

# Network Programming Assignment 1

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**1. Identify the following protocols on the basis of OSI reference model. Also explain each of them.**

SIP, SSI, DNS, FTP, Gopher, MIME, XDR, HTTP, NFS, NTP, SMPP, SMTP, SNMP, Telnet, DHCP, Netconf, IP, IPv4, ATM, SDLC, SCTP, DCCP, SPX, SAP, PPTP, RTP, IEEE802.2, LLC, L2TP, IEEE 802.3, PDH, SONET/SDH, PON, OTN, DSL, IEEE 802.3, IPv6, ARP, ICMP, IGMP, IPX, Frame Relay, TCP, UDP, HDLC, CSLIP, SLIP, IEEE 802.11, IEEE 802.15, IEEE 802.16, Bluetooth, RS-232, RS-449, , TLS/SSL, USB

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**(a) Layer 7 (Application Layer)**

**i. Session Initiation Protocol (SIP)**

The Session Initiation Protocol (SIP) is a signalling protocol used for initiating, maintaining, and terminating real-time sessions that include voice, video, and messaging applications.

**ii. Simple Sensor Interface (SSI) Protocol**

The Simple Sensor Interface (SSI) protocol is a simple communications protocol designed for data transfer between computers or user terminals and smart sensors.

**iii. Domain Name System (DNS)**

The Domain Name System (DNS) is a hierarchical and decentralized naming system for computers, services, or other resources connected to the internet or a private network.

**iv. File Transfer Protocol (FTP)**

The File Transfer Protocol (FTP) is a standard network protocol used for the transfer of computer files between a client and server on a computer network.

- v. Gopher Protocol  
The Gopher protocol is a communications protocol designed for distributing, searching, and retrieving documents in Internet Protocol networks.
- vi. Hypertext Transfer Protocol (HTTP)  
The Hypertext Transfer Protocol (HTTP) is an application layer protocol for distributed, collaborative, hypermedia information systems.
- vii. Network File System (NFS)  
Network File System (NFS) is a distributed file system protocol allowing a user on a client computer to access files over a computer network.
- viii. Network Time Protocol (NTP)  
The Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks.
- ix. Short Message Peer-to-Peer (SMPP)  
Short Message Peer-to-Peer (SMPP) in the telecommunications industry is an open, industry standard protocol designed to provide a flexible data communication interface for the transfer of short message data between External Short Messaging Entities (ESMEs), Routing Entities (REs) and SMSC.
- x. Simple Mail Transfer Protocol (SMTP)  
The Simple Mail Transfer Protocol (SMTP) is a communication protocol for electronic mail transmission. Mail servers and other message transfer agents use SMTP to send and receive mail messages. SMTP servers commonly use the Transmission Control Protocol on port number 25.
- xi. Simple Network Management Protocol (SNMP)  
Simple Network Management Protocol (SNMP) is an Internet Standard protocol for collecting and organizing information about managed devices on IP networks and for modifying that information to change device behaviour. Devices that typically support SNMP include cable modems, routers, switches, servers, workstations, printers, and more.
- xii. Telnet  
Telnet is an application protocol used on the Internet or local area network to provide a bidirectional interactive text-oriented communication facility using a virtual terminal con-

nection.

xiii. **Dynamic Host Configuration Protocol (DHCP)**

The Dynamic Host Configuration Protocol (DHCP) is a network management protocol used on Internet Protocol (IP) networks, whereby a DHCP server dynamically assigns an IP address and other network configuration parameters to each device on the network, so they can communicate with other IP networks.

xiv. **Network Configuration Protocol (NETCONF)**

The Network Configuration Protocol (NETCONF) is a network management protocol which provides mechanisms to install, manipulate, and delete the configuration of network devices. Its operations are realized on top of a simple Remote Procedure Call (RPC) layer.

(a) **Layer 6 (Presentation Layer)**

i. **Multipurpose Internet Mail Extensions (MIME)**

Multipurpose Internet Mail Extensions (MIME) is an Internet Standard that extends the format of email messages to support text in character sets other than ASCII, as well as attachments of audio, video, images, and application programs. Message bodies may consist of multiple parts, and header information may be specified in non-ASCII character sets.

ii. **External Data Representation (XDR)**

External Data Representation (XDR) is a standard data serialization format, for uses such as computer network protocols. It allows data to be transferred between different kinds of computer systems.

iii. **Transport Layer Security (TLS)** The TLS protocol aims primarily to provide privacy and data integrity between two or more communicating computer applications.

(a) **Layer 5 (Session Layer)**

i. **Session Announcement Protocol (SAP)** The Session Announcement Protocol (SAP) is an experimental protocol for advertising multicast session information. SAP typically uses Session Description Protocol (SDP) as the format for Real-time Transport Protocol (RTP) session descriptions. Announcement data is sent using IP multicast and the User Datagram Protocol (UDP).

- ii. Point-to-Point Tunneling Protocol (PPTP) The Point-to-Point Tunneling Protocol (PPTP) is an obsolete method for implementing virtual private networks.
- iii. Real-time Transport Protocol (RTP) The Real-time Transport Protocol (RTP) is a network protocol for delivering audio and video over IP networks. RTP typically runs over User Datagram Protocol (UDP).

(a) **Layer 4 (Transport Layer)**

- i. Transmission Control Protocol (TCP) TCP is connection-oriented, and a connection between client and server is established before data can be sent. The server must be listening (passive open) for connection requests from clients before a connection is established.
- ii. User Datagram Protocol (UDP) With UDP, computer applications can send messages, in this case referred to as datagrams, to other hosts on an Internet Protocol (IP) network.
- iii. Stream Control Transmission Protocol (SCTP) SCTP protocol provides the message-oriented feature of the User Datagram Protocol (UDP), while ensuring reliable, in-sequence transport of messages with congestion control like the Transmission Control Protocol (TCP).
- iv. Datagram Congestion Control Protocol (DCCP) In computer networking, the Datagram Congestion Control Protocol (DCCP) is a message-oriented transport layer protocol. DCCP implements reliable connection setup, teardown, Explicit Congestion Notification (ECN), congestion control, and feature negotiation.
- v. Sequenced Packet Exchange (SPX) The SPX layer sits on top of the IPX layer and provides connection-oriented services between two nodes on the network. SPX is used primarily by client-server applications.

(a) **Layer 3 (Network Layer)**

- i. Internet Protocol (IP) The Internet Protocol (IP) is the principal communications protocol in the Internet protocol suite for relaying datagrams across network boundaries. Its routing function enables internetworking, and essentially establishes the Internet.

- ii. Internet Protocol version 4 (IPv4) Internet Protocol version 4 (IPv4) is the fourth version of the Internet Protocol (IP). IPv4 uses a 32-bit address space which provides 4,294,967,296 unique addresses, but large blocks are reserved for special networking methods.
- iii. Internet Protocol version 6 (IPv6) Internet Protocol version 6 (IPv6) is the most recent version of the Internet Protocol (IP). IPv6 uses a 128-bit address.
- iv. Internet Control Message Protocol (ICMP) The Internet Control Message Protocol (ICMP) is a supporting protocol in the Internet protocol suite. It is used by network devices, including routers, to send error messages and operational information indicating success or failure when communicating with another IP address, for example, an error is indicated when a requested service is not available or that a host or router could not be reached.
- v. Internet Group Management Protocol (IGMP) The Internet Group Management Protocol (IGMP) is a communications protocol used by hosts and adjacent routers on IPv4 networks to establish multicast group memberships. IGMP is an integral part of IP multicast and allows the network to direct multicast transmissions only to hosts that have requested them.
- vi. Internetwork Packet Exchange (IPX) Internetwork Packet Exchange (IPX) is the network layer protocol in the IPX/SPX protocol suite.

(a) **Layer 2 (Data Link Layer)**

- i. Serial Line Internet Protocol (SLIP) The Serial Line Internet Protocol (SLIP) is an encapsulation of the Internet Protocol designed to work over serial ports and router connections.
- ii. Compressed SLIP (CSLIP) A version of SLIP with header compression is called Compressed SLIP (CSLIP). The compression algorithm used in CSLIP is known as Van Jacobson TCP/IP Header Compression.
- iii. High-Level Data Link Control (HDLC) High-Level Data Link Control (HDLC) is a bit-oriented code-transparent synchronous data link layer protocol. HDLC provides both connection-oriented and connectionless service.

- iv. Asynchronous Transfer Mode (ATM) Asynchronous Transfer Mode (ATM) is a telecommunications standard defined by ANSI and ITU (formerly CCITT) for digital transmission of multiple types of traffic, including telephony (voice), data, and video signals in one network without the use of separate overlay networks.
- v. Address Resolution Protocol (ARP) The Address Resolution Protocol (ARP) is a communication protocol used for discovering the link layer address, such as a MAC address, associated with a given internet layer address, typically an IPv4 address.
- vi. Frame Relay Frame Relay is a standardized wide area network technology that specifies the physical and data link layers of digital telecommunications channels using a packet switching methodology.
- vii. Synchronous Data Link Control (SDLC) Synchronous Data Link Control (SDLC) is a computer communications protocol. SDLC supports multipoint links as well as error correction.
- viii. Logical link control (LLC) The LLC sublayer provides multiplexing mechanisms that make it possible for several network protocols (e.g. IP, IPX and DECnet) to coexist within a multipoint network and to be transported over the same network medium.
- ix. Layer 2 Tunneling Protocol (L2TP) In computer networking, Layer 2 Tunneling Protocol (L2TP) is a tunneling protocol used to support virtual private networks (VPNs) or as part of the delivery of services by ISPs.

(a) **Layer 1 (Physical Layer)**

- i. IEEE 802.3 IEEE 802.3 is a working group and a collection of Institute of Electrical and Electronics Engineers (IEEE) standards produced by the working group defining the physical layer and data link layer's media access control (MAC) of wired Ethernet. This is generally a local area network (LAN) technology with some wide area network (WAN) applications.
- ii. IEEE 802.11 IEEE 802.11 is part of the IEEE 802 set of local area network (LAN) protocols, and specifies the set of

media access control (MAC) and physical layer (PHY) protocols for implementing wireless local area network (WLAN) Wi-Fi computer communication in various frequencies, including but not limited to 2.4 GHz, 5 GHz, 6 GHz, and 60 GHz frequency bands.

- iii. IEEE 802.15 IEEE 802.15 is a working group of the Institute of Electrical and Electronics Engineers (IEEE) IEEE 802 standards committee which specifies wireless personal area network (WPAN) standards.
- iv. IEEE 802.16 IEEE 802.16 is a series of wireless broadband standards written by the Institute of Electrical and Electronics Engineers (IEEE). The IEEE Standards Board established a working group in 1999 to develop standards for broadband for wireless metropolitan area networks.
- v. Bluetooth Bluetooth is a wireless technology standard used for exchanging data between fixed and mobile devices over short distances using UHF radio waves in the industrial, scientific and medical radio bands, from 2.402 GHz to 2.480 GHz, and building personal area networks (PANs).
- vi. Recommended Standard 232 (RS-232) RS-232, Recommended Standard 232 is a standard originally introduced in 1960 for serial communication transmission of data. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pinout of connectors.
- vii. Recommended Standard 449 (RS-449) The RS-449 specification defines the functional and mechanical characteristics of the interface between data terminal equipment, typically a computer, and data communications equipment, typically a modem or terminal server.
- viii. Universal Serial Bus (USB) Universal Serial Bus (USB) is an industry standard that establishes specifications for cables and connectors and protocols for connection, communication and power supply (interfacing) between computers, peripherals and other computers.
- ix. Passive Optical Network (PON) A passive optical network (PON) is a fiber-optic telecommunications technology for delivering broadband network access to end-customers.
- x. Digital subscriber line (DSL) DSL is a family of technologies

that are used to transmit digital data over telephone lines.

- xi. Optical Transport Network (OTN) Optical Transport Network (OTN) is a set of Optical Network Elements (ONE) connected by optical fiber links, able to provide functionality of transport, multiplexing, switching, management, supervision and survivability of optical channels carrying client signals.
- xii. Plesiochronous Digital Hierarchy (PDH) The plesiochronous digital hierarchy (PDH) is a technology used in telecommunications networks to transport large quantities of data over digital transport equipment such as fibre optic and microwave radio systems.
- xiii. Synchronous optical networking (SONET) Synchronous optical networking (SONET) and synchronous digital hierarchy (SDH) are standardized protocols that transfer multiple digital bit streams synchronously over optical fiber using lasers or highly coherent light from light-emitting diodes (LEDs).

## 2. References

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- [1] Wikipedia Article: List of Network Protocols (OSI Model)  
[https://en.wikipedia.org/wiki/List\\_of\\_network\\_protocolsOSI\\_model](https://en.wikipedia.org/wiki/List_of_network_protocolsOSI_model)  
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