GFT

# IoT

# Agenda

1. **Introduction**
   - What is IoT?
   - Use cases
   - Technology and platforms
2. **IoT Architecture**
   - Devices
   - Communication
   - Platforms & Cloud
3. **AI and IoT**
   - Intro & Use cases
   - Edge AI
4. **GFT experiences**
5. **Analytics, AI & IoT Practice**

# Intro

# What is **IoT?**


## Internet of People

One person, one pc.. A web for doing everything. Internet focused on communication… Wired connectivity, low volumes and low speed.

## Mobile Internet

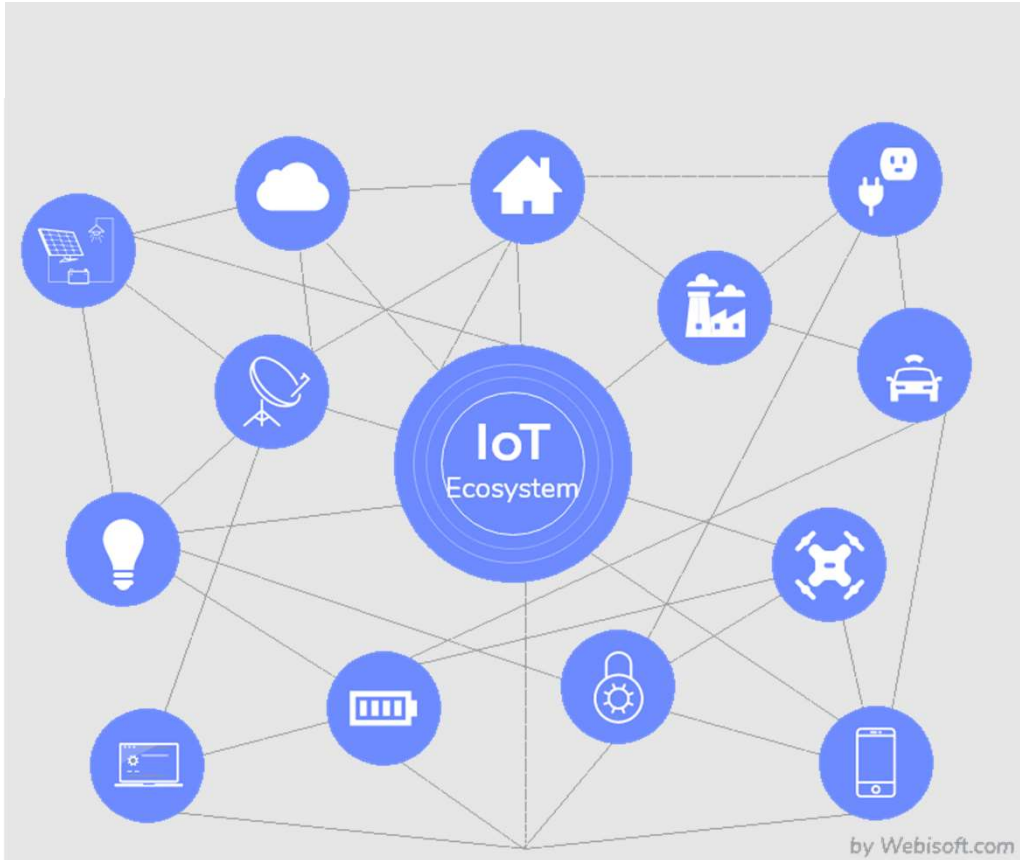
Wires disappear, and internet overloads daily activities. Do everything in a mobile and not even touch a pc becomes a reality.

## Internet of Things

Communication gets rid of intermediaries and is established M2M. Allowing devices to directly express their needs open the door to a new world.

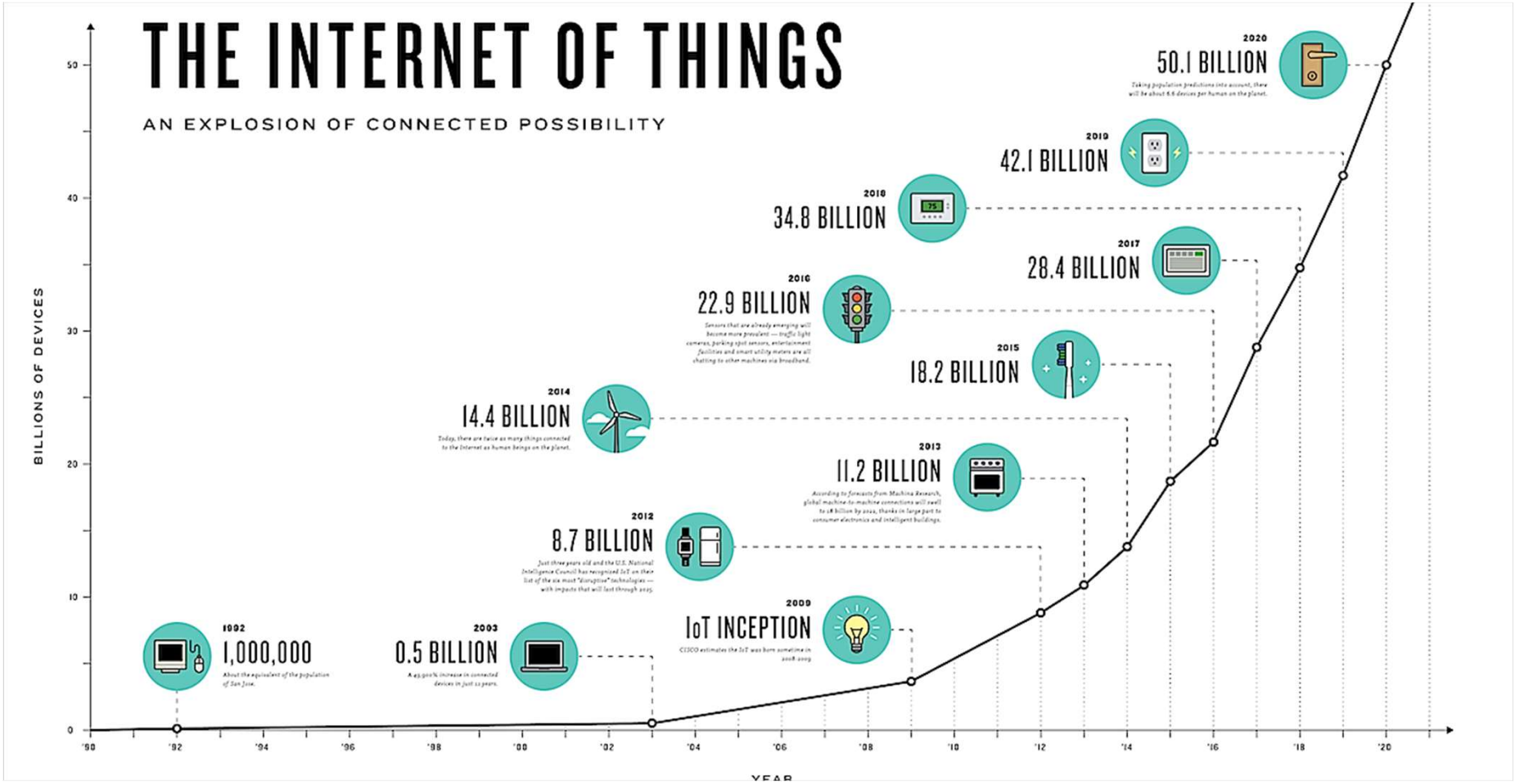
# Internet of People is the past…

# Welcome the internet of the things



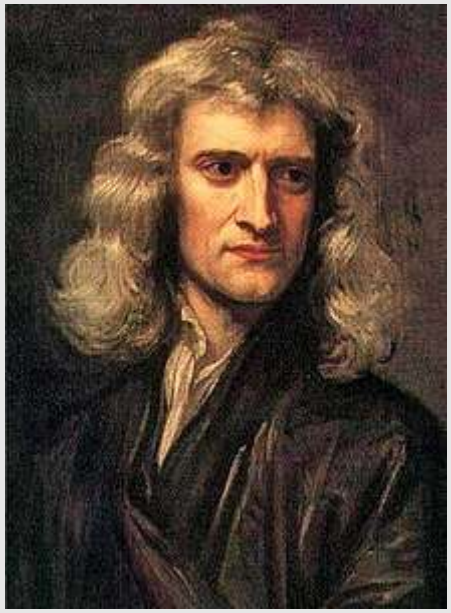

# Internet of Things

- Refers to the ever-growing **network of physical objects** that feature an IP address for **internet connectivity**, and the communication that occurs between these objects and other Internet-enabled devices and systems
- In simple words, **IoT is an ecosystem of connected physical objects that are accessible through the internet**
- Also referred to as **Machine-to-Machine (M2M)**


THE INTERNET OF THINGS
AN EXPLOSION OF CONNECTED POSSIBILITY
BILLIONS OF DEVICES
YEAR
1992
1,000,000
2003
0.5 BILLION
2009
IoT INCEPTION
2012
8.7 BILLION
2013
11.2 BILLION
2014
14.4 BILLION
2015
18.2 BILLION
2016
22.9 BILLION
2017
28.4 BILLION
2018
34.8 BILLION
2019
42.1 BILLION
2020
50.1 BILLION


Like a
Bosch

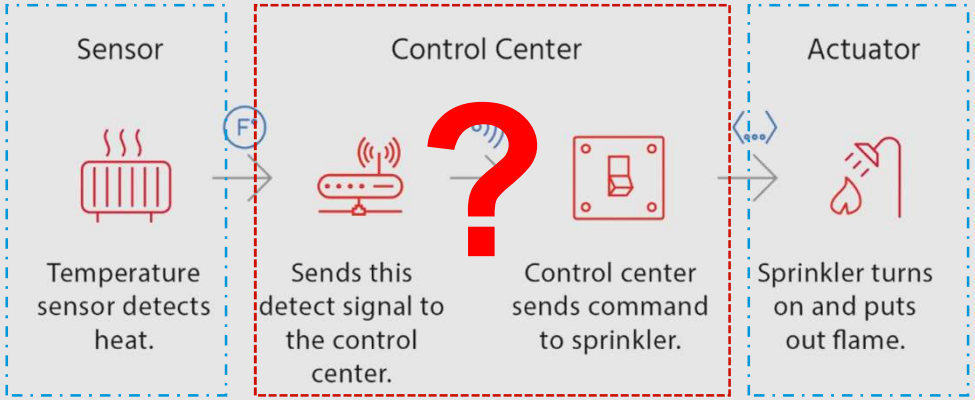
# How is IoT possible?



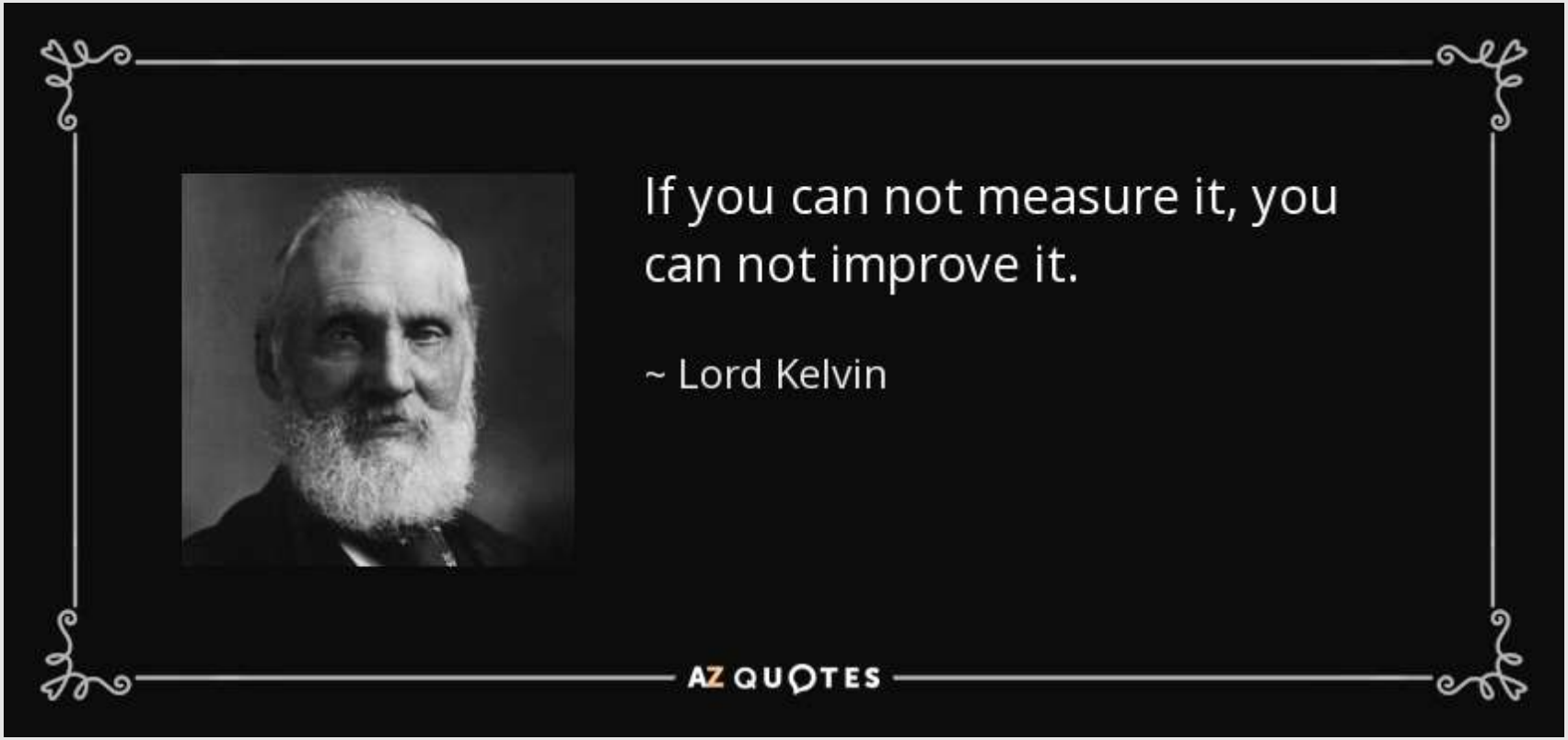
**Isaac Newton**
(1643 – 1727)

## Newton's Third Law

**"For every action, there is an equal and opposite reaction."**

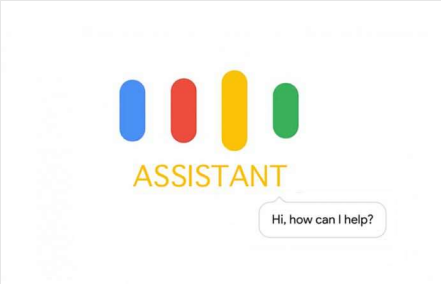



Sensor to **Actuator** Flow


If you can not measure it, you can not improve it.
~ Lord Kelvin
AZ QUOTES

# What has happened?

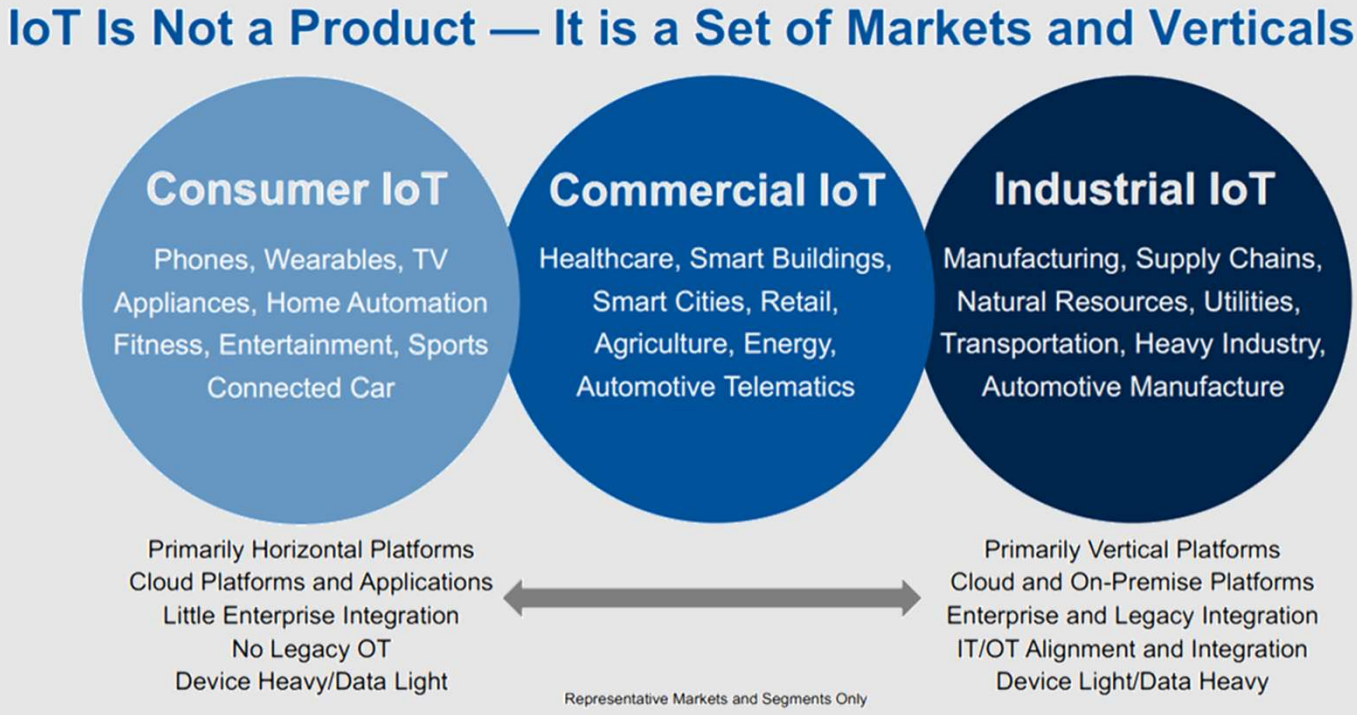
## Sensor

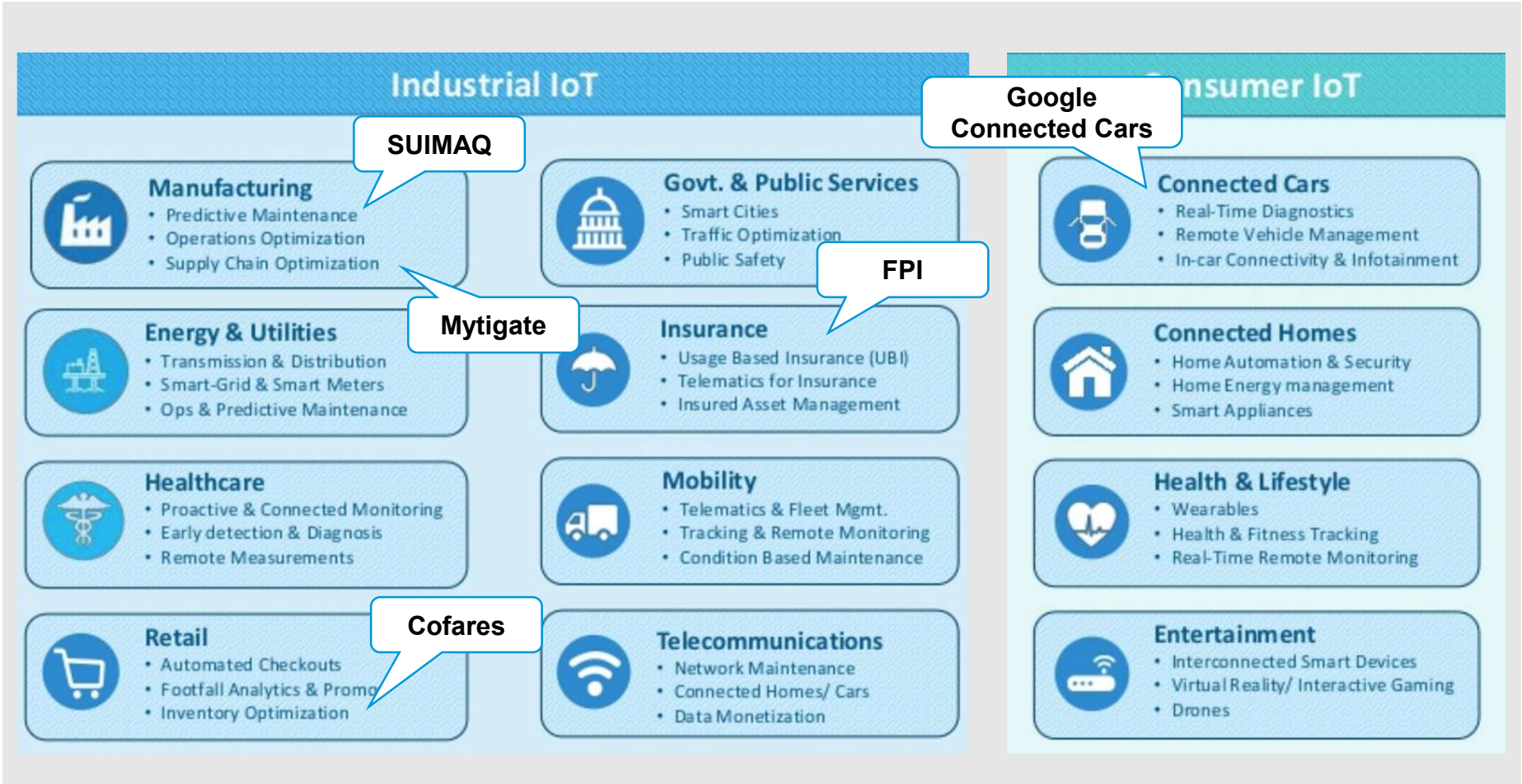



## Control Center

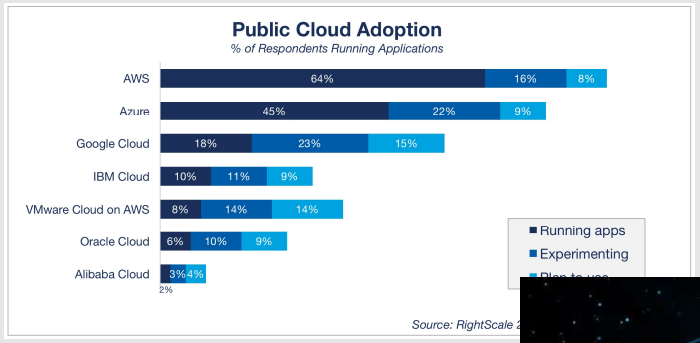

## Actuator

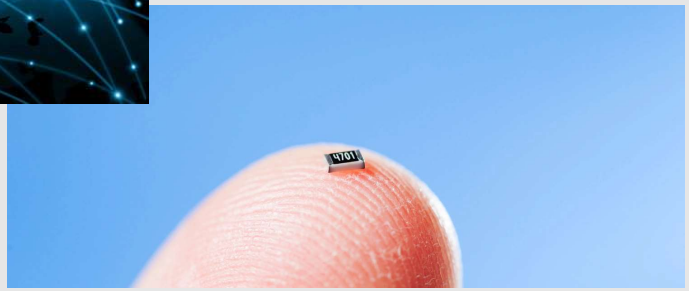
# What is Industrial IoT




Industrial IoT
SUIMAQ
Manufacturing
• Predictive Maintenance
• Operations Optimization
• Supply Chain Optimization
Govt. & Public Services
• Smart Cities
• Traffic Optimization
• Public Safety
Mytigate
Energy & Utilities
• Transmission & Distribution
• Smart-Grid & Smart Meters
• Ops & Predictive Maintenance
FPI
Insurance
• Usage Based Insurance (UBI)
• Telematics for Insurance
• Insured Asset Management
Healthcare
• Proactive & Connected Monitoring
• Early detection & Diagnosis
• Remote Measurements
Mobility
• Telematics & Fleet Mgmt.
• Tracking & Remote Monitoring
• Condition Based Maintenance
Cofares
Retail
• Automated Checkouts
• Footfall Analytics & Promo
• Inventory Optimization
Telecommunications
• Network Maintenance
• Connected Homes/ Cars
• Data Monetization
Google Connected Cars
nsumer IoT
Connected Cars
• Real-Time Diagnostics
• Remote Vehicle Management
• In-car Connectivity & Infotainment
Connected Homes
• Home Automation & Security
• Home Energy management
• Smart Appliances
Health & Lifestyle
• Wearables
• Health & Fitness Tracking
• Real-Time Remote Monitoring
Entertainment
• Interconnected Smart Devices
• Virtual Reality/ Interactive Gaming
• Drones

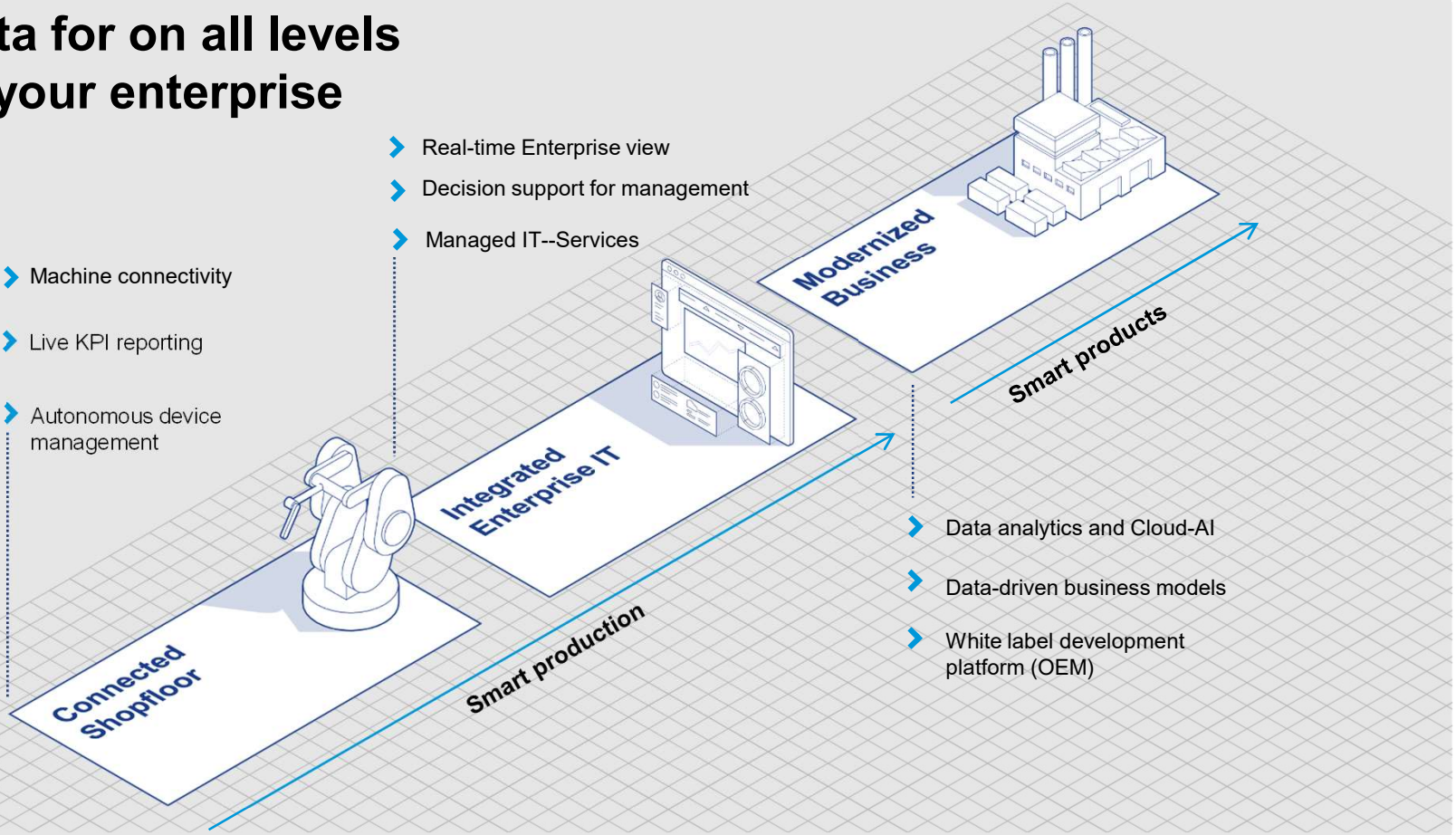
# Why Now?


Public Cloud Adoption
% of Respondents Running Applications
AWS
64%
16%
8%
Azure
45%
22%
9%
Google Cloud
18%
23%
15%
IBM Cloud
10%
11%
9%
VMware Cloud on AWS
8%
14%
14%
Oracle Cloud
6%
10%
9%
Alibaba Cloud
3%
4%
2%
Running apps
Experimenting
Source: RightScale



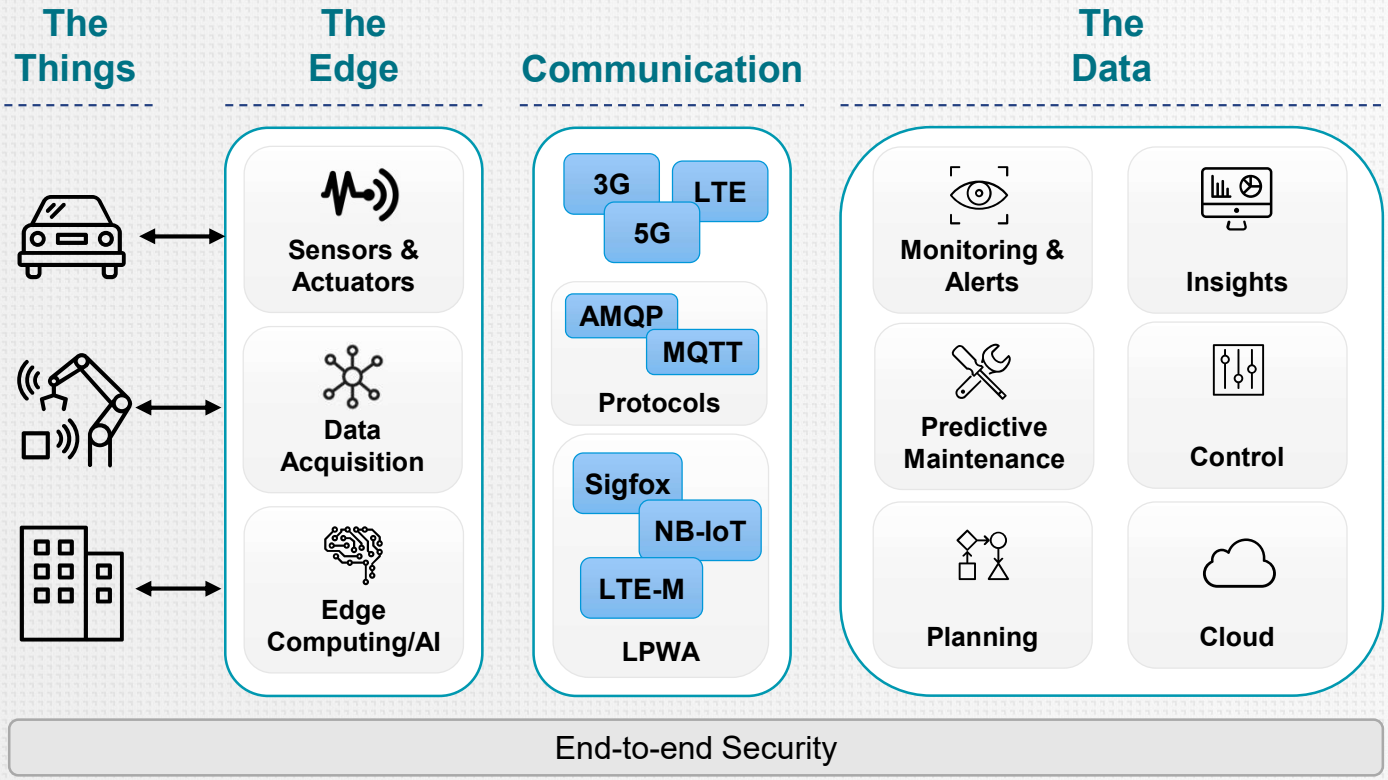
# Data for on all levels of your enterprise

- Real-time Enterprise view
- Decision support for management
- Managed IT--Services
- Machine connectivity
- Live KPI reporting
- Autonomous device management
- Data analytics and Cloud-AI
- Data-driven business models
- White label development platform (OEM)

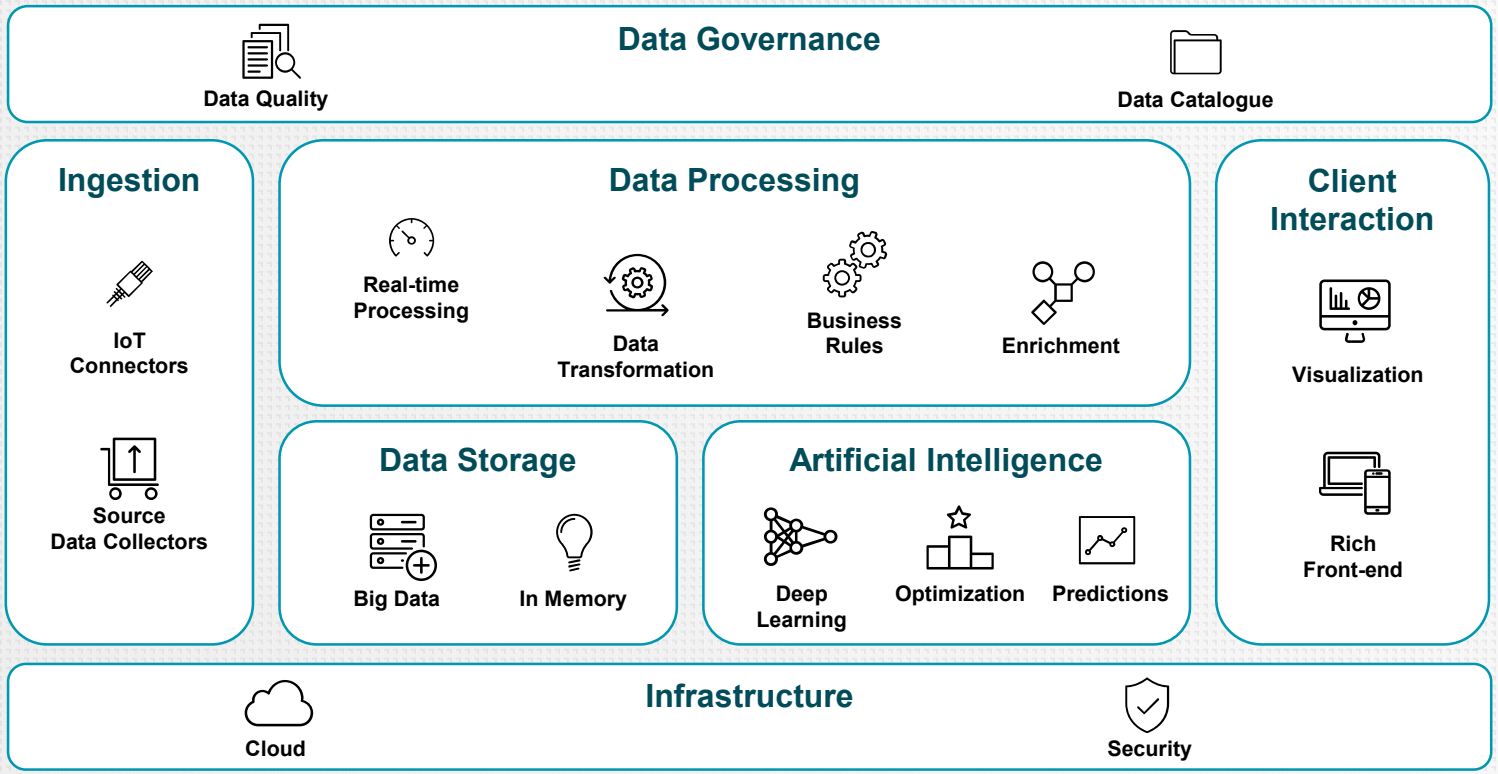


# IoT Architecture

# Architecture



# The Data Architecture




Devices

# Domestic

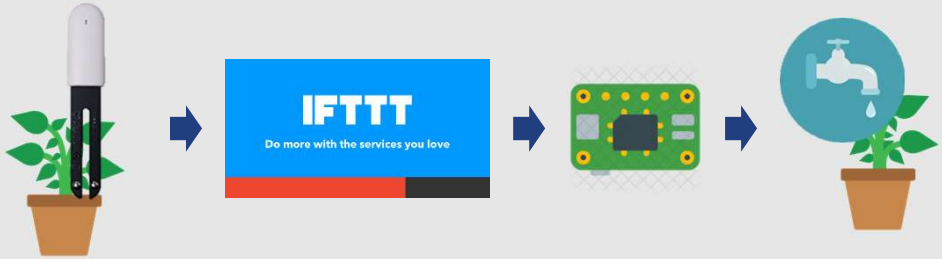
# Plants smart monitor

- Bluetooth connectivity
- Light intensity
- Temperature
- Nutrients (fertility)
- Humidity (watering)

- + knowledge base with more than 3000 plants

# My plants are dying…

I am very bad with plants… that is a common sentence that you can hear from your teammates. But we are IT can we do something to avoid us killing the planet?




# Smartwatch

- GPS
- Barometric altimeter
- Heart rate sensor
- Accelerometer
- Gyroscope
- Ambient light sensor

**TP-Link HS100**
Wifi connectivity


**Nest**
Smart
Thermostat

**Google Home & Alexa**
Home assistant

**ELM327**
Mini OBD-II bluetooth
On-Board Diagnostics
Real-time data

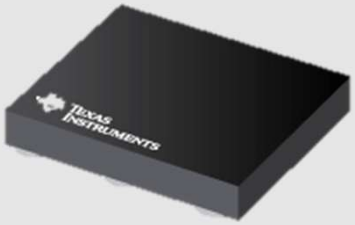

**TP-Link HS100**
Wifi connectivity

# Industry

# Texas Instruments


**CC3100**
Connect any low-cost, low-power microcontroller (MCU) to the Internet of Things (IoT).

Used in **Mytigate** project.




**OPT3006**
The OPT3006 is a single-chip **lux meter**, measuring the intensity of visible light as seen by the human eye. The OPT3006 is available in an ultra-small PicoStar package (fits into tiny spaces).

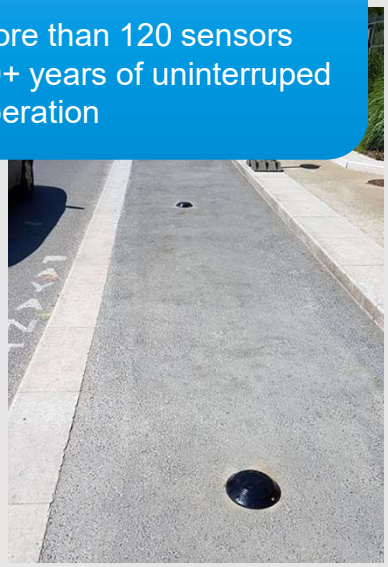

Use of **IWR6843**, which is a single-chip mmWave radar sensor with integrated DSP for an indoor and outdoor people counting application

# Libelium

**IoT Dashboard**

**Smart Parking Node**

More than 120 sensors
10+ years of uninterruped operation



**Waspmote**

More than 120 sensors
17 radio technologies
Open Sourcdd SDK/API

**Waspmote Plug & Sense! Smart Agriculture Xtreme sensor node**

# DIY

## Do It Yourself

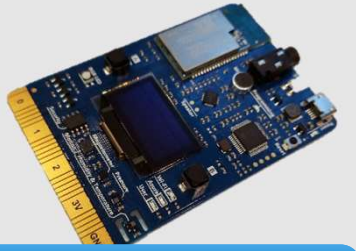
Raspberry Pi

NodeMcU

Arduino

Bosh XDK

BOSCH



MXCHIP Azure IoT DevKit

MXCHIP

Asus Tinker Board

circuito.io

# https://www.circuito.io/

¿Qué podrías hacer?


Communication

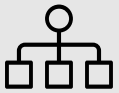
# Introduction

## TECHNOLOGY

How the data is going to be transmitted. Wired or wirless. Mobile or connected. All these decision have an impact on data direction, cost, speed, bandwidth, etc.
We will focus on wireless connections.


## ARCHITECTURE

The architecture defines, based on both functional and non-functional requirements, how the devices are connected, what is the topology, etc.



## PROTOCOL

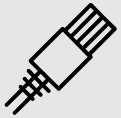
IoT Procols describe how the data is encapsulated and transmitted, including parameters such as headers, message details, reliability, security, etc.

# Technology

- There are **as many ways to connect IoT as communication protocols** in the market:





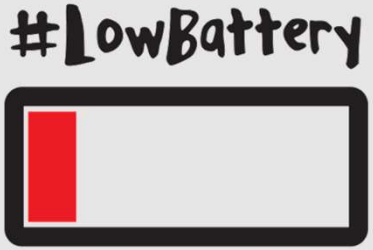


**Wired Connection**

- But we will focus on **LPWA (Low-Power Wide-Area)**, given its peculiarities, diferring from the above mentioned

# Technology – LPWA

- Main **characteristics** of LPWA




Low Energy Consumption

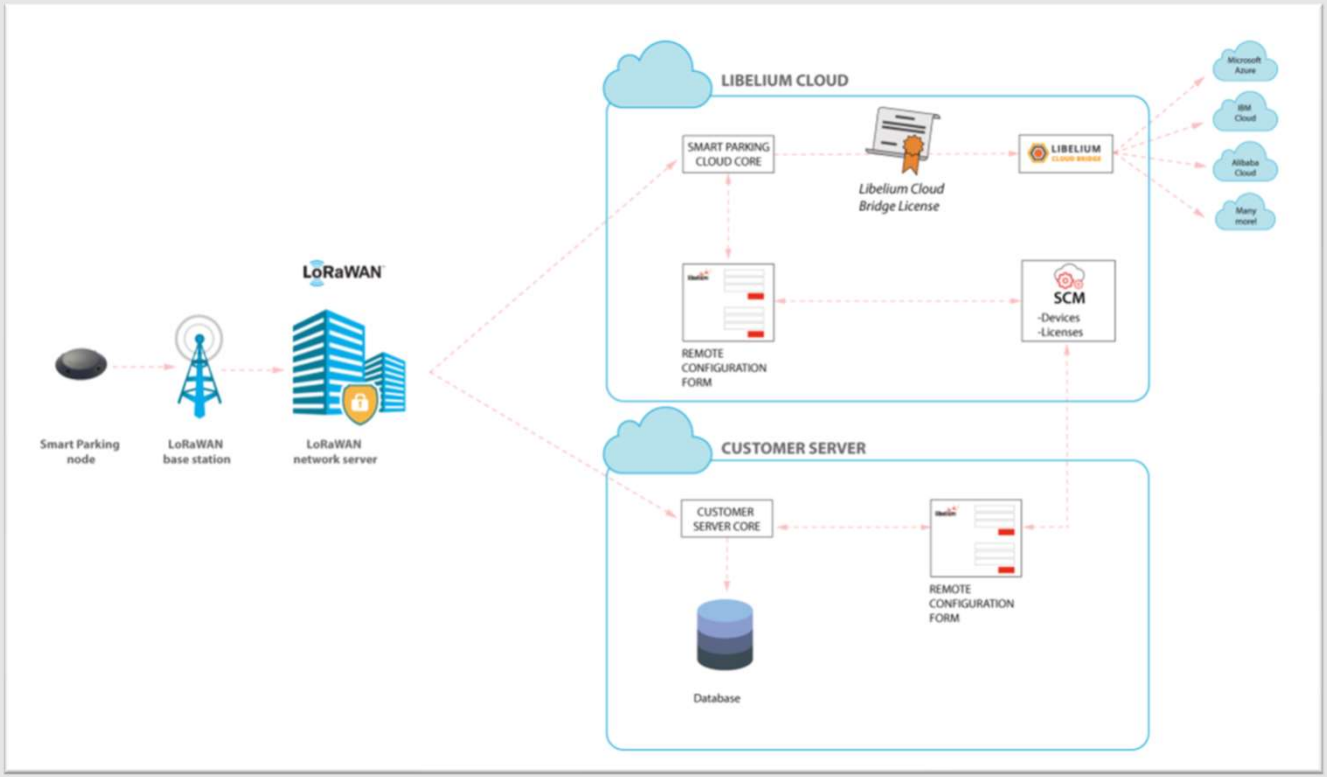
High Range

# Technology – LPWA

| LTE-M | NB-IoT | LoRa | sigfox |
|---|---|---|---|
| ▪ Based on 4G telco network<br>▪ Telcos and chips providers involved (Verizon, Qualcomm…)<br>▪ Chip is down most of the time<br>▪ 1 Mbit/s full or half duplex<br>▪ Depends on 4G coverage | ▪ 149 operators in 69 countries investing<br>▪ 250 kbits/s half duplex<br>▪ Focus on indoor, low cost, long battery and high connection density<br>▪ Works on 2G, 3G and 4G<br>▪ Battery can last up to 10 years! | ▪ Non-profit organization<br>▪ More than 500 members (Alibaba, Cisco, IBM…)<br>▪ Open standard to try to unify LPWA<br>▪ Star architecture, through gateway (connected as usual) | ▪ Proprietary<br>▪ Biggest LPWA in the world<br>▪ Long range (up to 50 km) and low bandwidth<br>▪ Not great for bidirectional comm.<br>▪ Star architecture, through Sigfox base |

**More info**: https://www.es.paessler.com/it-explained/lpwa

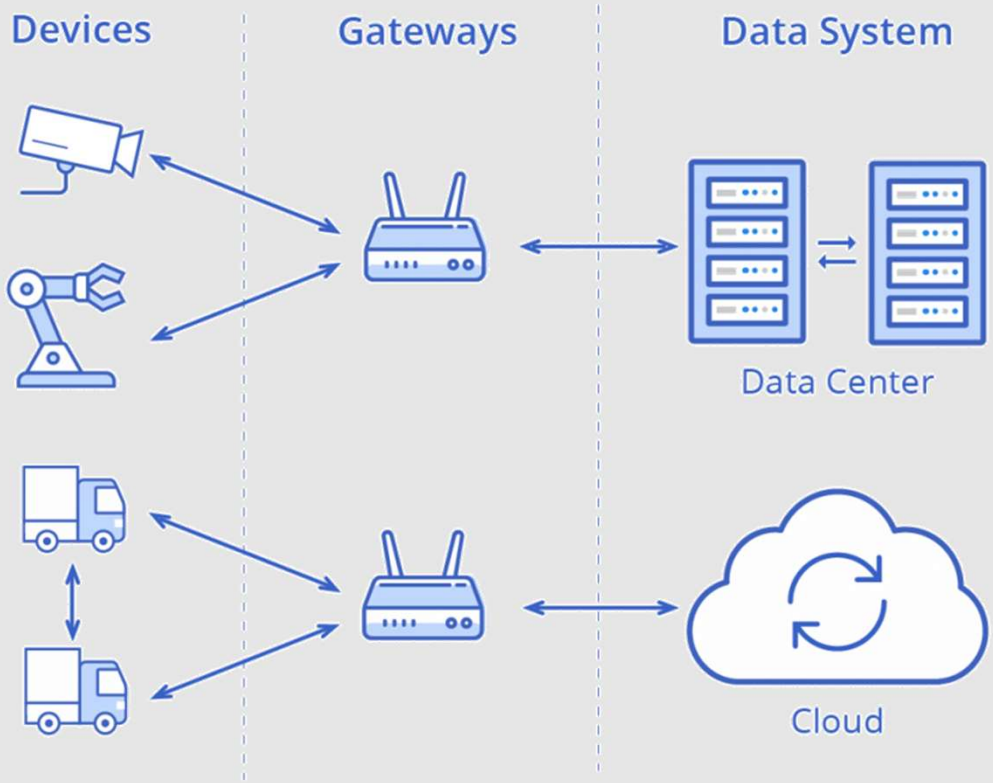
# Libelium Smart Parking – Network Architecture



# Architecture

- The IoT communication architecture defines how the devices are connected in order to **provide full connectivity**, meeting both **functional** and **non-funcional requirements**
- **Functional requirements** define how the IoT application behaves, based on all inputs and outputs. That is, describes the application.
- **Non-functional requirements** define the so called “quality attributes” which includes many parameters such as:
  - Security
  - Scalability
  - Throughput
  - Reliability
  - Coverage
  - Cost
  - Durability
  - Compatibility

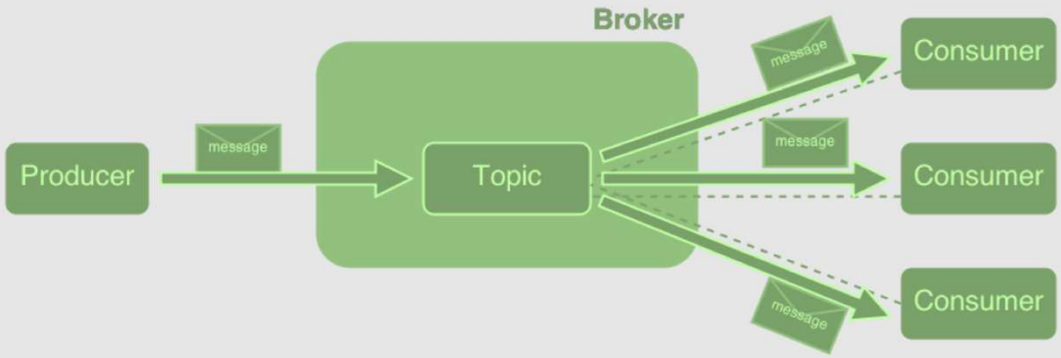
# Architecture



# Protocols

- Iot Protocols define how data is sent and received by the different devices. In order words we are talking about **messaging protocols**.

- **Basic concepts** about these protocols:
  - They are asynchronous
  - They have publishers (producers), subscribers (consumers) and brokers



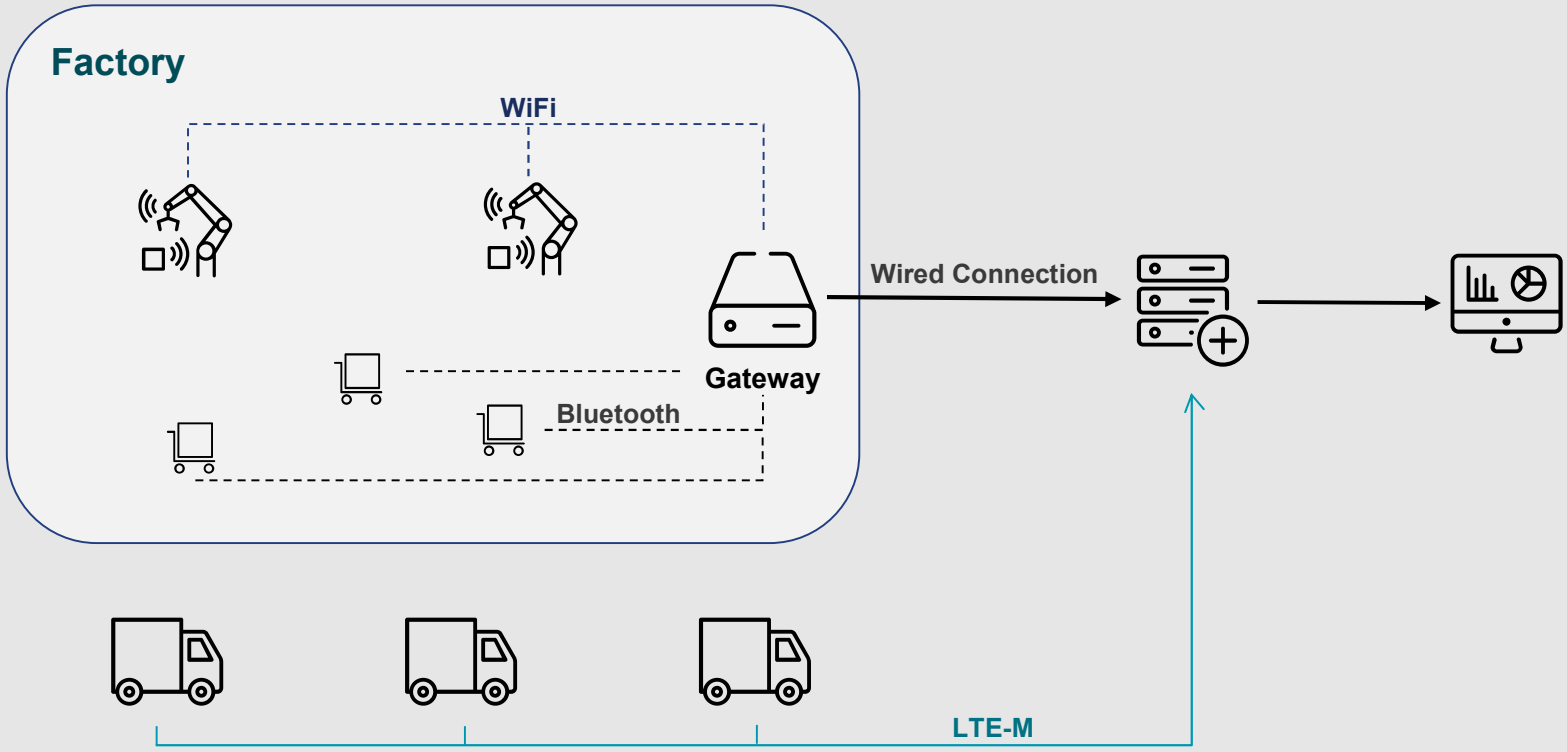
# Protocols


- Message Queuing Telemetry Transport
- Created by IBM, then submitted to OASIS
- ISO standard, over TCP/IP
- Extremely lightweight
- QoS (at most, at least and exactly once )
- Supported by most IoT tools/platforms, both on premises and cloud
- Implementations: Mosquitto
- **Good for**: throughput and low bandwidth


- Advanced Message Queuing Protocol
- Created by JPMorgan, then transferred to OASIS
- Open standard
- Main features: message orientation, queuing, transactionality, routing, reliability and security
- Implementations: Apache ActiveMQ, Solace PubSub+, RabbitMQ (some versions)…
- **Good for**: generic and complex messaging scenarios

**Other options**: STOMP, HTTP, XMPP…

# Sample IoT Topology

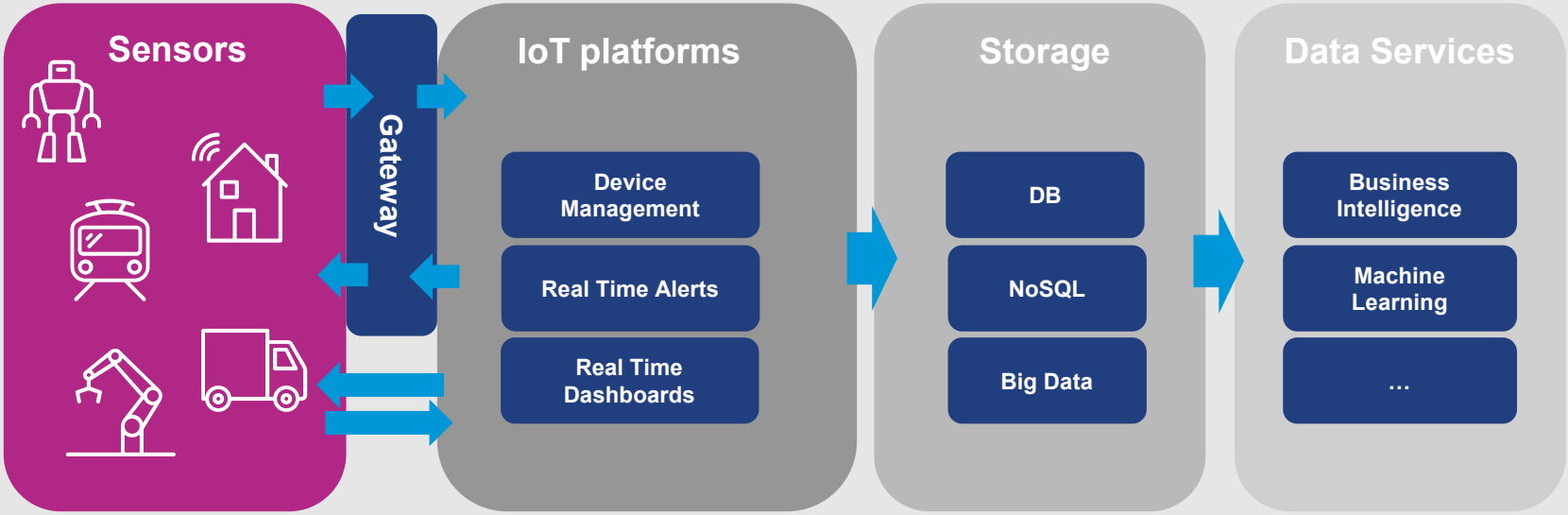



Platforms & Cloud

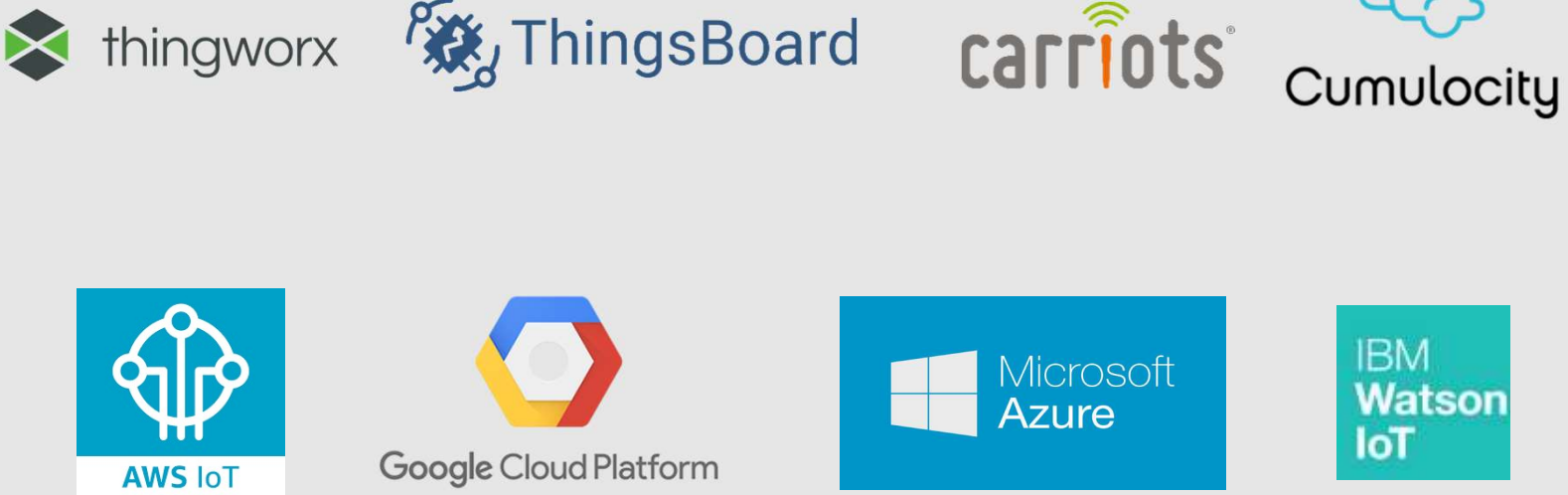

# IoT

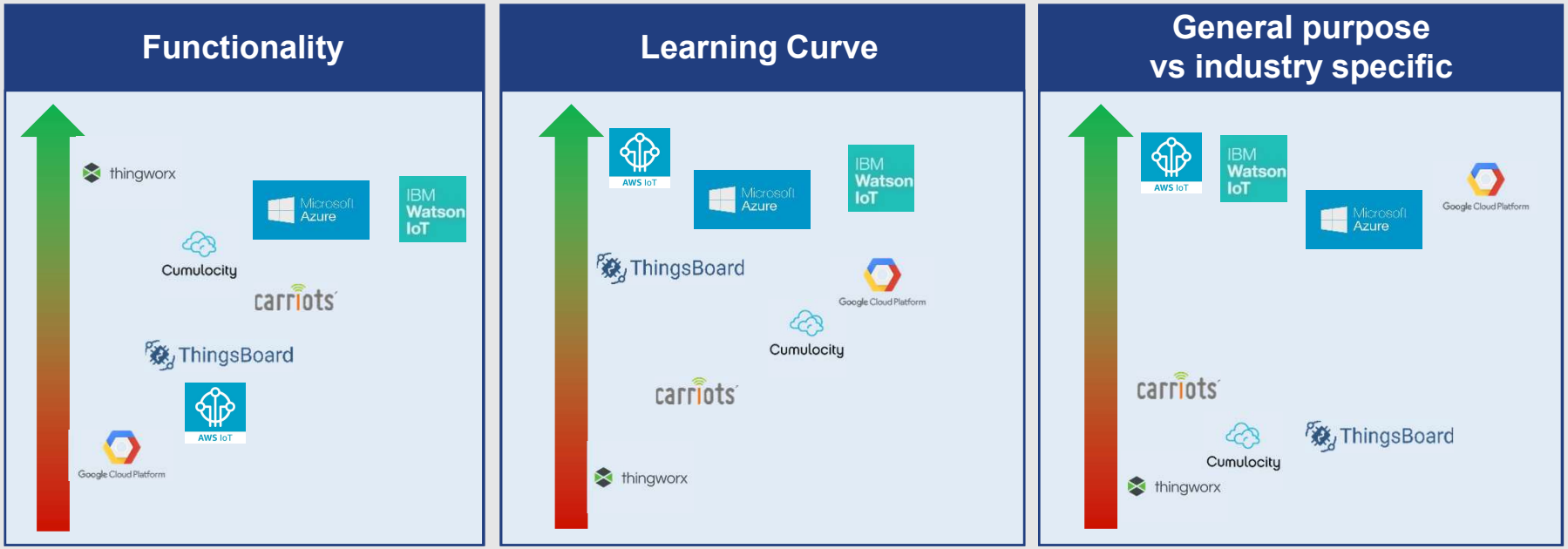
## Pieces Needed

# Pieces of the Puzzle



# IoT Platforms

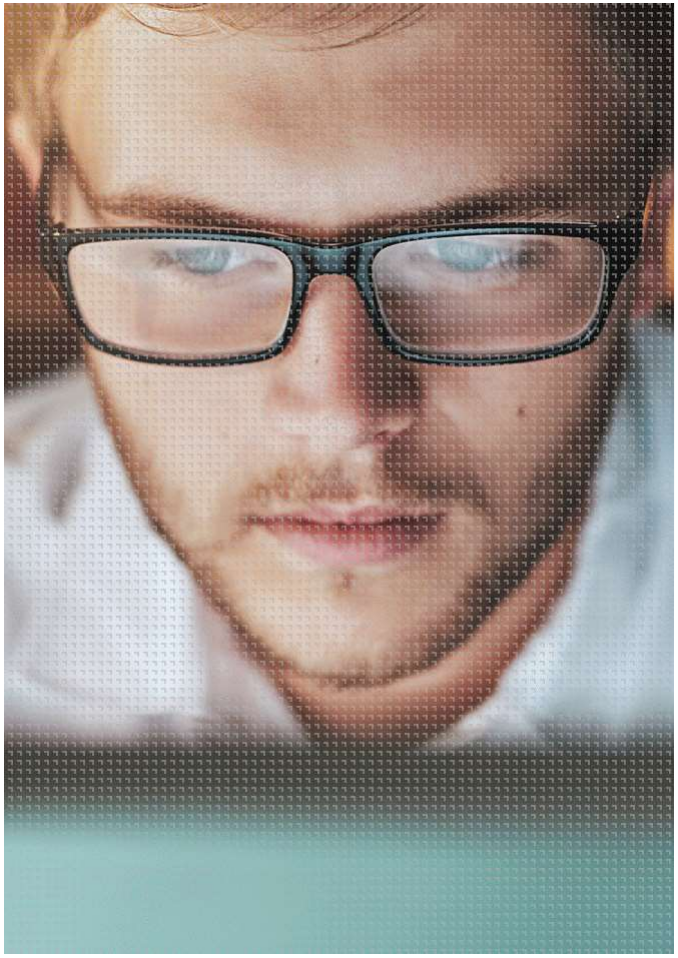




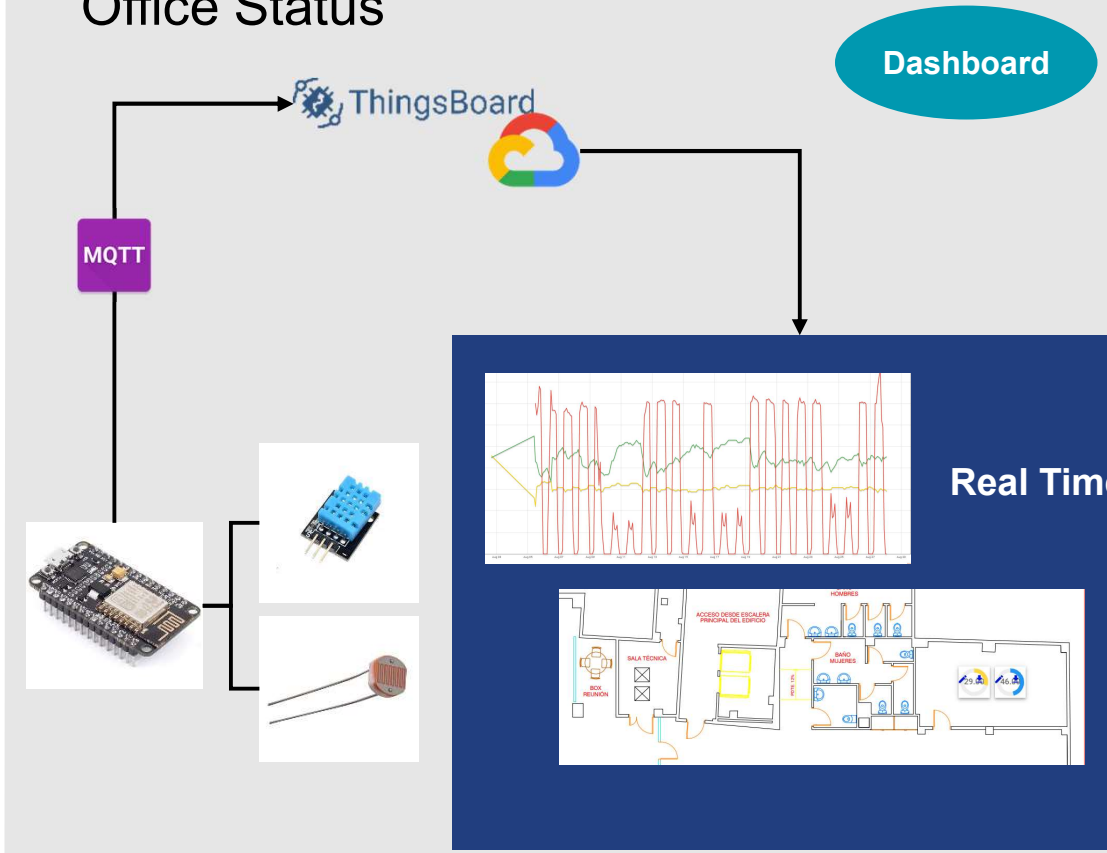

**IoT Platform Assessment**

https://confluence.gft.com/display/PSUIBERIA/Maximize+IoT+data+usage+using+artificial+intelligence+and+cloud

# Let’s measure this office



# Office Status



# Let’s do some analysis!


AI & IoT

# Introduction

*"The theory and development of computer systems able to perform tasks normally requiring human intelligence" -* ***Oxford***

Computer Vision

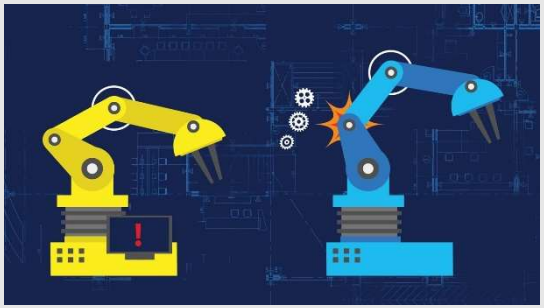
Smart Bots

Predictive

NLP / NLU

Deep Learning

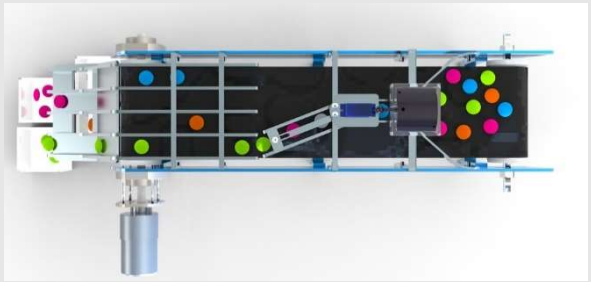
# Use cases



Predictive Maintenance

Anomaly Detection

Automous Guided Vehicles

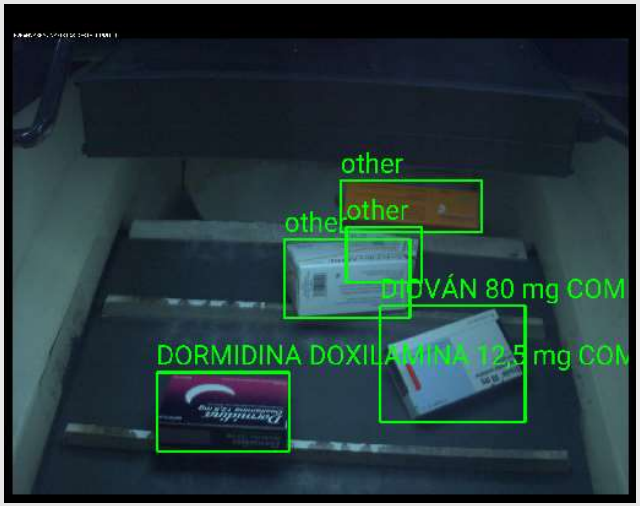


Object Separation

# Example Object Separation – Tomato Sorting Machine

# Use cases in GFT

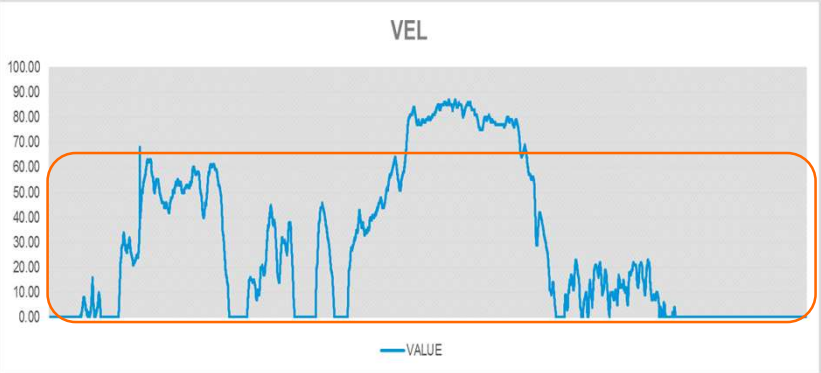

Connected Car (Google)




Medicine Recognition (Cofares)

# Am I a good driver?


**What do you think that is happening here?**

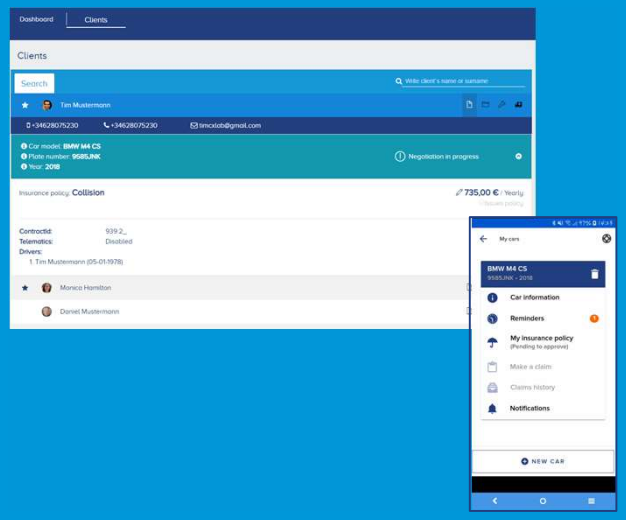


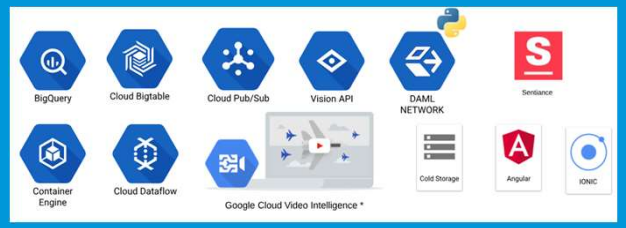

**Am I a highway driver or city driver?**

**3.99 €**

The **ELM327** is a programmed produced by ELM Electronics for translating the (OBD) interface found in most modern cars. The ELM327 command protocol is one of the most popular PC-to-OBD interface standards and is also implemented by other vendors.

# FLEXIBLE PERSONALISED CAR INSURANCE




## The challenge

- Create a DLT/Cloud/IOT fusion solution for the car insurance market
- Offer an insurance contract with a variable price depending on the way that you drive
- Only share the relevent data with the relevant party
- Create a solution that can scale to a national (or even international) level

## The engagement

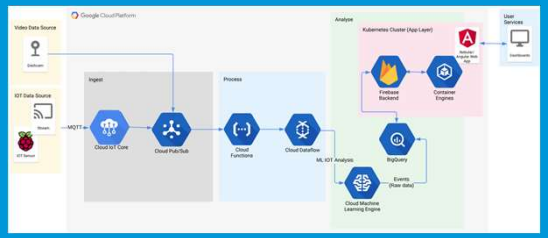
- Collaborating with Digital Assets to define the DAML contracts and deploy to GCP
- Defining a customized cloud native architecture
- Working with Sentiance to obtain IOT trip data
- Verifying functionality with AXA
- Presented at Google Next 18 (London) to an audience of 170 technology and business specialists

## The benefit

- A flexible car insurance policy that is based solely on DAML code
- An automated claims system
- IOT based data ingested into the system to be able to define your risk level (and price of your insurance policy)
- Intuitive web and mobile applications that can be interfaced with easily by the end use/insurer
- Data immutably stored to the blockchain and can be referenced to in the case of a disagreement (regarding the value of claims for eg)

# Improved insurance risk scoring using live driver behavior data

Live demo of instantly adapting car insurance policies based on an interpretation of driver behaviour with remotely controlled vehicles

## Challenge

- Extract telemetry data from cars in real time
- Analyse driving data to gives the driver a score that affects their insurance premium
- Create and interactive experience to demonstrate this using remote control vehicles for the Google Next 2019 (San Francisco, London)

## Engagement

- Create an architecture that uses Google Cloud native approach to receive data from remote control vehicles, process this data (via AI) and display it on a reactive dashboard.
- Risk scoring is generated while driving, based on machine learning models. Insurance premium is adapted accordingly in real time.
- Gamification of the experience to reward the “best” drivers at the event

## Benefit

- Real time analysis of telemetry data enables insurance companies to create flexible pricing models based on the way the client drive and their associated risk profile (these savings can also be passed on to the client)
- Scalable solution due to the use of Google Cloud technologies
- Adaptable data models can be created for different insurers/insurers in different geographical locations based on clients needs/driving styles

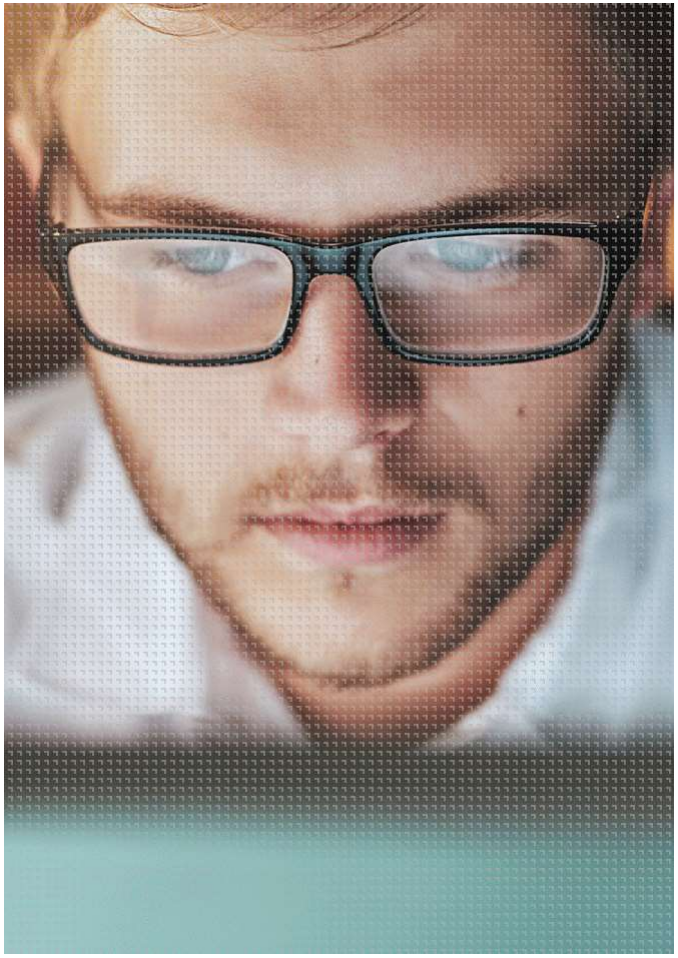
# Google Next

GFT

Digital Asset

sentiance

Google Cloud Platform

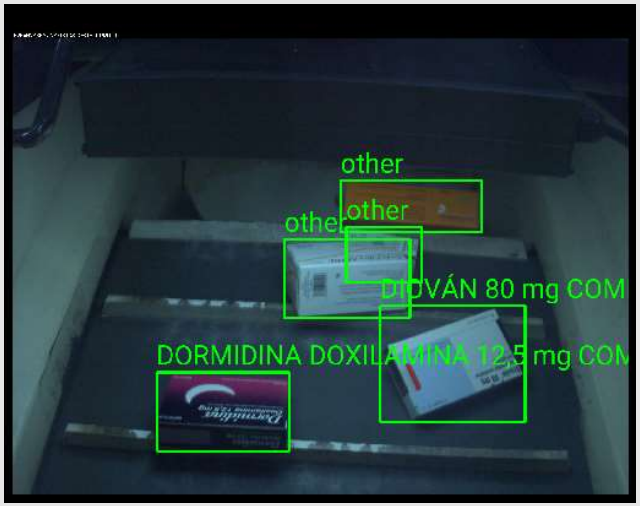


# **Video –** Google Next FPI

Demo Video

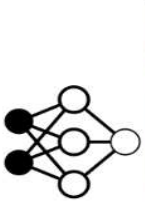
# Use cases in GFT

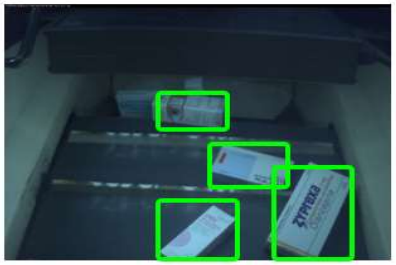

Connected Car (Google)




Medicine Recognition (Cofares)

# End2End





s HYLO

Diov?n 8o mg

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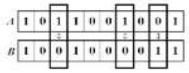


| Cod. Nacional | Presentación | Laboratorio |
|---|---|---|
| 64454 | DIOVAN 80 mg ... | Novartis ... |
| 23434 | HYLO | Labs :) |
| 96531 | OTIX | GFT LAB |

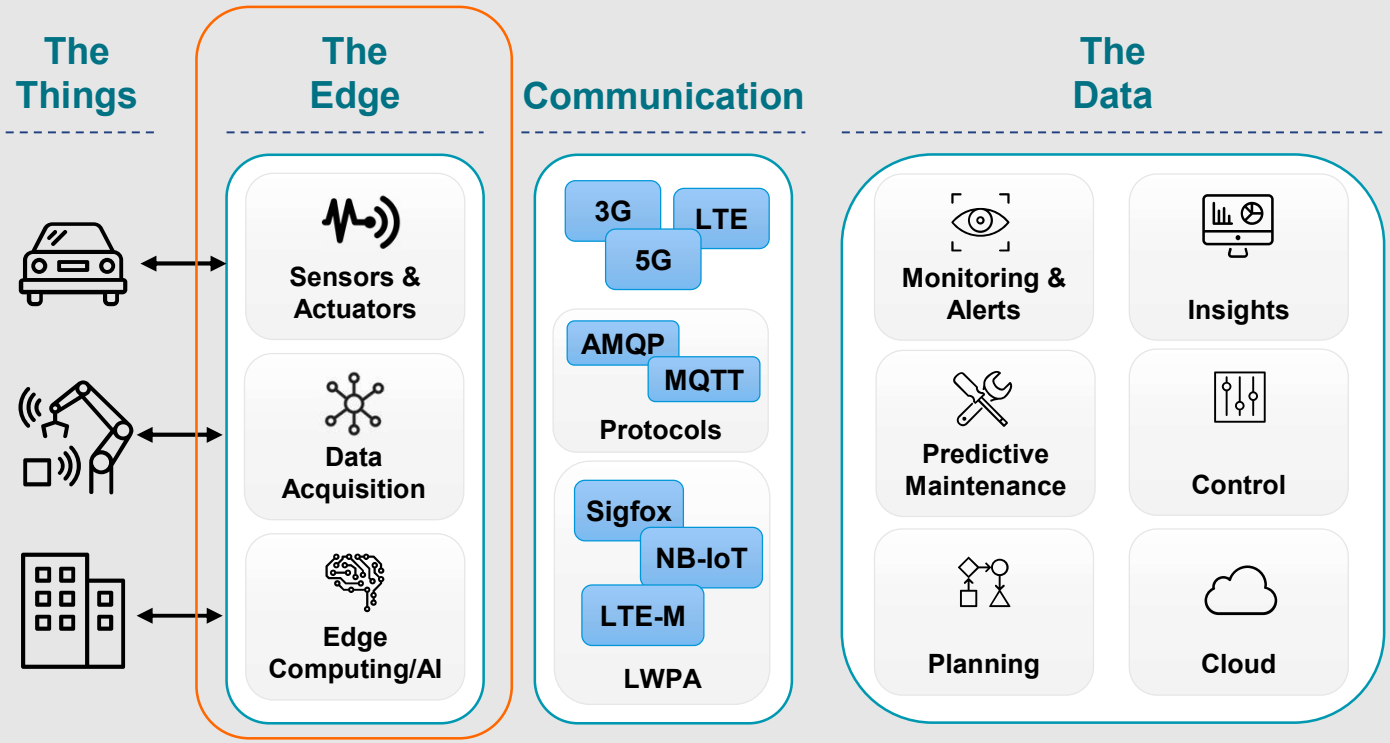
DIOVAN 80 mg COMPRIMIDOS RECUBIERTOS CON PELICULA

HYLO ....

OTIX ....

# Not that easy…


# Edge Computing




***All computation (and storage) happening as close as possible to where it is needed (in IoT, the devices)***

# Edge AI

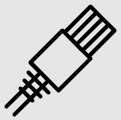
- **Artificial Intelligence**, as any other algorithm **can also run in the edge** but, when does it make sense to do it?

## Latency

When better response times are required

## Reliability

Avoid potential connection loss



## Bandwidth

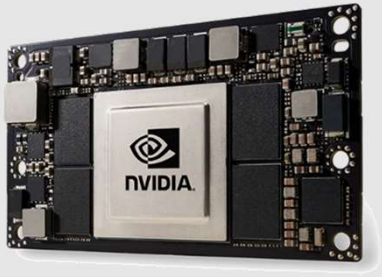
Not enough bandwidth to transfer (e.g. video)

## Security

Avoid legal, regulatory or privacy issues

# Edge AI - Devices

## **NVIDIA Jetson TX2 –** Embeddable AI




- **AI Performance**: 1.3 TOPs
- **GPU**: 256-core NVIDIA Pascal
- **CPU**: Dual-Core NVIDIA Denver 2 64-bit processor *and* quad-core ARM Cortex-A57 MPCore unit
- **Power**: 7.5W/15W (10W/20W for 'i' version)
- **Physical dimensions**: 87 x 50mm
- **Cost**: $399, 8GB version; $299, 4GB version; $749 for industrial module

## **NVIDIA Jetson Nano –** Compact and Cost-Effective AI

- **AI Performance**: 472 GFLOPs
- **GPU**: 128-core NVIDIA Maxwell
- **CPU**: Quad-Core ARM Cortex-A57 MPCore
- **Power**: 5W/10W
- **Physical dimensions**: 70 x 45mm
- **Cost**: $129

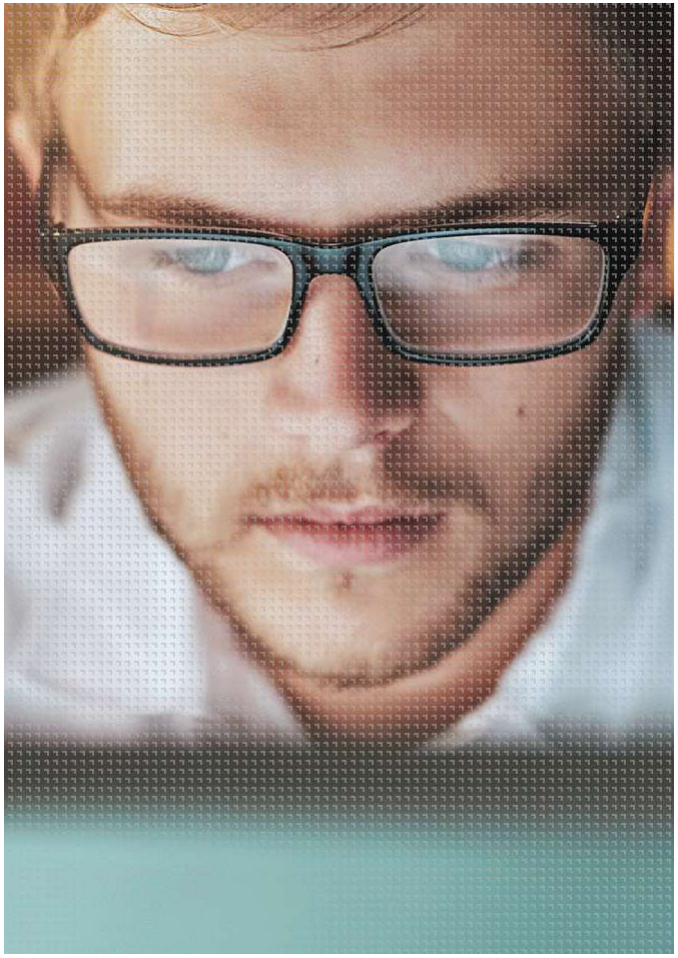
# Edge AI - Devices

## Google Coral

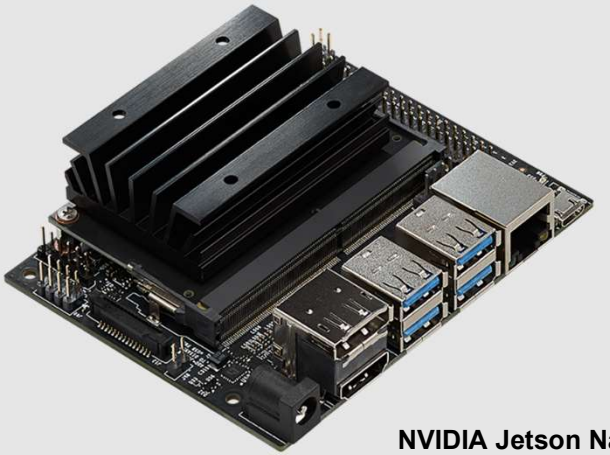
- **CPU**: NXP i.MX 8M SoC (quad Cortex-A53, Cortex-M4F)
- **GPU**: Integrated GC7000 Lite Graphics
- **ML accelerator**: Google Edge TPU coprocessor
- **RAM**: 1 GB LPDDR4
- **Flash memory**: 8 GB eMMC
- **Wireless**: Wi-Fi 2x2 MIMO (802.11b/g/n/ac 2.4/5GHz) and Bluetooth 4.2
- **Dimensions**: 48mm x 40mm x 5mm
- **Price**: 149$

## Google Coral – USB Accelerator


- **ML accelerator**: Google Edge TPU coprocessor
- **Connector**: USB 3.0 Type-C* (data/power)
- **Dimensions**: 65 mm x 30 mm
- **Price**: 74.99$



# **Demo –** Edge Vision



**NVIDIA Jetson Nano**

- Object recognition
- Segmentation
- Person recognition

# GFT experiences

# Examples of use cases explored so far at GFT

## Industrial

### DATA GATHERING FOR INDOOR TRACKING

Gather data generated by devices in indoor tracking and send to Cloud

### OPTIMISATION OF IRRIGATION IN AGRICULTURE

Prediction of the growth of tree trough IoT sensor data and AI techniques

### AIR COMPRESSOR DATA ANALYTICS


Solution tracking the physical location of any commodity, verifying ownership

### PHARMA SUPPLY CHAIN TRACKING

MYTIGATE

Tracking of supply chain conditions when shipping pharmaceutical products

## Comercial

### FLEXIBLE PERSONALISED CAR INSURANCE

Digital Asset Holdings

Flexible adaptive insurance contracts using IoT based alerts and tracking functionality

### FIRE INSURANCE USING NEST SENSORS

Use of Nest for alerting for fires and starting insurance claims process

### QUICK SAVINGS WITH AMAZON DASH

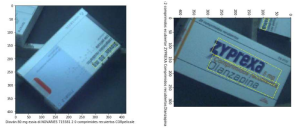

Amazon Dash button for automated transfers of money to savings account

### SMART MIRROR FOR RETAIL

Use of smart mirror as an interface for retail shopping experiences

## Laboratory

### MEDICINE BOX IDENTIFICATION




Medicine box analysis for pharmacy distributor

### ANIMAL TRACKING


Use of Deep learning in Animal Tracking

### HUMAN POSE


Apply DL to human pose analysis

### RL FACTORY

Integration of RL framework with a Robotic Arm

# Predictive maintenance for Putzmeister and SUIMAQ

# Solution Use Case

## The challenge

Get insights about machine sensors data for machines control and failures prediction on real time.

## The solution

Gather, process and analyze sensors data on real time. Provide a predictive model to detect possible future failures in advance and launch alarms or mitigation actions.

## The benefits

Predictive maintenance of machines, reducing failures impact in production.

Monitor and detect on real time machinery issues.

Sensor data analytics for production optimization.

# Cloud-based streaming data analytics

Data extraction and anomaly prediction of PCs hardware sensors simulating industry sensors data

## Challenge

- Get insights about machine sensors data for machines control and failures prediction on real time
- Provide a predictive model to detect possible future failures in advance and launch alarms or mitigation actions

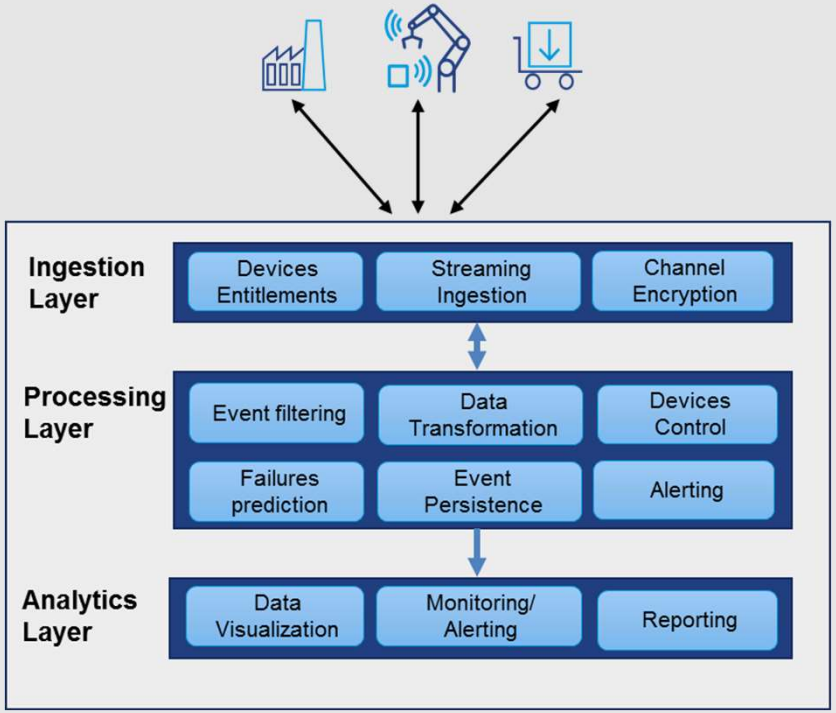
## Engagement

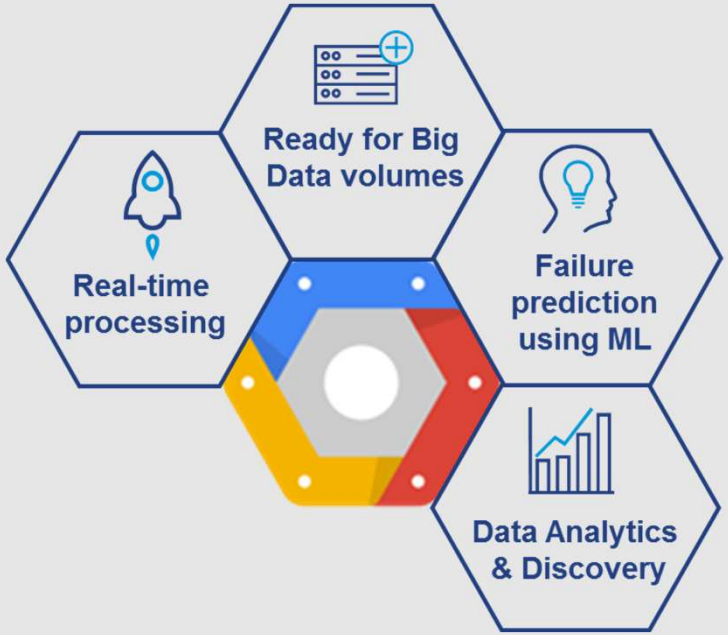
- Read out PCs hardware sensor data: CPU temperature, load and clock speed.
- Cloud dataflow application parses devices data and calls a Deep Learning model to get anomaly temperature increases.
- LSTM Neural model trained on cloud infrastructure was xposed via API rest to get the predictions.

## Benefit

- Predictive maintenance of PCs, reducing failures impact in production.
- Applicable to monitor and detect any real time machinery issues
- Sensor data analytics for production optimization

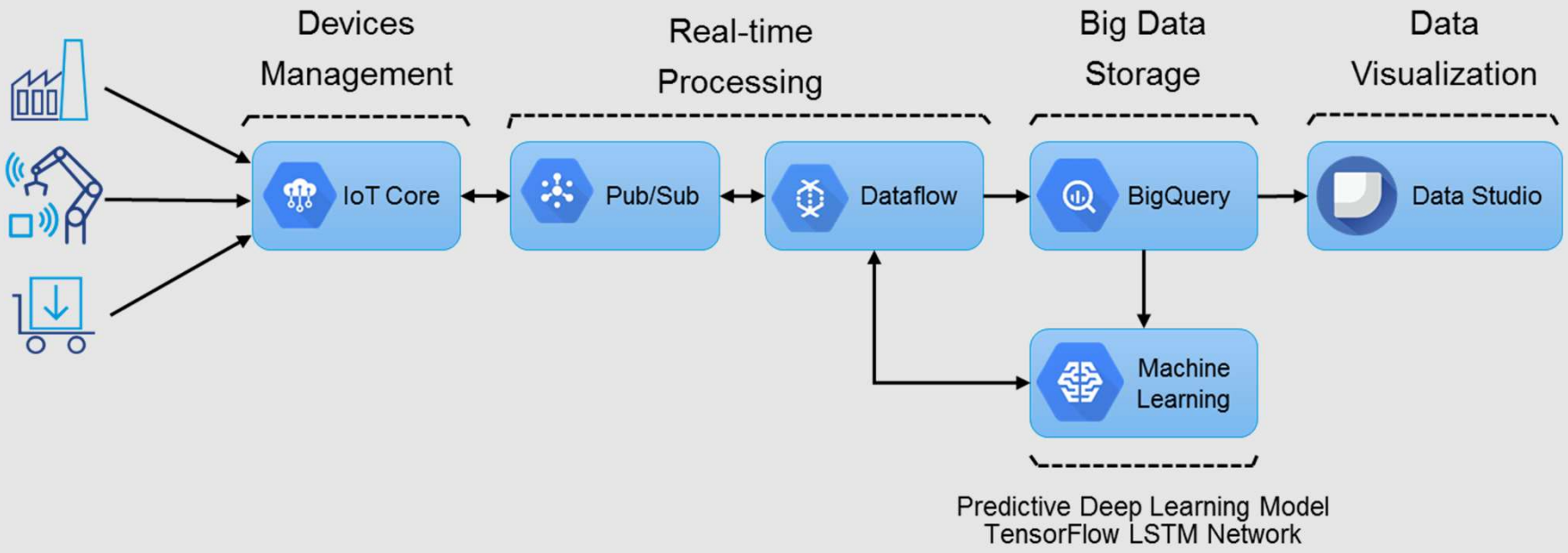
# Functional and technical architectures



# Functional and technical architectures

The architecture was based on cloud services, provided by the Google Cloud Platform, in order to get **flexibility**, **scalability**, **automation** and **reduced maintenance**



Putzmeister

A German manufacturer of concrete pumps

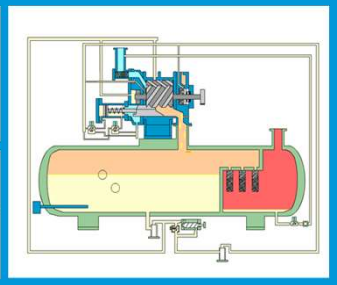

SUIMAQ
SISTEMAS DE AIRE COMPRIMIDO

A Spanish manufacturer of air compressors

# Air compressor data analysis

Remote monitoring of air compressor health at remote sites, including scheduling and planning of required maintenance tasks





## Challenge

- Our client distributes and maintains industrial air compressors at many different client sites in Spain and worldwide
- They have a need for remote monitoring, in order to better understand performance and plan maintenance activities

## Engagement

- Develop an IoT platform solution to collect, dashboard and analyse air compressor data from remote locations
- Azure based solution, with an architecture that can be used on any cloud or on premise
- Rich and flexible UI – Not only monitoring but also scheduling and planning

## Benefit

- Rapid creation and deploy of an IoT solution on the Azure platform (in future also other platforms)
- Ability to start processing data from a new customer within days, not weeks months

# Plant growth prediction for Progres

EMPRESAS NUEVAS TECNOLOGÍAS

## Compañía agrícola utilizará Inteligencia Artificial para optimizar cultivos

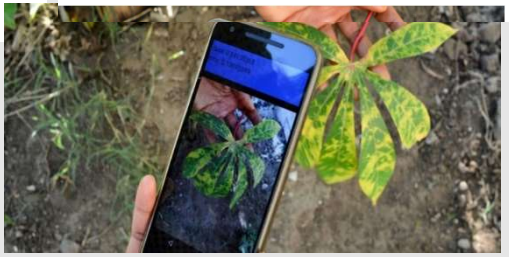
Por **Jorge Quijije** - Sep 7, 2017

TENDENCIAS

## Agricultores acuden a la Inteligencia Artificial para hacer crecer mejores cultivos


## Una app usa inteligencia artificial para detectar enfermedades en cultivos

Por ahora, la herramienta permite identificar un virus en la mandioca, pero gracias a un premio que recibieron los creadores se extenderá a otros cultivos.



INNOVACIÓN EN AGRICULTURA

## Inteligencia artificial para ahorrar agua en los regadíos

- Un grupo de la Universidad de Córdoba ha desarrollado un modelo basado en técnicas de inteligencia artificial que es capaz de predecir cuánta agua usará cada regante
- El sistema emplea algoritmos y redes neuronales para ayudar a una planificación más organizada de los suministros

# Use your Data

We are sure that Data is your biggest ally in empowering your systems with the intelligence needed to improve.

Having all the data organized and ready to be consumed will make the difference in the data revolution between companies that benefit from the data and those which struggle in keeping the market pace.

# Plant growth prediction for agricultural irrigation

Decision support system using AI, to help farmers optimize the use of resources and achieve optimal crop yield


## Challenge

- Many variables affect the crop yield, monitoring generates large quantities of data that farmers find to time-consuming to optimise
- There is a need for a tool that analyses and predicts crop yields based on current and past data, together with weather forecasts

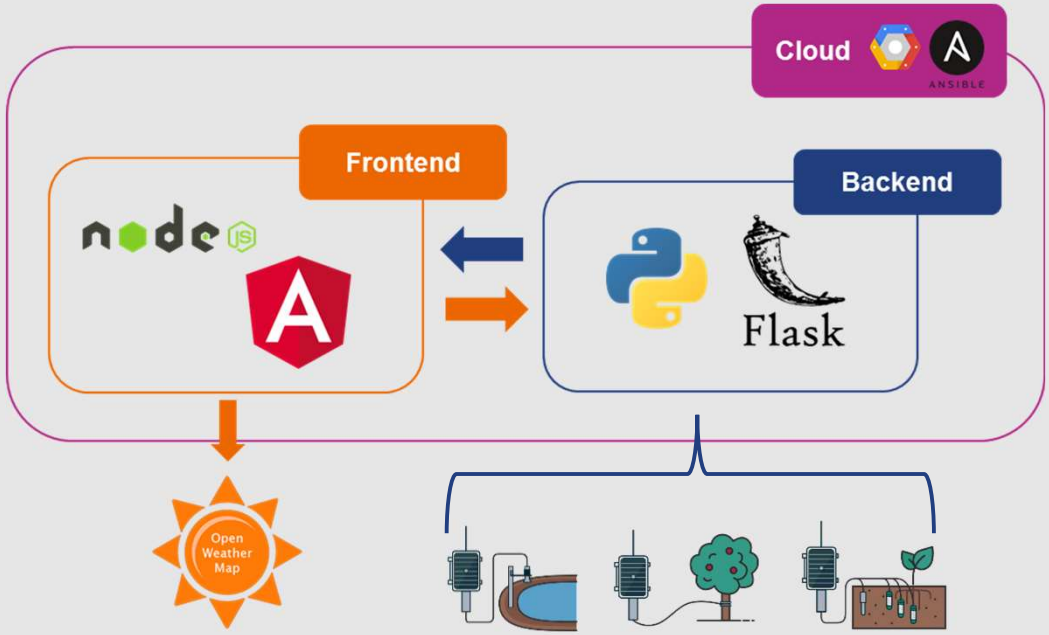
## Engagement

- Design and develop an AI-based solution to optimise crop yields by sensoring fields and using AI to predict plant growth
- Developed a responsive front-end, which could be used either at the office with a PC or on the field with a tablet
- Ability to check the current status in field, check the weather forecast, irrigation history and prediction on plant growth potential

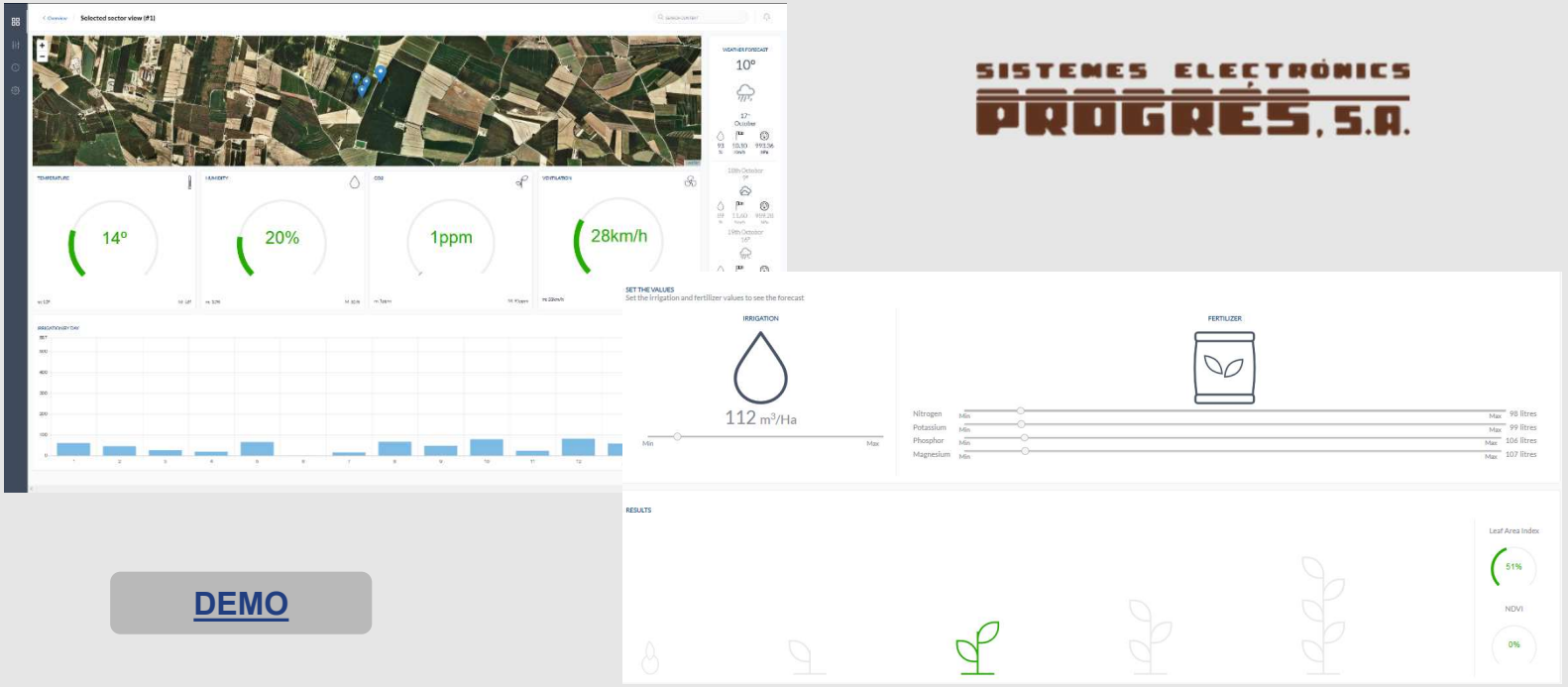
## Benefit

- All in one decision support tool with real-time information from the fields, without the need to move
- Possibility to scale to hundreds of sensors by using cloud-based technologies

# Behind the scenes…



# Is this science fiction?



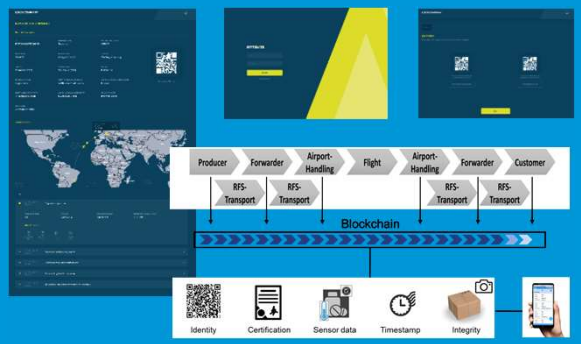

SISTEMES ELECTRÒNICS PROGRÉS, S.A.

**DEMO**

# Supply chain risk Management for Mytigate

# Pharma supply chain tracking solution

Solution for tracking of shipments along multiple stakeholders along the pharma supply chain




## Challenge

- Pharma shipments have a high and costly failure rate
- Common issues include temperatura deviations, theft and fraud
- Better tracking and tracing can help reduce supply chain risks
- Current fragmented and paper-based tracking systems are insufficient
- Blockchain/DLT is an enable for more secure multi-stakeholder tracking

## Engagement

- Develop a detailed understanding of pharma supply chain use case
- Develop a fully functional blockchain/DLT architecture
- Include easy-to-use front end for operators and administrators
- Extend to include IoT sensoring functionality

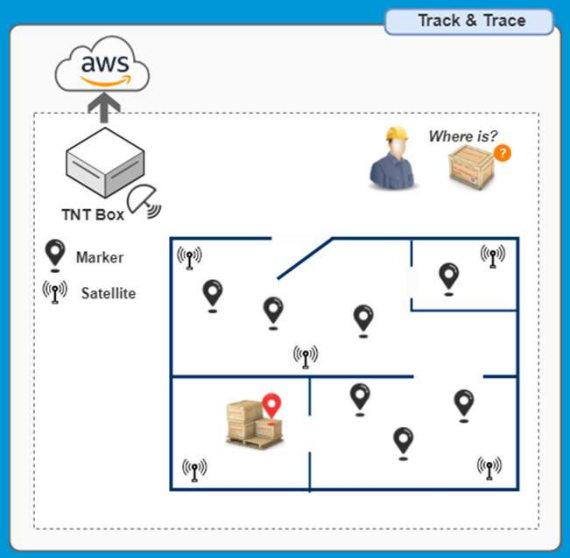
## Benefit

- Tracking delays in pharma shipments
- Detecting deviations in temperature and integrity
- Fully traceable ownership of shipment at all times
- Avoiding fraud

# Trumpf

# Indoor location data analysis

Management of IoT Edge Devices and their virtual representation in cloud in order to collect indoor location Data in Cloud




## Challenge

- Our client distributes and maintains industrial machines to manipulate metal at many different clients worldwide
- They have a need to track the elements inside a factory in order to understand its behavior and optimize the manufacturing process.

## Engagement

- Develop a management platform to setup and update the IoT Edge Devices and all the software running on it
- Develop an IoT platform solution to easily register new IoT Devices and to collect, dashboard and analyse indoor location data from remote locations
- Represent all the AWS infrastructure and services as code to reuse in other Cloud Providers
- AWS, Nifi and Puppet based solution

## Benefit

- Keep under control hundreds of remote IoT Edge Devices from a single place
- Collect the information generated by the IoT Edge Devices and move it to the cloud for analysis
- Rapid creation and deploy of an IoT solution on the AWS platform (in future also other platforms)

# IoT

## Object Tracking

## EasyCAD

## Axoom

TRUMPF

AWS IoT

AXOOM

## Challenge

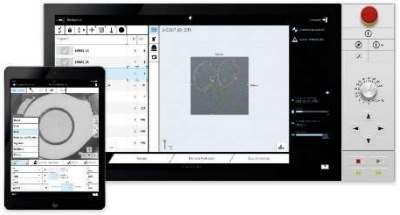
- Create an interface to design and print patterns using HMI
- They have a need to track the elements inside a factory in order to understand its behavior and optimize the manufacturing process.
- HMI (Human Machine Interface) is a very important project inside TRUMPF. It supports interface applications that are installed in machines in order to operate with them and also server side components required by these applications. Each machine types has specific applications.

## Engagement

- Develop a management platform to setup and update the IoT Edge Devices and all the software running on it
- Develop an IoT platform solution to easily register new IoT Devices and to collect, dashboard and analyse indoor GPS data from remote locations
- Represent all the AWS infrastructure and services as code to reuse in other Cloud Providers
- Drawing is converted to TRUMPF Technology Adaptor model in order to be converted in instructions to be processed/cut by 2D Laser cut machine

## Benefit

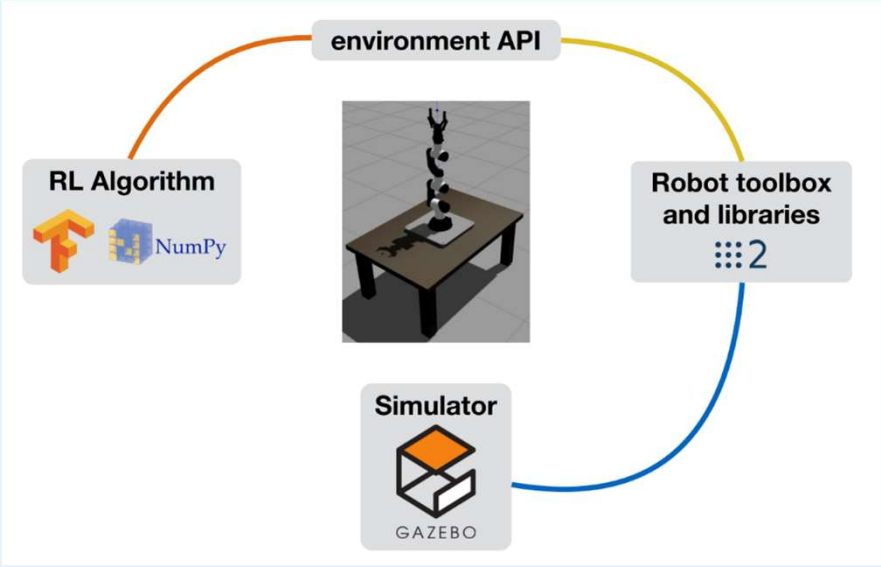
- Keep under control hundreds of remote IoT Edge Devices from a single place
- Collect the information generated by the IoT Edge Devices and move it to the cloud for analysis
- Rapid creation and deploy of an IoT solution on the AWS platform (in future also other platforms)

# RL Factory

# Workflow

In this research, we have installed in Ubuntu 16.04.2 LTS, ROS (Robot operating system), OpenAI reinforcement learning framework, Gazebo 3D simulator and Gazebo gym an extension of OpenAI gym for Gazebo.



GFT

# Shaping the future of digital business

## Analytics, AI and IoT Practice - Spain

**Pedro Nieto** – IoT SME

**Esteban Chiner** – Senior Architect