Exploring Parallel Computing with OpenMP on the Raspberry Pi

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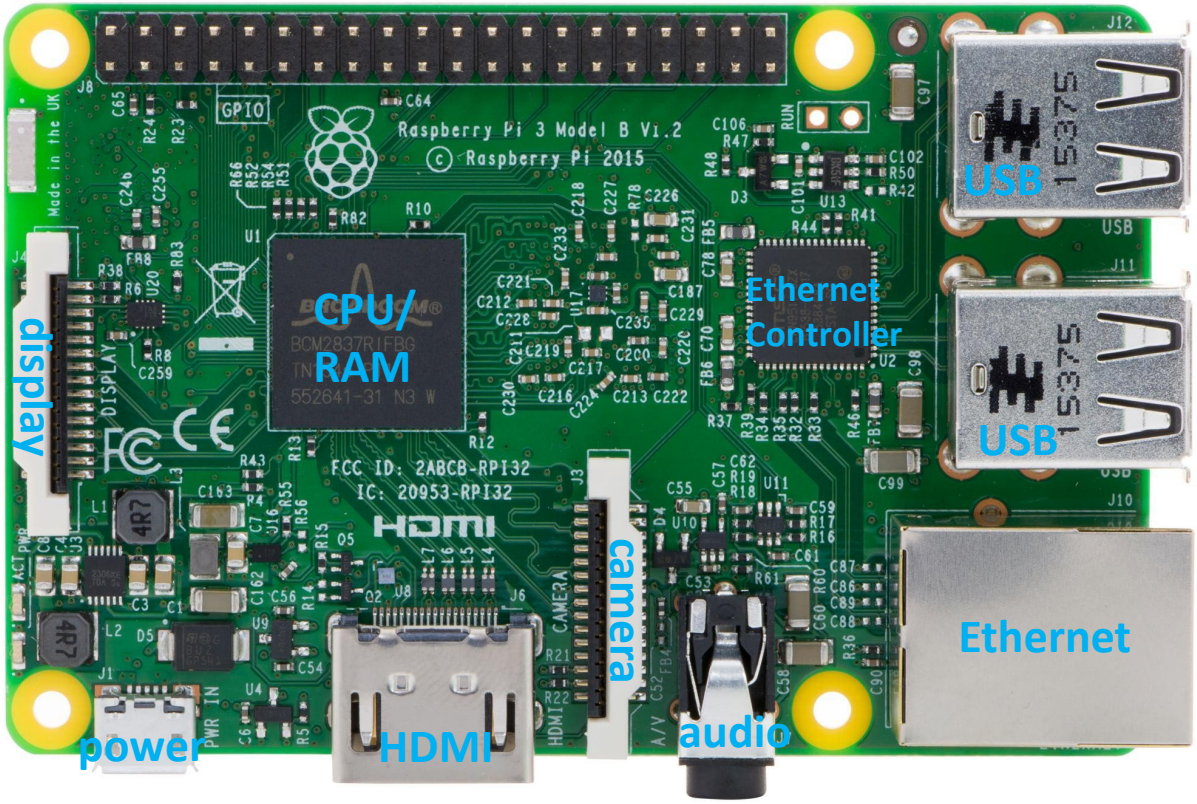
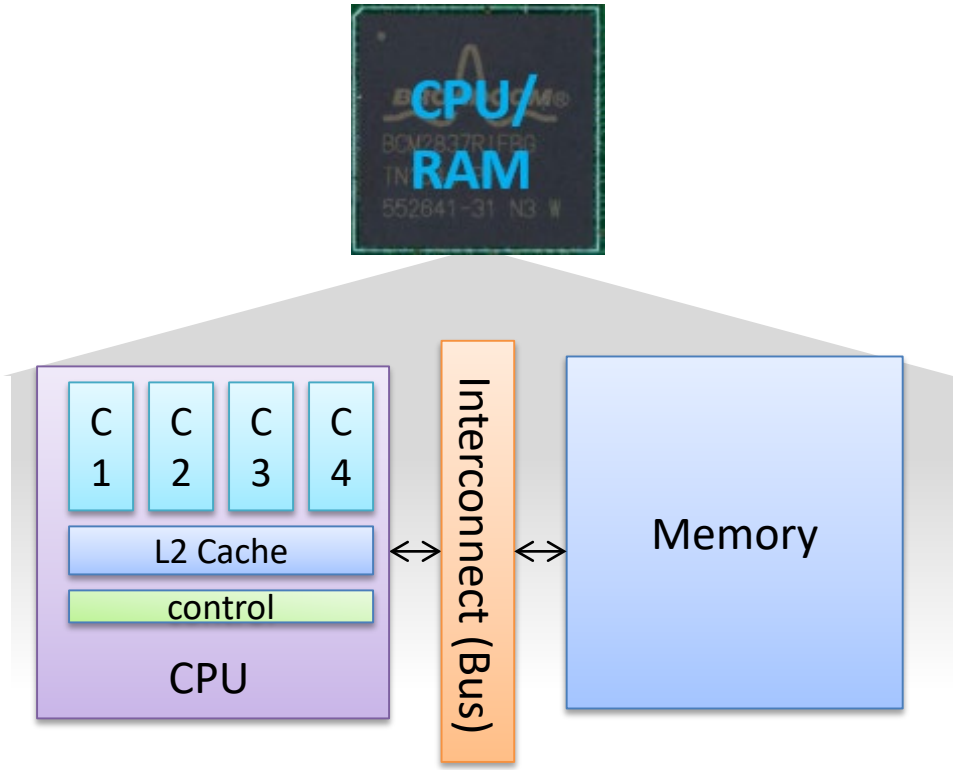
A Closer Look at the Raspberry Pi

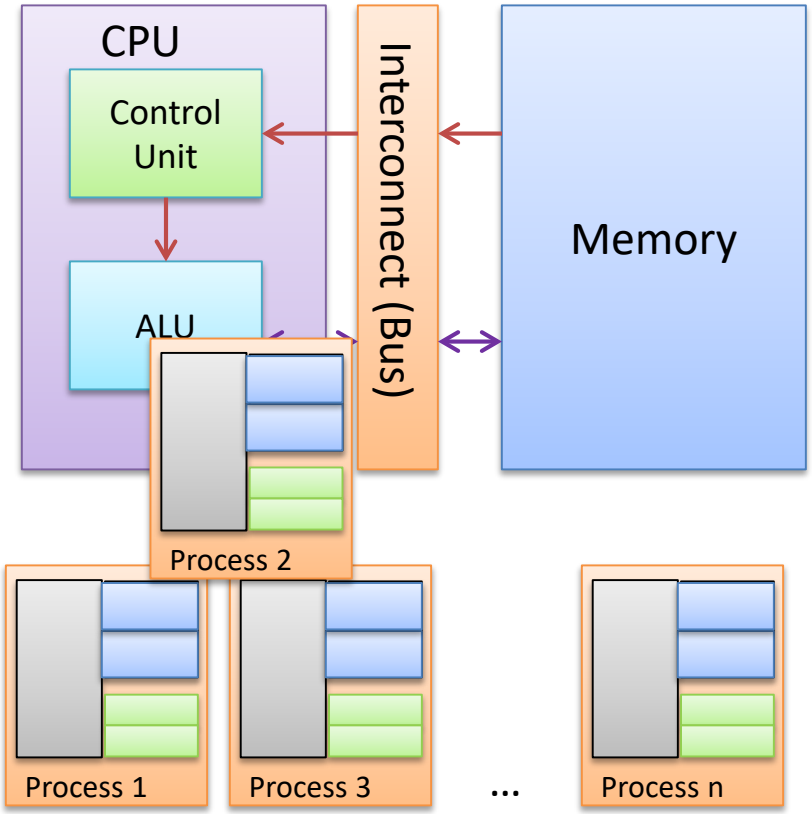


Single Board Computer
Quad-Core Multicore CPU
1 GB RAM
$35.00

What is a Multicore CPU?

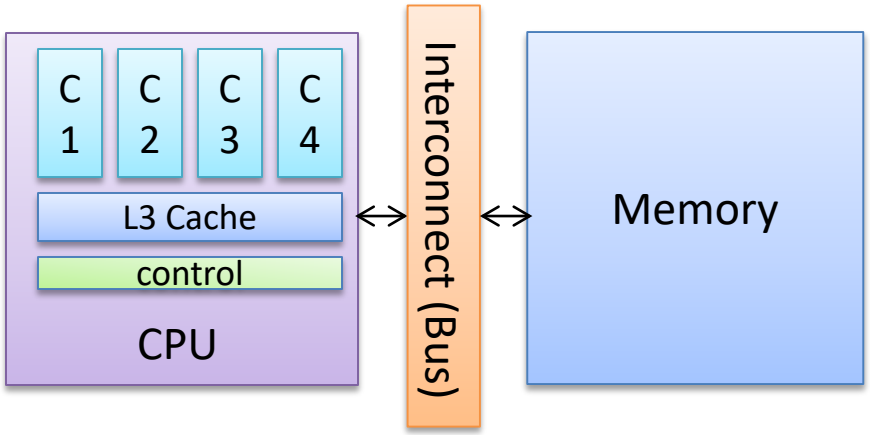


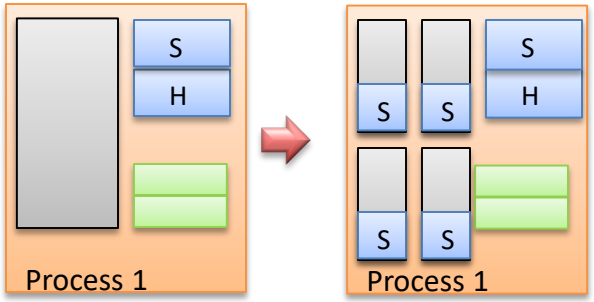
Advantage of Multicore



- A process is the abstraction of a running program.
  - Processes do not share memory with each other.
- A single-core CPU only operates on one process at a time.
  - Round-Robin Scheduling Algorithm
- More CPU cores = OS can execute more processes at once! (Concurrency)
  - Increases throughput of system.
  - Does this shorten the amount of time it takes to execute a single process?

Programming Multicore Architectures

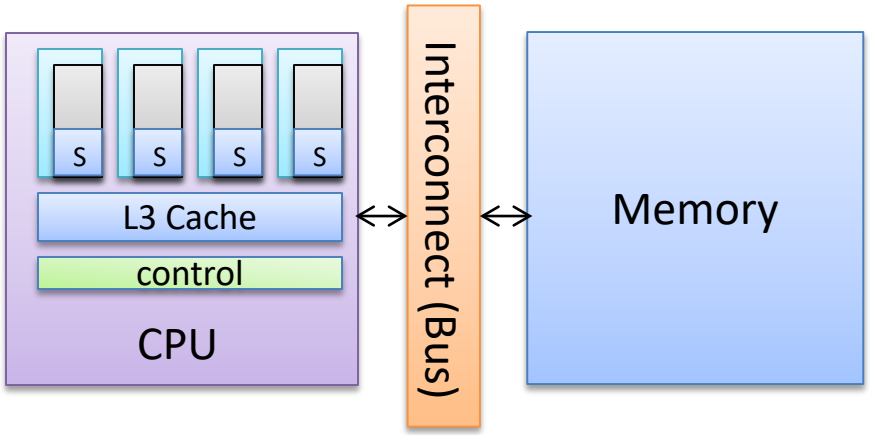


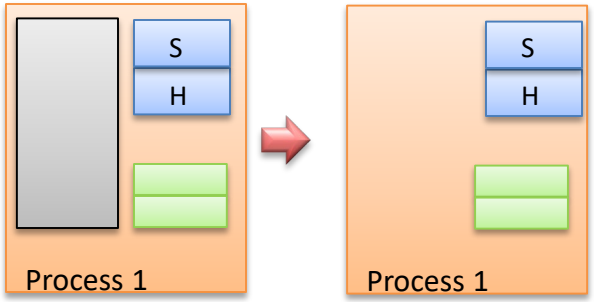


Multithreaded process

- Thread: a lightweight process that allows a single executable/process to be decomposed to smaller, independent parts.
  - All threads share the common memory of the process they belong to.
- An OS will schedule threads on separate cores/CPUs, as available.

Programming Multicore Architectures





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Programming Multicore Architectures

There are many libraries/languages available:

- POSIX Threads
- OpenMP
- C++11 threads, TBB, …

In today's workshop, we will cover OpenMP

- Industry standard since late 1990s.
- Native support with GCC compilers (> 4.3.x)
- Easier to program than POSIX threads.