ECE 471 – Embedded Systems
Lecture 9

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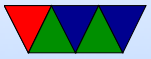
Announcements

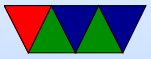
- HW#2 part A is out, involves setting up gumstix board part B will be posted later today, involving assembly language

- Read chapter 11 in textbook



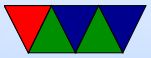
Update from Last Class

- Minix was indeed a microkernel.

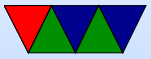


Gumstix Setup Overview

- Go over the HW2a handout



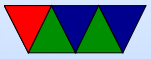
Booting a System



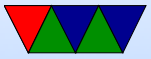
Firmware

Provides booting, configuration/setup, sometimes provides rudimentary hardware access routines.
Kernel developers like to complain about firmware authors.
Often mysterious bugs, only tested under Windows, etc.

- BIOS – legacy 16-bit interface on x86 machines
- UEFI – Unified Extensible Firmware Interface
  ia64, x86, ARM. From Intel. Replaces BIOS
- OpenFirmware – old macs, SPARC



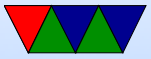
- LinuxBIOS



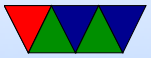
Boot Methods

Firmware can be quite complex.

- Floppy
- Hard-drive (PATA/SATA/SCSI/RAID)
- CD/DVD
- USB
- Network (PXE/tftp)

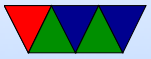


- Flash, SD card
- Tape
- Networked tape
- Paper tape? Front-panel switches?



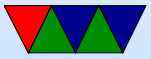
Disk Partitions

- Way to virtually split up disk.
- DOS GPT – old partition type, in MBR. Start/stop sectors, type
- Types: Linux, swap, DOS, etc
- GPT had 4 primary and then more secondary
- Lots of different schemes (each OS has own, Linux supports many). UEFI more flexible, greater than 2TB



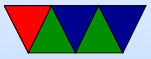
Bootloaders on ARM

- uBoot – Universal Bootloader, for ARM and under embedded systems
- So both BIOS and bootloader like minimal OSes



Gumstix Setup

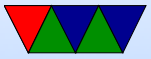
- FAT partition
  Why FAT? (Simple, Low-memory, Works on most machines, In theory no patents despite MS's best attempts)
  The boot firmware (burned into the CPU) is smart enough to mount a FAT partition and find an executable called "MLO"
  MLO is a "second-stage" boot-loader and is smart enough to run



u-boot.img – uboot

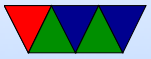
uboot is more complex and can write to serial port, has a mini-shell, etc

uImage – Linux kernel



Gumstix DISK Setup

- To set up from scratch, two partition by hand
- Then make a fat filesystem on /dev/hdc1
- Copy over MLO, u-boot.img, uImage
- Then make a Linux ext3 filesystem on /dev/hdc2
- Then un-tar the fs image over it
- OR just dd over the disk image I already have



Field Trip to Pick Up Gumstix Boards