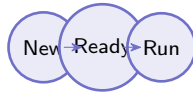


Operating Systems & Translation

A-Level Computer Science ■ Topic 16

A-Level Computer Science



What we will cover

- 1 Managing resources
- 2 Process management
- 3 Virtual memory & paging
- 4 Interpreters & compilers
- 5 Grammar & RPN
- 6 Recap

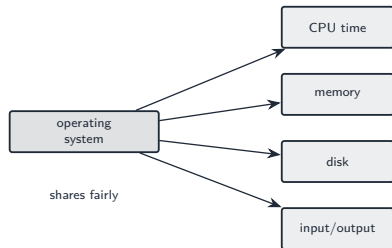


How an OS maximises use of resources

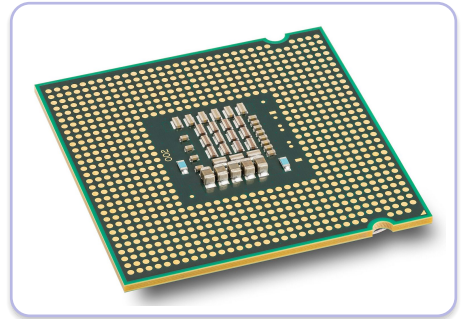
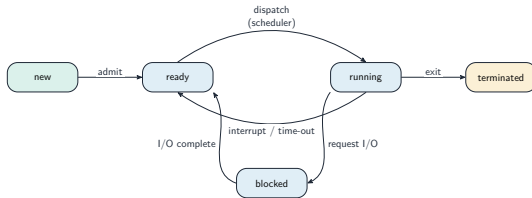
The **operating system** 操作系统 shares the CPU, memory, and I/O among competing programs:

- keeps the expensive CPU **busy**
- stops one program from harming another

Its job is to give each program the **illusion** that it has the machine to itself.

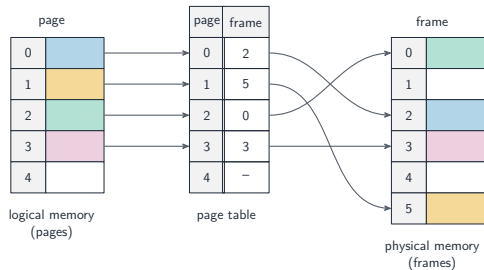


Process management



cpu cooler

Virtual memory and paging



Virtual memory 虚拟内存 lets programs use more memory than physically exists, by keeping unused **pages** 页 on disk:

- a needed page not in RAM is a **page fault** – fetch it from disk
- too much swapping is **thrashing**

Paging 分页 uses fixed-size blocks; **segmentation** 分段 uses variable, logical ones.

Interpreters and compilers

- an **interpreter** 解释器 runs source **line by line** – easy to debug, slower
- a **compiler** 编译器 translates it **all at once** to machine code – faster to run

Compilation stages: lexical analysis, syntax analysis, semantic analysis, code generation, optimisation.

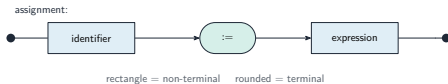
The interpreter re-translates every time; the compiler translates once.



Grammar and Reverse Polish Notation

- **BNF** 巴科斯范式 and syntax diagrams define a language's valid grammar
- **RPN** 逆波兰表示法 writes the operator **after** the operands: 3 4 +

RPN needs **no brackets** and is evaluated with a **stack** – push operands, pop two on an operator.



Topic 16 – key takeaways

1 OS

shares CPU, memory, I/O fairly and safely

2 Processes

ready/running/blocked; scheduler + context switch

3 Virtual mem

paging swaps pages to disk; beware thrashing

4 Translation

interpreter vs compiler; BNF, RPN

Check yourself

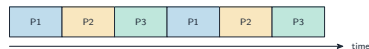
1 What are the three main process states?

2 What is a page fault?

3 Which translator is easier to debug?

4 Evaluate the RPN: 5 2 -

each process gets a fixed time slice, then the next one runs



Answers 1. ready, running, blocked 2. needed page not in RAM 3. interpreter 4. 3