

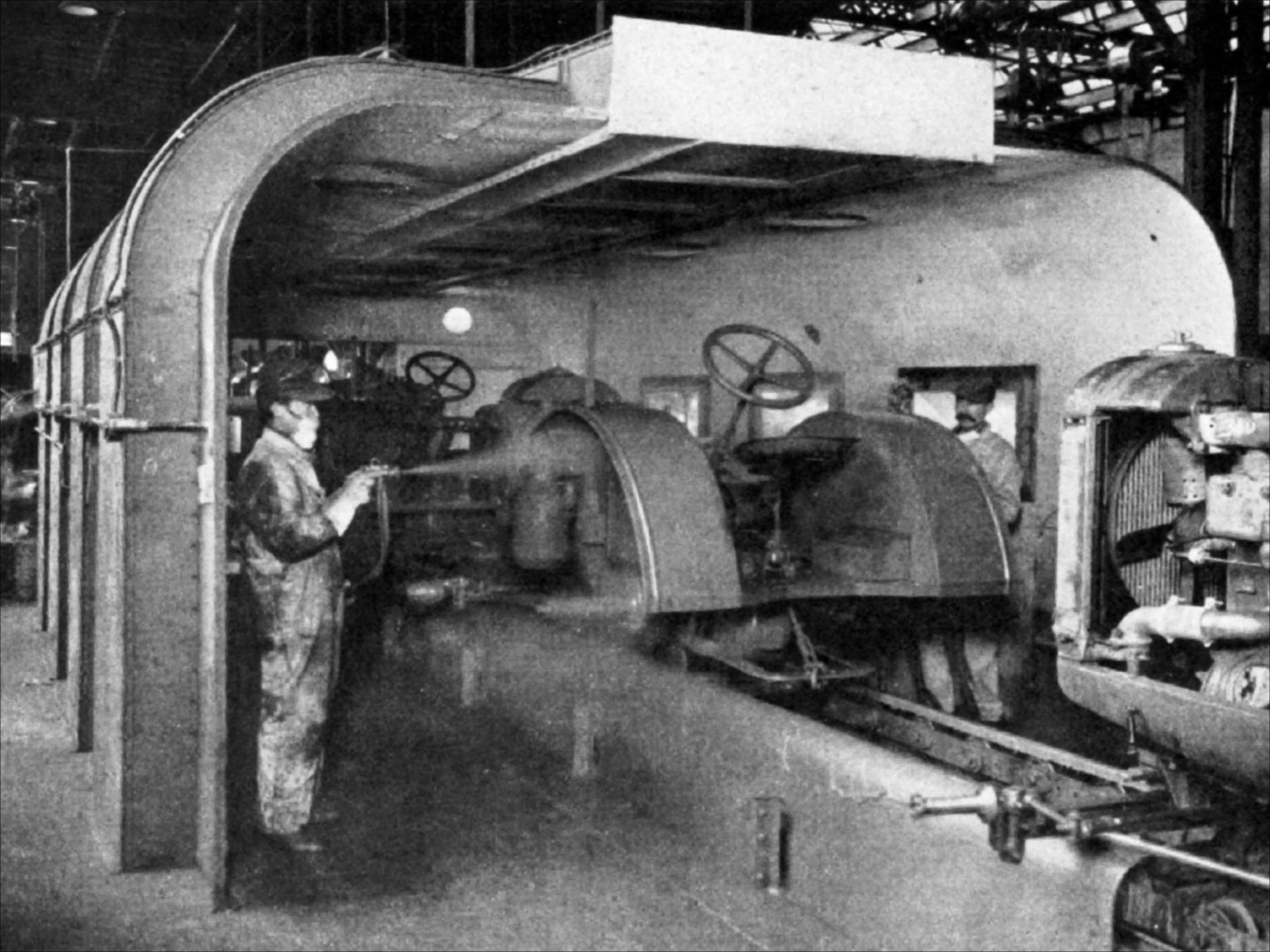


ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



Making your Washing Machine Talk with a Power Plant


@matteocollina





**What was the greatest
invention of the Industrial
Revolution?**

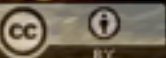
Washing Machines

- 
- We all need laundry
 - 10% jobs destroyed
 - Women were freed from their laundry, and can now have a job
 - Watch this awesome TED talk by Hans Rosling.

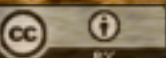
What form of energy would you choose?



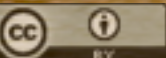
<http://www.flickr.com/photos/jalte/1687116108>



<http://www.flickr.com/photos/mikeweston/1462086624>



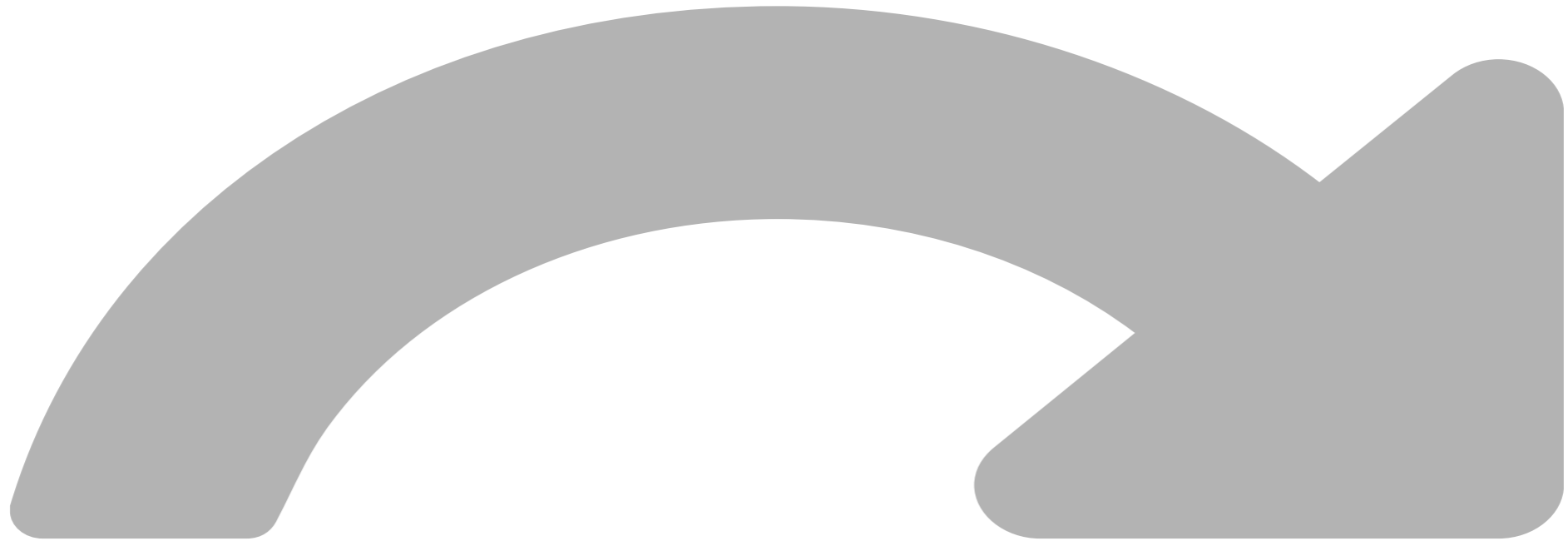
<http://www.flickr.com/photos/tommy-ironic/3437613067>



Would you postpone your laundry to use a different energy source?







Let's connect all the things!





Pidgeons are ~~not~~ a
communcation
protocol

See RFC 1149



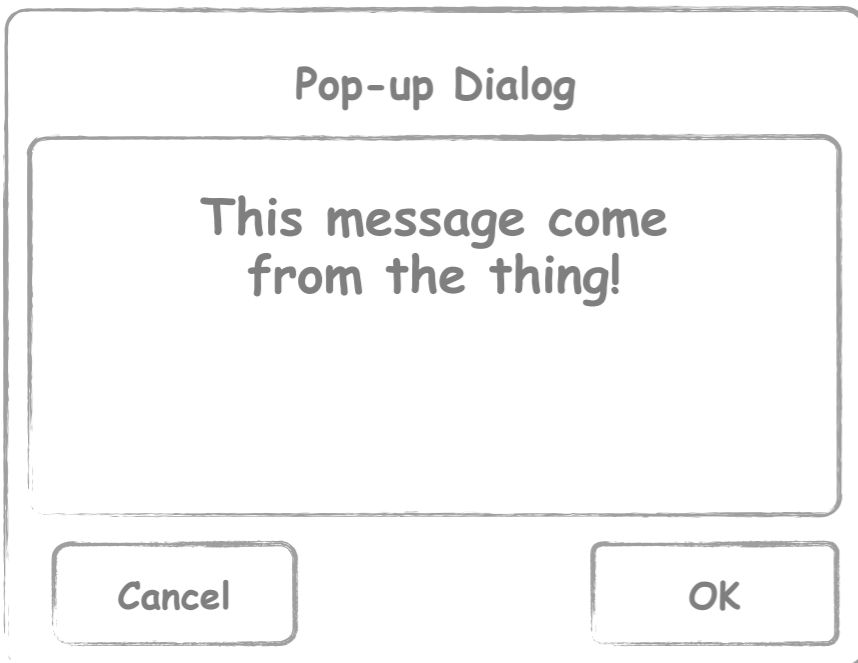
WORLD

IPV6

LAUNCH



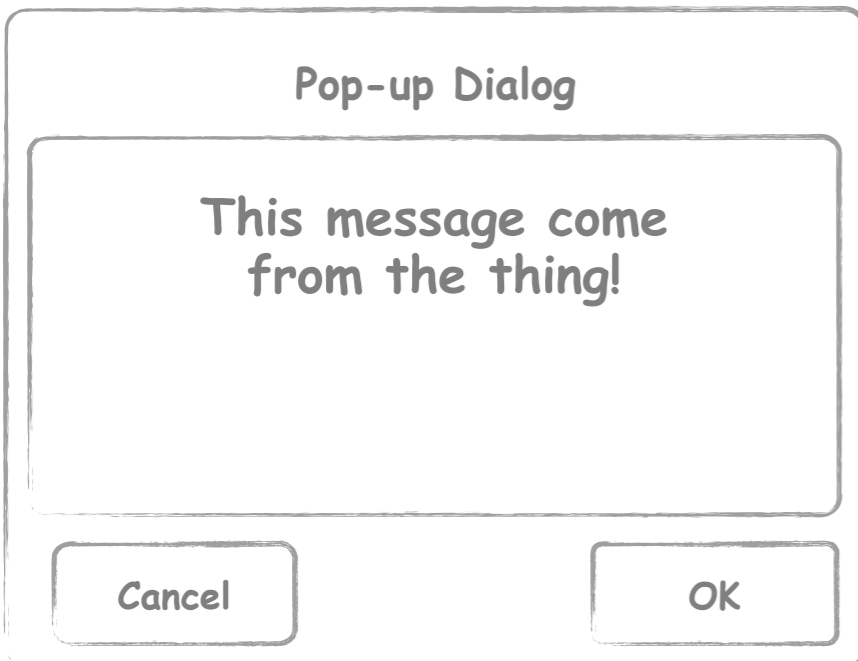
A new communication paradigm



We code a program that reacts to real-world events



A new communication paradigm



We want to receive
live data from the things



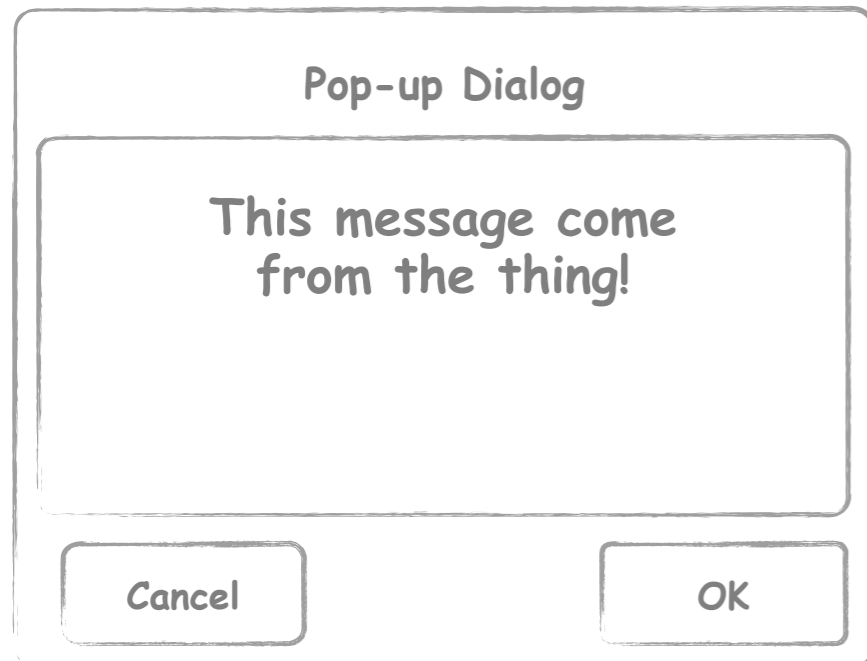
A new communication paradigm

Publish

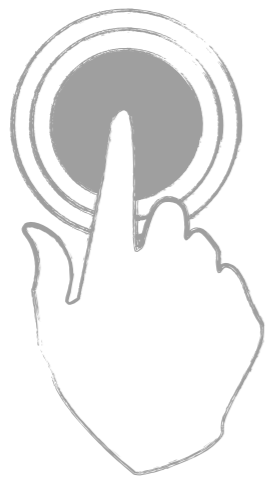


Publish

How can we know which user should be notified?



A new communication paradigm



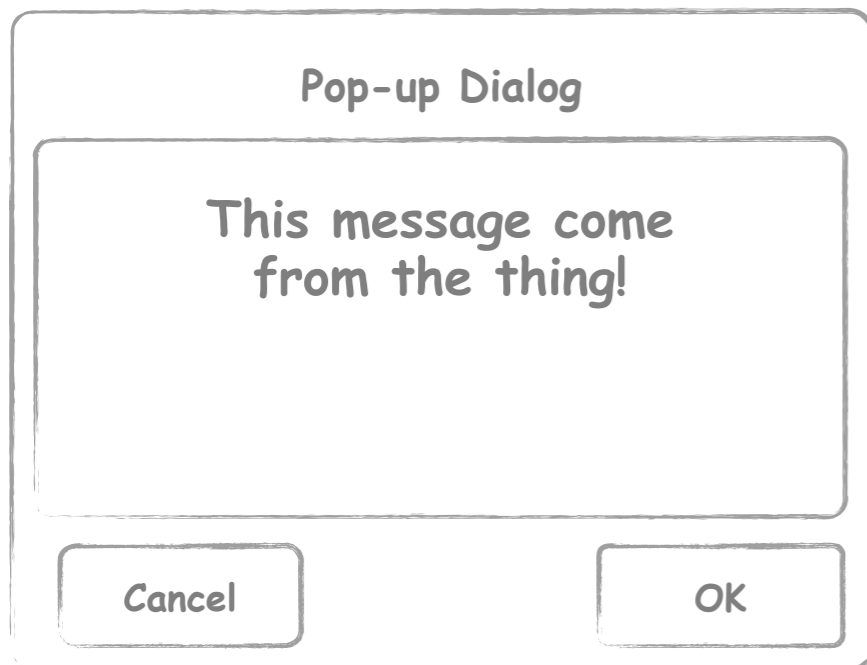
Tap



Subscribe

Publish

Publish



Problems

Developing IoT applications is hard for the developer. Why?



1. Application Protocols
2. Data Formats
3. Device Identification and Privacy

Problems

Application Open Protocols

	Pattern	Live Updates	Format	Transport
HTTP	REST	with custom protocol over Websocket	textual with binary support	TCP
CoAP	REST	with observe spec	binary	UDP
MQTT	Pub/Sub	Yes	binary	TCP

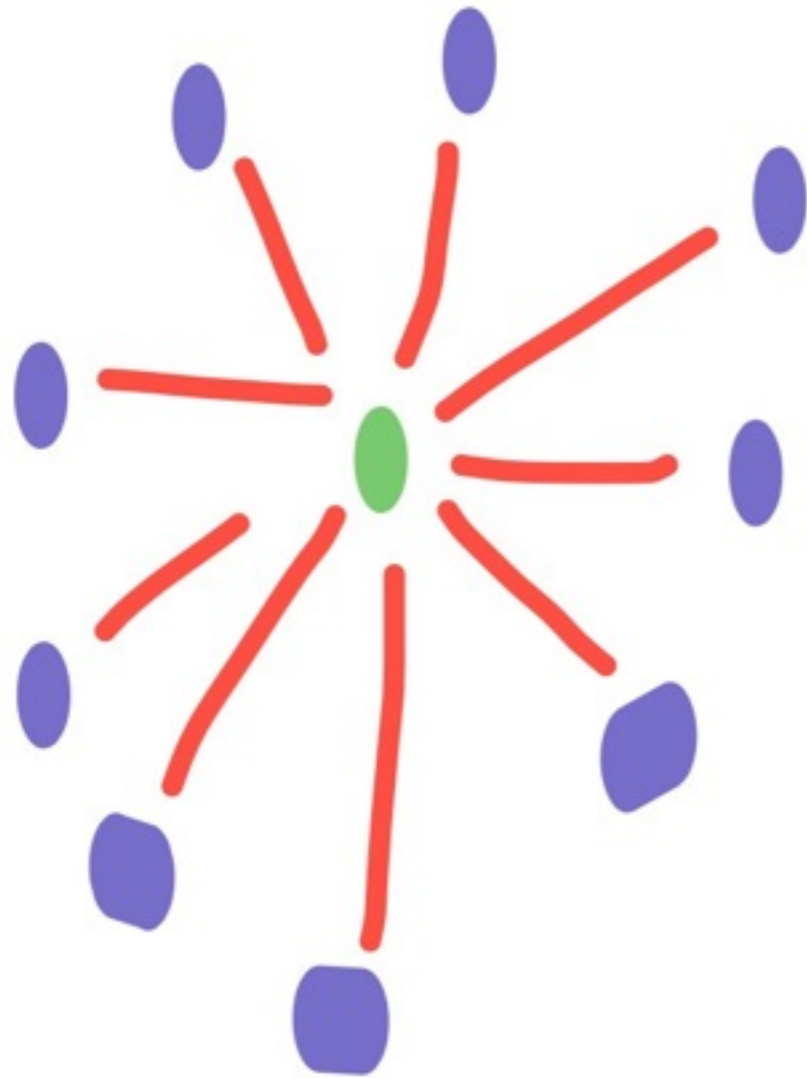


CoAP

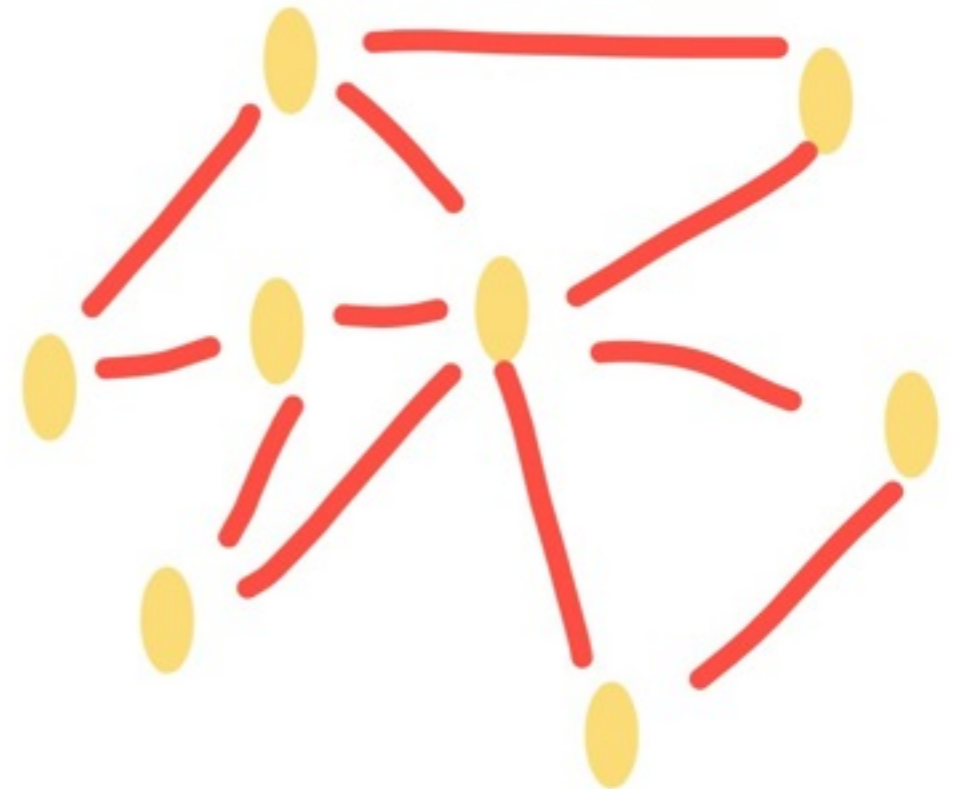
- Developed by IBM, in standardization at OASIS
- Various levels of QoS 0, 1, 2
- Offline support
- Retained Messages
- In standardization by the IETF as Constrained Application Protocol (CoAP)
- Optional confirmable messages
- Partial offline support through a proxy
- Multicast support



CoAP



Client/Server Architecture



P2P Architecture

Problems

Data Formats

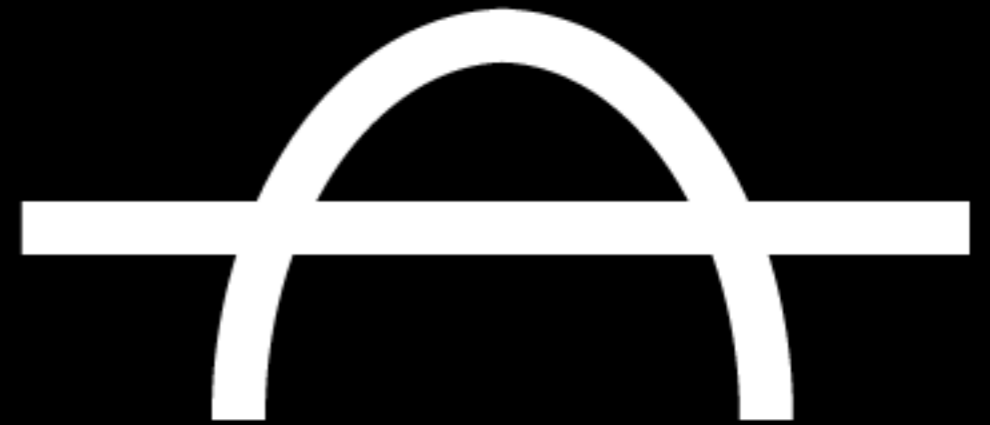
	Encoding	Tipology
XML	textual	Tree-Based, values as strings
EXI	binary	Tree-Based, different data types
N3/RDF	textual	Graph-Based, values as strings
JSON	textual	Object-Oriented, values as strings
MsgPack	binary	Object-Oriented, different data types
ProtoBuf	binary	Object-Oriented, different data types
Bysant	binary	Object-Oriented, different data types
BSON	binary	Object-Oriented, different data types

Problems


Device Identification & Privacy

- What devices can a user monitor?
- What devices can 'listen' to the state of other devices?
- Who can access the devices state?
- Is the communication secure?

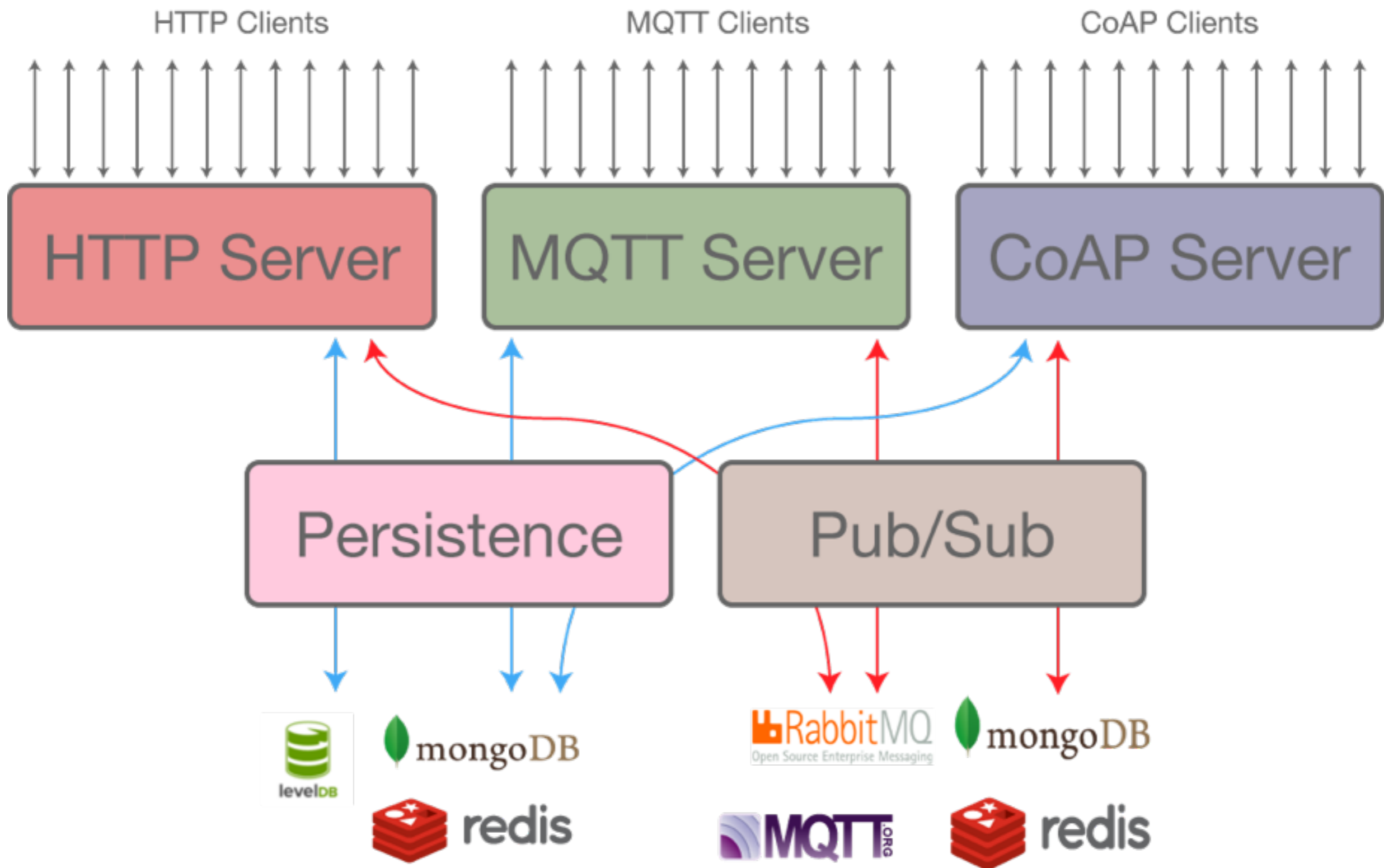
ponte
Connecting Things to Developers



<http://eclipse.org/ponte>

An aerial night photograph of a city skyline. The central focus is a tall, modern skyscraper with a distinctive tiered top, illuminated with white and blue lights. To its right, another tall building with a curved top is lit up. The foreground shows a large, brightly lit plaza with a fountain and a curved walkway. A river or canal flows along the right side of the image, reflecting the city lights. The overall scene is vibrant and modern.

We want to bring
developers to the
(real) world.

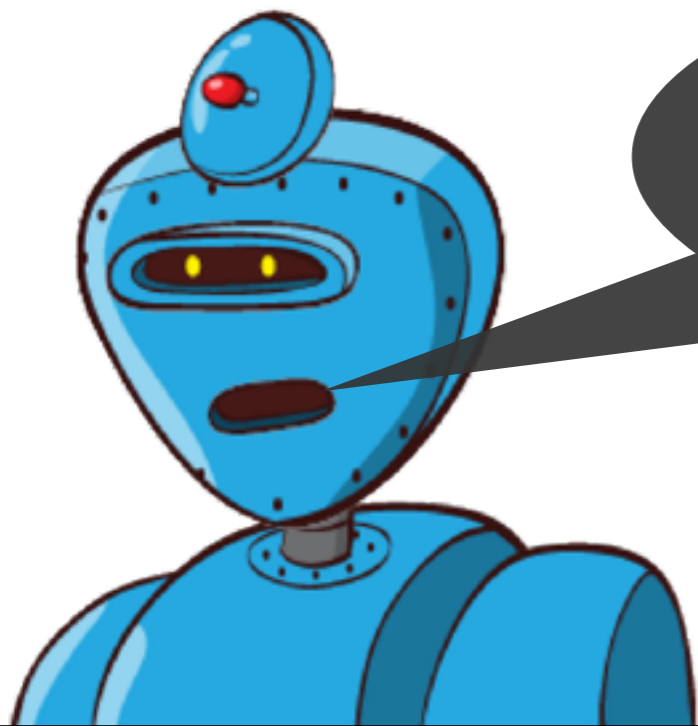


API

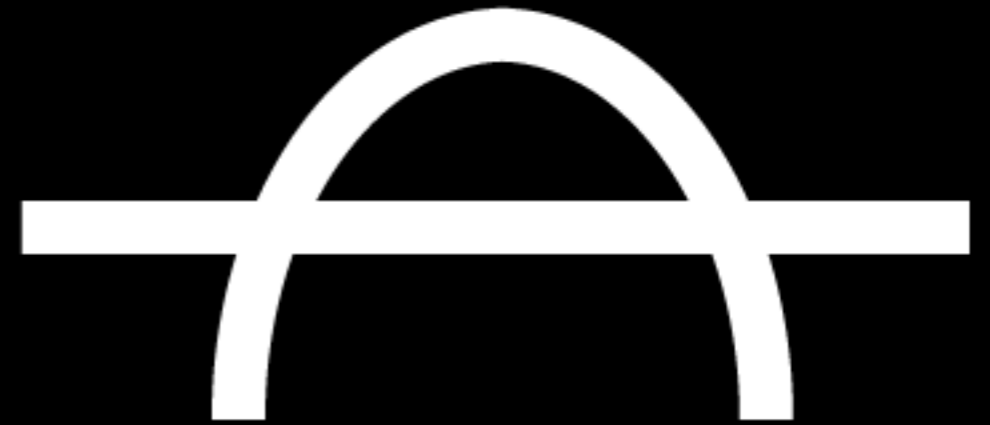
`http(s)://<your ponte>/resources/<your thing>`

`coap://<your ponte>/r/<your thing>`

`mqtt(s)://<your ponte>/<your thing>`



Use retained messages in MQTT



Internals

1. key-value store for latest data lookup
2. publish-subscribe with wildcards
3. storing and forwarding offline updates



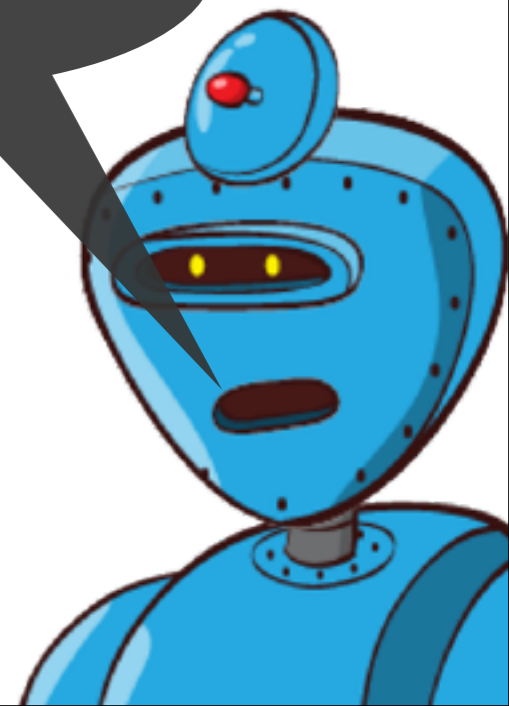
Data Formats

- Binary
- Textual
- Semantic



Automatic
conversion

with semantic





One format to rule them all

JSON-LD

- Full support for RDF and graph data
- Developer friendly
- Convertible to XML, MsgPack, Bysant, BSON.
- schema.org initiative for the IoT?

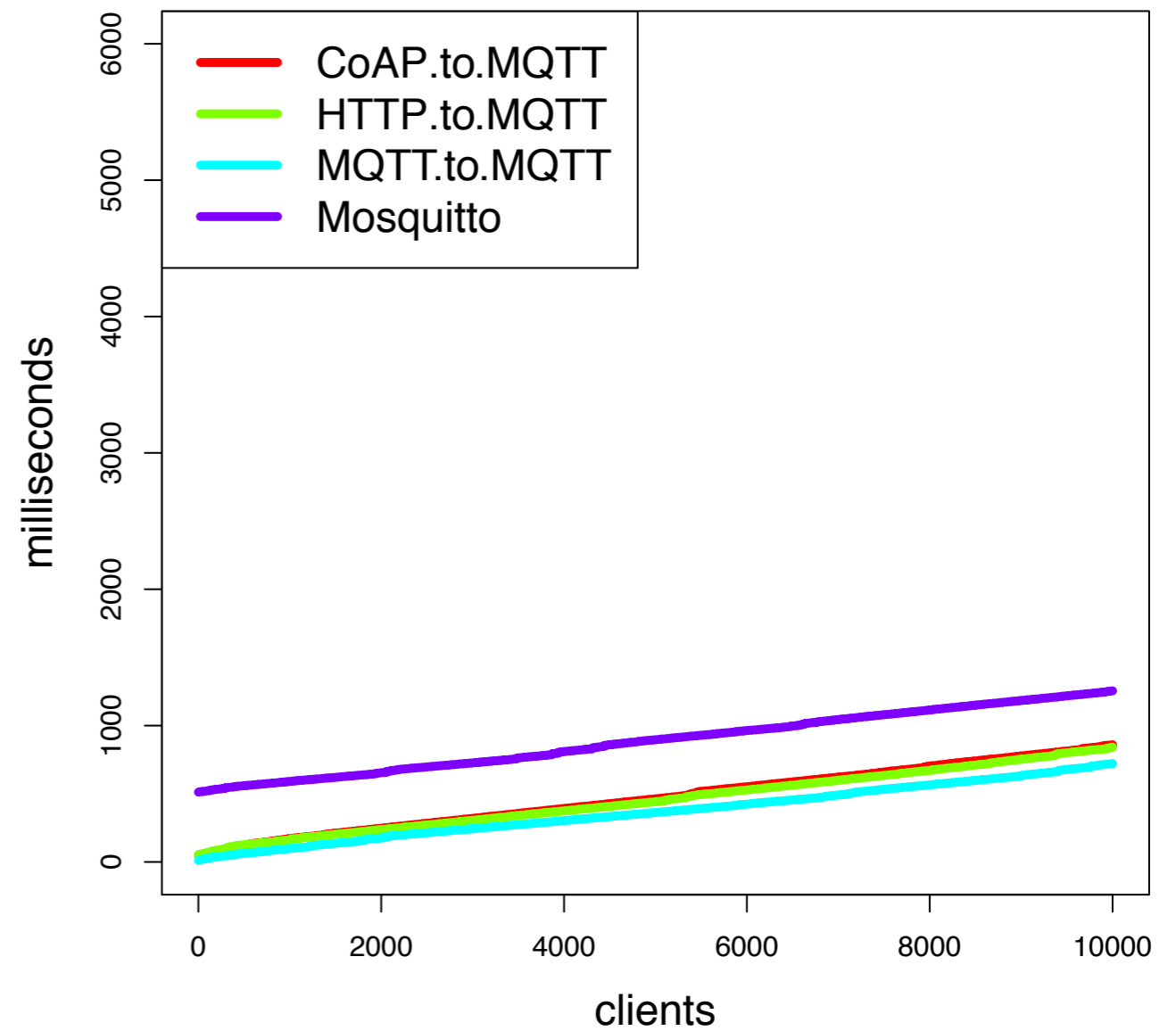
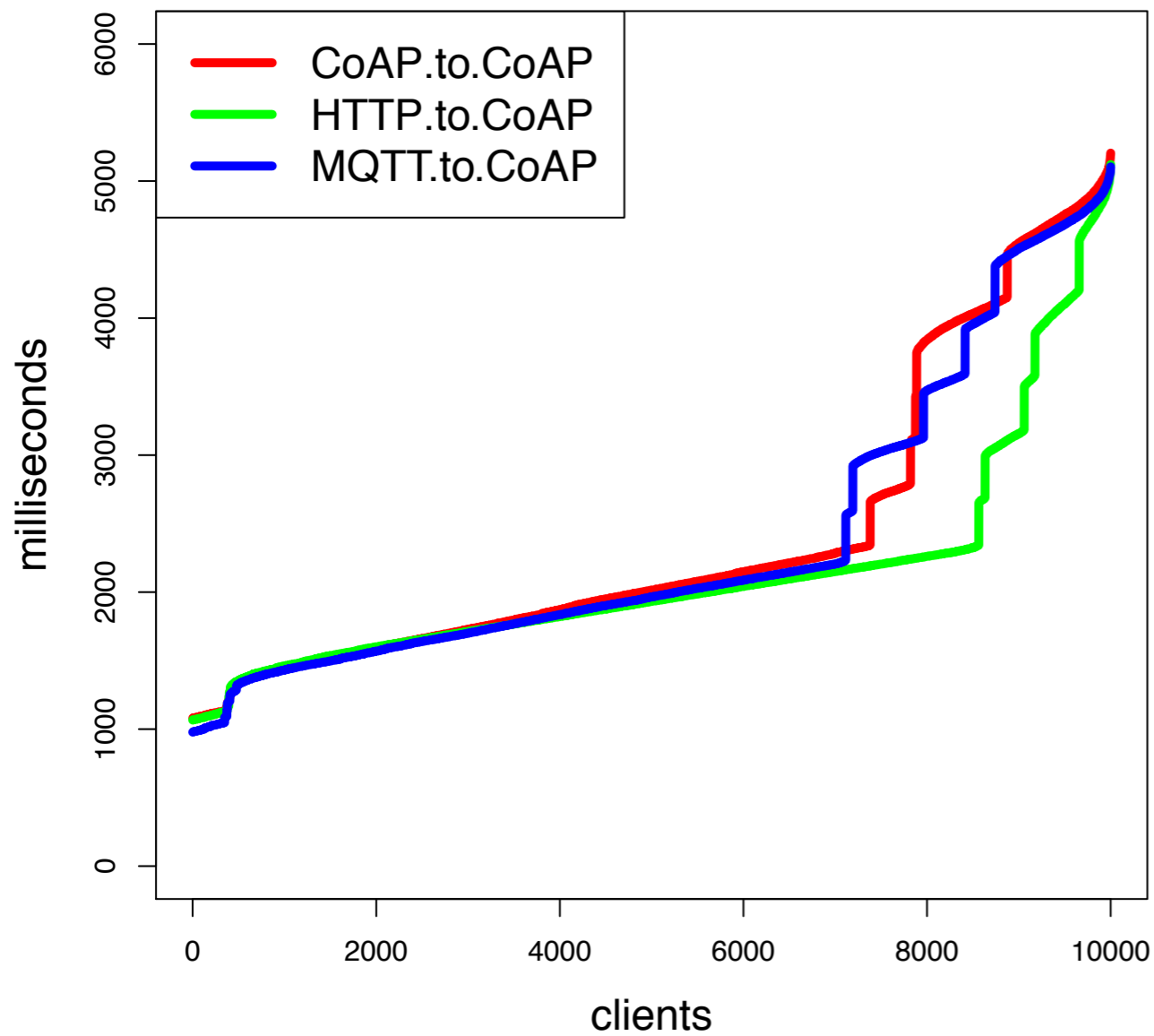
```
{
  "@context": {
    "name": "http://xmlns.com/foaf/0.1/name",
    "homepage": {
      "@id": "http://xmlns.com/foaf/0.1/homepage",
      "@type": "@id"
    }
  },
  "homepage": "http://manu.sporny.org/",
  "name": "Manu Sporny"
}
```

ponte's pillars

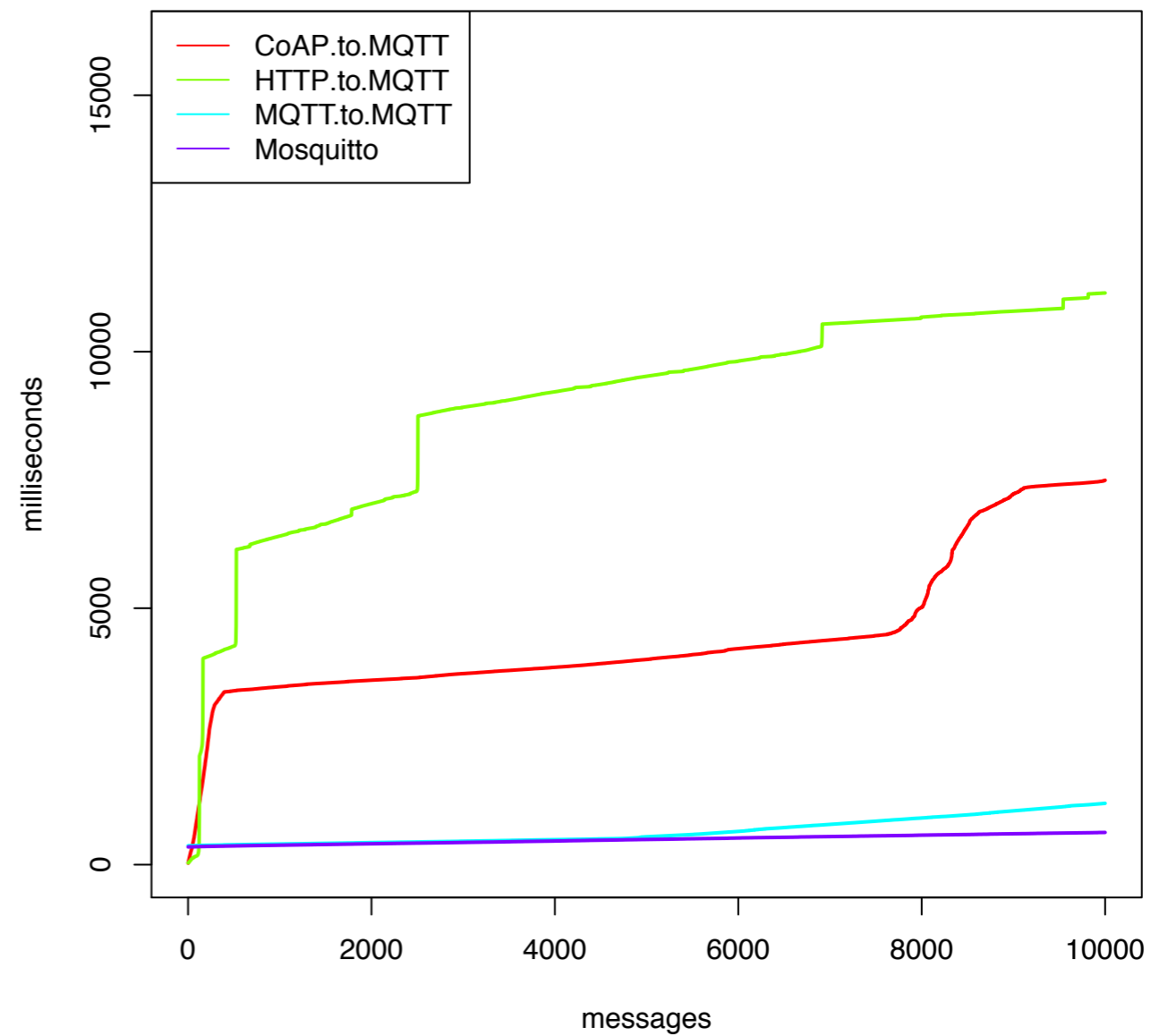
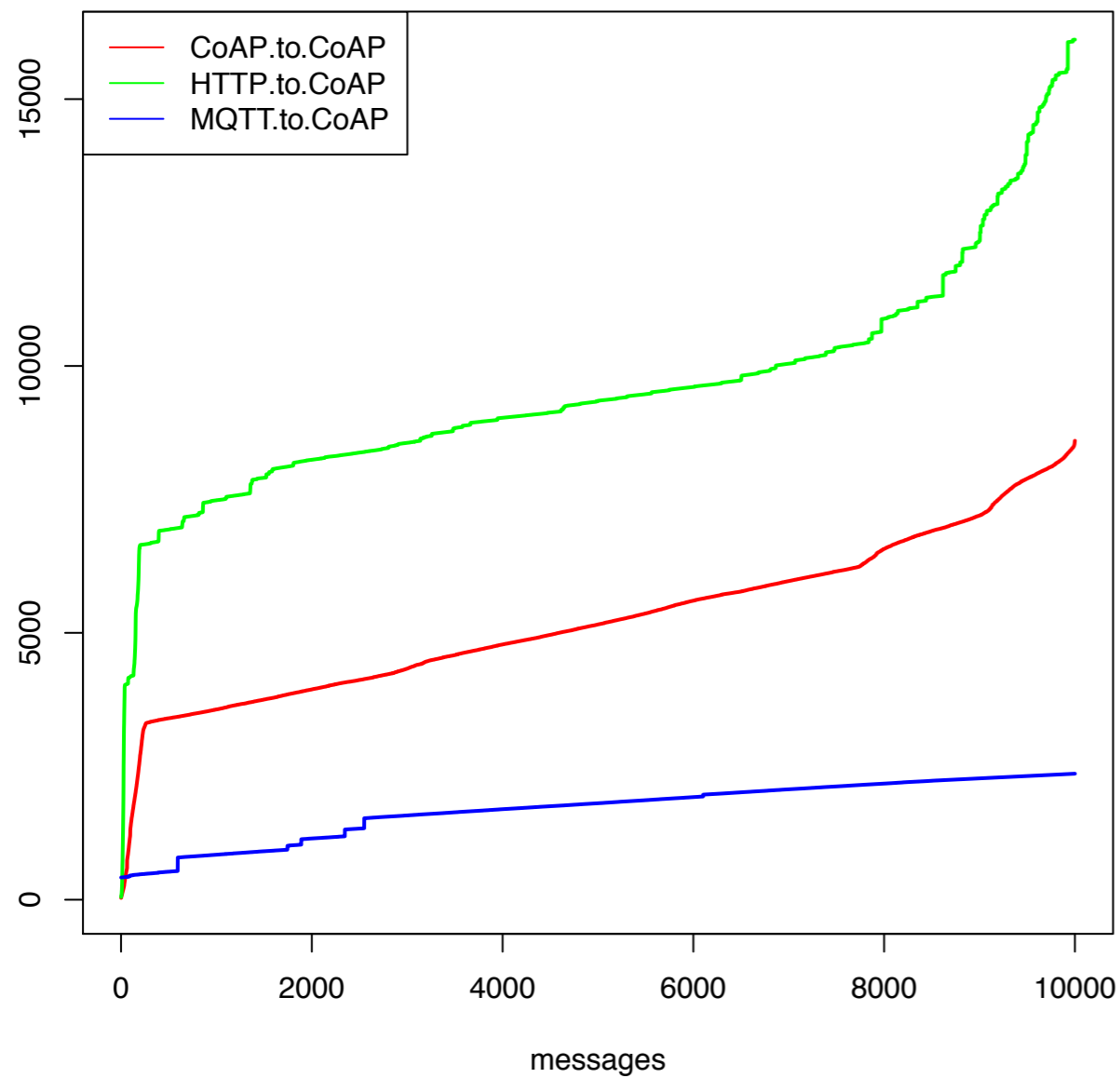


- **Ascoltatori**, the pub/sub library for node backed by every broker out there! npm.im/ascoltatori
- **Mosca**, the multi-transport MQTT broker for node.js. npm.im/mosca
- **MQTT.js**, the MQTT library for node: npm.im/mqtt
- **Node-CoAP**, the CoAP library for node: npm.im/coap

One to 10k clients



10k clients to One



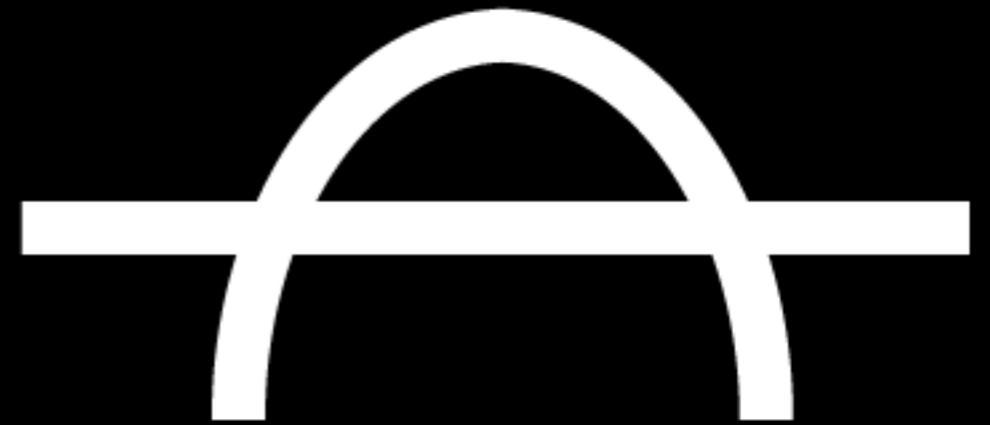
Todo List

- ~~Develop a multiprocol broker and bridge~~
- Official Eclipse Release
- JSON-LD based data format
- Device Identification & Privacy

DEMO!

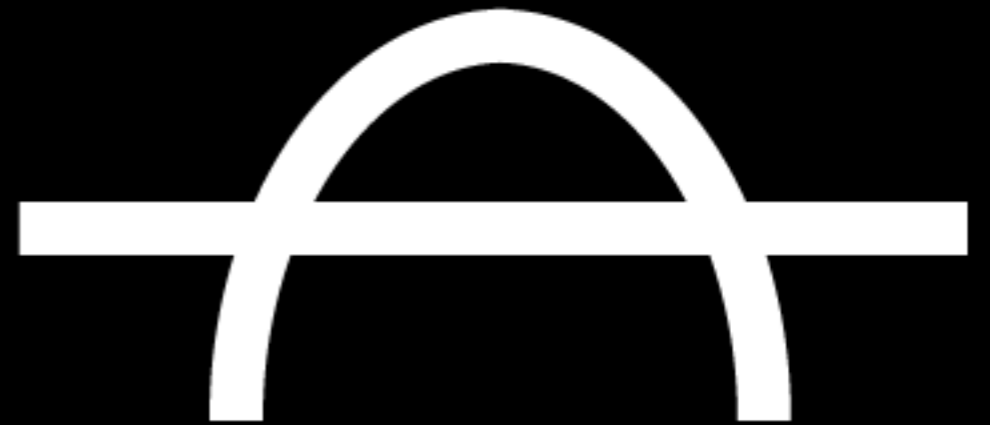


ponte
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<http://eclipse.org/ponte>

ponte
Connecting Things to Developers



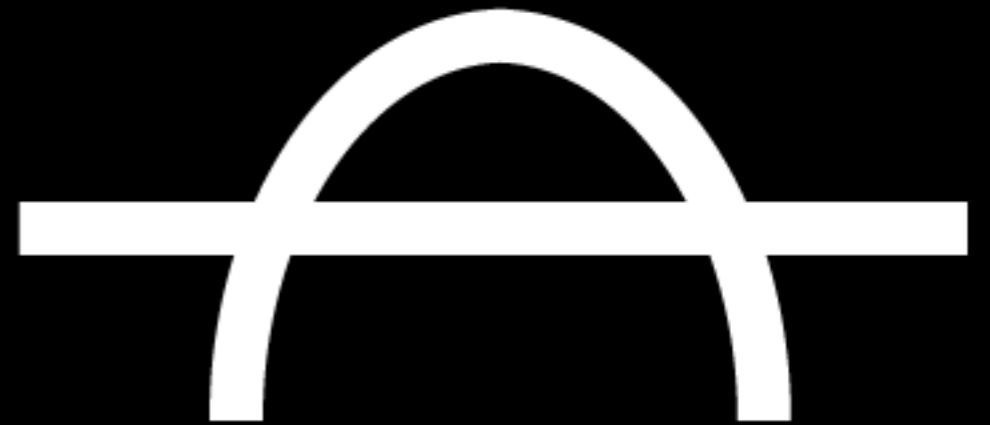
Install it:

```
$ npm install ponte bunyan -g
```

Run it:

```
$ ponte -v | bunyan
```

ponte
Connecting Things to Developers



...but why?

IoT development happens in silos



A photograph of the Golden Gate Bridge in San Francisco at dusk. The bridge's towers and suspension cables are illuminated with warm lights, contrasting with the cool blue and purple tones of the twilight sky. The city lights of San Francisco are visible in the background across the water.

Build a Ponte between them!

(Ponte means Bridge in Italian :))





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http://matteocollina.com
Joined on Feb 05, 2009

176 followers
2.1k starred
195 following

Organizations



Contributions

Repositories

Public Activity

+ Follow

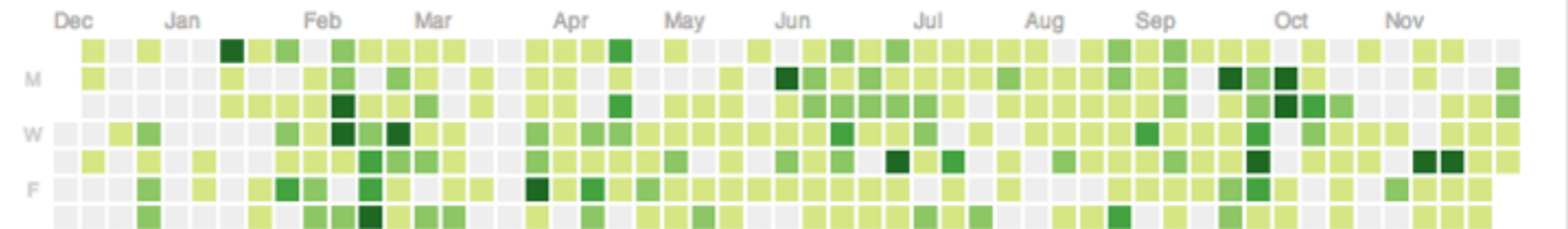
Popular repositories

levelgraph Graph database built on top of LevelUP ...	190 ★
mosca The multi-transport MQTT broker for nod...	116 ★
ascoltatori The pub/sub library for node backed by ...	67 ★
qest The Internet of Things broker that loves ...	58 ★
node-erremailer Sending email for each error in your no...	19 ★

Repositories contributed to

adamvr/MQTT.js An MQTT library for node.js	262 ★
rvagg/node-levelup LevelDB - Node.js style	727 ★
maxogden/websocket-stream websockets with the node stream api	91 ★
rvagg/bl Buffer List: collect buffers and access wi...	19 ★
rvagg/node-level-ttl Add a 'ttl' (time-to-live) option to LevelU...	12 ★

Public contributions



Summary of Pull Requests, issues opened and commits. [Learn more.](#) Less More

1,633 Total Dec 12 2012 - Dec 12 2013	18 days June 16 - July 03	4 days December 09 - December 12
Year of Contributions	Longest Streak	Current Streak

GRAZIE!

Monika