

APNIC eLearning: DNS Concepts

Contact: training@apnic.net

Overview

- What is DNS?
- DNS Features
- Domains and Namespaces
- Zones and Delegation
- Querying the DNS Tree
- Nameservers
- Resource Records
- Performance of DNS

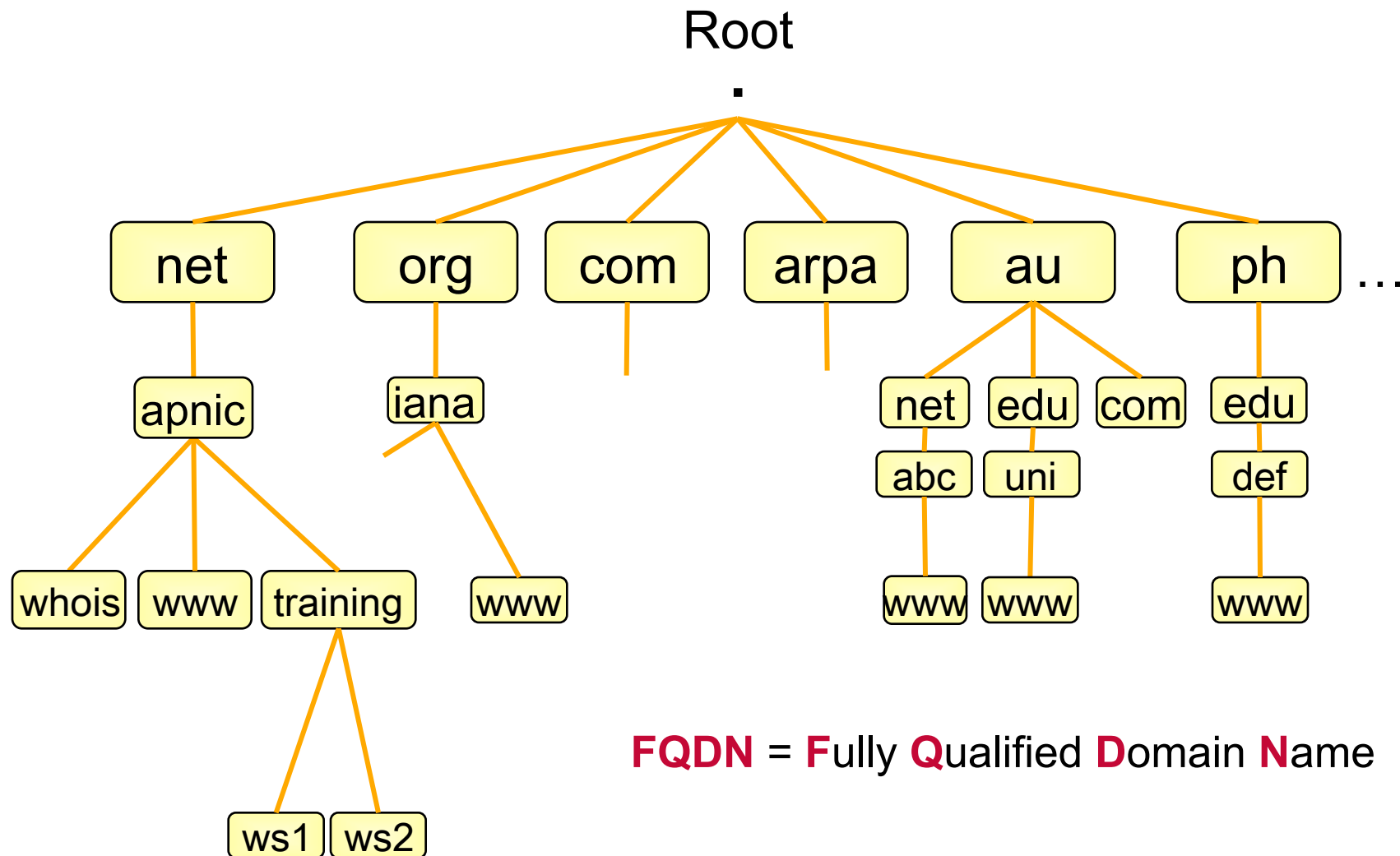
Domain Name System

- A lookup mechanism for translating objects into other objects
 - Mapping names to numbers and vice versa
- A globally distributed, loosely coherent, scalable, reliable, dynamic database
- Comprised of three components
 - A “name space”
 - Servers making that name space available
 - Resolvers (clients) which query the servers about the name space
- A critical piece of the Internet infrastructure

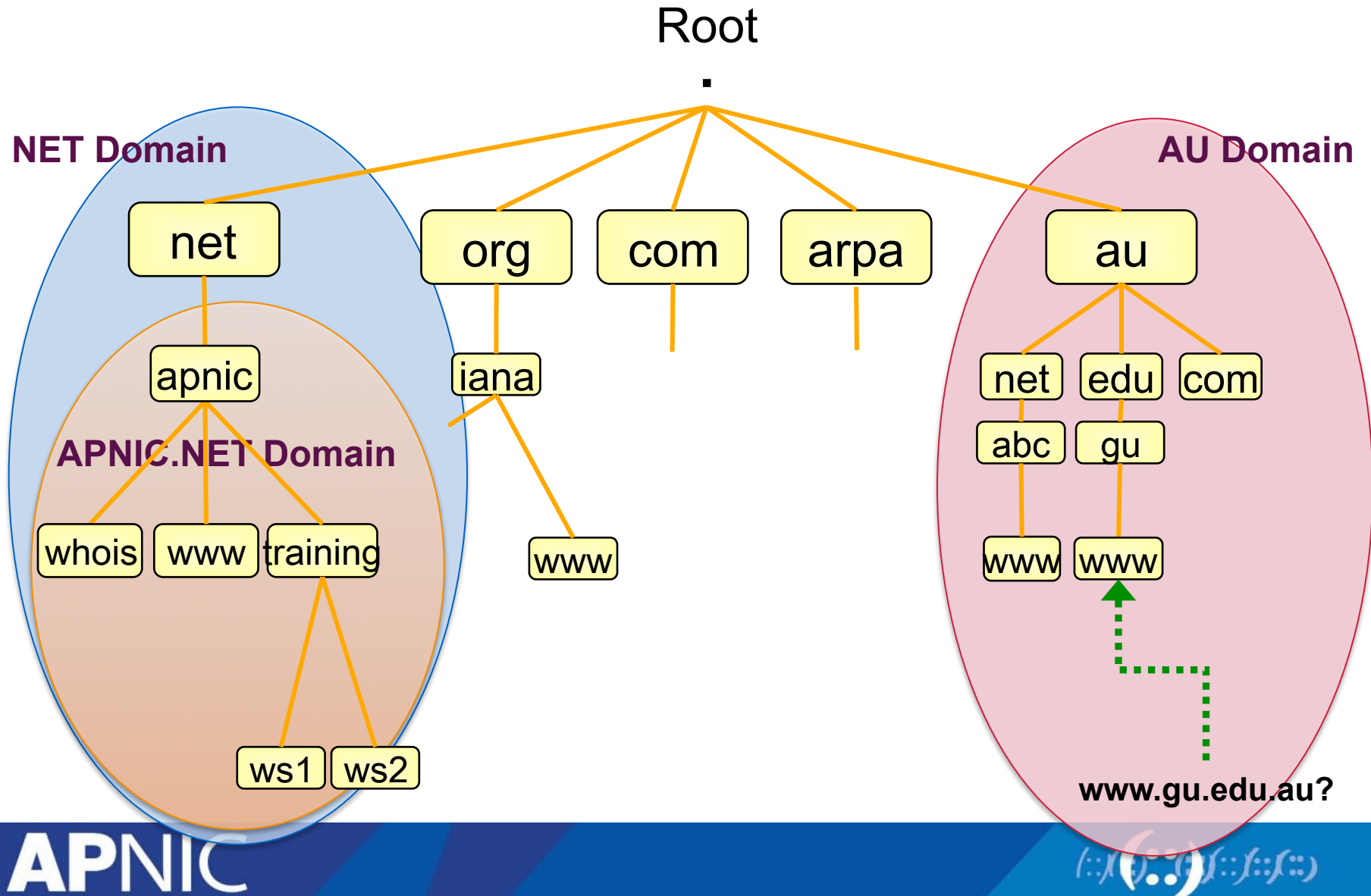
DNS Features

- Global distribution
 - Shares the load and administration
- Loose Coherency
 - Geographically distributed, but still coherent
- Scalability
 - can add DNS servers without affecting the entire DNS
- Reliability
- Dynamicity
 - Modify and update data dynamically

DNS Tree Hierarchy



Domains



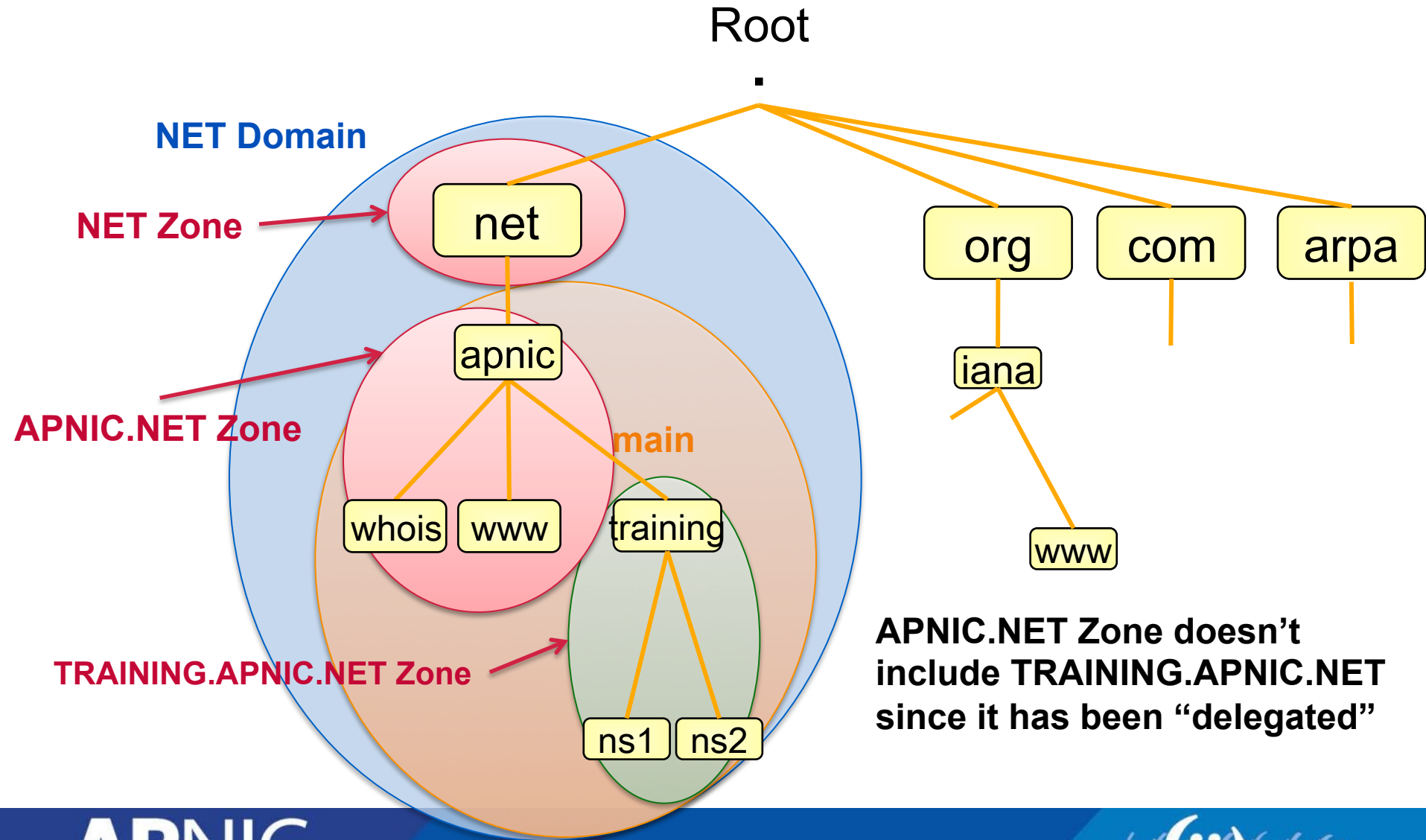
Delegation

- Administrators can create subdomains to group hosts
 - According to geography, organizational affiliation or any other criterion
- An administrator of a domain can delegate responsibility for managing a subdomain to someone else
- The parent domain retains links to the delegated subdomain
 - The parent domain “remembers” to whom it delegated the subdomain

Zones and Delegations

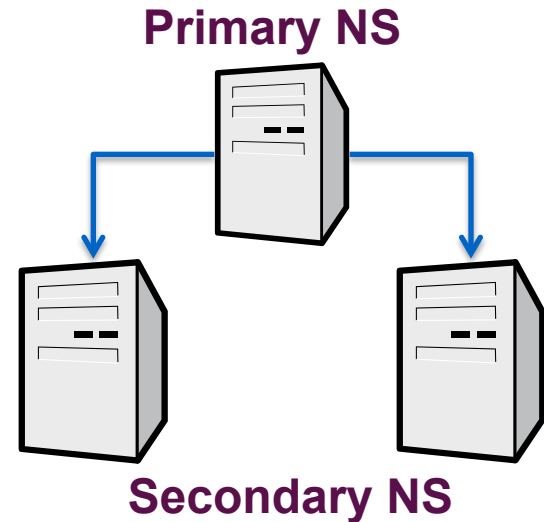
- Zones are “administrative spaces”
- Zone administrators are responsible for portion of a domain’s name space
- Authority is delegated from parent to child

Zones

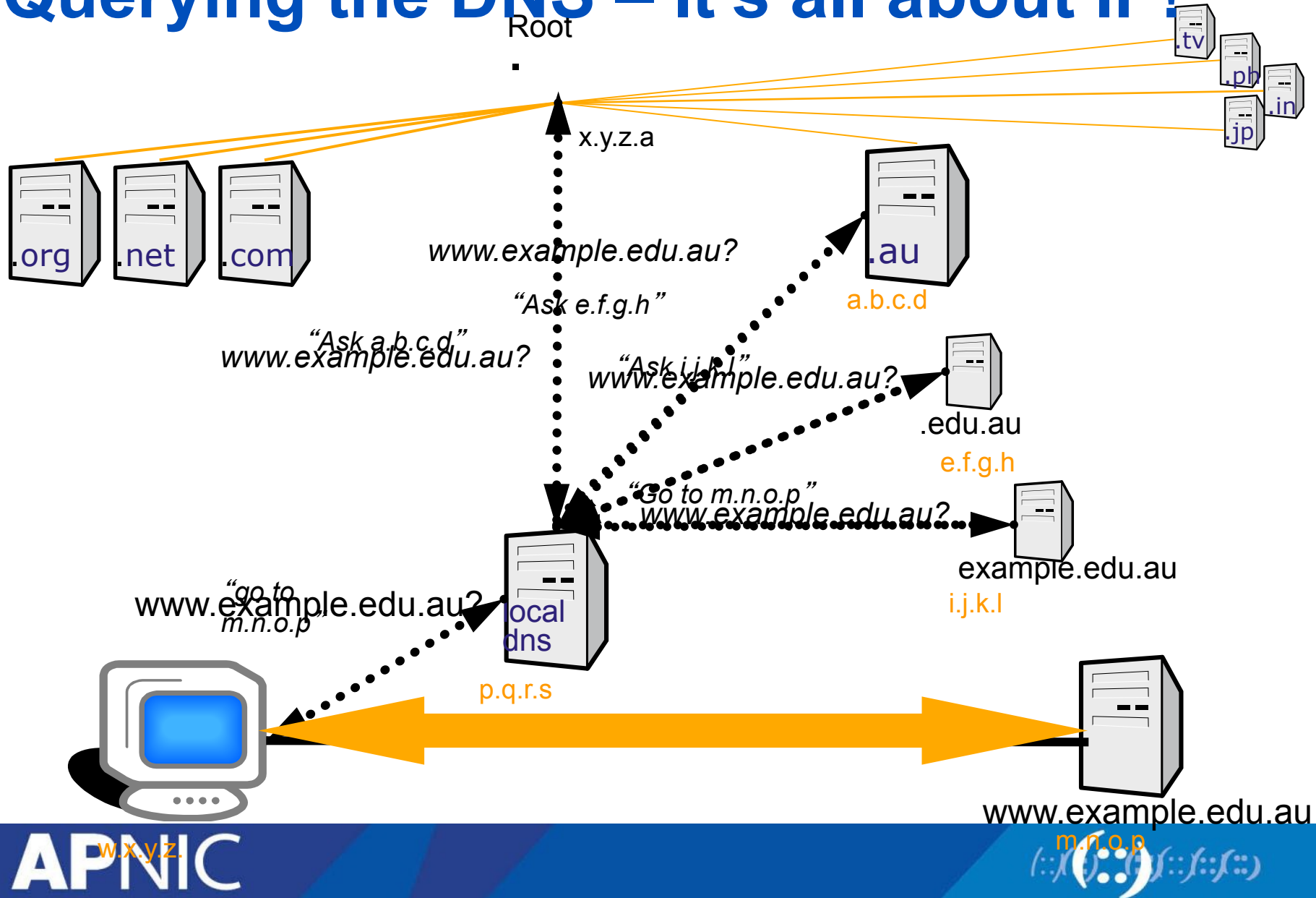


Name Servers

- Name servers answer 'DNS' questions
- Several types of name servers
 - Authoritative servers
 - Master / primary
 - Slave / secondary
 - Caching or recursive servers
 - also caching forwarders
- Mixture of functions

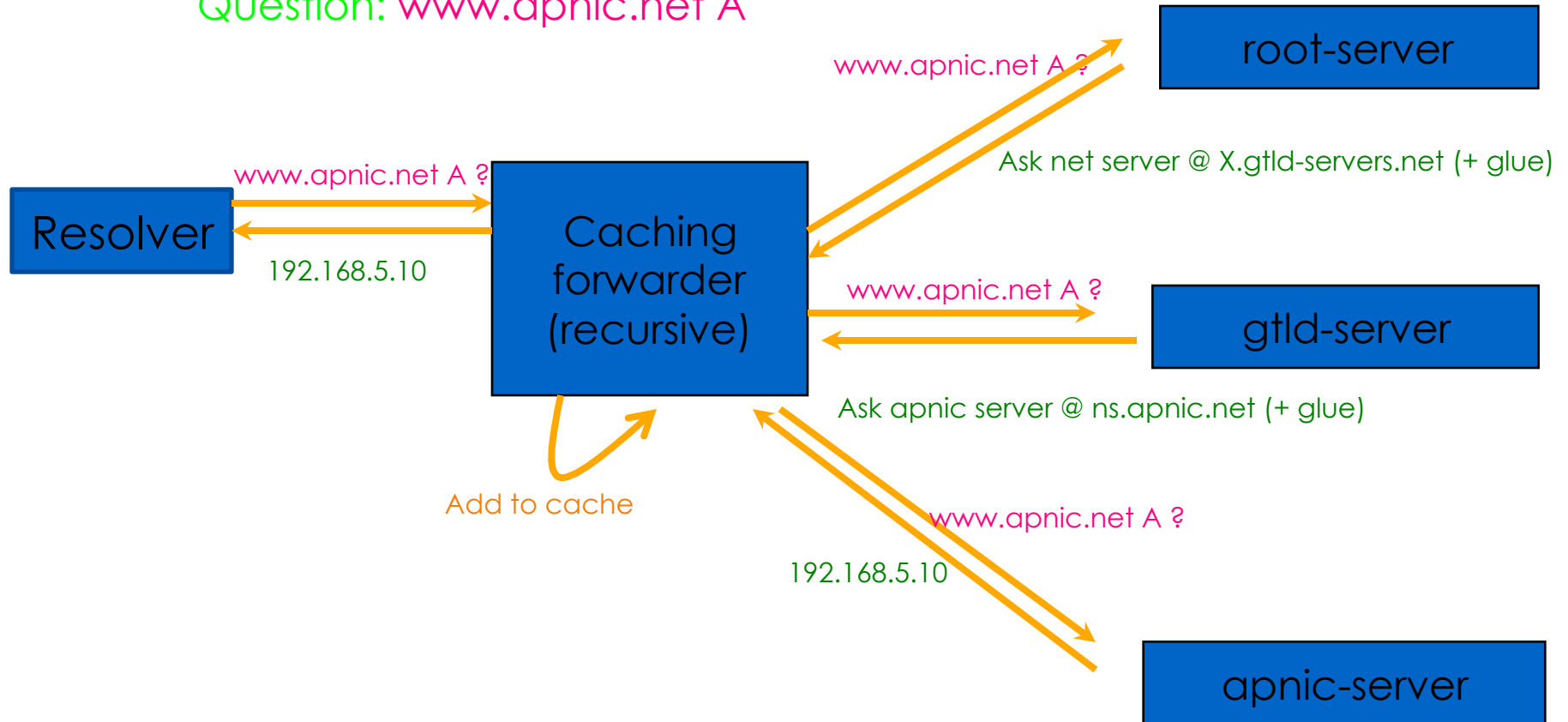


Querying the DNS – It's all about IP!



Concept: Resolving process & Cache

Question: **www.apnic.net A**



Resource Records

- Entries in the DNS zone file
- Components:

Resource Record	Function
Label	Name substitution for FQDN
TTL	Timing parameter, an expiration limit
Class	IN for Internet, CH for Chaos
Type	RR Type (A, AAAA, MX, PTR) for different purposes
RDATA	Anything after the Type identifier; Additional data

Common Resource Record Types

RR Type	Name	Functions
A	Address record	Maps domain name to IP address <code>www.apnic.net. IN A 203.176.189.99</code>
AAAA	IPv6 address record	Maps domain name to an IPv6 address <code>www.apnic.net. IN AAAA 2001:db8::1</code>
NS	Name server record	Used for delegating zone to a nameserver <code>apnic.net. IN NS ns1.apnic.net.</code>
PTR	Pointer record	Maps an IP address to a domain name <code>99.189.176.203.in-addr.arpa. IN PTR www.apnic.net.</code>
CNAME	Canonical name	Maps an alias to a hostname <code>web IN CNAME www.apnic.net.</code>
MX	Mail Exchanger	Defines where to deliver mail for user @ domain <code>apnic.net. IN MX 10 mail01.apnic.net. IN MX 20 mail02.apnic.net.</code>

Start of Authority (SOA) record

```
Domain_name. CLASS SOA hostname.domain.name. mailbox.domain.name (  
    Serial Number  
    Refresh  
    Retry  
    Expire  
    Minimum TTL )
```

- **Serial Number** – must be updated if any changes are made in the zone file
- **Refresh** – how often a secondary will poll the primary server to see if the serial number for the zone has increased
- **Retry** - If a secondary was unable to contact the primary at the last refresh, wait the retry value before trying again
- **Expire** - How long a secondary will still treat its copy of the zone data as valid if it can't contact the primary.
- **Minimum TTL** - The default TTL (time-to-live) for resource records

TTL Time Values

- The right value depends on your domain
- Recommended time values for TLD (based on RFC 1912)

Refresh	86400 (24h)
Retry	7200 (2h)
Expire	2592000 (30d)
Min TTL	345600 (4d)

- For other servers – optimize the values based on
 - Frequency of changes
 - Required speed of propagation
 - Reachability of the primary server
 - (and many others)

Example: RRs in a Zone File

```
apnic.net. 7200 IN      SOA  ns.apnic.net. admin.apnic.net. (  
    20130522          ; Serial  
    12h               ; Refresh 12 hours  
    4h                ; Retry 4 hours  
    4d                ; Expire 4 days  
    2h                ; Negative cache 2 hours )
```

```
apnic.net.      7200  IN      NS      ns.apnic.net.  
apnic.net.      7200  IN      NS      ns.ripe.net.  
whois.apnic.net. 3600  IN      A        193.0.1.162
```

www.apnic.net

3600

IN

A

192.0.3.25

Label

TTL

Class

Type

Rdata

Performance of DNS

- Server hardware requirements
- OS and the DNS server running
- How many DNS servers?
- How many zones expected to load?
- How large the zones are?
- Zone transfers
- Where the DNS servers are located?
- Bandwidth

Performance of DNS

- Are these servers Multihomed?
- How many interfaces are to be enabled for listening?
- How many queries are expected to receive?
- Recursion
- Dynamic updates
- DNS notifications

Questions

- Please remember to fill out the feedback form
 - `<survey-link>`
- Slide handouts will be available after completing the survey



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Your IP address:
2001:dc0:a000:4:595f:4f90:654f:402c

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Helpdesk

Monday - Friday
09:00 to 21:00 (UTC +10)

 **Email**
helpdesk@apnic.net

 **Phone**
+61 7 3858 3188

 **VoIP**
helpdesk@voip.apnic.net

 **Fax**
+ 61 7 3858 3199

Multi-language phone support
Bahasa Indonesia, Bengali, Cantonese, English, Filipino (Tagalog), Hindi, and Mandarin.

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Thank you!

End of Session