Lecture 5: Performance Analysis (part 2)

The Isoefficiency Metric

- **Parallel system**: A parallel program executing on a parallel computer

- **Scalability**: the scalability of a parallel system is a measure of its ability to increase performance as the number of processors increases.

- Let $T_0(n, p)$ be the total amount of time spent by all processes doing work not done by the sequential algorithm:

$$T_0(n, p) = (p - 1)\sigma(n) + p\kappa(n, p)$$

  - $T_0(n, p)$ can also be interpreted as:
    $p \times$ (Parallel execution time) $-$ (Sequential execution time)

- Let $T(n, 1)$ be the time of the sequential algorithm for solving the problem. $\quad \varepsilon(n, p) \leq \dfrac{1}{1 + \frac{T_0(n,p)}{\sigma(n)+\varphi(n)}} \leq \dfrac{1}{1 + \frac{T_0(n,p)}{T(n,1)}}$

$$T(n, 1) \geq \frac{\varepsilon(n, p)}{1 - \varepsilon(n, p)} T_0(n, p)$$

Isoefficiency Relation:

Suppose a parallel system has efficiency $\varepsilon(n, p)$. Define $C = \frac{\varepsilon(n,p)}{1-\varepsilon(n,p)}$. In order to maintain the same level of efficiency as the number of processors increases, n must be increases so that the following inequality is satisfied: $T(n, 1) \geq C T_0(n, p)$