Course: Computer Network Lab

Problem Statements

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1.	**Compare MAC Protocol Performance (802.11a vs 802.11g vs 802.11n)** Simulate a wireless network where multiple stations connect to an access point using different IEEE 802.11 standards.	• Create three stations: sta1 (802.11a), sta2 (802.11g), sta3 (802.11n). • Measure throughput between each station and an AP using `iperf`. • Analyze the impact of each MAC protocol on performance. • Plot the results.
2.	**Analyze Collision Impact with Hidden Terminals** Simulate a hidden terminal problem where two stations cannot hear each other but both send to the same AP.	• Create two stations and one AP with overlapping but non-mutual range. • Enable RTS/CTS mechanism and disable it in another run. • Compare performance with and without RTS/CTS. • Explain how the MAC protocol handles collisions.
3.	**Effect of Distance and Signal Strength on MAC Performance** Simulate a wireless network where stations are at different distances from the AP.	• Place sta1 near the AP and sta2 far from the AP. • Observe performance degradation over distance. • Analyze how MAC layer parameters like signal-to-noise ratio (SNR) affect throughput.
4.	**Load Impact on 802.11 MAC Protocol** Evaluate how the MAC layer handles traffic when multiple users are active.	• Create 5 stations and 1 AP. • Simulate concurrent downloads (using `iperf`) from AP to all stations. • Measure individual and total throughput. • Analyze fairness and delay introduced by the MAC protocol.
5.	**Bandwidth Sharing Between Stations Using the Same AP**	• Configure the AP to support a fixed data rate (e.g., 54 Mbps).

	Simulate a scenario where two stations share bandwidth while connected to one AP.	• Measure how this bandwidth is shared among the stations using `iperf`. • Observe MAC-layer retransmissions, collisions, and delays.
6.	**Basic Handover between Two Access Points** Simulate a network where a mobile station moves from AP1's coverage area to AP2's coverage area.	• Create 2 Access Points (ap1 and ap2) and 1 mobile Station (sta1). • Set a movement path where sta1 moves from ap1's range into ap2's range. • Capture when the handover occurs. • Measure packet loss or delay during handover.
7.	**Handover Delay Measurement** Measure how long it takes for a handover to complete when a station moves between two APs.	• Setup the network with 2 APs and 1 mobile Station. • Start a continuous `ping` from the station to a remote server or another host. • Track the time when packets start dropping and when communication resumes. • Calculate the handover delay.
8.	**Throughput Degradation During Handover** Observe how the throughput between a mobile device and a server is affected during handover.	• Use `iperf` to measure TCP or UDP throughput between the mobile Station and a Server. • Move the Station between AP1 and AP2 during the transmission. • Record throughput over time and plot the results.
9.	**Impact of Handover on Video Streaming** Test how real-time applications (like video streaming) behave during handover.	• Setup a video streaming server (like VLC server) connected to the APs. • Let the Station watch a video stream while moving across AP1 and AP2. • Observe interruptions, buffering, or delay during handover.

10	**Forced Handover by Manipulating Signal Strength** Manually reduce the signal strength of the AP to force a handover.	• Create 2 APs and 1 Station. • Decrease the transmit power (`txpower`) of AP1 gradually. • Force the Station to roam to AP2 as signal strength drops. • Log the events and measure the handover time.
11	**Multi-AP Handover Analysis** Test roaming in a network of 3 APs laid out in a row.	• Setup 3 Access Points: ap1, ap2, ap3 along a path. • Move the Station across all three APs. • Capture handover points and any packet loss. • Analyze whether the station always connects to the nearest AP.