Term Assignment on ns-3

1. Simulate the following networks as per assignment:

Std_id % 6	Wired	Wireless high-rate (e.g., 802.11) (static)	Wireless high-rate (e.g., 802.11) (mobile)	Wireless low-rate (e.g., 802.15.4) (static)	Wireless low-rate (e.g., 802.15.4) (mobile)
0		√		√	
1			√		√
2			√	√	
3	√				√
4		√			√
5	√			√	

2. In your simulation –
    a. The number of nodes need to be varied as 20, 40, 60, 80, and 100
    b. Besides, you need to vary the follow parameters –
        i. Number of flows (10, 20, 30, 40, and 50)
        ii. Number of packets per second (100, 200, 300, 400, and 500)
        iii. Speed of nodes (5 m/s, 10 m/s, 15 m/s, 20 m/s, and 25 m/s) [Only in case of having mobility]
        iv. Coverage area (square coverage are varying one side as Tx_range, 2 x Tx_range, 3 x Tx_range, 4 x Tx_range, and 5 x Tx_range) [Only in case of having static nodes only]
3. In all cases, you need to measure the following metrics and plot graphs –
    a. Network throughput
    b. End-to-end delay
    c. Packet delivery ratio (total # of packets delivered to end destination / total # of packets sent)
    d. Packet drop ratio (total # of packets dropped / total # of packets sent)
    e. Energy consumption [for wireless nodes]

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    Some example sources for trace analysis –

    https://bpressblogs.blogspot.com/2020/02/implementation-of-trace-analyzer-for-ns3.html

    https://www.researchgate.net/publication/342436725_Trace_Analyzer_for_NS3

    https://sourceforge.net/projects/tracemetrics/

    http://mohittahiliani.blogspot.com/2014/08/ns-3-tracemetrics-trace-file-analyzer.html

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4. ** While doing the above simulations, you MUST simulate at least the following –

a. A modified mechanism (at the algorithm level, NOT just at parameter tuning level) done by yourself, which can be one or a combination of the following –
    i. Modified mechanism for RTT calculation
    ii. Modified mechanism for congestion control in TCP
    iii. Modified mechanism of routing
    iv. Modified MAC layer protocol
    v. Or any other similar modification
b. Corresponding existing mechanisms in ns-3

5. The modification you want to make can be anything from any existing paper or from your own thinking. However, the codes that would be available online will NOT be counted as your modification.
6. You need to submit a report mentioning the following-
    a. Network topologies under simulation
    b. Parameters under variation
    c. Modifications made in the simulator
    d. Results with graphs
    e. Summary findings
7. Bonus: There are several places where you can get bonus. Examples include –
    a. Cross transmission of packets, i.e., transmission of packets from one type of node to that of another type (example: simulating a flow n1->n2->…->nx, where the first few nodes are wired and the rest nodes are wireless)
    b. Simulating any network not mentioned above (for example, 5G, LTE, WiMax, Satellite network, nanonetworks, cognitive radio networks, NFV, etc.)
    c. Measuring any metric not mentioned above (for example, per-node throughput, variation in queue size over time, jitter, etc.)
    d. Any brand new idea with a good performance improvement and not existing in the literature could be worth of double bonus!

[NOTE: It is NOT needed that you will come up with improvement in performance with your modified mechanism. Rather it is needed to make sure that whatever changes you would have done come with an intuition.]