README

Team Members

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Steps to Run

dotnet add package Akka –version 1.4.25
dotnet add package Akka.FSharp –version 1.4.25
dotnet fsi code.fsx <numberOfNodes> <topology> <algorithm>

- numberofNodes - An integer which specifies the number of nodes
- topology - A string specifying the topology to be used. Options present are:
  - "Full" for using Full topology
  - "Line" for using Line topology
  - "3D" for using 3D topology
  - "Imp3D" for using Imperfect 3D topology
- algorithm - A string specifying the algorithm to be used. Options present are:
  - "Gossip" for using the Gossip Algorithm
  - "Push" for using the Push Sum Algorithm

Introduction

Our program uses actor model in F# to implement the Gossip and Push-Sum Algorithm. Actors passes messages to each other as per the algorithms and finally converge to produce the desired output. For each combination of topology and algorithm mentioned above our program converges and gives the time taken for all the nodes to converge, as the output.

Observations

- Full topology using both Gossip and Push-Sum algorithms mostly takes the minimum time to converge for a particular number of nodes. This is logical because a particular node in the Full topology has all other nodes as its neighbors. This facilitates unhindered message passing, which helps the nodes to converge in a comparatively lesser time.
- Line topology using both Gossip and Push-Sum algorithms takes the most time to converge when compared to others. This is because a node has at most two neighbors(the ones adjacent to it). Message passing is restricted and thus convergence is slow. We could not converge 'Line' with Gossip algorithm after 2500 nodes. Also Line topology sometimes do not converge due to unavailibility of sufficient neighbors. A node might never converge because all its neighbors have converged and so the program does not complete in such a case.

- 3D topology with 6 neighbors perform better than 'Line' but worse than 'Full'.
- Imperfect 3D with 7 neighbors performs similar to 3D topology sometimes a bit better than '3D' due to the presence of an extra neighbor.
- Sometimes(Rarely for '3D', 'Imperfect 3D' but never for 'Full') few nodes do not converge. A node might not converge when all its neighbors have converged thus leaving no way to receive messages from its neighbors.

Largest Network

Listed below are the maximum number of nodes that could converge for each topology and algorithm combination.

- Full and Gossip algorithm - 8000
- Line and Gossip algorithm - 2500
- 3D and Gossip algorithm - 10000
- Imperfect 3D and Gossip algorithm - 10000
- Full and Push-Sum algorithm - 8000
- Line and Push-Sum algorithm - 10000
- 3D and Push-Sum algorithm - 10000
- Imperfect 3D and Push-Sum algorithm - 10000