IMC-4302A Wireless Networks
Cloud and IoT services
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Summary

- **Goals and business of IoT in the cloud**
- **Examples from the industry**
  - ➤ AWS IoT
  - ➤ Azure IoT
  - ➤ Balena
 - ➤ Things Board
  - ➤ Mozilla IoT

IoT and the cloud (1/2)

- Goal: bring physical objects online and make them communicate, cooperate and act intelligently without human intervention

- Internet of Things relies on IoT platforms to enable provisioning, management, and automation of smart objects within a given IoT infrastructure.

- Cloud-based solutions are not only more cost-effective in the long run; they also provide better security, corporate data mobility, increased co-worker collaboration, more advanced disaster recovery solutions

IoT and the cloud (2/2)

- Cloud computing provides shared pool of configurable computing resource to end users on demand

- Three traditional models:
  - IaaS: Infrastructure
  - PaaS: Platform
  - SaaS: Software

- The cloud hosting can be:
  - Public: AWS, Azure, GCP, Heroku, DigitalOcean…
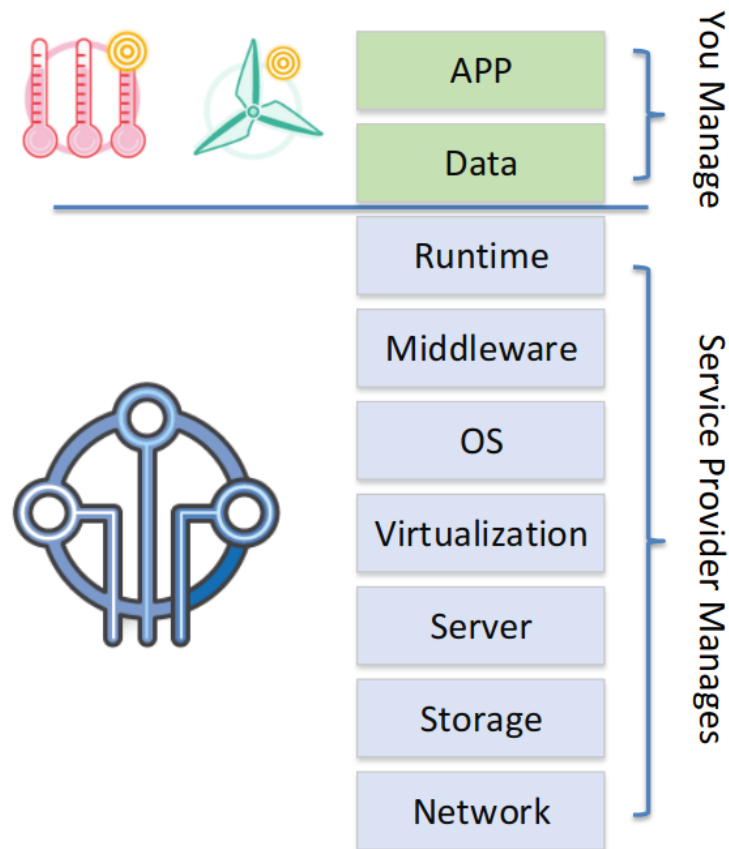 - Private: On-premise, based on OpenStack for example
  - Hybrid
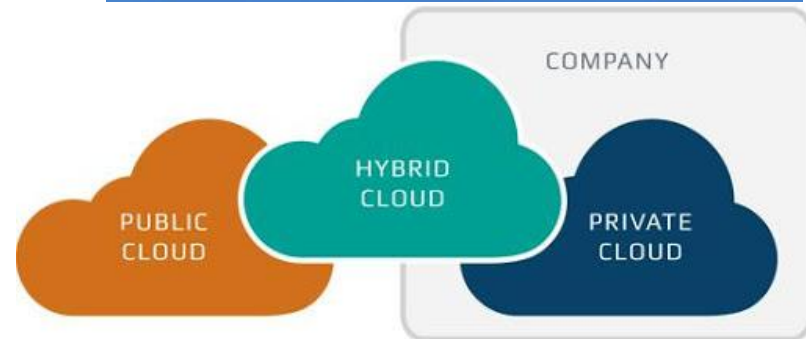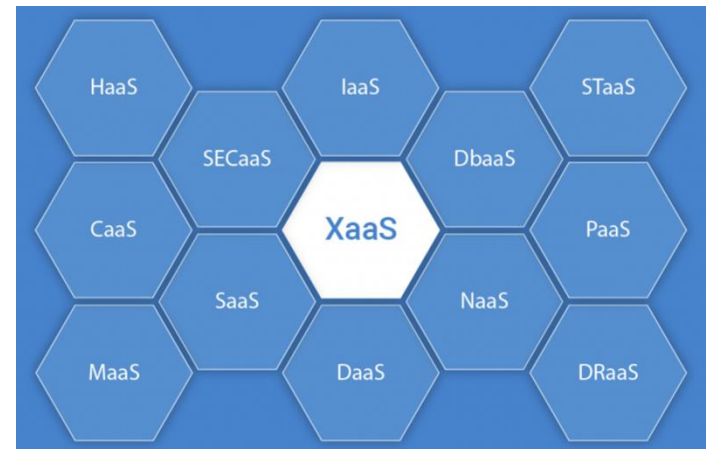
Infrastructure as a Service

- You get:
  - A physical server or:
  - A virtual machine with managed network, CPU, RAM, and disk

- EC2 from AWS is an example, but every cloud provider gives an equivalent service

- Example usage:
  - Build your own cluster of VMs for your applications or services to replace on-premise servers
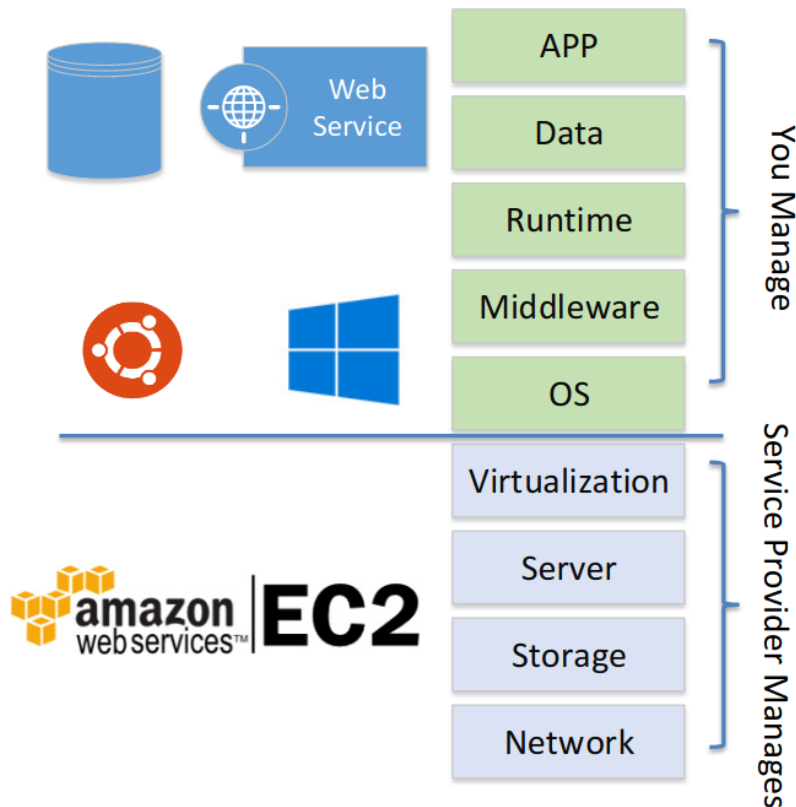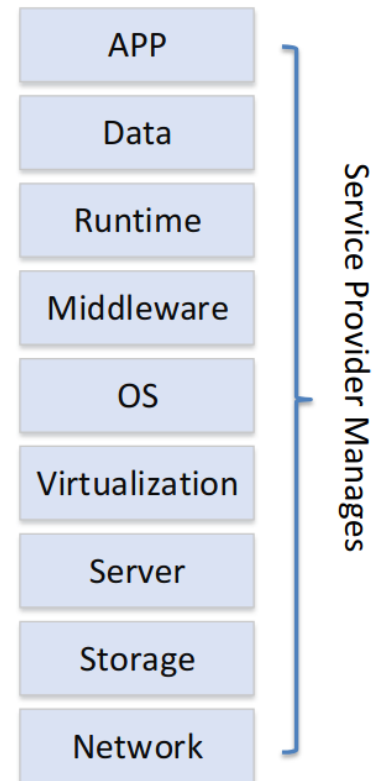
Platform as a Service

- You get:
  - The framework
  - You host the application

- AWS IoT is an example, but also Hosted Kubernetes or Serverless platforms

- Example usage:
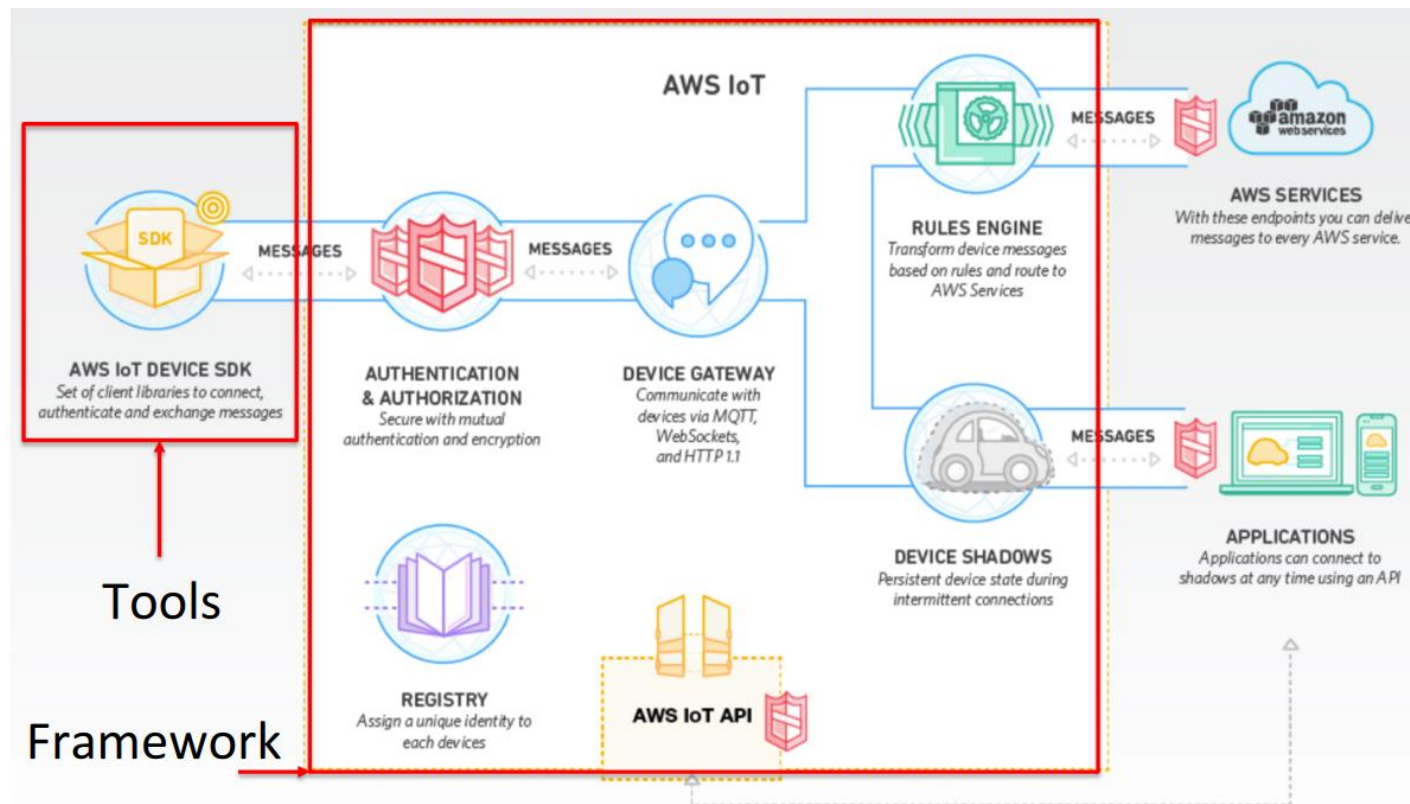 - Build your own controllers for your IoT applications on top of the data and services in the IoT catalogue

You Manage

| APP |
| Data |

Service Provider Manages

| Runtime |
| Middleware |
| OS |
| Virtualization |
| Server |
| Storage |
| Network |

Software as a Service

- You get:
  - The application

- Every hosted email solution is an example

| APP |
| Data |
| Runtime |
| Middleware |
| OS |
| Virtualization |
| Server |
| Storage |
| Network |

Service Provider Manages
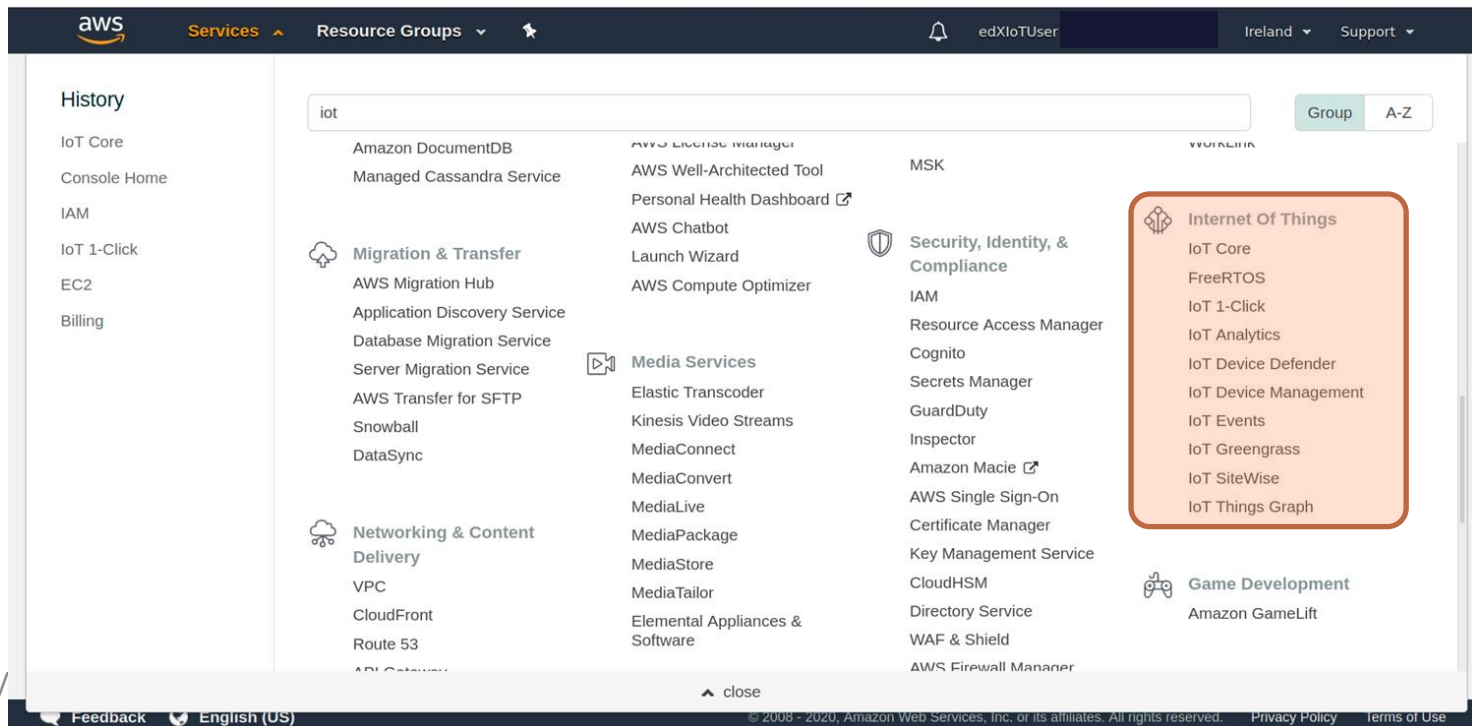
AWS IoT

AWS IoT in action

- AWS IoT provides secure, bi-directional communication between Internet-connected devices and the AWS Cloud.

- This enables you to collect telemetry data from multiple devices, and store and analyze the data.

- You can also create applications that enable your users to control these devices from their phones or tablets.

- AWS IoT consists of several components like: Alexa Voice Service (AVS) Integration for AWS IoT, Device gateway, Device shadow, Message broker, Security and Identity service
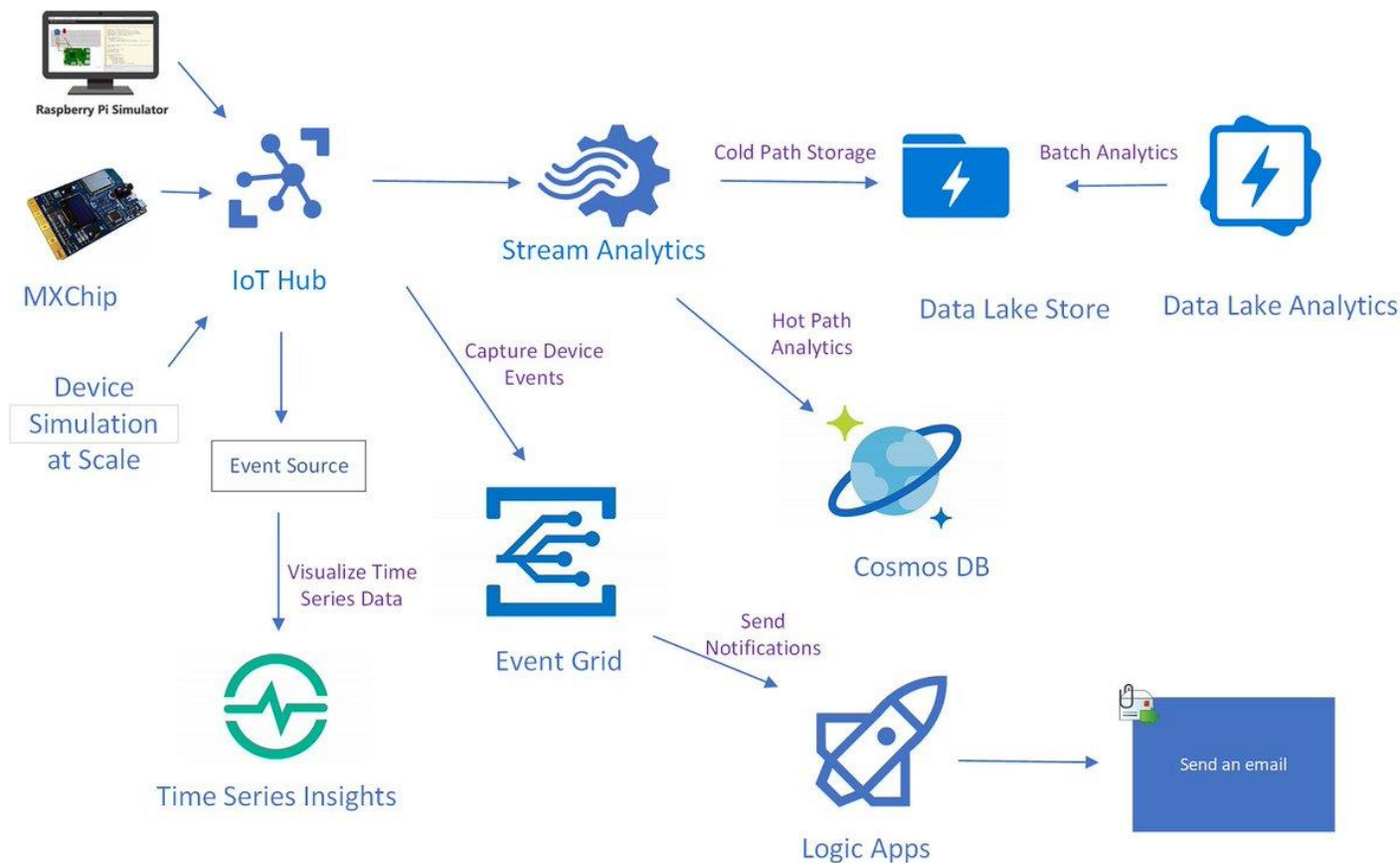
AWS IoT in action
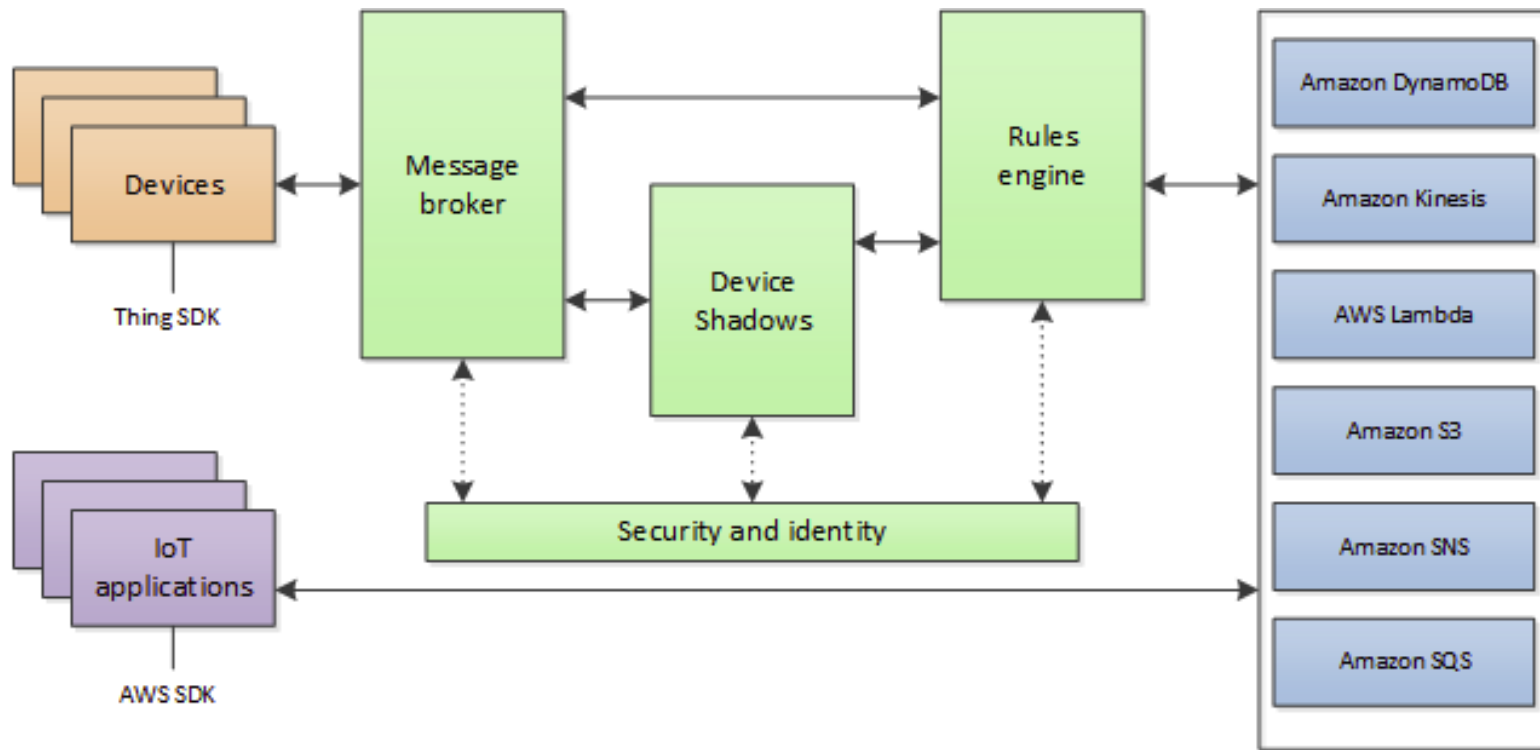
AWS IoT: how to start

- Create an AWS Account. There are some discounts for students.

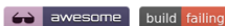- Jump right in for the AWS IoT services

Azure IoT

Azure IoT in action

- Azure IoT has a similar appeal to AWS IoT:
  - Integrate the IoT specific services with the rest of the cloud chain and provide the tools for data processing and security

- Support for common communication protocols like: HTTP, MQTT, and AMQP

- They provide a catalogue of certified devices that work with the platform: https://catalog.azureiotsolutions.com/alldevices

Azure IoT: how to start

- Start from the Azure IoT github page

Balena IoT in action

Balena IoT in action

- Balena makes it easy to deploy code to fleets of connected devices, bringing the power of Linux containers to the edge.

- They evolved from a cloud for IoT to a complete toolbox: OS, container engine, and tools

- You can develop and deploy your solutions locally or on the cloud

ThingsBoard in action

IoT and cloudification
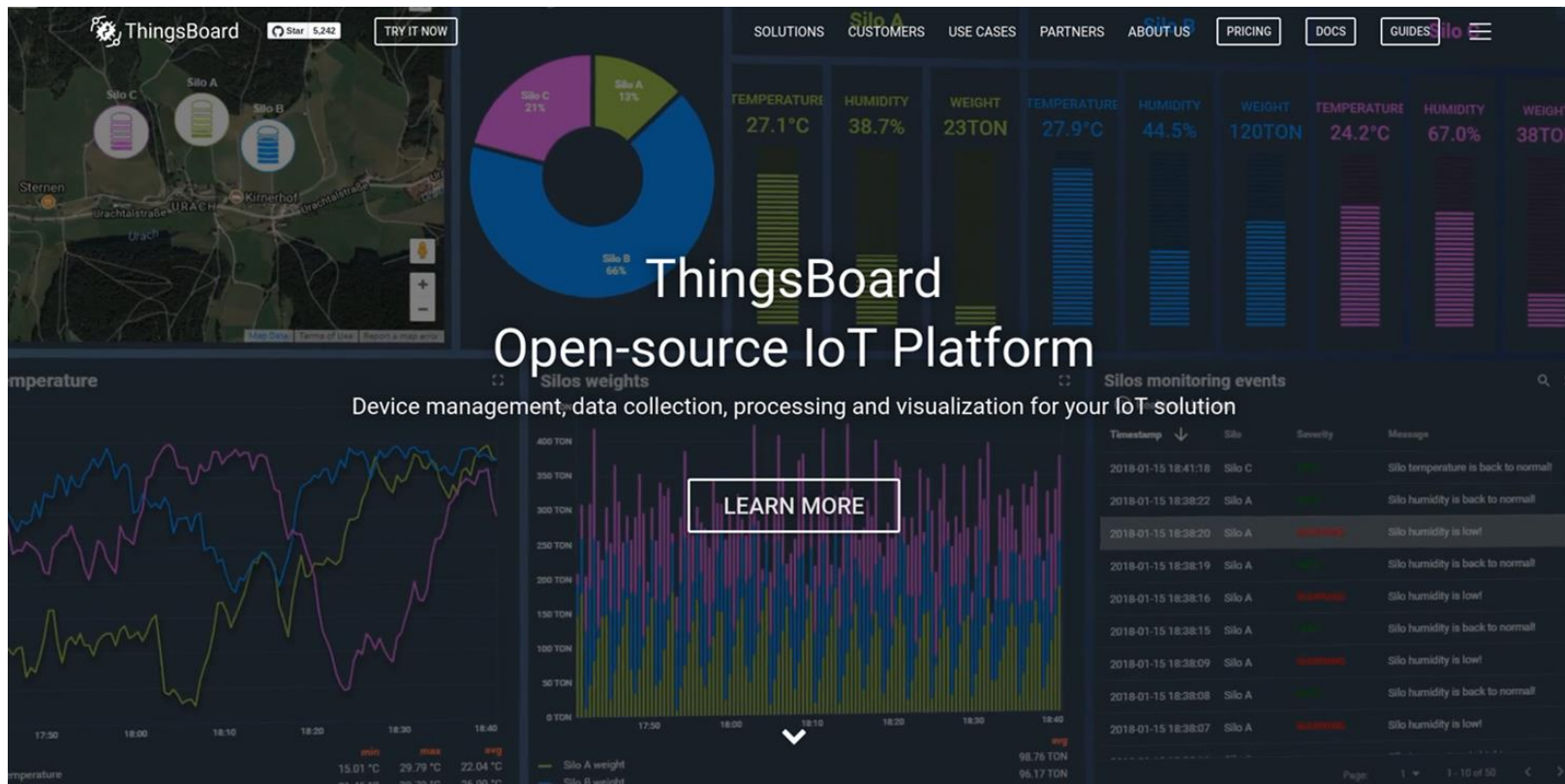
ThingsBoard in action

- A set of solutions proposed as community edition, or paid with support

- The goal is to host the data coming from devices either with MQTT or CoAP

- To start you simply need to follow instructions on the community edition. I did so on Digital Ocean (demo time).
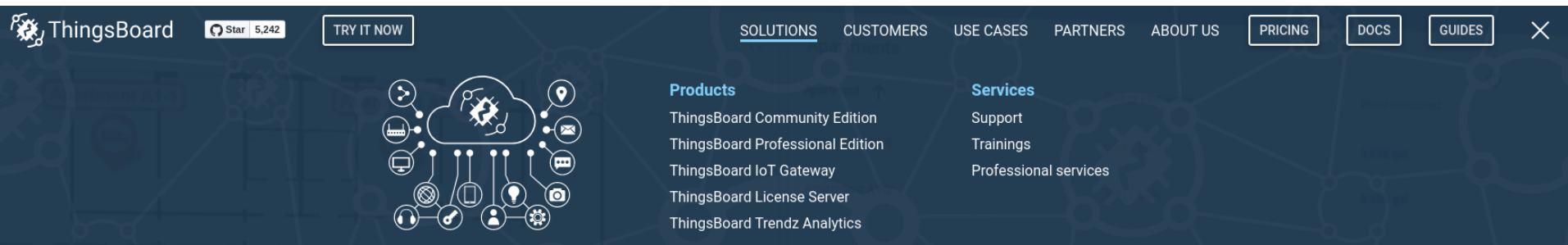
Mozilla IoT

- Mozilla proposes a Web of things that connects real-world objects to the World Wide Web.

- The goal is to unify the myriad of protocols for IoT into one common web platform that is being standardized at the W3C

- Mozilla also proposes a Framework to ease the development for beginners

Web of Things				
Weave	AMQP	MQTT	HomeKit	MQTT
WiFi/Thread	WiFi	WiFi	WiFi/BLE	WiFi/ZigBee/BLE/Thread
Linux/Android Things	Windows IoT	Linux/AWS Greengrass	iOS	Linux/ARTIK

Credits

- Some images and content are from the Course: "Cloud Tutorial: AWS IoT", Ruixuan Dai , CSE 521S Fall, Aug. 29, 2019, Washington University in St. Louis