COMP212 - 2018 - CA Coordination and Leader Election Communication in Distributed Computing

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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:

SERVER: LCR Simulator selected. Please enter the number of processors for random LCR simulation:
INPUT:

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

		gs-MacBook-Pro.local/100.77.6.84 waiting for connetions				
		 After LCRProcess in round 1				
MyID 7	IDtoSend 7	Status UNKNOWN				
9	9	UNKNOWN				
8	8	UNKNOWN				
MyID	 receivedID	After LCRMessage sent in round 1 Status				
7	8	UNKNOWN				
9	7 9	UNKNOWN UNKNOWN				
		After LCRProcess in round 2				
MyID	IDtoSend	Status				
7 9	8 null	UNKNOWN UNKNOWN				
8	9	UNKNOWN				
MyID	 receivedID	After LCRMessage sent in round 2 Status				
7	9	UNKNOWN				
9	8	UNKNOWN				
8	null 	UNKNOWN After LCRProcess in round 3				
MyID	IDtoSend	Status				
7	9 null	UNKNOWN				
9	null	UNKNOWN UNKNOWN				
	· · · · · · · · · · · · · · · · · · ·	After LCRMessage sent in round 3				
MyID 7	receivedID null	Status UNKNOWN				
9	j 9	UNKNOWN				
8	null	UNKNOWN After LCRProcess in round 4				
MyID	IDtoSend	Status				
7	null	UNKNOWN				
9	null null	LEADER UNKNOWN				
		After LCRMessage sent in round 4				
MyID 7	receivedID null	Status 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:

SERVER: HS Simulator selected. Please enter the number of processors for random HS simulation:
INPUT:

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 connections Accepted a connection from /127.0.0.1										
· 		After UC	Process in ro	und 1						
Processor 9 4	toSendCLK 9 4 1	Direction OUT OUT OUT	HopCount 1 1 1	toSendCCW 9 4 1	Direction OUT OUT OUT	HopCount 1 1	ProcPhase 0 0 0	MyStatus UNKNOWN UNKNOWN UNKNOWN		
Processor 4 1	receivedCLK 1 9 4	Direction OUT OUT OUT	ssage sent ir HopCount 1 1	ReceivedCCW 4 1 9	Direction OUT OUT OUT	HopCount 1 1	ProcPhase 0 0 0	MyStatus UNKNOWN UNKNOWN UNKNOWN		
Processor 9 4	toSendCLK null null 9	Direction IN	Process in ro	toSendCCW null 9 4	Direction IN IN	HopCount 1 1	ProcPhase 0 0 0	MyStatus UNKNOWN UNKNOWN UNKNOWN		
Processor 9 4 1	receivedCLK 9 null null	Direction IN	ssage sent ir HopCount 1 Process in ro	ReceivedCCW 9 4 null	Direction IN IN	HopCount 1 1	ProcPhase 0 0 0	MyStatus UNKNOWN UNKNOWN UNKNOWN		
Processor 9 4	toSendCLK 9 null null	Direction OUT	HopCount 2	toSendCCW 9 null null	Direction OUT	HopCount 2	ProcPhase 1 0 0	MyStatus UNKNOWN UNKNOWN UNKNOWN		
Processor 9 4	receivedCLK null 9 null	Direction OUT	ssage sent ir HopCount 2	ReceivedCCW null null 9	Direction OUT	HopCount 2	ProcPhase 1 0 0	MyStatus UNKNOWN UNKNOWN UNKNOWN		
Processor 9 4	toSendCLK null 9 null	Direction OUT	Process in ro HopCount 1	toSendCCW null null 9	Direction OUT	HopCount	ProcPhase 1 0 0	MyStatus UNKNOWN UNKNOWN UNKNOWN		
Processor 9 4	receivedCLK null null 9	Direction OUT	ssage sent ir HopCount	ReceivedCCW null 9 null	Direction OUT	HopCount 1	ProcPhase 1 0 0	MyStatus UNKNOWN UNKNOWN UNKNOWN		
Processor 9 4	toSendCLK null 9 null	Direction IN	Process in ro HopCount 1 ssage sent ir	toSendCCW null null 9	Direction IN	HopCount	ProcPhase 1 0 0	MyStatus UNKNOWN UNKNOWN UNKNOWN		
Processor 9 4	receivedCLK null null 9		HopCount 1	round 5 ReceivedCCW null 9 null	Direction IN	HopCount 1	ProcPhase 1 0 0	MyStatus UNKNOWN UNKNOWN UNKNOWN		

	12						13	V6 2
	11.6.16.16		Process in				ID DI	
Processor 9	toSendCLK null	Direction	HopCount	toSendCCW null	Direction	HopCount	ProcPhase 1	MyStatus UNKNOWN
4	null			9	IN	1	0	UNKNOWN
1	9	IN	1	null			0	UNKNOWN
	1idCLK	After me			Bii		I D Db	IM- Ct-t
Processor 9	receivedCLK	IN IN	HopCount 1	ReceivedCCW 9	Direction IN	HopCount 1	ProcPhase 1	MyStatus UNKNOWN
4	Inull	TIN	1	Inull	TIM	1	10	LINKNOWN
ī	Inull			null			10	UNKNOWN
		After HS	Process in				1*	10000000
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
Drassess	l receivedCLK	After me			Direction	HanCount	ProcPhase	IM-Ctatus
Processor 9	receivedCLK null	priection	HopCount	ReceivedCCW null	priection	HopCount	2	MyStatus UNKNOWN
4	19	OUT	4	Inull			10	UNKNOWN
i	Inull	001	7	19	OUT	4	10	UNKNOWN
		After HS	Process in				1*	15
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
Drosesser	receivedCLK		ssage sent	in round 8	Direction	HonCount	I DrocDhaco	IMuC+o+uc
Processor 9	Inull	Direction	HopCount	Inull	Direction	HopCount	ProcPhase 2	MyStatus UNKNOWN
4	Inull			19	OUT	3	10	UNKNOWN
i	19	OUT	3	null		•	10	UNKNOWN
		After HS	Process in					
Processor	toSendCLK	Direction	HopCount	toSendCCW	Direction	HopCount	ProcPhase	MyStatus
9	null			null			2	UNKNOWN
4	null		2	9	OUT	2	[0	UNKNOWN
1	9	OUT	2	null			0	UNKNOWN
Processor	receivedCLK		ssage sent HopCount	IReceivedCCW	Direction	HopCount	ProcPhase	MyStatus
9	19	OUT	2	9	OUT	2	2	UNKNOWN
4	Inull	001	-	Inull	001	-	10	UNKNOWN
i	null			null			10	UNKNOWN
No. 1 State - State - Austral - Aust		After HS	Process in	round 10				
Processor	toSendCLK	Direction	HopCount	toSendCCW	Direction	HopCount	ProcPhase	MyStatus
9	null			null			2	LEADER
4	null			null			[0	UNKNOWN
1	null	After	ssage sont	null			0	UNKNOWN
			HopCount	in round 10 ReceivedCCW	Direction	HopCount	ProcPhase	MyStatus
Processor	received		Hobcount	LUCCCTACCA	DIICCTION	Hopcount		Inystatus
Processor	receivedCLK	DITECTION		Inull			12	II FADER
Processor 9 4	receivedCLK null null	D11 CCC1011		null null			2 0	LEADER UNKNOWN
9	jnull	DIFECTION					2 0 0	
9 4 1 The leader 1	null null null D is: 9 elec			jnull	of sent mess	age: 23	jø	UNKNOWN
9 4 1	null null null D is: 9 elec			jnull jnull	of sent mess	age: 23	jø	UNKNOWN

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:

SERVER: LCR Simulator selected. Please enter the number of processors for random LCR simulation:
INPUT:
100
SERVER: Invalid input. Only 1 integer between 1–29999 is acceptable. Mission aborted.
Client: connection closed

Process finished with exit code 0
```