

Azure PaaS Databases

Microsoft Azure



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Agenda

- [10]. Azure Cloud Primer
- [20]. What are "Azure PaaS Databases"
- [30]. Introduction to CosmosDB
- [40]. Deep Dive into Azure SQL DB
- [50]. Introduction to Azure SQL DW
- [60]. Getting Started in Azure
- [70]. Wrap Up and Summary

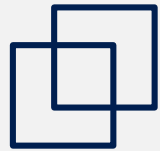
Introduction Azure Primer



Microsoft Azure Cloud Platform



Productive



Hybrid



Intelligent



Trusted

<https://azure.microsoft.com/en-us/overview/what-is-azure/>

Azure regions

Azure has more global regions than any other cloud provider—offering the scale needed to bring applications closer to users around the world, preserving data residency, and offering comprehensive compliance and resiliency options for customers.

50 regions worldwide **140** available in 140 countries





Productive



Hybrid



Intelligent



Trusted

Azure Active
Directory

Azure
Data Services

Azure
Services

Azure Security
& Management



101010
010101
101010



Common
Identity

Data
Platform

Unified
Development

Security &
Management



Active
Directory

SQL
Server

Azure
Stack

On-premises
Infrastructure

<https://azure.microsoft.com/en-us/overview/hybrid-cloud/>

Build and innovate with choice and flexibility

<https://azure.microsoft.com/en-us/overview/productivity/>

DevOps										
Management										
Applications										
App frameworks & tools										
Databases & middleware										
Infrastructure										

Comply with industry and regional requirements

<https://www.microsoft.com/en-us/TrustCenter/Security/default.aspx>

GLOBAL



ISO 27001



ISO 27018



ISO 27017



ISO 22301



SOC 1 Type 2



SOC 2 Type 2



SOC 3



CSA STAR
Self-Assessment



CSA STAR
Certification



CSA STAR
Attestation

US GOV



Moderate
JAB P-ATO



High
JAB P-ATO



DoD DISA
SRG Level 2



DoD DISA
SRG Level 4



DoD DISA
SRG Level 5



SP 800-171



FIPS 140-2



Section 508
VPAT



ITAR



CJIS



IRS 1075

INDUSTRY



PCI DSS
Level 1



CDSA



MPAA



FACT UK



Shared
Assessments



FISC Japan



HIPAA /
HITECH Act



HITRUST



GxP
21 CFR Part 11



MARS-E



IG Toolkit UK



FERPA



GLBA



FFIEC

REGIONAL



Argentina
PDPA



EU
Model Clauses



UK
G-Cloud



China
DJCP



China
GB 18030



China
TRUCS



Singapore
MTCS



Australia
IRAP/CCSL



New Zealand
GCIO



Japan My
Number Act



ENISA
IAF



Japan CS
Mark Gold



Spain
ENS



Spain
DPA



India
MeitY



Canada
Privacy Laws

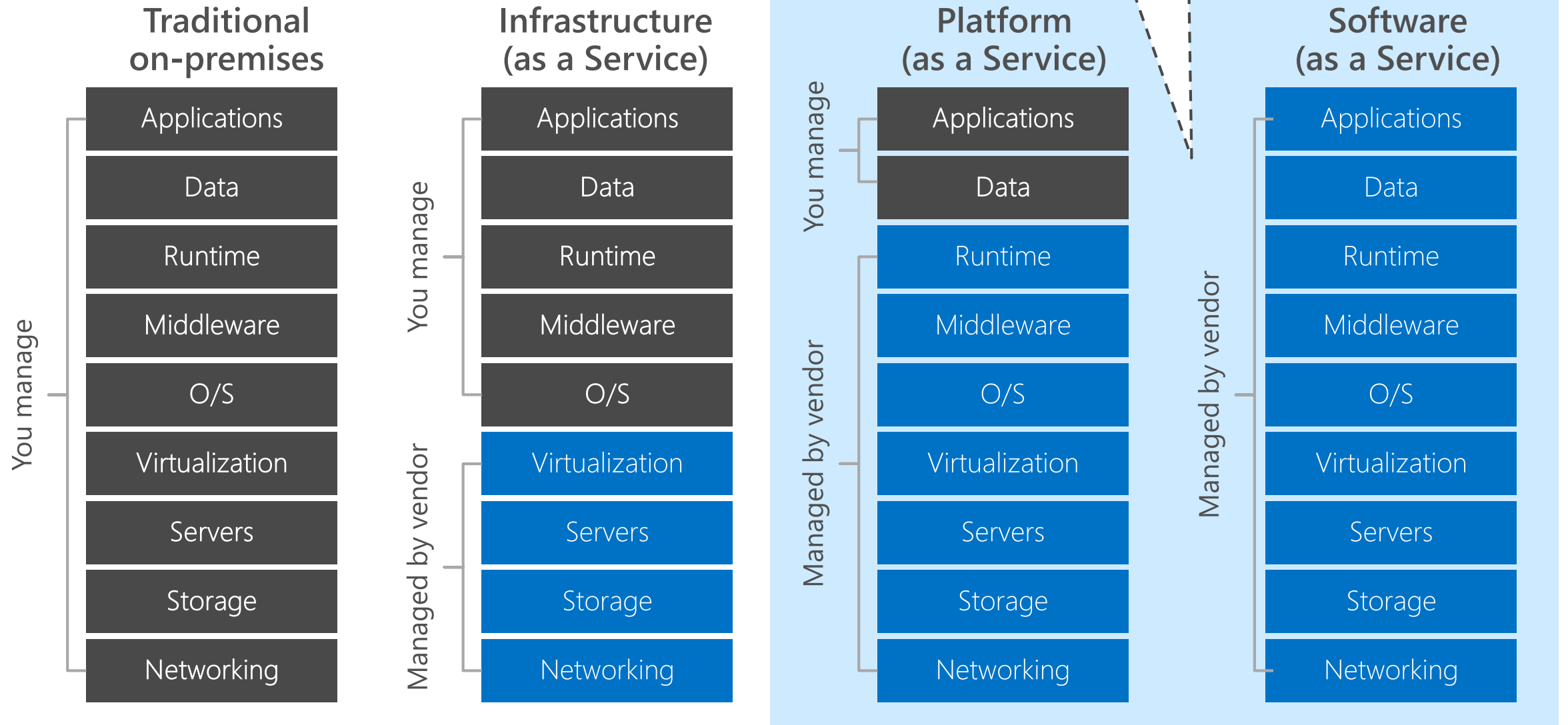


Privacy
Shield



Germany IT
Grundschutz
workbook

Cloud service models



Azure Services – Which One?

<http://azureinteractives.azurewebsites.net/Azure101Cards/default.html>

Compute

- Virtual Machines
- Virtual Machines Scale Sets
- App Service
- Functions
- Container Service
- Container Instances
- Batch
- Service Fabric
- Cloud Services

Networking

- Virtual Network
- Load Balancer
- Application Gateway
- VPN Gateway
- Azure DNS
- Content Delivery Network
- Traffic Manager
- ExpressRoute
- Azure DDoS Protection

Storage

- Storage
- Blob Storage
- Queue Storage
- File Storage
- Disk Storage
- Data Lake Store
- StorSimple
- Backup
- Site Recovery

Enterprise Integration

- Logic Apps
- Service Bus
- API Management
- StorSimple
- SQL Server Stretch Database
- Data Catalog
- Data Factory
- Event Grid

Security + Identity

- Security Center
- Azure Active Directory for Developers
- Key Vault
- Azure Active Directory
- Azure Active Directory B2C
- Azure Active Directory Domain Services
- Multi-Factor Authentication

Developer Tools

- Visual Studio Team Services
- Azure DevTest Labs
- Application Insights
- API Management
- HockeyApp
- Developer Tools and SDKs
- Xamarin
- Storage Explorer

Web + Mobile

- App Service
- Web Apps
- Web Apps for Containers
- Mobile Apps
- API Apps
- Content Delivery Network
- Media Services
- Azure Search

Containers

- Container Service
- Container Instances
- Container Registry
- Service Fabric
- App Service
- Batch

Databases

- SQL Database
- Azure Database for MySQL
- Azure Database for PostgreSQL
- SQL Data Warehouse
- SQL Server Stretch Database
- Azure Cosmos DB
- Table Storage
- Redis Cache

Data + Analytics

- HDInsight
- Stream Analytics
- Event Hubs
- Data Lake Analytics
- Data Lake Store
- Data Factory
- Azure Analysis Services
- SQL Data Warehouse

AI + Cognitive Services

- Machine Learning
- Azure Bot Service
- Cognitive Services
- Bing Web Search API
- Text Analytics API
- Face API
- Computer Vision API
- Custom Vision Service

Internet of Things

- IoT Hub
- IoT Edge
- Stream Analytics
- Time Series Insights
- Azure Cosmos DB
- Event Grid
- Logic Apps

Monitoring + Management

- Site Recovery
- Backup
- Log Analytics
- Application Insights
- Azure Monitor
- Azure Policy
- Microsoft Azure portal

Introduction

Azure PaaS Databases



Microsoft Azure Data Services

IaaS

PaaS

SQL Server, Oracle, Mongo, MySQL, ++ in Azure VM

Azure Relational Databases

SQL, PostgreSQL, MySQL

Azure No SQL Databases CosmosDB

Azure Table Storage

Azure Blob Storage

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1010101001
010011101
0100100101

fully featured RDBMS

transactional processing

rich query

managed as a service

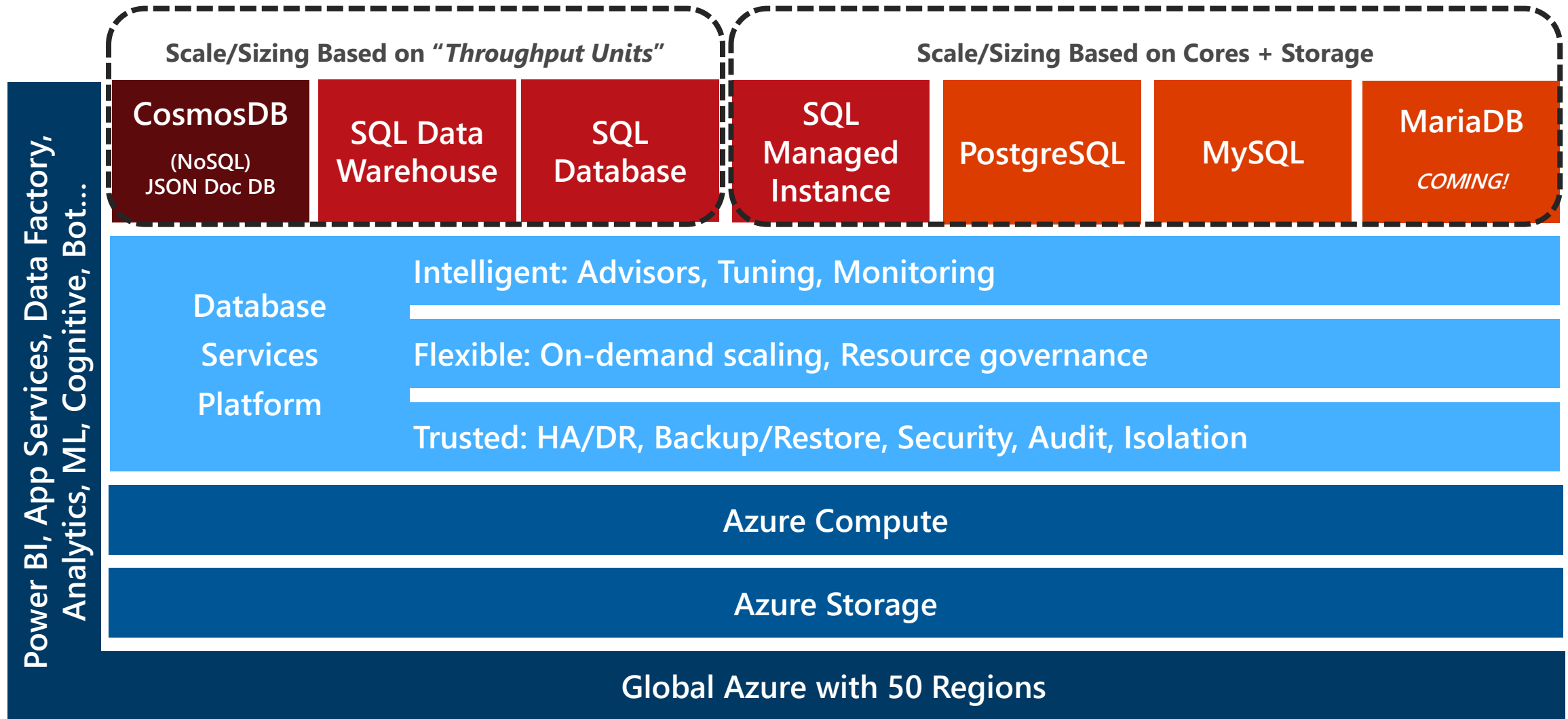
elastic scale

schema-free data model

Internet accessible http/rest

arbitrary data formats

Azure Relational Database Platform (PaaS)



<https://docs.microsoft.com/en-us/azure/architecture/guide/technology-choices/data-store-overview>

<https://docs.microsoft.com/en-us/azure/architecture/data-guide/technology-choices/analytical-data-stores>

DEMO

What does this look like in the Azure Portal?
And what about deploying something?



Introduction

Azure CosmosDB

Introducing Azure Cosmos DB

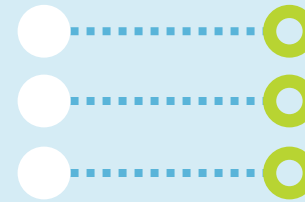
A globally distributed, massively scalable, multi-model database service

<https://docs.microsoft.com/en-us/azure/cosmos-db/introduction>

Global distribution

Multi-model + multi API

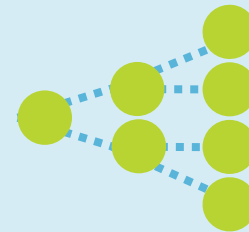
Use key-value, graph, and document with a schema-agnostic service that doesn't require any schema or secondary indexes



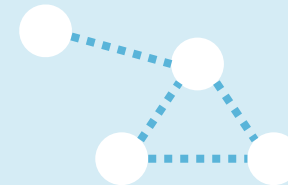
KEY-VALUE
(Azure Table)



COLUMN-FAMILY
(Cassandra)



DOCUMENT
(MongoDB)
(Azure CosmosDB)



GRAPH
(Gremlin)

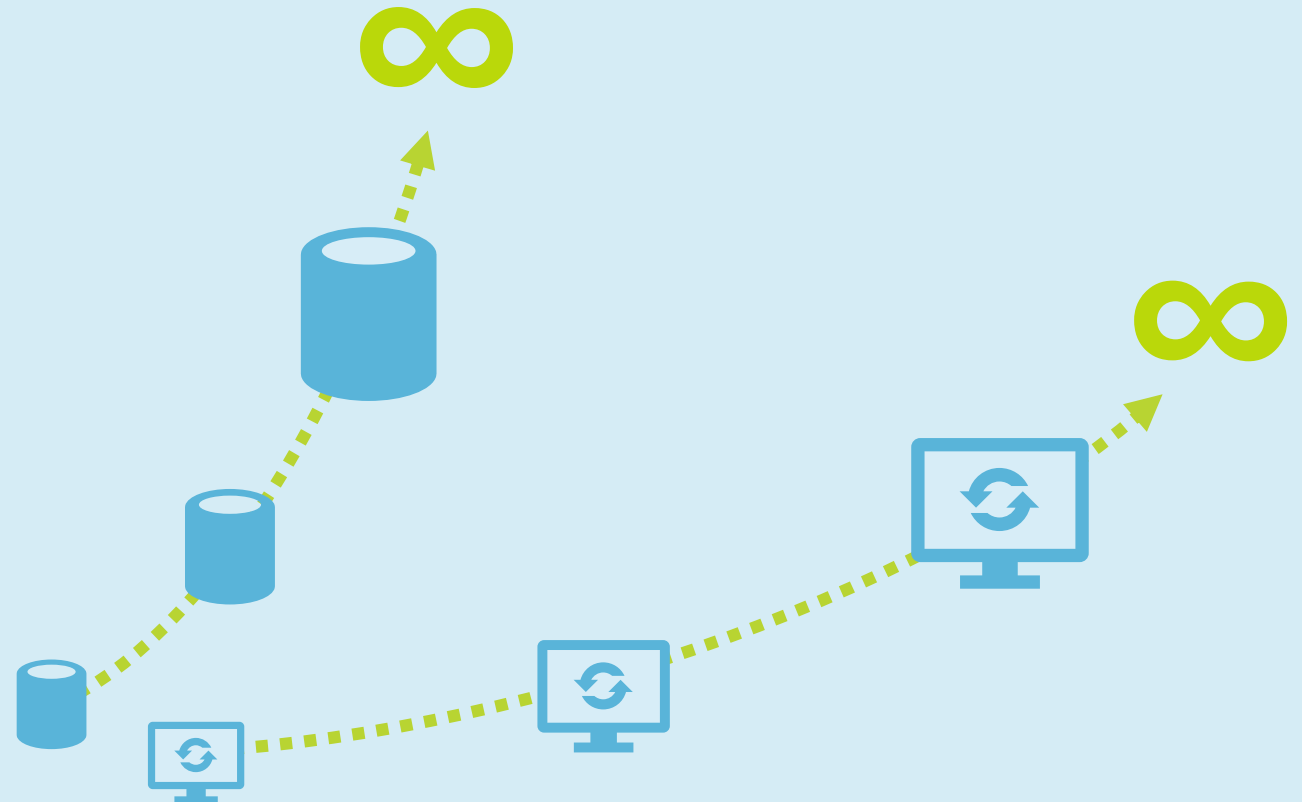
Introducing Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

<https://docs.microsoft.com/en-us/azure/cosmos-db/request-units>

- Global distribution
- Multi-model + multi API
- Elastic scale-out

Independently and elastically scale storage and throughput across regions



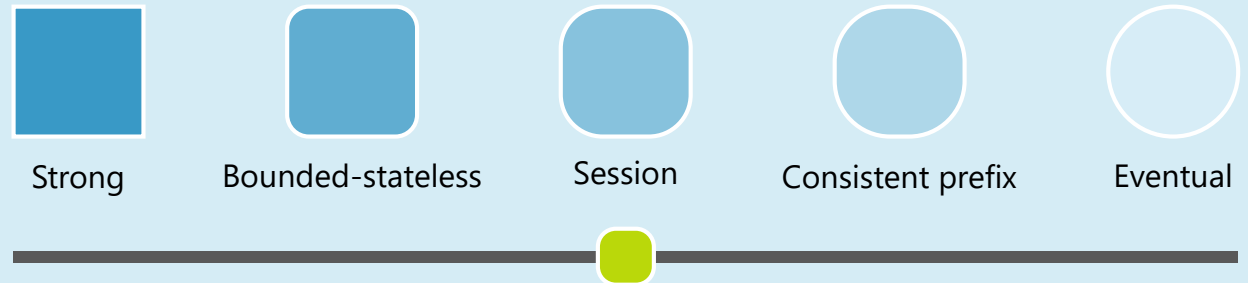
Introducing Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

<https://docs.microsoft.com/en-us/azure/cosmos-db/consistency-levels>

- Global distribution
- Multi-model + multi API
- Elastic scale-out
- **Choice of consistency**

Choose from five defined consistency levels for low latency and high availability



Introducing Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

<https://docs.microsoft.com/en-us/azure/cosmos-db/distribute-data-globally#LatencyGuarantees>

Global distribution

Multi-model + multi API

Elastic scale-out

Choice of consistency

Guaranteed single-digit latency

Serve <10 ms read and <15 ms write requests at the 99th percentile from the nearest region while delivering data globally



Guaranteed global
millisecond latency
at the 99th percentile

Introducing Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

<https://docs.microsoft.com/en-us/azure/cosmos-db/distribute-data-globally#AvailabilityGuarantees>

Global distribution

Multi-model + multi API

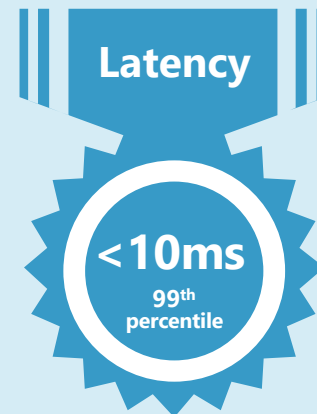
Elastic scale-out

Choice of consistency

Guaranteed single-digit latency

Enterprise-level SLAs

Only service with financially-backed SLAs for millisecond latency at the 99th percentile, 99.99% HA and guaranteed throughput and consistency



DEMO

Lets run some CosmosDB Queries!

```
SELECT * FROM CustomerOrders c WHERE c.id = "11000"
```

```
SELECT * FROM CustomerOrders c WHERE c.Name.Last="Yang" ORDER BY c.Name.First
```

```
SELECT TOP 10 c.id, o.OrderID, o.Amount FROM CustomerOrders AS c JOIN o IN c.Orders
```

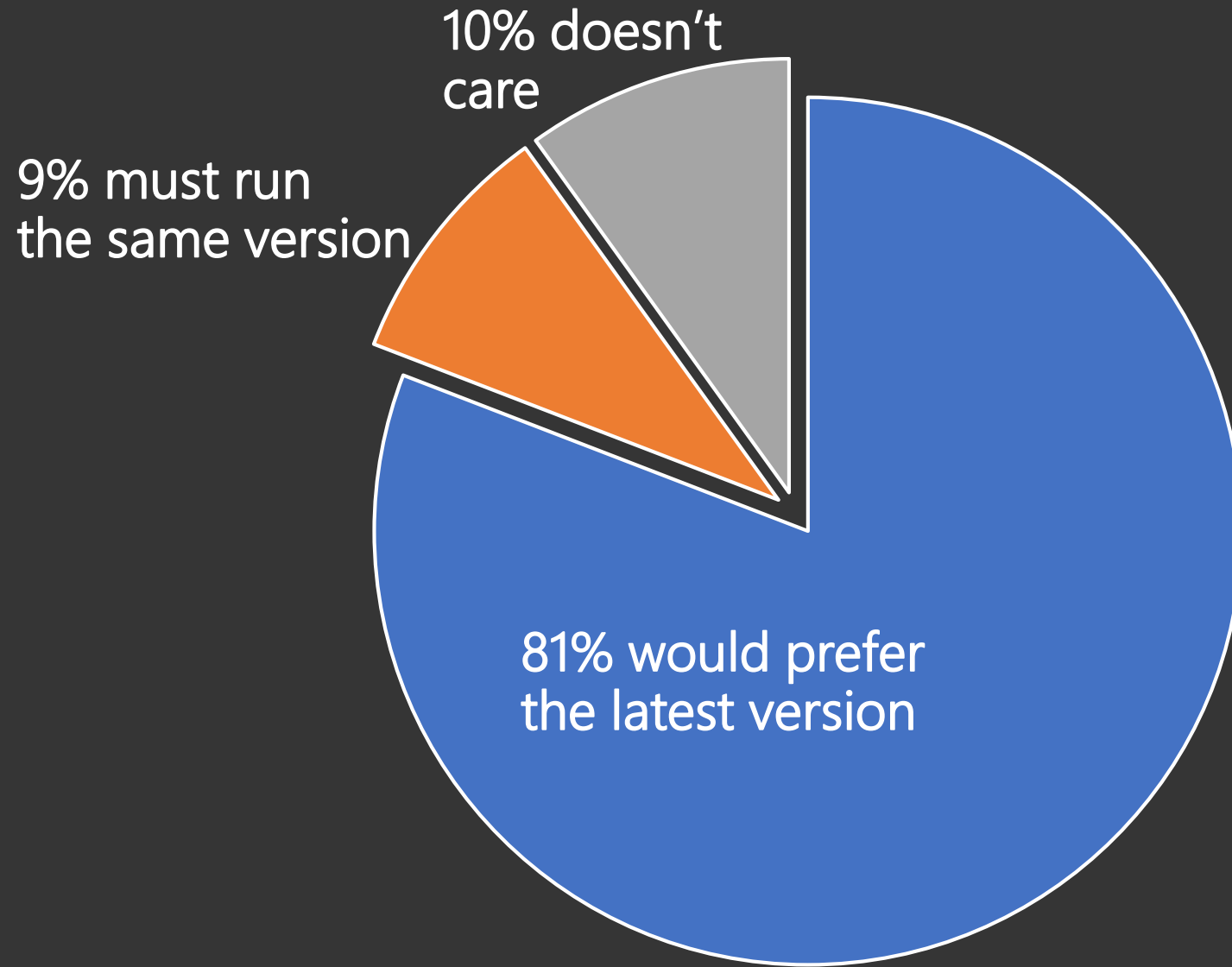
```
SELECT c.id, o.OrderID, o.Amount, o.OrderDate, od.OrderQty FROM CustomerOrders AS c  
JOIN o IN c.Orders JOIN od IN o.OrderDetail WHERE od.OrderQty between 20 and 25
```

```
SELECT c.OrderID, c.OrderNumber, c.Amount, od.OrderQty FROM CustomerOrders.Orders[0] AS c  
JOIN od IN c.OrderDetail WHERE od.OrderQty > 20 AND c.Amount > 5000 ORDER BY c.OrderID
```



Deep Dive Azure SQL Database

What about SQL Versions?



Azure SQL Database

Fully managed database-as-a-service that lets you focus on your business

No More Versions! Compatible with SQL Server 2014, 2016, 2017

Database provisioning on-demand up to 4TB in size

On-line Scalability and elastic performance for all workloads

99.99% availability, zero maintenance

Intelligent: learns and adapts to optimize performance

Secure and compliant to protect sensitive data

Auto backup, long term backup retention, point in time restore

Geo-replication to up to 4 regions with auto-failover (groups)

Geo-restore-from-backup for data protection

Azure
SQL Database



Azure SQL Database Service Tiers

	Basic	Standard	Premium	...
Intended Use	Light transactional workloads	Go-to option for most business applications	Highest throughput and most-responsive applications	
Performance	●	● ● ●	● ● ● ● ●	
Storage	2 GB	250 GB	500 GB – 4 TB	
Availability	99.99%			
Security	SQL/AAD auth, masking/RLS, auditing & threat detection, encryption, vulnerability assessment			
Business Continuity	Restore from automatic backups, geo-replication			
Management	Portal, PowerShell, plus REST and client APIs			

Predictable performance for single databases

Single databases are allocated isolated resources

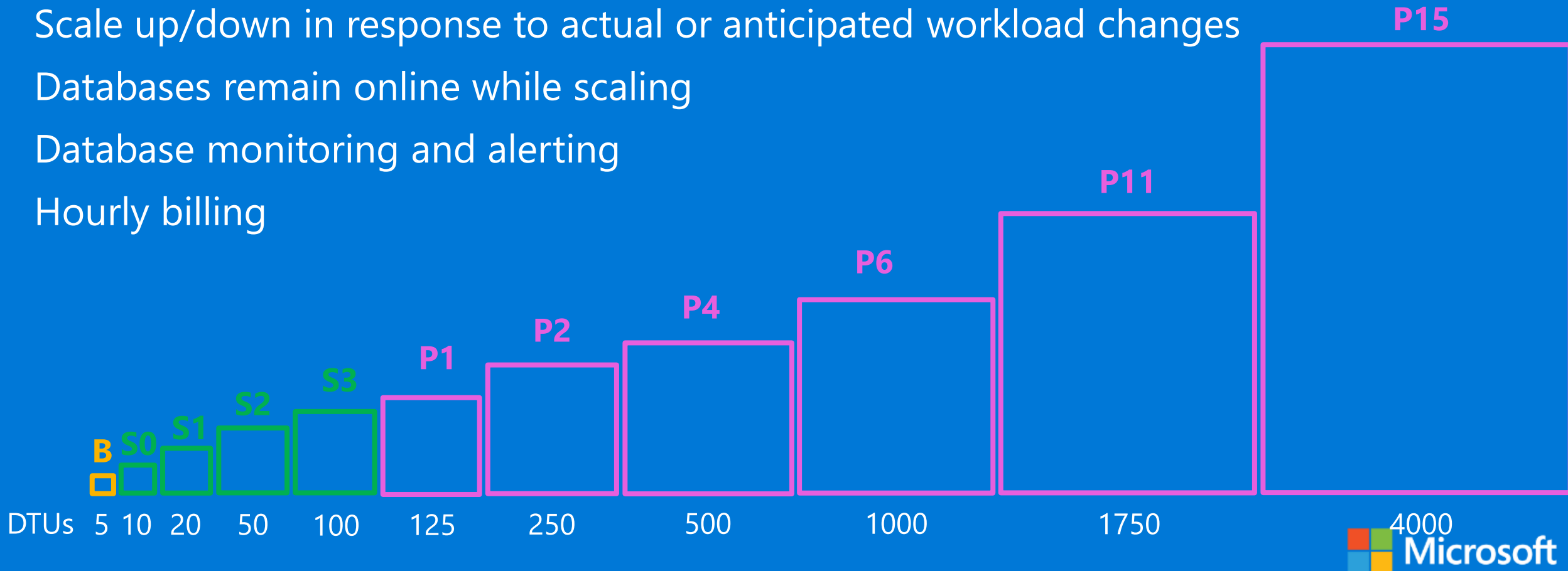
Basic, Standard, and Premium tiers provide increasing performance levels (DTUs)

Scale up/down in response to actual or anticipated workload changes

Databases remain online while scaling

Database monitoring and alerting

Hourly billing



Elastic performance for unpredictable workloads

Elastic pools provide shared resources for a group of databases on a server

Self-managed over-provisioning for unpredictable workloads
(e.g. SaaS database-per-tenant)

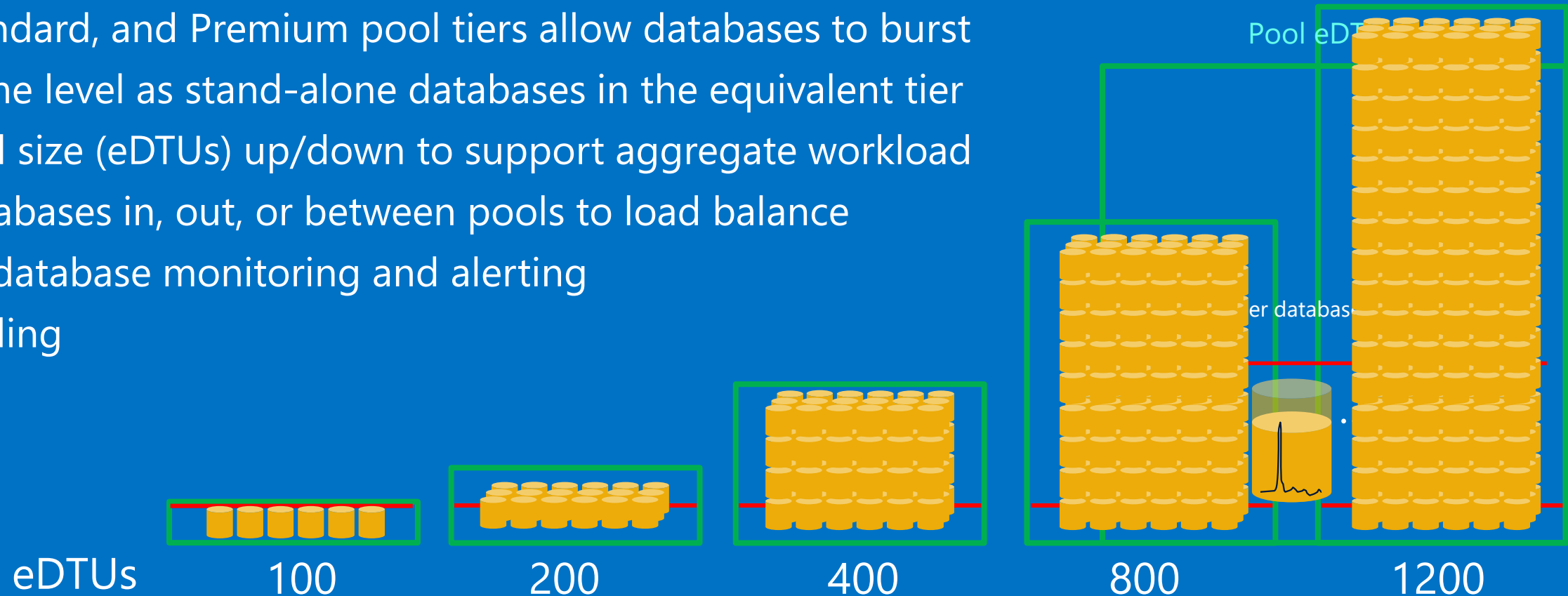
Basic, Standard, and Premium pool tiers allow databases to burst
to the same level as stand-alone databases in the equivalent tier

Scale pool size (eDTUs) up/down to support aggregate workload

Move databases in, out, or between pools to load balance

Pool and database monitoring and alerting

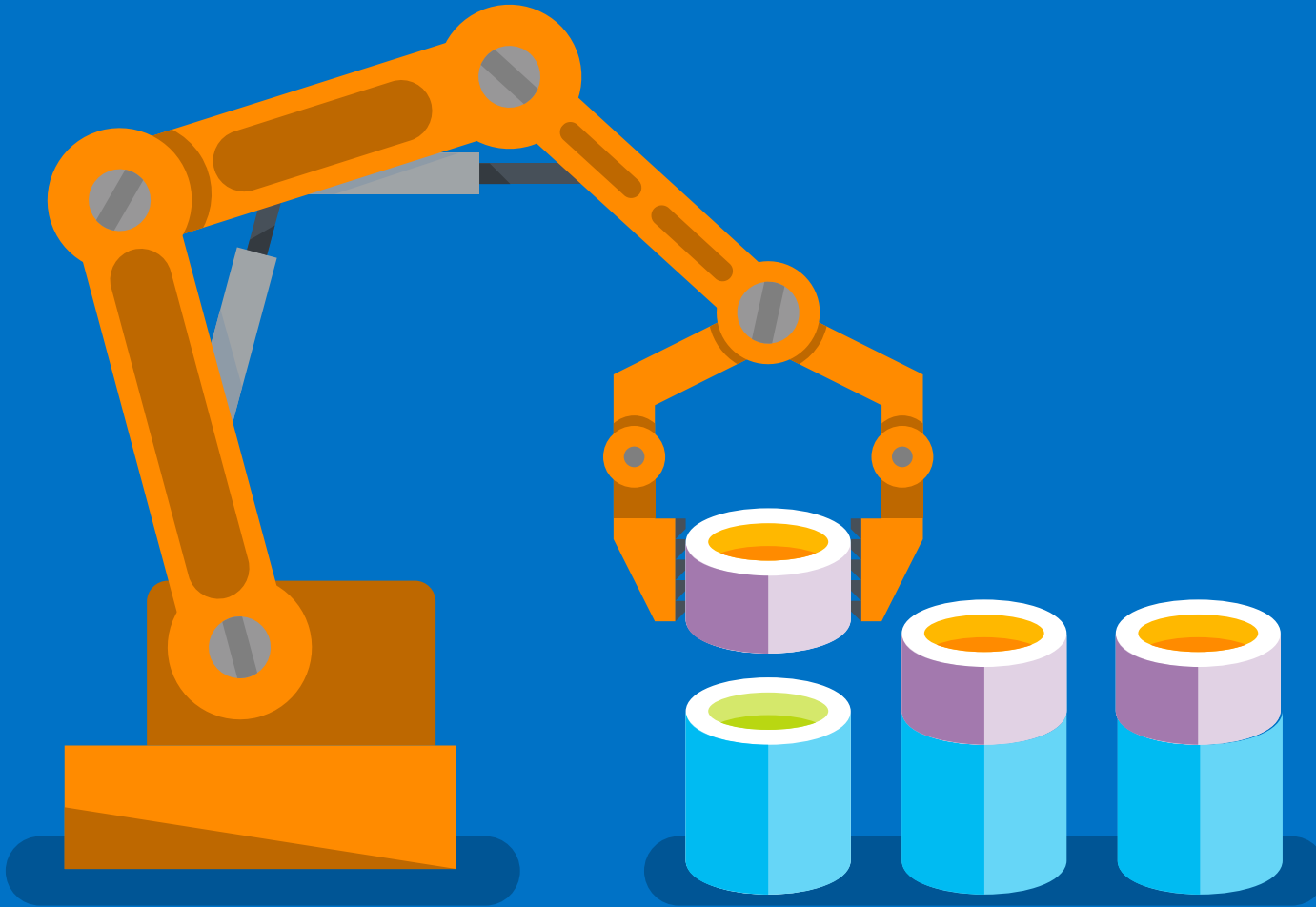
Hourly billing



AUTOMATIC TUNING

Continuously optimized by the platform

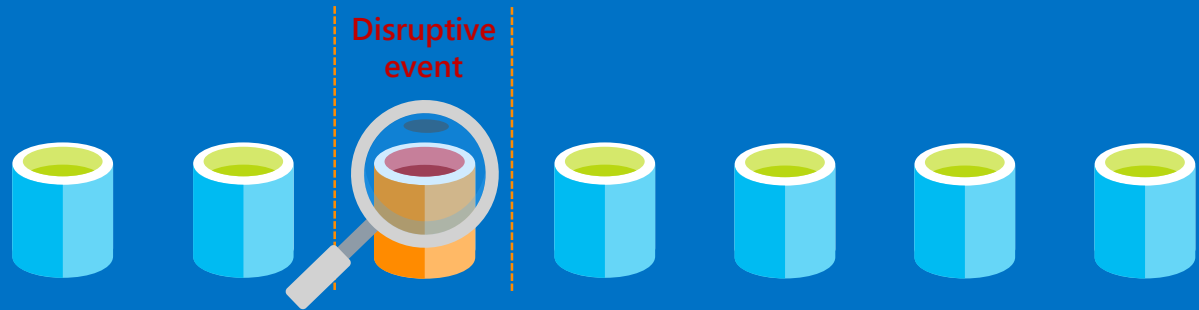
<https://docs.microsoft.com/en-us/sql/relational-databases/automatic-tuning/automatic-tuning?view=sql-server-2017>



- One-click to enable
- Prevent and mitigate performance issues
- No app changes needed
- **Tuning actions**
 - Create missing indexes
 - Drop unused/duplicate indexes
 - Force last good plan

INTELLIGENT INSIGHTS

Understand your database performance



Queries:	0X9003HA4J	OK
	0X9002FGJR	Regressed query
	0X901119GI	OK
	0X900044RJ	OK

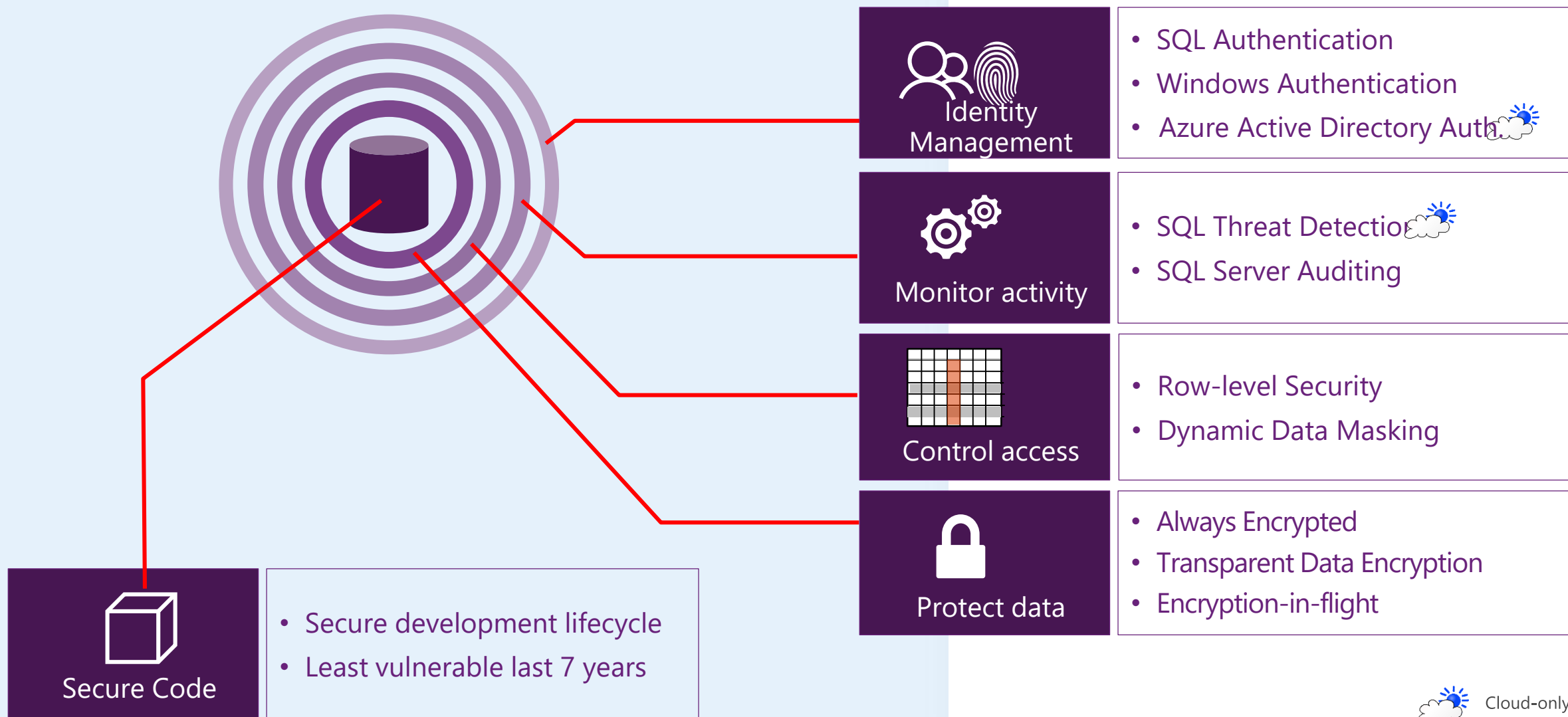


Root-cause: Hitting resource limits caused by new ad-hoc query 0X9001RTYU. Impacted query 0X9002FGJR started timing out. Consider stopping the ad-hoc query or increasing your pricing tier.

- Continuous monitoring
- Disruptive event detection
- Root cause analysis
- Available as diagnostic log
 - Azure SQL Analytics solution
 - Stream to Event Hub
 - Archive to Storage

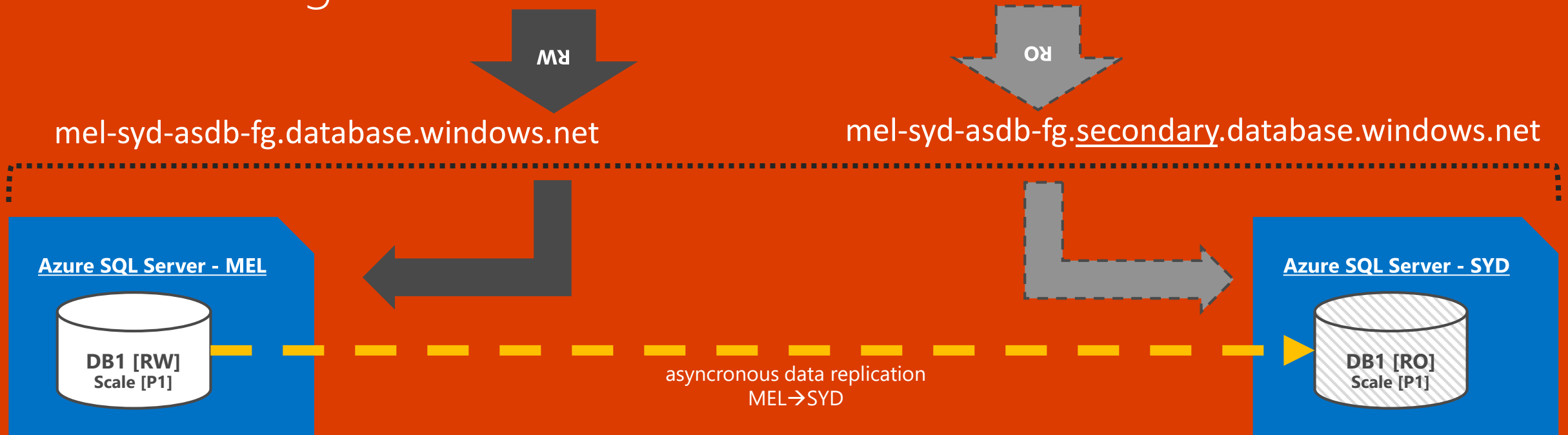
MOST SECURE DATABASE

Surrounded by layers of protection



DEMO

Check some SQL DB options, and settings
Monitor some performance metrics and alerts
Check Vulnerability Assessment, Data Classification, Masking
Lets deploy a new database into our failover group!
And lets do a geo-failover!

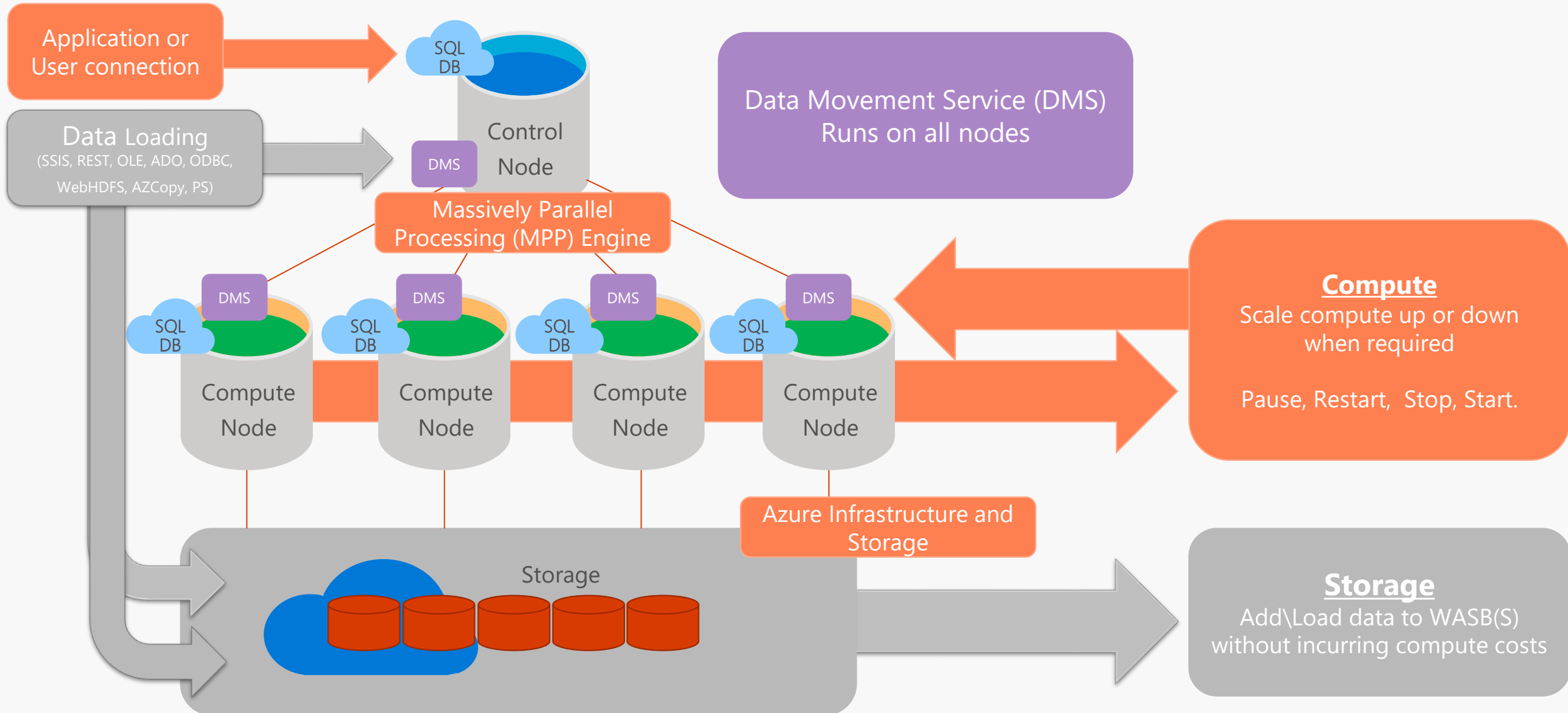


Introduction



Azure SQL Data Warehouse

Azure SQL Data Warehouse Architecture

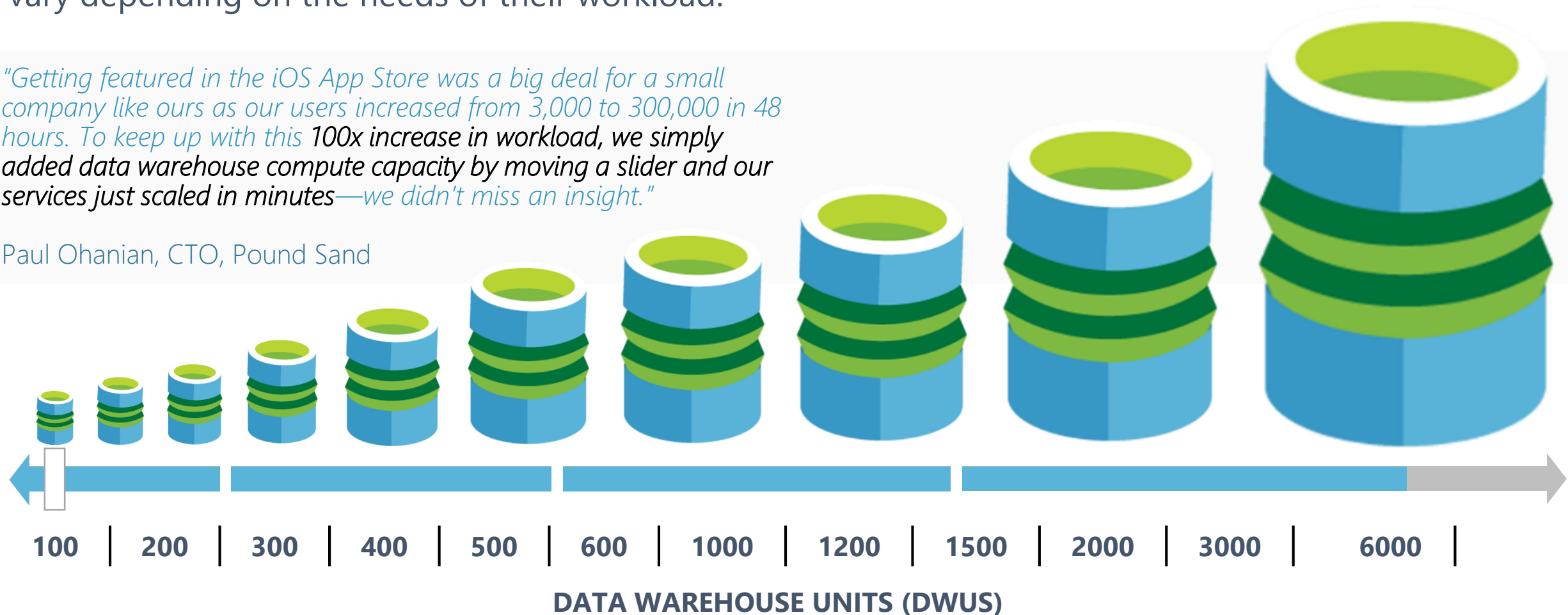


Scale compute on the fly when you need it

Data Warehouse Units (DWUs) are a measure of reserved compute performance or 'power.' A customer's DWU needs can vary depending on the needs of their workload.

"Getting featured in the iOS App Store was a big deal for a small company like ours as our users increased from 3,000 to 300,000 in 48 hours. To keep up with this 100x increase in workload, we simply added data warehouse compute capacity by moving a slider and our services just scaled in minutes—we didn't miss an insight."

Paul Ohanian, CTO, Pound Sand



Data Warehouse Units (DWU)

DWU

DW100

DW200

DW300

DW400

DW500

DW600

DW1000

DW1200

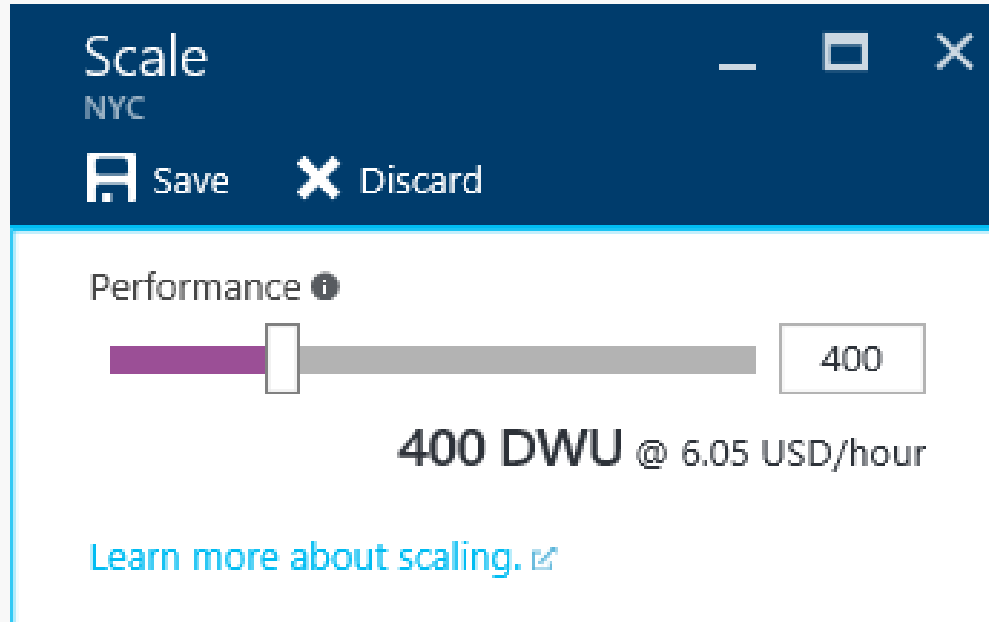
DW1500

DW2000

DW3000

DW6000

```
ALTER DATABASE ContosoDW MODIFY  
(service_objective = 'DW1000');
```



CPU

RAM

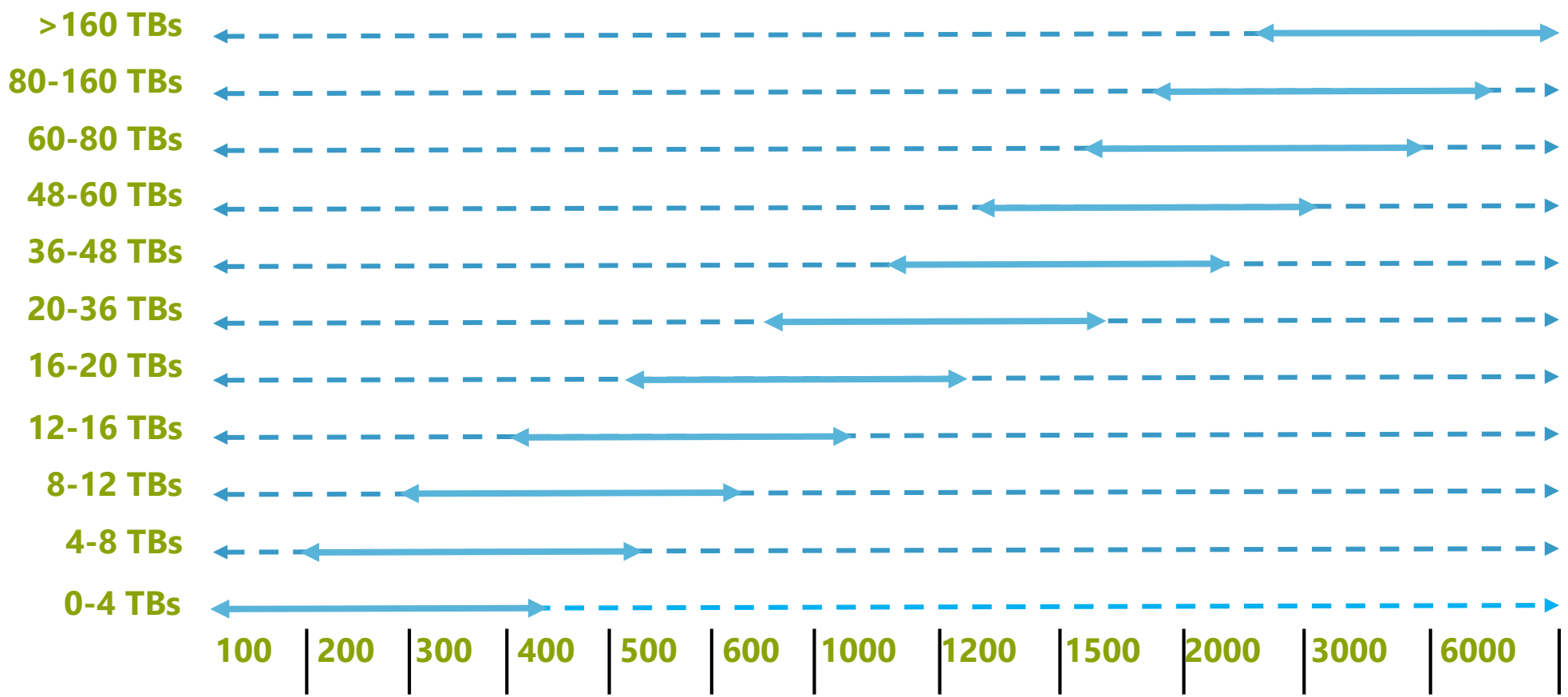
I/O

Compute Sizing "Rule of Thumb"

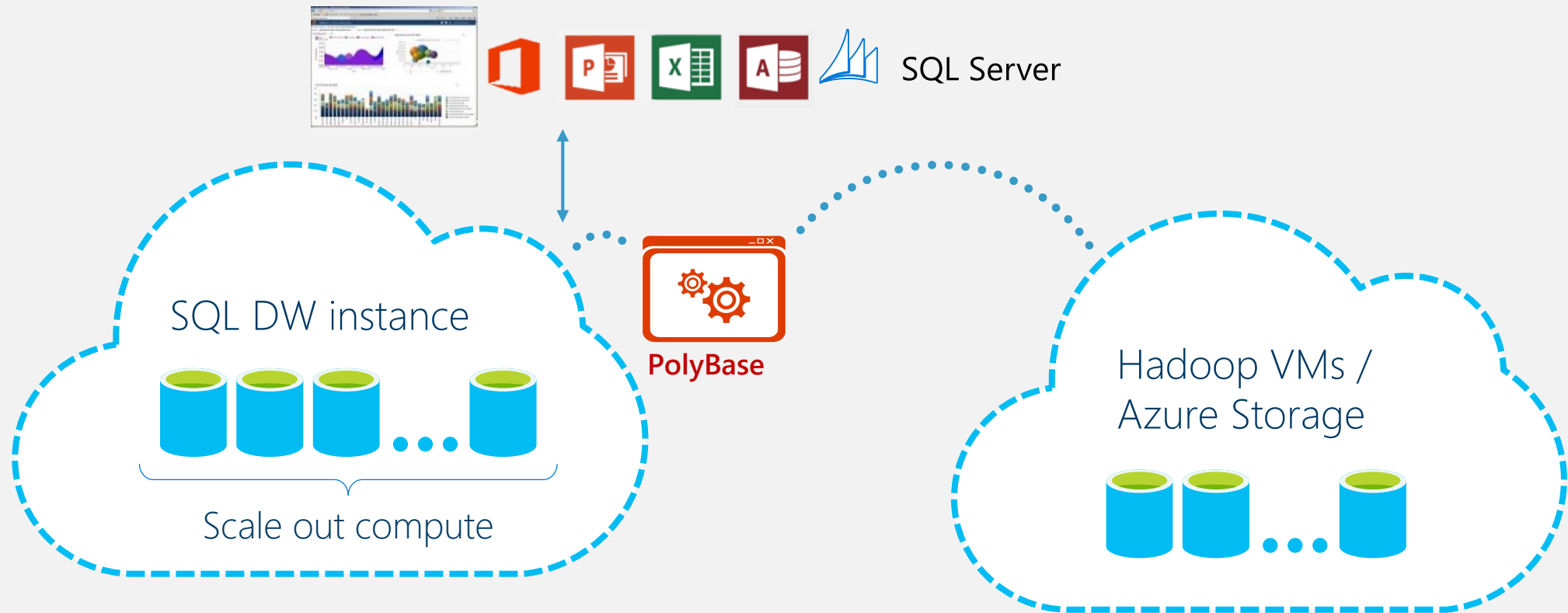
Sizing by capacity

Recommended starting point 

Flexibility to select any range of DWUs 



Query unstructured data via PolyBase/T-SQL



Any data, any size, anywhere

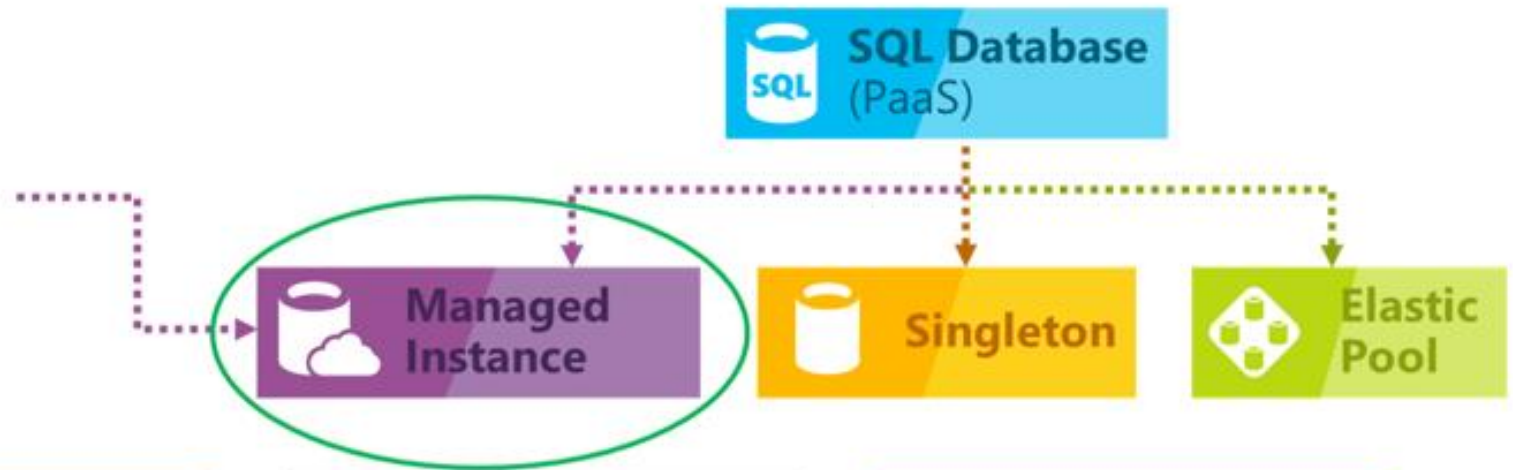


Introduction

Azure SQL Managed Instance

What is SQL Database Managed Instance?

New deployment option that enables frictionless migration for SQL apps and modernization in a fully managed service



Easy lift and shift

- Fully-fledged SQL instance with nearly 100% compat with on-prem

Fully managed PaaS

- Built on the same PaaS service infrastructure
- All PaaS features

Full isolation and security

- Native VNET implementation
- Private IP addresses

New business model

- Competitive
- Transparent
- Frictionless

Easy migration: nearly 100% like SQL Server

Data migration

- Native backup/restore
- Configurable DB file layout
- DMS (migrations at scale)

Security

- Integrated Auth (Azure AD)
- Encryption (TDE, AE)
- SQL Audit
- Row-Level Security
- Dynamic Data Masking

Programmability

- Global temp tables
- Cross-database queries and transactions
- Linked servers
- CLR modules

Operational

- DMVs & XEvents
- Query Store
- External SMTP

Scenario enablers

- Service Broker
- Change Data Capture
- Transactional Replication

Note: Features will be added in stages until General Availability of Managed Instance.

<https://docs.microsoft.com/en-us/azure/sql-database/sql-database-features>

<https://docs.microsoft.com/en-us/azure/sql-database/sql-database-managed-instance>

Overview

Azure PaaS Database Pricing



DEMO

What about Comparing some Azure PaaS Services Pricing?

<https://azure.microsoft.com/en-us/pricing/calculator/>

Wrap up + Summary

Getting Started in Azure



Get Azure...?

- **Your Enterprise Agreement (EA)**
 - Various options – Currently being setup and configured for MLC
 - Would be linked to your corporate identity/login/account
- **Azure 30 day free account up to \$260 (time boxed to 30 days)**
 - <https://azure.microsoft.com/en-au/free/>
 - Would be linked to your personal identity/login/account
- **MSDN**
 - There are free monthly Azure credits within MSDN subscriptions. Rolls over month to month
 - <https://azure.microsoft.com/en-us/pricing/member-offers/msdn-benefits-details/>
 - Would be linked to your corporate identity/login/account
- **Research Programs and Grants**
 - Free credits available for specific research programs = <https://www.microsoft.com/en-us/research/academic-program/microsoft-azure-for-research/>
 - You can apply for a Microsoft Azure for Research Grant = <http://research.microsoft.com/en-us/projects/azure/default.aspx>

Learn Azure...? Free Online-Training

edX – Free online courses on Microsoft Azure

45+ Free Azure Courses = https://www.edx.org/course?search_query=azure

- Introduction to Azure - <https://www.edx.org/course/introduction-microsoft-azure-microsoft-azure201x>
- Architecting Azure Solutions - <https://www.edx.org/course/architecting-microsoft-azure-solutions-microsoft-dev205bx-3>
- Developing Azure Solutions - <https://www.edx.org/course/developing-microsoft-azure-solutions-microsoft-dev233-1>
- Developing Apps and Bots - <https://www.edx.org/course/developing-intelligent-apps-bots-microsoft-dat211x-1>
- Deliver a DW in the Cloud - <https://www.edx.org/course/delivering-data-warehouse-cloud-microsoft-dat220x-0>
- Delivery Big Data Solutions with Machine Learning - <https://www.edx.org/course/developing-big-data-solutions-azure-microsoft-dat228x>
- Provision SQL Databases in Azure - <https://www.edx.org/course/provisioning-databases-azure-sql-server-microsoft-dat219x-0>

Learn Azure...? Patterns, Blogs and Feedback

Need Azure Patterns and Guidance? Check out the Azure Architecture Centre - !

- <https://docs.microsoft.com/en-au/azure/architecture/>
 - Reference Architectures - <https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/>
 - Application Architectures - <https://docs.microsoft.com/en-us/azure/architecture/guide/>
 - Azure Design Patterns - <https://docs.microsoft.com/en-au/azure/architecture/patterns/>
 - Azure Service Roadmap - <https://azure.microsoft.com/en-us/roadmap/>
 - Data Architecture Guide - <https://docs.microsoft.com/en-us/azure/architecture/data-guide/>

Need Some Azure Updates? Subscribe to the Global Azure Blog & Update Feed - !

- Blog - <https://azure.microsoft.com/en-us/blog/>
- Updates - <https://azure.microsoft.com/en-us/updates/>

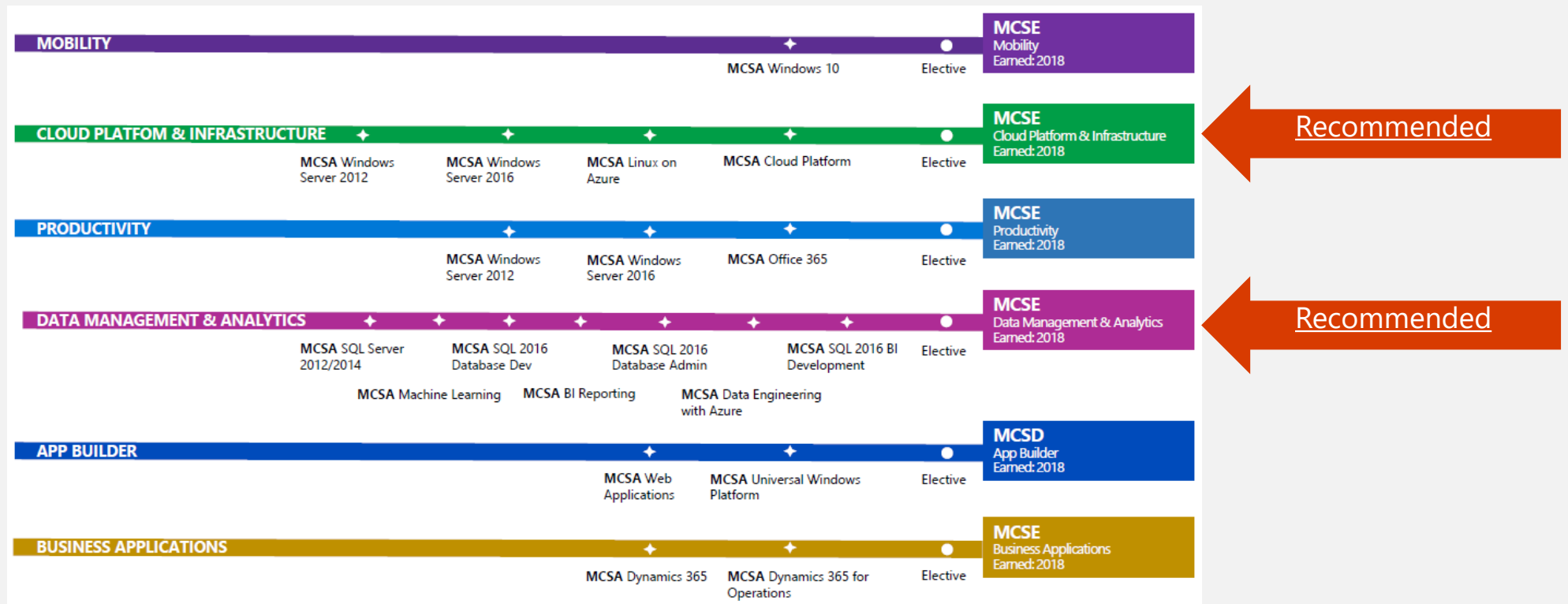
You Have a Cool New Azure Idea? Submit it to Azure Ideas & Feedback - !

- <https://feedback.azure.com/forums/34192--general-feedback>

Certify in Azure...?

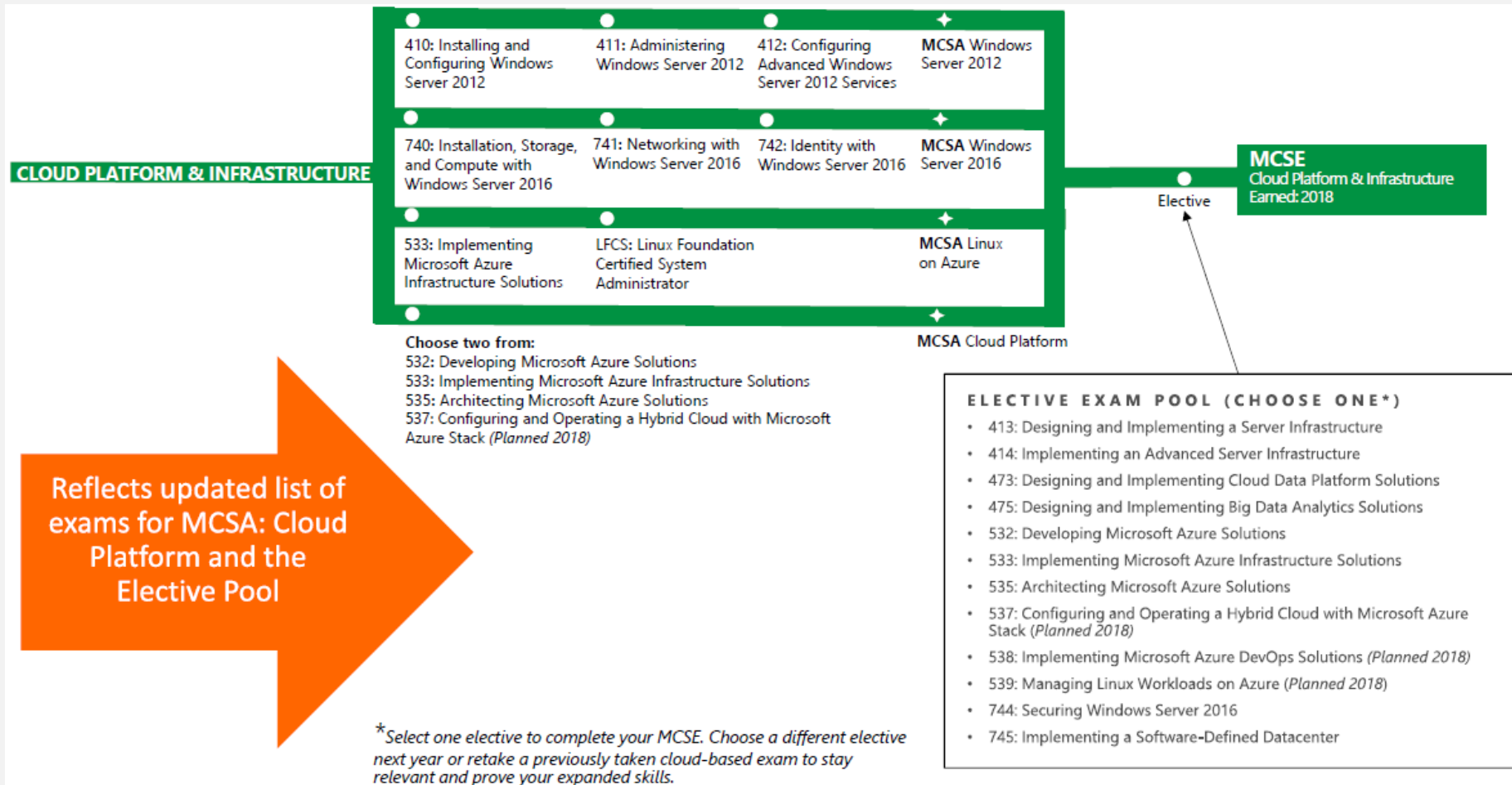
Azure Certifications

- Overview - <https://www.microsoft.com/en-au/learning/certification-overview.aspx>
- Detailed Guide - https://download.microsoft.com/download/2/B/F/2BFA3E78-546B-4C71-9EC3-2CB7751444BF/MCP_Cert_Paths_01_01_18.pdf



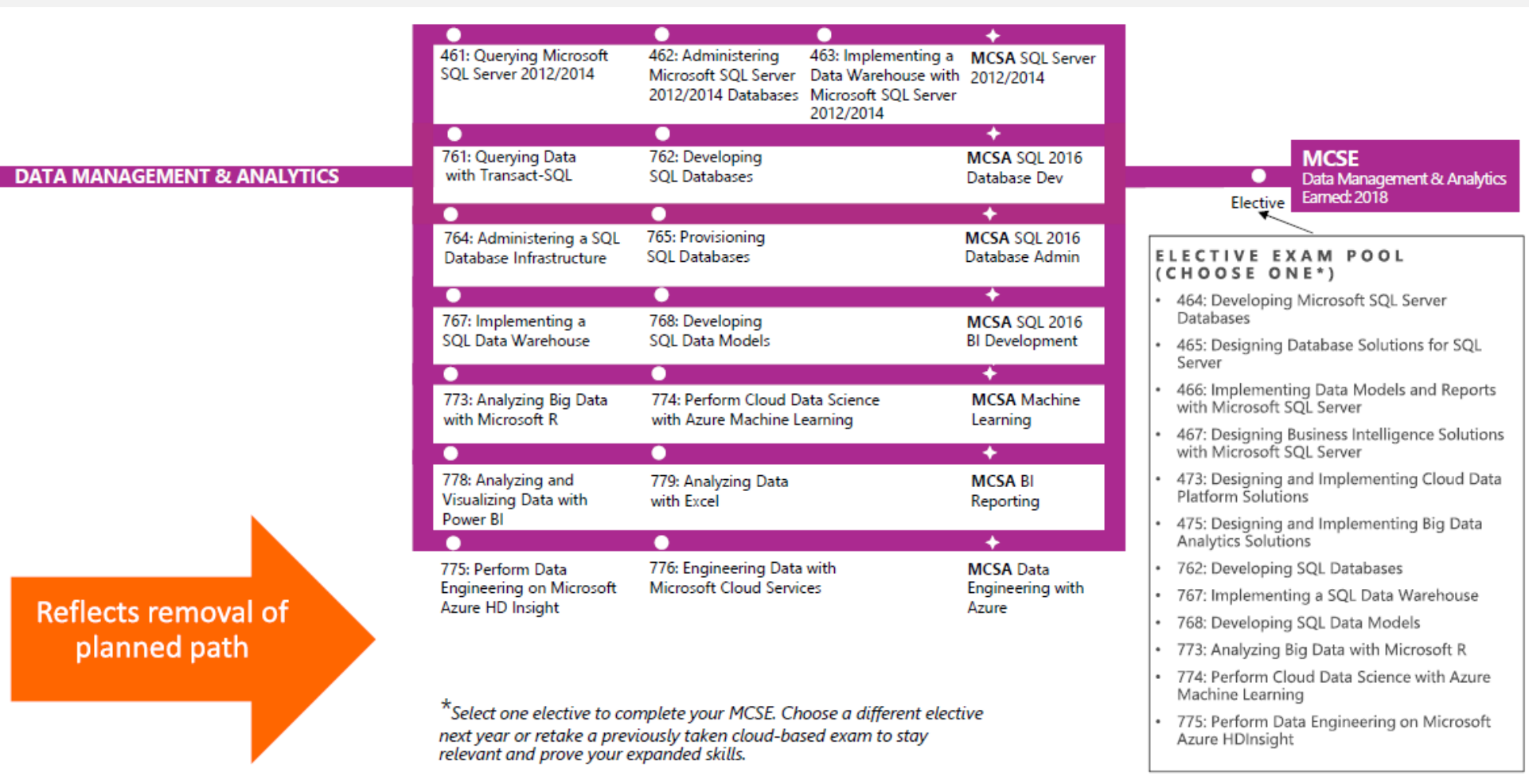
Certify in Azure...?

MCSE Cloud Platform & Infrastructure



Certify in Azure...?

MCSE Data Management & Analytics





Appendix