DNS Security & Privacy

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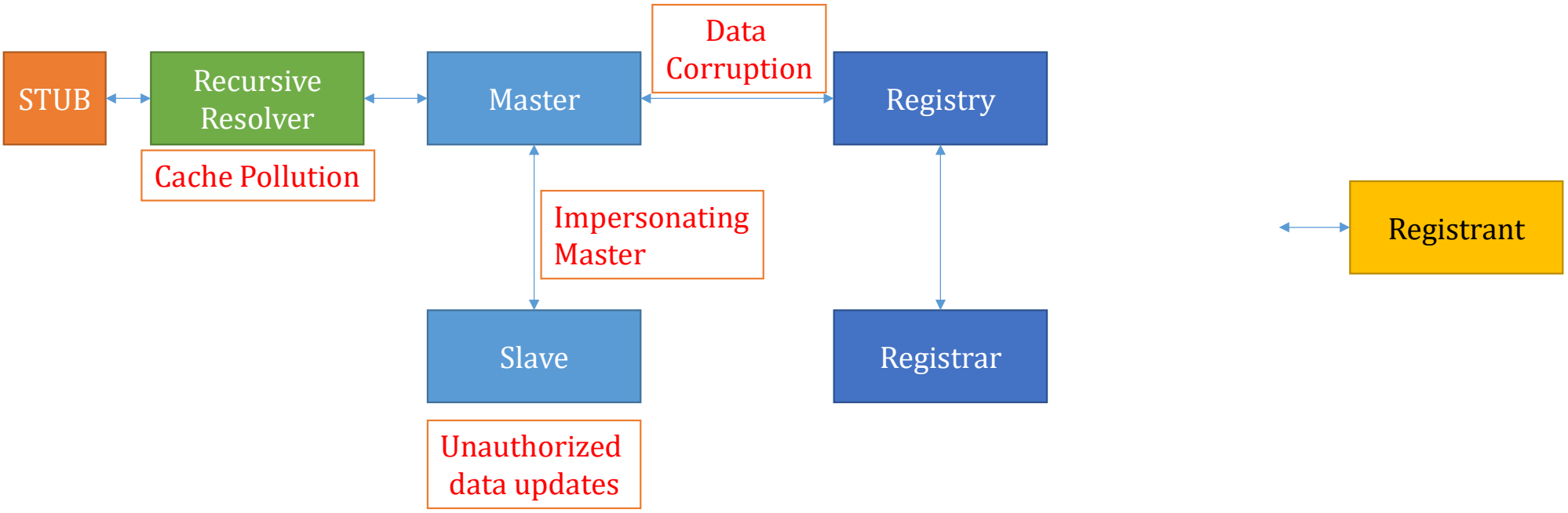
DNS Infrastructure Attack Landscape



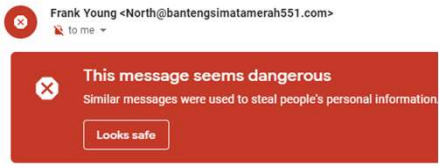
*MiTM between each entity

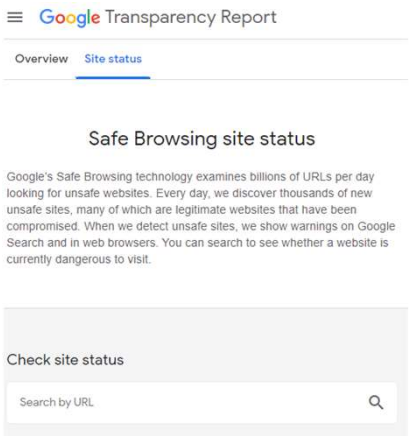
*DNS Software Vulnerability wherever applicable

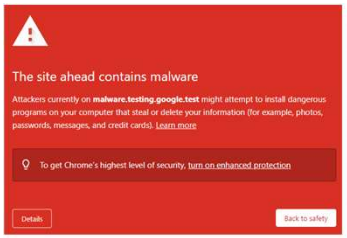
Disrupt DNS = Disrupt Internet = Disrupt Service

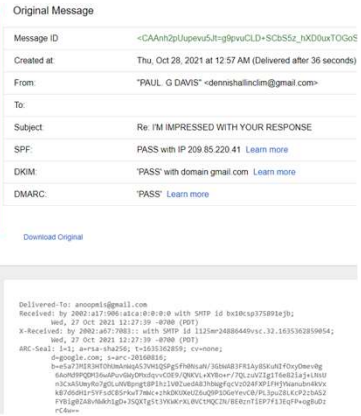
Some Checks

- Whois data
  - Recent domain registration creation date
  - Questionable Whois contact data
  - Privacy protection service
- Email
  - Show Original
  - Name & Email
- URL check
  - Brand misuse
  - Long URL, base site absent
- TLS Certificate check
- Suspicious host, operator, NS
- Safe Browsing Check
- URL Filter
- Tools like nslookup, dig









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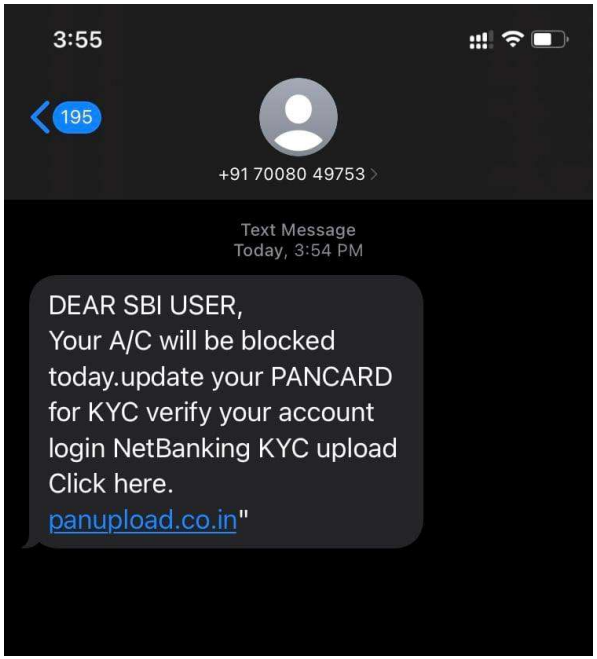

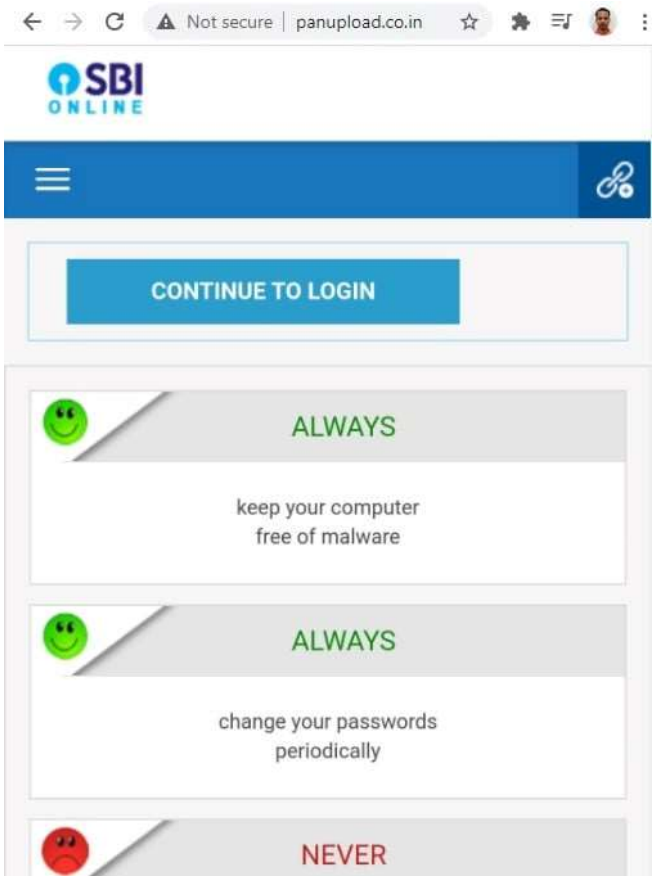

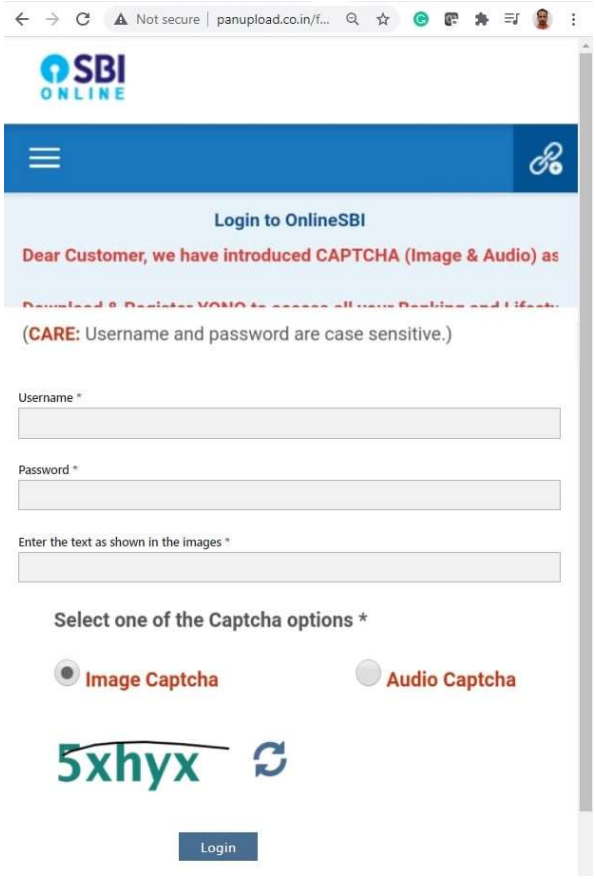

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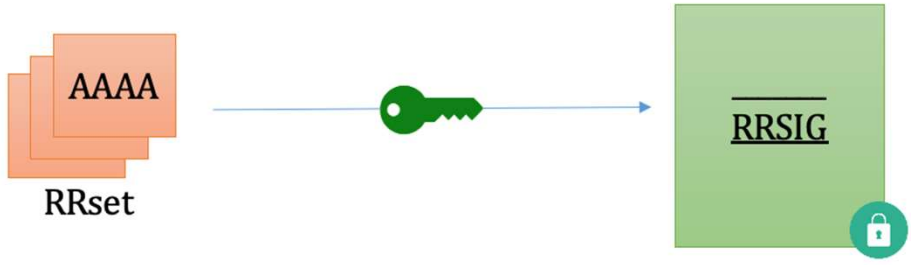
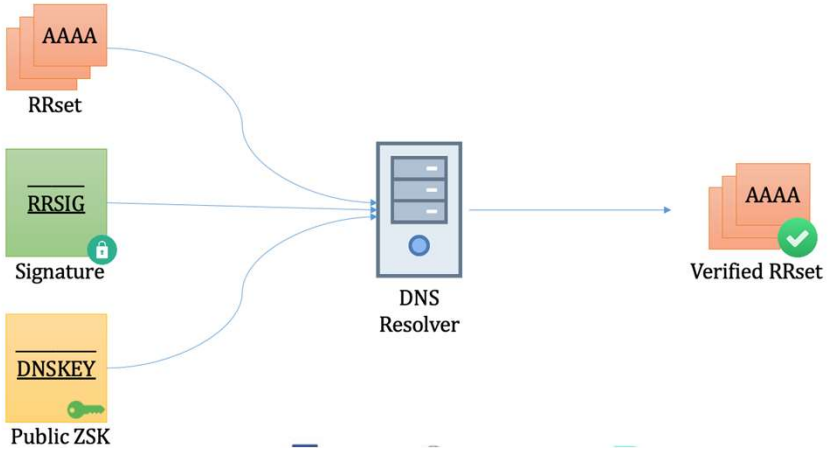
Some Remedies

- DNSSEC
- Mail Exchanger Security: SPF, DKIM
- Awareness: DNS Tools, Modus Operandi
- Open DNS Resolver
  - Configure well!
- Scam: Don’t believe too much on your luck
- End Point Protection
- Report

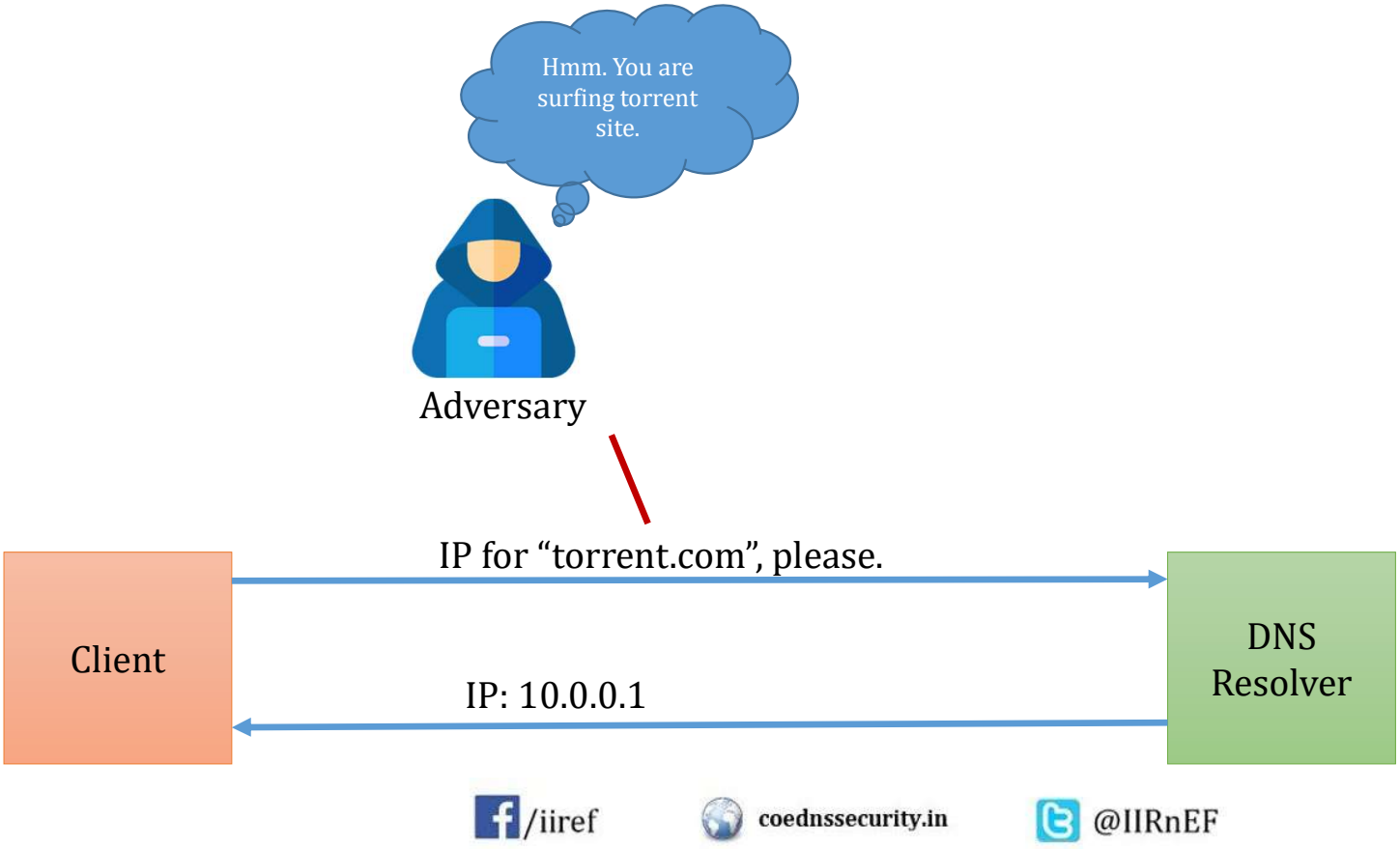
DNSSEC

- Adds a layer of Trust through authentication
  - Adds cryptographic signature to existing DNS Records
- Verify Signature
  - Data coming from authoritative server
  - Ensures
    - No modification en-route
    - No fake record injection
- Trust Propagation
- DNSSEC Guarantees:
  - Authenticity of DNS answer origin
  - Integrity of reply
  - Authenticity of denial of existence
- DNSSEC does not
  - Provide confidentiality for DNS data
  - Protect against Denial of Data

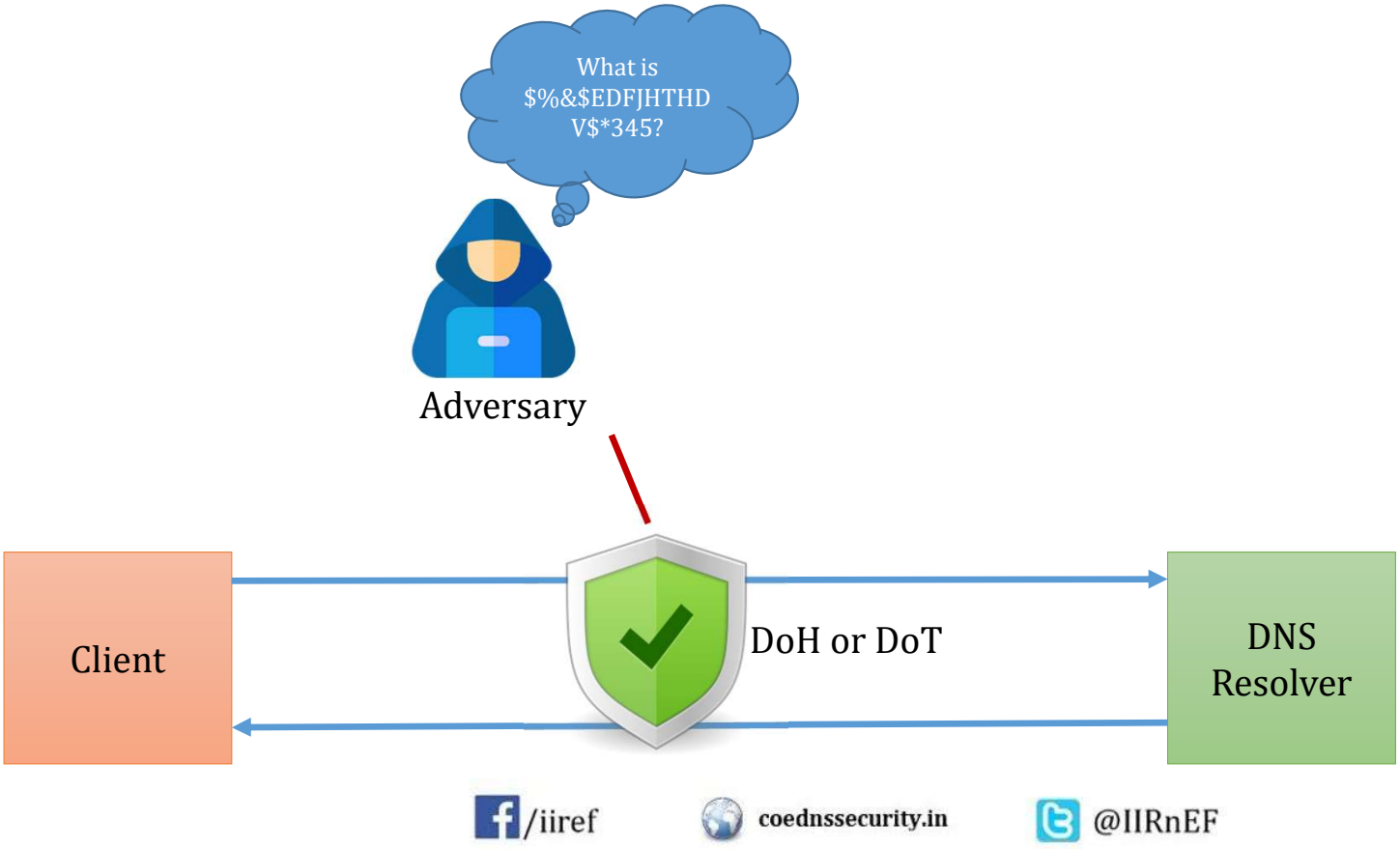




Need for Encrypted DNS Query



Encrypted DNS Traffic



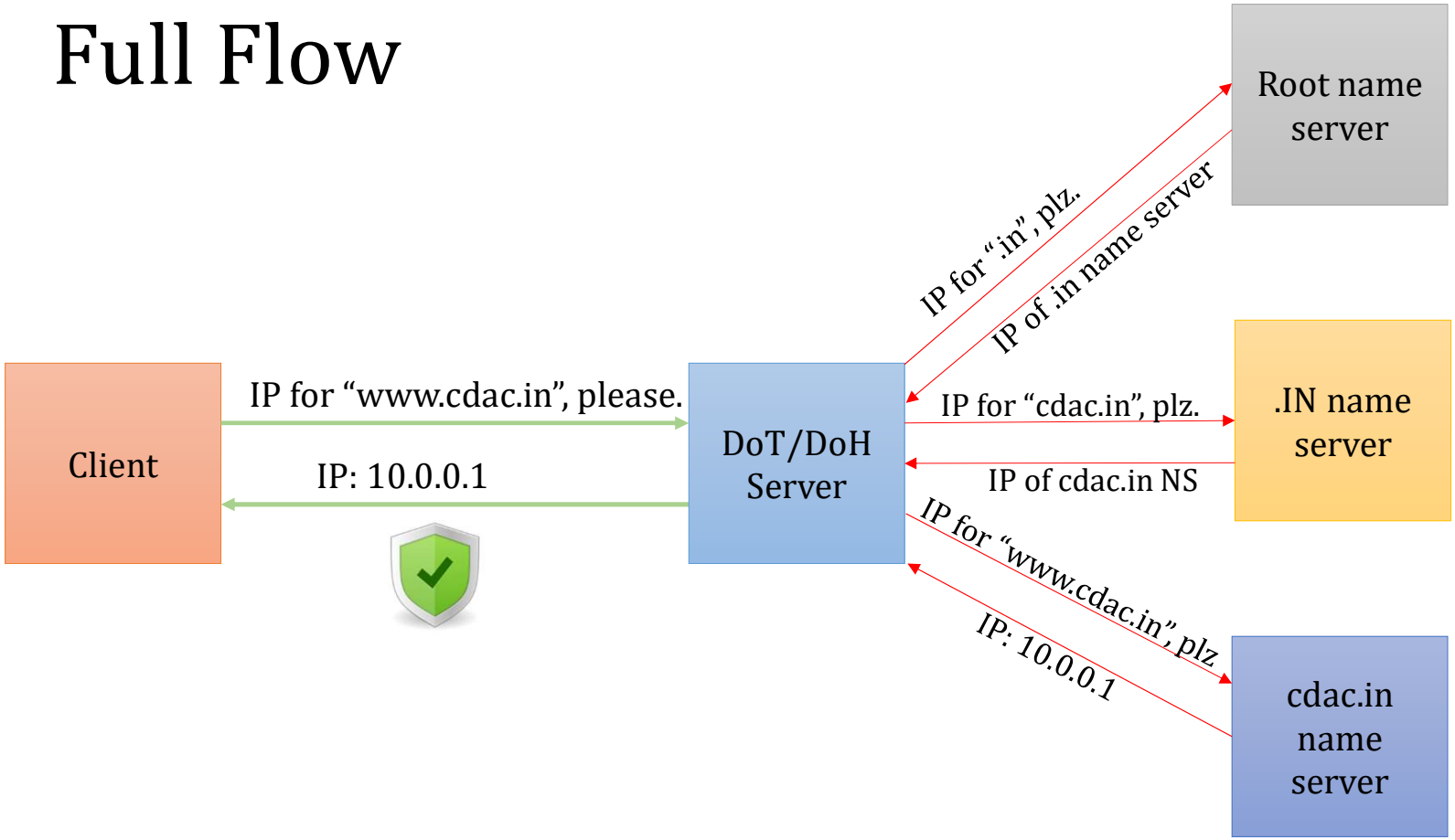
DNS over TLS (DoT)

- TLS Encryption on top of UDP
- Detailed in RFC 7858 (https://tools.ietf.org/html/rfc7858)
- Safeguard from MiTM
- Client doesn't query Authoritative Sever, rather DoT server makes traditional recursive queries.
- Default Port: 853
- Support
  - Android 9+
  - iOS 14+
  - Windows/Linux through packages

DNS over HTTPS (DoH)

- DNS Queries sent over HTTPS
- Request/Response in JSON format, GET/POST
- Port: 443
- Detailed in RFC 8484 (https://tools.ietf.org/html/rfc8484)
- Client doesn't query Authoritative Sever, rather DoH server makes traditional recursive queries.
- Support
  - Android 9+
  - iOS 14+
  - Windows, Linux (coming soon)
  - Firefox (working), others (intermittently)
- Server Examples
  - dns.google
  - cloudflare-dns.com

Full Flow


Root name server
IP for ".in", plz.
IP of .in name server
Client
IP for "www.cdac.in", please.
IP: 10.0.0.1
DoT/DoH Server
IP for "cdac.in", plz.
IP of cdac.in NS
.IN name server
IP for "www.cdac.in", plz
IP: 10.0.0.1
cdac.in name server

Thank You

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