- **Gene Myron Amdahl** (born November 16, 1922) is an American computer architect and high-tech entrepreneur, chiefly known for his work on mainframe computers at IBM and later his own companies, especially Amdahl Corporation. He formulated Amdahl's law, which states a fundamental limitation of parallel computing.
- The overall performance of a system is a result of the interaction of all of its components.
- System performance is most effectively improved when the performance of the most heavily used components is improved.
- This idea is quantified by Amdahl's Law:

$$S = \frac{1}{(1-f) + f/k}$$

Symbol	Definition
S	is the overall speedup
f	is the fraction of work performed by a faster component
k	is the speedup of the faster component

- Amdahl's Law gives us a handy way to estimate the performance improvement we can expect when we upgrade a system component.
- A system spends 70% of the time running in the CPU and 30% of the time waiting for service from the disk.
- The processor option offers a 50% faster CPU but costs $10,000.
- The disk option offers a 150% faster disk but costs $7,000.
- An upgrade of which component would offer the greater benefit for the lesser cost?
- Processor option:

Parameter Assignment	Discussion
$f = 0.70$	70% of the time running in the CPU makes $f = 0.70$.
$k = 1.5$	The processor option offers a 50% faster CPU makes $k = 1 + 0.5 = 1.5$.

$$S = \frac{1}{(1-0.7) + 0.7/1.5} \approx 1.30$$

- A 30% speedup is achieved at the cost of $10,000 or $333 for every 1% of performance improvement
- Disk option:

Parameter Assignment	Discussion
$f = 0.30$	30% of the time waiting for service from the disk makes $f = 0.30$.
$k = 1.5$	The disk option offers a 150% faster disk makes $k = 1 + 1.5 = 2.5$.

$$S = \frac{1}{(1-0.3) + 0.3/2.5} \approx 1.22$$

- A 22% speedup is achieved at the cost of $7,000 or $318 for every 1% of performance improvement
- The disk option is *slightly* more cost effective.
- Should price/performance be our only concern.