Network foundations

Stefan Petrov, EOC-Sofia
Audience – OLOm Interoute

interoute
from the ground to the cloud

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Basic terms

Network

- Set of technologies that connects computers
- Allows communication and collaboration between users

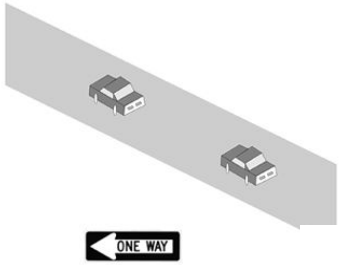
Communication

- Based on source and destination devices

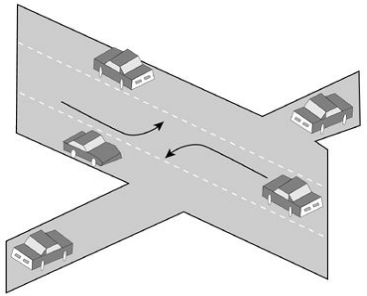
  1) Source - this originating point, or starting point, is called the sender, originator
  2) Destination - the second point, or arrival point, is called the receiver

- The generic term node or host refers to any device on a network

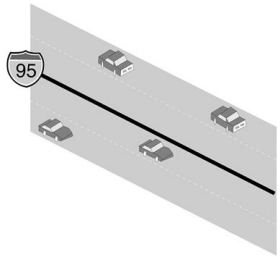
Data transmission modes



- Simplex
  - One-way-only transmission



- Half-duplex
  - Each device must take turn using the line
  - Limit the line performance



- Full-duplex
  - Both sides can send and receive at the same time

Data transmission modes

- Duplex mismatch
  - A condition where two connected devices operate in different duplex modes
  - Effect: the network that works but is often much slower than its nominal speed

- Errors on the half-duplex interface
  - Late collisions
  - Errors on input/output

CLI examples: CPE-SEAIR-IPAC-150153

Types of networks

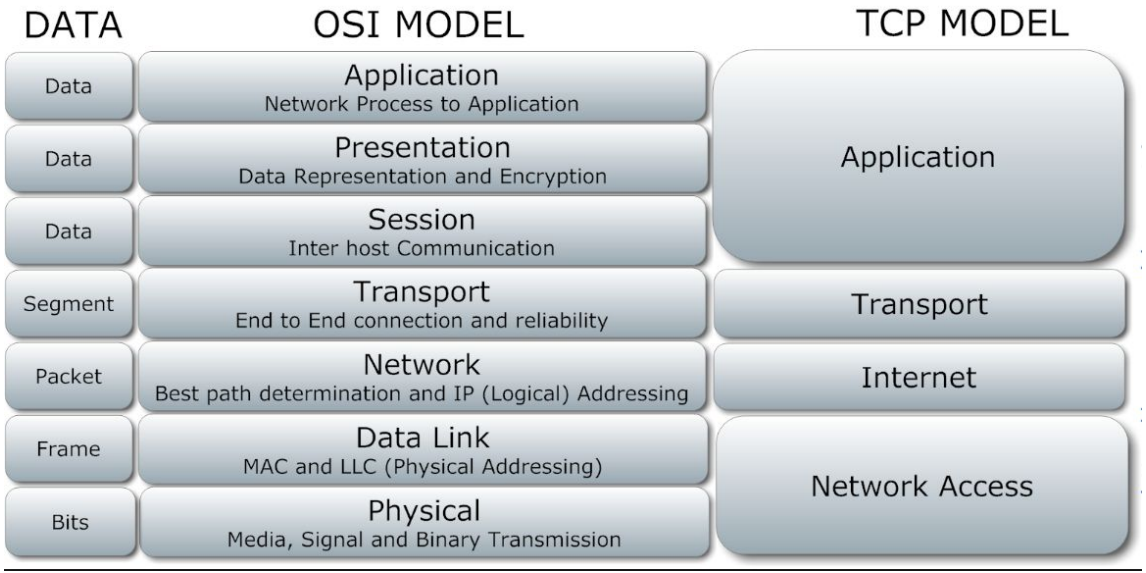
Three primary types of information networks are in use today

- Local-area networks (LANs) are found in small geographic areas, such as the floor of an office building.
- Metropolitan-area networks (MANs) are found in medium-sized geographic areas, such one or several city blocks.
- Wide-area networks (WANs) are found in large geographic areas, such as expanses that cross a state or country.

Network standards and models

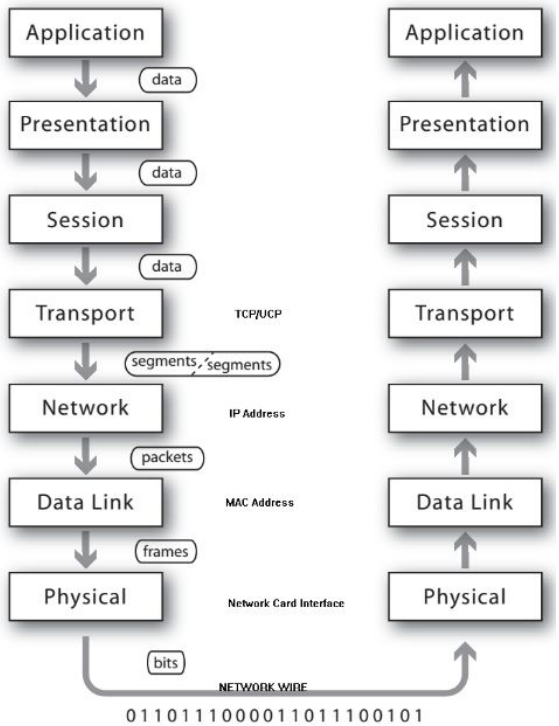
- Standards
  - In place to ensure that even the lowest level of communication on the media is possible, so that nodes, networking devices, and applications can all interoperate
  - Examples: IETF, IEEE
- Models
  - Provide the guiding principles for the development of these network standards and for the implementation of these networks
  - Examples: OSI, TCP/IP

OSI and TCP/IP Models



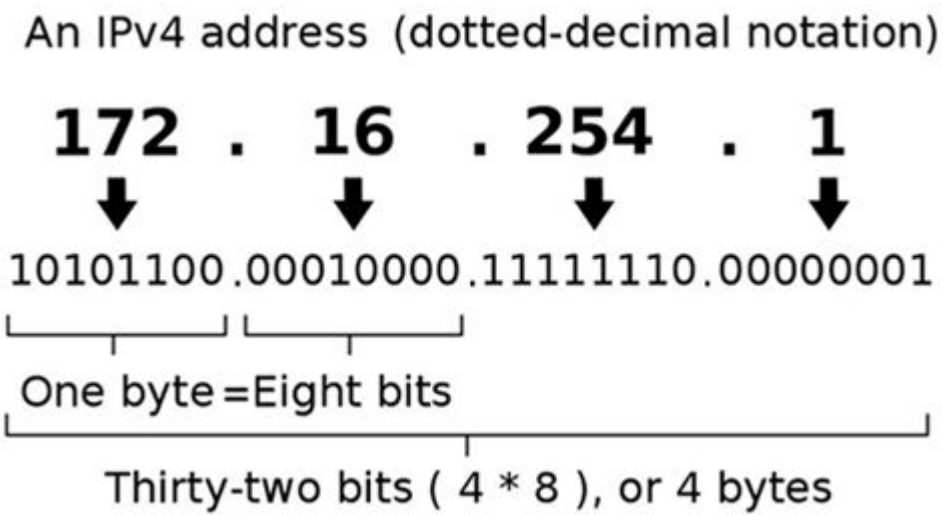
- The International Organization for Standardization (ISO) established the **Open Systems Interconnection (OSI) Reference Model**
- Each layer deals with a particular aspect of network communication

Moving through OSI Model



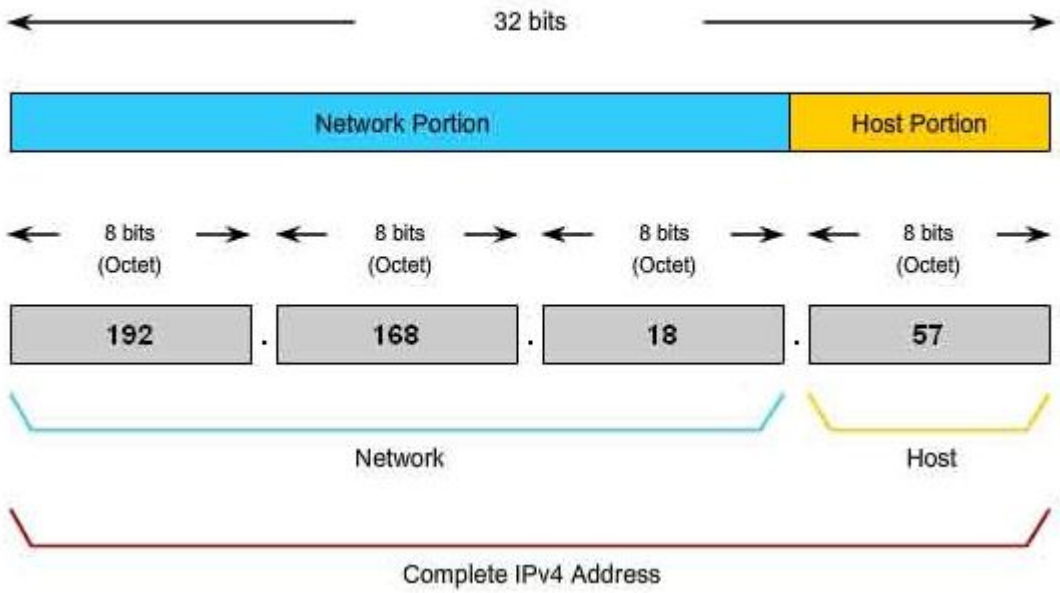
- The sending side encapsulates the data
- The receiving side dencapsulates the date
- The originating machine's protocol stack adds a header to the data received from the layer above it
- The receiving machine's protocol stack removes the headers, one layer at a time, as the data is passed up to its application

Basic internetwork addresses



- 32-bit address
- Four 8 bit numbers separated by dots
  - each 8 bit number – octet
- Machine friendly
- Not user friendly

Network address



- Internet routes only network addresses
- 24 bits of the IPv4 address are for the network portion
- Only the last octet is for hosts
- Ways of writing:
  192.168.18.0/24
  192.168.18.0 255.255.255.0

Ipv4 Classes table

Class	First Octet	Number of Networks	Number of Addresses per Network	Number of Hosts	Network Mask
A	1 – 126	$2^7 = 128$	$2^{24} = 16777216$	$2^{24} - 2 = 16777214$	255.0.0.0 (8 bits)
B	18 – 191	$2^{14} = 16384$	$2^{16} = 65536$	$2^{16} - 2 = 65534$	255.255.0.0 (16 bits)
C	192 – 223	$2^{21} = 2097152$	$2^8 = 256$	$2^8 - 2 = 254$	255.255.255.0 (24 bits)

Class A: 102.168.212.226 /8

Network ID: 102

Host ID: 168.212.226

Class B: 172. 16.54.0 /16

Network ID: 172.16

Host ID: 54.0

Class C: 182.168.0.54 /24

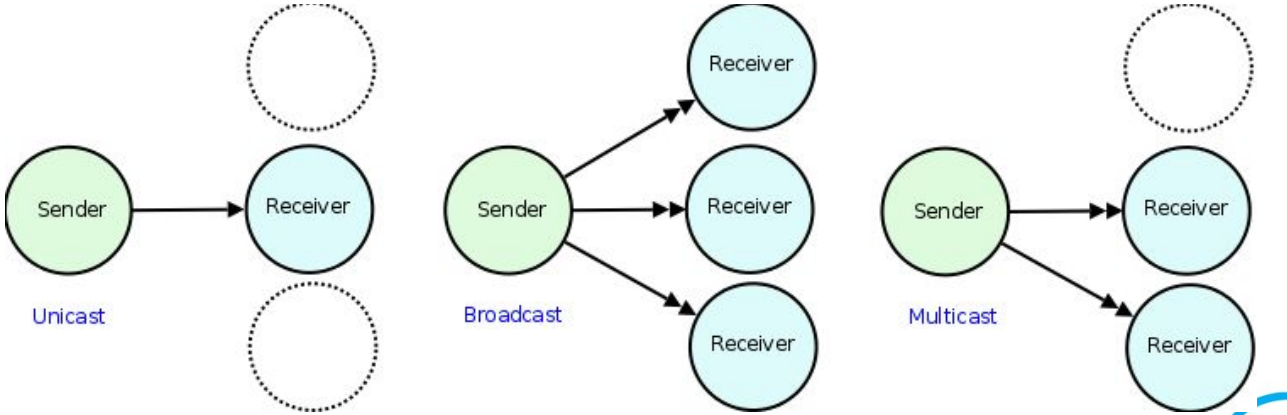
Network ID: 192.168.0

Network ID: 54

Subnetting – a way to split the classes to subnets, example: 102.168.212.224/30

Types of communication

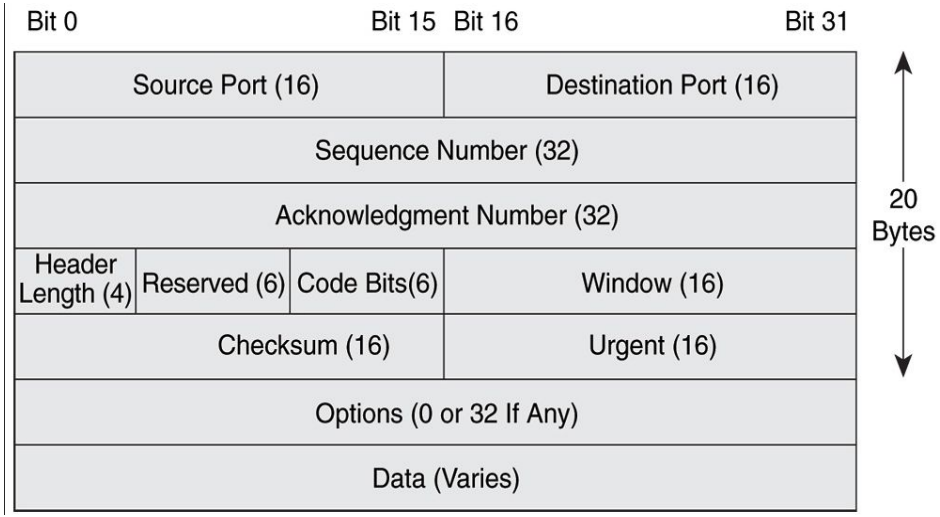
- **Unicast** - data is sent from one computer to another computer
- **Multicast** - IP multicast traffic are sent to a group and only members of that group receive and/or process the Multicast traffic.
- **Broadcast** - data is sent from one computer to all of IP the devices in the subnet



Layer 4 protocols

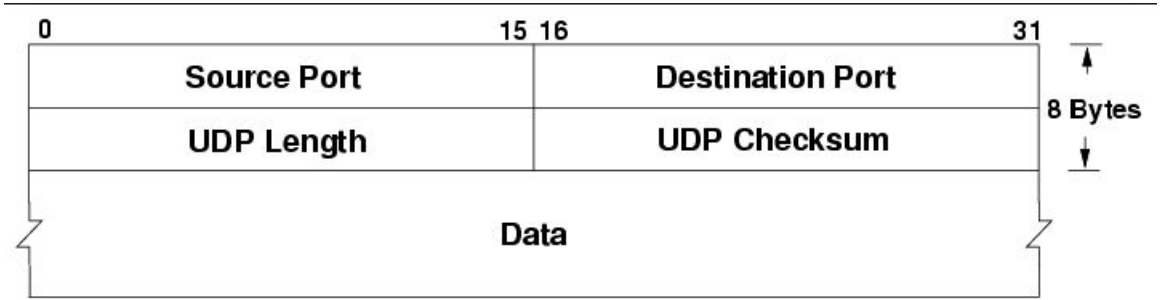
- TCP

Reliable – connection oriented protocol
Ordered – based on sequence numbers
Heavyweight
Examples: www, e-mail, ftp, ssh



Layer 4 protocols

- UDP
  - Not Reliable – connectionless protocol
  - *No ordered transfer*
  - Lightweight
  - *Examples: voice, IPTV, DNS, TFTP*



Time for questions