Connect and Control IOT Devices in Minutes

Using UI or Voice

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Cloud services: Voice, Storage, Security, MSG storage/Delivery, Analytics, Wiring/Logic, Views

Devices: Connect
Publish-Status/Description
Subscribe - Commands

MQTT

Voice Control

JSON

Device Connect & Control - Journey/Experience

Device Brokers

HomeKit

HealthKit
Looking forward

We will no longer have to learn to use the machine, the machine will learn from listening to us.

We will converse naturally within our own digital world to:

• Ask questions
• Control devices
• Collaborate more naturally
• Purchase goods and services using “Conversational Commerce”
• Carry out our daily tasks
• Learn, adapt, and extend out digital world
A demonstration connect and control a device with Voice commands

Using speech recognition and cloud technologies to:

- **Monitor** and help plan my day’s activities
- **Summarize** my portfolio and News
- **Analyze** business data
- **Search and follow** hot topics
- **Plan and track** my projects, **shop**, get help
- **Display and analyze** my devices
- **Securely control devices** around the world
- **Create reusable conversations** from my interactions, creating a “verbal mashup”
Demo2: Connect a Device

Live add a new device:

- Register new device
- Create keys
- Install sample code on device
  - developer.ibm.com/recipes/
- Publish Information to the cloud
- Monitor and create notifications
- Store data
- Add some control
What’s Changing?

- Devices integrating *Always on* listening for key words and voice as a command line.
- User polling/searching moving to *intelligent time sensitive* user programmed push.
- Bringing machine learning and *machine intelligence* to non data-scientists.
- Knowledge workers employing robotic process automation will **configure software and HW “robots” to automate** their interactions with the business systems.

“The last “next” mile of device interface and analytics”
Conversational Computing to Control a Device: Combining Services with Incremental Skill Sets

Cognitive Services

- Analyze
- Correlate
- Learn and Change
- Command and Control
- Connect and trigger
- GEO Location service
Conversational Computing: Combining Services with Incremental Skill Sets

Create, Save and Replay Discussions Like Play List
PaaS - Platform as a service, with large pallet of services
Behind The Scenes

Speech & NLP Controllers → Main App (MVC)

Alchemy News → BigInsights Twitter Sentiment → Business Service (KPIs) → IOT Foundation Services

Speech to Text

Text to Speech
Pick Your Device

IBM IoT Foundation

Recipes
developer.ibm.com/recipes/

ARM mbed
BeagleBone with SensorTag
SimpleLink™ Wi-Fi®
CC3200 LaunchPad
Intel Galileo
Raspberry Pi
Arduino Uno
with Wi-Fi Shield
Device Simulator
Wire new flows for your device
MQTT is simple to implement

```javascript
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
MQTT

Quality of Service for reliable messaging

Publish to topic iot-2/evt/<event-type-id>/fmt/json

Subscribe to topic iot-2/cmd/<event_id>/fmt/json

QoS 0
at most once
- doesn’t survive failures
- never duplicated

QoS 1
at least once
- survives connection loss
- can be duplicated

QoS 2
exactly once
- survives connection loss
- never duplicated
Bolt on simple speech front end - direct command/control

```
speechToText.recognize({audio: audio, content_type: 'audio/l16; rate=44100'},
  function(err, transcript){
    if (err) return res.status(500).json({error: err});
    else return res.json(transcript);  
  });

{ "results": [ { "alternatives": [ {
    "confidence": 0.8691191673278809,
    "transcript": "make my drone fly",
    "word_confidence": {"make": 0.95, "my": 0.56, "drone": 0.86, "fly": 0.8}
  } ], "final": true } ], "result_index": 0}
```

match text returned to cmd != strcmp

Speech code - handle speech to txt and txt to speech

1. Speech to Text API

2. Match text to CMD
Guess vs Final?
Word confidence score
Conversations & Context?
Phonetic matching?
Acronyms?
Nouns n verbs?
Utterances?

I said “my drone is Bryan's bebop”
I got “my German is Brian’s Bieber”

“Can you ask my drone to fly place”
“Can you ask my drum the fly place”

3. Format response Text to Speech API

YesIntent yes
YesIntent yep
YesIntent yeah
YesIntent please do
YesIntent sure

or

PortfolioIntent how is my stock portfolio doing
PortfolioIntent stocks update
PortfolioIntent stock update
PortfolioIntent check stocks
PortfolioIntent check my stocks
PortfolioIntent check portfolio
PortfolioIntent portfolio update

4. Send Command to IOT/ Foundation-device
Device control - from speech to command

Publish

```json
{
  "d": {
    "id": "5B937D56-2E75-5293-BE2B-CB17C2EA539B",
    "name": "David's Home : iDevicesNightLight",
    "data": {
      "hue": {
        "writable": true,
        "step": 1,
        "max": 360,
        "value": 220,
        "format": "number",
        "min": 0
      },
      "on": {
        "value": true,
        "writable": true,
        "format": "bool"
      }
    },
    "location": {
      "lng": -71.15152086101887,
      "lat": 42.29974632421209
    },
    "iso": "2016-04-11T10:54:29.317-0400"
  }
}
```

Subscribe cmd/set

```json
{
  "d": {
    "id": "5B937D56-2E75-5293-BE2B-CB17C2EA539B",
    "on": true,
    "hue": 160,
    "brightness": 80,
    "saturation": 50
  }
}
```
Cloudant map reduce - stats with API
API Management

Developers want to rapidly build secure RESTful APIs, yet don’t want to have to focus on elements that are not core to the API’s behavior

- Security
- Access control and authentication
- Metering
- Analytics
- Versioning
- Controlling Visibility and managing subscriptions

See Bluemix.net api mgmt blog by Steve Atkin
http://www.stevenatkin.com
Lessons Learned?

• No “Speech to text” service is perfect
  • Needs some special sauce to map to commands
  • We found it was best to have skill sets with context

• Devices must self describe capabilities for plug and play and have pronounceable names

• Commands over MQTT should be sent with QOS2 or have an ACT

• IBM IOT MQTT 4k message size limit
Lessons Learned - connecting heterogeneous devices?

- HomeKit
  - ble vs wifi
  - gateways

- HealthKit
  - security, privacy, and gateways
  - foreground/background data access

- Roll you own devices

- Standardization
The Future
What if…

Personal assistants or other devices could learn

The conversational style of interaction with devices is more than just asking the device to perform a set of static tasks.

We could teach the devices new things through conversation, combining tasks from an endless set of rich content components.

We are programming by example, the example in this case is in the form of conversation - do what I say! AND learn what I do!

In many ways, the zero UI of a conversational interaction pattern is much easier.

What better way to prescribe is there than to describe
Why PaaS? What is Bluemix? - Sign up for a free trial

(PaaS) - for rapidly building, managing, and running cloud based applications and services of all types without worrying about the underlying infrastructure. Program in your choice of language.

(IBM’s Bluemix) - Built on open-standards and open source technologies: Cloud Foundry, OpenStack, MQTT, docker,…

State of the Art User Interface

Services Catalog containing Services/APIs for Mobile, Data, Enterprise data connectors, Cognitive, Analytics, Social and any callable Rest based service

Multiple flavors - public, dedicated, on-premise, hybrid

Instant Runtimes

NEW: Virtual Machines

NEW: Containers

Build Apps Using Services
Thank you for your time

www.bluemix.net
for more info see the following blogs

Jon Kaufman: jkaufman.io
https://github.com/watson-developer-cloud/company-insights

Ryan Baxter: ryanjbaxter.com

Steve Atkin: stevenatkin.com

Niklas Heidlof: http://heidloff.net

James Thomas: http://jamesthom.as/blog/categories/bluemix/

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