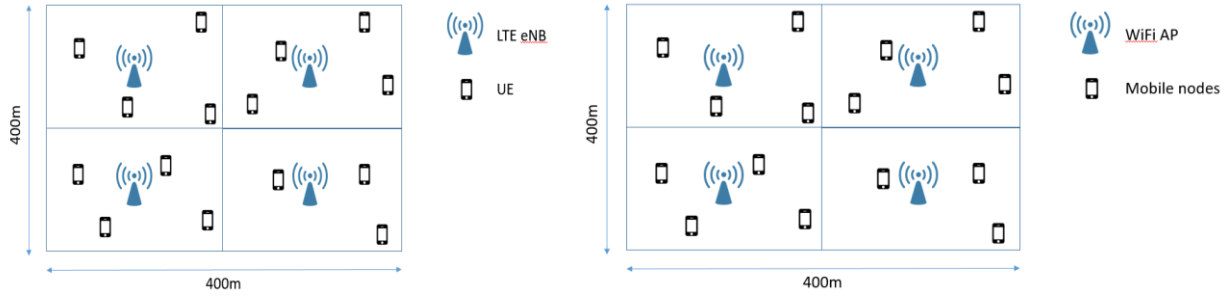
Performance measurement of multi-cell/AP networks in WiFi and LTE

1 Objective

Measure the performance of multi-cell/AP networks for two separate cases - WiFi and LTE, when each network runs in isolation, i.e., either LTE or WiFi is active. Estimate the maximum number of users and data rates at which the throughput becomes constant (for both uplink and downlink).

2 System Description



Place the source nodes randomly in the designated coverage area (10 per cell). Make sure you use the same random location parameters for both the LTE and WiFi cases. Place 1 WiFi AP/ LTE eNB each, at the center of each cell.

Assume that the WiFi APs are stand-alone but the LTE eNBs are connected to the internet through a gateway server. Use the following configuration options:

Parameters	**LTE**	**WiFi**
Coverage area	400 x 400 m^2	400 x 400 m^2
Topology	4 cells in a 2 x 2 grid configuration	4 cells in a 2 x 2 grid configuration
No. of source nodes per cell	10	10
No. of WiFi AP/LTE eNB per cell	1	1
Channel bandwidth	20 MHz	22 MHz
Tx Power	20 dBm	10 dBm
Path Loss Propagation Model	Log Distance	Log Distance
Frequency of Operation	2.4 Ghz	2.4 GHz
Stationary Number of Users	10	10
Version/Standard	Default LTE	802.11g
Application	CBR	CBR
Time to run Simulation	150s	150s

Part 1 :

The source nodes once placed randomly, remain stationary for the course of the simulation.

Part 2:

All the source nodes should be roaming. For this, use the random walk mobility model.

NS-3 has in-built classes and attributes for enabling automatic handover for both WiFi and LTE.

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Hints: For LTE, refer:

https://www.nsnam.org/docs/models/html/lte-design.html#fig-lte-legacy-handover-algorithm

use the A2-A4-RSRQ handover algorithm

For WiFi, refer:

https://github.com/direct-code-execution/ns-3-dce/blob/master/example/dce-mptcp-handoff-v6.cc

3 Simulation Tasks

1. Calculate the average uplink and downlink throughput per source node for each of the 4 cells.

2. Calculate the average number of handoffs per source node during the whole run of the simulation (150s) in each of the 4 cells.

Expected deliverables:

Your submission should include the items given below on the following day of your deadline.

NS3 simulation code

Results in the form of plots and tables

Report with detailed answer to each task, observations and conclusions derived from the study (About 10 pages without script)