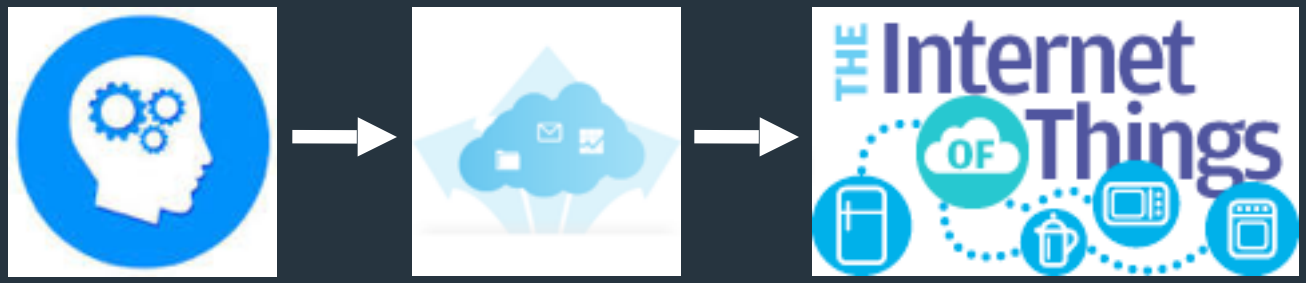
FROM CONCEPT TO OPERATION IN 30 MINUTES USING SERVICES AND A PAAS

30mins to Nirvana!

Add todo's for the presentation live http://markv-todo-php.mybluemix.net/



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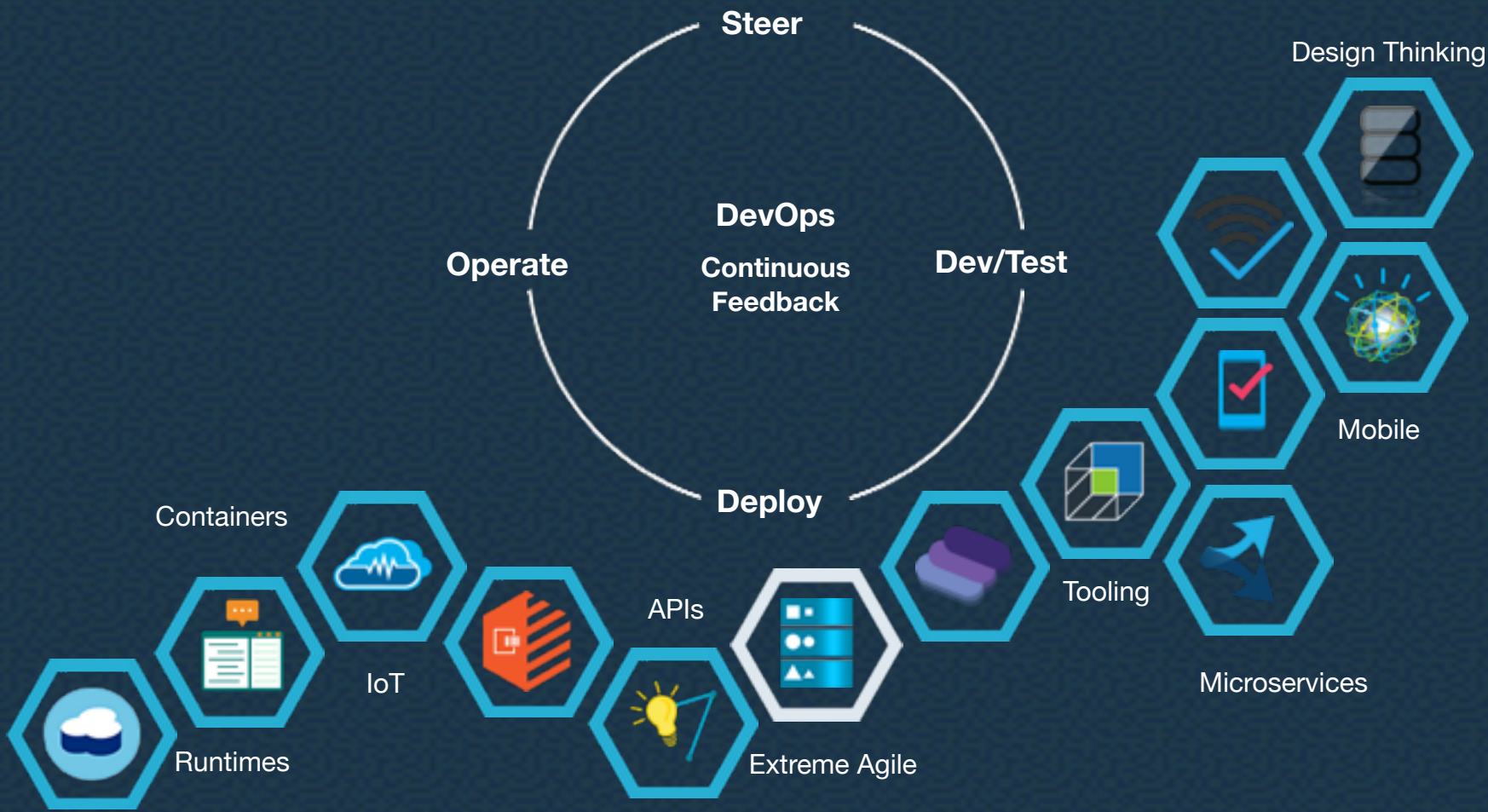
#bluemix

Tweet @IBMBluemix with hashtag #qconlondon

App development today is about speed and choice



Cloud provides developers with instant access to the APIs, services and infrastructure they need to launch their ideas into the present.

@vanderham -- #bluemix -- #ibmcloud

Enable your next billion dollar idea

It starts with an **idea**, **developer**, and a **line of code.**

Compose

Deploy

Monitor/Update

Scale

Companies of all sizes have the opportunity to **disrupt**, or face the prospect of **being disrupted**.

Today - we wil connect 2 devices

Register device -get keys

Install MQTT client

Publish/subscribe data

Store data in database

Control with voice commands

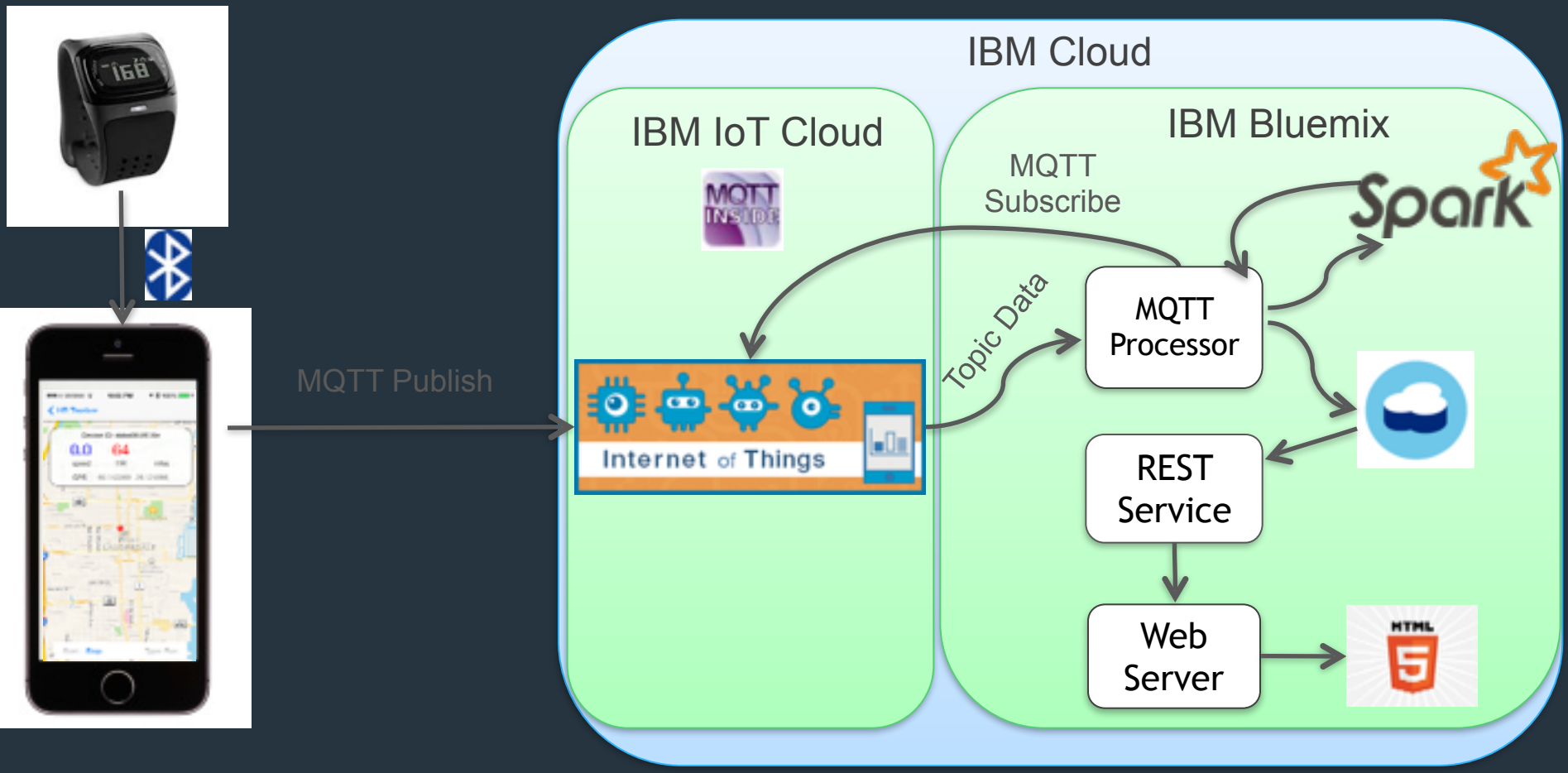
bluemix.net

https://developer.ibm.com/iot/

https://developer.ibm.com/iot/recipes/raspberry-pi/

https://www.ng.bluemix.net/docs/#services/IoT/index.html#gettingstartedtemplate

Sample 1 - Heart Rate Monitor Demo (continued)



Sample 2:
IoT Chariot

PUBLISH

telemetry
collision
color

RECEIVE

setRoll
setColor

MQTT

MQTT

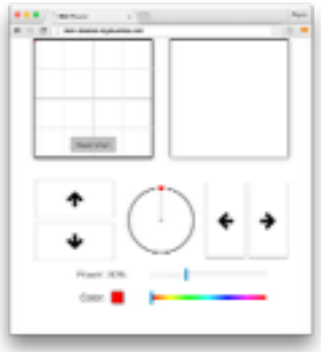
RECEIVE

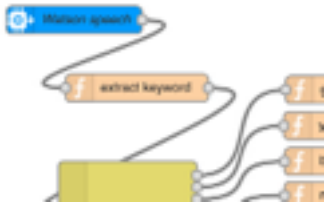
telemetry
collision
color

PUBLISH

setRoll
setColor

BLE





Device

App(s)

The app revolution

Fundamentally changing the way users interact with technology.

Apps are everywhere

Experience matters

Cloud/PaaS makes it possible

The API revolution

Fundamentally changing the way we expose and build capabilities

API Economy

Security, metering, billing matters

Cloud/PaaS provides the exposure and binding

Developer revolution

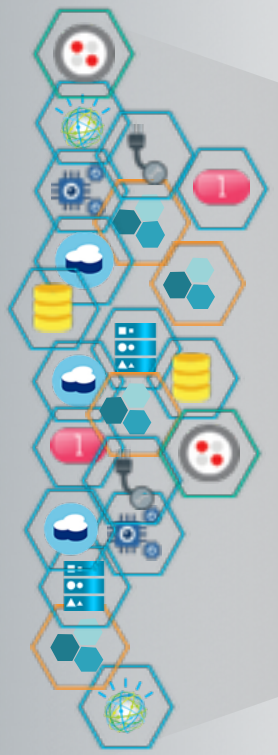
Freedom to innovate and collaborate at unprecedented speed with low risk

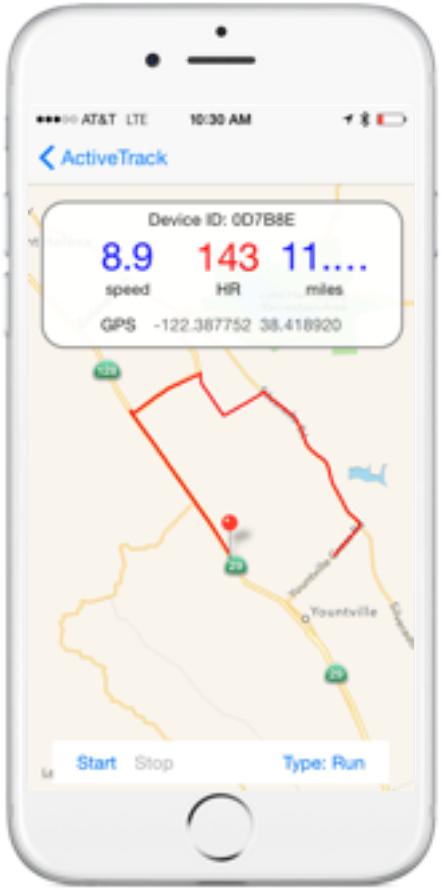
Code wins!

Developers focus only on differentiation

Quickly use new APIs and digital services to add features and increase engagement in areas such as:

- Cognitive & analytics
- Geo fencing
- Social engagement
- Push
- IOT
- Data storage/retrieval





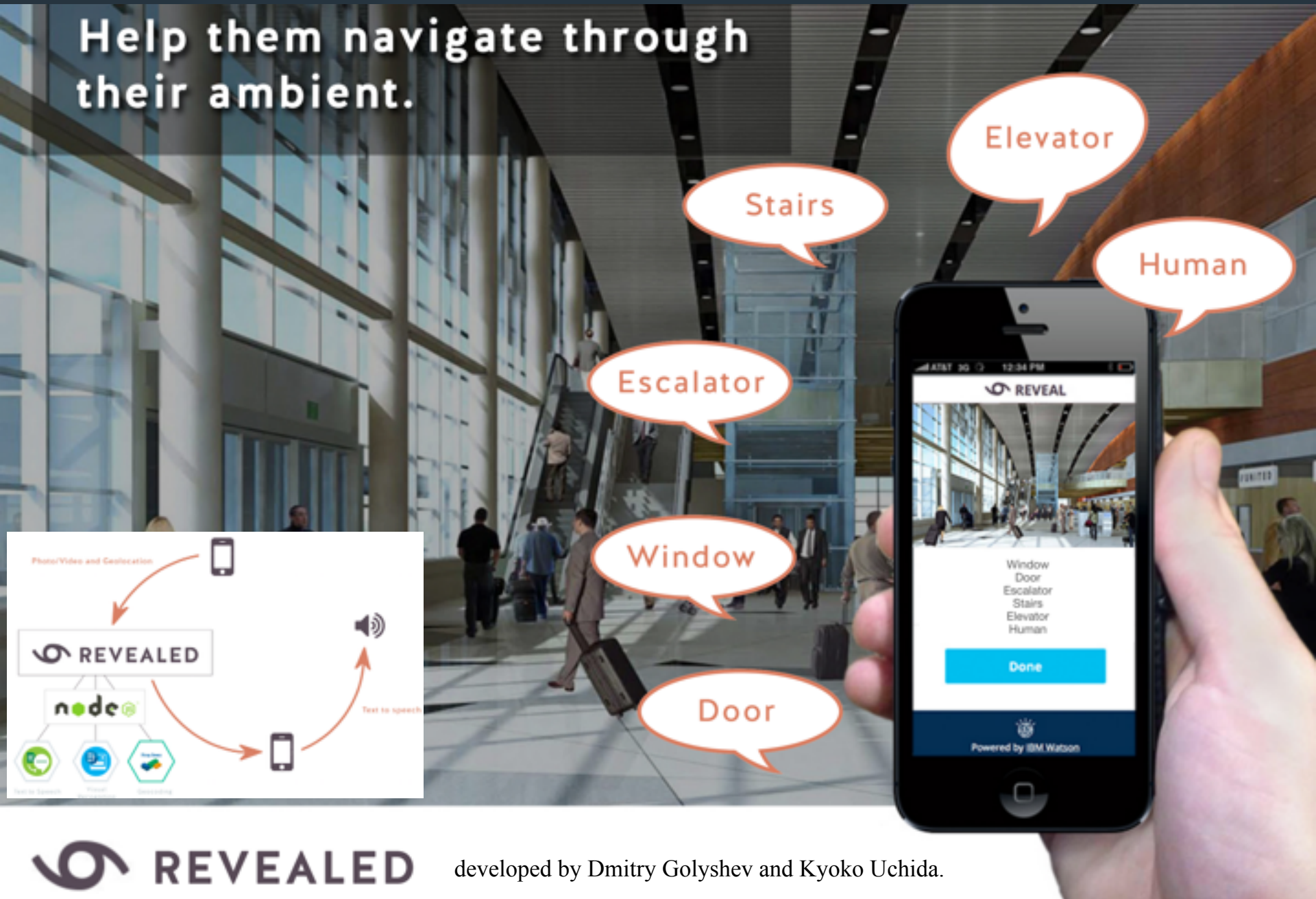
Cloud is about productivity, but not all cloud is equal

Manage only the resources the app/workload requires

CLOUD FOUNDRY docker SOFTLAYER openstack

Rapid Design and Prototyping Experience

2Day Hackathon results - Watson and Bluemix to help visually impaired People



REVEALED developed by Dmitry Golyshev and Kyoko Uchida.

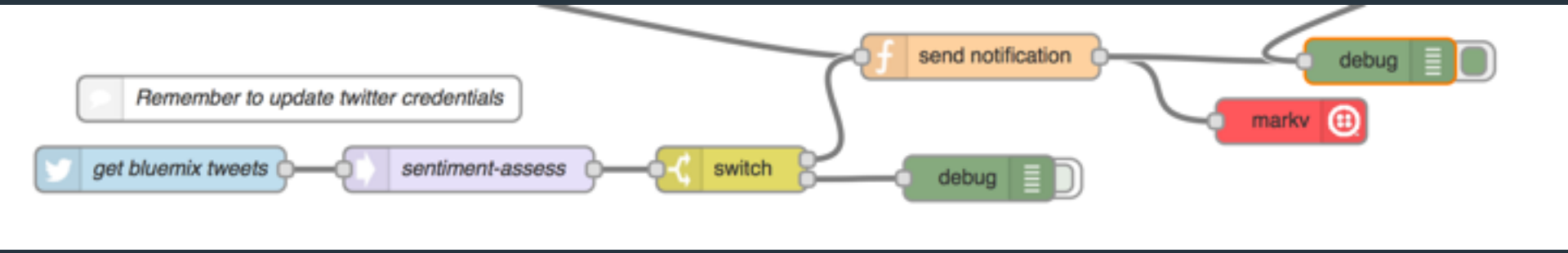
2Day Hackathon results - Bluemix and Watson find the healthiest and most affordable Spaces to live

http://hedge.mybluemix.net/

.. use on chrome

developed by Evan Pun, Dong-han Yao, Zachary Zeleznick, Emma Marriott, Jae Young Ryoo, Ryan Ma and Emily Le

Rapid development of situational applications or new ideas



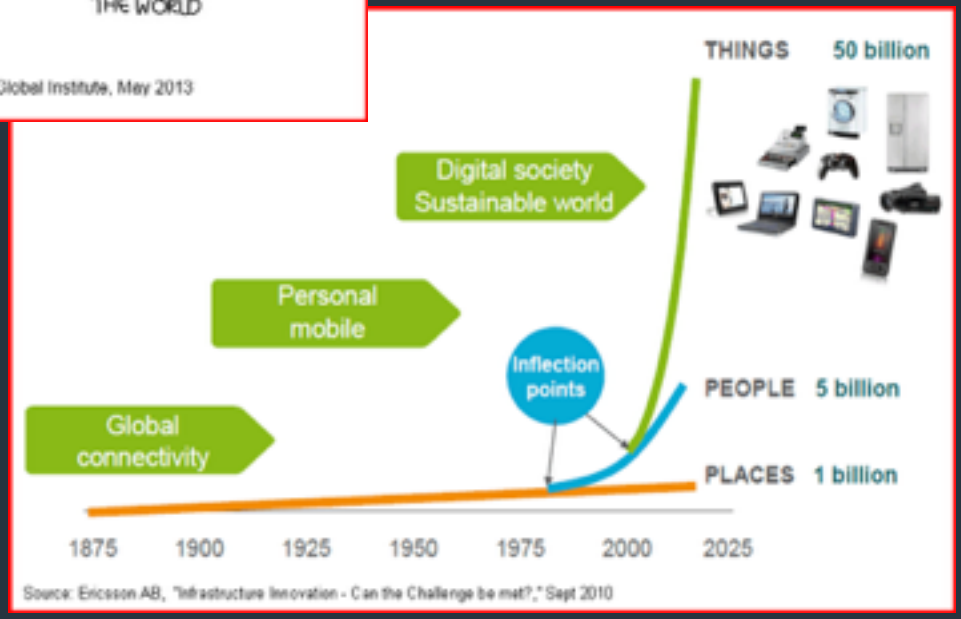
Internet of Things (IoT)

- **9 billion** devices around the world are currently connected to the Internet, including computers and smartphones
- The number is expected to increase dramatically within the next decade, with estimates ranging from **50 Billion devices** to reaching **1 trillion**
- The Internet of Things has the potential to create ***economic impact of $2.7 trillion to $6.2 trillion***[1] annually by 2025

Source: Disruptive Technologies, McKinsey Global Institute, May 2013

Many Things

Issues:
secure connectivity, limit power usage,
data storage, correlate events, provide analytics, & provide new user experience / Apps



Source: Ericsson AB, "Infrastructure Innovation - Can the Challenge be met?," Sept 2010

IOT Business Opportunity

GSMA "**Connected Life**" forecast **$4.5T in 2020**

"**Connected Life**" is:

everything that is **connected** and how they **interact - cars, mobile devices, buildings, sensors and people**

Top Ten in 2020

Connected Car	$600 billion
Clinical Remote Monitoring	$350 billion
Assisted Living	$270 billion
Home and Building Security	$250 billion
Pay-As-You-Drive Car Insurance	$245 billion
New Business Models for Car Usage	$225 billion
Smart Meters	$105 billion
Traffic Management	$100 billion
Electric Vehicle Charging	$75 billion
Building Automation	$40 billion

Source:http://www.globaltelecomsbusiness.com/article/2985699/Connected-devices-will-be-worth-45t.html

Internet of Things

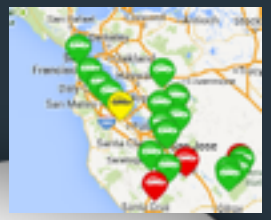
Developer Opportunity for Rapid Innovation

50B
Internet of Things
2020

41%
CAGR
Wearable Wireless Devices

12B ↑
Medical Wearables
2017

1. Instrument
2. Interconnect
3. Intelligent



Bluemix PaaS Cloud

Internet of Things (IoT) - dozens of industry use case

- Used at dozens of Industry and IBM events

Real-time Geospatial scenarios

Map Matching scenarios

Predictive Maintenance scenarios

SilverHook and Virtual Eye:
Driving the Powerboat Experience with IBM Bluemix

So you want to build an IoT Application :)

Bluemix lets you quickly get to the innovation

- How do I securely connect to my sensor?
- How do I combine info from my phone or other devices?
- How do I publish info to the cloud?
- How do I subscribe to my sensor info in the cloud?
- How do I combine data with other sources?
- How do I easily store info into a database?
- How do I provide APIs to access the data?

~Nirvana~

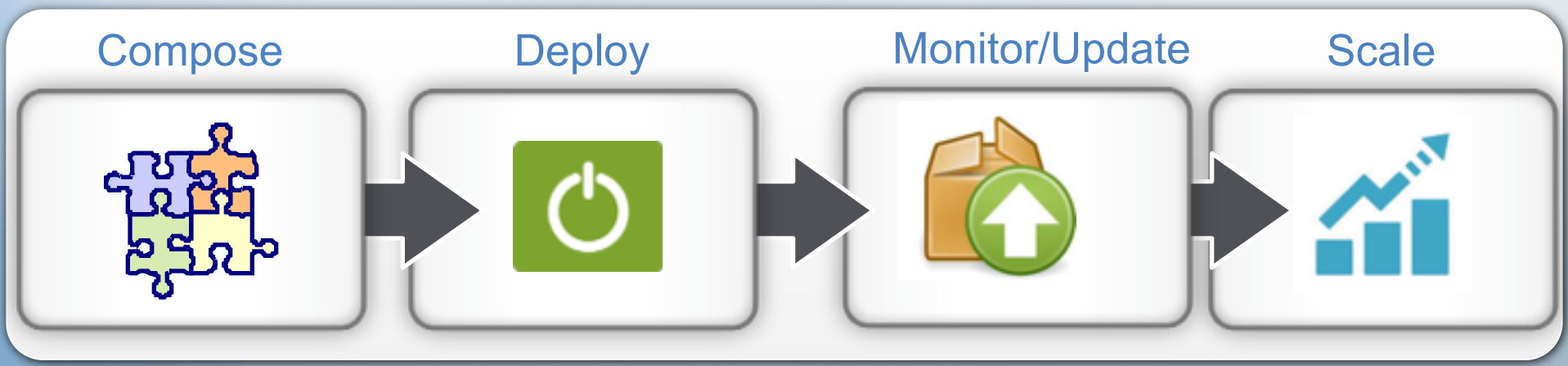
Create an application
that has a unique experience!

Why PaaS? What is IBM's Bluemix, exactly?

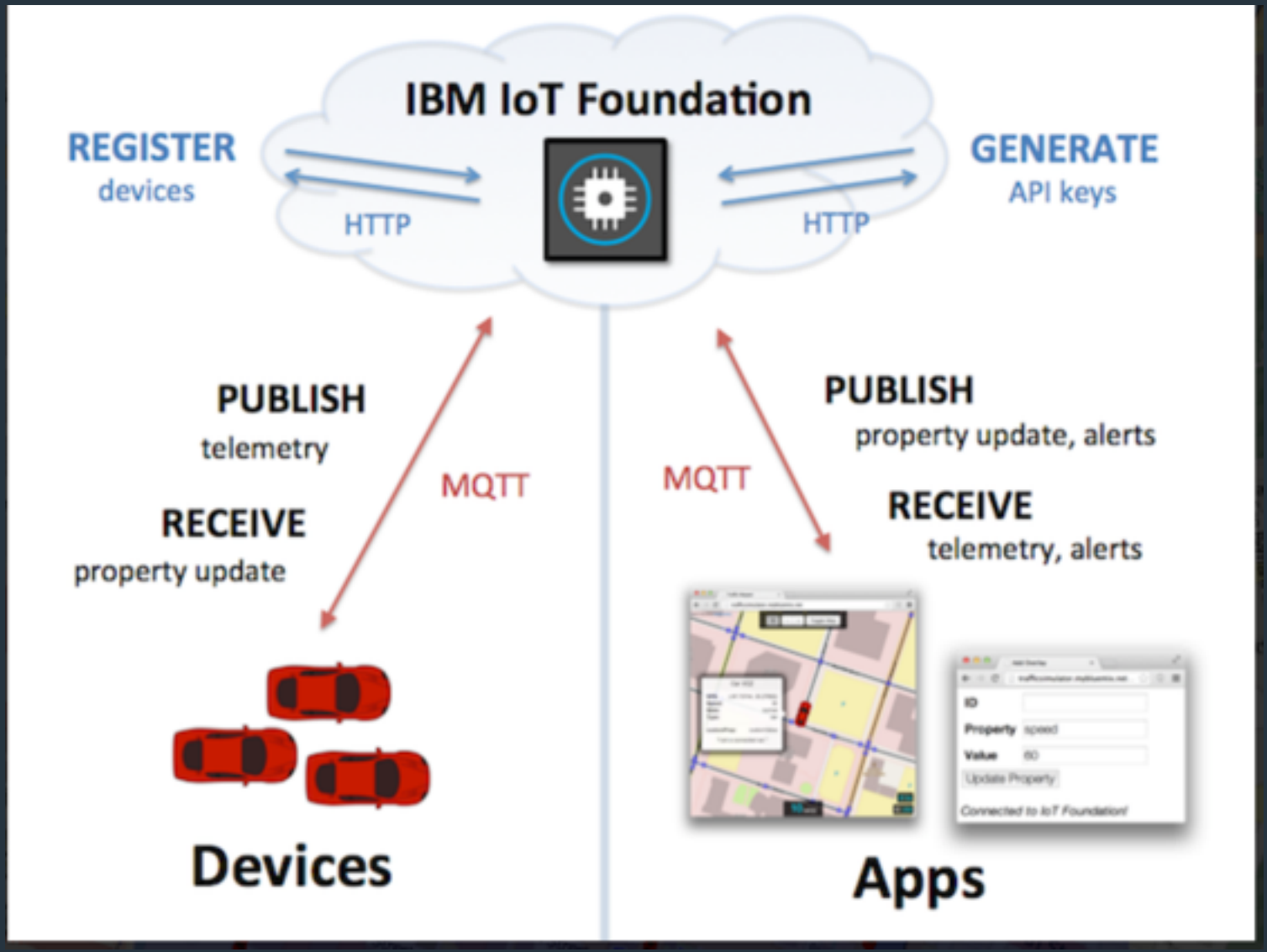
Platform as a Service (PaaS), Allows you to focus on design and development without worrying about the underlying infrastructure

BlueMix is an open-standards, open source cloud-based Platform as a Service (PaaS) for rapidly building, managing, and running cloud based applications and services of all types (web, mobile, big data, new smart devices), while tapping a growing ecosystem of available services and runtime frameworks.

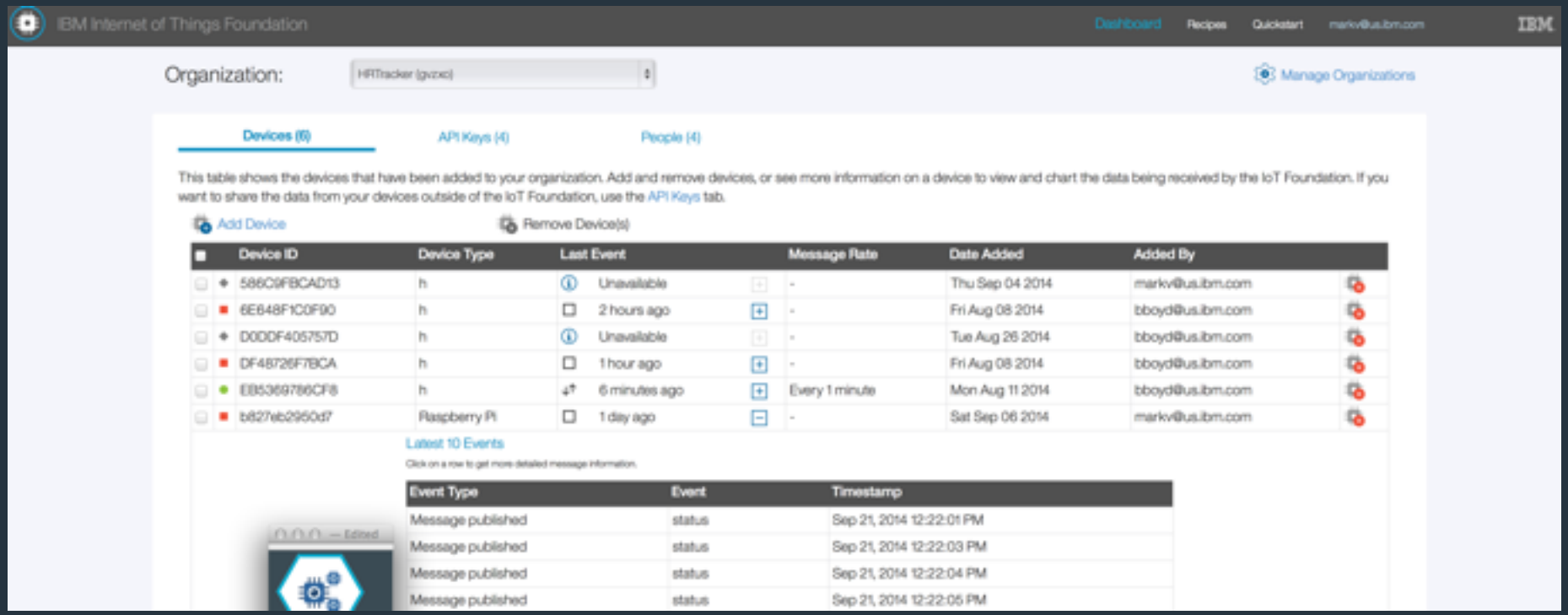
Capabilities include, your choice of language, such as Java, Python, Ruby, or Node, or community buildpacks, which lets developers focus on building and running your apps and not worrying about getting servers or installing software.



Bluemix - IOT MQTT Security and Scalability
10 million messages a second per instance



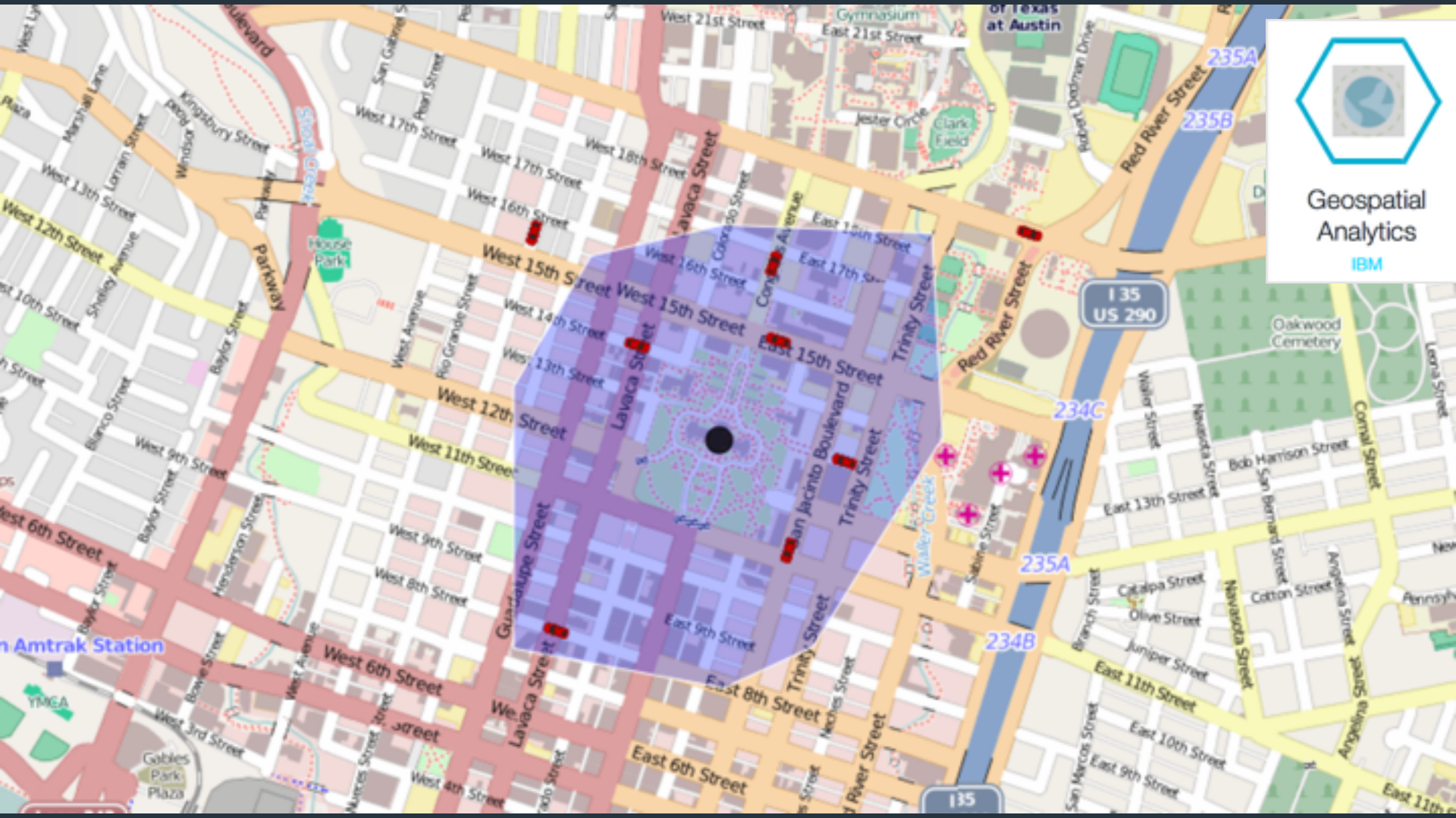
Bluemix IOT Secure device management



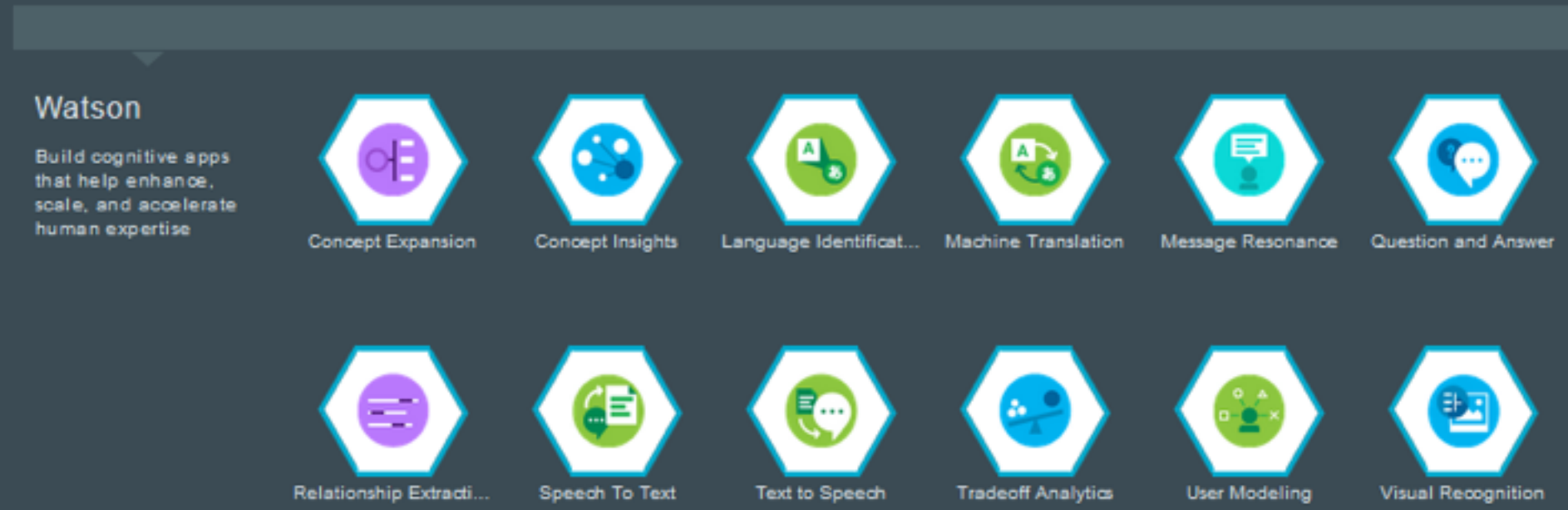
FREE PLAN

- Maximum of 20 registered devices
- Maximum of 100MB of data exchanged per month
- Maximum of 1GB of data storage (with 30 days expiry)
- Maximum of 10 application bindings

Geo Location Fencing/Notification



Watson services are now available to any developer…



…through Bluemix.

Imagine the Possibilities!

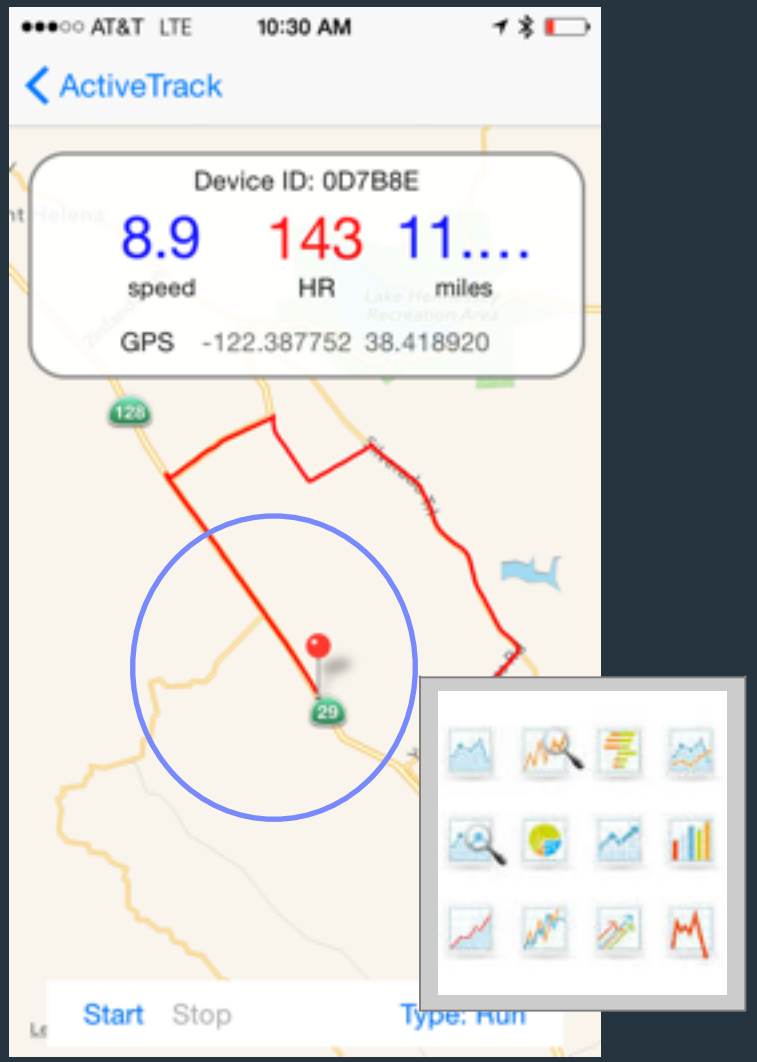
"The innovation is up to you; we (PaaS) make it fun & easy"

Heart Rate Monitor (Our Example)

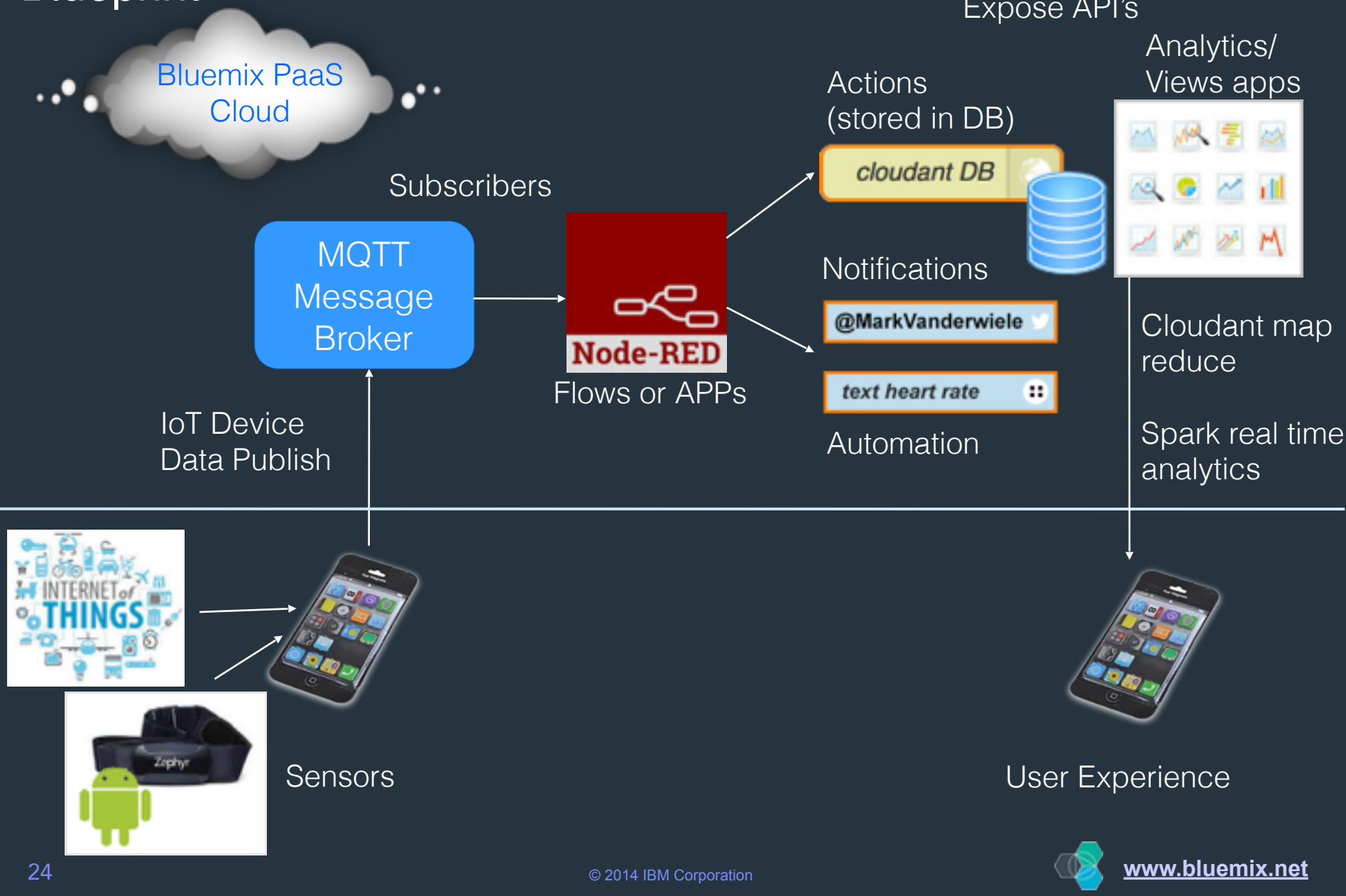
- Race and compare results with friends around the world
- Heart Rate, Speed, Location, Weather…
- Real-time as well as historic views
- Automated data capture
- Analytics - Data abnormalities and fraud detection

Tomorrow's Apps

- GIO fences, Live Weather Alerts, Home Automation, Machine Learning, Fall Detection…
- Medical alerts and applications
- Predictive analytics
- Device location notification



Sample 1 -IoT - Heart Rate Monitor Demo - Basic IOT Blueprint

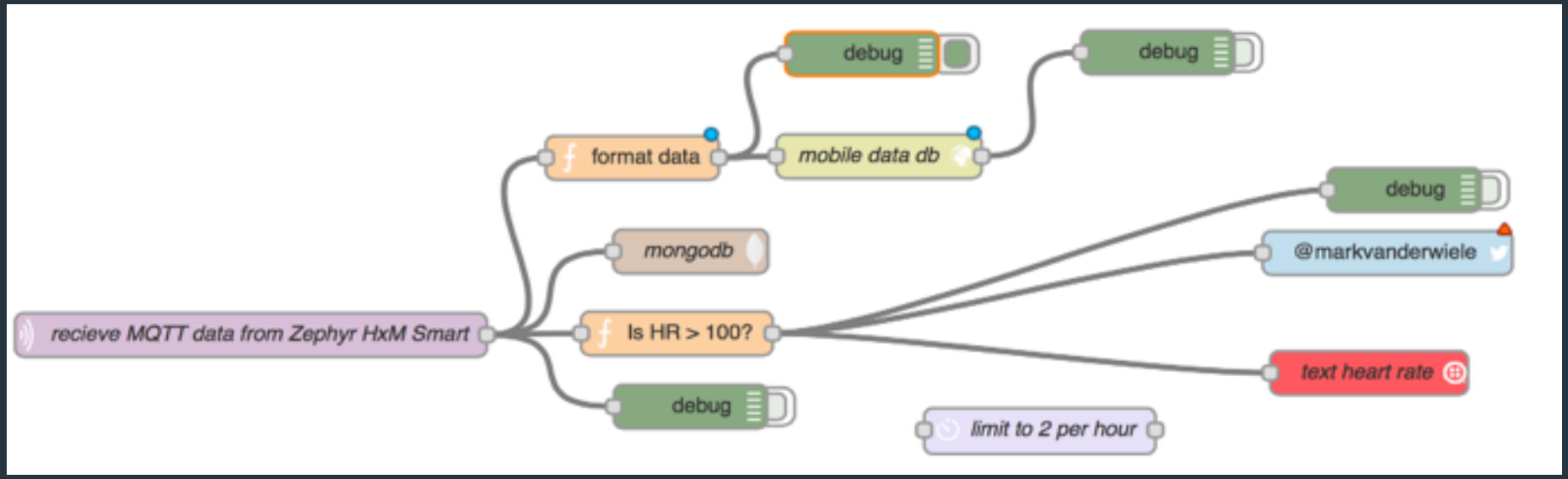


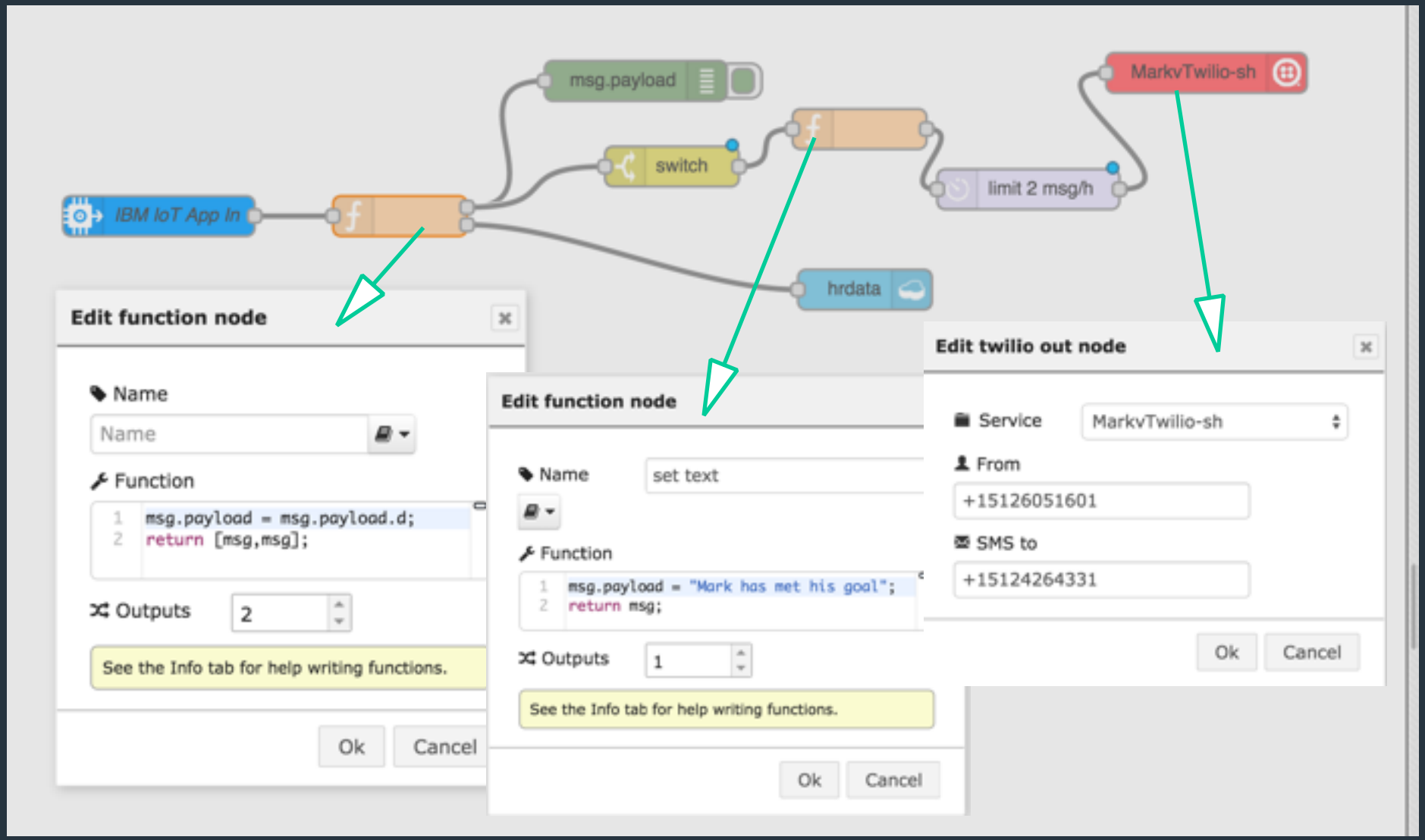
IoT - Heart Rate Monitor Demo (sample iOS code)

```
// Create MQTT connection
    Messenger *messenger = [Messenger sharedMessenger];

    NSArray *uuidBits = [uuid componentsSeparatedByString:@"-"];
    self.deviceId = [[uuidBits objectAtIndex:4] lowercaseString];

    if ([self.server isEqualToString:@"IoT"]) {
        topic = [NSString stringWithFormat:@"iot-2/evt/tripDataPoint/fmt/
json", self.deviceId];
        messenger.clientId = clientId;
        [messenger
connectWithHost:@"gvzxo.messaging.internetofthings.ibmcloud.com" port:1883
clientId:clientId username:@"use-token-auth" password:@"@xxxwzXwRQTA7q0"];
    } else if ([self.server isEqualToString:@"MessageSight"]) {
        topic = [NSString stringWithFormat:@"iot-1/d/%@/evt/hrtracker/json",
self.deviceId];
             messenger.clientId = clientId;
        [messenger connectWithHost:@"xx.xx.71.163" port:1883
clientId:clientId];

// Publish the data
Messenger *messenger = [Messenger sharedMessenger];
NSString *messageData = [NSString stringWithFormat:@"{ \"d\":     { \"userId
\":\"%@\", \"tripType\":\"%@\", \"tripName\": \"%@\", \"tripId\": \"%@\",
\"speed\": %.1f, \"longitude\":%.7f, \"latitude\":%.7f, \"elevation\":%d,
\"heartRate\":    %d, \"deviceId\":\"%@\", \"timestamp\": %@ } }",
self.name, self.tripType, self.tripName,   self.tripId, mph,
self.currentLocation.coordinate.longitude,
self.currentLocation.coordinate.latitude, elevationFeet, heartRate,
self.deviceId, timestamp];

[messenger publish:topic payload:messageData qos:0 retained:NO];
```

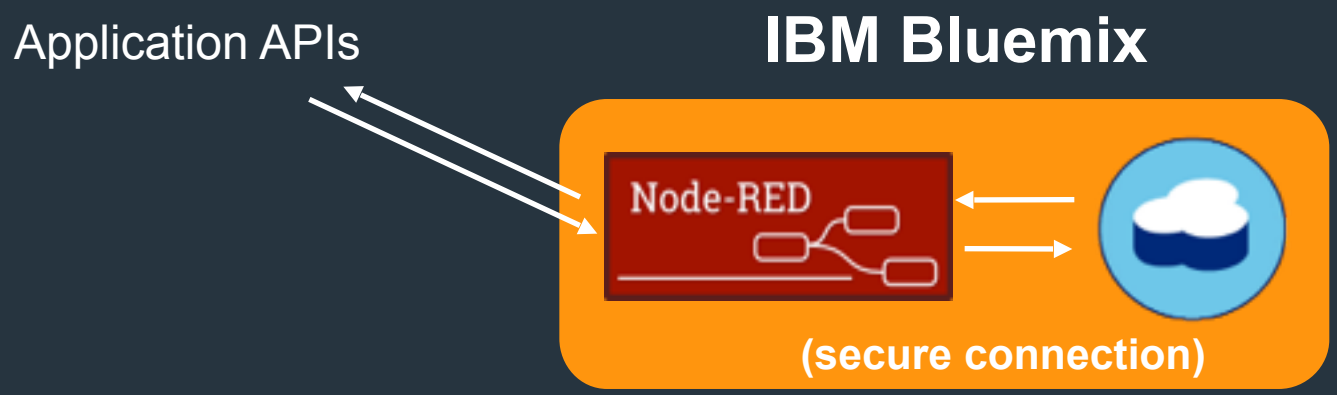
IoT - Heart Rate Monitor Demo (continued)

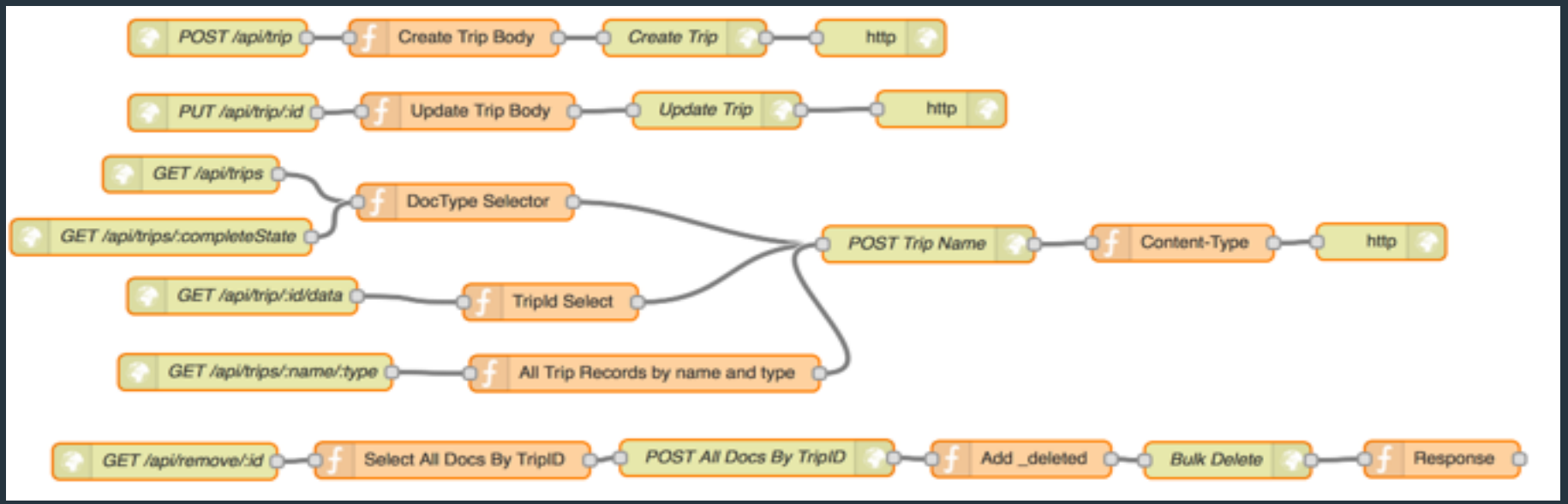
Node-RED flow to receive the data and perform actions





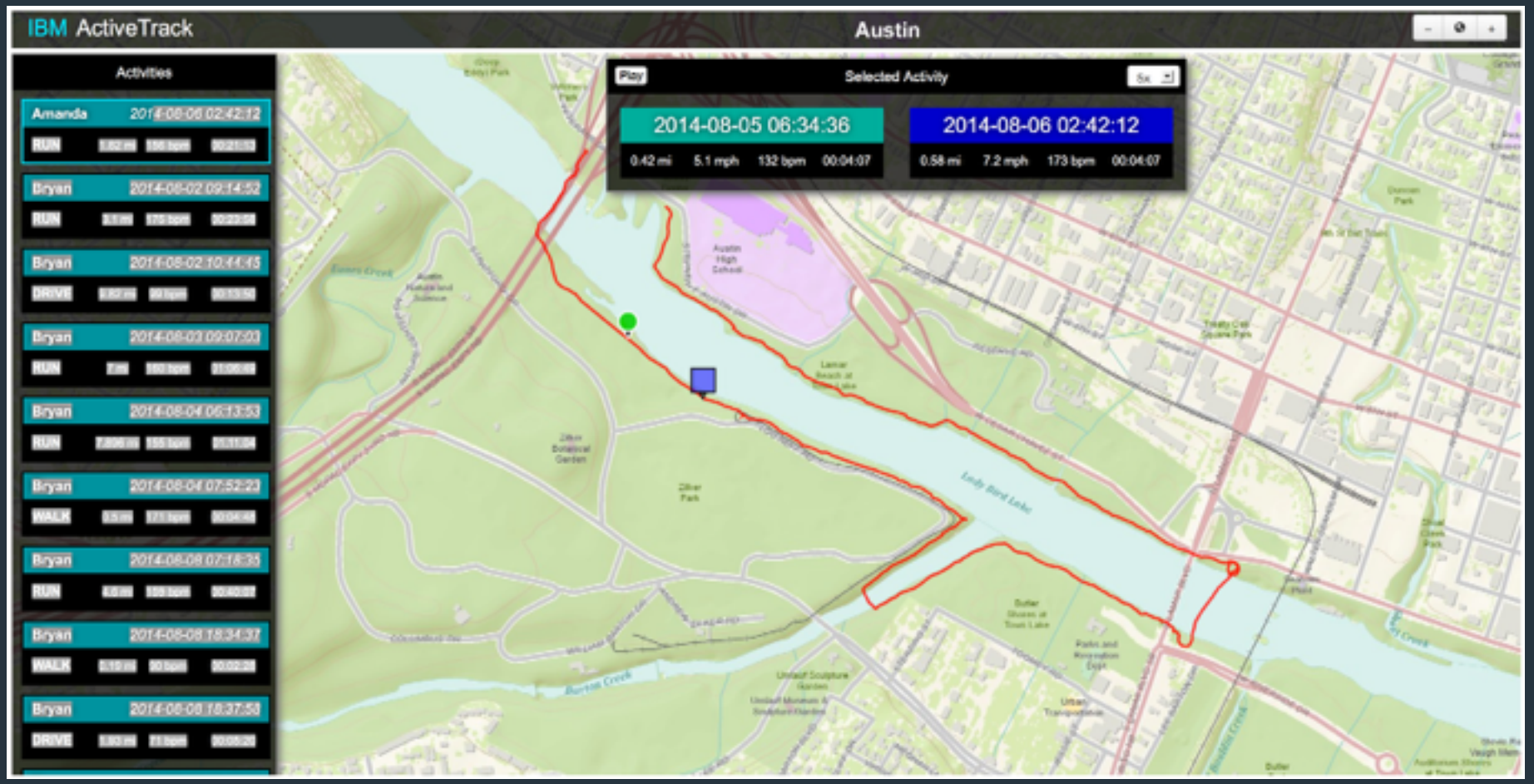
IoT - Heart Rate Monitor Application APIs - example



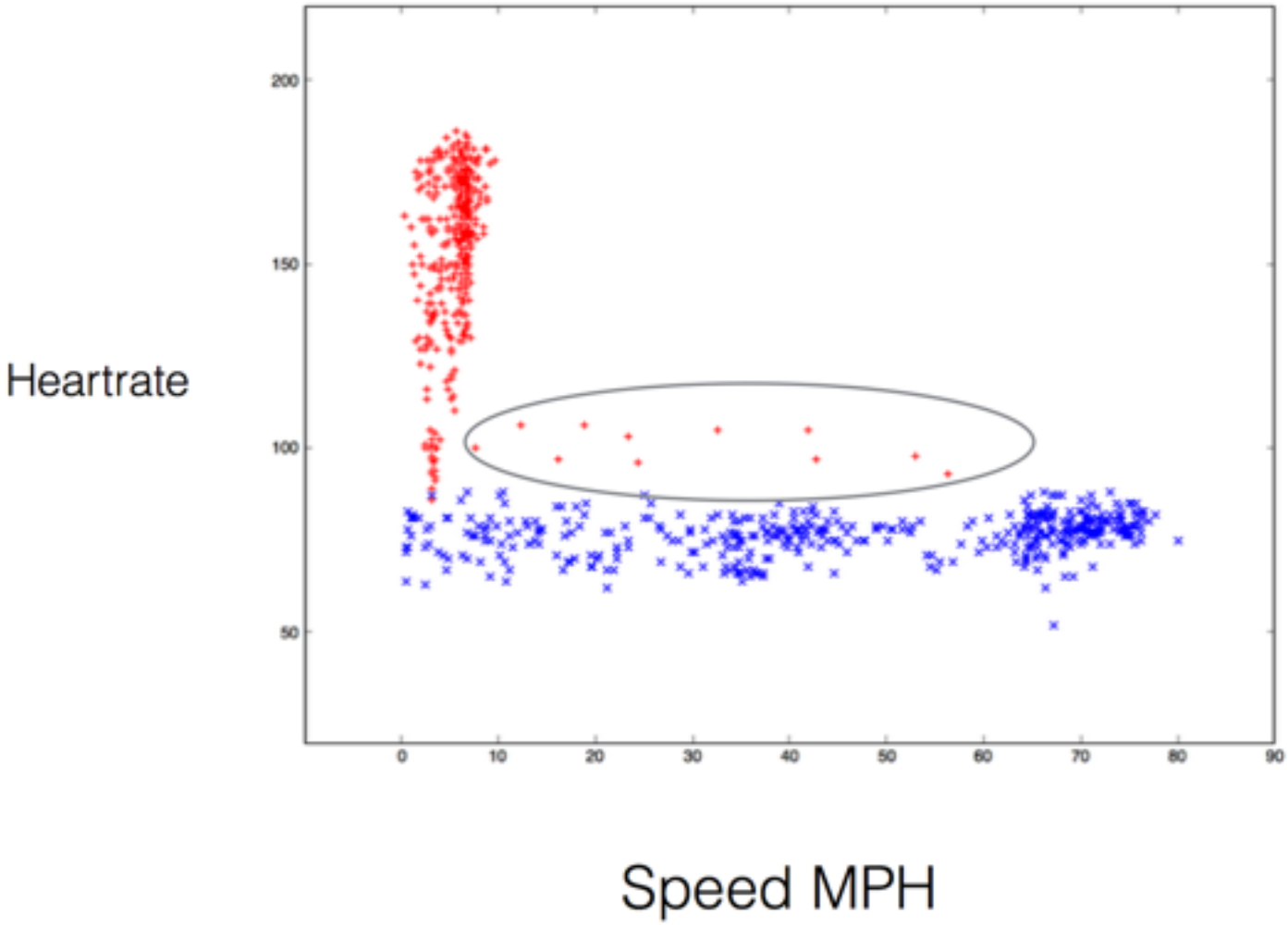


Trip Record Docs: http://hrtracker.mybluemix.net/api/trips
Completed Trip Record Docs: http://hrtracker.mybluemix.net/api/trips/completed

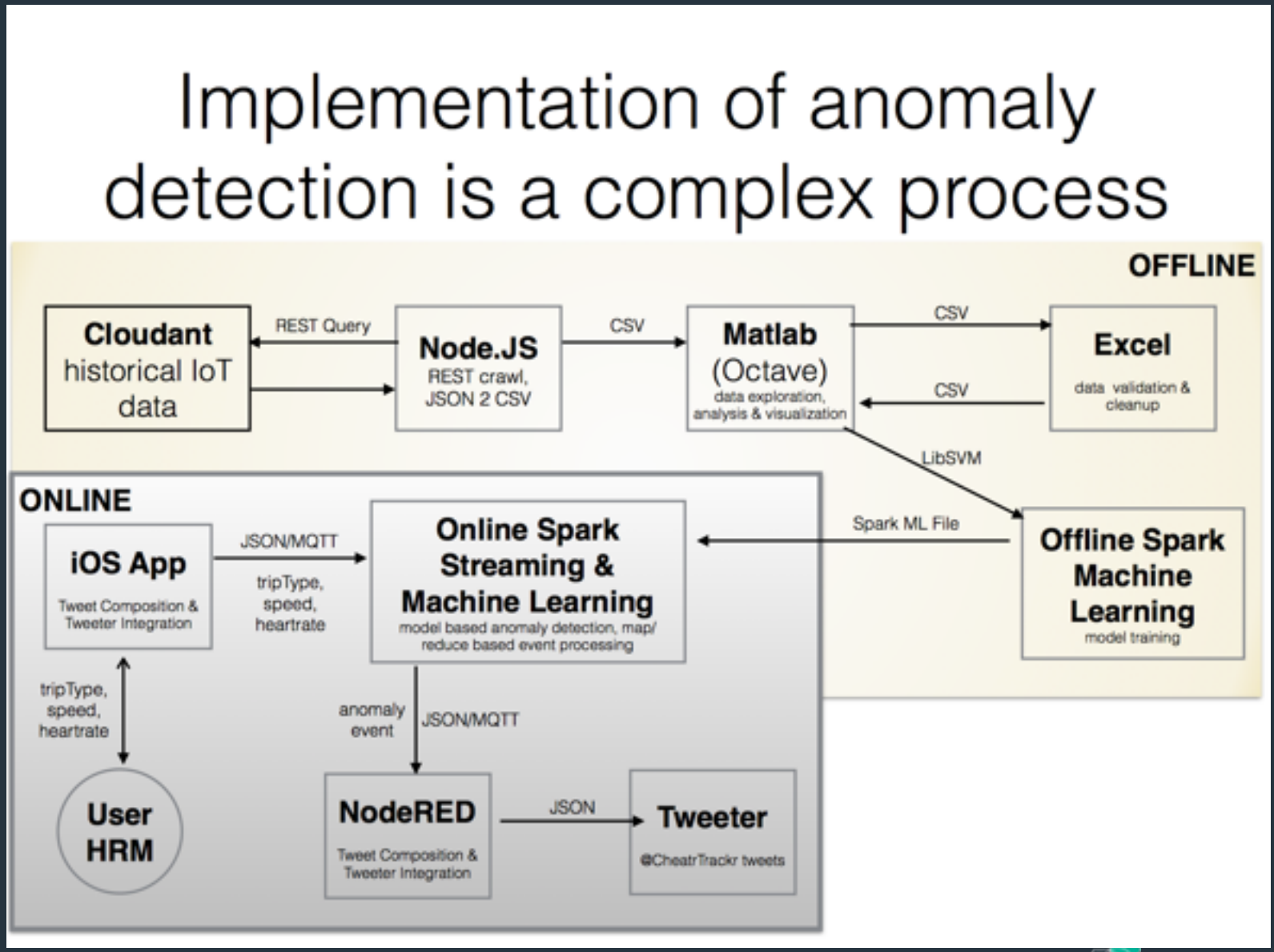
Nirvana! Create an app that has a unique experience



anomalies (selected in the oval) become prominent as well, helping to identify unsportsmanlike conduct.



Backend data analytics implementation - auto tweet if you cheat

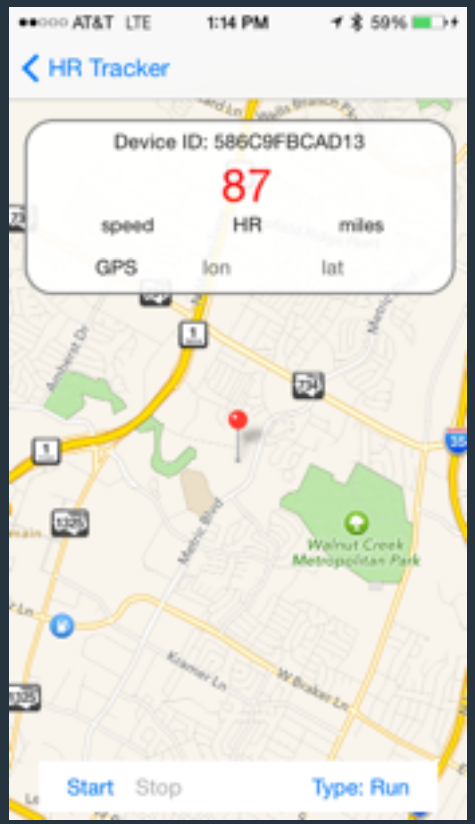


Other Fun IoT Automation Stuff

The 'Thing': The Drone

Real-time events for a 'Thing'

Scenario:
Launch a drone
in real-time
to take a picture
of an activity
(or a suspicious event)



GEO detection of the 'Thing'

Scenario:
Use GEO location
to detect when
the drone is near

Other Fun IoT Automation Stuff (continued)

Home Automation

On my return:

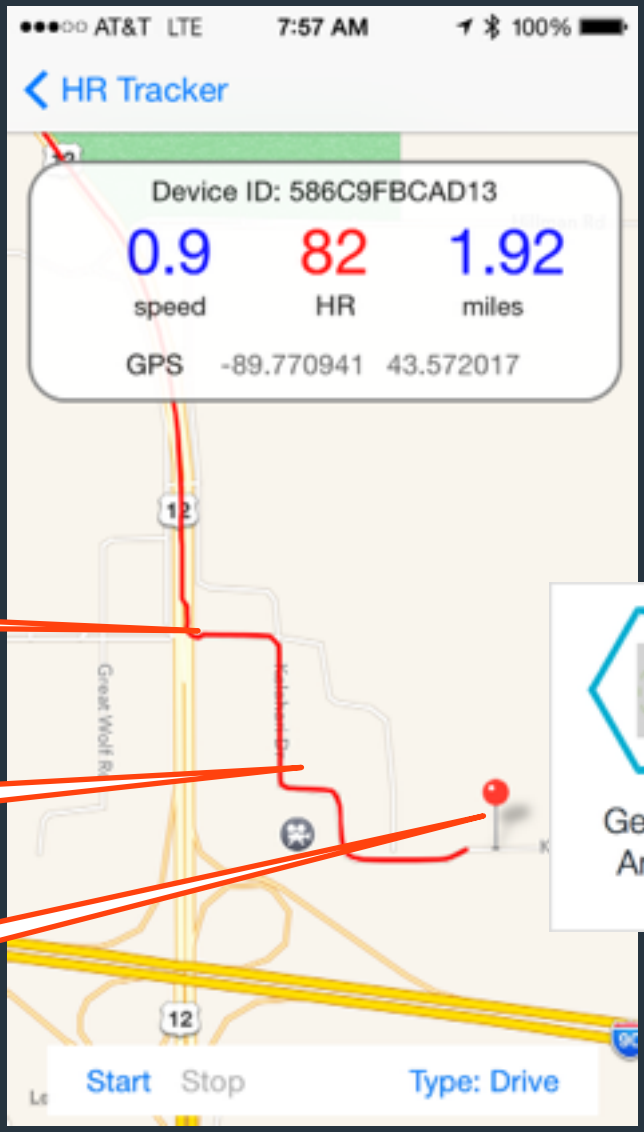
- Turn down my air
- Turn on my hot tub
- Turn on my outside lights if it is dark
- Open my garage door

(With learning on time to achieve goal)

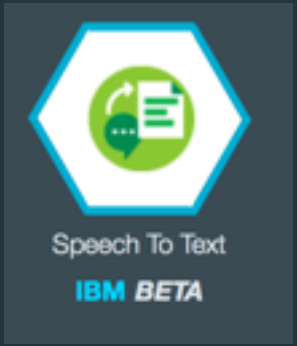
Hot tub on

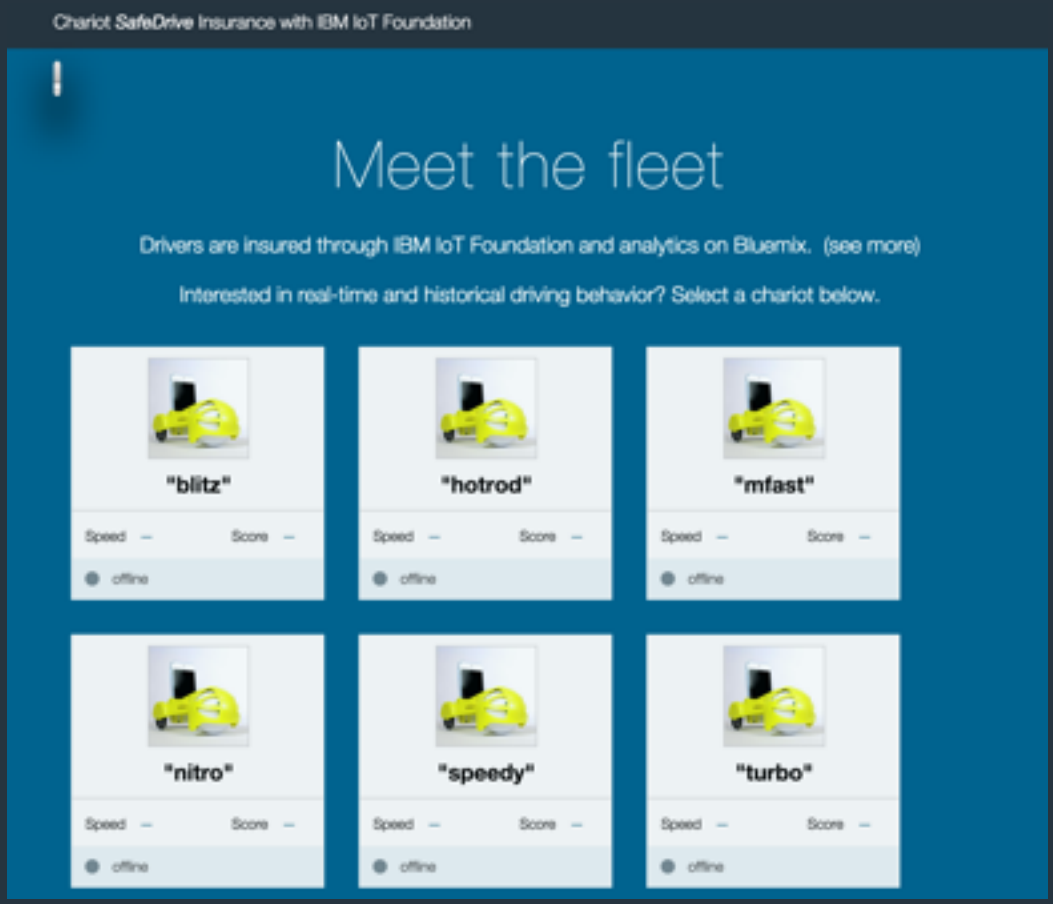
Air adjusted for your arrival

Door opened



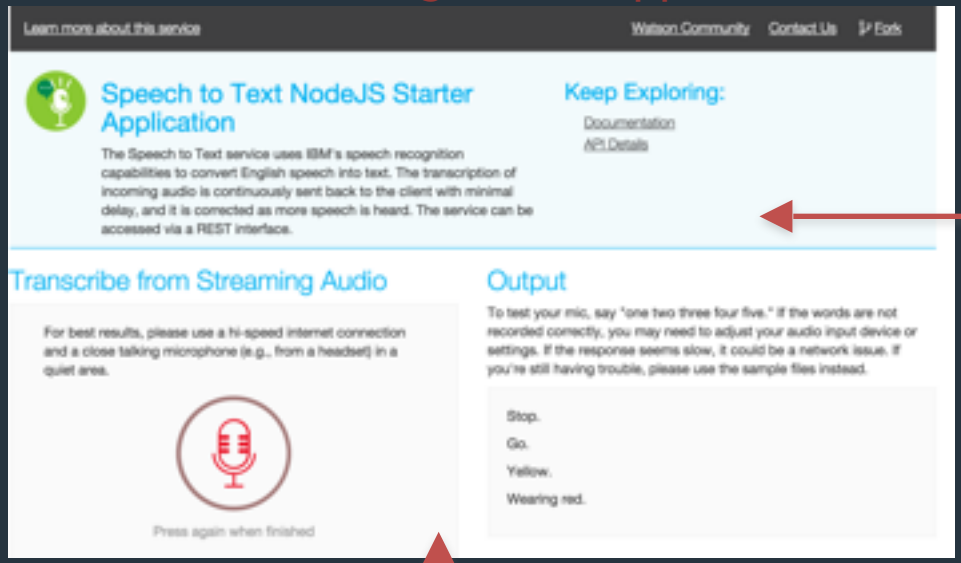
Internet of Things (IoT) - the fleet meets remote voice commands





Today - connect & control robotic ball from anywhere

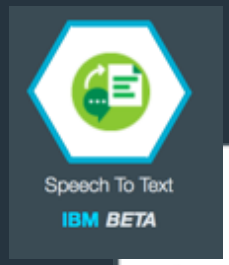
IBM IOT Registered App

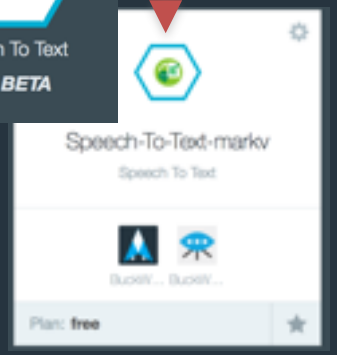


MQTT

Node-Red flow

IBM IOT Registered Device





Niklas Heidloff

https://www.youtube.com/watch?v=rpXGWObZyFw

Control a device with voice commands Recipe 1

IBM

- Signup Bluemix Account
  https://bluemix.net Use the IOT boilerplate add an IOT service
- Register your device and app with IOT Foundation on BlueMix
  - https://internetofthings.ibmcloud.com/#/ or launch the service Save the credentials
- Deploy sample code to your device IOT Foundation for the detail
  https://developer.ibm.com/iot/recipes
- git sample text to speech Watson Samples
  http://www.ibm.com/smarterplanet/us/en/ibmwatson/developercloud/doc/speech-to-text/#sampleApp

git clone https://github.com/watson-developer-cloud/speech-to-text-nodejs.git

Edit manifest.yml: // with your unique names

```
applications:
- services:
  - my-speech-to-text-service
  name: my-speech-to-text-nodejs
  command: node app.js
  path: .
  memory: 256m
  instances: 1
```

Control a device with voice commands Recipe

1. Add Mqttws31.js to js directory
   - for examples see https://eclipse.org/paho/clients/js/
2. Add MQTT calls to Demo.js

```
function showResult(data) {
 83    //if there are transcripts
 84    if (data.results && data.results.length > 0) {
 85
 86      //if is a partial transcripts
 87      if (data.results.length === 1 ) {
 88        var paragraph = transcript.children().last(),
 89          text = data.results[0].alternatives[0].transcript || '';
 90        publish("iot-2/type/"yourdevicetype"/id/"yourdeviceid"/evt/partial/fmt/json",
JSON.stringify({ value: data.results[0].alternatives[0].transcript }));
 91
 92        //Capitalize first word
 93        text = text.charAt(0).toUpperCase() + text.substring(1);
 94        // if final results, append a new paragraph
...
```

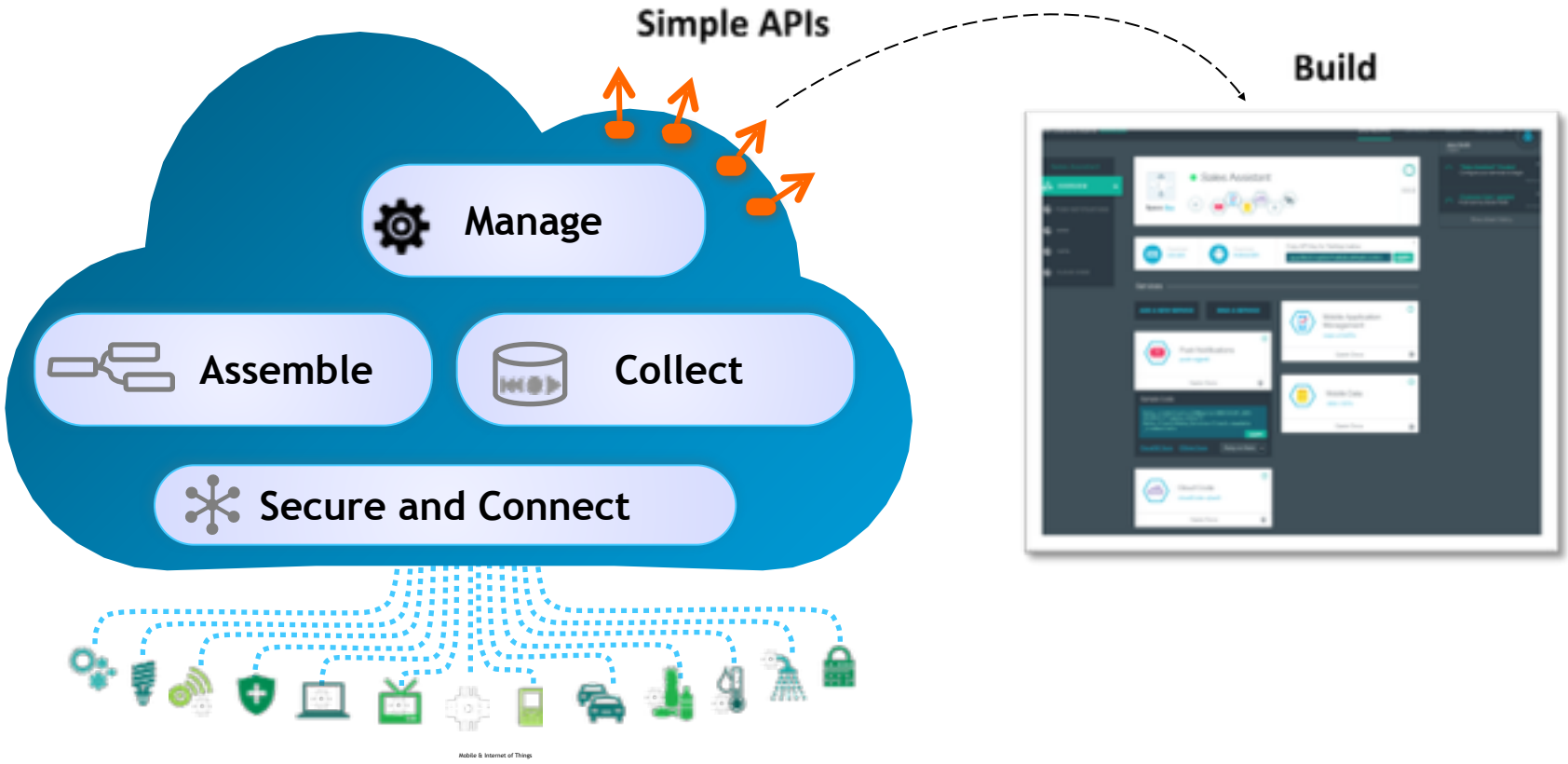
3. Add new file to layout.jade : script(type='text/javascript', src='/js/mqttws31.js')
4. Push to cloud

```
cf api https://api.ng.bluemix.net
cf login -u username
cf marketplace   // view service names
cf create-service <service-name  text_to_speech>  <plan  free> myspeech-to-text-service
cf push
```

App development is about speed and choice

Developers' expectations have evolved

IBM Internet of Things Foundation



Building with IoT Foundation

Devices

deviceType, deviceId

HTTP

auth token

1) **REGISTER** to obtain credentials

MQTT

2) **CONNECT** with MQTT

3) **SUBSCRIBE** to commands

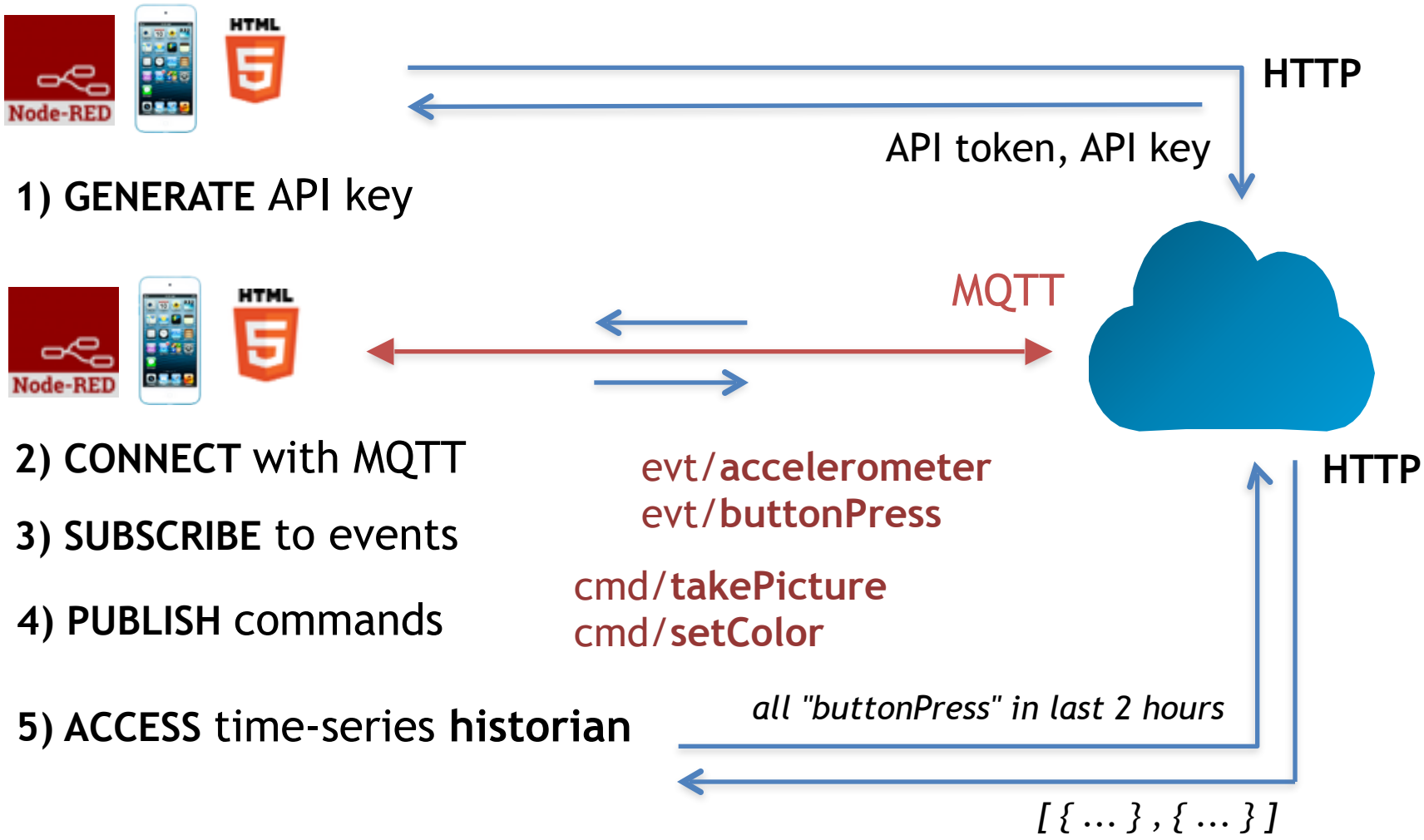
cmd/**takePicture**
cmd/**setColor**

4) **PUBLISH** events

evt/**accelerometer**
evt/**buttonPress**
evt/**status**

Building with IoT Foundation

Apps



MQTT

pub/sub protocol for the Internet of Things

Connect

Subscribe

Publish

Unsubscribe

Disconnect

```
client = new Messaging.Client(hostname, port, clientId)
client.onMessageArrived = messageArrived;
client.onConnectionLost = connectionLost;
client.connect({ onSuccess: connectionSuccess });

function connectionSuccess() {
     client.subscribe("planets/earth");
     var msg = new Messaging.Message("Hello world!");
     msg.destinationName = "planets/earth";
     client.publish(msg);
}

function messageArrived(msg) {
     console.log(msg.payloadString);
     client.unsubscribe("planets/earth");
     client.disconnect();
}
```

Eclipse Paho JavaScript MQTT client

open source (Eclipse Paho), standard (Oasis), can run on embedded devices

Sample 3:
ARM mbed

PUBLISH

accelerometer
potentiometer (x2)
joystick
temperature

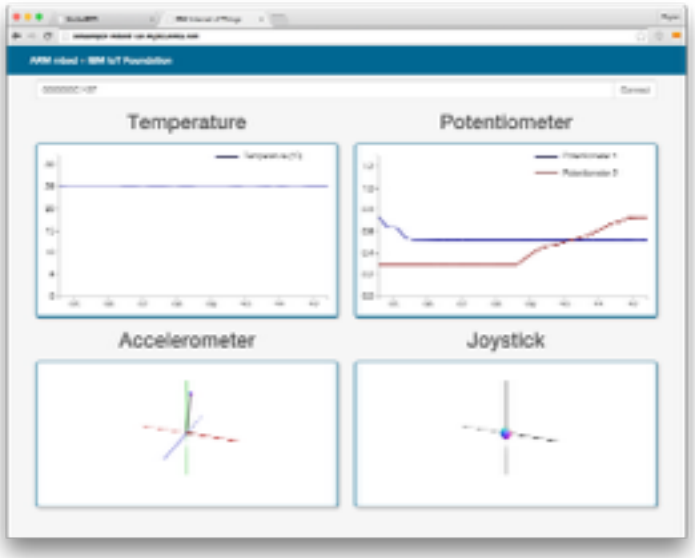
MQTT

MQTT

RECEIVE

accelerometer
potentiometer (x2)
joystick
temperature

Device



App

MQTT Recipe - Connecting to IOT

So if you're treating the app as a device:

<org_id>.messaging.internetofthings.ibmcloud.com -- server URL

d:<org_id>:<device type>:<device id> == a-<org>-client ID

use-token-auth == username

authorization token == password

So, if your are just connecting from the app using your API key?

<org_id>.messaging.internetofthings.ibmcloud.com == server URL

a:<org_id>:<api_key> == client ID and username

<api_token> -- == password

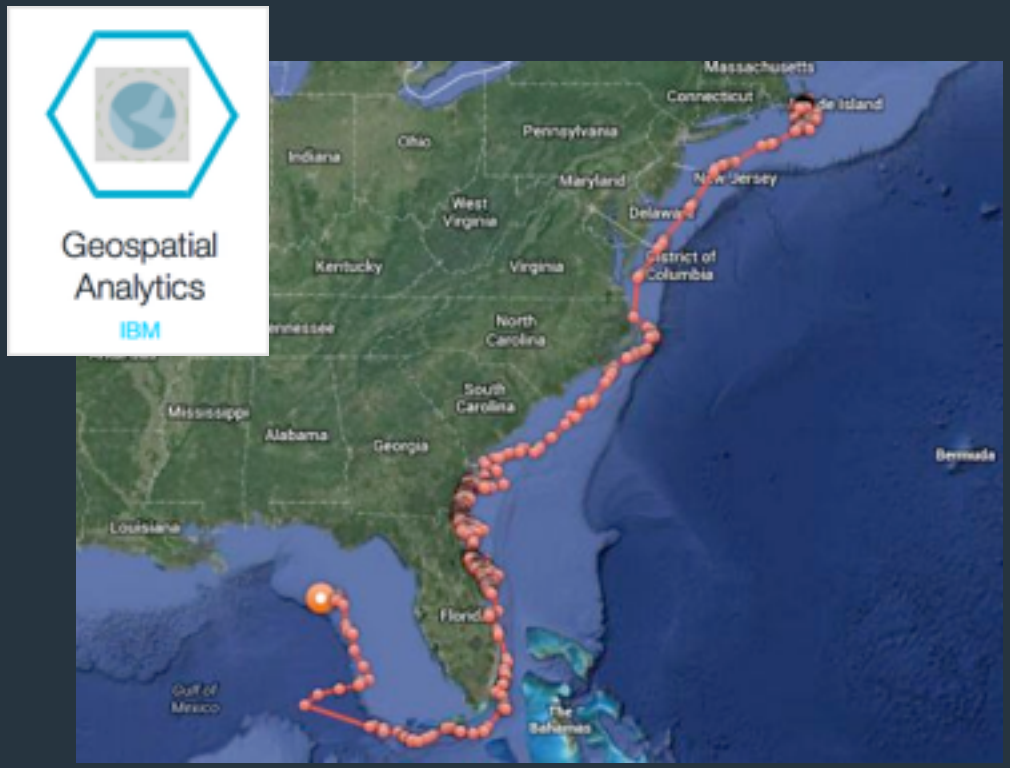
- Send command to device iot-2/type/<devtype>/id/<devid>/cmd/<cmdid>/fmt/<cmdfmt>
- Subscribe to all devices iot-2/type/iotsample-raspberrypi/id/+/evt/+/fmt/+

Other Fun IoT Automation Stuff (continued)

Shark Tracking

Scenario: Katharine and Betsy (great white sharks with tracking devices) are heading for Texas in search of food.

Notification to user of their range within a few miles of a large white shark based on GEO detection.



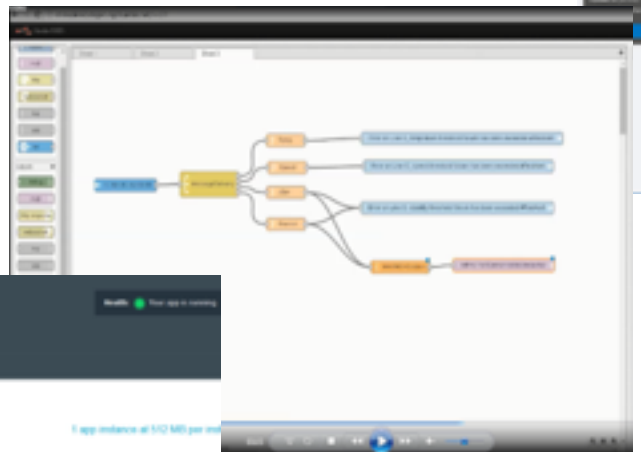
What You Can Do

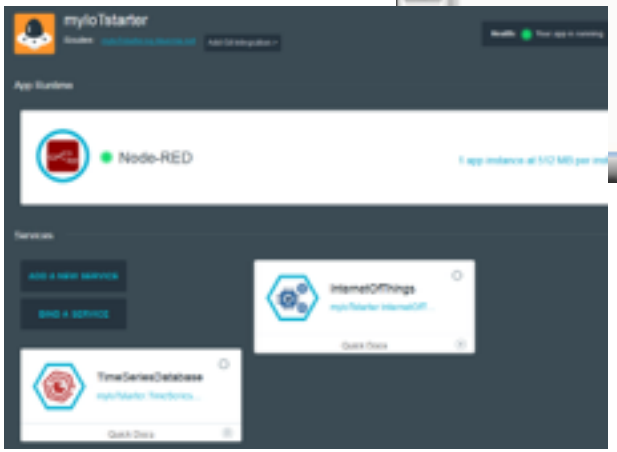
- Select from a growing list of device recipes

Let the IOT cloud provide:

- Massive Connectivity:
  Secure Registration, Scalable Data Transfer
- Simply connect & "recognize" device types
- Visualize real-time data stream

- Visually define logic flows using Node-RED
- Develop & deploy new applications





- Mix with other services in BlueMix
- Build applications that incorporate IoT

Bluemix Free Trial

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www.bluemix.net

Resources

Bluemix Demo Code

https://github.com/CodenameBlueMix/

IBM DeveloperWorks

https://www.ibmdw.net/bluemix/

Videos

https://www.youtube.com/user/IBMetinfo
https://www.youtube.com/watch?v=_LBZagavmxY
http://jamesthom.as/blog/2014/07/22/zero-downtime-deployments-using-bluemix/

jstart Bluemix Page

http://www-01.ibm.com/software/ebusiness/jstart/bluemix/

Getting started

https://hub.jazz.net/tutorials/jazzeditor

Developing apps using Eclipse/JaazHub and Bluemix

https://hub.jazz.net/tutorials/jazzrtc

CloudFoundry

http://cloudfoundry.org/index.html
http://www.gopivotal.com/platform-as-a-service/pivotal-cf
https://github.com/cloudfoundry