

ECCS-3631

Networks and Data Communications

Module 1-2

IP Addressing

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Mailing Address

Mailing address is written in the following format:

Street # Street Name

City, State ZIP_Code

For Example, Mailing address of ONU:

525 South Main Street,

Ada, OH 45810

Two key information the mailing address:

(1) Street Number and Name,

(2) ZIP Code

Mailing Address to IP Address

Computer Network is analogous to Postal Network

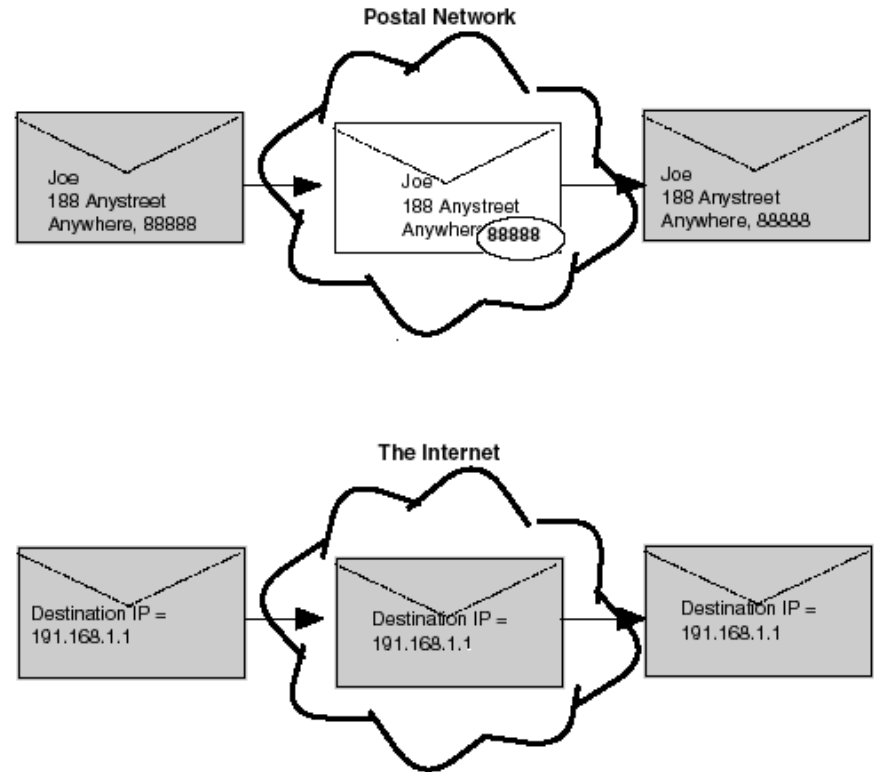
ZIP Code → Network Address

Street # and Name → Host Address

Complete Mailing Address → IP Address

From address → Source Address

To address → Destination Address



IP Address

- Consists of a group of 4 numbers separated by a period
- Each number ranges from 0 to 255
- Example: 192.168.1.10
 - google.com – [142.250.217.78](#)
 - search.yahoo.com – [98.136.144.138](#)
 - Bank of America – [171.159.118.100](#)
 - playstation.com – [209.200.152.198](#)
- Assigned by a DHCP Server, often runs on a Router
- IP Address is a combination of Network Address and Host Address, such as Mailing Address is a combination of Home address and ZIP Code.

Checking IP using ipconfig utility

Command Prompt

```
C:\Users\ajmal>ipconfig
```

```
Windows IP Configuration
```

```
Wireless LAN adapter Local Area Connection* 1:
```

```
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix  . :
```

```
Wireless LAN adapter Local Area Connection* 2:
```

```
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix  . :
```

```
Wireless LAN adapter Wi-Fi:
```

```
Connection-specific DNS Suffix  . : onu.edu
Link-local IPv6 Address . . . . . : fe80::f10a:f55b:1e8b:efeb%14
IPv4 Address. . . . . : 192.168.21.67
Subnet Mask . . . . . : 255.255.248.0
Default Gateway . . . . . : 192.168.16.1
```

```
Ethernet adapter Bluetooth Network Connection:
```

```
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix  . :
```

IP Addressing

IP address: 32 bits long, used to identify host, and router *interface*

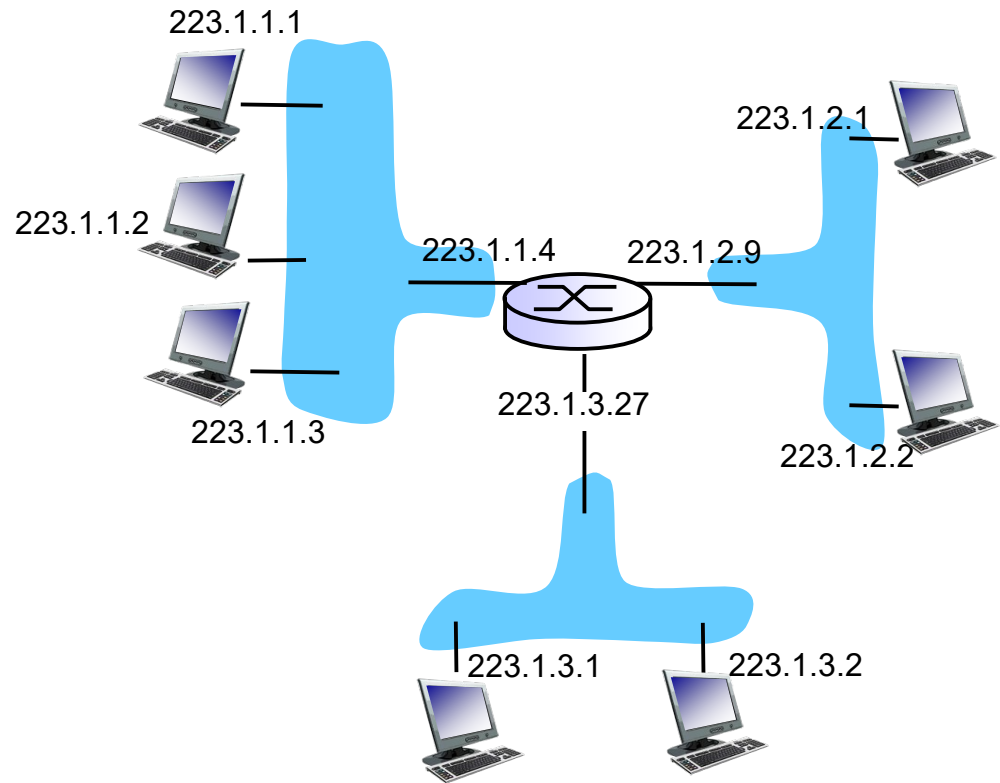
interface: connection between host/router and physical link

- Router's typically have multiple interfaces
- host typically has one or two interfaces (e.g., wired Ethernet, wireless 802.11)

➤ *IP addresses associated with each interface*

➤ About 4 billion possible IP addresses

➤ IP address is written in dotted-decimal notation

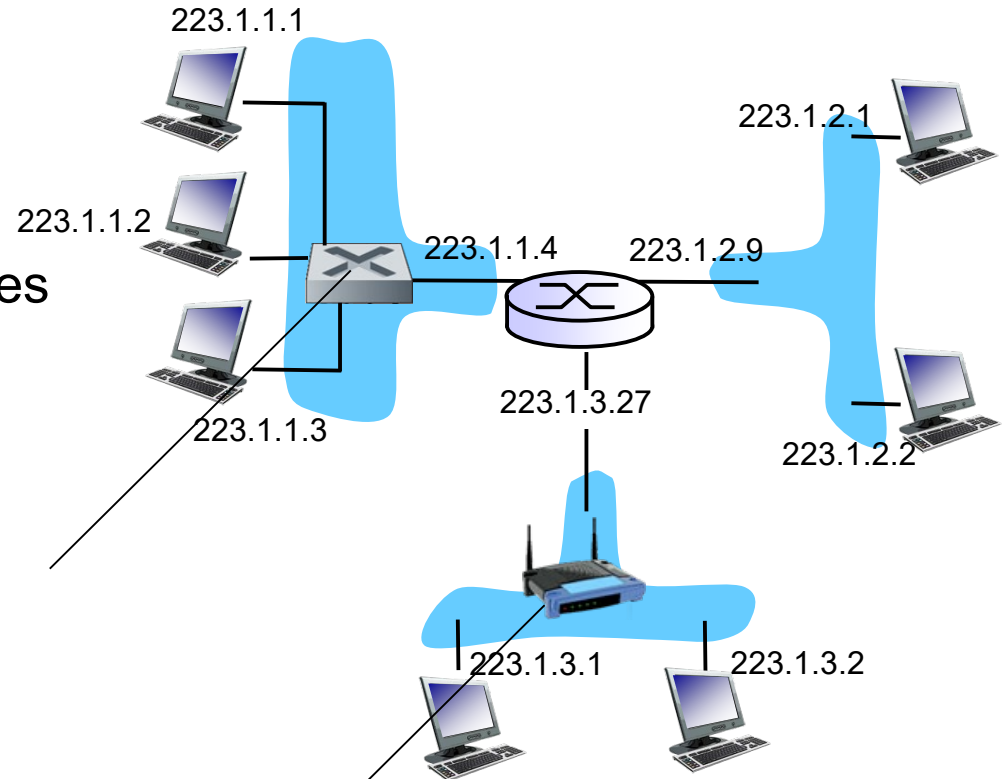


223.1.1.1 = $\underbrace{11011111}_{223} \underbrace{00000001}_1 \underbrace{00000001}_1 \underbrace{00000001}_1$

IP Addressing

Q: how are interfaces actually connected?

A: wired Ethernet interfaces connected by Ethernet switches



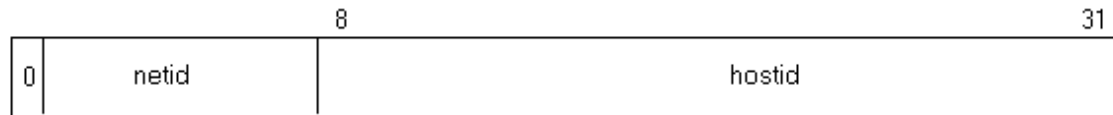
A: wireless WiFi interfaces connected by WiFi base station

IP Addressing

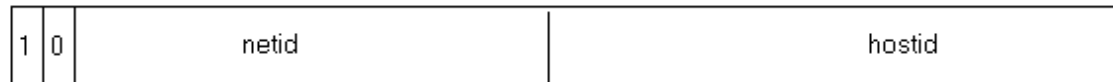
- IP Address is a combination of host and network/subnet addresses.
- **Subnet Mask:** A subnet mask is a 32-bit number that masks an IP address. It divides the IP address into network address and host address. Subnet Mask is made by setting network bits to all 1's and setting host bits to all 0's. When logical AND operation is performed between IP address and Subnet mask, it returns Network address.
- **Default Gateway:** A default gateway serves as an access point or IP router that a networked computer uses to send information to a computer in another network or the Internet. Basically, it is the IP address of the router interface for the connected network.
- **Broadcast Address:** The address used by applications and hosts to send information to all nodes on a network is called the broadcast address. When all bits in host address are set to "1" then it becomes Broadcast address for that particular network.

IP Addressing: Classful Addressing

Five forms of IP Addresses



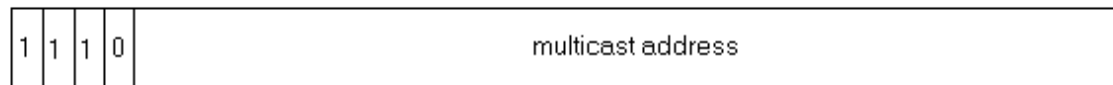
Class A



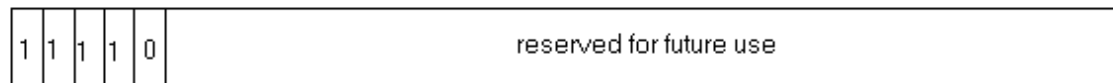
Class B



Class C



Class D



Class E

IP addressing: Classful Addressing

	Net ID	First Host	Last Host	Net ID (bytes)	Host ID (bytes)	Size of Net
Class A				1	3	Huge # of Host, Less # of NW
First Network	1.0.0.0	1.0.0.1	1.255.255.254			
Last Network	126.0.0.0	126.0.0.1	126.255.255.254			
Class B				2	2	# of Host = # of NW
First Network	128.1.0.0	128.1.0.1	128.1.255.254			
Last Network	191.254.0.0	191.254.0.1	191.254.255.254			
Class C				3	1	Huge # f NW, Less # of Hosts
First Network	192.0.1.0	192.0.1.1	192.0.1.254			
Last Network	223.255.254.0	223.255.254.1	223.255.254.254			

Class D: a multicast address. (224.0.0.0 - 240.0.0.0)

Class E: reserved for future use. (241.0.0.0 - 248.0.0.0)

Private IP Addresses

Several networks are reserved for private use and cannot be used on the Internet. They include:

Private IP Address Range
10.x.x.x
172.16.x.x through 172.31.x.x
192.168.x.x