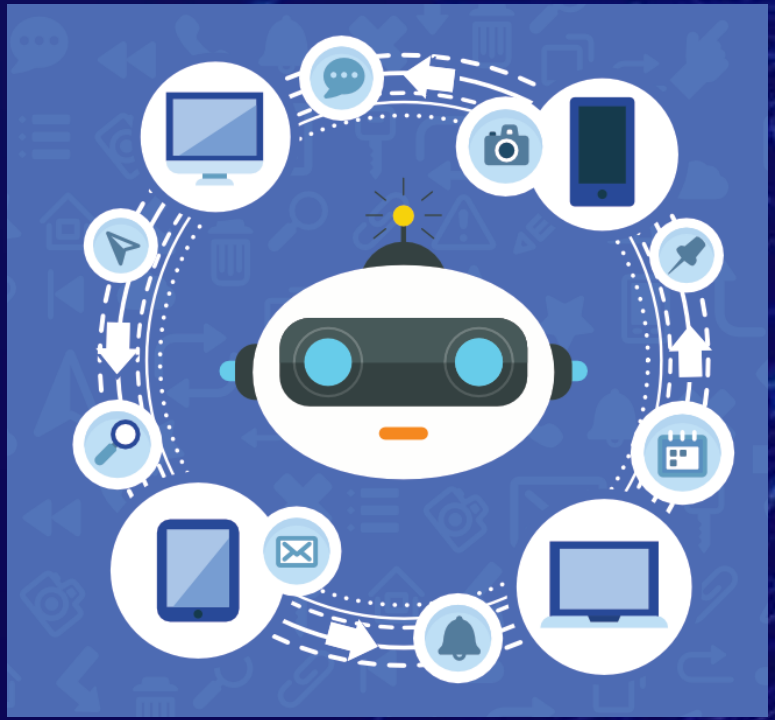
Unit 4
Machine Learning with IoT



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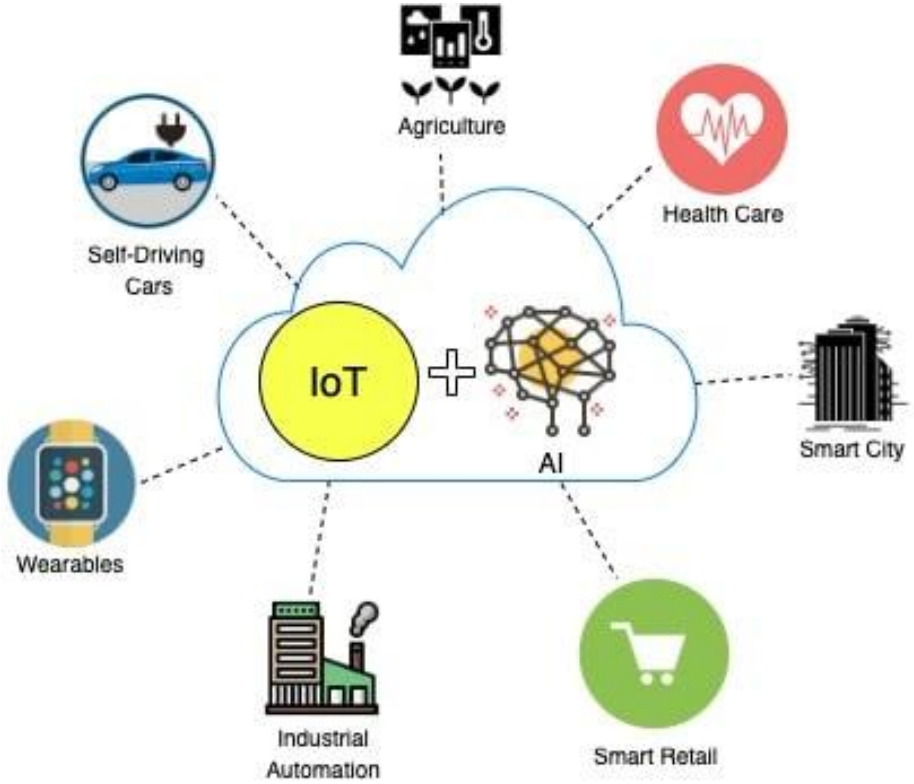
Discussion: Some Recent Trends



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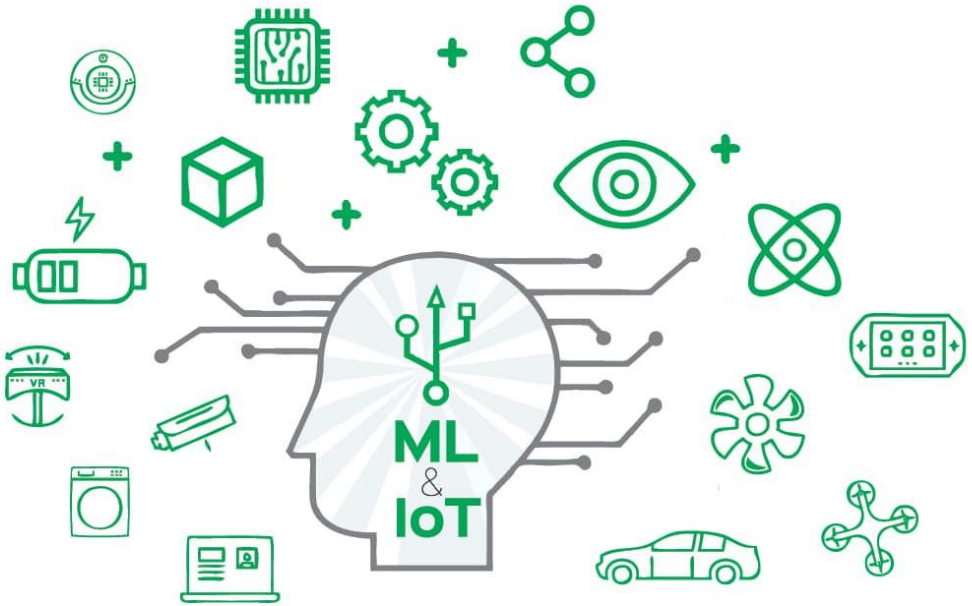
Learning Objectives

You will learn in this lesson:

- Significance of ML in IoT sector.
- Understand IoT Cloud features.
- Learn to connect device to cloud
- Acquire real time sensor data from cloud
- Integration of Machine learning with IoT

Introduction: ML with IoT

- One of the top trending topics
- IoT Data fuels the ML engines
- Can work together to improve lives.



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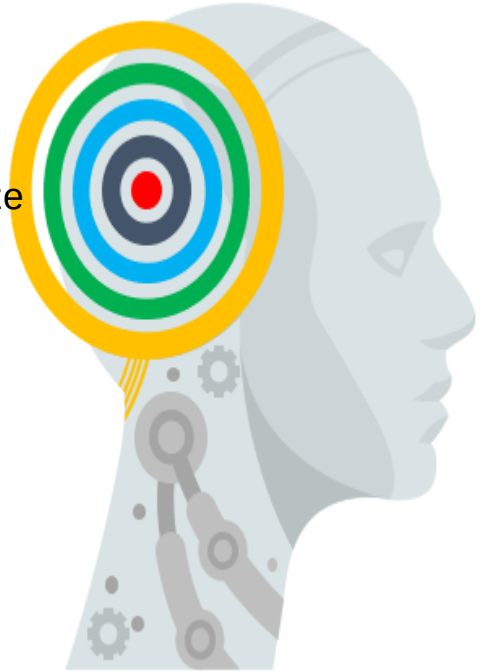
Advantages of ML with IOT

- Gather big data to avail best services.
- Quick and accurate responses
- Avoid unnecessary spending to optimize business
- Can spot inefficiency and recommend best practices
- Secured M2M communication
- NLP: Speak with machines



- ENHANCED CUSTOMER RELATIONSHIP
- COST EFFECTIVE
- INCREASED OPERATIONAL EFFICIENCY
- HIGHLY SECURED & SAFE
- FOCUS ON NEW PRODUCTS & SERVICES

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Applications of ML with IOT

Healthcare

Used to monitor patients remotely and provide real-time health diagnosis

Retail

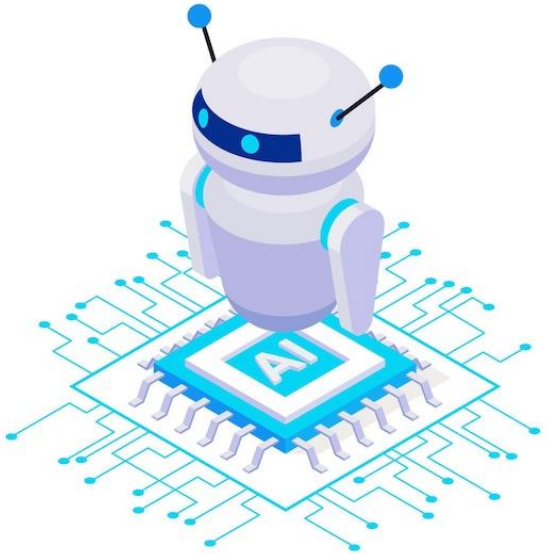
To enhance customer experiences and improve the efficiency of supply chain management.

Manufacturing

To optimize production processes, improve quality control, and reduce waste.

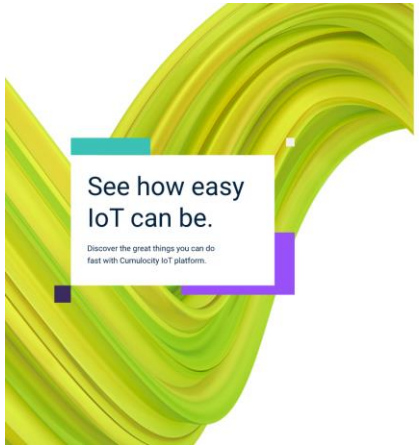
Agriculture

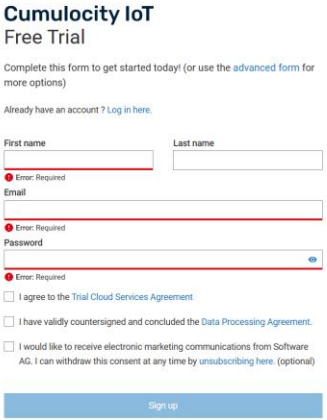
To improve crop yields, minimize waste, and reduce the use of harmful chemicals.

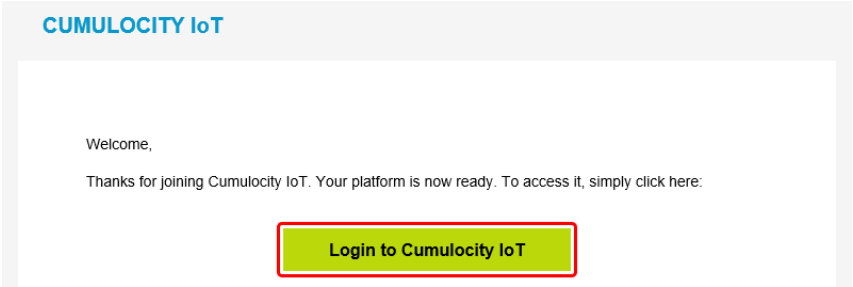


Transfer IoT Data to Cloud Services

Register and login to [Cumulocity IoT]







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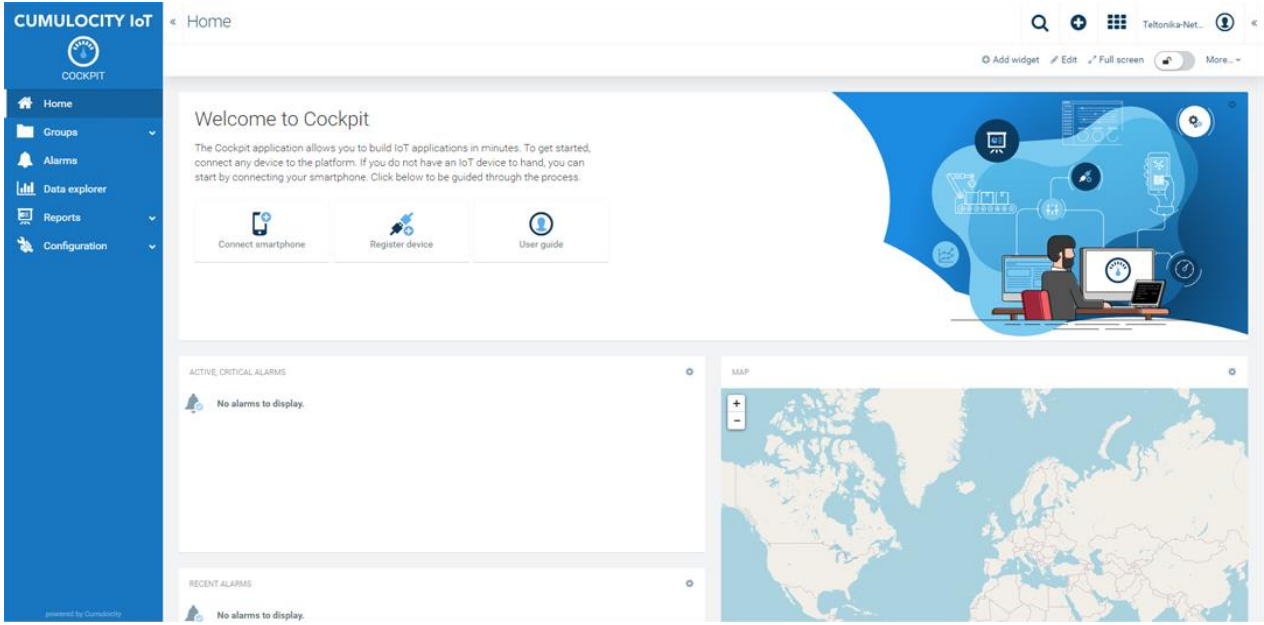
Lab 1: Transferring IoT Data to Cloud Services

Cumulocity Dashboard



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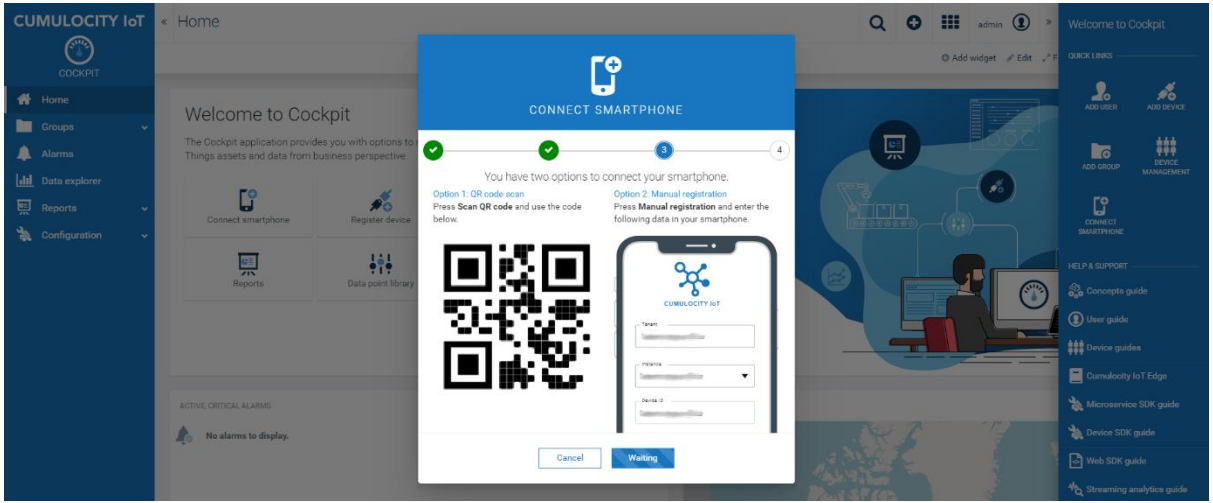
Connect Mobile Sensor Data to Cloud

- Click **Connect Smartphone** in the Welcome widget



- Install **Cumulocity app** and **scan the QR code** shown on your PC’s web browser

Lab 2: Registering a Raspberry PI on Cloud

Registering Raspberry PI on Cloud

- Clone below repository on RaspberryPi

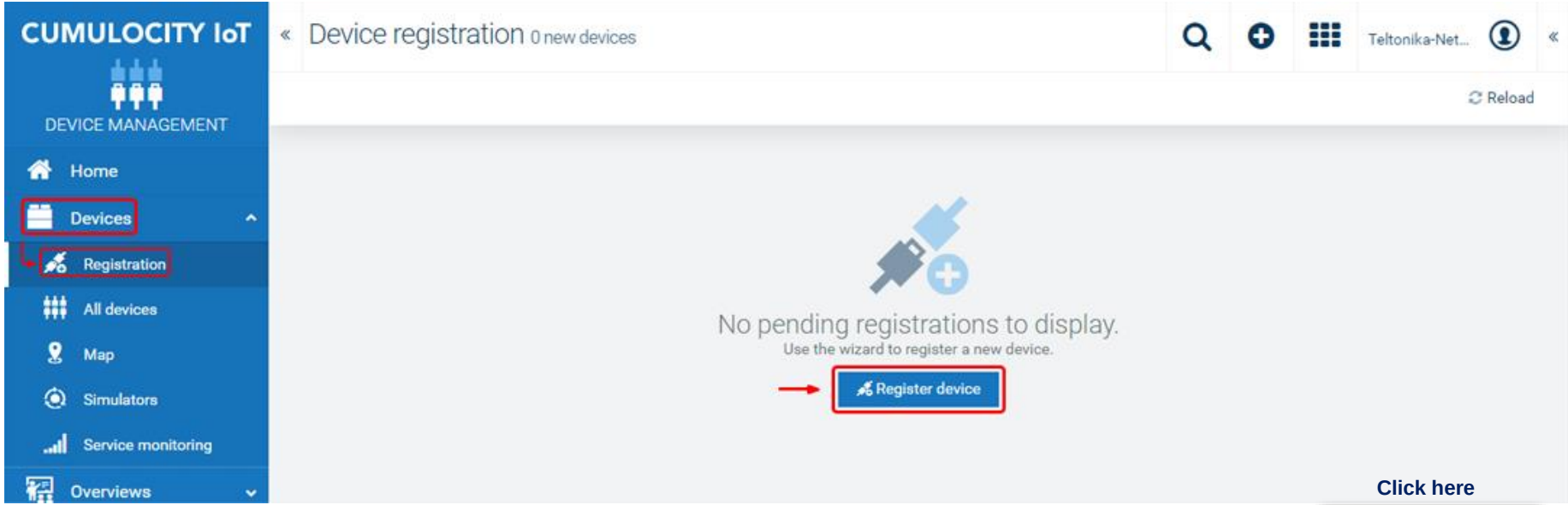
  https://github.com/SoftwareAG/cumulocity-devicemanagement-docker-example.git

- Open repository and notedown device id
- cat cumulocity-devicemanagement-docker-example/Agents/config/config.ini

```
pi@raspberrypi:~ $ cat cumulocity-devicemanagement-docker-example/Agents/config/config.ini
[C8Y]
tenantInstance = eu-latest.cumulocity.com

[Device]
id = 08152

[Registration]
user = management/devicebootstrap
password = Fhdt1bb1f
tenant = management
tenantPostFix = /devicecontrol/deviceCredentials

[MQTT]
prefix = aggregated
prefixSignaltype = signalType
broker = localhost
port = 1883
```

Registering Raspberry PI on Cloud..

- On dashboard click **Register Device**
- Enter your device's serial number into the **'Device ID'** field



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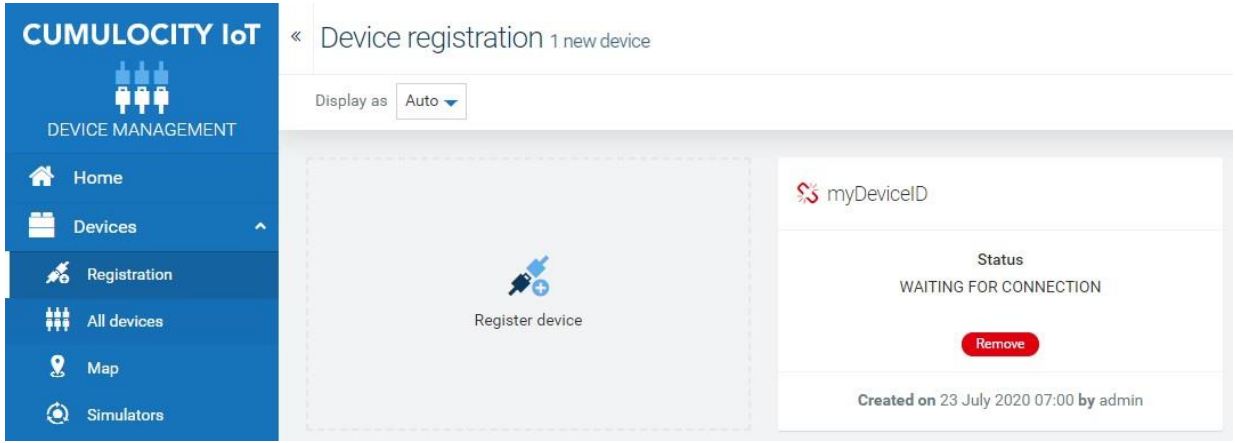
Registering Raspberry PI on Cloud..

- On dashboard Device shows **awaiting state**



- Run docker in Raspberry PI

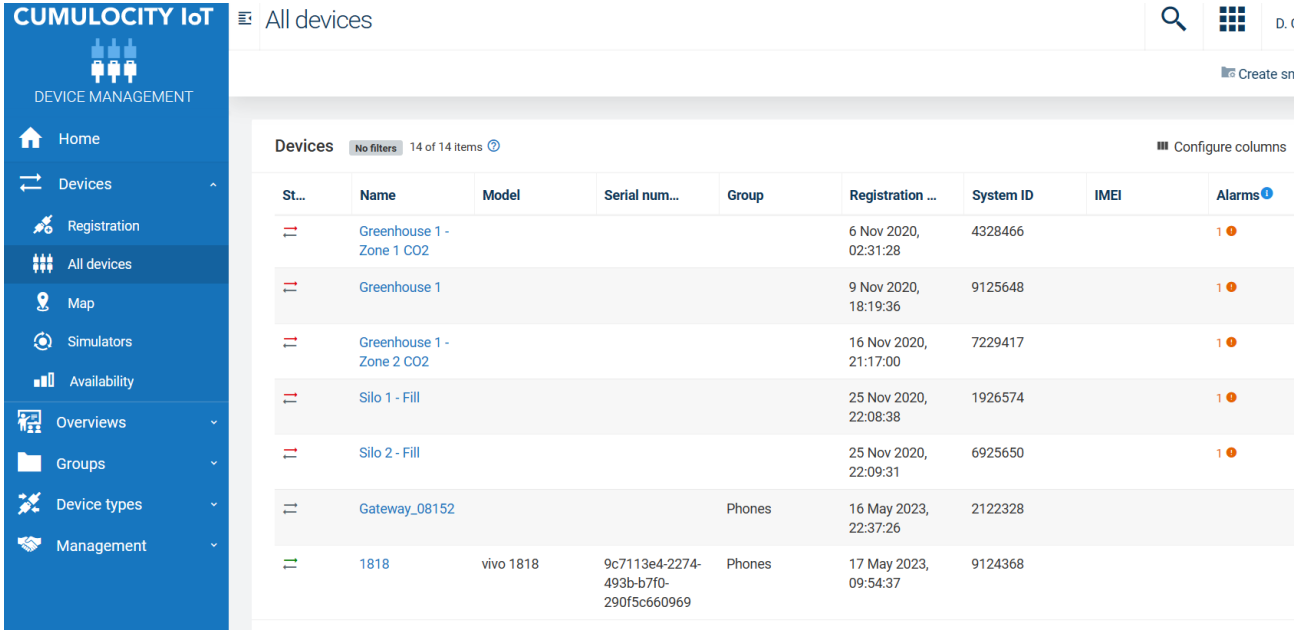
sudo bash cumulocity-devicemanagement-docker-example/start.sh

- Refer back to dashboard to accept connection and now your device is connected to cloud.

Lab 3: Collecting Sensors Data from Cloud

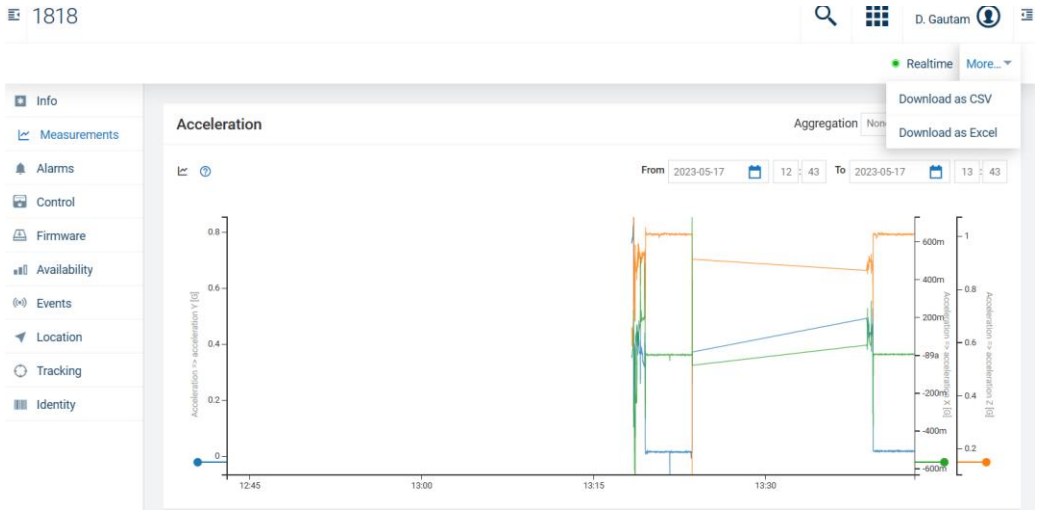
Collecting Sensors Data from Cloud

- Open **Cumulocity IOT Device Management** dashboard
- Click on **All Devices** shown in left



Collecting Sensors Data from Cloud..

- Open your connected device of interest.
- Refer to Measurement section to view the device activity
- Click on **More** to download device sensor data



Machine Learning on Sensor Data

- Downloaded data is majorly in form of unsupervised data.
- Try to aggregate data from various sensors and apply Machine Learning Algorithms.
- Identify the clusters and data homogeneity.

Lab 4: Machine Learning on Sensor Data

Summary

- In this session we have learned:
- What does it mean by the term ML-IoT?
- How to connect sensor data from mobile to cloud?
- How to connect device data from Raspberrypi to the cloud?
- How to manage devices on the Cumulocity cloud platform?
- How to implement machine learning on IoT data?
- Different aspects that come under IoT cloud services.

Quiz

Q1. What is the primary purpose of integrating Machine Learning with the Internet of Things (ML-IoT)?

A) To enhance network security

B) To automate data collection and analysis

C) To reduce IoT device costs

D) To improve IoT device battery life

Correct Answer: B) To automate data collection and analysis

Quiz

Q2. Which of the following is a key challenge in implementing ML algorithms on IoT devices?

A) Limited computational resources

B) Abundance of power supply

C) High-speed internet connectivity

D) Expensive hardware components

Correct Answer: A) Limited computational resources

Quiz

Q3. In an ML-IoT system, what role does edge computing play?

A) It handles all machine learning tasks in the cloud.

B) It manages device connectivity.

C) It processes data locally on IoT devices.

D) It serves as a database for IoT data storage.

Correct Answer: C) It processes data locally on IoT devices.

Quiz

Q4. What is the significance of data preprocessing in ML-IoT applications?

A) It ensures that IoT devices are connected to the internet.

B) It prepares raw sensor data for analysis by removing noise and outliers.

C) It determines the physical location of IoT devices.

D) It encrypts communication between IoT devices and the cloud.

Correct Answer: B) It prepares raw sensor data for analysis by removing noise and outliers.

References

- https://www.softwareag.com/corporate/products/cumulocity-iot/overview.html
- https://www.softwareag.com/en_corporate/resources/iot/article/machine-learning.html
- https://www.iotforall.com/
- https://aws.amazon.com/iot-core/
- https://azure.microsoft.com/en-us/services/iot-hub/
- https://cloud.google.com/iot-core
- https://www.ibm.com/cloud/watson-iot-platform
- https://docs.microsoft.com/en-us/samples/azure/iot-samples/
- https://cloud.google.com/community/tutorials/iot-overview
- https://aws.amazon.com/getting-started/hands-on/build-end-to-end-ml/

Thank You...!