Practice #5: Wireless Networks in NS3

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Due: 12/20 Sun, 11:59 pm.

Goal

- Better understand the characteristics of wireless network.
- In this task, you are required to use **NS-3** for network simulation.
- For the first task, we will explore the behavior of wireless connection.
- For the second task, we will experiment on RTS/CTS

Task 1 - 2.4GHz vs 5GHz (20pts)

1. You will be looking into the difference between 2.4GHz and 5GHz networks.

1.1. Complete the code by filling up `//TODO` template of `task_1_skeleton.cc`. You may refer to `examples/wireless/wifi-hidden-terminal.cc` as a base.(5pts)

1.1.1. Put the nodes in following coordinates. (Use `ListPositionAllocator`)

A: (15,0,0)

B: (0,0,0)

C: (-1,0,0)

1.1.2. Install WiFi with `WIFI_PHY_STANDARD_80211g` standard.

1.1.3. Print out ‘per flow statistics’ in the terminal

Task 1 - 2.4GHz vs 5GHz

1.2. Change the x coordinate of A from 10 to 80, at fixed intervals (at least 5 times). Plot the graph of the throughput. What can you learn from the result? (4pts)

1.3. Change the standard from `WIFI_PHY_STANDARD_80211g` to `WIFI_PHY_STANDARD_80211_10MHZ` and repeat 1.2.

1.3.1. What can you learn from the result? (4pts)

1.3.2. What difference are there between the two standards? (3pts)

1.4. What is the role of Node C? Discuss. (4pts)

Task 2 - WiFi RTS/CTS (25pts)

2. **In this task, you will be experimenting with the impact of RTS/CTS on applications in a WiFi network.**

   You have a provided file `task2_skeleton.cc`. Within the file, there are `// TODO` comments that give you guidance.

   You need to:

   2.1. Setup an 8x8 WiFi adhoc grid. The diagram is at Slide 7: Task 2 Diagram. You may use `examples/wireless/wifi-simple-adhoc-grid.cc` as a base. Setup the OLSR routing protocol. (3pts)

   2.2. Setup RTS/CTS. You can find how to do that in the skeleton code for Task 1. (2pts)

   2.3. Setup 8 traffic flows in this grid. The application used is the same as in Task 1. The sources and targets for these flows are described on the next page.

      2.3.1. Set each application to start 0.5 seconds after the previous one. Timings are given on the Diagram slide (1pt)

      2.3.2. Set all applications to stop at 90 seconds. (1pt)

   2.4. If you have configured everything correctly, you should see the 8 flows printed to the console (2pts)

Task 2 - WiFi RTS/CTS

1.5. Run the experiment with RTS/CTS. Show screenshots side by side:

- 1.5.1. RTS/CTS Enabled (3pts)
- 1.5.2. RTS/CTS Disabled (3pts)
- 1.5.3. What are the differences in throughput and packet drops? Why? (8pts)

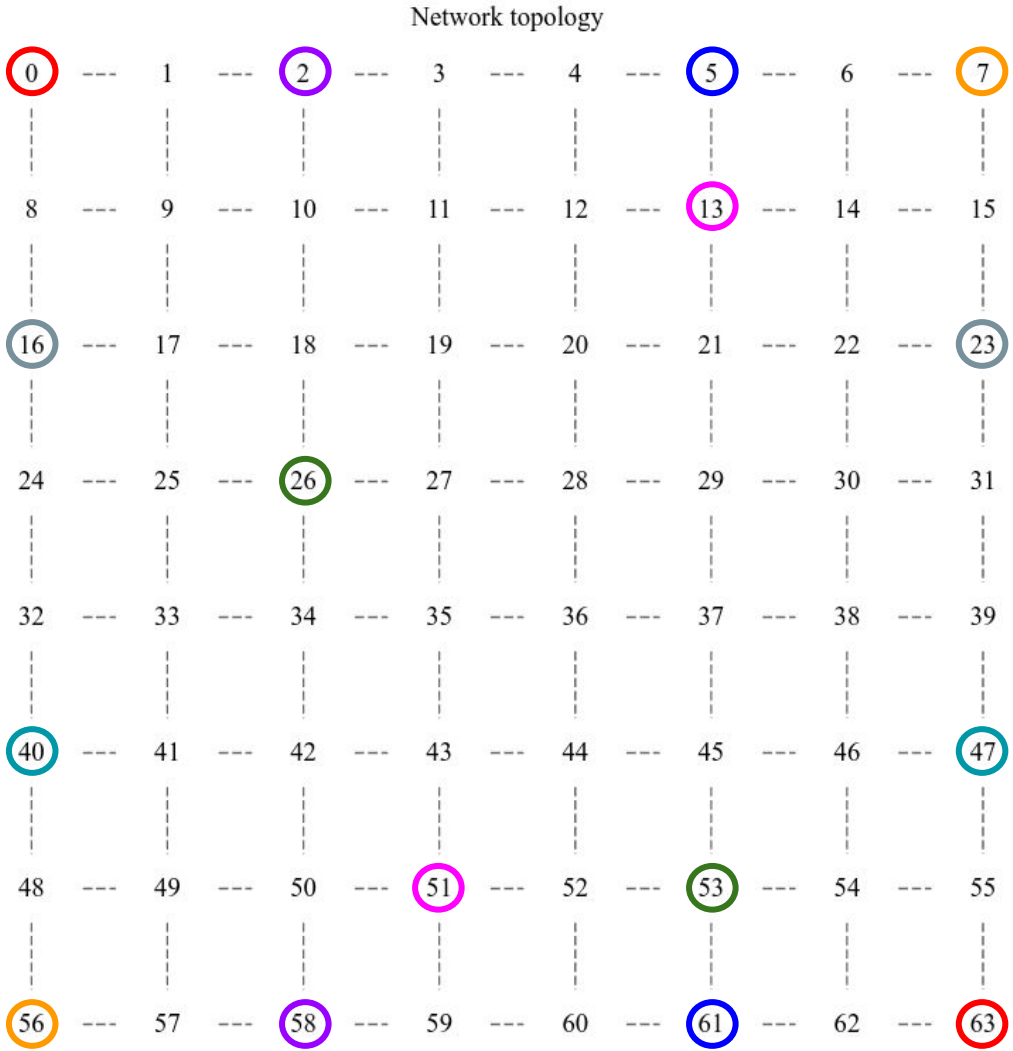
1.6. Clean, readable code (e.g. comments; using functions instead of duplicating code) (2pts)

Task 2 Diagram

Create flows from:

1. 0 → 63 (Start 10)
2. 56 → 7 (Start 10.5)
3. 16 → 23 (Start 11)
4. 40 → 47 (Start 11.5)
5. 58 → 2 (Start 12)
6. 5 → 61 (Start 12.5)
7. 26 → 53 (Start 13)
8. 13 → 51 (Start 13.5)

All end at 90 seconds



Task 3 - NS3 Projects Survey

3. **Feedback for practice assignments (5pts)**
   - You all did a great job. Congratulations!
   - This semester was the first semester of NS3 projects. We need your help to improve NS3 project for future use.
   - There is a survey so you can write detailed feedback for each practice (1-5). Please complete it after you have completed Tasks 1 and 2
   - You will get points for completing the survey!
   - You can find the survey here: https://docs.google.com/forms/d/e/1FAIpQLSe4Do5HjgK8b_rPdBYPl2oDHnFlRZcUGYmz1El4Zkprle_GLQ/viewform

   - Once you complete the survey, take a screenshot and put it in your report.
   - We are requiring Google login in order to avoid duplicate submission. However, emails are NOT recorded. The survey is completely anonymous! Please share your honest thoughts regarding these assignments. Thank you!

Submission Requirements

Submit your report in **pdf format in ENGLISH**, and the files for each task with the filename of ***taskX_20xxxxxx_YourName.cc.*** **The report should be no more than 5 pages.** Submit a zip file on KLMS.
Due: 12/20 Sun, 11:59 pm. *Plagiarism & Late submission: 0 points.*

Lab Session QnA

Q: In task 2 I want to know some requirements, like distance and wifi standard
A: You can use the values from `examples/wireless/wifi-simple-adhoc-grid.cc`