Introduction to SQL Azure

BenkoTips Live & On Demand

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CODE CAMP 2010

Where can I get more info?

- Visit my site – www.BenkoTIPS.com
  - Resources from today's talk
  - Webcasts
  - Downloads
  - More!
- Subscribe to my blog (my boss will love that ☺)
  - http://blogs.msdn.com/benko
- Register for MSDN Events at www.msdnEvents.com

- Have an office full of developers who couldn't make it?

  → Ask me about **MSDN OnSite Events**

Some PDC 2010 Announcements

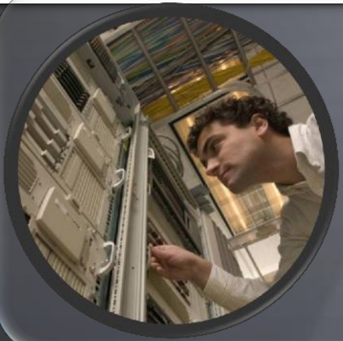
- Extra Small instances ($.05/computer hr)
- Azure Hosted Reporting Services
- Better Diagnostics
- Data Sync
- Online Database Management

- More info: http://microsoftpdc.com
- SQL Labs: http://sqlazurelabs.com
- Azure: http://windows.azure.com

Agenda

- Overview
- Architecture
- Getting Started
- Migration
- Considerations

Challenges Facing Enterprise IT

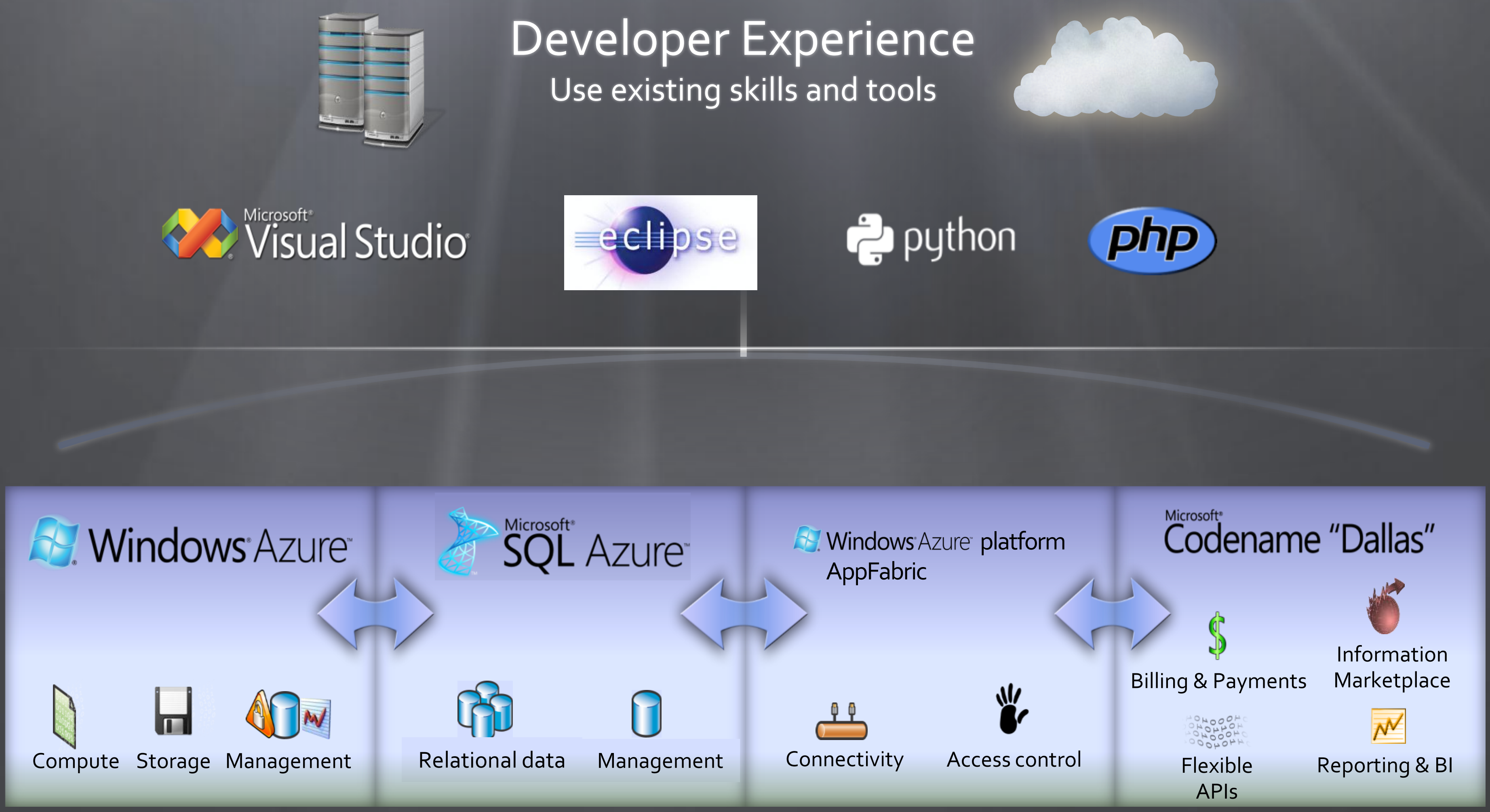


- Provisioning, deploying and managing servers at scale

- Enabling faster, more efficient development of applications with existing knowledge and toolsets

- Reducing IT hardware and infrastructure costs

The Windows Azure Platform



Developer Experience

Use existing skills and tools

Microsoft Visual Studio

eclipse

python

php

Windows Azure

- Compute
- Storage
- Management

Microsoft SQL Azure

- Relational data
- Management

Windows Azure platform AppFabric

- Connectivity
- Access control

Microsoft Codename "Dallas"

- Billing & Payments
- Information Marketplace
- Flexible APIs
- Reporting & BI

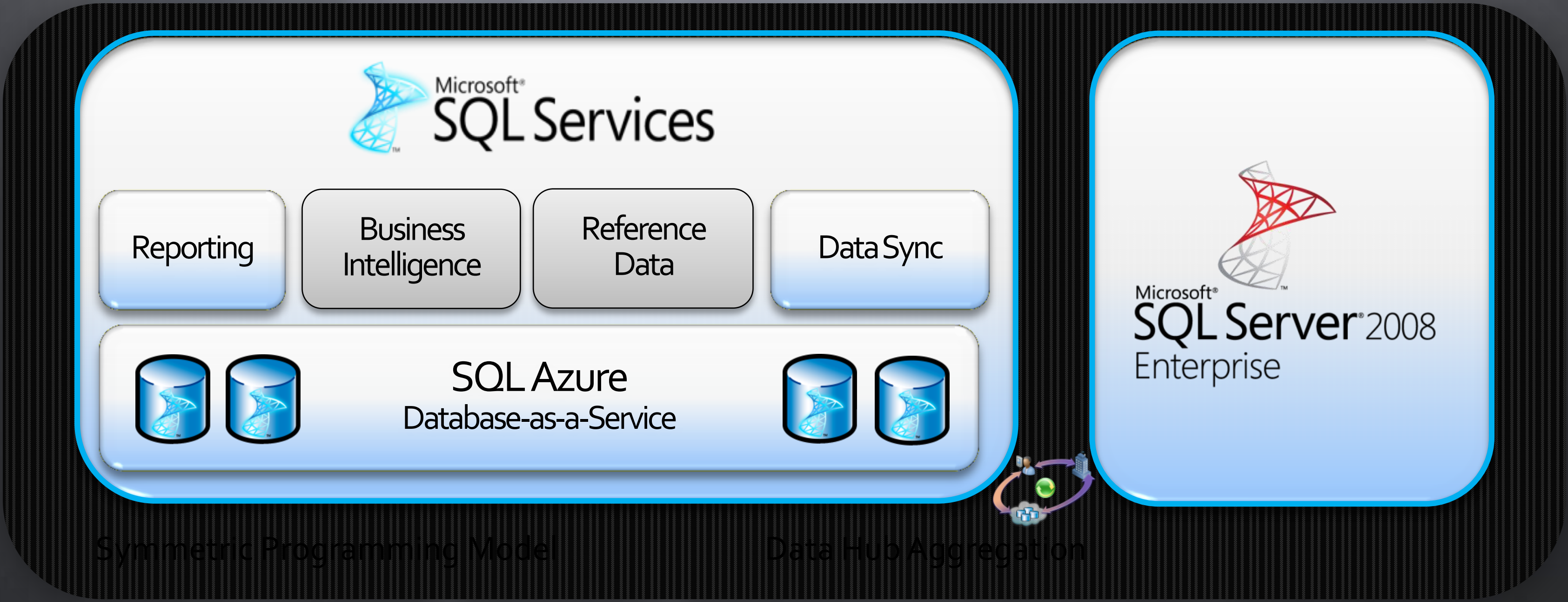
SQL Azure Database

Clear Feedback: "I want a SQL database in the Cloud"

- Familiar SQL Server relational model
- Uses existing APIs & tools
- Friction free provisioning and reduced management
- Built for the Cloud with availability and scale

Focus on combining the best features of SQL Server running at scale with low friction

SQL Azure – Database as a Service



Microsoft SQL Services

Reporting

Business Intelligence

Reference Data

Data Sync

SQL Azure
Database-as-a-Service

Microsoft SQL Server 2008
Enterprise

Symmetric Programming Model

Data Hub Aggregation

- Initial services – core RDBMS capabilities as a service (SDS), Data Sync and Data Hub
- Soon – Reporting Services

SQL Azure Database

The first and only true relational database as a service

Self-managed

- Easy provisioning and deployment
- Auto high-availability and fault tolerance
- Self-maintaining infrastructure; self-healing
- *No need for server or VM administration*

Elastic Scale

- Database utility; pay as you grow
- Flexible load balancing
- Business-ready SLAs
- Enable multi-tenant solutions
- World-wide presence

Developer Agility

- Build cloud-based database solutions on consistent relational model
- Leverage existing skills through existing ecosystem of developer and management tools
- Explore new data application patterns

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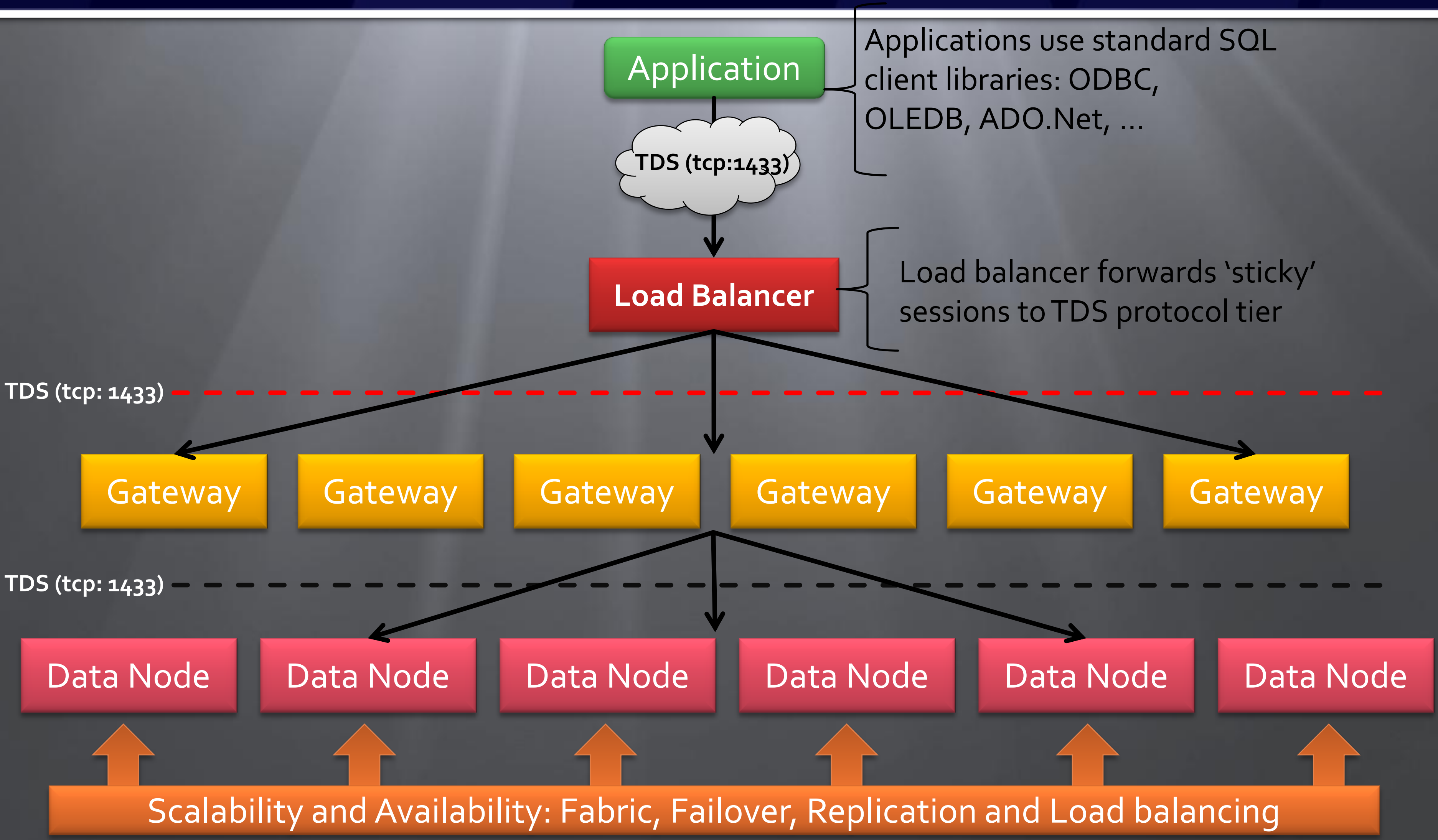
SQL Azure Network Topology



Application

TDS (tcp:1433)

Applications use standard SQL client libraries: ODBC, OLEDB, ADO.Net, …

Load Balancer

Load balancer forwards ‘sticky’ sessions to TDS protocol tier

TDS (tcp: 1433)

Gateway

Gateway

Gateway

Gateway

Gateway

Gateway

TDS (tcp: 1433)

Data Node

Data Node

Data Node

Data Node

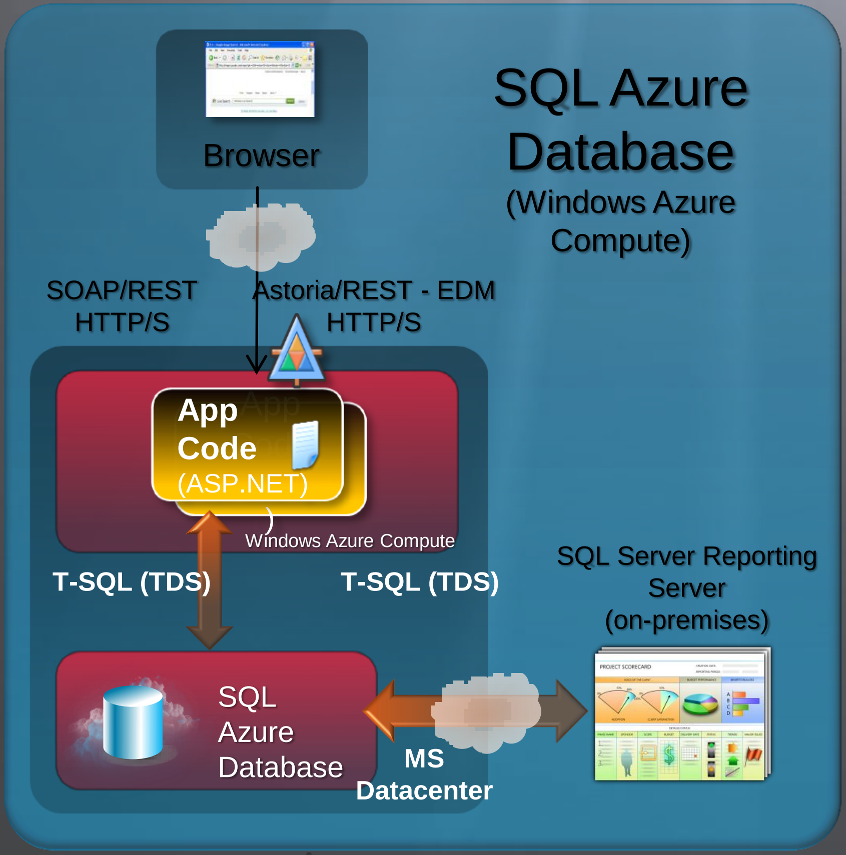
Data Node

Data Node

Scalability and Availability: Fabric, Failover, Replication and Load balancing

SQL Azure Database

Highly scaled out relational database as a service



- AD Federation (LiveId /.Net Svcs ACS)

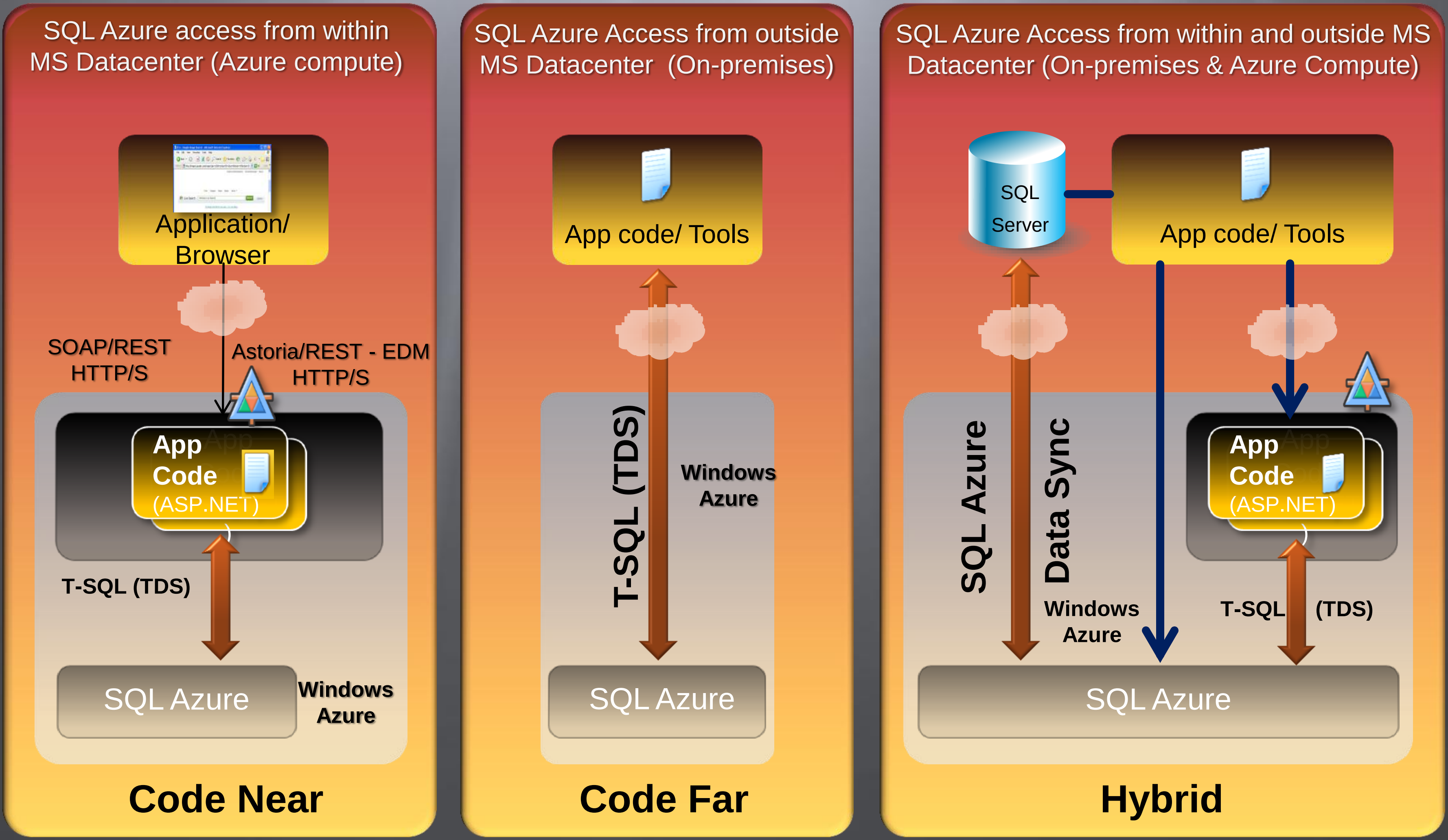
Relational database service

- SQL Server technology foundation
- Highly symmetrical
- Highly scaled
  - Database “as a Service” – beyond hosting

Customer Value Props

- Self-provisioning and capacity on demand
- Symmetry w/ on-premises database platform
- Automatic high-availability and fault-tolerance
- Automated DB maintenance (infrastructure)
- Simple, flexible pricing – “pay as you grow”

Application Topologies



SQL Azure access from within MS Datacenter (Azure compute)

Application/ Browser

SOAP/REST
HTTP/S

Astoria/REST - EDM
HTTP/S

App Code
(ASP.NET)

T-SQL (TDS)

SQL Azure

Windows Azure

Code Near

SQL Azure Access from outside MS Datacenter (On-premises)

App code/ Tools

T-SQL (TDS)

Windows Azure

SQL Azure

Code Far

SQL Azure Access from within and outside MS Datacenter (On-premises & Azure Compute)

SQL Server

App code/ Tools

SQL Azure

Data Sync

Windows Azure

App Code
(ASP.NET)

T-SQL (TDS)

SQL Azure

Hybrid

T-SQL Support *(full or partial)*

- Constants
- Constraints
- Cursors
- Index management and rebuilding indexes
- Local temporary tables
- Stored procedures
- Statistics management
- Transactions
- Triggers
- Tables, joins, and table variables
- Transact-SQL language elements such as
  - Create/drop databases
  - Create/alter/drop tables
  - Create/alter/drop users and logins
  - …
- User-defined functions
- Views

T-SQL Not Supported *(v1)*

- Common Language Runtime (CLR)
- Database file placement
- Database mirroring
- Distributed queries
- Distributed transactions
- Filegroup management
- Full Text Search
- Global temporary tables
- SQL Server configuration options
- SQL Server Service Broker
- System tables
- Trace Flags

- LOTS! Refer to MSDN for specific details

Agenda

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- **Getting Started**
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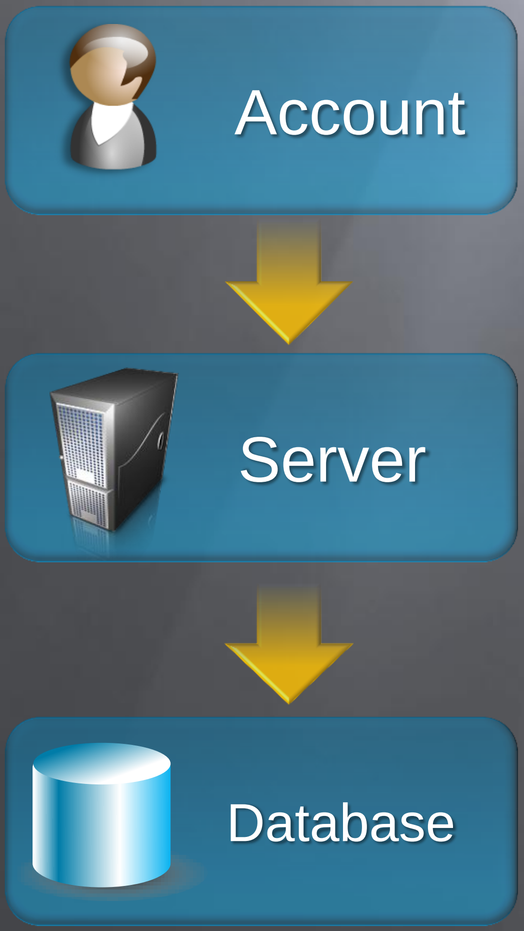
Service Provisioning Model



Account

Server

Database

- Each ***account*** has zero or more ***servers***
  - Azure wide, provisioned in a common portal
  - Billing instrument
- Each ***server*** has one or more databases
  - Contains metadata about the databases and usage
  - Unit of authentication
  - Unit of Geo-location
  - Generated DNS based name
- Each ***database*** has standard SQL objects
  - Unit of consistency
  - Unit of multi-tenancy
  - Contains Users, Tables, Views, Indices, etc.
  - Most granular unit of billing

Provisioning SQL Azure Overview

- Azure configuration portal
  - Browse to https://sql.azure.com
  - Configure instances
  - Create Databases
  - Setup Firewall rules
- (beta) SQL Azure Labs Management, OData & Sync Services
  - http://SqlAzureLabs.com

DEMO

Provisioning SQL Azure

Compatibility Goals

- Support common application patterns
- Consistent patterns for Azure and SQL
  - ADO.NET Interop
- Multi-tenancy considerations
  - Throttling and load balancing
  - Limits on DB size, duration of transaction, etc
  - Server based scale out

Version 1: *Address the needs of 95% or more standard application functionality (web/enterprise)*

Building Applications

- Can target SQL Azure either:
  - Remotely from on-premise
  - From Windows Azure
- Can promote existing applications or build new applications
- SQL Azure offering currently favors:
  - Cacheable data sets
  - Multi tenanted data
  - CPU/Memory intensive workloads

Tools

- SQL Server 2008 R2 Management Studio
  - Object Explorer
  - Tasks
  - Query windows

- Visual Studio
  - Developer tasks

- Project “Houston”
  - Silverlight based Management Console

Connecting to SQL Azure

- SQL Azure connection strings follow normal SQL syntax

- Applications connect directly to a database
  - "Initial Catalog = <db>" in connection string
  - No support for context switching (no USE <db>)
  - Some commands must be in their own batch
    - Create/Alter/Drop Database & Create/Alter/Drop Login, & Create/Alter USER with FOR/FROM LOGIN

- Encryption security
  - Set Encrypt = True, only SSL connections are supported
  - TrustServerCertificate = False, avoid Man-In-The-Middle-Attack!

- Format of username for authentication:
  - ADO.Net:

```
Data Source=server.database.windows.net;
User ID=user@server;Password=password;...
```

- Setup your firewall rules first!

DEMO

Connect to Azure

SQL Management Studio
Visual Studio
Project “Houston”

Agenda

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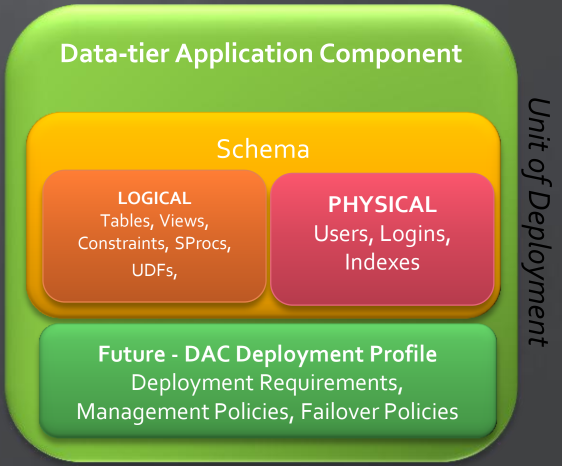
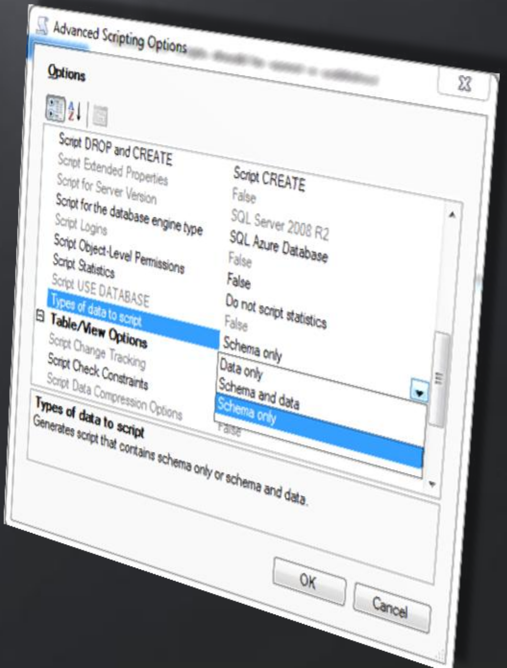
Deployment Options

- Generate Script Wizard
  - Produce a SQL script compatible with SQL Azure, Schema and/or data
- SQL Server Migration Assistants (downloadable)
  - MySQL, Oracle, Access, SQL Server…
- SQLAzureMW
  - Useful for catching unsupported features in SQL Azure
  - Moves data efficiently
  - Unofficially supported
- Data-tier Application Component (DAC)
  - New unit of deployment for T-SQL apps.
  - Supports Install, Uninstall
  - Contains developer intent as policies


Data-tier Application Component
Schema
LOGICAL
Tables, Views, Constraints, SProcs, UDFs,
PHYSICAL
Users, Logins, Indexes
Future - DAC Deployment Profile
Deployment Requirements, Management Policies, Failover Policies
Unit of Deployment

Management Studio – Generate Script Wizard

- Scenario
  - Migration of schema and/or data with fine grain control.
- Pros
  - Native support for SQL Azure Schema options: "Engine Type = SQL Azure"
    - Ensures correct options and settings are applied for the TSQL script generation.
    - Requires explicit action on unsupported objects.
- Cons
  - Verbose – INSERT Statements instead of raw data
  - Data is scripted with a fixed 100 row batch size.
    - Edit "GO" statements between small batches
  - Round-trip Efficiency
    - Use "SET NOCOUNT ON"



Advanced Scripting Options

Options

Script DROP and CREATE	Script CREATE
Script Extended Properties	False
Script for Server Version	SQL Server 2008 R2
Script for the database engine type	SQL Azure Database
Script Logins	False
Script Object-Level Permissions	False
Script Statistics	Do not script statistics
Script USE DATABASE	False
Types of data to script	Schema only
Table/View Options	
Script Change Tracking	
Script Check Constraints	
Script Data Compression Options	False

Data only
Schema and data
Schema only

Types of data to script
Generates script that contains schema only or schema and data.

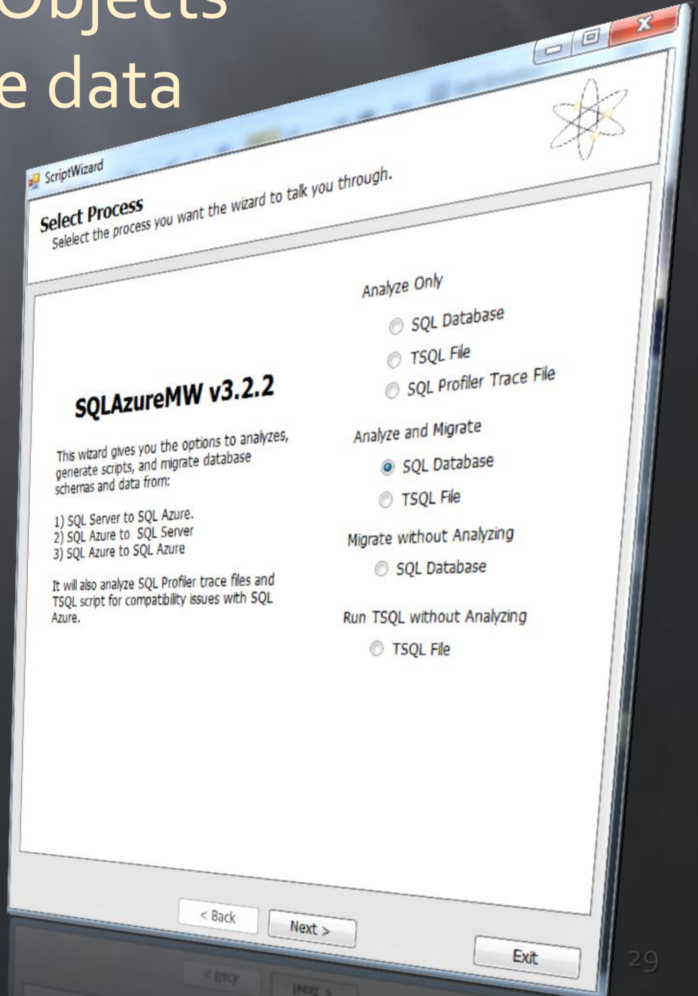
Migration Assistant for MySql and Access (CTP)

- Scenario
  - Auto porting of schema, database code and data from MySql and Access to SQL Azure
- SQL Server Migration Assistant for MySql and Access
  - Supports MySQL 4.1 and up
  - Support Access v 97 and up
  - SQL Server versions supported (all editions)
    - SQL Azure, SQL Server 2005, SQL Server 2008 and 2008 R2

SQL Azure Migration Wizard

- Supports Scripting of Schema & Objects
- Generates BCP Scripts to migrate data
- Supports large data volumes
- Not “officially” supported

- sqlazuremw.codeplex.com



Select Process

Selelect the process you want the wizard to talk you through.

SQLAzureMW v3.2.2

This wizard gives you the options to analyzes, generate scripts, and migrate database schemas and data from:

1) SQL Server to SQL Azure.
2) SQL Azure to SQL Server
3) SQL Azure to SQL Azure

It will also analyze SQL Profiler trace files and TSQL script for compatibility issues with SQL Azure.

Analyze Only
- ○ SQL Database
- ○ TSQL File
- ○ SQL Profiler Trace File

Analyze and Migrate
- ● SQL Database
- ○ TSQL File

Migrate without Analyzing
- ○ SQL Database

Run TSQL without Analyzing
- ○ TSQL File

DAC (Data-tier Application) Packages

- Scenarios
  - Self contained package for moving schema easily through the development lifecycle
- What is a DAC Pack?
  - Single unit for authoring, deploying, and managing the data-tier objects
    - Development Lifecycle (VS 2010)
      - Editing DACs
        - Schema and DB Code Development, Code Analyses, Deployment Policy Settings, Schema Comparison and more…
      - Building DACs – the self contained database package
    - Management Lifecycle (SSMS 2008 R2)
      - Managing DACs
        - Registering existing database as DACs
        - Deploying and Upgrading databases using DACs,

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Develop Locally

- Developing on a local SQL Express instance has some advantages
  - Easy to get started, you already know how to do it!
  - Full fidelity with the designer and debugging tools
  - Reduces latency when using local Azure development tools
  - Reduces bandwidth and databases costs for development
- Some caveats
  - Remember to alter your VS build settings to switch the connection string when deploying
  - Use tools (like SQLAzureMW) to keep you within the supported SQL Azure features
  - Always test in SQL Azure before deploying to production

SELECT INTO temp tables

- SELECT *
- INTO #Destination
- FROM Source
- WHERE [Color] LIKE 'Red‛

- To work around this you need to create your destination table then call INSERT INTO. Here is an example:

- CREATE TABLE #Destination (Id int NOT NULL, [Name] nvarchar(max), [Color] nvarchar(10))

- INSERT INTO #Destination(Id, [Name], [Color])
- SELECT Id, [Name], [Color]
- FROM Source
- WHERE [Color] LIKE 'Red';

Resilient Connection Management

- Connections can drop for variety of reasons
  - Idleness (greater than 30 minutes)
  - Throttling
    - Long running transactions > 5 minutes
    - Resource Management
  - Database failover
    - Hardware failure
    - Load Balancing
    - Upgrade

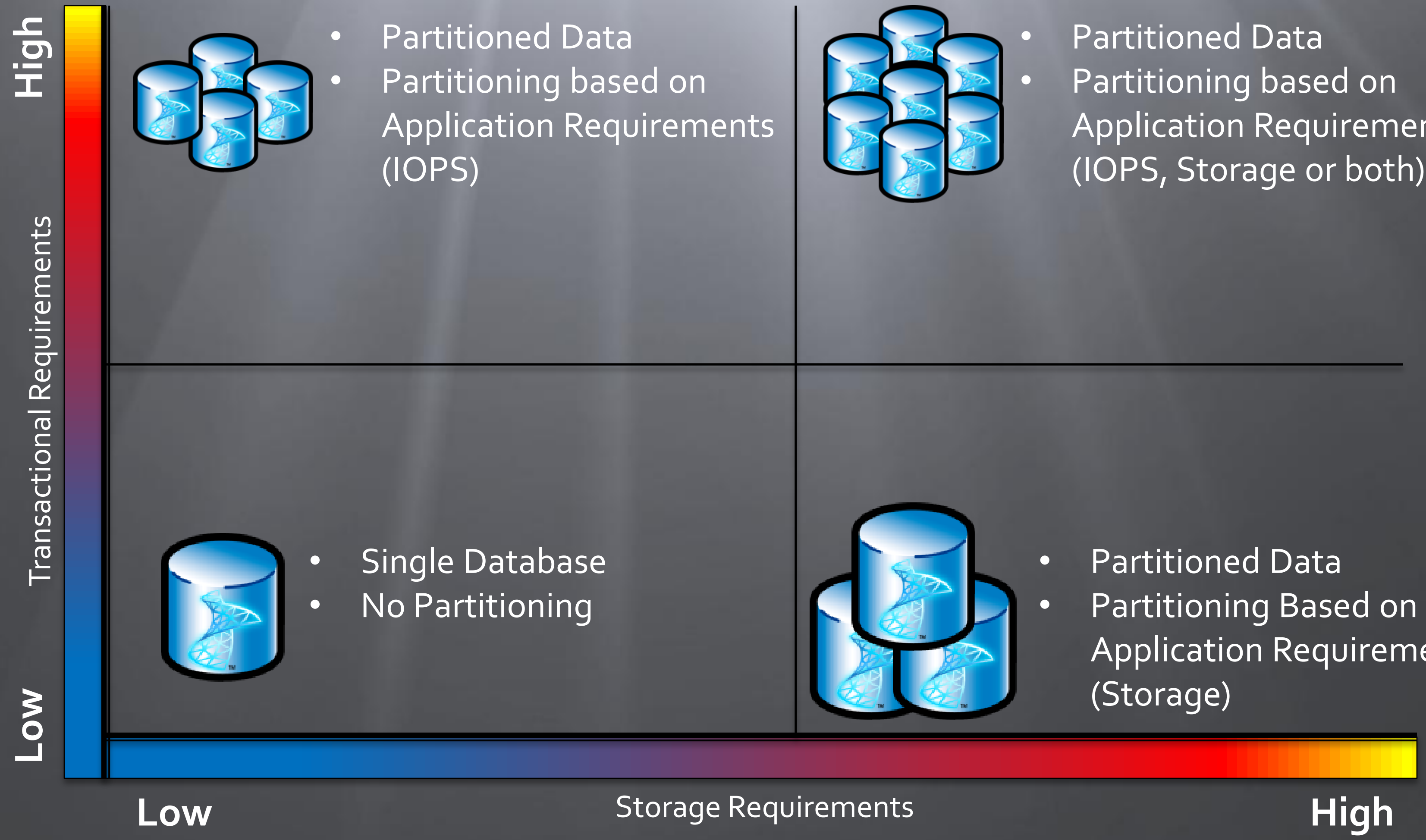
- What to do on connection failure?
  - Wait, then retry if it is a transient failure
  - Change your workload if throttled, i.e. break up your transaction

Connections: Use Pooled Connections

Increases efficiency by removing re-login

```
// When pooling, use connection and return immediately
// Do not hold for a long time – pool ensure fast turnaround
// one second use
using (SqlConnection conn = new SqlConnection(…))
{
   conn.Open();
   using (SqlCommand cmd = conn.CreateCommand())
   {
      cmd.CommandText = …;
      …
   }
}
using (SqlConnection conn = new SqlConnection(…))
{
   conn.Open();
   …
```

Partitioning, when do I need it?



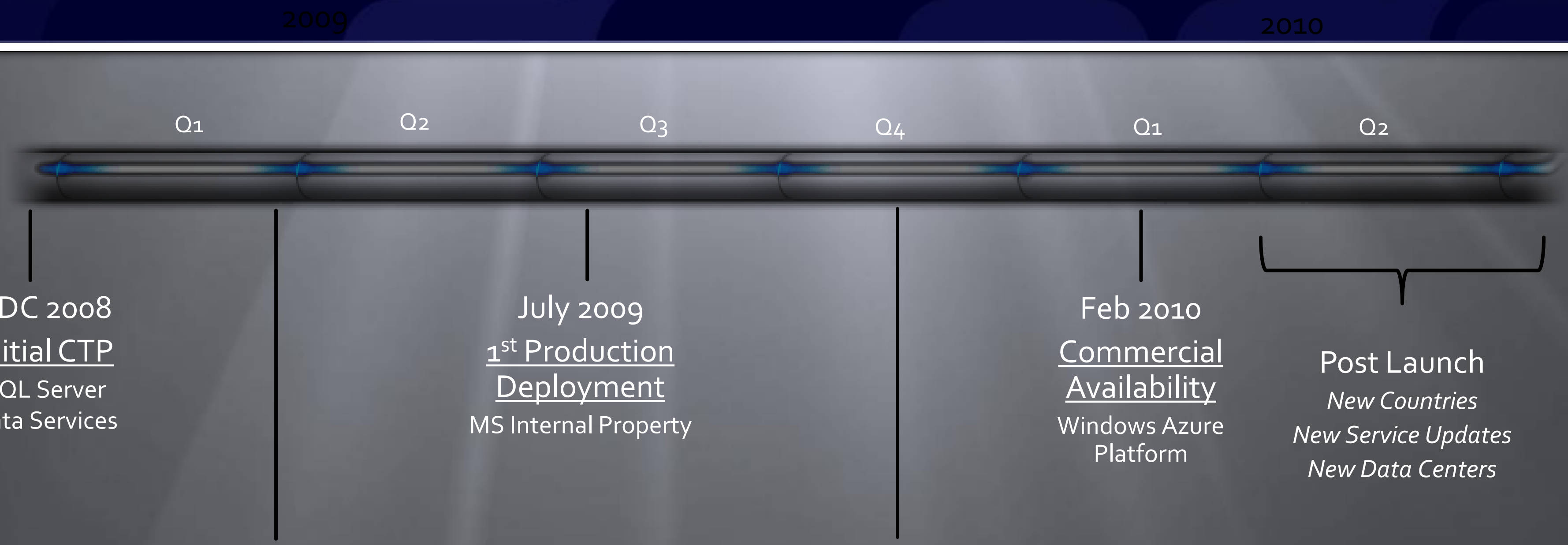
- Partitioned Data
- Partitioning based on Application Requirements (IOPS)

- Partitioned Data
- Partitioning based on Application Requirements (IOPS, Storage or both)

- Single Database
- No Partitioning

- Partitioned Data
- Partitioning Based on Application Requirements (Storage)

The Journey So Far…



PDC 2008

Initial CTP

SQL Server
Data Services

MIX 2009

Announce

Relational
Database as a
Service

July 2009

1st Production
Deployment

MS Internal Property

PDC 2009

Service Launch

Windows
Azure Platform

Feb 2010

Commercial
Availability

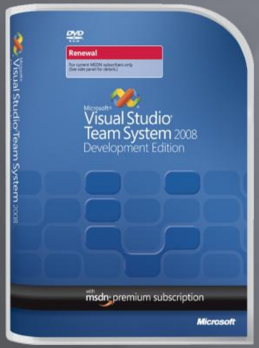
Windows Azure
Platform

Post Launch

New Countries
New Service Updates
New Data Centers

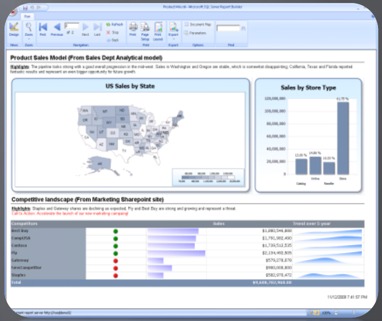
…On To *The New Stuff!*

Best Integration – Office 2010 & Other Tools


Renewal
Microsoft Visual Studio Team System 2008 Development Edition
with msdn premium subscription
Microsoft

Microsoft® Excel® 2010

Microsoft® SQL Server®

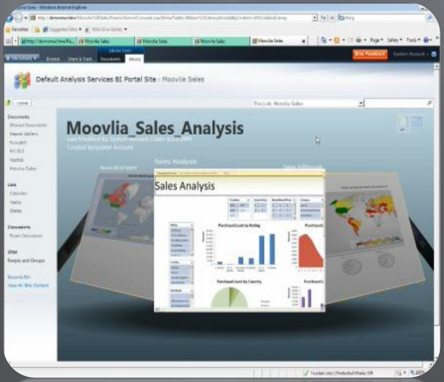

Product Sales Model (From Sales Dept Analytical model)

US Sales by State

Sales by Store Type

Competitive landscape (From Marketing Sharepoint site)

Microsoft® Access® 2010


Default Analysis Services BI Portal Site › Moovlia Sales

Moovlia_Sales_Analysis

Sales Analysis

Microsoft® SharePoint® 2010

eclipse

PowerPivot

Broad Reach – OData Support (Labs)

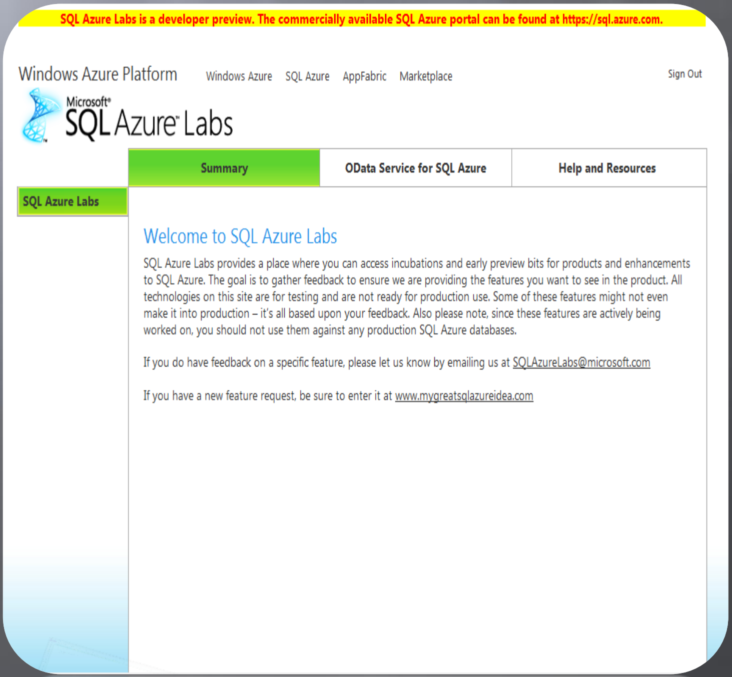
Open Data Protocol

JSON

ATOM PUB

HTTP

Sign up and send us your feedback!



SQL Azure Labs is a developer preview. The commercially available SQL Azure portal can be found at https://sql.azure.com.

Welcome to SQL Azure Labs

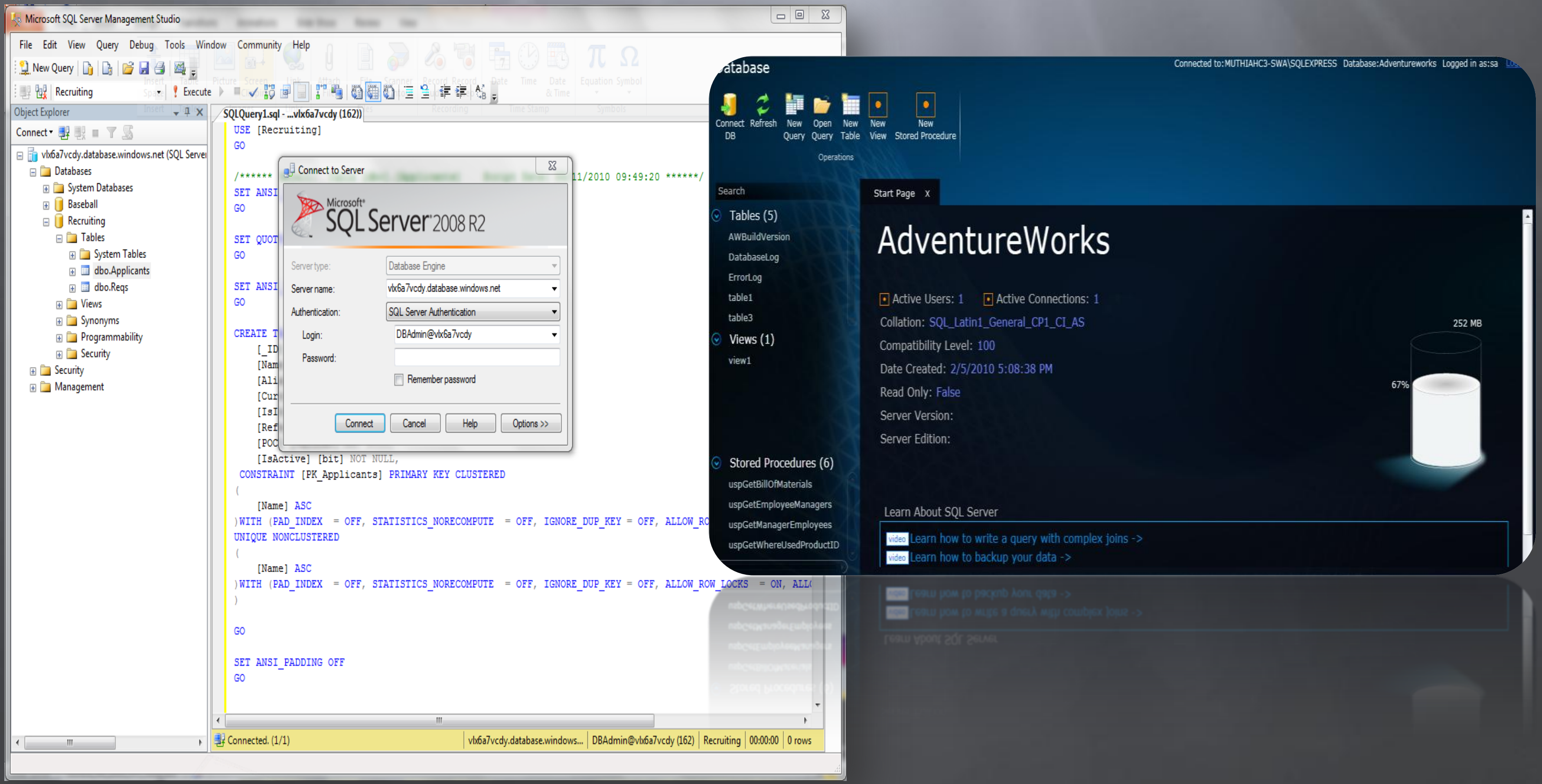
SQL Azure Labs provides a place where you can access incubations and early preview bits for products and enhancements to SQL Azure. The goal is to gather feedback to ensure we are providing the features you want to see in the product. All technologies on this site are for testing and are not ready for production use. Some of these features might not even make it into production – it's all based upon your feedback. Also please note, since these features are actively being worked on, you should not use them against any production SQL Azure databases.

If you do have feedback on a specific feature, please let us know by emailing us at SQLAzureLabs@microsoft.com

If you have a new feature request, be sure to enter it at www.mygreatsqlazureidea.com

https://www.sqlazurelabs.com

Interactive Management – SQL Web Management



```
USE [Recruiting]
GO

/******                                              11/2010 09:49:20 ******/
SET ANSI
GO

SET QUOT
GO

SET ANSI
GO

CREATE T
    [_ID
    [Nam
    [Ali
    [Cur
    [IsI
    [Ref
    [POC
    [IsActive] [bit] NOT NULL,
 CONSTRAINT [PK_Applicants] PRIMARY KEY CLUSTERED
(
    [Name] ASC
)WITH (PAD_INDEX  = OFF, STATISTICS_NORECOMPUTE  = OFF, IGNORE_DUP_KEY = OFF, ALLOW_RO
UNIQUE NONCLUSTERED
(
    [Name] ASC
)WITH (PAD_INDEX  = OFF, STATISTICS_NORECOMPUTE  = OFF, IGNORE_DUP_KEY = OFF, ALLOW_ROW_LOCKS  = ON, ALL(
)

GO

SET ANSI_PADDING OFF
GO
```

Connected. (1/1) | vlx6a7vcdy.database.windows... | DBAdmin@vlx6a7vcdy (162) | Recruiting | 00:00:00 | 0 rows

Connect to Server

Microsoft® SQL Server® 2008 R2

Server type: Database Engine

Server name: vlx6a7vcdy.database.windows.net

Authentication: SQL Server Authentication

Login: DBAdmin@vlx6a7vcdy

Password:

☐ Remember password

Connected to:MUTHIAHC3-SWA\SQLEXPRESS Database:Adventureworks Logged in as:sa

AdventureWorks

Active Users: 1   Active Connections: 1

Collation: SQL_Latin1_General_CP1_CI_AS

Compatibility Level: 100

Date Created: 2/5/2010 5:08:38 PM

Read Only: False

Server Version:

Server Edition:

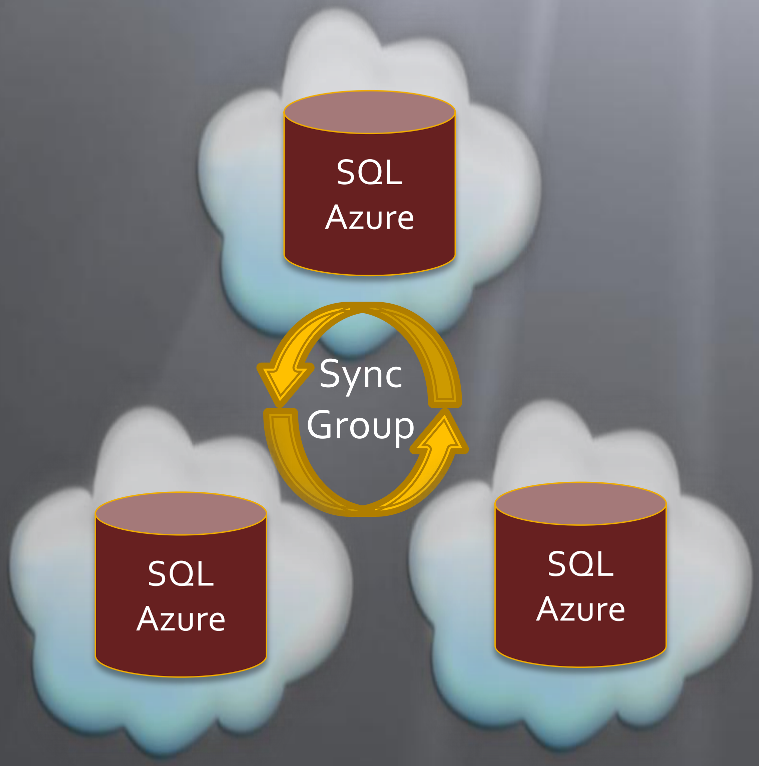
Learn About SQL Server

video Learn how to write a query with complex joins ->

video Learn how to backup your data ->

Getting Data Where You Need It

SQL Azure Data Sync Service



Benefits

- Scale-out read or read/write
- Geo replication of data
- Edge network data distribution
- Content delivery networks

Features Under Consideration

FUTURES

- *Multiple DB collations*
- *Operational Reporting*
- *Business Intelligence/Analytics*
- *Logical Back-up/Restore (incl. geo)*
- *Full text support*
- *Radical scale-up and scale-out*
- *Service Tiers*

…and much, much more…

We're Just Getting Started!

Summary

- Well established, commercially available service
- Symmetrical extension of the SQL Server data platform

  …unique capabilities integrated into an enterprise-class ecosystem
- Great new features including:
  - Microsoft Office 2010 integration
  - New DB sizes and billing tiers
  - Spatial data support
  - Web-based logical data administration
  - Broad reach through industry-standard web protocols
  - Rich relational data synchronization capabilities

BenkoTips Live & On Demand

Introduction to SQL Azure

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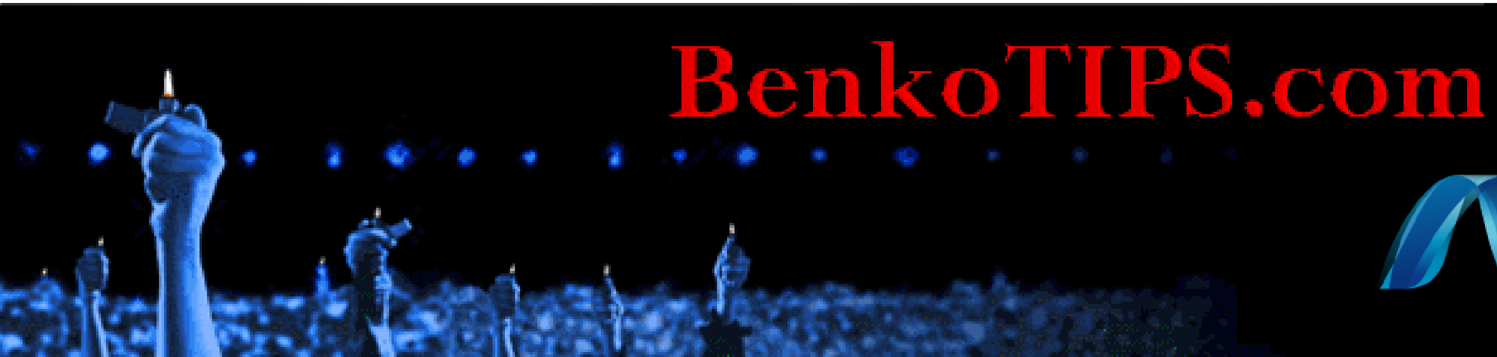
http://www.BenkoTIPS.com



Microsoft® .NET Framework