THADOMAL SHAHANI TSEC ENGINEERING COLLEGE

ASSIGNMENT NO. 1

Q.1 Explain in detail with merits and demerits.

a) Snooping TCP

Snooping TCP refers to a type of TCP flow control mechanism that monitors the state of each connection in a network and adjusts the flow of data accordingly. This helps to improve network performance by avoiding congestions and ensuring that each connection gets the necessary bandwidth to function optimally. In snooping TCP, the network switches or routers are responsible for the monitoring and controlling the flow of data in real-time, making it a more efficient way of managing network traffic compared to a traditional TCP flow control mechanism.

Working of Snooping TCP:

Until it receives an acknowledgement from the mobile node, the foreign agent buffers the packet. A foreign agent snoops the packet flow and acknowledgement in both directions. If the foreign agent snoops acknowledged packet from the mobile node, or if it receives duplicate acknowledgements, it believes that the packet or acknowledgement

has been lost. The packet is immediately retransmitted by foreign agent from its buffer. In addition, the foreign agent maintains its own timer for retransmission of buffered packets in case it is lost on the wireless link. If the foreign agent detects a missing packet during data transfer from the mobile node to the correspondent node, it sends a NAck to the mobile node. The mobile node can then promptly retransmit the missing packet. Packet reordering is handled automatically by TCP. Even if the foreign agent crashes, the timeout correspondent node still triggers retransmission.

Merits :

- End to end TCP semantic is preserved.
- No modifications at fixed host, i.e, the fixed computer TCP does not need any type of changes.
- No packet loss during handovers.

Demerits :

- The behavior of the wireless link:

- Snooping TCP does not isolate the behaviour of the wireless link or I-TCP. Transmission errors can spread to the correspondent nodes (CH).

- A mobile node needs additional mechanisms: The use of NAck between foreign agent and the node requires the mobile node to have additional mechanisms.

- Encryption at end-to-end: If such method is used, then snooping and buffering data can be considered worthless.

b) Mobile TCP:

The M-TCP approach has the same goal as I-TCP and Snooping TCP; To prevent the sender window from shrinking if bit errors or disconnection but not congestion cause current problems. M-TCP wants to improve overall throughput, lower the delay, maintain end to end semantics of TCP, and to provide a more efficient handover. The M-TCP wants to assume a low bit error rate on the wireless link and refrains from caching/ retransmitting data via a supplementary

entity called SH (Switching Hub). If a packet is lost on the wireless link, the original sender must retransmit it to maintain TCP end-to-end semantics. The SH monitors packets sent to and Acks returned from the Mobile Host (MH). If no Ack is received within a certain time, the SH assumes MH disconnection, sets the sender window size to 0, forcing it into persistent mode.

Merits :

- Faster Packet Loss Recovery ; thus enhancing overall reliability and performance.
- End-to-end semantics ; preserves data integrity, by having the sender retransmit lost packets.
- Automatic Disconnection Handling ; minimizes delays in response to network changes.
- No sender TCP modifications ; simplifies modifications, implementation.

Demerits :

- Dependency on low bit error rate ; thereby limiting effectiveness in environments with high error rates.

- No caching / retransmission via SH.

c) I-TCP (Indirect TCP):

It is a protocol designed for mobile computing environments to address the challenges of handovers and disconnections. Instead of modifying the end systems, I-TCP employs a Mobile host agent (MHA) to intercept and manage TCP connections on behalf of the mobile host.

Merits:

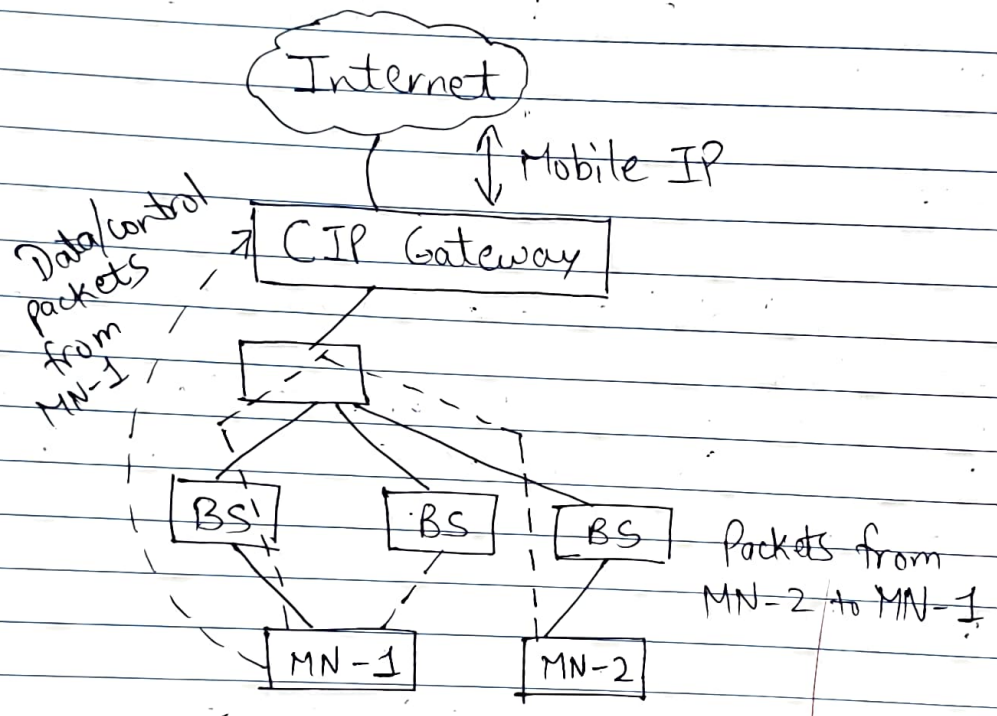
- Seamless Mobility; ensuring continuity without disruption.
- No modifications to end systems; minimizes the need for changes to existing implementations.
- Maintains connection integrity.

Demerits:

- Complexity of Mobile host agents.
- Potential latency; during handovers, some latency can occur.
- Compatibility issues could limit its adoption in heterogeneous network environments.

Q.2 Explain Cellular (Mobile) IP in detail.

Mobile IP is a communication protocol (created by extending Internet Protocol, IP) that allows the users to move from one network to another with the same IP addr It ensures that the communication will continue without the user's sessions or connections being dropped.



Cellular IP address shortcomings in Mobile IP, particularly concerning handover duration and registeration scalability. Unlike Mobile IP, Cellular IP facilitates fast and consistent local handovers within limited geographical

areas. It deploys a cellular IP gateway (CIP) in each domain, acting as a foreign agent for the external network. Nodes within the domain collect routing information based on packet origins towards the CIPGW, enabling efficient handover control. Soft handovers, achieved through simultaneous packet flow forwarding along multiple paths, allow smooth transitions for mobile nodes moving between adjacent cells. The self-configuring and straight forward architecture of Cellular IP addresses these challenges, but it requires modifications to the basic Mobile IP protocol and is not transparent to existing systems.

Q.3 Explain MIPv6.

Mobile IPv6 enables a device to keep the same internet address worldwide, as it provides support for IPv6, allowing seamless connectivity while changing locations. It allows mobility across heterogenous and homogenous media. Each mobile device has two IP addresses; a permanent home address and a temporary care of address that changes with location. When moving to a new location, the device acquires a care-of address using the IPv6 neighbourhood discovery methods. The home

agent, located in the home network, plays a key role by associating home and care -of addresses. It intercepts and forwards packets, ensuring continuous connectivity. The mobile node informs correspondent nodes of its care-of address through binding updates. Key functions include maintaining bindings caches, supporting Dynamic Home agent Address discovery, and aiding movement detection in visited networks. Basically, a fundamental function of MIPv6 is to provide a mechanism for mobile devices to move across different domains/ networks while maintaining a consistent and unchanging home address.

Q.4 Write short notes on HAWAII.

HAWAII stands for Handoff-Aware Wireless Access Internet Infrastructure. It is an extension protocol of Mobile IP designed to enhance the support of micro-mobility and paging functionality in wireless network.

It addresses the challenges associated with micro-mobility, which involves movement of a mobile node within a small geographical area. It provides mechanisms to efficiently

handle handovers in a small scale environment. It also enhances paging functionality, allowing the network to effectively locate a mobile node when needed, minimizing delays and optimizing resource usage.

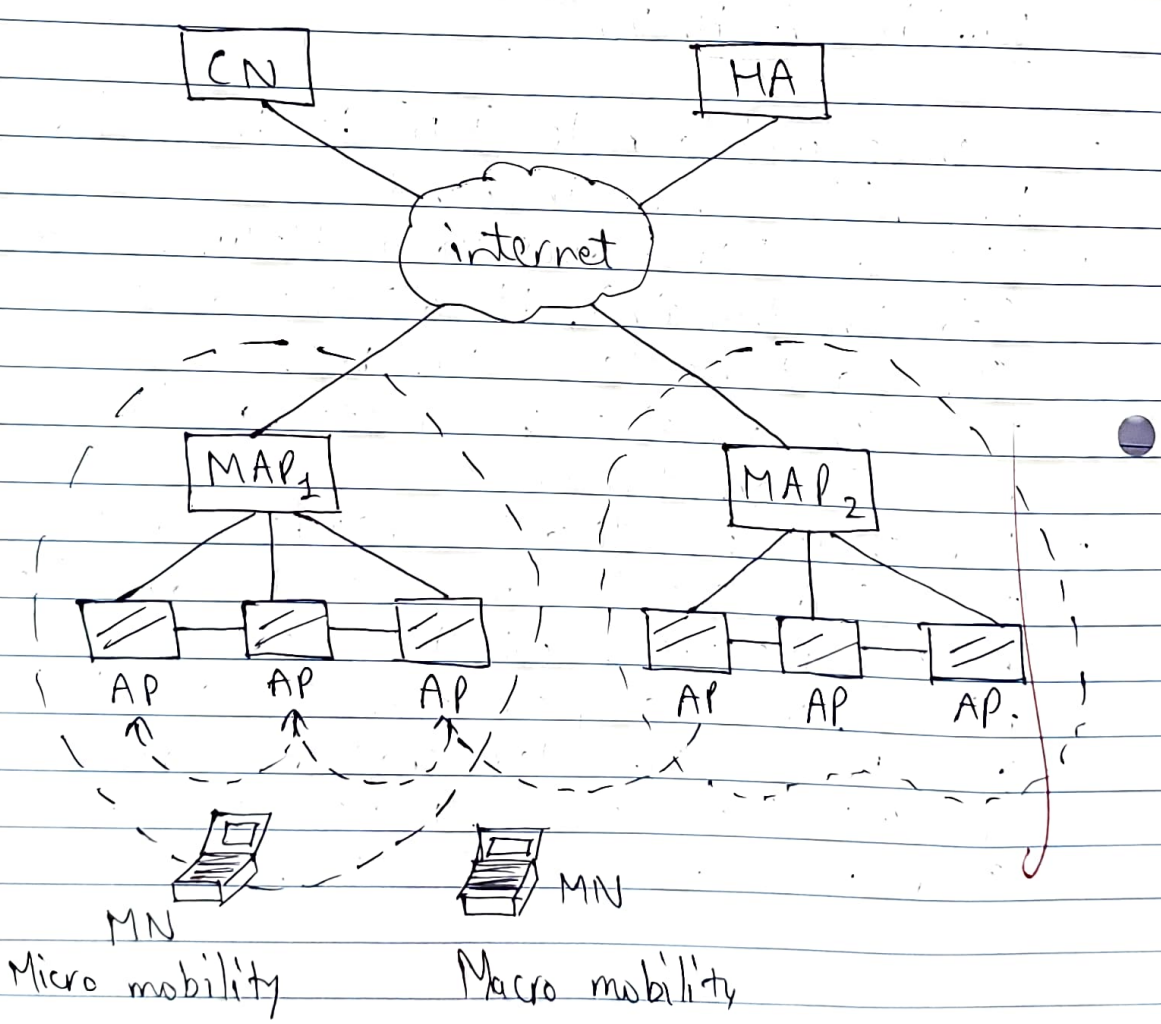
It also seamlessly integrates with existing Mobile IP infrastructure, thereby reducing the latency associated with locating and establishing connections with mobile nodes.

Working of HAWAII:

- When a mobile node (MN) is in a home domain, HAWAII is not involved.
- When an MN moves to a HAWAII domain (foreign domain), it obtains a co-located COA, and registers with HA.
- This COA remains unchanged as long as MN is in foreign domain.
- MN sends registeration request to new BS.
- The BS intercepts and sends out hand-off update message, which reconfigures all routers, on the path from the old and new BS to the so-called crossover router.
- The BS then sends a registeration reply to MN as if it were the FA.

Q.5 Write short notes on HMIPv6.

Hierarchical Mobile IPv6 (HMIPv6) is an extension of MIPV6 designed to enhance seamless mobility in wireless networks. It introduces a hierarchical structure with multiple domains, each having a home agent (HA) and a Mobility Anchor Point (MAP). This structure reduces signaling overhead, improves scalability, and minimizes the handover latency.



HMIPv6 includes a Mobile Node (MN), a correspondent Node (CN), Home agent (HA), MN moves across domains, maintaining communication, while HA and MAP play key roles in managing home and current location information.

When MN moves to a new domain, handover process involves detecting the move, exchanging router solicitation, updating binding tables, and ensuring the seamless communication with the correspondent Node using the Care-of Adress (CoA).

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