



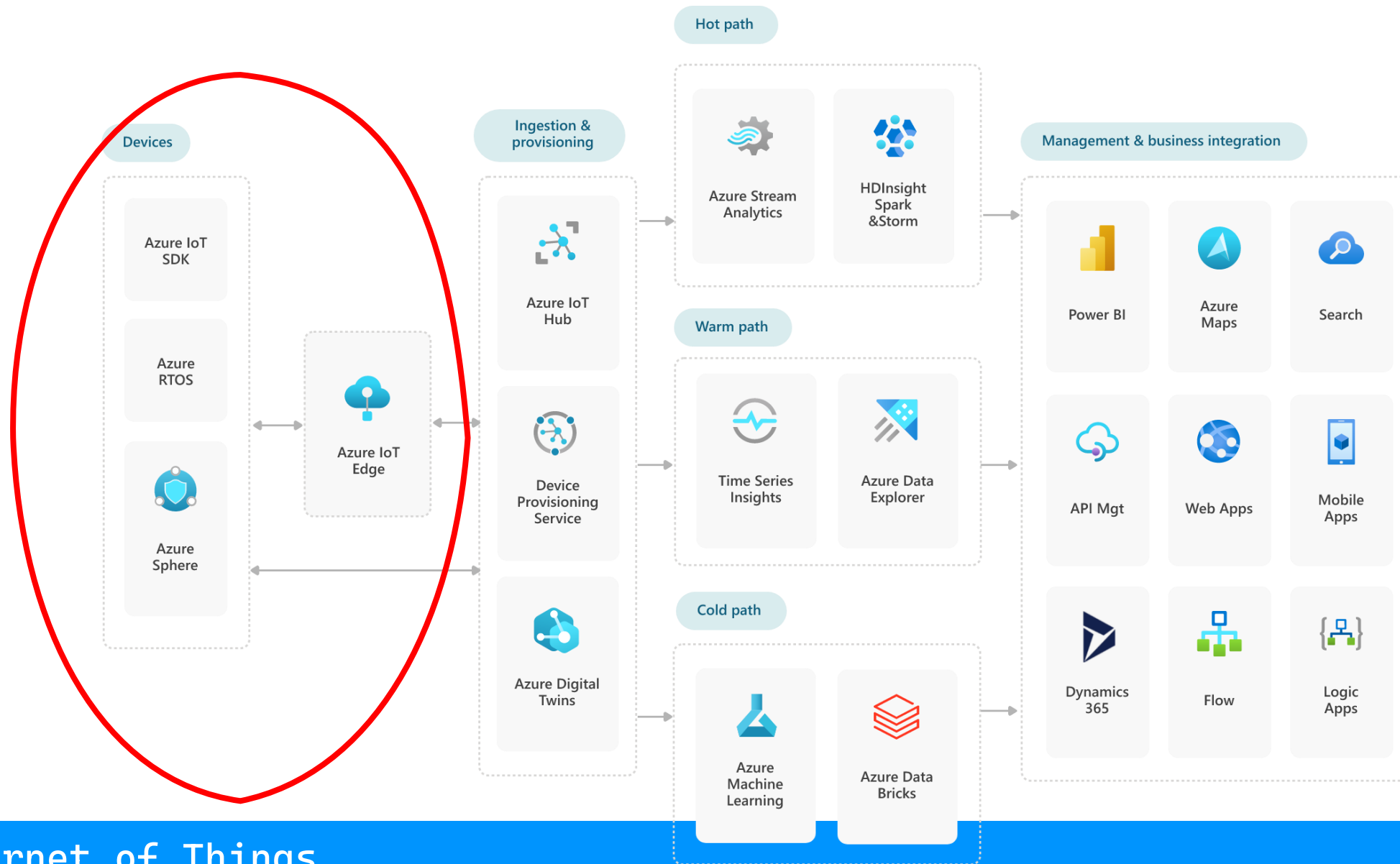
Internet of Things

After Hour 2021

50 sfumature (o meno) di THINGS!!!



Azure IoT Reference architecture



Azure SDK

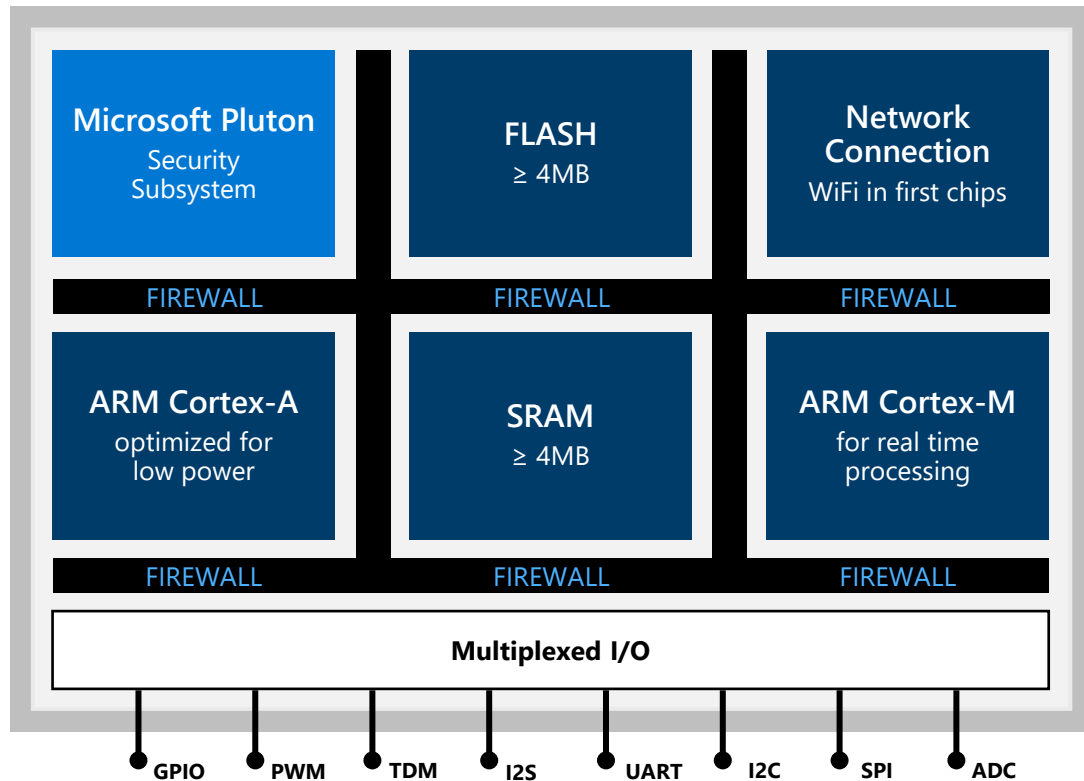
- Device SDK (General Purpose MPU, large compute and memory)
 - Azure IoT SDK for C
 - Azure IoT SDK for Python
 - Azure IoT SDK for Node.js
 - Azure IoT SDK for Java
 - Azure IoT SDK for .NET
- Embedded Device SDK (Special purpose MCU, limited compute and memory)
 - Azure RTOS Middleware
 - FreeRTOS Middleware
 - Azure SDK for Embedded C

Microsoft ecosystem

	Azure RTOS	Azure Sphere	Azure IoT Edge	Windows for IOT
Product/Components	Real-time OS, middleware & Windows tools	Silicon chips, OS, & cloud security service	A fully managed runtime service with cloud interface through Azure IoT Hub	Full-featured OS offerings
Headline	Small memory footprint for resource constrained devices. Hard real time processing (Sub-microsecond interrupt response). Inexpensive. Deployed to billions of devices.	Fairly small memory footprint. Meets the 7 properties of highly secured devices and supports a secured root of trust. Ongoing servicing for updates to keep devices secure.	Deploy your cloud workloads—artificial intelligence, Azure and third-party services, or your own business logic—to run on edge devices via standard containers.	Windows for specific-use (dedicated), embedded devices where a full feature set or GUI is required for complex scenarios. More than 1B Windows 10 devices deployed.
Primary Target Audience	Semiconductor companies of 32-bit parts as well as original equipment manufacturers (OEMs) and SOC suppliers	Greenfield manufacturers (or OEMs) who build new MCU-class connected devices Organizations who want to securely connect existing (brownfield) equipment	Intelligent edge devices needing to run containers locally and eventually coordinate through Azure IoT Hub.	OEMs/ODMs building specific/dedicated use devices with long lifecycles
Typical use case	Low cost, resource-constrained devices requiring reliably fast performance	Highly-secured, Internet-connected microcontroller (MCU) devices	Low latency required to determine alerts/actions on-premises OR enabling intelligence at the edge when devices may be disconnected.	Connected or unconnected devices which may have a rich GUI experience and require a higher level of processing power
Requires Cloud connection?	No	Yes	Yes (not constant)	No
Azure Connectivity*	Azure RTOS ships with an Azure Security Center for IoT security module that covers threats and vulnerabilities on real-time operating system devices.	Azure Sphere only natively connects to AS3 security service (no different to Windows getting an update).	Cloud interface through IoT Hub	Windows 10 IoT includes an IoT Device Agent, etc.

*Applications may also connect to Azure. For example, an application running on Azure Sphere can make it's own connection to it's own Azure IoT Hub.

Azure Sphere certified SOC's create a secured root of trust for connected, intelligence edge devices



Connected
with built-in networking

Secured
with built-in Microsoft silicon security technology including the Pluton Security Subsystem

Crossover
Cortex-A processing power brought to MCUs and crossover SOC's for the first time

Azure RTOS system components

Every Azure RTOS component is fully connected, easy to use—and helps developers get to market faster.



Azure RTOS ThreadX

A high-performance real-time operating system



Azure RTOS NetX and NetX Duo

A TCP/IP IPv4/IPv6 embedded network stack that includes cloud connectivity and IPsec and TLS/DTLS security protocols



Azure RTOS FileX

An embedded FAT file system that offers optional fault tolerant features



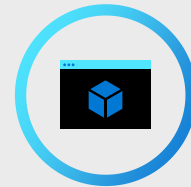
Azure RTOS GUIX Studio and GUIX

A complete design environment and run-time to create and maintain 2D graphical user interfaces



Azure RTOS USBX

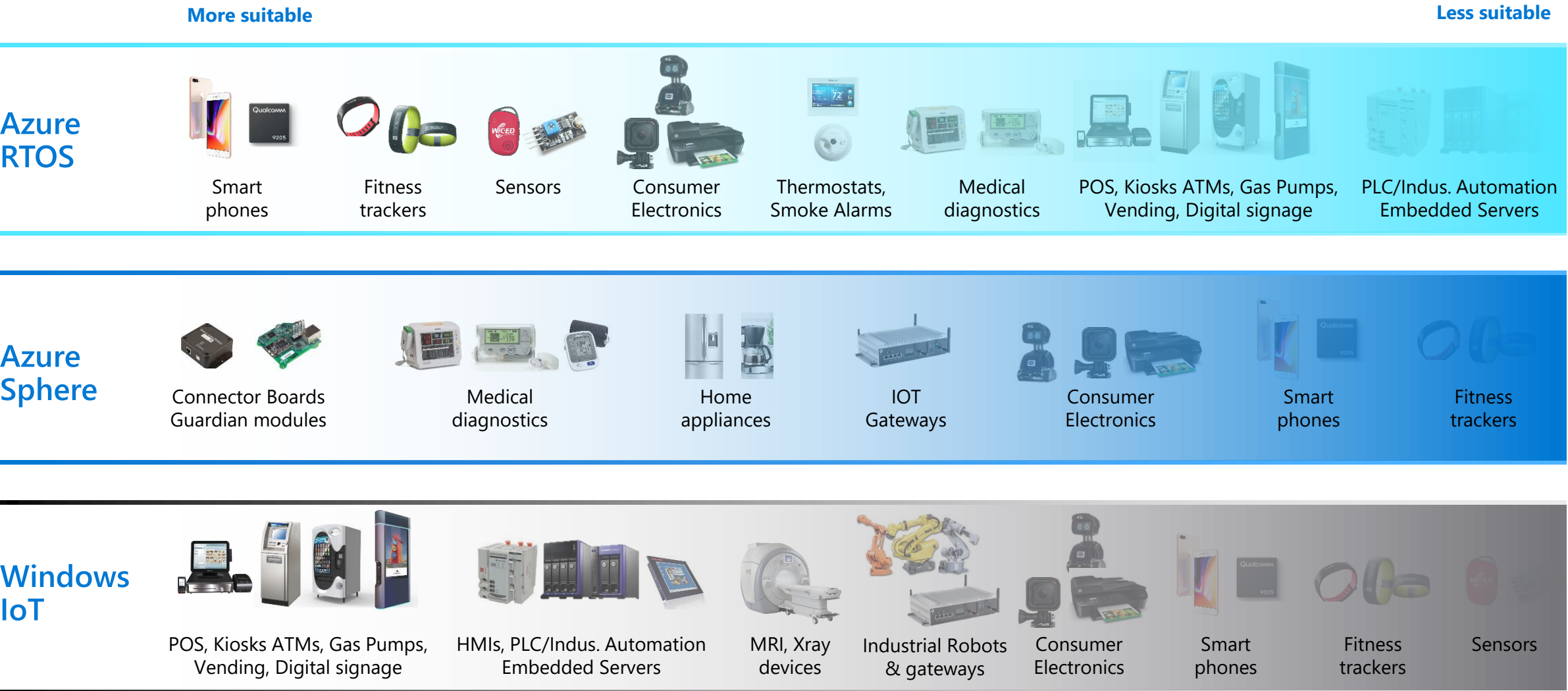
A USB stack that provides host, device, and on-the-go support



Azure RTOS TraceX

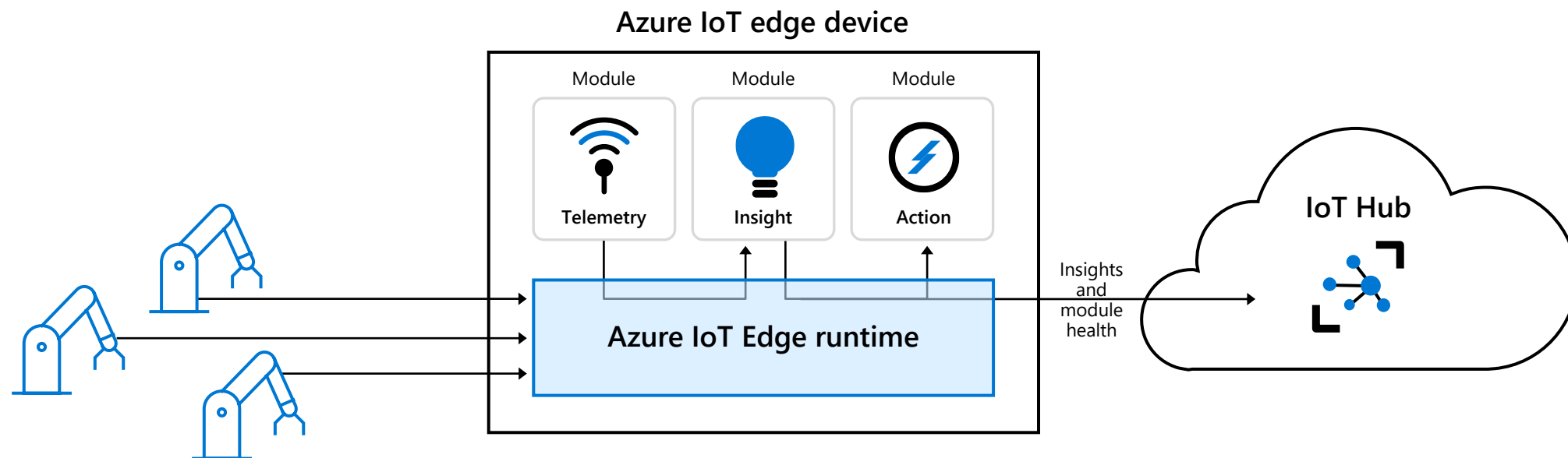
A graphical view of real-time events to help you analyze system-level behavior for problem solving and tuning

Understanding when to use what



Azure IoT Edge

Extend cloud intelligence to IoT devices



IoT Edge modules

Docker compatible containers, to execute business logic at the edge

- Containers that run Azure services, third-party services, or custom code.
- Deployed to IoT Edge devices and execute locally on those devices.
- Can communicate with each other, creating a pipeline of data processing.

IoT Edge runtime

Enables custom and cloud logic on IoT Edge devices

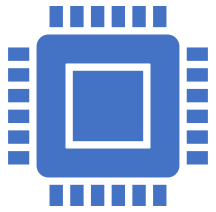
- Installs and update workloads on the device.
- Maintains Azure IoT Edge security standards on the device.
- Ensures that IoT Edge modules are always running.
- Reports module health to the cloud for remote monitoring.
- Manages communication between downstream leaf devices and an IoT Edge device, between modules on an IoT Edge device, and between an IoT Edge device and the cloud.

IoT Edge cloud interface

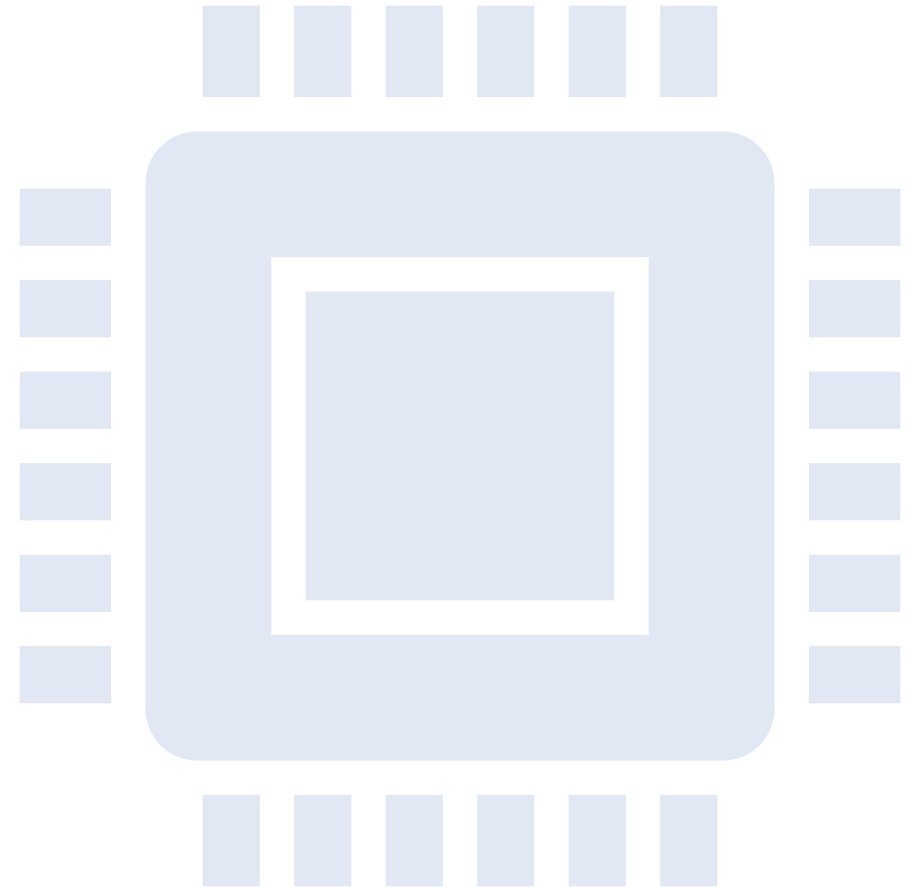
Enables remote monitoring and management

- Create and configure a workload to be run on a specific type of device.
- Send a workload to a set of devices.
- Monitor workloads running on devices in the field.

Other ecosystem



- FreeRTOS
- Mbed
- Arduino (e varianti)
- .NET NanoFramework
- Meadow Board
- ???



References

- [Overview of Azure IoT device SDK options | Microsoft Docs](#)
- [Send device telemetry to Azure IoT Hub quickstart | Microsoft Docs](#)
- [.NET nanoFramework \(github.com\)](#)
- [Developers \(wildernesslabs.co\)](#)
- [Azure/azure-iot-middleware-freertos: Azure IoT Middleware for FreeRTOS \(github.com\)](#)
- [ARMmbed/mbed-client-for-azure: Azure IoT Device SDK port for Mbed OS \(github.com\)](#)
- [microsoft/IoT-For-Beginners: 12 Weeks, 24 Lessons, IoT for All! \(github.com\)](#)

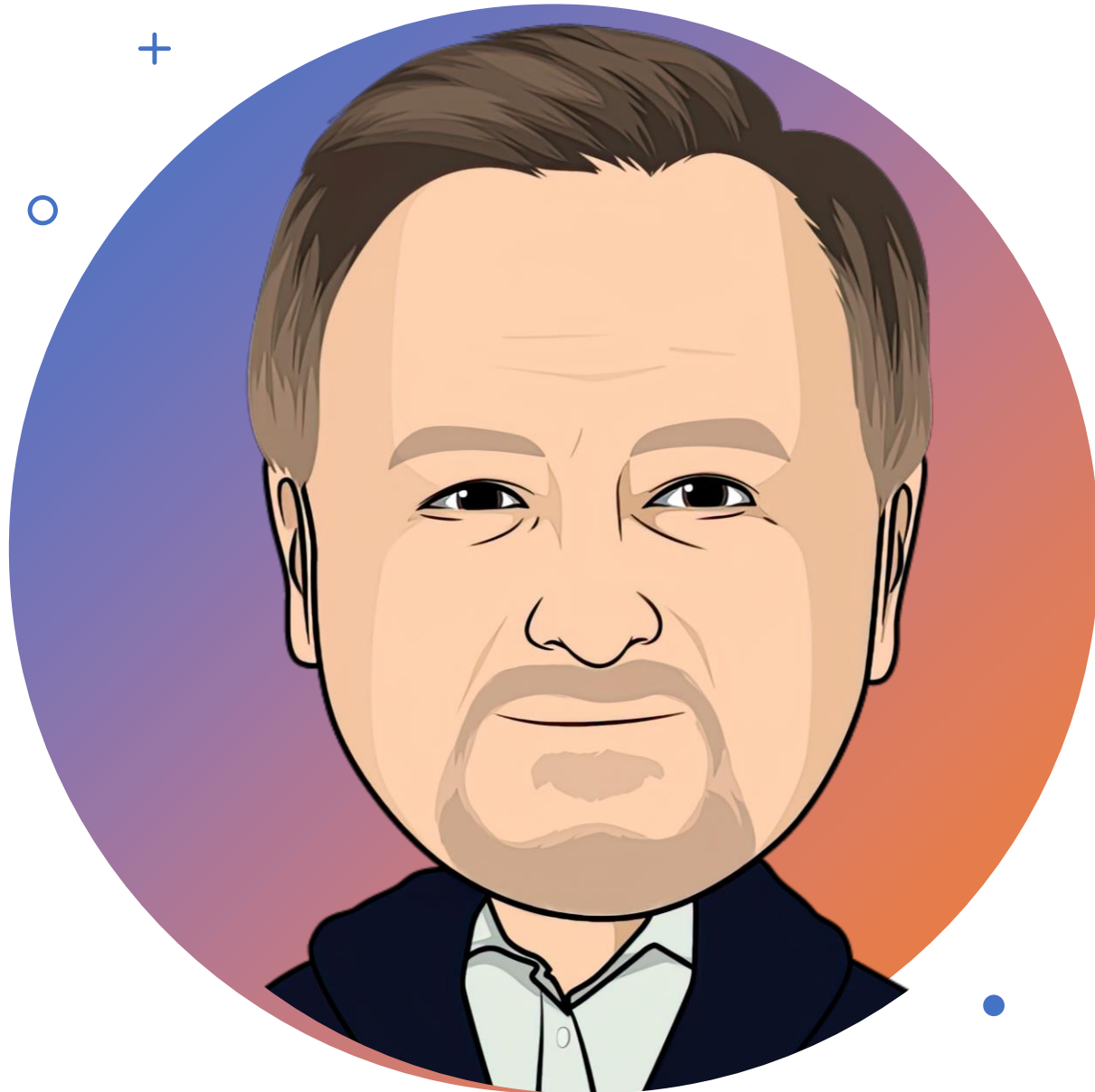


Questions?



Thanks





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