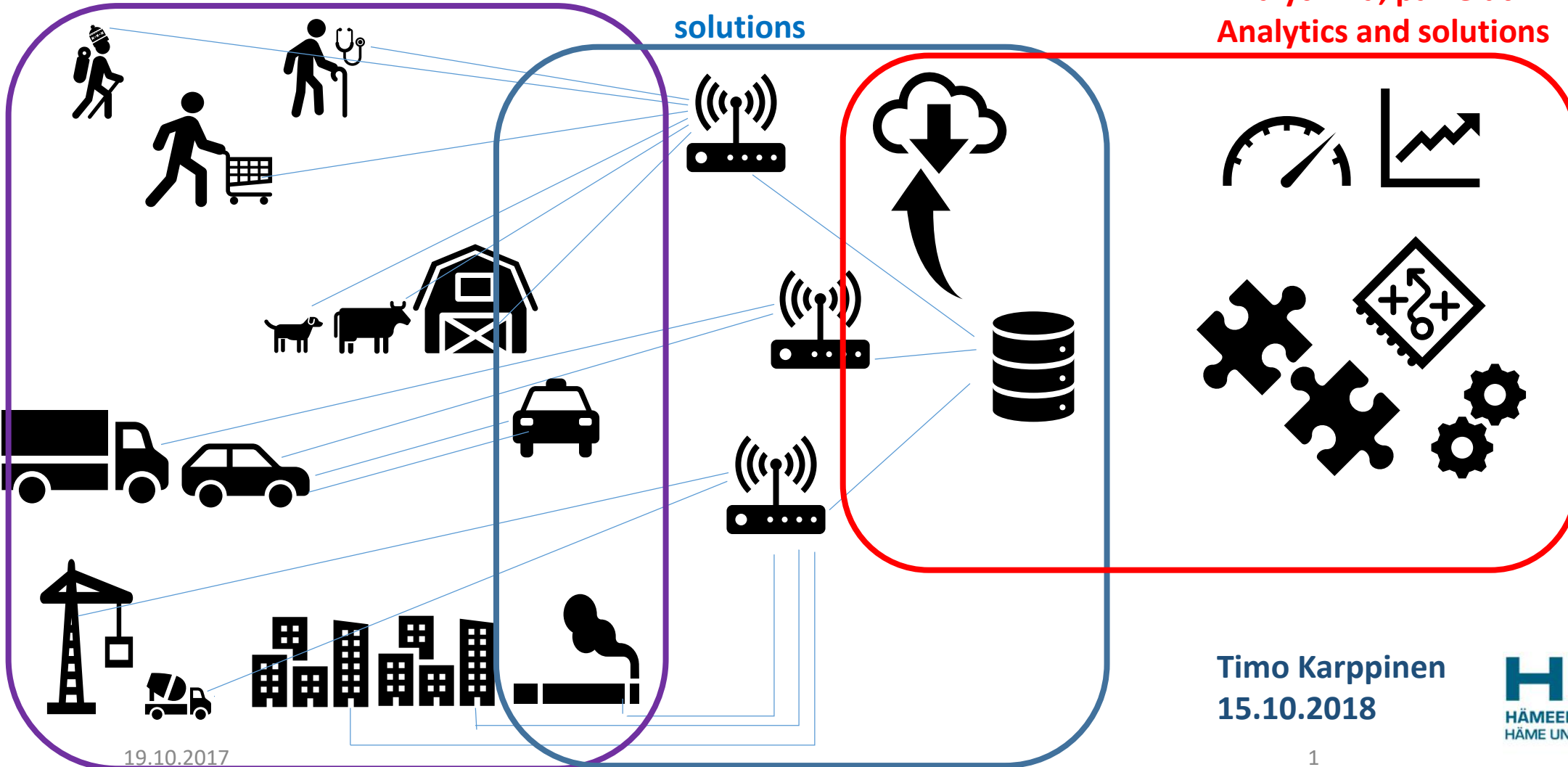


IoT Internet of Things – Esineiden Internet

Anturit ja laitteet – Sensors and devices

Tiedonsiirto- ja palvelinratkaisut
– communications and server
solutions

Analytiikka, palvelut –
Analytics and solutions



19.10.2017

Timo Karppinen
15.10.2018

HAMK
HÄMEEN AMMATTIKORKEAKOULU
HÅME UNIVERSITY OF APPLIED SCIENCES

IoT is a Business – but for which players?

Automation

- Capital investment on industry production line 1 milj. € .. 100 milj. €
- Automation for production line 100 thousand € ... 10 milj. €
- Engineering design work done for production line 20 thousand € ... 2 milj €

IoT

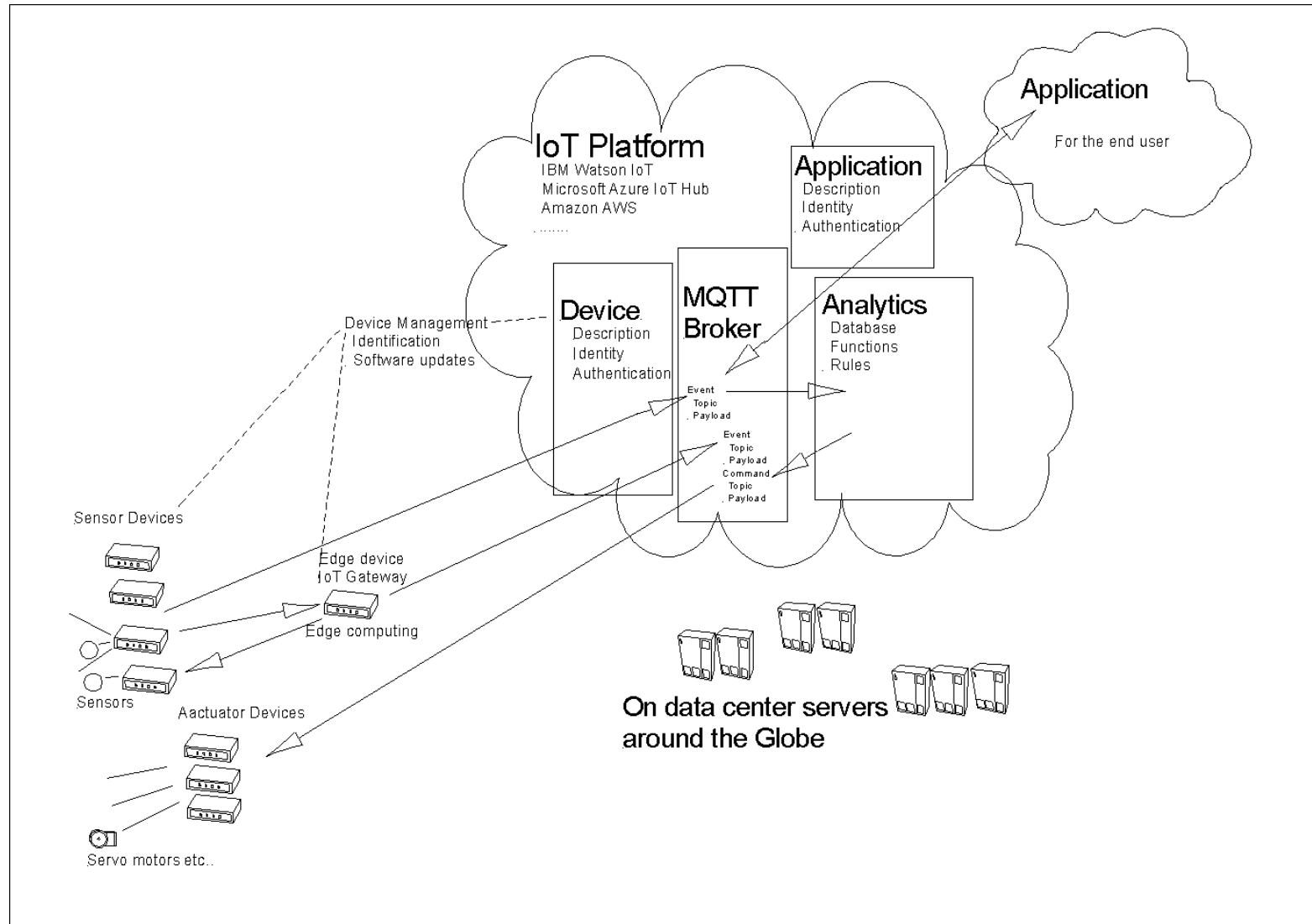
- Sensors , camera modules, etc. 1 € ... 10 € each
- Processor for local processing and a module for communications 5 € ... 50 €
- Monthly fee for processing in cloud application xx € / kk.
- Monthly fee for analytics capacity, etc. xx € / kk.
- Customer support xx €/kk.
- Modifying the application for specific needs xx €/kk
- ???? What is most important for generating turnover euros ?????

IoT as a part of product or part of service

The products or services have existed already and IoT is used for giving more value for the business:

- Timing of service activities
- Prediction of service needs
- Collection of user experience details
- Benefits for third parties; market segment analytics, etc.

IoT Platform , IoT MQTT Broker



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IoT Platform: The platform in IBM Cloud

The screenshot displays the IBM Bluemix Catalog interface. The browser address bar shows the URL <https://console.ng.bluemix.net/catalog/?category=iot>. The page features a sidebar on the left with navigation links under 'All Categories', including Infrastructure (Compute, Storage, Network, Security), Apps (Boilerplates, Cloud Foundry Apps, Containers, OpenWhisk, Mobile), and Services (Data & Analytics, Watson, Internet of Things, APIs, Network, Storage, Security, DevOps, Application Services, Integrate). The 'Internet of Things' category is selected. The main content area has a search bar and a 'Filter' button. Below the search bar, a grid of IoT services is displayed. The 'Internet of Things Platform' service is highlighted with a red rectangular box. Other visible services include Context Mapping, Driver Behavior, IoT for Electronics, IoT for Insurance, AT&T M2X, Car Diagnostic API, IQP IoT Code-Free App Development, XpertRule Decision Automation for node-RED, AT&T Flow Designer, and flowthings.io. Each service card includes an icon, a title, a brief description, and a provider label (IBM or Third Party).

IBM Bluemix Catalog

Search

Filter

A new generation of applications.

Internet of Things Platform
This service is the hub of all things IBM IoT, it is where you can set up and
IBM

Context Mapping
IBM Watson IoT Context Mapping Service brings the power to your
IBM

Driver Behavior
IBM Watson IoT Driver Behavior Service lets you analyze drivers'
IBM

IoT for Electronics
The IoT for Electronics service supports user and device registratio
IBM

IoT for Insurance
IBM® IoT for Insurance is an integrated IoT production instance that collect
IBM

AT&T M2X
Time Series IoT Data Service
Third Party

Car Diagnostic API
Translation service for OBD error codes.
Third Party

AT&T Flow Designer
Design, Build and Deploy IoT Solutions in Minutes
Flow
Third Party

flowthings.io
agile intelligence for IoT
Third Party

IQP IoT Code-Free App Development
Code-Free IoT App Creation
Third Party

XpertRule Decision Automation for node-RED
Decision Author for node-RED
Third Party

IoT Platform; Create an "organization"

Internet of Things Platform x

Secure | <https://console.ng.bluemix.net/catalog/services/internet-of-things-platform/>

Docs HAMK H

IBM Bluemix Catalog

The IBM Internet of Things service lets your apps communicate with and consume data collected by your connected devices, sensors, and gateways. Our recipes make it super easy to get devices connected to our Internet of Things cloud. Your apps can then use our real-time and REST APIs to communicate with your devices and consume the data you've set them up to collect.

IBM

Connect to:

Loading...

[View Docs](#)

AUTHOR IBM

PUBLISHED 02/13/2017

TYPE Service

LOCATION US South

Service name:

Create organization

1 2 3 4

Before you start using Bluemix, you need to set up your environment.

To start, name your first organization. Think of an org as a project or team that shares resources, such as apps, databases, and other services. Orgs exist in geographic regions, so decide where you'd like to put your first one.

United Kingdom ▼ HAMK_ICT_IoT Create

NEED SOME SUGGESTIONS? TRY THESE

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LOG OUT | SUPPORT

IoT Platform; Create a Device Type

Add Device for each of your devices

The image shows two overlapping screenshots of the IBM Watson IoT Platform interface. The top screenshot is the 'Create Device Type' page, and the bottom screenshot is the 'Add Device' page.

Create Device Type

General Information

Name: A_MKR1000

Description: Wifi capable Arduino Board with libraries for WIFI101, MQTTClient

Add Device

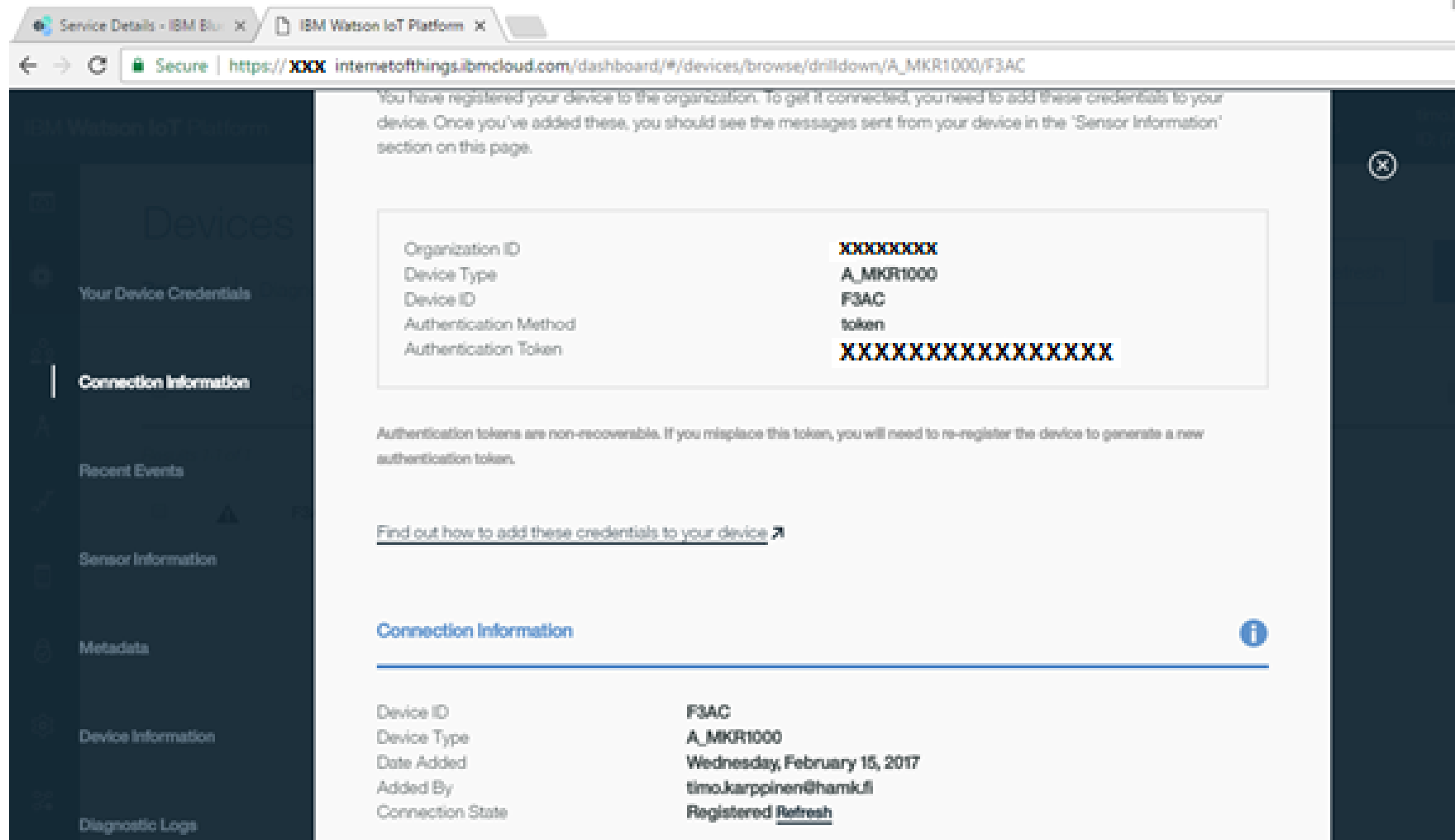
Choose Device Type

A_MKR1000

Or

Create device type

IoT Platform; An Authentication will be created for each individual device



The screenshot shows the IBM Watson IoT Platform dashboard. The left sidebar contains navigation links: 'Your Device Credentials', 'Connection Information' (selected), 'Recent Events', 'Sensor Information', 'Metadata', 'Device Information', and 'Diagnostic Logs'. The main content area displays the following information:

You have registered your device to the organization. To get it connected, you need to add these credentials to your device. Once you've added these, you should see the messages sent from your device in the 'Sensor Information' section on this page.

Organization ID	XXXXXXXXXX
Device Type	A_MKR1000
Device ID	F3AC
Authentication Method	token
Authentication Token	XXXXXXXXXXXXXXXXXXXX

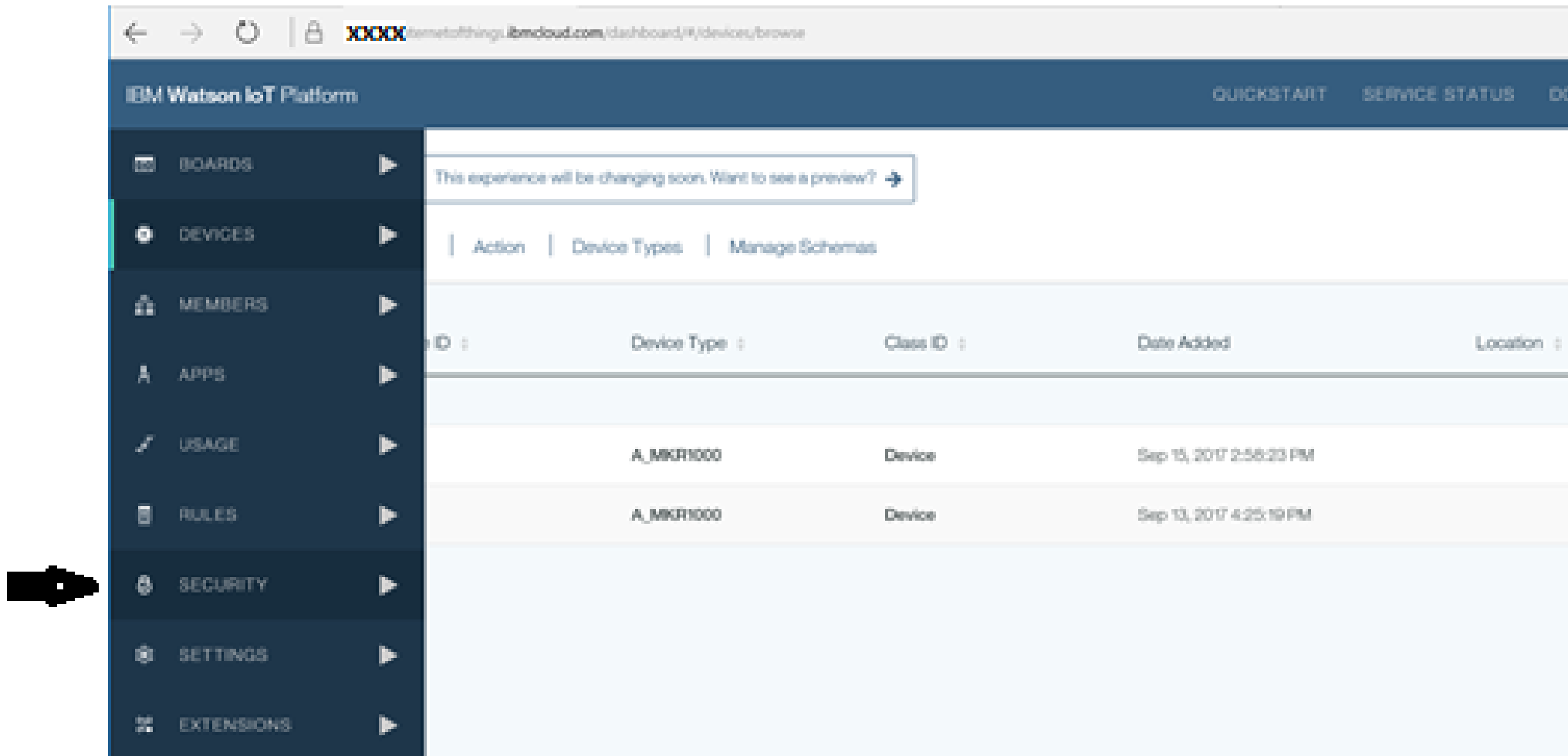
Authentication tokens are non-recoverable. If you misplace this token, you will need to re-register the device to generate a new authentication token.

[Find out how to add these credentials to your device](#)

Connection Information

Device ID	F3AC
Device Type	A_MKR1000
Date Added	Wednesday, February 15, 2017
Added By	timo.karppinen@hamk.fi
Connection State	Registered Refresh

IoT Platform; Adjust the security settings



The screenshot shows the IBM Watson IoT Platform dashboard. The left sidebar contains a menu with the following items: BOARDS, DEVICES, MEMBERS, APPS, USAGE, RULES, SECURITY, SETTINGS, and EXTENSIONS. A black arrow points to the 'SECURITY' item. The main content area displays a table with columns: ID, Device Type, Class ID, Date Added, and Location. The table contains two rows of data.

ID	Device Type	Class ID	Date Added	Location
	A_MKR1000	Device	Sep 15, 2017 2:58:23 PM	
	A_MKR1000	Device	Sep 13, 2017 4:25:19 PM	

IoT Device - Microcontroller; It is time to write the software.....authentication.....

```
#include <SPI.h>
#include <WiFi101.h>
#include <WiFiSSLClient.h>
#include <MQTTClient.h>

// WLAN
char ssid[] = "Moto_Z2_TK"; // your network SSID (name)
char pass[] = "xxxxxxxxxxxxx"; // your network password (use for WPA)

//char ssid[] = "HAMKvisitor"; // your network SSID (name)
//char pass[] = "xxxxxxxxxxxxxxxxxxxx"; // your network password (use for WPA)

// IBM Watson
// Your organization and device needs to be registered in IBM Watson IoT Platform.
// Instruction for registering on page
// https://internetofthings.ibmcloud.com/#

//char *client_id = "d:<your Organization ID>:<your Device Type>:<your Device ID>";
char *client_id = "d:xxxxxxx:A_MKR1000:DF48";
char *user_id = "use-token-auth"; // telling that authentication will be done with token
char *authToken = "xxxxxxxxx"; // Your IBM Watson Authentication Token

//char *ibm_hostname = "œyour-org-id.messaging.internetofthings.ibmcloud.comœ";
char *ibm_hostname = "xxxxxxxx.messaging.internetofthings.ibmcloud.com";
```

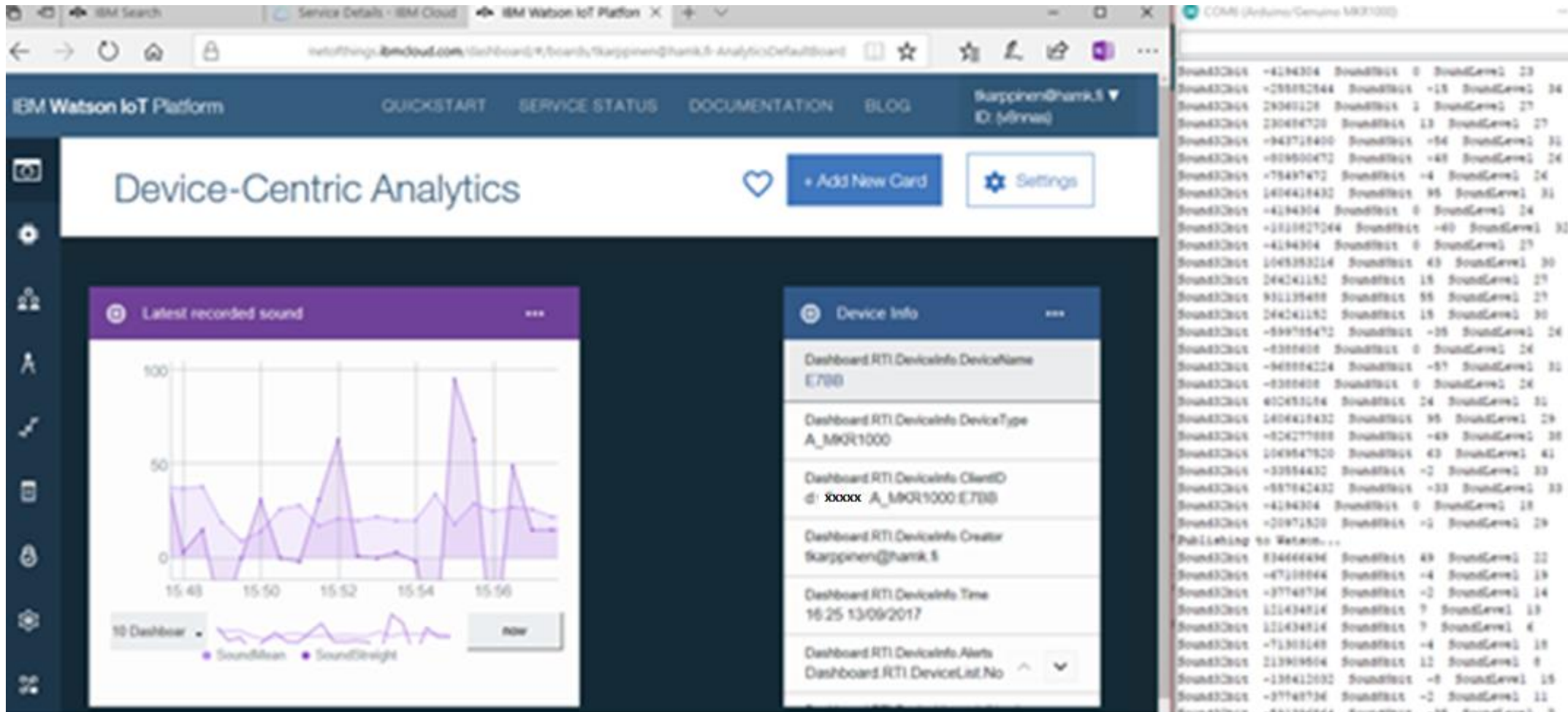
IoT Device - Microcontroller; It is time to write the software.....add a mqtt message...

```
/*
  client.begin("<Address Watson IOT>", 1883, net);
  Address Watson IOT:
  <WatsonIOTOrganizationID>.messaging.internetofthings.ibmcloud.com
  Example:
  client.begin("iqwckl.messaging.internetofthings.ibmcloud.com", 1883, net);
  */
  MQTTC.begin(ibm_hostname, 1883, net);
  .
  .
  .
  .

  String wpayload = "{\"d\":{\"TemperatureSensor\":\"TC1 \",\"TempScaledF3AC\":\"" +
  String(tempScaledF)+ ", \"TempStreightDF48\":\"" + String(temp14bit)+"}}";

  MQTTC.publish("iot-2/evt/TemperatureTC1/fmt/json", wpayload);
```

IoT Platform; Data in the Dashboard



IoT Platform; Analysis with **node.js** and **NodeRED** or the **NodeRED** on **Watson IoT**

The Node.js needs to be installed on computer. The installation file can be loaded from a web page.

<https://nodejs.org/en/>

NodeRed will be installed by following instructions at

<https://nodered.org/docs/platforms/windows>

Type on the command line:

```
npm install -g --unsafe-perm node-red
```

Getting started on IBM Cloud Watson

A new development can be started by installing a starter kit on IBM Cloud Watson. Instructions and installation: "Create and Connect a Node-Red device simulator" .

https://console.bluemix.net/docs/services/iot/nodereddevice_sample.html#creating-and-connecting-a-node-red-device-simulator

Installing a starter kit

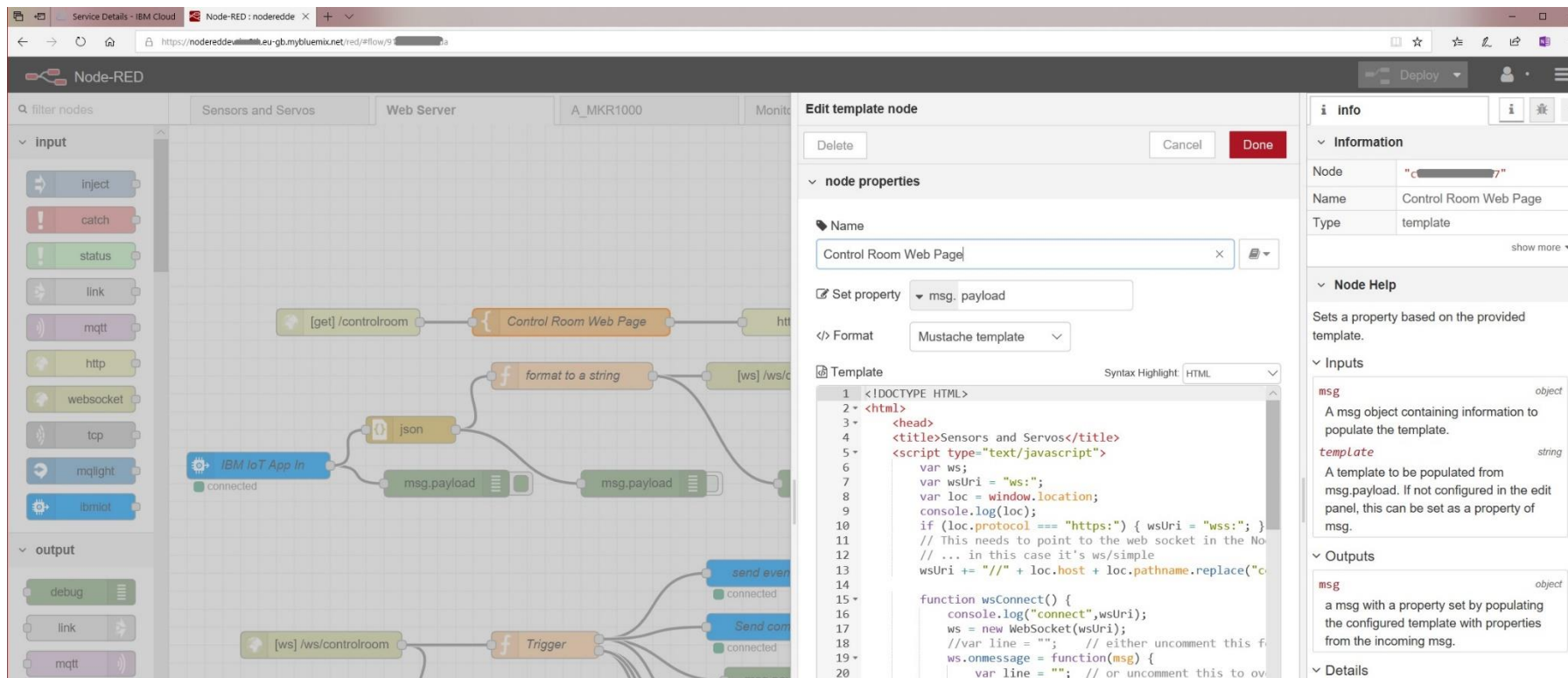
<https://console.bluemix.net/catalog/starters/internet-of-things-platform-starter>

www.hamk.fi



IoT Platform; User interface on

- Web page code can be inserted into a NodeRED flow



- Web page interface is typically for the “end user”

IoT Platform;

We have had a look on the signal chain from sensor value to user interface

Thank you for your attention!

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www.hamk.fi