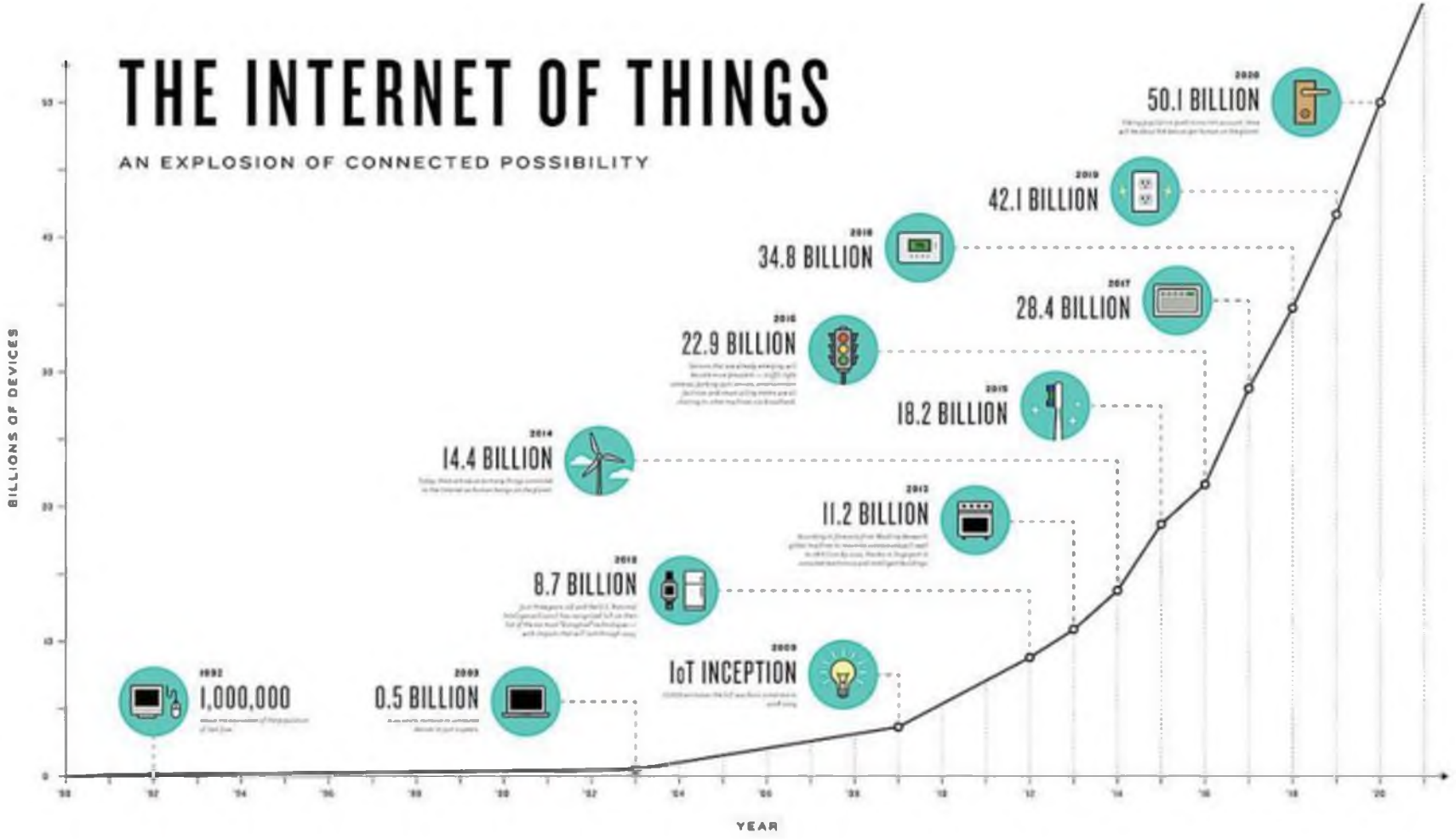
SOFTPROM

AWS as a leader IoT platform provider

Vladimir Grigorenko - Cloud Solutions Architect


THE INTERNET OF THINGS
AN EXPLOSION OF CONNECTED POSSIBILITY
BILLIONS OF DEVICES
YEAR
1992
1,000,000
2003
0.5 BILLION
2009
IoT INCEPTION
2010
8.7 BILLION
2012
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

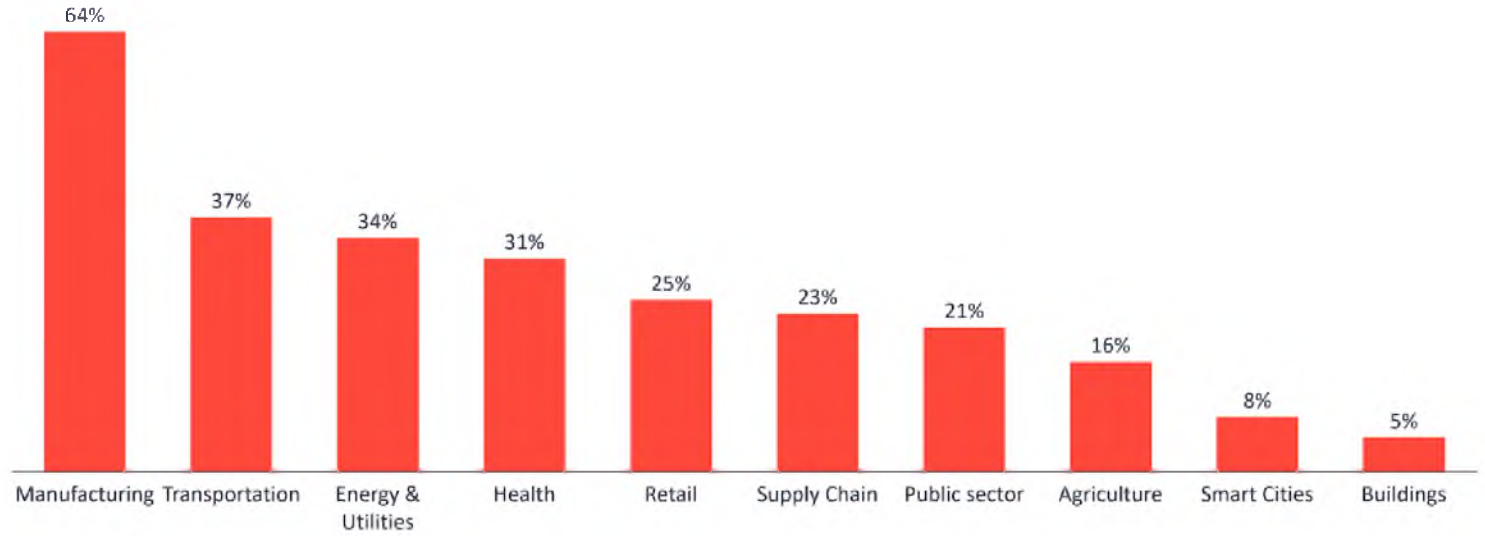
IoT Use Cases

IOT ANALYTICS

Your Global IoT Market Research Partner

64% of IoT integrators work for manufacturing companies

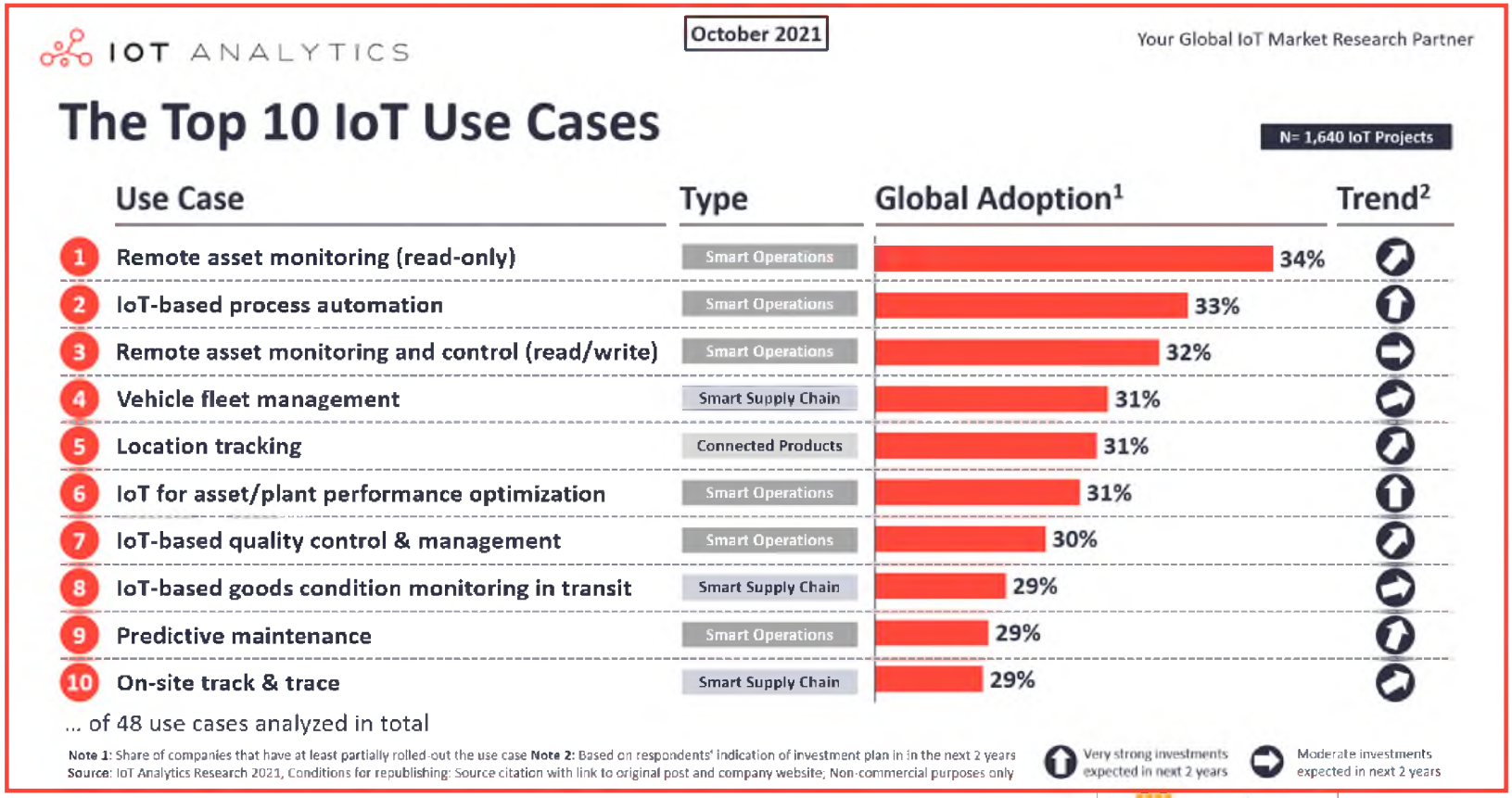
Share of IoT system integrators that are catering to a specific vertical



Note: The analysis is based on 700+ professional service companies offering services for the IoT. Totals can be larger than 100%, as most companies cater to multiple customer types

Source: IoT Analytics Research 2021; Conditions for republishing: Source citation with link to original post and company website; Non-commercial purposes only

IoT Use Cases



Smart Factories

- Industrial process automation/optimization
- Energy Management

Predictive Maintenance

Predictive maintenance utilizes data from various sources, such as critical equipment sensors, enterprise resource planning (ERP) systems, computerized maintenance management systems (CMMS), production data. And it allows early identification of deviations in real-time, even before anomalies occur.

Remote Production Control

Reallocating your company's computational resources to a custom cloud or connecting the device to BAAS/PAAS, you can collect and analyze the large-scale data sets necessary for supervising various field devices like switches, valves, and other indication elements.

Asset tracking

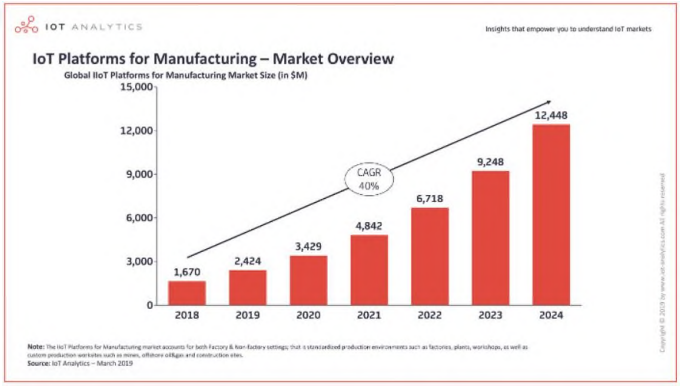
By providing accurate real-time data about enterprise's assets, their statuses, locations and movements, IoT-based asset management solutions remove the tracking burden from the employees (freeing up to 18 hours of monthly working time) and eliminate errors bound to the manual methods of data input.

Logistics management

Managing the automotive fleet via IoT-driven devices helps manufacturers eliminate or put down the risks concerning the costs related to vehicles, staff and transportation. Autonomous fleet solutions contribute to the greater efficiency of the company.

Digital Twins

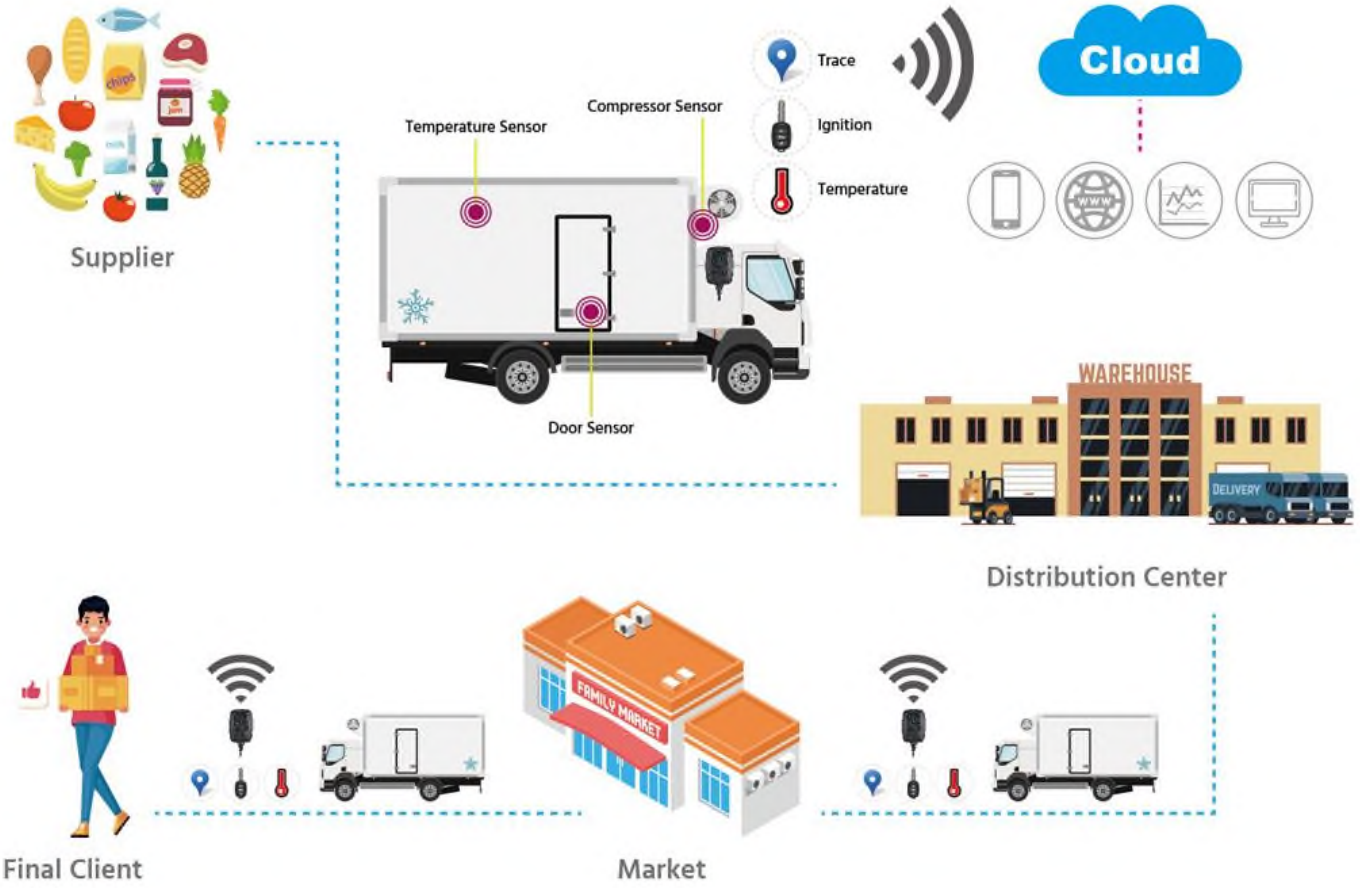
Industrial IoT Digital Twins optimize efficiency by predicting failures in production so that they can be fixed before they affect manufacturing targets. It also enables remote commissioning and diagnostics of products that are already in the field – lowering service costs, and improving customer satisfaction.



amazon web services | Partner Network
ADVANCED CONSULTING PARTNER

SOFTPROM
softprom.com • info@softprom.com

Smart Logistics

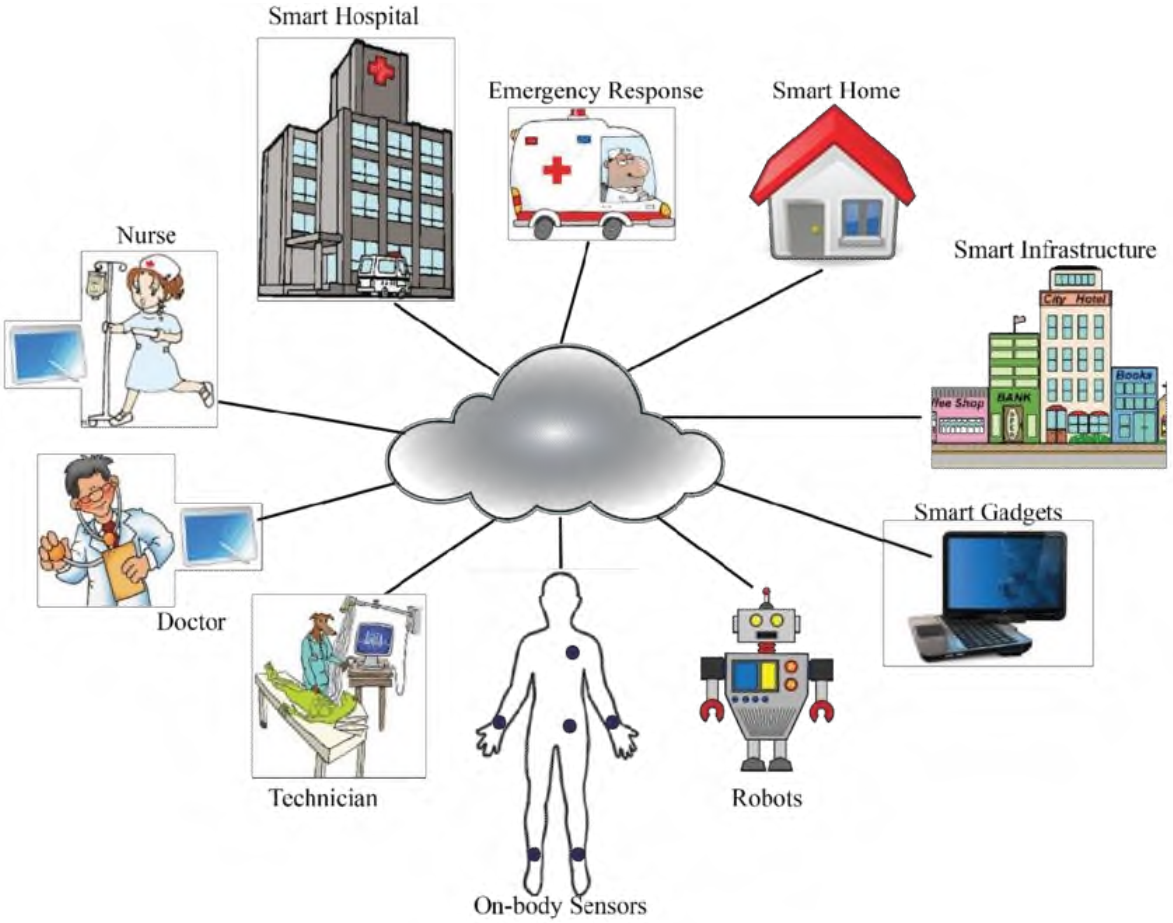


- Fleet Tracking
- Platooning
- Connected Vehicles

amazon web services Partner Network
ADVANCED CONSULTING PARTNER

SOFTPROM
softprom.com • info@softprom.com

Digital Health



- Ultraviolet Radiation Monitoring
- Fall Detection
- Companion Robots
- Medical Fridges
- Patient Surveillance/Remote Patient Monitoring

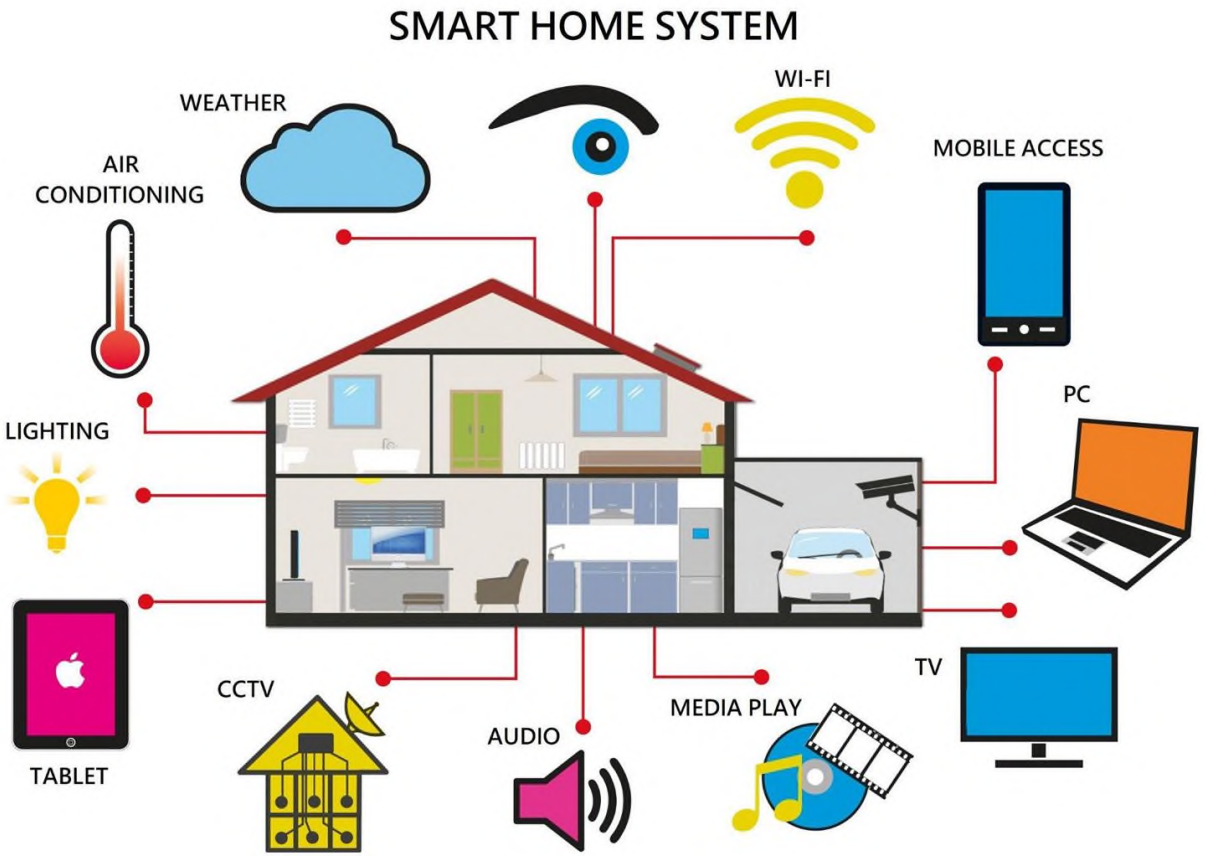
Smart Retail

- Supply Chain Control
- Near Field Communication (NFC) Payment
- Layout Optimization
- Smart Product Management

Smart Cities

- Outdoor surveillance
- Smart lighting
- Electronic Road Toll Collection and Traffic Management
- Smart parking
- Noise Monitoring
- Structural Health Monitoring
- Waste Management

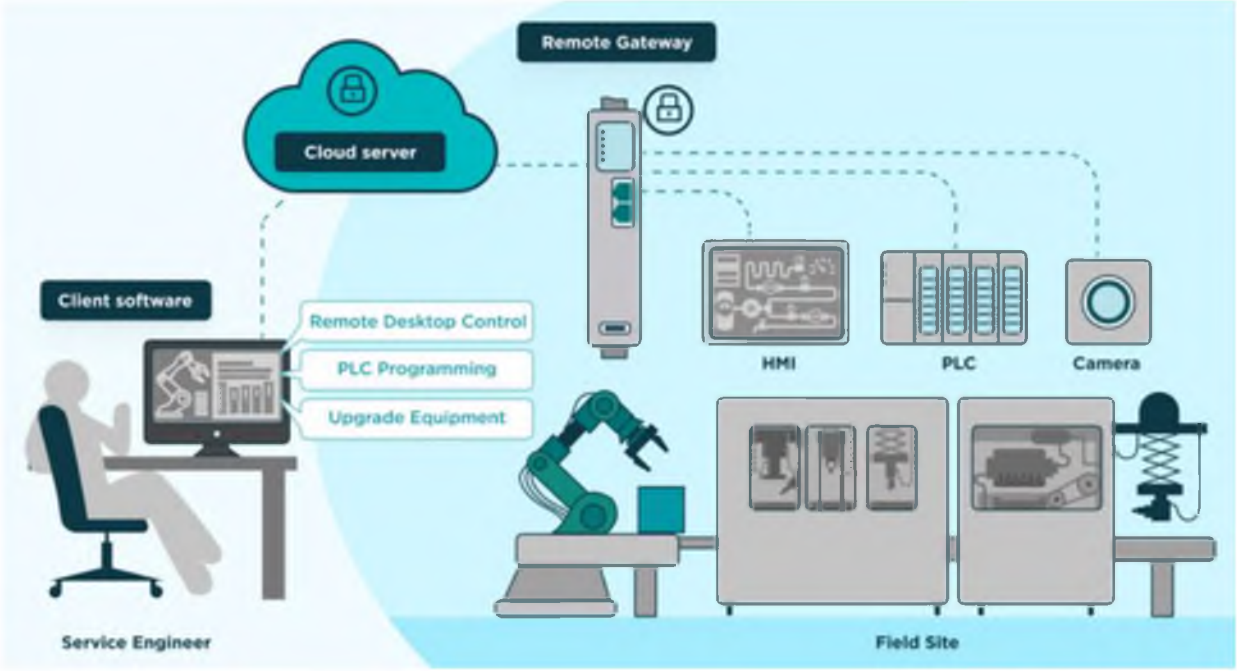
Smart Home



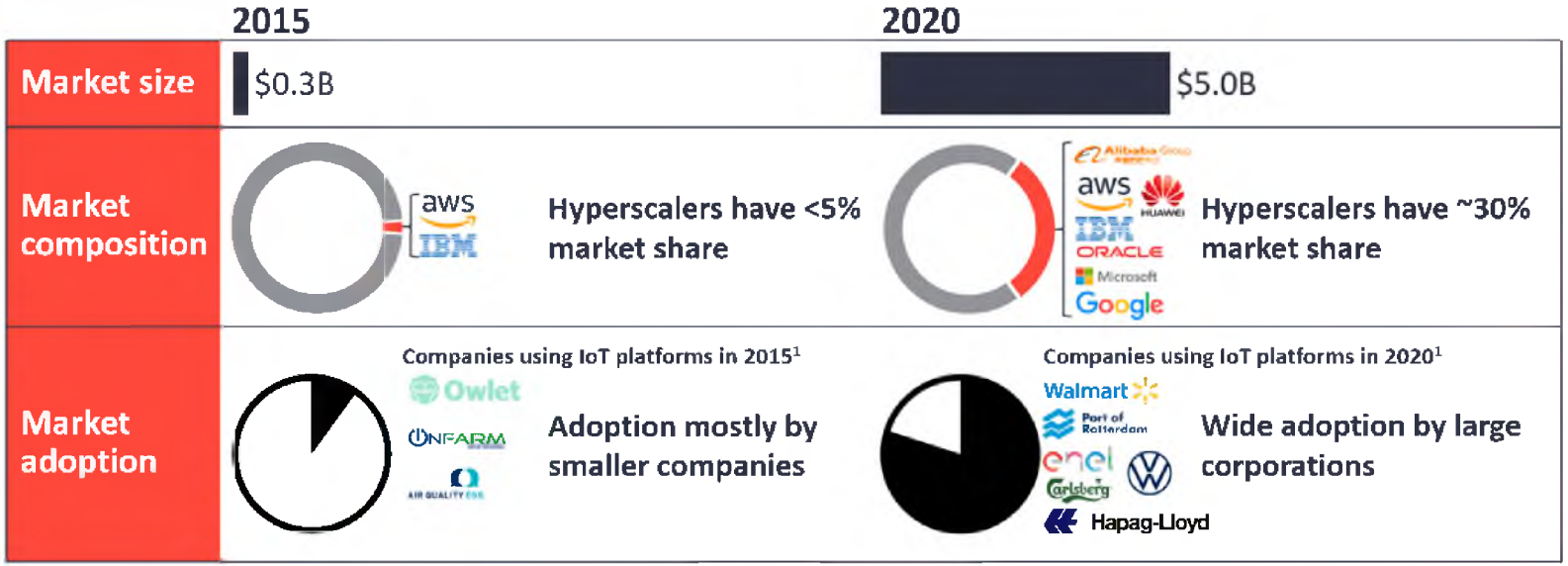
- Remote Control Appliances
  - turning on lights,
  - starting the coffee maker,
  - setting temperature,
  - open up a music playlist,
  - locking doors
- Home Intrusion Detection Systems:
  - Smart locks
  - Motion detection

Benefits of Using an IoT Platform

- Faster deployment
- Reduced investment to set up an IoT system

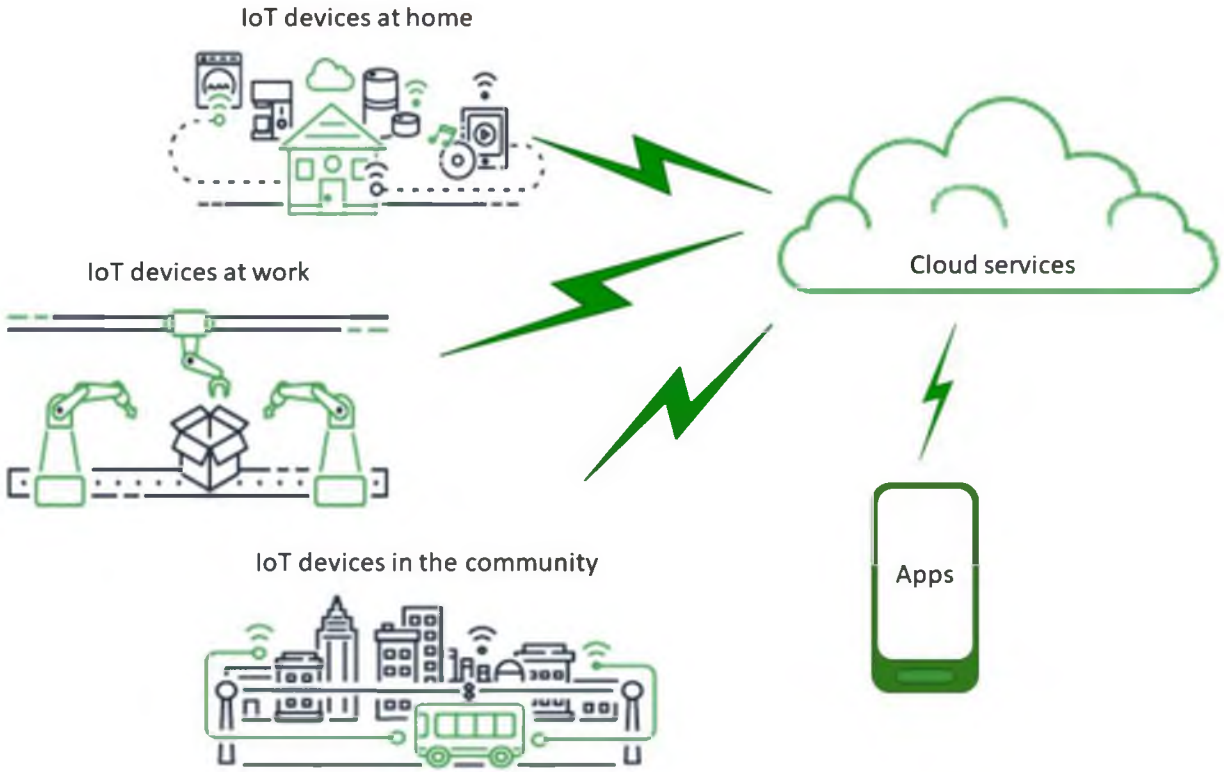


IoT Platforms Market 2021: Bigger, Broader, Hyperscaler-Dominated

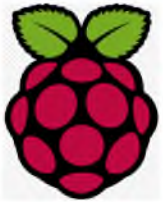


Source: IoT Analytics Research 2021 – based on five years of research coverage on the topic
1) Selected companies featured in reports published at that time; list is not exhaustive

How AWS IoT works



Amazon IoT Services



Device software

FreeRTOS

AWS IoT Greengrass

Connectivity & control services

AWS IoT Core

AWS IoT Device Defender

AWS IoT Device Management

Analytics services

AWS IoT Analytics

AWS IoT SiteWise

AWS IoT Events

AWS IoT Things Graph

SOFTPROM
softprom.com · info@softprom.com

IoT Devices Protocols

SCADA (Supervisory Control And Data Acquisition)

- ★ PLC (Programmable Logic Controller)
- ➢ TCP/IP (UDP)
- ➢ MODBUS
- ➢ OPC (Open Platform Communications)
  - ○ OPC DA (Data Access)
  - ○ OPC AE (Alarms & Events)
  - ○ OPC Batch
  - ○ OPC DX (Data eXchange)
  - ○ OPC HDA (Historical Data Access) OPC Security
  - ○ OPC XML-DA (XML-Data Access)
  - ○ OPC UA (Unified Architecture)
- ➢ COM, DCOM

AWS IoT GreenGrass, AWS IoT SiteWise
(OPC UA, MODBUS, TCP/IP)

AWS IoT Core

- MQTT (Message Queue Telemetry Transport)
- HTTPS
- WebSockets
- LoRaWAN (Long Range wide-area networks)

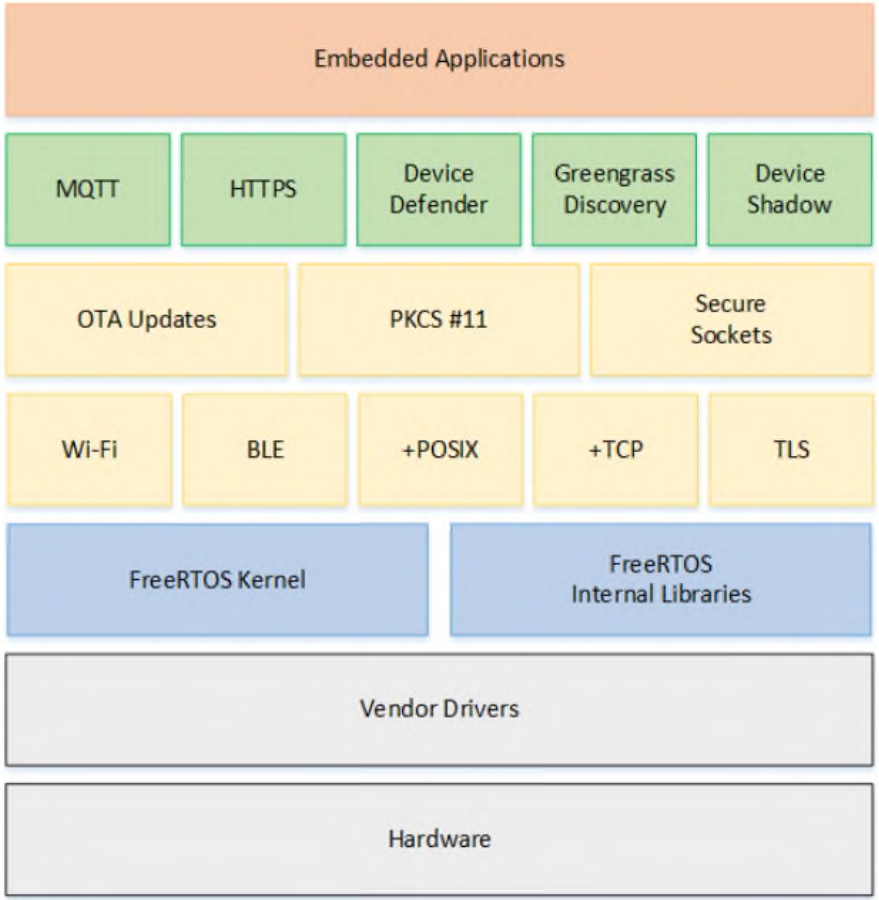
Other IoT Devices

- MQTT
- HTTPS
- LoRaWAN

AWS Timestream - Serverless Time series DB

FreeRTOS

FreeRTOS

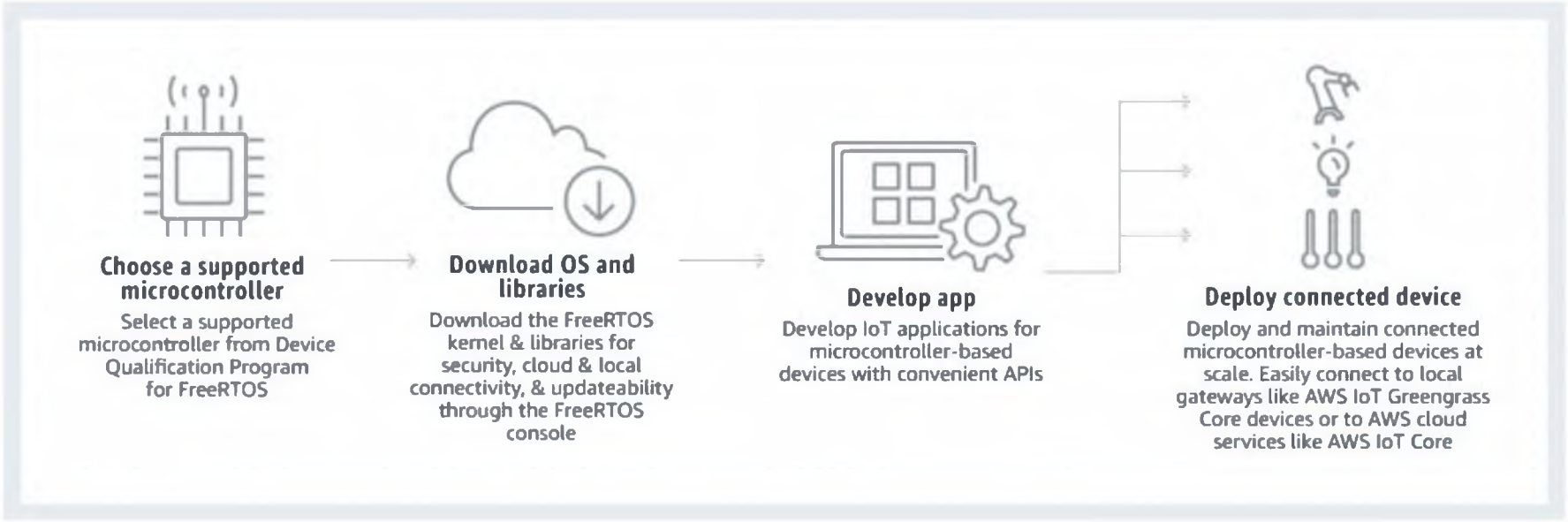


FreeRTOS — многозадачная операционная система реального времени для встраиваемых систем

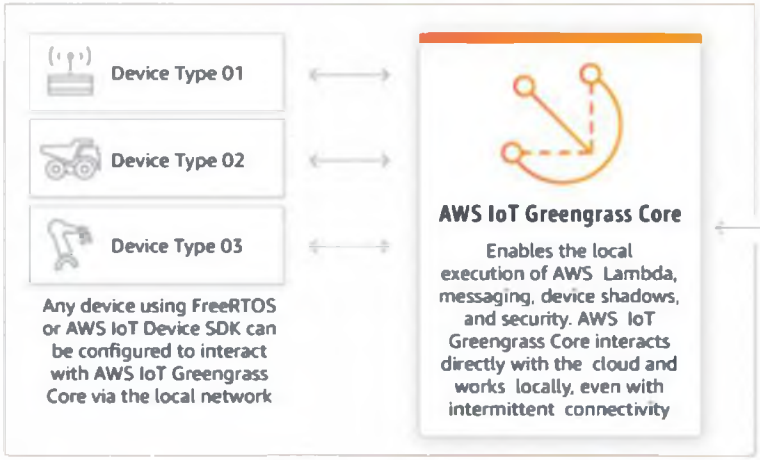
- ATECC608A Zero Touch Provisioning Kit for AWS IoT
- Cypress CYW943907AEVAL1F Development Kit
- Cypress CYW954907AEVAL1F Development Kit
- Espressif ESP32-DevKitC
- Espressif ESP-WROVER-KIT
- Infineon XMC4800 IoT Connectivity Kit
- Marvell MW320 AWS IoT Starter Kit
- Marvell MW322 AWS IoT Starter Kit
- MediaTek MT7697Hx Development Kit
- Microchip Curiosity PIC32MZEF Bundle
- Nordic nRF52840-DK
- NuMaker-IoT-M487
- NXP LPC54018 IoT Module
- OPTIGA Trust X Security Solution
- Renesas RX65N RSK IoT Module

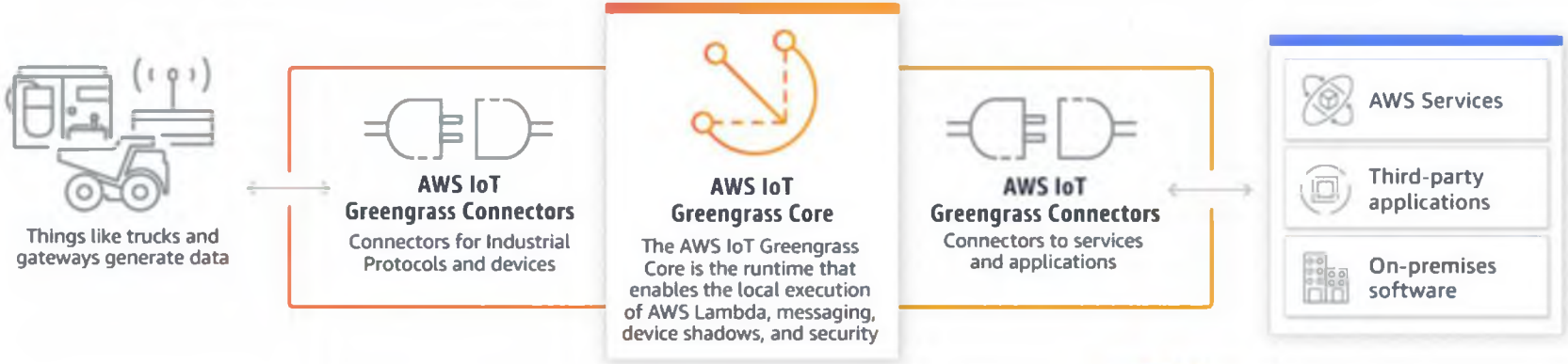
FreeRTOS

FreeRTOS



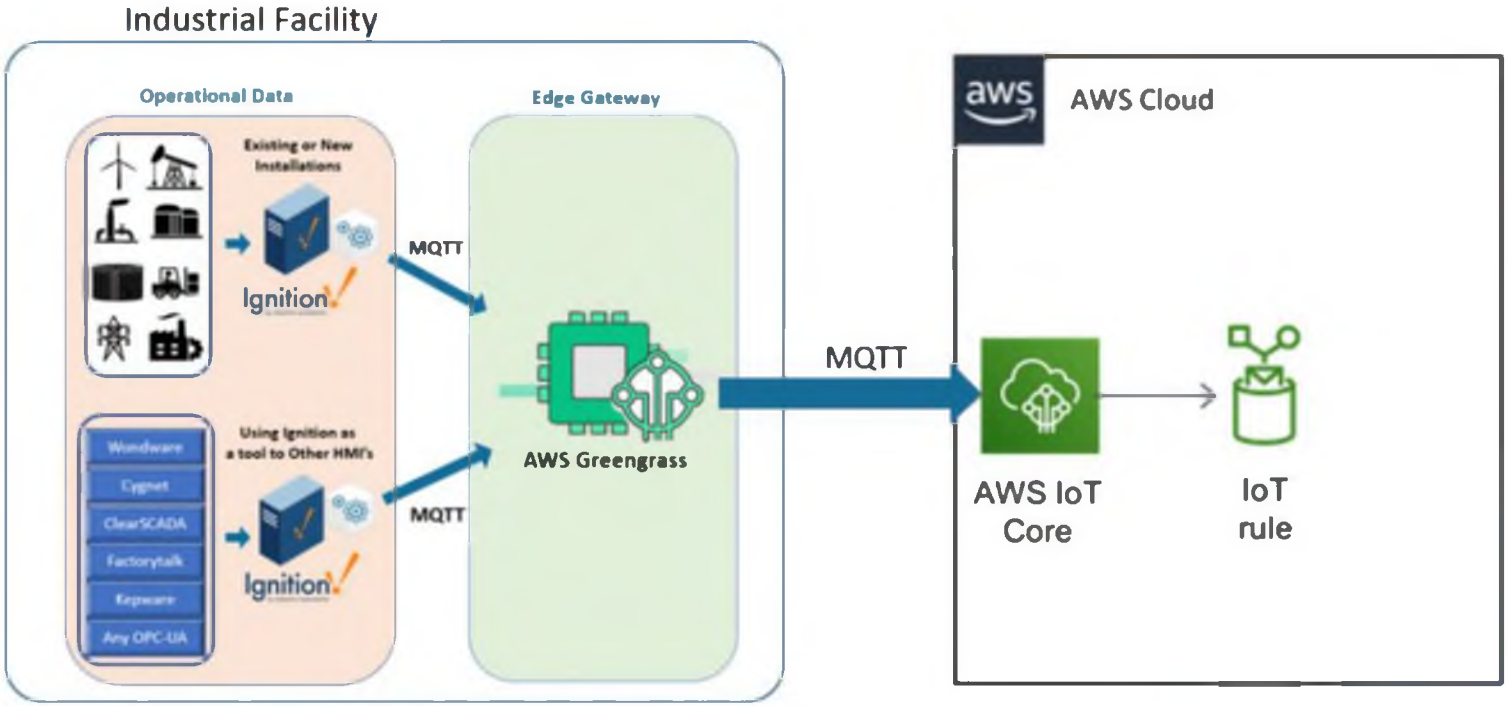
AWS IoT Greengrass





AWS IoT Greengrass

AWS IoT Greengrass for Industrial Facilities

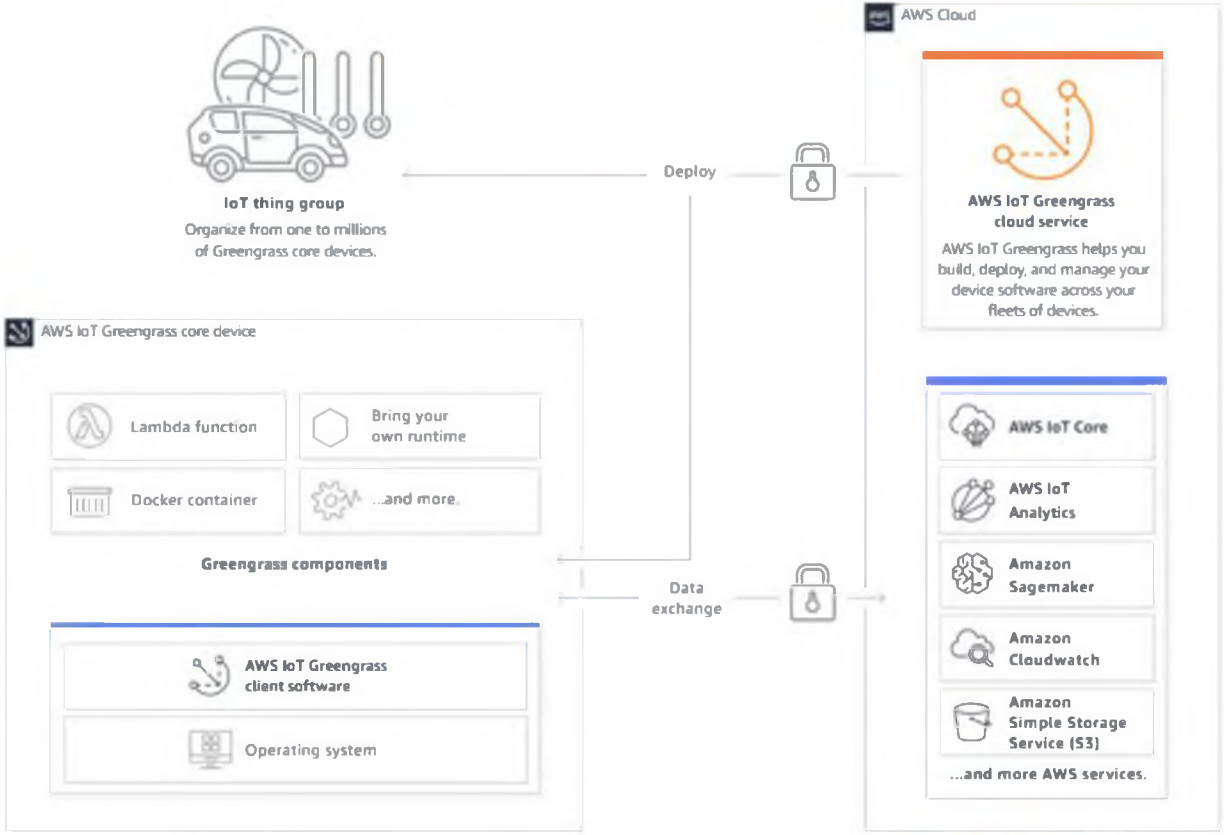


amazon web services | Partner Network
ADVANCED CONSULTING PARTNER

SOFTPROM
softprom.com • info@softprom.com

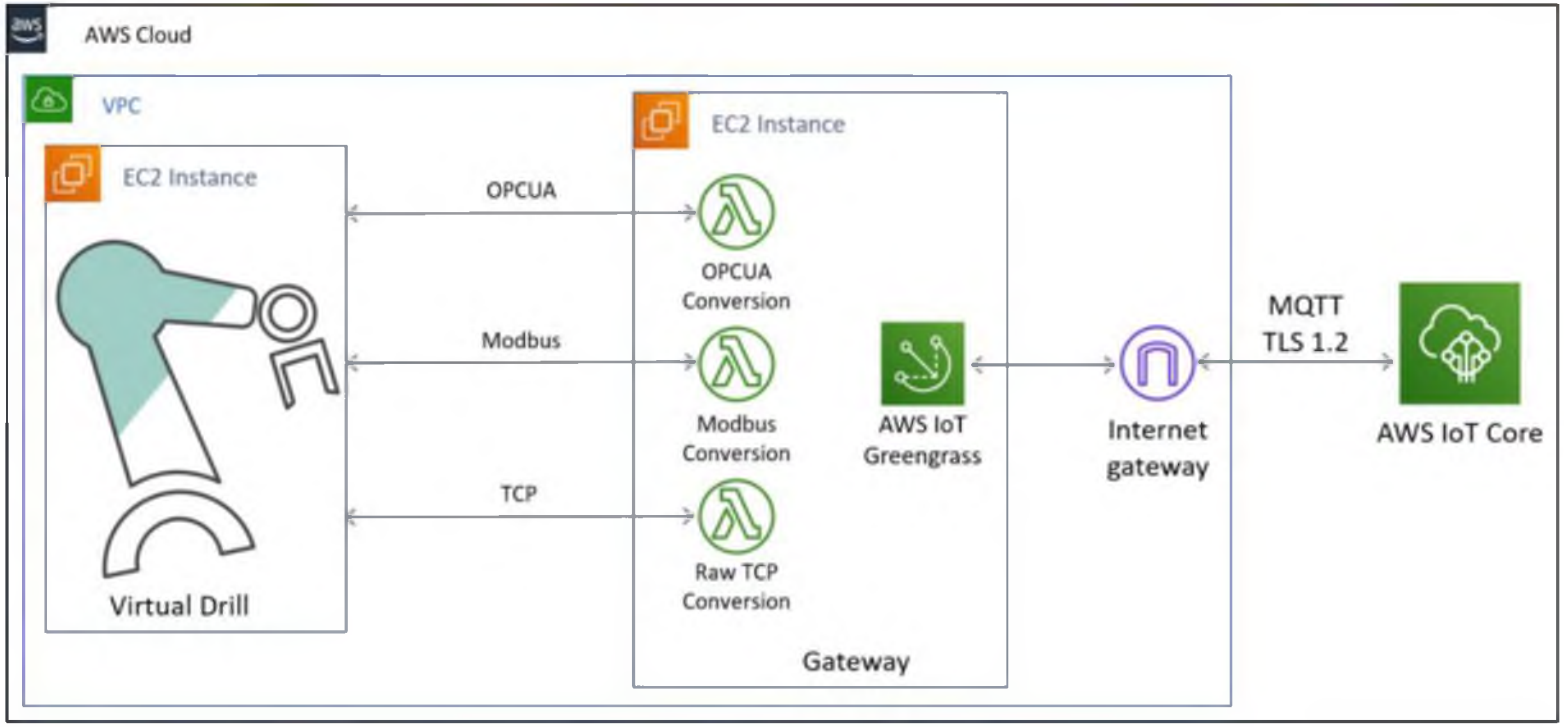
AWS IoT Greengrass

AWS IoT Greengrass



AWS IoT Greengrass

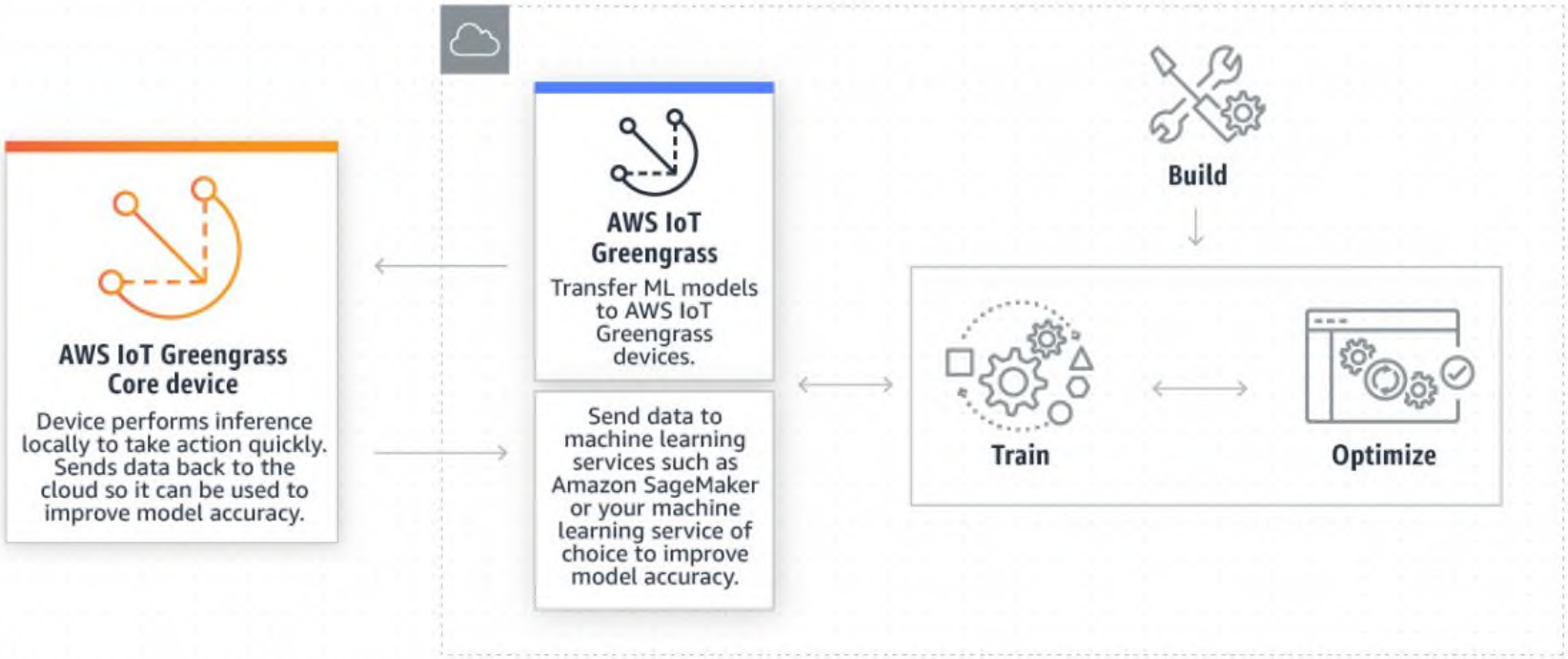
Converting protocols on AWS IoT Greengrass



- OPC-UA – A modern industrial protocol standard that includes security mechanisms as well as meta-data. Only the most recent versions of industrial assets typically have such an interface.
- Modbus TCP – An industrial protocol invented in 1979. This protocol is an example for many other dated protocols used in existing machines, which lack security mechanisms as well as structure to the data they deliver.
- TCP – This scenario includes a Transmission Control Protocol (TCP) to show that you can apply the protocol extraction pattern demonstrated here to custom or proprietary protocols. This also occurs with industrial assets that provide any binary payloads, such as images.

AWS IoT Greengrass

AWS IoT Greengrass ML Inference



- ***Greengrass*** включает среду глубокого обучения ***Amazon SageMaker Neo***
- готовые пакеты ***Apache MXNet, TensorFlow, Chainer PyTorch u Caffe2***
- для устройств на базе ***Intel Atom, NVIDIA Jetson TX2 u Raspberry Pi***

AWS IoT Core

AWS IoT Core
Publish and subscribe to messages

Devices publish & subscribe

Billions of devices can publish and subscribe to messages

AWS IoT Core

Messages are transmitted and received using the MQTT protocol which minimizes the code footprint on the device and reduces network bandwidth requirements

Devices communicate

AWS IoT Core enables devices to communicate with AWS services and each other

Protocols supported by AWS IoT Core

Protocols, authentication, and port mappings

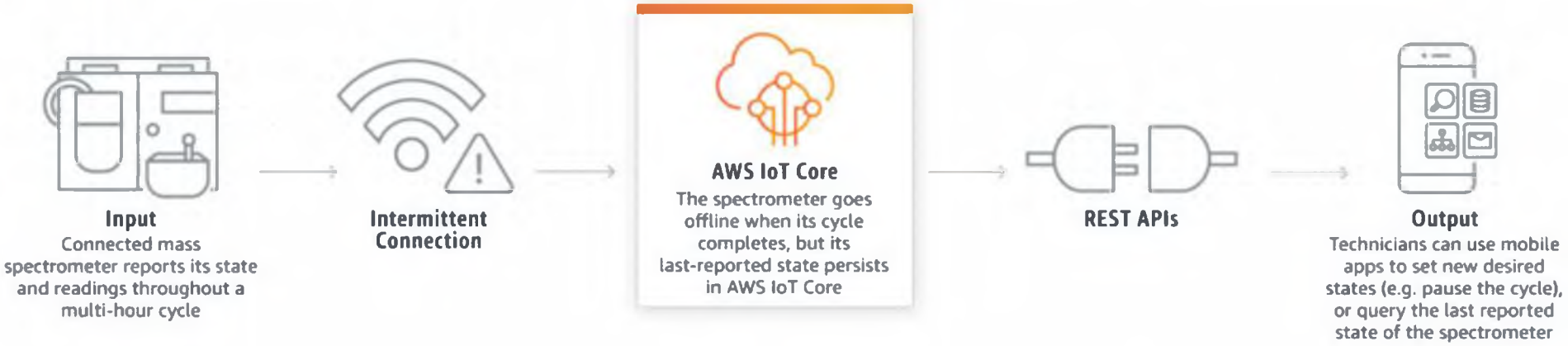
Protocol	Operations supported	Authentication	Port	ALPN protocol name
MQTT over WebSocket	Publish, Subscribe	Signature Version 4	443	N/A
MQTT over WebSocket	Publish, Subscribe	Custom authentication	443	N/A
MQTT	Publish, Subscribe	X.509 client certificate	443†	`x-amzn-mqtt-ca`
MQTT	Publish, Subscribe	X.509 client certificate	8883	N/A
MQTT	Publish, Subscribe	Custom authentication	443†	`mqtt`
HTTPS	Publish only	Signature Version 4	443	N/A
HTTPS	Publish only	X.509 client certificate	443†	`x-amzn-http-ca`
HTTPS	Publish only	X.509 client certificate	8443	N/A
HTTPS	Publish only	Custom authentication	443	N/A

Application Layer Protocol Negotiation (ALPN)

†Clients that connect on port 443 with X.509 client certificate authentication must implement the Application Layer Protocol Negotiation (ALPN) TLS extension and use the ALPN protocol name listed in the ALPN ProtocolNameList sent by the client as part of the `ClientHello` message.

AWS IoT Core

AWS IoT Core
Mirror device state with Device Shadow



AWS IoT Core

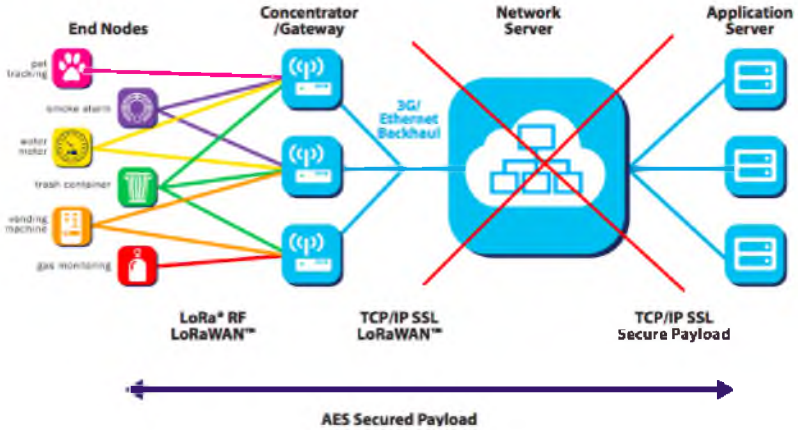
AWS IoT Core
Connect and manage LoRaWAN devices

Devices
LoRaWAN devices connect to customers' gateways via LoRa communication protocol.

Gateways
Gateways connect to AWS IoT Core using LoRa Basic Station protocol over Secure WebSockets

AWS IoT Core for LoRaWAN
Securely and easily connect LoRaWAN devices to the cloud

AWS Cloud Services
Messages are routed via AWS IoT Core Rules Engine to other AWS services

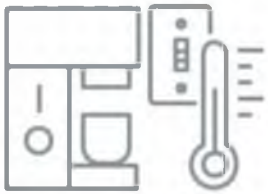


amazon web services | Partner Network
ADVANCED CONSULTING PARTNER

SOFTPROM
softprom.com • info@softprom.com

AWS IoT Core

AWS IoT Core
with Alexa Built-in devices



Produce devices using MCUs like Arm Cortex-M based devices with less than 1MB embedded RAM

AWS IoT Core

Securely and easily connect your devices to the cloud and to other devices with AWS IoT Core

AWS IoT Core receives audio messages from the device and delivers them to AVS through secure MQTT topics

The virtual Alexa built-in device processes the audio data and sends the response back to the device through AWS IoT Core as an MQTT message

amazon web services | Partner Network
ADVANCED CONSULTING PARTNER

SOFTPROM
softprom.com • info@softprom.com

AWS IoT Core Device Advisor

IoT Device

User connects and tests IoT Devices configured with Device Advisor's test end point. Users get results and logs from Device Advisor

AWS IoT Core Device Advisor

Easily test if IoT devices implement recommended best practices for reliable and secure connectivity with AWS IoT

- Provides pre-built tests for secure, reliable connectivity
- Provides an ability to choose and configure tests
- Sequences and executes selected tests
- Simulates failure scenarios
- Provides results and detailed cloud side logs

AWS IoT Core

For MQTT, Shadow and Jobs operations

Amazon CloudWatch

Provides detailed logs

AWS IoT Device Defender

Непрерывный мониторинг поведения устройств для выявления аномалий

- мониторинг метрик безопасности
- выявление аномалий
- определение открытых портов устройств
- взаимодействие с другими устройствами
- анализ передаваемого объема данных
- использование моделей машинного обучения

Аудит конфигураций устройства на наличие уязвимостей

- проверка соответствия конфигурации IoT набору заданных рекомендаций по безопасности IoT
- запуск постоянно или по необходимости
- включает в себя рекомендации по безопасности, которые можно выбирать и запускать в рамках проверки

Получение предупреждений и ответные меры

- отправляет предупреждения об опасности в консоль AWS IoT, Amazon CloudWatch и Amazon SNS
- предоставляет встроенные средства для нейтрализации угроз безопасности:
  - добавление объекта в группу (например, карантин),
  - обновление сертификатов устройств,
  - замена версии политики по умолчанию,
  - ведение журнала IoT.

AWS IoT SiteWise

AWS IoT SiteWise

Ingest data from industrial equipment, data servers, and historian databases

AWS IoT SiteWise

Collect, organize, and analyze industrial data at scale

Collect

Read data from onsite equipment using industrial protocols such as OPC-UA, Modbus and EtherNet/IP

Model

Create virtual representations of physical assets, process equipment data streams, and compute industrial performance metrics

Monitor

Create fully managed web applications to visualize real time and historical equipment data, with no coding

AWS IoT SiteWise Edge

Software that runs on premises on an industrial gateway to collect, process and monitor equipment data locally – even when not connected to the Internet

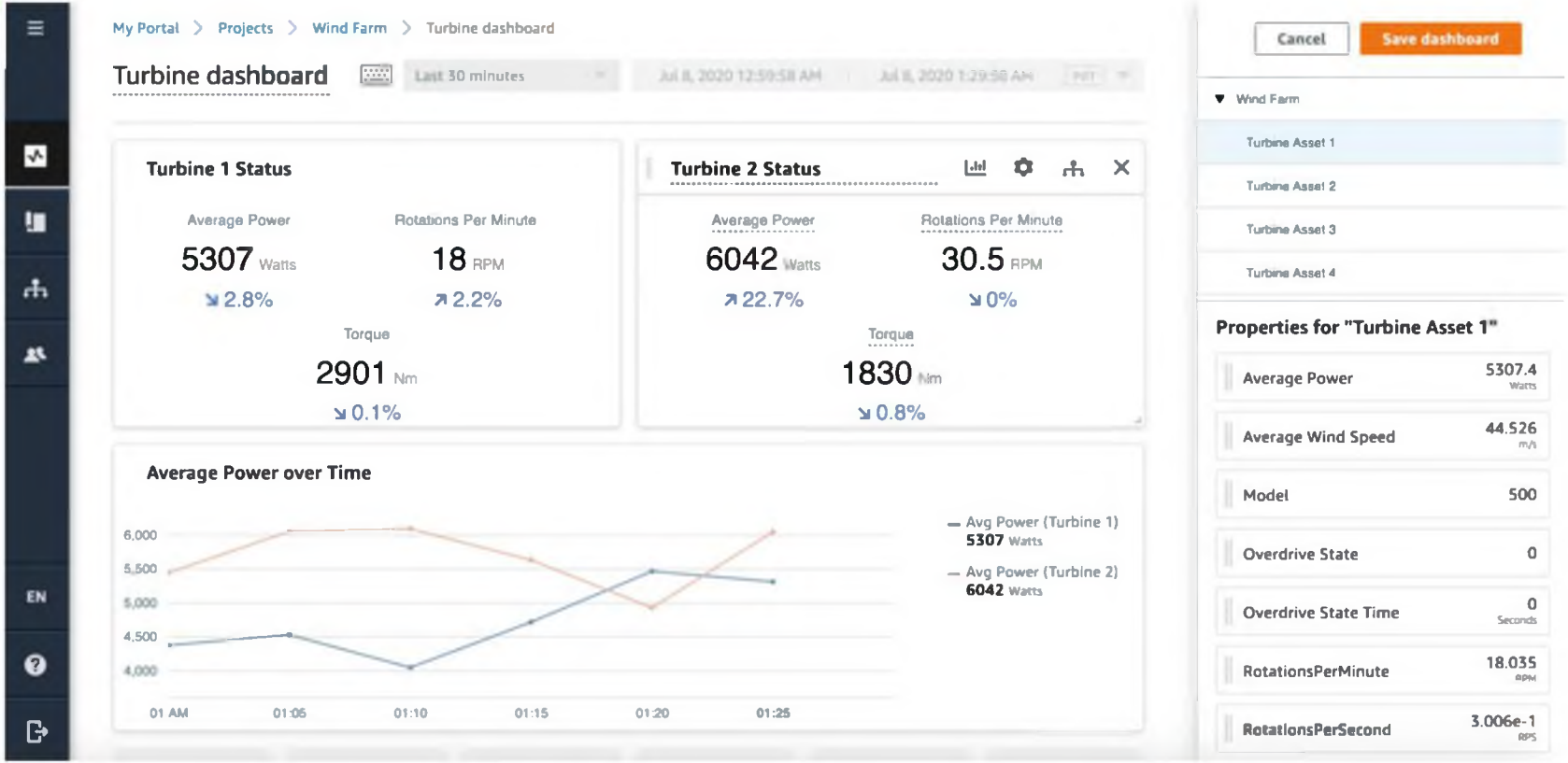
- Predictive quality
- Asset condition monitoring
- Predictive maintenance

Consume asset data to create local or cloud applications that optimize factory output quality, maximize asset utilization and identify equipment maintenance issues

amazon web services | Partner Network
ADVANCED CONSULTING PARTNER

SOFTPROM
softprom.com • info@softprom.com

AWS IoT SiteWise



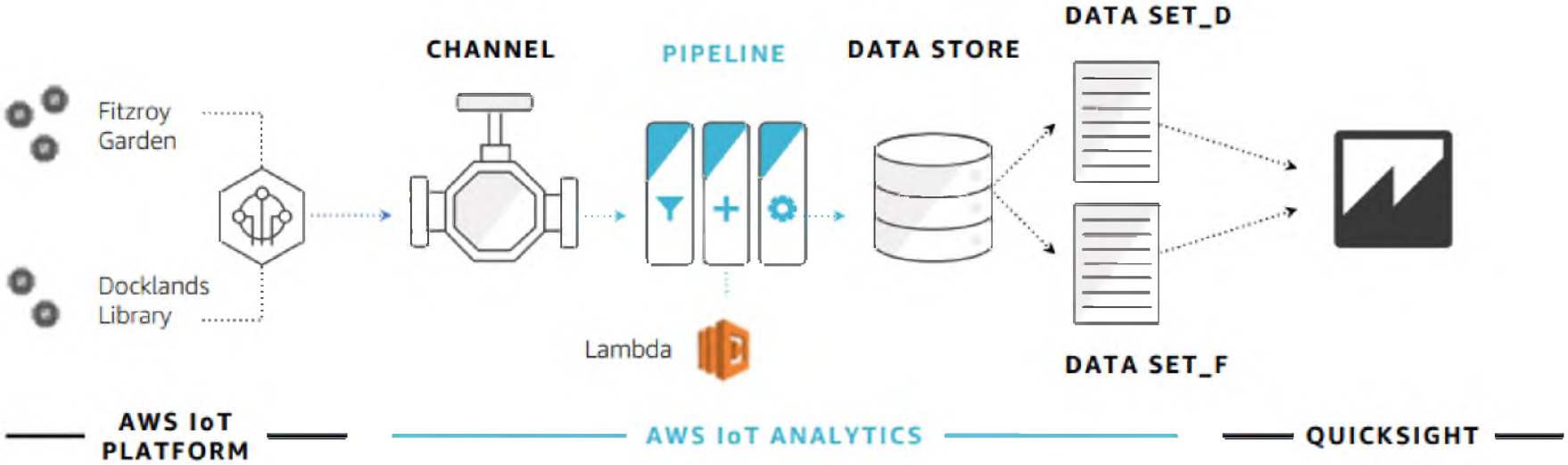
amazon web services | Partner Network
ADVANCED CONSULTING PARTNER

SOFTPROM
softprom.com • info@softprom.com

AWS IoT Analytics

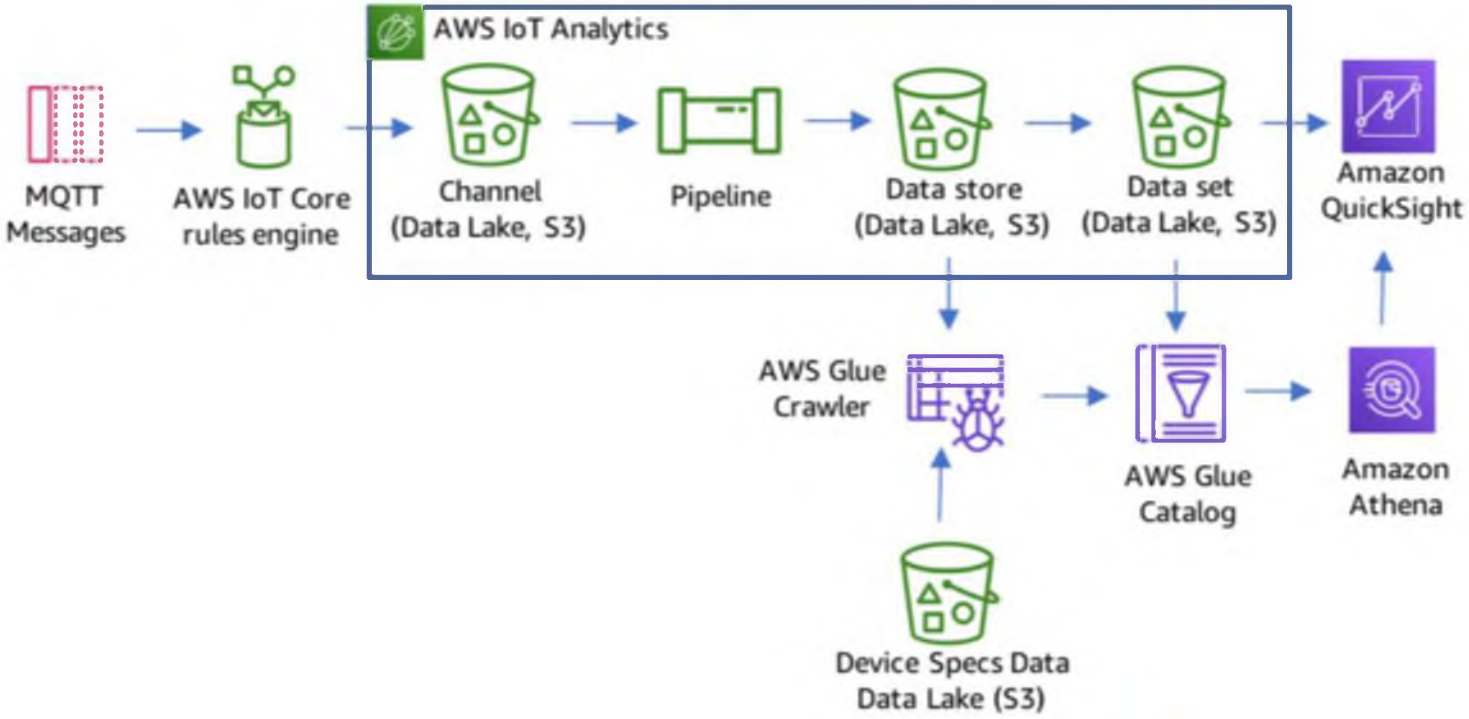
AWS IoT Analytics

AWS IoT Analytics



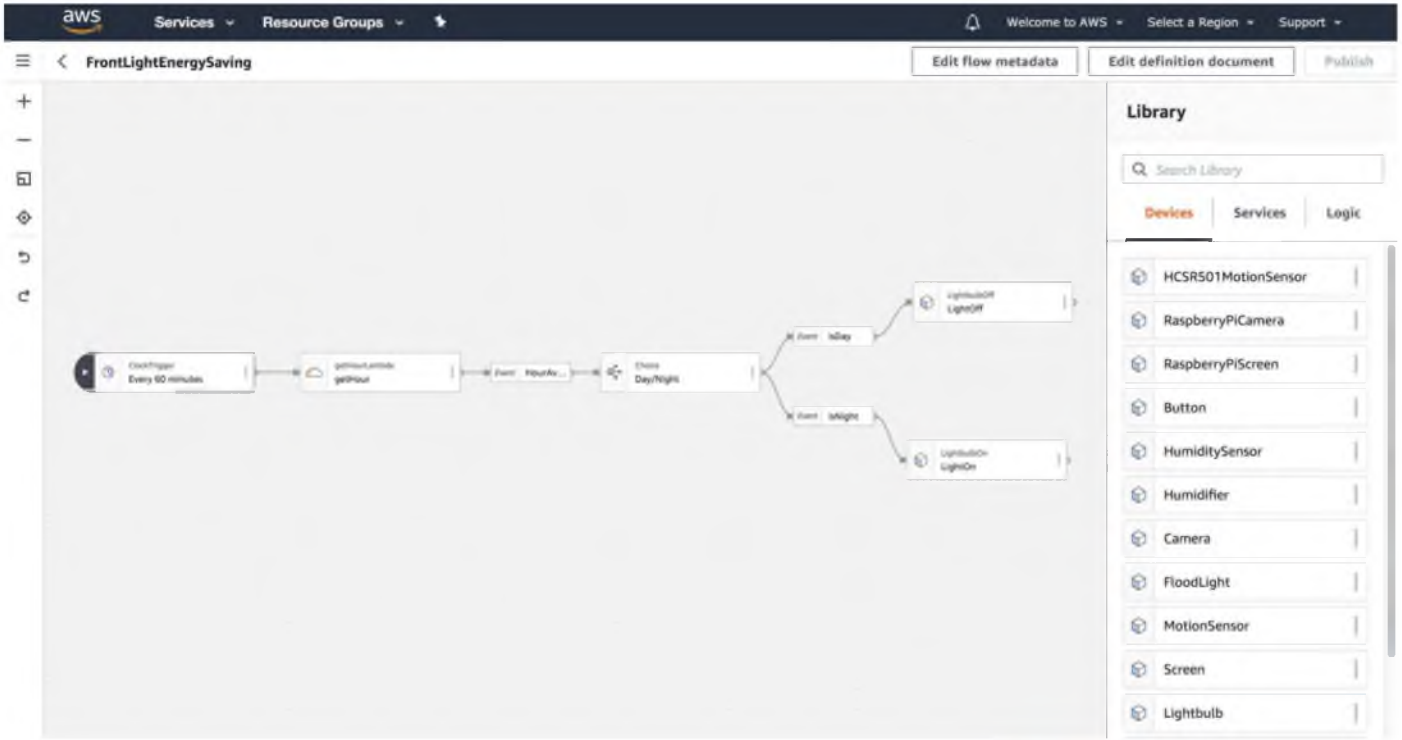
AWS IoT Analytics

AWS IoT Analytics
Integrating IoT data with data lake

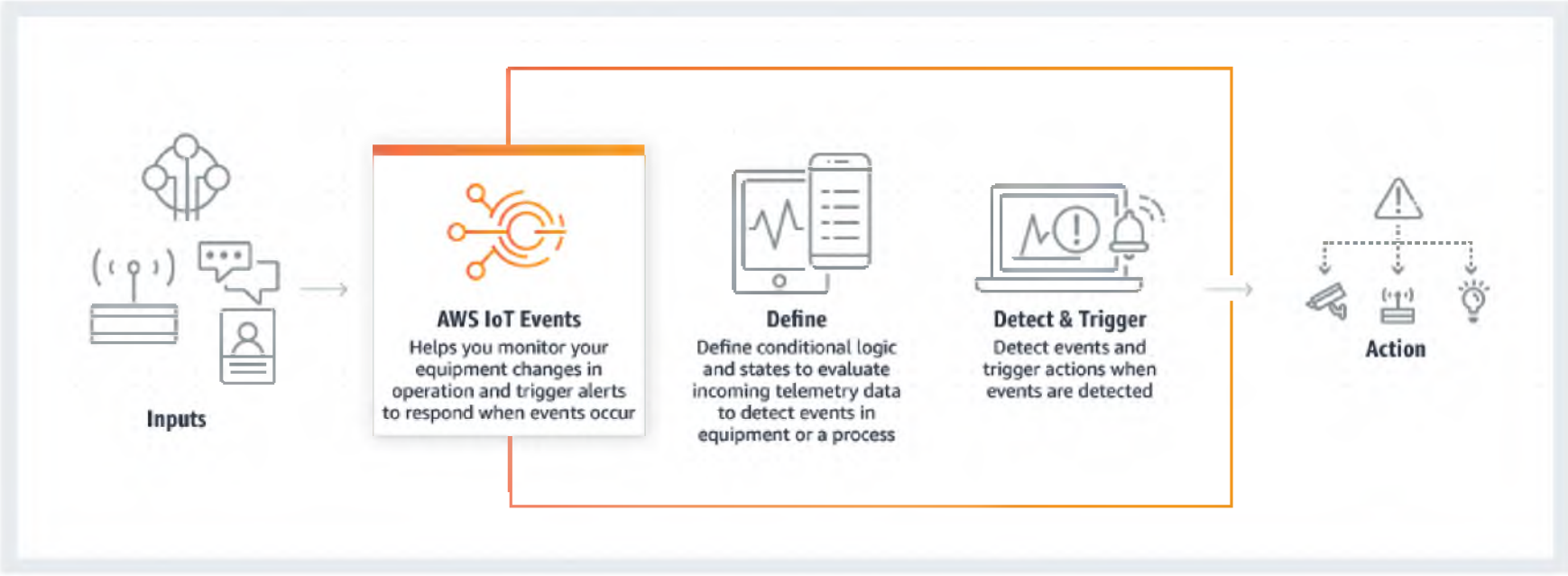


AWS IoT Graph

AWS IoT Things Graph



AWS IoT Events



AWS IoT Price

IoT Greengrass	One to 10,000 devices $0.18 per month
IoT Core	***Connectivity pricing:*** $0.096 (per million minutes of connection) ***MQTT and HTTP messaging pricing*** Up to 1 billion messages: $1.20 (per million messages) Next 4 billion messages: $0.96 (per million messages) Over 5 billion messages: $0.84 (per million messages) ***Device Shadow and Registry pricing:*** $1.50 (per million operations) ***LoRaWAN messaging pricing*** Up to 1 billion messages: $2.30 (per million messages) Next 4 billion messages: $1.50 (per million messages) Over 5 billion messages: $1.20 (per million messages) ***Rules Engine pricing*** Rules triggered: $0.18 (per million rules triggered / per million actions executed) Actions executed: $0.18 (per million rules triggered / per million actions executed)
IoT Device Management	***Bulk Registration*** Things Registered (per 1,000 things registered) $0.12 ***Fleet Indexing and Search*** Index Updates (per 1 million updates) $2.70 Search queries (per 10,000 queries) $0.06 ***Device Jobs*** First 250,000 Remote Actions / Month (per remote action) $0.0036 Over 250,000 Remote Actions / Month (per remote action) $0.0018 ***Secure Tunneling*** Tunnels Opened (per 1 tunnel opened) $6.00

AWS IoT Price

SiteWise	***Messaging Pricing:*** $1.20 (per million messages) ***Data Processing Pricing:*** $0.60 (per million computations) ***Storage Pricing:*** $0.0005 (per GB-hour) or $0.012(per GB-day) or $0.36 (per GB-Month) ***Monitor Pricing:*** $10.00 (per unique active user per month)
IoT Analytics	Prices (per GB of data processed) - $0.20 Prices (per GB of processed data stored per month) - $0.03 Prices (per TB of data scanned) - $6.50 Prices (per ACU-Hour, billed per second) - $0.36
IoT Device Defender	***Audit pricing*** Up to 100,000 devices $0.00132 monthly, per device audited Over 100,000 devices $0.0012 monthly, per device audited ***Rules Detect*** Up to 10B metric datapoints $0.03 monthly, per 100K metric datapoints Over 10B metric datapoints $0.024 monthly, per 100K metric datapoints ***ML Detect pricing*** Metric datapoints — Prices (monthly, per 100K metric datapoints) Up to 0.3M metric datapoints — $2.40 Next 9.7M metric datapoints — $0.90 Next 90M metric datapoints — $0.18 Over 100M metric datapoints — $0.12

Softprom - Advanced Consulting Partner в сети Amazon Web Services.

softprom.com | aws@softprom.com