

ITS 323 – ACRONYMS AND DEFINITIONS

A selection of the more commonly used acronyms and abbreviations used during the course. Short definitions or explanations are also given.

1 Application Layer

DNS **Domain Name Service:** maps domain names (such as www.siiit.tu.ac.th) to IP addresses (such as 203.160.17.2). Given a domain name that identifies a computer on the Internet, DNS will return the IP address for that computer.

HTTP **Hypertext Transfer Protocol:** transfer HTML pages (and other content) between web clients (browsers) and web servers. Uses a Request/Response model, where client requests the content and server responds with the content.

IMAP **Internet Message Access Protocol:** used by email client to retrieve email stored on an email server. See SMTP and POP.

POP **Post Office Protocol:** used by email client to retrieve email stored on an email server. See SMTP and IMAP.

SMTP **Simple Mail Transfer Protocol:** send emails from email clients/servers normally to servers. Email is sent to email servers (instead of directly to the intended client) because the email server must be running all the time. To receive the email, a client must use another protocol like POP or IMAP.

SNMP **Simple Network Management Protocol:** allows a central network manager to remotely monitor and control devices (such as switches, routers and computers) in a network.

URI **Uniform Resource Identifier:** generic format for describing a resource (such as file, computer, person, application) on the Internet. A URL is a URI.

URL **Uniform Resource Locator:** format for describing the location of a resource on the Internet. Commonly used for files on web servers (such as <http://www.siiit.tu.ac.th/test.html>). A type of URI.

2 Transport Layer

ACK **Acknowledgement:** refers to a TCP segment with the ACK flag set. Used in TCP data transfer to indicate that this TCP segment carries an acknowledgement (with the next byte expected carried in the Acknowledgement Number field).

FIN **Finish:** refers to a TCP segment with the FIN flag set. Used in TCP connection close to indicate to the other host this host is finished sending data.

- SYN** **Synchronise:** refers to a TCP segment with the SYN flag set. Used in TCP connection setup in agreeing upon (that is, synchronising) sequence numbers.
- TCP** **Transmission Control Protocol:** the most used transport protocol in the Internet, TCP provides reliable and efficient transfer of data between a source and destination application. Includes mechanisms for connection management, port numbers, error control, flow control and congestion control. Used by many Internet applications that require reliable data transfer, like web access, email, file downloads, file sharing, instant messaging, database access, custom business applications.
- UDP** **User Datagram Protocol:** a simple transport protocol used in the Internet, UDP provides only port numbering when compared to TCP. Used for applications that require quick response and can tolerate packet loss, such as voice/video calls, network management.

3 Network Layer

- ARP** **Address Resolution Protocol:** maps IP addresses to hardware (or MAC) addresses. IP addresses are logical address identifying a computer interface, but specific Data Link layers use hardware addresses (such as IEEE 48-bit address) to communicate. Given the IP address of a computer (interface), ARP will return the hardware address for that computer (interface).
- ICMP** **Internet Control Message Protocol:** report and diagnose errors in the Internet, including testing a route, and testing if a computer/router can be contacted.
- IP** **Internet Protocol:** send datagram from source host to destination host via a set of routers. The core of the Internet, every computer that wants to communicate with another computer on the Internet must implement IP. Provides simple, but unreliable service: datagrams are sent with no mechanisms for retransmissions, flow control or congestion control. Connectionless, datagram based packet switching.
- PDU** **Protocol Data Unit:** a generic term for a frame, message, packet, segment or datagram.
- TTL** **Time To Live:** Gives a life time to a packet. In IP, when a datagram is created it is given a TTL value (by default 255). Every time a router forwards the datagram the TTL is decremented by 1. If the TTL is 0 a router will delete (drop) the datagram, hence ending the life of the datagram.

4 Data Link Layer

- ARQ** **Automatic Repeat Request:** the mechanism of sending a packet and automatically retransmitting if an Acknowledgement is not received within time. An error control mechanism. Protocols include: Stop-and-wait, Go-Back-N and Selective-Reject (or Selective-Repeat) ARQ.
- DLL** **Data Link Layer.**
- FDM** **Frequency Division Multiplexing:** allows signals from multiple users to be sent over one line by sending the users' signals at different frequencies.
- LAN** **Local Area Network:** connects computers within an organisation, usually over areas such as an office, home or campus. Examples include: Ethernet, Wireless LAN, Token Ring.
- LLC** **Logical Link Control:** a sub-layer of DLL that is used in all IEEE 802 LANs/WANs. Includes mechanisms like addressing and link setup which are common to different types of LANs/WANs.
- MAC** **Medium Access Control:** protocol for control when nodes can transmit on a shared medium. A sub-layer of DLL that is used in all IEEE 802 LANs/WANs.
- TDM** **Time Division Multiplexing:** allows signals from multiple users to be sent over one line by sending a portion of data from each user at a time. Synchronous TDM allocates time to users in a fixed order; Asynchronous or Statistical TDM allocates time to users on demand.
- WAN** **Wide Area Network:** connects computers or networks over a large geographically area, such as connecting LANs together between offices, campuses, and connecting LANs to larger networks across cities and countries. Example technologies include: ATM, Frame Relay, X.25, PDH, SDH.

4.1 WAN Technologies

Some of those overlap between Physical layer, Data Link layer and Network layer.

- ATM** **Asynchronous Transfer Mode:** virtual circuit packet switching. Uses Statistical TDM. Built to replace Frame Relay and some parts of IP, but mainly used in WANs today. Typical speeds of 155Mb/s and 620Mb/s.
- FR** **Frame Relay:** virtual circuit packet switching. Built to replace X.25, speeds from 1.5Mb/s up to 44Mb/s. Still used.

PDH	Plesionchronous Digital Hierarchy: Uses TDM to create links between sites. Speeds from 2Mb/s up to 140Mb/s. Uses copper links. Some common speeds are referred to as T1, T2, T3 (in the US) or E1, E2 and E3 (in Europe and elsewhere).
PSTN	Public Switched Telephone Network: generally refers to the fixed, landline telephone network.
SDH	Synchronous Digital Hierarchy: Uses TDM to create links between sites. Built to replace PDH. Speeds from 155Mb/s up to 10Gb/s. Uses optical links.
X.25	OSI protocol X.25: virtual circuit packet switching. Old network technology with typical speeds of 64kb/s, upto 2Mb/s.

5 Physical Layer

AM	Amplitude Modulation: Used for sending analog data over analog signals.
ASK	Amplitude Shift Keying: Used for sending digital data over analog signals.
CRC	Cyclic Redundancy Check: An algorithm for performing error detection (similar to parity check, but more complex).
FEC	Forward Error Correction: method for correcting errors in transmissions by sending extra information such that the receiver can use that information to correct errors. No need for retransmissions. An example is to make use of the Hamming distance to detect and correct errors.
FM	Frequency Modulation: Used for sending analog data over analog signals.
FSK	Frequency Shift Keying: Used for sending digital data over analog signals.
NRZ	Non Return to Zero: Used for sending digital data over digital signals.
PCM	Pulse Code Modulation: Used for encoding analog voice into digital data.
PHY	Physical Layer.
PM	Phase Modulation: Used for sending analog data over analog signals.
PSK	Phase Shift Keying: Used for sending digital data over analog signals.

- SNR** **Signal to Noise Ratio:** measure of the strength of a signal compared to the amount of noise. The higher the value, the more chance the signal can be successfully decoded.
- STP** **Shielded Twisted Pair:** Copper transmission medium. Faster than UTP but more expensive and harder to install.
- UTP** **Unshielded Twisted Pair:** Copper transmission medium. Slower than STP but cheaper and easier to install.

6 Security

- AES** **Advanced Encryption Standard:** commonly used symmetric key encryption algorithm.
- DES** **Data Encryption Standard:** one of the main symmetric key encryption algorithms, although now is no longer recommended (since not as secure as AES).
- DoS** **Denial of Service:** an attack that attempts to make a computer or network unavailable to use. For example, a DoS attack on a web server would mean that no-one else can legitimately access the web server.
- HTTPS** **HTTP Secure:** Use of HTTP over TLS, to provide secure web access.
- IPsec** **Internet Protocol Security:** Protocol to allow encryption and authentication of IP datagrams.
- RSA** **Rivest, Shamir and Adleman:** the most commonly used public key encryption algorithm, named after the three inventors.
- SSL** **Secure Sockets Layer:** the older version of TLS.
- TLS** **Transport Layer Security:** enhancement to the transport layer to allow encryption of TCP traffic.

7 Organisations

- IANA** **Internet Assigned Numbers Authority:** manages the allocation of IP addresses, port numbers, protocol numbers and other identifiers used in the Internet. www.iana.org
- IEEE** **Institute of Electrical and Electronic Engineers:** professional and standards organisations – some of the standards include the IEEE 802 series on LANs and WANs: Ethernet, Wireless LAN, Token Ring, Bluetooth. www.ieee.org
- IETF** **Internet Engineering Task Force:** works on protocols and languages for the Internet, including defining many standards (IP, TCP, DNS, ...) as RFCs. www.ietf.org
- ISO** **International Organisations for Standardisation:** developed and published the OSI seven layer reference model, as well as many protocols within the layers. www.iso.org
- ITU** **International Telecommunications Union:** develops and publishes telecommunication standards, many at the physical and data link layer. Worked with ISO on OSI. www.itu.int
- RFC** **Request For Comment:** the name of documents produced by IETF. The documents are referred to by numbers, for example the TCP standard is RFC793.
- W3C** **World Wide Web Consortium:** standardises application layer protocols and languages such as HTTP, HTML, URIs and more. www.w3c.org

8 Message Types

The pieces of information sent by different protocols are referred to by many different names: messages, packets, datagrams, segments, PDUs, frames, and others. Although there is no formal agreement on the names used, where possible, I try to follow this convention:

- Applications send **messages**
- At the transport layer:
 - TCP sends **segments**
 - UDP sends **datagrams**
- At the network layer, IP sends **datagrams**
- The data link layer sends **frames**
- The physical layer sends **bits**.

Of course, the word **packet** may be used in some cases when talking about generic mechanisms, especially at the transport and network layer: packet switching, network packets, transport layer packets.