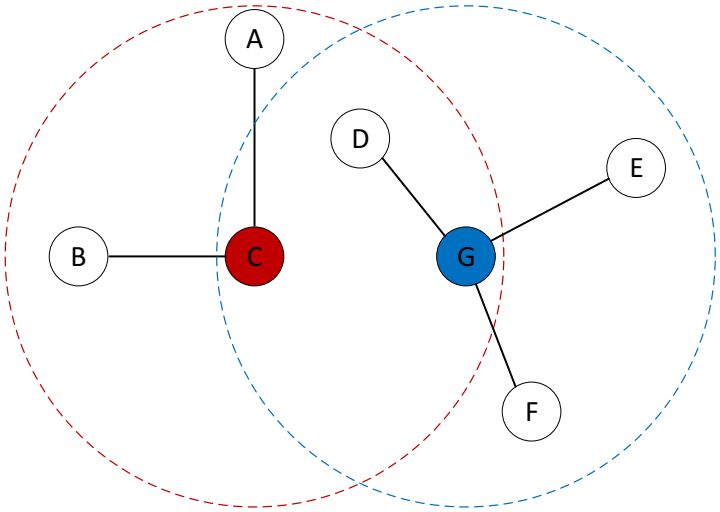
Homework

Chapter 2 Accessing Networks Randomly

1. (10 points) Consider the following WiFi topology, with five transmitters (A, B, D, E, and F) and two access points (C and G). As shown, A and B are associating with C, while D, E, and F are associating with G.



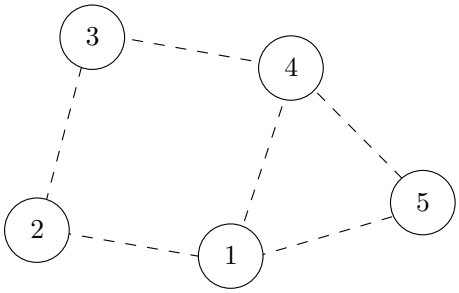
Suppose the two access points are each using non-overlapping channels. Each station is using the (slotted) ALOHA protocol, with a 40% probability of transmitting in each timeslot. What throughput does Station A achieve (in percentage)? How about Station D?

(Note we do NOT ask for total throughput here, which would have required us to multiply by the number of stations in each case.)

2. (5 points) Under CSMA, a WiFi device sends a frame to its AP. It waits a certain amount of time, but doesn't receive an acknowledgement. What will it do next? Assume the current contention window size is 8.
   a. It will assume the frame was not important and move to the next one.
   b. It will immediately re-transmit the frame.
   c. It will choose a random number between 0 and 7, and wait that many timeslots before re-transmitting.
   d. It will increase the contention window size to 9, choose a random number between 0 and 8, and wait that many timeslots before re-transmitting.
   e. It will increase the contention window size to 16, choose a random number between 0 and 15, and wait that many timeslots before re-transmitting.
   f. It will increase the contention window size to 9, and go through another wait-and-listen period before choosing a timeslot between 0 and 8 randomly.

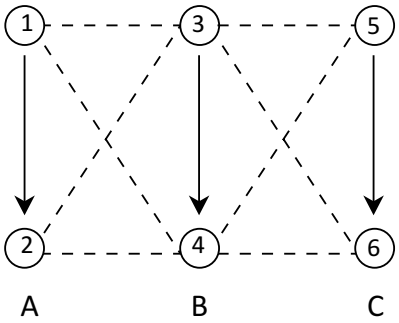
g. It will increase the contention window size to 16, and go through another wait-and-listen period before choosing a timeslot between 0 and 15 randomly.

3. (10 points) Consider the following network where a dashed edge between two nodes indicates that the nodes can transmit to and interfere with each other.



a. Suppose node 1 is transmitting to node 2. Which node(s) can cause the hidden node problem?
b. What about node 1 transmitting to node 4?
c. What about node 1 transmitting to node 5?

4. (10 points) Consider the following network topology, where three solid lines represent three intended transmission sessions, A (from 1 to 2), B (from 3 to 4), and C (from 5 to 6) and dashed lines represent interference as well as sensing between nodes.



The following figure shows the activities of sessions A and C in time, where grey areas indicate the time when a session is transmitting a frame. Draw in the figure **the range of time** when session B can transmit without colliding with other sessions. *Also explain why session B is disadvantaged.*