ROHINI

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UNIT-4

MOBILE TRANSPORT AND APPLICATION LAYER

(4)

UNIT - IV

MOBILE TRANSPORT & APPLICATION LAYERS

Mobile TCP – WAP – Architecture – WDP – WTLS – WTP – WSP – WAE – WTA Architecture – WML.

I. ~~MOBILE TCP~~:

II. WAP (WIRELESS APPLICATION PROTOCOL)

↳ The Wireless Application Protocol was founded in June 1997.

↳ The basic objective of the WAP forum and now of the OMA one is to bring diverse Internet contents and other data services to digital cellular phones & other wireless mobile terminals.

↳ A protocol suite should enable global wireless communication across different wireless network technologies.

Eg: GSM, CDPD, UMTS etc.

↳ The forum is embracing and extending existing standards & technologies of the internet wherever possible & is creating a framework for the development of contents & applications that scale across

a very wide range of wireless bearer networks & wireless device types.

1. Interoperable :-
Allowing terminals and software from different vendors to communicate with Networks from different providers.

2. scaleable :-
Protocols and services should scale with customer needs and no. of customers.

3. Efficient
Provision of QoS suited to the characteristics of the wireless & mobile Networks.

4. Reliable
provision of a consistent & predictable platform for deploying services

5. Secure
Preservation of the integrity of user data, protection of devices & services from security problems.

↳ WAP enabled mobile phones.

↳ All specifications are available from OMA

WAP ARCHITECTURE:-

↳ It's a protocols and components, and compare this architecture with a typical Internet Architecture when using WWW.

↳ The basis for transmission of data is formed by different bearer services.

↳ WAP does not specify bearer services → But it uses existing data services and will integrate feature services.

Examples:

Message services, such as short message service of Gsm. circuit switched data, such as general packet radio service in Gsm. or packet switched data, such as general packet radio service in Gsm.

↳ many other bearers are supported, such as cDPD IS-136.

↳ No, special interface has been specified between the bearer service & the next higher layer.

↳ The transport Layer with its wireless datagram protocol (WDP) & the additional wireless control message protocol (WCMP).

↳ The transport layer offers a bearer independent, consistent datagram oriented service to the higher layers of the WAP architecture.

↳ communication is done transparently over one of the available bearer services.

↳ The transport layer service access point (T-SAP) is the common interface to be used by higher layers independent of the underlying Network.

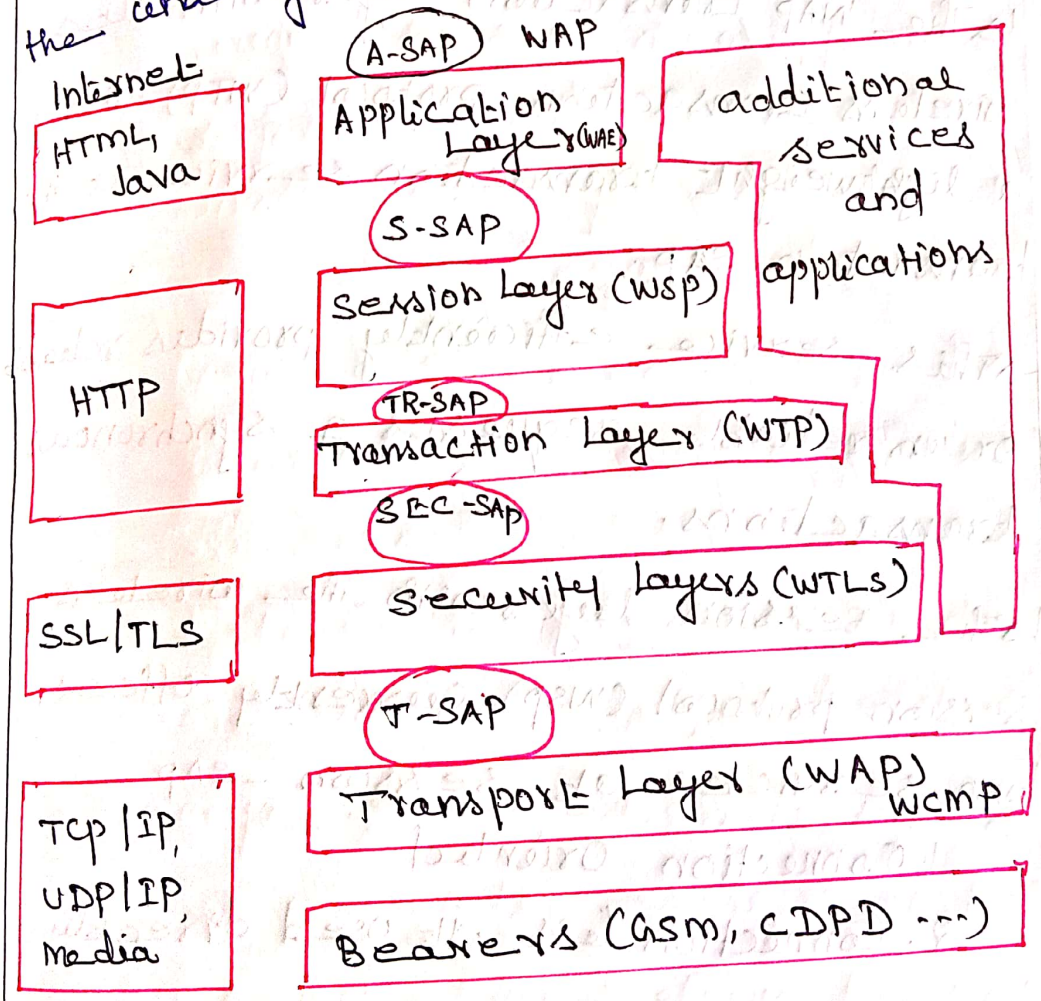

fig: Component & interface of the WAP 1.x architecture.

↳ The security layer with its wireless transport layer security protocol WTLS. Offers its service at the security SAP.

↳ WTLS is based on the transport layer security already known from the WWW.

↳ WTLS has been optimized for use in wireless networks with narrow-band channels.

↳ It can offer data integrity, privacy, authentication & denial-of-service protection.

↳ The WAP transaction layer with its wireless transaction protocol (WTP). It uses a lightweight transaction service at the transaction SAP.

↳ This service efficiently provides reliable or unreliable requests & synchronous transactions.

↳ The session layer with the wireless session protocol (WSP) currently offers two services at session-SAP.

1. Connection Oriented
2. Connection less. It used directly one top of WDP.

↳ A special service for browsing the web has been defined that offers HTTP 1.1 functionality.

↳ The Application layer with the wireless application environment (WAE)

↳ It uses a framework for the integration of different WWW & mobile telephony application

↳ The main issues here are scripting Languages, special markup Languages, interfaces to telephony applications & many content formats adapted to the special requirements of small handheld wireless devices.

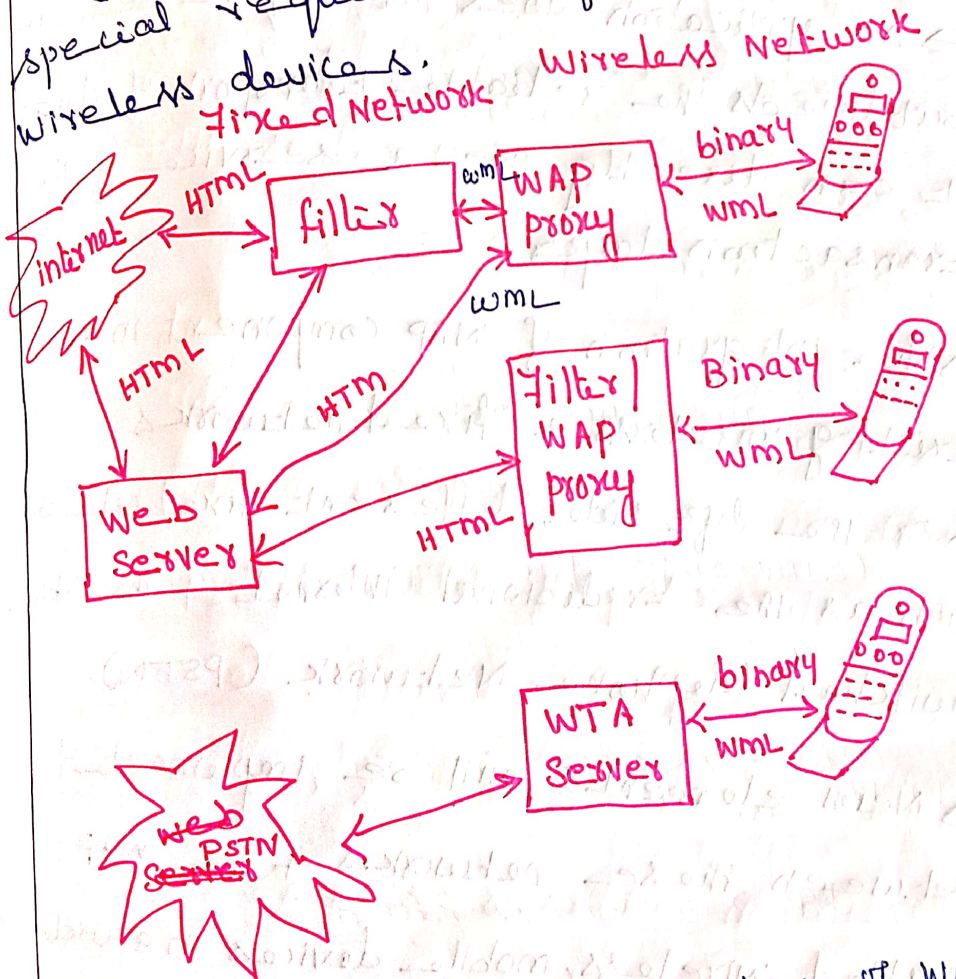

fig: Examples for the integration of WAP components.

↳ The WAP transport layer together with the bearers can be compared to the services offered by TCP or UDP over IP and different media in the internet.

↳ A bearer in the WAP architecture already offers IP services then UDP is used as WDP

↳ The functionality of session & transaction layer can roughly be compared with the role of HTTP in the web architecture.

↳ WAP does not always force all applications to use the whole protocol architecture.

↳ An application does not require security but needs the reliable transport of data. It can directly use a service of the transaction layer.

↳ The integration of WAP components in to existing wireless & fixed networks

↳ On the left side, different fixed network such as the traditional internet & the public switched telephone Network (PSTN).

↳ New elements will be implemented between these networks & the WAP enabled wireless, mobile devices in a wireless network on the right-hand side.

↳ The current WWW in the internet offers web pages with the help of HTML & Web servers.

↳ To be able to browse these pages or additional pages with handled devices, a wireless markup language (WML).

↳ The special filters within the fixed network can now translate HTML into WML.

↳ Web servers can already provide pages in WML, or the gateways between the fixed and wireless network can translate HTML into WML.

↳ These gateways not only filter pages but also act as proxies for web access.

↳ WML is additionally converted in to binary WML for more efficient transmission.

↳ A special gateway can be implemented to access traditional telephony services via binary WML.

↳ The wireless telephony application (WTA) server translates.

Eg: Signaling of the telephone network into WML events displayed at the handheld device.

WDP (WIRELESS DATAGRAM PROTOCOL)

The wireless datagram protocol (WDP) operates on top of many different bearer service capable of carrying data.

The T-SAP WDP offers a consistent datagram transport service independent of the underlying bearer.

↳ The closer the bearer service is to IP, the smaller the adaptation can be.

↳ If the bearer already offers IP services, UDP is used as WDP. WDP offers more or less the same services as UDP.

↳ WDP offers source & destination port numbers used for multiplexing & demultiplexing of data respectively.

→ The service primitive to send a datagram is TDUnit-data.req with the destination address (DA).
destination port (DP),
Source address (SA)
Source port (sp) & user Data (UD).

↳ Destination & source address are unique addresses for receiver and sender of the user data.

↳ These could be MISISDN's, (telephone) IP address, or any other unique identifiers,

↳ The T-DUnitdata.ind service primitive indicates the reception of data. here destination address & port are only operational optional Parameters.

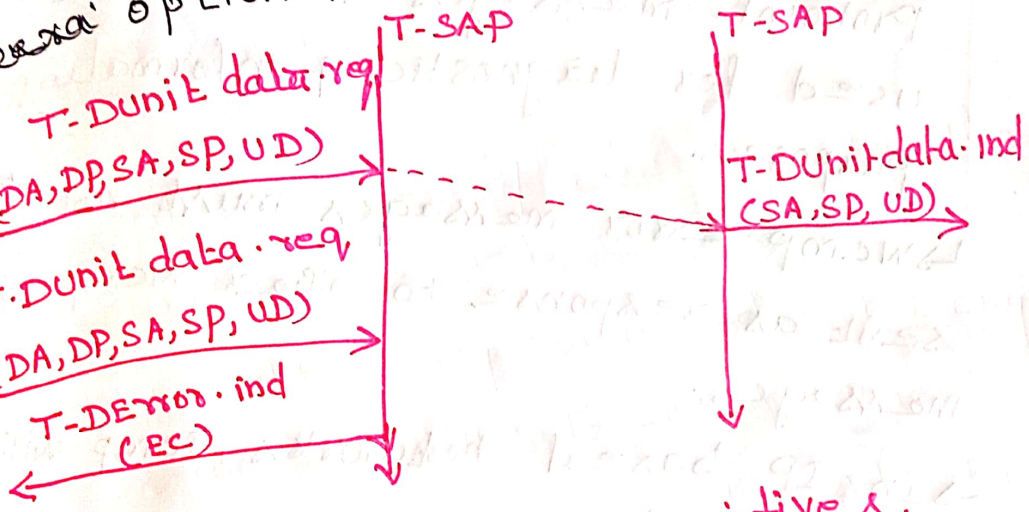

fig: WDP service primitives.

↳ If a higher layer requests a service the WDP cannot fulfill, this error is indicated with the T-DError.ind service primitive.

↳ An Error code (EC) is returned indicating the reason for the error to the higher layer.

↳ WDP is not allowed to use this primitive to indicate problems with the bearer service.

↳ WDP datagrams are sent from one WDP entity to another, the wireless Control message protocol (WCMP) provides error handling mechanisms for WDP.

↳ WCMP contains control messages that resemble the Internet control message protocol. messages & can also be used for diagnostic & informational purposes.

↳ WCMP error messages must not be sent as response to other WCMP error messages.

↳ In IP-based networks, Icmp will be used as WCMP.

↳ WCMP messages are destination unreachable parameter problem message too big, reassembly failure or echo request/reply.

↳ WDP management entity support WDP & provides information about changes in the environment.

↳ If the bearer already offers IP transmission, WDP relies on the

segmentation & reassembly capabilities of the IP layer.

WTLS (Wireless transport layer Security)

↳ If requested by an application, a security service, the wireless transport layer security.

↳ The WTLS can provide different levels of security & has been optimized for low bandwidth, high-delay bearer networks.

↳ WTLS takes in to account the low processing power & very limited memory capacity of the mobile devices for cryptographic algorithms.

↳ WTLS support datagram & connection oriented transport Layer protocols.

↳ WTLS took over many features & mechanisms from TLS, but it has an optimized handshaking b/w the peers.

↳ The session establishment consists of several steps, the sequence of service primitives needed for so-called full hand shake.

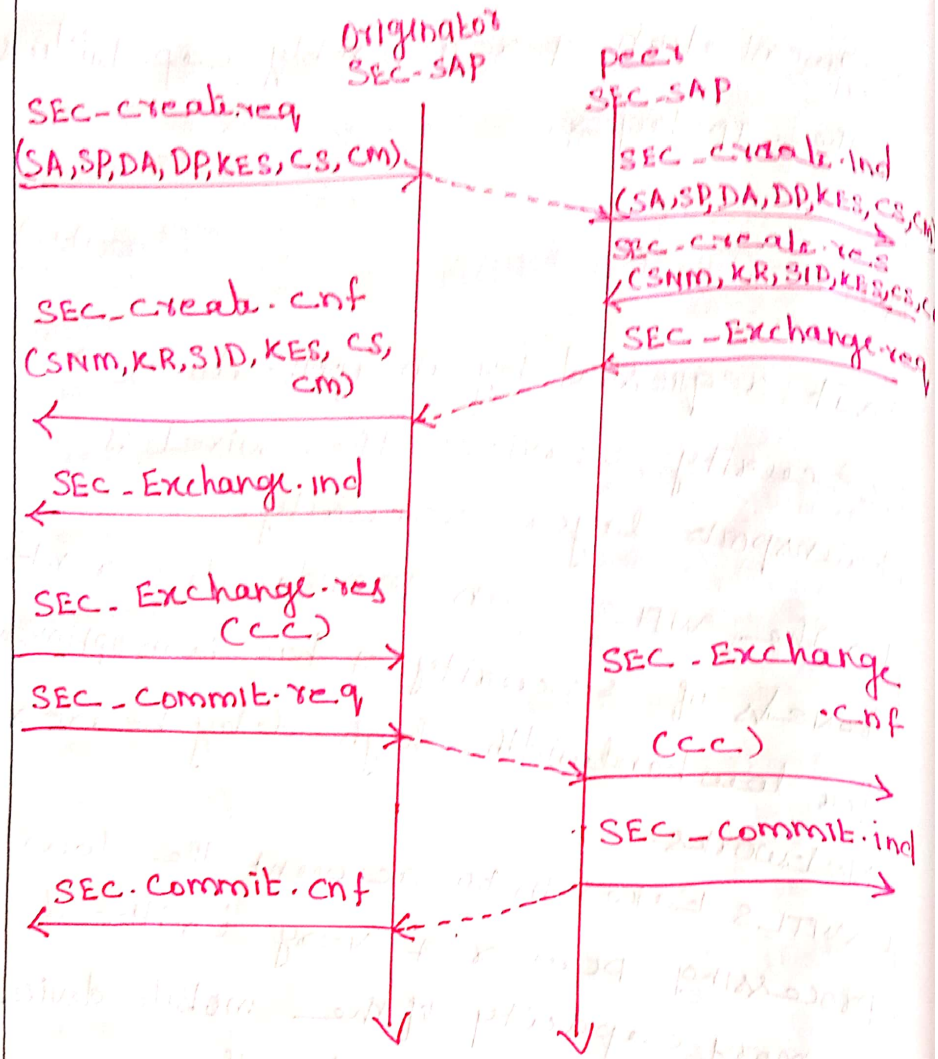

fig: WTLS establishment a secure session.

↳ The first step is to initiate the session with the SEC-create primitive parameters are source address (SA).

→ source port (SP) of the originator.

→ Destination address (DA) & destination port (DP) of the peer.

↳ The originator proposes a key Exchange suite (KES).

→ A cipher suite (CS) & a compression

method (CM)

→ The peer answers with parameters for the sequence Number mode (SNM).

the key refresh cycle (KR).

↳ The session identifier (SID) & the selected key Exchange suite (KES), cipher suite compression method (CM).

→ The peer also issues a SEC-Exchange primitive.

→ This indicates that the peer wishes to perform public key authentication with the client.

→ The peer requests a client certificate (CC) from the originator.

Mobile TCP

It is important to address the problem of occurrence of lengthy and frequent disconnections.

The Mobile-TCP has same goals as I-TCP and snooping TCP, to avoid the sender window from disconnection or shrinking if bit errors cause but not the congestion causes current problem.

↳ This Mobile-TCP aims to improve system throughput

↳ Mobile TCP lower delay time.

↳ M-TCP maintains end-to-end semantics TCP.

↳ when there is frequent or lengthy disconnections in network then mobile-TCP may be suitable to compensate it and increases system throughput.

↳ The M-TCP also segments TCP connection in to two as I-TCP. but an unmodified TCP is used on standard host-supervisory host (SH) connection.

→ The M-TCP achieves low bit error rate, in case of wireless links.

↳ The supervisory host (SH) supervises all the packets transmitted to mobile host and ACK's sent by MH's.

→ The ACK is not received from MH then SH decides that the MH is disconnected.

→ It sets the sender's window size as '0' and sender is ~~disconnected~~ now said to be in persistant mode.

The sender's state remain constant whatever be the time for which the receiver is disconnected. This is persistant mode.

↳ An adapted TCP is used by wireless link and it is capable of recovering from packet losses.

↳ It does not use slow start. The M-TCP also needs a bandwidth manager to provide fair sharing over wireless links.

Merits of M-TCP

1. Maintains end-to-end TCP semantics.
2. It can avoid unwanted retransmissions in case of MH disconnections
3. Lost packets will be retransmitted automatically.

Improvement in TCP performance:

A client & server program located at different points.

→ The client program uses a temporary port number & the server program uses permanent port number.

↳ This port numbers are used for authorized identification.

Protocol	port	Description
TELNET	23	Terminal Network
users	11	Active users
SMTP	25	simple mail transfer protocol
RPC	111	Remote procedure call
DNS	53	Domain name server

Improved TCP services:-

1. stream delivery services
   - ↳ sending & receiving the buffers.
   - ↳ segments.
2. Full duplex service
3. Connection oriented service
4. Reliable service.

1. Stream delivery service:-

↳ TCP is also known as stream oriented Protocol.

↳ An application program or process transmi a group of bytes to user datagram protocol for delivery purposes.

↳ There are may be several groups of data sent to UDP but the UDP considers only one group of data at a time.

↳ TCP monitors the sending process & receiving process for an ordered sequence of bytes transmission & reception of the exact replica of the data stream.

↳ Sending & receiving processes TCP requires buffers for data storage.

↳ Each direction there is sending & receiving buffers available.

↳ The buffer at the receiver end has to receive the corresponding data streams.

↳ TCP, the IP acts as a service provider for and it has to send data/message in the form of ordered bytes.

↳ TCP has to get the data bytes & it groups them into packet from known as segments.

(ii) Full duplex service:

↳ The data flow which is possible at a time in both directions and it is known as full duplex service.

↳ hence each TCP will have both transmitting and receiving buffer & the data segments are transmitted in both directions.

(iii) connection oriented services:

↳ TCP itself is a connection oriented protocol. when two processes (A & B) at different sites want to communicate a sequence are,

↳ TCP of A informs the TCP of B & gets approval status from TCP of B.

↳ TCP of A & TCP of B exchanges data streams in both directions.

↳ If all data are sent and buffer is in empty condition the TCP's of A & B processes will destroy their buffers. Such a kind of sending & receiving of data is highly improved with TCP/IP.

(iv) Reliable service:

TCP is a well known reliable transport protocol.

↳ the safe & accurate reception of data is carried with the help of this TCP protocol.

1. Retransmission timer
2. Persistence timer
3. keep alive timer
4. Time-Waited timer.

TCP also takes care to avoid congestion in the network.

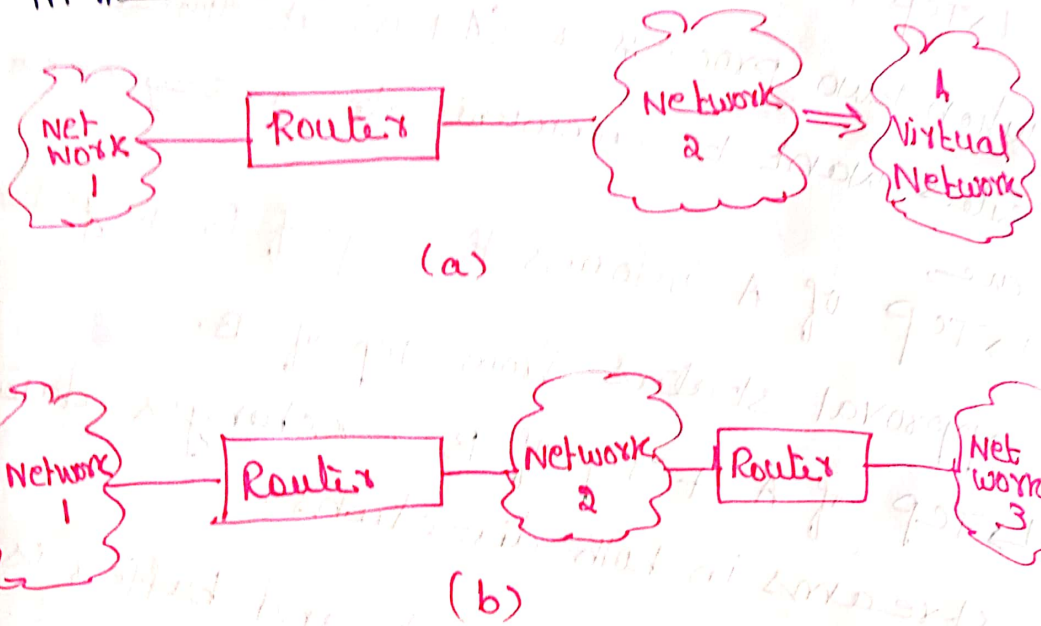

fig: Internet examples a) Two N/w interconnected
b) Multiple N/w interconnected

→ The 2 interconnected set of networks is seen as one logical N/w & a router enables communication between two networks.

↳ more than one router may be used in case of multiple N/w interconnected.

1) From the network point of view a router is a normal host.

2) From user point of view the routers are invisible and they form one large internetwork.

The Internet protocol (IP) address comprises of two parts and the IP address = <network number> <host number>.

This Nlw number is unique through out the internet & the host number is assigned by the organization that controls the network identified by the Network Number.

Adaptation of TCP window :-

↳ A three-way handshake is required for establishment of the 1st TCP session.

↳ using a SYN packet the local system communicates with the remote end.

↳ It sends an initial sequence number to the remote end.

↳ Receiving this at the receiving end, an Ack of the initial sequence number is sent back to local sln as response of the remote system.

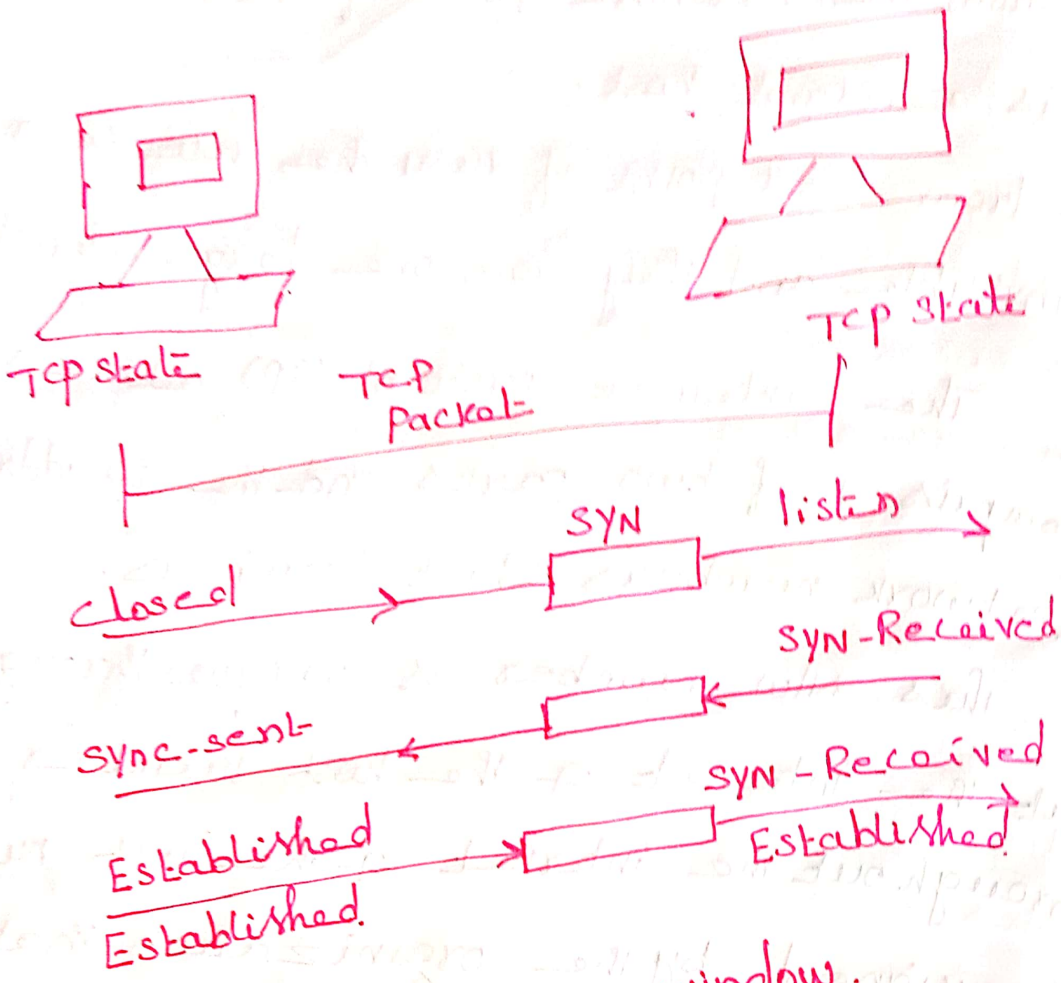

fig: Adaptation of tcp window.