

Getting Started with Elastic DB Database Tools with Azure SQL

Growing and shrinking capacity on demand is one of the key cloud computing promises. Delivering on this promise has historically been tedious and complex for the database tier of cloud applications. Over the last few years, the industry has converged on well-established design patterns commonly known as sharding. While the general sharding pattern addresses the challenge, building and managing applications using sharding requires significant infrastructure investments independent of the application's business logic.

Azure SQL Elastic DB Tools (in preview) enables the data-tier of an application to scale in and out via industry-standard sharding practices, while significantly streamlining the development and management of your sharded cloud applications. Elastic database tools delivers both developer and management functionality which are provided through a set of .Net libraries and Azure service templates that you can host in your own Azure subscription to manage your highly scalable applications. Azure DB Elastic tools implements the infrastructure aspects of sharding and thus allows you to focus on the business logic of your application instead.

In this lab, you will be introduced to the developer experience for Azure SQL Database Elastic tools.

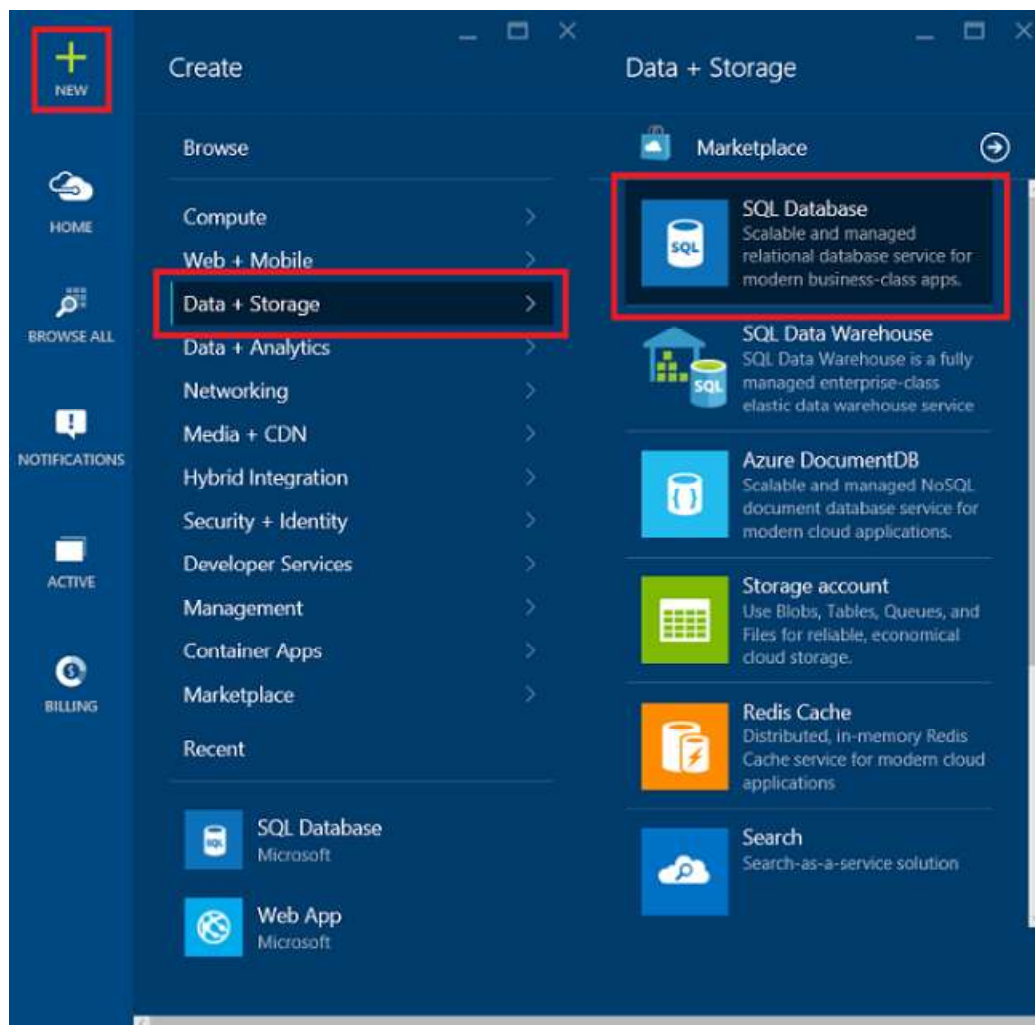
This lab includes the following tasks:

- Creating a Microsoft Azure SQL Database Server
- Walking through the sample
- Appendix - Cleanup

Creating a Microsoft Azure SQL Database Server

In this task you will create a new Microsoft Azure SQL Database Server and configure the firewall so that connections from applications running on your computer are allowed to access the databases on your SQL Database server.

1. Sign in to the [Azure Portal](#).
2. Click **New > Data + Storage > SQL Database**.



Navigating to the SQL Database Server tab

3. The **SQL Database** settings blade that appears is where you'll set up the **server and database** details.

A SQL database in Azure lives on a database server. A server can host multiple databases. As you set up a database, you can also create and set up the server that will host it, or you can use one that was created earlier. We'll set up a new one.

4. Type a **Name** for your database. We'll come back to cover other database settings later.
5. Under **Server** click **Configure required settings**, and then click **Create a new server**.

6. In the **New server** blade, type a **Server Name** that's unique throughout Azure and easy to remember. You'll need this name later when you connect and work with your database.
7. Type a **Server admin login** that's easy to remember. Then type a secure **Password** and type it again in **Confirm password**.

New server

Server name
adventureserver ✓
.database.windows.net

Server admin login
AdventureAdmin ✓

Password
***** ✓

Confirm password
***** ✓

* Location
East US 2 >

Create V12 server (Latest update)
Yes No

Allow azure services to access server ☒

OK

Leave *Create V12 Server (latest update)* set to **Yes** to use the latest features. The *Location* determines the data center region where your server is created.

8. Click **OK** to go back to **SQL Database** blade.
9. In the **SQL Database** blade, click **Select source** and then click **Blank**.

SQL Database

* Name
ad ✓

* Server
advserver (South India) >

* Select source ⁱ
Blank database ✓

Pricing tier ⁱ
Standard S0 >

Optional configuration ⁱ
Collation >

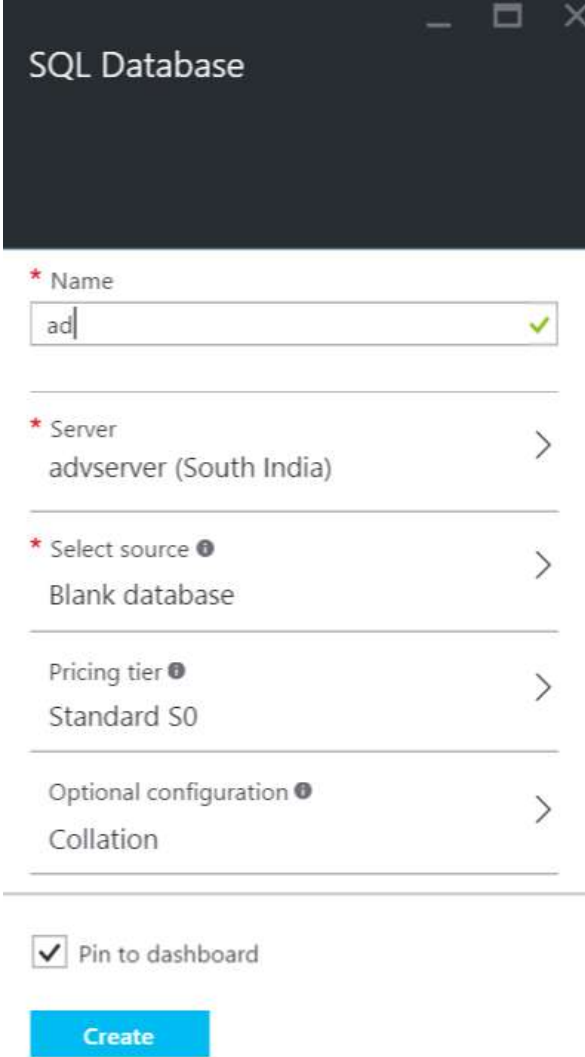
Select source

Blank database

Sample

Backup

10. Go back to the **SQL Database** blade, where **Select Source** now shows **Blank Database**. Click **Create** to kick off creation of the server and database.



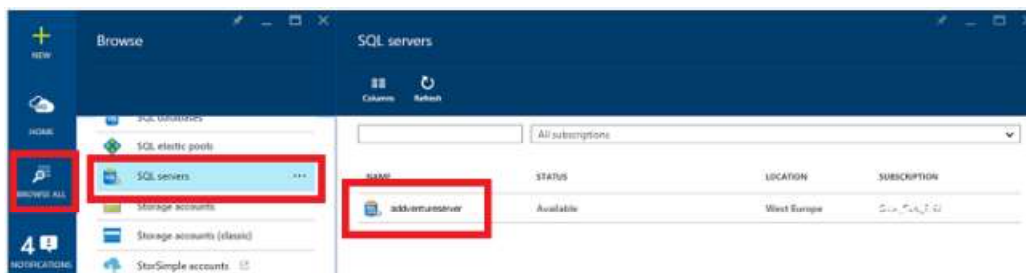
The screenshot shows the 'SQL Database' creation blade. It has a dark header with the title 'SQL Database'. Below the header, there are several configuration sections, each with a red asterisk icon and a right-pointing chevron:

- Name:** A text input field containing 'ad' with a green checkmark icon to its right.
- Server:** A dropdown menu showing 'advserver (South India)'.
- Select source:** A dropdown menu showing 'Blank database'.
- Pricing tier:** A dropdown menu showing 'Standard S0'.
- Optional configuration:** A dropdown menu showing 'Collation'.

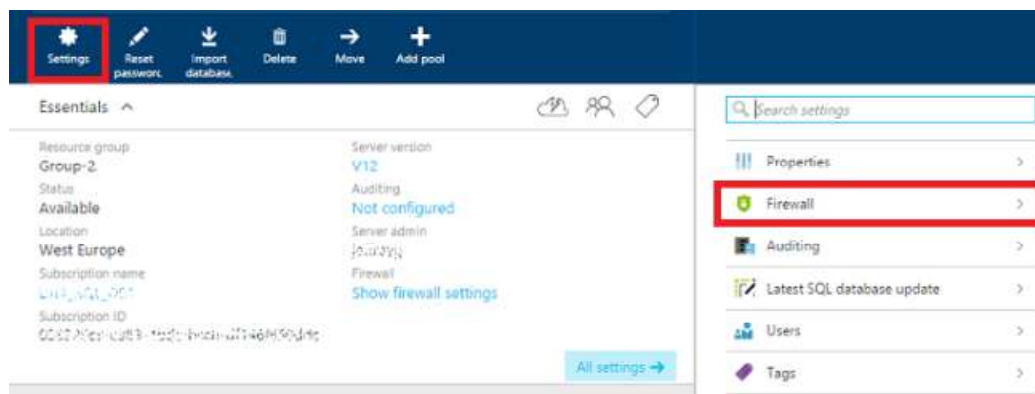
Below these sections is a checkbox labeled 'Pin to dashboard' which is checked. At the bottom is a blue 'Create' button.

You need to set up a firewall rule on the server that allows connections from your client computer's IP address so you can work with the database. This not only helps make sure you can connect, it's a great way to see the area where you can get other details about your SQL servers in Azure

11. Click **Browse all**, scroll down and then click **SQL servers**, and then click the name of the server you created earlier from the list of **SQL servers**



12. In the database properties blade that appears to the right, click **Settings** and then click **Firewall** from the list



The **Firewall settings** show your current **Client IP address**.



- Click **Add Client IP** to have Azure create a rule for that IP address, and then click **Save**.



- Take note of the name of the **SQL Database server** (e.g.: `z754axd2q8`), as you will need it in the following task.

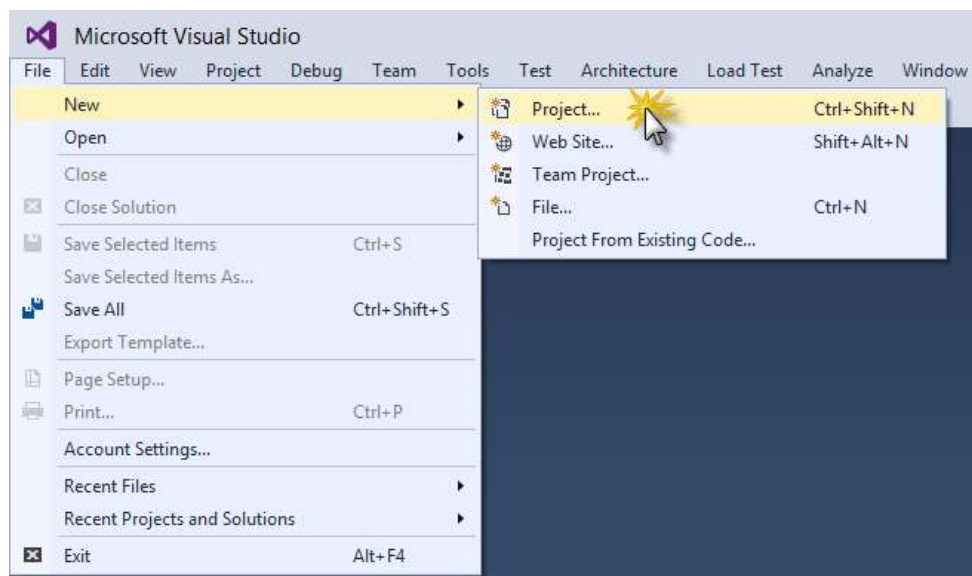
You now have a SQL Database server on Azure, a firewall rule that enables access to the server, and an administrator login.

Walking through the sample

The **Elastic Database with Azure SQL Database - Getting Started** sample application illustrates the most important aspects of the development experience for sharded applications using Azure SQL Elastic Database Tools. It focuses on key use cases for [Shard Map Management](#), [Data Dependent Routing](#) and [Multi-Shard Querying](#).

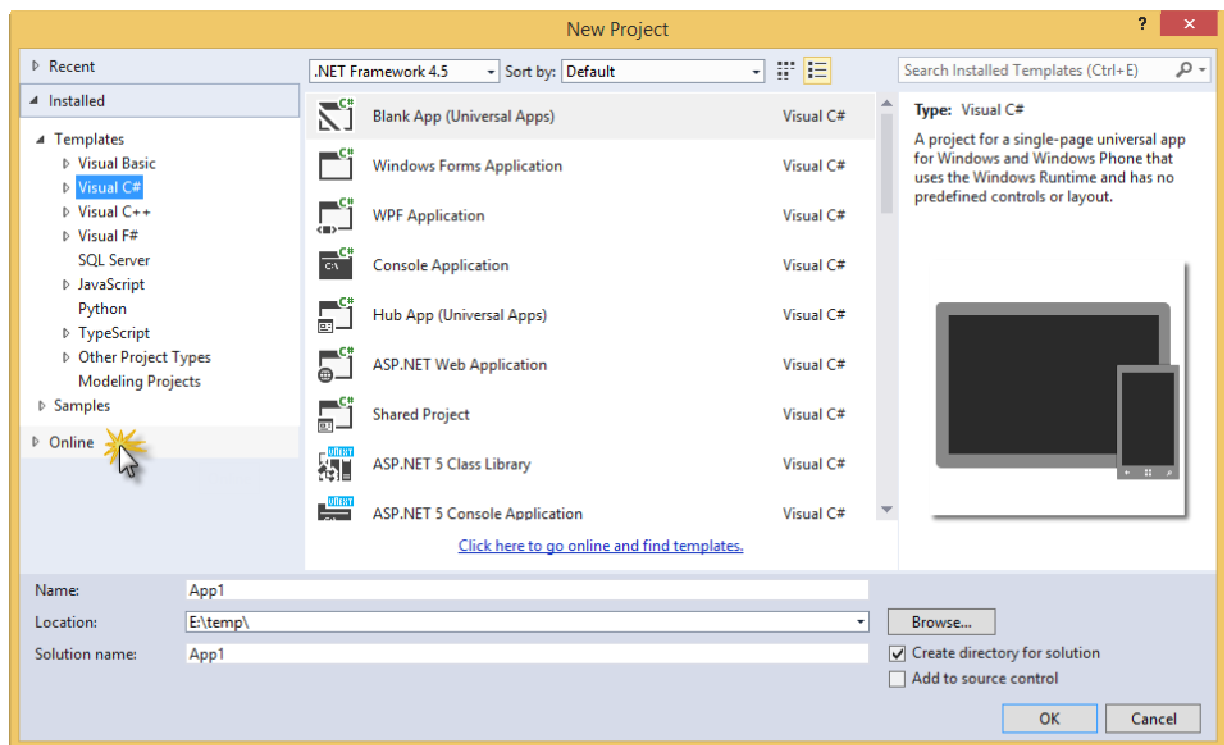
In this task, you will download and run this sample.

- Open Visual Studio and select **File -> New -> Project**.



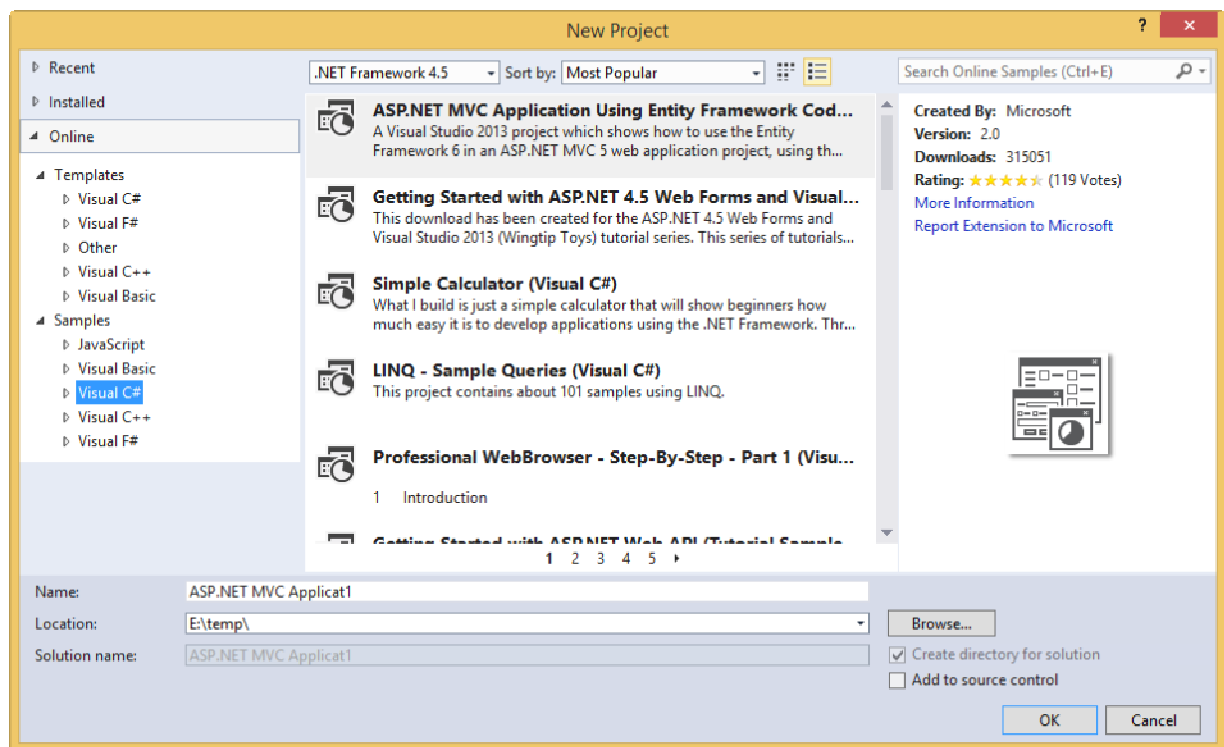
Creating a new project

2. In the **New Project** dialog box, click **Online**.



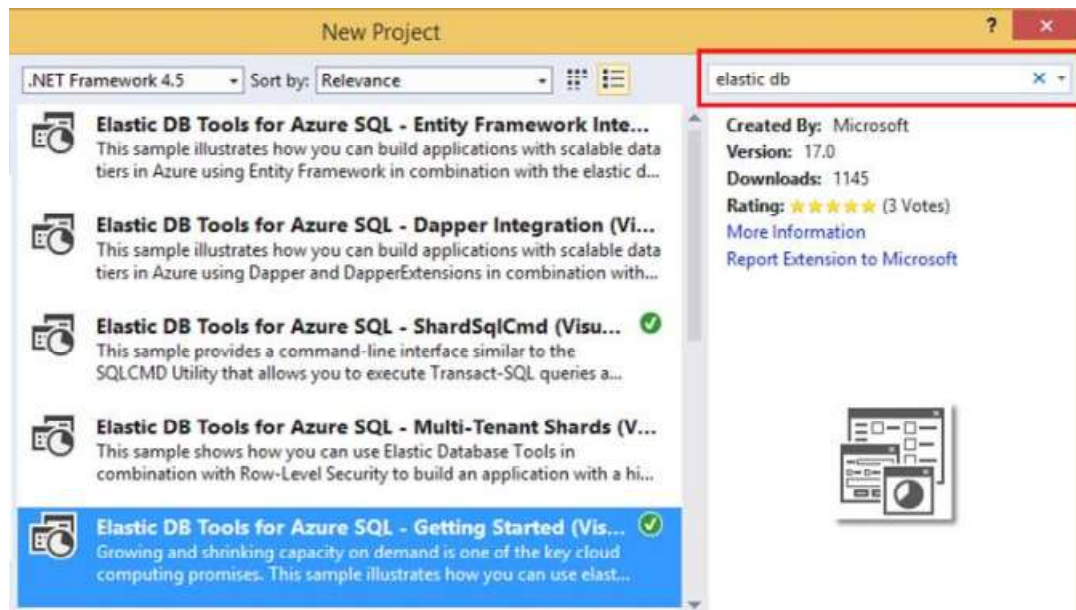
Clicking Online

3. Then click **Visual C#** under **Samples**.



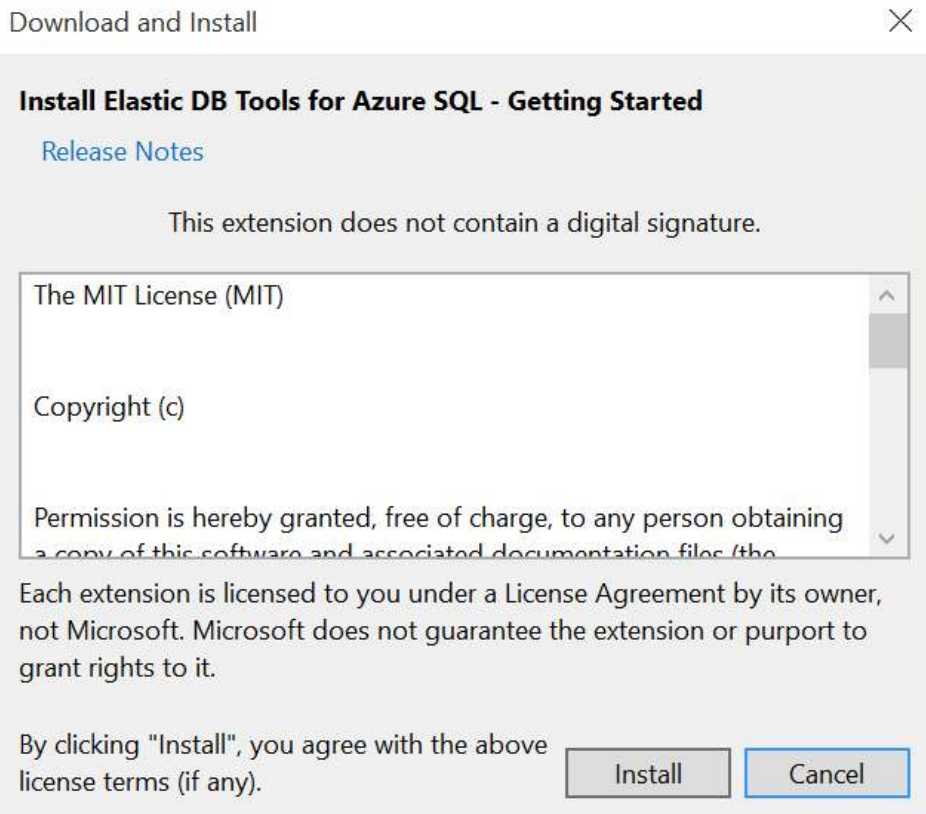
Navigating to online C# samples

4. In the search box, type **Elastic DB** to search for the sample. The title **Elastic DB Tools for Azure SQL - Getting Started** appears.
5. Select the sample, choose a name and a location for the new project and click **OK** to create the project.



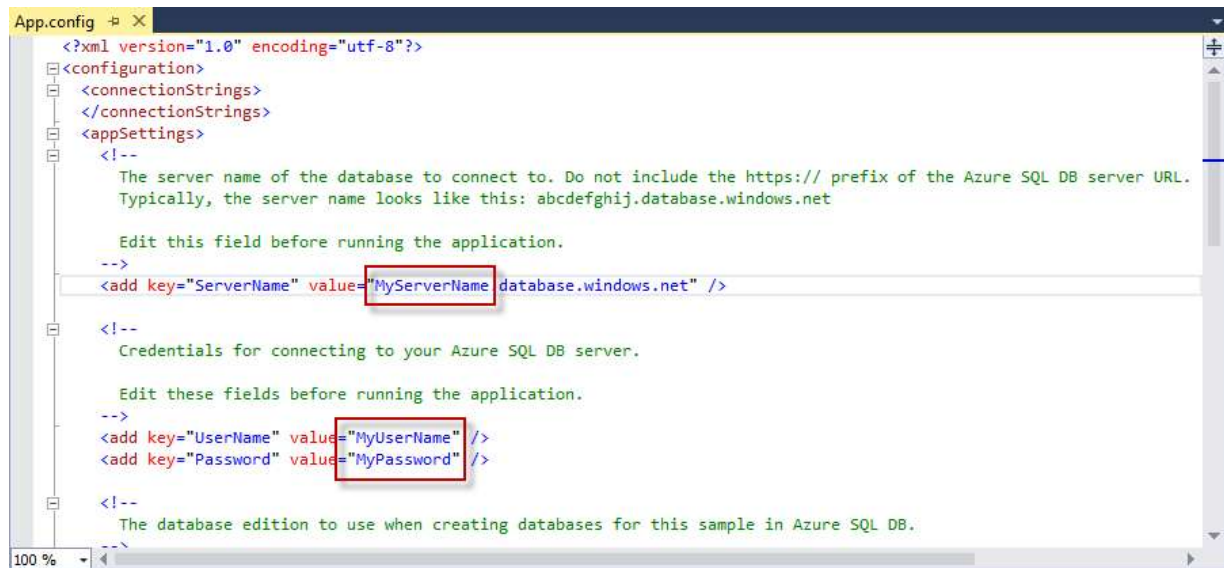
Creating the sample project

6. If the **Download and Install** dialog comes up, click **Install**.



Clicking Install in the Download and Install dialog

7. Open the **App.config** file in the solution for the sample project and replace the *MyServerName* placeholder with your Azure SQL database server name and the *MyUserName* and *MyPassword* placeholders with your login information (user name and password).



Configuring the sample project

8. Build and run the application. If asked, please allow Visual Studio to **restore the NuGet packages** of the solution. This will download the latest version of the Elastic Database Tools client libraries from **NuGet**.

```
C:\Windows\system32\cmd.exe

*****
***   Welcome to Elastic Database Tools Starter Kit   ***
*****

Current Shard Map state:
Shard Map Manager has not yet been created

1. Create shard map manager, and add a couple shards
2. Add another shard
3. Insert sample rows using Data-Dependent Routing
4. Execute sample Multi-Shard Query
5. Drop shard map manager database and all shards
6. Exit

Enter an option [1-6] and press ENTER:
```

Running the sample

9. In the application, type **1** and press **enter** in order to create the shard map manager and add several shards.

Note: The code illustrates how to work with shards, ranges, and mappings in file **ShardMapManagerSample.cs**. You can find more information about this topic here: [Shard Map Management](#).

The output will look like this:

Current Shard Map state:

Shard Map Manager has not yet been created

1. Create shard map manager, and add a couple shards
2. Add another shard
3. Insert sample rows using Data-Dependent Routing
4. Execute sample Multi-Shard Query
5. Drop shard map manager database and all shards
6. Exit

Enter an option [1-6] and press ENTER: 1

```
Creating database ElasticScaleStarterKit_ShardMapManagerDb
Database ElasticScaleStarterKit_ShardMapManagerDb is online
Created Shard Map Manager
Created Shard Map CustomerIDShardMap
Creating database ElasticScaleStarterKit_Shard0
Database ElasticScaleStarterKit_Shard0 is online
Executing script InitializeShard.sql
Added shard ElasticScaleStarterKit_Shard0 to the Shard Map
Mapped range [0:100) to shard ElasticScaleStarterKit_Shard0
Creating database ElasticScaleStarterKit_Shard1
Database ElasticScaleStarterKit_Shard1 is online
Executing script InitializeShard.sql
Added shard ElasticScaleStarterKit_Shard1 to the Shard Map
Mapped range [100:200) to shard ElasticScaleStarterKit_Shard1
```

Current Shard Map state:

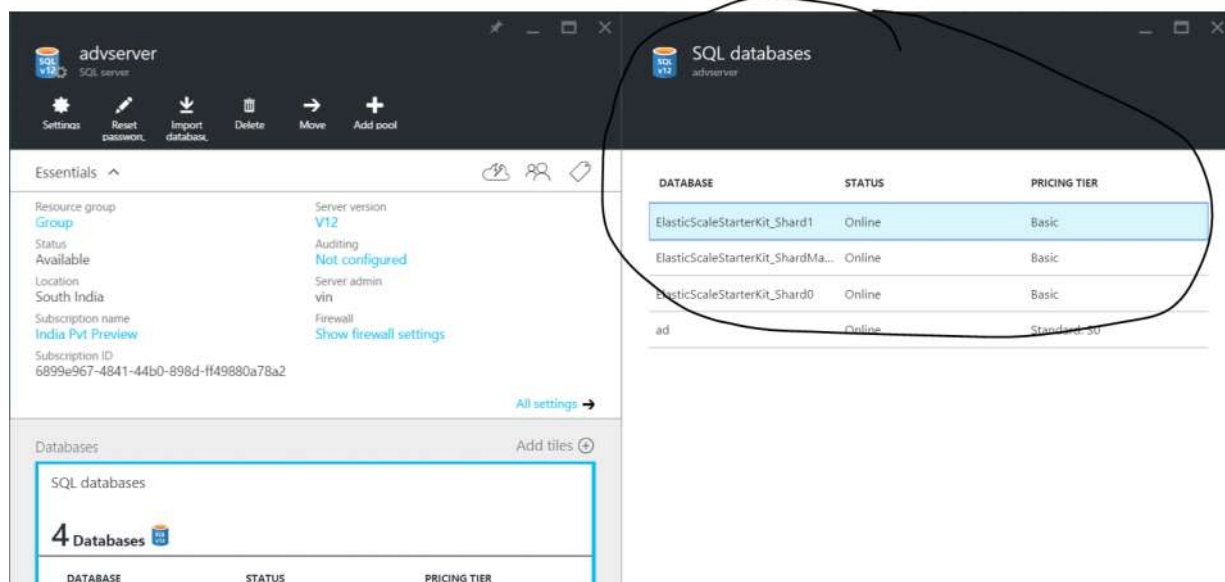
```
ElasticScaleStarterKit_Shard0 contains key range [0:100)
ElasticScaleStarterKit_Shard1 contains key range [100:200)
```

1. Create shard map manager, and add a couple shards
2. Add another shard
3. Insert sample rows using Data-Dependent Routing
4. Execute sample Multi-Shard Query
5. Drop shard map manager database and all shards
6. Exit

Enter an option [1-6] and press ENTER:

Creating the shard map manager and adding several shards

10. Switch to the [Azure Portal](#), navigate to the SQL Server created and click on the **SQL DATABASES** section.



Notice that you have three new databases: the shard manager and one for each shard.

- Switch back to the application, type **3** and then press **enter**. This will insert a sample row using Data-Dependent routing.

Note: Routing of transactions to the right shard is shown in **DataDependentRoutingSample.cs**. For more details, see [Data Dependent Routing](#).

```
file:///E:/samples/Elastic Scale with A1/ElasticScaleStarterKit/bin/Debug/Elastic...
ElasticScaleStarterKit_Shard1 contains key range [100:200)
1. Create shard map manager, and add a couple shards
2. Add another shard
3. Insert sample rows using Data-Dependent Routing
4. Execute sample Multi-Shard Query
5. Drop shard map manager database and all shards
6. Exit
Enter an option [1-6] and press ENTER: 3
    Inserted order for customer ID: 190
Current Shard Map state:
ElasticScaleStarterKit_Shard0 contains key range [0:100)
ElasticScaleStarterKit_Shard1 contains key range [100:200)
1. Create shard map manager, and add a couple shards
2. Add another shard
3. Insert sample rows using Data-Dependent Routing
4. Execute sample Multi-Shard Query
5. Drop shard map manager database and all shards
6. Exit
Enter an option [1-6] and press ENTER: _
```

Inserting sample row

- Repeat the last step at least three more times so that you have at least four rows.
- Now, type **4** and press **enter** in the application to execute a sample Multi-Shard Query.

Notice the `\$ShardName` column. It should show that the rows with a `CustomerId` from 0 to 99 are located in the `ElasticScaleStarterKit_Shard0` shard and those with a `CustomerId` from 100 to 199 are located in the `ElasticScaleStarterKit_Shard1` shard.

Note: Querying across shards is illustrated in the file **MultiShardQuerySample.cs**. For more information, see [Multi-Shard Querying](#).

```

file:///E:/samples/Elastic Scale with A1/ElasticScaleStarterKit/bin/Debug/Elastic...
1. Create shard map manager, and add a couple shards
2. Add another shard
3. Insert sample rows using Data-Dependent Routing
4. Execute sample Multi-Shard Query
5. Drop shard map manager database and all shards
6. Exit
Enter an option [1-6] and press ENTER: 4

CustomerId  CustomerName      OrderCount  $$ShardName
-----
90          Humongous Insurance 1          ElasticScaleStarterKit_Shard0
152         Coho Winery         1          ElasticScaleStarterKit_Shard1
172         Microsoft Corp.    1          ElasticScaleStarterKit_Shard1
190         AdventureWorks Cycles 1          ElasticScaleStarterKit_Shard1

(4 rows returned)
Current Shard Map state:
ElasticScaleStarterKit_Shard0 contains key range [0:100)
ElasticScaleStarterKit_Shard1 contains key range [100:200)

1. Create shard map manager, and add a couple shards
2. Add another shard
3. Insert sample rows using Data-Dependent Routing
4. Execute sample Multi-Shard Query
5. Drop shard map manager database and all shards
6. Exit
Enter an option [1-6] and press ENTER:

```

Executing a Multi-Shard Query

14. Type **2** and press **enter** in the application to add another shard. When prompted for the higher key of the new range, press **enter** to use the default value of 300.

Note: The iterative addition of new empty shards is performed by the code in file **AddNewShardsSample.cs**. For more information, see [Shard Map Management](#).

```

file:///E:/samples/Elastic Scale with A1/ElasticScaleStarterKit/bin/Debug/Elastic...
1. Create shard map manager, and add a couple shards
2. Add another shard
3. Insert sample rows using Data-Dependent Routing
4. Execute sample Multi-Shard Query
5. Drop shard map manager database and all shards
6. Exit
Enter an option [1-6] and press ENTER: 2

A new range with low key 200 will be mapped to the new shard.
Enter the high key for the new range [default 300]:

Creating shard for range [200:300)
Creating database ElasticScaleStarterKit_Shard2
Database ElasticScaleStarterKit_Shard2 is online
Executing script InitializeShard.sql
Added shard ElasticScaleStarterKit_Shard2 to the Shard Map
Mapped range [200:300) to shard ElasticScaleStarterKit_Shard2

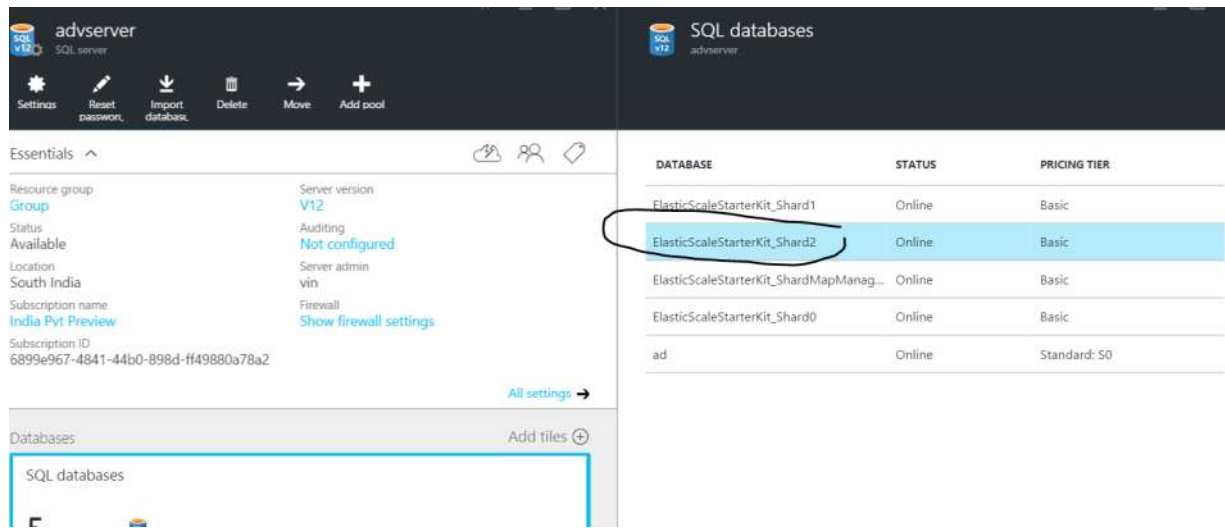
Current Shard Map state:
ElasticScaleStarterKit_Shard0 contains key range [0:100)
ElasticScaleStarterKit_Shard1 contains key range [100:200)
ElasticScaleStarterKit_Shard2 contains key range [200:300)

1. Create shard map manager, and add a couple shards
2. Add another shard
3. Insert sample rows using Data-Dependent Routing
4. Execute sample Multi-Shard Query
5. Drop shard map manager database and all shards
6. Exit
Enter an option [1-6] and press ENTER:

```

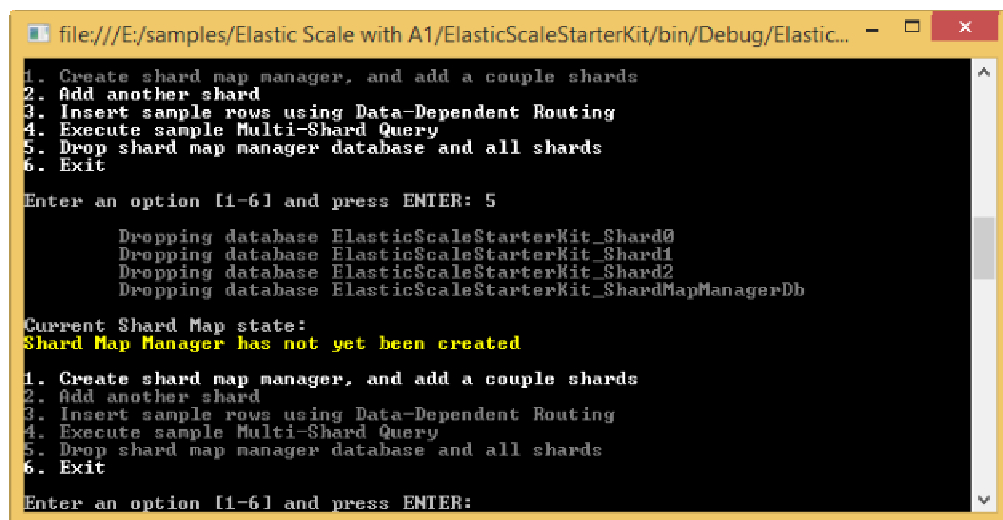
Adding a new shard

15. Switch back to the [Azure Portal](#). You should see a new database for the new shard named *ElasticScaleStarterKit_Shard2*.



Viewing the new database in the portal

- Switch back to the application, type **5** and press **enter**. This will drop all the shards and the map manager database.



Removing the shards and the map manager

- Stop debugging.

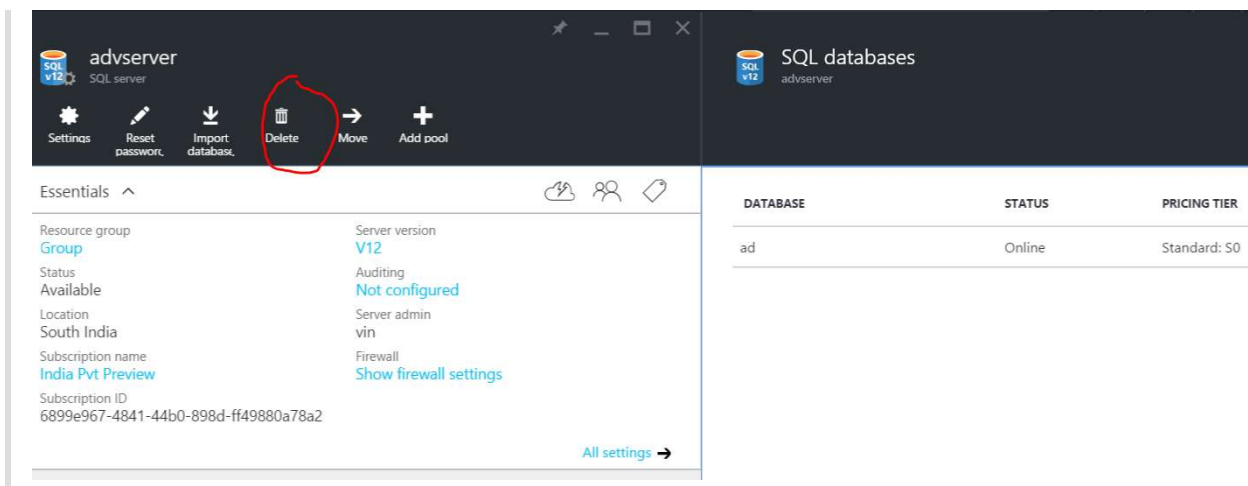
You have successfully built and run your first Elastic DB Tools application on Azure SQL DB. You can find information on other Elastic DB Tools operations in the following links:

- **Splitting an existing shard:** The capability to split shards is provided through the **Split/Merge service**. You can find more information about this service here: [Split/Merge Service](#).
- **Merging existing shards:** Shard merges are also performed using the **Split/Merge service**. For more information, see [Split/Merge Service](#).

Appendix - Cleanup

In this task you will learn how to delete the SQL Database Server created in the first task.

- Sign in to the [Azure Portal](#).
- Find the server created above.
- Select it and then click **DELETE** from the options.



4. In the confirmation dialog that appears, type the server name and the click the **Delete**.

The server will be deleted. Once it is done you should see a notification in the bottom bar.

Summary

By completing this lab, you have learned the basic concepts of Azure SQL Database Elastic DB Tools: Shard Map Management, Data Dependent Routing and Multi-Shard Querying.