#ScottishSummit2022

50 shades (or less) of THINGS!!!

Marco Dal Pino

Microsoft

SCOTTISH SUMMIT

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integrate your data

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Incremental
Part of Telefónica Tech

Data Quality	Event Lunch	Accessibility	Data Analytics
DQ GLOBAL DRIVING DATA QUALITY	Atech Technology Transformed	tisski	SquaredUp

Speaker Bio

ModApp Consultant
Microsoft

- 30+ years in IT (Developer, Consultant, PM, Trainer)
- Speaker, Community addicted
- IoT Influencer

https://www.linkedin.com/in/marcodalpino
https://about.me/marcodalpino
https://twitter.com/marcodalpino
info@contoso.blog
https://www.twitch.tv/dpcons

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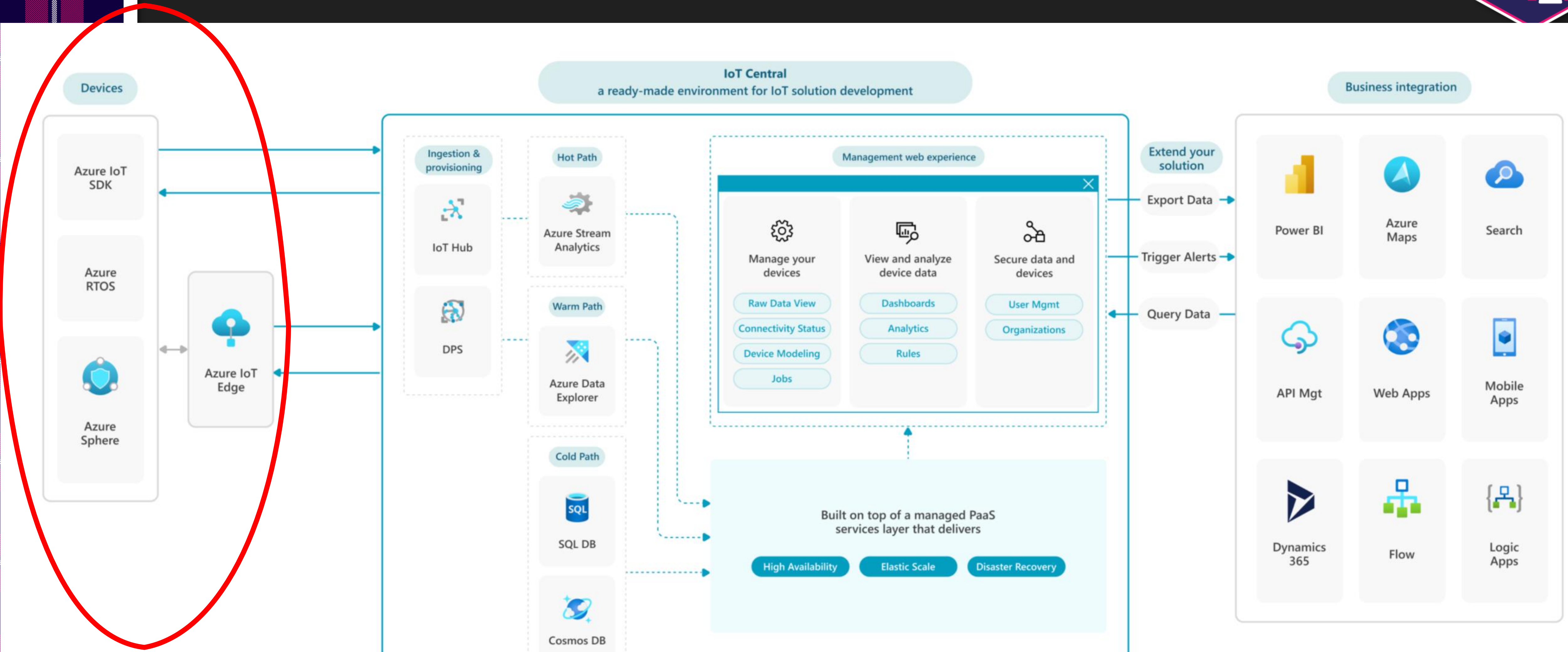
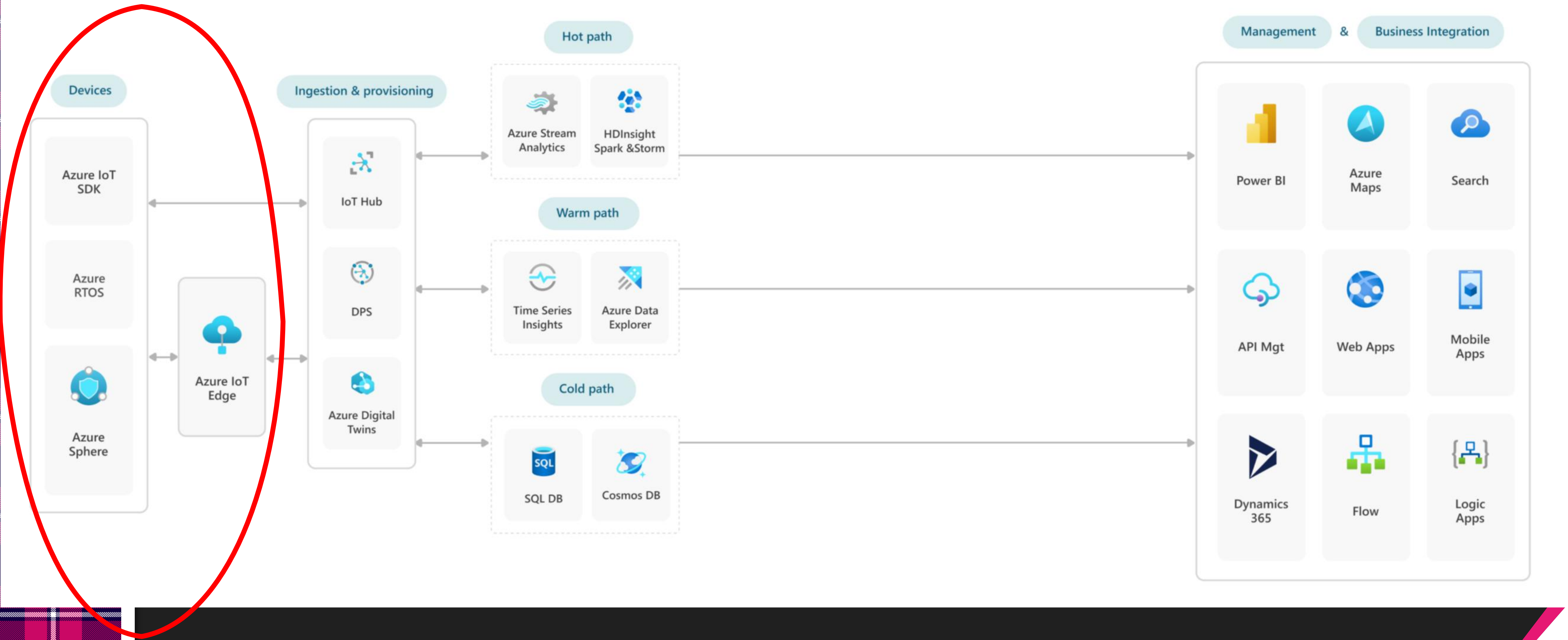
IoT Architecture (Azure IoT Central - aPaaS)


Devices
Azure IoT SDK
Azure RTOS
Azure Sphere
Azure IoT Edge
IoT Central
a ready-made environment for IoT solution development
Ingestion & provisioning
IoT Hub
DPS
Hot Path
Azure Stream Analytics
Warm Path
Azure Data Explorer
Cold Path
SQL DB
Cosmos DB
Management web experience
Manage your devices
Raw Data View
Connectivity Status
Device Modeling
Jobs
View and analyze device data
Dashboards
Analytics
Rules
Secure data and devices
User Mgmt
Organizations
Built on top of a managed PaaS services layer that delivers
High Availability
Elastic Scale
Disaster Recovery
Extend your solution
Export Data
Trigger Alerts
Query Data
Business integration
Power BI
Azure Maps
Search
API Mgt
Web Apps
Mobile Apps
Dynamics 365
Flow
Logic Apps

IoT Architecture (Azure IoT Hub - PaaS)

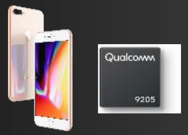

Devices
Azure IoT SDK
Azure RTOS
Azure Sphere
Azure IoT Edge
Ingestion & provisioning
IoT Hub
DPS
Azure Digital Twins
Hot path
Azure Stream Analytics
HDInsight Spark &Storm
Warm path
Time Series Insights
Azure Data Explorer
Cold path
SQL DB
Cosmos DB
Management
&
Business Integration
Power BI
Azure Maps
Search
API Mgt
Web Apps
Mobile Apps
Dynamics 365
Flow
Logic Apps

Market and applications

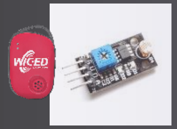
More suitable

Less suitable

Azure RTOS


Smart phones

Fitness trackers


Sensors

Consumer Electronics

Thermostats, Smoke Alarms

Medical diagnostics

POS, Kiosks ATMs, Gas Pumps, Vending, Digital signage

PLC/Indus. Automation Embedded Servers

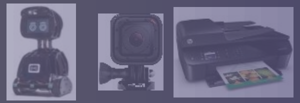
Azure Sphere

Connector Boards Guardian modules

Medical diagnostics

Home appliances

IOT Gateways


Consumer Electronics

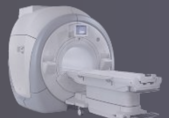
Smart phones

Fitness trackers

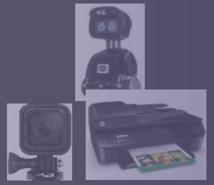
Windows IoT

POS, Kiosks ATMs, Gas Pumps, Vending, Digital signage

HMIs, PLC/Indus. Automation Embedded Servers


MRI, Xray devices

Industrial Robots & gateways


Consumer Electronics

Smart phones

Fitness trackers

Sensors

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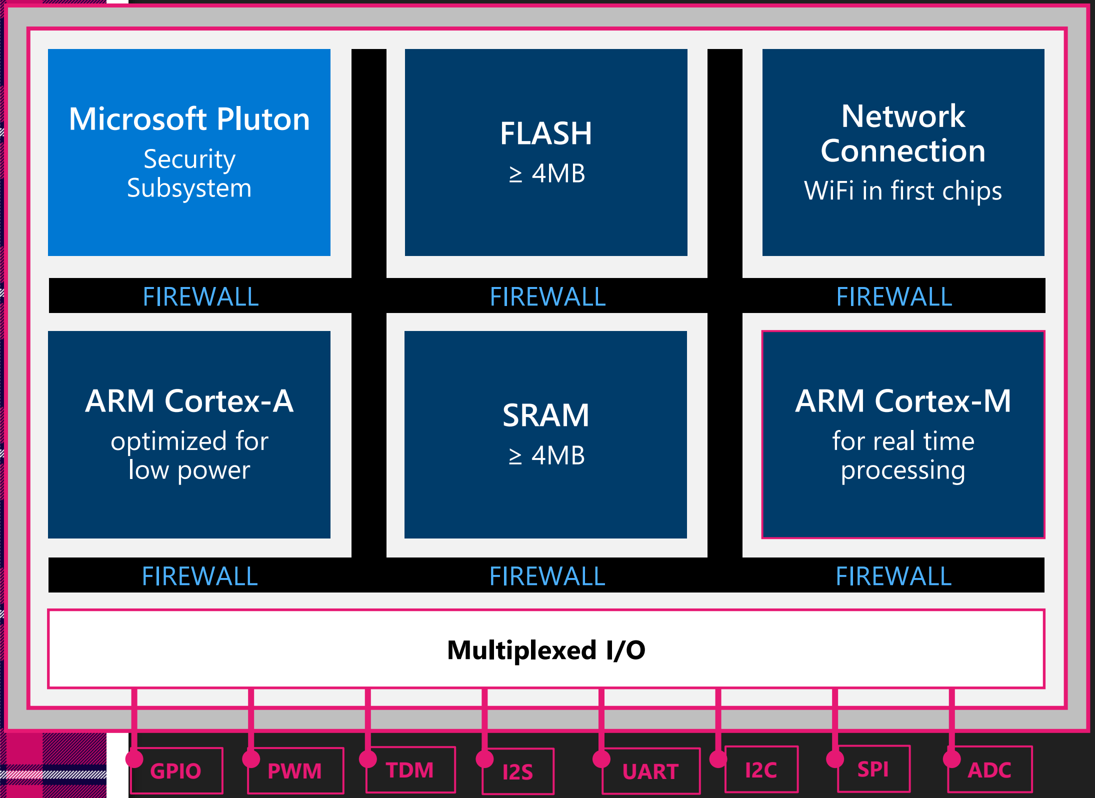
Azure

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 SOCs create a secured root of trust for connected, intelligence edge devices


Microsoft Pluton
Security Subsystem
FLASH
≥ 4MB
Network Connection
WiFi in first chips
FIREWALL
FIREWALL
FIREWALL
ARM Cortex-A
optimized for low power
SRAM
≥ 4MB
ARM Cortex-M
for real time processing
FIREWALL
FIREWALL
FIREWALL
Multiplexed I/O
GPIO
PWM
TDM
I2S
UART
I2C
SPI
ADC

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 SOCs 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

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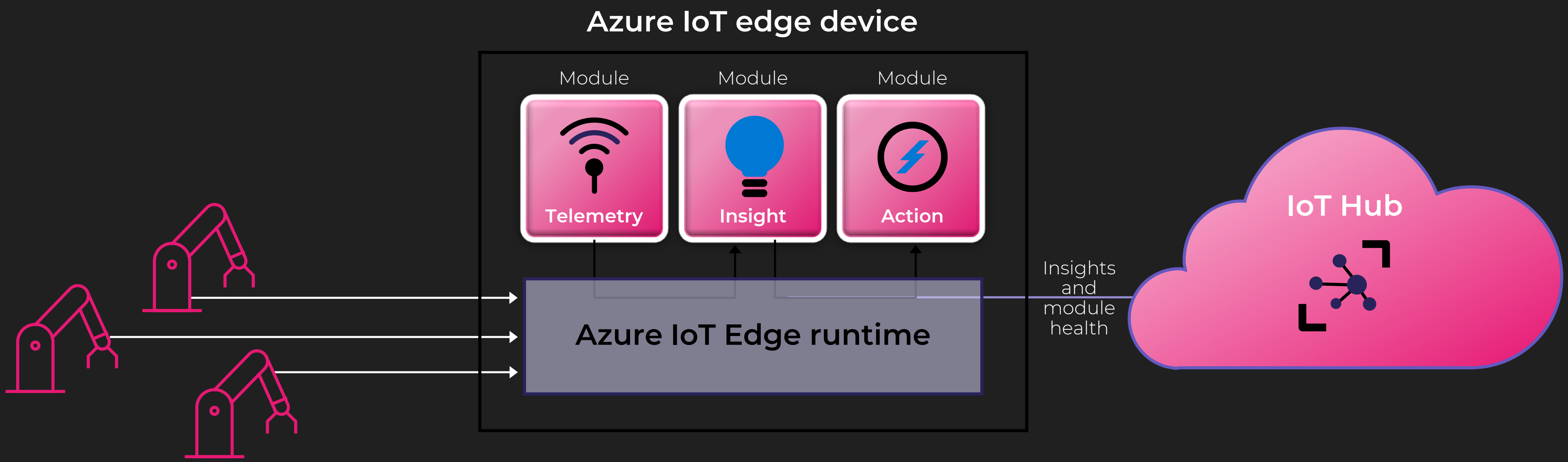
Azure IoT Edge

Extend cloud intelligence to IoT devices


Azure IoT edge device
Module
Module
Module
Telemetry
Insight
Action
Azure IoT Edge runtime
Insights and module health
IoT Hub

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.

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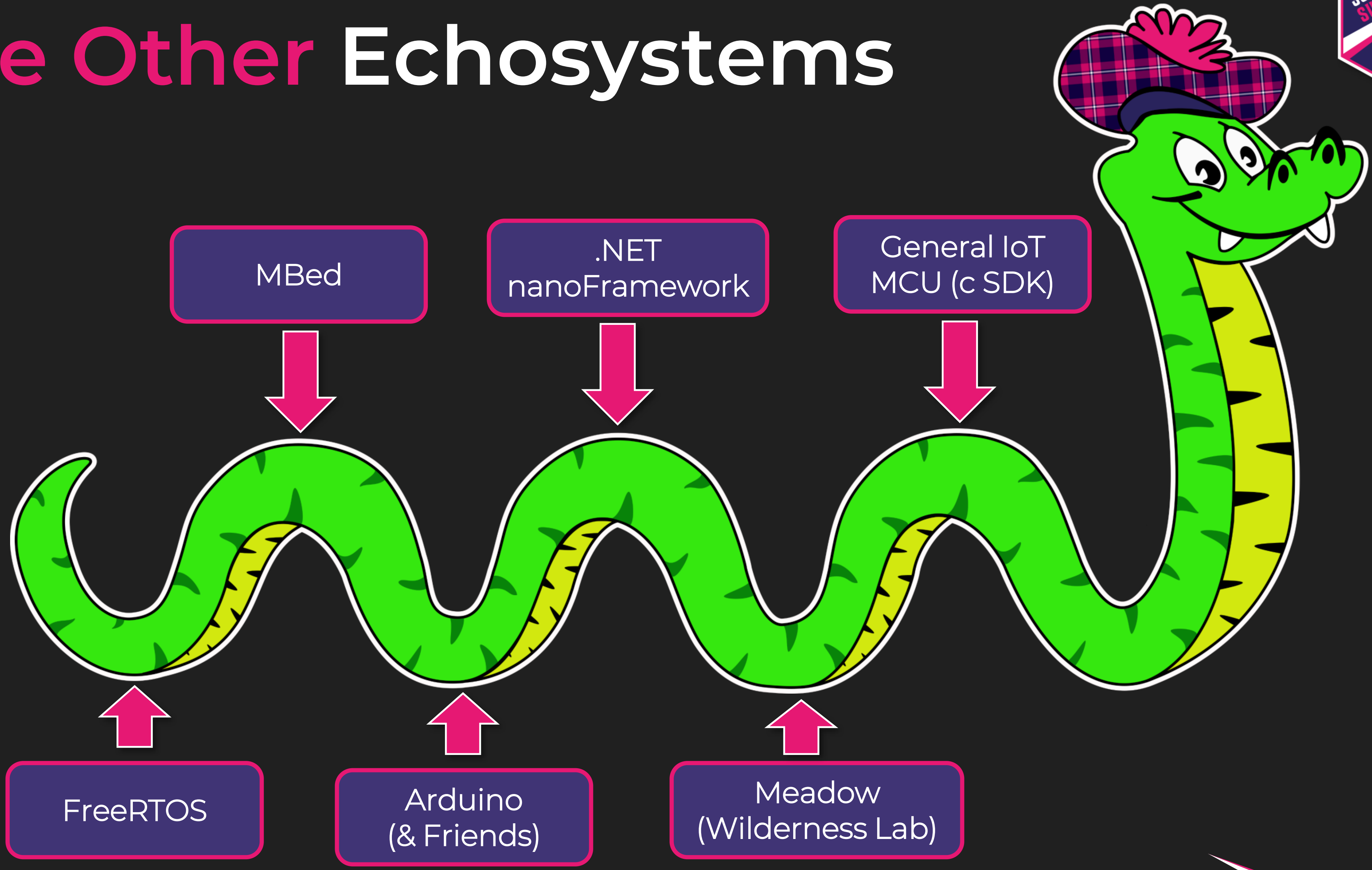
Other ecosystem

- FreeRTOS
- Mbed
- Arduino (& friends)
- .NET NanoFramework
- Meadow Board, WildernessLab (.NET on IoT device and Linux)

The Other Echosystems



FreeRTOS

MBed

Arduino
(& Friends)

.NET
nanoFramework

Meadow
(Wilderness Lab)

General IoT
MCU (c SDK)

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Azure SDK

- Device SDK (General Purpose MPU, large compute and memory)
  - 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 C
  - Azure SDK for Embedded C

Steps

- Device registration (on Azure)
- Connect device (using Connection String+SAS key (or certificate)
- Send/receive messages

Demo

References

Overview of Azure IoT device SDK options | Microsoft Docs

https://docs.microsoft.com/en-us/azure/iot-develop/about-iot-sdks#device-sdks

Send device telemetry to Azure IoT Hub quickstart | Microsoft Docs

https://docs.microsoft.com/en-us/azure/iot-develop/quickstart-send-telemetry-iot-hub?pivots=programming-language-ansi-c

.NET nanoFramework (github.com)

https://github.com/nanoframework

Meadow (wildernesslabs.co)

https://www.wildernesslabs.co/developers

Azure IoT Middleware for FreeRTOS

Azure/azure-iot-middleware-freertos: Azure IoT Middleware for FreeRTOS (github.com)

Azure IoT Device SDK port for Mbed OS

ARMmbed/mbed-client-for-azure: Azure IoT Device SDK port for Mbed OS (github.com)

IoT for Beginners - A Curriculum

microsoft/IoT-For-Beginners: 12 Weeks, 24 Lessons, IoT for All! (github.com)

Create a CA Certificate for Iot device

samples/create-certificate.md at main · dotnet/samples (github.com)

Microsoft IoT Developers – YouTube IoT Official Channel on Youtube

Azure MXChip IoT DevKit Get Started

https://docs.microsoft.com/en-us/samples/azure-samples/mxchip-iot-devkit-get-started/sample/

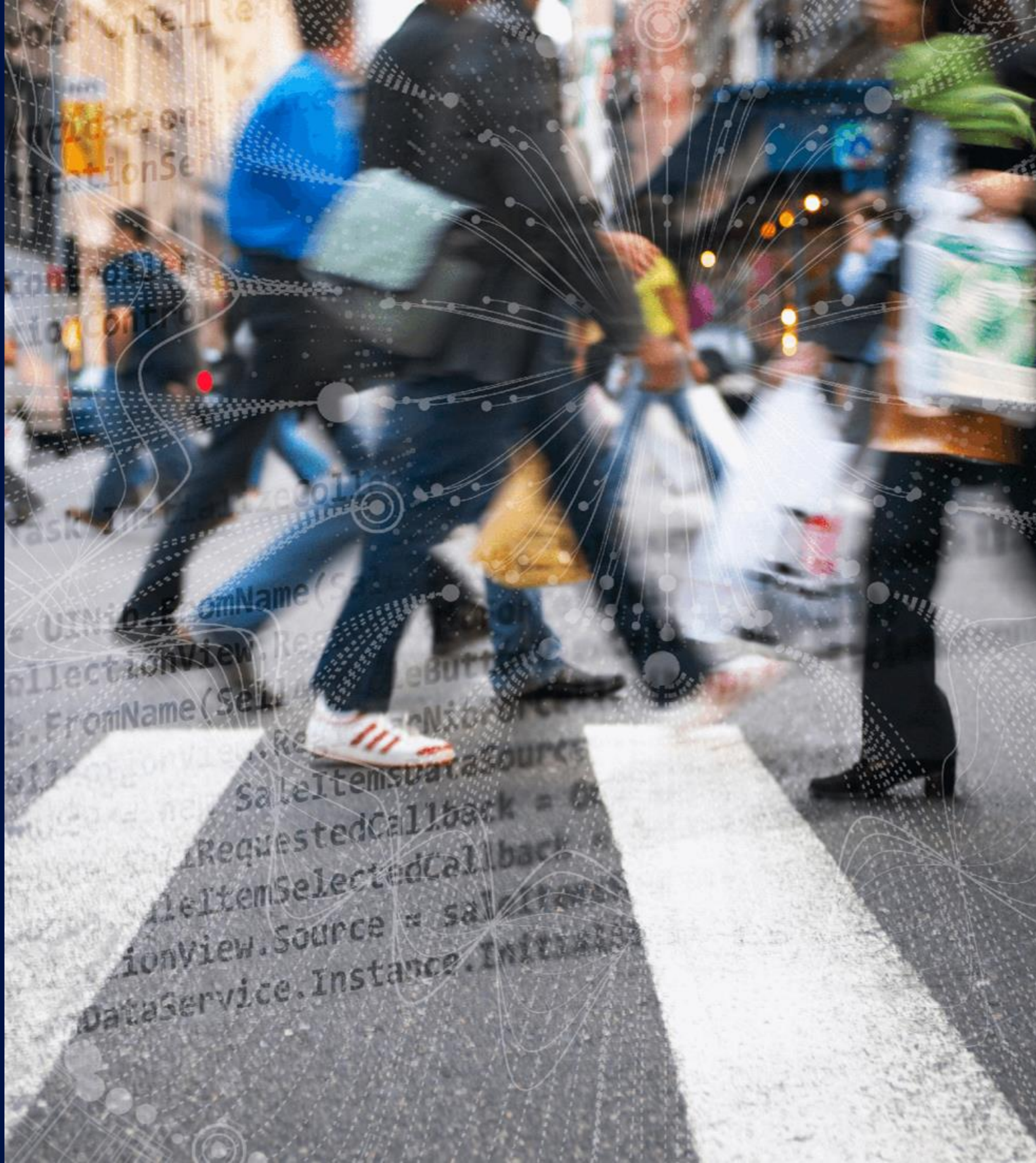
MXChip Azure IoT DevKit Repository

https://microsoft.github.io/azure-iot-developer-kit/

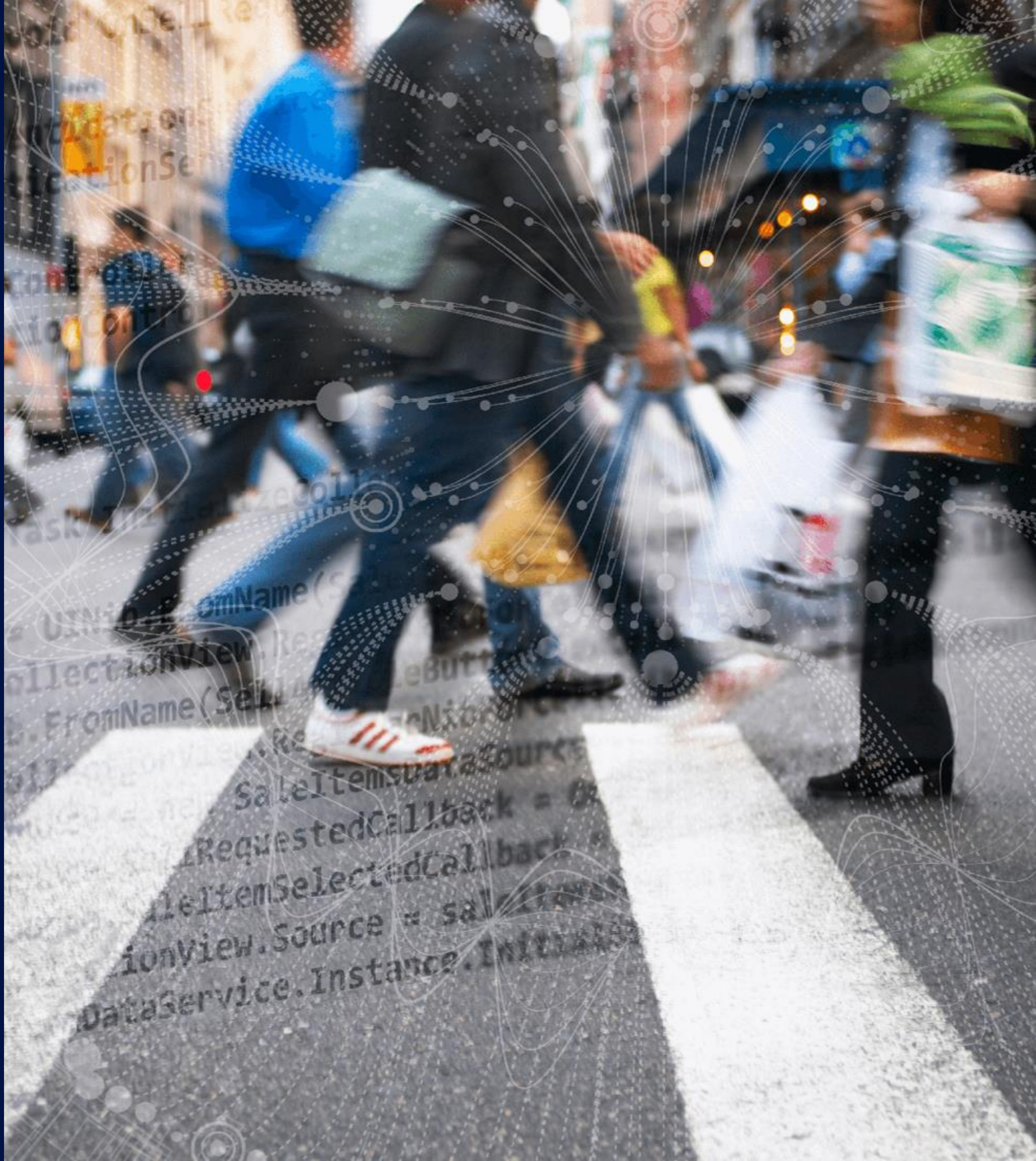
Photo by Shunya Koide on Unsplash

Question(s) ?

Free stickers for each question raised!
;)


SaleItemsDataSource
RequestedCallback
SaleItemSelectedCallback
ionView.Source = saleItems
DataService.Instance.Initial

Thanks



Marco
Dal Pino

ModApp Consultant
Microsoft

https://www.linkedin.com/in/marcodalpino
https://about.me/marcodalpino
https://twitter.com/marcodalpino
info@contoso.blog
https://www.twitch.tv/dpcons

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