

## **Assignment 1: Analyzing Wi-Fi Performance**

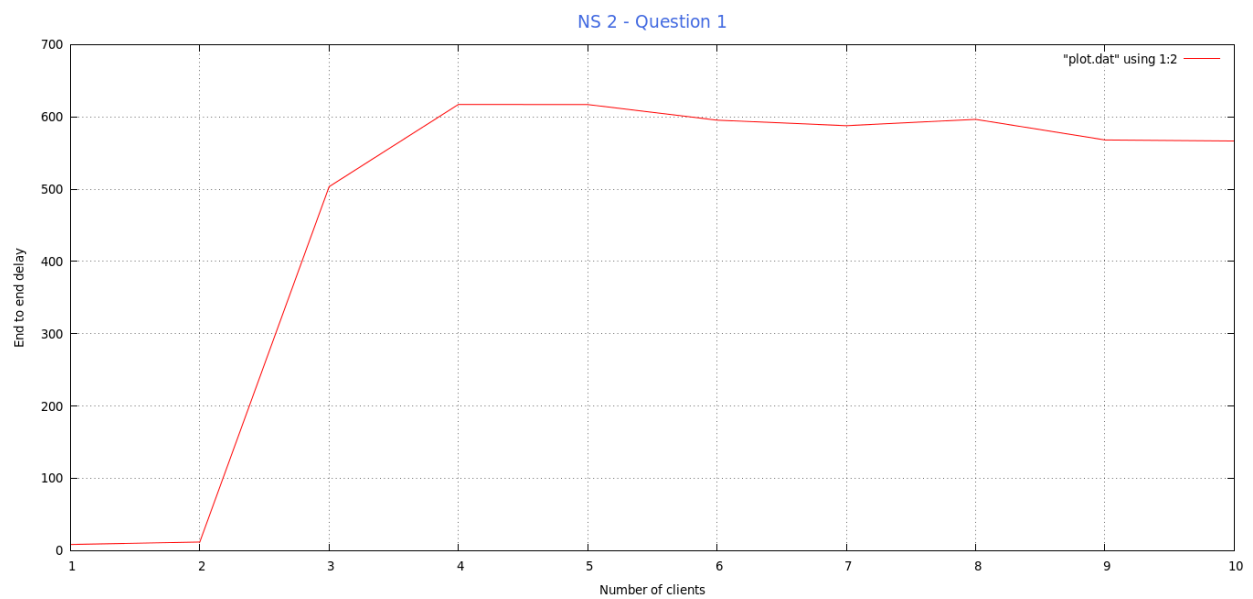
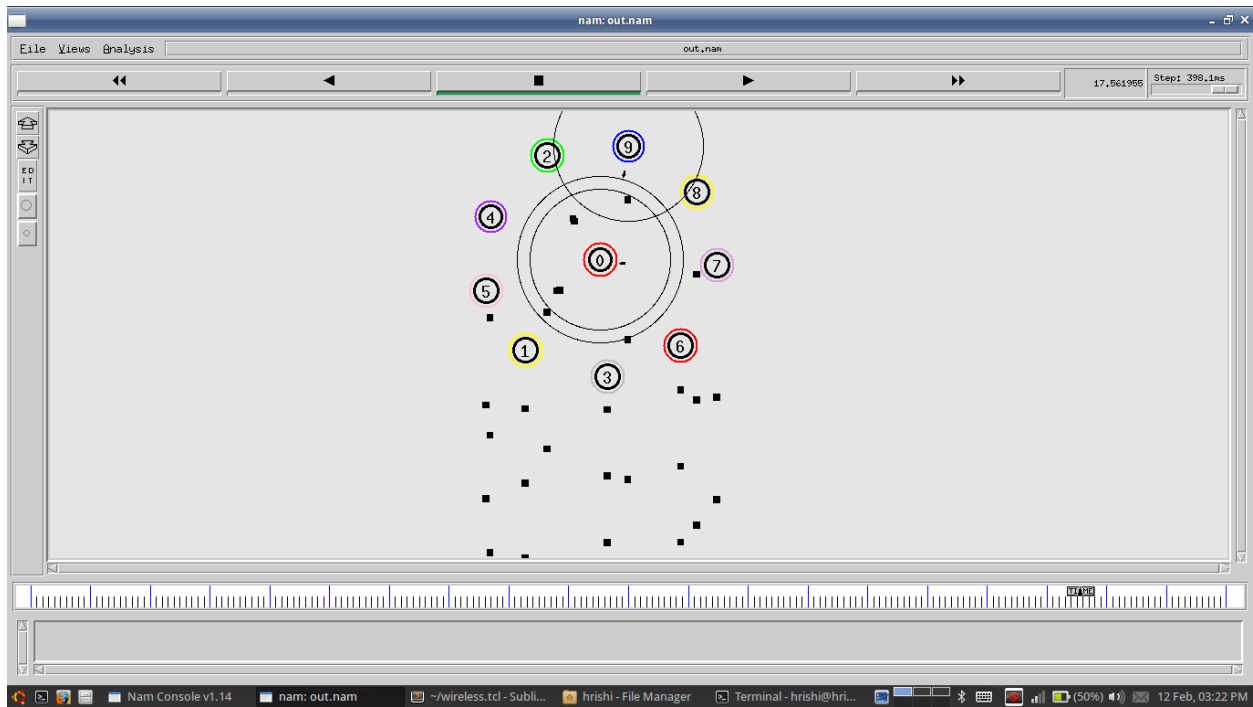
### **(SN 706 Wireless Security)**

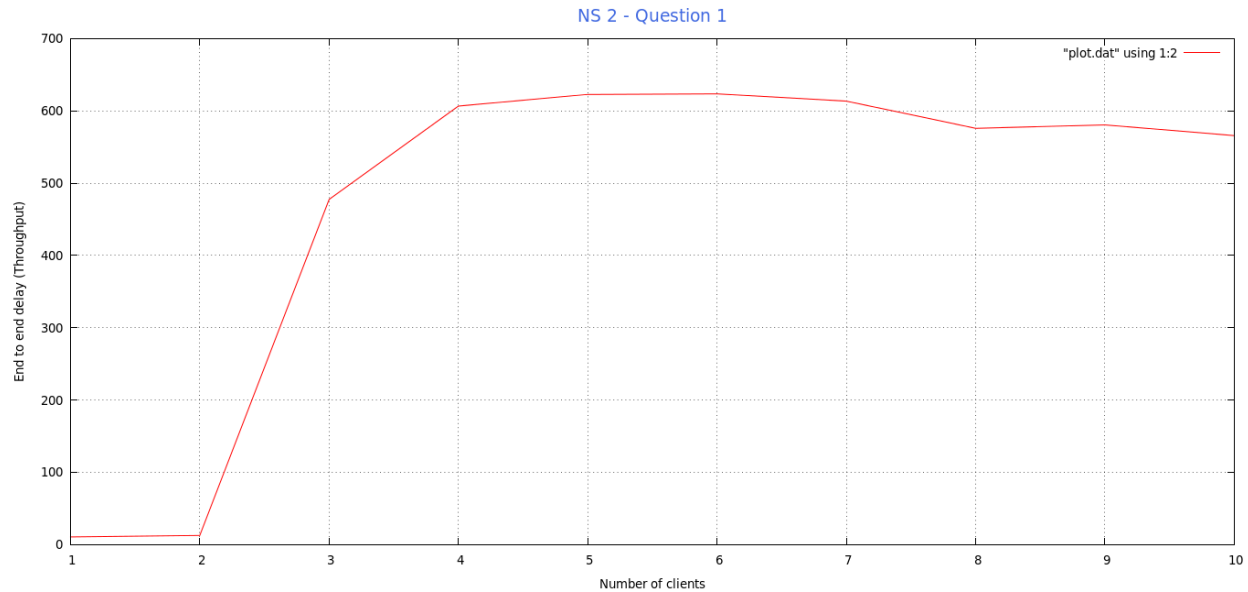
#### **Question a)**

Task to be accomplished: Create a WiFi network - Simulate a WiFi network with a single access point and a variable number of clients, ranging from 1 to 10. Arrange the clients equally spaced on a circle around the AP. For each number of clients, simulate 20 seconds worth of network traffic using the existing parameters. Repeat (or batch) the simulation for 20 trials, using a different seed for the random number generator each time, and compute the average total data delivered to the AP over the 20 simulation runs. Plot this quantity as a function of the number of clients, and describe your findings.

Steps involved:

1. To fulfill given task a .tcl script was written with the following parameters :
  - a. Routing protocol was set to DSDV
  - b. Number of nodes were taken as command line arguments
  - c. Interface queue type was set to Droptail
  
2. The steps involved in solving the given problems were
  - a. Assign number of client nodes using command line argument
  - b. Create a global Access Point(AP) node
  - c. Create client nodes and randomly place nodes around AP using seed value
  - d. Create a UDP agent and attach from and to AP and client nodes
  - e. Trace file was parsed using an awk script
  - f. Awk script used to parse calculates the throughput – i.e. the end to end delay between the AP and the client nodes
  - g. Bash file run.sh was used to automate the 20 random trials and parse the throughput from the trace file
  - h. A plot.dat file was finally generated in order to generate a graph to capture the performance and throughput estimation of the simulation.
  
3. The following images show the plot obtained for two separate simulation runs :





4. Two separate simulations were run each with randomized positions of clients with 20 trials for each number of clients
5. From the given graphs the following summarization is made:
  - a. As the number of clients grow the end to end delay increases almost exponentially
  - b. When the number of clients reach a certain threshold the throughput ceases to grow and stabilizes even with increasing number of clients

### Conclusion:

Throughput computed from end-end delay more or less normalizes and attains a stable graph after a certain number of nodes present in the topography.

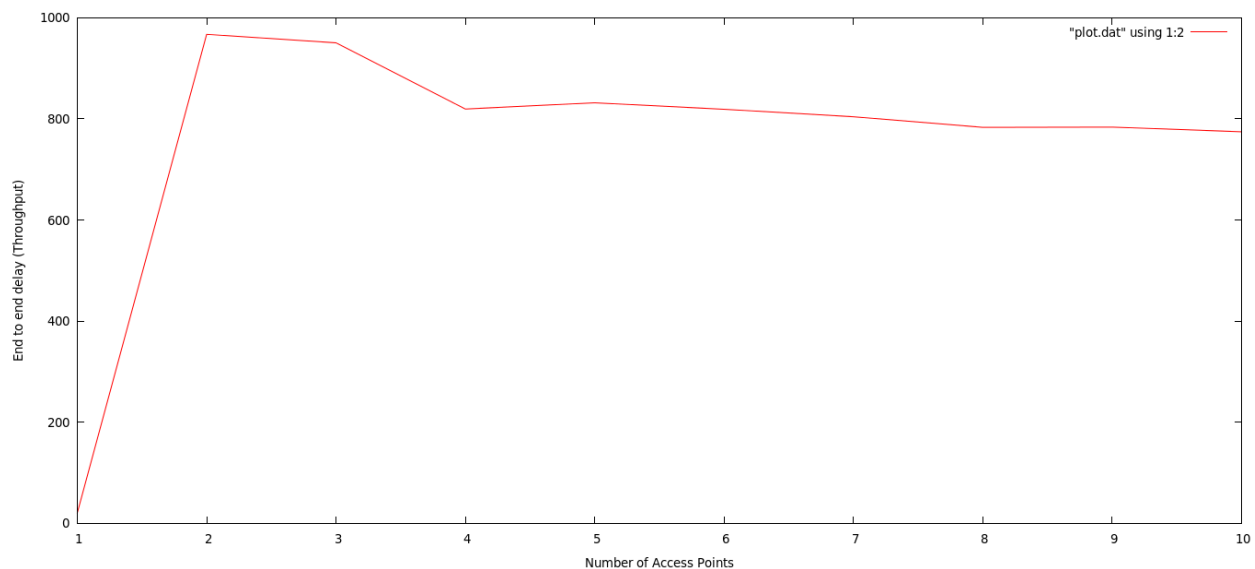
### Question b)

Create several competing Wi-Fi networks - Building on the previous task, add more Wi-Fi access points with different numbers of users, simulating what you might expect to happen in an apartment complex where each unit has their own WiFi network sharing the same channel. Choose the locations of the multiple APs as you see appropriate for the apartment scenario. Perform a similar study to the previous, but for different numbers or densities of APs in the apartment. Plot your results and describe your findings.

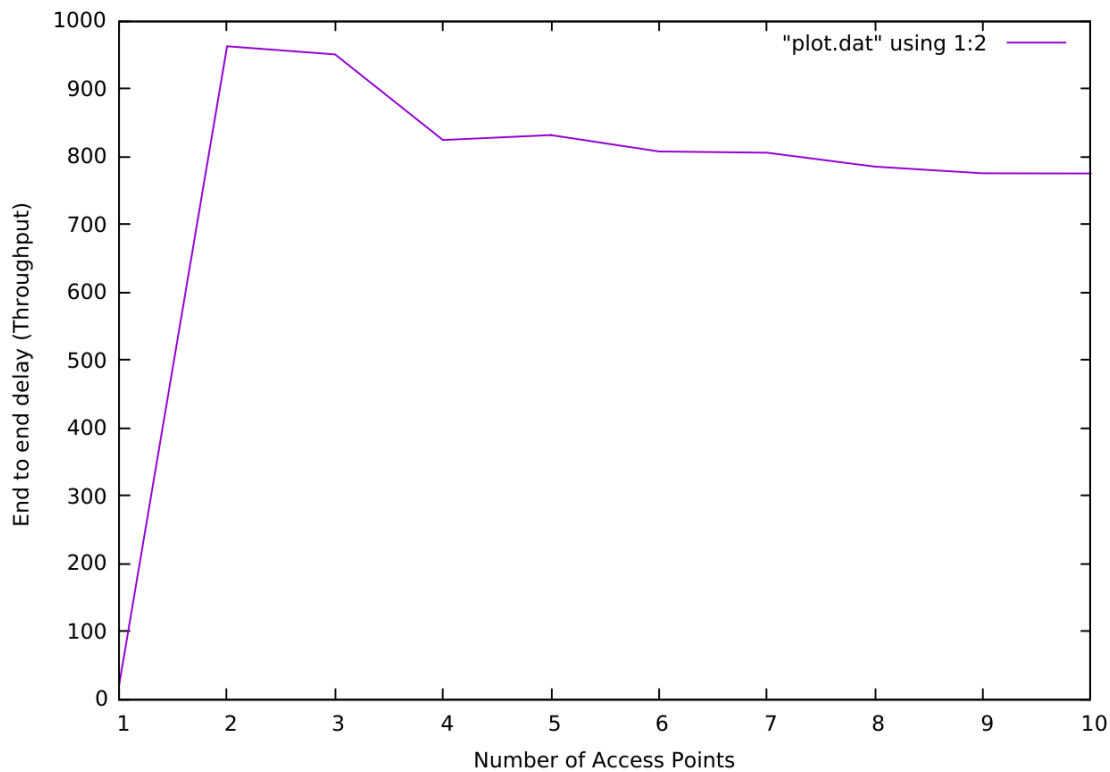
Steps involved:

1. To fulfill given task a .tcl script was written with the following parameters :

- a. Routing protocol was set to DSDV
  - b. Number of nodes were taken as command line arguments
  - c. Interface queue type was set to Droptail
2. The steps involved in solving the given problems were
- a. Assign number of Access Points(AP) and client nodes using command line argument
  - b. No central Access Point. All are competing Wi-Fi APs
  - c. Create APs and client nodes and randomly place nodes using seed value
  - d. Create a UDP agent and attach from and to different AP and client nodes
  - e. Trace file was parsed using an awk script
  - f. Awk script used to parse calculates the throughput – i.e. the end to end delay between the different APs and the client nodes
  - g. Bash file run.sh was used to automate the 20 random trials and parse the throughput from the trace file
  - h. A plot.dat file was finally generated in order to generate a graph to capture the performance and throughput estimation of the simulation.
3. The following images show the plot obtained for two separate simulation runs :



## NS 2 - Question 2



4. Two separate simulations were run each with randomized positions of clients with 20 trials for each number of APs with their corresponding number of clients
5. From the given graphs the following summarization is made:
  - a. As the number of APs and clients grow the end to end delay increases almost exponentially
  - b. When the number of nodes reach a certain threshold the throughput ceases to grow and stabilizes even with increasing number of nodes

**Conclusion:**

As seen from the previous problem, throughput computed from end-end delay more or less normalizes and attains a stable graph after a certain number of nodes present in the topography.