CORE CONCEPTS — DNS, ROUTER, AND NETWORK COMMUNICATION

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1. PRIVATE IP ADDRESSES AND LAN

• Private IPs are used within LANs (Local Area Networks).
• They are not visible on the Internet.
• Common ranges:
- Class A: 10.0.0.0 – 10.255.255.255
- Class B: 172.16.0.0 – 172.31.255.255 (second octet identifies private range)
- Class C: 192.168.0.0 – 192.168.255.255
• Private IPs allow devices within the same network to communicate.

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2. ROUTER AND NETWORK COMMUNICATION

• Routers connect multiple networks and forward packets between them.
• Each network connected to a router has a unique network ID.
• Routing enables a PC in one network to reach devices in another network.
• Commands for basic static routing:
ip route

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3. HOW A PC IN ONE NETWORK ACCESSES ANOTHER NETWORK'S SERVER

• A PC sends a DNS request to resolve a domain name (e.g., www.teacher.com).
• If the DNS is in another network, the request goes via the router using routing tables.
• The router forwards packets between both networks, ensuring communication.
• Once DNS provides the IP, the PC contacts the web server through the router.

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4. DNS CONCEPTS

• DNS converts domain names (like www.google.com) into IP addresses.
• Components:
- DNS Client: Sends query
- DNS Server: Resolves name to IP
• If the primary DNS fails, the secondary DNS acts as a backup.

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5. DNS IMPLEMENTATION WITH SWITCH AND ROUTER

With Switch:
• All devices (PCs, DNS servers) are in the same LAN/subnet.
• No routing required.
• PCs can have Primary and Secondary DNS servers for redundancy.
With Router:
• Devices are in different networks.
• Routers forward DNS queries and web traffic between networks using IP routing.

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6. DNS CONFIGURATION USING ROUTER

Routers can be involved with DNS in three main ways:
1. Router uses a DNS Server
ip name-server 8.8.8.8
ip domain-lookup
2. Router gives DNS information via DHCP
ip dhcp pool LAN
network 192.168.1.0 255.255.255.0
default-router 192.168.1.1
dns-server 192.168.2.100
3. Router acts as DNS forwarder (middleman)

ip dns server
ip name-server 192.168.2.100
ip domain-lookup

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7. ROUTER AS DNS FORWARDER (MIDDLEMAN)

• The router receives DNS queries from clients in its network.
• It forwards them to a real DNS server in another network.
• This allows clients to use the router's IP as their DNS.

Example Flow:
PC → Router → DNS Server → Router → PC

Commands:
Router(config)# ip dns server
Router(config)# ip name-server 192.168.2.100
Router(config)# ip domain-lookup

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8. SUMMARY OF ROLES

Component	Role
PC	Sends DNS & web requests
Router	Routes packets and can forward DNS queries
DNS Server	Resolves domain names to IP addresses
Web Server	Hosts website content

KEY TAKEAWAY:
Private IPs are used within LANs. Routers connect networks, enabling inter-network communication.
DNS servers resolve domain names, and routers can forward or distribute DNS services to clients.