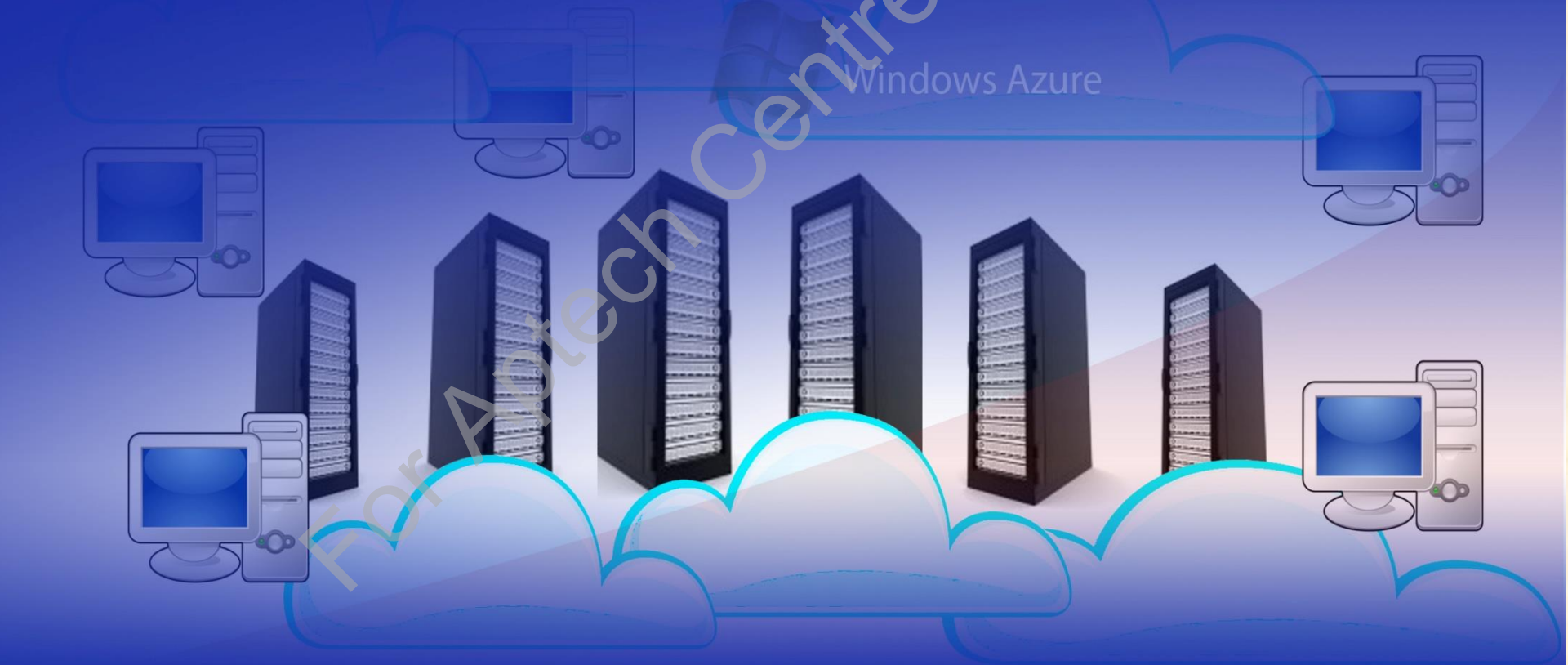
Enterprise Application Development Using Windows Azure and Web Services

Session 12

Advanced Concepts of SQL Database



Learning Objectives

- Explain Windows Azure SQL Database Architecture
- Describe Windows Azure SQL Database Provisioning Model
- Compare Windows Azure Table Storage with SQL Database
- Describe troubleshooting and error handling

Introduction 1-2

- Windows Azure SQL Database, also called SQL Database.

It is hosted in the cloud environment in Microsoft's datacenters across the world.

It is created and replicated on various hosts in one or more servers in the datacenters depending on the geographical location chosen while setting up the cloud application.

Introduction 2-2

- Advantages of SQL Database:

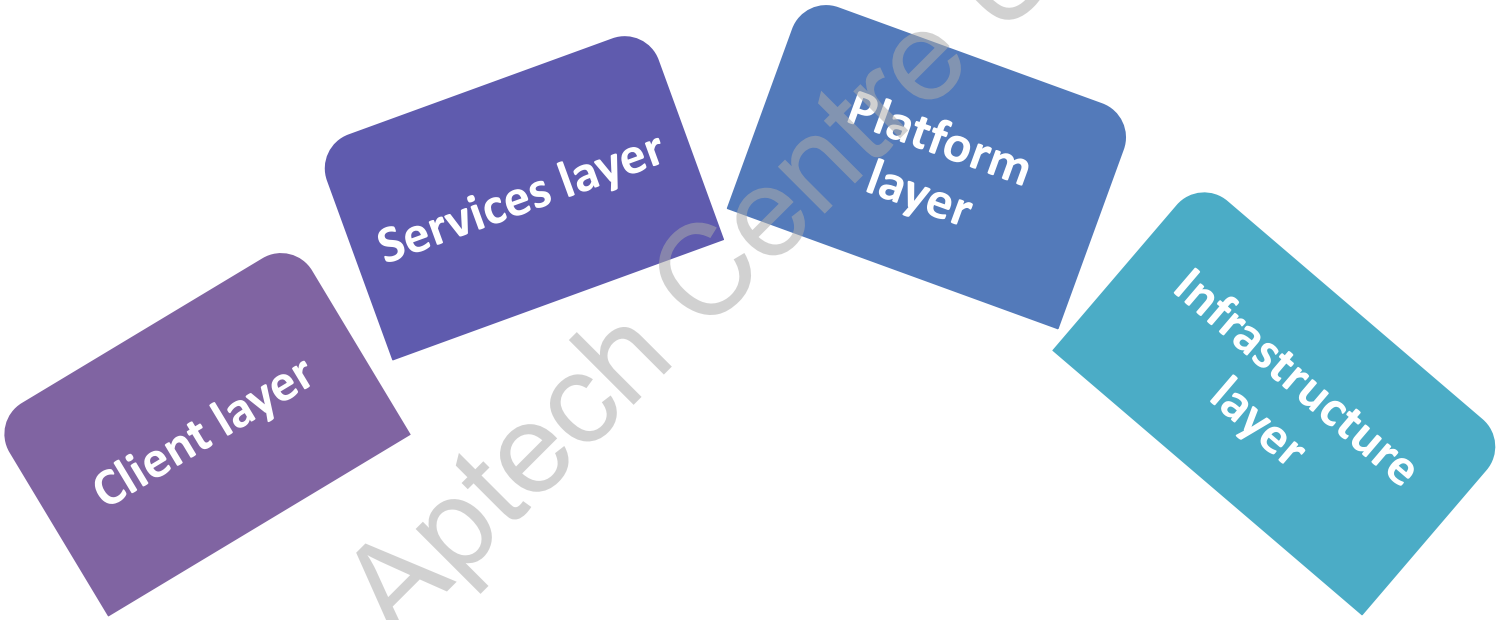
The database can be used with different types of applications, such as Microsoft, custom applications, and third-party.

You are not restricted to use only Microsoft technologies.

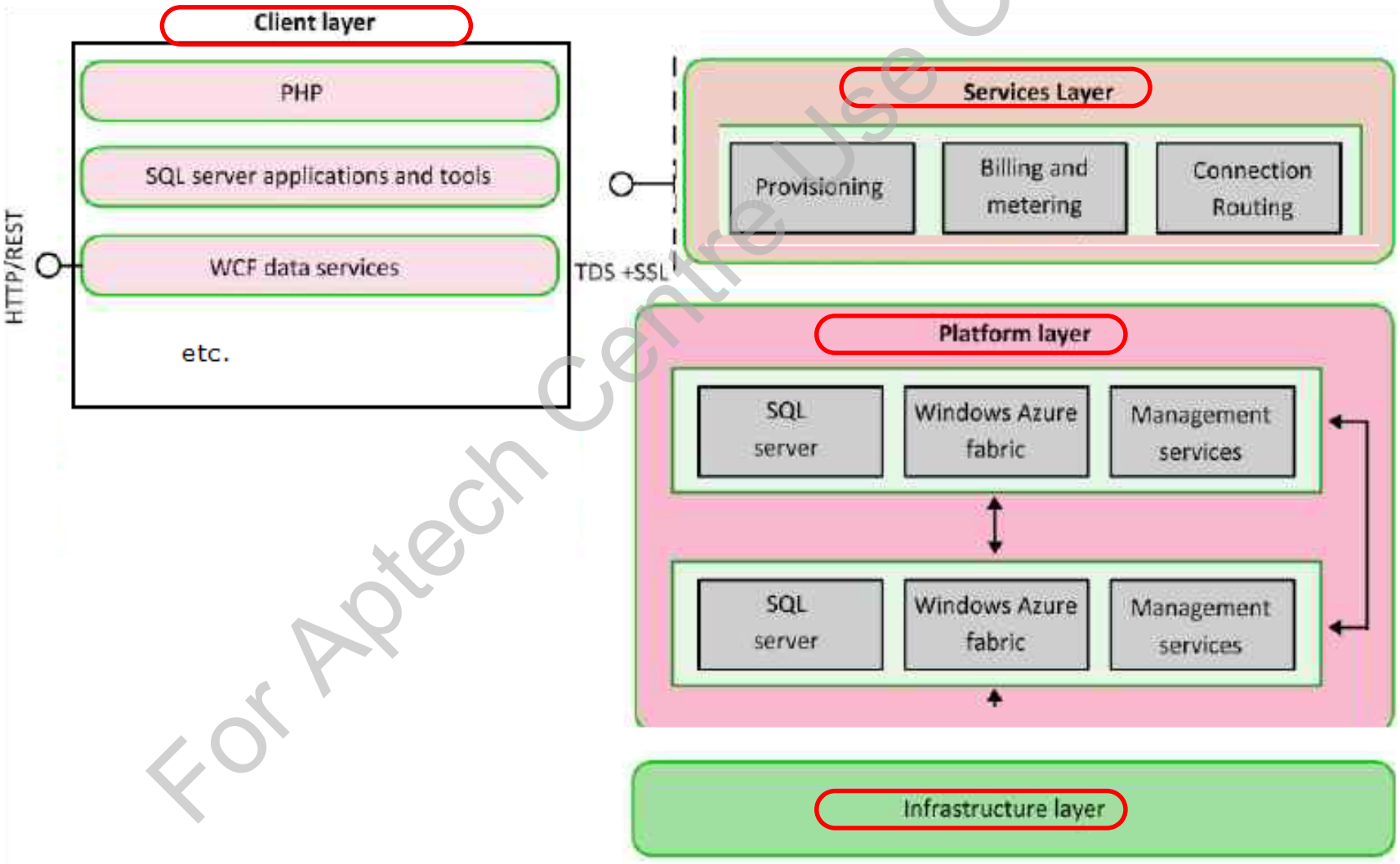
You can choose a technology of your choice as the front-end and for the back-end.

Windows Azure SQL Database Architecture 1-6

- Following are the four key layers of SQL Database:



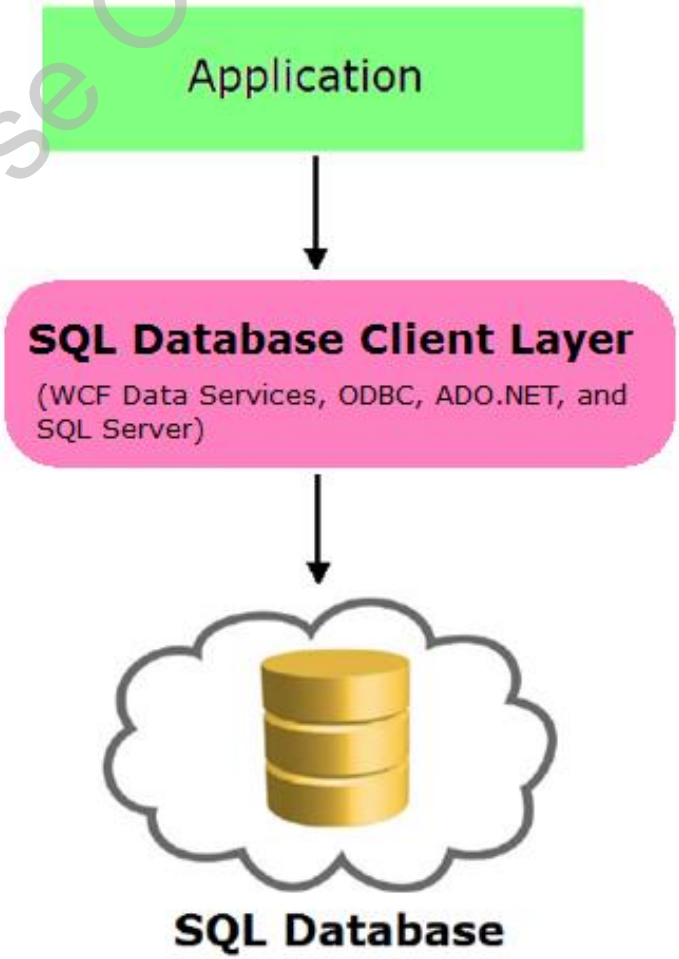
Windows Azure SQL Database Architecture 2-6



Windows Azure SQL Database Architecture 3-6

Client layer

- It is used by the client applications.
- A number of components, such as WCF Data Services, ODBC, ADO.NET, and SQL Server are used at this layer.
- It is used to communicate with the SQL Database.
- It can be situated in local datacenters of an organization or hosted in the cloud.



Windows Azure SQL Database Architecture 4-6

Services layer

- This layer connects both the Client layer and the Platform layer.
- Performs key tasks such as provisioning, billing, and connection routing.

Windows Azure SQL Database Architecture 5-6

Platform layer

- A combination of physical servers and services is presented at this layer.
- A number of SQL Server instances are contained at this level. Each of these instances are managed by Azure SQL Database Fabric.

Windows Azure SQL Database Architecture 6-6

Infrastructure layer

- A front-end for the IT team to manage the operating system and the physical hardware beneath it.

Windows Azure SQL Database Provisioning Model 1-8

- An SQL Database Server:
  - Can run a number of SQL databases.
  - Acts as a single entry point for the databases that are hosted on it.
  - Acts as a security boundary for the databases hosted on it.
  - Is assigned to host the databases associated with your subscription when you create a subscription.
- A single subscription can have maximum of six SQL Database servers assigned.

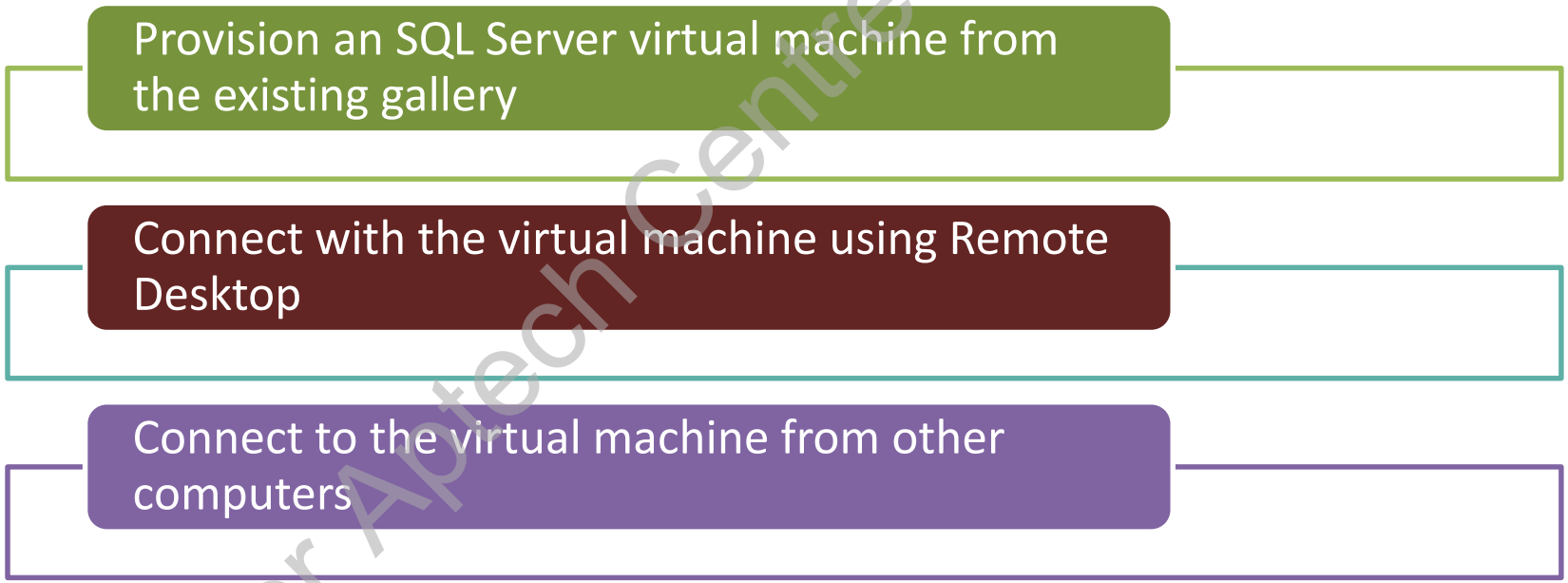
Windows Azure SQL Database Provisioning Model 2-8

- When an SQL Database server is assigned to a subscription, it can hold up to 150 databases as the upper limit.
- This limit also includes the **master** database.
- You need to use the Windows Azure Portal to provision an SQL Database instance.

Provisioning means arranging for access to data repositories or granting authorization to systems, databases, and so on.

Windows Azure SQL Database Provisioning Model 3-8

- Following steps need to be performed to provision an SQL Database:



Windows Azure SQL Database Provisioning Model 4-8

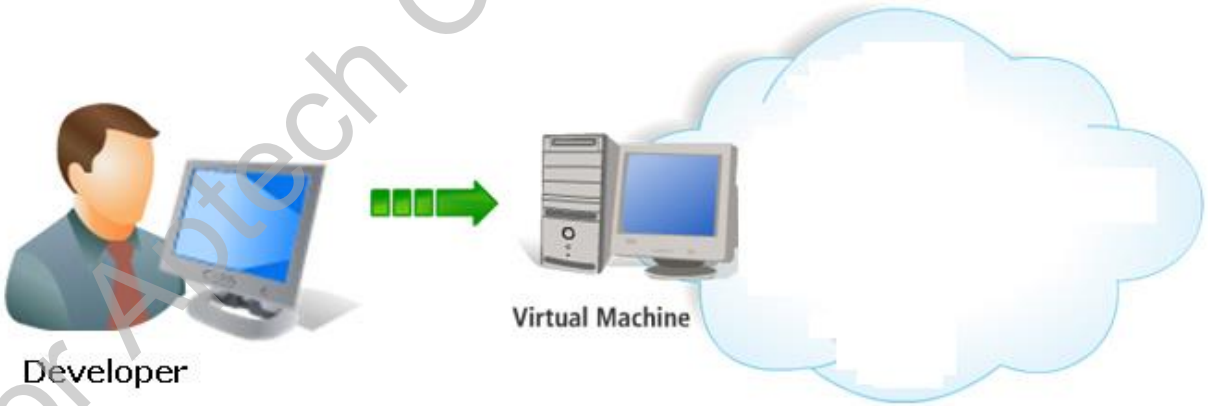
Provision an SQL Server virtual machine from the existing gallery

- In this process:
  - You need to provide the name of the SQL Server virtual machine, a user account, and password, and then select the size of the virtual machine.
  - There are different sizes of virtual machines available in the gallery.
  - Following recommended sizes can be considered as the minimum requirements for creating the SQL Server virtual machine:
    - A2: Use it for production environment
    - A3: Use it for SQL Server Enterprise Edition
    - A6: Use it for SQL Server 2012 Enterprise for Data Warehousing
    - A7: Use it for SQL Server 2014 for Data Warehousing

Windows Azure SQL Database Provisioning Model 5-8

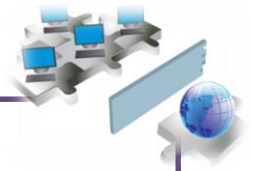
Connect with the virtual machine using Remote Desktop

- You will need to connect with the virtual machine after creating it.



Windows Azure SQL Database Provisioning Model 6-8

Connect to the virtual machine from other computers



- After you create and connect to the virtual machine, you need to complete the following tasks:
  - **Step 1: Create a Transport Control Protocol (TCP) Endpoint**: You will need to create this for the virtual machine.
  - **Step 2: Create firewall rules**: The ports for the virtual machine need to be created. You need to open TCP Port 1433.
  - **Step 3: Enable TCP/IP**: You will need to enable the TCP/IP protocol in SQL Server Configuration Manager on the system.
  - **Step 4: Enable mixed mode authentication**: You will need to connect to the virtual machine and enable mixed mode authentication for the SQL Server instance.
  - **Step 5: Create SQL Server logins**: After you enable mixed mode authentication, create one or more users in SQL Server.

Windows Azure SQL Database Provisioning Model 7-8

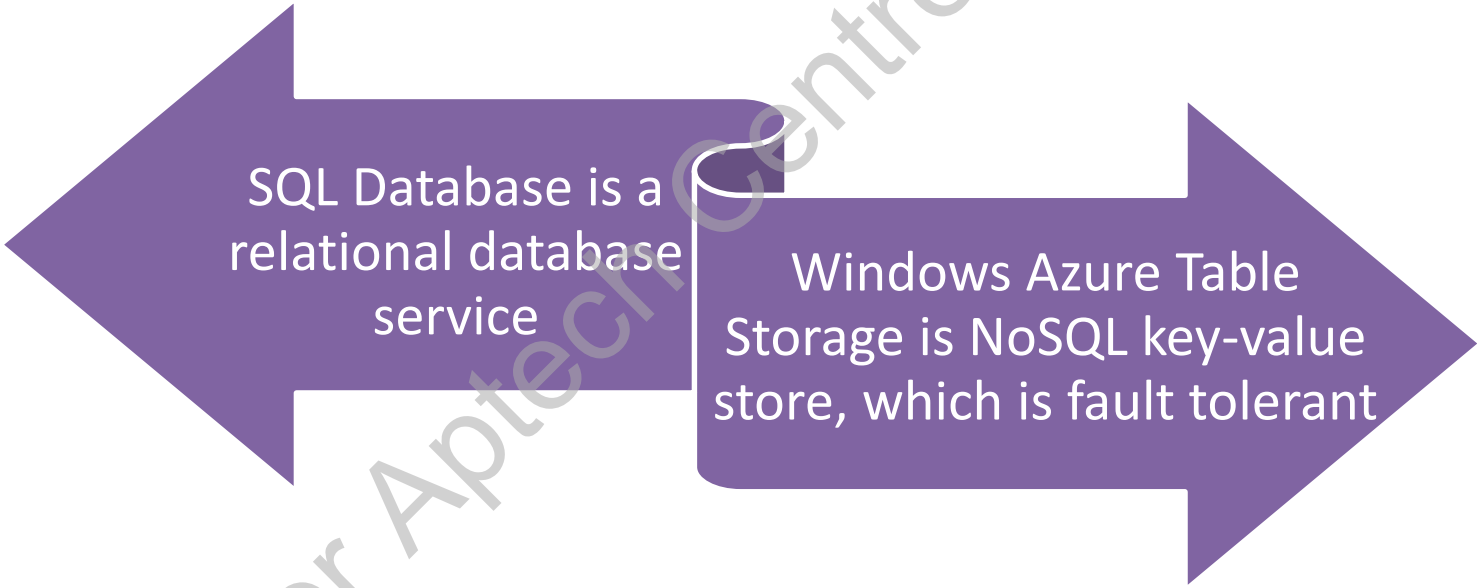
- You need to figure out the DNS name for your virtual machine, once you have performed the steps.
- You can get this name from the Azure Portal.
- Following figure shows the DNS name for the virtual machine:

Windows Azure SQL Database Provisioning Model 8-8

- The DNS name consists of a randomly generated server name with the standard URL, which is **.database.windows.net**.
- After the DNS name is determined, you can use SQL Server Management Studio on your local system to connect with the virtual machine as shown in the figure:
- In the provisioning process, the master database is automatically created.

Windows Azure Table Storage versus SQL Database 1-2

- Windows Azure Table Storage and SQL Database have their own primary benefits and features.



Windows Azure Table Storage versus SQL Database 2-2

- Following table describes the key differences between Windows Azure Table Storage and SQL Database:

Comparison Criteria	Windows Azure Table Storage	SQL Database
Data Relationship	No Relationship	Yes – using foreign keys
Processing at server side	Basic operations, such as insert, update, select, and delete are supported	Yes – uses standard SQL Server features, such as stored procedures
Transactions	Limited – Up to 100 operations in a transaction within the same table in same partition	Yes – within the same database
Geo-replication	Yes – across different regions	No
Scaling	Automatic	Manual
Data type support	Simple	Multiple – simple, complex, or user-defined
Partitioning	Can store more than 150 GB of data without partitioning	Requires partitioning when data is more than 150 GB per a single unit of co-located data sets

Troubleshooting and Error Handling 1-8

- The local instance of SQL Server provides a number of utilities that you can use to troubleshoot issues such as performance.
- Some of these utilities are:

SQL Server Profiler	Database Tuning Adviser (DTA)

- In the absence of these utilities, you can use a Dynamic Management Views (DMV).
- SQL Database has less number of DMVs as compared to a local instance of SQL Server.

Troubleshooting and Error Handling 2-8

- On SQL Database, if you face following issues, you need to check the `sys.event_log` file:
  - Database connections
  - Connection failures
  - Throttling
  - Deadlock

- With this file, you can view the events with the following details:

Troubleshooting and Error Handling 3-8

- If you suspect that some of the queries, which you have executed, are eating up resources, you can run the following DMVs to find those queries:

```
sys.dm_exec_query_stats
```

```
sys.dm_exec_sql_text
```

Troubleshooting and Error Handling 4-8

- A number of errors can crop up when using SQL Database such as a local database.
- Microsoft uses a set of error numbers to identify each error; and these error numbers are called error codes.
- When working with SQL Database, you may see a number of error codes depending on the errors.

Troubleshooting and Error Handling 5-8

- Following table describes some of the common error codes:

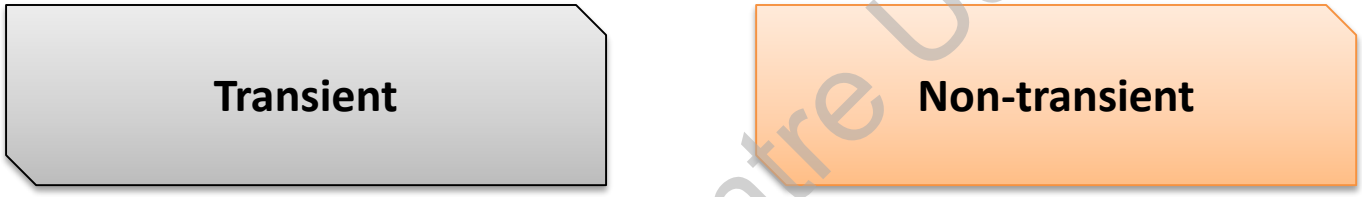
Error Code	Description
40014	For the same transaction, multiple databases cannot be used.
40133	It is not supported in this version of SQL Server.
40508	To switch between databases, USE statement is not supported. To connect to diverse database, use a new connection.
40607	In this version, Windows logins are not supported.
45168	• The SQL Azure system has a load and places an upper limit on concurrent DB CRUD operations for a single server. • In the error message, the server is specified and surpassed the maximum number of concurrent connections. • You need to try again later.

Troubleshooting and Error Handling 6-8

Error Code	Description
45169	• The SQL Azure system has a load and places an upper limit on concurrent server CRUD operations for a single subscription (such as, create server). • In the error message, the server is specified and surpassed the maximum number of concurrent connections, a request is rejected. • You need to try again later.
40637	Create database copy is currently disabled.

Troubleshooting and Error Handling 7-8

- The errors can be of two types:



  - You need to work with the retry logic in most cases to see if the error falls into the transient or non-transient category.
  - The transient errors go away by themselves and no errors are encountered after you retry the same action after some time.
  - One such example is network problem.
  - After you retry the same code, it works without any error.

Troubleshooting and Error Handling 8-8

- In the case of non-transient error, the error will remain no matter how many times you try it.
- For example:
  - If you have a syntax error in the query, no matter how many times you try it, an error will be generated.
- The retry logic requires you to retry the action after a while, so that you can figure out whether the error is in the transient or non-transient category.

Summary 1-2

- SQL Database can be used with different types of applications, such as Microsoft, custom applications, and third-party applications as well.
- SQL Database consists of four layers: Client, Services, Platform, and Infrastructure.
- An SQL Database server, which is located in a specific geographical location, can run a number of SQL Databases.
- SQL Database server can hold up to 150 databases as the upper limit.

Summary 2-2

- There are different sizes of virtual machines available in the Windows Azure gallery.
- These recommended sizes can be considered as the minimum requirements creating the SQL Server virtual machine.
- Windows Azure Table Storage and SQL Database have their own primary benefits.
- On SQL Database, if you face issues, such as database connections, connection failures, throttling, and deadlock, you need to check the sys.event_log file.