Centre of Excellence in DNS SECURITY

DNS Ecosystem and Security

04th May 2022

03:00 PM - 05:00 PM

Public DNS Server

Our Public DNS Recursive Resolver for both IPv4 and IPv6 traffic is available for Internet users Worldwide at :

IPv4: 223.31.121.171
IPv6: 2405:8a00:8001::20

☑ DNSSEC Enabled
☑ RFC 8806 Compliant

Ministry of Electronics and
Information Technology
Government of India

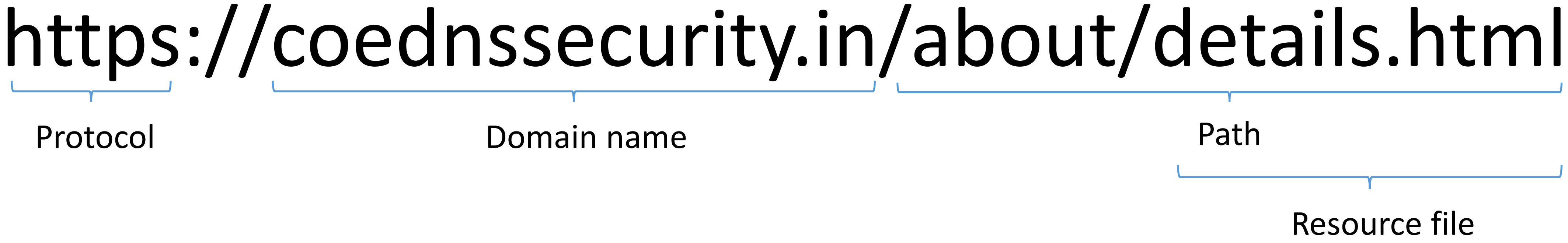
ICANN nixi

सी-डैक CDAC प्रगत संगणन विकास केन्द्र
CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING

Agenda

- What is domain name?
- Introduction to DNS
- DNS Ecosystem
- DNS Hierarchy
- Bind Components
- DIG – Domain Information Groper
- Setting up Recursive Resolver using BIND
- Setting up Authoritative Server using BIND
- References
- Q & A

What is a domain name?



https://coednssecurity.in/about/details.html

Protocol

Domain name

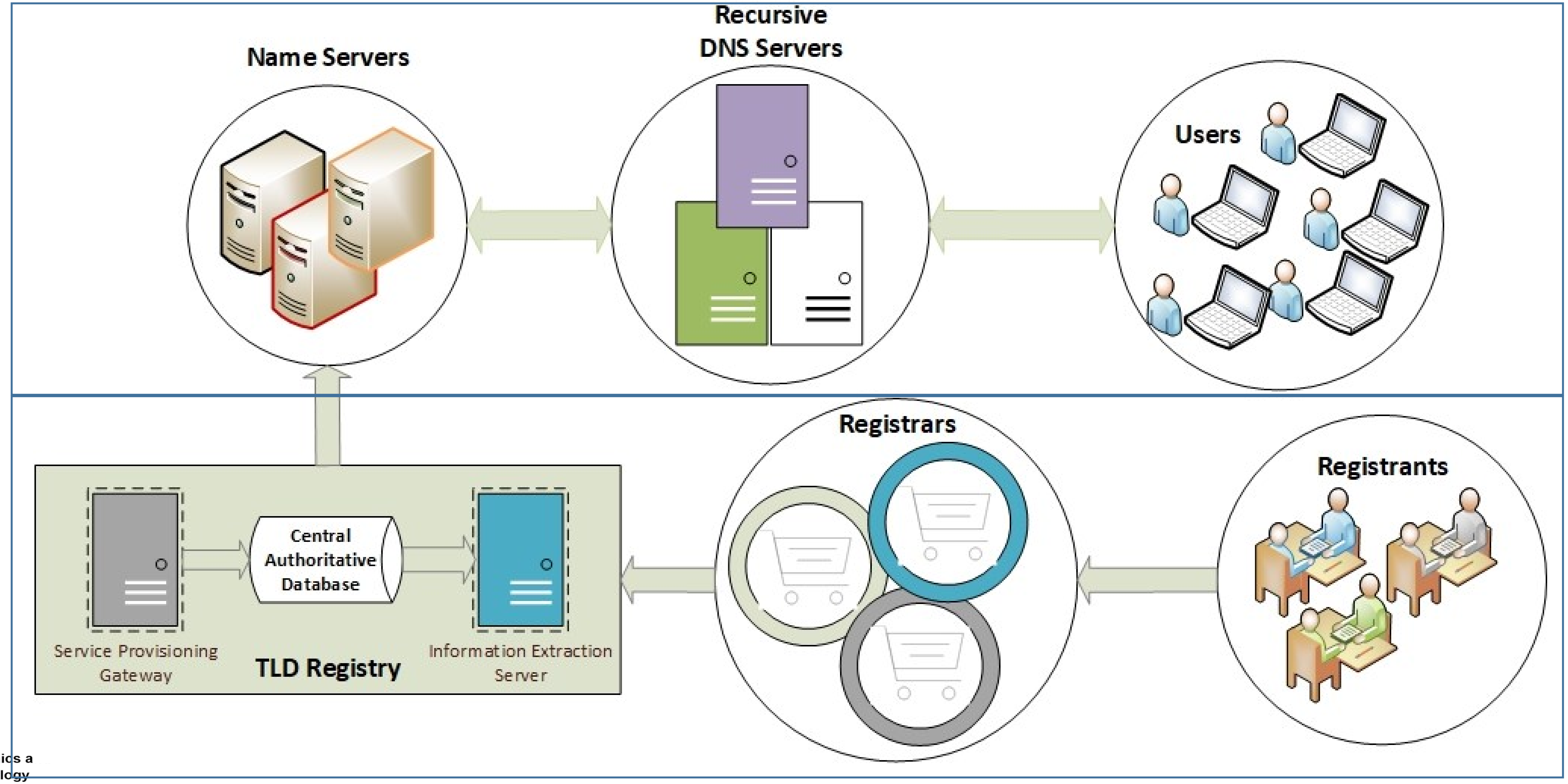
Path

Resource file

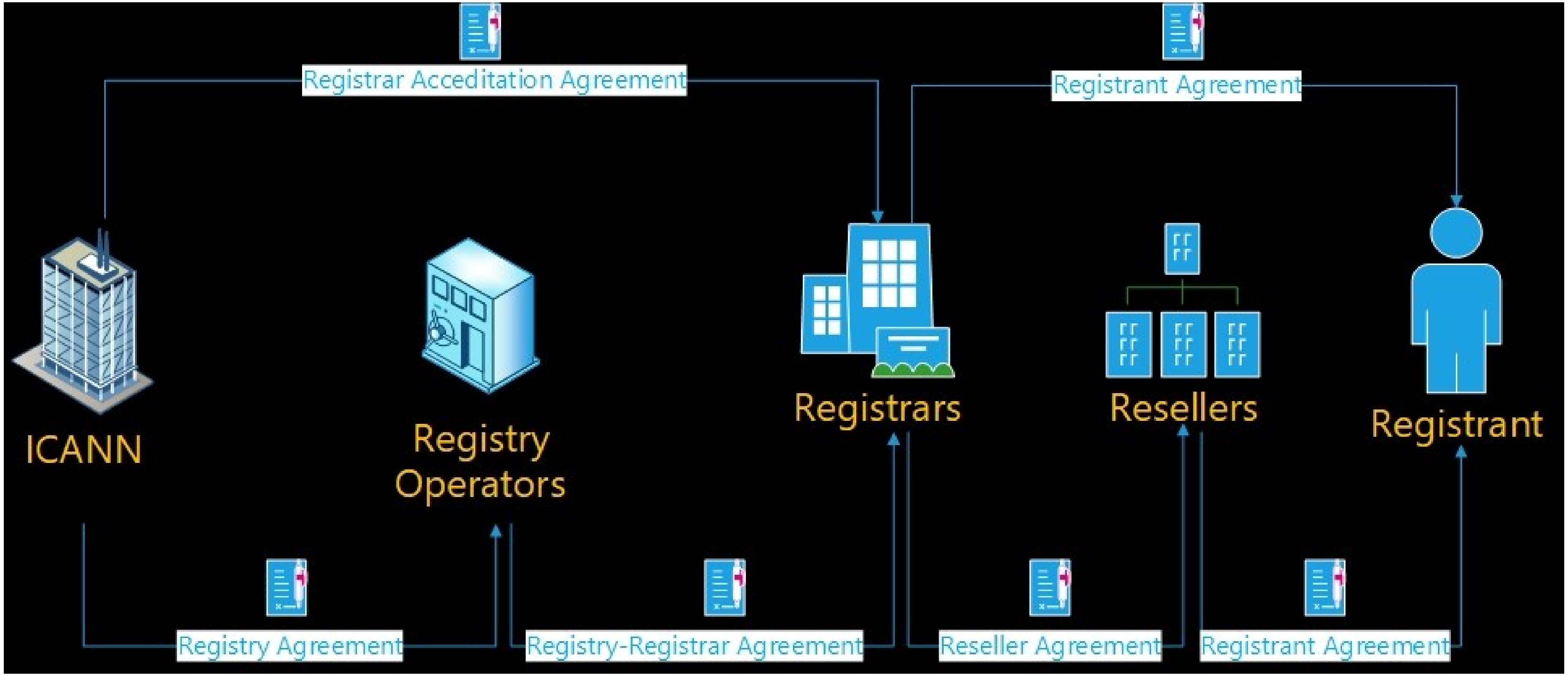
Introduction to DNS

- A vital component of Internet
- Translates domain name to IP address and vice versa
- Distributed system
- Monitored and maintained by:
  - ICANN (Internet Corporation for Assigned Names and Numbers)
  - IANA (Internet Assigned Numbers Authority)
- 13 Root servers across the globe

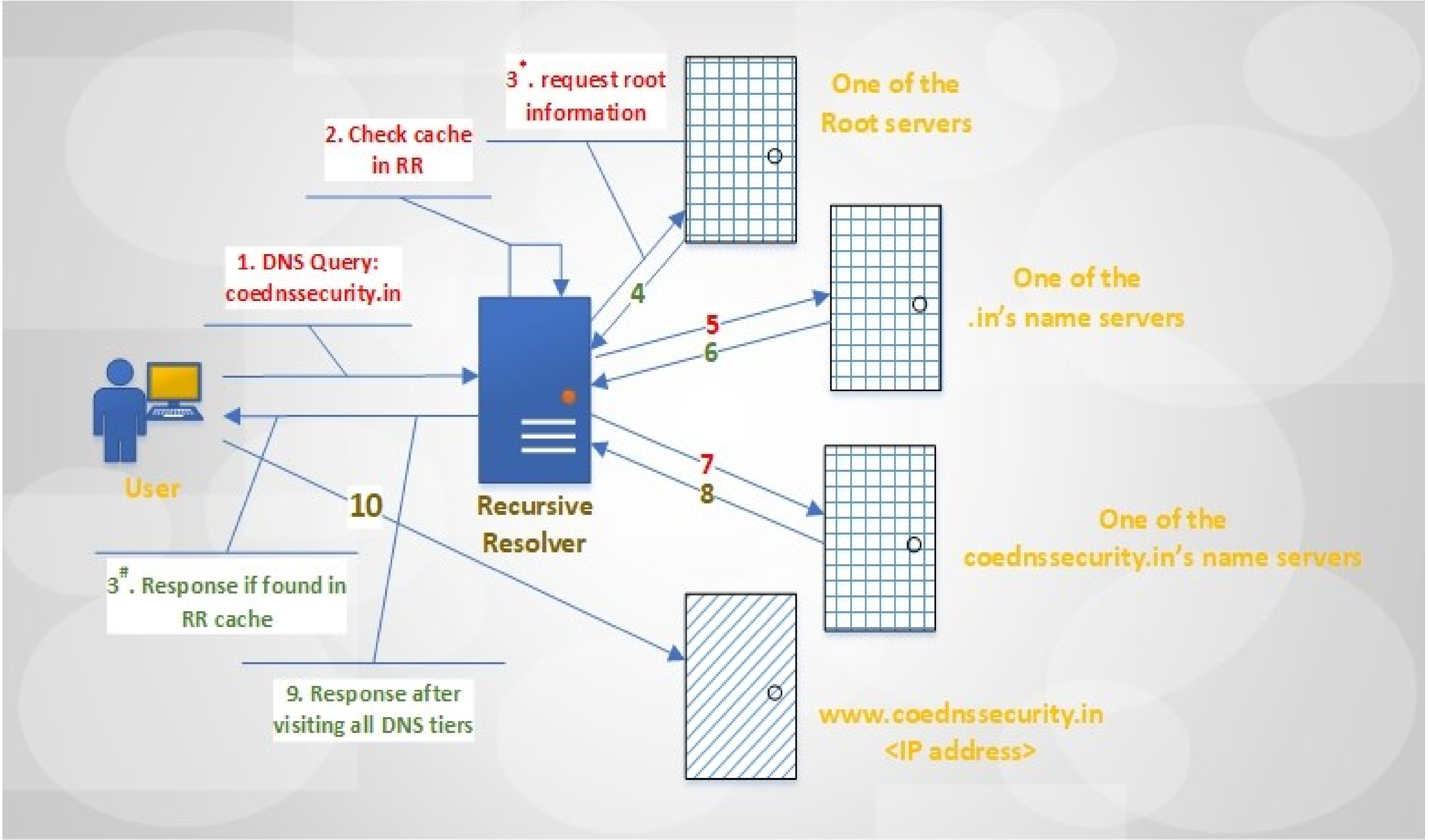
DNS Ecosystem


Name Servers
Recursive DNS Servers
Users
Central Authoritative Database
Service Provisioning Gateway
TLD Registry
Information Extraction Server
Registrars
Registrants

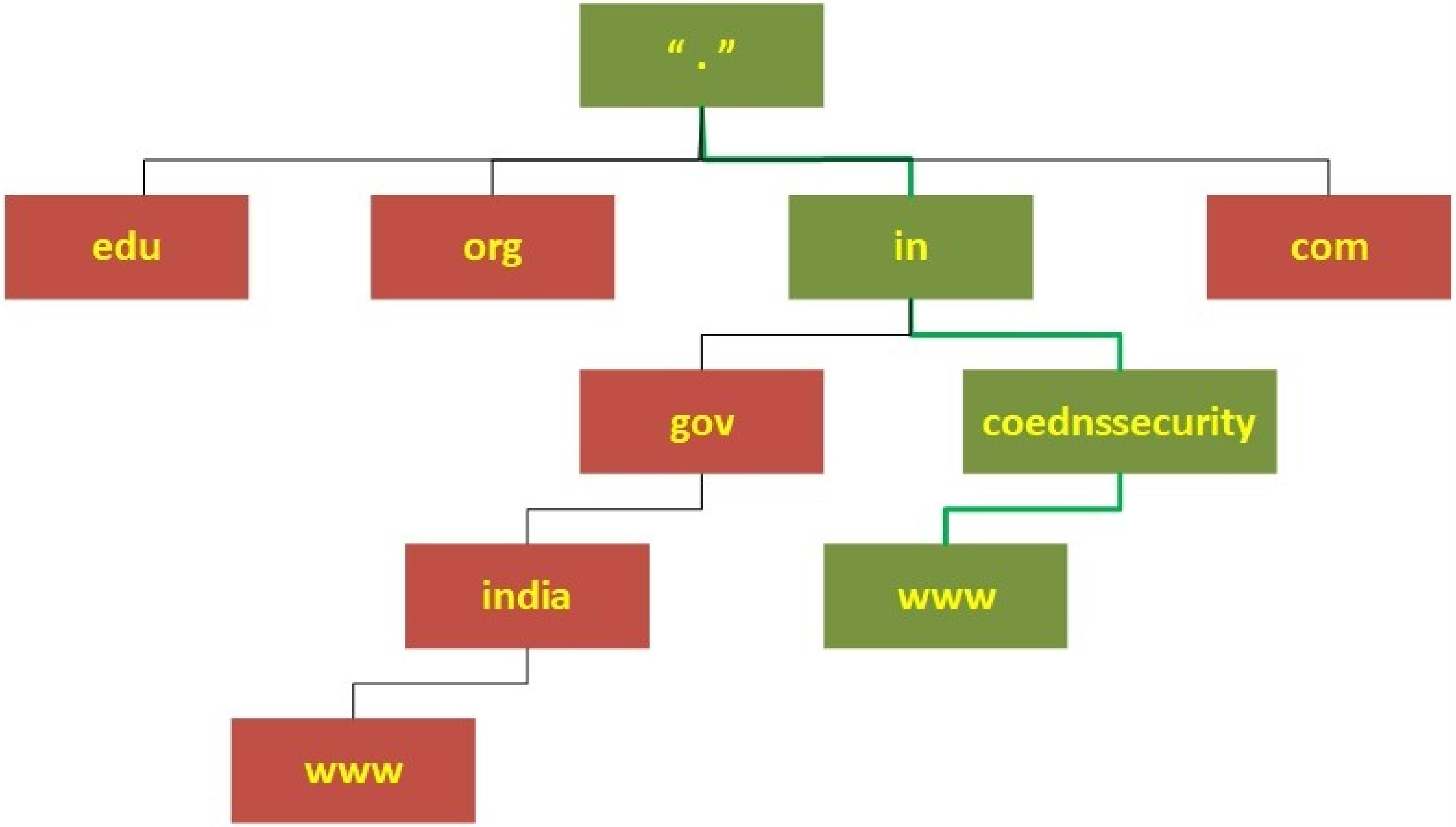
DNS Ecosystem contractual agreements



DNS Query Resolution


3*. request root information
2. Check cache in RR
1. DNS Query: coednssecurity.in
One of the Root servers
4
5
6
One of the .in's name servers
User
Recursive Resolver
10
7
8
One of the coednssecurity.in's name servers
3#. Response if found in RR cache
9. Response after visiting all DNS tiers
www.coednssecurity.in <IP address>

DNS Hierarchy



The root

Top-Level Domains

Second-Level Domains

Third-Level Domains

BIND

- BIND is the most popular Domain Name System (DNS) server.
- It is FOSS (Free & Open Source Software)
- BIND means Berkeley Internet Name Domain.
- It was developed in the 1980s at the University of Berkeley.
- It can be used both as a Caching Server as well as an Authoritative Server.
- The demonstrations are based on Bind 9.16.6

BIND Components

- *Name Server.*
  - Maintains a DNS Zone file and responds to DNS Requests
  - Acts either as a Caching only Name Server (Recursive Resolver) or Authoritative Name Server.
- *Lightweight Resolver.*
  - It contains a lightweight resolver library that can be run on DNS clients like host Operating System and routers
  - It also contains resolver daemon process which can run on a local host.
- *Name Server Tools.*
  - **dig** - allows users to resolve DNS queries
  - **host** - converts hostnames to IP addresses
  - **nslookup** - queries DNS servers for information about hosts and domains
  - **named-checkconf :** This tool checks the syntax of *named.conf* file
  - **Remote Name Daemon Control (rndc)**
    - Remote Name Daemon Control
    - It allows the System Administrators to control the operation of a name server over a TCP connection

DIG – Domain Information Groper

- DIG is an administrative tool for querying DNS Name Servers
- It is useful for performing DNS Lookups and displays the answers that are returned from the name server
- It is also useful for verifying and troubleshooting DNS Problems

Methodology for setting up DNS server using BIND

- Demonstration

Authoritative DNS Server

- An Authoritative DNS Server is the nameserver that provides an authoritative answer to the queries from Recursive DNS nameserver.
- Types:
  - Root Servers
  - Primary
  - Secondary

Authoritative DNS Server: Zone file

- DNS Zone file is the text file containing all DNS zone information.
- Format: RFC 1035
- Parts of Zone file:
  - “$ORIGIN” – start of a DNS zone file, it appends to all labels to form FQDN, if the label doesn’t end with a period
  - “@” – indicates $ORIGIN should replace it
  - “SOA” – Start of Authority (SOA) record follows “$ORIGIN”

Authoritative DNS Server: Zone file

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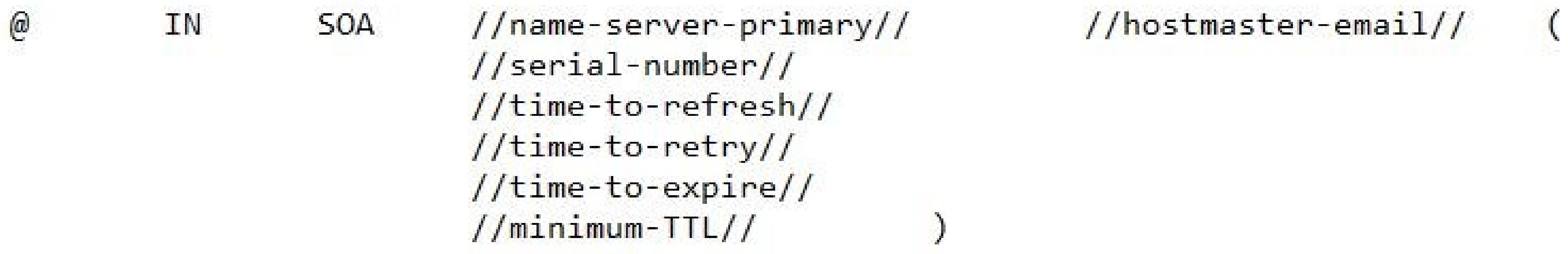
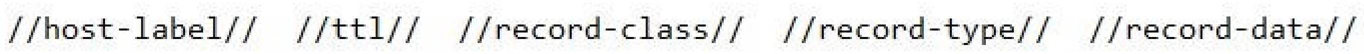


```
@       IN      SOA     //name-server-primary//         //hostmaster-email//    (
                        //serial-number//
                        //time-to-refresh//
                        //time-to-retry//
                        //time-to-expire//
                        //minimum-TTL//         )
```

  - *name-server-primary*: contains the original zone file
  - *serial-number*: version number
  - *time-to-refresh*: waiting time for secondary servers to check change in serial (seconds)
  - *time-to-retry*: waiting time for secondary servers after a failed attempt to update zone (seconds)
  - *time-to-expire*: time for *time-to-retry* to expire
  - *minimum-TTL*: caching time of negative response (seconds)

Authoritative DNS Server: Resource Record

- Parts of Resource Record:
  - A zone file can contain many resource records.



```
//host-label//  //ttl//  //record-class//  //record-type//  //record-data//
```

  - *host-label*: defines hostname of a record and “$ORIGIN” appends to it
  - *ttl*: caching time of the DNS record
  - *record-class*: usually “IN”
  - *record-type*: common types are- A, AAAA, NS, SOA, MX, CNAME
  - *record-data*: the data to returned as the answer/reply

References

- Bind 9.18.2 Software: https://coednssecurity.in/pdf/bind-9.18.2.tar.xz
- Bind 9.18.2 Manual: https://coednssecurity.in/pdf/DNS-Bind918-Server-Installation-Configuration.pdf
- RFC 1035: https://tools.ietf.org/html/rfc1035

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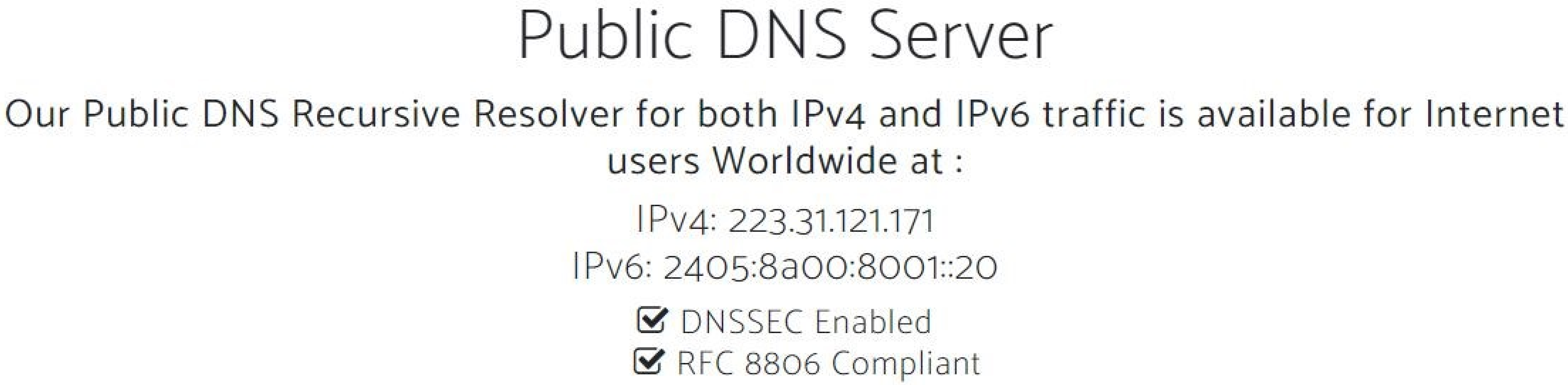
Q & A



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Please help us improve our email security solution by forwarding your spam emails to our SPAM BOX at:

spam@coednssecurity.in

Thank you

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