

**Name:** .....

**Department. :** *Computer Engineering*

**Class & Semester:** *B.E (Final Year), SEM VIII*

**Subject:** *Distributed Computing Lab (DCL)*

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***Expt. No. 06***

***Title:*** *Write a program to demonstrate Bully Election Algorithm.*

**Date:**

**Subject In-charge Sign:**

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## Experiment No. 06

**Aim:** Write a program to Demonstrate Bully Election Algorithm.

### Theory:

The Bully Algorithm was devised by Garcia-Molina in 1982. When a process notices that the coordinator is no longer responding to requests, it initiates an election. Process P, holds an election as follows:

- 1) P sends an ELECTION message to all processes with higher numbers.
- 2) If no one responds, P wins the election and becomes coordinator.
- 3) If one of the higher-ups answers, it takes over. P's job is done.

At any moment, a process can get an ELECTION message from one of its lower-numbered colleagues. When such a message arrives, the receiver sends an OK message back to the sender to indicate that it is alive and will take over. The receiver then holds an election, unless it is already holding one. Eventually, all processes give up but one and that one is the new coordinator. It announces its victory by sending all processes a message telling them that starting immediately it is the new coordinator.

If a process that was previously down comes back up, it holds an election. If it happens to be the highest-numbered process currently running, it will win the election and will take over the coordinator's job. Thus the biggest guy in town always wins, hence the name "Bully Algorithm".

### Program:

```
import java.io.*;
class BullyAlgo
{
    int cood,ch,crash;
    int prc[];
    public void election(int n) throws IOException
    {
        BufferedReader br=new BufferedReader(new
InputStreamReader(System.in));
        System.out.println("\n The COrdinator Has Crashed");
        int flag=1;
        while (flag==1)
        {
            crash=0;
            for(int i1=0;i1<n;i1++)
                if(prc[i1]==0)
                    crash++;
            if(crash==n)
            {
                System.out.println("\n***All processes are crashed ***");
                break;
            }
            else

```

```

        {
            System.out.println("\nEnter the Initiator");
            int init=Integer.parseInt(br.readLine());
            if((init<1)|| (init>n)|| (prc[init-1]==0))
            {
                System.out.println("\nInvalid Initiator");
                continue;
            }
            for(int il=init-1;il<n;il++)
            System.out.println("Process"+(il+1)+" called for election");
            System.out.println("");
            for(int il=init-1;il<n;il++)
            {
                if(prc[il]==0)
                    System.out.println("Process"+(il+1)+"Is Dead");
                else
                    System.out.println("Process"+(il+1)+"Is in");
            }
            for(int il=n-1;il>=0;il--)
            if(prc[il]==1)
            {
                cood=(il+1);
                System.out.println("\n*** New Coordintaors Is "+(cood)+"***");
                flag=0;
                break;
            }
        }
    }

    public void Bully( ) throws IOException
    {
        BufferedReader br= new BufferedReader(new
        InputStreamReader(System.in));
        System.out.println("Enter the number of prcoess:");
        int n=Integer.parseInt(br.readLine());
        prc=new int[n];
        crash=0;
        for(int i=0;i<n;i++)
        prc[i]=1;
        cood=n;
        do
        {
            System.out.println("\n\t 1.Crash a process");
            System.out.println("\n\t 2.Recover a process");
            System.out.println("\n\t 3.Display New Coordintor");
            System.out.println("\n\t 4.Exit");
            ch=Integer.parseInt(br.readLine());
            switch(ch)
            {
                case 1:System.out.println("Enter a process to crash ");
                    int cp=Integer.parseInt(br.readLine());
                    if((cp>n)|| (cp<1))
                    {
                        System.out.println("Invalid Process!Enter a valid process");
                    }
                    else if ((prc[cp-1]==1)&&(cood!=cp))
                    {

```

```

        prc[cp-1]=0;
        System.out.println("\nProcess"+cp+"Has been Crashed");
    }
    else if ((prc[cp-1]==1)&&(cood==cp))
    {
        prc[cp-1]=0;
        election(n);
    }
    else

System.out.println("\nProcess"+cp+"Is already Crashed");
        break;
    case 2: System.out.println("\n Crashed Processes Are: \n");
        for(int i=0;i<n;i++)
        {
            if(prc[i]==0)
                System.out.println(i+1);
            crash++;
        }
        System.out.println("Enter The Process You Want To Recover");
        int rp=Integer.parseInt(br.readLine());
        if((rp<1)|| (rp>n))
            System.out.println("\n Invalid Process. Enter A Valid ID");
        else if ((prc[rp-1]==0)&&(rp>cood))
        {
            prc[rp-1]=1;
            System.out.println("\n Process "+rp+" Has Recovered");
            cood=rp;
            System.out.println("\n Process "+rp+" Is The New Coordinator ");
        }
        else if (crash==n)
        {
            prc[rp-1]=1;
            cood=rp;
            System.out.println("\n Process "+rp+" Is The New Coordinator ");
            crash--;
        }
        else if ((prc[rp-1]==0)&&(rp<cood))
        {
            prc[rp-1]=1;
            System.out.println("\n Process "+rp+" Has Recovered");
        }
        else
            System.out.println("\n Process "+rp+" Is Not A Crashed Process");
        break;
    case 3: System.out.println("\nCurrent Coordinator Is "+cood);
        break;
    case 4: System.exit(0);
        break;
    default: System.out.println("\n Invalid Entry!");
        break;
    }
}
while(ch!=4);
}
public static void main(String args[]) throws IOException
{

```

```

        BullyAlgo ob=new BullyAlgo();
        ob.Bully();
    }
}

```

### Output:

```

C:\WINDOWS\system32\cmd.exe - java BullyAlgo
C:\Program Files\Java\jdk1.7.0_17\bin>javac BullyAlgo.java
C:\Program Files\Java\jdk1.7.0_17\bin>java BullyAlgo
Enter the number of process:
6

    1.Crash a process
    2.Recover a process
    3.Display New Coordinator
    4.Exit
3
Current Coordinator Is 6

    1.Crash a process
    2.Recover a process
    3.Display New Coordinator
    4.Exit

```

```

C:\WINDOWS\system32\cmd.exe - java BullyAlgo
Enter a process to crash
6

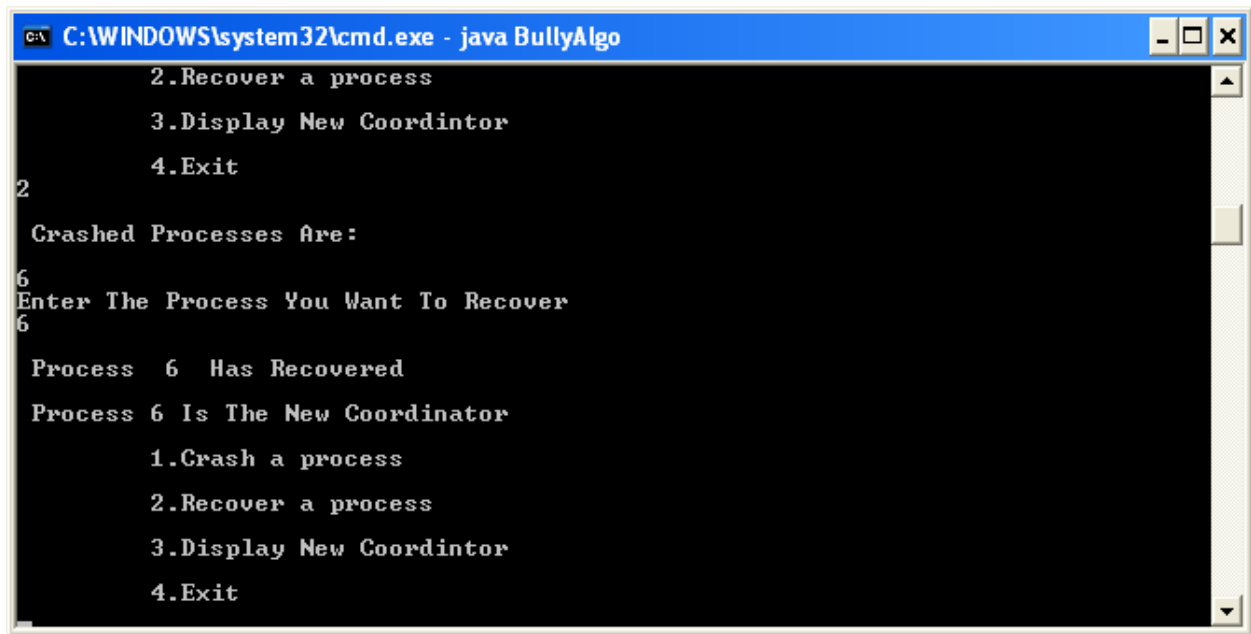
    The Coordinator Has Crashed
Enter the Initiator
4
Process4 called for election
Process5 called for election
Process6 called for election

Process4Is in
Process5Is in
Process6Is Dead

*** New Coordinators Is 5***

    1.Crash a process
    2.Recover a process
    3.Display New Coordinator
    4.Exit

```



```
C:\WINDOWS\system32\cmd.exe - java BullyAlgo

    2.Recover a process
    3.Display New Coordinitor
    4.Exit
2
Crashed Processes Are:
6
Enter The Process You Want To Recover
6
Process 6 Has Recovered
Process 6 Is The New Coordinator

    1.Crash a process
    2.Recover a process
    3.Display New Coordinitor
    4.Exit
```

**Conclusion:** Thus we have studied a program to demonstrate Bully Election Algorithm.