

Web of Things API

Owning home automation via HTTP

About myself

Christian Paul

- Open source enthusiast
- Web developer
- Information Security guy
- Working in Vancouver, BC
- Plays with IoT as a hobby



What IoT device to start with?

- Fridge?
- Thermostat?
- Cameras?
- Locks?
- Voice assistants?

VOICE ANALYSIS TO DETECT ALZHEIMER'S DISEASE WITHIN SECONDS

Meet Ludwig, a two-foot-tall robot that can determine whether people are showing symptoms of Alzheimer's disease in less than one minute simply by listening to their voices. Developed by Canadian firm WinterLight Labs, Ludwig uses proprietary voice analysis algorithms to pick up on subtle cues that reveal signs of Alzheimer's, [as reported by The Telegraph](#). The company claims its solution operates at an accuracy rate between 82 percent and 100 percent.

What series to choose?



LIFX



An app for everyThing



Where is the data stored?

Your data stored in many IoT
vendor data centers



Vendor gateways send data to cloud

There is NO CLOUD, just



other people's computers



WORKS WITH
amazon alexa

works with the
Google Assistant

Works with
IFTTT



Data “Takeout” from a TP-Link light bulb

The image shows two side-by-side Windows File Explorer windows. The left window is titled 'Archive.zip' and the right window is titled 'Takeout-20181115T084541Z-I'. Both windows show a list of folders with their respective sizes.

Name	Size
activitycenter	169,3 kB
auth	1,9 kB
data-analytics	909,2 kB
device	805 bytes
notifications	720 bytes
scenes	1,4 kB
userfeedback	3,0 kB

Name	Size
Devices	783 bytes
OAuth Authorizations	30 bytes
Profile	259 bytes

Data export

Start: 2018-02-21






End: 2018-11-07

Duration: 259 days

Events: 1334

- Which colors I liked
- When I was home
- Login times of my phone
- When I went to sleep
- How long I slept
- When my roommate was using the light

Vertical IoT technology stacks

					
<i>Cloud Services</i>	Google/Nest Cloud	Azure IoT	AWS IoT	iCloud	SmartThings Cloud
<i>Application Protocols</i>	Weave	AMQP	MQTT	HomeKit	MQTT
<i>Network Protocols</i>	WiFi/Thread	WiFi	WiFi	WiFi/BLE	WiFi/ZigBee/BLE/Thread
<i>Operating Systems</i>	Android Things	Windows IoT	Linux/AWS Greengrass	iOS	ARTIK

```
5404 {
5405   "eventId": "qImjERdjfqmluwoGjJdIGuPvhiQQtacU",
5406   "event": {
5407     "type": "IOT.DEVICE",
5408     "name": "OFF",
5409     "timestamp": 1537891373626,
5410     "data": "{\"brightness\":5,\"hue\":46,\"saturation\":92,\"temperature\":0,\"typeUri\":",
5411     "source": "local"
5412   },
5413   "device": {
5414     "deviceId": "80125967425B517AE99F43541B6D93DA185BD547",
5415     "deviceType": "IOT.SMARTBULB",
5416     "deviceAlias": "Bedroom",
5417     "deviceModel": "LB130(US)",
5418     "hardwareVersion": "1.0",
5419     "deviceCategory": "lightBulb"
5420   },
5421   "level": 10,
5422   "isNotified": false,
5423   "createdOn": 1537891377138,
5424   "updatedOn": 1537891377138,
5425   "expiresOn": 1545667377
5426 }
```

The issues

- Varying network protocols
- Varying application protocols
- Varying apps per vendor
- Most apps are only available for Android and iOS
- Most apps are only available on the main app stores
- The vendor's cloud stores all events
- Price is high; Resale value is low

Horizontal Web of Things layer



Using existing protocols

Transport

- IP stack
- HTTP
- HTTPS
- HTTP/2
- WebSocket

Best practices and data formats

- Semantic web
- OAuth
- JSON (with JSON Schemas)
- REST API
- WebSocket API
- DNS-SD

What it looks like (simplified)

GET http://192.168.0.31/things

Authorization: Bearer eyJhbGciOiJFUzI1NiR5...

Accept: application/json

What it looks like (simplified)

```
{
  "name": "On/Off Switch",
  "description": "A web connected switch",
  "properties": {
    "on": {
      "title": "On/Off",
      "type": "boolean",
      "description": "Whether the lamp is turned on",
      "links": [{"href": "/things/lamp/properties/on"}]
    }
  }
}
```

Pre-defined things (Mozilla's schema)

OnOffSwitch, MultiLevelSwitch, BinarySensor,
MultiLevelSensor, ColorControl, EnergyMonitor, SmartPlug,
Light, MotionSensor, DoorSensor, TemperatureSensor,
LeakSensor, PushButton, Camera, VideoCamera, Alarm

Source: <https://iot.mozilla.org/schemas/>

Things and controllers



Kitchen Light



DateTime



Bedroom

 Bedroom



Color



On/Off



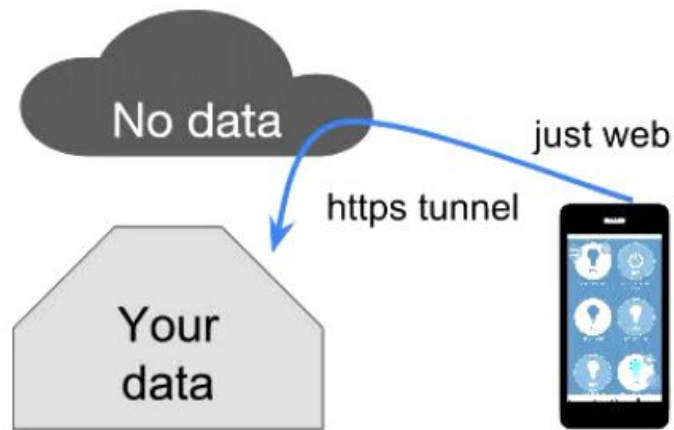
Power

A gateway

Benefits of a gateway

- Easy setup for new controllers
- Manage access
- Bridging local devices
- Bridging protocols
- Automation
- Device monitoring
- Controller built-in
- Remote access

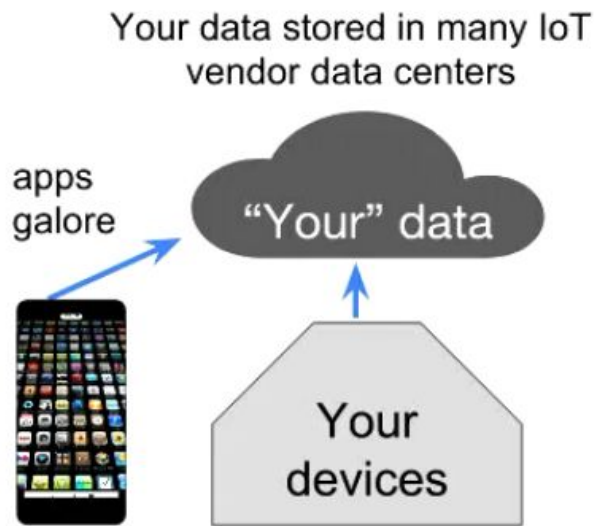
Mozilla's Decentralized WoT Approach Improves Privacy, Security, Interoperability



Mozilla gateway is in your home

Enabling IoT devices to be discoverable on the web

≠



Vendor gateways send data to cloud

Connecting IoT device data to the cloud



moz://a

IoT

Bedroom

My Computer

Intel
CORE i5

ThinkPad



Lights in the morning

If the time of day is 08:30 and DateTime is not
Weekend, set Bedroom On/Off to true





Lights in the morning ✎

If the time of day is 08:30 and DateTime is not Weekend, set Bedroom On/Off to true

Time of day
08 : 30 a.m.

DateTime
Not Weekend

Bedroom
On



Clock



Notification



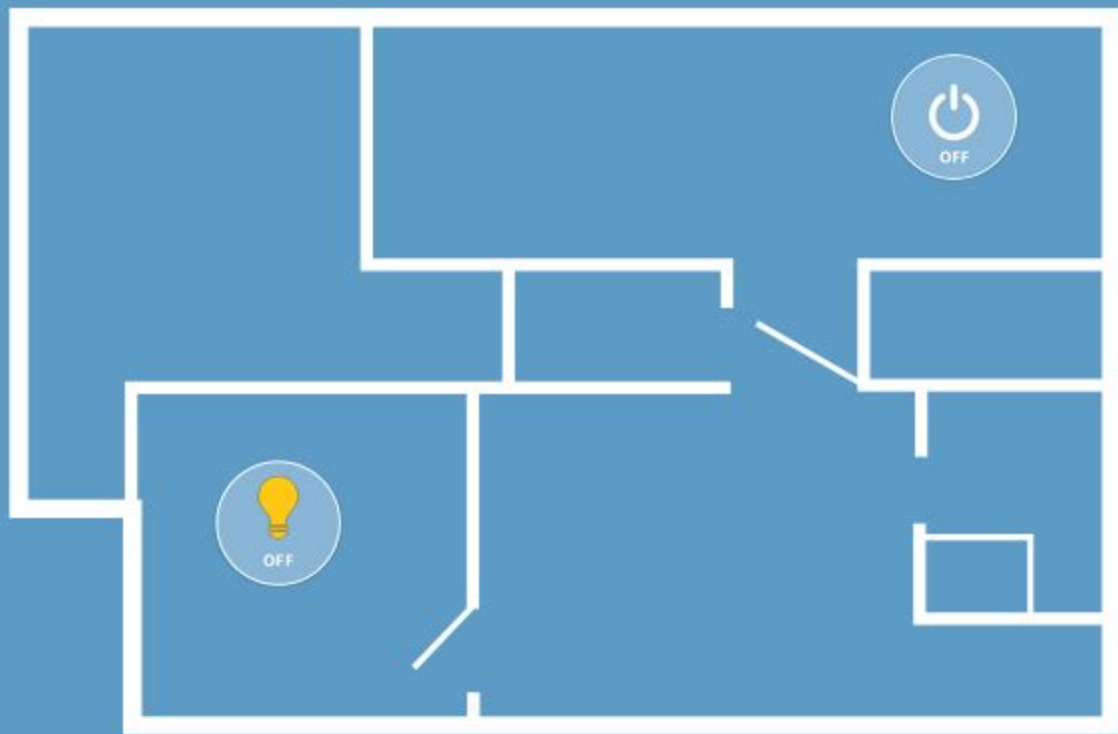
Kitchen Light



DateTime



Bedroom



23h

Turn the Kitchen Light on

OK, turning the kitchen light on.

Turn the Bedroom green.

OK, turning the bedroom green.



How can I help?



Get Involved

Build a Web Thing



Build your own IoT device which uses the Web Thing API

Create an Adapter



Create an adapter add-on to bridge an existing IoT device to the web

Hack on Project Things



Help us develop our Web of Things implementation

Ways to get started

Try out the gateway:

<https://iot.mozilla.org/>

IRC: #iot on Mozilla's IRC Moznet

Thanks for your attention!

My name is Christian Paul and I am a web developer.

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Other ways to contact me: <https://chrpaul.de/about/>

Useful links (and the slides at some point):

https://wiki.chrpaul.de/web_of_things