In the first report, you need to use ns-2 to conduct the following simulations. Collaborations across teams are allowed, and highly encouraged. However, please write the report using your own words.

1. Downlink transmissions

Create two wireless devices running 802.11 (WiFi) in ns-2. Call these two devices A and B. Put these two devices close to each other so that the communication link between them is very good. Create an application running on both A and B. With this application, A generates one packet every 10ms. When a packet is generated, A sends it to 802.11.

Measure the round trip time of each transmission. Round trip time is defined as the time between A generates a packet and A receives an ACK from B. From now on, we will say that this round trip time is the length of a time slot in downlink transmissions.

Provide details about your simulation set up, and the way you measure round trip time.

2. Uplink transmissions with PCF

Create two wireless devices running 802.11 (WiFi) in ns-2. Call these two devices A and B. Put these two devices close to each other so that the communication link between them is very good. Create an application running on both A and B. With this application, A sends one POLL packet every 10ms. When B receives the POLL packet, it replies with a data packet. You may need to define POLL packet and data packet by yourself.

Ns-2 does not have a module that supports PCF. Therefore, you need to mimic PCF from the application layer.

Measure the round trip time of each transmission. Round trip time is defined as the time between A sends a POLL packet and A receives a data packet from B. From now on, we will say that this round trip time is the length of a time slot in uplink transmissions.

Provide details about your simulation set up, and the way you measure round trip time.

3. Creating unreliable channels

Create two wireless devices running 802.11 in ns-2. Call these two devices A and B. Use the shadowing module as your wireless channel. Separate the two devices by a distance of X. You need to find out the transmission reliability for each X and plot a figure of the reliability. Find the reliability for both downlink transmissions and uplink transmissions.

An easy way to measure reliability is to transmit a large number of packets, and then count the number of transmissions that have been successfully received. To achieve this, you need to find a way for 802.11 to report whether a transmission is successful to your application.

One important detail to pay attention to: 802.11 has an automatic retry mechanism. When a transmission fails, it immediately retransmit the same packet. This mechanism is designed

to hide errors from the application. You need to disable this mechanism to get an accurate reliability.

4. Measuring delays

Create two wireless devices running 802.11 in ns-2. Call these two devices A and B. Use the shadowing module as your wireless channel. Separate the two devices so that the transmission reliability is a little higher than 55%. Use automatic retransmission in 802.11.

For downlink transmissions, write an application so that A generates a packet every two time slots and forwards these packets to 802.11.

For uplink transmissions, write an application so that A tries to POLL B every two time slots. When B receives a POLL packet, it replies with a data packet.

For both downlink transmissions and uplink transmissions, find the average delay of packets. The delay of a packet is defined as the time between it is generated and it is successfully delivered. Since some packets may take several transmissions to deliver, the delay of a packet is not the same as round trip time in problems 1 and 2.

5. Preference for final report

If you want to work on the topics described in the term project specification, please tell me your preference among the three topics. You may not get your favorite topic. If you decide to work on your own topic and have obtained my approval, you do not need to do anything.