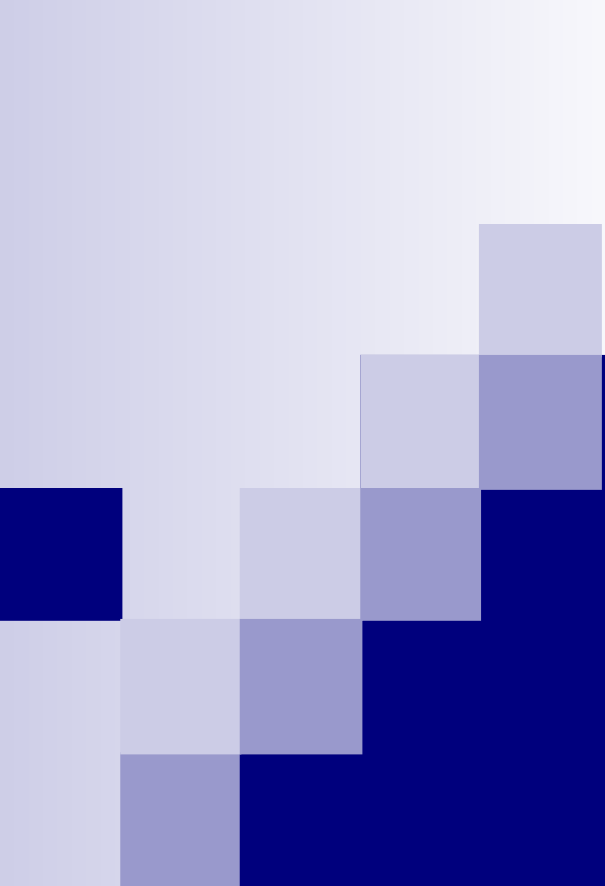




Administrative Overview

- 6 Projects
- Design Review: Monday before 6:30pm
- Lab Friend Center 010 (“Fishbowl”)



COS 318 Project 1

Bootloader

Problem

- We will write an Operating System
 - Manages programs, resources, users, etc.
- How are programs loaded?
 - The OS takes care of this
- How is the OS loaded?

...

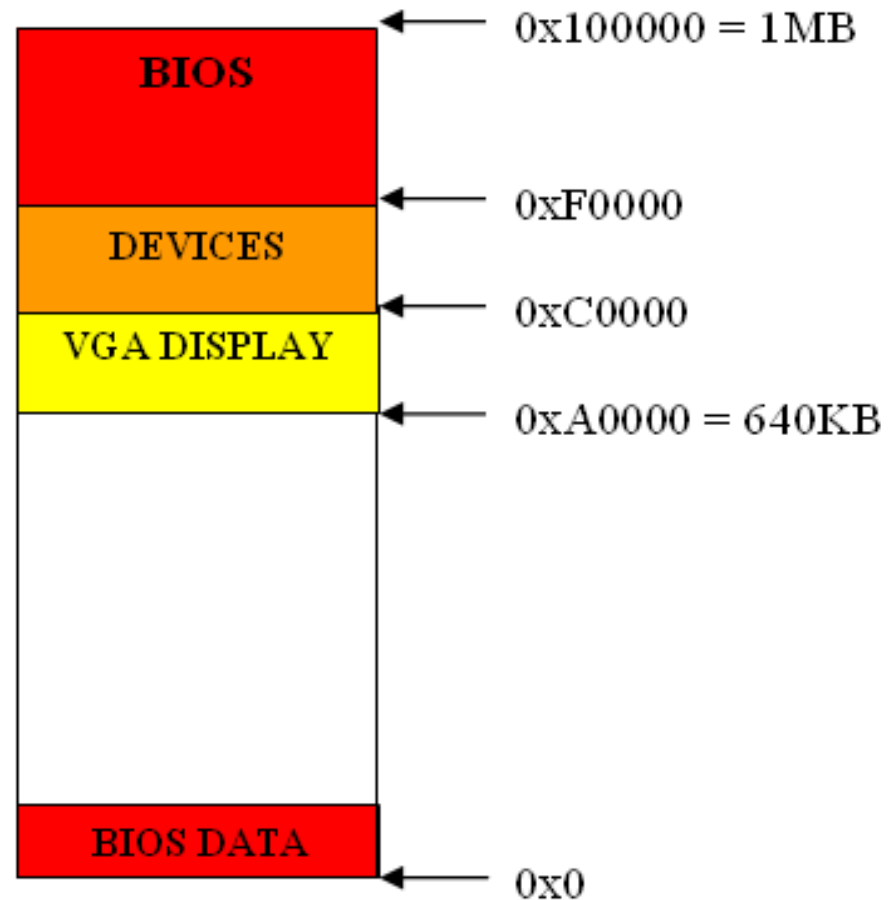
Booting a Computer

On Startup...

- The BIOS is loaded
 - Typically doesn't know anything about the OS
 - Minimal functionality
- The BIOS loads & runs the first sector of a boot device.
 - An OS cannot fit in just one sector

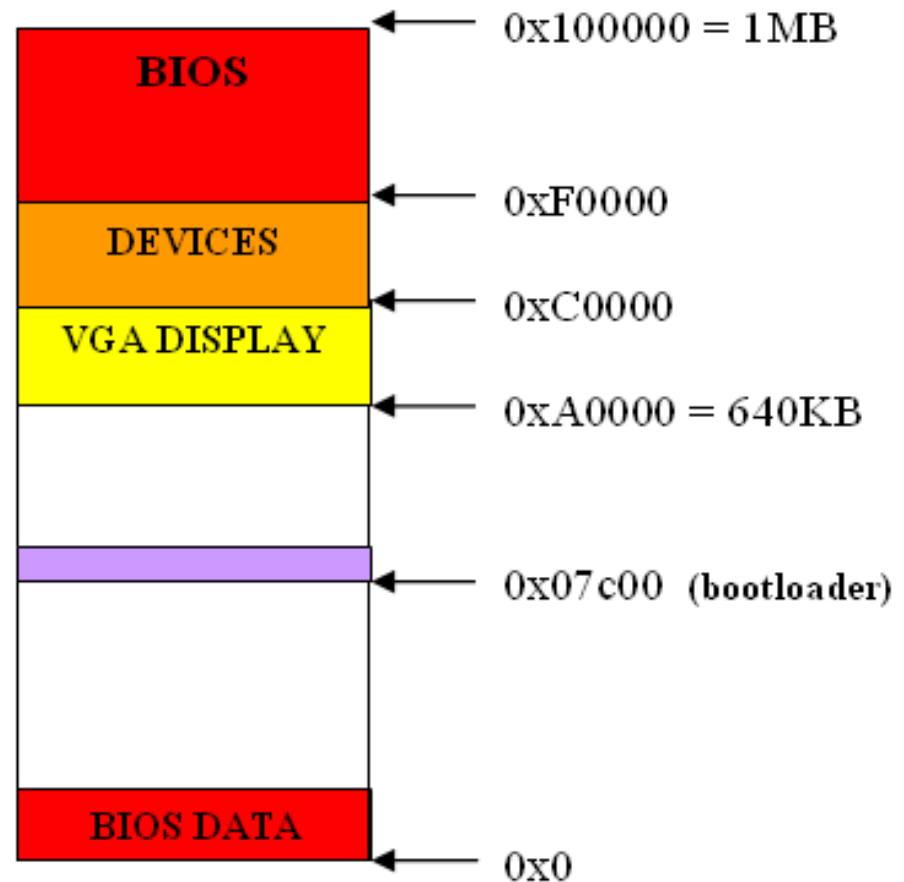
Bootup Details

- Start at 0xFFFF0
- Self test & initialization
- Search for a boot device
 - Hard disk
 - Floppy
 - Flash
 - ...

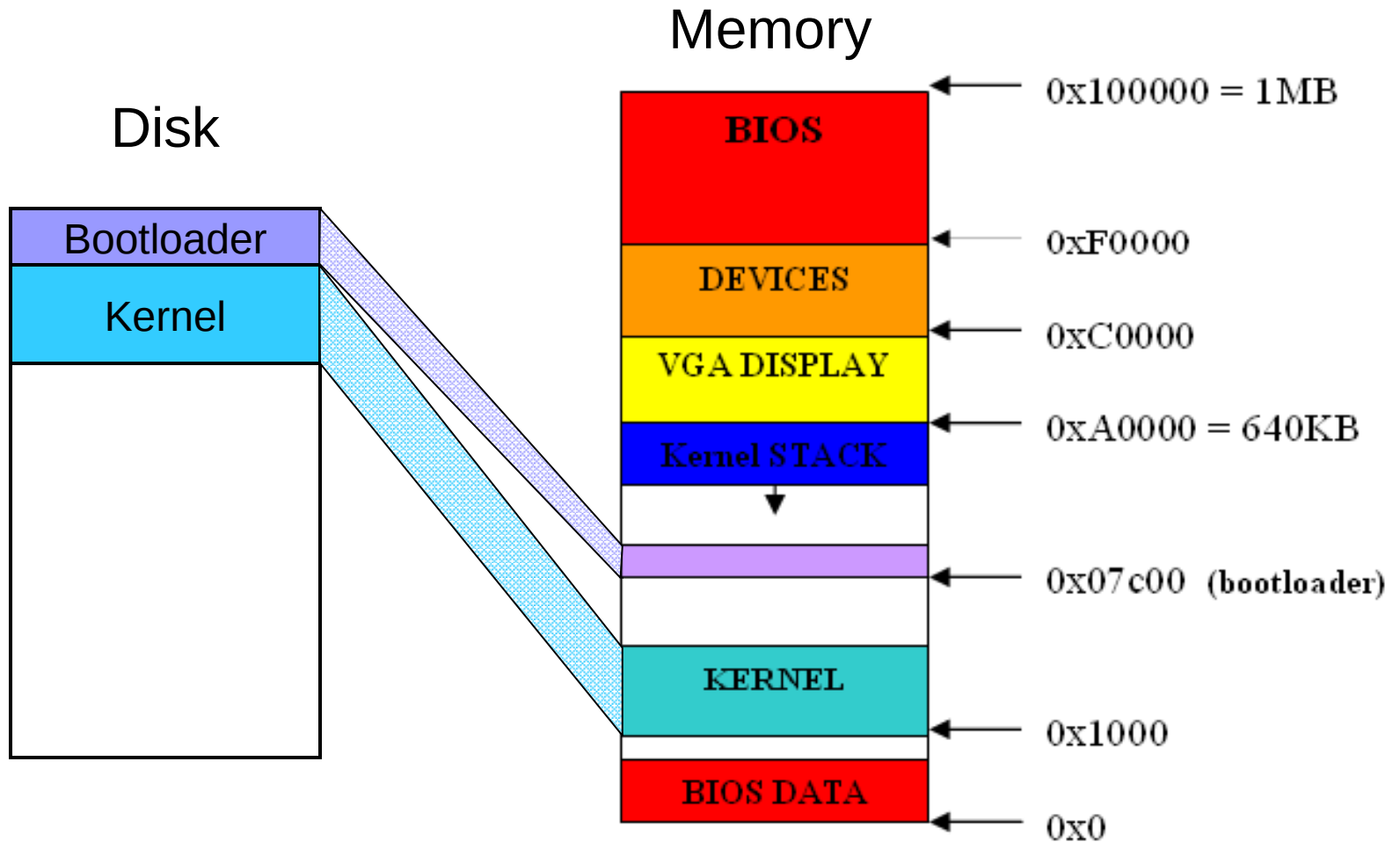


Bootup Details

- 1st sector loaded to 0x7c00
- Jump to 0x7c00
- 512 bytes to load the kernel



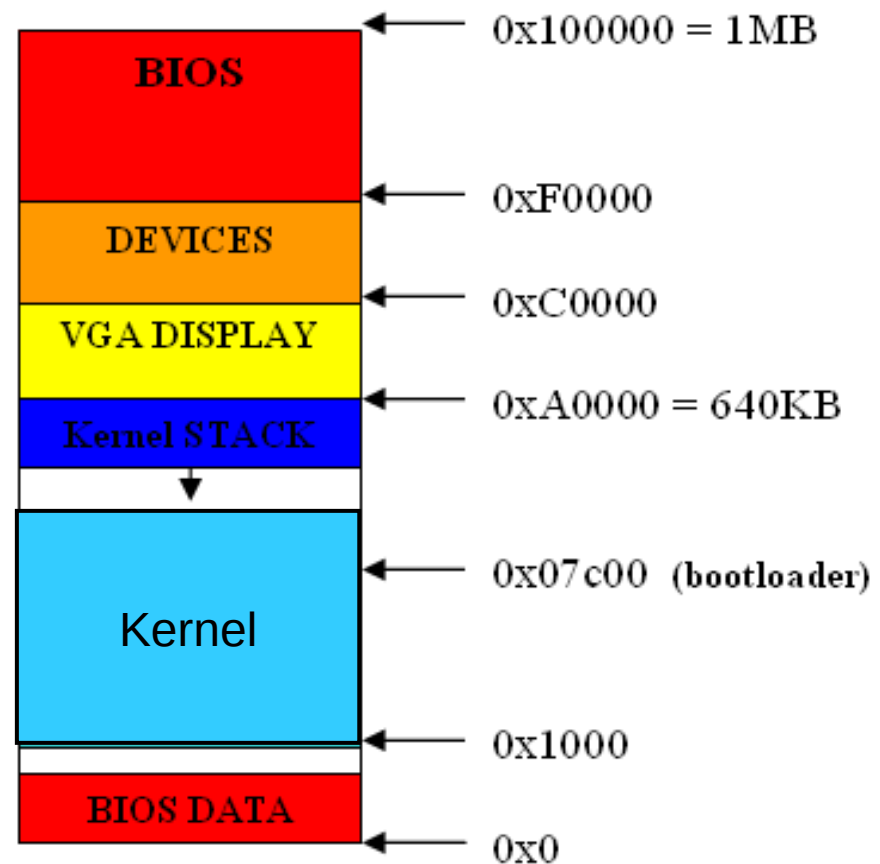
Bootloader



Entering the Bootloader

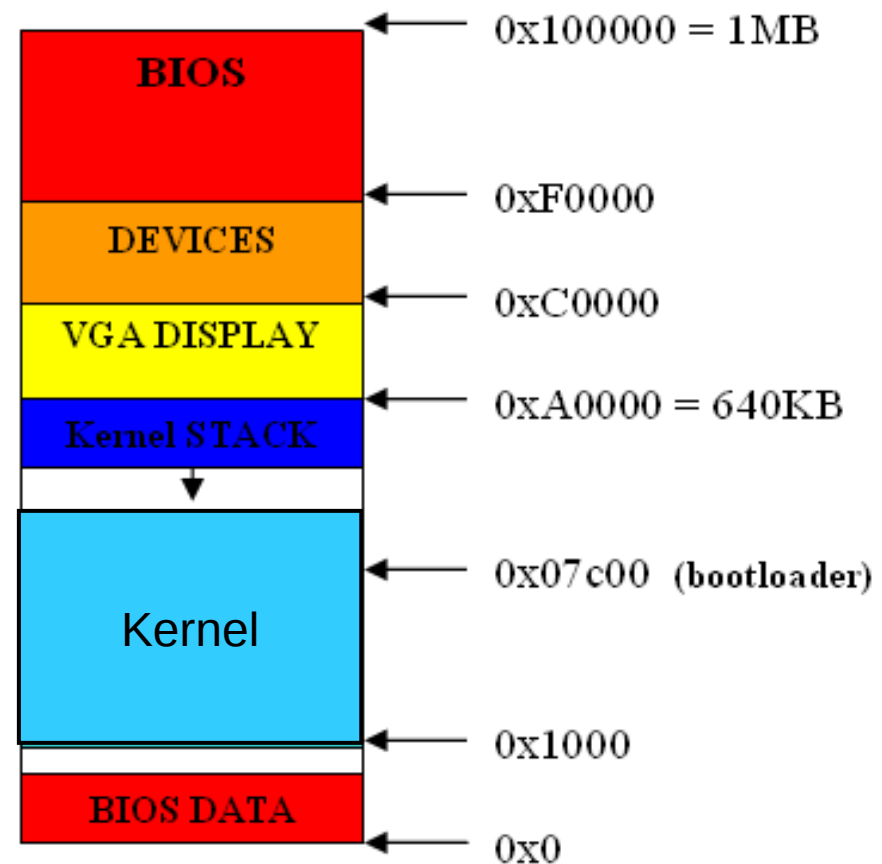
- %dl = Boot device number
 - Load the kernel from this device
- %cs = Code segment
- NO STACK! (%ss, %sp unset)
- %ds unset (set it to 0x07c0 before fetching from memory!)
- Other registers unset

The kernel might be big (extra credit)



Solution (extra credit)

- Move the bootloader





Loading the kernel

- Load to address 0x0000:1000
- Set up the stack
- Set %ds for kernel
- Switch control to the kernel (long jump to kernel)

Addressing

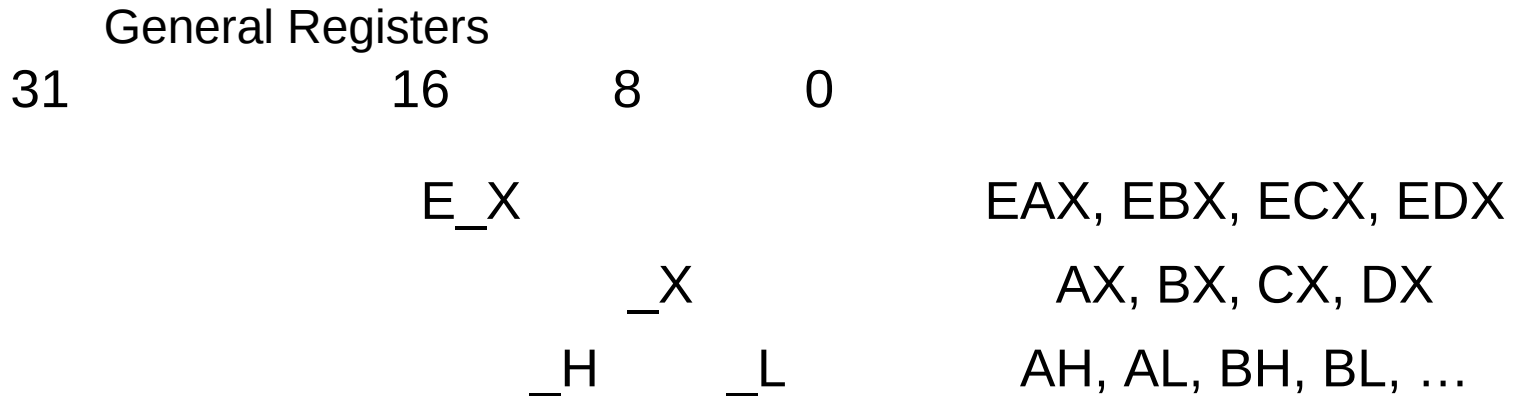
■ Real Mode

- 1 MB
- Format: 0x0000:0000
- Physical address = (segment << 4)+offset
 - Ex: 0x07c0:0000 = 0x0000:7c00

■ Protected Mode

- 4 GB (*32-bit*)
- Format: 0x0000:00000000 (*32-bit*)
- Virtual Addressing (user mode)
- Physical address = *a bit more complicated...*

Registers



Segment Registers	16	CS, DS, SS, ES, FS, GS
Index Registers	32	BP, SI, DI, SP
Status & Control	32	EFLAGS, EIP

AT&T Syntax

- Registers: %ax, %ah, %eax ,...
- Definitions
 - .equ BOOT_SEGMENT, 0x07c0
- Constants: \$0x0100, \$4
- Labels
 - _start:
 - print_string:
- Memory access
 - movw %ax, (0x40)
 - movb %dl, (a_label)
 - movw %es:(%ax), %dx
- Comments
 - /* multiline */
 - # to the end of the line
- Directives
 - .equ, .byte, .word, .ascii, .asciz