Building Internet of Things applications with COMPOSE and JavaScript

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@buildingiot

compose

CREATE-NET

Building Internet of Things applications with COMPOSE and JavaScript

PART A – Some Basics

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IoT: The main components

Devices – 'Smart Objects' – 'Things'

Online Services

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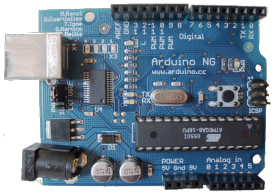
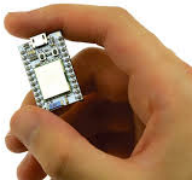
Devices

- Prototyping platforms (some IoT oriented)
- Arduino (….)
  - http://postscapes.com/arduino-wifi
- openPicus Flyport (WiFi, Ethernet, GPRS, Enocean)
- Libelium Waspmote
- mBed by ARM
- Pinocc.io (mesh network support, RF+WiFi)
- Spark core (WiFi)
- Electric Imp
- Tessel (WiFi, Node.js)





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Devices

- SODAQ (WiFi, Xbee, ..)
- XinoRF
- PanStamps
- Intel boards
- TI CC3200 Evaluation board
- Domain specific
  - BITalino (Wearables)
  - Thingsquare
  - Flutter

http://postscapes.com/internet-of-things-diy
http://postscapes.com/internet-of-things-hardware

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Gateways

- Why do I need a gateway?

- RaspberryPi
  - http://postscapes.com/raspberry-pi-wireless-options

- BeagleBone
- UDOO
- Intel Galileo
- Commercial:
  - SmartThings

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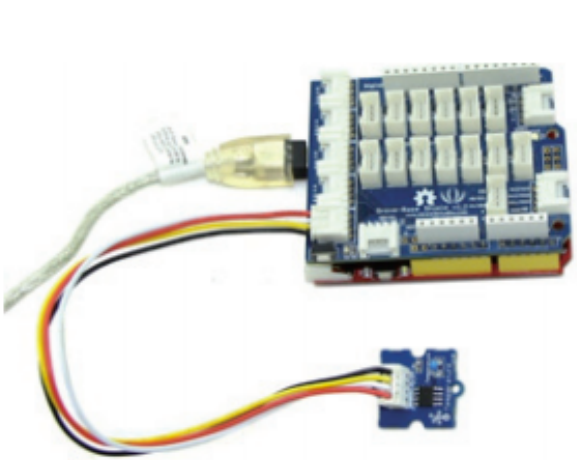
Sensors & Actuators

- Gas & Air quality
- Barometric pressure
- Temperature & Humidity
- Light & Sound
- Motion
- Flex & Force
- Position
- Magnetic fields
- Electricity
- Biometrics



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Sensors & Actuators

- Proximity & Presence
- Weight
- Liquids & Liquid flow
- Radiation
- …

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Sensors & Actuators

- Move things (motors)
- Activate (switches)
- Interfaces
  - Sound
  - Light
  - Displays
- Remote interfaces
  - Social
  - Email, text, …
  - Phone (twillio)

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Software

- Standard IDEs
  - Arduino IDE
  - Eclipse
- Code – less:
  - Scratch
- Cloud-based
  - Codebender (codebender.cc)
  - Spark.io
- Browser-based
  - mBed
  - Electron
  - Noduino
  - …

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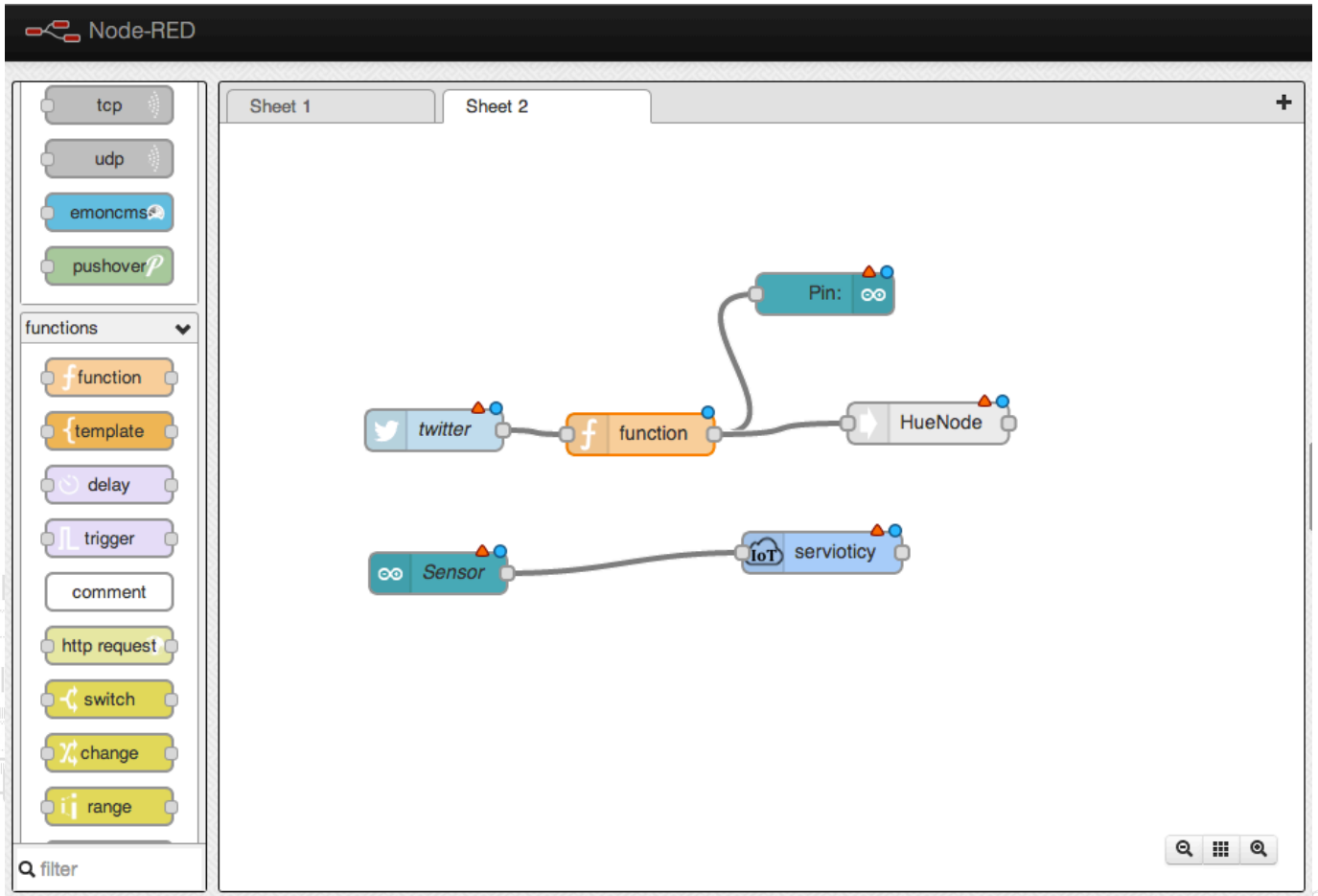
Workflow - based

- Node-RED



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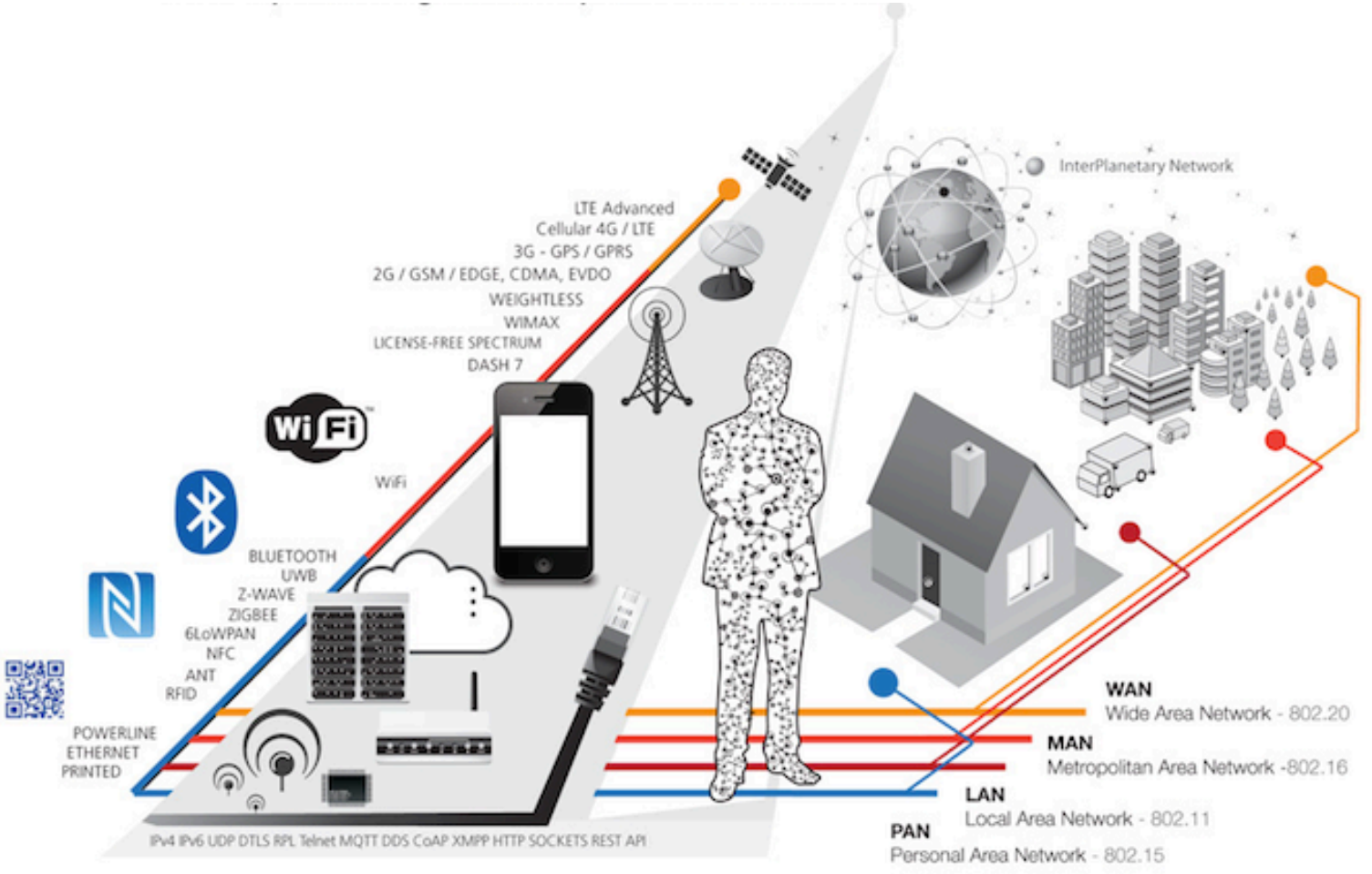
Networks



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Protocols

- Web based:
- HTTP
  - REST
  - WebSockets
- M2M (lower resources + actuation)
  - MQTT
  - CoAP - LWM2M
  - XMPP
  - STOMP
  - …

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Online Services

- Sensor Data
  - Pachube/Cosm/Xively
  - Paraimpu
  - TheThingsystem.io
- Device Management
- Full PaaS

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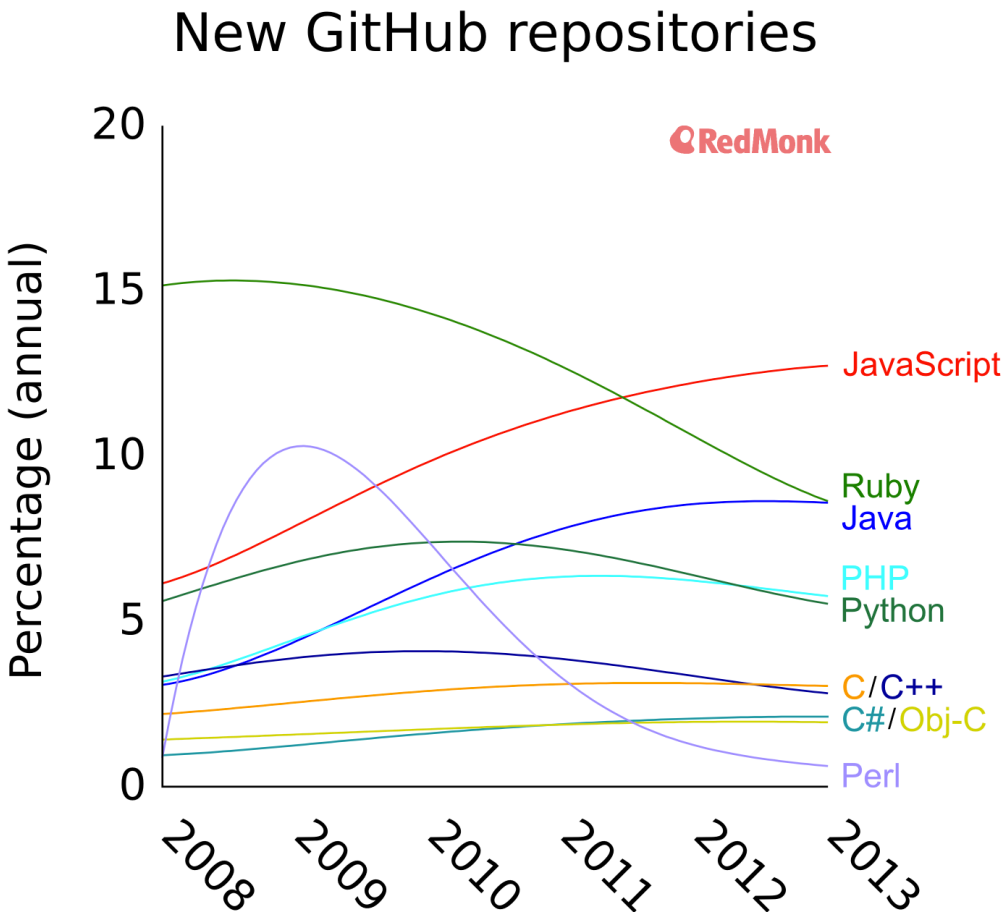
IoT & JavaScript

Why JavaScript?



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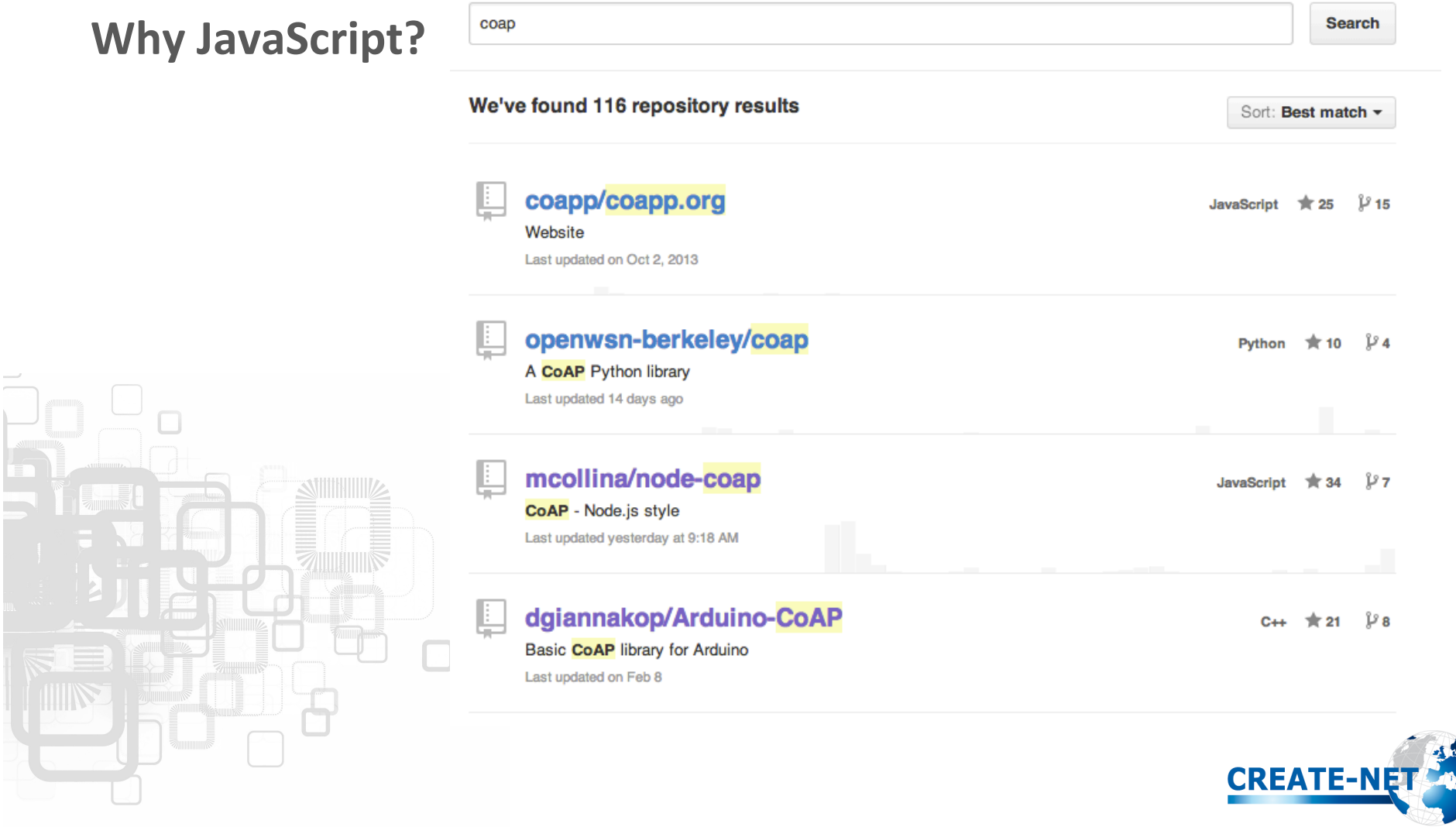
IoT & JavaScript

Why JavaScript?



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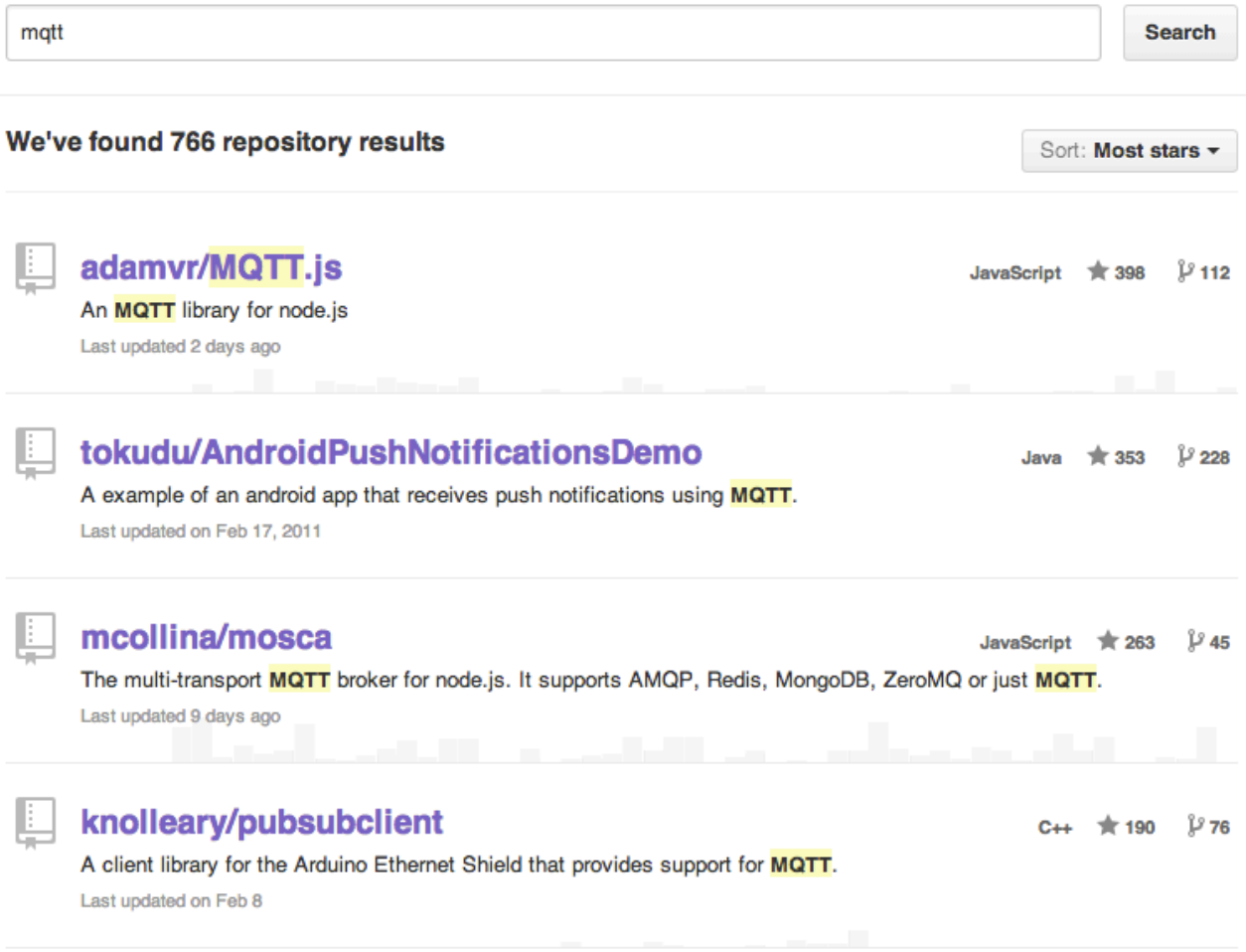
IoT & JavaScript

Why JavaScript?



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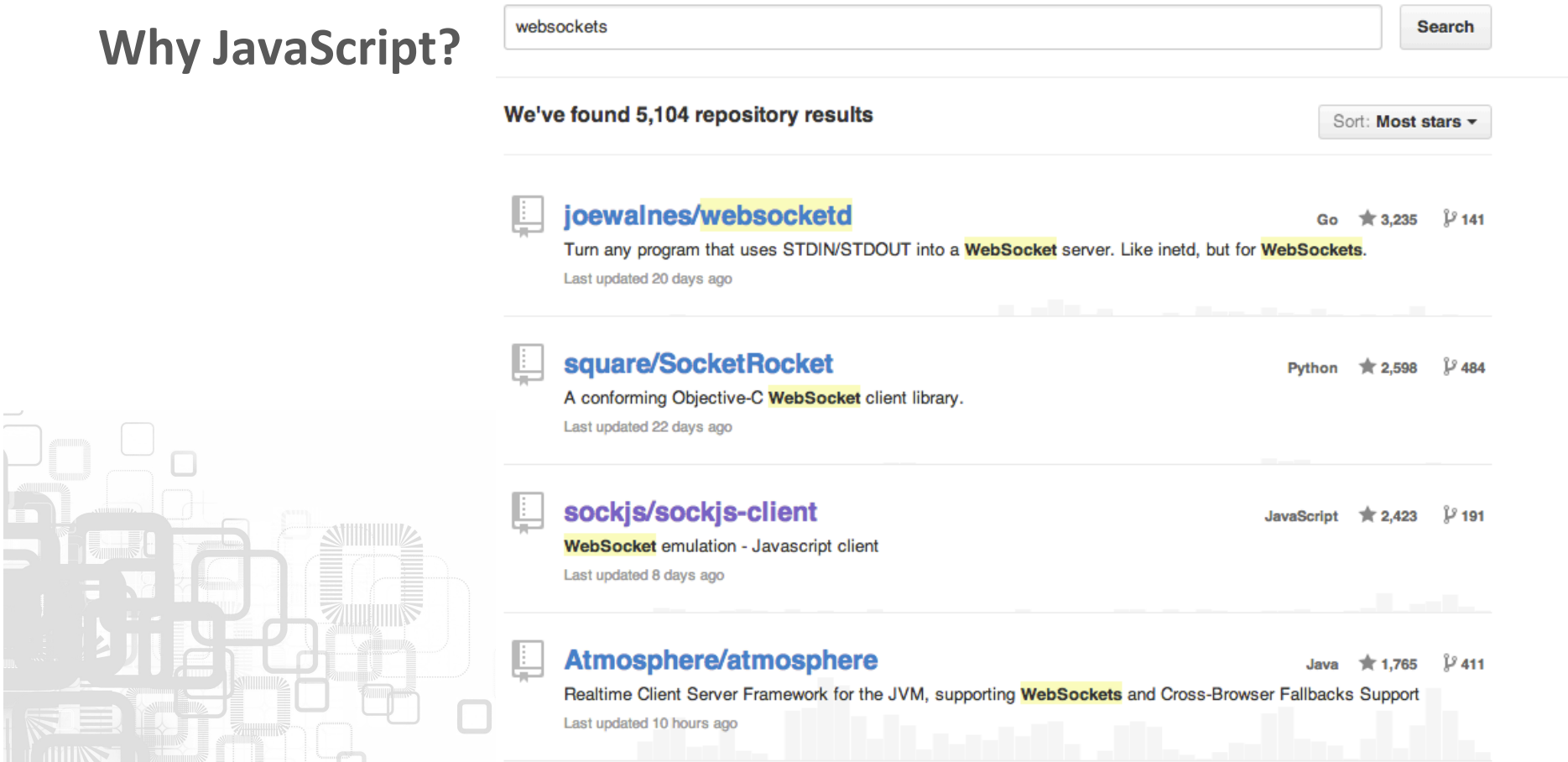
IoT & JavaScript

Why JavaScript?



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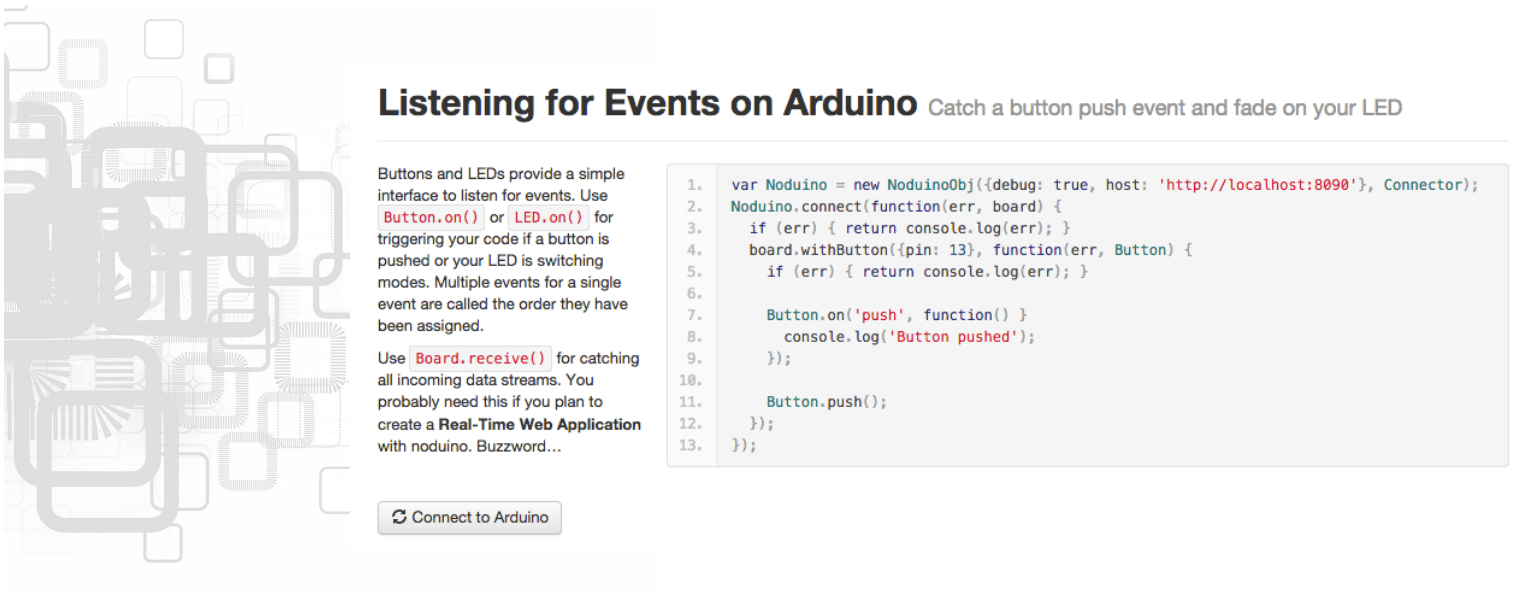
IoT & JavaScript

Software

- Noduino
- A simple and flexible JavaScript and Node.js Framework for accessing basic Arduino controls from Web Applications using HTML5, Socket.IO and Node.js



Listening for Events on Arduino Catch a button push event and fade on your LED

Buttons and LEDs provide a simple interface to listen for events. Use `Button.on()` or `LED.on()` for triggering your code if a button is pushed or your LED is switching modes. Multiple events for a single event are called the order they have been assigned.

Use `Board.receive()` for catching all incoming data streams. You probably need this if you plan to create a **Real-Time Web Application** with noduino. Buzzword…

Connect to Arduino

```
1.  var Noduino = new NoduinoObj({debug: true, host: 'http://localhost:8090'}, Connector);
2.  Noduino.connect(function(err, board) {
3.    if (err) { return console.log(err); }
4.    board.withButton({pin: 13}, function(err, Button) {
5.      if (err) { return console.log(err); }
6.
7.      Button.on('push', function() }
8.        console.log('Button pushed');
9.      });
10.
11.     Button.push();
12.   });
13. });
```

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IoT & JavaScript

Software

- Device.js
- DeviceJS is a JavaScript based development platform for reacting to sensors and controlling devices. It's built on top of Google's V8 JavaScript engine, Node.js and a real-time JSON database

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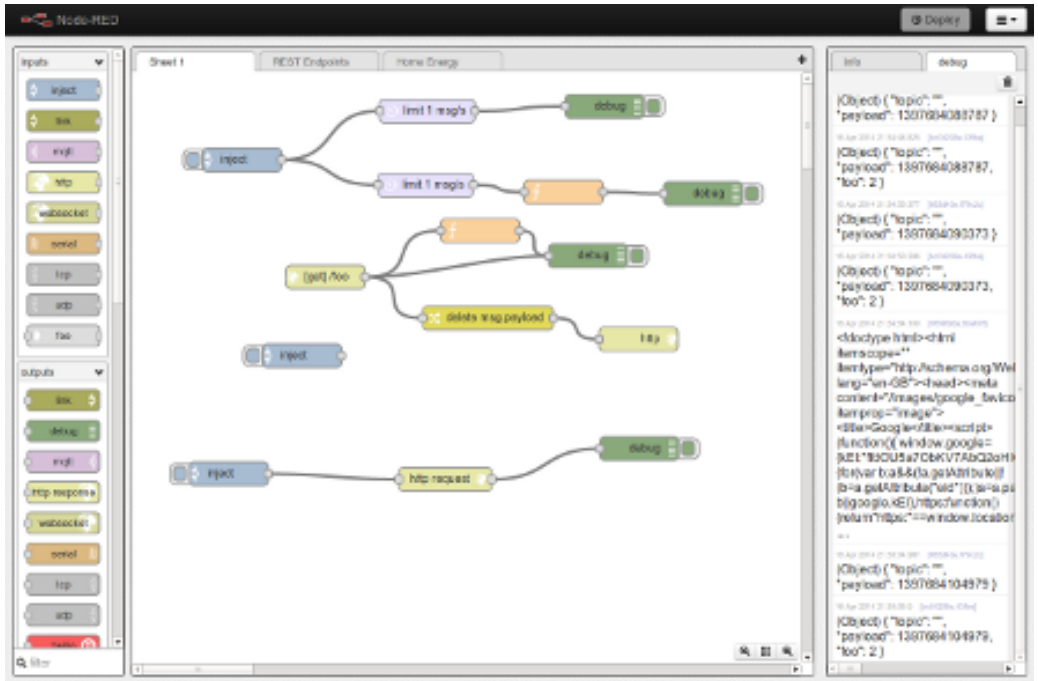
IoT & JavaScript

Software

- Node-RED
  - Node-RED is a tool for wiring together hardware devices, APIs and online services
  - Web-based
  - O/S



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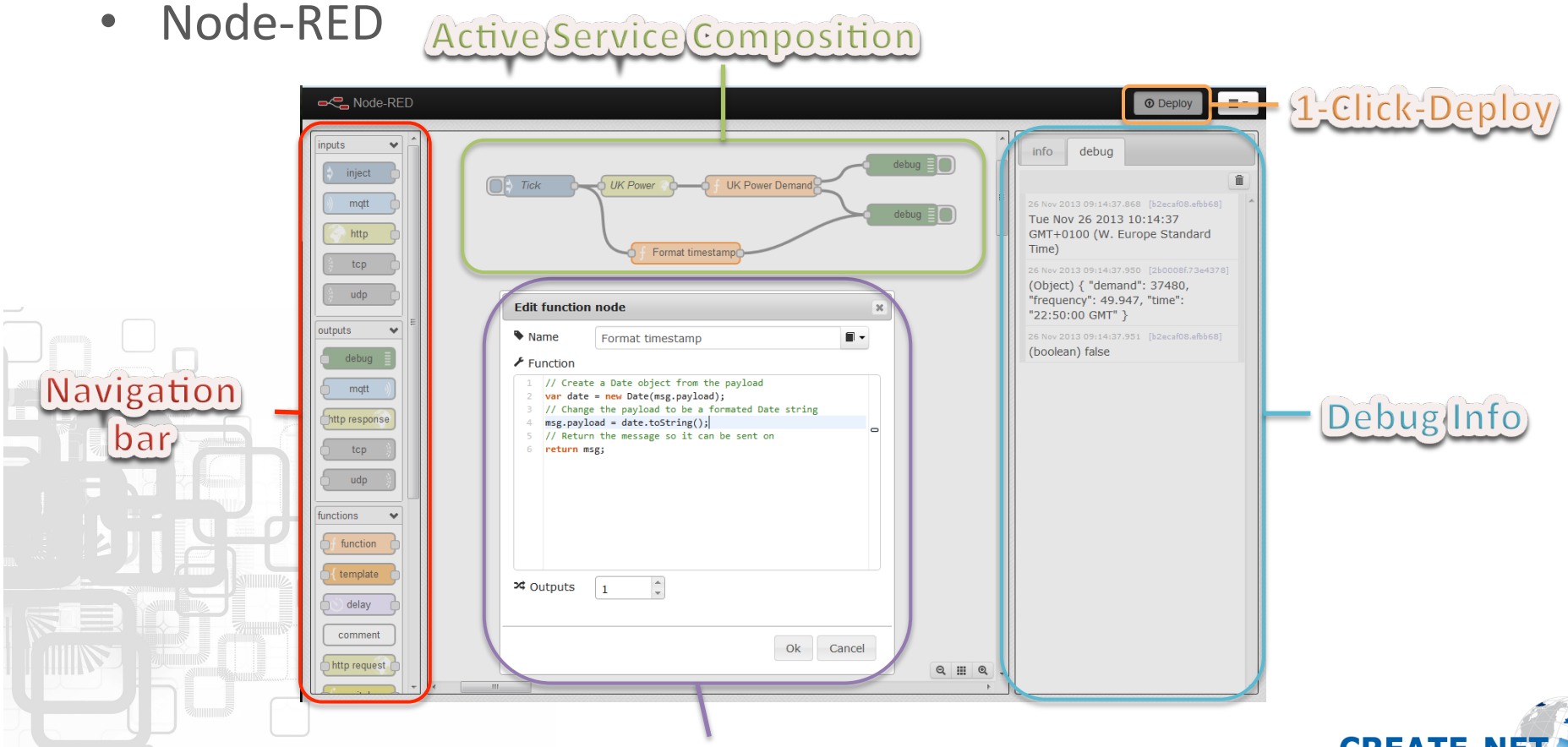
Software

- Node-RED



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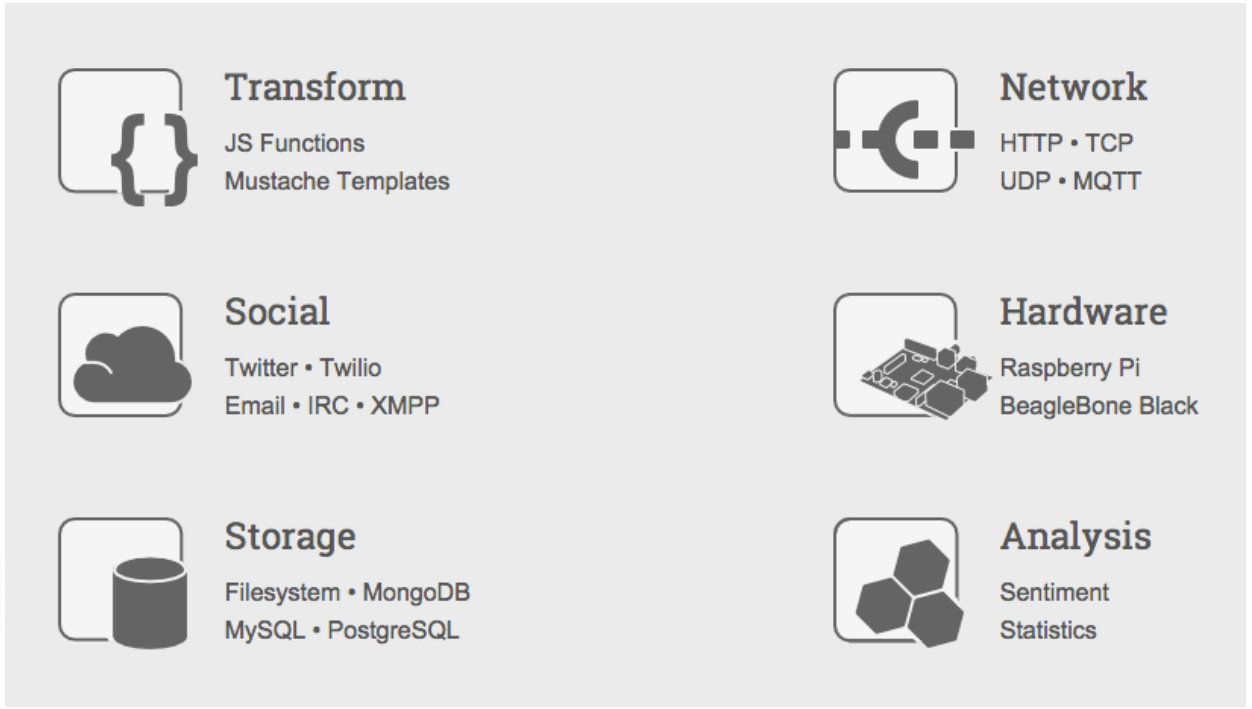
Software

- Node-RED
- Nodes available:

Over 40 user contributed nodes



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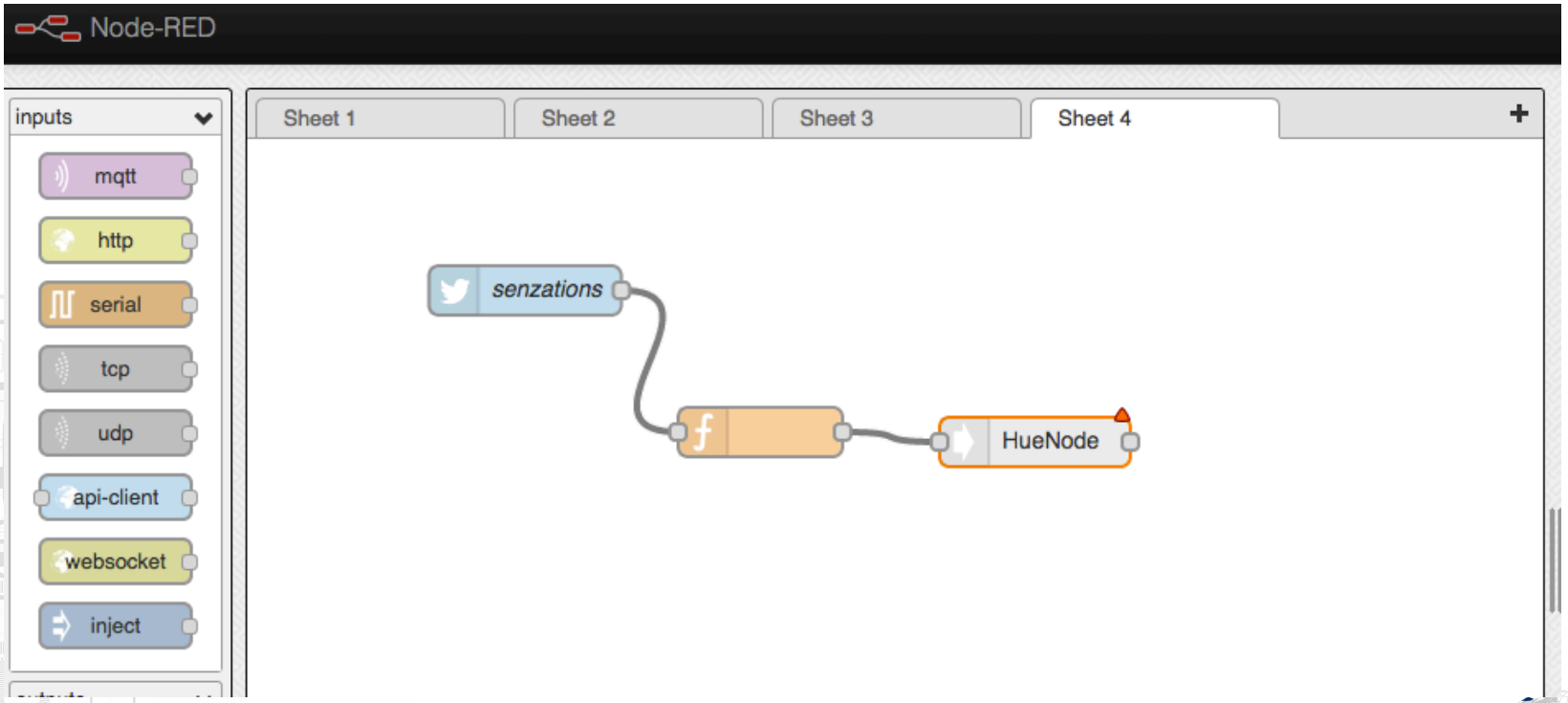
IoT & JavaScript

Software

- Node-RED



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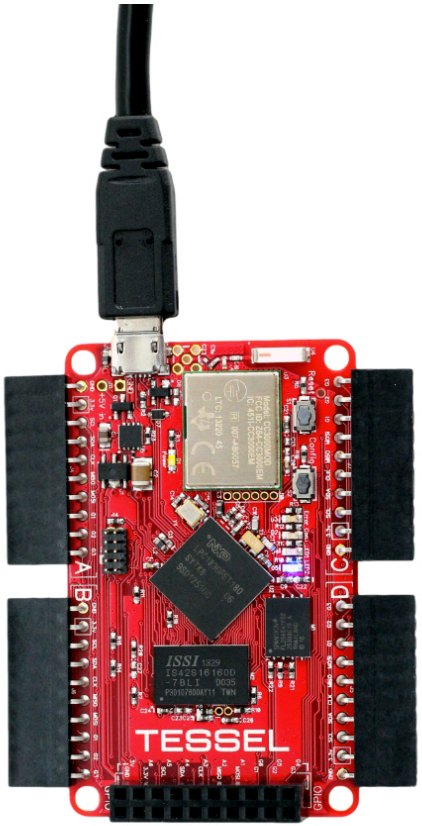
IoT & JavaScript

Hardware

- Tessel
  - 180mhz ARM Cortex-M3 LPC1830
  - 32mb SDRAM
  - 32mb Flash
  - TI CC3000 Wifi Radio
  - 16-pin GPIO bank for prototyping
  - Open source code, open source hardware
  - NPM module support



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IoT & JavaScript

Hardware

- Tessel

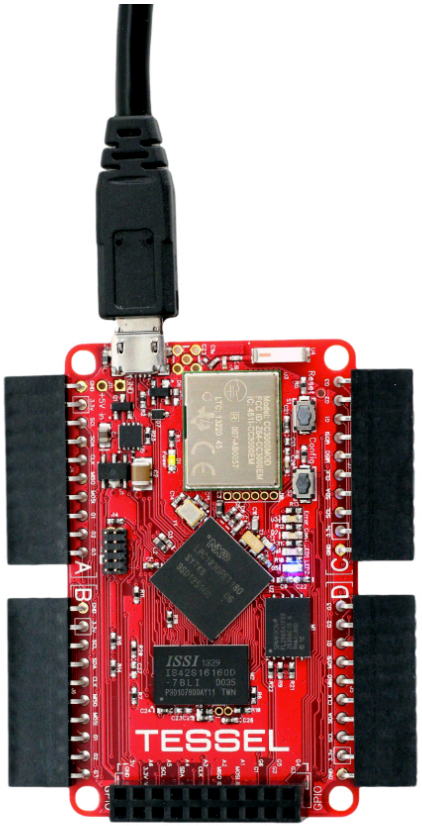
```
/*********************************************
This Bluetooth Low Energy module demo scans
for nearby BLE peripherals. Much more fun if
you have some BLE peripherals around.
*********************************************/

var tessel = require('tessel');
var blelib = require('ble-ble113a');

var ble = blelib.use(tessel.port['A']);

ble.on('ready', function(err) {
  console.log('Scanning...');
  ble.startScanning();
});

ble.on('discover', function(peripheral) {
  console.log("Discovered peripheral!", peripheral.toString());
});
```



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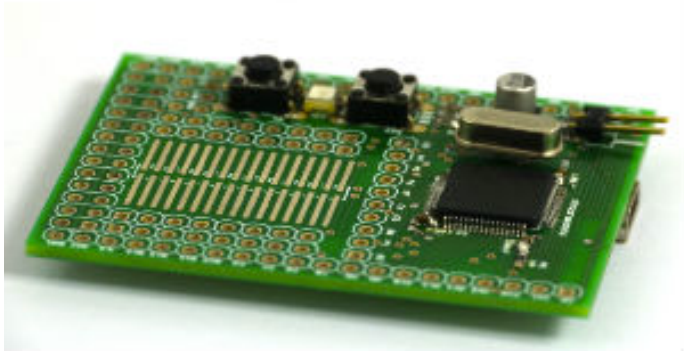
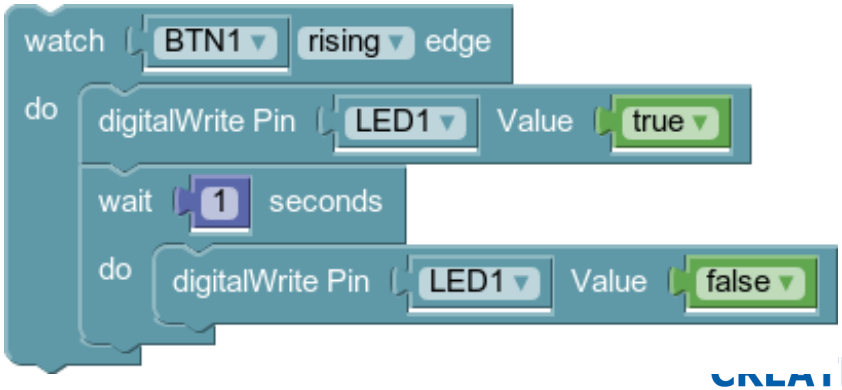
IoT & JavaScript

Hardware

- Espruino
  - TM32 32-bit 72MHz ARM Cortex M3 CPU
  - 256KB of Flash memory, 48KB of RAM
  - 44 GPIO Pins
  - WiFi Support with the TI CC3000
  - Open source code, open source hardware
  - Web-based IDE
  - Code-less IDE

Espruino





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Building IoT Applications

What else does it take?

Devices – 'Smart Objects' – 'Things'

Online Services

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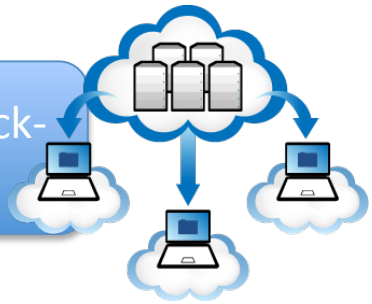
Building IoT Applications

What else does it take?

Deploy & Manage Back-End



Many APIs to connect and integrate

Management & Data Maintenance

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Building IoT Applications

What else does it take?

Software

Hardware

Data?

Libraries

APIs

Users?

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Building IoT Applications

What else does it take?

scalable Hosting

Resources

Management

Outsourcing

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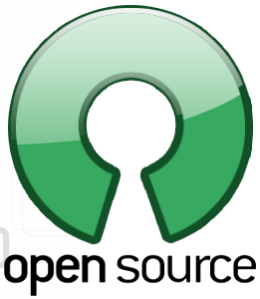
More than sensor data storing…

What is COMPOSE?

Collaborative Open Market to Place Objects at your Service

- Scalable PaaS
- IoT Marketplace
- Development Tools
- Sensor Communication Technologies



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IoT Platform As A Service

Node-RED

Apache STORM

MQTT
WebSockets
XMPP
…

compose Service Discovery

CLOUD FOUNDRY™

Security

API

Couchbase

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COMPOSE at heart

servIoTicy

- IoT Streaming made easy!
- RESTful API for:
  - Storing device (sensor) data
  - Querying & Retrieving the data
  - Pushing data to the device
  - Subscribing to notifications (e.g., new sensor data arrived)

- Free and Open Source
- Downloadable bundle (Ubuntu/Debian Image)
- Soon -> CloudFoundry installation

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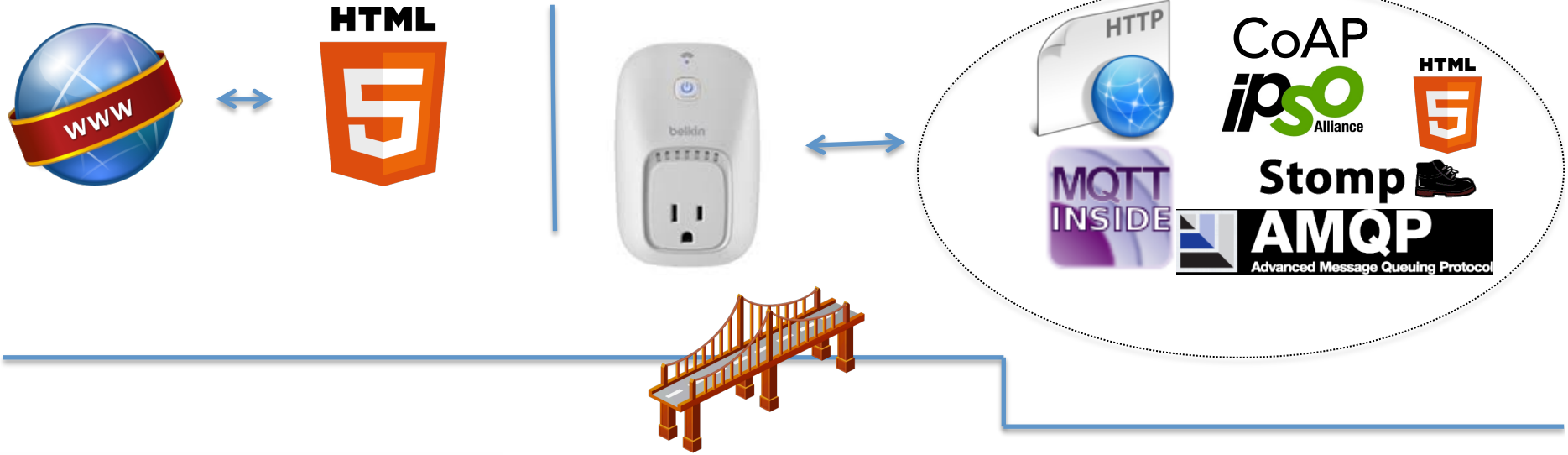
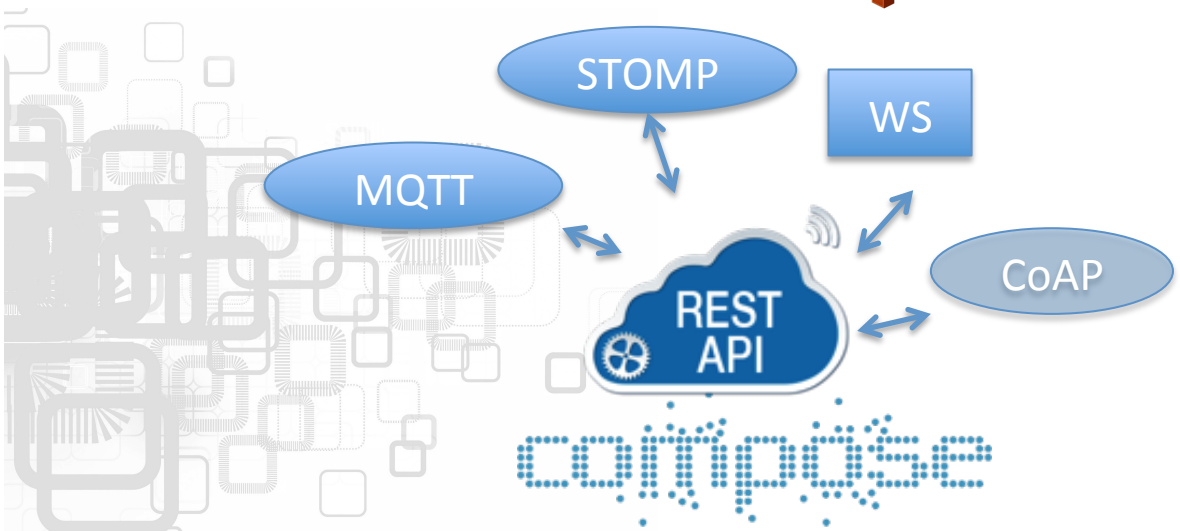
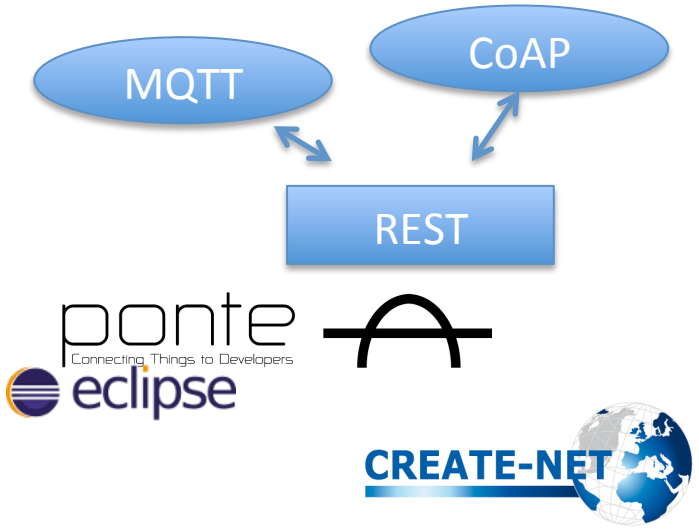
WWW -> IoT


WWW
HTML
belkin
HTTP
CoAP
ipso Alliance
HTML
MQTT INSIDE
Stomp
AMQP
Advanced Message Queuing Protocol


STOMP
WS
MQTT
REST API
CoAP
eclipse
coiniposé


MQTT
CoAP
REST
ponte
Connecting Things to Developers
eclipse
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COMPOSE at heart

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- Integration of popular frameworks:
- Apache STORM
- ElasticSearch
- CouchBase DB
- Apache Apollo – ActiveMQ
  - WS/STOMP/MQTT/AMQP/…
- Jetty
- ….

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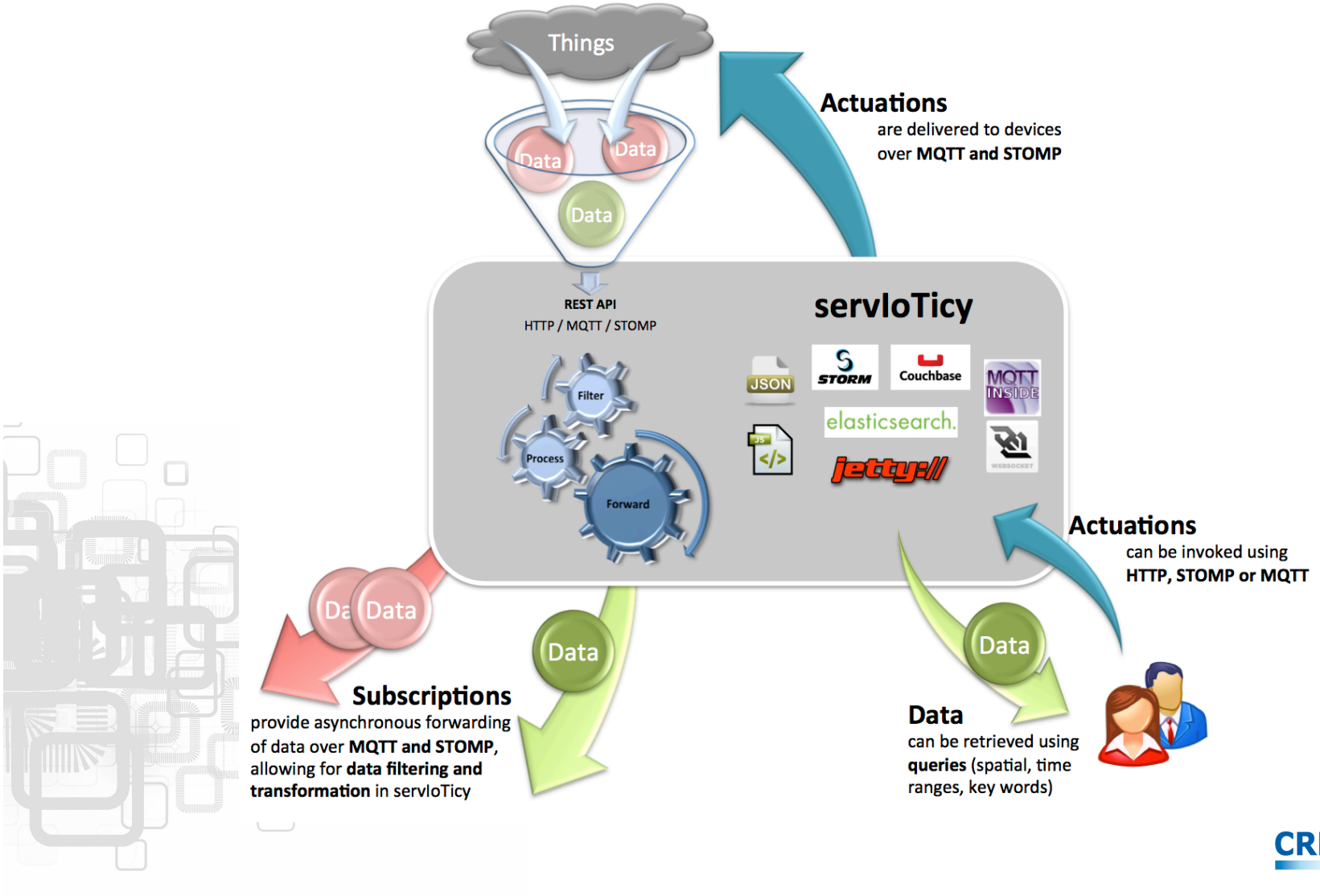
COMPOSE



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COMPOSE

glue.things

servIoTicy

IoT streaming made easy

COMPOSE SDKs

https://github.com/compose-eu

http://www.serviotic y.com

http://www.gluethings.com

iServe

CLOUD FOUNDRY™

Node-RED

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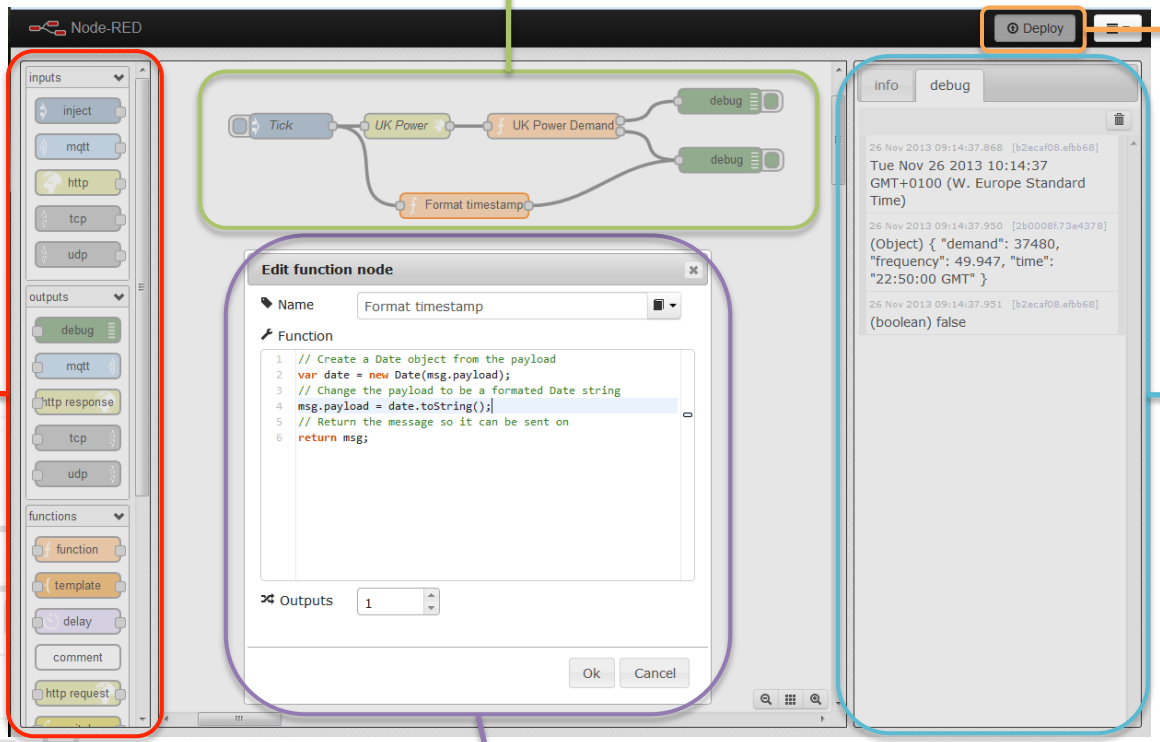
COMPOSE

Developer Friendly!

Conceptual idea from Node-RED



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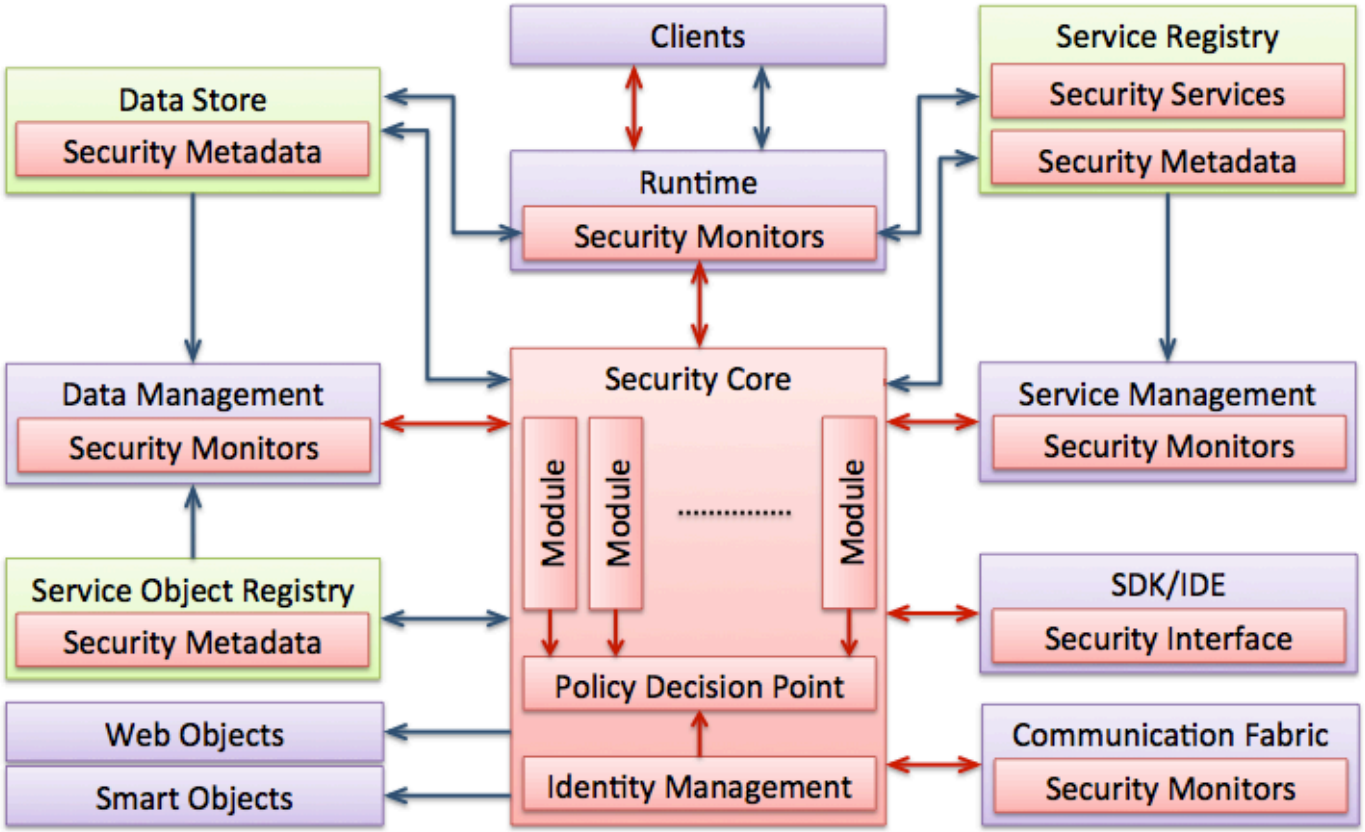
Meet COMPOSE

Security taken seriously!



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Meet COMPOSE

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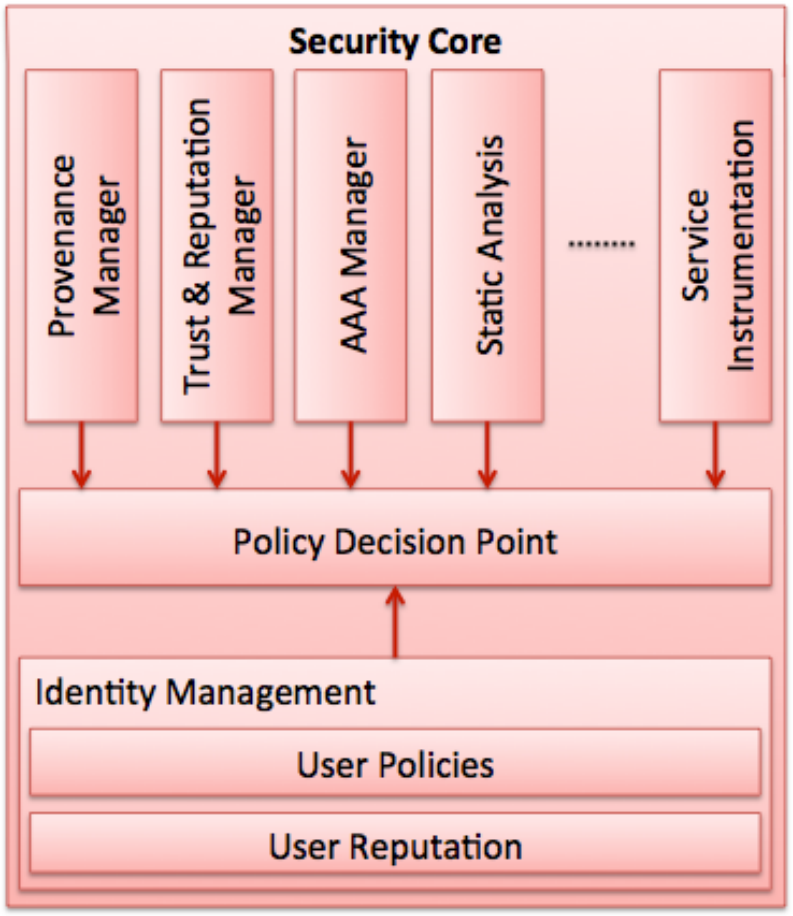

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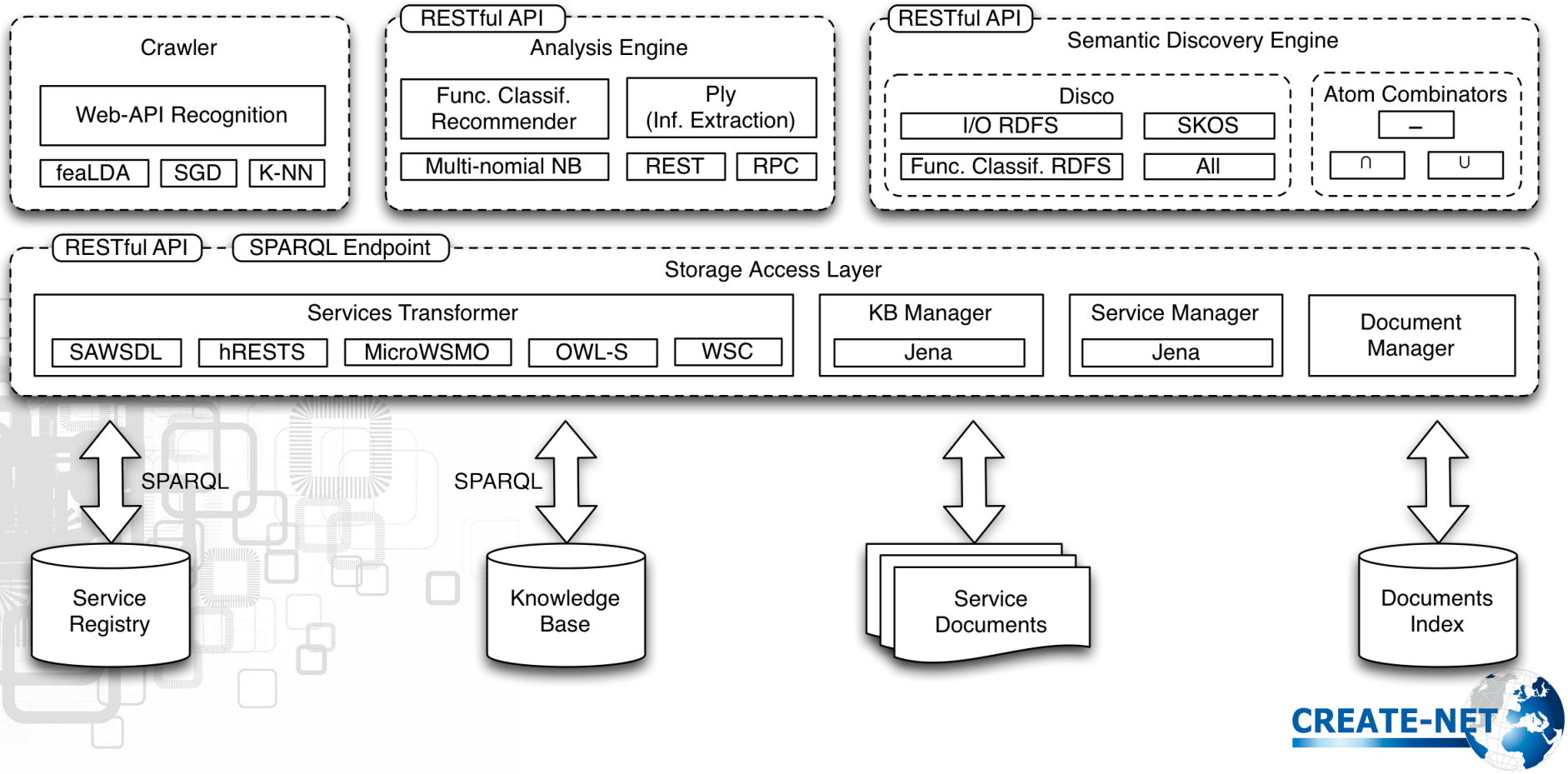
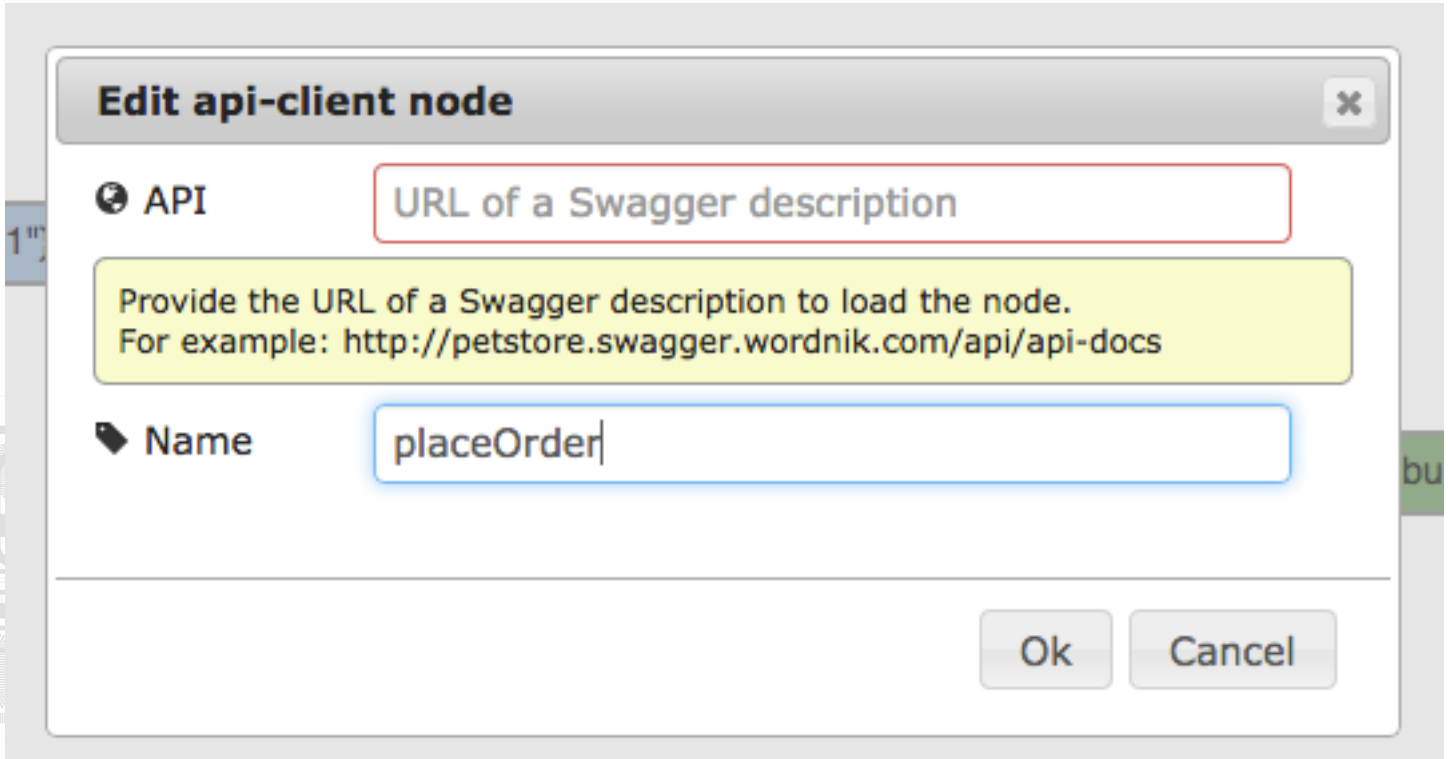
Meet COMPOSE

With Service Discovery!



Meet COMPOSE

With Service Discovery!



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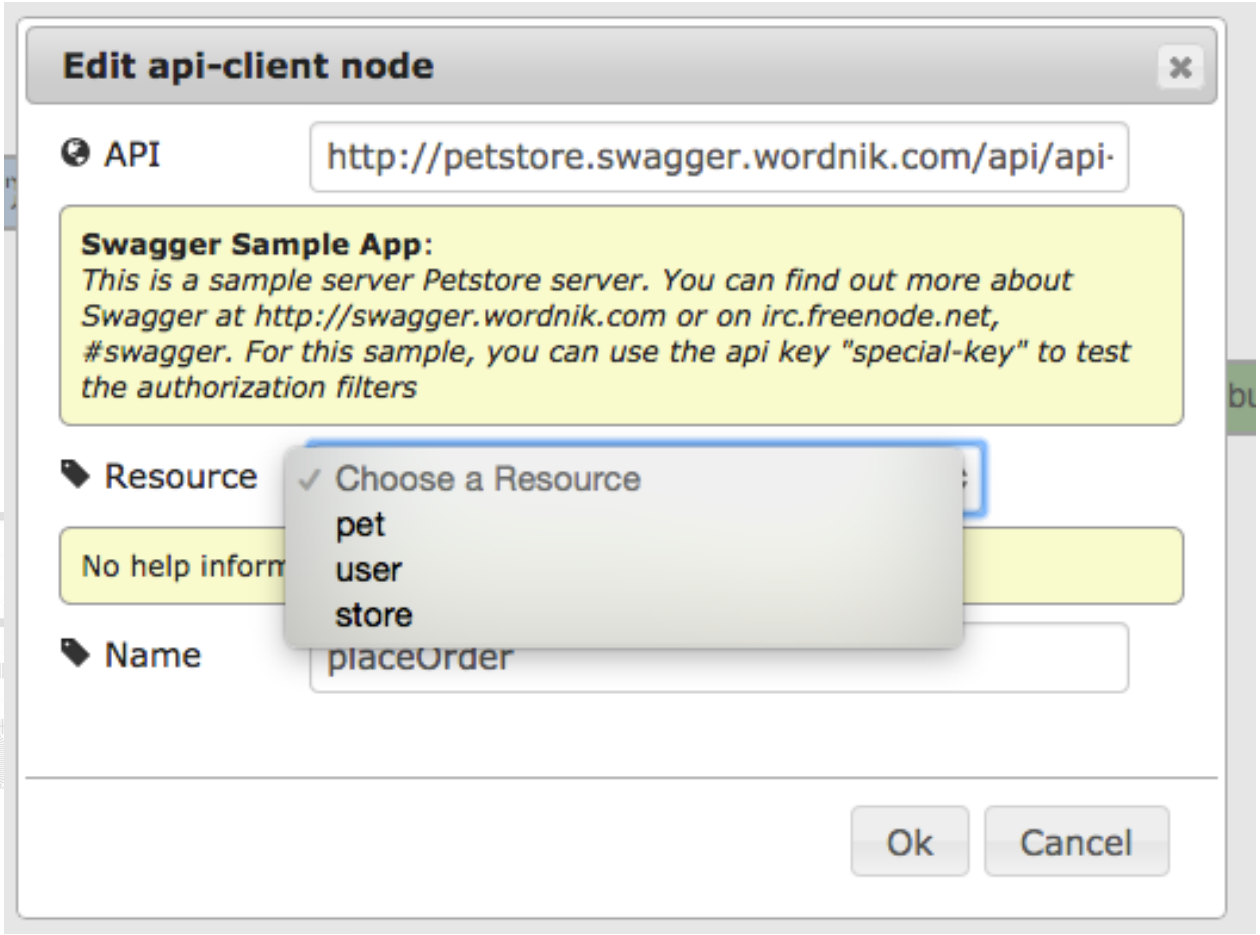
Meet COMPOSE

With Service Discovery!



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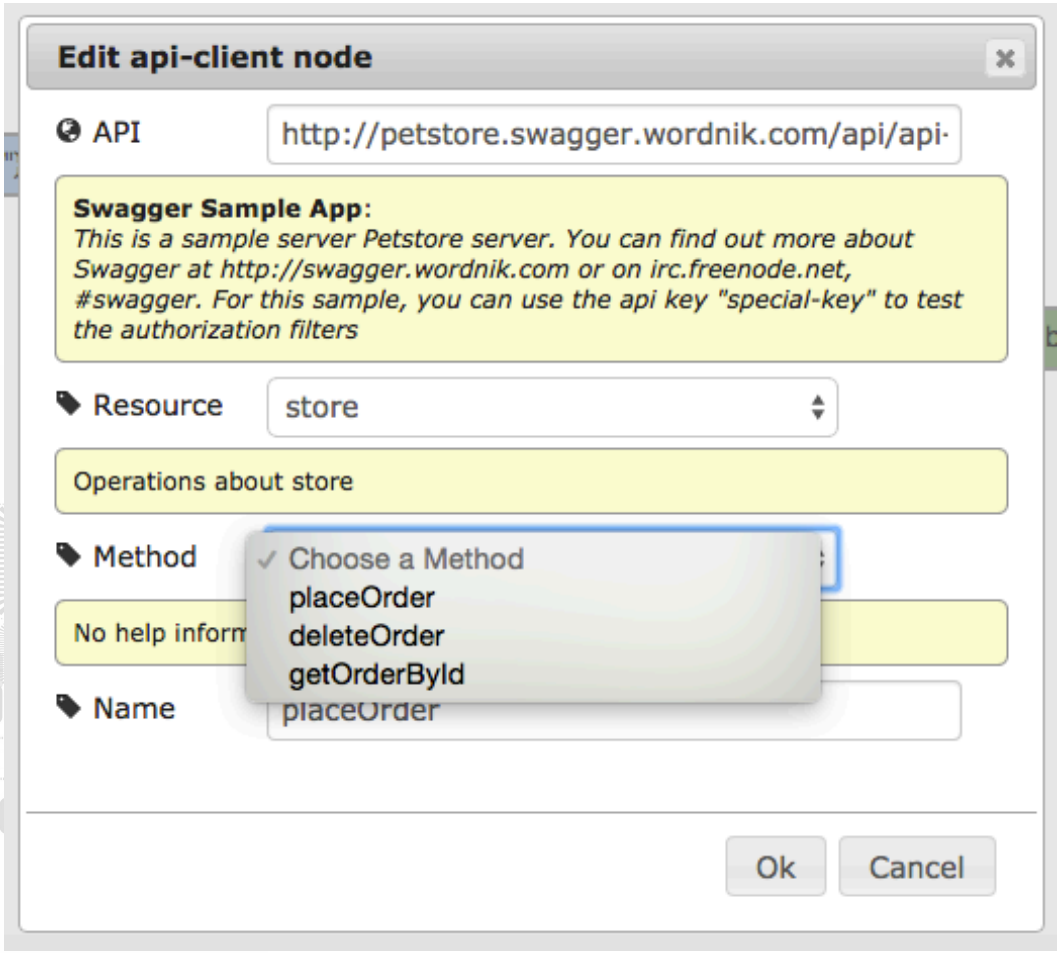
Meet COMPOSE

With Service Discovery!



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So how to use COMPOSE?

IDEA!

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So how to use COMPOSE?

Smart Device

Smart Device

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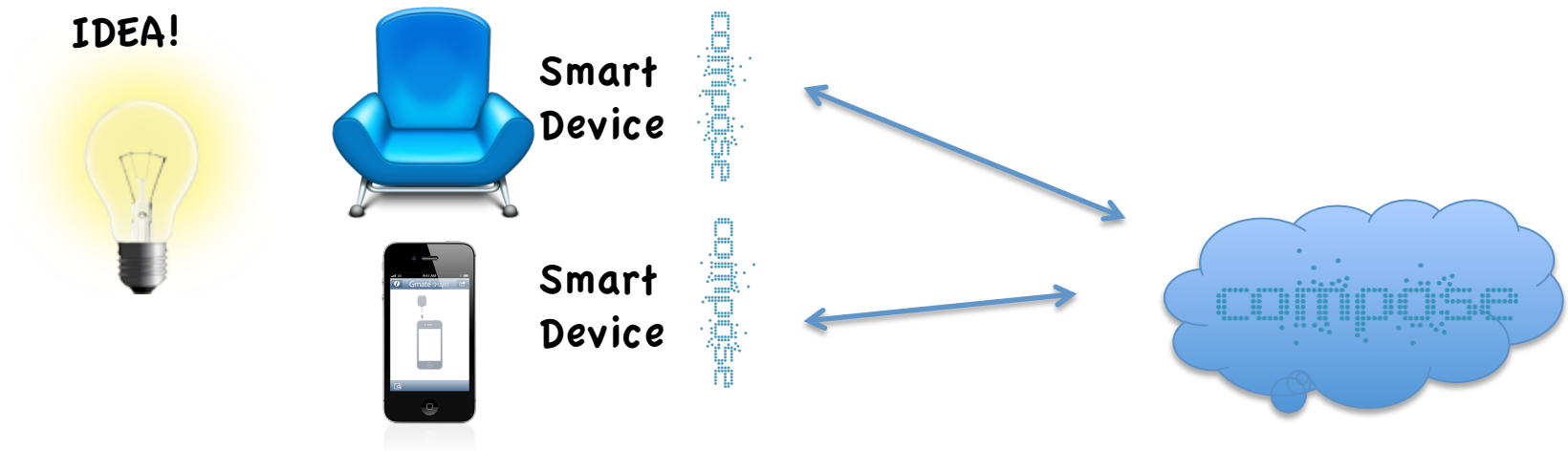
So how to use COMPOSE?



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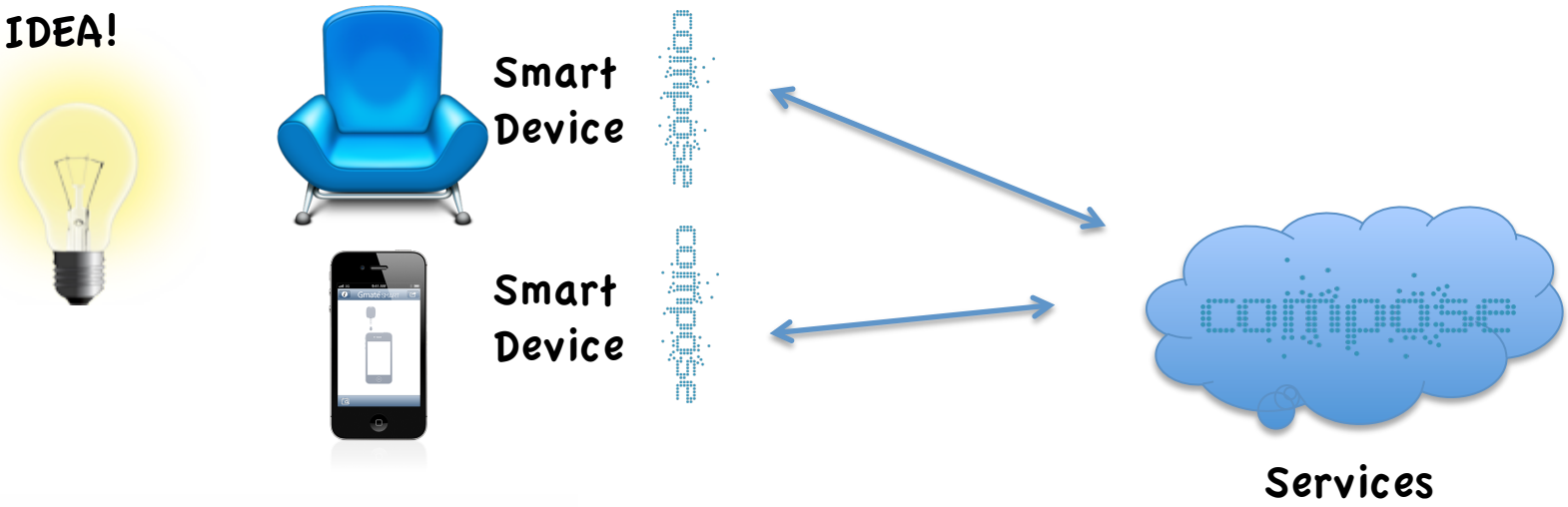
So how to use COMPOSE?



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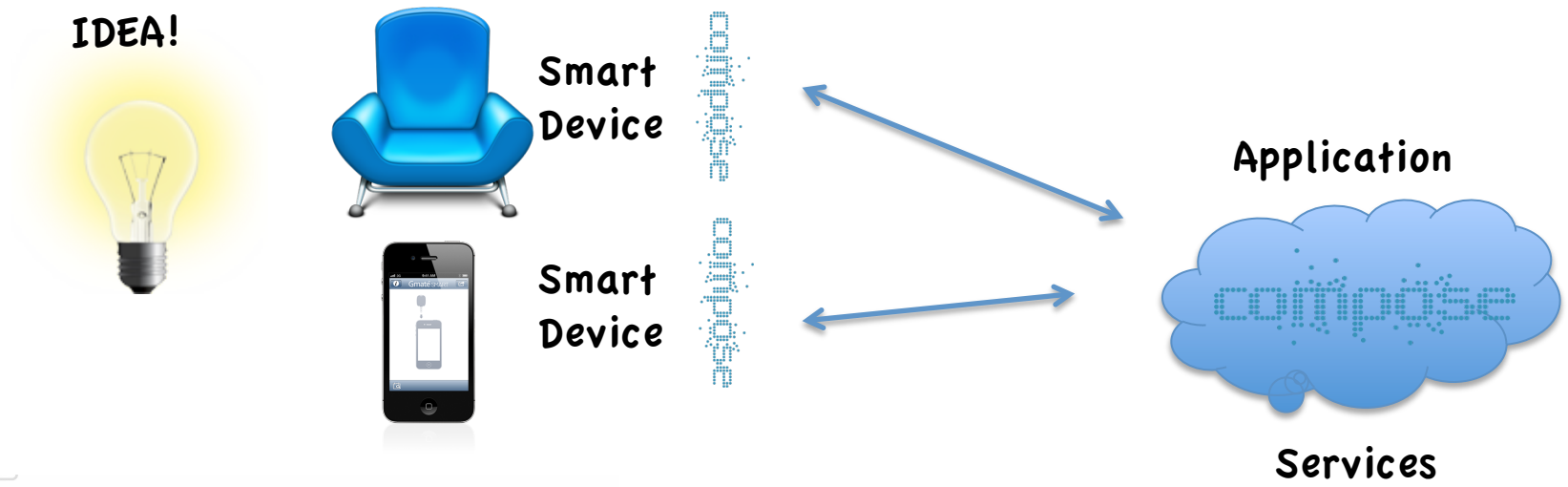
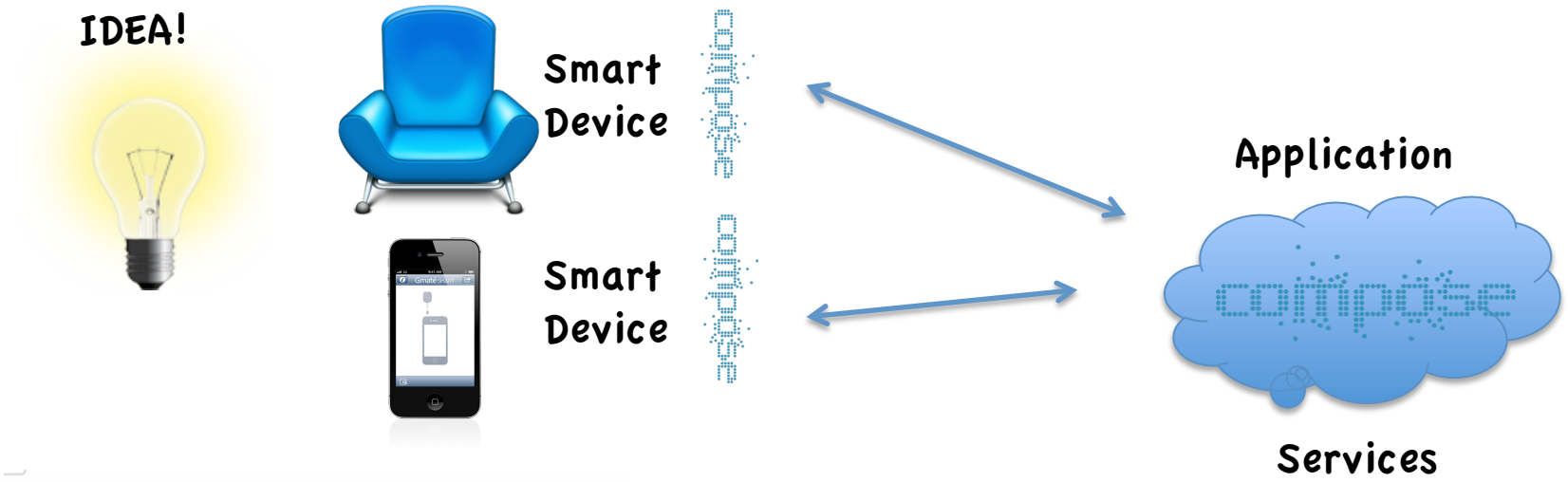
So how to use COMPOSE?



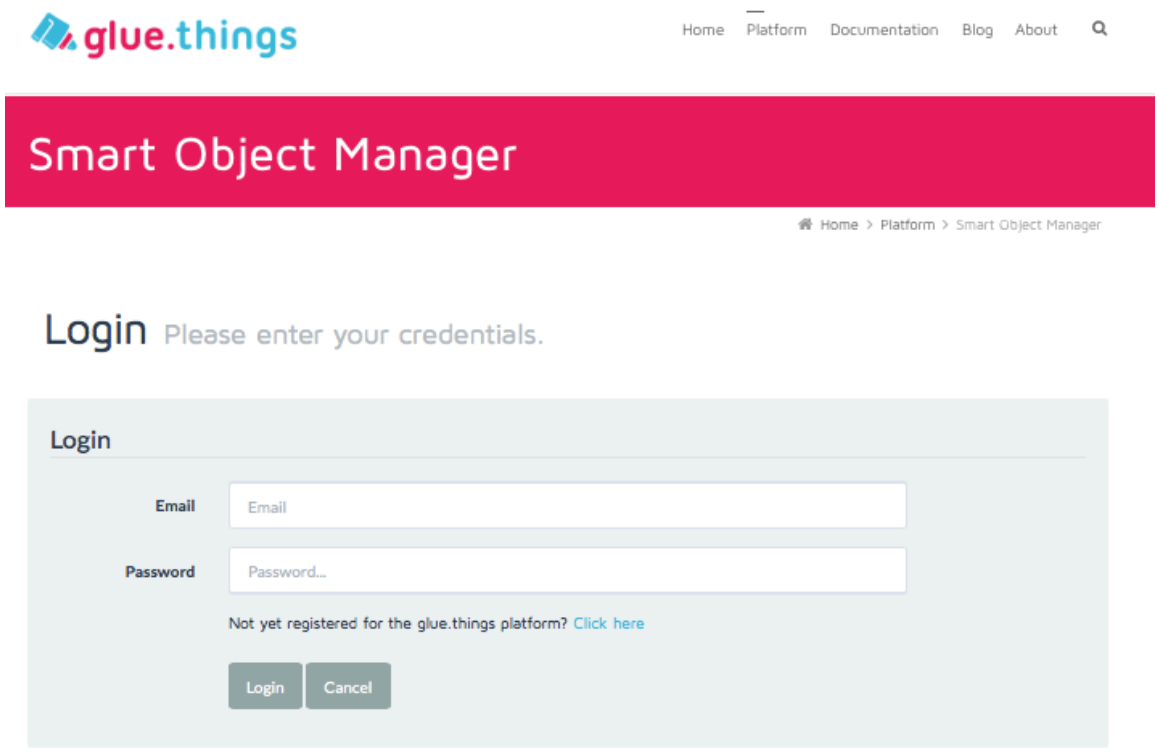
So how to use COMPOSE?



Step by Step…

Step 1

http://www.gluethings.com/platform/smart-object-manager/



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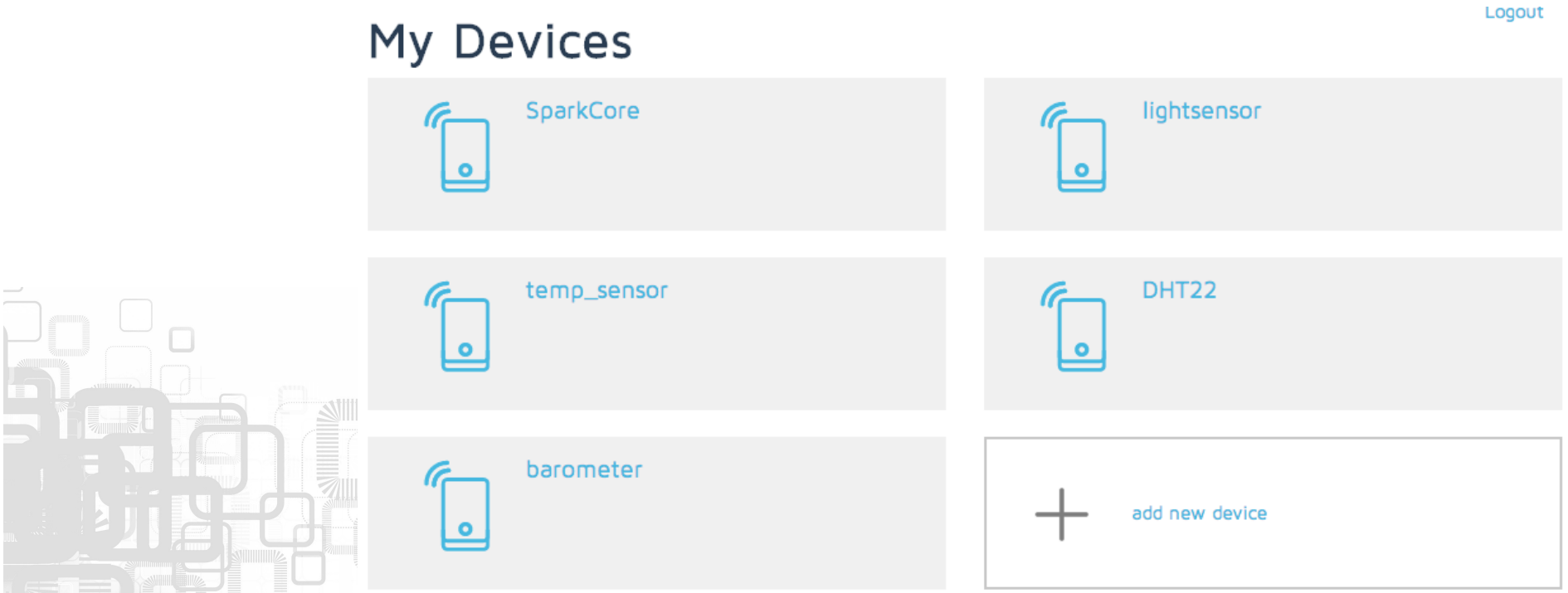
Step by Step…

Step 2

http://www.gluethings.com/platform/smart-object-manager/

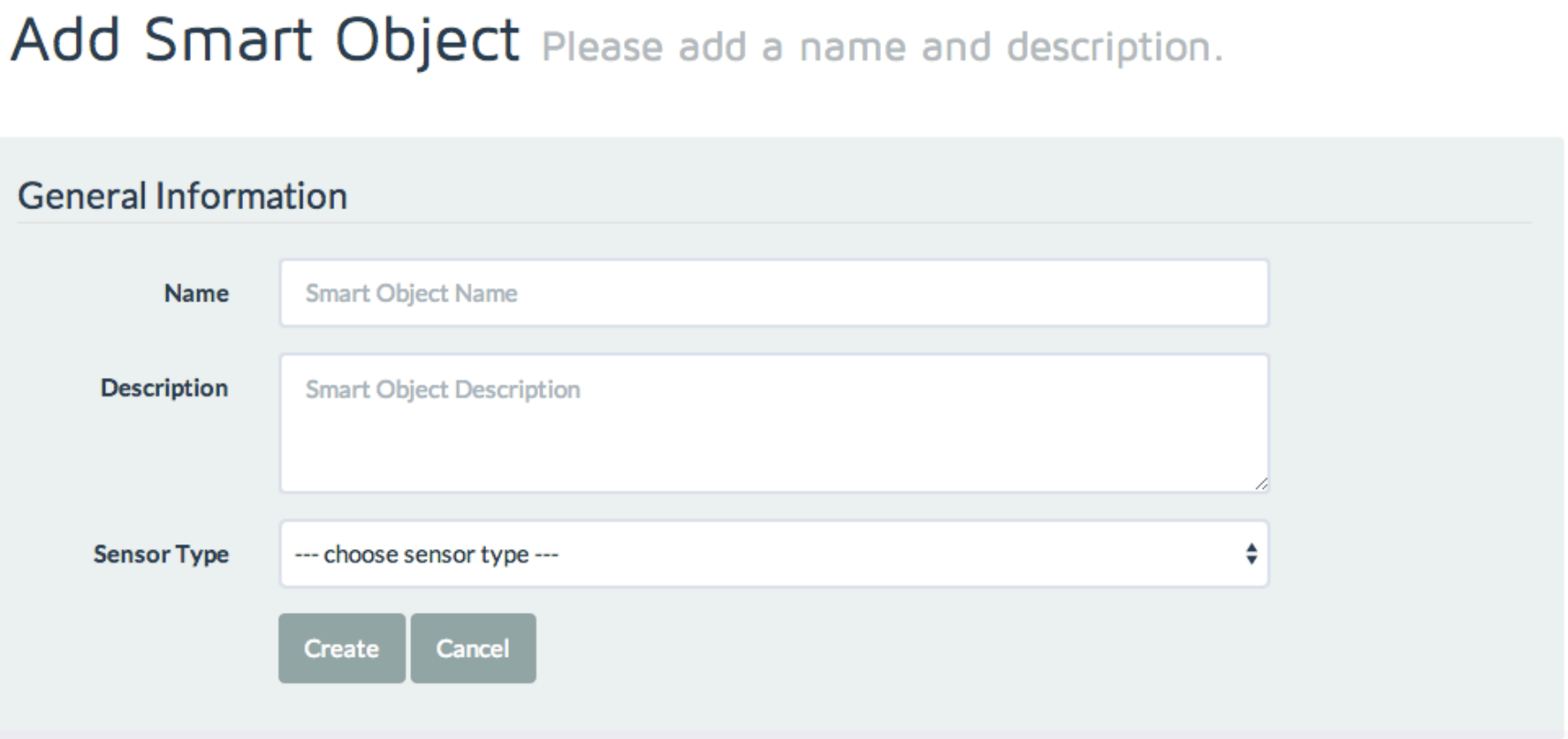


CREATE-NET

Step by Step…

Step 2

http://www.gluethings.com/platform/smart-object-manager/

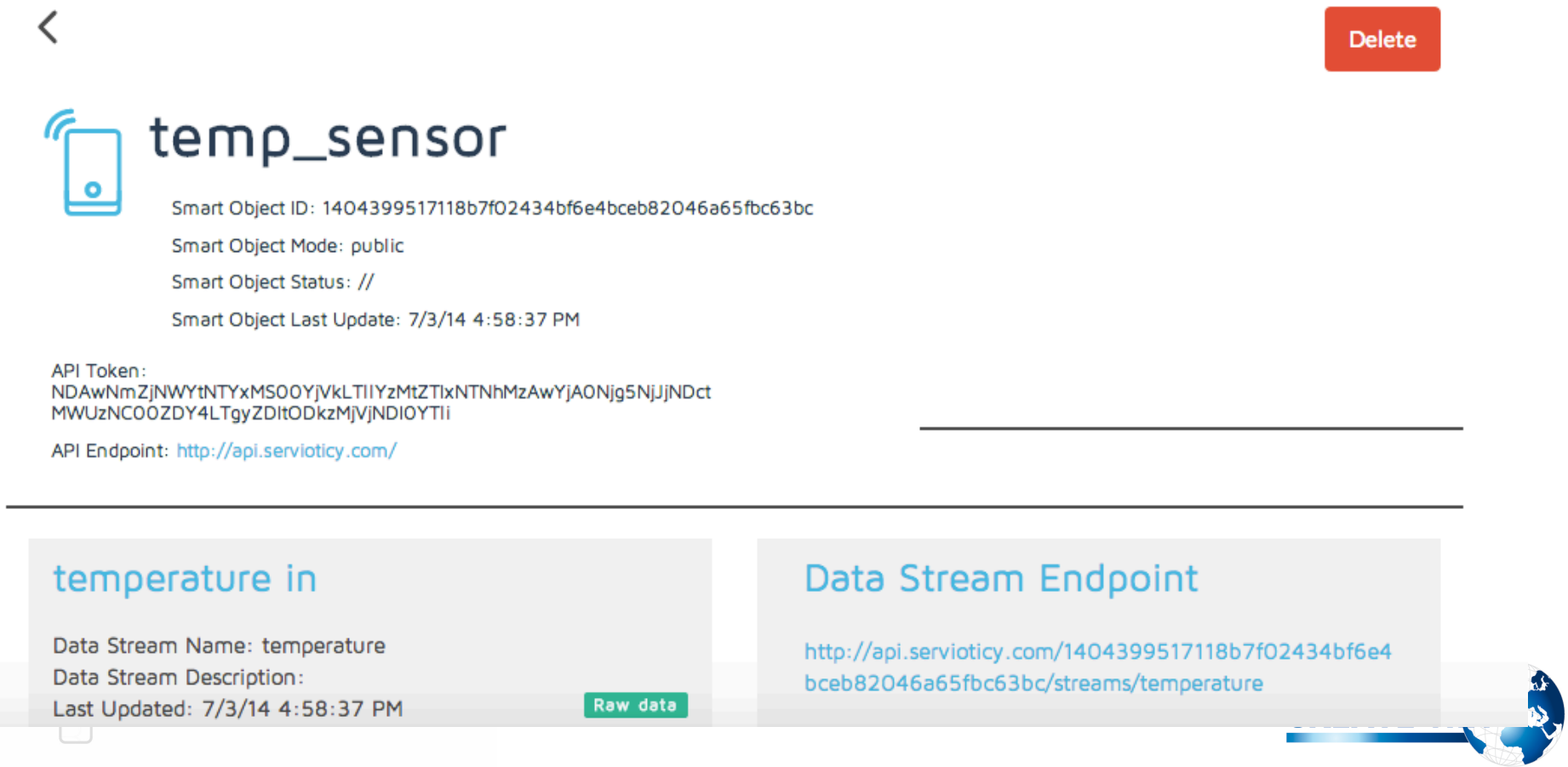


CREATE-NET

Step by Step…

Step 3

http://www.gluethings.com/platform/smart-object-manager/



Step by Step…

Step 4

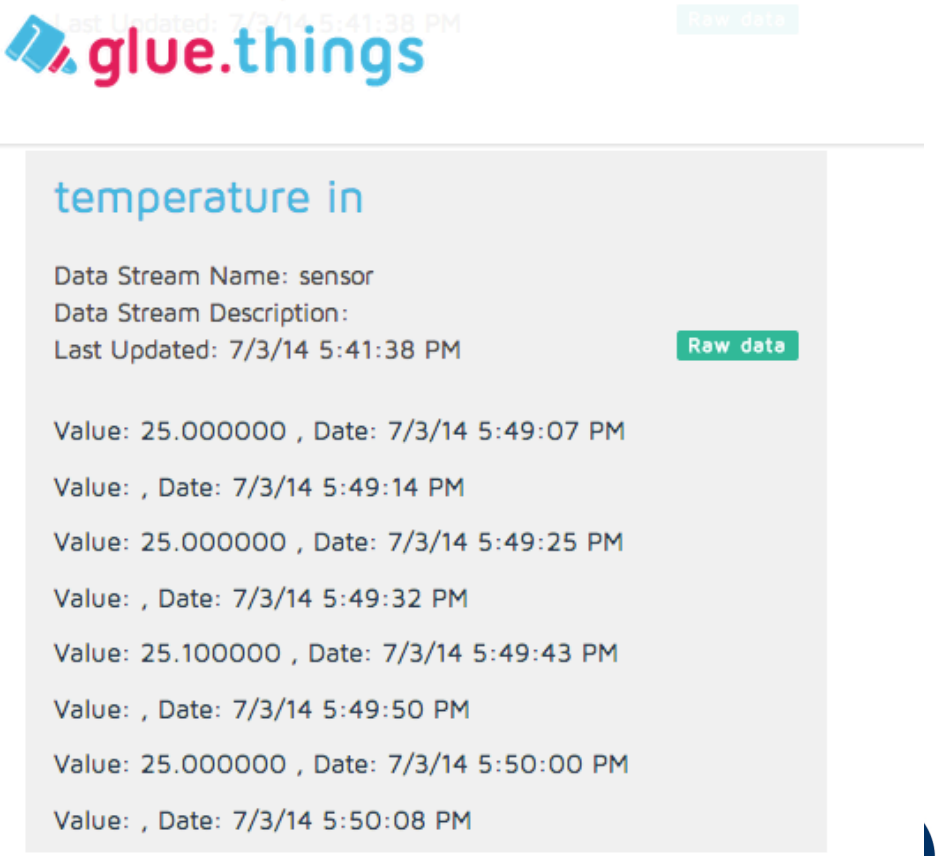
https://github.com/compose-eu/COMPOSE_client_libraries

```
//Initialise the client object for connectivity:
EthernetClient client;
...
void setup() {

    .....
    //Set the Authorisation key from COMPOSE:
    setAuthkey("YOUR_KEY_GOES_HERE");

    //as an example, read an analog pin input:
    String value = String(analogRead(A0));

    //Populate the channels with data
    setChannelData("temperature", value);
    setChannelData("user", "arduino");
    setChannelData("location", "universe");

    //Store the data into the SO, defining the stream name and the Service Object ID:
    submitSO("ArduinoSensor", "1395851631319a3fe402338134ca498cfef5d00fd8ace");
}
```

Step by Step…

Step 5

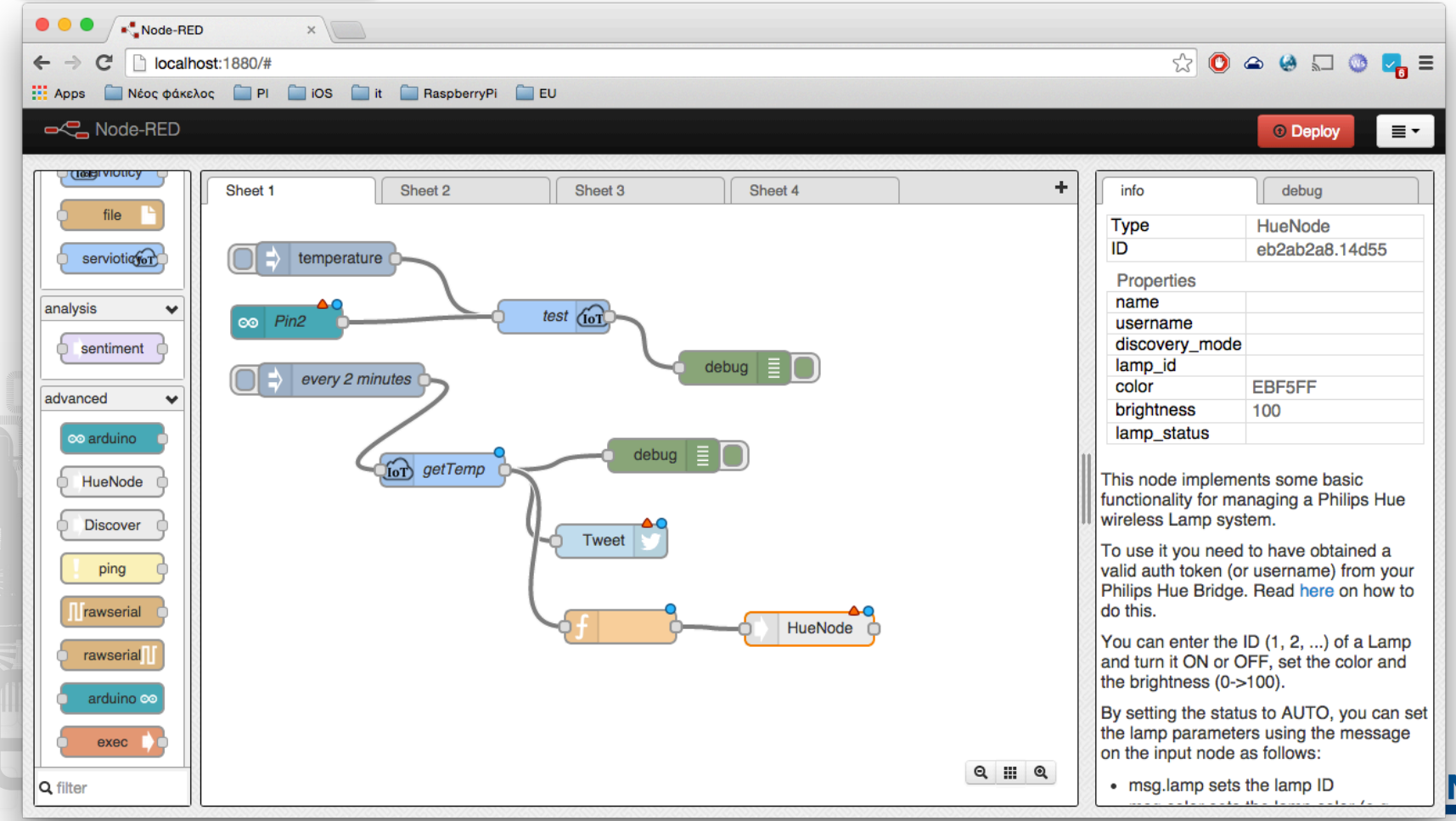
http://www.gluethings.com/platform/smart-object-manager/



Step by Step…

Step 6

http://your.nodered.installatino:1880



Step by Step…

Step 6

COMPOSE - Cloudfoundry

Node.JS , Java

COMPOSE APIs, SDKs

compose

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It scales…

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Find out more!

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http://www.compose-project.eu

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HACKATHON

Competitions

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Charalampos Doukas

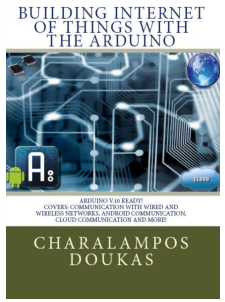
Researcher

- Information & Communication Systems Engineer
- PhD in Health Informatics
- Senior Researcher in CREATE-NET
- COMPOSE Project

Maker

@BuildingIoT

- IoT Blogger
  - Many DIY IoT Projects
- Workshops (Makerland, Makerfaire…)
- Author
  - Building Internet of Things with the Arduino
- Consultancy



github SOCIAL CODING
hdoukas

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