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IoT 101

Getting started with IoT Devices
and Applications

Jock Reed
@JockDaRock

DEVNET-1235

CISCO *Live!*

Barcelona | January 27-31, 2020



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Agenda

- Jock's Pinnacles of IoT
- Data
- Connectivity
- Protocols
- Edge Architecture
- IoT Devices
- Data Visualization
- Software Development
- Notes on Security
- DevNet and IoT resources

Jock's Pinnacles of IoT

Jock's Pinnacles of IoT

1. Connectivity
2. Data
3. Protocols
4. Edge Architecture
5. IoT Devices
6. IoT Data Visualizations
7. IoT Software Development

Data

Data

- IoT is about Data... and sometimes cool devices
- How do I get data from a sensor or device?
- How do I use that data?
 - Automation
 - Metrics
 - Business logic

Connectivity

Connectivity

- Connectivity to the Internet / Public or Private Cloud
- Wired – Ethernet or Serial
- Wireless – Cellular, WiFi(6), BLE, LoraWAN, Custom Radio frequency
- Custom Gateways
 - MHz – GHz, non-standard networking wireless

Connectivity



IoT Protocols

IoT Protocols

- Transport
 - Wifi, bluetooth, zigbee, lorawan, wired
- Data Protocols
 - HTTP, websockets, MQTT, AMQP, XMPP
- Data Constructs
 - JSON, YAML, XML, plain, text
- Brokers
 - MQTT / WebSockets, RabbitMQ

WebSocket Basics

- Layer 7 Protocol Leveraging persistent TCP connections
 - Original HTML5 spec referenced as “TCPConnection”
- Separate and distinct from HTTP, but interoperates with HTTP headers
 - Supports TLS encryption
 - Follows re-directs for SSL offloading, proxy support, load balancing
 - HTTP 101 Upgrade Header
 - Typically run on Port 80 & 443, but also other ports
- Lower overheads ideal for real-time data transfer
- Bi-directional messaging
- Full web browser support today (Chrome, Edge, IE, Edge, FF, Safari, Opera)
- Connect to Websockets without a browser

MQTT

- MQTT is Lightweight message queueing and transport protocol.
- Stands for Message Queue Telemetry Transport.
- Suited for Mobile to Mobile (M2M) , Wireless Sensor Network (WSN) and IoT Scenarios
- Asynchronous
- Low overhead (2 byte header)
- Publish / Subscribe (PubSub) Model
- Low complexity protocol for simple devices



MQTT / WebSockets Demo

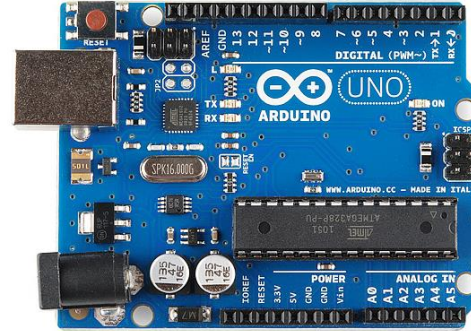
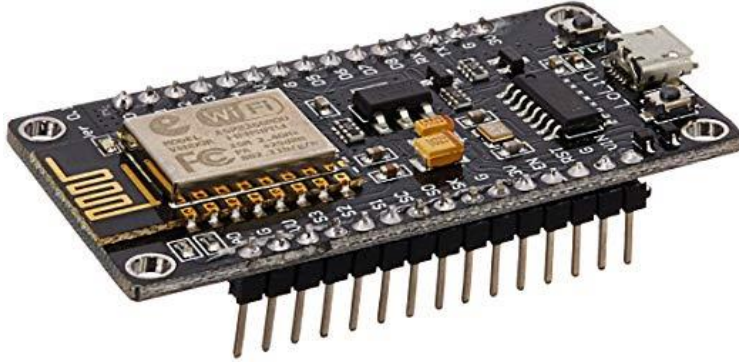
Edge Architecture

Edge Architecture

- Edge to Cloud
- Edge Devices
 - Network / Connectivity Devices and Gateways
 - Edge Compute Resources
- Edge Applications
- Cloud Compute resources
- Cloud Applications
 - Big Data Analytics
 - Metrics, Monitoring, Dashboarding
 - Machine Learning

IoT Devices

IoT Devices



IoT Devices

- Device Types

- Microcontrollers / PLCs
- X86 and Arm Devices
 - Gateways
 - SBCs

- Device Concepts

- Best tool for the job
- What is the device doing?
- Does the device need more than one application?

IoT Data Visualization

IoT Data Visualization

- Data to be visualized
 - Alerts
 - Monitoring
 - Significant Changes
 - Business importance
 - Automation data
- Visualization Tools
 - Freeboard, Grafana, etc.





IoT Visualtion Demo

IoT Software Development

IoT Software Development

- Lots of code languages work... but Python is great!
- Build pipelines for Continuous Integration of code and versioning
- Use Best Software practices

Notes on IoT Security

Notes on IoT Security

- IoT security is too big for a IoT 101 class.
- IoT Security touches aspects of all of the IoT Pinnacles
- Scale of IoT can make security solutions costly
- Mitigation of security risks
- Physical security of Devices

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