

IoT Applications



Node.js + MQTT

UpperValleyJS

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About me

- **Anani Sawadogo**
- Software Engineer at FreshAir Sensor
- Computer Engineering
 - Embedded systems
 - Android Applications
 - Web Applications



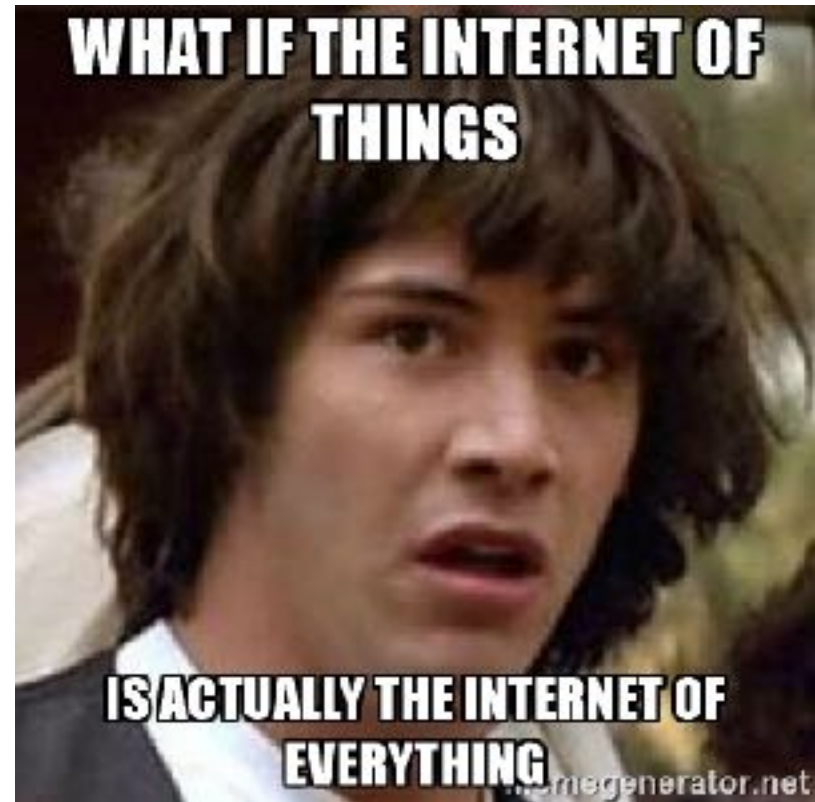
Overview

- IoT (+ minor rant)
- MQTT: A lightweight IoT Protocol
- MQTT x JavaScript
- Demo (volunteer needed)



The Internet of Things

- Things are (will be) everywhere
 - 20.4 Billion by 2020
- What's a Thing?
 - “A thing can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low -- or **any other natural or human-made object that can be assigned an IP address and provided with the ability to transfer data over a network.**”(1)



The Internet of Things (continued)

- <Rant Start>
- Public push back
 - The Internet of Useless Things: Smart devices becoming dumb?
 - Potential to fundamentally change the way humans interact with the physical world
- </Rand End>



The Internet of Things (continued)

- Challenges:
 - Data storage and processing
 - Open standards
 - **Data transmission**
 - Security and privacy
 - Waste disposal

What do Things want?

- Common properties
 - constrained resources
 - Diverse location: Unreliable networks
- Get the data out
 - Lightweight protocol
 - bidirectional communication
 - robust on multiple kinds of networks
 - independent of consumers



Why not use HTTP?

- Too verbose
- Resource hungry
- Request/Response
- No connection awareness

	OSI	TCP/IP
7	Application	Applications (FTP, SMTP, HTTP, etc.)
6	Presentation	
5	Session	
4	Transport	TCP (host-to-host)
3	Network	IP
2	Data link	Network access (usually Ethernet)
1	Physical	

MQTT: The solution?

- Message Queue Telemetry Transport?
- Invented by IBM & Arcom in 1999
- Sits on top of TCP/IP
- OASIS standard
- Why is it better: HTTPS vs MQTT on 3G
 - 93x faster throughput
 - 11.89x less battery to send
 - 170.9x less battery to receive
 - 1/2 as much power to keep connection open
 - 8x less network overhead

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MQTT: Overview

- pub/sub model
 - One to many
 - Independent clients
- Lightweight protocol
- Simple to implement
- Data Agnostic
- Continuous Session Awareness
- Provide a Quality of Service Data Delivery



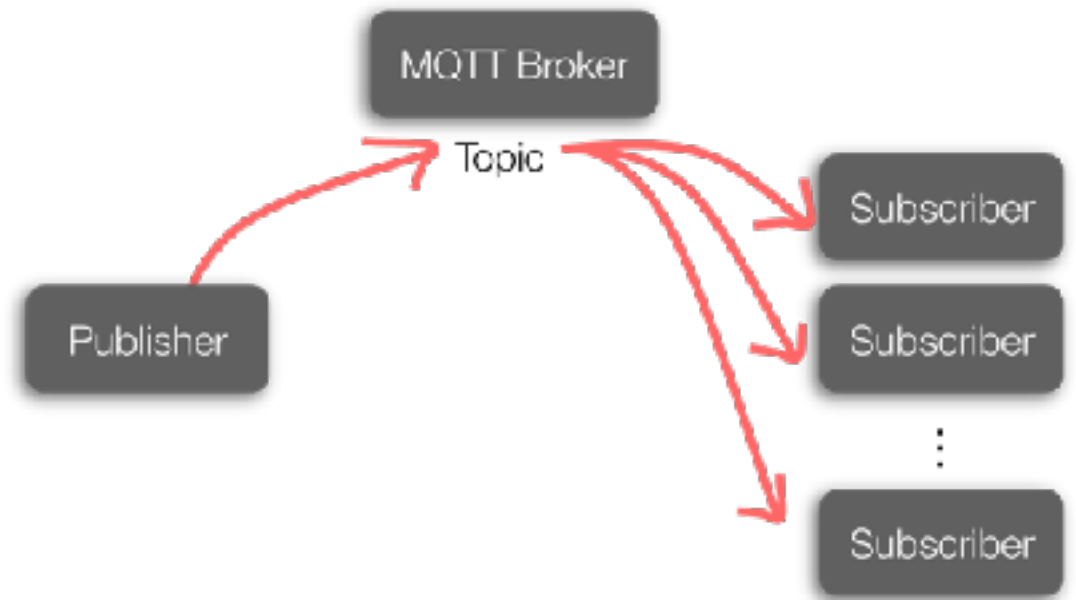
MQTT: Overview (continued)

- Elements

- Broker
- Publishers
- Subscribers

- MQTT in production

- Network level (VPNs, ...)
- Transport level (TLS, Client cert authentication)
- Application level (Authentication, authorization)



What does that have to do with JavaScript?

- Why JavaScript?
 - High performance
 - Fast application development
 - Vibrant community
 - ie: LinkedIn moved from Rails to NodeJS and reduced the number of servers from 30 to 3 and the new system was up to 20x faster
- Node.js brokers
 - Mosca
 - Aedes
- JavaScript clients: MQTT.js



Demo

- Part 1: Aedes + MQTT.js
- Part 2: “Real world” application



Thank you!

- Code and presentation will be available soon

- Sources:

- (1): <http://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT>
- <http://www.goodworklabs.com/12-facts-worth-knowing-about-the-internet-of-things-or-iot/>
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- http://mcollina.github.io/mqtt_and_nodejs
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- <http://es.memegenerator.net>

