Deterministic Multiprocessing System

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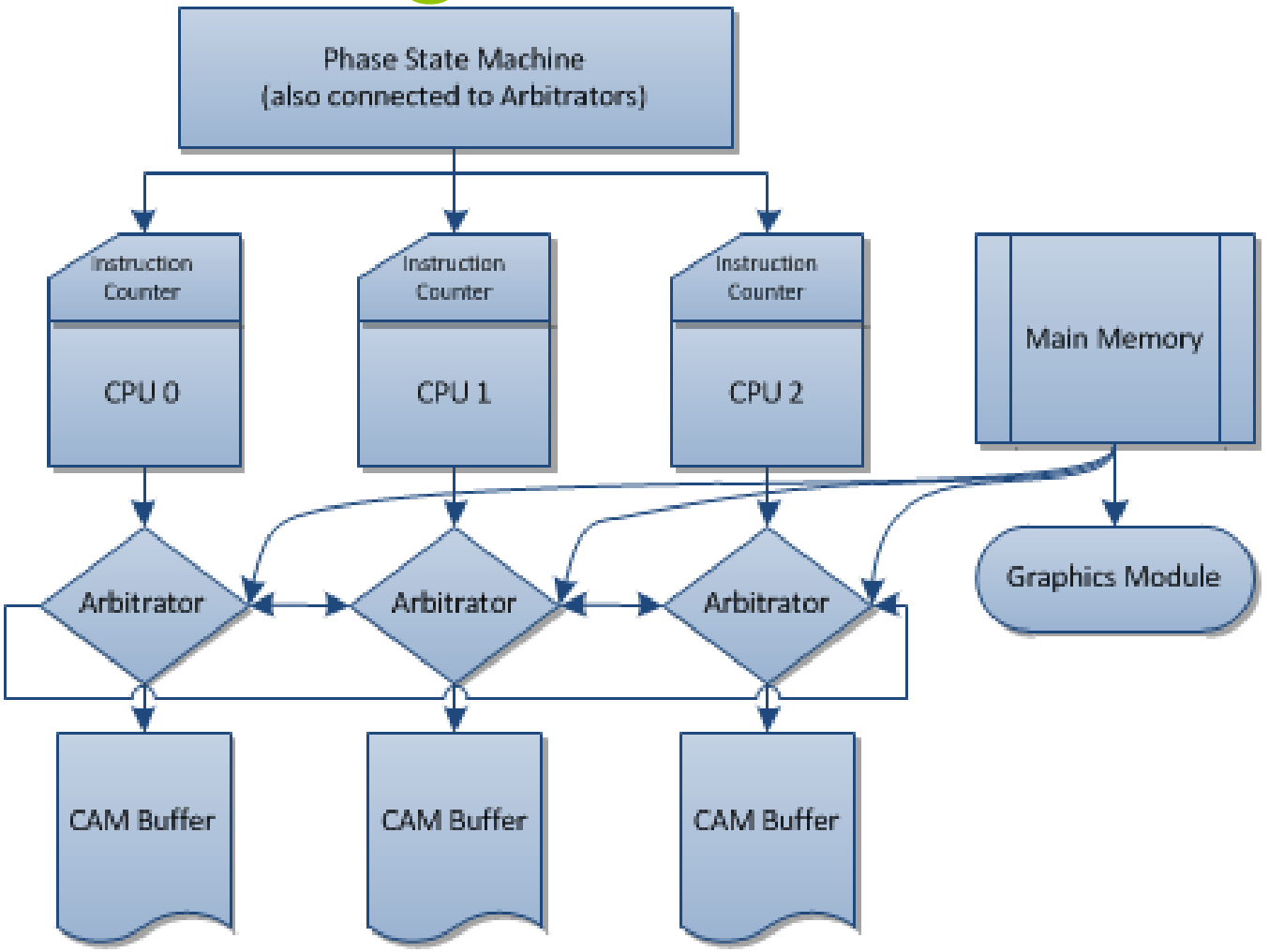
Overview

- Multiprocessing is usually nondeterministic
- Nondeterminism can be removed
- Sequential Ordering
- Weak Ordering
- Build a deterministic cache for a system
  - Storage Buffers

Block Diagram



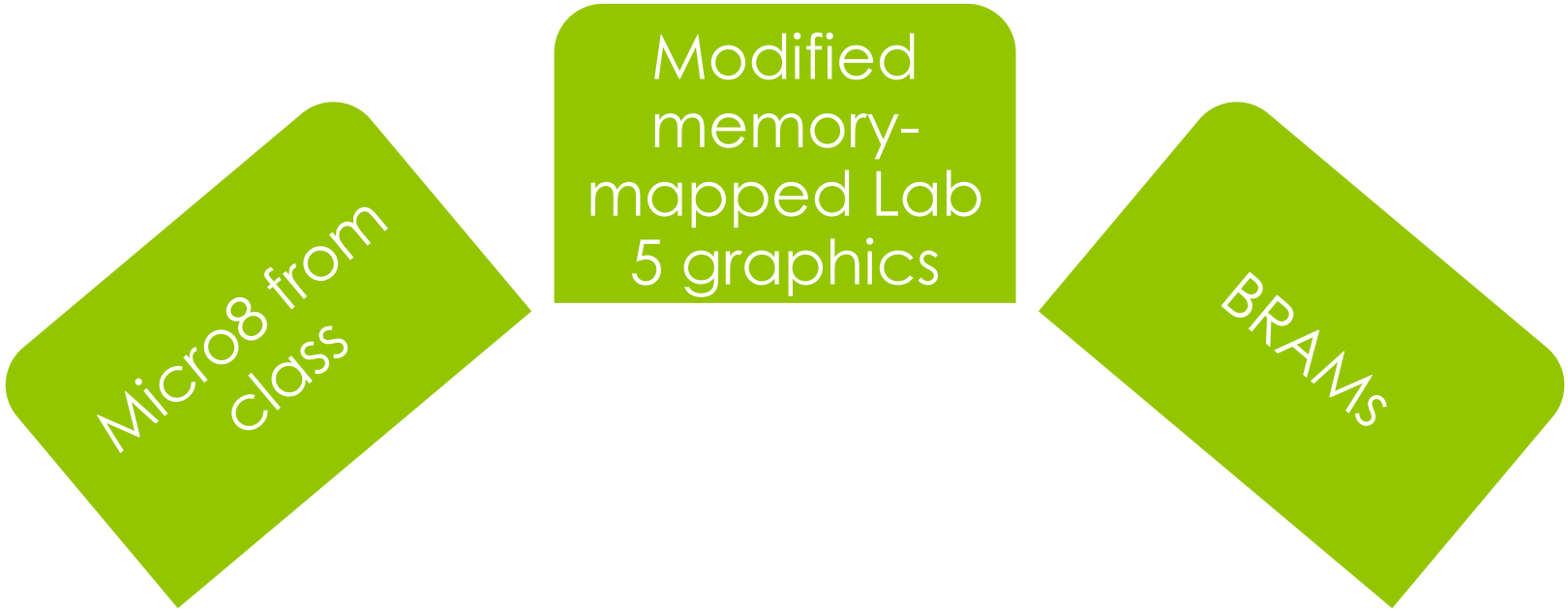
Storage Buffer

- Content Addressable Memory
- One read/write port
- One add/remove port

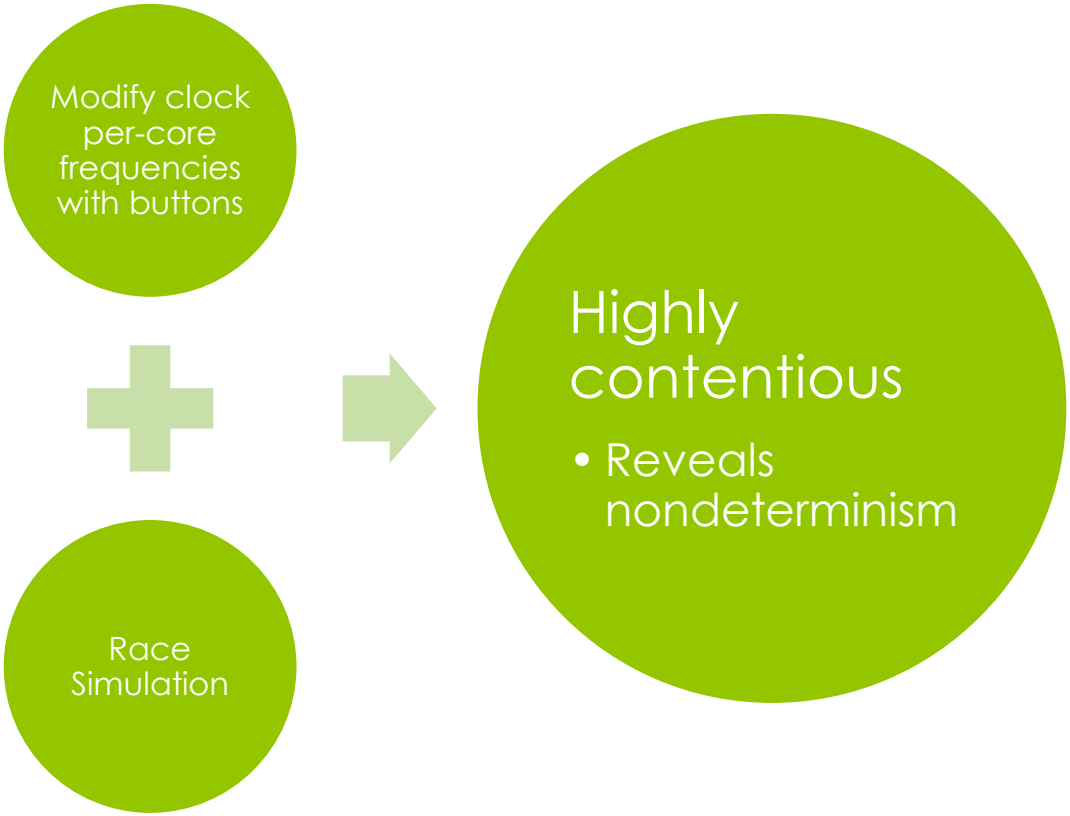
Arbitrator

- Commits memory during deterministic commit
- Fetches new data into storage buffer
- Controls CPU

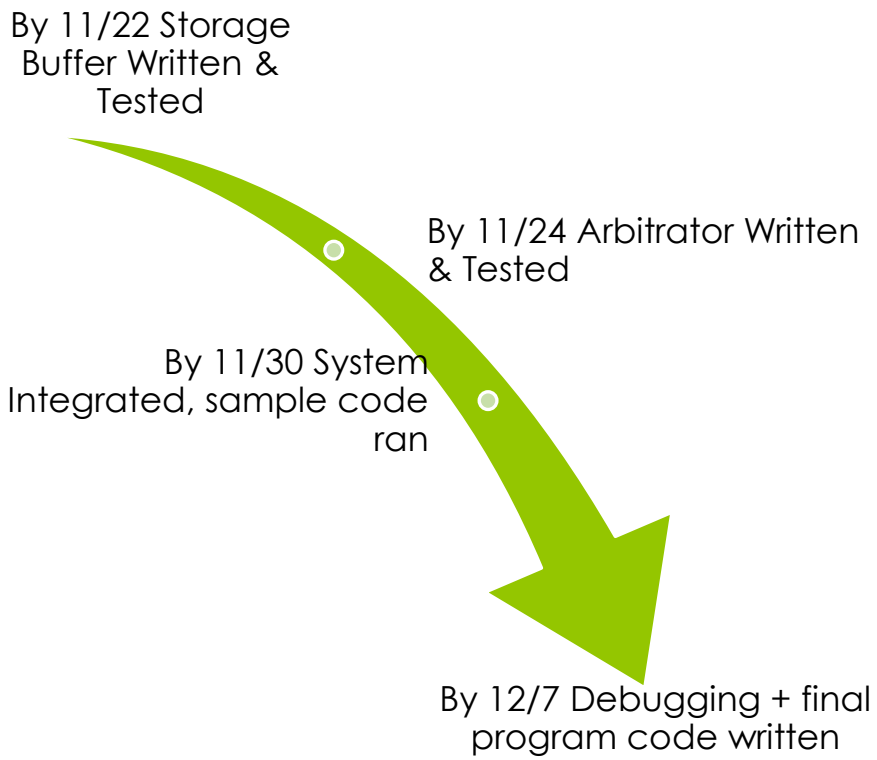
CPU, Memory, Graphics



Demo


Modify clock per-core frequencies with buttons
Race Simulation
Highly contentious
• Reveals nondeterminism

Timeline


By 11/22 Storage Buffer Written & Tested
By 11/24 Arbitrator Written & Tested
By 11/30 System Integrated, sample code ran
By 12/7 Debugging + final program code written