Sekapur Sirih

Jaringan Komputer

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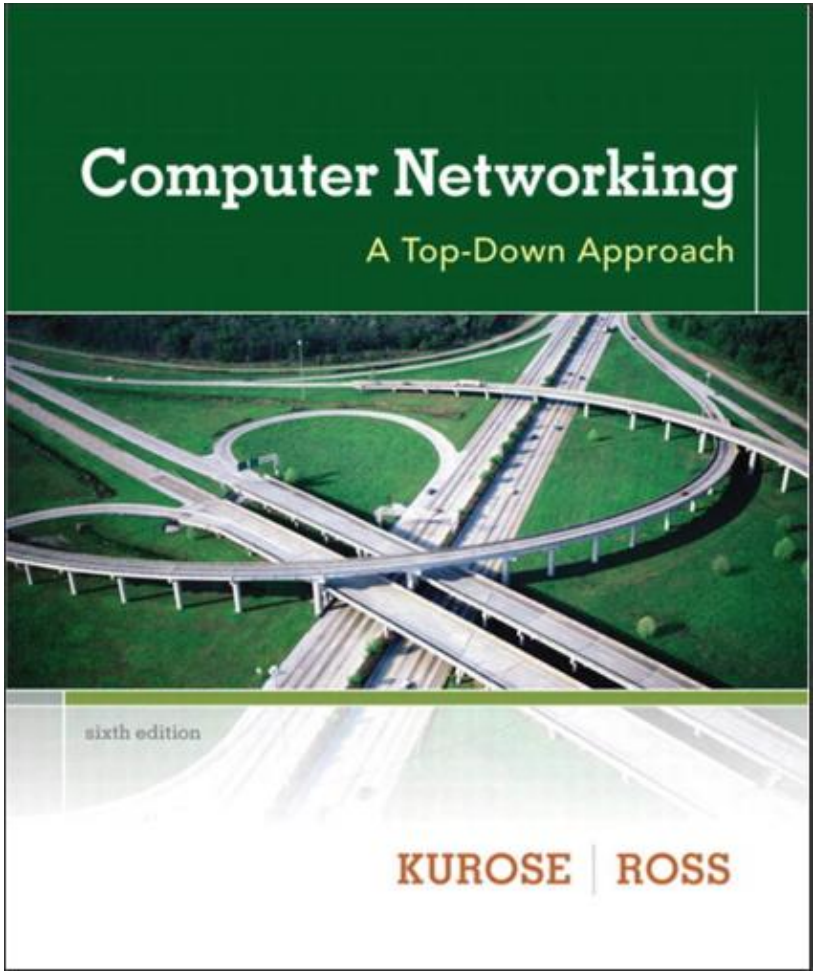
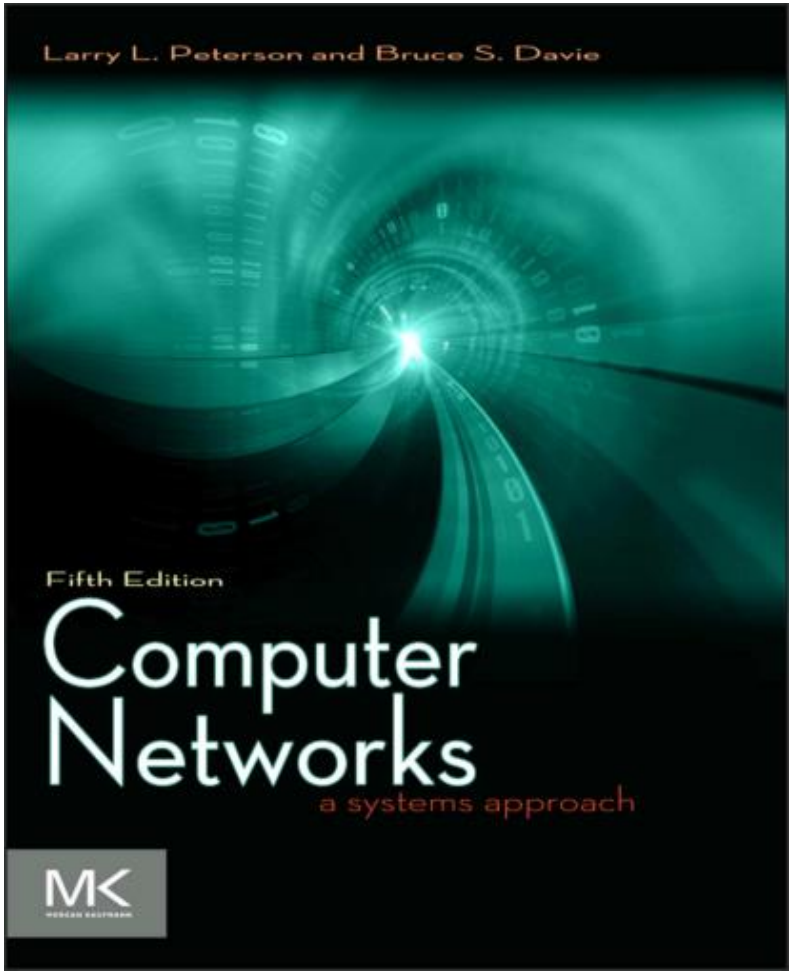
References


Computer Networking
A Top-Down Approach
sixth edition
KUROSE | ROSS


Larry L. Peterson and Bruce S. Davie
Fifth Edition
Computer Networks
a systems approach
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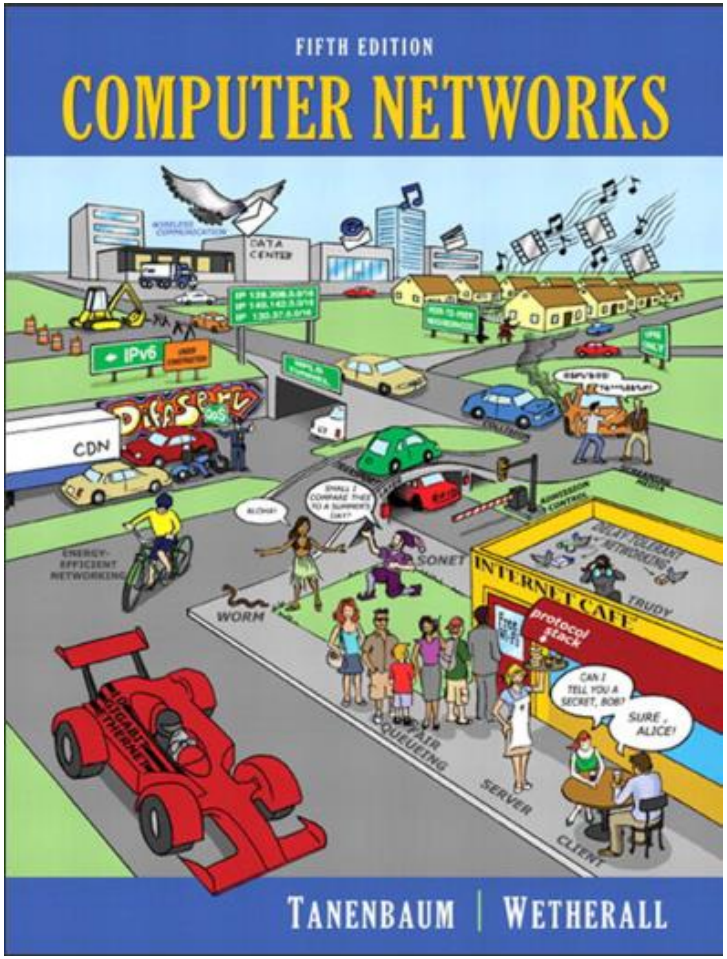

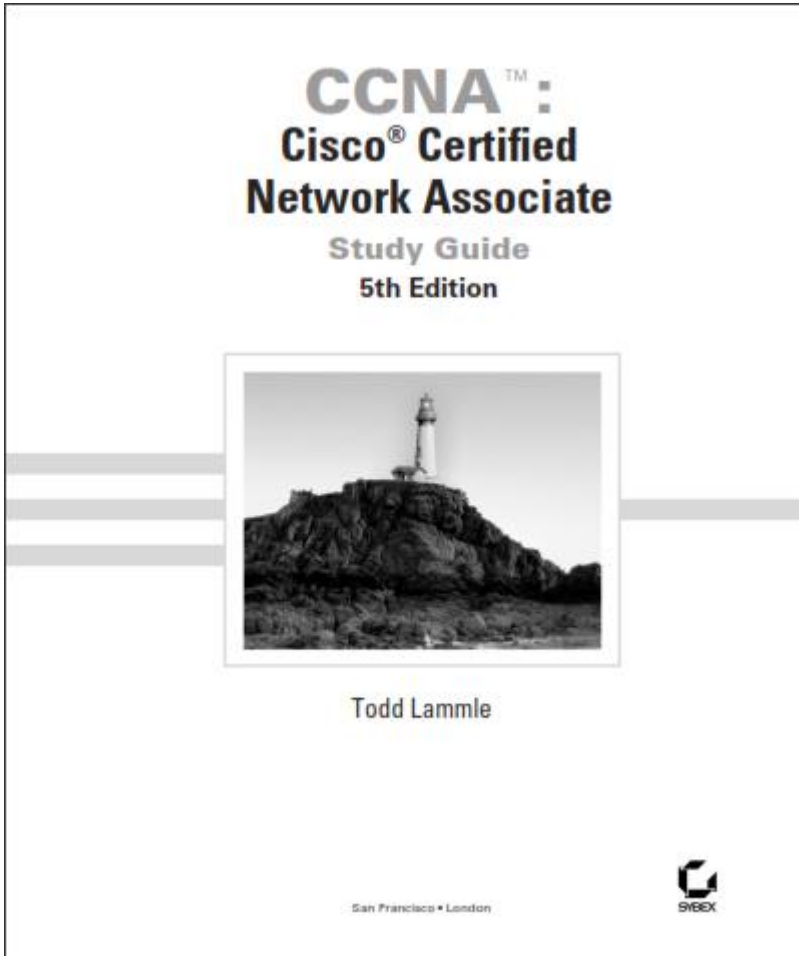

References Details

Chapter 1 : Comp.Net & The Internet
Chapter 2 : Application Layer
Chapter 3 : Transport Layer
Chapter 4 : Network Layer

Chapter 5 : Link Layer and LANs
Chapter 6 : Wireless and Mobile Net.
Chapter 7 : Multimedia Networking
Chapter 8 : Security in Comp.Net
Chapter 9 : Network Management

Rules

- Use 2012’ s Curiculum

- Scoring

Pre, Post, & Task (SCL)	: 15%
Attitute (SCL)	: 10%
Mid Test	: 35%
Final Test	: 40%

- Penalty

Plagiarism	→ E
Attendance	→ >= 75% (Roster)

CHAPTER 1
FOUNDATION

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Agenda

Chapter 1. Comp.Net & The Internet

1.1 Application
1.2 Requirements
1.3 Net. Architecture

1.4 Internet
1.5 Implementing Net Soft.
1.6 Performance

Application

- Most people know about the Internet (a computer network) through applications
  a) World Wide Web
  b) Email
  c) Online Social Network
  d) Streaming Audio Video
  e) File Sharing
  f) Instant Messaging
  g) …

Application

- URL
  - Uniform resource locater
  - http://www.cs.princeton.edu/~llp/index.html
- HTTP
  - Hyper Text Transfer Protocol
- TCP
  - Transmission Control Protocol
- 17 messages for one URL request
  - 6 to find the IP (Internet Protocol) address
  - 3 for connection establishment of TCP
  - 4 for HTTP request and acknowledgement
    - Request: I got your request and I will send the data
    - Reply: Here is the data you requested; I got the data
  - 4 messages for tearing down TCP connection

Agenda

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Requirement : Perspectives

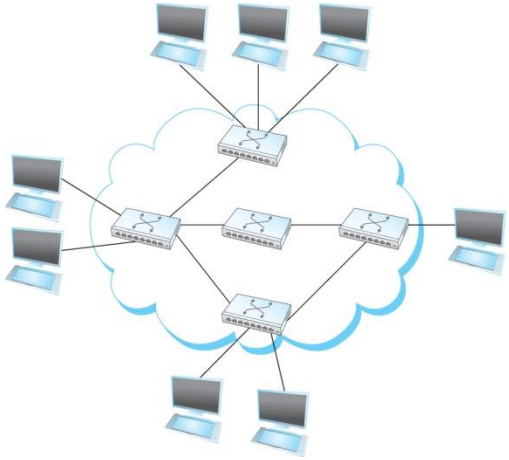
- Application Programmer
  - List the services that his application needs: delay bounded delivery of data
- Network Designer
  - Design a cost-effective network with sharable resources
- Network Provider
  - List the characteristics of a system that is easy to manage

Requirement : Connectivity

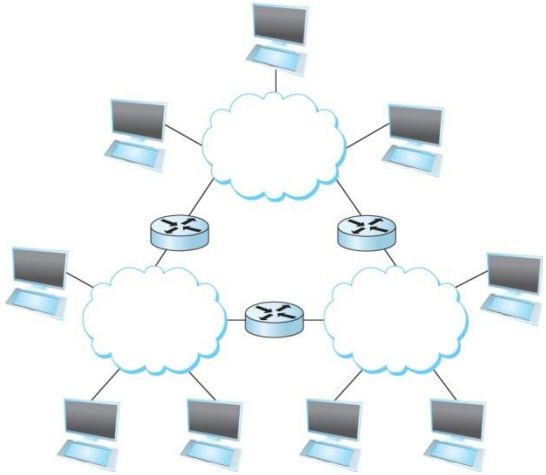
- Need to understand the following terminologies
  a) Scale
  b) Link
  c) Nodes
     - ✓ Point-to-point
     - ✓ Multiple access
  d) Switched Network
     - ✓ Circuit Switched
     - ✓ Packet Switched
  e) Store-and-forward

Requirement : Connectivity

(a)



(b)



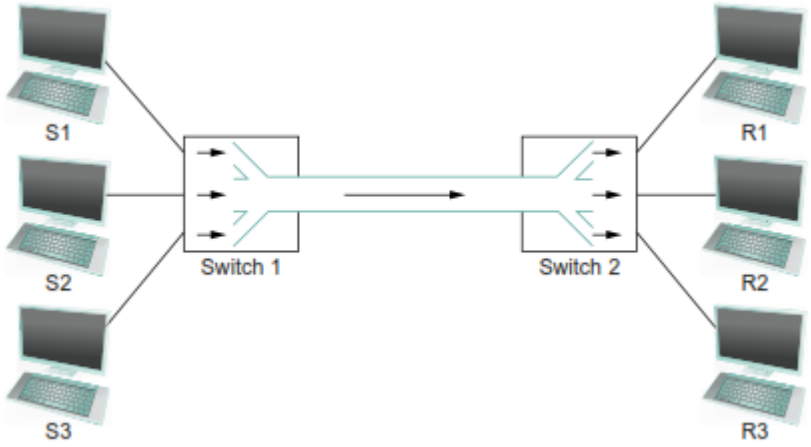
(a) A switched network

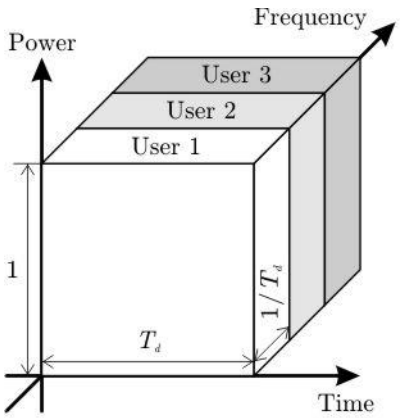
(b) Interconnection of networks

Terminologies (contd.)

- Cloud
- Hosts
- Switches
- internetwork
- Router/gateway
- Host-to-host connectivity
- Address
- Routing
- Unicast/broadcast/multicast

Requirement : Resource Sharing





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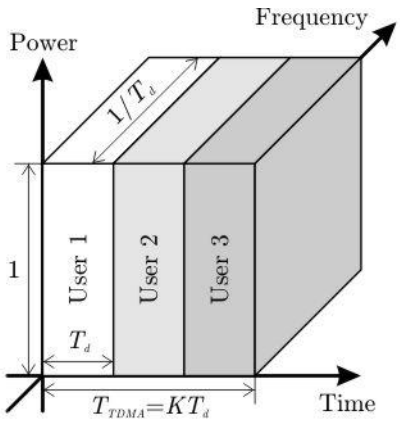
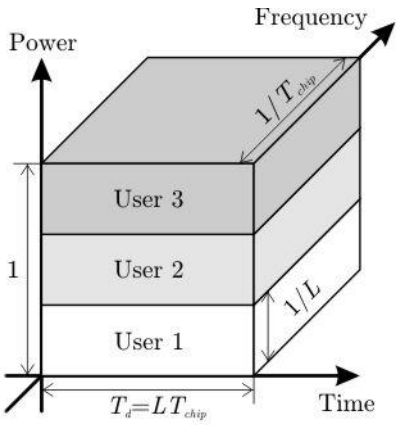


TDMA



CDMA

Agenda

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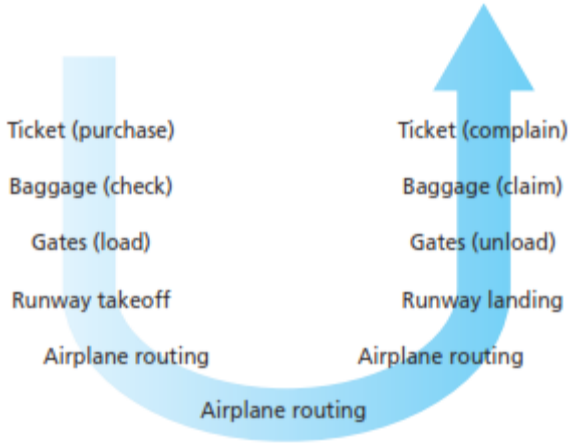
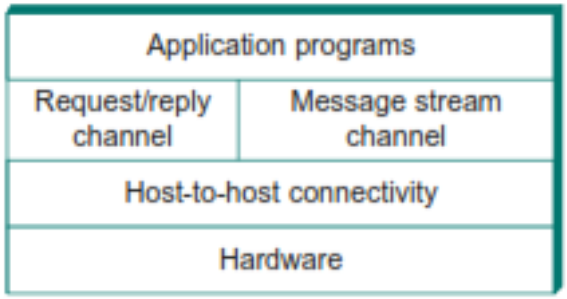
Network Architecture

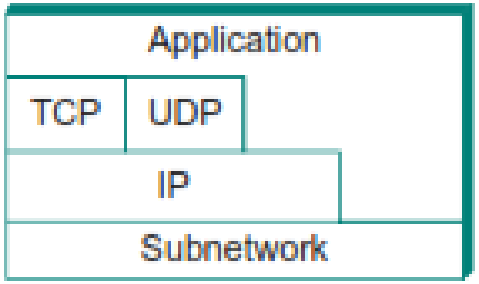
- a computer network must provide general, cost-effective, fair, and robust connectivity among a large number of computers.
- network designers have developed general blueprints—usually called *network architectures*—*that guide the* design and implementation of networks

Network Architecture

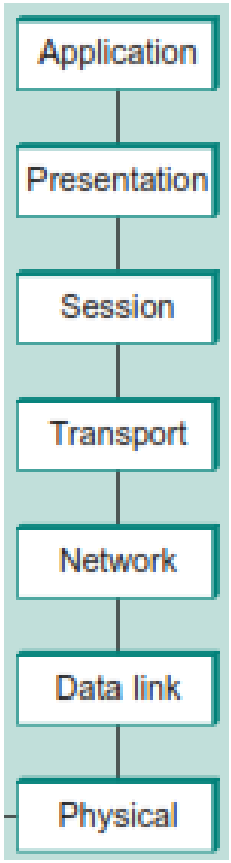




Analogy



TCP/IP

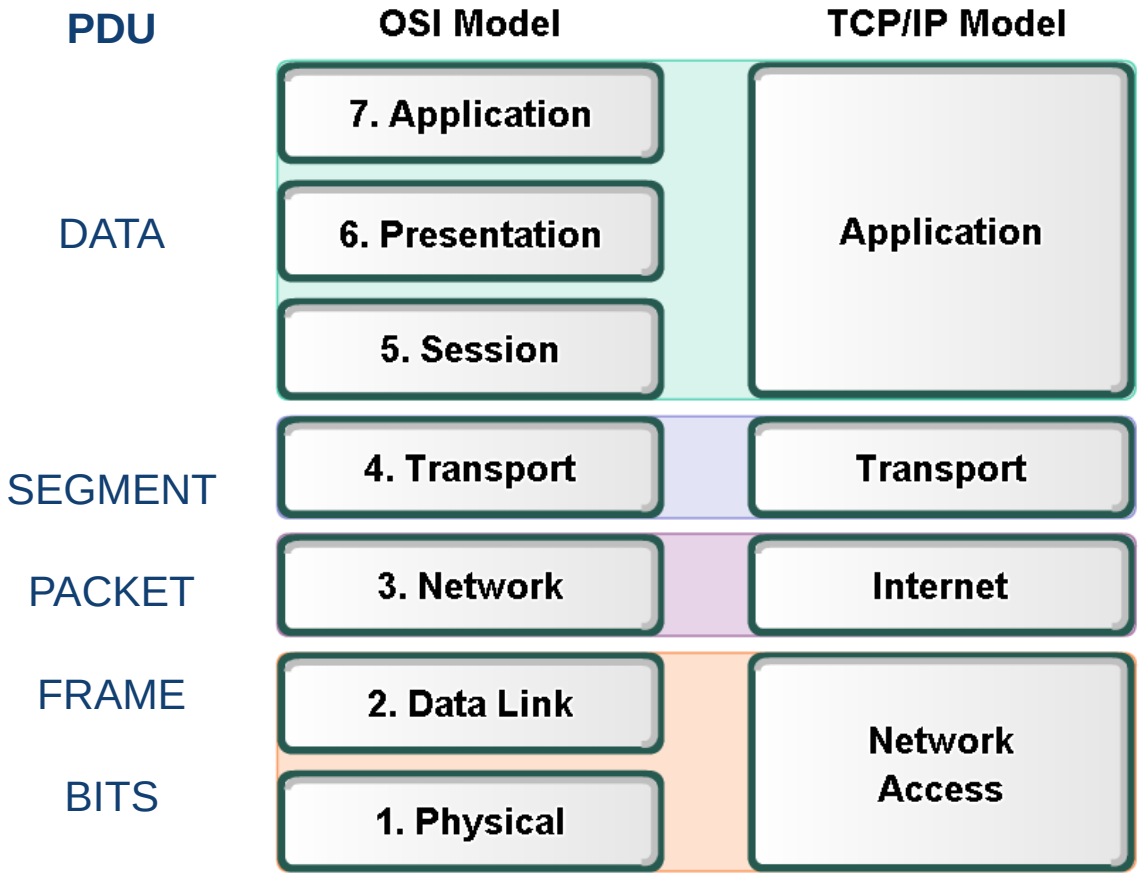


OSI

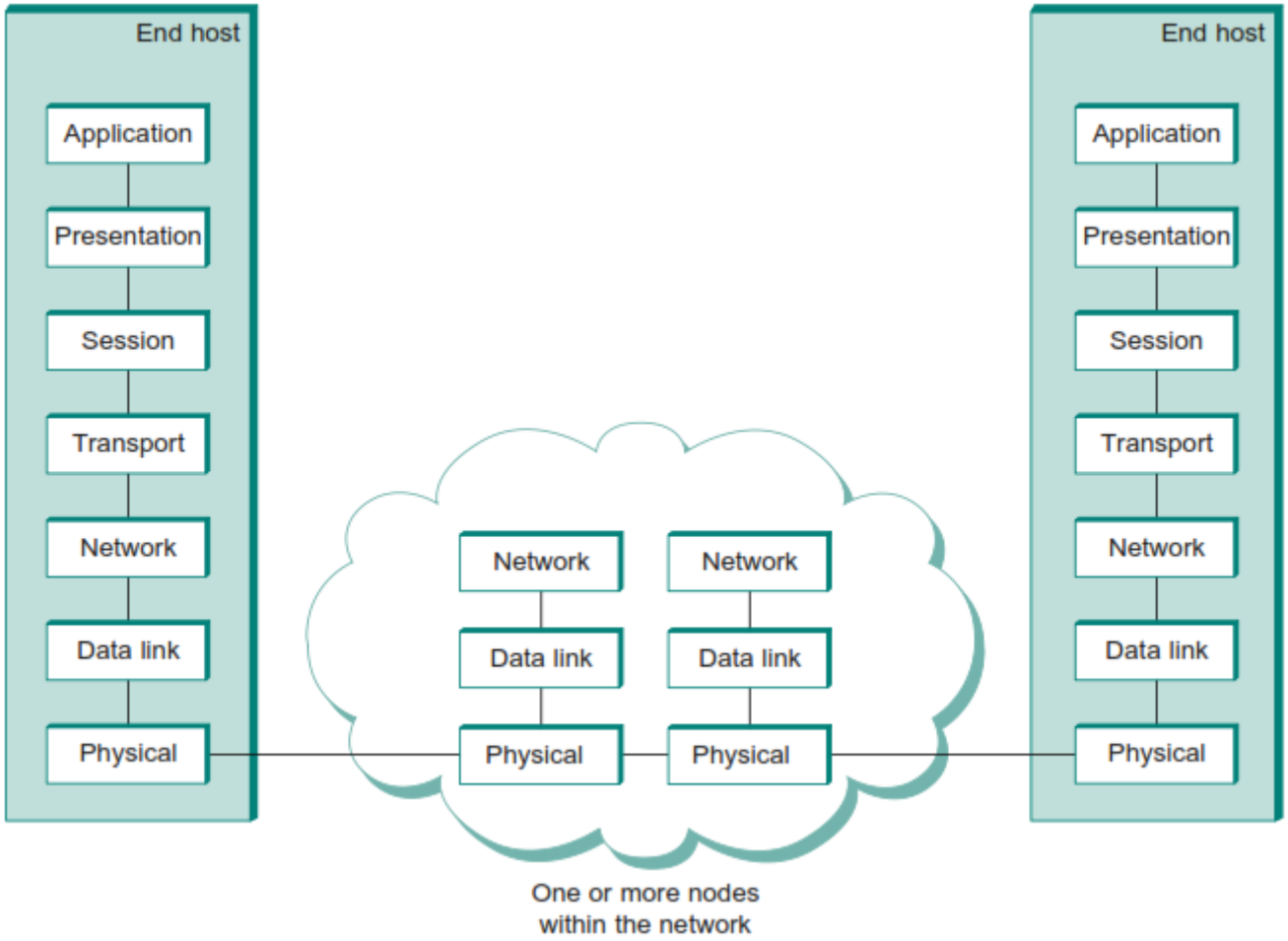
Protocols

- Protocol defines the interfaces between the layers in the same system and with the layers of peer system
- Building blocks of a network architecture
- Each protocol object has two different interfaces
  - service interface: operations on this protocol
  - peer-to-peer interface: messages exchanged with peer

Protocol Data Unit



Encapsulation, Mux, & DeMux



Agenda

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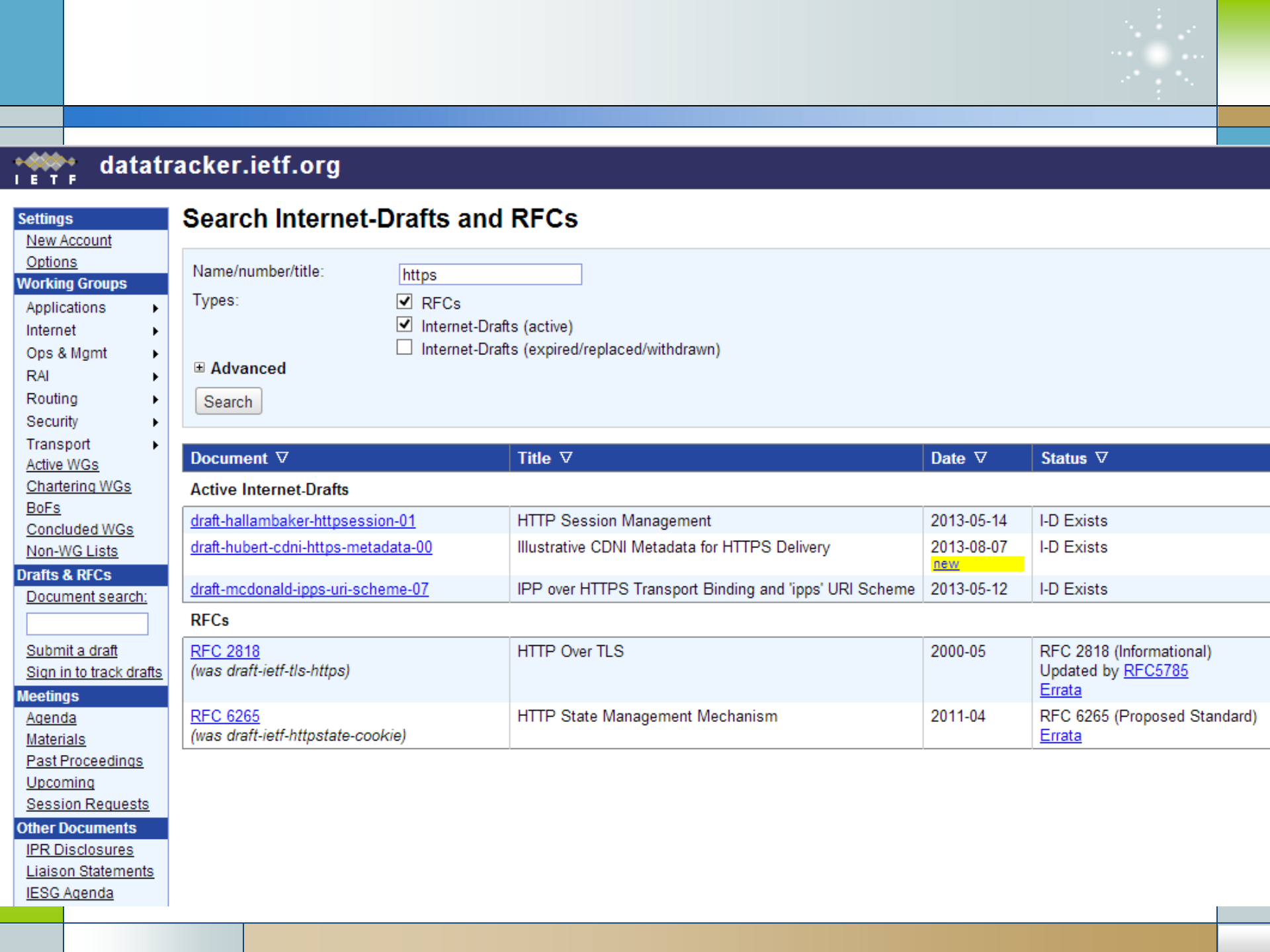
1.1 What is the Internet?

- Internet: "network of networks"
  - loosely hierarchical
  - public Internet versus private intranet
- Internet standards
  - RFC: Request for comments
  - IETF: Internet Engineering Task Force
  - IANA : Internet Assigned Numbers Authority

http://www.ietf.org/rfc.html


datatracker.ietf.org
Settings
New Account
Options
Working Groups
Applications
Internet
Ops & Mgmt
RAI
Routing
Security
Transport
Active WGs
Chartering WGs
BoFs
Concluded WGs
Non-WG Lists
Drafts & RFCs
Document search:
Submit a draft
Sign in to track drafts
Meetings
Agenda
Materials
Past Proceedings
Upcoming
Session Requests
Other Documents
IPR Disclosures
Liaison Statements
IESG Agenda
Search Internet-Drafts and RFCs
Name/number/title:
https
Types:
RFCs
Internet-Drafts (active)
Internet-Drafts (expired/replaced/withdrawn)
Advanced
Search
Document
Title
Date
Status
Active Internet-Drafts
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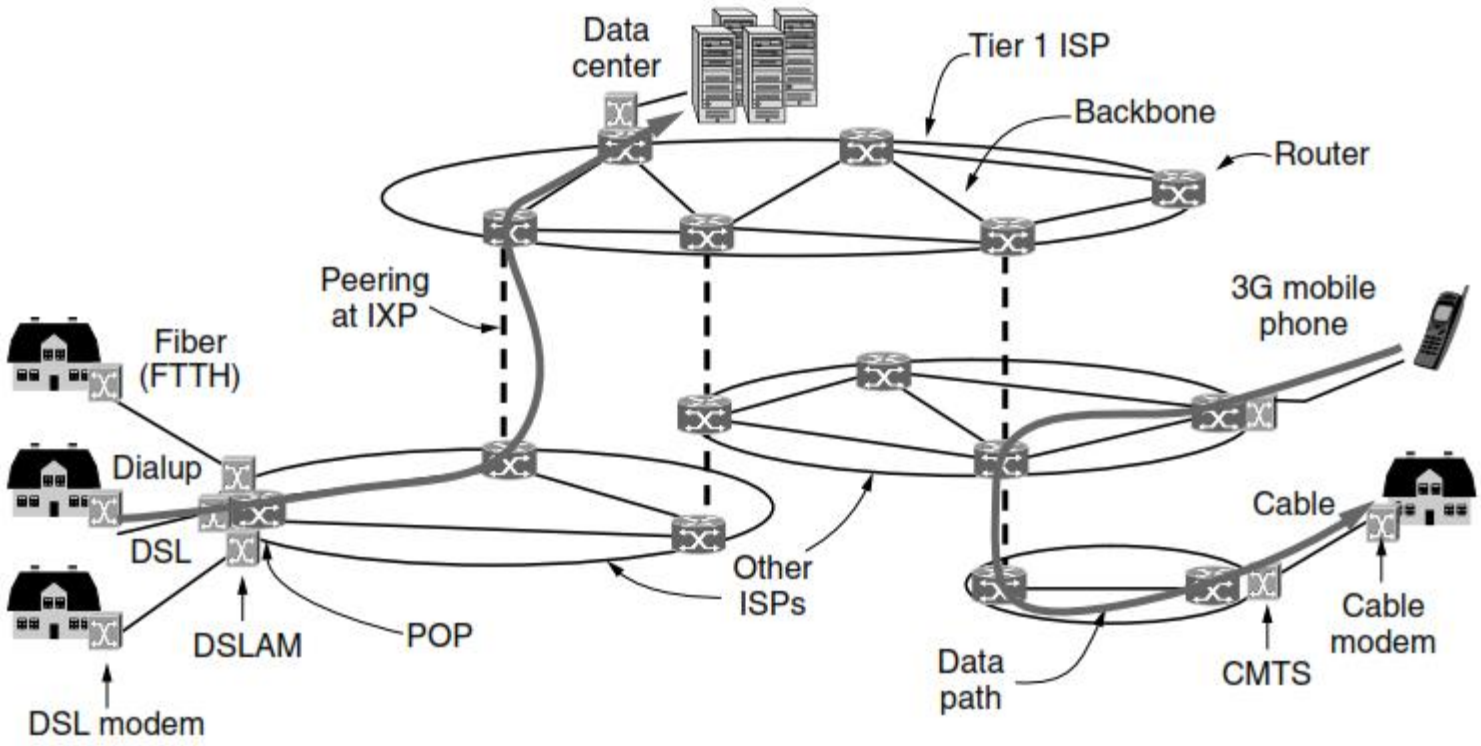
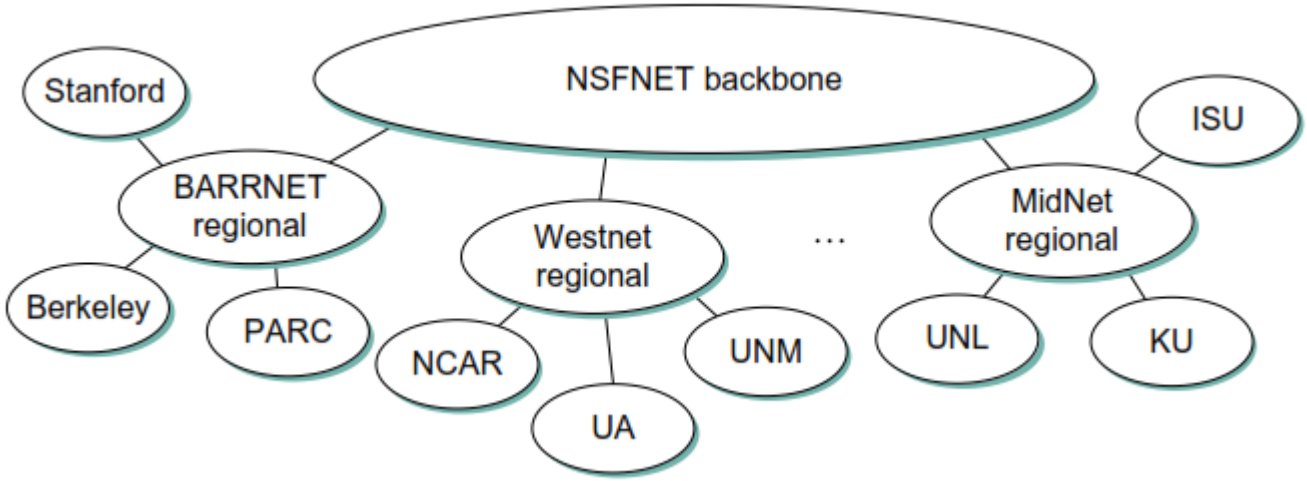
HTTP Session Management
2013-05-14
I-D Exists
draft-hubert-cdni-https-metadata-00
Illustrative CDNI Metadata for HTTPS Delivery
2013-08-07
new
I-D Exists
draft-mcdonald-ipps-uri-scheme-07
IPP over HTTPS Transport Binding and 'ipps' URI Scheme
2013-05-12
I-D Exists
RFCs
RFC 2818
(was draft-ietf-tls-https)
HTTP Over TLS
2000-05
RFC 2818 (Informational)
Updated by RFC5785
Errata
RFC 6265
(was draft-ietf-httpstate-cookie)
HTTP State Management Mechanism
2011-04
RFC 6265 (Proposed Standard)
Errata

Internet [Tanenbaum 2011]



The Internet is not really a network at all, but a ***vast collection of different networks*** that use certain common protocols and provide certain common services.

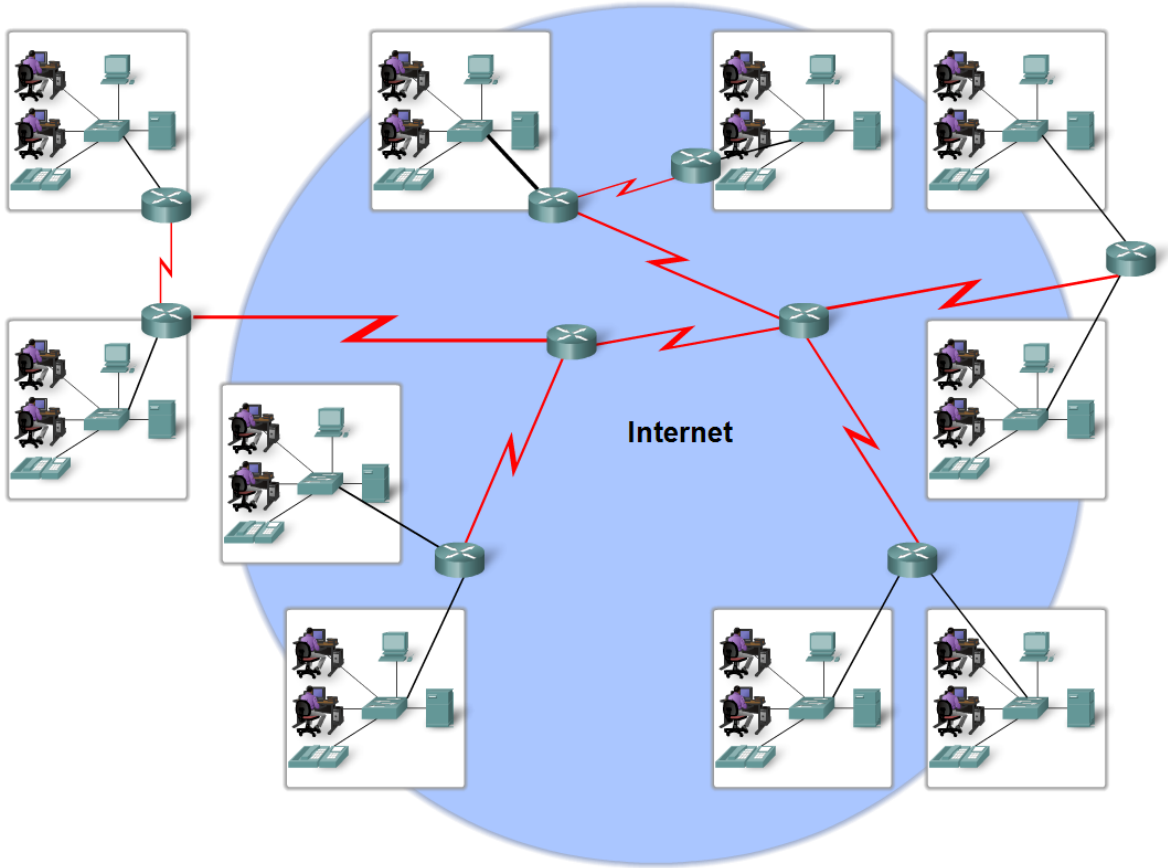
Internet [Perterson 2012]



Internet in 1990's

... how to connect a heterogeneous collection of networks to create an internetwork and how to use the ***simple hierarchy of the IP address*** to make routing in an internet somewhat scalable.

Internet [Lammle 2005]



The internet is defined as a ***global mesh of interconnected networks*** ...

Agenda

Chapter 1. Comp.Net & The Internet

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API

- Interface exported by the network
- Since most network protocols are implemented (those in the high protocol stack) in software and nearly all computer systems implement their network protocols as part of the operating system, when we refer to the interface "*exported by the network*", we are generally referring to the interface that the OS provides to its networking subsystem
- The interface is called the network Application Programming Interface (API)

API (sockets)

- Socket Interface was originally provided by the Berkeley distribution of Unix
  - Now supported in virtually all operating systems
- Each protocol provides a certain set of *services*, and the API provides a syntax by which those services can be invoked in this particular OS.

Socket

- What is a socket?
  - The point where a local application process attaches to the network
  - An interface between an application and the network
  - An application creates the socket
- The interface defines operations for
  - Creating a socket
  - Attaching a socket to the network
  - Sending and receiving messages through the socket
  - Closing the socket

Agenda

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Bandwidth

- Bandwidth
  - Width of the frequency band
  - Number of bits per second that can be transmitted over a communication link
- Example :

  1 Mbps: 1 x 10^6 bits/second

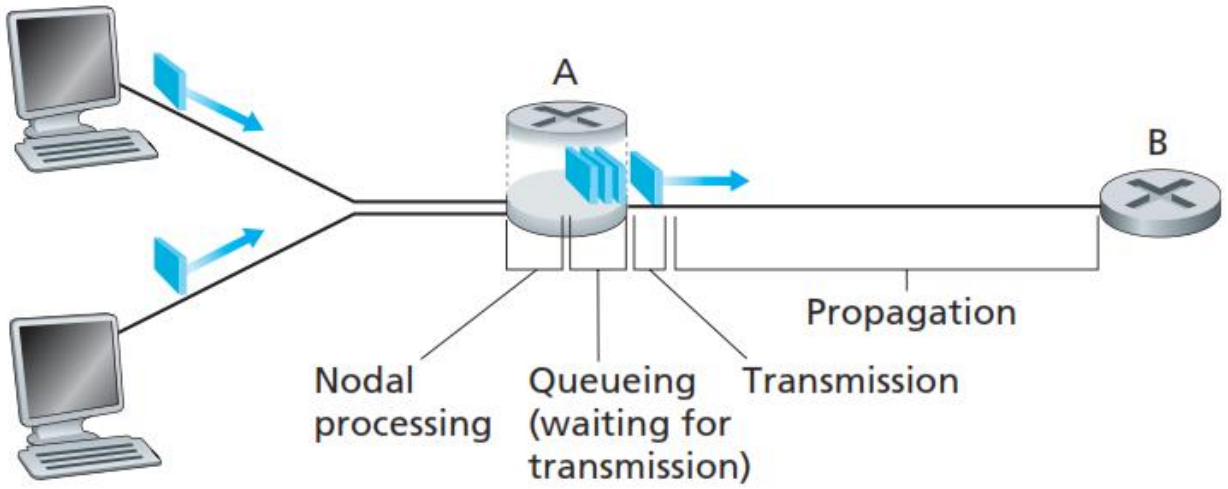
  meaning that it is able to deliver 10 million bits every second

- Bandwidth and throughput are two of the most confusing terms used in networking. What is The Difference?

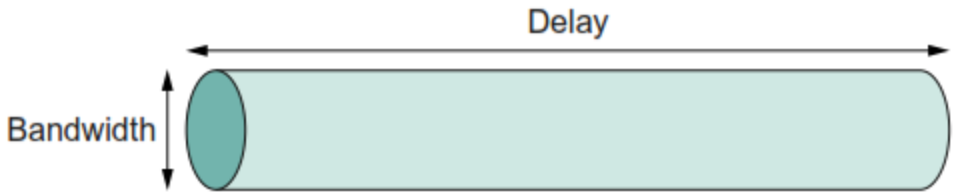
Latency (delay)

- Latency = Propagation + transmit + queue
- Propagation = distance/speed of light
- Transmit = size/bandwidth

$$d_{\text{total}} = d_{\text{queue}} + d_{\text{trans}} + d_{\text{prop}}$$



Delay X Bandwidth



- We think the channel between a pair of processes as a hollow pipe
- Latency (delay) length of the pipe and bandwidth the width of the pipe
- Delay of 50 ms and bandwidth of 45 Mbps
  - $\Rightarrow$ 50 x 10^{-3} seconds x 45 x 10^{6} bits/second
  - $\Rightarrow$ 2.25 x 10^{6} bits = 280 KB data.

Throughput

Throughput = TransferSize/TransferTime
TransferTime = RTT +1/Bandwidth ×TransferSize

Example :

- where a user wants to fetch a 1-MB file across a 1-Gbps network with a round-trip time of 100 ms.
- The TransferTime includes both the transmit time for 1 MB (1/1 Gbps ×1 MB = 8 ms) and the 100-ms RTT, for a total transfer time of 108 ms.

- This means that the effective throughput will be

  1 MB/108 ms = 74.1 Mbps

Throughput (con't)

Another Example :

- Suppose one wants to stream a video that is one quarter the size of a standard TV screen; that is, it has a resolution of 352 by 240 pixels.
- If each pixel is represented by 24 bits of information, as would be the case for 24-bit color, then the size of each frame would be

$$(352 \times 240 \times 24)/8 = 247.5 \text{ KB}$$

- If the application needs to support a frame rate of 30 frames per second, then it might request a throughput rate of 75 Mbps.

Packet Loss

- Instead, a packet can arrive to find a full queue. With no place to store such a packet, a router will **drop** that packet; that is, the packet will be **lost.**
- a packet loss will look like a packet having been transmitted into the network core but never emerging from the network at the destination.
- The fraction of *lost packets increases* as *the traffic intensity increases*.

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