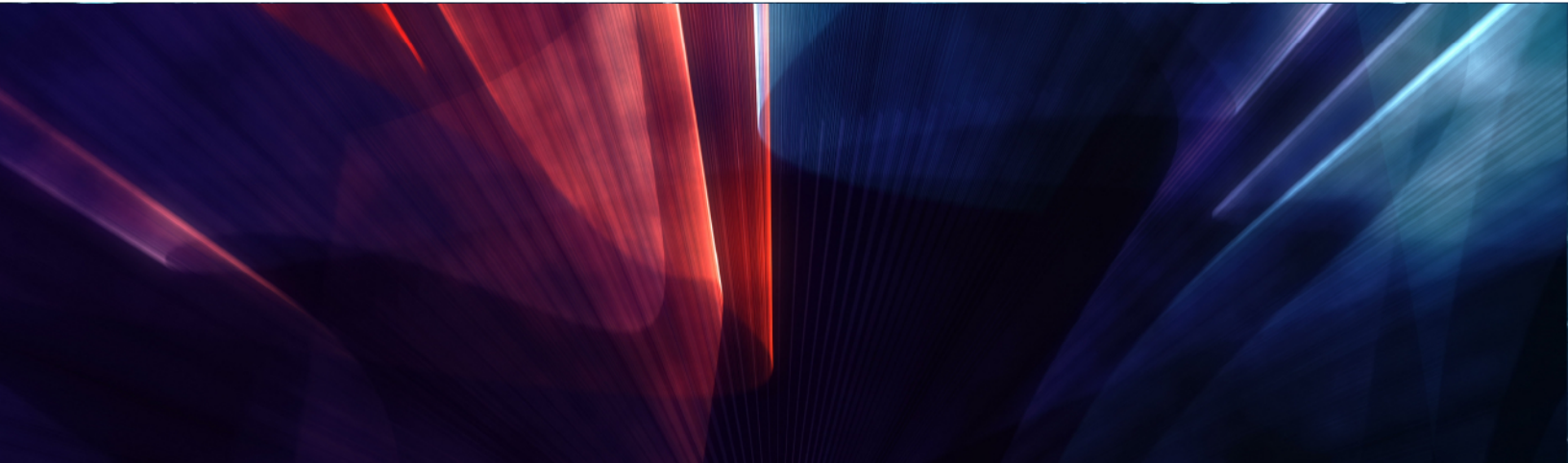




Step by Step: SQL Server 2019 FCI in OCI



Introduction

If you are deploying business-critical applications in Oracle Cloud Infrastructure (OCI), it's crucial to understand and leverage the availability SLA (Service Level Agreement) provided by OCI for optimal uptime and reliability. OCI's SLA varies based on the deployment strategy you choose:

Deployment across Availability Domains: OCI offers a 99.99% availability SLA when you deploy two or more Virtual Machines (VMs) across different Availability Domains within the same OCI region.

Deployment across Fault Domains: If you deploy VMs across Fault Domains, OCI provides a 99.95% availability SLA. It is important to note that not every OCI region has multiple Availability Domains, so in some regions, deployments across Fault Domains will be your only option.

Single VM Deployment: For deployments involving a single VM, the SLA stands at 99.9%.

This framework means that OCI guarantees a certain level of external connectivity based on how you deploy your VMs:

It's important to note that the SLA covers the availability of the VM itself, not the applications or services running on it. To ensure application availability, additional measures such as application monitoring, recovery planning, data replication, and transactional replication (for databases like SQL Server) are necessary. Strategies might include load balancing, clustering, or data replication to manage application availability effectively.

To meet the criteria for the 99.99% availability SLA in OCI, it's essential to deploy your VMs across multiple Availability Domains. This post will guide you on designing your OCI infrastructure to facilitate SQL Server Failover Cluster Instances that span Availability Domains, ensuring maximum uptime and reliability for your critical business applications.

Create the VCN and Subnets

In this guide, I assume you have some familiarity with Oracle Cloud Infrastructure (OCI) and a basic understanding of networking concepts. I will illustrate common configuration tasks with descriptions, and where necessary, provide additional guidance to navigate some of the common challenges encountered in OCI networking.

Starting with a well-thought-out network plan is crucial. This document won't cover the intricacies of cloud network planning, so the following example should be considered just one of many possibilities. Your network configurations may vary significantly. However, an important consideration is to plan for the use of at least three Availability Domains, allocating one for each cluster node and another for the file share witness. The important thing required for clustering is that each Availability Domain MUST be in a different subnet.

Although we are not covering configurations that span Fault Domains instead of Availability Domains, the same applies to clusters that span Fault Domains - all nodes must reside in different subnets.

In our scenario, we will set up three subnets across three different Availability Domains within a single Virtual Cloud Network (VCN) in OCI.

VCN: 10.0.0.0/16

- AD1: 10.0.0.0/18
- AD2: 10.0.64.0/18
- AD3: 10.0.128.0/18

OCI's user interface can change, but at the time of writing, the process for creating a new VCN and three subnets is straightforward in the OCI console. The specifics can be found in OCI's documentation or through its user interface, which guides you through the necessary steps for VCN and subnet creation.

Create the VCN

Create a Virtual Cloud Network Help

Name
WSFC-CLUSTER

Create In Compartment
slostechnology (root)

IPv4 CIDR Blocks

i You can assign up to 5 IPv4 CIDR blocks to a VCN. There must be at least one IPv4 CIDR block assigned to a VCN. [Learn more.](#)

IPv4 CIDR Blocks
10.0.0.0/16

IPv4 Example: 10.0.0.0/16

DNS Resolution
 Use DNS hostnames in this VCN
Required for instance hostname assignment if you plan to use VCN DNS or a third-party DNS. This choice cannot be changed after the VCN is created. [Learn more.](#)

DNS Label
WSFCCLUSTER
Generated from virtual cloud network name if not specified.

DNS Domain Name *Read-only*
WSFCCLUSTER.oraclevon.com
Generated from virtual cloud network name if not specified.

IPv6 Prefixes

i You can assign up to 5 IPv6 prefixes to a VCN. [Learn more.](#)

Assign an Oracle allocated IPv6 /56 prefix. [Learn More.](#)
Selecting this option allows a single Oracle assigned IPv6 prefix to your Virtual Cloud Network

BYOIPv6 Prefix

Add IPv6 Prefixs Remove

IPv6 Prefix	IP Range	Total IPs
No items found.		

0 selected Showing 0 items < 1 of 1 >

Create VCN Save as stack Cancel

Create three subnets in the VCN

Create Subnet

Name:

Create In Compartment:

Subnet Type: Regional (Recommended) Availability Domain-specific

Availability Domain:

IPv4 CIDR Block:

IPv6 Prefixes:

Route Table Compartment in **siostechnology (root)** [\(Change compartment\)](#)
Default Route Table for WSFC-CLUSTER1

Subnet Access: Private Subnet Public Subnet

DNS Resolution: Use DNS hostnames in this Subnet

DNS Label:

DNS Domain Name *Read-only*:

Dhcp Options Compartment in **siostechnology (root)** [\(Change compartment\)](#)
Default DHCP Options for WSFC-CLUSTER1

Security Lists: [+ Another Security List](#)

Resource logging: Resource logging disabled

[Show Tagging Options](#)

Create Subnet

Name
AD2

Create In Compartment
siostechnology (root)

Subnet Type
Regional (Recommended)
Instances in the subnet can be created in any availability domain in the region. Useful for high availability.

Availability Domain-specific
Instances in the subnet can only be created in one availability domain in the region. ✓

Availability Domain
Nq2:US-ASHBURN-AD-2

IPv4 CIDR Block
IPv4 CIDR Block
10.0.64.0/18
Specified IP addresses: 10.0.64.0-10.0.127.255 (16,384 IP addresses)

IPv6 Prefixes
i Maximum amount of 0 IPv6 prefixes per Subnet. IP ranges of the IPv6 prefixes must not overlap. [Learn more.](#)

Route Table Compartment in **siostechnology (root)** [\(Change compartment\)](#)
Default Route Table for WSFC-CLUSTER1

Subnet Access
Private Subnet
Prohibit public IP addresses for Instances in this Subnet

Public Subnet
Allow public IP addresses for Instances in this Subnet ✓

DNS Resolution
 Use DNS hostnames in this Subnet
Allows assignment of DNS hostname when launching an Instance.

DNS Label
AD2
Only letters and numbers, starting with a letter. 15 characters max.

DNS Domain Name Read-only
<dns-label>-wsfccluster1.oraclelvcn.com

Dhcp Options Compartment in **siostechnology (root)** [\(Change compartment\)](#)
Default DHCP Options for WSFC-CLUSTER1

Security Lists
You can associate up to 5 network security lists with the subnet.
Security List Compartment in **siostechnology (root)** [\(Change compartment\)](#)
Default Security List for WSFC-CLUSTER1

+ Another Security List

Resource logging
Enable resource logging to allow resource tracking, troubleshooting, and data insights
 Resource logging disabled

[Show Tagging Options](#)

Create Subnet Cancel

Create Subnet

Name
AD3

Create In Compartment
siostechnology (root)

Subnet Type

Regional (Recommended)
Instances in the subnet can be created in any availability domain in the region. Useful for high availability.

Availability Domain-specific
Instances in the subnet can only be created in one availability domain in the region. ✓

Availability Domain
NqZi:US-ASHBURN-AD-3

IPv4 CIDR Block

IPv4 CIDR Block
10.0.128.0/18
Specified IP addresses: 10.0.128.0-10.0.191.255 (16,384 IP addresses)

IPv6 Prefixes

Maximum amount of 0 IPv6 prefixes per Subnet. IP ranges of the IPv6 prefixes must not overlap. [Learn more.](#)

Route Table Compartment in **siostechnology (root)** ([Change compartment](#))
Default Route Table for WSFC-CLUSTER1

Subnet Access

Private Subnet
Prohibit public IP addresses for instances in this Subnet

Public Subnet
Allow public IP addresses for instances in this Subnet ✓

DNS Resolution
 Use DNS hostnames in this Subnet
Allows assignment of DNS hostname when launching an instance.

DNS Label
AD3
Only letters and numbers, starting with a letter; 15 characters max.

DNS Domain Name *Read-only*
<dns-label>.wsfccluster1.oraclevcn.com

Dhcp Options Compartment in **siostechnology (root)** ([Change compartment](#))
Default DHCP Options for WSFC-CLUSTER1

Security Lists

You can associate up to 5 network security lists with the subnet.

Security List Compartment in **siostechnology (root)** ([Change compartment](#))
Default Security List for WSFC-CLUSTER1

+ Another Security List

Resource logging

Enable resource logging to allow resource tracking, troubleshooting, and data insights

Resource logging disabled

[Show Tagging Options](#)

Create Subnet Cancel

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Create the Internet gateway

The internet gateway is how our instances will gain access to the internet. In your network you may not want your instances to be able to access the internet, but for this example we will enable it and add it to our default route table.

Create Internet Gateway Help

Name

Create In Compartment

[Show advanced options](#)

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Edit the Default Security List

Networking > Virtual cloud networks > WSFC-CLUSTER1 > Security List Details



AVAILABLE

Default Security List for WSFC-CLUSTER1

Instance traffic is controlled by firewall rules on each Instance in addition to this Security List

[Move resource](#) [Add tags](#) [Terminate](#)

Security List Information

Tags

OCID: ...o2plaa [Show](#) [Copy](#)

Compartment: siostechnology (root)

Created: Mon, Dec 18, 2023, 23:41:42 UTC

Resources

Ingress Rules (2)

Egress Rules (1)

Ingress Rules

[Add Ingress Rules](#) [Edit](#) [Remove](#)

<input type="checkbox"/>	Stateless ▾	Source	IP Protocol	Source Port Range	Destination Port Range	Type and Code	Allows	Description
<input type="checkbox"/>	No	0.0.0.0/0	TCP	All	3389		TCP traffic for ports: 3389	Remote Access ⋮
<input type="checkbox"/>	No	10.0.0.0/16	All Protocols				All traffic for all ports	Open in Subnet ⋮

0 selected Showing 2 Items < 1 of 1 >

Edit the route table

Edit the route table so that all traffic destined for outside the VCN is routed through the internet gateway.

Add Route Rules Help

Important:
For a route rule that targets a Private IP, you must first enable "Skip Source/Destination Check" on the VNIC that the Private IP is assigned to.

Route Rule

Target Type
Internet Gateway

Destination CIDR Block
0.0.0.0/0
Example: 10.0.0.0/24

Target Internet Gateway in **siostechnology (root)** [\(Change compartment\)](#)
IG1

Description *Optional*

Maximum 255 characters

[+ Another Route Rule](#)

[Add Route Rules](#) [Cancel](#)

Create Network Security Group

ORACLE Cloud Search resources, services, documentation, and Marketplace US East (Ashburn)

Create Network Security Group Help

1 Basic Info First, provide basic information about the group. Next, you will add security rules

2 Security Rules

Name
open

Create In Compartment
siostechnology (root)

[Show advanced options](#)

Create Network Security Group

[Help](#)

- 1 Basic Info
- 2 Security Rules

Add Security Rules

Optionally add one or more rules to the network security group. [Learn more about security rules.](#)

Rule [X]

Stateless ⓘ

Direction:

Source Type:

Source CIDR:
Specified IP addresses: 10.0.0.0-10.0.255.255 (65,536 IP addresses)

IP Protocol:

Source Port Range: Optional ⓘ

Destination Port Range: Optional ⓘ

Allows:

Description: Optional
Maximum 255 characters

[+ Another Rule](#)

Networking > Virtual cloud networks > WSFC-CLUSTER1 > Network Security Group Details



AVAILABLE

open

- [Edit](#) [Move resource](#) [Add tags](#) [Terminate](#)

Network Security Group Information Tags

OCID: ...be3vja [Show](#) [Copy](#) **Compartment:** siostechology (root)
Created: Tue, Dec 19, 2023, 21:44:04 UTC

Security Rules

These security rules apply to all VNICs in this network security group. You can filter the list by ingress or egress. There can be other security rules that apply to a given VNIC in this group: from any other network security groups the VNIC is in, and any security lists associated with the VNIC's subnet. [Learn more about security rules.](#)

<input type="checkbox"/>	Direction ⓘ	Source or Destination ⓘ	Protocol ⓘ	Details ⓘ	Description ⓘ
<input type="checkbox"/>	Direction: Ingress	Source Type: CIDR	All Protocols	Allow: All tra... Show	Allow all traffic within t he VCN
<input type="checkbox"/>	Stateless: No	Source: 10.0.0.0/16			

0 selected Showing 1 item < 1 of 1 >

Resources

Security Rules

VNICs

Filters

- Direction
- Egress
 - Ingress

Edit the security list

ORACLE Cloud Search resources, services, documentation, and Marketplace US East (Ashburn)

Networking > Virtual cloud networks > WSFC-CLUSTER1 > Security List Details > Ingress Rules

Default Security List for WSFC-CLUSTER1

Instance traffic is controlled by firewall rules on each Instance in addition to this Security List

Move resource Add tags Terminate

Security List Information Tags

OCID: ...o2piaa [Show](#) [Copy](#) **Compartment:** siostechnology (root)
Created: Mon, Dec 18, 2023, 23:41:42 UTC

Resources

- Ingress Rules (2)
- Egress Rules (1)

Ingress Rules

Add Ingress Rules Edit Remove

<input type="checkbox"/>	Stateless	Source	IP Protocol	Source Port Range	Destination Port Range	Type and Code	Allows	Description
<input type="checkbox"/>	No	0.0.0.0/0	TCP	All	3389		TCP traffic for ports: 3389	Remote Access
<input type="checkbox"/>	No	10.0.0.0/16	All Protocols				All traffic for all ports	Open in Subnet

0 selected Showing 2 items < 1 of 1 >

Networking > Virtual cloud networks > WSFC-CLUSTER1 > Security List Details > Egress Rules

Default Security List for WSFC-CLUSTER1

Instance traffic is controlled by firewall rules on each Instance in addition to this Security List

Move resource Add tags Terminate

Security List Information Tags

OCID: ...o2piaa [Show](#) [Copy](#) **Compartment:** siostechnology (root)
Created: Mon, Dec 18, 2023, 23:41:42 UTC

Resources

- Ingress Rules (2)
- Egress Rules (1)

Egress Rules

Add Egress Rules Edit Remove

<input type="checkbox"/>	Stateless	Destination	IP Protocol	Source Port Range	Destination Port Range	Type and Code	Allows	Description
<input type="checkbox"/>	No	0.0.0.0/0	All Protocols				All traffic for all ports	

0 selected Showing 1 item < 1 of 1 >

These settings allow unfettered access across availability domains, and allows RDP access from anywhere. You may consider limiting which IP addresses can RDP to your instances or even setting up a “jump VM” used exclusively for RDP access from the public network.

Edit DHCP options

For active directory to work correctly, you must set the DC1 as the primary DNS server in the DHCP options as shown below. In this case, we set it to 10.0.0.100, which is the static IP of the domain controller we are configuring. You should also add your domain to the custom search domain. In this case, we will use the domain called datakeeper.local, which we will build later when we configure our domain controller.

Edit DHCP Options Help

Name Read-only
Default DHCP Options for WSFC-CLUSTER1

DNS Type

Internet and VCN Resolver
Instance can resolve host names within the VCN and internet host names. No internet Gateway is required.

Custom Resolver
Specify one to three DNS Servers IP addresses below. At least one is required. ✓

DNS Server Address
10.0.0.100 + Another DNS Server

DNS Search Domain Type

Subnet Search Domain
Sends the subnet domain name to DHCP clients based on their subnet membership. Example: subnet1.vcn1.oraclevcn.com

VCN Search Domain
Sends the VCN domain name to DHCP clients based on their VCN membership. Example: vcn1.oraclevcn.com

Custom Search Domain
Sends the provided fully qualified domain name (FQDN) to DHCP clients. Use this option with more advanced DNS scenarios.

Search Domain
datakeeper.local
host.exampledomain.com

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Provision the VMs

Now that the VCN is configured, it is time to start provisioning the VMs. In this example we are going to use Windows Server 2022 and SQL Server 2019. However, the steps described in this article are almost identical across all versions of Windows Server and SQL Server, so you shouldn't have any issues regardless of which version of Windows or SQL Server you plan to use.

Before you begin, it is once again important to start with a plan. In this case you will want to plan your server names, IP addresses and their availability zone placement. As mentioned earlier, each cluster node and the file share witness must each reside in a different availability zone.

In the example configuration, we will deploy active-directory in an instance (DC1) that will also act as a file share witness.

AD1 - DC1 (10.0.0.100)

AD2 - SQL1 - (10.0.64.100, 10.0.64.101, 10.0.64.102)

AD3 - SQL2 - (10.0.128.100, 10.0.128.101, 10.0.128.102)

You may have noticed that each of the cluster nodes (SQL1, SQL2) have three IP addresses.

The first address is the private IP address of the instance. The other two IP addresses will be added as secondary addresses on each instance. These IP addresses account for the core cluster IP address and the virtual IP address associated with the SQL Server FCI network name resource.

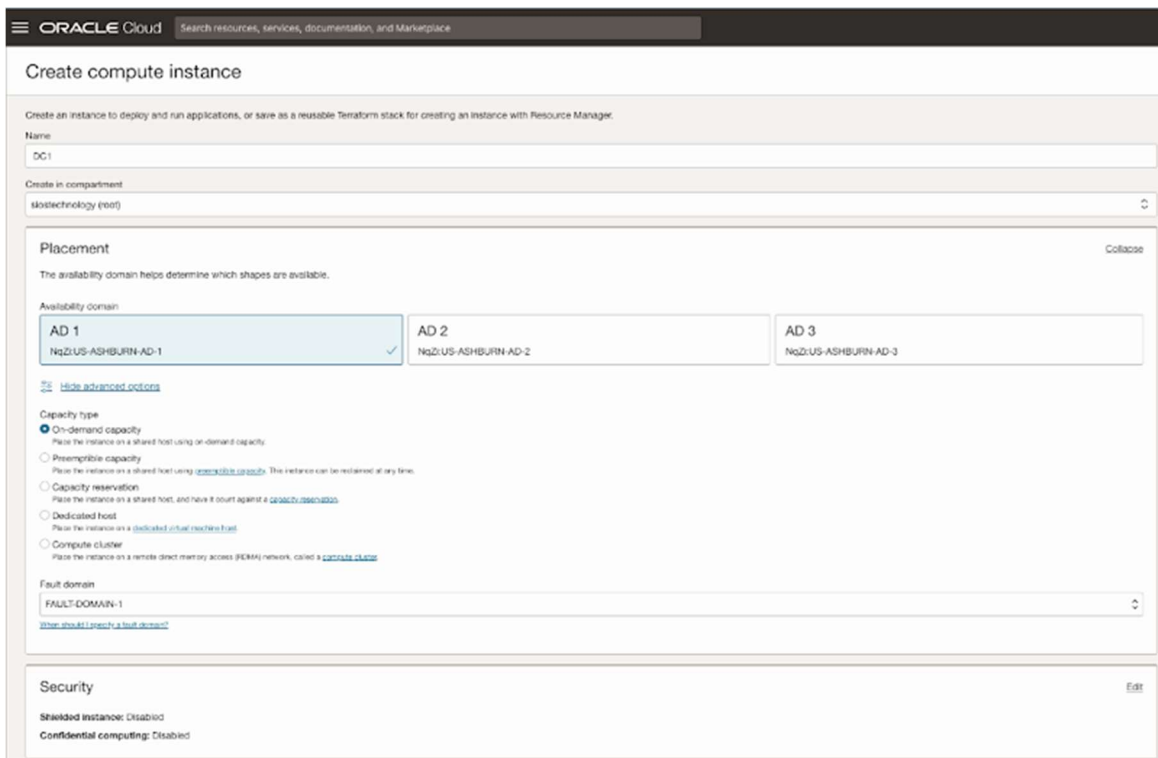
When we provision the cluster nodes we will use the base Windows Server 2022 images with no SQL Server software included. Instead we will download the SQL Server installation media and use a perpetual SQL Server license instead of the “pay-as-you-go” licensing available on the Marketplace.

The following sections illustrate the process of provisioning the three VMs used in this example.

Provision DC1 in FD1

When choosing an instance type you must size it properly for the workload. This is similar to what you would do if you were sizing a physical server to use on-premises, but the difference is that you can adjust the size easily if you over-provision, or under-provision the first time, or if your workload increases or decreases over time.

When specifying the instance details, make sure you choose the right VCN and the subnet for proper placement. On this first screen you also specify the static IP you want to associate with this instance.



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Create compute instance

Create an instance to deploy and run applications, or save as a reusable Terraform stack for creating an instance with Resource Manager.

Name: DC1

Create in compartment: siosotechnology (root)

Placement Collapsible

The availability domain helps determine which shapes are available.

Availability domain:

AD 1 Nq2:US-ASHBURN-AD-1 ✓	AD 2 Nq2:US-ASHBURN-AD-2	AD 3 Nq2:US-ASHBURN-AD-3
-------------------------------	-----------------------------	-----------------------------

[Hide advanced options](#)

Capacity type:

- On-demand capacity
Place the instance on a shared host using on-demand capacity.
- Preemptible capacity
Place the instance on a shared host using [preemptible capacity](#). This instance can be reclaimed at any time.
- Capacity reservation
Place the instance on a shared host, and have it count against a [capacity reservation](#).
- Dedicated host
Place the instance on a [dedicated virtual machine host](#).
- Compute cluster
Place the instance on a remote direct memory access (RDMA) network, called a [compute cluster](#).

Fault domain: FAULT-DOMAIN-1
[What should I specify a fault domain?](#)

Security Edit

Shielded instance: Disabled
Confidential computing: Enabled

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 2022 Standard
Image built: 2023.10.10-0



[Change image](#)

Shape



VM.Standard.E4.Flex
Virtual machine, 2 core OCPU, 16 GB memory, 2 Gbps network bandwidth



[Change shape](#)

Primary VNIC information

[Collapse](#)

A **virtual network interface card (VNIC)** connects your instance to a **virtual cloud network (VCN)** and endpoints in and outside the VCN. Having a public IP address is required to make this instance accessible from the internet.

VNIC name: Optional

DC1

Primary network

Select existing virtual cloud network Create new virtual cloud network Enter subnet OCID

VCN in **slostechnology (root)** [\(Change compartment\)](#)

WSFC-CLUSTER1

Subnet

An IP address from a public subnet and an [internet gateway](#) on the VCN are required to make this instance accessible from the internet.

Select existing subnet Create new public subnet

Subnet in **slostechnology (root)** [\(Change compartment\)](#)

AD1

Primary VNIC IP addresses

Private IPv4 address

Automatically assign private IPv4 address Manually assign private IPv4 address

IPv4 address

10.0.0.100

Must be within 10.0.0.0 to 10.0.0.255. Must not already be in use.

Public IPv4 address

Automatically assign public IPv4 address
If you're not sure whether you need a public IP address, you can always assign one later.

IPv6 addresses

Assign IPv6 addresses from subnet prefixes
You can only assign one IPv6 address per subnet prefix at first instance creation. Subnets can have more than one IPv6 prefix.

i The selected VCN and subnet combination does not support IPv6 addresses. You must enable IPv6 addressing on the VCN and subnet before you can assign IPv6 addresses to this instance.

[Show advanced options](#)

Login credentials

An initial password will be generated when you create the instance. It will be available on the details screen for the newly launched instance. You must reset the password when you sign in to the instance for the first time.

Boot volume

A **boot volume** is a detachable device that contains the image used to boot the compute instance.

Specify a custom boot volume size

[What's new](#) works with volume size. Default boot volume size: 47.0 GB. When you specify a custom boot volume size, service limits apply.

Use in-transit encryption

[Encryption](#) in transit between the instance, the boot volume, and the block volumes.

Provision SQL1 in FD2

As discussed earlier, this example uses the base install of Windows Server 2022. SQL Server 2019 will be downloaded later and used for the SQL Server FCI installation.

Create compute instance

Create an instance to deploy and run applications, or save as a reusable Terraform stack for creating an instance with Resource Manager.

Name: SQL1

Create in compartment: siosotechnology (root)

Placement

The availability domain helps determine which shapes are available.

Availability domain

AD 1 NqZi:US-ASHBURN-AD-1	AD 2 NqZi:US-ASHBURN-AD-2 ✓	AD 3 NqZi:US-ASHBURN-AD-3
------------------------------	--------------------------------	------------------------------

[hide advanced options](#)

Capacity type

- On-demand capacity
Place the instance on a shared host using on-demand capacity.
- Preemptible capacity
Place the instance on a shared host using [preemptible capacity](#). The instance can be reclaimed at any time.
- Capacity reservation
Place the instance on a shared host, and have it count against a [capacity reservation](#).
- Dedicated host
Place the instance on a dedicated virtual machine (VM).
- Compute cluster
Place the instance on a remote direct memory access (RDMA) network, called a [compute cluster](#).

Fault domain: FAULT-DOMAIN-2

What should I search a fault domain?

Security

Shielded instance: Disabled
Confidential computing: Disabled

Image and shape

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 2022 Standard
Image GUID: 2023.10.10-0

Change image

Shape

VM.Standard.E4.Flex
Virtual machine, 2 core OCPU, 16 GB memory, 2 Gbps network bandwidth

Change shape

Primary VNIC information

Collapsible

A [virtual network interface card \(VNIC\)](#) connects your instance to a [virtual cloud network \(VCN\)](#) and endpoints in and outside the VCN. Having a public IP address is required to make this instance accessible from the internet.

VNIC name: Optional

SQLZ

Primary network

Select existing virtual cloud network Create new virtual cloud network Enter subnet OCID

VCN in [siosotechnology \(root\)](#) [\(Change compartment\)](#)

WSFC-CLUSTER1

Subnet

An IP address from a public subnet and an [internet gateway](#) on the VCN are required to make this instance accessible from the internet.

Select existing subnet Create new public subnet

Subnet in [siosotechnology \(root\)](#) [\(Change compartment\)](#)

ADZ

Primary VNIC IP addresses

Private IPv4 address

Automatically assign private IPv4 address Manually assign private IPv4 address

IPv4 address

10.0.64.100

Must be within 10.0.0.0 to 10.0.127.255. Must not already be in use.

Public IPv4 address

Automatically assign public IPv4 address

If you're not sure whether you need a public IP address, you can always assign one later.

IPv6 addresses

Assign IPv6 addresses from subnet prefixes

You can only assign one IPv6 address per subnet prefix at first instance creation. Subnets can have more than one IPv6 prefix.

i The selected VCN and subnet combination does not support IPv6 addresses. You must enable IPv6 addressing on the VCN and subnet before you can assign IPv6 addresses to this instance.

[Show advanced options](#)

Login credentials

An initial password will be generated when you create the instance. It will be available on the details screen for the newly launched instance. You must reset the password when you sign in to the instance for the first time.

Boot volume

A [boot volume](#) is a detachable device that contains the image used to boot the compute instance.

Specify a custom boot volume size

[Learn more](#) about volume size. Default boot volume size: 47 GB. When you specify a custom boot volume size, service limits apply.

Use in-transit encryption

[Learn more](#) about in-transit encryption between the instance, the boot volume, and the disk volumes.

Encrypt this volume with a key that you manage

By default, Oracle manages the keys that encrypt this volume, but you can choose a key from a vault that you have access to if you want greater control over the key's lifecycle and how it's used. [Learn more](#) about [using your own keys](#).

Live migration

The instance is live migrated to a healthy physical VM host without any disruption. Use events to track the progress. If live migration isn't successful, reboot migration is used. When disabled, a notification is sent for the maintenance event, and the instance is only live migrated if you do not proactively reboot the instance before the due date.

[Show advanced options](#)

Provision SQL2 in FD3

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Create compute instance

Create an instance to deploy and run applications, or save as a reusable IFormstack stack for creating an instance with Resource Manager.

Name: SQL2

Create in compartment: sbstechnology (root)

Placement

The availability domain helps determine which shapes are available.

Availability domain

AD 1 NqZ1:US-ASHBURN-AD-1	AD 2 NqZ1:US-ASHBURN-AD-2	AD 3 NqZ1:US-ASHBURN-AD-3 ✓
------------------------------	------------------------------	--------------------------------

Hide advanced options

Capacity type

- On-demand capacity
Place the instance on a shared host using on-demand capacity.
- Preemptible capacity
Place the instance on a shared host using preemptible capacity. This instance can be reclaimed at any time.
- Capacity reservation
Place the instance on a shared host, and have it count against a capacity reservation.
- Dedicated host
Place the instance on a dedicated virtual machine host.
- Compute cluster
Place the instance on a remote direct memory access (RDMA) network, called a compute cluster.

Fault domain: FAULT-DOMAIN-3

Security

Shielded instance: Disabled
Confidential computing: Disabled

Image and shape

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 2022 Standard
Image build: 2023.10.10-0

Change image

Shape

VM.Standard.E4.Flex
Virtual machine, 2 core OCPU, 16 GB memory, 2 Gbps network bandwidth

Change shape

Primary VNIC information Collapse

A [virtual network interface card \(vNIC\)](#) connects your instance to a [virtual cloud network \(VCN\)](#) and endpoints in and outside the VCN. Having a public IP address is required to make this instance accessible from the internet.

VNIC name:

Primary network:
 Select existing virtual cloud network Create new virtual cloud network Enter subnet OCID

VCN in [siosotechnology \(root\)](#) [\(Change compartment\)](#)

Subnet:
An IP address from a public subnet and an [internet gateway](#) on the VCN are required to make this instance accessible from the Internet.
 Select existing subnet Create new public subnet

Subnet in [siosotechnology \(root\)](#) [\(Change compartment\)](#)

Primary VNIC IP addresses

Private IPv4 address
 Automatically assign private IPv4 address Manually assign private IPv4 address

Public IPv4 address
 Automatically assign public IPv4 address
If you're not sure whether you need a public IP address, you can always assign one later.

IPv6 addresses
 Assign IPv6 addresses from subnet prefixes
You can only assign one IPv6 address per subnet prefix at first instance creation. Subnets can have more than one IPv6 prefix.

[Show advanced options](#)

Login credentials

An initial password will be generated when you create the instance. It will be available on the details screen for the newly launched instance. You must reset this password when you sign in to the instance for the first time.

Boot volume

A [boot volume](#) is a detachable device that contains the image used to boot the compute instance.

Specify a custom boot volume size
[View restrictions](#) when with volume size. Default boot volume size: 47.0 GB. When you specify a custom boot volume size, see size limits.

Use in-transit encryption
[Encryption](#) is enabled between the instance, the boot volume, and the block volumes.

Encrypt this volume with a key that you manage
By default, Oracle manages the keys that encrypt this volume, but you can choose a key from a vault that you have access to if you want greater control over the key's lifecycle and how it's used: [TDE on OCI Storage \(TDE, DMK, and TDE Key\)](#)

Live migration

The instance is live migrated to a healthy physical VM host without any disruption. Use events to track the progress. If live migration isn't successful, reboot migration is used. When disabled, a notification is sent for the maintenance event, and the instance is only live migrated if you do not proactively reboot the instance before the due date.

[Show advanced options](#)

Adding Additional Volumes

Each server in the cluster requires at least one additional volume. These volumes are crucial for the storage needs of the SQL Server FCI and are replicated by SIOS DataKeeper.

Multiple Volumes

You can add multiple volumes to separate your data, logs, and backups.

Storage Types: Various storage types are available to suit different requirements.

Attachment Methods

There are multiple ways to attach storage to your servers.

Example Configuration

Below, we have included screen captures demonstrating one of the many possible storage configurations. This serves as a practical example to aid in understanding the setup process. This process should be completed on SQL1 and SQL2.

Create Block Volumes

First, create the block volumes in the right Availability domain for SQL1 and SQL2.

Create block volume Help

Name
SQL1-DATA

Create in compartment
siostechnology (root)

Availability domain
NqZl:US-ASHBURN-AD-2

Volume size and performance

Default Custom

Volume size (in GB)
50

Size must be between 50 GB and 32,768 GB (32 TB). Volume performance varies with volume size.

Target volume performance

Performance based auto-tune
 Off

Turning on performance based auto-tune will adjust the volume's performance automatically between the VPUs specified for Default and Maximum VPUs/GB, inclusive. When turned on, Default VPUs/GB cannot be set to 0 or 120 and Maximum VPUs/GB must be at least 10 VPUs/GB higher than Default VPUs/GB. Turning it off will change the volume's performance back to the Default VPUs/GB setting. [Learn more](#)

Balanced
VPUs/GB ⓘ

0 120

Default VPUs/GB ⓘ
10

IOPS: 3,000 IOPS

Throughput: 24 MB/s

Balanced choice for most workloads including those that perform random I/O such as boot disks. [Learn more](#)
Actual performance depends on the attached instance's shape. Select the appropriate instance shape to optimize performance. [Learn more](#)
See [Oracle Storage Cloud Pricing for Volume Performance Units \(VPUs\) cost details](#).

Detached volume auto-tune



Turning on detached volume auto-tune will change the volume's performance automatically to Lower Cost when it is detached. When reattached, its performance is automatically adjusted to the previous setting. [Learn more](#)

Backup policies

Select backup policy in **siostechnology (root)** ([Change compartment](#))

No Backup Policy Selected

Cross region replication

Enables asynchronous cross region volume replication. [Learn more](#)

ON OFF

Encryption

- Encrypt using Oracle-managed keys**
Leaves all encryption-related matters to Oracle.
- Encrypt using customer-managed keys**
Requires you to have access to a valid Key Management Key.

 [Show Tagging Options](#)

View detail page after this block volume is created



Create Block volume

Save as stack

Cancel

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Create block volume

[Help](#)

Name

SQ1.2-DATA

Created by @mpartment

slo.technology (mot)

Availability domain

NqZL:US-ASHBURN-AD 3

Volume size and performance

Default Custom

Volume size (in GB)

50

Size must be between 50 GB and 32,768 GB (32 TB). Volume performance varies with volume size.

Target volume performance

Performance based auto-tune

Off

Turning on performance based auto-tune will adjust the volume's performance automatically between the VPIUs specified for default and Maximum VPIUs/GB, inclusive. When turned on, Default VPIUs/GB cannot be set to a value less than 10 and Maximum VPIUs/GB must be at least 10 VPIUs/GB higher than Default VPIUs/GB. Turning it off will change the volume's performance back to the Default VPIUs/GB setting. [Learn more](#)

Balanced

VPIUs/GB



120

Default VPIUs/GB

10

IOPS: 3,000 IOPS

Throughput: 24 MB/s

Balanced choice for most workloads including those that perform random I/O such as boot disks. [Learn more](#)
Actual performance depends on the attached instance's shape. Select the appropriate instance shape to optimize performance. [Learn more](#)

See [Oracle Storage Cloud Pricing for Volume Performance Units \(VPUs\) cost details](#).

Detached volume auto-tune



On

Turning on detached volume auto-tune will change the volume's performance automatically to Lower Cost when it is detached. When reattached, its performance is automatically adjusted to the previous setting. [Learn more](#)

Backup policies

Select backup policy in **siostechnology (root)** ([Change compartment](#))

No Backup Policy Selected



Cross region replication

Enables asynchronous cross region volume replication. [Learn more](#)

ON OFF

Encryption

- Encrypt using Oracle-managed keys**
Leaves all encryption-related matters to Oracle.
- Encrypt using customer-managed keys**
Requires you to have access to a valid Key Management key.

 [Show Tagging Options](#)

View detail page after this block volume is created



Create Block Volume

Save as stack

[Cancel](#)

Attach Volumes

Now that the volumes have been created, you must attach them to the instances.

Attach block volume

[Help](#)

Volume

Select volume Enter volume OCID

Volume in **siostechnology (root)** ([Change compartment](#))

SQL1-DATA

OCID: ...tod2wq [Show](#) [Copy](#)

Target performance: Balanced

VPU: 10

IOPS: 3000 IOPS (60 IOPS/GB)

Throughput: 24.00 MB/s (480 KB/s/GB)

Attachment type

Let Oracle Cloud Infrastructure choose the best attachment type

iSCSI

Paravirtualized

Use in-transit encryption

Access

Read/write

Configures the volume attachment as read/write, not shared with other instances. This enables attachment to a single instance only and is the default configuration.

Read/write - shareable

Configures the volume attachment as read/write, shareable with other instances. This enables read/write attachment to multiple instances.

Read only - shareable

Configures the volume attachment as read-only, enabling attachment to multiple instances.



Attach

[Cancel](#)

Attached block volumes

[Block volumes](#) provide high-performance network storage to support a broad range of I/O intensive workloads.

Metrics

Quick actions

Attached block volumes

Attached VNICs


Boot volume

Console connection

Run command

Attach block volume

Name ▲	State	Volume type	Device path	Type	Access	Size	VPU	Multipath	Attached
SQL1-DATA	● Attached	Block volume	-	paravirtualized	Read/write	50 GB	10	No	Tue, Dec 19, 2023, 23:43:56 UTC

Showing 1 item < 1 0 

Attach block volume

[Help](#)

Volume

Select volume Enter volume OCID

Volume in **siostechnology (root)** ([Change compartment](#))

SQL2-DATA

OCID: ...vqfnpa [Show](#) [Copy](#)

Target performance: Balanced

VPU: 10

IOPS: 3000 IOPS (60 IOPS/GB)

Throughput: 24.00 MB/s (480 KB/s/GB)

Attachment type

Let Oracle Cloud Infrastructure choose the best attachment type

iSCSI

Paravirtualized

Use in-transit encryption

Access

Read/write

Configures the volume attachment as read/write, not shared with other instances. This enables attachment to a single instance only and is the default configuration.

Read/write - shareable

Configures the volume attachment as read/write, shareable with other instances. This enables read/write attachment to multiple instances.

Read only - shareable

Configures the volume attachment as read-only, enabling attachment to multiple instances.



Attach

[Cancel](#)

Attached block volumes

[Block volumes](#) provide high-performance network storage to support a broad range of I/O intensive workloads.

Attach block volume

Name ▲	State	Volume type	Device path	Type	Access	Size	VPU	Multipath	Attached
SQL2-DATA	● Attached	Block volume	-	paravirtualized	Read/write	50 GB	10	No	Tue, Dec 19, 2023, 23:45:38 UTC

Showing 1 item < 1 of 1 >

Key Points to Remember

The setup is flexible. You can configure one or more volumes based on your specific needs.

Consider different storage types and attachment methods available for your configuration.

Add the Secondary IP Addresses

In order for Windows Server Failover Clustering to work properly in OCI, you have to add the cluster IP address as secondary address on the virtual network interface (VNIC) attached to SQL1 and SQL2. As you recall, we discussed using the following IP addresses on each of our cluster nodes.

	SQL1	SQL2
Primary Address	10.0.64.100	10.0.128.100
Cluster IP 1 (core cluster resource)	10.0.64.101	10.0.128.101
Cluster IP 2 (SQL Server Cluster IP)	10.0.64.102	10.0.128.102

On both SQL1 and SQL2, edit the attached VNIC to add the secondary addresses.

Resources

IPv4 Addresses

Assign Secondary Private IP Address

Private IP Address	Public IP Address	Fully Qualified Domain Name	Assigned
10.0.64.100 (Primary IP)	129.213.95.108 (Ephemeral)	sql2... Show Copy	Tue, Dec 19, 2023, 00:47:52 UTC
10.0.64.101	(Not Assigned)	-	Wed, Dec 20, 2023, 02:41:17 UTC
10.0.64.102	(Not Assigned)	-	Wed, Dec 20, 2023, 02:41:34 UTC

Showing 3

IPv4 Addresses

Assign Secondary Private IP Address

Private IP Address	Public IP Address	Fully Qualified Domain Name	Assigned
10.0.128.100 (Primary IP)	129.213.47.151 (Ephemeral)	-	Wed, Dec 20, 2023, 02:59:55 UTC
10.0.128.101	(Not Assigned)	-	Wed, Dec 20, 2023, 03:01:50 UTC
10.0.128.102	(Not Assigned)	-	Wed, Dec 20, 2023, 03:02:06 UTC

Showing 3

Create the Domain

For resilience, you should provision multiple AD controllers across different availability zones, but for the purposes of this guide, we are just going to provision one AD controller. Follow the screenshots below to configure AD on DC1.

Log on using the credentials listed in the Instance Details section. You will be prompted to reset your password.

ORACLE Cloud

Search resources, services, documentation, and Marketplace

US East (Ashburn)

Compute > Instances > Instance details

DC1

Start | Stop | Reboot | **Terminate** | More actions

Instance information: Shielded Instance, Oracle Cloud Agent, Notifications, Tags

General information

- Availability domain: AD-1
- Fault domain: FD-1
- Region: us-east
- OCID: ocnid1-ashburn1-0001-0001
- Launched: Tue, Dec 19, 2023, 00:44:19 UTC
- Compartment: sios-technology (100)
- Capacity type: On-demand

Instance details

- Virtual cloud network: VCN-CLUSTER1
- Maintenance reboot: -
- Image: Windows_Server-2022-Standard-Edition-VM-2023.10.19-9
- Launch mode: NATIVE
- Instance metadata service: Versions 1 and 2 [Edit](#)
- Live migration: Enabled
- Maintenance recovery action: Restore instance

Shape configuration

- Shape: VM.Standard.E4.Flex
- OCPU count: 2
- Network bandwidth (Gbps): 2
- Memory (GB): 16
- Local disk: Block storage only

Instance access

The instance is a [SHIELDED INSTANCE](#) using Remote Desktop. The network that the instance is in must allow Remote Desktop Protocol (RDP) access. Use the instance's initial password to sign in for the first time, and then use the password that you set.

- Public IP address: 129.213.180.218 [Copy](#)
- Username: admin
- Initial password: 8h-qf1j09p01q-155k-C0dy

Primary VNIC

- Public IP address: 129.213.180.218
- Private IP address: 10.0.0.100
- Network security groups: None [Edit](#)
- Subnet: [Edit](#)
- Private DNS record: Enable
- Hostname: dc1
- Internal FQDN: dc1-1-0001-0001

Launch options

- NIC attachment type: PARAVIRTUALIZED
- Remote data volume: PARAVIRTUALIZED
- Firmware: UEFI_64
- Boot volume type: PARAVIRTUALIZED
- In-band encryption: Disabled
- Secure Boot: Disabled
- Measured Boot: Disabled
- Trusted Platform Module: Disabled
- Confidential computing: Disabled

Enable Active Directory Domain Services

Add Roles and Features Wizard

DESTINATION SERVER
DC1

Select server roles

- Before You Begin
- Installation Type
- Server Selection
- Server Roles**
- Features
- AD DS
- Confirmation
- Results

Select one or more roles to install on the selected server.

Roles

- Active Directory Certificate Services
- Active Directory Domain Services**
- Active Directory Federation Services
- Active Directory Lightweight Directory Services
- Active Directory Rights Management Services
- Device Health Attestation
- DHCP Server
- DNS Server
- Fax Server
- File and Storage Services (1 of 12 installed)
- Host Guardian Service
- Hyper-V
- Network Policy and Access Services
- Print and Document Services
- Remote Access
- Remote Desktop Services
- Volume Activation Services
- Web Server (IIS)
- Windows Deployment Services
- Windows Server Update Services

Description

Active Directory Domain Services (AD DS) stores information about objects on the network and makes this information available to users and network administrators. AD DS uses domain controllers to give network users access to permitted resources anywhere on the network through a single logon process.

< Previous Next > Install Cancel

Add Roles and Features Wizard

DESTINATION SERVER
DC1

Installation progress

- Before You Begin
- Installation Type
- Server Selection
- Server Roles
- Features
- AD DS
- Confirmation
- Results**

View installation progress

i Feature installation

Configuration required. Installation succeeded on DC1.

- Active Directory Domain Services**
Additional steps are required to make this machine a domain controller.
[Promote this server to a domain controller](#)
- Group Policy Management**
- Remote Server Administration Tools**
 - Role Administration Tools**
 - AD DS and AD LDS Tools
 - Active Directory module for Windows PowerShell
 - AD DS Tools
 - Active Directory Administrative Center
 - AD DS Snap-Ins and Command-Line Tools

1 You can close this wizard without interrupting running tasks. View task progress or open this page again by clicking Notifications in the command bar, and then Task Details.

[Export configuration settings](#)

< Previous Next > Close Cancel

Promote Server to Domain Controller

Before you begin this process, enable the local Administrator account on the server and set the password. If you don't, you will receive this message when you try to promote the domain controller.

The screenshot shows the 'Active Directory Domain Services Configuration Wizard' window. The title bar includes the text 'Active Directory Domain Services Configuration Wizard' and standard window controls. The main window title is 'Prerequisites Check' and the target server is identified as 'TARGET SERVER DC1'. A prominent red error banner at the top states: 'One or more prerequisites failed. Please fix these issues and click "Rerun prerequisites check"'. Below this, a left-hand navigation pane lists steps: 'Deployment Configuration', 'Domain Controller Options', 'DNS Options', 'Additional Options', 'Paths', 'Review Options', 'Prerequisites Check' (which is highlighted in blue), 'Installation', and 'Results'. The main content area displays the following information: 'Prerequisites need to be validated before Active Directory Domain Services is installed on this computer', a 'Rerun prerequisites check' link, and a 'View results' section. The 'View results' section contains two items: a yellow warning icon with the text 'Windows Server 2022 domain controllers have a default for the security setting named "Allow cryptography algorithms compatible with Windows NT 4.0" that prevents weaker cryptography algorithms when establishing security channel sessions. For more information about this setting, see Knowledge Base article 942564 (http://go.microsoft.com/fwlink/?LinkId=104751).', and a red error icon with the text 'Verification of prerequisites for Domain Controller promotion failed. The local Administrator account becomes the domain Administrator account when you create a new domain. The new domain cannot be created because the local Administrator account password does not meet requirements.' Below the results is a yellow warning icon with the text 'If you click Install, the server automatically reboots at the end of the promotion operation.' and a 'More about prerequisites' link. At the bottom of the wizard are four buttons: '< Previous', 'Next >', 'Install', and 'Cancel'.

Once you have the Administrator account enabled and the password set, proceed with the Post-Deployment Configuration

The screenshot shows the 'Post-deployment Configuration' window. The title bar includes a yellow warning icon, the text 'Post-deployment Configura...', a 'TASKS' dropdown menu, and a close button. The main content area is divided into sections. The first section, titled 'Configuration required for Active Directory Domain Services at DC1', includes a progress bar and a link 'Promote this server to a domain controller'. The second section, titled 'Feature installation', includes a blue information icon, a progress bar, the text 'Configuration required. Installation succeeded on DC1.', and a link 'Add Roles and Features'. At the bottom of the window is a 'Task Details' section.

Deployment Configuration

TARGET SERVER
DC1

Deployment Configuration

Domain Controller Options

Additional Options

Paths

Review Options

Prerequisites Check

Installation

Results

Select the deployment operation

- Add a domain controller to an existing domain
- Add a new domain to an existing forest
- Add a new forest

Specify the domain information for this operation

Root domain name:

[More about deployment configurations](#)

< Previous

Next >

Install

Cancel

Additional Options

TARGET SERVER
DC1

Deployment Configuration

Domain Controller Options

DNS Options

Additional Options

Paths

Review Options

Prerequisites Check

Installation

Results

Verify the NetBIOS name assigned to the domain and change it if necessary

The NetBIOS domain name:

[More about additional options](#)

< Previous

Next >

Install

Cancel

Paths

TARGET SERVER
DC1

- Deployment Configuration
- Domain Controller Options
 - DNS Options
 - Additional Options
 - Paths**
 - Review Options
 - Prerequisites Check
 - Installation
 - Results

Specify the location of the AD DS database, log files, and SYSVOL

Database folder: ...

Log files folder: ...

SYSVOL folder: ...

[More about Active Directory paths](#)

< Previous

Next >

Install

Cancel

Review Options

TARGET SERVER
DC1

- Deployment Configuration
- Domain Controller Options
 - DNS Options
 - Additional Options
 - Paths
 - Review Options**
 - Prerequisites Check
 - Installation
 - Results

Review your selections:

Configure this server as the first Active Directory domain controller in a new forest.

The new domain name is "datakeeper.local". This is also the name of the new forest.

The NetBIOS name of the domain: DATAKEEPER

Forest Functional Level: Windows Server 2016

Domain Functional Level: Windows Server 2016

Additional Options:

Global catalog: Yes

DNS Server: Yes

Create DNS Delegation: No

These settings can be exported to a Windows PowerShell script to automate additional installations

View script

[More about installation options](#)

< Previous

Next >

Install

Cancel

Prerequisites Check

TARGET SERVER
DC1

✔ All prerequisite checks passed successfully. Click 'Install' to begin installation.

[Show more](#)[Deployment Configuration](#)[Domain Controller Options](#)[DNS Options](#)[Additional Options](#)[Paths](#)[Review Options](#)[Prerequisites Check](#)[Installation](#)[Results](#)

Prerequisites need to be validated before Active Directory Domain Services is installed on this computer

[Rerun prerequisites check](#)[View results](#)

⚠ Windows Server 2022 domain controllers have a default for the security setting named "Allow cryptography algorithms compatible with Windows NT 4.0" that prevents weaker cryptography algorithms when establishing security channel sessions.

For more information about this setting, see Knowledge Base article 942564 (<http://go.microsoft.com/fwlink/?LinkId=104751>).

⚠ This computer has at least one physical network adapter that does not have static IP address(es) assigned to its IP Properties. If both IPv4 and IPv6 are enabled for a network adapter, both IPv4 and IPv6 static IP addresses should be assigned to both IPv4 and IPv6 Properties of the physical network adapter. Such static IP address(es) assignment should be done to all the physical network adapters for reliable Domain Name System

⚠ If you click Install, the server automatically reboots at the end of the promotion operation.

[More about prerequisites](#)

< Previous

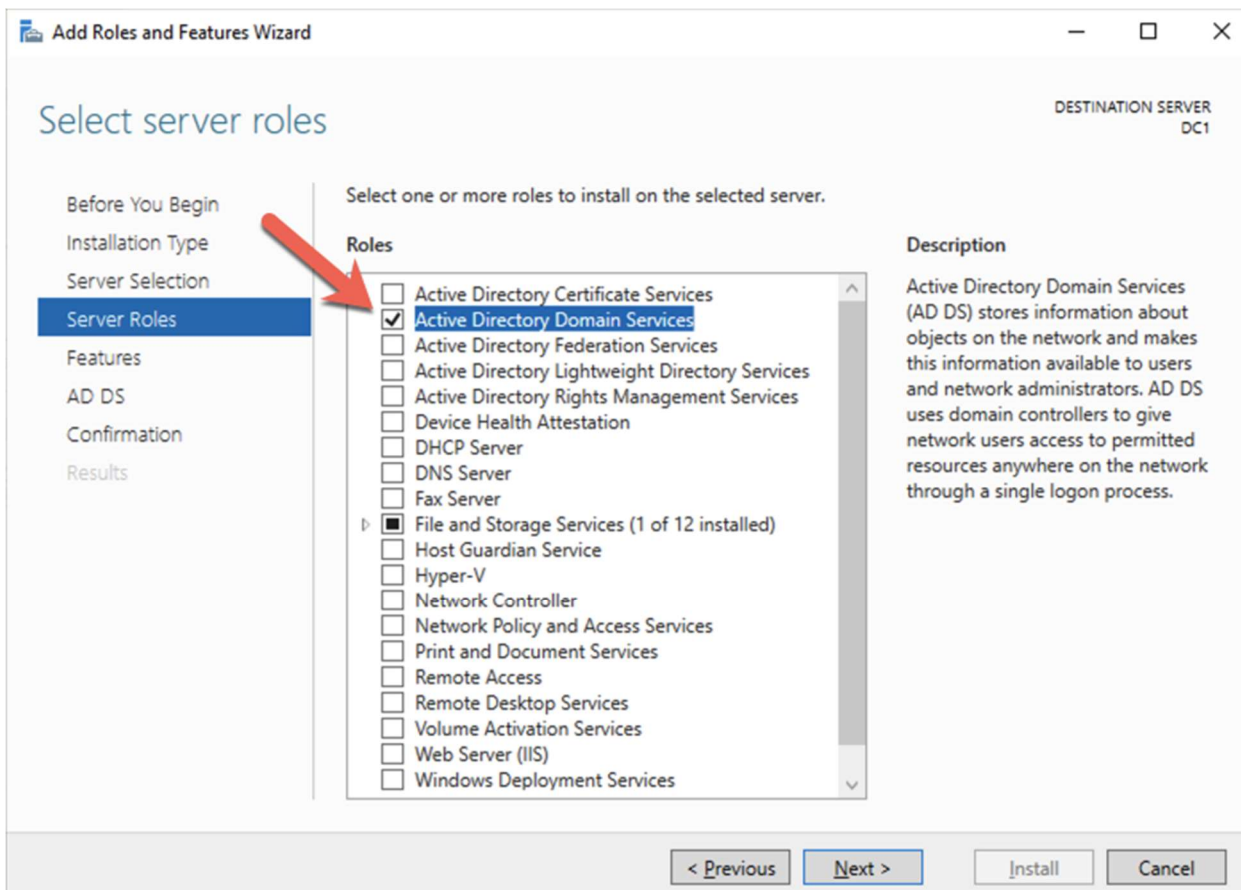
Next >

Install

Cancel

Before enabling Active Directory Domain Services, you must enable the local Administrator account and log on with that account.

Using your favorite RDP program, connect to DC1 using the public IP address associated with the instance. Add the Active Directory Domain Services role.



Confirm installation selections

Before You Begin

Installation Type

Server Selection

Server Roles

Features

AD DS

Confirmation

Results

To install the following roles, role services, or features on selected server, click Install.

 Restart the destination server automatically if required

Optional features (such as administration tools) might be displayed on this page because they have been selected automatically. If you do not want to install these optional features, click Previous to clear their check boxes.

Active Directory Domain Services
 Group Policy Management
 Remote Server Administration Tools
 Role Administration Tools
 AD DS and AD LDS Tools
 Active Directory module for Windows PowerShell
 AD DS Tools
 Active Directory Administrative Center
 AD DS Snap-Ins and Command-Line Tools

[Export configuration settings](#)
[Specify an alternate source path](#)

< Previous

Next >

Install

Cancel

Installation progress

Before You Begin

Installation Type

Server Selection

Server Roles


Features

AD DS

Confirmation

Results


View installation progress

 Feature installation

Configuration required. Installation succeeded on DC1.

Active Directory Domain Services
 Additional steps are required to make this machine a domain controller.
[Promote this server to a domain controller](#)

Group Policy Management
 Remote Server Administration Tools
 Role Administration Tools
 AD DS and AD LDS Tools
 Active Directory module for Windows PowerShell
 AD DS Tools
 Active Directory Administrative Center
 AD DS Snap-Ins and Command-Line Tools

 You can close this wizard without interrupting running tasks. View task progress or open this page again by clicking Notifications in the command bar, and then Task Details.

[Export configuration settings](#)

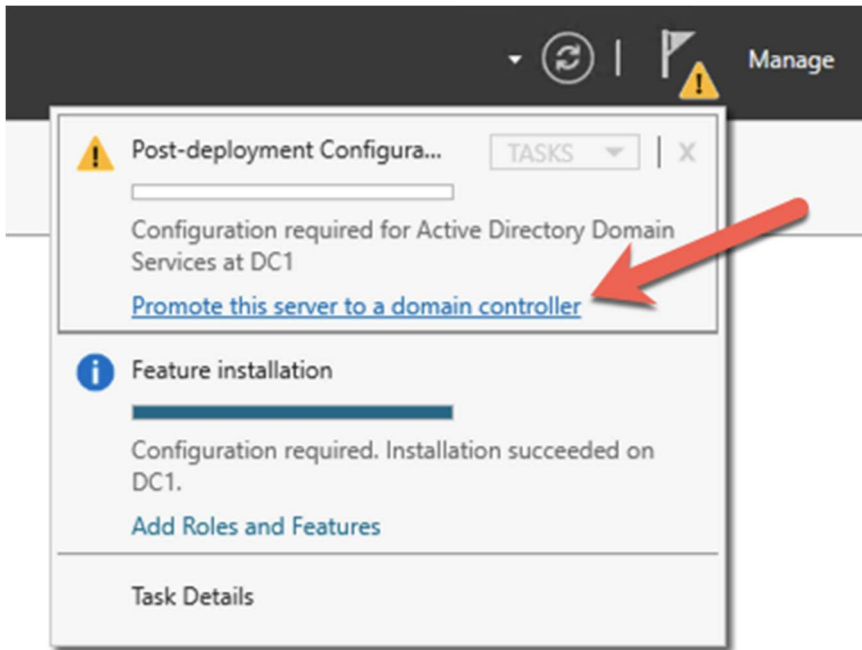
< Previous

Next >

Close

Cancel

After the installation completes, promote this server to a domain controller.



For our purposes we are going to create a new domain.

Deployment Configuration

TARGET SERVER
DC1

Deployment Configuration

Domain Controller Options

Additional Domain Controller Options

Select the deployment operation

- Add a domain controller to an existing domain
- Add a new domain to an existing forest
- Add a new forest

Specify the domain information for this operation

Root domain name:

[More about deployment configurations](#)

< Previous Next > Install Cancel

Domain Controller Options

TARGET SERVER
DC1

Deployment Configuration

Domain Controller Options

DNS Options

Additional Options

Paths

Review Options

Prerequisites Check

Installation

Results

Select functional level of the new forest and root domain

Forest functional level:

Domain functional level:

Specify domain controller capabilities

- Domain Name System (DNS) server
- Global Catalog (GC)
- Read only domain controller (RODC)

Type the Directory Services Restore Mode (DSRM) password

Password:

Confirm password:

[More about domain controller options](#)

< Previous Next > Install Cancel

DNS Options

TARGET SERVER
DC1

 A delegation for this DNS server cannot be created because the authoritative parent zone cannot be found... [Show more](#) 

- Deployment Configuration
- Domain Controller Options
- DNS Options**
- Additional Options
- Paths
- Review Options
- Prerequisites Check
- Installation
- Results

Specify DNS delegation options

Create DNS delegation

[More about DNS delegation](#)

< Previous

Next >

Install

Cancel

Additional Options

TARGET SERVER
DC1

- Deployment Configuration
- Domain Controller Options
- DNS Options
- Additional Options**
- Paths
- Review Options
- Prerequisites Check
- Installation
- Results

Verify the NetBIOS name assigned to the domain and change it if necessary

The NetBIOS domain name:

[More about additional options](#)

< Previous

Next >

Install

Cancel

Active Directory Domain Services Configuration Wizard

TARGET SERVER
DC1

Paths

Specify the location of the AD DS database, log files, and SYSVOL

Deployment Configuration
Domain Controller Options
DNS Options
Additional Options
Paths
Review Options
Prerequisites Check
Installation
Results

Database folder: C:\Windows\NTDS
Log files folder: C:\Windows\NTDS
SYSVOL folder: C:\Windows\SYSVOL

[More about Active Directory paths](#)

< Previous Next > Install Cancel

Active Directory Domain Services Configuration Wizard

TARGET SERVER
DC1

Review Options

Review your selections:

Configure this server as the first Active Directory domain controller in a new forest.

The new domain name is "datakeeper.local". This is also the name of the new forest.

The NetBIOS name of the domain: DATAKEEPER

Forest Functional Level: Windows Server 2016

Domain Functional Level: Windows Server 2016

Additional Options:

Global catalog: Yes

DNS Server: Yes

Create DNS Delegation: No

These settings can be exported to a Windows PowerShell script to automate additional installations

[View script](#)

[More about installation options](#)

< Previous Next > Install Cancel

Active Directory Domain Services Configuration Wizard

Prerequisites Check TARGET SERVER
DC1

✔ All prerequisite checks passed successfully. Click 'Install' to begin installation. [Show more](#) ✕

Deployment Configuration
Domain Controller Options
DNS Options
Additional Options
Paths
Review Options
Prerequisites Check
Installation
Results

Prerequisites need to be validated before Active Directory Domain Services is installed on this computer

[Rerun prerequisites check](#)

⬆ View results

adapter, both IPv4 and IPv6 static IP addresses should be assigned to both IPv4 and IPv6 Properties of the physical network adapter. Such static IP address(es) assignment should be done to all the physical network adapters for reliable Domain Name System (DNS) operation.

⚠ A delegation for this DNS server cannot be created because the authoritative parent zone cannot be found or it does not run Windows DNS server. If you are integrating with an existing DNS infrastructure, you should manually create a delegation to this DNS server in the parent zone to ensure reliable name resolution from outside the domain "datakeeper.local". Otherwise, no action is required.

ℹ Prerequisites Check Completed

✔ All prerequisite checks passed successfully. Click 'Install' to begin installation.

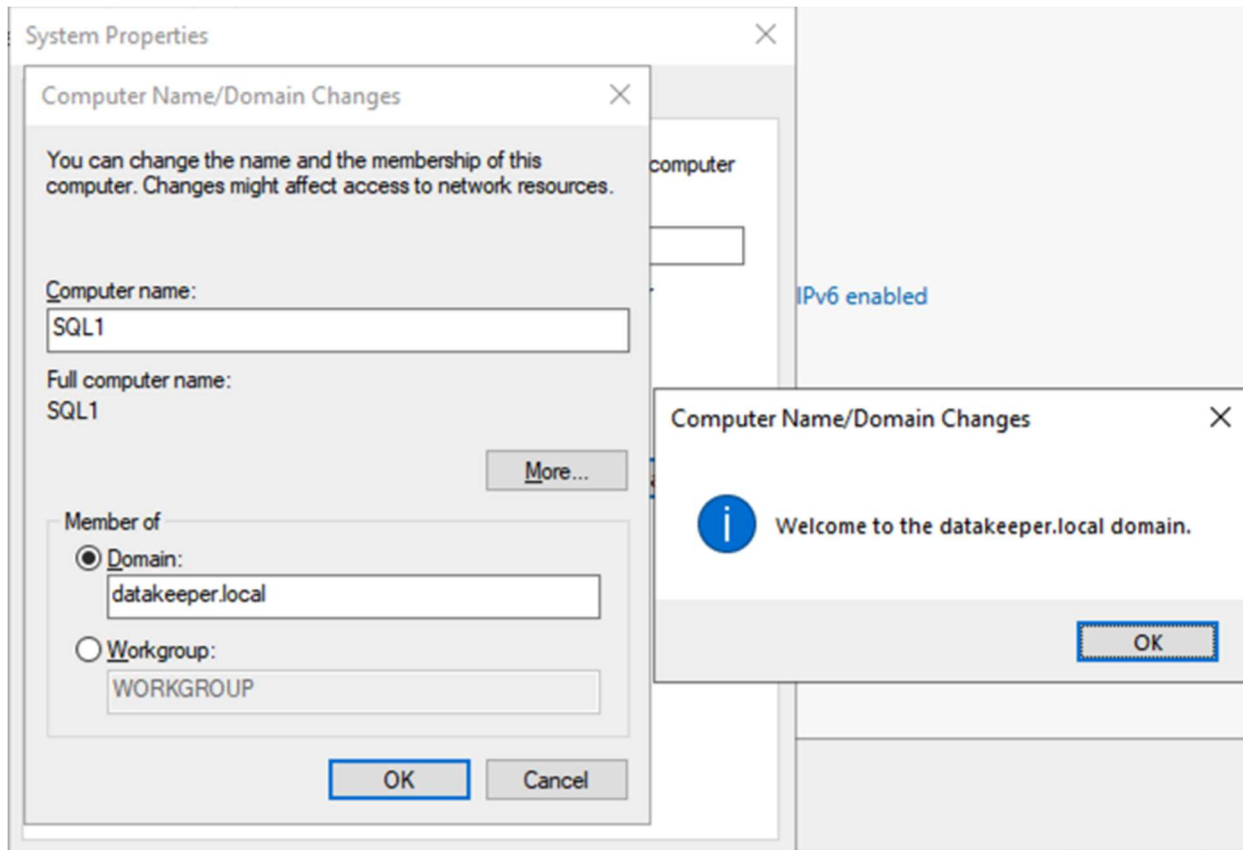
⚠ If you click Install, the server automatically reboots at the end of the promotion operation.

[More about prerequisites](#)

< Previous Next > Install Cancel

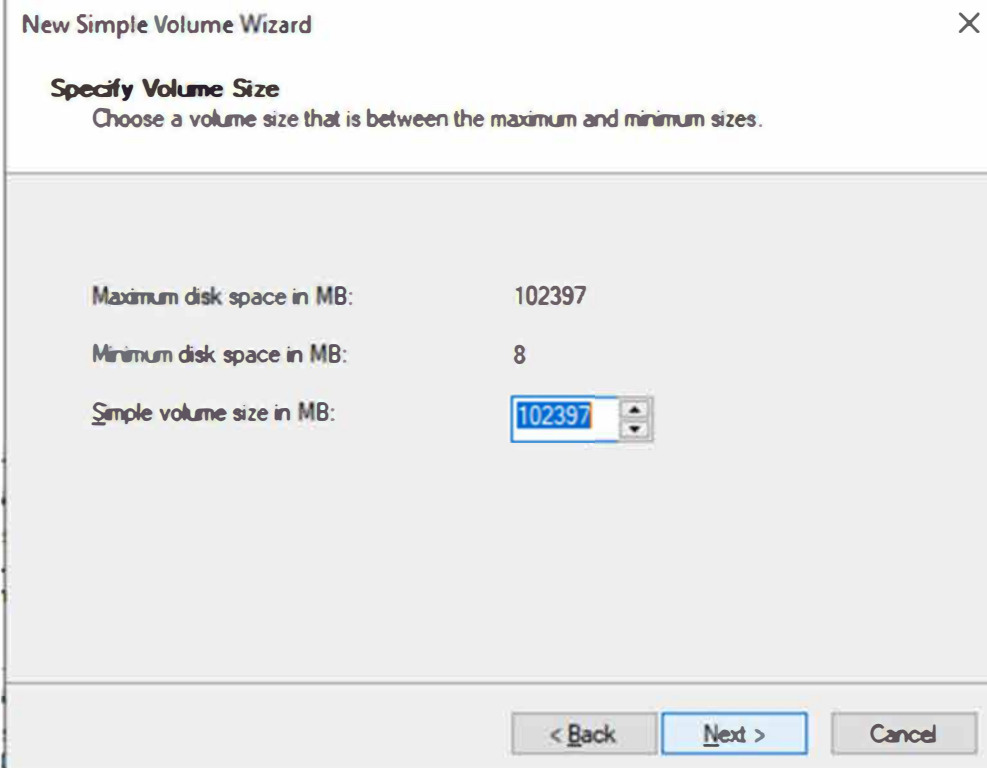
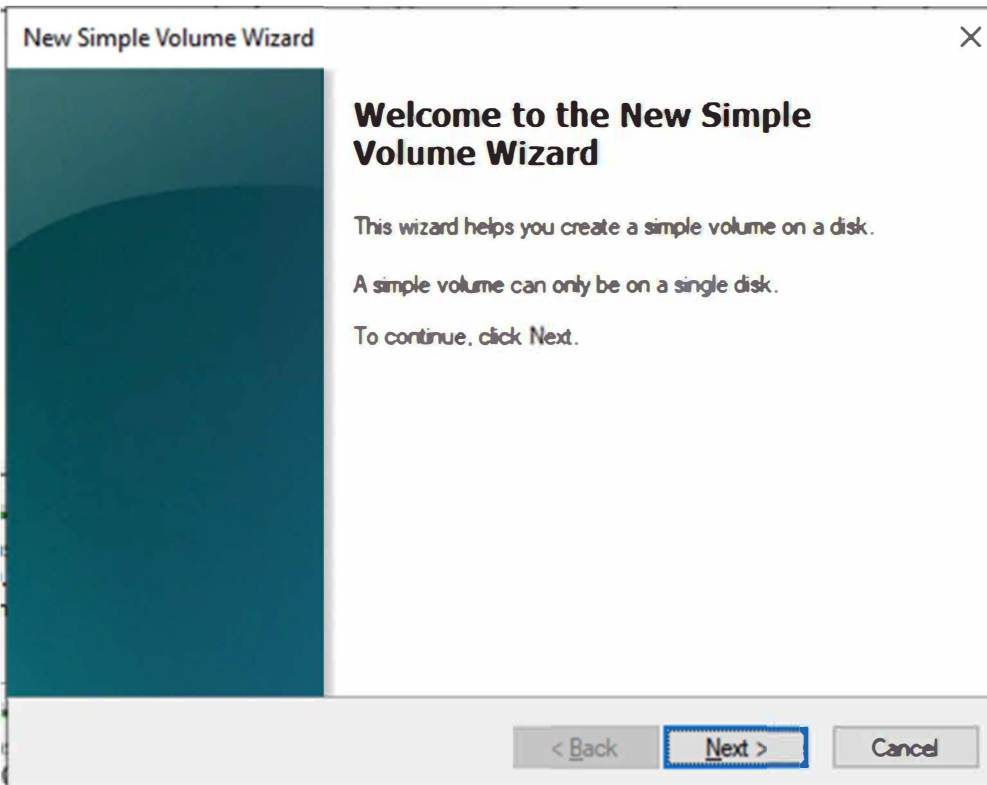
Reboot DC1 and move on to the next section.

Join SQL1 and SQL2 to the Domain



Prepare the Storage

Once SQL1 and SQL2 are added to the domain, connect to the instances with the Domain Admin account you created to complete the rest of the configuration steps. The first thing you need to do is to attach and format the EBS volumes that we added to SQL1 and SQL2 as shown below.



Assign Drive Letter or Path

For easier access, you can assign a drive letter or drive path to your partition.

- Assign the following drive letter: D ▾
- Mount in the following empty NTFS folder:
 Browse...
- Do not assign a drive letter or drive path

< Back

Next >

Cancel

Format Partition

To store data on this partition, you must format it first.

Choose whether you want to format this volume, and if so, what settings you want to use.

- Do not format this volume
- Format this volume with the following settings:

File system: NTFS ▾

Allocation unit size: Default ▾

Volume label: New Volume

Perform a quick format

Enable file and folder compression

< Back

Next >

Cancel

Configure Failover Clustering Feature

Enable the Failover Clustering feature on both SQL1 and SQL2.

Run this PowerShell command on SQL1 and SQL2

```
Install-WindowsFeature -Name Failover-Clustering -  
IncludeManagementTools
```

Validate your Cluster

Run this PowerShell command from SQL1 or SQL2

```
Test-Cluster -Node sql1,sql2
```

Depending upon the version of Windows Server you are using, you will see some warnings about Network and possibly storage. The network warning will likely tell you that each cluster node is accessible via a single interface. Earlier versions of Windows will warn you about the lack of shared storage.

You can ignore both of those errors as they are expected in a cluster hosted on OCI. As long as you have received no Errors, you can proceed with the next section. If you receive any errors, fix them, then run validation again and continue on to the next section.

Create the Cluster

Next, you will create the cluster. In the example below, you will notice I use the two IP addresses we planned to use, 10.0.64.101 and 10.0.128.101. You can run this Powershell from either cluster node.

```
New-Cluster -Name cluster1 -Node sql1,sql2 -  
StaticAddress 10.0.64.101, 10.0.128.101
```

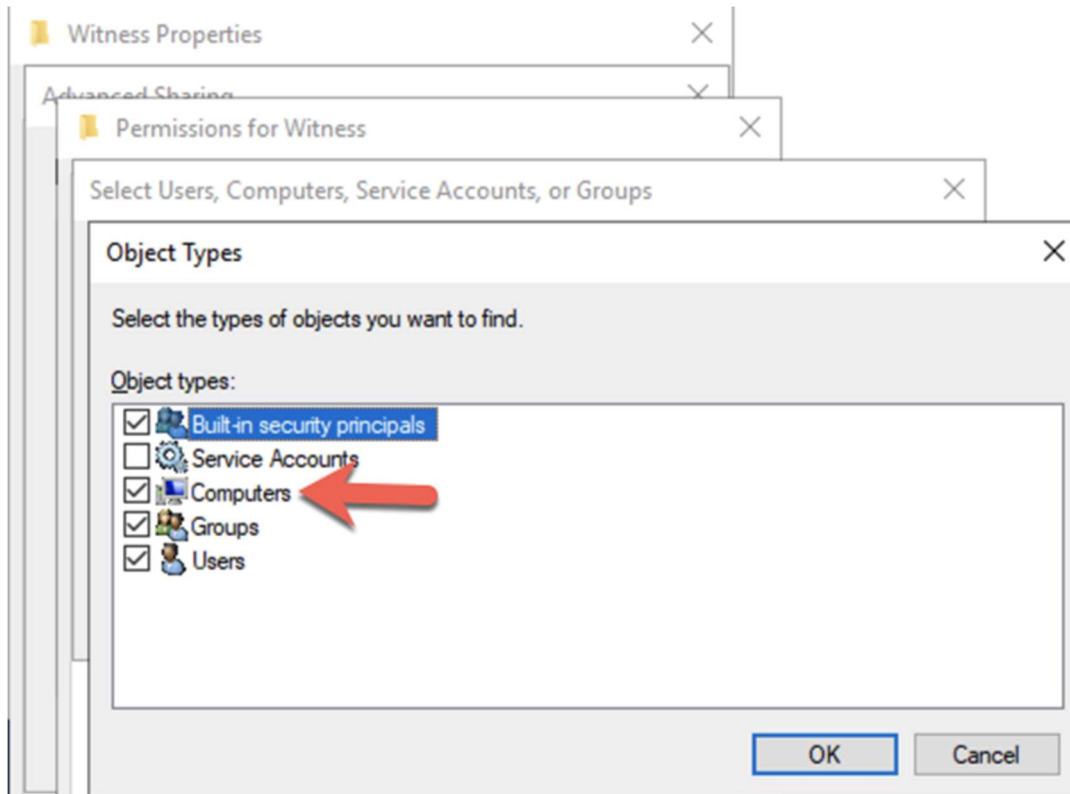
Please Note: do NOT try to create the cluster via the WSFC GUI. You will find that because the instances are using DHCP, the GUI will not give you the option to assign IP addresses for the cluster and instead will hand out duplicate IP addresses.

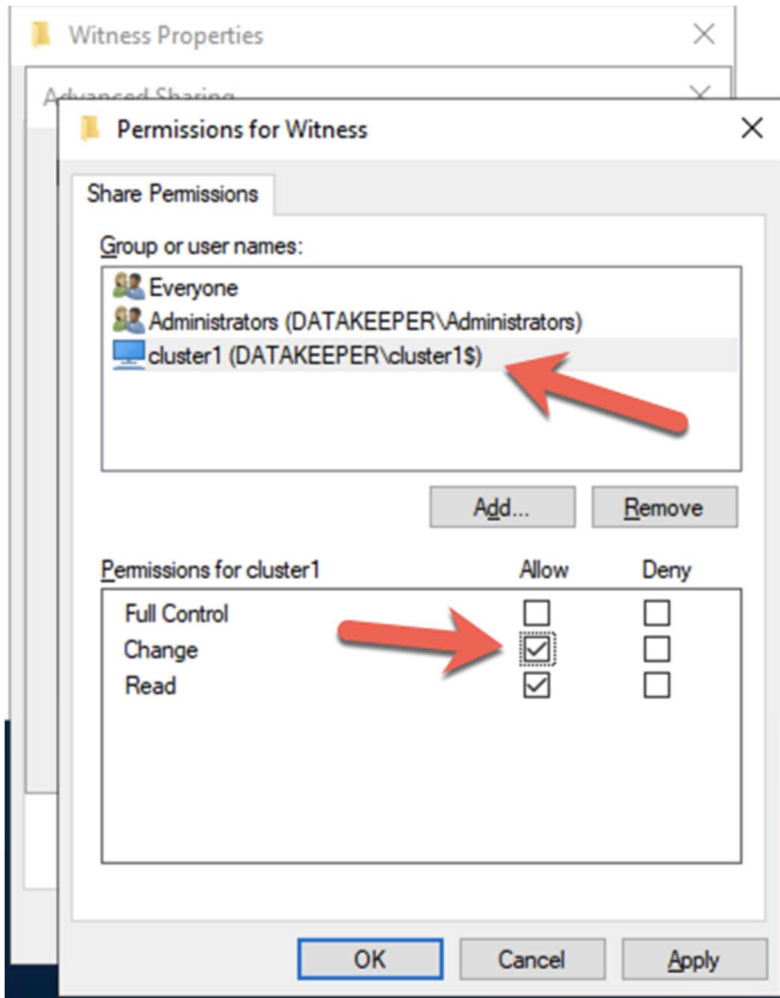
Add the File Share Witness

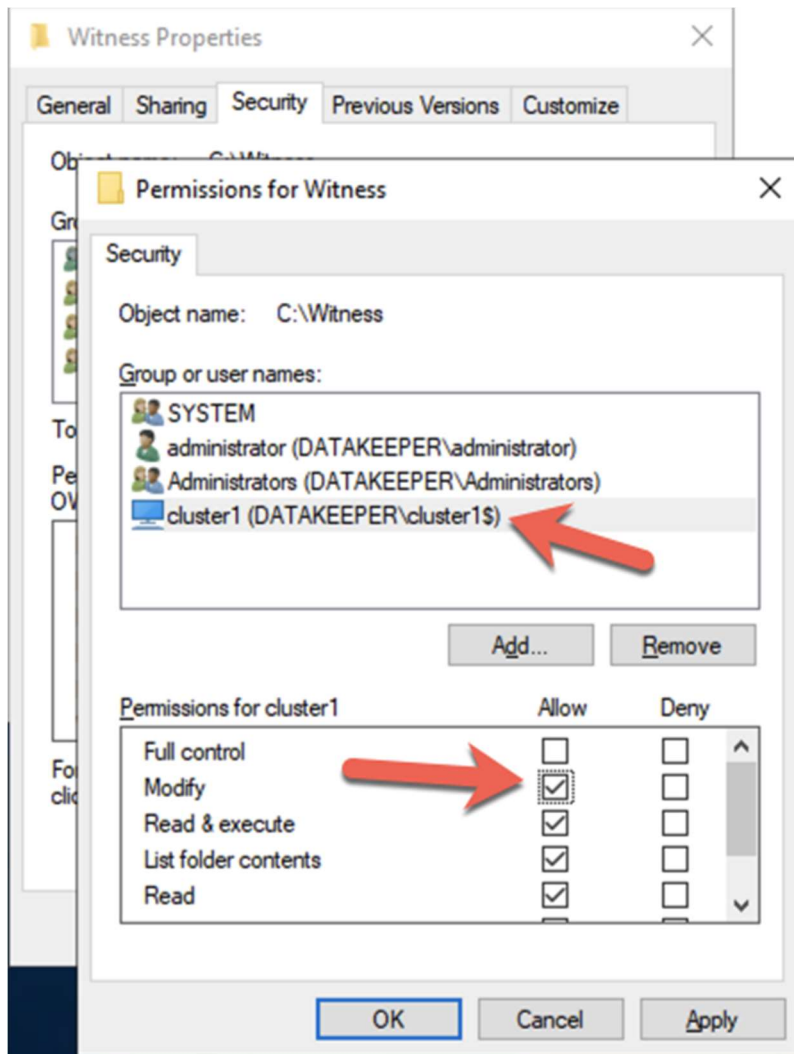
To maintain the cluster quorum, you need to add a witness. In OCI, the type of witness you will want to use is a File Share Witness. The file share witness must reside on a server that resides in a different Fault Domain than the two cluster nodes.

In the example below, the file share witness will be created on DC1, which resides in FD1.

On DC1, create a file share and assign the cluster name object (CNO) read-write permissions on the folder. Add permissions for the CNO on both the Share and Security tab of a folder that you created. In the example below I created a folder called "Witness".



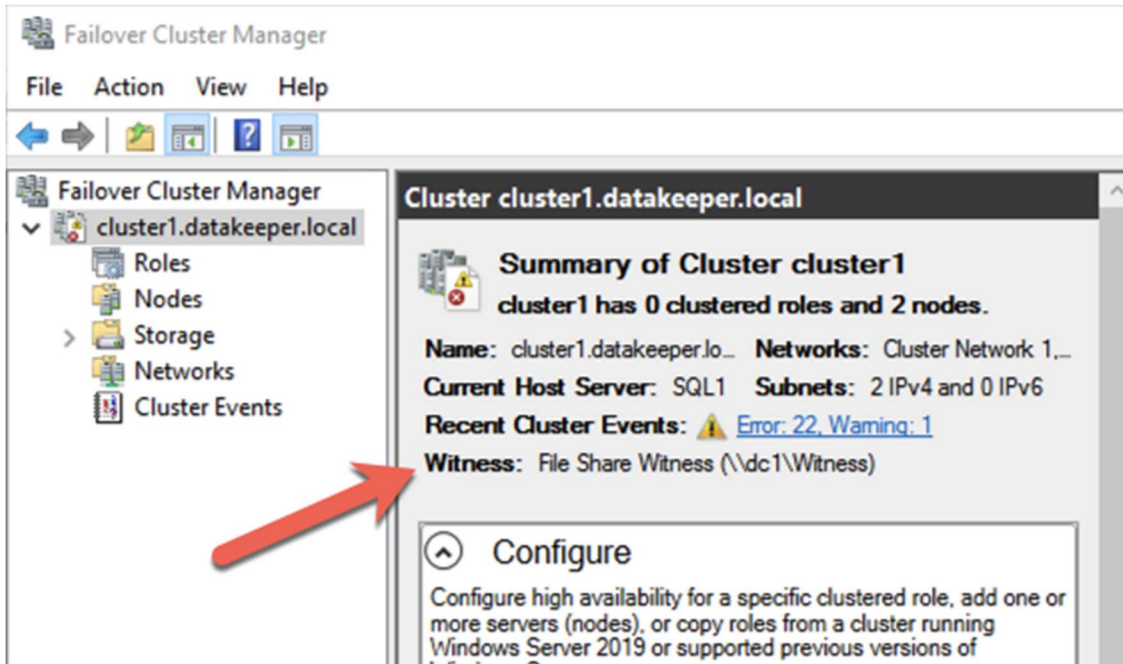




Once the folder has been created and the appropriate permissions have been assigned to the CNO, run the following PowerShell command on SQL1 or SQL2.

```
Set-ClusterQuorum -Cluster cluster1 -  
FileShareWitness \\dc1\Witness
```


Your cluster should now look like the following when you launch the Failover Cluster Manager on SQL1 or SQL2.



Creating the SQL Server FCI

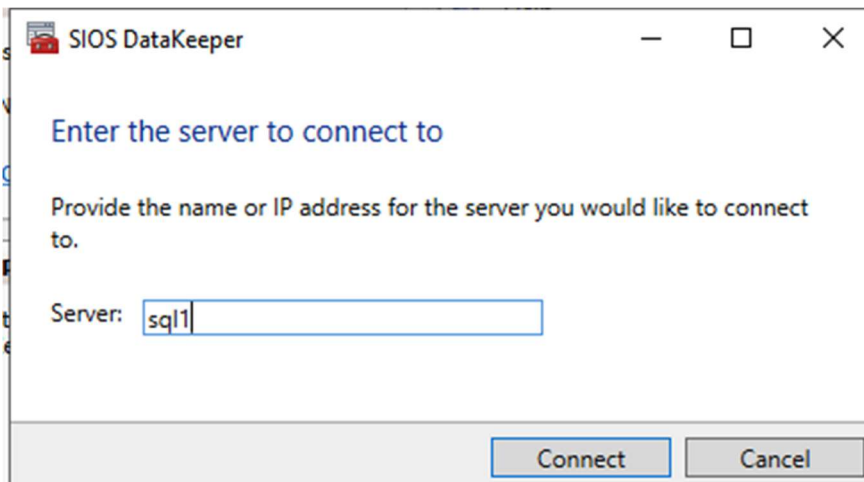
Install DataKeeper Cluster Edition

Before you can move on with the next steps, you will need to install DataKeeper Cluster Edition on both SQL1 and SQL2. Download the setup executable and run the DataKeeper setup on both nodes. Refer to the SIOS documentation for specific guidance on the installation.

Create the DataKeeper Volume Resource

Launch the DataKeeper UI on either of the cluster nodes and create your DataKeeper Volume Resource as shown below.

Connect to both servers, first SQL1 and then SQL2



If you have connected to both servers and the storage is configured properly, the Server Overview Report should look something like this.

SIOS DataKeeper

- Jobs
- Reports
 - Job Overview
 - Server Overview

Server Overview Report

SQL1.DATAKEEPER.LOCAL (SQL1)				
Volume	Mirror Role	State	File System	Total Size
D	None	Not mirrored	NTFS	100.00 GB

SQL2.DATAKEEPER.LOCAL (SQL2)				
Volume	Mirror Role	State	File System	Total Size
D	None	Not mirrored	NTFS	100.00 GB

Click Create Job to start the Job Creation Wizard

The image shows two screenshots of the SIOS DataKeeper Job Creation Wizard. The top screenshot shows the initial state with empty input fields. The bottom screenshot shows the wizard after the 'Create Job' button has been clicked, with the 'Job name' field containing 'D-Drive' and the 'Job description' field containing 'SQL Server Data'.

Top Screenshot (Initial State):

- Window title: SIOS DataKeeper
- Section: Create a new job
- Text: A job provides a logical grouping of related mirrors and servers. Provide a name and description for this new job to help remember it.
- Job name:
- Job description:
- Buttons: Create Job, Cancel

Bottom Screenshot (Filled State):

- Window title: SIOS DataKeeper
- Section: Create a new job
- Text: A job provides a logical grouping of related mirrors and servers. Provide a name and description for this new job to help remember it.
- Job name:
- Job description:
- Buttons: Create Job, Cancel



Choose a Source

Choose a Source	Choose the server with the source volume.
Choose a Target	Server: <input type="text" value="SQL1.DATAKEEPER.LOCAL"/> Connect to Server
Configure Details	
	Choose the IP address to use on the server.
	IP address: <input type="text" value="10.0.2.100 / 24"/>
	Choose the volume on the selected server.
	Volume: <input type="text" value="D"/>
	<input type="button" value="Next"/> <input type="button" value="Cancel"/>



Choose a Target

Choose a Source	Source server: SQL1.DATAKEEPER.LOCAL
Choose a Target	Source IP address: 10.0.2.100
Configure Details	Source volume: D
	Choose the server with the target volume.
	Server: <input type="text" value="SQL2.DATAKEEPER.LOCAL"/> Connect to Server
	Choose the IP address to use on the server.
	IP address: <input type="text" value="10.0.3.100 / 24"/>
	Choose the volume on the selected server.
	Volume: <input type="text" value="D"/>
	<input type="button" value="Previous"/> <input type="button" value="Next"/> <input type="button" value="Cancel"/>

DataKeeper supports both synchronous and asynchronous replication. For replication between availability zones in the same region, choose synchronous. If you want to replicate across regions or even across cloud providers, choose asynchronous

New Mirror

Configure Details

Choose a Source

Choose a Target

Configure Details

Source server: SQL1.DATAKEEPER.LOCAL

Source IP address: 10.0.2.100

Source volume: D

Specify how the data should be compressed when sent to the target.

None

How should the source volume data be sent to the target volume?

Asynchronous

Synchronous

Maximum bandwidth: 0 kbps
Use 0 for unlimited

Previous Done Cancel

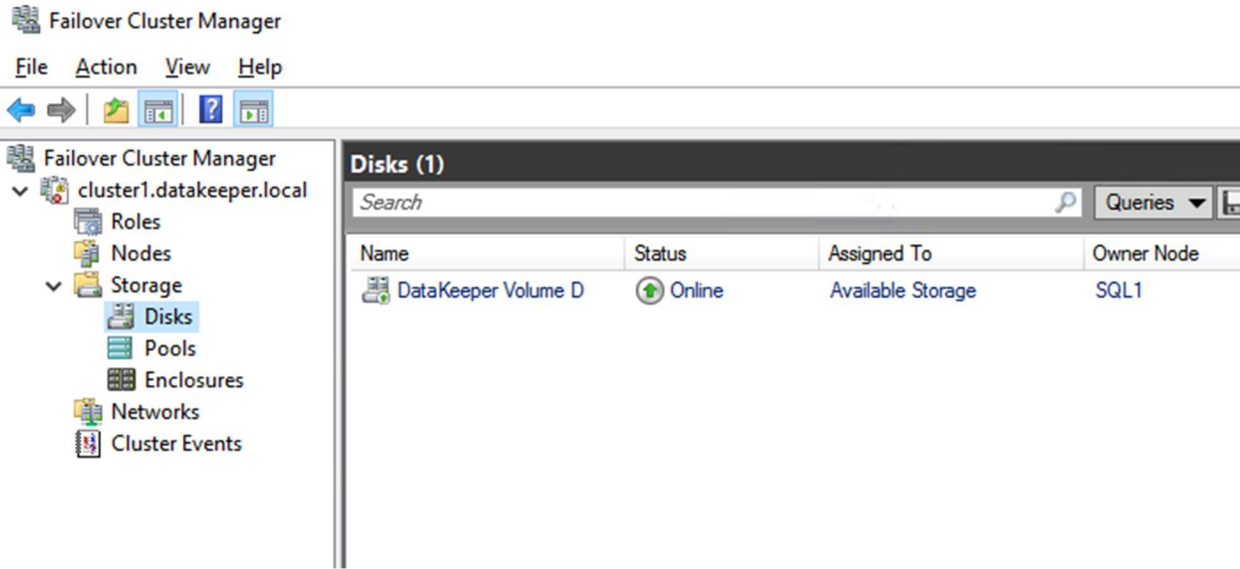
Click “Yes” here to register the DataKeeper Volume resource in Available Storage in the cluster

SIOS DataKeeper

? The volume created is eligible for WSFC cluster. Do you want to auto-register this volume as a cluster volume?

Yes No

The DataKeeper Volume D now appears in Failover Cluster Manager in Available Storage.

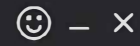


Install the First Node of the SQL Server FCI on SQL1

Now that the core cluster has been created and the DataKeeper volume resource is in Available Storage, it is time to install SQL Server on the first cluster node. As mentioned earlier, the example here illustrates a cluster configuration using SQL 2019 and Windows 2022, but all the steps described in this example are virtually identical, regardless of which version of Windows Server or SQL Server you are trying to deploy.

Follow the example below to install SQL Server on SQL1

SQL Server 2019



Developer Edition

Select an installation type:

Basic

Select Basic installation type to install the SQL Server Database Engine feature with default configuration.

Custom

Select Custom installation type to step through the SQL Server installation wizard and choose what you want to install. This installation type is detailed and takes longer than running the Basic install.

Download Media

Download SQL Server setup files now and install them later on a machine of your choice.

SQL Server transmits information about your installation experience, as well as other usage and performance data, to Microsoft to help improve the product. To learn more about data processing and privacy controls, and to turn off the collection of this information after installation, see the [documentation](#).

15.2002.4709.1

SQL Server 2019




Developer Edition

Specify SQL Server media download target location

MEDIA LOCATION

C:\SQL2019

 Browse

MINIMUM FREE SPACE

8994 MB

DOWNLOAD SIZE

1426 MB

Close

< Previous

Install

15.2002.4709.1

Planning

Installation

Maintenance

Tools

Resources

Advanced

Options



New SQL Server stand-alone installation or add features to an existing installation

Launch a wizard to install SQL Server 2019 in a non-clustered environment or to add features to an existing SQL Server 2019 instance.



Install SQL Server Reporting Services

Launch a download page that provides a link to install SQL Server Reporting Services. An internet connection is required to install SSRS.



Install SQL Server Management Tools

Launch a download page that provides a link to install SQL Server Management Studio, SQL Server command-line utilities (SQLCMD and BCP), SQL Server PowerShell provider, SQL Server Profiler and Database Tuning Advisor. An internet connection is required to install these tools.



Install SQL Server Data Tools

Launch a download page that provides a link to install SQL Server Data Tools (SSDT). SSDT provides Visual Studio integration including project system support for Microsoft Azure SQL Database, the SQL Server Database Engine, Reporting Services, Analysis Services and Integration Services. An internet connection is required to install SSDT.



New SQL Server failover cluster installation

Launch a wizard to install a single-node SQL Server 2019 failover cluster.



Add node to a SQL Server failover cluster

Launch a wizard to add a node to an existing SQL Server 2019 failover cluster.



Upgrade from a previous version of SQL Server

Launch a wizard to upgrade a previous version of SQL Server to SQL Server 2019.
[Click here to first view Upgrade Documentation](#)



New Machine Learning Server (Standalone) installation



Microsoft SQL Server 2019

Install a SQL Server Failover Cluster

Product Key

Specify the edition of SQL Server 2019 to install.

Product Key

License Terms

Global Rules

Microsoft Update

Product Updates

Install Setup Files

Install Failover Cluster Rules

Feature Selection

Feature Rules

Feature Configuration Rules

Ready to Install

Installation Progress

Complete

Validate this instance of SQL Server 2019 by entering the 25-character key from the Microsoft certificate of authenticity or product packaging. You can also specify a free edition of SQL Server: Developer, Evaluation, or Express. Evaluation has the largest set of SQL Server features, as documented in SQL Server Books Online, and is activated with a 180-day expiration. Developer edition does not have an expiration, has the same set of features found in Evaluation, but is licensed for non-production database application development only. To upgrade from one installed edition to another, run the Edition Upgrade Wizard.

Specify a free edition:

Developer

Enter the product key:

< Back

Next >

Cancel

License Terms

To install SQL Server 2019, you must accept the Microsoft Software License Terms.

- Product Key
- License Terms**
- Global Rules
- Microsoft Update
- Product Updates
- Install Setup Files
- Install Failover Cluster Rules
- Feature Selection
- Feature Rules
- Feature Configuration Rules
- Ready to Install
- Installation Progress
- Complete

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MICROSOFT SQL SERVER 2019 DEVELOPER

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SQL Server transmits information about your installation experience, as well as other usage and performance data, to Microsoft to help improve the product. To learn more about data processing and privacy controls, and to turn off the collection of this information after installation, see the [documentation](#).

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Cancel

Microsoft Update

Use Microsoft Update to check for important updates

- Product Key
- License Terms
- Global Rules
- Microsoft Update**
- Product Updates
- Install Setup Files
- Install Failover Cluster Rules
- Feature Selection
- Feature Rules
- Feature Configuration Rules
- Ready to Install
- Installation Progress
- Complete

Microsoft Update offers security and other important updates for Windows and other Microsoft software, including SQL Server 2019. Updates are delivered using Automatic Updates, or you can visit the Microsoft Update website.

Use Microsoft Update to check for updates (recommended)

[Microsoft Update FAQ](#)

[Microsoft Update Privacy Statement](#)

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Cancel

Install Failover Cluster Rules

Setup rules identify potential problems that might occur while running Setup. Failures must be corrected before Setup can continue.

Install Failover Cluster Rules

- Feature Selection
- Feature Rules
- Feature Configuration Rules
- Ready to Install
- Installation Progress
- Complete

Operation completed. Passed: 19. Failed 0. Warning 1. Skipped 0.



Hide details << Re-run
[View detailed report](#)

Result	Rule	Status
⚠	Microsoft Cluster Service (MSCS) cluster verification warnings	Warning
✔	Remote registry service (SQL1)	Passed
✔	Domain controller	Passed
✔	Windows Firewall	Passed
✔	DNS settings (SQL1)	Passed
✔	WOW64 setup	Passed
✔	SQL 2019 minimum CTP for Upgrade and Side by Side Support	Passed
✔	Windows Management Instrumentation (WMI) service (SQL2)	Passed
✔	Cluster Remote Access (SQL2)	Passed
✔	Distributed Transaction Coordinator (MSDTC) installed (SQL2)	Passed
✔	Remote registry service (SQL2)	Passed

< Back Next > Cancel

Feature Selection

Select the Developer features to install.

Install Failover Cluster Rules

- Feature Selection**
- Feature Rules
- Instance Configuration
- Cluster Resource Group
- Cluster Disk Selection
- Cluster Network Configuration
- Server Configuration
- Database Engine Configuration
- Feature Configuration Rules
- Ready to Install
- Installation Progress
- Complete

Looking for Reporting Services? [Download it from the web](#)

<p>Features:</p> <ul style="list-style-type: none"> Instance Features <input checked="" type="checkbox"/> Database Engine Services <ul style="list-style-type: none"> <input checked="" type="checkbox"/> SQL Server Replication <input type="checkbox"/> Machine Learning Services and Language <ul style="list-style-type: none"> <input type="checkbox"/> R <input type="checkbox"/> Python <input type="checkbox"/> Java <input checked="" type="checkbox"/> Full-Text and Semantic Extractions for Search <input checked="" type="checkbox"/> Data Quality Services <input type="checkbox"/> PolyBase Query Service for External Data 	<p>Feature description:</p> <p>The configuration and operation of each instance feature of a SQL Server instance is isolated from other SQL Server instances. SQL</p> <p>Prerequisites for selected features:</p> <p>Already installed: Windows PowerShell 3.0 or higher</p> <p>To be installed from media:</p> <p>Disk Space Requirements</p> <p>Drive C: 1427 MB required, 12937 MB available</p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

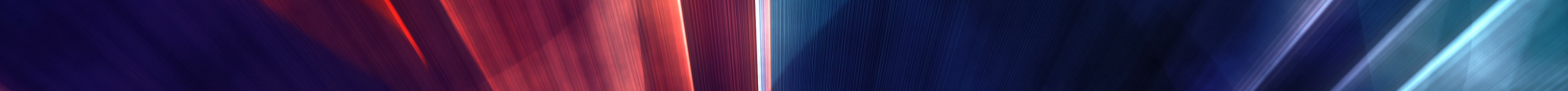
Select All Unselect All

Instance root directory: ...

Shared feature directory: ...

Shared feature directory (x86): ...

< Back Next > Cancel



The name you specify below is the client access point. This is the name your application servers will use when they want to connect to the SQL Server FCI.

Instance Configuration

Specify the name and instance ID for the instance of SQL Server. Instance ID becomes part of the installation path.

- Install Failover Cluster Rules
- Feature Selection
- Feature Rules
- Instance Configuration**
- Cluster Resource Group
- Cluster Disk Selection
- Cluster Network Configuration
- Server Configuration
- Database Engine Configuration
- Feature Configuration Rules
- Ready to Install
- Installation Progress
- Complete

Specify a network name for the new SQL Server failover cluster. This will be the name used to identify your failover cluster on the network.

SQL Server Network Name:

Default instance

Named instance:

Instance ID:

SQL Server directory: C:\Program Files\Microsoft SQL Server\MSSQL15.MSSQLSERVER

Detected SQL Server instances and features on this computer:

Instance	Cluster Network Name	Features	Edition	Version	Inst
< [Empty Table] >					

< Back Next > Cancel

Cluster Resource Group

Create a new cluster resource group for your SQL Server failover cluster.

- Install Failover Cluster Rules
- Feature Selection
- Feature Rules
- Instance Configuration
- Cluster Resource Group**
- Cluster Disk Selection
- Cluster Network Configuration
- Server Configuration
- Database Engine Configuration
- Feature Configuration Rules
- Ready to Install
- Installation Progress
- Complete

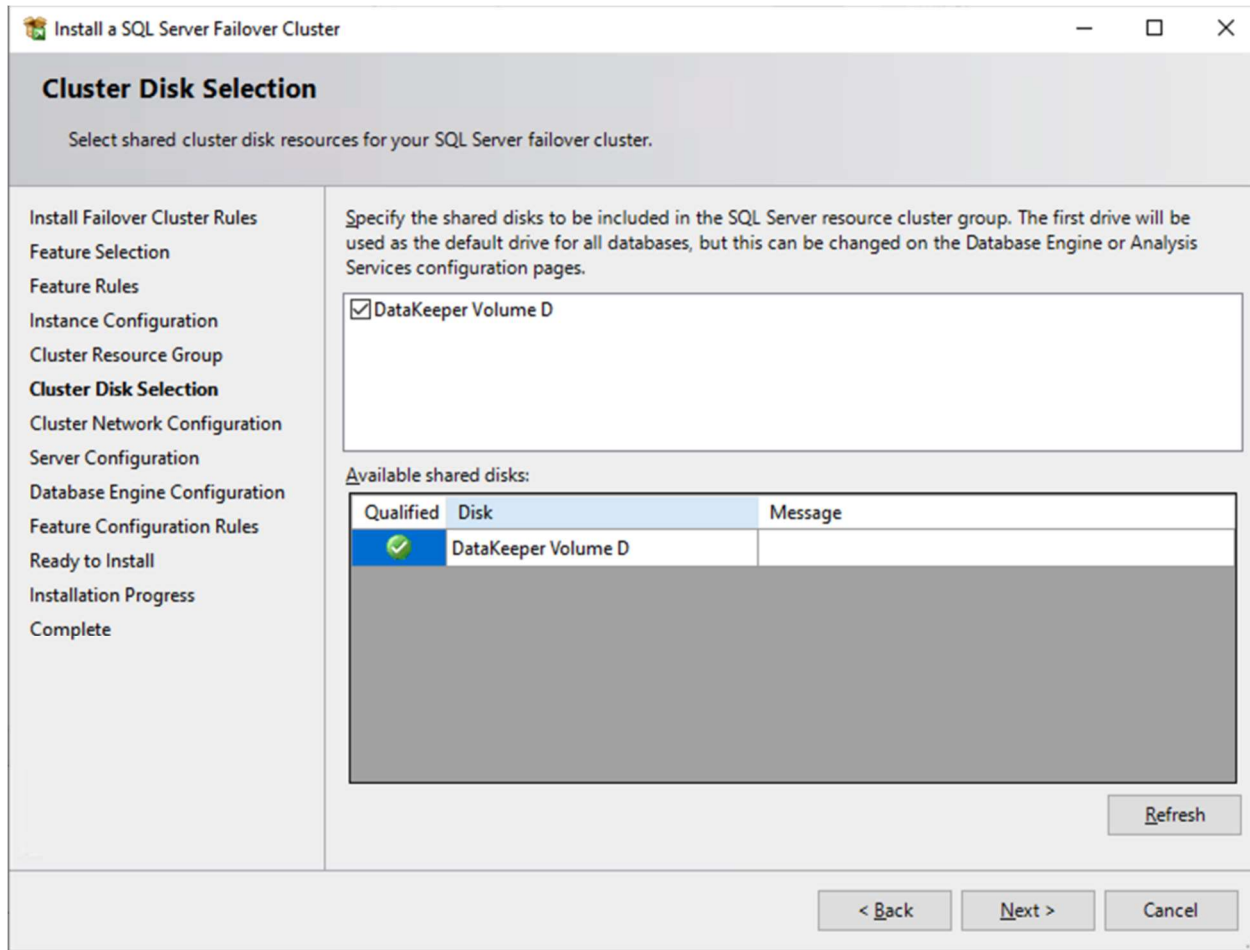
Specify a name for the SQL Server cluster resource group. The cluster resource group is where SQL Server failover cluster resources will be placed. You can choose to use an existing cluster resource group name or enter a new cluster resource group name to be created.

SQL Server cluster resource group name:

Qualified	Name	Message
	Available Storage	The cluster group 'Available Storage' is reserved by Windows Fai...
	Cluster Group	The cluster group 'Cluster Group' is reserved by Windows Failov...

Refresh

< Back Next > Cancel



On this screen you will add the SQL1 secondary IP address we identified earlier in the planning section of [Part 1](#) of this series.

Cluster Network Configuration

Select network resources for your SQL Server failover cluster.

- Install Failover Cluster Rules
- Feature Selection
- Feature Rules
- Instance Configuration
- Cluster Resource Group
- Cluster Disk Selection
- Cluster Network Configuration**
- Server Configuration
- Database Engine Configuration
- Feature Configuration Rules
- Ready to Install
- Installation Progress
- Complete

Specify the network settings for this failover cluster:

<input type="checkbox"/> IP Type	DHCP	Address	Subnet Mask	Subnet(s)	Network
<input checked="" type="checkbox"/> IPv4	<input type="checkbox"/>	10.0.2.102	255.255.255.0	10.0.2.0/24	Cluster Network 2
<input type="checkbox"/> IPv4	<input checked="" type="checkbox"/>		255.255.255.0	10.0.3.0/24	Cluster Network 1

Refresh

< Back

Next >

Cancel

Server Configuration

Specify the service accounts and collation configuration.

- Install Failover Cluster Rules
- Feature Selection
- Feature Rules
- Instance Configuration
- Cluster Resource Group
- Cluster Disk Selection
- Cluster Network Configuration
- Server Configuration**
- Database Engine Configuration
- Feature Configuration Rules
- Ready to Install
- Installation Progress
- Complete

Service Accounts Collation

Microsoft recommends that you use a separate account for each SQL Server service.

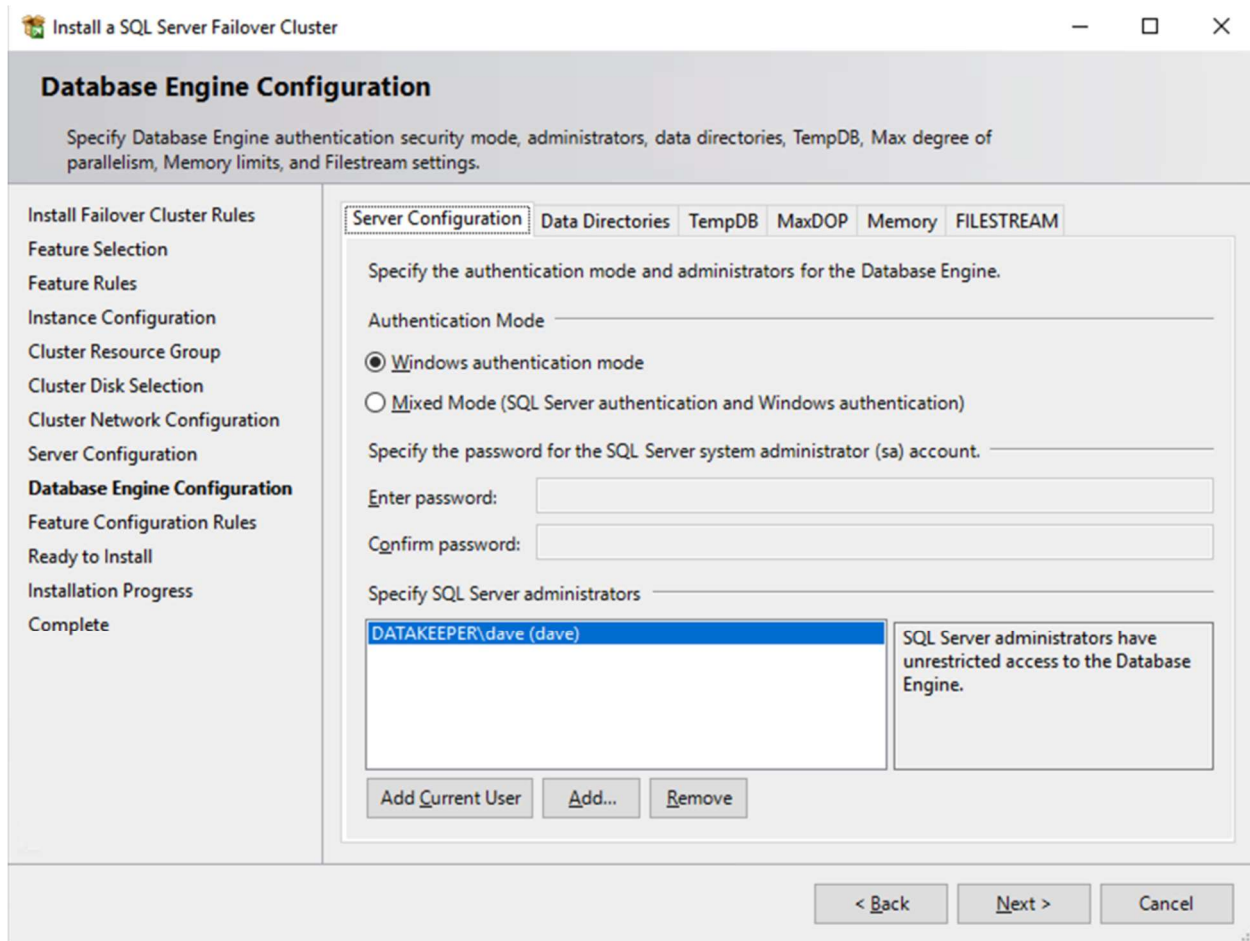
Service	Account Name	Password	Startup Type
SQL Server Agent	DATAKEEPER\dave	●●●●●●●●	Manual <input type="button" value="v"/>
SQL Server Database Engine	DATAKEEPER\dave	●●●●●●●●	Manual <input type="button" value="v"/>
SQL Full-text Filter Daemon Launc...	NT Service\MSSQLFDLa...		Manual
SQL Server Browser	NT AUTHORITY\LOCAL ...		Automatic <input type="button" value="v"/>

Grant Perform Volume Maintenance Task privilege to SQL Server Database Engine Service
 This privilege enables instant file initialization by avoiding zeroing of data pages. This may lead to information disclosure by allowing deleted content to be accessed.
[Click here for details](#)

< Back

Next >

Cancel



In this example we left tempdb on the D drive. However, for best performance it is recommended that you locate tempdb on a non-replicated volume.

Database Engine Configuration

Specify Database Engine authentication security mode, administrators, data directories, TempDB, Max degree of parallelism, Memory limits, and Filestream settings.

- Install Failover Cluster Rules
- Feature Selection
- Feature Rules
- Instance Configuration
- Cluster Resource Group
- Cluster Disk Selection
- Cluster Network Configuration
- Server Configuration
- Database Engine Configuration**
- Feature Configuration Rules
- Ready to Install
- Installation Progress
- Complete

Server Configuration **Data Directories** TempDB MaxDOP Memory FILESTREAM

Data root directory:	<input type="text" value="D:\"/>	...
System database directory:	<input type="text" value="D:\MSSQL15.MSSQLSERVER\MSSQL\Data"/>	
User database directory:	<input type="text" value="D:\MSSQL15.MSSQLSERVER\MSSQL\Data"/>	...
User database log directory:	<input type="text" value="D:\MSSQL15.MSSQLSERVER\MSSQL\Data"/>	...
Backup directory:	<input type="text" value="D:\MSSQL15.MSSQLSERVER\MSSQL\Backup"/>	...

< Back Next > Cancel

Ready to Install

Verify the SQL Server 2019 features to be installed.

- Install Failover Cluster Rules
- Feature Selection
- Feature Rules
- Instance Configuration
- Cluster Resource Group
- Cluster Disk Selection
- Cluster Network Configuration
- Server Configuration
- Database Engine Configuration
- Feature Configuration Rules
- Ready to Install**
- Installation Progress
- Complete

Ready to install the SQL Server 2019 failover cluster:

Summary

- Edition: Developer
- Action: InstallFailoverCluster (Product Update)
- Prerequisites
 - Already installed:
 - Windows PowerShell 3.0 or higher
 - To be installed from media:
 - Microsoft Visual C++ 2017 Redistributable
- General Configuration
 - Features
 - Database Engine Services
 - SQL Server Replication
 - Full-Text and Semantic Extractions for Search
 - Data Quality Services
 - Instance configuration
 - Instance Name: MSSQLSERVER
 - Instance ID: MSSQLSERVER
 - Instance IDs
 - SQL_B... MSSQLSERVER

Configuration file path:

C:\Program Files\Microsoft SQL Server\150\Setup Bootstrap\Log\20210406_153041\ConfigurationFile.ini

< Back Install Cancel

Complete

Your SQL Server 2019 failover cluster installation is complete with product updates.

- Install Failover Cluster Rules
- Feature Selection
- Feature Rules
- Instance Configuration
- Cluster Resource Group
- Cluster Disk Selection
- Cluster Network Configuration
- Server Configuration
- Database Engine Configuration
- Feature Configuration Rules
- Ready to Install
- Installation Progress
- Complete**

Information about the Setup operation or possible next steps:

Feature	Status
✓ Data Quality Services	Succeeded
✓ Full-Text and Semantic Extractions for Search	Succeeded
✓ Database Engine Services	Succeeded
✓ SQL Server Replication	Succeeded
✓ SQL Browser	Succeeded
✓ SQL Writer	Succeeded

Details:

Install successful.

Summary log file has been saved to the following location:

C:\Program Files\Microsoft SQL Server\150\Setup Bootstrap\Log\20210406_153041\Summary_SQL1_20210406_153041.txt

Close

Install the second node of the SQL Server FCI on SQL2

It is now time to install SQL Server on SQL2.

[Planning](#)**[Installation](#)**[Maintenance](#)[Tools](#)[Resources](#)[Advanced](#)[Options](#)

Microsoft SQL Server 2019

**[New SQL Server stand-alone installation or add features to an existing installation](#)**

Launch a wizard to install SQL Server 2019 in a non-clustered environment or to add features to an existing SQL Server 2019 instance.

**[Install SQL Server Reporting Services](#)**

Launch a download page that provides a link to install SQL Server Reporting Services. An internet connection is required to install SSRS.

**[Install SQL Server Management Tools](#)**

Launch a download page that provides a link to install SQL Server Management Studio, SQL Server command-line utilities (SQLCMD and BCP), SQL Server PowerShell provider, SQL Server Profiler and Database Tuning Advisor. An internet connection is required to install these tools.

**[Install SQL Server Data Tools](#)**

Launch a download page that provides a link to install SQL Server Data Tools (SSDT). SSDT provides Visual Studio integration including project system support for Microsoft Azure SQL Database, the SQL Server Database Engine, Reporting Services, Analysis Services and Integration Services. An internet connection is required to install SSDT.

**[New SQL Server failover cluster installation](#)**

Launch a wizard to install a single-node SQL Server 2019 failover cluster.

**[Add node to a SQL Server failover cluster](#)**

Launch a wizard to add a node to an existing SQL Server 2019 failover cluster.

**[Upgrade from a previous version of SQL Server](#)**

Launch a wizard to upgrade a previous version of SQL Server to SQL Server 2019.
[Click here to first view Upgrade Documentation](#)

**[New Machine Learning Server \(Standalone\) installation](#)**

Add a Failover Cluster Node

Product Key

Specify the edition of SQL Server 2019 to install.

Product Key
License Terms
Global Rules
Microsoft Update
Product Updates
Install Setup Files
Add Node Rules
Cluster Node Configuration
Feature Rules
Ready to Add Node
Add Node Progress
Complete

Validate this instance of SQL Server 2019 by entering the 25-character key from the Microsoft certificate of authenticity or product packaging. You can also specify a free edition of SQL Server: Developer, Evaluation, or Express. Evaluation has the largest set of SQL Server features, as documented in SQL Server Books Online, and is activated with a 180-day expiration. Developer edition does not have an expiration, has the same set of features found in Evaluation, but is licensed for non-production database application development only. To upgrade from one installed edition to another, run the Edition Upgrade Wizard.

Specify a free edition:
 Developer

Enter the product key:

< Back Next > Cancel

Add a Failover Cluster Node

License Terms

To install SQL Server 2019, you must accept the Microsoft Software License Terms.

Product Key
License Terms
Global Rules
Microsoft Update
Product Updates
Install Setup Files
Add Node Rules
Cluster Node Configuration
Feature Rules
Ready to Add Node
Add Node Progress
Complete

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MICROSOFT SQL SERVER 2019 DEVELOPER

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< Back Next > Cancel

Microsoft Update

Use Microsoft Update to check for important updates

- Product Key
- License Terms
- Global Rules
- Microsoft Update**
- Product Updates
- Install Setup Files
- Add Node Rules
- Cluster Node Configuration
- Feature Rules
- Ready to Add Node
- Add Node Progress
- Complete

Microsoft Update offers security and other important updates for Windows and other Microsoft software, including SQL Server 2019. Updates are delivered using Automatic Updates, or you can visit the Microsoft Update website.

Use Microsoft Update to check for updates (recommended)

[Microsoft Update FAQ](#)

[Microsoft Update Privacy Statement](#)

< Back Next > Cancel

Add Node Rules

Setup rules identify potential problems that might occur while running Setup. Failures must be corrected before Setup can continue.

- Add Node Rules**
- Cluster Node Configuration
- Feature Rules
- Ready to Add Node
- Add Node Progress
- Complete

Operation completed. Passed: 19. Failed 0. Warning 1. Skipped 0.



Hide details <<

Re-run

[View detailed report](#)

Result	Rule	Status
⚠	Microsoft Cluster Service (MSCS) cluster verification warnings	Warning
✔	Remote registry service (SQL2)	Passed
✔	Domain controller	Passed
✔	Windows Firewall	Passed
✔	DNS settings (SQL2)	Passed
✔	WOW64 setup	Passed
✔	SQL 2019 minimum CTP for Upgrade and Side by Side Support	Passed
✔	Windows Management Instrumentation (WMI) service (SQL1)	Passed
✔	Cluster Remote Access (SQL1)	Passed
✔	Distributed Transaction Coordinator (MSDTC) installed (SQL1)	Passed
✔	Remote registry service (SQL1)	Passed

< Back Next > Cancel

Cluster Node Configuration

Add a node to an existing SQL Server failover cluster.

Add Node Rules

Cluster Node Configuration

Cluster Network Configuration

Service Accounts

Feature Rules

Ready to Add Node

Add Node Progress

Complete

SQL Server instance name: MSSQLSERVER

Name of this node: SQL2

Disk Space Requirements: Drive C: 1427 MB required, 84556 MB available

Instance Name	Cluster Network Name	Features	Nodes
MSSQLSERVER	SQLCLUSTER	SQLEngine, SQ...	SQL1

< Back

Next >

Cancel

Cluster Network Configuration

Specify additional IP addresses that are available and valid on the current node and subnet (previously-configured SQL Server failover cluster IP addresses are shown read-only and dimmed).

- Add Node Rules
- Cluster Node Configuration
- Cluster Network Configuration**
- Service Accounts
- Feature Rules
- Ready to Add Node
- Add Node Progress
- Complete

Specify the network settings for this failover cluster:

<input checked="" type="checkbox"/>	IP Ty...	DHCP	Address	Subnet Mask	Subnet(s)	Network
<input checked="" type="checkbox"/>	IPv4	<input type="checkbox"/>	10.0.3.102	255.255.255.0	10.0.3.0/24	Cluster Network 1
<input checked="" type="checkbox"/>	IPv4	<input type="checkbox"/>	10.0.2.102	255.255.255.0	10.0.2.0/24	Cluster Network 2

Refresh

< Back Next > Cancel

Cluster Network Configuration

Specify additional IP addresses that are available and valid on the current node and subnet (previously-configured SQL Server failover cluster IP addresses are shown read-only and dimmed).

- Add Node Rules
- Cluster Node Configuration
- Cluster Network Configuration**
- Service Accounts
- Feature Rules
- Ready to Add Node
- Add Node Progress
- Complete

Specify the network settings for this failover cluster:

<input checked="" type="checkbox"/>	IP Ty...	DHCP	Address	Subnet Mask	Subnet(s)	Network
<input checked="" type="checkbox"/>	IPv4	<input type="checkbox"/>	10.0.3.102	255.255.255.0	10.0.3.0/24	Cluster Network 1
<input checked="" type="checkbox"/>	IPv4	<input type="checkbox"/>				Cluster Network 2

Add a Failover Cluster Node

SQL Server Setup detected that there are multiple subnets. Because of this, Setup sets the IP address resource dependency using an OR relationship for SQL Server multi-subnet failover clustering, so failover to other nodes does not happen until all the network cards fail on the node that owns the failover cluster. This may impact multi-homed cluster configurations on a subnet when client connections become unavailable. Do you want to proceed with SQL Server multi-subnet failover cluster configuration?

Copy message Yes No

Refresh

⚠ SQL Server Setup detected that there are multiple subnets. Because of this, Setup sets the IP address re...

< Back Next > Cancel

Service Accounts

Specify the service accounts and collation configuration.

- Add Node Rules
- Cluster Node Configuration
- Cluster Network Configuration
- Service Accounts**
- Feature Rules
- Ready to Add Node
- Add Node Progress
- Complete

Microsoft recommends that you use a separate account for each SQL Server service.

Service	Account Name	Password	Startup Type
SQL Full-text Filter Daemon Launcher	NT Service\MSSQLFDLaun...		Manual
SQL Server Database Engine	DATAKEEPER\dave	●●●●●●●●	Manual
SQL Server Browser	NT AUTHORITY\LOCAL SE...		Automatic ▾
SQL Server Agent	DATAKEEPER\dave	●●●●●●●●	Manual

Grant Perform Volume Maintenance Task privilege to SQL Server Database Engine Service

This privilege enables instant file initialization by avoiding zeroing of data pages. This may lead to information disclosure by allowing deleted content to be accessed.

[Click here for details](#)

Add a Failover Cluster Node

Ready to Add Node

Verify the SQL Server 2019 features to be installed as part of the add node operation.

Add Node Rules

- Cluster Node Configuration
- Cluster Network Configuration
- Service Accounts
- Feature Rules
- Ready to Add Node**
- Add Node Progress
- Complete

Ready to add this node to the SQL Server 2019 failover cluster:

Summary

- Edition: Developer
- Action: AddNode (Product Update)
- Prerequisites**
 - Already installed:
 - Windows PowerShell 3.0 or higher
 - To be installed from media:
 - Microsoft Visual C++ 2017 Redistributable
- General Configuration**
 - Features**
 - Database Engine Services
 - SQL Server Replication
 - Full-Text and Semantic Extractions for Search
 - Data Quality Services
 - Instance configuration**
 - Instance Name: MSSQLSERVER
 - Instance ID: MSSQLSERVER
 - Instance IDs
 - SQL_BUILTIN_5 - MSSQL15 - MSSQLSERVER

Configuration file path:

C:\Program Files\Microsoft SQL Server\150\Setup Bootstrap\Log\20210407_075537\ConfigurationFile.ini

< Back Install Cancel

Add a Failover Cluster Node

Complete

Your SQL Server 2019 failover cluster add node operation is complete with product updates.

Add Node Rules

- Cluster Node Configuration
- Cluster Network Configuration
- Service Accounts
- Feature Rules
- Ready to Add Node
- Add Node Progress
- Complete**

Information about the Setup operation or possible next steps:

Feature	Status
✓ Data Quality Services	Succeeded
✓ Full-Text and Semantic Extractions for Search	Succeeded
✓ Database Engine Services	Succeeded
✓ SQL Server Replication	Succeeded
✓ SQL Browser	Succeeded
✓ SQL Writer	Succeeded

Details:

Install successful.

Summary log file has been saved to the following location:

C:\Program Files\Microsoft SQL Server\150\Setup Bootstrap\Log\20210407_075537\Summary_SQL2_20210407_075537.txt

Close

Once you have installed SQL Server on both cluster nodes, Failover Cluster Manager should look like this.

Failover Cluster Manager

File Action View Help

cluster1.datakeeper.local

- Roles
- Nodes
- Storage
- Networks
- Cluster Events

Roles (1)

Name	Status	Type	Owner Node	Pri
SQL Server (MSSQLSE...)	Running	Other	SQL1	M...

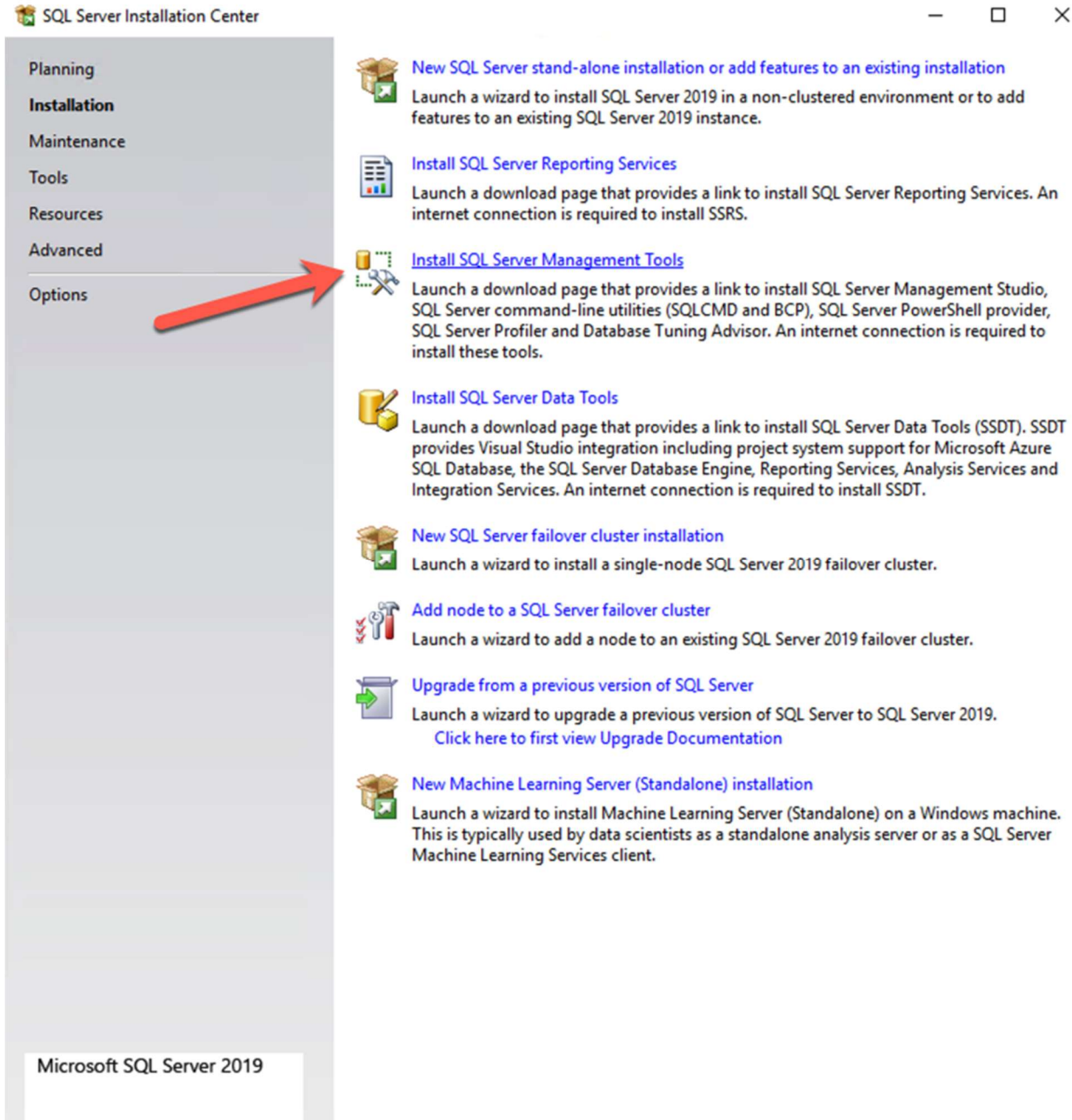
SQL Server (MSSQLSERVER) Preferred Owners: [Any node](#)

Name	Status	Inform
Storage		
DataKeeper Volume D	Online	
Server Name		
Name: sqlcluster	Online	
IP Address: 10.0.2.102	Online	
IP Address: 10.0.3.102	Offline	
Other Resources		
SQL Server	Online	
SQL Server Agent	Online	
Roles		
SQL Server CEIP (MSSQLSERVER)	Online	

Roles: SQL Server (MSSQLSERVER)

Install SQL Server Management Studio

On SQL Server Versions 2016 and later, you must download and install SSMS as a separate option as shown below. Note: In earlier versions of SQL Server, SQL Server Management Studio (SSMS) was an option that you could choose to install during the SQL installation.



The screenshot shows the 'SQL Server Installation Center' window. On the left is a navigation pane with the following items: Planning, Installation, Maintenance, Tools, Resources, Advanced, and Options. A red arrow points to the 'Options' item. The main area on the right lists several installation options:

- New SQL Server stand-alone installation or add features to an existing installation**
Launch a wizard to install SQL Server 2019 in a non-clustered environment or to add features to an existing SQL Server 2019 instance.
- Install SQL Server Reporting Services**
Launch a download page that provides a link to install SQL Server Reporting Services. An internet connection is required to install SSRS.
- Install SQL Server Management Tools**
Launch a download page that provides a link to install SQL Server Management Studio, SQL Server command-line utilities (SQLCMD and BCP), SQL Server PowerShell provider, SQL Server Profiler and Database Tuning Advisor. An internet connection is required to install these tools.
- Install SQL Server Data Tools**
Launch a download page that provides a link to install SQL Server Data Tools (SSDT). SSDT provides Visual Studio integration including project system support for Microsoft Azure SQL Database, the SQL Server Database Engine, Reporting Services, Analysis Services and Integration Services. An internet connection is required to install SSDT.
- New SQL Server failover cluster installation**
Launch a wizard to install a single-node SQL Server 2019 failover cluster.
- Add node to a SQL Server failover cluster**
Launch a wizard to add a node to an existing SQL Server 2019 failover cluster.
- Upgrade from a previous version of SQL Server**
Launch a wizard to upgrade a previous version of SQL Server to SQL Server 2019.
[Click here to first view Upgrade Documentation](#)
- New Machine Learning Server (Standalone) installation**
Launch a wizard to install Machine Learning Server (Standalone) on a Windows machine. This is typically used by data scientists as a standalone analysis server or as a SQL Server Machine Learning Services client.

Microsoft SQL Server 2019



RELEASE 18.8

Microsoft SQL Server Management Studio with Azure Data Studio

Welcome. Click "Install" to begin.

Location:

C:\Program Files (x86)\Microsoft SQL Server Management Studio 18

Change

By clicking the "Install" button, I acknowledge that I accept the [Privacy Statement](#) and the License Terms for [SQL Server Management Studio](#) and [Azure Data Studio](#)

SQL Server Management Studio transmits information about your installation experience, as well as other usage and performance data, to Microsoft to help improve the product. To learn more about data processing and privacy controls, and to turn off the collection of this information after installation, see the [documentation](#)

Install

Close



RELEASE 18.8

Microsoft SQL Server Management Studio with Azure Data Studio

Restart required in order to complete setup.

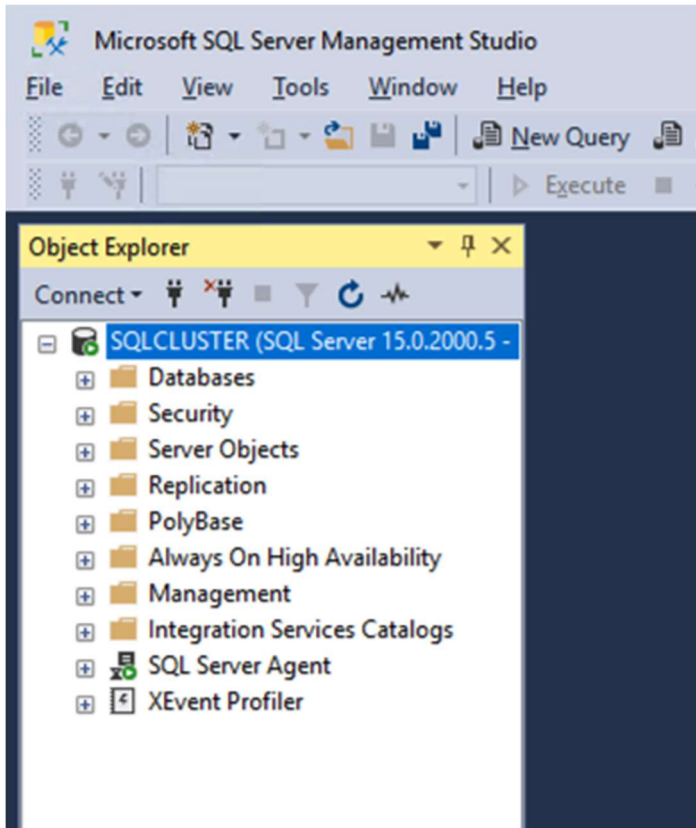
All specified components have been installed successfully.

The computer needs to be restarted before setup can continue.

Restart

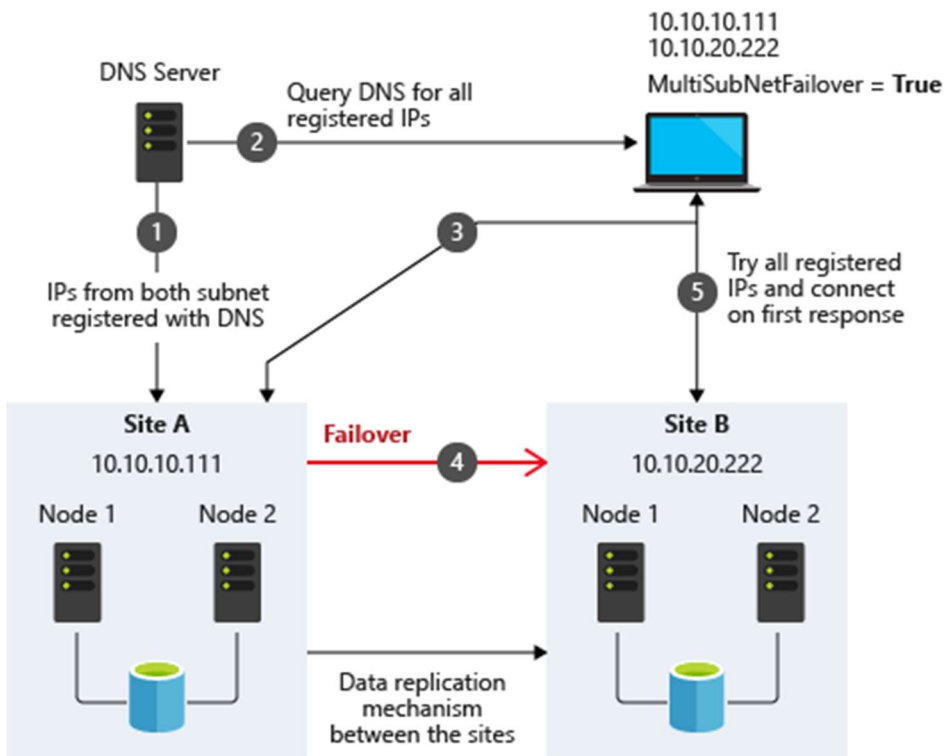
Close

Once SSMS installs, connect to the cluster via the client access point. Your SQL Server FCI should look like this.



Multi-Subnet Considerations

One of the biggest considerations for running a SQL Server FCI in OCI is the fact that the cluster nodes reside in different subnets. Microsoft started to account for the fact that cluster nodes might reside in different subnets by adding the “OR” functionality in Windows Server 2008 R2 as described in the Microsoft documentation.



Taken from [SQL Server Multi-Subnet Clustering \(SQL Server\)](#)

The important thing described in the documentation is the concept of the `RegisterAllProvidersIP` on the network name resource, which is enabled by default when you create a SQL Server FCI. As described, when this is enabled, two A records will be registered in DNS with the network name resource, one for each IP address.

Using the “OR” functionality, only the IP address associated with the active subnet will ever be online and the other one will be shown as offline. If your client supports adding `multisubnetfailover=true` to the connection string, then both IP addresses will be tried at the same time and the client will automatically connect to the active node. That is the easiest, and the default method of client redirection in a multi-subnet cluster.

The documentation goes on to say that if your client does NOT support the `multisubnetfailover=true` functionality, that you should “try to adjust the connection timeout in the client connection string by 21 seconds for each additional IP address. This ensures that the client's reconnection attempt does not timeout before it is able to cycle through all IP addresses in your multi-subnet FCI.”

Disabling `RegisterAllProvidersIP` is another option that will work. By disabling the `RegisterAllProvidersIP` you will only have a single A record in DNS. The DNS A record will be updated each time the cluster fails over with the active cluster IP address associated with the name resource.

The downside of this scenario configuration is that your clients will cache the old IP address until

the time to live (TTL) expires. To minimize the delay in reconnection, it is recommended that you change the TTL on the name resource. This process is described here and an example is shown below that sets the TTL to 5 minutes

```
Get-ClusterResource -Name sqlcluster | Set-ClusterParameter  
-Name HostRecordTTL -Value 300
```

Keep in mind that it also may take some time for the changes to your AD-integrated DNS server to propagate across your entire forest.

Summary

This technical guide provides a comprehensive overview of setting up a SQL Server 2019 Failover Cluster Instance (FCI) in Oracle Cloud Infrastructure (OCI). It begins by highlighting the importance of understanding OCI's availability SLAs, which differ based on deployment strategies: 99.99% for deployments across Availability Domains, 99.95% across Fault Domains, and 99.9% for single VM deployments. The guide emphasizes that the SLA covers VM availability, not the applications or services running on it, thus necessitating additional measures for application availability.

The guide details the initial steps of creating a Virtual Cloud Network (VCN) and subnets in OCI, emphasizing the need for a network plan that accommodates at least three Availability Domains for clustering purposes. Each Availability Domain must be in a different subnet, a requirement applicable to clusters spanning Fault Domains as well. It provides specific configurations for setting up three subnets across different Availability Domains within a single VCN.

Further, the guide describes the process of creating an internet gateway and editing default security lists and route tables to facilitate access and security across Availability Domains. It also covers the configuration of DHCP options for Active Directory compatibility and outlines the steps for provisioning VMs with Windows Server 2022 and SQL Server 2019, emphasizing the importance of planning server names, IP addresses, and availability zone placements.

The guide then delves into adding additional volumes for SQL Server FCI storage needs, detailing the process of creating and attaching block volumes to instances. It also instructs on configuring secondary IP addresses for Windows Server Failover Clustering in OCI.

Next, the guide addresses domain controller setup, including enabling Active Directory Domain Services and promoting the server to a domain controller. It walks through the preparation of storage and enabling of the Failover Clustering feature on SQL1 and SQL2, along with cluster validation and creation processes.

The guide further discusses adding a File Share Witness to maintain cluster quorum and installing DataKeeper Cluster Edition for volume replication. It provides a step-by-step approach to installing SQL Server on the cluster nodes and SQL Server Management Studio, along with considerations for multi-subnet deployments.

In summary, this guide offers a detailed blueprint for deploying and configuring a SQL Server 2019 FCI in OCI, covering aspects from network setup and VM provisioning to clustering, storage configuration, and domain control setup, ensuring maximum uptime and reliability for business-critical applications.



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