

2. Performance in Computer Systems

2.1 Computer system

- Personal computers (Desktops)
- Servers
- Embedded computers

2.2 Definitions

Performance?

| Airplane | Passenger capacity | Cruising range (miles) | Cruising speed (m.p.h.) | Passenger throughput (passengers x m.p.h.) |
|------------------|--------------------|------------------------|-------------------------|--|
| Boeing 777 | 375 | 4630 | 610 | 228,750 |
| Boeing 747 | 470 | 4150 | 610 | 286,700 |
| BAC/Sud Concorde | 132 | 4000 | 1350 | 178,200 |
| Douglas DC-8-50 | 146 | 8720 | 544 | 79,424 |

FIGURE 1.13 The capacity, range, and speed for a number of commercial airplanes. The last column shows the rate at which the airplane transports passengers, which is the capacity times the cruising speed (ignoring range and takeoff and landing times).

Computers

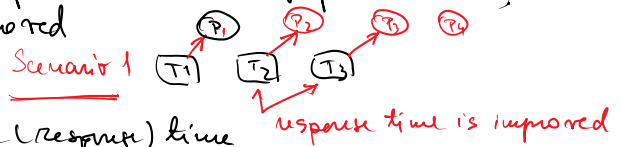
- Throughput
- Response (execution) time

Example of response time vs. throughput

The following changes increase throughput, response time or both?

1. Replace the processor in a computer with a faster version
2. Add additional processors to a system that uses multiple processors for separate tasks
1. Response time is improved, but throughput as well!
2. Throughput is improved

Terminology - avoid "increase/decrease"
- use "improve"



Performance as execution (response) time

$$\text{Performance}_x = \frac{1}{\text{Execution time}_x}$$

$$\text{Performance}_x > \text{Performance}_y \Rightarrow \text{Execution time}_x < \text{Execution time}_y$$

Computer x is n times faster than Computer y

$$\frac{\text{Performance}_x}{\text{Performance}_y} = n = \frac{\text{Execution time}_y}{\text{Execution time}_x}$$

Example Computer A runs a program in 10 seconds
Computer B runs the same program in 15 seconds

$$\frac{\text{Performance}_A}{\text{Performance}_B} = \frac{\text{Execution time}_B}{\text{Execution time}_A} = \frac{15 \text{ sec}}{10 \text{ sec}} = 1.5 \Rightarrow \text{Computer A is 1.5 times faster than Computer B}$$