Computação Distribuída e Paralela

- Threads em Java (básico)

TCPServer.java

```java
import java.net.*;
import java.io.*;
public class TCPServer {
    public static void main (String args[]) {
        try{
            int serverPort = 7896; // the server port
            ServerSocket listenSocket = new ServerSocket(serverPort);
            while(true) {
                Socket clientSocket = listenSocket.accept();
                Connection c = new Connection(clientSocket);
            }
        } catch(IOException e) {System.out.println("Listen socket:"+e.getMessage());}
    }
}
class Connection extends Thread {
    DataInputStream in;
    DataOutputStream out;
    Socket clientSocket;
    public Connection (Socket aClientSocket) {
        try {
            clientSocket = aClientSocket;
            in = new DataInputStream( clientSocket.getInputStream());
            out =new DataOutputStream( clientSocket.getOutputStream());
            this.start();
        } catch(IOException e) {System.out.println("Connection:"+e.getMessage());}
    }
    public void run(){
        try {                                // an echo server

            String data = in.readUTF();                       // read a line of data from the stream
            out.writeUTF(data);
        }catch (EOFException e){System.out.println("EOF:"+e.getMessage());
        } catch(IOException e) {System.out.println("readline:"+e.getMessage());
        } finally{ try {clientSocket.close();}catch (IOException e){/*close failed*/}}


    }
}
```

```
class Paralelo0 {
    private int loop;
    private String sFlechas;
    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
            sFlechas += ">";
        }
    }
    public void setLoop(int loop) {
        this.loop = loop;
    }
    public void roda() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

Nome do arquivo: LinhaExecucao0.java

```java
public class LinhaExecucao0 {  // ainda sem threads
    public static void main(String[] args) {
        Paralelo0 par1 = new Paralelo0();
        Paralelo0 par2 = new Paralelo0();
        par1.setFlechas(5);
        par1.setLoop(20);
        par2.setFlechas(10);
        par2.setLoop(20);
        par1.roda();
        par2.roda();
    }
}
```

```java
class Paralelo0 {
    private int loop;
    private String sFlechas;
    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
            sFlechas += ">";
        }
    }
    public void setLoop(int loop) {
        this.loop = loop;
    }
    public void roda() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

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    public static void main(String[] args) {
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        Paralelo0 par2 = new Paralelo0();
        par1.setFlechas(5);
        par1.setLoop(20);
        par2.setFlechas(10);
        par2.setLoop(20);
        par1.roda();
        par2.roda();
    }
}
```

```java
class Paralelo0 {
    private int loop;
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    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
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    }
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        this.loop = loop;
    }
    public void roda() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

Compilar:

javac LinhaExecucao0.java

Executar:

java LinhaExecucao0

ou

java –cp . LinhaExecucao0

Nome do arquivo: **LinhaExecucao0.java**

```java
public class LinhaExecucao0 {  // ainda sem threads
    public static void main(String[] args) {
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        par1.setFlechas(5);
        par1.setLoop(20);
        par2.setFlechas(10);
        par2.setLoop(20);
        par1.roda();
        par2.roda();
    }
}
```

```java
class Paralelo0 {
    private int loop;
    private String sFlechas;
    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
            sFlechas += ">";
        }
    }
    public void setLoop(int loop) {
        this.loop = loop;
    }
    public void roda() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

```
>>>>>  0
>>>>>  1
>>>>>  2
>>>>>  3
>>>>>  4
>>>>>  5
>>>>>  6
>>>>>  7
>>>>>  8
>>>>>  9
>>>>>  10
>>>>>  11
>>>>>  12
>>>>>  13
>>>>>  14
>>>>>  15
>>>>>  16
>>>>>  17
>>>>>  18
>>>>>  19
>>>>>>>>>>  0
>>>>>>>>>>  1
>>>>>>>>>>  2
>>>>>>>>>>  3
>>>>>>>>>>  4
>>>>>>>>>>  5
>>>>>>>>>>  6
>>>>>>>>>>  7
>>>>>>>>>>  8
>>>>>>>>>>  9
>>>>>>>>>>  10
>>>>>>>>>>  11
>>>>>>>>>>  12
>>>>>>>>>>  13
>>>>>>>>>>  14
>>>>>>>>>>  15
>>>>>>>>>>  16
>>>>>>>>>>  17
>>>>>>>>>>  18
>>>>>>>>>>  19
```

Compilar:

javac LinhaExecucao0.java

Executar:

java LinhaExecucao0

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java –cp . LinhaExecucao0

```java
class Paralelo0 {
    private int loop;
    private String sFlechas;
    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
            sFlechas += ">";
        }
    }
    public void setLoop(int loop) {
        this.loop = loop;
    }
    public void roda() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

```java
class Paralelo1 extends Thread {
    private int loop;
    private String sFlechas;
    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
            sFlechas += ">";
        }
    }
    public void setLoop(int loop) {
        this.loop = loop;
    }
    public void run() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

Diferenças?

```java
class Paralelo0 {
    private int loop;
    private String sFlechas;
    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
            sFlechas += ">";
        }
    }
    public void setLoop(int loop) {
        this.loop = loop;
    }
    public void roda() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

```java
class Paralelo1 extends Thread {
    private int loop;
    private String sFlechas;
    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
            sFlechas += ">";
        }
    }
    public void setLoop(int loop) {
        this.loop = loop;
    }
    public void run() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

Diferenças?

Nome do arquivo: LinhaExecucao1.java

”subprocesso em um processo”

```java
public class LinhaExecucao1 {
    public static void main(String[] args) {
        Paralelo1 par1 = new Paralelo1();
        Paralelo1 par2 = new Paralelo1();
        par1.setFlechas(5);
        par1.setLoop(20);
        par2.setFlechas(10);
        par2.setLoop(20);
        par1.start();
        par2.start();
    }
}
```

```java
class Paralelo1 extends Thread {
    private int loop;
    private String sFlechas;
    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
            sFlechas += ">";
        }
    }
    public void setLoop(int loop) {
        this.loop = loop;
    }
    public void run() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

Nome do arquivo: LinhaExecucao1.java

”subprocesso em um processo”

```java
public class LinhaExecucao1 {
    public static void main(String[] args) {
        Paralelo1 par1 = new Paralelo1();
        Paralelo1 par2 = new Paralelo1();
        par1.setFlechas(5);
        par1.setLoop(20);
        par2.setFlechas(10);
        par2.setLoop(20);
        par1.start();
        par2.start();
    }
}
```

```java
class Paralelo1 extends Thread {
    private int loop;
    private String sFlechas;
    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
            sFlechas += ">";
        }
    }
    public void setLoop(int loop) {
        this.loop = loop;
    }
    public void run() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

```
>>>>> 0
>>>>>>>>>> 0
>>>>> 1
>>>>> 2
>>>>> 3
>>>>>>>>>> 1
>>>>> 4
>>>>> 5
>>>>> 6
>>>>>>>>>> 2
>>>>> 7
>>>>>>>>>> 3
>>>>>>>>>> 4
>>>>>>>>>> 5
>>>>>>>>>> 6
>>>>>>>>>> 7
>>>>>>>>>> 8
>>>>>>>>>> 9
>>>>>>>>>> 10
>>>>> 8
>>>>> 9
>>>>> 10
>>>>> 11
>>>>> 12
>>>>> 13
>>>>> 14
>>>>> 15
>>>>> 16
>>>>>>>>>> 11
>>>>>>>>>> 12
>>>>>>>>>> 13
>>>>>>>>>> 14
>>>>> 17
>>>>>>>>>> 15
>>>>> 18
>>>>>>>>>> 16
>>>>>>>>>> 17
>>>>> 19
>>>>>>>>>> 18
>>>>>>>>>> 19
```

```java
public class LinhaExecucao2 {
    public static void main(String[] args) {
        Paralelo2 par1 = new Paralelo2();
        Paralelo2 par2 = new Paralelo2();
        par1.setFlechas(5);
        par1.setLoop(20);
        par2.setFlechas(10);
        par2.setLoop(20);
        Thread le1 = new Thread(par1);
        Thread le2 = new Thread(par2);
        le1.start();
        le2.start();
    }
}
```

```java
class Paralelo2 implements Runnable {
    private int loop;
    private String sFlechas;
    public void setFlechas(int nFlechas) {
        sFlechas = "";
        for (int i=0; i<nFlechas;i++) {
            sFlechas += ">";
        }
    }
    public void setLoop(int loop) {
        this.loop = loop;
    }
    public void run() {
        for(int i=0;i<loop;i++) {
            System.out.println(sFlechas + " " + i);
        }
    }

}
```

Testem

LinhaExecucao0
LinhaExecucao1
LinhaExecucao2

e comparem os resultados