

COL788: Advanced Topics in Embedded Computing

Lecture 3 – System Architecture (Cont.)



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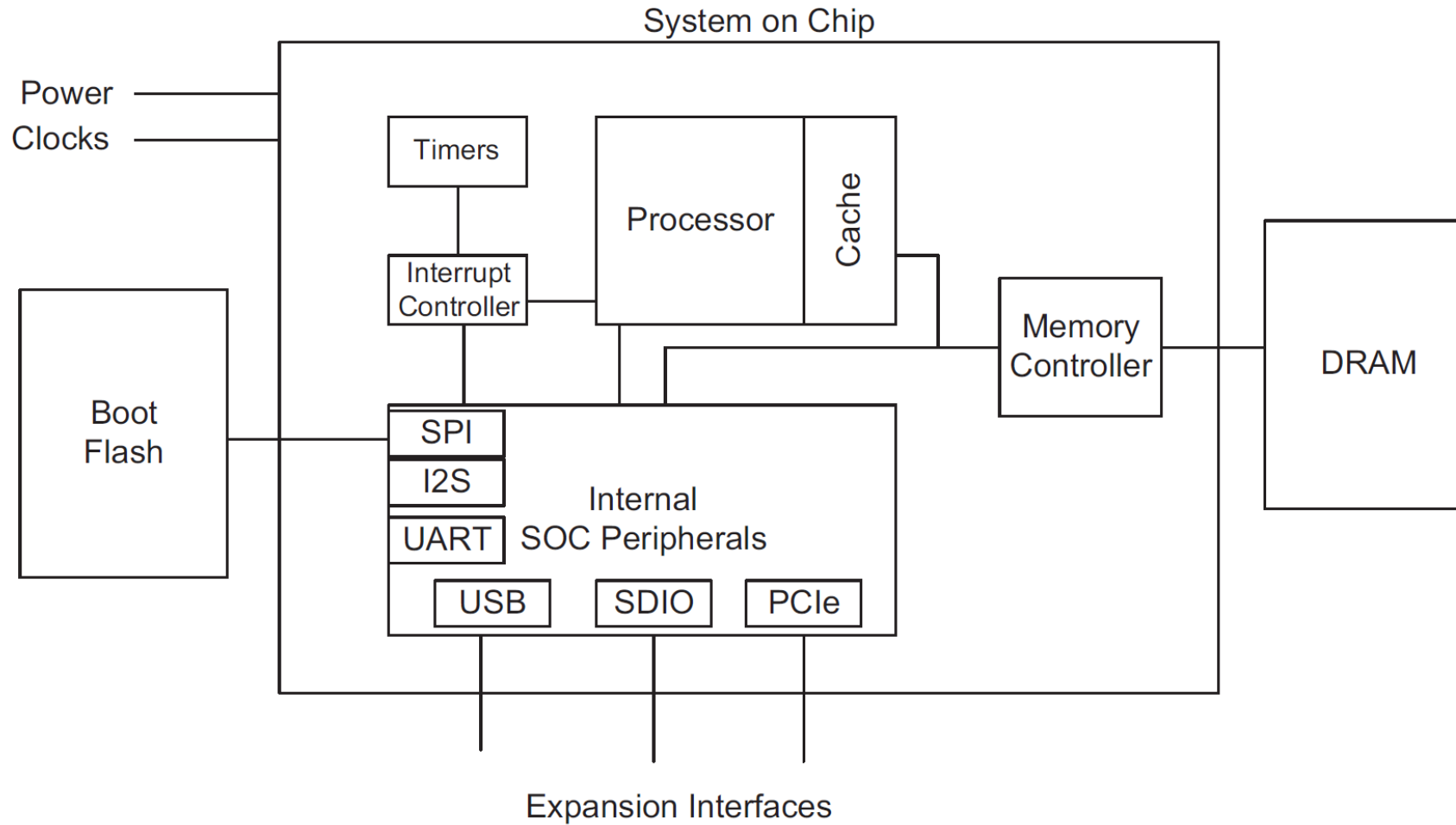
August 10, 2022

Semester I
2022-2023

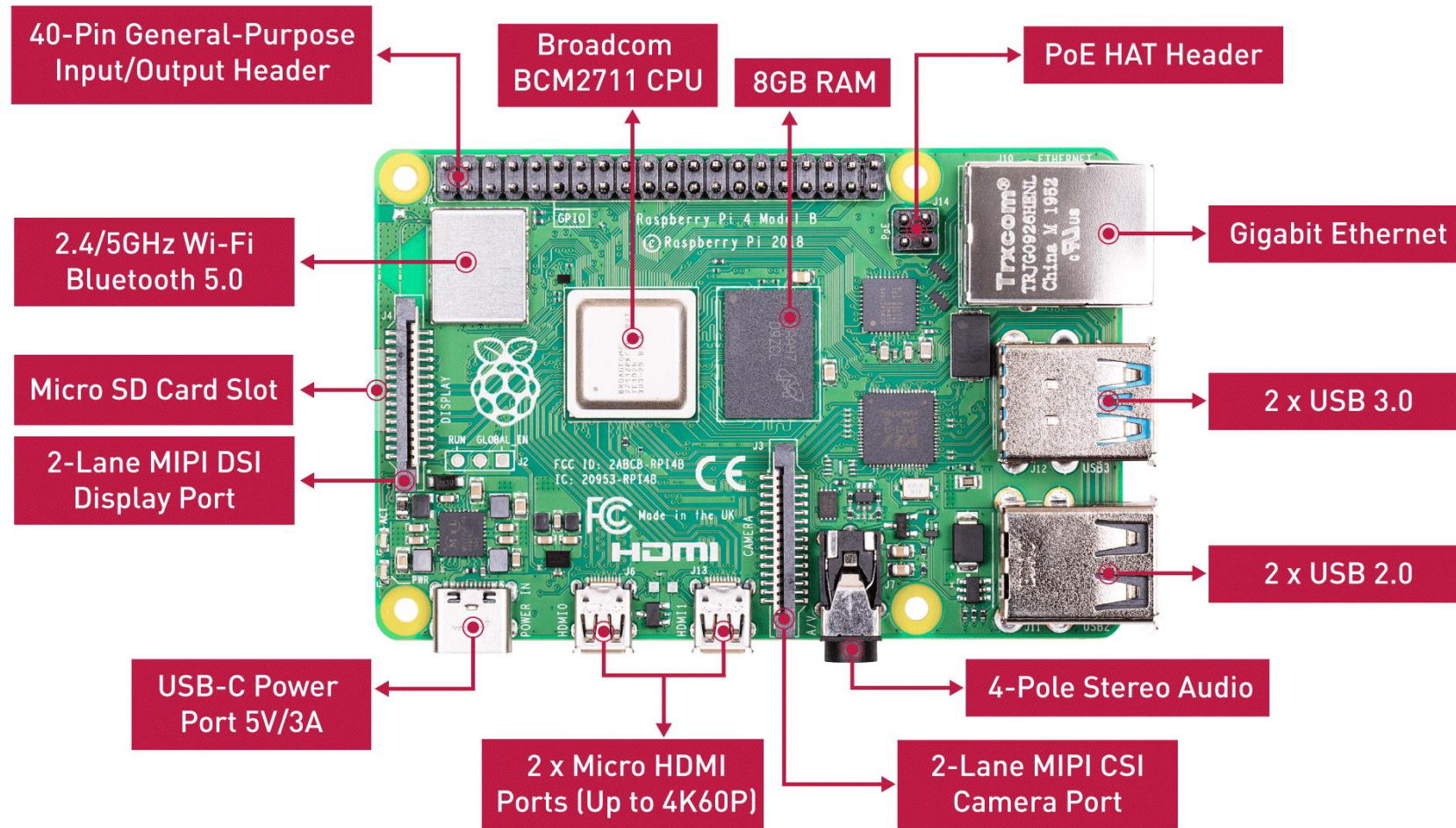
Agenda

- System Architecture

System on Chip (SoC)



Raspberry Pi 4B



Processor: Instruction Set

- Complex Instruction Set Computing (CISC)
 - e.g., Intel
 - Single instruction used for loading, evaluating and storing operations
 - Minimizes the number of instructions per program
 - Increases the number of cycles per instruction
- Reduced Instruction Set Computing (RISC)
 - e.g., ARM
 - Basic instructions for loading, evaluating and storing operations
 - Increases the number of instructions per program
 - Reduces the number of cycles per instruction

Processor: Scalar vs. Superscalar

- Scalar
 - Simple implementation
 - Slow
- Superscalar
 - Supports the parallel execution of instructions
 - Multiple copies of functional units, e.g., two arithmetic logic units
 - More than one instruction per clock cycle

Memory

- List of physical addresses of all the resources on the platform
 - DRAM
 - Interrupt controllers
 - I/O devices
- Usage
 - Processor generates a read or write request
 - Address is decoded by the system memory address decoders
 - Routed to the appropriate physical device to complete the transaction
- Address range
 - Main Memory Address Range: DRAM address accessed by CPU
 - Memory Mapped I/O (MMIO) Range: those decoded to select I/O devices

Memory Mapped I/O Address Range

- Fixed Address Memory Mapped Address
 - BIOS
 - timers
 - interrupt controllers
- Peripheral Component Interconnect Bus

What's Next?

- Next Lecture (August 17, Wednesday, 11 am – 12 pm)
 - Lecture 4