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Annexure I

Micro Project Proposal

PROTOCOLS IN DATA COMMUNICATION

1. Aims/Benefits of the Micro-Project:

- Avoiding the data bridges in the data when data communication occurs.
- Implementing the suitable protocols by recognizing which type of data communication takes place in the computer networks.
- Protocols are some constraint which must be get applied on the networks for better transfer in data through the exchange of data on the networks.
- FTP for file transfer over the connected computer networks.

2. Course Outcome Addressed:

- CO-1: Able to apply sufficient protocol on the type of which the data communication is get done.
- CO-2: Understanding the work of PROTOCOLS IN DATA COMMUNICATION.
- CO-3: Types of Protocols and their key features.

3. Proposed Methodology:

Protocols are the set of rules which governs the Date Communication. Protocols are basically used for filtering and providing some restrictions on the data in which manner it flows. Protocols are basically some constraint and rules applied on transferring or receiving of data.

4. Action Plan:

Sr. No.	Details of Activity	Planned Start date	Planned Finish date	Name of Responsible Team Members
1	Search the information of protocols	10-02-2023 2:00 – 3:00 PM	11-02-2023 2:00 – 3:00 PM	Kunal Nitin Nalwade
2	Collecting information regarding protocols	17-02-2023 2:00 – 3:00 PM	03-03-2023 2:00 – 3:00 PM	Kunal Nitin Nalwade
3	Analysis of different Different data collected	04-03-2023 2:00 – 3:00 PM	10-03-2023 2:00 – 3:00 PM	Harsh Moreshwar kale
4	Creating format of project	11-03-2023 2:00 – 3:00 PM	17-03-2023 2:00 – 3:00 PM	Harsh Moreshwar kale
5	Inserting information	18-03-2023 2:00 – 3:00 PM	25-03-2023 2:00 – 3:00 PM	Harsh Moreshwar kale
6	Detailing the project	31-03-2023 2:00 – 3:00 PM	01-04-2023 2:00 – 3:00 PM	Akshay Dashrath Gitte
7	Overview of the project	07-04-2023 2:00 – 3:00 PM	08-04-2023 2:00 – 3:00 PM	Akshay Dashrath Gitte
8	Final report of project	15-04-2023 2:00 – 3:00 PM	21-04-2023 2:00 – 3:00 PM	Akshay Dashrath Gitte

5. Resources Required:

Sr. No.	Name of resource / material	Specification	Quantity	Remarks
1	Computer	WINDOWS 11,8GB RAM	1	
2	Operating System	WINDOWS 11	1	
3	Browser	Google Chrome	1	

6. Names of Team Members with Roll No.'s:

Sr. No.	Enrollment No.	Name of Team Member	Roll No.
1	2110950049	Akshay Dashrath Gitte	01
2	2110950051	Harsh Moreshwar Kale	03
3	2110950099	Kunal Nitin Nalwade	49

Mr. Omkare R. S.

Name and Signature of the Teacher

Annexure – II

Micro-Project Report

PROTOCOLS IN DATA COMMUNICATION

1. Rationale:

Data communication are the exchange of data between two nodes via some form of link (transmission medium) such as cable. Now these Data are exchanged in three ways.

1. Simplex
2. Half Duplex
3. Full Duplex

2. Aims/Benefits of the Micro-Project:

- PROTOCOLS IN DATA COMMUNICATION are a set of rules that determine how data is transmitted over a network. They provide rules that define how a message is transmitted across a network.
- Protocols are just agreed-upon ways to ensure that two or more communication entities connected together can recognize and talk to each other.
- The main aim of PROTOCOLS IN DATA COMMUNICATION is to ensure that data is transmitted accurately and efficiently between devices. They provide a standard way of communicating between devices, which makes it easier for different devices to communicate with each other.

Some benefits of protocols include enabling different devices to communicate with each other regardless of their software and hardware differences, ensuring that data is transmitted accurately and efficiently between devices, and providing a secure way of transmitting data.

3. Course Outcomes Achieved:

- CO-1: Protocols are useful to handle the flow of data.
- CO-2: Protocols reduces the time and space complexity between the series of bits.
- CO-3: Protocols gives three types for better data communication i.e. Syntax, Scemantics, Timing

4. Literature Review:

Protocols is a set of rules that governs data communication. Protocol defines what is communicated, how it is communicated and when it is communicated. In Computer networks communication occurs between entities in different systems.

The key element of the protocol are syntax, scemantics and timing.

1) **Syntax (What is to be communicated?)**

   The Term syntax referred to the structure or format of the data, meaning of the order in which they are presented.

   For ex. The simple protocol might be expect the first 8-bit of data to be addressed of sender, the second 8-bit to be addressed at the receiver and the remaining stream to be message itself.

2) **Scemantics (How is to be communicated?)**

   The Word Scemantics refers to the meaning of each section of bits. How Is a particular pattern to be interpreted and what action is to be taken based on that interpretation.

   For ex. Does an address identify the route to be taken or the final destination of message.

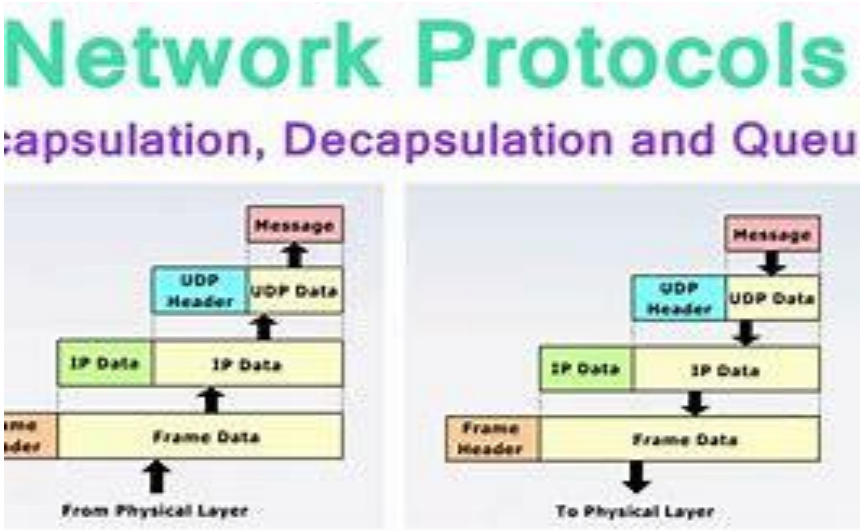
3) **Timing (When is to be communicated?)**

   The Term timing refers to the two characteristics when data should be send and how fast they can be send.

   For ex. If a Sender produces data at 100 Mbps but the receiver can process data at only 1 Mbps, the transmission will overload the receiver and data will be lost.

5.Actual Methodology followed

5.1 Following Image Shows Importance of PROTOCOLS IN DATA COMMUNICATION:



5.2 Protocols:

Human beings are the only creatures on the earth who are able to communicate with each other through the medium of language. But humans take this gift to another extent. Distance, time, and physical existence of the person don't matter in communication these days because they build a communication system through which they can communicate or share data like images, videos, text, files, etc. with their loved ones anytime anywhere. Communication is defined as a process in which more than one computer transfers information, instructions to each other and for sharing resources. Or in other words, communication is a process or act in which we can send or receive data.

- **Components of Data Communication**

A communication system is made up of the following components:

Message: A message is a piece of information that is to be transmitted from one person to another. It could be a text file, an audio file, a video file, etc.

Sender: It is simply a device that sends data messages. It can be a computer, mobile, telephone, laptop, video camera, or workstation, etc.

Receiver: It is a device that receives messages. It can be a computer, telephone mobile, workstation, etc.

Transmission Medium / Communication Channels: Communication channels are the medium that connect two or more workstations. Workstations can be connected by either wired media or wireless media.

Set of rules (Protocol): When someone sends the data (The sender), it should be understandable to the receiver also otherwise it is meaningless. For example, Sonali sends a message to Chetan. If Sonali writes in Hindi and Chetan cannot understand Hindi, it is a meaningless conversation.

❖ Protocol Definition:

It is a digital language through which we communicate with others on the Internet. **protocol meaning is that it a set of mutually accepted and implemented rules at both ends of the communications channel for the proper exchange of information**. By adopting these rules, two devices can communicate with each other and can interchange information. We can't even think of using the Internet without Protocols. Each *protocol* is defined in different terms and different use with unique name. Message travel from sender to receiver via a medium (The medium is the physical path over which a message travels) using a protocol.

Functions of protocols:

Connection Establishment/Release

A data transfer can be a communication-oriented transfer or connectionless transfer. The connectionless services are the most unreliable services. Most of the protocols provide connection-oriented services. If a large volume of data transfer is required, connection oriented services are always better.

Encapsulation

A protocol defines how the data is encapsulated in the frame or packet. Each packet in all PDUs contains three fields for control information along with the data field. There are three control information fields such as Address, Error Control and Protocol Control.

Segmentation and Reassembly

In a layered architecture, when the application entity sends data to another host's application entity, it moves from the application layer to the physical layer of the same host. Then the data packet travels on transmission media and then again from the physical layer to the application layer of destination.

In this process, the lower level protocol breaks up the data into smaller blocks and adds extra control information for peer-level use. This process is called Segmentation. Similarly, when the packet reaches the destination and it moves from the lower level to the upper-level. The upper level protocols recombine the blocks to get actual data after removing control information added by the sender's lower level protocols. This is called reassembly.

Data Transfer Management

If the sender can generate the data at the rate of 10 MBps and the receiver can accept at a speed of 1 MBps, then it is the protocol that synchronized them properly to provide matching and sequencing.

Multiplexing/Demultiplexing

The multiplexing function of the protocol is more related to addressing. One of the two types of multiplexing is used in protocols such as upward multiplexing or downward multiplexing. In upward multiplexing, several higher level connections are multiplexed or a single lower-level connection. In contrast, in downward multiplexing, a single higher level connection is built on top of multiple lower-level connections.

Addressing

Addressing is a process of defining the address of entities during communication. The concept of addressing is complex and includes addressing level, addressing scope, connection identifiers and addressing modes.

Ordered Delivery

If the communicating machine is not connected directly, they are indirectly connected in a network. There lies a possibility of data packets not reaching their destination in the same sequence in which they were sent. The basic reason for a break of the sequence is that the data units (PDUs) traverse different network paths.

Error Control

The damage of data and loss of data must be adequately monitored when data transmission takes place. The damage or error in data controls is detected by the error control methods defined in the protocol. The error control is implemented in two steps as follows−

- Error Detection
- Retransmission of data

For error detection, some error detection code is sent by the sender with each PDU. The receiver knows that code and checks if the code in the received data is correct or not. Suppose any error is detected, the receiver requests the sender to retransmit the data. On the other hand, if no error is detected, the receiver transmits an acknowledgement for correct receiving data to the sender.

Flow Control

Flow control is also a necessary process to control the problems like congestion, overloading, loss of data etc. Flow control is a function performed by the receiving machine to limit the data rate being sent by the transmitting machine. The stop and wait protocols are the simplest methods to control the data flow. Flow control is a must, especially if the communicating machines have different transmission and reception data rates.

Other Transmission Controls

Timing and Synchronization is one of the essential transmission controls. A protocol also provides different additional services to communicating entities which include the following.

- Priority
- Quality of Service
- Security

Types of Protocols:

TCP

Transmission control protocol is used for communication over a network. In TCP data is broken down into small packets and then sent to the destination. However, IP is making sure packets are transmitted to the right address.

Internet Protocol (IP)

IP is also working with TCP. It is an addressing Protocol. IP addresses packets route them and show different nodes and network Unless it reaches its right destination. The IP protocol is developed in 1970.

FTP

File transfer protocol is basically used for transferring files to different networks. There may be a mass of files such as text files, multimedia files, etc. This way of file transfer is quicker than other methods.

SMTP

Simple mail transfer protocol manages the transmission and outgoing mail over the internet.

HTTP

HTTP is based on client and server model. HTTP is used for making a connection between the web client and web server. HTTP shows information in web pages.

Ethernet

Ethernet is a most important for LAN communication. Ethernet transmits the data in digital packets. If any computer wants to use this protocol they should contain Ethernet Network Interface Card (NIC). The card is implemented with unique address code fixed in the microchip.

Telnet

Telnet is an established with some rules which are used to connect to another computer. Telnet is mainly used for the remote login process. The computer which is requesting for a connection that is a local computer and which is accepting the connection that is a remote computer. If you give a command in a local computer that command is executed in the remote computer. Telnet is also based on client and server model.

Gopher

Gopher is an application layer protocol, which is used for searching and retrieving documents from remote sites. This is possible to start an online connection with other computers through gopher.

Some other popular protocols act as co-functioning protocols associated with these primary protocols for core functioning. These are:

- ARP (Address Resolution Protocol)
- DHCP (Dynamic Host Configuration Protocol)
- IMAP4 (Internet Message Access Protocol)
- SIP (Session Initiation Protocol)
- RTP (Real-Time Transport Protocol)
- RLP (Resource Location Protocol)
- RAP (Route Access Protocol)
- L2TP (Layer Two Tunnelling Protocol)
- PPTP (Point To Point Tunnelling Protocol)
- SNMP (Simple Network Management Protocol)
- TFTP (Trivial File Transfer Protocol)

❖ **Protocols supported at various levels or layers of OSI model:**

Layer	Name	Protocols
Layer 7	Application	SMTP, HTTP, FTP, POP3, SNMP
Layer 6	Presentation	MPEG, ASCH, SSL, TLS
Layer 5	Session	NetBIOS, SAP
Layer 4	Transport	TCP, UDP
Layer 3	Network	IPV5, IPV6, ICMP, IPSEC, ARP, MPLS.
Layer 2	Data Link	RAPA, PPP, Frame Relay, ATM, Fiber Cable, etc.
Layer 1	Physical	RS232, 100BaseTX, ISDN, 11.

OSI is reference network model other then TCP/IP. This model has seven layers. All of these layers requires protocols for communication

6. Actual Resources Used:

Sr. No.	Name of resource /material	Specification	Quantity	Remarks
1	Computer	WINDOWS 11,8 GB RAM	1	
2	Operating System	WINDOWS 11	1	
3	Browser	Google Chrome	1	

7. Outputs of Micro-Projects:

When we talking about the outputs of the PROTOCOLS IN DATA COMMUNICATION is simply the transparent flow in the exchange of data within the global computer network interference.

It provides us some rule and constraints upon the data that we can manage it or handle it when we are transferring data from one end to another end in any computer network.

The Protocols provides us the filters that are filter the data and remove unwanted and unnecessary of data to make the transfer reliable and efficient.

These constraint and rules help us the user a good data fetching experience also data bridges and data loss is decreased.

FTP (file transfer protocol) allows the transfer of files. It establishes a connection to a remote client and transfers the files until completed, and then it disconnects. The connection can be in an internal network or over the Internet. Developed in 1971, this protocol served as one of the objectives for the development of the Internet.

The Internet Message Access Protocol (IMAP) allows an e-mail client to access e-mail messages on a remote e-mail server.

IMAP supports two modes of operation: online and offline. In online mode, e-mail clients using IMAP leave the e-mail messages on the server until the user purposely deletes them. In offline mode, the e-mail is downloaded and then deleted. This characteristic of the IMAP operation allows multiple clients to manage the same mailbox. The upshot is that the mail stays on the server automatically until deleted.

8. Skill developed / Learning out of this Micro-Project:

- We learnt how these techniques works like Hypertext Transfer Protocol aka HTTP is one of the most widely used application protocol.
- HTTP lies at the heart of World Wide Web (www). HTTPS is a communication Protocol for Secure connection commonly used by banking sectors and other financial companies.
- It has shown a growth in demand by nearly 16% in the last quarter. It stands rock solid at position number two.

9. Applications of this Micro-Project:

1.Text Communication –
We all are aware of the importance of Text Communication in the present times. Any discrepancy in texting between sender and receiver cannot be tolerated. Hence TCP is used in Text Communication due to its reliable transmission, error control, and in order receiving of the data.
Example : Whatsapp, Instagram, Google Chat,iMessage.
2.Transfer of files or FTP –
TCP is used in File transfer when we cannot tolerate the loss of data and receiving the data incorrect order is of utmost importance. FTP uses two TCP connections i.e., control connection and data connection.
Control Connection : FTP sends information like user identification and passwords.
Data Connection: In this connection, files are sent over the network.
Ex : FileZilla Client and Server

3.HyperText Transfer Protocol (HTTP) –
It is used to access the data present on the World Wide Web. It uses TCP protocol for accessing the web pages present on the internet due to the fact that TCP provides in order data, error control and flow control, and retransmission of data segments.

4.Simple Mail Transfer Protocol(SMTP)
It is an application layer protocol that is used to send Emails from one system to another. SMTP uses the services of TCP to start a connection with the SMTP server. Once the SMTP server accepts the connection request, it allows the sender to send the mails.
Ex: Yahoo, Gmail, Outlook, etc.