Automation Platform

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Platform?

FUSCHIA RAIN

edgeofurge.com
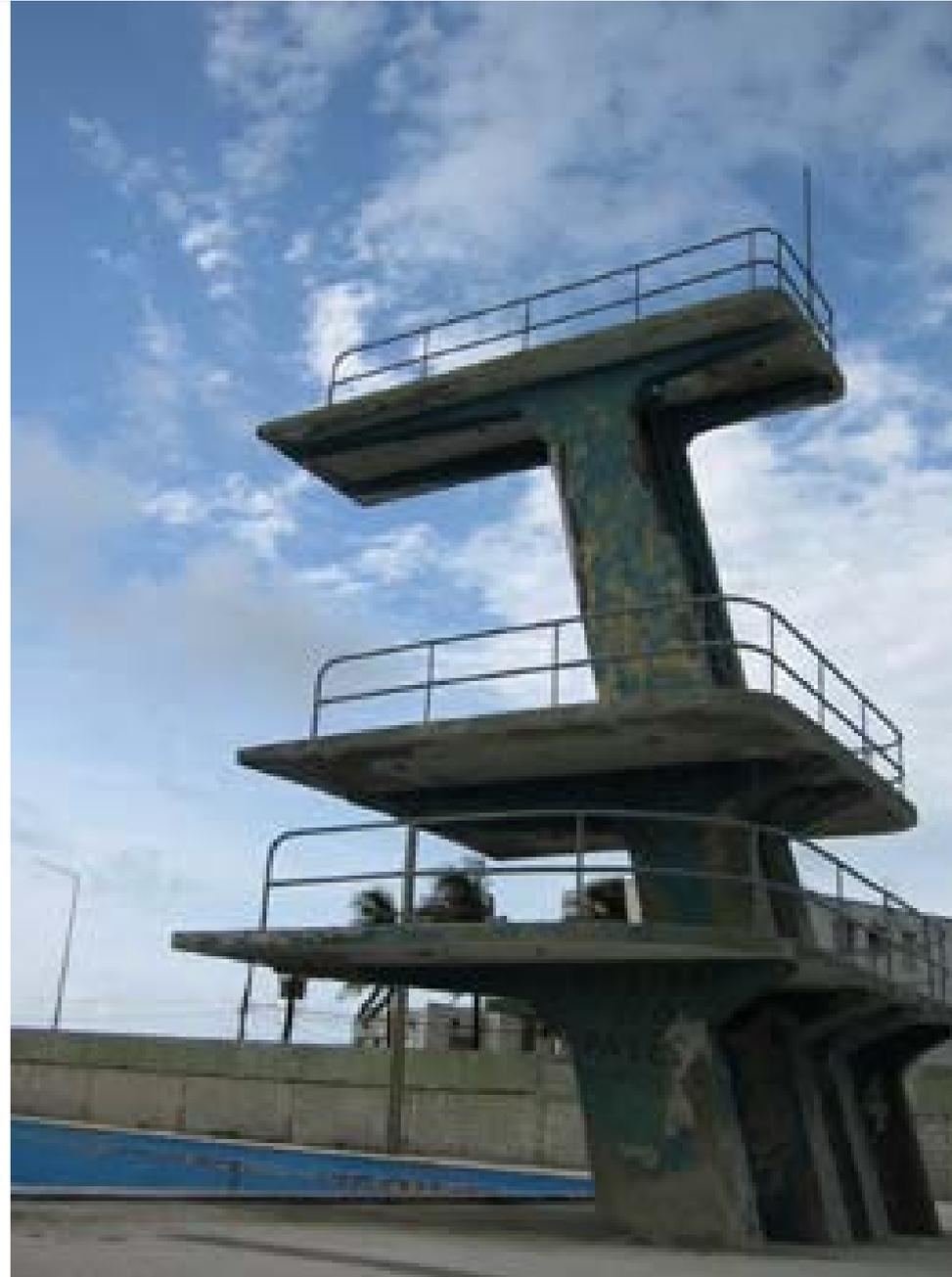
Platform?

Platform?

Automation Platform

- Platform for software developer's Automation Application
- Automation device = Platform + Software

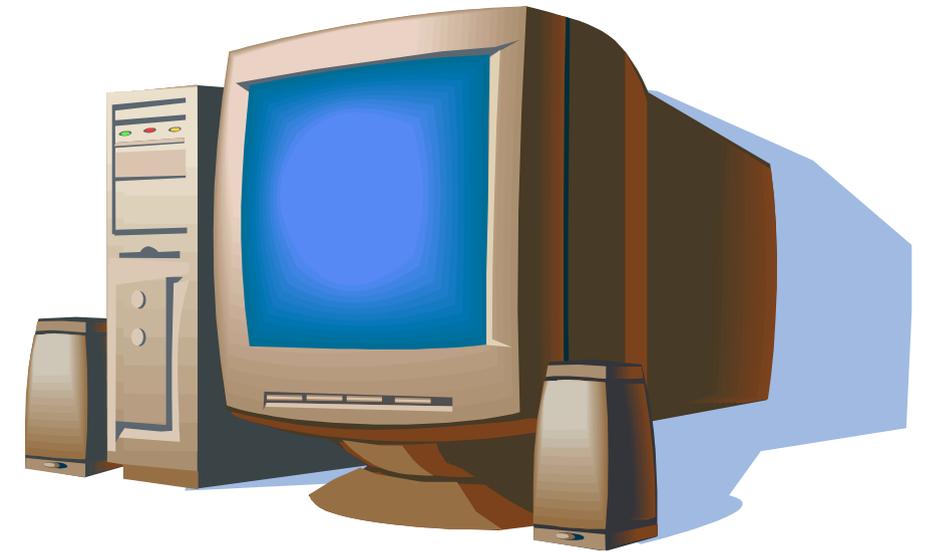# Application Platforms

- Windows PC/Mac PC
- Tablet
- Smart Phone

Automation Platform

- Platform for Automation Application
  - Rugged & Reliable (no one present to reboot)
  - No hard disks
  - No fans
  - Embedded OS (Linux/WinCE)
  - Backed up Real-time Clock
  - 24VAC/DC powered
  - DIN rail mounted
  - Automation Ports
  - CE/FCC and UL

Automation Ports

- May vary
- RS-485 (EIA-485)
- Ethernet
- EnOcean
- Wi-Fi
- KNX
- LonWorks, etc.

Program Media

- No hard disk
- Internal Flash
- SD Card
- eMMC

NOR Flash & NAND Flash

- NOR Flash reliable and expensive per MB
- NAND Flash is not as reliable but very inexpensive (like a hard drive)
- NOR Flash typically used to boot embedded systems
- NAND Flash is found in SD cards, eMMC, etc.
- NAND reliability is provided by the OS or external HW

CPU

- Whatever is required for your software/OS

- Linux
  - 166 MHz ARM9
  - 400 MHz ARM9
  - 1.2 GHz ARM9

Operating System

- ## Windows
  - WinCE
  - Available for ARM, MIPS, x86
  - No source
  - Not very popular

- ## Linux
  - Available for ARM, MIPS, x86, etc.
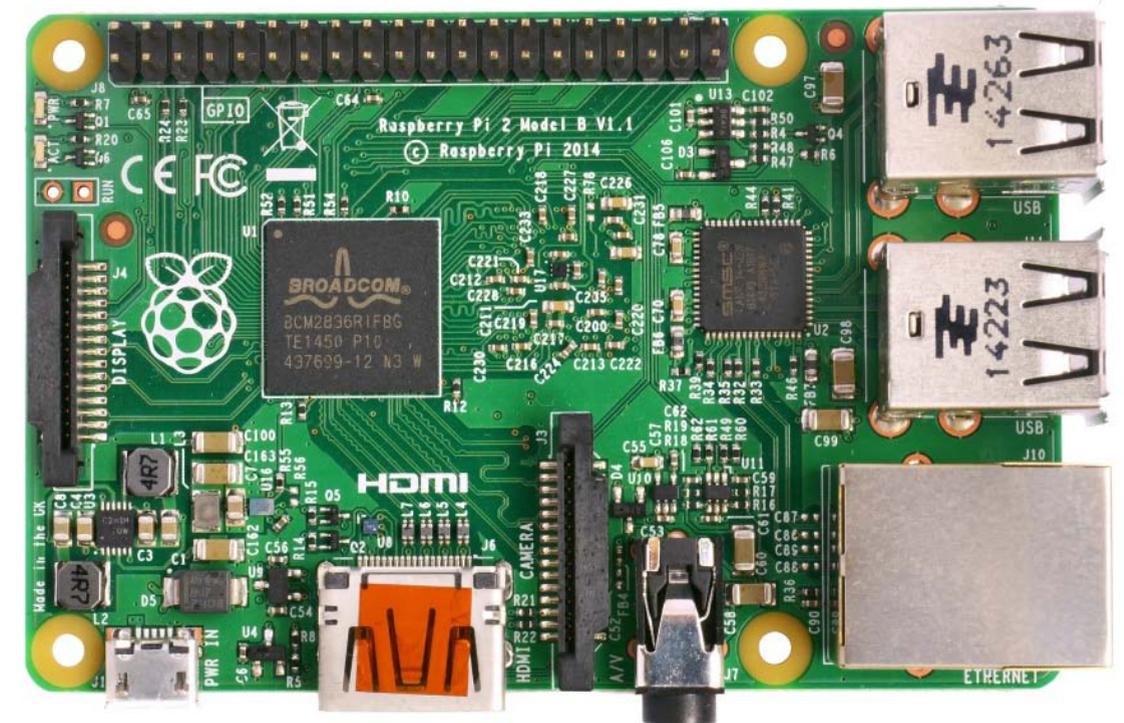 - Source and large community support
  - Very popular
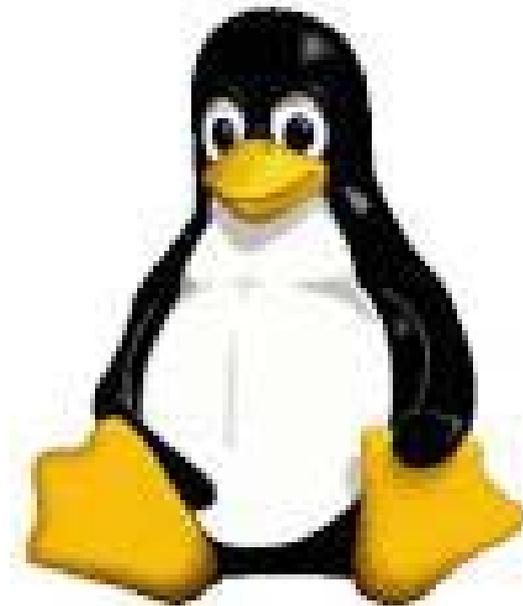
Popular Embedded Platforms

- Raspberry Pi

- BeagleBoard

- Arduino

Raspberry Pi

- Very popular for education/home projects
- 900 MHz quad-core ARM cortex-A7
- 1GB RAM
- MicroSD slot
- Ethernet port
- 4 USB & MicroUSB power

Raspberry Pi

- ## What is missing?
  - eMMC
  - DIN rail enclosure
  - RS-485 ports
  - Real-time clock
  - 24VAC power supply
  - UL/FCC/CE

BeagleBoard

- BeagleBone
- Very popular
- 1GHz CPU
- 512MB RAM
- USB
- Ethernet
- 4GB eMMC
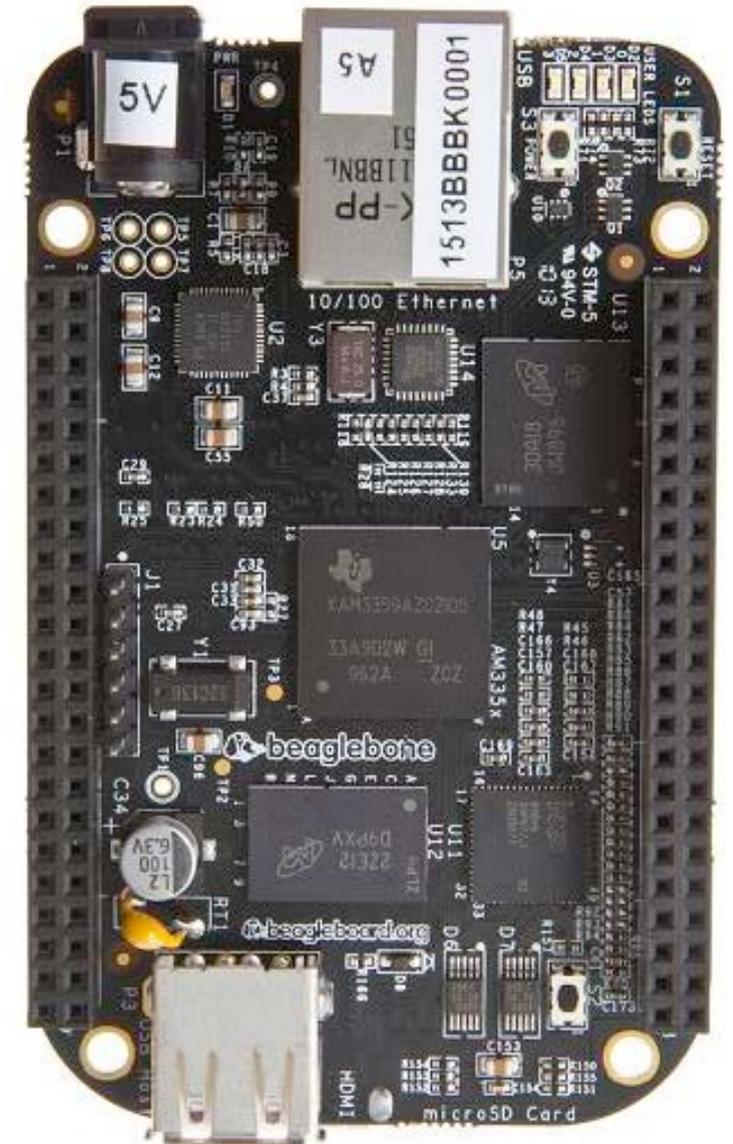
BeagleBoard

- What is missing?
  - Limited to 4GB eMMC
  - RS-485 port
  - 24VAC power
 - DIN rail mounting
  - UL/FCC/CE

Arduino

- Very popular educational platform
- Mostly 8-bit processors
- Very little RAM/ROM
- Cannot run Linux
- Many have I/O
- Some have serial ports
- Not really suited for Automation

SD card memory

- ## SD card
  - Secure Digital
  - Programmable NAND Flash memory
  - Inexpensive
  - 4GB, 8GB, 16GB up to 128GB and higher
  - Used in cameras, PCs, tablet PCs, smart phones
  - SLC – Single-Level Cell
  - MLC- Multi-Level Cell (most SD cards today)
  - Reliability will vary between different types of SDs

eMMC
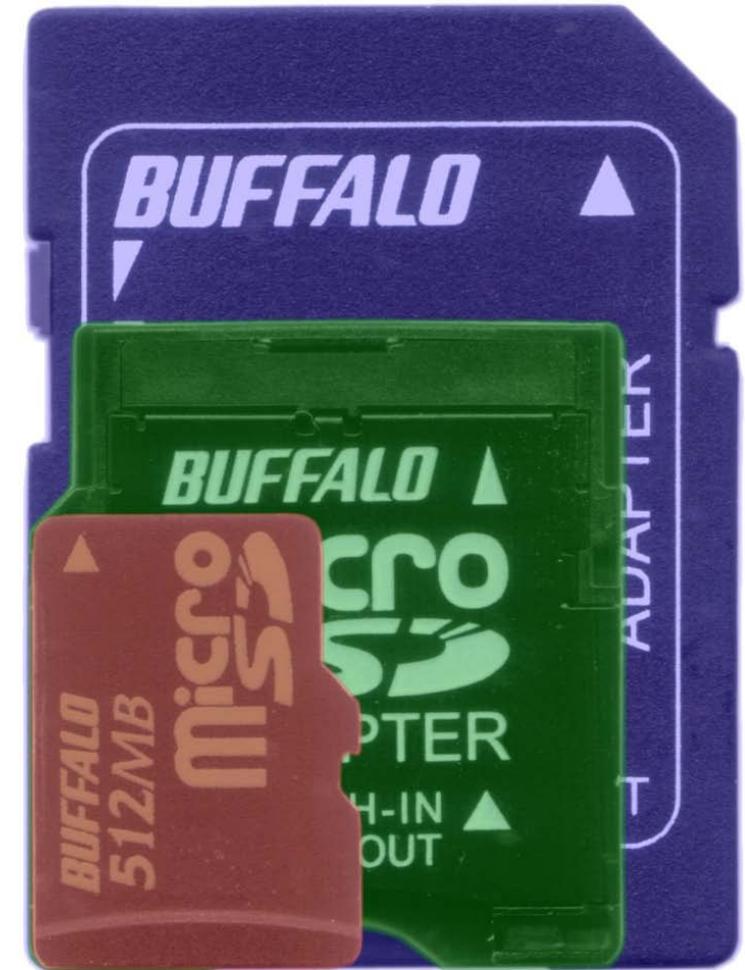
- Embedded MultiMedia Card
- Programmable NAND Flash memory
- Soldered to the PCB
- Error Correction Code (ECC)
- Wear leveling
- Bad block management

SLC and MLC
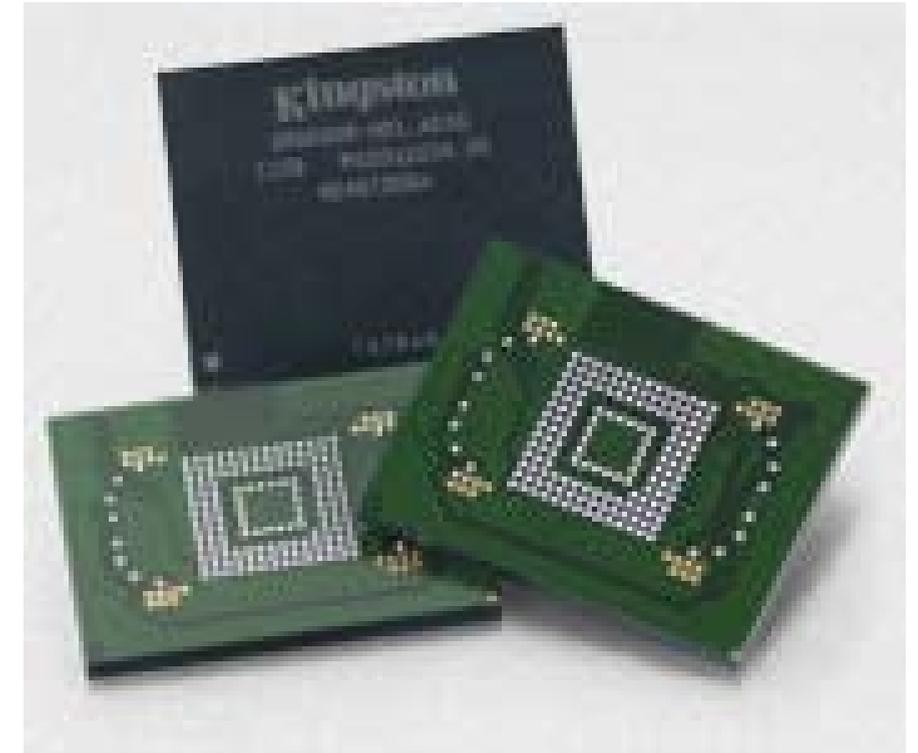
- To improve reliability convert MLC to SLC

- Flash is cut in half

- "Industrial" SD card provide SLC

- SLC can be used in eMMC to provide more reliability

File Systems

- The file system can also assist with bad sectors or inodes.
- Ext2 – older Linux file system – no journaling
- Ext4 – current standard - has journaling
- JFFS – has journaling but for Flash chips
- Btrfs – new file system with reported fault tolerance
- Many others

Journaling

- File system feature

- Keeps track of changes

- Can recover lost data from power failure

- There are many journaling file systems available in Linux

Contemporary Controls Automation Platform

- 1.2GHz ARMv5TE CPU, 512MB RAM
- microSD or eMMC
- Two optically isolated RS-485 ports
- 5 Gigabit Ethernet ports – 2 IP addresses
- USB port, Wi-Fi, EnOcean (optional)
- 0-60°C
- 24VAC/DC, DIN rail, UL/FCC/CE

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- Could be modified to suit special needs
- -40 to +75°C with reduction in CPU speed
- More RS-485 ports
- Other ports
- KNX, M-bus, LonWorks, etc.
- I/O
- UL864 or other regulatory

Current ports to the Platform

- DGLux5 from DGLogik

- FIN from J2 Innovations

- Looking at Niagara AX and Niagara4

For more info go to CControls.com