###### *CSE 473 – Introduction to Computer Networks*

Studio 3

##### (*Adapted from Jon Turner’s Studios*)

In this studio, you’ll be building a simple *ring overlay network* and testing it in ONL. In your repository, you will find an ONL configuration file and three java files: *Ring.java*, *Packet.java* and *Pair.java*.

1. You should login to ONL using your ONL account. Start the RLI, open the provided configuration file and commit it.
2. Copy the *studio3* directory to ONL. Read the comments at the start of *Ring.java* and then go through the code in all three files. Assuming the are doing the studio in a group, talk about it to make sure everyone understands the way things work. Ask questions about anything you’re not sure of.
3. Next, fill in the missing parts of the code (indicated by TODO in the provided code – basically, *Ring.java*). Again, talk over what you’re doing and make sure that you all agree on how to complete the program.
4. Assuming you are doing the studio as a group (from one ONL account), students in the group should now each open a Linux shell and *ssh* to ONL. In each window, type

source /users/onl/.topology

and then from *onlusr*, *ssh* to hosts $*h4x2*, $*h2x3*, $*h7x1* and $*h2x5* in your windows. In one window, run *Ring*, with the appropriate command-line arguments (include the *debug* argument). Then, run it again in each of the other windows, connecting each instance of *Ring* to one of the previous instances. Specifically, the instance on *h2x3* should be the successor of the instance on *h4x2*, and the instance on *h7x1* should be the successor of the instance on *h2x3*, and *h2x5* should be the successor of *h7x1*.

*h2x5*

*h7x1*

*h4x2*

*h2x3*

Observe the packets being printed in each window. Are they what you expect? If not, figure out what changes are needed to your program and try again.

1. When your program is running correctly, you should be able to observe packets being forwarded between routers in the monitoring windows. Make sure that the curves that show packets being forwarded are consistent with what you expect.

Now, click on port 2 of router NPR 1 and select the *filter table*. You should see a *packet filter* that has been configured for this port. Make sure you understand what this filter does, when it is enabled. Ask the TA or other students if you are unsure or post a question on piazza if you are doing the studio on your own. Filters specify actions, *e.g.,* drop, to be performed on packets of different types, *e.g.,* that match certain source and destination addresses, where sets of addresses are specified based on their subnet address and mask (see Sections 4.1-4.3 in the textbook). Now, enable the filter by clicking the check box all the way at the right end of the entry, and selecting “commit” from the file menu. Observe the effect this has on the operation of the ring. Which nodes are no longer receiving ring test packets? Why? Can you see the effect of the filter in the monitoring display?