Microsoft

SAP on Azure Enablement

Wednesday, Sep 30, 2020

Ravi Gangampalli
APAC, Singapore

Module One – Week Two

Day 3 – Tuesday, Sep 30, 2020

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- **Please note that the training will not and cannot be recorded in alignment with Microsoft's policies**

SAP on Azure Partner Enablement

Module One – Week Two

Day 3 – Introduction to Azure for SAP workloads

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Agenda

SAP on Azure – Learning Path Recap

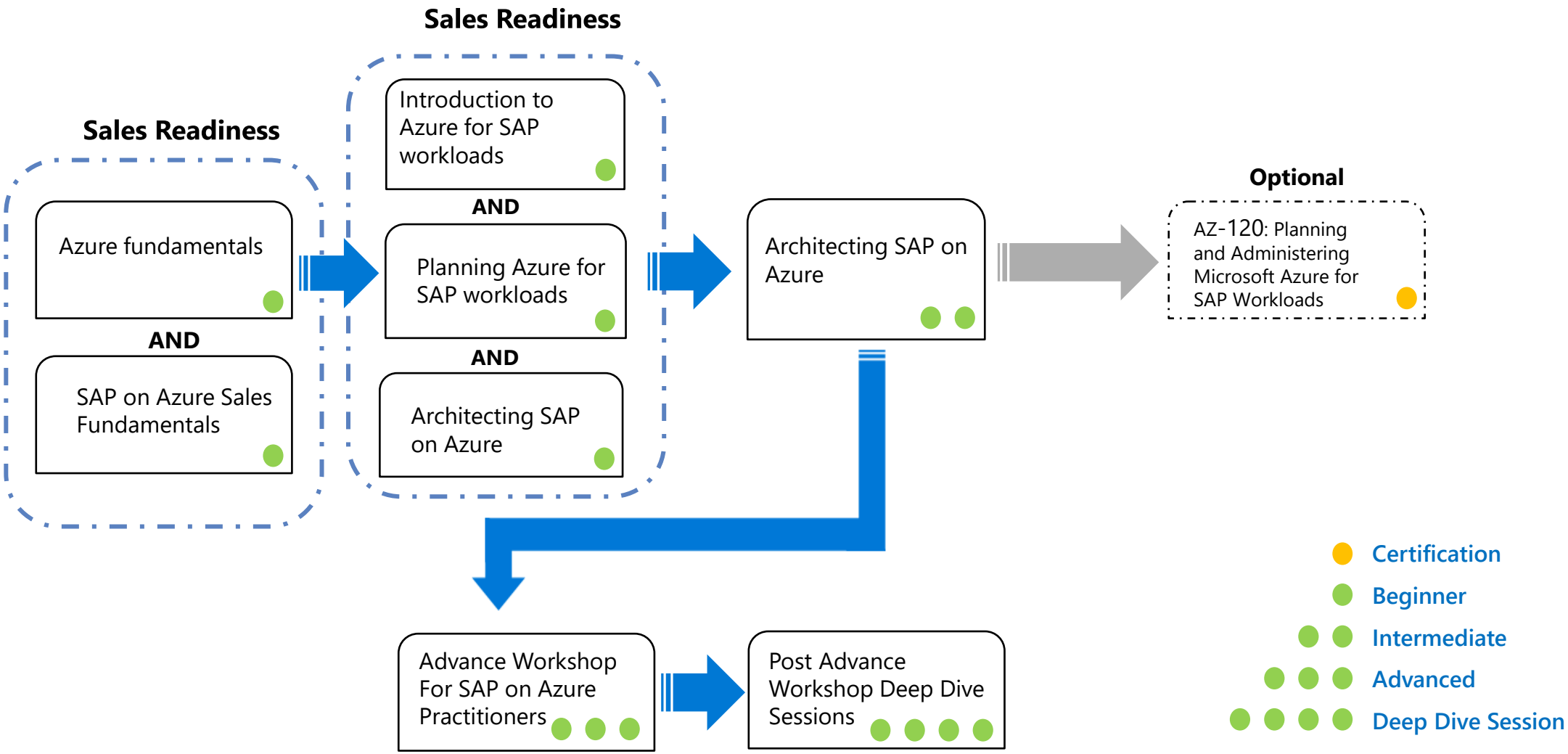
AZ-120 Certification – Introduction

Basic Cloud Concepts

Core Infrastructure for SAP

SAP on Azure Architect Learning Path

SAP on Azure Architects design and implement SAP solutions in Azure.



Free online digital training for partners are available at https://partneruniversity.microsoft.com/ (MPN ID Required)

Course	Description	Type and Duration
Azure fundamentals	Learn cloud concepts, Understand the benefits of cloud computing in Azure and Compare and contrast basic strategies for transitioning to the Azure cloud. This course covers topics including Cloud Concepts, Core Cloud Services, security, monitoring and cost optimization.	Available Online for public, self paced, duration: 3 Hours
SAP on Azure Sales Fundamentals	This course prepares the sellers within our partner organizations to learn how to position SAP on Azure with their customers. The topics include, how to position Azure for customers, customer sales pitch and guidance on how to conduct cloud assessment workshop.	Available at Partner University , MPN ID required
Introduction to Azure for SAP workloads	Provides introduction to SAP on Azure IaaS components that include virtual machines, virtual networks, storage accounts, and Azure AD. These modules will provide the basis for running SAP workloads in Azure. This course covers fundamentals of Azure IaaS components relevant SAP deployments; Azure Virtual machines, storage, networking, identity and HANA large instances.	Available Online, for public, self paced, duration: 1 Hour
Planning Azure for SAP workloads	In this course learn how to plan for a deployment of SAP solutions on Azure, the course will also cover the preparation required for migrating SAP workloads to Azure. The topics covered in this course include: Configure SAP NetWeaver with AnyDB , Configure SAP HANA on Azure VMs, Utilize SAP HANA on Azure (Large Instances) and SAP on Azure HANA Large Instances architecture.	Available Online, for public, self paced, duration: 3.5 Hours
Architecting SAP on Azure	This course provides in-depth coverage on the fundamental components and best practices needed to successfully architect, design and deploy SAP landscapes on Microsoft Azure. This course covers SAP deployments on Azure design and architecture in details, the topics covered include : Key design aspects for SAP on Azure, Resiliency on Azure, SAP deployments on Azure Availability Zones, SAP automation deployments on VM, Azure Netapp Files for enterprise and sample deplyment architectures.	This course is offered in person, virtual instructor led (VILT) or from Partner University as self paced sessions. (MPN ID Required)
Exam AZ-120: Planning and Administering Microsoft Azure for SAP Workloads (optional)	This optional certification is for architects and engineers who are knowledgeable in the SAP Landscape architecture, design and deployment and industry standards that are specific to the long-term operation of an SAP solution.	Certification Training

Free online digital training for partners are available at https://partneruniversity.microsoft.com/ (MPN ID Required)

SAP on Azure Architect Learning Path

Additional reference materials.

Subject	Description	Links
Self Paced Learning	Digital resources for partners for self paced learning	Partner University
Building SAP on Azure Practice	Guidance on how to develop SAP on Azure sales motions and engage with customers. Topics covered include Value Proposition and Differentiation, Engaging with Customers and Best Practices for Solution Deployment.	SAP on Azure Partner Playbook
SAP on Azure IaaS components	Understand how to leverage Azure resources that include virtual machines, virtual networks, storage accounts, and Azure AD for SAP	SAP certified offerings for Azure
SAP Embrace	SAP and Microsoft will accelerate and modernize customer transitions to SAP S/4HANA and SAP Cloud Platform on Microsoft Azure	Project Embrace
SAP LaMa Integration	Learn how to use SAP LaMa connector to deallocate and start virtual machines, copy and relocate managed disks, and delete managed disks. With these basic operations, you can relocate, copy, clone, and refresh SAP systems using SAP LaMa.	SAP LaMa connector for Azure
Certified AZURE machines for HANA	List of SAP certified virtual and HANA large instance machines in Azure	SAP HANA hardware directory
Supported Products and Azure VM types for SAP	This SAP note lists all the supported infrastructure components for SAP on Azure	SAP Applications on Azure: SAP note 1928533)SAP OSS ID required)
Oracle Product support on SAP applications on Azure	Details of Oracle Database versions are supported in a Microsoft Azure environment for SAP	SAP Applications on Microsoft Azure using the Oracle Database (SAP OSS ID required)

Preparing for AZ-120 Certification: *"Planning and Administering Microsoft Azure for SAP Workloads"*

Aim for SAP on Azure Certification

REVIEW PREREQUISITES

COURSE CONTENT AND EXPECTATIONS

HOW TO PREPARE FOR THE EXAM

Microsoft Certifications

**exam in beta*
^exam refresh coming soon

Role-based

Technical skills required to perform a job

Expert

Azure (Apps & Infra)
- Azure Solutions Architect^
- Azure DevOps Engineer

Modern Workplace
- Microsoft 365 Enterprise Administrator

Business Applications
- Power Apps + Dynamics 365 Solution Architect*
- Dynamics 365: Finance and Operations Apps Solution Architect*

Associate

Azure (Apps & Infra)
- Azure Administrator*
- Azure Developer*
- Azure Security Engineer

Azure (Data & AI)
- Azure Data Scientist
- Azure AI Engineer
- Azure Data Engineer
- Data Analyst*
- Azure Database Administrator*

Modern Workplace
- Microsoft 365 Modern Desktop Administrator
- Microsoft 365 Teamwork Administrator
- Microsoft 365 Messaging Administrator
- Microsoft 365 Security Administrator
- Microsoft 365 Teams Administrator
- Microsoft 365 Developer

Business Applications
- Dynamics 365 Sales Functional Consultant
- Dynamics 365 Customer Service Functional Consultant
- Dynamics 365 Marketing Functional Consultant
- Dynamics 365 Field Service Functional Consultant
- Dynamics 365 Finance Functional Consultant
- Data Analyst**
- Dynamics 365 Supply Chain Management, Manufacturing Functional Consultant
- Dynamics 365 Supply Chain Management Functional Consultant
- Power Apps + Dynamics 365 Developer
- Dynamics 365: Finance and Operations Apps Developer*

Fundamentals

Foundational understanding of technology

- Azure Fundamentals
- Microsoft 365 Fundamentals
- Dynamics 365 Fundamentals
- Power Platform Fundamentals

Specialty

Deep technical skills managing industry solutions

- Azure for SAP Workloads
- Azure IoT Developer

Last updated: April 2, 2020

https://www.microsoft.com/en-us/learning/browse-all-certifications.aspx

AZ-120 Prerequisites

Prior to taking the AZ-120, it is recommended that you have taken the Azure Administrator (AZ-103/4) or Azure Solutions Architect (AZ-300/3) exam, as well as SAP HANA or NetWeaver training.

AZ-120 Exam Content

1. Migrate SAP Workloads to Azure (10-15%)
2. Design an Azure Solution to Support SAP Workloads (20-25%)
3. Build and Deploy Azure for SAP Workloads (35-40%)
4. Validate Azure Infrastructure for SAP Workloads (10-15%)
5. Operationalize Azure SAP Architecture (10-15%)

Foundations of SAP on Azure

1: Introduction to Azure for SAP Workloads	• SAP HANA Certifications • SAP NetWeaver Certifications • Other SAP Workloads Supported on Azure • Common Terms and meaning
2: Foundations of Azure for SAP Workloads	• Azure Compute • Azure Storage • Azure Networking • SAP HANA on Azure (Large Instances) • Azure Active Directory (Azure AD) and (Azure AD DS)
3: SAP Certified Offerings on Azure	• Deployment options of SAP solutions on Azure • SAP product-specific support on Azure • Storage, networking and database support of SAP Azure workloads • High availability and disaster recovery • Monitoring, licensing, pricing and support

Planning for SAP for Azure

4: Azure for SAP Workloads – Reference Architecture	• SAP NetWeaver with AnyDB • SAP S4 HANA on Azure VMs • SAP HANA on Azure
5: Planning for Implementing SAP Solutions on Azure	• Azure VM Compute, Network, and Storage Considerations • SAP HANA Azure virtual Machine storage • Azure VM High availability and disaster recovery • Azure VM backup, monitoring, security, authentication and licensing
6: Planning for Migrating SAP Workloads to Azure	• Strategies for Migrating SAP Workloads to Azure • SAP Workload Planning and deployment checklist

Implementing SAP on Azure

7: Implementing Azure VM Based SAP Solutions	• Azure VM deployment and Single-Instance implementations • Implementing HA SAP NetWeaver with AnyDB • Implementing HA SAP HANA on Azure VM • Configure Azure Enhanced Monitoring Extensions for SAP • Implementing AD and Azure AD-based authentication
8: Deploying Hana Large Instances (HLI)	• Azure Implementing Hana Large Instances
9: Migrating SAP Workloads to Azure	• Migration Options • DMO Methodology • Cloud migration options • Very Large Database Migration to Azure

Running SAP on Azure

10: Maintaining Azure for SAP Workloads

- Remote management
- Performing backups and restores
- Networking changes
- OS and workload updates
- Vertical and horizontal scaling
- Disaster Recovery

11: Monitoring and Troubleshooting Azure for SAP Workloads

- Monitoring and troubleshooting Azure VM
- Monitoring and Troubleshooting SAP HANA
- Raising Support Requests

Introduction to Azure for SAP

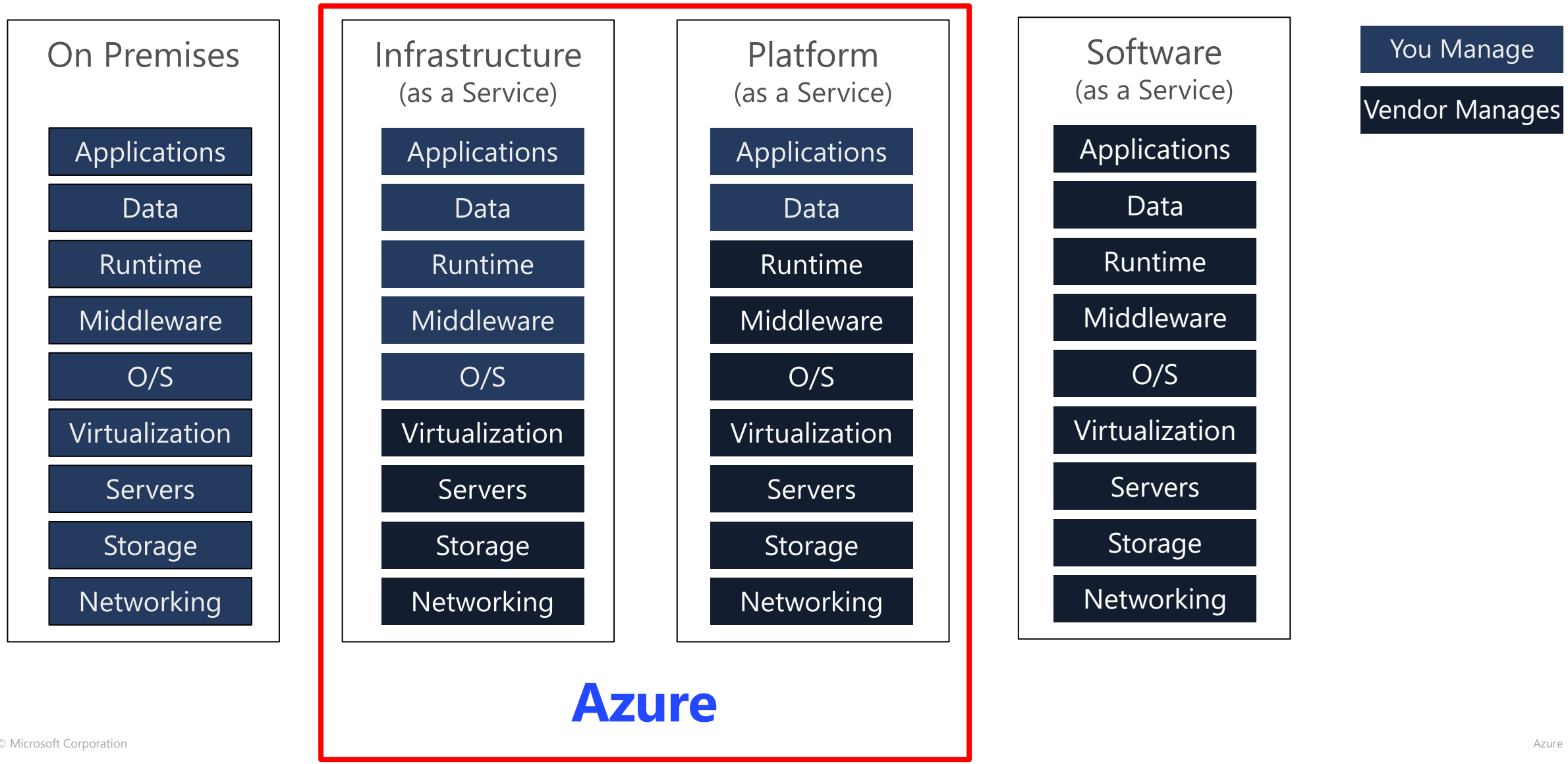
Some Basic Concepts

Public Cloud according to SAP

	 SAP S/4HANA Cloud	 SAP S/4HANA Cloud, single-tenant edition	 SAP S/4HANA*
Business Process	**Standardized, core ERP**	**Flexible, ext. ERP**	**Customizable, ext. ERP**
Innovation Lifecycle	Quarterly	Semi-annual	Annual, customer-led
TCO	Lowest	Lower	Higher
System Governance	SAP-led	Customer-influenced	Customer-led
IT Infrastructure	SAP, public	SAP, dedicated	Customer-managed
Customization	Within Standards	Within standards	Open to modifications
Extension	PaaS, SCP	PaaS, SCP	Open, SCP
System Delivery	New implementation	New implementation	New or ECC conversion

*Private cloud managed by SAP & On-premise managed by cloud providers or customers

Public Cloud?




ACR
Azure consumed revenue

Common OSS Notes

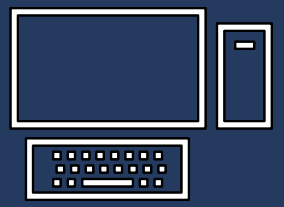
1928533 - SAP Applications on Azure: Supported Products and Azure VM types

2015553 - SAP on Microsoft Azure: Support prerequisites

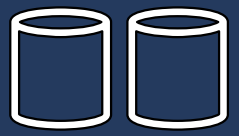
2191498 - SAP on Linux with Azure: Enhanced Monitoring

2876816 - Support for SAP Cloud Platform Services Running on Microsoft Azure (Embrace)

Core Infrastructure for SAP on Azure

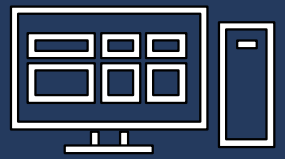


Compute



Storage

Networking

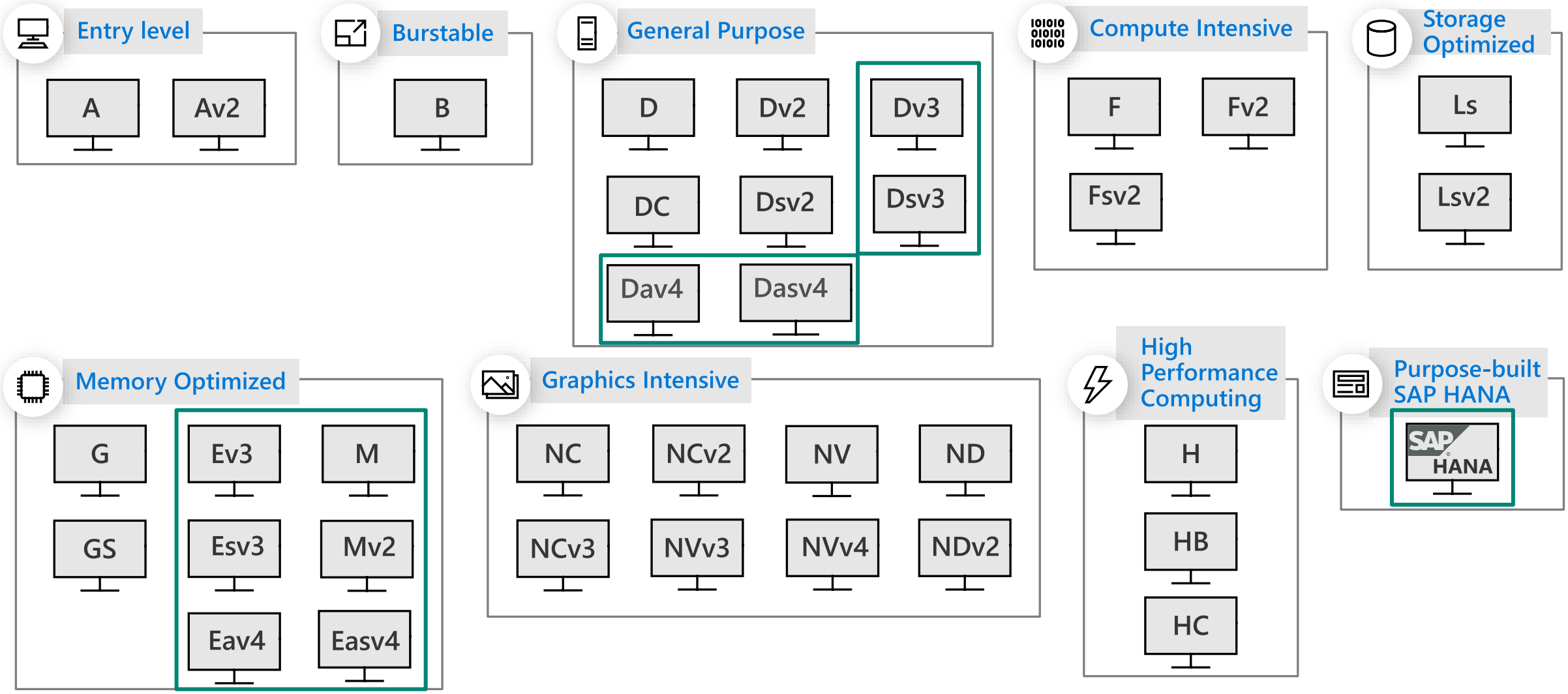


Management

Azure Virtual Machine

Accelerate | Connect | Excite

Compute options for all types of apps



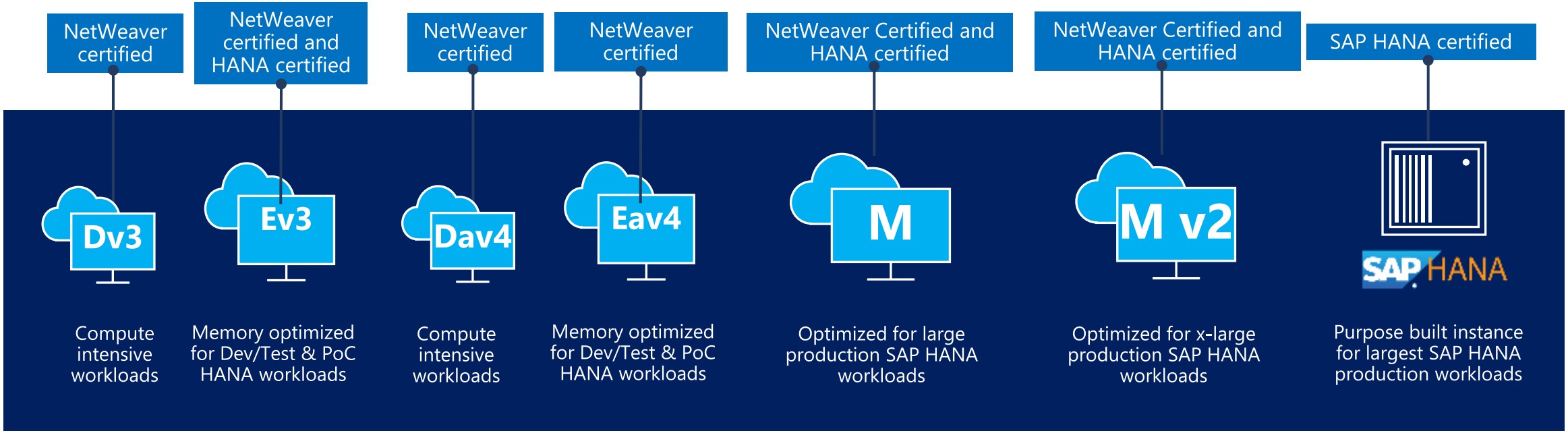
Azure virtual machines (VMs)

Azure VMs available in **specific sizes**

Predefined: processing, memory, and storage

- **General purpose** — balanced CPU-to-memory ratio
  - Testing and development, small to medium databases, and low to medium traffic web servers
- **Compute optimized** — high CPU-to-memory ratio
  - Medium traffic web servers, network appliances, batch processes, and application servers
- **Memory optimized** — high memory-to-CPU ratio
  - Relational database servers, medium to large caches, and in-memory analytics
- **Storage optimized** — high disk throughput and IO
  - Big Data, SQL, NoSQL databases, data warehousing and large transactional databases.
- **GPU** — heavy graphic rendering, model training and inferencing (ND)
  - Single or multiple GPUs
- **High performance compute** — most powerful CPU Azure VMs
  - High-throughput network interfaces (RDMA)

SAP on Azure— Large Variety on Compute Instances



HIGHEST VALUE — LARGEST SCALE-UP

vCPUs	2 – 64	2 – 64	2 – 64	2 – 64	32 - 128	208 - 416	96 - 768
RAM (GiB)	8 - 256	16 - 432	8 - 256	16 - 512	192 – 3,892 GiB	2,918 – 11,673 GiB	768 – 24,576 GiB
Max SAPS	69,680	70,050	96.700	96,700	134,630	488,230	786,100

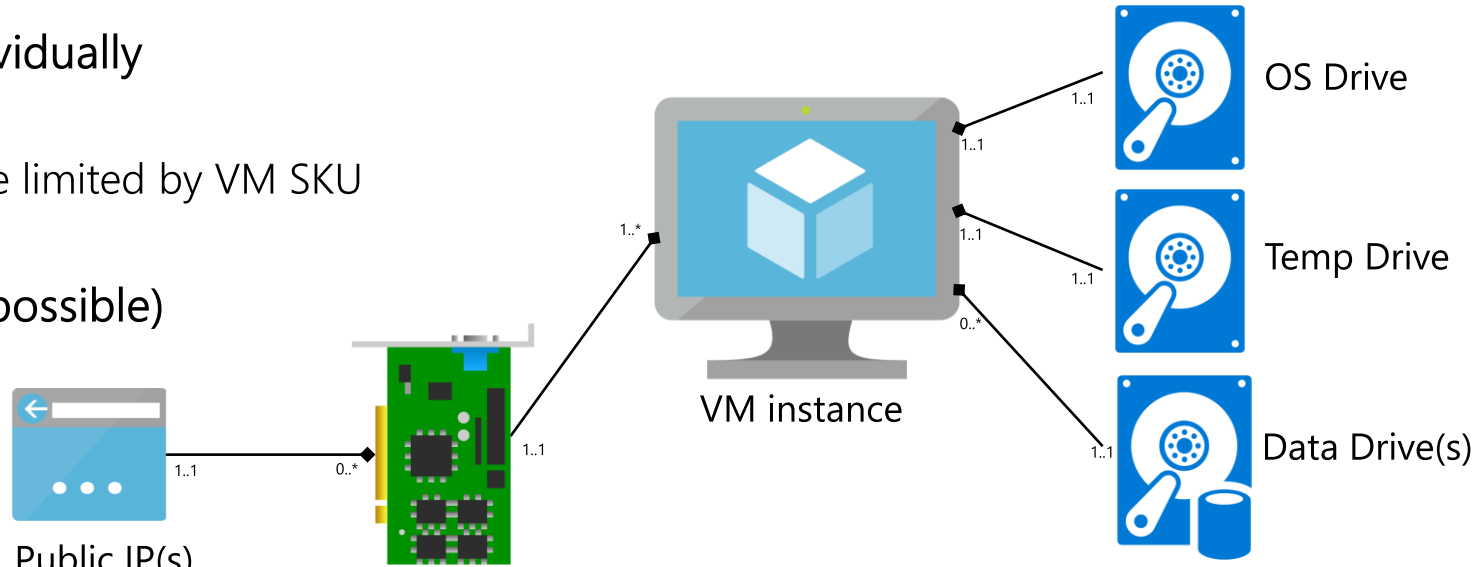
M-series sizes are supported both on the Intel® Xeon® CPU E7-8890 v3 @ 2.50GHz and on the Intel® Xeon® Platinum 8280M (Cascade Lake).

Virtual Machine itemization

- Virtual machines are charged according to size and usage
  - The bigger the more expensive
  - The more special the more expensive (GPU cards)
  - The more time of use, the more expensive. Development environments normally don't need to be running 24/7

- **Temp Drives are for free** (included in VM Price)
- OS drives are charged
- Data drives are optional and charged individually
  - Managed disks is the recommended way
  - Number of Data disks, IOPS and MB/s are limited by VM SKU

- NICs are free (use accl. networking when possible)
- Public IPs are charged
  - Basic SKU (Static or Dynamic)
  - Standard SKU (Static)
    - Secured by default
    - Zone redundant



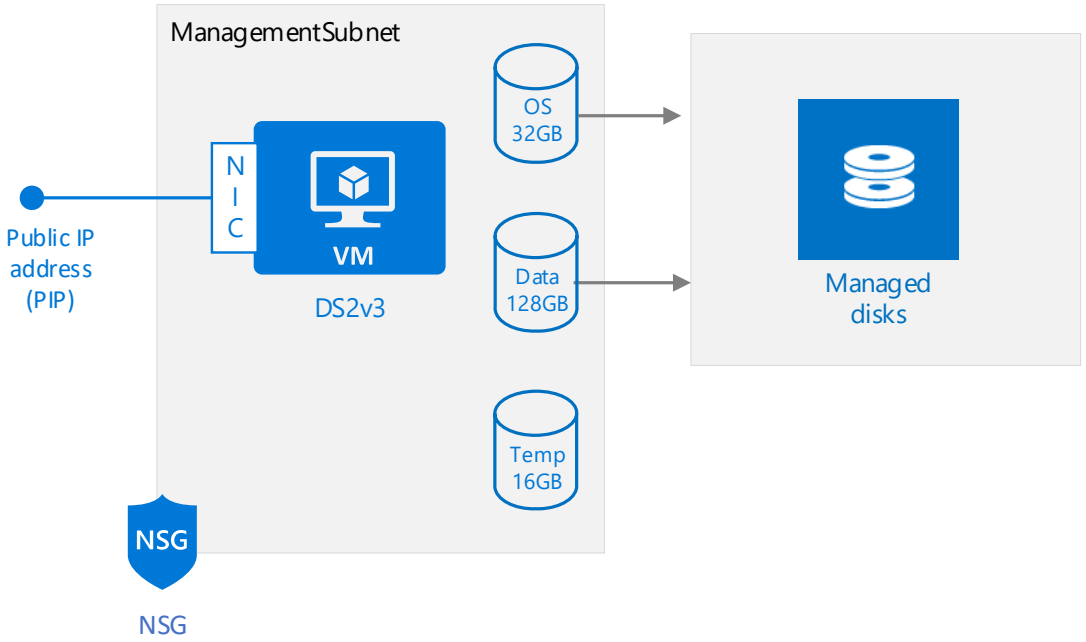
NOTE: UML Notation used for clarity

a..b means from a to b

* means many

1..* means "possibly from 1 to many"

Virtual Machine cost items



- VM type and hours
- OS disk type and size*
- Data disk type and size*
- Public IP address type and hours

*more info in Storage section

Azure VM Size Naming (New)

E64i_v3 NC24r_v3 M416ms_v2

<Family>[Sub-family]<#>[m][r][s]...[_v#]

Family series indicates target workload.

Optional **sub-family** further differentiates workloads (e.g. NC for GPU Compute; NV for GPU Visualization)

Number of vCPUs in the VM

One or more **additive features**:

d	=	Disk, local are present
h	=	Hibernation capable
i	=	Isolated
l	=	Low memory
m	=	Memory intensive
n	=	NVMe
t	=	Tiny memory
r	=	RDMA
s	=	Premium Storage capable

Version # of family, incremented with 10%+ performance improvements

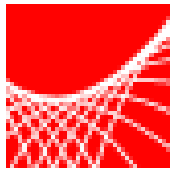
Marketplace OS Images Available

Microsoft

- Windows Server
- Windows 10 Enterprise N

Open Source

- Ubuntu
- Red Hat Enterprise Linux 7
- SUSE Linux Enterprise Server
- Debian Linux
- Container Linux by CoreOS
- FreeBSD 10.3
- ClearLinux OS
- openSUSE Leap



Oracle

- Oracle Linux 7

Licenses: included or BYOL

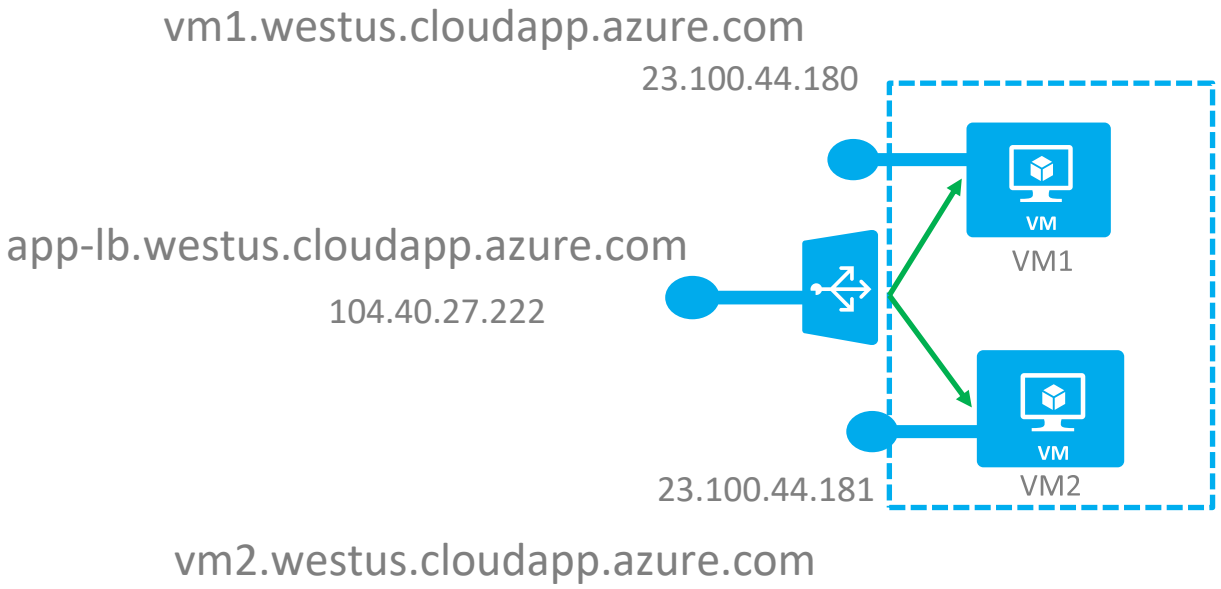
Virtual Machine Extensions

Name	Description
BGInfo	Uses the Sysinternals BGInfo tool to configure useful system information on the desktop background of the virtual machine.
VMAccess	Reset admin password or rename the account, reset network configuration.
Desired State Configuration	Apply Windows PowerShell Desired State Configuration (DSC) configuration documents to your virtual machines.
Custom Script	Deploy a PowerShell script to a virtual machine, without using PowerShell Remoting.
RDMA Drivers	Enable low-latency networking on A8 and A9 VM sizes.

Virtual machine extensions are executed through the Azure VM agent.

Azure VM IP addressing

- Each Azure VM has a private IP address
- You also have the option of assigning a public IP address to an Azure VM to make it accessible from Internet
- You can also place a VM behind a load balancer (internal or external)
- Private and public IP address can be static or dynamic
- For a public IP address, you can optionally assign a DNS name



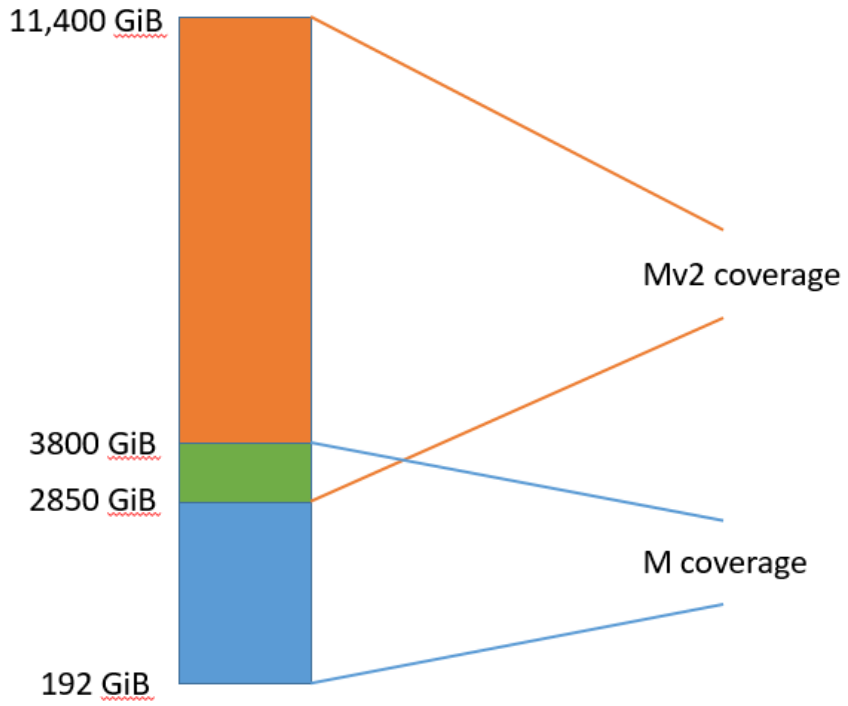
Compute/Storage : Mv2 – new larger VMs

Complete new host hardware based on Intel Skylake SP processor generation

- VM SKUs between 208 vCPUs and 416 vCPUs and 3TB to 12TB memory
- Gen2 VM type (only CMK+ SSE encryption)

Four SKUs that build on top of current M-Series

- M416ms_v2 with 11.4TiB and 416 vCPUs
- M416s_v2 with 5.7TiB and 416 vCPUs
- M208ms_v2 with 5.7TiB and 208 vCPUs
- M208s_v2 with 2.85TiB and 208 vCPUs



The Mv2-series features high throughput, low latency platform running on a hyper-threaded Intel® Xeon® Platinum 8180M 2.5GHz (Skylake) processor with an all core base frequency of 2.5 GHz and a max turbo frequency of 3.8 GHz.

SAP on Azure Certifications (AnyDB)

Category	Scenario	SAP Product	Guest OS	Database	VM/Server Type
SAP Any DB	-	SAP Business Suite 6.x (SAP NetWeaver Application Server 7.x)	Windows, SUSE, Red Hat, Oracle Linux *1	SQL Server, ASE, Oracle, MaxDB, DB2/UDB	D/DS11_v2, D/DS15_v2, GS1 – GS5, D_v3, E_v3, M_v1, M_v2
		SAP Business All-in-One			
		SAP NetWeaver Application Server 7.x (ABAP and Java)			
		SAP Business Objects Planning and Consolidation on NetWeaver			
		SAP Business Objects Planning and Consolidation Microsoft 10.01	Windows	SQL Server	
		TREX 7.10	Windows, SUSE, Red Hat *1	N/A	
		SAP LiveCache, SAP Content Server 6.50	Windows, SUSE, Red Hat *1	MaxDB	
		SAP BusinessObjects BI Platform/Clients 4.1/4.2, Dashboards, WebIntelligence, Explorer, Analysis for OLAP, Design Studio, Crystal Reports, Lumira Server/Desktop/Designer, Data Services 4.2	Windows, SUSE	N/A	
		SAP Business One (on SQL Server)	Windows Server	SQL Server	
		SAP Financial Consolidation 10.1 SP06 Patch 01 and higher	Windows Server	N/A	

(*1) SUSE and Red Hat are certified only with ASE, DB2 and HANA. Oracle Linux is for Oracle. Windows Server is for all databases.

SAP on Azure Certifications (HANA)

Category	Scenario	SAP Product	Guest OS	Database	VM/Server Type
SAP HANA	OLAP	SAP Business Warehouse (BW); BW/4HANA, HANA Enterprise, HANA Side Car	SUSE, Red Hat	SAP HANA	GS5, HANA on Azure (Large Instances), E64s v3), M_v1, M_v2
	OLTP	S/4HANA	SUSE, Red Hat	SAP HANA	HANA on Azure (Large Instances), E64s v3, M_v1, M_v2
	OLTP	SAP Business Suite on HANA, SAP NetWeaver	SUSE, Red Hat	SAP HANA	HANA on Azure (Large Instances), **E64s v3**, M_v1, M_v2
	OLTP	SAP Business One on HANA	SUSE, Red Hat	SAP HANA	DS14_v2, E64s v3, M_v1, M_v2
	-	SAP HANA One	SUSE, Red Hat	SAP HANA	DS14_v2

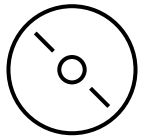
Choose Azure VM types to meet sizing requirements

VM Series	VM Type	VM Size	Temp SSD	SAPS	# of v-disks	Max IOPS (cached)	Max Disk Bandwidth (cached)	Max Network Bandwidth	Compute (No OS) hourly on demand, USE2	Supported HANA scenarios	Remark	SAP certification
DS v3	D2s_v3	2 vCPU, 8 GiB	16 GiB	2,178	4	4,000	32 MB/sec	1 Gbps	$ 0.110		Xeon E5-2673 v4 (Broadwell) 3.5Ghz TB	Certified (Any DB, App)
	D4s_v3	4 vCPU, 16 GiB	32 GiB	4,355	8	8,000	64 MB/sec	2 Gbps	$ 0.220			
	D8s_v3	8 vCPU, 32 GiB	64 GiB	8,710	16	16,000	128 MB/sec	4 Gbps	$ 0.440			
	D16s_v3	16 vCPU, 64 GiB	128 GiB	17,420	32	32,000	256 MB/sec	8 Gbps	$ 0.880			
	D32s_v3	32 vCPU, 128 GiB	256 GiB	34,840	32	64,000	512 MB/sec	16 Gbps	$ 1.760			
	D48s_v3	48 vCPU, 192 GiB	384 GiB	52,224	32	96,000	768 MB/sec	24 Gbps				
	D64s_v3	64 vCPU, 256 GiB	512 GiB	69,680	32	128,000	1024 MB/sec	30 Gbps	$ 3.520			
DAS v4	D2as_v4	2 vCPU, 8 GiB	16 GiB	3,022	4	4,000	32 MB/sec	1 Gbps			2.35Ghz AMD EPYCTM 7452 processor - boosted max frequency of 3.35GHz	Certified (Any DB, App)
	D4as_v4	4 vCPU, 16 GiB	32 GiB	6,044	8	8,000	64 MB/sec	2 Gbps				
	D8as_v4	8 vCPU, 32 GiB	64 GiB	12,088	16	16,000	128 MB/sec	4 Gbps				
	D16as_v4	16 vCPU, 64 GiB	128 GiB	24,175	32	32,000	255 MB/sec	8 Gbps				
	D32as_v4	32 vCPU, 128 GiB	256 GiB	48,350	32	64,000	510 MB/sec	16 Gbps				
	D48as_v4	48 vCPU, 192 GiB		72,525								
	D64as_v4	64 vCPU, 256 GiB		96,700								
ES v3	E2s_v3	2 vCPU, 16 GiB	32 GiB	2,178	4	4,000	32 MB/sec	1 Gbps	$ 0.146		Xeon E5-2673 v4 (Broadwell) 3.5Ghz TB	Certified (Any DB, App)
	E4s_v3	4 vCPU, 32 GiB	64 GiB	4,355	8	8,000	64 MB/sec	2 Gbps	$ 0.293			
	E8s_v3	8 vCPU, 64 GiB	128 GiB	8,710	16	16,000	128 MB/sec	4 Gbps	$ 0.585			
	E16s_v3	16 vCPU, 128 GiB	256 GiB	17,420	32	32,000	256 MB/sec	8 Gbps	$ 1.170		Xeon E5-2673 v4 (Broadwell) 3.5Ghz TB	HANA certification in roadmap App, Any DB certified
	E20s_v3	20 vCPU, 160 GiB		21,775								
	E32s_v3	32 vCPU, 256 GiB	512 GiB	34,840	32	64,000	512 MB/sec	16 Gbps	$ 2.341			
	E48s_v3	48 vCPU, 384 GiB	768 GiB	52,512								
	E64s_v3	64 vCPU, 432 GiB	864 GiB	70,050	32	128,000	1024 MB/sec	30 Gbps	$ 4.412	OLTP/OLAP		
EAS v4	E2as_v4	2 vCPU, 16 GiB	32 GiB	3,022	4	4,000	32 MB/sec	1 Gbps			2.35Ghz AMD EPYCTM 7452 processor - boosted max frequency of 3.35GHz	Certified (Any DB, App)
	E4as_v4	4 vCPU, 32 GiB	64 GiB	6,044	8	8,000	64 MB/sec	2 Gbps				
	E8as_v4	8 vCPU, 64 GiB	128 GiB	12,088	16	16,000	128 MB/sec	4 Gbps				
	E16as_v4	16 vCPU, 128 GiB	256 GiB	24,175	32	32,000	255 MB/sec	8 Gbps				
	E20as_v4	20 vCPU, 160 GiB	320 GiB	30,219	32	40,000	320 MB/sec	10 Gpbs				
	E32as_v4	32 vCPU, 256 GiB	512 GiB	48,350	32	64,000	510 MB/sec	16 Gbps				
	E48as_v4	48 vCPU, 384 GiB	768 GiB	72,525	32							
	E64as_v4	64 vCPU, 512 GiB	1024 GiB	96,700	32							
M	M32ts	32 vCPU, 192 GiB	1,000 GiB	33,670	16	40,000	400 MB/sec	8 Gbps	$ 2.707	OLTP	Intel® Xeon® E7-8890 v3 (Haswell)	HANA, App, Any DB certified
	M32ls	32 vCPU, 256 GiB	1,000 GiB	33,300	16	40,000	400 MB/sec	8 Gbps	$ 2.873	OLTP		
	M64ls	64 vCPU, 512 GiB	2,000 GiB	66,600	32	80,000	800 MB/sec	16 Gbps	$ 5.415	OLTP		
	M64s	64 vCPU, 1,024 GiB	2,000 GiB	67,315	32	80,000	800 MB/sec	16 Gbps	$ 6.669	OLTP/OLAP		
	M64ms	64 vCPU, 1,792 GiB	2,000 GiB	68,930	32	80,000	800 MB/sec	16 Gbps	$ 10.337	OLTP		
	M128s	128 vCPU, 2,048 GiB	4,000 GiB	134,630	64	160,000	1,600 MB/sec	30 Gbps	$ 13.338	OLTP/OLAP		
	M128ms	128 vCPU, 3,800 GiB	4,000 GiB	134,630	64	160,000	1,600 MB/sec	30 Gbps	$ 26.688	OLTP		
M v2	M208s v2	208 vCPU, 2,850 GiB	7,040 GiB	259,950	64	80,000	1.000 MB/sec	16 Gbps	$ 22.31	OLTP/OLAP	Intel® Xeon® Platinum 8180M 2.5GHz (Skylake)	HANA, App, Any DB certified
	M208ms v2	208 vCPU, 5,700 GiB	7,040 GiB	259,950	64	80,000	1,000 MB/sec	16 Gbps	$ 44.62	OLTP/OLAP		
	M416s v2	416 vCPU, 5,700 GiB	8,192 GiB	488,230	64	250,000	2,000 MB/sec	32 Gbps	$ 49.58	OLTP/OLAP		
	M416ms v2	416 vCPU, 11,400 GiB	8,192 GiB	488,230	64	250,000	2,000 MB/sec	32 Gbps	$ 99.15	OLTP/OLAP		

Azure Storage

Accelerate | Connect | Excite

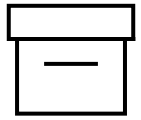
Secure, scalable, and highly available storage options for every use case



Disk storage

Ultra
Premium
Standard

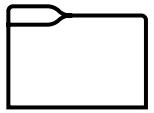
Reliable, persistent, high performing storage for Virtual Machines



Object storage

Azure Blobs

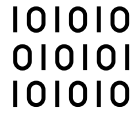
Secure, centralized storage target for backup/disaster recovery



File storage

Azure Files
Azure NetApp Files

Lift and shift of legacy applications that require file shares to the cloud



Data transport

Azure Import/Export
Azure DataBox

Move or migrate data into Azure

Hybrid storage

Azure StorSimple
Azure File Sync
Avere*

Secure, intelligent data tiering between on-premises and cloud storage

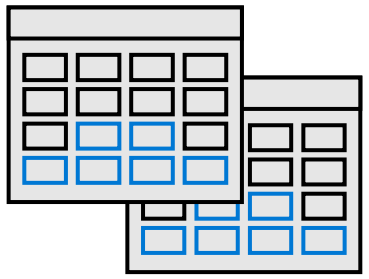
Azure storage resiliency solutions

Azure storage provides replication options based on availability needs

Storage	Local/zone/Geo-redundant storage

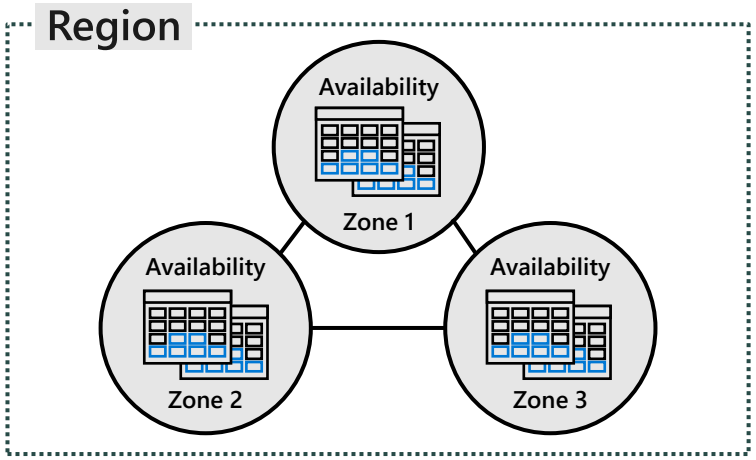
LRS

99.999999999% (11 9s)



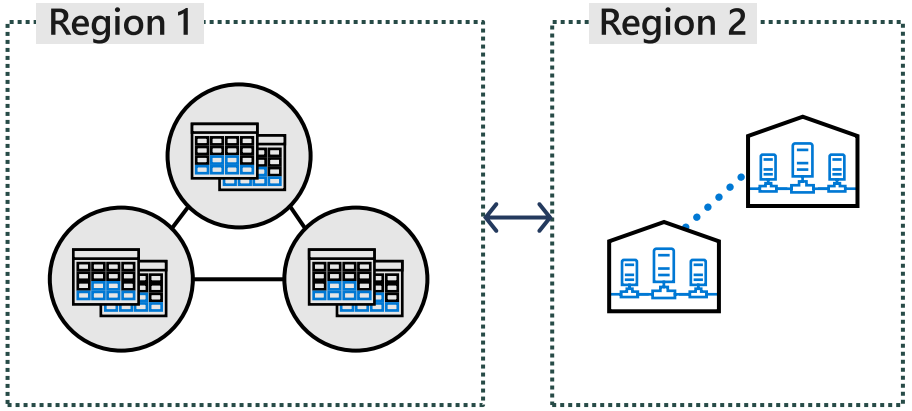
ZRS

99.9999999999% (12 9s)



GRS

99.99999999999999% (16 9s)



Locally redundant storage

The simplest, low-cost replication strategy that Azure Storage offers

Zone-redundant storage

A simple option for high availability and durability

Geo-redundant storage

Cross-regional replication to protect against region-wide unavailability

Storage Options for SAP

Standard HDD

Standard SSD

Premium SSD

Ultra

Single disk value

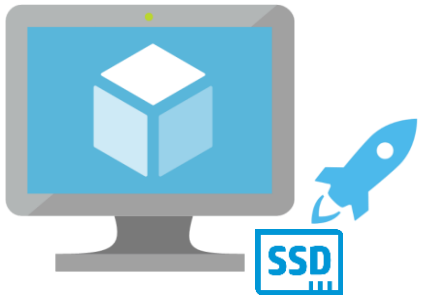
	Low-cost storage	Consistent performance	High performance (Write Accelerator optional)	Sub-millisecond latency
Max Size	32 TiB	32 TiB	32 TiB	64 TiB
Max IOPS	Up to 2,000	Up to 2,000	20,000	160,000
Max BW	Up to 500 MBps	Up to 500 MBps	750 MBps	2,000 MBps
SAP usage	No DBMS, eventually non-prod App layer	Eventually non-prod DBMS, non-prod App layer	Production DBMS, production App layer	Production DBMS

Storage : Premium Storage

- High performance, High IOPS, consistently low latency SSD Storage with predictable throughput
  - Even lower latency with Write Accelerator
- Stripe Premium Storage Disks to aggregate IOPS, Throughput and Storage Capacity

Premium Storage Disk Type	P4	P6	P10	P15	P20	P30	P40	P50	P60	P70	P80
Disk size	32 GiB	64 GiB	128 GiB	256 GiB	512 GiB	1024 GiB (1 TiB)	2048 GiB (2 TiB)	4096 GiB (4 TiB)	8192 GiB (8 TiB)	16384 GiB (16 TiB)	32767 GiB (32 TiB)
IOPS per disk	120	240	500	1100	2,300	5,000	7,500	7,500	12,500	15,000	20,000
Throughput per disk	25 MiB/s	50 MiB/s	100 MiB/s	125 MiB/s	150 MiB/s	200 MiB/s	250 MiB/s	250 MiB/s	480 MiB/s	750 MiB/s	750 MiB/s

Azure | Ultra Disk



- Sub-ms latency (fulfills HWCCT)
- Dynamically tune disk perf. without VM restart
- Disk Size, IOPS, Throughput can be defined separately.

Ultra SSD Disk Type	4	8	16	32	64	128	256	512	1024-65,536
Disk Size	4 GiB	8 GiB	16 GiB	32 GiB	64 GiB	128 GiB	256 GiB	512 GiB	1024 - 65,536 GiB
IOPS per disk	100-1,200	100-2,400	100-4,800	100-9,600	100-19,200	100-38,400	100-76,800	100-153,600	100-160,000
Throughput per disk	300 MB/s	600 MB/s	1,200 MB/s	2,000 MB/s	2,000 MB/s	2,000 MB/s	2,000 MB/s	2,000 MB/s	2,000 MB/s

Caching for VMs and data disks

Standard storage cache types:

- None
- Read
- Read/Write

Premium storage cache types:

- None
- Read
- Read/write
- None + Write Accelerator (applicable only to Azure M-Series VMs)
- Read + Write Accelerator (applicable only to Azure M-Series VMs)

Write Accelerator

Write Accelerator is a disk capability for M-Series Azure VMs with Premium storage-based Azure managed disks.

- Improves the I/O latency of writes
- Ideal when log file updates are required to persist to disk in modern databases
- Should be used for the volumes containing the transaction log or redo logs of a DBMS

When using Write Accelerator for an Azure VM disks, these restrictions apply:

- The disk caching must be set to ‘None’ or 'Read Only'
- Snapshot are not currently supported for Write Accelerator-enabled disks
- Only smaller I/O sizes (<=512 KiB) are taking the accelerated path

SAP HANA disk configurations (Prod)

Enable Write Accelerator

M SKU	RAM	Max. VM I/O Throughput	/hana/data	/hana/log	/hana/shared	/root volume	/usr/sap	hana/backup
M32ts	192 GiB	500 MB/s	3 x P20	2 x P20	1 x P20	1 x P6	1 x P6	1 x P20
M32ls	256 GiB	500 MB/s	3 x P20	2 x P20	1 x P20	1 x P6	1 x P6	1 x P20
M64ls	512 GiB	1000 MB/s	3 x P20	2 x P20	1 x P20	1 x P6	1 x P6	1 x P30
M64s	1000 GiB	1000 MB/s	4 x P20	2 x P20	1 x P30	1 x P6	1 x P6	2 x P30
M64ms	1750 GiB	1000 MB/s	3 x P30	2 x P20	1 x P30	1 x P6	1 x P6	3 x P30
M128s	2000 GiB	2000 MB/s	3 x P30	2 x P20	1 x P30	1 x P10	1 x P6	2 x P40
M128ms	3800 GiB	2000 MB/s	5 x P30	2 x P20	1 x P30	1 x P10	1 x P6	4 x P40
M208s_v2	2850 GiB	1000 MB/s	4 x P30	2 x P20	1 x P30	1 x P10	1 x P6	3 x P40
M208ms_v2	5700 GiB	1000 MB/s	4 x P40	2 x P20	1 x P30	1 x P10	1 x P6	3 x P50
M416s_v2	5700 GiB	2000 MB/s	4 x P40	2 x P20	1 x P30	1 x P10	1 x P6	3 x P50
M416ms_v2	11400 GiB	2000 MB/s	8 x P40	2 x P20	1 x P30	1 x P10	1 x P6	4 x P50

https://docs.microsoft.com/en-us/azure/virtual-machines/workloads/sap/hana-vm-operations-storage

SAP HANA disk configurations (cost efficient)

VM SKU	RAM	Max. VM I/O Throughput	/hana/data and /hana/log striped with LVM or MDADM	/hana/shared	/root volume	/usr/sap	hana/backup
E16v3	128GiB	384 MB/s	3 x P20	1 x E20	1 x E6	1 x E6	1 x E15
E32v3	128GiB	768 MB/s	3 x P20	1 x E20	1 x E6	1 x E6	1 x E20
E16v3	128GiB	1200 MB/s	3 x P20	1 x E20	1 x E6	1 x E6	1 x E30
M32ts	192 GiB	500 MB/s	3 x P20	1 x E20	1 x E6	1 x E6	1 x E20
M32ls	256 GiB	500 MB/s	3 x P20	1 x E20	1 x E6	1 x E6	1 x E20
M64ls	512 GiB	1,000 MB/s	3 x P20	1 x E20	1 x E6	1 x E6	1 x E30
M64s	1,000 GiB	1,000 MB/s	2 x P30	1 x E30	1 x E6	1 x E6	2 x E30
M64ms	1,750 GiB	1,000 MB/s	3 x P30	1 x E30	1 x E6	1 x E6	3 x E30
M128s	2,000 GiB	2,000 MB/s	3 x P30	1 x E30	1 x E10	1 x E6	2 x E40
M128ms	3,800 GiB	2,000 MB/s	5 x P30	1 x E30	1 x E10	1 x E6	2 x E50
M208s_v2	2,850 GiB	1,000 MB/s	4 x P30	1 x E30	1 x E10	1 x E6	3 x E40
M208ms_v2	5,700 GiB	1,000 MB/s	4 x P40	1 x E30	1 x E10	1 x E6	4 x E40
M416s_v2	5,700 GiB	2,000 MB/s	4 x P40	1 x E30	1 x E10	1 x E6	4 x E40
M416ms_v2	11400 GiB	2,000 MB/s	8 x P40	1 x E30	1 x E10	1 x E6	4 x E50

https://docs.microsoft.com/en-us/azure/virtual-machines/workloads/sap/hana-vm-operations-storage

SAP on Azure – Improve Agility with Azure NetApp Files (ANF)

Simplified Storage Management

- Native Azure experience for easy deployment & scale

Highly Performant

- Enterprise grade performance
- On-demand scalability

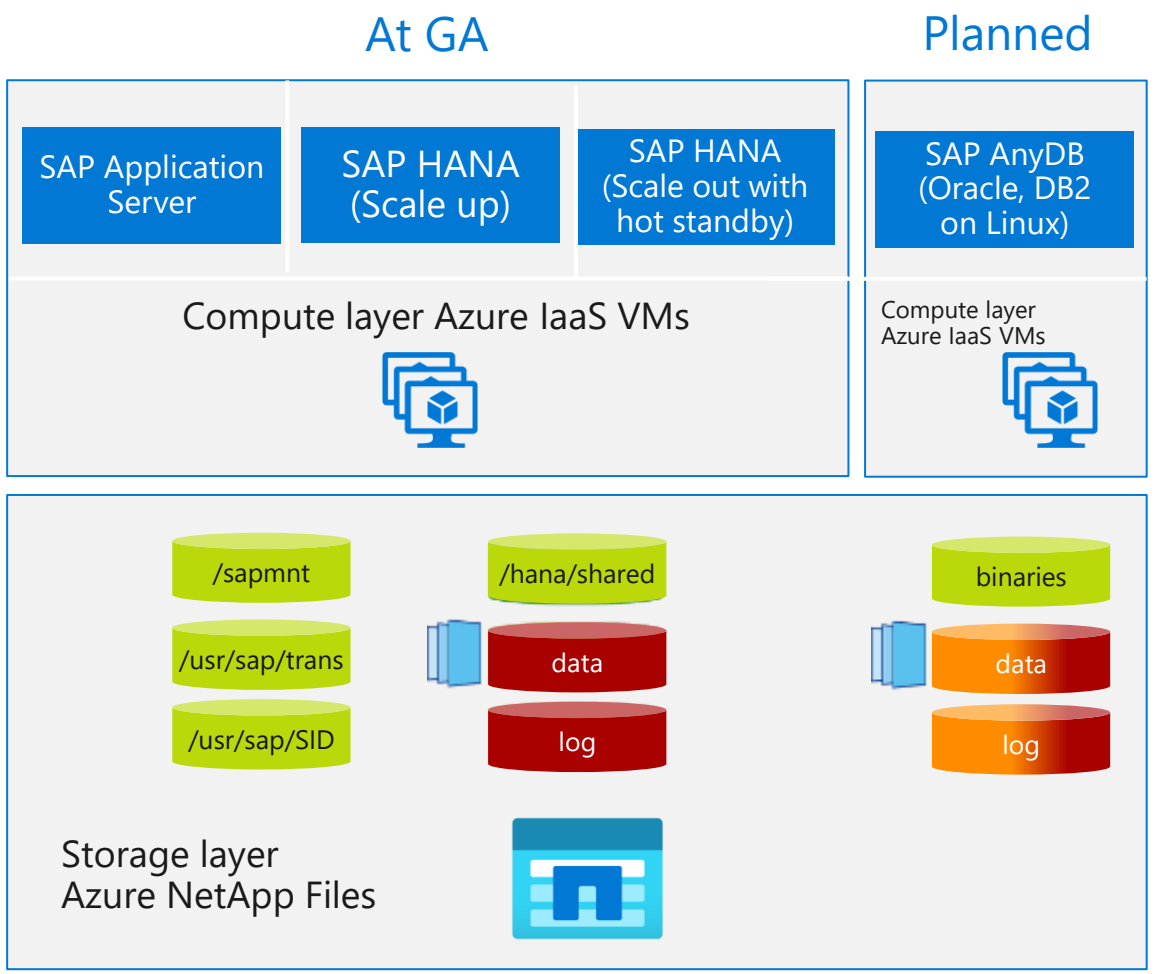
Enterprise Data Management

- Space / Time efficient snapshot and cloning

Hybrid

- Cloud Sync integration for hybrid cloud deployments

SAP solution architectures using Azure NetApp Files
https://docs.microsoft.com/en-us/azure/azure-netapp-files/azure-netapp-files-solution-architectures#sap-application-solutions

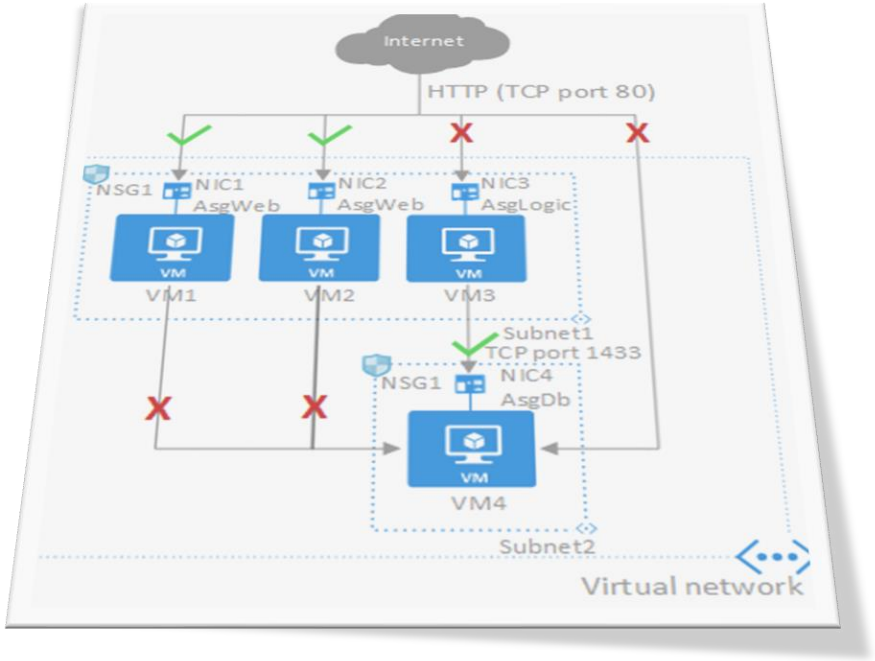


Networking

Accelerate | Connect | Excite

Virtual Network

- Logical isolation with control over the network
- Create subnets and isolate traffic with network security groups
- Support for Static IP addresses
- Support for Internal Load Balancing
- DNS options – BYO or Microsoft Azure-provided
- Extend your trust boundary – VMs on the same Network
- Connect virtual networks to on-premises networks making Azure an extension of your datacenter



Name resolution

Names of resources created in Azure can be resolved using the Azure-provided DNS service or a DNS server.

The Azure-provided DNS service is available by default.

Custom DNS server options:

- Hybrid connectivity between an Azure virtual network and an on-premises network
- Deploying your own Active Directory domain environment in Azure

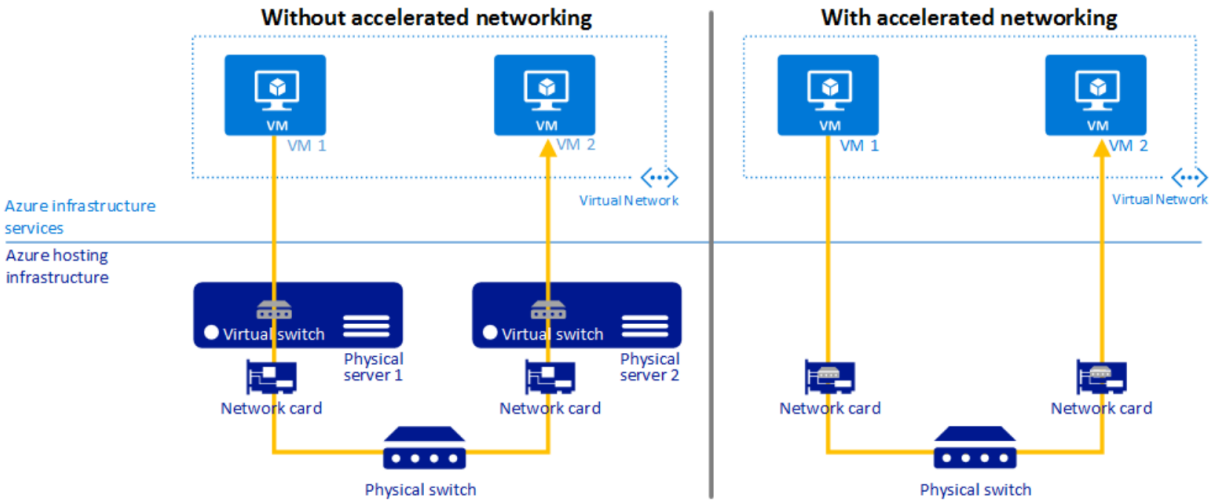
NOTE: Configure each Azure virtual machine (OS) to use the custom DNS server by modifying the properties of the Azure virtual network.

-or-

Override the virtual network setting by assigning a DNS server directly to a network adapter of a VM.

Accelerated networking

- Improves network performance by enabling single root I/O virtualization (SR-IOV) to a VM
- High-performance path bypasses the host from the Datapath, reducing latency, jitter, and CPU utilization.
- Supported on most general purpose and compute-optimized instance sizes with 2 or more vCPUs (D/DSv2 and F/Fs).
- On instances supporting hyperthreading, Accelerated Networking is supported on VM instances with 4 or more vCPUs (D/Dsv3, E/Esv3, Fsv2, Lsv2, Ms/Mms and Ms/Mmsv2).

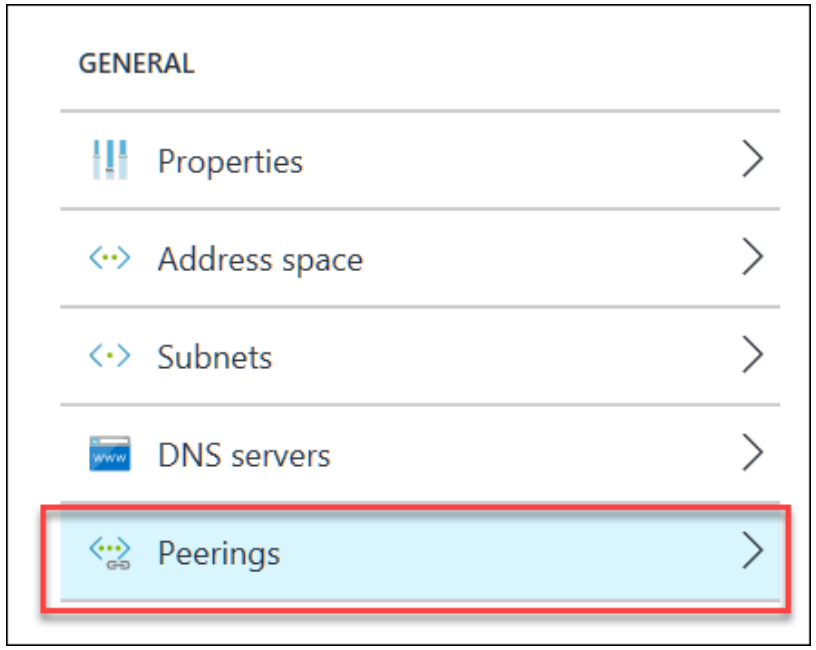


Connectivity within Azure

Cloud		Cloud	Characteristics
	VNet Peering		• Same-/cross-region direct, private VM-to-VM connectivity • NSG & UDR across VNets • GatewayTransit for hub-and-spoke
	VNet-to-VNet via Gateways		• Transitive routing via BGP and VPN gateways • Secure connectivity via IPsec/IKE across Azure WAN links

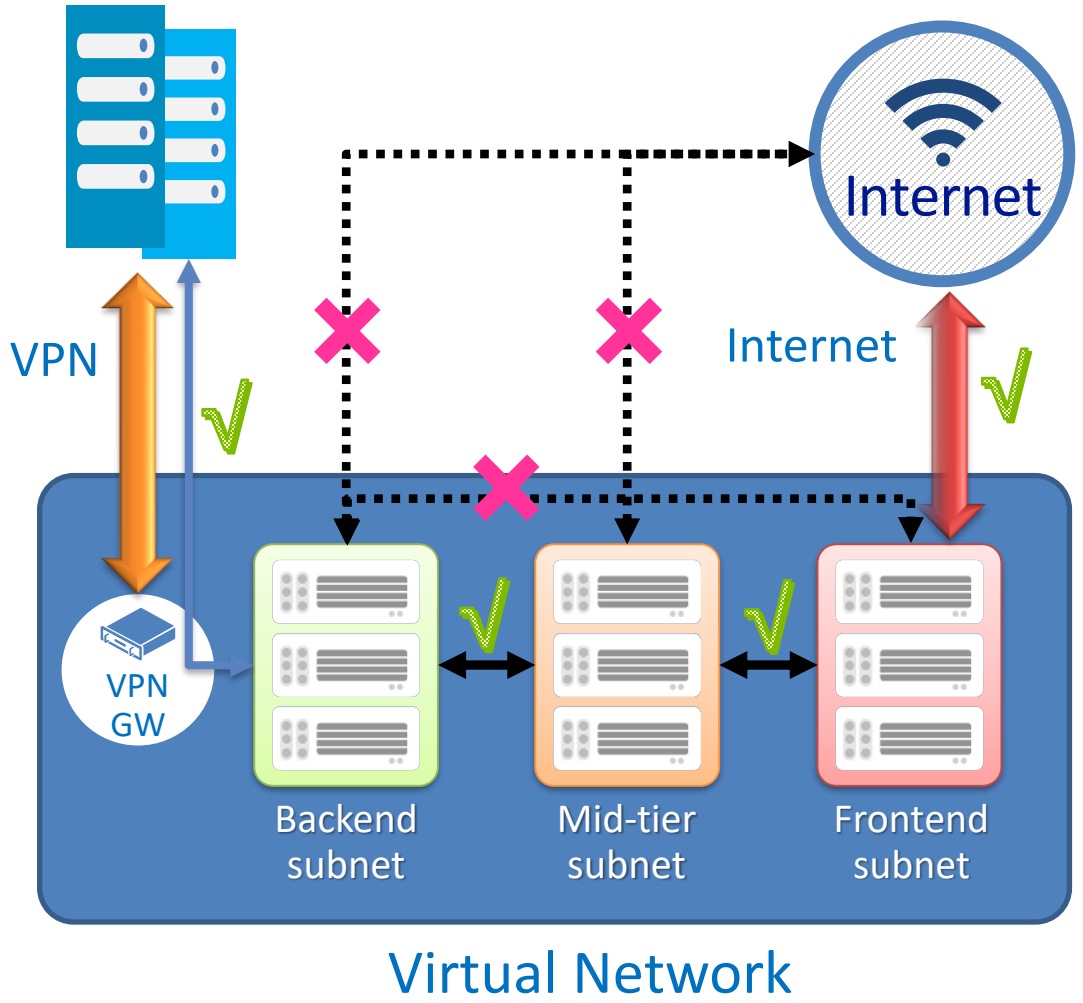
VNET Peering

- **VNET Peering -** Low-latency, high-bandwidth connection between VNETs
- Connect two VNETs
- Utilizes the Azure Backbone network
- No Encryption as traffic is isolated and on the MS backbone
- VNET address spaces cannot overlap
- VNET peering is between 2 VNETs
- VNETs can be in different subscriptions/Tenant
- There is no virtual networks, and there is no derived transitive relationship
- Ability to use resources as transit points in a peered VNET



Network Security Groups (NSG)

- Enables network segmentation & DMZ scenarios
- Access Control List
  - Filter conditions with allow/deny
  - Individual addresses, address prefixes, wildcards
- Associate with network interfaces of VMs or subnets



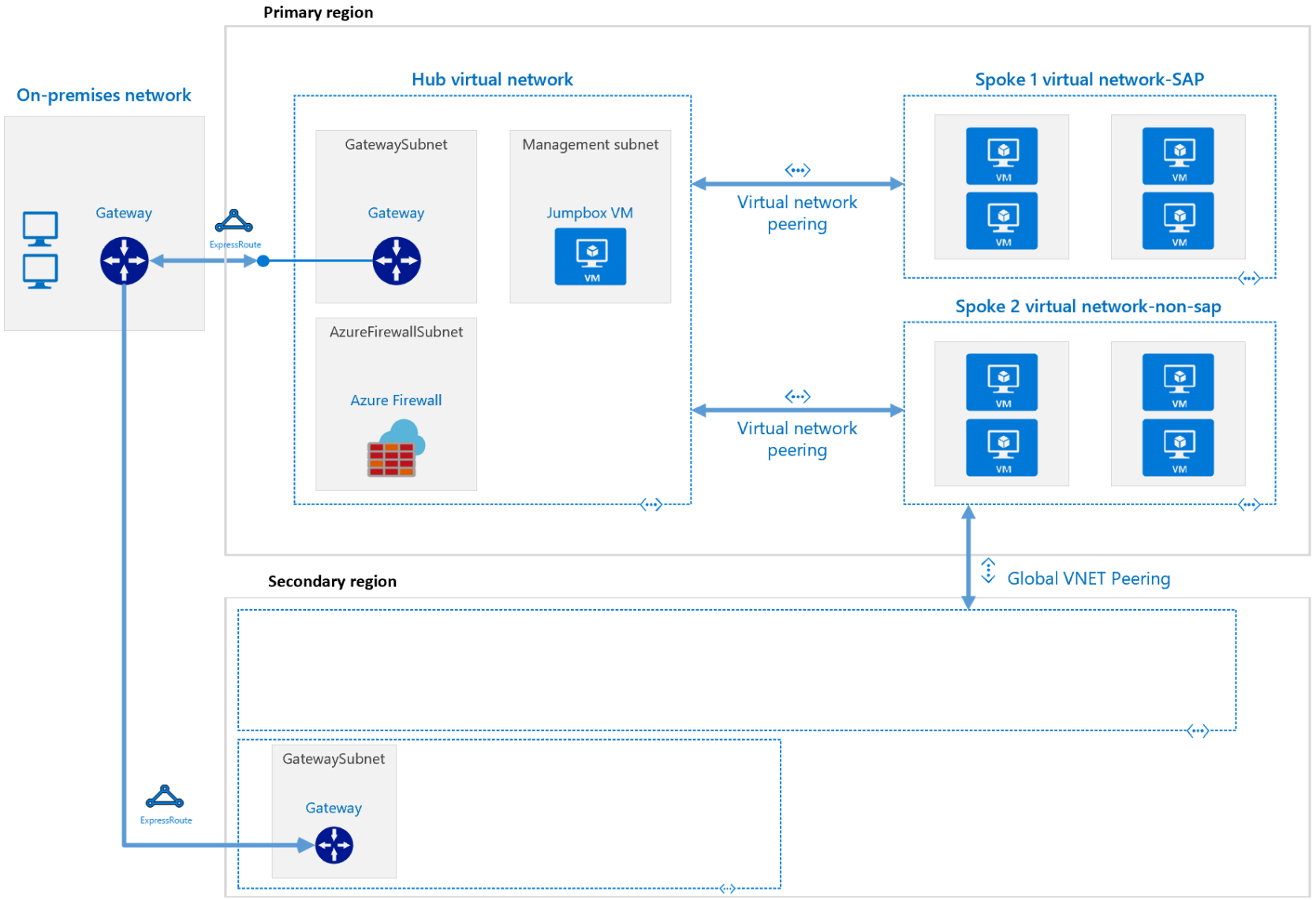
Connectivity to Azure

Cloud		Customer	Characteristics
	Internet Connectivity		• Internet facing with public IP addresses in Azure • DNS, load balancing, DDoS protection, WAF
	Remote access point-to-site connectivity		• Remote Access to VNet/On-prem • Connect from anywhere • Mac, Linux, Windows • Radius/AD authentication
	Site-to-site VPN connectivity		• High throughput, secure cross-premises connectivity • BGP, active-active for high availability & transit routing
	ExpressRoute private connectivity		• Private connectivity to Microsoft services (O365, Azure PaaS services) • Mission critical workloads

Bandwidth

- S2S VPN: depends on Gateway SKU: 100Mbps – 1.25Gbps
- ExpressRoute: 50Mbps – 10Gbps
- ExpressRoute Direct: 100Gbps

Hub & Spoke Network Topology



Main cost components

Bandwidth

Data transfer

Gateway

Service Provider

Standard LB & AZs Zone-redundant by default

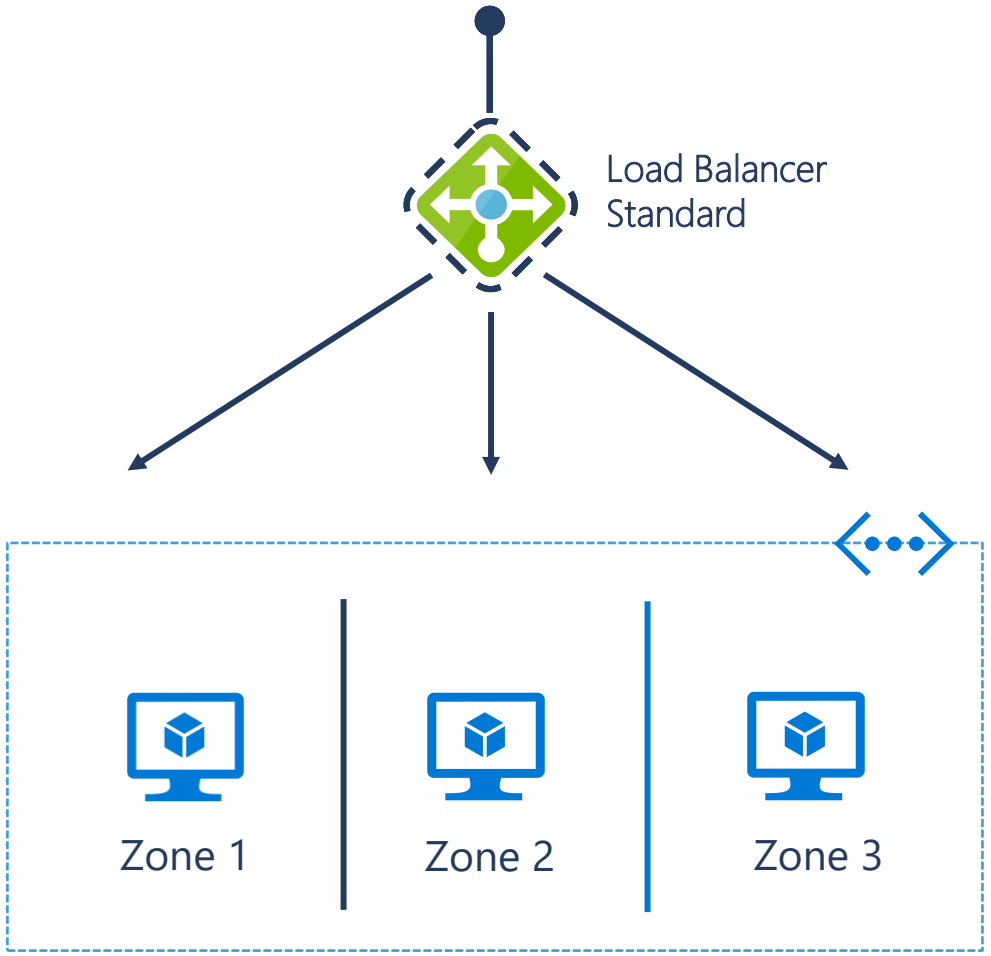
AZ's & Inbound and outbound flows

- Zone-redundant default (single IP)*
- Optional: Zonal guarantee option

Cross-zone load balancing

Zone-redundant data path

(regional anycast, public & internal, inbound & out)

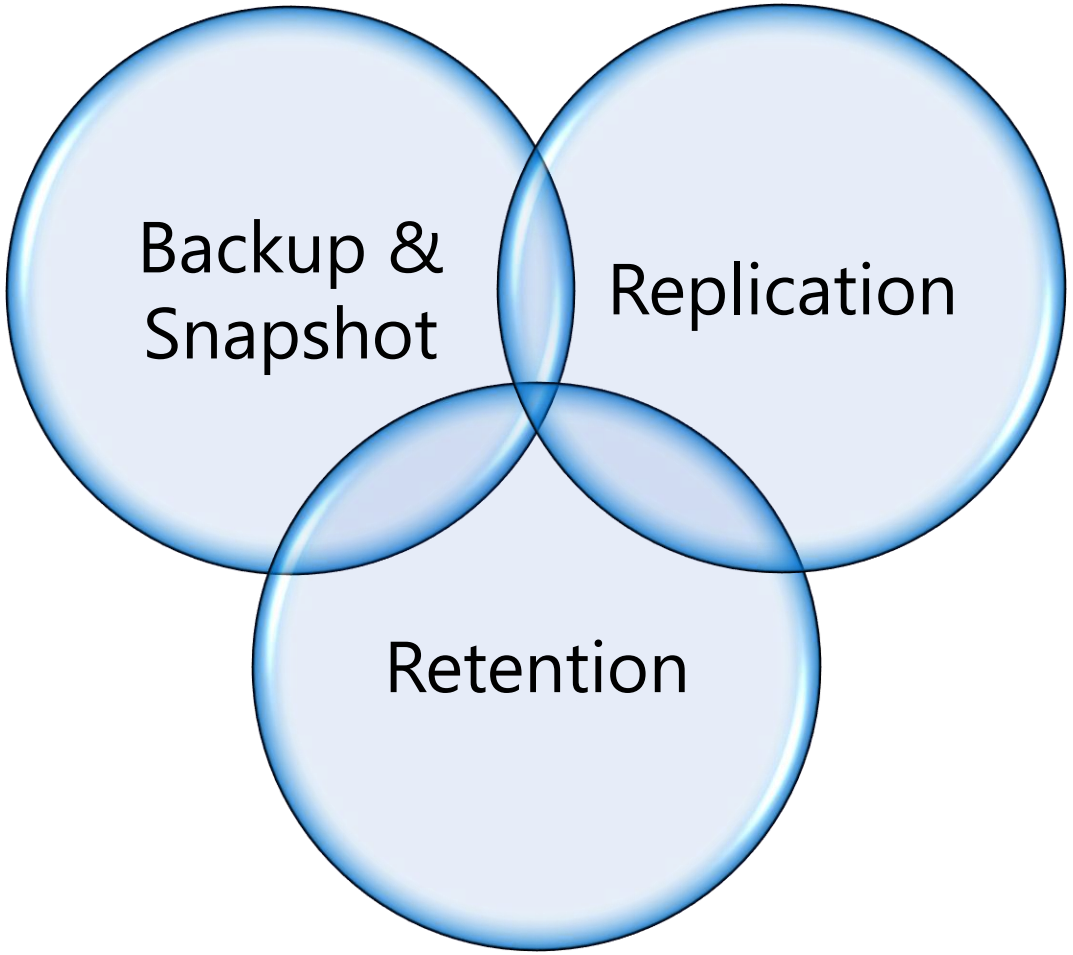


Management & Security

Accelerate | Connect | Excite

Data Protection Strategies

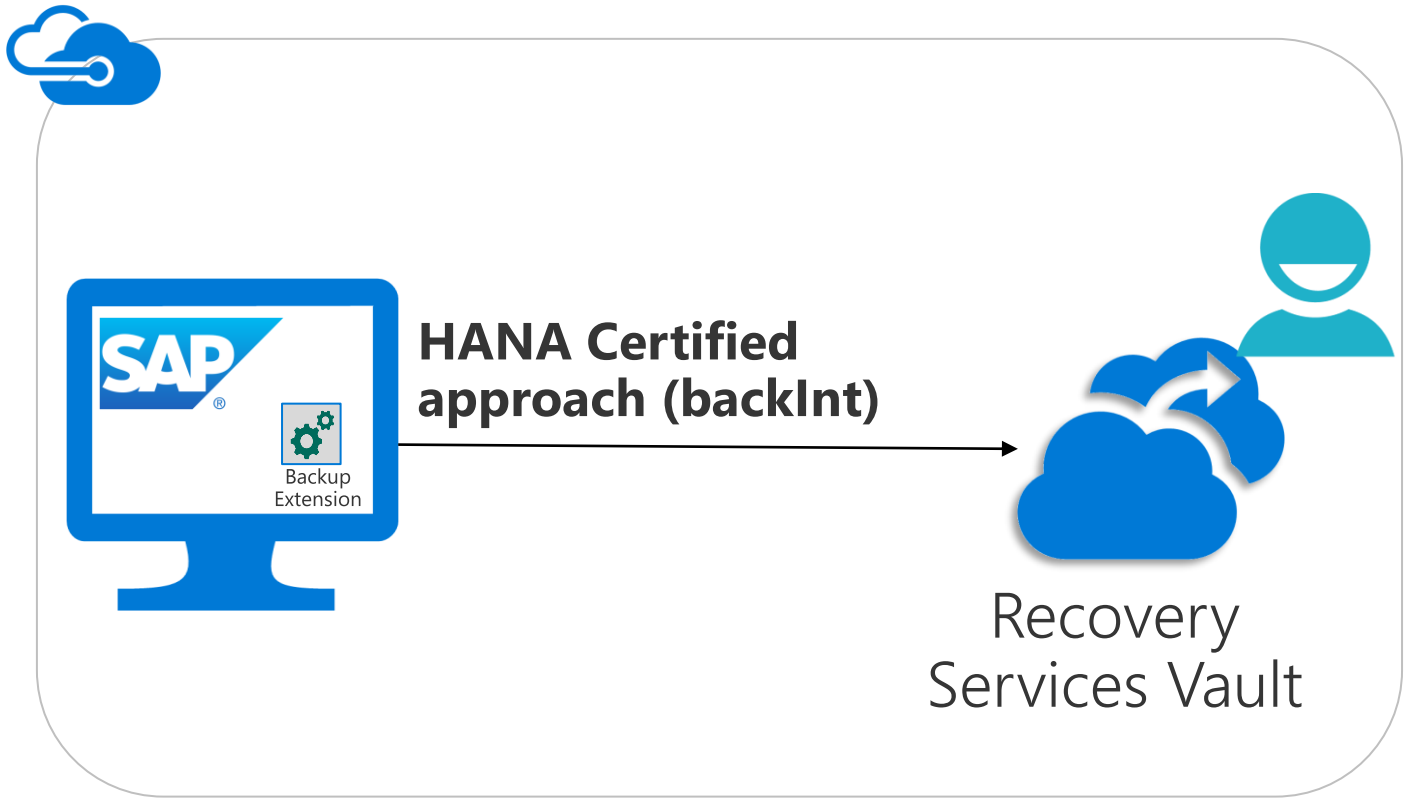
1. Database backup
2. File backup
3. VM/system backup
4. Snapshot
5. and Restore



1. Database Replication
2. File replication
3. VM replication
4. Snapshot replication
5. and Failover

1. Retention to local volume or nearby VM (short term)
2. Remote copy to cloud storage (long term)
3. and Restore

Azure Backup HANA Backint Support



Find the document here

- No backup infrastructure
- Enterprise scale
- Central Management
- 15 minute RPO
- True point in time restore
- Long term retention
- Central Customizable Reports

SAP on Azure Backup Solutions

	Standard DB backup (e.g. SQL, Oracle, HANA)	Azure Backup Server (=SCDPM on Azure)	3rd party solutions (e.g. Commvault, NetBackup)	Azure IaaS VM Backup	HANA on Azure Large Instances Storage Snapshot	HANA Backup using BackInt
Backup type	Database	Network/Agent	Network/Agent	Snapshot	Storage level snapshot	Network/Agent
Backup target	DBs within Azure VMs	SQL Server DBs, Files and OS States (Windows) within Azure VMs (link)	SQL Server/Oracle/HANA, Files and OS States (Windows, Linux) within Azure VMs	Azure VMs (Windows, Linux) running SQL Server (link)	HANA database volume, HANA log volume, boot volume (link)	HANA DBs (link)
Linux (Guest OS) support	-	No	Yes	Yes	Yes	Yes
SQL Server database backup capability	Transaction log (every minute), differential, full	Differential every 15 minutes and full (express)	Yes	Up to 3 times per day	-	HANA database backup (log backups for every 15 mins. Support for Full, differential. Support for incremental coming soon). SQL Server ready
Oracle database backup	No	No	Yes	file consistent backup	-	No
Compression	Supported	Supported (storage sizing : link)	Supported	None	-	None
Deduplication	Not Supported	Not Supported	Supported	Not Supported	Not Suppored	Not Supported
Backup servers running on	DB Server	Microsoft Azure Backup Server (on VM) (downloadable from Azure Portal) (VM sizing : link)	Backup Server (on VM)	None (Backup as a Service)	-	None (Backup as a Service)
Agent software required	No	Agent in backup target VMs and Azure Backup Agent in Azure Backup Server VMs	Yes	No (* Only Azure VM Agent)	No	No (* Only Azure VM Agent)
Network bandwidth required	Yes but controllable			None	None	Yes
Short term retention	Yes (on local storage)			None	Yes (on local NFS storage)	None
Long term retention	Possible				Up to 255 snapshots per volume	Possible
Point-in-time recovery	Possible					
Recovery speed	Depend on I/O speed of underneath Blob storage, Backup Vault, Disk and VM CPU and networking performance				Fast	I/O speed of underneath Blob

SAP-Certified 3rd party backup solutions

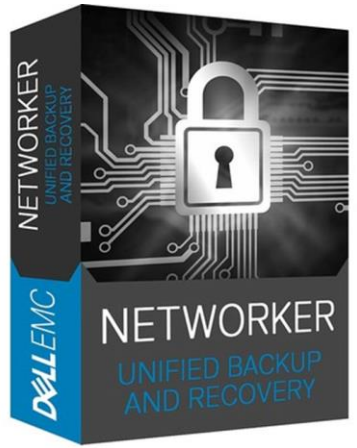
IBM Spectrum Protect

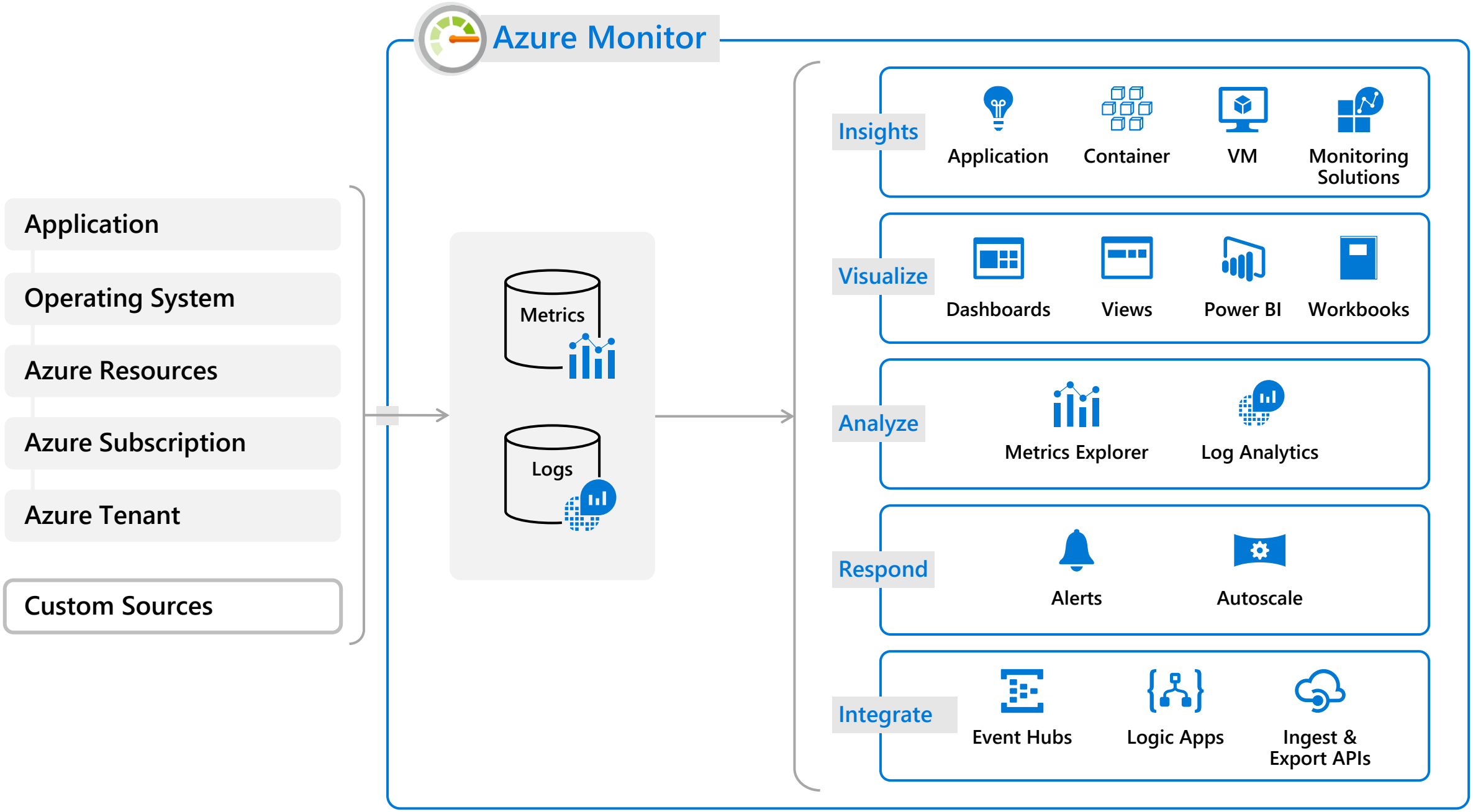
COMMVAULT

VERITAS

Data Protector

veeAM




Azure Monitor
Application
Operating System
Azure Resources
Azure Subscription
Azure Tenant
Custom Sources
Metrics
Logs
Insights
Application
Container
VM
Monitoring Solutions
Visualize
Dashboards
Views
Power BI
Workbooks
Analyze
Metrics Explorer
Log Analytics
Respond
Alerts
Autoscale
Integrate
Event Hubs
Logic Apps
Ingest & Export APIs

Azure Monitor for SAP Solutions (preview)

New! Azure Monitor for SAP Solutions

- Applicable for customers running their workloads on Azure Virtual Machine and Azure Large Instance.
- Does not run an agent on customer's HANA server.
- Scalable query framework
- Integration with Azure KeyVault

Visualization in Azure Portal

- Infrastructure utilization, anomalies and forecasts
- HA cluster metrics is in roadmap!

Available in Private Preview!

- Integration with Azure Marketplace

Improving security across hybrid cloud environments

Azure Security Center

Strengthen security posture

Protect against threats

Get secure faster

What is Governance ?

A collection of concepts and services that are designed to enable management of your various Azure resources at scale

Azure subscriptions will get very messy very quickly without proper governance and boundaries

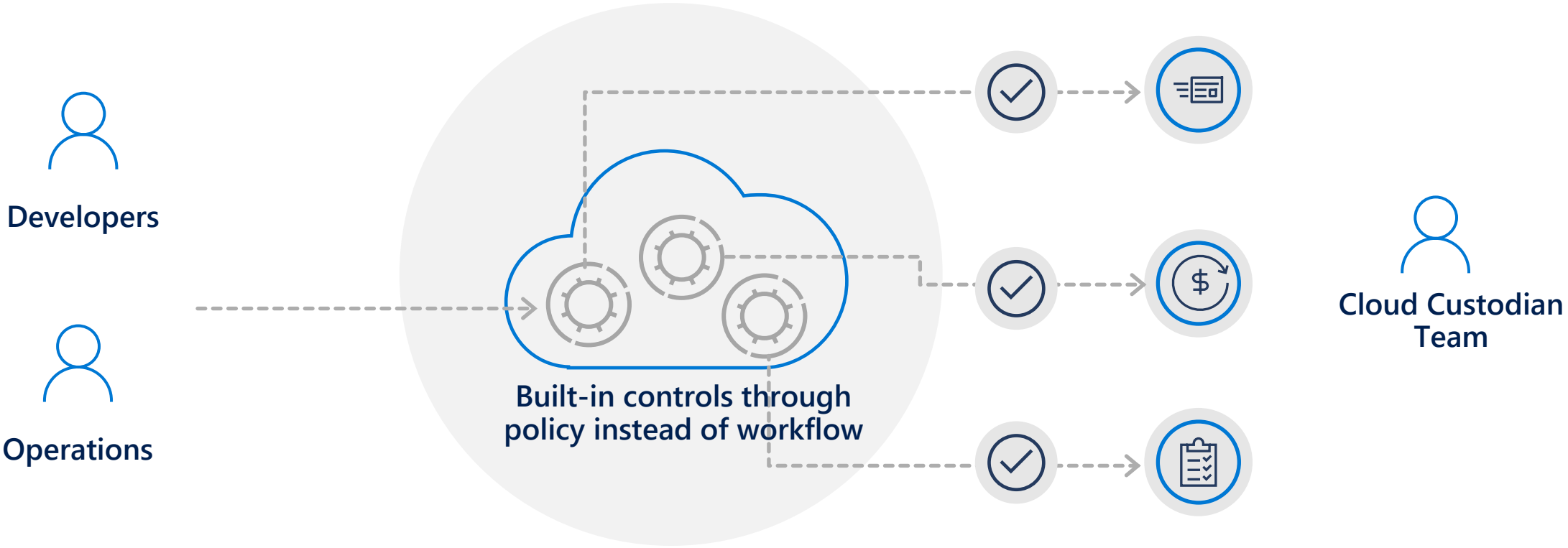
Tooling is there, but by default it has little value unless properly understood and employed

Traditional approach

Sacrifice Speed for Control

Cloud-native governance

Speed *and* Control



Governance for the cloud

Native platform capabilities to ensure compliant use of cloud resources

Policy

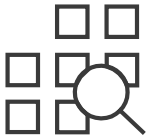
Real-time enforcement, compliance assessment and remediation

Control

Blueprints

Deploy and update cloud environments in a repeatable manner using composable artifacts

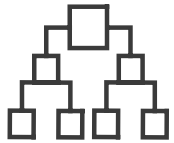
Environment



Resource Graph

Query, explore & analyze cloud resources at scale

Visibility



Management Group

Define organizational hierarchy

Hierarchy

Cost

Monitor cloud spend and optimize resources

Consumption

Overview: Identity services

Azure facilitates authentication and authorization scenarios for IaaS deployments using the following services:

- **Active Directory Domain Services (AD DS)**
- **Azure Active Directory (Azure AD)**
- **Azure Active Directory Domain Services (Azure AD DS)**

Azure Bastion

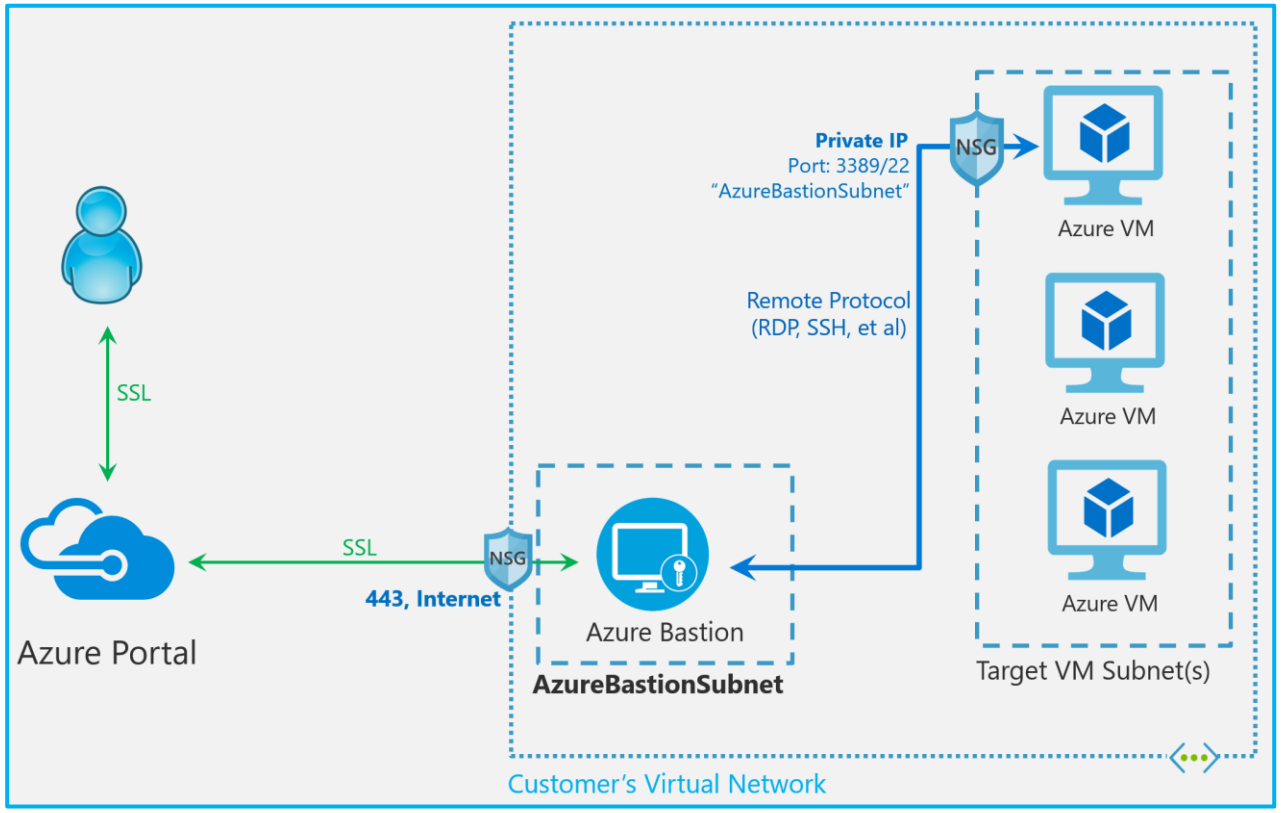
GA
Released @ Ignite
November 2019

Managed RDP/SSH to VMs over SSL using private IP on the VM

- Connect your RDP and SSH sessions directly in the Azure Portal using a single click experience
- Log into your Azure virtual machines and avoid public Internet exposure using SSH and RDP with private IP addresses only
- Integrate and traverse existing firewalls and security perimeter using a modern HTML5 based web client and standard SSL ports
- Use your SSH keys for authentication when logging into your Azure virtual machines

Value-Prop:

- **Limit public exposure of virtual machine IPs** - Access all virtual machines within a virtual network through a single hardened access point. Exposing the bastion host as primary exposed public access helps lockdown of public Internet exposure and limit threats such as port scanning and other types of malware targeting your VMs.
- **Fully managed bastion service** - Take advantage of a fully managed, autoscaling and hardened PaaS service, to provide you secure RDP and SSH connectivity.
- **RDP and SSH to Azure Virtual Machines over SSL** - connect to your virtual machines in your virtual network over SSL, port 443, directly in Azure Portal. This enables clientless RDP/SSH connectivity so that you can connect from anywhere – any device and any platform, and without any additional agent running inside your virtual machines.



Post-GA features in roadmap:

- Azure Active Directory Integration with M/2FA and SSH Key Management
- Native client support
- Peered virtual network support
- Full session video recording, monitoring and audit

[Public Preview released June CY18]

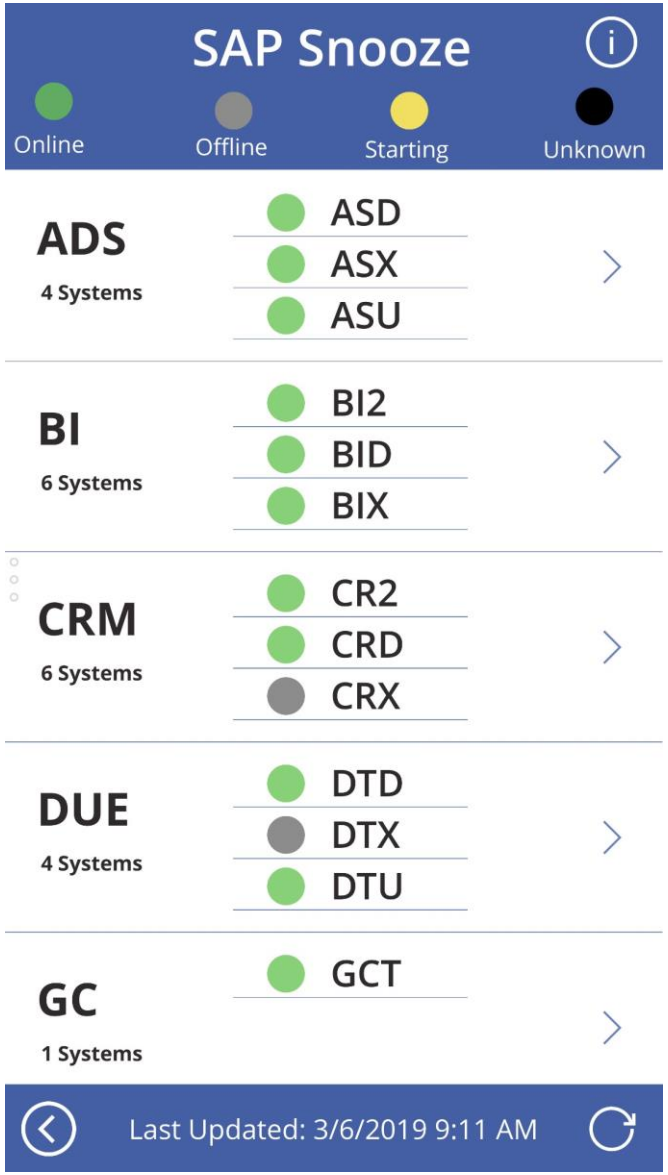
SAP Snooze Via PowerApps

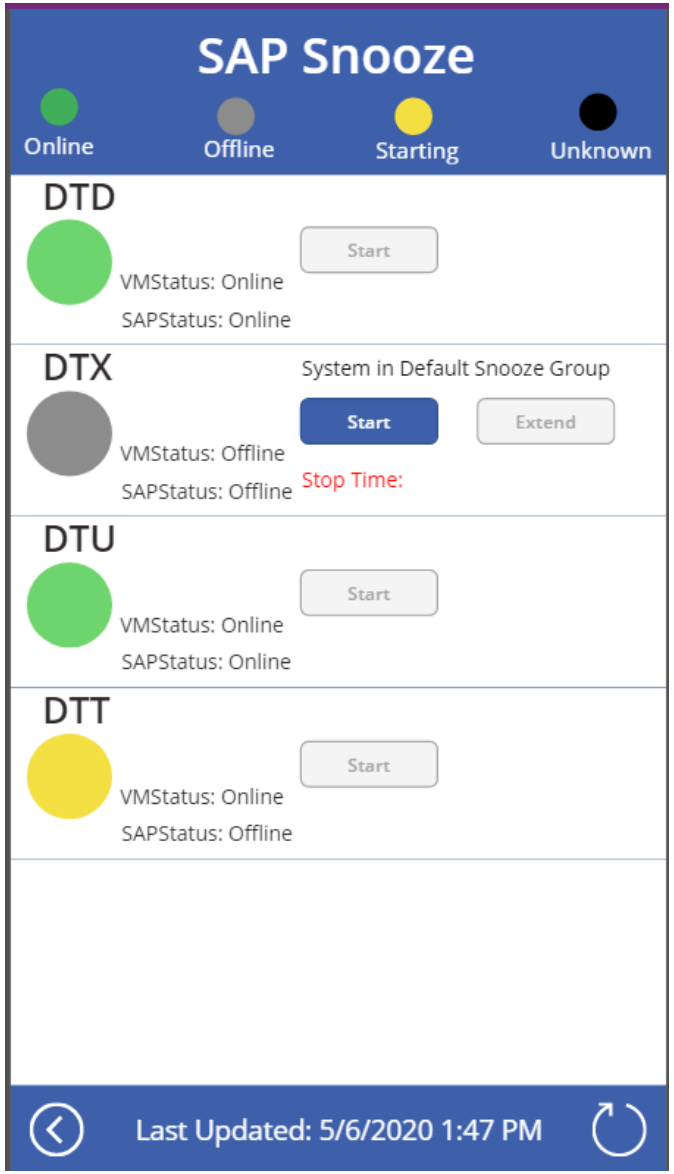
Simple PowerApps front-end to PowerShell scripts

Allows self-service snoozing and un-snoozing for authorized SAP Developers and Basis Team Members

Quick check of current snooze status

https://github.com/microsoft/SAPAzureSnooze





Q&A

Reach out to the team

sap-on-azure-pe-apac@microsoft.com

Feedback

Your feedback is very important for us.

Your responses are Anonymous

https://aka.ms/SAPAPAC-POE-FEEDBACK

New aka.ms link

https://aka.ms/apac-sap-enablement

Reach out to the team

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Microsoft

SAP on Azure Enablement

Next Session – Understanding Azure HA/DR & Backup solutions

Monday, Oct 05, 2020, 10am SGT

Reach out to the team
sap-on-azure-pe-apac@microsoft.com