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TRANSFORM

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# Protective DNS, DNS Encryption, & Zero-Trust: Tackling NSA Guidance

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# Is your DNS leaking?

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# Understanding DNS

# DNS (Domain Name System)

**Recursive DNS Resolver**

- Middleman between client and DNS infrastructure
- Caches information received during DNS lookups
- Typically provided by ISP

**Root Nameserver**

- There are 13 root nameservers [a-m].root-servers.net
- Multiple nodes using anycast
- Hosted by Verisign, USC, NASA, DoD, US Army, ICANN

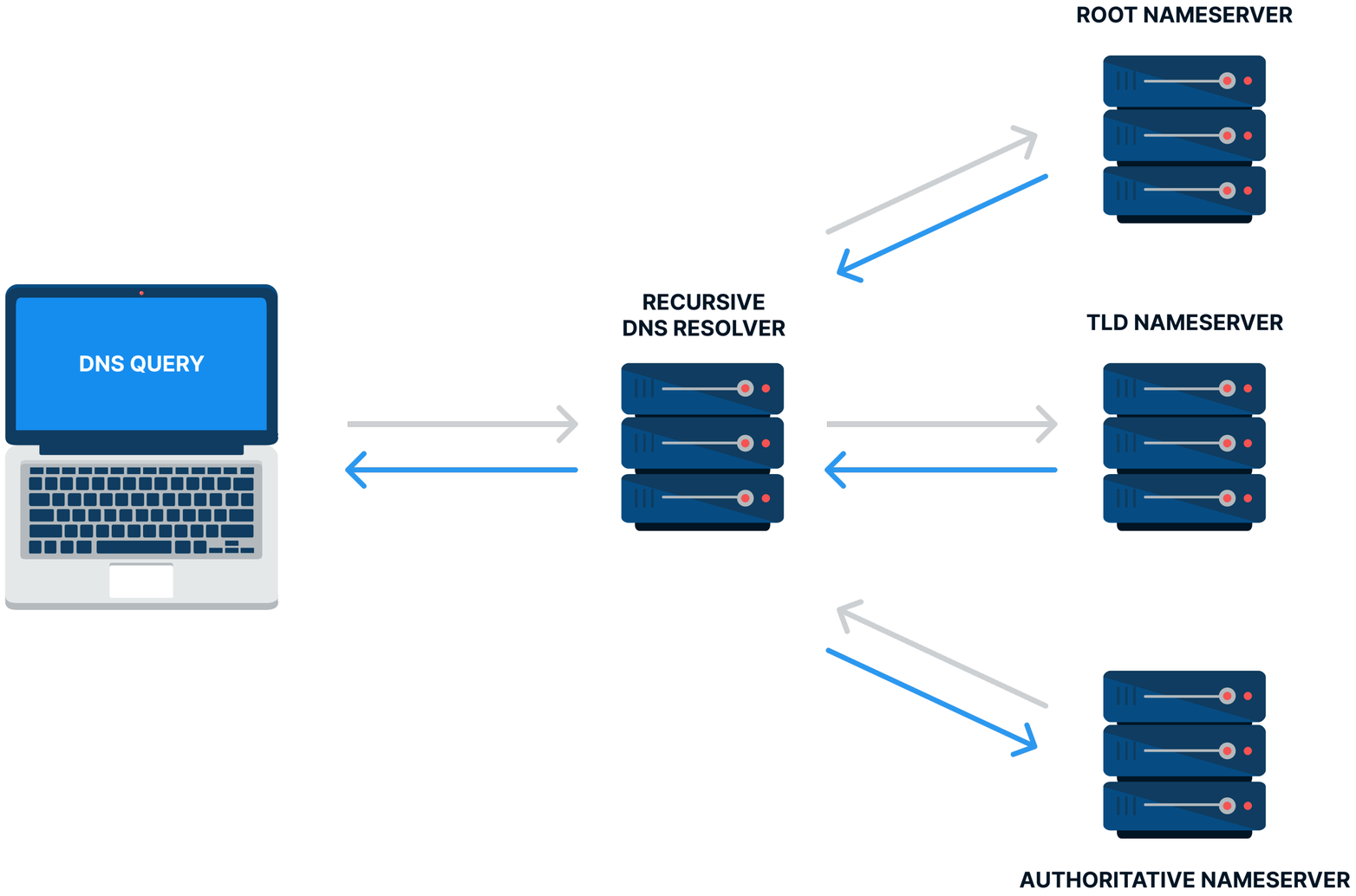
**TLD Nameserver**

- Stores info for all domains that share an extension
- Hosted by Internet Assigned Numbers Authority (IANA)
- gTLD (generic), sTLD (sponsored), ccTLD (country code)

**Authoritative Nameserver**

- Usually the last step in finding an IP address
- Configured by the domain owner
- Provides the officially answer for a DNS query

# How DNS Works?



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# DNS Encryption

# DoH (DNS-over-HTTPS)

- Runs on port 443
- Traffic is hidden from network admin
- Larger packet sizes
- Higher latency, more coding
- Good for privacy

# DoT (DNS-over-TLS)

- Runs on port 853
- Traffic is visible to network admin
- Smaller packet sizes
- Lower latency, less coding
- Not great for privacy

# DNSSEC (Domain Name System Security Extensions)

- DNSSEC extends the DNS protocol by adding cryptographic authentication for responses received from authoritative DNS servers.
- DNSSEC is the only protocol with protects against cache poisoning.

# DDR (Discovery of Designated Resolvers)

- Clients connecting to a new network don't have any way of automatically finding encrypted DNS servers that might be available.
- DDR creates special, new, DNS records that point to servers using DoT or DoH.

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# Is DNS security discussed at your organization?

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# NSA and CISA Release Cybersecurity Information on Protective DNS

# Protective DNS: March 2021

- DNS lookups were unencrypted
- DoH is fine for home or mobile users
- Only use designated enterprise resolvers, disable others
- Balance of DNS security, privacy and governance

# PDNS Guidance Outlined from NSA and CISA

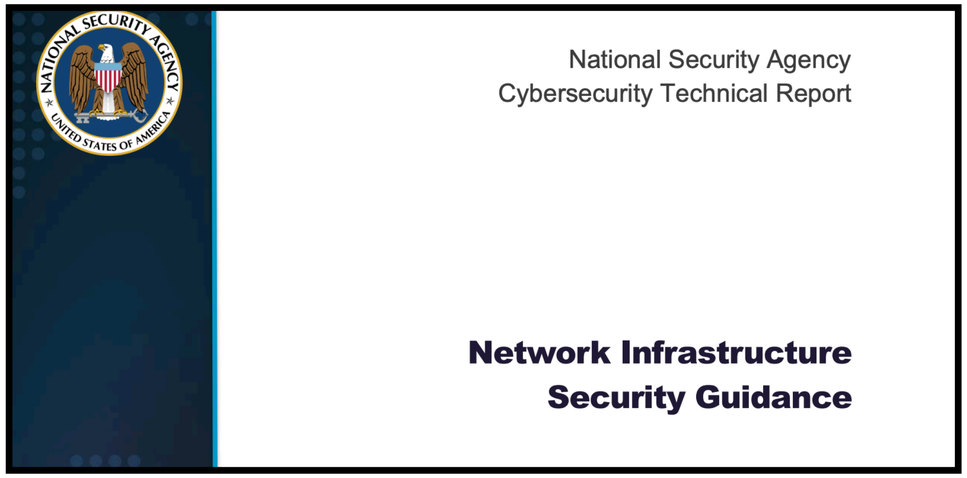
- Block:
  - Malware domains
  - Phishing domains
  - Malware DGA
- Supports:
  - Content filtering
  - SIEM integration
  - DNSSEC validation
  - DoH/DoT
  - Customizable policies
  - Hybrid architectures

# Why Protective DNS?

- DNS is ubiquitous
- DNS was not built with security in mind
- Bad actors use domain names
- Malicious domain names are often knowable

# Fast Forward: March 2022

- Zero Trust
- Multiple Defensive Layers
- Encryption and Secure Protocols



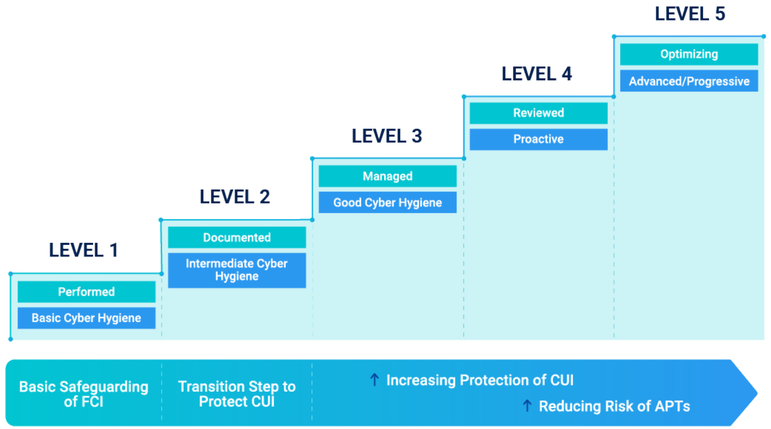

# CISA's Shields Up Program

- Reduce the likelihood of damaging cyber intrusion
- Take steps to quickly detect a potential intrusion
- Ensure the organization is prepared to respond
- Maximize the organization's resilience to a destructive cyber incident

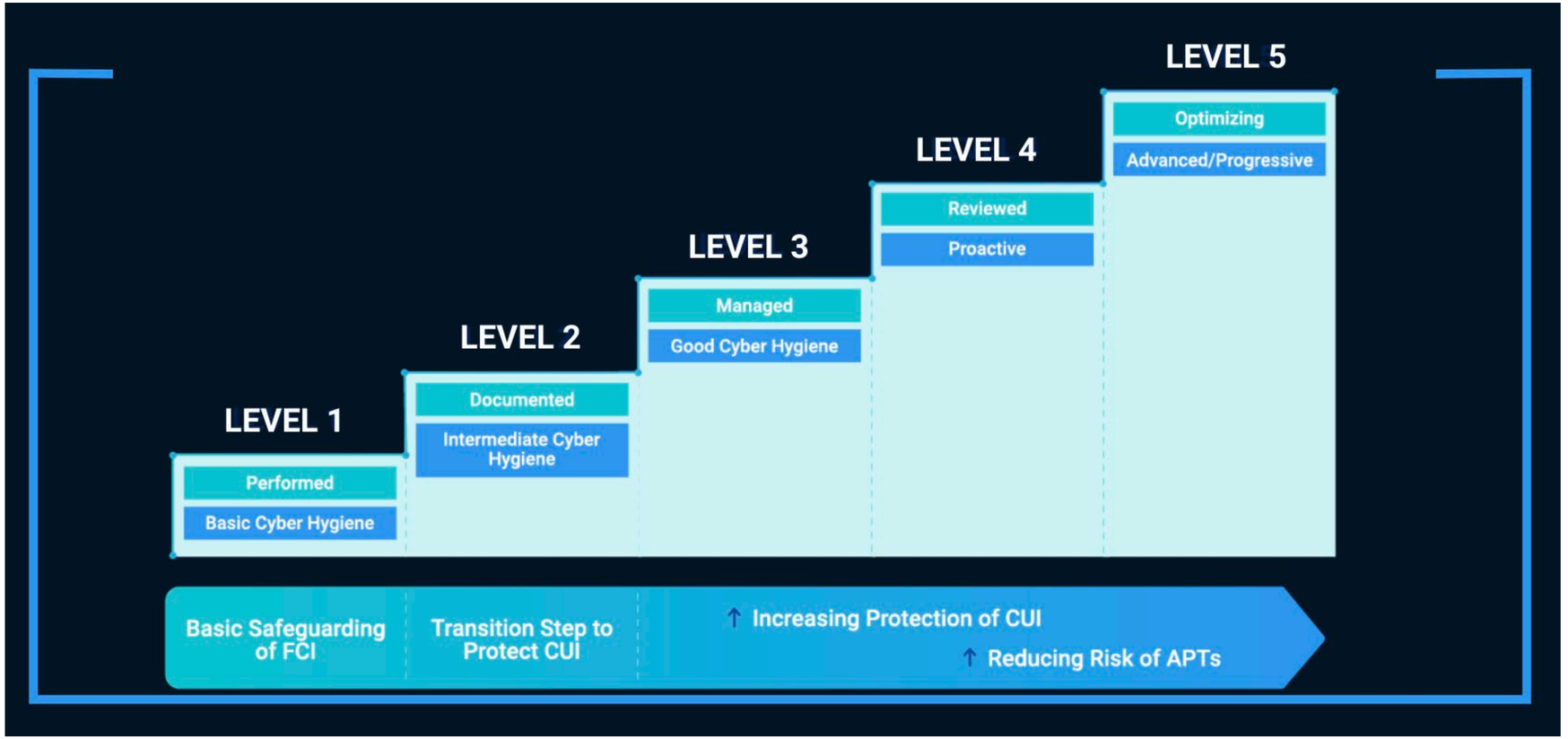
*"90% of successful cyber-attacks start with a phishing email"*

# Driving further interest of PDNS & DNS Encryption

CISA
CYBER+INFRASTRUCTURE

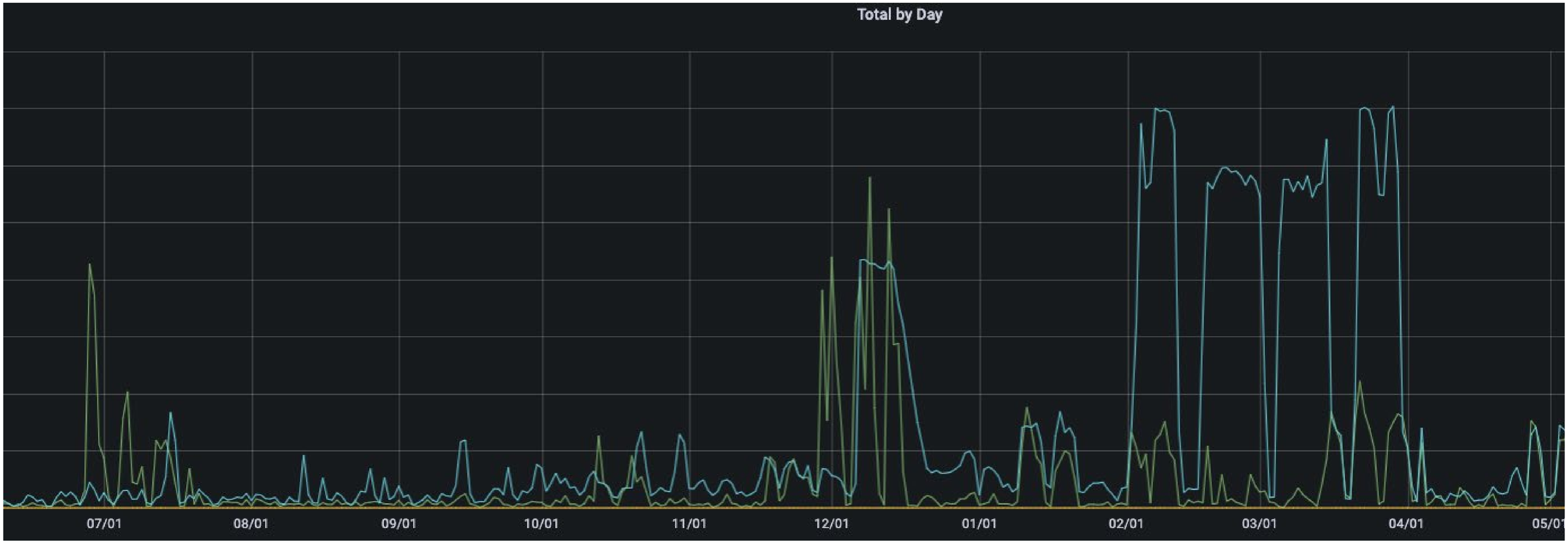


# CMMC 1.0 and CMMC 2.0 (coming soon)




CMMC 2.0 to include aspects of protective DNS

# Malicious Sites containing “gov”




Almost 500% increase in .gov domains seen in traffic over one year

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# Zero Trust

# Defining Zero Trust

| | | |
|---|---|---|
| **Zero** Trust | → | Trust **Nothing** |
| Zero Trust **Access** | → | Who (and What) Needs **Access** |
| Zero Trust **Network** Access | → | Which **Applications** You Should Allow |

# Now What? How to Apply - Part 1

- **Next week** ask how does your DNS work:
  - How is your DNS configured and who is managing your DNS?
  - When and why were settings configured?
- Over the next **three months:**
  - What DNS are you using for authoritative and recursive? (Public, private, independent?)
  - Do you have encryption, filtering, VPNs, firewalls that are relying on DNS?
  - Are you using tools like AD, Hyper-V, specific hardware, etc. that will impact DNS settings?

# Now What? How to Apply - Part 2

- Within **six months** you should:
  - Regularly audit and review your DNS security settings at least quarterly
  - Defining roles and responsibilities around DNS
  - Consider tools supporting protective DNS:
    - Enabling DoT and/or DoH in your environment
    - Blocking malware/phishing/ransomeware at DNS
    - Aggregating your DNS queries with your SIEM

# In Summary

- DNS is critical infrastructure
- DNS has become a major attack vector for bad actors
- DNS best practices are heading towards protective DNS
- Patch your leaks!

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# Protective DNS, DNS Encryption, & Zero Trust

## Tackling NSA Guidance

## Q&A