SQL Server on Azure

Webinar 2:
Choices and Costing

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SYNNEX CORPORATION

Why move SQL to Azure

Do big things with SQL Server on Azure

Is it time to replace aging hardware & software?

Can you run your technology more efficiently in the cloud?

Are you meeting today's security & compliance standards?

Can you use cloud innovation to better serve customers?

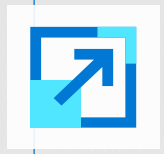
Small and medium businesses can move server workloads to Azure – and benefit from improved cost savings, innovation and security

Bring your SQL Server workloads to Azure

Unbeatable ROI: Run any part of your business in the cloud more cost-effectively than ever before: Azure SQL Database Managed Instance has the best ROI for cloud SQL with anticipated ROI of 212% and payback period of 6 months[1]

Unmatched security and compliance: With advanced security features and 90+ compliance certifications – more than any other public cloud – Azure helps secure your data

Flexible modernization: Add cloud innovation at your own pace, running SQL Server workloads on-premises and in the cloud



Unparalleled innovation: Eliminate administration and free your time to innovate with Azure SQL Database, a fully managed database service that's never needs to be patched or upgraded

1) Forrester Total Economic Impact™ of Azure SQL Database Managed Instance report

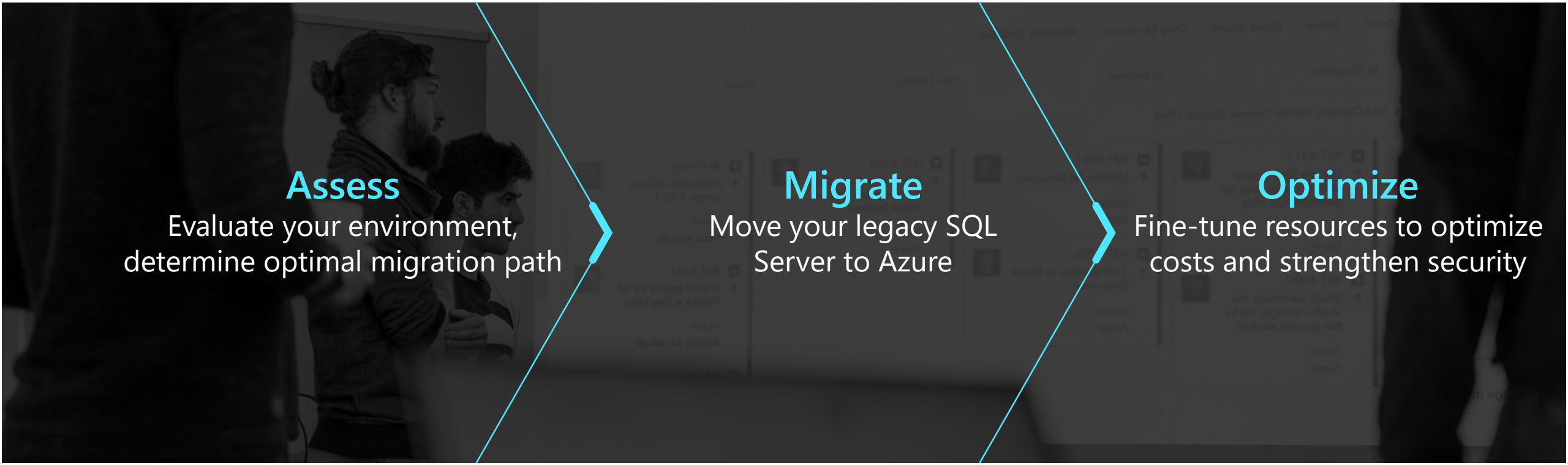
Azure SQL Database Managed Instance

Eliminate administration and free your time to innovate

Best ROI	Migration payback in six months or less[1]
SQL parity	Full parity based on 100% code consistency; supports source version back to SQL 2005
Intelligent DB	Machine-Learning based performance and security
Hybrid	Works with your on-premises investments
Easy migration	Lift and shift to the cloud with no code changes, using Microsoft's free tools

1) Forrester Total Economic Impact™ of Azure SQL Database Managed Instance report

Start today on your modernization



Get the details on SQL DB Managed Instance

Step-by-step guidance with the Database Migration Guide

Backup and Restore to Managed Instance

Use Database Compatibility Level for SQL Server to Managed Instance

Feel comfortable with Azure's PaaS model

Manage costs in Azure

Simplify migration with free tools

Assess: Inventory your workloads and map them to the right size of Azure SQL Database or SQL Server on virtual machines. **Use the free assessment tool Azure Migrate**

Migrate: Rehost applications with few to no code changes. Reliable migration at scale and with minimal downtime with **Azure Database Migration Service, free for 6 months**

Optimize: **Use free options for cost management and security monitoring** to make sure each Azure SQL Database and virtual machine is secure and well managed

What are the Options in Azure

Comparing manageability

SQL Server on Azure VMs

- Applications
- Data
- Database
- SQL instance-level features
- High Availability /DR/Backups
- Database provision/ Patch/Scaling
- Operating system
- Virtualization
- Hardware
- Datacenter management

Azure SQL DB managed instance

- Intelligent performance/security
- Applications
- Data
- Database
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Azure SQL Database

- Intelligent performance/security
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- Operating system
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- Hardware
- Datacenter management

Managed by customer

Managed by Microsoft

Machine learning capability

Comparing SQL on Azure

	 SQL Server on Azure VMs	 Azure SQL DB managed instance	 Azure SQL Database
Deployment	• Choose Azure VM compute and storage sizes • Portal or CLI gallery images • Full SQL Server Setup	• Dedicated instance or instance pools • vCore based compute • Portal or CLI instance deployment	• Provisioned and Serverless compute options • Multi-tenancy with elastic pools • Hyperscale for 100TB+ databases • DTU or vCore choices • Portal or CLI database deployment
Manageability	• Automated backups for SQL Server 2014+ • Managed backups with SQL Server 2016+ • Automated security updates • Manual patching and version upgrades • Dynamic VM sizing • Backup and Restore with Azure Blob Storage • Full SQL Server Engine features	• Automated and user-initiated backups • Point-in-time Restore • Automated patching and version upgrades • Dynamic scaling • Full Dynamic Management Views • Extended Events • Query Store • Database Mail • Resource Governor • SQL Server Agent	• System-initiated automatic backups • Long-term backup retention • Create new database based on restore • Automated patching and version upgrades • Dynamic scaling • Auto-scale with serverless • Azure Resource Health • Subset of Dynamic Management Views • Extended Events • Query Store
Security	• Integrated Security Authentication with domain joined VM • Full SQL Server Engine Security Features	• Azure Active Directory Authentication • Transparent Data Encryption (TDE) with BYOK • Always Encrypted • SQL Server Audit • Row Level Security and Dynamic Data Masking	• Azure Active Directory Authentication • Transparent Data Encryption (TDE) with BYOK • Always Encrypted • SQL Server Audit • Row Level Security and Dynamic Data Masking • Advanced Threat Protection
Availability	• Full Always On Availability Groups (AG) • Always On Failover Cluster Instance • SQL Server replication • Change Data Capture • Log Shipping • Database Snapshots • Accelerated Database Recovery (SQL Server 2019) • Tempdb Optimized Metadata	• Built in Azure HA/DR • Built-in readable secondary using geo-replication • Auto Failover Groups • SQL Server Replication • Change Data Capture	• Built in Azure HA/DR • Built-in readable secondary using geo-replication • Availability Zones • Active geo-replication • SQL Data Sync • Accelerated Data Recovery on by default

Comparing SQL on Azure (continued)

	 SQL Server on Azure VMs	 Azure SQL DB managed instance	 Azure SQL Database
Performance	• Automatic Plan Correction (SQL 2017+) • Full SQL Server Engine Performance Features	• Intelligent Query Processing • Columnstore Indexes • Memory Optimized Tables • Automatic Plan Correction	• Intelligent Query Processing • Columnstore Indexes • Memory Optimized Tables • Automated Tuning including Indexes and Plan Correction
Programmability	• All major programming interfaces • Server-level collations • UTF-8 (SQL Server 2019) • T-SQL JSON integration • Graph database (SQL Server 2017+) • Common Language Runtime • Native cross database queries • PolyBase external tables with Hadoop (SQL Server 2016+) • New PolyBase connectors (SQL Server 2019) • Java language extension (SQL Server 2019) • Distributed transactions • FileStream • Full T-SQL surface area	• All major programming interfaces • Server-level collations • UTF-8 • T-SQL JSON integration • Graph database • Common Language Runtime • Native cross database queries • Linked Servers • Service broker	• All major programming interfaces • Database-level collations • UTF-8 • T-SQL JSON integration • Graph database
Networking	• Public Endpoint with Network Security Group (NSG) • Private Endpoint with Native Azure Vnet	• Public Endpoint with Network Security Group (NSG) • Private Endpoint with Native Azure Vnet	• IP Firewall for Public Endpoint • Virtual Network Firewall within Azure • Private Endpoint with PrivateLink (preview)
Analytics and BI	• SQL Server Integration Services • SQL Server Reporting Services • SQL Server Analysis Services • Machine Learning Server (standalone) • Machine Learning Services and language extensions • Full-text and semantic extractions for search	**Compatible with:** • Azure Data Factory SSIS integration runtime • Azure Analysis Services • Migrate SSRS to Power BI paginated reports	**Compatible with:** • Azure Analysis Services • Migrate SSRS to Power BI paginated reports • R Services (Public Preview)
Storage limits	Instances up to 256 TB	Instance up to 8 TB	Databases up to 4 TB (100 TB with Hyperscale)
SLA	SLA varies based on tier level	99.99% availability SLA at instance level	Up to 99.995% availability SLA at database level

What are the Purchasing Models

vCore DTU

vCore

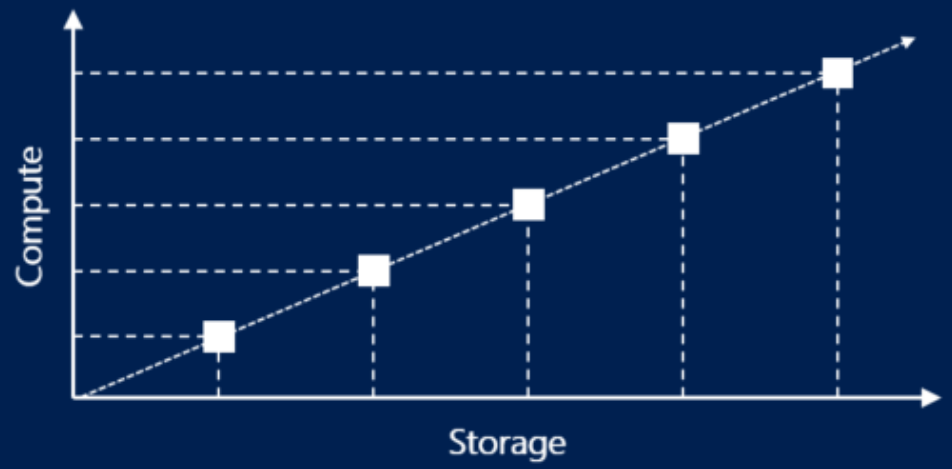
- Available for both Azure SQL Database and Azure SQL Managed Instance
- Flexibility, control & transparent
- Resources that are always provisioned for your workloads

DTU

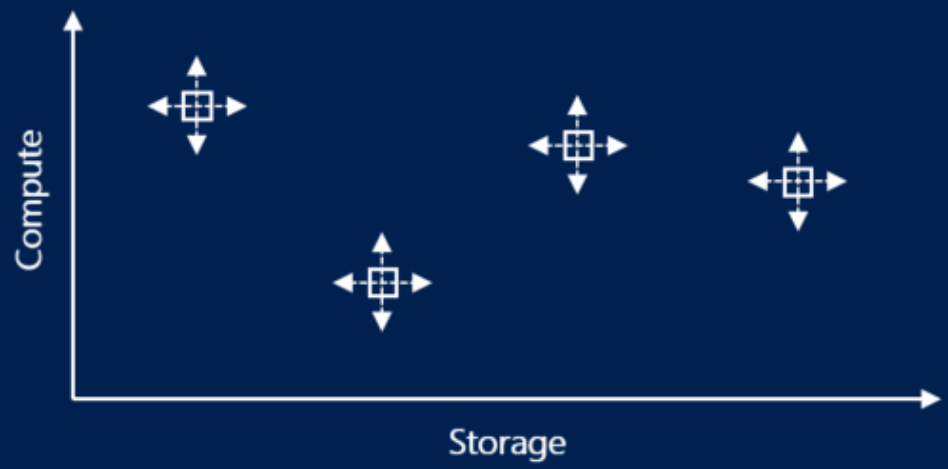
- Only available under Azure SQL Database
- Built for common workloads
- Simple preconfigured resource options

[Microsoft Doc: Choose between the vCore and DTU purchasing models]

vCore DTU



OR



Database Transaction Unit (DTU)-based model

- Bundled measure of compute, storage and IO resources
- Best for customers who want simple, pre-configured resource options.

vCore-based model

- Independent scaling of compute, storage and IO resources
- Best for customers who value flexibility, control and transparency
- Use with Azure Hybrid Benefit for SQL Server to gain cost savings

[Microsoft Doc: Choose between the vCore and DTU purchasing models]

What’s a DTU

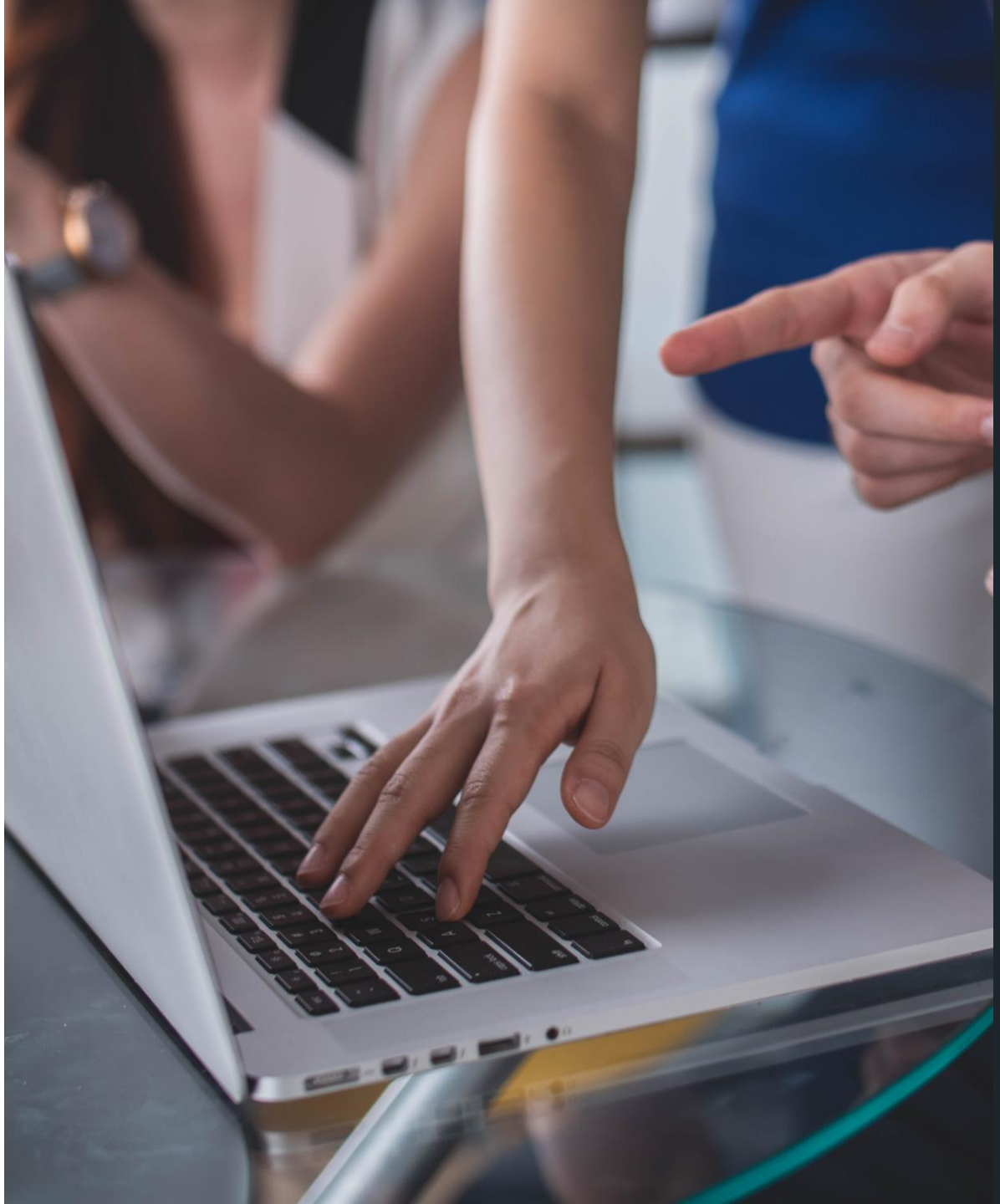
Defined

A DTU [Database Transaction Unit] is a blended measure of CPU, memory, and data I/O and transaction log I/O in a ratio determined by an OLTP benchmark workload designed to be typical of real-world OLTP workloads. Doubling the DTUs by increasing the performance level of a database equates to doubling the set of resource available to that database.

DTU Calculator

Tool

- http://dtucalculator.azurewebsites.net/
- PowerShell or Command Line
- Generates a CSV file
  - Total % processor time
  - Total Disk reads/second
  - Total Disk writes/second
  - Total log bytes flushed/second
- DTU Calculator isn't going to be perfect.
- Doesn’t isolate a single database



Determine DTU utilization

To determine the average percentage of DTU utilization relative to the DTU limit of a database or an elastic pool, use the following formula:

```
avg_dtu_percent =
MAX(avg_cpu_percent, avg_data_io_percent,
avg_log_write_percent)
```

The input values for this formula can be obtained from sys.dm_db_resource_stats, sys.resource_stats, and sys.elastic_pool_resource_stats DMVs. In other words, to determine the percentage of DTU utilization toward the DTU limit of a database or an elastic pool, pick the largest percentage value from the following: avg_cpu_percent, avg_data_io_percent, and avg_log_write_percent at a given point in time.

Mapping DTU’s to tradition hardare

An estimation

Number Cores	IOPS	Memory	DTUs	Service Tier	Comparable Azure VM Size
1 core, 5% utilization	10	???	5	Basic	Standard_A0, barely used
<1 core	150	???	100	Standard S0-S3	Standard_A0, not fully utilized
1 core	up to 4000	???	500	Premium – P4	Standard_DS1_v2
2-3 cores	up to 12000	???	1000	Premium – P6	Standard_DS3_v2
4-5 cores	up to 20000	???	1750	Premium – P11	Standard_DS4_v2
6-13	up to 48000	???	4000	Premium – P15	Standard_DS5_v2

Summary

DTU

Azure guarantees a certain level of resources for that database (independent of any other database in the Azure cloud). This guarantee provides a predictable level of performance. The amount of resources allocated for a database is calculated as a number of DTUs and is a bundled measure of compute, storage, and I/O resources.

When your workload exceeds the amount of any of these resources, your throughput is throttled, resulting in slower performance and time-outs.

vCore

The vCore-based purchasing model lets you independently choose compute and storage resources, match on-premises performance, and optimize price. In the vCore-based purchasing model, you pay for:

- Compute resources (the service tier + the number of vCores and the amount of memory + the generation of hardware).
- The type and amount of data and log storage.
- Backup storage (RA-GRS).

If your database consumes more than 300 DTUs, converting to the vCore-based purchasing model might reduce your costs.

Thank You

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