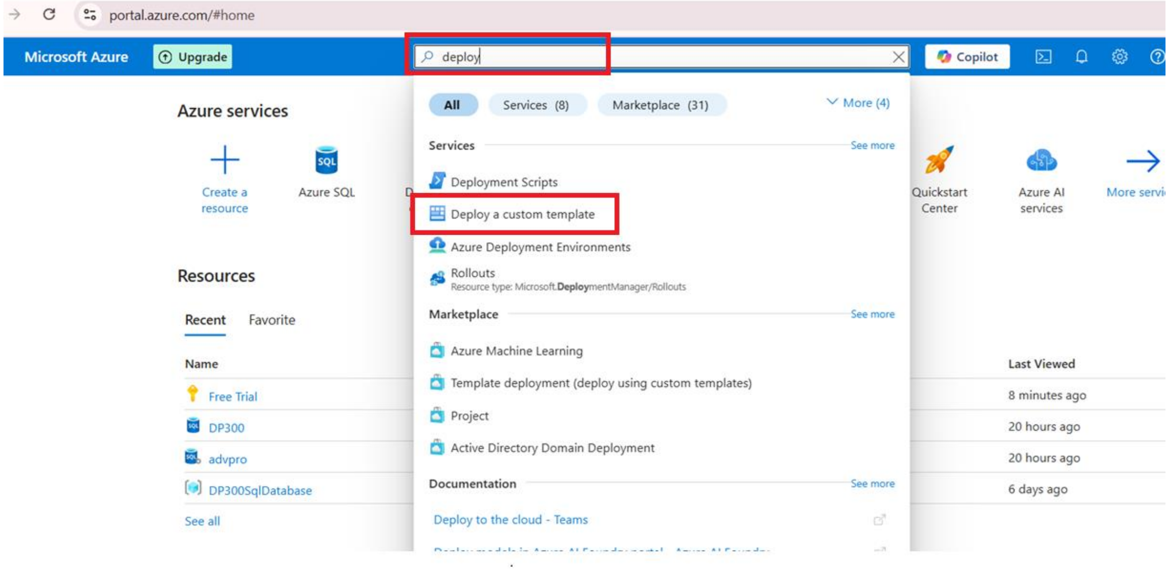
Automate Deployment using Azure Resource Manager (ARM) Templates

We're going to look now more deeply at how to automate deployment and we're going to start by using Azure Resource Manager, or ARM, templates.

So, an ARM template is a JSON, a *JavaScript Object Notation* file that defines your project.

I can create ones from templates, if I go to Deploy a custom template. So here you can I can select a template.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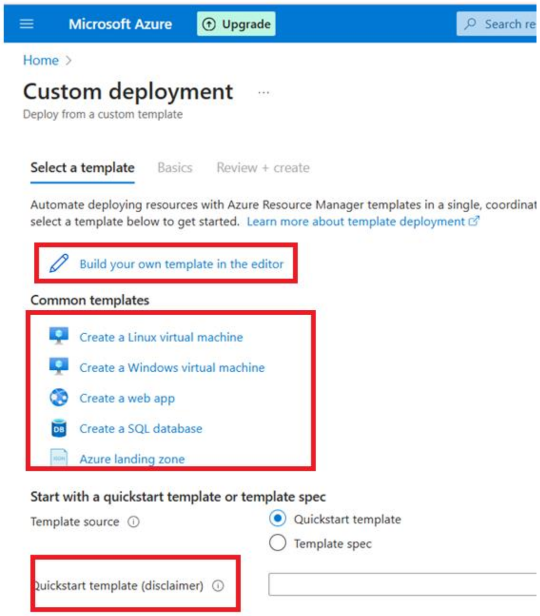
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Custom deployment ...

Deploy from a custom template

Select a template | Basics | Review + create

Automate deploying resources with Azure Resource Manager templates in a single, coordinat select a template below to get started. Learn more about template deployment

Build your own template in the editor

Common templates

- Create a Linux virtual machine
- Create a Windows virtual machine
- Create a web app
- Create a SQL database
- Azure landing zone

Start with a quickstart template or template spec

Template source ⓘ ● Quickstart template ○ Template spec

uickstart template (disclaimer) ⓘ

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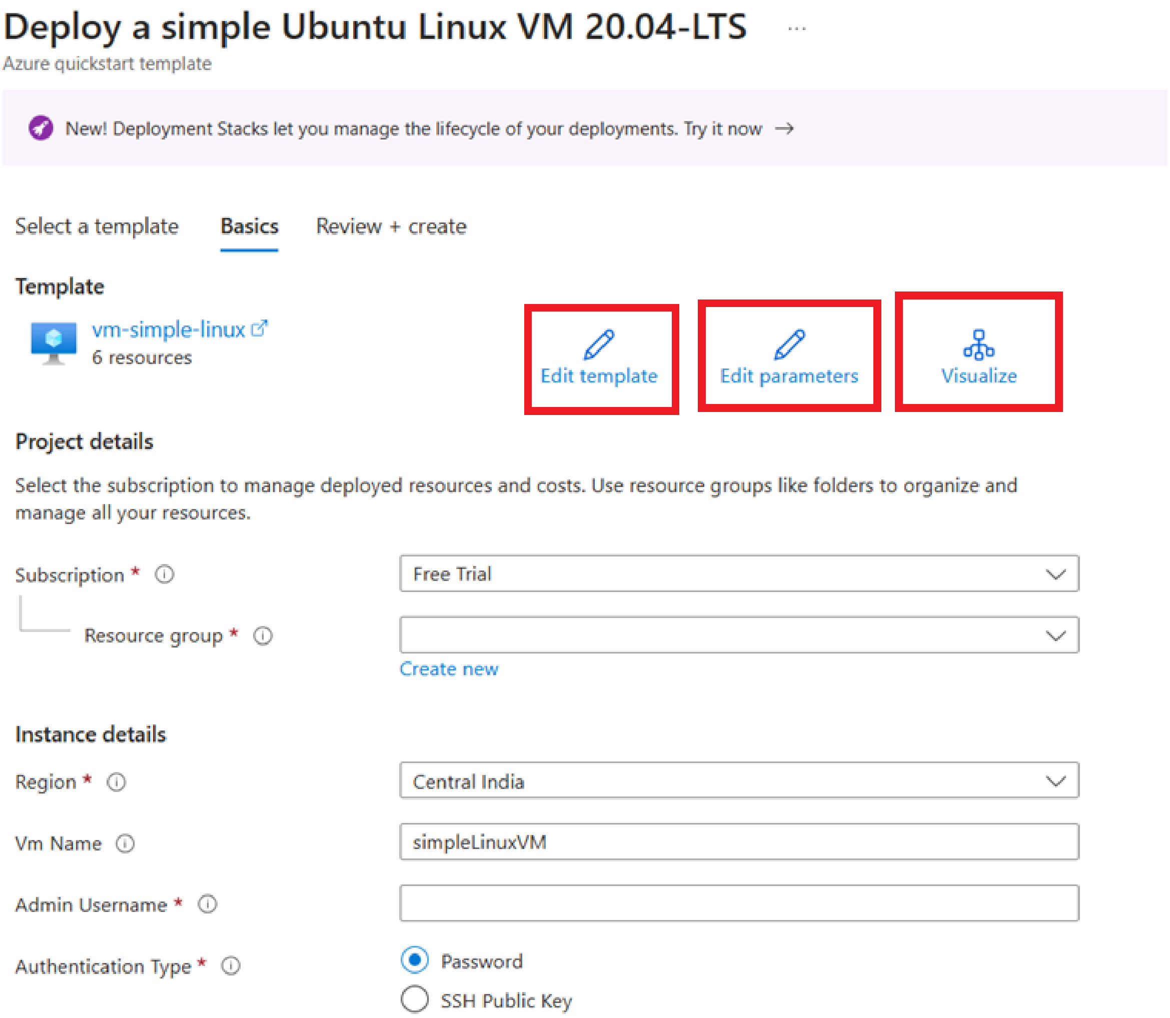
So, there are some common templates, such as create a SQL Database but if I click that, that gets me to something similar to the standard create an SQL database.

I can edit the template,

I can edit parameters

I can visualize.



Deploy a simple Ubuntu Linux VM 20.04-LTS ...

Azure quickstart template

New! Deployment Stacks let you manage the lifecycle of your deployments. Try it now →

Template

vm-simple-linux
6 resources

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * : Free Trial

Resource group * :

Create new

Instance details

Region * : Central India

Vm Name : simpleLinuxVM

Admin Username * :

Authentication Type * : ● Password ○ SSH Public Key

because it's an easy thing we're doing. You can see here, we've got the SQL Server and that's about it. So what I'm going to do is instead go back to the custom deployment.

Now, we can build our own template in the editor, and that just starts off with a very empty JSON document.

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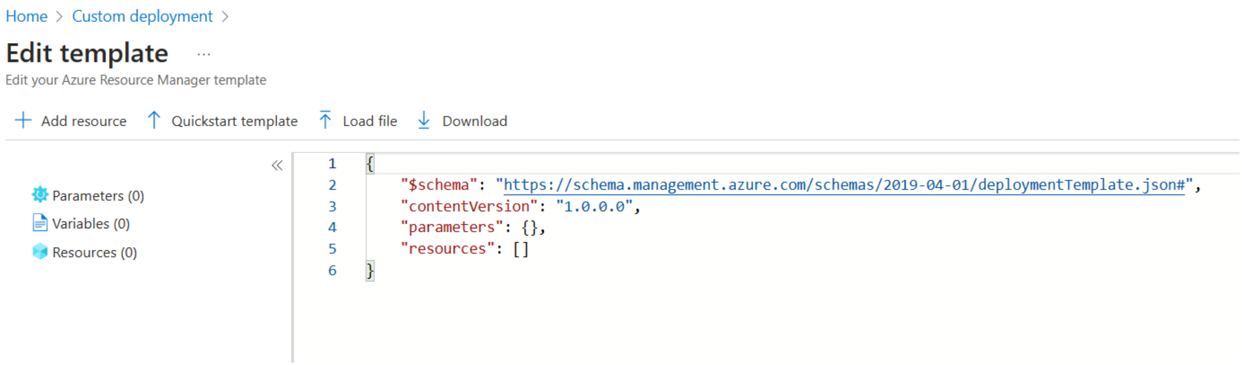
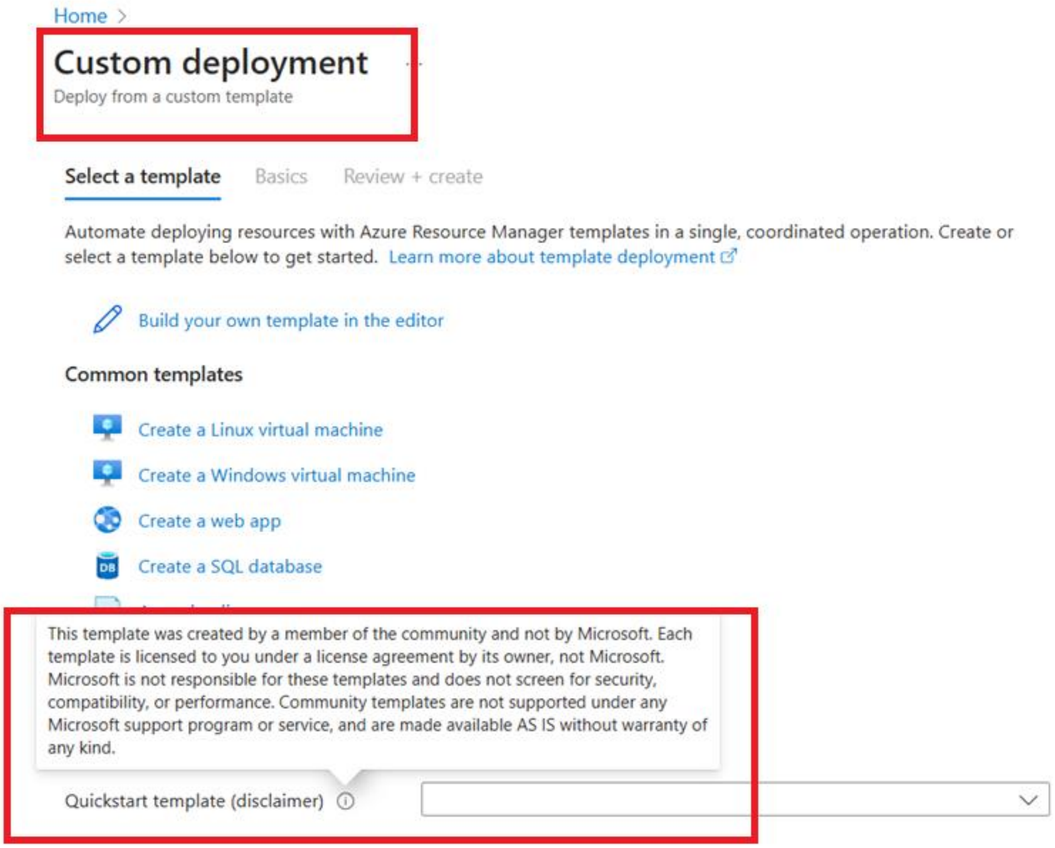


```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {},
    "resources": []
}
```

We've got the curly brackets at the beginning and at the end, and in between, we have got these key-value pairs. So, we have contentVersion and the value 1.0.0.0 content.

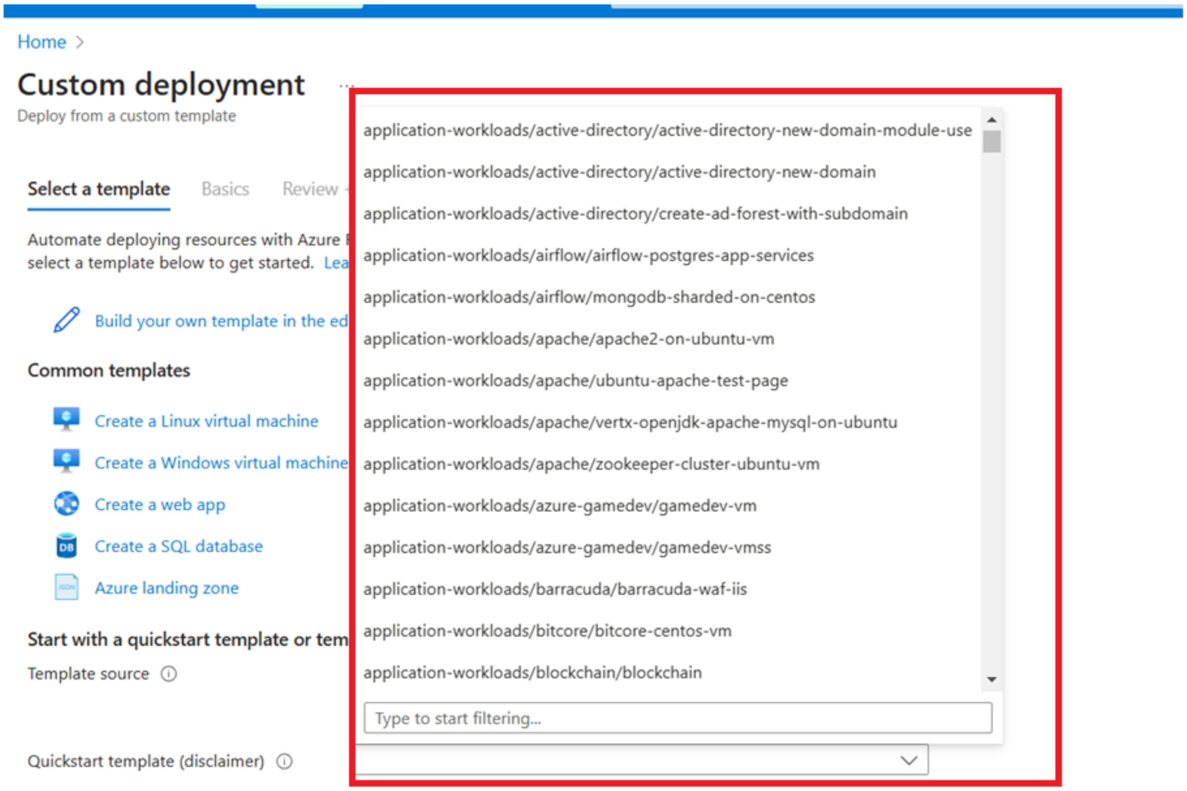
Instead, what I'm going to do is have a look at the *Quickstart template.* Now, these are not official Microsoft templates. You can see they're created by members of the community.


Home >
Custom deployment
Deploy from a custom template
Select a template
Basics
Review + create
Build your own template in the editor
Common templates
Create a Linux virtual machine
Create a Windows virtual machine
Create a web app
Create a SQL database
Quickstart template (disclaimer)

Automate deploying resources with Azure Resource Manager templates in a single, coordinated operation. Create or select a template below to get started. Learn more about template deployment

This template was created by a member of the community and not by Microsoft. Each template is licensed to you under a license agreement by its owner, not Microsoft. Microsoft is not responsible for these templates and does not screen for security, compatibility, or performance. Community templates are not supported under any Microsoft support program or service, and are made available AS IS without warranty of any kind.

Now, you might think that's a bit of a drawback, but it isn't because when I click on it, you can see because the community has contributed to all of these, there are an enormous number of them.



Home >

Custom deployment ...

Deploy from a custom template

Select a template | Basics | Review

Automate deploying resources with Azure R
select a template below to get started. Lea

Build your own template in the ed

Common templates

- Create a Linux virtual machine
- Create a Windows virtual machine
- Create a web app
- Create a SQL database
- Azure landing zone

Start with a quickstart template or tem

Template source

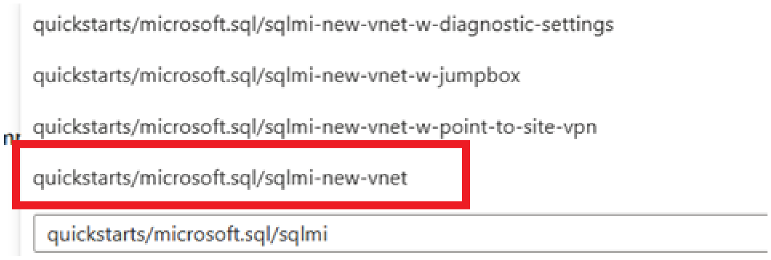
Quickstart template (disclaimer)

application-workloads/active-directory/active-directory-new-domain-module-use
application-workloads/active-directory/active-directory-new-domain
application-workloads/active-directory/create-ad-forest-with-subdomain
application-workloads/airflow/airflow-postgres-app-services
application-workloads/airflow/mongodb-sharded-on-centos
application-workloads/apache/apache2-on-ubuntu-vm
application-workloads/apache/ubuntu-apache-test-page
application-workloads/apache/vertx-openjdk-apache-mysql-on-ubuntu
application-workloads/apache/zookeeper-cluster-ubuntu-vm
application-workloads/azure-gamedev/gamedev-vm
application-workloads/azure-gamedev/gamedev-vmss
application-workloads/barracuda/barracuda-waf-iis
application-workloads/bitcore/bitcore-centos-vm
application-workloads/blockchain/blockchain

Type to start filtering...

So, it really makes your life a lot easier to start with. So, let's have a look for SQL. And if I scroll down to the Quickstart, you can see that we have got things relating to DB, and other things like here is our SQL database.

Now notice, we also have got further down



quickstarts/microsoft.sql/sqlmi-new-vnet-w-diagnostic-settings
quickstarts/microsoft.sql/sqlmi-new-vnet-w-jumpbox
quickstarts/microsoft.sql/sqlmi-new-vnet-w-point-to-site-vpn
quickstarts/microsoft.sql/sqlmi-new-vnet

quickstarts/microsoft.sql/sqlmi

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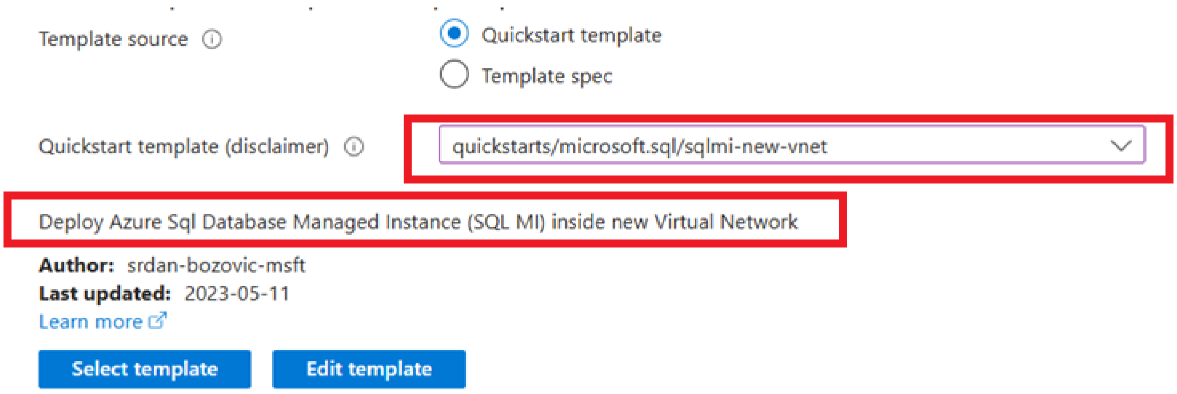
SQL managed instance with a new VNet. And you can see the definition of that, deploy Azure SQL database managed instance inside a new virtual network.

So, if you're not at all sure what any of this means, then you can just click on them and see a definition, and we've also got



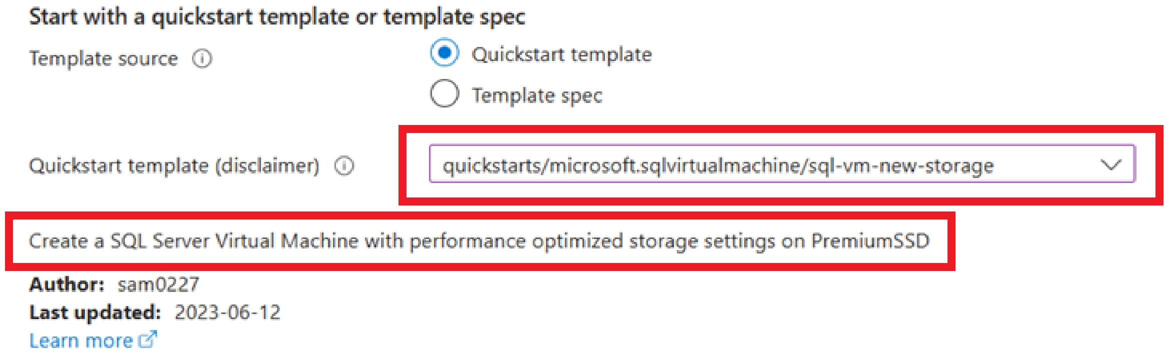
Template source ⓘ ● Quickstart template ○ Template spec

Quickstart template (disclaimer) ⓘ quickstarts/microsoft.sql/sqlmi-new-vnet

Deploy Azure Sql Database Managed Instance (SQL MI) inside new Virtual Network

Author: srdan-bozovic-msft
Last updated: 2023-05-11
Learn more

quickstartmicrosoft.sqlvirtualmachine/sqlvmnewstorage.



Start with a quickstart template or template spec

Template source ⓘ ● Quickstart template ○ Template spec

Quickstart template (disclaimer) ⓘ quickstarts/microsoft.sqlvirtualmachine/sql-vm-new-storage

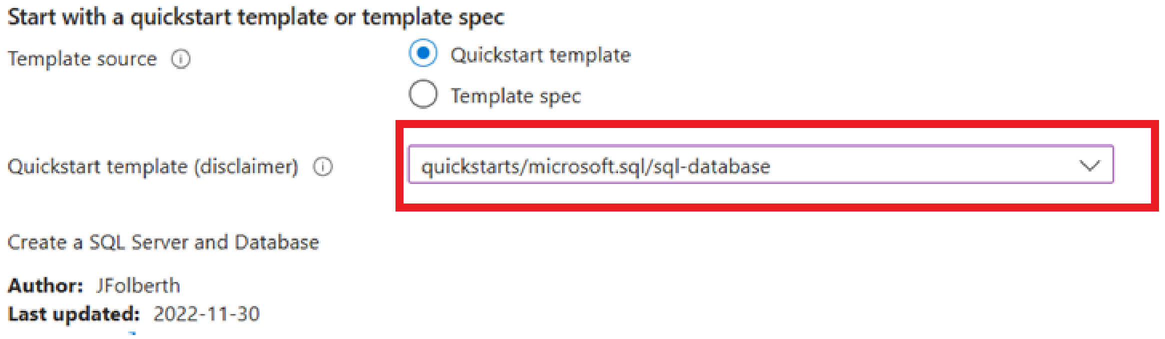
Create a SQL Server Virtual Machine with performance optimized storage settings on PremiumSSD

Author: sam0227
Last updated: 2023-06-12
Learn more

So, a SQL Server virtual machine with optimised storage settings.

So, what we're going to concentrate on for this is the SQL database,

quickstartmicrosoft.sqlsql-database.



Start with a quickstart template or template spec

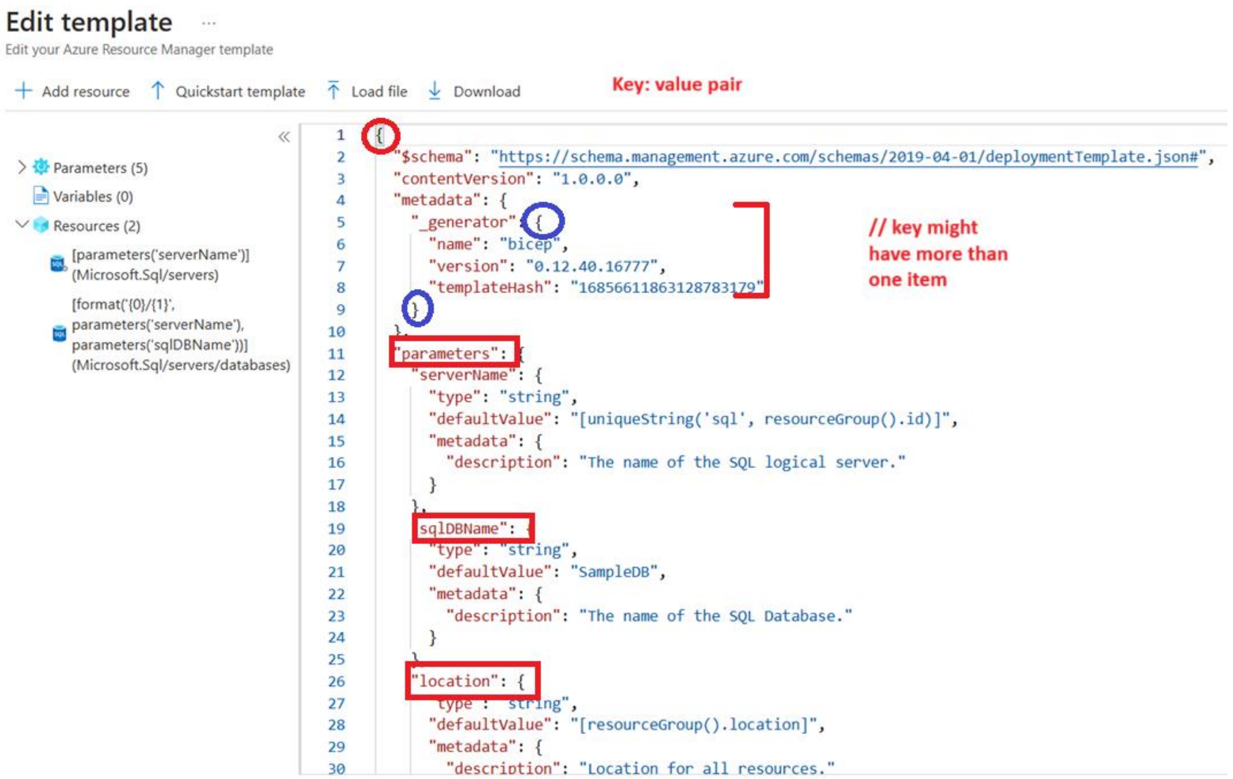
Template source ⓘ ● Quickstart template ○ Template spec

Quickstart template (disclaimer) ⓘ quickstarts/microsoft.sql/sql-database

Create a SQL Server and Database

Author: JFolberth
Last updated: 2022-11-30

I'm going to edit the template



Edit template ···
Edit your Azure Resource Manager template

+ Add resource
Quickstart template
Load file
Download
Parameters (5)
Variables (0)
Resources (2)
[parameters('serverName')] (Microsoft.Sql/servers)
[format('{0}/{1}', parameters('serverName'), parameters('sqlDBName'))] (Microsoft.Sql/servers/databases)

Key: value pair

```
{
  "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
  "contentVersion": "1.0.0.0",
  "metadata": {
    "_generator": {
      "name": "bicep",
      "version": "0.12.40.16777",
      "templateHash": "1685661186312878317 9"
    }
  },
  "parameters": {
    "serverName": {
      "type": "string",
      "defaultValue": "[uniqueString('sql', resourceGroup().id)]",
      "metadata": {
        "description": "The name of the SQL logical server."
      }
    },
    "sqlDBName": {
      "type": "string",
      "defaultValue": "SampleDB",
      "metadata": {
        "description": "The name of the SQL Database."
      }
    },
    "location": {
      "type": "string",
      "defaultValue": "[resourceGroup().location]",
      "metadata": {
        "description": "Location for all resources."
```

// key might have more than one item

so, we can see what it looks like. So again, we have got these curly brackets at the beginning and the end. And within that, these key-value pairs.

Now, something to note is that a particular key might have more than one item and so they're contained in squiggly brackets. So, we have got metadata,

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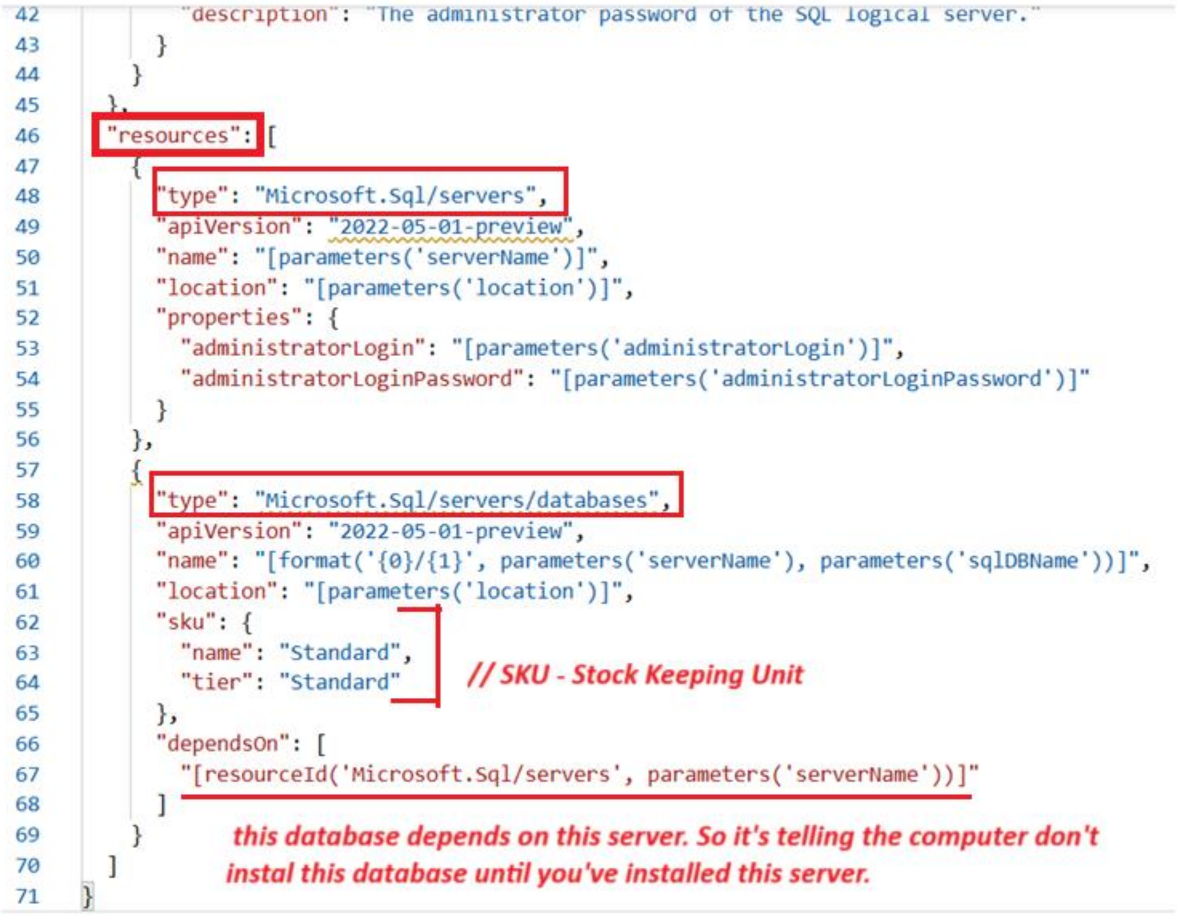
and within metadata, we have got _generator and within that, we've got name, version and templatehash.

Now, we've got a section for parameters. And the first parameter you can see here, servername. So, we've got a type, a string, a defaultvalue, which is actually a formula, so this isn't a literal. This says give me a unique string among SQL, so it'll be a computer-generated string.

Metadata, we've got the description. So, the name of the SQL logical server. We then have the SQL database name, its location, and credentials, administratorLogin

and administratorLoginPassword.

Now, if I scroll down,



```
        "description": "The administrator password of the SQL logical server."
      }
    }
  },
  "resources": [
    {
      "type": "Microsoft.Sql/servers",
      "apiVersion": "2022-05-01-preview",
      "name": "[parameters('serverName')]",
      "location": "[parameters('location')]",
      "properties": {
        "administratorLogin": "[parameters('administratorLogin')]",
        "administratorLoginPassword": "[parameters('administratorLoginPassword')]"
      }
    },
    {
      "type": "Microsoft.Sql/servers/databases",
      "apiVersion": "2022-05-01-preview",
      "name": "[format('{0}/{1}', parameters('serverName'), parameters('sqlDBName'))]",
      "location": "[parameters('location')]",
      "sku": {
        "name": "Standard",
        "tier": "Standard"
      },
      "dependsOn": [
        "[resourceId('Microsoft.Sql/servers', parameters('serverName'))]"
      ]
    }
  ]
}
```

// SKU - Stock Keeping Unit

this database depends on this server. So it's telling the computer don't instal this database until you've installed this server.

here we can see the resources, and this is probably the key line you need to remember for the DP-300 exam. The type.

So, we've got Microsoft.Sql/servers

and Microsoft.Sql/servers/databases.

So those are the types that you need for an Azure SQL database. So, for managed instance, it would say Microsoft.Sql/managedinstances.

And for virtual machine, it would say Microsoft.Computer/virtualmachines.

Now, let's have a look at some of the features of this. So, the name says I want to go back to the parameters and give me the servername. Same for the location and for the login properties.

Then for the database itself, we have got the name, which is given from the servername and the database name and location, and then we've got the SKU.

So, this is the type of database. It's the stock keeping unit. And then we've got this depends On. And what we're saying here is this database depends on this server. So, it's telling the computer doesn't install this database until you've installed this server.

Now, you notice what all of this is saying here. This is what we want. It is not saying to Azure this is how you are to install it.

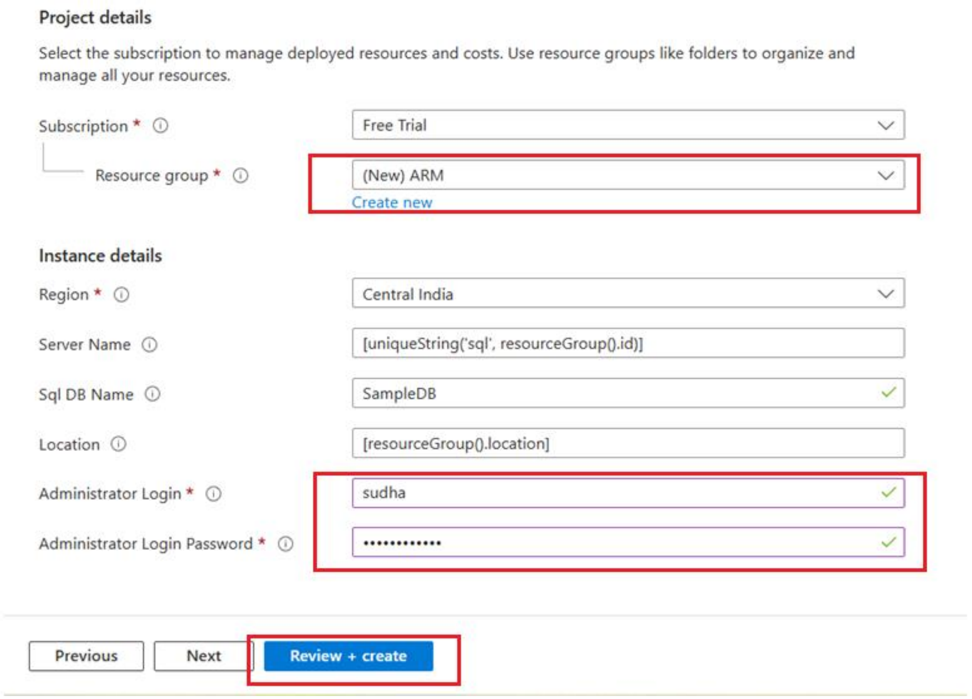
We are just giving the specifications, all the parameters, that sort of thing. But we're not saying to the computer and to do this, you need to install this server using this following method. We let the computer decide on the actual method.

So, what I'm going to do is say okay, that's completely fine. You may also have additional files, for instance, you might have a separate parameters file but here we've got the parameters in the main file.

So, let's click Save.

And now we can deploy. So, we've got the subscription. We can change that if we want. We are creating a new resource group. So, I'm going to call this ARM. We have a region; the server's name is our function. Got a database name and a location, which again goes back to the resource group location.

And then I need an administrator login. I'm going to give my name and a password and I'm going to give an obvious password that I never use elsewhere. So having done that, I can then review and create.



Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * : Free Trial

Resource group * : (New) ARM

Create new

Instance details

Region * : Central India

Server Name : [uniqueString('sql', resourceGroup().id)]

Sql DB Name : SampleDB

Location : [resourceGroup().location]

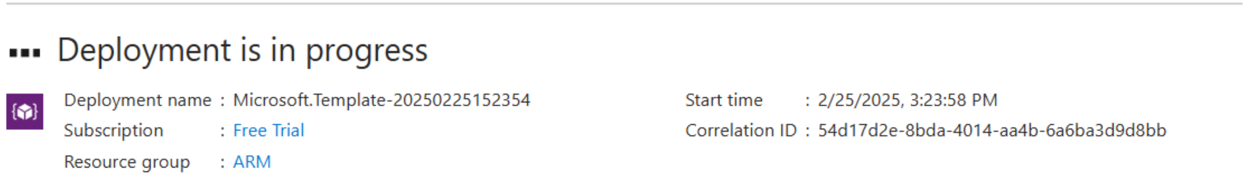
Administrator Login * : sudha

Administrator Login Password * : ••••••••••••

So, it's going to create two resources. So, you can see the validation is passed. If for some reason you see the validation has failed, then you might perhaps need to just go back and click on Select template. And just make sure all of your parameters are fine. So as the validation is passed,

we can click “Create”

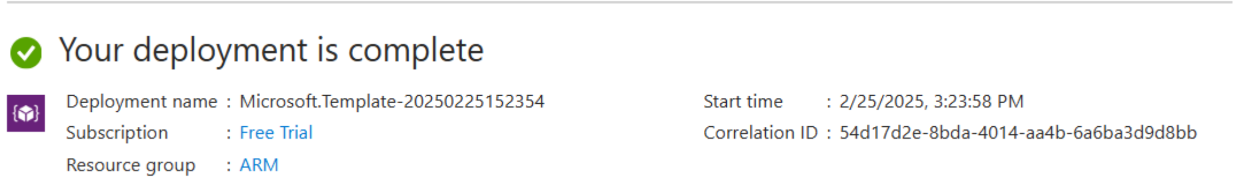
and now it is submitting and deploying it, just like any other SQL database. So, I'm just going to pause for a few seconds and allow Azure to build this server.



Deployment is in progress

Deployment name : Microsoft.Template-20250225152354	Start time : 2/25/2025, 3:23:58 PM
Subscription : Free Trial	Correlation ID : 54d17d2e-8bda-4014-aa4b-6a6ba3d9d8bb
Resource group : ARM	

So here you can see, it has succeeded,



Your deployment is complete

Deployment name : Microsoft.Template-20250225152354	Start time : 2/25/2025, 3:23:58 PM
Subscription : Free Trial	Correlation ID : 54d17d2e-8bda-4014-aa4b-6a6ba3d9d8bb
Resource group : ARM	

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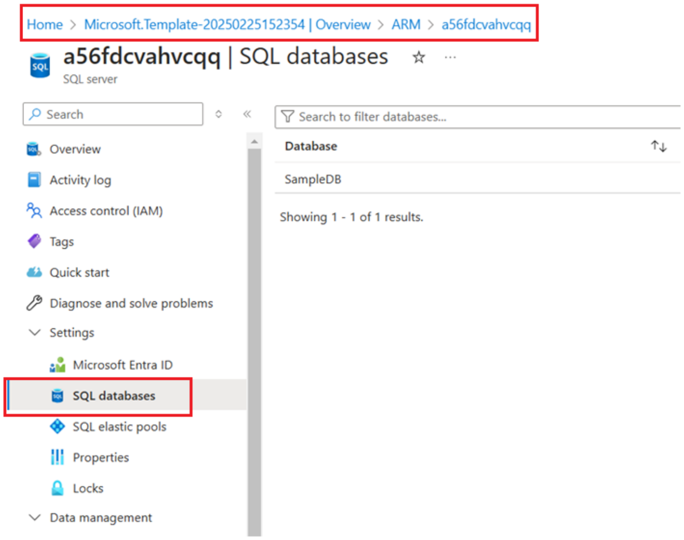
So, I can go to the resource group. So, this is my ARM resource group. And here we have an SQL Server, which has been named with this unique name. And I can click on it. And then go down to SQL databases. And there we have our database.



Home > Microsoft.Template-20250225152354 | Overview > ARM > a56fdcvahvcqq

a56fdcvahvcqq | SQL databases

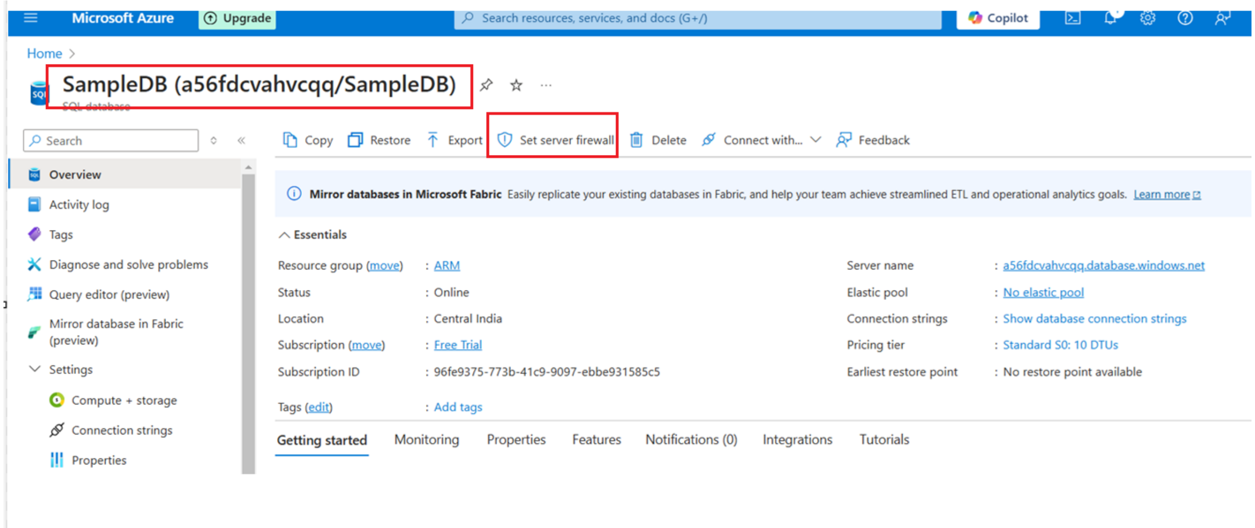
SQL server

Database
SampleDB

Showing 1 - 1 of 1 results.

Now, there's a lot more that I could put into the ARM template. For example, I haven't put anything to do with the server firewall.

So, if I add my IP address, I can now go into the Query editor, and I can log in.



Home >

SampleDB (a56fdcvahvcqq/SampleDB)

SQL database

Mirror databases in Microsoft Fabric Easily replicate your existing databases in Fabric, and help your team achieve streamlined ETL and operational analytics goals. Learn more

Essentials

Resource group (move) : ARM
Status : Online
Location : Central India
Subscription (move) : Free Trial
Subscription ID : 96fe9375-773b-41c9-9097-ebbe931585c5
Tags (edit) : Add tags

Server name : a56fdcvahvcqq.database.windows.net
Elastic pool : No elastic pool
Connection strings : Show database connection strings
Pricing tier : Standard S0: 10 DTUs
Earliest restore point : No restore point available

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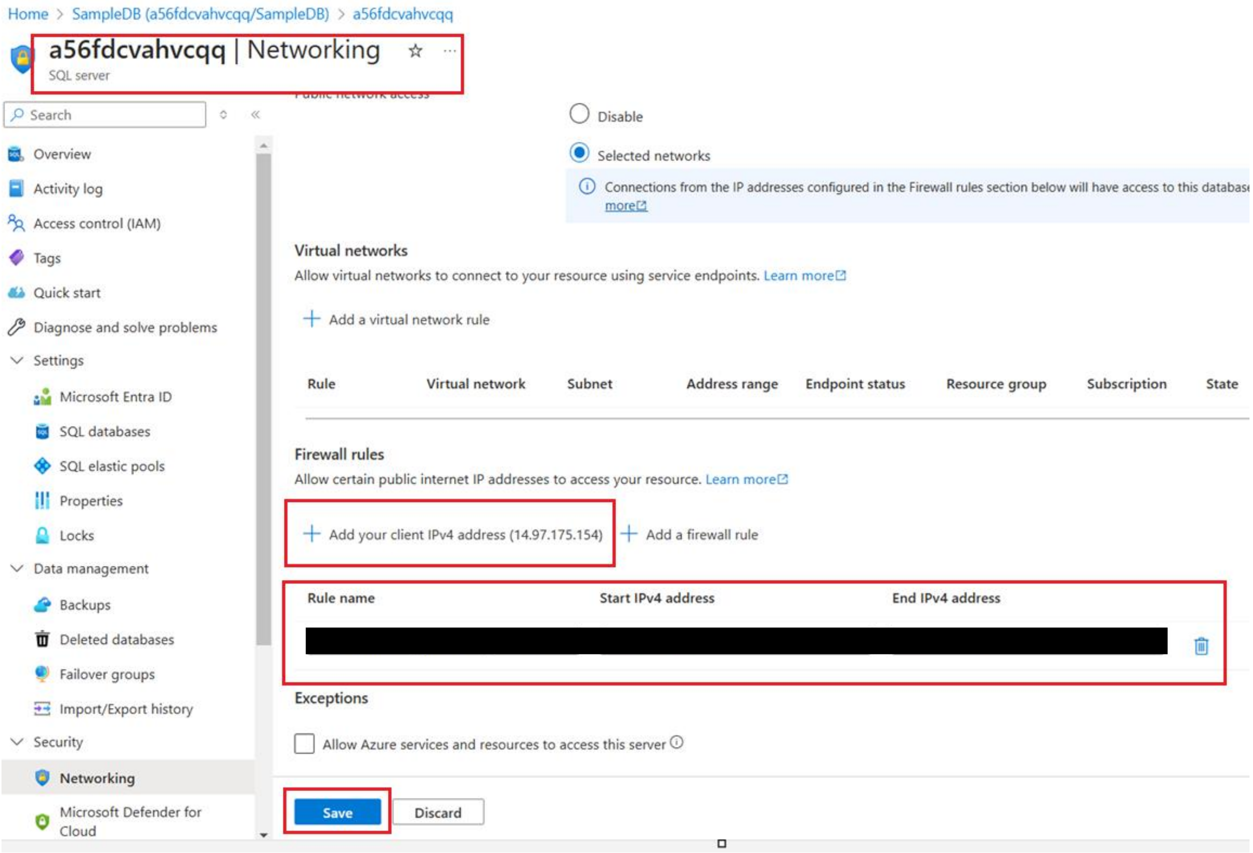

Public network access

○ Disable

● Selected networks

ⓘ Connections from the IP addresses configured in the Firewall rules section below will have access to this databas
more

Virtual networks

Allow virtual networks to connect to your resource using service endpoints. Learn more

+ Add a virtual network rule

Rule	Virtual network	Subnet	Address range	Endpoint status	Resource group	Subscription	State

Firewall rules

Allow certain public internet IP addresses to access your resource. Learn more

+ Add your client IPv4 address (14.97.175.154) + Add a firewall rule

Rule name	Start IPv4 address	End IPv4 address
[redacted]	[redacted]	[redacted]

Exceptions

□ Allow Azure services and resources to access this server ⓘ

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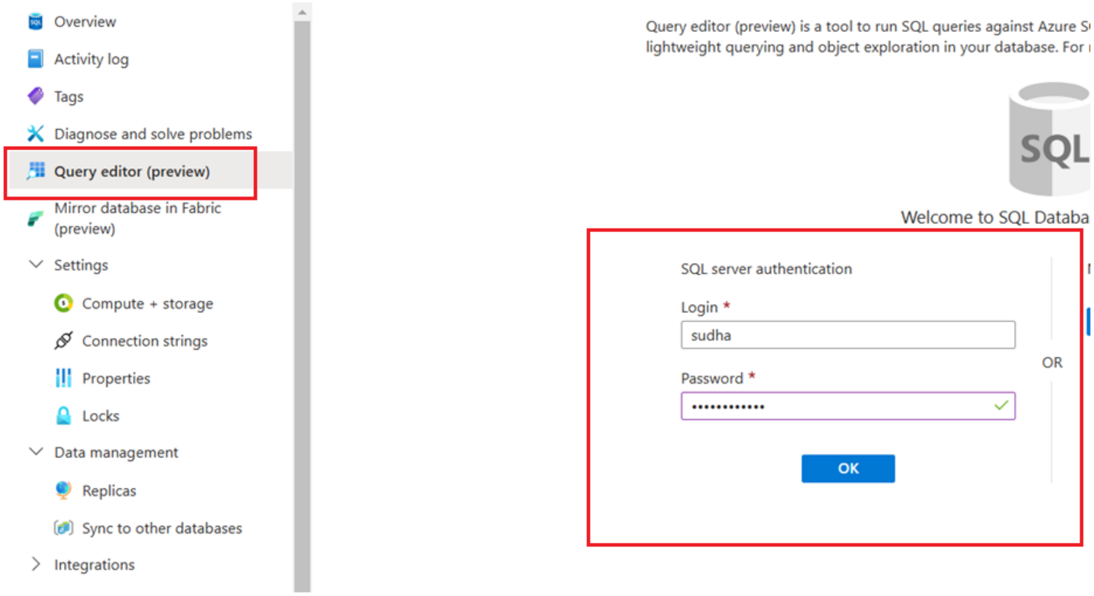


Query editor (preview) is a tool to run SQL queries against Azure S
lightweight querying and object exploration in your database. For

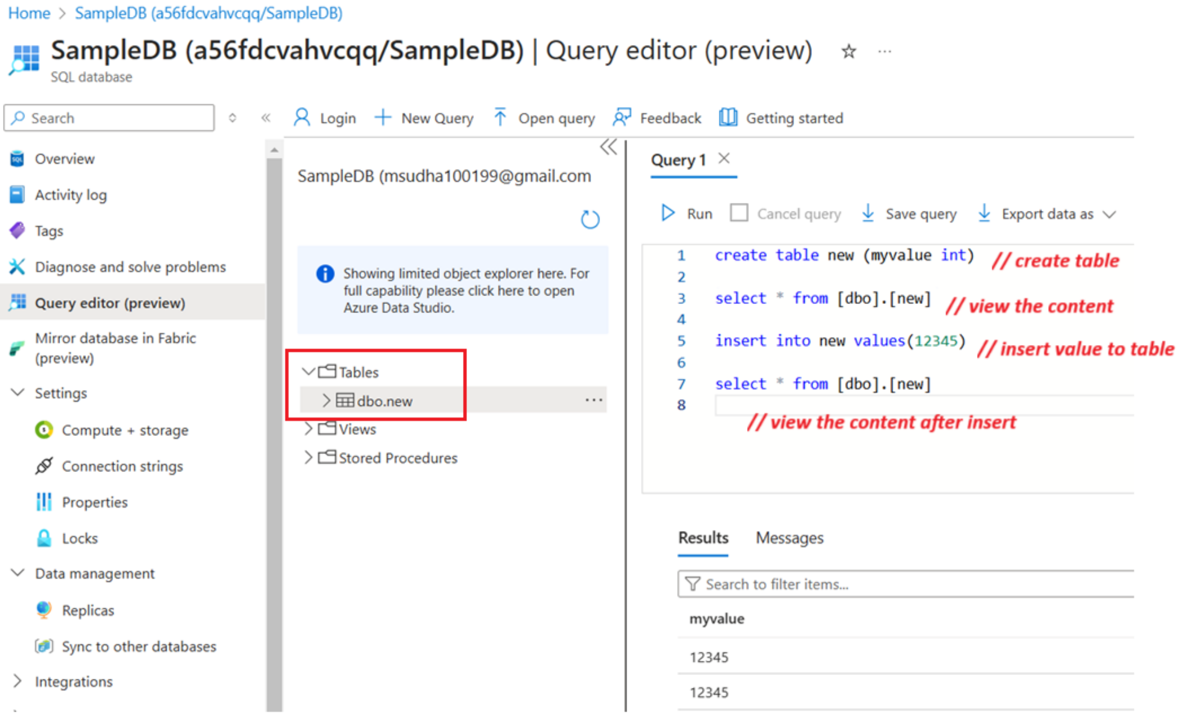
Welcome to SQL Databa

SQL server authentication

Login * sudha

Password * ••••••••••••

And here I can create a new table. Add values to it. And then retrieve the information.



SampleDB (msudha100199@gmail.com

Showing limited object explorer here. For full capability please click here to open Azure Data Studio.

```
create table new (myvalue int)    // create table

select * from [dbo].[new]    // view the content

insert into new values(12345)    // insert value to table

select * from [dbo].[new]

   // view the content after insert
```

```
myvalue
12345
12345
```

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We've had a look at how to deploy a custom template, an ARM template. So we can use one of the Quickstart templates, and for a SQL database, that would be Microsoft.Sql, and it's probably quicker if you just type SQL in there. And then SQL database for managed instance. It is sqlminewvnet.

And for virtual machine, this is Microsoft.sqlvirtualmachine/sqlvmnewstorage. And then you can edit the template and have a look at the type. So here we can see it is creating a new network security group, an NSG. And then further down root tables, virtual networks and then here we have got the managed instance.

And then if we have a quick look at the virtual machine new storage, we can see that we're getting even more complicated. We've got five resources here. And here we have a publicipaddress, a networksecuritygroup, networkinterfaces at the top, a virtualmachine, and an SqlVirtualMachine.

So, I think for the exam, the very important things, other than just a general understanding of it is the type. So, we've got this for SqlVirtualMachines and for managed instances, Microsoft.sqlmanagedinstances, and for databases, it's Microsoft.sql/servers and servers/databases.