Par teoria S3

SpeedUp vs Efficiency

SpeedUp (S_p): relative reduction of execution time whn using P processors with respect sequential

Efficiency (Eff_p): it is a measure of the fraction of time for which processing element is usefull

Escalability

> - Strong: resources x2 -> scalability x2
> - Weaak: resources x2 w. proportional work

Amdahl's law

> φ (Par_Fraction) = $T_{seq\_time\_of\_par\_part}$ / T_{seq_exec}

$$S_p = \frac{T_1}{T_p} = \frac{T_1}{(1-\varphi) \times T_1 + (\varphi \times T_1/P)}$$

$$S_p = \frac{1}{((1-\varphi) + \varphi/P)}$$

Note: If P approach to infinit, φ/P approach to 0, then S_p = 1/(1-φ).

Ex:

> ```
>     seq - 25s
>     par - 50s
>     seq - 25s
>           100s
> ```
>
> φ = 100/50 = 0,5 SpeedUp $_{par}$ = 50/10 = 5
>
> SpeedUp = 100/60 = 1.67

Sources of overhead

> - tark creation
> - barrier sync
> - tark sync
> - exclusive access to data
> - data sharing

> - Idleness
> - Computation (extra work to obtain a palallel algorithm)
> - Memory (extra memory to obtain a palallel algorithm)
> - Contention (competition for the access to shared resources)

$$T_p = (1 - \varphi) \times T_1 + \varphi \times T_1/p + overhead$$

How to model data sharing overload?

Example:

Jacobi solver

> T_{calc} = (N^2/P)*t_{boddy}
>
> T_p = T_{calc} + T_{comm}
>
> Tcomm = 2(t_s+t_w*N)