STUDY4 為學習而生 Build School

IoT/Edge Computing - AKSEE

Azure Kubernetes Service Edge Essential

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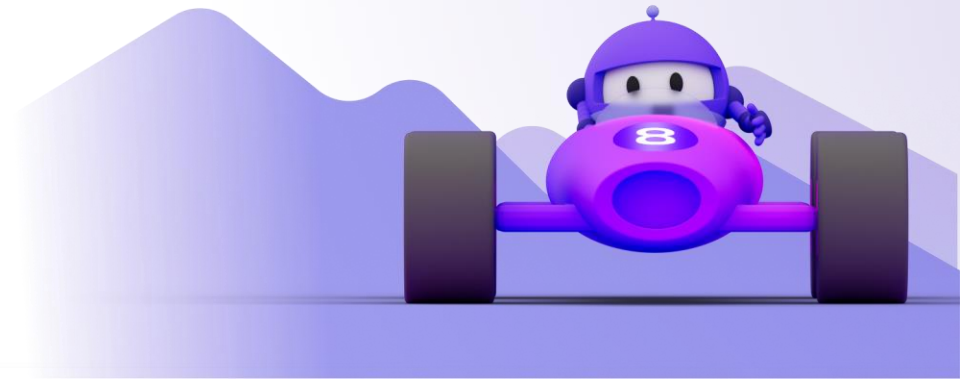
Micron – IT Staff Architect

Microsoft® MVP Most Valuable Professional

About Weithenn

- Microsoft MVP 2012 – 2023
- VMware vExpert 2012 – 2023
- Taiwan VMUG (VMware User Group) Leader
- 微軟 S2D 軟體定義儲存技術實戰...等 19 本著作
- 曾擔任 DevOpsDays Taipei 2023、COSCUP 2023、Cloud Summit Taiwan 2023、Cloud Summit Taiwan 2022、SRE Conference 2022、DevOpsDays Taipei 2021、Cloud & Edge Summit Taiwan 2021……等研討會講師

What is AKS EE?



Azure Kubernetes Service (AKS) hybrid options on Windows

Deploy your Linux and/or Windows containerized workloads

AKS hybrid options on Windows

Azure Arc control plane to manage your cluster in Azure

Standard kubectl to manage your cluster using PowerShell

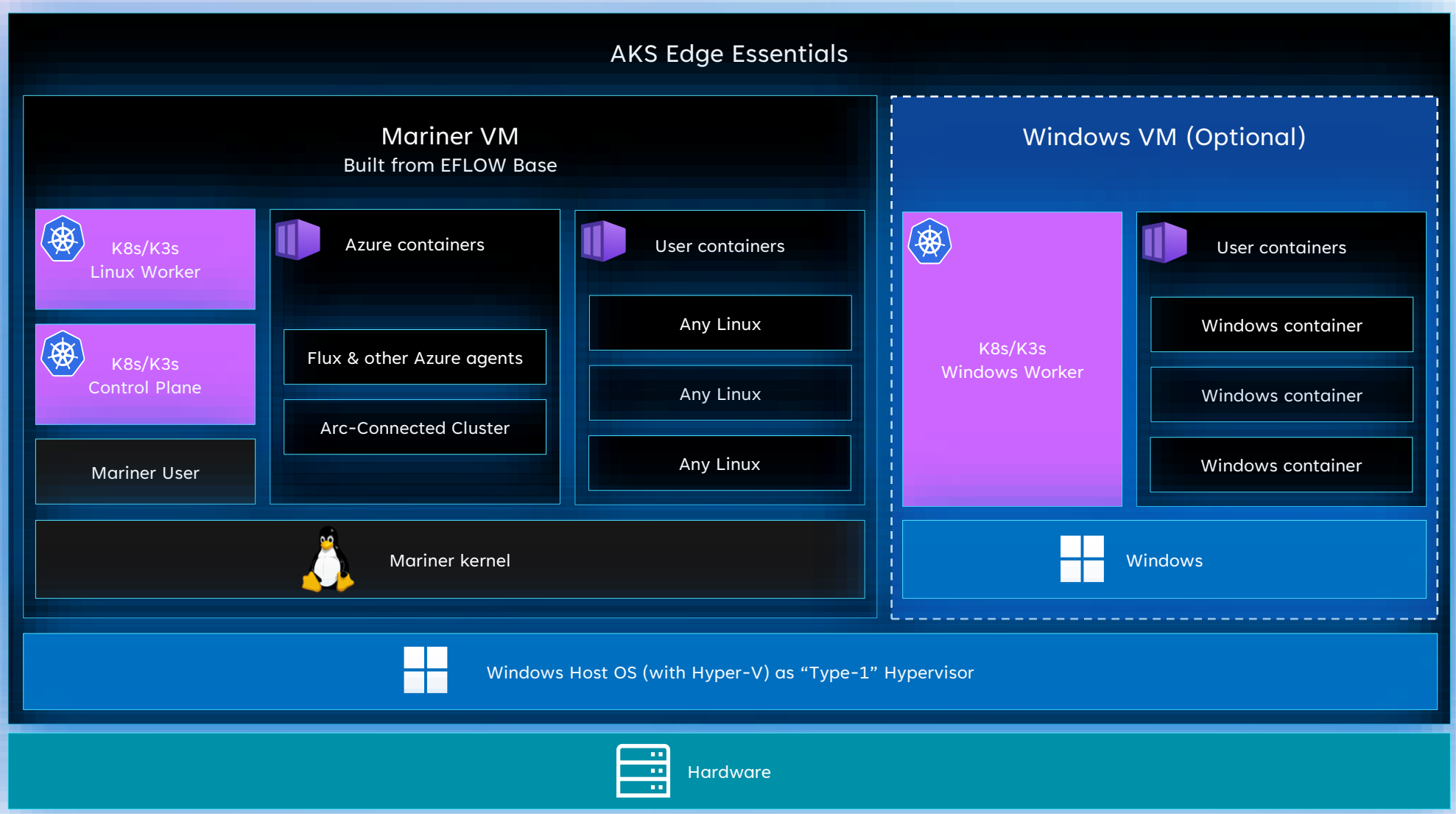
CNCF-conformant Kubernetes platform

PowerShell cmdlets and agents to enable provisioning and control of VMs and infra

Windows 10/11 (IoT Enterprise / Enterprise / Pro) and Windows Server

Edge computing devices (with 8GB+ RAM)

Azure Kubernetes Service Edge Essentials (AKS EE) Architecture



On a managed VM

With a managed VM you do not need to manage two operating systems

Use **your choice** of world-class Windows management & deployment tools for device config and updates

- Remote Desktop
- Remote PowerShell
- Image building and Reflash
- Endpoint Manager
- Azure Arc-enabled servers
- Ecosystem of MDMs & Tooling

VM Policies
VM config and A/B VM Update packages including Mariner OS + Kubernetes patches

OS Polices
OS Configurations, Updates, and Certificates

Use Azure to manage all your Containers and Kubernetes configs across cloud and on-prem with Arc-enabled Kubernetes

AKS Edge Essentials

Mariner VM
Built from EFLOW Base

- K8s/K3s Linux Worker
- K8s/K3s Control Plane
- Mariner User
- Azure containers
  - Flux & other Azure agents
  - Arc-Connected Cluster
- User containers
  - Any Linux
  - Any Linux
  - Any Linux
- Mariner kernel

Windows VM (Optional)

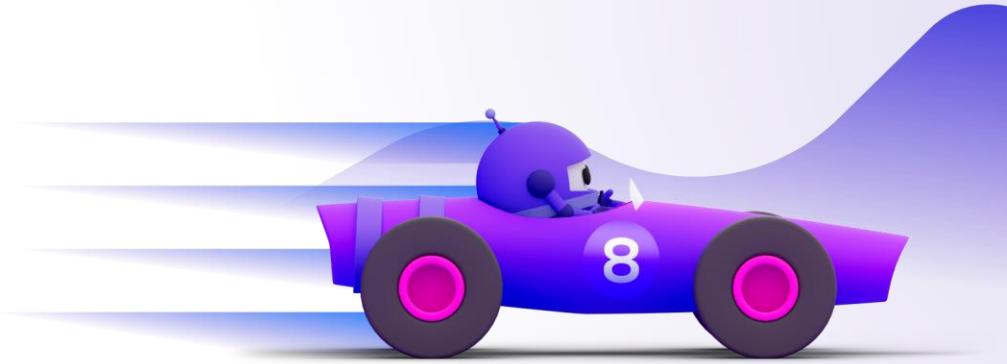
- K8s/K3s Windows Worker
- User containers
  - Windows container
  - Windows container
  - Windows container
- Windows

Windows Host OS (with Hyper-V) as “Type-1” Hypervisor

Hardware

AKS EE Requitement

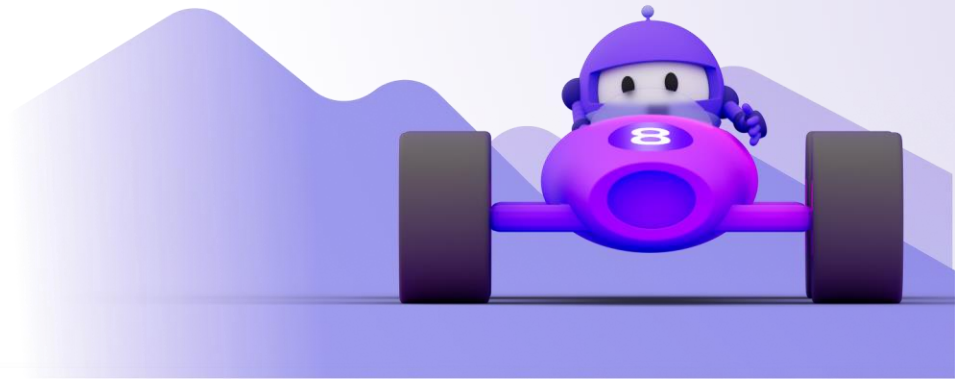
- **Host OS：**
  - Windows 10/11 IoT Enterprise / Enterprise / Pro
  - Windows Server 2019, 2022
- **CPU：**
  - 2 vCPUs, clock speed at least 1.8GHz
- **Memory：**
  - 4 GB with a least 2.5 GB free (Local cluster)
  - 8 GB with a least 4.5 GB free (Arc-connected cluster and GitOps)
- **Disk Space：**
  - At least 14 GB free
- **Kubernetes Distribution：**
  - K8s (network plugins is Calico)
  - K3s (network plugins is Flannel)



Demo

- Install AKE EE (K8s or K3s)
- Create Single Node AKS EE Cluster
- Deploy Linux / Windows / Metrics App to K8s/K3s
- How to uninstall AKE EE (K8s or K3s)

Single Node or Multi-Node



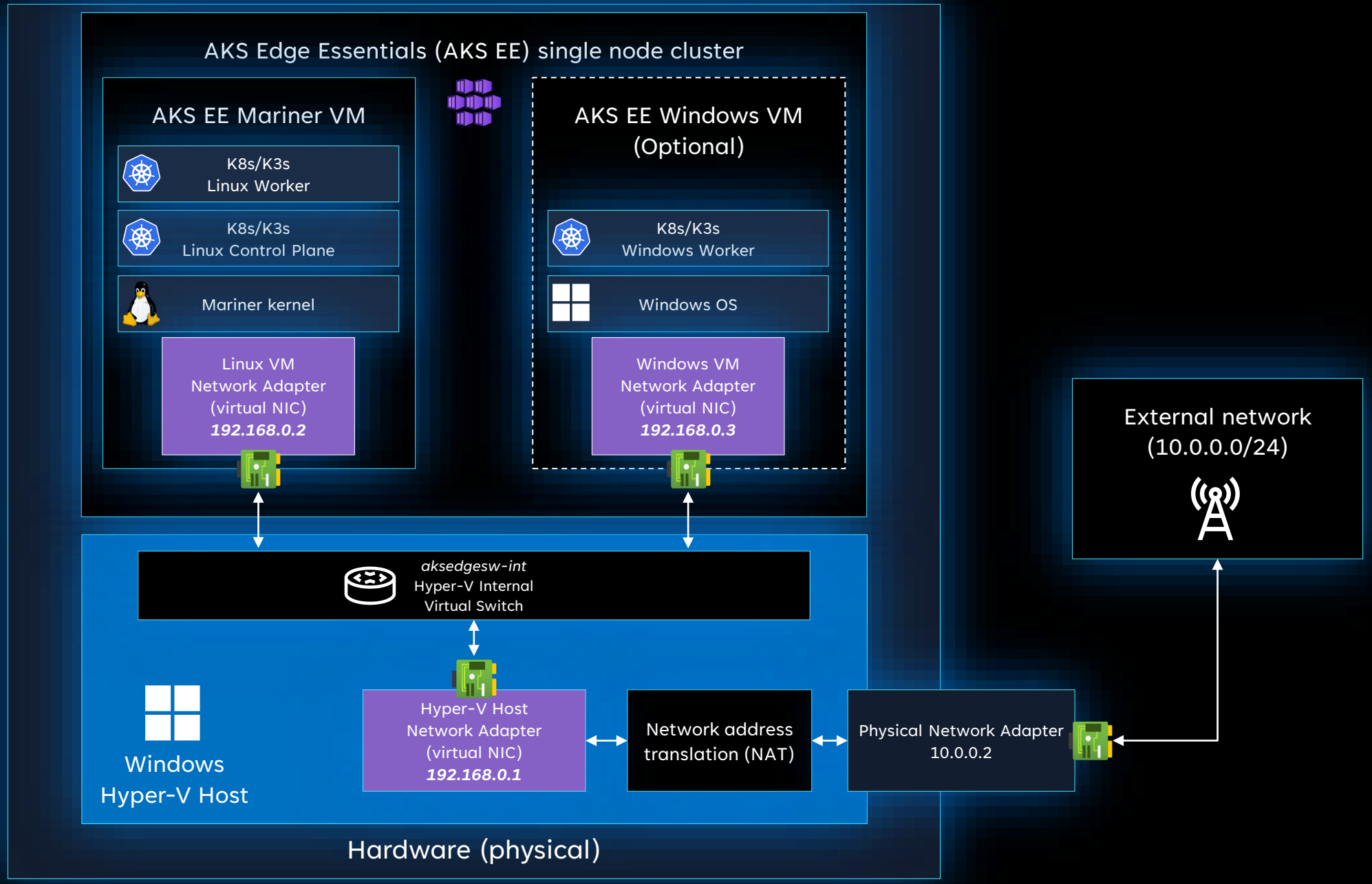
Azure Kubernetes Service Edge Essentials (AKS EE)

Networking – Comparison by deployment type

	Single Machine	Scalable Cluster
Type of Virtual switch	Internal	External
Virtual switch creation	Automatic	Automatic Based on NetAdapterName
IP address assignment	Automatic – Addresses defined	Static IP addresses
Outbound connections	Using NAT	Directly using Physical Net Adapter
Inbound connections	Not reachable	Using Node IP Address
Network Plugin	K8s – Calico K3s – Flannel	K8s – Calico K3s – Flannel
DNS	Configurable – If not provided, use Windows host DNS servers	Configurable – If not provided, use Windows host DNS servers
Proxy	Configurable – *http_proxy*, *https_proxy* & *no_proxy*	Configurable – *http_proxy*, *https_proxy* & *no_proxy*
Offline deployment	Available	Available
Service IP range	If *ServiceIPRangeSize* is defined, will start at *192.168.0.4*	Both *ServiceIPRangeStart* and *ServiceIPRangeSize* can be defined
Static MAC Address	Available	Available
Network MTU	Available	Available

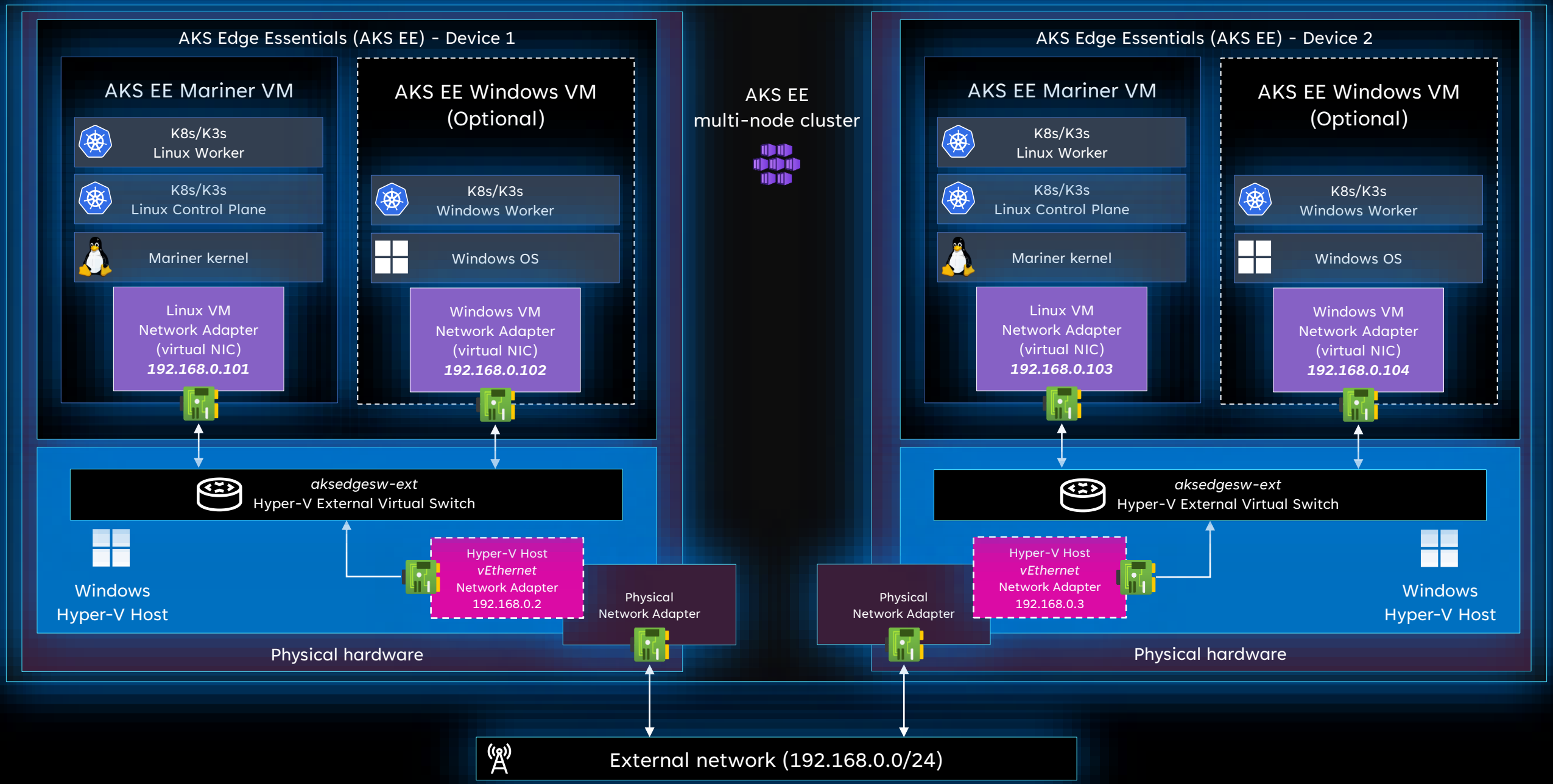
Azure Kubernetes Service Edge Essentials (AKS EE)

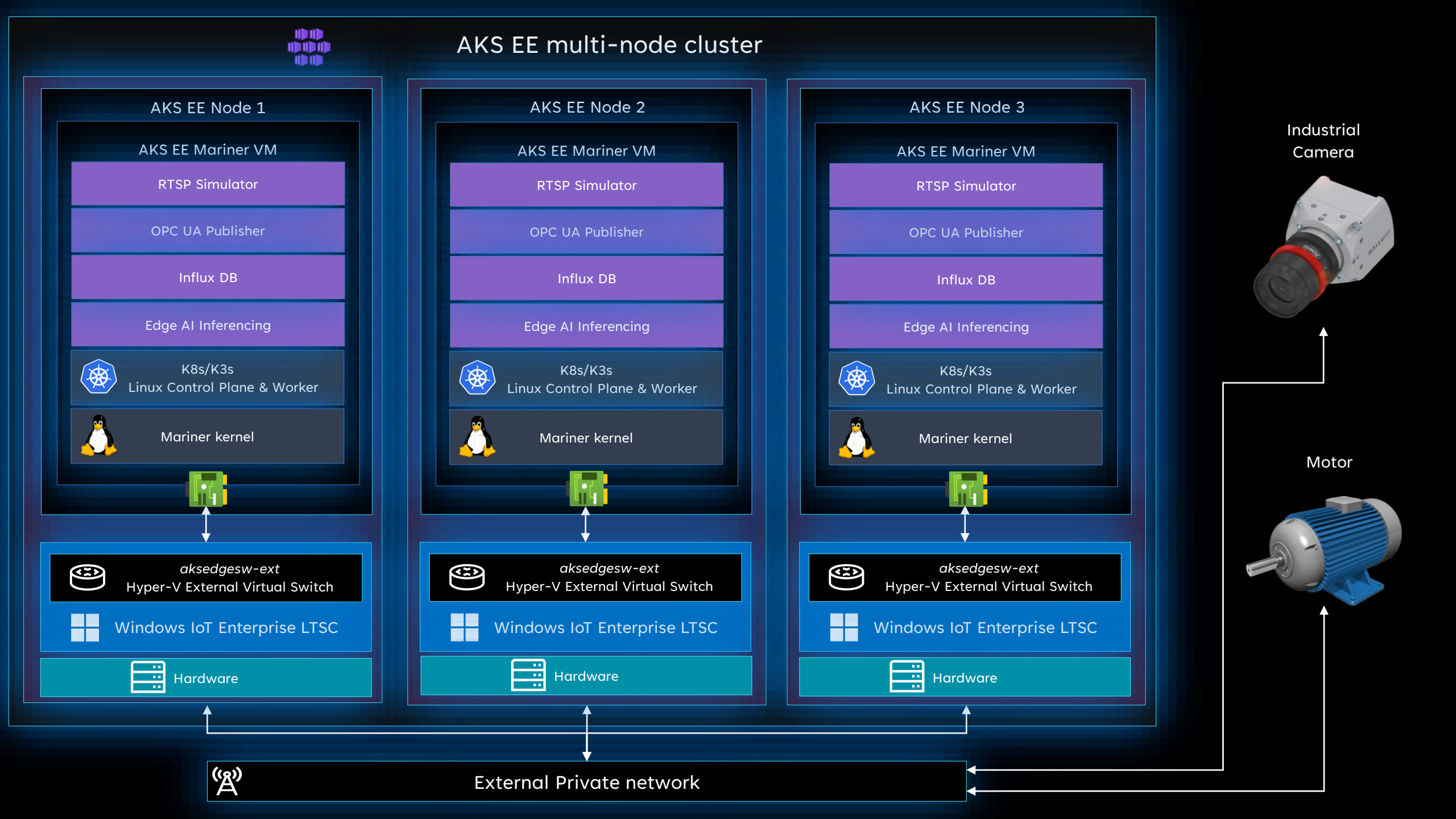
Single Node Cluster with Internal Virtual Switch network architecture



Azure Kubernetes Service Edge Essentials (AKS EE)

Multi-Machine Cluster with External Virtual Switch network architecture




AKS EE multi-node cluster
AKS EE Node 1
AKS EE Mariner VM
RTSP Simulator
OPC UA Publisher
Influx DB
Edge AI Inferencing
K8s/K3s
Linux Control Plane & Worker
Mariner kernel
aksedgesw-ext
Hyper-V External Virtual Switch
Windows IoT Enterprise LTSC
Hardware
AKS EE Node 2
AKS EE Mariner VM
RTSP Simulator
OPC UA Publisher
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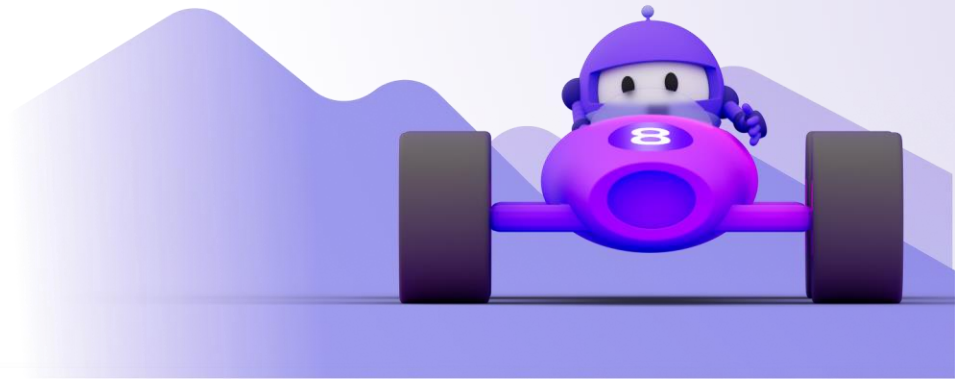
Hyper-V External Virtual Switch
Windows IoT Enterprise LTSC
Hardware
External Private network
Industrial Camera
Motor

Demo

- Install AKE EE (K8s or K3s)
- Create Single Node AKS EE Cluster

- Deploy Linux / Windows / Metrics App to K8s/K3s
- How to uninstall AKE EE (K8s or K3s)

AKS EE Architecture



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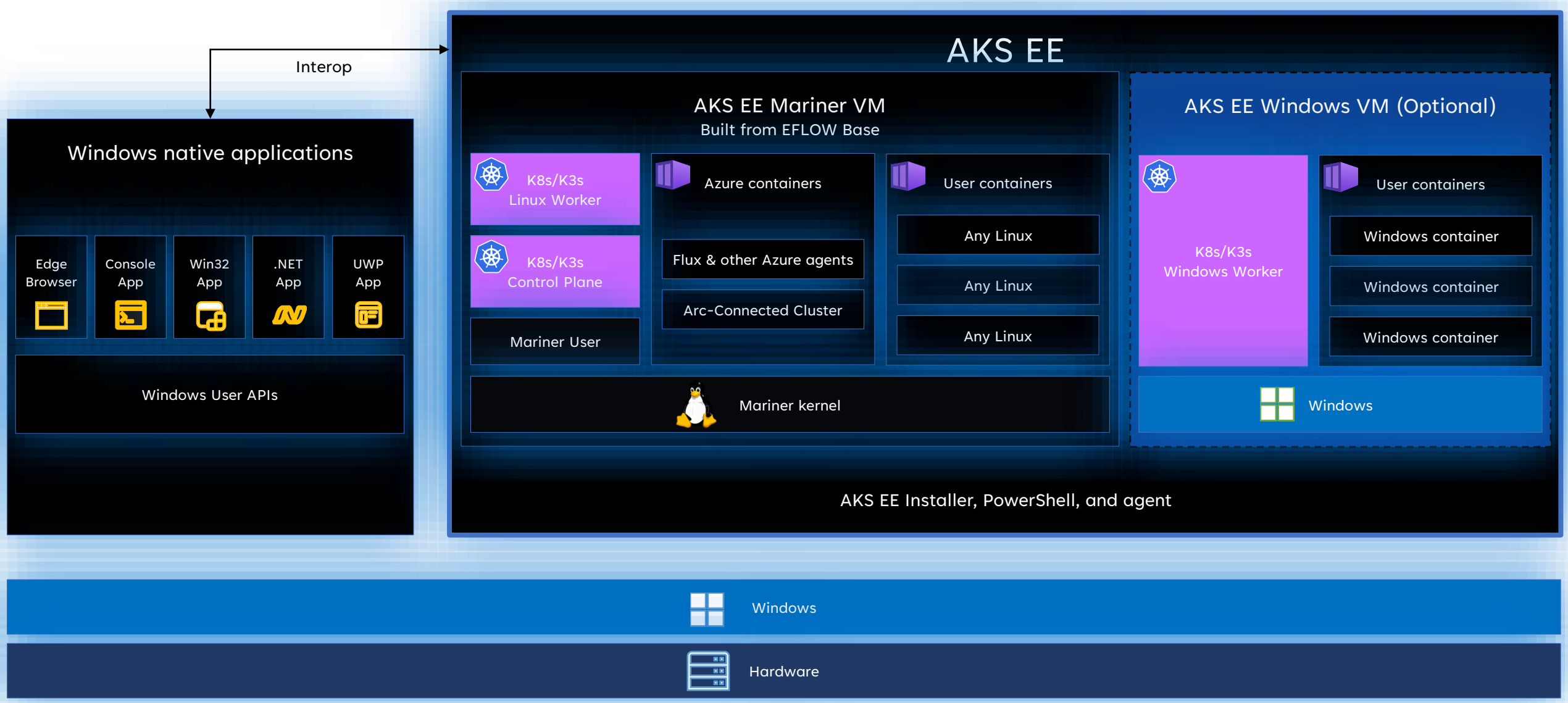
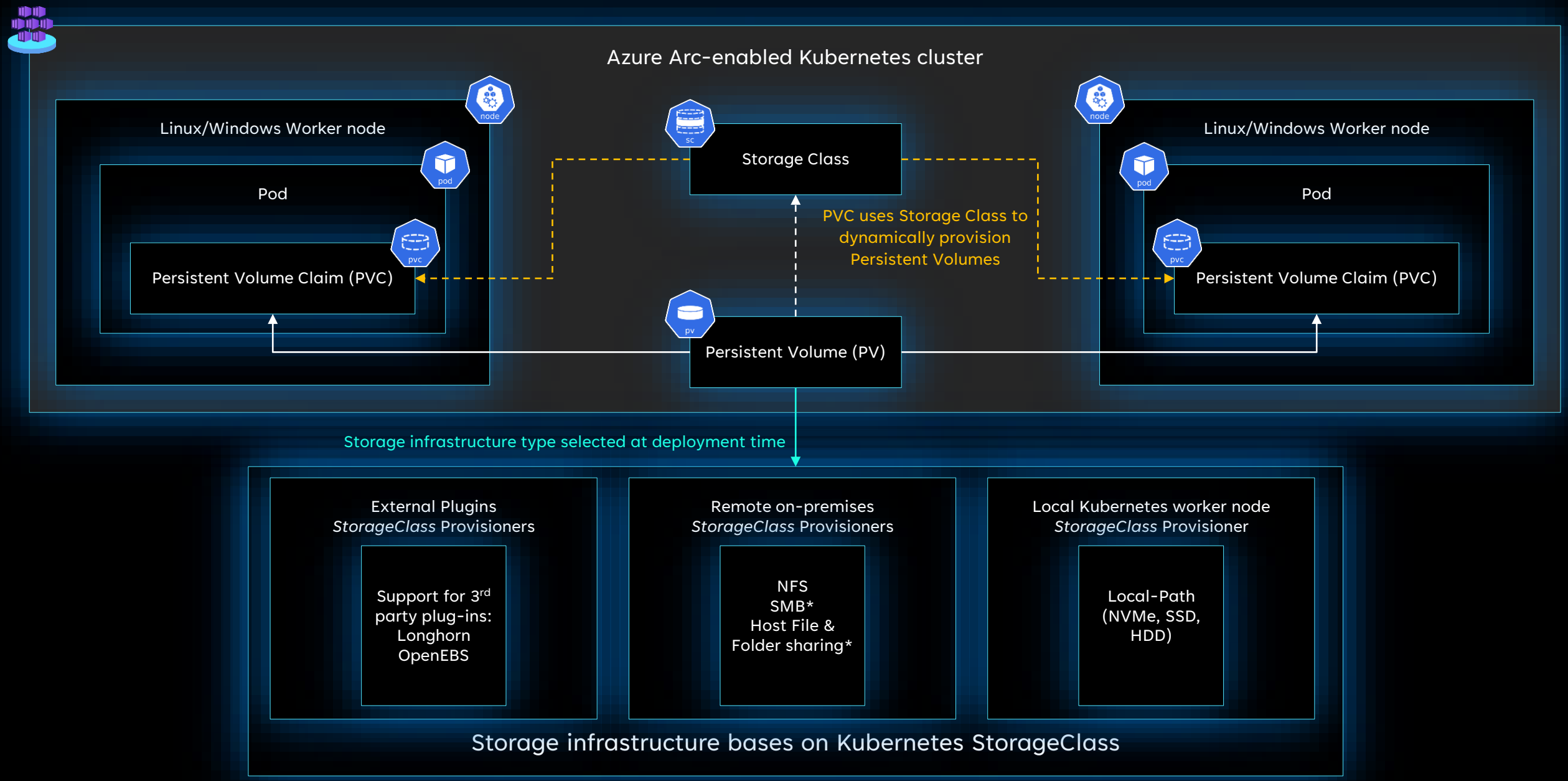


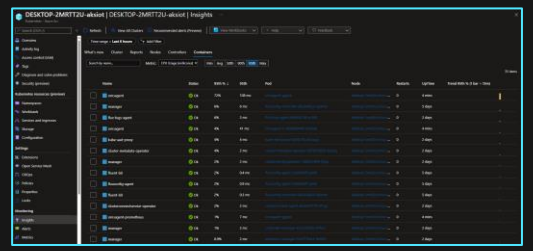
Azure Kubernetes Service Edge Essentials (AKS EE)

Storage options



Azure Resource Manager

Build and manage cloud deployments directly from the Azure portal



Deploy Cluster extensions

Azure Monitor
Monitor servers in Azure, machines on-premises or at other cloud providers.

Azure Policy
Enforce organizational standards and assess compliance at-scale.

Azure App Service
Quickly build, deploy, and scale web apps and APIs on Kubernetes or Azure.

Deploy your own workloads

PR Pipeline

App repository

GitOps
Manage your desired state Kubernetes cluster configurations with Git

CI Pipeline

CD Pipeline

GitOps repository

Microsoft Artifact Registry
Build, store, and manage container artifacts for your deployments

OS and VM Updates

Windows Update
Get the latest fixes, updates and security improvements

From cloud to edge and back

Azure Arc

Cluster extensions

User workloads

Flux

Containerized workloads

Pull cluster desired state

Deploy AKS-IoT on a device like an application

AKS EE Kubernetes Platform

K8s/K3s

Linux VM

Windows VM (optional)

Connected via Azure Arc-enabled Kubernetes

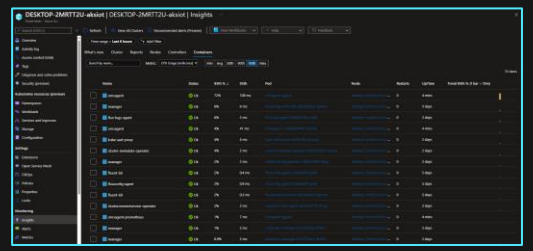
Connected via Azure Arc-enabled servers

Windows Host OS (with Hyper-V)

Hardware

Azure Resource Manager

Build and manage cloud deployments directly from the Azure portal



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Deploy AKS-IoT on a device like an application

Connected via Azure Arc-enabled Kubernetes

Cluster extensions

User workloads

Flux

Containerized workloads

AKS EE Kubernetes Platform

K8s/K3s

Linux VM

Windows VM (optional)

Windows Host OS (with Hyper-V)

Hardware

Cache containers

Cache updates

On-premises, user-owned private Container Registry

Pull cluster desired state

GitOps repository

Windows Server Update Services (WSUS) enables IT admins to deploy Microsoft updates.

Disconnected on-premises

Resources

- About AKS Edge Essentials
- AKS Edge Essentials requirements
- AKS Edge Essentials clusters and nodes

- Azure Kubernetes Service 簡介
- 使用 AKS 自動調整叢集
- 使用 AKS 協調雲端原生應用程式的容器
- 在 AKS 上部署、管理及監視 Windows 容器

特別感謝

.NET Conf
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Thank you!

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成功

HackMD

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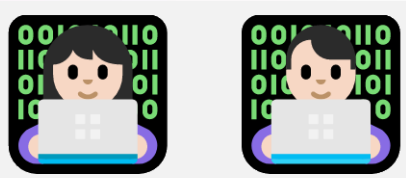

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Azure Taiwan User Group

以及各位參與活動的你們