Scalability Examples

Wednesday, September 6, 2017 7:49 PM

Speed-up: $\frac{T_1}{T_n}$ $\quad 0 \leq S_p \leq$ Amdahl's Law

$T_1 = 1\,min = 60\,sec$

$T_4 = 20\,sec \qquad T_9 = 15\,sec$

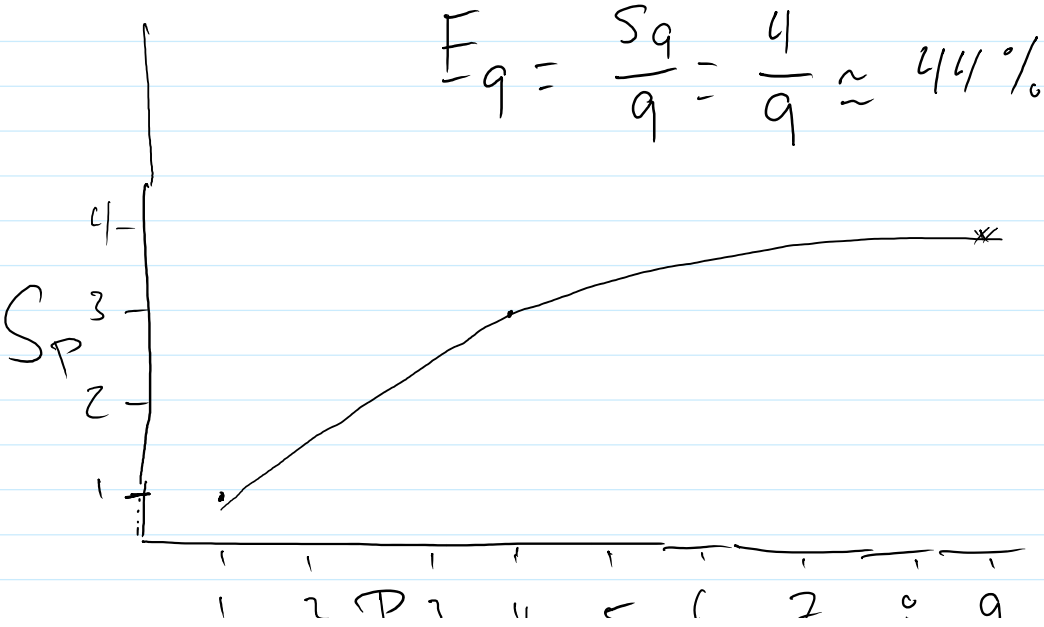
$S_p = \frac{60s}{20s} = 3 \qquad S_9 = \frac{60}{15} = 4x$

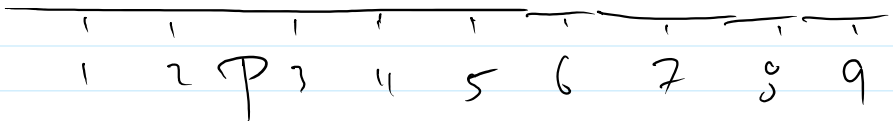
$S_4 = 3$

Efficiecy: $E_p = \frac{S_p}{P}$

$E_4 = \frac{S_4}{4} = \frac{3}{4} = 75\%$

$E_9 = \frac{S_9}{9} = \frac{4}{9} \simeq 44\%$





$$S_{1\pi} = \frac{T_1}{T_k} = \frac{T_s + T_p}{T_s + T_p/k} \left(\frac{T_1}{T_1}\right)$$

$$= \frac{1}{f_s + \frac{(1-f_s)}{k}}$$

$$S_\infty \to \frac{1}{f_s}$$

5% Serial

$$S_\infty = \frac{1}{0.05} = 20\times$$

Functional Profile

What percentage of time each function consumes.

5 routines, all taking 20% of run-time.

- for each routine optimized, the best you can do is ~~20~~ 25% improvement

$$S_p = \frac{T_1}{T_{opt}} = \frac{T_f + T_s}{T_f} = 1 + \frac{T_s}{T_f}$$

$$= \frac{1}{.8} = 1.25x$$

$$= \frac{1}{.4} = 2.5x$$