

4 Parallel and distributed computing

– Part 2

Name: _____ Class: _____ Date: _____

Recall

In Part A you met the internet. Now how computers work **faster** by sharing the job:

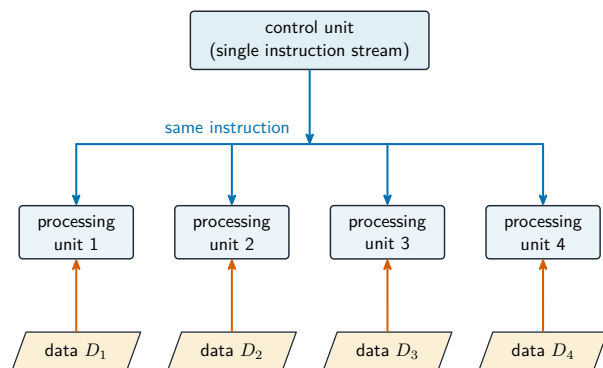
- Many hands make light work – computers can split a job too.
- Big problems are solved by many computers together.

Each idea has a worked example before the Practice.

New ideas

■ 1 Sequential versus parallel

- **Sequential computing** does one step at a time.
- **Parallel computing** splits a task into parts that run **at the same time** on several processors, finishing sooner.



■ 2 Speedup

The **speedup** is how much faster the parallel version is:

$$\text{speedup} = \frac{\text{sequential time}}{\text{parallel time}}$$

Worked example. If a job takes 100 seconds one at a time but 40 seconds split up, the speedup is $\frac{100}{40} = 2.5$.

■ 3 The limit

Speedup is limited: parts that **must** run in order cannot be sped up by adding more processors, so doubling the processors rarely doubles the speed.

■ 4 Distributed computing

Distributed computing uses **many computers** over a network to solve one problem too big for a single machine.

Watch out: the part of a task that **must** run in sequence sets a floor on how fast the whole job can finish. Adding more processors only speeds up the parallel part, not the sequential part.

Practice

Try these in order. The methods are all above.

2.1 State the difference between sequential and parallel computing. [2]

2.2 A task takes 60 seconds sequentially and 20 seconds in parallel. Find the speedup. [2]

2.3 A task takes 80 seconds sequentially and 32 seconds in parallel. Find the speedup.[2]

2.4 State why doubling the processors rarely doubles the speed. [2]

2.5 State what distributed computing is. [1]