

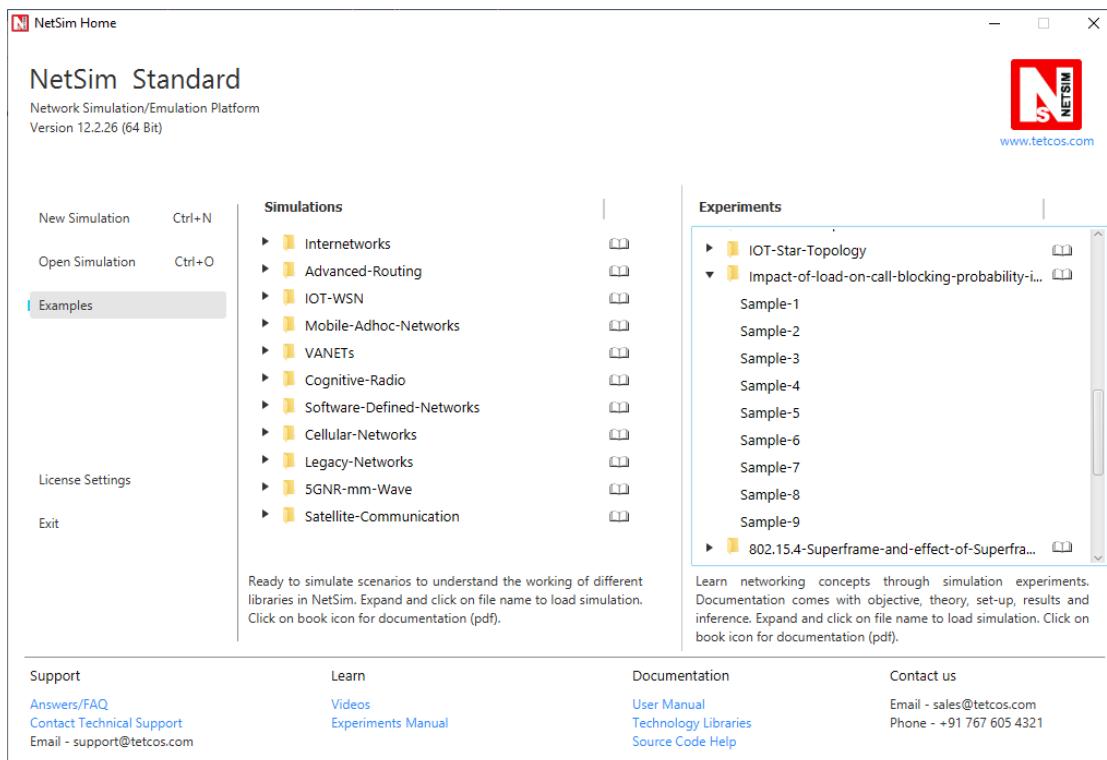
Exp 9: Multi-AP Wi-Fi Networks: Channel Allocation using NetSim software

Aim: To analyze and optimize channel allocation in Multi-Access Point (Multi-AP) Wi-Fi networks using NetSim software.

Apparatus: NETSIM V12, PC

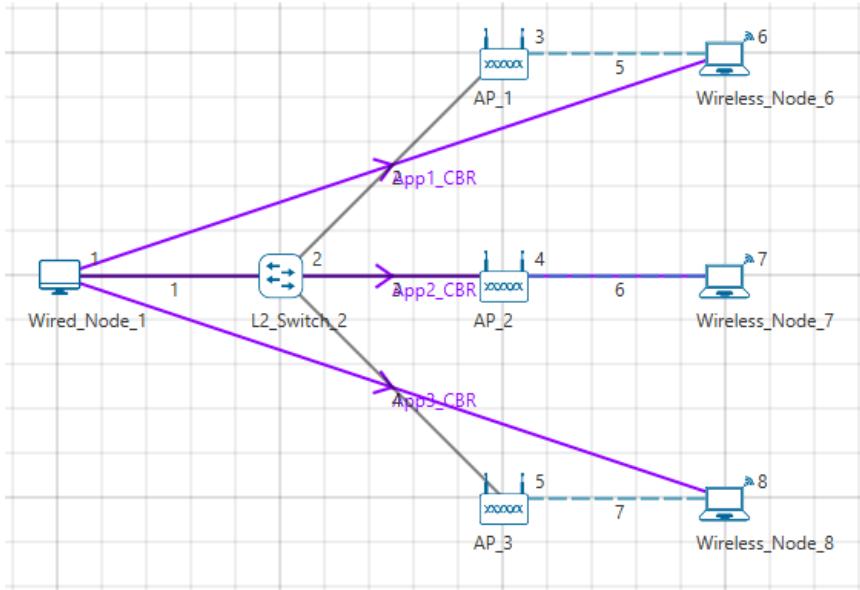
Network Setup:

1. Open NetSim and click **Examples → Experiments → Multi-AP-Wi-Fi-Networks-Channel-Allocation** as shown below:



NetSim UI displays the configuration file corresponding to this experiment as shown below:

APs on the same channel:



Sample-1

Procedure:

The following set of procedures were done to generate this sample:

Step 1: Before we start designing the network scenario, the Grid Length is set to 50 meters.

This can be set by choosing the Menu Option → Settings → Grid/Map → Grid from the GUI.

Step 2: A network scenario shown in sample-1 is designed in NetSim GUI comprising of 1Wired Node, 1 L2 Switch, 3Wireless Nodes and 3 Access Points in the **Internetworks** Network Library.

Step 3: The device positions are set as per the table given below.

General Properties		
Device Name	X / Lon	Y / Lat
AP_1	15	5
AP_2	15	10
AP_3	15	15
Wireless_Node_6	20	5
Wireless_Node_7	20	10
Wireless_Node_8	20	15

Step 4: In the INTERFACE (WIRELESS) → PHYSICAL LAYER Properties of all the Wireless Nodes and Access Points, the Protocol Standard is set to IEEE 802.11 b. In the INTERFACE (WIRELESS) → DATALINK LAYER Properties of all the Wireless Nodes and Access Points, Medium Access Protocol is set to DCF.

Step 5: Right-click on the link ID (of a wired link) and select → Properties . For all the Wired Links, Bit Error Rate and Propagation Delay is set to 0.

Step 6: The Wireless Link Properties are set according to the values given in the below table.

Channel Characteristics		PATH LOSS ONLY
Path Loss Model		LOG DISTANCE
Path Loss Exponent		3.5

Step 7: Right click on the Application Flow App1 CBR and select Properties or click on the Application icon present in the top ribbon/toolbar.

A CBR Application is generated from Wired Node 1 i.e. Source to Wireless Node 6 i.e. Destination with Packet Size set to 1460 Bytes and Inter Arrival Time set to 1168μs. Transport Protocol is set to UDP instead of TCP.

The Packet Size and Inter Arrival Time parameters are set such that the Generation Rate equals 10 Mbps. Generation Rate can be calculated using the formula:

$$\text{Generation Rate (Mbps)} = \text{Packet Size (Bytes)} * 8 / \text{Interarrival time (\mu s)}$$

Similarly, two more CBR applications are generated.

Step 8: Plots is enabled in NetSim GUI. Run the Simulation for 10 Seconds and note down the throughput for Sample-1.

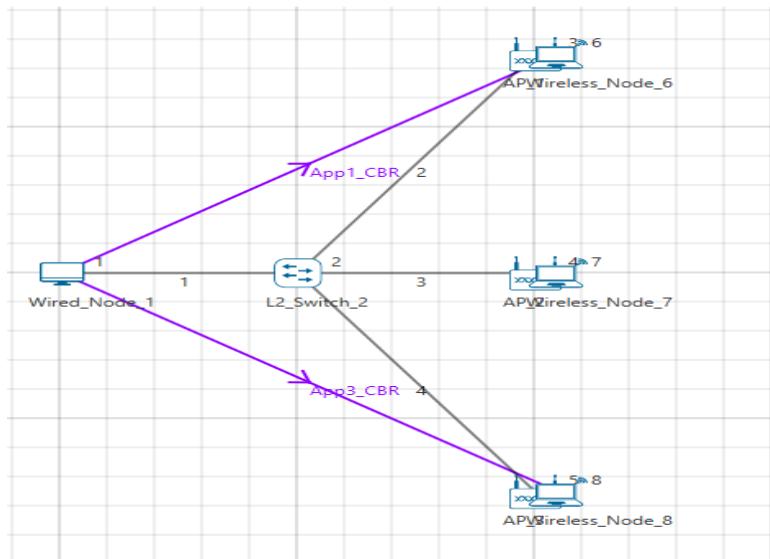
Sample2:

The following changes in settings are done from the previous sample:

Step 1: Before we start designing the network scenario, the Grid Length is set to 1000 meters.

This can be set by choosing the Menu Option Settings → Grid/Map → Grid from the GUI.

Step 2: From the previous sample, we have removed App2 CBR (i.e. from Wired Node1 to Wireless Node7), set distance between the other 2 Access Points (AP 1 and AP 3) as 400m and distance between APs and Wireless nodes as 10m as shown below:



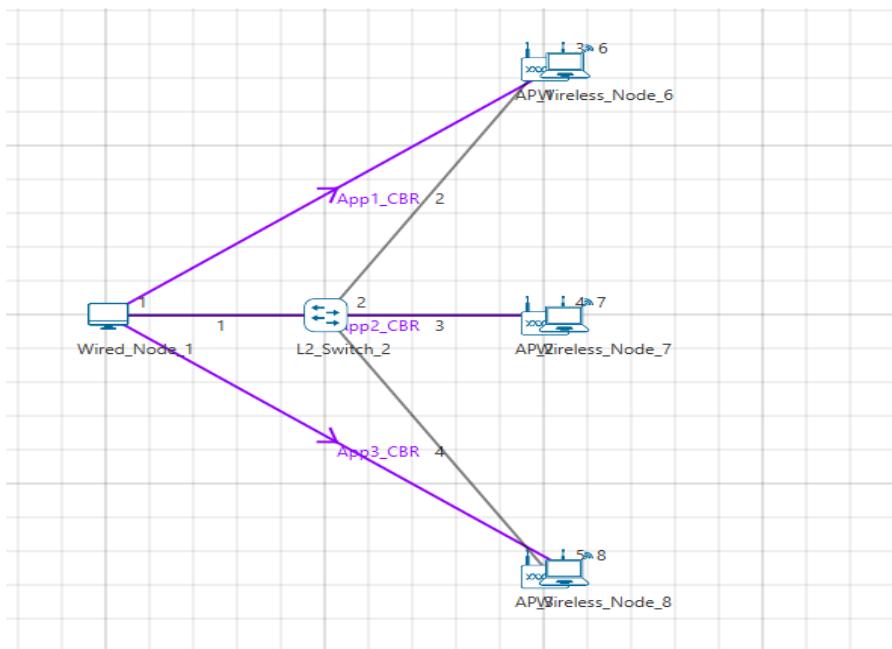
Sample 3: The following changes in settings are done from the previous sample:

Step 4: Plots are enabled in NetSim GUI. Run the Simulation for 10 Seconds and note down the throughput for Sample-2.

General Properties		
Device Name	X/Lon	Y/Lat
AP_1	400	0
AP_2	400	200
AP_3	400	400

Wireless_Node_6	410	0
Wireless_Node_7	410	200
Wireless_Node_8	410	400

Step 1: The distance between the Access Points (AP 1 and AP 3) is set to 400m and distance between APs and Wireless nodes as 10m as shown below:



Step 2: The device positions are set according to the table given below:

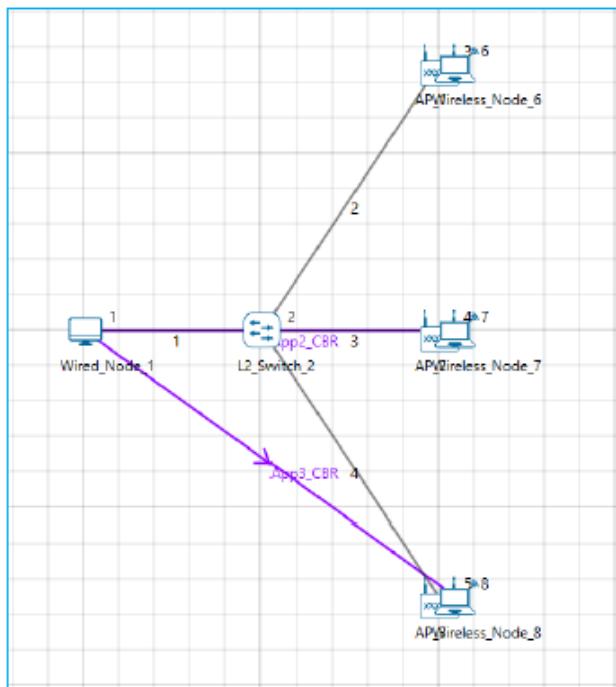
General Properties		
Device Name	X / Lon	Y / Lat
AP_1	400	0
AP_2	400	200
AP_3	400	400
Wireless_Node_6	410	0
Wireless_Node_7	410	200
Wireless_Node_8	410	400

Step 3: Plots are enabled in NetSim GUI. Run the Simulation for 10 Seconds and note down the throughput.

Sample 4:

The following changes in settings are done from the previous sample:

Step 1: From the previous sample, we have removed App1 CBR (i.e. from Wired Node 1 to Wireless Node 6), set distance between the other 2 Access Points (AP 2 and AP 3) as 200m and distance between APs and Wireless nodes as 10m as shown below:



Step 2: The device positions are set according to the table given below:

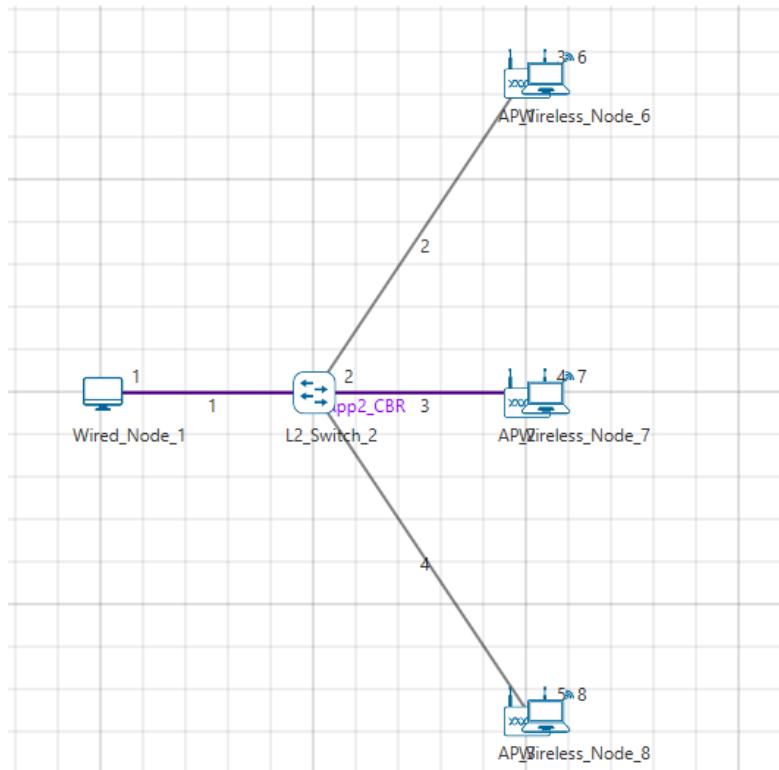
General Properties		
Device Name	X / Lon	Y / Lat
AP_1	400	0
AP_2	400	200
AP_3	400	400
Wireless_Node_6	410	0
Wireless_Node_7	410	200
Wireless_Node_8	410	400

Step 3: Plots is enabled in NetSim GUI. Run the Simulation for 10 Seconds and note down the throughput.

Sample 5:

The following changes in settings are done from the previous sample:

Step 1: From Sample 3, we have removed first and third applications as shown below:



Step 2: The device positions are set according to the table given below: **General Properties**

General Properties		
Device Name	X / Lon	Y / Lat
AP_1	400	0
AP_2	400	200
AP_3	400	400
Wireless_Node_6	410	0
Wireless_Node_7	410	200
Wireless_Node_8	410	400

Step 3: Run the Simulation for 10 Seconds and note down the throughput.

APs in different channel:

The following changes in settings are done from the previous sample:

Step 1: In Sample 3, we have changed standard channel to 11_2462 under INTERFACE (WIRELESS)

Step 2: Run the Simulation for 10 Seconds and note down the throughput.

Simulation Results

Application_Metrics_Table				
Application_Metrics				
Application Name	Packet generated	Packet received	Throughput (Mbps)	Delay(microsec)
App1_CBR	8562	1732	2.022976	4022639.672944
App2_CBR	8562	1832	2.139776	3936793.945371
App3_CBR	8562	1725	2.014800	3968222.283542

Note down the Through puts for all the samples as shown in below table.

Sample	Throughput(Mbps)		
	AP_1	AP_2	AP_3
All APs on the same channel			
1	2.03	2.07	2.08
2	5.94	NA	5.92
3	5.37	5.34	0.71
4	NA	3.27	3.3
5	NA	5.92	NA
Each AP on a different nonoverlapping channel			
1	5.94		5.92

Result:

In this experiment we verified how to allocate same / different channels over Multi-AP Wi-Fi Networks.