COMP212 - 2018 - CA Coordination and Leader Election

Communication in Distributed Computing

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March 2018

Abstract

Two distributed system leader election protocols—the LCR and the HS algorithms are implemented and simulated with Java and then the two simulators are made available over the network through either Java socket programming.

1 Introduction

The HS and LCR simulation services were made available on a server through the network for clients to connect and request the results of designated simulation with JAVA socket programming.

2 Functionality

- Successfully establishment of the client-server connections and information interchange between the two.
- The client was able to trigger the execution of a designated LCR/HS simulation.
- The client can also successfully obtain all experimental data/results of requested simulation

3 Feature

- Detailed computing process presented.
- Unexpected input handled.

4 Java Development

4.1 Simulation Part

- Processor: identical processors only with different ID for simulation.
- Message: for message passing between processors.
- Ass1HSSimulator: display simulation process and return a String of simulation results on the server

- Ass1LCRSimulator: display simulation process in server and return a String of simulation results on the server

4.2 Client-Server Part

- ClientServer: both clients and server use same socket methods -- readFromSocket and writeToSocket and are independent threads, so define class ClientServer as subclass of Thread.
- SimulationClient: subclass of ClientServer to implement the client terminal.
- SimulationServer: subclass of ClientServer to implement the server terminal.

5 Test

5.1 LCR Simulation

5.1.1 Results on Simulation Client

```
Client connected to localhost: 10001
SERVER: Hello, connection established. Please choose a simulator for Leader Election Algorithm Demo:"
SERVER: 1) LCR simulator    2) HS simulator  3) Any other input to Exit
INPUT:
1
SERVER: LCR Simulator selected. Please enter the number of processors for random LCR simulation:
INPUT:
3
SERVER: The leader ID is: 9 elected in round: 4 with number of sent message: 6
Client: connection closed

Process finished with exit code 0
```

5.1.2 Results on Simulation Server

```
Simulator server at Zhengs-MacBook-Pro.local/100.77.6.84 waiting for connetions
Accepted a connection from /127.0.0.1
------------------------------
------------------------------After LCRProcess in round 1
MyID        |IDtoSend    |Status
7           |7           |UNKNOWN
9           |9           |UNKNOWN
8           |8           |UNKNOWN
------------------------------After LCRMessage sent in round 1
MyID        |receivedID  |Status
7           |8           |UNKNOWN
9           |7           |UNKNOWN
8           |9           |UNKNOWN
------------------------------After LCRProcess in round 2
MyID        |IDtoSend    |Status
7           |8           |UNKNOWN
9           |null        |UNKNOWN
8           |9           |UNKNOWN
------------------------------After LCRMessage sent in round 2
MyID        |receivedID  |Status
7           |9           |UNKNOWN
9           |8           |UNKNOWN
8           |null        |UNKNOWN
------------------------------After LCRProcess in round 3
MyID        |IDtoSend    |Status
7           |9           |UNKNOWN
9           |null        |UNKNOWN
8           |null        |UNKNOWN
------------------------------After LCRMessage sent in round 3
MyID        |receivedID  |Status
7           |null        |UNKNOWN
9           |9           |UNKNOWN
8           |null        |UNKNOWN
------------------------------After LCRProcess in round 4
MyID        |IDtoSend    |Status
7           |null        |UNKNOWN
9           |null        |LEADER
8           |null        |UNKNOWN
------------------------------After LCRMessage sent in round 4
MyID        |receivedID  |Status
7           |null        |UNKNOWN
9           |null        |LEADER
8           |null        |UNKNOWN
The leader ID is: 9 elected in round: 4 with number of sent message: 6
Close the connection
```

5.2 HS Simulation

5.2.1 Results on Simulation Client

```
Client connected to localhost: 10001
SERVER: Hello, connection established. Please choose a simulator for Leader Election Algorithm Demo:"
SERVER: 1) LCR simulator    2) HS simulator  3) Any other input to Exit
INPUT:
2
SERVER: HS Simulator selected. Please enter the number of processors for random HS simulation:
INPUT:
3
SERVER: The leader ID is: 9 elected in Phase: 2 round:10 with number of sent message: 23
Client: connection closed

Process finished with exit code 0
```

5.2.2 Results on Simulation Server

```
Simulator server at Zhengs-MacBook-Pro.local/100.77.6.84 waiting for connetions
Accepted a connection from /127.0.0.1
----------------------------
----------------------------After HSProcess in round 1
Processor   |toSendCLK   Direction   HopCount    |toSendCCW   Direction   HopCount    |ProcPhase   |MyStatus
9           |9           OUT         1           |9           OUT         1           |0           |UNKNOWN
4           |4           OUT         1           |4           OUT         1           |0           |UNKNOWN
1           |1           OUT         1           |1           OUT         1           |0           |UNKNOWN
----------------------------After message sent in round 1
Processor   |receivedCLK Direction   HopCount    |ReceivedCCW Direction   HopCount    |ProcPhase   |MyStatus
9           |1           OUT         1           |4           OUT         1           |0           |UNKNOWN
4           |9           OUT         1           |1           OUT         1           |0           |UNKNOWN
1           |4           OUT         1           |9           OUT         1           |0           |UNKNOWN
----------------------------After HSProcess in round 2
Processor   |toSendCLK   Direction   HopCount    |toSendCCW   Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |0           |UNKNOWN
4           |null                                |9           IN          1           |0           |UNKNOWN
1           |9           IN          1           |4           IN          1           |0           |UNKNOWN
----------------------------After message sent in round 2
Processor   |receivedCLK Direction   HopCount    |ReceivedCCW Direction   HopCount    |ProcPhase   |MyStatus
9           |9           IN          1           |9           IN          1           |0           |UNKNOWN
4           |null                                |4           IN          1           |0           |UNKNOWN
1           |null                                |null                                |0           |UNKNOWN
----------------------------After HSProcess in round 3
Processor   |toSendCLK   Direction   HopCount    |toSendCCW   Direction   HopCount    |ProcPhase   |MyStatus
9           |9           OUT         2           |9           OUT         2           |1           |UNKNOWN
4           |null                                |null                                |0           |UNKNOWN
1           |null                                |null                                |0           |UNKNOWN
----------------------------After message sent in round 3
Processor   |receivedCLK Direction   HopCount    |ReceivedCCW Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |1           |UNKNOWN
4           |9           OUT         2           |null                                |0           |UNKNOWN
1           |null                                |9           OUT         2           |0           |UNKNOWN
----------------------------After HSProcess in round 4
Processor   |toSendCLK   Direction   HopCount    |toSendCCW   Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |1           |UNKNOWN
4           |9           OUT         1           |null                                |0           |UNKNOWN
1           |null                                |9           OUT         1           |0           |UNKNOWN
----------------------------After message sent in round 4
Processor   |receivedCLK Direction   HopCount    |ReceivedCCW Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |1           |UNKNOWN
4           |null                                |9           OUT         1           |0           |UNKNOWN
1           |9           OUT         1           |null                                |0           |UNKNOWN
----------------------------After HSProcess in round 5
Processor   |toSendCLK   Direction   HopCount    |toSendCCW   Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |1           |UNKNOWN
4           |9           IN          1           |null                                |0           |UNKNOWN
1           |null                                |9           IN          1           |0           |UNKNOWN
----------------------------After message sent in round 5
Processor   |receivedCLK Direction   HopCount    |ReceivedCCW Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |1           |UNKNOWN
4           |null                                |9           IN          1           |0           |UNKNOWN
1           |9           IN          1           |null                                |0           |UNKNOWN
```

```
----------After HSProcess in round 6
Processor   |toSendCLK   Direction   HopCount    |toSendCCW   Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |1           |UNKNOWN
4           |null                                |9           IN          1           |0           |UNKNOWN
1           |9           IN          1           |null                                |0           |UNKNOWN
----------After message sent in round 6
Processor   |receivedCLK Direction   HopCount    |ReceivedCCW Direction   HopCount    |ProcPhase   |MyStatus
9           |9           IN          1           |9           IN          1           |1           |UNKNOWN
4           |null                                |null                                |0           |UNKNOWN
1           |null                                |null                                |0           |UNKNOWN
----------After HSProcess in round 7
Processor   |toSendCLK   Direction   HopCount    |toSendCCW   Direction   HopCount    |ProcPhase   |MyStatus
9           |9           OUT         4           |9           OUT         4           |2           |UNKNOWN
4           |null                                |null                                |0           |UNKNOWN
1           |null                                |null                                |0           |UNKNOWN
----------After message sent in round 7
Processor   |receivedCLK Direction   HopCount    |ReceivedCCW Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |2           |UNKNOWN
4           |9           OUT         4           |null                                |0           |UNKNOWN
1           |null                                |9           OUT         4           |0           |UNKNOWN
----------After HSProcess in round 8
Processor   |toSendCLK   Direction   HopCount    |toSendCCW   Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |2           |UNKNOWN
4           |9           OUT         3           |null                                |0           |UNKNOWN
1           |null                                |9           OUT         3           |0           |UNKNOWN
----------After message sent in round 8
Processor   |receivedCLK Direction   HopCount    |ReceivedCCW Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |2           |UNKNOWN
4           |null                                |9           OUT         3           |0           |UNKNOWN
1           |9           OUT         3           |null                                |0           |UNKNOWN
----------After HSProcess in round 9
Processor   |toSendCLK   Direction   HopCount    |toSendCCW   Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |2           |UNKNOWN
4           |null                                |9           OUT         2           |0           |UNKNOWN
1           |9           OUT         2           |null                                |0           |UNKNOWN
----------After message sent in round 9
Processor   |receivedCLK Direction   HopCount    |ReceivedCCW Direction   HopCount    |ProcPhase   |MyStatus
9           |9           OUT         2           |9           OUT         2           |2           |UNKNOWN
4           |null                                |null                                |0           |UNKNOWN
1           |null                                |null                                |0           |UNKNOWN
----------After HSProcess in round 10
Processor   |toSendCLK   Direction   HopCount    |toSendCCW   Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |2           |LEADER
4           |null                                |null                                |0           |UNKNOWN
1           |null                                |null                                |0           |UNKNOWN
----------After message sent in round 10
Processor   |receivedCLK Direction   HopCount    |ReceivedCCW Direction   HopCount    |ProcPhase   |MyStatus
9           |null                                |null                                |2           |LEADER
4           |null                                |null                                |0           |UNKNOWN
1           |null                                |null                                |0           |UNKNOWN
The leader ID is: 9 elected in Phase: 2 round:10 with number of sent message: 23
Close the connection
```

5.3 Unexpected Input

```
Client connected to localhost: 10001
SERVER: Hello, connection established. Please choose a simulator for Leader Election Algorithm Demo:"
SERVER: 1) LCR simulator    2) HS simulator  3) Any other input to Exit
INPUT:
dfjhbsjdsddds
SERVER: Goodbye
Client: connection closed

Process finished with exit code 0
```

```
Client connected to localhost: 10001
SERVER: Hello, connection established. Please choose a simulator for Leader Election Algorithm Demo:"
SERVER: 1) LCR simulator    2) HS simulator  3) Any other input to Exit
INPUT:
1
SERVER: LCR Simulator selected. Please enter the number of processors for random LCR simulation:
INPUT:
10g
SERVER: Invalid input. Only 1 integer between 1-29999 is acceptable. Mission aborted.
Client: connection closed

Process finished with exit code 0
```