



Azure Meetup: IoT

April 2022



Vision & Roadmap

CHART YOUR COURSE

- North Star Vision to set direction
- IoT roadmap to identify next steps
- Organizational readiness scan



IoT Assessment

KNOW YOUR POSITION

- Broad scan of your IoT maturity
- Includes platform, business case, data
- Optional: hardware, security, organization



IoT Center of Excellence

ENABLE YOUR TEAM

- Set up an envision-build-run-govern team
- 5 key themes across 10 governance areas
- Integrate IoT disciplines in your organization



Azure IoT Blueprint & Landing Zone

BUILD YOUR PLATFORM

- Secure & compliant cloud platform
- Extendable Hub & Spoke model
- Infrastructure-as-Code accelerator



Our approach

FOR NEW IoT INITIATIVES



01. North Star Vision workshops



02. Rapid prototyping



03. Establish roadmap and IoT organization



04. Launch MVP and center of excellence

We help you connect people, spaces & devices, to optimize and transform your business

Accelerators

- Azure-based IoT Reference Architecture
- Standardized 4 week assessment approach
- IoT center of excellence blueprint

ZiGN
innovations

Scalys

kpn
IoT

TELTONIKA

vodafone

Agenda

1800

Food

1845

Introduction to Azure IoT

Tijmen & Matthijs

1930

Hands-on: ESPs

2100

Close



Tijmen van de Kamp

tvandekamp@xpirit.com



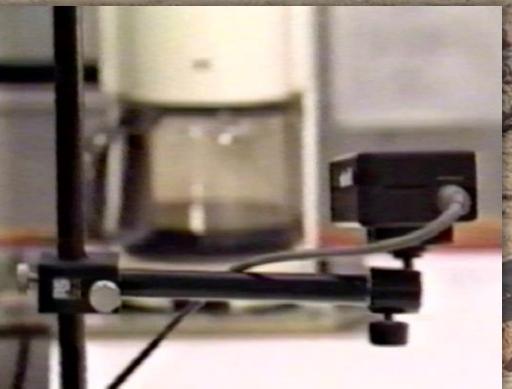
Matthijs van der Veer

mvanderveer@xpirit.com

IOT

IoT is the **extension of Internet connectivity** into physical devices and everyday objects.

These devices can **communicate** and **interact** with others over the Internet, and they can be **remotely monitored** and **controlled**



1982 Internet Coke Machine

1990 Connected toaster

1993 Trojan Room Coffee Pot

1995 First Cellular M2M module

1999 Term “Internet of Things” born

History of IoT

IoT analytics are still hyped...

“20 Billion active IoT devices”

- Gartner

“IoT devices are expected to generate 73.1 ZB by 2025”

- DataProt

“The market for IoT could reach \$11 Trillion in a few years”

- McKinsey

“29% of developers favor Azure IoT suite”

- Cowen

“2.3 Billion cellular IoT connects by 2023”

- Gartner



...but predictability is still low

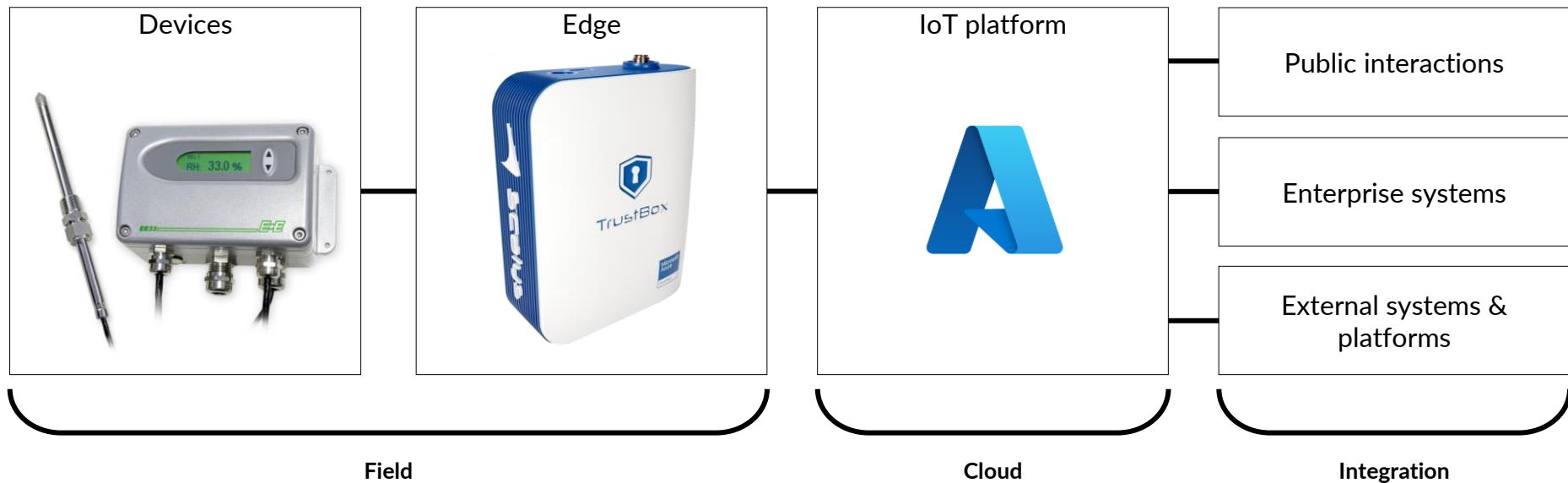
2020 IoT market CAGR dropped from **14.9%** forecast to **8.2%** actual

2021 Consumer IoT spend increased by **17%**,
where 11% was expected

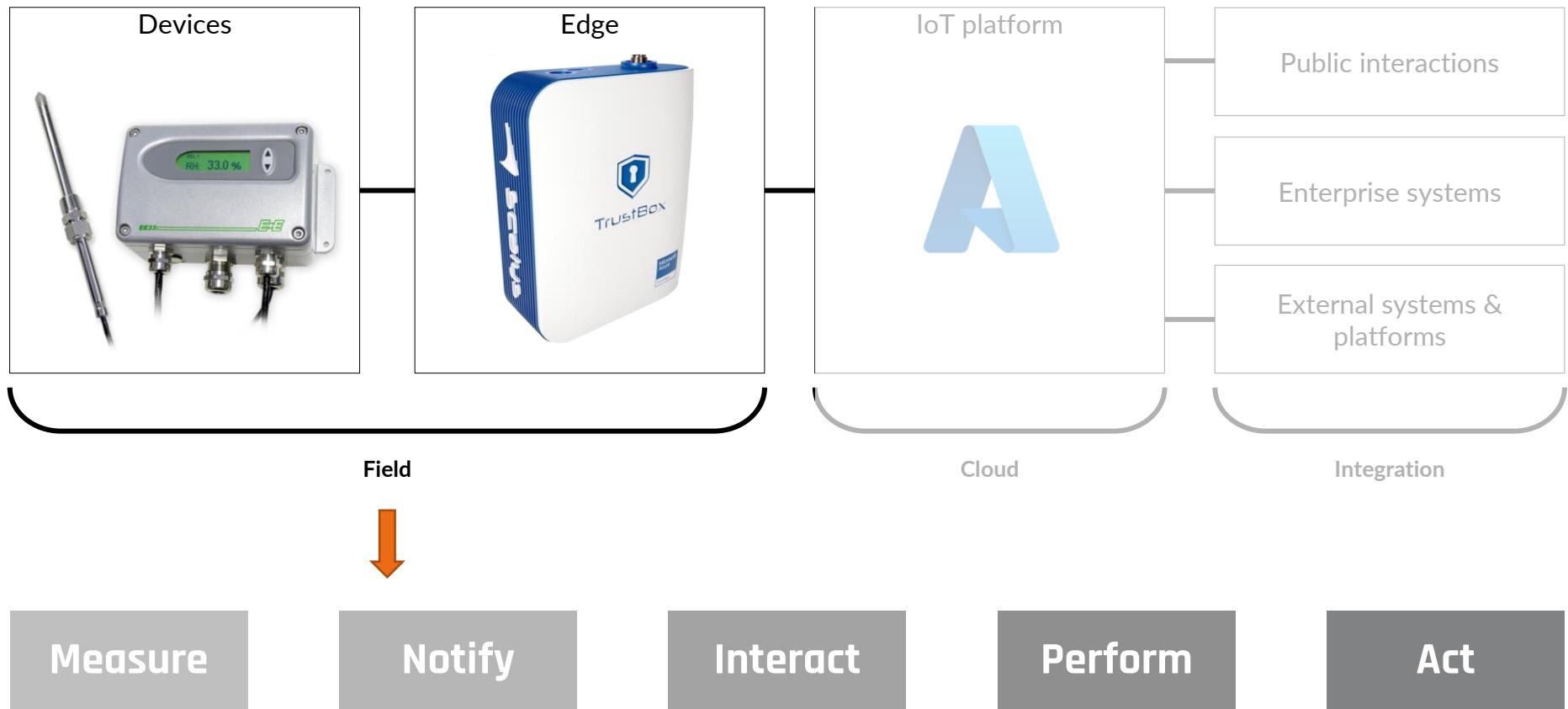
IoT security spendings grew **over 21%**,
but were expected to follow the market



Anatomy of an IoT solution

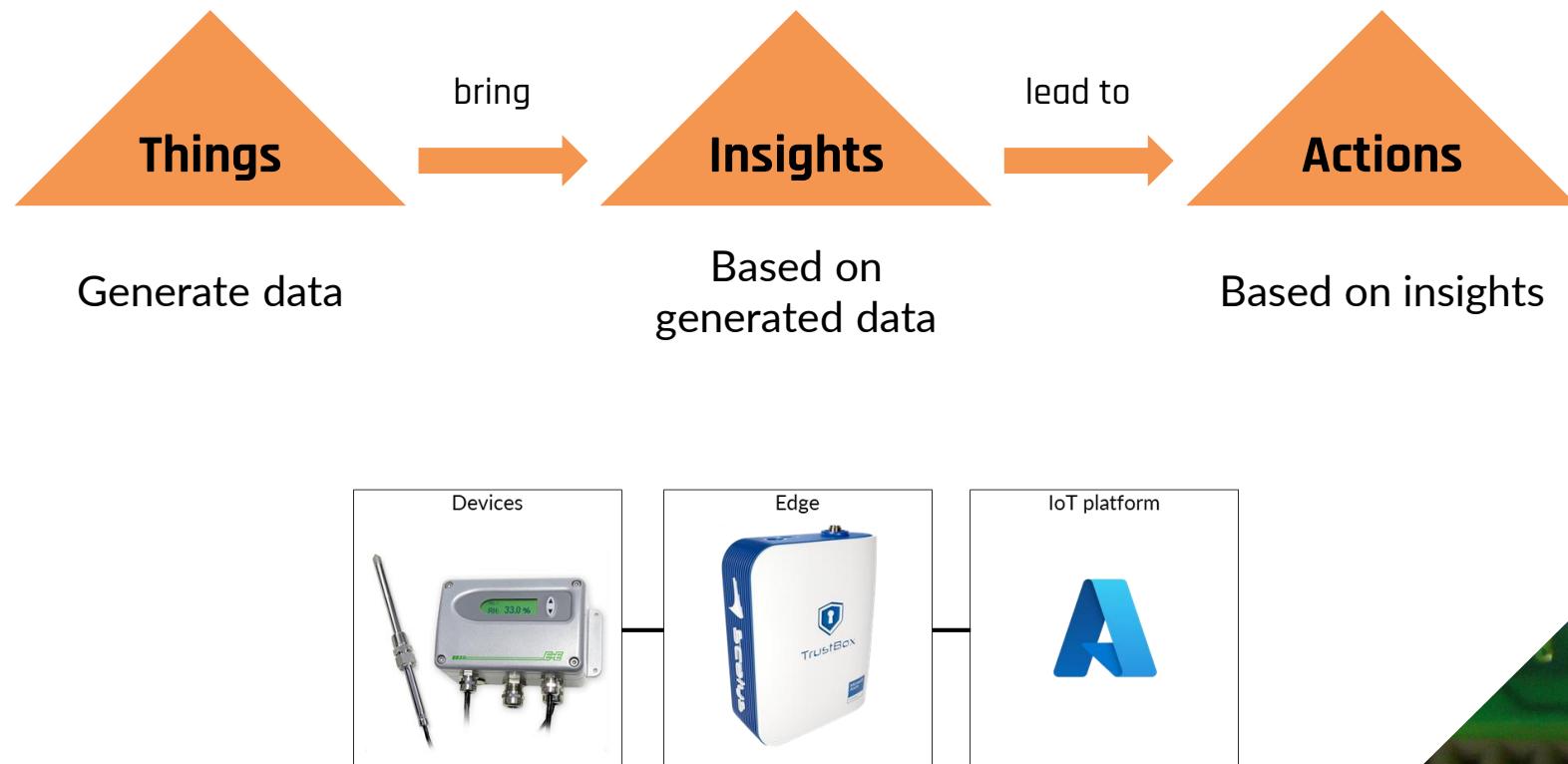


Anatomy of an IoT solution



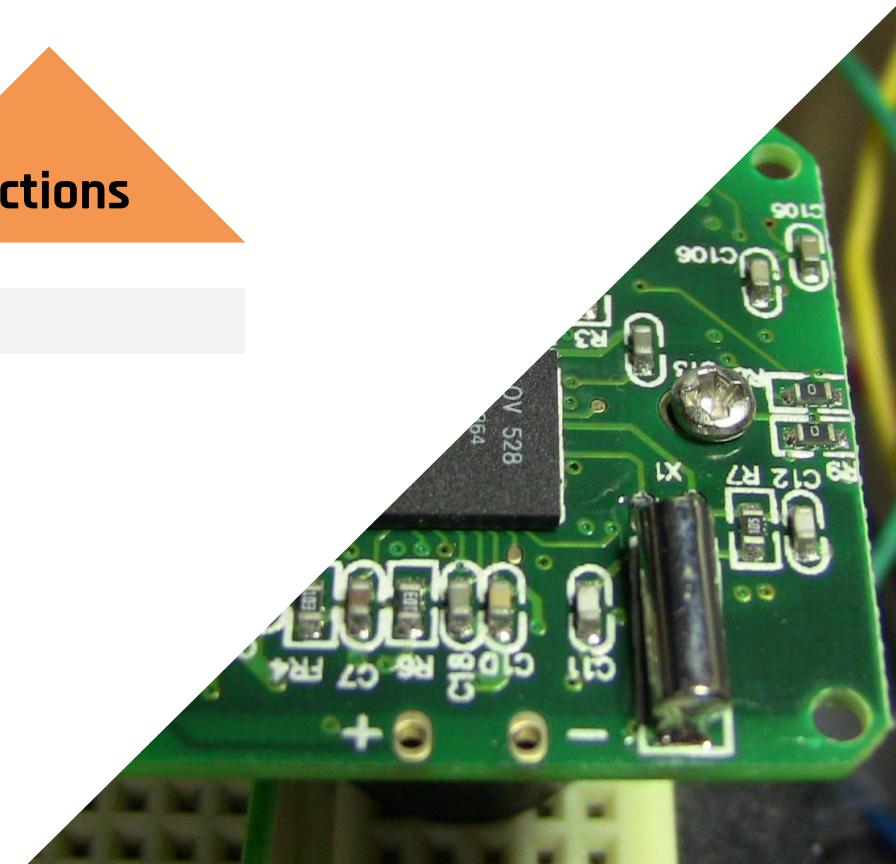
Connecting things transforms businesses

Connecting things starts to provide real value when data gets processed, distributed, and used across an enterprise, allowing for **Insights** and **Actions** to ultimately deliver human value



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Sample case: connected Garbage Trucks



Location

Fill level

Weight

Fuel status

Things

Insights

Actions

Sample case: connected Garbage Trucks



Location
Fill level
Weight
Fuel status



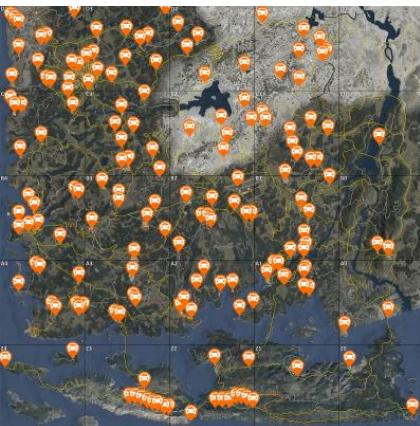
Fleet insights
Operator dashboard

Things

Insights

Actions

Sample case: connected Garbage Trucks



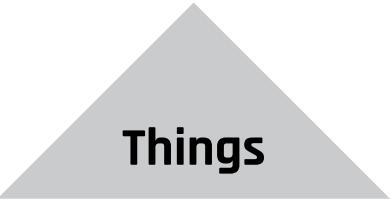
Location
Fill level
Weight
Fuel status



Fleet insights
Operator dashboard



Context-aware optimizations
Per-truck instructions



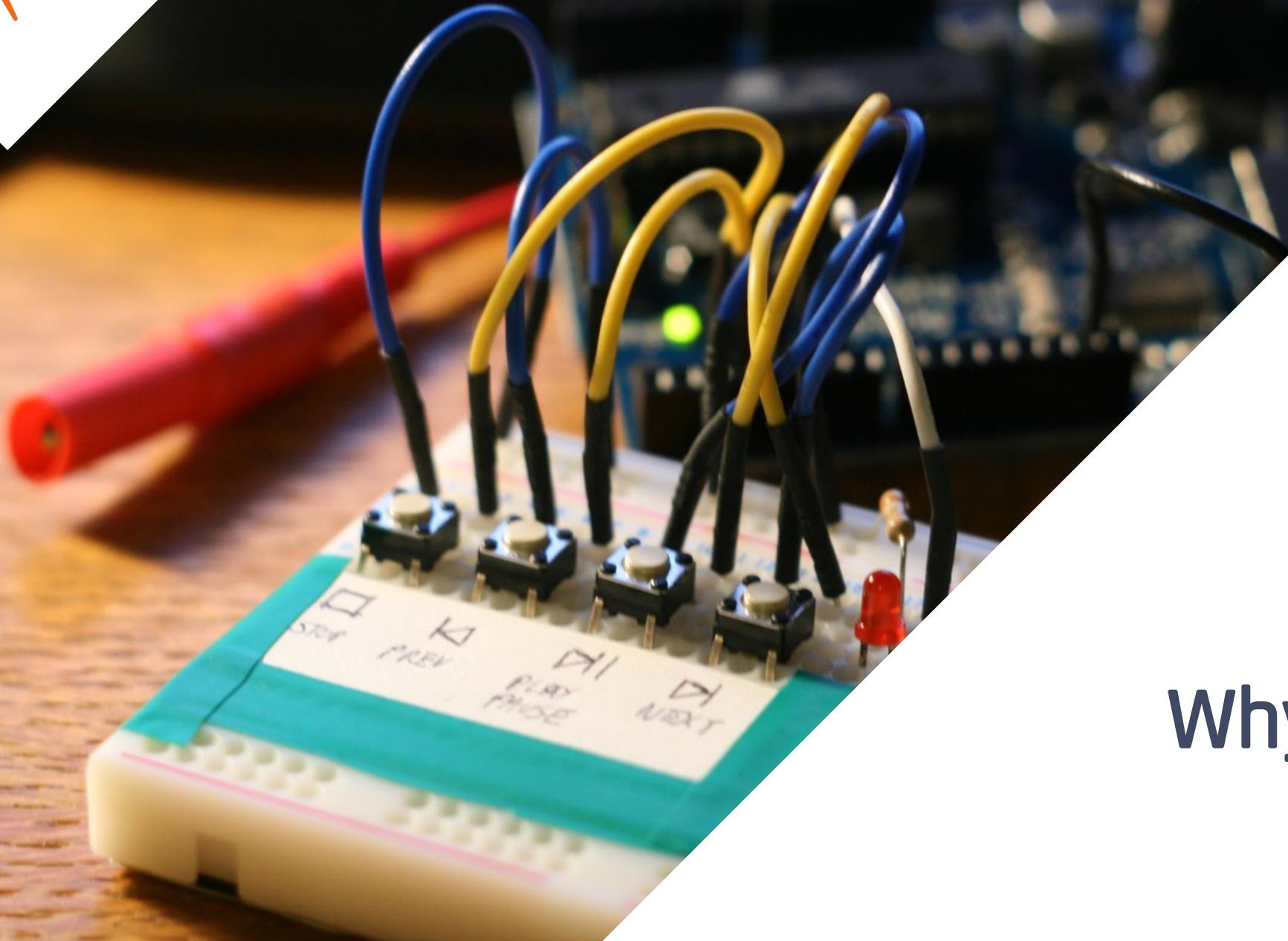
Things



Insights

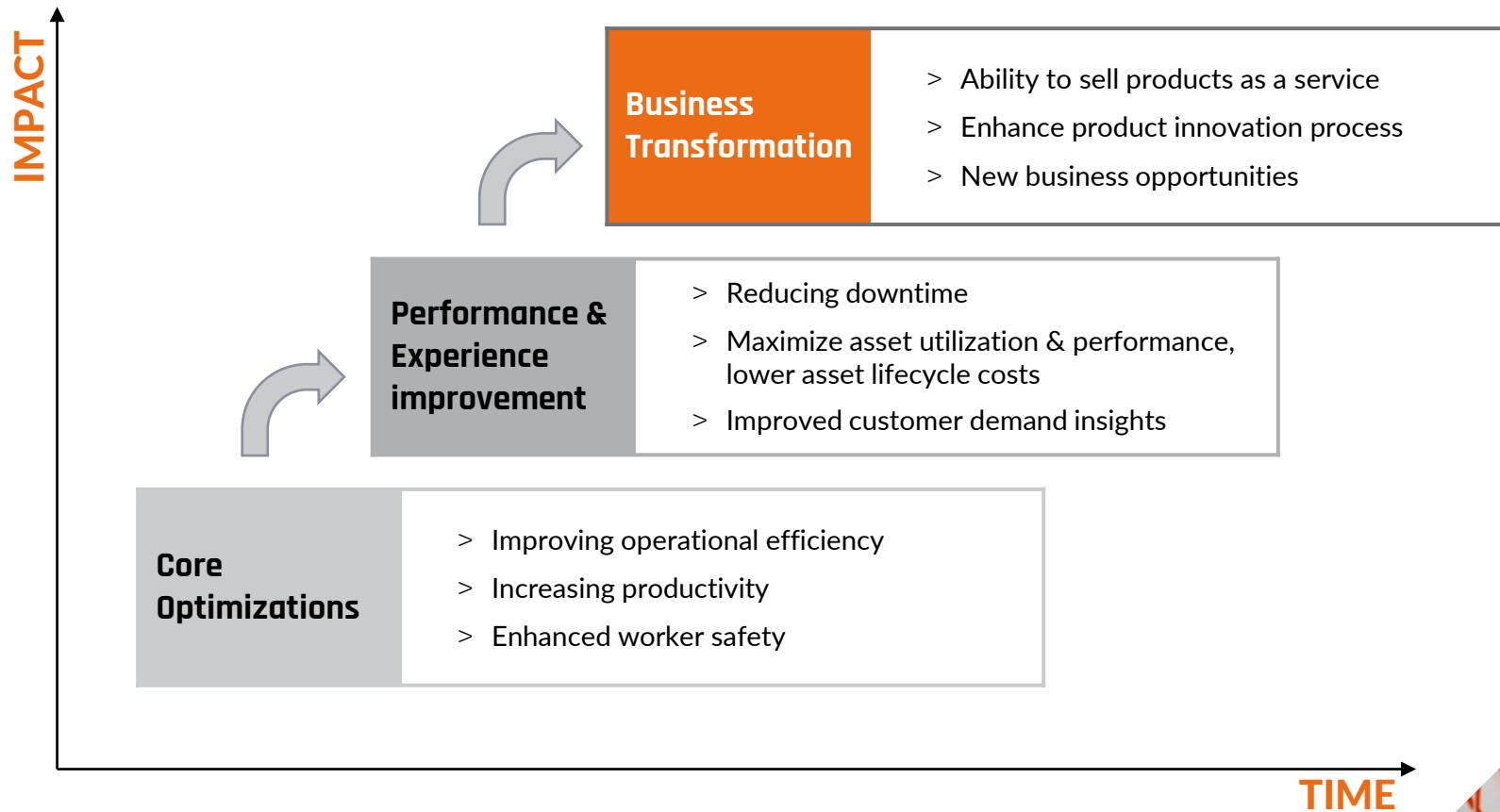


Actions



Why-o-T?

IoT drives impactful business outcomes



TIME



We look at 6 primary domains

Generic use cases

- > Remote monitoring
 - > Predictive maintenance
 - > Asset tracking
 - > Field service
 - > Resource optimization
 - > Energy efficiency
- Connected...ions**



Industry-specific scenarios

- > Connected factories
- > Smart cities
- > Flexible manufacturing
- > Smart retail
- > Intelligent infrastructure
- > Smart grids
- > Connected vehicles
- > Connected people
- > Connected products
- > Smart homes
- > Smart lighting
- > Impressive, you're still reading...



Recurring themes

- > Sustainability
- > Health & Safety



Opportunities, observations & challenges

Opportunities

IoT touches (almost) every market

AIoT is on the rise

5G & satellite connectivity

Observations

Focus on recurring income

Distributed vendor/supplier market

NL is lagging

Threats

Security (& fear)

Chip shortage

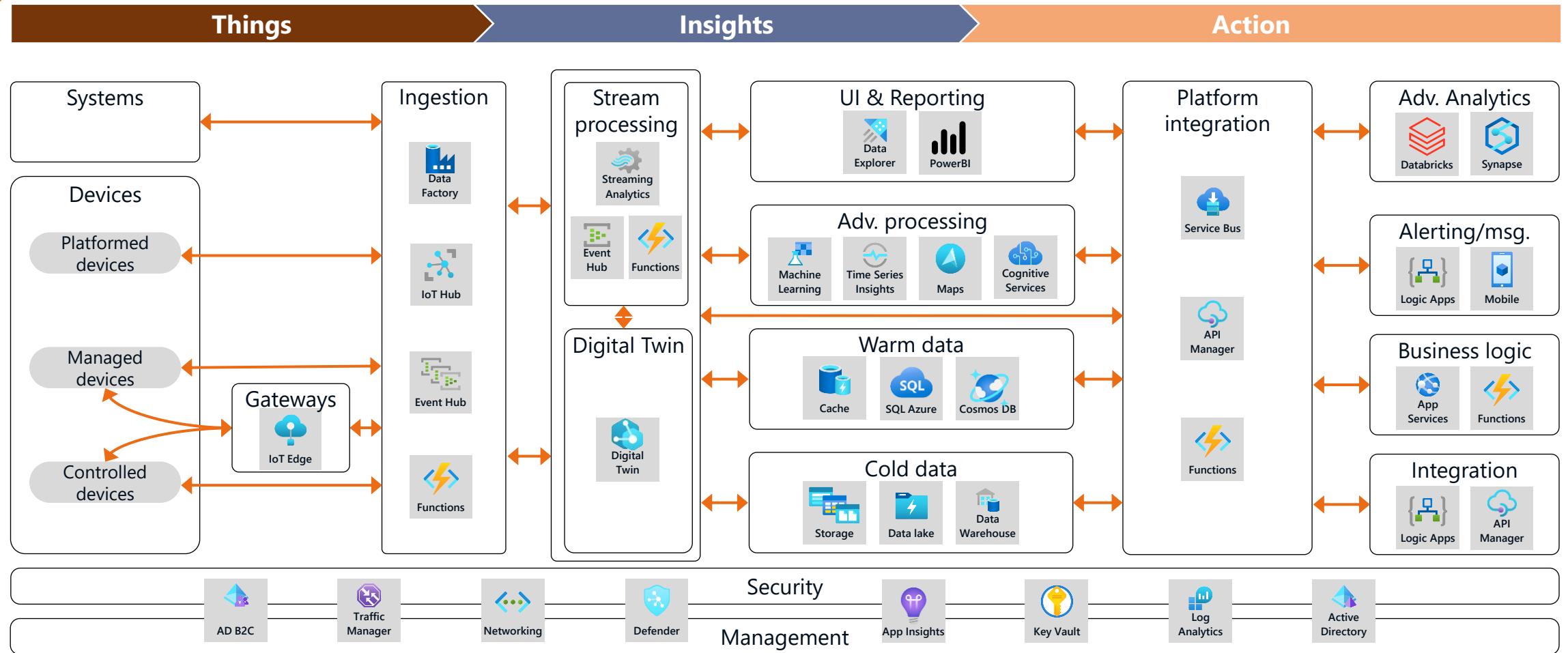
Investments vs current economy





Azure & IoT
Matthijs

Welcome.... to IoT!





Cloud and Edge

A close-up photograph of a printed circuit board (PCB). The board is blue with silver-colored metal traces and pads. A large, dark grey rectangular component, likely a memory module or a microcontroller, is mounted on the board. This component features a 'light edge' connector, which is a series of small, raised pins along its top and bottom edges. Several surface-mount components (SMDs) are visible, some with white labels like 'IC560' and '2080'. The overall texture is metallic and intricate.

Light Edge

Light Edge (Microcontrollers)

Single Task

Real-time

Small

Low Power
Usage

Embedded
Engineering

Azure RTOS



Heavy Edge

Heavy Edge

Latency

Performance

Safety

Connectivity

Privacy

General
Computing
Hardware



Real time Aggregate

Calculate

Count of people vs Time



Real time metrics

People detections in frame

4

People detections in zones (queue)

0

Max people detections in frame per second

4

Max people detections in zones (queue) per second

0

Aggregate stats in time window

mm/dd/yyyy --:-- --



Start

End

Calculate

Max people detections in frame per second

0

Max people detections in zones (queue) per second

0

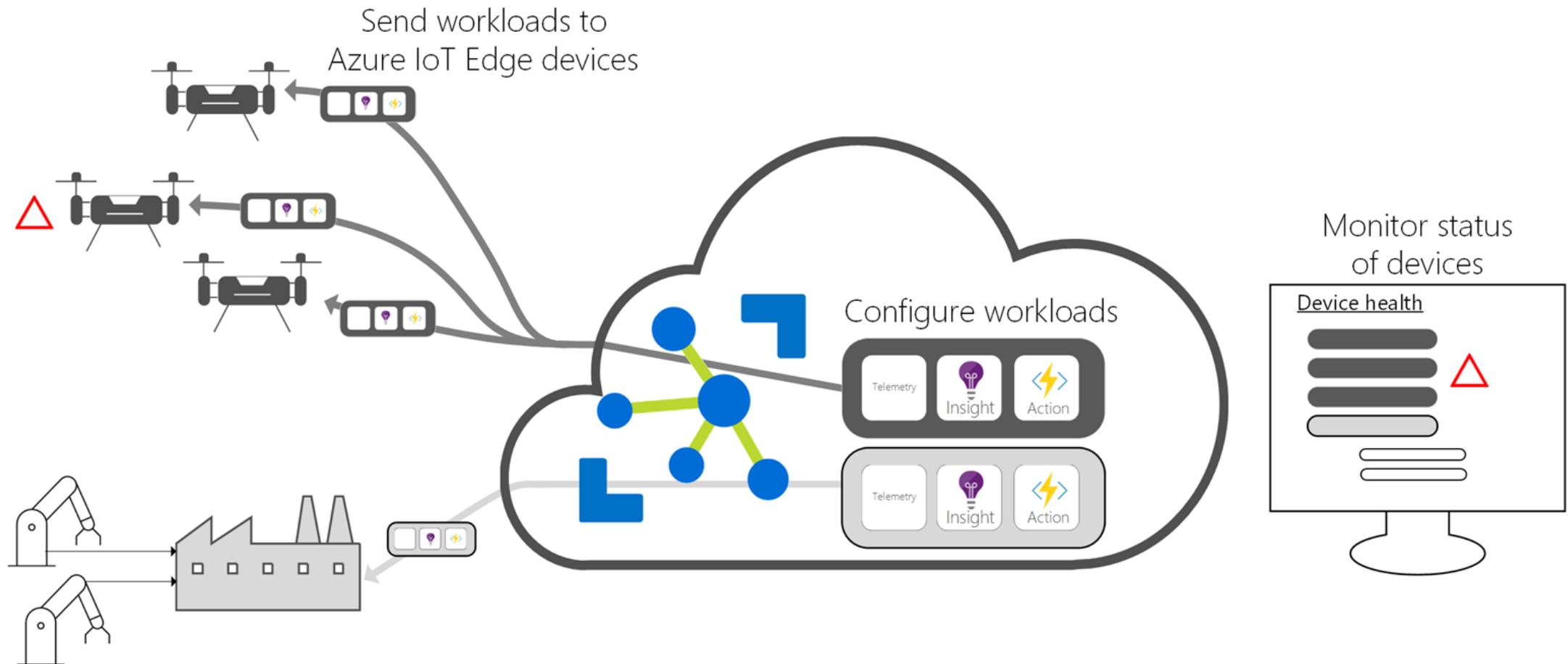
Zones

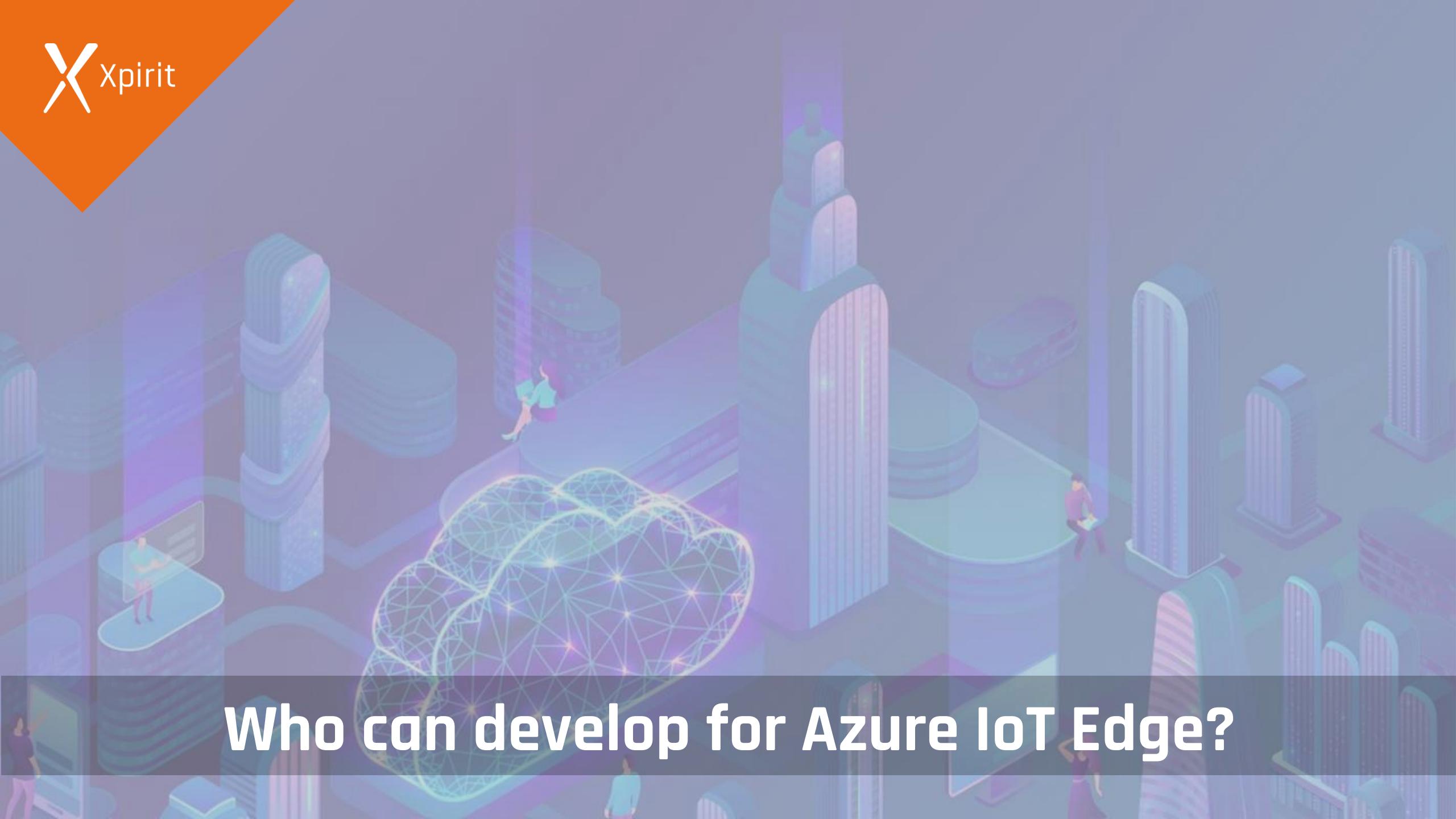
Queue

Clear

Video Analytics At The Edge

Azure IoT Edge





Who can develop for Azure IoT Edge?

A close-up photograph of a person's hand, wearing a dark long-sleeved shirt. The person is pointing their index finger directly towards the camera. The background is plain white.

You

Feel right at home at the edge



And 79 modules in the marketplace



Cloud

Azure IoT Hub



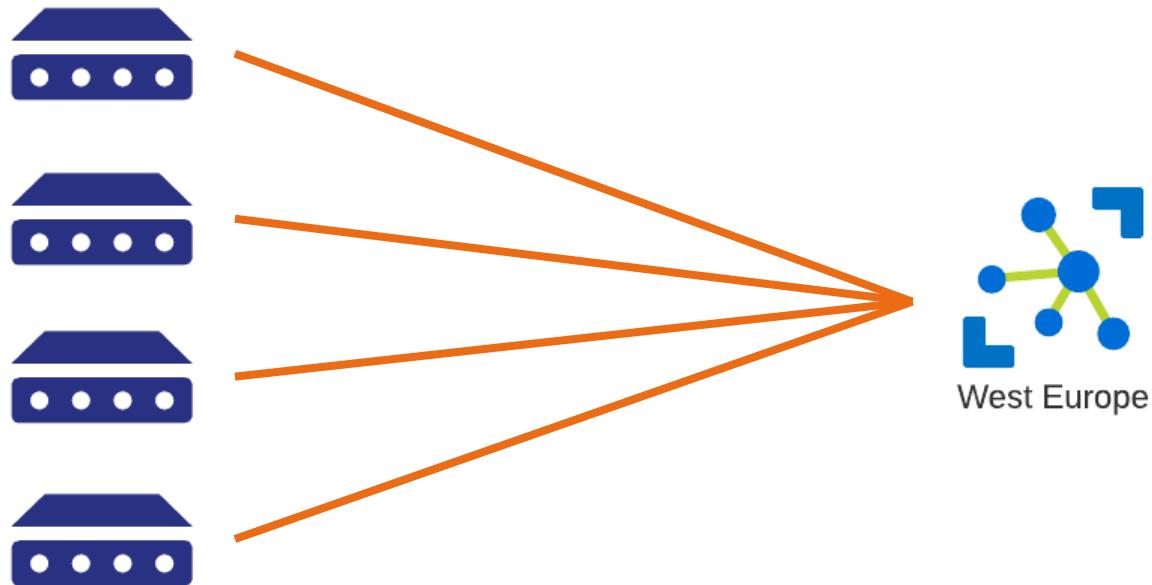
IoT Hub!

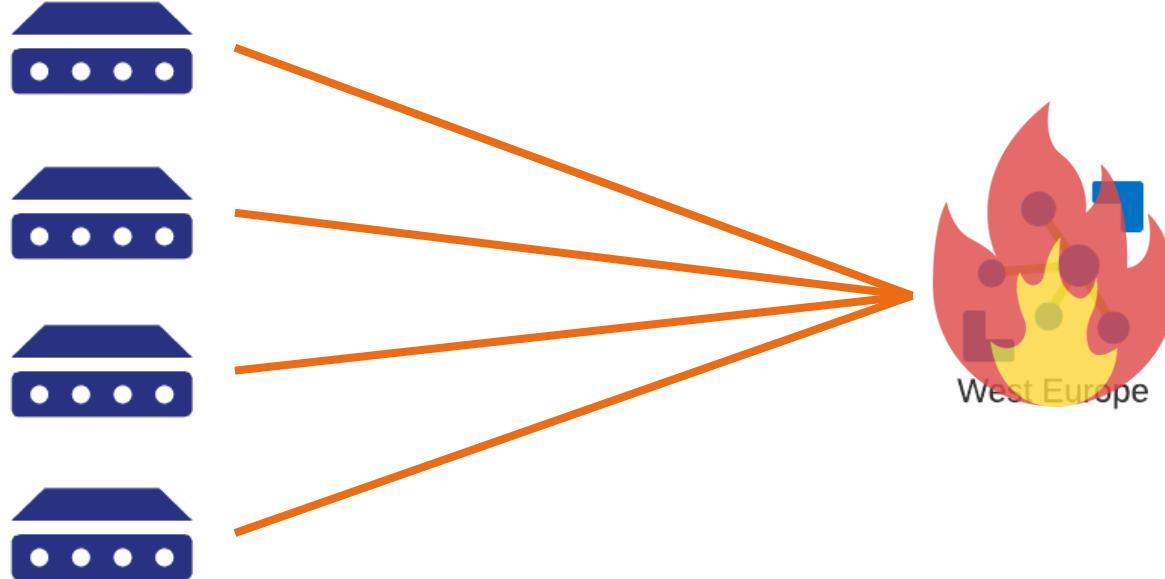
What does it do?

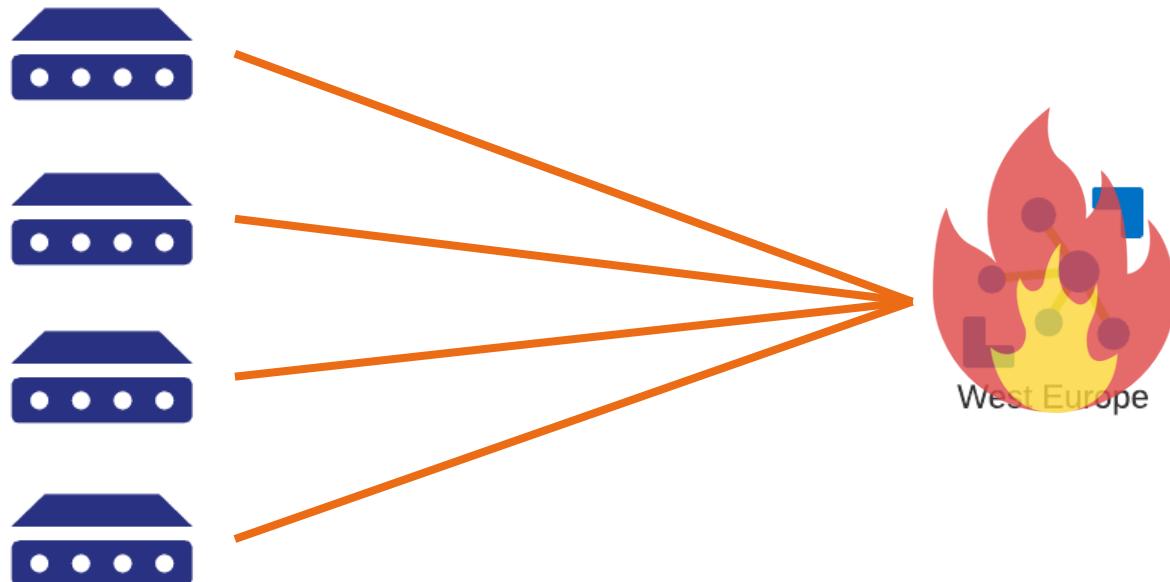
- Bi-directional device communication
- Device identity registry
- (Basic) device configuration
- Message routing and enrichment
- Scales through units and tiers

What doesn't it do?

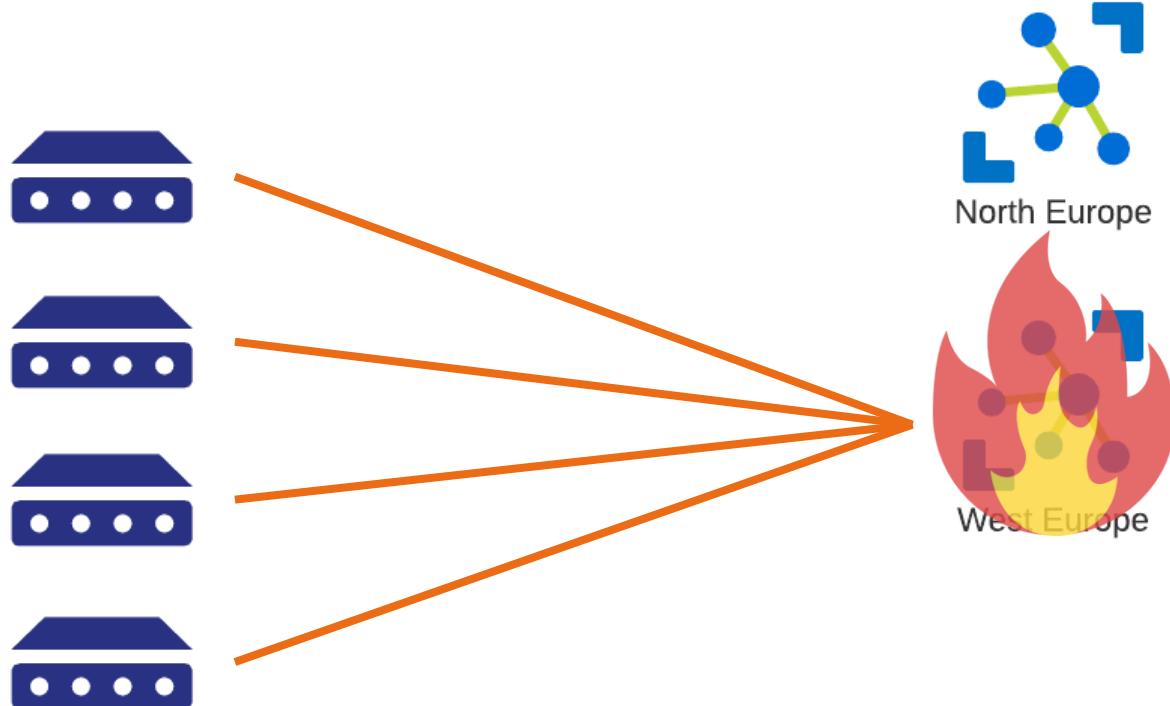
- Not a generic MQTT broker
- Pretty dashboards
- Anything other than MQTT, AMQP or HTTPS
- Doesn't go beyond 3,000,000,000 messages per day 😞



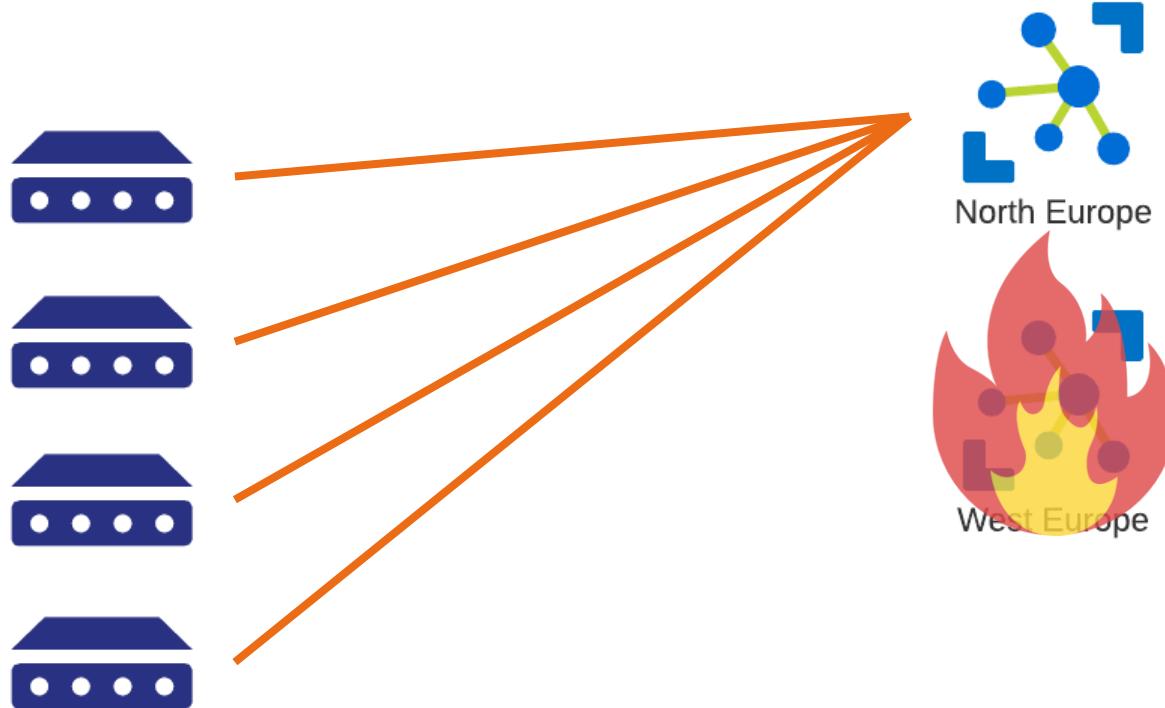


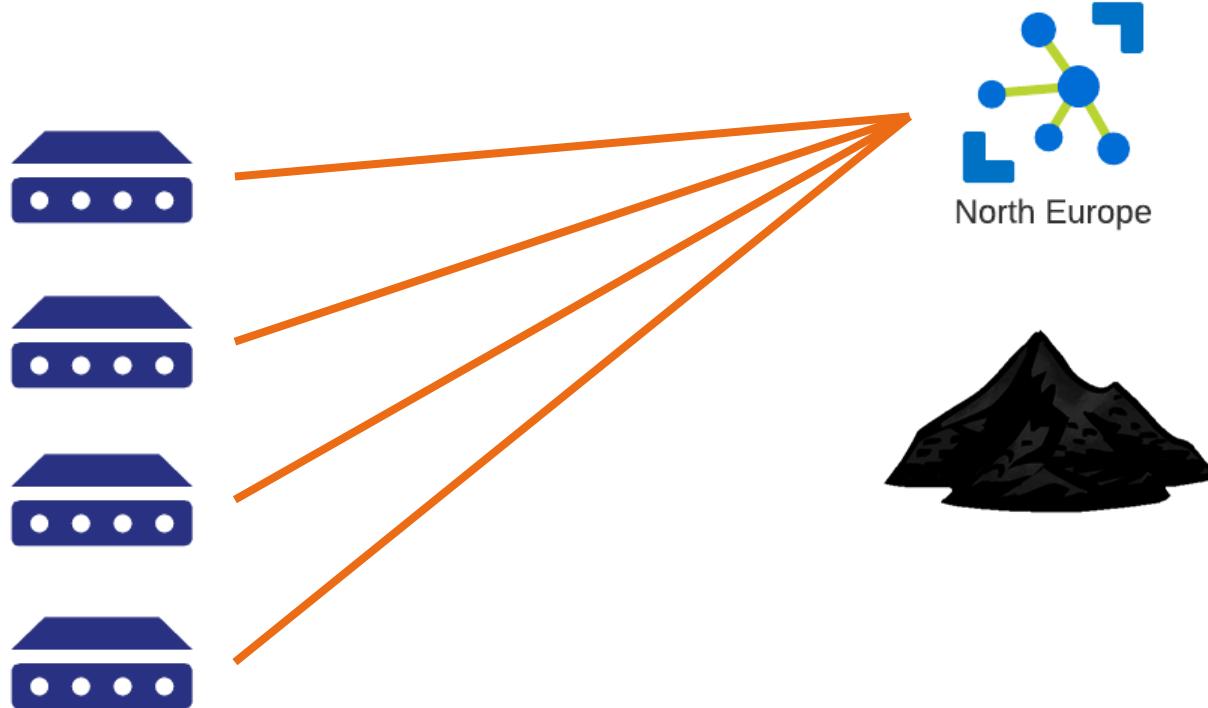


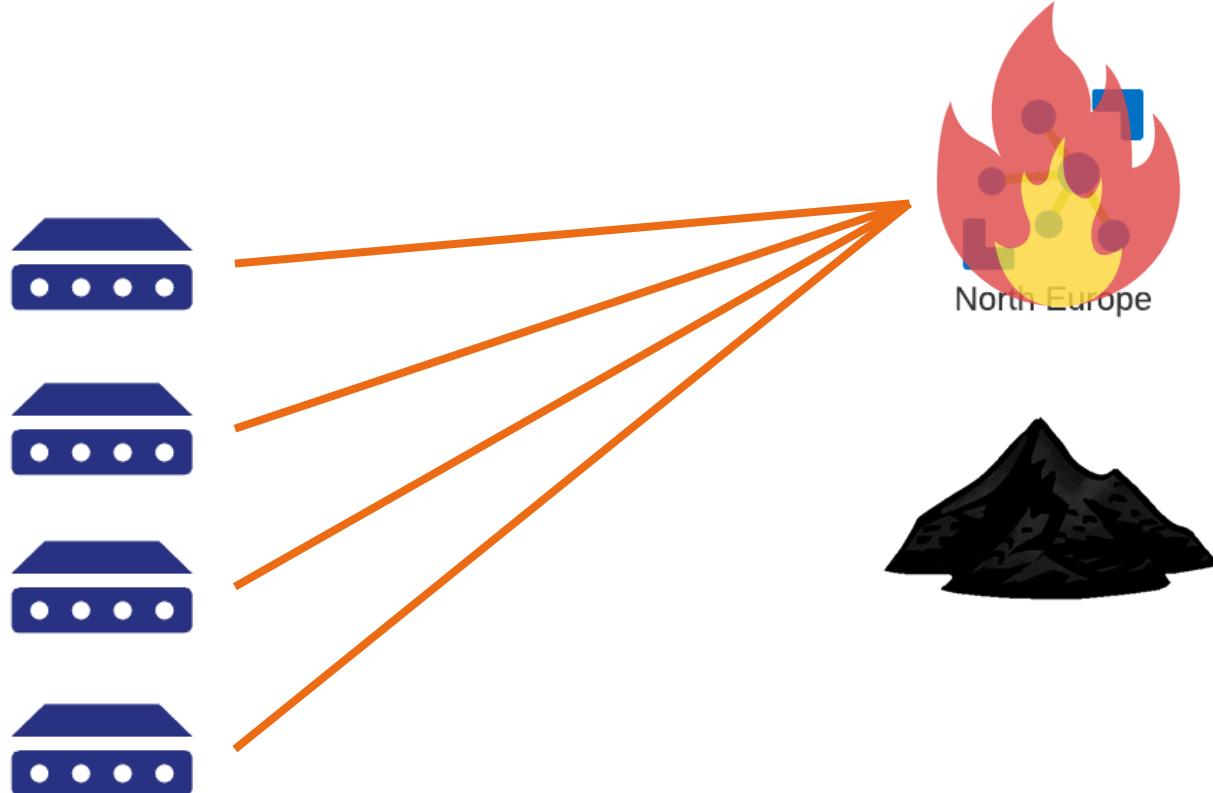
**Manual
Failover!**



**Manual
Failover!**

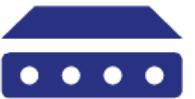


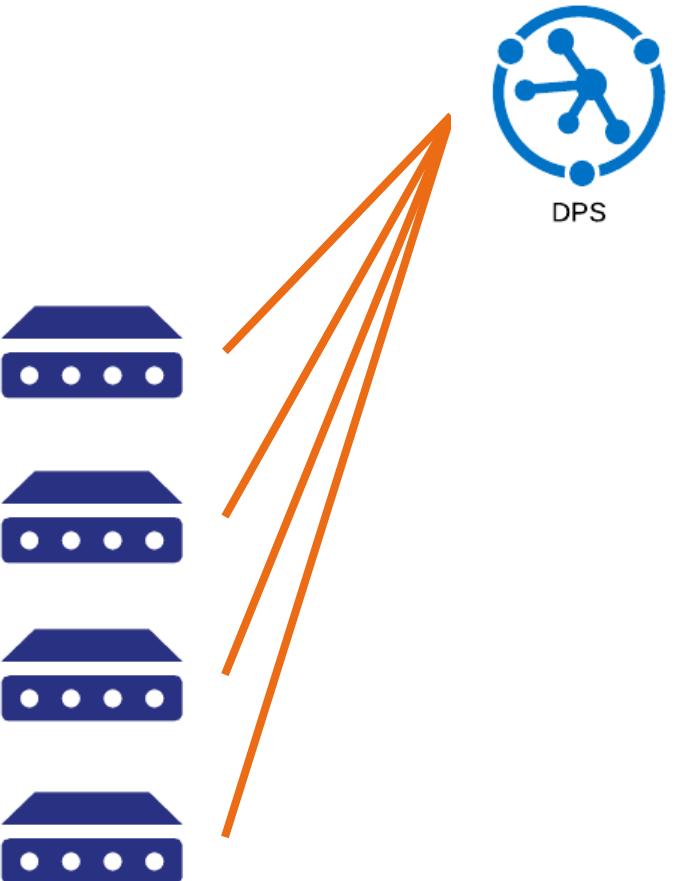


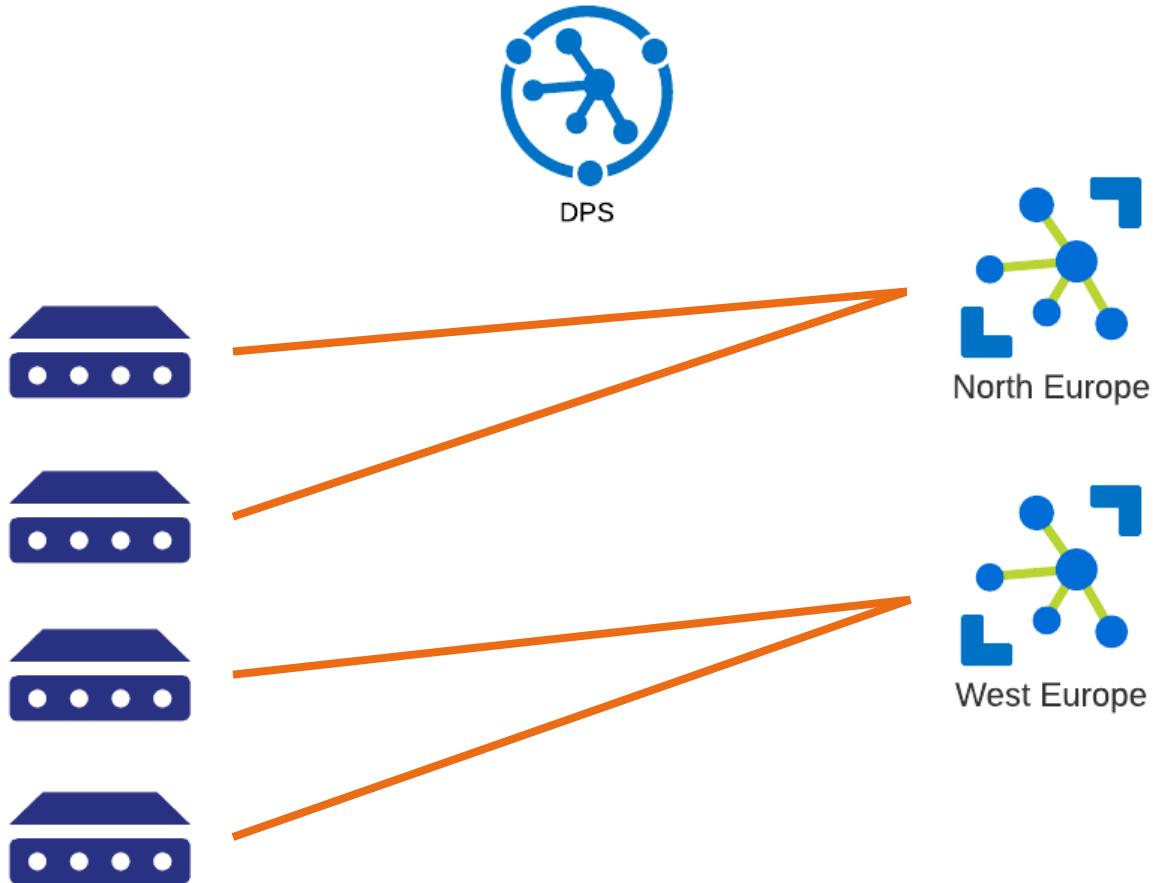


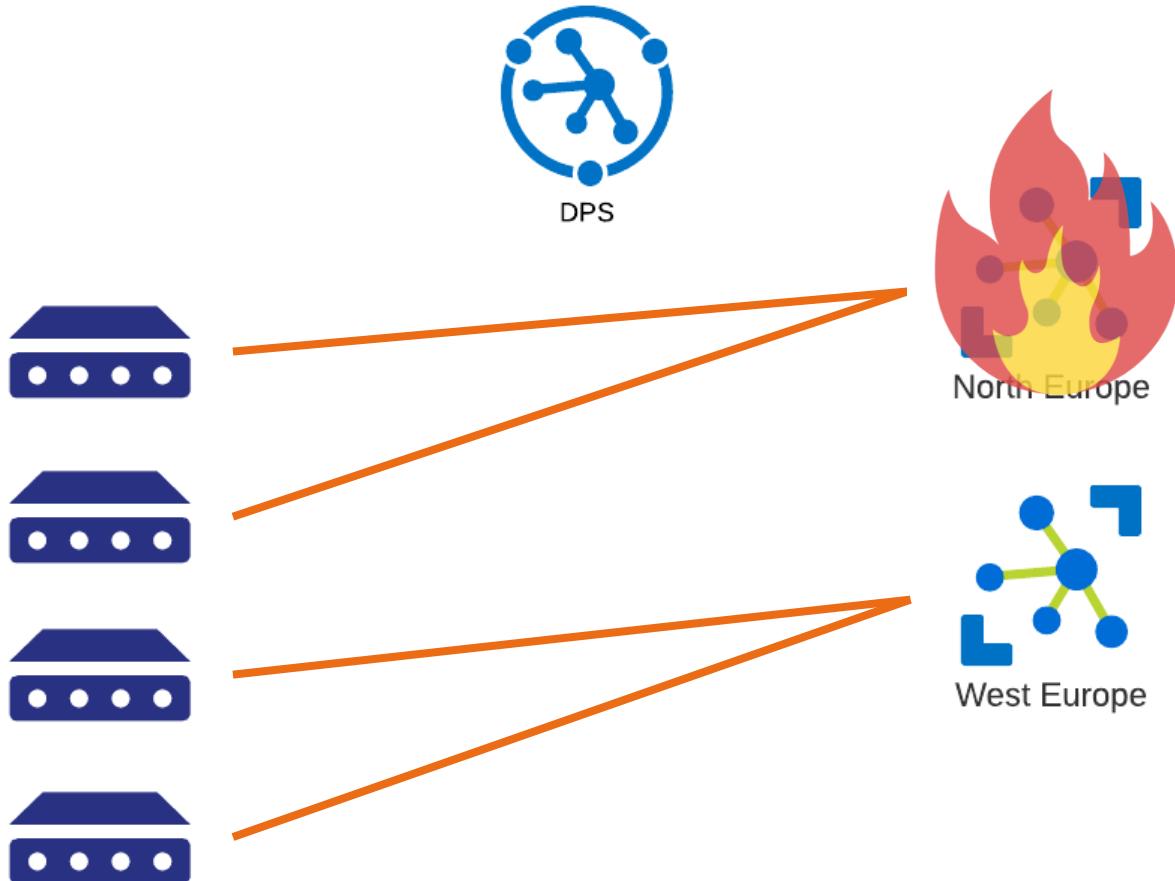


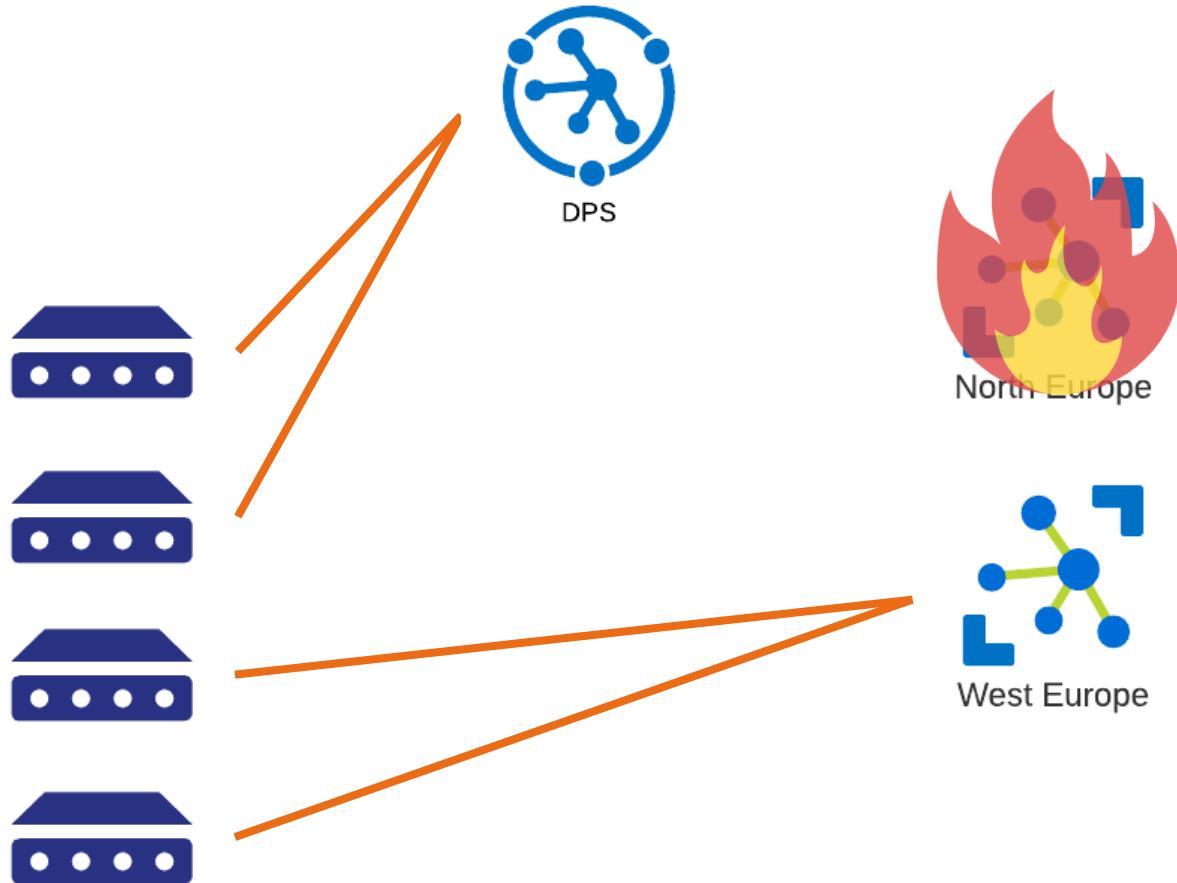
Device Provisioning Service

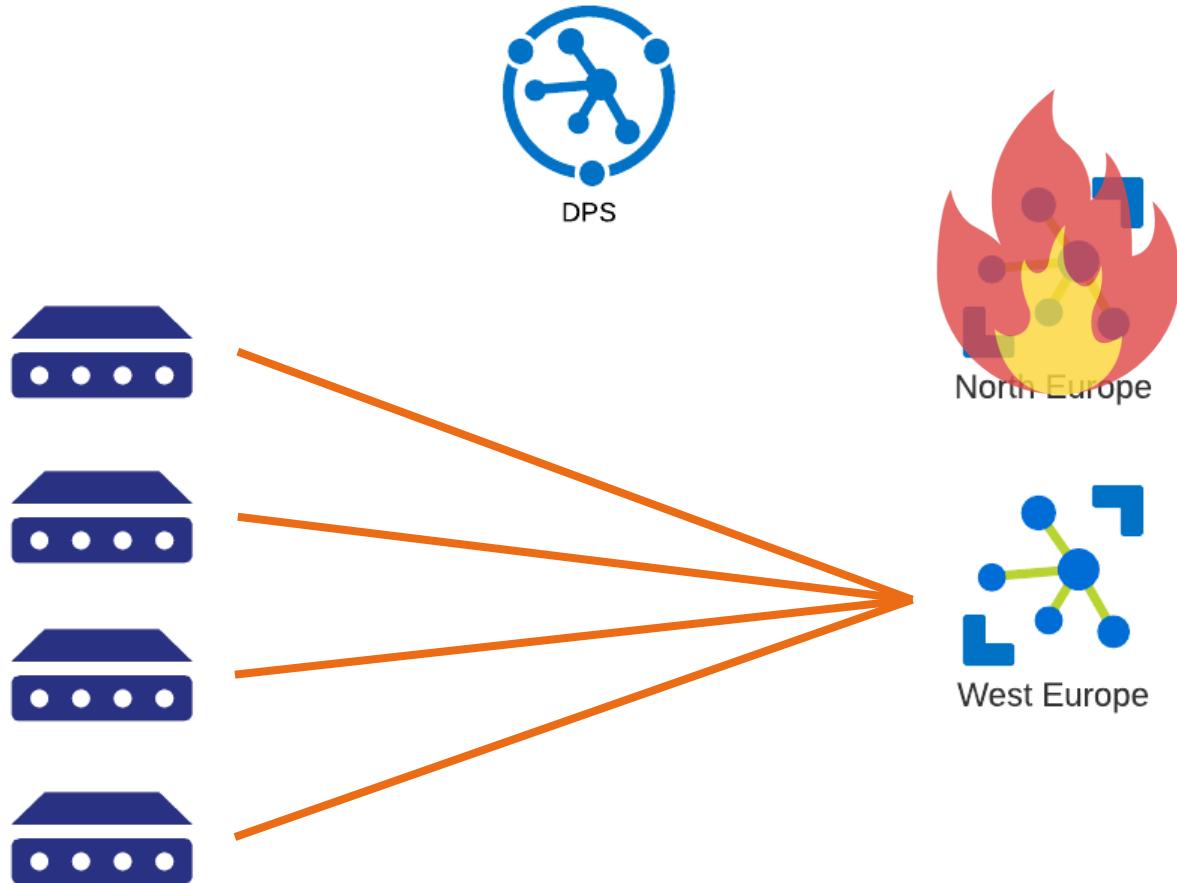












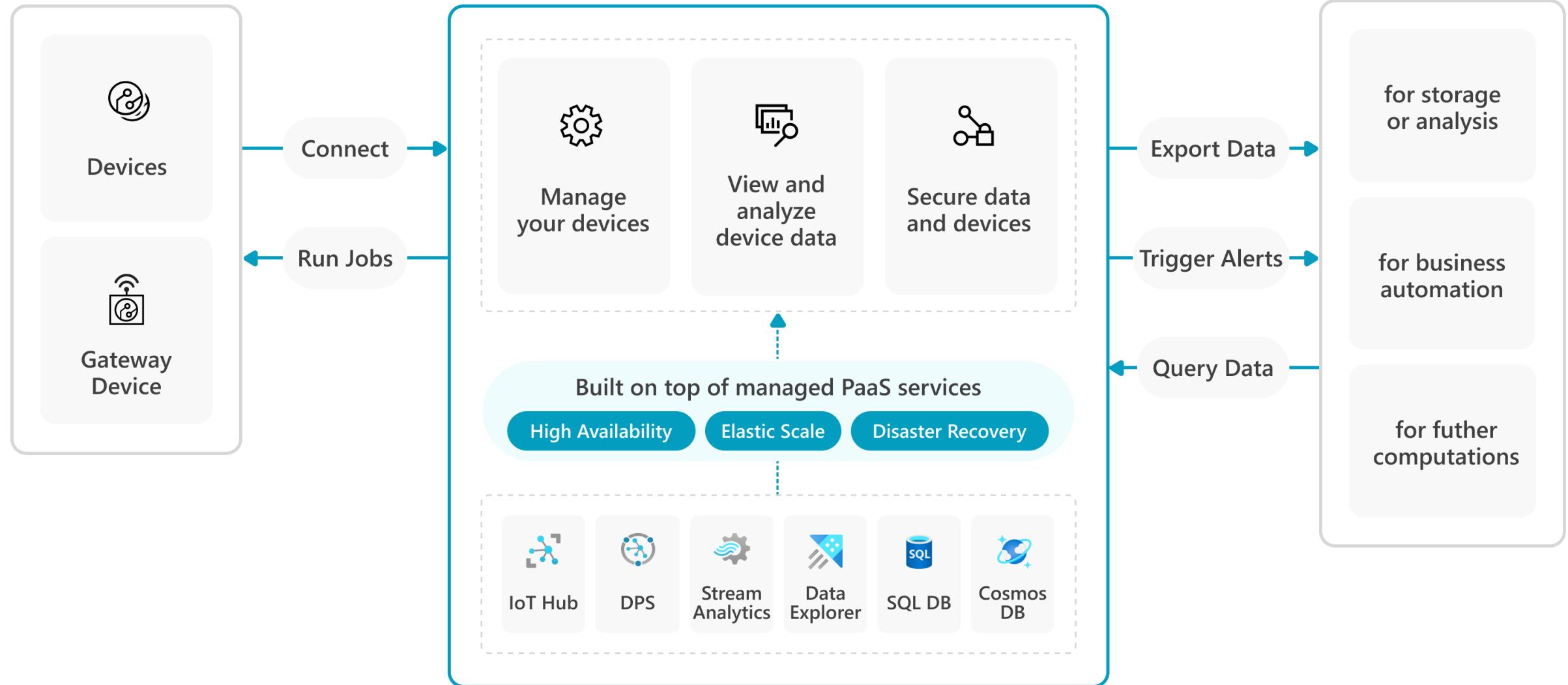


Azure IoT Central

Things

IoT Central a ready-made environment for IoT solution development

Business Insights





Connect

Devices

Device groups

Device templates

Analyze

Data explorer

Dashboards

Manage

Jobs

Extend

Rules

Data export

Security

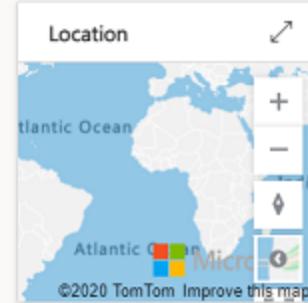
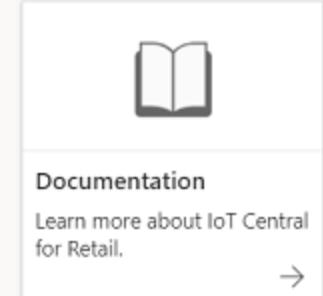
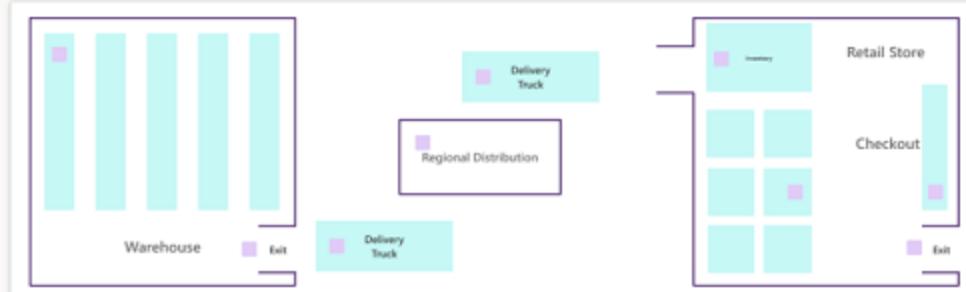
Permissions

Settings

New dashboard Edit Delete Copy

Dashboard settings

Northwind Traders inventory management dashboard



Last Reported
10/12/202... read only de...

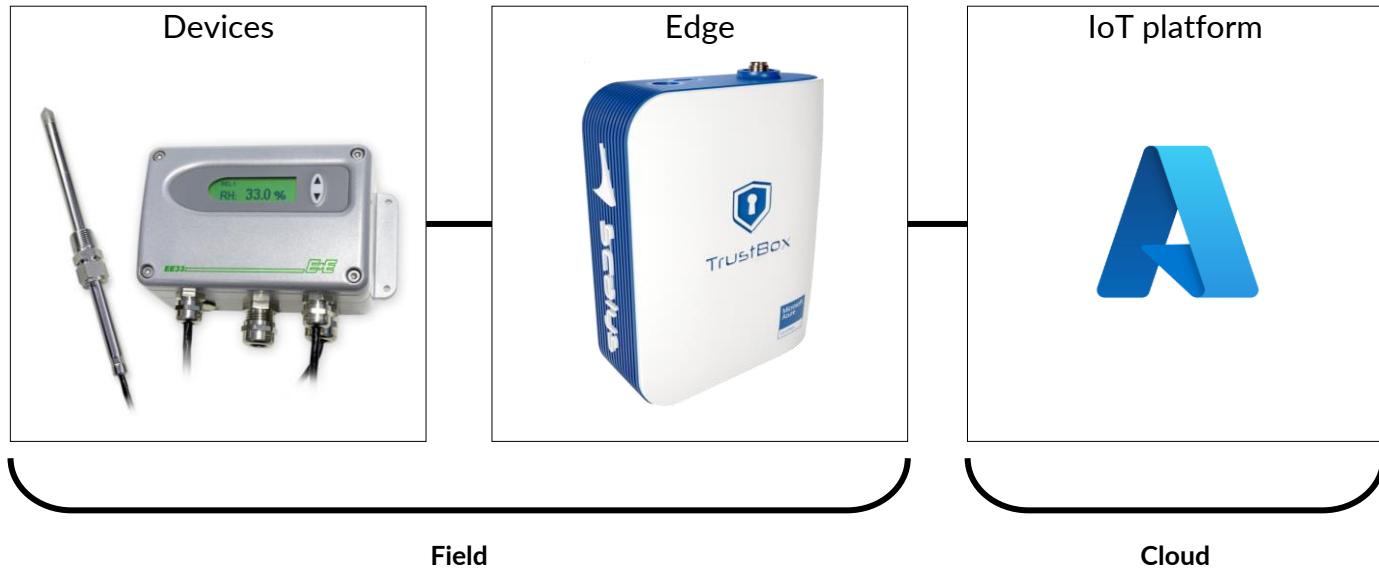


.NET NANOFRAMEWORK

Making it easy to write C# code for embedded systems.

.NET
nanoFramework

Devices, Edge Computing & the cloud



Limited hardware
(MCU or CPU)

Real-Time or
general OS

More powerful
hardware (CPU)

Typically
containerized

“Unlimited” power

Field deployed devices: a Microsoft view

Azure Sphere

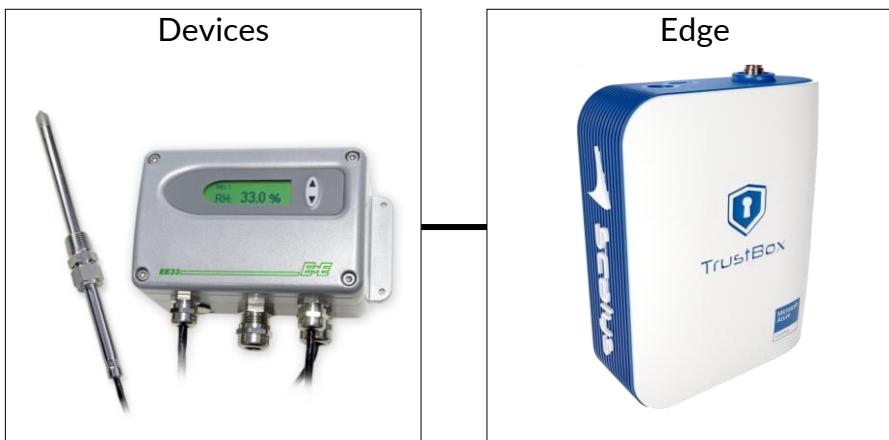
- > Specific hardware
- > Real-time & regular OS

.NET IoT

- > Raspberry Pi-like hardware
- > .NET libraries

nanoFramework

- > Fork of .NET micro framework
- > .NET libraries



Azure IoT Edge

- > Containers by design
- > On Linux or in VM
- > UI takes work

Windows IoT Enterprise

- > Basically kiosk mode

nanoFramework overview

Limited hardware

256 kB flash, 64 kB RAM, ARM Cortex-M, ESP32

Supports interconnects

GPIO, UART, USB, I2C, networking, etc.

Energy efficient operation

Including deep sleep support

Supports interop

Managed (C#) and native (C/C++) code

Subset of .NET BCL & reduced CLR

Familiar IDEs

With first-class debugging experience

