Booting

COSC-361

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Booting

- Booting is the process of getting the machine into the OS' state.
  - Cold boot - from power off to power on
  - Warm boot - from power on to power on
    - (AKA) Soft reset or just reset

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PCs

- Power is applied to the motherboard
  - Motherboard provides power to CPU and all components.
  - CPU executes the BIOS or UEFI (newer)
  - BIOS transfers control to the bootloader
  - Bootloader loads the operating system

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SoCs and Microcontrollers

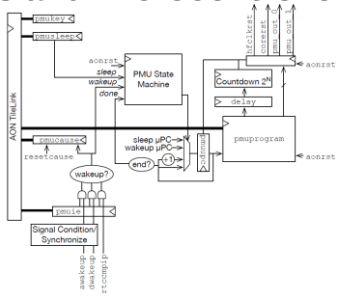

Figure 13.1: FE310-G000 Power-Management Unit.

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Getting To The OS

1. Pick a "boot" CPU. Put the rest into a waiting loop.
2. Copy data from storage to memory (RAM)
3. Set the trap vector for system calls and faults.
4. Jump to high-level code (C, C++, Rust, etc).

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Example RISC-V Boot Code

```
//start.S
//Entry point for advos
//Stephen Marz
//24 November 2018

//RVC must be turned off. The compressed instructions
//wont allow us to boot
.option norvc
.section .text.init
.global _start
_start:
        //Only allow hartid 0 to work
        csrr    a0, mhartid
        bnez    a0, 2f

        //Zero out the BSS
        la      t0, _bss_start
        la      t1, _bss_end
1:
        //t0 is the address of the BSS section
        bge     t0, t1, 1f
        sw      zero, (t0)
        addi    t0, t0, 4
        j       1b
1:
        //Set the stack and explicitly go into machine mode (mode: 3)
        la      sp, _memory_end
        tail    main

2:
        wfi
        j       2b
        .type _start, function
        .size _start, .-_start
```


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High Level Code

1. Initialize devices
2. Set-up graphics / screen
3. Enable interrupts
4. OS loop

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