

DNS hosting with FRED

ICANN 85 – TechDay - Mumbai

Content

- FRED is a complete open source system to manage TLD registry
- Last year we deployed FRED to manage gov.cz SLD on behalf of Czech government
- Several changes had to be implemented more common for DNS hosting providers systems:
 - Possibility to manage most important DNS records associated with domain
 - Generate zonefiles containing these DNS records
- FRED is now more flexible tool covering more potential use cases than ever before

FRED



- Open source registry solution
- EPP, WHOIS, RDAP, DNSSEC with automation via CDNSKEY scanning, ...
- Developed (and used) by CZ.NIC since 2006
- Website: <https://fred.nic.cz>
- Documentation: <https://fred.nic.cz/documentation/html/>
- Source code: <https://gitlab.nic.cz/fred>
- It is possible to order support (consultations, help with migration, NBD responses...)

Who uses FRED



Recent changes

- Three more components switched from deployment scheme via binary packages to Docker image deployment
- Switch to Debian 12 for remaining packages as only supported OS
- Upgrade to PostgreSQL 17
- Updated python epp client eppic
- BSA GlobalBlock module
- Virtual image with DEMO installation available to download and deploy
- More details at <https://fred.nic.cz/en/news/version-v2026-1-released/>

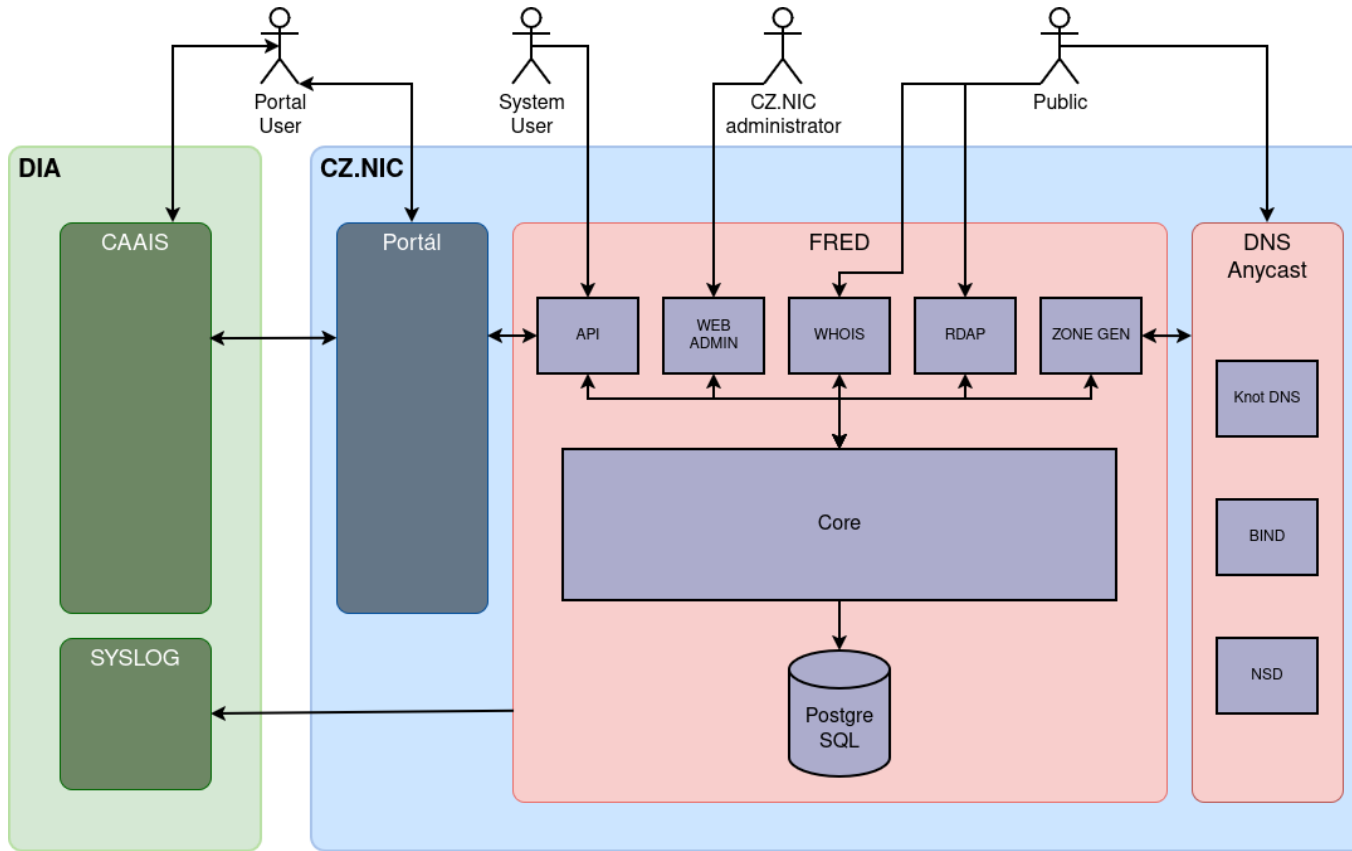
Czech government's gov.cz project

- Governmental decision in January 2023
 - Make it easier for citizens to recognize governmental websites in the age of increasing phishing attacks
- Tender for provider with deadline in June 2024
 - Who else should make submission if not us?
- Contract with Digital and Information Agency (DIA) signed in August 2024
- Delivery of final part according contract in December 2025

Scope

- DNS infrastructure for gov.cz
 - Transition into our anycast in December 2024
 - Manual processing of DNS record changes via ticketing system
- Registry
 - Web portal for DNS administrators from governmental institutions
 - Authentication via CAAIS – central authentication system for governmental employees
 - API for automated DNS administration
 - For example to solve domain ownership verification in TLS certificate issuance process
 - Solving dynamic DNS changes
 - Integration with GSLB systems
 - Testing instance configured for govtest.cz delivered in November 2025 and gov.cz instance deployed in December 2026

High level architecture



Domain lifecycle

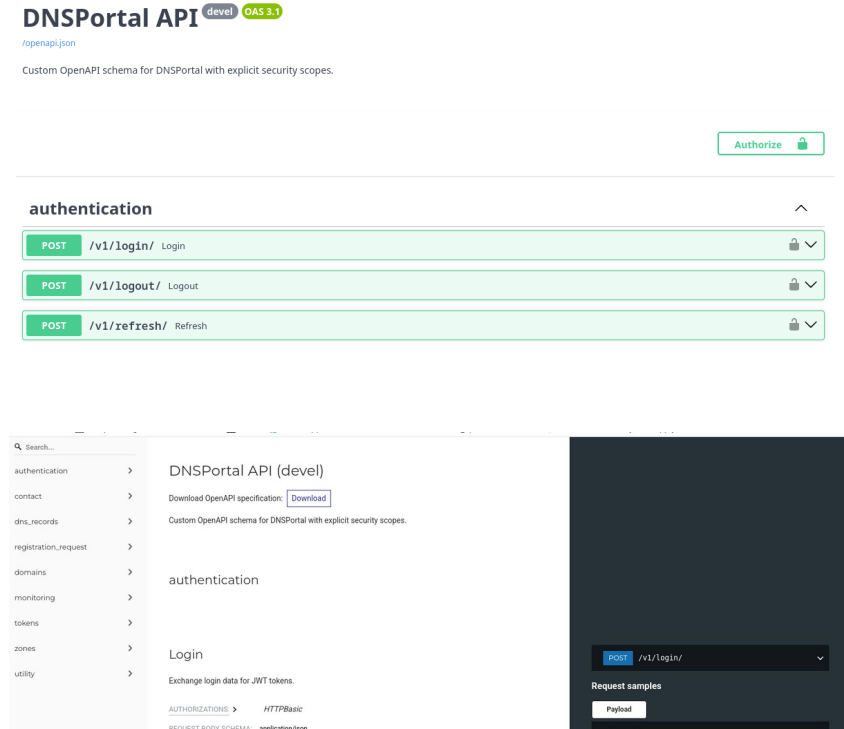
- No EPP, no registrars
 - DIA is the registrar and it's employees administrate domains jointly with employees of other governmental institutions
- Registration procedure starts with request
 - User provides only domain name, reason in the note and phone number
 - The organization represented by this user will be the holder
 - DNS configuration is the same for all domains – points to our nameservers
 - Internally, database of contact data is synced with public list of governmental institutions
 - Expiration date is set to 10 years from registration and is auto renewed
- Registration request must be approved or may be rejected
 - Notifications about request and rejections are send to respective people

Roles

- Users have assigned roles, each can be either ReadOnly or ReadWrite
 - DNS Admin
 - DNS Administrator from governmental institution
 - Allowed to request registration of domain under gov.cz
 - Allowed to modify DNS records for registered domain for his organization
 - DNS Superadmin
 - Administrator from Digital and Information Agency (DIA)
 - Allowed to approve or deny registration requests
 - Allowed to directly register domains
- User have assigned organization
 - Can administrate only domains where organization is the holder

REST API

- Contains full functionality of portal
- Access controlled by tokens
- Detailed documentation publicly available
 - Swagger UI
 - Redoc
- To support most expected use case, we implemented CertBot plugin
 - <https://gitlab.nic.cz/fred/dnsportal-certbot-plugin>



DNS Resource records

- A, AAAA, CAA, CNAME, HTTPS, MX, SVCB, SRV, SSHFP, TLSA, TXT
 - CNAME and subdomain collision detection
- ANAME
 - Inspired by <https://datatracker.ietf.org/doc/draft-ietf-dnsop-aname/>
 - Resolving ANAME into A/AAAA every minute
 - No change if resolving fails
 - DNSSEC signed or not? Azure Front Door is not DNSSEC signed

Zone files

- Each 3LD has separate zone file
- Zone file generator updated
 - To handle new DNS RR types
 - Possibility of creation of catalog zone for all configured domains
- Run every 5 minutes for quick propagation of changes
- DNSSEC automation handled via CDNSKEY processing in both Knot DNS and FRED

Directory services – Web WHOIS and RDAP

 Domain management

English | [Česky](#)

Search in the subdomain registry

Search results for handle [dia.gov.cz](#):

Domain name details

Domain name	dia.gov.cz
Registered since	12/01/2025
Last update date	12/01/2025
Expiration date	12/01/2035
Holder	DIGITALNI-INFORMACNI-AGENTURA Digitální a informační agentura
Administrative contact	
Sponsoring registrar	REG-DIA Digitální a informační agentura since Dec. 1, 2025, 4:17 p.m.
Secured by DNSSEC	✓
Status	

Name server set	NSS-GOV CZ
Name server	a.ns.nic.cz
Name server	b.ns.nic.cz
Name server	c.ns.nic.cz
Name server	d.ns.nic.cz
Technical contact	CZ-NIC CZ.NIC, z.s.p.o.
Sponsoring registrar	REG-CZNIC CZ.NIC, z.s.p.o. since Dec. 1, 2025, 4:09 p.m.
Status	Has relation to other records in the registry

```
objectClassName: "domain"
rdapConformance:
  0: "rdap_level_0"
  1: "fred_version_0"
handle: "dia.gov.cz"
ldhName: "dia.gov.cz"
links:
  0:
    value: "https://rdap.gov.cz/domain/dia.gov.cz"
    rel: "self"
    href: "https://rdap.gov.cz/domain/dia.gov.cz"
    type: "application/rdap+json"
port43: "whois.nic.cz"
events:
  0:
    eventAction: "registration"
    eventDate: "2025-12-01T15:17:06+00:00"
  1:
    eventAction: "expiration"
    eventDate: "2035-11-30T23:00:00+00:00"
  2:
    eventAction: "last changed"
    eventDate: "2025-12-01T15:22:52+00:00"
entities:
  0:
    objectClassName: "entity"
    handle: "DIGITALNI-INFORMACNI-AGENTURA"
    roles:
      0: "registrant"
    links:
      0:
        value: "https://rdap.gov.cz/entity/DIGITALNI-INFORMACNI-AGENTURA"
        rel: "self"
        href: "https://rdap.gov.cz/entity/DIGITALNI-INFORMACNI-AGENTURA"
        type: "application/rdap+json"
  1:
    objectClassName: "entity"
    handle: "REG-DIA"
```

Next steps

- Few updates discussed with DIA
 - Better scoped API access tokens
 - Hierarchy in contacts (ministries → subordinate organizations)
 - Show history of DNS records changes in portal
 - Redirection from registry RDAP to RDAP for gov.cz
- Portal is not part of FRED
 - Functionality should be integrated also into internal administration portal
 - Or we could potentially build generic portal for other customers
- API and DNS hosting backend will be part of next public FRED release

Additional use cases

- VIP domain commercial service
 - DNS hosting for high profile domains – T-Mobile, Czech TV, ...
 - Currently we are doing plain secondary hosting with zone transfers
 - We could provide to customer full self-service portal for zone administration
- Our own SLDs
 - We have about 100 SLDs for our own projects
 - Currently administrated by DNS admins in git and changes are processed via requests in ticketing system
 - We could transfer all our SLDs directly to FRED

Priorities for FRED

- Make FRED compliant with requirements of ICANN RST program
 - RDE exporter is done
 - RDAP alignment almost finished
 - EPP compliant through the proxy – we decided to write completely new EPP processor
- The goal is to become accredited RSP for newGTLDs
 - This includes extending our capabilities to run FRED as a service
 - Hosting registry for gov.cz gave us valuable “hosted FRED” experience

Thank you for watching!