BAIT1013 Introduction to Computer Networks

Tutorial 2: Network Protocols and Communication

Q1.

(a) Explain **THREE (3)** common elements in all the communication methods.

1. Message source (sender) - Message sources are people, or electronic devices, that need to send a message to other individuals or devices.
2. Message Destination (receiver) - The destination receives the message and interprets it.
3. Channel - This consists of the media that provides the pathway over which the message travels from source to destination.

(6 Marks)

(b) Discuss protocol and protocol suites.

(4 Marks)

Protocol	**Protocol Suites**
A formal description of a set of rules and conventions that govern a particular aspect of how devices on a network communicate.	A group of inter-related protocols that are necessary to perform a communication function.

(c) Protocol is **NOT** required in order for devices in the network to communicate with one another. Do you agree with this statement? Discuss your view.

No, I do not agree. Before communicating with one another, individuals must use established rules or agreements (protocols) to govern the conversation. Protocols must account for the following requirements to successfully deliver a message that is understood by the receiver:

- An identified sender and receiver
- Common language and grammar
- Speed and timing of delivery
- Confirmation or acknowledgment requirements

(8 Marks)

Q2.

(a) Identify the benefits of using a layered model to describe network protocols and operations. (4 Marks)

- Assists in protocol design, because protocols that operate at a specific layer have defined information that they act upon and a defined interface to the layers above and below.
- Fosters competition because products from different vendors can work together.
- Prevents technology or capability changes in one layer from affecting other layers above and below.
- Provides a common language to describe networking functions and capabilities.

(b) Describe the **SEVEN (7)** layers of the Open System Interconnection (OSI) model and identify at least **ONE (1)** protocol and name **the Protocol Data Unit (PDU)** for each layer.

(21 Marks)

OSI Model Layer	**Description**	**Protocols**	**PDU**
Application	Contains protocols used for process-to-process communications.	HTTP, FTP, TFTP, Telnet, SNMP, DNS	Data
Presentation	Provides for common representation of the data transferred between application layer services.	-Video (WMV, AVT) -Bitmap (JPG, PNG) -Audio (WAV, MP3)	Data
Session	Provides services to the presentation layer to organize its dialogue and to manage data exchange.	SQL, RPC, NETBIOS	Data
Transport	Defines services to segment, transfer, and reassemble the data for individual communications between the end devices.	TCP, UDP	Segment
Network	Provides services to exchange the individual pieces of data over the network between identified end devices.	-IP -IPX -AppleTalk	Datagram

BAIT1013 Introduction to Computer Networks

Tutorial 2: Network Protocols and Communication

Data link	Describe methods for exchanging data frames between devices over a common media	- LAN -WAN	Frame
Physical	Describe the mechanical, electrical, functional and procedural means to activate, maintain, and deactivate physical connections for a bit transmission to and from a network device.	FDDI, Ethernet	Bit (0,1)

(c) Differentiate the OSI and TCP/IP model.

- Both have application layers, though they include very different services.
- The OSI model consists of seven layers; the TCP/IP model originally had four layers.
- Both have comparable transport and network (Internet) layers.
- TCP/IP combines the presentation and session layer issues into its application layer.
- TCP/IP combines the OSI data link and physical layers into one layer.
- TCP/IP appears simpler because it has fewer layers.

(8 Marks)

d) Data is segmented into smaller and more manageable pieces to send over the network. Discuss **TWO (2)** primary benefits of doing so.

- Increases speed - Because a large data stream is segmented into packets, large amounts of data can be sent over the network without tying up a communications link. This allows many different conversations to be interleaved on the network called multiplexing.

- Increases efficiency - If a single segment is fails to reach its destination due to a failure in the network or network congestion, only that segment needs to be retransmitted instead of resending the entire data stream.

(6 marks)

Past Year

Jan 2019

Question 1

a) Open Systems Interconnection (OSI) model is a conceptual model that standardizes the communication functions of a computing system.

(i) List the remaining layers of OSI layers in descending order.

OSI Layers
Layer 7 Application layer
...

Table 1-1: OSI model

(6 marks)

(ii) Complete the illustration of the OSI model in Question 1 a) (i) with Protocol Data Units (PDUs).

OSI Layers	Protocol Data Units (PDUs)
Layer 7 Application layer	...
...	...

Table 1-2: OSI model and PDUs

(5 marks)

(iii) Besides the conceptual model, there is another model called protocol model. Briefly explain this model and provide an example of the protocol model. (3 marks)

(i)

OSI Layers
Layer 7 Application layer
Layer 6 Presentation layer
Layer 5 Session layer
Layer 4 Transport layer
Layer 3 Network layer
Layer 2 Data Link layer
Layer 1 Physical layer

(ii)

OSI Layers	Protocol Data Units (PDUs)
Layer 7 Application layer	Data
Layer 6 Presentation layer	Data
Layer 5 Session layer	Data
Layer 4 Transport layer	Segment
Layer 3 Network layer	Datagram
Layer 2 Data Link layer	Frame
Layer 1 Physical layer	Bit (0,1)

(iii)

A protocol model provides a model that closely matches the structure of a particular protocol suite. The hierarchical set of related protocols in a suite typically represents all the functionality required to interface the human network with the data network. For example, The TCP/IP model is a protocol model because it describes the functions that occur at each layer of protocols within the TCP/IP suite.

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BAIT1013 Introduction to Computer Networks

Tutorial 2: Network Protocols and Communication

(b) (i) You are required to advice the CEO of a company on the suitability of a peer-to-peer network for his company. This new company is expected to have high amount of network traffic and promising future expansion. (6 marks)

(ii) Suggest **TWO (2)** criteria to help him select an appropriate network media for his company. (4 marks)

(iii) Explain the differences between bandwidth and throughput to the CEO. (4 marks)

(i)

Scalability: P2P networks are generally not well-suited for organizations with anticipated growth. As your company expands, managing and maintaining a P2P network can become increasingly complex and challenging.

Network traffic: P2P networks rely on individual nodes (computers) to share resources and services directly with each other. In a high-traffic environment, this decentralized approach can lead to inefficient use of network bandwidth and increased latency, impacting the overall performance and responsiveness of your network.

Security Concerns: P2P networks pose significant security risks, as they often lack centralized control and visibility. Without proper security measures in place, company's sensitive data and resources could be at risk of unauthorized access and data breaches.

(ii)

Bandwidth Capacity: Choose a network media that offers high bandwidth capacity to accommodate the anticipated high network traffic. This ensures that the network can handle the data volume without experiencing bottlenecks or performance degradation.

Reliability: Select a network media known for its reliability and stability. High network uptime is critical for business operations, especially in environments with heavy network traffic.

(iii)

- Bandwidth refers to the maximum amount of data that can be transmitted over a communication channel in a given period of time. Bandwidth represents the capacity of the communication channel and is typically specified by the physical characteristics of the medium such as frequency range for wireless signals.
- Throughput refers to the actual amount of data that is successfully transmitted over a communication channel in a given period of time. It is a measure of the effective data transfer rate experienced by users and applications.