

ICS 167: Multiplayer Online Systems Project

Pong Game

Milestone 3: Network Latency (Due in dropbox 11:59pm: 2/25/2015)

In this milestone you are going to add artificial latency to every message the server sends or receives. You will observe how it affects the gaming experience. Then you need to design a way to estimate and mitigate the effect of the latency on the server and the clients.

- **Artificial latency**

One way to add latency to the messages is to put them in a queue (buffer) whenever you are about to send or receive them, associate a delay with each message specifying when it should actually be sent or received, then check this queue frequently to see if the message is now ready to be serviced.

- **Latency estimation**

A common way to estimate network latency is to put a timestamp in the message when it is sent. Then the receiver can estimate the latency by comparing the timestamp to its own clock. In this milestone, you are allowed to run your server and clients on the same machine so you do not need to consider the synchronization issue. In other words, they all have the same clock.

The features you need to implement are listed as follows:

- Server
 - Add artificial latency to each message being sent or received. It can be fixed, or random (best if a distribution is used, for example a uniform distribution with a minimum – maximum range).
 - Calculate the latency between the server and each of the clients for your latency mitigation mechanism.
- Client
 - Calculate the latency between the server and the client.

As with previous submissions, please put your server and client code in different folders with one team member's student ID as the name of the files and the folder. Compress them to a zip file, and make sure you upload it to the course dropbox by the deadline. Please use this Student for consecutive submissions. Always list all team members IDs and names in the files. Track participation and what each member contributed. This will be part of the overall evaluation of the team grade and individual grades.