# IoT Platforms

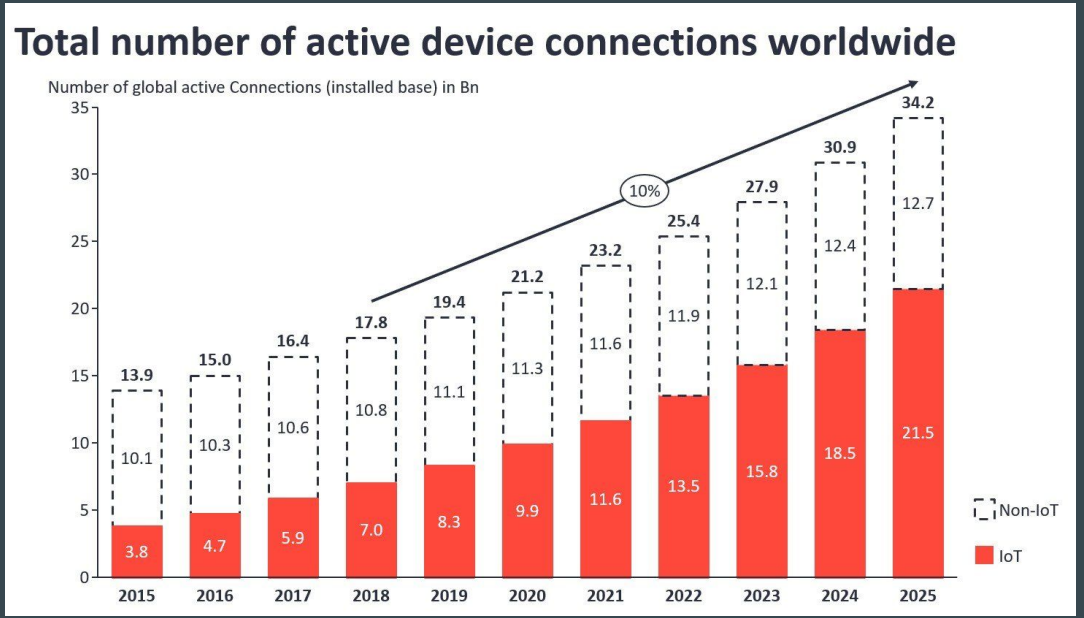
Making Sense of IoT Platforms
AWS vs Azure vs Google vs IBM vs Cisco

# Subjects

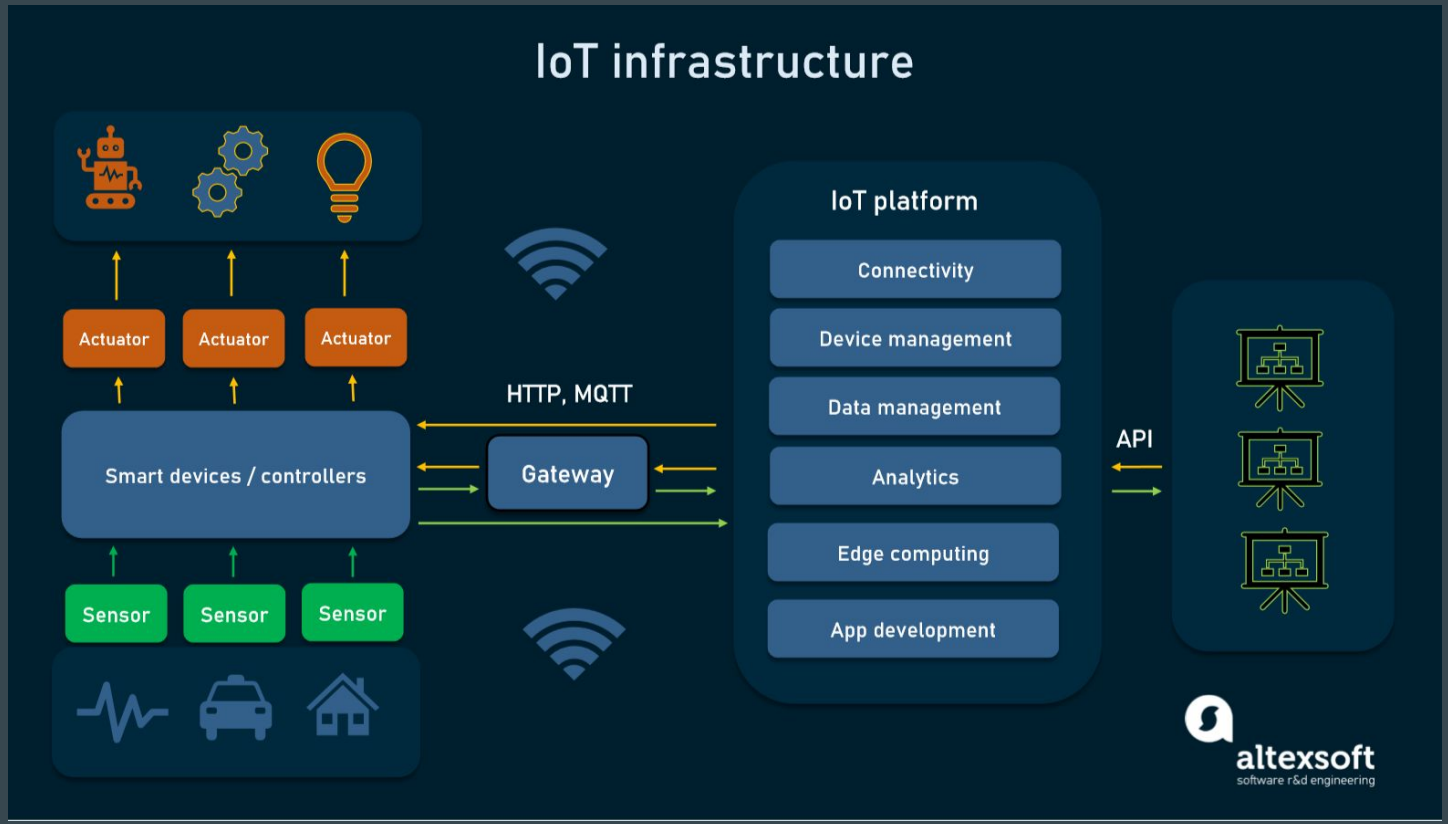
- IoT architecture layers
- IoT platform landscape and key players
- AWS IoT Platform: the best place to build smart cities
- Cisco IoT: the edge computing leader with the largest fleet of connected cars
- Google Cloud IoT: driving transportation with Google Maps
- IBM IoT suite: bringing intelligence to fields and factories
- Microsoft Azure IoT: ahead of the pack in healthcare and security
- How to choose the best IoT platform

# Introduction

The technology will shift into an even higher gear with the arrival of fifth-generation or 5G networks supporting a million gadgets per square kilometer — ten times as many as in the 4G era. The number of active IoT connections is expected to double by 2025, surging from today's 9.9 billion to 21.5 billion.



# IoT architecture layers



# IoT architecture layers

Perception layer: IoT hardware

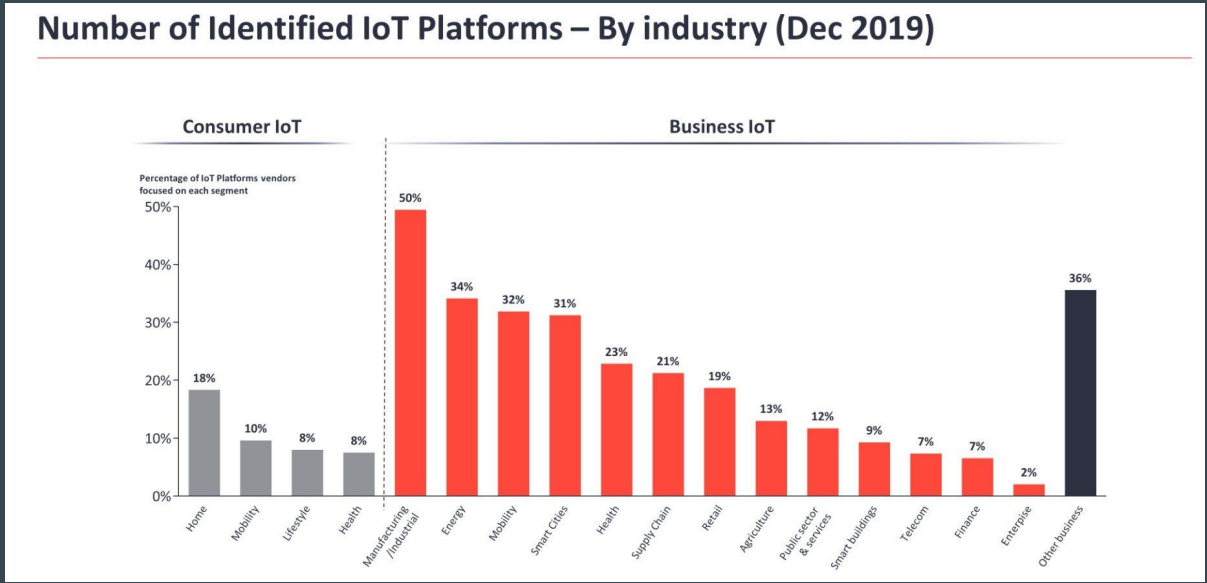
- **Electronic sensors** capture signals from the physical world, convert them into digital form, and feed them to the IoT system. You can monitor and manage sensors remotely, using a special application.
- **Actuators** receive signals from the IoT system and translate them into physical actions manipulating equipment. Similar to sensors, actuators can be configured from remote computers.
- **Devices** are connected to sensors or even have them embedded as an integral part. On the other side, devices link to a gateway or directly to an IoT platform. These hardware components cache and preprocess real-time data, reducing the burden on central storages and main processors.

# Processing layer: cloud middleware for IoT platforms

- Connectivity
- Device management
- Data management
- Data analysis
- Visualization
- Digital twin
- IoT app development
- Edge / fog computing

# IoT platform landscape and key players

By the end of 2019, the total number of known IoT platforms reached 620, with half of them focusing on manufacturing and industrial use (IIoT). Other popular activity areas are energy, mobility, smart cities, and healthcare



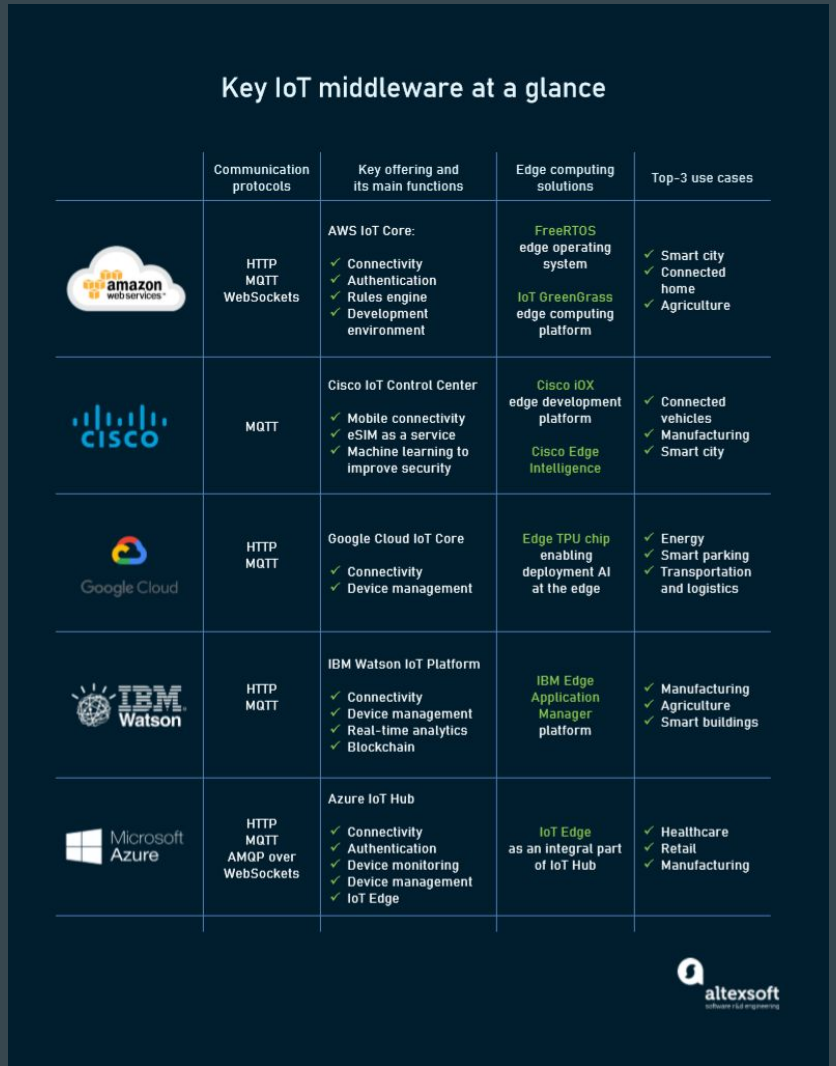
Amazon Web Service (AWS) IoT platform,

Cisco IoT,

Google Cloud IoT,

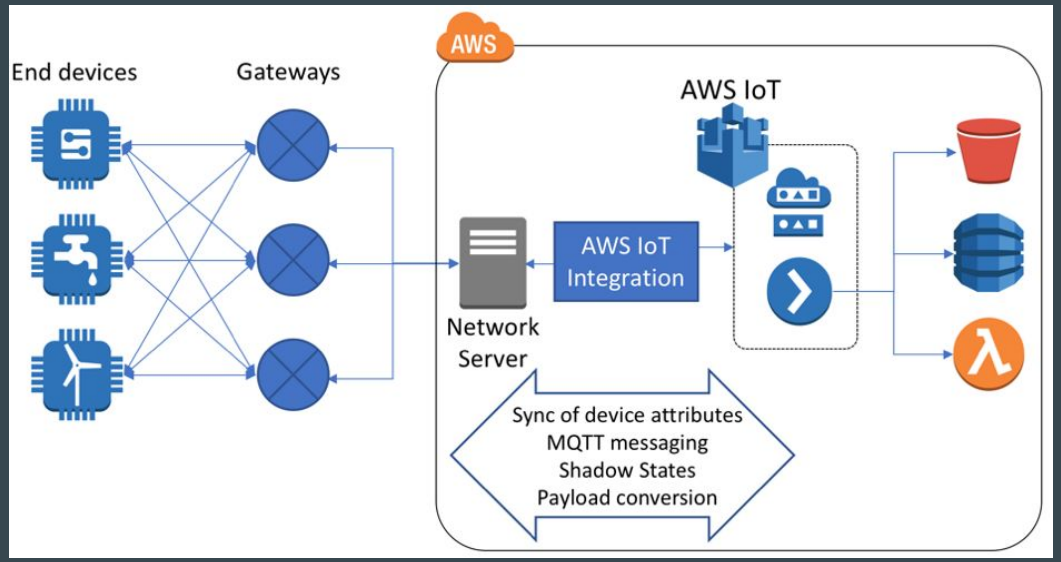
IBM Watson IoT platform, and

Microsoft Azure IoT.



# AWS IoT Platform: the best place to build smart cities

In 2020, AWS was recognized as a leading IoT applications platform empowering smart cities. It is also in the forefront of building connected home products, powered by Alexa Voice. Among successful use cases in other domains are projects for Philips HealthCare, Rio Tinto (the world's second largest metals and mining corporation), and Bayer Crops Science (agriculture).



# AWS IoT Core

IoT Core is the heart of the AWS IoT suite, which manages device authentication, connection, and communication with AWS services and each other. Its entry point — Device Gateway — supports MQTT, HTTP, and WebSocket protocols.

# Additional AWS IoT control services

- AWS IoT Device Management allows you to remotely organize, track, control, update, and scale large and diverse device fleets. Agnostic to a device type, the service supports any IoT thing, from microcontrollers to connected fridges.
- AWS IoT Device Defender continuously checks IoT configurations against security requirements and sends alerts when spotting any gaps.
- AWS IoT Events is designed to identify complicated changes in equipment behavior across thousands of devices and react to them based on predefined rules.
- AWS SiteWise comes in handy when you need to collect and organize data at an industrial level. The service connects to a manufacturer's equipment through a gateway, gathers and pre-processes data, and then sends it to the AWS Cloud.
- AWS IoT 1-Click is used to make a group of devices perform specific actions (like sending alert messages) at a button click.

# AWS IoT Analytics

- Amazon QuickSight, a business intelligence service to visualize data insights,
- Jupyter Notebook that provides powerful tools for machine learning and advanced statistical analysis, and
- Amazon SageMaker, an environment for building, training, and deployment of machine learning models.

# Cisco IoT: the edge computing leader with the largest fleet of connected cars

IoT Control Center is the largest cellular connectivity platform servicing over 160 million mobile devices and 29,000 enterprise-grade customers worldwide. The middleware is also known as the number one service provider for connected cars.

machine learning

eSIM as a service

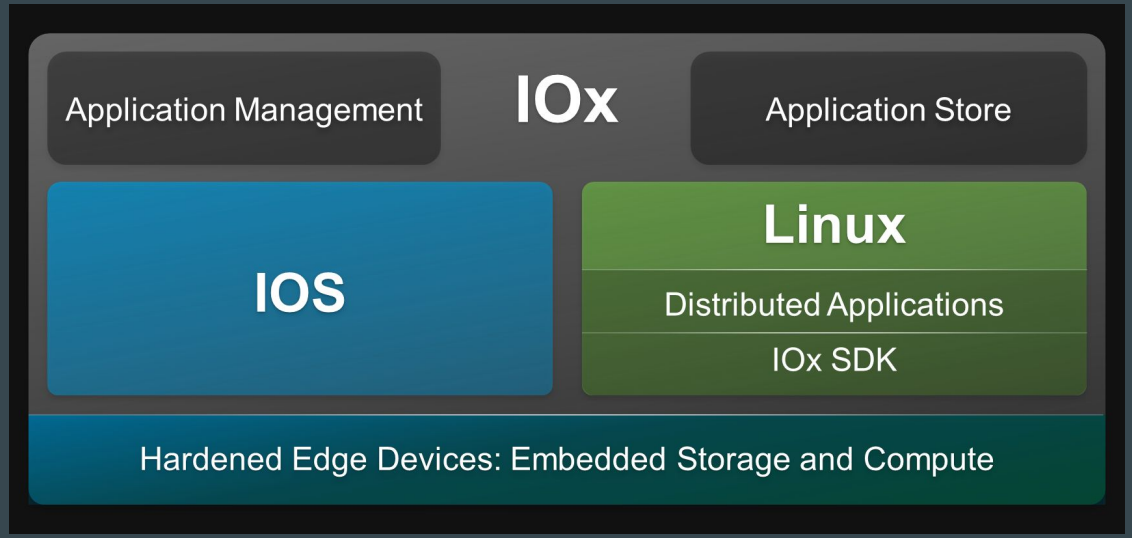
5G readiness

# Cisco Kinetic IoT operations platform

The Gateway Management Module monitors industrial gateways and enables their remote configuration.

The Edge and Fog Processing Module pushes selected data management processes from the cloud to nodes and devices closer to data sources.

The Data Control Module performs the opposite function and moves data from devices to cloud-based applications, ensuring that the right information will reach the right place.

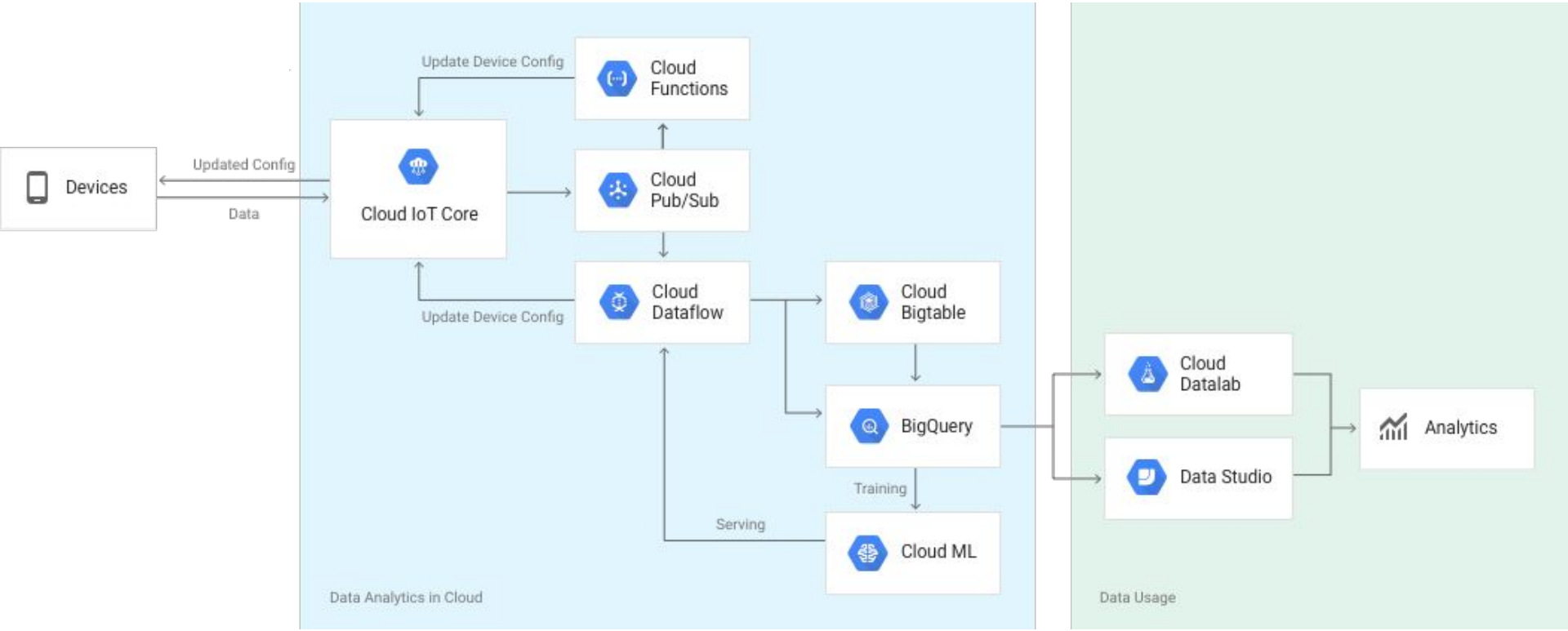


# Google Cloud IoT: driving transportation with Google Maps

The IoT suite from the most popular search engine is centered around its flagship product Cloud IoT Core, powerful enough to manage data from millions of devices. Teamed up with other Google Cloud services, it is already optimizing operations in manufacturing, building, energy, and other sectors. Its transportation and smart city solutions take advantage of Google Maps Platform allowing for visualization of geographical data.

# Google Cloud IoT Core

- Cloud Functions to create independent functions and instruct devices how to react on specific events,
- Cloud Dataflow to preprocess data in real time,
- Cloud Bigtable to ingest and store large volumes of data,
- BigQuery to analyze data in real time, create and train machine learning models,
- Data Studio to visualize insights extracted from BigQuery, using pre-built templates, and
- Cloud Datalab to develop custom analytics practices and visualizations.


Devices
Updated Config
Data
Cloud IoT Core
Update Device Config
Cloud Functions
Cloud Pub/Sub
Cloud Dataflow
Update Device Config
Cloud Bigtable
BigQuery
Training
Serving
Cloud ML
Data Analytics in Cloud
Cloud Datalab
Data Studio
Analytics
Data Usage

# IBM IoT suite: bringing intelligence to fields and factories

IBM combines IoT with powerful cognitive capabilities of Watson platform — an industry leader in AI and machine learning. Its assortment of AI-driven IoT products includes Watson Decision Platform for agriculture, Watson Supply Chain Insights for connected logistics and transportation, Watson Building Insights for analyzing energy and asset usage, and a set of industrial equipment solutions.

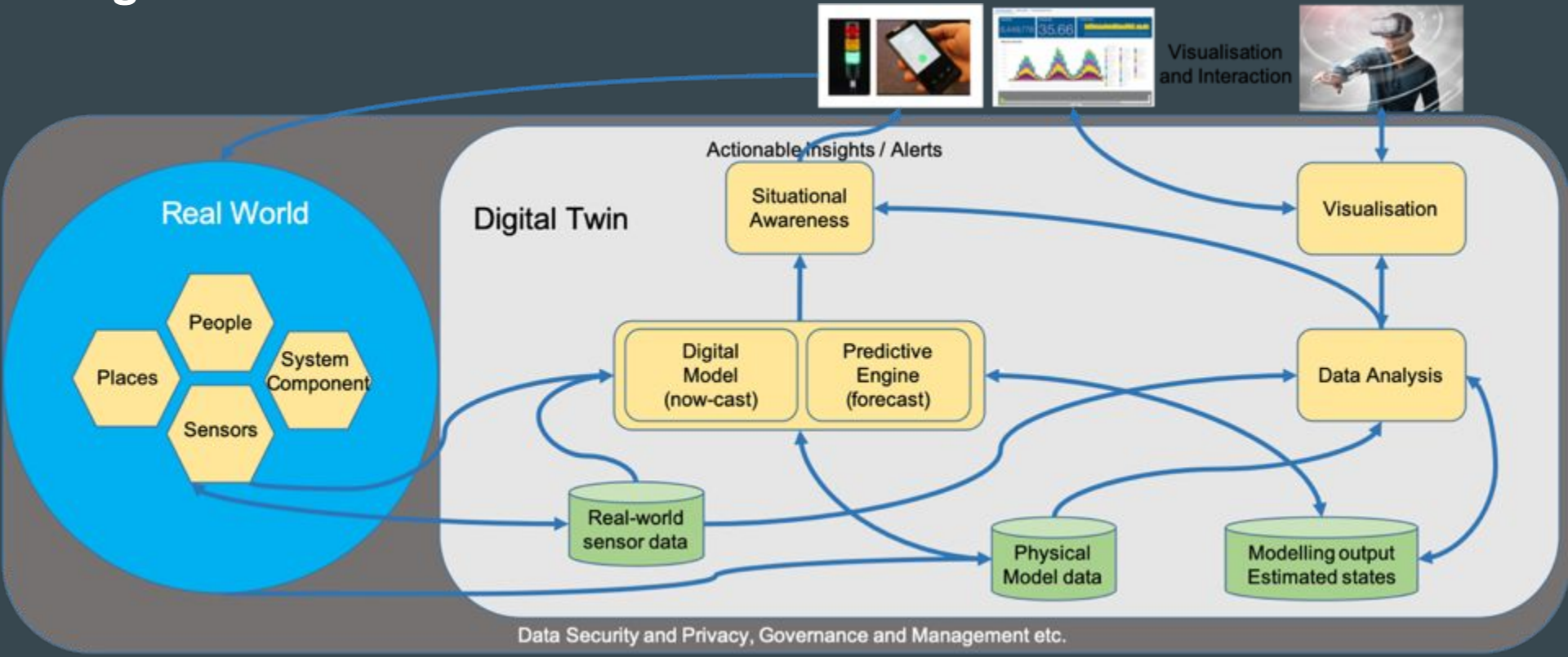
# IBM Watson IoT Platform

device management service to add and remove devices individually or in bulk, perform rebooting, update firmware, receive metadata, and so on,

safe connectivity and communication between devices based on MQTT protocol messaging; and

data lifecycle management, which enables you to store data from devices and access real-time and historical data whenever you need it.

# Digital Twins



# Microsoft Azure IoT: ahead of the pack in healthcare and security

Azure IoT Hub

IoT Hub is the foundational PaaS (platform-as-a-service) product, enabling device connectivity, management and communication. It comes in two tiers, basic and standard, with a different number of features supported. The basic tier provides services like:

Azure IoT Central

IoT Central is a scalable SaaS (software-as-a-service) offering rapid design of IoT software with built-in security features. The platform comes with the integrated device monitoring and management functions to connect, reconfigure, and update devices.

Additional IoT services

Azure Digital Twins,  Azure Sphere,  Time Series Insights

# How to choose the best IoT platform

high scalability, fitting the needs of any business, from startups to enterprises with millions of devices;

built-in security for every layer of an IoT system; and

tech support and detailed documentation on their products.

# References

https://www.altexsoft.com/blog/iot-platforms/