

CECS 327 Intro to Networking and Distributed Computing

Seminar Notes

August 29, 2018

Goal of Networking:

- Enable communication between network applications on different end points

Endpoint = computers, cell phones, ...

Application = web, peer to peer, streaming video

Communication = transfer bits

- Network must understand application needs/demands

- What data rate?
- Traffic pattern? (bursty or constant bit rate)
- Traffic target? (multipoint or single destination)
- Application sensitivity? (to delay, “jitter”, loss)
- Difficulty

- How does application “use” networking?

- client-server: web....
- peer to peer: Skype....

Defining a “Network”

- Network = nodes + links

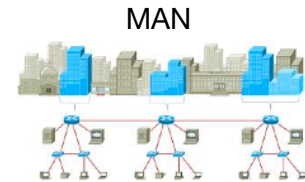
- Different networks:

- The Internet
- UWT network
- Telephone network
- Home Wireless Networks
- Others - sensor nets, cellular networks



- WAN (Wide Area Network)
 - All network talking to each other
- MAN (Metropolitan Area Network)
 - Like LAN but a bigger network

IE: LAN = home & WAN = School



“The Internet”

- Internet vs internet
- The interconnected set of networks of the Internet Service Providers (ISPs) and end-networks, providing data communications services
 - IE: www.csulb.edu —> .edu will provide ISPs which server to look for
 - About 17k different ISP networks make up the internet
 - ISP contact each other to find if that webaddr is cached
 - if not then it goes to DNS

Requirements

- Application Programmer

Connectivity

Terminologies

- Scale
- Link
- Nodes
- Point-to-Point (type of connection where 2 nodes talk to each other)
- Multiple Access (nodes have access to shared resources)
- Switched Network
 1. Circuit Switched
 - Circuit needs to be open until call ends
 - Second call can't be made until circuit is free

Types of Computer Networks



- while you are talking, package is send
- Even if you are not talking, you send empty pack.

2. Packet Switched

- Doesn't care about one on one circuit, as circuit is shared
- If package needs to be send, then it is send on same circuit
- Thus no one is waiting on circuit to open
- Big Different: send pieces of packages, not one whole
- Packet, Message
- Store-and-Forward
- Cloud
- Hosts
- Switches
- Internetwork
- Router/Gateway
- Host-to-host connectivity
- Address
- Routing
- Unicast/Broadcast/Multicast

September 03, 2018

Labor Day

September 05, 2018

Missed

September 10, 2018

What is Layering?

- A way to deal with complexity
 - Add multiple levels of abstraction

IE: Organization of Air Travel

- | | |
|---------------------|---------------------|
| * Ticket (Purchase) | * Ticket (Complain) |
| * Baggage (Check) | * Baggage (Claim) |
| * Gates (Load) | * Gates (Unload) |
| * Runway Takeoff | * Runway Landing |
| * Airplane Routing | * Airplane Routing |

Airplane Routing

- Series of Steps

Layers: each layer implement a service

IE: Network Layering

Application Programs	
Request/Replay Channel	Message Stream Channel
Host-to-Host Connectivity	
Hardware	

Features of Layering

- Sub-Divided the problem
 - Each layer relies on services from layer below
 - Each layer exports services to layer above

- Advantages of layering?
 - Simplifies design and implementation
 - Easy to modify/evolve

Protocol

- Standardized method for transmitting data and/or establishing communications between different devices
- protocols are the key to interoperability
 - Networks are very heterogeneous

Hardware/Link	Ethernet: 3com, Dlink
Network	Routers: Cisco, Juniper etc.
Application	APP: Email, IM, IE, etc.

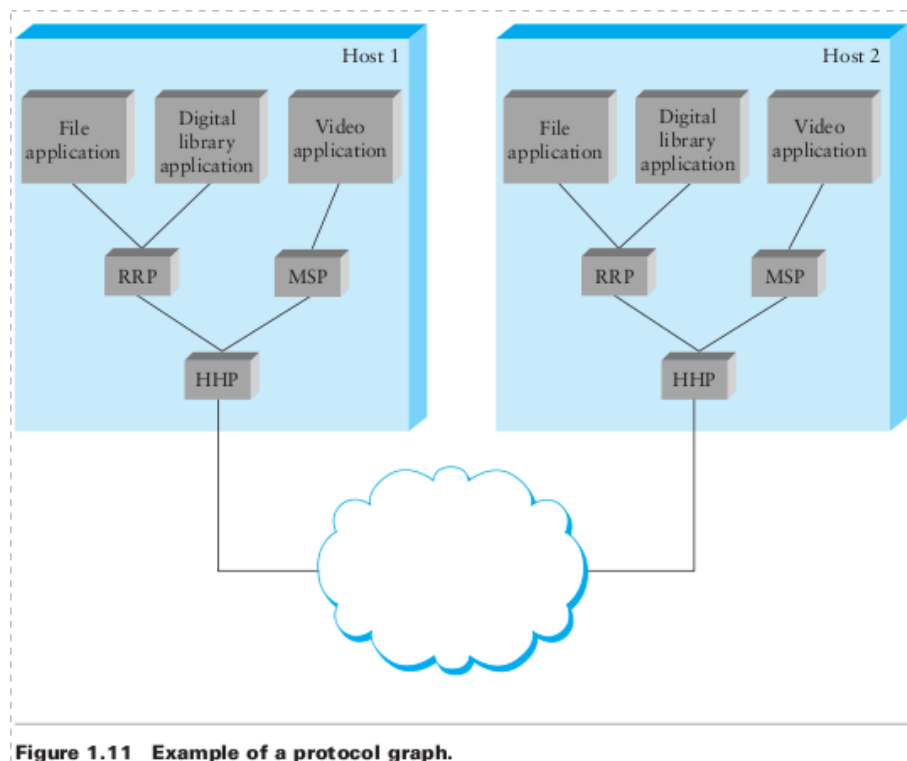
- Must speak the same language
- All hardware/software must communicate with each other with same specification
 - even if they are from different vendor

Protocol Layering

- Protocols exist at many levels
 - Application level protocols
 - Protocols at the hardware level
- Each protocol provides different service to higher layers and relied on services from lower layers
- Protocols build upon each other
 - adds value, improves functionality overall
 - IE: a reliable protocol running on top of IP
 - Reuse, Avoid Re-writing
 - IE: OS provides TCP, so application don't have to rewrite

Protocols Interfaces

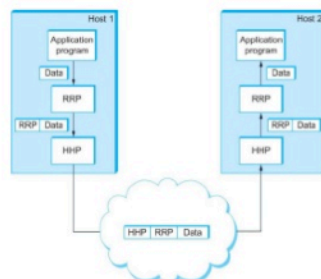
- Each protocol offers interfaces to communicate with each other
 - Service Interface:
 - Defines operations on this protocol
 - Peer-to-Peer Interface:
 - Defines messages exchanged with peer



Encapsulation

- High-Level messages are encapsulated inside of Low-Level messages

Encapsulation



OSI (Open Systems Interconnection) Architecture: 7-layers

Description of Layers (1)

- Physical Layer
 - Handles the transmission of raw bits over communication link
- Data Link Layer
 - Collects bits of data into larger “Frame”
 - Network adaptor implement the protocol in this layer
 - Frames are actually delivered to hosts
- Network Layer
 - Handles routing among nodes within a pack-switched network
 - “Packet” are exchanged here

Frame vs Packet:

- Frames are used in switch and hub while packet is used in router
- Switches and Hubs use MAC address to send Frame
- Routers use IP address to send Packet

Description of Layers (2)

- Transport Layer
 - Implements a process-to-process channel
 - Unit of data exchanges in this layer is called a “Message”
- Session Layer
 - Mechanism of Opening, Closing, and Managing communication between hosts
- Presentation Layer
 - Concerned about the format of data exchanged between peers
- Application Layer

- Ensure applications communication with other apps.

September 12, 2018

More about OSI Model

Why 7 Layers?

- Many Fundamental issues can be addressed at multiple layers
 - Flow Control
 - Reliability
 - Addressing

Not Widespread Acceptance? Why?

TCP/IP Model

Application protocols

Two Transport protocols: provide logical channels to applications

OSI vs TCP/IP

7 layers for OSI

TCP/IP =

- Application
- TCP/UDP
- IP
- Network

Switch is faster because it doesn't slow anyone else down

Encapsulation:

Know:

Message vs segment vs datagram vs frame

Multiplexing and Demultiplexing

- Packet header includes a demultiplexing field

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