**Design of Wireless Communication Networks**

**Design Challenge**

1. Each team will have 8 devices
2. A linear topology A-B-C-D-E-F-G-H will be used. Devices will be randomly picked to each of the 8 positions (i.e., A, B or C, etc). The distance and the antenna gain will be adjusted so that devices can only hear neighbors in two hops (for example, A can only hear B and C, H can only hear F and G, D can hear B, C, E, and F).
3. Devices are powered on from the left to the right. When it is powered on, it has to show its ID**.** The ID (not the MAC address) is determined based on the order a device is powered on. For example, a device placed in position D will have an "ID"  
   =4. Once a device determines its ID (say, X), it has to blink an LED for X times to show that it does obtain the correct IDs.
4. All devices should send a message (including the ID it obtains in step 3) to the rightmost device (i.e., the device placed at H). That device is connected to a laptop to show the reception time and the content of the message for each received.
5. The starting time for all other devices to send a message to the device at H is when the device at H finishes its blinking for 8 times. (How other knows that the device at H has finished blinking ... well.. that is the challenge)

***Topology***

***A B C D E F G H***

Address

0x0008

Address

0x0007

Address

0x0002

**Address**

0x0003

ID: 2

**Address**

0x0005

ID: 1

Address

0x0001

Address

0x0004

Address

0x0006

ID: 8

**🡨 Left Right 🡪**

**In the figure above, the "address" is the MAC address of each device which you can set to any value offline.**

***Console in the Laptop attached to the device at H***

**Time1:** Address:0x0005 / ID:1

**Time2:** Address:0x0007 / ID:2

**Time3:** Address:0x0003 / ID:3

**Time4:** Address:0x0002 / ID:4

**Time5:** Address:0x0001 / ID:5

**Time6:** Address:0x0008 / ID:6

**Time7:** Address:0x0004 / ID:7

Check list:

1. Show that the (logical connectivity) topology is indeed as required by step 2. (for example, if A can hear D, then you fail to satisfy step 2.
2. Show the results as indicated in the figure on page 1.
3. Record the total number of messages received by the device at H, starting from the time when the device at H finishes its blinking. (Note that in order for the device at H to receive the IDs of all other devices, many "control" or "routing messages might be generated by the 8 devices).
4. Record the duration between the time when the device at H finishes its blinking and the time when it collects (ID) messages from all other devices.

Grading:

1. If check list items 1 and 2 are completed, you get 85.

2. If the values of check list items 3 and 4 are smallest, you get extra bonus.