Darius Liktorius

PASS SQLSATURDAY

SQL Server in the Cloud: Microsoft Azure vs Amazon AWS

Please Silence Your Devices

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Presentation Landing Page & Resources:

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Introductions

About You

- DBA’s?
- DB or BI Developers?
- Architects?
- Who’s used SQL in the cloud?
- Which one: Azure or AWS?

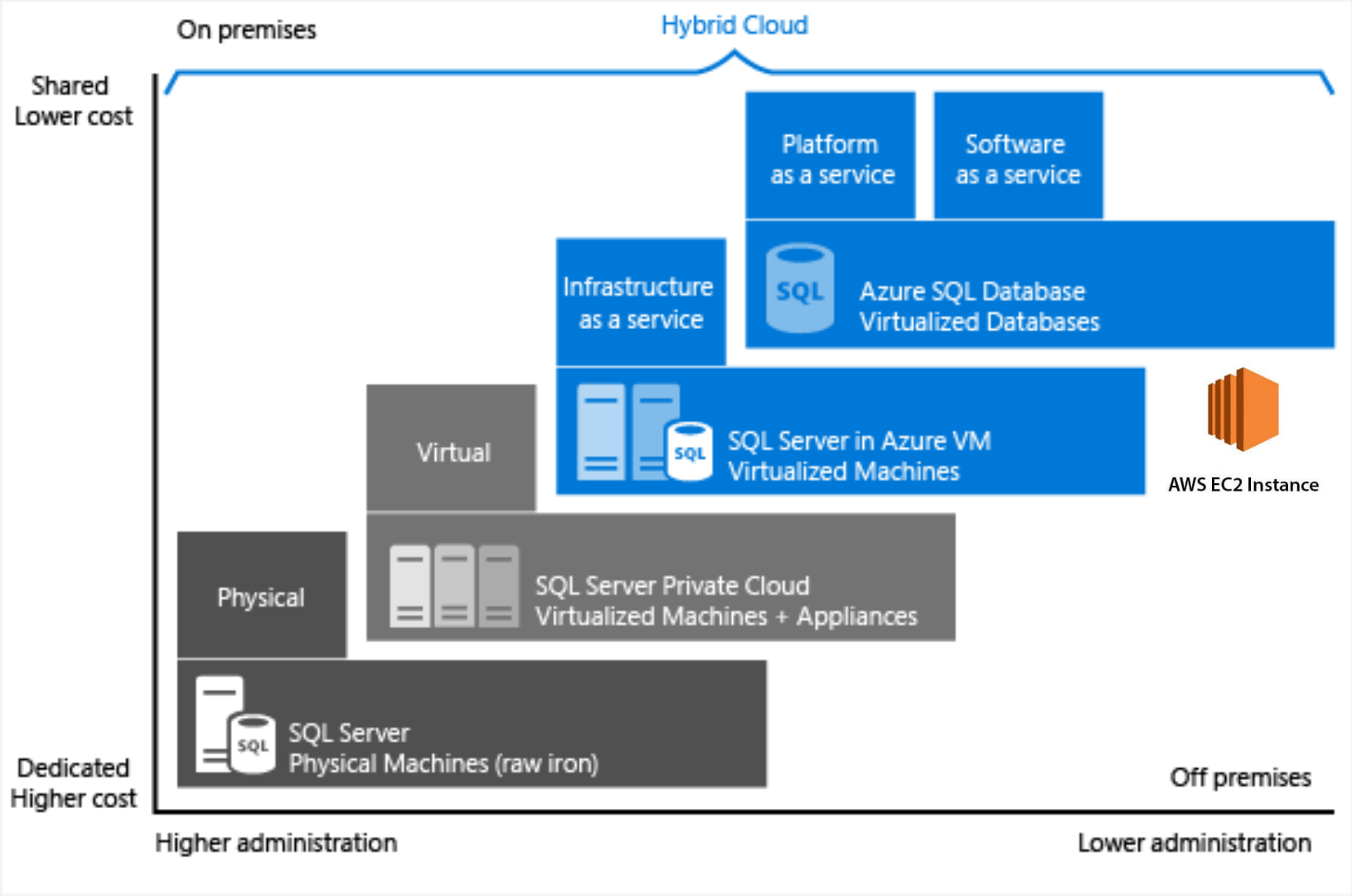
My Background

- Computing since IBM 8088 PC; professionally 25 years
- Using and Certified in SQL Server since 6.5
- SQL: Architecture, Development, Infrastructure & DBA
- From SMB to Fortune 100
- Certified on both AWS and Azure
  MCSE, MCSD, MCDBA & MCT – since 1996
- Hobby: Professional Photography

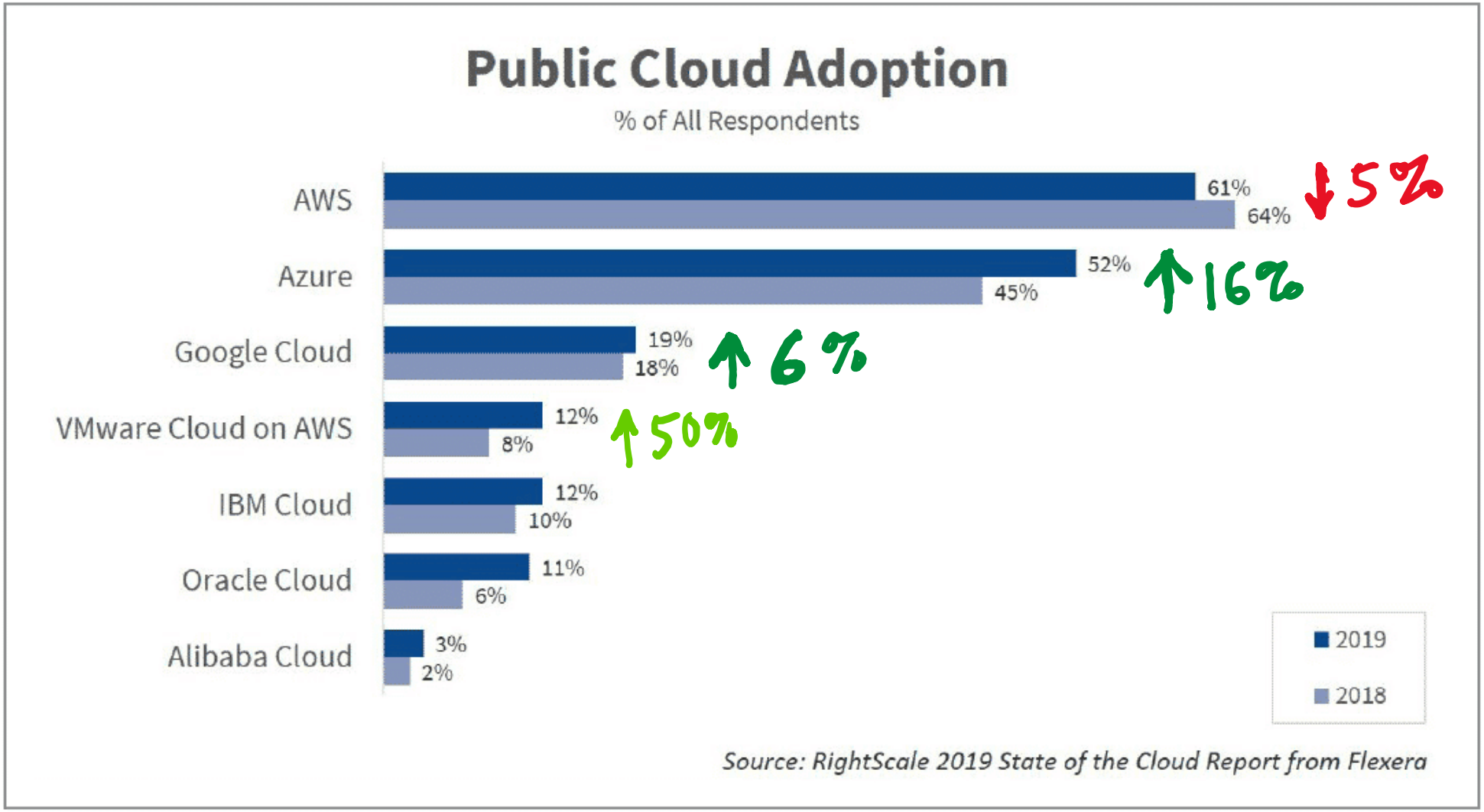
Our Agenda

- SQL Server Data Platform
- SQL Server in the Cloud
- Cloud Storage for SQL Server
- Licensing in the Cloud
- Q&A

Microsoft SQL Data Platform



Cloud Providers – By The Numbers



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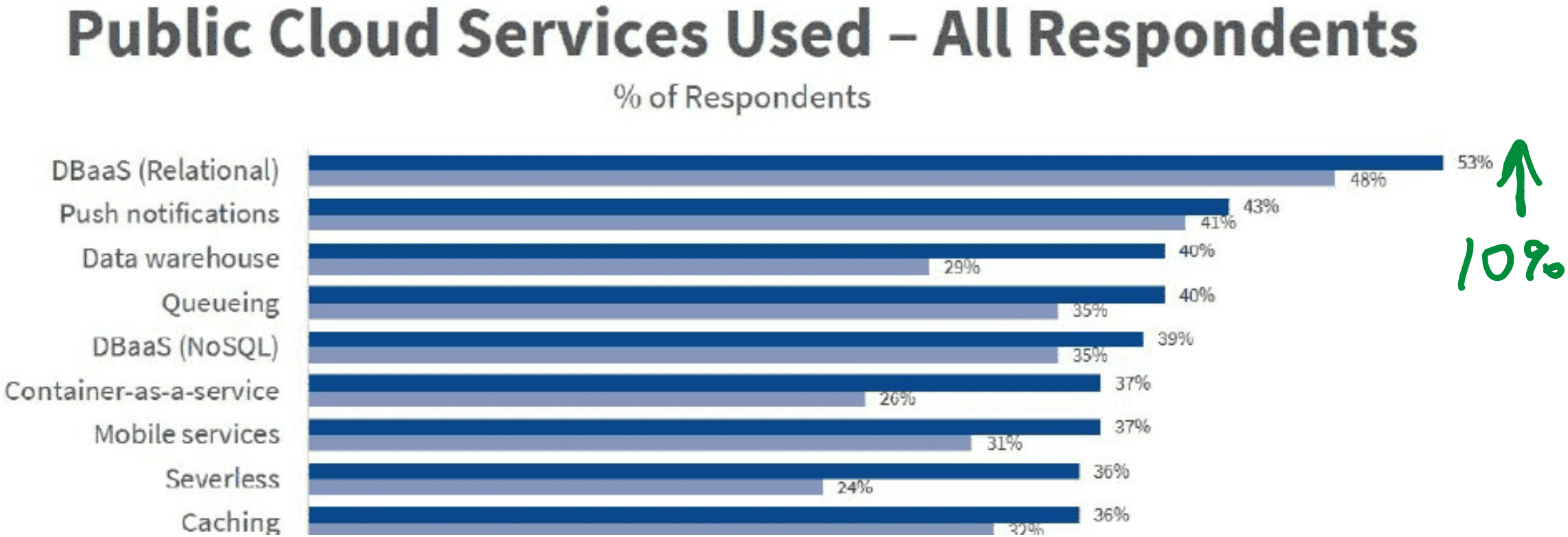


Source: RightScale 2019 State of the Cloud Report from Flexera

SQL Server in the Cloud

SQL Server Options – IaaS

Azure

SQL Server on Virtual Machines

- Most Versatile Option
- Install SQL yourself; or preloaded Marketplace image
- Full On-Prem Capability Support
- Up to 256 TB
- You maintain the VM
  - Security, Updates, Etc.

AWS

SQL Server on EC2 Instances (VMs)

- Most Versatile Option
- Install SQL yourself; or preloaded Marketplace image
- Full On-Prem Capability Support
- Up to 100 *TiB*
- You maintain the VM
  - Security, Updates, Etc.

SQL Server Options – PaaS

Azure

SQL Database –
Single DB & Elastic Pools

- *Proprietary* DB Engine
- Limited functionality
- Up to 100 TB
- Single DBs & Pools
- DTU: Basic, Std., Premium
- vCore: Gen., Hyper, Critical
- Transient Fault Exceptions

AWS

No MS SQL Direct Equivalent

Non-MS SQL Offering:
AWS Aurora (MySQL/Postgres)

Azure SQL DB – Transient Faults (EF Core)

```
// Startup.cs from any ASP.NET Core Web API
public class Startup
{
    // Other code ...
    public IServiceProvider ConfigureServices(IServiceCollection services)
    {
        // ...
        services.AddDbContext<CatalogContext>(options =>
        {
            options.UseSqlServer(Configuration["ConnectionString"],
            sqlServerOptionsAction: sqlOptions =>
            {
                sqlOptions.EnableRetryOnFailure(
                maxRetryCount: 10,
                maxRetryDelay: TimeSpan.FromSeconds(30),
                errorNumbersToAdd: null);
            });
        });
    }
//...
}
```

Azure SQL DB – Transient Faults (App Block)

```
public void HandleTransients()
{
    var connStr = "some database";
    var _policy = RetryPolicy.Create < SqlAzureTransientErrorDetectionStrategy(
        retryCount: 3,
        retryInterval: TimeSpan.FromSeconds(5));

    using (var conn = new ReliableSqlConnection(connStr, _policy))
    {
        // Do SQL stuff here.
    }
}
```

Transient Faults in C#

SQL Server Options – PaaS

Azure

SQL Database Managed Instance

- Actual Microsoft SQL Server
- Latest version of MS SQL
- ***No***: SSIS*, SSRS or SSAS
- More feature-complete than RDS
- Up to 8 TB
- Enterprise Edition
- Tiers: General Purpose (5-10ms) & Business Critical (1-2ms)

AWS

Relational DB Service (RDS)

- Actual Microsoft SQL Server
- Versions: 2012 thru 2017
- ***No***: SSIS, SSRS or SSAS, Replication, Bulk Insert, Log Shipping, DB Mail, MSDTC, Filestream, others…
- Up to 16 TiB
- Enterprise, Standard, Web, Express
- Multi-AZ Support: Ent. & Std.

Cloud Storage for SQL Server

Storage for SQL Server

Why should I care?

- SQL Server is sensitive to disk latency
- Optimal latency for data volumes: <= 10ms
- Optimal latency for transaction log: <= 2ms

Azure Storage – Architecture

Disks

Persistent disks for Azure IaaS VMs

Premium Storage Disks option:
SSD based, high IOPS, low latency

Files

Fully Managed File Shares in the Cloud

SMB and REST access

"Lift and shift" legacy apps

Blobs

Highly scalable, REST based cloud object store

Block Blobs: Sequential file I/O

Page Blobs: Random-write pattern data

Hybrid

Azure File Sync

StorSimple

Built on a **unified** Distributed Storage System

Durability, Encryption at Rest, Consistent Replication, Fault Tolerance, Load-Balancing

Azure Storage – Details

Shared Infrastructure

Throttling – choppy (*Network Policing*)

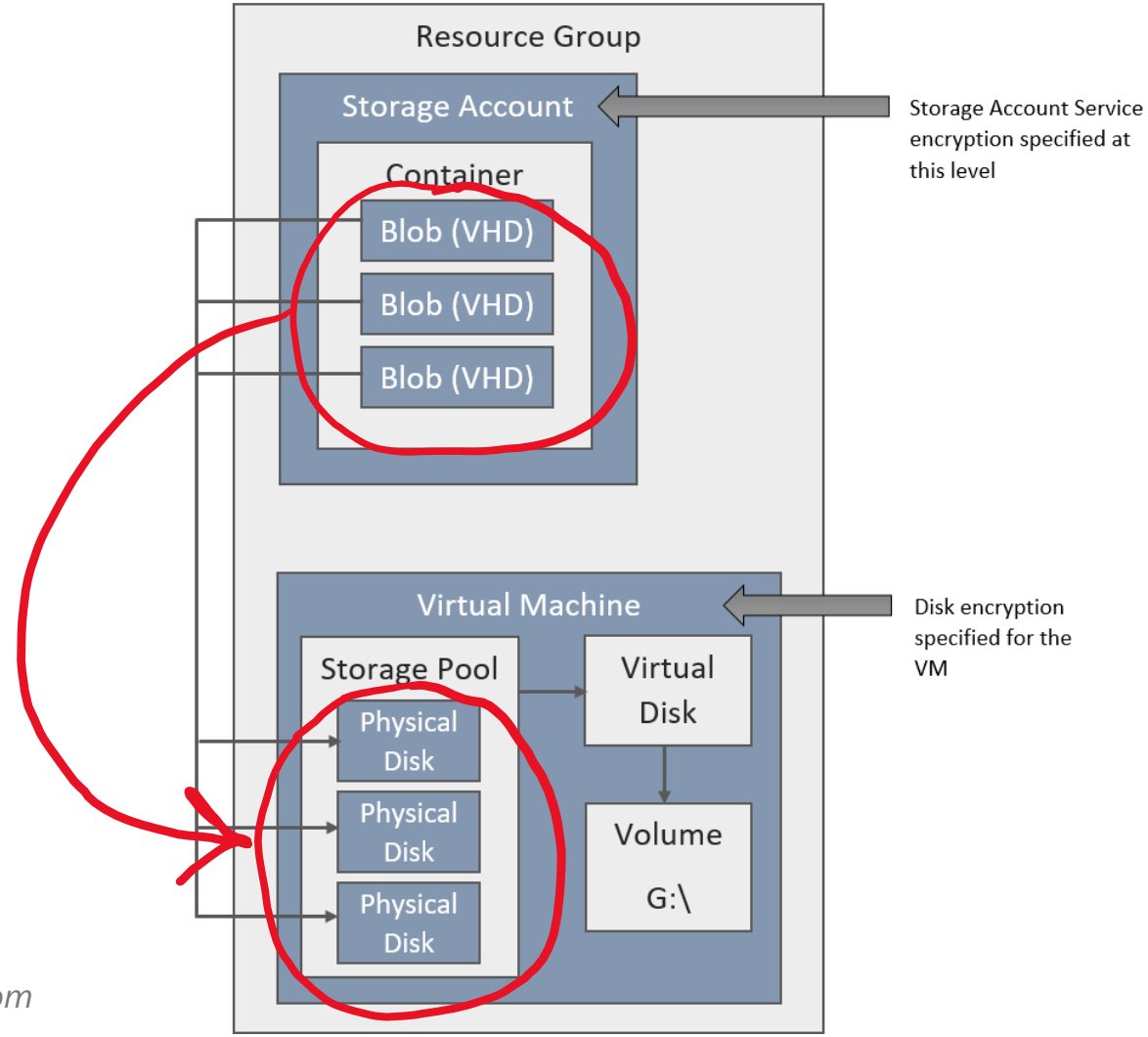
- At the VM
- At the Disk Volume

SQL Database: Managed Instance Tiers; Blob & Block

HA Options: LRS, ZRS, GRS, RA-GRS

Overcome Performance Limits w/ Storage Pools

Azure Storage – Windows Storage Pools



Courtesy: Melissa Coates, MVP -SQLChick.com

Azure Premium SSD Disks – Specs

	DISK SIZE	PRICE PER MONTH	IOPS PER DISK	THROUGHPUT PER DISK
P4	32 GiB	$4.81	120	25 MB/second
P6	64 GiB	$9.29	240	50 MB/second
P10	128 GiB	$17.92	500	100 MB/second
P15	256 GiB	$34.56	1,100	125 MB/second
P20	512 GiB	$66.56	2,300	150 MB/second
P30	1 TiB	$122.88	5,000	200 MB/second
P40	2 TiB	$235.52	7,500	250 MB/second
P50	4 TiB	$450.56	7,500	250 MB/second
P60	8 TiB	$860.16	16,000	500 MB/second
P70	16 TiB	$1,638.40	18,000	750 MB/second
P80	32 TiB (32767 GiB)	$3,276.80	20,000	900 MB/second

Azure Storage – Ultra SSD

NEW (in Preview)

- Dedicated Infrastructure
- Block Storage (for VMs)
- Throttling – smooth (Shaping)
- Locally Redundant Storage (LRS)
- Preview: only in East US 2 within single Availability Zone on ES/DS v3 VMs

Azure Ultra SSD Disks – Specs

Disk Size (GiB)	4	8	16	32	64	128	256	512	1024-65536 (in increments of 1 TiB)
IOPS Range	100-1200	100-2400	100-4800	100-9600	100-19200	100-38400	100-76800	100-~~160000~~ 153600	100-160000
Throughput Range (MB/s)	1-300	1-600	1-1200	1-2000	1-2000	1-2000	1-2000	1-2000	1-2000

AWS Storage – EBS

Elastic **Block** Store (EBS)

Dedicated Infrastructure storage (for VMs)

Predictable – throttling is smooth, not choppy (*Traffic Shaping*)

Multiple Tiers:

- General Purpose SSD (gp2)
- Provisioned IOPS SSD (io1)
- Throughput Optimized HDD (st1)
- Cold HDD (sc1)

Limited Redundancy – Local AZ only

AWS Storage – S3

Simple Storage Service (S3)

- Blob Storage (http/https access)
- 99.999999999% (11 9's) of data durability
- Region and Cross-Region Replication (CRR)

Storage Side-by-Side: Disks/Volumes

Azure

Unified Storage Performance:

- Size: 32 GiB to 32 TiB per disk
- IOPS: 120 to 20K IOPS per disk
- Throughput: 25 MiB/s to 900 MiB/s per disk

AWS

EBS Performance:

- Size: 4 GB to 16 TB per volume
- IOPS: 250 to 64K IOPS per volume
- Throughput: 250 MB/s to 1,000 MB/s per volume

Storage Side-by-Side: Disks/Volumes

Azure

Ultra-SSD Storage Performance:

- Size: 4 GiB to 64 TiB per disk
- IOPS: 300 IOPS/GiB to 160K per disk
- Throughput: 256 KiB/s per provisioned IOPS; max 2,000 MBps per disk

AWS

EBS Performance:

- Size: 4 GB to 16 TB per volume
- IOPS: 250 to 64K IOPS per volume
- Throughput: 250 MB/s to 1,000 MB/s per volume

Storage Side-by-Side: VMs/Instances

Azure

Virtual Machine Performance:

- Max IOPS per VM:
  80,000 (160,000 UltraSSD)

- Max Throughput per VM:
  2,000 MB/sec

AWS

EC2 Instance Performance:

- Max IOPS per Instance:
  80,000

- Max Throughput per Instance:
  1,750 MB/sec

Demo:
SQL Options
in Azure & AWS

Licensing in the Cloud

Licensing

Azure

Microsoft Provided:

- Windows Server (for VMs)
- SQL Server in a VM
- SQL Server Managed Instance

Bring Your Own License (BYOL)

- SQL Server w/ SA in VMs and Managed Instances
- Windows Server – Hybrid Benefit

AWS

Amazon Provided:

- Windows Server (for EC2 instances)
- SQL Server in a EC2 instance
- SQL Server in RDS

Bring Your Own License (BYOL)

- SQL Server w/ SA in EC2
- Discontinued: SQL BYOL in RDS

Q&A:
SQL Server in the Cloud

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