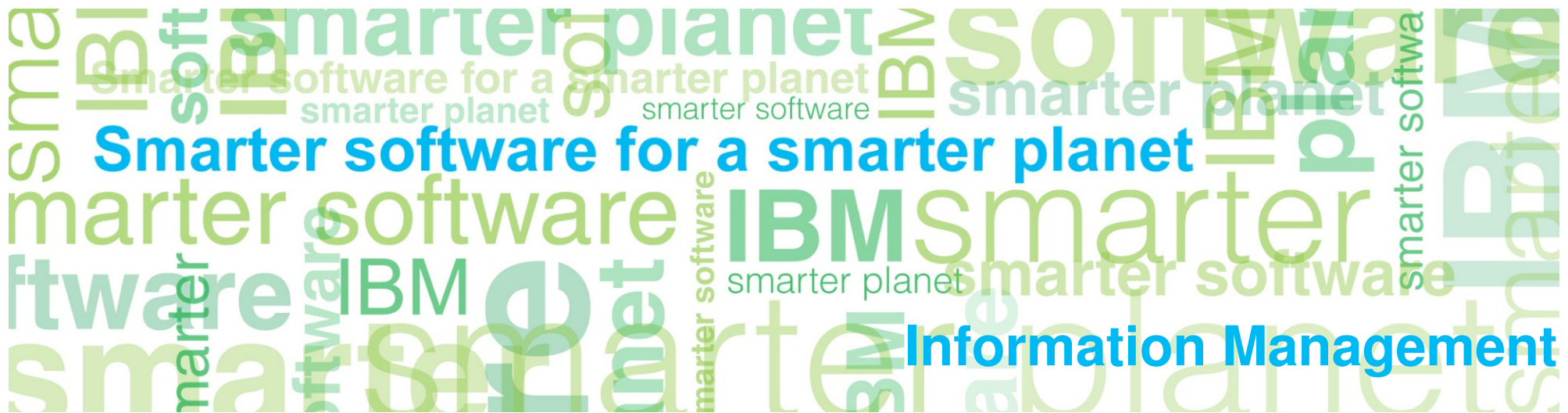
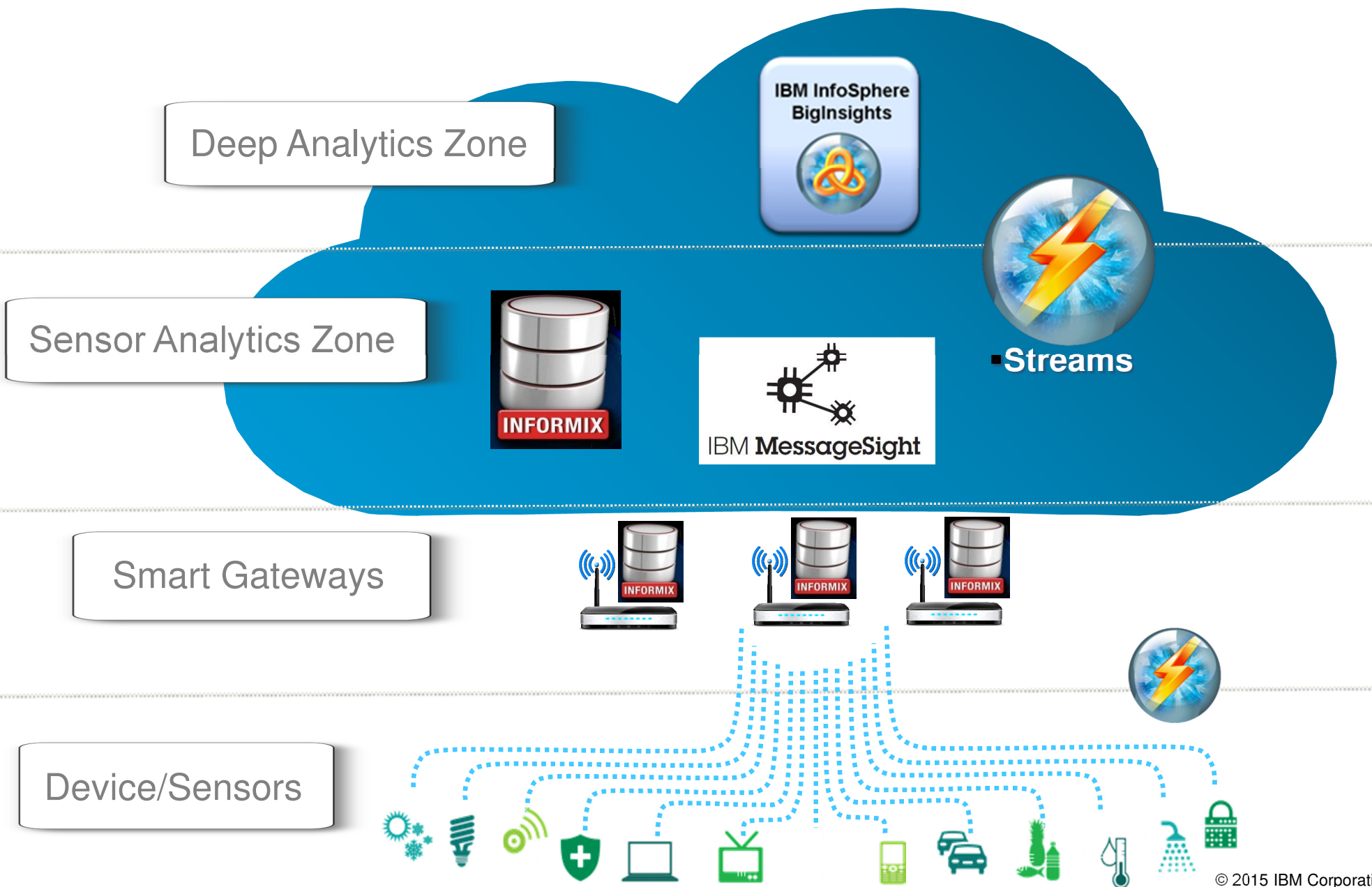


Informix Sensor Data: End-To-End Live Demo

Sensor → Node-Red → Raspberry Pi2 w/ Informix → Node-Red → Bluemix



Internet of Things Topography

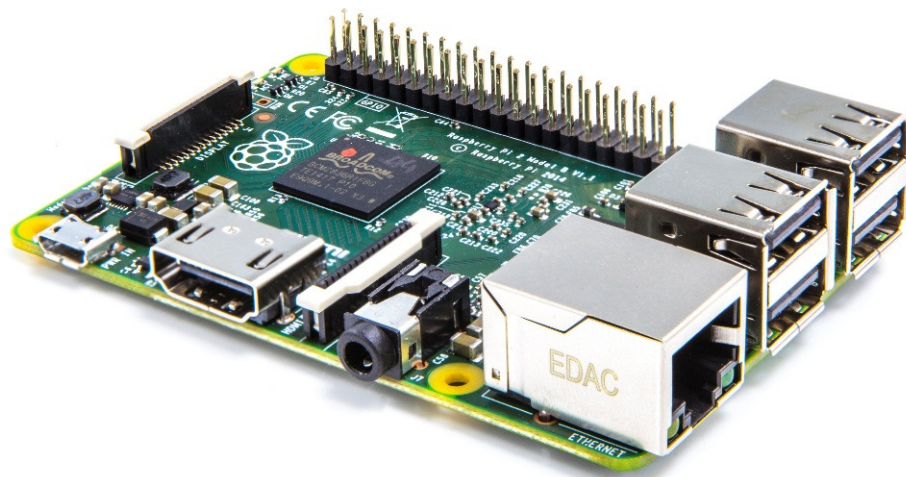


Informix Sensor Data End-To-End Demo

Demo Scenario

- Sensor Data acquisition via Bluetooth
 - Texas Instruments SensorTag CC2650
 - Multi Sensor device
 - Sends one JSON formatted data set every second
- Read out via Node.js sensortag node plus Node-RED sensortag node on a Raspberry Pi2 (w/ Raspian)
- Raw data insertion into an Informix JSON time series table via a Node-RED timeseries node on the RPi2
- Dynamic data aggregation to 1 minute intervals via an Informix Expression virtual table
- Cyclic (every minute) readout of the aggregated data via REST API and upload of the data via MQTT into Bluemix
- Simple Data visualization in Bluemix

Hardware Components



Raspberry Pi2 w/ Raspian



Ti SimpleLink SensorTag CC2650

Software Components

- Informix 12.10.UC5 for Linux / ARM v6
 - <https://www14.software.ibm.com/webapp/iwm/web/preLogin.do?source=ifxids>
- Node-RED
 - <http://nodered.org/>
- Node.js node-sensortag
 - <https://github.com/sandeepmistry/node-sensortag>
- Node-red-node-sensortag
 - <http://flows.nodered.org/node/node-red-node-sensortag>
 - Warning: that version currently needs modifications to support the new sensortag
- Informix TimeSeries Node-RED node
 - <http://flows.nodered.org/node/node-red-contrib-timeseries>
- IBM Bluemix
 - <https://console.ng.bluemix.net/>

Informix DDL Statements

```
insert into calendartable values (0, 0, 0, "ts_1sec", "startdate(2015-03-01
00:00:00.00000),pattstart(2015-03-01 00:00:00.00000),pattern({1 on},second)");

execute procedure TSContainerCreate (
    'sensor_json_cont',
    'datadbs',
    'sensor_json_t',
    2048,
    2048);

create row type sensor_json_t
(
    timestamp          datetime year to fraction(5),
    values              bson
);

create table sensor_json_ts (
    sensor_id char(40),
    sensor_type char(20),
    sensor_unit char(6),
    sensor_values timeseries(sensor_json_t),
    primary key (sensor_id)
) lock mode row;

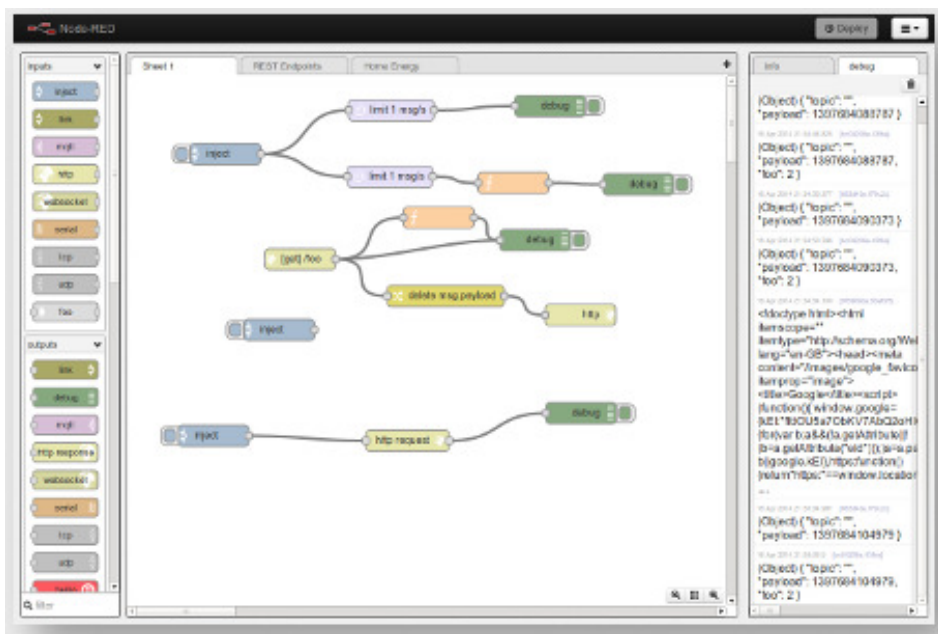
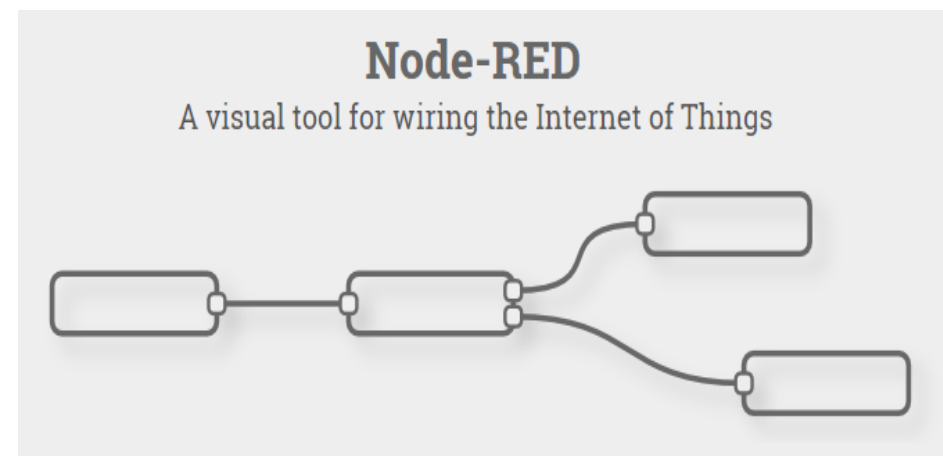
execute procedure TSCreateVirtualTab (
    'sensor_json_ts_v',
    'sensor_json_ts',
    'origin(2015-03-01
00:00:00.00000),calendar(ts_1sec),container(sensor_json_cont),threshold(0),irregular',0,'se
nsor_values');
```

Informix Aggregation Tables

```
create row type temp_min_avg_max_t (  
    timestamp datetime year to fraction(5),  
    object_min      decimal(5,2),  
    object_avg      decimal(5,2),  
    object_max      decimal(5,2),  
    ambient_min     decimal(5,2),  
    ambient_avg     decimal(5,2),  
    ambient_max     decimal(5,2));  
  
create row type lux_min_avg_max_t (  
    timestamp datetime year to fraction(5),  
    lux_min decimal(5,2),  
    lux_avg decimal(5,2),  
    lux_max decimal(5,2));  
  
EXECUTE PROCEDURE TSCreateExpressionVirtualTab(  
    'temp_min_avg_max_1min', 'sensor_json_ts',  
    'AggregateBy("min($object),avg($object),max($object),min($ambient),avg($ambient),max($ambient)",  
    "ts_1min", sensor_values, 1)',  
    'temp_min_avg_max_t');  
  
EXECUTE PROCEDURE TSCreateExpressionVirtualTab(  
    'temp_min_avg_max_1hour', 'sensor_json_ts',  
    'AggregateBy("min($object),avg($object),max($object),min($ambient),avg($ambient),max($ambient)",  
    "ts_1hour", sensor_values, 1)',  
    'temp_min_avg_max_t');  
  
EXECUTE PROCEDURE TSCreateExpressionVirtualTab(  
    'lux_min_avg_max_1min', 'sensor_json_ts',  
    'AggregateBy("min($lux),avg($lux),max($lux)", "ts_1min", sensor_values, 1)',  
    'lux_min_avg_max_t');
```

What is Node-Red

- nodered.org
- A visual tool for wiring the Internet of Things
- Node.js application. Uses building blocks of reusable code to control flow of data



- “Flows” are created to process data.
- Example: Take data in, transpose, process and store in a database and/or publish to a message broker
- Collaboration among node developers

Node-RED Demo Flows

The screenshot displays the Node-RED web interface in a browser window. The browser tabs include "Node-RED : 192.168.2.123", "IBM IoT Foundation - Informix...", "IBM Internet of Things Foundat...", and "Dashboard - IBM Bluemix". The address bar shows "192.168.2.123:1880/#". The Node-RED interface has a top bar with a "Deploy" button. On the left, there are panels for "input" and "output" nodes. The main workspace, labeled "Sheet 1", contains three flows:

- Flow 1:** Starts with a "sensorTag CC 2650" node, followed by a "conv" function node, then a "msg.payload" node, and finally a "sensor_json_ts" node.
- Flow 2:** Starts with a "TriggerTemp" node, followed by a "GetAggTemp1min" node, then a "conv bluemix" function node, then a "msg.payload" node, and finally a "sensorTagTemp to Bluemix" node.
- Flow 3:** Starts with a "TriggerLux" node, followed by a "GetAggLux1min" node, then a "conv bluemix" function node, then a "msg.payload" node, and finally a "sensorTagLux to Bluemix" node.

On the right side, the "debug" console shows the following log entries:

```
22.4.2015 13:16:18 [af7bb364.787f4]
sensorTag/temperature : [msg.payload] : object
{ "sensor_id":
  "sensorTag/temperature",
  "sensor_type": "TI SensorTag",
  "sensor_unit": "None", "timestamp":
  "2015-04-22 11:16:18", "values": {
    "object": "25.0", "ambient": "29.6" } }
```

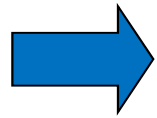
```
22.4.2015 13:16:20 [af7bb364.787f4]
sensorTag/lux : [msg.payload] : object
{ "sensor_id": "sensorTag/lux",
  "sensor_type": "TI SensorTag",
  "sensor_unit": "None", "timestamp":
  "2015-04-22 11:16:19", "values": {
    "lux": 71.96 } }
```

```
22.4.2015 13:16:20 [af7bb364.787f4]
sensorTag/temperature : [msg.payload] : object
{ "sensor_id":
  "sensorTag/temperature",
  "sensor_type": "TI SensorTag",
  "sensor_unit": "None", "timestamp":
  "2015-04-22 11:16:19", "values": {
    "object": "25.0", "ambient": "29.6" } }
```

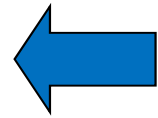
```
22.4.2015 13:16:20 [af7bb364.787f4]
sensorTag/lux : [msg.payload] : object
{ "sensor_id": "sensorTag/lux",
  "sensor_type": "TI SensorTag",
  "sensor_unit": "None", "timestamp":
  "2015-04-22 11:16:19", "values": {
    "lux": 71.96 } }
```

```
22.4.2015 13:16:21 [af7bb364.787f4]
sensorTag/temperature : [msg.payload] : object
{ "sensor_id":
  "sensorTag/temperature",
  "sensor_type": "TI SensorTag",
  "sensor_unit": "None", "timestamp":
  "2015-04-22 11:16:20", "values": {
    "object": "25.1", "ambient": "29.6" } }
```

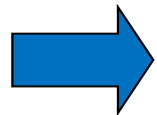
BlueMix Services



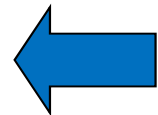
TimeSeries Service on BlueMix



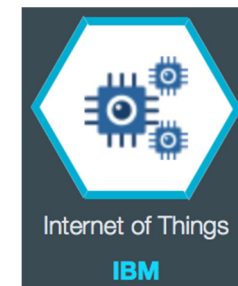
- Provides REST, JSON, ODBC/JDBC based services to:
 - Store, retrieve, and join time series, spatial, relational, and NoSQL data
- Built-in time series analytics
- Multi-tenancy support
- Scales out automatically as needed
- No Administration needed



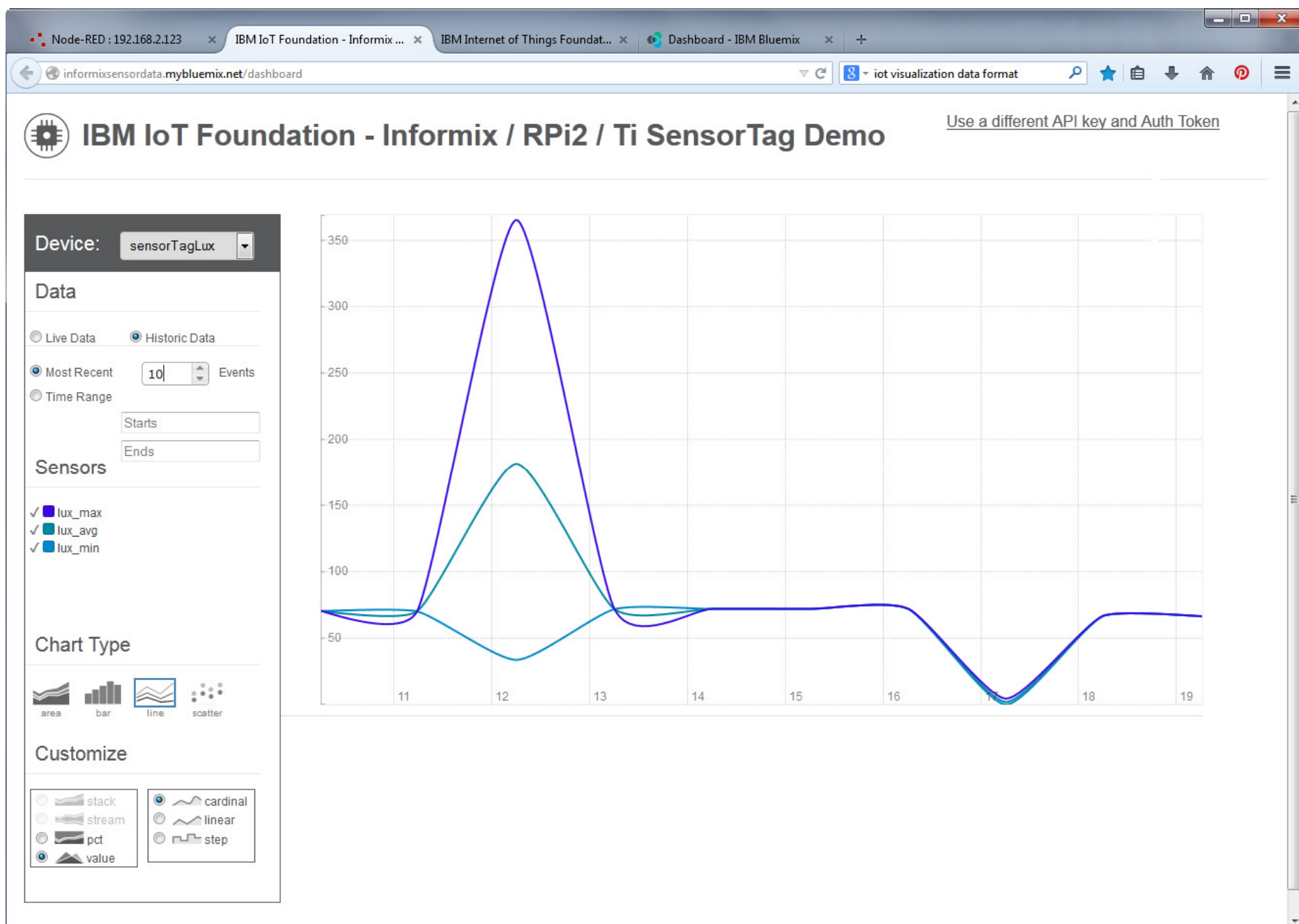
IoT Foundation Service on BlueMix



- Quickly and simply add new sensors
- Interface for continuously loading sensor data
- Adapters for MQTT and MessageSight



Bluemix Visualization



Thank You



Alexander Koerner vCard



Twitter: @AlexKoeMUC

My Informix@Home Project ☺

- An Informix TimeSeries, REST API, JSON & Raspberry Pi 2 based Weather Station...

