DNS Security and DNS Abuse Handling

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Presenters

- Champika Wijayatunga (ICANN)
  - Regional SSR Engagement Manager – APAC

    champika.wijayatunga@icann.org

- Kitisak Jirawannakool (EGA – Thailand)
  - Information Security Specialist

    kitisak.jirawannakool@ega.or.th

Acknowledgements

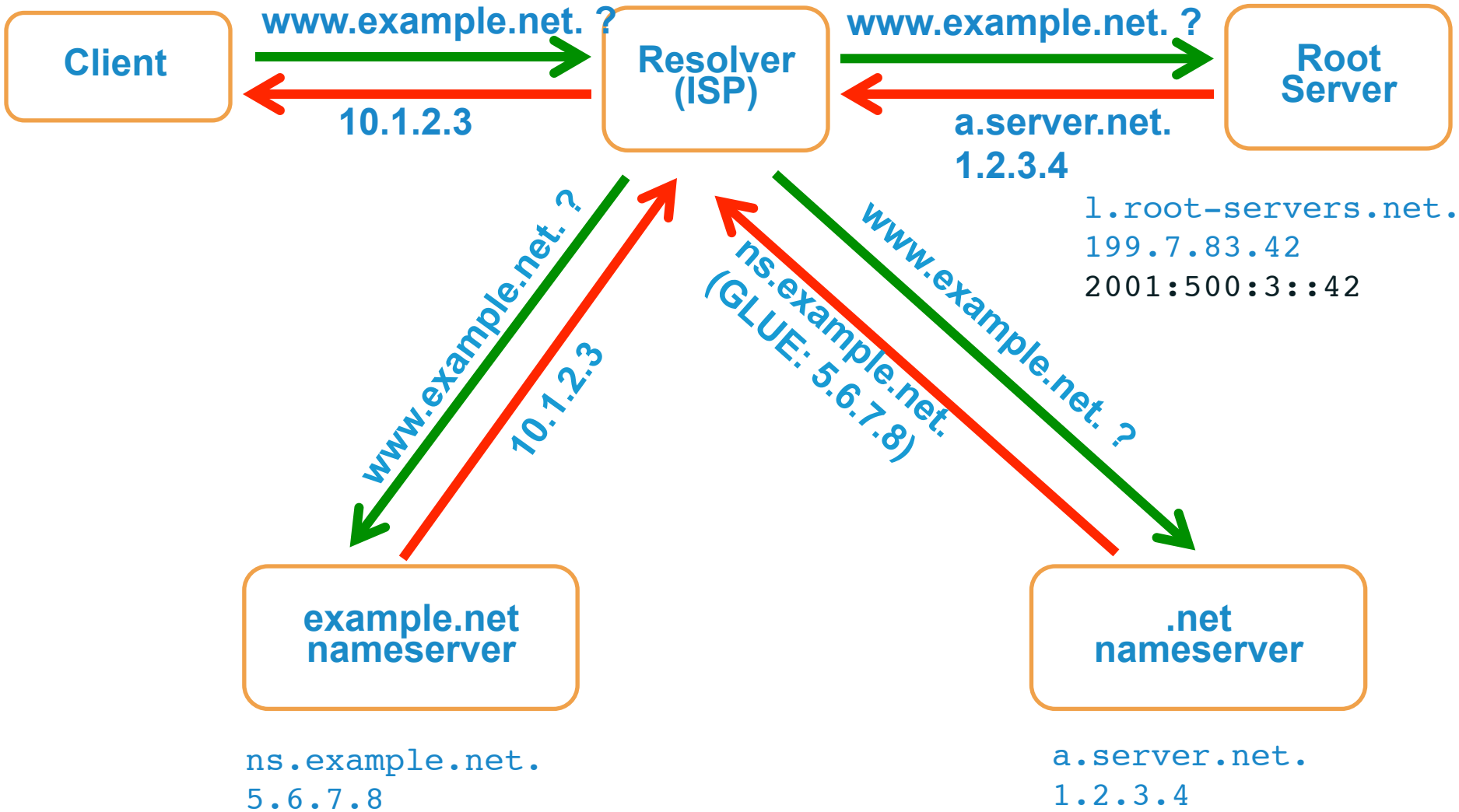
- Dave Piscitello
  - VP – Security and ICT Coordination – ICANN
- Richard Lamb
  - Senior Program Manager – DNSSEC – ICANN

Agenda

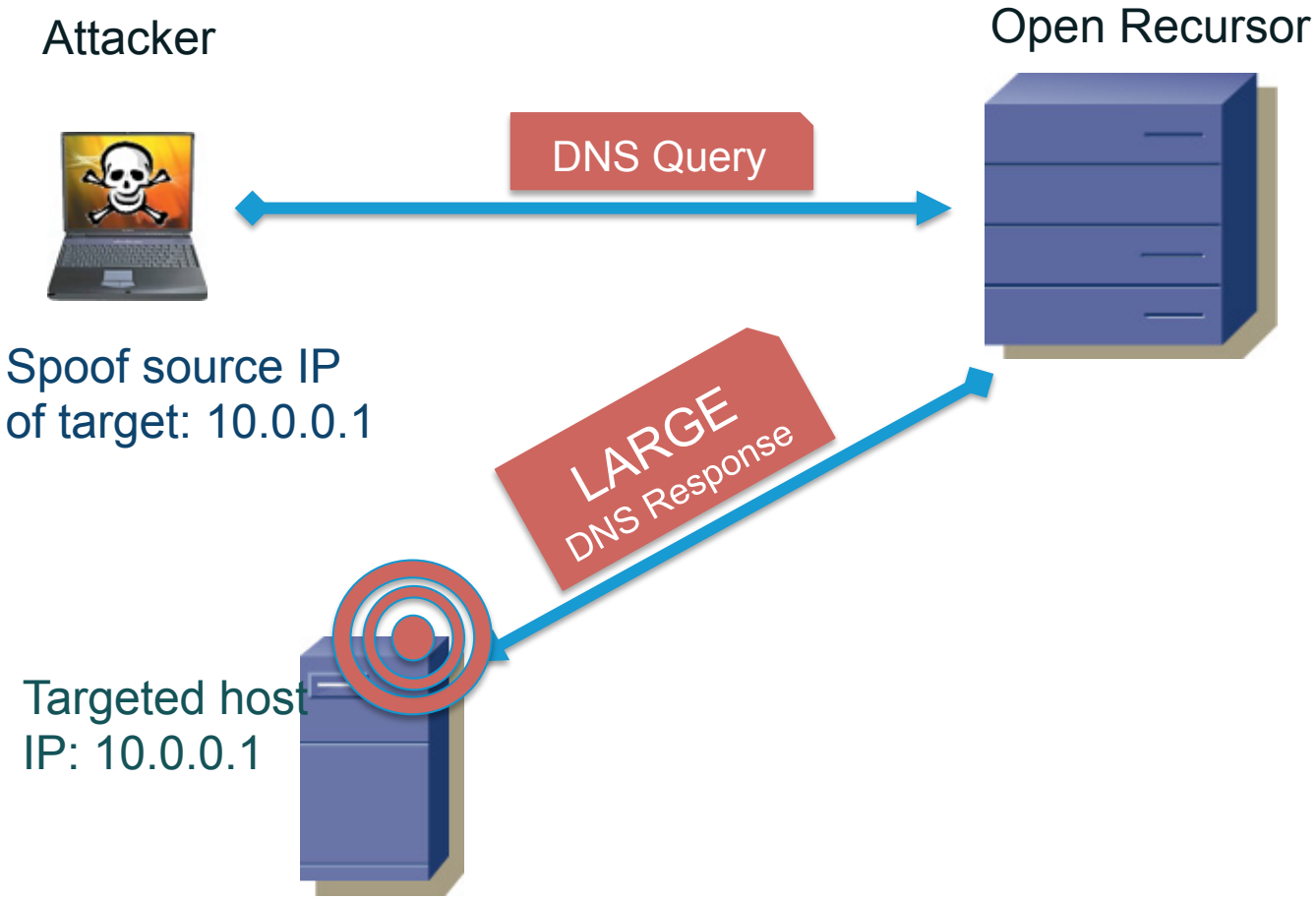
1. Threats and Risks in DNS
2. Importance of DNS Security
3. Handling DNS Abuse
4. Tools, Techniques and Policy considerations
5. Case Studies and Use cases
6. Collaboration with ICANN

Threats and Risks in DNS

DNS Resolution Recap

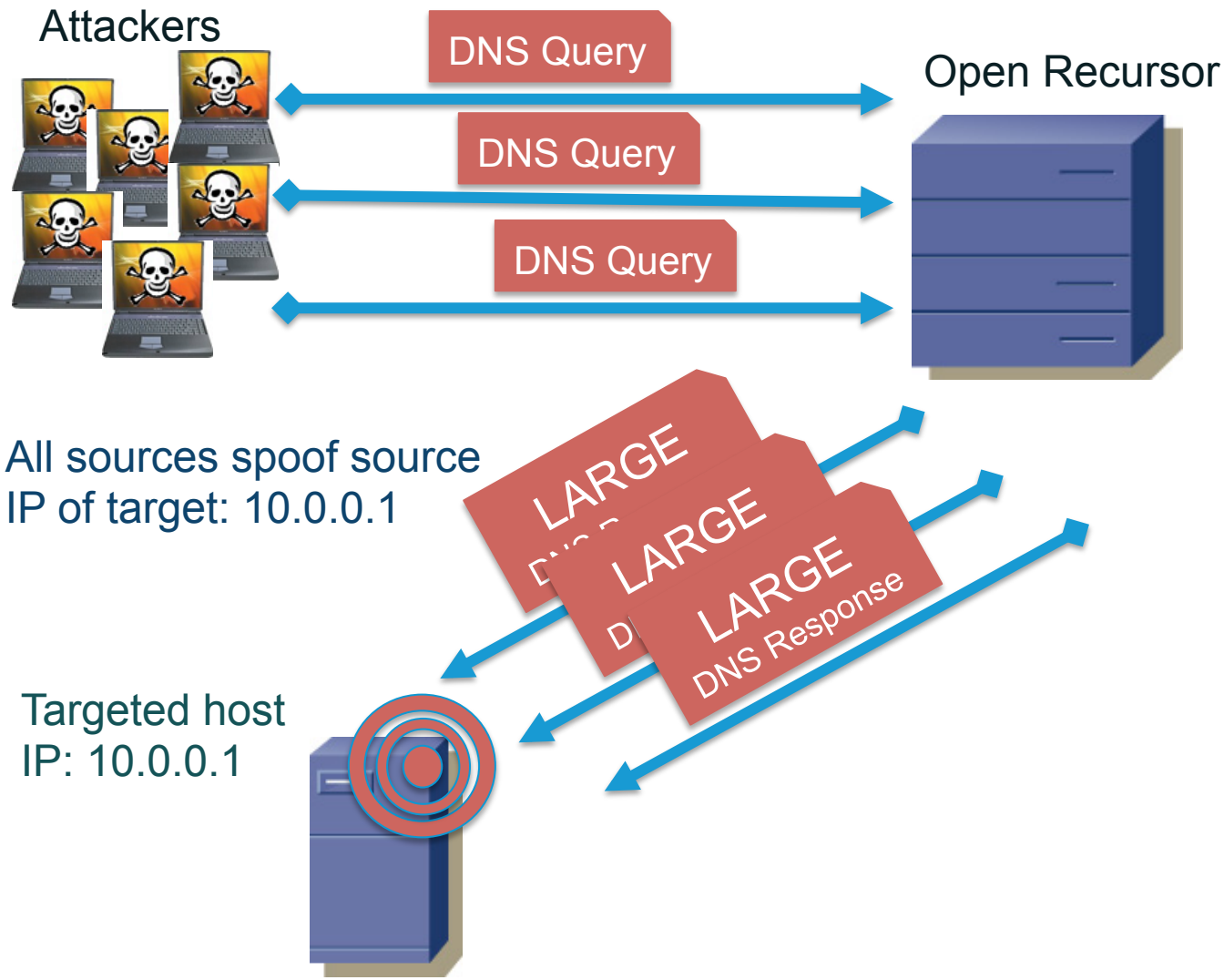


Reflection and Amplification Attack



- Attacker sends DNS messages to recursor from spoofed IP address of target
- Recursor sends LARGE responses to targeted host
- *Amplified* responses delivered to targeted host consume resources faster

Distributed Reflection & Amplification Attack (DDoS)



- Launch reflection and amplification attack from 1000s of origins
- Reflect through open recursor
- Deliver 1000s of large responses to target

Basic Cache Poisoning

Attacker

- Launches a spam campaign where spam message contains http://loseweightfastnow.com
- Attacker's name server will respond to a DNS query for loseweightnow.com with malicious data about ebay.com
- Vulnerable resolvers add malicious data to local caches
- The malicious data will send victims to an eBay phishing site for the lifetime of the cached entry

My Mac

What is the IPv4 address for loseweightfastnow.com

I'll cache this response… and update www.ebay.com

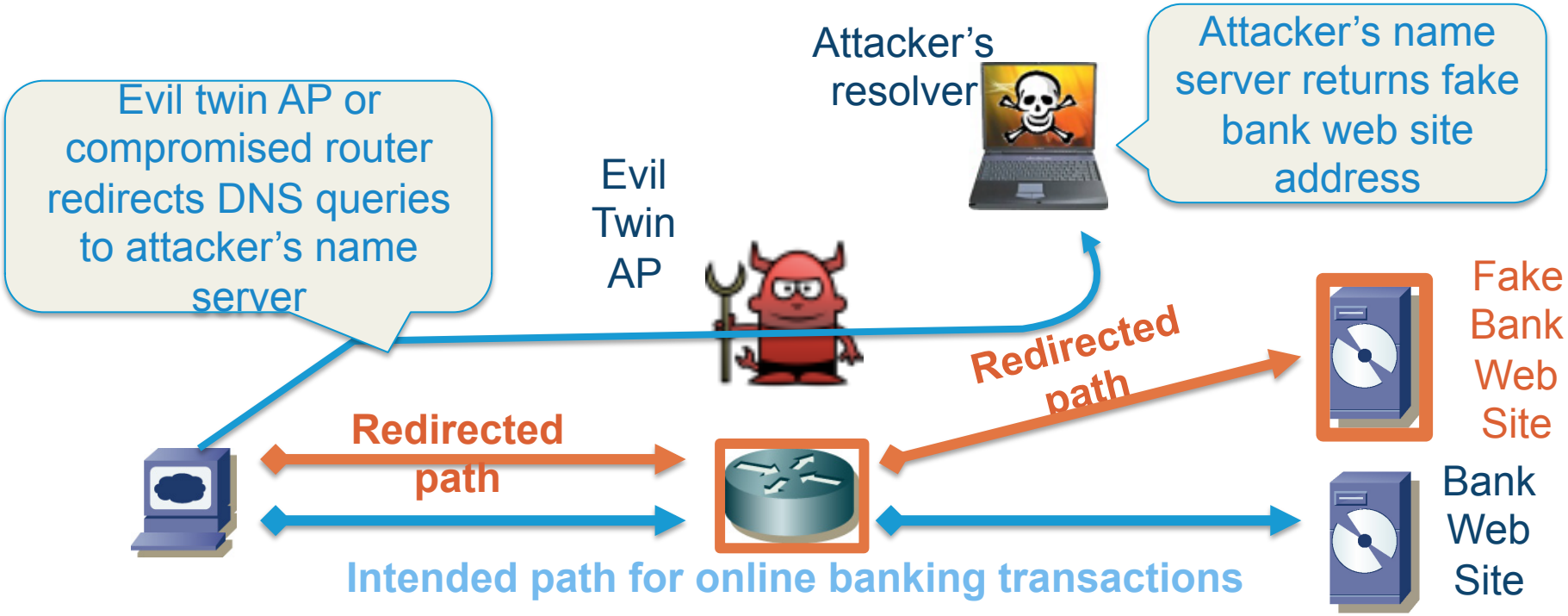
My local resolver

loseweightfastnow.com IPv4 address is 192.168.1.1
ALSO *www.ebay.com is at 192.168.1.2*

ecrime name server

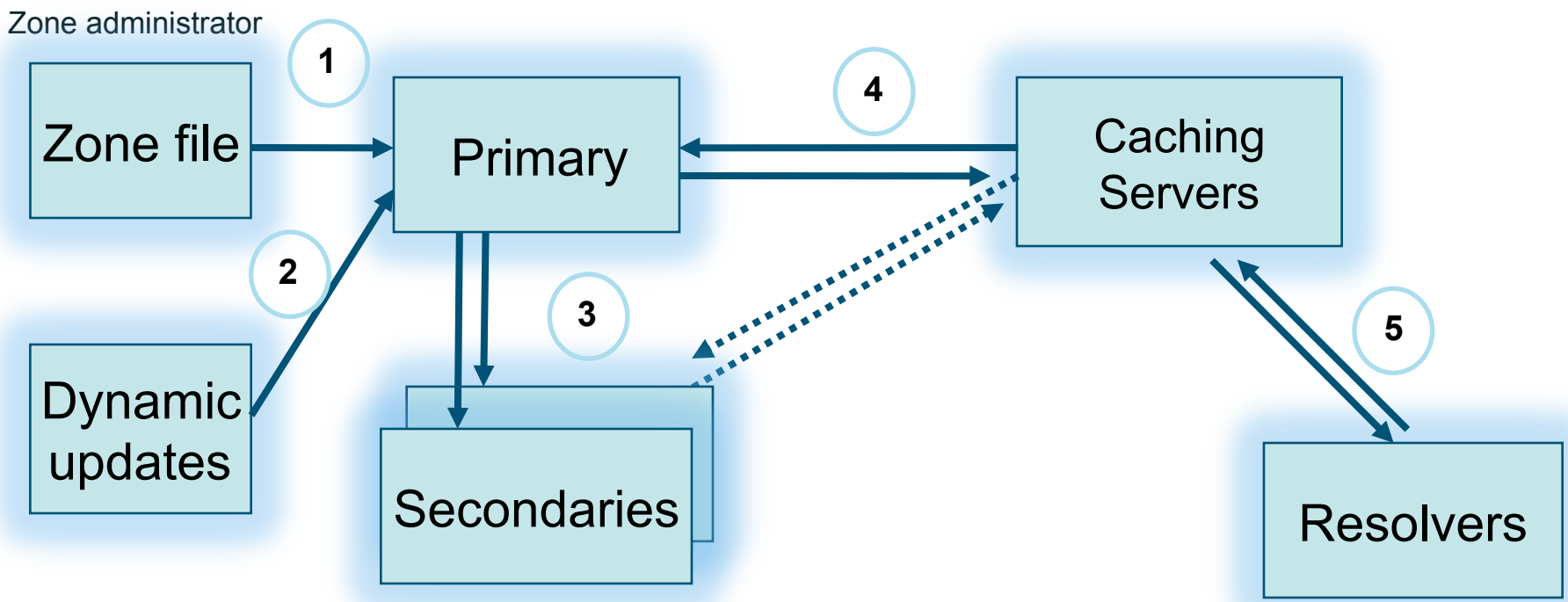
Query Interception (DNS Hijacking)

- A man in the middle (MITM) or spoofing attack forwards DNS queries to a name server that returns forge responses
  - Can be done using a DNS proxy, compromised access router or recursor, ARP poisoning, or evil twin Wifi access point

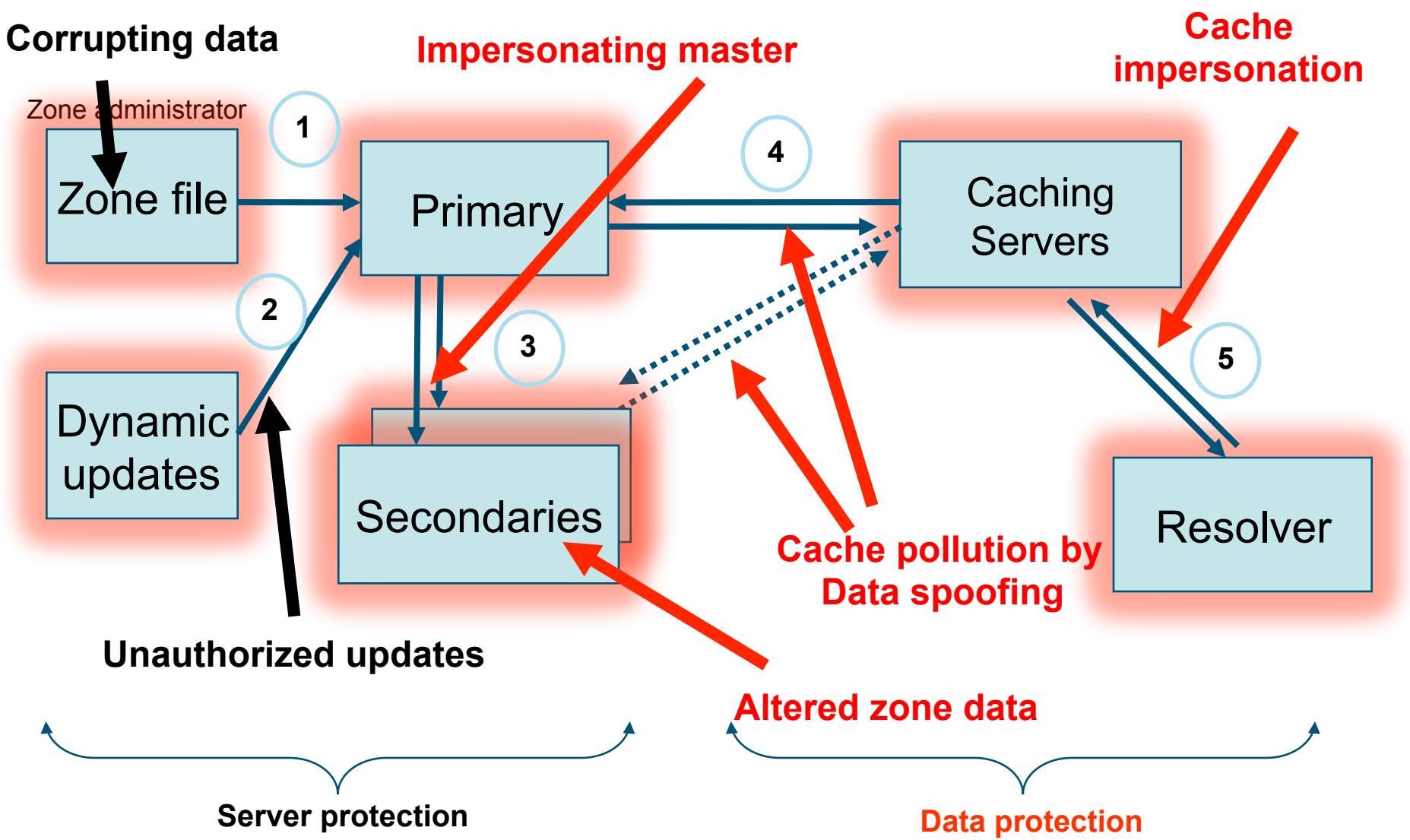


Importance of DNS Security

DNS: Data Flow



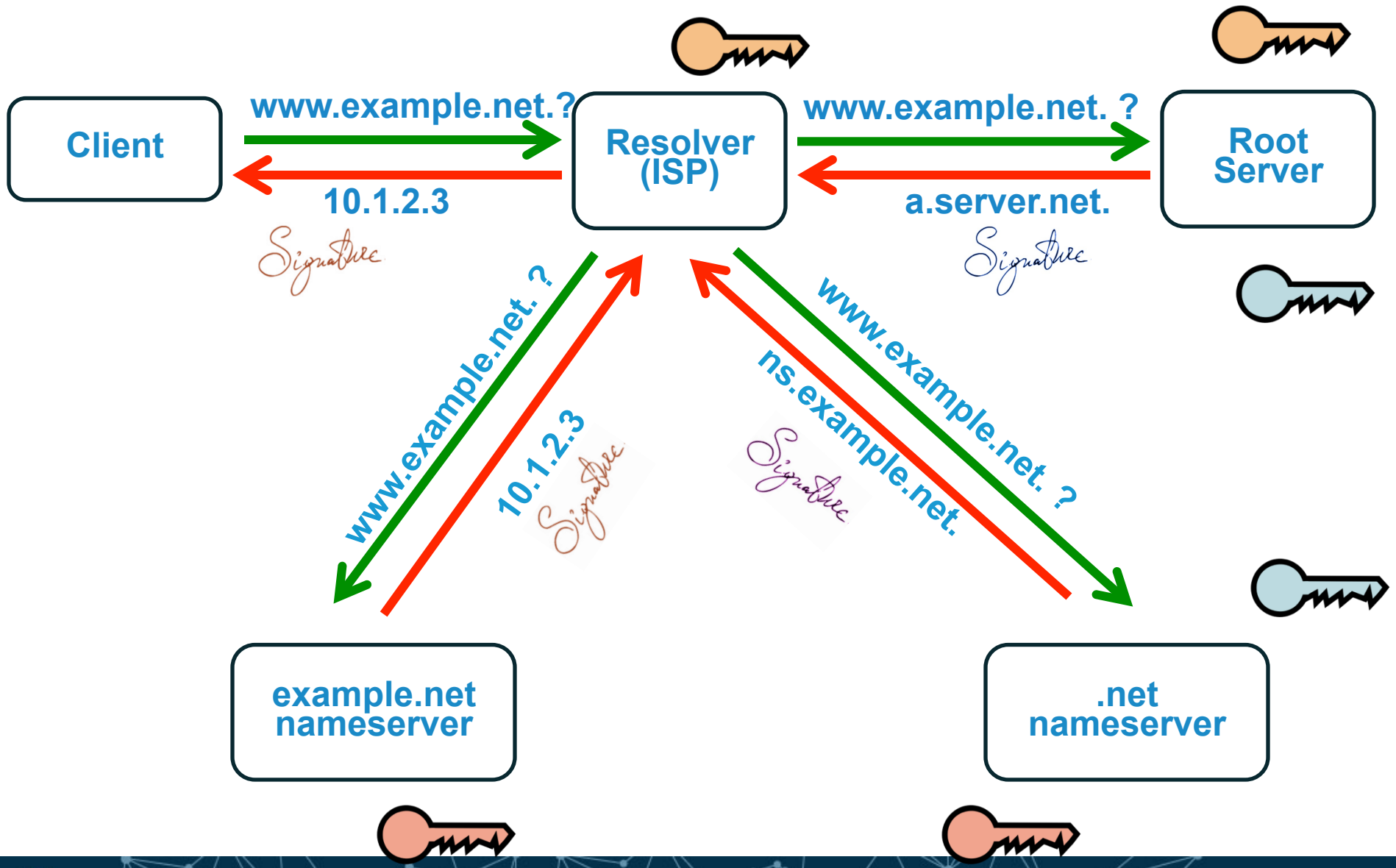
DNS Vulnerabilities



Securing DNS

- There are two aspects when considering DNS Security
  - Server protection
  - Data protection
- Server protection
  - Protecting servers
    - Make sure your DNS servers are protected (i.e. physical security, latest DNS server software, proper security policies, Server redundancies etc.)
  - Protecting server transactions
    - Deployment of TSIG, ACLs etc. (To secure transactions against server impersonations, secure zone transfers, unauthorized updates etc.)
- Data protection
  - Authenticity and Integrity of Data
    - Deployment of DNSSEC (Protect DNS data against cache poisoning, cache impersonations, spoofing etc.)

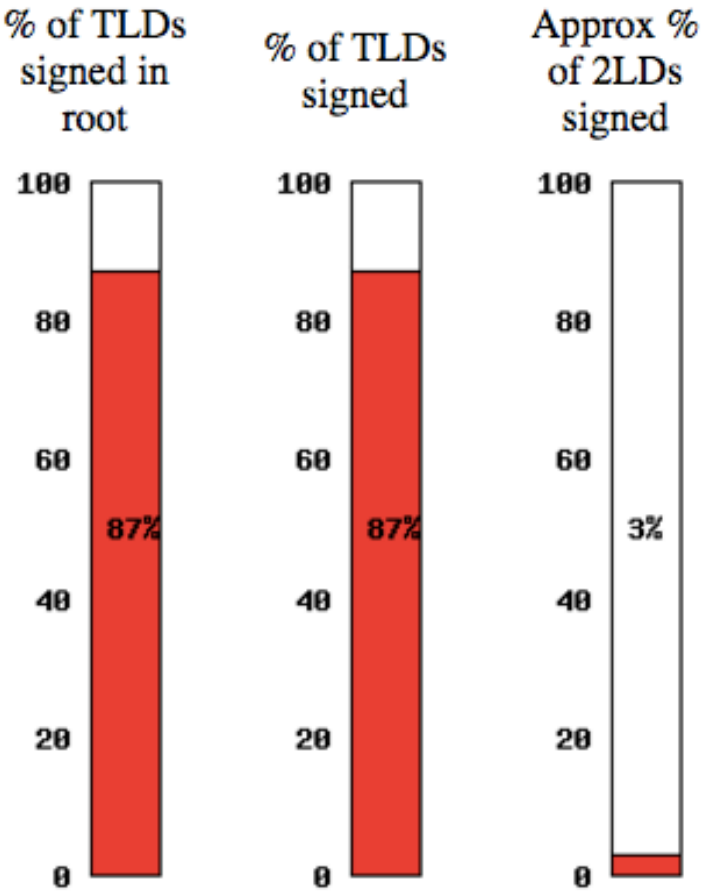
How DNSSEC Works

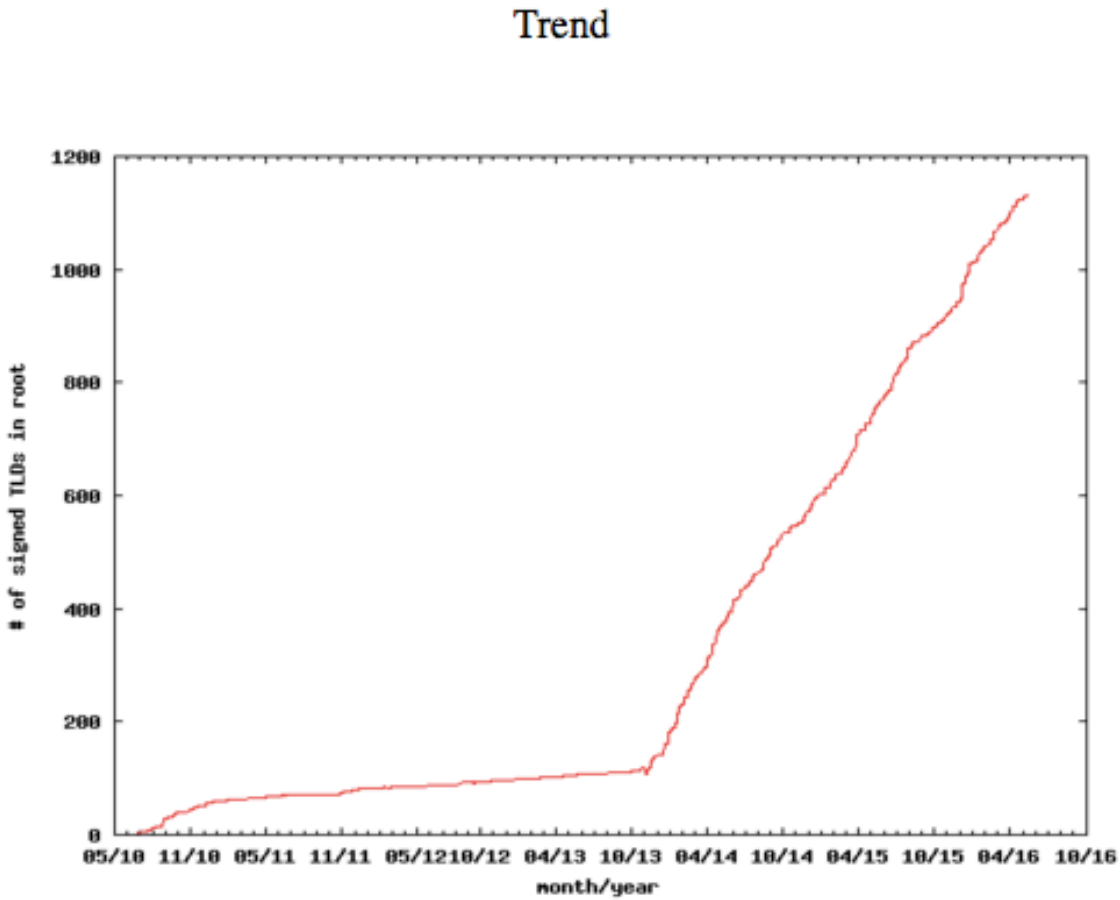


DNSSEC ccTLD Map

https://rick.eng.br/dnssecstat/

DNSSEC Deployment





https://rick.eng.br/dnssecstat/

DNSSEC: So what's the problem?

- Not enough IT departments know about it or are too busy putting out other security fires.
- When they do look into it they hear old stories of FUD and lack of turnkey solutions.
- Registrars*/DNS providers see no demand leading to "chicken-and-egg" problems.

*but required by new ICANN registrar agreement

Handling DNS Abuse

Common Uses for Maliciously Registered Domains

- Counterfeit goods
- Data exfiltration
- Exploit attacks
- Illegal pharma
- Infrastructure (ecrime name resolution)
- Malware C&C
- Malware distribution (drive-by pages)
- Phishing
- Scams (419, reshipping, stranded traveler…)

Abuses of other peoples' Domains & DNS

- Host criminal DNS infrastructure
- Domain, NS, or MX Hijacking
- Hacktivism (e.g., defacement)
- Host file modification (infected devices)
- Changing default resolvers (DNSChanger)
- Poisoning (resolver/ISP)
- Man in the Middle attacks (insertion, capture)
- etc.

How Abusers acquire DNS resources

- Purchase using stolen credit cards, compromised accounts
- Abuse“free” services
- Leverage bullet-proof or grey hat hosting/ domain providers
- Hack and exploit legitimate hosts
- Phish registration account credentials and use to modify domain zone data or buy domains

Best practices in collecting evidences when handling DNS Abuse

- Be aware of questionable WHOIS contact data (Names and IP addresses)
- Check whether privacy protection service is involved
- Check for suspicious values in DNS Zone data
- Examine the spoofing or confusing use of a brand
- Check on the name servers? Are they suspicious?
- Check for hosting locations? Are they suspicious?
- Examine the Base site content? Is it non-existent or bad?
- What about the linked content? Is it suspicious or bad?
- Analyze the mail headers, sender, or content? Are they suspicious?

Pop Quiz

Tools, Techniques and Policy considerations to Handle DNS Abuse

Tools for Abuse Handlers

- Many tools to help you you identify the abused or malicious resource
  - Domain names, host names, IP addresses, ASNs
  - Hosting location (web, DNS, mail) or origin
  - Content (URL, file, email, attachment)
- Many tools to identify whom to contact or report the resource
  - Databases of domain registrants, operators, ISPs
  - Block list and analysis sites and data providers

SAVE A COPY OF EVERYTHING YOU VISIT OR QUERY

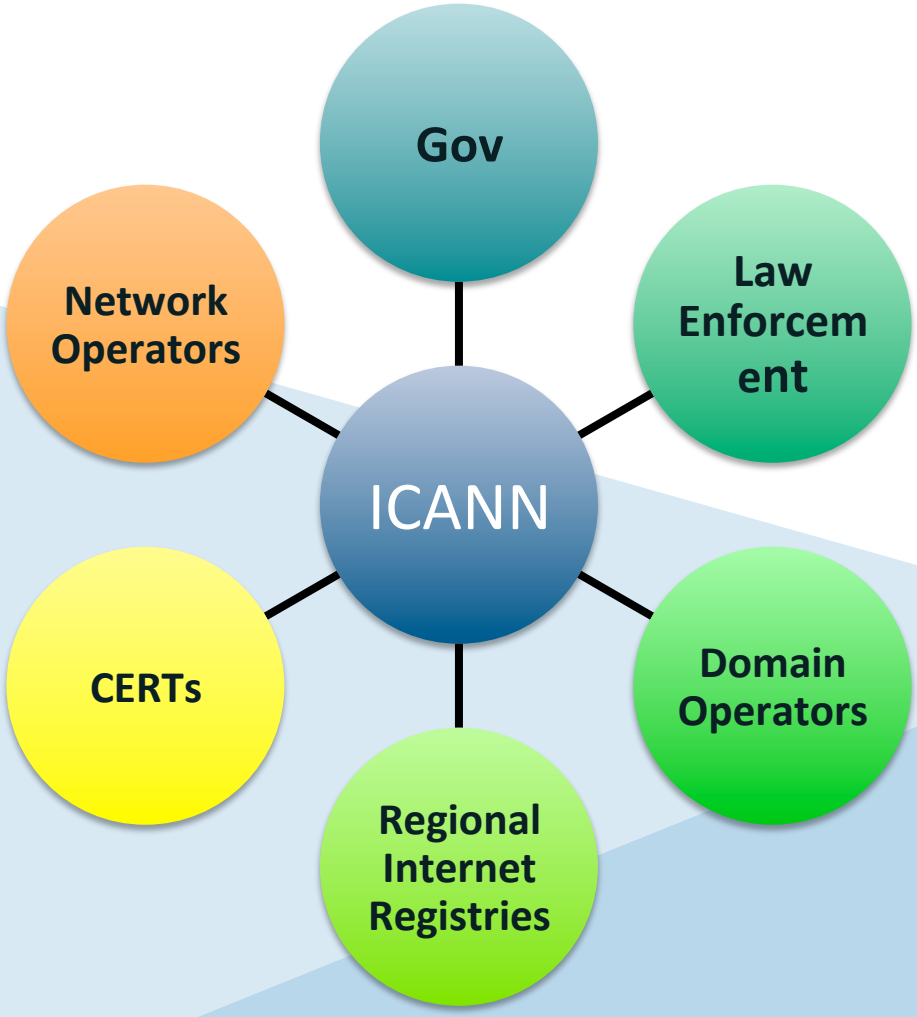
How the policies and guidelines can assist?

- When collecting abuse related evidences
- Dealing with registrars, privacy protection services, registries etc.
- Acceptable Use Policies (AUP)
- WHOIS database data accuracy
- Dealing with National CERTs
- Dealing with Law Enforcement
- ICANN Compliance

Case Studies

Collaboration with ICANN to keep Internet Secure, Stable and Resilient

Collaborative Measures at ICANN



- Threat Awareness and Response
- Trust-based Collaboration
- Capability Building
- Identifier SSR Analytics

Working Together - SSR Capability Building

Capability Building

SSR Training
- Security
- DNS Operations
- Abuse/Misuse

Knowledge Transfer
- Europol
- Interpol
- RIRs

+ Training and Outreach
  - Security, operations, DNS/DNSSEC deployment training
    - for TLD registry operators
    - Network Operators / ISPs
    - Enterprises, Corporates etc.
  - Information gathering to identify Internet Identifier Systems abuse/misuse and Investigation Techniques
    - Law Enforcement Agencies
    - CERTs
    - Internet Investigators etc.

Pop Quiz

Summary

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Thank you and Questions

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Email:
<champika.wijayatunga@icann.org>

Website: icann.org

twitter.com/icann
twitter.com/icann4biz

gplus.to/icann

facebook.com/icannorg

weibo.com/ICANNorg

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