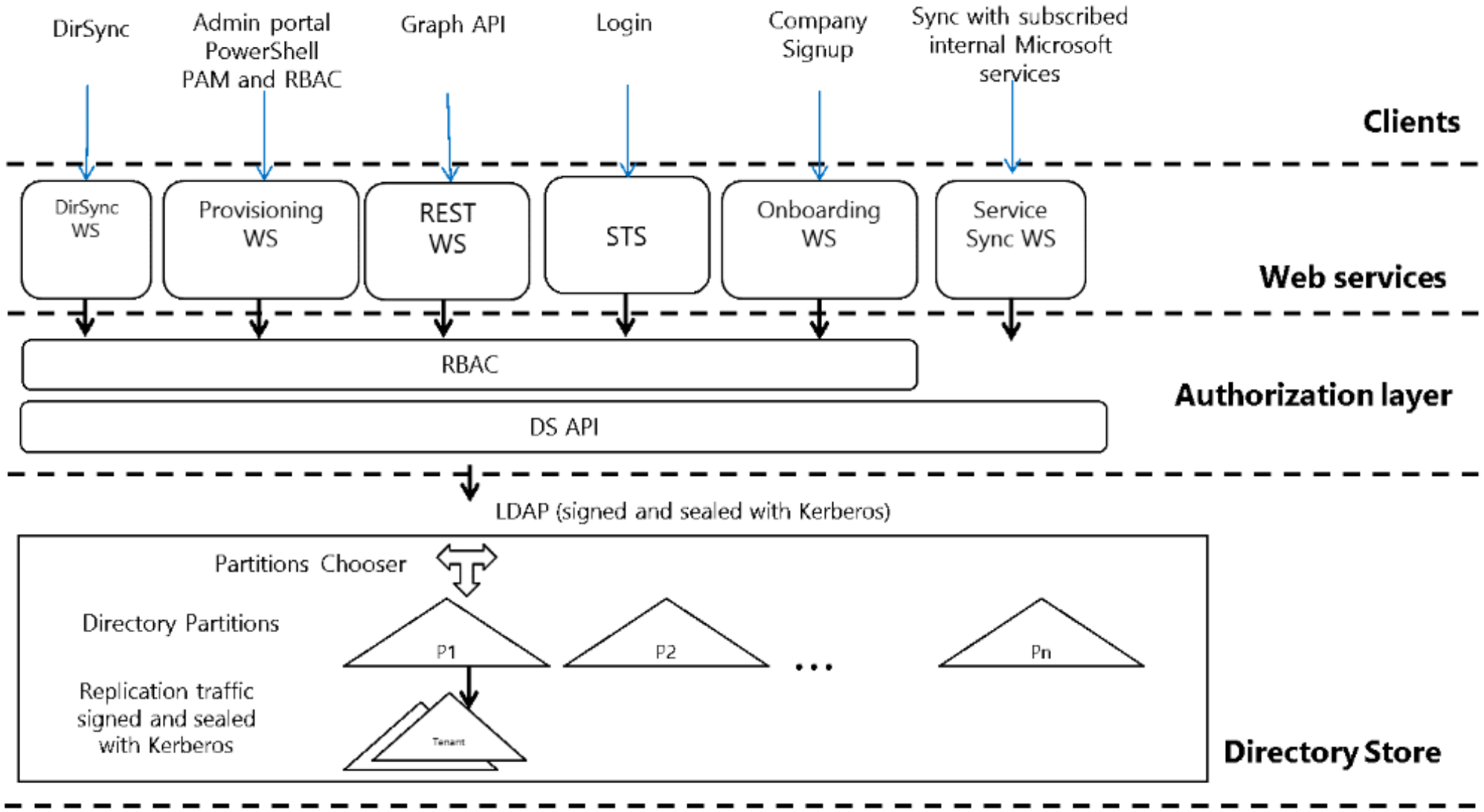
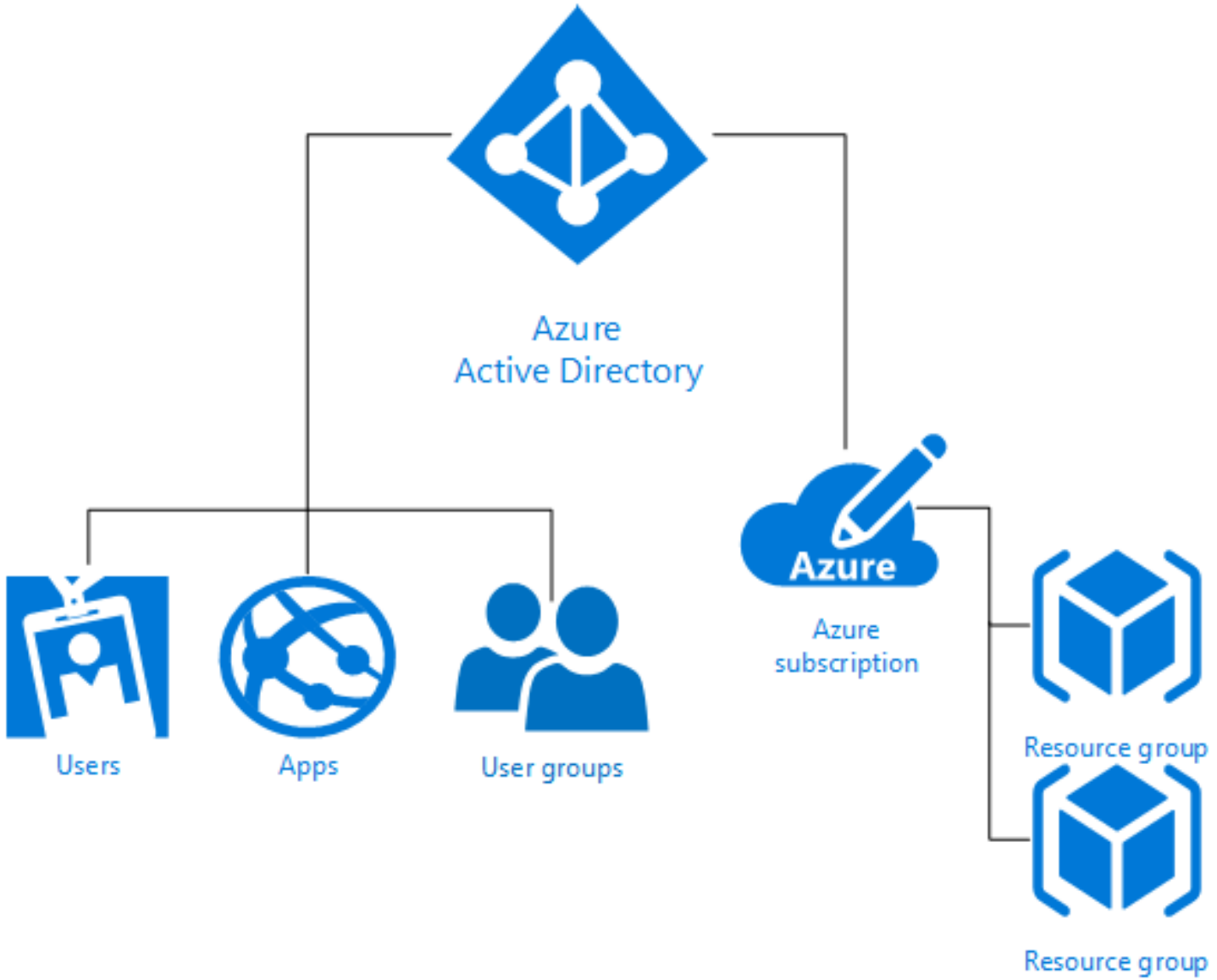
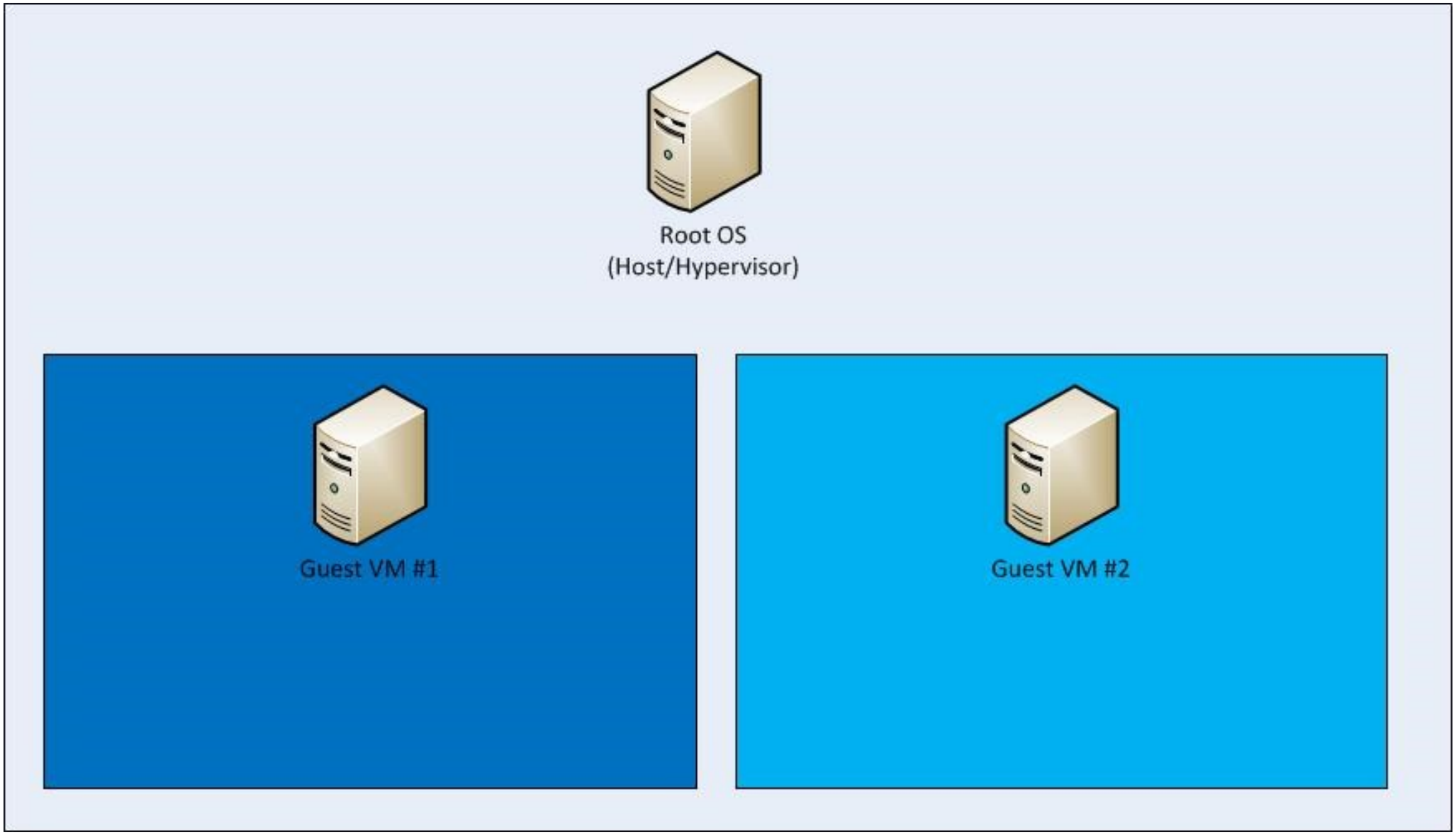
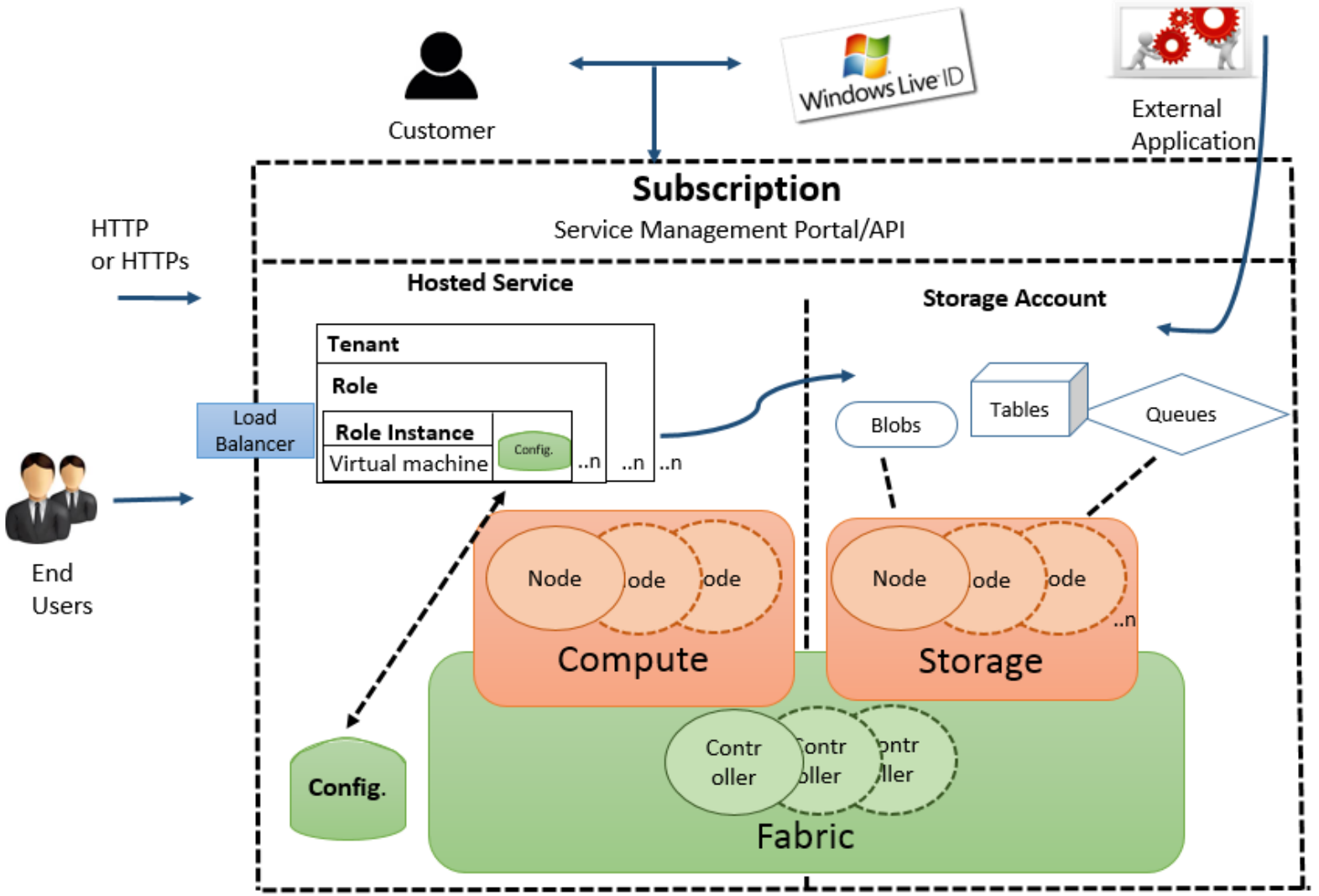
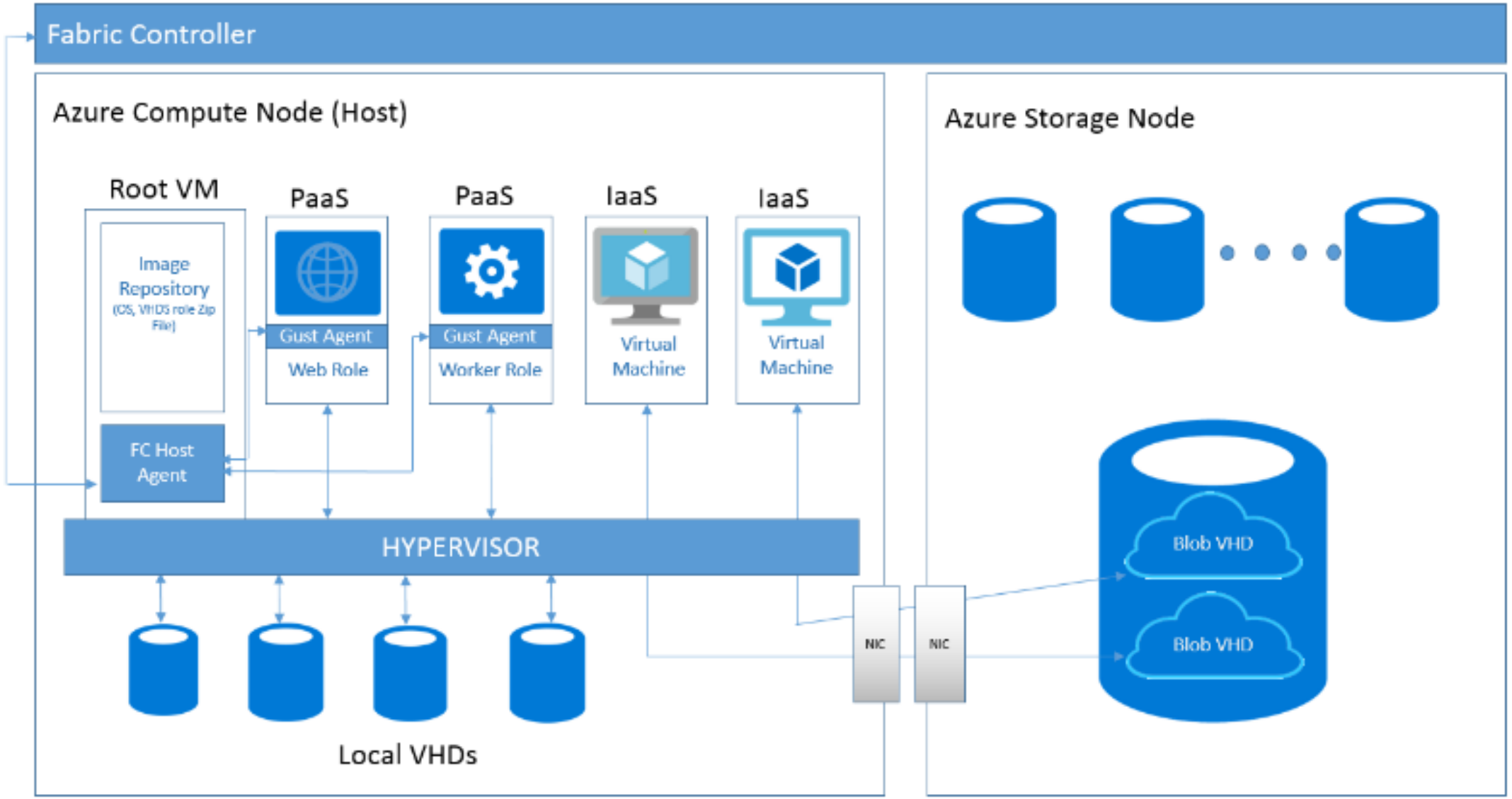
Azure Compute Essentials

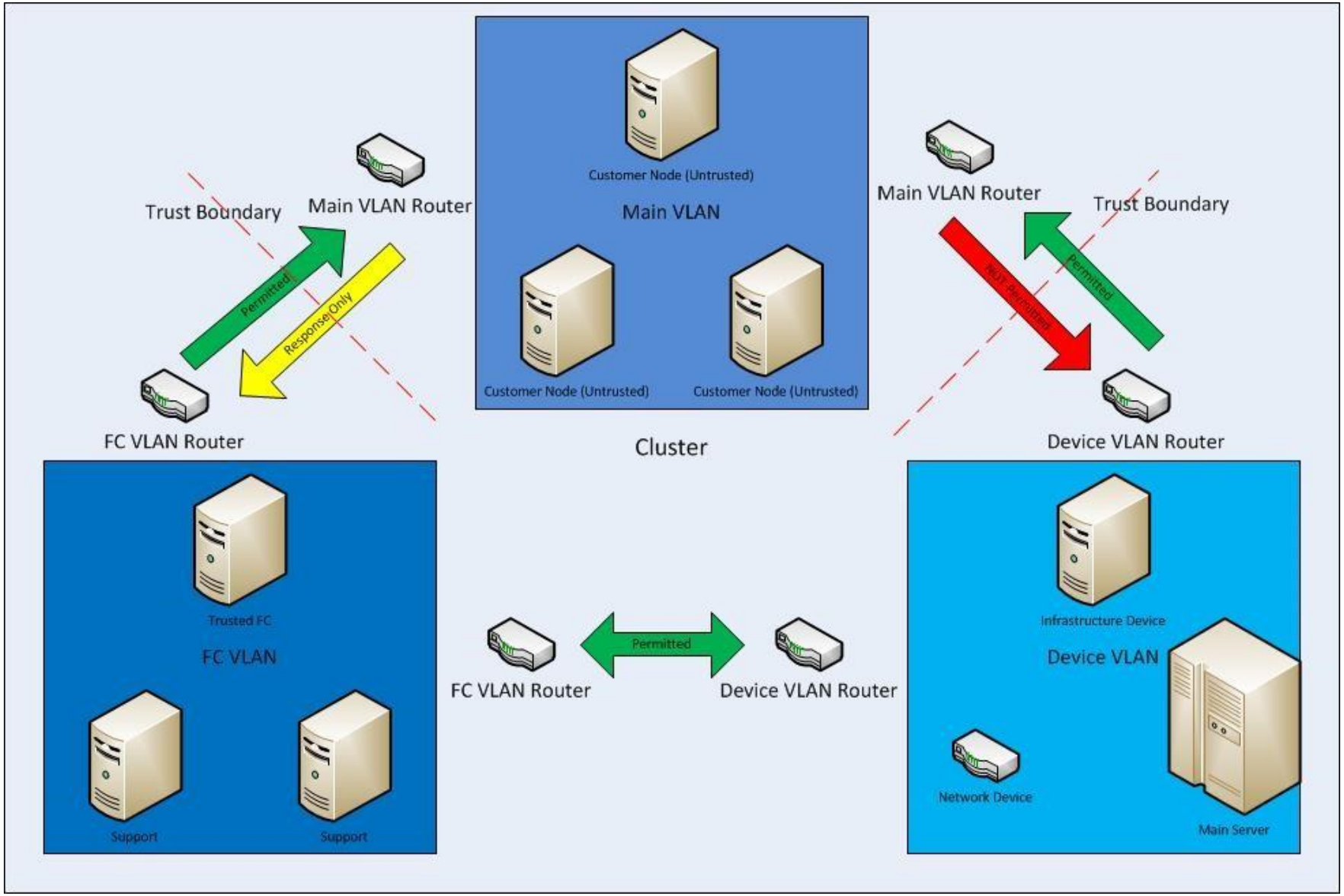

DirSync
Admin portal
PowerShell
PAM and RBAC
Graph API
Login
Company
Signup
Sync with subscribed
internal Microsoft
services
Clients
DirSync
WS
Provisioning
WS
REST
WS
STS
Onboarding
WS
Service
Sync WS
Web services
RBAC
DS API
Authorization layer
LDAP (signed and sealed with Kerberos)
Partitions Chooser
Directory Partitions
P1
P2
...
Pn
Replication traffic
signed and sealed
with Kerberos
Tenant
Directory Store


Azure
Active Directory
Users
Apps
User groups
Azure
Azure
subscription
Resource group
Resource group


Root OS
(Host/Hypervisor)
Guest VM #1
Guest VM #2


Customer
Windows Live ID
External Application
Subscription
Service Management Portal/API
HTTP
or HTTPs
Hosted Service
Storage Account
Tenant
Role
Role Instance
Virtual machine
Config.
..n
..n
..n
Load Balancer
Blobs
Tables
Queues
End Users
Node
ode
ode
Compute
Node
ode
ode
..n
Storage
Contr oller
Fabric
Config.


Fabric Controller
Azure Compute Node (Host)
Root VM
Image Repository
(OS, VHDS role Zip File)
FC Host Agent
PaaS
Gust Agent
Web Role
PaaS
Gust Agent
Worker Role
IaaS
Virtual Machine
IaaS
Virtual Machine
HYPERVISOR
Local VHDs
NIC
NIC
Azure Storage Node
Blob VHD
Blob VHD


Trust Boundary
Main VLAN Router
Permitted
Response Only
FC VLAN Router
Customer Node (Untrusted)
Main VLAN
Customer Node (Untrusted)
Customer Node (Untrusted)
Cluster
Main VLAN Router
Trust Boundary
NOT Permitted
Permitted
Device VLAN Router
Trusted FC
FC VLAN
Support
Support
Permitted
FC VLAN Router
Device VLAN Router
Infrastructure Device
Device VLAN
Network Device
Main Server

Azure Regions

List of regions and their locations

- Special Azure regions
  - US Gov Virginia and US Gov Iowa
  - Germany Central (T- Systems Deutsche)
  - China East (21Vianet)
- Region Pairs (approach for replication and geo failover)

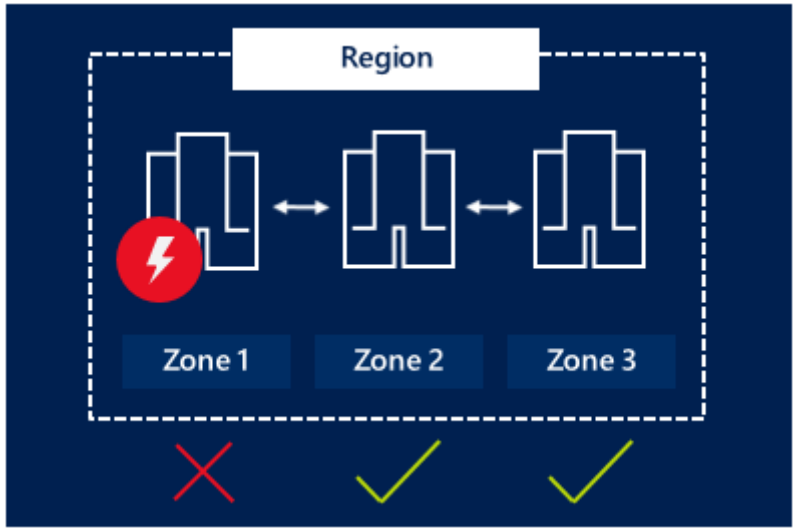
Southeast Asia	East Asia
West US	East US

Availability Sets

- Logical grouping of VM within a datacenter
  - Fault Domains (FD)
    - Logical group of underlying hardware (Top of rack switch)
  - Update Domain (UD)
    - Logical group of underlying hardware that undergo maintenance together
- Required to take advantage of the SLA 99.95%

Availability Zones

- Alternative to Availability Sets
- Physically separate zone within Azure
- Three Availability Zones per Azure Region



Sizes of Windows VMs

- General Purpose (B or D series) – Low web servers
- Compute Optimized (F series) – Medium Web servers
- Memory Optimized (Esv, GS)
- Storage Optimized (Ls) - High disk throughput and IO
- GPU (NV)
- High Performance Compute (H, A8-11)
- Tailored Compute (M) – SAP Hana
- CoreMark benchmark scores

Azure Compute Unit (ACU)

- ACU provides a way to compare CPU performance across Azure VM SKUs
- A Standard A1 VM is 100 ACU

D1-D14	160	1:1
D1_v2-D15_v2	210 - 250*	1:1
DS1-DS14	160	1:1
DS1_v2-DS15_v2	210-250*	1:1
D_v3	160-190*	2:1**

- * Intel
- ** Hyper Threading

Maintenance for Virtual Machines

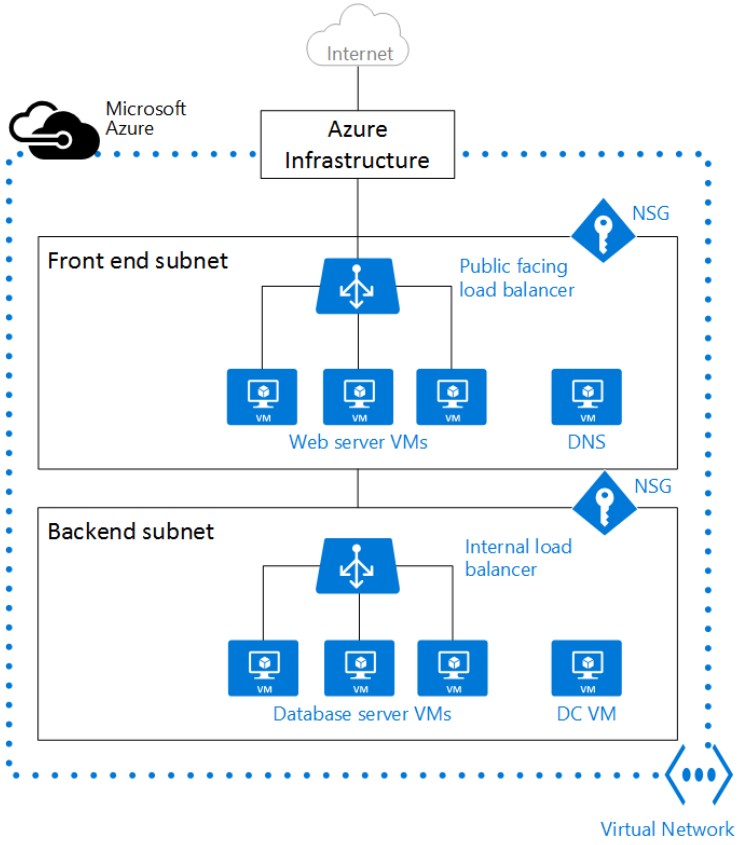
- Reboot-less update
  - Memory preserving maintenance to pause the VM
- Reboot required
  - You can choose the time reboot

Storage

- Refer to Storage Essentials for concepts like
  - Managed Disks
  - Premium Storage
  - Backup
  - DR

Networking

- Refer to Networking Essentials for concepts like
  - VNET
  - Subnets
  - Public and Private IP
  - NSG
  - Load Balancers

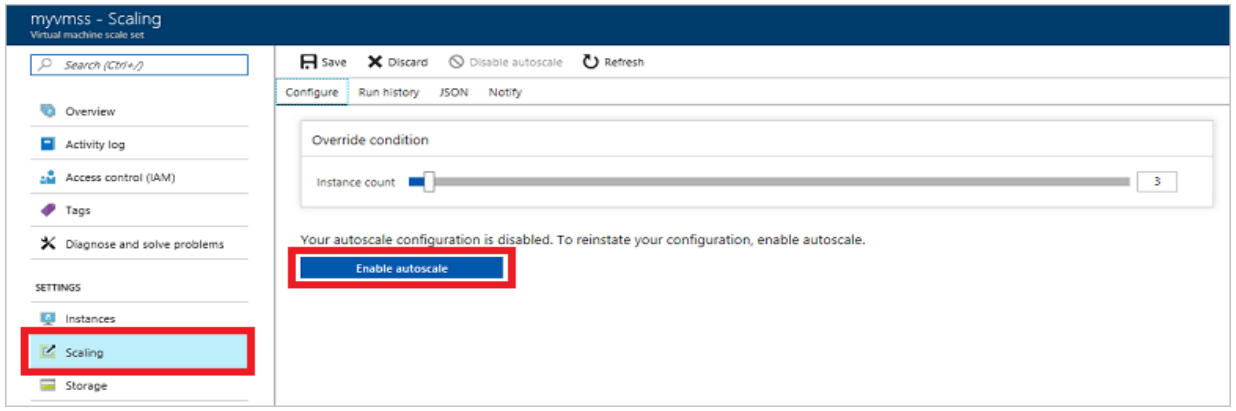


VM Scaling

- Horizontal
  - VM Scale Sets
- Vertical
  - Use automation to move to a higher SKU
  - Requires a stop and restart

Virtual Machine Scale Set

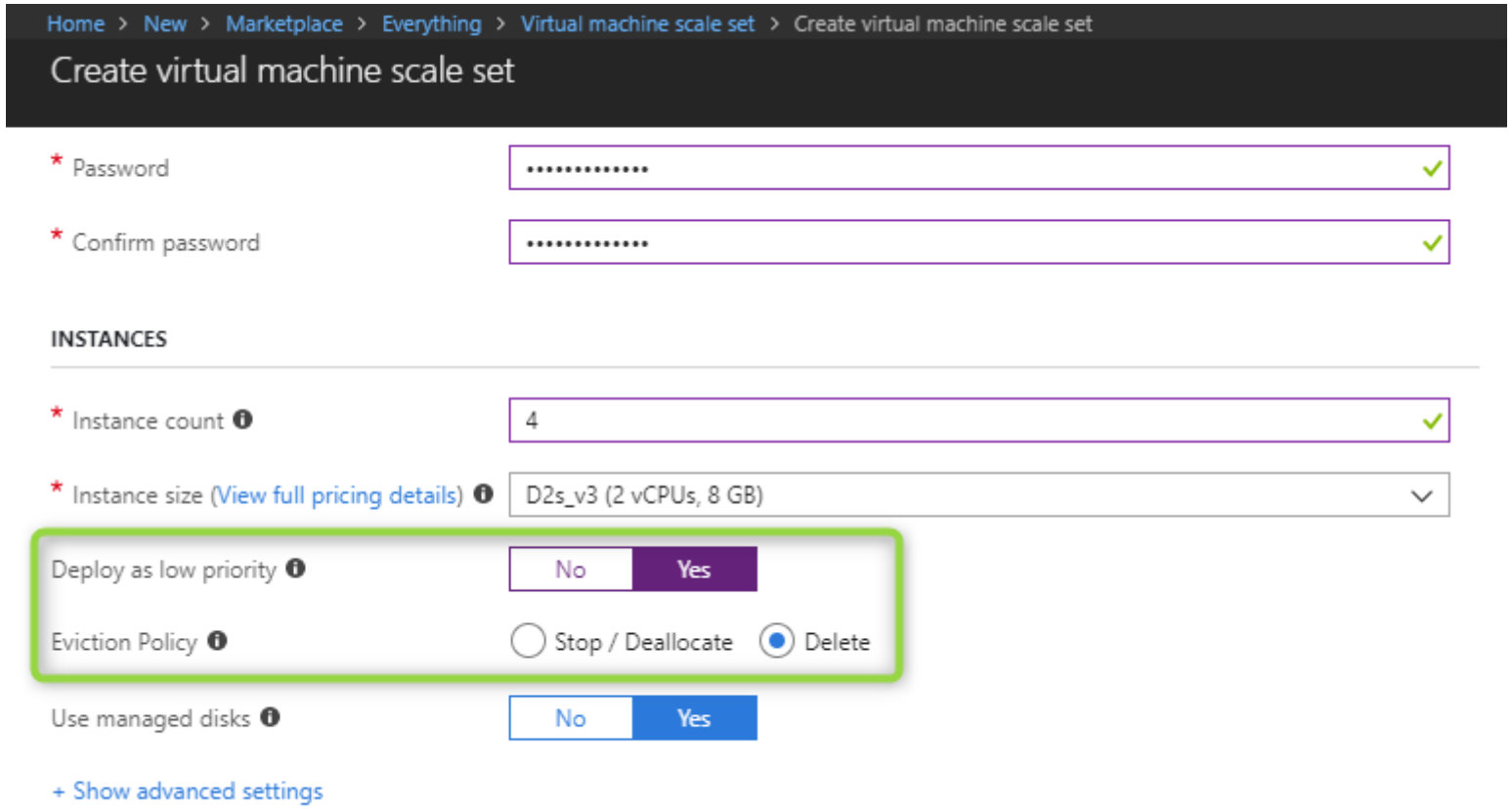
- Deploy identical machines as a set
- Windows and Linux
- Auto scale (or manual) using metrics (percentage CPU)
- Update the capacity property



VM Scale Set Considerations

- Suitable for machines that have similar configuration
- This makes scaling possible (also overprovisioning)
- Also makes reimaging possible
- Scale Set model” - desired state (Both Scale Set and VM)
- Scale Set Instance View - running state (Both Scale Set and VM)
- Properties
  - Global – subnet,
  - VM Level – Currently the only property support is attach / detach
- Upgrade Policy – e.g apply a change to custom extension

Low Priority VMs



VM Considerations

- Attach Data Disks to individual VMs
- Snapshot individual VM
- Assign IP V6 address

Scale Set Model

az vmss show --resource-group myResourceGroup --name myScaleSet


```
{
  "location": "westus",
  "overprovision": true,
  "plan": null,
  "singlePlacementGroup": true,
  "sku": {
    "additionalProperties": {},
    "capacity": 1,
    "name": "Standard_D2_v2",
    "tier": "Standard"
  },
}
```


$ az vmss show --resource-group myResourceGroup --name myScaleSet


```
{
  "location": "westus",
  "name": "{name}",
  "sku": {
    "name": "Standard_D2_v2",
    "tier": "Standard"
  },
}
```

Networking for ScaleSets

- In general, the entire scale set gets a single public IPV4
  - Although it is possible to assign individual IPs to VMs
  - Each VM can have NICs with multiple IP Configuration
- NSG can be applied to a scale set
- Scale set can leverage accelerated networking
- Scale set can reference Azure Load Balancer and Application Gateway
- You can attach non-empty data disks to individual VMs **but not VMs in a scale set.**

Automation

- Ansible, Chef and Puppet
- Cloud-init (Linux VMs)
- DSC
- Packer and Terraform
- Azure Automation
- Custom Script Extension

Security and Policy

- Antimalware
- Azure Security Center
- Encryption
  - Bitlocker
  - Dm-encrypt for Linux
- Key Vault (to store keys and secrets)
  - Note no Object Level Permissions
- SSH logon using public private key
- Azure Policies – Enforce naming conventions, SKU type
- RBAC roles

Monitoring

- Azure Portal provides basic metrics about a VM
  - CPU usage, network usage
- Boot diagnostics logs
  - ** The only way to know why a VM has got it into an non-bootable state
- Alerts based on specific perf metrics
- Logs
  - Control-plane events (Administrative, Service Health, AutoScale, Recommendation
- Advanced Monitoring
  - OMS
  - Log Analytics (Log Analytics VM Extension)
- Network Watcher

Backup and restore

- Azure Backup
  - Application consistent backup from Windows or Linux VM
  - Azure Backup created recovery points that are stored in recovery vaults
- Azure Site Recovery
  - Recover your entire application (collection of VMs)
  - Disaster recovery drills (on-demand failover)
- Managed Snapshot
  - Read-only full copy of a managed disk (difference from Blob snapshot)
  - Billed based on used portion of the disk

High Performance Computing

- Do it yourself
  - VM and VM Scale Set
- Hybrid
  - Burst into the cloud
- Big Compute Solutions as a service
  - Azure Batch
  - Cycle Computing

Azure Batch

- Platform for running HPC applications
- Schedules compute-intensive work on a “managed” pool of VMs
- Low-priority VMs (based on surplus capacity)
  - May be preempted

vCPU

- Provisioned VMs cannot exceed
  - Total Regional vCPUs
  - VM size family cores (e.g. Standard D Family vCPUs)

Reserved Instances

- Azure Reserved Virtual Machine Instances allow customers to save up to 72% on IaaS compute by pre-purchasing a virtual machine for a 1 or 3-year period.
- RI reservation applies at the Data Center level (not at the subscription level).
- RI reservation is a billing construct, no change to already provisioned VM is needed
- A-HUB benefits *can* be combined with RI (for a combined discount of 82%)
- Microsoft does allow RI Swaps, as well as, RI cancellations*

*Microsoft will charge a small fee. Then for the balance of the value of the RI,
the lesser of the retail price or what the customer paid goes back to customer's account overall

Reserved Instances

- Future price drops by the Azure team are not available
- Consider the differences between RI and auto/ scheduled scaling
- Does not apply to Cloud Services
- Accrued interest on pre-commit payments (applies to EA** customers as well)

VMWare on Azure

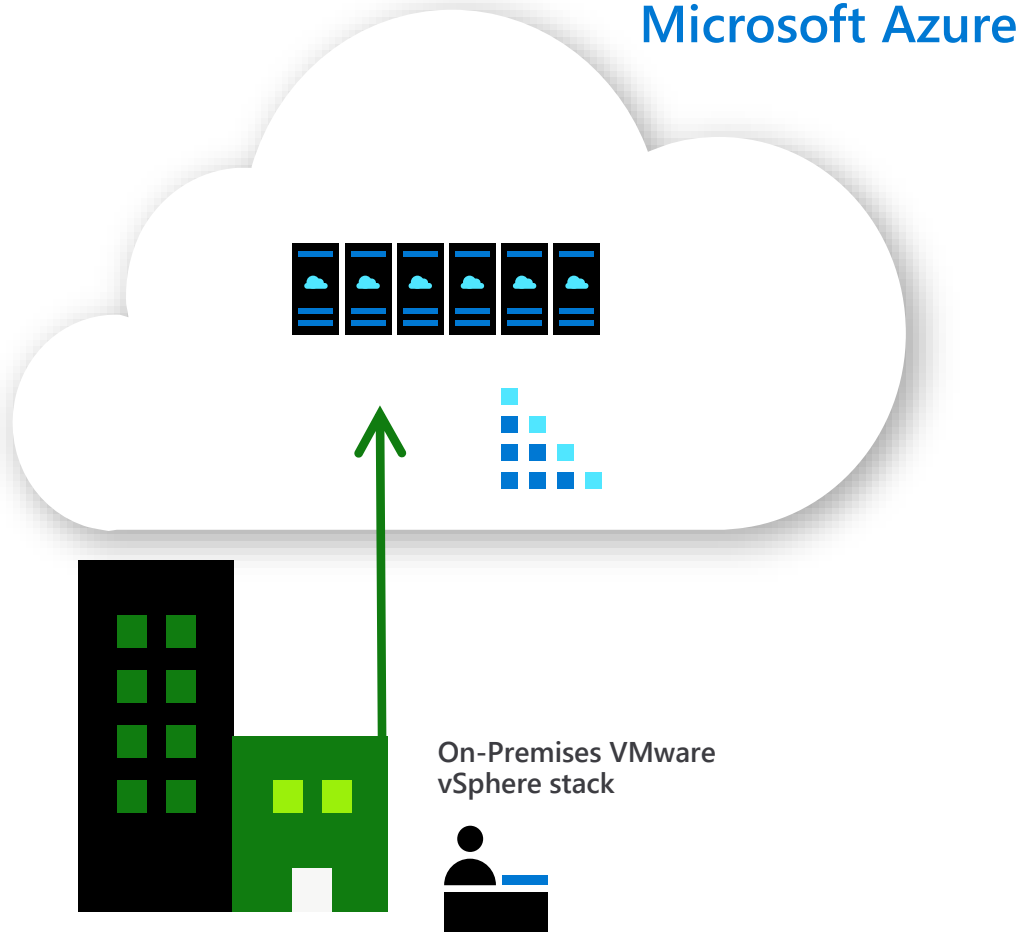
- Migrate your VMware virtualization stack to Azure
- For VMware workloads that are initially more challenging to migrate
- Full VMware stack on Azure co-located with other Azure services

Azure VMware Solution

It is a **comprehensive VMware environment on dedicated Azure infrastructure.** Built by Microsoft and VMware.

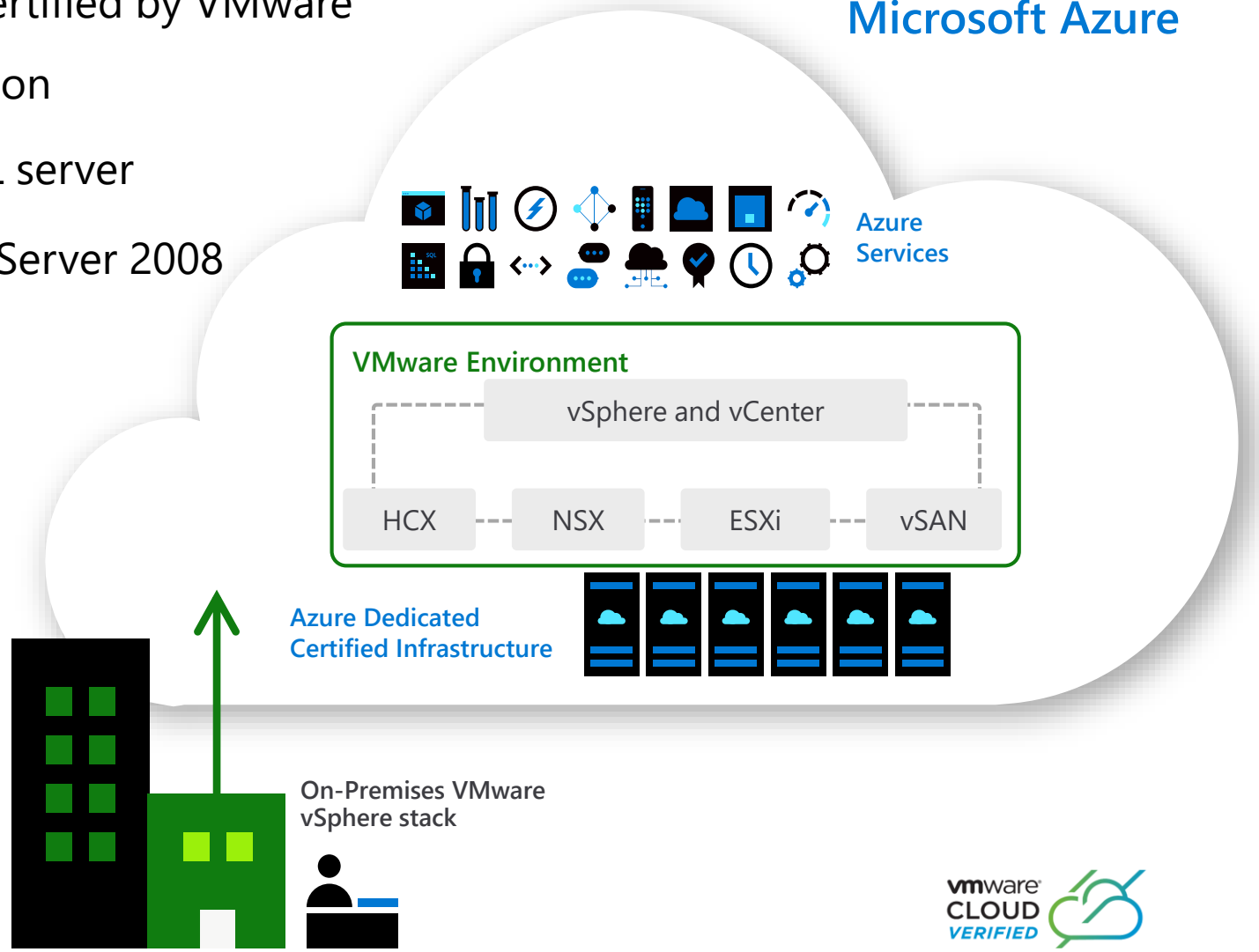
It runs **your VMware workloads natively on Azure,** supported and operated by Microsoft.

It allows **you to manage, and secure applications across VMware environments and Microsoft Azure** with a consistent operating framework.



New and differentiated features

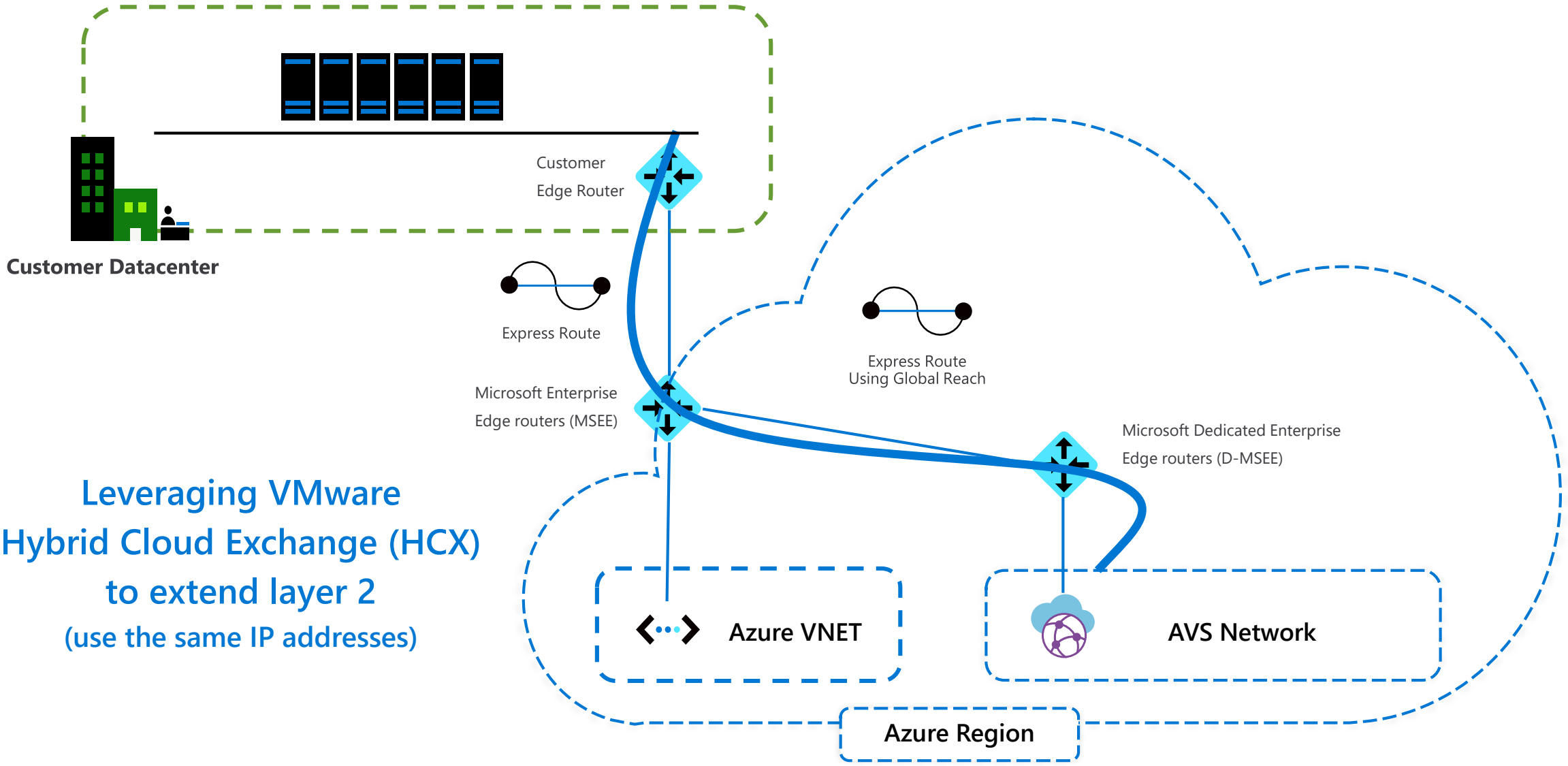
- Microsoft **first party Azure service**, cloud certified by VMware
- Seamless **Azure experience**, native integration
- **Azure Hybrid Benefit** for Windows and SQL server
- Free **extend security updates** for Windows Server 2008
- **Single Point of Support**
- Latest **VMware technology updates**
- **HCX Enterprise Edition** available
- High performance **Dedicated hosts**
- Unified **licensing and consumption**
- **Simplified NSX Interface**



Microsoft Azure

vmware CLOUD VERIFIED

Integrated into Azure Topology



Leveraging VMware
Hybrid Cloud Exchange (HCX)
to extend layer 2
(use the same IP addresses)

Demos