JaVA Building Block Stairs (JaBS)
(Multithreading)

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What is Multithreading?

- Allows concurrent execution of **two or more parts** of a program for maximum utilization of CPU.
  - **Each part** is called a thread → light-weight processes within a process.
- **What does concurrent execution mean? We must understand concurrency very well.**
  - **Concurrency** is about **multiple tasks** which start, run, and complete in **overlapping time periods**, in **no specific order**.
  - **Parallelism** is about **multiple tasks or subtasks of the same task** that **literally run at the same time on a hardware with multiple computing resources like a multi-core processor.**

N.B. Some courses of your B.Sc degree, such as, Operating System will strengthen your knowledge about **Thread vs Process.**

For the time being being **Thread vs Process:**

How could we create threads in Java?

- **Extending a Thread class**
  - extends the **java.lang.Thread** class
  - overrides the **run()** method
  - A thread begins execution inside the run**()**method.
  - **start()** invokes the **run()** method on the Thread object.
- **Implementing the Runnable Interface** → implements java.lang.Runnable interface and override **run()** method → instantiate a Thread object and invoke the **run()** method.
- **Note that** When all user level **threads** are executed **JVM tears down or terminates** the program.

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Types of Thread:

- **User level Thread:** A user level thread will be created when we start a thread.
- **Daemon Thread:** similar to user level Thread.

What can we do in Java?

- We can create multiple threads in a Java program and start them to perform their tasks.
- **Java Runtime** will take care of creating Machine level instructions and work within the operating system (OS) **to execute them in PARALLEL.**

```
/*
 * Java code for thread creation by extending Thread class
 *
 * Filename: DHMAIMultithreading.java where main() function belongs to
 */

import java.util.*;

class DHMAIMultithreading extends Thread
{
  public void run()
  {
    try
    {
      /*
       * output: Running Thread by ID
       */
      System.out.println( "Thread ID " + Thread.currentThread().getId()
                          + " is running");
    }catch (Exception exception) {
          System.out.println("Exception is caught");
```

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```
        }
     } // End of try-catch
}// End of DHMAIMultithreading Class

/*
 * Main Class
 */
public class JaBSMultithreading
{
  public static void main(String[] args)
  {
    int n = 8; // Number of threads

    for (int i = 0; i < n; i++)
    {
        DHMAIMultithreading  dhmaiMultithreading= new DHMAIMultithreading();
            object.start();
    }
}
}
```

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