**COP 5615 Project 2**

Du, Dafei 9328-7153

Shi, Yuhao 1707-3591

**Compile**

The command line should be like this format:

project2 [numNodes] [topology] [algorithm]

There are two algorithms written on the command line: gossip, push\_sum

Four topologies: full, imperfect3D, 3D, line

For example,

project2 8 full gossip

project2 8 3D gossip

project2 8 line gossip

project2 8 imperfect3D gossip

project2 8 full push\_sum

project2 8 3D push\_sum

project2 8 line push\_sum

project2 8 imperfect3D push\_sum

**Graphical user interface, text, application

Description automatically generated**

**Results**

The plots below represent the number of nodes we tested vs. convergence time in milliseconds.

The largest number of nodes we were able to test on the network is 3375 for both algorithms and topology methods.

Push Sum

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of Nodes | Full Network | 3D Grid | Line | Imperfect 3D Grid |
| 8 | 388.345 | 458.8129 | 608.1352 | 358.7341 |
| 27 | 318.5989 | 536.8684 | 686.2252 | 406.7905 |
| 64 | 287.3333 | 496.9748 | 780.0448 | 386.9128 |
| 125 | 327.2827 | 437.2081 | 770.1747 | 367.3247 |
| 216 | 346.9029 | 430.0762 | 721.0088 | 387.4937 |
| 343 | 298.1317 | 418.1859 | 848.548 | 368.8174 |
| 512 | 338.78 | 459.3646 | 789.2451 | 370.1671 |
| 729 | 331.0079 | 431.1396 | 840.7533 | 391.0683 |
| 1000 | 331.8598 | 427.3825 | 830.6734 | 391.2052 |
| 3375 | 9912.5235 | 13115.4004 | 26026.0845 | 1199.1591 |

Gossip

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of Nodes | Full Network | 3D Grid | Line | Imperfect 3D Grid |
| 8 | 4.744 | 4.8933 | 4.789 | 4.7754 |
| 27 | 4.846 | 4.8709 | 4.8423 | 4.7519 |
| 64 | 5.3117 | 5.8435 | 5.3285 | 5.6463 |
| 125 | 7.3802 | 6.6953 | 6.6514 | 6.9813 |
| 216 | 9.1738 | 8.7997 | 8.3221 | 7.9091 |
| 343 | 13.5251 | 10.4114 | 10.1929 | 11.8098 |
| 512 | 11.684 | 14.03350 | 13.5416 | 14.1627 |
| 729 | 15.8687 | 17.443 | 18.1171 | 18.7797 |
| 1000 | 16.4227 | 34.4597 | 32.6983 | 32.5293 |
| 3375 | 48.6366 | 48.0367 | 63.5206 | 58.5563 |

Chart, line chart

Description automatically generated

**Conclusion**

1. Based on the results we found, we found that the line topology seems to be the least efficient for both algorithms.
2. Full network is the most efficient topology method for gossip algorithm, and imperfect 3D grid is the most efficient for push sum algorithm.
3. Gossip seems to be much more efficient than push sum algorithm in terms of convergence time.