ECE 571 – Advanced Microprocessor-Based Design Lecture 20

Vince Weaver

http://web.eece.maine.edu/ vweaver

vincent.weaver@maine.edu

18 April 2017

Announcements

- Project – don't put it off until the last minute!

- HW#7 Grades were posted

- Don't forget HW#10

- There will be a short HW#11

When can we scale CPU down?

- System idle

- System memory or I/O bound

- Poor multi-threaded code (spinning in spin locks)

- Thermal emergency

- User preference (want fans to run less)

Non-CPU power saving

- RAM

- GPU

- Ethernet / Wireless

- Disk

- PCI

- USB

GPU power saving

- From Intel lesswatts.org
  - Framebuffer Compression
  - Backlight Control
  - Minimized Vertical Blank Interrupts
  - Auto Display Brightness
- from LWN: http://lwn.net/Articles/318727/
  - Clock gating or reclocking
  - Fewer memory accesses: compression.
    Simpler background image, lower power

- Moving mouse: 15W. Blinking cursor: 2W
- Powering off unneeded output port, 0.5W
- LVDS (low-voltage digital signaling) interface, lower refresh rate, 0.5W (start getting artifacts)

Ethernet

- PHY (transmitter) can take several watts

- WOL can draw power when system is turned off

- Gigabit draw 2W-4W more than 100Megabit 10 Gigabit 10-20W more than 100Megabit

- Takes up to 2 seconds to re-negotiate speeds

- Green Ethernet IEEE 802.3az

WLAN

- power-save poll – go to sleep, have server queue up packets. latency

- Auto association – how aggressively it searches for access points

- RFKill switch

- Unnecessary Bluetooth

Disks

- SATA Aggressive Link Power Management – shuts down when no I/O for a while, save up to 1.5W

- Filesystem atime

- Disk power management (spin down) (lifetime of drive)

- VM writeback – less power if queue up, but power failure potentially worse

Soundcards

- Low-power mode

USB

- autosuspend. Can sometimes cause issues

- off by default as some USB you disable don't come back