

## Practical No. 5

```
import java.util.*;
import java.util.concurrent.*;

class TokenRing {

    static final int NUM_PROCESSES = 5; // Number
    of processes

    static List<Process> processes = new
    ArrayList<>();

    static Semaphore mutex = new Semaphore(1);

    static boolean[] flags = new
    boolean[NUM_PROCESSES];

    static int tokenHolder = 0; // Initially, process 0
    holds the token

    static Random random = new Random();

    public static void main(String[] args) throws
    InterruptedException {

        for (int i = 0; i < NUM_PROCESSES; i++) {
            Process p = new Process(i);
            processes.add(p);
            new Thread(p).start();
        }
    }

    static class Process implements Runnable {

        int id;

        Process(int id) {
            this.id = id;
        }

        public void run() {
            while (true) {

                try {

                    Thread.sleep(random.nextInt(1000)); // Simulate
                    random wait
```

```
                requestToken();

                1 DS-5 code

                enterCriticalSection();

                releaseToken();

                Thread.sleep(random.nextInt(1000)); // Simulate
                random wait before next

                request

            }

        } catch (InterruptedException e) {

            e.printStackTrace();

        }

    }

    void requestToken() throws InterruptedException {

        mutex.acquire();

        while (tokenHolder != id) { // Wait for the token to
        be passed

            System.out.println("Process " + id + " waiting for
            the token.");

            mutex.release();

            Thread.sleep(100); // Simulate waiting time

            mutex.acquire();

        }

        System.out.println("Process " + id + " acquired the
        token.");

        mutex.release();

    }

    void enterCriticalSection() throws
    InterruptedException {

        System.out.println("Process " + id + " entering
        critical section.");

        Thread.sleep(random.nextInt(500)); // Simulate
        critical section work
```

```

}

void releaseToken() throws InterruptedException {

mutex.acquire();

2 DS-5 code

System.out.println("Process " + id + " exiting
critical section and passing token.");

tokenHolder = (tokenHolder + 1) %
NUM_PROCESSES; // Pass token to the next
process
}
}
}

mutex.release();

```

Output :

The screenshot shows the Visual Studio Code editor with the file `TokenRing.java` open. The code is a Java program that implements a token ring algorithm. It prompts the user to enter the number of nodes, a sender, a receiver, and data to be sent. The program then simulates the token passing process.

```

TokenRing.java
17 System.out.print("%Enter Sender: ");
18 int sender = sc.nextInt();
19
20 System.out.print("%Enter Receiver: ");
21 int receiver = sc.nextInt();
22
23 System.out.print("%Enter Data To Send: ");
24 int data = sc.nextInt();
25
26 System.out.print("%Token Passing: ");
27
28 int token = 0;
29 for (int i = token; i < sender; i++) {
30     System.out.print(" " + i + "->");
31 }
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100

```

The terminal output shows the execution of the program:

```

PS D:\VOGESH\Study\BE-2022-23\Semester-II\OS\Lab Assignments\Assignment-5> & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:65444' '-cp' 'C:\Users\VOGESH\AppData\Roaming\Code\User\workspaceStorage\96a4ed164a61388d356c920f0e5e0e\redhat.java\jdt_ws\Assignment-5_2416ea01\bin' 'TokenRing'
Enter The Number Of Nodes:
0 1 2 3 4 5 6 7 8 9 0
Enter Sender: 4
Enter Receiver: 9
Enter Data To Send:

```

The screenshot shows the Visual Studio Code editor with the file `TokenRing.java` open. The code is a Java program that implements a token ring algorithm. It prompts the user to enter the number of nodes, a sender, a receiver, and data to be sent. The program then simulates the token passing process.

```

TokenRing.java
29 for (int i = token; i < sender; i++) {
30     System.out.print(" " + i + "->");
31 }
32
33 System.out.println(" " + sender); sender = 4
34 System.out.println("Sender " + sender + " Sending Data: " + data); sender = 4, data = 45
35
36 for (int i = sender; i != receiver; i = (i + 1) % n) { sender = 4, receiver = 9, n = 10
37     System.out.println("Data " + data + " Forwarded by " + i);
38 }
39 System.out.println("Receiver " + receiver + " Received The Data: " + data + "\n");
40 token = sender;
41
42 System.out.println("%Do You Want To Send Data Again? Enter 1 For Yes And 0 For No : ");
43
44 ch = sc.nextInt();
45 while (ch == 1):
46
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100

```

The terminal output shows the execution of the program:

```

PS D:\VOGESH\Study\BE-2022-23\Semester-II\OS\Lab Assignments\Assignment-5> d; cd 'd:\VOGESH\Study\BE-2022-23\Semester-II\OS\Lab Assignment
s\Assignment-5'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:655
15' '-cp' 'C:\Users\VOGESH\AppData\Roaming\Code\User\workspaceStorage\96a4ed164ab61388d356c920f0e5e0e\redhat.java\jdt_ws\Assignment-5_2416e
a01\bin' 'TokenRing'
Enter The Number Of Nodes: 10
0 1 2 3 4 5 6 7 8 9 0
Enter Sender: 4
Enter Receiver: 9
Enter Data To Send: 45
Token Passing: 0-> 1-> 2-> 3-> 4
Sender 4 Sending Data: 45
Data 45 Forwarded by 4
Data 45 Forwarded by 5

```

TokenRing.java - Assignment-5 - Visual Studio Code

```
TokenRing.java 1 X
TokenRing.java > TokenRing > main(String[])
29 for (int i = token; i < sender; i++) {
30     System.out.print(" " + i + "->");
31 }
32 System.out.println(" " + sender); sender = 4
33 System.out.println("Sender " + sender + " Sending Data: " + data); sender = 4, data = 45
34
35 for (int i = sender; i != receiver; i = (i + 1) % n) { sender = 4, receiver = 9, n = 10
36     System.out.println("Data " + data + " Forwarded by " + i);
37 }
38 System.out.println("Receiver " + receiver + " Received The Data: " + data + "\n");
39 token = sender;
40
41 System.out.println("\nDo You Want To Send Data Again? Enter 1 For Yes And 0 For No : ");
42 ch = sc.nextInt();
43 while (ch == 1):
```

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL

cmd

Debug: TokenRing

b61308d356c920f0e5e0e\redhat.java\jdt\_ws\Assignment-5\_2416ea01\bin' 'TokenRing'

Enter The Number Of Nodes:

PS D:\VOGESH\Study\BE-2022-23\Semester-II\DS\Lab Assignments\Assignment-5> d; cd 'd:\VOGESH\Study\BE-2022-23\Semester-II\DS\Lab Assignment 5\Assignment-5'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' '-agentlib:jdwp=transport=dt\_socket,server=n,suspend=y,address=localhost:65515' '-cp' 'C:\Users\VOGESH\AppData\Roaming\Code\User\workspaceStorage\96a4a6d164ab61308d356c920f0e5e0e\redhat.java\jdt\_ws\Assignment-5\_2416ea01\bin' 'TokenRing'

Enter The Number Of Nodes: 10

0 1 2 3 4 5 6 7 8 9 0

Enter Sender: 4

Enter Receiver: 9

Enter Data To Send: 45

Token Passing: 0-> 1-> 2-> 3-> 4

Sender 4 Sending Data: 45

Data 45 Forwarded by 4

Data 45 Forwarded by 5

TokenRing.java - Assignment-5 - Visual Studio Code

```
TokenRing.java 1 X
TokenRing.java > TokenRing > main(String[])
29 for (int i = token; i < sender; i++) {
30     System.out.print(" " + i + "->");
31 }
32 System.out.println(" " + sender); sender = 4
33 System.out.println("Sender " + sender + " Sending Data: " + data); sender = 4, data = 45
34
35 for (int i = sender; i != receiver; i = (i + 1) % n) { sender = 4, receiver = 9, n = 10
36     System.out.println("Data " + data + " Forwarded by " + i);
37 }
38 System.out.println("Receiver " + receiver + " Received The Data: " + data + "\n");
39 token = sender;
40
41 System.out.println("\nDo You Want To Send Data Again? Enter 1 For Yes And 0 For No : ");
42 ch = sc.nextInt();
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PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL

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Debug: TokenRing

b61308d356c920f0e5e0e\redhat.java\jdt\_ws\Assignment-5\_2416ea01\bin' 'TokenRing'

Enter The Number Of Nodes:

PS D:\VOGESH\Study\BE-2022-23\Semester-II\DS\Lab Assignments\Assignment-5> d; cd 'd:\VOGESH\Study\BE-2022-23\Semester-II\DS\Lab Assignment 5\Assignment-5'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' '-agentlib:jdwp=transport=dt\_socket,server=n,suspend=y,address=localhost:65515' '-cp' 'C:\Users\VOGESH\AppData\Roaming\Code\User\workspaceStorage\96a4a6d164ab61308d356c920f0e5e0e\redhat.java\jdt\_ws\Assignment-5\_2416ea01\bin' 'TokenRing'

Enter The Number Of Nodes: 10

0 1 2 3 4 5 6 7 8 9 0

Enter Sender: 4

Enter Receiver: 9

Enter Data To Send: 45

Token Passing: 0-> 1-> 2-> 3-> 4

Sender 4 Sending Data: 45

Data 45 Forwarded by 4

Data 45 Forwarded by 5

Ubuntu-64 Bit [Running] - Oracle VM VirtualBox

Activities Text Editor May 21 20:26

TokenRing.java  
~\Desktop\LP-IV Distributed System Lab\Assignment-5

```
12 System.out.println("Ring Formed Is As Below:");
13 for(int i=0; i<n; i++){
14     System.out.print(i + " ");
15 }
16
17 System.out.println("");
18
19
20
21
22 int choice = 0;
23
24 do{
25     System.out.print("Enter Sender : ");
26     int sender = sc.nextInt();
27     System.out.print("Enter Receiver : ");
28     int receiver = sc.nextInt();
29
30     System.out.print("Enter Data To Send : ");
31     int data = sc.nextInt();
32
33     int token = 0;
34     System.out.println("Token Passing : ");
35
36     for(int i=token; i<sender; i++){
37         System.out.print(" " + i + "->");
38     }
39
40     System.out.println(" " + sender);
41     System.out.println("Sender: " + sender + " Sending Data: " + data);
42
43     for(int i=sender; i!=receiver; i = (i+1)%n){
44         System.out.println("Data: " + data + " Forwarded By: " + i);
45     }
46
47     System.out.println("Receiver: " + receiver + "Received The Data: " + data);
48     token = sender;
49
50     System.out.println("\nDo You Want To Send Data Again? If YES Enter 1, If NO Enter 0");
51     choice = sc.nextInt();
52
53 }while(choice == 1);
54
55
56
57
58 }
```

```
Text Editor
May 21, 2026
TokenRing.java
~/Desktop/LP-V Distributed System Labs/Assignment-5

12
13 System.out.println("Ring Formed Is As Below :");
14 for(int i=0; i<n; i++){
15     System.out.print(i + " ");
16 }
17
18 System.out.println("\n");
19
20
21 int choice = 0;
22
23 do{
24     System.out.print("Enter Sender : ");
25     int sender = sc.nextInt();
26
27     System.out.print("Enter Receiver : ");
28     int receiver = sc.nextInt();
29
30     System.out.print("Enter Data To Send : ");
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39     }
40
41     System.out.println(" " + sender);
42     System.out.println("Sender: " + sender + " Sending Data: " + data);
43
44     for(int i=sender; i<receiver; i = (i+1)%n){
45         System.out.println("Data: " + data + " Forwarded By: " + i);
46     }
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48     System.out.println("Receiver: " + receiver + "Received The Data: " + data);
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50     token = sender;
51
52     System.out.print("Do You Want To Send Data Again? If YES Enter 1, If NO Enter 0");
53     choice = sc.nextInt();
54
55 }while(choice == 1);
56
```

```
Text Editor
May 21, 2026
TokenRing.java
~/Desktop/LP-V Distributed System Labs/Assignment-5

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13 System.out.println("Ring Formed Is As Below :");
14 for(int i=0; i<n; i++){
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24     System.out.print("Enter Sender : ");
25     int sender = sc.nextInt();
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27     System.out.print("Enter Receiver : ");
28     int receiver = sc.nextInt();
29
30     System.out.print("Enter Data To Send : ");
31     int data = sc.nextInt();
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33     int token = 0;
34
35     System.out.println("Token Passing : ");
36
37     for(int i=token; i<sender; i++){
38         System.out.print(" " + i + "->");
39     }
40
41     System.out.println(" " + sender);
42     System.out.println("Sender: " + sender + " Sending Data: " + data);
43
44     for(int i=sender; i<receiver; i = (i+1)%n){
45         System.out.println("Data: " + data + " Forwarded By: " + i);
46     }
47
48     System.out.println("Receiver: " + receiver + "Received The Data: " + data);
49
50     token = sender;
51
52     System.out.print("Do You Want To Send Data Again? If YES Enter 1, If NO Enter 0");
53     choice = sc.nextInt();
54
55 }while(choice == 1);
56
57
58 }
```

```
Activities Terminal
May 21, 2024
admin_ubuntu@Ubuntu-64-bit: ~/Desktop/LP-V Distributed System Labs/Assignment-5
admin_ubuntu@Ubuntu-64-bit:~/Desktop/LP-V Distributed System Labs/Assignment-5$ javac TokenRing.java
admin_ubuntu@Ubuntu-64-bit:~/Desktop/LP-V Distributed System Labs/Assignment-5$ java TokenRing
Enter Number Of Nodes You Want In The Ring : 10
Ring Formed Is As Below:
0 1 2 3 4 5 6 7 8 9 0
Enter Sender : 4
Enter Receiver : 8
Enter Data To Send : 70
Token Passing :
0-> 1-> 2-> 3-> 4
Sender: 4 Sending Data: 70
Data: 70 Forwarded By: 4
Data: 70 Forwarded By: 5
Data: 70 Forwarded By: 6
Data: 70 Forwarded By: 7
Receiver: 8Received The Data: 70
Do You Want To Send Data Again? If YES Enter 1, If NO Enter 0
```