

I/O

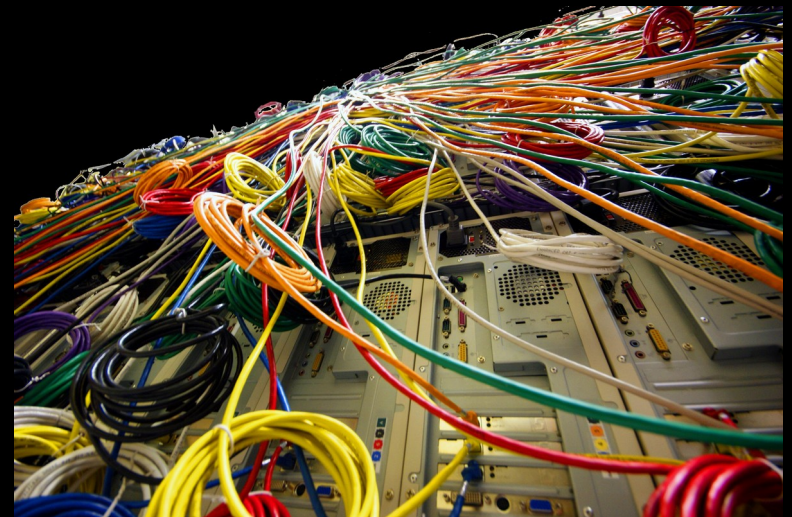
CPE380, Fall 2025

Hank Dietz

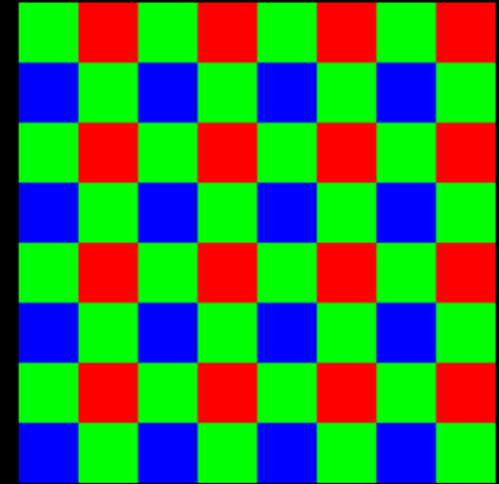
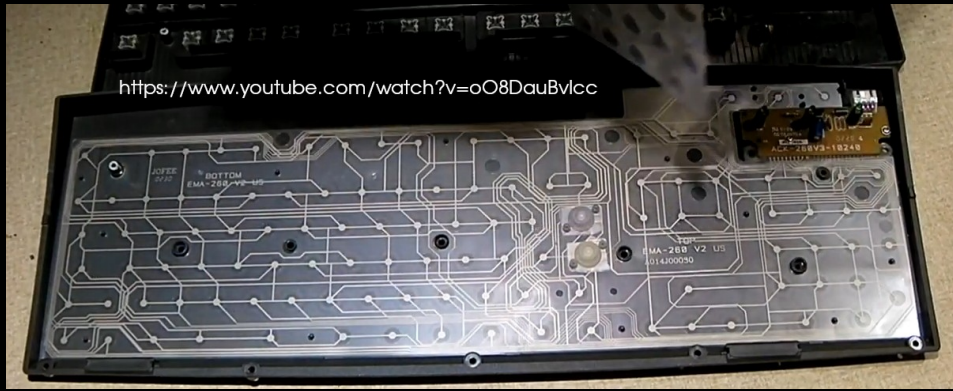
<http://aggregate.org/hankd/>

Network Terminology

- SAN, LAN, MAN, WAN – Area Network; System/Storage, Local, Metropolitan, Wide
- Ethernet, DSL (Digital Subscriber Line)
- USB, FireWire
- Hub, Switch, Router
- WiFi, Bluetooth, NFC
- Bandwidth, Latency

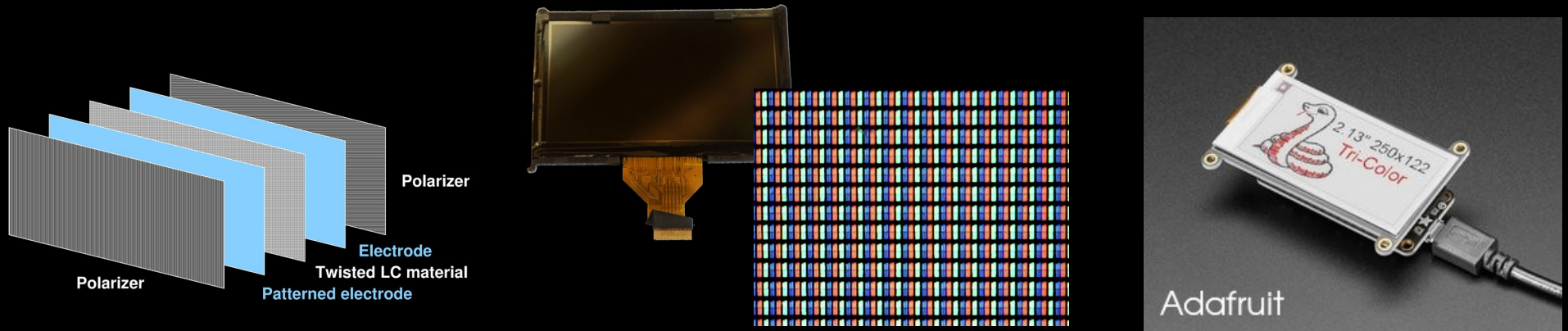


Other I/O Terminology



- Keyboard
- Mouse, Trackball, Touchscreen, Lightpen, Touchpad, etc.
- Pixel – Picture Element
- Camera: Charge-Coupled Device, CMOS, BackSide Illuminated, Stacked

Other I/O Terminology



- Display: Cathode Ray Tube, Plasma, Liquid Crystal Display, Digital Micromirror Device aka Digital Light Processor, Organic Light Emitting Diode, eInk

Input / Output

- We've discussed interfaces & device types... here are some external interface connectors:



- What's left is just two universal concepts:
 - How to name I/O device registers
 - How to interact with them

Naming I/O Device Registers

- **Memory-mapped I/O**
 - Most processors implement this
 - Some physical memory addresses are I/O; use load/store to access, **even from HLLs**
 - **Protection via page table**
- **Separate I/O address space**
 - Implemented on x86 family processors
 - Special port input/output instructions
 - **Separate I/O path and protection (**ioperm**)**

Interacting With I/O Devices

- **Polling**
 - Processor loops looking at device registers to see when things have happened
 - Fast, but keeps processor busy
- **Interrupts**, for infrequent things
 - Device signals processor when ready
 - Poll to discover “who rang” and why
- **DMA (Direct Memory Access)**
 - Cheap secondary processor moves data
 - Signals done using an interrupt