

22/11/19

UNIT-6

Transport Layer

* Transport layer

* Application layer

1. DNS Domain Name Server

2. Resource Records

3. Name Servers

* E-Mail

E-Mail Architecture

Services

* User Agents, Message formats and Delivery

Application Layer

* An application layer only interacting with sender and receiver system

* An application layer implements protocols like FTP, SMTP, HTTP, Telnet, SNMP and domain name server (DNS).

* Application layer along with HTTP connects to World wide Web server to carry and forward message request and responses.

* An application layer in a n/w maintains firewalls and application Gateways for secure message transfers.

DNS :- Domain Name Server (or) System (or) space

* Application layer of a computer n/w maintains domain name systems for providing services for the user query.

* DNS is invented in the year of 1983 with support of a hierarchical, domain based naming scheme and a distributed database system for implementing services to the end users in internet.

* A domain name system primarily used for mapping HostIP addresses and also used to address various resource records.

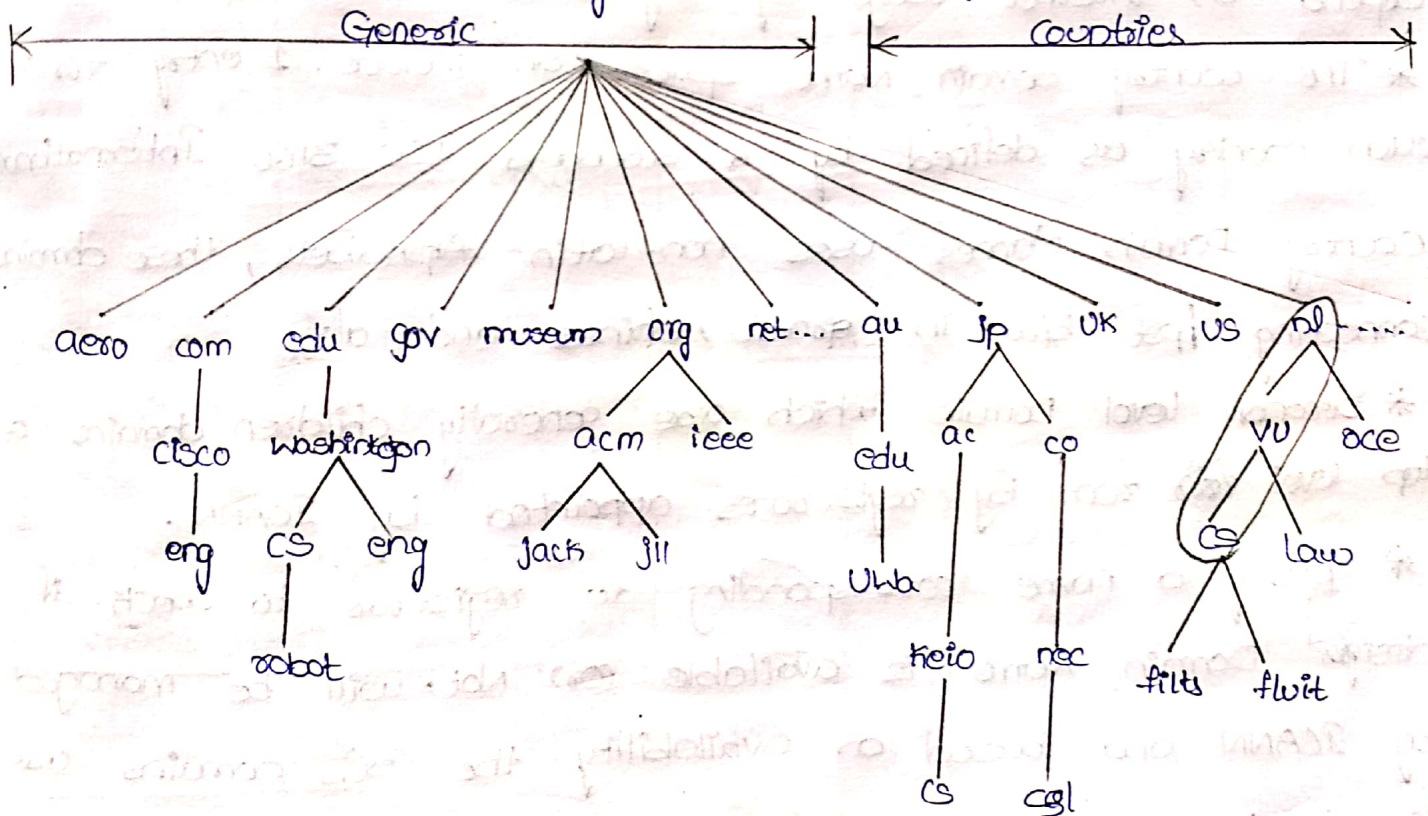
* Before 1983 handling a large databases which are connected to the internet is a non trivial problem.

* For the internet the naming hierarchy is managed by an organization called "ICANN" Internet Corporation for Assigned Names and Numbers.

* ICANN were started in the year of 1998 as part of Internet world wide web for the purpose of domain names assignment and resource record allocation.

* Totally internet is consisting 250 top level domains, where each domain covers many hosts.

* Each domain is consisting sub domains again



→ A portion of the internet domain name space.

* DNS Represents all internet Root and children domains in tree

structure which is represented in the above figure.

* In the above tree structure all domain names (top level domain) are directly connected to internet web server and the leaves of the tree represent sub domains where as sub domains

again causes further more divisions; but some specific sub domains have no further divisions they are directly links to the machines.

* A leaf domain may contain a single host (or) it may represent a company which is consisting thousands of host.

* The top-level domain of internet domain space is categorised into

→ Generic portion of Internet Domain Name Space

→ Countries portion of Internet Domain Name Space.

* The Generic portion of Domain name space is consisting the general domains which can be added furtherly in future depend on internet usage by organization.

* The country domain Name Space can include 1 entry for each country as defined by a standard ISO 3166 Internationalize

Country Domain Names uses non-latin Alphabets, these domains connecting host b/w in Arabic, chinese and also

* Second level Domain which are generally children domains of top level ~~(or)~~ ^{are} run by registrars appointed by ICANN.

* Getting a name corresponding to registrars to check if ^{desired} Domain name is available (or) Not, will be managed by ICANN and based on availability the sub domains are linked to registrars and also to the top-level domains.

Generic Top-level domains:— top-levels are run by registrars

Domain Name	Intended usage	started Year	Restricted
.com	commercial	1985	No
.edu	educational Institutions	1985	Yes
.gov	Government	1985	Yes
.int	international organization	1988	Yes
.mil	Military	1985	Yes
.net	Internet providers	1985	No
.org	Non profit organization	1985	No
.aero	Aerospace	2001	Yes
.biz	Business	2001	No
.coop	co-operatives	2001	Yes
.info	informational	2002	No
.museum	Museums	2002	Yes
.name	in people	2002	No
.pro	professionals	2002	Yes
.cat	Catalan	2005	Yes
.jobs	employment	2005	Yes
.mobi	Mobile devices	2005	Yes
.tel	contact details	2005	Yes
.travel	Travel Industry	2005	Yes

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 * Each domain is named by path from leaves to root the components are separated by dots.

eg:- ~~cs.vu.nl~~ cs.vu.nl

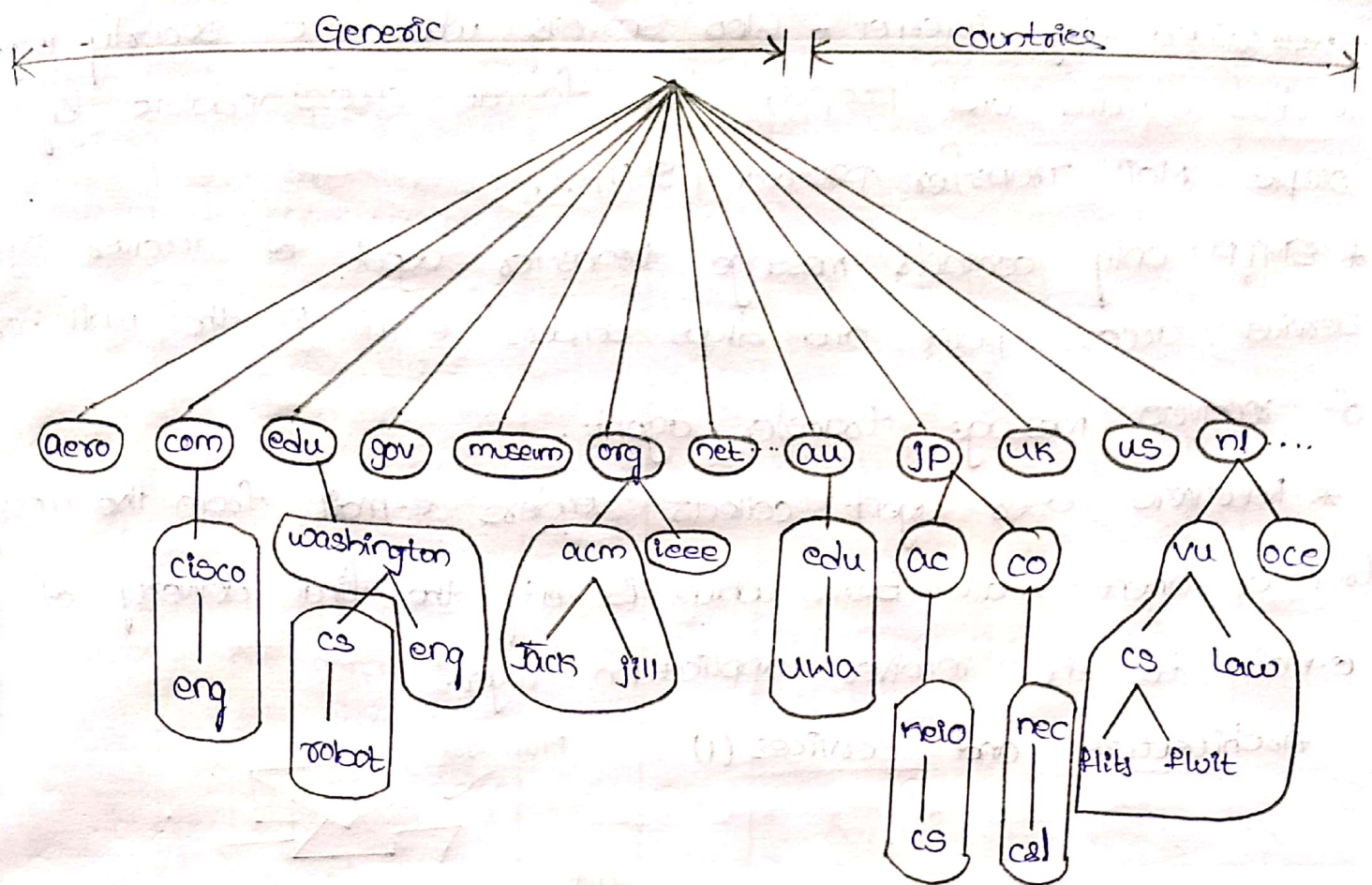
* The above statement is consisting the top level domain is "nl" (Netherlands), "vu" is sub domain to 'nl' which is

— beije university and 'cs' is a leaf to the 2nd third-level domain which is school of computer science.

* To create a new domain permission is required from the domain root, registrations, internet domain space availability should be confirmed by related country and finally issued by ICANN. physically domain data stored

Domain (Resource Records):-

TYPE	Meaning	Value
SOA	start of authority	parameters for this zone
A	IPV4 address of a host	32-Bit integer
AAAA	IPV6 address of a host	128-Bit integer
MX	Mail exchange	priority, domain willing to accept email
NS	Name server	Name of a server for this domain
CNAME	canonical name	Domain name
PTR	pointer	Alias for an IP address
SPF	Sender policy framework	Text encoding of mail sending policy
SRV	service	Host that provides it
TXT	Text	Descriptive ASCII text.



part of DNS Name space is divided into zones which

are serviced by
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E-mail:- (Electronic-Mail)

- * E-mail are basically introduced with the purpose of file transfer and specifically for resource sharing.
- * In Internet domains emails (or) launched with the support of basic protocol FTP and SMTP.

* Emails are prepared and initiated at the side of sender source along with WS World Wide Web with specific format.

E-mail Architecture:-

- * At the side of senders system user agent are programs prepared for submission of senders data with the rules and regulations of SMTP. User agent application programs only interacts with senders host.

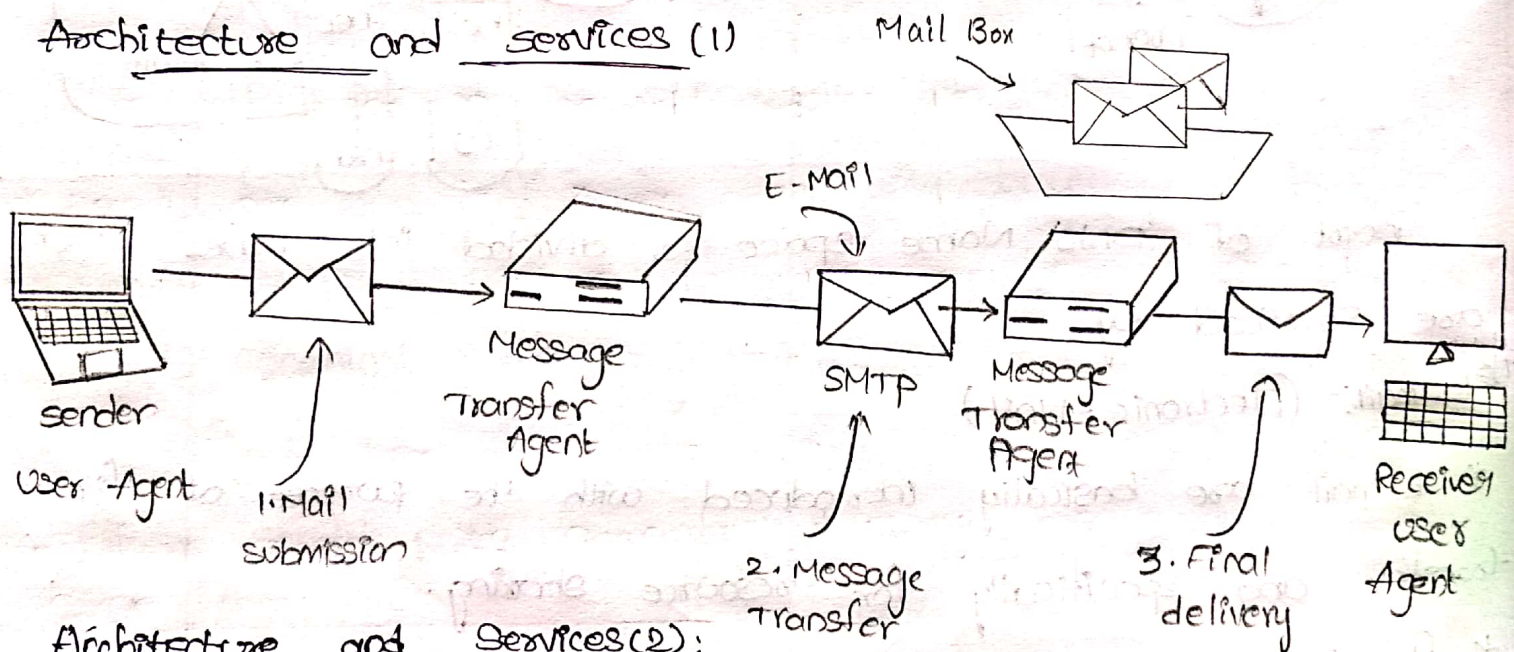
Message transfer agents are the application programs

maintained by Internet - Web servers which use security receive senders e-mails and prepares the -format understandable by simple Mail Transfer Protocol (SMTP).

* SMTP only contacts message transfer agent of receiver system service access point and drops senders e-mail in the mail box of receiver's message transfer agent.

* Receiver's user agent collects senders e-mail from the message transfer agent mail Box which is only the final delivery of e-mail to the receiver application layer.

Architecture and services (1)



Architecture and Services (2):

SAP - service Access Point

snail
message

Mr. Daniel Dumkopf
18 Willow Lane
White plains, NY 10604

United Gizmo
180 Main St
Boston, MA 02120
Sept. 1, 2010
Subject: Invoice 1081

Dear Mr. Dumkopf,
Our computer records show that you still have not paid the above Invoice of \$0.00. please send us a check for \$0.00 promptly.

Yours truly
United Gizmo

(a)

Envelope

Header

Body

Name: Mr. Daniel Dumkopf
Street 18 Willow Lane
city: White plains
state: NY
Zip code: 10604
priority: urgent
Encryption: None

From: United Gizmo
Address: 180 Main St.
Location: Boston, MA 02120
Date: Sept 1, 2010
Subject: Invoice 1081

Dear Mr. Dumkopf,
Our computer records show that you still have not paid the above Invoice of \$0.00. please Send us a check for \$0.00 promptly

Yours truly
United Gizmo

(b)

Envelope

Message

Envelopes and messages. (a) paper mail (b) Electronic mail.

Header	Meaning
TO:	Email address(es) of primary recipient(s)
CC:	Email address(es) of secondary recipient(s)
Bcc:	Email address(es) for blind carbon copies
From:	person or people who created the message
Sender:	Email address the actual sender
Received:	Line added by each transfer agent along the route
Return-path:	can be used to identify a path back to the Sender.

Message Formats (2)

Header	Meaning
Date:	The data and time the message was sent
Reply-TO:	Email address to which replies should be sent
Message-Id:	Unique no. of referencing this message later
In-Reply-TO:	Message-Id of the message to which this is a reply
References:	Other relevant Message-Ids
Keywords:	User-chosen Keywords
Subject:	Short summary of the message for the one-line display

Some fields used in the RFC 5322 message header.

* Emails are supporting MIME objects (Multipurpose Internet Mail Extensions) to create the message reliable and effectively from one sender to one (or) more receivers

* The device message formats of email according to RFC 5322 the MIME objects are added to message headers.

Message Formats (3)

Headers	Meaning
MIME-version:	Identify the MIME version
Content-Description:	Human-readable string telling what is in the msg.
Content-Id:	Unique identifier
Content-Transfer-Encoding:	How the body is wrapped for transmission
Content-Type:	Type and format of the content.

Message headers added by MIME.

Final Delivery (1):-

Command	Description.
CAPABILITY	List server capabilities
STARTTLS	Start secure transport (TLS; see chap. 8)
LOGIN	Log on the server
AUTHENTICATION	Log on with other method
SELECT	select a folder
EXAMINE (ready to send data)	select a read-only folder
CREATE	create a folder
DELETE	Delete a folder
RENAME	Rename a folder
SUBSCRIBE	Add folder to active set
UNSUBSCRIBE	Remove folder from active set.

IMAP (version 4) commands.

Final Delivery (2):-

LIST	List the available folders
LSUB	List the active folders.
STATUS	Get the status of a folder
APPEND	Add a message to a folder
CHECK	Get a checkpoint of a folder
FETCH	Get messages from a folder
SEARCH	Find messages in a folder
STORE	Alter message flags
COPY	Make a copy of a message in a folder
EXPUNGE	Remove messages flagged for deletion
UID	Issue commands using unique identifiers
NOOP	Do nothing
CLOSE	Remove flagged messages and close folder
LOGOUT	Log out and close connection.

* Final Delivery is ready to receive by receiver agent at the receiver system.

* Now a days the user agents on pc, Laptop (or) Mobile is likely on the different machine rather than ISP.

* The final Delivery of message is almost receives the message by the receiver but still IMAP protocol has to be called by the receiver agents.

* IMAP is Internet message access protocol define with RFC 5301 Version (4) standard.

* IMAP is similar to SMTP, to use IMAP the mail server runs an IMAP server that listens to the port 143 and the user agents runs as IMAP clients. The client can connects to the server by issuing commands.

* IMAP is an improvement to the pop3. (Post Office Protocol)

pop3 is an initial version for message transfers through emails according to RFC 1939.

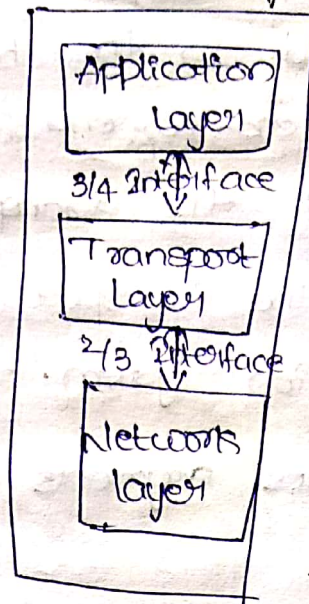
12/2/19 Transport Layer:-

* Transport Layer is works along with N/T Layer and both together implements reliable packet transmission as part of protocol hierarchy in a computer Network. Transport layer lies b/w

1. Application and Network layer of a N/T architecture.

* Transport layer access the services using 3/4 interface from the application layer and forward segments to the N/T layer using 2/3 Interface.

configuration of Transport Layer:



Transport Layer Services:-

- * Services provided to the upper layers
- * Transport layer implements services to the above layer using application / transport interface and also provides services to the below layers by transport / Network interface.

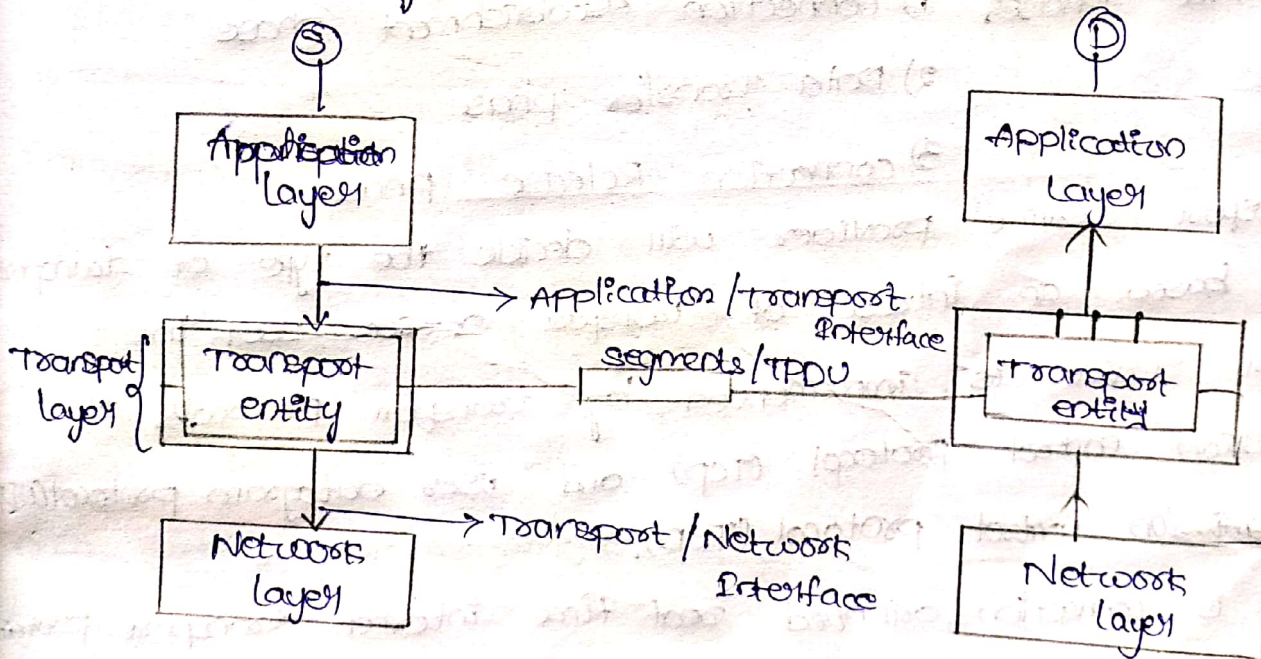


Fig:- N/I, Transport and application layer.

1) The ultimate goal of transport layer is to implement efficient, reliable and far cost effective data transmission to the user.

2) The S/W end entity / H/W within transport layer is called

transport entity. Generally the transport entities is used by transport layer is located in the kernel of OS.

3) A transport layer provides end-to-end functionality which needs the transport entity of the transport layer can be able to communicate with the transport entity of transport layer of source to Destination system. The transport layer transport entities only prepares segments which is the data format of transport layer.

4) There are two different types of transport services implemented by transport layer. These are connection oriented transport service and connection less transport service.

5) In both cases of transport services are implemented by using three phases

- 1) connection establishment phase
- 2) Data Transfer phase
- 3) connection Release phase.

6) Transport Service provider will decide the type of transport service based on interest of transport service user. The transport service is implemented by transport protocols of transmission control protocol (TCP) and user datagram protocol (UDP).

Transmission Control protocol (TCP): (Telegram, telephone)

* TCP is connection oriented real time internet transport protocol which is specifically designed to provide a reliable end to end byte stream protocol. TCP was designed according to RFC 793 and in the year of 1981 which is designed to adopt properties dynamically of the internet.

* TCP is a reliable protocol used to implement connection

oriented services and it is possible because of prominent design of TCP. TCP connection has its own 32 bit sequence number in the ethernet and consisting 56 Kbps leased lines.

- * The sending and receiving TCP entities exchange data in form of segments. The TCP segments consist a 20 byte header followed by 0 (or) more data bytes.

- * Each segments include TCP header, must fit in the ~~65,515~~ 65,515 byte IP payload and each link has an MTU (Maximum Transfer Unit).

- * In TCP data transportation the receiver will send an acknowledgment back to the sender so that it guarantees the reliable data transportation.

- * TCP specifies time stamp option so that the data is deliver from sender to receiver within specified timing values.

- * TCP can manages effectively congestion control and retransmissions, TCP timer and connection management

User Datagram protocol (UDP); - eg:- postcard

- * UDP is used to implement connection less services and which is an important internet transport protocol.

- * UDP protocol in a n/w will not give guarantee regarding reliable data transmission in communications.

- * UDP is a simple connection less protocol which runs in operating system and UDP typically runs in user space.

- * UDP provides a way for application to send encapsulated IP datagrams without having to establish a connection.

- * UDP is describe according to RFC 768

- * UDP transmits segments consisting of an 8 byte header

Followed by payload.

* The UDP header is consisting two parts to serve the communication end points within source and destination machine.

* The real time example for UDP is postal system.

* UDP header length includes 8 byte header and data. The minimum length is 8 bytes to cover the header and maximum length is 65535 bytes.

* In UDP header, UDP length field and checksum field is presented. UDP length field is includes 8 byte header and data. Checksum field is an optional field provided for extra reliability.

