CN LAB Realization of CSMA/CA Using NS2

Objective:

The primary goal of this lab assignment is to gain a comprehensive understanding of the Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) protocol and to implement and simulate CSMA/CA in the NS2 (Network Simulator 2) environment.

Prerequisites:

- Basic knowledge of networking concepts.
- Familiarity with the NS2 simulation environment.
- Understanding of MAC (Medium Access Control) protocols.

Equipment/Software Required:

- NS2 installed on your computer.
- Text editor for writing scripts.

Tasks:

Task 1: Theoretical Understanding of CSMA/CA Protocol

1. Research and summarize the key principles of the CSMA/CA protocol.
2. Explain how CSMA/CA differs from other MAC protocols, such as CSMA/CD (Carrier Sense Multiple Access with Collision Detection).
3. Discuss the advantages and disadvantages of CSMA/CA in wireless communication scenarios.

Task 2: Simulation Setup

1. Open your NS2 environment and create a new simulation script file (e.g.,`csma_ca.tcl`).
2. Define simulation parameters such as network topology, number of nodes, and communication range.
3. Choose a wireless channel and set relevant parameters.
4. Configure the traffic model, specifying the type and quantity of traffic to be generated.

Task 3: CSMA/CA Implementation

1. Write NS2 code to implement CSMA/CA protocol.
2. Define the backoff mechanism and other relevant parameters.
3. Ensure that the implementation considers the RTS/CTS (Request to Send/Clear to Send) mechanism in CSMA/CA.
4. Include mechanisms for acknowledging successful data transmission and handling collisions.

Task 4: Simulation Execution and Analysis

1. Run the simulation using the script created in Task 2.
2. Monitor the simulation output for key performance metrics such as throughput, packet loss, and delay.
3. Analyze the impact of varying parameters, such as contention window size and data rates, on the overall performance of CSMA/CA.

Task 5: Results Presentation and Report

1. Compile the simulation results into a comprehensive report.
2. Conclude the report with recommendations for optimizing CSMA/CA performance in specific scenarios.

Submission:

Submit the simulation script (`csma_ca.tcl`), the report detailing your findings.