Azure SQL Database Basics

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@sysframeworks

www.itprocamp.com - 4/16/2016

Mobile-First, Cloud-First-DC  www.meetup.com/MFCF-DC

www.novasql.com
Key Take-Aways

- Know the general features of cloud computing
- Know the general features of the Azure SQL Database

Agenda

- Cloud Primer
- Azure SQL Database Basics
- Resources
Cloud Primer

Spot Quiz:

• What Document Provides Key Recommendations for Defining Cloud Computing?
• Answer: NIST Special Publication 800-145, The NIST Definition of Cloud Computing
Cloud Primer

What Is In The NIST SP 800-145, Definition of Cloud Computing?

Essential Characteristics:
• On-demand self-service.
• Broad network access.
• Resource pooling.
• Rapid elasticity.
• Measured service.

Cloud Primer

What Is In The NIST SP 800-145, Definition of Cloud Computing?

Service Models:
• Software as a Service (SaaS)
• Platform as a Service (PaaS)
• Infrastructure as a Service (IaaS)
• Database as a Service (DbaaS)
Cloud Primer

What Is In The NIST SP 800-145, Definition of Cloud Computing?

Deployment Models:
• Private Cloud
• Community Cloud
• Public Cloud
• Hybrid Cloud
Cloud Trends

• By 2015, 50% of all new application independent software vendors will be pure SaaS providers.

• Through 2015, more than 90% of private cloud computing deployments will be for infrastructure as a service.

• By 2015, 50% of large global enterprises will rely on external cloud computing services for at least one of their top 10 revenue-generating processes.

• By 2016, all large global enterprises will use some level of public cloud services.

• Through 2020, the most common use of cloud services will be a hybrid model combining on-premises and external cloud services.

Gartner: Cloud Computing Innovation Key Initiative Overview, 2014

Cloud Providers

• **Amazon** - Offerings include Amazon Web Services (AWS).
• **Google** - Offerings include the Google Cloud Platform.
• **IBM** - Offerings include enabling technologies to build private clouds and services for public cloud applications, platforms and infrastructure.
• **Microsoft** - Offerings include Microsoft Azure for public cloud, and Windows Server and Systems Center for private cloud.
• **salesforce.com** - Offerings include sales, marketing and customer service application services and platform services.
• **VMware** - Offerings include vCloud Hybrid Service for public cloud and the vCloud Suite for private cloud.

Gartner: Cloud Computing Innovation Key Initiative Overview, 2014
What Is Microsoft Azure?

- [http://azure.microsoft.com](http://azure.microsoft.com)
- Microsoft’s Cloud Platform
- Compute
- Storage
- Data
- Networking
- Applications
- IaaS + PaaS, Significant SaaS Support
- Hybrid Support
- 24x7, 99.9 Uptime, Across Regional/Global Data Centers
Microsoft

Azure SQL Database Basics
Azure SQL Database Basics

- Managed Relational Database as a Service
- Hosted in Azure, Run on Azure Storage
- Redundant, Highly Available, Scalable
- Parity with SQL Server
- Supports Hybrid Operations
- Great for PaaS/SaaS Application Support
- Connect with common toolset, Excel, etc.
- Compliant - Azure Trust Center

Azure SQL Database Basics

<table>
<thead>
<tr>
<th>On-Premise</th>
<th>Private Cloud</th>
<th>Public Cloud</th>
<th>Public Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of Focus: SQL Server</td>
<td>Unit of Focus: SQL Server</td>
<td>Unit of Focus: SQL Server</td>
<td>Unit of Focus: Database</td>
</tr>
</tbody>
</table>

Owning Organization has Administrative / Operational Responsibility

Backups/Redundancy / Storage Managed by Azure.
Microsoft Azure Data Management — Overview

Options for Relational Data Services in the Cloud

**NON-RELATIONAL**

- **Blob Storage**
  - A cloud storage service offering the simplest way to store large amounts of unstructured text or binary data, such as video, audio and images, and for creating virtual hard drives in the cloud.
  - Best for inexpensive, scalable storage of data

- **Tables**
  - A NoSQL key/value store that provides simple access to semi-structured data at a lower cost for applications that do not need robust querying capabilities.
  - Best for inexpensive, scalable storage of semi-structured data

- **HDInsight**
  - A Big Data implementation 100% compatible with Apache Hadoop.
  - Best for Big Data Analytics across semi-structured and unstructured data

**RELATIONAL**

- **SQL Server in a VM**
  - A full-featured instance of SQL Server running in a Windows Azure Virtual Machine for quickly and easily running or testing SQL Server applications in the cloud.
  - Best for existing and new applications needing full SQL Server feature set

- **SQL Database**
  - A feature-rich, fully managed relational database service that offers a highly productive experience with business-ready capabilities built on SQL Server technology.
  - Best for new cloud applications needing relational capabilities and high availability

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**INFRASTRUCTURE AS A SERVICE (IaaS)**

- **SQL Server in a Windows Azure Virtual Machine**
  - Full Control & Flexibility
  - Highly Customized Environment
  - Eliminate Hardware Costs
  - Decrease Time to Market

**PLATFORM AS A SERVICE (PaaS)**

- **Windows Azure SQL Database**
  - Simplified Administration
  - Fully Managed Service
  - Eliminate Hardware & Administrative Costs
  - Build Modern Apps
Options for Relational Data Services in the Cloud

**INFRASTRUCTURE AS A SERVICE (IaaS)**
- SQL Server in a Windows Azure Virtual Machine

**PLATFORM AS A SERVICE (PaaS)**
- Windows Azure SQL Database

### Full Control & Flexibility
- Move Existing Apps
- Development & Test
- Hybrid HA & Disaster Recovery

### Simplified Administration
- Cloud-designed Business Apps
- Websites & Mobile Apps
- Extend On-Premises Apps

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Azure SQL Database Basics - Adaptability

### Business-class
- Built-in HA secondaries and 99.9% SLA on the database
- Reserved capacity for powerful & predictable performance
- Dynamic scale out of 1,000s of DBs
- Fully managed service (no patching of DB or OS)

### SQL Server Technology
- Extends familiar SQL Server technology
- Relational database engine for transactional integrity
- Consistent DB objects; tables, views, stored procedures
- Database app portability to and from on-premises

### IT & Dev Productivity
- Integration within SQL Server Management Studio
- PowerShell support to manage at scale
- Visual Studio to build once and deploy anywhere
Azure SQL Database Basics – High Availability

- Automatic HA built-in
- One primary node, two online replicas
- Writes are replicated to online secondaries
- Transactional integrity maintained with replication
- No database downtime even with Azure system patches

Azure SQL Database Basics - Scale Out

Massive Scale
Engage 1000s of nodes within the cluster

Simplified Development and Administration
Robust programming & connectivity model for creating dynamic applications

Simplified Multi-tenant Database Tiers
Multi-tenancy provides great efficiencies by increasing density of tenants per database
Applications don’t have to make a static decision about tenant placement
Azure SQL Database Basics

Azure SQL Database Basics
## Azure SQL Database Basics

**SQL Databases**

<table>
<thead>
<tr>
<th>DATABASES</th>
<th>SERVERS</th>
<th>DELETED DATABASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME</td>
<td>STATUS</td>
<td>REPLICATION</td>
</tr>
<tr>
<td>AuditTest</td>
<td>Online</td>
<td>None</td>
</tr>
<tr>
<td>AuditTest</td>
<td>Online</td>
<td>None</td>
</tr>
<tr>
<td>AuditTest_2015-05...</td>
<td>Online</td>
<td>None</td>
</tr>
</tbody>
</table>

### Azure SQL Database Basics

SQL Database is available in Basic, Standard and Premium editions. Customers can also continue to use our older Web and Business editions. Learn more about how to select a service tier and performance level.

<table>
<thead>
<tr>
<th>BASIC TIER</th>
<th>STANDARD TIER</th>
<th>PREMIUM TIER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uptime SLA</td>
<td>99.99%</td>
<td>99.99%</td>
</tr>
<tr>
<td>Maximum database size</td>
<td>2 GB</td>
<td>250 GB</td>
</tr>
<tr>
<td>Point in time Restore</td>
<td>Any point within 7 days</td>
<td>Any point within 14 days</td>
</tr>
<tr>
<td>Disaster Recovery</td>
<td>Geo-restore, restore to any Azure region</td>
<td>Standard geo-replication, offline secondary</td>
</tr>
<tr>
<td>Database Throughput Units</td>
<td>5</td>
<td>Up to 100</td>
</tr>
<tr>
<td>Performance Objectives</td>
<td>Transaction rate per hour</td>
<td>Transaction rate per minute</td>
</tr>
</tbody>
</table>

Azure SQL Database uses the Database Throughput Unit (DTU) to represent the power of the database as a blended measure of CPU, memory, and read and write rates.
## Azure SQL Database Basics

<table>
<thead>
<tr>
<th>How it works</th>
<th>Locally Redundant Storage (LRS)</th>
<th>Zone Redundant Storage (GRS)</th>
<th>Geographically Redundant Storage (GRS)</th>
<th>Read Access Geographically Redundant Storage (RA-GRS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makes multiple synchronous copies of your data within a single datacenter.</td>
<td>Stores three copies of data across multiple datacenters within or across regions. For block blobs only.</td>
<td>Same as LRS, plus multiple asynchronous copies to a second datacenter hundreds of miles away</td>
<td>Same as GRS, plus read access to the secondary datacenter</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total copies</th>
<th>LRS</th>
<th>GRS</th>
<th>GRS</th>
<th>RA-GRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Why use it</th>
<th>LRS</th>
<th>GRS</th>
<th>GRS</th>
<th>RA-GRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>For economical local storage or data governance compliance.</td>
<td>An economical, higher durability option for block blob storage.</td>
<td>For protection against a major datacenter outage or disaster.</td>
<td>Provides read access to data during an outage, for maximum data availability and durability.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Availability SLA</th>
<th>LRS</th>
<th>GRS</th>
<th>GRS</th>
<th>RA-GRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.9% read/write</td>
<td>99.9% read/write</td>
<td>99.9% read/write</td>
<td>99.9% read/write</td>
<td></td>
</tr>
</tbody>
</table>

## Azure SQL Database Basics

### Page Blobs & Disks

Optimized for random read and write operations, page blobs are ideal for VHD images.

Learn more +

<table>
<thead>
<tr>
<th>STORAGE CAPACITY</th>
<th>LRS</th>
<th>GRS</th>
<th>RA-GRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 1 TB / Month</td>
<td>$0.05 per GB</td>
<td>$0.095 per GB</td>
<td>$0.12 per GB</td>
</tr>
<tr>
<td>Next 49 TB (1 to 50 TB) / Month</td>
<td>$0.05 per GB</td>
<td>$0.08 per GB</td>
<td>$0.10 per GB</td>
</tr>
<tr>
<td>Next 450 TB (50 to 500 TB) / Month</td>
<td>$0.05 per GB</td>
<td>$0.07 per GB</td>
<td>$0.09 per GB</td>
</tr>
<tr>
<td>Next 500 TB (500 to 1,000 TB) / Month</td>
<td>$0.05 per GB</td>
<td>$0.065 per GB</td>
<td>$0.08 per GB</td>
</tr>
<tr>
<td>Next 4,000 TB (1,000 to 5,000 TB) / Month</td>
<td>$0.045 per GB</td>
<td>$0.06 per GB</td>
<td>$0.075 per GB</td>
</tr>
<tr>
<td>Over 5,000 TB / Month</td>
<td>Contact us</td>
<td>Contact us</td>
<td>Contact us</td>
</tr>
</tbody>
</table>
Azure SQL Database Basics

• Parity with SQL Server
  • Common Language Runtime (CLR) assemblies
  • Window functions, with OVER
  • XML indexes and selective XML indexes
  • Change tracking
  • SELECT...INTO
  • Full-text search

Azure SQL Database Basics

• Parity with SQL Server
  • Support for in-memory columnstore indexes.
  • Table partitioning by rows with related enhancements to TRUNCATE TABLE.
  • The availability of dynamic management views (DMVs) and Extended Events(XEvents) to help monitor and tune performance
Azure SQL Database Basics

• Parity with SQL Server
  • Azure SQL Database Index Advisor
  • Azure SQL Database Query Store
  • Elastic Database Pools
  • Share DTUs amongst databases to reduce costs for large numbers of databases.
  • Execute elastic database jobs to manage databases at scale.

Azure SQL Database Basics

• Parity with SQL Server
  • Row-level security (RLS)
  • Dynamic Data Masking
  • Contained databases
  • Application roles managed with GRANT, DENY, REVOKE
  • Transparent Data Encryption (TDE)
Azure SQL Database Basics

- Parity with SQL Server
  - Row-level security (RLS)
  - Dynamic Data Masking
  - Contained databases
  - Application roles managed with GRANT, DENY, REVOKE
  - Transparent Data Encryption (TDE)

Azure SQL Database

- Azure Trust Center
- ISO 27001/27002
- SOC 1/SSAE 16/ISAE 3402 and SOC 2
- Cloud Security Alliance CCM
- FedRAMP
- FISMA
- FBI CJIS (Azure Government)
- PCI DSS Level 1
- HIPAA
- FIPS 140-2
Resources

Microsoft Azure Portal
• http://azure.Microsoft.com

Azure Trust Center:
• http://azure.microsoft.com/en-us/support/trust-center/compliance/

Microsoft Virtual Academy
• Azure SQL Database / Azure Courses
• http://www.microsoftvirtualacademy.com/

Microsoft TechNet Virtual Labs
• https://technet.microsoft.com/en-us/virtuallabs/

NIST Special Publication 800-145, The NIST Definition of Cloud Computing
Summary

- Cloud Primer
- Azure SQL Database Basics
- Resources

Thank You!!