CECS 327 Intro to Networking and Distributed Computing

Seminar Notes

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 patter? (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….
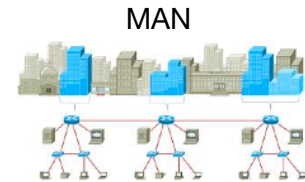
    - peer to peer: Skype….

Defining a "Network"

- Network = nodes + links

- Different networks:

    - The Internet

    - UWT network

    - Telephone network

    - Home Wireless Networks

    - Others - sensor nets, cellular networks

LAN

- WAN (Wide Area Network)

- • All network talking to each other

- MAN (Metropolitian Area Network)

- • Like LAN but a bigger network

MAN

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

Types of Computer Networks

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

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- 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

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Missed

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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

Aplication 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

Figure 1.11 Example of a protocol graph.
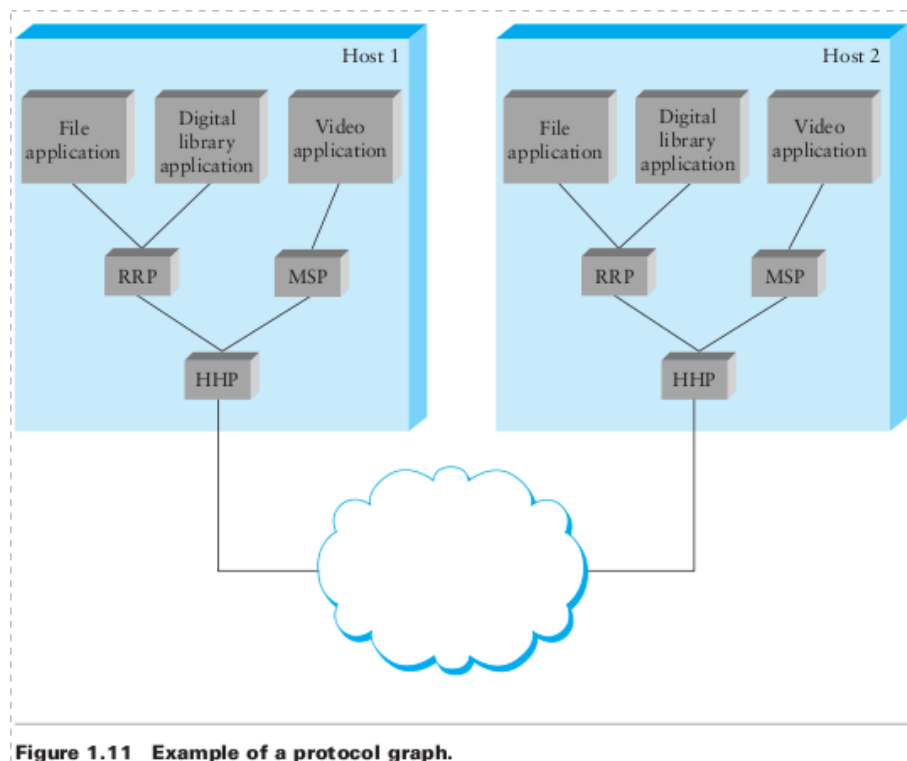
Encapsulation

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

Encapsulation

High-level messages are encapsulated
inside of low-level messages

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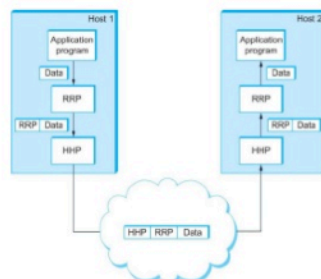
OSI (Open Systems Interconnection) Architecture: 7-layers

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.