

Lab 2 Distributed Systems

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Assumptions:

- Passwords must be provided as well as usernames and addresses in the following format in the configuration file :
 - RW.reader0=username@address password
- RW.path property in the configuration file indicates the path at each client where the executable for the client resides and will be started from.
- Logs are created in a logs folder in the path where the jar resides for each process.
- To start the server process which will create the server thread, and the process clients :
 - <java -jar start.jar> for socket version.
 - <java -jar start.jar rmi> for rmi version.
- Clients jars should be named clientV1.jar for socket version and clientV2.jar for RMI version.
- Clients jars will take 5 arguments(done automatically in our case), request type of client, id, server address, port and the number of accesses.
- Each client will sleep for a random time between 0 → 10 sec before each request, and each request will take 0 → 10 sec on the server to finish.

Main packages:

- **Client.rmi**
 - RMIClient.java
 - ❖ Invokes a remote method with the suitable parameters.
- **Client.socket**
 - Client.java
 - ❖ Creates a worker of type (Reader or Writer)
 - ❖ Calls worker execute method
 - ❖ Calls worker print_log method
- **Client.socket.worker**
 - Worker.java
 - ❖ Creates socket, sends request to server, get response and add to log
 - ReadWorker.java
 - ❖ Extends worker abstract class
 - ❖ Generate it's own request message
 - WriterWorker.java
 - ❖ Extends worker abstract class
 - ❖ Generate it's own request message
- **Main**
 - Start.java
 - ❖ Creates server for rmi mode or socket mode

- ❖ Creates clients
- **Server**
 - SharedServerObject.java
 - ❖ Core server object representing the shared news item.
 - ❖ Read value
 - ❖ Write value
- **Server.rmi**
 - ClientController.java
 - ❖ Executes task whether read or write value
 - RemoteAccessController.java
 - ❖ Interface implemented by clientController
 - RMIServerWorker.java
- **Server.socket**
 - ClientWorker.java
 - ❖ Read or write value to server.
 - ServerWorker.java
 - ❖ Accept clients connections and serve them by creating a client worker for each request.
- **Utils**
 - ClientArgs.java
 - ❖ Class containing arguments of clients
 - SSHConnection.java
 - ❖ Class that establish ssh connection using jsch
 - SystemCongiguration.java
 - ❖ Class that reads system.properties file
- **Utils.log**
 - Log.java
 - ❖ Handles the addition of records into the logs.
 - ❖ Handles writing the log in a suitable format according to its user.
- **Utils.log.record**
 - ReadRecord.java
 - ❖ Class wrapping sSeq, rSeq, oVal, rNum, rId,
 - Record.java
 - ❖ Interface implemented by read and write records
 - WriteRecord.java
 - ❖ Class wrapping sSeq, rSeq, oVal, wId,
- **utils.type**
 - RequestType.java (Read or write)
 - ❖ Enum representing the request type.

Socket Run Sample:

```
amrnasr@amrnasr-Lenovo-Y50-70:~/MyFiles/projects/distributedSystems/News_Bulletin_Board_System$ java -jar start.jar
Running in socket mode
System configuration detected :
  Server Address : 192.168.2.101
  Server Port : 49053
  Number of readers : 4
    Reader 0 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 1
      Password : a1s2d3f4
    Reader 1 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 2
      Password : a1s2d3f4
    Reader 2 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 3
      Password : a1s2d3f4
    Reader 3 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 4
      Password : a1s2d3f4
  Number of writers : 4
    Writer 0 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 5
      Password : a1s2d3f4
    Writer 1 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 6
      Password : a1s2d3f4
    Writer 2 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 7
      Password : a1s2d3f4
    Writer 3 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 8
      Password : a1s2d3f4
  Number of Accesses : 3
  Path for client executables : /home/amrnasr/MyFiles/projects/distributedSystems/News_Bulletin_Board_System
```

```
Turning Server On
Creating reader process 0
Server On...
Connected
data from process : Starting worker
Created !
Creating reader process 1
Connected
data from process : Starting worker
Created !
Creating reader process 2
Connected
data from process : Starting worker
Created !
Creating reader process 3
Connected
Accepted connection #1
data from process : Starting worker
Created !
Creating writer process 0
Connected
data from process : Starting worker
Created !
Creating writer process 1
Connected
data from process : Starting worker
Created !
Creating writer process 2
Connected
data from process : Starting worker
Created !
Creating writer process 3
Connected
data from process : Starting worker
Created !
Accepted connection #2
Accepted connection #3
Accepted connection #4
Accepted connection #5
Accepted connection #6
Accepted connection #7
Accepted connection #8
Accepted connection #9
Accepted connection #10
Accepted connection #11
Accepted connection #12
Accepted connection #13
Accepted connection #14
Accepted connection #15
Accepted connection #16
Accepted connection #17
Accepted connection #18
Accepted connection #19
Accepted connection #20
Accepted connection #21
```

Accepted connection #22
Accepted connection #23
Accepted connection #24
Server finished serving all requests
All clients terminated

Open ▾

log1.txt

Client type : Reader
Client Name : 1

rSeq	sSeq	oVal
7	7	8
15	15	8
23	23	8

Open ▾

log2.txt

Client type : Reader
Client Name : 2

rSeq	sSeq	oVal
1	1	-1
9	9	7
17	17	7

Open ▾

log3.txt

Client type : Reader
Client Name : 3

rSeq	sSeq	oVal
4	4	5
11	11	5
19	19	5

Open ▾

log4.txt

Client type : Reader
Client Name : 4

rSeq	sSeq	oVal
5	5	5
13	13	6
21	21	6

Open ▾

log5.txt

Client type : Writer
Client Name : 5

rSeq	sSeq
3	3
10	10
18	18

Open ▾

log6.txt

Client type : Writer
Client Name : 6

rSeq	sSeq
2	2
12	12
20	20

Open ▾

log7.txt

Client type : Writer
Client Name : 7

rSeq	sSeq
8	8
16	16
24	24

Open ▾

log8.txt

Client type : Writer
Client Name : 8

rSeq	sSeq
6	6
14	14
22	22

Open ▾

server_log.txt

Readers:

sSeq	oVal	rID	rNum
1	-1	2	1
4	5	3	1
5	5	4	2
7	8	1	1
9	7	2	1
11	5	3	1
13	6	4	1
15	8	1	1
17	7	2	1
19	5	3	1
21	6	4	1
23	8	1	1

Writers:

sSeq	oVal	wID
2	6	6
3	5	5
6	8	6
8	7	7
10	5	5
12	6	6
14	8	8
16	7	7
18	5	5
20	6	6
22	8	8
24	7	7

RMI Run Sample:

```
amrnasr@amrnasr-Lenovo-Y50-70:~/MyFiles/projects/distributedSystems/News_Bulletin_Board_System$ java -jar start.jar rmi
Running in RMI mode
System configuration detected :
  Server Address : 192.168.2.101
  Server Port : 49053
  RMI Port : 1099
  Number of readers : 4
    Reader 0 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 1
      Password : a1s2d3f4
    Reader 1 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 2
      Password : a1s2d3f4
    Reader 2 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 3
      Password : a1s2d3f4
    Reader 3 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 4
      Password : a1s2d3f4
  Number of writers : 4
    Writer 0 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 5
      Password : a1s2d3f4
    Writer 1 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 6
      Password : a1s2d3f4
    Writer 2 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 7
      Password : a1s2d3f4
    Writer 3 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 8
      Password : a1s2d3f4
  Number of Accesses : 3
  Path for client executables : /home/amrnasr/MyFiles/projects/distributedSystems/News_Bulletin_Board_System
```

```
Creating reader process 0
Server registered RMI successfully!
Connected
data from process : Starting client !
Created !
Creating reader process 1
Connected
data from process : Starting client !
Created !
Creating reader process 2
Connected
data from process : Starting client !
Created !
Creating reader process 3
Connected
data from process : Starting client !
Created !
Creating writer process 0
Connected
data from process : Starting client !
Created !
Creating writer process 1
Connected
Done request #2
data from process : Starting client !
Created !
Creating writer process 2
Connected
data from process : Starting client !
Created !
Creating writer process 3
Connected
data from process : Starting client !
Created !
```

```
Done request #1
Done request #3
Done request #4
Done request #5
Done request #6
Done request #7
Done request #9
Done request #8
Done request #10
Done request #11
Done request #12
Done request #13
Done request #14
Done request #15
Done request #16
Done request #18
Done request #17
Done request #19
Done request #20
Done request #21
Done request #22
Done request #24
Done request #23
Server served all requests!
Server finished serving all requests
All clients terminated
```

Open ▾ log1.txt			Open ▾ log2.txt			Open ▾ log3.txt		
Client type : Reader Client Name : 1			Client type : Reader Client Name : 2			Client type : Reader Client Name : 3		
rSeq	sSeq	oVal	rSeq	sSeq	oVal	rSeq	sSeq	oVal
9	8	7	1	2	-1	2	1	-1
18	17	5	11	11	5	6	6	6
23	24	7	19	19	5	15	15	7
Open ▾ log4.txt			Open ▾ log5.txt			Open ▾ log6.txt		
Client type : Reader Client Name : 4			Client type : Writer Client Name : 5			Client type : Writer Client Name : 6		
rSeq	sSeq	oVal	rSeq	sSeq		rSeq	sSeq	
8	9	7	3	3		5	5	
17	18	5	10	10		12	12	
24	23	7	16	16		20	20	
Open ▾ log7.txt			Open ▾ log8.txt			server_log.txt Save		
Client type : Writer Client Name : 7			Client type : Writer Client Name : 8			Readers: -----		
rSeq	sSeq		rSeq	sSeq		sSeq	oVal	rID
7	7		4	4		1	-1	3
14	14		13	13		2	-1	2
22	22		21	21		6	6	3
						8	7	1
						9	7	4
						11	5	2
						15	7	3
						17	5	1
						18	5	4
						19	5	2
						23	7	4
						24	7	1
						Writers: -----		
						sSeq	oVal	wID
						3	5	5
						4	8	8
						5	6	6
						7	7	7
						10	5	5
						12	6	6
						13	8	8
						14	7	7
						16	5	5
						20	6	6
						21	8	8
						22	7	7

Socket Run Sample Multiple Machine:

```
^Camrnasr@amrnasr-Lenovo-Y50-70:~/MyFiles/projects/distributedSystems/News_Bulletin_Board_System$ java -jar start.jar
Running in socket mode
System configuration detected :
  Server Address : 192.168.2.101
  Server Port : 49053
  Number of readers : 4
    Reader 0 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 1
      Password : a1s2d3f4
    Reader 1 :
      Username : amr
      Address : 192.168.2.102
      Id : 2
      Password : a1s2d3f4
    Reader 2 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 3
      Password : a1s2d3f4
    Reader 3 :
      Username : amr
      Address : 192.168.2.102
      Id : 4
      Password : a1s2d3f4
  Number of writers : 4
    Writer 0 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 5
      Password : a1s2d3f4
    Writer 1 :
      Username : amr
      Address : 192.168.2.102
      Id : 6
      Password : a1s2d3f4
    Writer 2 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 7
      Password : a1s2d3f4
    Writer 3 :
      Username : amr
      Address : 192.168.2.102
      Id : 8
      Password : a1s2d3f4
  Number of Accesses : 3
  Path for client executables : ~/client_test
Creating reader process 0
Turning Server On
```



```
Creating reader process 0
Turning Server On
Server On...
Connected
data from process : Starting worker
Created !
Creating reader process 1
Connected
data from process : Starting worker
Created !
Creating reader process 2
Connected
data from process : Starting worker
Created !
Creating reader process 3
Connected
Accepted connection #1
data from process : Starting worker
Created !
Creating writer process 0
Connected
data from process : Starting worker
Created !
Creating writer process 1
Connected
data from process : Starting worker
Created !
Creating writer process 2
Connected
data from process : Starting worker
Created !
Creating writer process 3
Connected
Accepted connection #2
data from process : Starting worker
Created !
Accepted connection #3
Accepted connection #4
Accepted connection #5
Accepted connection #6
Accepted connection #7
Accepted connection #8
Accepted connection #9
Accepted connection #10
Accepted connection #11
Accepted connection #12
Accepted connection #13
Accepted connection #14
Accepted connection #15
Accepted connection #16
Accepted connection #17
Accepted connection #18
Accepted connection #19
Accepted connection #20
```

```
Accepted connection #21
Accepted connection #22
Accepted connection #23
Accepted connection #24
Server finished serving all requests
```

```

amrnasr@amrnasr-Lenovo-Y50-70:~/MyFiles/projects/distributedSystems/News_Bulletin_Board_System$ ssh amr@192.168.2.102 cat /home/amr/client_test/logs/log2.txt
amr@192.168.2.102's password:
Client type : Reader
Client Name : 2
      rSeq      sSeq      oVal
      5          5          8
      12         12          8
      20         20          8
amrnasr@amrnasr-Lenovo-Y50-70:~/MyFiles/projects/distributedSystems/News_Bulletin_Board_System$ cat logs/
log1.txt  log2.txt  log3.txt  log4.txt  log5.txt  log6.txt  log7.txt  log8.txt  server_log.txt
amrnasr@amrnasr-Lenovo-Y50-70:~/MyFiles/projects/distributedSystems/News_Bulletin_Board_System$ cat logs/server_log.txt
Readers:
-----
      sSeq      oVal      rID      rNum
      1         -1         3         1
      2         -1         1         2
      4          8         1         3
      5          8         2         3
      7          5         4         4
     10          6         3         4
     12          8         2         3
     13          8         1         3
     15          5         4         3
     19          8         3         3
     20          8         2         3
     22          5         4         1

Writers:
-----
      sSeq      oVal      wID
      3          8         8
      6          5         5
      8          7         7
      9          6         6
     11          8         8
     14          5         5
     16          7         7
     17          6         6
     18          8         8
     21          5         5
     23          6         6
     24          7         7

```

RMI Run Sample Multiple Machine:

```
^[[A^[[B^Camrnasr@amrnasr-Lenovo-Y50-70:~/MyFiles/projects/distributedSystems/News_Bulletin_Board_System$ java -jar start.jar rmi
Running in RMI mode
System configuration detected :
  Server Address : 192.168.2.101
  Server Port : 49053
  RMI Port : 1099
  Number of readers : 4
    Reader 0 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 1
      Password : a1s2d3f4
    Reader 1 :
      Username : amr
      Address : 192.168.2.102
      Id : 2
      Password : a1s2d3f4
    Reader 2 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 3
      Password : a1s2d3f4
    Reader 3 :
      Username : amr
      Address : 192.168.2.102
      Id : 4
      Password : a1s2d3f4
  Number of writers : 4
    Writer 0 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 5
      Password : a1s2d3f4
    Writer 1 :
      Username : amr
      Address : 192.168.2.102
      Id : 6
      Password : a1s2d3f4
    Writer 2 :
      Username : amrnasr
      Address : 192.168.2.101
      Id : 7
      Password : a1s2d3f4
    Writer 3 :
      Username : amr
      Address : 192.168.2.102
      Id : 8
      Password : a1s2d3f4
  Number of Accesses : 3
  Path for client executables : ~/client_test
Creating reader process 0
Server registered RMI successfully!
Connected
data from process : Starting client !
Created !
```

```
Connected
data from process : Starting client !
Created !
Creating reader process 1
Connected
data from process : Starting client !
Created !
Creating reader process 2
Connected
data from process : Starting client !
Created !
Creating reader process 3
Connected
data from process : Starting client !
Created !
Creating writer process 0
Connected
data from process : Starting client !
Created !
Creating writer process 1
Connected
data from process : Starting client !
Created !
Creating writer process 2
Connected
data from process : Starting client !
Created !
Creating writer process 3
Connected
data from process : Starting client !
Created !
Done request #2
Done request #1
Done request #3
Done request #4
Done request #5
Done request #6
Done request #7
Done request #8
Done request #9
Done request #10
Done request #13
Done request #12
Done request #11
Done request #14
Done request #15
Done request #16
Done request #17
Done request #18
Done request #19
Done request #20
Done request #21
Done request #22
Done request #23
```

```

Done request #23
Done request #24
Server served all requests!
Server finished serving all requests
All clients terminated
amrnasr@amrnasr-Lenovo-Y50-70:~/MyFiles/projects/distributedSystems/News_Bulletin_Board_System$ ssh amr@192.168.2.102 cat /home/amr/client_test/logs/log2.txt
amr@192.168.2.102's password:
Client type : Reader
Client Name : 2
      rSeq      sSeq      oVal
      5          5          8
     13         11          8
     20         20          8

amrnasr@amrnasr-Lenovo-Y50-70:~/MyFiles/projects/distributedSystems/News_Bulletin_Board_System$ cat logs/server_log.txt
Readers:
-----
      sSeq      oVal      rID      rNum
      1         -1         3         2
      2         -1         1         1
      4          8         4         1
      5          8         2         2
      9          7         1         1
     11          8         2         3
     12          8         3         2
     13          8         4         1
     17          7         1         1
     19          8         3         1
     20          8         2         2
     22          6         4         1

Writers:
-----
      sSeq      oVal      wID
      3          8         8
      6          6         6
      7          5         5
      8          7         7
     10          8         8
     14          6         6
     15          5         5
     16          7         7
     18          8         8
     21          6         6
     23          5         5
     24          7         7
amrnasr@amrnasr-Lenovo-Y50-70:~/MyFiles/projects/distributedSystems/News_Bulletin_Board_System$

```