SQL Server in Azure:
Essentials for the Database Administrator

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intersection

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Reminder: Intersect with Speakers and Attendees

- **Tweet tips and tricks that you learn and follow tweets posted by your peers!**
  - Follow: #SQLintersection and/or #DEVintersection
- **Join us – Thursday Evening – for SQLafterDark**
  - Doors open at 7:30 pm
  - Trivia game starts at 8:00 pm

    Winning team receives something fun!
  - Raffle at the end of the night

    Lots of great items to win including a seat in a SQLskills Immersion Event!
  - The first round of drinks is sponsored by SQL Sentry and SQLskills

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SQLskills immerse yourself in sql server & SQL SENTRY

Abstract

With the constant expansion and improvement of Microsoft Azure, there are several data options available - including SQL Server VMs and SQL Database. As a database administrator, what do you need to know to use them effectively? In this session, I'll cover why you want to use SQL Server in Azure, what to know before you choose a service, and how to effectively perform administrative tasks such as backups, restores, and automating tasks.

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Azure basics

Secure cross-premises connectivity

- **Point-to-site VPN**
  - Configured on *each* client
  - Doesn't require a compatible VPN device
  - Doesn't require an internet-facing IPv4 IP address
- **Site-to-site VPN**
  - Configure compatible VPN device with Azure VPN Gateway
  - VPN device must have an Internet-facing IPv4 IP address
- **Express Route**
  - "More reliability, faster speeds, lower latencies and higher security"
  - More money
  - Limited locations and service providers
- **Channel 9: Azure Network Infrastructure** **https://channel9.msdn.com/Blogs/Azure-and-the-Modern-Data-Center/Azure-Network-Infrastructure**

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Networking Inside Azure

- **Virtual Networks (VNets)**
  - VNets are isolated from each other. Want them to talk? Set up a VPN.
    - VNet peering is in preview
  - …but VMs in the same VNet can communicate on private IPs.
- **Can divide into subnets**
- **Can put behind load balancer**
- **Set up a VNet before any VMs or services**
- **MVA: Azure Networking Fundamentals for IT Pros**
  https://mva.microsoft.com/en-US/training-courses/azure-networking-fundamentals-for-it-pros-8917?l=R70kv0B3_6104984382

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What are you paying for?

- Network (VPN Gateways, Public IP Address, Express Route)
- Compute (VMs)
- Licensing (SQL Server)
- Storage (disks)
- Throughput (SQL Database)
- Automation
- Data Out

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Management

- **Portal**
  - Classic Portal (manage.windowsazure.com)
  - Portal (portal.azure.com)
  - You can't manage all features from either one: https://azure.microsoft.com/en-us/features/azure-portal/availability/
- **PowerShell**
  - Learn it and **love** it
  - Download and install https://azure.microsoft.com/en-us/documentation/articles/powershell-install-configure/
  - Cmdlet Reference https://msdn.microsoft.com/en-us/library/azure/dn708514.aspx

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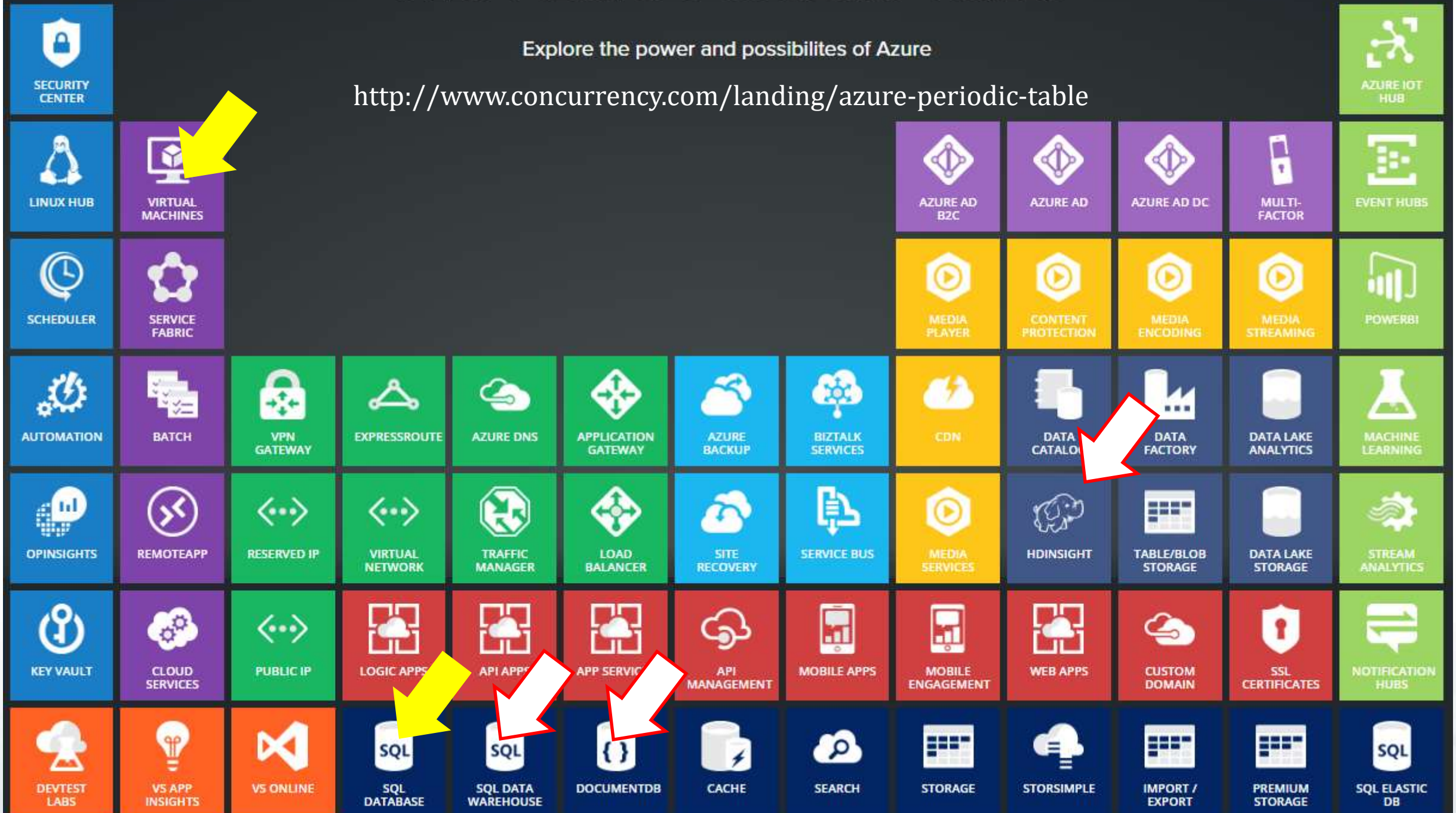
What options are available for SQL in Azure?

The Azure Periodic Table

Explore the power and possibilites of Azure

http://www.concurrency.com/landing/azure-periodic-table



IaaS

- Need to rapidly move existing database into Azure
- Databases larger than 1 TB
- Predictable, steady workloads
- DR for on-premises SQL Server instances

PaaS

- New cloud-designed apps
- Apps that need built-in HA and DR
- Variable workloads and usage patterns
- Scale-out
- SaaS / single-tenant databases

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IaaS

- **SQL Server licensing**
  - Bring your own licensing (BYOL)
    - Use a Windows VM image, install SQL Server with your license key, pay for compute costs
  - Image
    - Use a SQL Server VM image, pay compute & SQL Server costs
    - All features are installed – every last one!
    - SQL Server 2008R2, 2012, 2014, 2016
  - BYOL image
    - Enter your key within 10 days
    - All features are installed
- **No "development" or "test" tier**
  - Can use Express and Developer editions
  - Use Azure Dev Test Labs

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Compute costs

Tier/size	Cores	RAM	Disk Size	Price
Standard A2	2	3.5 GB	135 GB	$0.18/hr
Standard A7	8	56 GB	605 GB	$1.20/hr
Optimized D2	2	7 GB	100 GB	$0.26/hr
Optimized D13	8	56 GB	400 GB	$1.08/hr

SQL Server costs

Tier/size	Web	Standard	Enterprise
Standard A2	$0.032/hr	$0.40/hr	$1.50/hr
Standard A7	$0.064/hr	$0.80/hr	$3.00/hr
Optimized D2	$0.032/hr	$0.40/hr	$1.50/hr
Optimized D13	$0.064/hr	$0.80/hr	$3.00/hr

* Pricing current as of October 10, 2016; East US 2 region

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PaaS

- **SQL Database**
  - Single database
  - Elastic pools
- **Database only – no Analysis Services, Integration Services, or Reporting Services**
  - SQL Data Warehouse (GA as of July 13, 2016)
  - Data Factory
  - Power BI

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Single database

Tier/Size	DTUs	Max storage (per DB)	Price
Basic B	5	2 GB	$5/mo
Standard S1	20	250 GB	$30/mo
Premium P1	125	500 GB	$465/mo
Premium P11	1,750	1 TB	$7,001/mo

Elastic pool

Tier/DTUs	Max DBs (per pool)	Max storage (per pool)	Max eDTUs (per DB)	Price
Basic 100	200	10 GB	5	$149/mo
Standard 100	200	100 GB	100	$223/mo
Standard 1200	400	1.2 TB	100	$2,701/mo
Premium 1500	50	750 GB	1,000	$8,370/mo

* Pricing current as of October 10, 2016; East US 2 region

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IaaS: SQL Server on VM

Configure SQL Server

- **Use your checklist!**
- **Mine includes:**
  - Configure tempdb & model
  - Set MAXDOP & cost threshold for parallelism
  - Configure max & min memory
  - Add startup trace flags
  - Configure Database Mail
  - Set up Alerts for important errors
  - Set up and schedule maintenance

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Maintenance

Yes, you still need to do maintenance!

- **Backups**
  - BYOL
    - Recommend backup to Azure blob storage
  - SQL Server Images does allow you to set auto-backups
    - Uses SQL Server Managed Backup in the background
    - Backs up to Azure blob storage
- **CHECKDB**
- **Indexes/Statistics**

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Tools for maintenance

- Maintenance Plans
- T-SQL scripts
- 3rd party tools

Monitoring

Monitoring

- DMVs, system tables and views
- SQL Server Alerts
- 3rd party tools

HA & DR

Set up HA/DR

- **Azure options like Availability Sets protect the Windows VM and storage**
  - Availability Sets: https://azure.microsoft.com/en-us/documentation/articles/virtual-machines-windows-manage-availability/
- **No HA or DR for your databases!**

HA/DR options

HA	Azure VMs – same region
Availability Groups	Yes
Database Mirroring	Yes
Failover Cluster Instances	Yes – with caveats

DR	Hybrid – On-prem to Azure	Azure VMs – same region	Azure VMs – span regions
Availability Groups	Yes	Yes	Yes
Database Mirroring	Yes	Yes	Yes
Backup/restore	Yes	Yes	Yes
Log shipping	Yes	Yes	Yes

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Availability Groups

- All servers in the AG have to be in the same resource group
- You have to create a WSFC and set a static IP address
- In order to have a listener, you have to create an Internal Load Balancer to create a load-balanced endpoint
- Resource: 3 Keys to Configuring Azure Virtual Machines for Use in SQL Server Availability Groups
  http://www.concurrency.com/blog/w/3-keys-to-configuring-azure-virtual-machines-for-u

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Database Mirroring

- Set up synchronous mirroring between two VMs in the same region
- Just like on-prem, if the VMs don't share a domain, you can set up certificate-based authentication

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Failover Cluster Instances

- **Azure doesn't support shared storage**
- **Option 1: use SIOS DataKeeper, a 3rd party utility**
  - Uses synchronous data replication between two storage volumes
- **Option 2: remote iSCSI Target shared block storage via ExpressRoute**
  - On-premises shared storage presented over Express Route

Moving data into the database

- **Back up to and restore from URL**
- **Deploy a SQL Server Database to a Microsoft Azure VM wizard**
  - Built into SSMS
- **SQL Server Database Migration wizard**
  - CodePlex download

Changing VM size

- **Can I upgrade or downgrade?**
  - Yes!
- **Is it an online operation?**
  - Yes!
- **How long does it take?**
  - It depends
- **How?**
  - Portal
  - PowerShell

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When do you pay for the VM?

- **“If the status says “Stopped (Deallocated),” you’re not being billed. If it says “Stopped Allocated,” you’re still being billed for allocated virtual cores (not the software license itself).”**
- **“To ensure you’re not being billed, always stop virtual machines from the management portal. You can also stop the VM through Powershell by calling ShutdownRoleOperation with "PostShutdownAction" equal to "StoppedDeallocated".**
  If you shut down a VM from inside (using Windows power options) or through PowerShell by calling ShutdownRoleOperation with "PostShutdownAction" equal to "Stopped".”

- **https://azure.microsoft.com/en-us/pricing/details/virtual-machines/**

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That is only for compute!

- You still pay for storage
- You still pay for network
- If you have multiple VMs in a cluster or an AG, and you don't shut all of them down, you pay for those still running

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PaaS: SQL Database

Maintenance

Maintenance

- **Backups are automatic**
  - Full backup weekly
  - Differential backup hourly
  - Transaction log backup every 5 minutes
- **Restore**
  - You can restore, but it's always to a different name
- **CHECKDB**
  - Should be done, but how will you schedule it?
- **Indexes**
  - You can REORGANIZE and REBUILD
  - How will you schedule it?

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No SQL Server Agent! Oh noes!

Executing jobs

- **Use SQL Server Agent**
  - ...from an on-premises or cloud VM.
  - Yes, you're paying for licensing.
- **Azure Automation**
  - Requires .NET and PowerShell
  - You pay for it if jobs run for more than 500 minutes in a month
  - Reference: Azure Automation: Your SQL Agent in the Cloud https://azure.microsoft.com/en-us/blog/azure-automation-your-sql-agent-in-the-cloud/
- **Elastic Database Jobs**
  - Jobs are T-SQL
  - Scheduled with PowerShell
  - Logged
  - Reference: Elastic Database Jobs Overview https://azure.microsoft.com/en-us/documentation/articles/sql-database-elastic-jobs-overview/

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Azure Automation

- **Set up an Automation Account**
  - Can have multiple – one for Web Apps and one for SQL Database; one for dev and one for prod
- **Add a Runbook**
  - Test it!
- **Publish Runbook**
- **Schedule Runbook**
  - Run once, daily, or hourly

Elastic Database Jobs

- **Download & install Elastic Database Jobs PowerShell package - https://azure.microsoft.com/en-us/documentation/articles/sql-database-elastic-jobs-service-installation/**
- **Install services (Portal or PowerShell)**
  - A resource group is created that contains a SQL Server and control SQL Database
- **Create & schedule jobs with PowerShell**
- **Demo: Azure elastic database jobs https://www.pythian.com/blog/sql-edge-3-azure-elastic-database-jobs/**

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Monitoring & alerting

What

- Usage - DTUs, processor, memory, read/writes
- Connectivity - what connectivity % did you have?
- Performance - top queries, worst queries

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How

- **DMVs**
  - Commands with *os* or *server* in the name now have *database* in the name
  - Examples: https://azure.microsoft.com/en-us/documentation/articles/sql-database-monitoring-with-dmvs/
- **Portal**
  - Add Tiles
    - Resource Utilization, Database Connections, Storage
- **Alert Rules**
  - Not very fine-grained
- **SCOM**
  - Windows Azure SQL Database Management Pack for System Center 2012
- **3rd party tools**
  - SQL Sentry Performance Advisor
  - Dell Software Spotlight on SQL Server Enterprise

Add Alerts with PowerShell

- There are Azure RM cmdlets that let you add Alerts
- Thanks to Mike Fal for figuring this out and blogging it!
- http://www.mikefal.net/2016/08/23/creating-alerts-for-azure-sql-database-with-powershell/

HA & DR

How HA works

- All writes are replicated to two or more nodes
- There is a high possibility of the database moving to another node in the middle of the day. All clients need to implement transient connection handling!
- Reference: Azure Business Continuity Technical Guidance https://msdn.microsoft.com/library/azure/hh873027.aspx
- Reference: Using the Transient Fault Handling Application Block with SQL Azure https://msdn.microsoft.com/library/hh680899(v=pandp.50).aspx

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DR choices

- DR is based on your service tier
- Reference: Cloud business continuity and database disaster recovery with SQL Database https://azure.microsoft.com/en-us/documentation/articles/sql-database-business-continuity/

	Point in time restore	Geo-restore	Active Geo-replication
Basic	Any restore point in last 7 days	Yes	Yes
Standard	Any restore point in last 35 days	Yes	Yes
Premium	Any restore point in last 35 days	Yes	Yes

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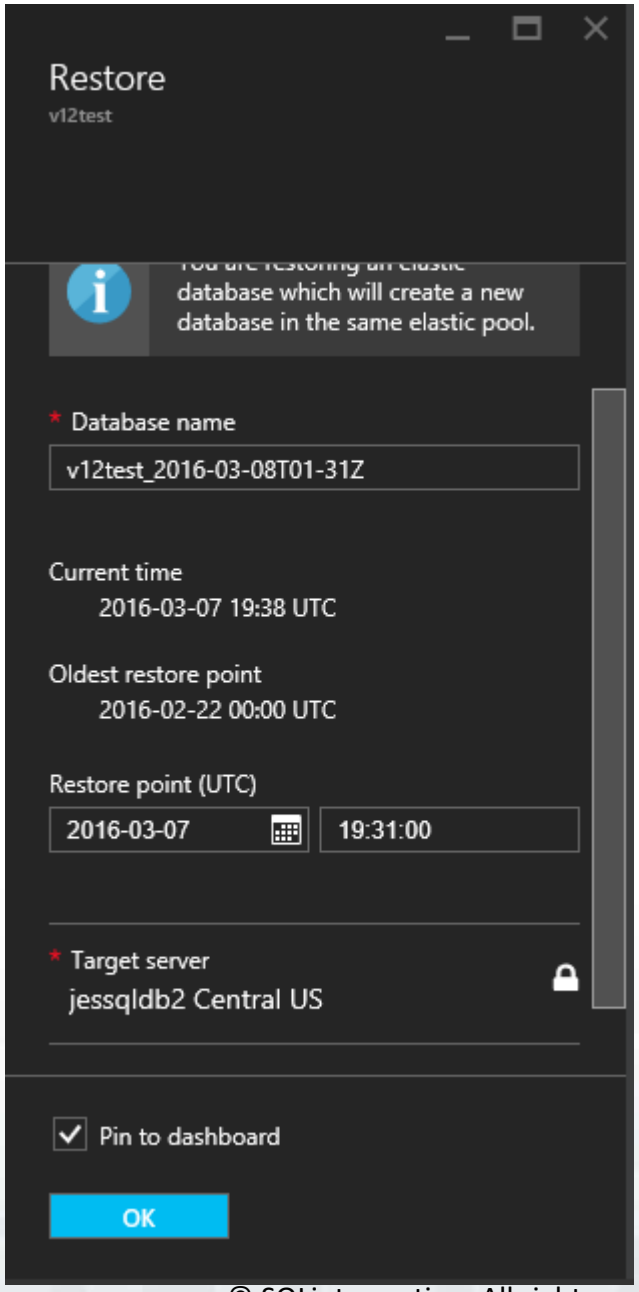
Point in time restore

- Always restores a new database with a different name
- How far back you can go depends on the tier



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Geo-Restore

- **Your backups are geo-replicated**
  - Can have up to 1 hour data loss
- **Used when there is an outage in a region**
- **Restore database to a new name**
- **Update connection strings**
- **Verify firewall rules**
- **Verify logins and users**
- **Reference: Azure SQL Database Geo-Restore https://azure.microsoft.com/en-us/blog/azure-sql-database-geo-restore/**

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Active Geo-replication

- Data is asynchronously written to a secondary region
- Can have up to four secondaries
- Secondaries are online, readable
- In case of primary region outage, terminate the relationship with a secondary and make that secondary the primary
- Update connection strings
- Verify firewall rules
- Verify logins and users
- Reference: Spotlight on SQL Database Active Geo-Replication https://azure.microsoft.com/en-us/blog/spotlight-on-sql-database-active-geo-replication/

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Come to the cloud!

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Questions?

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Links: http://tinyurl.com/azurefordba

Slides & demos: github.com/grrlgeek/azure-sql-server

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Don’t forget to complete an online evaluation!

SQL Server in Azure:
Essentials for the Database Administrator

Your evaluation helps organizers build better conferences and helps speakers improve their sessions.

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Thank you!

Save the Date!

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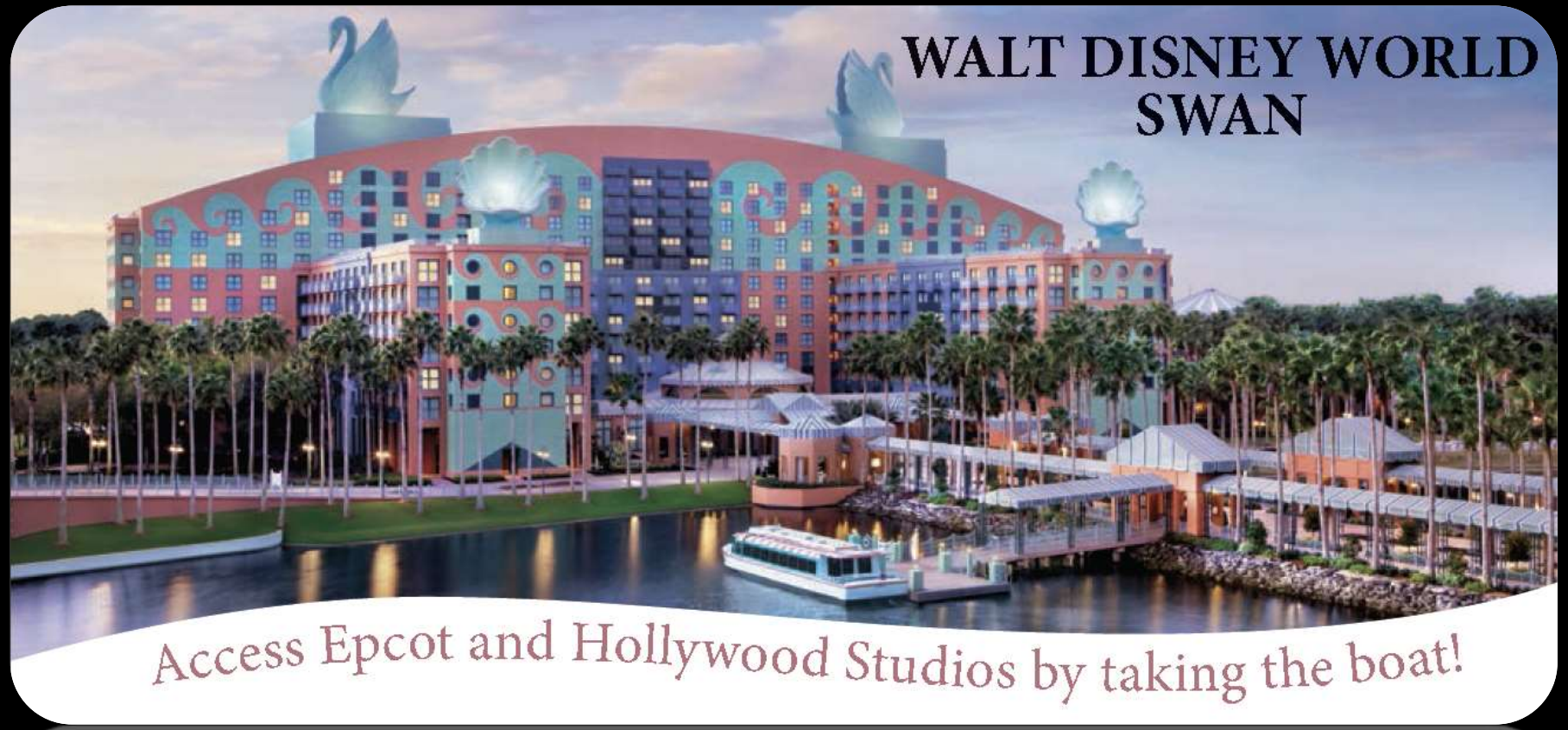

2017

May 21-24

We're back in Orlando!

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Leave the every day behind and enter a world of wonder and enchantment at the Walt Disney World® Resort. Located in the heart of the most magical place on earth, the Walt Disney World Swan and Dolphin Resort provides a truly extraordinary backdrop for our event! Beautiful tropical landscaping, tranquil waterways and classic art and architecture work together to create a stunning landmark!