Putting the Internet back into IoT

Or how you should / should not use the cloud
Let us lay some ground works…
What most “home” networks look like:

- Firewall
  - Main Network
  - Wireless Guest
More Groundwork: IoT devices
Typical ways devices connect to the Internet

- Through a Gateway:
  - Bluetooth
  - Z-wave
  - 802.11.6
  - Zigbee
  - IR
  - Smoke Signals
  - Carrier Pigeons

- Directly:
  - Wifi
  - Ethernet

- Using:
  - IPv4
  - IPv6
Let's come back to this for a minute to talk about IPv4 vs. IPv6.
Local Access vs. Remote Access

- IPv4 - Local
  - Direct Access
  - Straight Forward
  - Mostly ubiquitous support

- IPv4 - Remote
  - NAT traversal
  - Punching holes in firewalls
  - Port Forwarding
  - UPNP
  - Cloud reverse proxies

- IPv6 - Local
  - Direct Access
  - Straight Forward
  - Getting more ubiquitous but not there

- IPv6 - Remote
  - Direct Access
  - Punching holes in firewalls
  - UPNP
  - Cloud based IP lookup (and/or reverse proxies)
Some general words of caution...

- Think about what you are using the Internet for
- Be mindful of where your services live
- Sometimes UX the user can use may make you less secure
- Always change the default passwords!
- Make it possible to do things without auto-discovery
- Don’t always assume you are on the same network as the device
- Upgrade schemes need to be done
Shifting gears & talk about how to talk to the devices

But the real advantage to IoT is the I - Internet!

Lots of good ways to do this…

- MQTT
- Liota
- AMQP
- STOMP
- RabbitMQ
- REST
- WAMP
- ZeroMQ
- Java Message Service (JMS)
- CoAP
- CLOUD!
- XMPP-IOT
- XMPP
- etc…..

https://xkcd.com/927/
- CC-BY-NC 2.5
Now lets talk about something to try

- MQTT - Mosquitto, MQTT broker, good for local passing of data
- Think of it as a message bus on the network
- Clients Subscribe to Topics that can be hierarchical, and listen to the Topic
  - /myhome/groundfloor/livingroom/temperature for example
  - You can listen at any level of the hierarchy, anything below your level will be filtered to you
  - Wildcards, +, are allowed /myhome/+/*/temperature
- Devices Publish data to topics
  - The data is freeform, the receiving end is expected to interpret it
Lets just try listening...

On your laptop/VM:

yum install mosquitto

apt-get install mosquitto-clients

then

mosquitto_sub \
  -h 10.111.0.5 \
  -t "pugnose/temp/core0" \
  -u "ale" \
  -P "Penguins"

Expected output:

+67.0°C

What’s running on “pugnose”:

while [[ 1 ]];do \
  mosquitto_pub \
    -h 10.111.0.5 \
    -t "pugnose/temp/core0" \
    -m "$( \n      sensors | \
      grep "Core 0" | \n      tr " " "\n" | \n      grep "°" | \n      head -n 1 \n    )" \
    -u "ale" \
    -P "Penguins"; \
  sleep 10;\n  done
Next Up, adding the Raspberry Pi

Server Side:

● MQTT server
  ○ Mosquitto
  ○ Default config w/ username/password set

Client Side

● apt-get install mosquitto mosquitto-clients

● On your laptop / VM / not the Raspberry Pi
  ○ `mosquitto_sub \
    -h 10.111.0.5 \
    -t "topic_name" \
    -u "ale" \
    -P "Penguins"

● On the Raspberry Pi
  ○ `while [[ 1 ]];do \
    mosquitto_pub \
    -h 10.111.0.5 \
    -t "topic_name" \
    -m "hello world" \
    -u "ale" \
    -P "Penguins"; \
    sleep 10;\n    done`
What this is doing:

The MQTT broker is passing published messages (mosquitto_pub) to subscribed (mosquitto_sub) clients.
What this is doing:
The MQTT broker is passing published messages (mosquitto_pub) to subscribed (mosquitto_sub) clients.

mosquitto_sub \ <---------- The Command
  -h 10.111.0.5 \ <---- The (-h)ost
  -t "topic_name" \ <-- The (-t)opic
  -u "ale" \ <-------- The (-u)sername
  -P "Penguins" \ <------ The (-P)assword

Output:

hello world

mosquitto_pub \ <---------- The Command
  -h 10.111.0.5 \ <---- The (-h)ost
  -t "topic_name" \ <-- The (-t)opic
  -m "hello world" \ <- The (-m)essage
  -u "ale" \ <-------- The (-u)sername
  -P "Penguins" \ <------ The (-P)assword

Output:

<none unless error>
So Let’s try this:

**Laptop:**
mosquitto_sub \
  -h 10.111.0.5 \ 
  -t “ale/<your name no spaces>/test” \ 
  -u "ale" \ 
  -P "Penguins"

Output:

hello world

**Raspberry Pi:**
mosquitto_pub \
  -h 10.111.0.5 \ 
  -t “ale/<your name no spaces>/test” \ 
  -m "hello world" \ 
  -u "ale" \ 
  -P "Penguins"

Output:

<none unless error>