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?

- Interconnect (Bus)
- Memory
- L2 Cache
- Control
- CPU

C1 C2 C3 C4

Interconnect (Bus)
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

- **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.

Multithreaded process
Programming Multicore Architectures

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Multithreaded process
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.