

CompTIA Network+ Exam N10-008

Lesson 10



Explaining Network Services

Objectives

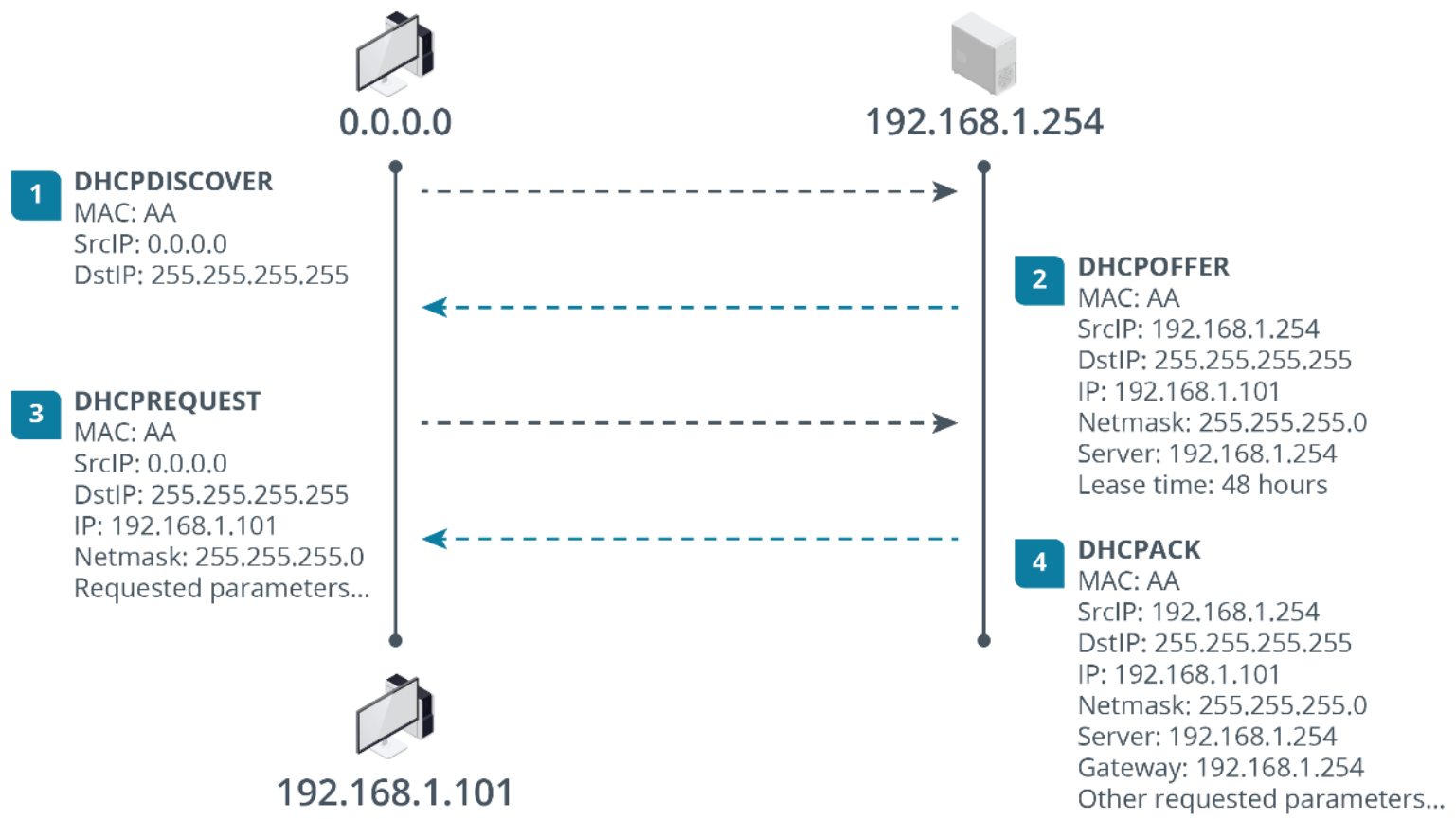
- Explain the use of network addressing services
- Explain the use of name resolution services
- Configure DNS services

Lesson 10

Topic 10A

Explain the Use of Network
Addressing Services

Dynamic Host Configuration Protocol



DHCP Server Configuration

- Appliance versus NOS implementation
- Scope
 - Range of IP addresses available to lease to clients on a particular subnet
 - Defined by start and end IP addresses and netmask
- Redundant DHCP services should use non-overlapping address pools

The screenshot displays the TP-Link AP300 web management interface. The top navigation bar is blue with the TP-LINK logo and 'AP300' on the left, and 'Quick Setup' and 'Advanced' tabs on the right. In the top right corner, there are icons for 'LED On', 'Logout', and 'Reboot'. A left sidebar contains a menu with 'Status', 'Wireless', 'Network' (highlighted in blue), 'LAN', 'DHCP Settings' (highlighted in blue), 'DHCP Client List', 'IP Address', and 'System Tools'. The main content area is titled 'DHCP Settings' and features a green question mark icon. It includes a 'DHCP Server' section with radio buttons for 'Auto', 'On' (selected), and 'Off'. Below this are input fields for 'IP Address Pool' (192.168.1.100 - 192.168.1.199), 'Address Lease Time' (720 minutes), 'Default Gateway' (192.168.1.254), 'Primary DNS' (192.168.1.254), and 'Secondary DNS' (0.0.0.0). A green 'Save' button is located at the bottom right of the settings area. The footer shows 'Firmware Version: 1.0.0 Build 20160909 Rel. 53890' and 'Hardware Version: AP300 v1.0', with a 'Support' link on the far right.

Field	Value	Notes
DHCP Server	On	Radio button selected
IP Address Pool	192.168.1.100 - 192.168.1.199	
Address Lease Time	720	(1-2880) minutes
Default Gateway	192.168.1.254	(Optional)
Primary DNS	192.168.1.254	(Optional)
Secondary DNS	0.0.0.0	(Optional)

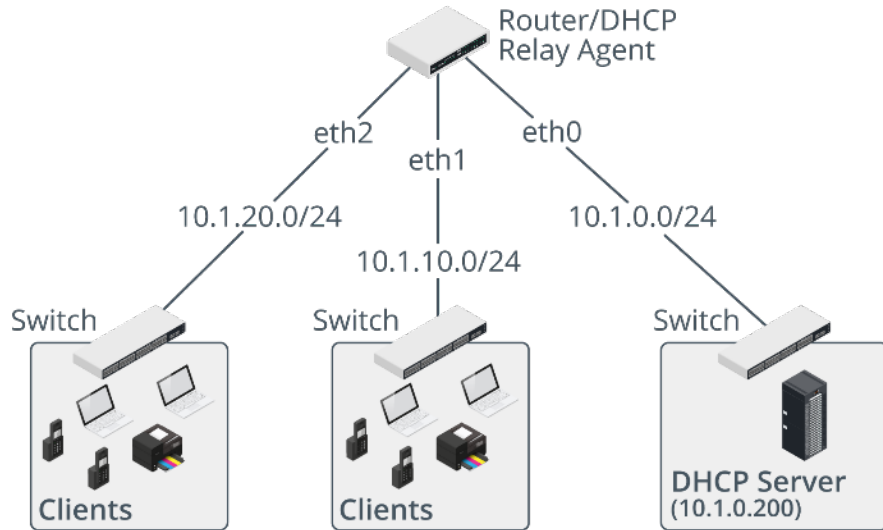
DHCP Options Configuration

- Lease time determines how long client keeps its address
 - Long lease reduces DHCP traffic but may risk address pool exhaustion
 - Environments with high host turnover will configure short leases
 - T1 timer and T2 timers
- Options
 - Default gateway
 - IP address(es) of DNS servers
 - DNS suffix (domain name) to be used by the client
 - Time synchronization (NTP), file transfer (TFTP), VoIP proxy, ...
- Server options versus scope options

DHCP Reservations and Exclusions

- Static assignments and exclusions
 - Use IP addresses outside address pool
 - Exclude specific IP addresses from pool range
- MAC/IP reservation
 - Always allocate a device the same pre-selected IP
- Automatic allocation
 - Lease any IP address from the pool to the same client persistently

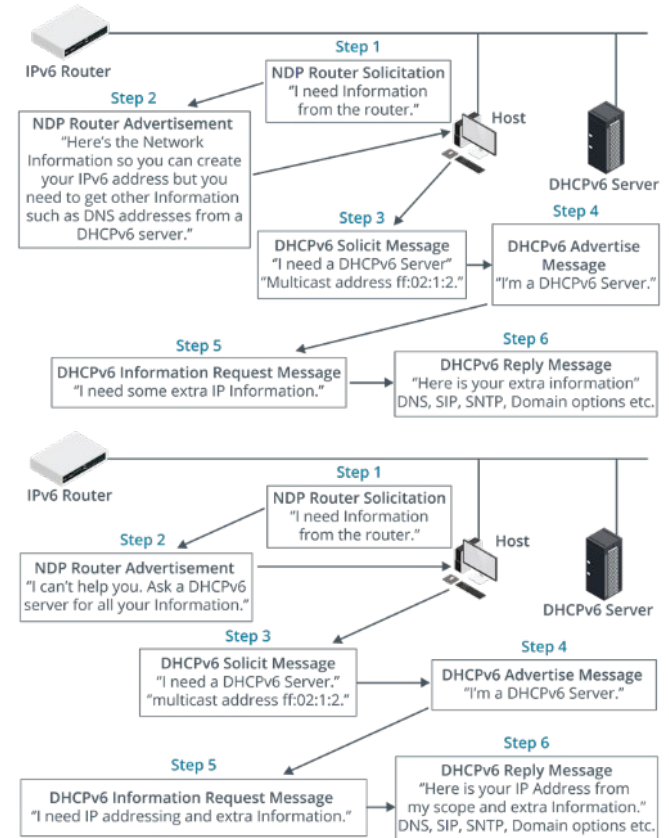
DHCP Relay and IP Helper



- DHCP relay agent/RFC 1542 compliant router
 - Forwards BOOTP/DHCP traffic broadcasts to specified interface for a DHCP server
 - Forwards responses from server back to appropriate client subnet
- ip helper
 - Cisco command supporting operation of DHCP relay
 - Can forward various types of broadcast traffic (not just DHCP)

DHCPv6 Server Configuration


- Client uses multicast ff:02::1:2 to locate server over port UDP/546 (client) and UDP/547 (server)
- Stateless
 - Host obtains prefix from router advertisement (RA)
 - RA advertises presence of DHCPv6 server to provide additional options
- Stateful
 - DHCPv6 server provides routable IPv6 address



Review Activity: Network Addressing Services

- Dynamic Host Configuration Protocol
- DHCP Server Configuration
- DHCP Options Configuration
- DHCP Reservations and Exclusions
- DHCP Relay and IP Helper
- DHCPv6 Server Configuration

Assisted Lab: Analyze a DHCP Server Configuration

- Lab types
 - Assisted labs guide you step-by-step through tasks
 - Applied labs set goals with limited guidance
- Complete lab
 - Submit all items for grading and check each progress box
 - Select “Grade Lab” from final page
- Save lab 
 - Select the hamburger menu and select “Save”
 - Save up to two labs in progress for up to 7 days
- Cancel lab without grading
 - Select the hamburger menu and select “End”

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Topic 10B

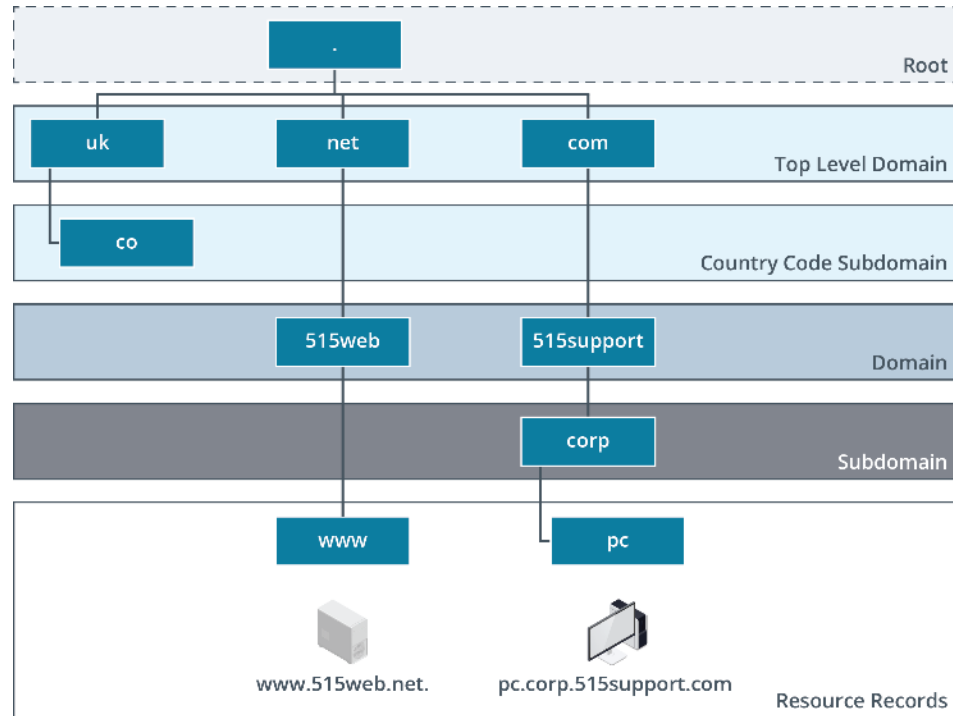
Explain the Use of Name
Resolution Services

Host Names and Fully Qualified Domain Names

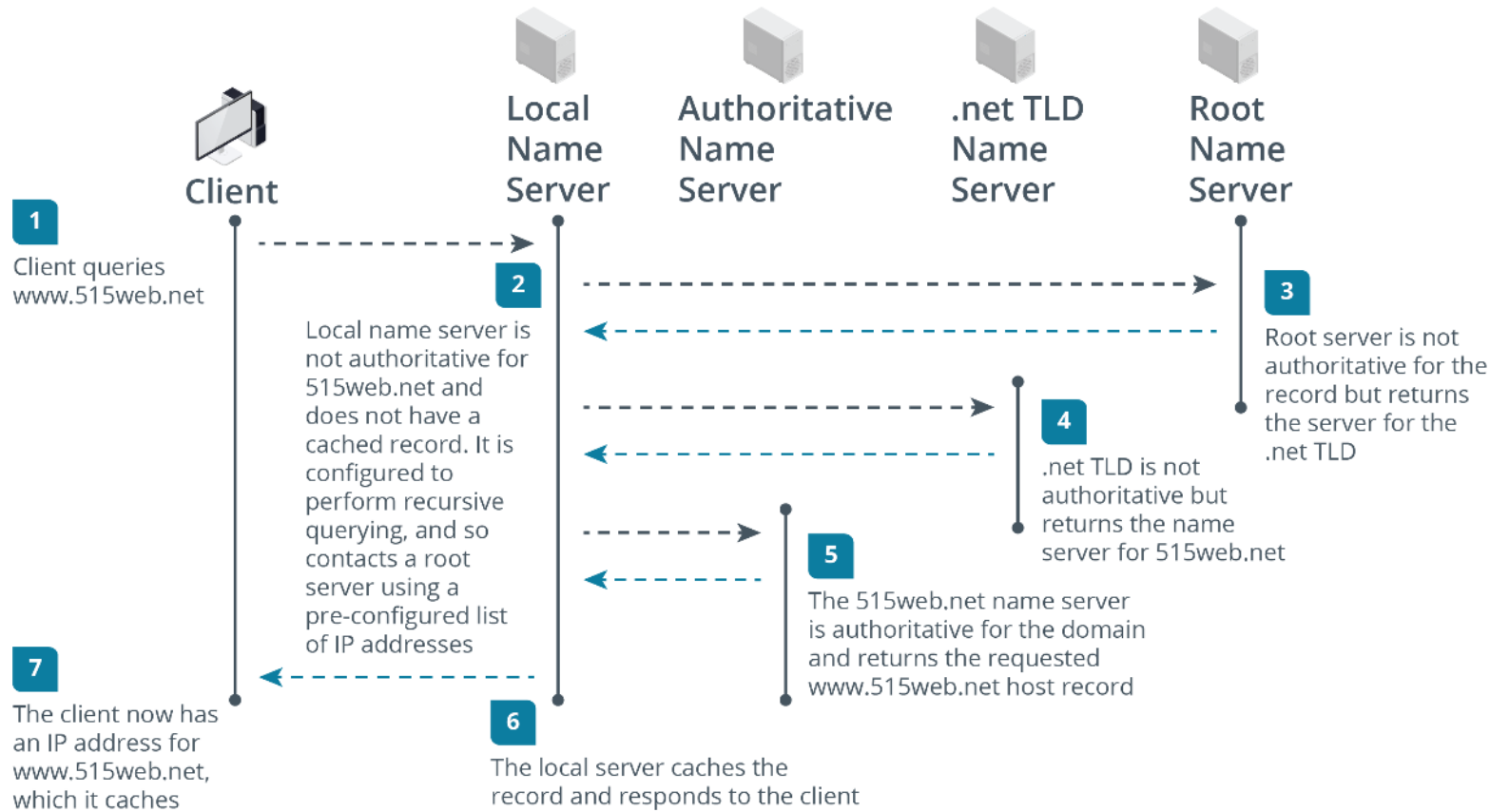
- Fully Qualified Domain Name (FQDN)
 - Host name + domain suffix
- Domain suffix
 - Domain name + Top Level Domain (TLD)
 - Subdomains
- Naming rules
 - Host name must be unique within domain
 - Labels separated by periods
 - Max length of 253 characters overall and 63 characters per label (excluding periods)

Domain Name System

- Hierarchical distributed database of name resource records
- Root domain contains 13 servers (A...M)
- Top Level Domains (TLDs) managed by ICANN and regional registries
- Domains can be registered within an appropriate TLD



Name Resolution Using DNS



Resource Record Types

The screenshot shows the 'corp.515support.com Properties' dialog box with the 'Start of Authority (SOA)' tab selected. The dialog has three tabs: 'General', 'Start of Authority (SOA)', and 'Name Servers'. The 'Start of Authority (SOA)' tab contains the following fields and controls:

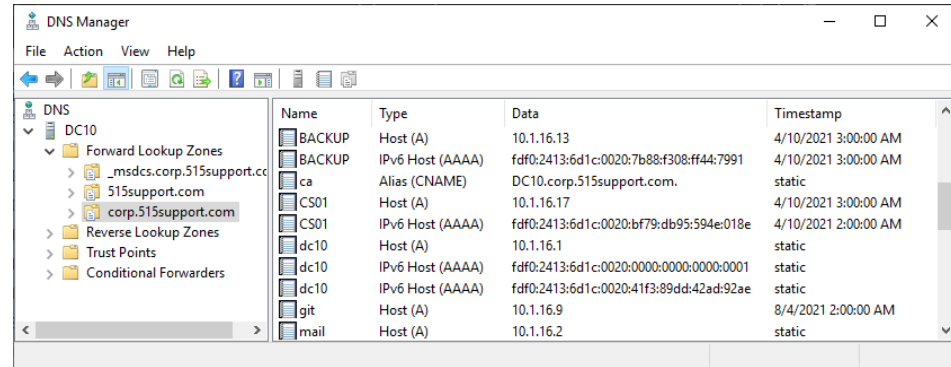
- Serial number:** A text box containing '112' and an 'Increment' button.
- Primary server:** A text box containing 'dc10.corp.515support.com.' and a 'Browse...' button.
- Responsible person:** A text box containing 'hostmaster.corp.515support.com.' and a 'Browse...' button.
- Refresh interval:** A spinner box set to '15' and a dropdown menu set to 'minutes'.
- Retry interval:** A spinner box set to '10' and a dropdown menu set to 'minutes'.
- Expires after:** A spinner box set to '1' and a dropdown menu set to 'days'.
- Minimum (default) TTL:** A spinner box set to '1' and a dropdown menu set to 'hours'.
- TTL for this record:** A text box containing '0 :1 :0 :0' and the label '(DDDDD:HH.MM.SS)'.

At the bottom of the dialog are four buttons: 'OK', 'Cancel', 'Apply', and 'Help'.

- Start of Authority (SOA)
 - Primary DNS name server that is authoritative for the zone
 - Contact information
 - Serial number for version control
- Name Server (NS)
 - Two or more NS records are usually configured for redundancy
 - Primary (editable) versus secondary (read-only)

Host Address and Canonical Name Records

- IPv4 Host (A)
 - Host record to resolve a name to an IPv4 address
- IPv6 Host (AAAA)
 - Host record to resolve a name to an IPv6 address
- Canonical Name (CNAME)
 - Alternative name for a particular A or AAAA record







The screenshot shows the Windows DNS Manager application. The left pane displays the hierarchy: DNS > DC10 > Forward Lookup Zones > corp.515support.com. The right pane shows a list of DNS records with columns: Name, Type, Data, and Timestamp.

Name	Type	Data	Timestamp
BACKUP	Host (A)	10.1.16.13	4/10/2021 3:00:00 AM
BACKUP	IPv6 Host (AAAA)	fdf0:2413:6d1c:0020:7b88:f308:ff44:7991	4/10/2021 3:00:00 AM
ca	Alias (CNAME)	DC10.corp.515support.com.	static
CS01	Host (A)	10.1.16.17	4/10/2021 3:00:00 AM
CS01	IPv6 Host (AAAA)	fdf0:2413:6d1c:0020:bf79:db95:594e:018e	4/10/2021 2:00:00 AM
dc10	Host (A)	10.1.16.1	static
dc10	IPv6 Host (AAAA)	fdf0:2413:6d1c:0020:0000:0000:0000:0001	static
dc10	IPv6 Host (AAAA)	fdf0:2413:6d1c:0020:41f3:89dd:42ad:92ae	static
git	Host (A)	10.1.16.9	8/4/2021 2:00:00 AM
mail	Host (A)	10.1.16.2	static

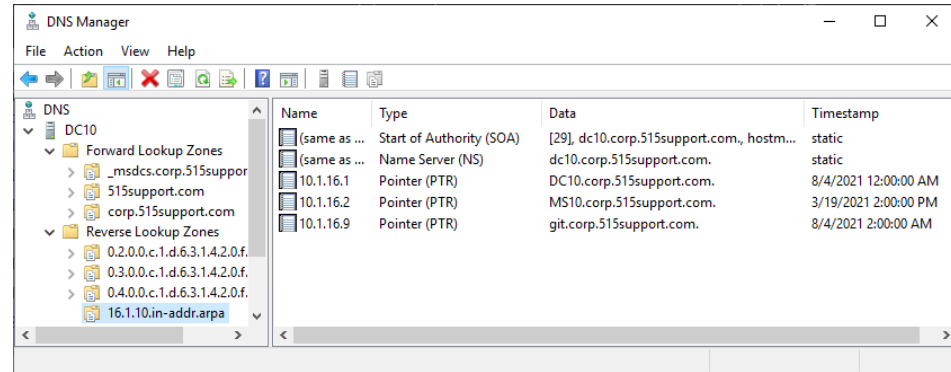
Mail Exchange, Service, and Text Records

- Mail Exchange (MX)
 - Identifies a host record that functions as an email server for the domain
 - Servers distinguished by priority value
- Service (SRV)
 - Identifies a host record that is providing a particular network service or protocol
- Text (TXT)
 - Stores any free-form text that may be needed to support other network services
 - Sender Policy Framework (SPF)
 - DomainKeys Identified E-mail (DKIM)

Name	Type	Data	Timestamp
 _gc	Service Location (SRV)	[0][100][3268] dc10.corp.515support.com.	8/3/2021 11:00:00 PM
 _kerberos	Service Location (SRV)	[0][100][88] dc10.corp.515support.com.	8/3/2021 11:00:00 PM
 _kpasswd	Service Location (SRV)	[0][100][464] dc10.corp.515support.com.	8/3/2021 11:00:00 PM
 _ldap	Service Location (SRV)	[0][100][389] dc10.corp.515support.com.	8/3/2021 11:00:00 PM

Pointer Records

- Forward versus reverse lookup zones
- Pointer (PTR)
 - Resolves an IP address to a host name
- in.addr.arpa domain
- ip6.arpa domain



Review Activity: Name Resolution Services

- Host Names and Fully Qualified Domain Names
- Domain Name System
- Name Resolution Using DNS
- Resource Record Types
- Host Address and Canonical Name Records
- Mail Exchange, Service, and Text Records
- Pointer Records

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Topic 10C

Configure DNS Services

DNS Server Configuration

- Service port UDP/53 or TCP/53
- Zones
 - Primary
 - Secondary
 - Cache-only
 - Authoritative (holds zone records) versus non-authoritative (responds from cache)
- DNS caching
 - Time to Live (TTL)
 - Server versus client cache

Internal versus External DNS

- Internal DNS zones
 - Name records for private servers and services
 - Only available to internal clients
 - Block access from Internet
- External DNS zones
 - Public services (websites, email, etc.)
 - Hosted on Internet-accessible name servers
- Forwarding and conditional forwarding

nslookup

- Query a name server for resource records
- nslookup –Option Host Server
- Interactive mode
- PowerShell cmdlets

```
C:\Users\Admin>nslookup -type=mx comptia.org 8.8.8.8
Server:  dns.google
Address:  8.8.8.8

Non-authoritative answer:
comptia.org      MX preference = 10, mail exchanger = comptia-org.mail.protection.outlook.com

C:\Users\Admin>nslookup -type=ns comptia.org 8.8.8.8
Server:  dns.google
Address:  8.8.8.8

Non-authoritative answer:
comptia.org      nameserver = ns2.comptia.org
comptia.org      nameserver = ns1.comptia.org

C:\Users\Admin>nslookup -type=mx comptia.org ns1.comptia.org
Server:  UnKnown
Address:  209.117.62.56

comptia.org      MX preference = 10, mail exchanger = comptia-org.mail.protection.outlook.com

C:\Users\Admin>
```



```
toor@LX20D:~$ dig +nocmd +noedns +noquestion 515support.com MX
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 12449
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

;; ANSWER SECTION:
515support.com.      6968      IN        MX       10 mail.515support.com.

;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Wed Aug 04 10:08:20 BST 2021
;; MSG SIZE rcvd: 53

toor@LX20D:~$ dig +nocmd +noedns +noquestion mail.515support.com
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 57840
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

;; ANSWER SECTION:
mail.515support.com. 7029      IN        A        198.51.100.29


;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Wed Aug 04 10:08:32 BST 2021
;; MSG SIZE rcvd: 53
```

- Domain Information Groper (dig)
- Shipped with BIND DNS server software
 - dig host
 - dig @ns1.isp.example host
 - dig @ns1.isp.example host all
 - dig @ns1.isp.example host MX
- Output parameters
 - +nocomments or +nostats

Review Activity: DNS Services

- Configure DNS Services
- DNS Server Configuration
- Internal versus External DNS
- nslookup
- dig

Assisted Lab: Analyze a DNS Server Configuration

- Lab types
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Summary