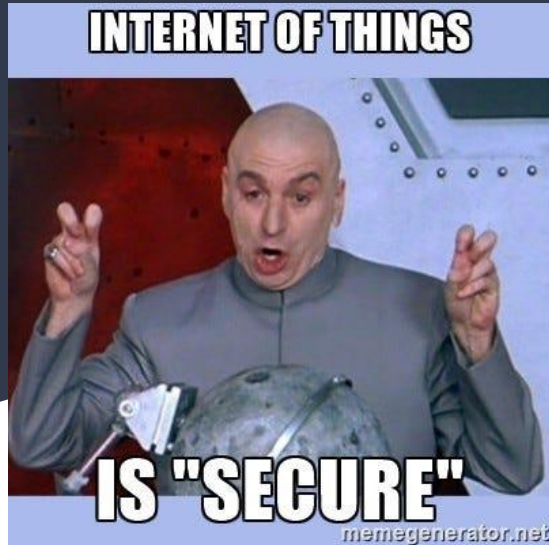


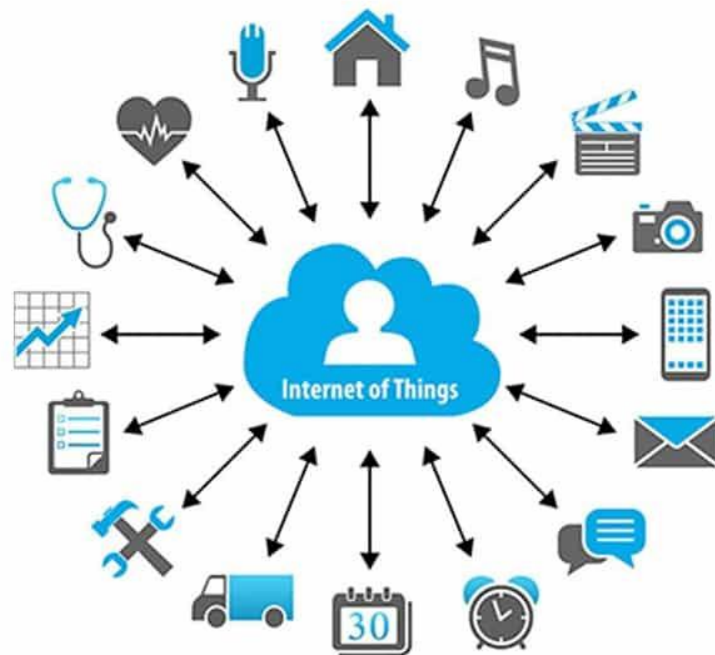
# Linux in the Internet of Things (IoT)

2/10/2022 - Henry Keena (Vice Supreme Penguin)



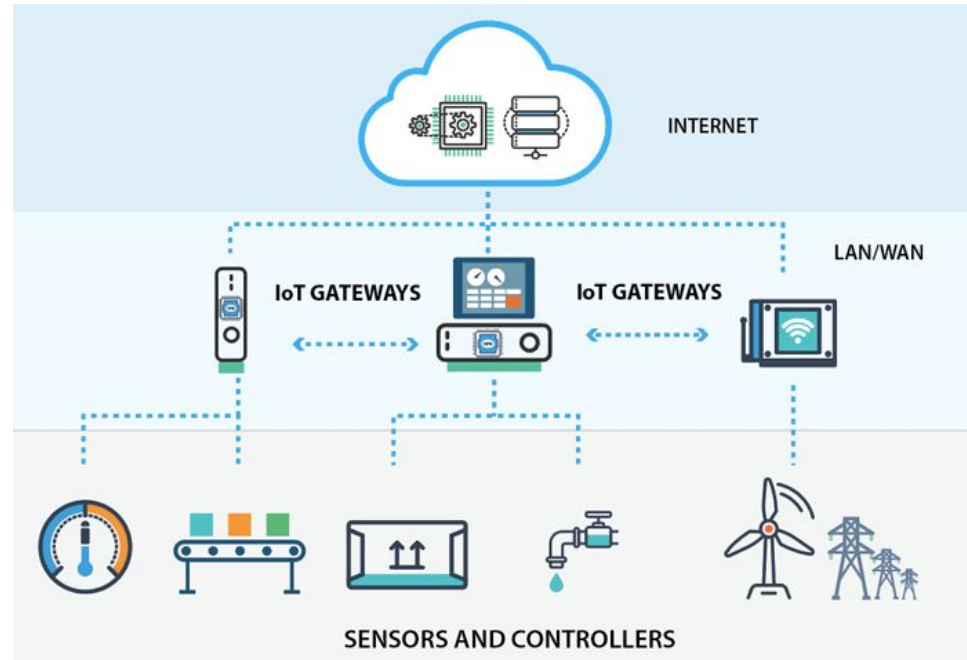
# Internet of Things (IoT)

- What is it?
  - The Internet of Things(IoT) is a term to physical hardware and objects with the ability to process and communicate data between similar objects/devices, and other computing devices or services. Examples:
    - Sensors
    - Construction Equipment
    - Security Cameras
    - Smart Refrigerators/Toasters
    - Self-Driving Automobiles
- “The internet was a mildly amusing idea, but the thought that now we should connect everything to it is fucking stupid” - some dude on reddit



# IoT Architecture

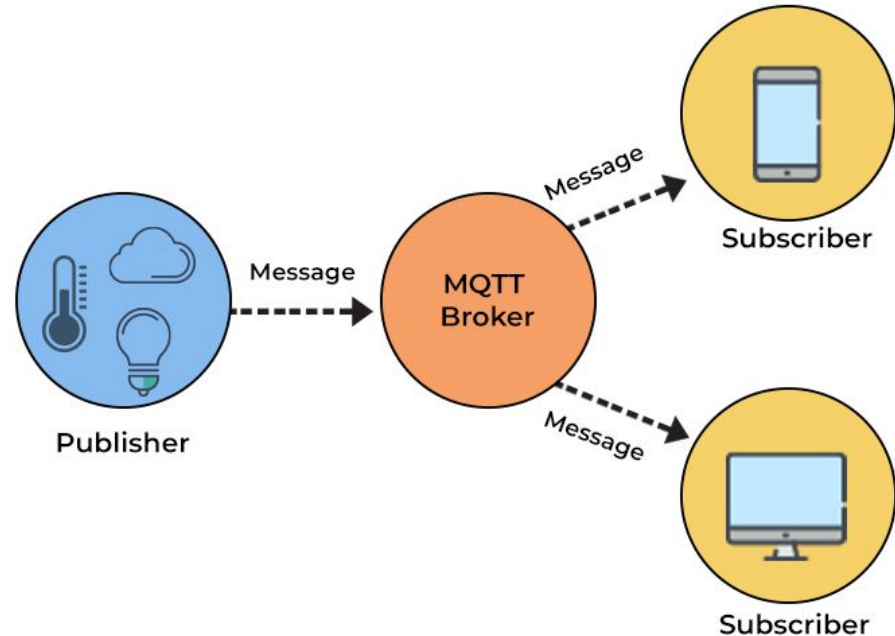
- **Hardware Controllers**
  - Physical hardware systems connected via wired/wireless access points, are connected to IoT Gateways on a LAN or WAN
- **IoT Gateways**
  - IoT Gateways act as the middle point communicators between a Local Area Network or Wide Area Network, and the wider Internet
- **The Internet**
  - Through the Internet, the IoT systems are able to communicate with wider/remote points or controllers physically located elsewhere



# MQTT

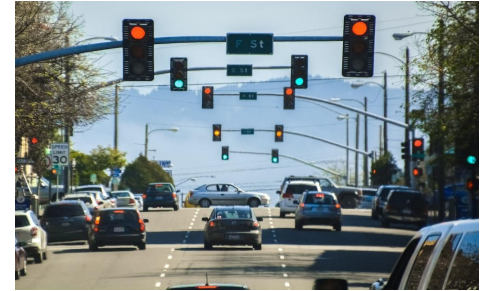
- MQTT (MQ Telemetry Transport), is a lightweight, publish-subscribe, messaging service often used in machine-to-machine communication systems. It often accomplishes communication through bi-directional protocols like TCP/UDP
- MQTT is often employed in IoT applications as it makes the transfer of data and messages between hardware devices, and computational devices simple

## MQTT PROCESS



# IoT in Physical Infrastructure

- IoT is steadily taking ever increasing importance in real world infrastructure automation:
  - Electric Power Plants
    - Obvermuntwerk II
  - Traffic Management Systems
  - City Water & Electric Power Grids
  
- A number of municipalities across the globe are now adopting a number of IoT devices to allow for automation of civil services and infrastructure in so called “Smart Cities”
  - “The Line”, Saudi Arabia



# Linux IoT in Consumer Electronics



- For most consumer electronics, various versions of Ubuntu or Debian
- Server or backend focused IoT systems often run on Redhat or Redhat based distros
- IoT is becoming increasingly common in various consumer electronics:
  - Smart Cars
  - Smart Watches
  - Smart Toasters
    - “Revolution InstaGLO R180 Toaster”
- Many IoT consumer products have a number of security flaws:
  - Default passwords
  - Many packages are never updated
  - Provide intrusion points on a network



# Linux IoT in Robotics

- Companies like Boston Dynamics are using IoT technologies for developing and constructing fully autonomous robots:
  - “Spot”
  - “Atlas”
- According to Boston Dynamics, they run on a “Custom Version of Ubuntu”
- A very promising application of IoT Technology for a variety of reasons:
  - Safety
  - Automation
  - Paying homage to our new overlords







# Linux IoT in Other Applications...



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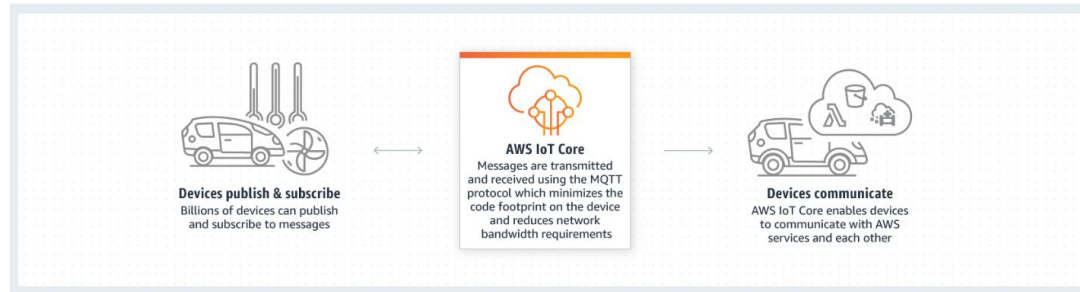
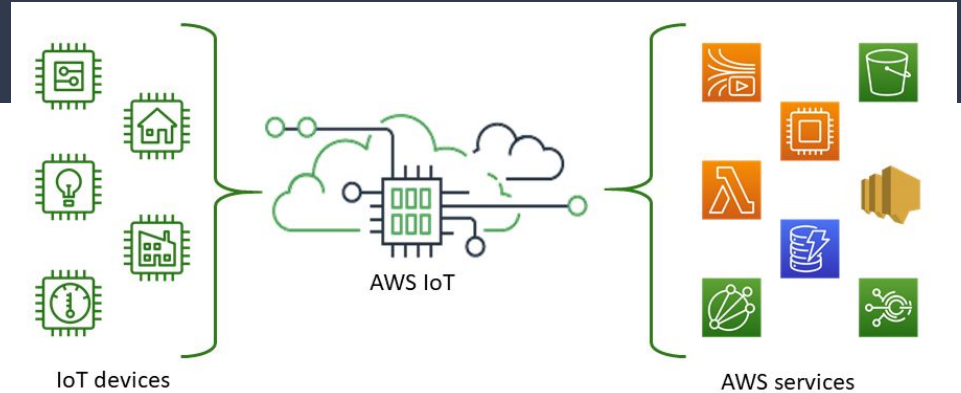
# Linux IoT in Military/Security Applications

- Linux in IoT is being used to power weapons technology for commercial and military uses:
  - TrackingPoint XS1 “Surgeon”
    - “Linux Gun”
    - Runs Debian
    - Costs \$17,000
    - Audited for security vulnerabilities... failed...
- US Military guidance systems primarily run Linux
- Many of these applications of IoT have a number of security problems too



# AWS IoT Core

- Amazon Web Service that allows you to make non-IoT devices into IoT devices
- Works with most OS platforms, but optimized for use on Linux
- Provides a simple development kit for integrating and managing IoT devices through a number of programming languages
  - Java
  - Node.js
  - Python



# Ubuntu for IoT

- Ubuntu and Canonical are taking a significant boost in the IoT space
- AWS IoT Core has specific plugins for connecting Ubuntu IoT systems to AWS Services
- “From smart homes to smart drones, robots, and industrial systems, Ubuntu is the new standard for embedded Linux.”
- You can have Canonical provide custom support services for your IoT product



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# Questions?

