Agenda

- ## What's new on Azure IaaS for SQL VMs

  - IaaS??? Is it still worth?

  - Performance guidelines

  - HA and networking

Marco Obinu

- **Geek to the bone** ☺

- **Advisory Engineer @ SoftJam S.p.A.**

- **Azure Solution Architect Expert**
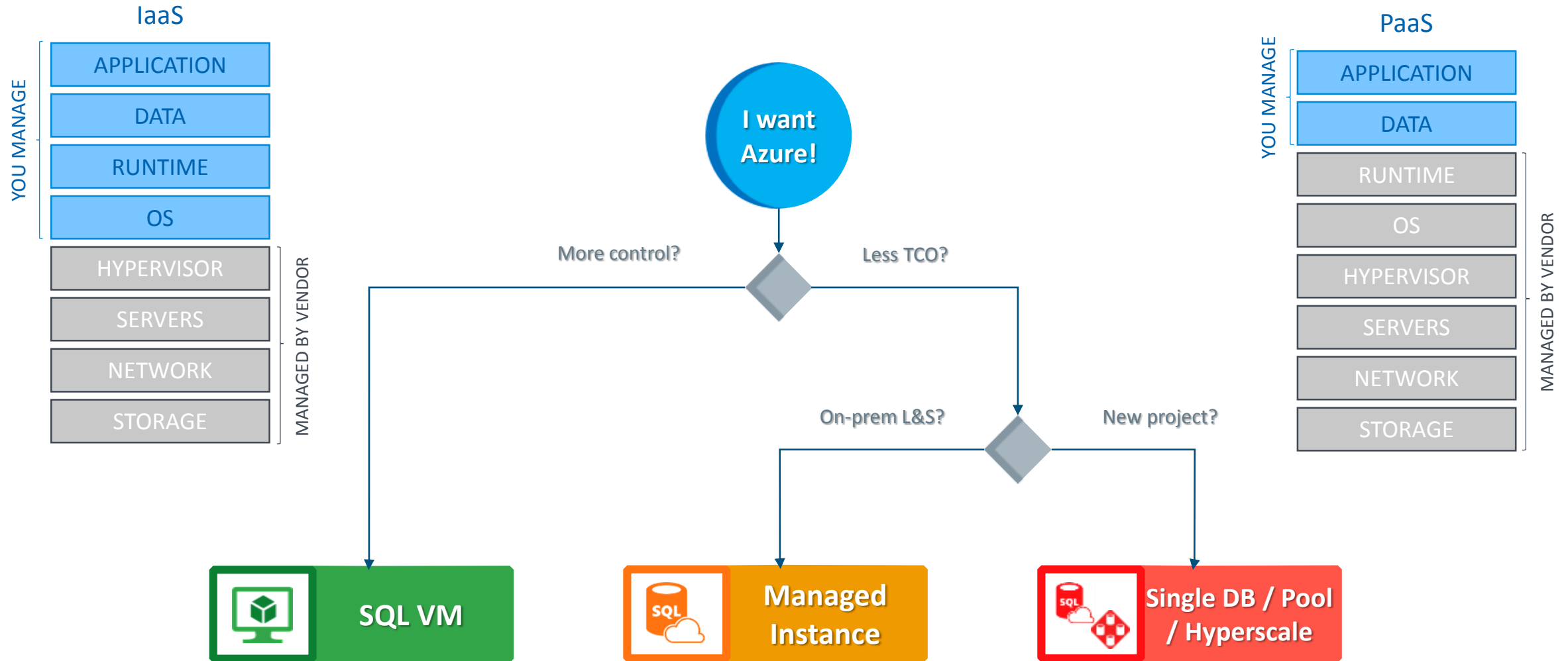
@OmegaMadLab

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http://www.omegamadlab.com

https://github.com/OmegaMadLab

https://www.linkedin.com/in/marco-obinu-omegamadlab/

https://www.youtube.com/channel/UCpkBeQSscC1iBvpNP4VNTKQ

IaaS??? Is it still worth?

SQL Server on Azure: proposition

IaaS

YOU MANAGE
- APPLICATION
- DATA
- RUNTIME
- OS

MANAGED BY VENDOR
- HYPERVISOR
- SERVERS
- NETWORK
- STORAGE

PaaS

YOU MANAGE
- APPLICATION
- DATA

MANAGED BY VENDOR
- RUNTIME
- OS
- HYPERVISOR
- SERVERS
- NETWORK
- STORAGE

I want Azure!

More control? Less TCO?

On-prem L&S? New project?

SQL VM

Managed Instance
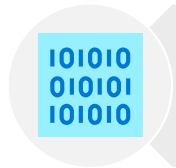
Single DB / Pool / Hyperscale
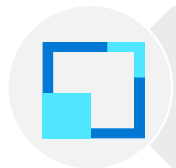
Azure SQL Database

Business continuity

High availability

Automated backups

Long term backup retention

Geo-replication

Scale

Advanced security

Automatic tuning

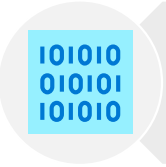Built-in monitoring

Built-in intelligence

Everything built-in!

Azure SQL VMs
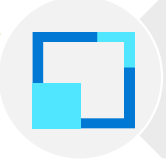
✓ Business continuity

✓ High availability

✓ Automated backups

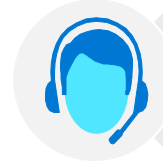✓ Long term backup retention

✓ Geo-replication

✓ Scale

✓ Advanced security

✓ Automatic tuning

Built-in monitoring

Built-in intelligence

Everything configurable

SQL Server on Azure VMs

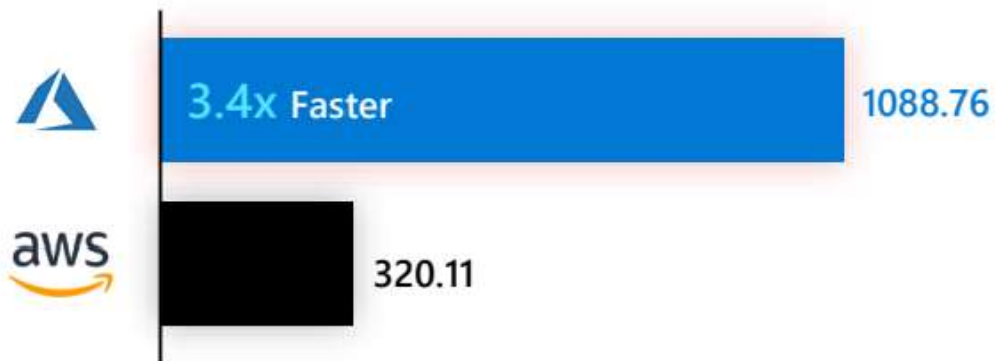## SQL Server 2017 Enterprise (Windows) on Azure and AWS

- SQL Server on Azure includes Azure Hybrid Benefit
- SQL Server on AWS includes license mobility

GIGAOM

Performance
Transactions per second (TPS)

Azure	3.4x Faster — 1088.76
aws	320.11

Price/performance*
3-year pricing / TPS

Azure	$59.02 — 87% Less
aws	$445.65

SQL Server on Azure VMs

Secure and compliant

Most compliant cloud

ISO **CSA** cloud security alliance™

Seamless cloud migration

100% SQL Server compatibility and only cloud with pre-configured Developer edition

Leading TCO

Save up to 43% vs. AWS EC2 with Azure Hybrid Benefit

Flexibility and control with automation

Easier to maintain than EC2 with automated security patches and automated backup

SQL Server on Azure VMs

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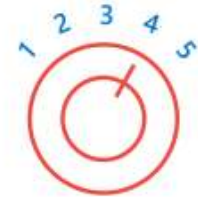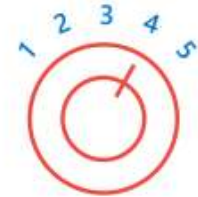## Seamless cloud migration

100% SQL Server compatibility and only cloud with pre-configured Developer edition

Leading TCO

Save up to 43% vs. AWS EC2 with Azure Hybrid Benefit

Flexibility and control with automation

Easier to maintain than EC2 with automated security patches and automated backup

Performance guidelines

Choosing the right VM

Family	Series	Optimized for
General purpose	B, Dsv3, Dv3, Dasv4, Dav4, DSv2, Dv2, Av2, DC, DCv2	Balanced CPU-to-memory ratio. Ideal for testing and development, small to medium databases, and low to medium traffic web servers.
Compute optimized	Fsv2	High CPU-to-memory ratio. Good for medium traffic web servers, network appliances, batch processes, and application servers.
Memory optimized	Esv3, Ev3, Easv4, Eav4, Mv2, M, DSv2, Dv2	High memory-to-CPU ratio. Great for relational database servers, medium to large caches, and in-memory analytics.
Storage optimized	Lsv2	High disk throughput and IO ideal for Big Data, SQL, NoSQL databases, data warehousing and large transactional databases.
GPU	NC, NCv2, NCv3, ND, NDv2 (Preview), NV, NVv3, NVv4	Specialized virtual machines targeted for heavy graphic rendering and video editing, as well as model training and inferencing (ND) with deep learning. Available with single or multiple GPUs.
High performance compute	HB, HBv2, HC, H	Our fastest and most powerful CPU virtual machines with optional high-throughput network interfaces (RDMA).

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What you're looking for:

DSv2-series 11-15

DSv2-series sizes run on the Intel® Xeon® 8171M 2.1 GHz (Skylake) or the Intel® Xeon® E5-2673 v4 2.3 GHz (Broadwell) or the Intel® Xeon® E5-2673 v3 2.4 GHz (Haswell) processors.

ACU: 210 - 250 [1]

Esv3-series

Esv3-series instances are based on feature the Intel® Xeon® 8171M 2.1 GHz (Skylake) or the Intel® Xeon® E5-2673 v4 2.3 GHz (Broadwell) processor, Intel Turbo Boost Technology 2.0, and use premium storage. Esv3-series instances are ideal for memory-intensive enterprise applications.

Esv3-series VM's feature Intel® Hyper-Threading Technology.

ACU: 160-190

Choosing the right VM

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What you're looking for:

- ACU value

- CPU to RAM ratio

- At least 4 cores

- Premium Storage
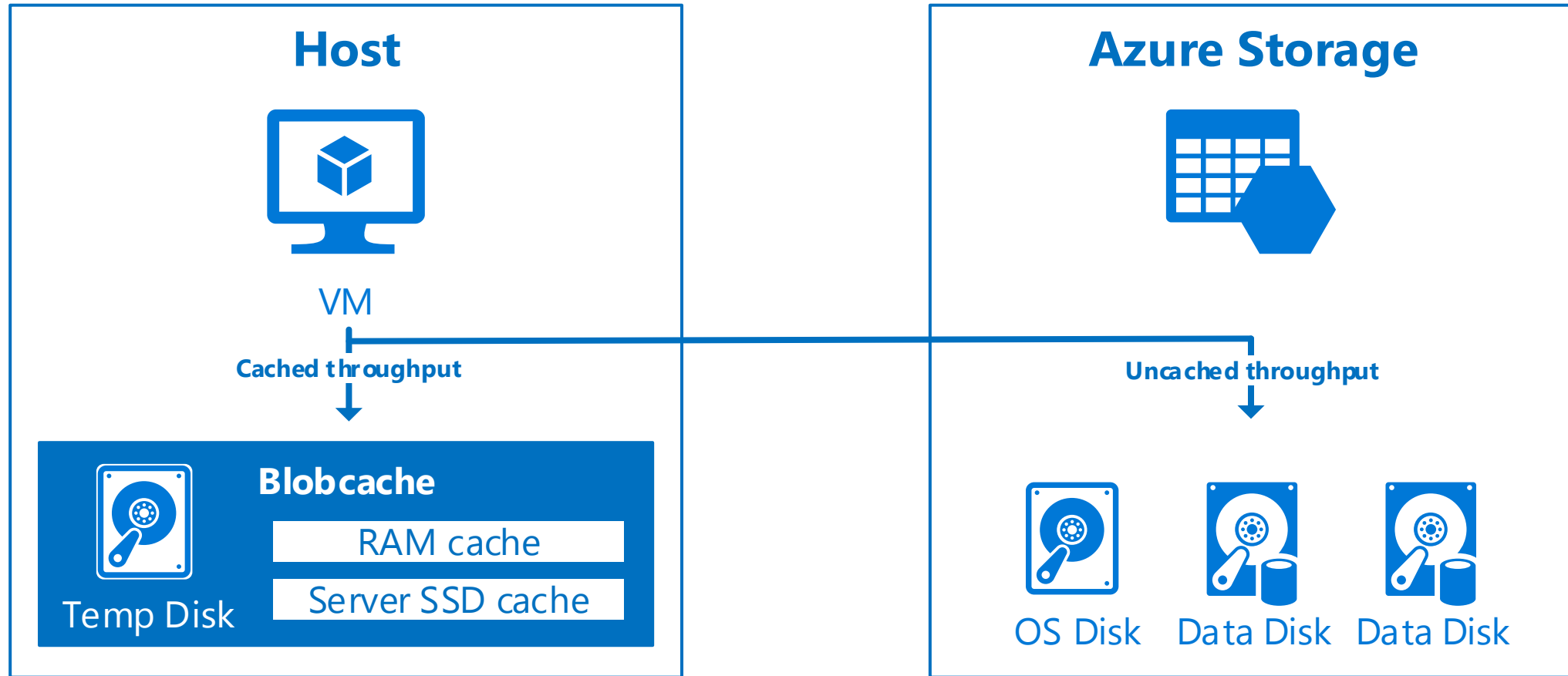
Choosing the right VM

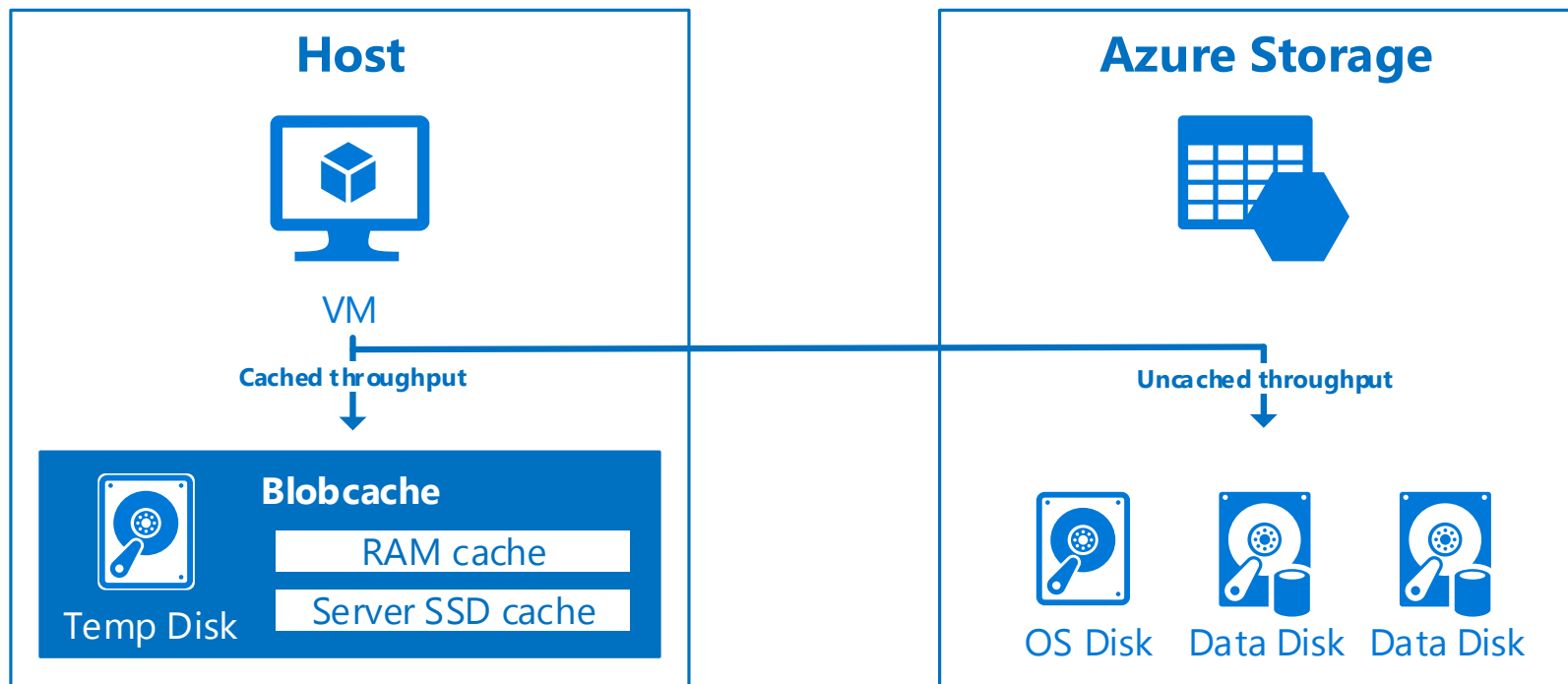| Family	Series	Optimized for
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- Disk and network throughput

Choosing the right VM

Host

VM

Cached throughput

Blobcache

RAM cache

Server SSD cache

Temp Disk

Azure Storage

Uncached throughput

OS Disk   Data Disk   Data Disk

CloudGen

Choosing the right VM

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Azure Storage

Uncached throughput

OS Disk   Data Disk   Data Disk

DS12v2 – 4 core 28 GB

Cached tp.	16000/128 (144)
Uncached tp.	12800/192
NIC/Mbps	4/3000

DS13v2 – 8 core 56 GB

Cached tp.	32000/256 (288)
Uncached tp.	25600/384
NIC/Mbps	8/6000

Easv4 – 8 core 64 GB

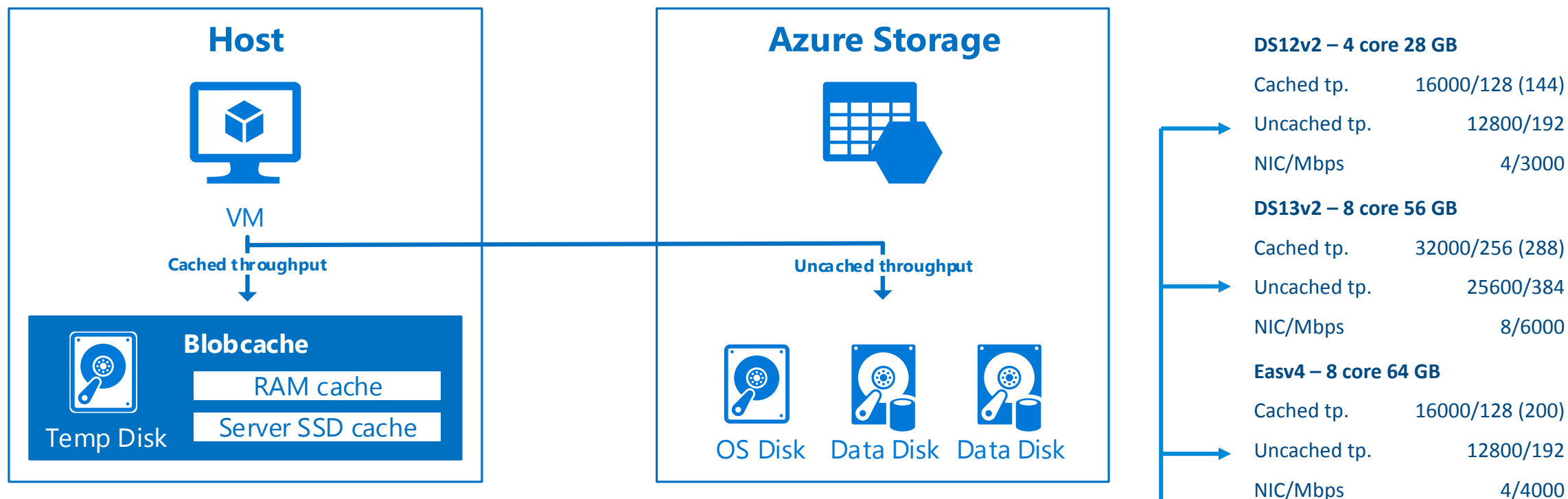|	
Cached tp.	16000/128 (200)
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The size of the VM also affects:

- Disk throughput
- Cache and Temporary disk size & throughput
- Network bandwidth
- Accelerated Network availability

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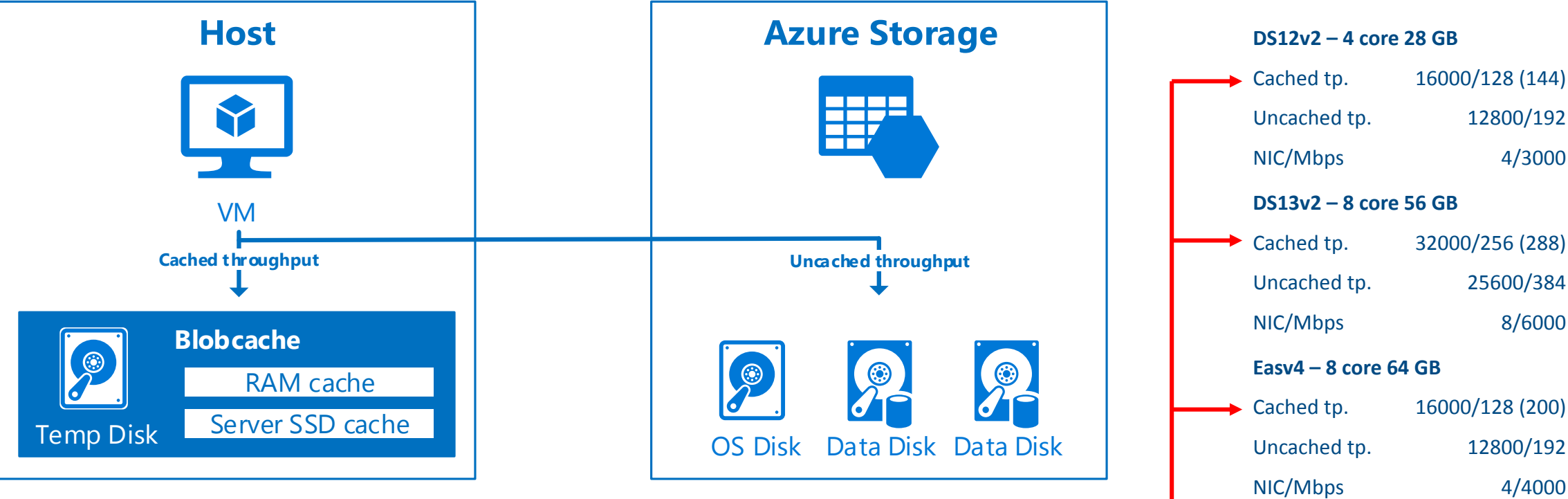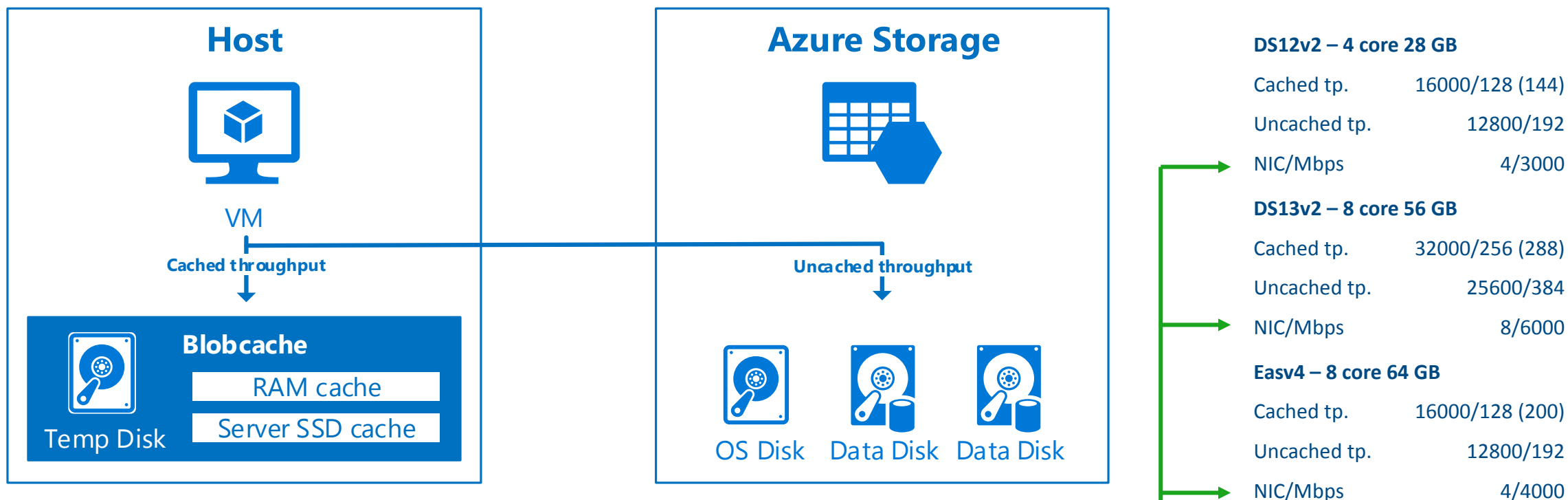- Accelerated Network availability

Choosing the right VM

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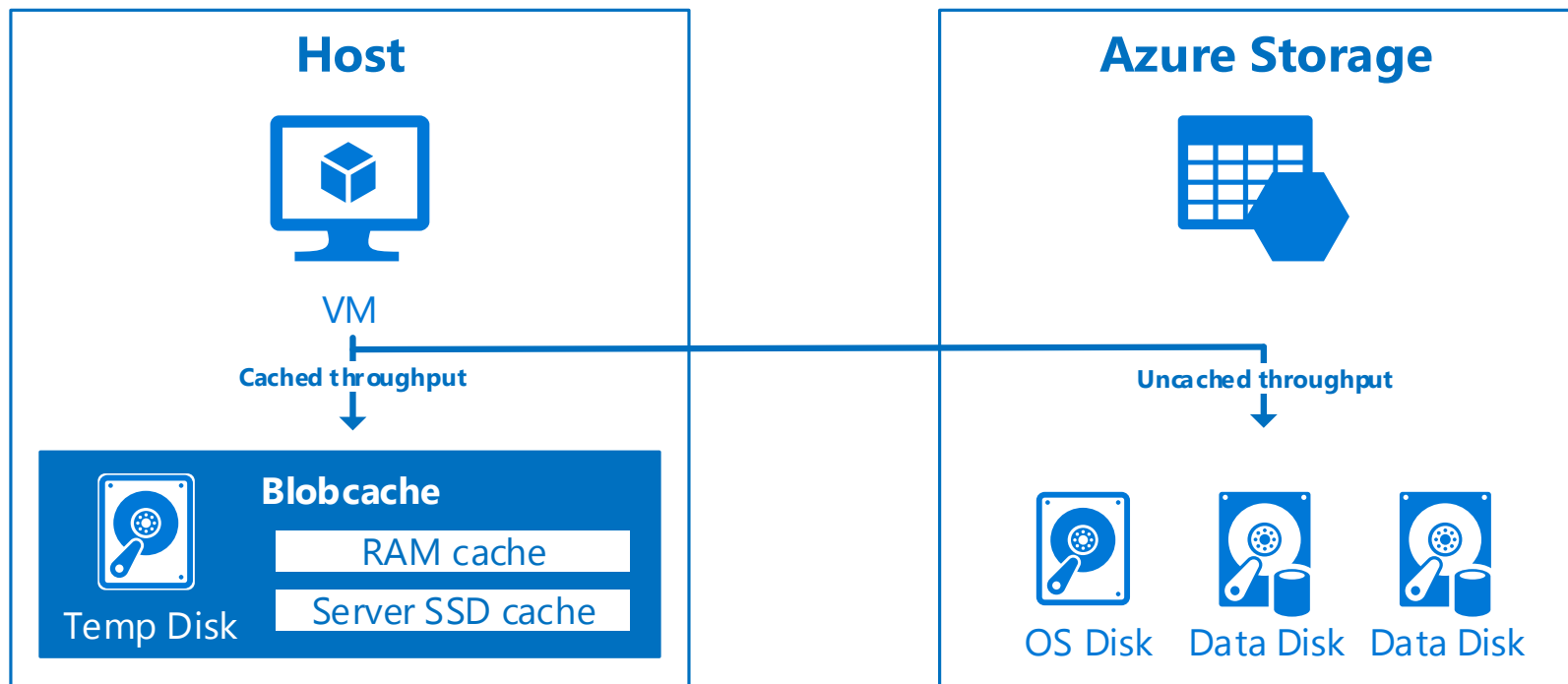- Network bandwidth
- Accelerated Network availability

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Choosing the right VM

Host

VM

Cached throughput

Blobcache

RAM cache

Server SSD cache

Temp Disk

Azure Storage

Uncached throughput

OS Disk   Data Disk   Data Disk

DS13-2v2 – 2 core 56 GB

Cached tp.   32000/256 (288)

Uncached tp.   25600/384

NIC/Mbps   8/6000

DS13-4v2 – 4 core 56 GB

Cached tp.   32000/256 (288)

Uncached tp.   25600/384

NIC/Mbps   8/6000

DS13v2 – 8 core 56 GB

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Uncached tp.   25600/384

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The size of the VM also affects:

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Need more of these, but have to contain licensing costs???
Go for Constrained vCPU!

Choosing the right disks

	Ultra SSD	Premium SSD	Standard SSD	Standard HDD
Disk type	SSD	SSD	SSD	HDD
Scenario	IO-intensive workloads such as SAP HANA, top tier databases, and other transaction-heavy workloads.	Production and performance sensitive workloads	Web servers, lightly used enterprise applications and dev/test	Backup, non-critical, infrequent access
Disk size	65,536 gibibyte (GiB)	32,767 GiB	32,767 GiB	32,767 GiB
Max throughput	2,000 MiB/s	900 MiB/s	750 MiB/s	500 MiB/s
Max IOPS	160,000	20,000	6,000	2,000
Latency	1 ms	5-10 ms	Variable	Variable

✓ Separate disks for data and logs

✓ Pay Attention to cache settings!

✓ Use Temporary disk for TempDB `NEW`

✓ Use striping to achieve more
  - Columns = # of disks
  - Interleave = 64KB for OLTP, 256KB for DWH

✓ Format with allocation unit size = 64 KB

Consider disk bursting for Premium SSD up to 512 GB `NEW`

Apply the right configurations

- Enable database page compression.

- Enable instant file initialization for data files.

- Limit autogrowth of the database.

- Disable autoshrink of the database.

- Move all databases to data disks, including system databases.

- Move SQL Server error log and trace file directories to data disks.

- Configure default backup and database file locations.

- Enable locked pages in memory.

- Apply SQL Server performance fixes.

Apply the right configurations

- Back up directly to blob storage

- Use file snapshot backups for databases larger than 12 TB `NEW`

- Use multiple Temp DB files, 1 file per core, up to 8 files

- Set max server memory at 90% or up to 50 GB left for the Operating System. `NEW`

- Enable soft NUMA `NEW`

Keep it easy

Key benefits of Resource Provider (RP) on self-installations `NEW`
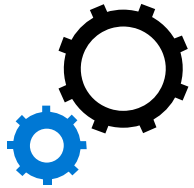
Comprehensive feature set

Self-installed VMs registered with RP now can access automation features in Azure Marketplace images

Leverage auto-backup and auto-patching to avoid time-consuming admin and VM customization
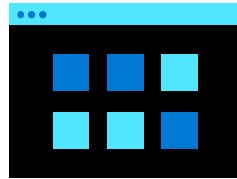
Dashboard view for VM awareness

Azure VMs are now discoverable on the new Azure SQL blade in Azure Marketplace

Easily manage your SQL VM and SQL PaaS deployments from one central location

Simple license conversions

Self-installed VMs with RP can be easily converted to PAYG images

Save money by converting variable workloads with Software Assurance to PAYG images

Straightforward compliance

Self-installed VMs with RP automatically indicate usage of Azure Hybrid Benefit

Ensure compliance with Azure terms and conditions without any extra effort

Learn more aka.ms/sqlvm_rp and aka.ms/sqlvm_rp_documentation

DEMO

SQL Server 2019 licensing rights
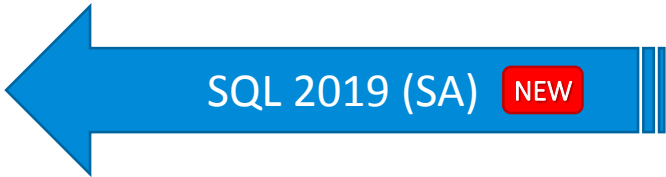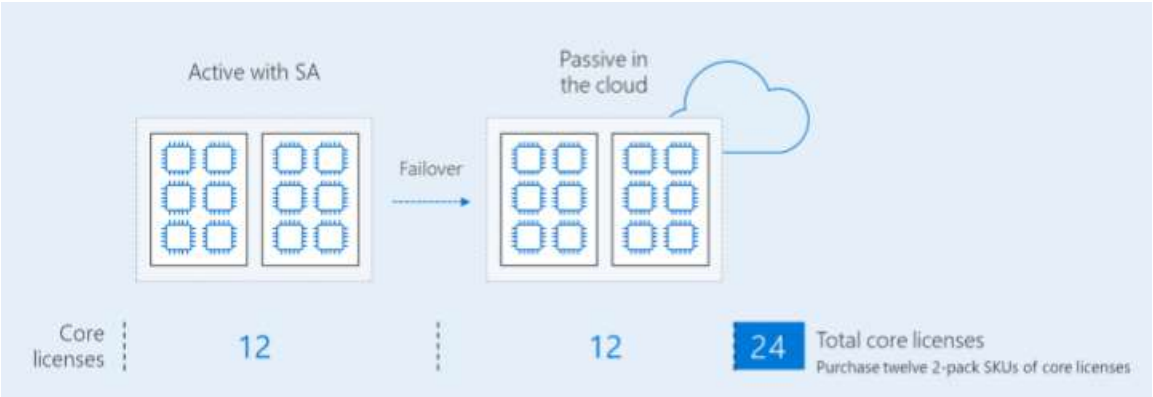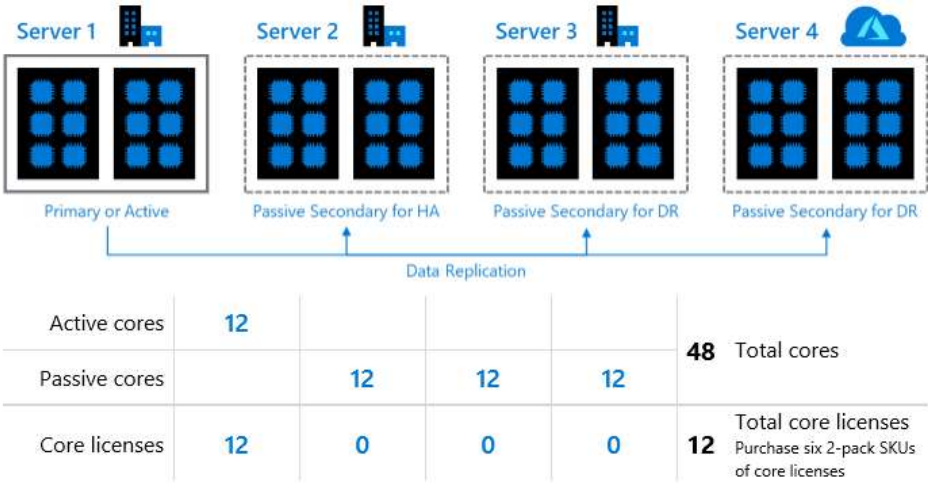
How to take advantage of Resource Provider

1. Register the resource provider to your subscription (one-time only) via the Azure Portal or Azure CLI below:

```
# Register the new SQL resource provider to your subscription
az provider register --namespace Microsoft.SqlVirtualMachine
```

2. Once **subscription registration is complete**, register your VM with the SQL VM Resource Provider:

```
# Register your existing SQL Server VM with the new resource provider
az sql vm create -n <VMName> -g <ResourceGroupName> -l <VMLocation>
```

Ways to get Resource Provider*

Recommended approach

Full version
Get full access to auto-patching, Always On, auto-backup and other features.

Note: Requires full SQL Server restart.

Lightweight version `NEW`
Speed your provision of Resource Provider with a lightweight process which does not require restarting your VMs.

Note: Does not enable full functionality.

Learn more aka.ms/sqlvm_rp and aka.ms/sqlvm_rp_documentation

*If you're unable to select Full or Lightweight RP, choose an Agentless approach. Note this option does not enable verification of Resource Provider.
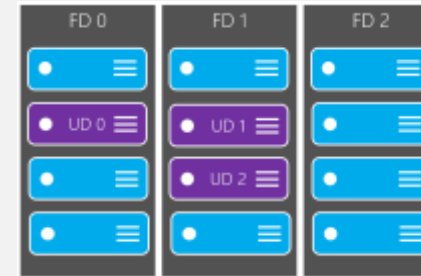
HA and networking

VMs and SLA

STANDARD

PREMIUM

FD 0   FD 1   FD 2

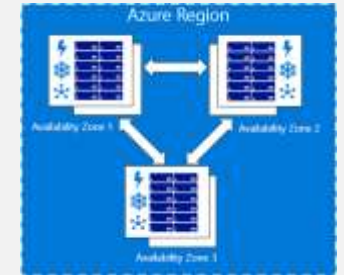UD 0   UD 1

UD 2

Azure Region

STANDARD STORAGE

PREMIUM STORAGE

AVAILABILITY SET

AVAILABILITY ZONE

No SLA ☹

99.5%

99.95%

99.99%

Proximity placement groups NEW
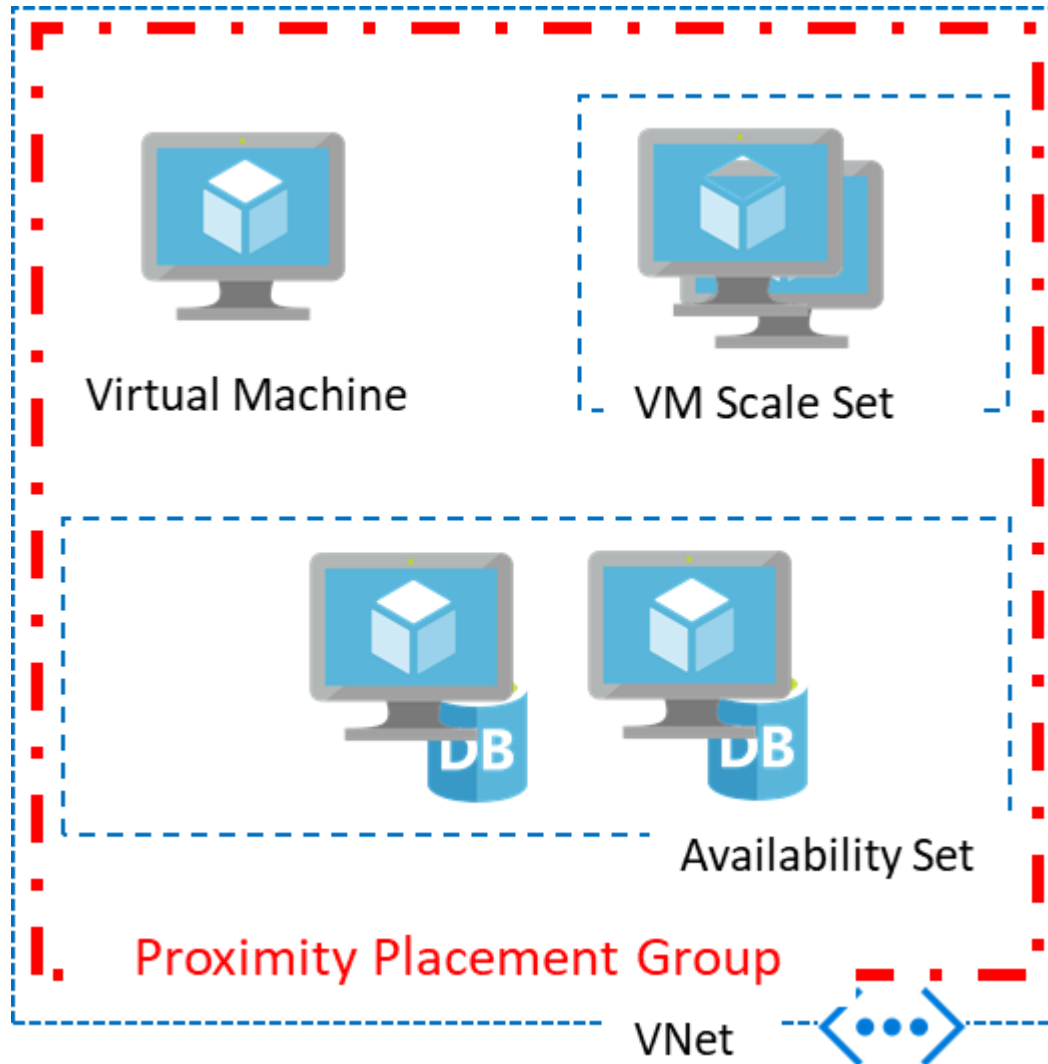
☺ Reduce latency to μs

☹ Possible allocation issues

Native HA technologies

- ## Always On Availability Groups
  SQL2012+ Enterprise Edition

- ## SQL Failover Cluster Instance with S2D
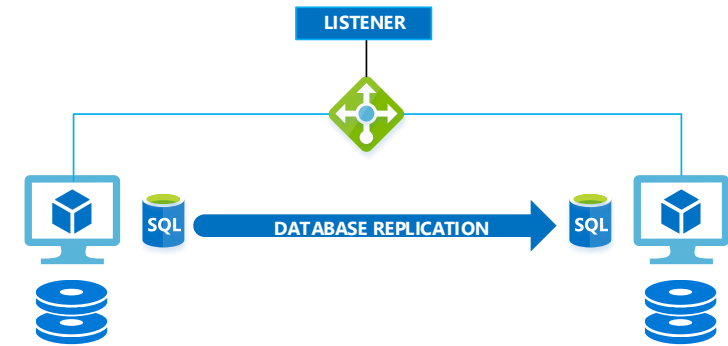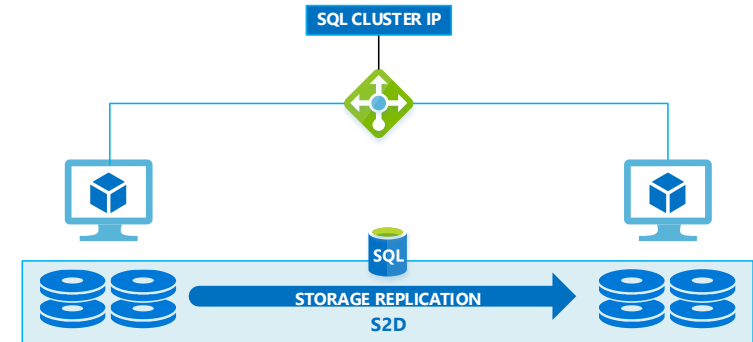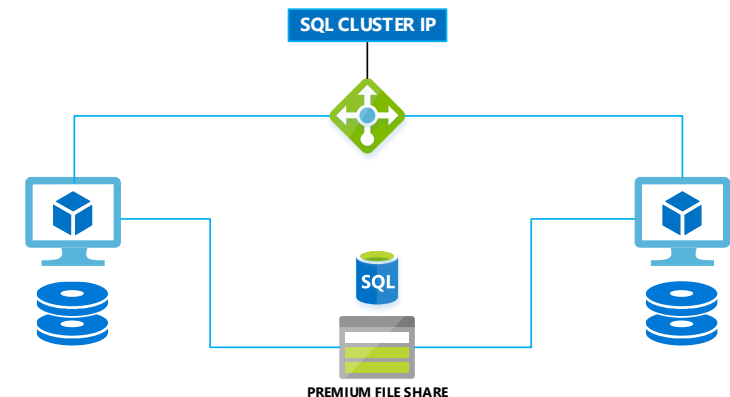 Windows Server 2016, SQL 2016+ Standard Edition

  While waiting for shared disks…

- ## SQL Failover Cluster Instance with PFS NEW
  Windows Server 2012 R2+, SQL 2012+ Standard

Windows Server 2019 recommended!

Azure Premium File Share

PREMIUM	RANGE	CALCULATED AS
Provisioned share size (GiB)	100 - 102,400 (in increments of 1 GiB)	Specified by share quota
Baseline IOPS	100 - 100,000	1 * provisioned GiB
Burst IOPS (on a best effort basis)	300 - 100,000	3 * Baseline IOPS
Egress rate (MiB/s)	66 - 6,204	60 MiB/s + 0.06 * provisioned GiB
Ingress rate (MiB/s)	44 - 4,136	40 MiB/s + 0.04 * provisioned GiB
Price	West Europe, as of 23/04/2020	0,243€ GB

Example for a 2TB share:

Baseline IOPS	2048
Burst IOPS	6144
Egress	182,88 MB/s
Ingress	121,92 MB/s
Price	497 €/month

DEMO

Resources

- Demo repository
  https://github.com/OmegaMadLab/SqlIaasVmPlayground
- Optimized ARM Template
  https://github.com/OmegaMadLab/OptimizedSqlVm-v2
- Official documentation
  http://aka.ms/SQLIaaSPerf
- DbaTools module
  https://dbatools.io

Thanks

Questions?

@OmegaMadLab

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https://www.youtube.com/channel/UCpkBeQSscC1iBvpNP4VNTKQ