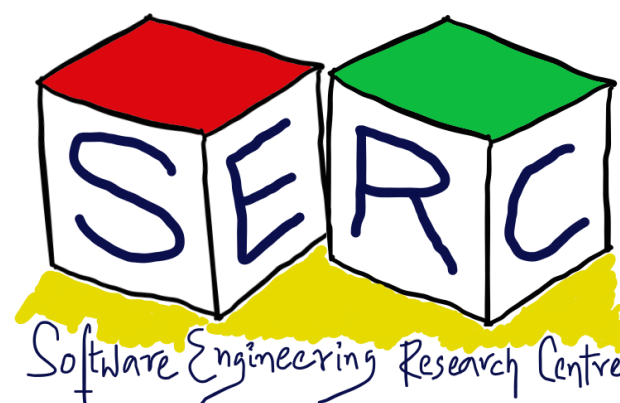


CS3.301 Operating Systems and Networks

OS: Overall Run Down and Concluding Thoughts!

Karthik Vaidhyanathan

<https://karthikvaidhyanathan.com>



Acknowledgement

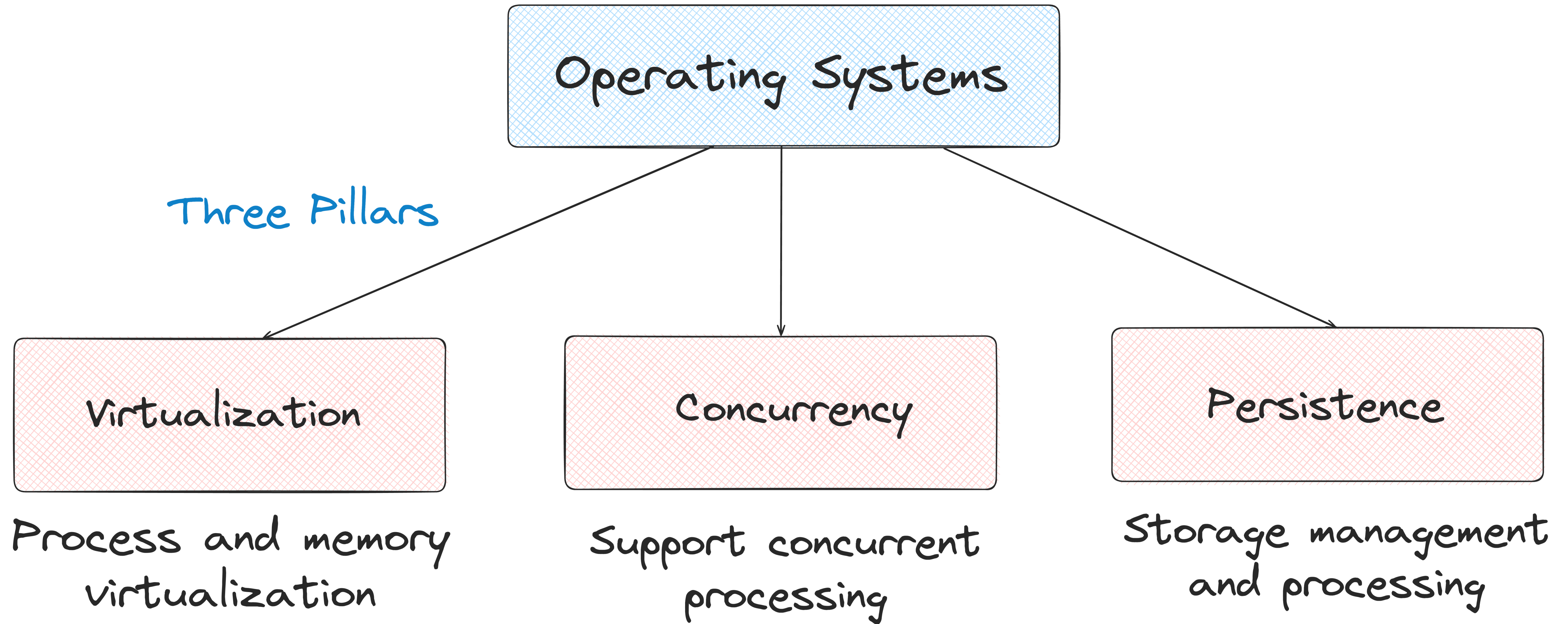
The materials used in this presentation have been gathered/adapted/generate from various sources as well as based on my own experiences and knowledge -- Karthik Vaidhyanathan

Sources:

- Operating Systems in Three Easy Pieces by Remzi et al.
- Different materials used throughout the course



OS: An Overview



Process Virtualization

Process Virtualization

Each Process feels that it has its own CPU

1. Process has different states
2. Process management API

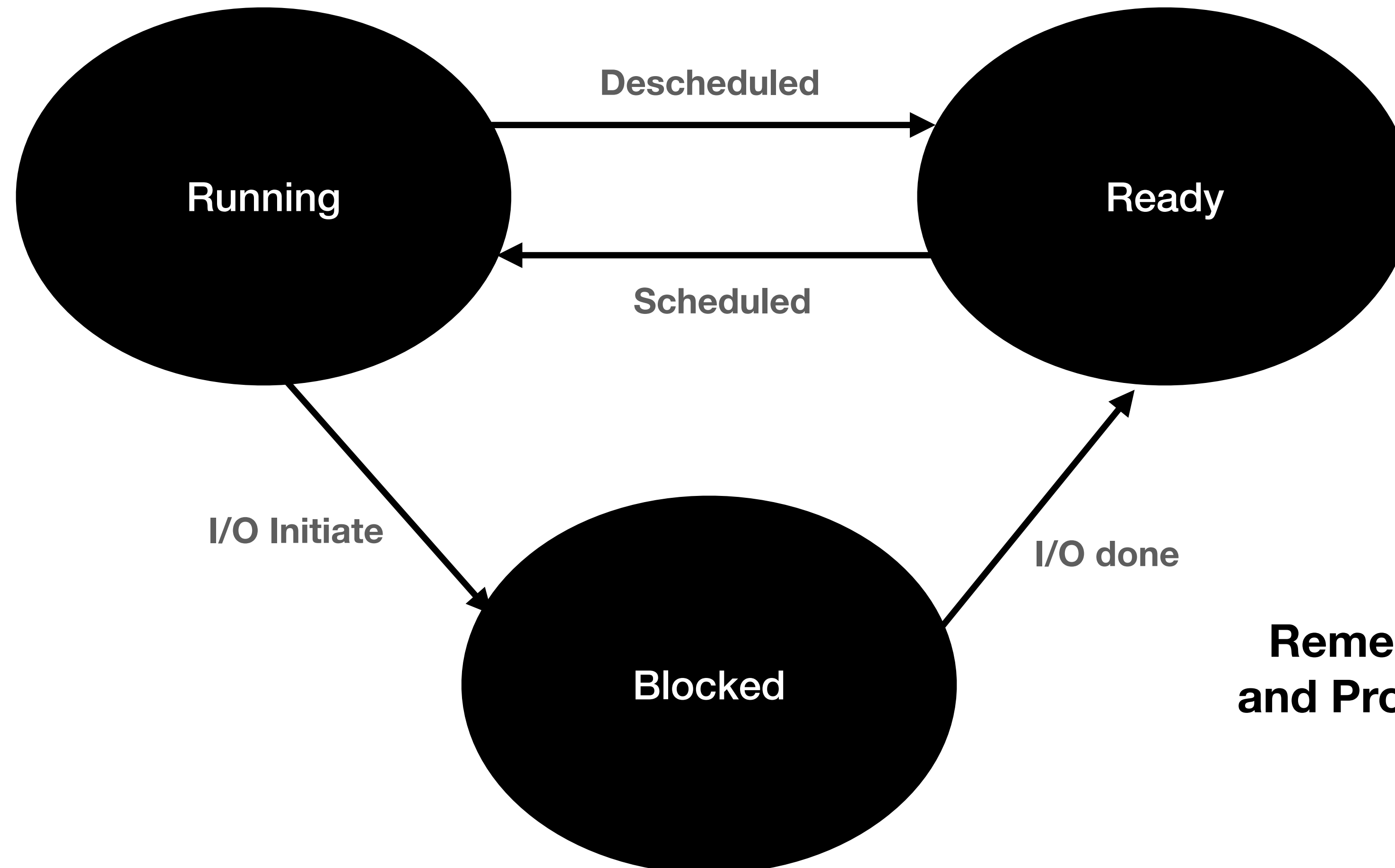
OS should be able to switch between process

1. Support for context switch
2. Process Scheduling



States of the Process

Process State Transitions

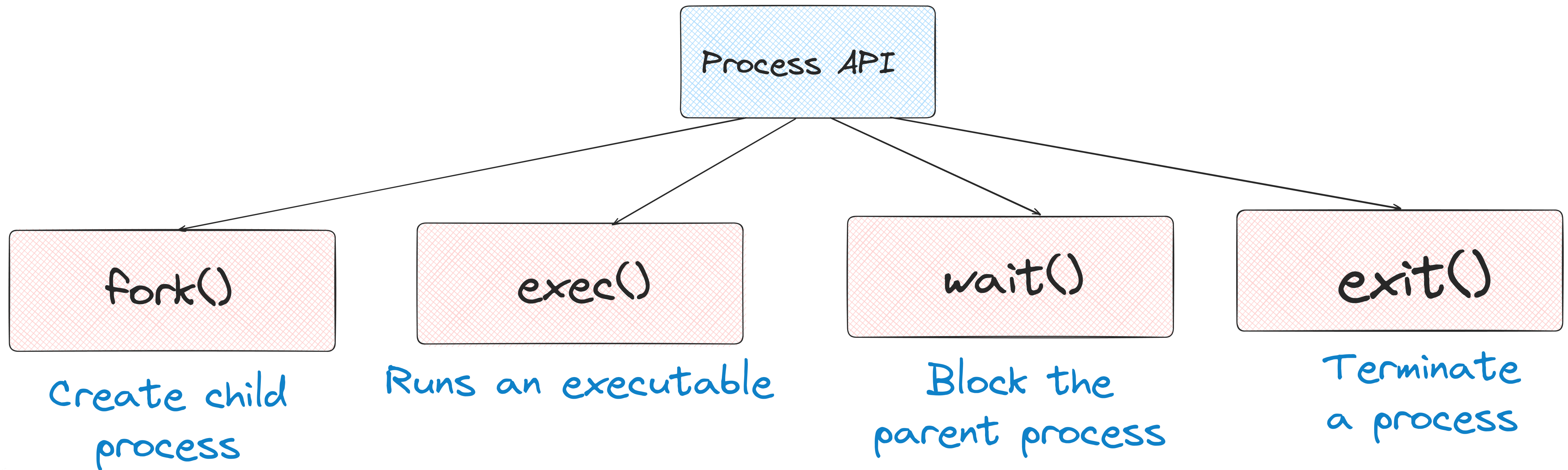


**Remember: Process lists
and Process Control Blocks**

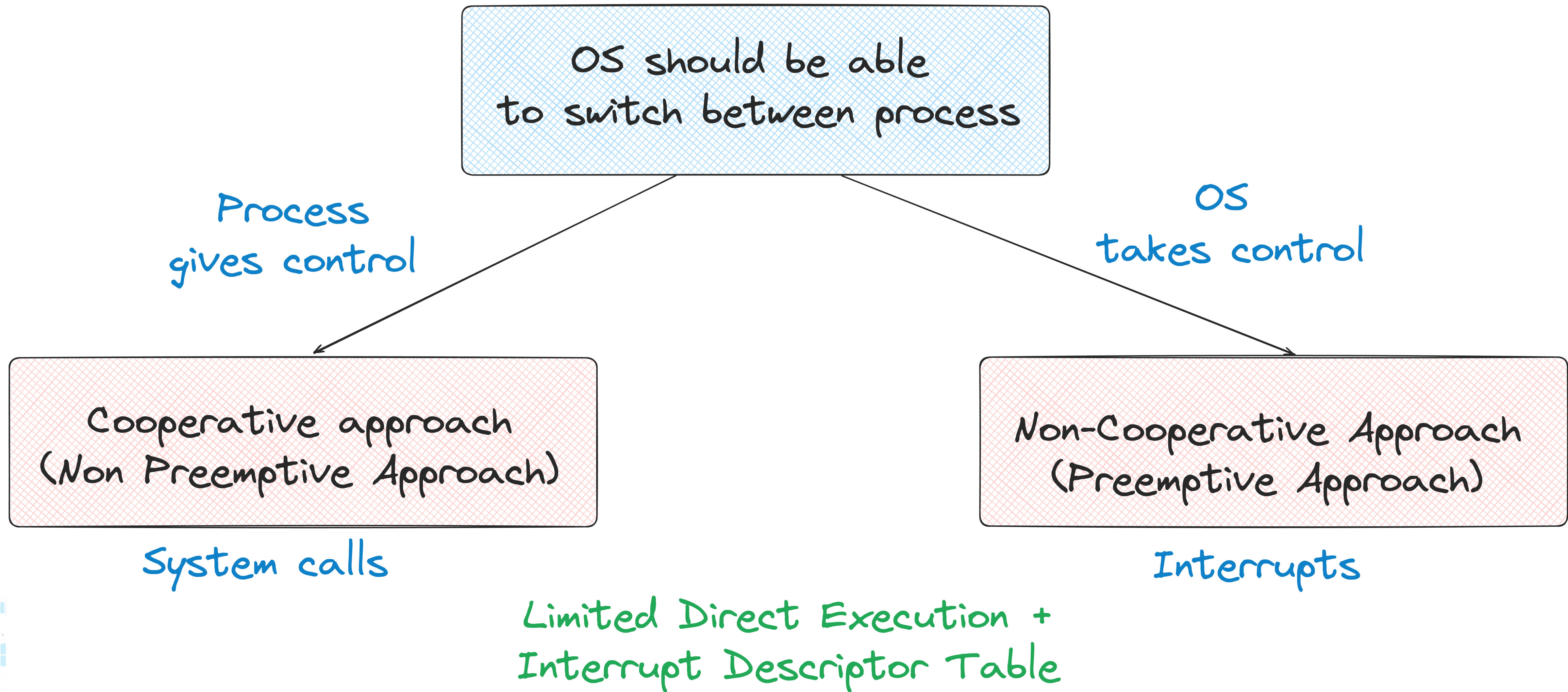


Process Management API

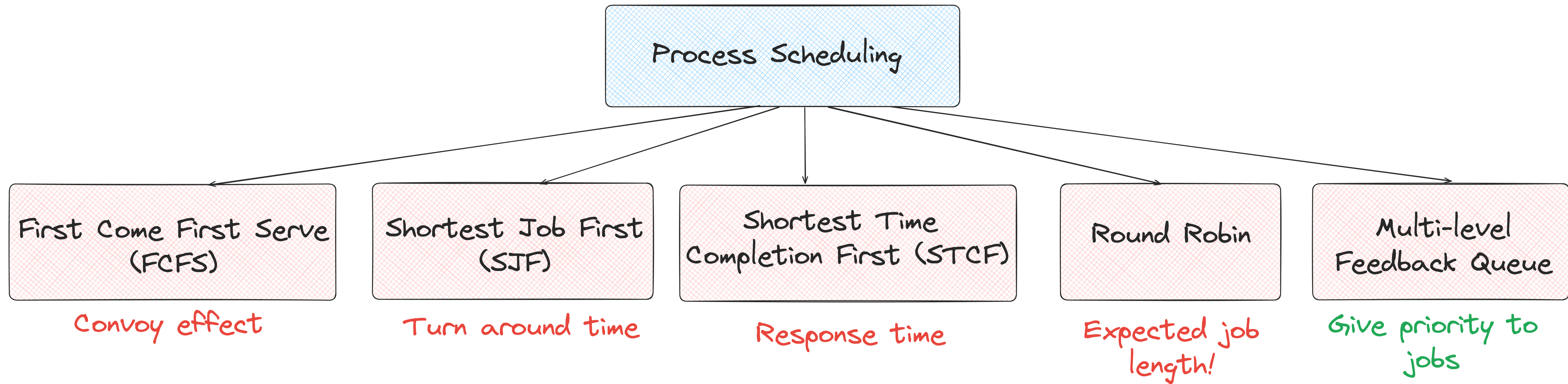
Memory image of a process - **Code, data, stack, and heap**



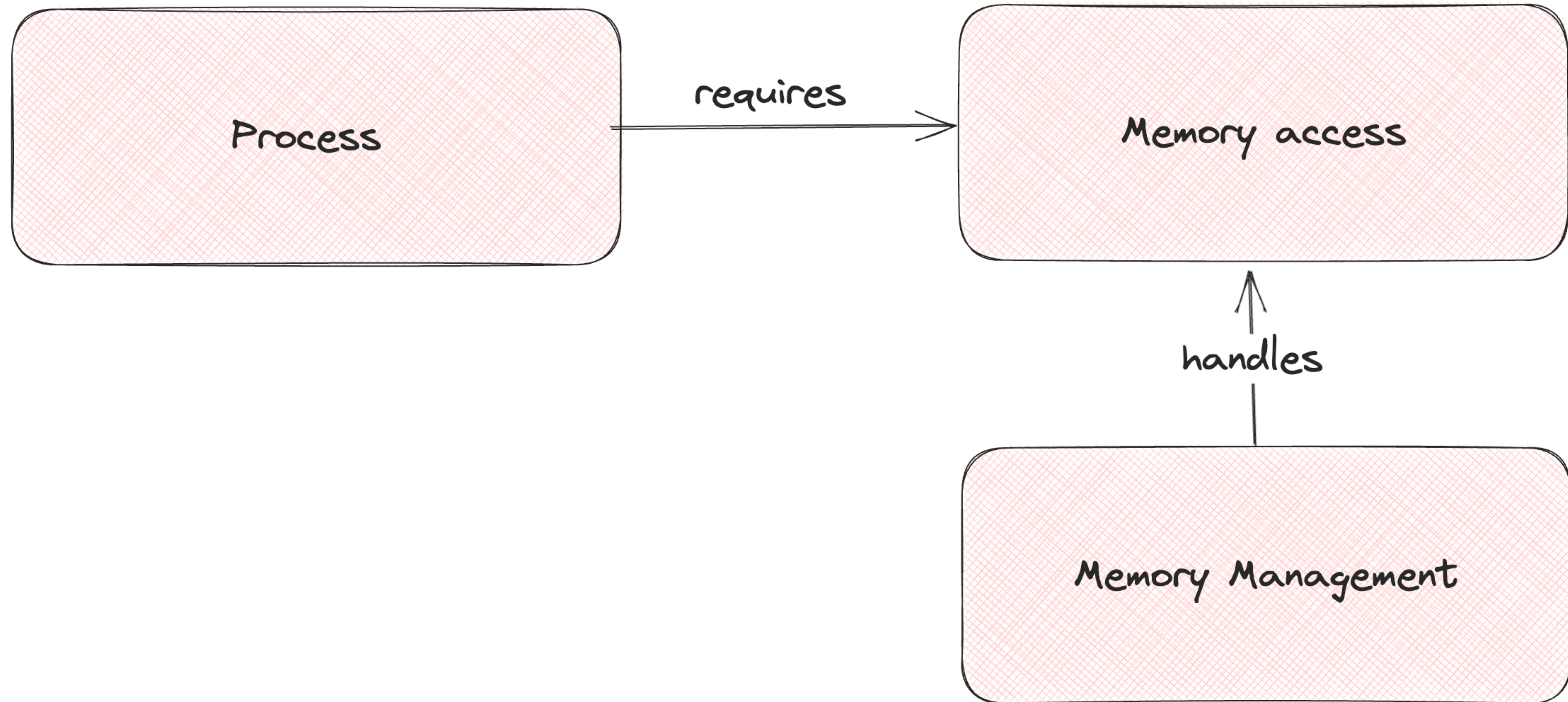
Switching Between Process



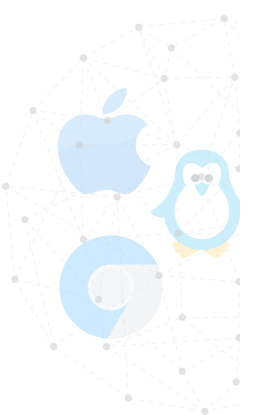
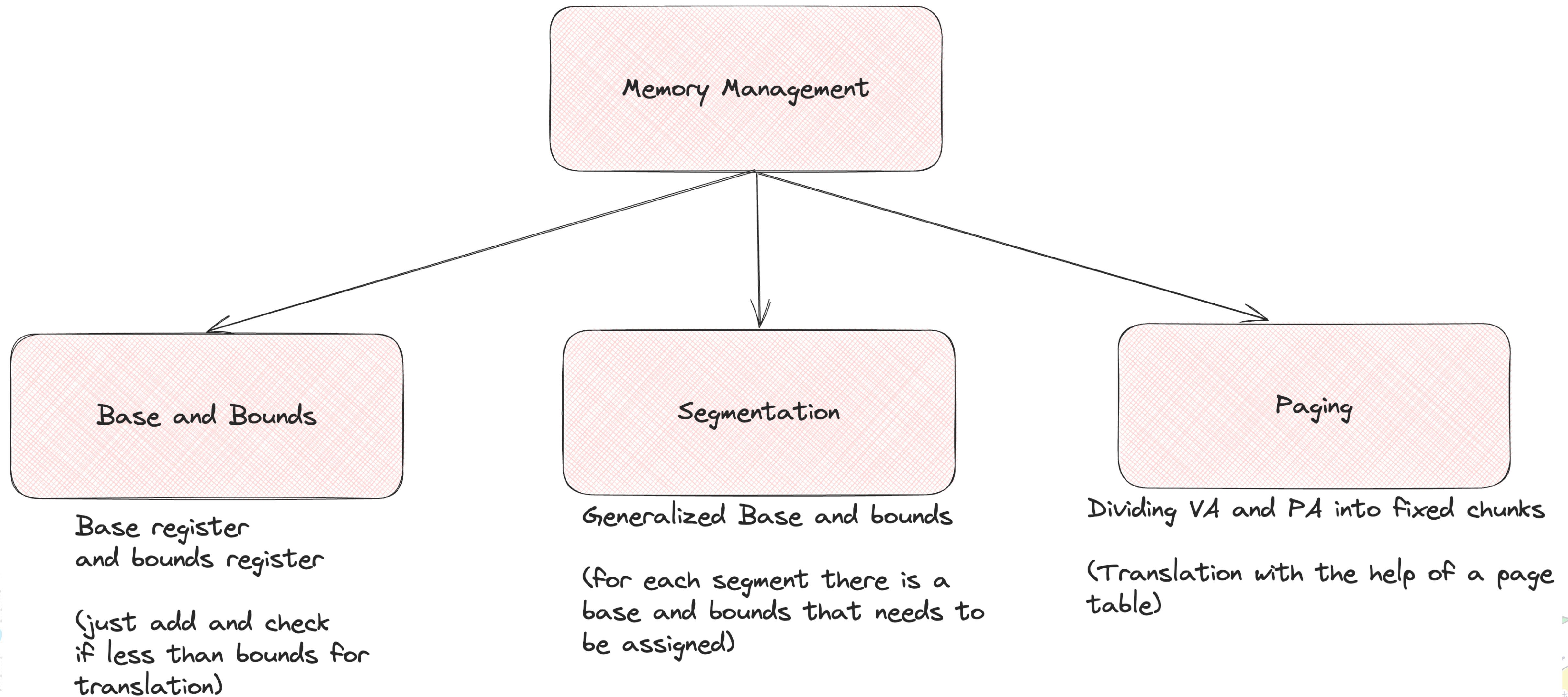
Process Scheduling



Memory Virtualization



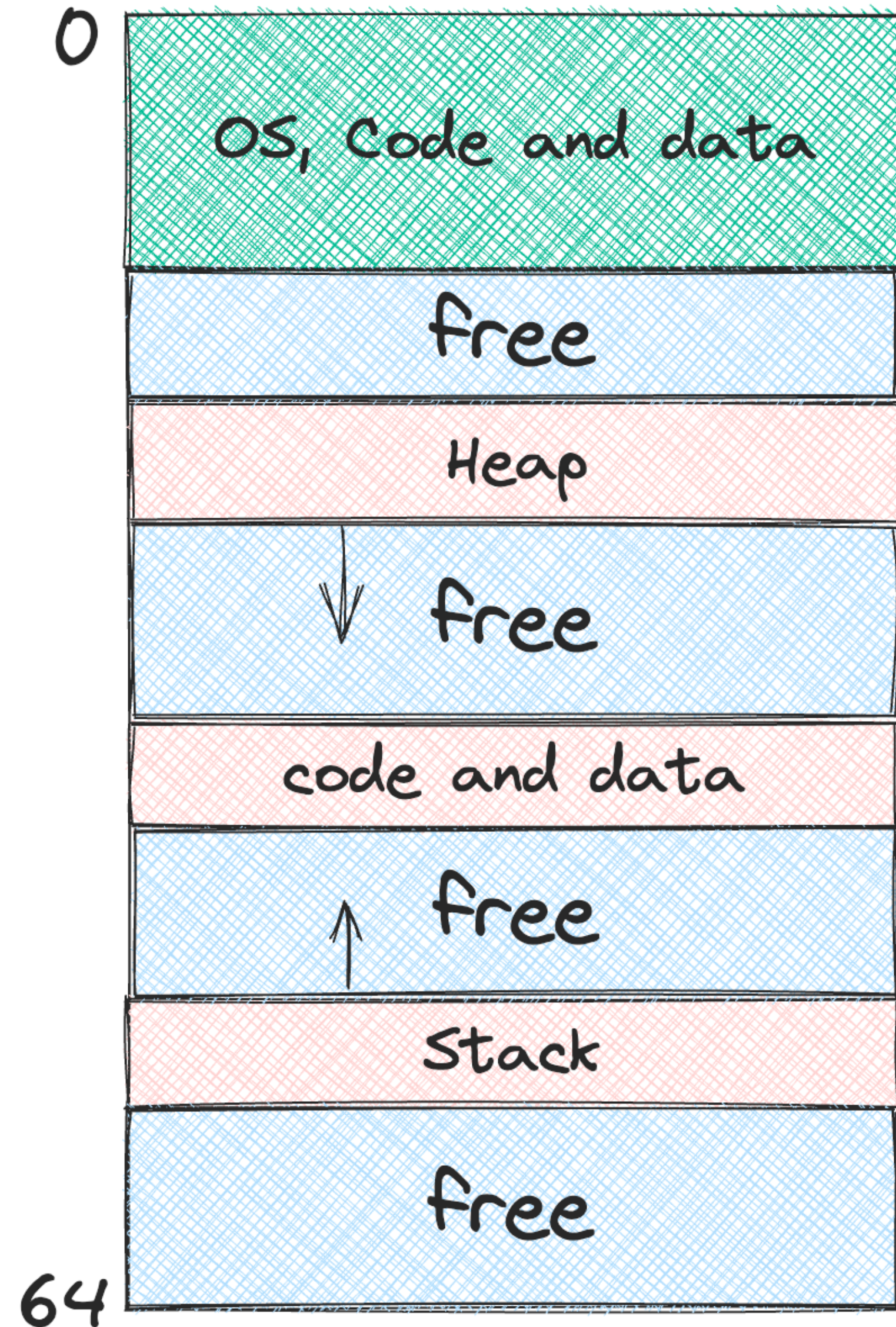
Memory Management



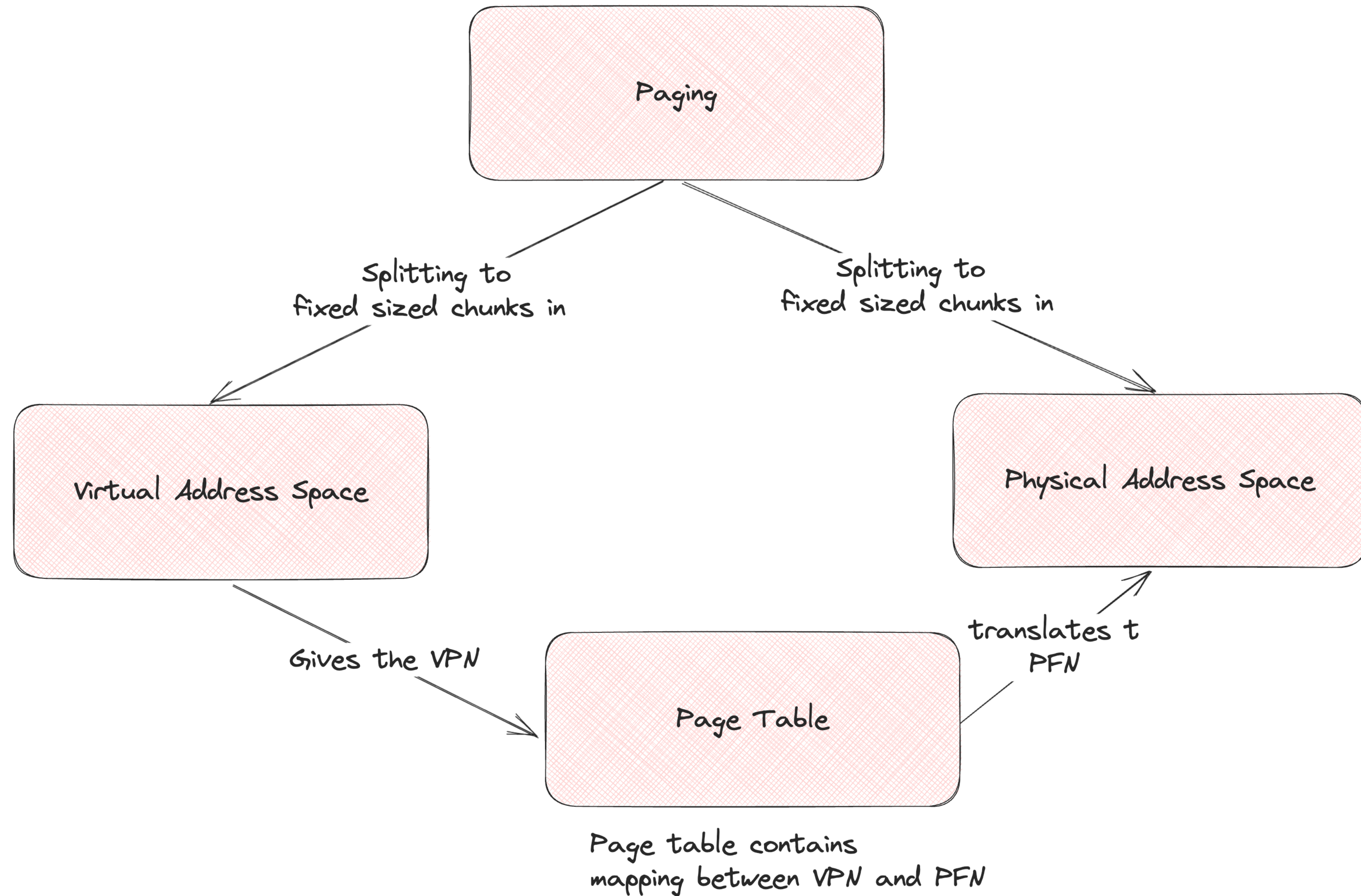
Segmentation

Generalized Base and Bounds

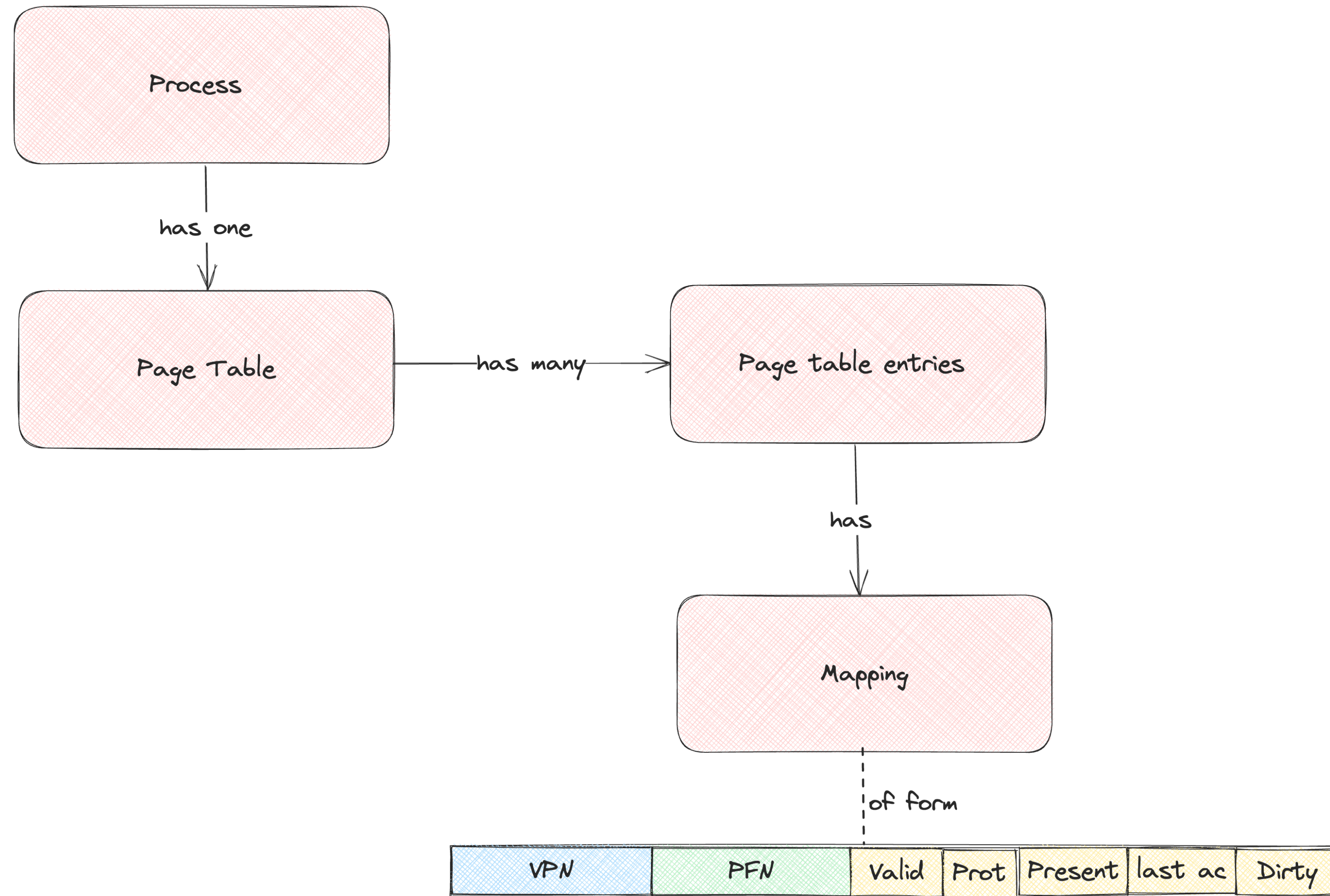
- Only used memory is allocated in physical memory
 - Allows allocating large address space
 - Sparse address space
- Different segments per process - code, stack, heap
- **For translation:** use first bits to identify segments and perform translation
- Results in **External fragmentation**



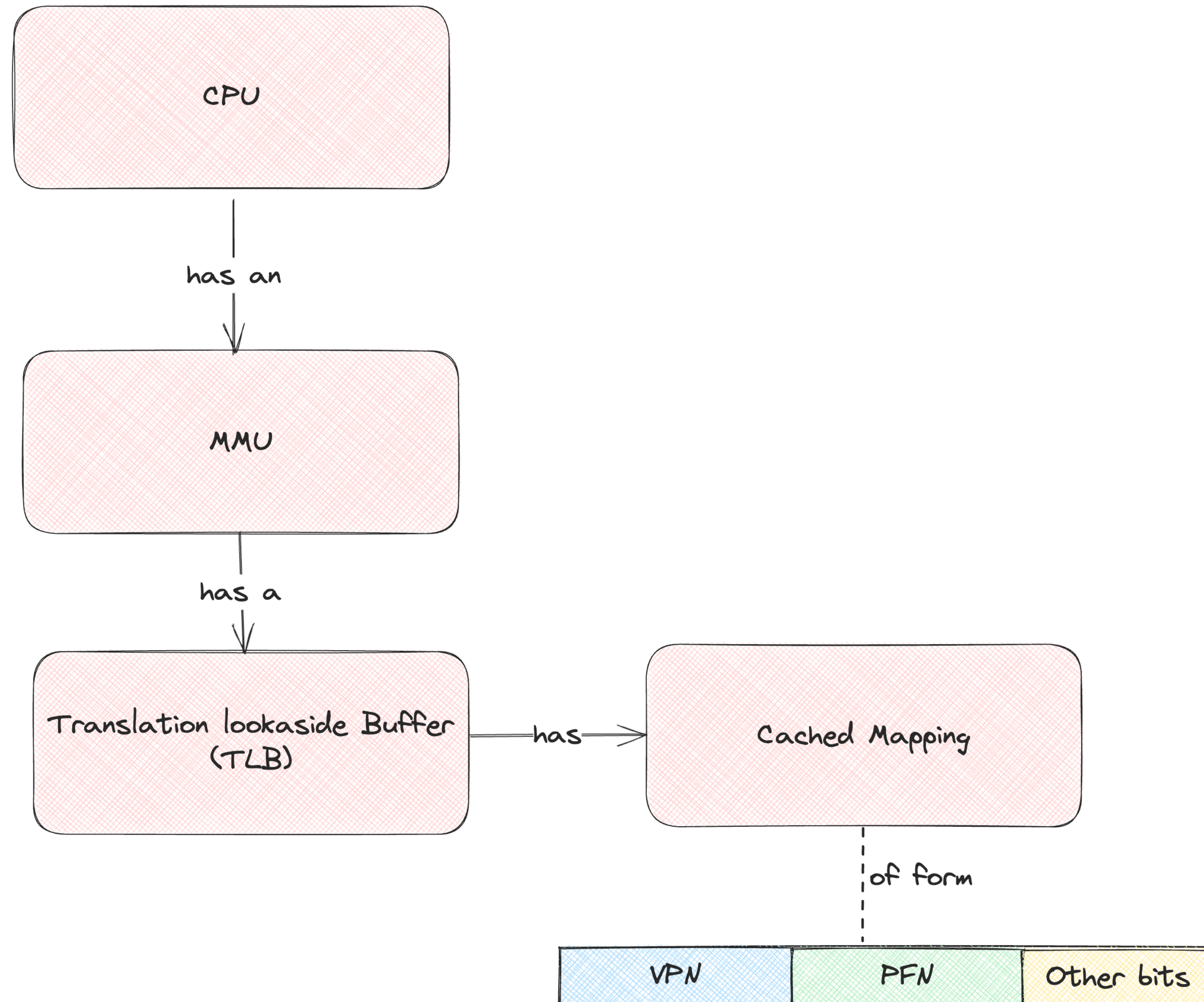
Paging

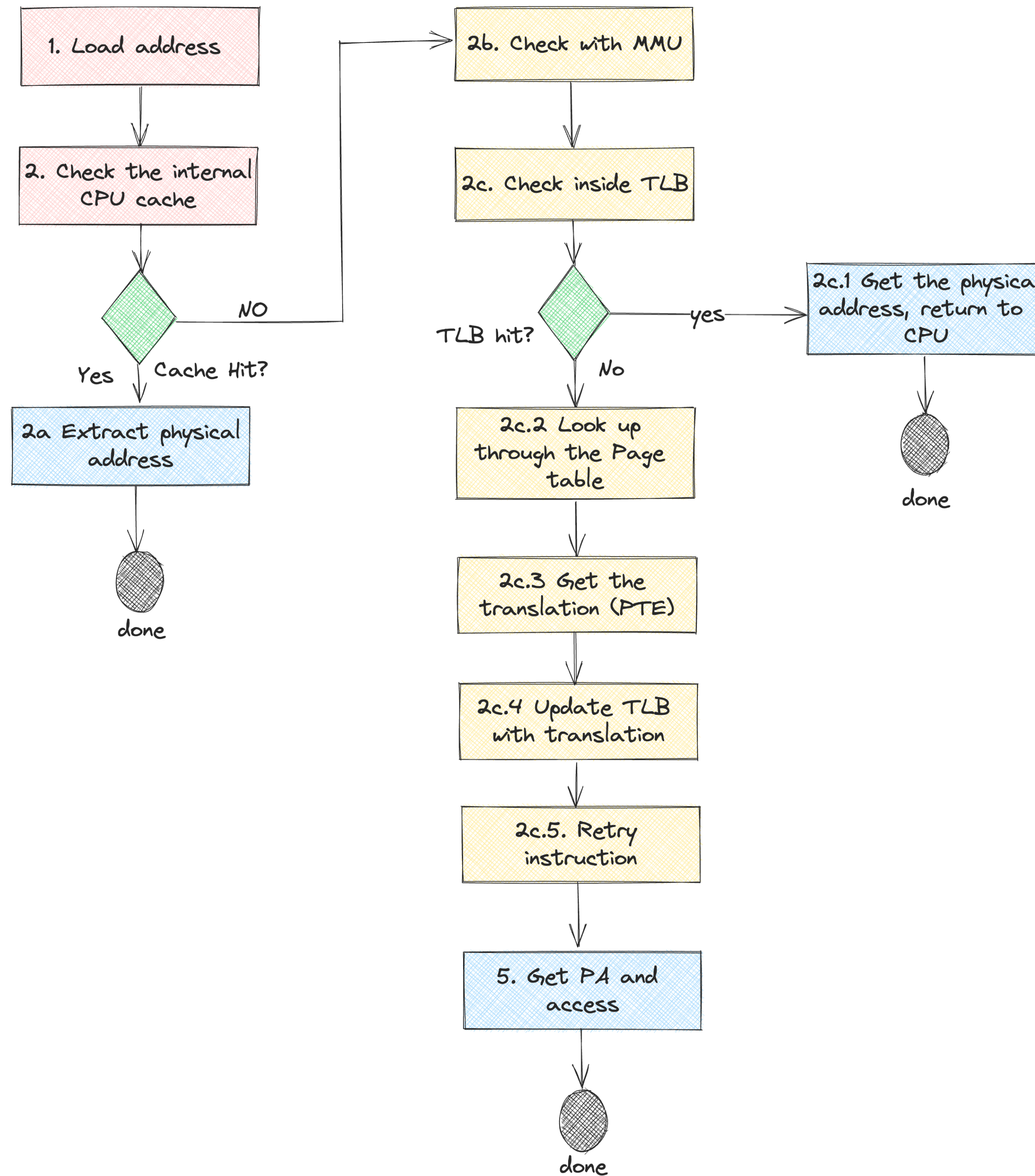


Page Tables



Paging - TLB



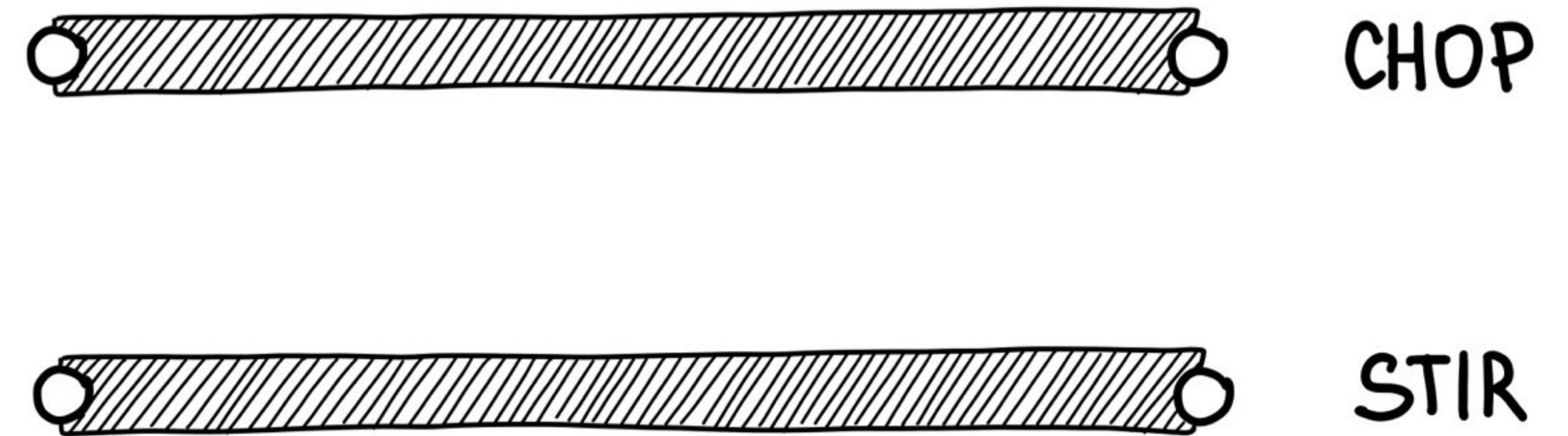
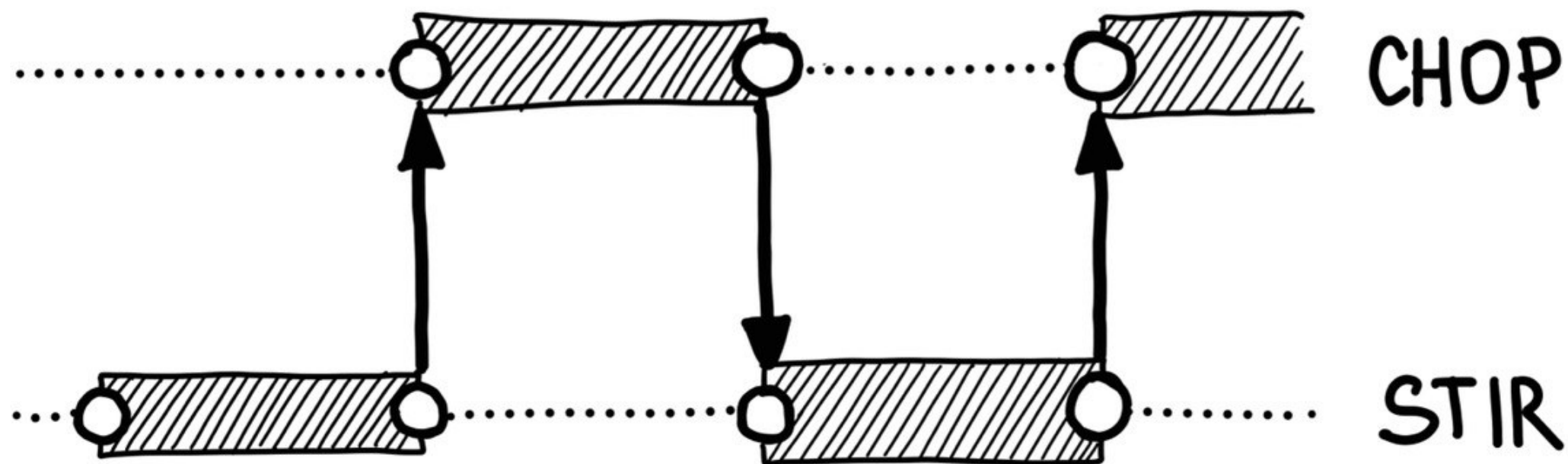
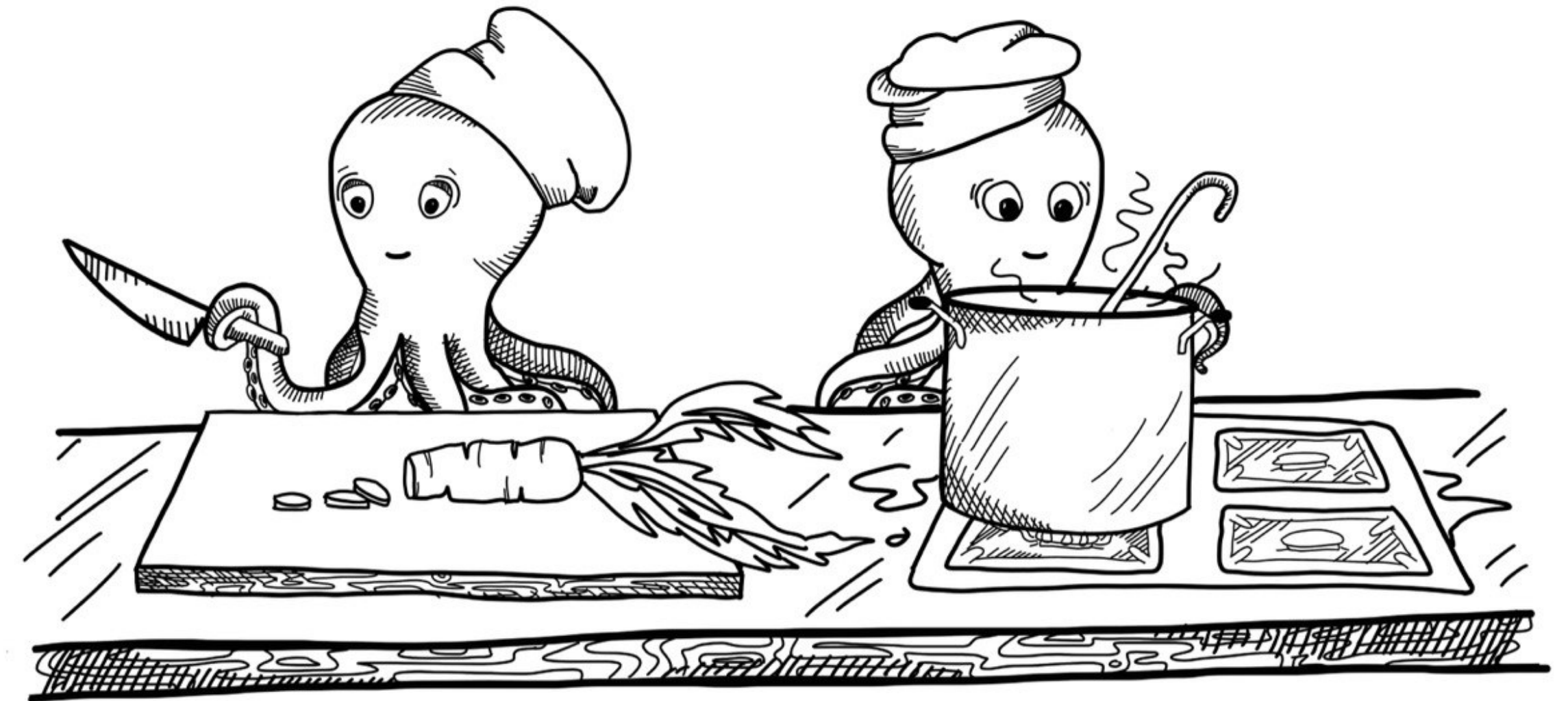
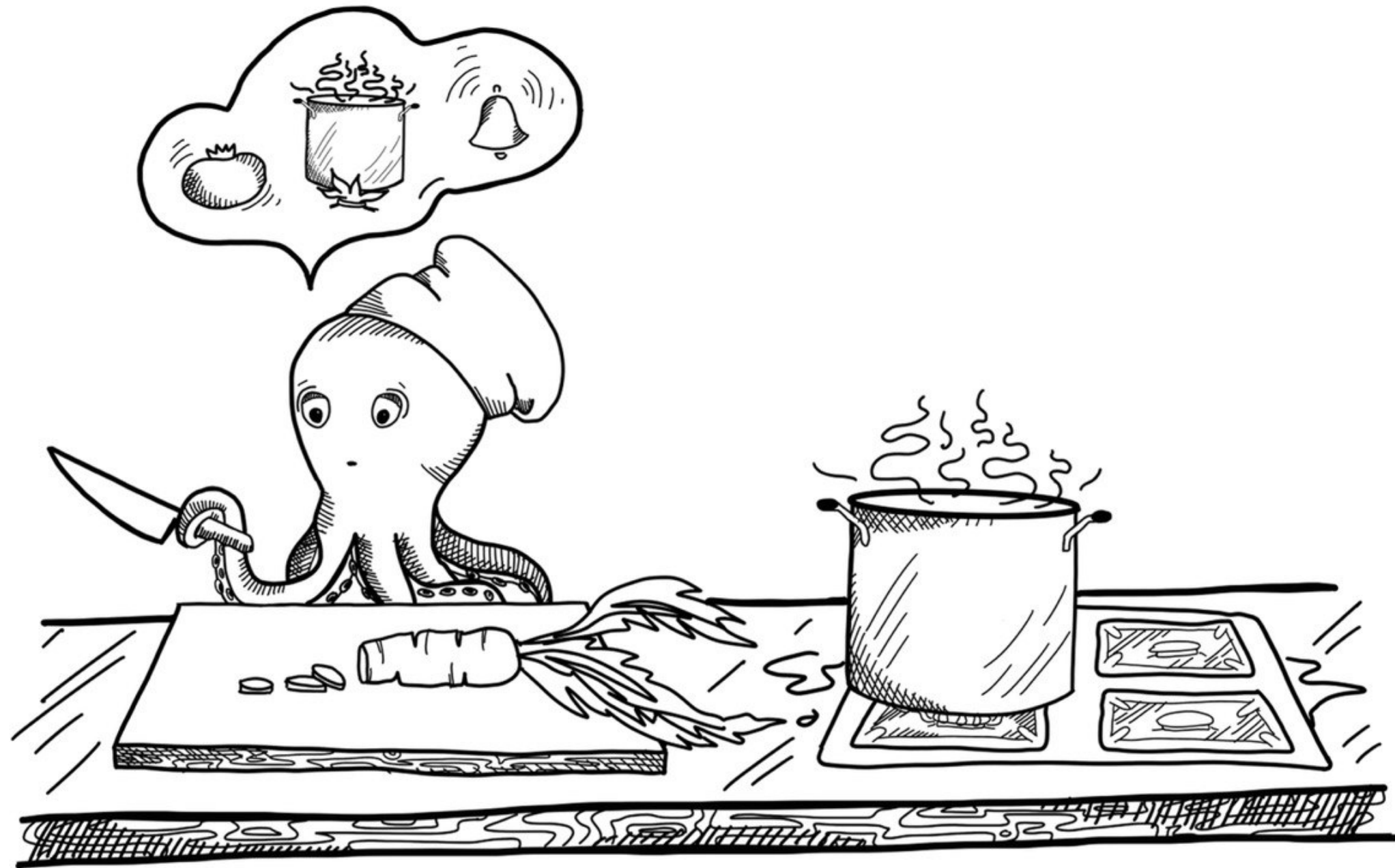


The overall address translation Process

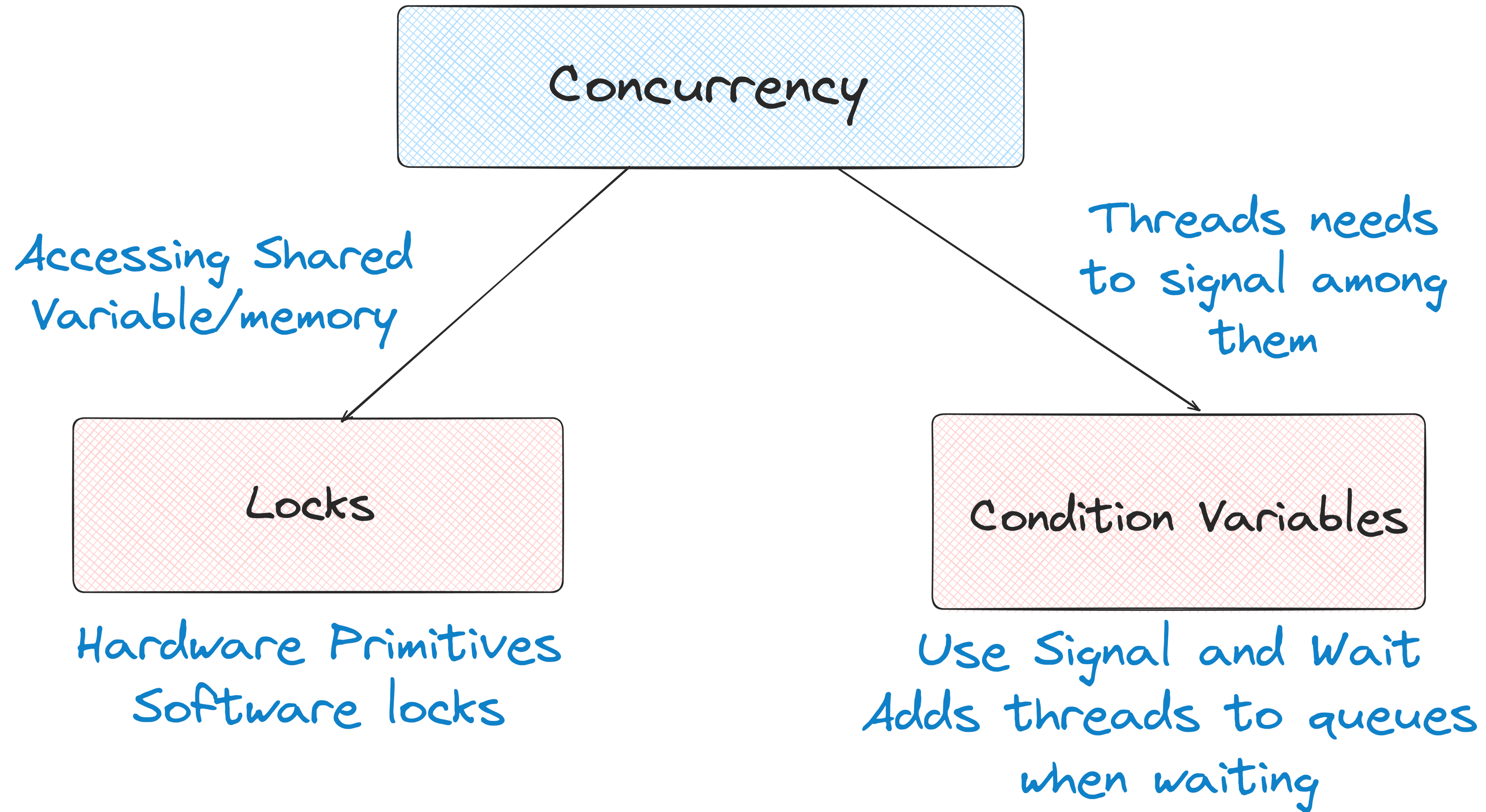


Concurrency and Parallelism

What is what?



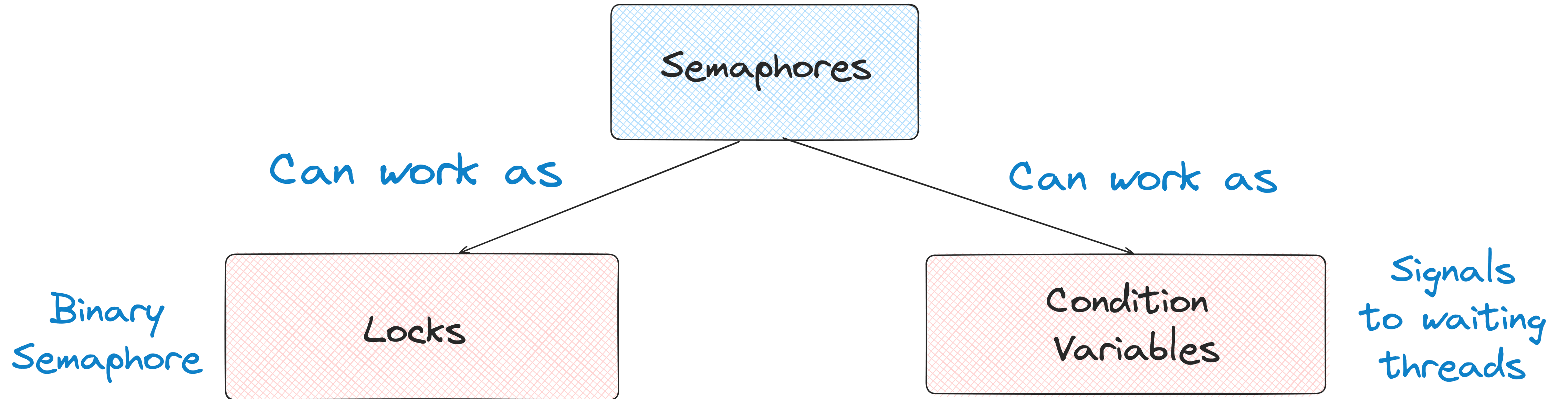
Locks and Condition Variables



Combination of Locks and Condition variables may be required to accomplish different tasks



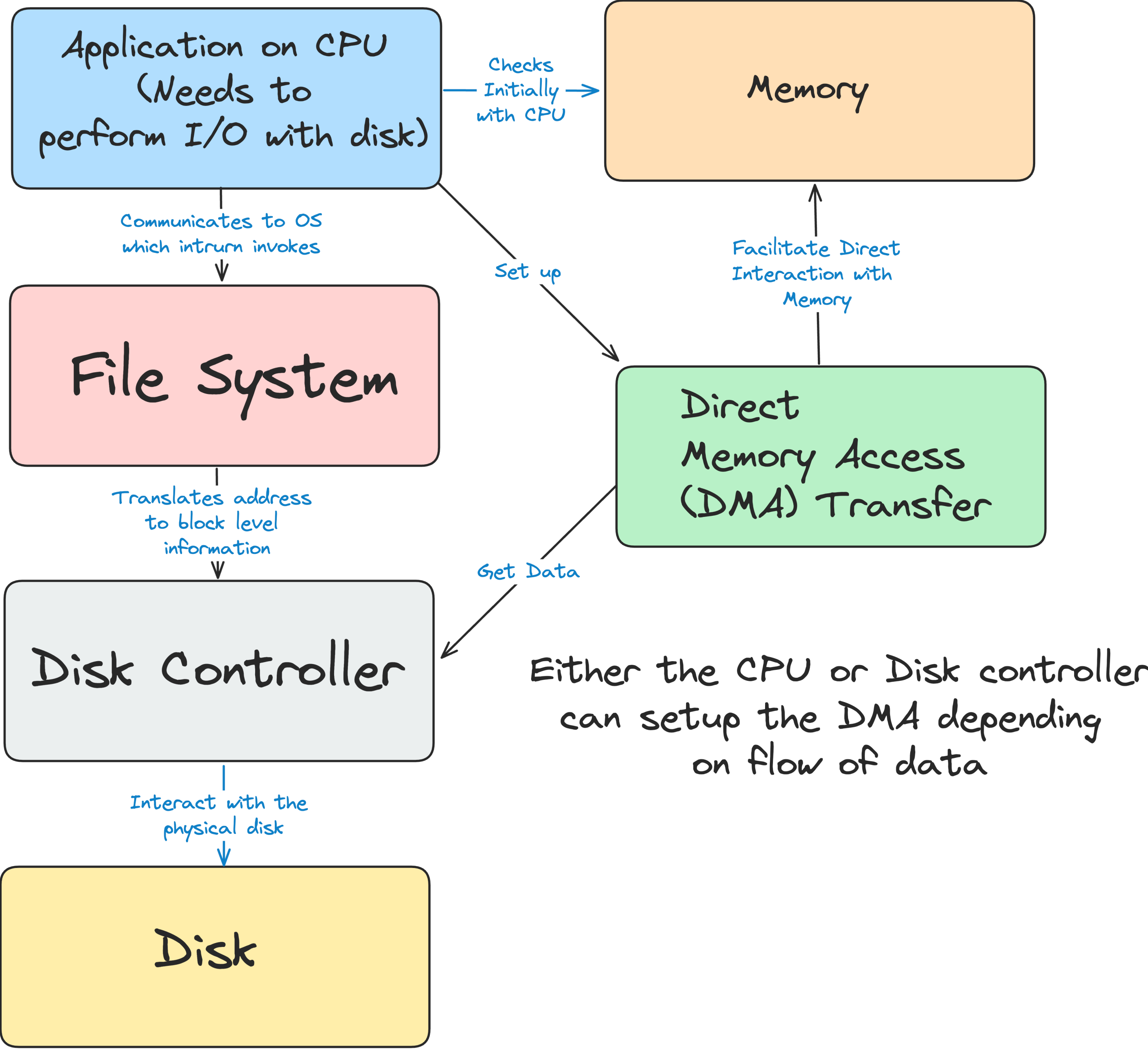
Semaphores



Two key operations: wait () and post()
Initialization of semaphore holds the key

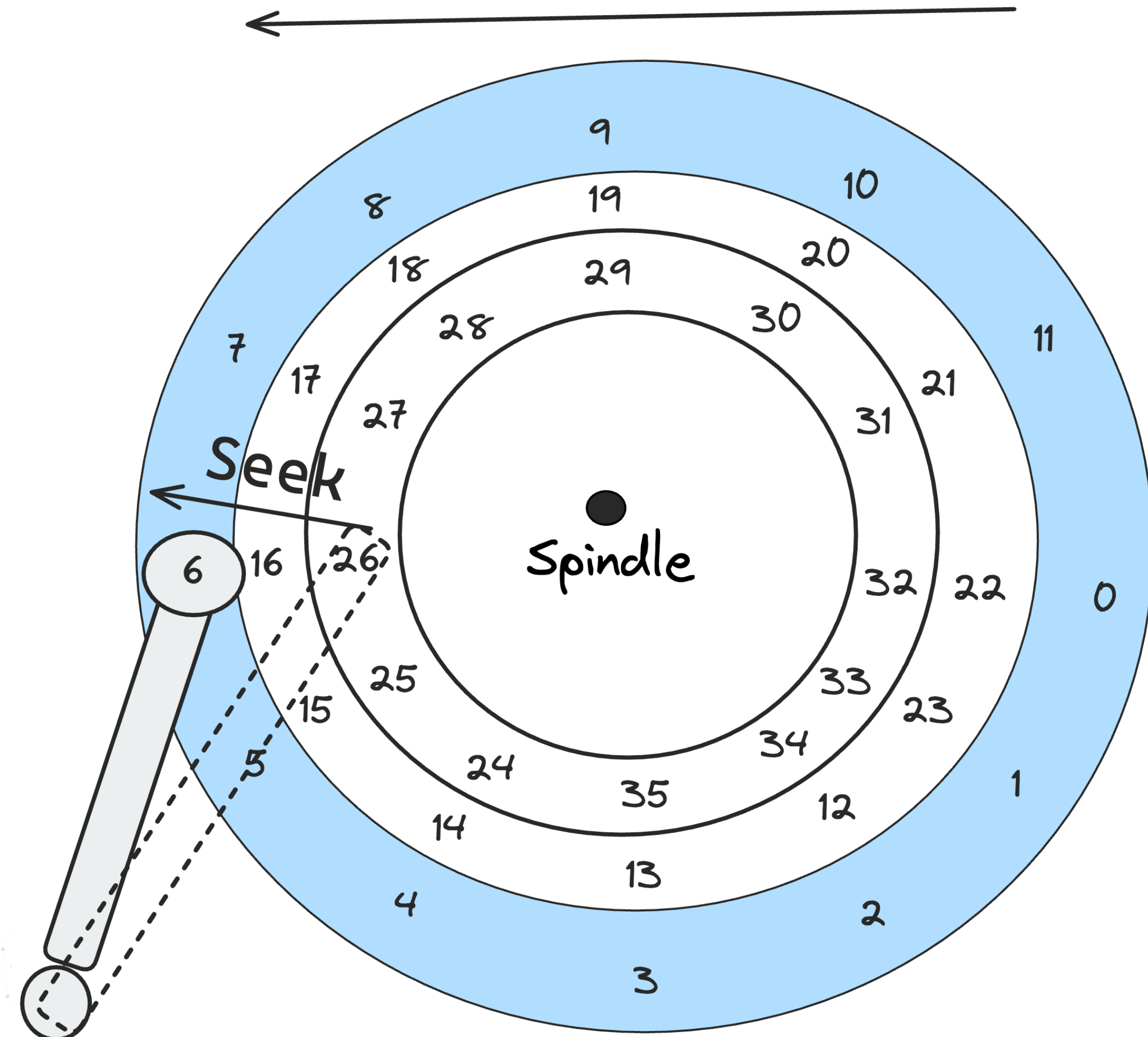


Persistence



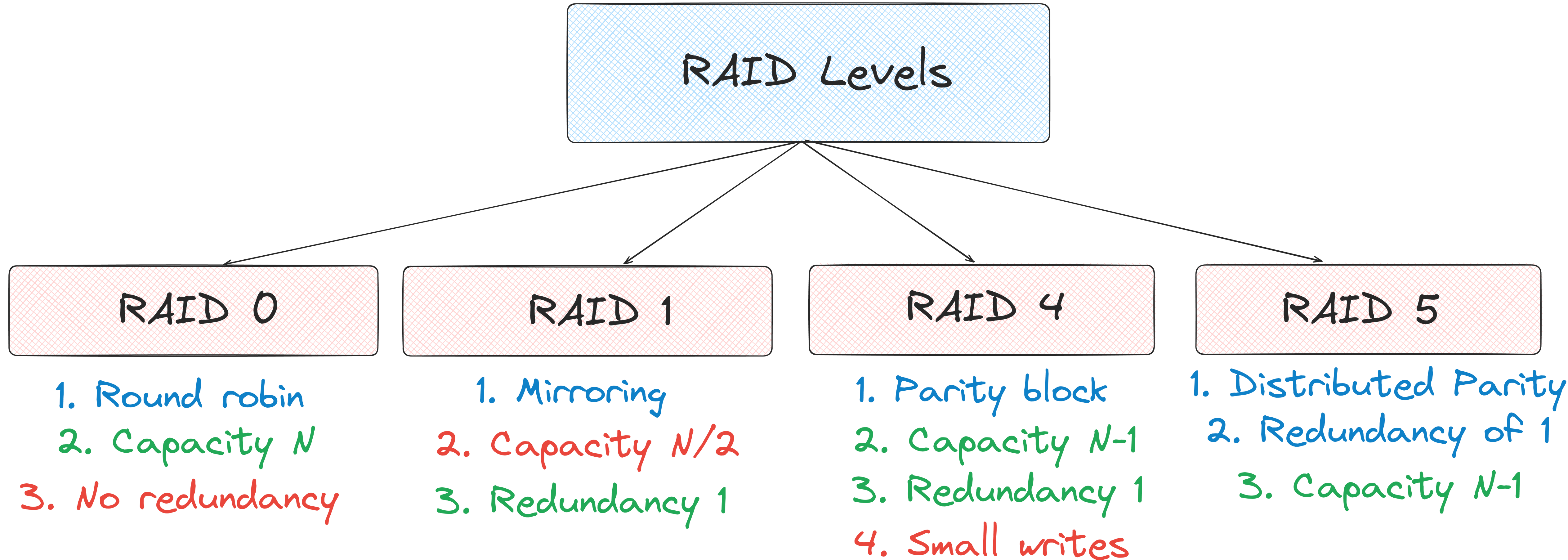
Disks: An Overview

Rotates this way



- Disk rotates on a spindle
 - The arm can move across (seek) or stay as the disk rotates
 - The head is used to read/write
- Data is arranged in tracks as blocks/sectors
- There are 100s of tracks on a single disk
- **Seek, rotate and transfer** - three key phases

RAIDs



Breaking down into two main aspects

- We worked on building a **Very Simple File System (VSFS)**
- In any FS, two key things make the difference

Data Structures

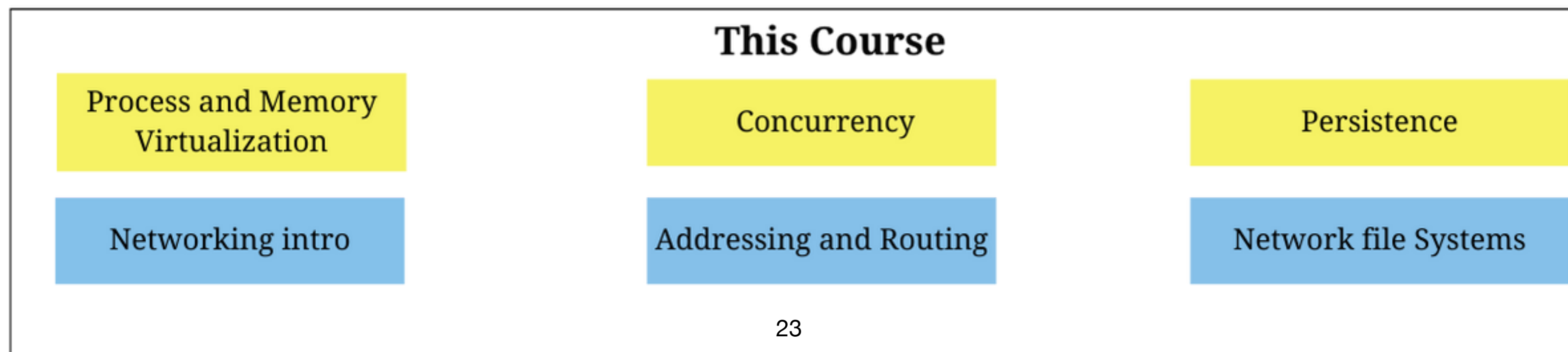
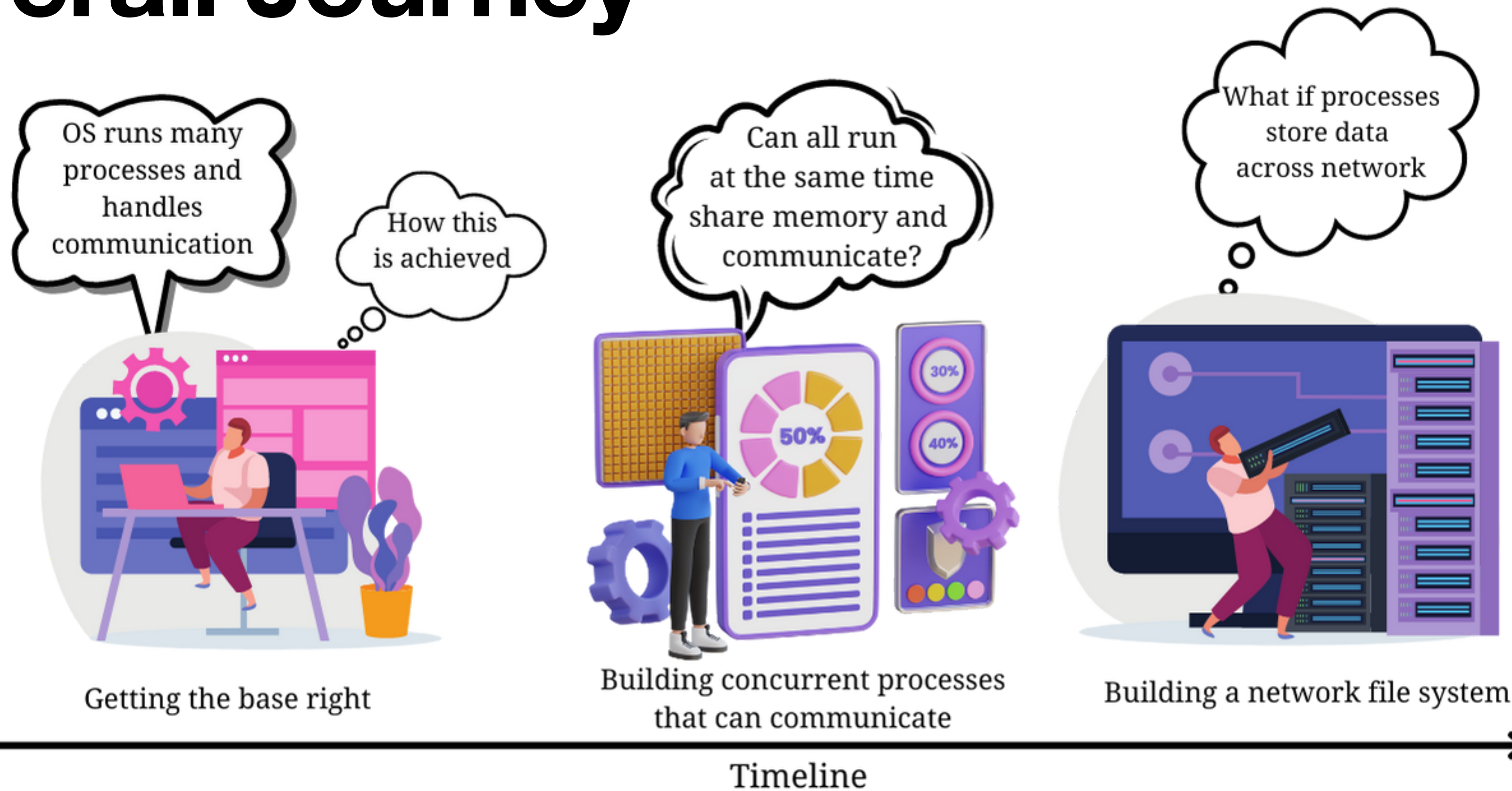
- Inode - Data structure for each file
- Store inodes, data, mapping to inodes, etc in a large array

Access Methods

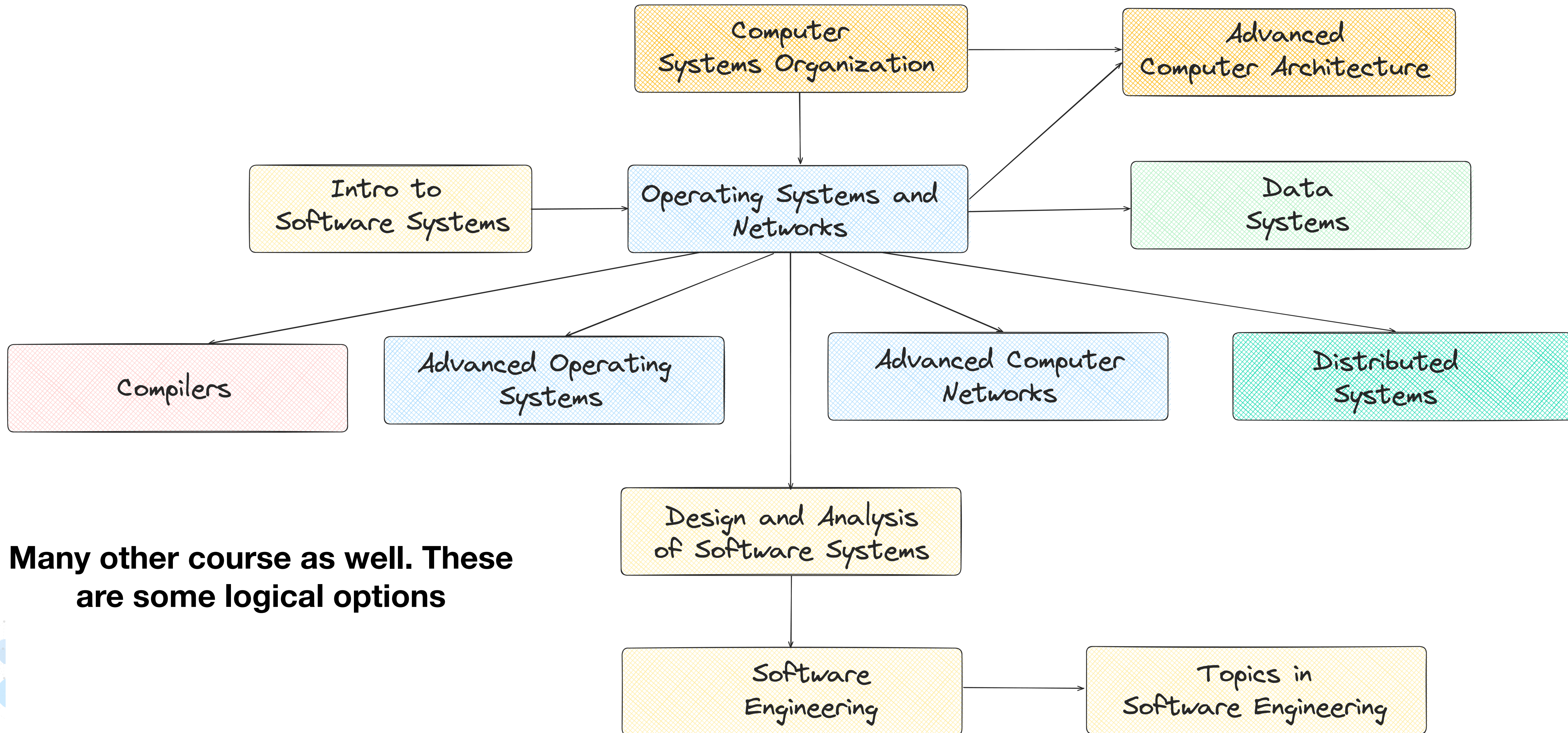
- Start with the root
- Traverse through the path using inode mapping
- Caching can be used to improve efficiency



The overall Journey



What next?



Course Restructuring

- **Fresh perspective** to the OSN course this year
- Adopted **different set of books**:
 - Modified the grading scheme - More weightage to projects
 - Introduced **course project (group)**
 - 3 Mini projects
 - Every project had a network component
 - OS + Networks were kept **more intertwined**
 - Countless hours of brainstorming with former students + TAs
- Feedbacks are always welcome!!



The Team! Many Thanks to all TAs



VJS Pranavasri



Ashna Dua



Divij D



Hitesh Goel



Karthik Vaidhyanathan



Jhalak Akhilesh Banzal



Prince Varshney



Roja Lakshmi Sahoo



Sarthak Bansal



Swayam Agrawal



Vineeth Bhat



Vyom Goyal





Thank you

Course site: karthikv1392.github.io/cs3301_osn

Email: karthik.vaidhyanathan@iiit.ac.in

Twitter: @karthi_ishere

