

Scalability testing

Milestone Extensions:

Multi-Floor Bomberman

The ability to play multiple floors was added to the project. As long as a player is still alive at the end of the round another floor will be randomly generated and players replaced (without their powerups) so they may continue to play until such time that they lose.

Planned extensions to the multiple floors (assuming that development were to continue) are:

- Increment the number of enemies to increase level difficulty
- Increase size of GameBoard to allow for more enemies

Multiple Games per Server

The ability to run multiple games on one server. Each game starts with its' own port. This allows groups of players that wish to play together to join a specific game on that server and play until their hearts content.

The ServerMain takes the ports you wish to run on as command line arguments. This gives you full control over what ports the servers run on as well as exactly how many servers to run. If no arguments are provided then a single server will start on the default port.

Performance Measurements

TestLatency - This class measures the round-trip time taken to send a specified number of messages from one network instance to another network instance, then back again, all on the same computer. The first test measures the round-trip time taken for one message to be sent in nanoseconds, since milliseconds does not have a large enough resolution. The second test does the same as the first, except that it sends five messages at a time, measuring the latency of that.

TestPacketLoss - This class measures the average packet loss from sending a burst of messages from one network instance to another network instance. The test runs ten sample each of sending 100, 500, 1000, 2000, 5000, 10000 messages in a burst. It then calculates the packet loss percentage for each level of messages and outputs the results.

Sample Performance Test Output

TestLatency - most important lines bolded
2014-04-04 11:24:45 INFO Network:139 - GOT MESSAGE from Inbox: 6334532291993
2014-04-04 11:24:45 INFO Network:139 - GOT MESSAGE from Inbox: 6334540744541

response time for 1 message : 3324746 nanoseconds

=====Network shutdown : default

2014-04-04 11:24:45 ERROR Network:118 - SOCKET ERROR (8888) [default]

java.net.SocketException: socket closed

=====Network shutdown : default

2014-04-04 11:24:45 ERROR Network:118 - SOCKET ERROR (8871) [default]

java.net.SocketException: socket closed

waiting for ports to clear...

starting test 2

2014-04-04 11:24:47 INFO Network:139 - GOT MESSAGE from Inbox: 6336546518861

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2014-04-04 11:24:47 INFO Network:139 - GOT MESSAGE from Inbox: 6336546518861

2014-04-04 11:24:47 INFO Network:139 - GOT MESSAGE from Inbox: 6336552846490

2014-04-04 11:24:47 ERROR Network:65 - ERROR EMPTY INBOX RETURNING NULL

2014-04-04 11:24:47 INFO Network:139 - GOT MESSAGE from Inbox: 6336555125707

2014-04-04 11:24:47 ERROR Network:65 - ERROR EMPTY INBOX RETURNING NULL

2014-04-04 11:24:47 INFO Network:139 - GOT MESSAGE from Inbox: 6336556918291

2014-04-04 11:24:47 INFO Network:139 - GOT MESSAGE from Inbox: 6336546518861

2014-04-04 11:24:47 INFO Network:139 - GOT MESSAGE from Inbox: 6336552649253

2014-04-04 11:24:47 INFO Network:139 - GOT MESSAGE from Inbox: 6336552760265

2014-04-04 11:24:47 INFO Network:139 - GOT MESSAGE from Inbox: 6336546518861

roundtrip for 5 messages : 12241236 nanoseconds

=====Network shutdown : default

=====Network shutdown : default

2014-04-04 11:24:47 ERROR Network:118 - SOCKET ERROR (8871) [default]

java.net.SocketException: socket closed

2014-04-04 11:24:47 ERROR Network:118 - SOCKET ERROR (8888) [default]

java.net.SocketException: socket closed

TestPacketLoss - most important lines bolded

Messages transmitted : 100, Messages received : 100 , PACKET LOSS(%) : 0.0%

Messages transmitted : 100, Messages received : 100 , PACKET LOSS(%) : 0.0%

Messages transmitted : 100, Messages received : 93 , PACKET LOSS(%) : 7.0%

Messages transmitted : 100, Messages received : 100 , PACKET LOSS(%) : 0.0%

Messages transmitted : 100, Messages received : 100 , PACKET LOSS(%) : 0.0%

Messages transmitted : 100, Messages received : 100 , PACKET LOSS(%) : 0.0%

Messages transmitted : 100, Messages received : 91 , PACKET LOSS(%) : 9.0%

Messages transmitted : 100, Messages received : 96 , PACKET LOSS(%) : 4.0%

Messages transmitted : 100, Messages received : 100 , PACKET LOSS(%) : 0.0%

Messages transmitted : 100, Messages received : 98 , PACKET LOSS(%) : 2.0%

Average packet loss for 100 Messages Transmitted : 2.2%

Messages transmitted : 500, Messages received : 499 , PACKET LOSS(%) :

0.20000000000000284%

Messages transmitted : 500, Messages received : 155 , PACKET LOSS(%) : 69.0%

Messages transmitted : 500, Messages received : 500 , PACKET LOSS(%) : 0.0%

Messages transmitted : 500, Messages received : 500 , PACKET LOSS(%) : 0.0%

Messages transmitted : 500, Messages received : 499 , PACKET LOSS(%) :
0.20000000000000284%

Messages transmitted : 500, Messages received : 494 , PACKET LOSS(%) :
1.2000000000000028%

Messages transmitted : 500, Messages received : 500 , PACKET LOSS(%) : 0.0%

Messages transmitted : 500, Messages received : 496 , PACKET LOSS(%) :
0.7999999999999972%

Messages transmitted : 500, Messages received : 497 , PACKET LOSS(%) :
0.5999999999999943%

Messages transmitted : 500, Messages received : 441 , PACKET LOSS(%) :
11.799999999999997%

Average packet loss for 500 Messages Transmitted : 8.379999999999999%

Messages transmitted : 1000, Messages received : 1000 , PACKET LOSS(%) : 0.0%

Messages transmitted : 1000, Messages received : 999 , PACKET LOSS(%) :
0.09999999999999432%

Messages transmitted : 1000, Messages received : 675 , PACKET LOSS(%) : 32.5%

Messages transmitted : 1000, Messages received : 46 , PACKET LOSS(%) : 95.4%

Messages transmitted : 1000, Messages received : 1000 , PACKET LOSS(%) : 0.0%

Messages transmitted : 1000, Messages received : 778 , PACKET LOSS(%) :
22.200000000000003%

Messages transmitted : 1000, Messages received : 1000 , PACKET LOSS(%) : 0.0%

Messages transmitted : 1000, Messages received : 997 , PACKET LOSS(%) :
0.29999999999999716%

Messages transmitted : 1000, Messages received : 996 , PACKET LOSS(%) :
0.4000000000000057%

Messages transmitted : 1000, Messages received : 997 , PACKET LOSS(%) :
0.29999999999999716%

Average packet loss for 1000 Messages Transmitted : 15.12%

Messages transmitted : 2000, Messages received : 2000 , PACKET LOSS(%) : 0.0%

Messages transmitted : 5000, Messages received : 2132 , PACKET LOSS(%) : 57.36%

Messages transmitted : 10000, Messages received : 2103 , PACKET LOSS(%) : 78.97%