UCLA

Scratchpad Memory

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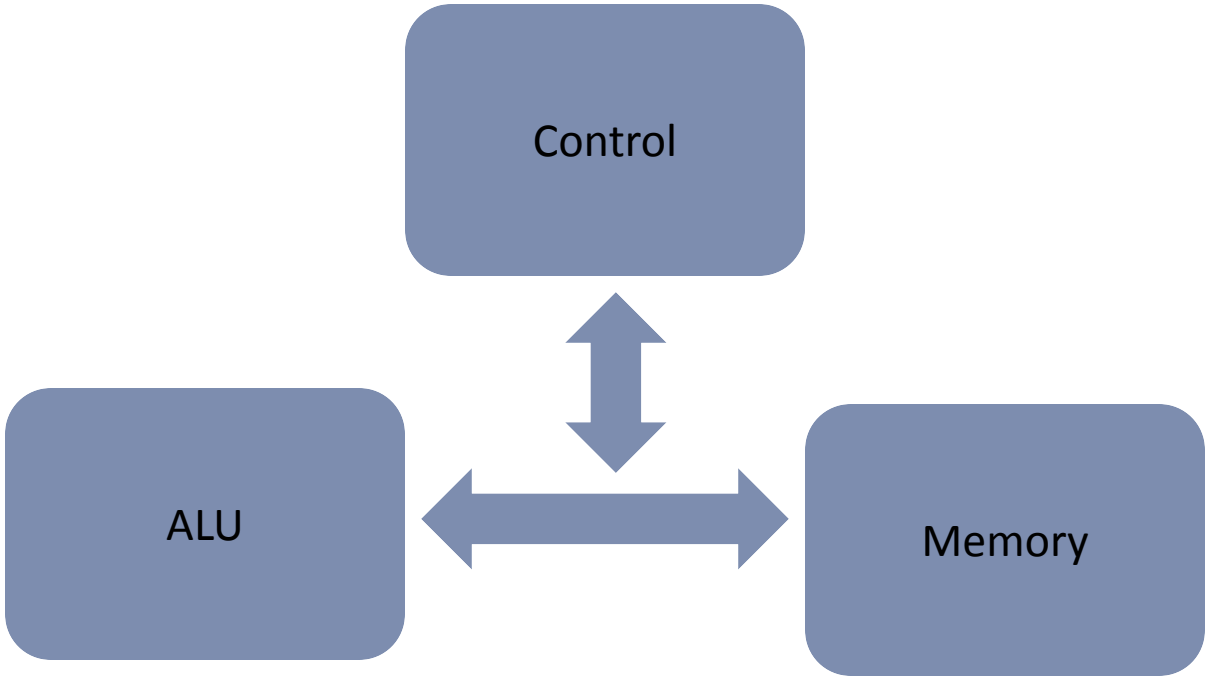
Computer Architecture

- "Key of computer architecture is to get the correct operands"

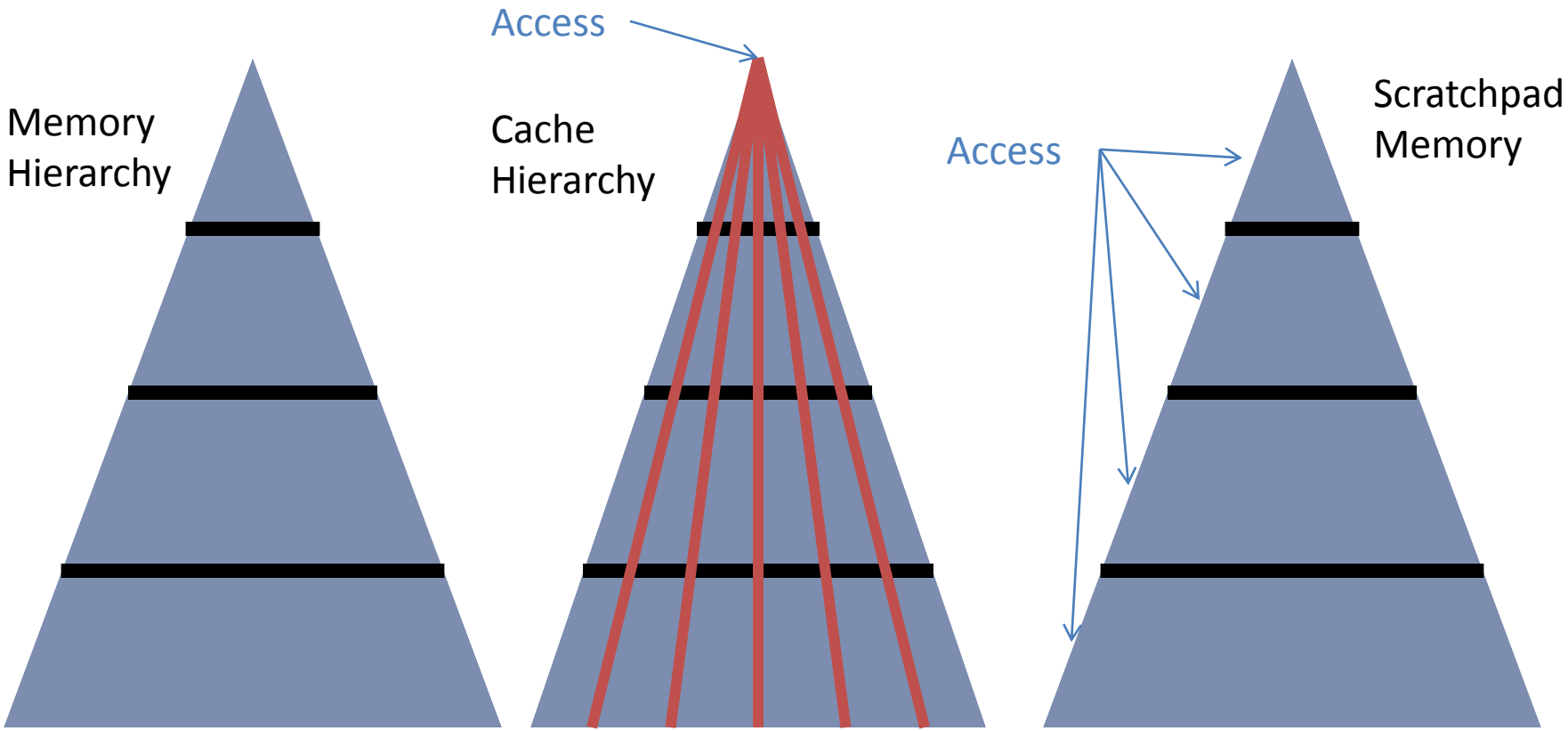


Memory Hierarchy

- Motivation:
  - Memory access time vs. Memory size
  - Memory access pattern
- Use large memory to store more data
- Use small memory for fast access

Memory Hierarchy ≠ Cache

- Cache is one way of realizing memory hierarchy



Scratchpad Memory vs. Cache

Cache	Scratchpad Memory
• Larger	• Smaller
• Store a copy of the next level cache	• Store part of the data that requires fast access
• Mapping (same address)	• Moving (dedicated address)
• Hit/Miss	• Only Hit
• Unpredictable access time	• Controlled by software or compiler
• Runtime control	

Scratched Memory Control

- Content Control
  - By special instructions
- Data Transfer
  - Direct Memory Access (DMA)
- Data Assignment
  - Identify “critical” data
  - With known access pattern
- Hybrid System

Scratchpad Memory Example

```
for i=1:1024
    for j=1:1024
        level=intensity[i][j];
        hist[level]=hist[level]+1;
    end
end
```

Regular Access

Irregular Access