DataKeeper Cluster Edition Oracle Cloud Infrastructure Guide

1 — Last update: 27 October 2023

SIOS TECHNOLOGY CORP.

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1. DataKeeper Cluster Edition Oracle Cloud Infrastructure Guide

This guide walks you through creating the following configurations as examples of using a cluster environment.

- DataKeeper cluster nodes (two nodes cluster join in a domain node)
- Failover Cluster
- SQL Server Cluster

1.1. Oracle Cloud Infrastructure Overview

Oracle Cloud Infrastructure (OCI) is a set of complementary cloud services that enable you to build and run a wide range of applications and services in a highly available hosted environment provided by Oracle. OCI provides high-performance computing capabilities (such as physical hardware instances) and storage capacity in a flexible overlay virtual network that can be securely accessed from an on-premises network.

For more information, please visit https://www.oracle.com/cloud/.

1.2. Configuration Information

In this verification, we used two cluster nodes joined in a domain node with the following configuration with DataKeeper for Windows installed.

Domain node

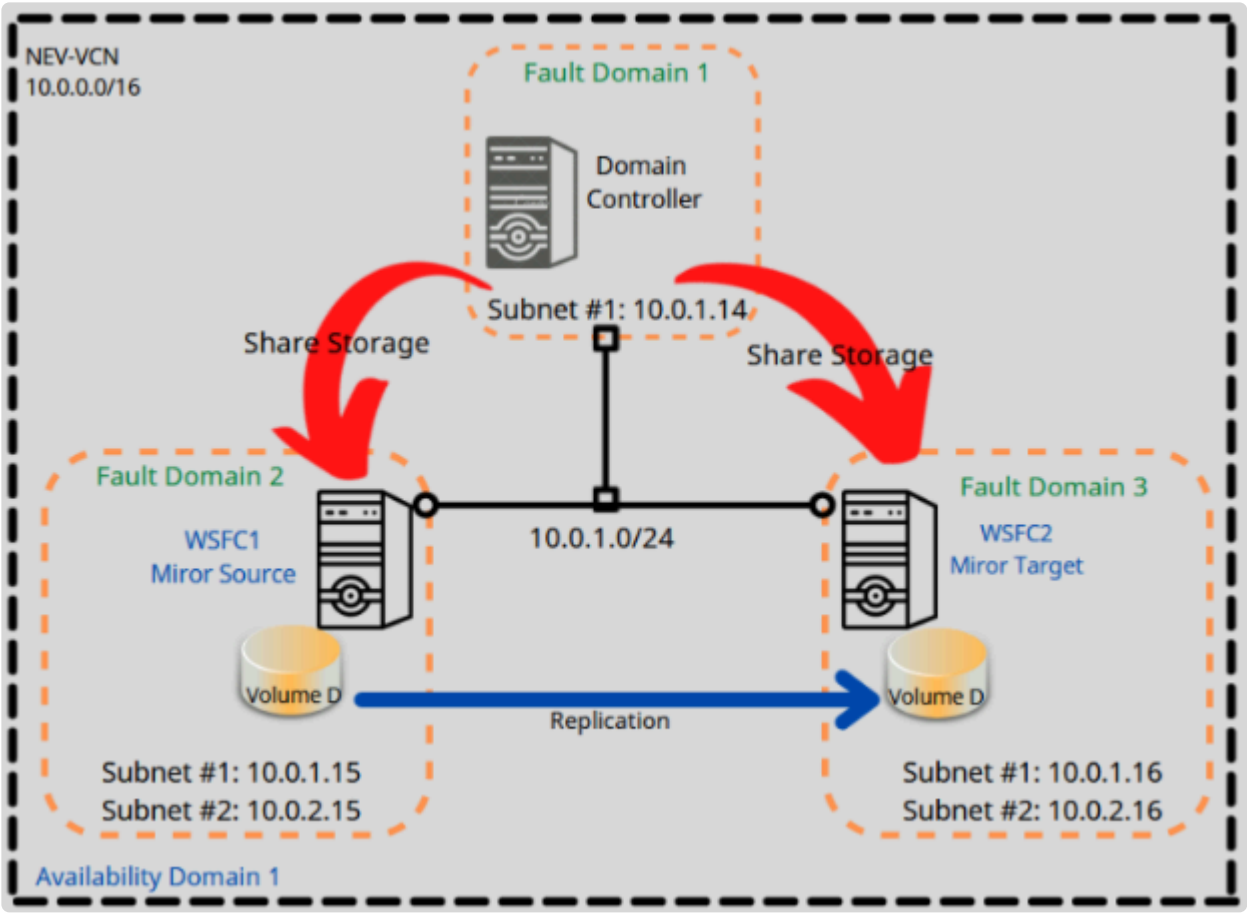
Region	US East
Availability Domain	AD-1
Fault Domain	FD1
Virtual Cloud Network	10.0.0.0/16
Subnet	10.0.1.0/24 (public) 10.0.2.0/24 (private)
Instance	Compute shape: VM.Standard.E4.Flex OS: Windows Server 2019 Standard Additional disks: N/A Network: Global IP address for connection 10.0.1.0/24 (public)
OS	Windows Server 2019 Standard

Cluster nodes (x2)

Region	US East
Availability Domain	AD-1
Fault Domain	FD2, FD3
Virtual Cloud Network	10.0.0.0/16
Subnet	10.0.1.0/24 (public), 10.0.2.0/24 (private)
Instances	Compute shape: VM.Standard.E4.Flex OS: Windows Server 2019 Standard Additional disks: For Volume D: 50GB (For SQL Server cluster data, replicated by DataKeeper) Network: Global public IP address for remote connection 10.0.1.0/24 (public) 10.0.2.0/24 (private)
OS	Windows Server 2019 Standard

Verification Environment System Diagram

- Two cluster nodes and a domain node are in different fault domains.
- DataKeeper is used to replicate data between nodes.



1.2.1. OCI Instance Configuration

Domain node

Server name	NODE-AD
Public IP address 1	10.0.1.14/24
CPU	2vCPU 4 processors
Memory	8GB
Disk	System driver 200GB

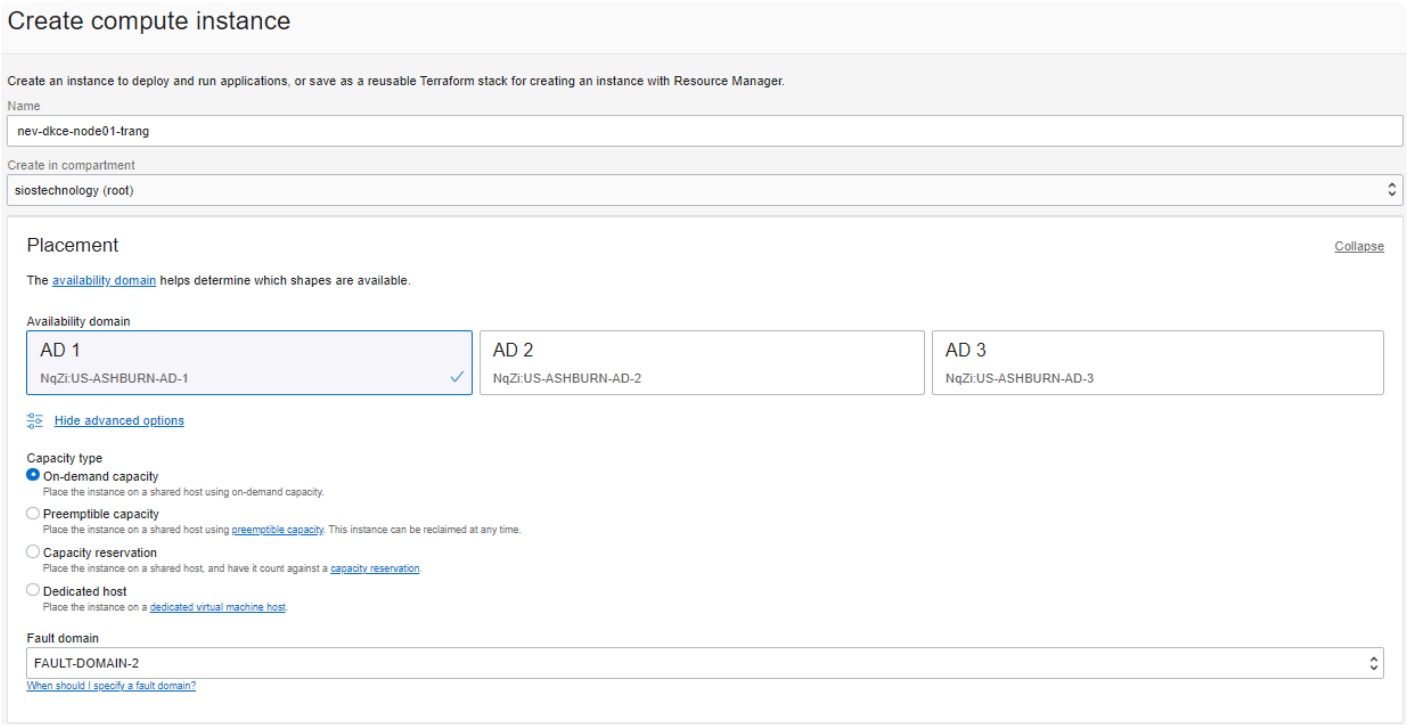


Image and shape

Collapse

A shape is a template that determines the number of CPUs, amount of memory, and other resources allocated to an instance. The image is the operating system that runs on top of the shape.

Image

Windows Server 2019 Standard
Image build: 2022.03.08-0

Change image

Shape

AMD VM.Standard.E4.Flex
Virtual machine, 2 core OCPU, 8 GB memory, 2 Gbps network bandwidth

Change shape

Show advanced options

Networking

Collapse

Networking is how your instance connects to the internet and other resources in the Console. To make sure you can connect to your instance, assign a public IP address to the instance.

Primary network
- (selected) Select existing virtual cloud network
- Create new virtual cloud network
- Enter subnet OCID

Virtual cloud network in **siostechnology (root)** (Change Compartment)

NEV_VCN

Subnet
- (selected) Select existing subnet
- Create new public subnet

Subnet in **siostechnology (root)** (Change Compartment)

Public Subnet-NEV_VCN (regional)

Public IP address
- (selected) Assign a public IPv4 address
- Do not assign a public IPv4 address

Assigning a public IP address makes this instance accessible from the internet. If you're not sure whether you need a public IP address, you can always assign one later.

Hide advanced options

- [ ] Use network security groups to control traffic

Private IP address *Optional*

10.0.1.14

DNS record
- (selected) Assign a private DNS record
- Do not assign a private DNS record

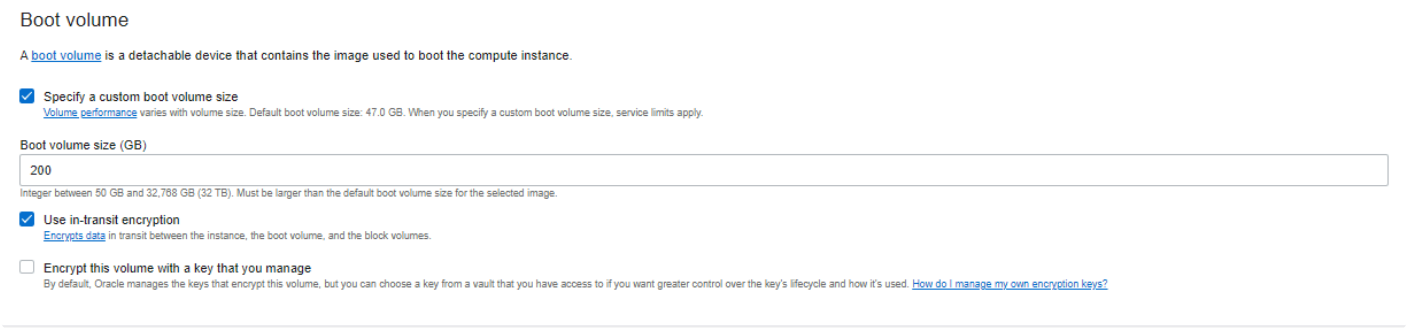
Hostname *Optional*

NODE-AD

No spaces. Only letters, numbers, and hyphens. 63 characters max.

Fully qualified domain name: NODE-AD.sub04080341510.nevvcn.oraclevcn.com

Launch options
- (selected) Let Oracle Cloud Infrastructure choose the best networking type
  Allow Oracle Cloud Infrastructure to choose the networking type, depending on the instance shape and operating system image.
- Paravirtualized networking
  For general purpose workloads such as enterprise applications, microservices, and small databases.
- Hardware-assisted (SR-IOV) networking
  For low-latency workloads such as video streaming, real-time applications, and large or clustered databases.



Cluster Node 1

Server name	DKCE-NODE01
Public IP address	Static IP address issued by OCI for connections over the internet.
IP address (public)	10.0.1.15/24
IP address (private)	10.0.2.15/24
CPU	2vCPU 4 processors
Memory	8GB
Disks	System disk 50GB Disk 1 (Volume D) 50GB (used to hold SQL data and replicated by DataKeeper*)

*The server name is registered as the hostname in the OS. Please do not use "_" in the hostname.

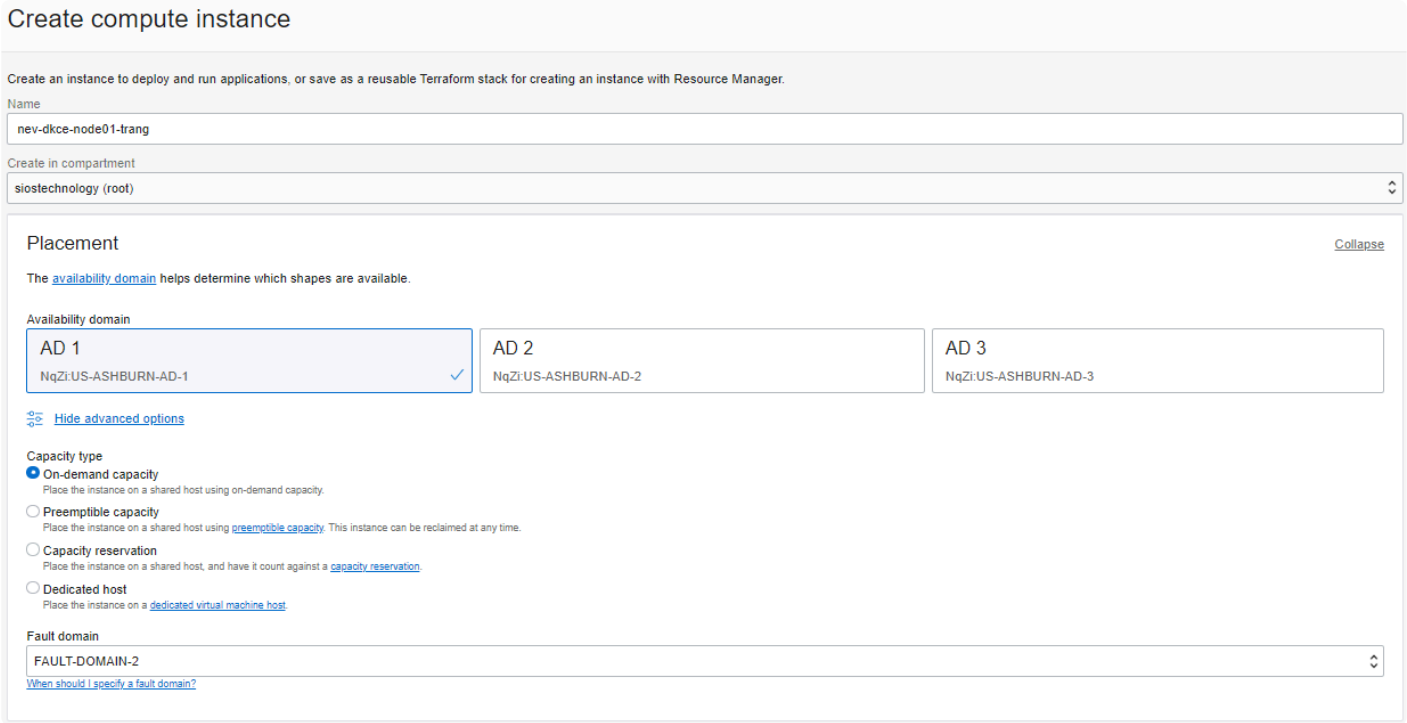


Image and shape

Collapse

A shape is a template that determines the number of CPUs, amount of memory, and other resources allocated to an instance. The image is the operating system that runs on top of the shape.

Image

Windows Server 2019 Standard
Image build: 2022.03.08-0

Change image

Shape

AMD VM.Standard.E4.Flex
Virtual machine, 2 core OCPU, 8 GB memory, 2 Gbps network bandwidth

Change shape

Show advanced options

Networking

Collapse

Networking is how your instance connects to the internet and other resources in the Console. To make sure you can connect to your instance, assign a public IP address to the instance.

Primary network
- (selected) Select existing virtual cloud network
- Create new virtual cloud network
- Enter subnet OCID

Virtual cloud network in **siostechnology (root)** (Change Compartment)

NEV_VCN

Subnet
- (selected) Select existing subnet
- Create new public subnet

Subnet in **siostechnology (root)** (Change Compartment)

Public Subnet-NEV_VCN (regional)

Public IP address
- (selected) Assign a public IPv4 address
- Do not assign a public IPv4 address

Assigning a public IP address makes this instance accessible from the internet. If you're not sure whether you need a public IP address, you can always assign one later.

Hide advanced options

- [ ] Use network security groups to control traffic

Private IP address *Optional*

10.0.1.15

DNS record
- (selected) Assign a private DNS record
- Do not assign a private DNS record

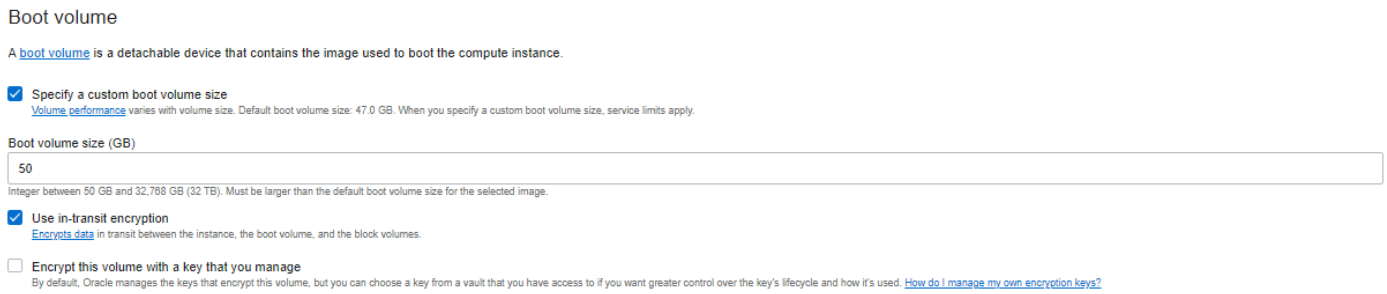
Hostname *Optional*

DKCE-NODE01

No spaces. Only letters, numbers, and hyphens. 63 characters max.

Fully qualified domain name: DKCE-NODE01.sub04080341510.nevvcn.oraclevcn.com

Launch options
- (selected) Let Oracle Cloud Infrastructure choose the best networking type
  Allow Oracle Cloud Infrastructure to choose the networking type, depending on the instance shape and operating system image.
- Paravirtualized networking
  For general purpose workloads such as enterprise applications, microservices, and small databases.
- Hardware-assisted (SR-IOV) networking
  For low-latency workloads such as video streaming, real-time applications, and large or clustered databases.



Cluster Node 2

Server name	DKCE-NODE02
Public IP address	Static IP address issued by OCI for connections over the internet.
Private IP address (public)	10.0.1.16/24
Memory	8GB
Disks	System disk 50GB Disk 1 (Volume D) 50GB (used to hold SQL data and replicated by DataKeeper*)
CPU	2vCPU 4 processors

*The server name is registered as the hostname in the OS. Please do not use "_" in the hostname.

1.2.2. Software Configuration

In this document, we tested the cluster nodes with the following software configuration.

OS	Windows Server 2019 Standard
DataKeeper	DataKeeper for Windows 8.9.0
SQL Server	SQL Server 2016

1.2.3. OCI Network Configuration

The following configuration was used for OCI verification. The IP addresses have been granted with public and private subnets assigned to the cluster nodes. With the domain node, the IP address is only associated with a public subnet.

Cluster Nodes	
Virtual Cloud Network	10.0.0.0/16
Public Subnet	10.0.1.0/24
Private Subnet	10.0.2.0/24
Domain Node	
Virtual Cloud Network	10.0.0.0/16
Public Subnet	10.0.1.0/24

The OCI network subnet has a security policy.

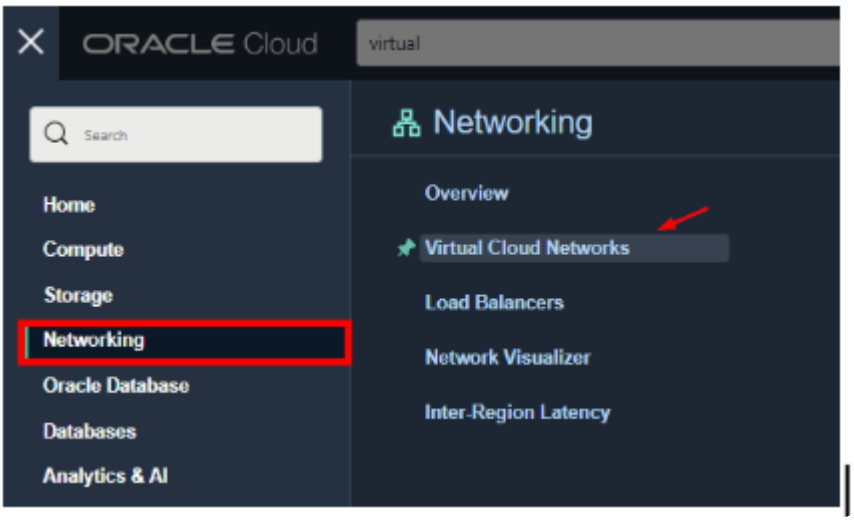
1.3. Configuration on OCI

Creating a VCN Network

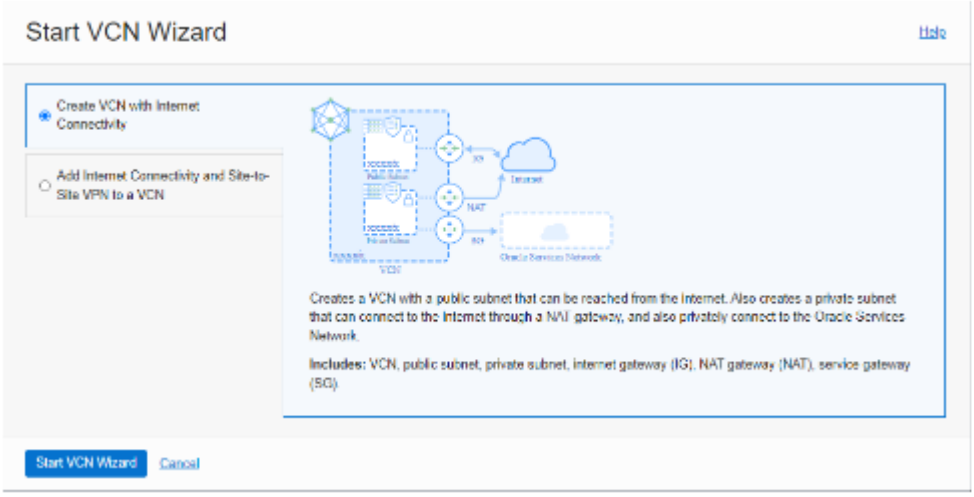
Create the VCN using the following two subnets.

VCN Name	NEV-VCN
Configure VCN and Subnets	
VCN CIDR Block	10.0.0.0/16
Public Subnet CIDR Block	10.0.1.0/24
Private Subnet CIDR Block	10.0.2.0/24
DNS Resolution	Selected

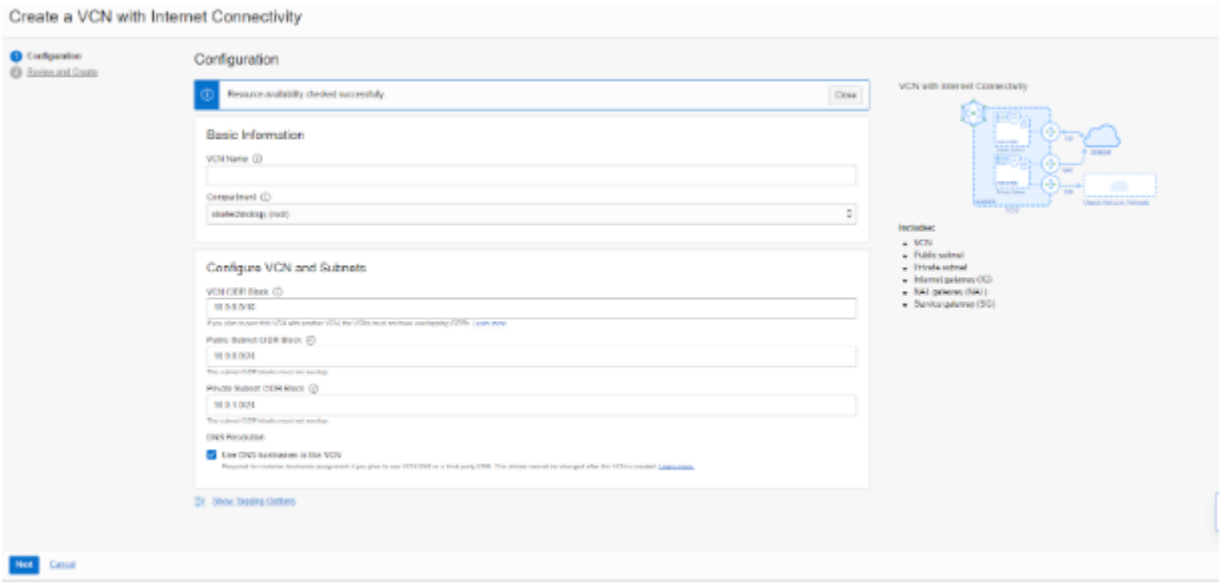
1. Log in to the Oracle Cloud Infrastructure.
2. From the navigation menu, select **Networking** > **Virtual Cloud Networks**.



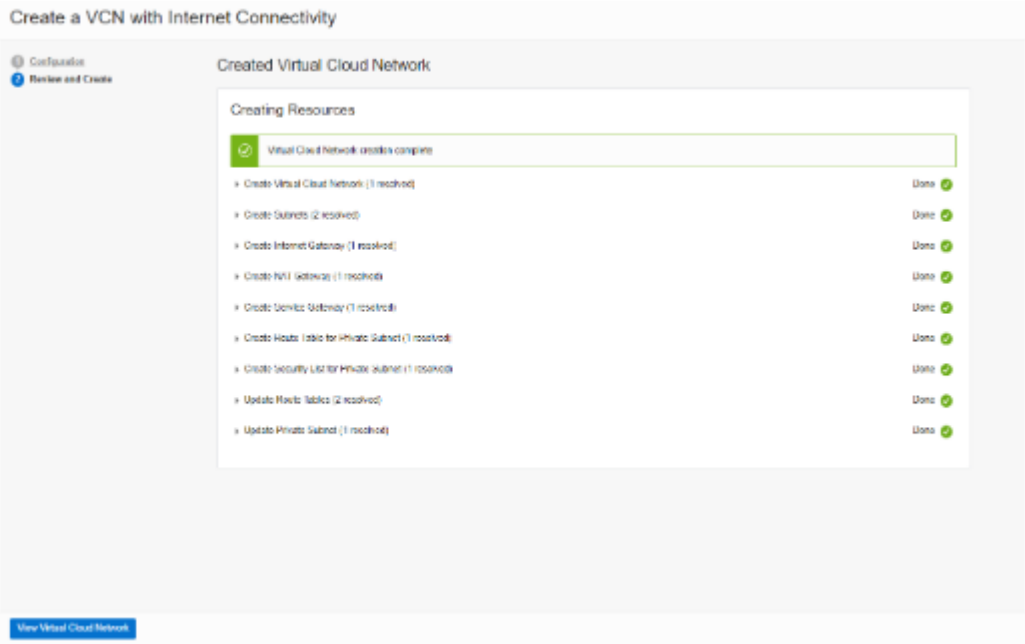
3. Click on **Start VCN Wizard**. Select the **Create VCN with Internet Connectivity** and **Start VCN Wizard**.



4. Enter the VCN name in the **VCN Name** field. In the Configure VCN and Subnets, enter the IP address range for **VCN CIDR Block/Public Subnet CIDR Block/Private Subnet CIDR Block**.

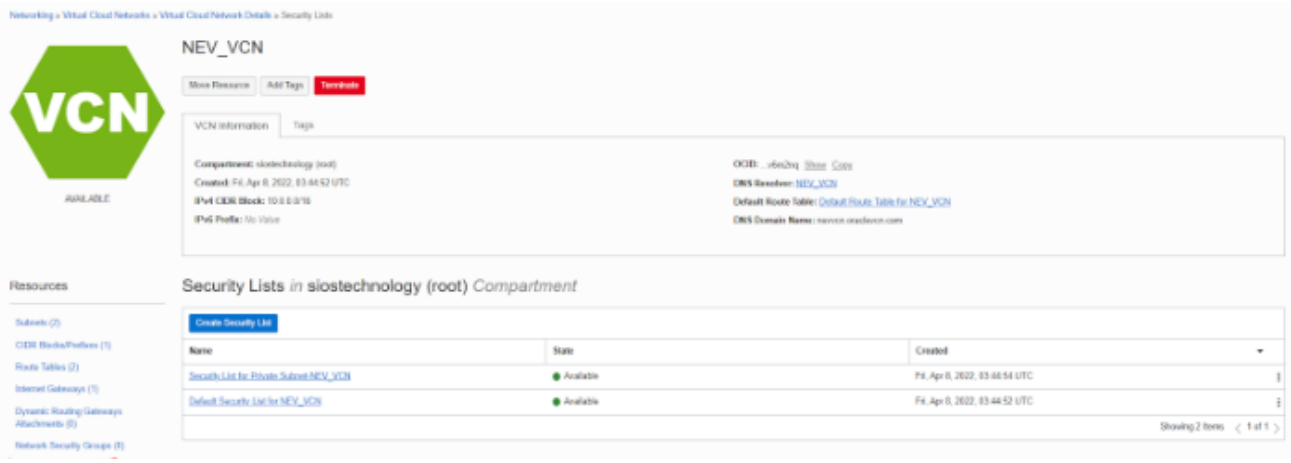


5. Click **Next**.
6. Review and click on **Create**.
7. The new VCN has been created successfully.


Create a VCN with Internet Connectivity
Configuration
Review and Create
Created Virtual Cloud Network
Creating Resources
Virtual Cloud Network creation complete
Create Virtual Cloud Network (1 resolved)
Done
Create Subnets (2 resolved)
Done
Create Internet Gateway (1 resolved)
Done
Create NAT Gateway (1 resolved)
Done
Create Service Gateway (1 resolved)
Done
Create Route Table for Private Subnet (1 resolved)
Done
Create Security List for Private Subnet (1 resolved)
Done
Update Route Tables (2 resolved)
Done
Update Private Subnet (1 resolved)
Done
View Virtual Cloud Network

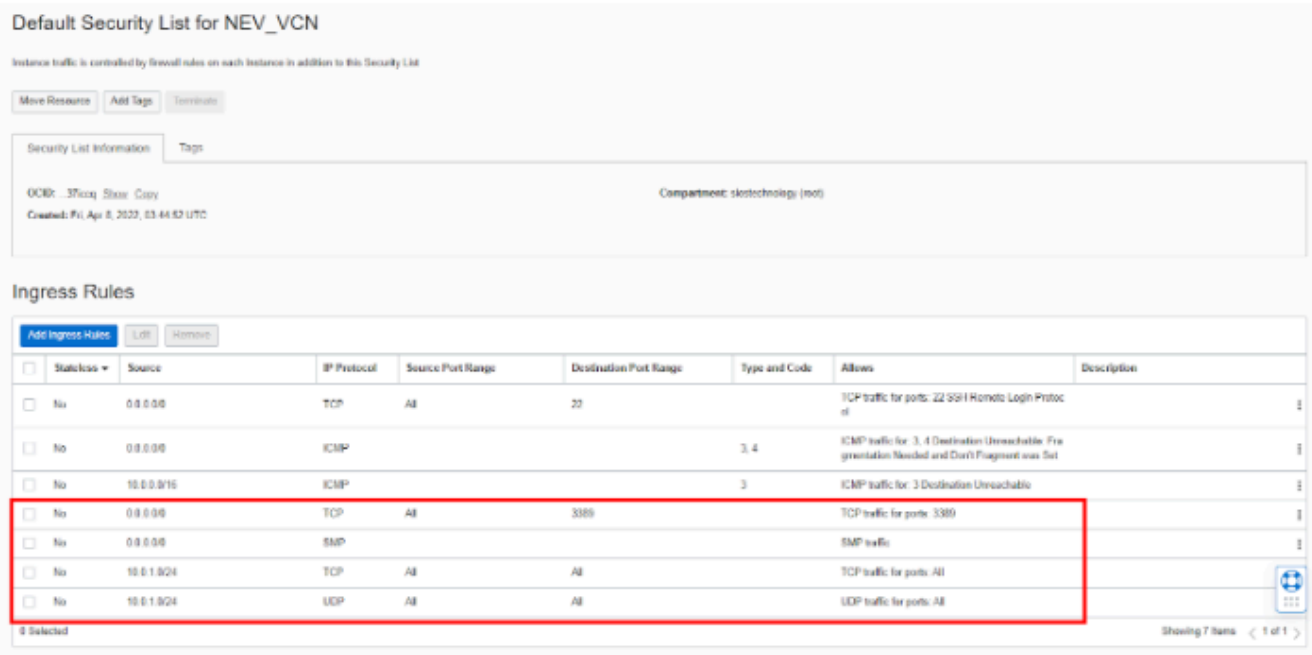
1.3.1. Creating Security Rules

1. In the **Virtual Cloud Network Details**, scroll down to **Resources** and click on **Security Lists**.



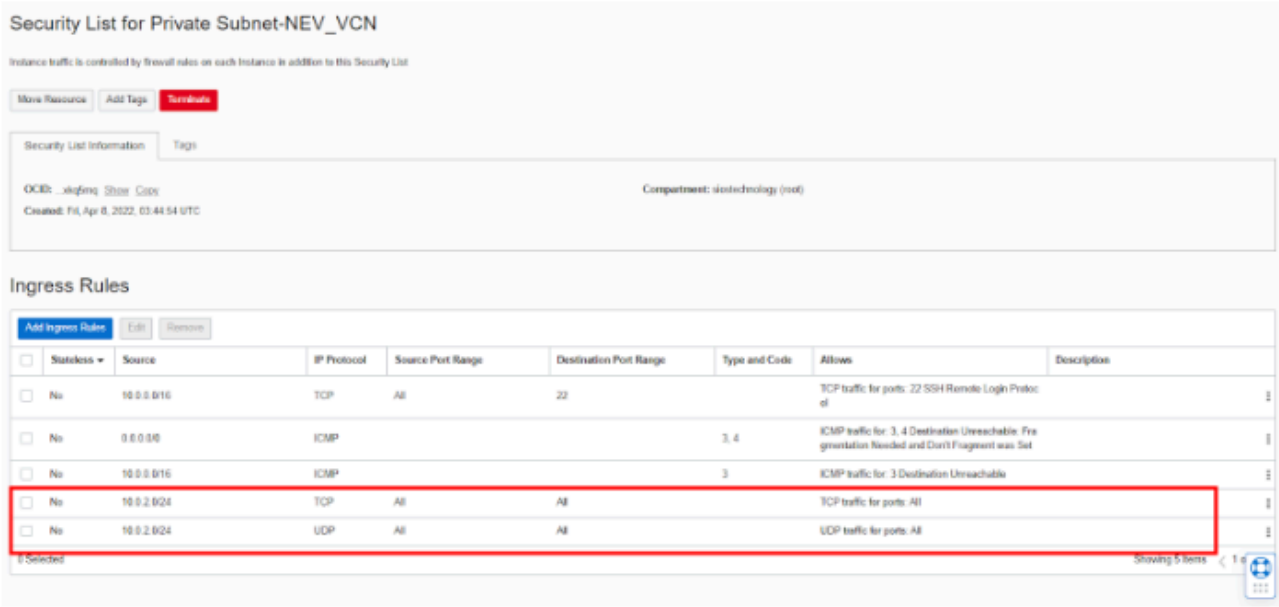
2. Select the **Default Security Lists for NEV_VCN > Add Ingress Rules**.

   Add rules as shown in the image below:



3. Back to Security List and select the **Security List for Private Subnet-NEV_VCN > Add Ingress Rules**.

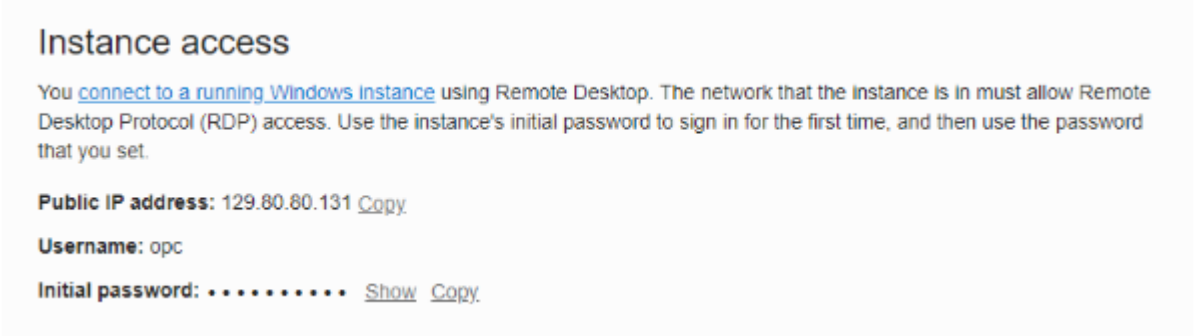
   Add rules as shown in the image below:

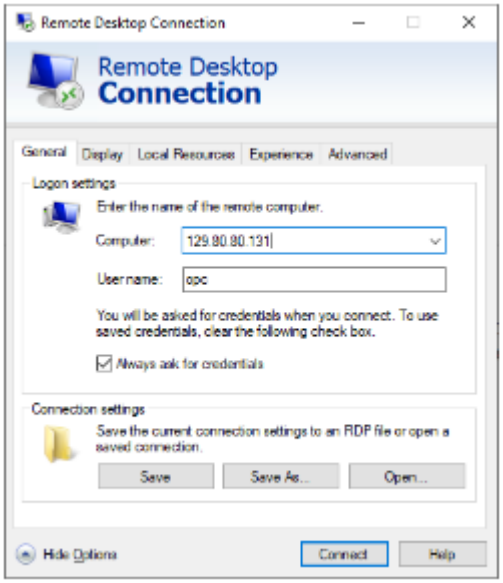

Security List for Private Subnet-NEV_VCN
Instance traffic is controlled by firewall rules on each Instance in addition to this Security List
More Resource
Add Tags
Terminate
Security List Information
Tags
OCID: ...xkqfmq Show Copy
Created: Fri, Apr 8, 2022, 03:44:54 UTC
Compartment: siostechnology (root)
Ingress Rules
Add Ingress Rules
Edit
Remove
Stateless
Source
IP Protocol
Source Port Range
Destination Port Range
Type and Code
Allows
Description
No 10.0.0.0/16 TCP All 22 TCP traffic for ports: 22 SSH Remote Login Protocol
No 0.0.0.0/0 ICMP 3, 4 ICMP traffic for: 3, 4 Destination Unreachable: Fragmentation Needed and Don't Fragment was Set
No 10.0.0.0/16 ICMP 3 ICMP traffic for: 3 Destination Unreachable
No 10.0.2.0/24 TCP All All TCP traffic for ports: All
No 10.0.2.0/24 UDP All All UDP traffic for ports: All
0 Selected
Showing 5 Items

1.4. Configuration for an OCI Instance

GUI Startup and VNC Connection

After creating the instance, run RDP with the public IP using the username and initial password. It will prompt you to change the password.

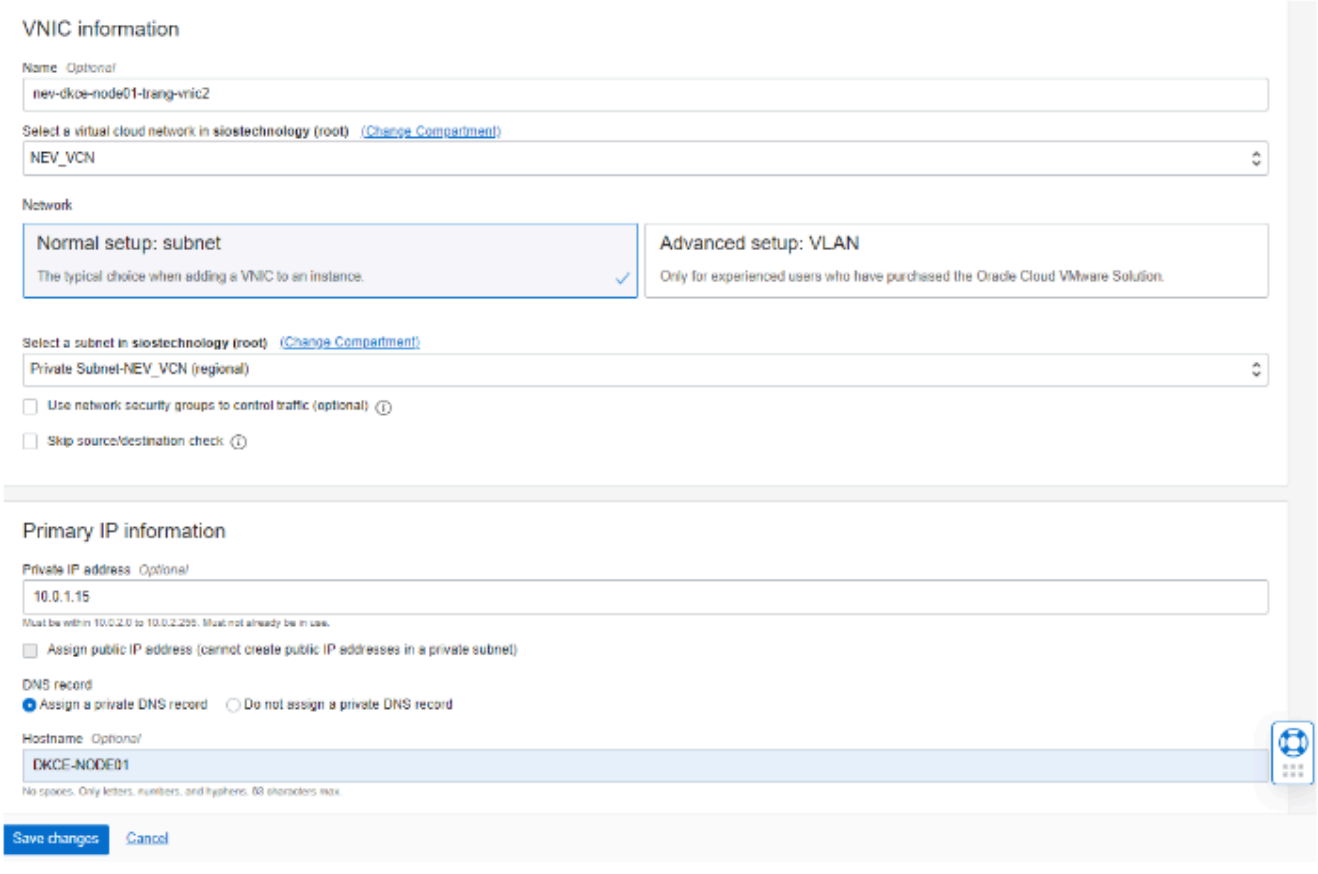




Scroll down to the resource, attached to the second VNICs and block volumes.

- Attached VNICs

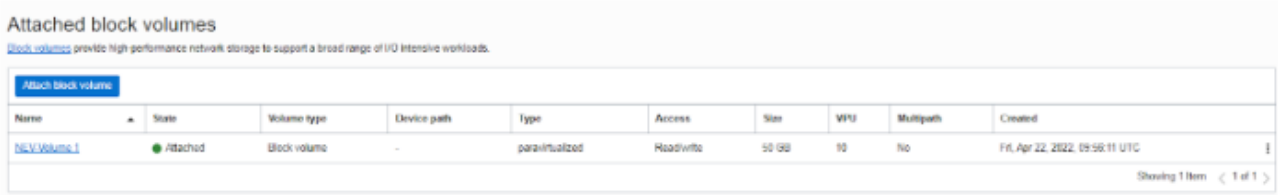
Click on **Create VNIC** button, input the second VNIC information.



- Attached block volumes

Click on **Attached block volumes** and Attach block volume on your instance:

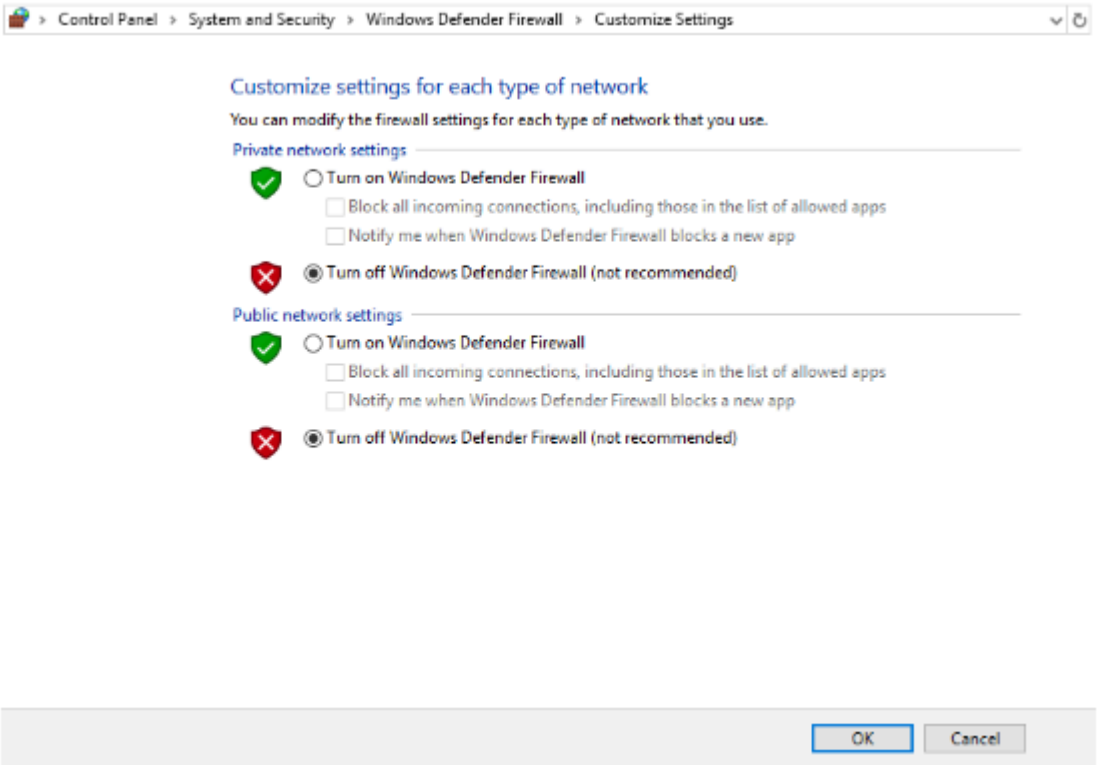
Attached block volume for DataKeeper Replication using Access Read/Write



Preparation for Installing DataKeeper Cluster Edition for Windows

- Change the firewall settings.

Turn off Private/Public Firewall



- Windows Domain Setting

In this document, the cluster nodes are members of a Windows domain, add the cluster nodes (DKCE-NODE01 and DKCE-NODE02) to the domain (SIOS-LKW.local) and log in as the domain administrator (SIOS-LKW\Administrator).

1.5. Building a DataKeeper Cluster Edition Volume Cluster

Creating a DataKeeper Cluster Edition for Windows on OCI Instances

Connect the same size volume to each node. DataKeeper will use this volume. Refer to https://docs.cloud.oracle.com/en-us/iaas/Content/Block/Tasks/attachingavolume.htm for information on attaching a volume to an instance.

Creating the Failover Cluster

Before you create the failover cluster, we strongly recommend that you validate the configuration to make sure that the hardware and hardware settings are compatible with failover clustering. Microsoft supports a cluster solution only if the complete configuration passes all validation tests and if all hardware is certified for the version of Windows Server that the cluster nodes are running.

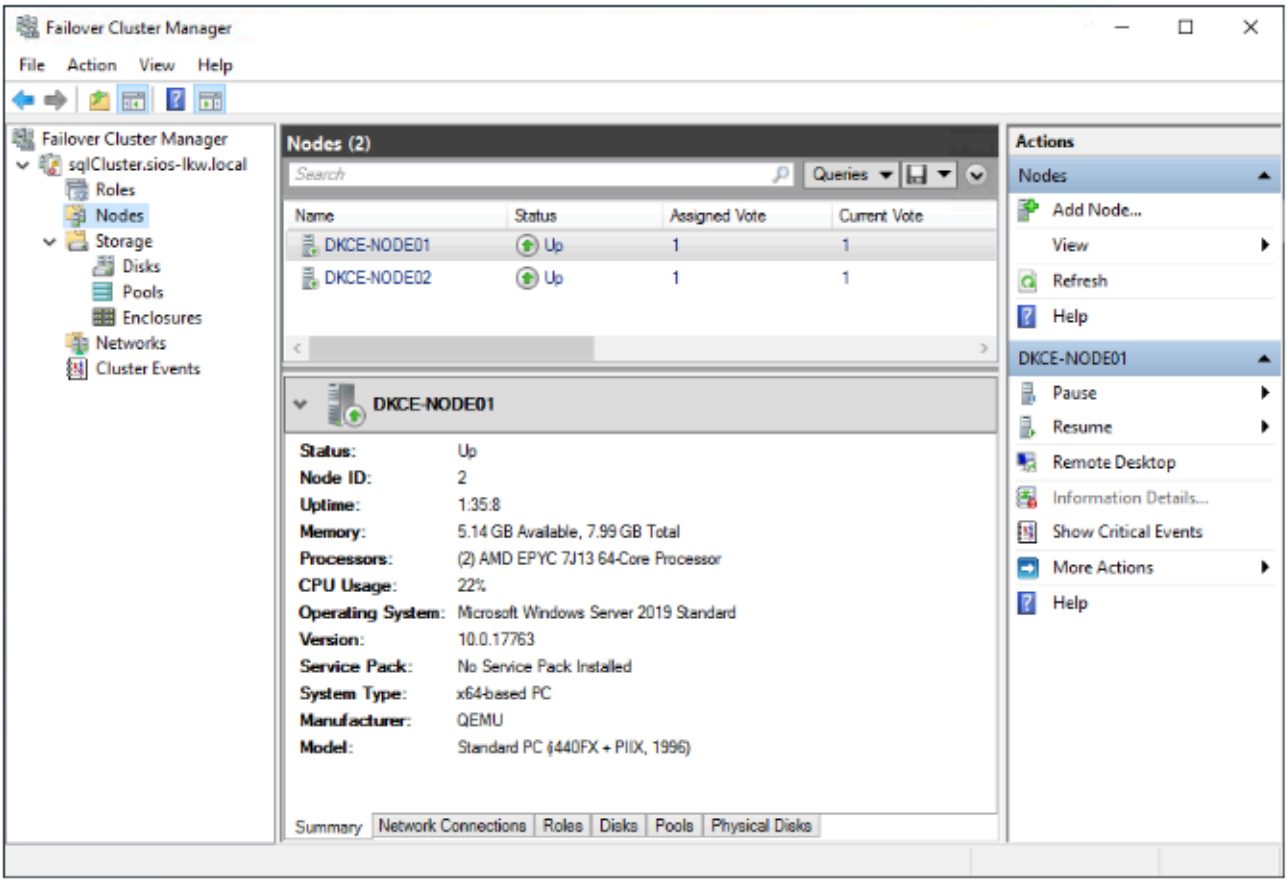
1. Open Failover Cluster Manager from Windows.
2. In the right panel, select Validate Configuration…
3. In the Validate a Configuration Wizard, use the following:

Before You Begin	Default
Select Servers or a Cluster	DKCE-NODE01.sios-lkw.local DKCE-NODE02.sios-lkw.local
Testing Options	Default (Run all tests)
Confirmation	Default
Validating	Check all successes
Summary	Check to “Create the cluster now using the validated nodes…” and Finish

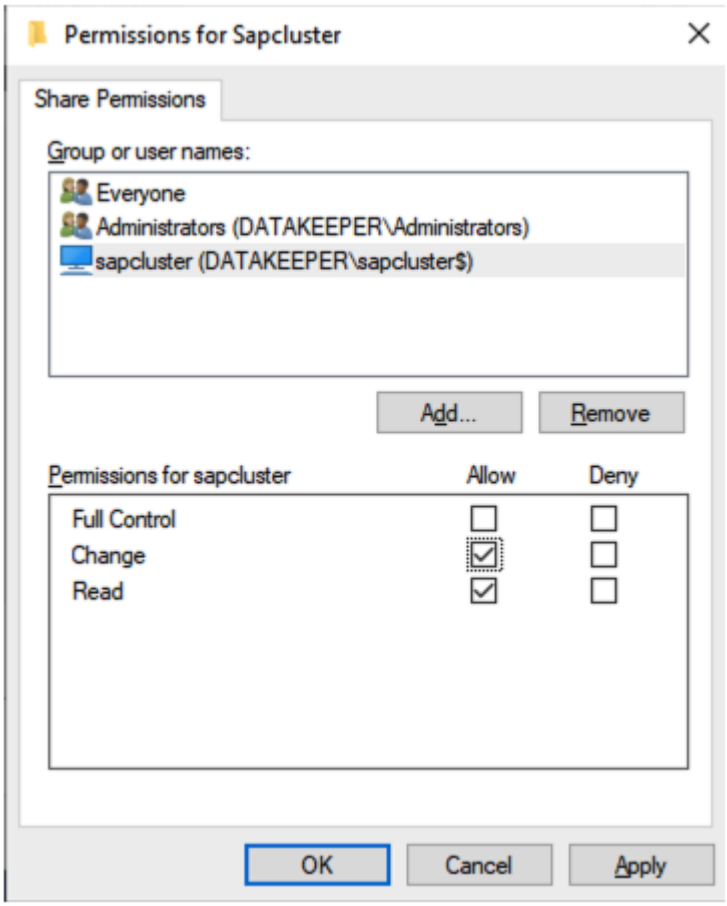
4. In the Create Cluster Wizard, use the following:

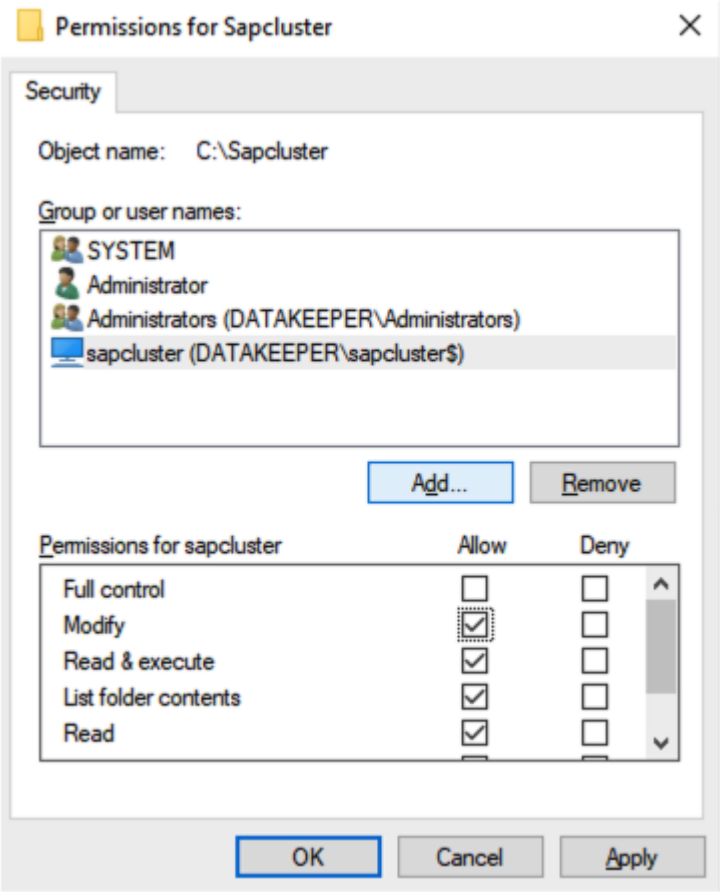
Before You Begin	Default
Access Point for Administering the Cluster	Cluster Name: sqlCluster Address: 10.0.1.100
Confirmation	Default
Creating New Cluster	Wait to install
Summary	Finish

5. The following screen appears when a failover cluster is created.



6. Add the File Share Witness. First, create a folder on another server in a 3rd availability zone. Once you have the folder created, share it and give the Cluster Name Object (CNO). Change permissions at the Share level and Modify permissions at the Security level.


Permissions for Sapcluster
Share Permissions
Group or user names:
Everyone
Administrators (DATAKEEPER\Administrators)
sapcluster (DATAKEEPER\sapcluster$)
Add...
Remove
Permissions for sapcluster
Allow
Deny
Full Control
Change
Read
OK
Cancel
Apply



Once the permissions are assigned, run the following PowerShell command to update the cluster quorum to add this file share witness.

Set-ClusterQuorum -FileShareWitness cluster name

Installing DataKeeper Cluster Edition

Install DataKeeper Cluster Edition on each of the two OCI instances. For this example, we used DataKeeper Cluster Edition v8.9.0-1543246.

Run DK-8.9.0-Setup.exe file as administrator.

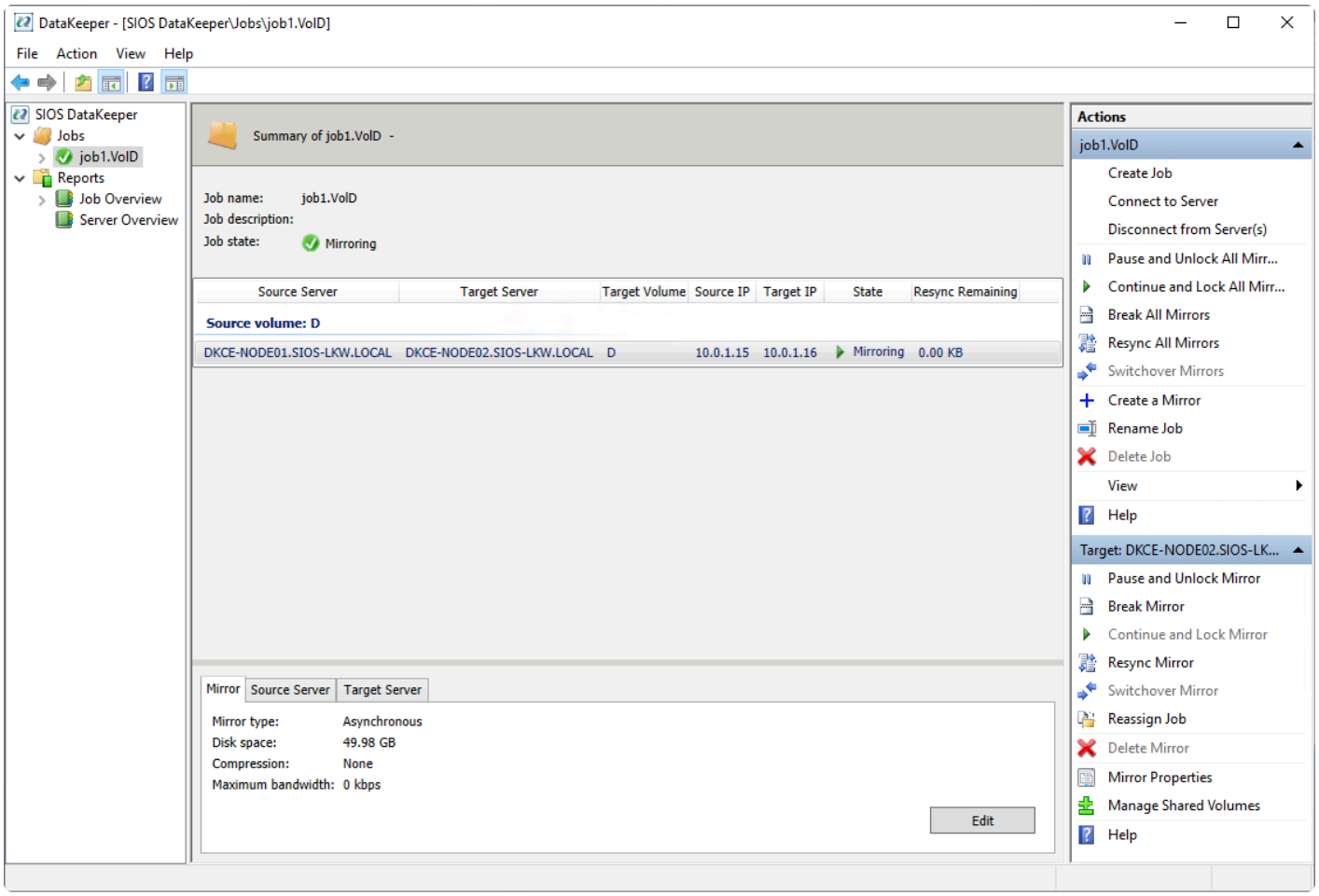
DataKeeper Cluster Edition	
Select feature	Default
Choose Destination Location	C:\Program Files (x86)\SIOS\DataKeeper
System Configuration change prompt	Yes
Service Setup	Domain or Server account (recommended)
DataKeeper Service Logon Account Setup	Password: xxxxxxxxxxxx

	Password Confirm: xxxxxxxxxx
SIOS DataKeeper for Windows	Finish
SIOS License Key Manager	Install License File…
Restart OS	

Creating a Volume Mirror

- Create a DataKeeper (Replication) resource. DataKeeper specifies a network route between the nodes to be replicated. In order to allow ping over this network route, add a rule to enable ICMP (type 0, 8) communication to the security list of the network you want to use from the OCI management screen.

- Create a new mirror using volume D. Refer to Creating a Mirror.



1.6. Creating a SQL Server Cluster on a Failover Cluster

Installing MSSQL Server 2016 on the Source Node

1. Download the SQL Server 2016 (Windows x86-64) installation image from the following site, save it anywhere, and right-click to Mount.

   https://www.microsoft.com/en-us/evalcenter/evaluate-sql-server-2016

2. After mounting the iso file, double-click on the setup.exe file to open.

3. The **SQL Server Installation Center** screen appears. Select **New SQL Server failover cluster installation**.

4. Complete the following steps:

- When the Feature Selection screen appears, select **Database Engine Service**, **SQL Server Replication**, **Full-Text and Semantic Extractions**, and **Data Quality Services**.

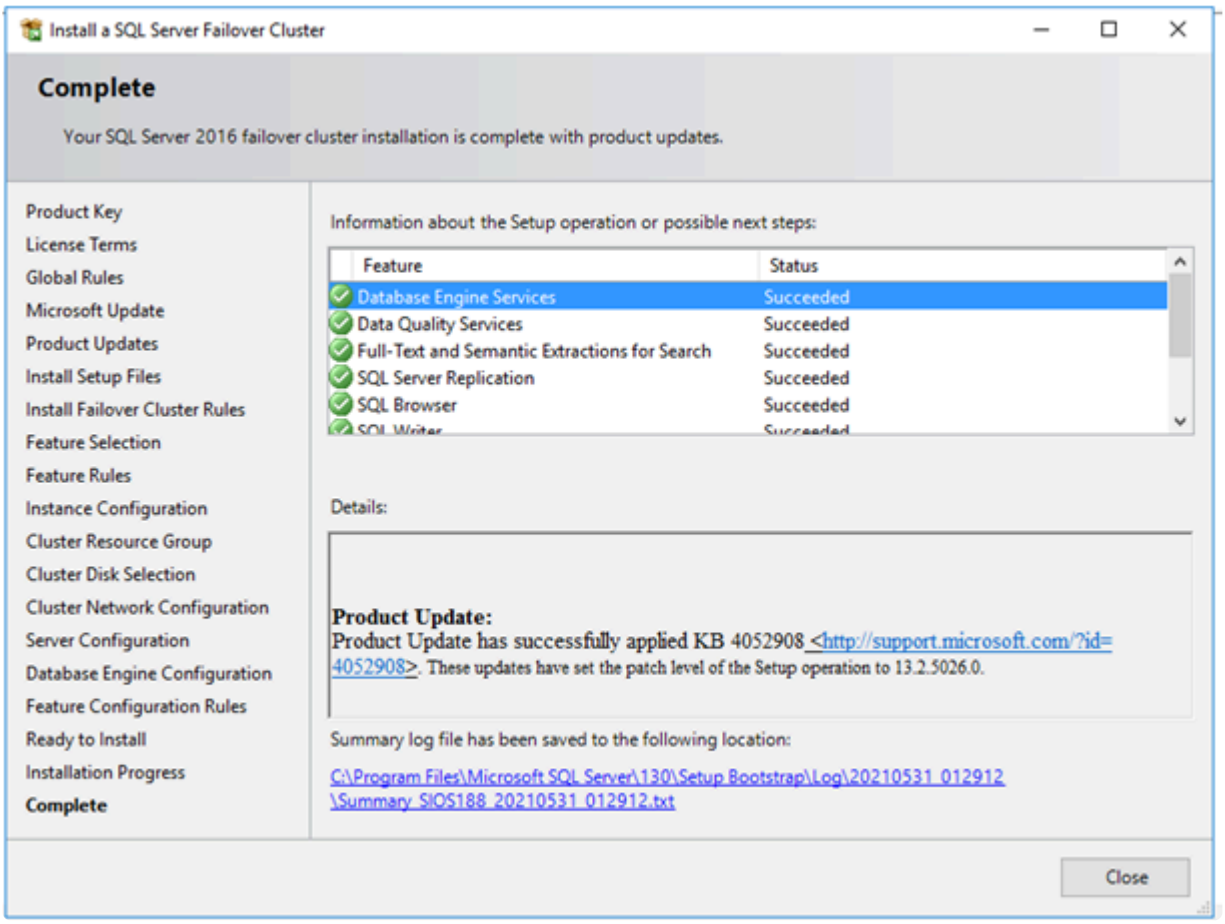
- When the **Instance Configuration** screen appears, input **MSSQLSERVER2016** to fields **SQL Server Network Name**, **Name Instance**, and **Instance ID**.

- When the **Cluster Network Configuration** screen appears, select the **IPv4** checkbox, and input an available **IP Address** in the Address field.

- When the **Server Configuration** screen appears, go to the **SQL Server Agent Account Name** field and **click the drop-down**, then **Browse**. Type in **Administrator**, then click the option to **click names**. Return to the **Server Configuration** page. Then, type in the password field and repeat these same steps for SQL Server Database Engine.

- When the **Database Engine Configuration** screen appears, click **Add Current User** at the bottom of the page.

5. Complete the **Install**.



Installing MSSQL Server 2016 on the Target Node

1. Download the SQL Server 2016 (Windows x86-64) installation image from the following site, save it anywhere, and right-click to Mount.

   https://www.microsoft.com/en-us/evalcenter/evaluate-sql-server-2016

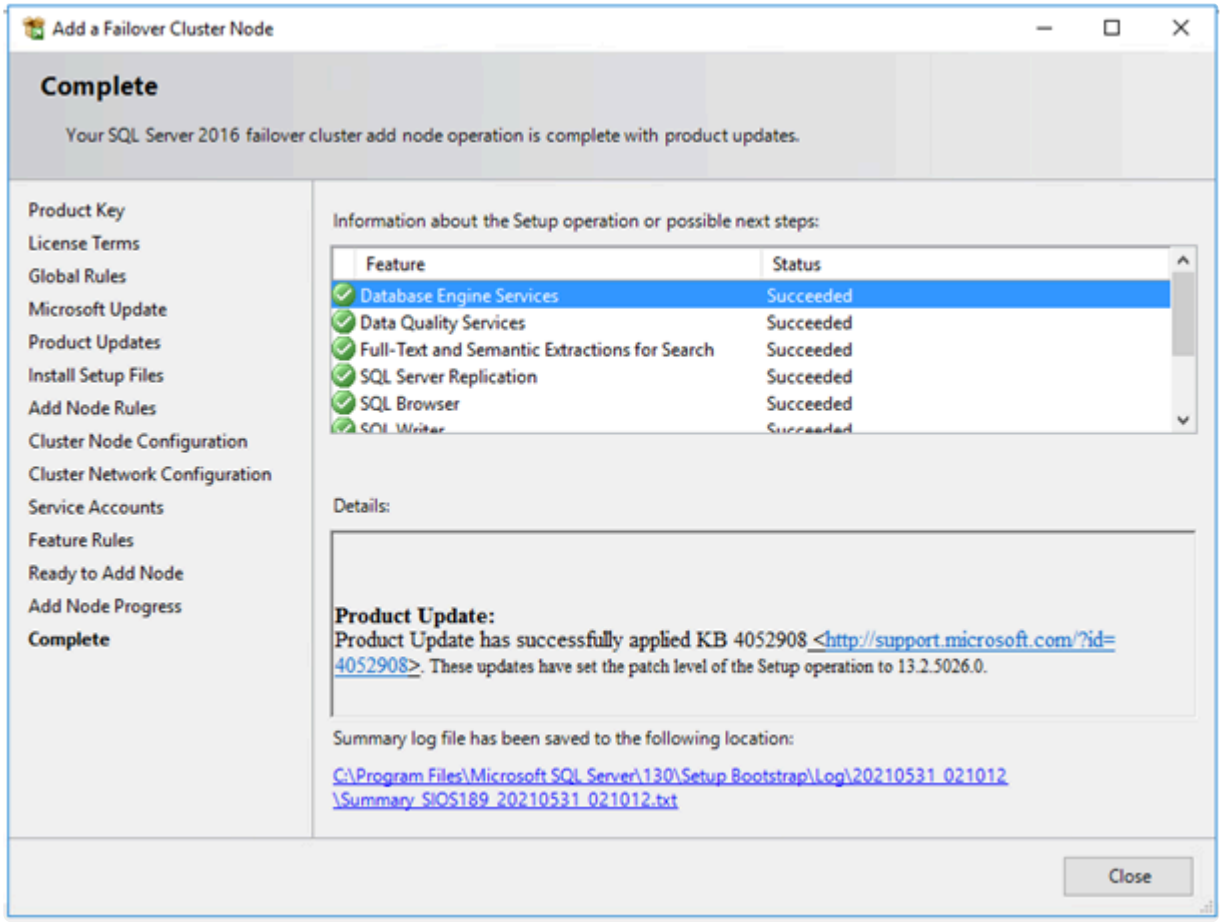
2. After mounting the iso file, double-click on the setup.exe file to open.

3. When the **SQL Server Installation Center** screen appears, select **Add node to a SQL failover cluster**.

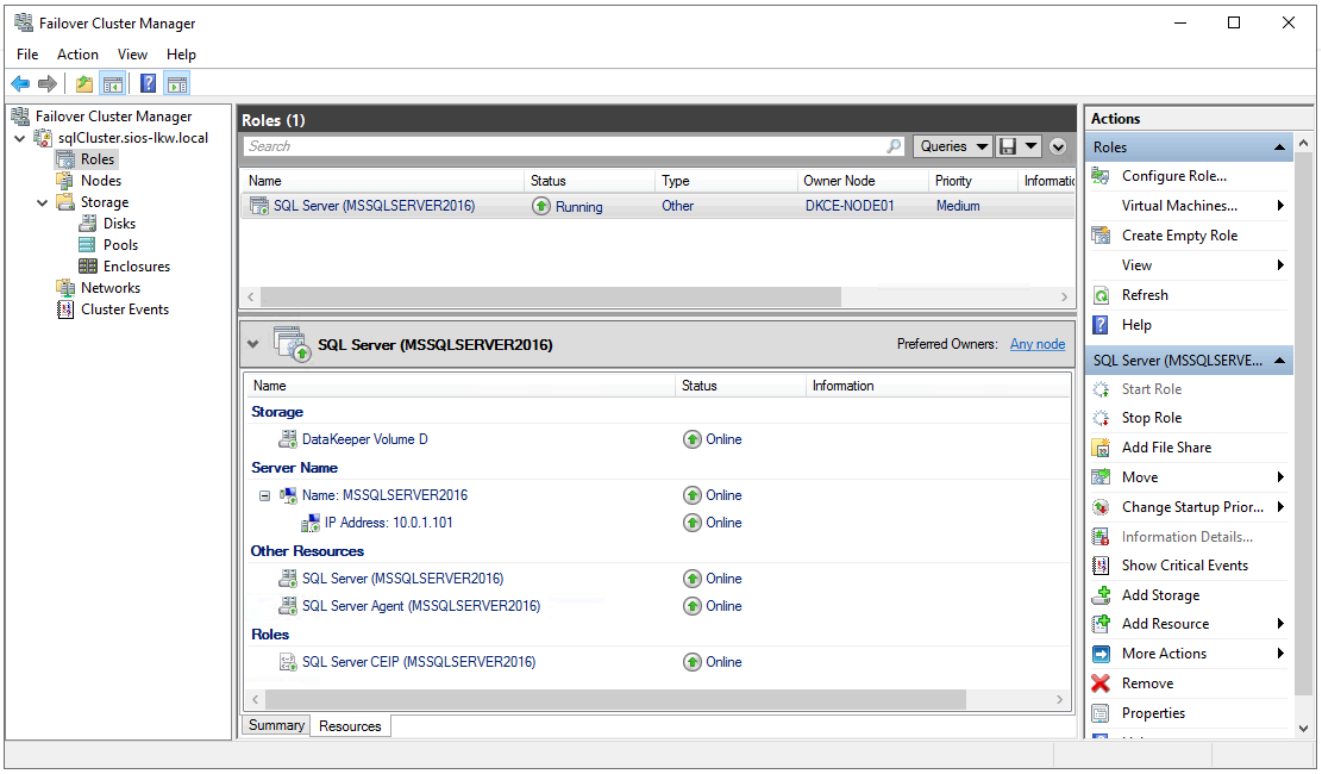
4. Complete the following steps:

- For Service Accounts, input the Password fields as same as the source node.

- Follow the remaining setup to complete.

- 

5. The SQL Server Failover cluster has been successfully installed on the Windows Server Failover Cluster.

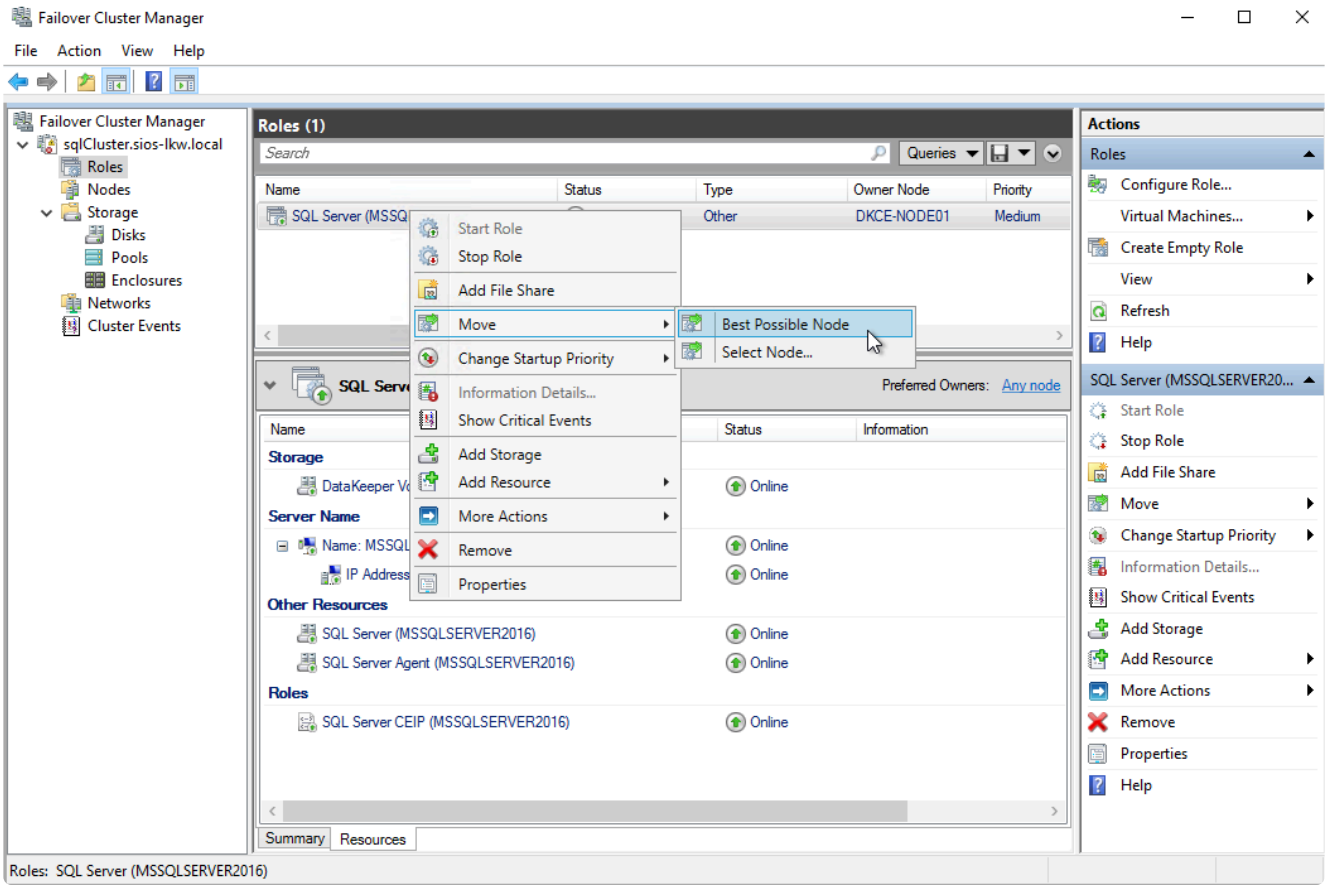


Check for Fault Tolerance

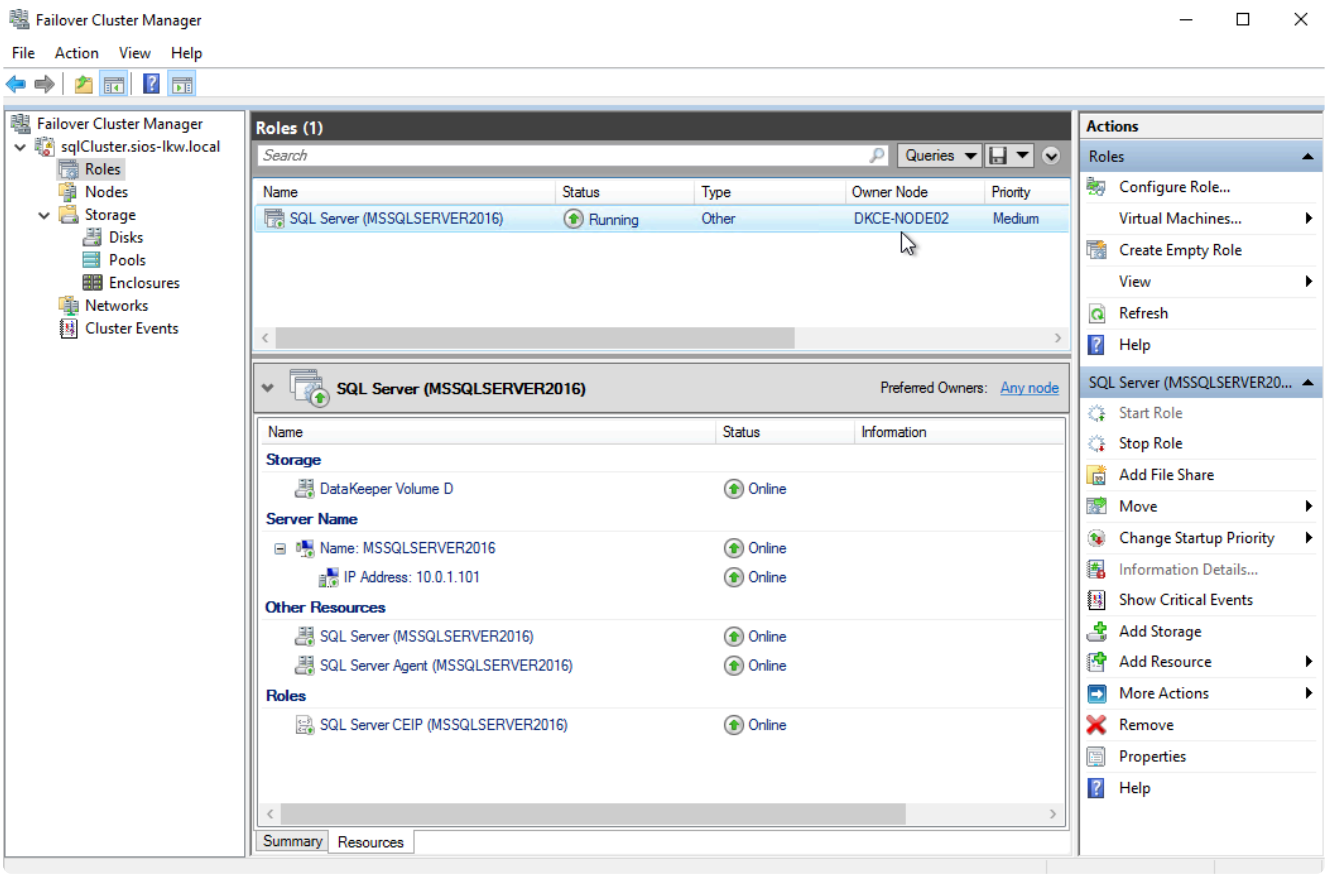
Performing the switchover from Source Node to Target Node in Windows Server Failover Cluster console:

1. Log in to the Window OS on the Source Node (DKCE-NODE01) as SIOS-LKW\Administrator.

2. Go to Failover Cluster Manager, select **Roles** and right-click on **SQL Server**, then select **Move – Best Possible Node**.



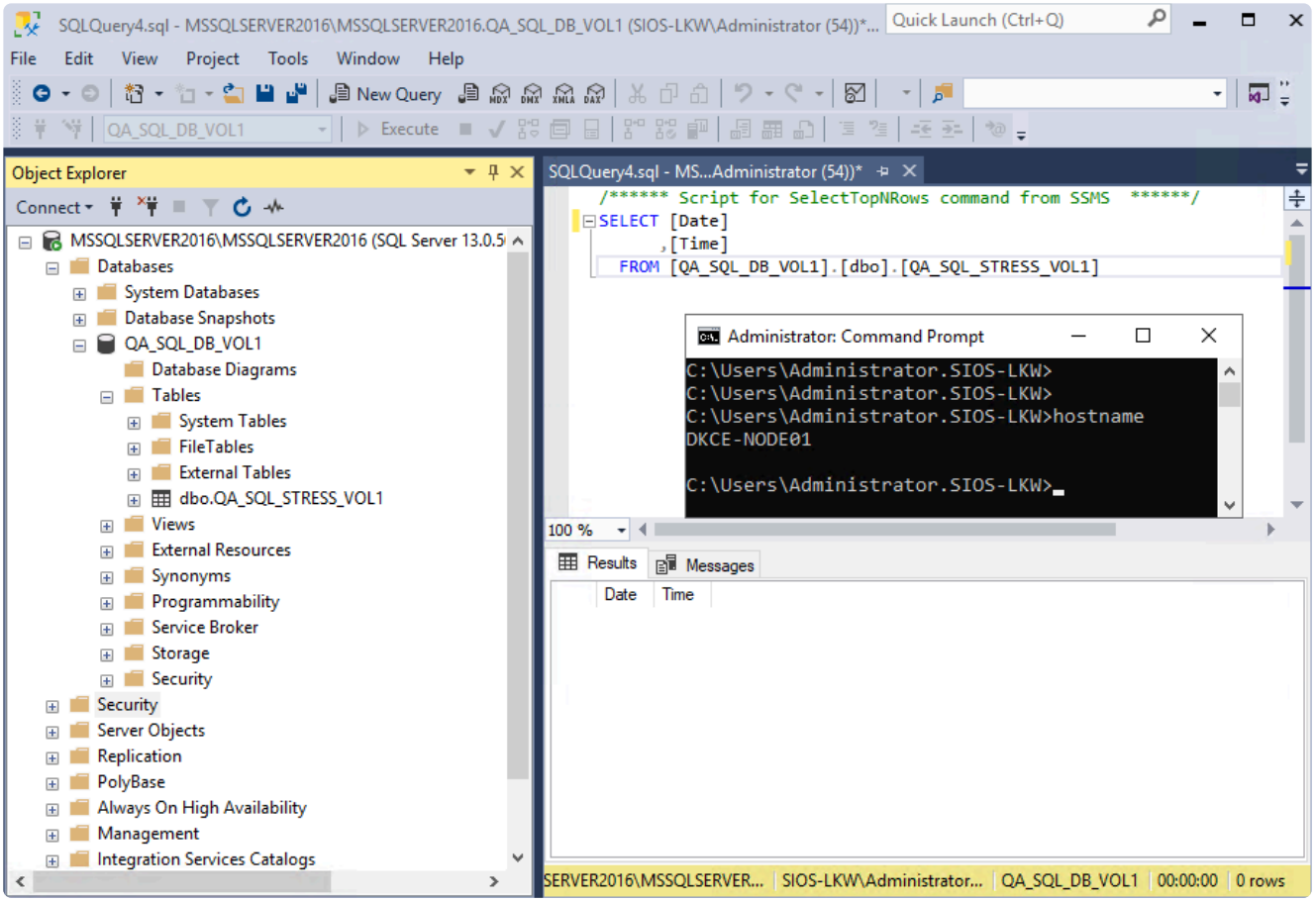
3. Wait until the resource conversion is finished. The SQL Server is running on DKCE-NODE02.



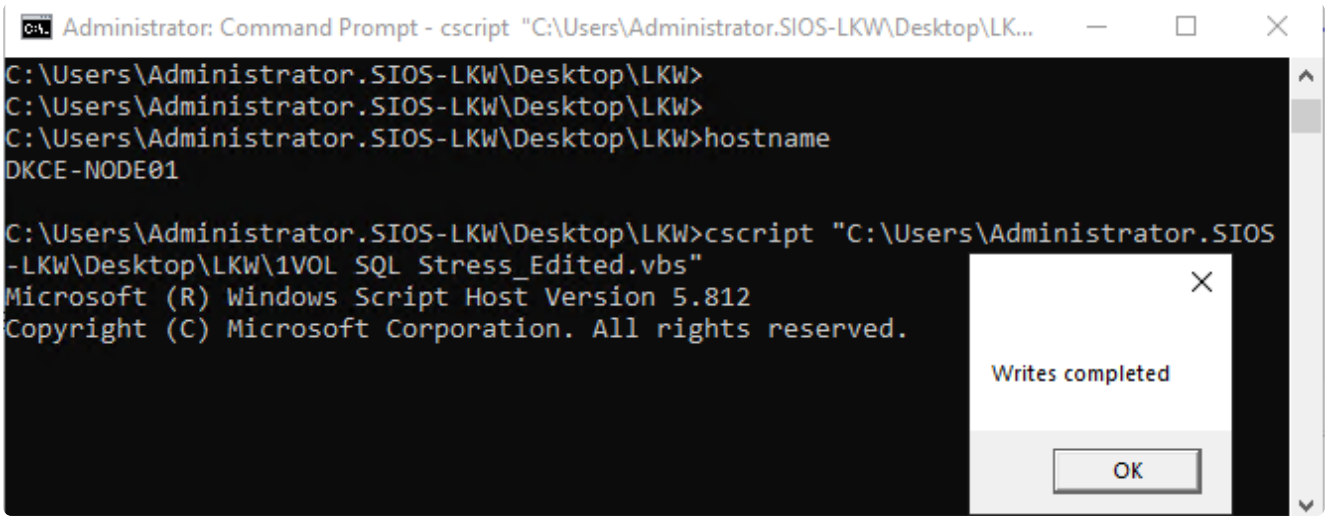
Connect to the database via SQL Server Management Studio

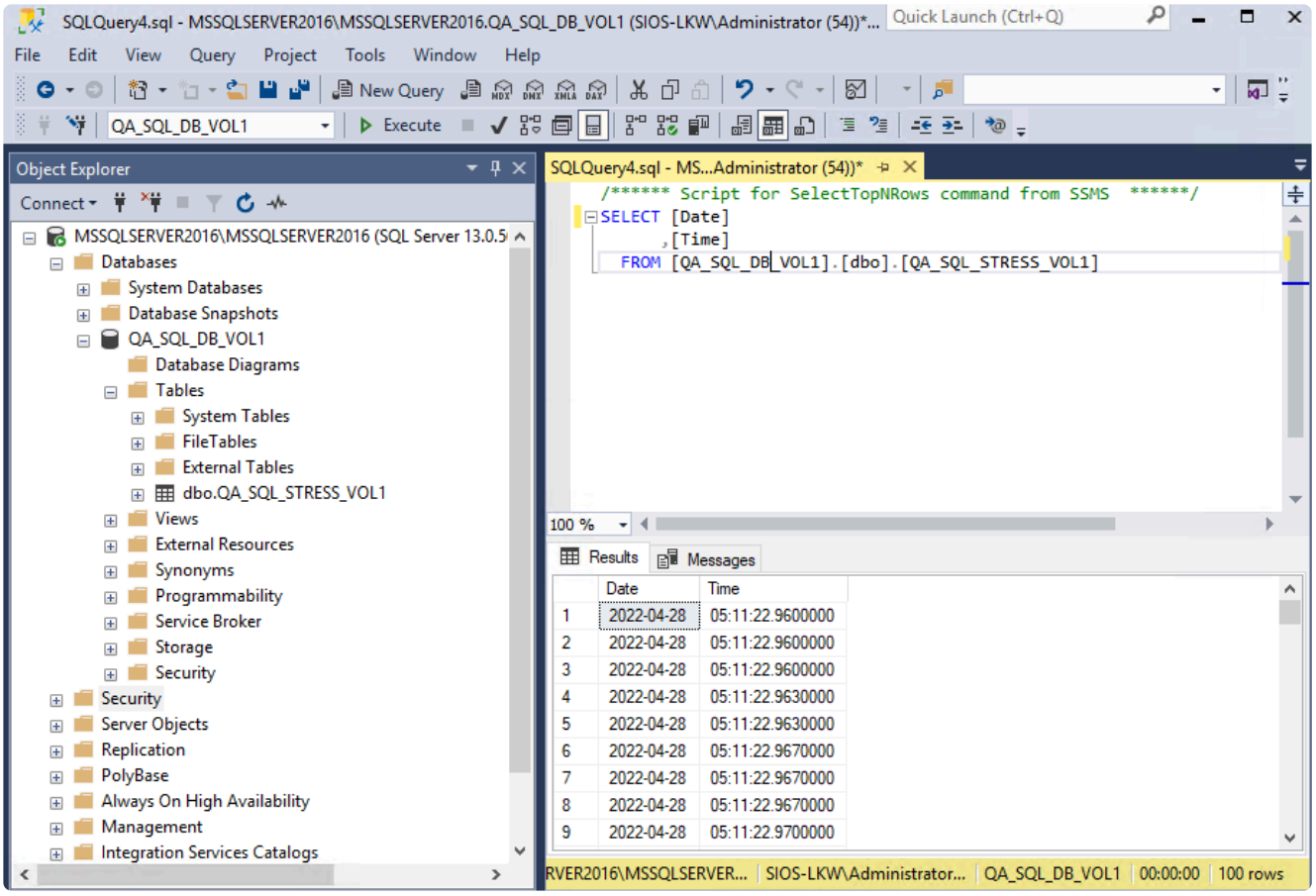
To connect to the database of SQL Server 2016, follow these steps:

1. Open Microsoft SQL Server Management Studio and connect to the SQL Server 2016 database.

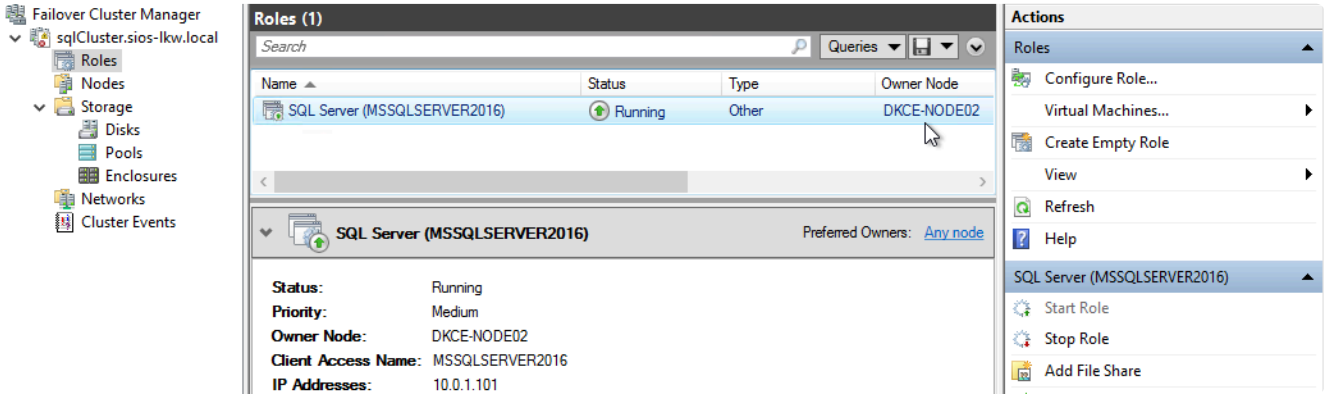


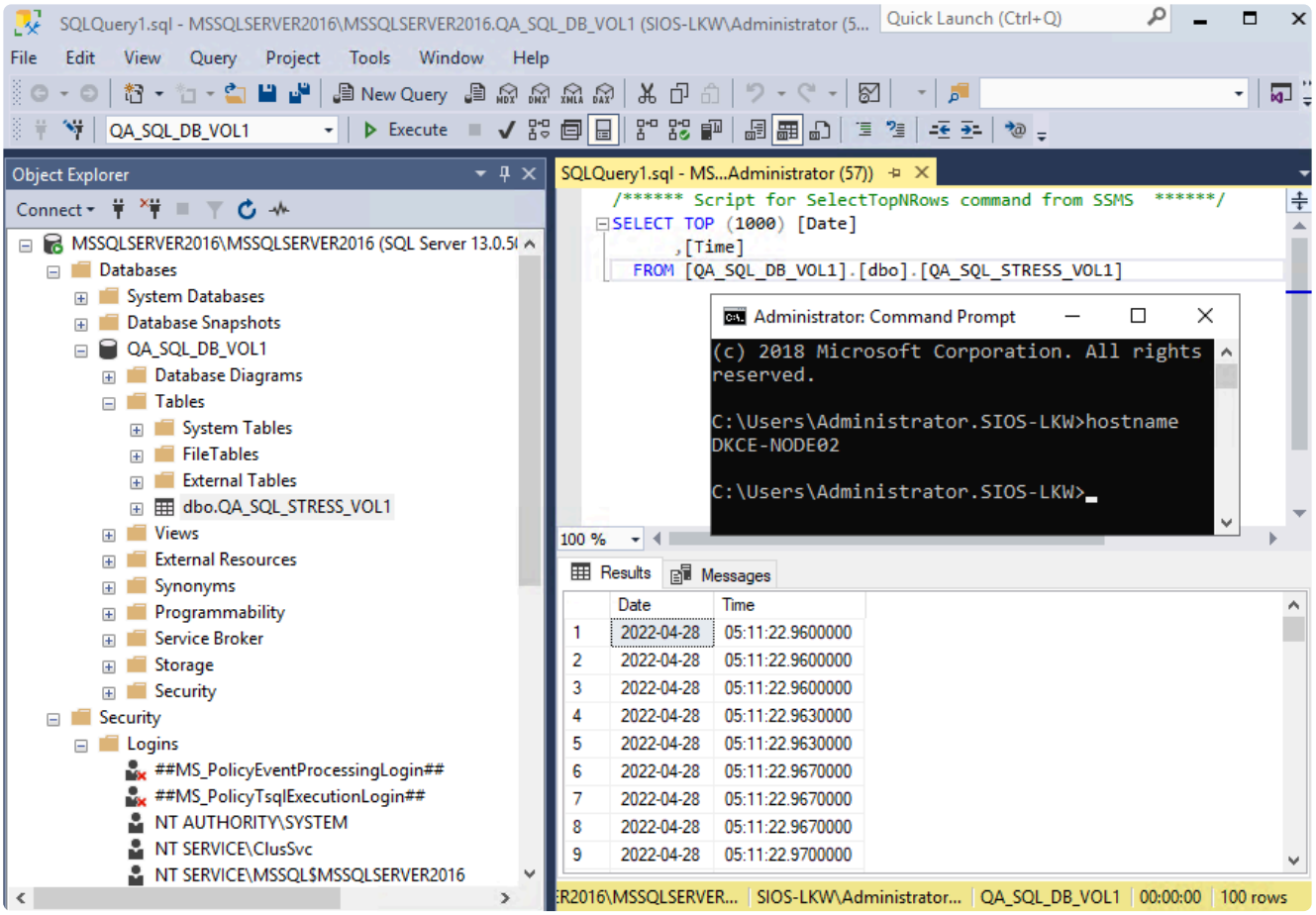
2. Using the script, write constant date\time stamps to the database.





3. Switchover the SQL resource to Target Node then connect to the Database on Target Node.





4. In the SQL Management Studio editor, run the command **select * from <database table>** to confirm the timestamps have been reflected.