    loggers:
        '':
            handlers: [syslog]
            level: DEBUG
registry_netloc: localhost:2240
```

2. Whois apache configuration:

   Add the following line:

```
WhoisBlacklistMessage "BSAPP" "% This name has been blocked by a GlobalBlock␣
↪service."
```

   to virtualhost section of /etc/apache2/sites-available/whois.nic.cz.conf so it will look like this:

```
<VirtualHost *:43>
CorbaEnable             On
CorbaNameservice        "{{ corba.host }}:{{ corba.port }}"
CorbaObject             "Whois"          "Whois_alias"
CorbaObject             "LoggerNew"      "Logger_alias"
WhoisLogdObject         "Logger_alias"
```

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```
WhoisProtocol          On
WhoisDisclaimer        "/etc/fred/disclaimer.txt"
WhoisObject            "Whois_alias"
WhoisBlacklistMessage "BSAPP" "% This name has been blocked by a GlobalBlock␣
↪service."
...
```

Cron jobs

- **Cron job description: Fetch new orders from BSA**
  - **Server:** `app`
  - **When / Recurrence:** hourly
  - **Command:** `fred-bsapp-fetch-orders`
- **Cron job description: Process new orders from BSA**
  - **Server:** `app`
  - **When / Recurrence:** hourly (offset from fetch by 20 mins)
  - **Command:** `fred-bsapp-process-orders`
- **Cron job description: Report unregistrable domains to BSA**
  - **Server:** `app`
  - **When / Recurrence:** daily (try to avoid parallel runs with other crons)
  - **Command:** `fred-bsapp-report-domains [list of zones to report] [list of managed zones specified with --managed zone flag]`
- **Cron job description: Daily check of blocked domains**
  - **Server:** `app`
  - **When / Recurrence:** daily (try to avoid parallel runs with other crons)
  - **Command:** `fred-bsapp-check-domains`

CHAPTER

EIGHT

CONCEPTS

8.1 Users and user interfaces

This chapter is an introduction to FRED users and user interfaces.

The end-user groups of the Registry system are:

- registrars,
- administrators,
- the public.

See also the *context diagram*, which illustrates basic data flows between the users and the Registry.

8.1.1 Registrar interface (RIF)

The registrar interface enables the **registrars** to access the registry and registrable object information, and provides them with tools to implement operations concerning objects within the Registry. The registrars use the RIF to send requests for the operations and receive replies from the Registry through it.

The RIF provides the following:

- communication with registrars using the EPP protocol and secure connection,
- support for all operations concerning domains (and related *registrable object*s) provided by the Registry,
- support for automatic request processing,
- connection of several registrars at the same time,
- individual account with specific access rights for each registrar,
- *logging* of all communication with registrars – each request is logged with a registrar identifier and a *transaction identifier*,
- support for hiding contact information.

System registrar

This is a registrar account that belongs to the Registry itself and allows the Registry to edit *registrable object*s as necessary. Normal rules do not apply – it can edit any object in any state (and without being designated to manage the object), it does not need to have credit, and it does not generate EPP notifications.

Important: The system registrar account must always exist in the Registry database and there must be exactly one of this kind!

See *Preparing registrars* during registry initialization.

8.1.2 Administrator interface (ADIF)

The administrator interface provides **administrators** (such as customer support workers) with tools for displaying and handling of information in the Registry and tools for manual intervention.

The basic function of the ADIF is search in Registry records (registrars, *registrable object*s, logs, communications), display of their details and manual editing thereof. The interface allows composition of complex search queries by any record attribute and using logical operators, limiting and sorting results, and even their export. Users may examine historical values and their period of validity.

Editing abilities can be used for managing registrars, blocking domains (e.g. during legal disputes or in case of law or rule breakage), or forcing their inclusion in (or exclusion from) a zone.

Access rights are configured per user, who can be given read-only or read-write permissions for various record types, depending on requirements of their job.

All user activity is *logged* to ensure security of sensitive data.

The ADIF is mainly a Web service (WebAdmin/Daphne), which is friendly to non-tech users. But there are also CLI programs to support some other administrative operations, which are not available in the Web service itself, including automated self-administration tasks.

The Registry staff may also edit domains and the other *registrable object*s for various administrative reasons, but they must use the RIF with the *system registrar* account.

8.1.3 Public interface (PIF)

The public interface provides the **public** with public information about domains and other *registrable object*s recorded in the Registry.

The PIF has 3 services which provide the public information in various formats via various protocols: Unix WHOIS service, Web WHOIS service, and RDAP service. The Web WHOIS allows visitors to download the public information as a signed PDF statement, too.

In addition to these services, the Registry provides a website listing accredited registrars, which can be used by potential domain holders to pick a suitable registrar, and *public request* forms.

Public requests

Public requests are a set of public websites which allow authorized stakeholders to send requests to the Registry directly, whether it is for AuthInfo, object (un)locking, or an overview of recorded personal information.

If the stakeholder requires information for a registered contact, the request is authorized automatically and resolved immediately. If the stakeholder requires information for an unregistered contact, they must prove that they are authorized for this request by sending either an electronically-signed email or a letter containing a notarized signature. The authorization is checked by Registry staff and the request is resolved manually.

8.2 Life cycle of registrable objects

This chapter describes the life cycle of *registrable object*s that is based on object *flags*.

A set of flags assigned to an object at a given moment constitutes an object *state*.

Legend

`0` zero state
: any object state that does not involve any other flags from the same basic flow

arrow description
: transition originator, e.g.:

  - `time` – transition is based on the flow of time
  - `EPP` – transition caused by an EPP operation
  - `admin` – transition by administrative intervention

: *prohibition(s)*

`! flag`
: flag must not be set

8.2.1 Domains

The life cycle of a domain is influenced by *registration expiration*, *validation expiration* (in ENUM domains), and eventually by forced *presence in a zone* (in or out) and *prohibitions*.

Registration expiration

This section describes a flow of states related to domain registration expiration.

Setting
: automatically

Visible
: internally or externally

Allowed for
: domains

Affects

zone presence, existence

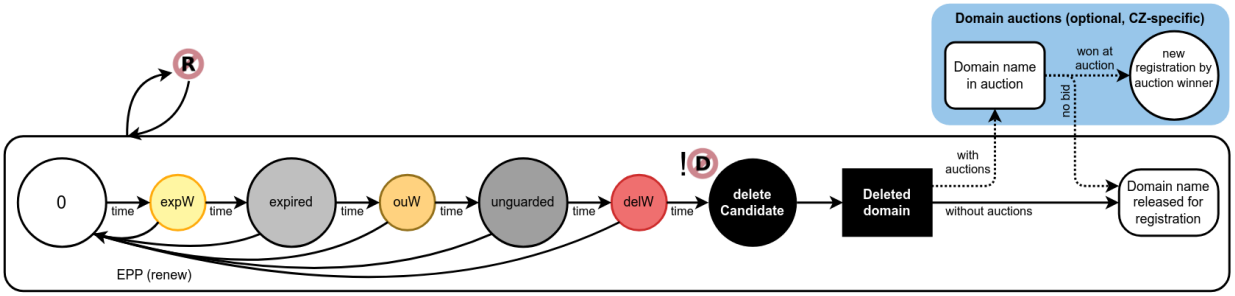

Fig. 1: Domain registration expiration
Legend

Basic flow

- **0** *(zero state)* When a domain is freshly registered or renewed, none of the flags is on.
- **expW** (internal) When the expiration date is approaching, by default 30 days before expiration (configurable by the *expiration_notify_period* parameter), the `expirationWarning` flag is set, which may trigger a notification.
- **expired** When the actual expiration date arrives, the `expired` flag is set, which may trigger a notification. However, the domain is still generated to the zone for some time.
- **ouW** (internal) 25 days after expiration (configurable by the *outzone_unguarded_email_warning_period* parameter), the `outzoneUnguardedWarning` flag is set, which may trigger a notification.
- **unguarded** 30 days after expiration (configurable by the *expiration_dns_protection_period*), the domain becomes `unguarded` (and is flagged so), which results in exclusion from the zone (flagged also `outzoneUnguarded`).
- **delW** (internal) 34 days after expiration (configurable by the *expiration_letter_warning_period* parameter), the `deletionWarning` flag is set, which may trigger a notification.
- **deleteCandidate** 61 days after expiration (configurable by the *expiration_registration_protection_period* parameter), the `deleteCandidate` flag is set, unless there is *delete prohibition* on the domain. If set, the domain cannot be renewed anymore and the Registry is allowed to delete the domain.

The flags accumulate. (Each state includes flags of the preceding state, e.g. when a domain has the `expired` flag, it also has the `expirationWarning` flag.)

The flags are unset when the domain is renewed.

Prohibitions

Setting of the *renew prohibition* will cause the domain to be taken out of the basic flow (none of those flags will be set). The expiration flags are, however, returned to the domain (re-calculated according to the current date), once the renew prohibition has been revoked.

Delete prohibition prevents the Registry from setting the `deleteCandidate` flag on the domain and consequently deleting the domain, until the delete prohibition is revoked.

Zone-inclusion according to registration states

State	0	expW	expired	ouW	unguarded	delW	delCandidate
Allows inclusion	Yes	Yes	Yes	Yes	No	No	No

Formal rules

See *Domain registration expiration rules*.

Validation expiration

This section describes a flow of states related to ENUM domain validation expiration.

Setting
automatically

Visible
internally or externally

Allowed for
ENUM domains

Affects
zone presence

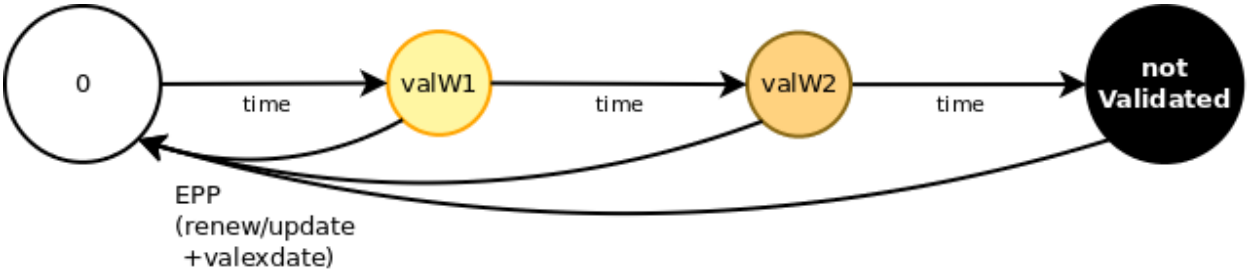

Fig. 2: ENUM domain validation expiration
Legend

Basic flow

- **0** *(zero state)* When a domain is freshly registered or its validation expiration date renewed/updated, none of the flags is on.
- **valW1** (internal) When the validation expiration date is approaching, 30 (validation_notify1_period) days (*configurable*) before validation expiration, `validationWarning1` flag is set, which may trigger the 1st warning notification.
- **valW2** (internal) When the validation expiration date is approaching, 15 (validation_notify2_period) days (*configurable*) before validation expiration, `validationWarning2` flag is set, which may trigger the 2nd warning notification.

- **notValidated** When the actual validation expiration date comes, `notValidated` flag is set, which results in the domain not being generated to the zone anymore.

The flags accumulate. (Each state includes flags of the preceding state, e.g. when a domain has the `notValidated` flag, it also has the `validationWarning1` and `validationWarning2` flags.)

The flags are unset when the validation is renewed/updated.

Prohibitions

Prohibitions do not affect this flow.

Zone-inclusion according to validation states

State	0	valW1	valW2	notVal
Allows inclusion	Yes	Yes	Yes	No

Formal rules

See *ENUM domain validation rules*.

Zone presence

There are two ways to determine whether a domain shall be generated to a zone.

The domain is naturally included in the zone if and only if it meets the following conditions:

- the domain is not `unguarded`, and
- the domain is validated if it is an ENUM domain, and
- the domain has an nsset assigned to it, and
- the domain is not forced out of the zone manually, i.e. it does not have the `serverOutzoneManual` flag. This flag forces the domain not to be included despite having met the conditions above.

The domain can be forced to the zone by setting the manual flag `serverInzoneManual`. This can override registration expiration flow up to `deleteCandidate` and expired validation. However, if the domain does not have an nsset, this flag will not have the desired effect.

Neither of these manual flags affects the basic flow.

When the domain is not generated to the zone for *any reason*, it is indicated with the `outzone` flag.

8.2.2 Non-domains obsoletion

Non-domains are contacts, nssets, or keysets.

The life cycle of these objects is influenced mainly by their usage in EPP operations, and *prohibitions* eventually.

Setting
: automatically

Visible
: externally

Allowed for
contacts, nssets, keysets

Affects
existence

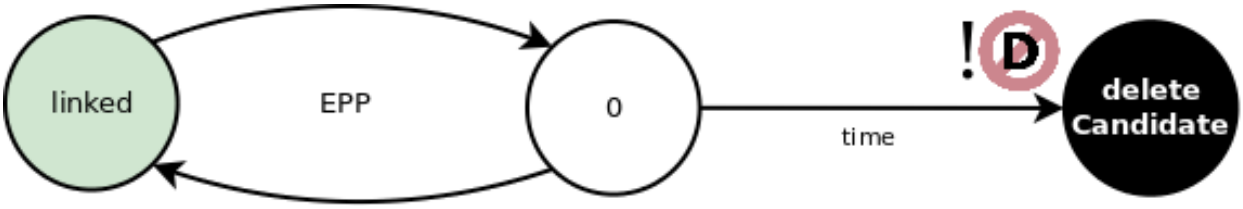

Fig. 3: Non-domains obsoletion
Legend

Basic flow

- **linked** As long as an object is assigned to another object (also is flagged `linked`), it cannot become obsolete. When an unlinked object is linked again, the protection period is "reset".
- **0** *(zero state)* Once the object is unlinked, it can become obsolete. This is the moment when the protection period starts running.
- **deleteCandidate** When the object has been left idle (unlinked and not modified) for the whole protection period of 2 (object_registration_protection_period) months (*configurable*), then the `deleteCandidate` flag is set, unless there is *delete prohibition* on the object. If set, the Registry is allowed to delete the object.

Prohibitions

Delete prohibition prevents the Registry from setting the `deleteCandidate` flag on the object and consequently deleting the object, until the delete prohibition is revoked.

Formal rules

See *Non-domain obsoletion rules*.

8.2.3 Prohibitions

Prohibitions are flags which affect the basic flow of objects' life cycle or forbid some operations on objects.

Note: The prohibitions do NOT apply to the system registrar! No matter which prohibition flags are set, the system registrar may always modify objects.

Setting
manually

Visible
externally

Prohibition flags

Allowed for
domains

`serverRegistrantChangeProhibited` The registrar may not change the *domain owner* (`update_domain ... <registrant> ...`).

`serverRenewProhibited` The registrar may not renew the domain.

Allowed for
all registrable objects

`serverDeleteProhibited` The registrar may not delete the object.

`serverTransferProhibited` Registrars may not transfer the object.

`serverUpdateProhibited` The registrar may not update the object.

User blocking (locks)

Any registrable object may be blocked as an enhanced security setting by a contact linked to this object or the contact itself via the *public request*s.

Affects
EPP

- **0** *(zero state)* **– no blocking** If the object has no blocking, the registrant may request to *block transfer* or *block all changes* (transfer and update).
- **blocked transfer** (`serverTransferProhibited` flag) If transfer is already blocked, the registrant may request either to *unblock transfer* or to *block all changes*.
- **blocked all changes** (`serverTransferProhibited` and `serverUpdateProhibited` flags) The registrant may request to *unblock all changes*.

These changes are allowed only assuming that the object does not have the flag `serverBlocked`.

Administrative blocking

Affects
EPP, expiration, obsoletion

Domains (together with the *domain owner*s, eventually) can be blocked by the Registry operator via CLI client (fred-admin), e.g. when the registration rules or the law are being violated, or when there is a police investigation or litigation ongoing.

When an object is blocked by the Registry operator, it has the flag `serverBlocked`.

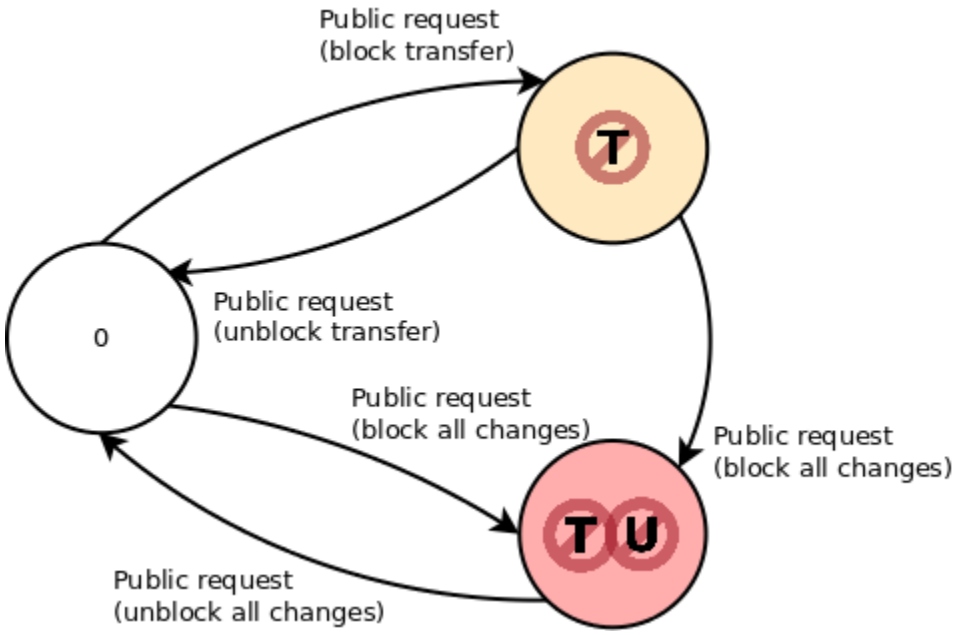

Fig. 4: Locks
Legend

B `serverBlocked` domains, contacts Prohibitions are set by the Registry operator and they can be revoked **only** by the Registry operator.

To define a blocking state, any combination of the prohibition flags above can be set, and in domains, this can even be combined with the manual zone presence flags `serverInzoneManual` or `serverOutzoneManual`.

There are no restrictions on transitions from one blocking state to another.

8.2.4 Rules for setting automatic flags

This section describes the formal rules for automatic flag setting.

Legend:

- `<name>` the parameter which is queried from the `domain_lifecycle_parameters` table with the `name` key
- `[...]` unit of measure for the preceding parameter
- `current_date` the current date (calculated from the timestamp within the time zone of the database server)
- `current_timestamp` the current date and time (within the time zone of the database server)
- `current_timestamp at time zone <...>` conversion of the current date and time into the time zone specified within `<...>`

Domain registration expiration rules

Legend:

- `regexdate` the date when a domain expires (`domain.exdate`)

Listing 1: expirationWarning

```
regexdate + <expiration_notify_period> <= current_date
   && !serverRenewProhibited
```

Listing 2: expired

```
regexdate <= current_date
   && !serverRenewProhibited
```

Listing 3: unguarded

```
regexdate + <expiration_dns_protection_period> + <regular_day_outzone_procedure_
↪period> [hour]
   <= current_timestamp at time zone <regular_day_procedure_zone>
   && !serverRenewProhibited
```

Listing 4: nssetMissing

```
nsset is not assigned
```

Listing 5: outzone

```
nssetMissing
   || serverOutzoneManual
   || !serverInzoneManual && (unguarded || notValidated)
```

Listing 6: outzoneUnguardedWarning

```
regexdate + <outzone_unguarded_email_warning_period>
   <= current_timestamp at time zone <regular_day_procedure_zone>
   && !serverRenewProhibited
   && !serverInzoneManual
```

Listing 7: outzoneUnguarded

```
unguarded && !serverInzoneManual
```

Listing 8: deleteWarning

```
regexdate + <expiration_letter_warning_period> <= current_date
    && !serverRenewProhibited
```

Listing 9: deleteCandidate

```
regexdate + <expiration_registration_protection_period> + <regular_day_procedure_
↪period> [hour]
   <= current_timestamp at time zone <regular_day_procedure_zone>
   && !serverRenewProhibited
```

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```
   && !serverDeletePohibited
```

ENUM domain validation rules

Legend:

- `valexdate` the date till which an ENUM domain is validated (`enumval.exdate`)

Listing 10: validationWarning1

```
valexdate + <validation_notify1_period> <= current_date
```

Listing 11: validationWarning2

```
valexdate + <validation_notify2_period> <= current_date
```

Listing 12: notValidated

```
valexdate + <regular_day_outzone_procedure_period> [hour]
   <= current_timestamp at time zone <regular_day_procedure_zone>
```

Non-domain obsoletion rules

Legend:

- `last_linked_timestamp` the timestamp when this was linked to another object the last time
- `update` the date of the last update
- `crdate` the date of creation

Listing 13: deleteCandidate

```
max(last_linked_timestamp, update, crdate)
   + <object_registration_protection_period> [months]
   + <regular_day_procedure_period> [hour]
   <= current_timestamp at time zone <regular_day_procedure_zone>
   && !serverDeleteProhibited
   && !linked
```

8.3 Contacts

Contacts are a type of *registrable object*s which represents a natural or legal person in the Registry.

The FRED understands a contact without a value in the *organization* attribute as a natural person for the purpose of disclosure.

See also *attributes of contacts (EPP Reference)* for a description of contact details.

8.3.1 Roles of linked contacts

Contacts can have the following roles depending on the type of the registrable object to which they are linked:

- the domain holder,
- an administrative contact of a domain,
- a technical contact of an nsset or a keyset.

The *domain holder* may request any modification of their domain, including the change of the domain holder.

An *administrative contact* may request any modification of the domain except the change of the domain holder. See also *attributes of domains (EPP Reference)*.

A *technical contact* may request any modification of the linked nsset or keyset. See also *attributes of nssets (EPP Reference)* or *attributes of keysets (EPP Reference)*.

A single contact can appear in several roles.

8.3.2 Annual reminder

Contacts themselves are responsible for completeness, accuracy and recency of their contact details.

To keep contact information updated, contacts should be called on by email once a year to check their details and correct them if there was a change.

This can be set as a *periodic task* in the FRED.

8.3.3 Disclosure of information

The Registry defines policies for disclosure of contact information in the public interface (whois services):

- the general approach ("Registry shows information" vs. "Registry hides information"),
- disclosure of which attributes registrars will be allowed to manipulate (signal the contact's preference opposite to the general approach), and
- default disclosure settings if no preference is requested (show or hide per attribute).

All of this can be *configured*.

8.4 Object transfer

Object transfer is a mechanism that allows to change the *designated registrar* of an object.

Each object has **authorization information** (AuthInfo for short) that in this case represents a transfer password. The AuthInfo must be provided with the transfer request to authorize the transfer. More information about AuthInfo TTL can be found at *AuthInfo TTL*.

The transfer process in the FRED is different from the standard one (see **RFC 5730#section-2.9.3.4**) and it works as follows:

1. A contact linked to an object intended for transfer requests AuthInfo of the object. He can do so via the current registrar, via the new registrar or by submitting a *public request* to the Registry directly.
2. The AuthInfo is provided to the contact either through one of the involved registrars, or sent from the Registry.
3. The contact requests the transfer from the new registrar and provides the AuthInfo.

4. The new registrar requests the transfer from the Registry (via EPP) and provides the AuthInfo.
5. The Registry transfers the object immediately and generates new AuthInfo for the transferred object.
6. The Registry notifies the old registrar and the linked contacts about the transfer.

This model favours the holder because it does not allow the current designated registrar to reject nor inhibit the transfer.

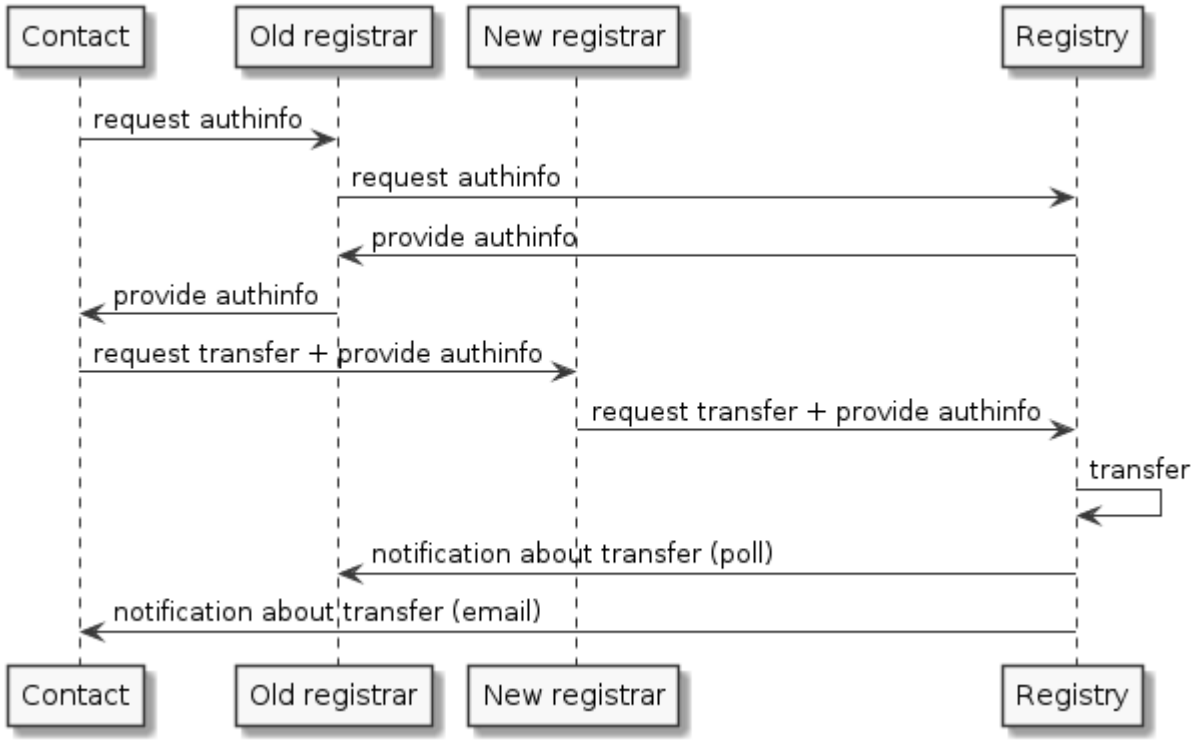

Fig. 5: Sequence diagram – Object transfer process

8.4.1 Further authorization options

A transfer of a domain may also be authorized using AuthInfo of the domain holder or any of its administrative contacts.

A transfer of an nsset or keyset may also be authorized using AuthInfo of any of its technical contacts.

8.5 DNScheck (Technical checks)

DNScheck is a system for checking nssets and DNS records. As a result, it monitors the quality of domain delegation. The system periodically scans all nssets in the registry and runs tests on them using Zonemaster.

DNScheck is a replacement for the old technical checks.

Prerequisites:

- FRED system
- Messenger
- Zonemaster software package

DNScheck is a dockerized Python service with its own database (PostgreSQL). The service selects which nssets will be checked and tells the Zonemaster service to run the DNS records and delegation test of associated domains. Then it collects the results, aggregates them and, if there are any problems found, sends notifications to nsset technical contacts.

8.5.1 Zonemaster

Zonemaster is a third-party open-source service that runs the DNS records and domain delegation tests. Each test ends with a severity level evaluation which is then processed by DNScheck.

Number of report for each severity is calculated for the domains delegation of each nsset.

Severity levels (as described in the Zonemaster documentation):

- `CRITICAL` – The message means a very serious error.
- `ERROR` – The message means a problem that is very likely (or possibly certain) to negatively affect the function of the zone being tested, but not so severe that the entire zone becomes unresolvable.
- `WARNING` – The message means something that will under some circumstances be a problem, but that is unlikely to be noticed by a casual user.
- `NOTICE` – The message means something that should be known by the zone's administrator but that need not necessarily be a problem at all.
- `INFO` – The message is something that may be of interest to the zone's administrator but that definitely does not indicate a problem.

For details, please visit the Zonemaster documentation.

Note: The tests are only informative, they do not affect inclusion/exclusion of a domain in/from a zone.

8.5.2 Reporting

You can set a level of reporting (`reportlevel`) for each nsset. The level defines at which severity are test result notifications sent.

Table 1: Reporting levels

`reportlevel`	Send notification according to severity
0	never
1	`CRITICAL`
2	`CRITICAL`, `ERROR`
3	`CRITICAL`, `ERROR`, `WARNING`
4 and more	`CRITICAL`, `ERROR`, `WARNING`, `NOTIFY`

If during the evaluation at least one test on at least one associated domain ends with the given severity, a notification e-mail is sent. The email contains a count of all problems found with reported severity and a list of the most problematic domains (ordered from worst results). A notification e-mail is sent to all nsset technical contacts.

8.6 EPP client workflow

Registrars communicate with the registry through FRED's registrar interface, which is based on the EPP and which the registrars use as clients.

There are 3 options for using the registrar interface:

- command-line Python client fred/eppic,
- client Python API library fred/utils/epplib,
- registrar's custom client built on the raw EPP.

Although these three options vary in syntax, they have the same workflow, since they all talk to the same EPP server. This chapter describes the general workflow, which is independent from the syntax, while giving you hints about the syntax.

Of course, correct syntax is a necessary condition for the commands to be carried out.

Each EPP command allows you to append your own *client transaction identifier*.

Note: This chapter assumes that the client is a *regular* registrar (not the *system* registrar).

Where to get detailed help with syntax

The CLI client has an embedded command help. It also allows you to enter the commands in an interactive mode by filling in command parameters one by one, or enter the parameters by their names. See *Additional EPPIC abilities*.

Python API methods have the same names as CLI client commands, they differ in parameter syntax and order. You may view the API reference by starting the pydoc server `pydoc -p 8080` from the command line and then opening http://localhost:8080 in a browser.

The EPP syntax itself is described in detail in the *EPP Reference Manual*. This chapter will provide you with links to specific EPP-commands as you read on.

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- *Renewing domains*
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8.6.1 Connecting to the server

The client must:

- create a secure socket using a public certificate and private key,
- connect via the socket to the EPP server using a hostname and port,
- once connected, start reading data coming from the EPP server.

When you use the raw EPP, you need to find your own way of connecting to the EPP server, whereas the client programs will do it for you, all you need to do is supply connection settings in a configuration file.

Detailed requirements for transfer over TCP are in **RFC 5734**.

8.6.2 Getting service information

Once the client is connected to the server, the first data it receives contains the *greeting*.

What might interest you in the greeting (`xpath:/epp/greeting/`):

- protocol version (`svcMenu/version`),
- service languages provided (`svcMenu/lang`),
- namespaces of managed objects (`svcMenu/objURI`),
- namespaces of service extensions (`svcExtension/extURI`),
- description of the data collection policy (`dcp`).

You actually need the first four items to establish a session.

To get the greeting, you just need to *connect to the EPP server* or send a *hello*.

8.6.3 Establishing a session (login)

This is the first command you must issue.

To login, you send the `login` command (*display help* / *see the reference*) with a username, password and, eventually, other session settings, such as the interface language.

The CLI client can use configuration settings to login automatically when it is launched. It requests use of all namespaces automatically.

Once you are logged in, you may start issuing other commands.

8.6.4 Registering domains & other objects

In a nutshell, if you're a newcomer without previous records, you must proceed with registrations in this order:

1. *Login*, before you begin.
2. *Check* that an object can be registered.
3. *Create a contact*.
4. Optionally, *create an nsset* (using a contact).
5. Optionally, *create a keyset* (using a contact).
6. *Create a domain* (using a contact, and optionally an nsset and keyset).

Check domain names and handles

When registering a new object of any type, you need to name it with a **unique identifier** – a domain name or a handle. In case of domain names, the holders choose them for themselves of course. But for the other objects, it is you who names them. To make sure that a domain name or handle can be registered, use a `check` command according to the object type:

- `check-domain` (*display help*) / `domain:check` (*see the reference*),
- `check-contact` (*display help*) / `contact:check` (*see the reference*),
- `check-nsset` (*display help*) / `nsset:check` (*see the reference*),
- `check-keyset` (*display help*) / `keyset:check` (*see the reference*).

The command will tell you not only whether an object has not been registered yet, but also whether the name/handle has correct syntax and is acceptable by the Registry.

Formats for domain names and handles are properly described in chapter *Common object attributes* (EPP Reference).

You may also check several objects of the same type with one call, because the commands accept multiple parameters.

Create a contact

To register a domain name, you must first record personal information, to which the domain name will be linked. Personal information is recorded using *contact objects*, which hold information about people (or organizations) in various roles, such as the domain holder or a technician responsible for domain's name servers. (*More about the roles of contacts in the Registry.*)

A contact is registered using the command `create-contact` (*display help*) / `contact:create` (*see the reference*) and required parameters.

Note: Setting **contact** disclosure preference (disclose flags) requires special attention as described in *Policies & rules of disclosure*.

- `auth-info` is generated on demand by the `send-authinfo-contact` command. For more information, see *AuthInfo TTL*.

If you omit:

- `disclose`, the server sets disclose flags to defaults according to the disclosure policy,
- other optional parameters, they are left unset.

Create a nsset OPTIONAL

To have the future domain included in the zone, you need to have some name servers recorded in the Registry as well. Name servers are recorded using *nsset objects*.

A nsset is registered using the command `create-nsset` (*display help*) / `nsset:create` (*see the reference*) and required parameters.

- `auth-info` is generated on demand by the `send-authinfo-nsset` command. For more information, see *AuthInfo TTL*.

If you omit:

- `reportlevel`, the server sets it to the default (see also *DNScheck (Technical checks)*),
- other optional parameters, they are left unset.

Create a keyset OPTIONAL

To have the future domain secured, you need to have some DNSSEC keys recorded in the Registry as well. The DNSSEC keys are recorded using *keyset objects*.

A keyset is registered using the command `create-keyset` (*display help*) / `keyset:create` (*see the reference*) and required parameters.

- `auth-info` is generated on demand by the `send-authinfo-keyset` command. For more information, see *AuthInfo TTL*.

If you omit:

- `dnskey`, it will be left empty and the linked domains still will not be secured.

Create a domain

Now, you're ready to actually register a domain name. Domain names are recorded using *domain objects*.

A domain is registered using the command `create-domain` (*display help*) / `domain:create` (*see the reference*) and required parameters.

- `auth-info` is generated on demand by the `send-authinfo-contact` command. For more information, see *AuthInfo TTL*.

If you omit:

- `period`, the server makes registration for the smallest period allowed,
- other optional parameters, they are left unset.

Conditions for success

- You must be granted access to the zone, in which you want to register the domain.
- You must have credit, if the registry charges for domain creation.

Re-use

Of course, if you have previously recorded some contacts, nssets, or keysets, you may re-use them to register new domains, nssets, and keysets.

Beware, though, other registrars may link your objects to their objects, too. (This can happen when an object has been transferred.)

8.6.5 Listing objects

Recorded objects can be retrieved in the form of lists. This is done in two (or more) steps within separate requests.

The first request asks the server to prepare a list on its side. Use one of the commands starting with `prep-*` (*display help*) / a listing element (*see the reference*).

Note: The list preparation commands that do not accept parameters (such as `prep-domains` / `fred:listDomains`), will list only objects that you are *designated* to manage. The parametrized commands (such as `prep-domains-by-contact` / `fred:domainsByContact`) ignore who the designated registrar is.

The server responds with a total of prepared items.

A subsequent request orders the server to send a bulk of list items and it is to be called repeatedly until the server returns an empty list.

To retrieve the next bulk, use the command `get-results` (*display help*) / `fred:getResults` (*see the reference*) which does not require any parameters.

The server retains the remaining list items between these calls. Another prepare request resets the list.

Conditions for success

- You must be *logged in*.

8.6.6 Getting object information

To view object details, use an `info` command according to the object type:

- `info-domain` (*display help*) / `domain:info` (*see the reference*),
- `info-contact` (*display help*) / `contact:info` (*see the reference*),
- `info-nsset` (*display help*) / `nsset:info` (*see the reference*),
- `info-keyset` (*display help*) / `keyset:info` (*see the reference*).

Conditions for success

- You must be *logged in*.
- The object must exist.

8.6.7 Renewing domains

To renew a domain, use the command `renew-domain` (*display help*) / `domain:renew` (*see the reference*) and required parameters.

If you don't know its current *expiration date*, you can find out from the domain's details – see *Getting object information*.

If you omit `period`, the server makes renewal for the smallest period allowed.

Conditions for success

- You must be *logged in*.
- The domain must exist.
- The domain must not be marked for deletion (`deleteCandidate` status flag).
- The domain must not be administratively blocked.
- The domain must not be prohibited renewal.
- You must have credit, if the registry charges for domain renewal.

8.6.8 Transferring objects

See the *Object transfer* concept for an explanation of how transfer works in general.

To proceed with a transfer request (and thus become the *designated registrar* of the object), use a `transfer` command according to the object type:

- `transfer-domain` (*display help*) / `domain:transfer` (*see the reference*),
- `transfer-contact` (*display help*) / `contact:transfer` (*see the reference*),
- `transfer-nsset` (*display help*) / `nsset:transfer` (*see the reference*),

- `transfer-keyset` (*display help*) / `keyset:transfer` (*see the reference*).

Conditions for success

- You must be *logged in*.
- The object must exist.
- The AuthInfo must match.
- The object must not be administratively blocked.
- The object must not be prohibited transfers.

8.6.9 Updating objects

Generally, there are 3 "methods" for editing object details: `add`, `rem` (remove), and `chg` (change).

`add` and `rem` are used for editing attributes that can have multiple-child values, such as admin/tech contacts, name servers, or DNS keys. There is no difference between an omitted child (`NULL`) and a child that contains an empty string (`''`), both are interpreted as no change.

`chg` is used to edit single-child values, such as a domain owner, linked nsset, disclosure preference, or AuthInfo. If the child is omitted (`NULL`), it means that a change is not being requested, whereas when a child contains an empty string (`''`), it means that the old value shall be overwritten and thus left empty after the update.

To edit object details, use an `update` command according to the object type:

- `update-domain` (*display help*) / `domain:update` (*see the reference*),
- `update-contact` (*display help*) / `contact:update` (*see the reference*),
- `update-nsset` (*display help*) / `nsset:update` (*see the reference*),
- `update-keyset` (*display help*) / `keyset:update` (*see the reference*).

Note: Editing **contact** disclosure preference (disclose flags) requires special attention as described in *Policies & rules of disclosure*.

Conditions for success

- You must be *logged in*.
- The object must exist.
- You must be *designated* to manage the object.
- The object must not be administratively blocked.
- The object must not be prohibited updates.

8.6.10 Deleting objects

To delete an object, use a `delete` command according to the object type:

- `delete-domain` (*display help*) / `domain:delete` (*see the reference*),
- `delete-contact` (*display help*) / `contact:delete` (*see the reference*),
- `delete-nsset` (*display help*) / `nsset:delete` (*see the reference*),
- `delete-keyset` (*display help*) / `keyset:delete` (*see the reference*).

Conditions for success

- You must be *logged in*.
- The object must exist.
- You must be *designated* to manage the object.
- The object must not be linked to (referenced by) other objects.
- The object must not be administratively blocked.
- The object must not be prohibited deletion.

8.6.11 Reading messages

The server generates service messages. Reading of the messages is done in two (or more) steps within separate requests.

To ask the server if it has any messages, use the command `poll req` (*display help*) / `<poll op="req"/>` (*see the reference*).

The server responds with the first message in the queue and the count of messages.

A subsequent request acknowledges that the message has been read and orders the server to remove it from the queue.

To acknowledge, use the command `poll ack` (*display help*) / `<poll op="ack"/>` (*see the reference*) with the message identifier.

To read the next message(s), just repeat the process.

You must be *logged in* to read your messages.

8.6.12 Reading credit

Just use the command `credit-info` (*display help*) / `fred:creditInfo` (*see the reference*), which does not require any parameters.

You must be *logged in*.

8.6.13 Ending a session (logout)

Just use the `logout` command (*display help* / *see the reference*), which does not require any parameters.

Then your client may close the connection (it times out anyway).

If you want to logout, disconnect and quit, you may use `exit`.

8.6.14 Additional EPPIC abilities

This section describes additional abilities of the CLI client. All these abilities can be used from the running client.

Note: This guide doesn't describe all features, only highlights. For all eppic features, see the documentation contained with the program fred/eppic.

Display command help

To show available FRED client commands, type `help`.

To show help for a specific command, type `help <command>` (e.g. `help update-contact`) or `? <command>` (e.g. `? create-domain`).

Parameter usage

FRED client accepts positional and named parameters. Use help commands to display parameter information.

View raw EPP messages

If you need to read the xml-formatted communication, in addition to the default output, the CLI client can display the raw xml data sent to and received from the server. Input can be read from a file.

8.7 Contact merger

The purpose of contact merger is to minimize duplicate contacts in the Registry.

The core of the merger is the *merge operation* which allows to merge a pair of identical and mergeable contacts, from a *source contact* to a *destination contact*. If the contacts are linked to other objects, then the *source contact*(s) is (are) replaced with the *destination contact* in every linked object. The *source contact*(s) is (are) then deleted from the Registry.

The Registry operator may choose a pair of duplicate contacts themself and merge just the two of them if the two contacts are *mergeable*. (See the task *Merge a pair of duplicate contacts (manual)*.)

The other option is to use the automatic merge procedure which can select a whole set of duplicate contacts automatically and merge them into a single *destination contact*. The *destination contact* is determined by filtering the set with various criteria (see *Selection of the destination contact in an automatic merger*), which make the outcome the best possible choice. The other contacts in the set are treated as *source contacts*. (This task can be set as a *periodic task*.)

In both cases, the contacts must be managed by the same registrar, however, they are replaced in linked objects even if the linked objects have different registrars.

8.7.1 Identical contacts

For contacts to be considered identical by the merger, they must have the following attributes identical:

- current designated registrar: `object.clid`
- name: `contact.name`[1]
- organization: `contact.organization`[1]
- address (permanent): `contact.street1`, `contact.street2`, `contact.street3`, `contact.city`, `contact.stateorprovince`, `contact.postalcode`, `contact.country`[1]
- email: `contact.email`[1]
- notification email: `contact.notifyemail`[1]
- fax: `contact.fax`[1]
- telephone: `contact.telephone`[1]
- identity document type: `contact.ssntype`
- identity document number: `contact.ssn`[1]
- VAT: `contact.vat`[1]
- disclose flags: `contact.disclosename`, `contact.discloseorganization`, `contact.discloseaddress`, `contact.disclosetelephone`, `contact.disclosefax`, `contact.discloseemail`, `contact.disclosevat`, `contact.discloseident`, `contact.disclosenotifyemail`
- user's preference of sending domain expiration letters: `contact.warning_letter`
- and for each associated contact address of any type (`MAILING`, `BILLING`, `SHIPPING`, `SHIPPING_2`, `SHIPPING_3`):
  - *contact_address*`.company_name`[1]
  - *contact_address*`.street1`[1]
  - *contact_address*`.street2`[1]
  - *contact_address*`.street3`[1]
  - *contact_address*`.city`[1]
  - *contact_address*`.stateorprovince`[1]
  - *contact_address*`.postalcode`[1]
  - *contact_address*`.country`[1]

[1] These values are trimmed before they are compared. Trimming means that spaces at the beginning and at the end of strings are removed. Trimming does not affect any other whitespace characters nor spaces that separate words.

8.7.2 Mergeable contacts

Contacts must be *identical* and comply with the following conditions:

- **the *source contact*(s):**
  - must not be administratively blocked (`serverBlocked` status active), and
  - must not have the `serverDeleteProhibited` status active, and
  - must not belong to a mojeID account (`mojeidContact` status active), and
  - must not have the `contactInManualVerification` status active, and
  - must not have the `contactFailedManualVerification` status active,
- **and the *destination contact*:**
  - must not be administratively blocked (`serverBlocked` status active), and
  - must not have the `contactInManualVerification` status active, and
  - must not have the `contactFailedManualVerification` status active,
- **and registrable objects linked to the *source contact*:**
  - must not have the `serverBlocked` status active, and
  - must not have the `serverUpdateProhibited` status active.

Note: The rules for identity and merge-ability are hard-coded.

8.7.3 Merge operation

The procedure of merging a pair of duplicate contacts performs as follows:

1. Checks that the contacts are *mergeable*.
2. In objects linked to the *source contact*, replaces the *source contact* with the *destination contact* (using update operations).
3. If the *source contact* has had the `contactPassedManualVerification` status active, sets it on the *destination contact*.
4. Deletes the *source contact* from the Registry.
5. Generates new AuthInfo for the *destination contact*.
6. Generates poll messages for changes made in the step 2.

8.7.4 Selection of the *destination contact* in an automatic merger

Because the detection of duplicates is automatic, the Registry must also select the *destination contact*, into which the merge will result and which will be used to replace the duplicate contacts in linked objects.

The contact of the best qualities is selected according to the following criteria evaluated in this order[2]:

- contact is identified,

[2] This is the default setting used in CZ.NIC. The Registry operator may modify which criteria will be applied and in what order, in a command option.

- contact is conditionally identified,
- contact handle complies with the syntax for mojeID handles,
- contact has most domains linked (as a *holder* or administrative contact),
- contact has most objects linked (domains, name-server sets or key sets),
- contact has been updated most recently,
- contact has been created most recently.

The contact that matches the most of the criteria, is the *destination contact*. If more than one contact meets all of these criteria, the *destination contact* is chosen from them randomly.

8.8 Automated keyset management

AKM is based on the two RFCs:

- **RFC 7344** Automating DNSSEC Delegation Trust Maintenance,
- **RFC 8078** Managing DS Records from the Parent via CDS/CDNSKEY.

Domains are included in the *AKM* strictly on demand when they publish valid CDNSKEY resource records[1] on domains' name servers. Registrants are supposed to ask their DNS operators to do so or not to do so.

Tip: The KnotDNS can be easily configured to support automatic key management.

A CDNSKEY contains the KSK of a child zone (domain) solely for the purpose to request updates to DS records in the parent zone (Registry). DS records are calculated by the Registry; see also *zone generation concept*.

The CDNSKEY resource records are recognized by the FRED as **valid** when they comply with the same constraints as the rest of managed keysets – see *keyset attributes in the EPP Reference Manual*.

A special case is the "delete key" (`CDNSKEY 0 3 0 AA==`) which can be published to request removal of a domain from AKM.

8.8.1 Security status cases

The Registry handles the request for update according to the security status of a domain:

- an insecured domain (registered without a keyset) requests to be included in AKM,
- a domain secured with a manually-managed keyset requests to be switched to AKM,
- a domain secured with an auto-managed keyset requests to update the keys.

[1] The FRED does not support CDS resource records.

8.8.2 Acceptance of new keys

When introducing a new domain in AKM, the Registry handles differently domains which do not register yet as DNSSEC-enabled (without a keyset, insecured) and those that are secured with a keyset:

- When a domain is already secured with a keyset, adoption of new keys happens immediately because the new keys can be authenticated using the old keys, and the domain is switched to AKM.
- When a domain is not secured yet, the detected keys must undergo the **acceptance period** during which they must remain valid and unchanged on all name servers in the associated nsset. The acceptance period acts as a security measure instead of key authentication. After the keys pass the acceptance period successfully, then they are adopted and the domain is switched to AKM.

The **acceptance period** is initiated when valid CDNSKEY resource records are found for the first time during a scan. In subsequent scans, the records must be found again in exactly the same state and on all the name servers as before, otherwise the acceptance period is broken and the whole process must be restarted.

In special cases where there is a network unavailability of all domain nameservers, AKM-NG ignores the invalid scan results. However, valid scans of the original responses must occure so that there is less than 48 hours between two valid neighboring scans.

8.8.3 Management task

The task of keyset management is performed in several steps:

1. Loads selected domains and all name servers of insecured domains from their nssets, and sorts them in the scan queue.
2. Scans domains in the scan queue:
   - if a domain is insecured, name servers are asked by the scanner directly via TCP queries whether they have CDNSKEY records for domains,
   - if a domain is secured, the CDNSKEY records are requested via a local resolver and a response is validated with DNSSEC inside the scanner,

   and saves the results.
3. Updates keys:
   - checks if the domain has a blocking status (e.g. `serverblocked` and `deletecandidate`), AKM ignores the `serverUpdateProhibited` status,
   - applies new keys if they have passed the acceptance period (EPP operations create_keyset & update_domain),
   - switches domains to AKM if they have been secured and they have requested AKM (EPP operations create_keyset & update_domain),
   - updates auto-managed keysets (AKM keyset update operation),
   - removes auto-managed keysets where removal from AKM has been requested (EPP operation update_domain).

See also the *AKM periodic task*.

8.8.4 Components

The AKM subsystem includes the following components:

- **CDNSKEY scanner**
  - **binary `cdnskey-scanner` from the fred/cdnskey-scanner project**
    - scans for the existence of `CDNSKEY` records for the specified set of domains
- **Control part of AKM (CDNSKEY processor)**
  - **binary `fred-akm-ng` from the fred/akm-ng project**
    - via the gRPC API to/from the `cdnskey-processor-api` service, it exports a list of domains to scan obtained from the `fred` registry database or obtains a list of accepted `CDNSKEY` entries and applies them back to the registry
  - **binary `cdnskey-processor-api` from the fred/cdnskey-processor project**
    - via the gRPC API allows to specify a list of domains to scan and get a list of scanned `CDNSKEY` records
    - stores and retrieves data from the PostgreSQL database `cdnskey_processor`, runs every 10 minutes
  - **binary `cdnskey-processor-master` from the fred/cdnskey-processor project**
    - stores and retrieves data from the PostgreSQL database `cdnskey_processor`
    - divides the set of domains to be scanned into smaller parts and sends them to *worker* via `rabbitMQ`
    - reads the scan results of *worker* from `rabbitMQ`
  - **binary `cdnskey-processor-worker` from the fred/cdnskey-processor project**
    - from `rabbitMQ` reads the domain sets to be scanned from *master*
    - runs `cdnskey-scanner`
    - writes the scan results for *master* to `rabbitMQ`
- **testing tools**
  - **binary `cdnskey-processor-db-loader` from the fred/cdnskey-processor project**
    - used to set up data in the `cdnskey_processor` database for testing purposes

See also the *overall architecture* for component relations.

8.8.5 Notifications

The utilized EPP operations (create_keyset, update_domain) trigger the following notifications:

- *Email type: notification_create* and/or
- *Email type: notification_update* and *EPP poll message type: Object update*.

8.8.6 Scan results

Scan results are webwhois extension of the domain name details page.

Secured domain is a domain with DNSSEC. *Unsecured domain* is a domain without DNSSEC.

The following results are possible:

- **insecure**
  - Nameserver on the IP address contains for the unsecured domain a `CDNSKEY` record with values: flags, protocol, algorithm, public key.
- **insecure-empty**
  - Nameserver on the IP address for the unsecured domain doesn't contain a `CDNSKEY` record.
- **secure**
  - For secured domain exists a `CDNSKEY` record with trustworthy signature and values: flags, protocol, algorithm, public key.
- **secure-empty**
  - For secured domain there is no trustworthy `CDNSKEY` record.
- **untrustworthy**
  - (Non)Existence of `CDNSKEY` record for secured domain could not be reliably verified.
- **unknown**
  - No information could be obtained from the DNS about a secured domain.
- **unresolved**
  - No information could be obtained from the nameserver on the IP address about the unsecured domain.
- **unresolved-ip**
  - Unable to obtain any IP address of the nameserver.

8.9 Communication

This chapter provides an overview of communication which is triggered by events in the Registry.

Chapter TOC

- *Channels*
  - *Generic email addresses* *CZ-specific*
- *Object modifications*
  - *Settings*
- *Life-cycle events*
  - *Outzone unguarded warnings*
  - *Settings*
- *Administrative events*

- *Public request events*
- *Registrar events*
  - *Settings*

8.9.1 Channels

The FRED is capable of using the following channels of communication:

- **Email**
  - mandatory piece of information in contacts and registrars
  - used for most communication
- **Notify email**
  - optional, contacts only
  - used for notifications only
  - If a contact does not have a notify email, it is not notified.
- ***Generic* and additional emails**
  - extra addresses uncontained in Registry records
  - additional addresses must be *supplied manually*
  - used only for *outzone unguarded warnings* (a life-cycle event)
- **Poll messages**
  - an integral part of EPP
  - used for communication with registrars related to EPP activity
- Letter or Registered letter *CZ-specific*
- SMS *CZ-specific*

Generic email addresses CZ-specific

The generic email addresses are a qualified guess in an attempt to reach domain stakeholders. The Registry applies a set of patterns with local-part names which the stakeholders often use to name their domain-based mailboxes.

The generic email addresses are generated based on the following patterns: `info@<fqdn>`, `kontakt@<fqdn>`, `postmaster@<fqdn>`, `<fqdn>@<fqdn>`, where `<fqdn>` is the domain name in question.

The patterns for the generic email addresses are hard-coded and *CZ-specific*.

8.9.2 Object modifications

This section describes communication that arises from modifications of *registrable object*s by registrars, **except** the system registrar.

Modifications must finish successfully for notifications to occur.

Name	Trigger	Addressee	Channel
Create notification			Notify email (*CS params*)
	Registrar created a domain	*Holder and admin. contacts*	
	Registrar created a contact	The contact	
	Registrar created an nsset	*Tech. contacts*	
	Registrar created a keyset	*Tech. contacts*	
Delete notification			Notify email (*CS params*)
	Registrar deleted a domain	*Holder and admin. contacts*	
	Registrar deleted a contact	The contact	
	Registrar deleted an nsset	*Tech. contacts*	
	Registrar deleted a keyset	*Tech. contacts*	
Renew notification	Registrar renewed a domain	*Holder and admin. contacts*	Notify email (*CS params*)
Transfer notification			Notify email (*CS params*)
	Registrar transferred a domain	*Holder and admin. contacts*	
	Registrar transferred a contact	The contact	
	Registrar transferred an nsset	*Tech. contacts*	
	Registrar transferred a keyset	*Tech. contacts*	
	Registrar transferred an object	Previous registrar	Poll message (*structure*)
Update notification			Notify email (*CS params*)
	Registrar updated a domain	*Holder and admin. contacts* both old and new	
	Registrar updated a contact	The contact both old and new notify email	
	Registrar updated a contact linked to a domain of another registrar	The registrar of the linked domain	Poll message (*structure*)
	Registrar updated an nsset	*Tech. contacts* both old and new	
	Registrar updated a keyset	*Tech. contacts* both old and new	

Settings

Configuration allows to disable all EPP notifications in the Registry altogether (allowed by default):

Listing 14: Configure in the **fred-rifd** configuration file

```
[registry]
disable_epp_notifier = true
```

It is also possible to allow registrars to disable EPP notifications per command by configuring a special prefix for client transaction identifiers:

Listing 15: Configure in the **fred-rifd** configuration file

```
[registry]
disable_epp_notifier_cltrid_prefix = no_notification_
```

When the registrar signs a command with a client transaction identifier starting with the prefix `no_notification_`, the operation will not trigger a notification.

8.9.3 Life-cycle events

This section describes communication that arises from the *life cycle of registrable objects* (state changes).

Name	Trigger	Addressee	Channel
Expiration warning	Domain expiration is approaching – the *expW state* has been reached	Registrar	Poll message (*structure*)
Expiration notice	Domain has *expired*	*Holder and admin. contacts*	Email (*CS params*)
		Registrar	Poll message (*structure*)
Outzone warning (unguarded)	Domain is becoming unguarded – the *ouW state* has been reached	*Generics + additionals*	Email (*CS params*)
Outzone notice (unguarded)	Domain has become *unguarded*	*Holder and admin. contacts*	Email (*CS params*)
		Technical contacts of the domain's nsset	Email (*CS params*)
		Registrar	Poll message (*structure*)
Deletion warning *CZ-specific*	Domain is going to be deleted – the *delW state* has been reached *CZ.NIC: This letter was discontinued in January 2019.*	*Holder*	Letter
Deletion notice	Domain is being deleted – the *deleteCandidate state* has been reached	*Holder and admin. contacts*	Email (*CS params*)
		Technical contacts of the domain's nsset	Email (*CS params*)
		Registrar	Poll message (*structure*)
1st validation warning	Validation of an ENUM domain is expiring – the *valW1 state* has been reached	Registrar	Poll message (*structure*)
2nd validation warning	Validation of an ENUM domain is expiring – the *valW2 state* has been reached	*Holder and admin. contacts* of the domain	Email (*CS params*)
Outzone notice (not validated)	Validation of an ENUM domain has expired – the domain is *not validated* anymore	*Holder, admin. contacts and tech. contacts of the nsset*	Email (*CS params*)
		Registrar	Poll message (*structure*)
Unused notification	Object (nsset, keyset, or contact) has become *obsolete* and is being deleted	*Technical contacts* or the contact	Notify email (*CS params*)

Outzone unguarded warnings

These warnings are sent to *generic* and additional custom email addresses which are not direcly related to records in the Registry database.

Additional email addresses can be manually loaded to the Registry in the WebAdmin (Daphne). You just import a CSV file with domain names and lists of email addresses to send the warning email to.

Listing 16: Example of a line in a CSV file with additional emails

```
domain.tld,mail@example.tld,anothermail@example.tld,etc@example.tld
```

After the warnings are sent, the list of additional email addresses is cleared in the Registry database. A new list of addresses must be imported if there is need for another warning of this type.

Settings

To disable these messages, remove the corresponding row in the database table `notify_statechange_map` for the state change that you do not wish to communicate. See *Customizing state-change notifications* for details.

To modify **when** the messages are sent, *reconfigure* parameters of the *object life cycle* itself.

8.9.4 Administrative events

This section describes communication that arises from administrative tasks of the Registry.

Name	Trigger	Addressee	Channel
Contact merger	Registry has merged a contact automatically because it was detected as a duplicate	The contact	Email (*CS params*)
Object update (contact merger)	Registry has updated an object as a result of contact merger (replaced duplicate contacts in linked objects)	Registrar	Poll message (*structure*)
Contact update (address disclosure)	Registry has changed disclosure of contact address (contact has started or stopped complying with the *rules for hiding address*)	Registrar	Poll message (*structure*)
Contact reminder	Contact registration anniversary is approaching in 2 months	The contact	Email (*CS params*)
Domain update (Admin.blocking)	Registry has updated a domain	Registrar	Poll message (*structure*)
Domain delete (Admin.verification)	Registry has deleted a domain	Registrar	Poll message
Automated keyset management – Acceptance period iniated	Registry has discovered valid CDNSKEY records on an insecured domain	*Technical contacts* of the nsset	Email
Automated keyset management – Acceptance period broken	Registry has detected that CDNSKEY records changed during the acceptance period	*Technical contacts* of the nsset	Email
Automated keyset management – Acceptance period completed	Registry has updated a domain with the newly accepted key set	See *Update notification*	
		Registrar	Poll message (*structure*)
Automated keyset management – Keys update	Registry has discovered new valid CDNSKEY records on a secured domain	*Technical contacts* of the nsset	Email (*CS params*)

8.9.5 Public request events

This section describes communication that arises from requests of the public submitted through a web form.

Name	Trigger	Addressee	Channel
AuthInfo	Request for AuthInfo, which has been placed as a *public request*	*Linked contacts* or the contact	Email (*CS params*)
AuthInfo	Request for AuthInfo, which has been placed through a registrar	*Linked contacts* or the contact	Email (*CS params*)
Blocking confirmation	Public request for object (un)blocking has been executed	*Linked contacts* or the contact	Email (*CS params*)
Personal information	Request for personal information, which has been placed as a *public request*	The contact	Email (*CS params*)

8.9.6 Registrar events

This section describes communication that arises from registrar administration.

Name	Trigger	Addressee	Channel
Low credit	Registrar's credit has dropped below the limit, see *Settings* below	Registrar	Poll message (*structure*)
Request usage	Daily (depends on the *task setup*)	Registrar	Poll message (*structure*)
Monthly bill – No audit invoice *CZ-specific*	The end of the month in which paid services were not used	Registrar	Email
Monthly bill – Audit invoice included *CZ-specific*	The end of the month in which paid services were used	Registrar	Email
Confirmation of a received payment for credit deposit – Advance invoice included *CZ-specific*	An advance payment has been matched	Registrar	Email

Settings

The credit limit for the *low credit* message can be configured per zone in the database table `poll_credit_zone_limit`.

8.10 Zone generation

This chapter provides an overview of zone generation functionality in FRED.

FRED can generate zone files, which are compliant with **RFC 1034**, **RFC 1035**, **RFC 2308**, **RFC 4027**.

These zone files contain SOA, NS, A, AAAA and DS records, which are consistent with the data in the registry. The domain records are generated based on domain, nsset and keyset objects in the registry. FRED generates domains into the zone only if they are linked to a nsset. Domains can also be kept administratively out of the zone by statuses. DNSKEY records are immediately transformed into DS records and both A and AAAA records are only generated when GLUE records are required.

FRED itself only generates the text representation of zone file. The actual authoritative domain name service must be done through a DNS server such as KNOT or BIND. Although zone generator can execute additional scripts after zone file is generated in order to automate validation.

8.11 Billing

Billing in the FRED is targeted at **registrars**, who are charged for various operations, such as registrations, renewals, or the annual fee. The FRED supports both *prepaid* and *postpaid* model, which can be configured *per operation*.

A virtual account is managed for each registrar, which holds just the amount of **credit** without a specific currency. Incoming payments increase the credit on this account and charging for operations decreases it. The current state of credit is available over EPP. An account is kept for each zone separately.

Payment model

If a charged operation in in the **prepaid model**, it **fails** when there is not enough credit (EPP response code: `2104 Billing failure`). Therefore registrars must pay in advance to use these operations.

If a charged operation is in the **postpaid model**, it **succeeds** even when there is not enough credit. Therefore registrars do not have to pay in advance. This situation can create debt and it is up to the Registry to force registrars to pay it off.

Each operation can have a different model. Generally, setting the model means to (dis)allow negative credit.

Chapter TOC

- *Scanning bank transactions*
- *Processing payments*
- *Charging according to the price list*
- *Invoicing*
- *Customization options*

8.11.1 Scanning bank transactions

The idea is to run periodical scans for payments on bank accounts of the Registry operator.

The FRED contains *CZ-specific* scripts (connectors) to process transcripts of transactions collected from several banks that operate in the Czech Republic. (To study the scripts may help you in writing your custom connectors.)

Each bank has a B2B interface or API, but the individual banks use various channels (HTTP, IMAP) and various formats (CSV, XML). Therefore there is a specialized script for each bank, which transforms the payments into a common format and loads it into the FRED database.

A registrar can be identified in each payment with a payment symbol, which is given to them by the Registry operator, and which the registrar must enter with the bank transaction. If the symbol in a transaction matches a registrar, the payment is associated with this registrar. Unmatched transactions may be *associated manually* in the web administration (Daphne).

Changed in version 2.38: Bank transactions are collected, parsed and associated with registrars externally, and imported to FRED via a new Accounting interface for further processing. See also *The Future of Payments & Invoices*.

8.11.2 Processing payments

Once the payment is associated, the money can be processed further. If the registrar has debt, the money is used to cover the debt. The remaining amount, or all of it if there was no debt, is accepted as an **advance payment**.

For an advance payment, an invoice is issued to the registrar. (This is based on a legal requirement in CZ. It may not be necessary in another environment, but it is hard-coded.)

Then the *VAT* is subtracted from the amount. The VAT percentage is *configurable*.

Note: VAT subtraction applies to registrars who are marked as VAT-payers. The FRED marks registrars as VAT-payers by default. They can be unmarked (designated as not VAT-payers) individually:

- either with the `--no_vat` argument when *adding a new registrar* with **`fred-admin`**, or
- by unchecking the `DPH` checkbox in *registrar details* in **`Daphne`**.

Tip: To disable the VAT completely:

- set all registrars as not VAT-payers, or
- configure VAT percentage to 0 %.

After that, the (VAT-reduced) amount is added to credit.

Tip: Credit can be added for the registrar even without having to scan for bank transactions. Just use the CLI tool **`fred-admin`** to *assign credit to a registrar*.

8.11.3 Charging according to the price list

The FRED has a configurable **price list** for operations that involve charging:

- establishment of a new domain record (`CreateDomain`) via EPP,
- prolongation of an existing domain record (`RenewDomain`) via EPP,
- EPP requests over a limit (`GeneralEppOperation`).

This can be configured through the CLI tool **`fred-admin`**, see *Creating price list*. Prices are set for each zone separately. A price can be valid for a limited time (validity period).

Charging for specific EPP requests

Registrars are charged when EPP commands are carried out, for EPP commands:

- `renew_domain` – charged for one operation: prolongation only, and
- `create_domain` – charged for 2 operations: establishment and immediate prolongation.

Establishment is charged one time, whereas prolongation is multiplied by the length of the registration period. For example: If prices are *CreateDomain for USD 4* and *RenewDomain for USD 6*, then creating a new domain registration for 2 years costs `4 + (2 * 6) = USD 16`, and renewing an existing domain for 3 years costs `3 * 6 = USD 18`.

The amount is subtracted from credit. In the prepaid model, if there is not enough credit, the command fails.

Charging for all EPP requests over a limit OPTIONAL

Each registrar has an individual monthly limit of free EPP transactions based on the number of registered domains. (There is a minimum for new registrars.) At the end of a month, we count transactions and charge for the difference over the limit[1]. The amount is subtracted from credit. If there is not enough credit, we still charge in negative credit.

Tasks: Call `fred-admin --charge_request_fee` before monthly billing `fred-admin --invoice_billing ...`.

Other charges

Other charges can be implemented only as custom SQL scripts, but it is risky!

For example, the Czech Registry charges additionally:

- *an annual fee for zone access* (`Fee`):

  Once a year, we inform registrars to increase credit, first, and then we subtract the annual fee (USD 3,000) from the credit. If there is not enough credit, we still charge in negative credit.

- *a fine for too few registrations* (`Fine`):

  Each registrar must register for at least USD 7,000 per year (new domains or renewals). At the end of a year, we count the current state and if there is a difference, we charge for the difference under the minimum. This is not subtracted from credit, but it is covered by the next payment.

Both these charges, however, are made manually with ad-hoc scripts, which are not released with the FRED.

8.11.4 Invoicing

There are 2 types of invoices stored in the FRED database: advance (for advance payments) and account (monthly bills). Invoices are automatically numbered, but initial numbers (per year and invoice type) must be configured before invoices can be generated, see *Invoice numbering*.

Invoices are delivered to registrars' email in both XML and PDF formats. The XML format is FRED's format for invoices and it can be transformed with XSLT for import into accounting software. The PDF format is generated with a templating system.

8.11.5 Customization options

- Configure prepaid/postpaid model per operation
- Configure price list and VAT
- Write custom connectors for bank systems or add credit manually
- Invoices can be ignored or *PDF templates must be adapted*
- Write XSL transformations to upload invoices to accounting software

[1] Transactions (except poll req/ack) are counted for all object types and for all zones together, but they are billed with the zone configured in the table `request_fee_parameter.zone_id` by the price that is configured for this zone and this operation in the price list. Failed commands are not billed.

8.12 The Future of Payments & Invoices

We are aware that the *original billing subsystem* in FRED may not be suitable for use in other countries as it is. Therefore we have decided to detach this subsystem from FRED and leave billing to other tools as much as possible.

This detachment will be done in several phases and the *phase 1* is part of FRED 2.38 (see below).

The target state

The intention is to remove payments (bank transactions) collection, parsing, registrar association, *VAT* calculations and invoicing from FRED.

Payments will be processed by an external tool which will interface with both FRED and an accounting system that should handle invoices, VAT and currencies properly.

FRED will only keep the currency-neutral credit account for each registrar and provide an interface for increasing and decreasing credit amount.

It will be up to the Registry operator which accounting system they choose and how they interconnect it with FRED.

The state of affairs in version 2.38

Scanning for payments, parsing and association with registrars is done in an external tool that calls FRED's Accounting interface (IDL) to import payment data for further processing: to handle credit and generate invoices, because they remain in FRED for now. FRED handles credit internally, there is no interface yet.

The external tool we use in the Czech Registry is **`Django PAIN`**, which we started to develop for our own accounting purposes. This tool is released to the public along with FRED, but it is *CZ-specific* and is intended only as an example implementation for inspiration or customization. When we reach the target state, we will provide some customization instructions.

See also /ReleaseNotes/Upgrade-2-38.

8.13 Audit log (logger)

Audit log is the ability of the Registry to record user interface transactions, who requested them, from where, and what the result was.

Among *other purposes*, audit log records are also suitable for generating Registry statistics.

Disabling the logger

If the Registry operator does not need audit log records, they just do not launch the logger daemon (`fred-logd`). Most *depending components* will still operate without recording the audit log data, only the *EPP Apache module* has to be re-configured not to require it (set the option `EPPlogdMandatory` to `Off`).

8.13.1 Logged services

Logged services of user interfaces encompass (a selection of services that are not *CZ-specific* from the db table `service`):

- EPP (infix `epp_`)
- RDAP (infix `rdap_`)
- Unix whois (infix `whois_`)
- Web whois (infix `webwhois_`)
- Public request (infix `pubreq_`)
- Admin (infix `admin_`)
- WebAdmin (infix `webadmin_`)

The infixes are used to name logger database tables, see *Database & partitioning*.

8.13.2 Contents of a log record

An audit log record is made per user request and it is composed of:

- request initiation (time_begin),
- request completion (time_end),
- service (see *Logged services*),
- request type (further classification under the individual services),
- user name,
- source IP address,
- result (code and message),
- properties (request and reply parameters as key-value pairs).

For some activities, even the whole request and reply are logged, e.g. for EPP.

8.13.3 Browsing the log

The audit log records can be viewed in the web administration (Daphne) under a user with the permission `read.logger`. The log records can be searched like any other records, see *Database search*.

8.13.4 Database & partitioning

Audit log data can be stored in an independent database that can be completely separated from the rest of FRED data, even physically, which is recommended for better performance.

The database must be properly secured so that nobody can modify the records.

Partitioning logic

The audit log data is partitioned into tables according to:

- purpose – records are used by system admins for *monitoring* (infix `mon_`) or not (empty infix),
- service (see *Logged services*),
- date – year as 2 digits `YY` and month as 2 digits `MM`.

Which means that the db tables are named using the pattern `request_<service-infix><monitoring-infix><YY>_<MM>` and they contain only the logs of the specified period and service.

Creating partitions

New partitions can be prepared using the Python script `create_parts`, which is included with the package `fred-logger-maintenance`. If the logger needs to write into a new partition, which does not exist yet, it will create the new partition automatically on the fly but at a cost. Therefore, we recommend to prepare partitions in advance (e.g. for a whole year).

Archiving partitions

Legislation may require to keep the records for a certain period of time (e.g. for 2 years). Older records should be regularly removed from the database to free system resources.

Partitions are to be archived by month using `pg_dump` and archived partitions can be dropped using the Python script `drop_parts` afterwards. This script is included with the package `fred-logger-maintenance`, too.

CHAPTER

NINE

ARCHITECTURE DESCRIPTION

This document describes the top-level architecture and internal bindings of the FRED system.

Target audience

Developers, system administrators, customer support

Purpose

Knowing the basic top-level composition and organization of the system (reflects general design, no implementation details).

Terms & definitions

Terms and definitions can be found *in the glossary*.

Chapters

9.1 Blackbox model

This model, which can be also considered a context diagram, illustrates basic data flows between Registry end users and the Registry.

9.2 Top-level components

This chapter contains diagrams and brief descriptions of FRED top-level components and their relationships.

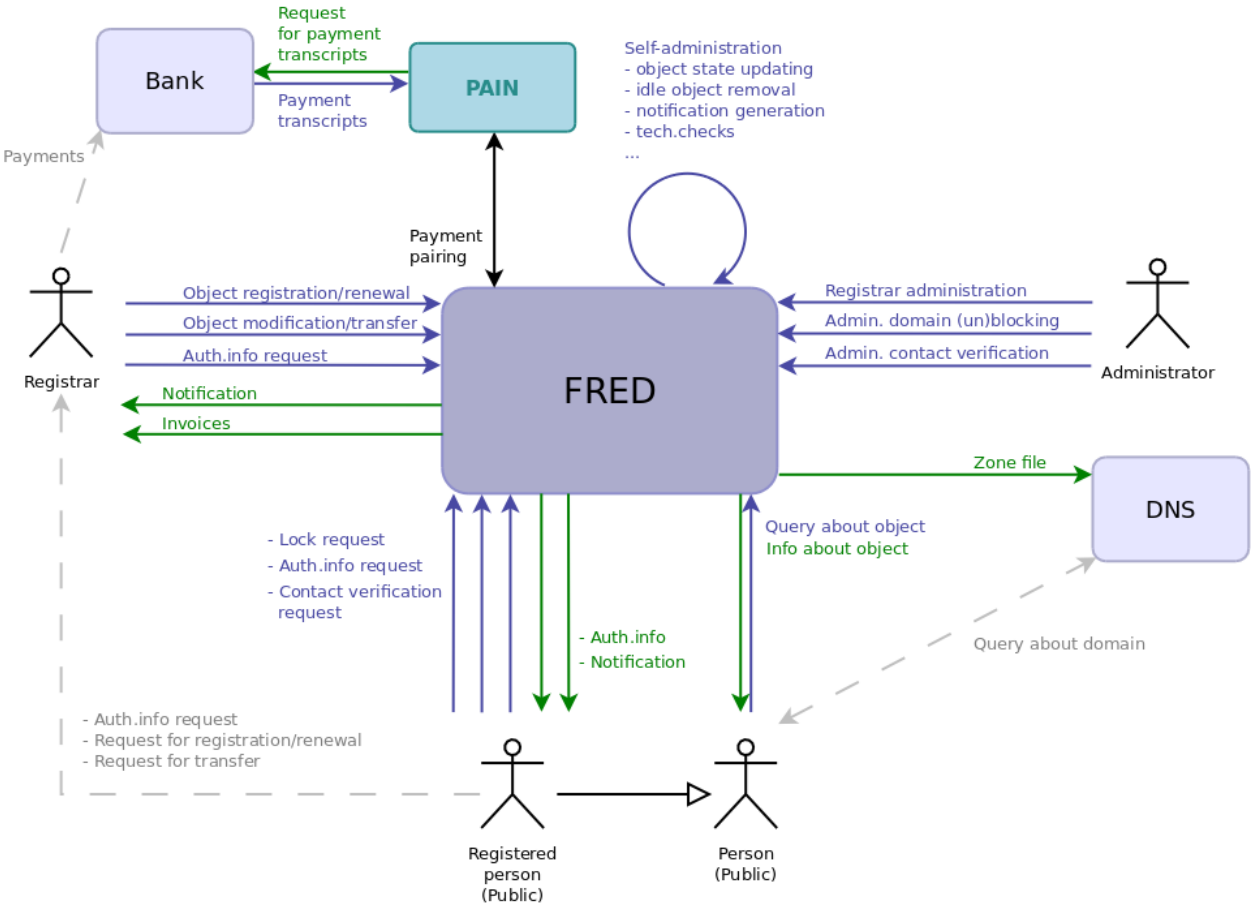
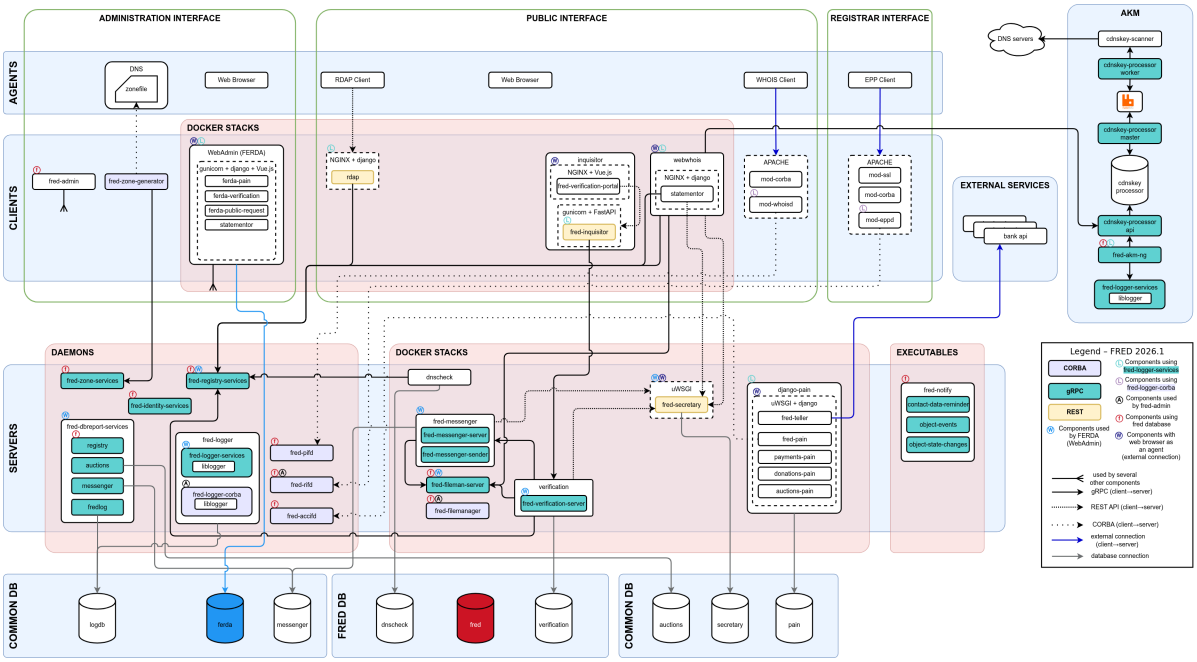


Fig. 1: Context diagram – Overview of users and general data flows

Diagram of FRED components (For full resolution Click here)



Legend

- *Arrows* signify direct cooperation of components (the arrow points at the component which serves the other component); neither the colour nor the style of arrows carry any meaning.

For pin list of all necessary packages see the latest release notes.

9.2.1 User agents

In general, user agents are applications in the client-server model that act as clients and communicate with a server on behalf of a user. Most user agents in the FRED schema, such as a web browser, are not actual components of FRED. However, there is an exception of the EPP client which is a user agent that comes with the FRED.

- *EPP client*
- *Whois client*
- *RDAP client*
- *Web browser*

EPP client

The EPP client is a tool that allows registrars to register, delete and modify objects in the Registry.

The EPP client API allows registrars to implement their own application to access the EPP service or integrate it with their systems. The API is coded in Python.

Also, the **`fred-client`** command-line application is available which is a reference implementation of the API and ready to use.

Whois client

This can be any application that can request domain information via the WHOIS protocol (typically the command-line **`whois`**).

RDAP client

This can be any application that can request domain information via the REST API and process a response in the JSON format.

Web browser

A web browser used to access FRED's services should support graphics and JavaScript.

9.2.2 Clients

Clients constitute the frontend interfaces that serve actual users.

- *Registrar interface*
  - *EPP service*
- *Administration interface*
  - *WebAdmin service (Daphne)*
  - *WebAdmin service (Ferda)*
  - *Fred-zone-generator*
  - *Transproc*
  - *Fred-admin*
  - *Fred-akm*
  - *CDNSKEY scanner*
  - *PAIN utility & admin service*
- *Public interface*
  - *Unix whois service*
  - *Web whois service*
  - *RDAP service*

Registrar interface

This interface provides only a single service to the registrars.

EPP service

This service negotiates communication between registrars and the Registry by means of the *EPP* protocol which was designed for creation and administration of registrable objects.

The **mod-eppd** module translates the incoming requests in XML into remote CORBA calls (supported by the **mod-corba** module) and then translates their results back to the outgoing responses in XML. The structure of the XML documents is formally described in XML schemas and can be validated.

The communication is secured with the SSL using the **mod-ssl** Apache module. Transportation is provided by the TCP/IP protocols.

The service is built on a web server engine (Apache). It has its own configuration in the Apache config. syntax.

Administration interface

This interface provides the web service and command-line utilities for Registry administration.

WebAdmin service (Daphne)

This service provides web access to Registry administration. It can be used by the Registry customer service for manual administrative tasks.

This component is coded in Python using the CherryPy framework which provides a self-contained web server.

The service has its own configuration file.

WebAdmin service (Ferda)

Ferda is a new and enhanced web administration interface and tool for FRED and it is expected to replace the *Daphne webadmin* in the future.

Ferda is meant mainly for helpdesk workers who can use it to view and manage registrars and objects within the FRED system. You can see registrar and object details, the entire object history, e-mails, letters and SMS messages, passwords, etc.

The current set of features is listed in *FERDA webadmin features*.

It is coded in Python using the Django web framework and distributed via Docker images. The service has its own database and configuration file (although the configuration is mostly done by setting `.env` variables while running the docker container).

Fred-zone-generator

Important: Genzone client is deprecated and is no longer used.

The fred-zone-generator generates zone files and catalog zones based on data obtained from the fred-zone-services and fred-dnshosting-services servers.

The client has its own configuration file.

Transproc

This Python script is used to download and analyze transcripts of bank transactions or simple payments. It parses a downloaded transcript, whose format is specific to each bank, using a *processor* (configurable script), transforms it into an internal XML format and calls *pain* to save this data into the **PAIN** database.

The script has its own configuration file.

See also *The Future of Payments & Invoices*.

Fred-admin

This command-line application is used mainly (but not only) for automated administration tasks, such as keeping object states up to date, cancelling expired domains, deleting unused objects, generating notifications and billing registrars. Refer to `fred-admin --help` for all available commands.

This program shares configuration with C++ daemons.

Fred-akm

This command-line application implements the processing logic of *Automated keyset management* and is used to perform the *periodic task*. Refer to `fred-akm --help` for all available commands.

The program has its own *configuration* file.

The program uses a local SQLite database to store internal intermediary data (scan state) between runs.

CDNSKEY scanner

This command-line utility is used during automated management of keysets to scan specified name servers for requests to update DNSSEC keys of specified domains. The utility spreads queries over a specified run time to avoid overloading the DNS infrastructure and distributes queries per name server.

The utility is implemented with the getdns and libevent APIs.

Neither a configuration file nor database access are required. The scanner reads from STDIN and writes to STDOUT.

PAIN utility & admin service

This utility collects and parses payments, and saves them to an independent database. It is based on Django.

The utility allows to pair processed payments with a registrar credit account and invoices in FRED, either automatically or manually using the Django admin interface.

The `fred-pain` module connects this independent utility to FRED over CORBA.

See also *The Future of Payments & Invoices*.

Public interface

This interface provides information services to the public.

Unix whois service

This service implements the WHOIS protocol as described in **RFC 3912**. The protocol allows to query the Registry about registrable objects.

The **`mod-whoisd`** module translates incoming WHOIS requests into remote CORBA calls (supported by the **`mod-corba`** module) and then translates their results back to outgoing WHOIS responses.

Each response contains the link to the web whois service site which can be used to win full information about domain owners and administrative contacts.

The unix whois service allows to query even ENUM domains, although these responses do not contain the link to the web whois because the rules of information disclosure that apply to ENUM domains are different from those of common domains.

The service is built on a web server engine (Apache). It has its own configuration in the Apache config. syntax.

Web whois service

This service allows to browse the database of the Registry. It allows to search in domains, contacts, name server sets and DNS key sets. The web site is protected against data mining with CAPTCHA.

This service does not allow to browse information about ENUM domains.

It is based on Django.

RDAP service

This service processes queries sent via the HTTP protocol using the REST API. If the query is successful, the response contains JSON-formatted data.

It is based on Django.

9.2.3 Servers

This is a set of components which implement the backend of the Registry and which can run independently of each other. All of them use the same ORB implementation (omniORB) which takes care of the server side and process threading.

- *C++ daemons*
  - *fred-rifd*
  - *fred-pifd*
  - *fred-rsifd*
  - *fred-adifd*
  - *fred-akmd*
  - *fred-accifd*
  - *fred-msgd*
  - *fred-logd*
  - *fred-logger-services*
  - *fred-mifd*
  - *fred-dbifd*
  - *fred-registry-services*
  - *fred-zone-services*
- *fred-messenger*
- *django-secretary*
- *fred-fileman*
- *PYFRED daemon(s)*
  - *GenZone*
  - *Mailer*
  - *FileManager*
  - *TechCheck*

C++ daemons

These backend components are coded in C++.

Each of them is launched in a separate process and they may share a single *configuration* file.

fred-rifd

The registrar interface *daemon*.

This daemon implements operations over the database defined in the EPP protocol and it is used by the *EPP service*. Every EPP operation is mapped to a corresponding CORBA operation. Operations over objects are *idempotent*, i.e. if the same operation is invoked repeatedly, it does not change the state of object in the Registry.

The daemon is aware of all connected clients; if a client connects in a new session, a unique identifier is generated to identify the session in EPP communication and in the audit log.

All clients' activity is recorded in the database including the original request and response XML files.

Object-altering operations make the system record the object in the history before the change is applied.

A database connection is opened during each EPP operation (and closed at the end). Therefore the **pgpool** tool is utilized to cache the connections, thus reducing the connection overhead.

fred-pifd

The public interface *daemon*.

This daemon implements operations over the database which make information about domains accessible to the public; it functions as the backend for the *unix whois*, *web whois* and *RDAP*.

fred-rsifd

Important: The `fred-rsifd` daemon has been removed in FRED 2.48.0 and replaced by the `fred-statementor` library.

The record statement interface *daemon*.

This daemon implements operations over the database which allow generation of signed PDF documents with information about registrable objects; it functions as another backend for *Daphne*, *web whois* and Domain Browser extension.

fred-adifd

The administration interface *daemon*.

This daemon implements administration operations over the database which allow to browse any information in the Registry (including the history and audit log) and to add and modify some of it.

It functions as the backend for Daphne, the *web administration service*.

fred-akmd

The automated keyset management *daemon*.

This daemon implements operations over the database that support automatic management of keysets (loading domains with name servers, updating DNSSEC, notifying contacts); it functions as the backend for the *AKM client*.

fred-accifd

The accounting *daemon*.

This daemon implements operations for pairing processed payments of registrars with credit and invoices.

fred-msgd

The messaging *daemon*.

This daemon implements operations for generating and sending text messages (SMS) and printed letters.

Important: The `fred-msgd` daemon has been replaced by *messenger* and its dependent services in FRED 2.48.0.

The `fred-msgd` daemon has been replaced by following services:

- Sending the messages is replaced by `fred-messenger`.
- File creation (PDF, XML, CSV) is replaced by `django-secretary`. The `doc2pdf` package is not used anymore in any part of messaging process.
- Communication with *fred-fileman* (e.g. storing attachments) is now via library, `file-client` is not used anymore.

Generating specific messages is handled by these clients:

- `fred-notify-contact-data-reminder` – runs daily, sends annual message to contacts.
- `fred-notify-object-state-changes` – runs after regular object procedure (twice a day), sends notification about changes in object states.
- `fred-notify-object-events` – runs every 5 minutes, sends notification about used commands (create, update, delete, renew, transfer), typically done via EPP.

fred-logd

The audit logging *daemon* or "logger".

This daemon creates audit trail of all user activity that passes through FRED applications and modules (i.e. Clients, see the *Diagram of FRED components (For full resolution Click here)*).

Important: The `fred-logd` daemon has been replaced in FRED 2.48.0 by the binaries *fred-logger-services* and `fred-logger-corba`. Both are independent services that only use the same core library `librogger`. `Fred-logger-services` implements gRPC interface, `fred-logger-corba` implements CORBA interface and is intended for old CORBA-based clients.

---

fred-logger-services

This deamon replaces the `fred-logd` deamon, but the `fred-logger-services's` clients are gRPC apps, not CORBA apps (a different communication protocol is used). We are developing a wrapper from Corba to gRPC for CORBA clients that will simplify transition of clients to only one logger service implementation.

fred-mifd

The *daemon* of the MojeID extension.

This daemon implements operations for the *MojeID extension*.

fred-dbifd

The *daemon* of the Domain Browser extension.

This daemon implements operations for the *Domain Browser extension*.

fred-registry-services

This deamon provides features via gRPC interface for getting information about objects in registry, for searching among registry entries, and, in the future, also for managing (creating, deleting, updating) objects in registry. It works directly with the FRED database.

fred-zone-services

This is a gRPC backend for generating zone file.

In addition to the backend itself, the solution also includes the client fred-zone-generator, which is used for generating the zone file.

fred-messenger

FRED services for sending, generation and archivation of documents. You can see its dependencies on a simplified diagram:

django-secretary

Service for generating documents and template management.

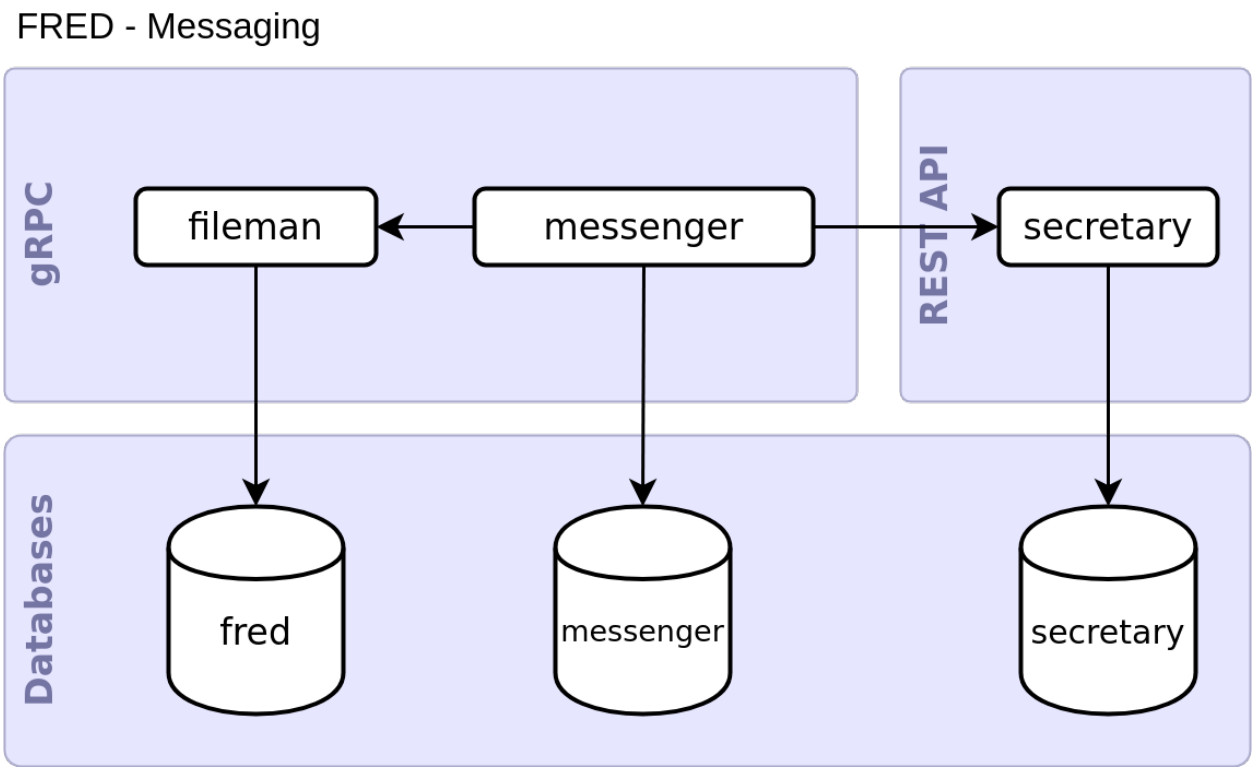


Fig. 2: Diagram of FRED messaging components

fred-fileman

Service for file management.

PYFRED daemon(s)

These backend components are coded in Python.

The PYFRED is a framework which provides common functions to several modules that act as standalone CORBA servers and implement various operations over the database.

The common functions provided by the framework encompass:

- process logging,
- database connection management,
- parsing of a configuration file,
- ORB initialization and registration of objects with the CORBA naming service,
- launching of periodic tasks registered by the modules.

The modules can run either in a single process or in several processes and they may share a single *configuration* file.

GenZone

Important: The genzone daemon is deprecated and is no longer used. It has been replaced by *fred-servers-zone* and its dependent services.

The zone generator *daemon*.

This daemon implements operations over the database used during zone file generation.

A generation is requested by the *client application* that can run on another machine. The client receives a portion of data of a fixed size, first, and then orders the remaining data in small chunks. (The total size of a zone file can reach hundreds of MB.)

Mailer

Important: Since FRED 2.48.0 the mailer daemon is deprecated and is no longer used. It has been replaced by *messenger* and its dependent services.

The mailer *daemon*.

This daemon implements the part of the notification system that delivers messages through email. It integrates a templating system for email assembly, operations for sending and archivation of outgoing email and search in archived messages.

Note: The mailer does not send email by itself, it just hands all email over to a mail transfer agent.

Attachments are either constructed from templates or retrieved from the file manager.

The mailer is used by the CORBA servers *fred-rifd*, *fred-adifd*, and also by the CORBA clients *WebAdmin* and MojeID extension.

FileManager

The file manager *daemon*.

This daemon implements operations for managing files, namely the upload, download and search of managed files. Each file is stored in the file system as such and only its metadata are recorded in the database.

The file manager is used by *mailer*, *web whois service* and file manager client.

TechCheck

Important: Since FRED 2.48.0 the TechCheck daemon is deprecated and is no longer used. It has been replaced by *messenger* and its dependent services.

The technical checks *daemon*.

This daemon implements operations for performing technical tests on name server sets.

The tests are either launched periodically and a report is sent to the corresponding technical contact of the nsset by email, or they are requested by registrars and the reports are included in EPP poll messages.

The technical tests are scaled by severity and the tests of higher severity can be performed only if the tests of lower severity were successful.

Both planned checks and results are stored in the database.

9.2.4 Databases

The selected database solution is PostgreSQL.

The C++ backend components use the `libpq` library for database connectivity. The Python backend components use Python's own database interface.

9.3 Distributed deployment example

Deploying FRED on multiple servers brings at least two advantages:

- increased performance,
- access control on the network level.

Deploying on multiple physical servers is not the only distributed solution, deploying on virtual servers or separating tasks on the process level is also possible.

Nodes overview

Nodes in this document represent execution environments.

We work with the following nodes:

- *EPP node* – EPP service
- *ADMIN node* – web admin service
- *WEB node* – public web services: Unix WHOIS, Web WHOIS, RDAP
- *HM node* – zone management
- *APP node* – application servers, CLI admin tools, pgbouncer, CORBA naming service
- *DB node* – the main FRED database
- *LOGDB node* – the logger database
- *Secretary node*
- *Messenger node*

Tip:

Redundancy

This text does not describe redundancy options in detail, but here is a quick tip:

- database replication is a standard technique to protect data,
- the whole system can be replicated in several instances on different localities, which can substitute one another when one instance fails or during a system upgrade.

- *Network*
- *EPP node*
- *ADMIN node*
- *WEB node*
- *HM node*
- *APP node*
- *Database nodes*
- *Secretary node*
- *Messenger node*

9.3.1 Network

Network rules are described per node in the following sections, but here is an overview of logical connections in the network (a single instance of the system).

Restricted network access means that servers should be accessed only from IP addresses and ports allowed on a firewall.

Unrestricted network access means that servers can be accessed from any IP address, but only necessary ports should be open for access as illustrated in the network rules for each node.

9.3.2 EPP node

Provides: EPP service

Packages:

- libapache2-mod-corba
- libapache2-mod-eppd;

Network:

- access to EPP (tcp, port 700) permitted only from particular IP addresses (or ranges) declared by registrars

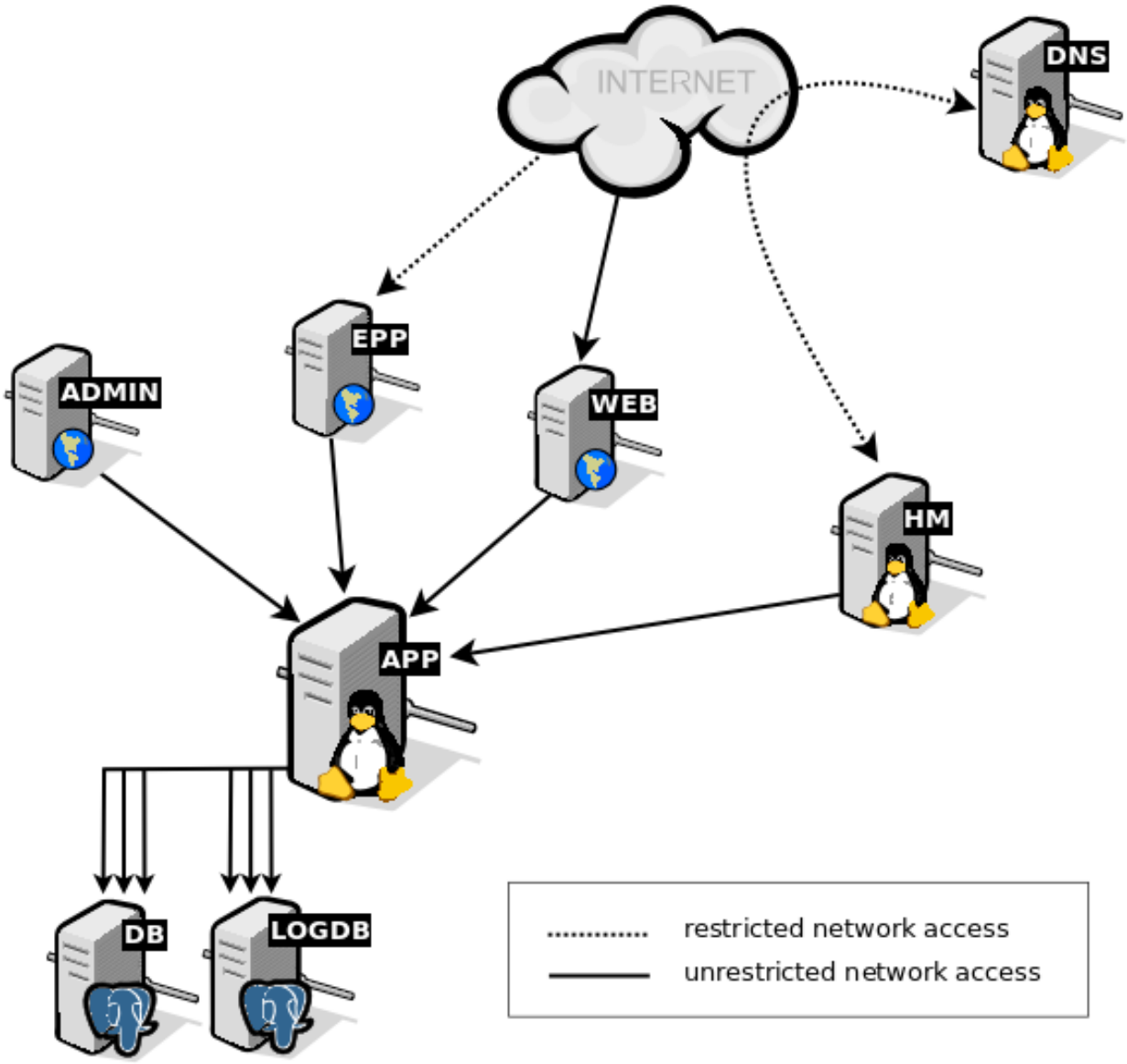


Fig. 3: Network – Logical topology

Table 1: EPP node packages

Package	Provided services	Description	Default config location
`liba-pache2-mod-corba`	None (is only an Apache module)	Apache module that provides common functionality of CORBA communication for EPP and WHOIS Apache modules	`/etc/apache2/sites-enabled` (generated after module activation)
`liba-pache2-mod-eppd`	None (is only an Apache module)	Apache module for parsing EPP commands and transforming them into CORBA calls to server (and vice versa)	`/etc/apache2/sites-available/02-fred-mod-eppd-apache.conf` (generated after module activation)

9.3.3 ADMIN node

Provides: Web administration interface

Network:

- access to HTTPS (tcp, port 443) permitted only from the private network of the Registry

Table 2: ADMIN node docker images

Docker image	Description	Default config location
`ferda-nginx`	http webserver	none, configuration example in fred/ferda/-/tree/master/docs/demo-deploy
`ferda-uwsgi`	webserver gateway interface	none, configuration example in fred/ferda/-/tree/master/docs/demo-deploy

9.3.4 WEB node

Provides: Unix WHOIS, Web WHOIS, RDAP

Network:

- access to HTTPS (tcp, port 443) permitted from anyone
- access to WHOIS (tcp, port 43) permitted from anyone

Table 3: WEB node packages

Package	Provided services	Description	Default config location
`liba-pache2-mod-corba`	No provided services (is only an Apache module)	Apache module that provides common functionality of CORBA communication for EPP and WHOIS Apache modules	`/etc/apache2/sites-enabled` (generated after module activation)
`liba-pache2-mod-whoisd`	No provided services (is only an Apache module)	Apache module for parsing EPP commands and transforming them into CORBA calls to server (and vice versa)	`/etc/apache2/sites-available/02-fred-mod-whoisd-apache.conf` (generated after module activation)

Table 4: WEB node docker images

Docker image	Description	Default config location
`rdap-nginx`	http webserver	none, configuration example in fred/ferda/-/tree/master/docs/demo-deploy
`rdap-uwsgi`	webserver gateway interface	none, configuration example in fred/ferda/-/tree/master/docs/demo-deploy
`webwhois-nginx`	http webserver	none, configuration example in fred/ferda/-/tree/master/docs/demo-deploy
`webwhois-uwsgi`	webserver gateway interface	none, configuration example in fred/ferda/-/tree/master/docs/demo-deploy

9.3.5 HM node

Hidden master for the DNS infrastructure.

Provides: zone file generation, zone signing, DNS servers notification

Network:

- access to IXFR (tcp, port 53) permitted only from DNS servers

Table 5: HM node packages

Package	Provided services	Description	Default config location
`fred-zone-generator`	None	System binary for zonefile generation	`/etc//fred/fred-zone-generator.conf`

9.3.6 APP node

Provides:

- CORBA naming service (omninames) as a virtual server “corba”,
- backend application servers,
- CLI administration tools,

Tip: In addition to FRED components we recommend adding **`pgbouncer`** for database connection distribution.

Network:

- only internal access from the private network of the Registry

Table 6: APP node packages

Package	Provided services	Description	Default config location
fred-accifd	/lib/systemd/system/fred-accifd.service	FRED backend for accounting	/etc/init/fred-accifd.conf
fred-adifd	/lib/systemd/system/fred-adifd.service	Administration interface daemon	/etc/init/fred-adifd.conf
fred-akm	None	FRED automatic keyset management client	etc/fred/fred-akm.conf
fred-akmd	/lib/systemd/system/fred-akmd.service	FRED backend for automatic keyset management	/etc/init/fred-akmd.conf
fred-api-fileman	None	FRED fileman services interface definition files	None
fred-api-logger	None	FRED logger services interface definition files	None
fred-backend-dbreport	/lib/systemd/system/fred-dbreport-services.service /lib/systemd/system/fred-dbreport-services@.service	FRED server for database reports (gRPC)	None
fred-backend-fileman	/lib/systemd/system/fred-fileman-server.service	FRED service for file management	/etc/fred/fileman.conf
fred-backend-logger	/lib/systemd/system/fred-backend-logger.service	FRED logger services (gRPC)	None
fred-backend-logger-corba	/lib/systemd/system/fred-backend-logger-corba.service	FRED logger services (CORBA)	None
fred-backend-notify	None	FRED notify implementation	/etc/fred/fred-notify-contact-data-reminder-conf /etc/fred/fred-notify-object-events-example.conf /etc/fred/fred-notify-object-state-changes-e conf
fred-backend-public-request	/lib/systemd/system/fred-backend-public-request.service	FRED backend for public request management	None
fred-backend-registry	/lib/systemd/system/fred-backend-registry.service	FRED registry core services (gRPC)	None
fred-backend-zone	/lib/systemd/system/fred-zone-services.service	FRED backend service for DNS zone generator	etc/fred/fred-zone-services.conf
fred-idl	None	FRED server interface definition files	None
fred-pifd	/lib/systemd/system/fred-pifd.service	FRED public interface daemon	/etc/init/fred-pifd.conf
fred-rifd	/lib/systemd/system/fred-rifd-services.service	FRED registrar interface daemon	/etc/init/fred-rifd.conf
cdnskey-scanner	None	CDNSKEY records scanner	None
python3-pydantic	None	Data validation and settings management using python type hinting	None

9.3.7 Database nodes

Database is separated into several nodes:

- DB – the main database `freddb` – data of all domains, contacts, registrars, history etc.
- LOGDB – the *audit log (logger)* database `logdb` – logging of all user transactions
- messenger
- secretary
- FERDA

We have the logger database separately due to high workload.

Network:

- accessed only by the backend server(s) from the *APP node*

Table 7: DB node packages

Package	Provided services	Description	Default config location
`fred-db`	None	Database schema and example data for FRED	None
`post-gresql-13`	None	PostgreSQL database server	None

9.3.8 Secretary node

Table 8: Secretary node packages

Package	Provided services	Description	Default config location
`python3-django-secretary`	`/usr/share/doc/python3-django-secretary/examples/fred-secretary.service`	Django app for rendering e-mails and PDFs	`/usr/share/doc/python3-django-secretary/examples/settings.py`
`nginx-full`	None	http web server	None
`uwsgi`	None	webserver gateway interface	None

9.3.9 Messenger node

Table 9: Messenger node packages

Package	Provided services	Description	Default config location
`fred-api-fileman`	None	FRED fileman services interface definition files	None
`fred-api-messenger`	None	FRED messenger services interface definition files	None
`fred-backend-messenger`	`/lib/systemd/system/fred-messenger-server.service` `/lib/systemd/system/fred-messenger-sender-email.service` `/lib/systemd/system/fred-messenger-sender-sms.service`	FRED service for sending and archiving messages	None

9.4 Source code

FRED's source code is split across multiple subprojects, each maintained as a separate repository in the fred GitLab group, where every repository's description explains its role in the system.

CHAPTER

TEN

ADMINISTRATION MANUAL

This document provides guidance on installation, operation and maintenance of the system.

Target audience

System administrators, customer support

Purpose

Making the system work and keeping it operational (installation, configuration, customization, maintanance), setting automated tasks, being aware of the tools for manual intervention.

Prerequisites

To understand this manual, you should already be familiar with the general *features* and the *architecture* of the system.

The procedures of this manual expect at least basic experience in the usual tasks of a Un*x/Linux-like environment.

Terms & definitions

Terms and definitions can be found *in the glossary*.

Chapters

10.1 Installation

This chapter describes how to install the FRED.

10.1.1 System requirements

This section describes the environment suitable for running the FRED.

Hardware

We recommend to run the FRED on **64-bit** architectures.

Binaries are available only for 64-bit architectures.

Sources can be compiled for both 32-bit and 64-bit architectures but the 32-bit variant is no longer tested or supported.

Operating system

To deploy binaries, you must have installed this **operating system**:

- Debian 12 (Bookworm)

To compile sources from tarballs, you may try to use any Linux distribution of your choice, but we tested the current compilation/installation procedure only on Debian.

Auxiliary software

To make use of all FRED features, the following auxiliary programs are required:

- (essential) CORBA naming server (OmniNames),
- (essential) PostgreSQL database server (PG17),
- (essential) Apache web server (Apache>2.2),
- mail server (Postfix, Sendmail, Exim or other),
- DNS server (KnotDNS, Bind, NSD or other).

Note: All of these tools are installed automatically when installing from binaries but they must be installed manually when you decide to compile source code yourself. But don't worry, the appropriate packages are included in the dependency lists for each supported operating system.

10.1.2 FRED demo

The demo environment differs from a production deployment in several important ways:

- **Sample data.** The database is already filled in with a sample zone (`.demo`), two registrars (an internal `REG-SYSTEM` and an external `REG-DEMO`), a set of test contacts and domains. In regular deployment, you initialize the zone, registrar, and price list by yourself during *registry initialization*.
- **Relaxed security.** TLS certificates, EPP passwords and database credentials are set to well-known test values.
- **Single-node layout.** All FRED services run on one machine. More details about the differences are explained in *registry infrastructure basics* section.
- **No mail or DNS integration.** The demo does not send emails or publish zone files to a live DNS server. Emails are created and processed by `messenger`, so it is possible to find them in messenger db (`sudo -u postgres psql messenger`) or Ferda.

1. For testing and demonstration purposes, we provide a virtual image of Debian server with uninitialized instance of FRED. Download the image here. For building the demo we use script in the repository fred/demo-install.
2. Import the `.qcow2` image.
3. After importing, you can launch the server and ssh into the machine with user: `fred`, password: `password`.

Note: One of the possible ways to import and run the image is using Virtual Machine Manager on Linux. The steps are as follows:

- **Install Virtual Machine Manager:**

```
sudo apt-get update
sudo apt-get install virt-manager
```

- **Import the Image:**

```
sudo virt-install --name fred-demo --import \
   --disk=/home/$USER/path-to-image/fred-v2026.1-debian12.qcow2 \
   --vcpus=6 \
   --memory=8192 \
   --os-variant=debian12 \
   --noautoconsole
```

- **Find the IP Address:**

```
virsh domifaddr fred-demo
```

Note the `IP address` assigned to the interface.

- **Connect to the Virtual Machine:**

```
ssh -L 8445:localhost:8445 \
   -L 8443:localhost:8443 \
   -L 8444:localhost:8444 \
   -L 8446:localhost:8446 \
   fred@<IP_ADDRESS>
```

(Replace `<IP_ADDRESS>` with the address obtained in the previous step.)

Tip: The `-L` flags forward the specified local ports to the corresponding ports on the remote VM. Accessing the services via `localhost` only works after establishing the SSH tunnel shown above or adding an alias in `/etc/hosts` – otherwise, use the VM's IP address directly.

---

4. After successfully logging in, you can see all registry services via command:

```
sudo systemctl status 'fred-*'
```

and the containers status via:

```
sudo docker ps
```

Note: At this point, the registry is running, but the billing is not enabled and the price for domain registration is not set. This is done to allow you to explore the registry without worrying about the billing.

However, to make the registry fully functional, you should follow the next steps described in chapter *registry initialization*.

5. **The registry is ready to use. You can find the following services running on these locations:**
   - **Browser:**
     - FERDA – web based administration interface: https://localhost:8445 login `admin` / `password`
     - Secretary – django admin app for editing mail templates: https://localhost:8443 login `admin` / `password`
     - **WebWHOIS – simple website for searching domains using whois protocol: https://localhost:8444**
       - block objects: https://localhost:8444/block_objects
       - unblock objects: https://localhost:8444/unblock_objects
       - send AuthInfo: https://localhost:8444/send-password
   - **Protocols:**
     - EPP localhost:700
     - WHOIS https://localhost:8444
     - RDAP https://localhost:8446
   - **CLI Tools:**
     - `fred-admin` – Administrate the registry, registrars and customise pricing (some of these actions are also available in more user-friendly FERDA administration interface) - see repository
     - `eppic` – A Python EPP client for registrars to allow administration of registry objects without having to write their own implementation of EPP - see repository.
     - C++ and python daemons as described *here*
   - **Databases: Database cluster is accessible from the VM with `sudo -u postgres psql`. Access from external client is also feasible with appropriate modifications.**
     After logging in, you can see the list of all available databases with command: `\l`.

Note: Please note that for full functionality you should configure periodic tasks, as described in chapter *periodic tasks*.

10.1.3 Installation of FRED

This section of documentation explains required steps that need to be done to install software required for the operation of FRED registry.

Please be advised that the current version of FRED(2026.1) is only supported by Debian 12. If you need to use a different system, you can build FRED daemons manually using the source code available here.

Multinode setup

This installation will guide you through installing FRED in a multinode setup (separate individual applications logically from each other). This method is recommended by us. It is possible to divide individual applications onto machines according to your preferences.

For a test installation and to try out FRED, you can install everything on a single virtual machine with Debian 12, or try the demo image we have published at https://fred-demo.nic.cz/.

VMs preparation

To install FRED, prepare the following machines, ideally KVMs:

Node	Specs(minimum recommended for production use)	OS	Description
DB	4vCPU, 16GB RAM, 250GB SSD STORAGE	Up to you	Postgresql 17 database.
APP	8vCPU, 16GB RAM, 100GB SSD STORAGE	Debian 12	Core FRED registry backend.
EPP	4vCPU, 8GB RAM, 50GB SSD STORAGE	Debian 12	Registrar interface.
ADMIN	4vCPU, 8GB RAM, 50GB SSD STORAGE	Up to you	Docker server used for administration(FERDA).
WEB	4vCPU, 8GB RAM, 50GB SSD STORAGE	Debian 12	Docker server used for web apps(WebWHOIS, RDAP…), also used for UNIX whois.
HM	4vCPU, 8GB RAM, 50GB SSD STORAGE	Debian 12	Hidden master server for generating and loading the zone file.
BACKEND	4vCPU, 8GB RAM, 50GB SSD STORAGE	Up to you	Docker server used for dockerized backend services such as secretary, messenger and fileman.
AKM	4vCPU, 8GB RAM, 50GB SSD STORAGE	Debian 12	Server for automated keyset management utilities - cdnskey-processor and rabbitmq.

For testing purposes, it is not necessary to have the same hardware resources as described above; for each domain registry, the hardware specifications should be modified according to the possibilities and expected traffic.

Nodes installation

DB node

```
# OS is up to you, postgresql 17 is required

apt update
apt install -y ca-certificates curl gnupg lsb-release git sudo

# Clone repo with configurations(.sql structures of databases)
cd /tmp/
```

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```
git clone https://gitlab.nic.cz/fred/demo-install.git

# Move conf files to /tmp
mv demo-install/files /tmp/

# Install postgresql 17
wget --quiet -O - https://www.postgresql.org/media/keys/ACCC4CF8.asc | sudo apt-key␣
↪add -
echo "deb http://apt.postgresql.org/pub/repos/apt/ `lsb_release -cs`-pgdg main" |sudo␣
↪tee  /etc/apt/sources.list.d/pgdg.list
apt update
apt -y install postgresql-17 postgresql-client-17

# Set psql timezone to UTC, set correct listen addresses and setup pg_hba correctly
sed -i~ -e "s/^#\?\s*timezone\s*=.*/timezone = 'UTC'/" /etc/postgresql/17/main/
↪postgresql.conf
sed -i "s/#listen_addresses = 'localhost'/listen_addresses = '*'/" /etc/postgresql/17/
↪main/postgresql.conf
systemctl restart postgresql

# Initialize fred and fredlog database
mkdir -p /var/lib/postgresql/17/fred
cp -r files/db-config/* /var/lib/postgresql/17/fred/
sudo -u postgres psql -c "CREATE USER fred WITH ENCRYPTED PASSWORD '<strong-password>
↪';"
sudo -u postgres psql -c "CREATE USER logd WITH ENCRYPTED PASSWORD '<strong-password>
↪';"
sudo -u postgres psql -c 'CREATE DATABASE fred;'
sudo -u postgres psql -c 'CREATE DATABASE fredlog;'
sudo -u postgres psql -c 'ALTER DATABASE fred OWNER TO fred;'
sudo -u postgres psql -c 'ALTER DATABASE fredlog OWNER TO logd;'
sudo -u postgres psql -c 'GRANT ALL PRIVILEGES ON DATABASE fred TO fred;'
sudo -u postgres psql -c 'GRANT ALL PRIVILEGES ON DATABASE fredlog TO logd;'

su - postgres -c "PGPASSWORD='<strong-password>' psql -h 127.0.0.1 -U fred -d fred -f␣
↪17/fred/structure.sql"
su - postgres -c "PGPASSWORD='<strong-password>' psql -h 127.0.0.1 -U fred -d fred -f␣
↪17/fred/fred_db.sql"
su - postgres -c "PGPASSWORD='<strong-password>' psql -h 127.0.0.1 -U logd -d fredlog␣
↪-f 17/fred/structure.sql"
su - postgres -c "PGPASSWORD='<strong-password>' psql -h 127.0.0.1 -U logd -d fredlog␣
↪-f 17/fred/logdb_db.sql"
su - postgres -c "PGPASSWORD='<strong-password>' psql -h 127.0.0.1 -U logd -d fredlog␣
↪-f 17/fred/fix-seq.sql"

# Initialize cdnskey_processor database
sudo -u postgres psql -c "CREATE USER cdnskey_processor WITH ENCRYPTED PASSWORD '
↪<strong-password>';"
sudo -u postgres psql -c "CREATE USER cdnskey_processor_ro WITH ENCRYPTED PASSWORD '
↪<strong-password>';"
sudo -u postgres psql -c 'CREATE DATABASE cdnskey_processor;'
sudo -u postgres psql -c 'ALTER DATABASE cdnskey_processor OWNER TO cdnskey_processor;
↪'
sudo -u postgres psql -c 'GRANT ALL PRIVILEGES ON DATABASE cdnskey_processor TO␣
↪cdnskey_processor;'

su - postgres -c "PGPASSWORD='<strong-password>' psql -h 127.0.0.1 -U cdnskey_
↪processor -d cdnskey_processor -f 17/fred/cdnskey/0001_schema.sql"
```

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```
# Add akm-worker into the cdnskey_processor database
su - postgres -c "PGPASSWORD='<strong-password>' psql -h 127.0.0.1 -U cdnskey_
↪processor -d cdnskey_processor -c \"INSERT INTO worker (name) VALUES ('worker-1');\"
↪"

# Dont forget to configure /etc/postgresql/17/main/pg_hba.conf with correct ip␣
↪addresses
```

APP node

```
# OS: Debian 12

apt update
apt install -y ca-certificates curl gnupg lsb-release git sudo

# Clone repo with configurations(.sql structures of databases)
cd /tmp/
git clone https://gitlab.nic.cz/fred/demo-install.git

# Move conf files to /tmp
mv demo-install/files /tmp/

# Add cznic keyring for fred packages
mkdir -p /usr/share/keyrings/
curl https://archive.nic.cz/dists/cznic-archive-keyring.gpg >/usr/share/keyrings/
↪cznic-archive-keyring.gpg

# Add source list for FRED
if [ ! -f /etc/apt/sources.list.d/fred.list ]; then
cat << EOT >> /etc/apt/sources.list.d/fred.list
deb [signed-by=/usr/share/keyrings/cznic-archive-keyring.gpg] http://archive.nic.cz/
↪public $(lsb_release -sc) main
EOT
fi

# Copy FRED pin list to /etc/apt/preferences.d/fred
cp files/fred /etc/apt/preferences.d/fred

apt update

# Installation of FRED
apt -y install fred-backend-logger fred-backend-logger-corba fred-backend-registry␣
↪fred-backend-notify fred-backend-public-request fred-backend-zone fred-zone-
↪generator fred-backend-dbreport fred-rifd fred-pifd fred-adifd fred-akm-ng fred-
↪accifd libapache2-mod-eppd python3-fred-epplib fred-eppic

# Remove installation files created by packages, and use example confs from demo␣
↪repository - it is expected that you will change these configurations according to␣
↪your needs
rm -rf /etc/fred/*
cp -r files/configs/* /etc/fred/
cp files/configs/eppic.conf /etc/eppic/eppic.conf
rm /etc/fred/eppic.conf
```

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```
# Initial FRED registry setup - create system registrar, your initial registrar, add␣
↪EPP access, create zone etc..
# More usage can be found in manual page of fred-admin

# You can name the system registrar as you want - but then dont forget to change it␣
↪in FRED configurations in /etc/fred/
# REG-SYSTEM is the default one
/usr/sbin/fred-admin --registrar_add --handle=REG-SYSTEM --reg_name=REG-SYSTEM --
↪organization=SYSTEM --street1=SYSTEM --city=SYSTEM --email=SYSTEM --url=SYSTEM --
↪country=CZ --dic=12345 --no_vat --system

# Create your registrar that will be used to register domains, contacts, nssets etc..
fred-admin --registrar_add --handle "REG-YOUR_HANDLE" --country "EXAMPLE COUNTRY␣
↪CODE(2)" --ico "123456789" --reg_name "REG-NAME" --organization "Your org" --
↪street1 "Your street" --city "Your city" --postalcode "00000" --telephone "+000.
↪123456789" --email "someemail@something.com" --url "https://webpage.com" --dic
↪"DEMO12345678" --system

# Add EPP access to your registrar
# Please change the certificate used to your own generated certificate(authority used␣
↪to generate the certificate needs to be configured on EPP node - as shown below)
# Also the password should be something strong - max. 16 chars
# Fingerprint of certificate can be obtained via `openssl x509 -noout -fingerprint -
↪md5 -in /path/to/cert.crt`
fred-admin --registrar_acl_add --handle REG-YOUR_HANDLE --certificate "Certificate␣
↪MD5 fingerprint" --password <strong-password>

# Create zone you want to manage using FRED
fred-admin --zone_add --zone_fqdn=<zone> --hostmaster hostmaster@domain.something \
        --ns_fqdn some.ns.test.something
fred-admin --zone_ns_add --zone_fqdn=<zone> --ns_fqdn=other.ns.test.something

# Ensure the log files are created
touch /var/log/fred-zone-services.log
chown fred /var/log/fred-zone-services.log

# Restart all of the Fred daemons
systemctl restart 'fred-*'

# Mask services not included in public release(they are not usable)
systemctl mask fred-auction-warehouse
systemctl mask fred-dbreport-services
rm /lib/systemd/system/fred-auction-warehouse.service
systemctl reset-failed

# If any of the services are failing to start, you can debug them using manual run,␣
↪for example if you want to debug why `fred-backend-logger.service` is not starting␣
↪use: `sudo -u fred fred-logger-services --config /etc/fred/fred-logger-services.
↪conf` - it will show you what's wrong
```

EPP node

```
# OS: Debian 12

apt update
apt install -y ca-certificates curl gnupg lsb-release git sudo

# Clone repo with configurations(.sql structures of databases)
cd /tmp/
git clone https://gitlab.nic.cz/fred/demo-install.git

# Move conf files to /tmp
mv demo-install/files /tmp/

# Add cznic keyring for fred packages
mkdir -p /usr/share/keyrings/
curl https://archive.nic.cz/dists/cznic-archive-keyring.gpg >/usr/share/keyrings/
↪cznic-archive-keyring.gpg

# Add source list for FRED
if [ ! -f /etc/apt/sources.list.d/fred.list ]; then
cat << EOT >> /etc/apt/sources.list.d/fred.list
deb [signed-by=/usr/share/keyrings/cznic-archive-keyring.gpg] http://archive.nic.cz/
↪public $(lsb_release -sc) main
EOT
fi

# Copy FRED pin list to /etc/apt/preferences.d/fred
cp files/fred /etc/apt/preferences.d/fred

apt update

# Installation of FRED packages
apt -y install apache2 libapache2-mod-corba libapache2-mod-eppd python3-fred-epplib

# Enable apache2 modules required by EPP
a2enmod corba eppd ssl

# Enable eppd site in apache
a2ensite 02-fred-mod-eppd-apache

# Change logger configuration to point to correct name
sed -i 's/\(CorbaObject[[:space:]]*\)"Logger"\([[:space:]]*"Logger_alias"\)/\1
↪"LoggerNew"\2/' /etc/apache2/sites-enabled/02-fred-mod-eppd-apache.conf

# Do not forget to edit configuration to suit your needs (/etc/apache2/sites-enabled/
↪), then you can restart
# In this configuration you can specify certification authority that is used to␣
↪authenticate registrars via EPP
systemctl restart apache2

# After installation you should be able to see apache2 listening on port 700, and you␣
↪should be able to connect via fred-eppic to this node
```

ADMIN node

```
# OS: Up to you - this is a docker server

apt update
apt install -y ca-certificates curl gnupg lsb-release git sudo nginx-full

# Clone repo with configurations(.sql structures of databases)
cd /tmp/
git clone https://gitlab.nic.cz/fred/demo-install.git

# Move conf files to /tmp
mv demo-install/files /tmp/

# Docker installation
sudo mkdir -m 0755 -p /etc/apt/keyrings

# Add docker gpg key
sudo curl -fsSL https://download.docker.com/linux/debian/gpg -o /etc/apt/keyrings/
↪docker.asc
sudo chmod a+r /etc/apt/keyrings/docker.asc

# Add docker repository
echo \
"deb [arch=$(dpkg --print-architecture) signed-by=/etc/apt/keyrings/docker.asc]␣
↪https://download.docker.com/linux/debian \
$(lsb_release -cs) stable" | sudo tee /etc/apt/sources.list.d/docker.list > /dev/null

# Install required docker packages
apt update
apt install -y docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-
↪compose-plugin

# Install and configure nginx
# Also consider using LE certificate or your own self-signed TLS cert to secure the␣
↪webpage
apt install -y nginx-full
rm /etc/nginx/sites-enabled/default
# In this file `ferda` change the server name and certificates used
cp -r /tmp/files/docker-apps/nginx-demo/ferda /etc/nginx/sites-available/
ln -sf /etc/nginx/sites-available/ferda /etc/nginx/sites-enabled/ferda

systemctl restart nginx

# Create directory, where docker apps will store its configurations
mkdir -p /var/docker-apps

# Prepare Ferda app directory
cp -r /tmp/files/docker-apps/ferda /var/docker-apps/

# Move into Ferda directory
cd /var/docker-apps/ferda/

# There you should edit .env file without your configuration - that means correct␣
↪addresses of registry services, address of database node for ferda etc...
# After you configure these options you can run ferda containers
docker compose up -d
```

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```
# You should be able to see ferda containers in the output of `docker ps`, if so run␣
↪migrations, and create superuser

docker compose run --rm ferda_uwsgi django-admin migrate

docker compose run -e DJANGO_SUPERUSER_USERNAME=<admin_username> -e DJANGO_SUPERUSER_
↪EMAIL=<your-email-address> -e DJANGO_SUPERUSER_PASSWORD=<strong-password> --rm␣
↪ferda_uwsgi django-admin createsuperuser --noinput

# After that you can login at your Ferda domain as a created superuser
```

WEB node

```
# OS: Debian 12 - altough it is a docker server, Debian 12 is needed for UNIX whois

apt update
apt install -y ca-certificates curl gnupg lsb-release git sudo whois

# Clone repo with configurations(.sql structures of databases)
cd /tmp/
git clone https://gitlab.nic.cz/fred/demo-install.git

# Move conf files to /tmp
mv demo-install/files /tmp/

# Install UNIX WHOIS
## Add cznic keyring for fred packages
mkdir -p /usr/share/keyrings/
curl https://archive.nic.cz/dists/cznic-archive-keyring.gpg >/usr/share/keyrings/
↪cznic-archive-keyring.gpg

## Add source list for FRED
if [ ! -f /etc/apt/sources.list.d/fred.list ]; then
cat << EOT >> /etc/apt/sources.list.d/fred.list
deb [signed-by=/usr/share/keyrings/cznic-archive-keyring.gpg] http://archive.nic.cz/
↪public $(lsb_release -sc) main
EOT
fi

## Copy FRED pin list to /etc/apt/preferences.d/fred
cp files/fred /etc/apt/preferences.d/fred

apt update

## Installation of FRED packages
apt -y install apache2 libapache2-mod-corba libapache2-mod-whoisd

## Enable apache2 modules required by EPP
a2enmod corba whoisd ssl

## Enable eppd site in apache
a2ensite 02-fred-mod-whoisd-apache
```

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```
# Change logger configuration to point to correct name
sed -i 's/\(CorbaObject[[:space:]]*\)"Logger"\([[:space:]]*"Logger_alias"\)/\1
↪"LoggerNew"\2/' /etc/apache2/sites-enabled/02-fred-mod-whoisd-apache.conf

## Do not forget to edit configuration to suit your needs (/etc/apache2/sites-enabled/
↪), then you can restart
## In this configuration you can specify certification authority that is used to␣
↪authenticate registrars via EPP
systemctl restart apache2

## After the installation you should be able to see apache2 listening on port 53, and␣
↪you should be able to ask for domain using `whois` command

# Install other "public" docker apps - RDAP, WebWHOIS
## Docker installation
sudo mkdir -m 0755 -p /etc/apt/keyrings

## Add docker gpg key
sudo curl -fsSL https://download.docker.com/linux/debian/gpg -o /etc/apt/keyrings/
↪docker.asc
sudo chmod a+r /etc/apt/keyrings/docker.asc

## Add docker repository
echo \
"deb [arch=$(dpkg --print-architecture) signed-by=/etc/apt/keyrings/docker.asc]␣
↪https://download.docker.com/linux/debian \
$(lsb_release -cs) stable" | sudo tee /etc/apt/sources.list.d/docker.list > /dev/null

## Install required docker packages
apt update
apt install -y docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-
↪compose-plugin

## Install and configure nginx
## Also consider using LE certificate or your own self-signed TLS cert to secure the␣
↪webpage
apt install -y nginx-full
rm /etc/nginx/sites-enabled/default
## In these files `webwhois` and `rdap` change the server name and certificates used
cp -r /tmp/files/docker-apps/nginx-demo/webwhois /etc/nginx/sites-available/
cp -r /tmp/files/docker-apps/nginx-demo/rdap /etc/nginx/sites-available/
ln -sf /etc/nginx/sites-available/webwhois /etc/nginx/sites-enabled/webwhois
ln -sf /etc/nginx/sites-available/rdap /etc/nginx/sites-enabled/rdap

systemctl restart nginx

## Create directory, where docker apps will store its configurations
mkdir -p /var/docker-apps

## Prepare apps config directories
cp -r /tmp/files/docker-apps/ferda /var/docker-apps/

## Configure and start the apps
## Edit network locations to match your FRED configuration
vim /var/docker-apps/webwhois/.env
vim /var/docker-apps/rdap/.env
```

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```
## After you configure these options you can run both apps
cd /var/docker-apps/webwhois/ && docker compose up -d
cd /var/docker-apps/rdap/ && docker compose up -d

## You should be able to see rdap and webwhois containers in the output of `docker ps`

## After that you can check both websites using your browser
```

HM node

```
# OS: Debian 12

apt update
apt install -y ca-certificates curl gnupg lsb-release git sudo

# Clone repo with configurations(.sql structures of databases)
cd /tmp/
git clone https://gitlab.nic.cz/fred/demo-install.git

# Move conf files to /tmp
mv demo-install/files /tmp/

# Add cznic keyring for fred packages
mkdir -p /usr/share/keyrings/
curl https://archive.nic.cz/dists/cznic-archive-keyring.gpg >/usr/share/keyrings/
↪cznic-archive-keyring.gpg

# Add source list for FRED
if [ ! -f /etc/apt/sources.list.d/fred.list ]; then
cat << EOT >> /etc/apt/sources.list.d/fred.list
deb [signed-by=/usr/share/keyrings/cznic-archive-keyring.gpg] http://archive.nic.cz/
↪public $(lsb_release -sc) main
EOT
fi

# Copy FRED pin list to /etc/apt/preferences.d/fred
cp files/fred /etc/apt/preferences.d/fred

apt update

# Installation of FRED packages
apt -y install fred-zone-generator

# Remove installation files created by packages, and use example confs from demo␣
↪repository - it is expected that you will change these configurations according to␣
↪your needs
rm -rf /etc/fred/*
cp -r files/configs/fred-zone-generator.conf /etc/fred/

# Configure zone-generator to match your FRED configuration
vim /etc/fred/fred-zone-generator.conf

# After the installation and configuration you should be able to generate zone via␣
↪fred-zone-generator command
```

BACKEND node

```
# OS: Up to you - this is a docker server

apt update
apt install -y ca-certificates curl gnupg lsb-release git sudo nginx-full

# Clone repo with configurations(.sql structures of databases)
cd /tmp/
git clone https://gitlab.nic.cz/fred/demo-install.git

# Move conf files to /tmp
mv demo-install/files /tmp/

# Docker installation
sudo mkdir -m 0755 -p /etc/apt/keyrings

# Add docker gpg key
sudo curl -fsSL https://download.docker.com/linux/debian/gpg -o /etc/apt/keyrings/
↪docker.asc
sudo chmod a+r /etc/apt/keyrings/docker.asc

# Add docker repository
echo \
"deb [arch=$(dpkg --print-architecture) signed-by=/etc/apt/keyrings/docker.asc]␣
↪https://download.docker.com/linux/debian \
$(lsb_release -cs) stable" | sudo tee /etc/apt/sources.list.d/docker.list > /dev/null

# Install required docker packages
apt update
apt install -y docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-
↪compose-plugin

# Install and configure nginx
# Also consider using LE certificate or your own self-signed TLS cert to secure the␣
↪webpage
apt install -y nginx-full
rm /etc/nginx/sites-enabled/default
# In this file `secretary` change the server name and certificates used
cp -r /tmp/files/docker-apps/nginx-demo/secretary /etc/nginx/sites-available/
ln -sf /etc/nginx/sites-available/secretary /etc/nginx/sites-enabled/secretary

systemctl restart nginx

# Create directory, where docker apps will store its configurations
mkdir -p /var/docker-apps

# Prepare docker app directories
cp -r /tmp/files/docker-apps/secretary /var/docker-apps/
cp -r /tmp/files/docker-apps/messenger /var/docker-apps/
cp -r /tmp/files/docker-apps/fileman /var/docker-apps/

# Move into secretary directory
# There you should edit .env file with your configuration - DB connection, secret␣
↪token..
# And the same goes for the other docker apps - configure them to match your FRED␣
↪installation
```

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```
vim /var/docker-apps/secretary/.env
vim /var/docker-apps/messenger/.env
vim /var/docker-apps/fileman/.env

# Create volume for secretary files
docker volume create secretary_media

# Create also volume for fileman
mkdir -p /var/lib/fileman
docker volume create --driver local --opt type=none --opt device=/var/lib/fileman --
↪opt o=bind fileman_files

# Create fileman user - needed to correctly mount fileman_files volume - GID and UID␣
↪can be changed - but dont forget to change it in fileman docker compose too
sudo groupadd -g 30002 fileman
sudo useradd  -u 30002 -g 30002 -M -s /usr/sbin/nologin fileman
chown -R 30002:30002 /var/lib/fileman

# Create secretary user - needed to correctly mount secretary_media volume - GID and␣
↪UID can be changed - but dont forget to change it in secretary docker compose too
sudo groupadd -g 30001 secretary
sudo useradd  -u 30001 -g 30001 -M -s /usr/sbin/nologin secretary
chown -R 30001:30001 /var/lib/docker/volumes/secretary_media/

# After you configure these options you can run all of the docker apps
cd /var/docker-apps/secretary/ && docker compose up -d
cd /var/docker-apps/messenger/ && docker compose up -d
cd /var/docker-apps/fileman/ && docker compose up -d

# You should be able to see secretary, messenger and fileman containers in the output␣
↪of `docker ps`

# If you see secretary running - create superuser and load templates
mv /tmp/files/secretary-templates /tmp/

cd /var/docker-apps/secretary

docker compose run --rm -v /tmp/secretary-templates:/app/secretary-templates:ro -w /
↪app/secretary-templates secretary_uwsgi python3 load_templates.py fred-migration.yml
docker compose run --rm -v /tmp/secretary-templates:/app/secretary-templates:ro -w /
↪app/secretary-templates secretary_uwsgi python3 load_templates.py fred-templates.yml
docker compose run --rm -v /tmp/secretary-templates:/app/secretary-templates:ro -w /
↪app/secretary-templates secretary_uwsgi python3 load_templates.py pdf-templates.yml

docker compose run -e DJANGO_SUPERUSER_USERNAME=<admin-user> -e DJANGO_SUPERUSER_
↪EMAIL=<your-email> -e DJANGO_SUPERUSER_PASSWORD=<strong-password> --rm secretary_
↪uwsgi django-admin createsuperuser --noinput

# For messenger - create master trigger file
mkdir -p /etc/master
touch /etc/master/messenger-sender

# After that you can browse secretary in your browser - templates or /admin for admin␣
↪interface
# Also messenger and fileman container should be visible as up and running in the␣
↪output of `docker ps`
```

AKM node

```
# OS: Debian 12

apt update
apt install -y ca-certificates curl gnupg lsb-release git sudo

# Clone repo with configurations(.sql structures of databases)
cd /tmp/
git clone https://gitlab.nic.cz/fred/demo-install.git

# Move conf files to /tmp
mv demo-install/files /tmp/

# Add cznic keyring for fred packages
mkdir -p /usr/share/keyrings/
curl https://archive.nic.cz/dists/cznic-archive-keyring.gpg >/usr/share/keyrings/
↪cznic-archive-keyring.gpg

# Add keyring for rabbitmq
curl -1sLf "https://keys.openpgp.org/vks/v1/by-fingerprint/
↪0A9AF2115F4687BD29803A206B73A36E6026DFCA" | sudo gpg --dearmor | sudo tee /usr/
↪share/keyrings/com.rabbitmq.team.gpg > /dev/null

# Add source list for rabbitmq
if [ ! -f /etc/apt/sources.list.d/rabbitmq.list ]; then
sudo tee /etc/apt/sources.list.d/rabbitmq.list <<EOF
deb [arch=amd64 signed-by=/usr/share/keyrings/com.rabbitmq.team.gpg] https://deb1.
↪rabbitmq.com/rabbitmq-erlang/debian/bookworm bookworm main
deb [arch=amd64 signed-by=/usr/share/keyrings/com.rabbitmq.team.gpg] https://deb2.
↪rabbitmq.com/rabbitmq-erlang/debian/bookworm bookworm main
deb [arch=amd64 signed-by=/usr/share/keyrings/com.rabbitmq.team.gpg] https://deb1.
↪rabbitmq.com/rabbitmq-server/debian/bookworm bookworm main
deb [arch=amd64 signed-by=/usr/share/keyrings/com.rabbitmq.team.gpg] https://deb2.
↪rabbitmq.com/rabbitmq-server/debian/bookworm bookworm main
EOF
fi

# Add source list for FRED
if [ ! -f /etc/apt/sources.list.d/fred.list ]; then
cat << EOT >> /etc/apt/sources.list.d/fred.list
deb [signed-by=/usr/share/keyrings/cznic-archive-keyring.gpg] http://archive.nic.cz/
↪public $(lsb_release -sc) main
EOT
fi

# Copy FRED pin list to /etc/apt/preferences.d/fred
cp files/fred /etc/apt/preferences.d/fred

apt update

# Installation of FRED
apt -y install cdnskey-scanner cdnskey-processor-common cdnskey-processor-master␣
↪cdnskey-processor-api cdnskey-processor-worker

## Install Erlang packages
sudo apt-get install -y erlang-base \
```

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```
                        erlang-asn1 erlang-crypto erlang-eldap erlang-ftp erlang-
↪inets \
                        erlang-mnesia erlang-os-mon erlang-parsetools erlang-public-
↪key \
                        erlang-runtime-tools erlang-snmp erlang-ssl \
                        erlang-syntax-tools erlang-tftp erlang-tools erlang-xmerl

## Install rabbitmq-server and its dependencies
sudo apt-get install rabbitmq-server -y --fix-missing

# Create vhost in rabbitmq for cdnskey-processor
# vhost
rabbitmqctl add_vhost cdnskey-processor

# api
rabbitmqctl add_user api 'password'
rabbitmqctl set_permissions -p cdnskey-processor api "^queue_results$" "^(exchange_
↪response|queue_results)$" "^queue_results$"

# worker
rabbitmqctl add_user worker 'password'
rabbitmqctl set_permissions -p cdnskey-processor worker "^(queue_(insecure|diag)_[-\\
↪w]+)$" "^(queue_diag|queue_secure|queue_insecure_[-\\w]+|exchange_insecure_fanout)$
↪" "^(exchange_diag|exchange_response|exchange_insecure_fanout|queue_secure|queue_
↪(insecure|diag)_[-\\w]+)$"

# admin
rabbitmqctl add_user admin 'password'
rabbitmqctl set_permissions -p / admin ".*" ".*" ".*"
rabbitmqctl set_user_tags admin administrator

# Copy rabbitmq configs
cp -r files/rabbitmq-config/* /etc/rabbitmq/

# Restart rabbitmq
systemctl restart rabbitmq-server

# Configure these services to match your FRED configuration, then restart them
# Restart cdnskey_processor services
systemctl restart cdnskey-processor-api.service
systemctl restart cdnskey-processor-worker.service
systemctl restart cdnskey-processor-producer.service
systemctl restart cdnskey-processor-consumer.service
```

After completing all of the above steps, you should have FRED running. If you encounter any problems, please do not hesitate to contact us.

10.1.4 Setting timezone in PostgreSQL

The FRED assumes database connections using UTC timezone, so configure PostgreSQL to handle connections using this timezone.

Open `/etc/postgresql/17/main/postgresql.conf` with a text editor and change the **timezone** parameter to `UTC`, or use a script like this:

```
sudo sed -i~ -e "s/^#\?\s*timezone\s*=.*/timezone = 'UTC'/" \
   /etc/postgresql/17/main/postgresql.conf
```

Then restart PostgreSQL:

```
sudo service postgresql restart
```

10.1.5 System initialization

The system is installed and running, however it still is not fully functional – domains cannot be registered yet because the database does not contain any information about zones or registrars. This initial data must be put in, first.

There are two ways to initialize the system:

- you can run the provided *config-zone script* for a quick setup of a single TLD zone – see below, or
- you can use administration tools directly to input custom data – this is described in detail in the *Registry initialization* chapter.

Config-zone script

For a simple setup of your particular TLD, you can download and use this Python script as follows.

It takes a TLD as an argument and generates a set of shell commands on std.output, which can be directly executed. Of course, you can have a look at those commands first to see what they do.

They will configure a zone, setup zero price for registrations and create one system registrar with the handle `REG-TLD` and EPP password `passwd`. Zone SOA parameters are extracted from the real DNS.

Here is an example of usage with the `.cz` TLD:

Listing 1: Config-zone script usage example

```
# Download the script
wget -O fred-config-zone.py https://fred.nic.cz/public/media/1689167142/149/
# Generate a configuration script for a particular zone
python3 fred-config-zone.py cz > fred-config-cz.sh
# Run the script
. fred-config-cz.sh
```

10.1.6 Testing the installation

Once the installation is finished, you may want to check that it was successful.

There are several levels of testing the installation:

- *a check of running processes*,
- *a smoke test* that will check that all FRED's interfaces are correctly configured and responding,
- *a zone test* that will check that a registrar can access the zone, make registrations and that the registered domain is generated into the zone file and available via the public interface.

Check of running processes

The following daemons should start automatically after the FRED was installed:

- `fred-accifd.service`
- `fred-adifd.service`
- `fred-backend-logger.service`
- `fred-backend-public-request.service`
- `fred-backend-registry.service`
- `fred-logger-corba.service`
- `fred-pifd.service`
- `fred-rifd.service`
- `fred-zone-services.service`

These daemons should be running on APP node only!

You can check the running FRED processes with the command `ps -ef | grep "fred-"`.

The list of running containers is available via command `sudo docker ps`.

Smoke test of an uninitialized system

To test the plain installation, you can try these command:

- `eppic` should be able to connect to your registry and send `hello` command:

```
REG-DEMO@localhost > hello
access: all
expiry: null
ext_uris:
- http://www.nic.cz/xml/epp/enumval-1.2
- http://www.nic.cz/xml/epp/extra-addr-1.0
- http://www.nic.cz/xml/epp/auction-1.0
langs:
- en
- cs
obj_uris:
- http://www.nic.cz/xml/epp/contact-1.6
- http://www.nic.cz/xml/epp/domain-1.4
- http://www.nic.cz/xml/epp/nsset-1.2
- http://www.nic.cz/xml/epp/keyset-1.3
statements:
- purpose:
   - admin
   - prov
   recipient:
   - public
   retention: stated
sv_date: '2026-02-17T13:05:48Z'
sv_id: EPP server (DSDng)
versions:
- '1.0'
```

- command `whois -h localhost whatever` should return:

```
%ERROR:101: no entries found
%
% No entries found.
```

Test of registrations in a zone

You can use the following set of commands to test registrations on your system after the *initialization with the config-zone script*.

After you initialize the system with your registrars and zones, you can test object creation, whois, rdap, zone-generator etc..

Adjust the parameters in the tests according to how you have configured the zone. In this example, we are using the zone ".demo".

```
# Connect to the server via EPP and login with the specified username and password
eppic --username=REG-DEMO --password=password --hostname=localhost --port=700 --cert-
↪file=/usr/share/fred-eppic/ssl/test-cert.pem --key-file=/usr/share/fred-eppic/ssl/
↪test-key.pem --verify=false

# Connect + run command that will create a contact with given credentials
eppic --session=REG-DEMO -- create-contact --id=TEST-CONTACT --postal-info.name=Name -
↪-postal-info.addr.street-1=Street --postal-info.addr.city=City --postal-info.addr.
↪pc=12345 --postal-info.addr.cc=CZ --email=example@example.com
```

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```
# Connect + run command that will create a set of nameservers with the contact␣
↪assigned as a technical contact
eppic --session=REG-DEMO -- create-nsset --id=TEST-NSSET --nss-1.name=ns1.test-domain.
↪demo --nss-1.addrs-1=111.222.111.222 --nss-2.name=ns2.test-domain.demo --nss-2.
↪addrs-2=222.111.222.111 --tech-1=TEST-CONTACT

# Create a domain with the contact as the domain owner and with the NS set
eppic --session=REG-DEMO -- create-domain --name=test-domain.demo --registrant=TEST-
↪CONTACT --nsset=TEST-NSSET
```

After creating objects, you should be able to test following commands:

```
# whois
whois -h localhost test-domain.demo

# rdap - replace URL with your RDAP domain
curl -k -L https://localhost:8446/domain/test-domain.demo | json_pp

# zone generator
sudo fred-zone-generator --config /etc/fred/fred-zone-generator.conf && cat db.demo
```

10.2 Configuration

Caution: This section is currently under construction. If you run into any issues, please contact us at fred@nic.cz

This chapter contains an overview of executable files that are a part of the FRED and the location and names of their default configuration files.

There are also some *configurable database values*, which you should consider revising.

Note: The descriptions of configurable values are contained in the default configuration files.

Chapter TOC

- *Security notice*
- *Executables*
  - *Servers*
    - *C++ daemons*
    - *Python daemon(s)*
  - *Web administration servers*
    - *Ferda webadmin*
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- *Database tables*
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- *Contact information disclosure*
    - *Example configurations*
- *Restricting contact attributes*
    - *Mandatory telephone*
- *AuthInfo TTL*

10.2.1 Security notice

Important: Always adapt access control information (especially user names and passwords) for the use on production!

10.2.2 Executables

The overview of executable files should give you an idea about the names of the FRED components that actually can be launched, and about the settings that must be configured on the system level. The mentions of the default configuration files are there to guide you to locations where these settings are made.

The default configuration files are located in `@PREFIX@/etc/fred`.

Servers

The CORBA servers are located in a system-binaries directory (`@PREFIX@/sbin`).

`Systemd` startup scripts are included with FRED packages (e.g. `/lib/systemd/system/fred-rifd.service`). A startup command is introduced with `ExecStart=` in the scripts.

C++ daemons

These daemons provide operations via the IDL interface implemented in C++.

In the default deployment scheme, all daemons run on a single machine and they share an all-in-one configuration file named `server.conf`.

In the deployment scheme adopted in the CZ.NIC, separate configuration files are used for each daemon, therefore they are listed with the daemons below and marked [CZ.NIC].

Note: If you decide to deploy servers on several machines, you must specify the common configuration settings on each machine, namely the sections: `[database]`, `[nameservice]`, `[log]` and `[registry]`, plus the daemon-specific settings for each daemon that runs on that machine.

- `fred-adifd` – administration interface daemon – operations for administration (WebAdmin)
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-adifd.conf`
- `fred-rifd` – registrar interface daemon – operations for the EPP-protocol Apache module (mod-eppd)
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-rifd.conf`
- `fred-pifd` – public interface daemon – operations for Unix whois, web whois, RDAP and contact verification
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-pifd.conf`
- `fred-rsifd` – record statement interface daemon – operations for the provision of registry record statements
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-rsifd.conf`
- `fred-akmd` – automated keyset management daemon – operations for managing keysets automatically
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-akmd.conf`
- `fred-accifd` – accounting daemon – operations for payment pairing
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-accifd.conf`
- `fred-msgd` – messaging daemon – operations for sending SMS text messages and paper letters
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-msgd.conf`
- `fred-logd` – logging daemon (logger) – operations for the logging of user activity
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-logd.conf`
- `fred-mifd` – mojeID daemon (extension) – operations for the mojeID service
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-mifd.conf`
- `fred-dbifd` – domain browser daemon (extension) – operations for the Domain Browser web application
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-dbifd.conf`
- `fred-zone-generator` – operations for generating zone files,
  - standalone configuration file [CZ.NIC]: `/etc/fred/fred-zone-generator.conf`

Configuration parameters can also be passed as *command-line arguments* to the daemons, see `<daemon> --help`.

ORB parameters

Additionally, each daemon accepts ORB parameters which it hands over to its ORB.

Important: OmniORB minimum

You need to override the following omniORB settings when running FRED servers:

- native character encoding – to encode/decode text data for transmission with UTF-8; this can be set on the command-line as `<daemon> -ORBnativeCharCodeSet UTF-8` or in the ORB configuration file (possibly `/etc/omniORB.cfg`) as the `nativeCharCodeSet` variable,
- endpoint address – to specify a *port* on which a server listens for CORBA calls; a unique port must be specified for each server; this must be set on the command-line, such as `<daemon> -ORBendPoint giop:tcp::<port>`.

To list all possible ORB parameters, run `omniNames -help`; see also omniORB configuration for a more detailed explanation of the ORB parameters.

Python daemon(s)

This daemon provides operations via the IDL interface implemented in Python.

In the default deployment scheme, the daemon loads all modules and runs in a single process (on a single machine) and all modules share an all-in-one configuration file named `pyfred.conf`.

In the deployment scheme adopted in the CZ.NIC, separate configuration files are used for each daemon, therefore they are listed with the daemons below and marked [CZ.NIC].

- `fred-pyfred` – a framework that integrates several Python CORBA servers as modules:
  - `mailer` – operations for email assembly and dispatch,
    - standalone configuration file [CZ.NIC]: `/etc/fred/pyfred-mailer.conf`
  - `filemanager` – operations for managing files (mostly email attachments),
    - standalone configuration file [CZ.NIC]: `/etc/fred/pyfred-filemanager.conf`

Web administration servers

- `fred-webadmin` – server for the web administration of the FRED

Default config.file: `@PREFIX@/etc/fred/webadmin_cfg.py`

Ferda webadmin

Backends required by Ferda are configured in `.conf` files. There will be example configuration files included (`fred-registry-services.conf.example` and `fred-logger-services.conf.example`).

Environment

Ferda's behaviour can be modified by configuring the following variables in the `.env` file in the directory from which `docker-compose` is run:

Table 1: Variables

Name	Default value	Description
ADMINS	''	List of names and e-mails with names separated from e-mails by colons and individual admins separated by commas (e.g. John Doe:john.doe@example.com,Jane Doe:jane.doe@example.com)
ALLOWED_HOSTS	* (if DEBUG=true, else an empty list)	Comma-separated list of hosts; this variable needs to be set, unless you are in DEBUG mode. Otherwise, you will not be able to access Ferda on any hostname.
DATABASE_URL	sqlite:////app/db.sqlite3	Very important variable defining the connection with database; it is highly recommended to change the default value, otherwise the database gets lost when the container is deleted; format for PostgreSQL is psql://USER:PASSWORD@HOST:PORT/NAME
DEBUG	false	Enabling/disabling debug mode; true/false
DEFAULT_FROM_EMAIL EMAIL_HOST EMAIL_HOST_USER EMAIL_HOST_PASSWORD EMAIL_PORT SERVER_EMAIL	localhost '' (empty) webmaster@localhost '' (empty) 25 root@localhost	Various e-mail settings (more details at https://docs.djangoproject.com/en/dev/ref/settings/)
FERDA_LOGGER_NETLOC	gloss:50051 (value working when using docker-compose from gloss)	Logging server address
FERDA_REGISTRY_NETLOC	**required**	Configuration, address and port of the server running fred-backend-registry
FIDO_ENABLED	false	Enabling/disabling two-factor authentication via FIDO2 tokens; true/false
LANGUAGE_CODE	en	system language
LANGUAGES	en:English,cs:Česky	List of available languages, format is similar as ADMINS
LDAP_AUTH_URL LDAP_AUTH_USE_TLS LDAP_AUTH_SEARCH_BASE	None True N/A	LDAP configuration variables (see https://github.com/etianen/django-python3-ldap); authentication via LDAP is enabled only when the LDAP_AUTH_URL variable is defined and in case the support for LDAP was enabled during the image build using EXTRAS=ldap.
SECRET_KEY	**required**	Long random string; sensitive data
SESSION_COOKIE_AGE	1200	Age of session cookie; the user will be automatically logged out after this period of inactivity (in seconds).
SESSION_SAVE_EVERY_REQUEST	true	Enabling/disabling session saving after every request; true/false
TIME_ZONE	UTC	Time zone

CLI utilities

Located in `@PREFIX@/bin`

- `cdnskey-scanner` – CDNSKEY resource record mining utility (no config. file)
- `filemanager_client` – Inserting a new file into the system (uses `pyfred.conf`)
- `fred-akm` – Automated keyset management client (`/etc/fred/fred-akm.conf`)
- `fred-admin` – Automated administration tasks (`server.conf`), especially those performed periodically, see also *Periodic tasks*
- `fred-eppic` – Tool for registrars (`/etc/eppic/eppic.conf`)
- `fred-doc2pdf` – Rendering the standard input (RML) into the PDF (`/etc/fred/fred-doc2pdf.conf`)
- `fred-zone-generator` – Generating zones (`/etc/fred/fred-zone-generator.conf`)
- `mailer_client` – Sending email (`pyfred.conf`)
- `simple_stats.py` – Statistics (???)
- `transproc` – Processing the transcripts of bank transactions (`/etc/fred/transproc.conf`)

Database management

- `fred-dbmanager` (in `@PREFIX@/sbin`) – Basic database management script (no config. file)
- `create_parts` and `drop_parts` (in `@PREFIX@/bin`) – *Logger partitions* maintenance scripts (example config in `@PREFIX@/share/doc/fred-logger-maintenance/examples/logger.conf.example`)

Database search

Located in `@PREFIX@/bin`

- `filemanager_admin_client` – search in managed files
- `mailer_admin_client` – search in sent email

Apache modules

Configuration of FRED Apache modules and FRED sites can be found in Apache configuration subdirectories, usually under `/etc/apache2/`.

Django PAIN

Configuration of this Django utility is in the `settings.py` and described within project source.

10.2.3 Database tables

Some parts of the Registry behaviour can be configured by modifying or adding values in certain database tables.

Important: If you reconfigure the system using database tables, remember to examine changes in the database component before upgrading the FRED!

Sometimes we need to edit the database configuration for ourselves and these changes are added to a database upgrade script, which would overwrite your settings. Therefore you should either **backup** your current database tables to recover your settings after the upgrade, **or adapt** the upgrade script directly, so that you don't lose your settings.

Section TOC

- *Life cycle parameters*
- *Domain name format validation*
- *Handle format validation*
- *Restricting domain names*
- *Adding a registrar memo to annual reminders*

Life cycle parameters

A part of database configuration relates to the *life cycle* of *registrable object*s. It states e.g. when to send a notification to a contact before their domain expires or for how long a domain is protected before it can be re-registered.

There are two tables dedicated to this kind of configuration: `enum_parameters` and `domain_lifecycle_parameters`.

Parameters that affect **all types** of registrable objects (stored in the `enum_parameters` table):

- `regular_day_procedure_period` – an hour in the day when the *regular procedure* is run (24-hour system, 0 means 00:00, 14 means 14:00 etc.), default: `0`
- `regular_day_procedure_zone` – time zone for periodic tasks, default: `Europe/Prague`. The format of the value is the standardized PostgreSQL name of a time zone which can be found either in the Postgres table `pg_timezone_names` (the *name* column) or in this Wikipedia list (the *TZ* column).

  Important: It is necessary to adapt the time zone to your area!

  Note: `regular_day_outzone_procedure_period` (an hour in the day when the outzone procedure is run) and `regular_day_procedure_period` - the value must agree with a *CRON job* setting

- `roid_suffix` – suffix used in **r**epository **o**bject **id**entifiers (see also *ROID*), which are *assigned to registrable objects* by the Registry, default: `EPP`

Parameters that affect **only non-domain objects** (stored in the `enum_parameters` table):

- `handle_registration_protection_period` – for how many months is a handle (of a contact, nsset or keyset) protected before it can be re-registered, default: `2`

- `object_registration_protection_period` – how many months an object (nsset, keyset) must be unedited and unassigned to be considered idle and marked for deletion, default: `6`

Parameters that affect **only domains** (stored in the `domain_lifecycle_parameters` table):

- `valid_for_exdate_after` – all the other parameters of the given record are valid only for domains with expiration date after this date
- `expiration_dns_protection_period` – for how many days after expiration is a domain still generated in a zone, integer, default: `30`
- `expiration_letter_warning_period` – how many days after expiration is the owner warned about domain deletion, integer, default: `34`
- `expiration_notify_period` – how many days before a domain expiration is the owner notified about the expiration, negative integer, default: `-30`
- `expiration_registration_protection_period` – for how many days after expiration is a domain protected before it is deleted and can be re-registered, integer, default: `61`
- `outzone_unguarded_email_warning_period` – for how many days after expiration may customer support enter additional email addresses in Daphne before the system starts sending warnings about domain exclusion from the zone to them, integer, default: `25`
- `validation_notify1_period` [ENUM domains] – how many days before validation expiry the owner should be notified for the first time, negative integer, default: `-30`
- `validation_notify2_period` [ENUM domains] – how many days before validation expiry the owner should be notified for the second time, negative integer, default: `-15`

Important: The system does not verify that the time intervals follow one another correctly. It only verifies that the parameters in the `domain_lifecycle_parameters` table are in chronological order. Double check with the *life cycle*!

Note:

– The parameters' values have the integer format only within the fred-admin command, but in the `domain_lifecycle_parameters` table, they are stored as time intervals.

The parameters in this table can be changed using the following commands:

List all the records in the table in chronological order:

```
fred-admin --domain_lifecycle_parameters --list
```

Delete the record with the `valid_for_exdate_after` date furthest in the future (only records with the `valid_for_exdate_after` date in the future can be deleted):

```
fred-admin --domain_lifecycle_parameters --delete
```

Append another record with a set of parameters (all parameters must be defined), with the `valid_for_exdate_after` parameter in the future, while there cannot be any record with the `valid_for_exdate_after` parameter further in the future:

```
fred-admin --domain_lifecycle_parameters --append \
              --valid_for_exdate_after="2021-08-03" \
              --expiration_notify_period=-30 \
```

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```
                --outzone_unguarded_email_warning_period=25 \
                --expiration_dns_protection_period=30 \
                --expiration_letter_warning_period=34 \
                --expiration_registration_protection_period=61 \
                --validation_notify1_period=-30 \
                --validation_notify2_period=-15
```

Domain name format validation

The implemented rules for domain-name formatting are enumerated in the table `enum_domain_name_validation_checker`. The Registry operator can turn them on or off by adding or removing an association in the table `zone_domain_name_validation_checker_map`, such as:

Listing 2: Example of SQL insertion of format association with a zone

```
INSERT INTO zone_domain_name_validation_checker_map (checker_id, zone_id)
   values (2, 1);
```

where `checker_id` is an id of a formatting rule and `zone_id` is an id of a zone.

For a domain name to be valid, it must comply with all rules assigned to its zone.

Further restrictions on domain names may be required by the domain blacklist.

Handle format validation

The format of handles can be prescribed for non-domain object types—contacts, nssets and keysets—with settings in two database tables:

- `regex_handle_validation_checker` – contains all patterns but does not specify which of them have to be matched,
- `regex_object_type_handle_validation_checker_map` – determines which patterns will have to be matched for which object types.

To configure a new allowed pattern, connect to the database and insert a new regular expression into the `regex_handle_validation_checker` table, such as:

Listing 3: Example of SQL insertion of a handle format pattern

```
INSERT INTO regex_handle_validation_checker (regex, description)
   values ('^[Cc]', 'must start with the letter c or C');
```

Now, associate the new pattern to object types using the map table, such as:

Listing 4: Example of SQL insertion of format association with an object type

```
INSERT INTO regex_object_type_handle_validation_checker_map (type_id, checker_id)
   values (1, 3);
```

where `checker_id` is the id of our new pattern and `type_id` is the id of the desired object type from the `enum_object_type` table, in our case contact. A regex pattern can be associated with several object types. In our example, the pattern will make sure that contact handles start with the letter c or C.

In case an invalid regular expression was set up in the database, then the corresponding `check_object`, `create_object` and `info_object` operations will respond with the `2400 Command failed` result code.

For a handle to be valid, it must match all patterns assigned to its object type.

If a handle is not valid according to db settings, the EPP client receives a response with the `2005 Parameter value syntax error` result code.

Important: It may be necessary to adapt the XML schemas of EPP as well. Handle formats are defined in the `fred-com-1.2.1.xsd` file with the following *simple types*:

- `objIDCreateType` – handles of objects being created – must correspond with the current db setting,
- `objIDType` – handles of objects occurring elsewhere – must correspond with the current setting and allow all historical db settings so that handles conforming previous formatting rules can still be used,
- `objIDChgType` – same as `objIDType` but allowing an empty string.

If a handle is not valid according to XML schemas, the EPP client receives a response with the `2001 Command syntax error` result code due to failed XML validation.

Restricting domain names

A forbidden pattern for domain names can be configured by inserting a new pattern with a validity period (i.e. when the pattern is applicable) into the `domain_blacklist` table, such as:

Listing 5: Example of SQL insertion in domain blacklist (minimum query)

```
INSERT INTO domain_blacklist (regexp, valid_from, reason)
   VALUES ('^..\.cz$', '2017-07-01 07:00:00', 'forbid 2-char length in cz zone');
```

The syntax for these patterns is POSIX regular expressions and pattern matching is case insensitive (the `~*` operator).

Temporal validity (`valid_from`–`valid_to`) must be specified for each pattern, however the `valid_to` datetime can be left empty and then the validity is unbounded (the pattern is applicable forever).

The patterns can be used in various ways:

- to list forbidden words, for example: pattern `good|bad|ugly` will refuse registrations of any domain names that contain one of the words “good”, “bad” or “ugly”,
- to force length of domain names, for example: pattern `^..\.cz$` will refuse registrations of 2-character domain names in the cz TLD,
- or any other that regular expressions can express.

For a domain name to be valid, it must not match any pattern that is currently applicable.

Adding a registrar memo to annual reminders

The *email template* for *annual reminders of contacts* allows to include a memo from the designated registrar in the email and a custom email address to which the contact can reply.

The Registry operator may insert this information into the `reminder_registrar_parameter` table:

- `registrar_id` – identify the registrar,
- `template_memo` – enter the memo in plain text; use the `~@~` sequence to separate language variants (local language first, English second); whitespace is preserved,
- `reply_to` – enter an email address for the Reply-To header.

This must be done manually with an SQL insert.

10.2.4 Contact information disclosure

Disclosure of contact details must be configured in both the back end (fred-rifd) and the front end (Apache module mod-eppd).

mod-eppd

`EPPdataCollectionPolicyAccess` – sets the general approach and implies the logic for contact preference requests (`create`/`update`) and display (`info`):

- `all` – the general approach is "Registry shows information", registrars shall use `flag='0'` to signal contact preference to hide listed attributes,
- `none` – the general approach is "Registry hides information", registrars shall use `flag='1'` to signal contact preference to show listed attributes.

`EPPcontact`*`Operation`*`Discloseflags` lists names of the elements that can be used in the disclose element of the corresponding operation.

Important: The `*Discloseflags` lists must allow the same elements that are allowed in the XSD schemas!

---

fred-rifd

`contact_data_filter` – a method of enforcing server's disclosure policy:

- `set_unused_discloseflags` – sets disclosure of attributes, for which there was no preference, to the configured defaults unconditionally
- `cznic_specific` – controls conditional disclosure of *address* (see *Hiding address*), sets other disclosure settings, for which there was no preference, to the configured defaults unconditionally

The Registry operator may develop and assign custom methods.

Default disclosure settings `default_disclose*` are listed for `create` and `update` operations separately. If the attribute's disclosure cannot be set in an operation, it must have a default setting listed here.

Specify the share policy by using preset or by selecting specific groups of relationship.

`data_share_policy` – set up preset policy with regard to the contact data shared between registrars

- `show_all` – allow access to all registrars (default settings)

    - `cznic_specific` – hide attributes independently on the disclosure to the "other" registrar relationship
- `show_private_data_to` – specify one or multiple groups of registrar's relationship
- `admin_contact` – a sponsoring registrar of domain with the contact in the "administrative contact of a domain" role
- `authorized_registrar` – a registrar informed about AuthInfo password
- **`domain_holder` – a sponsoring registrar of domain with the contact in the "holder" role**
    - `sponsoring_registrar` – a sponsoring registrar of contact
    - `system_registrar` – a registrar marked as the "system registrar"
- `other` – all other relationships

Example configurations

Pre-GDPR configuration with the CZ-specific filter (as in version 2.36)

Listing 6: mod-eppd

```
EPPdataCollectionPolicyAccess all
EPPcontactCreateDiscloseflags telephone fax email vat ident notifyemail
EPPcontactUpdateDiscloseflags address telephone fax email vat ident notifyemail
EPPcontactInfoDiscloseflags address telephone fax email vat ident notifyemail
```

Listing 7: fred-rifd

```
[rifd]
contact_data_filter = cznic_specific
[rifd::cznic_specific::create_contact]
default_disclosename = show
default_discloseorganization = show
default_discloseaddress = show
[rifd::cznic_specific::update_contact]
default_disclosename = show
default_discloseorganization = show
```

GDPR-compliant configuration with the CZ-specific filter (as in version 2.37 and newer)

Listing 8: mod-eppd

```
EPPdataCollectionPolicyAccess none
EPPcontactCreateDiscloseflags telephone fax email vat ident notifyemail
EPPcontactUpdateDiscloseflags address telephone fax email vat ident notifyemail
EPPcontactInfoDiscloseflags address telephone fax email vat ident notifyemail
```

Listing 9: fred-rifd

```
[rifd]
contact_data_filter = cznic_specific
[rifd::cznic_specific::create_contact]
default_disclosename = show
default_discloseorganization = show
```

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```
default_discloseaddress = show
[rifd::cznic_specific::update_contact]
default_disclosename = show
default_discloseorganization = show
```

GDPR-compliant configuration with the CZ-specific filter (as in version 2.43 and newer)

Listing 10: fred-rifd

```
[rifd::info_contact]
data_share_policy = show_all
```

GDPR-compliant configuration without the CZ-specific filter

Listing 11: mod-eppd

```
EPPdataCollectionPolicyAccess none
EPPcontactCreateDiscloseflags telephone fax email vat ident notifyemail
EPPcontactUpdateDiscloseflags address telephone fax email vat ident notifyemail
EPPcontactInfoDiscloseflags address telephone fax email vat ident notifyemail
```

Listing 12: fred-rifd

```
[rifd]
contact_data_filter = set_unused_discloseflags
[rifd::set_unused_discloseflags::create_contact]
default_disclosename = show
default_discloseorganization = show
default_discloseaddress = show
[rifd::set_unused_discloseflags::update_contact]
default_disclosename = show
default_discloseorganization = show

# This configuration is by default. In case this setting section is missing, set up␣
↪the following settings below.
[rifd::info_contact]
data_share_policy = show_all
```

10.2.5 Restricting contact attributes

Mandatory telephone

Since `fred-rifd@2.70.0`, it is server-configurable to restrict presence and format of the telephone number (EPP element `voice`).

There are two options in the `fred-rifd` config file to enable restrictions for operations *create* and *update* regarding the object's contact:

```
# If true, valid telephone is required when contact is created
epp_create_contact_requires_telephone = false
```

(continues on next page)

(continued from previous page)

```
# If true, valid telephone is required as the result of update operation
epp_update_contact_requires_telephone = false
```

Additionally, since `fred-rifd@2.71.0`, another two options for operations *create domain* and *update domain* are available:

```
# If true, valid telephone is required when domain is created
epp_create_domain_requires_telephone = false
# If true, valid telephone is required as the result of update operation
epp_update_domain_contact_requires_telephone = false
```

10.2.6 AuthInfo TTL

TTL value must be configured for the following applications: `fred-dbifd`, `fred-rifd`, `fred-admin` (server.conf).

- `authinfo_ttl` – TTL of object authinfos; in seconds.

The value is defined in the document Rules of Technical Communication, which can be found here. *CZ-specific*

10.3 Registry initialization

This chapter will help you initialize the Registry, i.e. introduce the crucial data that must be present in the system prior to registrations or any work with registrable objects.

It is assumed that you have installed the FRED's database schema already and that the database is blank (you have not input any data yet).

To initialize the Registry, you need to perform these tasks:

- prepare a zone:
  - create a zone,
  - assign name servers to the zone,
- prepare registrars:
  - add registrar(s),
  - set authentication data for registrar(s),
  - grant registrars access to the zone(s),
- prepare billing:
  - create a price list for operations,
  - define the parameters for invoice numbering,
  - set the VAT tax and coefficient,
  - assign credit to registrars,
- adapt parameters in the database.

Important: Perform the tasks in the same order as presented!

For most tasks, the **`fred-admin`** command-line utility is used. The commands of this utility have both mandatory and optional parameters. The mandatory parameters are marked with an asterisk (*) and default values are stated for the optional parameters. If you omit an optional parameter, the default value is assigned.

Note: The presented listings of parameters are only illustrative and often incomplete. To see all available commands and parameters, refer to `fred-admin --help`.

Chapter TOC

- *Preparing a zone*
  - *Creating a zone*
  - *Adding zone name servers*
  - *Zone file example*
- *Preparing registrars*
  - *Creating a registrar*
  - *Setting authentication data*
  - *Granting access to a zone*
- *Preparing billing*
  - *Creating price list*
  - *Invoice numbering*
    - *Creating default initial numbers*
    - *Defining custom initial numbers*
  - *Value-added tax*
  - *Assigning credit to a registrar*
- *Setting parameters in the database*
  - *Timezone for automated administration* *MANDATORY*
  - *Registry contact information* *RECOMMENDED*

10.3.1 Preparing a zone

Preparing a zone is the most crucial task. The information you enter about a zone will appear in the header of a generated zone file. When you create a zone, you enter the fields of the SOA record, and in the next step, you add the zone name servers. An example of the resulting zone file header is given *below*.

Creating a zone

```
fred-admin --zone_add \
   --zone_fqdn=cz \
   --ex_period_min=12 \
   --ex_period_max=120 \
   --ttl=18000 \
   --hostmaster=hostmaster@nic.cz \
   --refresh=900 \
   --update_retr=300 \
   --expiry=604800 \
   --minimum=900 \
   --ns_fqdn=a.ns.nic.cz
```

This command creates a new zone in the Registry. It does not have to be only a TLD zone of course, you might provide access for example to **go.to**, **com.tw** or ENUM zones (like **0.2.4.e164.arpa**).

Important: Consider thoroughly which parameters you set, there is no command for editing zones.

- `--zone_fqdn` (*) – FQDN of the zone to be added – it also serves as a key in subsequent commands
- `--ex_period_min`, `--ex_period_max` – minimum and maximum number of months for which a domain in the zone can be registered

  ---

  Note: The `ex_period_min` number is also used as a unit for registration periods which are then defined as multiples of this number, i.e. with `--ex_period_min=12` domains can be registered (and renewed) for whole years, not e.g. year and half.

  Defaults:

  - `--ex_period_min=12` [months]
  - `--ex_period_max=120` [months]
- `--ttl`, `--hostmaster`, `--refresh`, `--update_retr`, `--expiry`, `--minimum`, `--ns_fqdn` – zone's SOA fields

  Defaults:

  - `--ttl=18000` [s]
  - `--hostmaster=hostmaster@localhost`
  - `--refresh=900` [s]
  - `--update_retr=300` [s]
  - `--expiry=604800` [s]
  - `--minimum=900`
  - `--ns_fqdn=localhost`

Adding zone name servers

```
fred-admin --zone_ns_add --zone_fqdn=cz --ns_fqdn=a.ns.nic.cz
fred-admin --zone_ns_add --zone_fqdn=cz --ns_fqdn=b.ns.nic.cz --addr=1.2.3.4
fred-admin --zone_ns_add --zone_fqdn=cz --ns_fqdn=c.ns.nic.cz --addr=5.6.7.8 9.0.1.2
# or
fred-admin --zone_ns_add --zone_fqdn cz --ns_fqdn c.ns.nic.cz --addr 5.6.7.8 --addr 9.
↪0.1.2
```

This command assigns a name server to a zone.

- `--zone_fqdn` (*) – the zone a name server is added to
- `--ns_fqdn` (*) – name server's *FQDN*
- `--addr` – name server's IP address (glue) – it is required when the nameserver's FQDN is from the same zone to which it is being added; you can list several IP addresses separated with a space

Zone file example

The data given in the examples above result in the following zone file header:

```
$TTL 18000 ;default TTL for all records in zone
cz.             IN      SOA     a.ns.nic.cz.    hostmaster.nic.cz. (1445442458 900␣
↪300 604800 900)
                IN      NS      a.ns.nic.cz.
                IN      NS      b.ns.nic.cz.
                IN      NS      c.ns.nic.cz.
b.ns.nic.cz.    IN      A       1.2.3.4
c.ns.nic.cz.    IN      A       5.6.7.8
c.ns.nic.cz.    IN      A       9.0.1.2
;
;--- domain records ---
;
```

10.3.2 Preparing registrars

There are two types of registrars:

- a **common registrar** is an organization which provides domain administration to end users and pays for access to the Registry, and
- the **system registrar** which is used by the Registry to manage domains manually and to perform automated administration procedures. This registrar has full permissions (he can change any object regardless of object's designated registrar or its blocking of changes).

Both types of registrars are prepared in the same way:

- create a registrar,
- assign them authentication data,
- permit them to operate in a zone (or zones).

Important: For the system to work properly, exactly one system registrar must be present.

Tip: If you want to work only with the EPP communication, the system registrar will do. However, if it is the billing and invoicing subsystem you want to work with, we recommend adding a (testing) common registrar, too.

Creating a registrar

```
# adding a common registrar:
fred-admin --registrar_add \
   --handle=REG-FRED-A --reg_name="Testing registrar A" \
   --organization="Company l.t.d." --country=CZ

# adding a system registrar:
fred-admin --registrar_add \
   --handle=REG-SYSTEM --reg_name="System registrar" \
   --country=CZ --system
```

This command creates a new registrar with some data.

- `--handle` (*) – handle of the registrar to be added
- `--reg_name` – registrar's name – you may set it the same as `--organization`
- `--organization` – registrar's organization or company
- `--country` (*) – registrar's country by 2-letter country code (table `enum_country`)
- `--no_vat` – flag this registrar as NOT a *VAT*-payer
- `--system` – designates this registrar to be the "system registrar"
- many other parameters are available, see the program help `fred-admin --registrar_add --help`.

Note: Registrar information can be edited later via the WebAdmin.

Setting authentication data

Authentication data allows registrars to connect to the Registry securely.

```
fred-admin --registrar_acl_add \
   --handle=REG-FRED-A \
   --certificate="39:D1:0C:CA:05:3A:CC:C0:0B:EC:6F:3F:81:0D:C7:9E" \
   --password=passwd
```

This command assigns the given access control data to a registrar.

- `--handle` (*) – registrar's handle
- `--password` (*) – registrar's password – both the password and certificate are needed to access the Registry
- `--certificate` (*) – fingerprint of the registrar's certificate

  It can be created from an existing certificate with the following command:

  ```
  openssl x509 -noout -fingerprint -md5 -in /path/to/cert.pem | cut -d= -f2
  ```

Note: For testing purposes, you can use the test certificate that comes with the `fred-mod-eppd` package and was installed in *`$PREFIX`*`/share/fred-mod-eppd/ssl/`.

Tip: If that is the case, you can copy & paste the fingerprint from this example.

Granting access to a zone

```
fred-admin --registrar_add_zone \
   --zone_fqdn=cz --handle=REG-FRED-A \
   --from_date="2007-01-01"
```

This command grants a registrar permissions to manage objects in a specified zone.

- `--handle` (*) – registrar's handle
- `--zone_fqdn` (*) – name of a zone the registrar gains access to
- `--from_date` – date since when the access is allowed – default: today

10.3.3 Preparing billing

The billing subsystem allows you to set prices for operations, charge registrars for these operations, keep track of their credit and create bills (invoices) for them.

All these functions are built-in and on by default.

You can **turn charging off**: find the `[rifd]` section in the server configuration and set `epp_operations_charging = false`. Then you don't need to do anything else from this section and you can skip the rest of it.

Otherwise you need to prepare the subsystem for use by doing these tasks:

- create a price list for operations,
- define initial numbers for invoice numbering,
- set a custom VAT tax rate,
- assign initial credit to common registrars.

Creating price list

A price list is created by listing prices for operations individually. The price lists are defined for each zone separately.

Chargeable operations include:

- `CreateDomain` – domain creation (one-time payment when a new domain is introduced to the Registry, corresponding EPP command: create_domain), pricing period: one-time
- `RenewDomain` – domain renewal (renewal per unit, corresponding EPP commands: create_domain, renew_domain), pricing period: per unit (*ex_period_min*)
- `GeneralEppOperation` – operation over request-usage limit (charged only after all uncharged requests were exhausted), pricing period: per operation

```
fred-admin --price_add --operation='CreateDomain' --zone_fqdn=cz \
   --valid_from='2014-12-31 23:00:00' \
   --operation_price 0 --period 1

fred-admin --price_add --operation='RenewDomain' --zone_fqdn=cz \
   --valid_from='2014-12-31 23:00:00' --valid_to='2015-01-31 22:59:59' \
   --operation_price 155 --period 1

fred-admin --price_add --operation='RenewDomain' \
   --valid_from='2015-01-31 23:00:00' --zone_fqdn=cz \
   --operation_price 140 --period 1

fred-admin --price_add --operation='RenewDomain' --zone_fqdn=cz \
   --valid_from='2015-09-01 19:15:56.159594' --valid_to='2015-12-31 23:00:00' \
   --operation_price 190 --period 1

fred-admin --price_add --operation='GeneralEppOperation' \
   --valid_from='2015-05-31 22:00:00' --zone_fqdn=cz \
   --operation_price 0.10 --period 1 --enable_postpaid_operation
```

This command adds a price of an operation in a zone valid in a given time span. The amount is currency-independent, decimals are allowed. If you don't want to charge for an operation, just set the price to zero.

- `--valid_from`, `--valid_to` – range of UTC datetimes when the pricing scheme will be used, e.g. '2006-09-09 19:15:56', valid_from < valid_to
- `--operation_price` (*) – amount, e.g. 140.00
- `--period` – pricing period/quantity (default = 1)
- `--zone_fqdn` (*) – zone FQDN
- `--operation` (*) – charged operation
- `--enable_postpaid_operation` – operation charge doesn't require prepaid credit (allows negative credit)

Note: The first domain renewal is made upon domain registration that means that a registration of a new domain is in fact billed as 2 operations: `CreateDomain + RenewDomain` whereas a renewal of an existing domain is billed only as one operation `RenewDomain`.

Invoice numbering

To allow the invoices to be numbered automatically, *initial numbers* must be defined for each invoice type, zone and year. An initial number is then incremented on invoice creation and the updated value is kept in the database for future reference.

You have two ways of defining initial invoice numbers:

- you can set invoice prefixes and let the system create the initial numbers following the fixed pattern **PPYY00001**:
  - **PP** – 2-digit invoice number prefix
  - **YY** – 2 last digits of a year
  - **00001** – the 5-digit order number

  Tip: This way is recommended if you have many zones to administer.

- you can set custom initial numbers manually.

Creating default initial numbers

```
fred-admin --add_invoice_number_prefix \
   --prefix=24 --zone_fqdn=cz --invoice_type_name=advance
fred-admin --add_invoice_number_prefix \
   --prefix=23 --zone_fqdn=cz --invoice_type_name=account
```

This command adds a number prefix for invoices of a given type in a zone.

- `--prefix` – the prefix value for the given combination of a zone and invoice type
- `--zone_fqdn` – the zone FQDN for which the prefix is designated
- `--invoice_type_name` – the invoice type by name:
  - `account` – billing (balance between the deposit and the total for provided services), usually monthly
  - `advance` – depositing credit, when a payment was received

```
fred-admin --create_invoice_prefixes --for_current_year
```

This command creates initial invoice numbers for all available combinations for the current year. If the `--for_current_year` argument is omitted, initial numbers are created for the next year.

Defining custom initial numbers

```
fred-admin --invoice_add_prefix --zone_fqdn=cz --type 0 --year 2017 --prefix 401700001
```

This command adds a custom initial number (prefix) for the given combination of a year, zone and invoice type (0 – advance, 1 – account).

Value-added tax

To add your own VAT tax rate, you must know three things:

- the rate percentage,
- the rate coefficient and
- when the validity of the previous rate ends.

The percentage (PERC) is usually given by the law, e.g. 21 %. So is the period of validity. The coefficient (COEF) is the officially correct way (in the Czech Republic) to figure out the tax basis and therefore it is used in calculations. You can calculate the coefficient with the following formula: `PERC / (PERC + 100) = COEF` and the result is then rounded to four decimal places, e.g. for 21 % VAT: `21 / (21 + 100) = 0.1736`.

Since there is no command to change the VAT rate, you must run an SQL script directly:

```
psql -U fred
fred=> begin;
update price_vat set valid_to = '2014-12-31 23:00:00' where valid_to is null;
insert into price_vat (koef, vat) values (0.1736, 21) ;
commit ;
```

This SQL script will:

- end the validity of the last rate to the specified date time in UTC,
- add the new coefficient and the new percentage.

Assigning credit to a registrar

```
fred-admin --invoice_credit \
   --zone_id=1 --registrar_id=1 --price=15000
```

This command adds some credit to a registrar in a zone and creates an advance invoice in the system. If the registrar is a VAT-payer, then an appropriate amount is subtracted automatically.

- `--zone_id` – zone id,
- `--registrar_id` – registrar id,
- `--price` – the credit to add,
- `--taxdate` – tax date, default is today, for arg format see `fred-admin --help_dates`

Tip: To find an *id* of a zone or a registrar, you must run an SQL query against the database, for example:

Listing 13: Find out registrar id

```
psql -U fred -c "SELECT id FROM registrar where handle = 'REG-FRED-A';"
```

This command will find a registrar by its handle and return its identifier.

Listing 14: Find out zone id

```
psql -U fred -c "SELECT id FROM zone where fqdn = 'cz';"
```

This command will find a zone by its FQDN and return its identifier.

10.3.4 Setting parameters in the database

There are some tables of configurable parameters in the main database. Most of these parameters can be used with the default values, however, it is important to adapt at least the values mentioned in this chapter.

For more information about configuration of the Registry via database values see *Database tables*.

Timezone for automated administration MANDATORY

Important: The following parameter **must** be adapted to your environment!

Set the appropriate time zone for automated administration with the **regular_day_procedure_zone** parameter:

Listing 15: Set the appropriate time zone for automated administration

```
fred-admin --enum_parameter_change \
   --parameter_name=regular_day_procedure_zone \
   --parameter_value=TZNAME
```

where TZNAME is the standardized name of your time zone, which can be found in the Postgres table `pg_time-zone_names` (the *name* column) or in this Wikipedia list (the *TZ* column), for example `Europe/Prague` (this is the default value).

Registry contact information RECOMMENDED

For the purpose of email communication from the Registry, adapt Registry contact information, which is used in email templating.

See *Customizing email templates – Registry contact information* for details.

10.4 Periodic tasks

This chapter should help you with the setting of automated tasks in CRON.

Chapter TOC

- *Zone file generation*
- *Administration of registrable objects*
  - *Regular procedure*
  - *Separate object deletion*
  - *Automatic contact merger*
  - *Automatic contact verification* *CZ-specific*
  - *Automated keyset management*
- *Communication*
  - *Processing public requests*
- *Registrars*
  - *Generating poll messages about request usage*
  - *Blocking registrars over limit* *CZ-specific*
  - *Import & pairing of payments*
- *Invoicing*
- *Annual contact reminder*
- *Collect statistics* *CZ-specific*

10.4.1 Zone file generation

Task command:

```
/usr/sbin/fred-zone-generator
```

Typically launched: every 30 minutes

Real run time [CZ.NIC]: ~ 5 min (.cz zone)

Required FRED components: `fred-zone-services` : zone generator backend

Other required components: none

Task activities:

- generates a zone file for each configured zone

10.4.2 Administration of registrable objects

Regular procedure

Important: This task is critical for Registry operation, it must be set up!

Task command:

```
/usr/sbin/fred-admin --object_regular_procedure [--object_delete_types="contact,
↪domain,keyset,nsset"]
```

Warning: To keep the notifications about state changes functional in FRED 2.48.0, run:

```
fred-admin --object_regular_procedure --object_delete_types="contact,keyset,nsset" \
   && fred-notify-object-state-changes
```

Typically launched: at midnight (00:00) and noon (12:00)

Real run time [CZ.NIC]: ~ 20 min

Required FRED components:

- `pyfred`: Mailer module – email generation, FileManager module + filemanager_client – saving expiration letters (pdf)
- `fred-doc2pdf`: letter templates + PDF generation

Other required components:

- `xsltproc`

Task activities:

- updates the states of the registrable objects of all types; the states depend on time and other states that are set manually
- **notifies registrars and end users (contacts) about state changes:**
  - generates poll messages to notify registrars

  - generates emails to notify contacts
  - generates letters for domain deletion warning
- generates poll messages to notify registrars about low credit
- deletes objects of selected types that have been marked for deletion – this activity can be disabled by omitting the `--object_delete_types` argument and can be run in a separate task (see the next task)

Separate object deletion

Important: This task is critical for Registry operation!

Set this cronjob if you want to perform object deletion (or part of it) separately from the *Regular procedure*.

Task command:

```
/usr/sbin/fred-admin --object_delete_candidates <options>
```

Typically launched: at least once a day (if you delete all at once, you can include it with the regular procedure or launch it after the regular procedure is finished)

Required FRED components: none

Other required components: none

Task activities:

- deletes objects of selected types that have been marked for deletion

Task variants:

- deleting *all at once* (suitable for non-domains), for example:

```
/usr/sbin/fred-admin --object_delete_candidates --object_delete_types="contact,
↪keyset,nsset"
```

- deleting *by parts* (suitable for domains) with the `--object_delete_parts` option – this variant allows you to randomize deletion of objects by spreading it over several calls; this variant of the task means these activities:
  - creates a randomly-ordered list of objects (delete candidates)
  - deletes a fraction of the list, repeatedly in iterations, the size of the fraction is given in the `--object_delete_parts` option, e.g. if `--object_delete_parts=2`, a half of the list is deleted in a single iteration, if `object_delete_parts=10`, a tenth of the list is deleted in a single iteration and so on
  - single iteration can be spread over a period of time specified in the `--object_delete_spread_during_time` argument in seconds
  - the value of `object_delete_parts` is calculated depending on CRON configuration (how often the task is run)
  - finally, deletes the rest (`--object_delete_parts=1` – this is the default value if the parameter is omitted)
  - *Example*: spread the deletion of domains over a whole day:

```
# Iteration
*/10 1-22 * * *  /usr/sbin/fred-admin --object_delete_candidates --object_
↪delete_types="domain" --object_delete_parts=$((((24 * 60 - (10#$(date \+"\%H
↪") * 60 + 10#$(date \+"\%M")))/10) - 6)) --object_delete_spread_during_
↪time=600

# Finalization
45 23 * * *  /usr/sbin/fred-admin --object_delete_candidates --object_delete_
↪types="domain" --object_delete_parts=1
```

Real run time [CZ.NIC]: ~ 5 s (one iteration)

Automatic contact merger

See also *introduction to the contact merger*.

Task command:

```
/usr/sbin/fred-admin --contact_merge_duplicate_auto \
   [--except_registrar <registrar-handle> ... OR --registrar <registrar-handle> ...] \
   [--selection_filter_order <filter1,filter2,filter3>] \
   [--dry_run]
```

Typically launched: once a week

Required FRED components:

- `pyfred`: Mailer module
- `fred-logd`: Logger

Other required components: none

Task activities:

- **looks for duplicate contacts per registrar that can be specified as:**
  - all registrars in the database except registrars given in `--except_registrar` arguments (e.g. when you don't want to merge contacts managed by the system registrar), or
  - only registrars given in `--registrar` arguments,
- *selects the best destination contact*,
- *merges* all *source contacts* into the *destination contact*.

Useful filters for selection of the *destination contact*:

- MCS_FILTER_MAX_DOMAINS_BOUND (contact has most domains linked as a holder or administrative contact)
- MCS_FILTER_MAX_OBJECTS_BOUND (contact has most objects linked – domains, nssets or keysets)
- MCS_FILTER_RECENTLY_UPDATED (contact has been updated most recently)
- MCS_FILTER_RECENTLY_CREATED (contact has been created most recently)

The procedure will apply the filters in the order specified on the command line; if not specified, the default filters in the default order will be applied, see the *concept*.

The `--dry_run` option is available to preview what the command will do. Also see the program `--help` for more options.

Automatic contact verification [CZ-specific]

Automated keyset management

See also the *AKM concept*.

Task command: `/usr/sbin/fred-akm-ng -c /etc/fred/fred-akm-ng.conf import`

- **Typically launched**: once a day
- **Required FRED components**: `fred-akm-ng`
- **Task activities**: obtains a list of domains to be scanned from the `fred` registry database and exports it to the scanner via the `gRPC API`
- **Configuration**: in a configuration file

Task command: `/usr/sbin/fred-akm-ng -c /etc/fred/fred-akm-ng.conf update`

- **Typically launched**: once a day
- **Required FRED components**: `fred-akm-ng`
- **Task activities**: via the `gRPC API` imports the list of accepted CDNSKEY records and applies them back to the registry, i.e. creates / modifies / deletes the keyset for a domain where the record was found
- **Configuration**: in a configuration file

10.4.3 Communication

- Letters Postservis [CZ-specific]
- Letters Optys [CZ-specific]
- SMS Texts [CZ-specific]
- Registered Letters [CZ-specific]

Processing public requests

Note: This procedure processes only *public request*s for personal information.

Task command:

```
/usr/sbin/fred-admin --process_public_requests [--types <list of public request types>
↪]
```

Typically launched: every 5 minutes

Required FRED components:

- `pyfred`: Mailer module – email generation
- `fred-logd`: Logger interface

Other required components: none

Task activities:

- generates emails in response to *resolved* public requests of types:

- `personalinfo_auto_pif` – requests to send personal info to an email in the registry (authorized and resolved automatically),
- `personalinfo_email_pif` – requests to send personal info to another email, authorized with an email signed with a digital signature (*resolved manually*),
- `personalinfo_post_pif` – requests to send personal info to another email, authorized with a letter containing a notarized signature (*resolved manually*).

If the `--types` argument is omitted, all of the aforementioned types are processed.

10.4.4 Registrars

Generating poll messages about request usage

Task command:

```
/usr/sbin/fred-admin --poll_create_request_fee_messages
```

Typically launched: once a day (night time recommended, e.g. 1 AM)

Real run time [CZ.NIC]: ~ 10 min

Required FRED components:

- `fred-logd`: Logger interface

Other required components: none

Task activities:

- generates poll messages about the usage of free EPP requests and if the registrar exceeded the limit, calculates the price of the requests over limit

Configuration

- in the database, table: `request_fee_parameter`

Blocking registrars over limit CZ-specific

Task command:

```
/usr/sbin/fred-admin --block_registrars_over_limit [--email support@nic.tld]
```

Typically launched: once a day

Real run time [CZ.NIC]: ~ 10 min

Required FRED components:

- `fred-logd`: Logger interface
- `fred-rifd`: EPP interface

Other required components: none

Task activities:

- calculates the current usage of free EPP requests and if exceeded, blocks the registrar's access to the Registry
  - blocks until the end of the current month
  - only if the registrar is not blocked yet and

  - only if the registrar was not unblocked in the current month yet
- disconnects all EPP sessions of the blocked registrars
- if the `--email` address is given and registrars were blocked, sends a notification with a list of registrars blocked on this day

Note: In the CZ.NIC, the customer support calls the blocked registrars and unblocks their access on demand.

Configuration

- in the database, table: `request_fee_registrar_parameter`

Import & pairing of payments

Important: Changed in version 2.38: This feature has partially been moved from FRED to an external system. See *The Future of Payments & Invoices*.

10.4.5 Invoicing

- Numbering
- "Archiving" (gen. XML & PDF)
- **Monthly**
  - charge fee (subtract from credit)
  - bill (create invoice record)

10.4.6 Annual contact reminder

The goal is to remind users to review their contact details and to inform them about objects linked to their contact.

Task command:

```
/usr/sbin/fred-admin --contact_reminder [--date <date>]
```

Important: In FRED 2.48.0 the call `fred-admin --contact-reminder` was replaced by `fred-notify-contact-data-reminder`

The default `<date>` is today. Refer to `fred-admin --help_dates` for acceptable date formatting.

Typically launched: once a day

Real run time [CZ.NIC]: ~ 2 min

Required FRED components:

- `fred-pyfred`: Mailer interface

Other required components: none

Task activities:

- **selects contacts which**
  - are linked to objects,
  - were created on the day and month 300 days ago (before the specified date)
  - were not changed in the last 300 days (relatively to the specified date)
- sends them an email of the `annual_contact_reminder` type (see *template params*)

10.4.7 Collect statistics CZ-specific

The statistics collector program is used in CZ.NIC to collect and export data for the statistics server which is not a part of the FRED.

Task command:

```
/usr/bin/collect_stats.py -s fred_daily[,mojeid_daily]
```

Typically launched: once a day (night time)

Required FRED components: none (database access)

Other required components: none

Task activities:

- creates CSV files that can be imported into the statistics server

10.5 Administrative tasks

This chapter will give you hints on how the typical administrative tasks are done.

While some can be performed using the web administration application (WebAdmin), and we will guide you to the respective screen for each task, others must be executed with other administration utilities.

To use the WebAdmin, you have to log in.

If the WebAdmin is not providing some functionality described here, check the permissions of the user under which you login.

10.5.1 Manage users and permissions

This section describes how to manage permissions, create users and add security features in Ferda webadmin tool.

Permissions

Permissions are managed through the Django admin site, which is separate from the main Ferda user interface, and can be accessed on the `/admin` path.

A user with access to the admin site must be given the *Staff status* and can be designated to have all permissions implicitly with the *Superuser status*.

User management permissions:

- `Can view user`
- `Can add user`

- `Can change user`
- `Can delete user`

Registry management permissions:

- `Can view basic registry content` – required to display any information from the Registry
- `Can view AuthInfo` – required to display the authorization information (AuthInfo)
- `Can view registrar credit`

You may create groups of these permissions and assign them to users.

Users and groups example

This example describes a model situation where we have two groups of permissions: one for customer support team workers and another for customer support team managers.

Groups

- a *Customer Support Lead* group might have all Registry management permissions
- a *Customer Support Worker* group might have only the permission `Can view basic registry content`

Users

- users of customer support who require only basic permissions would be assigned the *Customer Support Worker* group
- a user of a customer support manager who requires extended permissions, would be assigned the *Customer Support Lead* group

Security features

You can add several security features to assure safety of the system, e.g. two-factor authentication for login or automatic log out from Ferda.

Two-factor Authentication

Ferda offers a possibility to use a two-factor authentication via FIDO tokens. This highly increases security of the administration system.

Before you enforce the second step of the authentication, you first need to set up the FIDO token at least for one admin. Otherwise, you could get stuck in a situation where no one can log in. Because of that, the setup of the two-factor authentication is divided into the following two steps.

First, you need to assign tokens to users (or at least one admin) in administration.

Then you can enforce the second step of authentication by setting up the `FIDO_ENABLED=true` in `.env` file when running the container.

Automatic log out

You can set an automatic log out from Ferda after a specified amount of time of inactivity. In `.env` file change the variable `SESSION_COOKIE_AGE` to a desired value (in seconds).

10.5.2 Registrar administration

All registrar information can be managed via the WebAdmin after login.

List all registrars

Select in the WebAdmin menu: *Registrars ▸ List*

Or run on the command line `sudo fred-admin --registrar_list` (XML output containing all registrars' details).

View registrar's details

List all registrars or *search* for a registrar in the WebAdmin and then click on its *handle* to display the details.

Add a registrar

To add a new registrar in the WebAdmin, follow this procedure:

1. Select *Registrars ▸ Create new* from the menu to display the edit form and fill it in:
   - Registrar data – contact and billing information (*handle* and *country* are mandatory)
   - Authentication – password and MD5 sum of the certificate for EPP connection
   - Zones – grant access to zones
   - Groups – assign membership in groups (you may need to *create a group* first)
   - Certifications – evaluation of registrar's retail services (it can be used in the public overview of registrars (default location: http://localhost/whois/registrars.py, see also the Certification programme in the CZ.NIC)
2. Click the *Save* button to save the new registrar.

Or provide the details on the command line. (See the program help for command parameters.)

- Registrar data: `sudo fred-admin --registrar_add <parameters>`
- Authentication: `sudo fred-admin --registrar_acl_add <parameters>`
- Zones: `sudo fred-admin --registrar_add_zone <parameters>`
- Groups: `sudo fred-admin --registrar_into_group <parameters>`
- Certifications: `sudo fred-admin --registrar_create_certification <parameters>`

Edit registrar's details

To modify registrar's information, use the WebAdmin:

1. *View registrar's details*, then scroll to the bottom and click *Edit* to display the edit form.
2. Edit the details (see *Add a registrar* for a description of the details).
3. Click the *Save* button, when you finish, to save the changes.

Registrar blocking

Blocking a registrar means that their EPP access is suspended until the end of the current month. The usual reason is that a registrar wants to cease activity when their monthly budget for EPP requests is exhausted.

Block a registrar

Registrars are blocked by the system automatically if they exceed their preset price limit for EPP requests and the *periodic task to block registrars over limit* is set up.

Registrars cannot be blocked via the WebAdmin.

In case of emergency, a registrar can be blocked on the command line:

```
sudo fred-admin --block_registrar_id <registrar_id>
```

Note: If a registrar was unblocked this month, they cannot be blocked again till the next month.

Unblock a registrar

A registrar can be unblocked via the WebAdmin:

1. *View registrar's details*, scroll down and click the *Unblock* button.
2. You will be prompted for an extra confirmation by retyping a number. Type it and hit *OK*.
3. The registrar is unblocked.

Or on the command line:

```
sudo fred-admin --unblock_registrar_id <registrar_id>
```

Registrar groups

Registrar groups are handy when you want to categorize the registrars, e.g. to mark which of them support DNSSEC or IPv6.

To view the list of groups, select in the WebAdmin menu: *Registrars ▸ Groups*

You can **change membership in a group** when you *edit registrar's details*.

Create a group

In the list of groups, find the last (empty) form field, enter the name of a new group and click *Save*.

Or provide the details on the command line: `sudo fred-admin --registrar_create_group <parameters>` (see the program help for parameters).

Rename a group

In the list of groups, find the group you want to rename, rewrite the name in the form field and click *Save*.

Remove a group

In the list of groups, find the group you want to delete, check the *Delete* checkbox and click *Save*.

Note: The WebAdmin lets you remove only empty groups.

Assign a payment to a registrar

Important: Changed in version 2.38: This feature is no longer supported in Daphne (WebAdmin). You may assign payments using **`Django PAIN`** or through the Accounting interface directly.

See *The Future of Payments & Invoices*.

10.5.3 Objects administration

All information about objects (registrable and other) can be browsed and viewed via the WebAdmin after login.

To modify *registrable object*s, you have to use an *EPP client* (e.g. **`fred-eppic`**).

Chapter TOC

- *Operations to modify registrable objects*
- *View object's details*
- *Administrative blocking of domains*
  - *State flags for blocking*
  - *Block a domain*
  - *Change blocking of a domain*
  - *Unblock a domain*
  - *Blacklist and delete a domain*
  - *Blocking, unblocking, or blacklisting in bulk*
- *Contact verification* *CZ-specific*

  - *Enqueue contact for verification*
  - *View results of automatic verification*
  - *Resolve manual verification*
- *Merge contacts*
  - *Merge a pair of duplicate contacts (manual)*
  - *Merge a set of duplicate contacts (automatic)*
- *Resolve a public request*
- *Generate a record statement*

Operations to modify registrable objects

The operations for registrable object modification encompass:

- check – see if an object can be registered,
- create – register a new object,
- delete – unregister an object,
- info – view object's details,
- renew – prolong a domain registration,
- sendauthinfo – request an AuthInfo,
- transfer – perform a transfer,
- update – change object's details.

These operations are typically performed by registrars and they can be achieved only through the *Registrar interface*. If you need to do any of these as the Registry, it is what the **system registrar** is for.

Refer to the *EPP client workflow* concept for details.

View object's details

Search for an object in the WebAdmin and then click on its *id* or *handle* or *fqdn* to display the details.

If the search result contains only one record, you are redirected to its details.

Administrative blocking of domains

Blocking a domain means to withdraw it from the typical workflow by forcing or prohibiting some operations over this domain.

State flags for blocking

The blocking is achieved by setting various blocking state flags (prohibitions, see also *Life cycle of registrable objects*). Which flags are suitable, depends on each case and the purpose of blocking.

Sometimes you may need to block even the domain holder together with the domain name, in which case the same blocking state flags are applied to both the owner contact and the domain.

- *The domain is administratively kept out of zone* – forces the exclusion of a domain from the zone (overrides all rules for domain inclusion),
- *The domain is administratively kept in zone* – forces the inclusion of a domain in the zone (overrides all rules for domain exclusion),
- *Deletion forbidden* – prohibits the deletion of the domain/contact,
- *Registration renewal forbidden* – prohibits the prolongation of a domain registration,
- *Sponsoring registrar change forbidden* – prohibits the transfer of the domain/contact,
- *Update forbidden* – prohibits changes of domain/contact details,
- *Registrant change forbidden* – prohibits to reassign the domain owner.

Block a domain

To set a blocking of a single domain, follow this procedure:

1. In the WebAdmin, *view domain's details* and click the *Block* button at the bottom.
2. The form with blocking options appears. Fill in:
   - *Reason* – the reason why the domain(s) has(have) to be withdrawn from the usual flow (e.g. indication of a violated law or rule),
   - ***Holder blocking* – decide what to do with the domain's owner:**
     - `Do not block the holder` will not do anything with the registrant, they will be able to change any contact information or the designated registrar or to be deleted,
     - `Block the holder` will apply the same blocking flags to the registrant as the blocked domain(s) (this option can be selected only if you're blocking all domains of this registrant at once),
     - `Create copy of the holder` will duplicate the contact and apply the same blocking flags to the duplicate as to the domain being blocked while the other domains and the original contact remain intact.
   - *Block to date* – on this date, the blocking will be cancelled automatically,
   - *Blocking statuses* – select which blocking flags to turn on.
3. Apply the blocking by clicking the *Block* button and confirm with *OK*.

Note: A blocked holder will be restored during domain unblocking automatically under certain conditions. See *Unblock a domain*.

Change blocking of a domain

If a domain already has been set some blocking flags, you can modify them following this procedure:

1. In the WebAdmin, *view domain's details* and click the *Change blocking* button at the bottom.
2. The form with blocking options appears. Fill in:
   - *Reason* – the reason why the blocking is being changed,
   - *Block to date* – change the end of blocking or leave empty to keep the old value,
   - *Blocking statuses* – check or uncheck flags to change the blocking.
3. Apply the blocking by clicking the *Block* button and confirm with *OK*.

Unblock a domain

To remove blocking flags from a domain, follow this procedure:

1. In the WebAdmin, *view domain's details* and click the *Unblock* button at the bottom.
2. The form with unblocking options appears. Fill in:
   - *Reason* – the reason why the domain is being unblocked,
   - *New holder* – assign a new owner by their *handle*,
   - *Remove admin. contacts* – unassign all administrative contacts,
   - *Restore prev. state* – restore the object state that was before blocking.
3. Proceed with the unblocking by clicking the *Unblock* button and confirm with *OK*.

The system removes all blocking flags, eventually restores the former set of flags which used to be assigned before the blocking, if requested.

The system attempts to unblock the original owner contact, if it had been blocked together with the domain, and if it is not linked to any other blocked domains. If it is linked to other blocked domains, the system creates a copy of the owner contact, replaces the original contact with the copy in the blocked domains, and unblocks the original owner.

Blacklist and delete a domain

A domain can be added to the Registry's blacklist, so that it may not be re-registered for some time or at all.

1. In the WebAdmin, *view domain's details* and click the *Blacklist and delete* button at the bottom.
2. The form with blacklist options appears. Fill in:
   - *Reason* – the reason why the domain has to be blacklisted and deleted (e.g. indication of a violated law or rule),
   - *To* (date) – on this date, the domain will be made available for registrations again. Leave it empty to blacklist the domain indefinitely.
3. Confirm by clicking the *Blacklist and delete* button and then *OK*.

Blocking, unblocking, or blacklisting in bulk

To block, unblock, change blocking of or blacklist a set of domains, follow this procedure:

1. *Search* domains to get those you need to block or blacklist.
2. Click the *Administrative blocking* link under the result table. It will allow you to select domains for blocking by using checkboxes. Check the box in the table header to select all displayed domains.
3. Above the result table, select which blocking operation you need to perform (block, change blocking, unblock, blacklist) and click *Start…*.
4. The blocking form appears that lets you set the blocking parameters for all selected domains at once. Options are the same as for the single-domain variant of these operations (see *block a domain*, *change blocking of a domain*, *unblock a domain* or *blacklist and delete a domain*).
5. Proceed by clicking the button and confirm by *OK*.

Contact verification CZ-specific

TBD (to be developed)

Enqueue contact for verification

View results of automatic verification

Resolve manual verification

Important: `Manual` and `thank-you` verifications were removed in FRED 2.48.0. Only `automatic` verification remains.

Merge contacts

The contact merger allows to fuse together two or more contacts that appear to represent the same identity and that are in a merge-able state.

The contact merger can be used from the command line only.

The definition of merge-able contacts and the description of the merge operation can be found in the *Contact merger* concept.

Merge a pair of duplicate contacts (manual)

The Registry operator can use a manual merge and select a pair of duplicate contacts by themself. The operator must also decide which contact will be the *destination contact*, which will remain.

A pair of merge-able contacts can be then merged by running a command like this:

```
fred-admin --contact_merge --src <src-contact-handle> --dst <dst-contact-handle> [--
↪dry_run]
```

This command will *merge* the *source contact* given by its handle into the *destination contact* given by its handle.

The `--dry_run` option is available to preview what the command will do. Also see the program `--help` for more options.

Merge a set of duplicate contacts (automatic)

The automatic merge procedure should be set up as a *periodic task*.

Resolve a public request

The public has the option to request an AuthInfo, personal information, or turn on/off enhanced security of their objects in the Registry database.

The form for request input and more details about the public requests can be found on the default location: http://localhost/whois/publicrequest.py

The types of public requests:

- Sending AuthInfo
- Blocking of transfer
- Unblocking of transfer
- Blocking of all changes
- Unblocking of all changes
- Sending personal information

Procedure to resolve a public request:

1. In the WebAdmin, select *Logs* ▸ *PublicRequests*.
2. *Search* for unresolved requests (use the field *Status* with the value `PRS_OPENED`).
3. View request's details.
4. If the request has been authorized, click the *Accept and send* button to answer it, otherwise click *Invalidate and close*. In both cases, you will be prompted for an extra confirmation by retyping a number. Type it and hit *OK*.
5. The request has been resolved.

Generate a record statement

1. *View object's details* and scroll down.
2. Under the *Generate record statement* heading, select the date and time to which the record shall be retrieved from the history of registrations.
3. Click the *Download PDF* button.
4. The generated PDF file will start downloading shortly.

10.5.4 Database search

The WebAdmin allows you to search any objects in the database, typically registrars or registrable objects but also archived mail and messages, public requests or the audit log.

This is the general search procedure:

1. First, you select from the WebAdmin menu what kind of objects you want to search (e.g. *Objects ▸ Search domains*).
2. You continue with composing a search filter in which you specify search criteria. It can be a simple query, such as a search for a domain by its handle, or a complex statement combining many attributes and logical operations (`and`, `or`, `not`).
3. Start the search by clicking the *OK* button. You can also save the search filter for a later use under a name of your choice by clicking the *Save* button.

   A saved search filter will appear above the search form as a text link.
4. If results are found, they are displayed in the *result table* below the search form. Results can be sorted by any column by clicking the column header.

   To view the details of a record, click the icon in the *id* column. If the search result contains only one record, the details are displayed directly.

Note: The column collection of the result table is hard-coded and it cannot be adjusted.

10.5.5 Viewing history

The WebAdmin allows you to view the history of registrable objects. The history of object's values is displayed together with object's details. The display of history is turned on by checking the *History* checkbox in the top right area of the screen. You can turn it off by unchecking the checkbox. The setting is applied to the whole session, so you do not have to check it for every object you visit.

10.6 Maintenance

This chapter should help you with the maintenance of the system, especially the dynamic data that is generated during the system operation.

Unfortunately, specific maintenance practices depend greatly on the way you deploy the system. However, there are some general guidelines in this chapter that you may find useful.

Chapter TOC

- *Maintained dynamic data*
- *Databases*
  - *Simple backup: pg_dump*
    - *Logger database content archivation*
  - *Advanced backup: continuous archiving*
- *Managed files*

- *Syslog data*
- *Upgrading*

10.6.1 Maintained dynamic data

There are several types of data that are generated during the operation of the system:

- the *main* database,
- the *logger* database,
- managed files,
- syslog data.

Some of these data should be duplicated as a safety precaution or archived if a release of system resources is required.

Most of them can be packed by a compressing archiver and moved to a backup location (i.e. a backup server).

10.6.2 Databases

We recommend these standard PostgreSQL's tools for database maintenance:

- Backup and Restore for database backups and
- Automatic Vacuuming for database cleanup.

Simple backup: pg_dump

Textual backup of the whole database which you may want to perform daily using CRON. It also may come in handy in the case you need to migrate the data to a higher version of PostgreSQL.

Recommended for both FRED databases—*main* and *logger*—as a minimum crash-safety precaution.

See PostgreSQL's documentation: SQL Dump.

Logger database content archivation

The *logger* database is divided into partitions by months which is embedded in its schema. This allows you to dump only the data from a specified month (usually the previous one).

Advanced backup: continuous archiving

Incremental binary backup that allows to recover the database to the most recent state at a minimum cost, since it backs up at a rate of minutes but it only records the difference from the previous backup.

Recommended for the *main* database as an advanced crash-safety precaution.

See PostgreSQL's documentation: Continuous Archiving.

10.6.3 Managed files

You may archive and/or remove the older content of `/var/lib/pyfred/*` where the files managed by the FRED are located.

The system can handle missing files. When some part of the system requests a file, that has been removed, from the file manager, it reports an exception.

10.6.4 Syslog data

Local syslog files can be maintained by the `logrotate` utility which is a part of the operating system.

Syslog data on a remote log server can be maintained for example by the `syslog-ng` application, see the syslog-ng documentation

10.6.5 Upgrading

Important: Before you upgrade to a newer version, read the *Release Notes* and associated upgrade considerations carefully!

Considerations overview

- /ReleaseNotes/Upgrade-2-39
- /ReleaseNotes/Upgrade-2-38
- /ReleaseNotes/Upgrade-2-37
- /ReleaseNotes/Upgrade-2-35

10.7 Customization

The customization of the FRED mainly concerns the public web interface, generated announcements or notifications, and exported PDFs.

10.7.1 Customizing public web interface

The *public web interface* (see also *Public interface (PIF)*) is sourced as the component **`fred-webwhois`**. It is a standard **Django application**.

Note: We give quickstart tips in this customization tutorial, however, we recommend you to familiarize yourself with the Django framework.

Also notice that there is a difference between a Django app and a Django project.

The `fred-webwhois` app has some *templates* and *views*. It does not have any *models*, since it handles data through CORBA calls.

The public web interface can be divided into 3 feature groups:

- whois lookup – a form for web WHOIS search, results and details about registered objects,
- registrar listing – a list of accredited registrars and their details,
- public requests – forms and responses for submission of requests from the public.

These feature groups are not stricly separated in the code, they are only used in this documentation for better clarity.

Redesigning stylesheets

If you need to adapt the visual style only, changing CSS should suffice.

Create a folder for stylesheets under the `static/webwhois` directory of the **`fred-webwhois`** app, such as `css`, and put your stylesheet(s) in there.

Then you have to add a reference to your stylesheet file(s) in the template that contains the HTML head (by default in the *base template*) as follows:

Listing 16: Link to a stylesheet in a template

```
<link rel="stylesheet" type="text/css" href="{% static "webwhois/css/mystyle.css" %}"/
↪>
```

You should use the `static` tag and a path relative to the static directory. Django will render this expression to the full file path accordingly.

Before deployment, you must collect static files (e.g. images, JavaScript, CSS) to a single location, see Django 1.11: Managing static files.

Reconfiguring URLs

The URL patterns of the public web interface are composed as `http(s)://`*`hostname/base-path/app-paths`*.

The scheme, *hostname*, and eventually the *base path* are defined in web-server configuration.

The webwhois *app-paths* suffixes look like this by default (strings following the *base path*):

- (empty suffix) – the whois lookup form,
- `registrars/` – the list of registrars,
- `send-password/` – the public request to send AuthInfo password,
- and so on (the list is not complete).

You can find the *app-paths* configuration in `webwhois/urls.py` of the **`fred-webwhois`** app and redefine them to your liking.

Redesigning templates

Django uses its own template system (the `DjangoTemplates` backend), which is recommended.

The default webwhois templates are written in the *Django template language*, which allows separation of templates into several files, their inclusion, and inheritance, among other features.

If you want to reorganize how information is presented or to add custom site components, you can override only the components necessary.

For example:

Let us say that you want a different representation of the list of registrars: a simple list instead of a table. You only need to override the template component that defines the table (block `webwhois_content`), which originates in the template `webwhois/registrar_list.html`.

- Create a file such as `/path/to/my-templates/webwhois/my_registrar_list.html` with the following content:

Listing 17: Django: Overriding a template block

```
{# Name the template to be extended. #}
{% extends "webwhois/registrar_list.html" %}

{# Load library with webwhois filters (allows the use of "add_scheme" filter␣
↪below). #}
{% load webwhois_filters %}

{# Name the block to override. #}
{% block webwhois_content %}
   {# Your own definition of the block follows. #}
   <ul>
      {% for item in registrars|dictsort:"registrar.name" %}
         <li><a href="{{ item.registrar.url|add_scheme }}">{{ item.registrar.name␣
↪}}</a></li>
      {% endfor %}
   </ul>
{% endblock webwhois_content %}

{# The rest of the template is inherited from the template being extended. #}
```

- Define the `template_name` variable for the corresponding view in your URLs module:

Listing 18: Django: Reconfiguring a template for a view

```
urlpatterns = [
 # From the template reference, we know that the list is rendered by this view
 # so we tell it that we want to use another template than the default
 url(r'^registrars/$', RegistrarListView.as_view(template_name="webwhois/my_
↪registrar_list.html"), name='registrars'),
 # ...
 # Include the original webwhois URLs
 url(r'^', include('webwhois.urls')
]
```

- Then add the directory path of the custom template to the `DIRS` list in templates configuration as follows:

Listing 19: Django: Setting a custom template path in project settings

```
TEMPLATES = [
    {
        'BACKEND': 'django.template.backends.django.DjangoTemplates',
        # ...
        'DIRS': [
           '/path/to/my-templates',
        ],
    },
]
```

For more about Django templates in fred-webwhois see *Webwhois Django Templates*.

See also Django 1.11: Templates (a brief introduction).

Creating a new localization

Django uses **gettext** for internationalization and localization.

To make your own localization, create language files, into which you will place your translations.

Before deployment, remember to compile the language files.

See also Django 1.11: Iternationalization and localization.

Webwhois Django Templates

This section explains the basics of Django templates and gives a reference of the contexts that are passed to the webwhois templates by default.

You can find the templates in `webwhois/templates` of the **`fred-webwhois`** app.

Templating basics

A resulting site is rendered from a *template* and a *context*. A context is a dictionary of keys and values that are passed to a template from a view. Context values can be accessed in templates by using context keys as variable names.

The basic components of the *Django template system* allow you to:

- Output a value of a variable

Listing 20: Django templating example: Variable

```
My first name is {{ first_name }}.
```

- Control the flow

Listing 21: Django templating example: Conditional expression

```
{% if user.is_authenticated %}Hello, {{ user.username }}.{% endif %}
```

- Define (or override) a block

Listing 22: Django templating example: Block definition

```
{% block main_content %}
   <p>Some main content here.</p>
{% endblock %}
```

- Include a partial template

Listing 23: Django templating example: Inclusion

```
{% include "webwhois/include/public_request_form_fields.html" with pubreq_
↪selected_menu="personal_info" %}
```

- Extend a template

Listing 24: Django templating example: Extension

```
{% extends template_name %}

{# Here you can override some blocks. And this is a line comment. #}
```

- And more.

See Django 1.11: Template language reference.

Basic context

The reference below mentions only template context that is added by specific webwhois class-based views.

The template context contains also items that are generated by the super classes, from which the webwhois views inherit, such as generic views and context mixins.

The template context of all class-based generic views include a `view` variable that points to the `View` instance. This allows you to access attributes of the view in the template, such as `view.attribute_name`.

For information on context inherited from Django class-based views, see Django 1.11: Built-in class-based views API reference.

Template reference

- *Base template*
- *Server exceptions template*
- *Templates for whois lookup*
- *Templates for registrar listing*
- *Templates for public requests*
- *Templates inheritance diagram*

Base template

The default base-template name is `base_site_example.html`, but changing it is complicated, therefore we recommend to use the default name.

Server exceptions template

The template used to render errors.

Template name: `webwhois/server_exception.html`

Default additional context (see also *basic context*):

- `handle` – The handle, which a user has entered in the search form.
- `managed_zone_list` – A list of zones managed by the Registry. (Available only with the `server_exception.unmanaged_zone` error.)

  Changed in version NEXT: This variable is deprecated, use `managed_zones` context processor instead.
- `server_exception` – An error object. It has the following attributes:
  - `code` – A code of the error, e.g. `OBJECT_NOT_FOUND`, `UNMANAGED_ZONE`, `INVALID_HANDLE` etc.
  - `title` – A title of the error.
  - `message` – An error message. .. versionchanged:: NEXT

    The message may be `None`.

  And may have following keys:

  Changed in version NEXT: Following keys are deprecated. Use `code` and/or `view.object_type_name` instead.

  - `handle_is_in_zone` – `True` if the user-provided handle is recognized as a valid domain name but does not match any record.
  - `too_many_parts_in_domain_name` – `True` if the user-provided handle is recognized as a domain name but has more parts than are managed by the Registry.
  - `unmanaged_zone` – `True` if the user-provided handle is recognized as a domain name but is not in any zone managed by the Registry (wrong TLD).
  - `object_not_found` – `True` if the user-provided handle was not found in the Registry.

This template is rendered by `RegistryObjectMixin`.

Templates for whois lookup

This section covers a set of templates for whois lookup and results.

Templates for whois lookup

- *Search form template*
- *Multiple-entries result template*
- *Contact details template*

- *Domain details template*
- *Nsset details template*
- *Keyset details template*

Search form template

Template name: `webwhois/form_whois.html`

Default additional context (see also *basic context*): None additional.

This template is rendered by `WhoisFormView`.

Multiple-entries result template

Template name: `webwhois/multiple_entries.html`

Default additional context (see also *basic context*):

- `handle` – The handle, which a user has entered in the search form.
- `registry_objects.contact.*` – Same structure as in *Contact details template*.
- `registry_objects.domain.*` – Same structure as in *Domain details template*.
- `registry_objects.nsset.*` – Same structure as in *Nsset details template*.
- `registry_objects.keyset.*` – Same structure as in *Keyset details template*.
- `registry_objects.registrar.*` – Same structure as in *Registrar details template*.

This template is rendered by `ResolveHandleTypeView`.

Contact details template

Template name: `webwhois/contact.html`

Default additional context (see also *basic context*):

- `handle` – A contact handle.
- `registry_objects.contact.detail` – A CORBA object with contact data, see `Contact` structure in Whois2.idl.
- `registry_objects.contact.birth_date` – A contact birth date.
- `registry_objects.contact.status_descriptions` – List of contact status labels. Verification statuses are excluded.
- `registry_objects.contact.verification_status` – List of verification statuses. Each member has the following keys:
  - `code` – Status code
  - `label` – Status label
  - `icon` – Path to a status icon
- `registry_objects.contact.is_linked` – Whether a contact is linked to another object in the Registry.

- `registry_objects.contact.creating_registrar` – The creating registrar – a CORBA object with registrar data, see `Registrar` structure in Whois2.idl.
- `registry_objects.contact.sponsoring_registrar` – The current sponsoring registrar – a CORBA object with registrar data, see `Registrar` structure in Whois2.idl.
- `object_delete_candidate` – Whether the contact is in delete candidate status.

This template is rendered by `ContactDetailView`.

Domain details template

Template name: `webwhois/domain.html`

Default additional context (see also *basic context*):

- `handle` – A domain handle.
- `registry_objects.domain.detail` – A CORBA object with domain data, see `Domain` structure in Whois2.idl. If the domain has delete candidate status, it is `None`.
- `registry_objects.domain.status_descriptions` – List of domain status labels.
- `registry_objects.domain.registrant` – The domain holder – CORBA object with contact data, see `Contact` structure in Whois2.idl.
- `registry_objects.domain.registrar` – The current sponsoring registrar – a CORBA object with registrar data, see `Registrar` structure in Whois2.idl.
- `registry_objects.domain.admins` – List of domain's administrative contacts. Each member is a CORBA object with contact data, see `Contact` structure in Whois2.idl.
- `registry_objects.domain.nsset` – Domain's nsset – a CORBA object with nsset data, see `NSSet` structure in Whois2.idl.
- `registry_objects.domain.keyset` – Domain's keyset – a CORBA object with keyset data, see `KeySet` structure in Whois2.idl.
- `object_delete_candidate` – Whether the domain is in delete candidate status.
- `DNSSEC_URL` – Value of `WEBWHOIS_DNSSEC_URL` setting.

This template is rendered by `DomainDetailView`.

Nsset details template

Template name: `webwhois/nsset.html` + includes `webwhois/nsset_detail.html`

Default additional context (see also *basic context*):

- `handle` – A nsset handle.
- `registry_objects.nsset.detail` – A CORBA object with nsset data, see `NSSet` structure in Whois2.idl.
- `registry_objects.nsset.status_descriptions` – List of nsset status labels.
- `registry_objects.nsset.registrar` – The sponsoring registrar – a CORBA object with registrar data, see `Registrar` structure in Whois2.idl.
- `registry_objects.nsset.admins` – List of technical contacts. Each member is a CORBA object with contact data, see `Contact` structure in Whois2.idl.

- `object_delete_candidate` – Whether the nsset is in delete candidate status.

This template is rendered by `NssetDetailView`.

Keyset details template

Template name: `webwhois/keyset.html` + includes `webwhois/keyset_detail.html`

Default additional context (see also *basic context*):

- `handle` – A keyset handle.
- `registry_objects.keyset.detail` – A CORBA object with keyset data, see `KeySet` structure in Whois2.idl.
- `registry_objects.keyset.status_descriptions` – List of keyset status labels.
- `registry_objects.keyset.registrar` – The sponsoring registrar – a CORBA object with registrar data, see `Registrar` structure in Whois2.idl.
- `registry_objects.keyset.admins` – List of technical contacts. Each member is a CORBA object with contact data, see `Contact` structure in Whois2.idl.
- `object_delete_candidate` – Whether the keyset is in delete candidate status.

This template is rendered by `KeysetDetailView`.

Templates for registrar listing

This section covers a set of templates for registrar listing.

Templates for registrar listing

- *A list of registrars template*
- *Registrar details template*

A list of registrars template

Template name: `webwhois/registrar_list.html`

Default additional context (see also *basic context*):

- `groups` – Mapping of all registrar groups.
- **`registrars` – List of registrar context objects. Each object has following keys:**
  - `registrar` – A CORBA object with registrar data, see `Registrar` structure in Whois2.idl.
  - `cert` – Certification object.
  - `score` – Certification score.
  - `stars` – Range of certification score.
- **`is_retail` – Denotes whether a list of registrars was filtered to retail or wholesale registrars:**
  - `None` if not using the retail/wholesale filtering,

  - `True` if only retail registrars are displayed,
  - `False` if only wholesale registrars are displayed.

Deprecated since version 1.15: Will be removed in 1.16. Use `group_name` instead.

This template is rendered by `RegistrarListView`.

Registrar details template

Template name: `webwhois/registrar.html`

Default additional context (see also *basic context*):

- `registry_objects.registrar.detail` – A CORBA object with registrar data, see `Registrar` structure in Whois2.idl.

This template is rendered by `RegistrarDetailView`.

Templates for public requests

This section covers a set of templates for submission of *public request*s and according responses.

Templates for public requests

- *Request forms – Send authorization information template*
- *Request forms – Send personal information template*
- *Request forms – Lock an object template*
- *Request forms – Unlock an object template*
- *Responses – Unknown public response template*
- *Public response data*
- *Responses – Public response with an answer sent to an email in the Registry template*
- *Responses – Public response with an answer sent to a custom email template*
- *Responses – Public response confirmed with a notarized letter template*

Request forms – Send authorization information template

Template name: `webwhois/form_send_password.html` + includes `webwhois/include/public_request_form_fields.html`

Default additional context (see also *basic context*): None additional.

This template is rendered by `SendPasswordFormView`.

Request forms – Send personal information template

Template name: `webwhois/form_personal_info.html` + includes `webwhois/include/public_request_form_fields.html`

Default additional context (see also *basic context*): None additional.

This template is rendered by `PersonalInfoFormView`.

Request forms – Lock an object template

Template name: `webwhois/form_block_object.html` + includes `webwhois/include/public_request_form_fields.html`

Default additional context (see also *basic context*): None additional.

This template is rendered by `BlockObjectFormView`.

Request forms – Unlock an object template

Template name: `webwhois/form_unblock_object.html` + includes `webwhois/include/public_request_form_fields.html`

Default additional context (see also *basic context*): None additional.

This template is rendered by `UnblockObjectFormView`.

Responses – Unknown public response template

Returned when a link to a public request is no longer valid (e.g. an outdated request).

Template name: `webwhois/public_request_response_not_found.html`

Default additional context (see also *basic context*): None additional.

This template is rendered by `PublicResponseNotFoundView`.

Public response data

Default additional context common to the following templates:

- **`public_response` – A public response object.**
  - `object_type` – A type of the *registrable object* in question.
  - `public_request_id` – An identifier of the public request.
  - `handle` – The handle of the *registrable object*.
  - `request_type` - A type of the public request.
  - `confirmation_method` - Confirmation method used.
  - `create_date` - Public request create date.

This template is rendered by `BaseResponseTemplateView`.

Responses – Public response with an answer sent to an email in the Registry template

Template name: `webwhois/public_request_email_in_registry.html`

Default additional context (see also *basic context*):

- `public_response` – A *public response* object.
- `text_title` – A page title.
- `text_header` – A page header.
- `text_content` – A page content.

This template is rendered by `EmailInRegistryView`.

Responses – Public response with an answer sent to a custom email template

Template name: `webwhois/public_request_custom_email.html`

Default additional context (see also *basic context*):

- `public_response` – A *public response* object.
- `text_title` – A page title.
- `text_header` – A page header.
- `text_subject` – The email subject.
- `text_content` – The email body content.

This template is rendered by `CustomEmailView`.

Responses – Public response confirmed with a notarized letter template

Template name: `webwhois/public_request_notarized_letter.html`

Default additional context (see also *basic context*):

- `public_response` – A *public response* object.
- `text_title` – A page title.
- `notarized_letter_pdf_url` – The URL of the PDF file with the notarized letter.
- `pdf_name` – The name of the PDF file.

This template is rendered by `NotarizedLetterView`.

Templates inheritance diagram

10.7.2 Customizing email templates

Email templates are used to generate automatic Registry email communication, such as notifications and warnings.

The templates can be modified through the web interface at <https://secretary.nic.cz/admin/>

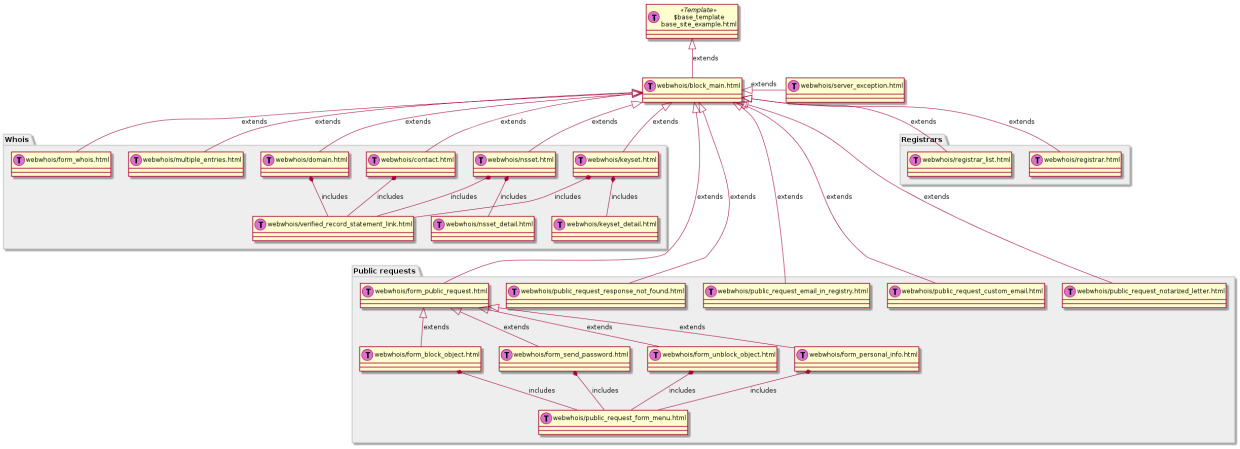

Fig. 1: Templates inheritance diagram

Caution: Due to the dockerization of the messenger and secretary projects, the following section is depracated. If you run into any issues, please contact us at fred@nic.cz

The templates can me modified through SQL queries. Emails are decomposed into several database tables as follows.

Important: If you customize database tables, remember to examine changes in the database component before upgrading the FRED!

Sometimes we need to edit the templates for ourselves and these changes are added to a database upgrade script, which would overwrite your settings. Therefore you should either **backup** your current database tables to recover your settings after the upgrade, **or adapt** the upgrade script directly, so that you don't lose your settings.

Chapter TOC

- *Registry contact information (defaults)*
- *Email types*
- *Email composition*
  - *Email headers*
  - *Email footers*
  - *Email vCards*
  - *Email template bodies*
- *Body templating*

Registry contact information (defaults)

Table: `mail_template_default`

This table contains Registry contact information (called `defaults`) grouped in the JSON form.

`defaults.*` are a data subset that is passed to all email templates.

The parameters are described *in the parameter reference*.

Listing 25: Example: Registry information JSON

```
{
   "defaults.company": "CZ.NIC, z. s. p. o.",
   "defaults.company_cs": "CZ.NIC, správce domény CZ",
   "defaults.company_en": "CZ.NIC, the CZ domain registry",
   "defaults.emailsupport": "podpora@nic.cz",
   "defaults.tel": "+420 222 745 111",
   "defaults.street": "Milešovská 1136/5",
   "defaults.city": "Praha 3",
   "defaults.postalcode": "130 00",
   "defaults.whoispage": "https://www.nic.cz/whois",
   "defaults.authinfopage": "http://www.nic.cz/whois/publicrequest/",
   "defaults.registrarlistpage": "https://www.nic.cz/whois/registrars"
}
```

You may have several defaults and associate each with an email template by referencing it in the `mail_template.mail_template_default_id` attribute.

Email types

Table: `mail_type`

This table maps an email type `name`, which is referred to in the *Email Parameters Reference*, to an `id` referenced by the `mail_template` table.

Each email type serves a specific purpose that is built in into the overall functionality of the Registry. For this reason, there is no easy way of adding custom email types at the moment, although you may easily customize the existing types.

It is also possible to disable sending of some email types, see *Customizing state-change notifications*.

Email types are briefly described in the *Email Parameters Reference*.

Email composition

An email message is composed of:

- header fields,
- a subject,
- a body,
- a footer at the end of the body,
- vCard attachment.

Email headers

Table: mail_header_default

This table allows you to preset email header fields, namely:

- h_from – sender address, From header, e.g. support@registry.com or "Registry Support" <support@registry.com>,
- h_replyto – address that should be used to reply, Reply-To header,
- h_errorsto – address(es) for additional notification of delivery errors, Errors-To header,
- h_organization – sender organization, Organization header,
- h_contentencoding – content encoding for the Content-Type header, e.g. charset=UTF-8,
- h_messageidserver – hostname that will be used to generate the Message-ID header, e.g. registry.com, which will result in Message IDs like <39370682.1555751410@registry.com>.

You may have several sets of headers. To associate one with an email template, reference it in the mail_template.mail_header_default_id attribute.

Message-ID generation

A complete Message-ID is composed in the following manner:

```
<mail_archive.id>.<int(epoch_time)>@<mail_header_default.h_messageidserver>
```

Email footers

Table: mail_template_footer

This table allows you to preset email footers.

An email footer is a component of email content that is added right after the body, typically used to include uniformly-formatted *Registry contact information*. For example:

Listing 26: Email footer example

```
--
<?cs var:defaults.company ?>
<?cs var:defaults.street ?>
<?cs var:defaults.postalcode ?> <?cs var:defaults.city ?>
---------------------------------
phone: <?cs var:defaults.tel ?>
email: <?cs var:defaults.emailsupport ?>
---------------------------------
```

You may have several footers. To associate one with an email template, reference it in the mail_template.mail_template_footer_id attribute.

Email vCards

Table: `mail_vcard`

This table contains a unique Registry vCard that is inserted by Mailer to all emails as an attachment.

You may redefine it by updating the row. VCard version is not restricted by the FRED, it is up to you to decide which to use, just consider compatibility with email clients.

Listing 27: vCard example

```
BEGIN:VCARD
VERSION:2.1
N:podpora CZ.NIC, z. s. p. o.
FN:podpora CZ.NIC, z. s. p. o.
ORG:CZ.NIC, z. s. p. o.
TITLE:zákaznická podpora
TEL;WORK;VOICE:+420 222 745 111
ADR;WORK:;;Milešovská 1136/5;Praha 3;;130 00;Česká republika
URL;WORK:http://www.nic.cz
EMAIL;PREF;INTERNET:podpora@nic.cz
REV:20161108T120000Z
END:VCARD
```

Email template bodies

Table: `mail_template`

This table contains the core of the email templates, and it has the following attributes:

- `mail_type_id` – reference to a mail type `id` from `mail_type`,
- `version` – version number of the template (see below),
- `subject` – a short description of message content for the `Subject` header,
- `body_template` – the main part of a template, see *Body templating*,
- `body_template_content_type` – content subtype of the message (only `plain` is tested),
- `mail_template_footer_id` – reference to a footer `id` from `mail_template_footer`,
- `mail_template_default_id` – reference to a defaults `id` from `mail_template_default`,
- `mail_header_default_id` – reference to a headers `id` from `mail_header_default`,
- `created_at` – template creation timestamp.

Subject

We use the convention `Local-language subject text / English subject text`. Feel free to adapt the local-language text. If you decide to change the optical separator (`/`), you should use it consistently across the email types.

Content type

The general content type of an email body is always `text`. The `body_template_content_type` attribute is a subtype, usually `plain`, therefore the full content type results in `text/plain`. Other text subtypes are theoretically possible (such as html, css, xml, csv), although only `plain` has been tested!

Versioning

- The last version is used in generation of new emails.
- Older versions are kept to regenerate archived messages for viewing in the WebAdmin.
- When you're changing any attribute of a mail template, **insert a new row** with the change and with the version number incremented by 1.

Tip: To write upgrades, you may use our database functions `get_current_mail_template_version(mail_type_id)` and/or `get_next_mail_template_version(mail_type_id)`.

Body templating

In the email body template, we use the convention: local-language (Czech) text first, English text second, and the language variants are optically separated with a couple of newlines.

Note: We recommend to replace the Czech variant of texts with the variant in your local language and keep the English variant for common understanding.

Email bodies are processed with the ClearSilver template system, which takes a template in plain text and passes it a data set to create a resulting email. Each email template is passed a different data set, which depends on the email type. Data (parameters) are passed to a template in a hierarchical form. To traverse the hierarchy, a dot convention is used.

ClearSilver lets you do some basic templating:

- Output the value of a variable:

Listing 28: ClearSilver example: Variable

```
Handle: <?cs var:handle ?>
```

- Control the flow:

Listing 29: ClearSilver example: Conditional expression

```
<?cs if:ident_type != "" ?>
 <?cs
 if:ident_type == "OP"?>Personal ID: <?cs
 elif:ident_type == "PASS"?>Passport number: <?cs
 elif:ident_type == "BIRTHDAY"?>Date of birth: <?cs
 /if ?> <?cs var:ident_value ?>
<?cs /if ?>
```

- Iterate over a list:

Listing 30: ClearSilver example: List iteration

```
<?cs each:item = administrators ?>Administrative contact: <?cs var:item ?>
<?cs /each ?>
```

- And more.

See templates in ClearSilver for complete syntax reference.

For a detailed reference of the passed parameters according to the email type see *Email Parameters Reference*.

10.7.3 Customizing state-change notifications

State-change notifications are the part of Registry email communication that is based on the life cycle of *registrable object*s, in other words, on *state changes* of registrable objects.

See also *Life-cycle events* for the table of lifecycle-based notifications.

These notifications can be disabled by removal of rows from the database table `notify_statechange_map`:

```
fred=> select * from notify_statechange_map;
 id | state_id | obj_type | mail_type_id | emails
----+----------+----------+--------------+--------
  1 |        9 |        3 |            3 |      1
  2 |       20 |        3 |            4 |      1
  3 |       17 |        3 |            5 |      1
  4 |       17 |        2 |           14 |      1
  5 |       17 |        1 |           14 |      1
  6 |       20 |        3 |            6 |      2
  7 |       17 |        3 |            7 |      2
  8 |       12 |        3 |            8 |      1
  9 |       13 |        3 |            9 |      1
 10 |       13 |        3 |            6 |      2
 11 |       17 |        4 |           14 |      1
 12 |       28 |        3 |           31 |      3
 13 |       28 |        3 |           31 |      4
(13 rows)
```

This table says: when an object of the type `obj_type` is set the status flag `state_id`, an email message of the type `mail_type_id` is sent to recipients according to `emails`.

Object states

See the table `enum_object_states` and compare with *Life cycle of registrable objects*.

Object types

`obj_type` is the type of an object to be notified (1..contact, 2..nsset, 3..domain, 4..keyset), see the table `enum_object_type`.

Mail types

`mail_type_id` is the type of mail to be sent from the table `mail_type`, see also *Email Parameters Reference*.

Email recipients

`emails` are only distinguished in case of domains:

- 1 – all administrative contacts of the domain
- 2 – all technical contacts of the domain's nsset
- 3 – *generic* emails, see *communication channels*
- 4 – *additional* domain notification emails, see *communication channels*

In case of nssets or keysets, recipients are all technical contacts.

In case of contacts, recipient is the contact itself.

10.7.4 Customizing PDF templates

The rendering of PDF files is done by Django application `secretary`.

The templates can be modified through the web interface at <https://secretary.nic.cz/admin/>

Link to the secretary project repository <https://gitlab.nic.cz/fred/django-secretary>.

> **Caution:** Due to the dockerization of the messenger and secretary projects, the following section is depracated. If you run into any issues, please contact us at fred@nic.cz

The Portable Document Format (PDF) is used for many documents exported by the system such as letters (expiration warning), invoices or the portion of public requests delivered by post.

These documents are rendered with the **`fred-doc2pdf`** script from RML (Report Markup Language), which is an XML-based intermediary format for PDF rendering.

Intermediary RML files are constructed from dynamic XML data (generated from the database) and *static strings* stored in XML files in the same folder as templates. Standard XSLT templates and an XSLT processor are employed to construct these intermediary files.

The templates (.xsl) can be found in the directory `@PREFIX@/share/fred-doc2pdf/templates/`.

The *static strings* (.xml) are available in Czech and English localizations and the localization is selected in each template with the `lang` parameter.

The easiest way to customize PDFs is to **adapt the headers and footers** to match your corporate identity (logo and graphic design). The default design (used in CZ.NIC) is in the `cznic_design.xsl` template, which is imported by all other templates.

10.7.5 Localization

Setting up localization for Ferda webadmin tool.

Basic languages for Ferda are English and Czech.

If you want to add another language, you have to add locales both in Python and JavaScript.

Localizing Python

Python uses the *gettext* system where locales are stored in message files (.po).

Generate a message file for the new language using the command `django-admin makemessages -l <language>` command from the root of the Ferda app.

Translate the strings into the target language.

You need to compile them with the command `django-admin compilemessages` before deployment.

Localizing JavaScript

JavaScript stores translations in the `yaml <https://learnxinyminutes.com/docs/yaml/>` format.

Ferda has locales in the directory `ferda/static/ferda/locales/`, which contains a subdirectory for each language.

Copy the contents of one of them (e.g. from `en`) to a new directory named after the target language (e.g. `es`).

Translate the strings into the target language.

Setting up a new language

After creating localizations, you need to enable them for use in Ferda.

To set up your new language (e.g. Spanish), modify the following variables in the `.env` file:

Listing 31: Localization setting example

```
LANGUAGE_CODE=es
LANGUAGES=en:English,cs:Česky,es:Español
```

If a translation string is missing, the localization falls back to the English string.

10.8 Appendixes

10.8.1 Dependencies Ubuntu 20.04 LTS

Changed in version 2.37: Support for Ubuntu 16.04 LTS has been discontinued.

Package list

```
apache2
apache2-dev
automake
build-essential
chrpath
doxygen
gettext
ldnsutils
libapache2-mod-python
libapache2-mod-wsgi
libboost-all-dev
libcurl4-openssl-dev
libidn11-dev
libminizip-dev
libmpdec-dev
libomniorb4-dev
liborbit2-dev
libpq-dev
libssh-dev
libssl-dev
libtool
libxml2-dev
libxml2-utils
omniidl
omniidl-python
omniorb-nameserver
patchutils
postfix
postgresql
postgresql-client
python
python-beaker
python-cherrypy3
python-clearsilver
python-dev
python-django
python-djangorestframework
python-dnspython
```

(continues on next page)

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```
python-idna
python-omniorb
python-psycopg2
python-pygresql
python-reportlab
python-simplejson
python-simpletal
python-trml2pdf
ttf-dejavu
ttf-freefont
ttf-mscorefonts-installer
whois
xsltproc
zlib1g-dev
```

10.8.2 Email Parameters Reference

This is a reference of available parameters (data sets) which are passed to email templates when generating email based on events in the FRED.

The parameter names are listed for each email type together with the corresponding trigger event, and there is an index with short descriptions of common parameters at the end of this appendix.

See also *Customizing email templates* for detailed information on template customization.

Chapter TOC

- *Email type:* `sendauthinfo_pif`
- *Email type:* `sendauthinfo_epp`
- *Email type:* `expiration_notify`
- *Email type:* `expiration_dns_warning_owner`
- *Email type:* `expiration_dns_owner`
- *Email type:* `expiration_register_owner`
- *Email type:* `expiration_dns_tech`
- *Email type:* `expiration_register_tech`
- *Email type:* `expiration_validation_before`
- *Email type:* `expiration_validation`
- *Email type:* `notification_create`
- *Email type:* `notification_update`
- *Email type:* `notification_transfer`
- *Email type:* `notification_renew`
- *Email type:* `notification_unused`
- *Email type:* `notification_delete`
- *Email type:* `request_block`

- *Email type:* `annual_contact_reminder`
- *Email type:* `merge_contacts_auto`
- *Email type:* `akm_candidate_state_ok`
- *Email type:* `akm_candidate_state_ko`
- *Email type:* `akm_keyset_update`
- *Email type:* `record_statement`
- *Email type:* `sendpersonalinfo_pif`
- *Description of parameters*
  - *Registry information (defaults)*
  - *Common parameters*

Email type: `sendauthinfo_pif`

- sent in response to a request for an authorization information (AuthInfo) which was placed through the Registry website
- passed parameters: *defaults.**, *AuthInfo*, *handle*, *reqdate*, *reqid*, *type*

Email type: `sendauthinfo_epp`

- sent in response to a request for an authorizationinformation (AuthInfo) which was placed through a registrar
- passed parameters: *defaults.**, *AuthInfo*, *handle*, *registrar*, *type*

Email type: `expiration_notify`

- sent to the domain owner in response to the domain expiration
- passed parameters: *defaults.**, *administrators*, *checkdate*, *dnsdate*, *domain*, *exdate*, *exregdate*, *owner*, *registrar*,

Email type: `expiration_dns_warning_owner`

- sent to the domain owner in response to the upcoming exclusion of a domain from the zone
- passed parameters: *defaults.**, *administrators*, *day_before_exregdate*, *dnsdate*, *domain*, *exregdate*, *owner*, *registrar*, *zone*

Email type: `expiration_dns_owner`

- sent to the domain owner in response to the exclusion of a domain from the zone
- passed parameters: *defaults.**, *administrators*, *day_before_exregdate*, *domain*, *exregdate*, *owner*, *registrar*, *zone*

Email type: `expiration_register_owner`

- sent to the domain owner in response to the upcoming domain cancellation
- passed parameters: *defaults.**, *domain*,

Email type: `expiration_dns_tech`

- sent to the technical contacts of the nsset whose domain was just excluded from zone
- passed parameters: *defaults.**, *domain*, *nsset*, *statechangedate*

Email type: `expiration_register_tech`

- sent to the technical contacts of the nsset whose domain was just cancelled
- passed parameters: *defaults.**, *domain*, *exregdate*, *nsset*,

Email type: `expiration_validation_before`

- sent to the owner of an ENUM domain in response to the upcoming expiry of domain's validation
- passed parameters: *defaults.**, *administrators*, *checkdate*, *domain*, *owner*, *registrar*, *valdate*

Email type: `expiration_validation`

- sent to the owner of the ENUM domain in response to the expiry of domain's validation
- passed parameters: *defaults.**, *administrators*, *checkdate*, *domain*, *owner*, *registrar*,

Email type: `notification_create`

- sent when a new object (domain, contact, nsset, keyset) is created, to the email contact of the created object
- common passed parameters: *defaults.**, *handle*, *registrar*, *ticket*, *type*
- **additional parameters concerning a new contact:**
  - `fresh.object.authinfo` – the authorization information (AuthInfo)
  - `fresh.contact.name` – name of contact person
  - `fresh.contact.org` – organization name
  - `fresh.contact.address.permanent` – permanent personal address / organization headquarters address
  - `fresh.contact.address.mailing` – mailing address
  - `fresh.contact.address.billing` – billing address

  - `fresh.contact.address.shipping` – 1st shipping address
  - `fresh.contact.address.shipping_2` – 2nd shipping address
  - `fresh.contact.address.shipping_3` – 3rd shipping address
  - `fresh.contact.telephone` – phone/mobile number
  - `fresh.contact.fax` – fax number
  - `fresh.contact.email` – email address
  - `fresh.contact.notify_email` – notification email address
  - `fresh.contact.ident_type` – type of personal identification
  - `fresh.contact.ident` – personal identifier
  - `fresh.contact.vat` – VAT-payer registration number (DIČ)
  - `fresh.contact.disclose.name` – name disclosure setting (show/hide)
  - `fresh.contact.disclose.org` – organization disclosure setting (show/hide)
  - `fresh.contact.disclose.email` – email disclosure setting (show/hide)
  - `fresh.contact.disclose.address` – address disclosure setting (show/hide)
  - `fresh.contact.disclose.notify_email` – notification email disclosure setting (show/hide)
  - `fresh.contact.disclose.ident` – personal identifier disclosure setting (show/hide)
  - `fresh.contact.disclose.vat` – VAT-payer identification number disclosure setting (show/hide)
  - `fresh.contact.disclose.telephone` – phone number disclosure setting (show/hide)
  - `fresh.contact.disclose.fax` – fax number disclosure setting (show/hide)
- There are no additional parameters concerning new objects of other types (domain, nsset, keyset).

Email type: `notification_update`

- sent after an object (domain, contact, nsset, keyset) is updated, to the email contact of the updated object
- common passed parameters: *defaults.**, *handle*, *registrar*, *ticket*, *type*
- additional parameters concerning changes in an object:
  - `changes` – general indication of changes: `0` – there are **no** changes, `1` – there are some changes
  - Whether a change has occured or not, is indicated for each attribute of an object and parameters containing both the old and the new value of the attribute are passed in the following manner:
    * `changes.<object>.<attribute>` indicates a change in an attribute – if the attribute has changed, it contains the value `1`; otherwise the parameter is not passed,
    * `changes.<object>.<attribute>.old` contains the value of the attribute before the change (passed only if the attribute has changed),
    * `changes.<object>.<attribute>.new` contains the value of the attribute after the change (passed only if the attribute has changed).
  - `changes.object.authinfo` – indicates that the object's AuthInfo has changed,
  - Indication of changes of other attributes is specific for each object type as follows.
- **additional parameters concerning changes in a contact:**

  - `changes.contact.name` – contact name has changed
  - `changes.contact.org` – organization name has changed
  - `changes.contact.telephone` – phone number has changed
  - `changes.contact.fax` – fax number has changed
  - `changes.contact.email` – email address has changed
  - `changes.contact.notify_email` – notification email address has changed
  - `changes.contact.ident_type` – type of personal identification has changed
  - `changes.contact.ident` – personal identifier has changed
  - `changes.contact.vat` – VAT-payer registration number (DIČ) has changed
  - `changes.contact.address.permanent` – permanent (headquarters) address has changed
  - `changes.contact.address.mailing` – mailing address has changed
  - `changes.contact.address.billing` – billing address has changed
  - `changes.contact.address.shipping` – 1st shipping address has changed
  - `changes.contact.address.shipping_2` – 2nd shipping address has changed
  - `changes.contact.address.shipping_3` – 3rd shipping address has changed
  - `changes.contact.disclose.name` – name disclosure setting has changed
  - `changes.contact.disclose.org` – organization disclosure setting has changed
  - `changes.contact.disclose.email` – email disclosure setting has changed
  - `changes.contact.disclose.address` – address disclosure setting has changed
  - `changes.contact.disclose.notify_email` – notification email disclosure setting has changed
  - `changes.contact.disclose.ident` – personal identifier disclosure setting has changed
  - `changes.contact.disclose.vat` – VAT-payer number disclosure setting has changed
  - `changes.contact.disclose.telephone` – phone number disclosure setting has changed
  - `changes.contact.disclose.fax` – fax number disclosure setting has changed
- **additional parameters concerning changes in a nsset:**
  - `changes.nsset.check_level` – level of technical checks has changed
  - `changes.nsset.tech_c` – list of technical contacts has changed
  - **`changes.nsset.dns` – list of name servers has changed**
    - the old and new value of each name server can be accessed using an index number (counting from zero) at the end of the parameter name, for example:
    - `changes.nsset.dns.old.1` – the value of the second name server before the change,
    - `changes.nsset.dns.new.1` – the value of the second name server after the change.
- **additional parameters concerning changes in a domain:**
  - `changes.domain.registrant` – domain owner has changed
  - `changes.domain.nsset` – nsset assignment has changed
  - `changes.domain.keyset` – keyset assignment has changed

  - `changes.domain.admin_c` – list of administrative contacts has changed
  - `changes.domain.temp_c` DEPRECATED – list of temporary contacts has changed
  - `changes.domain.val_ex_date` ENUM – date of validation expiry has changed
  - `changes.domain.publish` ENUM – publication in telephone directory has changed
- **additional parameters concerning changes in a keyset:**
  - `changes.keyset.tech_c` – list of technical contacts has changed
  - `changes.keyset.dnskey` – list of DNS keys has changed

Email type: `notification_transfer`

- sent after an object (domain, contact, nsset, keyset) is transferred to a new registrar, to the email contact of the transferred object
- passed parameters: *defaults.**, *handle*, *registrar*, *ticket*, *type*

Email type: `notification_renew`

- sent after a domain is renewed, to its owner's email
- passed parameters: *defaults.**, *handle*, *registrar*, *ticket*, *type*

Email type: `notification_unused`

- sent after an unused object (contact, keyset, nsset) is removed from the database, to the email contact of the removed object
- passed parameters: *defaults.**, *deldate*, *handle*, *type*

Email type: `notification_delete`

- sent after an object (domain, contact, nsset, keyset) is deleted, to the email contact of the deleted object
- passed parameters: *defaults.**, *handle*, *registrar*, *ticket*, *type*

Email type: `request_block`

- sent to the domain owner / the contact / technical contacts of an object after a *public request* for object (un)blocking has been carried out
- common passed parameters: *defaults.**, *handle*, *reqdate*, *reqid*, *type*
- **additional parameters:**
  - `otype` – operation type: `1` – blocking, `2` – unblocking,
  - `rtype` – request type: `1` – all object changes, `2` – object transfer.

Email type: `annual_contact_reminder`

- sent to a contact in response to the upcoming contact registration anniversary as a reminder to check accuracy of contact information in the registry
- common passed parameters: *defaults.**, *handle*
- **additional parameters:**
  - `organization` – name of contact's organization,
  - `name` – personal or company name,
  - `address` – address (in a single line),
  - **`ident_type` – identity-document identification type:**
    - `RC` – birth number,
    - `OP` – personal ID card number,
    - `PASS` – passport number,
    - `ICO` – organization ID number,
    - `MPSV` – MPSV ID (number from the Ministry of Labour and Social Affairs),
    - `BIRTHDAY` – the date of birth,
  - `ident_value` – identity-document identification number,
  - `dic` – VAT-payer identifier,
  - `telephone` – phone number,
  - `fax` – fax number,
  - `email` – email address,
  - `notify_email` – notification email address,
  - `registrar_name` – name of the *designated registrar*,
  - `registrar_url` – website address of the *designated registrar*,
  - `registrar_memo_cz` – a memo provided by the registrar (Czech/local variant),
  - `registrar_memo_en` – a memo provided by the registrar (English variant),

    Note: The registrar memo is *configurable*.

  - `domains` – list of domains where the contact is the owner,
  - `nssets` – list of nssets where the contact is a technical contact,
  - `keysets` – list of keysets where the contact is a technical contact.

Email type: `merge_contacts_auto`

- sent to the contact after an automatic merger of its duplicates
- common passed parameters: *defaults.**
- **additional parameters:**
  - `dst_contact_handle` – handle of the destination contact into which the duplicates have been merged,
  - `domain_registrant_list` – list of handles of domains in which the registrant contact had to be replaced with the destination contact,
  - `domain_admin_list` – list of handles of domains in which some administrative contacts had to be replaced with the destination contact,
  - `nsset_tech_list` – list of handles of nssets in which some technical contacts had to be replaced with the destination contact,
  - `keyset_tech_list` – list of handles of keysets in which some technical contacts had to be replaced with the destination contact,
  - `removed_list` – list of contacts which have been deleted as a result of the merger.

  Values of the lists can be accessed by adding an index number at the end of the parameter name, counting from zero, for example: `domain_registrant_list.0` for the first item.

Email type: `akm_candidate_state_ok`

- sent after valid CDNSKEY records are discovered on a insecured domain and the acceptance period is initiated, to technical contacts of the domain's nsset
- common passed parameters: *defaults.**, *domain*, *zone*
- additional parameters:
  - `keys` – list of discovered CDNSKEY records (the first item of the list as `keys.0` etc.), a single key item looks like this:

```
[flags: 257, protocol: 3, algorithm: 13, key:
↪"mdsswUyr3DPW132mOi8V9xESWE8jTo0dxCjjnopKl+GqJxpVXckHAeF+KkxLbxILfDLUT0rAK9iUzy1L53eKGQ==
↪"]
```

  - `datetime` – date and time of the discovery,
  - `days_to_left` – how many days the acceptance period is going to last.

Email type: `akm_candidate_state_ko`

- sent when the acceptance period is broken by absence of the CDNSKEY records or by discovery of changed records, to technical contacts of the domain's nsset
- common passed parameters: *defaults.* domain*
- **additional parameters:**
  - `datetime` – date and time of the discovery.

Email type: `akm_keyset_update`

- sent when an auto-managed keyset is updated from new CDNSKEY records, to technical contacts of the domain's nsset
- common passed parameters: *defaults.**, *domain*, *zone*
- **additional parameters:**
  - `keys` – list of discovered CDNSKEY records (the first item of the list as `keys.0` etc.),
  - `datetime` – date and time of the discovery.

Email type: `record_statement`

- sent in response to a request for a registry record statement about an object, to the email of the domain owner / the contact / technical contacts
- common passed parameters: *defaults.**,
- **additional parameters:**
  - `request_day` – the day of the request date,
  - `request_month` – the month of the request date,
  - `request_year` – the year of the request date.

Email type: `sendpersonalinfo_pif`

- sent in response to a resolved *public request* for personal information of a contact, to the email selected within the request
- common passed parameters: *defaults.**, *handle*
- **additional parameters:**
  - `name` – name (personal),
  - `organization` – name of an organization,
  - `address` – main (permanent) address,
  - `mailing_address` – mailing address,
  - `billing_address` – billing address,
  - `shipping_address_1` – 1st shipping address,
  - `shipping_address_2` – 2nd shipping address,
  - `shipping_address_3` – 3rd shipping address,
  - `ident_type` – identity document type,
  - `ident_value` – identity document number,
  - `dic` – *VAT*-payer number,
  - `telephone` – phone number,
  - `fax` – fax number,
  - `email` – main email address,

  - `notify_email` – notification email address,
  - `registrar_name` – name of the designated registrar,
  - `registrar_url` – website of the designated registrar.

Description of parameters

This section contains description of parameters which are common to several email types.

Registry information (defaults)

These parameters are passed to all email types. See also *Registry contact information (defaults)*.

- `defaults.company` – name of the Registry
- `defaults.street` – street in the headquarters address of the Registry
- `defaults.postalcode` – postal code in the headquarters address of the Registry
- `defaults.city` – city in the headquarters address of the Registry
- `defaults.tel` – phone contact of the Registry
- `defaults.fax` – fax contact of the Registry
- `defaults.emailsupport` – email contact of the technical support
- `defaults.authinfopage` – URL of the site from which registrants can request the authorization information (AuthInfo)
- `defaults.whoispage` – URL of the site from which the public can search in the Registry
- `defaults.company_cs` – Czech variant of the company name of the Registry
- `defaults.company_en` – English variant of the company name of the Registry

Common parameters

`administrators`
: list of administrative contacts (items are accessed by adding index number at the end of the parameter name, counting from zero, for example: `administrators.0` for the first item)

`AuthInfo`
: authorization information

`checkdate`
: the date when the object-state check was performed and this email created (according to the server's local time, date format: YYYY-MM-DD)

`deldate`
: date of deletion of an idle (obsolete) object

`dnsdate`
: date from which the domain will not be included in the zone anymore

`domain`
: domain name in question

`exdate`
: date of domain expiration (till when the registration has been prepaid)

exregdate
: date from which the domain can be registered by another subject (domain is unguarded)

day_before_exregdate
: date of the last day the domain is guarded (one day before registration cancellation)

handle
: string identifier of the object in question

owner
: identifier of the owner of the domain in question (contact handle)

nsset
: identifier of the name server set assigned to the domain in question (nsset handle)

registrar
: name and website of the current designated registrar (in case of transfer, the new designated registrar)

reqdate
: the date when the public request was placed (date format dd.mm.YYYY)

reqid
: the identification number of the public request by which it can be traced in the Registry

statechangedate
: date when the respective object state was set

ticket
: email identifier

type
: object type by number: `1` – contact, `2` – nsset, `3` – domain, `4` – keyset

valdate
: date till when the ENUM domain has been validated

zone
: zone in question (FQDN with the leading dot)

CHAPTER

ELEVEN

EPP REFERENCE MANUAL

This document provides a reference of XML-formatted requests and replies in the EPP protocol which has been implemented in the FRED with extensions to suit FRED particularities.

Target audience

Developers, testers

Purpose

Have reference information for implementing and debugging a custom EPP client.

Prerequisites

You should have a basic understanding of XML terminology and principles.

Terms & definitions

Terms and definitions can be found *in the glossary*.

Chapters

11.1 Introduction

This is a reference manual for the EPP protocol as implemented in the FRED.

The manual describes protocol basics and the generic structure of messages in a nutshell (based on the main RFC standard), introduces registrable objects managed in the FRED, contains basic guidelines on the use of the namespaces and schemas and finally embraces an overview and a detailed reference of specific commands and responses, all interleaved with examples. Appendices contain overviews of result codes, error reasons and simple data types from schemas.

Conformance of this reference

The global XSD schema `all-2.4.8` has been taken as the baseline.

Specifications

- **RFC 5730** Extensible Provisioning Protocol (EPP) – the main standard
- **RFC 5731** EPP Domain Name Mapping
- **RFC 5732** EPP Host Mapping
- **RFC 5733** EPP Contact Mapping
- **RFC 5734** EPP Transport over TCP

11.1.1 General workflow

This reference manual focuses on the syntax and allowed values but it does not describe how to use the registrar interface in general. The description of the command workflow can be found in this concept article: *EPP client workflow*. We recommend reading it to understand the broader context.

11.1.2 Conventions for describing XML structures

To describe XML structures, the following notation is used.

Element names are represented enclosed between the lower-than and the greater-than sign in a similar way as in actual XML documents, e.g. `<nameSpace:elementName>`. If a namespace prefix is collapsed into an asterisk, e.g. `<*:elementName>`, it means that the element is used (similarly) in several namespaces and these should be listed somewhere nearby.

After the element name, the number of allowed **occurrences** of the element is stated within parentheses and in bold, e.g. **(1..3)** means between one and three occurrences of an element, **(0..1)** means an optional element, **(1)** means an element must occur exactly once, **(1..n)** means that an element must occur at least once but the maximum number of occurrences is unbound, and so on.

Children of an element are formatted as a sub-list, hence indentation models the tree structure of XML. Although the lists are not numbered, elements must appear in the order they are listed. If a sub-list is introduced with the phrase **one of**, then the sub-list represents possible choices (only one of the listed elements may appear) instead of a sequence.

Attribute names are prefixed with an `@`, e.g. `@attributeName`. After the attribute name, the **use of the attribute** is specified if it is different from the default (attributes are optional), that is **(R)** if the attribute is required or **(P)** if the attribute is prohibited.

Element and attribute names are also generated to the **index** under the Symbols section. They are prefixed either with an for elements or with an for attributes, so that they are distinguished from general index keys.

11.2 Protocol basics

Extensible Provisioning Protocol (EPP) is an application-layer client-server protocol which was designed for the provisioning and management of objects stored in a shared central repository. It is a standard (**RFC 5730**) that is usually chosen for communication between registrars (clients) and a domain registry (server). The standard allows the protocol to be extended by providing an extension framework which is used extensively in the FRED EPP implementation.

Communication between a client and the EPP server is performed as an exchange of XML documents (further referred to as *messages*) whose structure and content are defined by a *series of schemas*. EPP takes advantage of XML namespaces which make extensions easy.

A message sent from a client to the server is called a *request message* which the server answers with what is called a *reply message*.

XML messages are transported over the Transmission Control Protocol (TCP) with Transport Layer Security (TLS) using a client's certificate. (See also **RFC 5734**.)

Chapter TOC

11.2.1 Introduction to the EPP

This section introduces basic aspects of the EPP, describes the activities of normal communication between a client and the EPP server and explains in general how FRED extends the standard protocol.

Service aspects

EPP has the following basic service aspects:

- service discovery,
- commands & responses, and
- an extension framework.

Service discovery allows a client to be aware of managed objects, supported services, extensions and policy of the EPP server.

Commands are used by a client either to establish and to end a session or to request standard operations over objects managed in the Registry. The server replies to the commands with coordinated **responses**, each containing the result of the requested operation.

The **extension framework** allows the protocol to be extended on several levels:

- *command/response-level* extensions – extensions of standard commands & responses,
- *object-level* extensions – object extensions with definitions of managed objects and relationship of protocol requests and replies to those objects,
- *protocol-level* extensions – protocol extensions with non-standard requests (such as new commands).

The FRED extends the EPP on all three levels as described *below*.

Protocol characteristics

- EPP is a stateful protocol. (The server retains session information about each client.)
- All comunication is initiated by a client. (The server does not send anything to a client unless it was requested by the client.)
- The server responds to a communication-initiating request made by a client (which can be either a TCP connection request or an EPP service discovery request (`hello`)) by returning a `greeting` to the client.
- The server responds to each EPP command with a coordinated response that describes the results of processing the command. (See also EPP Server State Machine for a more detailed description of server's behaviour.)
- Commands are processed by the server in the order they are received from clients.
- Commands are atomic. (There is no partial success or partial failure.)
- The FRED EPP server does not allow delayed execution of commands (pending), commands are performed immediately.

Normal communication

Normal communication between a client and the EPP server is:

- The client connects to the server over TCP+TLS.
- The server identifies itself and the commands and extensions that it supports. (Sends the `greeting`.)
- The client logs in by supplying login name, password and session options.
- The server establishes a session and confirms the login.
- The client issues commands to the server, which replies immediately with a result.
- The client then idles until it has more commands to send, querying periodically for *poll notifications*.
- The client logs out (or times out).
- The server terminates the session and confirms the logout.
- If a session has not been established for a client, the server rejects all commands from the client (except for the login).

Use of the extension framework in FRED EPP

- ***protocol-level extensions***
  - define some custom commands (listing commands, creditInfo, sendAuthInfo, test)
  - XPath location: `/epp/extension/*:*`
- ***object-level extensions***
  - define custom managed objects (attributes, command-response mapping)
  - **XPath locations:**
    - `/epp/command/std-cmd/object:std-cmd` where `std-cmd` can be any standard command, and
    - `/epp/extension/fred:extcommand/fred:ext-cmd/object:ext-cmd` where `ext-cmd` can be any protocol-extension command
- **command/response-level extensions**

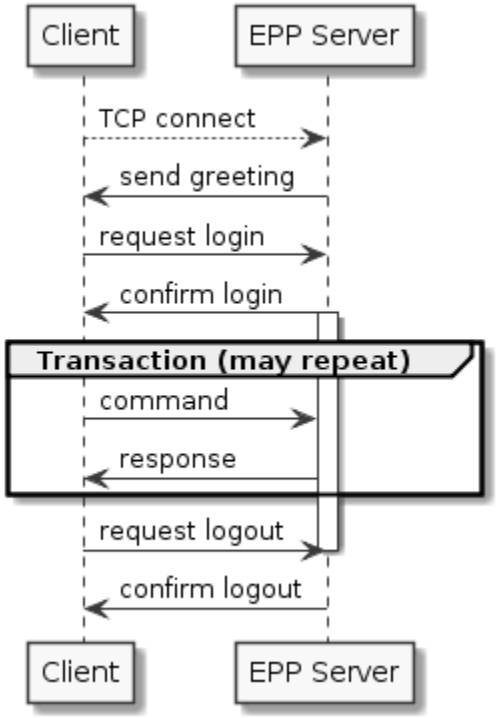

Fig. 1: Sequence diagram – Normal EPP communication

- define command-response mapping for additional attributes that extend some managed objects
- *command extensions* – XPath location: `/epp/command[std-cmd]/extension/*:*` where `std-cmd` can be any standard command
- *response extensions* – XPath location: `/epp/response[result]/extension/*:*`

11.2.2 Generic message structure

This section describes the top-level syntax of the XML messages and explains how it relates to various message types.

All messages must begin with an **XML prolog** to:

- identify the version of XML that is being used (1.0 or 1.1),
- identify the character encoding of the message (optional), and
- provide a hint to an XML parser that an external schema file is needed to validate the XML instance (optional).

Listing 1: Example of XML prolog

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
```

Note: UTF-8 is the recommended and default character encoding for use with EPP.

If the document requires an external definition (such as a schema) to be complete (for example to determine default values for absent optional attributes), then it is *not standalone*.

After the prolog, the **root element** follows and identifies the protocol and its version. This is always `<epp>` in the standard base EPP namespace (`urn:ietf:params:xml:ns:epp-1.0`) which must be declared at the `<epp>` element. See also *Namespaces & schemas* on how to enable client-side XML validation.

Listing 2: Example of the root element

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp
   xmlns="urn:ietf:params:xml:ns:epp-1.0"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">

   <!-- message content -->

</epp>
```

Note: It is customary in the FRED and in the examples of this publication to declare this namespace as the default namespace (the one which does not have a prefix).

A namespace can be used for the element, at which it was declared, and all its descendants and their attributes. More on the scoping of namespaces.

The singular child of the `<epp>` element determines the **type of a message** and it must be **one of** the following:

- `<hello>` – service discovery request (contents and use described in *Service discovery*),
- `<greeting>` – service discovery reply (contents and use described in *Service discovery*),
- `<command>` – container for a standard EPP command (contents and use described in *Commands & responses*),
- `<response>` – reply to a command (contents and use described in *Commands & responses*),
- `<extension>` – protocol extension (non-standard request). The protocol extensions are described in *FRED protocol extension*.

Request-reply mapping of message types

The following table contains an illustration of relationships between the message types to clarify which types are *requests* sent by a client and which are *replies* sent by the server.

Service aspect	Request	Reply
Service discovery	`hello`	`greeting`
Commands	`command`	`response`
Protocol extensions	`extension`	`response`[1]

[1] The content of a reply to a protocol extension is defined by the FRED EPP server as a standard response. All FRED protocol extensions are just commands, therefore having the standard response as a reply is sufficient.

11.2.3 Service discovery

To request service information, the client sends a *hello* message and the server replies with a *greeting* message which contains the service information.

The server also replies with a *greeting* when a TCP connection is initiated.

Hello element structure

The `<hello/>` element is a child of `<epp>` and is defined in the standard EPP namespace.

The element must not contain any child elements nor attributes.

Listing 3: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">

 <hello/>

</epp>
```

Listing 4: FRED-eppic equivalent

```
> hello
```

Greeting element structure

The `<greeting>` element is a child of `<epp>` and is defined in the standard EPP namespace.

It contains the following child elements:

- `<svID>` – the name of the EPP server as a *xs:normalizedString* of the length between 3 and 64 characters,
- `<svDate>` – the server's *timestamp* as *xs:dateTime*,
- `<svcMenu>` – services supported by the EPP server:
  - `<version>` **(1..n)** – listing of protocol versions supported by the server; the FRED EPP server supports only one version and that is `1.0`,
  - `<lang>` **(1..n)** – listing of the available localizations of response texts; the FRED EPP server provides two localizations by default: `en` and `cs`,
  - `<objURI>` **(1..n)** – listing of a *managed object* identified by its namespace as *xs:anyURI*,
  - `<svcExtension>` **(0..1)** – a list of *command/response-level extensions* of objects supported by the server:
    - `<extURI>` **(1..n)** – an extension namespace as *xs:anyURI*,
- `<dcp>` – data collection policy that describes the server's privacy policy for data collection and management:
  - `<access>` **(1)** – describes the access provided by the server to the client on behalf of the originating data source; must contain **one of** the following child elements:
    - `<all/>` – Access is given to all identified data.
    - `<none/>` – No access is provided to identified data.

    * <null/> – Data is not persistent, so no access is possible.
    * <personal/> – Access is given to identified data relating to individuals and organizational entities.
    * <personalAndOther/> – Access is given to identified data relating to individuals, organizational entities, and other data of a non-personal nature.
    * <other/> – Access is given to other identified data of a non-personal nature.

- <statement> **(1..n)** – describe data collection purposes, data recipients, and data retention:
    * <purpose> **(1)** – describes the purposes for which data is collected; must contain **one or more of** the following child elements:
        · <admin/> – Administrative purposes. Information can be used for administrative and technical support of the provisioning system.
        · <contact/> – Contact for marketing purposes. Information can be used to contact individuals, through a communications channel other than the protocol, for the promotion of a product or service.
        · <prov/> – Object-provisioning purposes. Information can be used to identify objects and inter-object relationships.
        · <other/> – Other purposes. Information may be used in other ways not captured by the above definitions.
    * <recipient> **(1)** – describes the recipients of collected data; must contain **one or more of** the following child elements:
        · <other/> – Other entities following unknown practices.
        · <ours> – Server operator and/or entities acting as agents or entities for whom the server operator is acting as an agent. An agent in this instance is defined as a third party that processes data only on behalf of the service provider for the completion of the stated purposes. The <ours> element may contain a <recDesc> element **(0..1)** that can be used to describe the recipient.
        · <public/> – Public forums.
        · <same/> – Other entities following server practices.
        · <unrelated/> – Unrelated third parties.
    * <retention> **(1)** – describes data retention practices; must contain **one of** the following child elements:
        · <business/> – Data persists per business practices.
        · <indefinite/> – Data persists indefinitely.
        · <legal/> – Data persists per legal requirements.
        · <none/> – Data is not persistent and is not retained for more than a brief period of time necessary to make use of it during the course of a single online interaction.
        · <stated/> – Data persists to meet the stated purpose.

- **<expiry> (0..1) – describes the lifetime of the policy; must** contain **one of** the following child elements:
    * <absolute/> – The policy is valid from the current date and time until it expires on the specified date and time. The format is dateTime (e.g., 2021-05-04T03:14:15+02:00).
    * <relative/> – The policy is valid from the current date and time until the end of the specified duration. The format is duration (e.g., P0Y0M1DT10H15M20S).

More about DCP in **RFC 5730#page-9**.

See also *Policies & rules of disclosure*.

Listing 5: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">

    <greeting>
        <svID>EPP server (DSDng)</svID>
        <svDate>2018-05-15T21:05:42+02:00</svDate>
        <svcMenu>
            <version>1.0</version>
            <lang>en</lang>
            <lang>cs</lang>
            <objURI>http://www.nic.cz/xml/epp/contact-1.4</objURI>
            <objURI>http://www.nic.cz/xml/epp/domain-1.4</objURI>
            <objURI>http://www.nic.cz/xml/epp/nsset-1.2</objURI>
            <objURI>http://www.nic.cz/xml/epp/keyset-1.3</objURI>
            <svcExtension>
                <extURI>http://www.nic.cz/xml/epp/enumval-1.2</extURI>
            </svcExtension>
        </svcMenu>
        <dcp>
            <access>
                <none/>
            </access>
            <statement>
                <purpose>
                    <admin/>
                    <prov/>
                </purpose>
                <recipient>
                    <public/>
                </recipient>
                <retention>
                    <stated/>
                </retention>
            </statement>
        </dcp>
    </greeting>

</epp>
```

11.2.4 Commands & responses

A command is an *EPP request*.

EPP commands fall into three categories: session management commands, query commands, and object transform commands.

- *Session management commands* are used to establish and end persistent sessions with the EPP server.
- *Query commands* are used to perform read-only object information retrieval operations.
- *Transform commands* are used to perform read-write object management operations.

A response is an *EPP reply* coordinated with the command.

The command-response pair is also called a **transaction**. Transactions are always described together as a whole in this manual.

Implemented standard commands

- Session management commands: login, logout
- Query commands: check, info, poll (`request` and `acknowledge` operations)
- Transform commands: create, update, transfer (`request` operation only), renew, delete

See also *command overview* for implemented non-standard (custom) commands, or *FRED protocol extension* for the generic syntax of custom commands.

Note: The standard suggests a more complex handling of object transfer which is not applicable in the FRED. Therefore the other transfer operations (query, cancel, approve, reject) are not implemented in the FRED EPP.

Transaction identification

To make sure that both the client and the EPP server have consistent temporal and state-management records, both commands and responses should be marked with unique identifiers.

A **command** should be assigned a `clTRID` (client transaction identifier) by the client which uniquely identifies the command to the client. The client is supposed to maintain its own transaction identifier space to ensure uniqueness. Also the format of the identifier is arbitrary as long as it complies with the restrictions of the XML schema (*epp:trIDStringType*).

A **response** will be assigned by the server:

- the `clTRID` of the command for which the response is being returned *if provided by the client*,
- an additional `svTRID` (server transaction identifier) that marks this transaction from the server's perspective.

Transaction identifiers should be logged, retained and protected.

Command element structure

The `<command>` element is a child of `<epp>` and is defined in the standard EPP namespace. It contains a command type of object-related commands or an actual object-independent command, also in the standard namespace, which must be a **singular** occurrence of **one of** the following:

- `<login>` – client login (establish a session), an object-independent command, see *Login*,
- `<logout>` – client logout (end the session), an object-independent command, see *Logout*,
- `<check>` – object availability checks, an object-related command type,
- `<create>` – object registrations, an object-related command type,
- `<delete>` – object unregistrations, an object-related command type,
- `<info>` – requests for object details, an object-related command type,
- `<renew>` – object registration renewals (to be used only with domains), an object-related command type,
- **`<transfer>` – object transfer requests, an object-related command type:**

  - `@op` **(R)** – transfer operation – Because of *the concept of transfer* in the FRED, only one value is permitted and that is `request` which is used to request a transfer.

- `<update>` – updates of object details, an object-related command type,
- **`<poll>` – polling for notifications from the Registry, an object-independent command, see *Polling*.**
  - **`@op` (R) – poll operation as one of values:**
    - `req` – requests poll messages,
    - `ack` – acknowledges reading of a message,
  - `@msgID` – identifier of the message to be acknowledged as a *xs:token*. Use only with `@op = 'ack'`.

Each object-related command type may contain elements from any namespace. This is where the namespaces and appropriate top-level elements of *managed objects* come in. The object's top-level element must correspond with the command type.

The command type may be followed by:

- `<extension>` **(0..1)** – command extension container (see *Command extensions*),
- `<clTRID>` **(0..1)** – client *transaction identifier* as *epp:trIDStringType*.

Listing 6: Example of a standard command

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <!-- Command container -->
   <command>
      <!-- Command type: info, check, create, delete... -->
      <info>
         <!-- Command arguments container -->
         <object:info>
            <!-- Object-defined content -->
         </object:info>
      </info>
      <!-- Client transaction identifier -->
      <clTRID>fyyp004#17-05-30at13:02:36</clTRID>
   </command>
</epp>
```

Command contents are described separately for each justified combination of a command type and a managed object.

Response element structure

The `<response>` element is a child of `<epp>` and is defined in the standard EPP namespace. It contains the following child elements:

- **`<result>` (1..n) – report of the *success or failure of command* execution:**
  - `@code` **(R)** – result code (4-digit number), for a list of possible values see *result codes*,
  - **`<msg>` (1) – human-readable description of the result,**
    - `@lang` – language of the result description as *xs:language*; default is `en` (English),
  - `<value>` **(0..n)** – identification of a client-provided element or other information that caused a server error condition,

  - **<extValue> (0..n) – additional error diagnostic information:**
    - <value> **(1)** – identification of a client-provided element or other information that caused a server error condition,
    - <reason> **(1)** – human readable message that describes the reason for the error (see *Error reasons* for a complete list),
      - @lang – language of the reason description as *xs:language*; default is en (English),
- <msgQ> **(0..1)** – description of queued poll messages; in the FRED EPP, this element is present only in a response to a poll command, for detailed syntax and usage see *Polling*,
- <resData> **(0..1)** – response data element that contains child elements specific to the command and/or associated object,
- <extension> **(0..1)** – response extension container, see *Response extensions*,
- **<trID> (1) – *transaction identifier* composed of:**
  - <clTRID> **(0..1)** – client transaction identifier,
  - <svTRID> **(1)** – server transaction identifier.

Listing 7: Example of a response (successful execution)

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <!-- Response container -->
   <response>
      <!-- Result code and message -->
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <!-- Response data -->
      <resData>
         <!-- Data container -->
         <object:someData xmlns:object="object:namespace:id"
          xsi:schemaLocation="object:namespace:id path/to/schema.xsd">
            <!-- Object-defined content -->
         </object:someData>
      </resData>
      <!-- Transaction identification -->
      <trID>
         <clTRID>fyyp004#17-05-30at13:02:36</clTRID>
         <svTRID>ReqID-0000135148</svTRID>
      </trID>
   </response>
</epp>
```

Note:

Plain result message

A response is called a "plain result message" when it contains only the result (`<result>`) and transaction identification (`<trID>`) and nothing else. The result can be either a success or failure.

Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <trID>
         <clTRID>sdmj001#17-03-06at18:48:03</clTRID>
         <svTRID>ReqID-0000126633</svTRID>
      </trID>
   </response>
</epp>
```

Success or failure of a command

A response always contains the result of executing the command and each result is described by both a code and a textual message.

If the execution succeeded, a code of 1xxx series is returned. If the execution failed, a code of 2xxx series is returned. See *Result codes & messages* for an overview.

The standard allows to return several results, but the FRED EPP server returns exactly one result at a time.

Important: The **response element structure** of specific commands is described only for cases when the execution is **successful** and therefore it is expected that it may contain some response data, depending on the command.

Listing 8: Example of a response (failure)

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="2306">
         <msg>Parameter value policy error</msg>
         <extValue>
            <value>
               <nsset:tech xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2">C12-58326
↪</nsset:tech>
            </value>
            <reason>Duplicity contact</reason>
         </extValue>
         <extValue>
```

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```
            <value>
               <nsset:tech xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2">C17-58326
↪</nsset:tech>
            </value>
            <reason>Duplicity contact</reason>
         </extValue>
      </result>
      <trID>
         <clTRID>znmw008#17-08-11at16:20:05</clTRID>
         <svTRID>ReqID-0000512432</svTRID>
      </trID>
   </response>
</epp>
```

11.2.5 FRED protocol extension

Protocol-level extensions are extensions in the XPath `/epp/extension/*:*`.

The FRED EPP extends the protocol in such way that the `<extension>` element *if used*, must contain only a single child:

- `<fred:extcommand>` **(1)** – container for extending commands which must declare the FRED *namespace and schema* and can contain **one of** the custom commands:
  - `<fred:creditInfo/>` – requests information about the credit of the current client (object-independent command), see *Credit info*,
  - `<fred:sendAuthInfo>` – requests an AuthInfo of an object (custom command type for object-related commands), see *Send AuthInfo*,
  - or one of the listing commands (object-independent), e.g. `<fred:listDomains/>`, for the complete reference of listing commands see *Listing*.

  The custom command may be followed by the `<fred:clTRID>` element **(0..1)**, which contains a client *transaction identifier* as *epp:trIDStringType*. (Same as with the standard commands but the element is in the `fred` namespace.)

Listing 9: Example of a protocol extension

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">

   <!-- Standard container for protocol extensions -->
   <extension>

   <!-- FRED's container for extending commands -->
   <fred:extcommand xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
    xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">

      <!-- An extending command (some have descendants) -->
      <fred:listDomains/>
      <!-- Transaction identification of the extending command -->
      <fred:clTRID>jqsi002#17-05-18at16:58:03</fred:clTRID>
```

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```
   </fred:extcommand>

   </extension>

</epp>
```

Examples of responses are illustrated for each specific command with its structure description in further chapters.

11.2.6 FRED command & response extensions

Extensions of standard commands and responses allow to manage additional attributes for some managed objects by including them in transactions where appropriate.

Currently, these extensions are used in transactions of *ENUM domains* and *contacts with an additional mailing address*.

Command extensions

Command extensions are extensions in the XPath `/epp/command/extension/*:*`.

According to the general requirements of the standard, the `<extension>` element is optional but if used then it must contain a sequence of one or more elements (any namespace). The FRED EPP server requires the `<extension>` element to have a single child at most.

These extensions are used with the following commands:

- *domain:create*,
- *domain:update*,
- *domain:renew*,
- *contact:create*,
- *contact:update*.

Listing 10: Example of a command with an extension

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <create>
         <domain:create xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>1.1.1.7.4.5.2.2.2.0.2.4.e164.arpa</domain:name>
            <domain:period unit="y">1</domain:period>
            <domain:registrant>CID-MYOWN</domain:registrant>
         </domain:create>
      </create>
      <!-- Extension of the standard command -->
      <extension>
         <enumval:create xmlns:enumval="http://www.nic.cz/xml/epp/enumval-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/enumval-1.2 enumval-1.2.0.xsd
↪">
            <enumval:valExDate>2018-01-14</enumval:valExDate>
         </enumval:create>
```

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```
      </extension>
      <clTRID>tucj013#17-07-14at16:22:30</clTRID>
   </command>
</epp>
```

Response extensions

Response extensions are extensions in the XPath `/epp/response/extension/*:*`.

According to the general requirements of the standard, the `<extension>` element is optional but if used then it must contain a sequence of one or more elements (any namespace). The FRED EPP server requires the `<extension>` element to have a single child at most.

These extensions are used in response to the following commands:

- *domain:info*,
- *contact:info*.

Listing 11: Example of a response with an extension

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <domain:infData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>1.2.2.4.5.0.2.4.e164.arpa</domain:name>
            <domain:roid>D0009770598-CZ</domain:roid>
            <domain:status s="outzone">The domain isn't generated in the zone</
↪domain:status>
            <domain:registrant>C0-79371</domain:registrant>
            <domain:clID>REG-MYREG</domain:clID>
            <domain:crID>REG-MYREG</domain:crID>
            <domain:crDate>2017-05-18T17:04:29+02:00</domain:crDate>
            <domain:exDate>2018-05-18</domain:exDate>
            <domain:authInfo>LmpdDXW2</domain:authInfo>
         </domain:infData>
      </resData>
      <!-- Extension of the standard response -->
      <extension>
         <enumval:infData xmlns:enumval="http://www.nic.cz/xml/epp/enumval-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/enumval-1.2 enumval-1.2.0.xsd
↪">
            <enumval:valExDate>2017-10-08</enumval:valExDate>
            <enumval:publish>0</enumval:publish>
         </enumval:infData>
      </extension>
      <trID>
         <clTRID>klde004#17-05-30at15:28:16</clTRID>
         <svTRID>ReqID-0000135159</svTRID>
```

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```
      </trID>
   </response>
</epp>
```

11.3 Managed objects

The FRED EPP uses custom representations of registrable objects:

- domain (regular or ENUM),
- contact,
- nsset = a set of name servers,
- keyset = a set of DNSSEC keys.

Each registrable object is defined by its associated attributes which can be viewed and modified by the client (the *designated registrar*) or the server, and by command-response mapping.

Attribute values are defined by the data types of schemas (syntax, i.e. allowed characters, length, pattern), and sometimes additional constraints that are described in this chapter.

Custom managed objects are object-level extensions of EPP which appear in these XPaths:

- standard commands: `/epp/command/`*`std-cmd`*`/`*`object`*`:`*`std-cmd`*
- extending commands: `/epp/extension/fred:extcommand/fred:`*`ext-cmd`*`/`*`object`*`:`*`ext-cmd`*

Substitutions used in the XPaths:

- `std-cmd` can be a name of a standard object-related command, such as `create`,
- `ext-cmd` can be a name of an extending object-related command, such as `sendAuthInfo`,
- `object` is a prefix for an object namespace.

Chapter TOC

11.3.1 Common object attributes

Each managed object has the following attributes:

roid
: Repository object identifier as *eppcom:roidType*. An id that is generated by the server during object creation. See also *ROID*.

clID
: The handle of the current designated registrar as *eppcom:clIDType*.

crID
: The handle of the registrar who created this object as *eppcom:clIDType*.

upID
: The handle of the registrar who was the last to update this object as *eppcom:clIDType*.

crDate
: The *timestamp* of the creation of this object in the repository as *xs:dateTime*.

upDate
The *timestamp* of the last update of this object as *xs:dateTime*.

trDate
The *timestamp* of the last transfer of this object as *xs:dateTime*.

authInfo
Authorization information as *fredcom:authInfoType*.

Starting from *Release 2.47.0*, `authInfo` has limited validity (TTL). The value can be configured, see *AuthInfo TTL*.

`Create` command containing `authInfo` attribute will run, but the `authInfo` is not written to the system.

It is not possible to get `authInfo` value using the `info` command. Validity can be checked by `info` command with `authInfo` parameter.

If `authInfo` is invalid, the server returns error `2202 - Invalid authorization information.`

Since *Release 2.48.0* the `authInfo` length can be configured.

status
Current object status(es) (possible values are object-specific).

Statuses are set by the server and cannot be directly altered by a client.

An object can have one or more statuses but they can appear only in certain combinations which are not contradictory.

Domain names and hostnames

A domain name being registered or a name-server hostname being assigned to an nsset must be in the *FQDN* form and must comply with restrictions as follows.

Regular domain names (e.g. in the `cz` zone)

- are composed of 2 labels separated with a period `.`,
- **the first label**
  - contains only upper-case and lower-case letters of the English alphabet, digits (characters 0 through 9), and `-`[1] characters,
  - does not begin nor end with the `-`[Page 238, 1] character,
  - does not contain two or more consecutive `-`[1] characters,
  - has the length of 1–63 characters,
- the second label is a TLD zone (e.g. `cz`),
- may end with a period.

The register is case-insensitive and presents the domain names transformed to lower case.

[1] the character of the basic ASCII set for hyphen/minus

ENUM domain names (e.g. in the `0.2.4.e164.arpa` zone)

- are composed of 6–15 labels separated with a period `.`,
- each label preceeding the zone contains exactly one digit (characters 0 through 9),
- ends with a Tier1 ENUM zone (e.g. `0.2.4.e164.arpa`),
- may end with a period.

The register is case-insensitive and presents the domain names transformed to lower case.

Note: Validation of the format of domain names may be configured by the Registry operator differently. The Registry operator is supposed to publish a document that declares the rules of registrar communication with the Registry, including a definition of valid domain names.

Hostnames

- are composed of labels separated with periods `.`,
- **labels**
  - contain only upper-case and lower-case letters of the English alphabet, digits (characters 0 through 9), and –[1] characters,
  - do not begin nor end with the –[Page 238, 1] character,
  - have the length of 1–63 characters,
- may end with a period,
- must not exceed the total length of 255 characters (including delimiter periods and the final period).

Handles of contacts, nssets and keysets

Handles of contacts, name-server sets and key sets:

- contain only upper-case and/or lower-case letters of the English alphabet, digits (characters 0 through 9), and –[Page 238, 1] characters,
- do not begin nor end with the –[Page 238, 1] character,
- do not exceed the length of 30[2] characters.

The register is case-insensitive and presents the identifiers transformed to upper case.

Note: Validation of the format of handles may be configured by the Registry operator differently. The Registry operator is supposed to publish a document that declares the rules of registrar communication with the Registry, including a definition of valid handles.

---

[2] The length of a handle that is an argument to a `create` command, must not exceed 30 characters (*fredcom:objIDCreateType*), in other cases, a handle may be up to 63 characters long (*fredcom:objIDType* or *fredcom:objIDChgType*).

Timestamps

Timestamps are provided in local time of the FRED EPP server with an offset from UTC in compliance with **RFC 3339** and *xs:dateTime* syntax.

11.3.2 Domains

A domain contains information which represents a regular domain or an *ENUM* domain.

Namespace: http://www.nic.cz/xml/epp/domain-1.4 Schema: domain-1.4.5.xsd

---

Note: Domain name mapping is based on the standard **RFC 5731** but implemented with the following modifications:

- replacement of a list of name servers with an nsset,
- addition of a keyset,
- simplification of the list of contacts to just one type of contact (admin).

Object attributes

In addition to the *common attributes*, domains also have the following attributes:

`name`
: The domain name. See *Domain names and hostnames*.

`registrant`
: The *handle* of the domain owner contact.

`admin`
: The *handle*(s) of zero or more administrative contact(s).

`nsset`
: The *handle* of a nameserver set.

`keyset`
: The *handle* of a DNSSEC-key set.

`exDate`
: The date of domain name expiration.

`valExDate` **ENUM extension**
: The date of the expiration of ENUM domain validation.

`publish` **ENUM extension + DEPRECATED**
: Flag of publishing an ENUM domain in a public ENUM directory.

  This attribute has currently no meaning for the server and it will be removed in the future. Use of this attribute is discouraged.

Object states

A domain can have one or more of the following statuses:

- `ok` – no other states are set
- `serverDeleteProhibited` – deletion of the domain is forbidden
- `serverRenewProhibited` – renewal of the domain is forbidden
- `serverTransferProhibited` – transfer of the domain is forbidden
- `serverUpdateProhibited` – update of the domain is forbidden
- `serverRegistrantChangeProhibited` – the change of the registrant of the domain is forbidden
- `serverBlocked` – the domain is blocked by administration
- `serverOutzoneManual` – domain's absence in the zone is forced by administration
- `serverInzoneManual` – domain's presence in the zone is forced by administration
- `expired` – the domain is expired
- `outzone` – the domain is not included in the zone
- `notValidated` [ENUM only] – the ENUM domain is not validated
- `deleteCandidate` – the domain is scheduled for deletion

Command-response mapping

For command-response mapping see a specific command syntax description:

- *domain:check*
- *domain:create*
- *domain:delete*
- *domain:info*
- *domain:renew*
- *domain:transfer*
- *domain:update*
- *domain:sendAuthInfo*

ENUM domains

ENUM domains have the same set of attributes as regular domains except for two additional attributes. Therefore they are managed by the same commands & responses as regular domains, only the handling of the additional attributes requires *extensions of the standard commands & responses*, so that these attributes can be included in transactions where appropriate.

Namespace: http://www.nic.cz/xml/epp/enumval-1.2 Schema: enumval-1.2.0.xsd

These extensions are used with the following commands:

- *domain:create*,
- *domain:update*,

- *domain:renew*,

and with responses to the *domain:info* command.

11.3.3 Contacts

A contact contains information which represents a person or a company. See also *the concept of contacts*.

Namespace: http://www.nic.cz/xml/epp/contact-1.6 Schema: contact-1.6.6.xsd

---

Note: Contact mapping is based on the standard **RFC 5733** but implemented with the following modifications:

- addition of notification email, VAT-payer identification number, identity-document number and the type thereof,
- replacement of two postal addresses with just one postal address.

Object attributes

In addition to the *common attributes*, contacts also have the following attributes:

`id`
: The contact handle. See *Handles of contacts, nssets and keysets*.

`postalInfo`
: Information for postal purposes, consisting of:

  `name`
  : The contact name (person or company).

  `org`
  : The name of an organization (use with a company). You may leave this empty to signify a natural person.

  `addr`
  : The permanent address / company seat, consisting of:

    `street`
    : 1–3 street line(s).

    `city`
    : City.

    `sp`
    : State or province.

    `pc`
    : Postal code.

    `cc`
    : Country code.

`voice`
: Phone number.

`fax`
: Fax number.

`email`
: A list of email addresses.

notifyEmail
A list of notification email addresses.

vat
VAT-payer identifier.

ident
Identity-document type and number. (A document that proves the contact's identity.)

disclose
Disclosure preference for: `addr`, `voice`, `fax`, `email`, `vat`, `ident`, `notifyEmail`.

Note: The contact handle, name and organization are always disclosed.

---

mailing/addr [extension]
An additional *mailing address*, which consists of the same items as the permanent address (`postalInfo`/`addr`).

Object states

A contact can have one or more of the following statuses:

- `ok` – no other states are set
- `linked` – the contact has relation to other records in the Registry
- `serverDeleteProhibited` – deletion of the contact is forbidden
- `serverTransferProhibited` – transfer of the contact is forbidden
- `serverUpdateProhibited` – update of the contact is forbidden
- `serverBlocked` – the contact is blocked by administration
- `deleteCandidate` – the contact is scheduled for deletion
- `conditionallyIdentifiedContact` – the contact's identity is partially verified
- `identifiedContact` – the contact's identity is fully verified
- `validatedContact` – the contact is validated
- `mojeidContact` – the contact is used in the mojeID extension and has more attributes and possibilities than a regular contact
- `serverLinkProhibited` – link of new objects to the object is forbidden
- `serverContactNameChangeProhibited` – change of the contact's name is forbidden
- `serverContactOrganizationChangeProhibited` – change of the contact's organization is forbidden
- `serverContactIdentChangeProhibited` – change of the contact's `ident` atribute is forbidden
- `serverContactPermanentAddressChangeProhibited` – change of the contact's permanent adress is forbidden

Command-response mapping

For command-response mapping see a specific command syntax description:

- *contact:check*
- *contact:create*
- *contact:delete*
- *contact:info*
- *contact:transfer*
- *contact:update*
- *contact:sendAuthInfo*

Mailing address

Command & response extensions allow to manage an additional address with a contact.

Namespace: http://www.nic.cz/xml/epp/extra-addr-1.0 Schema: extra-addr-1.0.0.xsd

These extensions are used with the following commands:

- *contact:create*,
- *contact:update*.

and with responses to the *contact:info* command.

11.3.4 Nssets

A nsset contains information which represents a set of name servers.

Namespace: http://www.nic.cz/xml/epp/nsset-1.2 Schema: nsset-1.2.4.xsd

---

Note: Name-server host mapping is partially based on the standard **RFC 5732** but implemented with the following modifications:

- host names are grouped in a set that is identified by a handle,
- addition of the report level,
- association with technical contacts.

Object attributes

In addition to the *common attributes*, nssets also have the following attributes:

`id`
: The nsset handle. See *Handles of contacts, nssets and keysets*.

`ns`
: The 2–10 name servers, consisting of:

  `name`
  : Name-server hostname. See *Domain names and hostnames*.

addr
Name-server IP address(es). (Glue record.)

At least one IP address must be present if and only if the hostname is in the generated zone.

Both IPv4 and IPv6 are allowed, accepted in textual representation:

- The syntax of an IPv4 address: Four decimal integers 0–255 separated by periods, leading zeroes are optional.
- The syntax of an IPv6 address is described in **RFC 4291#section-2.2**.

An IP address must not belong to an invalid range. See the *Prohibited networks* section in IANA's Technical requirements for authoritative name servers.

tech
The *handle*(s) of 1–10 technical contact(s).

reportlevel
The highest level of technical tests to be performed and reported. A higher number means more detail, zero means no tests.

Object states

A nsset can have one or more of the following statuses:

- `ok` – no other states are set
- `linked` – the nsset has relation to other records in the Registry
- `serverDeleteProhibited` – deletion of the nsset is forbidden
- `serverTransferProhibited` – transfer of the nsset is forbidden
- `serverUpdateProhibited` – update of the nsset is forbidden
- `deleteCandidate` – the nsset is scheduled for deletion

Command-response mapping

For command-response mapping see a specific command syntax description:

- *nsset:check*
- *nsset:create*
- *nsset:delete*
- *nsset:info*
- *nsset:transfer*
- *nsset:update*
- *nsset:sendAuthInfo*

11.3.5 Keysets

A keyset contains information which represents a set of DNSSEC keys.

Namespace: http://www.nic.cz/xml/epp/keyset-1.3 Schema: keyset-1.3.4.xsd

---

Note: DNSSEC keys mapping is partially based on the standard **RFC 5910** but implemented with the following modifications:

- keys are grouped in a set that is identified by a handle,
- a standalone object instead of just a domain extension,
- custom element structure for DNSSEC key representation,
- association with technical contacts.

Object attributes

In addition to the *common attributes*, keysets also have the following attributes:

`id`
: The keyset handle. See *Handles of contacts, nssets and keysets*.

`dnskey`
: The 1–10 DNSSEC key(s), consisting of:

  `flags`
  : Flags. Allowed values are: `0`, `256`, `257`.

  `protocol`
  : Protocol. The only allowed value is `3`.

  `alg`
  : Algorithm number defined by IANA, see DNS Security Algorithm Numbers.

    The FRED EPP server does not allow to use `0`, `1`, `2` and `252` by default. This can be customized in the blacklist table `dnssec_algorithm_blacklist` (db: `fred`, schema: `public`:)

  `pubKey`
  : Public key as *keyset:keyT*.

  Note: A DNSSEC key corresponds to a DNSKEY Resource Record, see **RFC 4034#section-2**.

`tech`
: The *handle*(s) of 1–10 technical contact(s).

Object states

A keyset can have one or more of the following statuses:

- `ok` – no other states are set
- `linked` – the keyset has relation to other records in the Registry
- `serverDeleteProhibited` – deletion of the keyset is forbidden
- `serverTransferProhibited` – transfer of the keyset is forbidden
- `serverUpdateProhibited` – update of the keyset is forbidden
- ``serverLinkProhibited `` – link of new objects to the object is forbidden
- `deleteCandidate` – the keyset is scheduled for deletion

Command-response mapping

For command-response mapping see a specific command syntax description:

- *keyset:check*
- *keyset:create*
- *keyset:delete*
- *keyset:info*
- *keyset:transfer*
- *keyset:update*
- *keyset:sendAuthInfo*

11.4 Namespaces & schemas

A namespace must be identified for each prefix using the `@xmlns:`*`prefix`* attribute.

Important: The client must use the same version of a namespace as the server! The current namespace versions are listed in the `greeting` (see *Service discovery*).

If the versions in the documentation differ from the versions in the `greeting`, follow the versions in the `greeting`.

To enable XML validation on the client side, depending on the selected XML-validation tool, there are 2 options:

- to link a namespace to the location of a schema (see the table below) inside messages using the `@xsi:schemaLocation` attribute, for the tool to locate the schema from here – *this option is illustrated in structure descriptions*, or
- to pass the location of the global schema as an argument to the XML-validation tool directly, such as:

```
xmllint --noout --schema "/usr/share/fred-eppic/schemas/all.xsd" -
```

The FRED EPP server as such does NOT require schema locations inside messages and ignores them if they are present.

The global schema `all-2.4.8.xsd` (alias `all.xsd`) imports the following partial schemas and thus provides the definitions of all namespaces in a single file.

Prefix[Page 248, 1]	Namespace identifier	Schema file (partial)	Description
epp or default	urn:ietf:params:xml:ns:epp-1.0	epp-1.0.xsd	Extensible Provisioning Protocol v1.0 Protocol base (generic message structure)
epp-com	urn:ietf:params:xml:ns:epp-pcom-1.0	epp-pcom-1.0.xsd	Extensible Provisioning Protocol v1.0 Shared structures
fred	http://www.nic.cz/xml/epp/fred-1.5	fred-1.5.0.xsd	FRED EPP protocol extensions
fred-com	http://www.nic.cz/xml/epp/fredcom-1.2	fred-com-1.2.1.xsd	FRED EPP protocol extensions Shared structures
domain	http://www.nic.cz/xml/epp/domain-1.4	domain-1.4.5.xsd	FRED object extension for domain provisioning Command-response mapping and structures
contact	http://www.nic.cz/xml/epp/contact-1.6	contact-1.6.6.xsd	FRED object extension for contact provisioning Command-response mapping and structures
nsset	http://www.nic.cz/xml/epp/nsset-1.2	nsset-1.2.4.xsd	FRED object extension for nsset provisioning Command-response mapping and structures
keyset	http://www.nic.cz/xml/epp/keyset-1.3	keyset-1.3.4.xsd	FRED object extension for keyset provisioning Command-response mapping and structures
enumval	http://www.nic.cz/xml/epp/enumval-1.2	enumval-1.2.0.xsd	FRED command/response extensions for ENUM domains
extra-addr	http://www.nic.cz/xml/epp/extra-addr-1.0	extra-addr-1.0.0.xsd	FRED command/response extensions for a mailing address in contacts
xsi	http://www.w3.org/2001/XMLSchema-instance	N/A	Namespace for an XML Schema instance Required when the `@xsi:schemaLocation` attribute is used.
xs	http://www.w3.org/2001/XMLSchema	N/A	Namespace for the XML Schema Used only in this manual.

11.5 Command & response structure

This chapter contains the detailed reference of all the FRED EPP commands, both object-independent and object-related, and the responses mapped to these commands.

Overview

Session management commands

Login | *Logout*

Query commands

Check | *Info* | *Polling*

Transform commands

Create | *Update* | *Transfer* | *Delete* | *Renew domain*

[1] These prefixes are used throughout this manual and some of them in schemas but you are not bound to use the same prefixes in your implementation. It is important just to assign correct namespace identifiers to prefixes.

Custom commands

Credit info | *Send AuthInfo* | *Listing*

Chapter TOC

11.5.1 Login

A login *command* is used to establish and authenticate a session with the EPP server. The login command must be sent to the server before any other EPP command and identifies and authenticates the client identifier to be used by the session.

An EPP session is terminated by a *Logout* command.

The login command is a `login` element in the default namespace (`urn:ietf:params:xml:ns:epp-1.0`).

Command element structure

The `<login>` element contains the following child elements:

- `<clID>` **(1)** – the client identifier as *eppcom:clIDType*,
- `<pw>` **(1)** – the client's plain-text password as *epp:pwType*, case sensitive,
- `<newPW>` **(0..1)** – a new password to be used for subsequent login commands as *epp:pwType*, case sensitive,
- `<options>` **(1)** – options of the EPP communication with the server:
  - `<version>` **(1)** – the protocol version to be used; this must be `1.0`,
  - `<lang>` **(1)** – the response-text language to be used; this must be one of the values that are announced in *the greeting* (usually `en` or `cs`),
- `<svcs>` **(1)** – list of services to be used during the session – declare the schemas for all the objects that will be manipulated during the session:
  - `<objURI>` **(1..n)** – an object namespace URI as *xs:anyURI*. Further details on the namespace URIs can be found in the *Namespaces & schemas* section.
  - `<svcExtension>` **(0..1)** – list of service extensions – declare the schema extensions for all the objects that will be manipulated during the session:
    - `<extURI>` **(1..n)** – an extension namespace URI as *xs:anyURI*.

Listing 12: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <login>
         <clID>REG-MYREG</clID>
         <pw>passwd</pw>
         <options>
            <version>1.0</version>
            <lang>en</lang>
         </options>
         <svcs>
            <objURI>http://www.nic.cz/xml/epp/contact-1.6</objURI>
```

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```
            <objURI>http://www.nic.cz/xml/epp/nsset-1.2</objURI>
            <objURI>http://www.nic.cz/xml/epp/domain-1.4</objURI>
            <objURI>http://www.nic.cz/xml/epp/keyset-1.3</objURI>
            <svcExtension>
               <extURI>http://www.nic.cz/xml/epp/enumval-1.2</extURI>
            </svcExtension>
         </svcs>
      </login>
      <clTRID>sdmj001#17-03-06at18:48:03</clTRID>
   </command>
</epp>
```

Note: The following usage assumes eppic has the session configured. See Eppic configuration documentation for more info.

Listing 13: FRED-eppic equivalent

```
> login --session-id=REG-MYREG
```

Note: To execute login command without a session, use command line parameters:

Listing 14: cmd equivalent

```
> eppic --username="REG-MYREG" --password=passwd --hostname=epp.example.com --
↪port=700 --cert-file='/etc/fred/REG-MYREG_cert.pem' --key-file='/etc/fred/REG-MYREG_
↪key.pem'
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

11.5.2 Logout

A logout *command* is used to end a session with the EPP server established by a *Login* command.

The logout command is a `logout` element in the default namespace (`urn:ietf:params:xml:ns:epp-1.0`).

Command element structure

The `<logout/>` element does not contain any child elements.

Listing 15: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
    <command>
        <logout/>
        <clTRID>scui002#17-05-03at16:54:42</clTRID>
    </command>
</epp>
```

Listing 16: FRED-eppic equivalent

```
> logout
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

Listing 17: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
    <response>
        <result code="1500">
            <msg>Command completed successfully; ending session</msg>
        </result>
        <trID>
            <clTRID>scui002#17-05-03at16:54:42</clTRID>
            <svTRID>ReqID-0000132660</svTRID>
        </trID>
    </response>
</epp>
```

11.5.3 Check

Commands for checking object availability.

Check domain

A domain check *command* is used to check the availability of one or more domain names.

The domain check command is a `check` element in the `domain` namespace (`http://www.nic.cz/xml/epp/domain-1.4`).

The command must be contained in the `<check>` command type.

Element structure without Auction module

Command element structure

The `<domain:check>` element must declare the `domain` *namespace and schema* and it must contain the following child elements:

- `<domain:name>` **(1..n)** – a domain name as *eppcom:labelType*.

Listing 18: Example

```
<?xml version="1.0" encoding="UTF-8"?>
   <epp xmlns="urn:ietf:params:xml:ns:epp-1.0" xmlns:xsi="http://www.w3.org/2001/
↪XMLSchema-instance" xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
      <command>
            <check>
               <domain:check xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"␣
↪xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
                  <domain:name>
                        available-example.cz
                  </domain:name>
                  <domain:name>
                        registered-example.cz
```

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```
                </domain:name>
             </domain:check>
          </check>
          <clTRID>
             nlr23s#2024-04-15T16:07:37.622471
          </clTRID>
       </command>
    </epp>
```

Listing 19: FRED-eppic example

```
> check-domain --names-1=available-example.cz --names-2=registered-example.cz
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<domain:chkData>` which declares the `domain` *namespace and schema* and it contains the following child elements:

- `<domain:cd>` **(1..n)** – the check resolution of a single domain name:
  - `<domain:name>` **(1)** – the domain name as *eppcom:labelType*,
    - `@avail` **(R)** – availability as *xs:boolean*; `true` – available, `false` – not available,
  - `<domain:reason>` **(0..1)** – if the availability is negative, this element contains an explanation why the domain name is not available, as *fredcom:msgType*.
    - `@lang` – language of the reason as *xs:language*; default is `en` (English).

Listing 20: Example

```
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0" xmlns:xsi="http://www.w3.org/2001/
↪XMLSchema-instance" xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<response>
   <result code="1000">
      <msg>Command completed successfully</msg>
   </result>
   <resData>
      <domain:chkData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"␣
↪xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
      <domain:cd>
         <domain:name avail="1">available-example.cz</domain:name>
      </domain:cd>
      <domain:cd>
         <domain:name avail="0">registered-example.cz</domain:name>
         <domain:reason>Registered already</domain:reason>
      </domain:cd>
      </domain:chkData>
   </resData>
   <trID>
      <clTRID>nlr23s#2024-04-15T16:07:37.622471</clTRID>
      <svTRID>ReqID-0063282953</svTRID>
   </trID>
```

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```
</response>
</epp>
```

Listing 21: FRED-eppic example

```
Command completed successfully (1000)

data:
- avail: true
  name: available-example.cz
  reason: null
- avail: false
  name: registered-example.cz
  reason: Registered already
```

Element structure with Auction module

Command element structure

Since `fred-2.50.0` you can add an **optional** extension for the `<domain:check>` command if domain auctions are active. If the domain can be registered by the winner and the extension contains the element `<registrant>` with the correct winner handle, the command returns `avail="1"`. If you do not use the extension or use non-winning handle, the response contains `avail="0"` and corresponding reason.

Listing 22: Example

```
<?xml version="1.0" encoding="UTF-8"?>
   <epp xmlns="urn:ietf:params:xml:ns:epp-1.0" xmlns:xsi="http://www.w3.org/2001/
↪XMLSchema-instance" xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
      <command>
            <check>
               <domain:check xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"␣
↪xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
                  <domain:name>
                        available-domain.cz
                  </domain:name>
                  <domain:name>
                        registered-domain.cz
                  </domain:name>
                  <domain:name>
                        auction-pending.cz
                  </domain:name>
                  <domain:name>
                        is-auction-winner.cz
                  </domain:name>
                  <domain:name>
                        is-not-auction-winner.cz
                  </domain:name>
               </domain:check>
            </check>
            <extension>
               <check xmlns="http://www.nic.cz/xml/epp/auction-1.0"␣
↪xsi:schemaLocation="http://www.nic.cz/xml/epp/auction-1.0 auction-1.0.0.xsd">
                  <registrant>
```

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```
                        AUCTION-WINNER-1
                    </registrant>
                </check>
            </extension>
            <clTRID>
                nlr23s#2024-04-15T16:07:37.622471
            </clTRID>
        </command>
    </epp>
```

Listing 23: FRED-eppic example

```
> check-domain --names-1=available-domain.cz --names-2=registered-domain.cz --names-
↪3=auction-pending.cz --names-4=is-auction-winner.cz --names-5=is-not-auction-winner.
↪cz --auction.registrant=AUCTION-WINNER-1
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<domain:chkData>` which declares the `domain` *namespace and schema* and it contains the following child elements:

- `<domain:cd>` **(1..n)** – the check resolution of a single domain name:
  - `<domain:name>` **(1)** – the domain name as *eppcom:labelType*,
    - `@avail` **(R)** – availability as *xs:boolean*; `true` – available, `false` – not available,
  - `<domain:reason>` **(0..1)** – if the availability is negative, this element contains an explanation why the domain name is not available, as *fredcom:msgType*.
    - For domains in auctions, specific explanations can be displayed:
      - `Auction pending` – the domain is in auction and has no winner yet.
      - `Only the auction winner is authorized to register this domain` – when the auction winner is known and is possible to `<domain:create>` only by the winner.
    - `@lang` – language of the reason as *xs:language*; default is `en` (English).

Listing 24: Example

```
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0" xmlns:xsi="http://www.w3.org/2001/
↪XMLSchema-instance" xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<response>
   <result code="1000">
      <msg>Command completed successfully</msg>
   </result>
   <resData>
      <domain:chkData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"␣
↪xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
      <domain:cd>
         <domain:name avail="1">available-domain.cz</domain:name>
      </domain:cd>
      <domain:cd>
```

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```
         <domain:name avail="0">registered-domain.cz</domain:name>
         <domain:reason>Registered already</domain:reason>
      </domain:cd>
      <domain:cd>
         <domain:name avail="0">auction-pending.cz</domain:name>
         <domain:reason>Auction pending</domain:reason>
      </domain:cd>
      <domain:cd>
         <domain:name avail="1">is-auction-winner.cz</domain:name>
      </domain:cd>
      <domain:cd>
         <domain:name avail="0">is-not-auction-winner.cz</domain:name>
         <domain:reason>Only the auction winner is authorized to register this domain
↪</domain:reason>
      </domain:cd>
      </domain:chkData>
   </resData>
   <trID>
      <clTRID>nlr23s#2024-04-15T16:07:37.622471</clTRID>
      <svTRID>ReqID-0063282953</svTRID>
   </trID>
</response>
</epp>
```

Listing 25: FRED-eppic example

```
Command completed successfully (1000)

data:
- avail: true
  name: available-domain.cz
  reason: null
- avail: false
  name: registered-domain.cz
  reason: Registered already
- avail: false
  name: auction-pending.cz
  reason: Auction pending
- avail: true
  name: is-auction-winner.cz
  reason: null
- avail: false
  name: is-not-auction-winner.cz
  reason: Only the auction winner is authorized to register this domain
```

Check contact

A contact check *command* is used to check the availability of one or more contact handles.

The contact check command is a `check` element in the `contact` namespace (`http://www.nic.cz/xml/epp/contact-1.6`).

The command must be contained in the `<check>` command type.

Command element structure

The `<contact:check>` element must declare the `contact` *namespace and schema* and it must contain the following child elements:

- `<contact:id>` **(1..n)** – a contact handle as *fredcom:objIDType*.

Listing 26: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <check>
         <contact:check xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd
↪">
            <contact:id>MYOWN</contact:id>
            <contact:id>NONE</contact:id>
         </contact:check>
      </check>
      <clTRID>dyih007#17-07-11at15:35:42</clTRID>
   </command>
</epp>
```

Listing 27: FRED-eppic equivalent

```
> check-contact --ids-1=MYOWN --ids-2=NONE
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<contact:chkData>` which declares the `contact` *namespace and schema* and it contains the following child elements:

- `<contact:cd>` **(1..n)** – the check resolution of a single contact handle:
  - `<contact:id>` **(1)** – the contact handle as *fredcom:objIDType*,
    - `@avail` **(R)** – availability as *xs:boolean*; `true` – available, `false` – not available,
  - `<contact:reason>` **(0..1)** – if the availability is negative, this element contains an explanation why the contact handle is not available, as *fredcom:msgType*.
    - `@lang` – language of the reason as *xs:language*; default is `en` (English).

Listing 28: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <contact:chkData xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd
↪">
            <contact:cd>
               <contact:id avail="0">MYOWN</contact:id>
               <contact:reason>Registered already</contact:reason>
            </contact:cd>
            <contact:cd>
               <contact:id avail="1">NONE</contact:id>
            </contact:cd>
         </contact:chkData>
      </resData>
      <trID>
         <clTRID>dyih007#17-07-11at15:35:42</clTRID>
         <svTRID>ReqID-0000139763</svTRID>
      </trID>
   </response>
</epp>
```

Check nsset

A nsset check *command* is used to check the availability of one or more nsset handles.

The nsset check command is a `check` element in the `nsset` namespace (`http://www.nic.cz/xml/epp/nsset-1.2`).

The command must be contained in the `<check>` command type.

Command element structure

The `<nsset:check>` element must declare the `nsset` *namespace and schema* and it must contain the following child elements:

- `<nsset:id>` **(1..n)** – an nsset handle as *fredcom:objIDType*.

Listing 29: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <check>
         <nsset:check xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
```

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```
          xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd">
            <nsset:id>NSSET-MYNSSET</nsset:id>
            <nsset:id>NSSET-NONE</nsset:id>
         </nsset:check>
      </check>
      <clTRID>hity005#17-07-12at11:18:08</clTRID>
   </command>
</epp>
```

Listing 30: FRED-eppic equivalent

```
> check-nsset --ids-1=NSSET-MYNSSET --ids-2=NSSET-NONE
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<nsset:chkData>` which declares the `nsset` *namespace and schema* and it contains the following child elements:

- `<nsset:cd>` **(1..n)** – the check resolution of a single nsset handle:
  - `<nsset:id>` **(1)** – the nsset handle as *fredcom:objIDType*,
    - `@avail` **(R)** – availability as *xs:boolean*; `true` – available, `false` – not available,
  - `<nsset:reason>` **(0..1)** – if the availability is negative, this element contains an explanation why the nsset handle is not available, as *fredcom:msgType*.
    - `@lang` – language of the reason as *xs:language*; default is `en` (English).

Listing 31: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <nsset:chkData xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd">
            <nsset:cd>
               <nsset:id avail="0">NSSET-MYNSSET</nsset:id>
               <nsset:reason>Registered already</nsset:reason>
            </nsset:cd>
            <nsset:cd>
               <nsset:id avail="1">NSSET-NONE</nsset:id>
            </nsset:cd>
         </nsset:chkData>
      </resData>
      <trID>
         <clTRID>hity005#17-07-12at11:18:08</clTRID>
```

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```
        <svTRID>ReqID-0000139774</svTRID>
      </trID>
   </response>
</epp>
```

Check keyset

A keyset check *command* is used to check the availability of one or more keyset handles.

The keyset check command is a `check` element in the `keyset` namespace (`http://www.nic.cz/xml/epp/keyset-1.3`).

The command must be contained in the `<check>` command type.

Command element structure

The `<keyset:check>` element must declare the `keyset` *namespace and schema* and it must contain the following child elements:

- `<keyset:id>` **(1..n)** – a keyset handle as *fredcom:objIDType*.

Listing 32: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <check>
         <keyset:check xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.xsd">
            <keyset:id>KEYSET-MYKEYSET</keyset:id>
            <keyset:id>KEYSET-NONE</keyset:id>
         </keyset:check>
      </check>
      <clTRID>ygxv005#17-07-12at13:06:45</clTRID>
   </command>
</epp>
```

Listing 33: FRED-eppic equivalent

```
> check-keyset --ids-1=KEYSET-MYKEYSET --ids-2=KEYSET-NONE
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<keyset:chkData>` which declares the `keyset` *namespace and schema* and it contains the following child elements:

- `<keyset:cd>` **(1..n)** – the check resolution of a single keyset handle:
  - `<keyset:id>` **(1)** – the keyset handle as *fredcom:objIDType*,
    - `@avail` **(R)** – availability as *xs:boolean*; `true` – available, `false` – not available,
  - `<keyset:reason>` **(0..1)** – if the availability is negative, this element contains an explanation why the keyset handle is not available, as *fredcom:msgType*.
    - `@lang` – language of the reason as *xs:language*; default is `en` (English).

Listing 34: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <keyset:chkData xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.xsd">
            <keyset:cd>
               <keyset:id avail="0">KEYSET-MYKEYSET</keyset:id>
               <keyset:reason>Registered already</keyset:reason>
            </keyset:cd>
            <keyset:cd>
               <keyset:id avail="1">KEYSET-NONE</keyset:id>
            </keyset:cd>
         </keyset:chkData>
      </resData>
      <trID>
         <clTRID>ygxv005#17-07-12at13:06:45</clTRID>
         <svTRID>ReqID-0000139780</svTRID>
      </trID>
   </response>
</epp>
```

11.5.4 Info

Commands for viewing object details.

Info domain

A domain info *command* is used to view details of a domain.

The domain info command is an `info` element in the `domain` namespace (`http://www.nic.cz/xml/epp/domain-1.4`).

The command must be contained in the `<info>` command type.

Command element structure

The `<domain:info>` element must declare the `domain` *namespace and schema* and it must contain the following child element:

- `<domain:name>` **(1)** – a domain name as *eppcom:labelType*.
- `<domain:authInfo>` **(0..1)** – the authorization information (AuthInfo) as *fredcom:authInfoType*.

Listing 35: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <info>
         <domain:info xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>example.cz</domain:name>
            <domain:authInfo>MyPassword</domain:authInfo>
         </domain:info>
      </info>
      <clTRID>iops002#17-07-28at13:14:47</clTRID>
   </command>
</epp>
```

Listing 36: FRED-eppic equivalent

```
> info-domain --name=example.cz --auth-info=MyPassword
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<domain:infData>` which declares the `domain` *namespace and schema* and it contains the following child elements:

- `<domain:name>` **(1)** – the domain name as *eppcom:labelType*,
- `<domain:roid>` **(1)** – the domain repository identifier as *eppcom:roidType*,

- **<domain:status> (1..n) – the *domain object state(s)*:**
  - **@s (R) – the state name as one of values:**
    - ok
    - serverDeleteProhibited
    - serverRenewProhibited
    - serverTransferProhibited
    - serverUpdateProhibited
    - serverRegistrantChangeProhibited
    - serverBlocked
    - serverOutzoneManual
    - serverInzoneManual
    - expired
    - outzone
    - notValidated ENUM only
    - deleteCandidate
  - @lang – the language of the state description as a *xs:language* (default: en),
  - element content: the state description as a *xs:normalizedString*,
- <domain:registrant> **(0..1)** – the domain owner handle as *fredcom:objIDType*,
- <domain:admin> **(0..n)** – an administrative contact handle as *fredcom:objIDType*,
- <domain:nsset> **(0..1)** – the nsset handle as *eppcom:labelType*,
- <domain:keyset> **(0..1)** – the keyset handle as *eppcom:labelType*,
- <domain:clID> **(1)** – the designated registrar's handle as *eppcom:clIDType*,
- <domain:crID> **(0..1)** – the handle of the registrar who created this domain as *eppcom:clIDType*,
- <domain:crDate> **(0..1)** – the *timestamp* of creation as *xs:dateTime*,
- <domain:upID> **(0..1)** – the handle of the registrar who was the last to update this domain as *eppcom:clIDType*,
- <domain:upDate> **(0..1)** – the *timestamp* of the last update as *xs:dateTime*,
- <domain:exDate> **(0..1)** – the date of expiration as *xs:date*,
- <domain:trDate> **(0..1)** – the *timestamp* of the last transfer as *xs:dateTime*,
- <domain:authInfo> **(0..1)** – the authorization information (AuthInfo) as *fredcom:authInfoType*,
- <domain:tempcontact> **(0..n)** – a temporary contact handle as *fredcom:objIDType*.

Listing 37: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<response>
   <result code="1000">
      <msg>Command completed successfully</msg>
```

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```
   </result>
   <resData>
      <domain:infData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
         <domain:name>example.cz</domain:name>
         <domain:roid>D0009907597-CZ</domain:roid>
         <domain:status s="ok">Object is without restrictions</domain:status>
         <domain:registrant>MYOWN</domain:registrant>
         <domain:admin>ADMIN2</domain:admin>
         <domain:nsset>NSSET-MYNSSET</domain:nsset>
         <domain:keyset>KEYSET-MYKEYSET</domain:keyset>
         <domain:clID>REG-MYREG</domain:clID>
         <domain:crID>REG-MYREG</domain:crID>
         <domain:crDate>2017-07-11T13:28:48+02:00</domain:crDate>
         <domain:upID>REG-MYREG</domain:upID>
         <domain:upDate>2017-07-18T10:46:19+02:00</domain:upDate>
         <domain:exDate>2020-07-11</domain:exDate>
      </domain:infData>
   </resData>
   <trID>
      <clTRID>iops002#17-07-28at13:14:47</clTRID>
      <svTRID>ReqID-0000140984</svTRID>
   </trID>
</response>
</epp>
```

ENUM extension

The `<domain:infData>` element is used in the same way as described above.

The *response extension* is used to display the validation of an ENUM domain and/or its publish flag.

The response's `<extension>` element contains a **single** `<enumval:infData>` element which declares the `enumval` namespace (`http://www.nic.cz/xml/epp/enumval-1.2`) and *schema* and contains:

- `<enumval:valExDate>` **(0..1)** – the validation expiration date as *xs:date*,
- `<enumval:publish>` **(0..1)** – the setting for publishing the ENUM domain in a public directory as *xs:boolean*; `true` – display, `false` – hide.

Listing 38: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <domain:infData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>1.1.1.7.4.5.2.2.2.0.2.4.e164.arpa</domain:name>
            <domain:roid>D0009907598-CZ</domain:roid>
            <domain:status s="ok">Object is without restrictions</domain:status>
```

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```
            <domain:registrant>MYOWN</domain:registrant>
            <domain:admin>ADMIN1</domain:admin>
            <domain:admin>ADMIN2</domain:admin>
            <domain:nsset>NSSET-MYNSSET</domain:nsset>
            <domain:keyset>KEYSET-MYKEYSET</domain:keyset>
            <domain:clID>REG-MYREG</domain:clID>
            <domain:crID>REG-MYREG</domain:crID>
            <domain:crDate>2017-07-14T16:22:32+02:00</domain:crDate>
            <domain:upID>REG-MYREG</domain:upID>
            <domain:upDate>2017-07-18T10:49:43+02:00</domain:upDate>
            <domain:exDate>2021-07-14</domain:exDate>
         </domain:infData>
      </resData>
      <extension>
         <enumval:infData xmlns:enumval="http://www.nic.cz/xml/epp/enumval-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/enumval-1.2 enumval-1.2.0.xsd
↪">
            <enumval:valExDate>2018-01-02</enumval:valExDate>
            <enumval:publish>0</enumval:publish>
         </enumval:infData>
      </extension>
      <trID>
         <clTRID>ites005#17-07-31at10:26:32</clTRID>
         <svTRID>ReqID-0000140992</svTRID>
      </trID>
   </response>
</epp>
```

Info contact

A contact info *command* is used to view details of a contact.

A new AuthInfo is generated for the contact by the server after successfully executing the contact info command with the AuthInfo parameter.

The contact info command is an `info` element in the `contact` namespace (`http://www.nic.cz/xml/epp/contact-1.6`).

The command must be contained in the `<info>` command type.

Command element structure

The `<contact:info>` element must declare the `contact` *namespace and schema* and it must contain the following child element:

- `<contact:id>` **(1)** – the contact handle as *fredcom:objIDType*.
- `<contact:authInfo>` **(0..1)** – the authorization information (AuthInfo) as *fredcom:authInfoType*.

Note: For successful execution of the contact info command with the AuthInfo parameter it is necessary to use the authorization information corresponding to the one in the registry.

Listing 39: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<command>
<info>
   <contact:info xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
    xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd">
      <contact:id>MYCONTACT</contact:id>
      <contact:authInfo>MyPassword</contact:authInfo>
   </contact:info>
</info>
<clTRID>zmge004#17-05-04at12:20:55</clTRID>
</command>
</epp>
```

Listing 40: FRED-eppic equivalent

```
> info-contact --id=MYCONTACT --auth-info=MyPassword
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<contact:infData>` which declares the `contact` *namespace and schema* and it contains the following child elements:

- `<contact:id>` **(1)** – the contact handle as *fredcom:objIDType*,
- `<contact:roid>` **(1)** – the contact repository identifier as *eppcom:roidType*,
- **`<contact:status>` (1..n) – the *contact object state(s)*:**
  - **`@s` (R) – state name as one of values:**
    - `ok`
    - `linked`
    - `serverTransferProhibited`
    - `serverDeleteProhibited`
    - `serverUpdateProhibited`
    - `serverBlocked`
    - `deleteCandidate`
    - `conditionallyIdentifiedContact`
    - `identifiedContact`
    - `validatedContact`
    - `mojeidContact`
    - `serverContactNameChangeProhibited`

        * `serverContactOrganizationChangeProhibited`
        * `serverContactIdentChangeProhibited`
        * `serverContactPermanentAddressChangeProhibited`
    - `@lang` – language of the state description as a *xs:language* (default: `en`),
    - element content: the state description as a *xs:normalizedString*,
- **`<contact:postalInfo>` (1) – contact's postal information:**
    - `<contact:name>` **(0..1)** – the person name as *contact:postalLineType*,
    - `<contact:org>` **(0..1)** – the organization name as *contact:optPostalLineType*,
    - **`<contact:addr>` (0..1) – the postal address:**
        * `<contact:street>` **(0..3)** – the street line(s) as *contact:optPostalLineType*,
        * `<contact:city>` **(0..1)** – the city as *contact:postalLineType*,
        * `<contact:sp>` **(0..1)** – the state or province as *contact:optPostalLineType*,
        * `<contact:pc>` **(0..1)** – the postal code as *contact:pcType*,
        * `<contact:cc>` **(0..1)** – the country code as *contact:ccType*,
- `<contact:voice>` **(0..1)** – the phone number as *contact:e164StringType*,
- `<contact:fax>` **(0..1)** – the fax number as *contact:e164StringType*,
- `<contact:email>` **(0..1)** – a comma-separated list of email addresses as *contact:emailCommaListType*,
- `<contact:authInfo>` **(0..1)** – the authorization information as *fredcom:authInfoType*,
- `<contact:clID>` **(1)** – the designated registrar's handle as *eppcom:clIDType*,
- `<contact:crID>` **(1)** – the handle of the registrar who created this contact as *eppcom:clIDType*,
- `<contact:crDate>` **(1)** – the *timestamp* of creation as *xs:dateTime*,
- `<contact:upID>` **(0..1)** – the handle of the registrar who was the last to update this contact as *eppcom:clIDType*,
- `<contact:upDate>` **(0..1)** – the *timestamp* of the last update as *xs:dateTime*,
- `<contact:trDate>` **(0..1)** – the *timestamp* of the last transfer as *xs:dateTime*,
- **`<contact:disclose>` (0..1) – contact information disclosure settings:**
    - `@flag` **(R)** – disclose flag as a *xs:boolean*: `0` – listed items are hidden, `1` – listed items are published,
    - `<contact:addr/>` **(0..1)** – the address disclosure setting as an empty element,
    - `<contact:voice/>` **(0..1)** – the voice disclosure setting as an empty element,
    - `<contact:fax/>` **(0..1)** – the fax disclosure setting as an empty element,
    - `<contact:email/>` **(0..1)** – the email disclosure setting as an empty element,
    - `<contact:vat/>` **(0..1)** – the VAT number disclosure setting as an empty element,
    - `<contact:ident/>` **(0..1)** – the identity document disclosure setting as an empty element,
    - `<contact:notifyEmail/>` **(0..1)** – the notification email disclosure setting as an empty element,

    Note: Omitted items must be interpreted according to the server disclosure policy.

    See *Policies & rules of disclosure*.

- `<contact:vat>` **(0..1)** – the *VAT*-payer identifier as a *contact:vatT*,
- **`<contact:ident>` (0..1) – identity-document identification:**
  - `@type` **(R)** – the type of the identity document as one of values: `op` (identity card number), `passport` (passport number), `mpsv` (number from the Ministry of Labour and Social Affairs), `ico` (company number), `birthday` (the date of birth),
  - element content: the identification number as a *contact:identValueT*,
- `<contact:notifyEmail>` **(0..1)** – a comma-separated list of email addresses for notification as *contact:emailCommaListType*.

Listing 41: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<response>
   <result code="1000">
      <msg>Command completed successfully</msg>
   </result>
   <resData>
   <contact:infData xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
    xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd">
      <contact:id>MYCONTACT</contact:id>
      <contact:roid>C0009746170-CZ</contact:roid>
      <contact:status s="linked">Has relation to other records in the registry</
↪contact:status>
      <contact:postalInfo>
         <contact:name>Name Surname</contact:name>
         <contact:addr>
            <contact:street>Street</contact:street>
            <contact:city>City</contact:city>
            <contact:pc>12345</contact:pc>
            <contact:cc>CZ</contact:cc>
         </contact:addr>
      </contact:postalInfo>
      <contact:email>email@example.com</contact:email>
      <contact:clID>REG-MYREG</contact:clID>
      <contact:crID>REG-MYREG</contact:crID>
      <contact:crDate>2017-05-04T11:30:25+02:00</contact:crDate>
      <contact:disclose flag="1">
         <contact:addr/>
      </contact:disclose>
   </contact:infData>
   </resData>
   <trID>
      <clTRID>zmge004#17-05-04at12:20:55</clTRID>
      <svTRID>ReqID-0000132810</svTRID>
   </trID>
</response>
</epp>
```

Mailing address extension

The `<contact:infData>` element is used in the same way as described above.

The *response extension* is used to display the mailing address.

The response's `<extension>` element must contain a **single** `<extra-addr:infData>` element which declares the `extra-addr` namespace (`http://www.nic.cz/xml/epp/extra-addr-1.0`) and *schema* and contains:

- **`<extra-addr:mailing>` (1) – mailing address container:**
  - **`<extra-addr:addr>` (1) – address:**
    - `<extra-addr:street>` **(1..3)** – street line 1–3 as *extra-addr:postalLineType*,
    - `<extra-addr:city>` **(1)** – city as *extra-addr:postalLineType*,
    - `<extra-addr:sp>` **(0..1)** – state or province as *extra-addr:postalLineType*,
    - `<extra-addr:pc>` **(1)** – postal code as *extra-addr:pcType*,
    - `<extra-addr:cc>` **(1)** – country code as *extra-addr:ccType*.

Listing 42: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <contact:infData xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd
↪">
            <contact:id>EXTRAADDR</contact:id>
            <contact:roid>C0000000009-CZ</contact:roid>
            <contact:status s="ok">Object is without restrictions</contact:status>
            <contact:postalInfo>
               <contact:name>Foo Bar</contact:name>
               <contact:addr>
                  <contact:street>Kratka 42</contact:street>
                  <contact:city>Praha</contact:city>
                  <contact:pc>11150</contact:pc>
                  <contact:cc>CZ</contact:cc>
               </contact:addr>
            </contact:postalInfo>
            <contact:voice>+420.000000001</contact:voice>
            <contact:email>foobar@nic.cz</contact:email>
            <contact:clID>REG-FRED-A</contact:clID>
            <contact:crID>REG-FRED-A</contact:crID>
            <contact:crDate>2015-08-25T17:03:11+02:00</contact:crDate>
            <contact:upID>REG-FRED-A</contact:upID>
            <contact:upDate>2015-08-25T17:37:31+02:00</contact:upDate>
            <contact:disclose flag="1">
               <contact:addr/>
            </contact:disclose>
            <contact:notifyEmail>foobar-notify@nic.cz</contact:notifyEmail>
         </contact:infData>
```

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```
      </resData>
      <extension>
         <extra-addr:infData
          xmlns:extra-addr="http://www.nic.cz/xml/epp/extra-addr-1.0"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/extra-addr-1.0 extra-addr-1.0.
↪0.xsd">
            <extra-addr:mailing>
               <extra-addr:addr>
                  <extra-addr:street>Dlouha 24</extra-addr:street>
                  <extra-addr:city>Lysa nad Labem</extra-addr:city>
                  <extra-addr:pc>28922</extra-addr:pc>
                  <extra-addr:cc>CZ</extra-addr:cc>
               </extra-addr:addr>
            </extra-addr:mailing>
         </extra-addr:infData>
      </extension>
      <trID>
         <clTRID>pmlb002#15-08-26at13:51:12</clTRID>
         <svTRID>ReqID-0000000113</svTRID>
      </trID>
   </response>
</epp>
```

Info nsset

A nsset info *command* is used to view details of an nsset.

The nsset info command is an `info` element in the `nsset` namespace (`http://www.nic.cz/xml/epp/nsset-1.2`).

The command must be contained in the `<info>` command type.

Command element structure

The `<nsset:info>` element must declare the `nsset` *namespace and schema* and it must contain the following child element:

- `<nsset:id>` **(1)** – an nsset handle as *fredcom:objIDType*.
- `<nsset:authInfo>` **(0..1)** – the authorization information (AuthInfo) as *fredcom:authInfoType*.

Listing 43: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<command>
   <info>
      <nsset:info xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd">
         <nsset:id>NSSET-MYNSSET</nsset:id>
         <nsset:authInfo>MyPassword</nsset:authInfo>
      </nsset:info>
   </info>
```

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```
   <clTRID>kttq005#17-07-31at12:21:02</clTRID>
</command>
</epp>
```

Listing 44: FRED-eppic equivalent

```
> info-nsset --id=NSSET-MYNSSET --auth-info=MyPassword
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<nsset:infData>` which declares the `nsset` *namespace and schema* and it contains the following child elements:

- `<nsset:id>` **(1)** – the nsset handle as *fredcom:objIDType*,
- `<nsset:roid>` **(1)** – the nsset repository identifier as *eppcom:roidType*,
- **`<nsset:status>` (1..n) – the *nsset object state(s)*:**
  - **`@s` (R) – the state name as one of values:**
    - `ok`
    - `linked`
    - `serverDeleteProhibited`
    - `serverTransferProhibited`
    - `serverUpdateProhibited`
    - `deleteCandidate`
  - `@lang` – the language of the state description as a *xs:language* (default: `en`),
  - element content: the state description as a *xs:normalizedString*,
- `<nsset:clID>` **(1)** – the designated registrar's handle as *eppcom:clIDType*,
- `<nsset:crID>` **(0..1)** – the handle of the registrar who created this nsset as *eppcom:clIDType*,
- `<nsset:crDate>` **(0..1)** – the *timestamp* of creation as *xs:dateTime*,
- `<nsset:upID>` **(0..1)** – the handle of the registrar who was the last to update this nsset as *eppcom:clIDType*,
- `<nsset:upDate>` **(0..1)** – the *timestamp* of the last update as *xs:dateTime*,
- `<nsset:trDate>` **(0..1)** – the *timestamp* of the last transfer as *xs:dateTime*,
- `<nsset:authInfo>` **(0..1)** – the authorization information (AuthInfo) as *fredcom:authInfoType*,
- **`<nsset:ns>` (0..10) – a nameserver given by:**
  - `<nsset:name>` **(1)** – a nameserver hostname as *eppcom:labelType*,
  - `<nsset:addr>` **(0..n)** – a namesever's IP address as *nsset:addrStringType*,
- `<nsset:tech>` **(1..n)** – a technical contact handle as *fredcom:objIDType*,
- `<nsset:reportlevel>` **(1)** – the report level of technical checks as *nsset:reportlevelType*.

Listing 45: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<response>
   <result code="1000">
      <msg>Command completed successfully</msg>
   </result>
   <resData>
      <nsset:infData xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd">
         <nsset:id>NID-MYNSSET</nsset:id>
         <nsset:roid>N0009907595-CZ</nsset:roid>
         <nsset:status s="linked">Has relation to other records in the registry</
↪nsset:status>
         <nsset:clID>REG-MYREG</nsset:clID>
         <nsset:crID>REG-MYREG</nsset:crID>
         <nsset:crDate>2017-07-11T13:28:42+02:00</nsset:crDate>
         <nsset:upID>REG-MYREG</nsset:upID>
         <nsset:upDate>2017-07-27T16:54:53+02:00</nsset:upDate>
         <nsset:ns>
            <nsset:name>ns1.example.cz</nsset:name>
            <nsset:addr>111.222.111.222</nsset:addr>
         </nsset:ns>
         <nsset:ns>
            <nsset:name>nameserver-example.cz</nsset:name>
         </nsset:ns>
         <nsset:tech>TECH2</nsset:tech>
         <nsset:reportlevel>4</nsset:reportlevel>
      </nsset:infData>
   </resData>
   <trID>
      <clTRID>kttq005#17-07-31at12:21:02</clTRID>
      <svTRID>ReqID-0000140998</svTRID>
   </trID>
</response>
</epp>
```

Info keyset

A keyset info *command* is used to view details of a keyset.

The keyset info command is an `info` element in the `keyset` namespace (`http://www.nic.cz/xml/epp/keyset-1.3`).

The command must be contained in the `<info>` command type.

Command element structure

The `<keyset:info>` element must declare the `keyset` *namespace and schema* and it must contain the following child element:

- `<keyset:id>` **(1)** – a keyset handle as *fredcom:objIDType*.
- `<keyset:authInfo>` **(0..1)** – the authorization information (AuthInfo) as *fredcom:authInfoType*.

Listing 46: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <info>
         <keyset:info xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.xsd">
            <keyset:id>KEYSET-MYKEYSET</keyset:id>
            <keyset:authInfo>MyPassword</keyset:authInfo>
         </keyset:info>
      </info>
      <clTRID>gyyp005#17-07-31at13:03:07</clTRID>
   </command>
</epp>
```

Listing 47: FRED-eppic equivalent

```
> info-keyset --id=KEYSET-MYKEYSET --auth-info=MyPassword
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<keyset:infData>` which declares the `keyset` *namespace and schema* and it contains the following child elements:

- `<keyset:id>` **(1)** – the keyset handle as *fredcom:objIDType*,
- `<keyset:roid>` **(1)** – the keyset repository identifier as *eppcom:roidType*,
- **`<keyset:status>` (1..n) – the *keyset object state(s)*:**
  - **`@s` (R) – the state name as one of values:**
    - `ok`
    - `linked`
    - `serverDeleteProhibited`
    - `serverTransferProhibited`
    - `serverUpdateProhibited`
    - `deleteCandidate`
  - `@lang` – the language of the state description as a *xs:language* (default: `en`),

  - element content: the state description as a *xs:normalizedString*,

- `<keyset:clID>` **(1)** – the designated registrar's handle as *eppcom:clIDType*,
- `<keyset:crID>` **(0..1)** – the handle of the registrar who created this keyset as *eppcom:clIDType*,
- `<keyset:crDate>` **(0..1)** – the *timestamp* of creation as *xs:dateTime*,
- `<keyset:upID>` **(0..1)** – the handle of the registrar who was the last to update this keyset as *eppcom:clIDType*,
- `<keyset:upDate>` **(0..1)** – the *timestamp* of the last update as *xs:dateTime*,
- `<keyset:trDate>` **(0..1)** – the *timestamp* of the last transfer as *xs:dateTime*,
- `<keyset:authInfo>` **(0..1)** – the authorization information (AuthInfo) as *fredcom:authInfoType*,
- `<keyset:dnskey>` **(0..10)** – a DNS key (*see object's attributes for allowed values*) given by:
  - `<keyset:flags>` **(1)** – flags as *xs:unsignedShort*,
  - `<keyset:protocol>` **(1)** – protocol as *xs:unsignedByte*,
  - `<keyset:alg>` **(1)** – algorithm as *xs:unsignedByte*,
  - `<keyset:pubKey>` **(1)** – public key as *keyset:keyT*,
- `<keyset:tech>` **(1..n)** – a technical contact handle as *fredcom:objIDType*.

Listing 48: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <keyset:infData xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.xsd">
            <keyset:id>KEYSET-MYKEYSET</keyset:id>
            <keyset:roid>K0009907596-CZ</keyset:roid>
            <keyset:status s="linked">Has relation to other records in the registry</
↪keyset:status>
            <keyset:clID>REG-MYREG</keyset:clID>
            <keyset:crID>REG-MYREG</keyset:crID>
            <keyset:crDate>2017-07-11T13:28:45+02:00</keyset:crDate>
            <keyset:upID>REG-MYREG</keyset:upID>
            <keyset:upDate>2017-07-20T20:04:35+02:00</keyset:upDate>
            <keyset:dnskey>
               <keyset:flags>257</keyset:flags>
               <keyset:protocol>3</keyset:protocol>
               <keyset:alg>5</keyset:alg>
               <keyset:pubKey>aXN4Y2lpd2ZicWtkZHF4dnJyaHVtc3BreXN6ZGZy</keyset:pubKey>
            </keyset:dnskey>
            <keyset:dnskey>
               <keyset:flags>257</keyset:flags>
               <keyset:protocol>3</keyset:protocol>
               <keyset:alg>5</keyset:alg>
               <keyset:pubKey>eGVmbmZrY3lvcXFwamJ6aGt2YXhteXdkc2tjeXBp</keyset:pubKey>
            </keyset:dnskey>
            <keyset:tech>TECH2</keyset:tech>
```

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```
         </keyset:infData>
      </resData>
      <trID>
         <clTRID>gyyp005#17-07-31at13:03:07</clTRID>
         <svTRID>ReqID-0000141004</svTRID>
      </trID>
   </response>
</epp>
```

11.5.5 Polling

Polling is used by the client to manage notifications about relevant events in the Registry.

The relevant events are mostly those that are not triggered by the client, such as time-based events (expiration, deletion of idle objects), asynchronous responses (technical check results), events that are triggered by other registrars (transfer) or by the Registry itself (consequences of contacts' merger).

The workflow is following:

1. The client orders the notification messages by issuing a poll request.
2. In response, the server informs about the status of the message queue (the message count), includes contents of the first (oldest) message and provides its identifier for acknowledgement.
3. The client is supposed to confirm the receipt of this message by issuing a poll acknowledgement with the identifier of the read message.
4. The server removes the acknowledged message from the message queue and responds with a new message count and the identification of the next message in the queue.
5. The previous steps can be repeated to read the remaining messages until the count is reduced to zero.

Note: The EPP standard allows to announce a non-empty message queue (`<msgQ>`) in response to any command, however the FRED EPP server gives such response exclusively to an explicit poll request.

Poll request

A poll request *command* is used to obtain the message queue status (message count) and contents of the first message in the queue (the oldest one).

The poll command is a `poll` element in the default namespace (`urn:ietf:params:xml:ns:epp-1.0`).

Command element structure

The `<poll/>` **(1)** element must be empty and contain only this attribute:

- `@op` **(R)** poll operation; must equal `req` to make the request.

Listing 49: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

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```
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <poll op="req"/>
      <clTRID>cmmp002#17-07-21at11:19:09</clTRID>
   </command>
</epp>
```

Listing 50: FRED-eppic equivalent

```
> poll-req
```

Response element structure

The *response* from the FRED EPP server contains the result, message queue and transaction identification.

See also *Success or failure of a command*.

Structure of the message queue:

- **<msgQ> (0..1) – the message queue:**
  - `@count` **(R)** – number of messages in the queue as *xs:unsignedLong*,
  - `@id` **(R)** – current message identifier as *eppcom:minTokenType*,
  - `<qDate>` **(0..1)** – the *timestamp* when the message was enqueued as *xs:dateTime*,
  - **<msg> (0..1) – the container of the current message,**
    - `@lang` – language of the message text as *xs:language*; default is `en` (English),
    - **one of** the messages such as `<fred:lowCreditData>`, `<fred:requestFeeInfoData>` or other, see *Poll message types*.

Note: There is always just one message contained in the `<msg>` element.

The content of the `<msg>` element is not processed for validity.

Listing 51: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1301">
         <msg>Command completed successfully; ack to dequeue</msg>
      </result>
      <msgQ count="7" id="19596173">
         <qDate>2017-07-15T01:18:13+02:00</qDate>
         <msg>
            <fred:requestFeeInfoData xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5">
               <fred:periodFrom>2017-07-01T00:00:00+02:00</fred:periodFrom>
               <fred:periodTo>2017-07-14T23:59:59+02:00</fred:periodTo>
               <fred:totalFreeCount>25000</fred:totalFreeCount>
               <fred:usedCount>120</fred:usedCount>
```

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```
                <fred:price>0.00</fred:price>
             </fred:requestFeeInfoData>
          </msg>
       </msgQ>
       <trID>
          <clTRID>cmmp002#17-07-21at11:19:09</clTRID>
          <svTRID>ReqID-0000140400</svTRID>
       </trID>
    </response>
</epp>
```

Poll acknowledgement

A poll acknowledgement *command* is used to confirm that a message has been received by the client and can be removed from the queue on the server.

The poll command is a `poll` element in the default namespace (`urn:ietf:params:xml:ns:epp-1.0`).

Command element structure

The `<poll/>` **(1)** element must be empty and contain only attributes:

- `@op` **(R) –** poll operation; must equal `ack` to acknowledge the reading of the message,
- `@msgID` – the identification number of a message to be confirmed as *eppcom:minTokenType*; required with `@op = 'ack'`; this is the current message identifier returned in *response to a poll request*.

Listing 52: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <poll msgID="19596173" op="ack"/>
      <clTRID>cmmp003#17-07-21at11:21:41</clTRID>
   </command>
</epp>
```

Listing 53: FRED-eppic equivalent

```
> poll-ack 19596173
```

Response element structure

The *response* from the FRED EPP server contains the result, message queue information and transaction identification.

See also *Success or failure of a command*.

Structure of message queue information:

- `<msgQ/>` **(0..1)** – message queue information as an empty element; present only if there are some messages in the queue,
  - `@count` **(R)** – the count of messages in the queue as *xs:unsignedLong*,
  - `@id` **(R)** – the identification number of the first message in the queue as *eppcom:minTokenType*.

Listing 54: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <msgQ count="6" id="19603978"/>
      <trID>
         <clTRID>cmmp003#17-07-21at11:21:41</clTRID>
         <svTRID>ReqID-0000140401</svTRID>
      </trID>
   </response>
</epp>
```

Poll message types

Note: The content of messages is not processed for validity, the markup has a formatting purpose.

- *Low credit*
- *Request usage*
- *Domain expiration*
- *ENUM domain validation*
- *Object transfer*
- *Object update*
- *Idle object deletion*

- *Domain deletion*

Low credit

Event: Client's credit has dropped below the stated limit.

`<fred:lowCreditData>` **(1)** declares the `fred` *namespace and schema*, and contains:

- `<fred:zone>` **(1)** – FQDN of the zone in question as *eppcom:labelType*,
- **`<fred:limit>` (1) – the stated limit:**
  - `<fred:zone>` **(1)** – zone as *eppcom:labelType*,
  - `<fred:credit>` **(1)** – credit treshold for notice as *fred:amountType*,
- **`<fred:credit>` (1) – amount of credit:**
  - `<fred:zone>` **(1)** – zone as *eppcom:labelType*,
  - `<fred:credit>` **(1)** – current client's credit as *fred:amountType*.

Listing 55: Example of a notice of low credit

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1301">
         <msg>Command completed successfully; ack to dequeue</msg>
      </result>
      <msgQ count="1" id="19681433">
         <qDate>2017-07-25T15:03:43+02:00</qDate>
         <msg>
            <fred:lowCreditData xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
             xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
               <fred:zone>cz</fred:zone>
               <fred:limit>
                  <fred:zone>cz</fred:zone>
                  <fred:credit>5000.00</fred:credit>
               </fred:limit>
               <fred:credit>
                  <fred:zone>cz</fred:zone>
                  <fred:credit>4999.00</fred:credit>
               </fred:credit>
            </fred:lowCreditData>
         </msg>
      </msgQ>
      <trID>
         <clTRID>fwpn006#17-07-25at16:04:34</clTRID>
         <svTRID>ReqID-0000140888</svTRID>
      </trID>
   </response>
</epp>
```

Request usage

Event: Daily report of how many free requests have been made this month so far, and how much the client will be charged for the requests that exceed the limit.

`<fred:requestFeeInfoData>` **(1)** declares the `fred` *namespace and schema*, and contains:

- `<fred:periodFrom>` **(1)** – the *timestamp* of the start of the period as *xs:dateTime*,
- `<fred:periodTo>` **(1)** – the *timestamp* of the end of the period as *xs:dateTime*,
- `<fred:totalFreeCount>` **(1)** – the amount of free requests (the limit) for this month as *xs:unsignedLong*,
- `<fred:usedCount>` **(1)** – the total of requests used during the period as *xs:unsignedLong*,
- `<fred:price>` **(1)** – additional charge for requests over the limit that the client will be billed as *fred:amountType*.

Listing 56: Example of a message about request usage

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1301">
         <msg>Command completed successfully; ack to dequeue</msg>
      </result>
      <msgQ count="1" id="19690926">
         <qDate>2017-07-27T01:15:10+02:00</qDate>
         <msg>
            <fred:requestFeeInfoData xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5">
               <fred:periodFrom>2017-07-01T00:00:00+02:00</fred:periodFrom>
               <fred:periodTo>2017-07-26T23:59:59+02:00</fred:periodTo>
               <fred:totalFreeCount>25000</fred:totalFreeCount>
               <fred:usedCount>243</fred:usedCount>
               <fred:price>0.00</fred:price>
            </fred:requestFeeInfoData>
         </msg>
      </msgQ>
      <trID>
         <clTRID>twnx002#17-07-27at12:10:13</clTRID>
         <svTRID>ReqID-0000140940</svTRID>
      </trID>
   </response>
</epp>
```

Domain expiration

There are several messages concerning expiration of domains that have the same content but are issued on different **events**:

- `<domain:impendingExpData>` – the domain is going to expire (see *expW state*),
- `<domain:expData>` – the domain has *expired*,
- `<domain:dnsOutageData>` – the domain has become *unguarded* and has been excluded from the zone,
- `<domain:delData>` – the domain has been *deleted* after registration expiration.

Only one of these elements can occur in a single poll message.

All of these elements declare the `domain` *namespace and schema*, and contain the following child elements:

- `<domain:name>` **(1)** – the domain name they are referring to as *eppcom:labelType*,
- `<domain:exDate>` **(1)** – the expiration date of the domain name as *xs:date*.

Listing 57: Example of a message about impending domain expiration

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1301">
         <msg>Command completed successfully; ack to dequeue</msg>
      </result>
      <msgQ count="1" id="19690946">
         <qDate>2017-07-27T12:13:55+02:00</qDate>
         <msg>
            <domain:impendingExpData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.
↪4"
             xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.1.xsd
↪">
               <domain:name>somedomain.cz</domain:name>
               <domain:exDate>2017-08-26</domain:exDate>
            </domain:impendingExpData>
         </msg>
      </msgQ>
      <trID>
         <clTRID>lelg003#17-07-27at12:42:33</clTRID>
         <svTRID>ReqID-0000140944</svTRID>
      </trID>
   </response>
</epp>
```

ENUM domain validation

Messages concerning the validation of ENUM domains for **events**:

- `<enumval:impendingValExpData>` – domain's validation is going to expire (see *valW1 state*),
- `<enumval:valExpData>` – domain's validation has expired (see *notValidated state*).

Only one of these elements can occur in a single poll message.

Both of these elements declare the `enumval` *namespace and schema*, and contain the same child elements:

- `<enumval:name>` **(1)** – the domain name to which they are referring as *eppcom:labelType*,
- `<enumval:valExDate>` **(1)** – the expiration date of domain validation as *xs:date*.

Listing 58: Example of a message about ENUM validation expiration

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1301">
         <msg>Command completed successfully; ack to dequeue</msg>
      </result>
```

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```
      <msgQ count="1" id="19847350">
         <qDate>2017-08-14T13:19:29+02:00</qDate>
         <msg>
            <enumval:impendingValExpData xmlns:enumval="http://www.nic.cz/xml/epp/
↪enumval-1.2"
             xsi:schemaLocation="http://www.nic.cz/xml/epp/enumval-1.2 enumval-1.2.0.
↪xsd">
               <enumval:name>1.1.1.7.4.5.2.2.2.0.2.4.e164.arpa</enumval:name>
               <enumval:valExDate>2017-08-15</enumval:valExDate>
            </enumval:impendingValExpData>
         </msg>
      </msgQ>
      <trID>
         <clTRID>fmvu002#17-08-14at13:23:05</clTRID>
         <svTRID>ReqID-0000141213</svTRID>
      </trID>
   </response>
</epp>
```

Object transfer

Event: An object has been transferred to another registrar.

This message type appears in all 4 object namespaces: `domain`, `contact`, `nsset`, `keyset`.

`<*:trnData>` **(1)** declares the object *namespace and schema*, and contains:

- **an object identifier (1) which is one of:**
  - `<domain:name>` – a domain name as *eppcom:labelType*,
  - `<*:id>` – an object handle as *fredcom:objIDType* (for objects other than domains),
- `<*:trDate>` **(1)** – the date of the transfer as *xs:dateTime*,
- `<*:clID>` **(1)** – the handle of the registrar who requested the transfer as *eppcom:clIDType*.

Listing 59: Example of a transfer message

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1301">
         <msg>Command completed successfully; ack to dequeue</msg>
      </result>
      <msgQ count="1" id="19681434">
         <qDate>2017-07-25T16:34:42+02:00</qDate>
         <msg>
            <domain:trnData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
             xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.1.xsd
↪">
               <domain:name>trdomain.cz</domain:name>
               <domain:trDate>2017-07-25</domain:trDate>
               <domain:clID>REG-FRED-A</domain:clID>
            </domain:trnData>
```

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```
        </msg>
      </msgQ>
      <trID>
         <clTRID>qfja002#17-07-25at16:39:03</clTRID>
         <svTRID>ReqID-0000140900</svTRID>
      </trID>
   </response>
</epp>
```

Object update

Event: An object has been updated by the Registry, or a contact linked to a domain of another registrar has been updated by its sponsoring registrar.

This message type appears in the following object namespaces: `domain`, `contact`, `nsset`, `keyset`.

`<*:updateData>` **(1)** declares the object *namespace and schema*, and contains:

- `<*:opTRID>` **(1)** – operation transaction identifier (an identification of the operation in the Registry that has caused this message) as *domain:trIDStringType*,
- `<*:oldData>` **(1)** – data before the update, the content is presented as an `infData` element (the same as in response to the `info` command: *domain:infData*, *contact:infData*, *nsset:infData*, *keyset:infData*),
- `<*:newData>` **(1)** – data after the update, the content is presented as an `infData` element (the same as in response to the `info` command: *domain:infData*, *contact:infData*, *nsset:infData*, *keyset:infData*).

Listing 60: Example of a message about a domain update

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1301">
         <msg>Command completed successfully; ack to dequeue</msg>
      </result>
      <msgQ count="1" id="19852593">
         <qDate>2017-08-14T13:29:06+02:00</qDate>
         <msg>
            <domain:updateData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
             xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.1.xsd
↪">
               <domain:opTRID>ReqID-0000141228</domain:opTRID>
               <domain:oldData>
                  <domain:infData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
                   xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.
↪4.1.xsd">
                     <domain:name>mydomain.cz</domain:name>
                     <domain:roid>D0009907597-CZ</domain:roid>
                     <domain:status s="serverBlocked">Domain blocked</domain:status>
                     <domain:status s="serverDeleteProhibited">Deletion forbidden</
↪domain:status>
                     <domain:status s="serverRenewProhibited">Registration renewal␣
↪forbidden</domain:status>
                     <domain:status s="serverRegistrantChangeProhibited">Registrant␣
↪change forbidden</domain:status>
```

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```
                        <domain:status s="serverTransferProhibited">Sponsoring registrar␣
↪change forbidden</domain:status>
                        <domain:status s="serverUpdateProhibited">Update forbidden</
↪domain:status>
                        <domain:registrant>CID-MYOWN</domain:registrant>
                        <domain:admin>CID-ADMIN1</domain:admin>
                        <domain:admin>CID-ADMIN2</domain:admin>
                        <domain:nsset>NID-MYNSSET</domain:nsset>
                        <domain:clID>REG-MYREG</domain:clID>
                        <domain:crID>REG-MYREG</domain:crID>
                        <domain:crDate>2017-07-11T13:28:48+02:00</domain:crDate>
                        <domain:upID>REG-FRED-C</domain:upID>
                        <domain:upDate>2017-08-11T10:46:14+02:00</domain:upDate>
                        <domain:exDate>2020-07-11</domain:exDate>
                        <domain:authInfo>rvBcaTVq</domain:authInfo>
                     </domain:infData>
                  </domain:oldData>
                  <domain:newData>
                     <domain:infData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
                      xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.
↪4.1.xsd">
                        <domain:name>mydomain.cz</domain:name>
                        <domain:roid>D0009907597-CZ</domain:roid>
                        <domain:status s="serverBlocked">Domain blocked</domain:status>
                        <domain:status s="serverDeleteProhibited">Deletion forbidden</
↪domain:status>
                        <domain:status s="serverRenewProhibited">Registration renewal␣
↪forbidden</domain:status>
                        <domain:status s="serverRegistrantChangeProhibited">Registrant␣
↪change forbidden</domain:status>
                        <domain:status s="serverTransferProhibited">Sponsoring registrar␣
↪change forbidden</domain:status>
                        <domain:status s="serverUpdateProhibited">Update forbidden</
↪domain:status>
                        <domain:registrant>CID-MYCONTACT</domain:registrant>
                        <domain:admin>CID-ADMIN1</domain:admin>
                        <domain:admin>CID-ADMIN2</domain:admin>
                        <domain:nsset>NID-MYNSSET</domain:nsset>
                        <domain:clID>REG-MYREG</domain:clID>
                        <domain:crID>REG-MYREG</domain:crID>
                        <domain:crDate>2017-07-11T13:28:48+02:00</domain:crDate>
                        <domain:upID>REG-CZNIC</domain:upID>
                        <domain:upDate>2017-08-14T13:29:06+02:00</domain:upDate>
                        <domain:exDate>2020-07-11</domain:exDate>
                        <domain:authInfo>rvBcaTVq</domain:authInfo>
                     </domain:infData>
                  </domain:newData>
               </domain:updateData>
            </msg>
         </msgQ>
         <trID>
            <clTRID>fmvu004#17-08-14at13:29:27</clTRID>
            <svTRID>ReqID-0000141230</svTRID>
         </trID>
      </response>
</epp>
```

Listing 61: Example of a message about a contact update

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
    <response>
        <result code="1301">
            <msg>Command completed successfully; ack to dequeue</msg>
        </result>
        <msgQ count="1" id="24024414">
            <qDate>2019-07-31T15:36:17+02:00</qDate>
            <msg>
                <contact:updateData xmlns:contact="http://www.nic.cz/xml/epp/contact-
↪1.6"
                 xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.
↪6.6.xsd">
                    <contact:opTRID>ReqID-0001071557</contact:opTRID>
                    <contact:oldData>
                        <contact:infData xmlns:contact="http://www.nic.cz/xml/epp/
↪contact-1.6"
                         xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6␣
↪contact-1.6.6.xsd">
                            <contact:id>TEST-POLL</contact:id>
                            <contact:roid>C0011364592-CZ</contact:roid>
                            <contact:status s="linked">Has relation to other records␣
↪in the registry</contact:status>
                            <contact:postalInfo>
                                <contact:name>Jan Novak</contact:name>
                                <contact:addr>
                                    <contact:street>Narodni trida 1230/12</
↪contact:street>
                                    <contact:city>Praha</contact:city>
                                    <contact:pc>12000</contact:pc>
                                    <contact:cc>CZ</contact:cc>
                                </contact:addr>
                            </contact:postalInfo>
                            <contact:voice>+420.606000048</contact:voice>
                            <contact:email>primary@nic.cz</contact:email>
                            <contact:clID>REG-FRED-A</contact:clID>
                            <contact:crID>REG-FRED-A</contact:crID>
                            <contact:crDate>2019-07-31T15:34:15+02:00</contact:crDate>
                            <contact:disclose flag="1">
                                <contact:addr/>
                            </contact:disclose>
                            <contact:ident type="birthday">1990-06-06</contact:ident>
                        </contact:infData>
                    </contact:oldData>
                    <contact:newData>
                        <contact:infData xmlns:contact="http://www.nic.cz/xml/epp/
↪contact-1.6"
                         xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6␣
↪contact-1.6.6.xsd">
                            <contact:id>TEST-POLL</contact:id>
                            <contact:roid>C0011364592-CZ</contact:roid>
                            <contact:status s="linked">Has relation to other records␣
↪in the registry</contact:status>
```

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```
                            <contact:postalInfo>
                                <contact:name>Zmena Jmena</contact:name>
                                <contact:addr>
                                    <contact:street>Nova adresa 2</contact:street>
                                    <contact:street>Nova druha adresa</contact:street>
                                    <contact:city>Nove Mesto</contact:city>
                                    <contact:pc>143 11</contact:pc>
                                    <contact:cc>CZ</contact:cc>
                                </contact:addr>
                            </contact:postalInfo>
                            <contact:voice>+420.606000048</contact:voice>
                            <contact:email>primary@nic.cz</contact:email>
                            <contact:clID>REG-FRED-A</contact:clID>
                            <contact:crID>REG-FRED-A</contact:crID>
                            <contact:crDate>2019-07-31T15:34:15+02:00</contact:crDate>
                            <contact:upID>REG-FRED-A</contact:upID>
                            <contact:upDate>2019-07-31T15:36:17+02:00</contact:upDate>
                            <contact:disclose flag="1">
                                <contact:addr/>
                            </contact:disclose>
                            <contact:ident type="birthday">1990-06-06</contact:ident>
                        </contact:infData>
                    </contact:newData>
                </contact:updateData>
            </msg>
        </msgQ>
        <trID>
            <clTRID>rtjr004#19-07-31at15:36:22</clTRID>
            <svTRID>ReqID-0001071558</svTRID>
        </trID>
    </response>
</epp>
```

Idle object deletion

Event: An object has been deleted because it had become *obsolete*.

This message type appears in the following object namespaces: `contact`, `nsset`, `keyset`.

`<*:idleDelData>` **(1)** declares the object *namespace and schema*, and contains:

- `<*:id>` **(1)** – the handle of the deleted object as *fredcom:objIDType*.

Listing 62: Example of a message about a deleted idle object

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1301">
         <msg>Command completed successfully; ack to dequeue</msg>
      </result>
      <msgQ count="1" id="19689674">
         <qDate>2017-07-26T18:28:55+02:00</qDate>
         <msg>
```

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```
            <contact:idleDelData xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
             xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.
↪xsd">
               <contact:id>CID-IDLE</contact:id>
            </contact:idleDelData>
         </msg>
      </msgQ>
      <trID>
         <clTRID>cjtp007#17-07-26at18:30:02</clTRID>
         <svTRID>ReqID-0000140927</svTRID>
      </trID>
   </response>
</epp>
```

Domain deletion

Event: A domain has been deleted by the Registry for another reason than expiration.

`<domain:delData>` **(1)** declares the object *namespace and schema*, and contains:

- `<domain:name>` **(1)** – the handle of the deleted object as *eppcom:labelType*,
- `<domain:exDate>` **(1)** – the date of deletion as *xs:date*.

Note: This message type has the same content as domain deletion in *Domain expiration*.

Listing 63: Example of a message about a deleted domain

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1301">
         <msg>Command completed successfully; ack to dequeue</msg>
      </result>
      <msgQ count="1" id="24115160">
         <qDate>2019-07-30T14:43:20+02:00</qDate>
         <msg>
             <domain:delData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
              xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.1.
↪xsd">
                <domain:name>example.cz</domain:name>
                <domain:exDate>2019-07-30</domain:exDate>
             </domain:delData>
         </msg>
      </msgQ>
      <trID>
         <clTRID>budt002#19-07-30at14:48:59</clTRID>
         <svTRID>ReqID-0001043237</svTRID>
      </trID>
   </response>
</epp>
```

11.5.6 Create

Commands for registrations of new objects.

Create domain

A domain create *command* is used to register a new domain.

The contact create command is a `create` element in the `domain` namespace (`http://www.nic.cz/xml/epp/domain-1.4`).

The command must be contained in the `<create>` command type.

Command element structure

The `<domain:create>` element must declare the `domain` *namespace and schema*, and it must contain the following child elements:

- `<domain:name>` **(1)** – a domain name as *eppcom:labelType*,
- `<domain:period>` **(0..1)** – the registration period as *domain:pLimitType*,
  - `@unit` **(R)** – the unit the period is counted in; it can be either `m` for months or `y` for years.

  If omitted, the domain expiration is set to the minimum. (FRED's default: 1 year)
- `<domain:nsset>` **(0..1)** – an nsset handle to associate as *fredcom:objIDType*,
- `<domain:keyset>` **(0..1)** – the keyset handle to associate as *fredcom:objIDType*,
- `<domain:registrant>` **(1)** – the domain owner handle as *fredcom:objIDType*,

  Note: Since `fred-rifd@2.71.0`, it is server-configurable to restrict presence and format of the telephone number.

  See configuration *here*

- `<domain:admin>` **(0..n)** – an administrative contact handle as *fredcom:objIDType*,
- `<domain:authInfo>` **(0..1)** – authorization information (AuthInfo) as *fredcom:authInfoType*; the AuthInfo will be generated by the server.

Important: Since FRED 2.48.0, in accordance with RFC 9154, `create` with nonempty AuthInfo is forbidden. Empty AuthInfo (meaning Authinfo is present, but empty) is allowed.

Listing 64: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <create>
         <domain:create xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
```

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```
            <domain:name>example.cz</domain:name>
            <domain:nsset>NSSET-MYNSSET</domain:nsset>
            <domain:registrant>MYOWN</domain:registrant>
            <domain:admin>ADMIN1</domain:admin>
         </domain:create>
      </create>
      <clTRID>zbdm002#17-08-09at12:31:47</clTRID>
   </command>
</epp>
```

Listing 65: FRED-eppic equivalent

```
> create-domain --name=thisdomain.cz --registrant=CID-MYOWN --admins-1=CID-ADMIN1 --
↪nsset=NID-MYNSSET
```

ENUM extension

The `<domain:create>` element is used in the same way as described above.

The *command extension* can be used to set the validation and/or the publish flag of an ENUM domain at the time of creation. Otherwise you can set the validation and/or publish flag later with the *domain:update*, or you can change the validation when renewing the domain with the *domain:renew* command.

The command's `<extension>` element must contain a **single** `<enumval:create>` element which declares the `enumval` namespace (`http://www.nic.cz/xml/epp/enumval-1.2`) and *schema* and contains:

- `<enumval:valExDate>` **(0..1)** – a validation expiration date as *xs:date*; the date must range from `tomorrow` to `today + max. validation period`,
- `<enumval:publish>` **(0..1)** – a setting for publishing the ENUM domain in a public directory as *xs:boolean*; `true` – display, `false` – hide (default).

Listing 66: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <create>
         <domain:create xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>2.1.1.7.4.5.2.2.2.0.2.4.e164.arpa</domain:name>
            <domain:period unit="y">1</domain:period>
            <domain:registrant>MYOWN</domain:registrant>
         </domain:create>
      </create>
      <extension>
         <enumval:create xmlns:enumval="http://www.nic.cz/xml/epp/enumval-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/enumval-1.2 enumval-1.2.0.xsd
↪">
            <enumval:valExDate>2018-02-09</enumval:valExDate>
         </enumval:create>
      </extension>
      <clTRID>zbdm003#17-08-09at12:39:34</clTRID>
```

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```
   </command>
</epp>
```

Listing 67: FRED-eppic equivalent

```
> create-domain --name=2.1.1.7.4.5.2.2.2.0.2.4.e164.arpa --registrant=MYOWN --period.
↪length=1 --period.unit=YEAR --enum.val-ex-date=2018-02-09
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<domain:creData>` which declares the `domain` *namespace and schema* and it contains the following child elements:

- `<domain:name>` **(1)** – the domain name as *eppcom:labelType*,
- `<domain:crDate>` **(1)** – the *timestamp* of creation as *xs:dateTime*,
- `<domain:exDate>` **(0..1)** – the date of expiration as *xs:date*.

Listing 68: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <domain:creData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>example.cz</domain:name>
            <domain:crDate>2017-08-09T12:31:49+02:00</domain:crDate>
            <domain:exDate>2018-08-09</domain:exDate>
         </domain:creData>
      </resData>
      <trID>
         <clTRID>zbdm002#17-08-09at12:31:47</clTRID>
         <svTRID>ReqID-0000141086</svTRID>
      </trID>
   </response>
</epp>
```

ENUM extension

Response extension is not used in reply to this command.

Create contact

A contact create *command* is used to register a new contact.

The contact create command is a `create` element in the `contact` namespace (`http://www.nic.cz/xml/epp/contact-1.6`).

The command must be contained in the `<create>` command type.

Command element structure

The `<contact:create>` element must declare the `contact` *namespace and schema*, and it must contain the following child elements:

- `<contact:id>` **(1)** – the contact handle as *fredcom:objIDCreateType*.
- **`<contact:postalInfo>` (1) – contact's postal information:**
  - `<contact:name>` **(1)** – personal name as *contact:postalLineType*,
  - `<contact:org>` **(0..1)** – organization name as *contact:optPostalLineType*,
  - **`<contact:addr>` (1) – address:**
    - `<contact:street>` **(1..3)** – street line 1–3 as *contact:optPostalLineType*,
    - `<contact:city>` **(1)** – city as *contact:postalLineType*,
    - `<contact:sp>` **(0..1)** – state or province as *contact:optPostalLineType*,
    - `<contact:pc>` **(1)** – postal code as *contact:pcType*,
    - `<contact:cc>` **(1)** – country code as *contact:ccType*,
- `<contact:voice>` **(0..1)** – telephone number as *contact:e164StringType*,

  Note: Since `fred-rifd@2.70.0`, it is server-configurable to restrict presence and format of the telephone number.

  See configuration *here*

- `<contact:fax>` **(0..1)** – fax number as *contact:e164StringType*,
- `<contact:email>` **(1)** – email address(es) as *contact:emailCommaListType*,
- `<contact:authInfo>` **(0..1)** – authorization information (AuthInfo) as *fredcom:authInfoType*; the AuthInfo will be generated by the server,
- **`<contact:disclose>` (0..1) – contact information disclosure settings:**
  - `@flag` **(R)** – disclose flag as a *xs:boolean*: `0` – hide listed items, `1` – publish listed items,
  - `<contact:voice/>` **(0..1)** – telephone disclosure setting as an empty element,
  - `<contact:fax/>` **(0..1)** – fax disclosure setting as an empty element,
  - `<contact:email/>` **(0..1)** – email disclosure setting as an empty element,

  - `<contact:vat/>` **(0..1)** – VAT number disclosure setting as an empty element,
  - `<contact:ident/>` **(0..1)** – identity document disclosure setting as an empty element,
  - `<contact:notifyEmail/>` **(0..1)** – notification email disclosure setting as an empty element.

Note: Omitted items will be set by the server according to its disclosure policy.

Whether the new disclosure settings will have an effect, also depends on the server's policy.

If the whole `<contact:disclose>` element is omitted, then the dislosure preference of all attributes is set according to the server disclosure policy.

See also *Policies & rules of disclosure*, which contain examples of behaviour.

- `<contact:vat>` **(0..1)** – *VAT*-payer identifier as a *contact:vatT*,
- **`<contact:ident>` (0..1) – identity-document identification:**
  - `@type` **(R)** – the type of the identity document as one of values: `op` (identity card number), `passport` (passport number), `mpsv` (number from the Ministry of Labour and Social Affairs), `ico` (company number), `birthday` (the date of birth),
  - element content: an identification number as a *contact:identValueT*,
- `<contact:notifyEmail>` **(0..1)** – notification email address(es) as *contact:emailUpdCommaListType*.

Important: Since FRED 2.48.0, in accordance with RFC 9154, `create` with nonempty AuthInfo is forbidden. Empty AuthInfo (meaning Authinfo is present, but empty) is allowed.

Listing 69: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <create>
         <contact:create xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd
↪">
            <contact:id>MYCONTACT</contact:id>
            <contact:postalInfo>
               <contact:name>John Doe</contact:name>
               <contact:org>Company X Ltd.</contact:org>
               <contact:addr>
                  <contact:street>Street 123</contact:street>
                  <contact:city>City</contact:city>
                  <contact:pc>12300</contact:pc>
                  <contact:cc>CZ</contact:cc>
               </contact:addr>
            </contact:postalInfo>
            <contact:voice>+420.222123456</contact:voice>
            <contact:email>john@doe.cz</contact:email>
            <contact:disclose flag="1">
               <contact:fax/>
               <contact:vat/>
               <contact:ident/>
```

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```
            <contact:voice/>
            <contact:notifyEmail/>
         </contact:disclose>
         <contact:vat>1312112029</contact:vat>
         <contact:notifyEmail>notify-john@doe.cz</contact:notifyEmail>
      </contact:create>
   </create>
   <clTRID>ckmf002#17-07-28at12:11:37</clTRID>
</command>
</epp>
```

Listing 70: FRED-eppic equivalent

```
> create-contact --id=MYCONTACT --postal-info.name='John Doe' --email=john@doe.cz --
↪postal-info.addr.street-1='Street 123' --postal-info.addr.city=City --postal-info.
↪addr.pc=12300 --postal-info.addr.cc=CZ --postal-info.org='Company X Ltd.' --
↪voice=+420.222123456 --vat=1312112029  --notify-email=notify-john@doe.cz --
↪disclose=fax,vat,ident,voice,notifyEmail
```

Mailing address extension

The `<contact:create>` element is used in the same way as described above.

The *command extension* can be used to set the mailing address at the time of creation. Otherwise you can set the mailing address later with the *contact:update*.

The command's `<extension>` element must contain a **single** `<extra-addr:create>` element which declares the `extra-addr` namespace (`http://www.nic.cz/xml/epp/extra-addr-1.0`) and *schema* and contains:

- **`<extra-addr:mailing>` (1) – mailing address container:**
  - **`<extra-addr:addr>` (1) – address:**
    - `<extra-addr:street>` **(1..3)** – street line 1–3 as *extra-addr:postalLineType*,
    - `<extra-addr:city>` **(1)** – city as *extra-addr:postalLineType*,
    - `<extra-addr:sp>` **(0..1)** – state or province as *extra-addr:postalLineType*,
    - `<extra-addr:pc>` **(1)** – postal code as *extra-addr:pcType*,
    - `<extra-addr:cc>` **(1)** – country code as *extra-addr:ccType*.

Listing 71: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <create>
         <contact:create xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd
↪">
            <contact:id>EXTRAADDR</contact:id>
            <contact:postalInfo>
               <contact:name>Foo Bar</contact:name>
```

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```
               <contact:addr>
                  <contact:street>Kratka 42</contact:street>
                  <contact:city>Praha</contact:city>
                  <contact:pc>11150</contact:pc>
                  <contact:cc>CZ</contact:cc>
               </contact:addr>
            </contact:postalInfo>
            <contact:email>foobar@nic.cz</contact:email>
         </contact:create>
      </create>
      <extension>
         <extra-addr:create
          xmlns:extra-addr="http://www.nic.cz/xml/epp/extra-addr-1.0"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/extra-addr-1.0 extra-addr-1.0.
↪0.xsd">
            <extra-addr:mailing>
               <extra-addr:addr>
                  <extra-addr:street>Dlouha 24</extra-addr:street>
                  <extra-addr:city>Lysa nad Labem</extra-addr:city>
                  <extra-addr:pc>28922</extra-addr:pc>
                  <extra-addr:cc>CZ</extra-addr:cc>
               </extra-addr:addr>
            </extra-addr:mailing>
         </extra-addr:create>
      </extension>
      <clTRID>hehr010#15-08-25at17:03:10</clTRID>
   </command>
</epp>
```

Listing 72: FRED-eppic equivalent

```
> create-contact --id=EXTRAADDR --email=foobar@nic.cz --postal-info.name='Foo Bar' --
↪postal-info.addr.street-1='Kratka 42' --postal-info.addr.city=Praha --postal-info.
↪addr.pc=11150 --postal-info.addr.cc=CZ --mailing.addr.street-2="Dlouha 24" --
↪mailing.addr.city="Lysa nad Labem" --mailing.addr.pc=28922 --mailing.addr.cc=CZ
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<contact:creData>` which declares the `contact` *namespace and schema*, and it contains the following child elements:

- `<contact:id>` **(1)** – the contact handle as *fredcom:objIDType*,
- `<contact:crDate>` **(1)** – the *timestamp* of creation as *xs:dateTime*.

Listing 73: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
```

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```
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <contact:creData xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd
↪">
            <contact:id>MYCONTACT</contact:id>
            <contact:crDate>2017-07-28T12:11:43+02:00</contact:crDate>
         </contact:creData>
      </resData>
      <trID>
         <clTRID>ckmf002#17-07-28at12:11:37</clTRID>
         <svTRID>ReqID-0000140980</svTRID>
      </trID>
   </response>
</epp>
```

Mailing address extension

Response extension is not used in reply to this command.

Create nsset

A nsset create *command* is used to register a new nsset.

The nsset create command is a `create` element in the `nsset` namespace (`http://www.nic.cz/xml/epp/nsset-1.2`).

The command must be contained in the `<create>` command type.

Command element structure

The `<nsset:create>` element must declare the `nsset` *namespace and schema*, and it must contain the following child elements:

- `<nsset:id>` **(1)** – the nsset handle as *fredcom:objIDCreateType*.
- **`<nsset:ns>` (1..10) – a nameserver given by:**
  - `<nsset:name>` **(1)** – the nameserver hostname as *eppcom:labelType*,
  - `<nsset:addr>` **(0..n)** – the namesever's IP address(es) as *nsset:addrStringType*,
- `<nsset:tech>` **(1..10)** – a handle of a contact that will be assigned as a technical contact as *fredcom:objIDType*,
- `<nsset:authInfo>` **(0..1)** – authorization information (AuthInfo) as *fredcom:authInfoType*; the AuthInfo will be generated by the server,
- `<nsset:reportlevel>` **(0..1)** – the default highest level of technical checks to be performed as *nsset:reportlevelType*.

Listing 74: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <create>
         <nsset:create xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd">
            <nsset:id>NSSET-ANSSET</nsset:id>
            <nsset:ns>
               <nsset:name>ns1.exapmle.cz</nsset:name>
            </nsset:ns>
            <nsset:ns>
               <nsset:name>nameserver-example.cz</nsset:name>
            </nsset:ns>
            <nsset:ns>
               <nsset:addr>217.31.207.130</nsset:addr>
               <nsset:addr>217.31.207.131</nsset:addr>
            </nsset:ns>
            <nsset:tech>TECH1</nsset:tech>
            <nsset:reportlevel>1</nsset:reportlevel>
         </nsset:create>
      </create>
      <clTRID>pvlt002#17-08-09at15:52:40</clTRID>
   </command>
</epp>
```

Listing 75: FRED-eppic equivalent

```
> create-nsset --id=NSSET-ANSSET --nss-1.name=ns1.example.cz --nss-2.name=nameserver-
↪example.cz --nss-1.addrs-1=217.31.207.130 --nss-2.addrs-2=217.31.207.131 --tech-
↪1=TECH1 --reportlevel=1
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<nsset:creData>` which declares the `nsset` *namespace and schema*, and it contains the following child elements:

- `<nsset:id>` **(1)** – the nsset handle as *fredcom:objIDType*,
- `<nsset:crDate>` **(1)** – the *timestamp* of creation as *xs:dateTime*.

Important: Since FRED 2.48.0, in accordance with RFC 9154, `create` with nonempty AuthInfo is forbidden. Empty AuthInfo (meaning Authinfo is present, but empty) is allowed.

Listing 76: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <nsset:creData xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd">
            <nsset:id>NSSET-ANSSET</nsset:id>
            <nsset:crDate>2017-08-09T15:53:15+02:00</nsset:crDate>
         </nsset:creData>
      </resData>
      <trID>
         <clTRID>pvlt002#17-08-09at15:52:40</clTRID>
         <svTRID>ReqID-0000141092</svTRID>
      </trID>
   </response>
</epp>
```

Create keyset

A keyset create *command* is used to register a new keyset.

The keyset create command is a `create` element in the `keyset` namespace (`http://www.nic.cz/xml/epp/keyset-1.3`).

The command must be contained in the `<create>` command type.

Command element structure

The `<keyset:create>` element must declare the `keyset` *namespace and schema*, and it must contain the following child elements:

- `<keyset:id>` **(1)** – the keyset handle as *fredcom:objIDCreateType*.
- `<keyset:dnskey>` **(1..10)** – a DNS key (*see object's attributes for allowed values*) given by:
  - `<keyset:flags>` **(1)** – flags as *xs:unsignedShort*,
  - `<keyset:protocol>` **(1)** – protocol as *xs:unsignedByte*,
  - `<keyset:alg>` **(1)** – algorithm as *xs:unsignedByte*,
  - `<keyset:pubKey>` **(1)** – public key as *keyset:keyT*,
- `<keyset:tech>` **(1..10)** – a handle of a contact that will be assigned as a technical contact as *fredcom:objIDType*,
- `<keyset:authInfo>` **(0..1)** – authorization information (AuthInfo) as *fredcom:authInfoType*; the AuthInfo will be generated by the server.

Listing 77: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <create>
         <keyset:create xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.xsd">
            <keyset:id>KEYSET-AKEYSET</keyset:id>
            <keyset:dnskey>
               <keyset:flags>257</keyset:flags>
               <keyset:protocol>3</keyset:protocol>
               <keyset:alg>5</keyset:alg>
               <keyset:pubKey>AwEAAddt2AkLfYGKgiEZB5SmIF8EvrjxNMH6HtxWEA4RJ9Ao6LCWheg8
↪</keyset:pubKey>
            </keyset:dnskey>
            <keyset:dnskey>
               <keyset:flags>257</keyset:flags>
               <keyset:protocol>3</keyset:protocol>
               <keyset:alg>5</keyset:alg>
               <keyset:pubKey>AwEAAddt2AkLfYGKgiEZB5SmIF8EvrjxNMH6HtxWEA4RJ9Ao6LCWheg9
↪</keyset:pubKey>
            </keyset:dnskey>
            <keyset:tech>TECH2</keyset:tech>
         </keyset:create>
      </create>
      <clTRID>dsce002#17-08-09at16:13:30</clTRID>
   </command>
</epp>
```

Listing 78: FRED-eppic equivalent

```
> create-keyset --id=KEYSET-AKEYSET --dnskeys-1.flags=257 --dnskeys-1.protocol=3 --
↪dnskeys-1.alg=5 --dnskeys-1.pub-
↪key=AwEAAddt2AkLfYGKgiEZB5SmIF8EvrjxNMH6HtxWEA4RJ9Ao6LCWheg8 --dnskeys-2.flags=257 -
↪-dnskeys-2.protocol=3 --dnskeys-2.alg=5 --dnskeys-2.pub-
↪key=AwEAAddt2AkLfYGKgiEZB5SmIF8EvrjxNMH6HtxWEA4RJ9Ao6LCWheg9 --tech-1=TECH2
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<keyset:creData>` which declares the `keyset` *namespace and schema*, and it contains the following child elements:

- `<keyset:id>` **(1)** – the keyset handle as *fredcom:objIDType*,
- `<keyset:crDate>` **(1)** – the *timestamp* of creation as *xs:dateTime*.

Important: Since FRED 2.48.0, in accordance with RFC 9154, `create` with nonempty AuthInfo is forbidden. Empty AuthInfo (meaning Authinfo is present, but empty) is allowed.

Listing 79: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <keyset:creData xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.xsd">
            <keyset:id>KEYSET-AKEYSET</keyset:id>
            <keyset:crDate>2017-08-09T16:13:50+02:00</keyset:crDate>
         </keyset:creData>
      </resData>
      <trID>
         <clTRID>dsce002#17-08-09at16:13:30</clTRID>
         <svTRID>ReqID-0000141095</svTRID>
      </trID>
   </response>
</epp>
```

11.5.7 Update

Commands for altering object details.

Update domain

A domain update *command* is used to alter details of a domain.

The domain update command is an `update` element in the `domain` namespace (`http://www.nic.cz/xml/epp/domain-1.4`).

The command must be contained in the `<update>` command type.

Command element structure

The `<domain:update>` element must declare the `domain` namespace and *schema* and it must contain the following child elements:

- `<domain:name>` **(1)** – the domain name as *eppcom:labelType*,
- `<domain:add>` **(0..1)** – a list of contact handles that will be added to the list of administration contacts of this domain:
  - `<domain:admin>` **(0..n)** – a contact handle as *fredcom:objIDType*,
- `<domain:rem>` **(0..1)** – a list of contact handles that will be removed from the list of administration contacts of this domain:
  - `<domain:admin>` **(0..n)** – a contact handle as *fredcom:objIDType*,
- `<domain:chg>` **(0..1)** – the new values of domain attributes that will be changed by this update. Omitted attributes will remain unchanged.

– `<domain:nsset>` **(0..1)** – change the domain's nsset by its handle as *fredcom:objIDChgType*; if the element is empty, the current nsset will be unlinked from the domain,

> **Note:** During an update of domain's nsset, the following rules for nsset and keyset apply:
>
> * If a new nameserver set is assigned to a domain, the keyset is automatically removed.
> * If a nameserver set is removed from a domain, the keyset is automatically removed as well.
> * If the request to change the nameserver set also includes repeating the keyset identifier, it remains set.

– `<domain:keyset>` **(0..1)** – change the domain's keyset by its handle as *fredcom:objIDChgType*; if the element is empty, the current keyset will be unlinked from the domain,

– `<domain:registrant>` **(0..1)** – change the domain's registrant by its handle as *fredcom:objIDType*,

> **Note:** Since `fred-rifd@2.71.0`, it is server-configurable to restrict presence and format of the telephone number.
>
> See configuration *here*

– `<domain:authInfo>` **(0..1)** – change the domain's authorization information (AuthInfo) as *fredcom:authInfoType*.

Important: Since FRED 2.48.0, server can be configured so that the AuthInfo must meet some basic requirements, such as minimum length (which can be configured).

```
[registry]
# Minimal length of authinfo
authinfo_length_min = 8
```

Calling update object with empty AuthInfo leads to removal of all object AuthInfos.

Listing 80: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <update>
         <domain:update xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>example.cz</domain:name>
            <domain:add>
               <domain:admin>ADMIN2</domain:admin>
            </domain:add>
            <domain:rem>
               <domain:admin>ADMIN1</domain:admin>
            </domain:rem>
            <domain:chg>
               <!-- do nothing with nsset (absent element) ~ NULL -->
               <!-- remove keyset ~ empty string -->
```

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```
                <domain:keyset/>
                <!-- change registrant -->
                <domain:registrant>MYOWN</domain:registrant>
             </domain:chg>
          </domain:update>
       </update>
       <clTRID>uafh003#17-07-18at10:45:41</clTRID>
    </command>
</epp>
```

Listing 81: FRED-eppic equivalent

```
> update-domain --name=example.cz --add-1=ADMIN2 --rem-1=ADMIN1 --registrant=MYOWN --
↪keyset=''
```

ENUM extension

The `<domain:update>` element is used in the same way as described above.

The *command extension* can be used to change the validation of an ENUM domain and/or its publish flag.

The command's `<extension>` element must contain a **single** `<enumval:update>` element which declares the `enumval` namespace (`http://www.nic.cz/xml/epp/enumval-1.2`) and *schema* and contains:

- `<enumval:valExDate>` **(0..1)** – a new validation expiration date as *xs:date*; the new date must be within range – see *the explanation in RenewDomain*,
- `<enumval:publish>` **(0..1)** – a new setting for publishing the ENUM domain in a public directory as *xs:boolean*; `true` – display, `false` – hide.

Listing 82: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <update>
         <domain:update xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>1.1.1.7.4.5.2.2.2.0.2.4.e164.arpa</domain:name>
         </domain:update>
      </update>
      <extension>
         <enumval:update xmlns:enumval="http://www.nic.cz/xml/epp/enumval-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/enumval-1.2 enumval-1.2.0.xsd
↪">
            <enumval:chg>
               <enumval:valExDate>2018-01-02</enumval:valExDate>
            </enumval:chg>
         </enumval:update>
      </extension>
      <clTRID>cant003#17-07-18at10:49:42</clTRID>
   </command>
</epp>
```

Listing 83: FRED-eppic equivalent

```
> update-domain --name=1.1.1.7.4.5.2.2.2.0.2.4.e164.arpa --enum.val-ex-date=2018-01-02
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

ENUM extension

Response extension is not used in reply to this command.

Update contact

A contact update *command* is used to alter details of a contact.

The contact update command is an `update` element in the `contact` namespace (`http://www.nic.cz/xml/epp/contact-1.6`).

The command must be contained in the `<update>` command type.

Command element structure

The `<contact:update>` element must declare the `contact` namespace and *schema* and it must contain the following child elements:

- `<contact:id>` **(1)** – the contact handle as *fredcom:objIDType*.
- `<contact:chg>` **(0..1)** – comprises the new values of contact attributes that will be changed by this update. Omitted attributes will remain unchanged.
  - **`<contact:postalInfo>` (0..1) – change contact's postal information:**
    - `<contact:name>` **(0..1)** – personal name as *contact:postalLineType*,
    - `<contact:org>` **(0..1)** – organization name as *contact:optPostalLineType*,
    - **`<contact:addr>` (0..1) – address:**
      - `<contact:street>` **(1..3)** – street line 1–3 as *contact:optPostalLineType*,
      - `<contact:city>` **(1)** – city as *contact:postalLineType*,
      - `<contact:sp>` **(0..1)** – state or province as *contact:optPostalLineType*,
      - `<contact:pc>` **(1)** – postal code as *contact:pcType*,
      - `<contact:cc>` **(1)** – country code as *contact:ccType*,
  - `<contact:voice>` **(0..1)** – change telephone number as *contact:e164StringType*,

> **Note:** Since `fred-rifd@2.70.0`, it is server-configurable to restrict presence and format of the telephone number.

See configuration *here*

- `<contact:fax>` **(0..1)** – change fax number as *contact:e164StringType*,
- `<contact:email>` **(0..1)** – change email as *contact:emailCommaListType*,
- `<contact:authInfo>` **(0..1)** – change authorization information (AuthInfo) as *fredcom:authInfoType*
- **`<contact:disclose>` (0..1) – change contact information disclosure settings:**
  - `@flag` **(R)** – disclose flag as a *xs:boolean*: `0` – hide listed items, `1` – publish listed items,
  - `<contact:addr/>` **(0..1)** – address disclosure setting (applies to all addresses) as an empty element,
  - `<contact:voice/>` **(0..1)** – telephone disclosure setting as an empty element,
  - `<contact:fax/>` **(0..1)** – fax disclosure setting as an empty element,
  - `<contact:email/>` **(0..1)** – email disclosure setting as an empty element,
  - `<contact:vat/>` **(0..1)** – VAT number disclosure setting as an empty element,
  - `<contact:ident/>` **(0..1)** – identity document disclosure setting as an empty element,
  - `<contact:notifyEmail/>` **(0..1)** – notification email disclosure setting as an empty element.

  Note: Omitted items will be reset by the server according to its disclosure policy.

  Whether the new disclosure settings will have an effect, also depends on the server's policy.

  If the whole `<contact:disclose>` element is omitted, it means no change of the disclosure preference.

  See also *Policies & rules of disclosure*, which contain examples of behaviour.
- `<contact:vat>` **(0..1)** – change *VAT*-payer identifier as a *contact:vatT*,
- **`<contact:ident>` (0..1) – change identity-document identification:**
  - `@type` **(R)** – the type of the identity document as one of values: `op` (identity card number), `passport` (passport number), `mpsv` (number from the Ministry of Labour and Social Affairs), `ico` (company number), `birthday` (the date of birth),
  - element content: an identification number as a *contact:identValueT*,
- `<contact:notifyEmail>` **(0..1)** – change notification email as *contact:emailUpdCommaListType*.

Listing 84: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <update>
         <contact:update xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd
↪">
            <contact:id>MYOWN</contact:id>
            <contact:chg>
               <contact:voice>+420.222333444</contact:voice>
```

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```
                <contact:disclose flag="1">
                   <contact:voice/>
                </contact:disclose>
             </contact:chg>
          </contact:update>
       </update>
       <clTRID>rxzw005#17-07-18at12:03:30</clTRID>
    </command>
</epp>
```

Listing 85: FRED-eppic equivalent

```
> update-contact --id=MYOWN --voice=+420.222333444 --disclose=voice
```

Mailing address extension

The <contact:update> element is used in the same way as described above.

The *command extension* can be used to set or remove the mailing address.

The command's <extension> element must contain a **single** <extra-addr:update> element which declares the extra-addr namespace (http://www.nic.cz/xml/epp/extra-addr-1.0) and *schema* and contains:

- <extra-addr:set> **(0..1)** – a new address will be set; if the contact already has a mailing address, it will be replaced:
  - **<extra-addr:mailing> (1) – mailing address container:**
    - **<extra-addr:addr> (1) – address:**
      - <extra-addr:street> **(1..3)** – street line 1–3 as *extra-addr:postalLineType*,
      - <extra-addr:city> **(1)** – city as *extra-addr:postalLineType*,
      - <extra-addr:sp> **(0..1)** – state or province as *extra-addr:postalLineType*,
      - <extra-addr:pc> **(1)** – postal code as *extra-addr:pcType*,
      - <extra-addr:cc> **(1)** – country code as *extra-addr:ccType*,
- **<extra-addr:rem> (0..1) – an address will be removed from the contact:**
  - <extra-addr:mailing/> **(1)** – the mailing address must be specified as an empty element.

Important: Since FRED 2.48.0, server can be configured so that the AuthInfo must meet some basic requirements, such as minimum length (which can be configured).

```
[registry]
# Minimal length of authinfo
authinfo_length_min = 8
```

Calling update object with empty AuthInfo leads to removal of all object AuthInfos.

Listing 86: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <update>
         <contact:update
          xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd
↪">
            <contact:id>EXTRAADDR</contact:id>
            <contact:chg>
               <contact:voice>+420.000000001</contact:voice>
               <contact:notifyEmail>foobar-notify@nic.cz</contact:notifyEmail>
            </contact:chg>
         </contact:update>
      </update>
      <extension>
         <extra-addr:update
          xmlns:extra-addr="http://www.nic.cz/xml/epp/extra-addr-1.0"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/extra-addr-1.0 extra-addr-1.0.
↪0.xsd">
            <extra-addr:set>
               <extra-addr:mailing>
                  <extra-addr:addr>
                     <extra-addr:street>Kratka 24</extra-addr:street>
                     <extra-addr:city>Praha</extra-addr:city>
                     <extra-addr:pc>11150</extra-addr:pc>
                     <extra-addr:cc>CZ</extra-addr:cc>
                  </extra-addr:addr>
               </extra-addr:mailing>
            </extra-addr:set>
         </extra-addr:update>
      </extension>
      <clTRID>zbab002#15-08-25at17:37:28</clTRID>
   </command>
</epp>
```

Listing 87: FRED-eppic equivalent

```
> update-contact --id=EXTRAADDR --voice=+420.000000001 --notify-email=foobar-
↪notify@nic.cz --mailing.addr.street-1='Kratka 24' --mailing.addr.city=Praha --
↪mailing.addr.pc=11150 --mailing.addr.cc=CZ
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

Update nsset

A nsset update *command* is used to alter details of an nsset.

The nsset update command is an `update` element in the `nsset` namespace (`http://www.nic.cz/xml/epp/nsset-1.2`).

The command must be contained in the `<update>` command type.

Command element structure

The `<nsset:update>` element must declare the `nsset` namespace and *schema* and it must contain the following child elements:

- `<nsset:id>` **(1)** – an nsset handle as *fredcom:objIDType*,
- `<nsset:add>` **(0..1)** – a list of items that will be added to this nsset:
  - **`<nsset:ns>` (0..10) – a nameserver given by:**
    - `<nsset:name>` **(1)** – a nameserver hostname as *eppcom:labelType*,
    - `<nsset:addr>` **(0..n)** – a namesever's IP address as *nsset:addrStringType*,
  - `<nsset:tech>` **(0..n)** – a handle of a contact that will be added as a technical contact as *fredcom:objIDType*,
- `<nsset:rem>` **(0..1)** – a list of items that will be removed from this nsset:
  - `<nsset:name>` **(0..n)** – a nameserver hostname as *eppcom:labelType*,
  - `<nsset:tech>` **(0..n)** – a handle of nsset's technical contact as *fredcom:objIDType*,
- `<nsset:chg>` **(0..1)** – the new values of nsset attributes that will be replaced by this update. Omitted attributes will remain unchanged.
  - `<nsset:authInfo>` **(0..1)** – change the nsset's authorization information (AuthInfo) as *fredcom:authInfoType*,
  - `<nsset:reportlevel>` **(0..1)** – change the level of technical checks to be reported as *nsset:reportlevelType*.

Important: Since FRED 2.48.0, server can be configured so that the AuthInfo must meet some basic requirements, such as minimum length (which can be configured).

```
[registry]
# Minimal length of authinfo
authinfo_length_min = 8
```

Calling update object with empty AuthInfo leads to removal of all object AuthInfos.

Listing 88: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<command>
   <update>
      <nsset:update xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd">
         <nsset:id>NSSET-MYNSSET</nsset:id>
         <nsset:add>
            <nsset:ns>
               <nsset:name>ns.example.cz</nsset:name>
               <nsset:addr>217.31.207.130</nsset:addr>
               <nsset:addr>217.31.207.131</nsset:addr>
            </nsset:ns>
            <nsset:tech>CID-TECH2</nsset:tech>
         </nsset:add>
         <nsset:rem>
            <nsset:name>nameserver-example.cz</nsset:name>
            <nsset:tech>TECH1</nsset:tech>
         </nsset:rem>
         <nsset:chg>
            <nsset:reportlevel>4</nsset:reportlevel>
         </nsset:chg>
      </nsset:update>
   </update>
   <clTRID>kgev002#17-07-18at15:38:08</clTRID>
</command>
</epp>
```

Listing 89: FRED-eppic equivalent

```
> update-nsset --id=NSSET-MYNSSET --rem-ns-1=nameserver-example.cz --rem-tech-1=TECH1␣
↪--add-ns-1.name=ns.example.cz --add-ns-1.addrs-1=217.31.207.130 --add-ns-1.addrs-
↪2=217.31.207.131 --add-tech-1=TECH2 --reportlevel=4
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

Update keyset

A keyset update *command* is used to alter details of a keyset.

The keyset update command is an `update` element in the `keyset` namespace (`http://www.nic.cz/xml/epp/keyset-1.3`).

The command must be contained in the `<update>` command type.

Command element structure

The `<keyset:update>` element must declare the `keyset` namespace and *schema* and it must contain the following child elements:

- `<keyset:id>` **(1)** – a keyset handle as *fredcom:objIDType*,
- `<keyset:add>` **(0..1)** – a list of items that will be added to this keyset:
  - `<keyset:dnskey>` **(0..10)** – a DNS key (*see object's attributes for allowed values*) given by:
    - `<keyset:flags>` **(1)** – flags as *xs:unsignedShort*,
    - `<keyset:protocol>` **(1)** – protocol as *xs:unsignedByte*,
    - `<keyset:alg>` **(1)** – algorithm as *xs:unsignedByte*,
    - `<keyset:pubKey>` **(1)** – public key as *keyset:keyT*,
  - `<keyset:tech>` **(0..n)** – a handle of a contact that will be added to technical contacts as *fredcom:objIDType*,
- `<keyset:rem>` **(0..1)** – a list of items that will be removed from this keyset:
  - `<keyset:dnskey>` **(0..10)** – a DNS key (*see object's attributes for allowed values*) given by:
    - `<keyset:flags>` **(1)** – flags as *xs:unsignedShort*,
    - `<keyset:protocol>` **(1)** – protocol as *xs:unsignedByte*,
    - `<keyset:alg>` **(1)** – algorithm as *xs:unsignedByte*,
    - `<keyset:pubKey>` **(1)** – public key as *keyset:keyT*,
  - `<keyset:tech>` **(0..n)** – a handle of keyset's technical contact as *fredcom:objIDType*,
- `<keyset:chg>` **(0..1)** – the new values of keyset attributes that will be replaced by this update. Omitted attributes will remain unchanged.

– <keyset:authInfo> **(0..1)** – change the keyset's authorization information (AuthInfo) as *fredcom:authInfoType*.

Important: Since FRED 2.48.0, server can be configured so that the AuthInfo must meet some basic requirements, such as minimum length (which can be configured).

```
[registry]
# Minimal length of authinfo
authinfo_length_min = 8
```

Calling update object with empty AuthInfo leads to removal of all object AuthInfos.

Listing 90: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <update>
         <keyset:update xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
         xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.xsd">
            <keyset:id>KEYSET-MYKEYSET</keyset:id>
            <keyset:add>
               <keyset:dnskey>
                  <keyset:flags>257</keyset:flags>
                  <keyset:protocol>3</keyset:protocol>
                  <keyset:alg>5</keyset:alg>
                  <keyset:pubKey>eGVmbmZrY3lvcXFwamJ6aGt2YXhteXdkc2tjeXBp</
↪keyset:pubKey>
               </keyset:dnskey>
               <keyset:dnskey>
                  <keyset:flags>257</keyset:flags>
                  <keyset:protocol>3</keyset:protocol>
                  <keyset:alg>5</keyset:alg>
                  <keyset:pubKey>aXN4Y2lpd2ZicWtkZHF4dnJyaHVtc3BreXN6ZGZy</
↪keyset:pubKey>
               </keyset:dnskey>
               <keyset:tech>TECH2</keyset:tech>
            </keyset:add>
            <keyset:rem>
               <keyset:tech>TECH1</keyset:tech>
            </keyset:rem>
            <keyset:chg>
               <keyset:authInfo>aBcD1234</keyset:authInfo>
            </keyset:chg>
         </keyset:update>
      </update>
      <clTRID>pkxv003#17-07-20at20:04:32</clTRID>
   </command>
</epp>
```

Listing 91: FRED-eppic equivalent

```
> update-keyset --id=KEYSET-AKEYSET --add-dnskey-1.flags=257 --add-dnskey-1.
↪protocol=3 --add-dnskey-1.alg=5 --add-dnskey-1.pub-
↪key=eGVmbmZrY3lvcXFwamJ6aGt2YXhteXdkc2tjeXBp --add-dnskey-2.flags=257 --add-dnskey-
↪2.protocol=3 --add-dnskey-2.alg=5 --add-dnskey-2.pub-
↪key=aXN4Y2lpd2ZicWtkZHF4dnJyaHVtc3BreXN6ZGZy --add-tech-1=TECH2 --rem-tech-1=TECH1 -
↪-auth-info=aBcD1234
```

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Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

11.5.8 Transfer

Commands for object transfers. See also *Object transfer*.

Transfer domain

A domain transfer *command* is used to take over sponsorship of a domain.

An AuthInfo (in role of transfer password) must be provided for authorization. It can be the AuthInfo of:

- the domain,
- the domain owner contact, or
- an administrative contact of the domain.

A new AuthInfo is generated for the domain by the server after a successful transfer.

The domain transfer command is a `transfer` element in the `domain` namespace (`http://www.nic.cz/xml/epp/domain-1.4`).

The command must be contained in the `<transfer>` command type. The command type must specify the request operation (`@op = 'request'`).

Command element structure

The `<domain:transfer>` element must declare the `domain` namespace and *schema* and it must contain the following child elements:

- `<domain:name>` **(1)** – a domain name as *eppcom:labelType*,
- `<domain:authInfo>` **(1)** – the authorization information (AuthInfo for short, in role of transfer password) as *fredcom:authInfoType*.

Listing 92: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<command>
   <transfer op="request">
      <domain:transfer xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
        <domain:name>example.cz</domain:name>
        <domain:authInfo>trpwd123</domain:authInfo>
```

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```
      </domain:transfer>
   </transfer>
   <clTRID>zhbf002#17-07-25at16:34:40</clTRID>
</command>
</epp>
```

Listing 93: FRED-eppic equivalent

```
> transfer-domain --name=example.cz --auth-info=trpwd123
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

Transfer contact

A contact transfer *command* is used to take over sponsorship of a contact.

An AuthInfo of the contact (in role of transfer password) must be provided for authorization.

A new AuthInfo is generated for the contact by the server after a successful transfer.

The contact transfer command is a `transfer` element in the `contact` namespace (`http://www.nic.cz/xml/epp/contact-1.6`).

The command must be contained in the `<transfer>` command type. The command type must specify the request operation (`@op = 'request'`).

Command element structure

The `<contact:transfer>` element must declare the `contact` namespace and *schema* and it must contain the following child elements:

- `<contact:id>` **(1)** – the contact handle as *fredcom:objIDType*,
- `<contact:authInfo>` **(1)** – the authorization information (AuthInfo for short, in role of transfer password) as *fredcom:authInfoType*.

Listing 94: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <transfer op="request">
         <contact:transfer xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd
↪">
            <contact:id>TRCONT</contact:id>
            <contact:authInfo>trpwd123</contact:authInfo>
         </contact:transfer>
```

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```
      </transfer>
      <clTRID>gcnd002#17-08-01at13:00:14</clTRID>
   </command>
</epp>
```

Listing 95: FRED-eppic equivalent

```
> transfer-contact --id=TRCONT --auth-info=trpwd123
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

Transfer nsset

A nsset transfer *command* is used to take over sponsorship of an nsset.

An AuthInfo (in role of transfer password) must be provided for authorization. It can be the AuthInfo of:

- the nsset, or
- a technical contact of the nsset.

A new AuthInfo is generated for the nsset by the server after a successful transfer.

The nsset transfer command is a `transfer` element in the `nsset` namespace (`http://www.nic.cz/xml/epp/nsset-1.2`).

The command must be contained in the `<transfer>` command type. The command type must specify the request operation (`@op = 'request'`).

Command element structure

The `<nsset:transfer>` element must declare the `nsset` namespace and *schema* and it must contain the following child elements:

- `<nsset:id>` **(1)** – the nsset handle as *fredcom:objIDType*,
- `<nsset:authInfo>` **(1)** – the authorization information (AuthInfo for short, in role of transfer password) as *fredcom:authInfoType*.

Listing 96: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <transfer op="request">
         <nsset:transfer xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd">
            <nsset:id>NSSET-TRNSSET</nsset:id>
            <nsset:authInfo>trpwd123</nsset:authInfo>
```

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```
        </nsset:transfer>
      </transfer>
      <clTRID>yoie002#17-08-01at13:15:51</clTRID>
   </command>
</epp>
```

Listing 97: FRED-eppic equivalent

```
> transfer-nsset --id=NSSET-TRNSSET --auth-info=trpwd123
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

Transfer keyset

A keyset transfer *command* is used to take over sponsorship of a keyset.

An AuthInfo (in role of transfer password) must be provided for authorization. It can be the AuthInfo of:

- the keyset, or
- a technical contact of the keyset.

A new AuthInfo is generated for the keyset by the server after a successful transfer.

The keyset transfer command is a `transfer` element in the `keyset` namespace (`http://www.nic.cz/xml/epp/keyset-1.3`).

The command must be contained in the `<transfer>` command type. The command type must specify the request operation (`@op = 'request'`).

Command element structure

The `<keyset:transfer>` element must declare the `keyset` namespace and *schema* and it must contain the following child elements:

- `<keyset:id>` **(1)** – the keyset handle as *fredcom:objIDType*,
- `<keyset:authInfo>` **(1)** – the authorization information (AuthInfo for short, in role of transfer password) as *fredcom:authInfoType*.

Listing 98: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <transfer op="request">
         <keyset:transfer xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.xsd">
            <keyset:id>KEYSET-TRKEYSET</keyset:id>
```

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```
            <keyset:authInfo>trpwd123</keyset:authInfo>
         </keyset:transfer>
      </transfer>
      <clTRID>skmb002#17-08-01at13:22:08</clTRID>
   </command>
</epp>
```

Listing 99: FRED-eppic equivalent

```
> transfer-keyset --id=KEYSET-TRKEYSET --auth-info=trpwd123
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

11.5.9 Delete

Commands for object deletion/unregistration.

A deleted object enters the protection period during which it can not be re-registered.

Delete domain

A domain delete *command* is used to delete a domain whose status allows it to be deleted.

The domain delete command is a `delete` element in the `domain` namespace (`http://www.nic.cz/xml/epp/domain-1.4`).

The command must be contained in the `<delete>` command type.

Command element structure

The `<domain:delete>` element must declare the `domain` namespace and *schema* and it must contain the following child element:

- `<domain:name>` **(1)** – the domain name as *eppcom:labelType*.

Listing 100: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
   <delete>
      <domain:delete xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
         <domain:name>example.cz</domain:name>
      </domain:delete>
   </delete>
```

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```
   <clTRID>zuhv011#17-05-05at14:51:57</clTRID>
   </command>
</epp>
```

Listing 101: FRED-eppic equivalent

```
> delete-domain --name=example.cz
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

Delete contact

A contact delete *command* is used to delete a contact whose status allows it to be deleted.

The contact delete command is a `delete` element in the `contact` namespace (`http://www.nic.cz/xml/epp/contact-1.6`).

The command must be contained in the `<delete>` command type.

Command element structure

The `<contact:delete>` element must declare the `contact` namespace and *schema* and it must contain the following child element:

- `<contact:id>` **(1) –** the contact handle as *fredcom:objIDType*.

Listing 102: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
   <delete>
      <contact:delete
       xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd">
         <contact:id>MYCONTACT</contact:id>
      </contact:delete>
   </delete>
   <clTRID>fyem005#17-05-04at22:22:12</clTRID>
   </command>
</epp>
```

Listing 103: FRED-eppic equivalent

```
> delete-contact --id=MYCONTACT
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

Delete nsset

A nsset delete *command* is used to delete an nsset whose status allows it to be deleted.

The nsset delete command is a `delete` element in the `nsset` namespace (`http://www.nic.cz/xml/epp/nsset-1.2`).

The command must be contained in the `<delete>` command type.

Command element structure

The `<nsset:delete>` element must declare the `nsset` namespace and *schema* and it must contain the following child element:

- `<nsset:id>` **(1)** – the nsset handle as *fredcom:objIDType*.

Listing 104: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
   <delete>
      <nsset:delete xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd">
         <nsset:id>NSSET-MYNSSET</nsset:id>
      </nsset:delete>
   </delete>
   <clTRID>ripo005#17-05-05at15:21:44</clTRID>
   </command>
</epp>
```

Listing 105: FRED-eppic equivalent

```
> delete-nsset --id=NSSET-MYNSSET
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

Delete keyset

A keyset delete *command* is used to delete a keyset whose status allows it to be deleted.

The keyset delete command is a `delete` element in the `keyset` namespace (`http://www.nic.cz/xml/epp/keyset-1.3`).

The command must be contained in the `<delete>` command type.

Command element structure

The `<keyset:delete>` element must declare the `keyset` namespace and *schema* and it must contain the following child element:

- `<keyset:id>` **(1) –** the keyset handle as *fredcom:objIDType*.

Listing 106: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
   <delete>
      <keyset:delete xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.xsd">
         <keyset:id>KEYSET-MYKEYSET</keyset:id>
      </keyset:delete>
   </delete>
   <clTRID>osnc004#17-05-05at15:44:51</clTRID>
   </command>
</epp>
```

Listing 107: FRED-eppic equivalent

```
> delete-keyset --id=KEYSET-MYKEYSET
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no `<resData>`).

See also *Success or failure of a command*.

11.5.10 Renew domain

A domain renew *command* is used to prolong the registration of a domain name.

The domain renew command is a `renew` element in the `domain` namespace (`http://www.nic.cz/xml/epp/domain-1.4`).

The command must be contained in the `<renew>` command type.

Command element structure

The <domain:renew> element must declare the domain *namespace and schema* and it must contain the following child elements:

- <domain:name> **(1)** – the domain name as *eppcom:labelType*,
- <domain:curExpDate> **(1)** – the domain's current expiration date as *xs:date*,
- <domain:period> **(0..1)** – the prolongation period as *domain:pLimitType*,
  - @unit **(R)** – the unit in which the period is counted; it can be either m for months or y for years.

Note: The prolongation period must be a multiple of the allowed step and it must be in the allowed range for prolongation in the zone according to the registration rules of the Registry.

The FRED's default minimum and the allowed step is 1 year. The FRED's default maximum is 10 years.

Listing 108: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <renew>
         <domain:renew xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>example.cz</domain:name>
            <domain:curExpDate>2018-07-11</domain:curExpDate>
            <domain:period unit="y">2</domain:period>
         </domain:renew>
      </renew>
      <clTRID>xykf008#17-07-13at19:14:56</clTRID>
   </command>
</epp>
```

Listing 109: FRED-eppic equivalent

```
> renew-domain --name=example.cz --cur-exp-date=2018-07-11 --period.length=2 --period.
↪unit=YEAR
```

ENUM extension

The <domain:renew> element is used in the same way as described above.

The *command extension* can be used to prolong the validation of an ENUM domain together with prolongation of expiration. If you need to change the validation independently, use the *domain:update* command.

The command's <extension> element must contain a **single** <enumval:renew> element which declares the enumval namespace (http://www.nic.cz/xml/epp/enumval-1.2) and *schema* and contains:

- <enumval:valExDate> **(0..1)** – a new validation expiration date as *xs:date*,

---

Note: Before the actual validation expiration date, there is a period of time which allows to prolong the validation relatively to the old validation expiration date and thus seemingly exceed the allowed maximum for validation. This

period is called the "continuation window" and its duration depends on the Registry policy.

FRED's default continuation window is 14 days. FRED's default validation period is 6 months.

The `new valExDate` must be in the range depending on the current date:

- if `today` is in the continuation window, the `new valExDate` can range from `tomorrow` to `old exValDate + validation period` (inclusive),
- otherwise the `new valExDate` can range from `tomorrow` to `today + validation period` (inclusive).

- `<enumval:publish>` **(0..1)** – a new setting for publishing the ENUM domain in a public directory as *xs:boolean*; `true` – display, `false` – hide.

Listing 110: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <command>
      <renew>
         <domain:renew xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>1.1.1.7.4.5.2.2.2.0.2.4.e164.arpa</domain:name>
            <domain:curExpDate>2018-07-14</domain:curExpDate>
            <domain:period unit="y">1</domain:period>
         </domain:renew>
      </renew>
      <extension>
         <enumval:renew xmlns:enumval="http://www.nic.cz/xml/epp/enumval-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/enumval-1.2 enumval-1.2.0.xsd
↪">
            <enumval:valExDate>2018-01-14</enumval:valExDate>
         </enumval:renew>
      </extension>
      <clTRID>vzic002#17-07-14at18:55:41</clTRID>
   </command>
</epp>
```

Listing 111: FRED-eppic equivalent

```
> renew-domain --name=1.1.1.7.4.5.2.2.2.0.2.4.e164.arpa --cur-exp-date=2018-07-14 --
↪period.length=1 --period.unit=YEAR --enum.val-ex-date=2018-01-14
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<domain:renData>` which declares the `domain` *namespace and schema* and it contains the following child elements:

- `<domain:name>` **(1)** – the domain name as *eppcom:labelType*,
- `<domain:exDate>` **(0..1)** – the new expiration date of the domain name after renewal as *xs:date*.

Listing 112: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
         <msg>Command completed successfully</msg>
      </result>
      <resData>
         <domain:renData xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd">
            <domain:name>mydomain.cz</domain:name>
            <domain:exDate>2020-07-11</domain:exDate>
         </domain:renData>
      </resData>
      <trID>
         <clTRID>xykf008#17-07-13at19:14:56</clTRID>
         <svTRID>ReqID-0000139811</svTRID>
      </trID>
   </response>
</epp>
```

ENUM extension

Response extension is not used in reply to this command.

11.5.11 Credit info

A credit info command is used to find out about the current credit amounts of the authenticated registrar in all zones for which the registrar is accredited.

The credit info command is a `creditInfo` element in the `fred` namespace (`http://www.nic.cz/xml/epp/fred-1.5`).

This command is a part of the *protocol extension* defined by the FRED EPP server.

Command element structure

The `<fred:creditInfo/>` element does not contain any child elements.

Listing 113: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <extension>
   <fred:extcommand xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
    xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
      <fred:creditInfo/>
      <fred:clTRID>hlxk002#17-05-18at16:55:06</fred:clTRID>
```

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```
   </fred:extcommand>
   </extension>
</epp>
```

Listing 114: FRED-eppic equivalent

```
> credit-info-request
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<fred:resCreditInfo>` which declares the `fred` *namespace and schema* and it contains the following child elements:

- **`<fred:zoneCredit>` (0..n) – the credit information of a single zone:**
  - `<fred:zone>` **(1)** – the zone FQDN as *eppcom:labelType*,
  - `<fred:credit>` **(1)** – the amount of credit in this zone as *fred:amountType*.

Listing 115: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
   <result code="1000">
      <msg>Command completed successfully</msg>
   </result>
   <resData>
      <fred:resCreditInfo xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
         <fred:zoneCredit>
            <fred:zone>0.2.4.e164.arpa</fred:zone>
            <fred:credit>66112.00</fred:credit>
         </fred:zoneCredit>
         <fred:zoneCredit>
            <fred:zone>cz</fred:zone>
            <fred:credit>82640.00</fred:credit>
         </fred:zoneCredit>
      </fred:resCreditInfo>
   </resData>
   <trID>
      <clTRID>hlxk002#17-05-18at16:55:06</clTRID>
      <svTRID>ReqID-0000133058</svTRID>
   </trID>
   </response>
</epp>
```

11.5.12 Send AuthInfo

Commands for provision of the autorization information (AuthInfo) for object transfers.

Send AuthInfo for domain

A domain sendAuthInfo command is used to provide the autorization information (AuthInfo) associated with the domain object to the registrant and the administrative contacts of the domain.

The client sends only the request for the provision to the Registry and the Registry sends the AuthInfo to the email of the registrant and of all administrative contacts.These actions do not happen when the transfer of the domain is forbidden, i.e the domain has the status `serverTransferProhibited`.

This command is a part of the *protocol extension* defined by the FRED EPP server.

The command must be contained in the `<fred:sendAuthInfo>` command type.

Command element structure

The `<domain:sendAuthInfo>` element must declare the `domain` namespace and *schema* and it must contain the following child element:

- `<domain:name>` **(1)** – a domain name as *eppcom:labelType*.

Listing 116: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <extension>
      <fred:extcommand xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
         <!-- Custom command type -->
         <fred:sendAuthInfo>
            <!-- The object-defined command -->
            <domain:sendAuthInfo xmlns:domain="http://www.nic.cz/xml/epp/domain-1.4"
             xsi:schemaLocation="http://www.nic.cz/xml/epp/domain-1.4 domain-1.4.5.xsd
↪">
               <domain:name>example.cz</domain:name>
            </domain:sendAuthInfo>
         </fred:sendAuthInfo>
         <fred:clTRID>chsu002#17-08-08at16:33:10</fred:clTRID>
      </fred:extcommand>
   </extension>
</epp>
```

Listing 117: FRED-eppic equivalent

```
> send-auth-info-domain --name=example.cz
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no <resData>).

Important: Since FRED 2.48.0, server can be configured to return partially disclosed email addresses of AuthInfo recipients. In such case, response may contain <resData>.

Listing 118: Example - possible configuration in FRED 2.48.0

```
[rifd]
# With this flag set, even if disclose policy "hide" is set for
# email and notify_email, their values can be partially disclosed
# in response to SendAuthInfo.
partially_disclose_contact_emails = true
```

Listing 119: Example - possible response in FRED 2.48.0

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
            <msg>Command completed successfully</msg>
      </result>
      <resData>
            <nsset:sendAuthInfoData
               xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
               xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd
↪">
               <nsset:email>j*****@d*****.*</nsset:email>
            </nsset:sendAuthInfoData>
      </resData>
      <trID>
            <clTRID>pxmeik#2025-04-08T14:21:27.062118</clTRID>
            <svTRID>ReqID-0009067996</svTRID>
      </trID>
   </response>
</epp>
```

See also *Success or failure of a command*.

Send AuthInfo for contact

The contact's sendAuthInfo command provides the autorization information (AuthInfo) which can be used either as a password for contact transfers, or as a parameter of the `contact_info` command to make hidden data visible.

The client sends only the request for the provision to the Registry and the Registry sends the AuthInfo to the email of the contact. These actions happen even when the transfer of the contact is forbidden, i.e the contact has the status `serverTransferProhibited`.

This command is a part of the *protocol extension* defined by the FRED EPP server.

The command must be contained in the `<fred:sendAuthInfo>` command type.

Command element structure

The `<contact:sendAuthInfo>` element must declare the `contact` namespace and *schema* and it must contain the following child element:

- `<contact:id>` **(1)** – a contact handle as *fredcom:objIDType*.

Listing 120: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<extension>
   <fred:extcommand xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
    xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
      <!-- Custom command type -->
      <fred:sendAuthInfo>
         <!-- The object-defined command -->
         <contact:sendAuthInfo xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.6.6.xsd
↪">
            <contact:id>MYOWN</contact:id>
         </contact:sendAuthInfo>
      </fred:sendAuthInfo>
      <fred:clTRID>rhgo002#17-08-08at17:10:00</fred:clTRID>
   </fred:extcommand>
</extension>
</epp>
```

Listing 121: FRED-eppic equivalent

```
> send-auth-info-contact --id=MYOWN
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no <resData>).

Important: Since FRED 2.48.0, server can be configured to return partially disclosed email addresses of AuthInfo recipients. In such case, response may contain <resData>.

Listing 122: Example - possible configuration in FRED 2.48.0

```
[rifd]
# With this flag set, even if disclose policy "hide" is set for
# email and notify_email, their values can be partially disclosed
# in response to SendAuthInfo.
partially_disclose_contact_emails = true
```

Listing 123: Example - possible response in FRED 2.48.0

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
    <response>
        <result code="1000">
            <msg>Command completed successfully</msg>
        </result>
        <resData>
            <contact:sendAuthInfoData
                xmlns:contact="http://www.nic.cz/xml/epp/contact-1.6"
                xsi:schemaLocation="http://www.nic.cz/xml/epp/contact-1.6 contact-1.
↪6.6.xsd">
                <contact:email>
                        a*****@b*****.*,c*****@d*****.*
                </contact:email>
            </contact:sendAuthInfoData>
        </resData>
        <trID>
            <clTRID>somecltrid</clTRID>
            <svTRID>ReqID-0000000001</svTRID>
        </trID>
    </response>
</epp>
```

See also *Success or failure of a command*.

Send AuthInfo for nsset

A nsset sendAuthInfo command is used to provide the autorization information (AuthInfo) of an nsset to the technical contacts of the nsset.

The client sends only the request for the provision to the Registry and the Registry sends the AuthInfo to the email of all technical contacts. These actions do not happen when the transfer of the nsset is forbidden, i.e the nsset has the status `serverTransferProhibited`.

This command is a part of the *protocol extension* defined by the FRED EPP server.

The command must be contained in the `<fred:sendAuthInfo>` command type.

Command element structure

The `<nsset:sendAuthInfo>` element must declare the `nsset` namespace and *schema* and it must contain the following child element:

- `<nsset:id>` **(1)** – an nsset handle as *fredcom:objIDType*.

Listing 124: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<extension>
   <fred:extcommand xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
    xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
      <!-- Custom command type -->
      <fred:sendAuthInfo>
         <!-- The object-defined command -->
         <nsset:sendAuthInfo xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd">
            <nsset:id>NSSET-MYNSSET</nsset:id>
         </nsset:sendAuthInfo>
      </fred:sendAuthInfo>
      <fred:clTRID>rhgo003#17-08-08at17:13:13</fred:clTRID>
   </fred:extcommand>
</extension>
</epp>
```

Listing 125: FRED-eppic equivalent

```
> send-auth-info-nsset --id=NSSET-MYNSSET
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no <resData>).

Important: Since FRED 2.48.0, server can be configured to return partially disclosed email addresses of AuthInfo recipients. In such case, response may contain <resData>.

Listing 126: Example - possible configuration in FRED 2.48.0

```
[rifd]
# With this flag set, even if disclose policy "hide" is set for
# email and notify_email, their values can be partially disclosed
# in response to SendAuthInfo.
partially_disclose_contact_emails = true
```

Listing 127: Example - possible response in FRED 2.48.0

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
            <msg>Command completed successfully</msg>
      </result>
      <resData>
            <nsset:sendAuthInfoData
               xmlns:nsset="http://www.nic.cz/xml/epp/nsset-1.2"
               xsi:schemaLocation="http://www.nic.cz/xml/epp/nsset-1.2 nsset-1.2.4.xsd
↪">
               <nsset:email>j*****@d*****.*</nsset:email>
            </nsset:sendAuthInfoData>
      </resData>
      <trID>
            <clTRID>ohji6q#2025-04-08T14:46:28.084841</clTRID>
            <svTRID>ReqID-0009068001</svTRID>
      </trID>
   </response>
</epp>
```

See also *Success or failure of a command*.

Send AuthInfo for keyset

A keyset sendAuthInfo command is used to provide the autorization information (AuthInfo) of a keyset to the technical contacts of the keyset.

The client sends only the request for the provision to the Registry and the Registry sends the AuthInfo to the email of all technical contacts. These actions do not happen when the transfer of the keyset is forbidden, i.e the keyset has the status `serverTransferProhibited`.

This command is a part of the *protocol extension* defined by the FRED EPP server.

The command must be contained in the `<fred:sendAuthInfo>` command type.

Command element structure

The `<keyset:sendAuthInfo>` element must declare the `keyset` namespace and *schema* and it must contain the following child element:

- `<keyset:id>` **(1)** – a keyset handle as *fredcom:objIDType*.

Listing 128: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<extension>
   <fred:extcommand xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
    xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
      <!-- Custom command type -->
      <fred:sendAuthInfo>
         <!-- The object-defined command -->
         <keyset:sendAuthInfo xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
          xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.xsd">
            <keyset:id>KEYSET-MYKEYSET</keyset:id>
         </keyset:sendAuthInfo>
      </fred:sendAuthInfo>
      <fred:clTRID>nuhe002#17-08-08at17:20:11</fred:clTRID>
   </fred:extcommand>
</extension>
</epp>
```

Listing 129: FRED-eppic equivalent

```
> send-auth-info-keyset --id=KEYSET-MYKEYSET
```

Response element structure

The FRED EPP server responds with a *plain result message* which does not contain any response data (no <resData>).

Important: Since FRED 2.48.0, server can be configured to return partially disclosed email addresses of AuthInfo recipients. In such case, response may contain <resData>.

Listing 130: Example - possible configuration in FRED 2.48.0

```
[rifd]
# With this flag set, even if disclose policy "hide" is set for
# email and notify_email, their values can be partially disclosed
# in response to SendAuthInfo.
partially_disclose_contact_emails = true
```

Listing 131: Example - possible response in FRED 2.48.0

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <response>
      <result code="1000">
            <msg>Command completed successfully</msg>
      </result>
      <resData>
            <keyset:sendAuthInfoData
               xmlns:keyset="http://www.nic.cz/xml/epp/keyset-1.3"
               xsi:schemaLocation="http://www.nic.cz/xml/epp/keyset-1.3 keyset-1.3.4.
↪xsd">
               <keyset:email>j*****@d*****.*</keyset:email>
            </keyset:sendAuthInfoData>
      </resData>
      <trID>
            <clTRID>l826uf#2025-04-08T14:41:35.315240</clTRID>
            <svTRID>ReqID-0009067998</svTRID>
      </trID>
   </response>
</epp>
```

See also *Success or failure of a command*.

11.5.13 Listing

Commands for object listing.

Object listing is done in two steps which are performed separately in this order:

1. Prepare a list – objects are selected and prepared on the server, the client receives only the count of prepared objects,
2. Get results – a chunk of handles of the prepared objects is delivered to the client. This command must be repeated to retrieve the remaining chunks until it returns an empty results list.

The list of objects remaining on the server is retained between sessions.

Calling another list preparation resets the list of unretrieved results on the server!

Prepare a list

These commands are used to prepare lists of objects which are managed by the authenticated client. (In other words, of which the client is the *designated registrar*.)

All list commands are elements in the `fred` namespace (`http://www.nic.cz/xml/epp/fred-1.5`).

These commands are a part of the *protocol extension* defined by the FRED EPP server.

Command element structure

The list command can be **one of** the following:

- `<fred:listDomains/>` **(1)** – select all domains as an empty element,
- `<fred:listContacts/>` **(1)** – select all contacts as an empty element,
- `<fred:listNssets/>` **(1)** – select all nssets as an empty element,
- `<fred:listKeysets/>` **(1)** – select all keysets as an empty element,
- **`<fred:domainsByContact>` (1) – select domains by a contact (registrant or administrative contact),**
  - `<fred:id>` **(1)** – a contact handle as *fredcom:objIDType*,
- **`<fred:domainsByNsset>` (1) – select domains by an nsset,**
  - `<fred:id>` **(1)** – an nsset handle as *fredcom:objIDType*,
- **`<fred:domainsByKeyset>` (1) – select domains by a keyset,**
  - `<fred:id>` **(1)** – a keyset handle as *fredcom:objIDType*,
- **`<fred:nssetsByContact>` (1) – select nssets by a technical contact,**
  - `<fred:id>` **(1)** – a contact handle as *fredcom:objIDType*,
- **`<fred:keysetsByContact>` (1) – select keysets by a technical contact,**
  - `<fred:id>` **(1)** – a contact handle as *fredcom:objIDType*,
- **`<fred:nssetsByNs>` (1) – select nssets by a name server,**
  - `<fred:name>` **(1)** – a name-server hostname as *eppcom:labelType*.

Note: For preparing without direct listing, there has to be configured `print_list_results_automatically: true` in `~/.eppic.conf`

Listing 132: Example of a parametrized listing command

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<extension>
   <fred:extcommand xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
    xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
      <fred:domainsByContact>
         <fred:id>ADMIN1</fred:id>
      </fred:domainsByContact>
      <fred:clTRID>ovcu002#17-08-11at12:26:39</fred:clTRID>
   </fred:extcommand>
</extension>
</epp>
```

Listing 133: FRED-eppic equivalent

```
> list-domains-by-contact --id=ADMIN1
```

Listing 134: Example of a simple listing command

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
   <extension>
      <fred:extcommand xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
         <fred:listContacts/>
         <fred:clTRID>egrx002#17-08-30at18:49:12</fred:clTRID>
      </fred:extcommand>
   </extension>
</epp>
```

Listing 135: FRED-eppic equivalent

```
> list-contacts
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<fred:infoResponse>` which declares the `fred` *namespace and schema* and it contains the following child element:

- `<fred:count>` **(1)** – the count of prepared items as *xs:unsignedLong*.

Listing 136: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<response>
   <result code="1000">
      <msg>Command completed successfully</msg>
   </result>
   <resData>
      <fred:infoResponse xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
         <fred:count>4</fred:count>
      </fred:infoResponse>
   </resData>
   <trID>
      <clTRID>ovcu002#17-08-11at12:26:39</clTRID>
      <svTRID>ReqID-0000141134</svTRID>
   </trID>
</response>
</epp>
```

Get the results

This command is used to retrieve a chunk of the results that were prepared in a previous step with a *list command*. The command must be called repeatedly to collect all results until the returned results list is empty.

The command is a `getResults` element in the `fred` namespace (`http://www.nic.cz/xml/epp/fred-1.5`).

This command is a part of the *protocol extension* defined by the FRED EPP server.

Command element structure

The `<fred:getResults/>` element does not contain any child elements.

Listing 137: Example

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<extension>
   <fred:extcommand xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
    xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
      <fred:getResults/>
      <fred:clTRID>ovcu003#17-08-11at12:27:01</fred:clTRID>
   </fred:extcommand>
</extension>
</epp>
```

Listing 138: FRED-eppic equivalent

```
> get-results
```

Response element structure

The *response* from the FRED EPP server contains the result, response data, and transaction identification.

See also *Success or failure of a command*.

The response data element (`<resData>`) contains a single child element `<fred:resultsList>` which declares the `fred` *namespace and schema* and it contains the following child elements:

- `<fred:item>` **(0..n)** – an item of the results list as *xs:token*.

Listing 139: Example

```
<?xml version="1.0" encoding="UTF-8"?>
<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0 epp-1.0.xsd">
<response>
   <result code="1000">
      <msg>Command completed successfully</msg>
   </result>
   <resData>
      <fred:resultsList xmlns:fred="http://www.nic.cz/xml/epp/fred-1.5"
       xsi:schemaLocation="http://www.nic.cz/xml/epp/fred-1.5 fred-1.5.0.xsd">
         <fred:item>1.1.1.7.4.5.2.2.2.0.2.4.e164.arpa</fred:item>
         <fred:item>example.cz</fred:item>
         <fred:item>example2.cz</fred:item>
         <fred:item>example3.cz</fred:item>
      </fred:resultsList>
   </resData>
   <trID>
      <clTRID>ovcu003#17-08-11at12:27:01</clTRID>
      <svTRID>ReqID-0000141135</svTRID>
   </trID>
</response>
</epp>
```

11.6 Policies & rules of disclosure

There are some built-in policies and rules concerning contact information disclosure to third-party entities, which include the public.

The contact information that is subject to the data collection policy and disclosure policy entails these *contact attributes*: *name*, *organization*, *address* (`<addr/>`), *telephone* (`<voice/>`), *fax* (`<fax/>`), *email* (`<email/>`), *vat* (`<vat/>`), *identity document* (`<ident/>`), *notify email* (`<notifyEmail/>`).

Clients (registrars) are not considered third-party entities in the FRED, and they deal with the information under terms of a contract with the Registry operator.

Changed in version 2.38: The policies are configurable. This chapter describes the default *CZ-specific configuration* that used to be hard-coded in version 2.37.

Note: The policies & rules of disclosure may be configured by the Registry operator differently.

The Registry operator is supposed to publish a document that declares the rules of registrar communication with the Registry, including a description of the policies & rules of disclosure.

If you are a CZ.NIC registrar, the following description applies to you.

Chapter TOC

- *Data collection policy*
- *Server disclosure policy*
- *Contact disclosure preference*
- *Hiding address*
- *Examples of behaviour*
  - `contact:create` *command*
  - `contact:update` *command*

11.6.1 Data collection policy

This policy is expressed in the *greeting* from the EPP server, in the element `<dcp>` (data collection policy); *hide* is expressed as `<access><none/></access>` and can be checked e.g. by examining that the xpath `/epp/greeting/dcp/access/none` is an existing node.

This says that the policy of the server is to disclose none of the data collected over EPP to third-party entities. However, this policy has exceptions arising from the disclosure policy of the server and individual disclosure preferences of each contact.

11.6.2 Server disclosure policy

The server disclosure policy defines the default disclosure preference (flag) for each attribute and also says which attribute's disclosure preference is adjustable by contacts.

The server's default disclosure preference is to **hide all** personal information **except** *name* and *organization*, which are always visible, and *address*, which is forced visible on creation, but is hidden later when certain conditions are met (see *Hiding address*). Visibility of other contact attributes can be adjusted on demand as explained in *Contact disclosure preference*.

Table 1: Summary – Server disclosure policy

Attributes	name	organization	address	telephone	fax	email	vat	identity	notifyemail
Default flags (contact:create)	show	show	show	hide	hide	hide	hide	hide	hide
Nature	fixed	fixed	adjustable *	adjustable	adjustable	adjustable	adjustable	adjustable	adjustable

Server disclosure preference also means, that responses to `contact:info` use `flag="1"` to describe contact disclosure preference, i.e. which attributes are *shown* as opposed to the server's default disclosure preference.

11.6.3 Contact disclosure preference

The contact disclosure preference expresses an opposite of the server disclosure preference where it is allowed by the policy to be adjusted. With the server disclosure preference to hide data, the contact disclosure preference represents consent to disclose a piece of personal information.

To set or view disclosure preference, the `<contact:disclose>` element is used. Its syntax is described in the reference of each command:

- viewing disclosure preference with *contact:info*;
- setting disclosure preference with *contact:create* is allowed for the attributes: *telephone* (`<voice/>`), *fax* (`<fax/>`), *email* (`<email/>`), *vat* (`<vat/>`), *identity document* (`<ident/>`), *notify email* (`<notifyEmail/>`);
- setting disclosure preference with *contact:update* is allowed for the attributes: *address* (`<addr/>`), *telephone* (`<voice/>`), *fax* (`<fax/>`), *email* (`<email/>`), *vat* (`<vat/>`), *identity document* (`<ident/>`), *notify email* (`<notifyEmail/>`).

Disclosure preference for *name* and *organization* cannot be adjusted, therefore they are never listed in requests nor responses.

If the contact does not satisfy the conditions for *hiding address*, then `<addr/>` must be listed in update requests that are based on `flag="1"`.

See also the *examples* at the end of this chapter.

11.6.4 Hiding address

When a new contact is being created, the contact disclosure preference for *address* cannot be requested and the server uses its default disclosure preference, which is to **show** *address*.

Once the contact[1] is verified (gets the status flag `identifiedContact` or `validatedContact`), the server changes the disclosure preference for *address* to "**hide**" automatically and notifies the client (the designated registrar) about this change in a poll message. At this point, the contact is allowed to change it.

When the contact[Page 335, 1] loses verification, the server changes the disclosure preference for *address* back to "**show**" automatically (the client is NOT notified about this change). At this point, the contact cannot change it.

When the contact[1] regains verification, the same thing happens as if it has gained it for the first time, see above. The previous contact disclosure preference for *address* is ignored and overwritten.

Note: The `<addr/>` disclose flag affects disclosure of **all addresses** in a contact.

---

[1] This works only for contacts of natural persons, i.e. contacts that have the attribute *organization* without a value.

11.6.5 Examples of behaviour

Examples overview

- *contact:create command*
  - *Request – without the element <contact:disclose>*
  - *Requests to show listed attributes – <contact:disclose flag="1">*
    - *Request – empty element <contact:disclose>*
    - *Request – show all you can*
    - *Request – show a specified subset*
  - *Requests to hide listed attributes – <contact:disclose flag="0">*
- *contact:update command*
  - *Request – without the element <contact:disclose>*
  - *Requests to show listed attributes – <contact:disclose flag="1">*
    - *Request – empty element <contact:disclose> – contact does NOT satisfy conditions for hiding address*
    - *Request – empty element <contact:disclose> – contact DOES satisfy conditions for hiding address*
    - *Request – show all you can*
    - *Request – show a specified subset – contact does NOT satisfy conditions for hiding address (and <addr/> is NOT listed)*
    - *Request – show a specified subset – contact does NOT satisfy conditions for hiding address (and <addr/> IS listed)*
    - *Request – show a specified subset – contact DOES satisfy conditions for hiding address*
  - *Requests to hide listed attributes – <contact:disclose flag="0">*

contact:create command

Request – without the element <contact:disclose>

The EPP request does not contain <contact:disclose>

Result – the response to contact:info contains:

```
<contact:disclose flag="1">
  <contact:addr/>
</contact:disclose>
```

Interpretation of the result:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	hide	hide	hide	hide	hide	hide

Requests to show listed attributes – `<contact:disclose flag="1">`

Request – empty element `<contact:disclose>`

The EPP request contains:

```
<contact:disclose flag="1">
</contact:disclose>
```

Result – the response to `contact:info` contains:

```
<contact:disclose flag="1">
  <contact:addr/>
</contact:disclose>
```

Interpretation of the result:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	hide	hide	hide	hide	hide	hide

Request – show all you can

The EPP request contains:

```
<contact:disclose flag="1">
  <contact:voice/>
  <contact:fax/>
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
  <contact:notifyEmail/>
</contact:disclose>
```

Result – the response to `contact:info` contains:

```
<contact:disclose flag="1">
  <contact:addr/>
  <contact:voice/>
  <contact:fax/>
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
  <contact:notifyEmail/>
</contact:disclose>
```

Interpretation of the result:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	show	show	show	show	show	show

Request – show a specified subset

The EPP request contains:

```
<contact:disclose flag="1">
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
</contact:disclose>
```

Result – the response to `contact:info` contains:

```
<contact:disclose flag="1">
  <contact:addr/>
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
</contact:disclose>
```

Interpretation of the result:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	hide	hide	show	show	show	hide

Requests to hide listed attributes – `<contact:disclose flag="0">`

These requests don't make sense when the policy is to *hide*; it always results in a contact having all disclosure settings set to *hide* except for *address* which can't be set in the operation `create` and is set to *show*.

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	hide	hide	hide	hide	hide	hide

`contact:update` command

Request – without the element `<contact:disclose>`

Contact disclosure settings before the request:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	hide	hide	hide	hide	hide	show

The EPP request does not contain `<contact:disclose>`

Result – the response to `contact:info` contains:

```
<contact:disclose flag="1">
  <contact:addr/>
  <contact:notifyEmail/>
</contact:disclose>
```

Interpretation of the result:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	hide	hide	hide	hide	hide	show

Requests to show listed attributes – `<contact:disclose flag="1">`

The result depends on the contact, whether it satisfies conditions for hiding *address* and the element `<addr/>` is listed in the request.

Element `<addr/>` listed in the request	Contact satisfies conditions for hiding address	Result
NO	NO	`code=2304 msg=Object status prohibits operation`
NO	YES	`code=1000 msg=Command completed successfully`
YES	NO	`code=1000 msg=Command completed successfully`
YES	YES	`code=1000 msg=Command completed successfully`

Request – empty element `<contact:disclose>` – contact does NOT satisfy conditions for hiding address

The EPP request contains:

```
<contact:disclose flag="1">
</contact:disclose>
```

The request results in an error:

```
<result code="2304">
   <msg>Object status prohibits operation</msg>
</result>
```

Request – empty element `<contact:disclose>` – contact DOES satisfy conditions for hiding address

Contact disclosure settings before the request:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	show	show	hide	hide	hide	hide

The EPP request contains:

```
<contact:disclose flag="1">
</contact:disclose>
```

Result – the response to `contact:info` contains:

```
<contact:disclose flag="1"/>
```

Interpretation of the result:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	hide	hide	hide	hide	hide	hide	hide

Request – show all you can

Contact disclosure settings before the request:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	show	show	hide	hide	hide	hide

The EPP request contains:

```
<contact:disclose flag="1">
  <contact:addr/>
  <contact:voice/>
  <contact:fax/>
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
  <contact:notifyEmail/>
</contact:disclose>
```

Result – the response to `contact:info` contains:

```
<contact:disclose flag="1">
  <contact:addr/>
  <contact:voice/>
  <contact:fax/>
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
  <contact:notifyEmail/>
</contact:disclose>
```

Interpretation of the result:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	show	show	show	show	show	show

Request – show a specified subset – contact does NOT satisfy conditions for hiding address (and <addr/> is NOT listed)

The EPP request contains:

```
<contact:disclose flag="1">
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
  <contact:notifyEmail/>
</contact:disclose>
```

The request results in an error:

```
<result code="2304">
   <msg>Object status prohibits operation</msg>
</result>
```

Request – show a specified subset – contact does NOT satisfy conditions for hiding address (and <addr/> IS listed)

Contact disclosure settings before the request:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	hide	show	hide	hide	show	show

The EPP request contains:

```
<contact:disclose flag="1">
  <contact:addr/>
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
  <contact:notifyEmail/>
</contact:disclose>
```

Result – the response to `contact:info` contains:

```
<contact:disclose flag="1">
  <contact:addr/>
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
  <contact:notifyEmail/>
</contact:disclose>
```

Interpretation of the result:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	hide	hide	show	show	show	show

Request – show a specified subset – contact DOES satisfy conditions for hiding address

Contact disclosure settings before the request:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	show	hide	show	hide	hide	show	show

The EPP request contains:

```
<contact:disclose flag="1">
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
  <contact:notifyEmail/>
</contact:disclose>
```

Result – the response to `contact:info` contains:

```
<contact:disclose flag="1">
  <contact:email/>
  <contact:vat/>
  <contact:ident/>
  <contact:notifyEmail/>
</contact:disclose>
```

Interpretation of the result:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	hide	hide	hide	show	show	show	show

Requests to hide listed attributes – `<contact:disclose flag="0">`

These requests don't make sense when the policy is to *hide*; it results in:

- **an error** if the contact does not satisfy conditions for hiding *address*:

  ```
  <result code="2304">
    <msg>Object status prohibits operation</msg>
  </result>
  ```

- otherwise, all disclosure settings being set to *hide*:

name	organization	address	telephone	fax	email	vat	ident	notifyemail
show	show	hide	hide	hide	hide	hide	hide	hide

11.7 Appendixes

11.7.1 Result codes & messages

The result codes and messages are taken from the **RFC 5730#section-3** where they are described in detail.

The result messages are provided in the language of *the session*.

Successful command completion responses

Code	Message
1000	Command completed successfully
1001	Command completed successfully; action pending
1300	Command completed successfully; no messages
1301	Command completed successfully; ack to dequeue
1500	Command completed successfully; ending session

Command error responses

Code	Message
2000	Unknown command
2001	Command syntax error
2002	Command use error
2003	Required parameter missing
2004	Parameter value range error
2005	Parameter value syntax error
2100	Unimplemented protocol version
2101	Unimplemented command
2102	Unimplemented option
2103	Unimplemented extension
2104	Billing failure
2105	Object is not eligible for renewal
2106	Object is not eligible for transfer
2200	Authentication error
2201	Authorization error
2202	Invalid authorization information
2300	Object pending transfer
2301	Object not pending transfer
2302	Object exists
2303	Object does not exist
2304	Object status prohibits operation
2305	Object association prohibits operation
2306	Parameter value policy error
2307	Unimplemented object service
2308	Data management policy violation
2400	Command failed
2500	Command failed; server closing connection
2501	Authentication error; server closing connection
2502	Session limit exceeded; server closing connection

11.7.2 Error reasons

If a *response* was returned with an error result code, the response may also contain a reason that explains further why the error occurred.

The reason is provided in the language of *the session*.

Possible reasons of errors are:

1. An invalid format of the contact handle
2. An invalid format of the nsset handle
3. An invalid format of the domain name
4. The domain name not applicable
5. An invalid format
6. Registered already
7. Within the protection period
8. An invalid IP address
9. An invalid nameserver hostname
10. A duplicate nameserver address
11. Glue IP address not applicable
12. The validity period exceeds the allowed maximum
13. The validity period is not an integer multiple of the allowed step
14. An unknown country code
15. An unknown message ID
16. A validation expiration date not applicable
17. The validation expiration date is not valid
18. The technical contact cannot be removed
19. The technical contact is assigned to the object already
20. The technical contact does not exist
21. The administrative contact is assigned to the object already
22. The administrative contact does not exist
23. The nsset does not exist
24. The registrant contact does not exist
25. The nameserver is included in the nsset already
26. The nameserver is not included in the nsset
27. The domain expiration date does not match recorded data
28. The “transfer” element is missing an “op” attribute
29. The “ident” element is missing a “type” attribute
30. The “poll” element is missing an “msgID” attribute
31. Registration is prohibited

32. XML validation error:
33. A duplicate contact
34. An invalid format of the keyset handle
35. The keyset does not exist
36. Unauthorized access to the object
37. Too many administrative contacts
38. Too many DS records
39. Too many DNSKEY records
40. No DNSKEY record
41. The “flags” field must be 0, 256 or 257
42. The “protocol” field must be 3
43. An unsupported value of the “alg” field, see IANA DNS Security Algorithm Numbers
44. The “key” field has an invalid length
45. The “key” field contains an invalid character
46. The DNSKEY exists for the keyset already
47. The DNSKEY does not exist for the keyset
48. A duplicate DNSKEY
49. The keyset must have a DNSKEY record or a DS record
50. A duplicate nameserver hostname
51. The administrative contact is not assigned to the object
52. Temporary contacts are discontinued
53. The validity period is shorter than the allowed minimum

11.7.3 FRED-defined data types

Simple data types defined in the FRED *namespaces*.

contact:ccType
extra-addr:ccType
: a *xs:token* of the length of 2 characters

contact:e164StringType
: a phone number in the international format without spaces and the national prefix separated from the rest with a period (a *xs:token* matching the `(\+[0-9]{1,3}\.[0-9]{1,14})?` pattern and having the maximum length of 17 characters)

contact:emailCommaListType
: a comma-separated list of email addresses (a *xs:token* matching the `[^@, ]{1,64}@[^@, ]+(,[^@, ]{1,64}@[^@, ]+)*` pattern and having the maximum length of 320 characters)

contact:emailType
: a single email address (a *xs:token* matching the `[^@]{1,64}@[^@]+` pattern and having the maximum length of 320 characters)

contact:emailUpdCommaListType
: a comma-separated list of email addresses, empty string allowed (a *xs:token* matching the `([^@, ]{1, 64}@[^@, ]+(,[^@, ]{1,64}@[^@, ]+)*)?` pattern and having the length between 0 and 320 characters)

contact:identValueT
: a *xs:token* of the maximum length of 32 characters

contact:optPostalLineType
: a *xs:normalizedString* of the length between 0 and 255 characters

contact:pcType
extra-addr:pcType
: a *xs:token* of the maximum length of 16 characters

contact:postalLineType
extra-addr:postalLineType
: a *xs:normalizedString* of the length between 1 and 255 characters

contact:vatT
: a *xs:token* of the maximum length of 20 characters

domain:pLimitType
: an *xs:unsignedShort* ranging from 1 to 99 (inclusive)

domain:trIDStringType
: a *xs:token* of the length between 3 and 64 characters

fred:amountType
: a *xs:decimal* of the maximum length of 10 digits of which at most 2 digits are the fraction

fredcom:authInfoType
: a *xs:normalizedString* of the length between 0 and 300 characters

fredcom:msgType
: an unbounded *xs:normalizedString*

fredcom:objIDChgType
: a *xs:token* of the length between 0 and 63 characters

fredcom:objIDCreateType
: a *xs:token* of the length between 1 and 30 characters matching the `[a-zA-Z0-9](-?[a-zA-Z0-9])*` pattern

fredcom:objIDType
: a *xs:token* of the length between 1 and 63 characters

keyset:keyT
: a *xs:base64Binary* string, non-empty

nsset:addrStringType
: a *xs:token* of the length between 3 and 45 characters

nsset:reportlevelType
: an *xs:unsignedByte* ranging from 0 to 10 (inclusive)

nsset:trIDStringType
: a *xs:token* of the length between 3 and 64 characters

11.7.4 EPP-defined data types

Simple data types defined in the standard EPP *namespaces*.

epp:pwType
: a *xs:token* of the length between 6 and 16 characters

epp:trIDStringType
: a *xs:token* of the length between 3 and 64 characters

eppcom:clIDType
: a *xs:token* of the length between 3 and 16 characters

eppcom:labelType
: a *xs:token* of the length between 1 and 255 characters

eppcom:minTokenType
: a *xs:token* of the length at least 1

eppcom:roidType
: a *xs:token* matching the `(\w|_){1,80}-\w{1,8}` pattern

11.7.5 XMLSchema-defined data types

Simple data types defined in the XML Schema *namespace*.

xs:anyURI
: an Internationalized Resource Identifier reference (IRI)

  https://www.w3.org/TR/xmlschema11-2/#anyURI

xs:base64Binary
: binary data represented in Base64 encoding, see **RFC 4648#section-4**

  https://www.w3.org/TR/xmlschema11-2/#base64Binary

xs:boolean
: `True`/`False` or `1`/`0`

  https://www.w3.org/TR/xmlschema11-2/#boolean

xs:date
: a date

  https://www.w3.org/TR/xmlschema11-2/#date

xs:dateTime
: a date and time

  https://www.w3.org/TR/xmlschema11-2/#dateTime

xs:decimal
: a real number represented by decimal numerals (low precision)

  https://www.w3.org/TR/xmlschema11-2/#decimal

xs:language
: a *xs:token* matching the `[a-zA-Z]{1,8}(-[a-zA-Z0-9]{1,8})*` pattern

  https://www.w3.org/TR/xmlschema11-2/#language

xs:normalizedString
a *xs:string* which does not contain carriage return, line feed nor tab characters

https://www.w3.org/TR/xmlschema11-2/#normalizedString

xs:string
a generic non-restricted character string

https://www.w3.org/TR/xmlschema11-2/#string

xs:token
a *xs:normalizedString* which has no leading nor trailing spaces and no internal sequence of 2 or more spaces

https://www.w3.org/TR/xmlschema11-2/#token

xs:unsignedByte
a small non-negative integer (up to 255 incl.)

https://www.w3.org/TR/xmlschema11-2/#unsignedByte

xs:unsignedLong
a potentially big non-negative integer

https://www.w3.org/TR/xmlschema11-2/#unsignedLong

xs:unsignedShort
an average non-negative integer

https://www.w3.org/TR/xmlschema11-2/#unsignedShort

CHAPTER

TWELVE

RDAP API REFERENCE

FRED RDAP is a prototype and implements only the part of the standard necessary for working with resources of a domain name registry.

The FRED also introduces extension concerning ENUM domains, nssets and keysets. The FRED extension of RDAP is officially registered with IANA.

Target audience

Developers, testers

Purpose

Having reference information for implementing and debugging a custom RDAP client with FRED extensions.

Prerequisites

You should have basic understanding of HTTP and JSON.

12.1 Introduction

The Registration Data Access Protocol (RDAP) is built as a RESTful API using the benefits of HTTP(S).

The RDAP standard allows only two HTTP methods: **HEAD** and **GET**. More on usage of HTTP in **RFC 7480**.

Client authentication is **not** implemented, all data in responses is public.

IDNs are fully supported (both A-labels and U-labels, **RFC 5890#section-2.3.2.1**).

Registered RDAP servers can be found at https://data.iana.org/rdap/dns.json.

Conformance of this reference

- RDAP Level 0
- FRED Extension Version 0

Implemented interface overview

FRED RDAP does not implement any *RIR (Regional Internet Registry)* functionality, only some of *DNR (Domain Name Registry)* functionality as follows:

- **Lookup:**
  - Domain by name (reverse lookup by IP not implemented)
  - Nameserver by hostname (reverse lookup by IP not implemented)
  - Entity by handle
- Unimplemented lookup: IP (`/ip`), autonomous system (`/as`)
- **Lookup extensions:**
  - FRED nsset by handle
  - FRED keyset by handle
- Help (`/help`)
- Search queries are **not** implemented (`/domains`, `/nameservers`, `/entities`)

Specifications

- **RFC 7480** HTTP Usage in the Registration Data Access Protocol (RDAP)
- **RFC 7481** Security Services for the Registration Data Access Protocol (RDAP)
- **RFC 7482** Registration Data Access Protocol (RDAP) Query Format
- **RFC 7483** JSON Responses for the Registration Data Access Protocol (RDAP)
- **RFC 7484** Finding the Authoritative Registration Data (RDAP) Service
- **RFC 8056** Extensible Provisioning Protocol (EPP) and Registration Data Access Protocol (RDAP) Status Mapping
- FRED RDAP Extension Specification

12.2 Domain lookup

This query can be used to look up a single domain by the *FQDN* in a zone administered by the Registry.

Lookup by IP is not implemented.

The server does not recognize any parameters with this query.

Listing 1: Query path segment

```
/domain/example.cz
```

On the top level, the response may contain members:

- `entities` – an array of entities (linked contacts and the *designated registrar*), **RFC 7483#section-5.1**
- `events` – an array of events that have occurred on the domain, **RFC 7483#section-4.5**
- `fred_keyset` – linked keyset (FRED extension), see *Keyset lookup* for members
- `fred_nsset` – linked nsset (FRED extension), see *Nsset lookup* for members
- `handle` – registry-unique string identifier referencing the domain (domain name), **RFC 7483#section-3**
- `ldhName` – textual representation of DNS names, **RFC 7483#section-3**
- `links` – navigation to related on-line resources, **RFC 7483#section-4.2**
- `nameservers` – an array of *nameserver objects*, **RFC 7483#section-5.2**
- `notices` – information about the service, **RFC 7483#section-4.3**
- `objectClassName` – string "domain" representing the object type in RDAP, **RFC 7483#section-4.9**
- `port43` – hostname of Registry WHOIS server, **RFC 7483#section-4.7**
- `rdapConformance` – an array of strings, each providing a hint on the used specification, **RFC 7483#section-4.1**
- `secureDNS` – secure DNS information, **RFC 7483#section-5.3**
- `status` – an array of status flags describing the object state, see *Status mapping*, **RFC 7483#section-4.6** and **RFC 8056#section-2**

Note: A response may contain an `actionEvent` called "enum validation expiration", which is an extension of events in ENUM domains. See specification.

Listing 2: Example of additional event in an ENUM domain

```
{
   "handle": "1.2.3.4.5.6.7.8.9.0.2.4.e164.arpa",
   "...",
   "events": [
      "...",
      {
         "eventAction": "enum validation expiration",
         "eventDate": "2018-09-15T14:00:00+00:00"
      },
      "...",
   ]
}
```

Listing 3: Response example (https://rdap.nic.cz/domain/nic.cz)

```
{
   "fred_nsset": {
      "nameservers": [
         {
            "ipAddresses": {
```

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```
            "v4": [
               "194.0.12.1"
            ],
            "v6": [
               "2001:678:f::1"
            ]
         },
         "objectClassName": "nameserver",
         "handle": "a.ns.nic.cz",
         "links": [
            {
               "href": "https://rdap.nic.cz/nameserver/a.ns.nic.cz",
               "type": "application/rdap+json",
               "rel": "self",
               "value": "https://rdap.nic.cz/nameserver/a.ns.nic.cz"
            }
         ],
         "ldhName": "a.ns.nic.cz"
      },
      {
         "ipAddresses": {
            "v4": [
               "194.0.13.1"
            ],
            "v6": [
               "2001:678:10::1"
            ]
         },
         "objectClassName": "nameserver",
         "handle": "b.ns.nic.cz",
         "links": [
            {
               "href": "https://rdap.nic.cz/nameserver/b.ns.nic.cz",
               "type": "application/rdap+json",
               "rel": "self",
               "value": "https://rdap.nic.cz/nameserver/b.ns.nic.cz"
            }
         ],
         "ldhName": "b.ns.nic.cz"
      },
      {
         "ipAddresses": {
            "v4": [
               "193.29.206.1"
            ],
            "v6": [
               "2001:678:1::1"
            ]
         },
         "objectClassName": "nameserver",
         "handle": "d.ns.nic.cz",
         "links": [
            {
               "href": "https://rdap.nic.cz/nameserver/d.ns.nic.cz",
               "type": "application/rdap+json",
               "rel": "self",
               "value": "https://rdap.nic.cz/nameserver/d.ns.nic.cz"
```


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```
                }
            ],
            "ldhName": "d.ns.nic.cz"
        }
    ],
    "objectClassName": "fred_nsset",
    "handle": "CZ.NIC",
    "links": [
        {
            "href": "https://rdap.nic.cz/fred_nsset/CZ.NIC",
            "type": "application/rdap+json",
            "rel": "self",
            "value": "https://rdap.nic.cz/fred_nsset/CZ.NIC"
        }
    ]
},
"handle": "nic.cz",
"links": [
    {
        "href": "https://rdap.nic.cz/domain/nic.cz",
        "type": "application/rdap+json",
        "rel": "self",
        "value": "https://rdap.nic.cz/domain/nic.cz"
    }
],
"port43": "whois.nic.cz",
"fred_keyset": {
    "objectClassName": "fred_keyset",
    "handle": "CZNIC",
    "links": [
        {
            "href": "https://rdap.nic.cz/fred_keyset/CZNIC",
            "type": "application/rdap+json",
            "rel": "self",
            "value": "https://rdap.nic.cz/fred_keyset/CZNIC"
        }
    ],
    "dns_keys": [
        {
            "protocol": 3,
            "flags": 257,
            "algorithm": 13,
            "publicKey":
↪"LM4zvjUgZi2XZKsYooDE0HFYGfWp242fKB+O8sLsuox8S6MJTowY8lBDjZD7JKbmaNot3+1H8zU9TrDzWmmHwQ==
↪"
        }
    ]
},
"secureDNS": {
    "keyData": [
        {
            "protocol": 3,
            "flags": 257,
            "algorithm": 13,
            "publicKey":
↪"LM4zvjUgZi2XZKsYooDE0HFYGfWp242fKB+O8sLsuox8S6MJTowY8lBDjZD7JKbmaNot3+1H8zU9TrDzWmmHwQ==
↪"
```


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```
            }
        ],
        "zoneSigned": true,
        "maxSigLife": 1209600,
        "delegationSigned": true
    },
    "nameservers": [
        {
            "ipAddresses": {
                "v4": [
                    "194.0.12.1"
                ],
                "v6": [
                    "2001:678:f::1"
                ]
            },
            "objectClassName": "nameserver",
            "handle": "a.ns.nic.cz",
            "links": [
                {
                    "href": "https://rdap.nic.cz/nameserver/a.ns.nic.cz",
                    "type": "application/rdap+json",
                    "rel": "self",
                    "value": "https://rdap.nic.cz/nameserver/a.ns.nic.cz"
                }
            ],
            "ldhName": "a.ns.nic.cz"
        },
        {
            "ipAddresses": {
                "v4": [
                    "194.0.13.1"
                ],
                "v6": [
                    "2001:678:10::1"
                ]
            },
            "objectClassName": "nameserver",
            "handle": "b.ns.nic.cz",
            "links": [
                {
                    "href": "https://rdap.nic.cz/nameserver/b.ns.nic.cz",
                    "type": "application/rdap+json",
                    "rel": "self",
                    "value": "https://rdap.nic.cz/nameserver/b.ns.nic.cz"
                }
            ],
            "ldhName": "b.ns.nic.cz"
        },
        {
            "ipAddresses": {
                "v4": [
                    "193.29.206.1"
                ],
                "v6": [
                    "2001:678:1::1"
                ]
```


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```
        },
        "objectClassName": "nameserver",
        "handle": "d.ns.nic.cz",
        "links": [
            {
                "href": "https://rdap.nic.cz/nameserver/d.ns.nic.cz",
                "type": "application/rdap+json",
                "rel": "self",
                "value": "https://rdap.nic.cz/nameserver/d.ns.nic.cz"
            }
        ],
        "ldhName": "d.ns.nic.cz"
    }
],
"ldhName": "nic.cz",
"entities": [
    {
        "objectClassName": "entity",
        "handle": "CZ-NIC",
        "links": [
            {
                "href": "https://rdap.nic.cz/entity/CZ-NIC",
                "type": "application/rdap+json",
                "rel": "self",
                "value": "https://rdap.nic.cz/entity/CZ-NIC"
            }
        ],
        "roles": [
            "registrant"
        ]
    },
    {
        "objectClassName": "entity",
        "handle": "REG-CZNIC",
        "roles": [
            "registrar"
        ]
    },
    {
        "objectClassName": "entity",
        "handle": "FEELA",
        "links": [
            {
                "href": "https://rdap.nic.cz/entity/FEELA",
                "type": "application/rdap+json",
                "rel": "self",
                "value": "https://rdap.nic.cz/entity/FEELA"
            }
        ],
        "roles": [
            "administrative"
        ]
    },
    {
        "objectClassName": "entity",
        "handle": "MAPET",
        "links": [
```


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```
            {
               "href": "https://rdap.nic.cz/entity/MAPET",
               "type": "application/rdap+json",
               "rel": "self",
               "value": "https://rdap.nic.cz/entity/MAPET"
            }
         ],
         "roles": [
            "administrative"
         ]
      }
   ],
   "rdapConformance": [
      "rdap_level_0",
      "fred_version_0"
   ],
   "notices": [
      {
         "description": [
            "(c) 2015 CZ.NIC, z.s.p.o.\n\nIntended use of supplied data and␣
↪information\n\nData contained in the domain name register, as well as information␣
↪supplied through public information services of CZ.NIC association, are appointed␣
↪only for purposes connected with Internet network administration and operation, or␣
↪for the purpose of legal or other similar proceedings, in process as regards␣
↪a matter connected particularly with holding and using a concrete domain name.\n"
         ],
         "title": "Disclaimer"
      }
   ],
   "objectClassName": "domain",
   "events": [
      {
         "eventAction": "registration",
         "eventDate": "1997-10-30T00:00:00+00:00"
      },
      {
         "eventAction": "expiration",
         "eventDate": "2027-03-15T13:00:00+00:00"
      },
      {
         "eventAction": "last changed",
         "eventDate": "2016-11-22T14:07:40+00:00"
      },
      {
         "eventAction": "transfer",
         "eventDate": "2007-02-28T13:55:00+00:00"
      }
   ],
   "status": [
      "active"
   ],
}
```

12.3 Nameserver lookup

This query can be used to look up a single nameserver by the *FQDN*.

Lookup by IP is not implemented.

The server does not recognize any parameters with this query.

Listing 4: Query path segment

```
/nameserver/ns.example.cz
```

On the top level, the response may contain members:

- `handle` – registry-unique string identifier referencing the nameserver (hostname), **RFC 7483#section-3**
- `ldhName` – textual representation of DNS names, **RFC 7483#section-3**
- `links` – navigation to related on-line resources, **RFC 7483#section-4.2**
- `notices` – information about the service, **RFC 7483#section-4.3**
- `objectClassName` – string "nameserver" representing the object type in RDAP, **RFC 7483#section-4.9**
- `rdapConformance` – an array of strings, each providing a hint on the used specification, **RFC 7483#section-4.1**

Listing 5: Response example (https://rdap.nic.cz/nameserver/a.ns.nic.cz)

```
{
    "handle": "a.ns.nic.cz",
    "links": [
        {
            "href": "https://rdap.nic.cz/nameserver/a.ns.nic.cz",
            "type": "application/rdap+json",
            "rel": "self",
            "value": "https://rdap.nic.cz/nameserver/a.ns.nic.cz"
        }
    ],
    "ldhName": "a.ns.nic.cz",
    "rdapConformance": [
        "rdap_level_0"
    ],
    "notices": [
        {
            "description": [
                "(c) 2015 CZ.NIC, z.s.p.o.\n\nIntended use of supplied data and␣
↪information\n\nData contained in the domain name register, as well as information␣
↪supplied through public information services of CZ.NIC association, are appointed␣
↪only for purposes connected with Internet network administration and operation, or␣
↪for the purpose of legal or other similar proceedings, in process as regards␣
↪a matter connected particularly with holding and using a concrete domain name.\n"
            ],
            "title": "Disclaimer"
        }
    ],
    "objectClassName": "nameserver"
}
```

12.4 Entity lookup

This query can be used to look up a single contact by its handle. The query cannot be used to look up a registrar.

The server does not recognize any parameters with this query.

Listing 6: Query path segment

```
/entity/HANDLE
```

On the top level, the response may contain members:

- `entities` – an array of entities (the *designated registrar*), **RFC 7483#section-5.1**
- `events` – an array of events that have occurred on the entity, **RFC 7483#section-4.5**
- `handle` – registry-unique string identifier referencing the entity (contact handle), **RFC 7483#section-3**
- `links` – navigation to related on-line resources, **RFC 7483#section-4.2**
- `notices` – information about the service, **RFC 7483#section-4.3**
- `objectClassName` – string "entity" representing the object type in RDAP, **RFC 7483#section-4.9**
- `port43` – hostname of Registry WHOIS server, **RFC 7483#section-4.7**
- `rdapConformance` – an array of strings, each providing a hint on the used specification, **RFC 7483#section-4.1**
- `status` – an array of status flags describing the object state, see *Status mapping*, **RFC 7483#section-4.6** and **RFC 8056#section-2**
- `vcardArray` – a jCard with the entity's contact information, **RFC 7483#section-5.1**

Listing 7: Response example (https://rdap.nic.cz/entity/CZ-NIC)

```
{
    "status": [
        "associated"
    ],
    "entities": [
        {
            "objectClassName": "entity",
            "handle": "REG-CZNIC",
            "roles": [
                "registrar"
            ]
        }
    ],
    "handle": "CZ-NIC",
    "links": [
        {
            "href": "https://rdap.nic.cz/entity/CZ-NIC",
            "type": "application/rdap+json",
            "rel": "self",
            "value": "https://rdap.nic.cz/entity/CZ-NIC"
        }
    ],
    "rdapConformance": [
        "rdap_level_0"
    ],
    "port43": "whois.nic.cz",
```

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```
    "objectClassName": "entity",
    "notices": [
        {
            "description": [
                "(c) 2015 CZ.NIC, z.s.p.o.\n\nIntended use of supplied data and␣
↪information\n\nData contained in the domain name register, as well as information␣
↪supplied through public information services of CZ.NIC association, are appointed␣
↪only for purposes connected with Internet network administration and operation, or␣
↪for the purpose of legal or other similar proceedings, in process as regards␣
↪a matter connected particularly with holding and using a concrete domain name.\n"
            ],
            "title": "Disclaimer"
        }
    ],
    "vcardArray": [
        "vcard",
        [
            [
                "version",
                {},
                "text",
                "4.0"
            ],
            [
                "fn",
                {},
                "text",
                "CZ.NIC, z.s.p.o."
            ],
            [
                "org",
                {},
                "text",
                "CZ.NIC, z.s.p.o."
            ],
            [
                "adr",
                {
                    "type": ""
                },
                "text",
                [
                    "",
                    "Milesovska 1136/5",
                    "",
                    "",
                    "Praha 3",
                    "",
                    "130 00",
                    "CZ"
                ]
            ]
        ]
    ],
    "events": [
        {
            "eventActor": "REG-CZNIC",
```


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```
            "eventAction": "registration",
            "eventDate": "2008-10-17T10:08:21+00:00"
        },
        {
            "eventAction": "last changed",
            "eventDate": "2018-05-15T19:32:00+00:00"
        }
    ]
}
```

12.5 Nsset lookup

This query can be used to look up a single nsset by its handle.

The server does not recognize any parameters with this query.

Listing 8: Query path segment

```
/fred_nsset/HANDLE
```

On the top level, the response may contain members:

- `entities` – an array of entities (linked contacts and the *designated registrar*), **RFC 7483#section-5.1**
- `events` – an array of events that have occurred on the nsset, **RFC 7483#section-4.5**
- `handle` – registry-unique string identifier referencing the nsset, **RFC 7483#section-3**
- `links` – navigation to related on-line resources, **RFC 7483#section-4.2**
- `nameservers` – an array of *nameserver objects*, **RFC 7483#section-5.2**
- `notices` – information about the service, **RFC 7483#section-4.3**
- `objectClassName` – string "fred_nsset" representing the object type in RDAP, **RFC 7483#section-4.9**
- `port43` – hostname of Registry WHOIS server, **RFC 7483#section-4.7**
- `rdapConformance` – an array of strings, each providing a hint on the used specification, **RFC 7483#section-4.1**
- `status` – an array of status flags describing the object state, see *Status mapping*, **RFC 7483#section-4.6** and **RFC 8056#section-2**

Listing 9: Response example (https://rdap.nic.cz/fred_nsset/CZ.NIC)

```
{
    "status": [
        "associated"
    ],
    "entities": [
        {
            "objectClassName": "entity",
            "handle": "REG-CZNIC",
            "roles": [
                "registrar"
            ]
        },
        {
```

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```
            "objectClassName": "entity",
            "handle": "JAROMIR-TALIR",
            "links": [
                {
                    "href": "https://rdap.nic.cz/entity/JAROMIR-TALIR",
                    "type": "application/rdap+json",
                    "rel": "self",
                    "value": "https://rdap.nic.cz/entity/JAROMIR-TALIR"
                }
            ],
            "roles": [
                "technical"
            ]
        },
        {
            "objectClassName": "entity",
            "handle": "JTALIR",
            "links": [
                {
                    "href": "https://rdap.nic.cz/entity/JTALIR",
                    "type": "application/rdap+json",
                    "rel": "self",
                    "value": "https://rdap.nic.cz/entity/JTALIR"
                }
            ],
            "roles": [
                "technical"
            ]
        }
    ],
    "handle": "CZ.NIC",
    "links": [
        {
            "href": "https://rdap.nic.cz/fred_nsset/CZ.NIC",
            "type": "application/rdap+json",
            "rel": "self",
            "value": "https://rdap.nic.cz/fred_nsset/CZ.NIC"
        }
    ],
    "rdapConformance": [
        "rdap_level_0",
        "fred_version_0"
    ],
    "port43": "whois.nic.cz",
    "objectClassName": "fred_nsset",
    "nameservers": [
        {
            "ipAddresses": {
                "v4": [
                    "194.0.12.1"
                ],
                "v6": [
                    "2001:678:f::1"
                ]
            },
            "objectClassName": "nameserver",
            "handle": "a.ns.nic.cz",
```


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```
            "links": [
                {
                    "href": "https://rdap.nic.cz/nameserver/a.ns.nic.cz",
                    "type": "application/rdap+json",
                    "rel": "self",
                    "value": "https://rdap.nic.cz/nameserver/a.ns.nic.cz"
                }
            ],
            "ldhName": "a.ns.nic.cz"
        },
        {
            "ipAddresses": {
                "v4": [
                    "194.0.13.1"
                ],
                "v6": [
                    "2001:678:10::1"
                ]
            },
            "objectClassName": "nameserver",
            "handle": "b.ns.nic.cz",
            "links": [
                {
                    "href": "https://rdap.nic.cz/nameserver/b.ns.nic.cz",
                    "type": "application/rdap+json",
                    "rel": "self",
                    "value": "https://rdap.nic.cz/nameserver/b.ns.nic.cz"
                }
            ],
            "ldhName": "b.ns.nic.cz"
        },
        {
            "ipAddresses": {
                "v4": [
                    "193.29.206.1"
                ],
                "v6": [
                    "2001:678:1::1"
                ]
            },
            "objectClassName": "nameserver",
            "handle": "d.ns.nic.cz",
            "links": [
                {
                    "href": "https://rdap.nic.cz/nameserver/d.ns.nic.cz",
                    "type": "application/rdap+json",
                    "rel": "self",
                    "value": "https://rdap.nic.cz/nameserver/d.ns.nic.cz"
                }
            ],
            "ldhName": "d.ns.nic.cz"
        }
    ],
    "events": [
        {
            "eventAction": "registration",
            "eventDate": "2008-06-09T12:30:16+00:00"
```


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```
        },
        {
            "eventAction": "last changed",
            "eventDate": "2013-09-20T09:18:20+00:00"
        }
    ],
    "notices": [
        {
            "description": [
                "(c) 2015 CZ.NIC, z.s.p.o.\n\nIntended use of supplied data and␣
↪information\n\nData contained in the domain name register, as well as information␣
↪supplied through public information services of CZ.NIC association, are appointed␣
↪only for purposes connected with Internet network administration and operation, or␣
↪for the purpose of legal or other similar proceedings, in process as regards␣
↪a matter connected particularly with holding and using a concrete domain name.\n"
            ],
            "title": "Disclaimer"
        }
    ]
}
```

12.6 Keyset lookup

This query can be used to look up a single keyset by its handle.

The server does not recognize any parameters with this query.

Listing 10: Query path segment

```
/fred_keyset/HANDLE
```

On the top level, the response may contain members:

- `dns_keys` – an array of keyData objects defined as a part of the Domain object class, **RFC 7483#section-5.3**
- `entities` – an array of entities (linked contacts and the *designated registrar*), **RFC 7483#section-5.1**
- `events` – an array of events that have occurred on the keyset, **RFC 7483#section-4.5**
- `handle` – registry-unique string identifier referencing the keyset, **RFC 7483#section-3**
- `links` – navigation to related on-line resources, **RFC 7483#section-4.2**
- `notices` – information about the service, **RFC 7483#section-4.3**
- `objectClassName` – string "fred_keyset" representing the object type in RDAP, **RFC 7483#section-4.9**
- `port43` – hostname of Registry WHOIS server, **RFC 7483#section-4.7**
- `rdapConformance` – an array of strings, each providing a hint on the used specification, **RFC 7483#section-4.1**
- `status` – an array of status flags describing the object state, see *Status mapping*, **RFC 7483#section-4.6** and **RFC 8056#section-2**

Listing 11: Response example (https://rdap.nic.cz/fred_keyset/CZ.NIC)


```
{
    "status": [
        "associated"
    ],
    "handle": "CZ.NIC",
    "links": [
        {
            "href": "https://rdap.nic.cz/fred_keyset/CZ.NIC",
            "type": "application/rdap+json",
            "rel": "self",
            "value": "https://rdap.nic.cz/fred_keyset/CZ.NIC"
        }
    ],
    "port43": "whois.nic.cz",
    "entities": [
        {
            "objectClassName": "entity",
            "handle": "REG-CZNIC",
            "roles": [
                "registrar"
            ]
        },
        {
            "objectClassName": "entity",
            "handle": "JAROMIR-TALIR",
            "links": [
                {
                    "href": "https://rdap.nic.cz/entity/JAROMIR-TALIR",
                    "type": "application/rdap+json",
                    "rel": "self",
                    "value": "https://rdap.nic.cz/entity/JAROMIR-TALIR"
                }
            ],
            "roles": [
                "technical"
            ]
        },
        {
            "objectClassName": "entity",
            "handle": "JTALIR",
            "links": [
                {
                    "href": "https://rdap.nic.cz/entity/JTALIR",
                    "type": "application/rdap+json",
                    "rel": "self",
                    "value": "https://rdap.nic.cz/entity/JTALIR"
                }
            ],
            "roles": [
                "technical"
            ]
        }
    ],
    "dns_keys": [
        {
            "protocol": 3,
```


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```
            "flags": 257,
            "algorithm": 5,
            "publicKey":
↪"BQEAAAABt3LenoCVTV0okqKYPDnnVJqvwCD9MKJNXg8fcOCdLQYncyoehpwM5RK2UkZDcDxWkMo7yMa35ej+Mhpaji9si4xXD-
↪5GlVlrIdE3GW7zC7Z4sS14Vz8FbYfcRmhsh19Ob718jGZneGfw2UPbvkyxUR8wD7mguZn02fQ6tjj/
↪Ktp4uSW9tpz3bjGMo2rX+iZk4xgbPaesAOlR/
↪AaHdatGZsWC9CPon8mnLZeu6czm8CBDgBmnf3PE8c5+uyWj1Pw4pp0VQmnX5UrnuGpErg7qXhJm7wY2CRVRMcLX3zmjVWXW1uT9
↪pZzxnASfKKltZpuw=="
        }
    ],
    "rdapConformance": [
        "rdap_level_0",
        "fred_version_0"
    ],
    "notices": [
        {
            "description": [
                "(c) 2015 CZ.NIC, z.s.p.o.\n\nIntended use of supplied data and␣
↪information\n\nData contained in the domain name register, as well as information␣
↪supplied through public information services of CZ.NIC association, are appointed␣
↪only for purposes connected with Internet network administration and operation, or␣
↪for the purpose of legal or other similar proceedings, in process as regards␣
↪a matter connected particularly with holding and using a concrete domain name.\n"
            ],
            "title": "Disclaimer"
        }
    ],
    "objectClassName": "fred_keyset",
    "events": [
        {
            "eventAction": "registration",
            "eventDate": "2009-01-21T14:12:26+00:00"
        },
        {
            "eventAction": "last changed",
            "eventDate": "2013-09-20T09:18:37+00:00"
        }
    ]
}
```


12.7 Status mapping

Note: This reference lists external status flags only.

The RDAP server contains the mapping of **all** status flags as specified in RFC 8056#section-2. Not all of them, however, are employed in the FRED backend, because FRED has a customized set of status flags.

Table 1: FRED EPP-to-RDAP Status Mapping

Std/FRED[Page 366, 1]	Status flag	RDAP status
FRED	contactPassedManualVerification	validated
FRED	deleteCandidate	pending delete
Std	linked	associated
FRED	outzone	inactive
Std	serverDeleteProhibited	server delete prohibited
Std	serverRenewProhibited	server renew prohibited
Std	serverTransferProhibited	server transfer prohibited
Std	serverUpdateProhibited	server update prohibited
FRED	validatedContact	validated

12.8 HTTP Statuses

In RDAP, each response to a request made to the server contains appropriate data in JSON format (if applicable) together with one of the four following HTTP statuses:

- **200 OK –** Valid query for an existing object in the registry.
- **400 Bad Request –** Invalid query.
- **404 Not Found –** Valid query for a non-existent object in the registry.
- **500 Internal Server Error –** Received in case of a server error.

[1] Indication whether the status flag is FRED custom (`FRED`) or EPP standard (`Std`).

CHAPTER

THIRTEEN

RELEASE NOTES

Overview of changes in software from preceding versions.

13.1 Version v2026.1

See repository changelogs for more details.

13.1.1 Release v2026.1

- add keyset state flag `serverLinkProhibited`
- redesign session management and add support for mailing address removal in fred/eppic
- add reference links to messages in fred/ferda
- add batch info methods to fred/api/registry
- add update states flags methods to fred/api/registry
- add authinfo management methods to fred/api/registry
- add methods for contact merging to fred/api/registry
- add methods to list registrable objects filtered by other linked objects to fred/api/registry
- dockerization of * fred/backend/fileman, fred/backend/messenger and fred/django-secretary services
- add Python 3.13 support, drop Python 3.8 support
- add Django 5.2 support

13.2 Version v2024.1

See repository changelogs for more details.

13.2.1 Release v2024.1

Enhancements

- **fred/server**
  - Add optional parameter `registrant` to the `check-domain` EPP function which checks domain availability for a specific contact in the registry.
  - Added items summary to accounts invoice.
- **fred/backend/zone**
  - New zone service implementation (deprecates old pyfred genzone).
- **Documentation**
  - Replace *Demo installation script* with pre-installed virtual image.

13.3 Version 2.49

See repository changelogs for more details.

13.3.1 Release 2.49.0

Added support for the BSA – GlobalBlock feature.

13.4 Version 2.48

See repository changelogs for more details.

13.4.1 Release 2.48.0

Enhancements

- **fred/server**
  - Transition from CORBA to *gRPC logger*
  - *TechCheck* removed
  - Old *verifications* removed, only `automatic` verification remains
  - **Enhance AuthInfo with TTL implementation:**
    - Objects cannot be created if the `create` command contains AuthInfo
    - Registrars can see a hint to which email was an AuthInfo sent (e.g. `a*****@b*****.**`)
    - In the EPP `update` operation the server now accepts only AuthInfo with minimum number of characters (can be configured)
    - In the EPP `update` operation, entering the AuthInfo as an empty string invalidates the current AuthInfo value
  - Change registrar scoring system from 0-5 to 0-100%

  - New contact state flag `serverLinkProhibited` – disallows linking of new objects to the object with this flag
  - Configurable logger name for LoggerClient
  - Add new `clean_expired_authinfos` command in `fred-admin`
  - Add possibility to end domain name life cycle with auction (configurable per zone)
  - fred-mifd now uses *messenger* to send emails/letters/SMS
  - **MojeID registry backend**
    - **The beginning of registry and MojeID contact relationship transformation**
      - Implement new methods to create and update contact
      - Support for optional permanent address
      - No handling of the verification states – will be handled by client side
      - Removal of two-phase commit for new methods

- **FRED gRPC backend services**
  - **fred/backend/identity**
    - Add support for AuthInfo with TTL feature
  - **fred/backend/logger**
    - Integrate common diagnostics service using `libdiagnostics`
    - Adapt to `libstrong` library
    - Change `LogEntryInfo` (add `log_entry_id` and `session_id`)
  - **fred/backend/notify**
    - `fred-notify-contact-data-reminder` now does not send reminder to validated contacts, validation age limit can be configured
    - Switch to new storage of additional contacts
  - **fred/backend/public-request**
    - New public requests management server based on gRPC API
  - **fred/backend/registry**
    - Implement methods for registrars management
    - Add support for registrars management
    - Implement method for a host name of domain name server checking
    - Use `registrar.is_internal` flag
    - Add `validation_expires_at` into DomainInfoReply
    - Implement `get_domain_life_cycle_stage` method for WHOIS/RDAP
    - Add objects light infos
    - `get_domains_by_contact` optionally also returns deleted domains
    - Change example configuration to jinja2 template
    - Implement method `update_contact_state` (Contact service)
    - Implement ContactRepresentative service

        * Add support for domain auctions
    - **FRED verifications**
        * New gRPC service for validation and verification of registry contacts' data
- **FERDA**
    - Change PluginConfig from dataclass to pydantic model (the interface stayed the same, but types and values are now strictly checked)
    - Add registrar, groups and certification management
    - Add deleted domains to related domains list in contact detail
    - Add new universal REST API for registry search
    - Add plugin permissions
    - Add `output_properties` to `ferda.tests.utils.LoggerMixin.assertLog`
    - Add search by notify_email to contact detail
    - Add registry search CSV export for exact matches
    - Add action buttons to registry search results
    - Add missing object state descriptions
    - Add endpoints for contact representative
    - Enable frontend report list filtering
    - Add settings API (will replace django-settings and ferda-version context processors in the future)
    - Add URL prefixes to settings API
    - Add user API (will replace user-profile and user-permissions context processors in the future)
    - Add regal-based API to replace `ferda.backend.client`
    - Add pluggy plugin framework
    - Add create permissions plugin hook
    - Add endpoint to download certification file
    - Add a link from object detail to logger module
    - Change default search registry object type from contact to domain
    - Add message subtype labels to message detail
    - Display raw message data in message detail
    - Update log request detail design
    - Remove opening links in new tabs
    - Add `registrant_ref` to domain info results
    - Register logger object reference types
    - Limit minimal length of contact registry search queries
- **FERDA plugins**
    - FERDA verification – new plugin for manual contact verification
    - FERDA public request – new plugin for public request management

  - FERDA auction – new plugin for domain auction management
- **Messaging: fred/backend/messenger, fred/backend/fileman and fred/django-secretary**
  - New services for all parts of messaging process
  - Migrate all messaging to the new services
  - See *messenger*
- **Documentation**
  - *Demo installation script*

Bugfixes

- Fix registrar EPP auth operations in libfred (bump dependencies)
- Fix registrar group membership
- Fix three switches which malfunctioned under certain circumstances (`fred-admin --invoice_export --invoice_dont_send`, `--invoice_archive --invoice_dont_send`, `--invoice_archive --debug_context`)
- Fix `serverUpdateProhibited` block
- Fix single invoice export
- poll-client now uses UTC timestamp when calling logger (fix for new logger)
- fred-logd `getRequestCountUsers` now expects UTC timestamps
- Set contact validation public request as processed even if email is not sent

13.5 Version 2.47

13.5.1 Release 2.47.0

We are going to implement an autorization information (AuthInfo) modification with a time-limited validity.

The AuthInfo is used in the domain registry for object transfer or for viewing object details.

The validity period of the generated AuthInfo will be set to 14 days. *CZ-specific*

- **New *epp* schemas of the version `2.4.3` are available at https://www.nic.cz/page/744/registracni-system/.**
  - allow to set AuthInfo as an optional attribute of the `info_keyset`, `info_nsset` and `info_domain` *epp* request.

13.5.2 AuthInfo without TTL (previous version)

Previous state scenarios

For object transfer to another registrar:

1. The user needs to get AuthInfo to transfer an object (see *Four options to get AuthInfo without TTL*).
2. The user passes the obtained AuthInfo to the target registrar.
3. The target registrar calls the `transfer` function.
4. After the successful transfer the registry generates a new AuthInfo.

For registrar's access to user's contact information hidden according to the disclosure settings:

1. The user requests the current AuthInfo from the registrar website or gets new AuthInfo (see *Four options to get AuthInfo without TTL*).
2. The user passes obtained AuthInfo to the registrar to whom he wishes to disclose his non-public data on a one-time basis.
3. After the data is disclosed the registry generates a new AuthInfo.

Four options to get AuthInfo without TTL

The user can get AuthInfo:

1. **via the designated registrar's website of the transferred object or the contact connected to the object,**
   - **On the designated registrar's website the user gets the current AuthInfo or sets his own AuthInfo, i.e.:**
     - **The designated registrar calls a `send_authinfo` function, then the registry sends the current AuthInfo**
       by e-mail to all contacts relevant for the object, one of them should be also a transfer initiator (the user).
     - The designated registrar uses an `info` function and passes the current AuthInfo returned by the registry the user.
     - The designated registrar sets up AuthInfo value in the registry via an `update` function.
2. **via the target registrar's website,**
   - **The target registrar calls `send_authinfo` function, then the registry sends the current AuthInfo**
     by e-mail to all contacts relevant for the object, one of them should ale be the transfer initiator (the user).
3. by viewing the current AuthInfo in the Domain browser,
4. via the request form directly on the CZ.NIC Association's website. *CZ-specific*

13.5.3 AuthInfo with TTL (current version)

Current state scenarios

For object transfer to another registrar:

1. The user needs to get AuthInfo for object transfer (see *Four options to get AuthInfo with TTL*).
2. The user passes the obtained AuthInfo to the target registrar.
3. The target registrar calls a `transfer` function.
4. The registry invalidates the used AuthInfo.

For registrar's access to user's contact information hidden according to the disclosure settings:

1. The user requests to generate and send new AuthInfo from the registrar's website or gets new AuthInfo (see *Four options to get AuthInfo with TTL*).
2. The user passes obtained AuthInfo to the registrar to whom he wishes to disclose his non-public data on a one-time basis.
3. AuthInfo is valid even after the registrar obtains the non-public data. AuthInfo validity is determined by the TTL, limit starts after the AuthInfo is generated.

Four options to get AuthInfo with TTL

The user can get Authinfo:

1. **via the designated registrar's website of the transferred object or the contact connected to the object,**
    - **On the designated registrar's website the user requests valid AuthInfo or sets his own AuthInfo, i.e.:**
        - **The designated registrar calls a `send_authinfo` function, then the registry generates and sends the AuthInfo**
          by e-mail to all contacts relevant for the object. One of them should also be the transfer initiator (the user).
        - The designated registrar sets up AuthInfo value to the registry via an `update` function.
2. **via target registrar website,**
    - **Target registrar calls a `send_authinfo` function, then the registry generates and sends the AuthInfo**
      by e-mail to all contacts relevant for the object. One of them should be also transfer initiator.
3. **sets his own AuthInfo in the Domain browser,**
    - This AuthInfo is valid only for MojeID contact currently logged in. However, it is possible to use it for transfer of linked objects.
    - The system saves AuthInfo with corresponding TTL only if it meets password stregth requirements.
4. via the request form directly on the CZ.NIC Association website. *CZ-specific*

New option for AuthInfo validity verification

It will not be possible to get an AuthInfo value of any object in the registry via `info` function. The registry will allow an AuthInfo verification by registrar in a different way. If any registar sends the correct AuthInfo in any object's `info` command, the registry returns a valid data about the requested object. If the AuthInfo is not correct (all are already expired or none is generated/saved), the registry returns error `2202 - Invalid authorization information`.

13.6 Version 2.46

See repository changelogs for more details.

13.6.1 Release 2.46.0

Enhancements

- **fred/api/registry**
  - add `log_entry_id` into history records of objects
- **fred/rdap**
  - use logging in grill (a gRPC interface logging library - fred/utils/grill) for RDAP
- **fred/api/logger**
  - add `log_entry_ident` and `session_ident` to message `LogEntryInfo` in service `SearchLoggerHistory`
- FERDA
  - add new logger module for searching and viewing logs
  - add possibility of more than one reporting backend
  - add date-time picker into date-time widget in Messages
  - add pasting of date from `clipboard` into date-time widget in Messages
  - minor adjustments of report list module

Bugfixes

- **fred**
  - fix build for Fendora Linux distribution
- **fred/server and fred/libfred**
  - fix of auto registering procedure
  - rework object factories to manual registration instead of the malfunctioning automatic merge procedure
- **fred/server**
  - fix `101 not found` error in the case of existing registrar after the command `whois -h whois.nic.cz -T registrar HANDLE`
  - fix poll message `updateData` sending after domain/keyset/nsset change by system registrar
- **FERDA**

  - fix value of `transfered` and `updated` attributes (dates)

13.7 Version 2.45

See repository changelogs for more details.

13.7.1 Release 2.45.0

Enhancements

- change Authinfo after after a successful execution of the info contact command with the AuthInfo parameter
- add possibility to send contact's Authinfo on email given in the registry even in case the transfer of the contact is forbidden, i.e the contact has the status `serverTransferProhibited`

13.8 Version 2.44

See repository changelogs for more details.

13.8.1 Release 2.44.0

Enhancements

- add concept of external identity which can be linked to the registry contact
- modify domain browser backend to be usable with mojeID contacts and external identity contacts
- **add new contact states for disabling the contact attributes change**
  - related changes in epp contact update and contact auto merge procedure

13.9 Version 2.43

See repository changelogs for more details.

13.9.1 Release 2.43.0

Enhancements

- *epp* command `info_contact` has new optional attribute AuthInfo to allow other than *designated registrar* request disclosed attributes of a given contact
- ***epp*** **command `info_contact` shows:**
  - data according to the set `disclose flags`, if a given registrar **is not** a *designated registrar* for `<handle>`
  - **all data,**

        * if a given registrar **is** a *designated registrar* for `<handle>`
        * **if a given registrar is not a *designated registrar* for `<handle>`**
            - but enters AuthInfo in the request of a given contact
            - but contact with `<handle>` **is** attached to an object like domain (in the role of `registrant` or `admin`), for which a given registrar **is** a *designated registrar*
- if the server evaluates AuthInfo in the `info_contact` request as incorrect, it returns error `2202 - Invalid authorization information`
- *epp* command poll req for a contact data change message, displays the same information as before
- **all data:**
    - receive a *designated registrar* of a given contact
    - receive *designated registrars* of a domain, which has the given contact established in the role of `registrant` or `admin`
- **New *epp* schemas of the version `2.4.2` are available at https://www.nic.cz/page/744/registracni-system/**
    - allow to set AuthInfo as an optional attribute of the `info_contact` *epp* request
    - add new contact states to inform that some of the contact attributes are locked and cannot be changed

13.10 Version 2.42

See repository changelogs for more details.

13.10.1 Release 2.42.0

Enhancements

- **FERDA**
    - new project for modern web administration interface (future Daphne replacement)
    - implemented search and detail browser for basic registry objects (domain, contact, nsset, keyset, registrar) including history
    - implemented user request and data access logging
    - implemented possibility to add additional contact representative to registry contact
    - support for FIDO2 authentication
- **Domain life-cycle parameters can be now changed over time (with parameters history being maintained).**
    - **`fred-admin --domain_lifecycle_parameters`**
        * new interface for domain life-cycle parameters management
        * replacement for domain parameters originally set with `--enum_parameter_change`

Bugfixes

- **fred/server**
  - `fred-admin --block_registrar_over_limit` – fix daily e-mail notification (query time zone)
- **fred/server**
  - `fred-admin --process_public_requests` – fix e-mail notification after resolving block/unblock requests

13.11 Version 2.41

See repository changelogs for more details.

13.11.1 Release 2.41.0

Enhancements

- **fred/libfred**
  - unify random numbers generator
  - lessen strictness of locking `registrar_credit` on initialization of a new record
- fred/pyfred – port from Distutils to Setuptools
- **fred/rdap**
  - include standard server prohibition flags in status display
  - clean up configuration variables
- **fred/server**
  - allow invoicing registrars for the annual fee monthly or yearly
  - add manpages for **`fred-admin`**
- `fred/utils/distutils` – discontinue
- fred/webadmin – allow modification of registrar handles

Bugfixes

- fred/client – fix an error in the `--version` option
- fred/libfred – fix CMake `libpq` detection

13.12 Version 2.40

See repository changelogs for more details.

13.12.1 Release 2.40.0

Enhancements

- **Server:**
  - notify registrars of domains linked to a contact of another registrar about a change in this contact via a poll message
  - improve notifications about deletions and updates of domains and contacts by the Registry

Bugfixes

- Server: fix detection of changes in contact data
- **Doc2pdf – record statements:**
  - fix template formatting
  - fix conversion of the date of birth
- **Webadmin – record statements:**
  - fix timezone conversion in the statement timestamp

13.13 Version 2.39

See repository changelogs for more details.

13.13.1 Release 2.39.2

Bugfixes

- Minor changes in packaging (client, pyfred, server, transproc, webadmin)
- IDL (Accounting): Add optional custom tax date to payment import
- Server: Fix default configuration

13.13.2 Release 2.39.1

Bugfixes

- Cdnskey-scanner: Prolong the time gap between DNS queries
- Database: Fix autoanalysis of `contact` and `contact_address` tables
- (*CZ-specific*) Server (fred-mifd): Fix detection of changes in MojeID contact data (avoid dropping of verification states)
- Server: Fix logging in unix whois (IDN conversion error)

13.13.3 Release 2.39.0

Enhancements

- all components: update LICENSEs to GPLv3+ (code) and CC BY-SA 4.0 (docs)
- Database: add UUID identifier for *registrable object*s and their history records
- Libfred: a new component and repository that reimplements operations on core registry objects
- Server: remove an obsolete database layer from back end – phase 2
- Daphne: allow administrative unblocking of a contact together with a domain if possible
- complete porting C++ components from Autotools to CMake – affects installation from sources
- continue porting Python components from Distutils to Setuptools (Client, WebAdmin)
- Client repository no longer contains compiled `fred-client`, added README with build instructions

13.14 Version 2.38

See repository changelogs for more details.

13.14.1 Release 2.38.5

Bugfixes

- AKM Client: fix insecured-domain key acceptance when interfered by a manually-added keyset

13.14.2 Release 2.38.4

Bugfixes

- (*CZ-specific*) Server (fred-mifd): fix MojeID PIN3 resending

Important: Resending of PIN3 was removed in FRED 2.48.0. New request can be created.

13.14.3 Release 2.38.3

Bugfixes

- (*CZ-specific*) Stat collector: fix parsing of realms with asterisk in authority in MojeID stats

13.14.4 Release 2.38.2

Bugfixes

- fred-pain: Log suspicious invoices from FRED
- (*CZ-specific*) Stat collector: query optimizations, add Py3 support
- Transproc: Restrict console logging to ERROR level
- WebWhois: Return status codes to HTML `data-` attributes of object details

13.14.5 Release 2.38.1

Bugfixes

- **Database:**
  - fix `mail_archive` migration (modifies behaviour of the upgrade scripts `2.32.0-2.33.0-{1,3,4}-*.sql`, see updated ./Upgrade-2-35)
  - drop a constraint to allow multiple invoices for a single payment or a single invoice for multiple payments

    Important: Run the upgrade script 2.35.0-2.35.1.sql, if you want to use *PAIN* with FRED 2.38.
- Server (fred-accifd): fix search for a registrar by payment data
- Transproc: add another *CZ-specific* bank connector

13.14.6 Release 2.38.0

Enhancements

- Server (fred-admin): change `--zone_ns_add` syntax – when entering multiple IP addresses, separate them with a space or repeat the argument (see *Adding zone name servers*)
- Server: remove an obsolete database layer from back end
- Mod-eppd, Server (fred-rifd): make disclosure policy and default disclose flags configurable, see also Upgrade-2-38
- improve public requests – asynchronous processing with a command in fred-admin
- continue porting to setuptools (`doc2pdf`, `transproc`)
- continue porting to Python 3
- *PAIN Phase 1* – detach payment import and processing from FRED, see also *The Future of Payments & Invoices* and Upgrade-2-38
  - **new Django application `django-pain`**

    - `fred-pain`: FRED plugin for PAIN
    - `payments-pain`: Ginger plugin for PAIN (not released to the public)
  - IDL: new `Accounting` interface
  - Database: migrate `bank_payment` table to PAIN DB
  - **Server:**
    - fred-admin: remove `--bank_import_xml` command
    - new daemon `fred-accifd` will handle registrar credit based on payments already processed with PAIN
    - currently in transitional state - handles payment import call from PAIN because invoices are still managed with FRED
  - **Transproc:**
    - rename back-end command configuration variables
    - call `django-pain` instead of `fred-admin`
  - **WebAdmin:**
    - remove `Payments` (move manual pairing to PAIN)
    - change format for saving search filters

Bugfixes

- Server (fred-admin): check that a domain has not been deleted yet before deleting it (using the command `--object_delete_candidates` with the argument `--object_delete_spread_during_time` used to log an error when attempting to delete a domain repeatedly)
- Mod-eppd, Client: show extra-addr extension in the EPP greeting (`<extURI>http://www.nic.cz/xml/epp/extra-addr-1.0</extURI>`) when enabled in mod-eppd
  - Client upgrade is necessary!
- Server (fred-rifd): in `sendauthinfo` operations, check validity of the main email address of linked contacts; if there is no valid address in any of the linked contacts, end with the "2400 Command failed" error to signify that nothing will be sent

13.15 Version 2.37

See repository changelogs for more details.

13.15.1 Release 2.37.3

Bugfixes

- Doc2pdf: (*CZ-specific*) fixed helios.xsl transformation (invoice export)

13.15.2 Release 2.37.2

Bugfixes

- Database: restore (alter function schemas for security reasons)

13.15.3 Release 2.37.1

Bugfixes

- Server: fixed sending of AuthInfo to multiple recipients when sending it to an email in the registry
- Server: fixed separator escaping in CSV serializer

13.15.4 Release 2.37.0

Enhancements

- ***GDPR*** **compliance – dealing with personal information**
  - **EPP: server disclosure policy switched to *hide by default* (used to be *show by default*):**
    - changed *greeting* content: `dcp/access/all -> dcp/access/none`
    - `contact:info` response displays disclosure settings with `flag="1"` (in reverse to previous versions)
    - affected also behaviour of `contact:create` and `contact:update`
  - added new *public request* types (requests for personal information) with a new web form, fred-admin procedure, filtering and resolving in Daphne, and an email template
  - provided utility `fred-disclose-flags-update` for a custom reset of contact disclosure preference
  - see also Upgrade-2-37
- DB: improved email template for contact identification (included phone number)
- WebWhois: removed some configuration options from the list of registrars (moved to CMS)
- removed old IDL types in pyfco (affects WebWhois, RDAP, Daphne)
- continuing preparations to port Python 2 code to Python 3

Bugfixes

- Daphne: fixed returning zone access to a registrar from whom the access to this zone was taken away before
- EPPClient: fixed interpretation of disclose flags in responses to `contact:info` to handle both the old and the new server disclosure policy

13.16 Version 2.36

See repository changelogs for more details.

13.16.1 Release 2.36.1

Bugfixes

- WebWhois+RDAP: fixed display of domains in the `deleteCandidate` state

13.16.2 Release 2.36.0

Enhancements

- IDL: unified types for date, time and buffer (frontend-backend interface)
- preparations to port Python 2 code to Python 3

Bugfixes

- EPP: fixed contact update removing a street line
- Record statements: fixed exception type when object is not found

13.17 Release 2.35.0

See repository changelogs for more details.

Enhancements

- **changes in the database schema concerning email storage – see ./Upgrade-2-35**
  - email stored unrendered to decrease `mail_archive` table size
  - support for email template versioning
  - email rendered only on demand (sending, inspecting details)
  - newer minimum version of PostgreSQL required – see the *System requirements*
- transproc allows to restrict payment downloads with dynamic date intervals
- new fred-admin command (`--create_expired_domain` – re-register a domain for another owner and force the domain expired)

- generation of historical record statements in Daphne

Bugfixes

- fixed record statement generation for objects in `deleteCandidate` state

13.18 Release 2.34.0

See repository changelogs for more details.

Enhancements

- transitioned to a newer C++ standard (C++14)
- Registrars' passwords stored as hashes
- reimplemented object deletion (object types by name, spread during time argument)
- reimplemented generation of poll messages
- documentation updates (see *record of changes*)

Bugfixes

- hotfix in payment transcript processing (added backslash escaping of some elements)
- fixed database-level locking during some of the EPP operations

13.19 Release 2.33.1

See repository changelogs for more details.

Enhancements

- updated `getdns` (to v1.2.1) in cdnskey-scanner
- added mailing address handling to fred-client commands

Bugfixes

- corrected `serverBlocked` description in db
- fixed error with null-byte-terminated public keys in cdnskey-scanner
- fixed `info_contact` mailing address response extension in EPP (omit `sp` element completely when empty)
- hotfix for EPP `info_contact` error when contact is `serverBlocked`

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