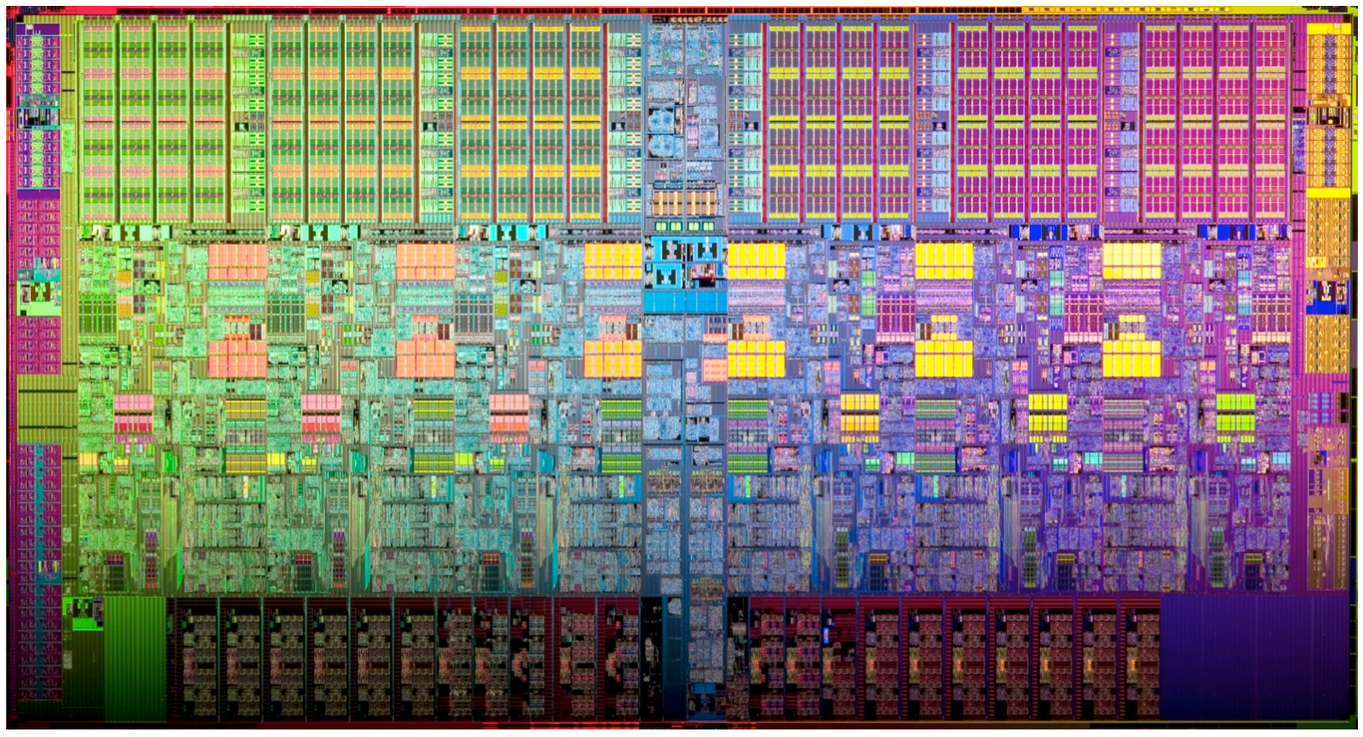
Storage Hierarchy

Andrew S. Fitz Gibbon

Shodor Education Foundation
National Computational Science Institute



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Outline

- What do we mean, "Storage Hierarchy?"
- Registers
- Cache
- RAM
- Disk and everything else

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The Analogy

- Imagine sitting on your couch, eating potato chips...

Where are my chips?

- Now: In your hand, about to be eaten
- Soon: In the bag, on the table
- Later: From the kitchen pantry
- Much later: On the shelves, in the store
- Much much later: Shipped from the warehouse
- Even later: Order from the factory, grown at the farm

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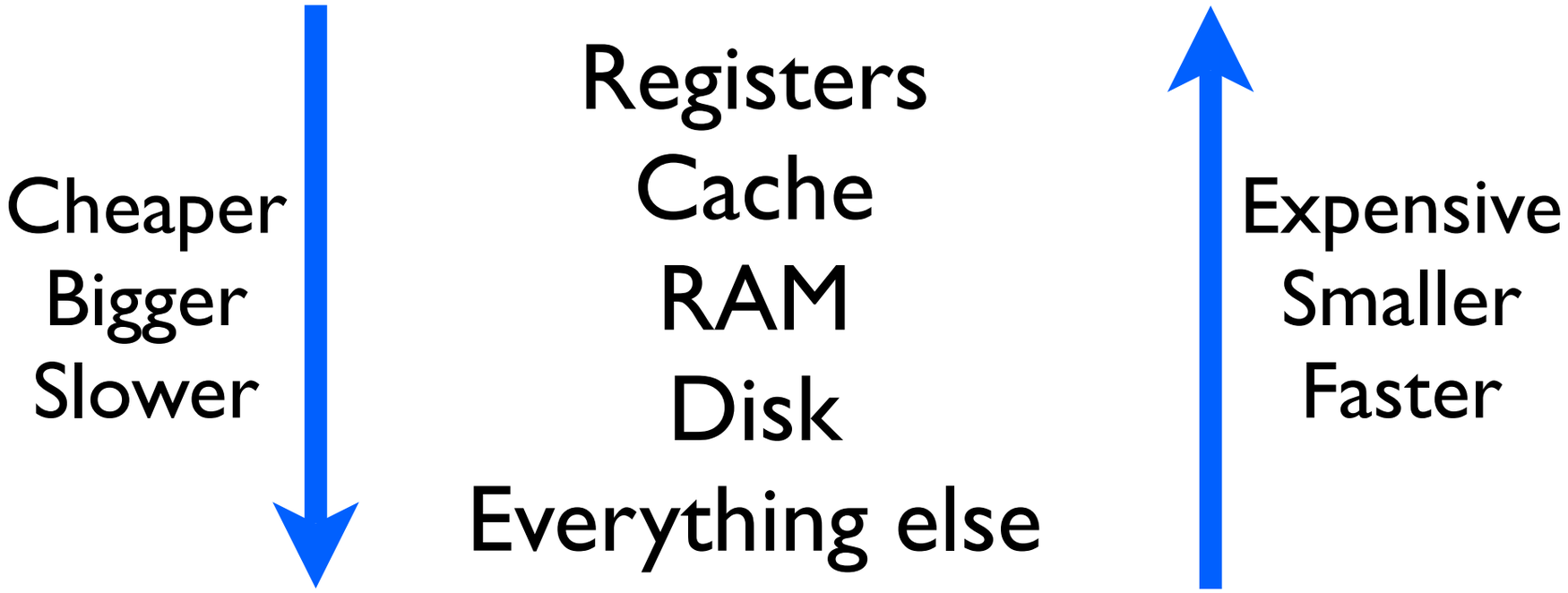
Storage Hierarchy

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Registers

- Data about to be used *right now*
- Really close to the CPU
- Operands for an operation in register
- Result of an operation stored in register
- Really fast, small, expensive

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Cache

- Data that are likely to be used soon
- On the CPU, so it's very fast.
- Multiple "levels," each slower but bigger than the last (and cheaper)
  - Remember: Faster = More expensive = smaller


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RAM

- Data that are being using by program *currently running*
  - This means that data is both in RAM and in Cache (all levels!)
- Much bigger than cache, Much less expensive
- Quick, but still much slower than cache

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Why Cache?

- With the size/speed/cost of RAM, why would we need cache?
- Moving data from RAM to CPU takes hundreds of clock cycles
- Moving data from Cache to CPU takes only 10s or dozens of clock cycles


Disk

- Hard Disks, mechanical storage
- Longer-term storage
- Programs and data that aren't being used right now and likely won't be used soon
- Huge, slow, very cheap

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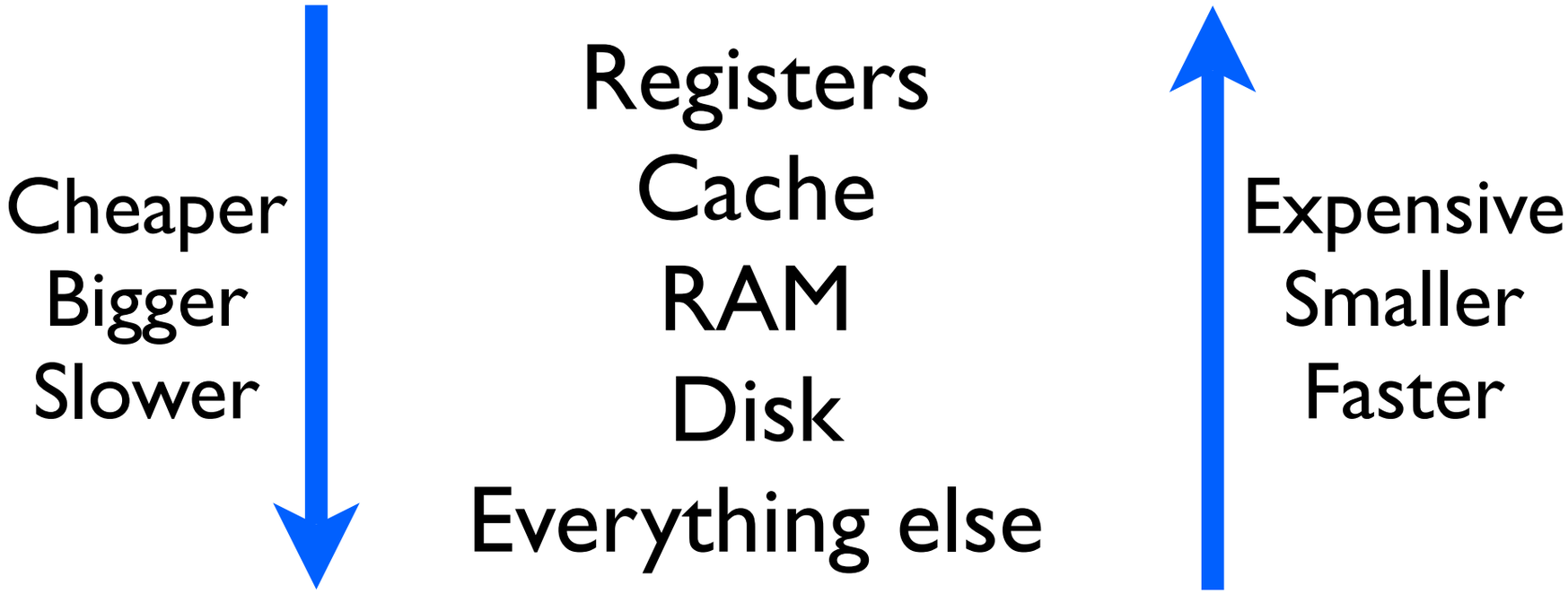
Overview



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Questions?

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