Networking 100

Part 1 - The Basics

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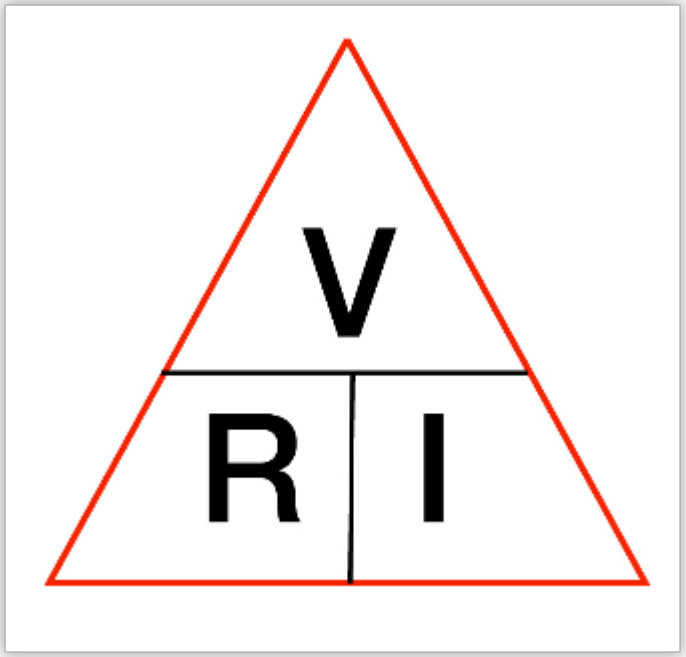
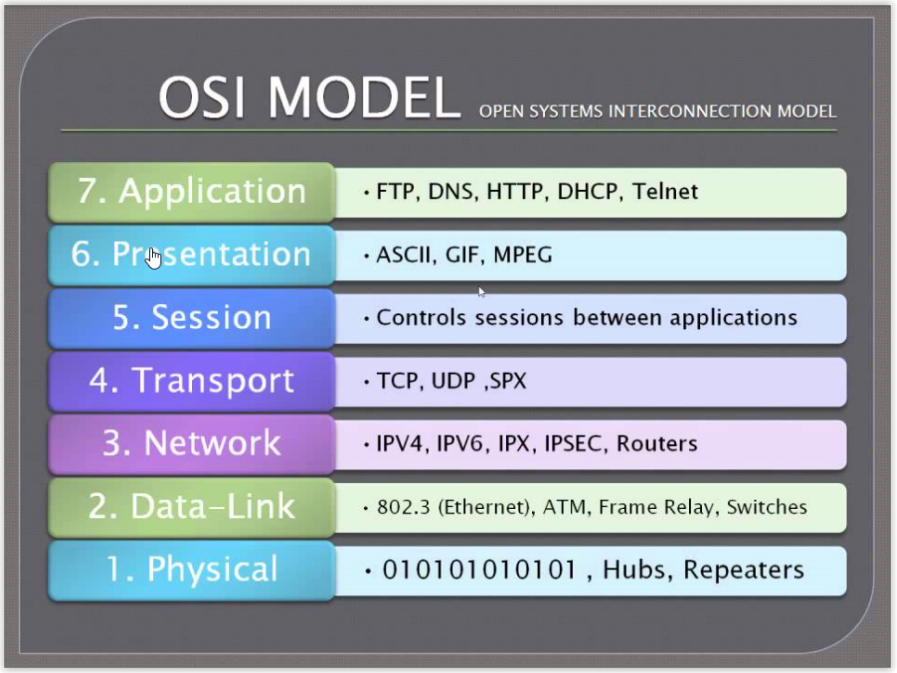
E=IR and OSI Model





The Bottom 4 Layers

- **TCP/UDP – Ports**
- **IP – IP addresses**
- **Data Link – Mac Addresses**
- **Physical – Wired or wireless**

Data Link / MAC

- Think of this layer as the devices physical address
- A MAC address look like 00:E0:4C:68:52:2F (Hex)
  - The first three hex segment represent the OUI – in this case the NIC is from Realtek Semiconductor
  - 24-bits for OUT and 24-bits for NIC address
  - 2^24 power = 16,777,216 (spoofing)
- Important item to remember, computers on a LAN communicate via MAC addresses, not IP addresses

IP Layer

- These are the IP addresses that we all know about
  - Private address – not routable on the Internet
    - 10.x.x.x/8
    - 172.16.16.x – 172.16.32.x/16
    - 192.168.0.0 – 192.168.255.0/24
  - Public addresses – Internet routable network addresses
    - The rest of the address space with few exceptions

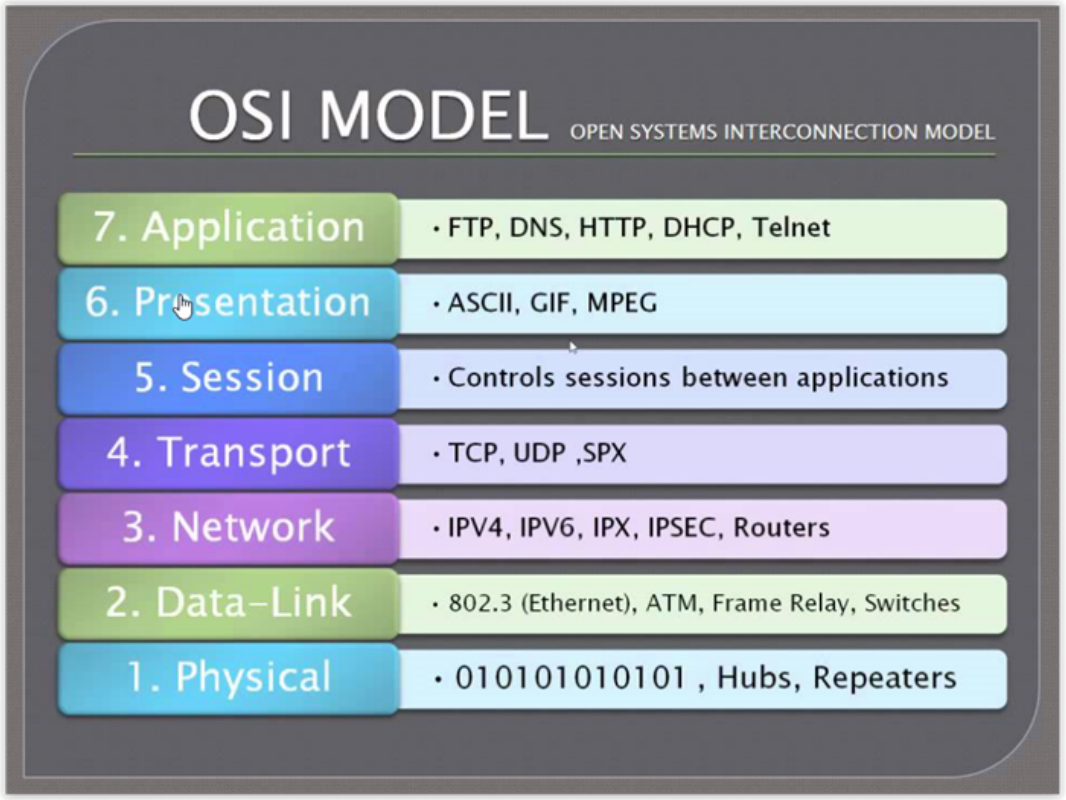
TCP/UDP Layer

- TCP vs UDP
  - TCP is a guaranteed delivery service that has error correction, UDP is best effort with no error correction, voice vs. web example.
- Port numbers, can be compared to communications channels for specific services such as email (TCP 25), DNS (UDP 53), Web Surfing (TCP 80) etc.

- Telnet 192.168.1.20:25

TCP Example

- telnet 192.168.2.25:25



ARP – Computers Communicate at Layer 2 on a LAN

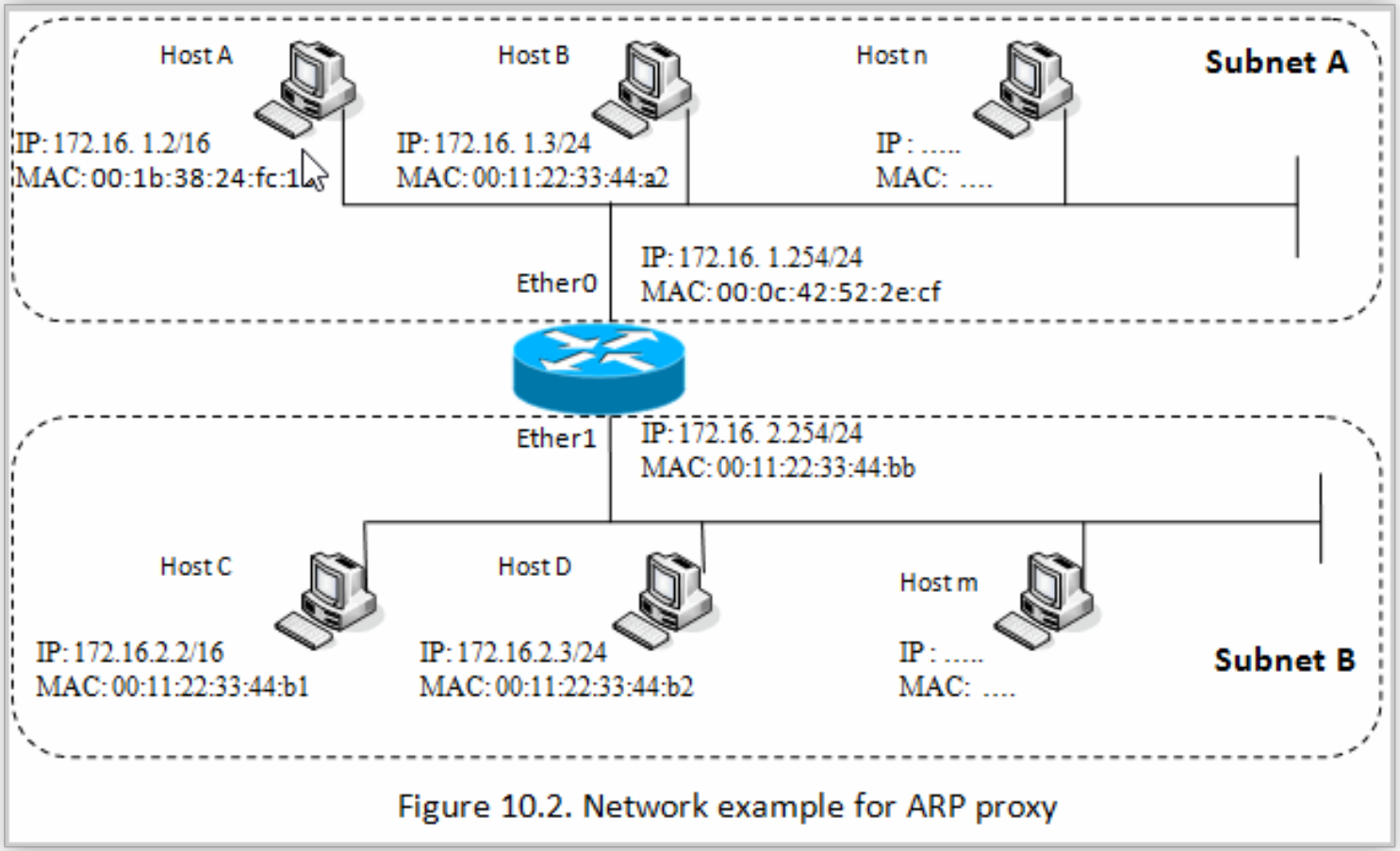
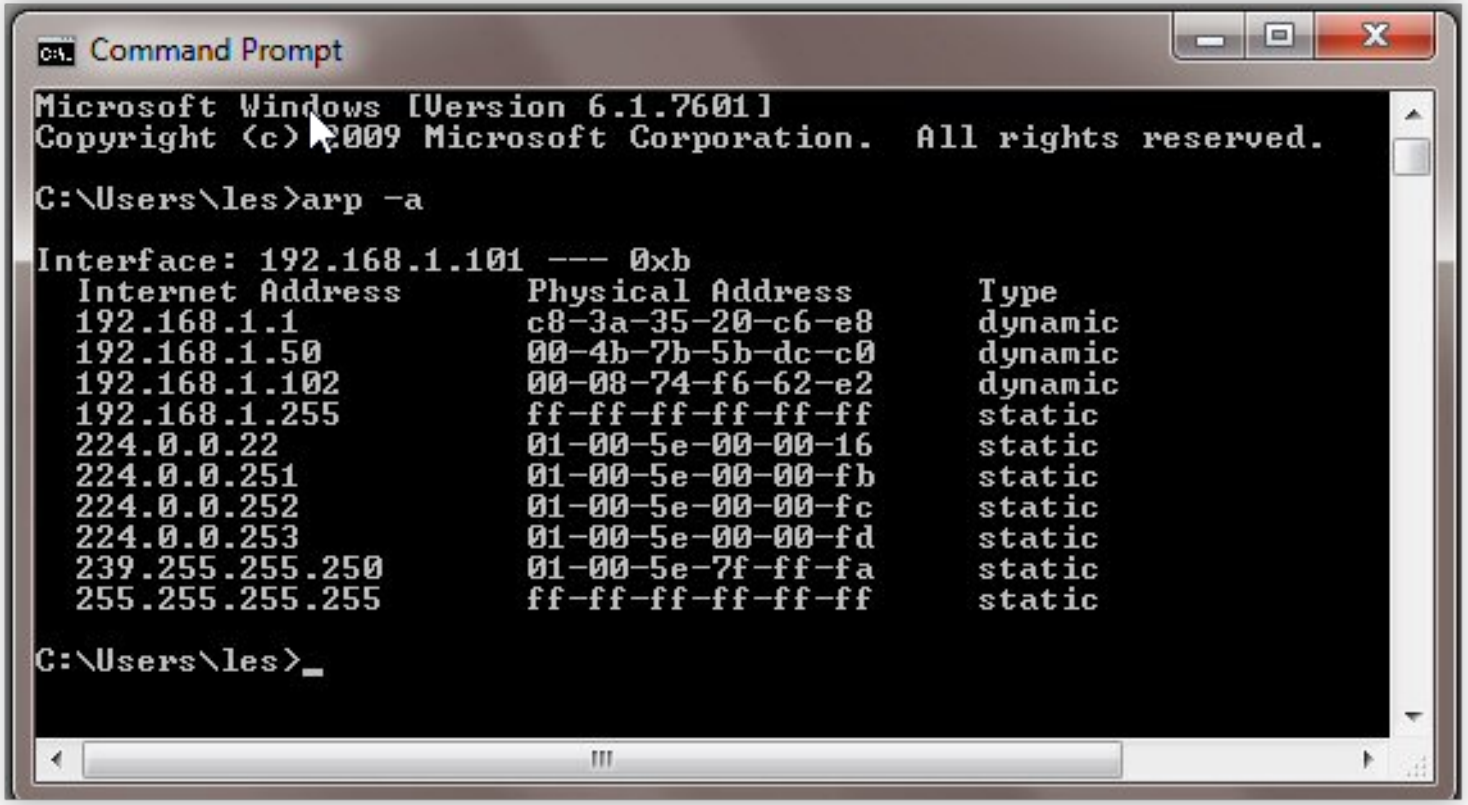


Figure 10.2. Network example for ARP proxy

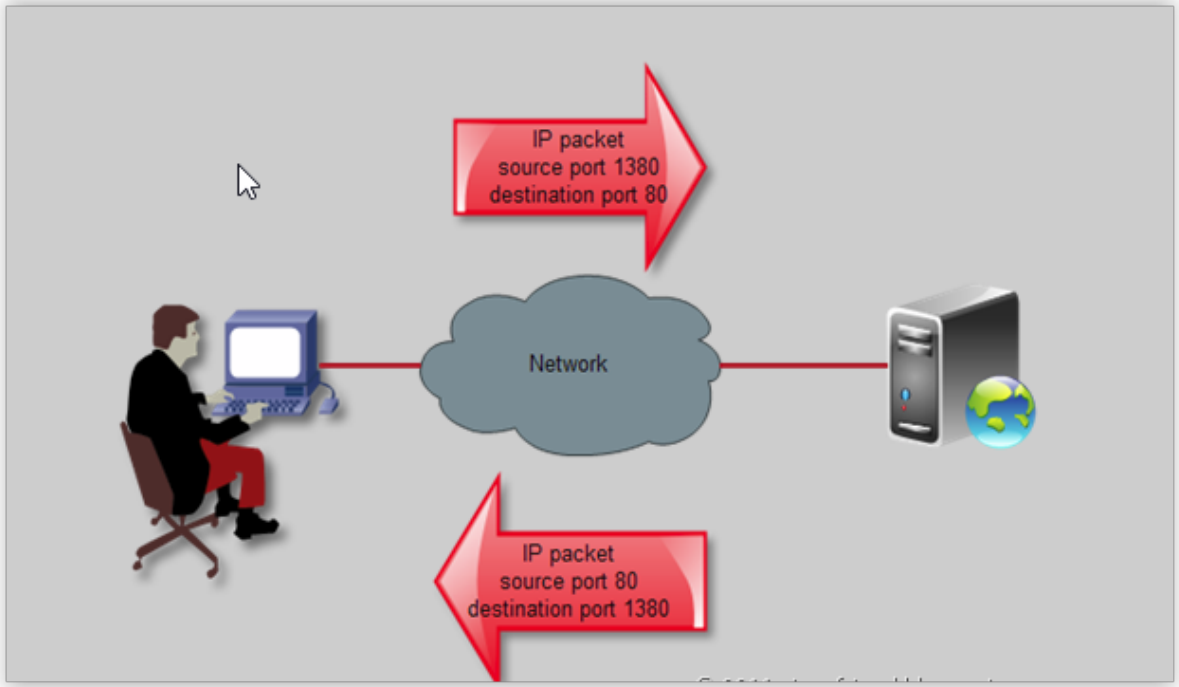
ARP Table


YOUR PASSWORD?
YOURNAME1234


Command Prompt
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.
C:\Users\les>arp -a
Interface: 192.168.1.101 --- 0xb
Internet Address Physical Address Type
192.168.1.1 c8-3a-35-20-c6-e8 dynamic
192.168.1.50 00-4b-7b-5b-dc-c0 dynamic
192.168.1.102 00-08-74-f6-62-e2 dynamic
192.168.1.255 ff-ff-ff-ff-ff-ff static
224.0.0.22 01-00-5e-00-00-16 static
224.0.0.251 01-00-5e-00-00-fb static
224.0.0.252 01-00-5e-00-00-fc static
224.0.0.253 01-00-5e-00-00-fd static
239.255.255.250 01-00-5e-7f-ff-fa static
255.255.255.255 ff-ff-ff-ff-ff-ff static
C:\Users\les>_

TCP and UDP Ports

- IP and MAC addresses refer to a computer address, a port number is a communications channel the computer listens on for a specific service such as web, mail, DNS etc.



Routing and IP Addressing

- IP V4 – addresses have two parts, an address and a subnet
  - Example 192.168.1.25/255.255.255.0 (192.168.1.25/24)
    - The address has 32 and defines the devices IP address
    - The subnet masks defines the address range that is that on the same local network (LAN)
    - For a computer to communicate outside the LAN it needs to know the address of the router, aka the default gateway (for most home users this is 192.168.1.1)

Routing Diagram Example

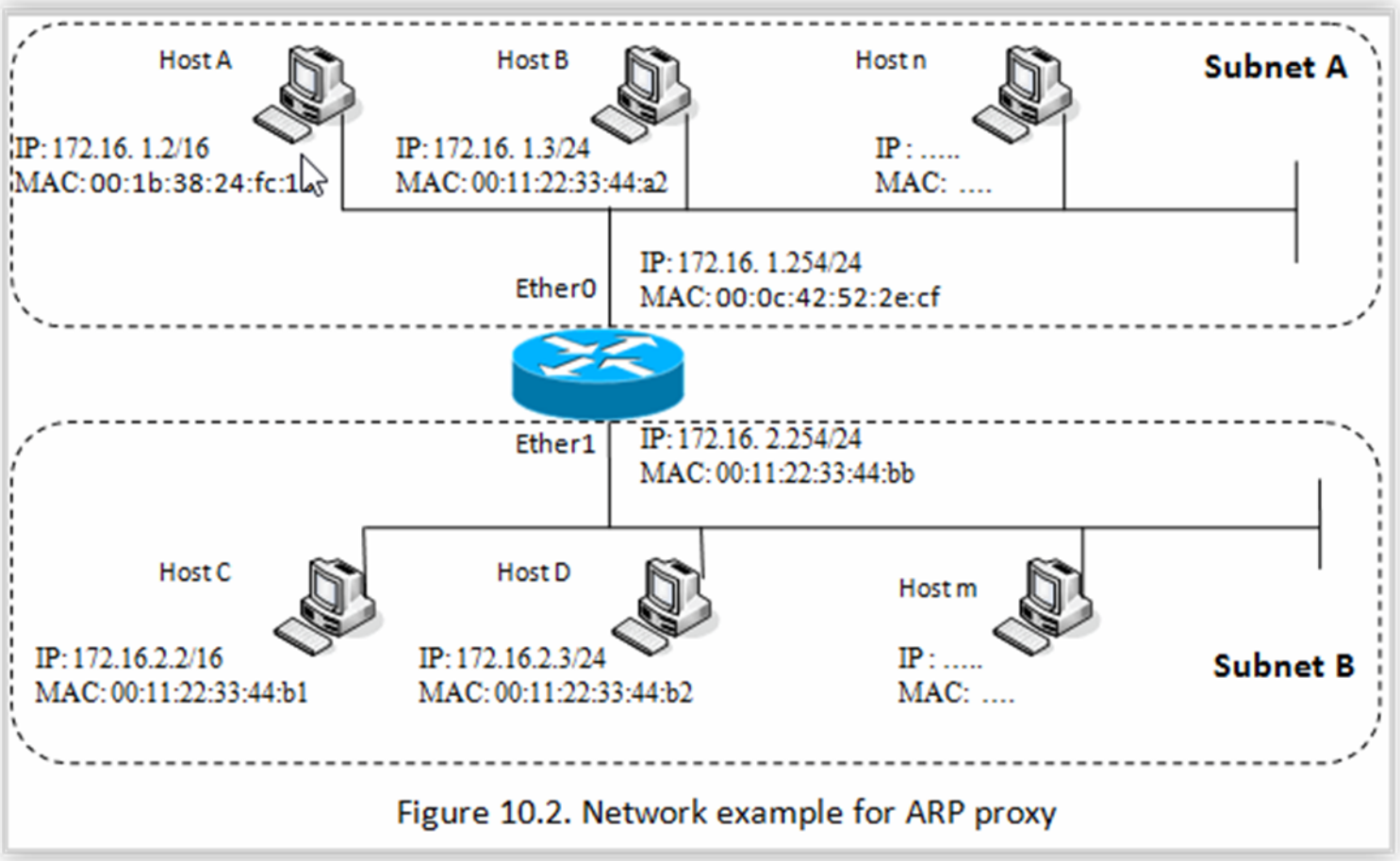
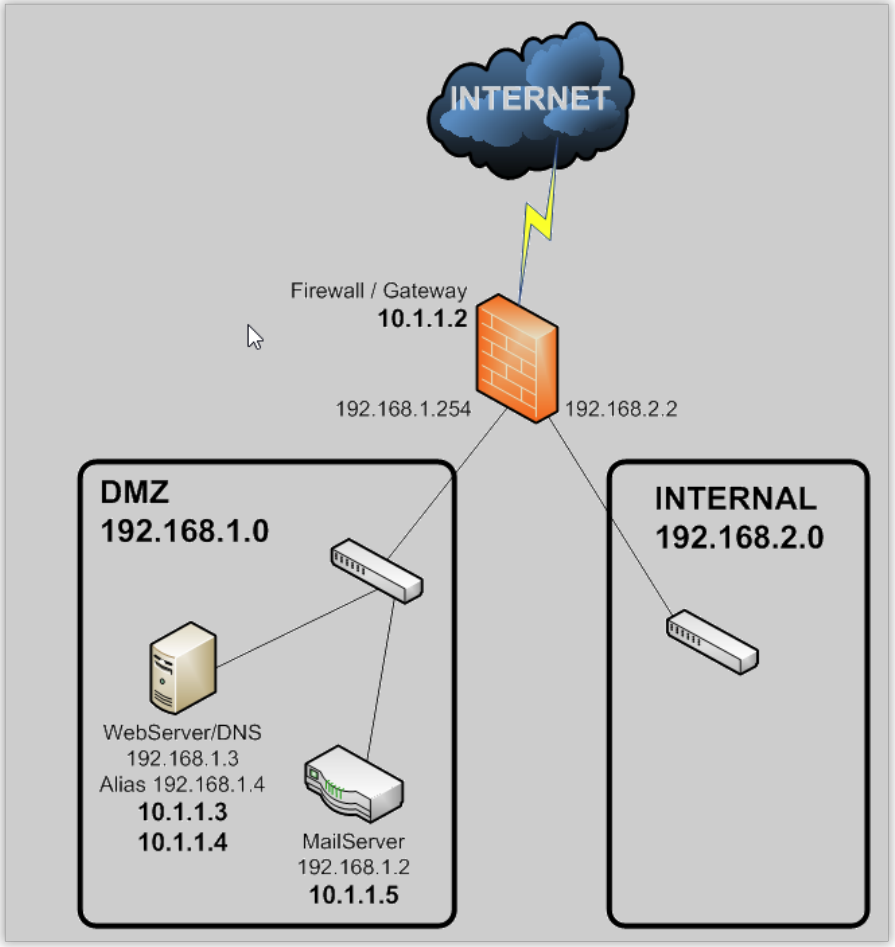


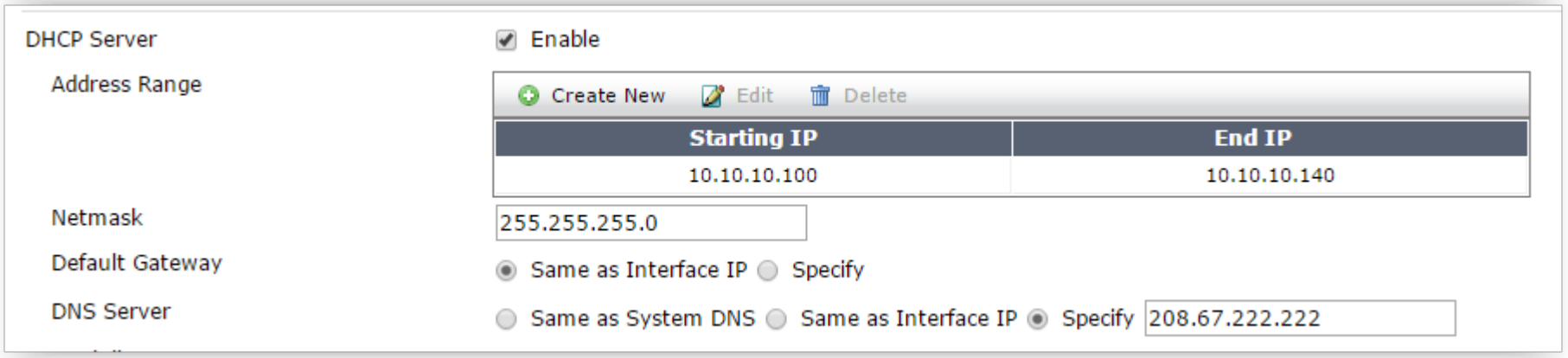
Figure 10.2. Network example for ARP proxy

DNS UDP Port 53

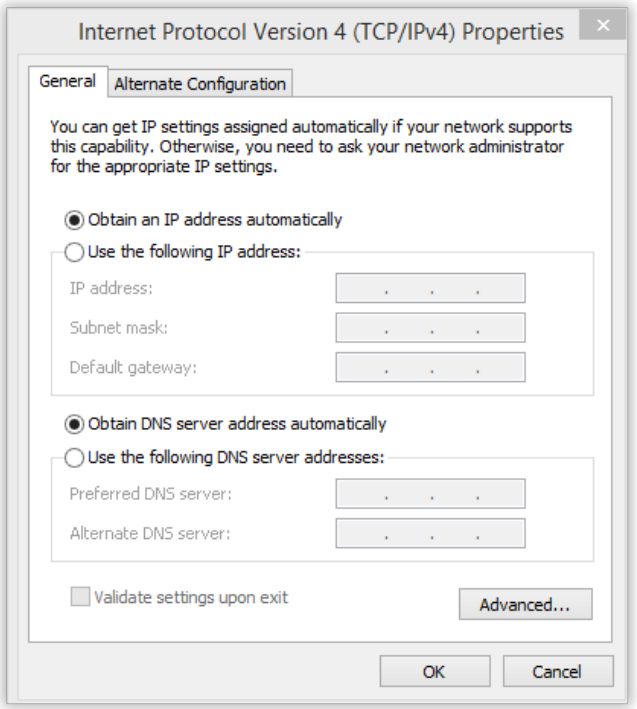


DHCP

- Dynamic Host Configuration Protocol



DHCP Client



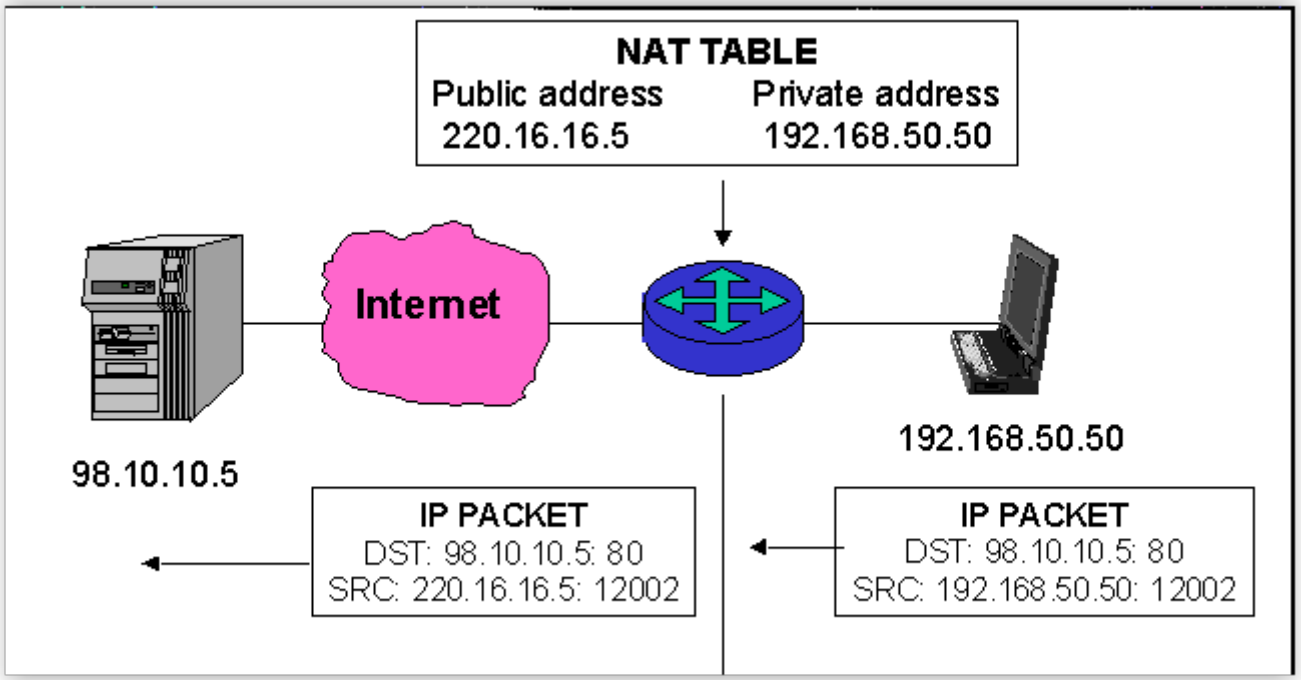
Ipconfiig /all

```
Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Realtek PCIe GBE Family Controller
   Physical Address. . . . . . . . . : 94-DE-80-A9-85-44
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   IPv4 Address. . . . . . . . . . . : 10.10.10.200(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 10.10.10.254
   DNS Servers . . . . . . . . . . . : 208.67.220.220
                                       208.67.222.222
   NetBIOS over Tcpip. . . . . . . . : Disabled
```

NAT – Network Address Translation

- Private Address are not routable to NAT is used to translate private address to public address.



Questions