NETWORK PROTOCOLS AND COMMUNITATION

Edi Surya Negara,M.Kom.
Postgraduate Program, Informatics Engineering (S2)
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Universitas **Bina Darma**

References :

- Computer Networks - A Tanenbaum - 5th edition (2011)
- Data Communications and Networking - Behrouz A.Forouzan - 4th edition (2007)
- Cisco System Inc - 2011 - Cisco Configuration Profesional User Guide.

Chapter 2: Objectives

After completing this chapter, students will be able to:

- Explain how rules are used to facilitate communication.
- Explain the role of protocols and standards organizations in facilitating interoperability in network communications.
- Explain how devices on a LAN access resources in a small to medium-sized business network.

Chapter 2:

- 2.1 Rules of Communication
- 2.2 Network Protocols and Standards
- 2.3 Moving Data in the Network

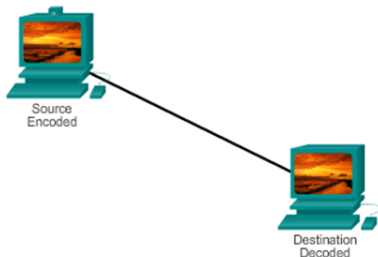# 2.1 Rules of Communication

What is Communication?

Human Communication

Establishing the Rules

- An identified sender and receiver
- Agreed upon method of communicating (face-to-face, telephone, letter, photograph)
- Common language and grammar
- Speed and timing of delivery
- Confirmation or acknowledgment requirements

Message Encoding

Message Size

An overview of the segmenting process:

- The size restrictions of frames require the source host to break a long message into individual pieces (or segments) that meet both the minimum and maximum size requirements.

- Each segment is encapsulated in a separate frame with the address information, and is sent over the network.

- At the receiving host, the messages are de-encapsulated and put back together to be processed and interpreted.

Message Timing

- Access Method The set of rules that defines how a computer puts data onto the network cable and takes data from the cable is called an access method. Once data is moving on the network, access methods help to regulate the flow of network traffic.
  - Carrier-sense multiple-access with collision detection (CSMA/CD)
  - Carrier-sense multiple-access with collision avoidance (CSMA/CA)
  - Token passing
  - Demand priority
- Flow Control
- Response Timeout

Features of Different Access Methods

Feature or function	CSMA/CD	CSMA/CA	Token passing	Demand priority
Type of Communication	Broadcast-Based	Broadcast-Based	Token-based	Hub-based
Type of access method	Contention	Contention	Noncontention	Contention
Type of network	Ethernet	LocalTalk	Token Ring ARCNet	100VG-AnyLan

Message Delivery Options
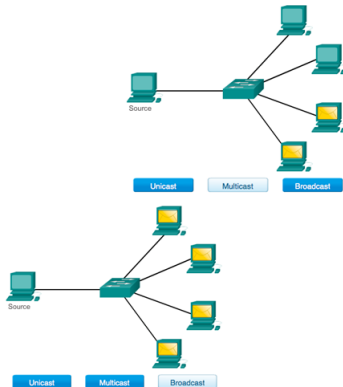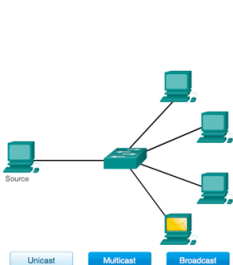
2.2 Network Protocols and Standards

Network Protocols

- How the message is formatted or structured
- The process by which networking devices share information about pathways with other networks
- How and when error and system messages are passed between devices
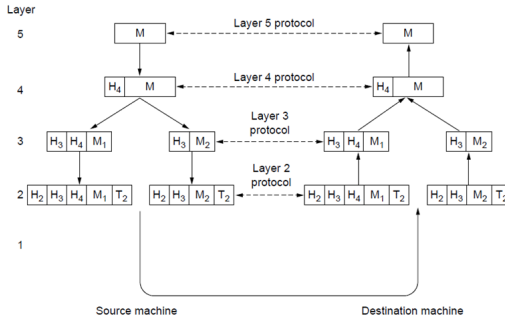- The setup and termination of data transfer sessions

Interaction of Protocols

- Application Protocol Hypertext Transfer Protocol (HTTP)
- Transport Protocol Transmission Control Protocol (TCP)
- Internet Protocol Internet Protocol (IP)
- Network Access Protocols Data link & physical layers

Protocol Hierarchies
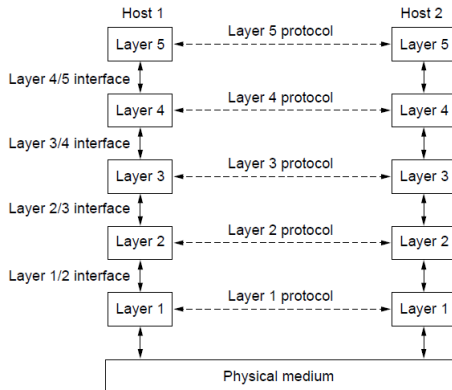
Protocol Hierarchies

Example information flow supporting virtual communication in layer 5.

Protocol Suites and Industry Standards

TCP/IP	ISO	AppleTalk	Novell Netware
HTTP DNS DHCP FTP	ACSE ROSE TRSE SESE	AFP	NDS
TCP UDP	TP0 TP1 TP2 TP3 TP4	ATP AEP NBP RTMP	SPX
IPv4 IPv6 ICMPv4 ICMPv6	CONP/CMNS CLNP/CLNS	AARP	IPX
Ethernet PPP Frame Relay ATM WLAN			

TCP/IP Protocol Suite and Communication
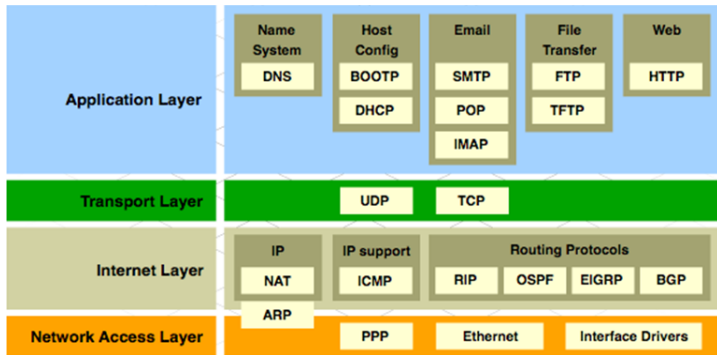
Standards Organizations Open Standards

- The Internet Society (ISOC)
- The Internet Architecture Board (IAB)
- The Internet Engineering Task Force (IETF)
- Institute of Electrical and Electronics Engineers (IEEE)
- The International Organization for Standards (ISO)

Open Standards

Standards Organizations IEEE

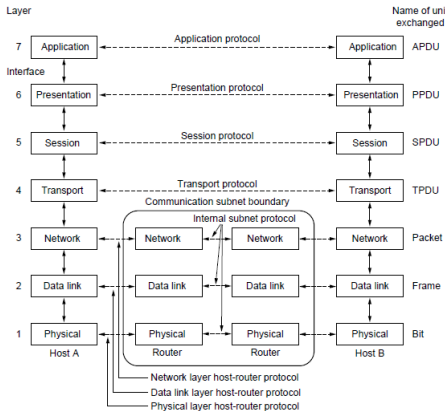| Number	Topic
802.1	Overview and architecture of LANs
802.2 ↓	Logical link control
802.3 *	Ethernet
802.4 ↓	Token bus (was briefly used in manufacturing plants)
802.5	Token ring (IBM's entry into the LAN world)
802.6 ↓	Dual queue dual bus (early metropolitan area network)
802.7 ↓	Technical advisory group on broadband technologies
802.8 †	Technical advisory group on fiber optic technologies
802.9 ↓	Isochronous LANs (for real-time applications)
802.10 ↓	Virtual LANs and security
802.11 *	Wireless LANs (WiFi)
802.12 ↓	Demand priority (Hewlett-Packard's AnyLAN)

Standards Organizations IEEE

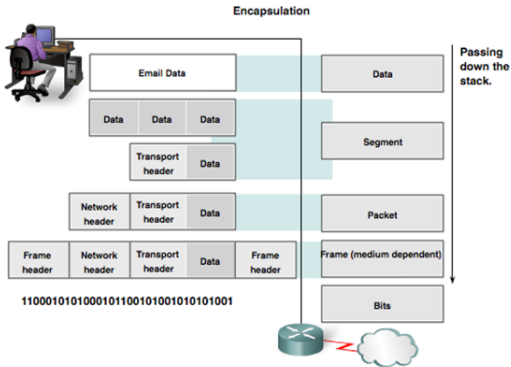| 802.13 | Unlucky number; nobody wanted it |
802.14 ↓	Cable modems (defunct: an industry consortium got there first)
802.15 *	Personal area networks (Bluetooth, Zigbee)
802.16 *	Broadband wireless (WiMAX)
802.17	Resilient packet ring
802.18	Technical advisory group on radio regulatory issues
802.19	Technical advisory group on coexistence of all these standards
802.20	Mobile broadband wireless (similar to 802.16e)
802.21	Media independent handoff (for roaming over technologies)
802.22	Wireless regional area network

Other Standards Organization

- The Electronic Industries Alliance (EIA)
- The Telecommunications Industry Association (TIA)
- The International Telecommunications Union Telecommunications Standardization Sector (ITU-T)
- The Internet Corporation for Assigned Names and Numbers (ICANN)
- The Internet Assigned Numbers Authority (IANA)
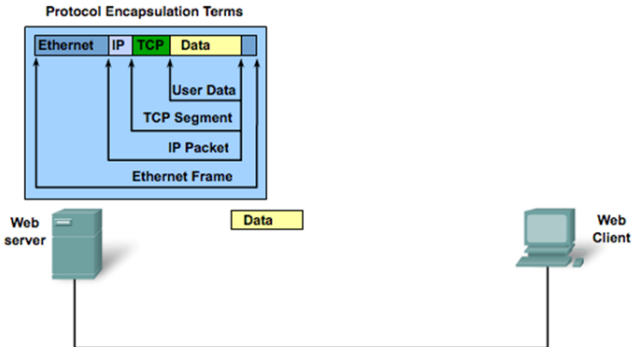
The OSI Reference Model

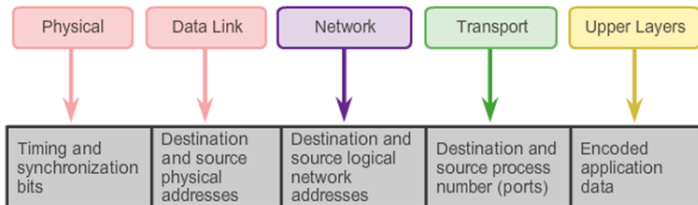# 2.3 Moving Data in the Network
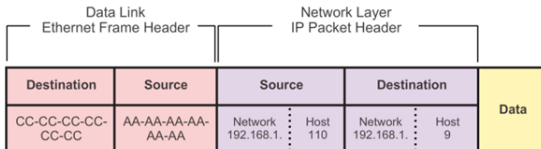
Protocol Data Units (PDUs)

Encapsulation

				Passing down the stack.
Email Data				Data
Data	Data	Data		Segment
	Transport header	Data		
Network header	Transport header	Data		Packet
Frame header	Network header	Transport header	Data	Frame header	Frame (medium dependent)
				Bits

110001010100010110010100101010101001

Protocol Encapsulation

Accessing Local Resources

Network Addresses and Data Link Addresses

Physical	Data Link	Network	Transport	Upper Layers
Timing and synchronization bits	Destination and source physical addresses	Destination and source logical network addresses	Destination and source process number (ports)	Encoded application data

Communicating with Device / Same Network
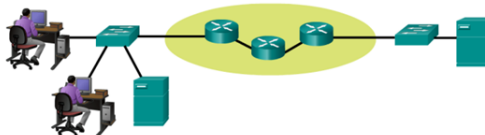
MAC and IP Addresses
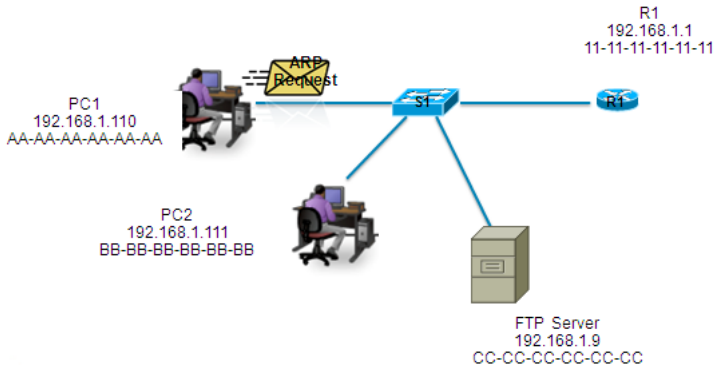
Communicating Device / Remote Network