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Assignment No : 1

Q.1 Explain in detail with merits and demerits.

a) Snooping TCP (S-TCP)

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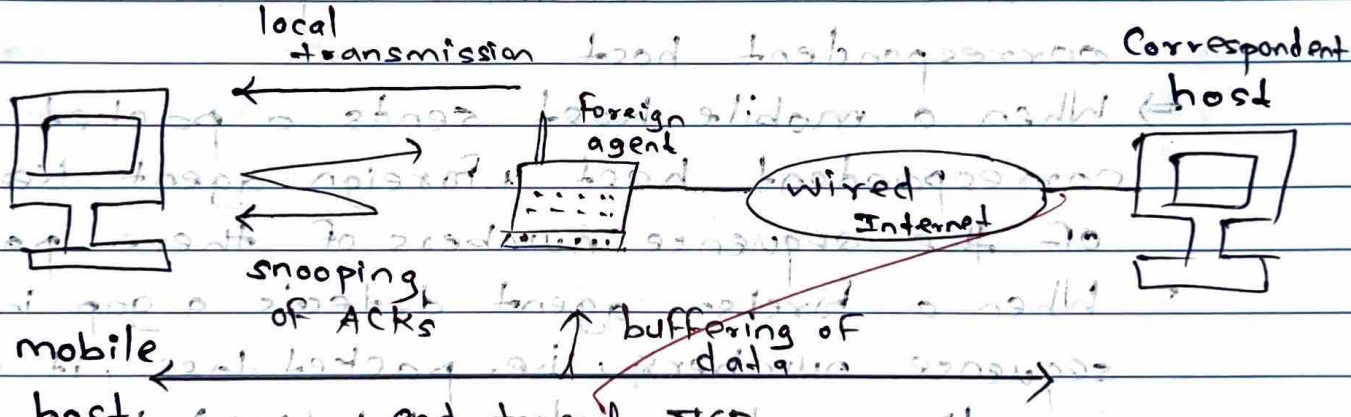
- Snooping TCP works completely transparently and leaves the TCP end-to-end connection intact.
- It overcomes some drawback of Indirect TCP (I-TCP)



- Snooping TCP works as follows :

1) Correspondent host sends a packet to mobile host

⇒ Correspondent host sends a pack to mobile host via a wired TCP connection. The access point buffers the packet sent by correspondent host.

- Access point also snoops on the packet in both directions to recognize acknowledgements

- Once the mobile host receives the packet, it sends an acknowledgment and this ACK also passes through the access point.
- IF the access point doesn't receive any ACK from a mobile host within certain amount of time, then it retransmits the packet from its buffer, performing a much faster retransmission compared to the fixed host

2) Mobile host transmits a packet to a correspondent host

⇒ When a mobile host sends a packet to correspondent host, foreign agent keeps track of the sequence numbers of these packet.
- When a foreign agent detects a gap in the sequence numbers, i.e. packet loss, it sends a negative acknowledgment (NACK) to the mobile host.
- Once the mobile host receives the NACK, it can retransmit the missing packet immediately.

- Merits of Snooping TCP

⇒

1) The end-to-end semantics are preserved
2) Correspondent host need not be changed, most of the enhancements are done in foreign agent.

- Demerits of Snooping TCP

⇒

1) Using NACK between foreign agent and the mobile host assumes additional mechanisms on mobile host. This approach is no longer transparent for arbitrary mobile hosts.
2) If user applies end-to-end encryption, I-TCP fails.

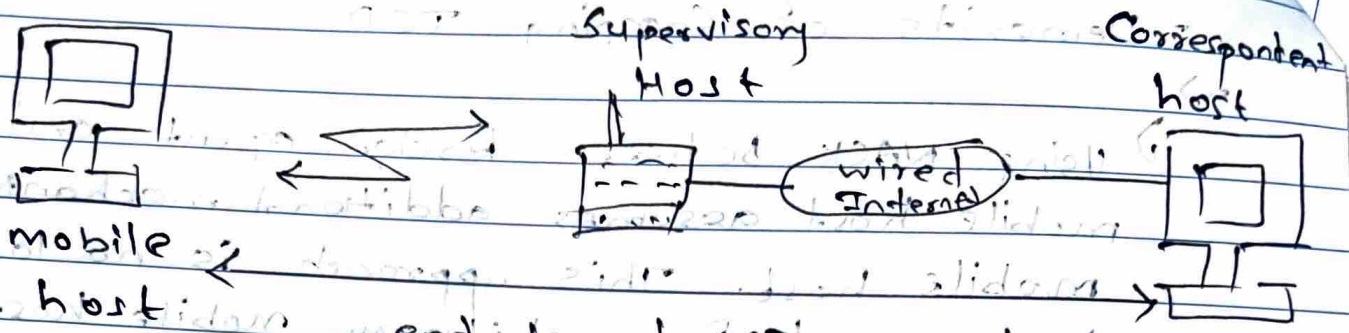
2) Mobile TCP (M-TCP)

⇒ The occurence of lengthy and/or frequent disconnection is the major problem in wireless networks.

- M-TCP aims
  1) To improve overall throughput
  2) To lower the delay
  3) To maintain end-to-end semantics of TCP
  4) To provide a more efficient handover

- Working of M-TCP

⇒ Packets are sent to the mobile host by a correspondent host.
- If any packet is lost on the wireless side, then the original sender retransmits the packet.
- Thus, end-to-end semantics are maintained
- All the packets sent to MH are monitored by the SH and are acknowledged by the MH via ACK packets



- After a set amount of time, if the SH still does not receive any ACK, it assumes that the MH is disconnected.
- SH sets sender's window size to zero and thus chokes the sender.
- Once the window size is set to zero, the sender is forced to go into a persistent mode.
- In the persistent mode, independent of the receiver's period of disconnected state, the state of the sender will not change.
- Once the SH detects the connectivity again, the sender's window size is again set to the old value, enabling the sender to send at full speed.

Merits of M-TCP:

⇒

1) End-to-end semantics are maintained. SH itself doesn't send any ACK, it only forwards ACKs that were received from the MH.
2) It avoids unnecessary retransmissions, if the MH is disconnected.

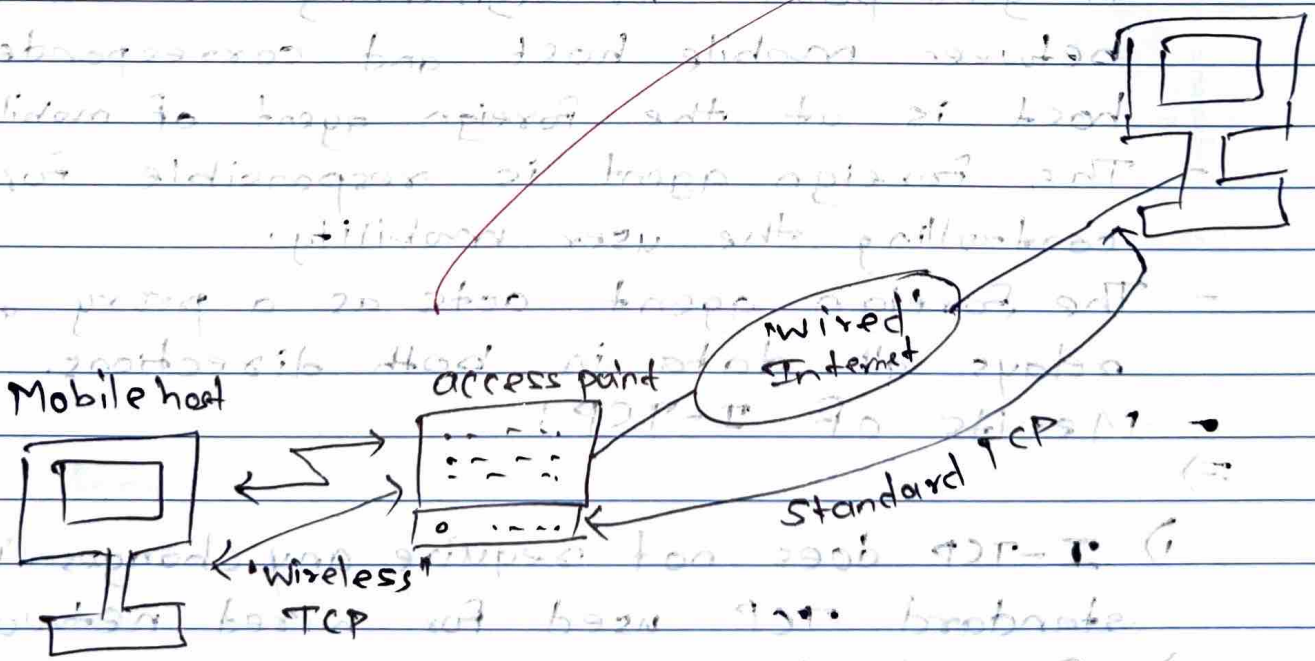
- Demerits of M-TCP

⇒

1) Losses on wireless link are propagated to the wired link. this is because SH does not act as a proxy and does not buffer the packets and is not responsible for local retransmission.
2) It requires new network element like bandwidth manager.

3) Indirect TCP (I-TCP)

⇒ There are two facts : one is that TCP performs poorly together with wireless link and second is that TCP within the fixed network cannot be changed.



- Above figure shows an example with a mobile host connected via a wireless link and an access point to the wired internet where the correspondent node resides. The correspondent node could also use wireless access.
- I-TCP separates a TCP connection into two parts:
  1) Fixed part is between the mobile support router and the fixed host over the fixed network.
  2) Wireless part is between the MH and its access point over the wireless medium.
- Standard TCP is used between the fixed computer and access point.
- A good point for segmenting the connection between mobile host and correspondent host is at the foreign agent of mobile IP.
- The foreign agent is responsible for controlling the user mobility.
- The foreign agent acts as a proxy and relays all data in both directions.
- Merits of I-TCP:

1) I-TCP does not require any changes in the standard TCP used for wired networks.
2) Due to the partioning transmission errors on the wireless link cannot propagate into the fixed networks

Demerits of I-TCP

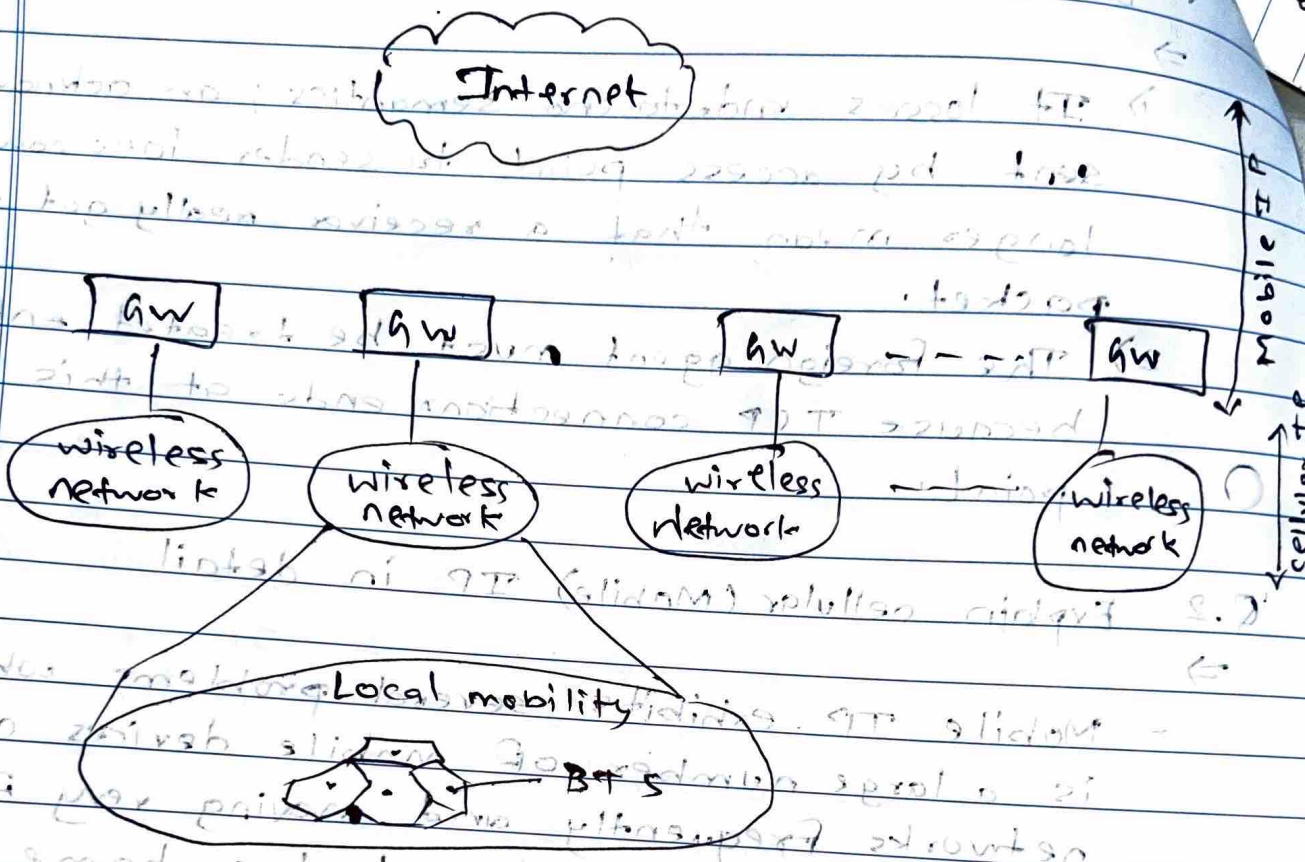
⇒

1) It losses end-to-end semantics; an acknowledgment sent by access point to sender does now no longer mean that a receiver really got a packet.
2) The foreign agent must be treated entity because TCP connections ends at this point.

2 Explain cellular (Mobile) IP in detail

⇒

- Mobile IP exhibits several problems when there is a large number of mobile devices changing networks frequently and moving very fast.
- In such cases, a high load on home agents and on the network is generated by registration and binding update message.
- Mobile IP basically designed for macro level mobility and relatively slow moving hosts.
- Cellular IP (CIP) is a new robust, simple and flexible protocol for highly mobile hosts.
- CIP complements Mobile IP by supporting local mobility.
- It can accomodate large number of users by separating idle hosts from active hosts.



- CIP architecture :

⇒ The architecture of cellular IP is shown in above figure.

- It consists of three major components :-

1) cellular IP gateway (GW)
2) Cellular IP node or base station (BS)
3) Cellular IP mobile host (MH)

Q.3 Explain MIPv6

⇒

- The first IP mobility protocol, Mobile IP was developed for IPv4.
- The mobile IP protocol solves the TCP/IP Layer 3 mobility problem, by assigning a permanent IP address to the mobile node.
- Mobile IP supports for both MIPv4 and MIPv6 but IPv4 has a couple of drawbacks
- The main drawback of IPv4 is address exhaustion, making MIPv4 the future option for mobility protocol in IP networks.
- Mobile IPv6 (MIPv6) is protocol developed as a subset of IPv6 support mobility.
- MIPv6 is an update of the Mobile IP standard designed to authenticate mobile device using IPv6 addresses
- In traditional IP routing, IP addresses represent a topology. Routing mechanisms rely on the assumption that each network node will always have the same point of attachment to the Internet, and that each node's IP address identifies the network link where it is connected.
- In this routing scheme, if you disconnect a mobile device from the internet and want to reconnect through different network, you have to configure the device with a new IP address, and the appropriate netmask

and default router.

- Otherwise, routing protocols have no means of delivering packets because the device's network address doesn't contain the necessary information about the node's network point of attachment to the Internet
- Mobile IPv6 allows a mobile node to transparently maintain connection while moving from one subset to another.

Q.4 Write short note on: HAWAII

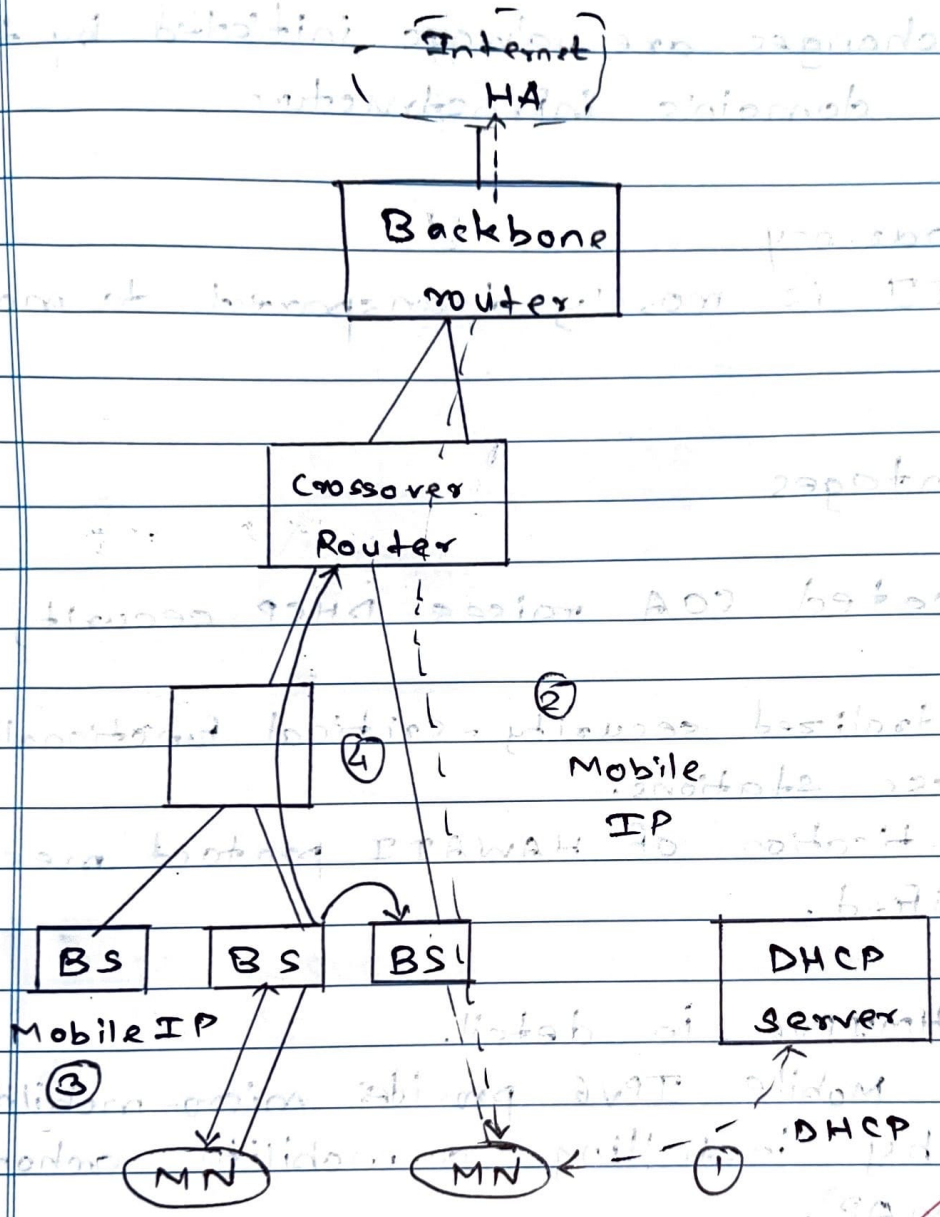
⇒

- HAWAII stands for Handoff-Aware Wireless Access Internet Infrastructure tries to keep micro mobility support as transparent as possible for both home agent and MN.
- Working:

Step 1: On entering an HAWAII domain, a mobile node obtains a co-located COA.

Step 2: MN registers with the HA.

Step 3: When MN moving another cell inside the foreign domain, the MN sends a registration request to the new base station as to a foreign agent.



Step 4: The base station interprets the registration request and sends out a handoff update message, which reconfigure all routers on the paths from the old and new base station to the crossover router.

Advantages:

1) Security: Challenges response extensions are mandatory. In contrast to cellular IP,

routing changes are always initiated by the foreign domain's infrastructure.

2) Transparency

⇒ HAWAII is mostly transparent to mobile nodes.

- Disadvantages

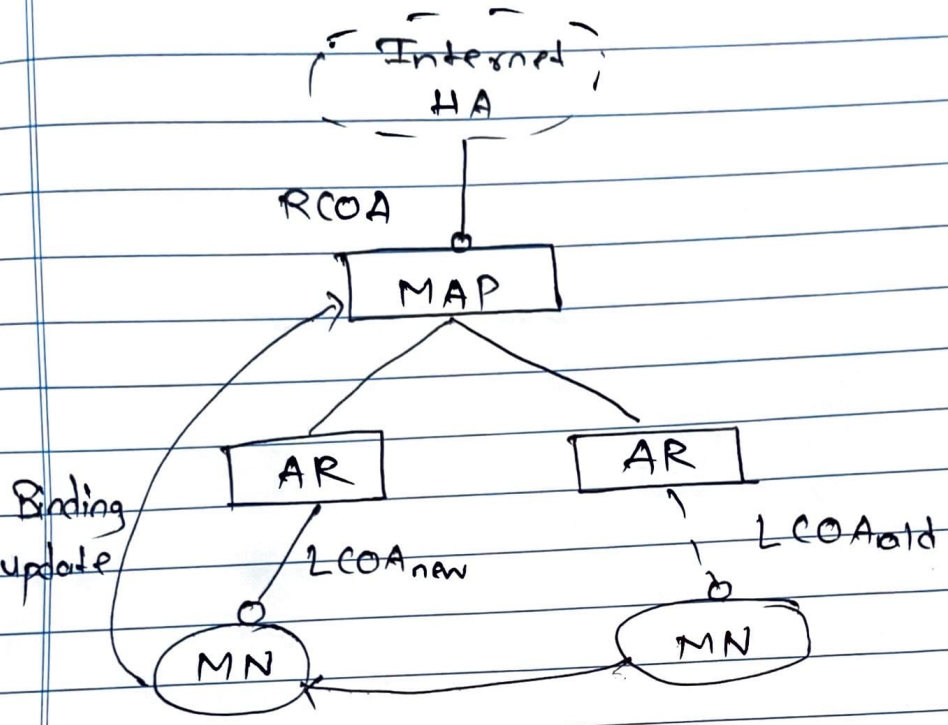
⇒

1) Co-located COA raises DHCP security issue.
2) Decentralized security-critical functionality in base stations.
3) Authentication of HAWAII protocol message unspecified.

Q.] Explain HMIPV6 in detail.

⇒ Hierarchical Mobile IPv6 provides micro-mobility support by installing a mobility anchor point (MAP).

- MAP is an entity which is responsible for a certain domain and acts as a local HA within this domain for visiting MN's
- The following figure shows the basic architecture of HMIPv6
- The MAP receives all packets on behalf of the MN, encapsulates and forwards them directly to the MN's current address LCOA



- Advantages :

1) MNs can have location privacy because LCOAs can be hidden.
2) Direct routing between CN's sharing the same link is possible.

- Disadvantages :

1) Additional infrastructure component (MAP)
2) Routing tables are changed based on messages sent by mobile nodes.

Pain - A+