

# Addressing Machines (Hosts)

- To receive messages, each machine (e.g., a web or a desktop/laptop) must an "address"
- host device has unique 32-bit IP(v4) address
- Exercise:
  - On Windows, use `ipconfig` from command prompt to get your IP address
  - On Mac, use `ifconfig` from command prompt to get your IP address
- Remembering IP addresses is a pain in the neck (for humans)
- Host (or domain) names
  - e.g., `mail.cs.umn.edu`, or `www.google.com`
  - DNS translates domain names to IP addresses
- Given the IP address, Network performs routing & forwarding to deliver msgs between (end) hosts

# IP Addresses

- Used to identify machines (network interfaces)
- Each IP address is 32-bit
  - IPv6 addresses are 128-bit
- Represented as x1.x2.x3.x4
  - Each xi corresponds to a byte
  - E.g.: 192.168.200.10
- Each IP packet contains a destination IP address

# Hostnames

- 206.207.85.33 67.99.176.30
- www.home.com www.funnymovies.com
- Machines are good at remembering numbers, while human beings are good at remember names.
- The name (e.g., [www.cs.umn.edu](http://www.cs.umn.edu)) consists of multiple parts:
  - First part is a machine name (or special identifier like www)
  - Each successive part is a domain name which contains the previous domain

# Domain Name Service (DNS)

- IP routing uses IP addresses
- Need a way to convert hostnames to IP addresses
- DNS is a distributed mapping service
  - Maintains "table" of name-to-address mapping
  - Used by most applications. E.g.: Web, email, etc.
- Advantages
  - Easier for programmers and users
  - Can change mapping if needed
  - more next week .....

# Internet Routing

- The Internet consists of a number of routers
- Each router forwards packets onto the next hop
- Goal is to move the packet closer to its destination
  - Each router has a table
  - Matches packet address to determine next hop

# Addressing Processes

- to receive messages, process must have *identifier*
- host device has unique 32-bit IPv4 address
- Exercise:
  - On Windows, use `ipconfig` from command prompt to get your IP address
  - On Mac, use `ifconfig` from command prompt to get your IP address
- Q: does IP address of host on which process runs suffice for identifying the process?
  - A: No, many processes can be running on same
- *Identifier* includes both **IP address** and **port numbers** associated with process on host.
- Example port numbers:
  - HTTP server: 80
  - Mail server: 25

# Identifying Remote Processes

- IP addresses and hostnames allow you to identify machines
- But what about processes on these machines?
- Can we use PIDs?

# Ports

- Identifiers for remote processes
- Each application communicates using a port
- Communication is addressed to a port on a machine
  - Delivers the packets to the process using the port
- Both TCP and UDP have their own port numbers
- Many applications use well-known port numbers
  - HTTP: 80, FTP: 21



## Summary: to communicate

- Sender shall include both **IP address** and **port numbers** associated with process on host.
- Example port numbers:
  - HTTP server: 80
  - Mail server: 25
- For example, to send HTTP message to gaia.cs.umass.edu web server:
  - IP address: 128.119.245.12
  - Port number: 80
- more shortly...