Capacity Estimation, Threads

What is Capacity Estimation ?

Capacity estimation is the process of predicting or determining the amount of resources needed (like CPU, memory, storage, bandwidth, users, etc.) to handle a certain level of workload efficiently — either for a software system, application, infrastructure, or business process.

What is the difference between Single threaded and multi threaded ?

- In Single threaded one task or thread runs at one time by single cpu core.
- JavaScript in browsers handles one event at a time.
- In Multi threaded we can run multiple tasks at same time on multiple cpu cores
- In Java, a web server can handle multiple client requests simultaneously using different threads..

✅ In a Single-Threaded Language (e.g., JavaScript, C by default):

🧠 Execution:

- One instruction is executed **at a time** by a **single CPU core**.
- The loop runs **from i = 0 to i = 100** sequentially.
- **Each iteration blocks the next** — no other code or task runs until the loop completes.

💡 Example (in JavaScript):

```
for (let i = 0; i <= 100; i++) {
  console.log(i);
}
```

✅ In a Multi-Threaded Language (e.g., Java, C++ with threads):

🧠 Execution:

- By default, this `for` loop still runs **in one thread**, just like in single-threaded code.
- But **you can split the loop across multiple threads** manually to make it faster (especially for CPU-heavy work).

💡 Example (in Java with threads):

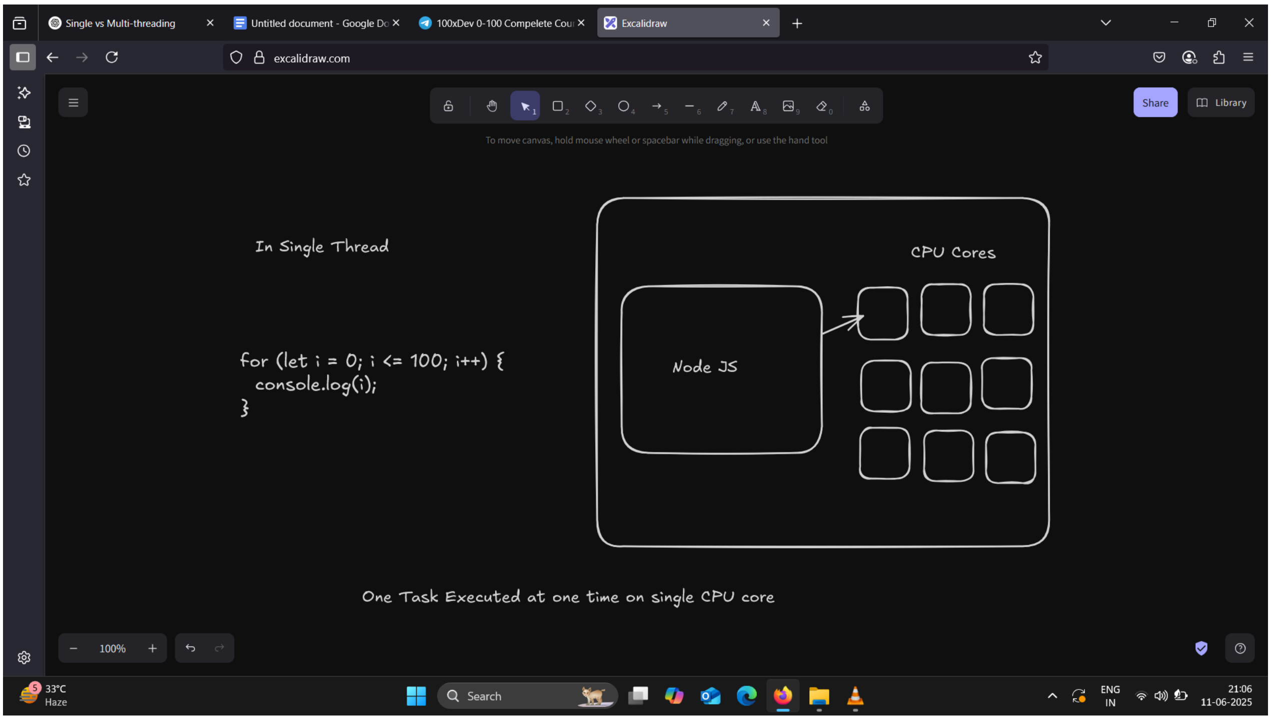
```
class MyTask extends Thread {
    int start, end;

    MyTask(int s, int e) {
        start = s;
        end = e;
    }

    public void run() {
        for (int i = start; i <= end; i++) {
            System.out.println(i);
        }
    }
}

public class Main {
    public static void main(String[] args) {
        MyTask t1 = new MyTask(0, 50);
        MyTask t2 = new MyTask(51, 100);

        t1.start();
        t2.start();
    }
}
```



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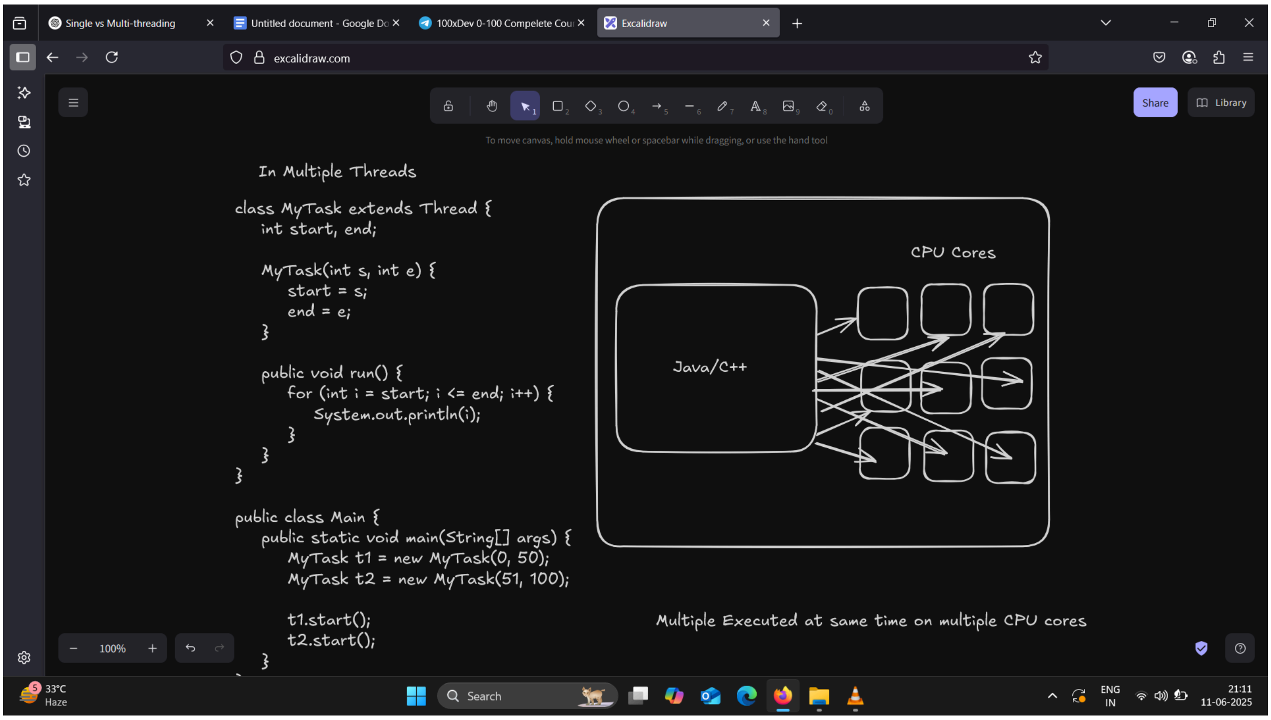
```
for (let i = 0; i <= 100; i++) {
  console.log(i);
}
```

One Task Executed at one time on single CPU core



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In Multiple Threads

```
class MyTask extends Thread {
    int start, end;

    MyTask(int s, int e) {
        start = s;
        end = e;
    }

    public void run() {
        for (int i = start; i <= end; i++) {
            System.out.println(i);
        }
    }
}

public class Main {
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        MyTask t1 = new MyTask(0, 50);
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Multiple Executed at same time on multiple CPU cores