



Department of Information Technology
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IT301 : PARALLEL COMPUTING

Topic: AMDAHL's LAW

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Parallel Processing → Speed Up

- Speed up is the factor by which the time is reduced compared to a single processor.

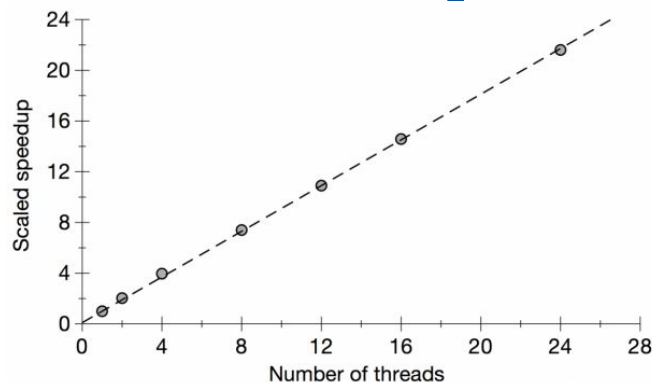
$$\text{Speedup} = \frac{\text{Execution time using one processor}}{\text{Execution time using multiple processors}}$$

Example: It time taken to perform a task (T_1) using **one processor** is **1 unit** then time taken to perform the same task (T_N) on **N processors** is **$1/N$ unit**.

$$\text{Then Speed up is} = T_1/T_N = \frac{1}{1/N}$$

Parallel Processing → Speed Up

- Speedup is linear !
- That means as the number of processors increase, the speed up should also increase.
- Ideally this is what is to be achieved.
- But it is not practically achieved.
- Thus Amdahl's law gives us a better insight.



Amdahl's Law

- Speed up depends on the portion of program that is serial and portion of program that is parallel or enhanced.
- So the PARALLEL program (T) will have SERIAL part (S) + PARALLEL part (P)
- In single processor Time taken by Parallel program $T_1 = S+P$
- In multiple processor (say n processors) Time taken by $T_n = S+P/n$
- If time required for parallel program on single processor is 1 unit. Then time taken to execute Serial portion is $S=1-P$

$$\text{Speed up} = \frac{T_1}{T_n} \quad \text{FINALLY} \quad \text{Speed up} = \frac{1}{(1-P) + P/n}$$

THANK YOU