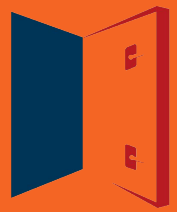
IoT: Internet of things Opportunities and challenges



#CoderBunker

Ricky Ng-Adam <ricky@coderbunker.com>

Ricky Ng-Adam

Founder of Coderbunker

ricky@coderbunker.com

Ricky Ng-Adam

Specialties

- 20 years experience in software development
- Architecture, design, R&D
- Team recruitment, building and coaching
- Javascript, Python, C/C++, bash, plpgsql
- API: REST, Websockets, GraphQL
- Deployment (Linux, Ansible, Cloud, Docker)
- Database (PostgreSQL)

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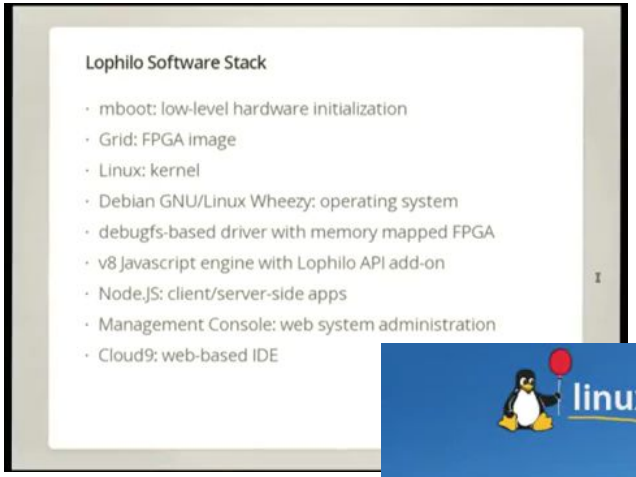
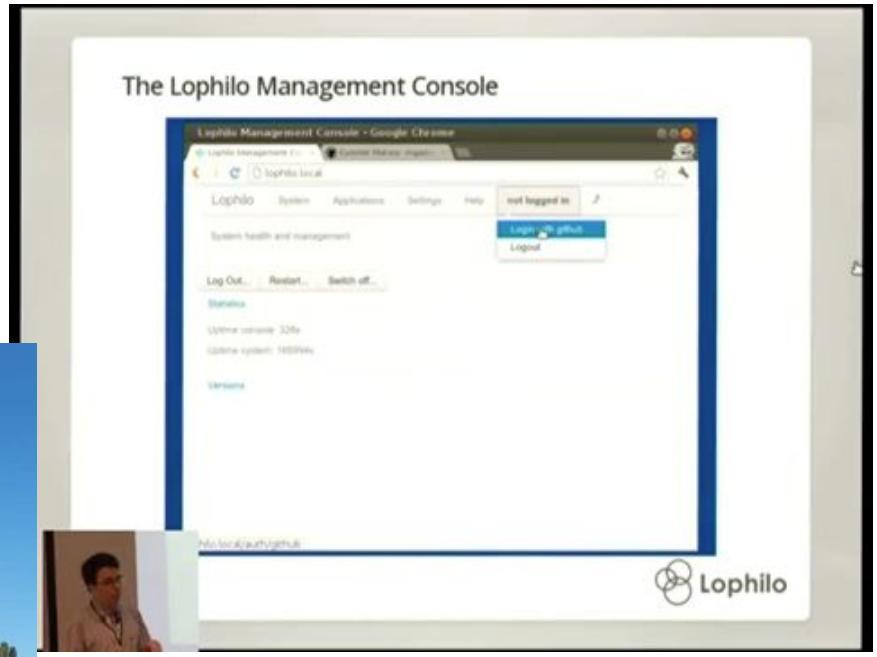




Ricky Ng-Adam's Lophilo, presented at [linux.conf.au 2013]: NodeJS / Linux / ARM + FPGA with web interface... built 2012. Stopped 2013.

Agenda - IoT Opportunities and Challenges

- What is IoT?
- Why should you care?
- Recap of the different subsystems
- What are the challenges?

IoT: Internet of Things

Sensing and controlling

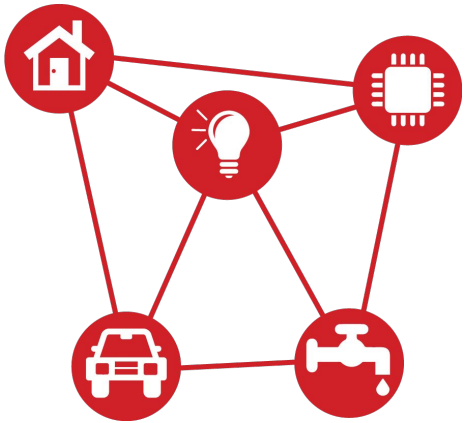
the environment

through Internet connected

devices

IoT: Internet of Things

The Internet of things (IoT) is the internetworking of physical devices, vehicles, buildings, and other items—embedded with electronics, software and network connectivity that enable these objects to collect and exchange data.



Opportunities

IoT: enabler for better, faster, cheaper

- Gain new business insights faster
- Increase efficiency of processes
- Enable just-in-time actions and decisions
- Real-time monitoring of devices
- Protection of assets against misuse and theft
- Opportunities for new, richer user interfaces
- Deeper customer engagement

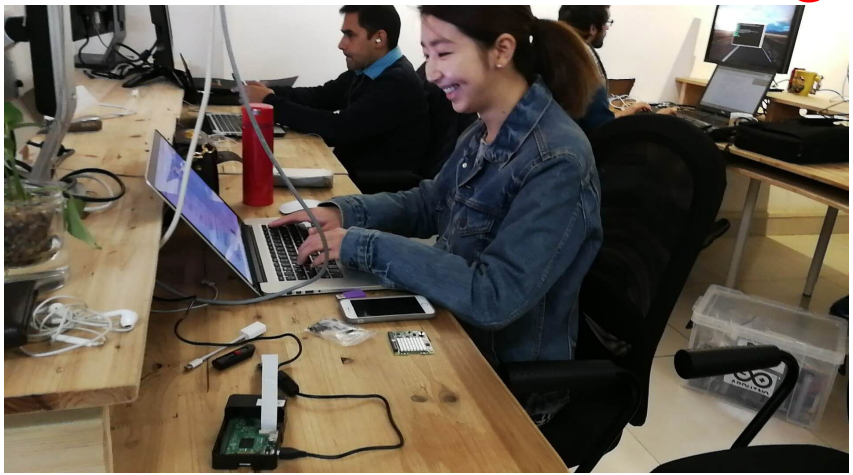
How was the opportunity created?

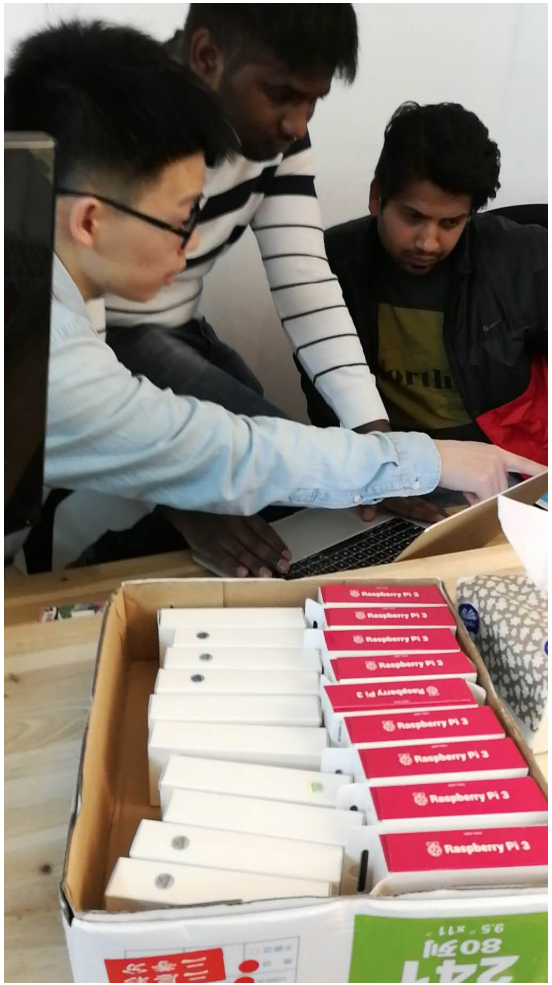
- Data is the future (well, information is)
- Cheap, widespread wireless networks
- Inexpensive “smart” electronics
- Smartphones as mini-computers in our pockets

Example IoT Solution Benefits

- 24H/day remote monitoring and analysis
- Remote control and optimization
- Predictive maintenance

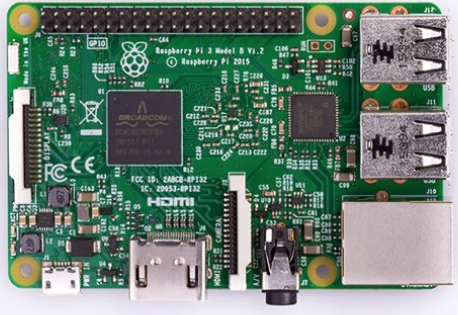
How to build the Internet of Things

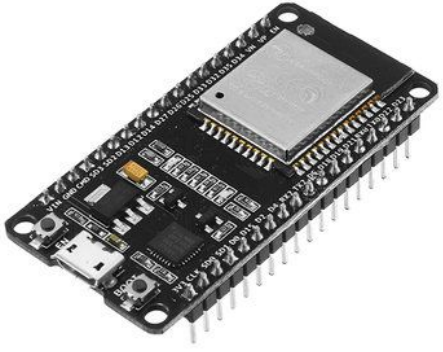




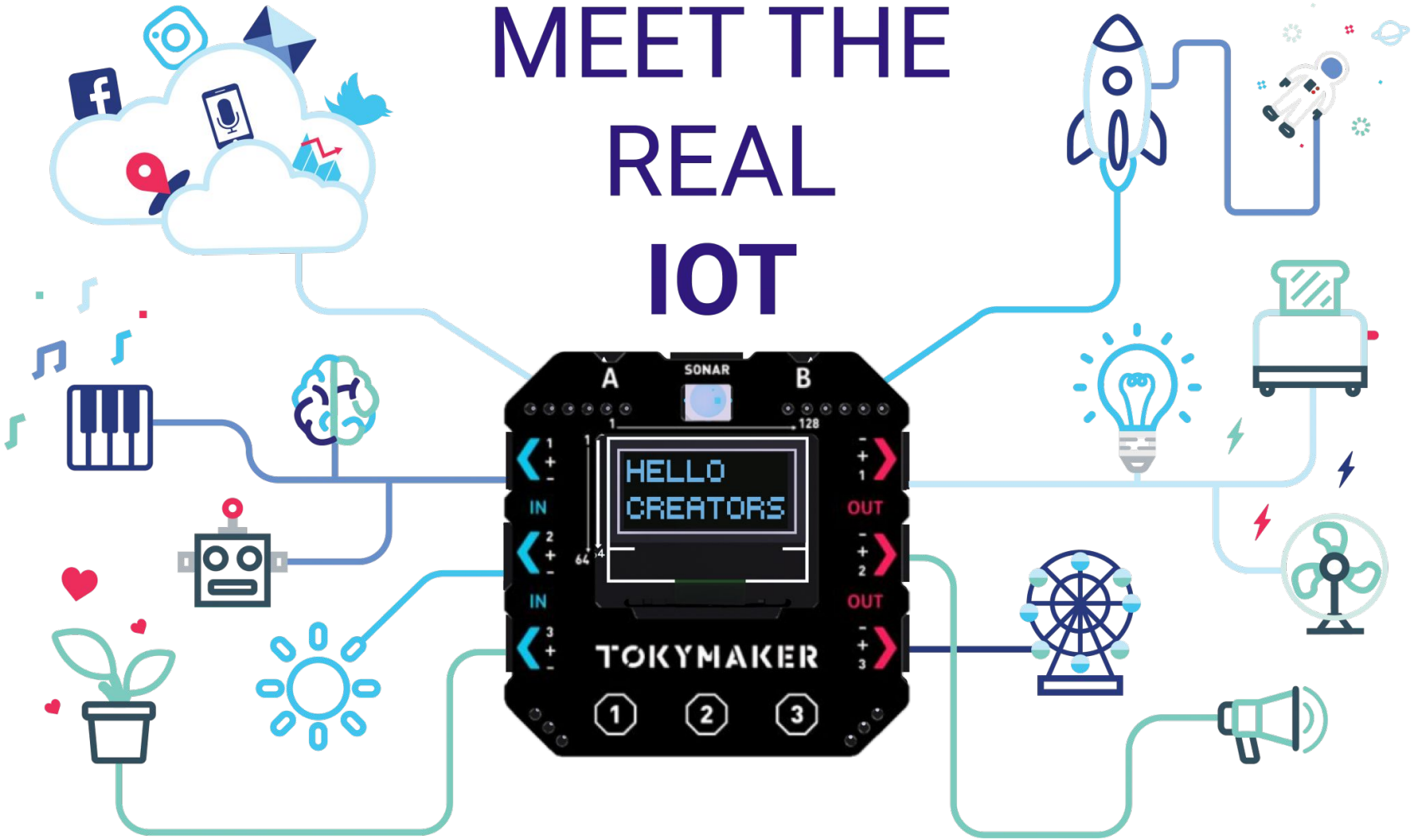

VCC
DATA
GND

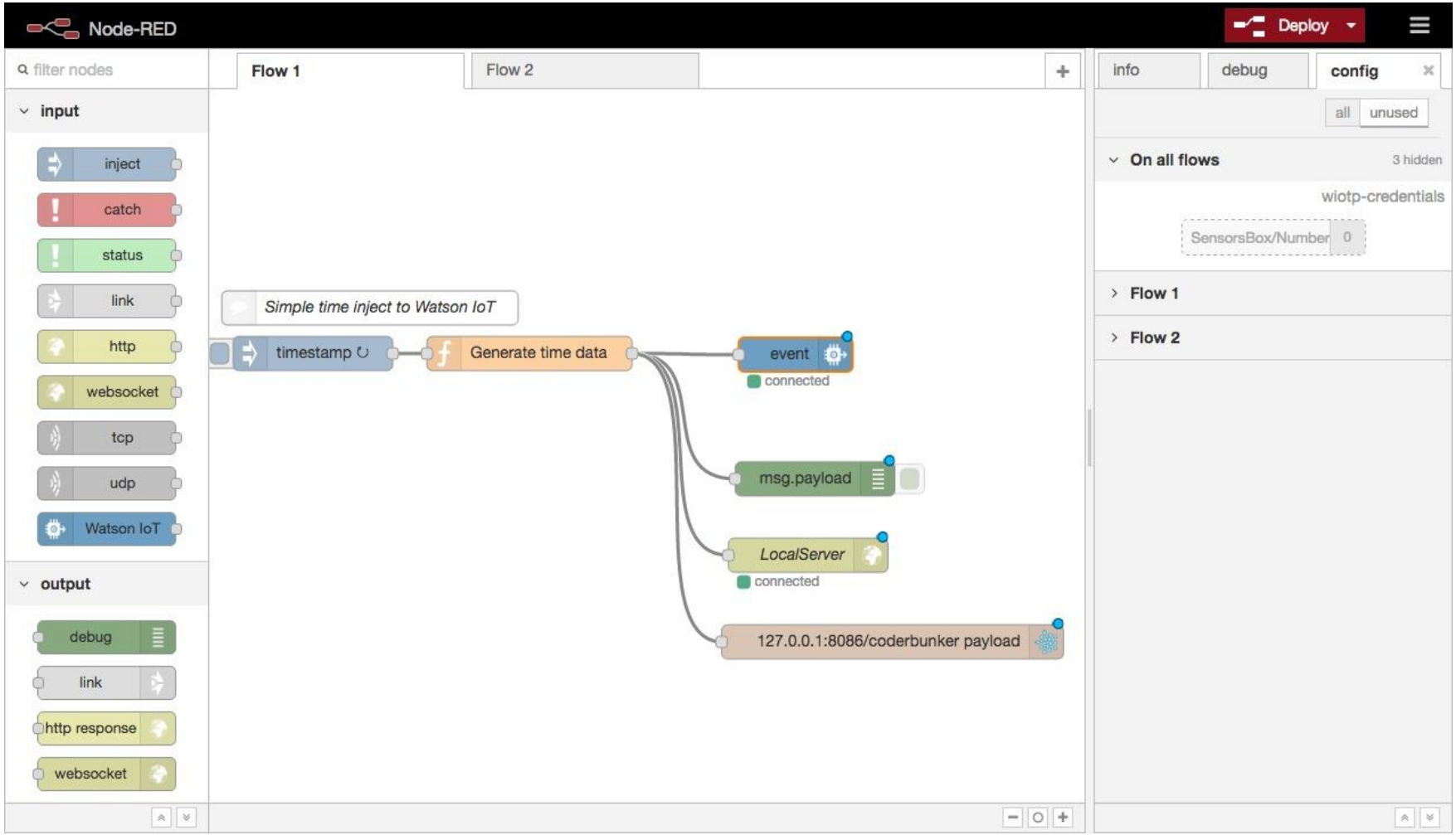

DIGITAL (PWM~)
UNO
ARDUINO
POWER
ANALOG IN

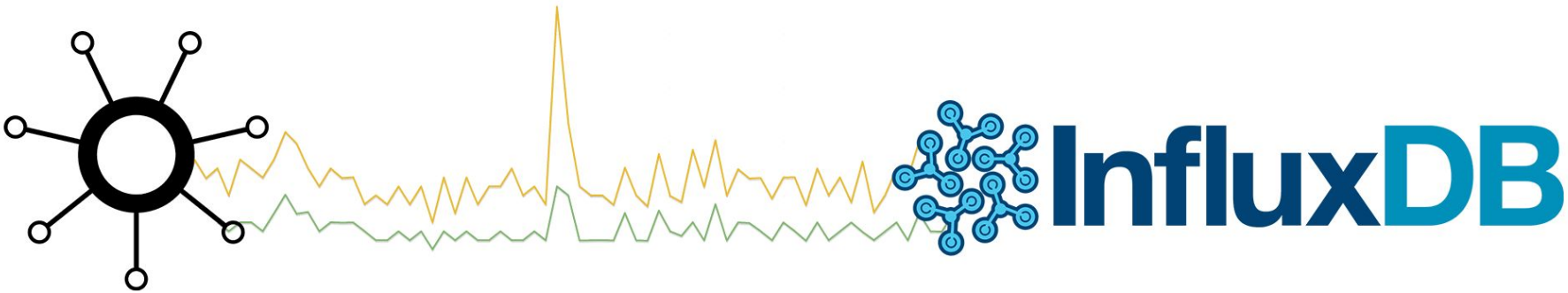




MEET THE REAL IOT

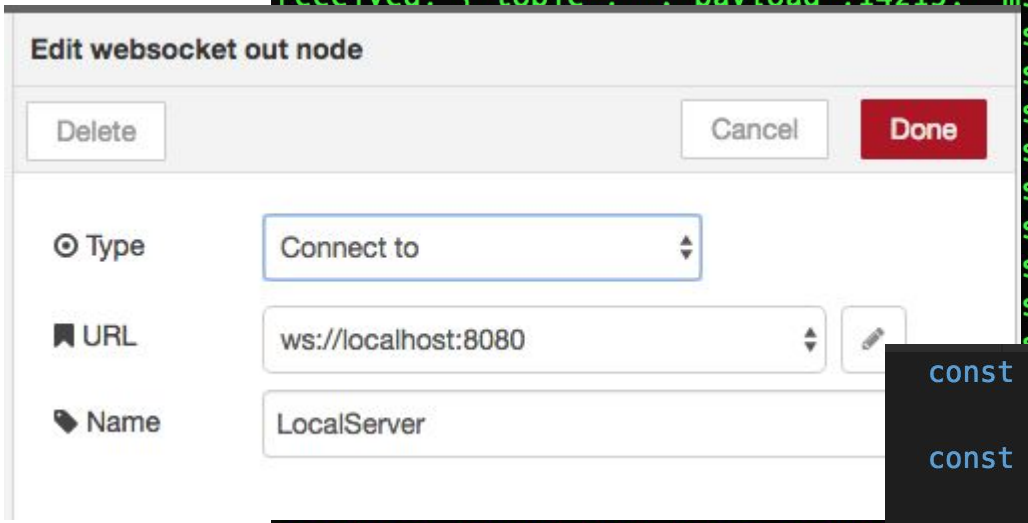



Node-RED
Deploy
filter nodes
Flow 1
Flow 2
info
debug
config
all
unused
input
inject
catch
status
link
http
websocket
tcp
udp
Watson IoT
output
debug
link
http response
websocket
On all flows
3 hidden
wiotp-credentials
SensorsBox/Number
0
Flow 1
Flow 2
Simple time inject to Watson IoT
timestamp
Generate time data
event
connected
msg.payload
LocalServer
connected
127.0.0.1:8086/coderbunker payload


InfluxDB

From devices to server to browser

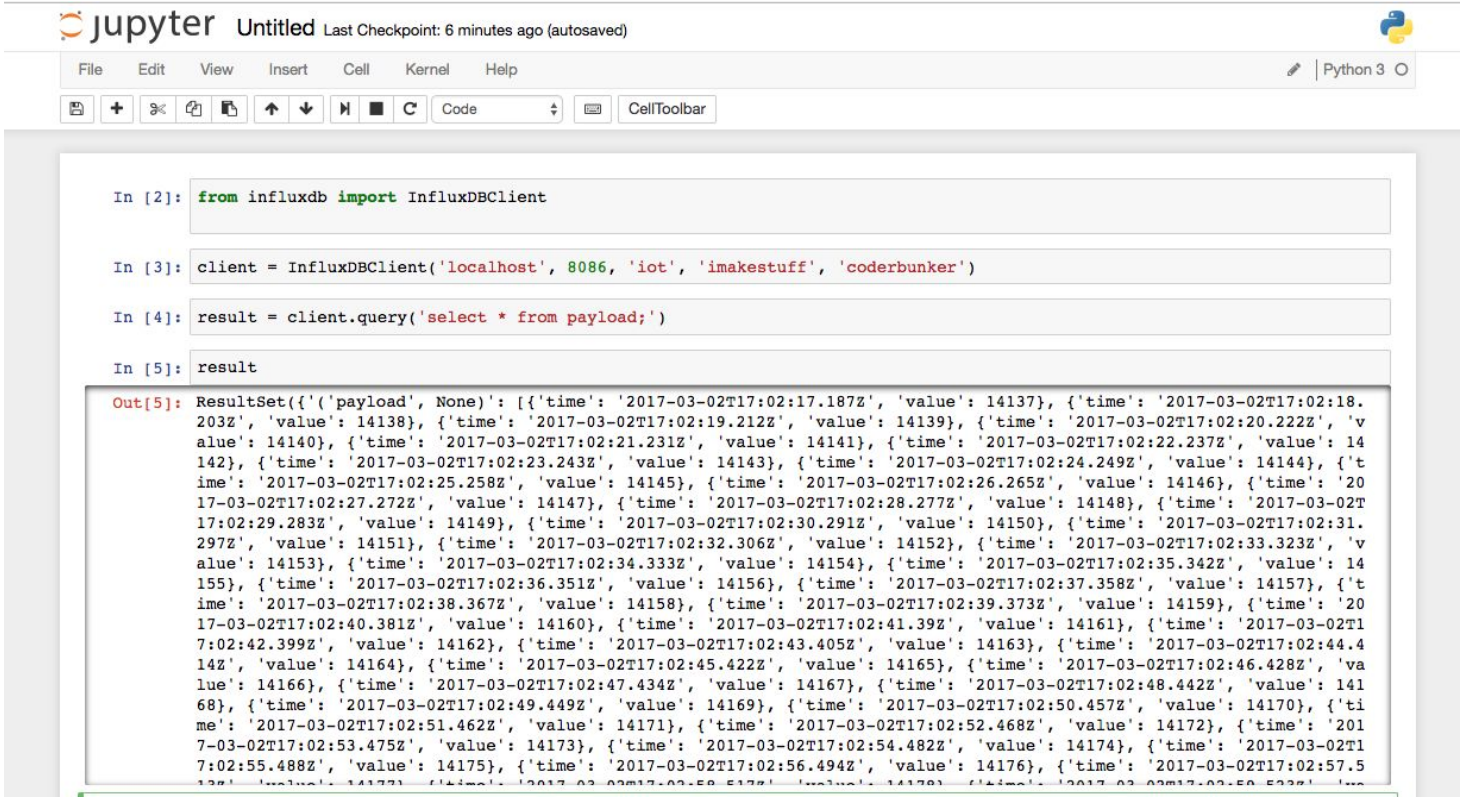
```
received: {"topic":"","payload":14211,"_msgid":"a67a52c9.cc0f2"}
received: {"topic":"","payload":14212,"_msgid":"266f3977.9c84c6"}
received: {"topic":"","payload":14213,"_msgid":"6d85840b.74c5ec"}
sgid":"cc256231.13419"}
sgid":"58c40442.e96f3c"}
sgid":"1e85a55f.0707cb"}
sgid":"d063b09c.d21df"}
sgid":"71ef970d.7e5f58"}
sgid":"5e6b6d72.751c54"}
sgid":"d2725b02.ad4ba8"}
sgid":"fa90f643.e45ca8"}
```



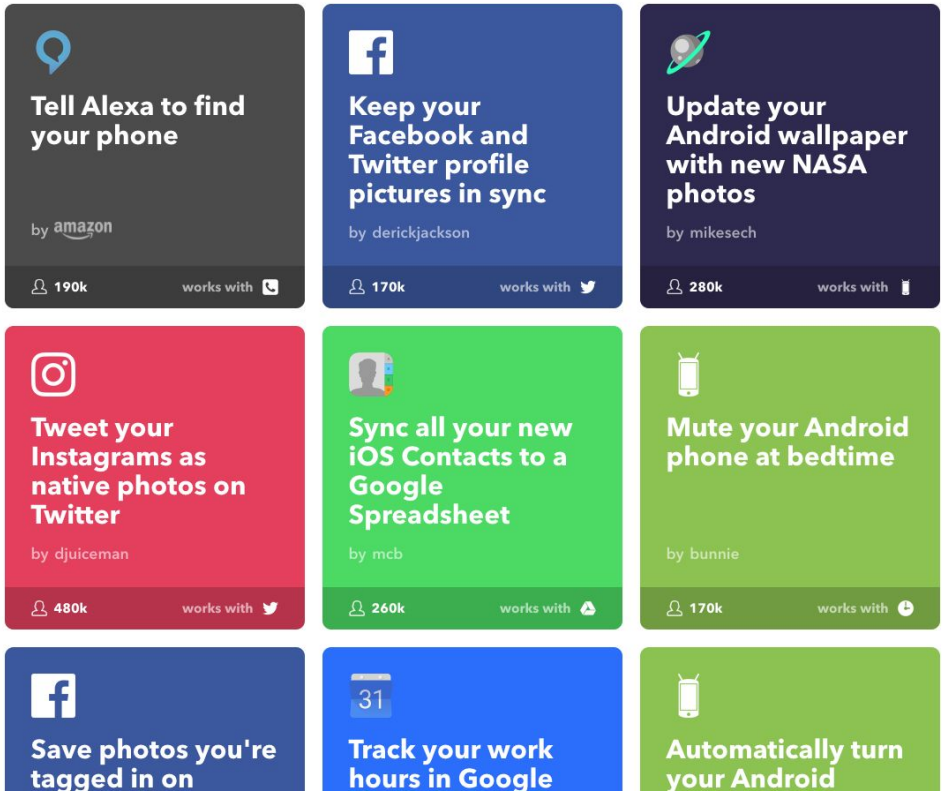

```
received: {"topic":"","payload":14
```

```
const WebSocket = require('ws');

const wss = new WebSocket.Server({ port: 8080 });

wss.on('connection', function connection(ws) {
  ws.on('message', function incoming(message) {
    console.log('received: %s', message);
  });
});
```

From data in to structured information

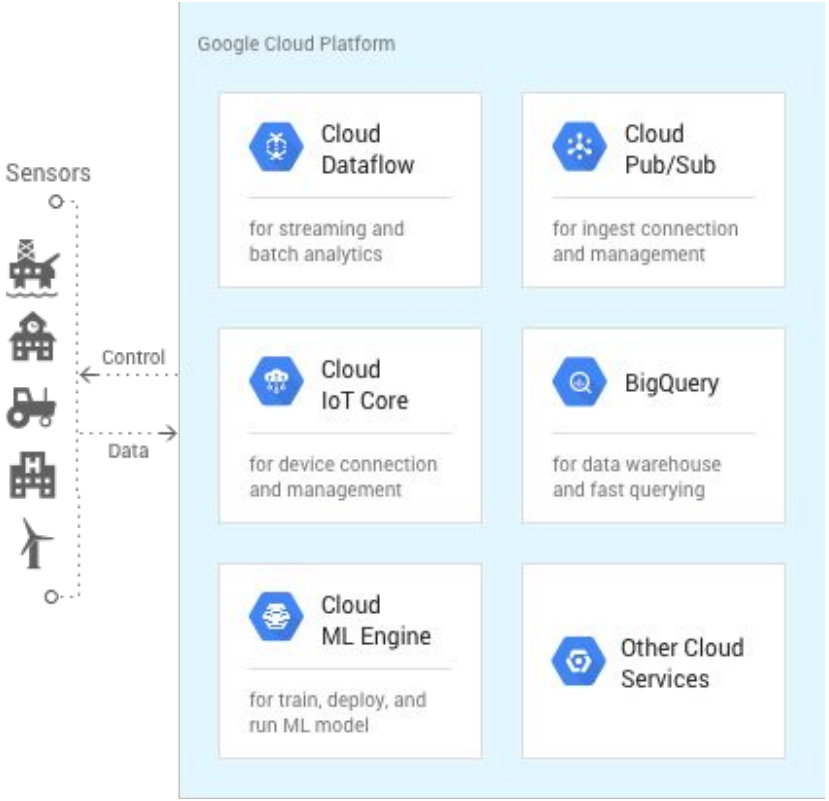


Integration with IFTT

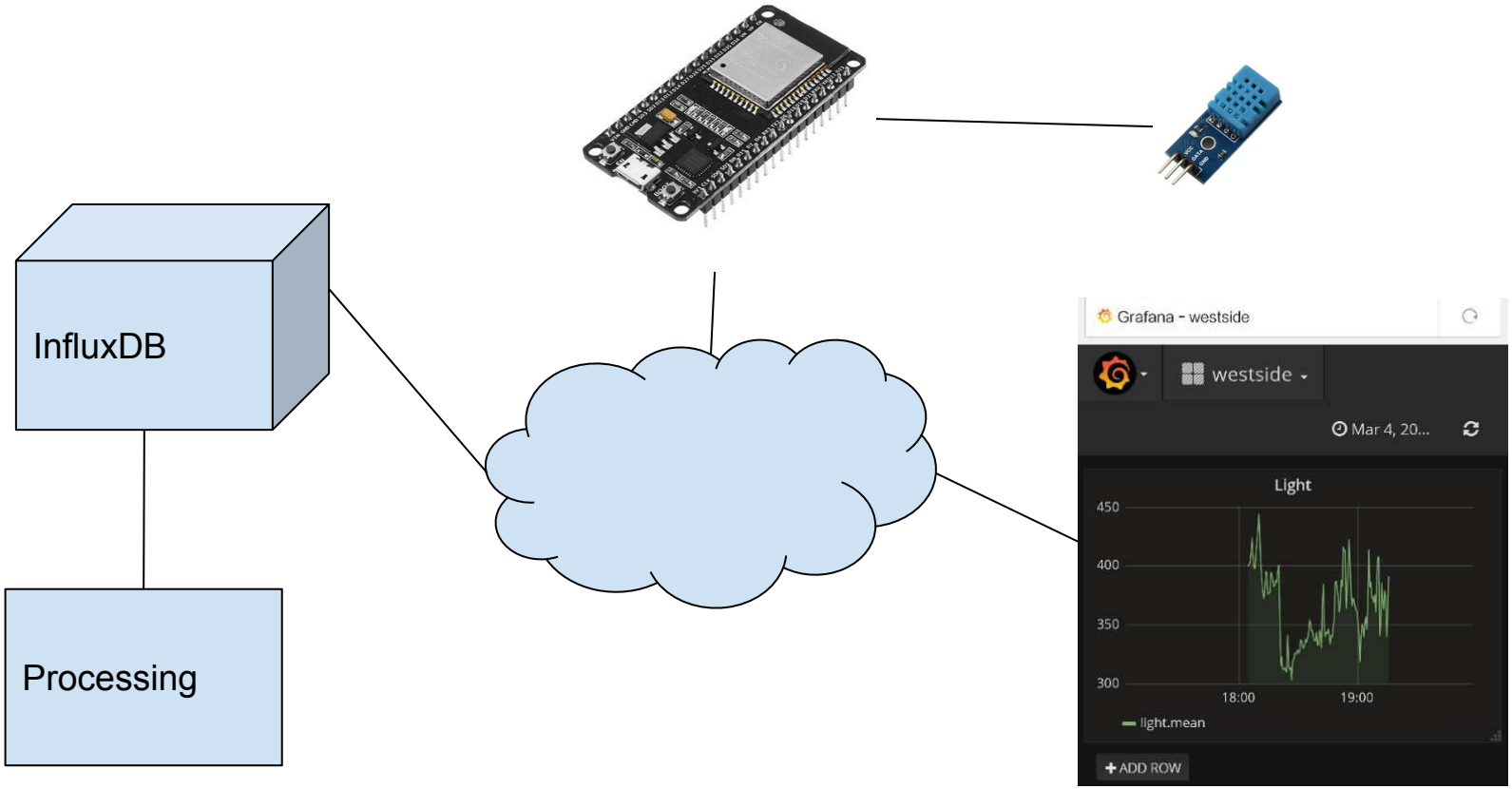


- hundreds of actions on events through the web
- Incoming and outgoing actions to IoT device
- https://ifttt.com/maker

Processing data “intelligently”



Build & train ML models in the cloud



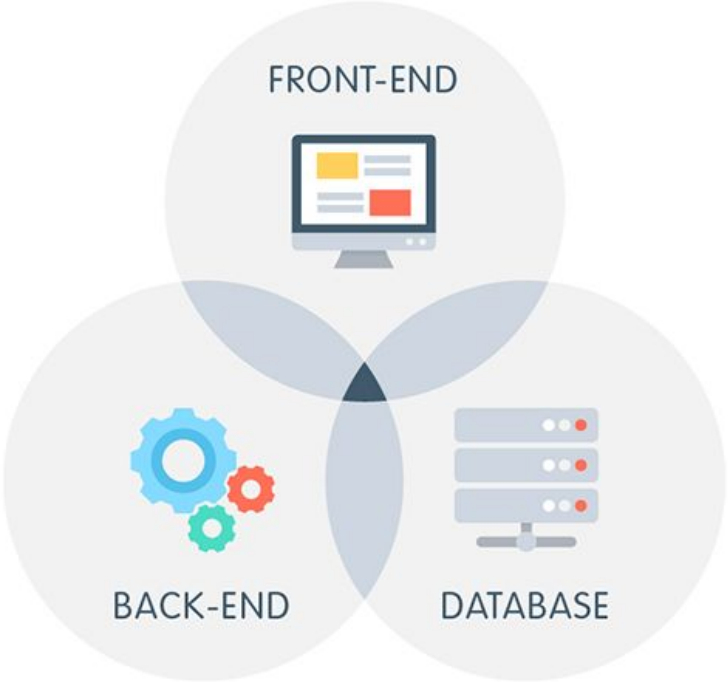
Integration example: sensors -> Arduino -> Raspberry Pi (Node-RED) -> influxdb

Components of IoT systems

- Sensors (and actuators)
- Devices
- Networking
- Cloud services
- Processing pipeline
- Frontend
- Orthogonal concerns
  - Security
  - Device management
  - Deployment
  - Automated Testing

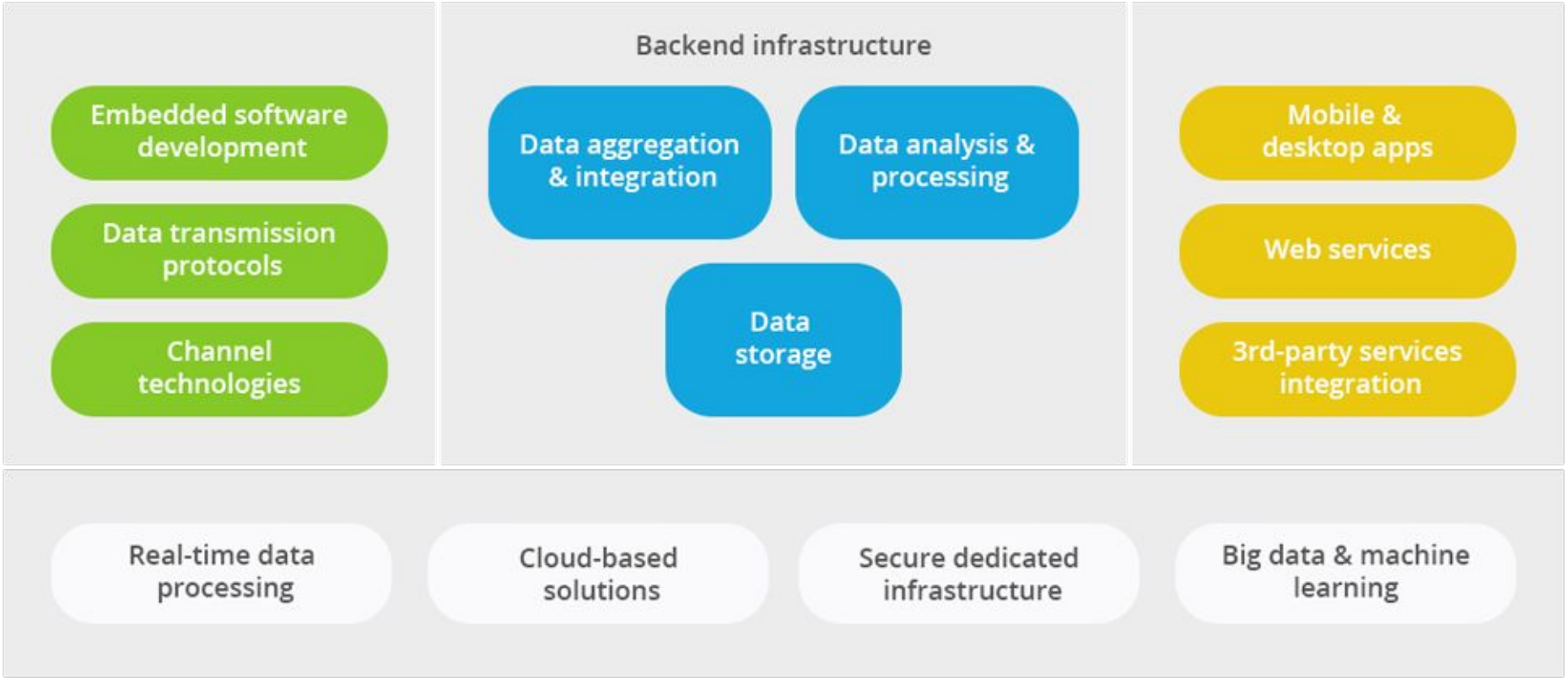
Challenges

FULL-STACK DEVELOPMENT



The Magical Fullstack Developer

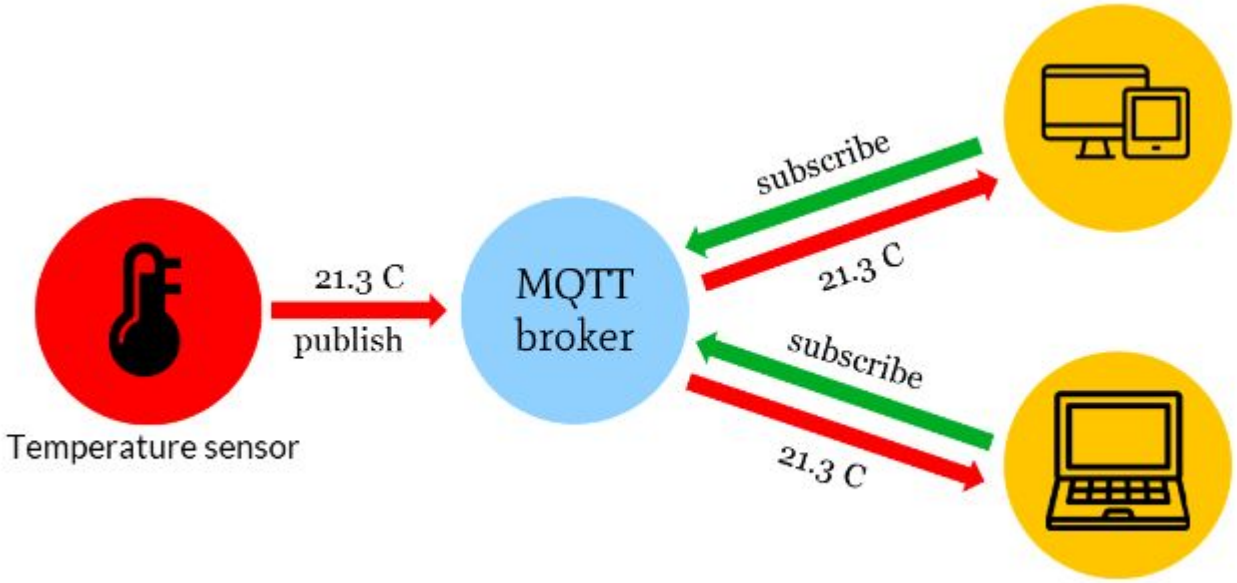
A little bit more complicated...



An IoT engineering team

- Hardware design & development
- Embedded system engineering
- Backend & Frontend development (mobile & web)
- Data Science (ETL, reporting, analysis and prediction)
- Network engineering
- Product Management
- Quality assurance
- Security engineering

Messaging



Schematic data flow from sensor (machine) to devise (machine)

Engineering Challenges

- Hardware production is hard
- Embedded software development is hard
- Networking small chunks of data at large scale is hard
- Turning data into information is hard
- Managing a large set of devices is hard
- Securing so many devices outside of our control is hard

What to look out for

- Focus on insights understandable by the business
- Secure access, transfer and storage of sensitive data
- Reliability of services, hardware, networking
- Redundancy and disaster recovery
- Testing and quality assurance
- Monitoring and escalation

What to think about before getting started

- Is there a large scale application? A profitable business?
- Are there regulatory rules preventing us from achieving it?
- Do we have enough budget?
  - Minimum 1 million RMB for hardware development
  - Minimum 1 million RMB for hardware production
  - Minimum 1 million RMB for software
- Are we planning for enough iterations?
- Can we assemble the engineering team?

Coderbunker IoT

Panyu Road 1199, Building 8, Bunker
Xuhui District, Shanghai 200030, CHINA

http://www.coderbunker.com
services@coderbunker.com

T: +86 (21) 6054 8081

#CoderBunker