Threads

A thread contains - ① Thread ID ④ Stack
② Register set
③ Program counter

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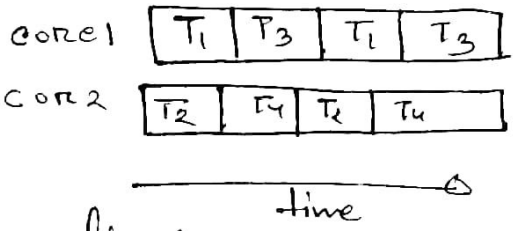
unit of cpu utilization

Threads share code section, data section and os resources belonging to the same process.

Parallelism implies a system can perform more than one task at a time simultaneously

Concurrency implie a system can supports more than one task making progress.



Advantages of multi-threading:

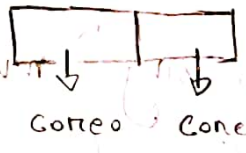
1. Responsiveness: One thread can provide rapid responsiveness while others are blocked or slowed down for intensive calculation.
2. Resourse sharing: Threads share code, data, and other os resources which allows

multiple tasks to perform at same time simultaniously.

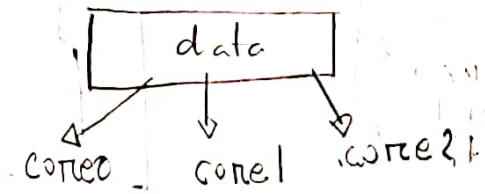
Economys Creating and managing thread are more faster than performing same task for processes.

Scalability: It means program can take advantage of multiple processors if available. Unlike single threaded program it can use only one processor regardless of how many available. while multi-threaded program ~~share~~ spread work among ~~prog~~ processor making them faster and efficient.

Data parallelism: distribute subset of same data across cores.



Task parallelism: distribute threads across cores, each thread performing unique operation.



Amdal's law: Identifies performance gain by adding additional cores to an application that has both parallel and serial component.

$$\text{speed up} \leq \frac{1}{S + \left(\frac{1-S}{N}\right)}$$

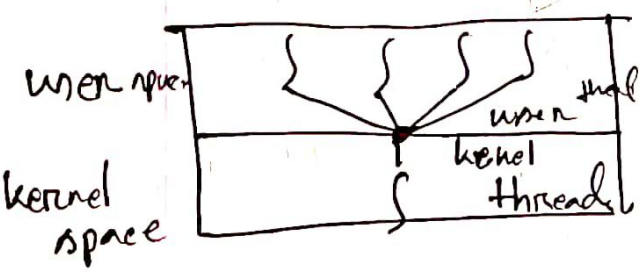
S = serial

N = no. of core

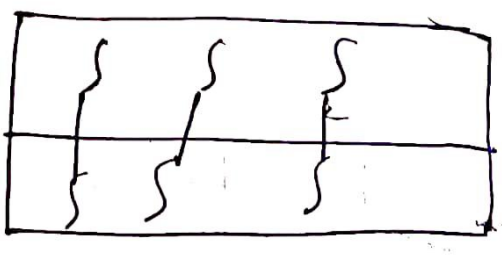
User threads supported above the kernel without kernel support. Programmer put this in their application.

Kernel thread supported within the kernel of the os itself. Os utilize kernel thread by processing multiple tak or system call at a time.

Many to ones



one to ones



Pthread:

1. Pthread stands for POSIX thread. They are a set of standard ~~that~~ for creating and managing thread in a program

2. Workings Global variable are shared among all the thread. So all thread within program can access and modify these variable.

3. Syncronizations One thread can wait for other thread to finish his execution before it can start its own.

4. Pthread begain executing in specified function. So function need to be defined, and it will start running.

Java thread:

1. Java thread are like pthread but for Java programing language.
2. Java thread are manged by JVM
3. They are created by ① extending thread class
   ② implementing runnable interface.