Defining Things

- A device that either senses or interacts with the world while utilizing existing internet infrastructure.
- Term coined in 1999
- First IEEE standard in 2003, many more in 2012-2013
- Projected growth into tens of billions of devices and hundreds of billions in market value by 2020
IoT Growth

Examples

- Amazon Dash Button
- Phillips Hue
- Nest Smart Thermostat
- Smart Plugs
- Smart ______
Hardware

- Low Power
- Small Size
- Low Cost
- Network Connectivity

Hardware Architectures

- Advanced RISC Machines (ARM)
  - Raspberry Pi
  - Texas Instruments
  - Nordic Semi
- AVR (Atmel)
  - 8-bit RISC
  - Arduinos
- Intel
  - Atom – x86 based processor/modules
  - Quark – 32 bit SoC/MCU
ARM

- M0
  - Armv6 architecture
  - 3 stage pipeline
  - Partial Thumb 1/2 Instruction sets
- M4
  - Armv7 architecture
  - 3 stage pipeline with branch speculation
  - 32 bit arithmetic hardware
  - Floating Point hardware
  - Sleep modes

Network Communication

- Wifi
- Bluetooth
- LTE/Cellular
- LoRa
- ANT
- Zigbee
- ISM
- NFC
- Wired
Network Architectures

- Peer to Peer (P2P)
  - Robust
  - Non-trivial for changing number of nodes
  - Constant network traffic
- Client/Server
  - Less network traffic
  - Only one internet connection required
  - More vulnerable to outages
- Hybrid
  - Small P2P network for data collection, e.g. LoRa
  - One or more hubs/gateways for data to periodically be uploaded/downloaded

Sources

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