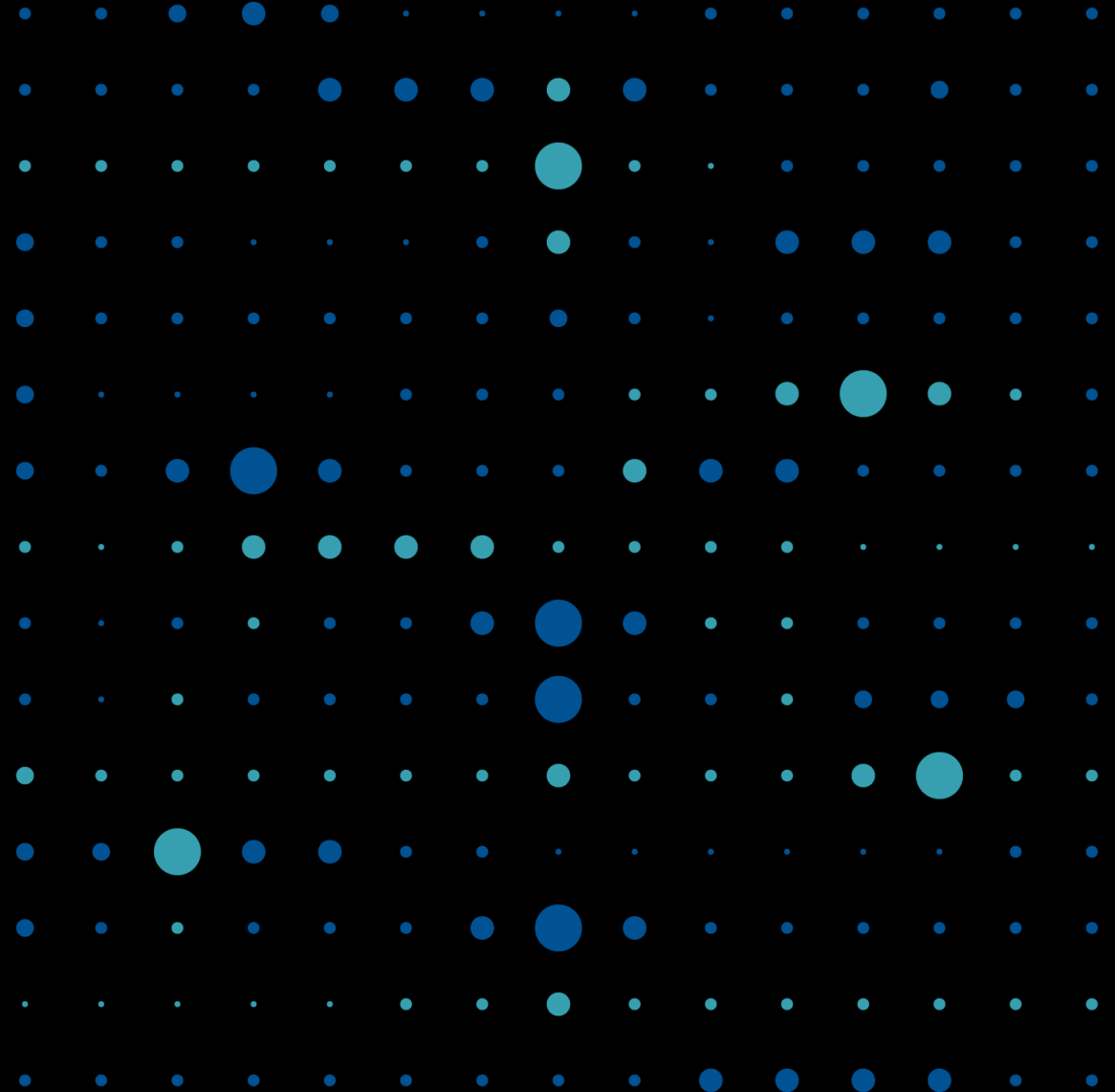




Windows IoT

Azure IoT Academy

May 2021



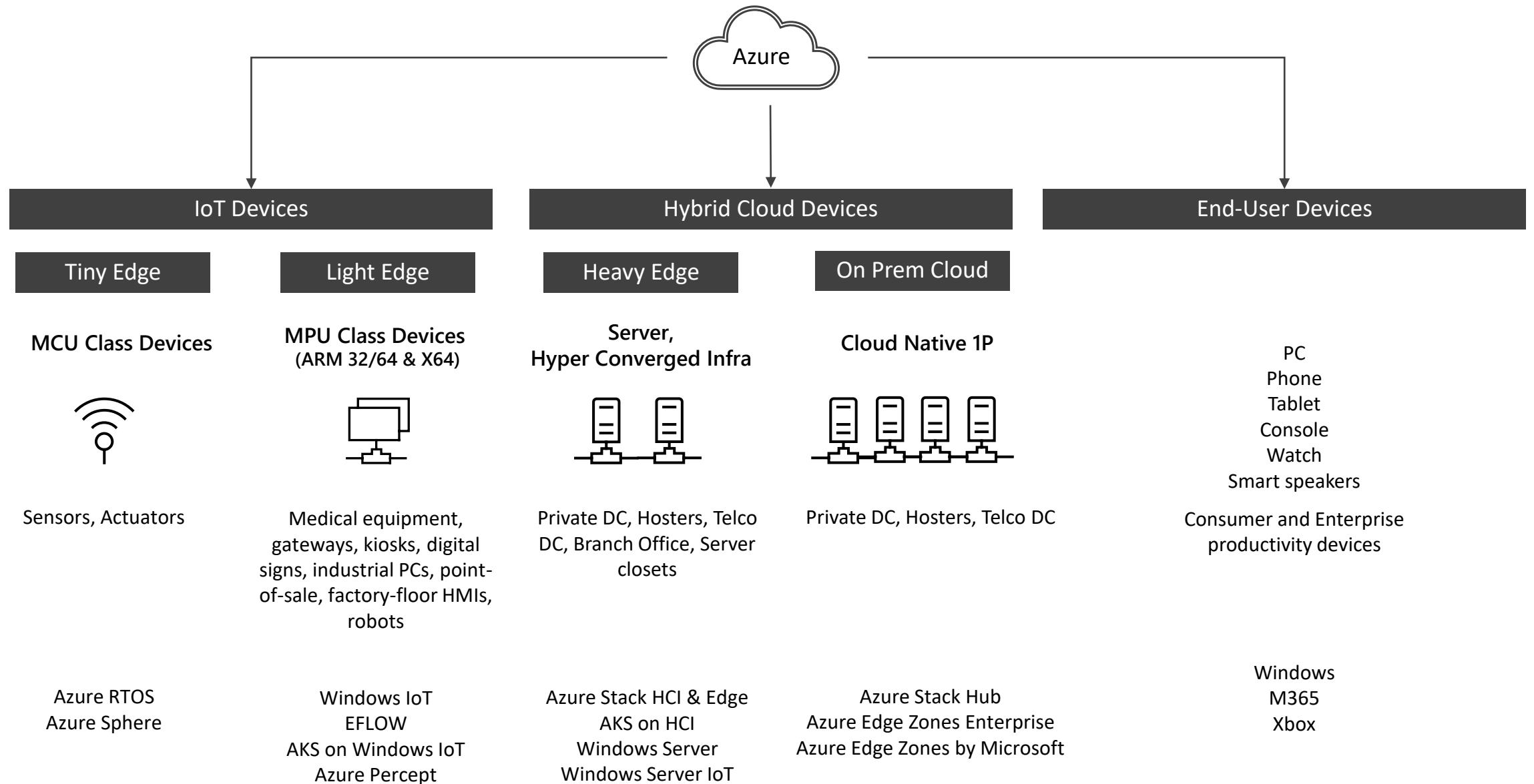
Agenda (all timings are in EST)

- 11:00am - 11:30am EST : Windows IoT Theory
- 11:30am - 1:00pm EST : HOLs
- 1:00pm - 1:45pm EST : Lunch break
- 1:45pm - 3:15pm EST : HOLs
- 3:15pm - 3:30pm EST : Coffee Break
- 3:30pm - 4:30pm EST : HOLs

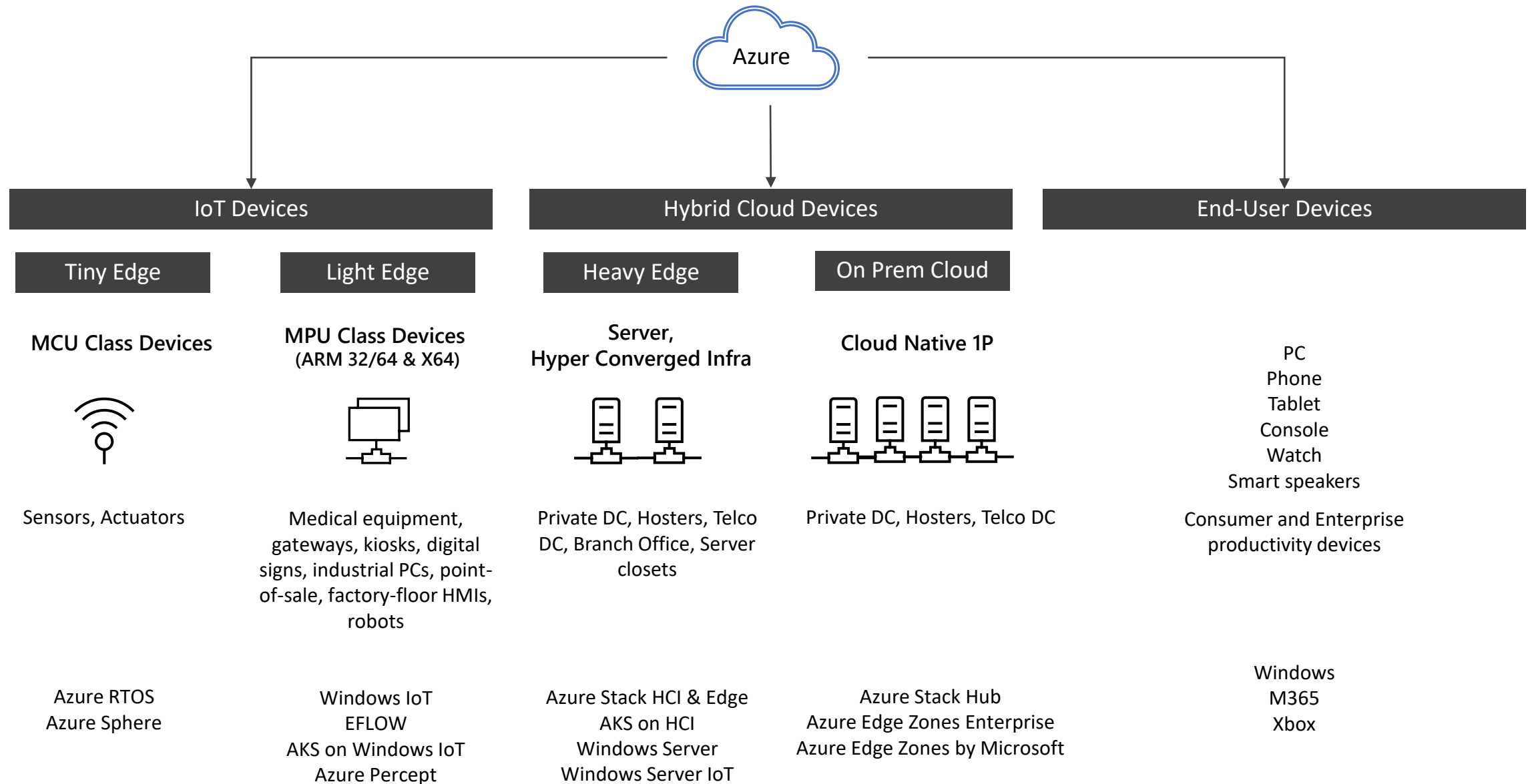
Session Agenda

- Product Overview
- Windows IoT + Linux + Azure == Better Together
- Live Video Analytics Lab

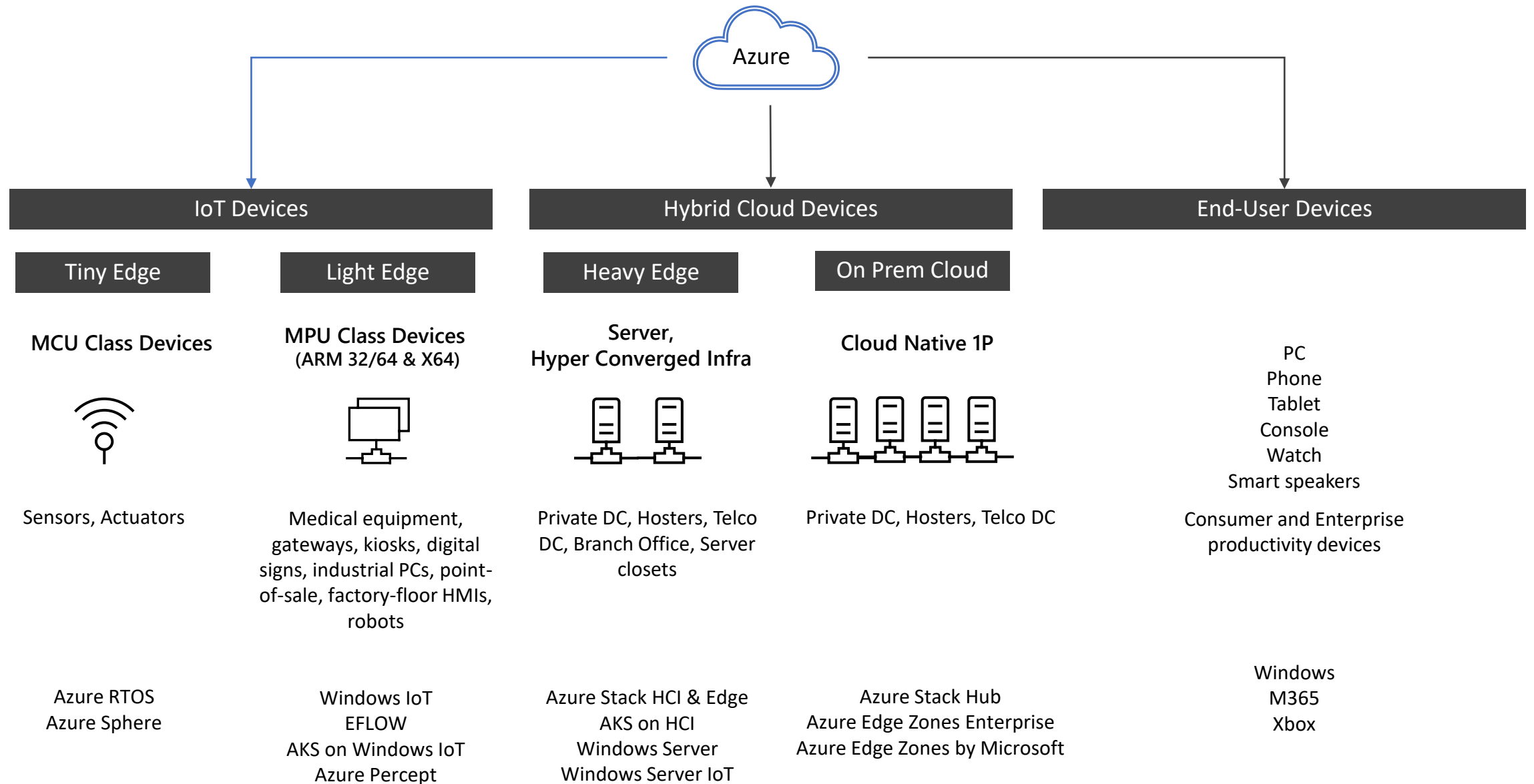
Azure Edge Device Categories



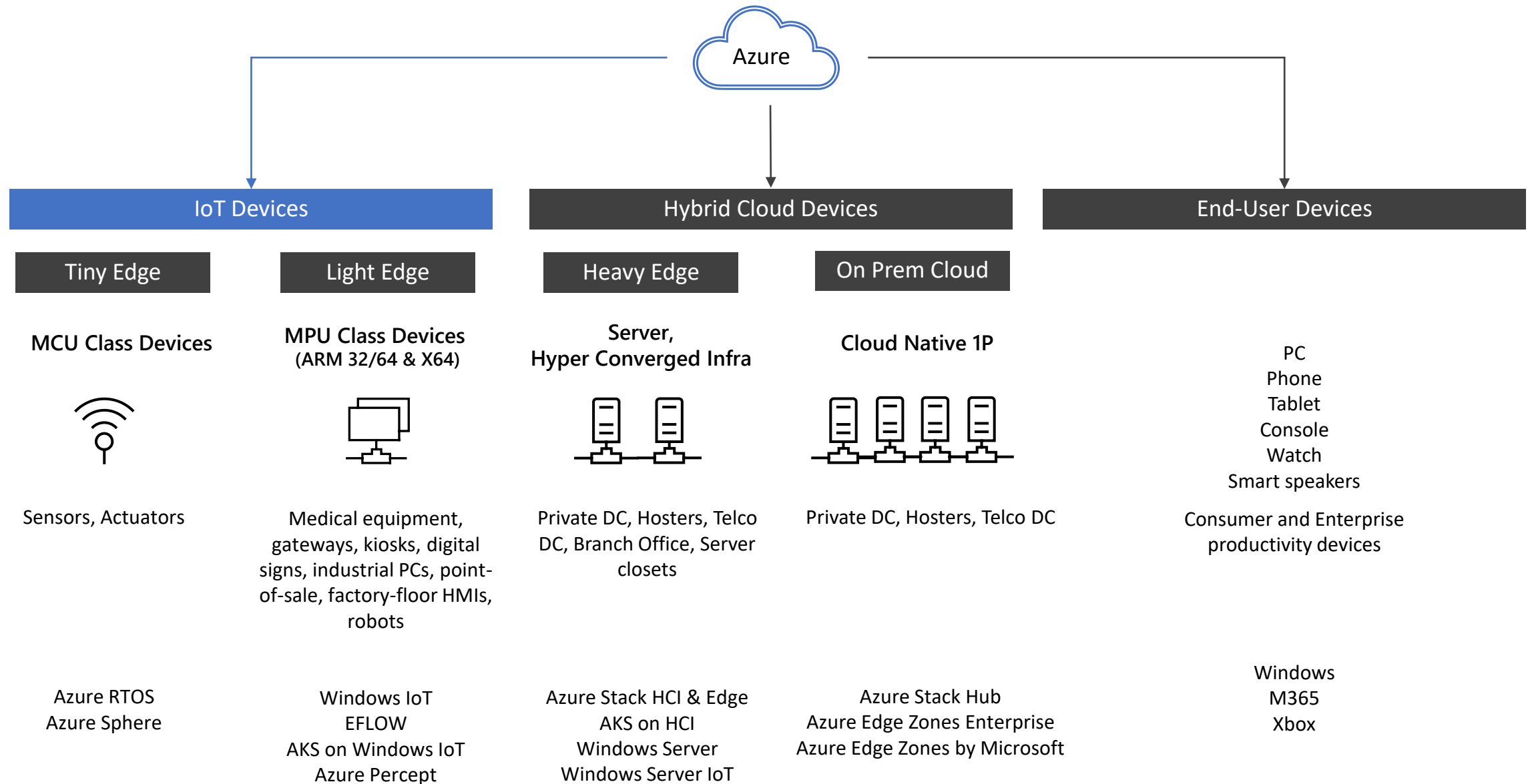
Azure Edge Device Categories



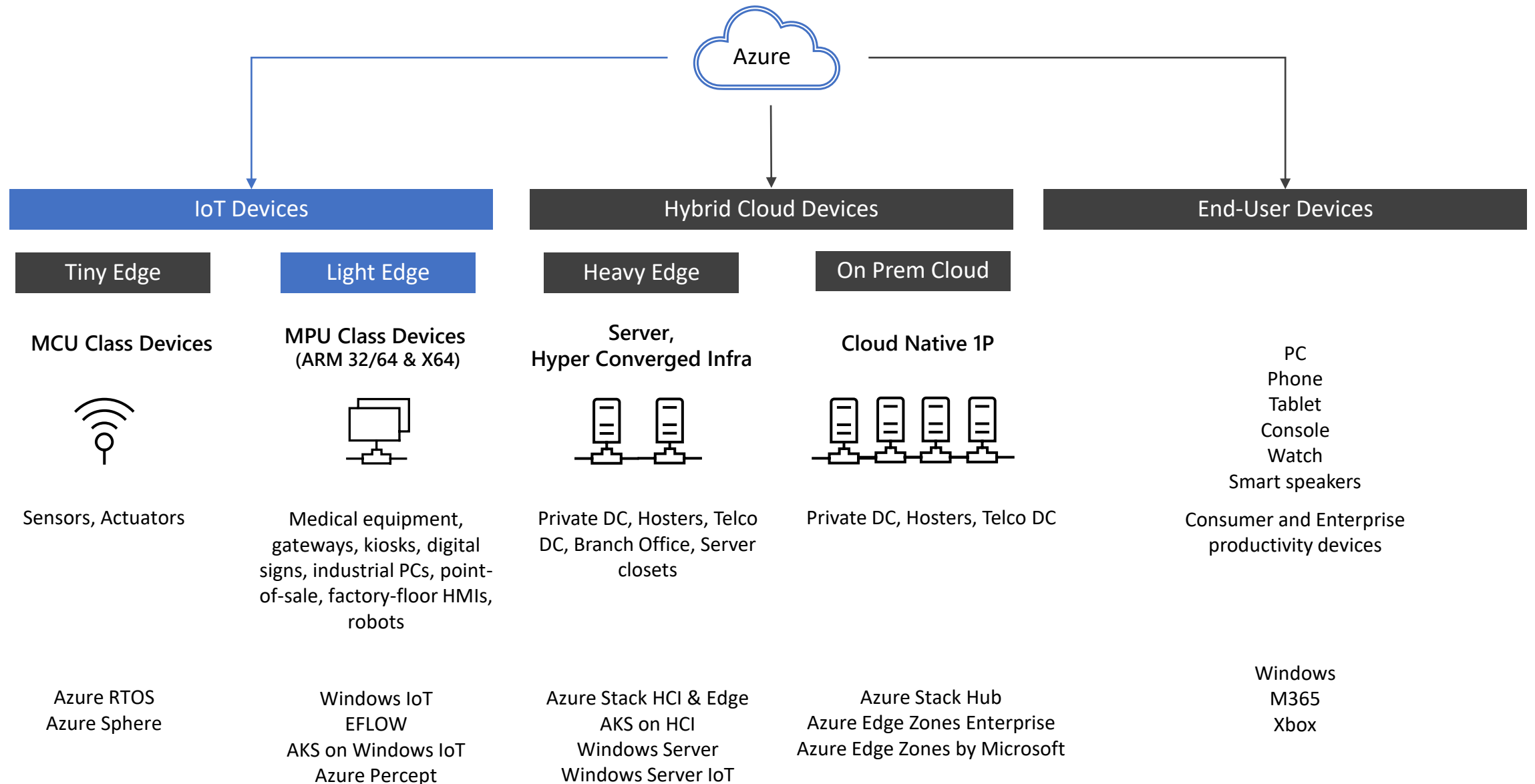
Azure Edge Device Categories



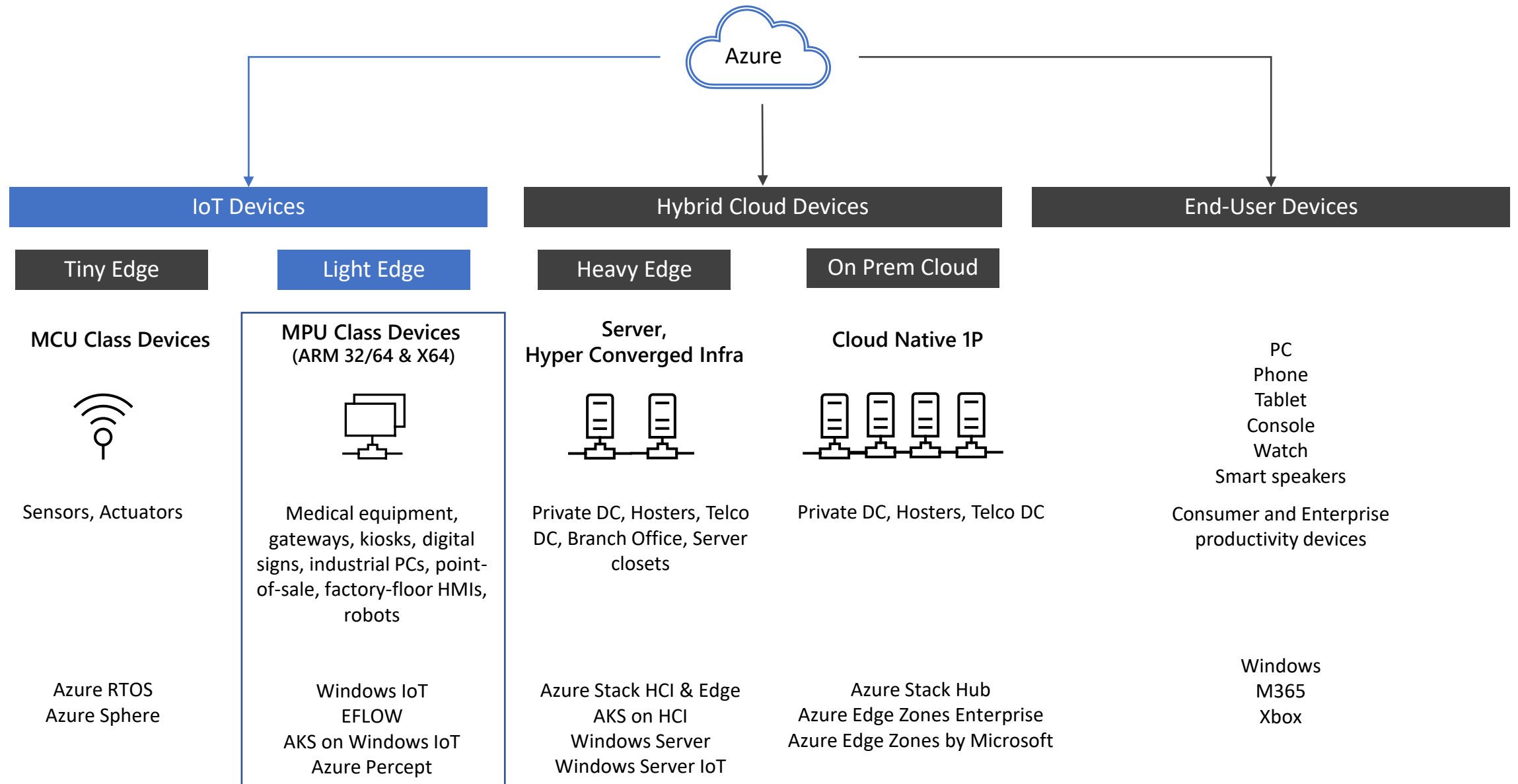
Azure Edge Device Categories



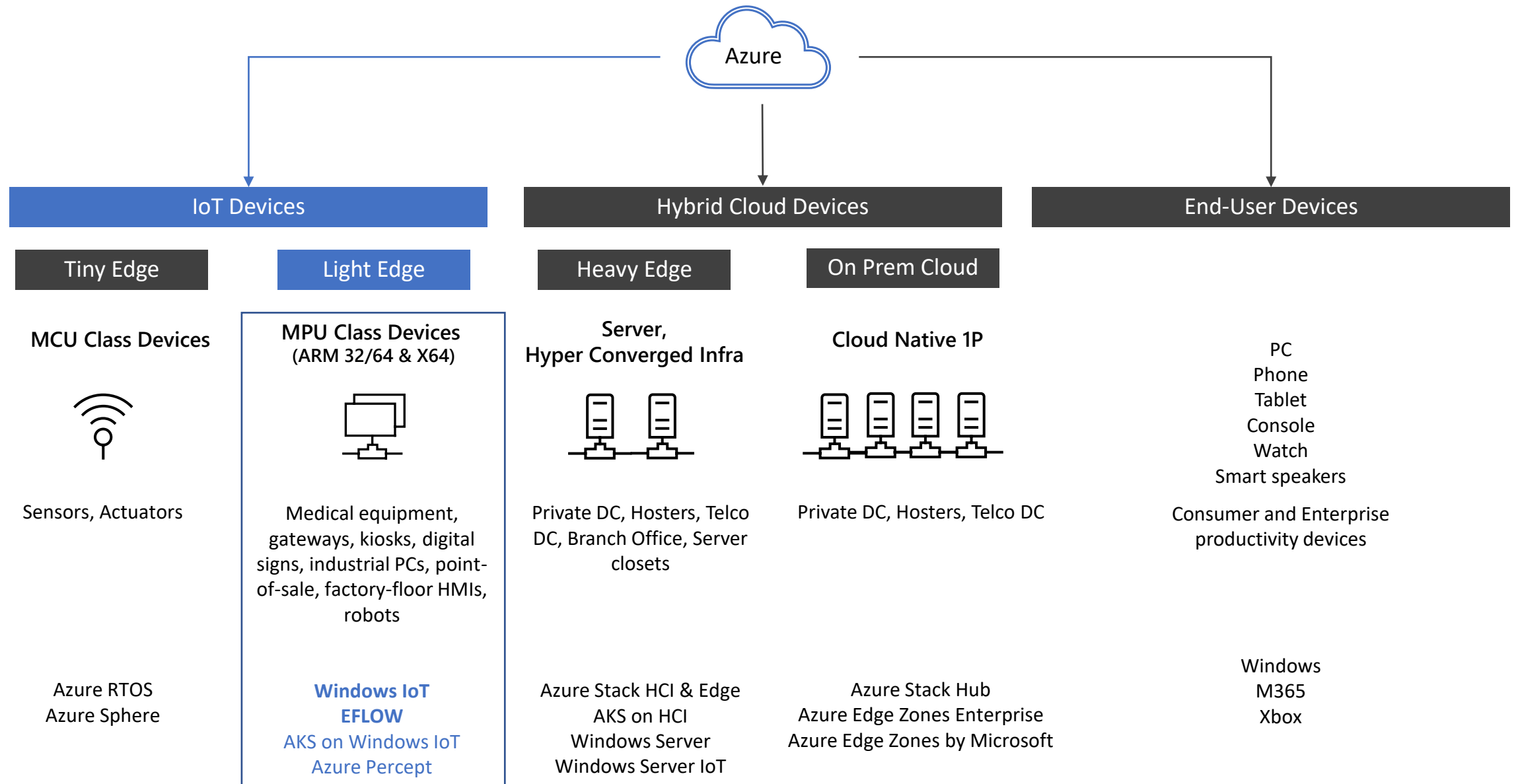
Azure Edge Device Categories



Azure Edge Device Categories



Azure Edge Device Categories



Windows IoT



Gas Pumps



Industrial Machinery



Essential Devices



Kiosks



Medical Devices



Voting Machines

Windows IoT + Azure

Windows 10 IoT Offerings



Windows 10 IoT Core and Services

For smallest-footprint,
lowest-cost devices



Windows 10 IoT Enterprise

For powerful, smart
devices

Locked down, full edition
of Windows 10



Windows Server IoT

For the most demanding
edge computing workloads



SQL Server IoT

For embedded solutions
requiring the full power of
SQL Server

Customer Value Prop

1. 10 Years of Long-Term Servicing (LTSC)
2. World-class security
3. Enterprise-grade device management
4. Seamlessly connect with Azure
5. Build beautiful user experiences with natural input
6. Extensive Win32 app ecosystem, 1B Windows devices
7. Out-of-the-box solution

Bringing Linux, Azure and Cloud Native
Microservices to Windows IoT

Azure IoT Edge for Linux on Windows (EFLOW)

Enabling Linux-based Edge Modules on Windows

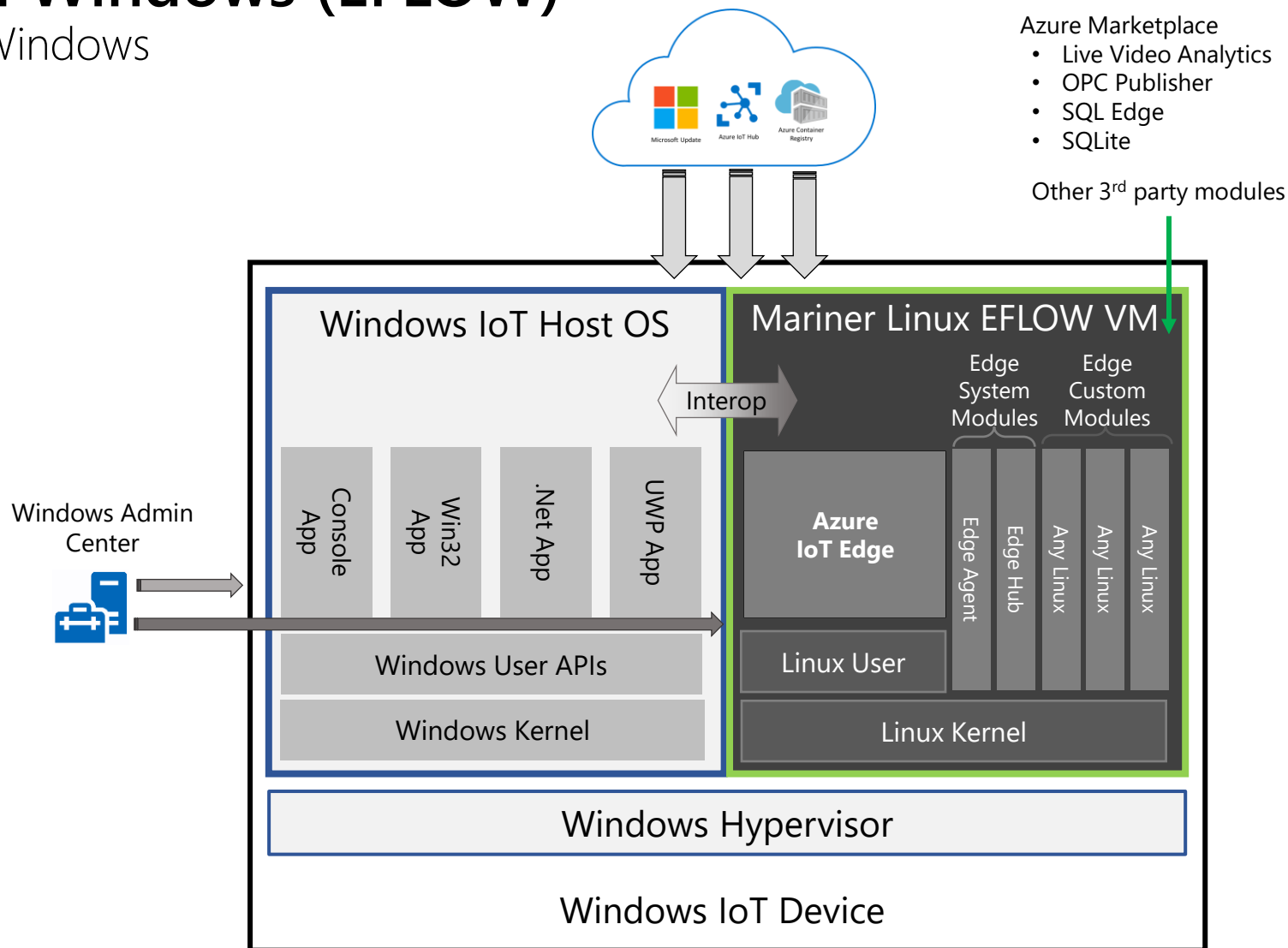
Windows IoT Strengths

- Apps with Interactive UI
- Win32 app ecosystem
- 10-year long-term servicing
- World-class security
- Enterprise-grade device management
- Out-of-the box solution

+

Linux Strengths

- Flexibility / Customizability
- Low Cost of Entry
- AI workloads
- Cloud Native Programming Models
 - Containerized Microservices



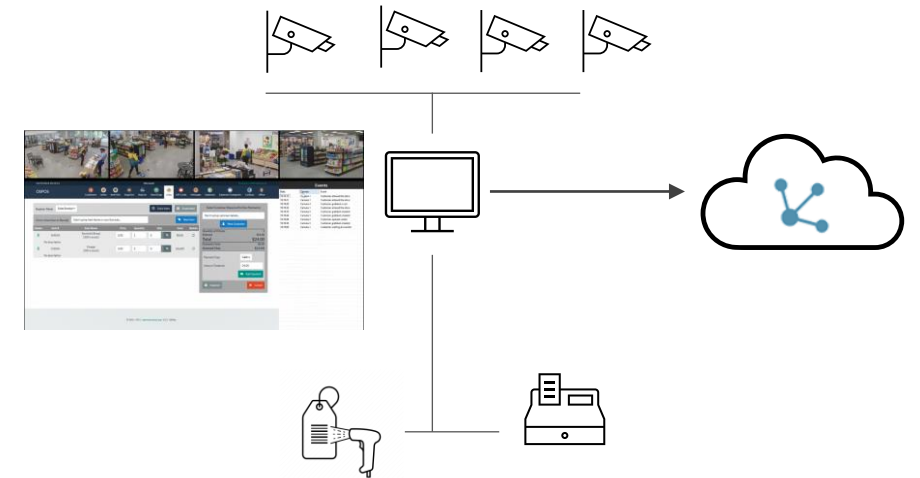
Edge Vision AI – Partner Solutions

Windows + Live Video Analytics + Azure

Store Surveillance and Business Insight

Small Business Stores across India and China with two screen POS and video surveillance setup. POS operation diverts attention from video system which needs constant attention to be effective. Windows + LVA Edge AI enables:

- AI based theft and tampering detection, staff and people flow monitoring
- Integrated POS and store video surveillance improving user experience and reducing TCO
- Cloud device management and store operation insight



Demo: Windows IoT + EFLOW + Azure Live Video Analytics

Win 32 point-of-sale application + Win32 RTSP app + Linux LVA running in EFLOW VM, all on one Windows IoT Device

Demo: Windows IoT + EFLOW + Azure Live Video Analytics

Win 32 point-of-sale application + Win32 RTSP app + Linux LVA running in EFLOW VM, all on one Windows IoT Device

The image is a screenshot of a software application titled "EFLOW-LVA - Microsoft Confidential". The main interface is divided into three sections. The top section displays a multi-camera security feed of a grocery store. The leftmost camera shows a customer in a purple shirt walking through the aisles. The middle camera shows a checkout area with a cashier and a customer. The rightmost camera shows a fruit and vegetable section. Below the security feed is a login screen for "OSPOS". It features a blue logo with the letters "op" and the text "OSPOS" below it. The login form has two input fields: "Username" and "Password", each preceded by a small icon (a person for username, a padlock for password). Below these fields is a blue button labeled "Go". At the bottom of the login section is a blue button labeled "Open Source Point Of Sale 3.3.3". To the right of the login section is an "Events" log. It has a table with three columns: "Date", "Camera", and "Event". The first row of data shows the date "18:18:12", the camera "Camera 1", and the event "Customer entered the store". The table has several empty rows below it.



Windows IoT + EFLOW

The best of Windows and Linux



Lower Cost

One device can do it all

Simple to deploy, manage, and update with existing tooling

Maintain Windows application investments

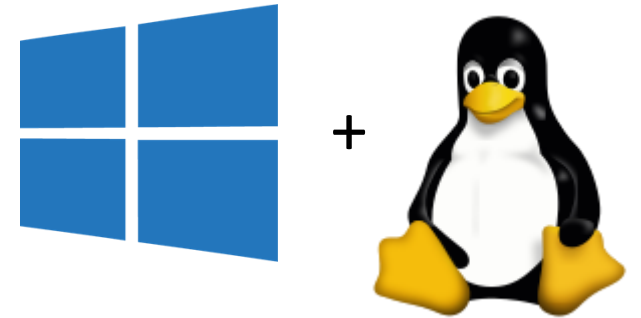


New Capabilities

Easily connect to Azure

Run Linux workloads on Windows IoT, without needing a Linux team

Run the broadest set of AI modules



Blog Post: <https://aka.ms/azeflow-blog>

Documentation: <https://aka.ms/azeflow-docs>

Lab Overview

Goal: Simulate a Win 32 application + Win32 RTSP app + Linux LVA running in EFLOW VM, all on one Windows IoT Device

1. Set up an Azure Resources
2. Set up EFLOW
3. Set up Live Video Analytics
4. Clean-up Resources

AZURE IOT ACADEMY

EPISODE I

THE AZURE RESOURCES

Objective: Set up Azure Resources

- Task 1: Virtual Network
- Task 2: Virtual Machine
- Task 3: Connect to Virtual Machine

Mission: Set up Azure Resources

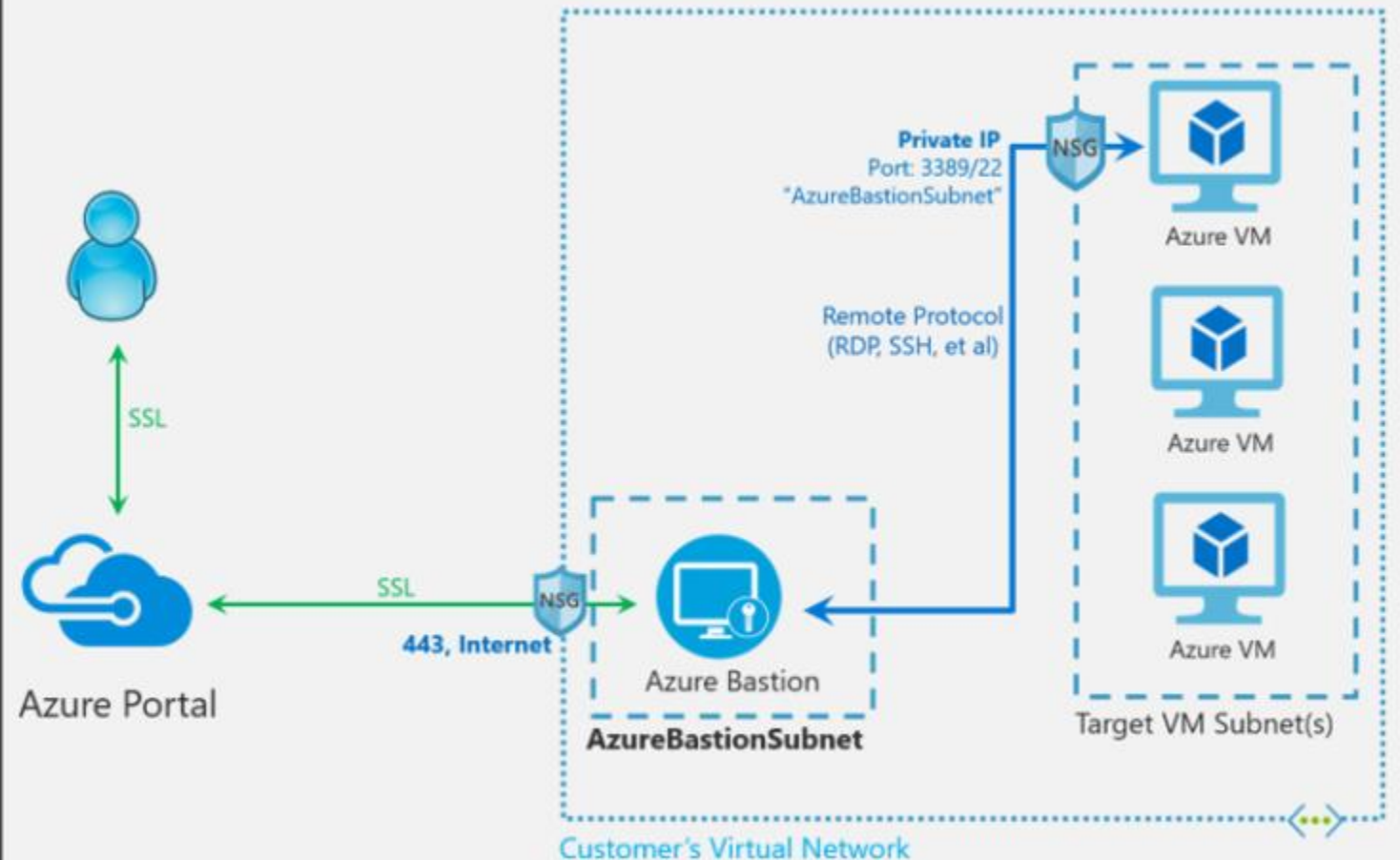
- This lab will be completed in a Windows Virtual Machine
 - We want both PC users and Mac users to have an identical experience
- We will be using **Azure Bastion**
 - Bastion allows you to create a virtual machine in a Tab of your Browser Window

Resource: Azure Bastion

Architecture

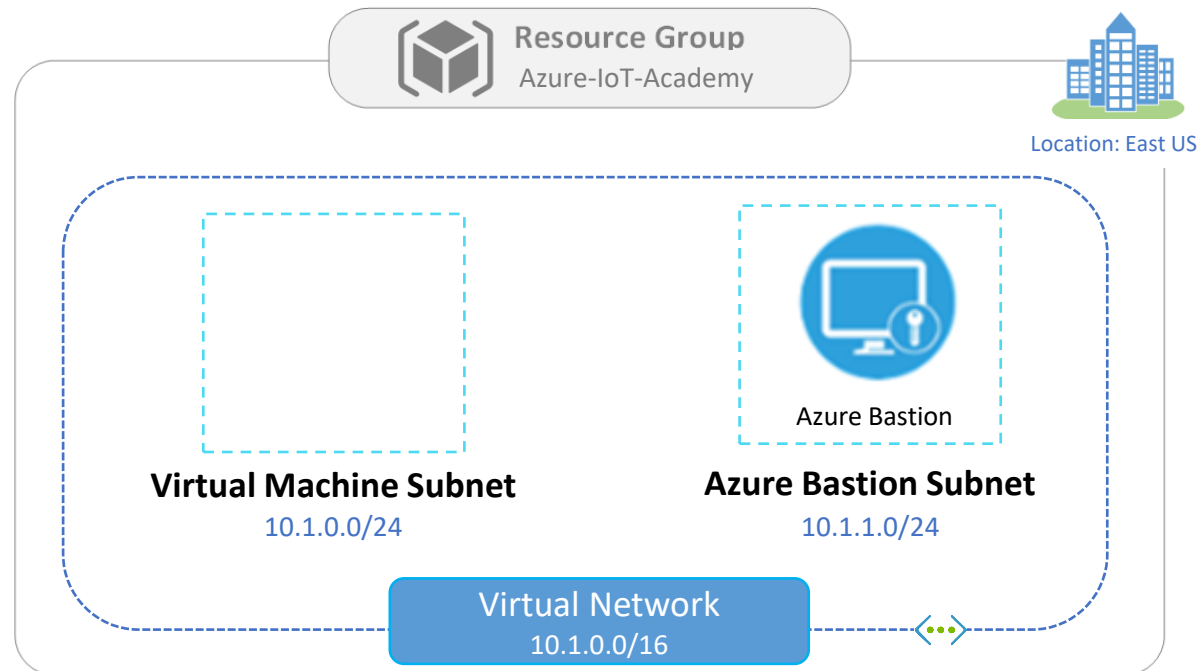
Azure Bastion deployed in Customer's Virtual Network

- User connects to the Azure Portal using any HTML5 browser
- Select the workload to RDP/SSH
- Single-click RDP/SSH session inside the browser
- No Public IP required on the Azure VM

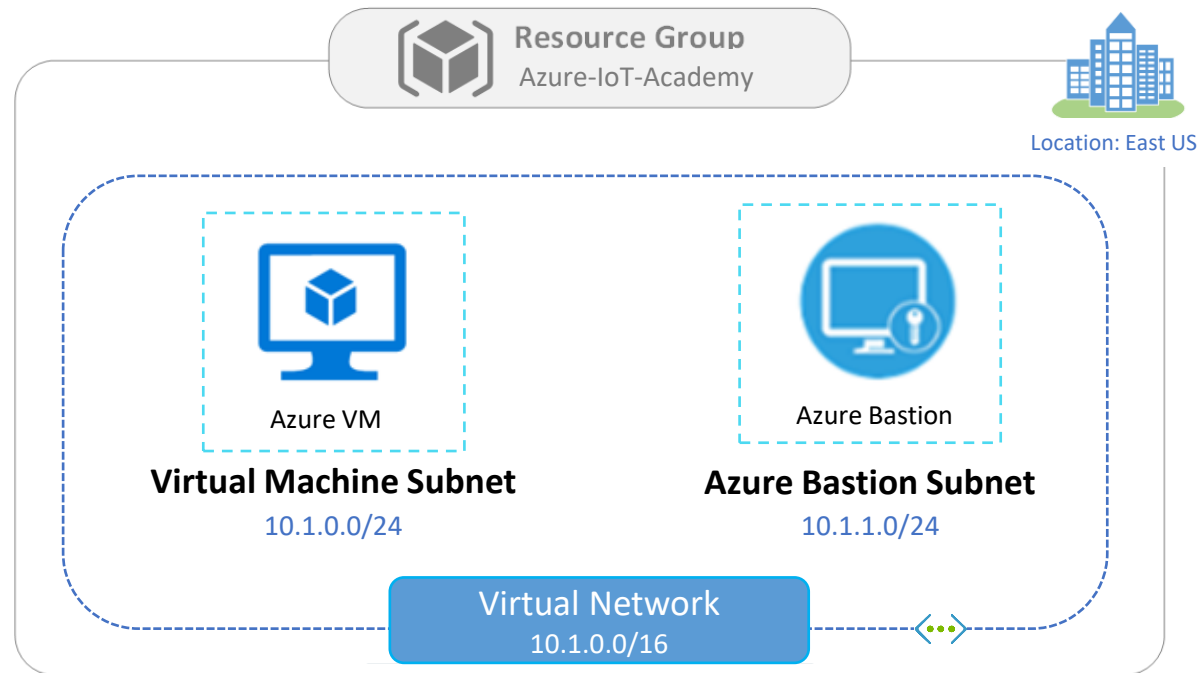


Task 1: Virtual Network

- We want to create a virtual network that will support the VM and Bastion connection



Task 2: Virtual Machine



Task 2: Virtual Machine

- This lab requires we create a Virtual Machine (VM)
- VM needs to Azure IoT Edge for Linux on Windows (EFLOW) + LVA
 - Editions: Windows 10 version 1809 or later; build 17763 or later
 - Professional, Enterprise, IoT Enterprise
 - Hardware requirements
 - Minimum Free Memory: 1 GB
 - Minimum Free Disk Space: 10 GB

Instance details

Virtual machine name *

myVM1

✓

Region *

(US) East US

▼

Availability options

Availability zone


▼

Availability zone *

1

▼


Image *

 Windows 10 Pro, vNext - Gen1

▼

See all images

Marketplace

 You have private offers available. [View private offers](#)

Offer Type : **Virtual Machine**

Pricing : **All**

Operating System : **All**













Publisher Type : **All**

VM Generation : **All**


☐ Azure benefit eligible only ⓘ

Publisher name : **All**

Showing results for 'Windows 10'.

 Windows 10 Preview Microsoft No rating Virtual Machine Windows 10 Preview Bring your own license Select 	 IIS 10 on Windows Server for Python, MySQL and PHP Apps4Rent LLC ★★★★★ 5.0 (1 ratings) Virtual Machine Get the latest versions of with Python, MySQL, and PHP with IIS on Windows Server 2016. Bring your own license Select 	 Microsoft Windows 10 Microsoft Corporation ★★★★★ 4.5 (6 ratings) Virtual Machine Microsoft Windows 10 Desktop Virtual Machine Images Select 	 Joget DX Low Code Platform - Windows - 10 Joget Inc. No rating Virtual Machine Joget is an open source no-code/low-code application platform. Software plan starts at \$0.10/hour Select 	 iPerf3 Server on Debian 10 Virtual Pulse S. R. O. No rating Virtual Machine Production-ready and Cross-platform Tool for Network Performance Measurement and Tuning Software plan starts at \$0.027/hour Select 	 Jenkins With Debian 10 Cognosys No rating Virtual Machine Jenkins 2.263.4 With Debian Software plan starts at \$0.034/hour Select 
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Marketplace

 You have private offers available. [View private offers](#)

Offer Type : **Virtual Machine**

Pricing : **All**

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Publisher Type : **All**

VM Generation : **All**

☐ Azure benefit eligible only ⓘ

Publisher name : **All**

Showing results for 'Windows 10'.

 Windows 10 Preview Microsoft No rating Virtual Machine Windows 10 Preview Bring your own license <div>Select</div> 	 IIS 10 on Windows Server for Python, MySQL and PHP Apps4Rent LLC ★★★★★ 5.0 (1 ratings) Virtual Machine Get the latest versions of with Python, MySQL, and PHP with IIS on Windows Server 2016. Bring your own license <div>Select</div> 	 Microsoft Windows 10 Microsoft Corporation ★★★★★ 4.5 (6 ratings) Virtual Machine Microsoft Windows 10 Desktop Virtual Machine Images <div>Select</div> 	 Joget DX Low Code Platform - Windows - 10 Joget Inc. No rating Virtual Machine Joget is an open source no-code/low-code application platform. Software plan starts at \$0.10/hour <div>Select</div> 	 iPerf3 Server on Debian 10 Virtual Pulse S. R. O. No rating Virtual Machine Production-ready and Cross-platform Tool for Network Performance Measurement and Tuning Software plan starts at \$0.027/hour <div>Select</div> 	 Jenkins With Debian 10 Cognosys No rating Virtual Machine Jenkins 2.263.4 With Debian Software plan starts at \$0.034/hour <div>Select</div> 
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Task 2: Virtual Machine – Azure VM

- Size: Standard_D4s_v3 - 4 vcpus, 16 GiB memory

Instance details

Virtual machine name * ⓘ

myVM1



Region * ⓘ

(US) East US



Availability options ⓘ

Availability zone




Availability zone * ⓘ

1



Image * ⓘ

 Windows 10 Pro, vNext - Gen1



[See all images](#)

Azure Spot instance ⓘ

☐

Size * ⓘ

Standard_D4s_v3 - 4 vcpus, 16 GiB memory (\$274.48/month)

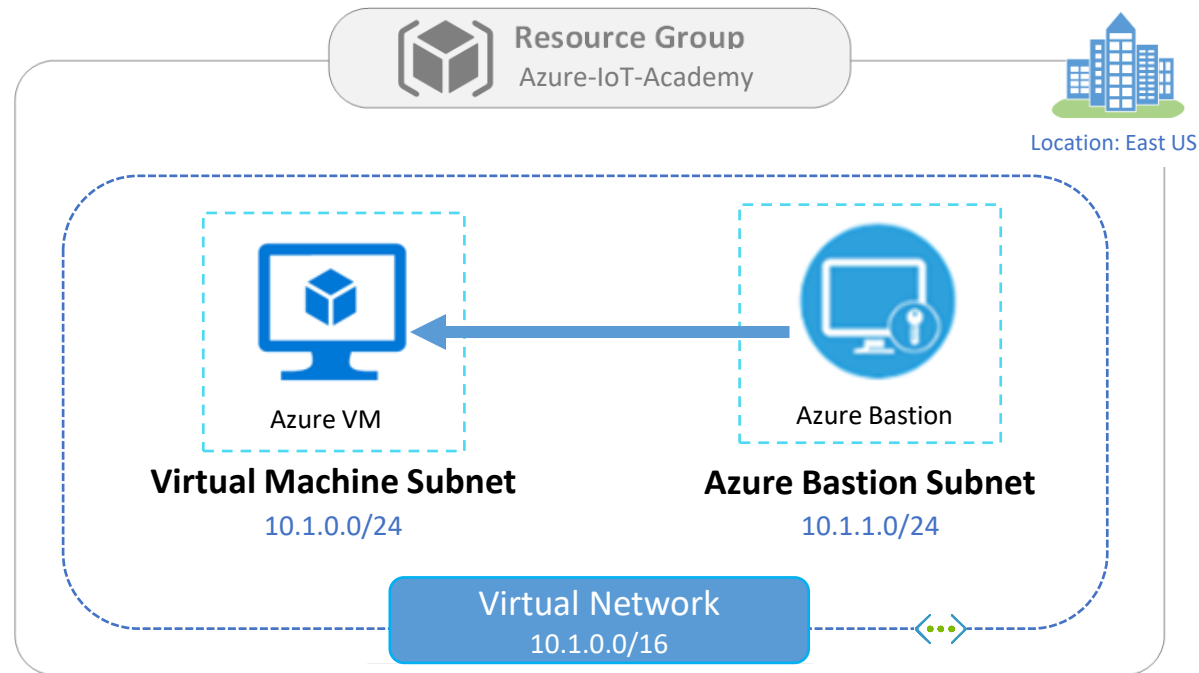


[See all sizes](#)

Showing 407 VM sizes. | Subscription: IOT-Athens-SLFHST | Region: East US | Current size: Standard_D4s_v3 | Image: Windows 10 Enterprise 2019 LTSC | [Learn more about VM sizes](#)

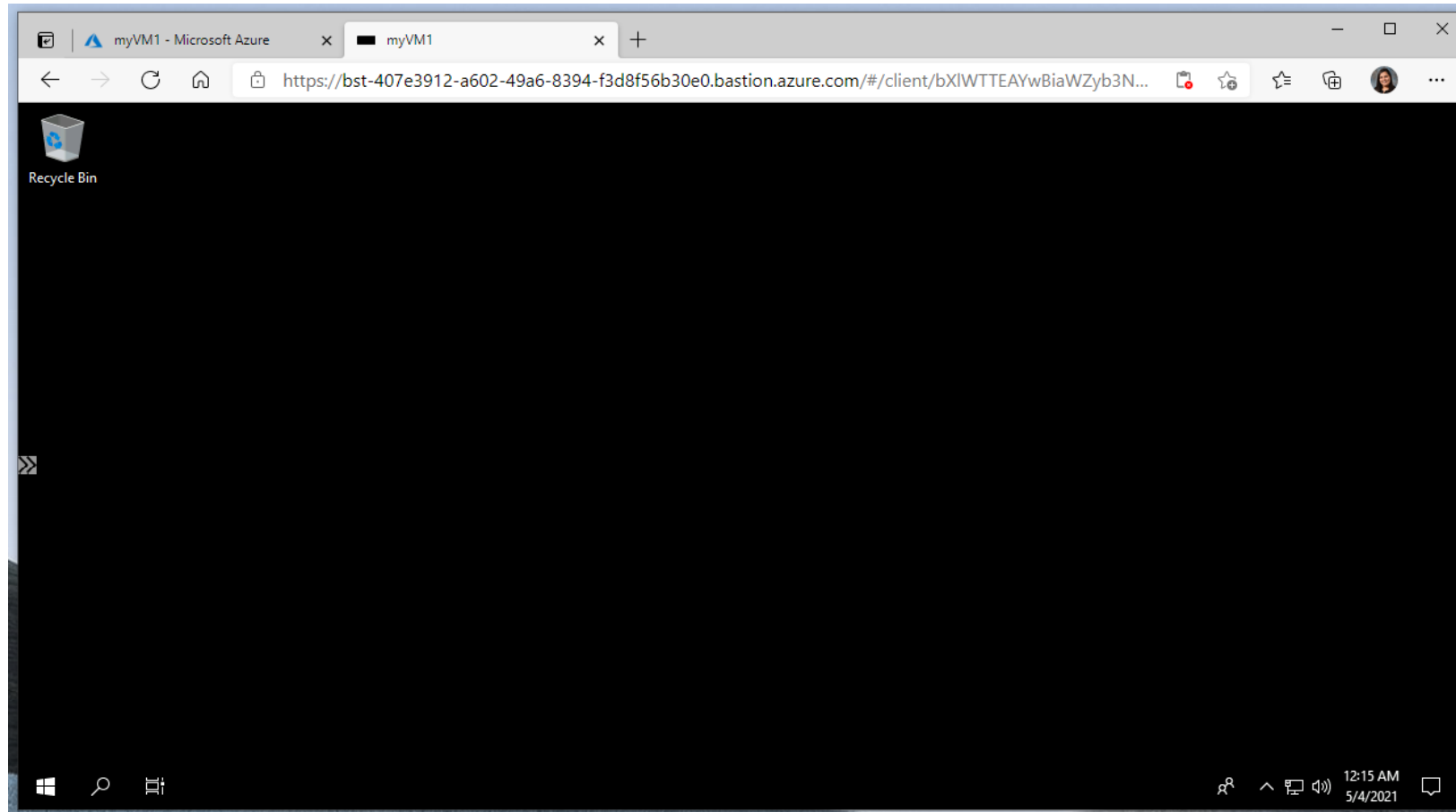
VM Size ↑↓	Family ↑↓	vCPUs ↑↓	RAM (GiB) ↑↓	Data disks ↑↓	Max IOPS ↑↓	Temp storage (GiB) ↑↓	Premium disk ↑↓
Most used by Azure users							
The most used sizes by users in Azure							
DS1_v2 ↗ ⓘ	General purpose	1	3.5	4	3200	7	Supported
D2s_v3 ↗ ⓘ	General purpose	2	8	4	3200	16	Supported
D2as_v4 ↗ ⓘ	General purpose	2	8	4	3200	16	Supported
B2s ↗ ⓘ	General purpose	2	4	4	1280	8	Supported
B1s ↗ ⓘ	General purpose	1	1	2	320	4	Supported
B2ms ↗ ⓘ	General purpose	2	8	4	1920	16	Supported
B1ls ↗ ⓘ	General purpose	1	0.5	2	160	4	Supported
DS2_v2 ↗ ⓘ	General purpose	2	7	8	6400	14	Supported
B4ms ↗ ⓘ	General purpose	4	16	8	2880	32	Supported
D4s_v3 ↗ ⓘ	General purpose	4	16	8	6400	32	Supported
DS3_v2 ↗ ⓘ	General purpose	4	14	16	12800	28	Supported
D8s_v3 ↗ ⓘ	General purpose	8	32	16	12800	64	Supported

Task 3: Connect to the Virtual Machine



Task 3: Connect to Virtual Machine

- Use the Bastion client to open up the Virtual Machine



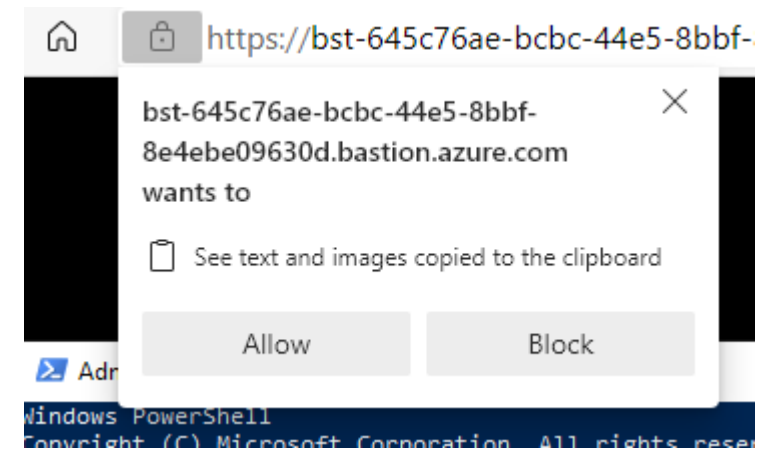
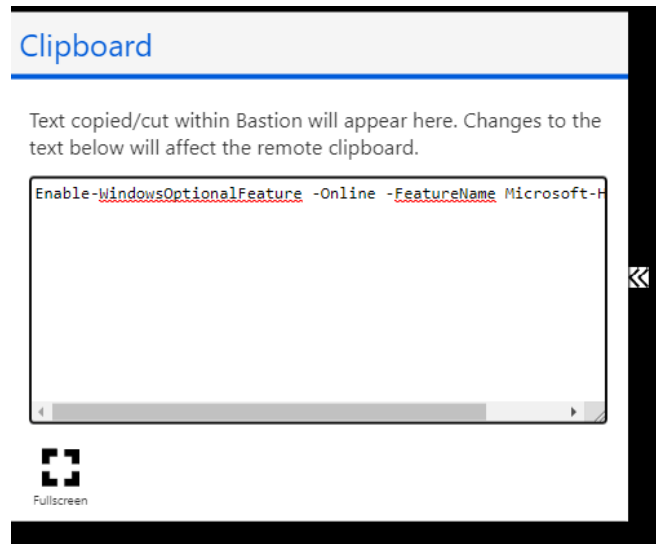
A dramatic scene from Star Wars showing Darth Vader on the left and Yoda on the right, both holding lit lightsabers. The blades are crossed in the center, creating a bright white and yellow spark. Vader's blade is red, and Yoda's is green. The background is dark and smoky, with some light rays filtering through. The overall tone is intense and cinematic.

Quick Battle Check!

Can you open up the Bastion connection in a Tab?

Quick Bastion Tips

- If asked for permission – Allow Clipboard to be shared
- You can see what is in your clipboard (arrows)
- Paste clipboard contents by right-clicking
 - Helpful for PowerShell Commands



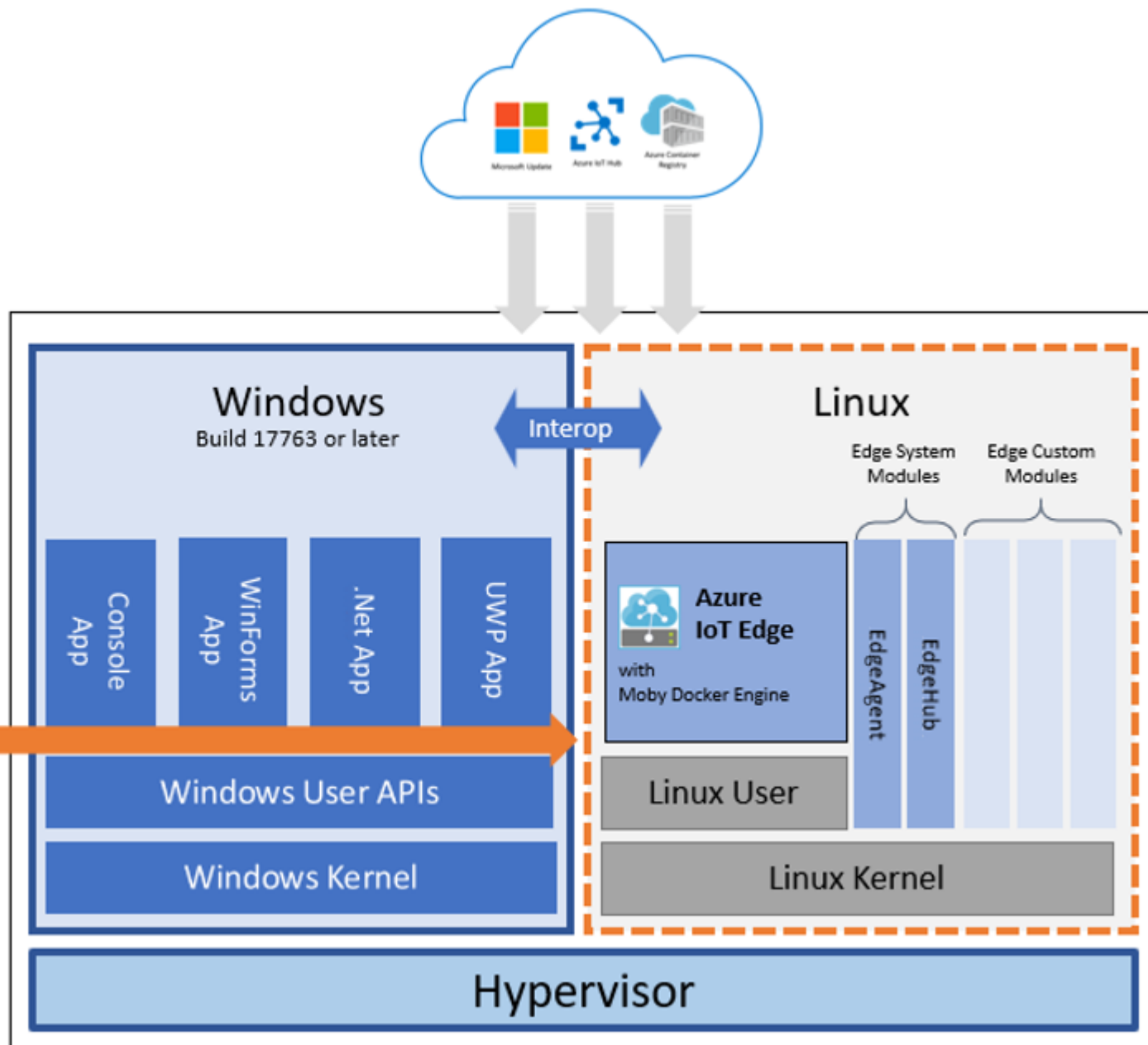
AZURE IOT ACADEMY

EPISODE II

CONJUNCTION OF THE OS

Objective: Set up EFLOW

- Task 1: Enable Hyper-V
- Task 2: Set up Azure IoT Hub
- Task 3: Register an IoT Hub Device
- Task 4: Download Windows Admin Center
- Task 5: Create a new deployment
- Task 6: Verify successful configuration

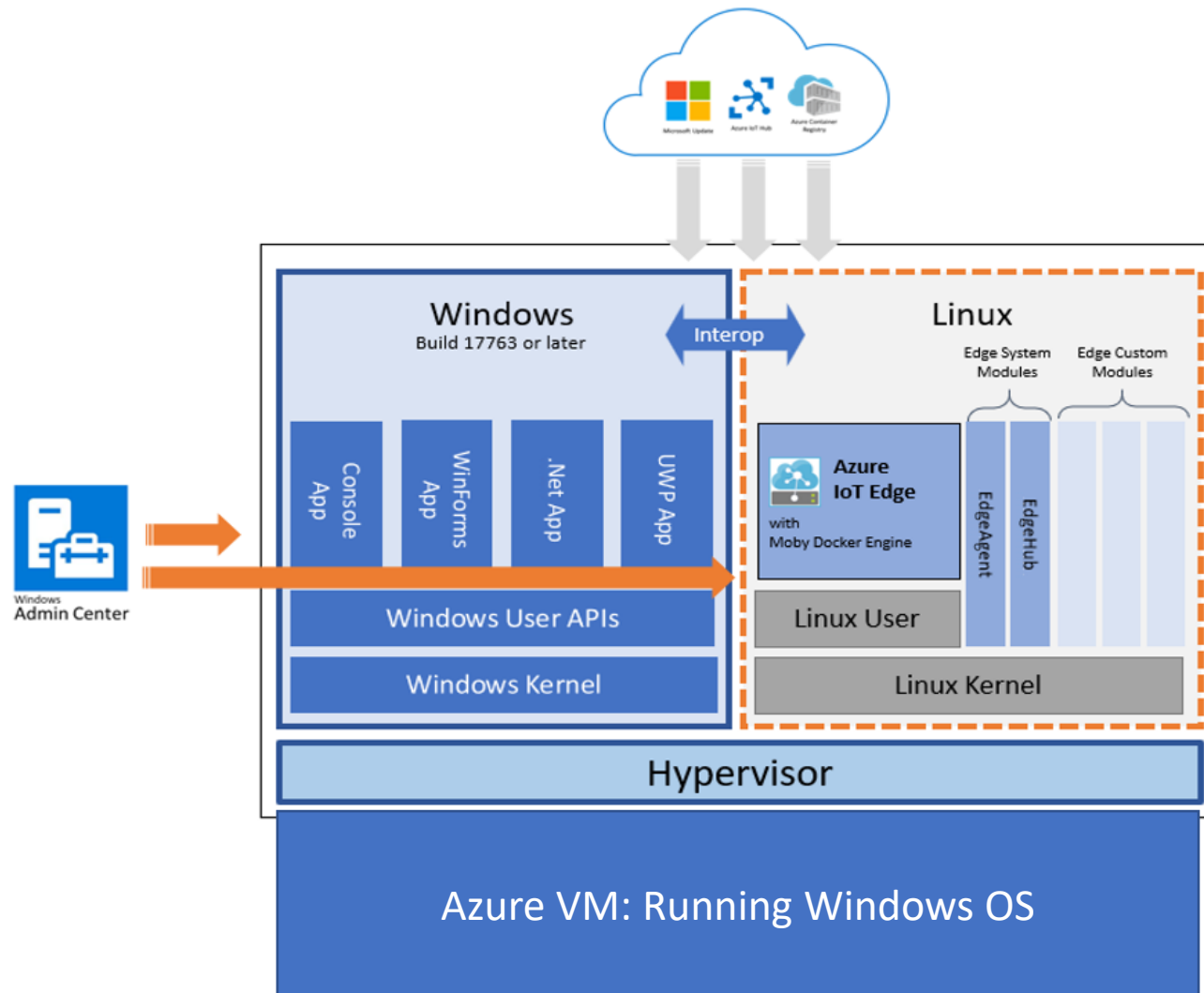


Task 1: Enable Hyper-V

- To run EFLOW – you need to run a Linux VM on the Windows Host
- Enable Hyper-V to run a VM
- Your VM must support ‘Nested Virtualization’



Task 1: Enable Hyper-V



A dramatic scene from Star Wars showing Darth Vader on the left and Yoda on the right, both in their iconic robes and capes. They are engaged in a lightsaber duel, with their blades crossed in the center. The background is dark and atmospheric, with light reflecting off the characters' armor and robes. The text "Quick Battle Check!" is overlaid in the center in a large, white, sans-serif font.

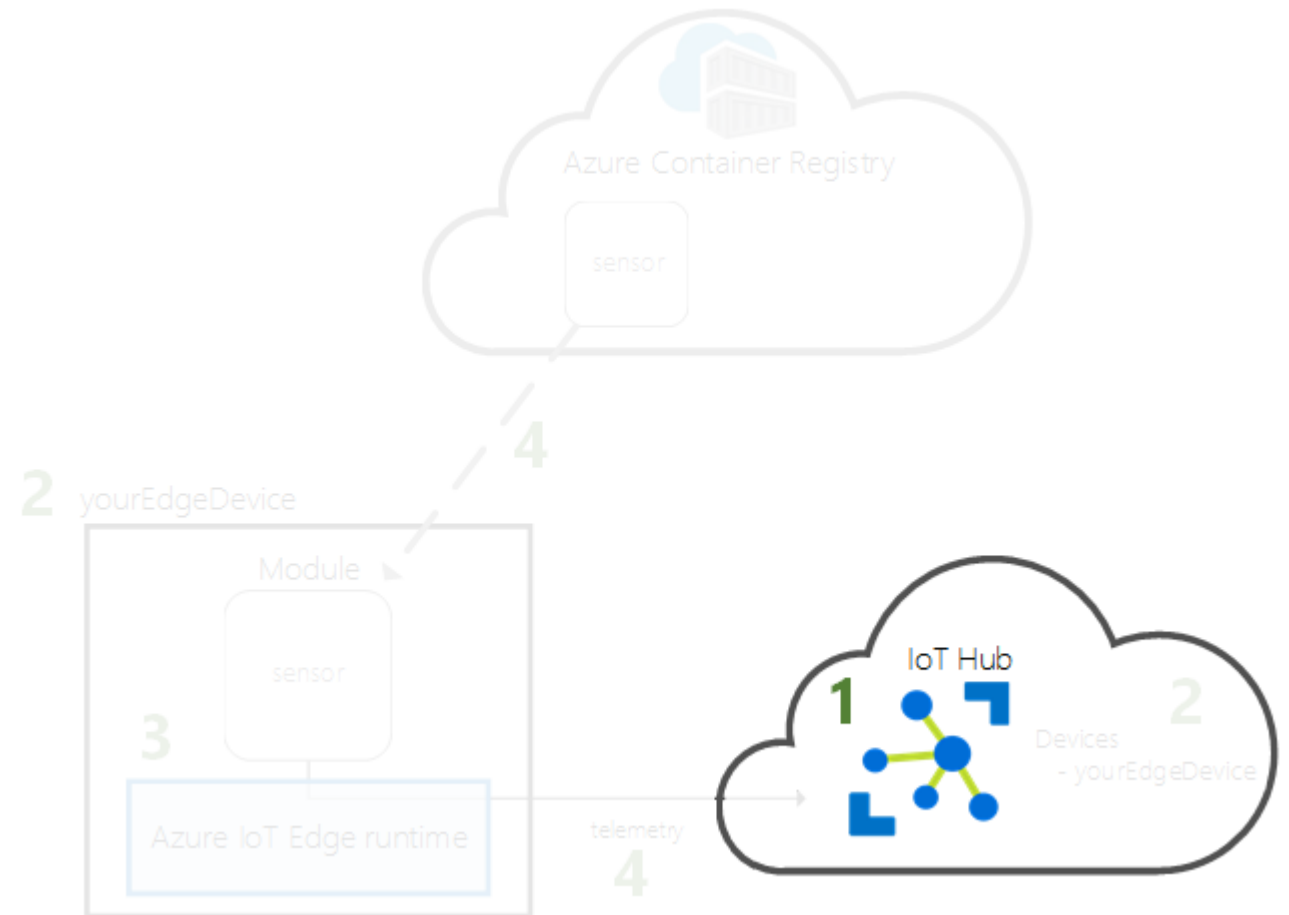
Quick Battle Check!

Did you (or did your) virtual machine restart after enabling Hyper-V?

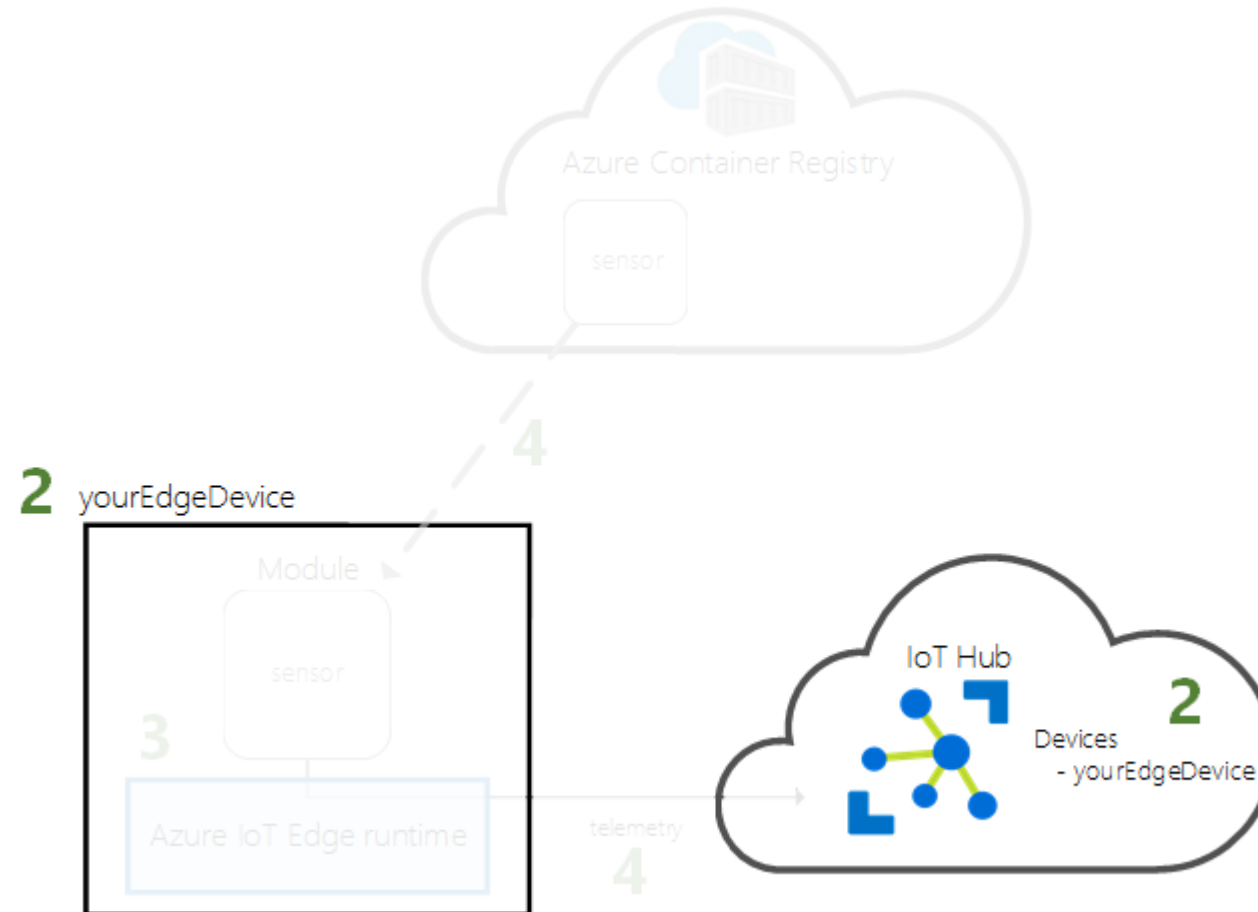
Task 2: Set up Azure IoT Hub

Azure IoT Hub provides feature support in the following areas:

- Security
- Scalability
- Routing
- Service Integration
- Device Management
- Monitoring



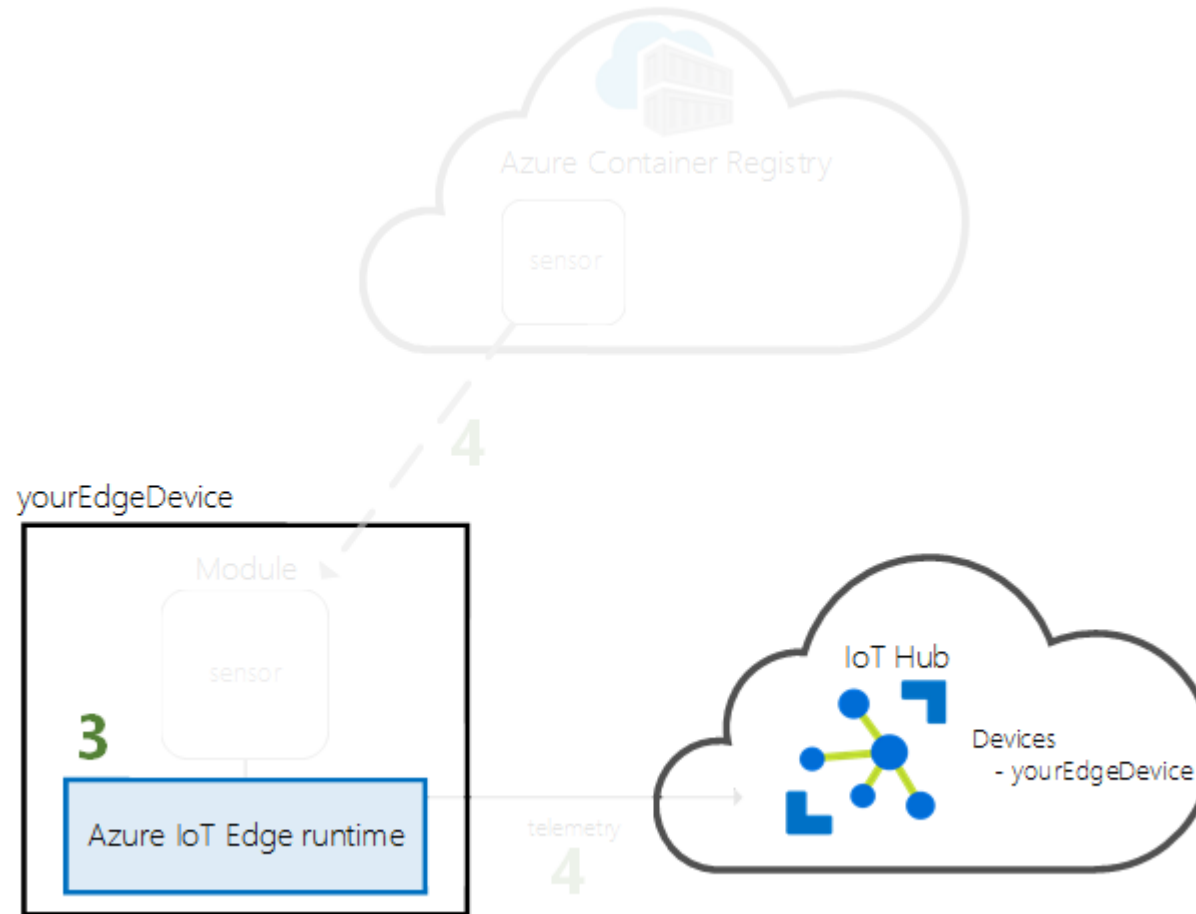
Task 3: Register an IoT Hub Device



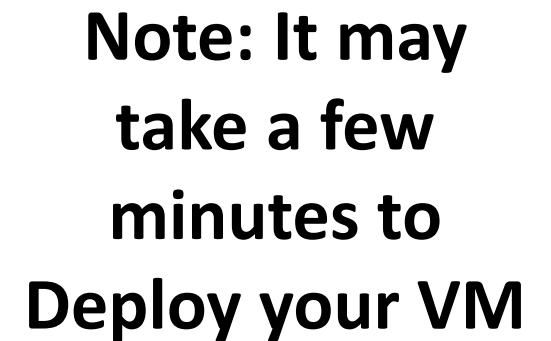
Task 4: Download Windows Admin Center

- We use Windows Admin Center to Deploy the Linux VM
- Make sure to download this in your **Azure VM**

Task 5: Create a new deployment



Install IoT Edge for Linux on Windows on your VM and configure it with the device connection string.



Task 6: Verify successful configuration

- Select your IoT Edge device from the list of connected devices in Windows Admin Center to connect to it.

A dramatic scene from Star Wars showing Darth Vader on the left and Yoda on the right, both holding lightsabers and engaged in a duel. The background is dark and atmospheric, with light reflecting off the characters' armor and robes. The text "Quick Battle Check!" is overlaid in the center in a large, white, sans-serif font.

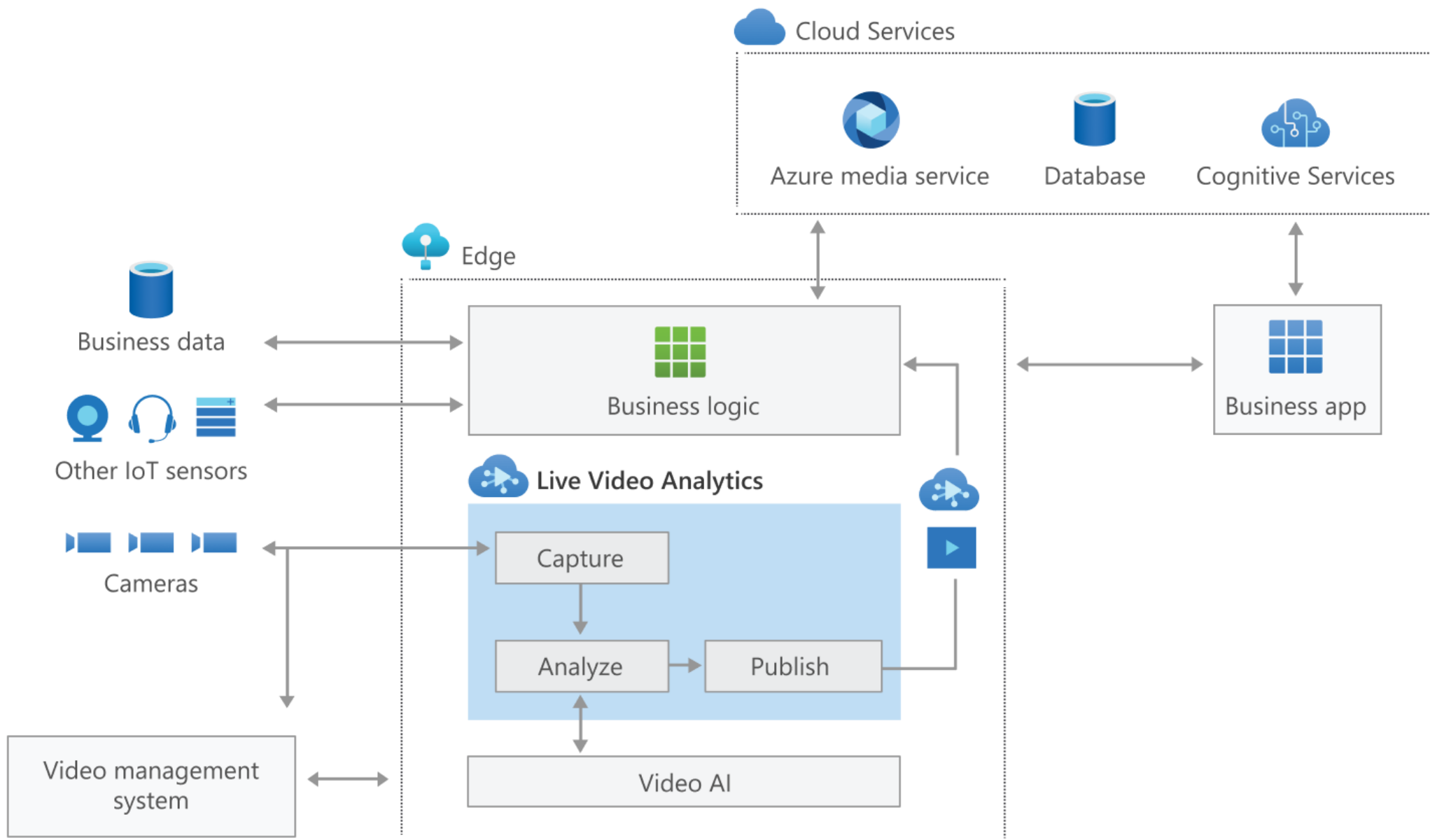
Quick Battle Check!

Can you connect to your IoT Edge Device?

AZURE IOT ACADEMY

EPISODE III

CREATION OF THE LVA



Objective: Set up Live Video Analytics

- Task 1: Download Tools and Resources
- Task 2: Create Azure Resources
- Task 3: Configure the Azure IoT Tools extension
- Task 4: Deploy Modules on Windows Host
- Task 5: Provision Azure IoT Edge for Linux Configuration
- Task 6: Test Video Stream
- Task 7: Enable Live Video Analytics: Inferencing
- Task 8: Connect Windows Video with Linux Inferencing

Task 1: Download Tools and Resources

- To configure LVA:
 - Visual Studio Code
- Run Windows Application:
 - Net Core 3.1 SDK
- Test Video Stream:
 - VLC Media Player
- Download Files (Unzip + move to Desktop)
 - Windows Application
 - Certificates

Task 2: Create Azure Resources

- Run a script to create/allocate all LVA Resources
- Net new:
 - **Streaming Endpoint** - This will help in the playing the recorded AMS asset
 - (we will not use in this lab)
 - **Media service account** - This helps with managing and streaming media content in Azure.
 - (we will not use in this lab)
 - **Storage account** - You must have one Primary storage account and you can have any number of Secondary storage accounts associated with your Media Services account.
 - **Container registry** - This helps in storing and managing your private Docker container images and related artifacts.

Task 3: Configure the Azure IoT Tools extension

- Configure IoT Hub Extension in Visual Studio

Task 4: Deploy Modules on Windows Host

- Copy Raw Deployment.JSON file
- Note you will have two on-going PowerShell sessions
 1. Windows VM
 2. Ssh into the EFLOW VM

```
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\AIOTA> Get-EflowVmAddr

[05/04/2021 04:23:35] Querying IP and MAC addresses from virtual machine (myVM1-EFLOW)

- Virtual machine MAC: 00:15:5d:00:04:00
- Virtual machine IP : 172.18.78.62

[05/04/2021 04:23:35] Done.

00:15:5d:00:04:00
172.18.78.62
PS C:\Users\AIOTA>
```

Windows Host

```
OpenSSH SSH client

inet6 addr: fe80::e408:e4ff:fe6:f0af/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:77 errors:0 dropped:0 overruns:0 frame:0
TX packets:71 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:16975 (16.9 KB) TX bytes:30964 (30.9 KB)

vethf0d77c7 Link encap:Ethernet HWaddr ae:f5:ee:23:5e:d1
inet6 addr: fe80::acf5:eeff:fe23:5ed1/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:54 errors:0 dropped:0 overruns:0 frame:0
TX packets:59 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:8161 (8.1 KB) TX bytes:21312 (21.3 KB)

iotedge-user@myVM1-EFLOW-5433da52 [ ~ ]$ wget https://raw.githubusercontent.com/Azure/live-video-analytics/master/edge/s
etup/prep_device.sh
--2021-05-04 04:21:53-- https://raw.githubusercontent.com/Azure/live-video-analytics/master/edge/setup/prep_device.sh
Resolving raw.githubusercontent.com... 185.199.109.133, 185.199.108.133, 185.199.110.133, ...
Connecting to raw.githubusercontent.com|185.199.109.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1292 (1.3K) [text/plain]
Saving to: 'prep_device.sh'

prep_device.sh          100%[=====>] 1.26K --.-KB/s in 0s

2021-05-04 04:21:54 (62.9 MB/s) - 'prep_device.sh' saved [1292/1292]

iotedge-user@myVM1-EFLOW-5433da52 [ ~ ]$ sudo sh prep_device.sh
% Total % Received % Xferd Average Speed Time Time Time Current
Dload Upload Total Spent Left Speed
100 17.3M 100 17.3M 0 0 11.0M 0 0:00:01 0:00:01 --:--:-- 11.0M
% Total % Received % Xferd Average Speed Time Time Time Current
Dload Upload Total Spent Left Speed
100 15.4M 100 15.4M 0 0 10.4M 0 0:00:01 0:00:01 --:--:-- 10.4M
% Total % Received % Xferd Average Speed Time Time Time Current
Dload Upload Total Spent Left Speed
100 11.5M 100 11.5M 0 0 9089k 0 0:00:01 0:00:01 --:--:-- 9089k
% Total % Received % Xferd Average Speed Time Time Time Current
Dload Upload Total Spent Left Speed
100 24.6M 100 24.6M 0 0 12.8M 0 0:00:01 0:00:01 --:--:-- 12.8M
iotedge-user@myVM1-EFLOW-5433da52 [ ~ ]$
```

EFLOW VM

Task 5: Provision Azure IoT Edge for Linux Configuration

- Update file paths of Certificates
- Uncomment file paths (remove #)
- Update hostname with EFLOW VM IP

Certificates are for the interop communication between the Linux and Windows side

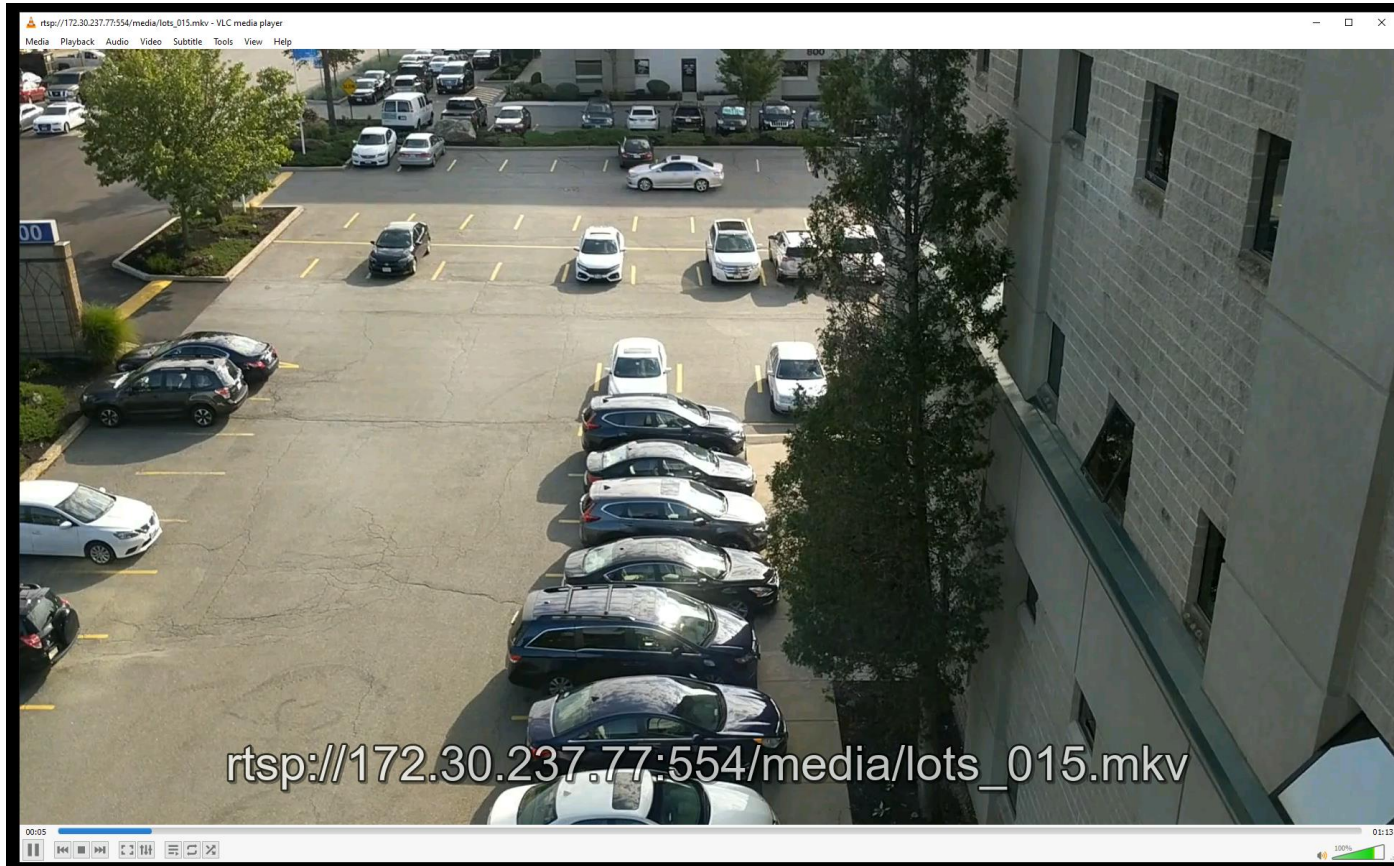
A dramatic scene from Star Wars showing Darth Vader on the left and Yoda on the right, both holding lit lightsabers. The blades are crossed in the center, creating a bright white and yellow spark. Vader's blade is red, and Yoda's is green. The background is dark and smoky, with some light rays filtering through. The overall tone is intense and cinematic.

Quick Battle Check!

Run “`sudo iotedge list`” and see if your modules are running

Task 6: Test Video Stream

- Test to see if the video stream can be captured



A dramatic scene from Star Wars showing Darth Vader on the left and Yoda on the right. They are engaged in a lightsaber duel. Vader's red lightsaber is extended, and Yoda's green lightsaber is also extended, meeting in the center. Bright sparks and energy are visible at the point of contact. Both characters have their capes flowing. The background is dark and atmospheric.

Quick Battle Check!

Are you seeing a video stream?

Task 7: Enable Live Video Analytics: Inferencing


- Download Live Video Analytics on IoT Edge (Visual Studio Extension)
- Create Child IoT Device
- Invoke Graph Topology
- Start Inferencing with Open VINO
- Monitor Built-In-Endpoint
- Activate Graph Instance

Purpose: Set up AI inferencing on the Linux Side

Task 8: Connect Windows Video with Linux Inferencing

- Run Windows Application
- Enable Connection Points

EFLOW+LVA - Microsoft Confidential



Type: vehicle
Score: 0.63295674

IoT Hub Device Connection String
o-Hubs.azure-devices.net;DeviceId=AIOTA-Device;SharedAccessKey=pNZMjmvpgYHZhW2mSnZFYT/P6ufCoTIX6wZt3yOsfE=

EFLOW VM Hostname/IP
172.30.237.77

Certificate Path (azure-iot-test-only.root.ca.cert.pem)
C:\Users\AIOTA\Desktop\certs\azure-iot-test-only.root.ca.cert.pem

RTSP Connection String
rtsp://172.30.237.77/media/lots_015.mkv

Connect Disconnect Connection established

Date	Message
05:26:33	{"tag":{"value":"vehicle","confidence":0.82846487},"box":{"l":0.2539989,"t":0.08292638,"w":0.05043602...
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A dramatic scene from Star Wars showing Darth Vader on the left and Yoda on the right, both in their iconic robes and capes. They are engaged in a lightsaber duel, with their blades crossed in the center. The blades are red for Vader and green for Yoda, creating a bright white and yellow point of contact with sparks flying out. The background is dark and atmospheric, with some light rays filtering through. The overall tone is epic and cinematic.

Quick Battle Check!

Are you seeing Live Inferencing?

Clean Up

- Delete VM
- Delete Resource Group
- Verify that everything has been deleted