COP5615 – DISTRIBUTED OPERATING SYSTEM PRINCIPLES

PROJECT 2

GOSSIP SIMULATOR USING ERLANG

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OUTPUT SCREENSHOTS:

GOSSIP ALGORITHM OUTPUTS:

GOSSIP - FULL TOPOLOGY:

```
enter number of Nodes12.
enter the topology: full.
enter the algorithm: gossip.
No of workers: 12
Final No of workers after rounding: 12
Worker pids is [<0.83.0>,<0.84.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>,<0.93.0>,<0.94.0>]
hello
2> Neighbors of Node <0.83.0> are: [<0.84.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                                    <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>,<0.93.0>,
                                    <0.94.0>]
2> Neighbors of Node <0.84.0> are: [<0.83.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                                    <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>,<0.93.0>,
                                    <0.94.0>]
2> Neighbors of Node <0.85.0> are: [<0.84.0>,<0.83.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                                    <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>,<0.93.0>,
                                    <0.94.0>]
2> Neighbors of Node <0.86.0> are: [<0.85.0>,<0.84.0>,<0.83.0>,<0.87.0>,<0.88.0>,
                                    <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>,<0.93.0>,
                                    <0.94.0>]
2> Neighbors of Node <0.87.0> are: [<0.86.0>,<0.85.0>,<0.84.0>,<0.83.0>,<0.88.0>,
                                    <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>,<0.93.0>,
                                    <0.94.0>]
2> Neighbors of Node <0.88.0> are: [<0.87.0>,<0.86.0>,<0.85.0>,<0.84.0>,<0.83.0>,
```

```
                                <0.85.0>,<0.84.0>,<0.83.0>,<0.92.0>,<0.93.0>,
                                <0.94.0>]
                                <0.87.0>,<0.86.0>,<0.85.0>,<0.84.0>,<0.83.0>,
                                <0.94.0>]
2> Neighbors of Node <0.94.0> are: [<0.93.0>,<0.92.0>,<0.91.0>,<0.90.0>,<0.89.0>,
                                <0.88.0>,<0.87.0>,<0.86.0>,<0.85.0>,<0.84.0>,
                                <0.83.0>]
2> Node <0.83.0> received rumour: "Hello_Process"
2> Node <0.86.0> received rumour: "Hello_Process"
2> Node <0.87.0> received rumour: "Hello_Process"
2> Node <0.94.0> received rumour: "Hello_Process"
2> Node <0.84.0> received rumour: "Hello_Process"
2> Node <0.88.0> received rumour: "Hello_Process"
2> Node <0.89.0> received rumour: "Hello_Process"
2> Node <0.85.0> received rumour: "Hello_Process"
2> Node <0.93.0> received rumour: "Hello_Process"
2> Node <0.92.0> received rumour: "Hello_Process"
2> Node <0.90.0> received rumour: "Hello_Process"
2> Node <0.91.0> received rumour: "Hello_Process"
2> Gossip Converged
2> Time Elapsed is 119
```

GOSSIP – 2D TOPOLOGY:

```
enter number of Nodes12.
enter the topology: 2D.
enter the algorithm: gossip.
No of workers: 12
Final No of workers after rounding: 16
Worker pids is [<0.83.0>,<0.84.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>,<0.93.0>,<0.94.0>,
                <0.95.0>,<0.96.0>,<0.97.0>,<0.98.0>]
hello
2> Neighbors of Node <0.98.0> are: [<0.97.0>,<0.94.0>,<0.93.0>]
2> Neighbors of Node <0.97.0> are: [<0.92.0>,<0.93.0>,<0.94.0>,<0.98.0>,<0.96.0>]
2> Neighbors of Node <0.96.0> are: [<0.91.0>,<0.92.0>,<0.93.0>,<0.97.0>,<0.95.0>]
2> Neighbors of Node <0.95.0> are: [<0.96.0>,<0.91.0>,<0.92.0>]
2> Neighbors of Node <0.94.0> are: [<0.89.0>,<0.90.0>,<0.93.0>,<0.97.0>,<0.98.0>]
2> Neighbors of Node <0.93.0> are: [<0.88.0>,<0.89.0>,<0.90.0>,<0.92.0>,<0.94.0>,
                                <0.96.0>,<0.97.0>,<0.98.0>]
2> Neighbors of Node <0.92.0> are: [<0.87.0>,<0.88.0>,<0.89.0>,<0.91.0>,<0.93.0>,
                                <0.95.0>,<0.96.0>,<0.97.0>]
2> Neighbors of Node <0.91.0> are: [<0.87.0>,<0.88.0>,<0.92.0>,<0.95.0>,<0.96.0>]
2> Neighbors of Node <0.90.0> are: [<0.85.0>,<0.86.0>,<0.89.0>,<0.93.0>,<0.94.0>]
2> Neighbors of Node <0.89.0> are: [<0.84.0>,<0.85.0>,<0.86.0>,<0.88.0>,<0.90.0>,
                                <0.92.0>,<0.93.0>,<0.94.0>]
2> Neighbors of Node <0.88.0> are: [<0.83.0>,<0.84.0>,<0.85.0>,<0.87.0>,<0.89.0>,
                                <0.91.0>,<0.92.0>,<0.93.0>]
```

```
                                <0.91.0>,<0.92.0>,<0.93.0>]
2> Neighbors of Node <0.87.0> are: [<0.83.0>,<0.84.0>,<0.88.0>,<0.91.0>,<0.92.0>]
2> Neighbors of Node <0.86.0> are: [<0.85.0>,<0.90.0>,<0.89.0>]
2> Neighbors of Node <0.85.0> are: [<0.88.0>,<0.84.0>,<0.86.0>,<0.89.0>,<0.90.0>]
2> Neighbors of Node <0.84.0> are: [<0.87.0>,<0.83.0>,<0.85.0>,<0.88.0>,<0.89.0>]
2> Neighbors of Node <0.83.0> are: [<0.84.0>,<0.87.0>,<0.88.0>]
2> Node <0.83.0> received rumour: "Hello_Process"
2> Node <0.88.0> received rumour: "Hello_Process"
2> Node <0.87.0> received rumour: "Hello_Process"
2> Node <0.84.0> received rumour: "Hello_Process"
2> Node <0.89.0> received rumour: "Hello_Process"
2> Node <0.91.0> received rumour: "Hello_Process"
2> Node <0.92.0> received rumour: "Hello_Process"
2> Node <0.93.0> received rumour: "Hello_Process"
2> Node <0.85.0> received rumour: "Hello_Process"
2> Node <0.90.0> received rumour: "Hello_Process"
2> Node <0.96.0> received rumour: "Hello_Process"
2> Node <0.94.0> received rumour: "Hello_Process"
2> Node <0.97.0> received rumour: "Hello_Process"
2> Node <0.98.0> received rumour: "Hello_Process"
2> Node <0.86.0> received rumour: "Hello_Process"
2> Node <0.95.0> received rumour: "Hello_Process"
2> Gossip Converged
2> Time Elapsed is 338
```

GOSSIP – IMP2D TOPOLOGY:

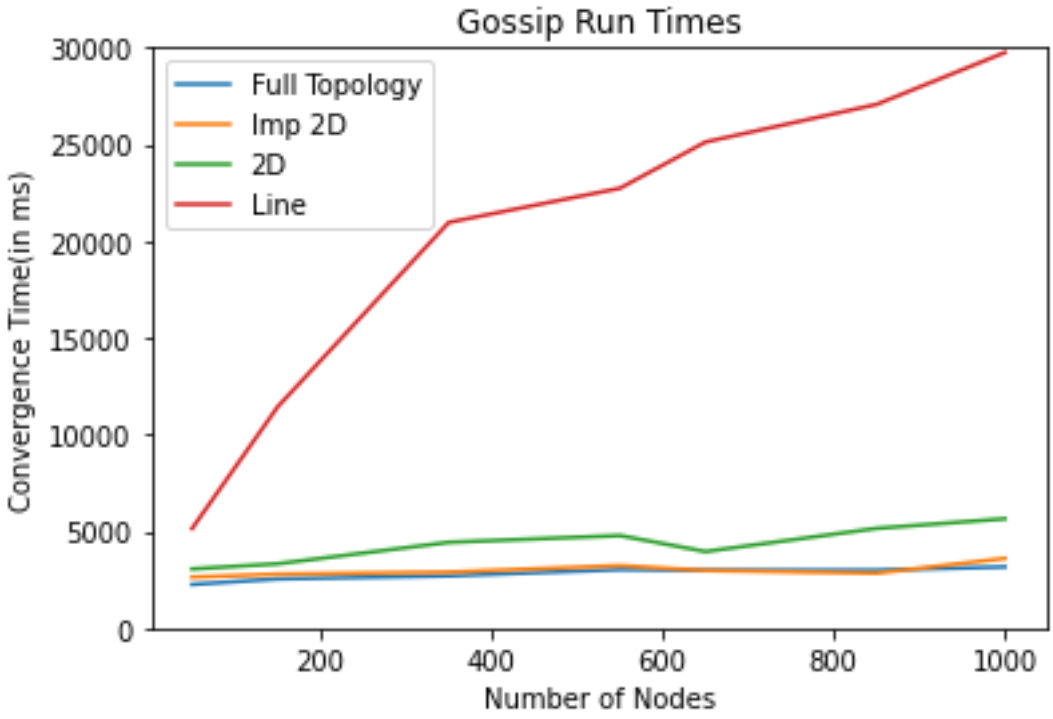
```
1> algorithm_executer:start().
enter number of Nodes12.
enter the topology: imp2D.
enter the algorithm: gossip.
No of workers: 12
Final No of workers after rounding: 16
Worker pids is [<0.83.0>,<0.84.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>,<0.93.0>,<0.94.0>,
                <0.95.0>,<0.96.0>,<0.97.0>,<0.98.0>]
hello
2> Neighbors of Node <0.98.0> are: [<0.92.0>,<0.97.0>,<0.94.0>,<0.93.0>]
2> Neighbors of Node <0.97.0> are: [<0.90.0>,<0.92.0>,<0.93.0>,<0.94.0>,<0.98.0>,
                                   <0.96.0>]
2> Neighbors of Node <0.96.0> are: [<0.84.0>,<0.91.0>,<0.92.0>,<0.93.0>,<0.97.0>,
                                   <0.95.0>]
2> Neighbors of Node <0.95.0> are: [<0.95.0>,<0.96.0>,<0.91.0>,<0.92.0>]
2> Neighbors of Node <0.94.0> are: [<0.94.0>,<0.89.0>,<0.90.0>,<0.93.0>,<0.97.0>,
                                   <0.98.0>]
2> Neighbors of Node <0.93.0> are: [<0.84.0>,<0.88.0>,<0.89.0>,<0.90.0>,<0.92.0>,
                                   <0.94.0>,<0.96.0>,<0.97.0>,<0.98.0>]
2> Neighbors of Node <0.92.0> are: [<0.85.0>,<0.87.0>,<0.88.0>,<0.89.0>,<0.91.0>,
                                   <0.93.0>,<0.95.0>,<0.96.0>,<0.97.0>]
2> Neighbors of Node <0.91.0> are: [<0.83.0>,<0.87.0>,<0.88.0>,<0.92.0>,<0.95.0>,
                                   <0.96.0>]
```

```
                                <0.92.0>]
2> Neighbors of Node <0.86.0> are: [<0.98.0>,<0.85.0>,<0.90.0>,<0.89.0>]
2> Neighbors of Node <0.85.0> are: [<0.87.0>,<0.88.0>,<0.84.0>,<0.86.0>,<0.89.0>
                                <0.90.0>]
2> Neighbors of Node <0.84.0> are: [<0.91.0>,<0.87.0>,<0.83.0>,<0.85.0>,<0.88.0>
                                <0.89.0>]
2> Neighbors of Node <0.83.0> are: [<0.92.0>,<0.84.0>,<0.87.0>,<0.88.0>]
2> Node <0.83.0> received rumour: "Hello_Process"
2> Node <0.87.0> received rumour: "Hello_Process"
2> Node <0.88.0> received rumour: "Hello_Process"
2> Node <0.92.0> received rumour: "Hello_Process"
2> Node <0.84.0> received rumour: "Hello_Process"
2> Node <0.94.0> received rumour: "Hello_Process"
2> Node <0.91.0> received rumour: "Hello_Process"
2> Node <0.89.0> received rumour: "Hello_Process"
2> Node <0.85.0> received rumour: "Hello_Process"
2> Node <0.96.0> received rumour: "Hello_Process"
2> Node <0.93.0> received rumour: "Hello_Process"
2> Node <0.95.0> received rumour: "Hello_Process"
2> Node <0.97.0> received rumour: "Hello_Process"
2> Node <0.90.0> received rumour: "Hello_Process"
2> Node <0.98.0> received rumour: "Hello_Process"
2> Node <0.86.0> received rumour: "Hello_Process"
2> Gossip Converged
```

GOSSIP – LINE TOPOLOGY:

```
4> c(algo_pushsum).
{ok,algo_pushsum}
5> algorithm_executer:start().
enter number of Nodes12.
enter the topology: line.
enter the algorithm: gossip.
No of workers: 12
Final No of workers after rounding: 12
Worker pids is [<0.103.0>,<0.104.0>,<0.105.0>,<0.106.0>,<0.107.0>,<0.108.0>,
                <0.109.0>,<0.110.0>,<0.111.0>,<0.112.0>,<0.113.0>,<0.114.0>]
hello
Neighbors of Node <0.114.0> are: [<0.113.0>]
Neighbors of Node <0.113.0> are: [<0.112.0>,<0.114.0>]
6> Node <0.109.0> received rumour: "Hello_Process"
6> Node <0.110.0> received rumour: "Hello_Process"
6> Node <0.111.0> received rumour: "Hello_Process"
6> Node <0.112.0> received rumour: "Hello_Process"
6> Node <0.113.0> received rumour: "Hello_Process"
6> Node <0.114.0> received rumour: "Hello_Process"
6> Gossip Converged
6> Time Elapsed is 3317
6>
```

GOSSIP ALGORITHM FOR DIFFERENT TOPOLOGIES:



PUSH SUM ALGORITH:

PUSH SUM – FULL TOPOLOGY:

```
1> algorithm_executer:start().
enter number of Nodes10.
enter the topology: full.
enter the algorithm: push-sum.
No of workers: 10
Final No of workers after rounding: 10
Worker pids is [<0.83.0>,<0.84.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>]
hello
2> Node <0.83.0> Neighbours are: [<0.84.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                                  <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>]
2> Node <0.84.0> Neighbours are: [<0.83.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                                  <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>]
2> Node <0.85.0> Neighbours are: [<0.84.0>,<0.83.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                                  <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>]
2> Node <0.86.0> Neighbours are: [<0.85.0>,<0.84.0>,<0.83.0>,<0.87.0>,<0.88.0>,
                                  <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>]
2> Node <0.87.0> Neighbours are: [<0.86.0>,<0.85.0>,<0.84.0>,<0.83.0>,<0.88.0>,
                                  <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>]
2> Node <0.88.0> Neighbours are: [<0.87.0>,<0.86.0>,<0.85.0>,<0.84.0>,<0.83.0>,
                                  <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>]
2> Node <0.89.0> Neighbours are: [<0.88.0>,<0.87.0>,<0.86.0>,<0.85.0>,<0.84.0>,
                                  <0.83.0>,<0.90.0>,<0.91.0>,<0.92.0>]
2> Node <0.90.0> Neighbours are: [<0.89.0>,<0.88.0>,<0.87.0>,<0.86.0>,<0.85.0>,
                                  <0.84.0>,<0.83.0>,<0.91.0>,<0.92.0>]
```

```
2> Node <0.87.0> Neighbours are: [<0.86.0>,<0.85.0>,<0.84.0>,<0.83.0>,<0.88.0>,
                                  <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>]
2> Node <0.88.0> Neighbours are: [<0.87.0>,<0.86.0>,<0.85.0>,<0.84.0>,<0.83.0>,
                                  <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>]
2> Node <0.89.0> Neighbours are: [<0.88.0>,<0.87.0>,<0.86.0>,<0.85.0>,<0.84.0>,
                                  <0.83.0>,<0.90.0>,<0.91.0>,<0.92.0>]
2> Node <0.90.0> Neighbours are: [<0.89.0>,<0.88.0>,<0.87.0>,<0.86.0>,<0.85.0>,
                                  <0.84.0>,<0.83.0>,<0.91.0>,<0.92.0>]
2> Node <0.91.0> Neighbours are: [<0.90.0>,<0.89.0>,<0.88.0>,<0.87.0>,<0.86.0>,
                                  <0.85.0>,<0.84.0>,<0.83.0>,<0.92.0>]
2> Node <0.92.0> Neighbours are: [<0.91.0>,<0.90.0>,<0.89.0>,<0.88.0>,<0.87.0>,
                                  <0.86.0>,<0.85.0>,<0.84.0>,<0.83.0>]
2> Pushsum Converged and ratio is 5.000000000009502
2> Time Elapsed is 1
2>
```

PUSH SUM – 2D TOPOLOGY:

```
1> algorithm_executer:start().
enter number of Nodes10.
enter the topology: 2D.
enter the algorithm: push-sum.
No of workers: 10
Final No of workers after rounding: 16
Worker pids is [<0.83.0>,<0.84.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>,<0.93.0>,<0.94.0>,
                <0.95.0>,<0.96.0>,<0.97.0>,<0.98.0>]
hello
2> Node <0.98.0> Neighbours are: [<0.97.0>,<0.94.0>,<0.93.0>]
2> Node <0.97.0> Neighbours are: [<0.92.0>,<0.93.0>,<0.94.0>,<0.98.0>,<0.96.0>]
2> Node <0.96.0> Neighbours are: [<0.91.0>,<0.92.0>,<0.93.0>,<0.97.0>,<0.95.0>]
2> Node <0.95.0> Neighbours are: [<0.96.0>,<0.91.0>,<0.92.0>]
2> Node <0.94.0> Neighbours are: [<0.89.0>,<0.90.0>,<0.93.0>,<0.97.0>,<0.98.0>]
2> Node <0.93.0> Neighbours are: [<0.88.0>,<0.89.0>,<0.90.0>,<0.92.0>,<0.94.0>,
                                  <0.96.0>,<0.97.0>,<0.98.0>]
2> Node <0.92.0> Neighbours are: [<0.87.0>,<0.88.0>,<0.89.0>,<0.91.0>,<0.93.0>,
                                  <0.95.0>,<0.96.0>,<0.97.0>]
2> Node <0.91.0> Neighbours are: [<0.87.0>,<0.88.0>,<0.92.0>,<0.95.0>,<0.96.0>]
2> Node <0.90.0> Neighbours are: [<0.85.0>,<0.86.0>,<0.89.0>,<0.93.0>,<0.94.0>]
2> Node <0.89.0> Neighbours are: [<0.84.0>,<0.85.0>,<0.86.0>,<0.88.0>,<0.90.0>,
                                  <0.92.0>,<0.93.0>,<0.94.0>]
2> Node <0.88.0> Neighbours are: [<0.83.0>,<0.84.0>,<0.85.0>,<0.87.0>,<0.89.0>,
```

```
2> Node <0.88.0> Neighbours are: [<0.83.0>,<0.84.0>,<0.85.0>,<0.87.0>,<0.89.0>,
                                  <0.91.0>,<0.92.0>,<0.93.0>]
2> Node <0.87.0> Neighbours are: [<0.83.0>,<0.84.0>,<0.88.0>,<0.91.0>,<0.92.0>]
2> Node <0.86.0> Neighbours are: [<0.85.0>,<0.90.0>,<0.89.0>]
2> Node <0.85.0> Neighbours are: [<0.88.0>,<0.84.0>,<0.86.0>,<0.89.0>,<0.90.0>]
2> Node <0.84.0> Neighbours are: [<0.87.0>,<0.83.0>,<0.85.0>,<0.88.0>,<0.89.0>]
2> Node <0.83.0> Neighbours are: [<0.84.0>,<0.87.0>,<0.88.0>]
2> Pushsum Converged and ratio is 7.999999999633493
2> Time Elapsed is 4
2>
```

PUSH SUM – IMP2D TOPOLOGY:

```
enter number of Nodes10.
enter the topology: imp2D.
enter the algorithm: push-sum.
No of workers: 10
Final No of workers after rounding: 16
Worker pids is [<0.83.0>,<0.84.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>,<0.93.0>,<0.94.0>,
                <0.95.0>,<0.96.0>,<0.97.0>,<0.98.0>]
hello
2> Node <0.98.0> Neighbours are: [<0.95.0>,<0.97.0>,<0.94.0>,<0.93.0>]
2> Node <0.97.0> Neighbours are: [<0.85.0>,<0.92.0>,<0.93.0>,<0.94.0>,<0.98.0>,
                                  <0.96.0>]
2> Node <0.96.0> Neighbours are: [<0.83.0>,<0.91.0>,<0.92.0>,<0.93.0>,<0.97.0>,
                                  <0.95.0>]
2> Node <0.95.0> Neighbours are: [<0.88.0>,<0.96.0>,<0.91.0>,<0.92.0>]
2> Node <0.94.0> Neighbours are: [<0.84.0>,<0.89.0>,<0.90.0>,<0.93.0>,<0.97.0>,
                                  <0.98.0>]
2> Node <0.93.0> Neighbours are: [<0.95.0>,<0.88.0>,<0.89.0>,<0.90.0>,<0.92.0>,
                                  <0.94.0>,<0.96.0>,<0.97.0>,<0.98.0>]
2> Node <0.92.0> Neighbours are: [<0.85.0>,<0.87.0>,<0.88.0>,<0.89.0>,<0.91.0>,
                                  <0.93.0>,<0.95.0>,<0.96.0>,<0.97.0>]
2> Node <0.91.0> Neighbours are: [<0.90.0>,<0.87.0>,<0.88.0>,<0.92.0>,<0.95.0>,
                                  <0.96.0>]
2> Node <0.90.0> Neighbours are: [<0.84.0>,<0.85.0>,<0.86.0>,<0.89.0>,<0.93.0>,
```

```
                                  <0.94.0>]
2> Node <0.89.0> Neighbours are: [<0.95.0>,<0.84.0>,<0.85.0>,<0.86.0>,<0.88.0>,
                                  <0.90.0>,<0.92.0>,<0.93.0>,<0.94.0>]
2> Node <0.88.0> Neighbours are: [<0.88.0>,<0.83.0>,<0.84.0>,<0.85.0>,<0.87.0>,
                                  <0.89.0>,<0.91.0>,<0.92.0>,<0.93.0>]
2> Node <0.87.0> Neighbours are: [<0.95.0>,<0.83.0>,<0.84.0>,<0.88.0>,<0.91.0>,
                                  <0.92.0>]
2> Node <0.86.0> Neighbours are: [<0.92.0>,<0.85.0>,<0.90.0>,<0.89.0>]
2> Node <0.85.0> Neighbours are: [<0.83.0>,<0.88.0>,<0.84.0>,<0.86.0>,<0.89.0>,
                                  <0.90.0>]
2> Node <0.84.0> Neighbours are: [<0.98.0>,<0.87.0>,<0.83.0>,<0.85.0>,<0.88.0>,
                                  <0.89.0>]
2> Node <0.83.0> Neighbours are: [<0.98.0>,<0.84.0>,<0.87.0>,<0.88.0>]
2> Pushsum Converged and ratio is 7.999999999536086
2> Time Elapsed is 3
2>
```

PUSH SUM – LINE TOPOLOGY:

```
1> algorithm_executer:start().
enter number of Nodes10.
enter the topology: line.
enter the algorithm: push-sum.
No of workers: 10
Final No of workers after rounding: 10
Worker pids is [<0.83.0>,<0.84.0>,<0.85.0>,<0.86.0>,<0.87.0>,<0.88.0>,
                <0.89.0>,<0.90.0>,<0.91.0>,<0.92.0>]
hello
2> Node <0.92.0> Neighbours are: [<0.91.0>]
2> Node <0.91.0> Neighbours are: [<0.90.0>,<0.92.0>]
2> Node <0.90.0> Neighbours are: [<0.89.0>,<0.91.0>]
2> Node <0.89.0> Neighbours are: [<0.88.0>,<0.90.0>]
2> Node <0.88.0> Neighbours are: [<0.87.0>,<0.89.0>]
2> Node <0.87.0> Neighbours are: [<0.86.0>,<0.88.0>]
2> Node <0.86.0> Neighbours are: [<0.85.0>,<0.87.0>]
2> Node <0.85.0> Neighbours are: [<0.84.0>,<0.86.0>]
2> Node <0.84.0> Neighbours are: [<0.83.0>,<0.85.0>]
2> Node <0.83.0> Neighbours are: [<0.84.0>]
2> Pushsum Converged and ratio is 4.999999221475031
2> Time Elapsed is 5
2>
```

PUSH SUM GRAPH FOR DIFFERENT TOPOLOGIES: