EXPRESSCLUSTER X 5.0
HA Cluster Configuration Guide for Microsoft Azure (Linux)

Release 2

NEC Corporation

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CHAPTER

ONE

PREFACE

1.1 Who Should Use This Guide

The *HA Cluster Configuration Guide for Microsoft Azure (Linux)* is intended for administrators who want to build a cluster system, and for system engineers and maintenance personnel who provide user support.

The software and setup examples introduced in this guide are for reference only, and the software is not guaranteed to run.

1.2 Scope of application

This guide covers the following product versions.

- EXPRESSCLUSTER X 4.2 for Linux (Internal version: 4.2.0-1)
- CentOS 7.6
- Microsoft Azure portal: Environment as of December 19, 2019
- Azure CLI 2.0

If the product versions that you use differ from the above, some display and configuration contents may differ from those described in this guide.

The display and configuration contents may also change in the future. Therefore, for the latest information, see the website or manual of each product and service.

1.3 How This Guide is Organized

- 2. *Overview*: Describes the functional overview.
- 3. *Operating Environments*: Describes the tested operating environment of this function.
- 4. *Cluster Creation Procedure (for an HA Cluster Using Azure DNS)*: Describes the procedure to create an HA cluster using Azure DNS.
- 5. *Cluster Creation Procedure (for an HA Cluster Using a Public Load Balancer)*: Describes the procedure to create an HA cluster using an public load balancer.
- 6. *Cluster Creation Procedure (for an HA Cluster Using an Internal Load Balancer)*: Describes the procedure to create an HA cluster using an internal load balancer.
- 7. *Error Messages*: Describes the error messages and solutions.
- 8. *Notes and Restrictions*: Describes the notes and restrictions on creating and operating a cluster.

1.4 EXPRESSCLUSTER X Documentation Set

The EXPRESSCLUSTER X manuals consist of the following five guides. The title and purpose of each guide is described below:

EXPRESSCLUSTER X Getting Started Guide

> This guide is intended for all users. The guide covers topics such as product overview, system requirements, and known problems.

EXPRESSCLUSTER X Installation and Configuration Guide

> This guide is intended for system engineers and administrators who want to build, operate, and maintain a cluster system. Instructions for designing, installing, and configuring a cluster system with EXPRESSCLUSTER are covered in this guide.

EXPRESSCLUSTER X Reference Guide

> This guide is intended for system administrators. The guide covers topics such as how to operate EXPRESSCLUSTER, function of each module and troubleshooting. The guide is supplement to the Installation and Configuration Guide.

EXPRESSCLUSTER X Maintenance Guide

> This guide is intended for administrators and for system administrators who want to build, operate, and maintain EXPRESSCLUSTER-based cluster systems. The guide describes maintenance-related topics for EXPRESSCLUSTER.

EXPRESSCLUSTER X Hardware Feature Guide

> This guide is intended for administrators and for system engineers who want to build EXPRESSCLUSTER-based cluster systems. The guide describes features to work with specific hardware, serving as a supplement to the Installation and Configuration Guide.

1.5 Conventions

In this guide, Note, Important, See also are used as follows:

Note: Used when the information given is important, but not related to the data loss and damage to the system and machine.

Important: Used when the information given is necessary to avoid the data loss and damage to the system and machine.

See also:

Used to describe the location of the information given at the reference destination.

The following conventions are used in this guide.

Convention	Usage	Example
Bold	Indicates graphical objects, such as text boxes, list boxes, menu selections, buttons, labels, icons, etc.	Click Start. Properties dialog box
Angled bracket within the command line	Indicates that the value specified inside of the angled bracket can be omitted.	`clpstat -s[-h` *`host_name`*`]`
#	Prompt to indicate that a Linux user has logged on as root user.	`# clpstat`
Monospace	Indicates path names, commands, system output (message, prompt, etc.), directory, file names, functions and parameters.	`/Linux`
bold	Indicates the value that a user actually enters from a command line.	Enter the following: **# clpcl -s -a**
`italic`	Indicates that users should replace italicized part with values that they are actually working with.	`# ping` *`<IP address>`*

In the figures of this guide, this icon represents EXPRESSCLUSTER.

1.6 Contacting NEC

For the latest product information, visit our website below:

https://www.nec.com/en/global/prod/expresscluster/

CHAPTER

TWO

OVERVIEW

2.1 Functional overview

This guide describes how to configure an HA cluster based on EXPRESSCLUSTER X (hereinafter referred to as "EXPRESSCLUSTER") using Azure Resource Manager on a Microsoft Azure cloud service.

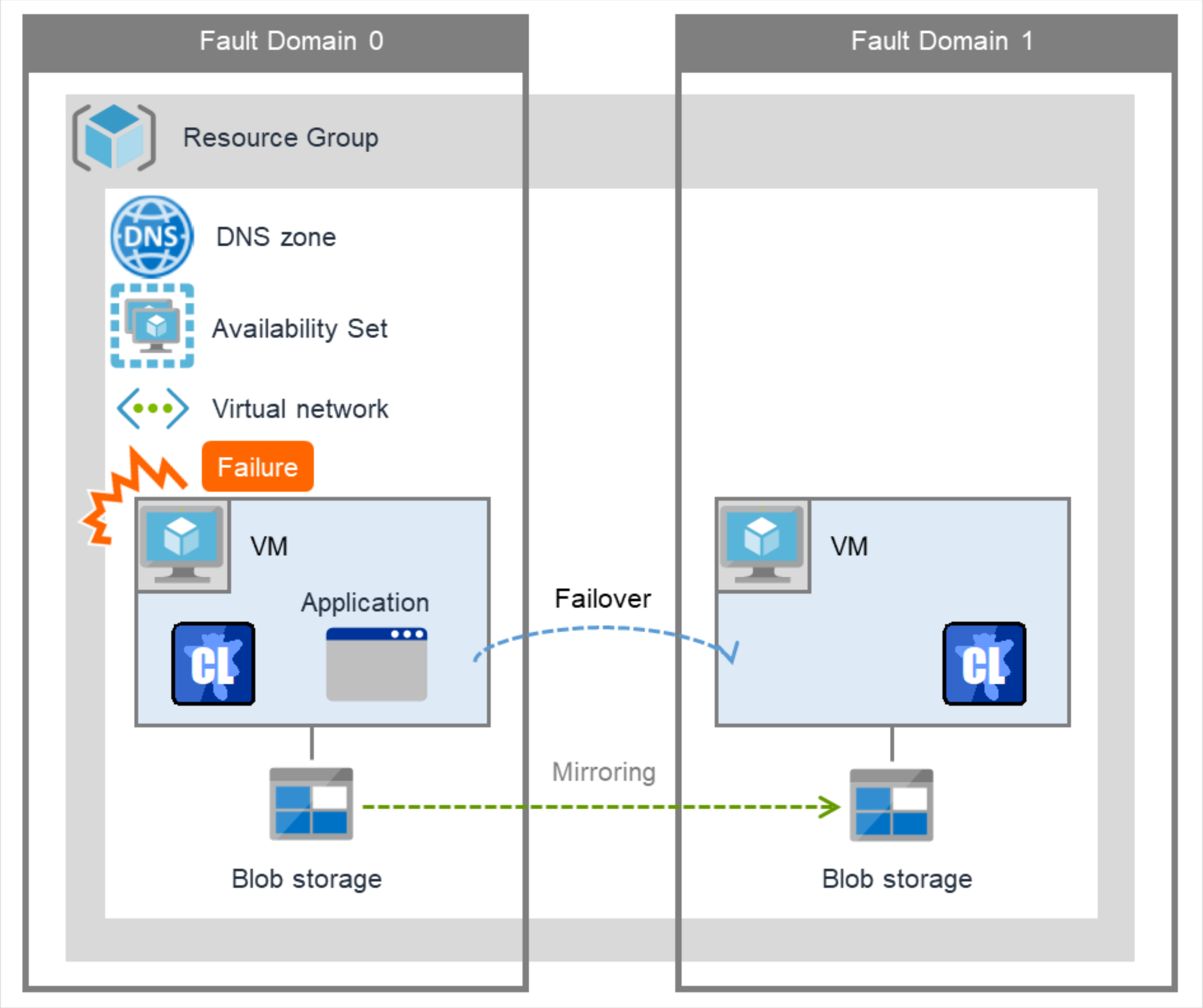

Fig. 2.1: HA Cluster on a Cloud Service (Using Azure DNS)

Operational availability can be increased by clustering virtual machines (VMs in Figure 2.1 HA Cluster on a Cloud Service (Using Azure DNS)) using a Microsoft Azure region and availability set in a Microsoft Azure environment.

- Microsoft Azure region

  Physical and logical units called a Microsoft Azure region are provided.
  It is possible to build all nodes in a single region (such as Japan East or Japan West). However, if all nodes are built in a single region, there is a possibility for nodes to go down due to a network failure or natural disaster, causing interruption to the flow of business. Distributing nodes into multiple regions can improve the operational availability.

- Availability set

  Microsoft Azure allows each node to be deployed in a logical group called an *availability set*. Locating each node in an availability set minimizes the impact of planned maintenance or unplanned maintenance due to a physical hardware failure of the Microsoft Azure platform. This guide describes the configuration using an availability set.
  For details about an availability set, see the following website:

  Manage the availability of Linux virtual machines:
  https://docs.microsoft.com/en-us/azure/virtual-machines/linux/manage-availability

2.2 Basic configuration

This guide assumes two types of HA clusters. One is an HA cluster using Azure DNS of the Resource Manager deployment model. The other is an HA cluster using a load balancer of the Resource Manager deployment model. (Both HA clusters are configured as a unidirectional standby cluster.) The following table describes the EXPRESSCLUSTER resources to be selected depending on the Microsoft Azure deployment model in use.

Purpose	EXPRESSCLUSTER resource to use
Accessing the cluster by using a DNS name (Azure DNS needs to be installed)	Azure DNS resource
Accessing the cluster by using a virtual IP address(global IP address) (Use public load balancer)	Azure probe port resource
Accessing the cluster by using a virtual IP address(private IP address) (Use internal load balancer)	Azure probe port resource
Accessing the cluster by using a virtual IP address(private IP address) and applications to be clustered is Always On configuretion (Use internal load balancer and configure Direct Server Return (DSR))	Azure probe port resource

HA cluster using Azure DNS

In this configuration, two virtual machines are deployed the same resource group so that the cluster can be accessed by using the same DNS name. The EXPRESSCLUSER Azure DNS resource uses Azure DNS to enable access with a DNS name. For details about Azure DNS, see the following website:

Azure DNS: https://azure.microsoft.com/en-us/services/dns/

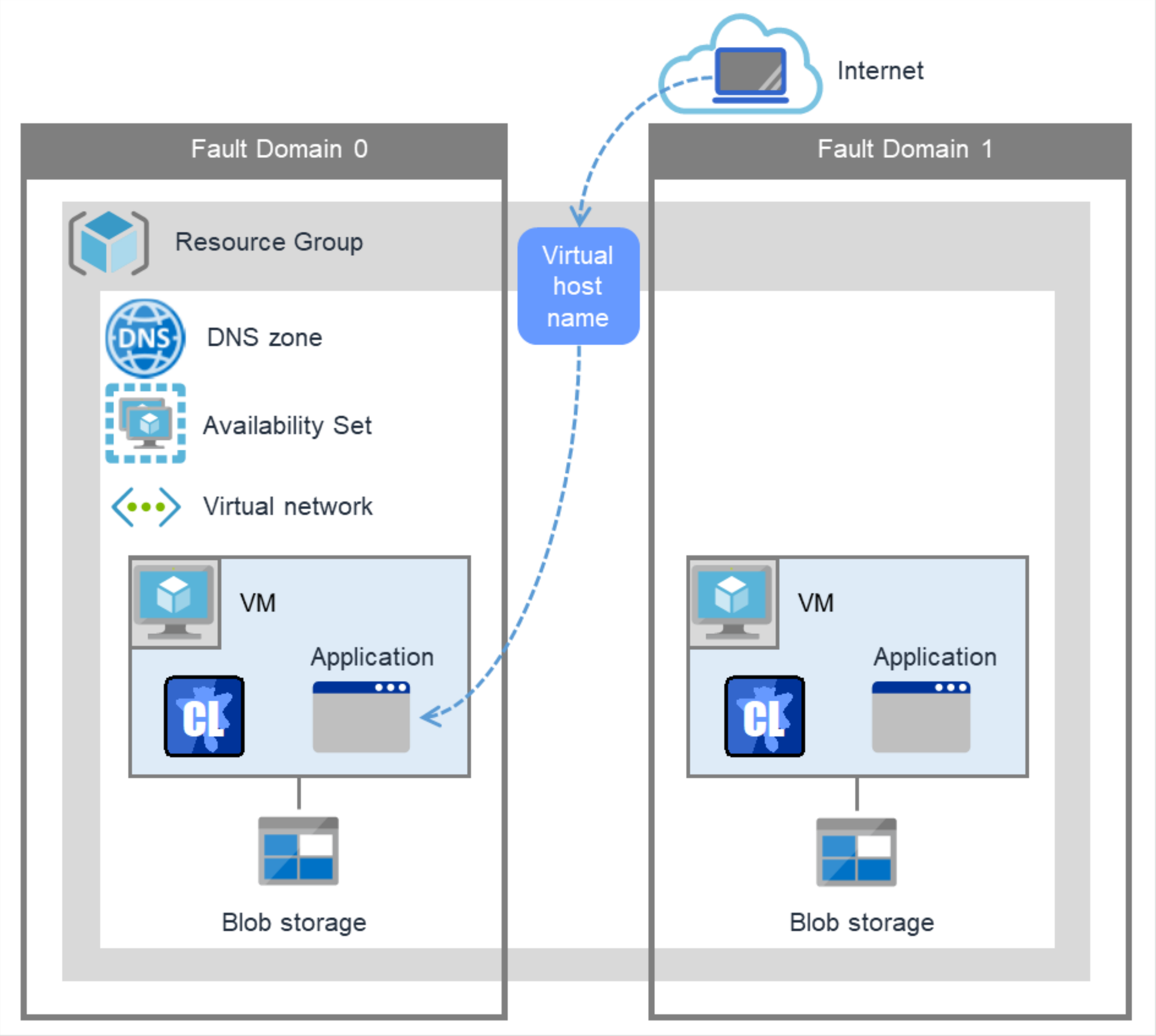

Fig. 2.2: HA Cluster Using Azure DNS

These two virtual machines use the same availability set to minimize the impact of planned maintenance or unplanned maintenance due to a physical hardware failure of the Microsoft Azure platform.

The cluster in Figure 2.2 HA Cluster Using Azure DNS is accessed by using the DNS name of the Azure DNS zone. EXPRESSCLUSTER manages record sets and DNS A records of the Azure DNS zone to find an IP address according to the DNS name. A client need not be conscious about the switching of virtual machines upon failover occurrence or group migration.

The following table describes the EXPRESSCLUSTER resources and monitor resources required for a HA cluster configuration using Azure DNS.

Resource or monitor resource type	Description	Setting
Azure DNS resource	Manages the record sets (A records) of the Azure DNS zone to find an IP address according to the DNS name.	Required
Azure DNS monitor resource	Monitors that the results of name resolution are normal in relation to the Azure DNS record set.	Required
IP monitor resource	Monitors whether communication with the Microsoft Azure Service Management API is possible, and also monitors health of communication with an external network.	When an public load balancer is used, required to monitor communication between clusters that are configured with virtual machines, and also to monitor health of communication with an internal network.
Custom monitor resource	Monitors communication between clusters that are configured with virtual machines, and also monitors health of communication with an internal network.	When an public load balancer is used, required to monitor whether communication with the Microsoft Azure Service Management API is possible, and also to monitor health of communication with an external network.
Multi target monitor resource	Monitors the statuses of both the IP monitor resource and custom monitor resource. If the statuses of both monitor resources are abnormal, a script in which a process for network partition resolution (NP resolution) is described is executed.	When an public load balancer is used, required to monitor health of communication between an internal network and external network.
Other resources and monitor resources	Depends on the configuration of application, such as a mirror disk, that is used in an HA cluster.	Optional

HA cluster using a load balancer

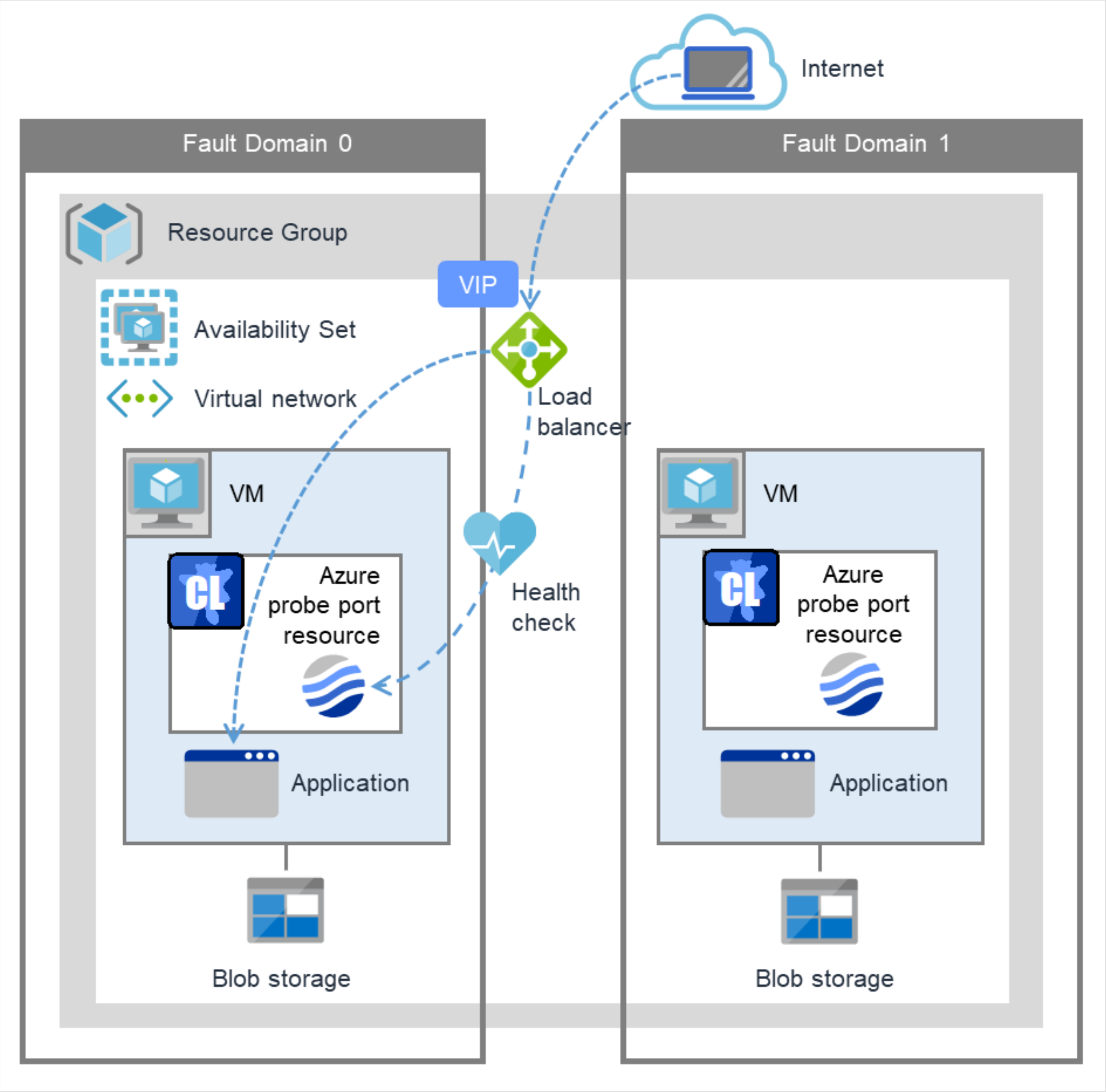

Fig. 2.3: HA Cluster Using an Public Load Balancer

A client application can connect a virtual machine on an availability set in a Microsoft Azure environment to a cluster node by using frontend IP address. By using a VIP (Virtual IP), a client need not be conscious about the switching of virtual machines upon failover occurrence or group migration.

A cluster built in a Microsoft Azure environment in Figure 2.3 HA Cluster Using an Public Load Balancer is accessed by specifying a global IP address of the Microsoft Azure Load Balancer (Load Balancer in Figure 2.3 HA Cluster Using an Public Load Balancer).

Active and standby nodes of a cluster are switched by using probes of Microsoft Azure Load Balancer. To use Microsoft Azure Load Balancer probes, use a probe port provided by the EXPRESSCLUSTER Azure probe port resource.

Activating the Azure probe port resource starts a probe port control process in standby for alive monitoring (access to a probe port) from Microsoft Azure Load Balancer.

Deactivating the Azure probe port resource stops a probe port control process in standby for alive monitoring (access to a probe port) from Microsoft Azure Load Balancer.

The Azure probe port resource also supports the Microsoft Azure internal load balancer (Internal Load Balancing: ILB). For the internal load balancer, a Microsoft Azure private IP address is used as a VIP.

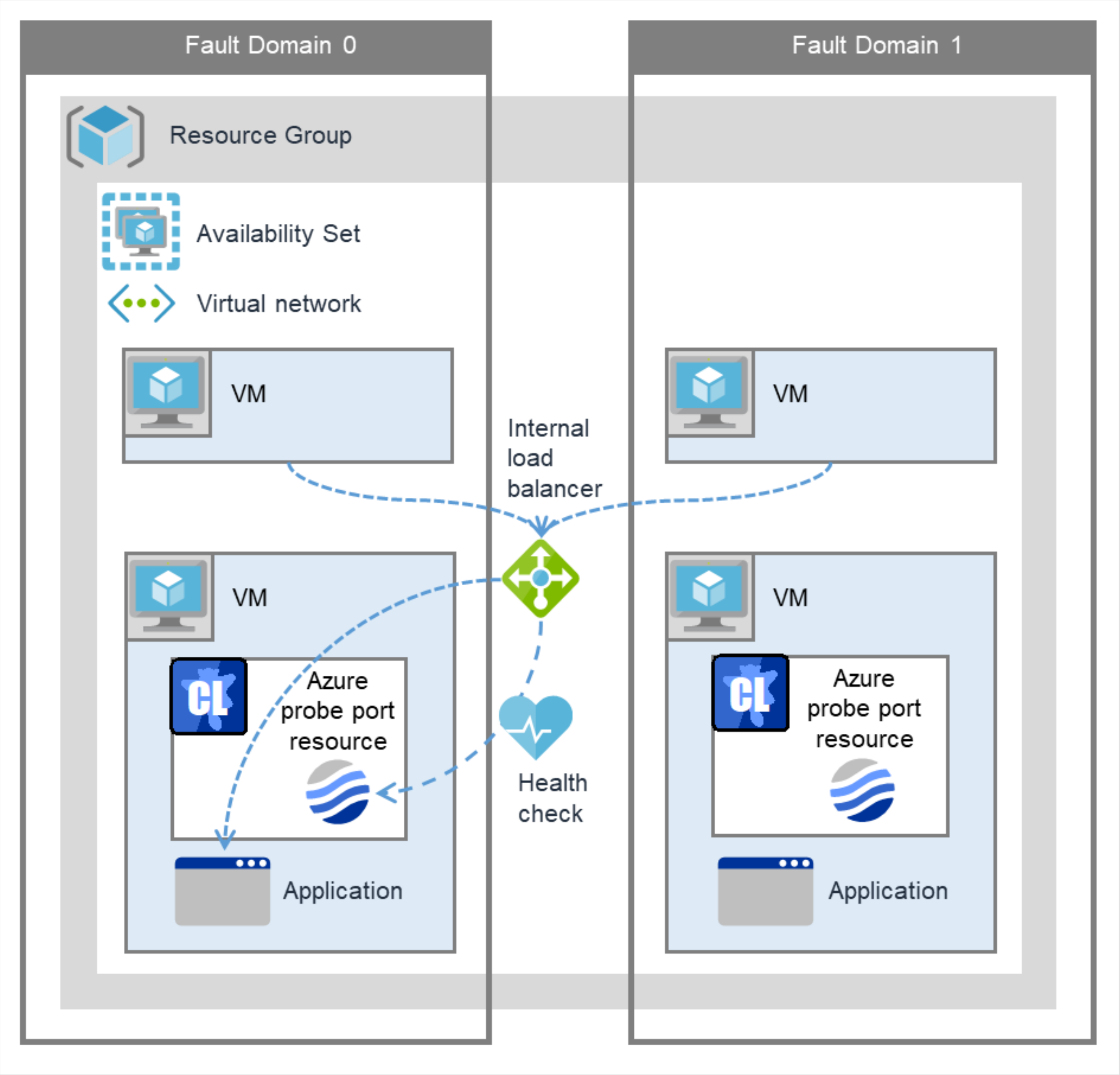

Fig. 2.4: HA Cluster Using the Internal Load Balancer

The following are examples of two HA cluster configurations using a load balancer. Select a load balancer to use depending on your purpose.

Purpose	Load balancer to use	Creating procedure
Disclosing operations outside the Microsoft Azure network	Public load balancer	See "*5. Cluster Creation Procedure (for an HA Cluster Using a Public Load Balancer)*" in this guide.
Publishing operations within the Microsoft Azure network	Internal load balancer (ILB)	See "*6. Cluster Creation Procedure (for an HA Cluster Using an Internal Load Balancer)*" in this guide.

The following table describes the EXPRESSCLUSTER resources and monitor resources required for a HA cluster using a load balancer.

Resource or monitor resource type	Description	Setting
Azure probe port resource	Provides a mechanism to wait for alive monitoring from a load balancer on a specific port of a node in which operations are running.	Required
Azure probe port monitor resource	Performs alive monitoring of a probe port control process, which starts upon activation of the Azure probe port resource, for a node in which the Azure probe port resource is running.	Required
Azure load balance monitor resource	Monitors whether a port with the same number as a probe port is open for a node in which the Azure probe port resource is not running.	Required
IP monitor resource	Monitors whether communication with the Microsoft Azure Service Management API is possible, and also monitors health of communication with an external network.	When an public load balancer is used, required to monitor communication between clusters that are configured with virtual machines, and also to monitor health of communication with an external network.
Custom monitor resource	Monitors communication between clusters that are configured with virtual machines, and also monitors health of communication with an internal network.	When an public load balancer is used, required to monitor whether communication with the Microsoft Azure Service Management API is possible, and also to monitor health of communication with an external network.

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Table 2.4 – continued from previous page

Resource or monitor resource type	Description	Setting
Multi target monitor resource	Monitors the statuses of both the IP monitor resource and custom monitor resource. If the statuses of both monitor resources are abnormal, a script in which a process for network partition resolution (NP resolution) is described is executed.	When anpublic load balancer is used, required to monitor health of communication between an internal network and external network.
PING network partition resolution resource	When an internal load balancer (ILB) is used, monitors health of communication between subnets by checking whether to communicate with a device that is always on and can return a response to ping (ping device).	When an internal load balancer (ILB) is used, required to monitor health of communication between subnets.
Other resources and monitor resources	Depends on the configuration of application, such as a mirror disk, that is used in an HA cluster.	Optional

2.3 Network partition resolution

Virtual machines configuring an HA cluster mutually performs alive monitoring through a heartbeat communication. If the virtual machines exist in different subnets, an undesirable event, such as an application starting more than once, occurs if a heartbeat ceases. To prevent a service from starting more than once, it is necessary to identify whether other virtual machines went down or whether the applicable virtual machine was isolated from a network (network partitioning: NP).

The network partition resolution feature (NP resolution) sends ping to or checks a LISTEN port of a device that is always on and can return a response to ping etc. (access destination). If there is no reply, this feature judges that the device entered the NP status and executes the specified action (such as a warning, recovery action, and server shutdown).

The access destination in the following table are used as ping devices for Microsoft Azure.

(*) A private IP address of an internal load balancer (ILB) cannot be used because it does not reply to ping.

Scope of disclosure	access destination	Procedure	EXPRESSCLUSTER resources, monitor resources, and commands to be used for NP resolution
Outside the Microsoft Azure Virtual network	Microsoft Azure Service Management API (management.core.windows.net)	Checking a LISTEN port	Custom monitor resource clpazure_port_checker command
	each cluster server	Ping	IP monitor resource
Inside the Microsoft Azure Virtual network	Servers, excluding a cluster server, that exist within the Microsoft Azure network(*)	Ping	PING network partition resolution resource
	Web servers that exist within the Microsoft Azure network	HTTP	HTTP network partition resolution resource

For details about NP resolution, see the following:

- "Network partition resolution resources details" in the Reference Guide.

Setting the NP resolution destination

You need to examine the NP resolution destination and method depending on the location of clients accessing a cluster system and the condition for connecting to an on-premise environment (for example, using a dedicated line). There is no NP resolution destination nor method to recommend.

How to judge the network partition status

EXPRESSCLUSTER provides the clpazure_port_checker command to check the TCP port listening status. Use this command as **Script created with this product** of the custom monitor resource or multi target monitor resource.

For details about the clpazure_port_checker command, see the following subsections.

Checking the TCP port listening status (clpazure_port_checker command)

`clpazure_port_checker`

Checks whether a LISTEN port exists among TCP ports of the specified server.

Command line clpazure_port_checker -h *hostname* -p *port*

Description

This command checks whether a LISTEN port exists among TCP ports of the server specified for an argument.

If there is no response five seconds (fixed) after the command execution, it is judged that an error (timeout) has occurred.

In case of an error, an error message is output to the standard output.

Executing this command from the custom monitor resource makes it possible to judge the network partition status.

For the configuration example of network partition resolution using this command, see "4.3. *Configuring the EXPRESSCLUSTER settings*" and "6.3. *Configuring the EXPRESSCLUSTER settings*"

Options

-h *hostname* Specify the determining server as *hostname* (by using an FQDN name or IP address). This option cannot be omitted.

-p *port* *Specify* the determining *port number* as *port (by using a port number or service name). This option cannot be omitted.*

Return values

0 Normal

1 Error (communication error)

2 Error (timeout)

3 Error (invalid argument or internal error)

2.4 Differences between on-premises and Microsoft Azure

The following table describes the functional differences of EXPRESSCLUSTER between on-premises and Microsoft Azure. "✓" indicates that the relevant function can be used and "n/a" indicates that the relevant function cannot be used.

Function	On-premise	Microsoft Azure
Creating a shared disk type cluster	✓	✓
Creating a mirror disk type cluster	✓	✓
Creating a hybrid disk type cluster	✓	✓
Using the floating IP resource	✓	n/a
Using the virtual IP resource	✓	n/a
Using the Azure probe port resource	n/a	✓
Using the Azure DNS resource	n/a	✓

For the procedure to create a 2-node cluster using a mirror disk on an on-premise or Microsoft Azure environment, see the following subsections.

The difference of the procedure to create a cluster between an on-premise environment and Microsoft Azure environment is whether or not configuring the Microsoft Azure settings in advance is required.

HA cluster using Azure DNS

For Microsoft Azure, execute steps 1 to 6 in the following table after logging in to the Microsoft Azure portal (https://portal.azure.com/).

For Microsoft Azure, execute steps 7 to 18 after logging in to each virtual machine.

- Before Installing EXPRESSCLUSTER

Step No.	Procedure	On-premise	Microsoft Azure
1	Creating a resource group	Not required	See "4.2. *Configuring Microsoft Azure*" in this guide.
2	Creating a virtual network	Not required	See "4.2. *Configuring Microsoft Azure*" in this guide.
3	Creating a virtual machine	Not required	See "4.2. *Configuring Microsoft Azure*" in this guide.
4	Setting a private IP address	Not required	See "4.2. *Configuring Microsoft Azure*" in this guide.
5	Adding a disk	Not required	See "4.2. *Configuring Microsoft Azure*" in this guide.
6	Creating a DNS zone	Not required	See "4.2. *Configuring Microsoft Azure*" in this guide.

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Table 2.7 – continued from previous page

Step No.	Procedure	On-premise	Microsoft Azure
7	Setting up the DNS server	See the manual provided with an OS or DNS server such as Red Hat Enterprise Linux 7 Network Guide.	Not required
8	Setting a partition for the mirror disk resource	See the following: "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide "Understanding Mirror disk resources" in the Reference Guide.	See "*4.2. Configuring Microsoft Azure*" in this guide.
9	Adjusting the OS startup time	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"
10	Checking the network setting	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"
11	Checking the root file system	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"
12	Checking the firewall setting	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"
13	Synchronizing the server time	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"

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Table 2.7 – continued from previous page

Step No.	Procedure	On-premise	Microsoft Azure
14	Checking the SELinux setting	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"
15	Installing the Azure CLI	Not required	See "*4.2. Configuring Microsoft Azure*" in this guide.
16	Registering the service principal	Not required	See "*4.2. Configuring Microsoft Azure*" in this guide.
17	Installing EXPRESSCLUSTER	See "Installing EXPRESSCLUSTER" in the Installation and Configuration Guide.	Same as "On-premise"

- After Installing EXPRESSCLUSTER

Step No.	Procedure	On-premise	Microsoft Azure
18	Registering the EXPRESSCLUSER license	See Registering the license in the Installation and Configuration Guide.	Same as "On-premise"
19	Creating a cluster: Setting the heartbeat method	See "Creating the configuration data of a 2-node cluster" in Creating the cluster configuration data in the Installation and Configuration Guide.	The COM heartbeat, BMC heartbeat, and disk heartbeat cannot be used.
20	Creating a cluster: Setting the NP resolution processing	The network partition resolution resource is used. See the following: "Creating the configuration data of a 2-node cluster" in Creating the cluster configuration data in the Installation and Configuration Guide. "Network partition resolution resources details" in the Reference Guide.	See "*4.3. Configuring the EXPRESSCLUSTER settings*" in this guide.

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Table 2.8 – continued from previous page

Step No.	Procedure	On-premise	Microsoft Azure
21	Creating a cluster: Creating a failover group and monitor resource	See "Creating the configuration data of a 2-node cluster" in Creating the cluster configuration data in the Installation and Configuration Guide.	In addition tthe references for on-premises, see the following: "Understanding Azure DNS resources" in the Reference Guide. "Understanding Azure DNS monitor resources" in the Reference Guide. "4.3. *Configuring the EXPRESSCLUSTER settings*" in this guide.

HA cluster using a load balancer

For Microsoft Azure, execute steps 1 to 5, and 7 to 8 in the following table after logging in to the Microsoft Azure portal (https://portal.azure.com/).

For Microsoft Azure, execute steps 6, and 9 to 16 after logging in to each virtual machine.

- Before Installing EXPRESSCLUSTER

Step No.	Procedure	On-premise	Microsoft Azure
1	Creating a resource group	Not required	See either of the following depending on the load balancer to use: "5.2. *Configuring Microsoft Azure*" in this guide "6.2. *Configuring Microsoft Azure*" in this guide
2	Creating a virtual network	Not required	See either of the following depending on the load balancer to use: "5.2. *Configuring Microsoft Azure*" in this guide "6.2. *Configuring Microsoft Azure*" in this guide

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Table 2.9 – continued from previous page

Step No.	Procedure	On-premise	Microsoft Azure
3	Creating a virtual machine	Not required	See either of the following depending on the load balancer to use: "*5.2. Configuring Microsoft Azure*" in this guide "*6.2. Configuring Microsoft Azure*" in this guide
4	Setting a private IP address	Not required	See either of the following depending on the load balancer to use: "*5.2. Configuring Microsoft Azure*" in this guide "*6.2. Configuring Microsoft Azure*" in this guide
5	Adding a disk	Not required	See either of the following depending on the load balancer to use: "*5.2. Configuring Microsoft Azure*" in this guide "*6.2. Configuring Microsoft Azure*" in this guide
6	Setting a partition for the mirror disk resource	See the following: "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide. "Understanding Mirror disk resources" in the Reference Guide.	See either of the following depending on the load balancer to use: "*5.2. Configuring Microsoft Azure*" in this guide "*6.2. Configuring Microsoft Azure*" in this guide

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Table 2.9 – continued from previous page

Step No.	Procedure	On-premise	Microsoft Azure
7	Creating and configuring a load balancer	Not required	See either of the following depending on the load balancer to use: "*5.2. Configuring Microsoft Azure*" in this guide "*6.2. Configuring Microsoft Azure*" in this guide
8	Setting the inbound security rules	Not required	"*5.2. Configuring Microsoft Azure*" in this guide
9	Adjusting the OS startup time	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"
10	Checking the network setting	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"
11	Checking the root file system	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"
12	Checking the firewall setting	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"
13	Synchronizing the server time	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"
14	Checking the SELinux setting	See "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide.	Same as "On-premise"

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Table 2.9 – continued from previous page

Step No.	Procedure	On-premise	Microsoft Azure
15	Installing EXPRESSCLUSTER	See "Installing EXPRESSCLUSTER" in the Installation and Configuration Guide.	Same as "On-premise"

- After Installing EXPRESSCLUSTER

Step No.	Procedure	On-premise	Microsoft Azure
16	Registering the EXPRESSCLUSER license	See Registering the license in the Installation and Configuration Guide.	Same as "On-premise"
17	Creating a cluster: Setting the heartbeat method	See "Creating the configuration data of a 2-node cluster" in Creating the cluster configuration data in the Installation and Configuration Guide.	The COM heartbeat, BMC heartbeat, and DISK heartbeat cannot be used.
18	Creating a cluster: Setting the NP resolution processing	The network partition resolution resource is used. See the following: "Creating the configuration data of a 2-node cluster" in Creating the cluster configuration data in the Installation and Configuration Guide. "Network partition resolution resources details" in the Reference Guide.	See either of the following depending on the load balancer to use: See "*5.3. Configuring the EXPRESSCLUSTER settings*" in this guide. See "*6.3. Configuring the EXPRESSCLUSTER settings*" in this guide.

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Table 2.10 – continued from previous page

Step No.	Procedure	On-premise	Microsoft Azure
19	Creating a cluster: Creating a failover group and monitor resource	See "Creating the configuration data of a 2-node cluster" in Creating the cluster configuration data in the Installation and Configuration Guide.	See the following in addition to the description of "On-premise." "Understanding Azure probe port resources" in the Reference Guide. "Understanding Azure probe port monitor resources" in the Reference Guide. "Understanding Azure load balance monitor resources" in the Reference Guide. See either of the following depending on the load balancer to use: See "*5.3. Configuring the EXPRESSCLUSTER settings*" in this guide. See "*6.3. Configuring the EXPRESSCLUSTER settings*" in this guide.

CHAPTER

THREE

OPERATING ENVIRONMENTS

3.1 HA cluster using Azure DNS

Supports the OS versions listed in the following manuals:

- "Getting Started Guide" > "Installation requirements for EXPRESSCLUSTER" > "Operation environment for Azure DNS resource, Azure DNS monitor resource"

Its operation has been verified in the following environments.
If the OS version is supported by Azure in EXPRESSCLUSTER X 4.2, you can use it by the same procedure.
If the procedure differs depending on the OS version, Microsoft Azure portal, and Azure CLI, please replace it as appropriate.

x86_64

OS	CentOS 7.6
EXPRESSCLUSTER	EXPRESSCLUSTER X 4.2 for Linux (Internal version: 4.2.0-1)
Microsoft Azure deployment model	Resource Manager
Region	(Asia Pacific) Japan East
Mirror disk size	Disk size: 20 GB (1 GB for a cluster partition and 19 GB for a data partition)
Azure CLI	Azure CLI 2.0
Python	2.7

The Azure CLI and Python must be installed because Azure DNS resource use them.
Since Python 2.7 is required when using Azure CLI 2.0.
For details about the Azure CLI, see the following website:

Get started with Azure CLI:
https://docs.microsoft.com/en-us/cli/azure/get-started-with-azure-cli?view=azure-cli-latest

Install the Azure classic CLI:
https://docs.microsoft.com/en-us/cli/azure/install-classic-cli

Python is bundled with Linux OS.

Since Azure CLI 1.0 (Azure classic CLI) running on Python 2.6 has been unrecommended, install Python by using the package manager of each distribution (e.g. APT, yum, and zipper) if Python 2.7 is not bundled.

Azure DNS must be installed because the Azure DNS resource use it. For details about Azure DNS, see the following website:

Azure DNS: https://azure.microsoft.com/en-us/services/dns/

3.2 HA cluster using a load balancer

Supports the OS versions listed in the following manuals:

- "Operation environment for Azure probe port resource, Azure probe port monitor resource, Azure load balance monitor resource" in "Installation requirements for EXPRESSCLUSTER" in the Getting Started Guide.

Its operation has been verified in the following environments.

If the OS version is supported by Azure in EXPRESSCLUSTER X 4.2, you can use it by the same procedure.

If the procedure differs depending on the OS version, Microsoft Azure portal, and Azure CLI, please replace it as appropriate.

x86_64

OS	CentOS 7.6
EXPRESSCLUSTER	EXPRESSCLUSTER X 4.2 for Linux (Internal version: 4.2.0-1)
Microsoft Azure deployment model	Resource Manager
Region	(Asia Pacific) Japan East
Mirror disk size	Disk size: 20 GB (1 GB for a cluster partition and 19 GB for a data partition)

CHAPTER

FOUR

CLUSTER CREATION PROCEDURE (FOR AN HA CLUSTER USING AZURE DNS)

4.1 Creation example

This guide introduces the procedure for creating a 2-node unidirectional standby cluster using EXPRESSCLUSTER. This procedure is intended to create a mirror disk type configuration in which node1 is used as an active server.

The following tables describe the parameters that do not have a default value and the parameters whose values are to be changed from the default values.

- Microsoft Azure settings (common to node1 and node2)

Setting item	Setting value
Resource group setting	
– Resource group	TestGroup1
– Region	(Asia Pacific) Japan East
Virtual network setting	
– Name	Vnet1
– Address space	10.5.0.0/24
– Subnet Name	Vnet1-1
– Subnet Address range	10.5.0.0/24
– Resource group	TestGroup1
– Location	(Asia Pacific) Japan East
DNS zone setting	
– Name	cluster1.zone
– Resource group	TestGroup1
– Record set	test-record1

- Microsoft Azure settings (specific to each of node1 and node2)

Setting item	Setting value	
	node1	node2
Virtual machine setting		
– Disk type	Standard HDD	
– User name	testlogin	
– Password	PassWord_123	
– Resource group	TestGroup1	
– Region	(Asia Pacific) Japan East	
Network security group setting		
– Name	node1-nsg	node2-nsg
Availability set setting		
– Name	AvailabilitySet1	
– Update domains	5	
– Fault domains	2	
Diagnostics storage account setting		
– Name	Automatically generated	
– Performance	Standard	
– Replication	Locally-redundant storage (LRS)	
IP configuration setting		
– IP address	10.5.0.110	10.5.0.111
Disk setting		
– Name	node1_DataDisk_0	node2_DataDisk_0
– Source type	None (empty disk)	
– Account type	Standard HDD	
– Size	20	

- EXPRESSCLUSTER settings (cluster properties)

Setting item	Setting value	
	node1	node2
– Cluster Name	Cluster1	
– Server Name	node1	node2
– Timeout Tab: Heartbeat timeout	120	

- EXPRESSCLUSTER settings (failover group)

Resource name	Setting item	Setting value
Mirror disk resource	Name	md
	Details Tab: Mount Point	/mnt/md
	Details Tab: Data Partition Device Name	/dev/sdc2
	Details Tab: Cluster Partition Device Name	/dev/sdc1
	Details Tab: File System	ext4
	Mirror Tab: Execute the initial mirror construction	On
	Mirror Tab: Execute initial mkfs	On
Azure DNS resource	Name	azuredns1
	Record Set Name	test-record1
	Zone Name	cluster1.zone
	IP Address	(node1) 10.5.0.110 (node2) 10.5.0.111
	Resource Group Name	TestGroup1
	User URI	http://azure-test
	Tenant ID	xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx
	File Path of Service Principal	/home/testlogin/tmpbyJ1cK.pem
	Azure CLI File Path	/usr/bin/az

- EXPRESSCLUSTER settings (monitor resource)

Monitor resource name	Setting item	Setting value
Mirror disk monitor resource	Name	mdw1
Azure DNS monitor resource	Name	azurednsw1
Custom monitor resource	Name	genw1
	Script created with this product	On
	Monitor Type	Synchronous
	Normal Return Value	0
	Recovery Action	Execute only the final action

Continued on next page

Table 4.2 – continued from previous page

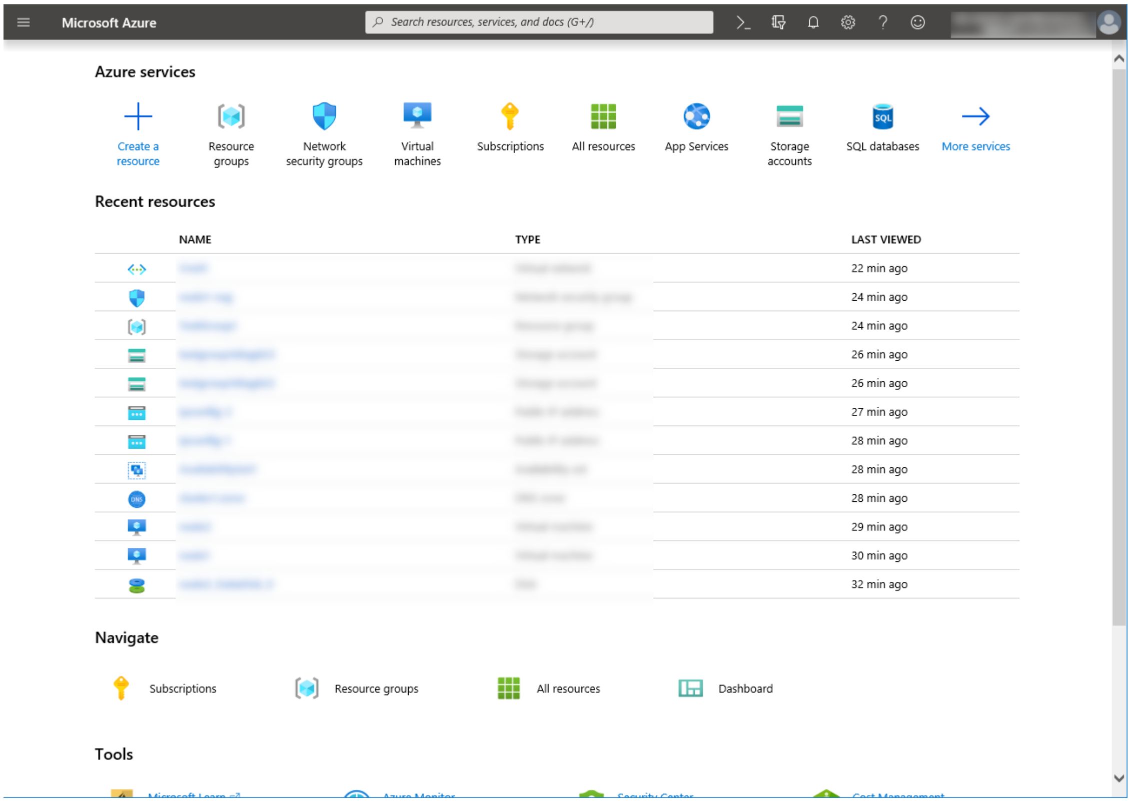
Monitor resource name	Setting item	Setting value
	Recovery Target	LocalServer
IP monitor resource	Name	ipw1
	Server to monitor	node1
	IP Address	10.5.0.111
	Recovery Action	Execute only the final action
	Recovery Target	LocalServer
IP monitor resource	Name	ipw2
	Server to monitor	node2
	IP Address	10.5.0.110
	Recovery Action	Execute only the final action
	Recovery Target	LocalServer
Multi target monitor resource	Name	mtw1
	Monitor resource list	genw1 ipw1 ipw2
	Recovery Action	Execute only the final action
	Recovery Target	LocalServer

4.2 Configuring Microsoft Azure

1) **Creating a resource group**

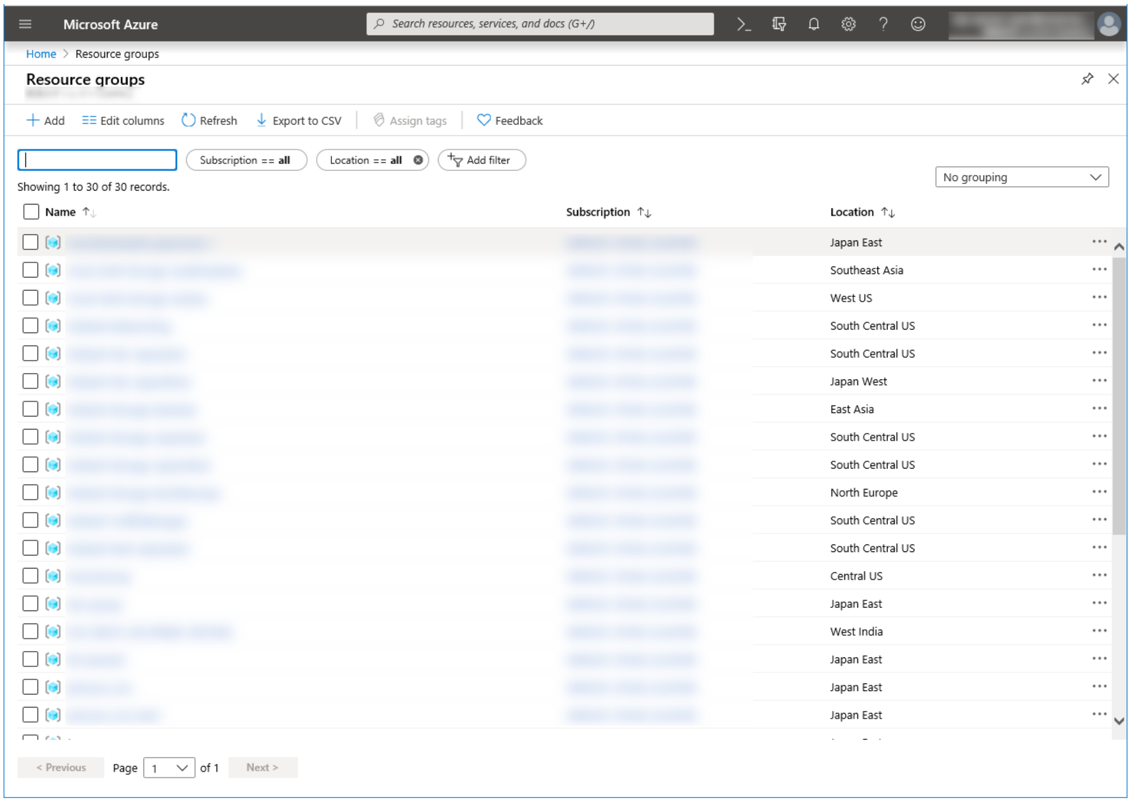
Log in to the Microsoft Azure portal (https://portal.azure.com/) and create a resource group following the steps below.

1. Select the **Resource groups** icon on the upper part of the window. If there are existing resource groups, they are displayed in a list.



NAME	TYPE	LAST VIEWED
[redacted]	[redacted]	22 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	27 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	29 min ago
[redacted]	[redacted]	30 min ago
[redacted]	[redacted]	32 min ago

2. Select **+Add** on the upper part of the window.

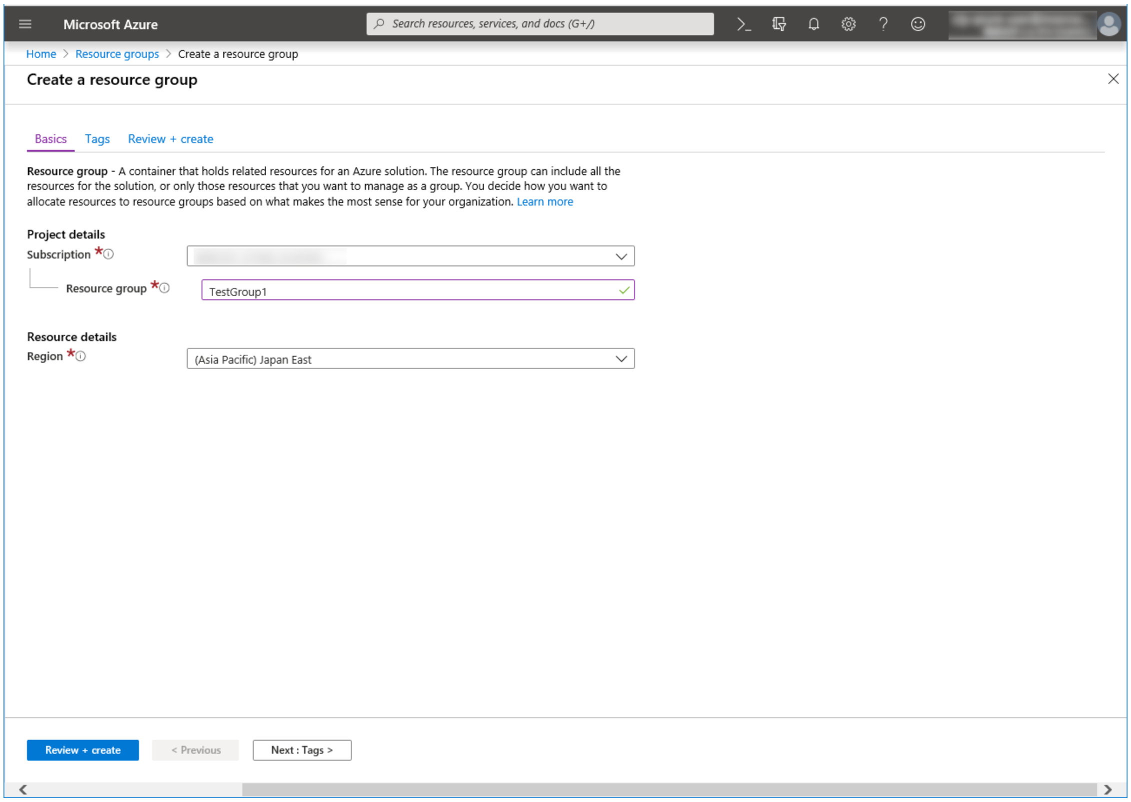


Resource groups

Showing 1 to 30 of 30 records.

Name	Subscription	Location
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	Southeast Asia
[redacted]	[redacted]	West US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	Japan West
[redacted]	[redacted]	East Asia
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	North Europe
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	Central US
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	West India
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	Japan East

3. Specify **Subscription**, **Resource group**, and **Region**, and click **Review+Create**.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > Resource groups > Create a resource group

Create a resource group

Basics
Tags
Review + create

Resource group - A container that holds related resources for an Azure solution. The resource group can include all the resources for the solution, or only those resources that you want to manage as a group. You decide how you want to allocate resources to resource groups based on what makes the most sense for your organization. Learn more

Project details

Subscription * [redacted]

Resource group * TestGroup1

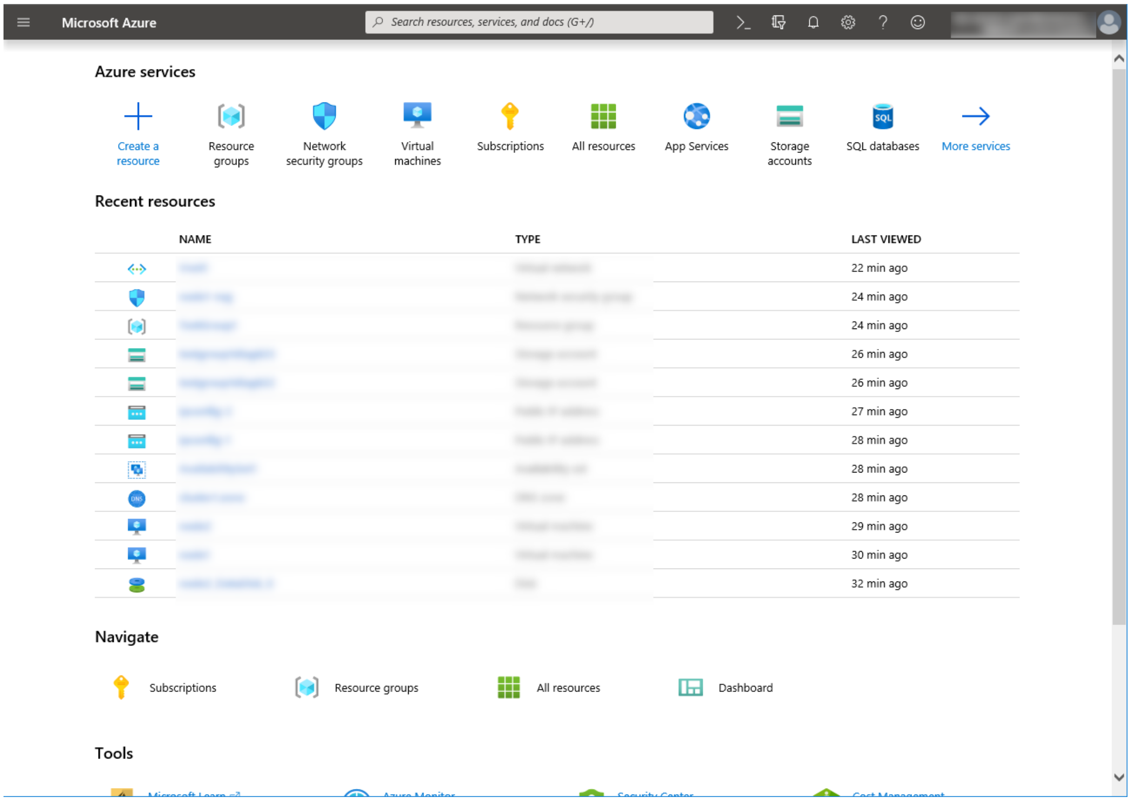
Resource details

Region * (Asia Pacific) Japan East

2) **Creating a virtual network**

Log in to the Microsoft Azure portal (https://portal.azure.com/) and create a virtual network following the steps below.

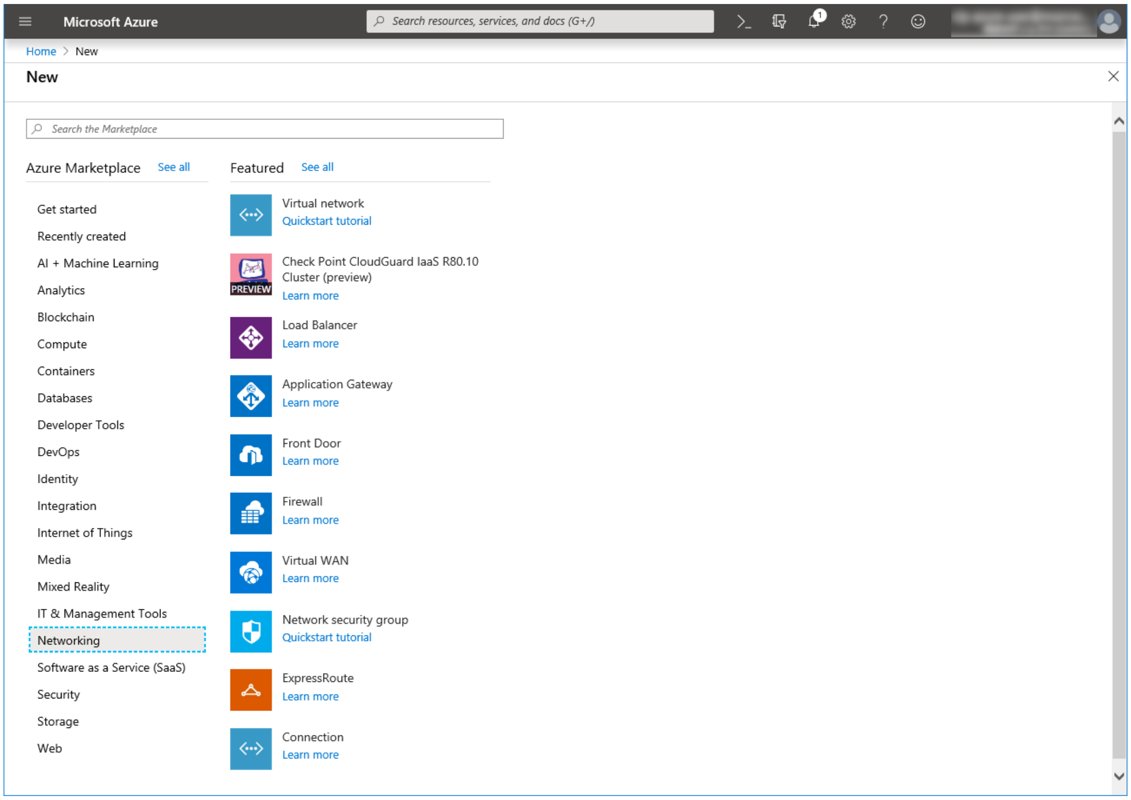
1. Select the **+Create a resource** icon on the upper part of the window.



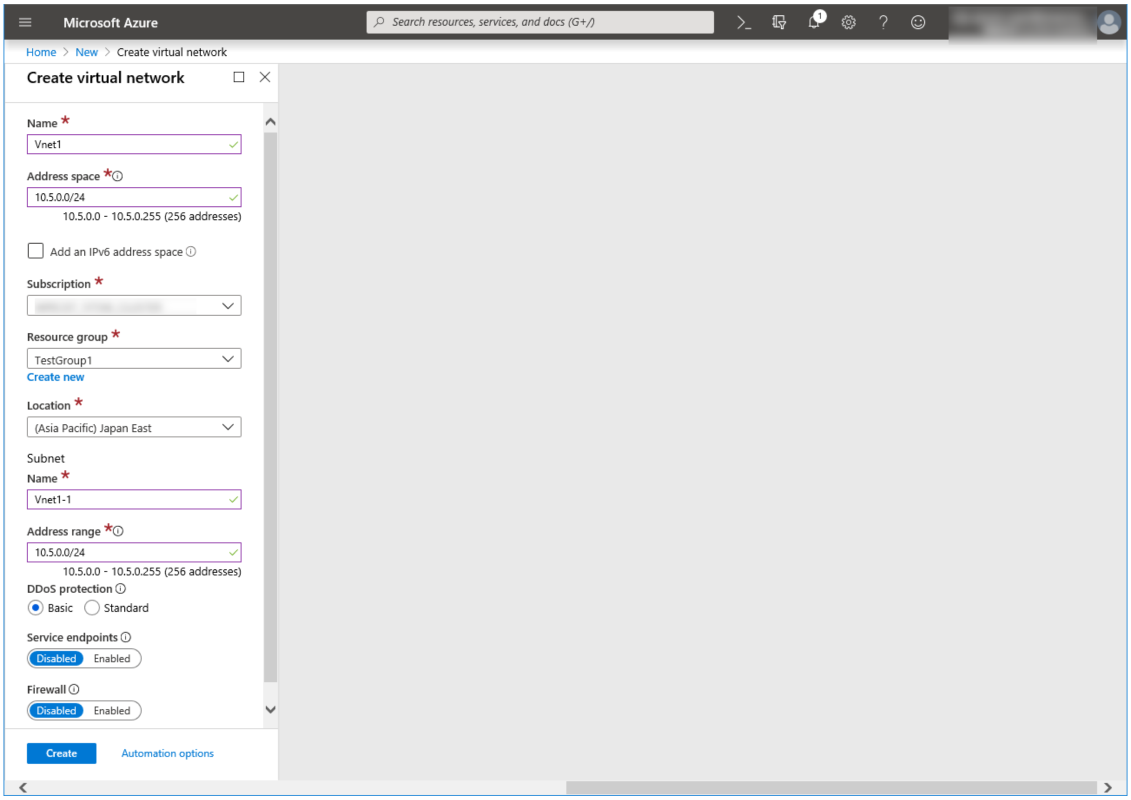
Recent resources

NAME	TYPE	LAST VIEWED
[illegible]	[illegible]	22 min ago
[illegible]	[illegible]	24 min ago
[illegible]	[illegible]	24 min ago
[illegible]	[illegible]	26 min ago
[illegible]	[illegible]	26 min ago
[illegible]	[illegible]	27 min ago
[illegible]	[illegible]	28 min ago
[illegible]	[illegible]	28 min ago
[illegible]	[illegible]	28 min ago
[illegible]	[illegible]	29 min ago
[illegible]	[illegible]	30 min ago
[illegible]	[illegible]	32 min ago

2. Select **Networking** and then **Virtual network**.



3. Specify **Name**, **Address space**, **Subscription**, **Resource group**, **Location**, **Name** of Subnet, and **Address range** of Subnet, and click **Create**.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create virtual network

Create virtual network

Name * Vnet1

Address space * 10.5.0.0/24
10.5.0.0 - 10.5.0.255 (256 addresses)

□ Add an IPv6 address space

Subscription * [redacted]

Resource group * TestGroup1
Create new

Location * (Asia Pacific) Japan East

Subnet
Name * Vnet1-1

Address range * 10.5.0.0/24
10.5.0.0 - 10.5.0.255 (256 addresses)

DDoS protection
● Basic ○ Standard

Service endpoints
[✓ Disabled] Enabled

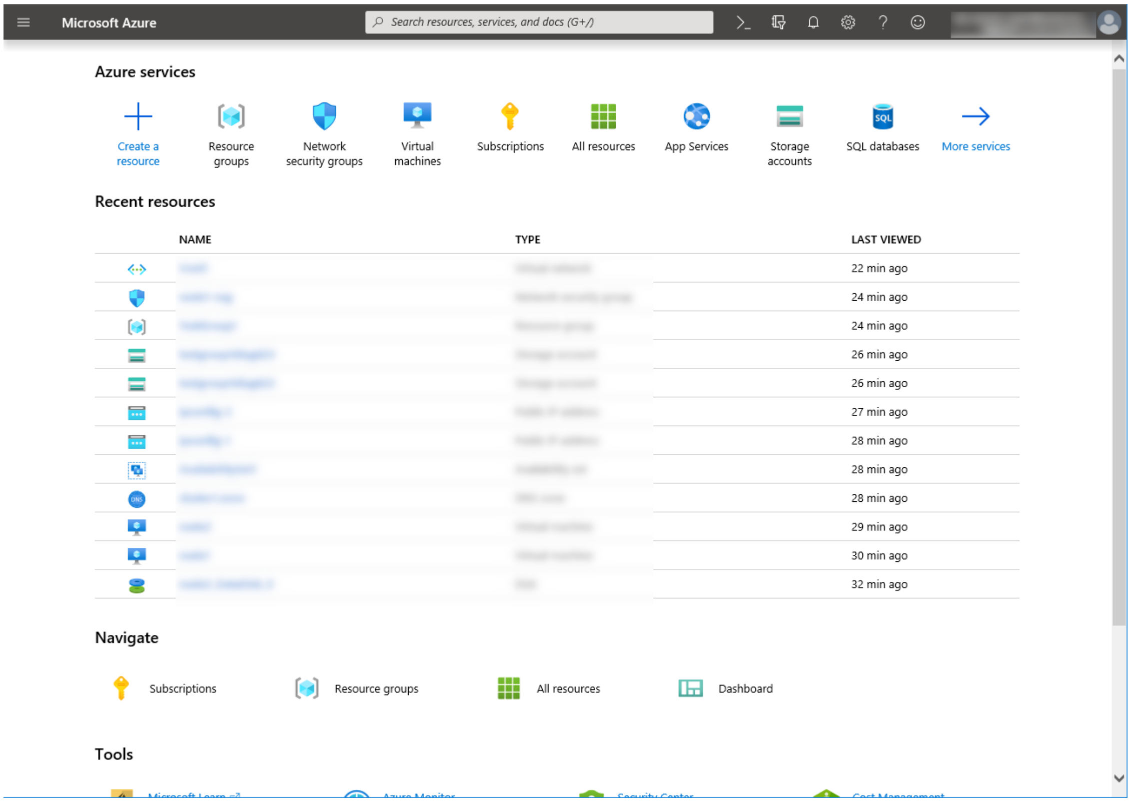
Firewall
[✓ Disabled] Enabled

Create
Automation options

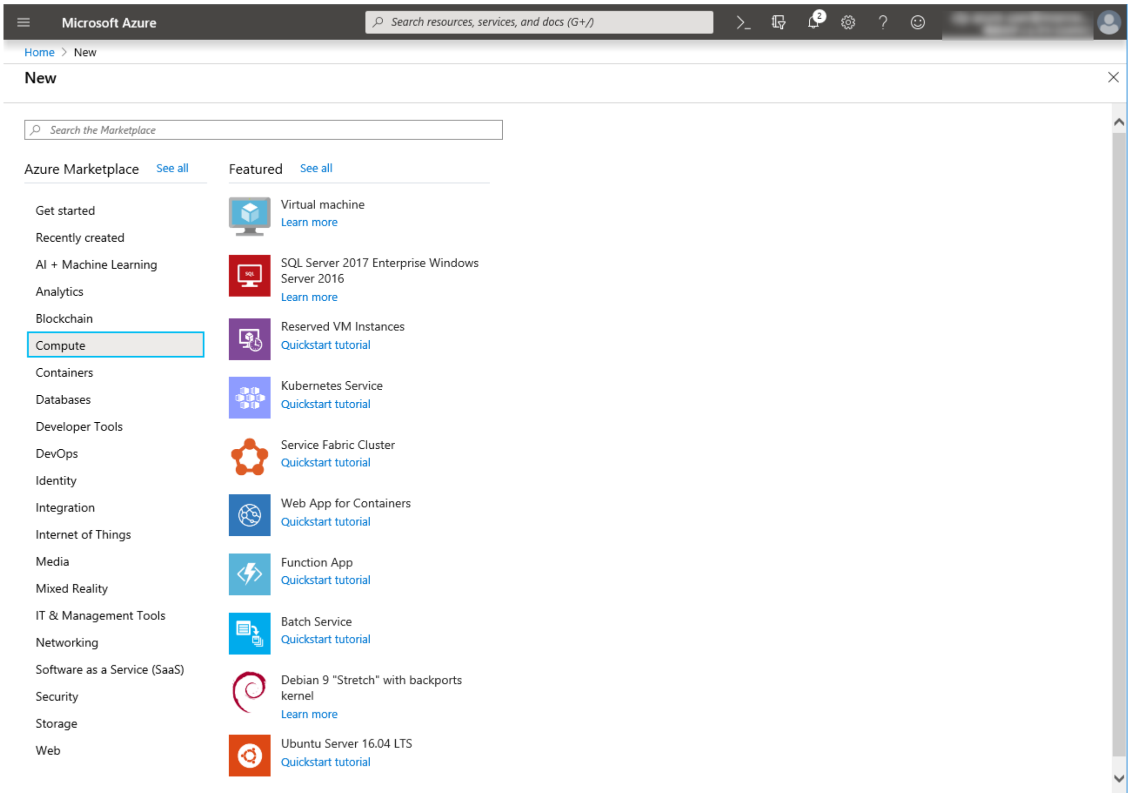
3) Creating a virtual machine

Log in to the Microsoft Azure portal (https://portal.azure.com/) and create virtual machines and disks following the steps below.
Create as many virtual machines as required to create a cluster. Create node1 and then node2.

1. Select the **Create a resource** icon on the upper part of the window.



2. Select **Compute** and then **See all**.



Microsoft Azure   Search resources, services, and docs (G+/)   [redacted]

Home > New

New

Search the Marketplace

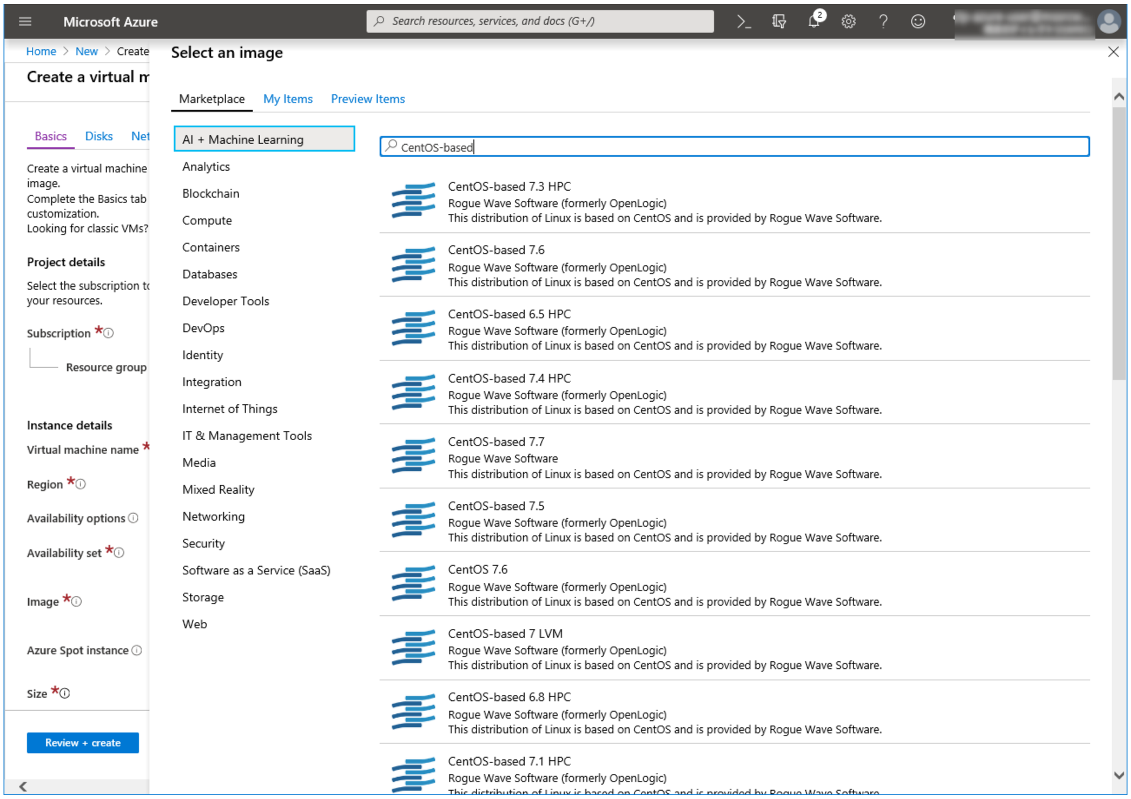
Azure Marketplace   See all

- Get started
- Recently created
- AI + Machine Learning
- Analytics
- Blockchain
- Compute
- Containers
- Databases
- Developer Tools
- DevOps
- Identity
- Integration
- Internet of Things
- Media
- Mixed Reality
- IT & Management Tools
- Networking
- Software as a Service (SaaS)
- Security
- Storage
- Web

Featured   See all

- Virtual machine — Learn more
- SQL Server 2017 Enterprise Windows Server 2016 — Learn more
- Reserved VM Instances — Quickstart tutorial
- Kubernetes Service — Quickstart tutorial
- Service Fabric Cluster — Quickstart tutorial
- Web App for Containers — Quickstart tutorial
- Function App — Quickstart tutorial
- Batch Service — Quickstart tutorial
- Debian 9 "Stretch" with backports kernel — Learn more
- Ubuntu Server 16.04 LTS — Quickstart tutorial

3. Select **CentOS-based 7.6**.



Microsoft Azure   Search resources, services, and docs (G+/)   [redacted]

Home > New > Create

Create a virtual m

Basics   Disks   Net

Create a virtual machine image.
Complete the Basics tab customization.
Looking for classic VMs?

Project details

Select the subscription t your resources.

Subscription *

Resource group

Instance details

Virtual machine name *

Region *

Availability options

Availability set *

Image *

Azure Spot instance

Size *

Review + create

Select an image

Marketplace   My Items   Preview Items

- AI + Machine Learning
- Analytics
- Blockchain
- Compute
- Containers
- Databases
- Developer Tools
- DevOps
- Identity
- Integration
- Internet of Things
- IT & Management Tools
- Media
- Mixed Reality
- Networking
- Security
- Software as a Service (SaaS)
- Storage
- Web

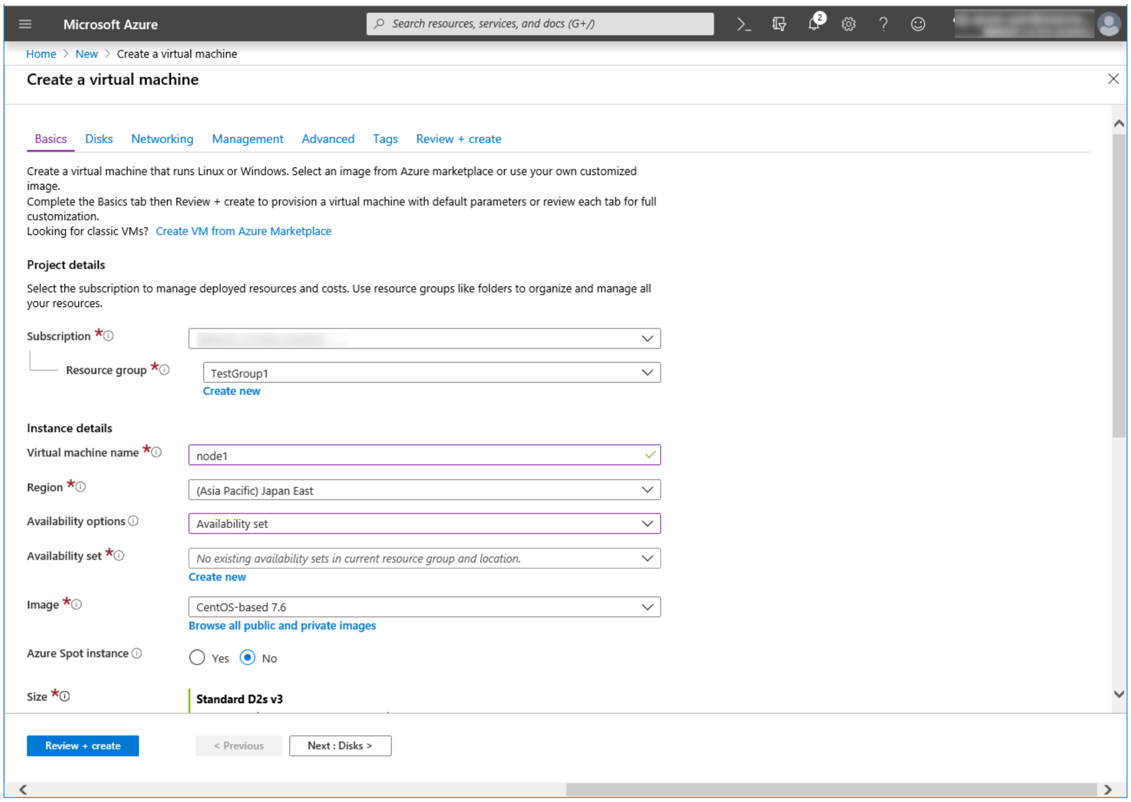
CentOS-based

- CentOS-based 7.3 HPC
  Rogue Wave Software (formerly OpenLogic)
  This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
- CentOS-based 7.6
  Rogue Wave Software (formerly OpenLogic)
  This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
- CentOS-based 6.5 HPC
  Rogue Wave Software (formerly OpenLogic)
  This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
- CentOS-based 7.4 HPC
  Rogue Wave Software (formerly OpenLogic)
  This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
- CentOS-based 7.7
  Rogue Wave Software
  This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
- CentOS-based 7.5
  Rogue Wave Software (formerly OpenLogic)
  This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
- CentOS 7.6
  Rogue Wave Software (formerly OpenLogic)
  This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
- CentOS-based 7 LVM
  Rogue Wave Software (formerly OpenLogic)
  This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
- CentOS-based 6.8 HPC
  Rogue Wave Software (formerly OpenLogic)
  This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
- CentOS-based 7.1 HPC
  Rogue Wave Software (formerly OpenLogic)
  This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

4. Click **Create**.

5. When the **Basics** tab appears, specify the settings of **Subscription**, **Resource group**, **Virtual machine name**, **Region**, **Image**, **Size**, **Username**, **Password**, and **Confirm password**.

   Select **Availability set** from **Availability options**, and click **Create new** under the **Availability set** field. When **Create new** appears, specify the settings of **Name**, **Fault domains**, and **Update domains**. Then click **OK**.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create a virtual machine

Create a virtual machine

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image.
Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization.
Looking for classic VMs? Create VM from Azure Marketplace

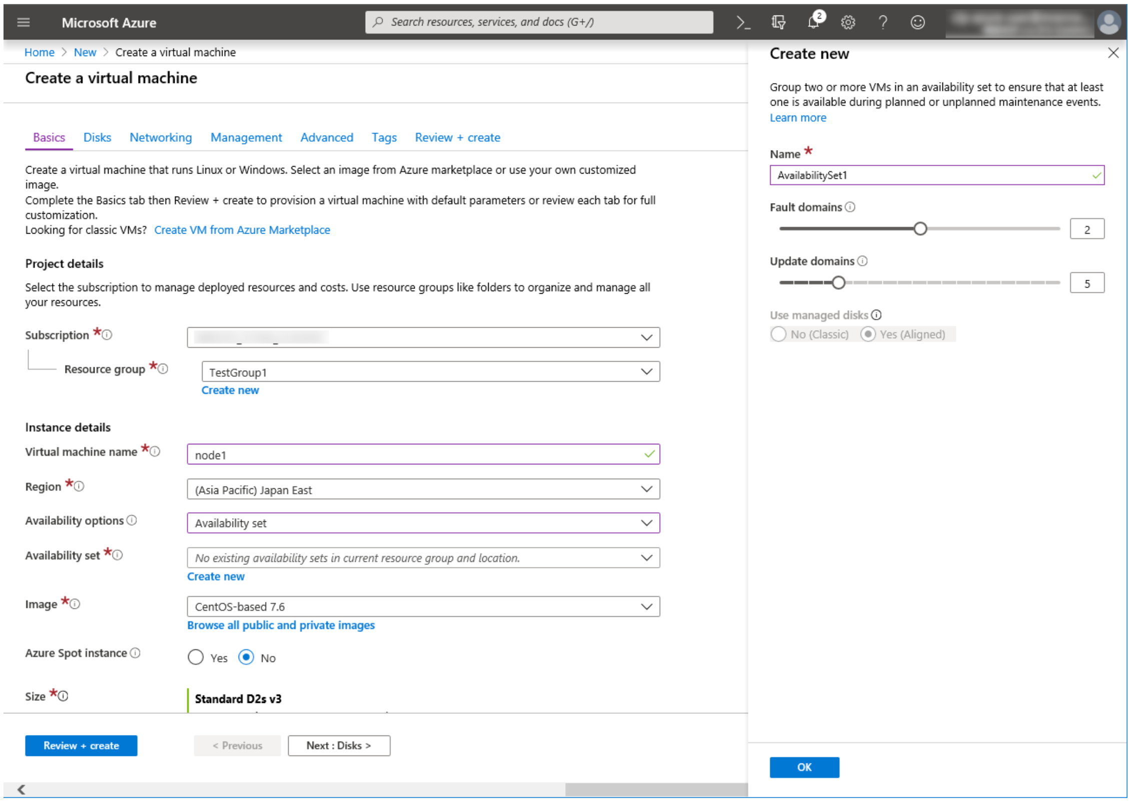
Project details

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

Subscription * [redacted]
Resource group * TestGroup1
Create new

Instance details

Virtual machine name * node1
Region * (Asia Pacific) Japan East
Availability options Availability set
Availability set * *No existing availability sets in current resource group and location.*
Create new
Image * CentOS-based 7.6
Browse all public and private images
Azure Spot instance ○ Yes ● No
Size * **Standard D2s v3**


Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create a virtual machine

Create a virtual machine

Basics
Disks
Networking
Management
Advanced
Tags
Review + create

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image.
Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization.
Looking for classic VMs? Create VM from Azure Marketplace

Project details

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

Subscription *: [redacted]

Resource group *: TestGroup1
Create new

Instance details

Virtual machine name *: node1

Region *: (Asia Pacific) Japan East

Availability options: Availability set

Availability set *: No existing availability sets in current resource group and location.
Create new

Image *: CentOS-based 7.6
Browse all public and private images

Azure Spot instance: ○ Yes ● No

Size *: Standard D2s v3

Create new

Group two or more VMs in an availability set to ensure that at least one is available during planned or unplanned maintenance events.
Learn more

Name *: AvailabilitySet1

Fault domains: 2

Update domains: 5

Use managed disks: ○ No (Classic) ● Yes (Aligned)

6. Click **Change size** to display **Select a VM size**.

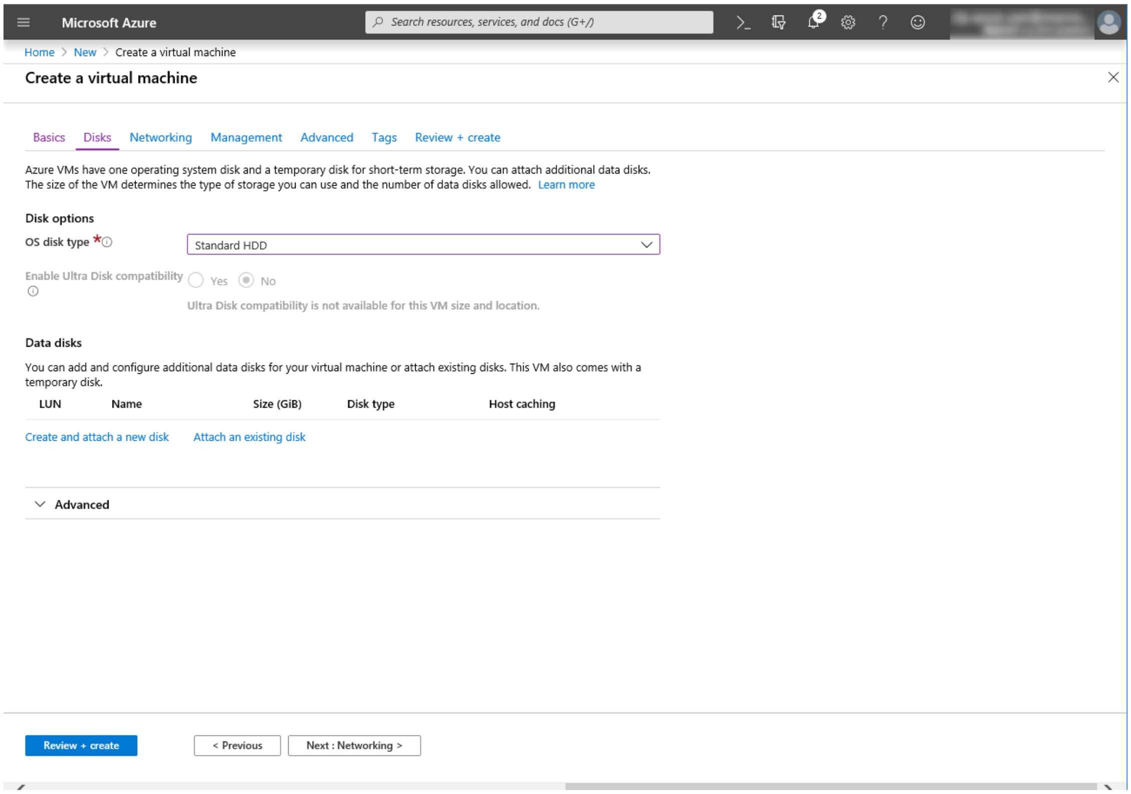
   From the list, choose a size (**Standard - A1** in this guide) suitable for your virtual machine and click **Select**.

   Regarding the **Virtual machine name**, node1 is for node1, and node2 is for node2.

   Click **Next: Disks >**

7. When the **Disks** tab appears, go through the following steps to add a disk to be used for a mirror disk (cluster partition or data partition).

   From the **DATA DISKS** list, click **Create and attach a new disk**.



Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create a virtual machine

Create a virtual machine

Basics
Disks
Networking
Management
Advanced
Tags
Review + create

Azure VMs have one operating system disk and a temporary disk for short-term storage. You can attach additional data disks. The size of the VM determines the type of storage you can use and the number of data disks allowed. Learn more

Disk options

OS disk type * Standard HDD

Enable Ultra Disk compatibility ○ Yes ● No

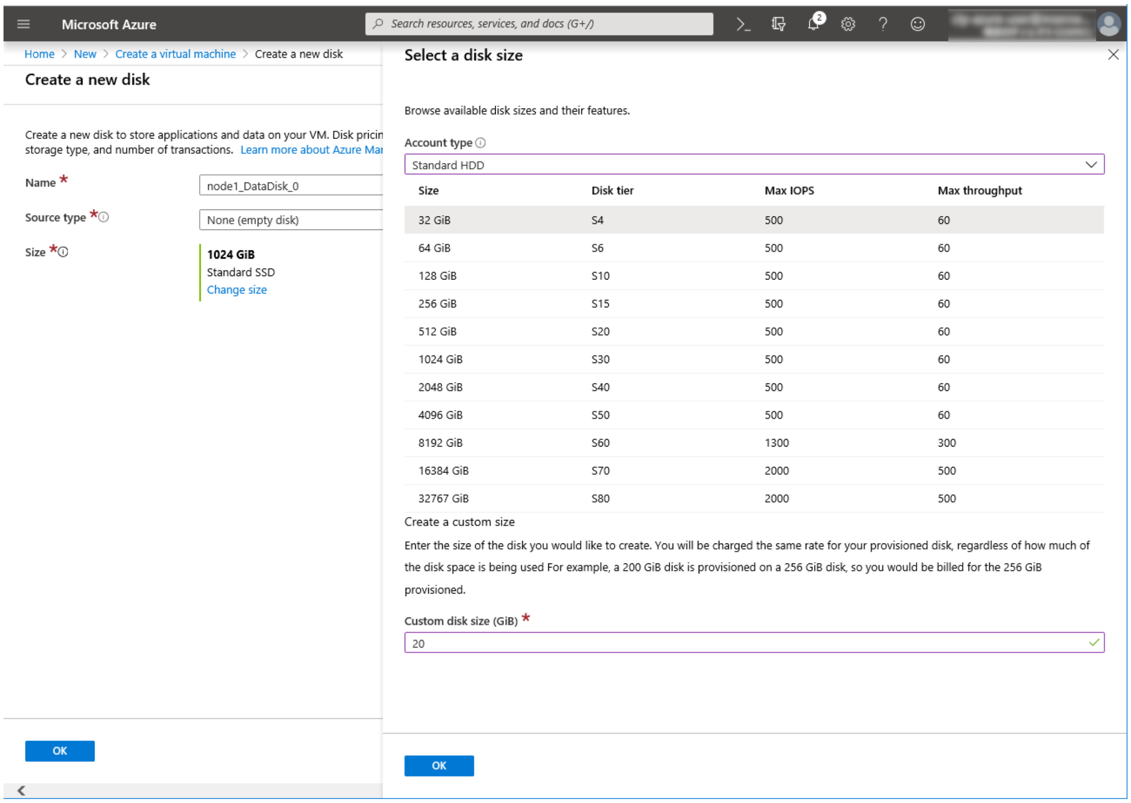
Ultra Disk compatibility is not available for this VM size and location.

Data disks

You can add and configure additional data disks for your virtual machine or attach existing disks. This VM also comes with a temporary disk.

LUN	Name	Size (GiB)	Disk type	Host caching

8. **Create a new disk** appears.
   Specify the settings of **Name**, **Source type**, and **Size**. Then click **OK**.
   Click **Next: Networking >**



Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create a virtual machine > Create a new disk

Create a new disk

Create a new disk to store applications and data on your VM. Disk pricin storage type, and number of transactions. Learn more about Azure Ma

Name * node1_DataDisk_0

Source type * None (empty disk)

Size * 1024 GiB
Standard SSD
Change size

Select a disk size

Browse available disk sizes and their features.

Account type: Standard HDD

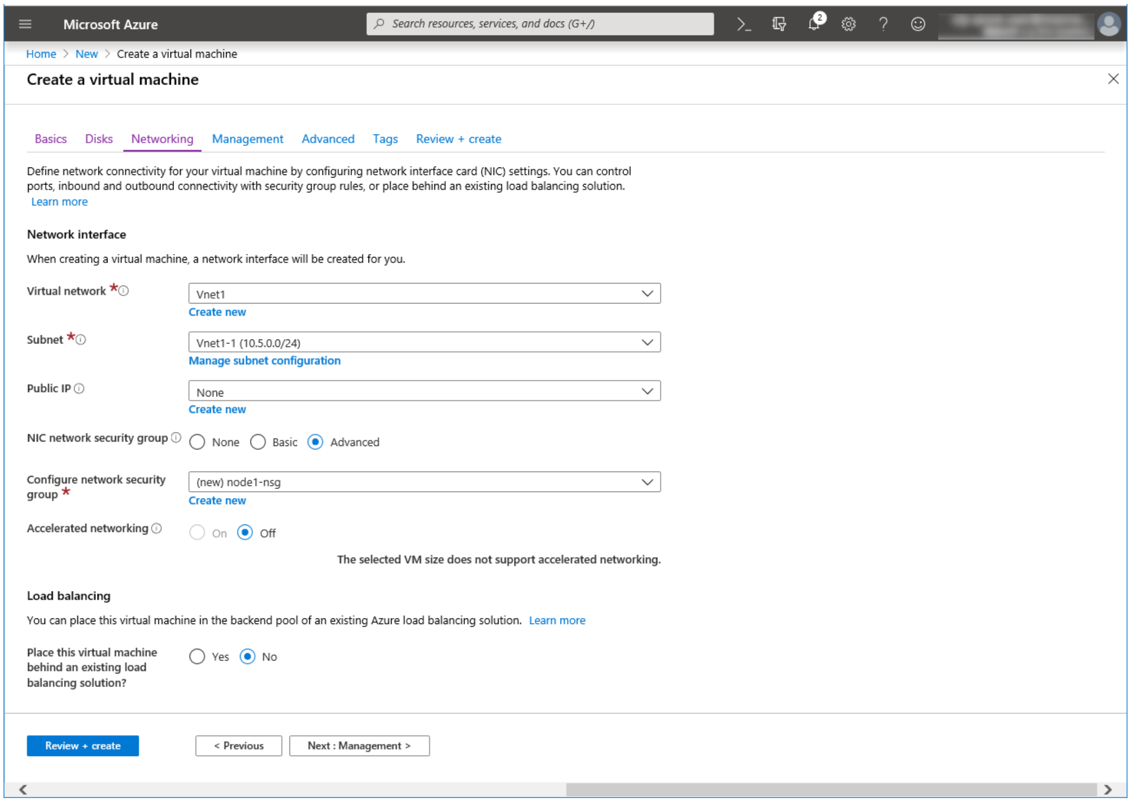
Size	Disk tier	Max IOPS	Max throughput
32 GiB	S4	500	60
64 GiB	S6	500	60
128 GiB	S10	500	60
256 GiB	S15	500	60
512 GiB	S20	500	60
1024 GiB	S30	500	60
2048 GiB	S40	500	60
4096 GiB	S50	500	60
8192 GiB	S60	1300	300
16384 GiB	S70	2000	500
32767 GiB	S80	2000	500

Create a custom size

Enter the size of the disk you would like to create. You will be charged the same rate for your provisioned disk, regardless of how much of the disk space is being used For example, a 200 GiB disk is provisioned on a 256 GiB disk, so you would be billed for the 256 GiB provisioned.

Custom disk size (GiB) * 20

9. The **Networking** tab appears.
   Specify the settings of **Virtual network**, **Subnet**, **NIC Network security group**, and **Configure network security group**.
   Click **Create new** under the **Configure network security group** field to display **Create network security group**. Specify the setting of **Name** and then click **OK**.
   Click **Next: Management >**.



Create a virtual machine

Define network connectivity for your virtual machine by configuring network interface card (NIC) settings. You can control ports, inbound and outbound connectivity with security group rules, or place behind an existing load balancing solution.
Learn more

Network interface

When creating a virtual machine, a network interface will be created for you.

Virtual network * : Vnet1
Create new

Subnet * : Vnet1-1 (10.5.0.0/24)
Manage subnet configuration

Public IP : None
Create new

NIC network security group : ○ None ○ Basic ● Advanced

Configure network security group * : (new) node1-nsg
Create new

Accelerated networking : ○ On ● Off

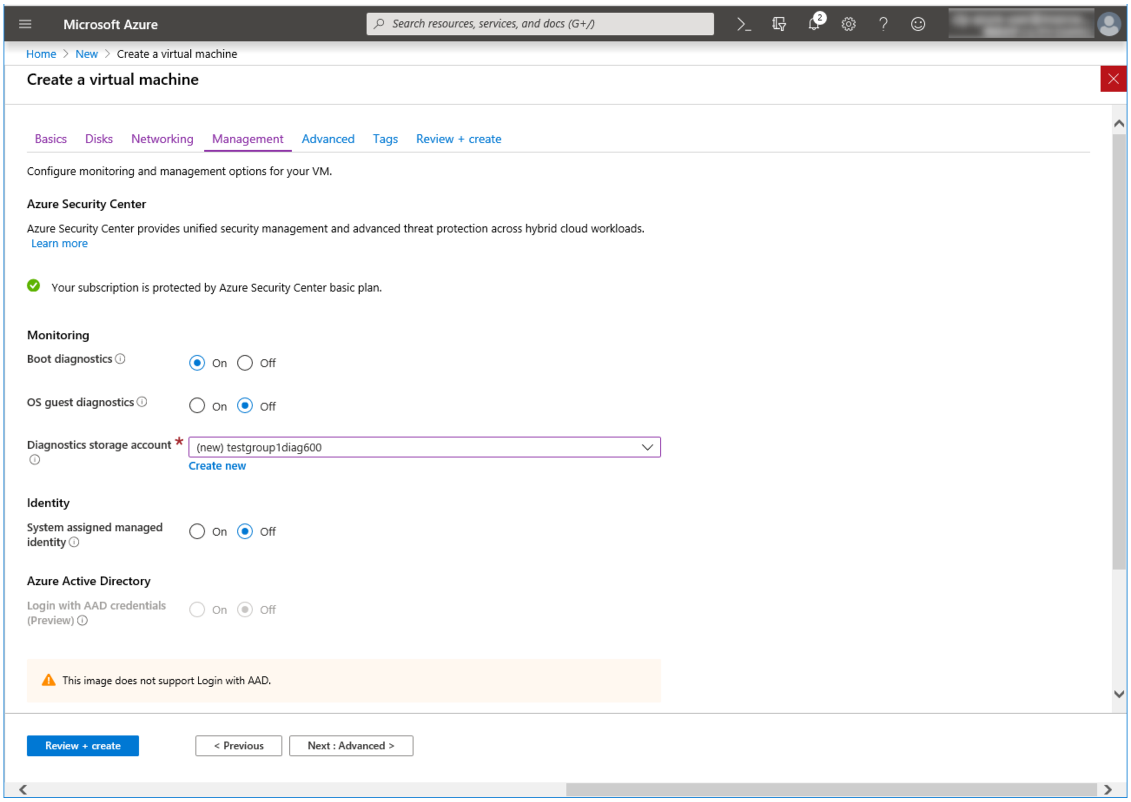
The selected VM size does not support accelerated networking.

Load balancing

You can place this virtual machine in the backend pool of an existing Azure load balancing solution. Learn more

Place this virtual machine behind an existing load balancing solution? ○ Yes ● No

10. The **Management** tab appears.
    Click **Create new** under the **Diagnostics storage account** field to display **Create storage account**.
    Specify the settings of **Name**, **Account kind**, and **Replication**. Then click **OK**.
    In the **Diagnostics storage account** field, the default value is automatically generated and entered.
    Click **Next: Details >**.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create a virtual machine

Create a virtual machine

Basics Disks Networking Management Advanced Tags Review + create

Configure monitoring and management options for your VM.

Azure Security Center

Azure Security Center provides unified security management and advanced threat protection across hybrid cloud workloads. Learn more

Your subscription is protected by Azure Security Center basic plan.

Monitoring

Boot diagnostics ● On ○ Off

OS guest diagnostics ○ On ● Off

Diagnostics storage account * (new) testgroup1diag600
Create new

Identity

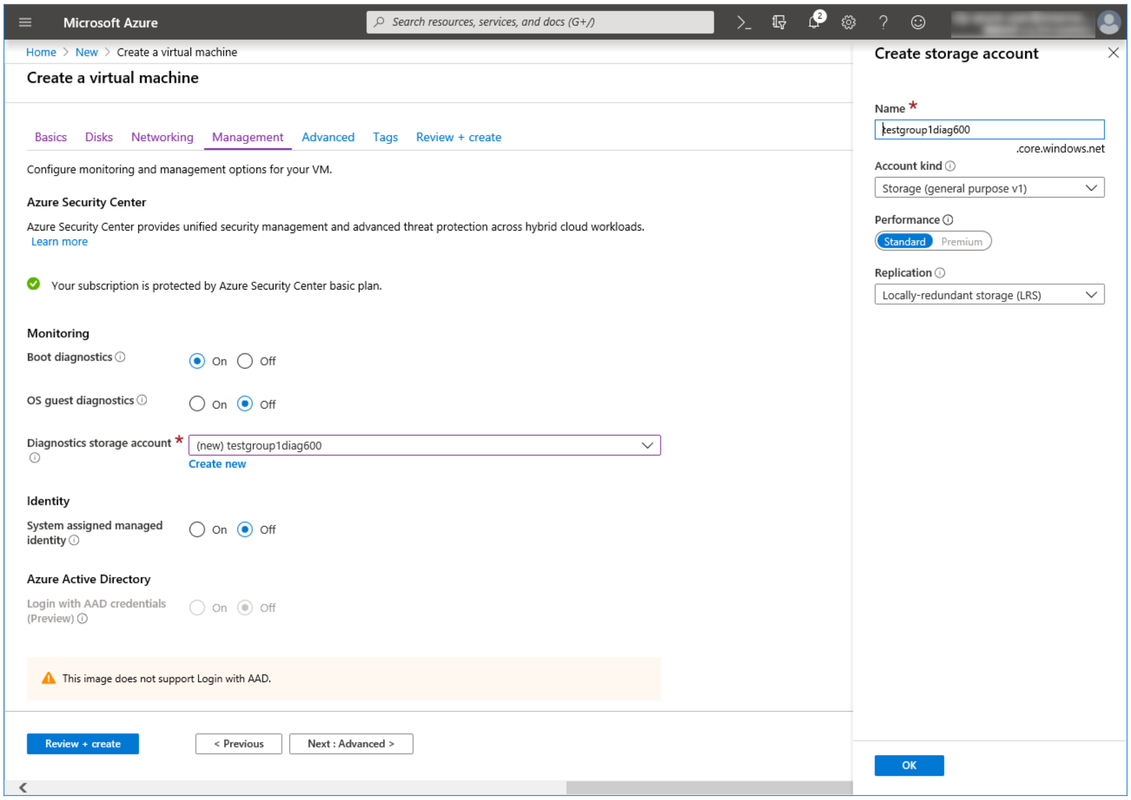
System assigned managed identity ○ On ● Off

Azure Active Directory

Login with AAD credentials (Preview) ○ On ● Off

This image does not support Login with AAD.

Review + create
< Previous
Next : Advanced >


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create a virtual machine

Create a virtual machine

Configure monitoring and management options for your VM.

Azure Security Center

Azure Security Center provides unified security management and advanced threat protection across hybrid cloud workloads. Learn more

Your subscription is protected by Azure Security Center basic plan.

Monitoring

Boot diagnostics ● On ○ Off

OS guest diagnostics ○ On ● Off

Diagnostics storage account * (new) testgroup1diag600
Create new

Identity

System assigned managed identity ○ On ● Off

Azure Active Directory

Login with AAD credentials (Preview) ○ On ● Off

This image does not support Login with AAD.

Create storage account

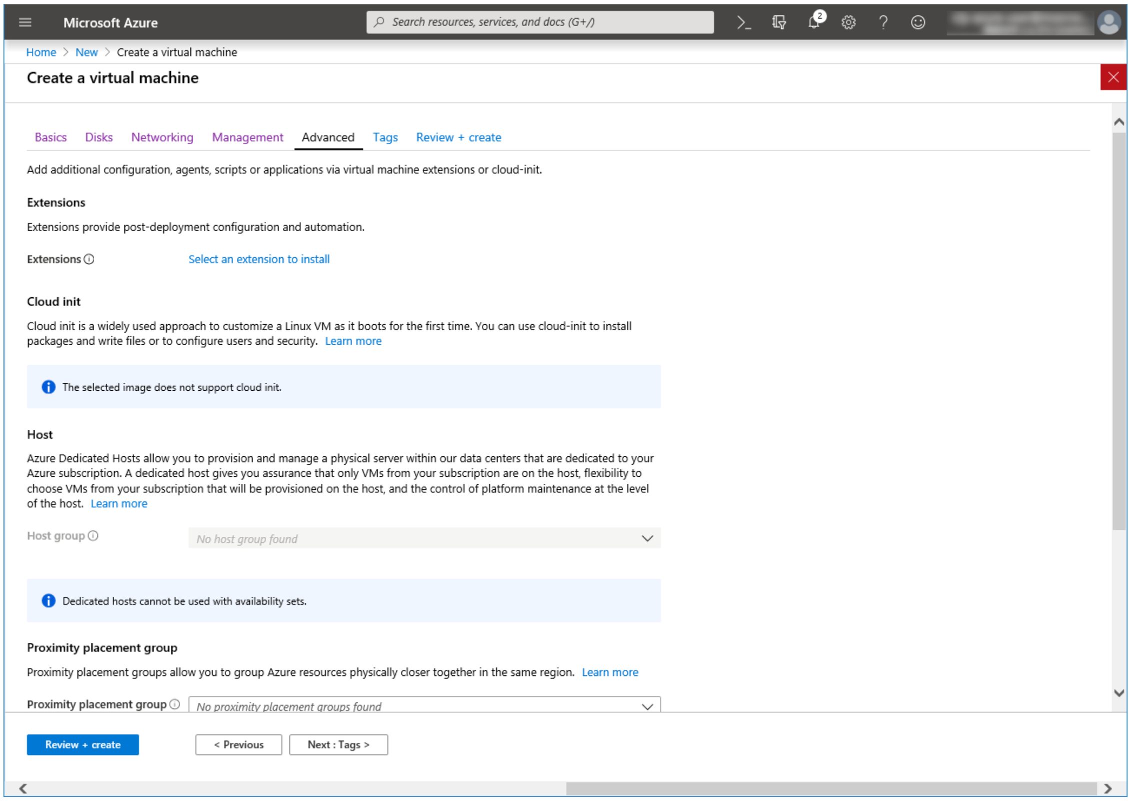
Name * testgroup1diag600 .core.windows.net

Account kind: Storage (general purpose v1)

Performance: [✓ Standard] Premium

Replication: Locally-redundant storage (LRS)

11. Click **Next: Tags >**.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create a virtual machine

Create a virtual machine

Add additional configuration, agents, scripts or applications via virtual machine extensions or cloud-init.

Extensions

Extensions provide post-deployment configuration and automation.

Extensions ⓘ Select an extension to install

Cloud init

Cloud init is a widely used approach to customize a Linux VM as it boots for the first time. You can use cloud-init to install packages and write files or to configure users and security. Learn more

The selected image does not support cloud init.

Host

Azure Dedicated Hosts allow you to provision and manage a physical server within our data centers that are dedicated to your Azure subscription. A dedicated host gives you assurance that only VMs from your subscription are on the host, flexibility to choose VMs from your subscription that will be provisioned on the host, and the control of platform maintenance at the level of the host. Learn more

Host group ⓘ No host group found

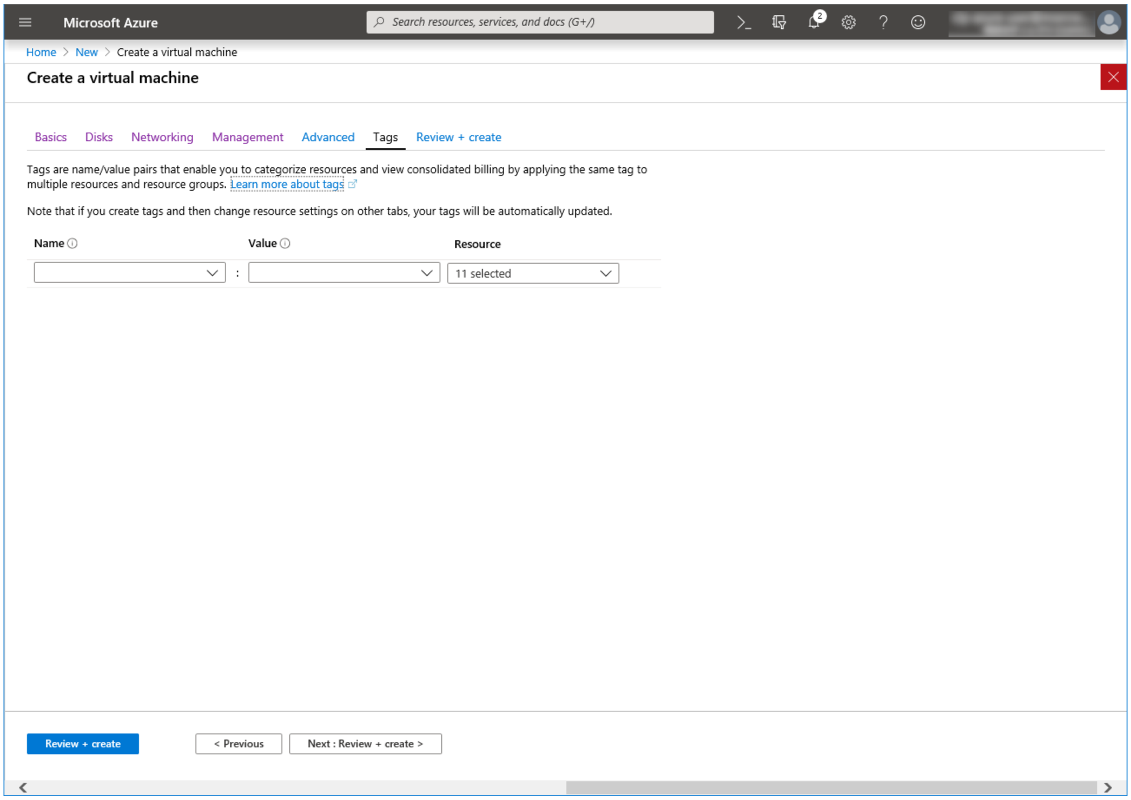
Dedicated hosts cannot be used with availability sets.

Proximity placement group

Proximity placement groups allow you to group Azure resources physically closer together in the same region. Learn more

Proximity placement group ⓘ No proximity placement groups found

12. Click **Next: Review + create >**.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create a virtual machine

Create a virtual machine

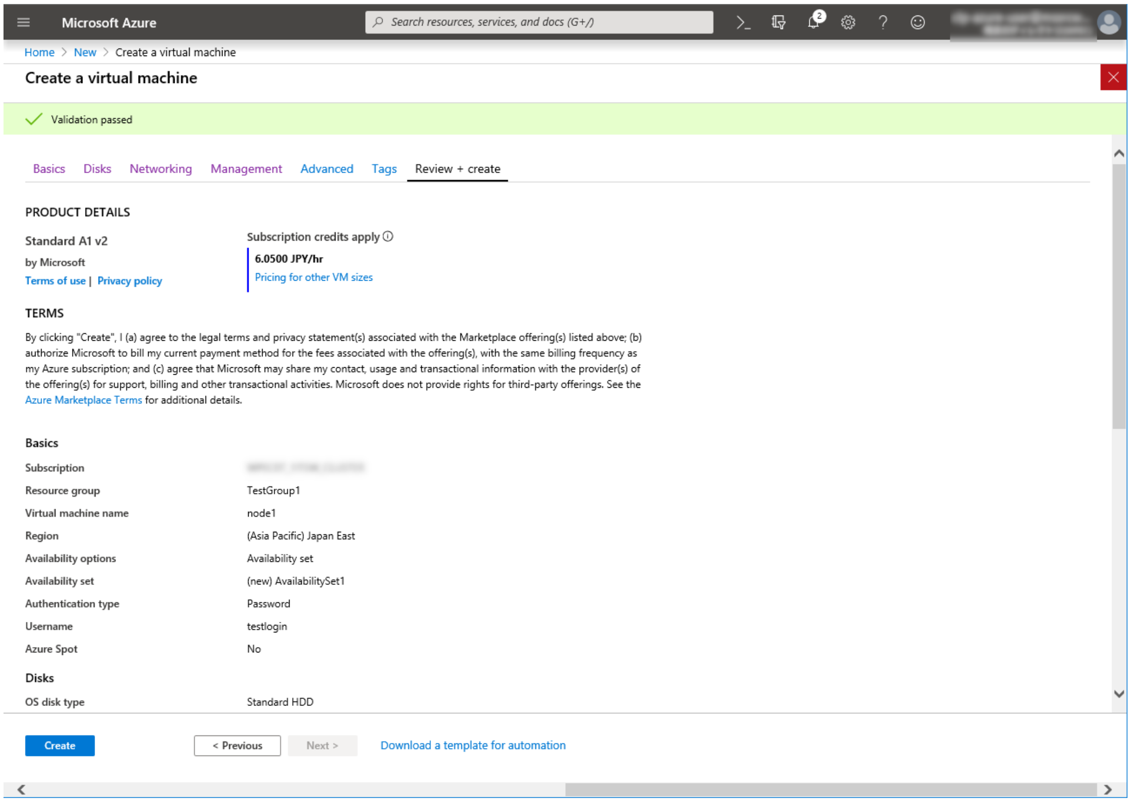
Tags are name/value pairs that enable you to categorize resources and view consolidated billing by applying the same tag to multiple resources and resource groups. Learn more about tags

Note that if you create tags and then change resource settings on other tabs, your tags will be automatically updated.

Name ⓘ		Value ⓘ	Resource
	:		11 selected

13. The **Review + create** tab appears. Check the contents. If there is no problem, click **Create**. The deploy-

ment starts and takes several minutes.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create a virtual machine

Create a virtual machine

✓ Validation passed

PRODUCT DETAILS

Standard A1 v2

by Microsoft

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Subscription credits apply ⓘ

6.0500 JPY/hr

Pricing for other VM sizes

TERMS

By clicking "Create", I (a) agree to the legal terms and privacy statement(s) associated with the Marketplace offering(s) listed above; (b) authorize Microsoft to bill my current payment method for the fees associated with the offering(s), with the same billing frequency as my Azure subscription; and (c) agree that Microsoft may share my contact, usage and transactional information with the provider(s) of the offering(s) for support, billing and other transactional activities. Microsoft does not provide rights for third-party offerings. See the Azure Marketplace Terms for additional details.

Basics

Subscription	[redacted]
Resource group	TestGroup1
Virtual machine name	node1
Region	(Asia Pacific) Japan East
Availability options	Availability set
Availability set	(new) AvailabilitySet1
Authentication type	Password
Username	testlogin
Azure Spot	No

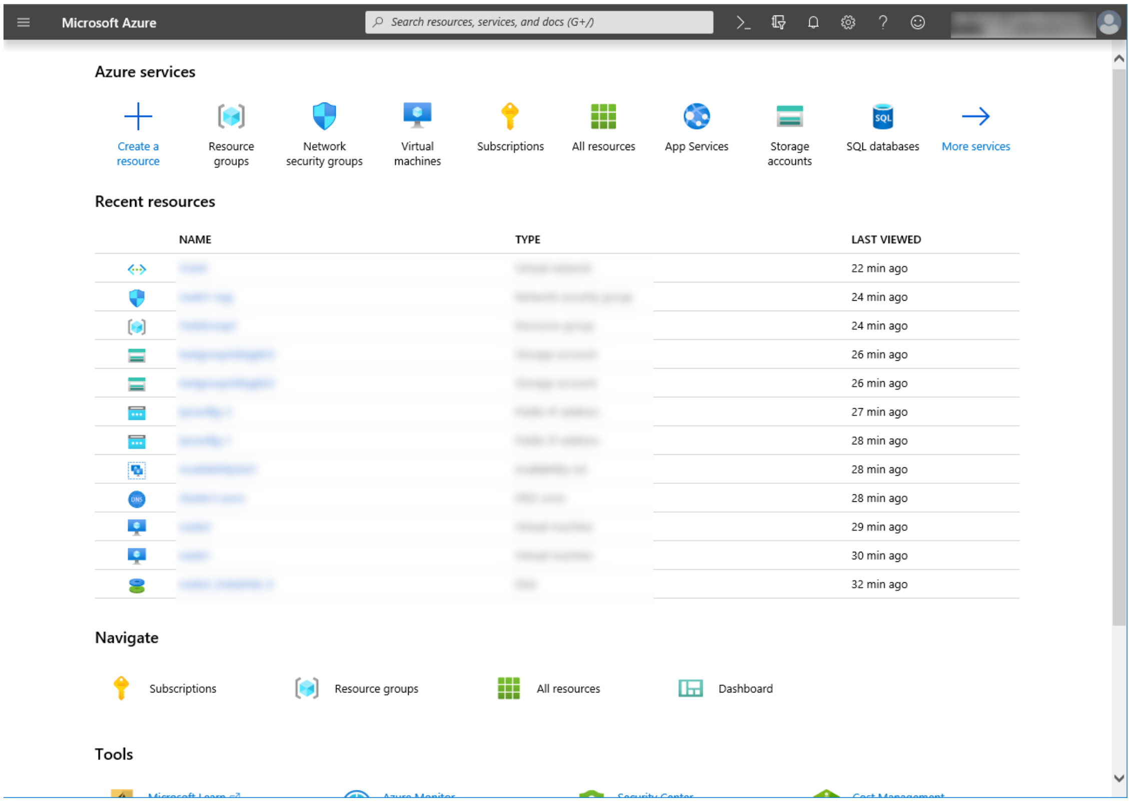
Disks

OS disk type	Standard HDD

4) **Setting a private IP address**

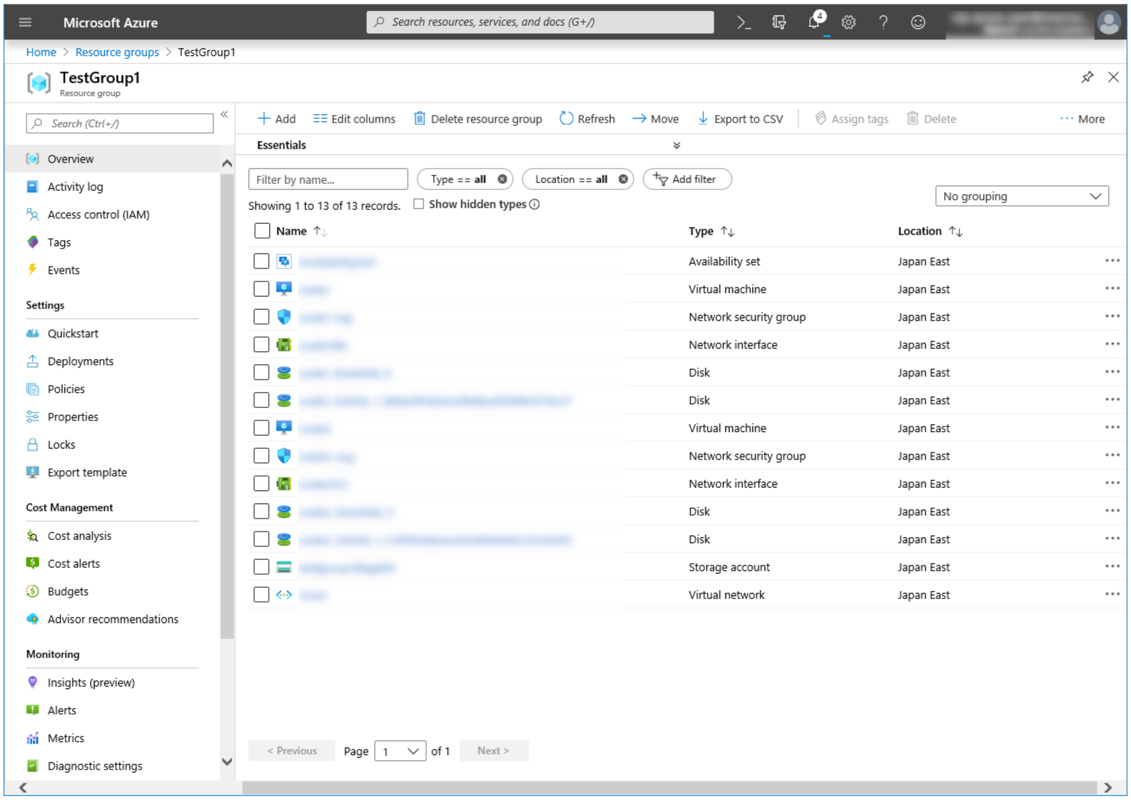
Log in to the Microsoft Azure portal (https://portal.azure.com/) and change the private IP address setting following the steps below. Since an IP address is initially set to be assigned dynamically, change the setting so that an IP address is assigned statically. Change the settings of node1 and then node2.

1. Select the **Resource groups** icon on the upper part of the window.



NAME	TYPE	LAST VIEWED
[illegible]	[illegible]	22 min ago
[illegible]	[illegible]	24 min ago
[illegible]	[illegible]	24 min ago
[illegible]	[illegible]	26 min ago
[illegible]	[illegible]	26 min ago
[illegible]	[illegible]	27 min ago
[illegible]	[illegible]	28 min ago
[illegible]	[illegible]	28 min ago
[illegible]	[illegible]	28 min ago
[illegible]	[illegible]	29 min ago
[illegible]	[illegible]	30 min ago
[illegible]	[illegible]	32 min ago

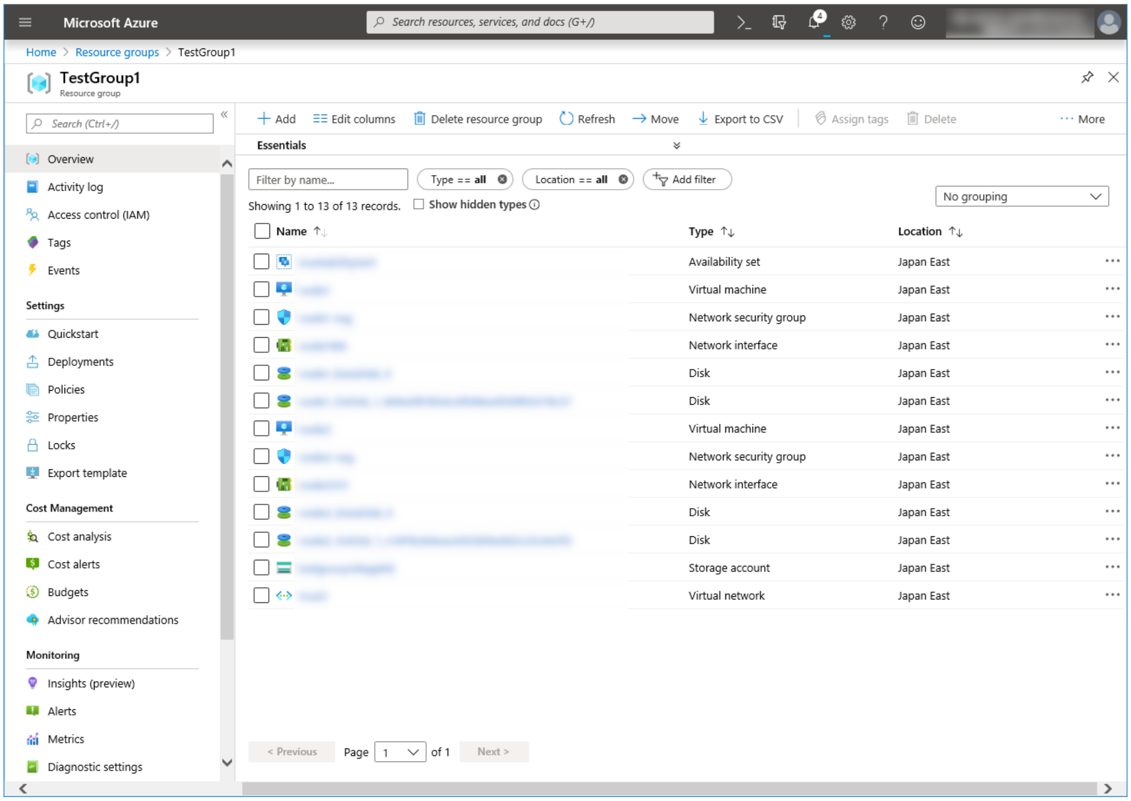
2. Select TestGroup1 from the resource group list.
3. The summary of TestGroup1 is displayed. Select virtual machine node1 or node2 from the item list.



Showing 1 to 13 of 13 records. □ Show hidden types

Name	Type	Location
[illegible]	Availability set	Japan East
[illegible]	Virtual machine	Japan East
[illegible]	Network security group	Japan East
[illegible]	Network interface	Japan East
[illegible]	Disk	Japan East
[illegible]	Disk	Japan East
[illegible]	Virtual machine	Japan East
[illegible]	Network security group	Japan East
[illegible]	Network interface	Japan East
[illegible]	Disk	Japan East
[illegible]	Disk	Japan East
[illegible]	Storage account	Japan East
[illegible]	Virtual network	Japan East

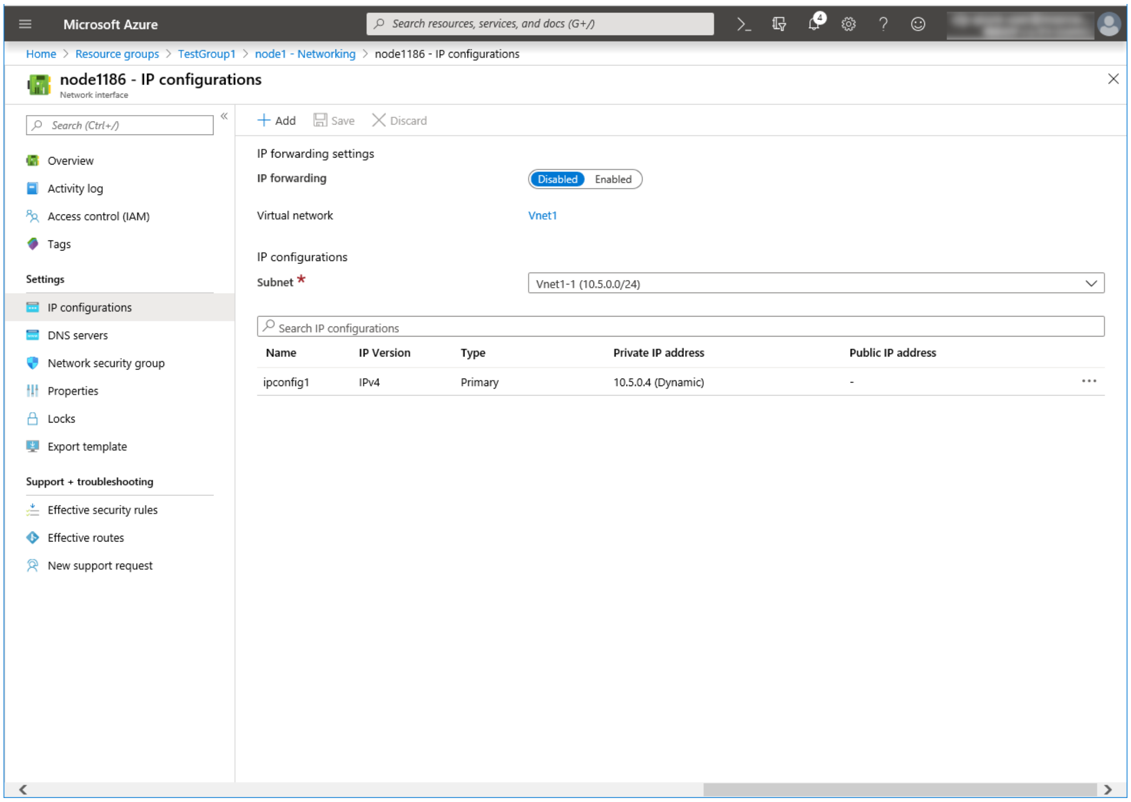
4. Select **Networking**.



Name	Type	Location
[redacted]	Availability set	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Storage account	Japan East
[redacted]	Virtual network	Japan East

5. Select a network interface displayed in the list. The network interface name is generated automatically.

6. Select **IP configurations**.



IP forwarding settings

IP forwarding: [✓ Disabled] Enabled

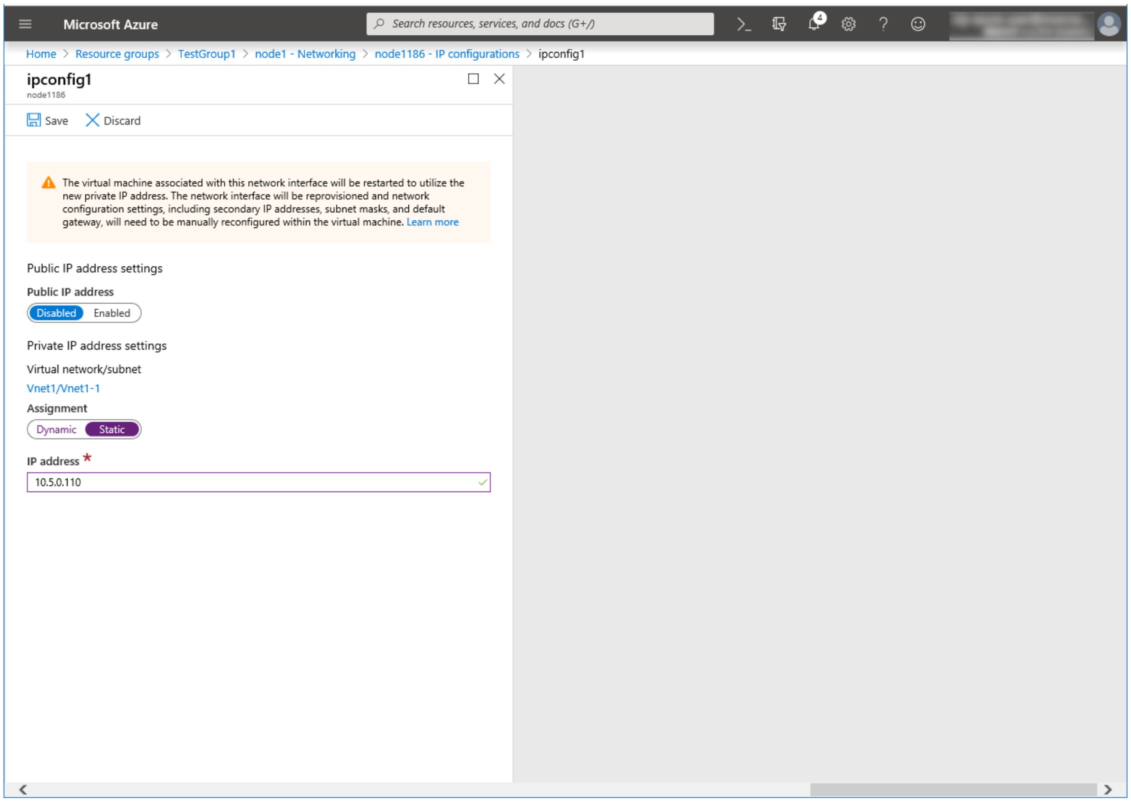
Virtual network: Vnet1

IP configurations

Subnet *: Vnet1-1 (10.5.0.0/24)

Name	IP Version	Type	Private IP address	Public IP address
ipconfig1	IPv4	Primary	10.5.0.4 (Dynamic)	-

7. Only ipconfig1 is displayed in the list. Select it.
8. Select **Static** for **Assignment** under **Private IP address settings**. Enter the IP address to be assigned statically in the **IP address** text box and click **Save** at the top of the window. The IP address of node1 is 10.5.0.110. The IP address of node2 is 10.5.0.111.


Microsoft Azure
Search resources, services, and docs (G+/)
4
Home > Resource groups > TestGroup1 > node1 - Networking > node1186 - IP configurations > ipconfig1
Save
Discard

ipconfig1
node1186

The virtual machine associated with this network interface will be restarted to utilize the new private IP address. The network interface will be reprovisioned and network configuration settings, including secondary IP addresses, subnet masks, and default gateway, will need to be manually reconfigured within the virtual machine. Learn more

Public IP address settings

Public IP address: [✓ Disabled] Enabled

Private IP address settings

Virtual network/subnet: Vnet1/Vnet1-1

Assignment: Dynamic [✓ Static]

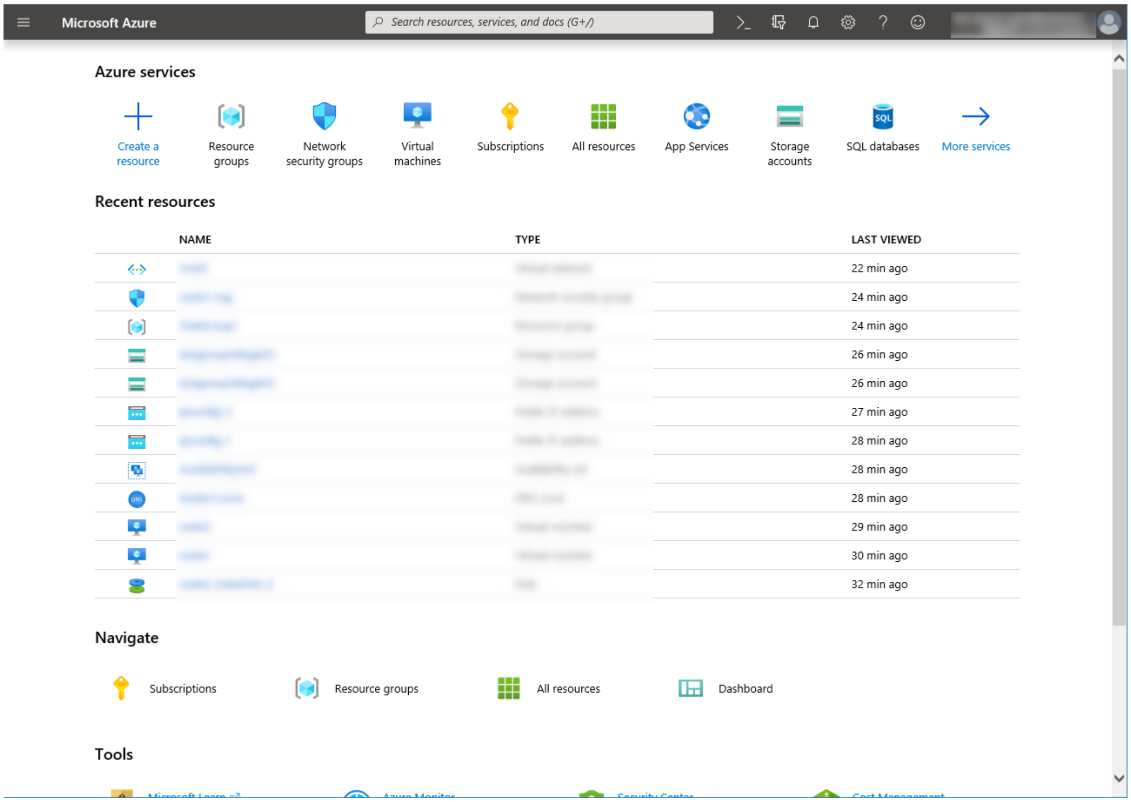
IP address *: 10.5.0.110

9. The virtual machines restart automatically so that new private IP addresses can be used.

5) **Creating a DNS zone**

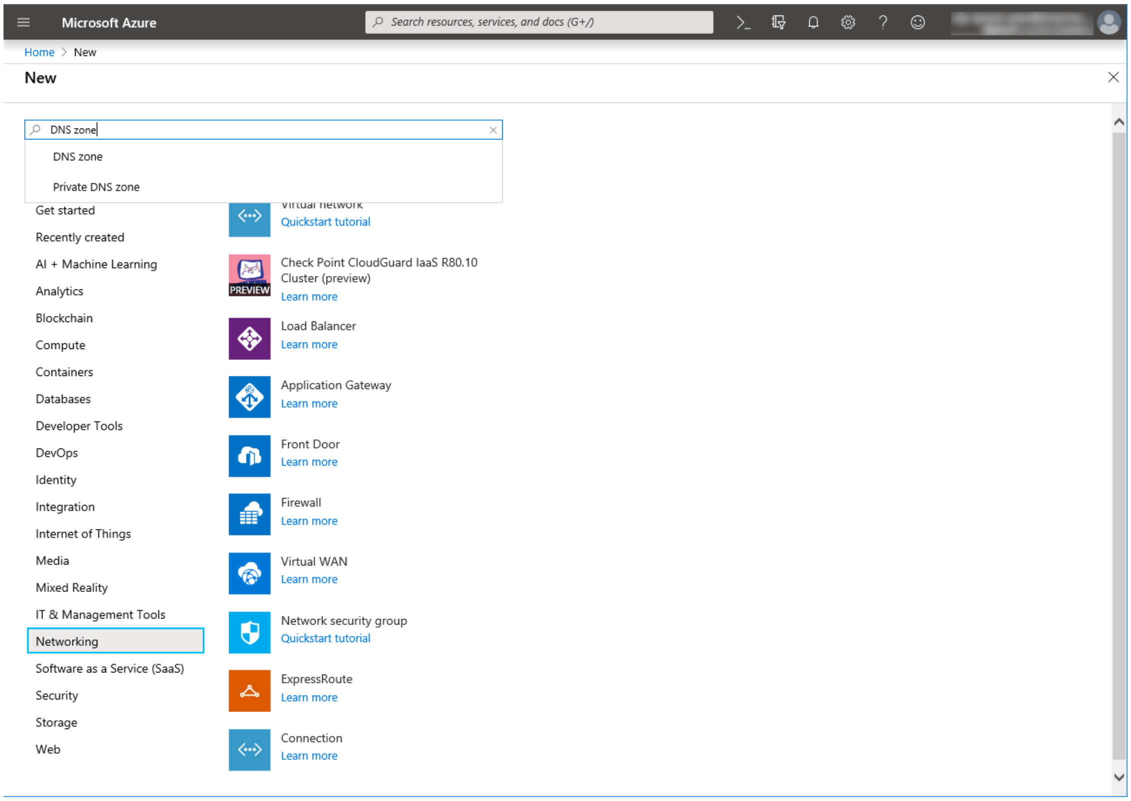
Log in to the Microsoft Azure portal (https://portal.azure.com/) and configure the DNS zone following the steps below.

1. Select the **Create a resource** icon on the upper part of the window.



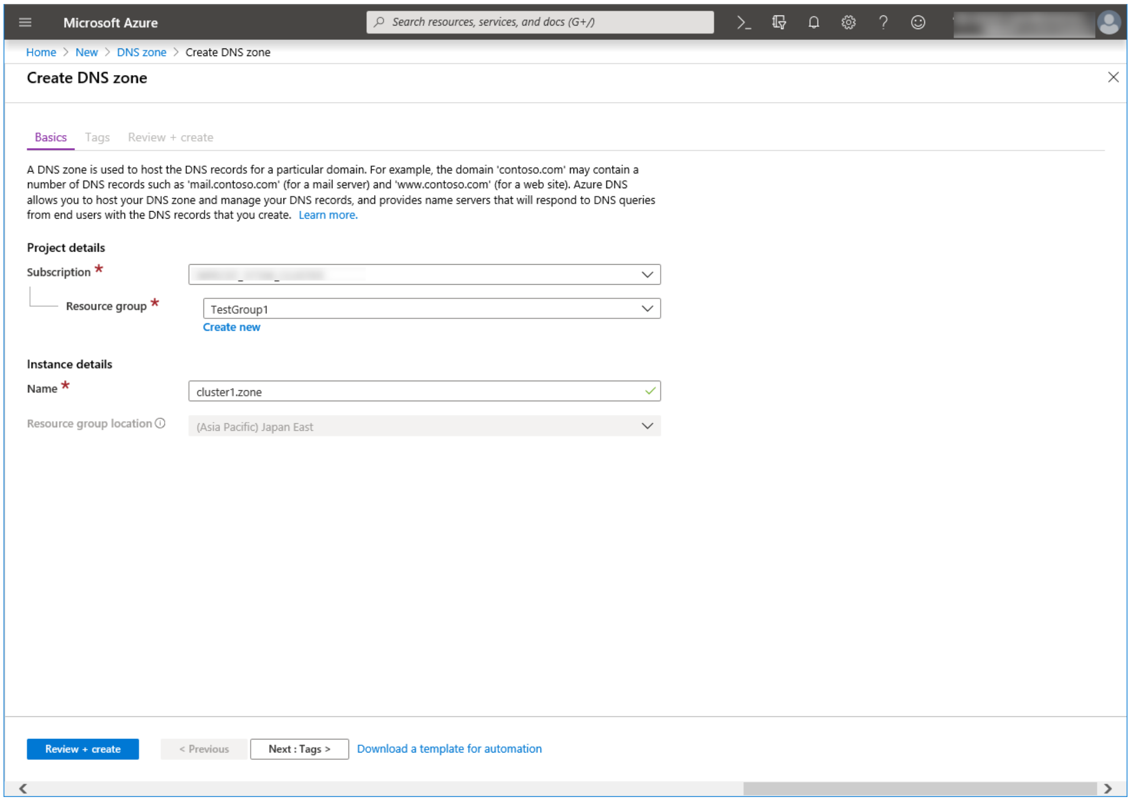
NAME	TYPE	LAST VIEWED
[redacted]	[redacted]	22 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	27 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	29 min ago
[redacted]	[redacted]	30 min ago
[redacted]	[redacted]	32 min ago

2. Select **Networking** and then **See all**. Search for DNS zone.



3. **Create DNS zone** is displayed. Specify **Subscription**, **Resource group**, and **Name**, and click **Re-**

view+create. Then click **Create**.



Home > New > DNS zone > Create DNS zone

Create DNS zone

Basics Tags Review + create

A DNS zone is used to host the DNS records for a particular domain. For example, the domain 'contoso.com' may contain a number of DNS records such as 'mail.contoso.com' (for a mail server) and 'www.contoso.com' (for a web site). Azure DNS allows you to host your DNS zone and manage your DNS records, and provides name servers that will respond to DNS queries from end users with the DNS records that you create. Learn more.

Project details

Subscription * [redacted]

Resource group * TestGroup1

Create new

Instance details

Name * cluster1.zone

Resource group location (Asia Pacific) Japan East

Microsoft Azure
Search resources, services, and docs (G+/)
Review + create
< Previous
Next : Tags >
Download a template for automation

6) **Configuring virtual machines**

Log in to the created node1 and node2 and specify the settings following the procedure below.

Set a partition for the mirror disk resource. Create a file system in the added disk.

Secure an area in the added disk by using the fdisk command and then create a file system.

For details about the partition for the mirror disk resource, see "Partition settings for Mirror disk resource (when using Replicator)" in "Settings after configuring hardware" in "Determining a system configuration" in the Installation and Configuration Guide.

1. Check the partition list. In the following example, the last line shows the added disk.

```
$ cat /proc/partitions
major minor  #blocks  name

   2        0          4 fd0
   8        0   31457280 sda
   8        1     512000 sda1
   8        2   30944256 sda2
   8       16   73400320 sdb
   8       17   73398272 sdb1
   8       32   20971520 sdc
```

2. Create a cluster partition and data partition in the added disk by using the fdisk command. Allocate 1 GB (1*1024*1024*1024 bytes) or more to a cluster partition. (If the size is specified as just 1 GB, the actual size will be larger than 1 GB depending on the disk geometry difference. This is not a problem.) Also, do not create a file system in a cluster partition.

3. If you select **Execute initial mkfs** when creating the cluster configuration data by using Cluster WebUI,

EXPRESSCLUSTER creates a file system automatically. Note that existing data in the partition will be lost.

7) **Adjusting the OS startup time, checking the network setting, checking the root file system, checking the firewall setting, synchronizing the server time, and checking the SELinux setting.**

For each procedure, see "Settings after configuring hardware." in "Determining a system configuration" in the Installation and Configuration Guide.

8) **Installing the Azure CLI**

Install the Azure CLI.
The procedure to install the Azure CLI from an npm package is described.
For details about this procedure and other procedures, see the following websites:

Install the Azure CLI:
https://docs.microsoft.com/en-us/cli/azure/install-azure-cli
Log in to the created node1 and node2 and install the Azure CLI following the procedure below.
Be sure to use the following installation procedure. If the Azure CLI is installed in other ways, Azure DNS resource will not work properly.

```
$ sudo yum check-update; sudo yum install -y gcc libffi-devel python-devel␣
↪openssl-devel
$ curl -L https://aka.ms/InstallAzureCli | bash -
$ exec -l $SHELL
```

9) **Creating a service principal**

Create a service principal using the Azure CLI.
Azure DNS resource performs login to Microsoft Azure and DNS zone registration and monitoring. When logging in to Microsoft Azure, Azure login with a service principal is used.
Please note that certificates have an expiration date.
For more details, see the --years option of az ad sp create-for-rbac.
https://docs.microsoft.com/en-us/cli/azure/ad/sp?view=azure-cli-latest#az-ad-sp-create-for-rbac

For details about a service principal and procedure, see the following websites:

Sign in with Azure CLI:
https://docs.microsoft.com/en-us/cli/azure/authenticate-azure-cli

Create an Azure service principal with Azure CLI:
https://docs.microsoft.com/en-us/cli/azure/create-an-azure-service-principal-azure-cli

1. Log in with an organizational account.

   ```
   $ az login -u <account_name> -p :<password>*
   ```

2. Create and register a service principal. Write down the displayed name and tenant because it is necessary to set them in the Azure DNS resource settings of Cluster WebUI. In the following example, a service principal is created in /home/testlogin/tmpbyJ1cK.pem. The valid period of certificates is set to 10 years.

   ```
   $ az ad sp create-for-rbac --name azure-test --create-cert --years 10
   {
     "appId": "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx",
     "displayName": "azure-test",
     "fileWithCertAndPrivateKey": "/home/testlogin/tmpbyJ1cK.pem",
     "name": "http://azure-test",
     "password": null,
     "tenant": "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx""
   }
   ```

3. Log out.

   ```
   $ az logout --u <account_name>
   ```

4. Check whether login to Microsoft Azure using the created service principal is possible.

   ```
   $ az login --service-principal -u <name_value_in_step_2> --tenant
   ↪<tenant_value_in_step_2> -p <fileWithCertAndPrivateKey_value_in_
   ↪step_2>
   ```

   The following is displayed upon successful sign-in.

   ```
   [
     {
       "cloudName": "AzureCloud",
       "id": "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxxx",
       "isDefault": true,
       "name": "xxxxxxxxxx",
       "state": "Enabled",
       "tenantId": "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx",
       "user": {
         "name": "http://azure-test",
         "type": "servicePrincipal"                }
     }
   ]
   ```

5. Log out.

   ```
   $ az logout --username <name_value_in_step_4>
   ```

   When changing the role of the created service principal from the default "Contributor" to another role, select a role that has access permissions to all of the following operations as the Actions properties. If the role is changed to a role that does not satisfy this condition, monitoring by the Azure DNS monitor resource, which are set up later, will fail due to an error.

   ```
   Microsoft.Network/dnsZones/A/write
   Microsoft.Network/dnsZones/A/delete
   Microsoft.Network/dnsZones/NS/read
   ```

10) **Installing EXPRESSCLUSTER**

For the installation procedure, see the Installation and Configuration Guide.
After installation is complete, restart the OS.

11) **Registering the EXPRESSCLUSER license**

For the license registration procedure, see the Installation and Configuration Guide.

4.3 Configuring the EXPRESSCLUSTER settings

For the Cluster WebUI setup and connection procedures, see "Creating the cluster configuration data" in the Installation and Configuration Guide.

This section describes the procedure to add the following resources and monitor resources:

- Mirror disk resource
- Azure DNS resource
- Azure DNS monitor resource
- Custom monitor resource (for NP resolution)
- IP monitor resource (for NP resolution)
- Multi target monitor resource (for NP resolution)

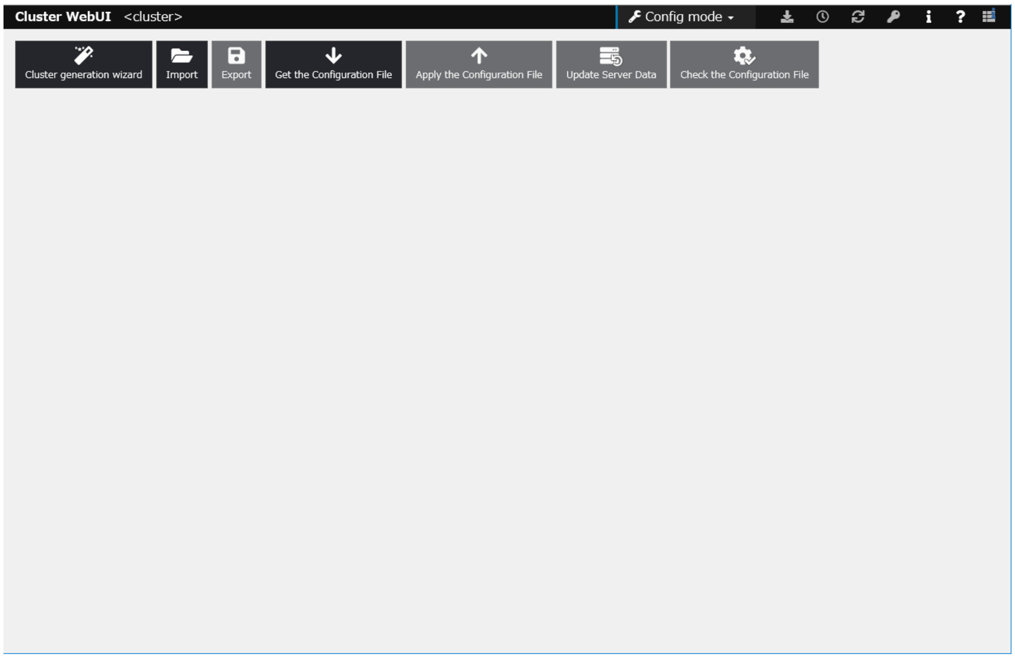
For the settings of other resources and monitor resources, see the Installation and Configuration Guide and the Reference Guide.

1) **Creating a cluster**

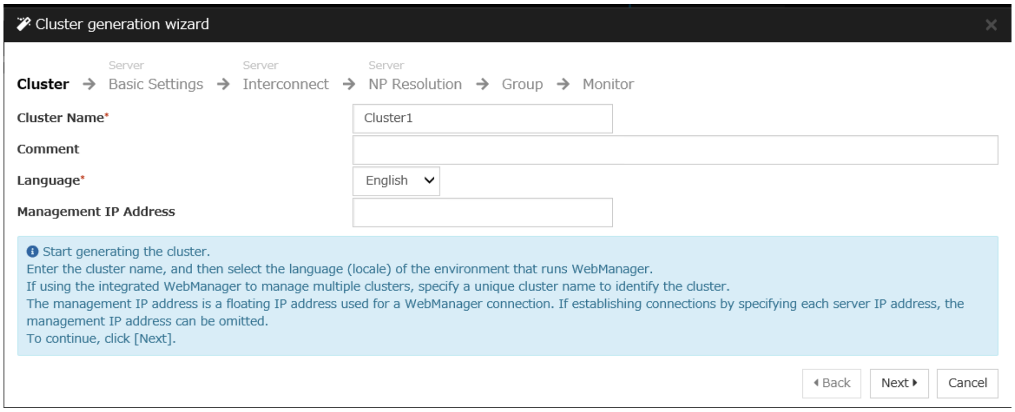
   Start the Cluster generation wizard to create a cluster.

   - Creating a cluster

     1. .Access Cluster WebUI, and click **Cluster generation wizard**.


Cluster WebUI <cluster>
Config mode
Cluster generation wizard
Import
Export
Get the Configuration File
Apply the Configuration File
Update Server Data
Check the Configuration File

     2. **Cluster** of **Cluster generation wizard** is displayed.
        Enter a desired name in **Cluster Name**.
        Select an appropriate language in **Language**. Click **Next**.


Cluster generation wizard
Cluster → Server Basic Settings → Server Interconnect → Server NP Resolution → Group → Monitor
Back
Next
Cancel

Cluster Name* Cluster1

Comment

Language* English

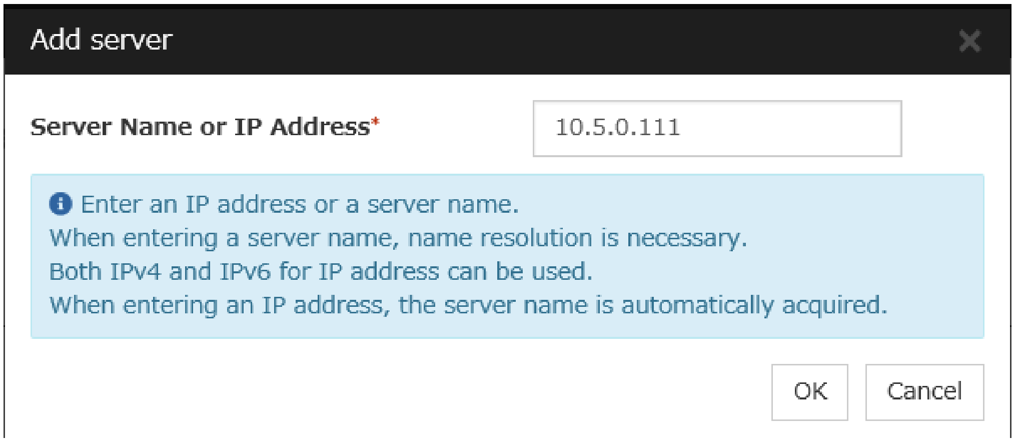
Management IP Address

Start generating the cluster.
Enter the cluster name, and then select the language (locale) of the environment that runs WebManager.
If using the integrated WebManager to manage multiple clusters, specify a unique cluster name to identify the cluster.
The management IP address is a floating IP address used for a WebManager connection. If establishing connections by specifying each server IP address, the management IP address can be omitted.
To continue, click [Next].

3. **Basic Settings** is displayed.

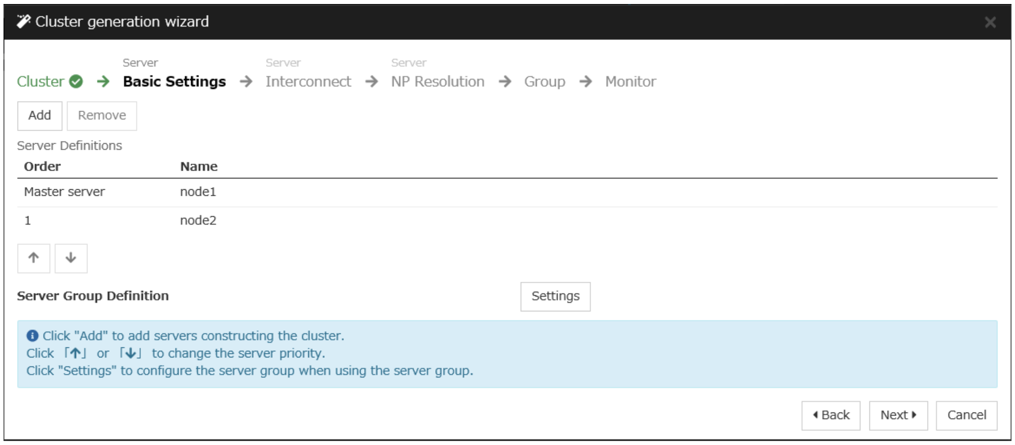
   The instance connected to Cluster WebUI is displayed as a registered master server.

   Click **Add** to add the remaining instances (by specifying the private IP address of each instance). Click **Next**.



Server Name or IP Address* 10.5.0.111

Enter an IP address or a server name.
When entering a server name, name resolution is necessary.
Both IPv4 and IPv6 for IP address can be used.
When entering an IP address, the server name is automatically acquired.


Cluster generation wizard
Cluster → Server Basic Settings → Server Interconnect → Server NP Resolution → Group → Monitor
Add
Remove
Settings
Back
Next
Cancel

Server Definitions

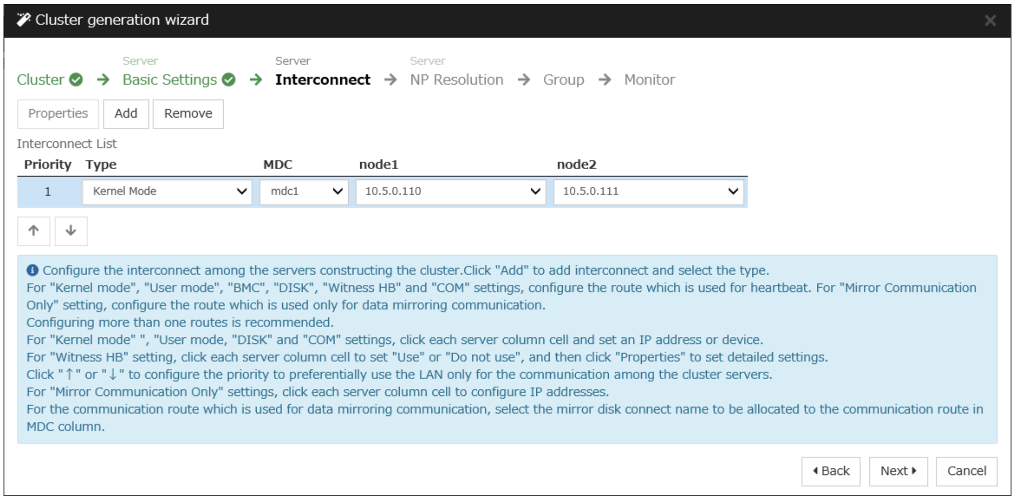
Order	Name
Master server	node1
1	node2

Server Group Definition

Click "Add" to add servers constructing the cluster.
Click 「↑」 or 「↓」 to change the server priority.
Click "Settings" to configure the server group when using the server group.

4. The **Interconnect** window is displayed.

   Specify the IP addresses (IP address of each instance) to be used for interconnect. In addition, select mdc1 for **MDC** as a communication path of a mirror disk resource to be created later. Click **Next**.



Interconnect List

Priority	Type	MDC	node1	node2
1	Kernel Mode	mdc1	10.5.0.110	10.5.0.111

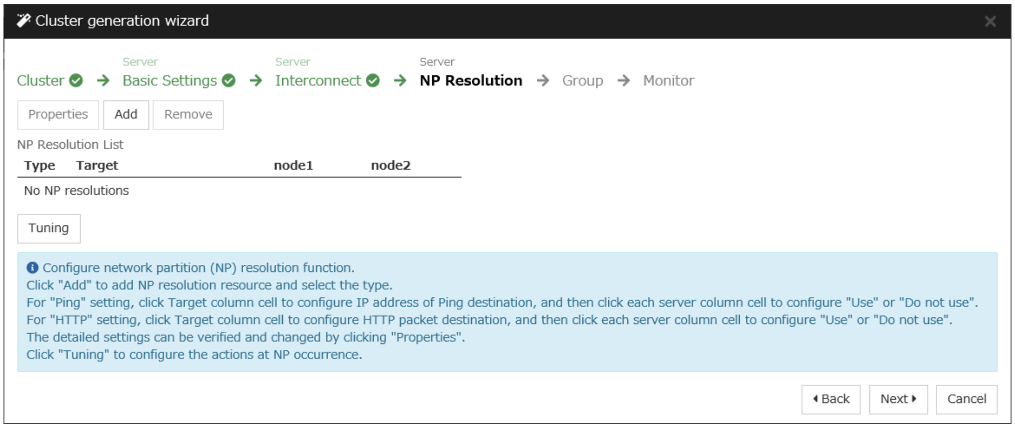
Configure the interconnect among the servers constructing the cluster.Click "Add" to add interconnect and select the type.
For "Kernel mode", "User mode", "BMC", "DISK", "Witness HB" and "COM" settings, configure the route which is used for heartbeat. For "Mirror Communication Only" setting, configure the route which is used only for data mirroring communication.
Configuring more than one routes is recommended.
For "Kernel mode" ", "User mode, "DISK" and "COM" settings, click each server column cell and set an IP address or device.
For "Witness HB" setting, click each server column cell to set "Use" or "Do not use", and then click "Properties" to set detailed settings.
Click "↑" or "↓" to configure the priority to preferentially use the LAN only for the communication among the cluster servers.
For "Mirror Communication Only" settings, click each server column cell to configure IP addresses.
For the communication route which is used for data mirroring communication, select the mirror disk connect name to be allocated to the communication route in MDC column.

5. The **NP Resolution** window is displayed.

   Note that NP resolution is not configured on this window. The equivalent feature is achieved by adding the IP monitor resource, custom monitor resource, and multi target monitor resource. Configure NP resolution in "3 **Adding a monitor resource**."

   You need to examine the NP resolution destination and method depending on the location of clients accessing a cluster system and the condition for connecting to an on-premise environment (for example, using a dedicated line). There is no NP resolution destination nor method to recommend. Additionally, you can use network partition resolution resources for NP resolution.

   Click **Next**.



NP Resolution List

Type	Target	node1	node2
No NP resolutions			

Configure network partition (NP) resolution function.
Click "Add" to add NP resolution resource and select the type.
For "Ping" setting, click Target column cell to configure IP address of Ping destination, and then click each server column cell to configure "Use" or "Do not use".
For "HTTP" setting, click Target column cell to configure HTTP packet destination, and then click each server column cell to configure "Use" or "Do not use".
The detailed settings can be verified and changed by clicking "Properties".
Click "Tuning" to configure the actions at NP occurrence.

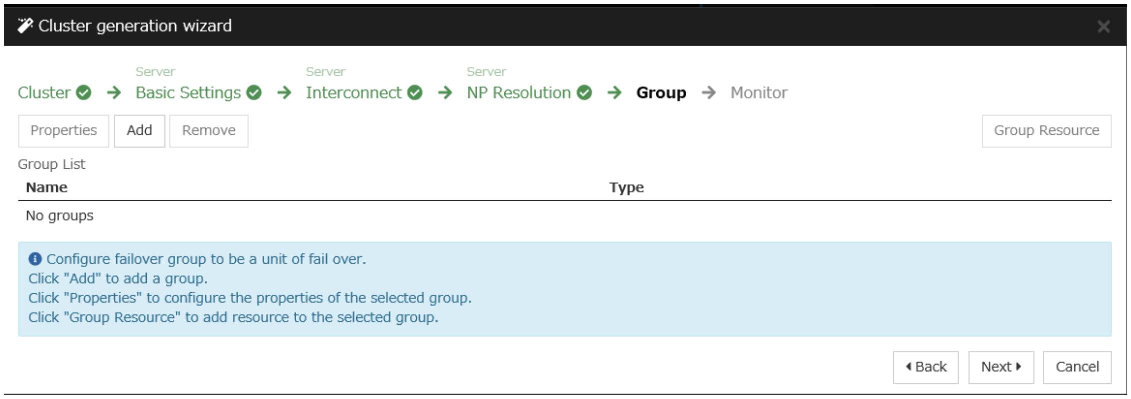
2) **Adding a group resource**

- Defining a group

Create a failover group.

1. The **Group List** window s displayed.

   Click **Add**.

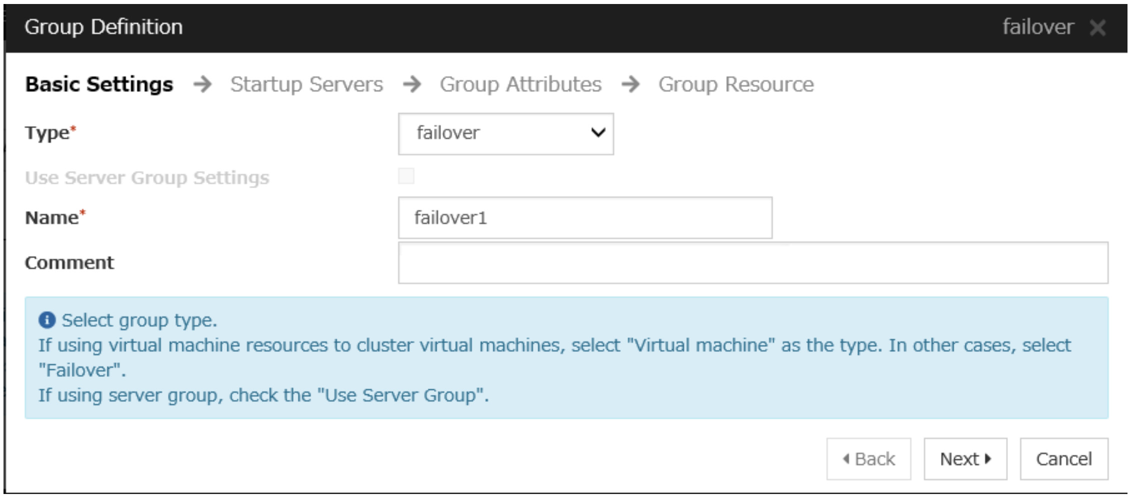

Cluster generation wizard
Cluster → Server Basic Settings → Server Interconnect → Server NP Resolution → Group → Monitor
Properties
Add
Remove
Group Resource
Back
Next
Cancel

Group List

Name	Type
No groups	

Configure failover group to be a unit of fail over.
Click "Add" to add a group.
Click "Properties" to configure the properties of the selected group.
Click "Group Resource" to add resource to the selected group.

2. The **Group Definition** window is displayed.
   Specify a failover group name (failover1) for **Name**. Click **Next**.


Group Definition
failover
Basic Settings → Startup Servers → Group Attributes → Group Resource
Back
Next
Cancel

Type*: failover

Use Server Group Settings: □

Name*: failover1

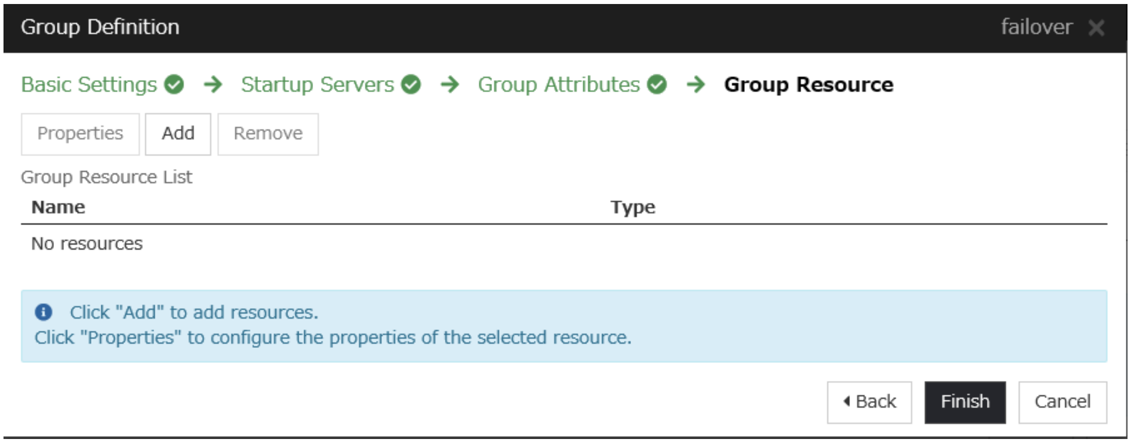
Comment:

Select group type.
If using virtual machine resources to cluster virtual machines, select "Virtual machine" as the type. In other cases, select "Failover".
If using server group, check the "Use Server Group".

3. The **Startup Servers** window is displayed.
   Click **Next** without specifying anything.

4. The **Group Attributes** window is displayed.
   Click **Next** without specifying anything.

5. **Group Resource List** is displayed.
   On this page, add a group resource following the procedure below.


Group Definition
failover
Basic Settings → Startup Servers → Group Attributes → Group Resource
Properties
Add
Remove
Back
Finish
Cancel

Group Resource List

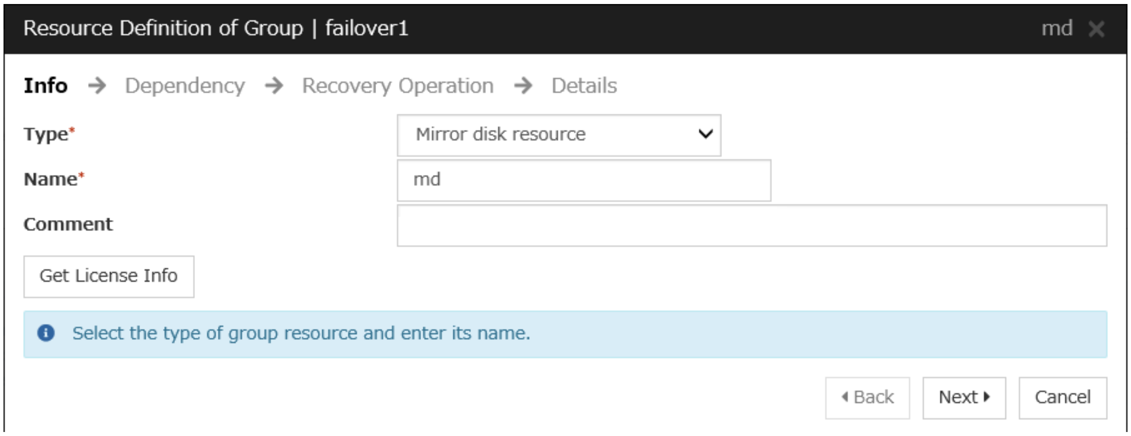
Name	Type
No resources	

Click "Add" to add resources.
Click "Properties" to configure the properties of the selected resource.

- Mirror disk resource

Create a mirror disk resource.
For details, see "Understanding mirror disk resources" in the Reference Guide.

1. Click **Add** on the **Group Resource List** page.
2. The **Resource Definition of Group | failover1** window is displayed.
   Select the group resource type (Mirror disk resource) from the **Type** box and enter the group name (md) in the **Name** box. Click **Next**.



Resource Definition of Group | failover1

Info → Dependency → Recovery Operation → Details

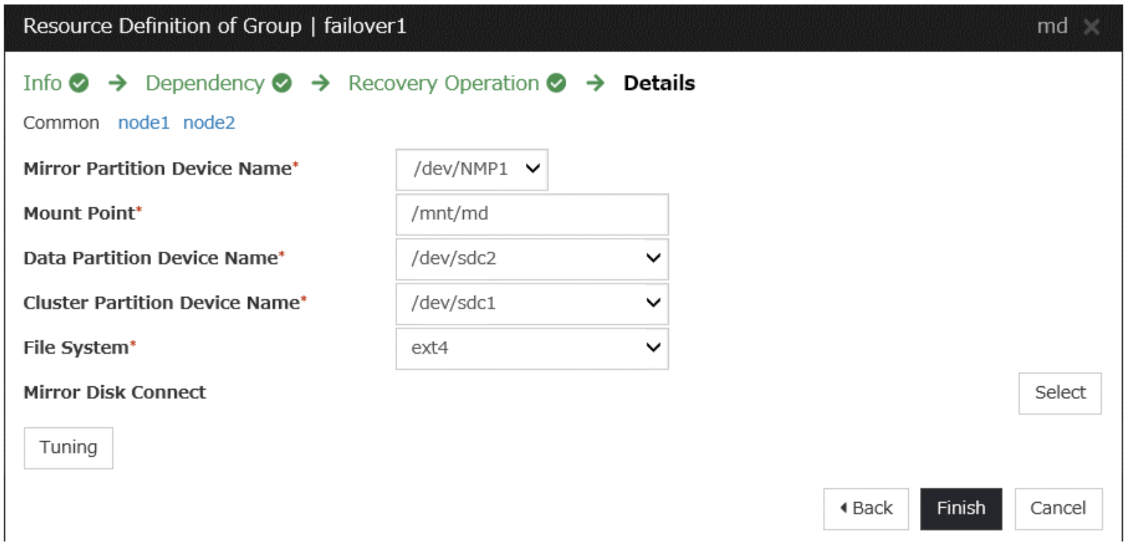
Type* : Mirror disk resource

Name* : md

Comment :

Select the type of group resource and enter its name.

3. The **Dependency** window is displayed.
   Click **Next** without specifying anything.
4. The **Recovery Operation** window is displayed.
   Click **Next**.
5. The **Details** window is displayed.
   Enter the device name of the partition created in "6. **Configuring virtual machines**" in **Data Partition Device Name** and **Cluster Partition Device Name**. Specify **Mount Point** and **File System**. Click **Finish** to finish setting.



Resource Definition of Group | failover1

Info ✓ → Dependency ✓ → Recovery Operation ✓ → Details

Common node1 node2

Mirror Partition Device Name* : /dev/NMP1

Mount Point* : /mnt/md

Data Partition Device Name* : /dev/sdc2

Cluster Partition Device Name* : /dev/sdc1

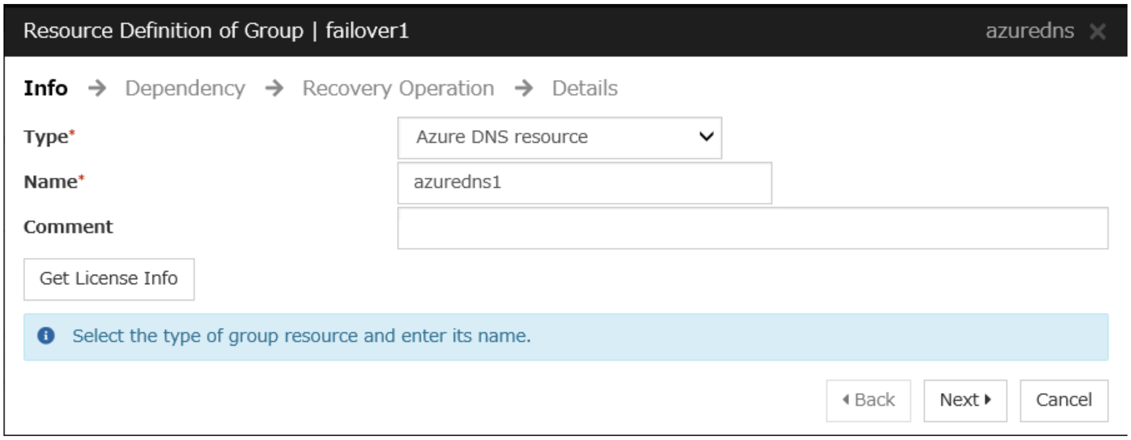
File System* : ext4

Mirror Disk Connect

- Azure DNS resource

Provides a mechanism to register or unregister a record to or from Azure DNS.
For details about the Azure DNS resource, see "Understanding Azure DNS resources" in the Reference Guide.

1. Click **Add** on the **Group Resource List** page.
2. The **Resource Definition of Group | failover1** window is displayed. Select the group resource type (Azure DNS resource) from the **Type** box and enter the group name (azuredns1) in the **Name** box. Click **Next**.



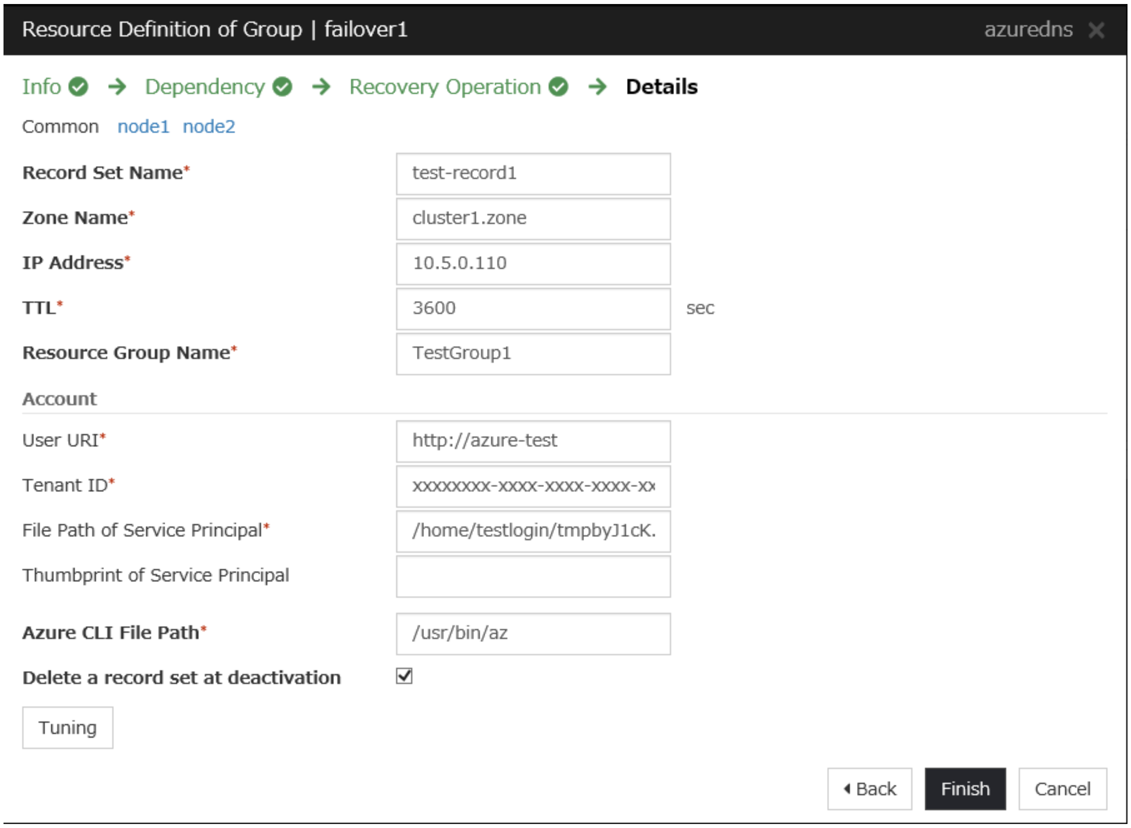
Type* Azure DNS resource

Name* azuredns1

Comment

Select the type of group resource and enter its name.

3. The **Dependency** window is displayed.
   Click **Next** without specifying anything.
4. The **Recovery Operation** window is displayed.
   Click **Next**.
5. Enter the values for each of the following: **Record Set Name**, **Zone Name**, **IP Address**, **Resource Group Name**, **User URI**, **Tenant ID**, **File Path of Service Principal**, **Thumbprint of Service Principal , Azure CLI File Path**. When using the IP address of each server, enter the IP address in the tab for each server. When setting up the servers separately, enter any IP address of the servers in the **Common** tab and then make settings for other servers. Only when using Azure CLI 1.0 (Azure classic CLI), enter **Thumbprint of Service Principal**. For **User URI** and **Tenant ID**, specify respectively the name and the tenant you wrote down at "9. **Creating a service principal**".


Resource Definition of Group | failover1
azuredns ✕
Info ✓ → Dependency ✓ → Recovery Operation ✓ → Details
Common node1 node2

Record Set Name* test-record1

Zone Name* cluster1.zone

IP Address* 10.5.0.110

TTL* 3600 sec

Resource Group Name* TestGroup1

Account

User URI* http://azure-test

Tenant ID* xxxxxxxx-xxxx-xxxx-xxxx-xx

File Path of Service Principal* /home/testlogin/tmpbyJ1cK.

Thumbprint of Service Principal

Azure CLI File Path* /usr/bin/az

Delete a record set at deactivation ☑

Tuning
◂ Back
Finish
Cancel

6. Click **Finish**.

3) **Adding a monitor resource**

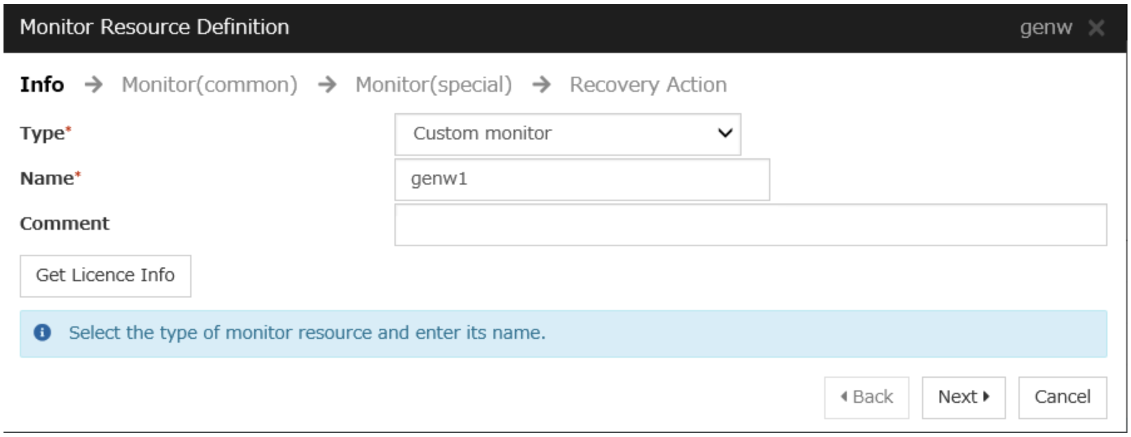
- Azure DNS monitor resource

The mechanism to check the record sets registered to the Azure DNS and whether the name resolution is available is provided.
For details about Azure DNS monitor resources, see "Reference Guide" > "Understanding Azure DNS monitor resources"
Adding one Azure DNS resource creates one Azure DNS monitor resource automatically.

- Custom monitor resource

Sets a script to monitor whether communication with the Microsoft Azure Service Management API is possible, and also to monitor health of communication with an external network.
For details about the custom monitor resource, see "Understanding custom monitor resources" in the Reference Guide.

1. Click **Add** on the **Monitor Resource List** page.
2. Select the monitor resource type (Custom monitor) from the **Type** box and enter the monitor resource name (genw1) in the **Name** box. Click **Next**.


Monitor Resource Definition
genw ✕
Info → Monitor(common) → Monitor(special) → Recovery Action
Get Licence Info
◂ Back
Next ▸
Cancel

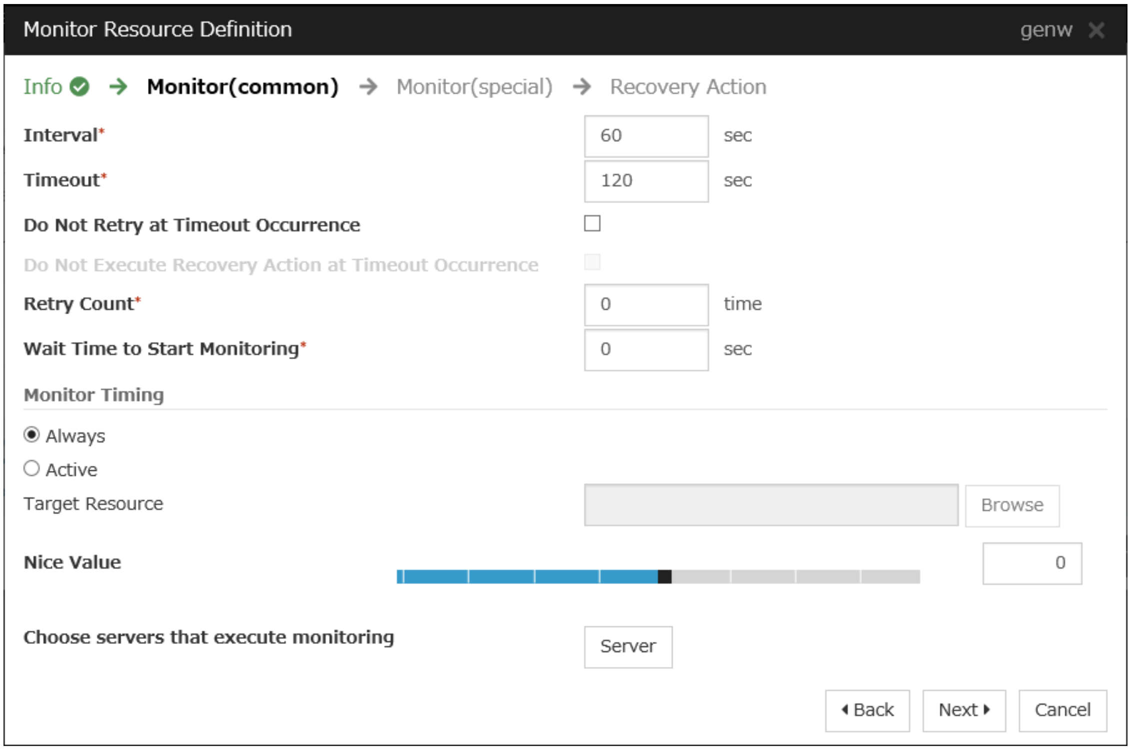
Type* Custom monitor

Name* genw1

Comment

Select the type of monitor resource and enter its name.

3. The **Monitor (common)** window is displayed.
   Confirm that **Monitor Timing** is **Always** and click **Next**.


Monitor Resource Definition
genw ✕
Info ✓ → Monitor(common) → Monitor(special) → Recovery Action
Browse
Server
◂ Back
Next ▸
Cancel

Interval* 60 sec

Timeout* 120 sec

Do Not Retry at Timeout Occurrence □

Do Not Execute Recovery Action at Timeout Occurrence □

Retry Count* 0 time

Wait Time to Start Monitoring* 0 sec

Monitor Timing

● Always

○ Active

Target Resource

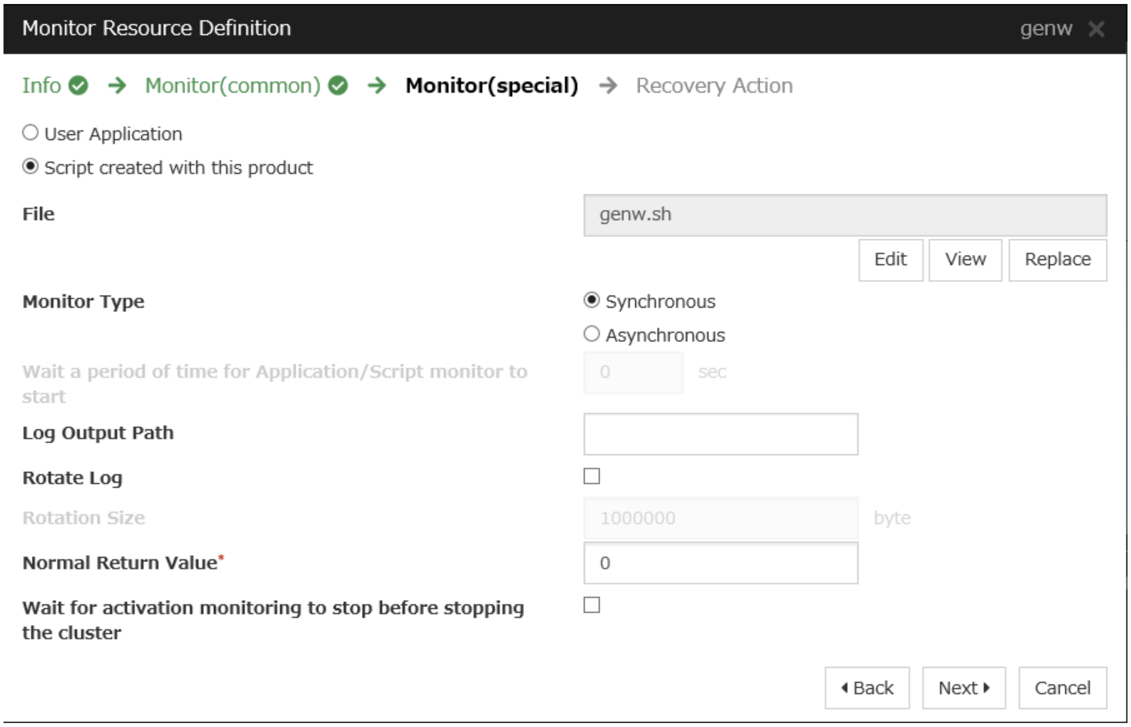
Nice Value 0

Choose servers that execute monitoring

4. The **Monitor (special)** window is displayed.
   Select **Script created with this product**.
   The following shows the sample of a script to be created.

```
#! /bin/sh
<EXPRESSCLUSTER-installation-path>/bin/clpazure_port_checker -h␣
↪management.core.windows.net -p 443
exit $?
```

Select **Synchronous** for **Monitor Type**. Click **Next**.



Monitor Resource Definition — genw ✕

Info ✓ → Monitor(common) ✓ → **Monitor(special)** → Recovery Action

○ User Application
● Script created with this product

File: genw.sh [Edit] [View] [Replace]

Monitor Type: ● Synchronous ○ Asynchronous

Wait a period of time for Application/Script monitor to start: 0 sec

Log Output Path:

Rotate Log: □

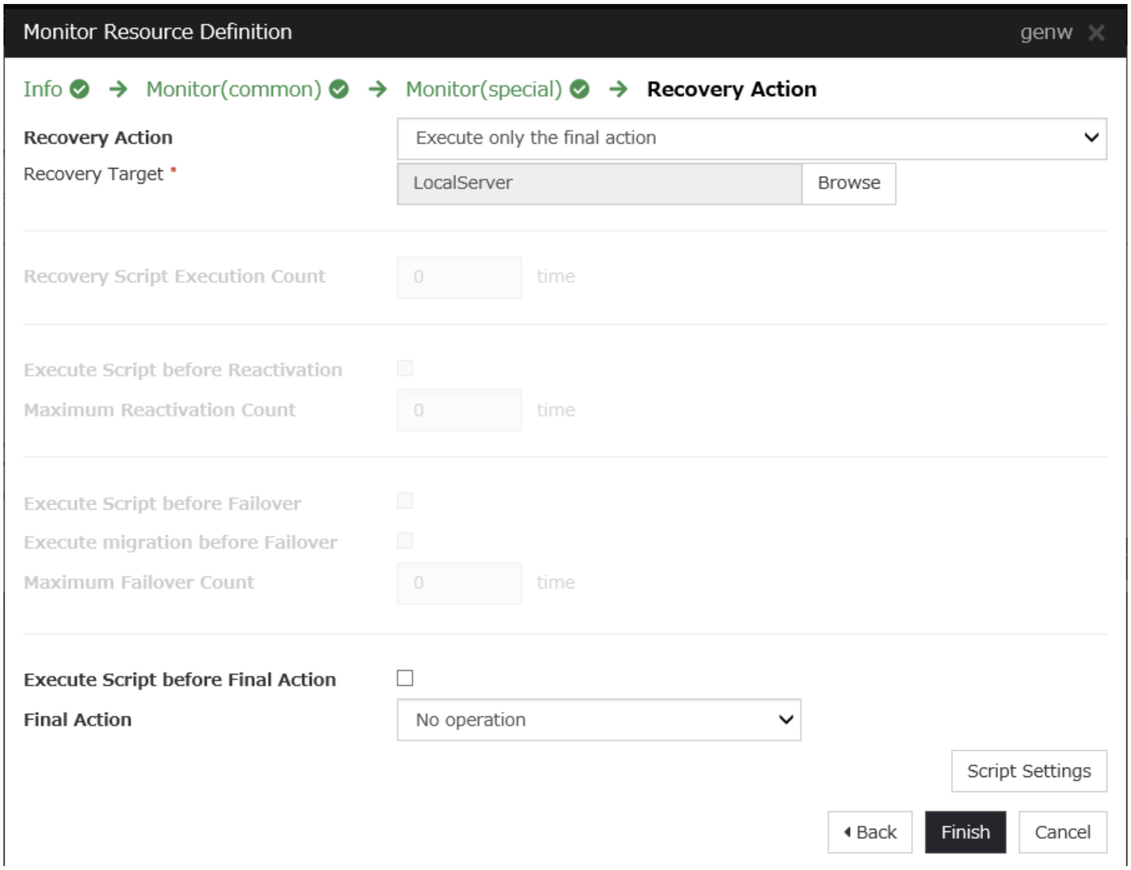
Rotation Size: 1000000 byte

Normal Return Value*: 0

Wait for activation monitoring to stop before stopping the cluster: □

[◂ Back] [Next ▸] [Cancel]

5. The **Recovery Action** window is displayed.
   Select **Execute only the final action** for **Recovery Action**, **LocalServer** for **Recovery Target**, and **No operation** for **Final Action**.



Monitor Resource Definition — genw ✕

Info ✓ → Monitor(common) ✓ → Monitor(special) ✓ → **Recovery Action**

Recovery Action: Execute only the final action

Recovery Target *: LocalServer [Browse]

Recovery Script Execution Count: 0 time

Execute Script before Reactivation: □

Maximum Reactivation Count: 0 time

Execute Script before Failover: □

Execute migration before Failover: □

Maximum Failover Count: 0 time

Execute Script before Final Action: □

Final Action: No operation

[Script Settings]

[◂ Back] [Finish] [Cancel]

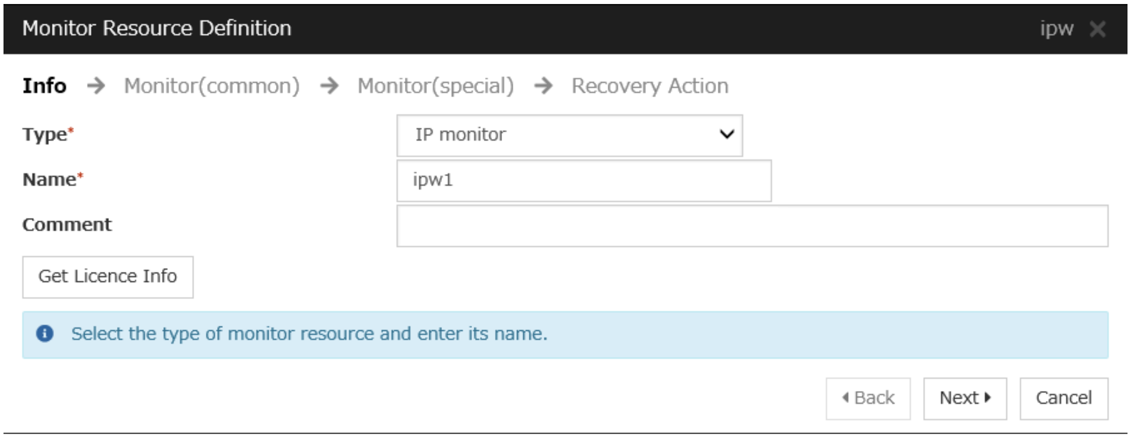
6. Click **Finish** to finish setting.

- IP monitor resource

Creates an IP monitor resource to monitor communication between clusters that are configured with virtual machines, and also to monitor whether communication with an internal network is health.

For details about the IP monitor resource, see Understanding IP monitor resources in the Reference Guide.

1. Click **Add** on the **Monitor Resource List** page.
2. Select the monitor resource type (IP monitor) from the **Type** box and enter the monitor resource name (ipw1) in the **Name** box. Click **Next**.



Monitor Resource Definition

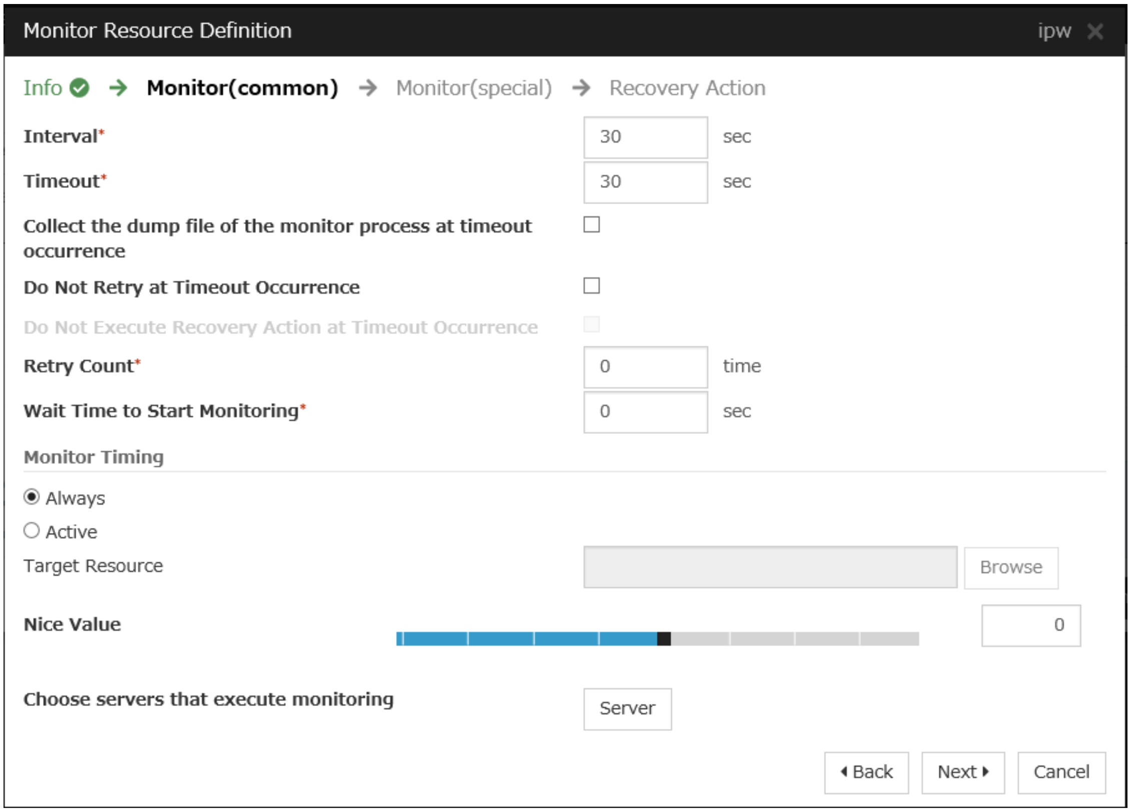
Type*: IP monitor

Name*: ipw1

Comment:

Select the type of monitor resource and enter its name.

3. The **Monitor (common)** window is displayed.
   Confirm that **Monitor Timing** is **Always**.



Monitor Resource Definition — ipw

Info ✓ → **Monitor(common)** → Monitor(special) → Recovery Action

Interval*	30	sec
Timeout*	30	sec
Collect the dump file of the monitor process at timeout occurrence	□	
Do Not Retry at Timeout Occurrence	□	
Do Not Execute Recovery Action at Timeout Occurrence	□	
Retry Count*	0	time
Wait Time to Start Monitoring*	0	sec

Monitor Timing

● Always

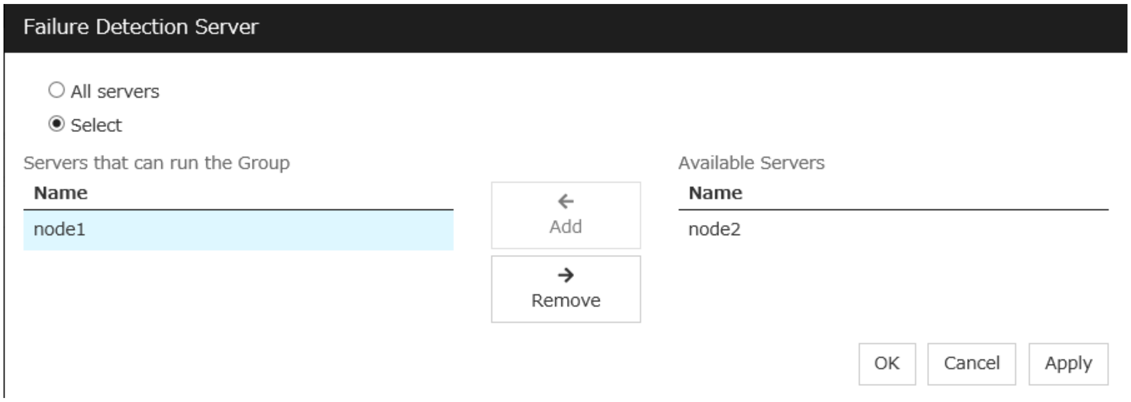
○ Active

Target Resource [ ] Browse

Nice Value 0

Choose servers that execute monitoring [Server]

Select one available server for **Choose servers that execute monitoring**.



Failure Detection Server

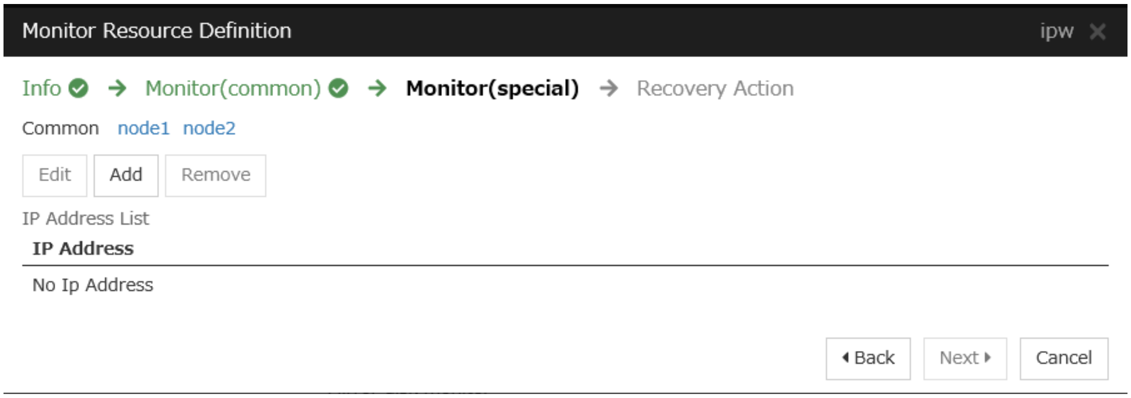
○ All servers

● Select

Servers that can run the Group: Name	Available Servers: Name
node1	node2

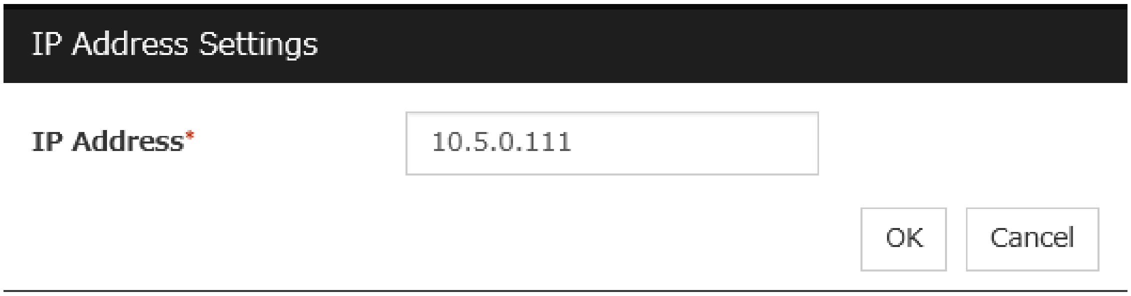
Click **Next**.

4. The **Monitor (special)** window is displayed.

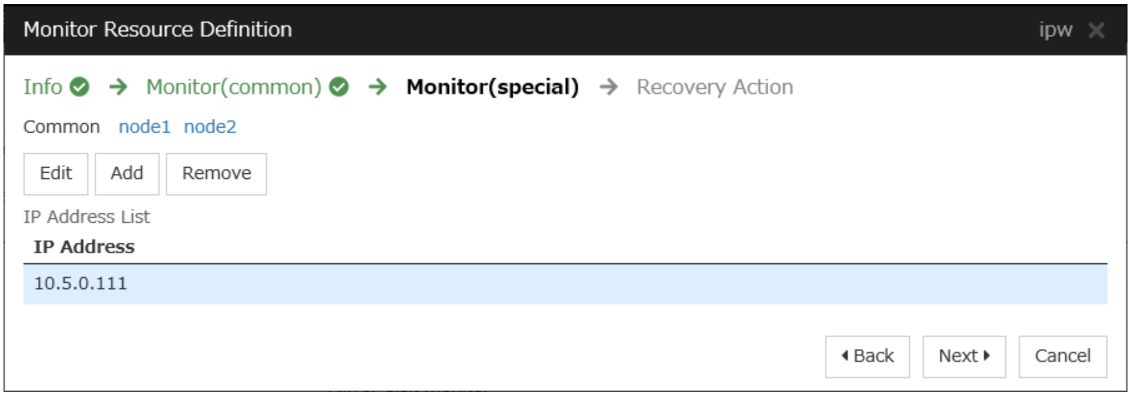


No Ip Address

On the **Common** tab, select **Add** of **IP Address** and set an IP address of a server other than the server selected in step 3. Click **Next**.



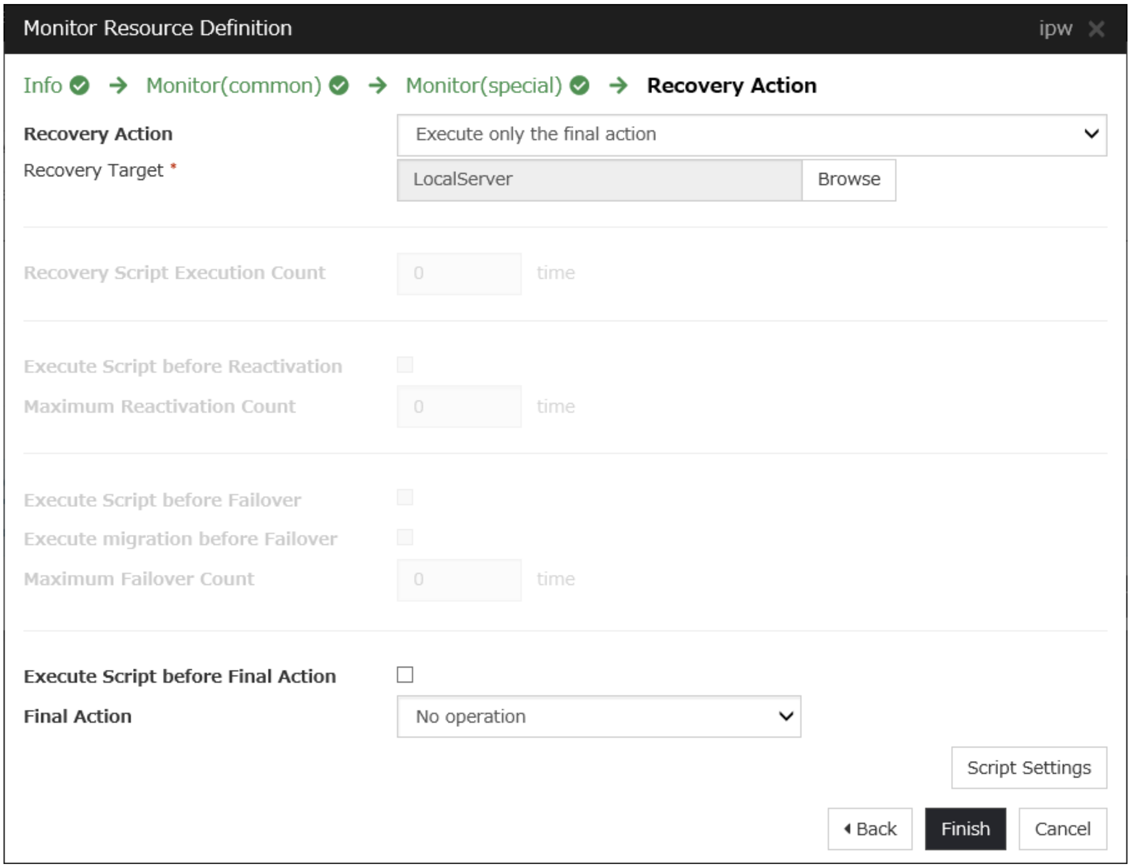
IP Address* 10.5.0.111



IP Address
10.5.0.111

5. The **Recovery Action** window is displayed.

   Select **Execute only the final action** for **Recovery Action**, **LocalServer** for **Recovery Target**, and **No operation** for **Final Action**.


Monitor Resource Definition
ipw
Info → Monitor(common) → Monitor(special) → Recovery Action
Browse
Script Settings
Back
Finish
Cancel

Recovery Action: Execute only the final action
Recovery Target *: LocalServer
Recovery Script Execution Count: 0 time
Execute Script before Reactivation: □
Maximum Reactivation Count: 0 time
Execute Script before Failover: □
Execute migration before Failover: □
Maximum Failover Count: 0 time
Execute Script before Final Action: □
Final Action: No operation

6. Click **Finish** to finish setting.
7. Then, create a monitor resource on the other server. Click **Add** on the **Monitor Resource List** page.
8. Select the monitor resource type (IP monitor) from the **Type** box and enter the monitor resource name (ipw2) in the **Name** box. Click **Next**.
9. The **Monitor (common)** window is displayed.
   Confirm that **Monitor Timing** is **Always**.
   Select one available server for **Choose servers that execute monitoring**.
   Click **Next**.
10. The **Monitor (special)** window is displayed.
    On the **Common** tab, select **Add** of **IP Address** and set an IP address of a server other than the server selected in step 9. Click **Next**.
11. The **Recovery Action** window is displayed.
    Select **Execute only the final action** for **Recovery Action**, **LocalServer** for **Recovery Target**, and **No operation** for **Final Action**.
12. Click **Finish** to finish setting.

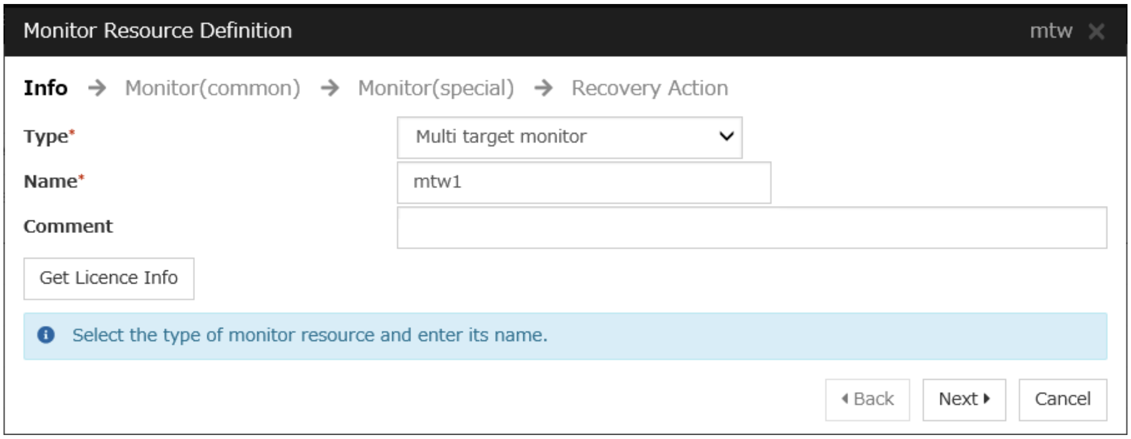
- Multi target monitor resource

Creates a multi target monitor resource to check the statuses of both the custom monitor resource monitoring communication to Microsoft Azure Service Management API and the IP monitor resource between clusters that are configured with virtual machines.

If the statuses of both monitor resources are abnormal, execute the script in which the processing for NP resolution is described.

For details about the multi target monitor resource, see Understanding multi target monitor resources in the Reference Guide.

1. Click **Add** on the **Monitor Resource List** page.
2. Select the monitor resource type (Multi target monitor) from the **Type** box and enter the monitor resource name (mtw1) in the **Name** box. Click **Next**.



Monitor Resource Definition

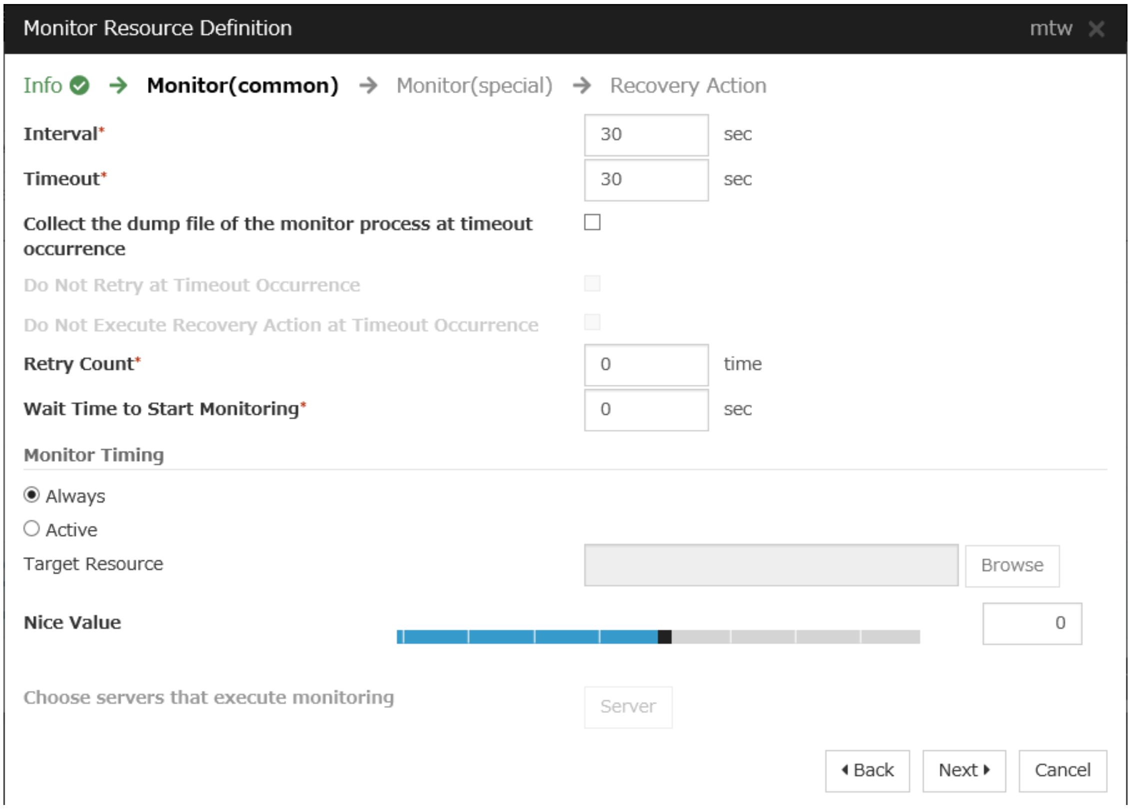
Type*: Multi target monitor

Name*: mtw1

Comment:

Select the type of monitor resource and enter its name.

3. The **Monitor (common)** window is displayed.
   Confirm that **Monitor Timing** is **Always** and click **Next**.



Monitor Resource Definition

Interval*: 30 sec

Timeout*: 30 sec

Collect the dump file of the monitor process at timeout occurrence: □

Do Not Retry at Timeout Occurrence: □

Do Not Execute Recovery Action at Timeout Occurrence: □

Retry Count*: 0 time

Wait Time to Start Monitoring*: 0 sec

Monitor Timing

● Always

○ Active

Target Resource:

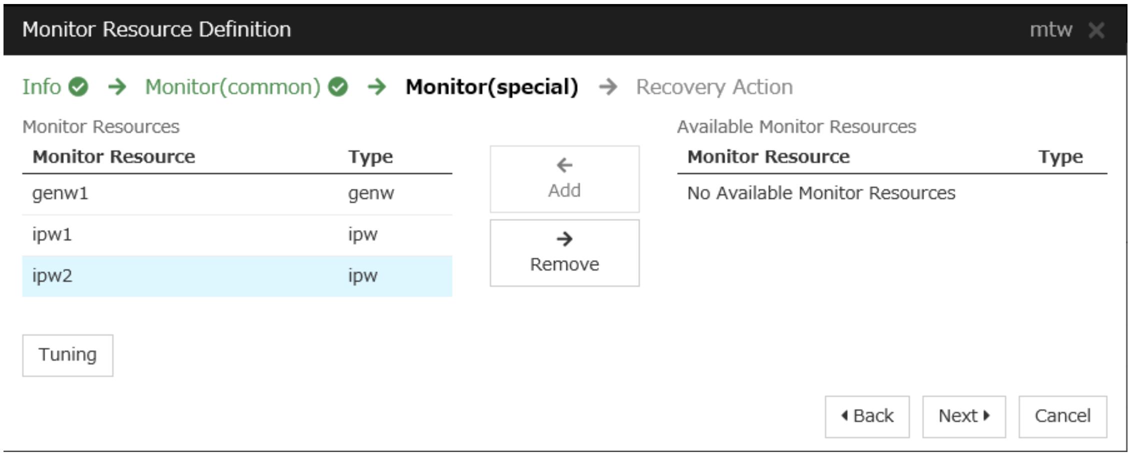
Nice Value: 0

Choose servers that execute monitoring

mtw ✕
Info ✓ → Monitor(common) → Monitor(special) → Recovery Action
Browse
Server
◂ Back
Next ▸
Cancel

4. The **Monitor (special)** window is displayed.

From **Available Monitor Resources**, select the custom monitor resource (genw1) for checking communication with Service Management API and two IP monitor resources (ipw1 and ipw2) that are set to both servers. Then, click **Add** to add them to **Monitor Resource List**. Click **Next**.



Monitor Resource Definition

Info → Monitor(common) → **Monitor(special)** → Recovery Action

Monitor Resources

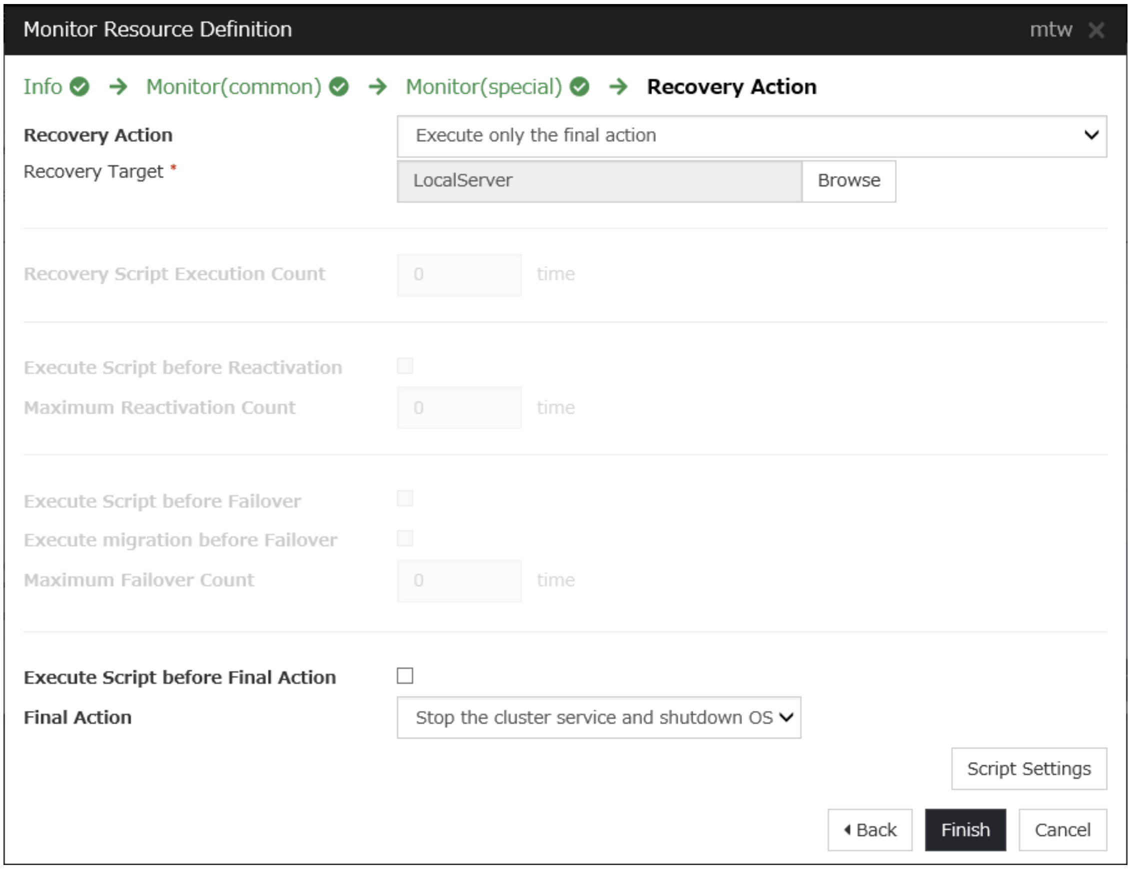
Monitor Resource	Type
genw1	genw
ipw1	ipw
ipw2	ipw

Available Monitor Resources

Monitor Resource	Type
No Available Monitor Resources	

5. The **Recovery Action** window is displayed.

   Specify **Execute only the final action** for **Recovery Action**, **LocalServer** for **Recovery Target**, and **Stop the cluster service and shutdown OS** for **Final Action**.



Monitor Resource Definition

Info → Monitor(common) → Monitor(special) → **Recovery Action**

Recovery Action: Execute only the final action

Recovery Target *: LocalServer

Recovery Script Execution Count: 0 time

Execute Script before Reactivation: □

Maximum Reactivation Count: 0 time

Execute Script before Failover: □

Execute migration before Failover: □

Maximum Failover Count: 0 time

Execute Script before Final Action: □

Final Action: Stop the cluster service and shutdown OS

6. Click **Finish**.

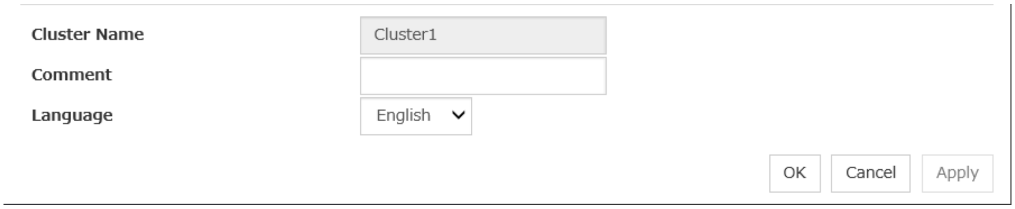
4) **Setting the cluster properties**

For details about the cluster properties, see "Cluster properties" in the Reference Guide.

- Cluster properties

  Configure the settings in **Cluster Properties** to link Microsoft Azure and EXPERSSCLUSTER.

  1. Enter **Config Mode** from Cluster WebUI, click the property icon of a cluster name.



Cluster Name: Cluster1
Comment:
Language: English

  2. Select the **Timeout** tab. For **Timeout** of **Heartbeat**, specify a value calculated by "A+B+C" as described below.

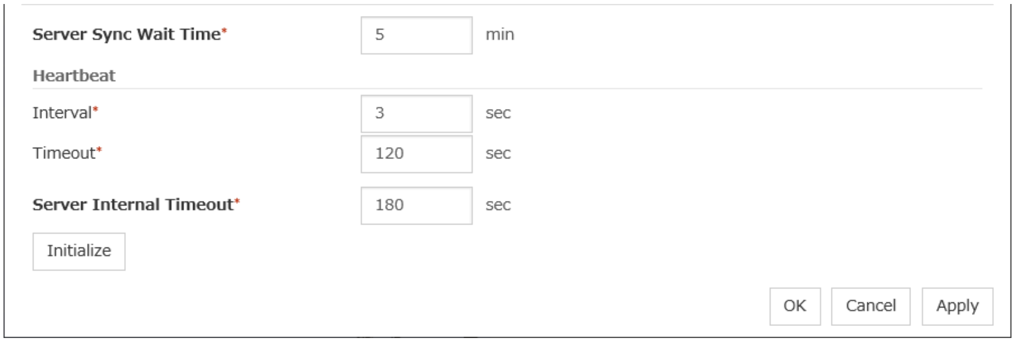
     – A: **Interval** of the monitor resource being monitored by the multi target monitor resource for NP resolution x (**Retry Count**+1)

     * Among three monitor resources, select the monitor resource whose calculation result is the largest.

     – B: **Interval** of the multi target monitor resource x (**Retry Count**+1)

     – C: 30 seconds (Waiting time for heartbeat not to time out before the multi target monitor resource detects an error. The time can be changed accordingly.

Note: If **Timeout** of **Heartbeat** is shorter than the time that it took for the multi target monitor resource to detect an error, a heartbeat timeout will be detected before starting the NP resolution processing. In this case, the same service may start doubly in the cluster because the service also starts on the standby server.



Server Sync Wait Time*: 5 min

Heartbeat

Interval*: 3 sec
Timeout*: 120 sec

Server Internal Timeout*: 180 sec

  3. Click **OK**.

5) **Applying the settings and starting the cluster**

1. Click **Apply the Configuration File** on the **File** in the config mode of Cluster WebUI.
   If the upload succeeds, the message saying "The application finished successfully."

2. Select the **Operation Mode** on the drop down menu of the toolbar in Cluster WebUI to switch to the operation mode.

3. The procedure depends on the resource used. For details, refer to the following:Installation and Configuration Guide -> How to create a cluster

4.4 Verifying the created environment

Verify whether the created environment works properly by generating a monitoring error to fail over a failover group. If the cluster is running normally, the verification procedure is as follows:

1. Start the failover group (failover1) on the active node (node1). In the **Status** tab on the Cluster WebUI, confirm that **Group Status** of failover1 of node1 is **Normal**.
2. Log in to the Microsoft Azure portal, select cluster1.zone on the DNS zone, and then select **Summary**. Check the DNS servers displayed on the upper right of the window (name server 1, name server 2, name server 3, and name server 4 in the window example).
3. Confirm that the relevant record set exists in the DNS servers checked in the above step by executing the nslookup command as follows:

   ```
   $ nslookup test-record1.cluster1.zone <DNS_servers_checked_in_the_above_
   ↪step>
   ```

4. On the Microsoft Azure portal, delete an A record from the DNS zone. This causes azurednsw1 to detect a monitoring error. On the DNS zone, select cluster1.zone and then **Summary**.
5. Select the record you want to delete and click **Delete**. When the deletion confirmation dialog box is displayed, select **Yes**.
6. When the time specified for **Interval** of azurednsw1 elapses, the failover group (failover1) enters an error status and fails over to node2. In the **Status** tab on the Cluster WebUI, confirm that **Group Status** of failover1 of node2 is **Normal**.
7. Confirm that the relevant record set exists in the DNS servers checked in the above step by executing the nslookup command as follows:

   ```
   $ nslookup test-record1.cluster1.zone <DNS_servers_checked_in_the_above_
   ↪step>
   ```

Verifying the failover operation when an A record is deleted from the DNS server is now complete. Verify the operations in case of other failures if necessary.

CHAPTER

FIVE

CLUSTER CREATION PROCEDURE (FOR AN HA CLUSTER USING A PUBLIC LOAD BALANCER)

5.1 Creation example

This guide introduces the procedure for creating a 2-node unidirectional standby cluster using EXPRESSCLUSTER on Microsoft Azure. This procedure is intended to create a mirror disk type configuration in which node1 is used as an active server.

The following tables describe the parameters that do not have a default value and the parameters whose values are to be changed from the default values.

- Microsoft Azure settings (common to node1 and node2)

Setting item	Setting value
Resource group setting	
– Resource group	TestGroup1
– Region	(Asia Pacific) Japan East
Virtual network setting	
– Name	Vnet1
– Address space	10.5.0.0/24
– Subnet Name	Vnet1-1
– Subnet Address range	10.5.0.0/24
– Resource group	TestGroup1
– Location	(Asia Pacific) Japan East

Continued on next page

Table 5.1 – continued from previous page

Setting item	Setting value
Load balancer setting	
– Name	TestLoadBalancer
– Type	Public
– Public IP address	TestLoadBalancerPublicIP
– Public IP address: Assignment	Static
– Resource group	TestGroup1
– Region	(Asia Pacific) Japan East
– Backend pool: Name	TestBackendPool
– Associated to	Availability set
– Target virtual machine	node1 node2
– Network IP configuration	10.5.0.110 10.5.0.111
– Health probe: Name	TestHealthProbe
– Health probe: Port	26001
– Load balancing rule: Name	TestLoadBalancingRule
– Load balancing rule: Port	80 (Port number offering the operation)
– Load balancing rule: Backend port	8080 (Port number offering the operation)
Inbound security rule setting	
– Name	TestHTTP

Continued on next page

Table 5.1 – continued from previous page

Setting item	Setting value
– Protocol	TCP
– Destination Port range	8080 (Port number offering the operation)

- Microsoft Azure settings (specific to each of node1 and node2)

Setting item	Setting value	
	node1	node2
Virtual machine setting		
– Disk type	Standard HDD	
– User name	testlogin	
– Password	PassWord_123	
– Resource group	TestGroup1	
– Region	(Asia Pacific) Japan East	
Network security group setting		
– Name	node1-nsg	node2-nsg
Availability set setting		
– Name	AvailabilitySet1	
– Update domains	5	
– Fault domains	2	
Diagnostics storage account setting		
– Name	Automatically generated	
– Performance	Standard	
– Replication	Locally-redundant storage (LRS)	
IP configuration setting		
– IP address	10.5.0.110	10.5.0.111
Disk setting		
– Name	node1_DataDisk_0	node2_DataDisk_0
– Source type	None (empty disk)	
– Account type	Standard HDD	
– Size	20	

- EXPRESSCLUSTER settings (cluster properties)

Setting item	Setting value	
	node1	node2
– Cluster Name	Cluster1	
– Server Name	node1	node2
– Timeout Tab: Heartbeat timeout	120	

- EXPRESSCLUSTER settings (failover group)

Resource name	Setting item	Setting value
Mirror disk resource	Name	md
	Details Tab: Mount Point	/mnt/md
	Details Tab: Data Partition Device Name	/dev/sdc2
	Details Tab: Cluster Partition Device Name	/dev/sdc1
	Details Tab: File System	ext4
	Mirror Tab: Execute the initial mirror construction	On
	Mirror Tab: Execute initial mkfs	On
Azure probe port resource	Name	azurepp1
	Probe port	26001 (Value specified for Port of Health probe)

- EXPRESSCLUSTER settings (monitor resource)

Monitor resource name	Setting item	Setting value
Mirror disk monitor resource	Name	mdw1
Azure probe port monitor resource	Name	azureppw1
	Recovery Target	azurepp1
Azure load balance monitor resource	Monitor resource name	aurelbw1
	Recovery Target	azurepp1
Custom monitor resource	Name	genw1
	Script created with this product	On
	Monitor Type	Synchronous
	Normal Return Value	0
	Recovery Action	Execute only the final action
	Recovery Target	LocalServer
IP monitor resource	Name	ipw1
	Server to monitor	node1
	IP Address	10.5.0.111
	Recovery Action	Execute only the final action

Continued on next page

Table 5.3 – continued from previous page

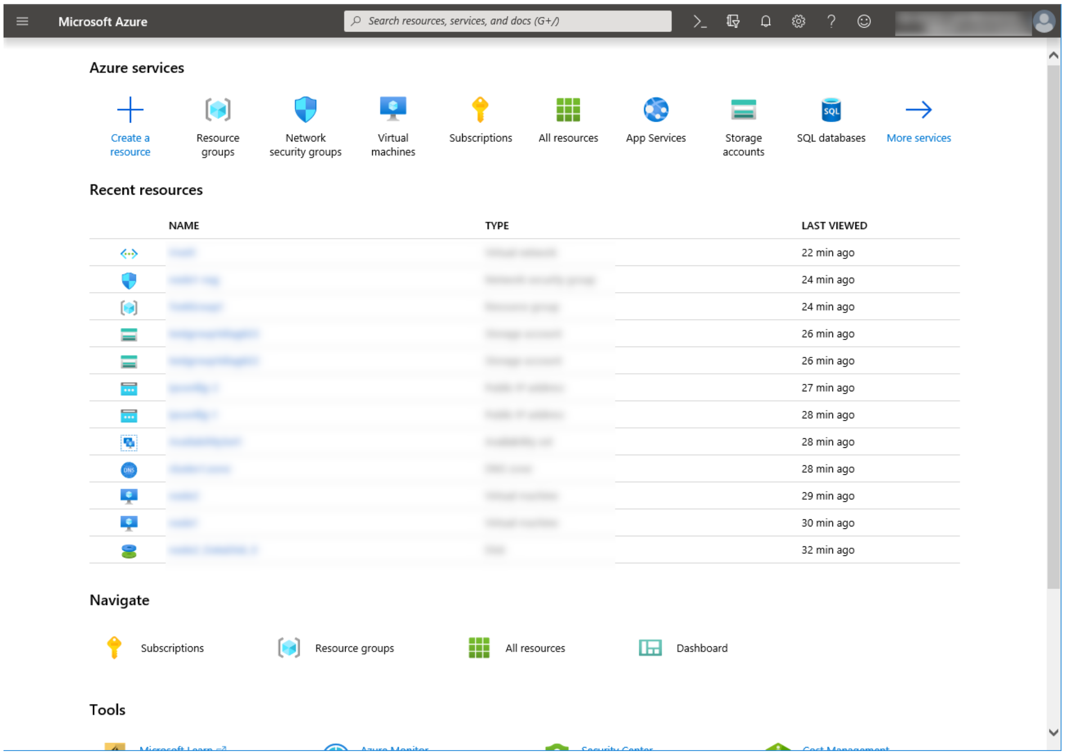
Monitor resource name	Setting item	Setting value
	Recovery Target	LocalServer
IP monitor resource	Name	ipw2
	Server to monitor	node2
	IP Address	10.5.0.110
	Recovery Action	Execute only the final action
	Recovery Target	LocalServer
Multi target monitor resource	Name	mtw1
	Monitor resource list	genw1 ipw1 ipw2
	Recovery Action	Execute only the final action
	Recovery Target	LocalServer
	Execute Script before Final Action	On
	Timeout	30

5.2 Configuring Microsoft Azure

1. **Creating a resource group**

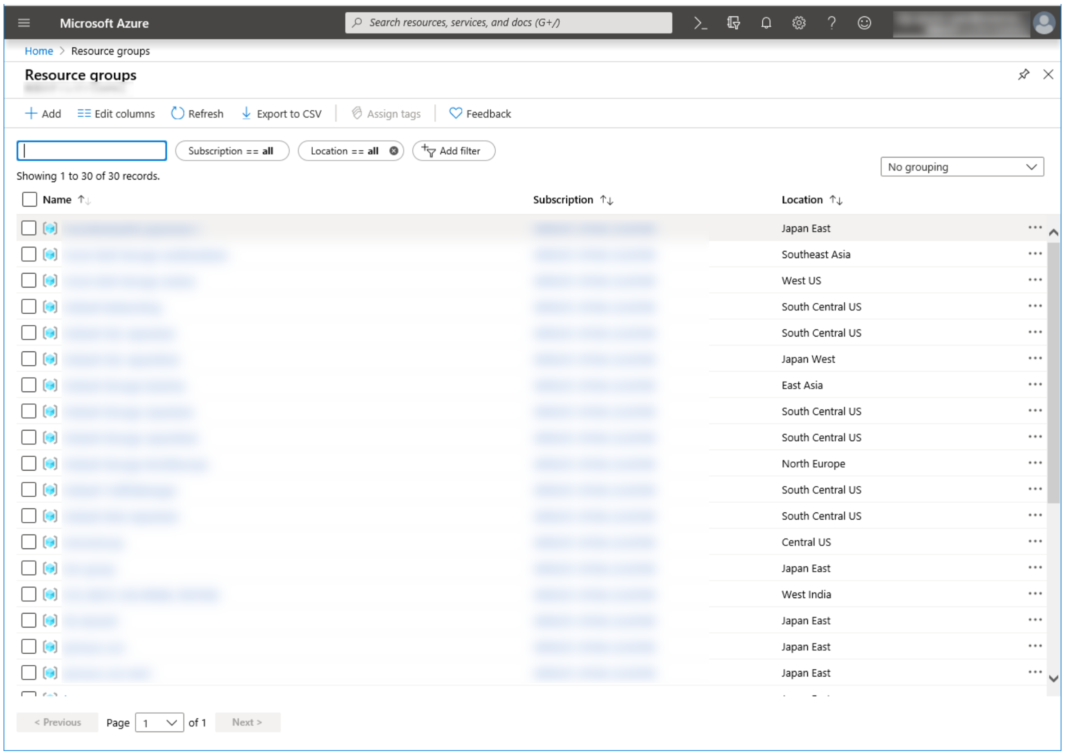
   Log in to the Microsoft Azure portal (https://portal.azure.com/) and create a resource group following the steps below.

   1. Select the **Resource groups** icon on the upper part of the window. If there are existing resource groups, they are displayed in a list.



NAME	TYPE	LAST VIEWED
[illegible]	[illegible]	22 min ago
[illegible]	[illegible]	24 min ago
[illegible]	[illegible]	24 min ago
[illegible]	[illegible]	26 min ago
[illegible]	[illegible]	26 min ago
[illegible]	[illegible]	27 min ago
[illegible]	[illegible]	28 min ago
[illegible]	[illegible]	28 min ago
[illegible]	[illegible]	28 min ago
[illegible]	[illegible]	29 min ago
[illegible]	[illegible]	30 min ago
[illegible]	[illegible]	32 min ago

   2. Select **+Add** at the upper part of the window.

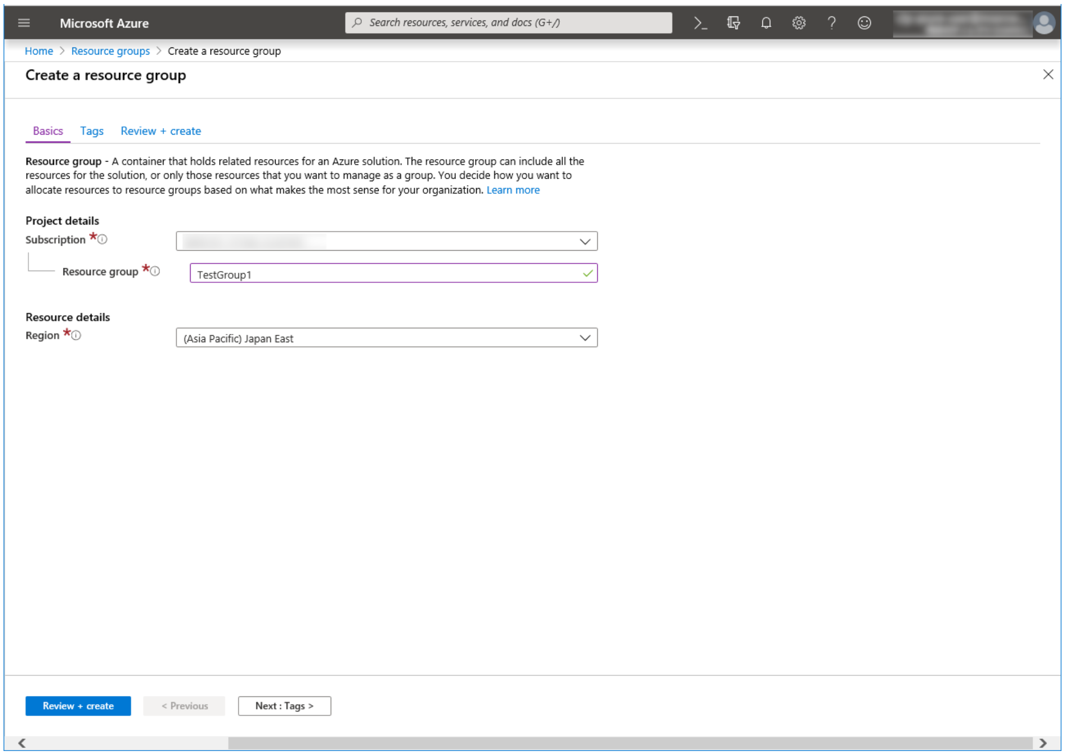


Resource groups

Showing 1 to 30 of 30 records.

Name	Subscription	Location
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	Southeast Asia
[redacted]	[redacted]	West US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	Japan West
[redacted]	[redacted]	East Asia
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	North Europe
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	Central US
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	West India
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	Japan East

3. Specify **Subscription**, **Resource group**, and **Region**, and click **Review+Create**.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > Resource groups > Create a resource group
Basics
Tags
Review + create
Review + create
< Previous
Next : Tags >

Create a resource group

Resource group - A container that holds related resources for an Azure solution. The resource group can include all the resources for the solution, or only those resources that you want to manage as a group. You decide how you want to allocate resources to resource groups based on what makes the most sense for your organization. Learn more

Project details

Subscription *: [redacted]

Resource group *: TestGroup1

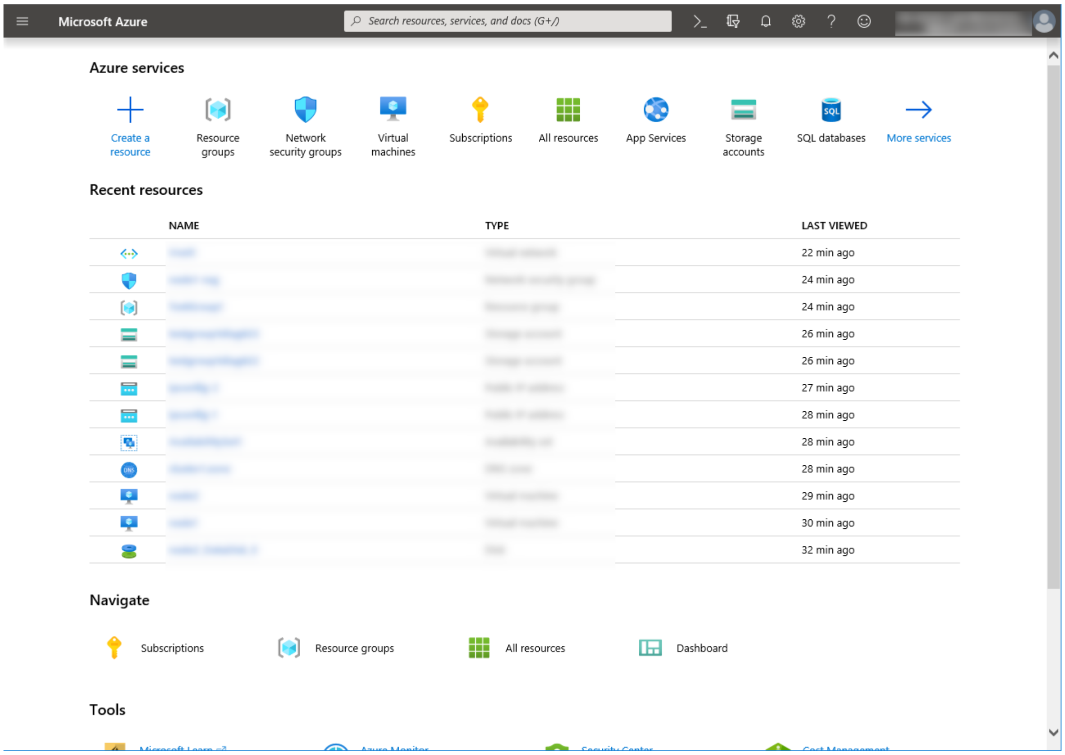
Resource details

Region *: (Asia Pacific) Japan East

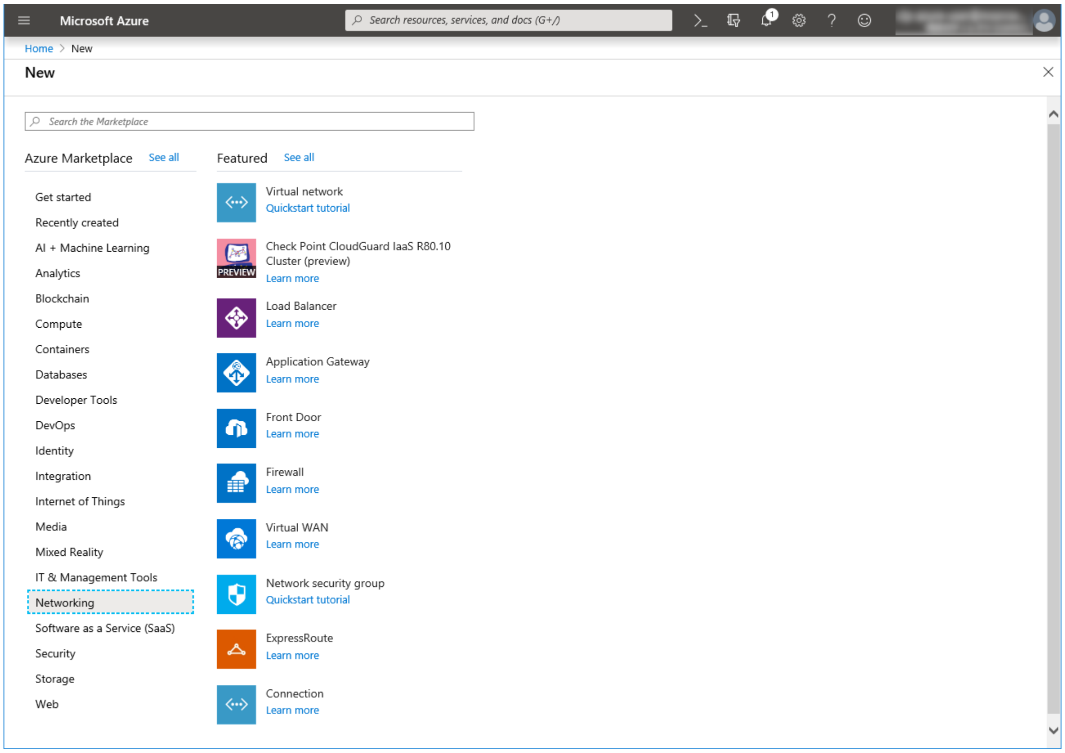
2. **Creating a virtual network**

Log in to the Microsoft Azure portal (https://portal.azure.com/) and create a virtual network following the steps below.

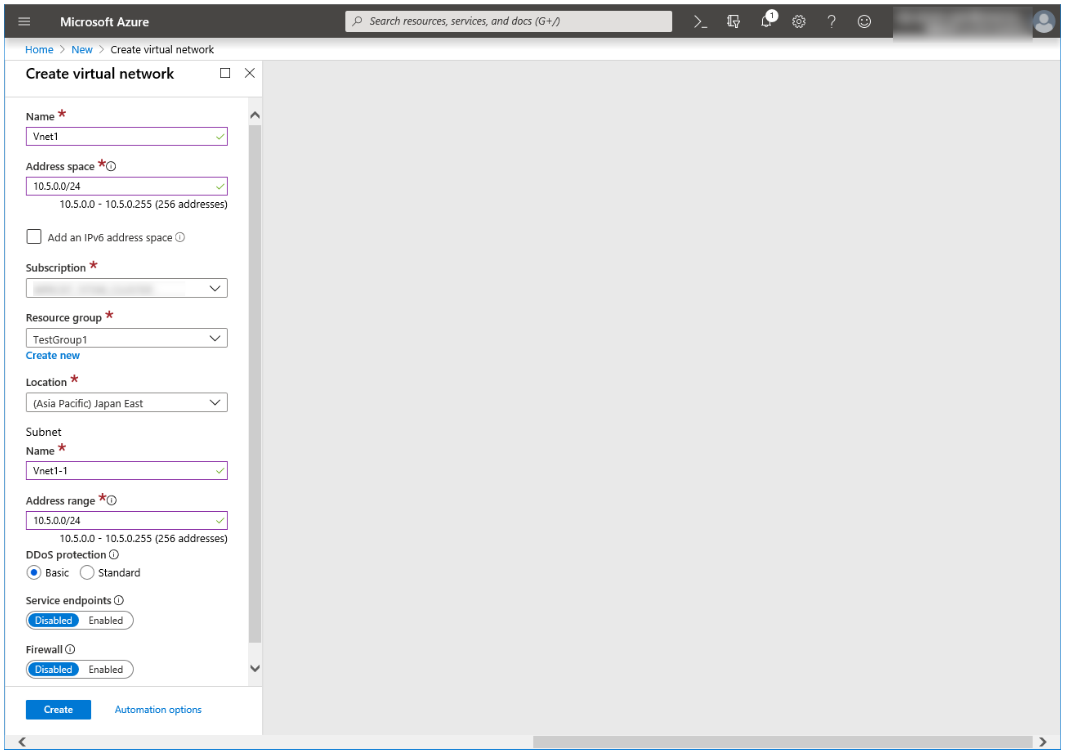
1. Select the **Create a resource** icon on the upper part of the window.



2. Select **Networking** and then **Virtual network**.



3. Specify **Name**, **Address space**, **Subscription**, **Resource group**, **Location**, **Name** of Subnet, and **Address range** of Subnet, and click **Create**.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create virtual network
Create virtual network

Name *
Vnet1

Address space * ⓘ
10.5.0.0/24
10.5.0.0 - 10.5.0.255 (256 addresses)

□ Add an IPv6 address space ⓘ

Subscription *
[redacted]

Resource group *
TestGroup1
Create new

Location *
(Asia Pacific) Japan East

Subnet

Name *
Vnet1-1

Address range * ⓘ
10.5.0.0/24
10.5.0.0 - 10.5.0.255 (256 addresses)

DDoS protection ⓘ
● Basic ○ Standard

Service endpoints ⓘ
Disabled | Enabled

Firewall ⓘ
Disabled | Enabled

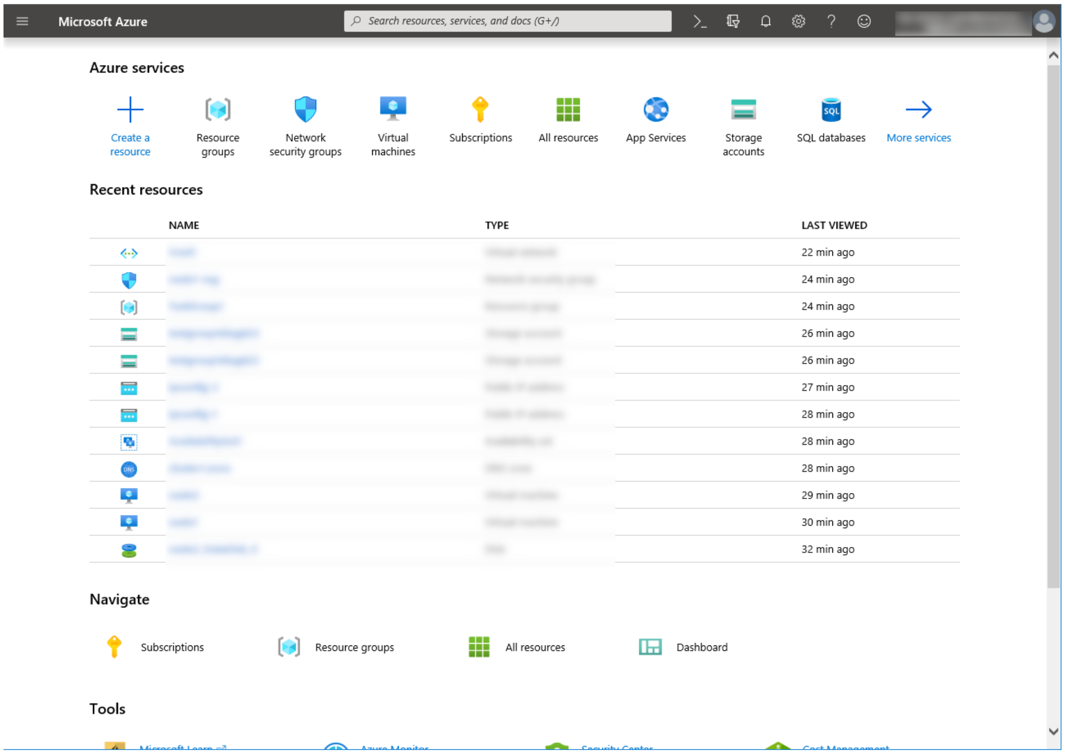
Create
Automation options

3. **Creating a virtual machine**

   Log in to the Microsoft Azure portal (https://portal.azure.com/) and create virtual machines and disks following the steps below.

   Create as many virtual machines as required to create a cluster. Create node1 and then node2.

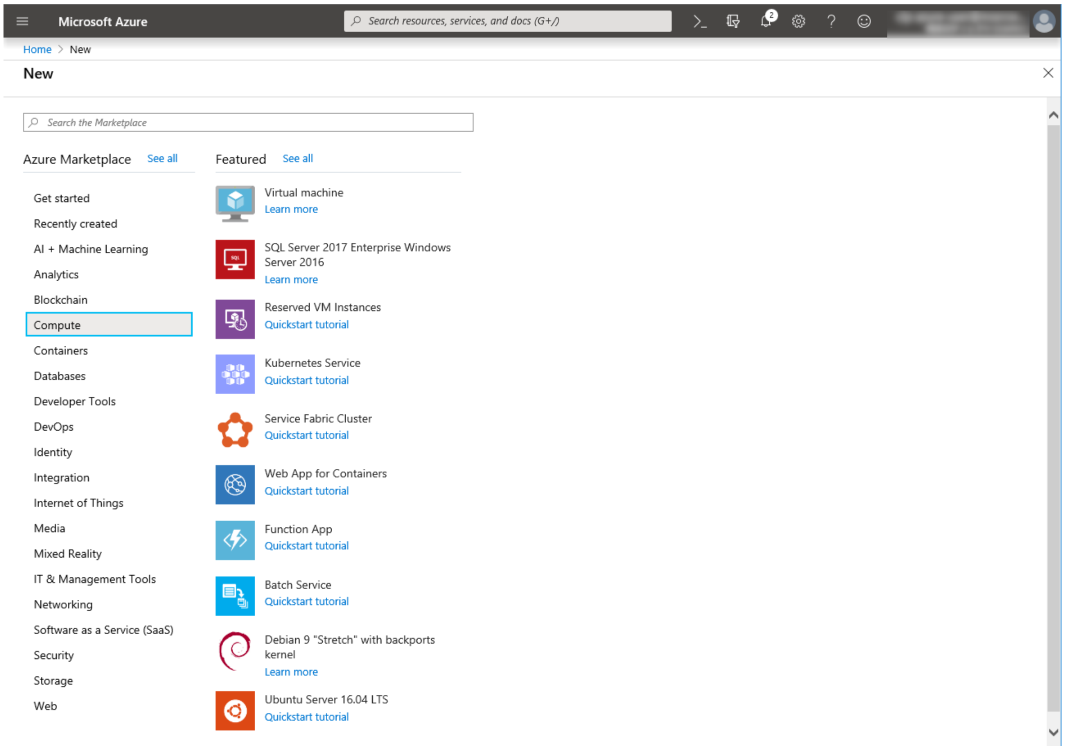
   1. Select the **Create a resource** icon on the upper part of the window.



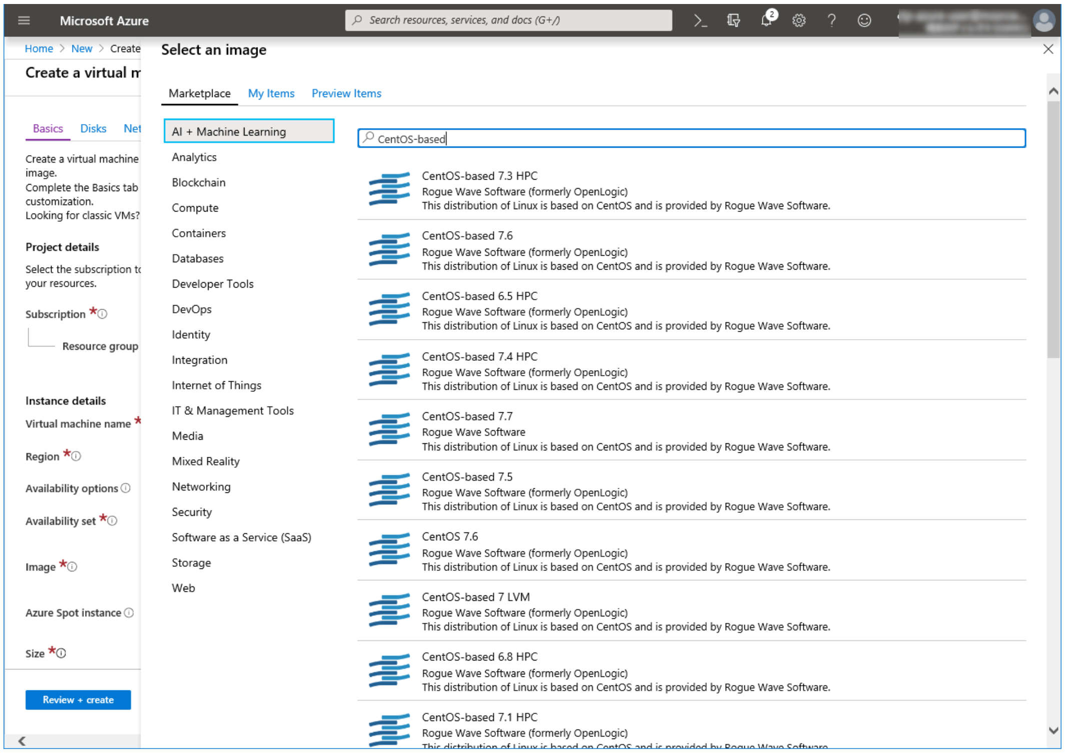
Recent resources

NAME	TYPE	LAST VIEWED
[redacted]	[redacted]	22 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	27 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	29 min ago
[redacted]	[redacted]	30 min ago
[redacted]	[redacted]	32 min ago

2. Select **Compute** and then **See all**.



3. Select **CentOS-based 7.6**



Create a virtual machine image.
Complete the Basics tab customization.
Looking for classic VMs?

Select the subscription to your resources.

CentOS-based 7.3 HPC
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 7.6
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 6.5 HPC
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 7.4 HPC
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 7.7
Rogue Wave Software
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 7.5
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS 7.6
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 7 LVM
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 6.8 HPC
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

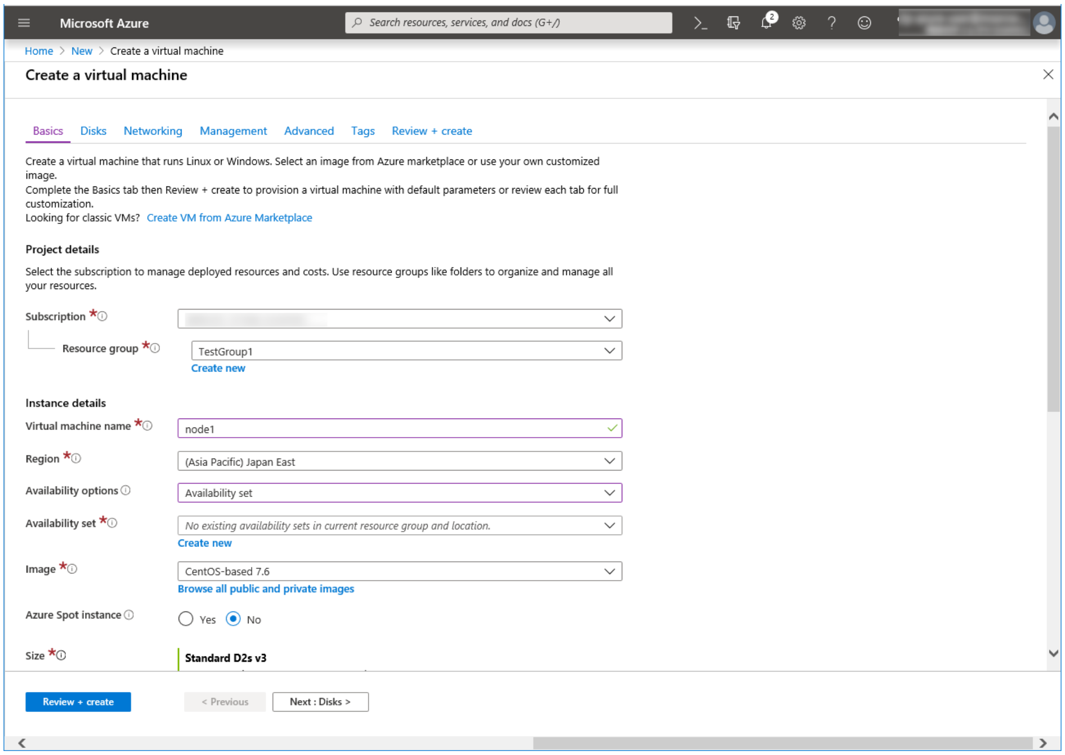
CentOS-based 7.1 HPC
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

4. Click **Create**.

5. When the **Basics** tab appears, specify the settings of **Subscription**, **Resource group**, **Virtual**

machine name, **Region**, **Image**, **Size**, **Username**, **Password**, and **Confirm password**.

Select **Availability set** from **Availability options**, and click **Create new** under the **Availability set** field. When **Create new** appears, specify the settings of **Name**, **Fault domains**, and **Update domains**. Then click **OK**.



Create a virtual machine

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image.
Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization.
Looking for classic VMs? Create VM from Azure Marketplace

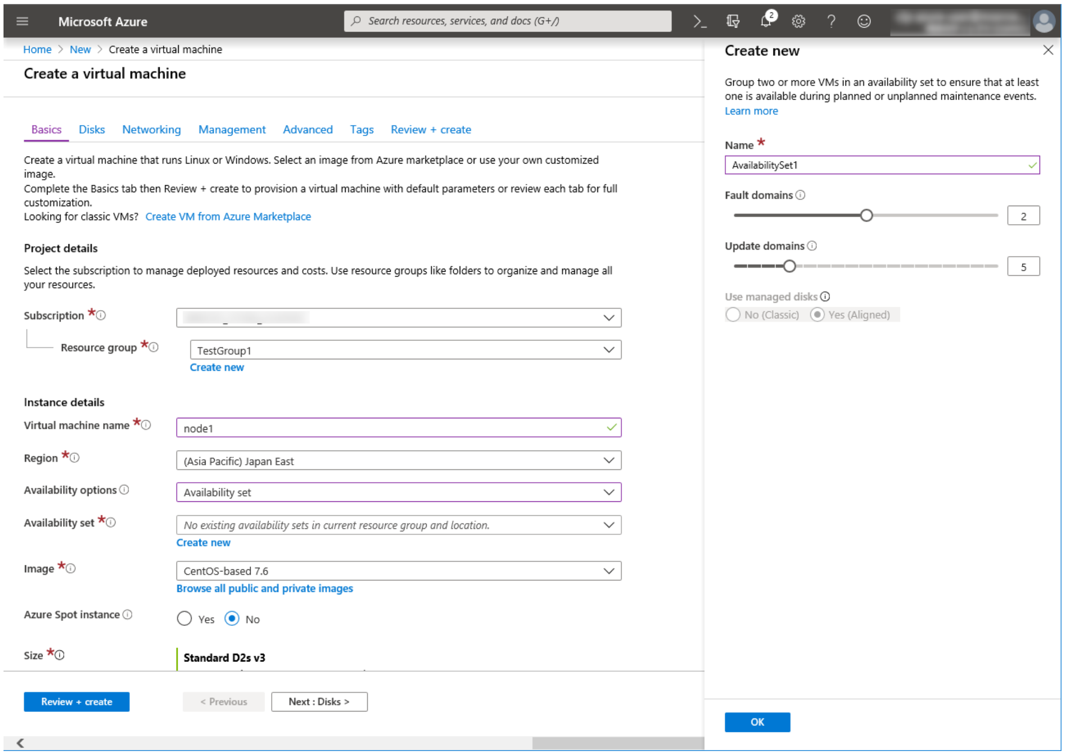
Project details

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

Subscription *: [redacted]
Resource group *: TestGroup1
Create new

Instance details

Virtual machine name *: node1
Region *: (Asia Pacific) Japan East
Availability options: Availability set
Availability set *: *No existing availability sets in current resource group and location.*
Create new
Image *: CentOS-based 7.6
Browse all public and private images
Azure Spot instance: ○ Yes ● No
Size *: **Standard D2s v3**



Create a virtual machine

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image.
Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization.
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Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription *: [redacted]
Resource group *: TestGroup1
Create new

Instance details

Virtual machine name *: node1
Region *: (Asia Pacific) Japan East
Availability options: Availability set
Availability set *: *No existing availability sets in current resource group and location.*
Create new
Image *: CentOS-based 7.6
Browse all public and private images
Azure Spot instance: ○ Yes ● No
Size *: **Standard D2s v3**

Create new

Group two or more VMs in an availability set to ensure that at least one is available during planned or unplanned maintenance events.
Learn more

Name *: AvailabilitySet1
Fault domains: 2
Update domains: 5
Use managed disks: ○ No (Classic) ● Yes (Aligned)

6. Click **Change size** to display **Select a VM size**.

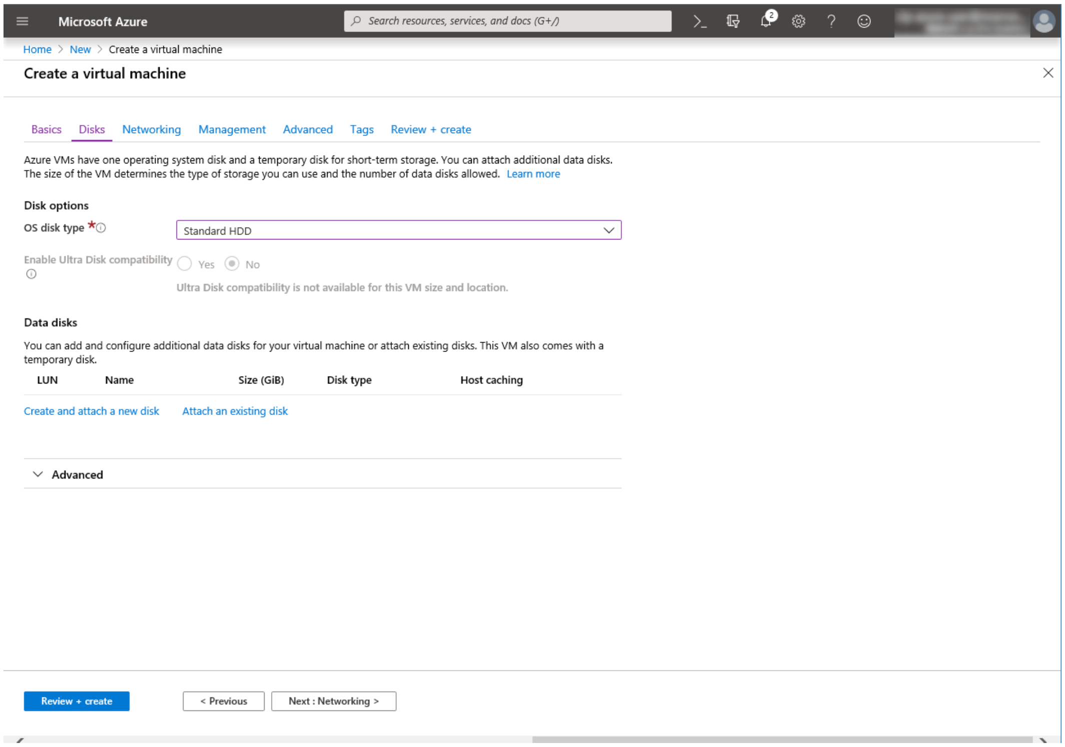
From the list, choose a size (**Standard - A1** in this guide) suitable for your virtual machine and click **Select**.

Regarding the **Virtual machine name**, node1 is for node1, and node2 is for node2.

Click **Next: Disks >**

7. When the **Disks** tab appears, go through the following steps to add a disk to be used for a mirror disk (cluster partition or data partition).

   From the **DATA DISKS** list, click **Create and attach a new disk**.

   Create a virtual machine

   Azure VMs have one operating system disk and a temporary disk for short-term storage. You can attach additional data disks. The size of the VM determines the type of storage you can use and the number of data disks allowed.

   OS disk type *: Standard HDD

   Enable Ultra Disk compatibility: ○ Yes ● No

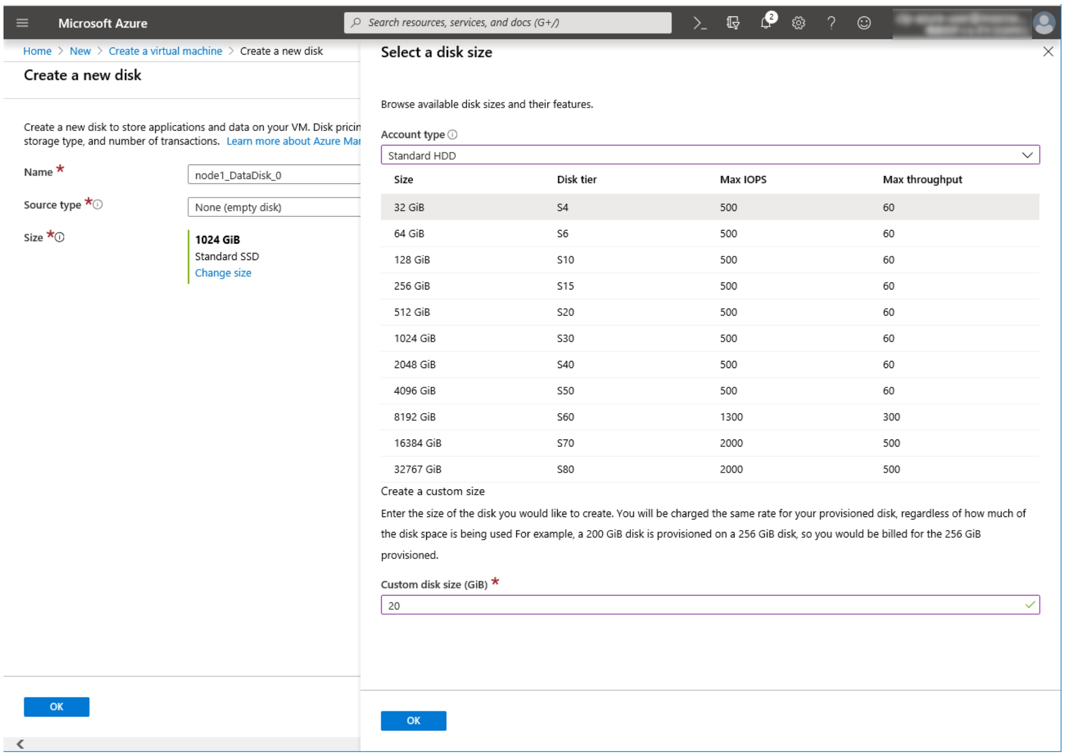
   Ultra Disk compatibility is not available for this VM size and location.

   You can add and configure additional data disks for your virtual machine or attach existing disks. This VM also comes with a temporary disk.

8. **Create a new disk** appears.

   Specify the settings of **Name**, **Source type** and **Size**. Then click **OK**.

   Click **Next: Networking >**.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create a virtual machine > Create a new disk

Create a new disk

Create a new disk to store applications and data on your VM. Disk pricin
storage type, and number of transactions. Learn more about Azure Mar

Name * node1_DataDisk_0

Source type * None (empty disk)

Size * 1024 GiB
Standard SSD
Change size

Select a disk size

Browse available disk sizes and their features.

Account type: Standard HDD

Size	Disk tier	Max IOPS	Max throughput
32 GiB	S4	500	60
64 GiB	S6	500	60
128 GiB	S10	500	60
256 GiB	S15	500	60
512 GiB	S20	500	60
1024 GiB	S30	500	60
2048 GiB	S40	500	60
4096 GiB	S50	500	60
8192 GiB	S60	1300	300
16384 GiB	S70	2000	500
32767 GiB	S80	2000	500

Create a custom size

Enter the size of the disk you would like to create. You will be charged the same rate for your provisioned disk, regardless of how much of the disk space is being used For example, a 200 GiB disk is provisioned on a 256 GiB disk, so you would be billed for the 256 GiB provisioned.

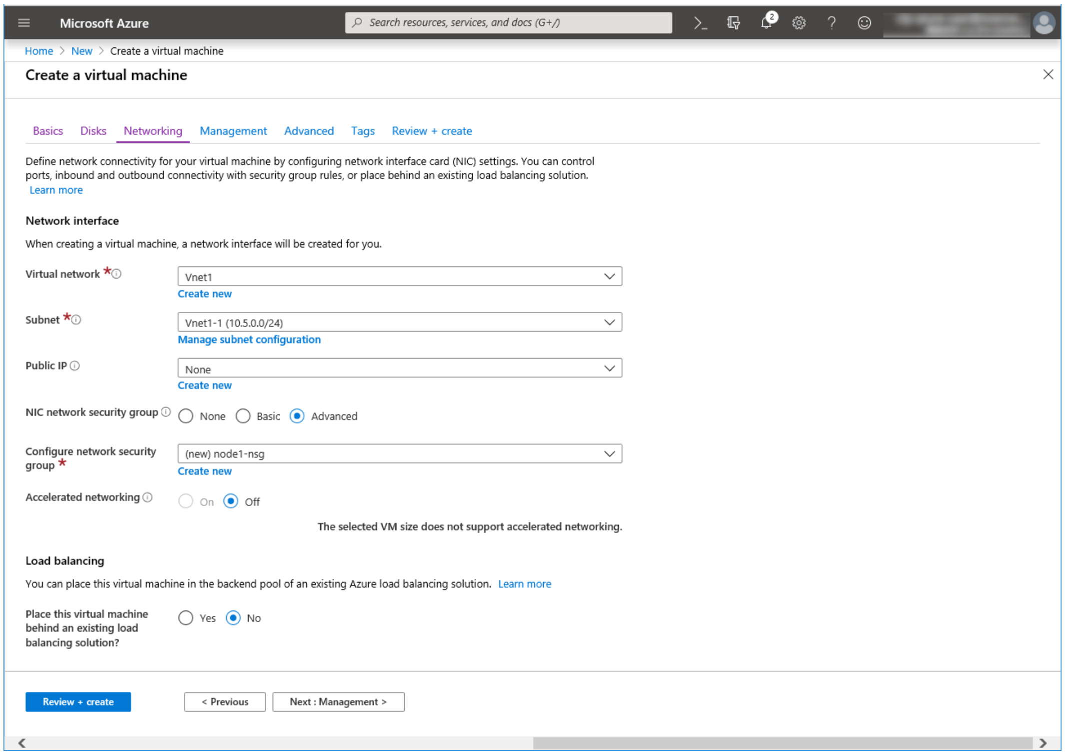
Custom disk size (GiB) * 20

9. The **Networking** tab appears.

   Specify the settings of **Virtual network**, **Subnet**, **NIC Network security group**, and **Configure network security group**.

   Click **Create new** under the **Configure network security group** field to display **Create network security group**. Specify the setting of **Name** and then click **OK**.

   Click **Next: Management >**.



Create a virtual machine

Define network connectivity for your virtual machine by configuring network interface card (NIC) settings. You can control ports, inbound and outbound connectivity with security group rules, or place behind an existing load balancing solution.

Network interface

When creating a virtual machine, a network interface will be created for you.

Virtual network * : Vnet1

Subnet * : Vnet1-1 (10.5.0.0/24)

Public IP : None

NIC network security group : ○ None ○ Basic ● Advanced

Configure network security group * : (new) node1-nsg

Accelerated networking : ○ On ● Off

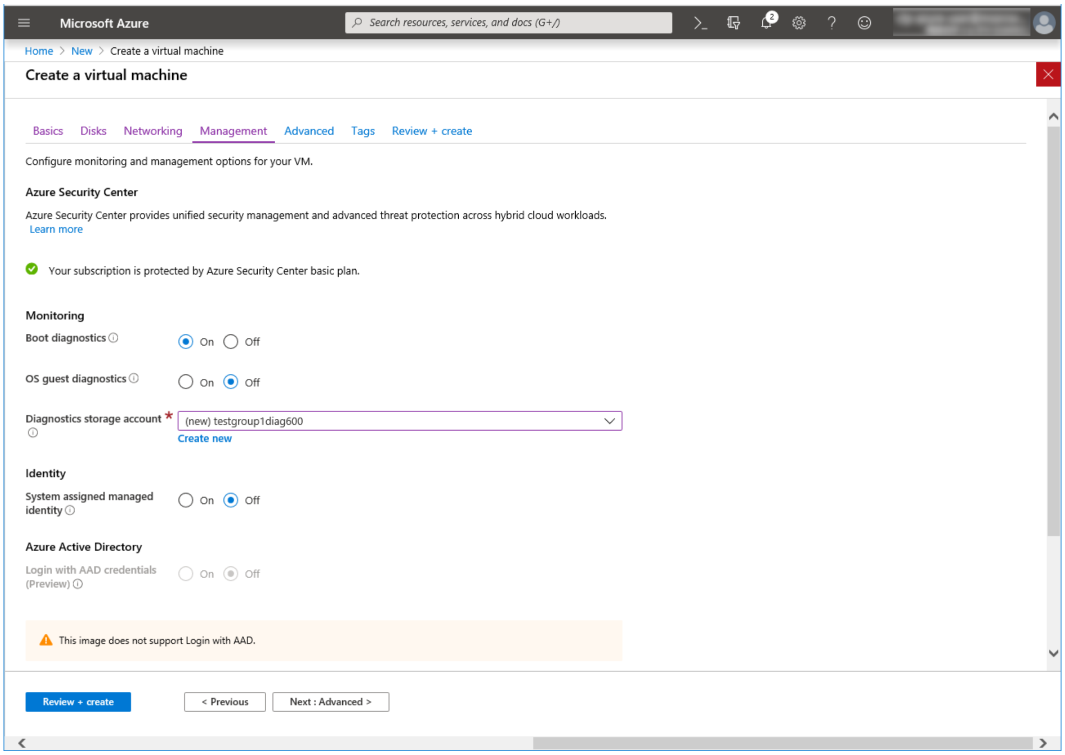
The selected VM size does not support accelerated networking.

Load balancing

You can place this virtual machine in the backend pool of an existing Azure load balancing solution.

Place this virtual machine behind an existing load balancing solution? ○ Yes ● No

10. The **Management** tab appears.
    Click **Create new** under the **Diagnostics storage account** field to display **Create storage account**.
    Specify the settings of **Name**, **Account kind**, and **Replication**. Then click **OK**.
    In the **Diagnostics storage account** field, the default value is automatically generated and entered.
    Click **Next: Details >**.



Create a virtual machine

Configure monitoring and management options for your VM.

Azure Security Center

Azure Security Center provides unified security management and advanced threat protection across hybrid cloud workloads.

✓ Your subscription is protected by Azure Security Center basic plan.

Monitoring

Boot diagnostics : ● On ○ Off

OS guest diagnostics : ○ On ● Off

Diagnostics storage account * : (new) testgroup1diag600

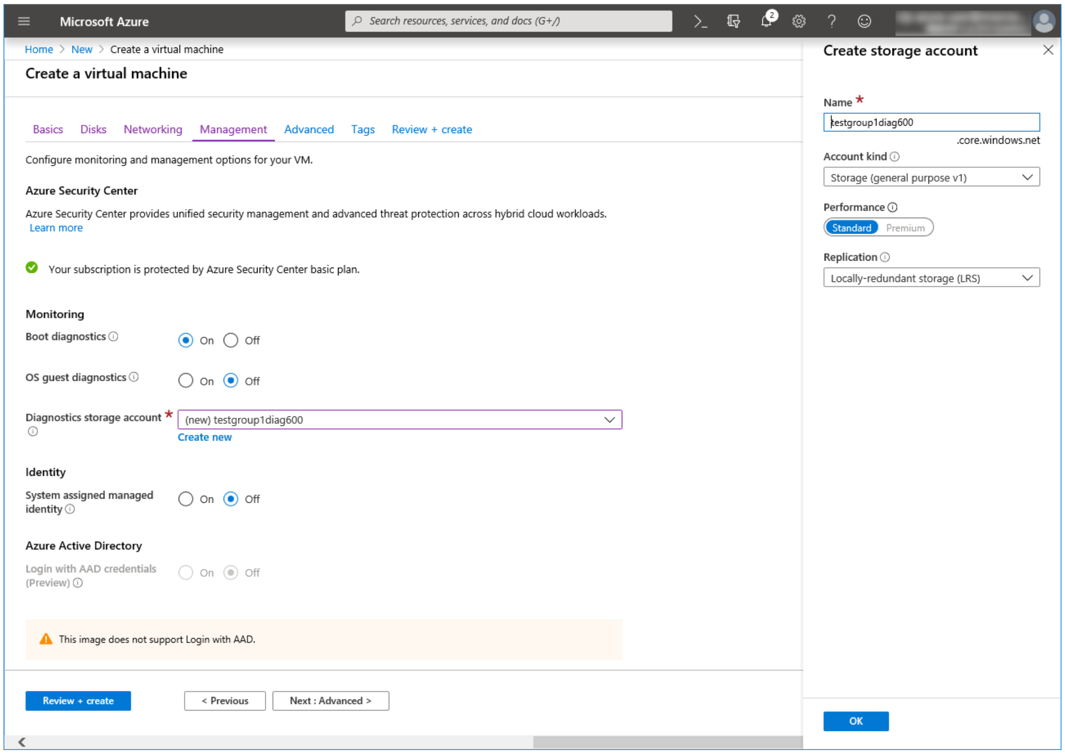
Identity

System assigned managed identity : ○ On ● Off

Azure Active Directory

Login with AAD credentials (Preview) : ○ On ● Off

⚠ This image does not support Login with AAD.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create a virtual machine

Create a virtual machine

Basics
Disks
Networking
Management
Advanced
Tags
Review + create

Configure monitoring and management options for your VM.

Azure Security Center

Azure Security Center provides unified security management and advanced threat protection across hybrid cloud workloads. Learn more

Your subscription is protected by Azure Security Center basic plan.

Monitoring

Boot diagnostics ● On ○ Off

OS guest diagnostics ○ On ● Off

Diagnostics storage account * (new) testgroup1diag600

Create new

Identity

System assigned managed identity ○ On ● Off

Azure Active Directory

Login with AAD credentials (Preview) ○ On ● Off

This image does not support Login with AAD.

Create storage account

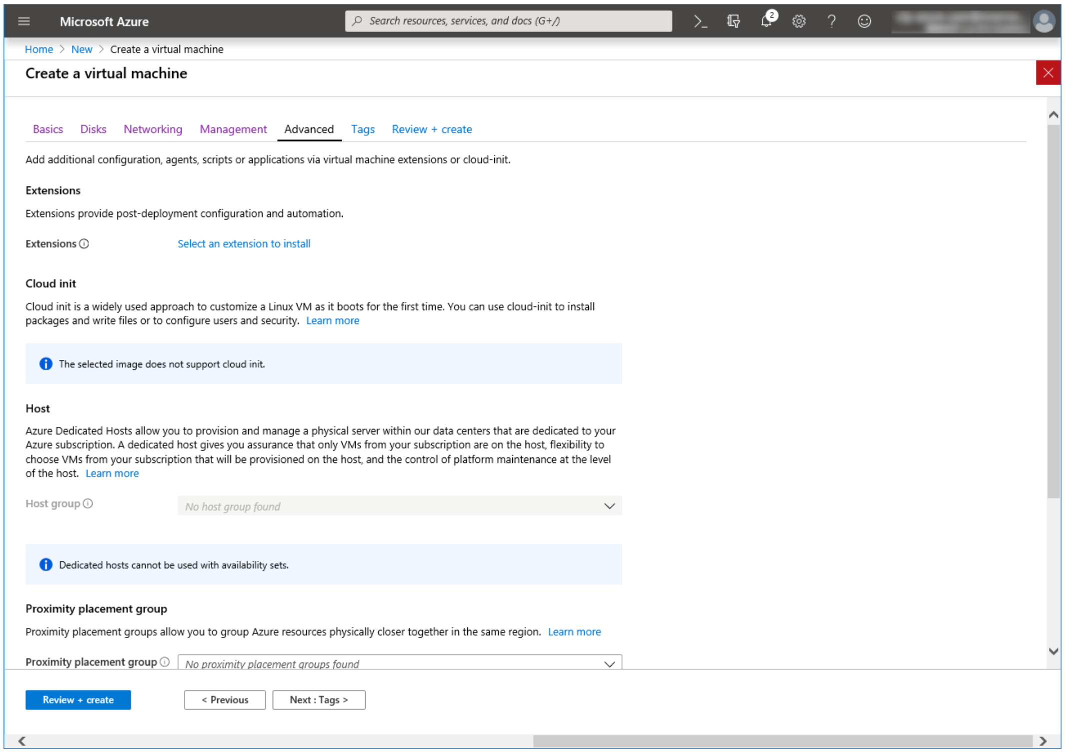
Name * testgroup1diag600 .core.windows.net

Account kind: Storage (general purpose v1)

Performance: Standard | Premium

Replication: Locally-redundant storage (LRS)

11. Click **Next: Tags >**.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create a virtual machine

Create a virtual machine

Basics
Disks
Networking
Management
Advanced
Tags
Review + create

Add additional configuration, agents, scripts or applications via virtual machine extensions or cloud-init.

Extensions

Extensions provide post-deployment configuration and automation.

Extensions: Select an extension to install

Cloud init

Cloud init is a widely used approach to customize a Linux VM as it boots for the first time. You can use cloud-init to install packages and write files or to configure users and security. Learn more

The selected image does not support cloud init.

Host

Azure Dedicated Hosts allow you to provision and manage a physical server within our data centers that are dedicated to your Azure subscription. A dedicated host gives you assurance that only VMs from your subscription are on the host, flexibility to choose VMs from your subscription that will be provisioned on the host, and the control of platform maintenance at the level of the host. Learn more

Host group: No host group found

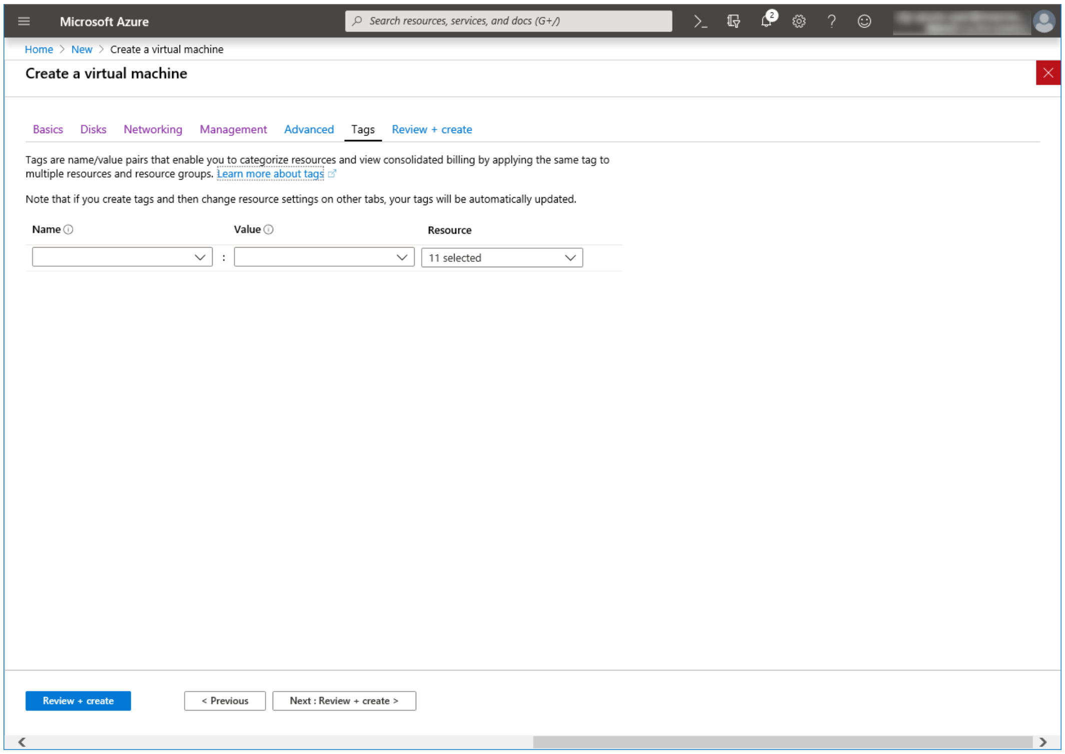
Dedicated hosts cannot be used with availability sets.

Proximity placement group

Proximity placement groups allow you to group Azure resources physically closer together in the same region. Learn more

Proximity placement group: No proximity placement groups found

12. Click **Next: Review + create >**.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create a virtual machine
Review + create
< Previous
Next : Review + create >

Create a virtual machine

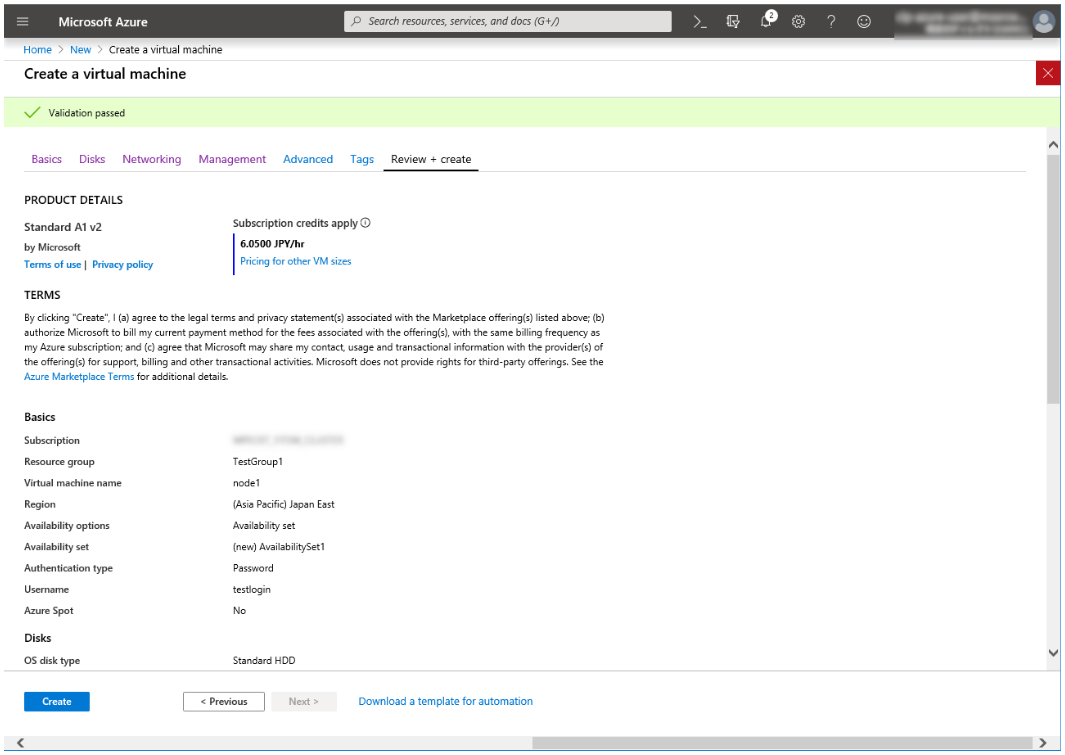
Basics | Disks | Networking | Management | Advanced | Tags | Review + create

Tags are name/value pairs that enable you to categorize resources and view consolidated billing by applying the same tag to multiple resources and resource groups. Learn more about tags

Note that if you create tags and then change resource settings on other tabs, your tags will be automatically updated.

Name		Value	Resource
	:		11 selected

13. The **Review + create** tab appears. Check the contents. If there is no problem, click **Create**. The deployment starts and takes several minutes.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create a virtual machine
Create
< Previous
Next >
Download a template for automation

Create a virtual machine

Validation passed

Basics | Disks | Networking | Management | Advanced | Tags | Review + create

PRODUCT DETAILS

Standard A1 v2
by Microsoft
Terms of use | Privacy policy

Subscription credits apply
6.0500 JPY/hr
Pricing for other VM sizes

TERMS

By clicking "Create", I (a) agree to the legal terms and privacy statement(s) associated with the Marketplace offering(s) listed above; (b) authorize Microsoft to bill my current payment method for the fees associated with the offering(s), with the same billing frequency as my Azure subscription; and (c) agree that Microsoft may share my contact, usage and transactional information with the provider(s) of the offering(s) for support, billing and other transactional activities. Microsoft does not provide rights for third-party offerings. See the Azure Marketplace Terms for additional details.

Basics

Subscription	[redacted]
Resource group	TestGroup1
Virtual machine name	node1
Region	(Asia Pacific) Japan East
Availability options	Availability set
Availability set	(new) AvailabilitySet1
Authentication type	Password
Username	testlogin
Azure Spot	No

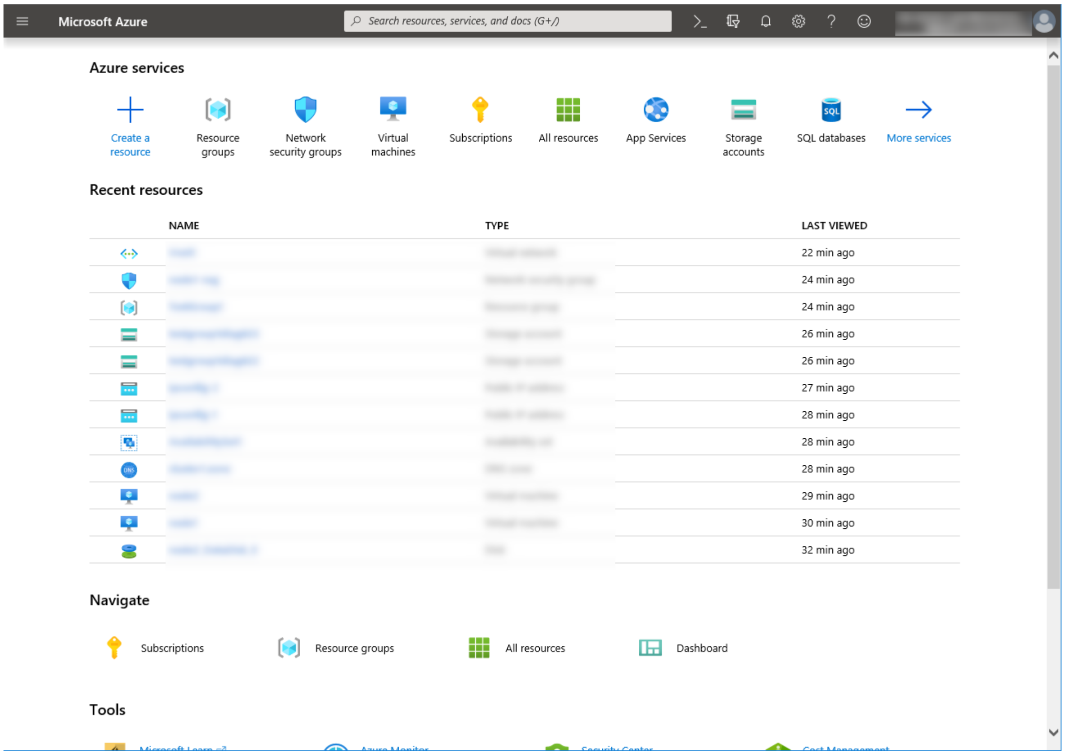
Disks

OS disk type	Standard HDD

4. **Setting a private IP address**

   Log in to the Microsoft Azure portal (https://portal.azure.com/) and change the private IP address setting following the steps below. Since an IP address is initially set to be assigned dynamically, change the setting so that an IP address is assigned statically. Change the settings of node1 and then node2.

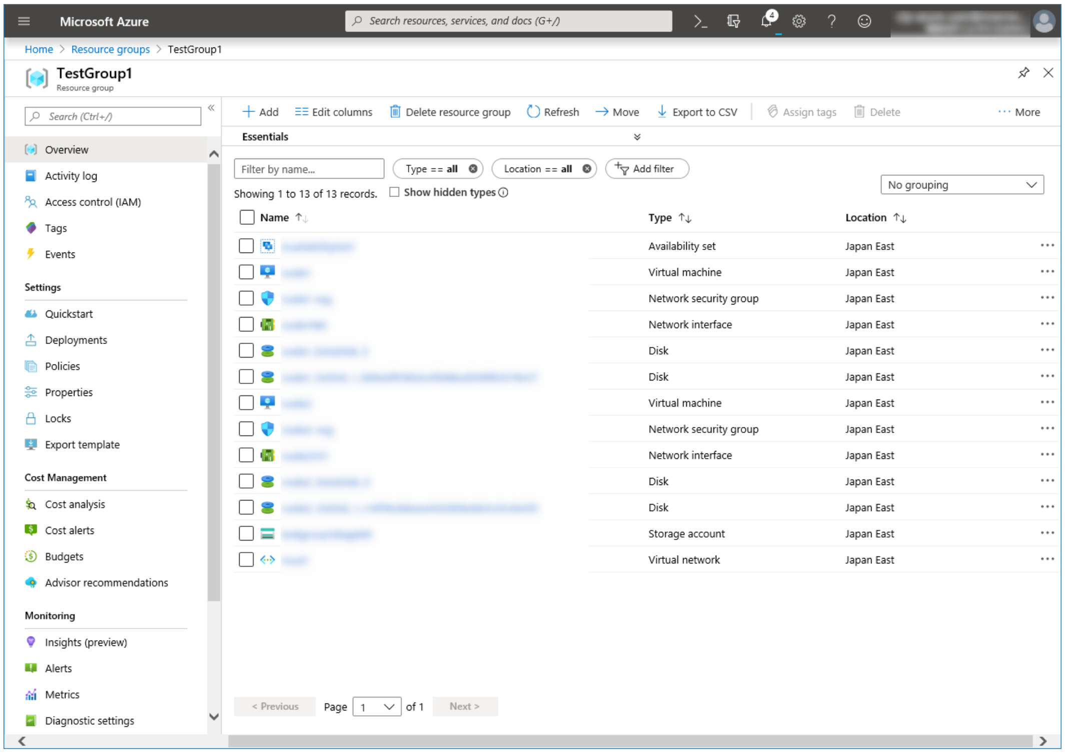
1. Select the **Resource groups** icon on the upper part of the window.



NAME	TYPE	LAST VIEWED
[redacted]	[redacted]	22 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	27 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	29 min ago
[redacted]	[redacted]	30 min ago
[redacted]	[redacted]	32 min ago

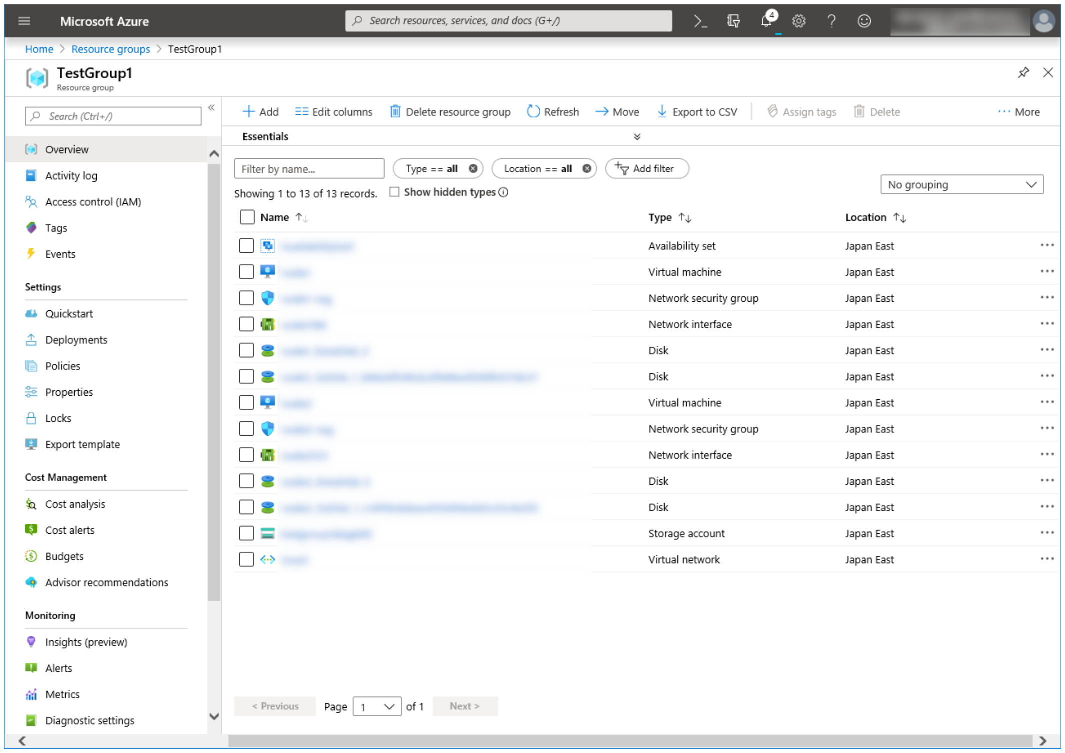
2. Select TestGroup1 from the resource group list.

3. The summary of TestGroup1 is displayed. Select virtual machine node1 or node2 from the item list.



Name	Type	Location
[redacted]	Availability set	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Storage account	Japan East
[redacted]	Virtual network	Japan East

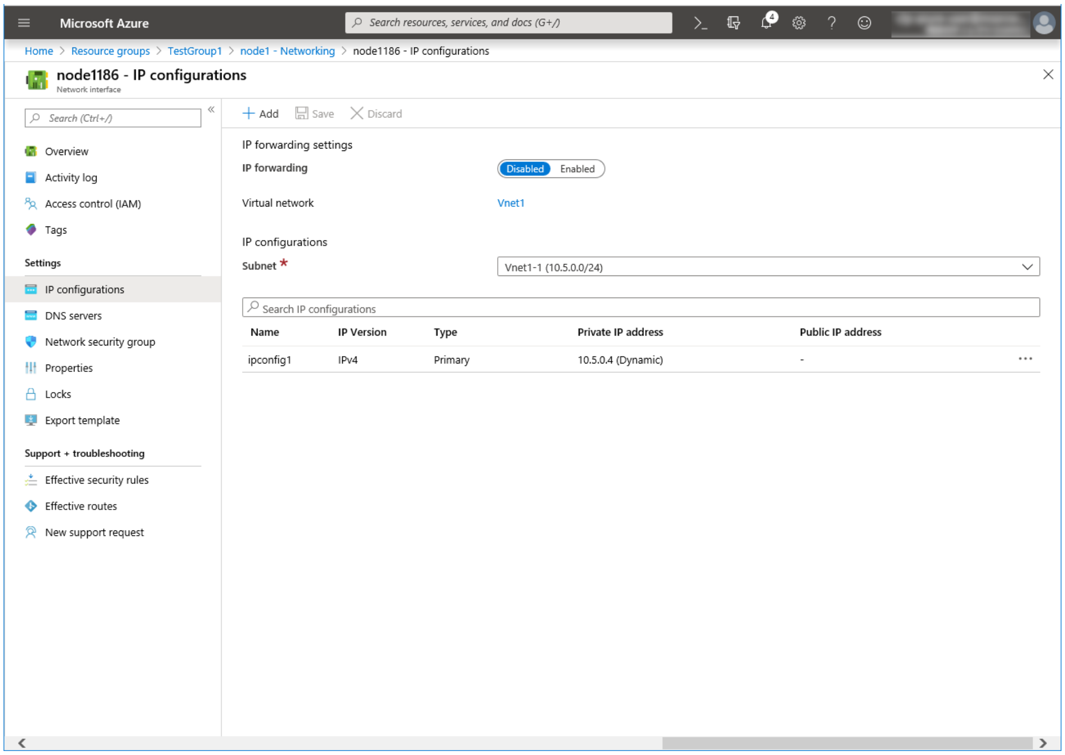
4. Select **Networking**.



Name	Type	Location
[redacted]	Availability set	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Storage account	Japan East
[redacted]	Virtual network	Japan East

5. Select a network interface displayed in the list. The network interface name is generated automatically.

6. Select **IP configurations**.



IP forwarding settings

IP forwarding: [✓ Disabled] Enabled

Virtual network: Vnet1

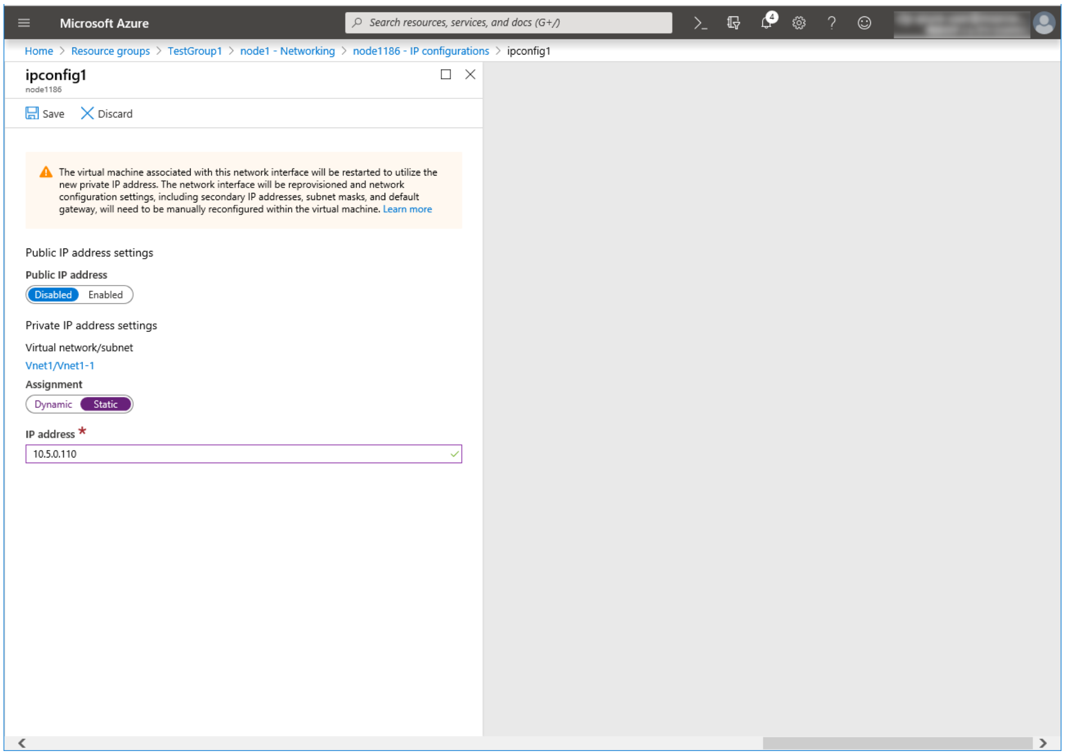
IP configurations

Subnet *: Vnet1-1 (10.5.0.0/24)

Name	IP Version	Type	Private IP address	Public IP address
ipconfig1	IPv4	Primary	10.5.0.4 (Dynamic)	-

7. Only ipconfig1 is displayed in the list. Select it.

8. Select **Static** for **Assignment** under **Private IP address settings**. Enter the IP address to be assigned statically in the **IP address** text box and click **Save** at the top of the window. The IP address of node1 is 10.5.0.110. The IP address of node2 is 10.5.0.111.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > Resource groups > TestGroup1 > node1 - Networking > node1186 - IP configurations > ipconfig1
ipconfig1
node1186
Save
Discard

The virtual machine associated with this network interface will be restarted to utilize the new private IP address. The network interface will be reprovisioned and network configuration settings, including secondary IP addresses, subnet masks, and default gateway, will need to be manually reconfigured within the virtual machine. Learn more

Public IP address settings

Public IP address: [✓ Disabled] Enabled

Private IP address settings

Virtual network/subnet: Vnet1/Vnet1-1

Assignment: Dynamic [✓ Static]

IP address *: 10.5.0.110

9. The virtual machines restart automatically so that new private IP addresses can be used.

5. **Configuring virtual machines**

   Log in to the created node1 and node2 and specify the settings following the procedure below.

   Set a partition for the mirror disk resource. Create a file system in the added disk.

   Secure an area in the added disk by using the fdisk command and then create a file system.

   For details about the partition for the mirror disk resource, see "Partition settings for Mirror disk resource (when using Replicator)." in "Settings after configuring hardware" in "Determining a system configuration".in the Installation and Configuration Guide.

   1. Check the partition list. In the following example, the last line shows the added disk.

```
$ cat /proc/partitions
major minor  #blocks  name

   2        0          4 fd0
   8        0   31457280 sda
   8        1     512000 sda1
   8        2   30944256 sda2
   8       16   73400320 sdb
   8       17   73398272 sdb1
   8       32   20971520 sdc
```

   2. Create a cluster partition and data partition in the added disk by using the fdisk command. Allocate 1 GB (1*1024*1024*1024 bytes) or more to a cluster partition. (If the size is specified as just 1 GB,

the actual size will be larger than 1 GB depending on the disk geometry difference. This is not a problem.) Also, do not create a file system in a cluster partition.

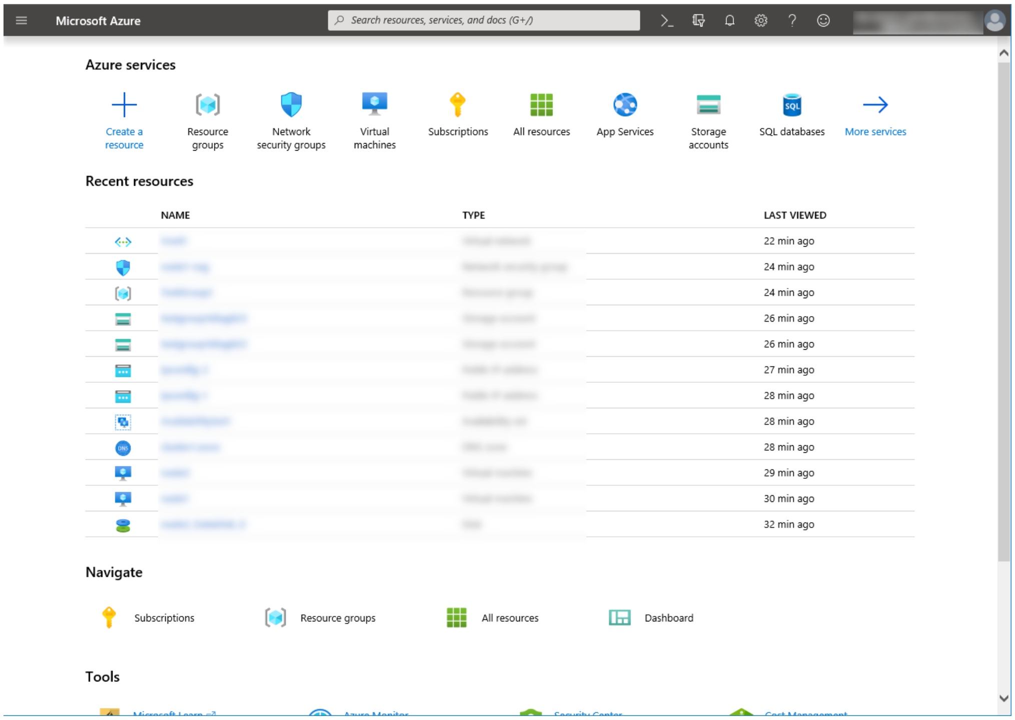
3. If you select **Execute initial mkfs** when creating the cluster configuration data by using Cluster WebUI, EXPRESSCLUSTER creates a file system automatically. Note that existing data in the partition will be lost.

6. **Configuring a load balancer**

Log in to the Microsoft Azure portal (https://portal.azure.com/) and add a load balancer following the steps below.
For details, see the following websites:

- Load Balancer documentaion:
https://docs.microsoft.com/en-us/azure/load-balancer/

1. Select the **Create a resource** icon on the upper part of the window.



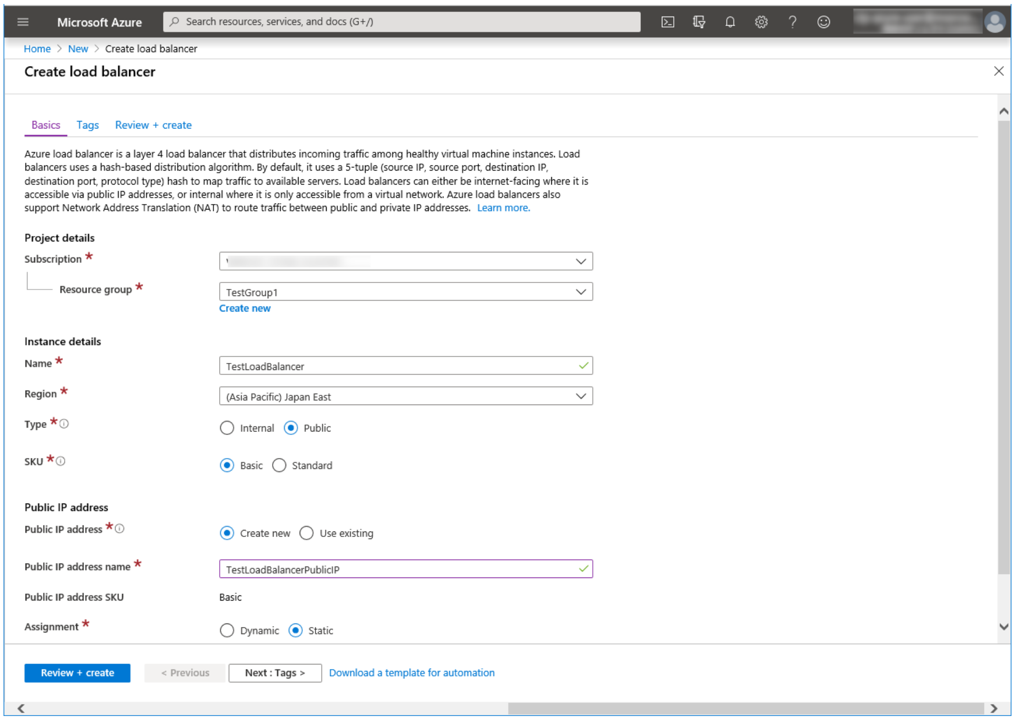
NAME	TYPE	LAST VIEWED
[redacted]	[redacted]	22 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	27 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	29 min ago
[redacted]	[redacted]	30 min ago
[redacted]	[redacted]	32 min ago

2. Select **Networking** and then **Load Balancer**.

3. The **Create load balancer** blade is displayed. Specify **Name**. Select **Public** for **Type** and **Basic** for **SKU**, respectively.

4. Specify **Create new**, **Public IP address Name** and **Assignment** for **Public IP address**.

5. Specify **Subscription**, **Resource group**, and **Region**, and click **Review+create**. Then click **Create**. Deploying the load balancer starts. This processing takes several minutes.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create load balancer
Review + create
< Previous
Next : Tags >
Download a template for automation

Create load balancer

Basics | Tags | Review + create

Azure load balancer is a layer 4 load balancer that distributes incoming traffic among healthy virtual machine instances. Load balancers uses a hash-based distribution algorithm. By default, it uses a 5-tuple (source IP, source port, destination IP, destination port, protocol type) hash to map traffic to available servers. Load balancers can either be internet-facing where it is accessible via public IP addresses, or internal where it is only accessible from a virtual network. Azure load balancers also support Network Address Translation (NAT) to route traffic between public and private IP addresses. Learn more.

Project details

Subscription *: [redacted]

Resource group *: TestGroup1
Create new

Instance details

Name *: TestLoadBalancer

Region *: (Asia Pacific) Japan East

Type *: ○ Internal ● Public

SKU *: ● Basic ○ Standard

Public IP address

Public IP address *: ● Create new ○ Use existing

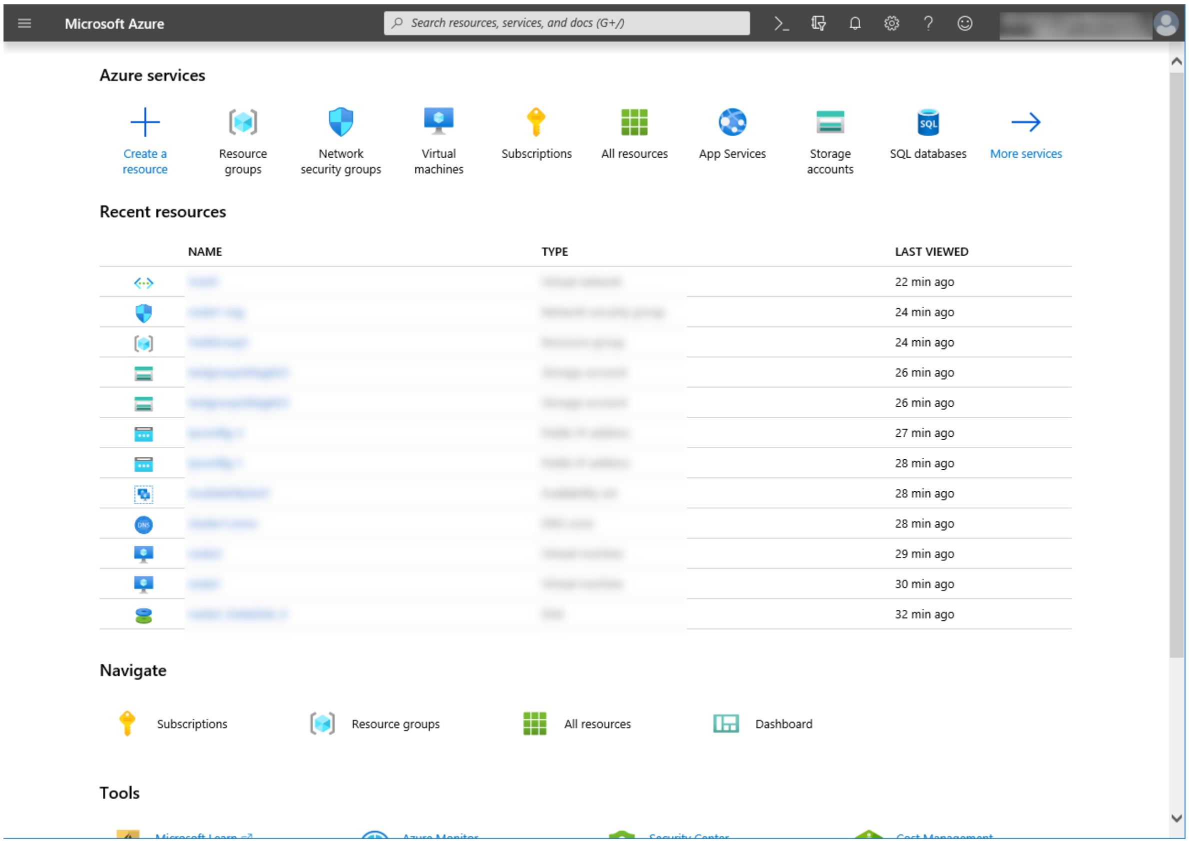
Public IP address name *: TestLoadBalancerPublicIP

Public IP address SKU: Basic

Assignment *: ○ Dynamic ● Static

7. **Configuring a load balancer (configuring a backend pool)**

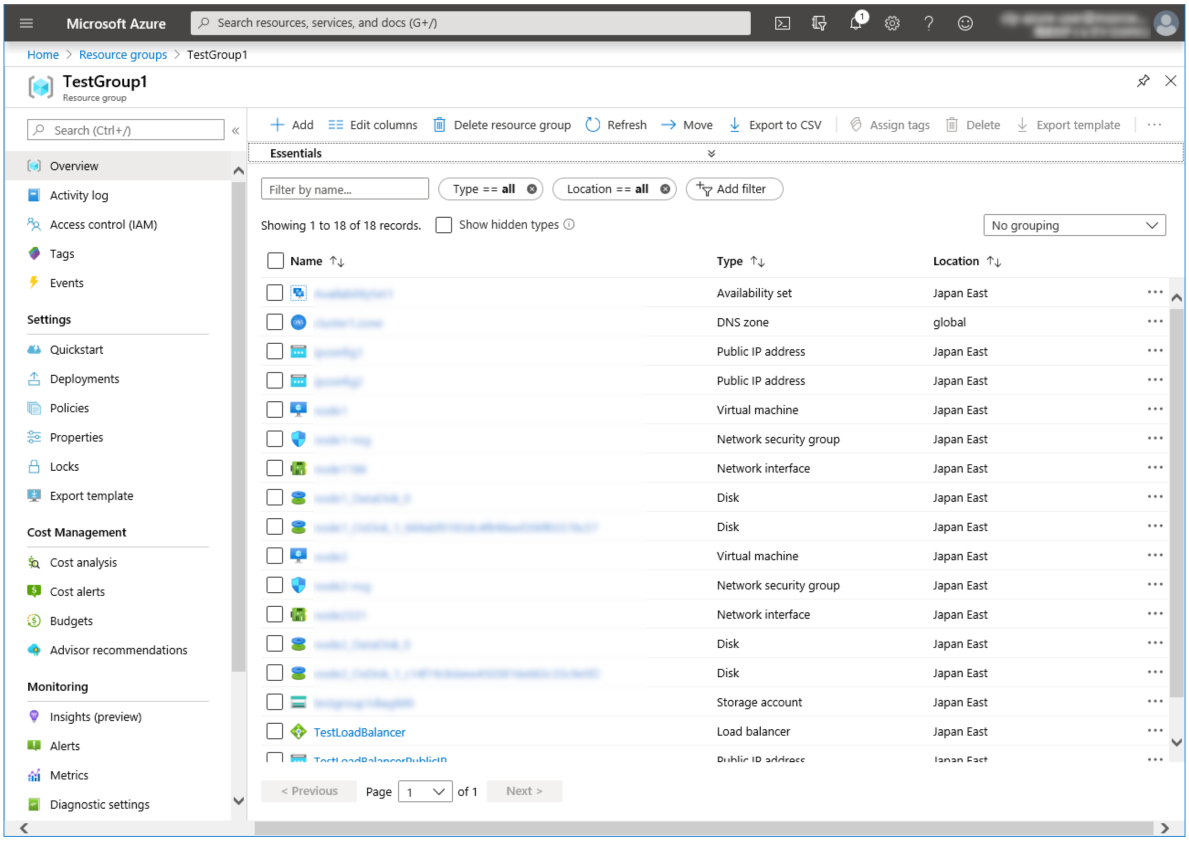
1. Associate a virtual machine registered to the availability set to the load balancer. After the load balancer has been deployed, select the **Resource groups** icon on the upper part of the window.



Recent resources

NAME	TYPE	LAST VIEWED
[redacted]	[redacted]	22 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	27 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	29 min ago
[redacted]	[redacted]	30 min ago
[redacted]	[redacted]	32 min ago

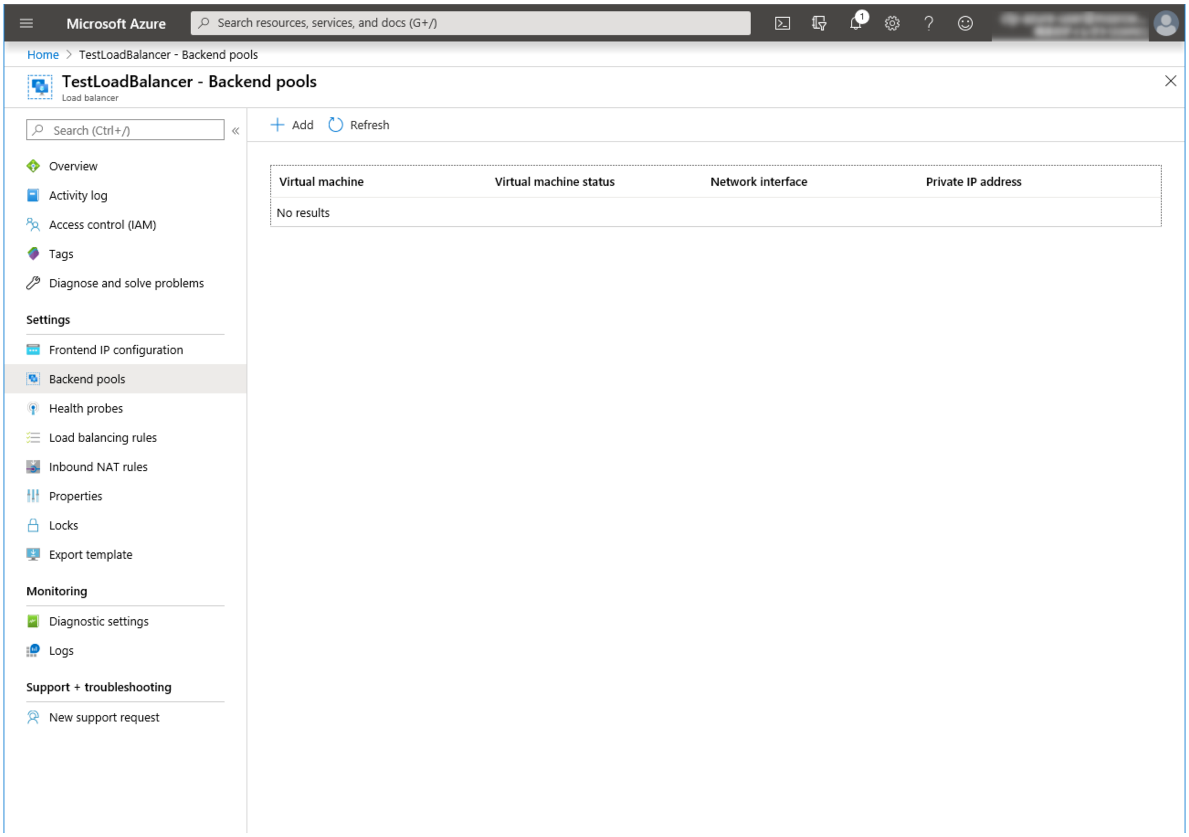
2. Select the resource group to which the created load balancer belongs from the resource group list.
3. The summary of the selected resource group is displayed. Select the created load balancer from the item list.



Showing 1 to 18 of 18 records. □ Show hidden types

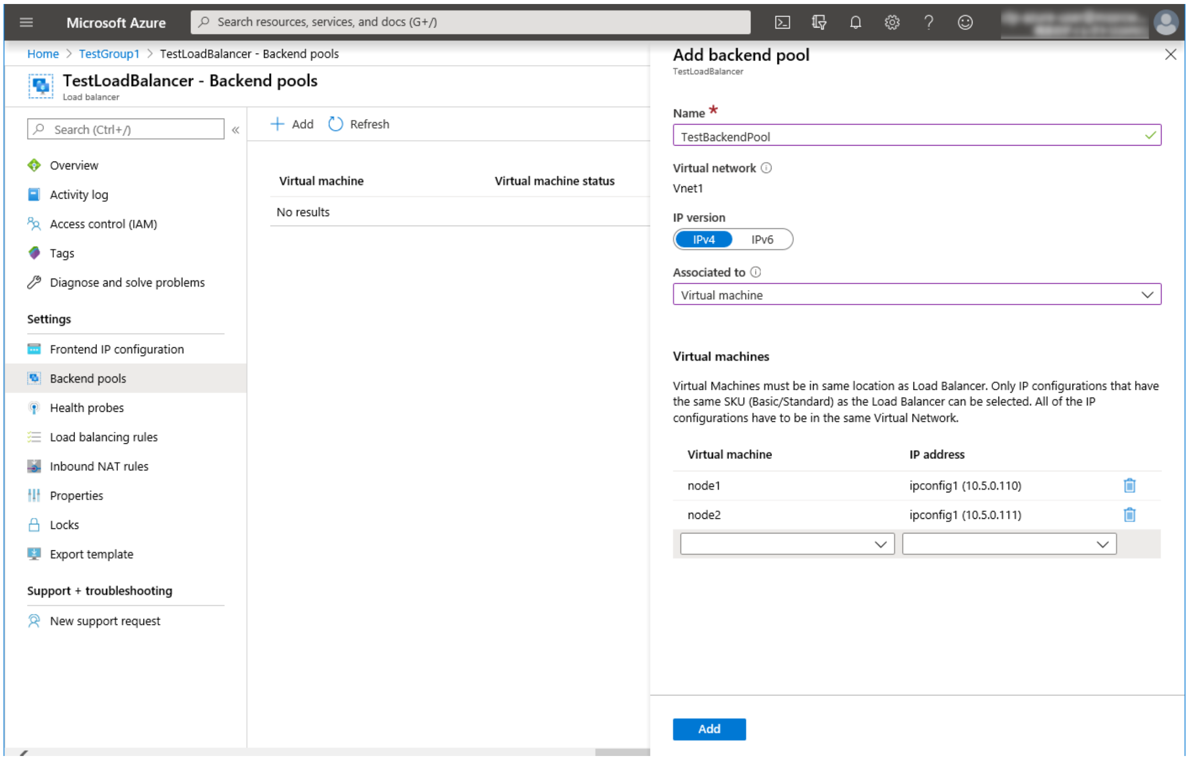
□ Name ↑↓	Type ↑↓	Location ↑↓
□ [redacted]	Availability set	Japan East
□ [redacted]	DNS zone	global
□ [redacted]	Public IP address	Japan East
□ [redacted]	Public IP address	Japan East
□ [redacted]	Virtual machine	Japan East
□ [redacted]	Network security group	Japan East
□ [redacted]	Network interface	Japan East
□ [redacted]	Disk	Japan East
□ [redacted]	Disk	Japan East
□ [redacted]	Virtual machine	Japan East
□ [redacted]	Network security group	Japan East
□ [redacted]	Network interface	Japan East
□ [redacted]	Disk	Japan East
□ [redacted]	Disk	Japan East
□ [redacted]	Storage account	Japan East
□ TestLoadBalancer	Load balancer	Japan East
□ TestLoadBalancerPublicIP	Public IP address	Japan East

4. Select **Backend pools**.
5. Click **Add**.



Virtual machine	Virtual machine status	Network interface	Private IP address
No results			

6. **Add backend pool** is displayed. Specify **Name**.
7. Select **Virtual machine** for **Associated to**.
8. Specify **Virtual machine** and **IP address** for the virtual machine you want to associate. Repeat this procedure for the rest of such virtual machines.
9. Then click **Add**.



Virtual machine	Virtual machine status
No results	

Add backend pool

Name * TestBackendPool

Virtual network Vnet1

IP version IPv4 IPv6

Associated to Virtual machine

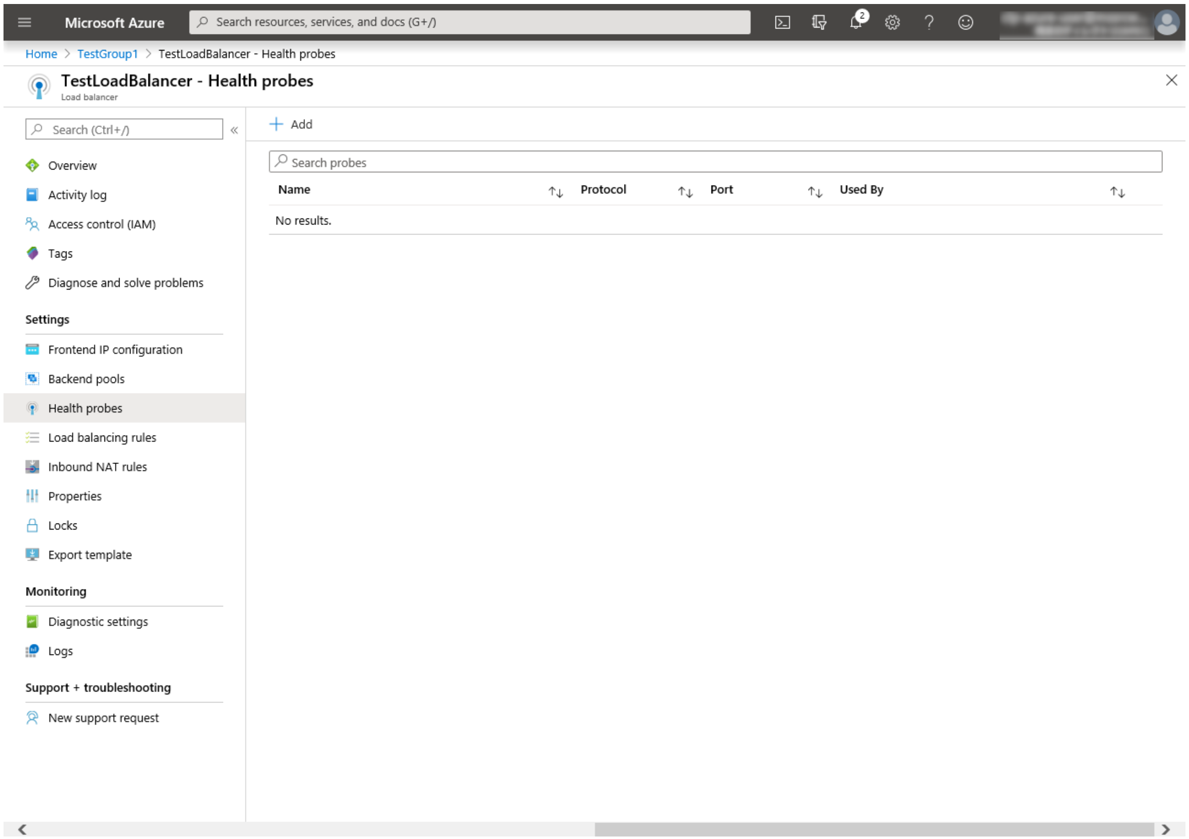
Virtual machines

Virtual Machines must be in same location as Load Balancer. Only IP configurations that have the same SKU (Basic/Standard) as the Load Balancer can be selected. All of the IP configurations have to be in the same Virtual Network.

Virtual machine	IP address
node1	ipconfig1 (10.5.0.110)
node2	ipconfig1 (10.5.0.111)

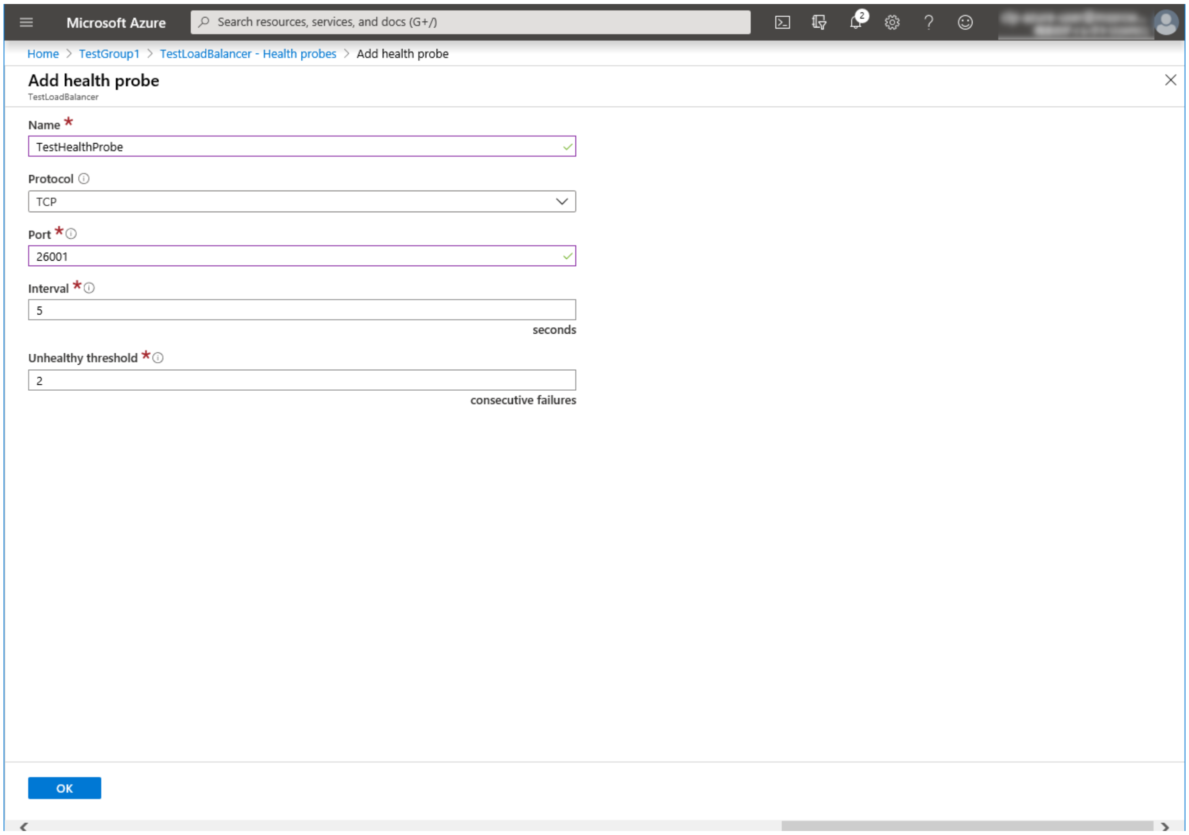
8. **Configuring a load balancer (configuring a health probe)**

1. Select **Health probes**.



Name	Protocol	Port	Used By
No results.			

2. Click **Add**.
3. **Add health probe** is displayed. Specify **Name**.
4. Specify **Protocol** and **Port**, and click **OK**.



Microsoft Azure
Search resources, services, and docs (G+/)
Home > TestGroup1 > TestLoadBalancer - Health probes > Add health probe
OK

Add health probe
TestLoadBalancer

Name * TestHealthProbe

Protocol TCP

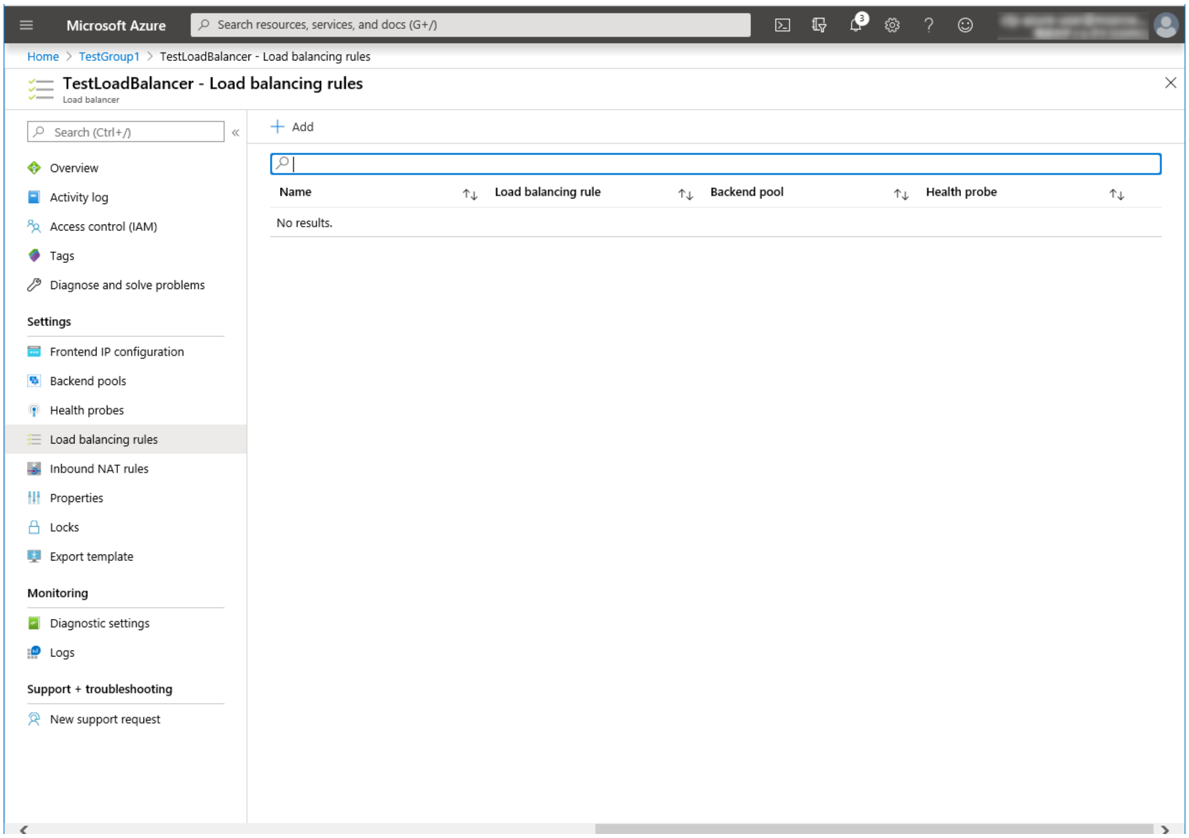
Port * 26001

Interval * 5 seconds

Unhealthy threshold * 2 consecutive failures

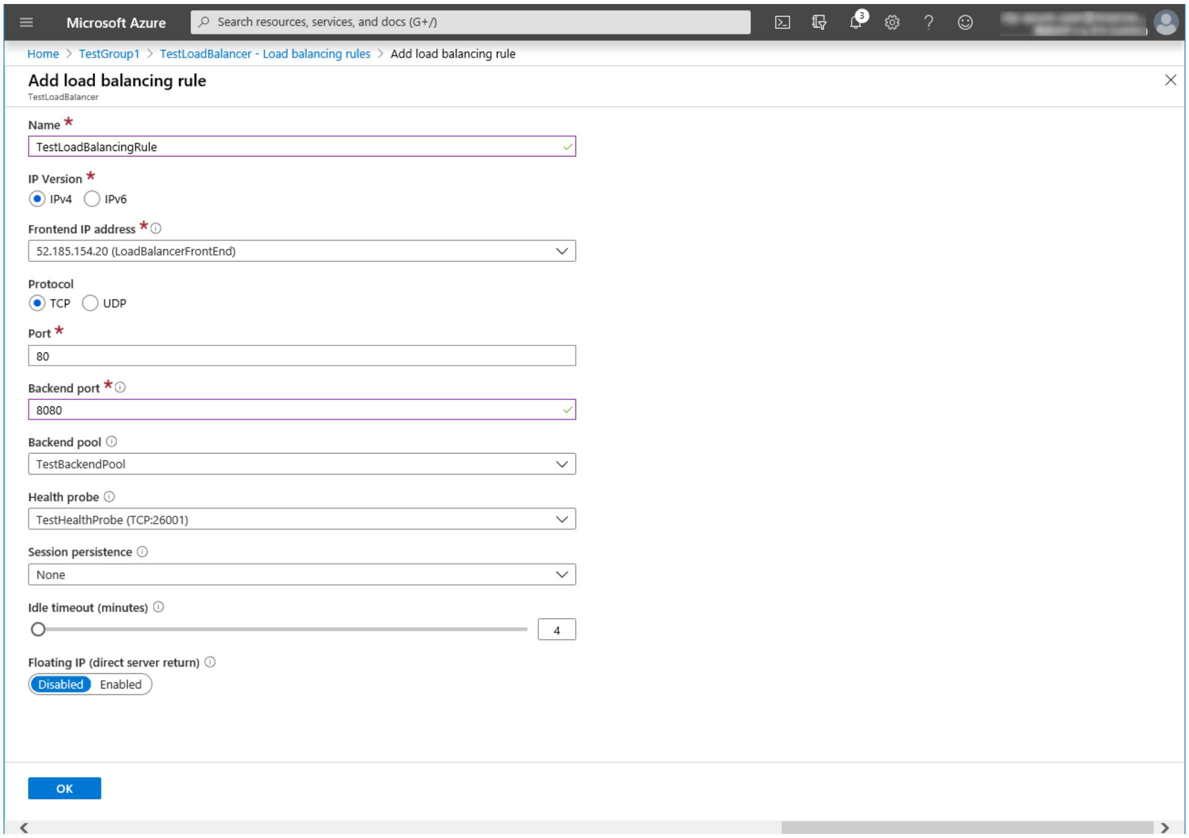
9. **Configuring a load balancer (setting the load balancing rules)**

1. Select **Load balancing rules**.



Name	Load balancing rule	Backend pool	Health probe
No results.			

2. Click **Add**.
3. The **Add load balancing rule** blade is displayed. Specify **Name**.
4. Specify **Port** and **Backend port**, and click **OK**.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > TestGroup1 > TestLoadBalancer - Load balancing rules > Add load balancing rule

Add load balancing rule
TestLoadBalancer

Name * TestLoadBalancingRule

IP Version * ● IPv4 ○ IPv6

Frontend IP address * 52.185.154.20 (LoadBalancerFrontEnd)

Protocol ● TCP ○ UDP

Port * 80

Backend port * 8080

Backend pool TestBackendPool

Health probe TestHealthProbe (TCP:26001)

Session persistence None

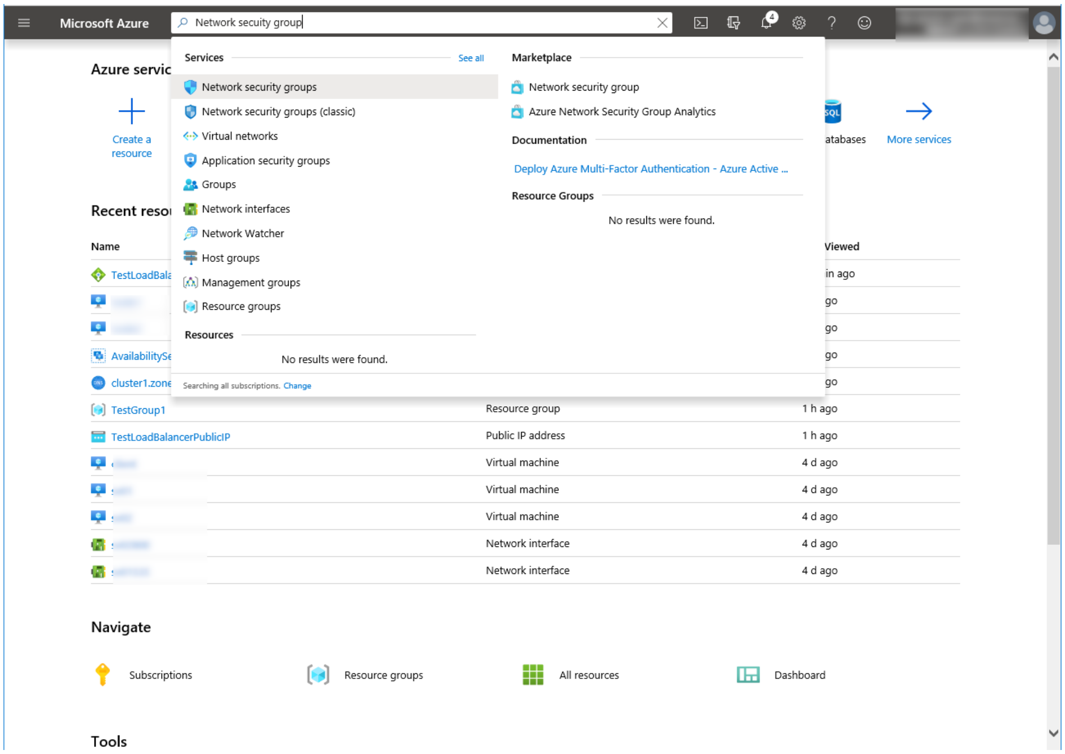
Idle timeout (minutes) 4

Floating IP (direct server return) [✓ Disabled] Enabled

10. **Setting the inbound security rules**

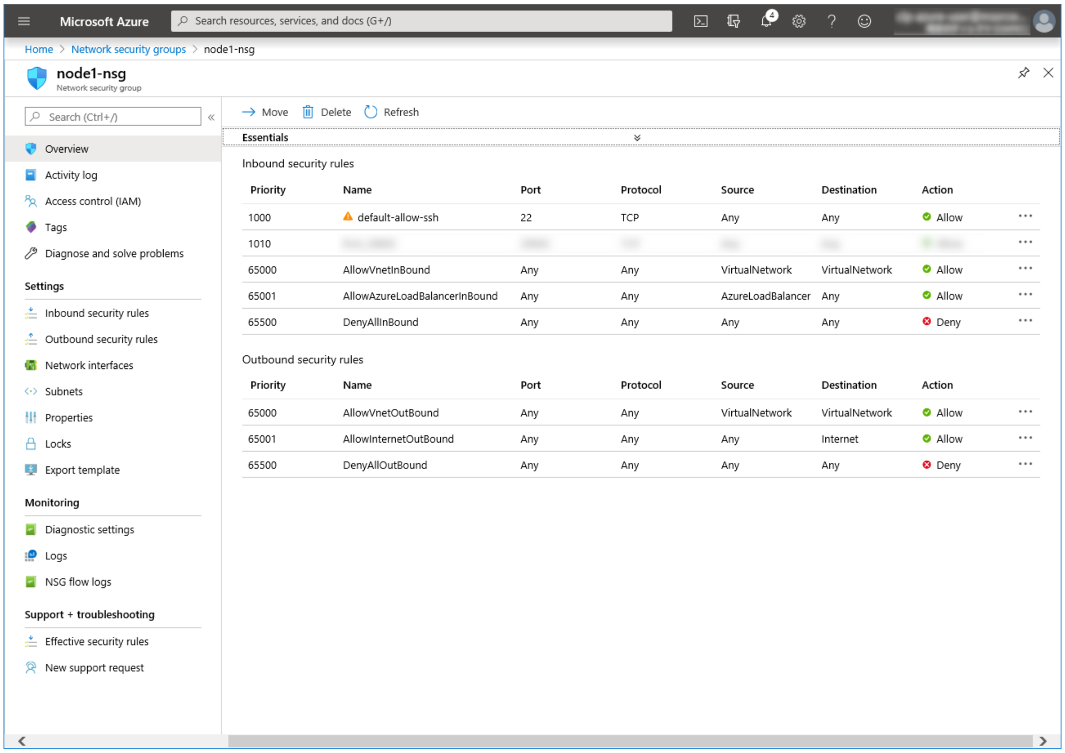
    Log in to the Microsoft Azure portal (https://portal.azure.com/) and set the inbound security rules following the steps below.

    1. Search for Network security group.
    2. Select **Network security groups**.



Name		Viewed
TestLoadBala		in ago
[redacted]		go
[redacted]		go
AvailabilitySe		go
cluster1.zone		go
TestGroup1	Resource group	1 h ago
TestLoadBalancerPublicIP	Public IP address	1 h ago
[redacted]	Virtual machine	4 d ago
[redacted]	Virtual machine	4 d ago
[redacted]	Virtual machine	4 d ago
[redacted]	Network interface	4 d ago
[redacted]	Network interface	4 d ago

3. From the network security group list, select node1-nsg for node1 or node2-nsg for node2.
4. The summary is displayed.



Inbound security rules

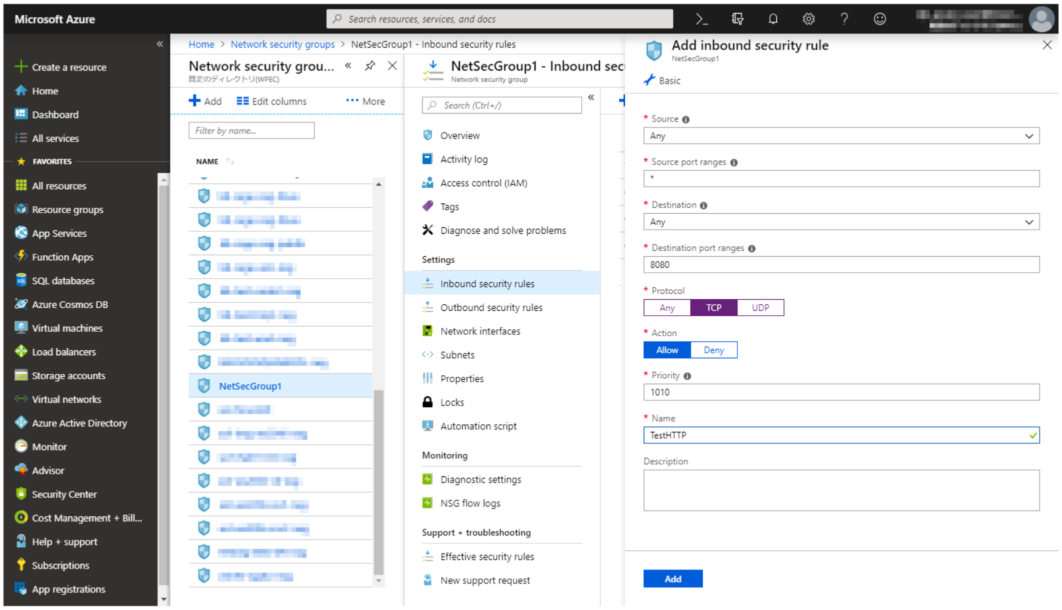
Priority	Name	Port	Protocol	Source	Destination	Action
1000	⚠ default-allow-ssh	22	TCP	Any	Any	✓ Allow
1010	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	✓ Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	✓ Allow
65500	DenyAllInBound	Any	Any	Any	Any	✗ Deny

Outbound security rules

Priority	Name	Port	Protocol	Source	Destination	Action
65000	AllowVnetOutBound	Any	Any	VirtualNetwork	VirtualNetwork	✓ Allow
65001	AllowInternetOutBound	Any	Any	Any	Internet	✓ Allow
65500	DenyAllOutBound	Any	Any	Any	Any	✗ Deny

5. Select **Inbound security rules**.
6. Click **Add**.

7. The **Add inbound security rule** blade is displayed. Specify **Name**.
8. Specify **Destination port range** and **Protocol**, and click **Add**.



* Source: Any

* Source port ranges: *

* Destination: Any

* Destination port ranges: 8080

* Protocol: Any [✓ TCP] UDP

* Action: [✓ Allow] Deny

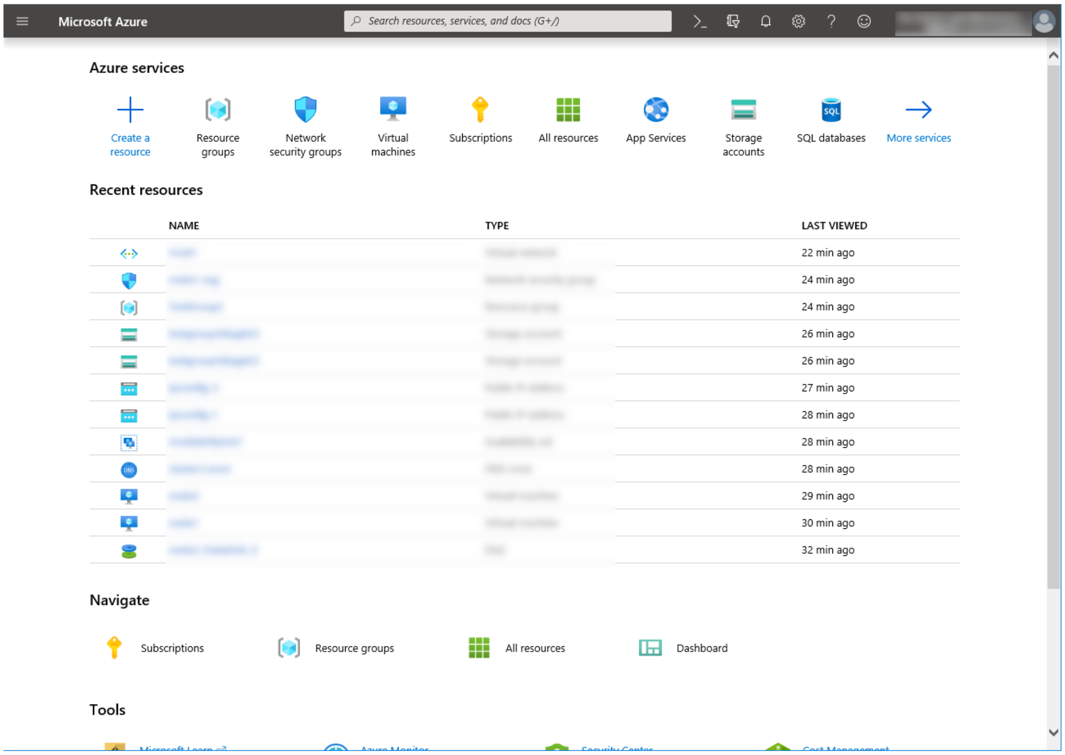
* Priority: 1010

* Name: TestHTTP

Description:

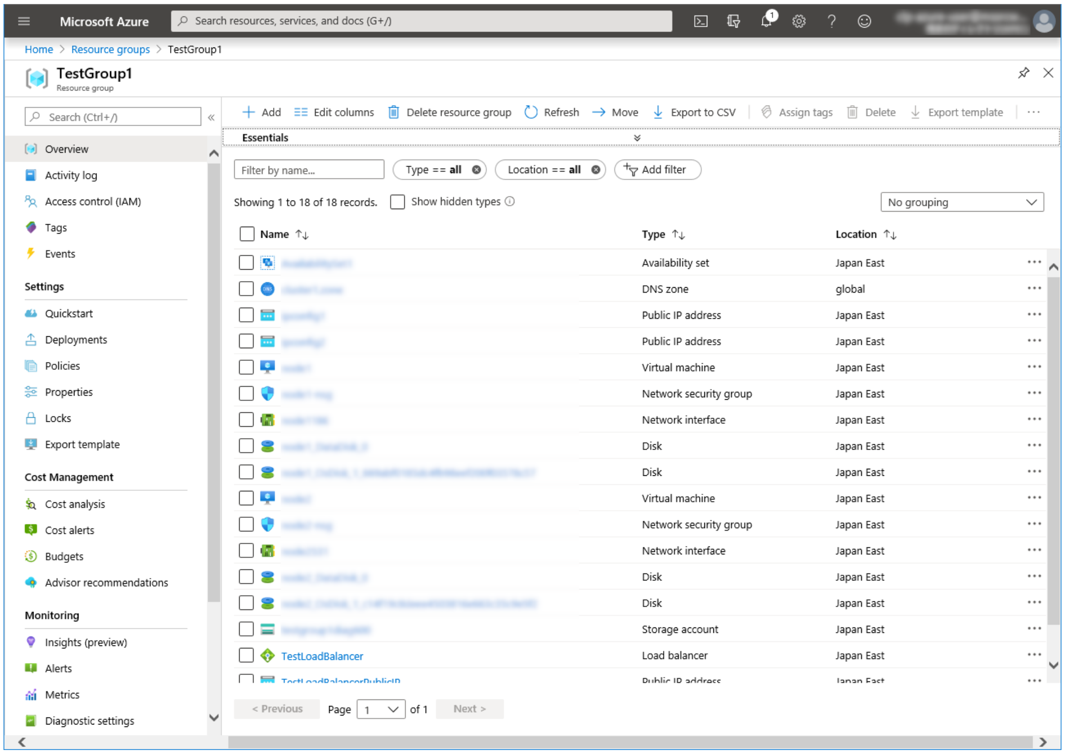
Then, check *<Load_balancer_frontend_IP(public_IP_address)>* specified in the script before recovery action of the multi target monitor resource that is set in "3. **Adding a monitor resource**". Write down the confirmatory result.

1. Select the **Resource groups** icon on the upper part of the window.



2. Select the resource group to which the created load balancer belongs from the resource group list.

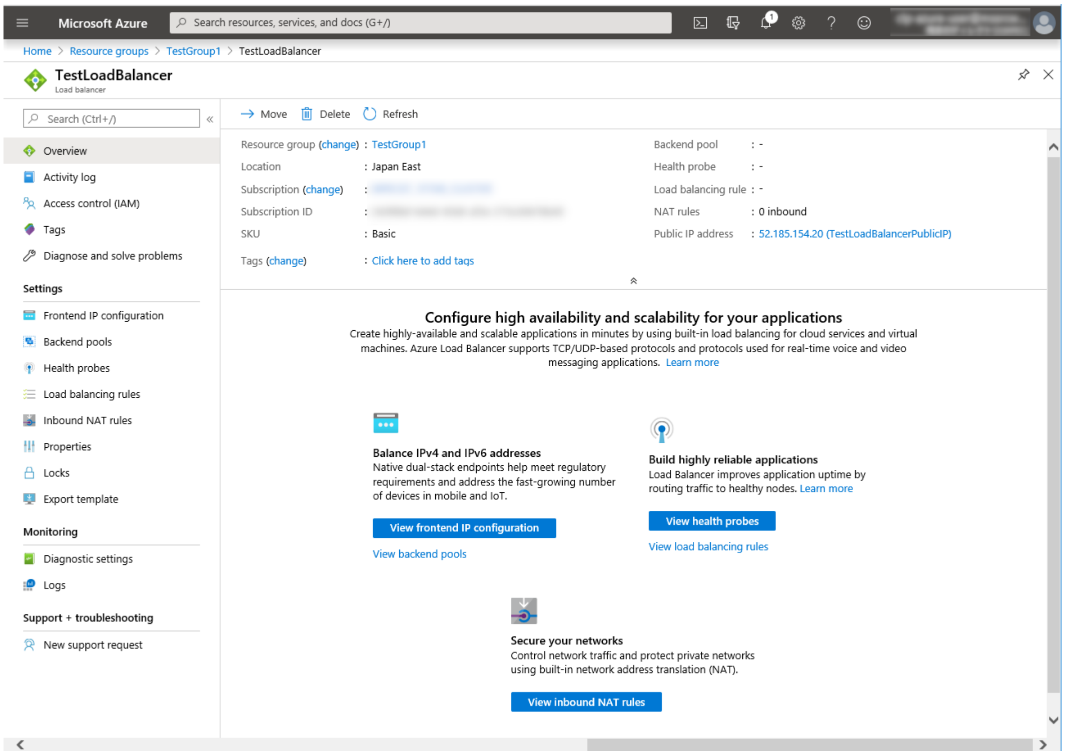
3. The summary of the selected resource group is displayed. Select the created load balancer from the item list.



Showing 1 to 18 of 18 records. □ Show hidden types

Name ↑↓	Type ↑↓	Location ↑↓
[redacted]	Availability set	Japan East
[redacted]	DNS zone	global
[redacted]	Public IP address	Japan East
[redacted]	Public IP address	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Storage account	Japan East
TestLoadBalancer	Load balancer	Japan East
TestLoadBalancerPublicIP	Public IP address	Japan East

4. The summary of the load balancer is displayed. Select **Public IP address** from the item list.



Resource group (change) : TestGroup1
Location : Japan East
Subscription (change) : [redacted]
Subscription ID : [redacted]
SKU : Basic
Tags (change) : Click here to add tags

Backend pool : -
Health probe : -
Load balancing rule : -
NAT rules : 0 inbound
Public IP address : 52.185.154.20 (TestLoadBalancerPublicIP)

Configure high availability and scalability for your applications

Create highly-available and scalable applications in minutes by using built-in load balancing for cloud services and virtual machines. Azure Load Balancer supports TCP/UDP-based protocols and protocols used for real-time voice and video messaging applications. Learn more

Balance IPv4 and IPv6 addresses

Native dual-stack endpoints help meet regulatory requirements and address the fast-growing number of devices in mobile and IoT.

Build highly reliable applications

Load Balancer improves application uptime by routing traffic to healthy nodes. Learn more

Secure your networks

Control network traffic and protect private networks using built-in network address translation (NAT).

11. **Adjusting the OS startup time, checking the network setting, checking the root file system, checking the firewall setting, synchronizing the server time, and checking the SELinux setting.**

For each procedure, see "Settings after configuring hardware" in "Determining a system configuration" in the Installation and Configuration Guide.

12. **Installing EXPRESSCLUSTER**

    For the installation procedure, see the Installation and Configuration Guide.
    After installation is complete, restart the OS.

13. **Registering the EXPRESSCLUSER license**

    For the license registration procedure, see the Installation and Configuration Guide.

5.3 Configuring the EXPRESSCLUSTER settings

For the Cluster WebUI setup and connection procedures, see "Creating the cluster configuration data" in the Installation and Configuration Guide.

This section describes the procedure to add the following resources and monitor resources:

- Mirror disk resource
- Azure probe port resource
- Azure probe port monitor resource
- Azure load balance monitor resource
- Custom monitor resource (for NP resolution)
- IP monitor resource (for NP resolution)
- Multi target monitor resource (for NP resolution)

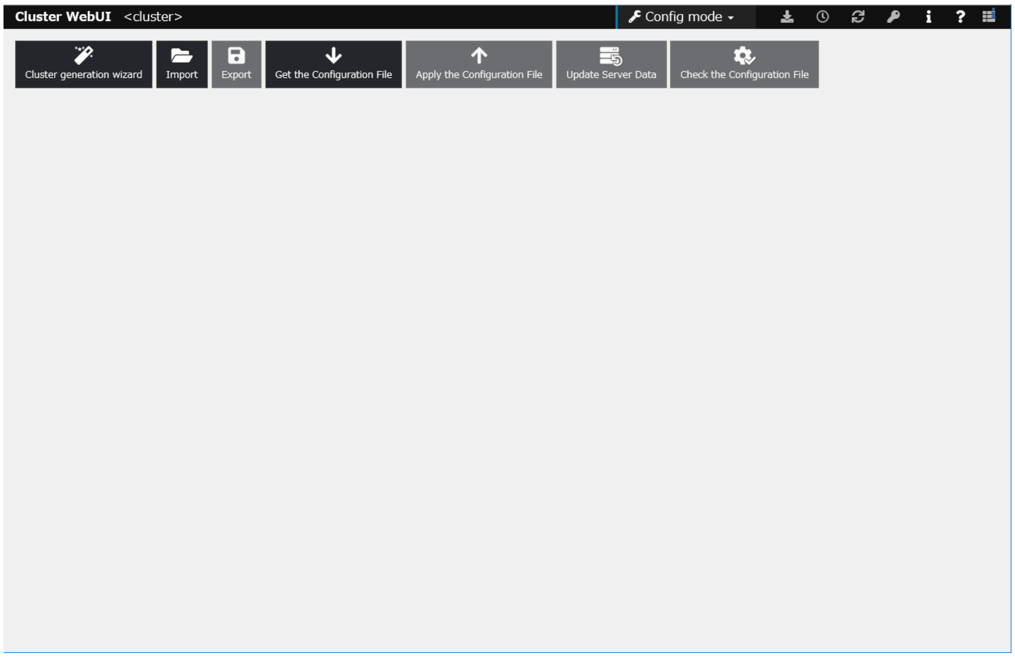
For the settings of other resources and monitor resources, see the Installation and Configuration Guide and the Reference Guide.

1) **Creating a cluster**

   Start the Cluster generation wizard to create a cluster.

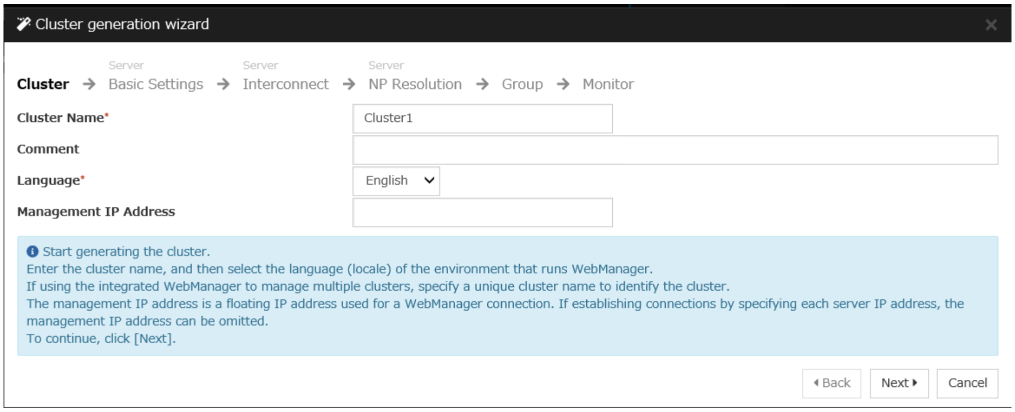
   - Creating a cluster

     1. Access Cluster WebUI, and click **Cluster generation wizard**.


Cluster WebUI <cluster>
Config mode
Cluster generation wizard
Import
Export
Get the Configuration File
Apply the Configuration File
Update Server Data
Check the Configuration File

     2. **Cluster** of **Cluster generation wizard** is displayed.

        Enter a desired name in **Cluster Name**.
        Select an appropriate language in **Language**. Click **Next**.



Cluster generation wizard

Cluster → Server Basic Settings → Server Interconnect → Server NP Resolution → Group → Monitor

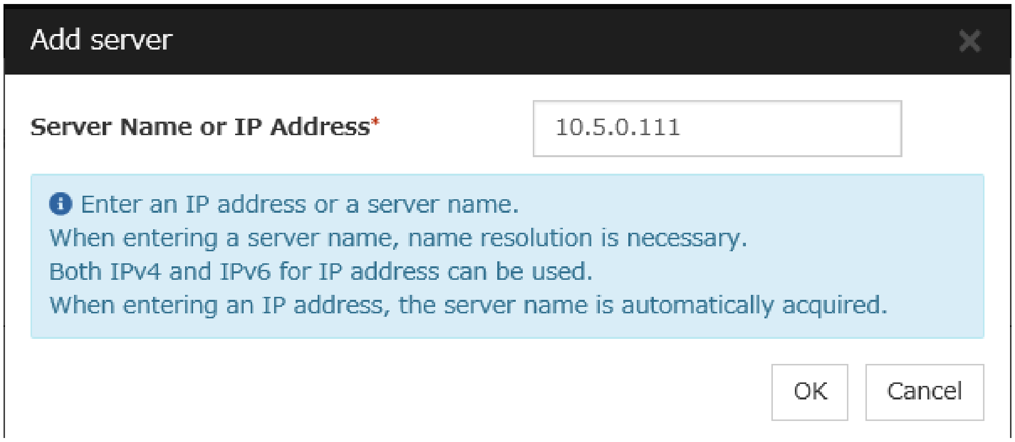
Cluster Name*	Cluster1
Comment	
Language*	English
Management IP Address	

Start generating the cluster.
Enter the cluster name, and then select the language (locale) of the environment that runs WebManager.
If using the integrated WebManager to manage multiple clusters, specify a unique cluster name to identify the cluster.
The management IP address is a floating IP address used for a WebManager connection. If establishing connections by specifying each server IP address, the management IP address can be omitted.
To continue, click [Next].

3. The **Basic Settings** window is displayed.

   The instance connected to Cluster WebUI is displayed as a registered master server.

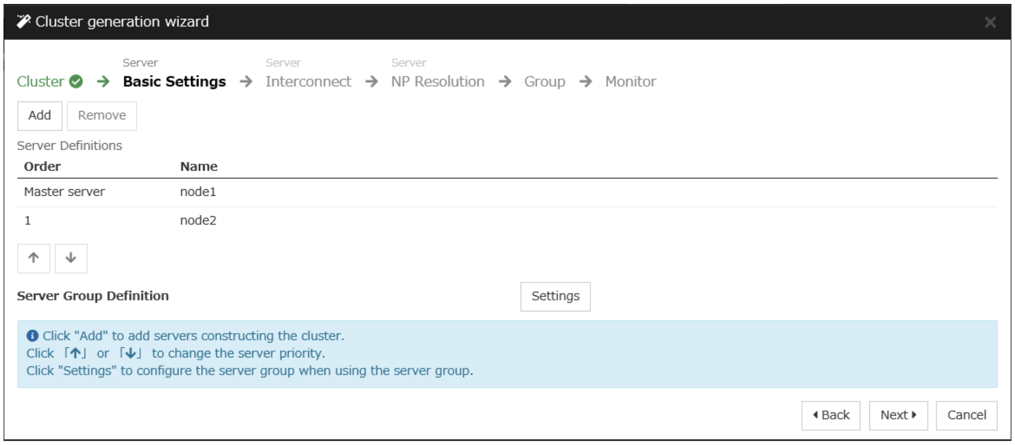
   Click **Add** to add the remaining instances (by specifying the private IP address of each instance). Click **Next**.



Add server

Server Name or IP Address*: 10.5.0.111

Enter an IP address or a server name.
When entering a server name, name resolution is necessary.
Both IPv4 and IPv6 for IP address can be used.
When entering an IP address, the server name is automatically acquired.



Cluster generation wizard

Cluster → Server Basic Settings → Server Interconnect → Server NP Resolution → Group → Monitor

Server Definitions

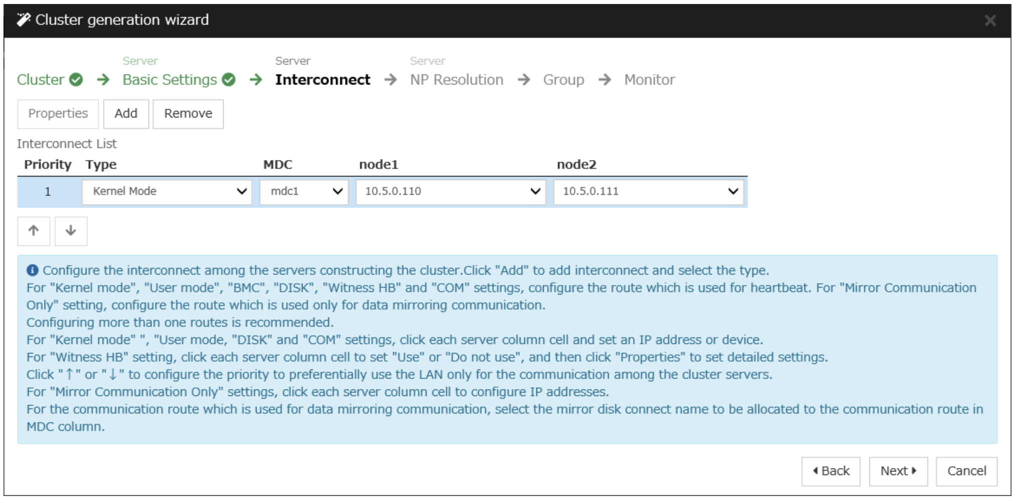
Order	Name
Master server	node1
1	node2

Server Group Definition

Click "Add" to add servers constructing the cluster.
Click 「↑」 or 「↓」 to change the server priority.
Click "Settings" to configure the server group when using the server group.

4. The **Interconnect** window is displayed.

   Specify the IP addresses (IP address of each instance) to be used for interconnect. In addition, select mdc1 for **MDC** as a communication path of a mirror disk resource to be created later. Click **Next**.


Cluster generation wizard
Cluster → Server Basic Settings → Server Interconnect → Server NP Resolution → Group → Monitor
Properties
Add
Remove
↑
↓
Back
Next
Cancel

Interconnect List

Priority	Type	MDC	node1	node2
1	Kernel Mode	mdc1	10.5.0.110	10.5.0.111

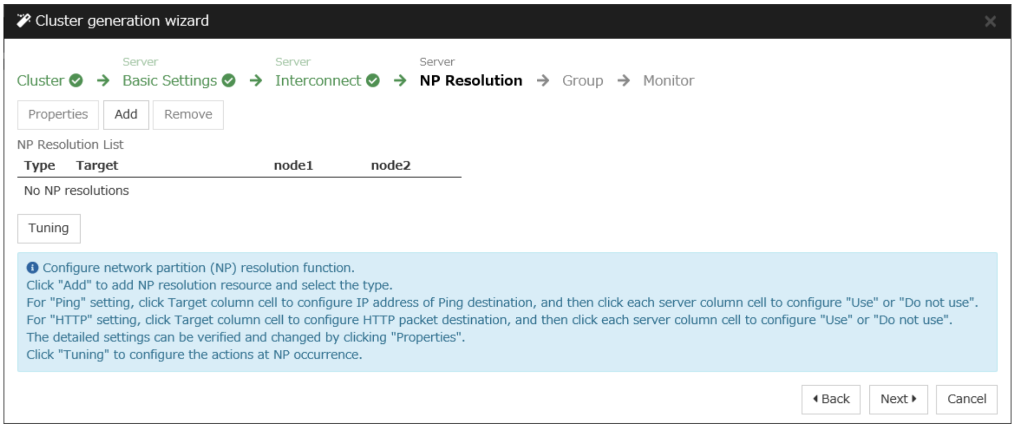
Configure the interconnect among the servers constructing the cluster.Click "Add" to add interconnect and select the type.
For "Kernel mode", "User mode", "BMC", "DISK", "Witness HB" and "COM" settings, configure the route which is used for heartbeat. For "Mirror Communication Only" setting, configure the route which is used only for data mirroring communication.
Configuring more than one routes is recommended.
For "Kernel mode" ", "User mode, "DISK" and "COM" settings, click each server column cell and set an IP address or device.
For "Witness HB" setting, click each server column cell to set "Use" or "Do not use", and then click "Properties" to set detailed settings.
Click "↑" or "↓" to configure the priority to preferentially use the LAN only for the communication among the cluster servers.
For "Mirror Communication Only" settings, click each server column cell to configure IP addresses.
For the communication route which is used for data mirroring communication, select the mirror disk connect name to be allocated to the communication route in MDC column.

5. The **NP Resolution** window is displayed.

   Note that NP resolution is not configured on this window. The equivalent feature is achieved by adding the IP monitor resource, custom monitor resource, and multi target monitor resource. Configure NP resolution in "3. **Adding a monitor resource**".

   You need to examine the NP resolution destination and method depending on the location of clients accessing a cluster system and the condition for connecting to an on-premise environment (for example, using a dedicated line). There is no NP resolution destination nor method to recommend. Additionally, you can use network partition resolution resources for NP resolution.

   Click **Next**.


Cluster generation wizard
Cluster → Server Basic Settings → Server Interconnect → Server NP Resolution → Group → Monitor
Properties
Add
Remove
Tuning
Back
Next
Cancel

NP Resolution List

Type	Target	node1	node2
No NP resolutions			

Configure network partition (NP) resolution function.
Click "Add" to add NP resolution resource and select the type.
For "Ping" setting, click Target column cell to configure IP address of Ping destination, and then click each server column cell to configure "Use" or "Do not use".
For "HTTP" setting, click Target column cell to configure HTTP packet destination, and then click each server column cell to configure "Use" or "Do not use".
The detailed settings can be verified and changed by clicking "Properties".
Click "Tuning" to configure the actions at NP occurrence.

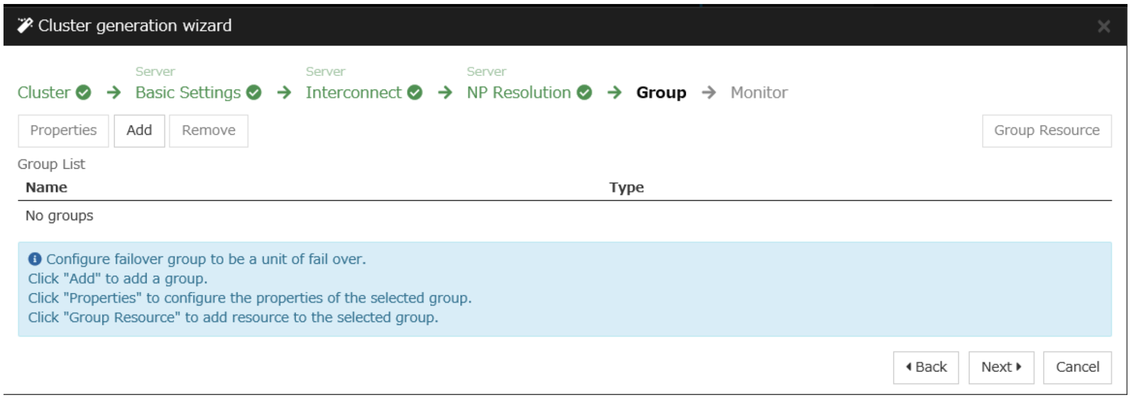
2) **Adding a group resource**

- Defining a group

  Create a failover group.

  1. The **Group List** window s displayed.

     Click **Add**.



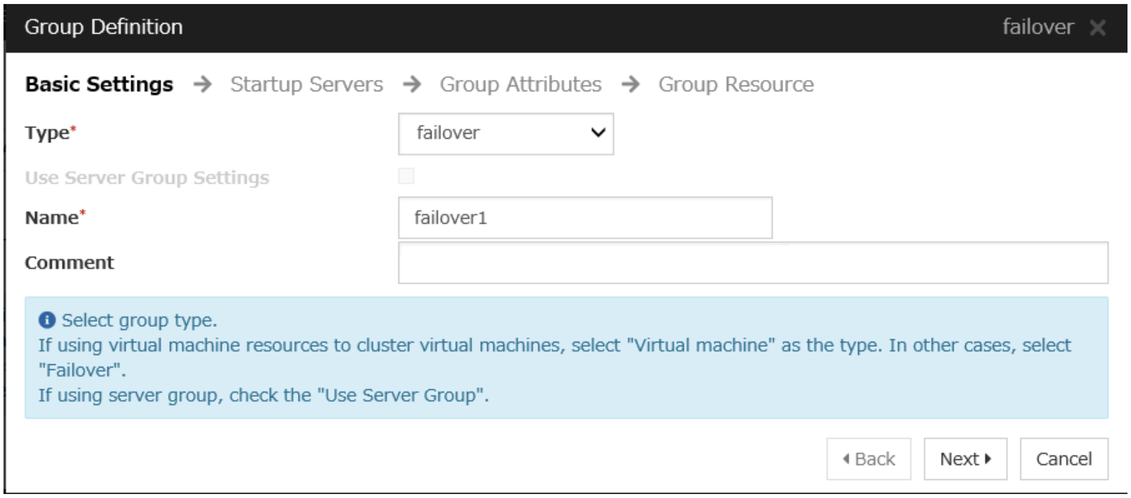
Group List

Name	Type
No groups	

Configure failover group to be a unit of fail over.
Click "Add" to add a group.
Click "Properties" to configure the properties of the selected group.
Click "Group Resource" to add resource to the selected group.

2. The **Group Definition** window is displayed.

   Specify a failover group name (failover1) for **Name**. Click **Next**.



Type* failover

Use Server Group Settings □

Name* failover1

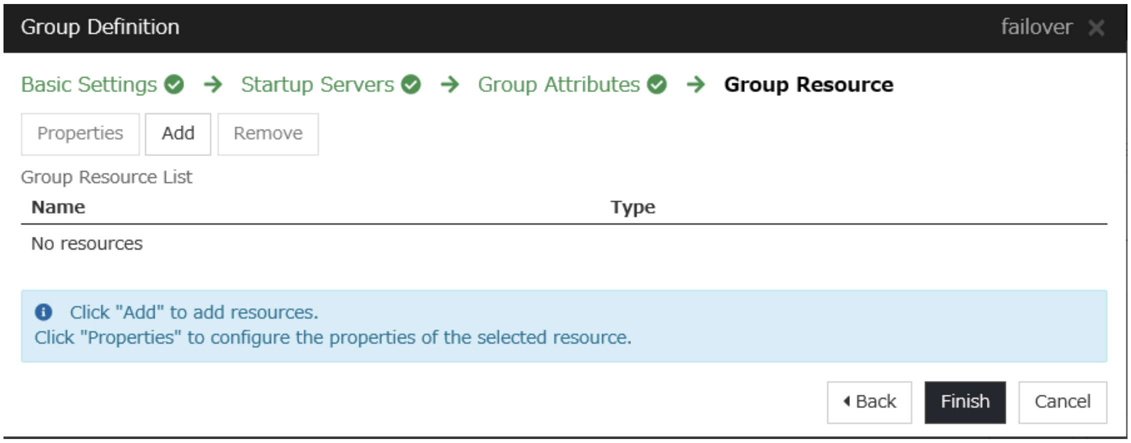
Comment

Select group type.
If using virtual machine resources to cluster virtual machines, select "Virtual machine" as the type. In other cases, select "Failover".
If using server group, check the "Use Server Group".

3. The **Startup Servers** window is displayed.
   Click **Next** without specifying anything.

4. The **Group Attributes** window is displayed.
   Click **Next** without specifying anything.

5. The **Group Resource** window is displayed.
   On this page, add a group resource following the procedure below.



Group Resource List

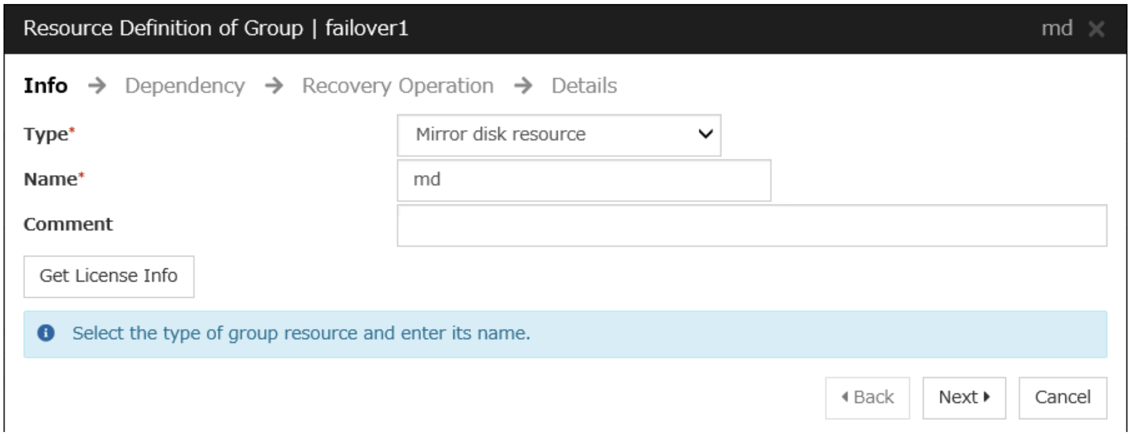
Name	Type
No resources	

Click "Add" to add resources.
Click "Properties" to configure the properties of the selected resource.

- Mirror disk resource

  Create a mirror disk resource. For details, see Understanding Mirror disk resources in "Group resource details" in the Reference Guide.

  1. Click **Add** on the **Group Resource List** page.
  2. The **Resource Definition of Group | failover1** window is displayed.
     Select the group resource type (Mirror disk resource) from the **Type** box and enter the group name (md) in the **Name** box. Click **Next**.

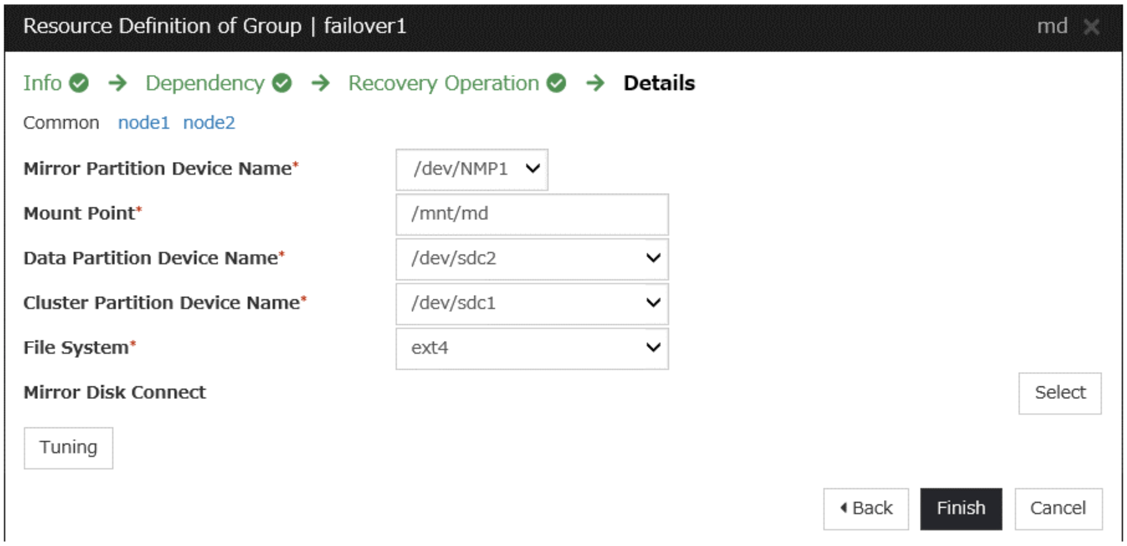


Resource Definition of Group | failover1

Type*: Mirror disk resource
Name*: md
Comment:

Select the type of group resource and enter its name.

  3. The **Dependency** window is displayed.
     Click **Next** without specifying anything.
  4. The **Recovery Operation** window is displayed.
     Click **Next**.
  5. The **Details** window is displayed.
     Enter the device name of the partition created in "5. **Configuring virtual machines**" in **Data Partition Device Name** and **Cluster Partition Device Name**. Specify **Mount Point** and **File System**. Click **Finish** to finish setting.



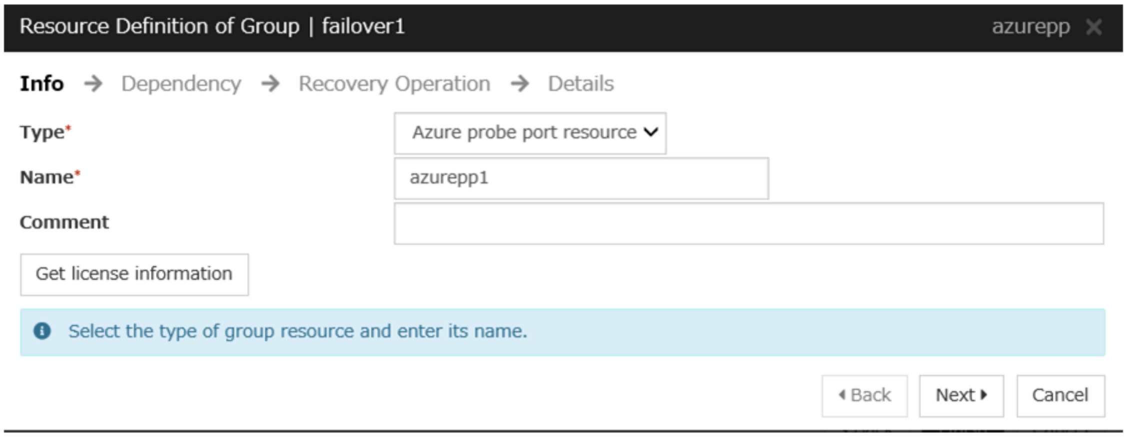
Resource Definition of Group | failover1

Mirror Partition Device Name*: /dev/NMP1
Mount Point*: /mnt/md
Data Partition Device Name*: /dev/sdc2
Cluster Partition Device Name*: /dev/sdc1
File System*: ext4
Mirror Disk Connect

- Azure probe port resource

  When EXPRESSCLUSTER is used on Microsoft Azure, EXPRESSCLUSTER provides a mechanism to wait for alive monitoring from a load balancer on a port specific to a node in which operations are running. For details about the Azure probe port resources", see "Understanding Azure probe port resources" in "Group resource details" in the Reference Guide.

1. Click **Add** on the **Group Resource List** page.
2. The **Resource Definition of Group | failover1** window is displayed. Select the group resource type (Azure probe port resource) from the **Type** box and enter the group name (azurepp1) in the **Name** box. Click **Next**.



Resource Definition of Group | failover1

Info → Dependency → Recovery Operation → Details

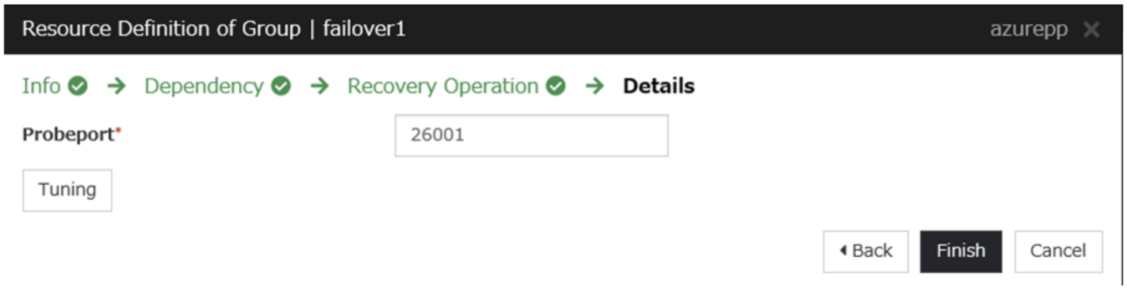
Type*: Azure probe port resource

Name*: azurepp1

Comment:

Select the type of group resource and enter its name.

3. The **Dependency** window is displayed. Click **Next** without specifying anything.
4. The **Recovery Operation** window is displayed. Click **Next**.
5. For **Probeport**, enter the value specified for **Port** when configuring a load balancer (configuring health probe).



Resource Definition of Group | failover1

Info → Dependency → Recovery Operation → Details

Probeport*: 26001

6. Click **Finish**.

3) **Adding a monitor resource**

- Azure probe port monitor resource

  The port monitoring mechanism for alive monitoring is provided for the node in which the Microsoft Azure probe port resource is running. For details about the Azure probe port monitor resource, see "Understanding Azure probe port monitor resources" in the Reference Guide. Adding one Azure probe port monitor resource creates one Azure probe port monitor resource automatically.

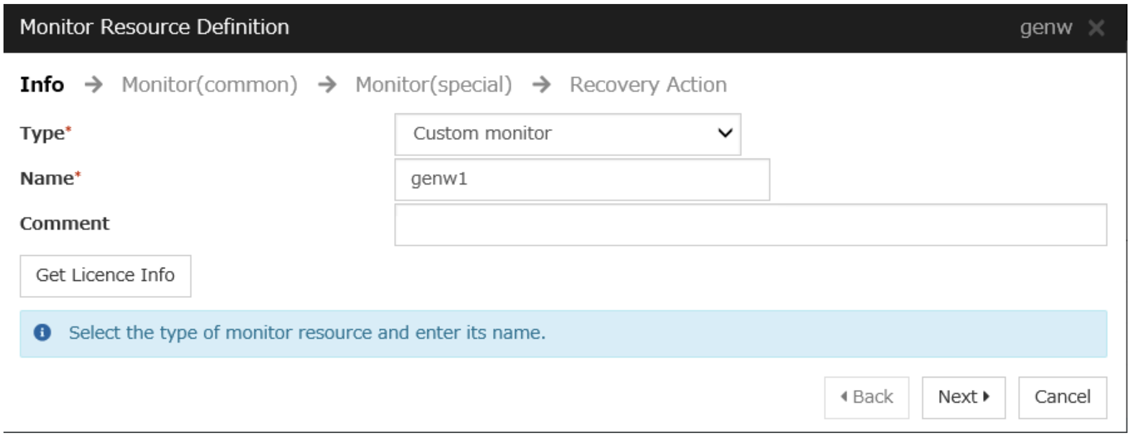
- Azure load balance monitor resource

  The mechanism to monitor whether the port with the same port number as the probe port is open or not is provided for the node in which the Microsoft Azure probe port resource is not running. For details about the Azure load balance resource, see "Understanding Azure load balance monitor resources" in the Reference Guide. Adding one Azure probe port resource creates one Azure load balance monitor resource automatically.

- Custom monitor resource

Sets a script to monitor whether communication with Microsoft Azure Service Management API is possible, and also monitors health of communication with an external network. For details about the custom monitor resource, see "Understanding custom monitor resources" in the Reference Guide.

1. Click **Add** on the **Monitor Resource List** page.
2. Select the monitor resource type (Custom monitor) from the **Type** box and enter the monitor resource name (genw1) in the **Name** box. Click **Next**.


Monitor Resource Definition

Info → Monitor(common) → Monitor(special) → Recovery Action

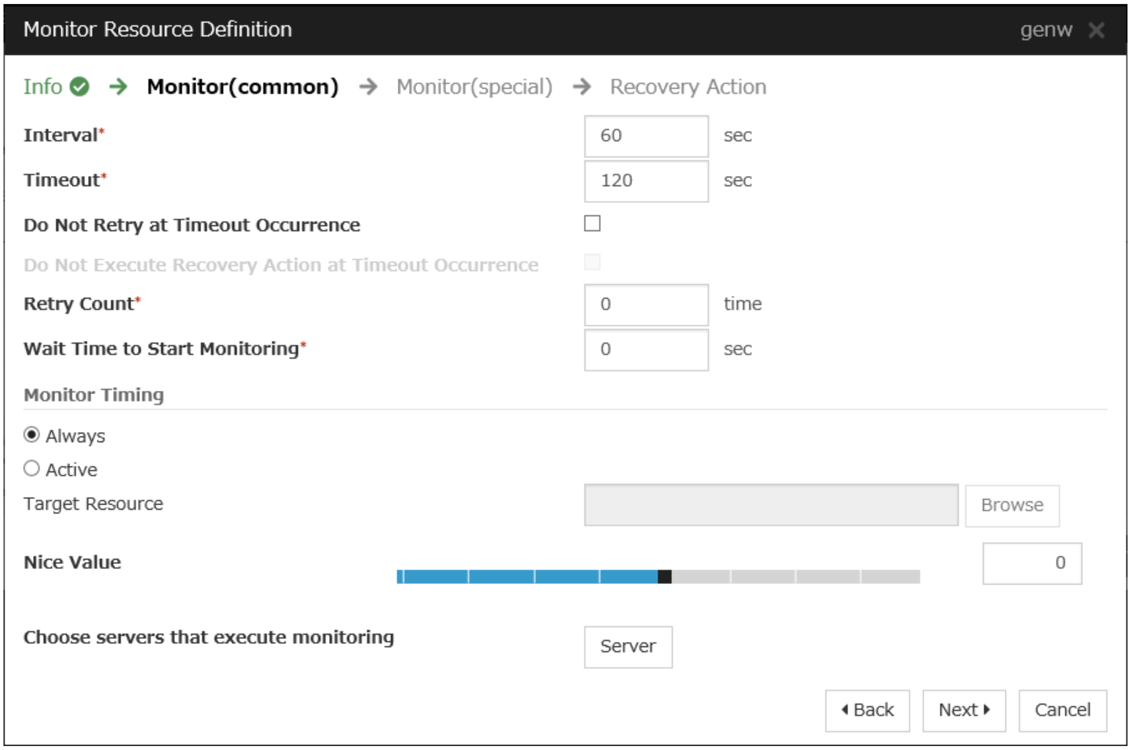
Type*: Custom monitor

Name*: genw1

Comment:

Select the type of monitor resource and enter its name.

3. The **Monitor (common)** window is displayed.
   Confirm that **Monitor Timing** is **Always** and click **Next**.


Monitor Resource Definition

Info → Monitor(common) → Monitor(special) → Recovery Action

Interval*: 60 sec

Timeout*: 120 sec

Do Not Retry at Timeout Occurrence ☐

Do Not Execute Recovery Action at Timeout Occurrence ☐

Retry Count*: 0 time

Wait Time to Start Monitoring*: 0 sec

Monitor Timing

● Always

○ Active

Target Resource

Nice Value: 0

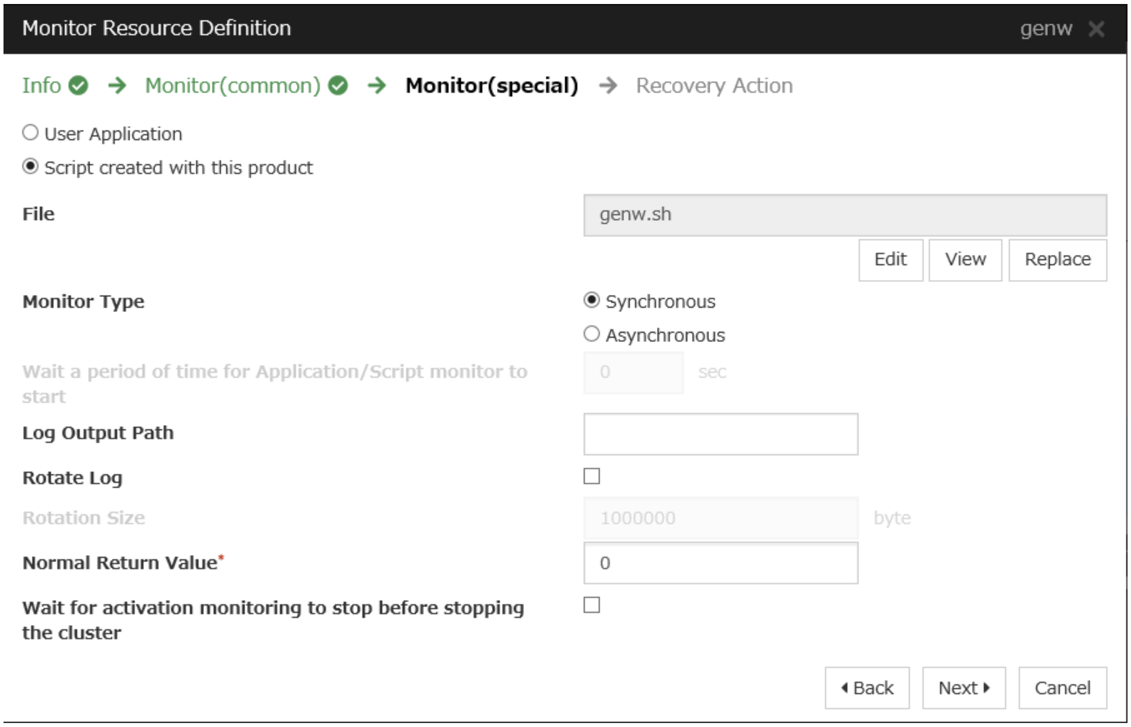
Choose servers that execute monitoring

4. The **Monitor (special)** window is displayed.
   Select **Script created with this product**.
   The following shows the sample of a script to be created.

```
#! /bin/sh
```

```
<EXPRESSCLUSTER_installation_path>/bin/clpazure_port_checker ?h management.core.windows.net -p 443
exit $?
```

Select **Synchronous** for **Monitor Type**. Click **Next**.


Monitor Resource Definition
genw ✕
Info ✓ → Monitor(common) ✓ → Monitor(special) → Recovery Action
Edit
View
Replace
◂ Back
Next ▸
Cancel

○ User Application
● Script created with this product

File: genw.sh

Monitor Type: ● Synchronous ○ Asynchronous

Wait a period of time for Application/Script monitor to start: 0 sec

Log Output Path:

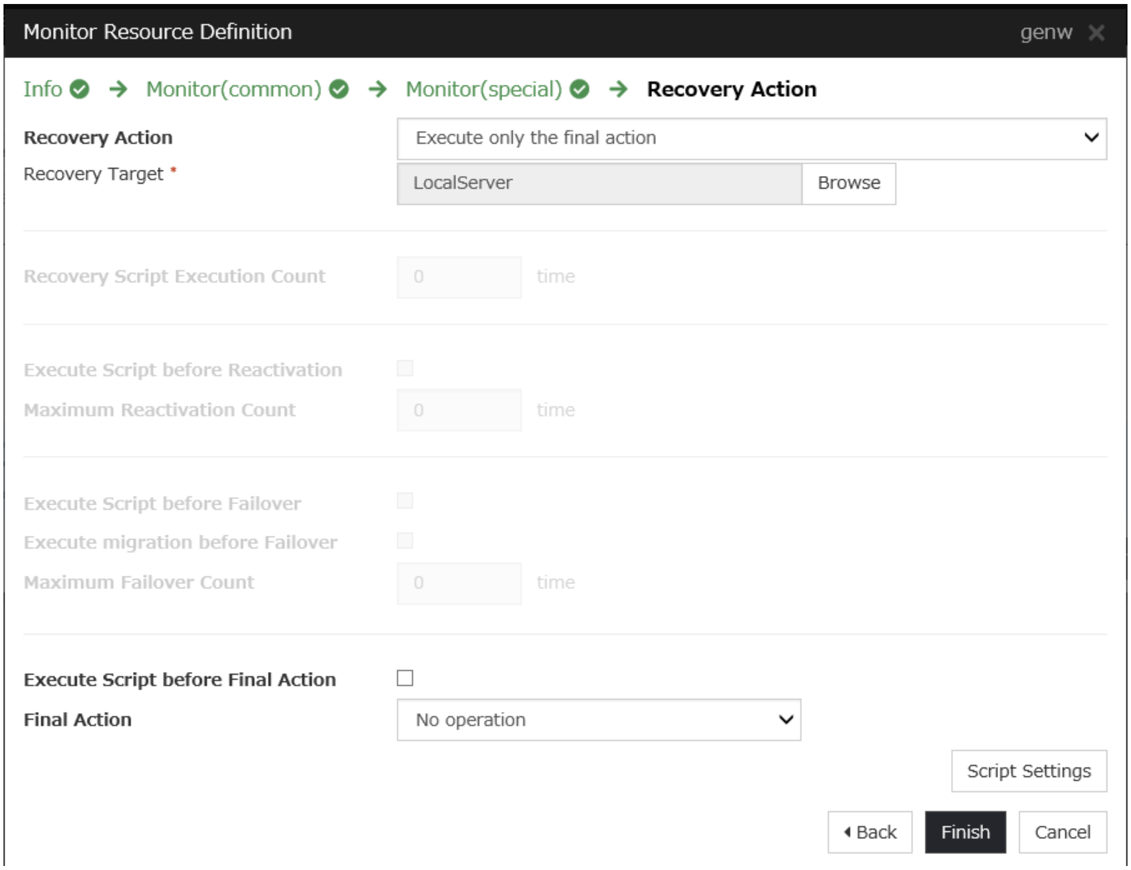
Rotate Log: □

Rotation Size: 1000000 byte

Normal Return Value*: 0

Wait for activation monitoring to stop before stopping the cluster: □

5. The **Recovery Action** window is displayed.
   Select **Execute only the final action** for **Recovery Action**, **LocalServer** for **Recovery Target**, and **No operation** for **Final Action**.



Monitor Resource Definition — genw

Info → Monitor(common) → Monitor(special) → **Recovery Action**

Recovery Action: Execute only the final action

Recovery Target *: LocalServer

Recovery Script Execution Count: 0 time

Execute Script before Reactivation: □

Maximum Reactivation Count: 0 time

Execute Script before Failover: □

Execute migration before Failover: □

Maximum Failover Count: 0 time

Execute Script before Final Action: □

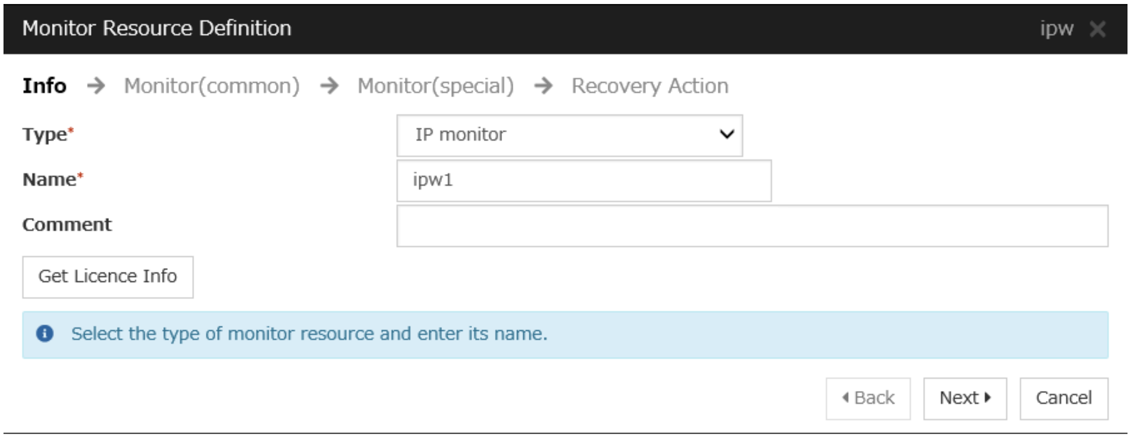
Final Action: No operation

6. Click **Finish** to finish setting.

- IP monitor resource

  Creates an IP monitor resource to monitor communication between clusters that are configured with virtual machines, and also to monitor whether communication with an internal network is health. For details about the IP monitor resource, see Understanding IP monitor resources in the Reference Guide.

  1. Click **Add** on the **Monitor Resource List** page.
  2. Select the monitor resource type (IP monitor) from the **Type** box and enter the monitor resource name (ipw1) in the **Name** box. Click **Next**.



Monitor Resource Definition — ipw

Info → Monitor(common) → Monitor(special) → Recovery Action

Type*: IP monitor

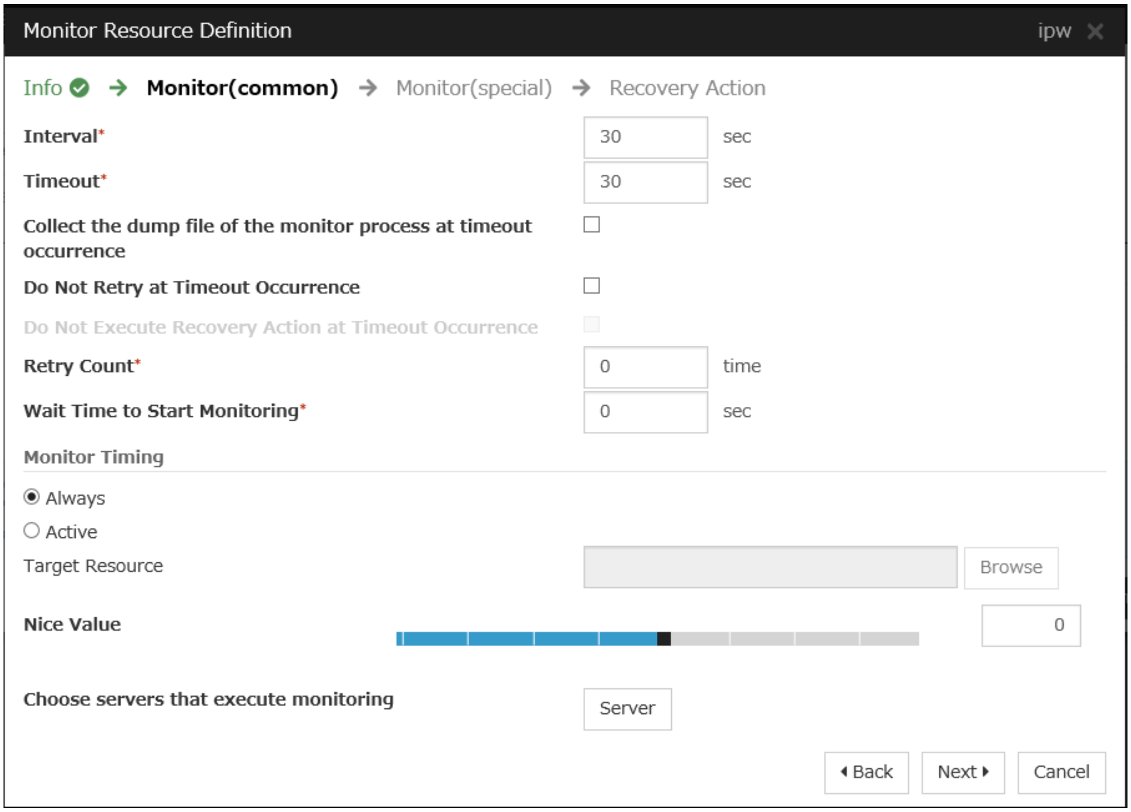
Name*: ipw1

Comment:

Select the type of monitor resource and enter its name.

  3. The **Monitor (common)** window is displayed.

Confirm that **Monitor Timing** is **Always**.



Monitor Resource Definition

Info → Monitor(common) → Monitor(special) → Recovery Action

Interval* 30 sec

Timeout* 30 sec

Collect the dump file of the monitor process at timeout occurrence □

Do Not Retry at Timeout Occurrence □

Do Not Execute Recovery Action at Timeout Occurrence □

Retry Count* 0 time

Wait Time to Start Monitoring* 0 sec

Monitor Timing

● Always

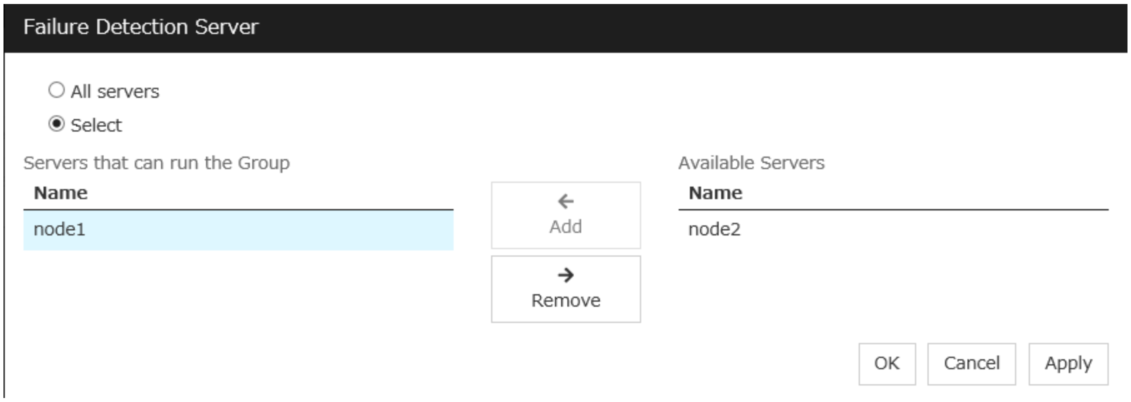
○ Active

Target Resource

Nice Value 0

Choose servers that execute monitoring

Select one available server for **Choose servers that execute monitoring**.



Failure Detection Server

○ All servers

● Select

Servers that can run the Group

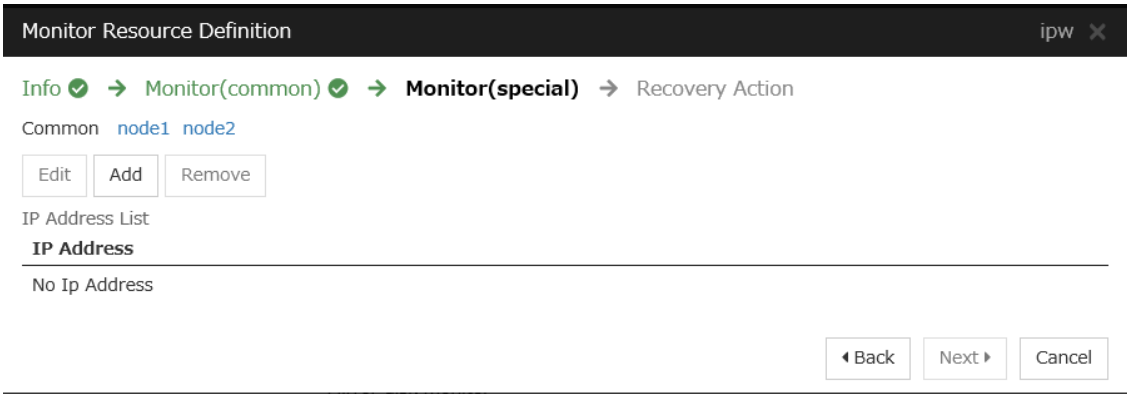
Name
node1

Available Servers

Name
node2

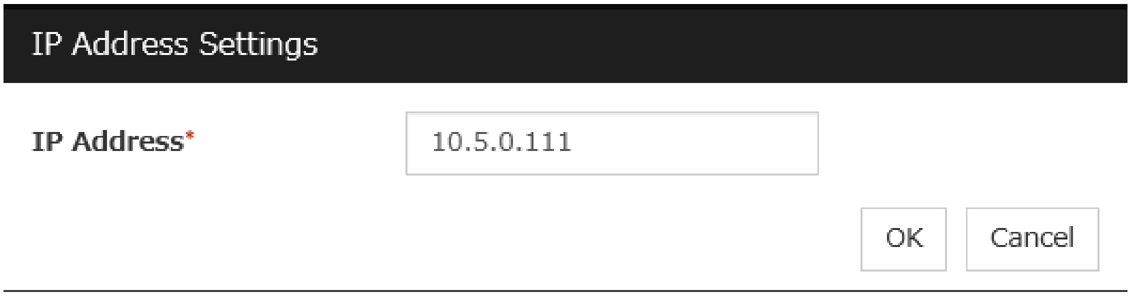
Click **Next**.

4. The **Monitor (special)** window is displayed.

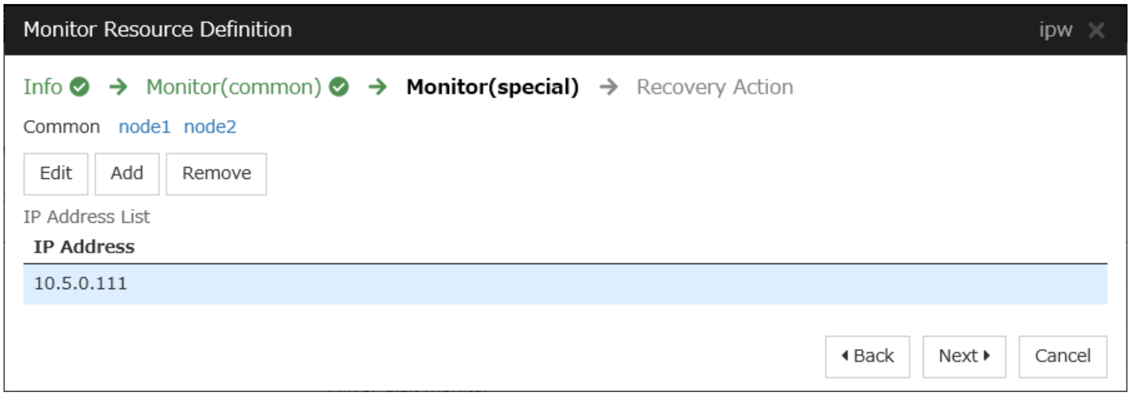


No Ip Address

On the **Common** tab, select **Add** of **IP Address** and set an IP address of a server other than the server selected in step 3. Click **Next**.



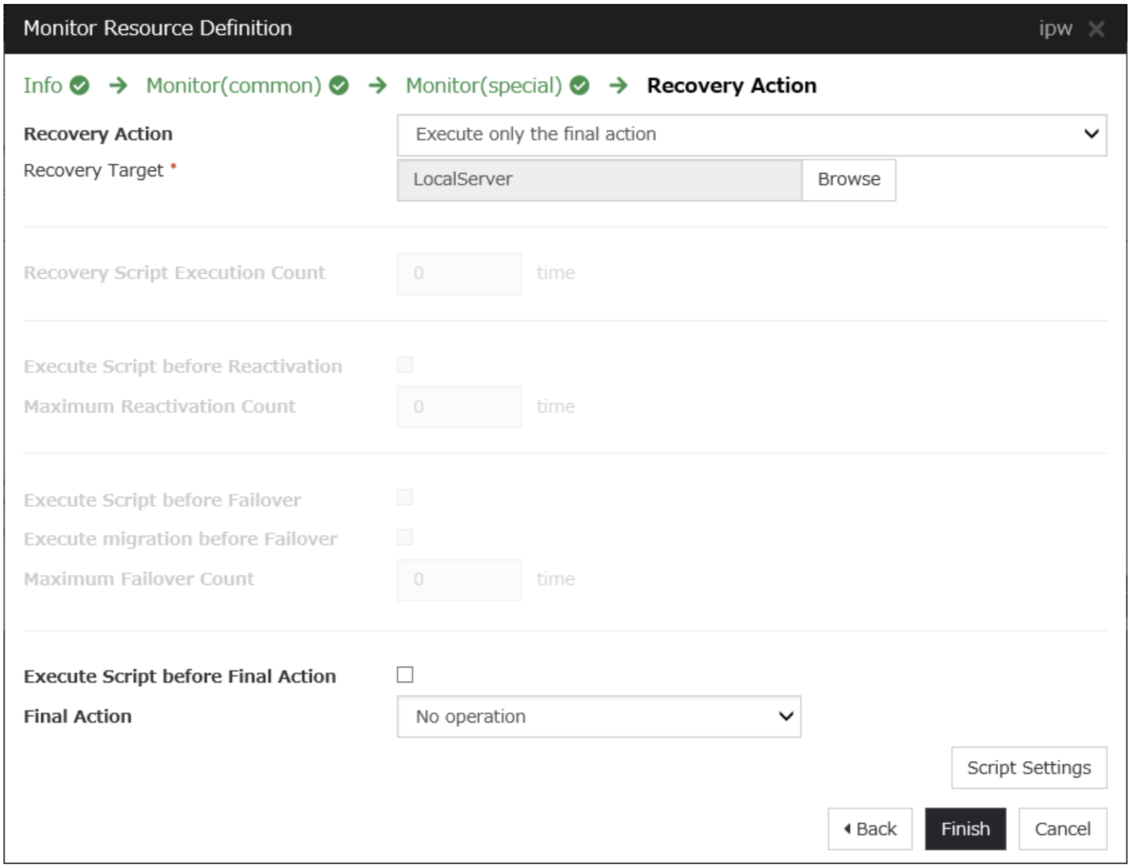
IP Address* 10.5.0.111



10.5.0.111

5. The **Recovery Action** window is displayed.

   Select **Execute only the final action** for **Recovery Action**, **LocalServer** for **Recovery Target**, and **No operation** for **Final Action**.



Monitor Resource Definition

ipw

Info ✓ → Monitor(common) ✓ → Monitor(special) ✓ → Recovery Action

Recovery Action: Execute only the final action

Recovery Target *: LocalServer

Recovery Script Execution Count: 0 time

Execute Script before Reactivation: □

Maximum Reactivation Count: 0 time

Execute Script before Failover: □

Execute migration before Failover: □

Maximum Failover Count: 0 time

Execute Script before Final Action: □

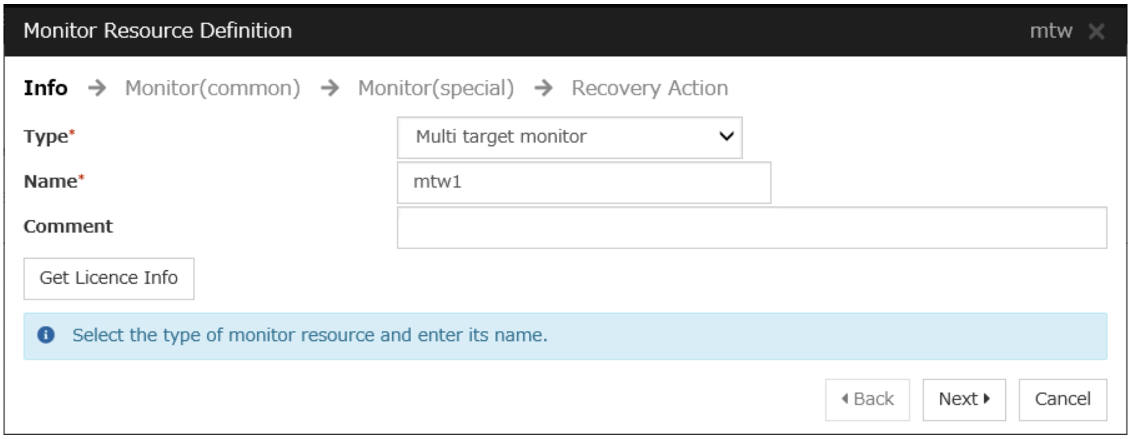
Final Action: No operation

6. Click **Finish** to finish setting.
7. Then, create a monitor resource on the other server. Click **Add** on the **Monitor Resource List** page.
8. Select the monitor resource type (ip monitor) from the **Type** box and enter the monitor resource name (ipw2) in the **Name** box. Click **Next**.
9. The **Monitor (common)** window is displayed.
   Confirm that **Monitor Timing** is **Always**.
   Select one available server for **Choose servers that execute monitoring**.
   Click **Next**.
10. The **Monitor (special)** window is displayed.
    On the **Common** tab, select **Add** of **IP Address** and set an IP address of a server other than the server selected in step 9. Click **Next**.
11. The **Recovery Action** window is displayed.
    Select **Execute only the final action** for **Recovery Action**, **LocalServer** for **Recovery Target**, and **No operation** for **Final action**.
12. Click **Finish** to finish setting.

- Multi target monitor resource

  Creates a multi target monitor resource to check the statuses of the custom monitor resource and IP monitor resource. The custom monitor resource monitors communication to Microsoft Azure Service Management API. The IP monitor resource monitors communication between clusters that are configured with virtual machines. If their statuses are abnormal, execute the script in which the processing for NP resolution is described. For details about the multi target monitor resource, see Understanding multi target monitor resources in the Reference Guide.

1. Click **Add** on the **Monitor Resource List** page.
2. Select the monitor resource type (Multi target monitor) from the **Type** box and enter the monitor resource name (mtw1) in the **Name** box. Click **Next**.



Monitor Resource Definition

Info → Monitor(common) → Monitor(special) → Recovery Action

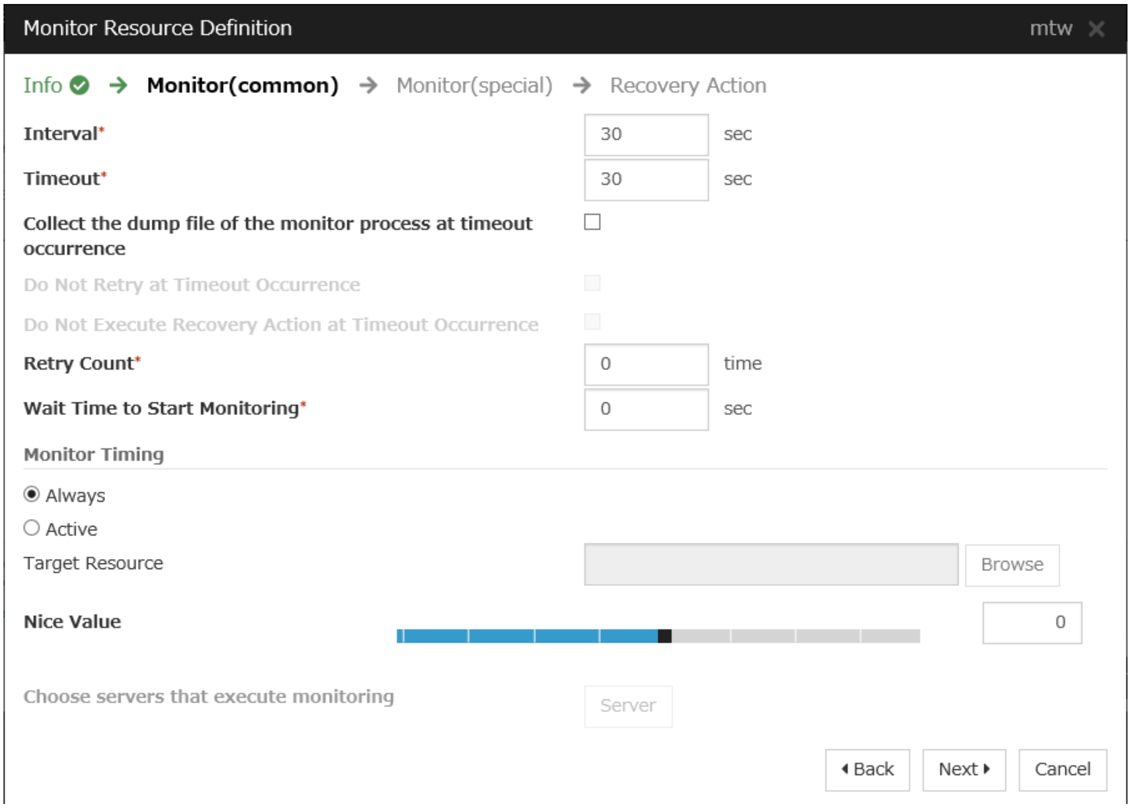
Type*: Multi target monitor

Name*: mtw1

Comment:

Select the type of monitor resource and enter its name.

3. The **Monitor (common)** window is displayed.
   Confirm that **Monitor Timing** is **Always** and click **Next**.



Monitor Resource Definition

Info → Monitor(common) → Monitor(special) → Recovery Action

Interval*: 30 sec

Timeout*: 30 sec

Collect the dump file of the monitor process at timeout occurrence: □

Do Not Retry at Timeout Occurrence: □

Do Not Execute Recovery Action at Timeout Occurrence: □

Retry Count*: 0 time

Wait Time to Start Monitoring*: 0 sec

Monitor Timing

● Always

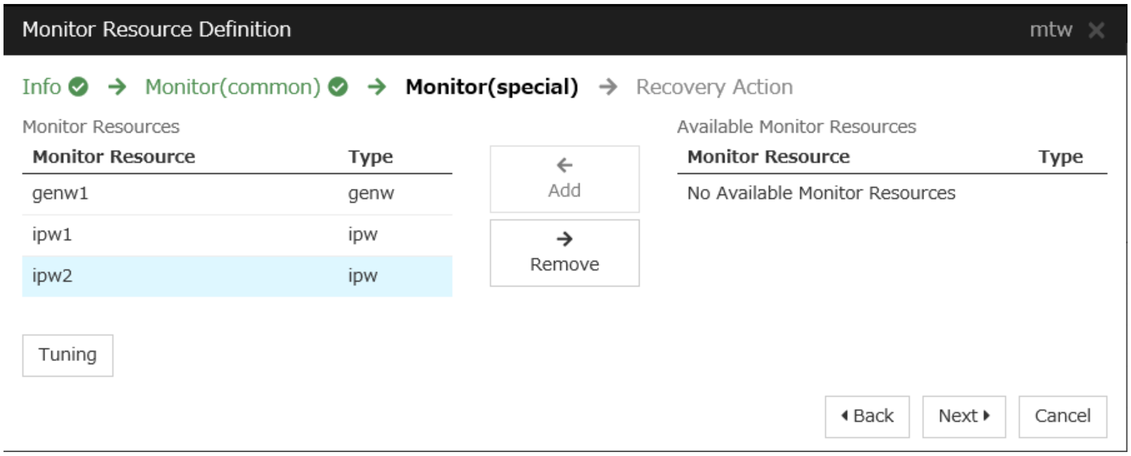
○ Active

Target Resource:

Nice Value: 0

Choose servers that execute monitoring

4. The **Monitor (special)** window is displayed.
   From **Available Monitor Resources**, select the custom monitor resource (genw1) for checking communication with Service Management API and two IP monitor resources (ipw1 and ipw2) that are set to both servers. Then, click **Add** to add them to **Monitor Resource List**. Click **Next**.



Monitor Resource Definition

Info → Monitor(common) → **Monitor(special)** → Recovery Action

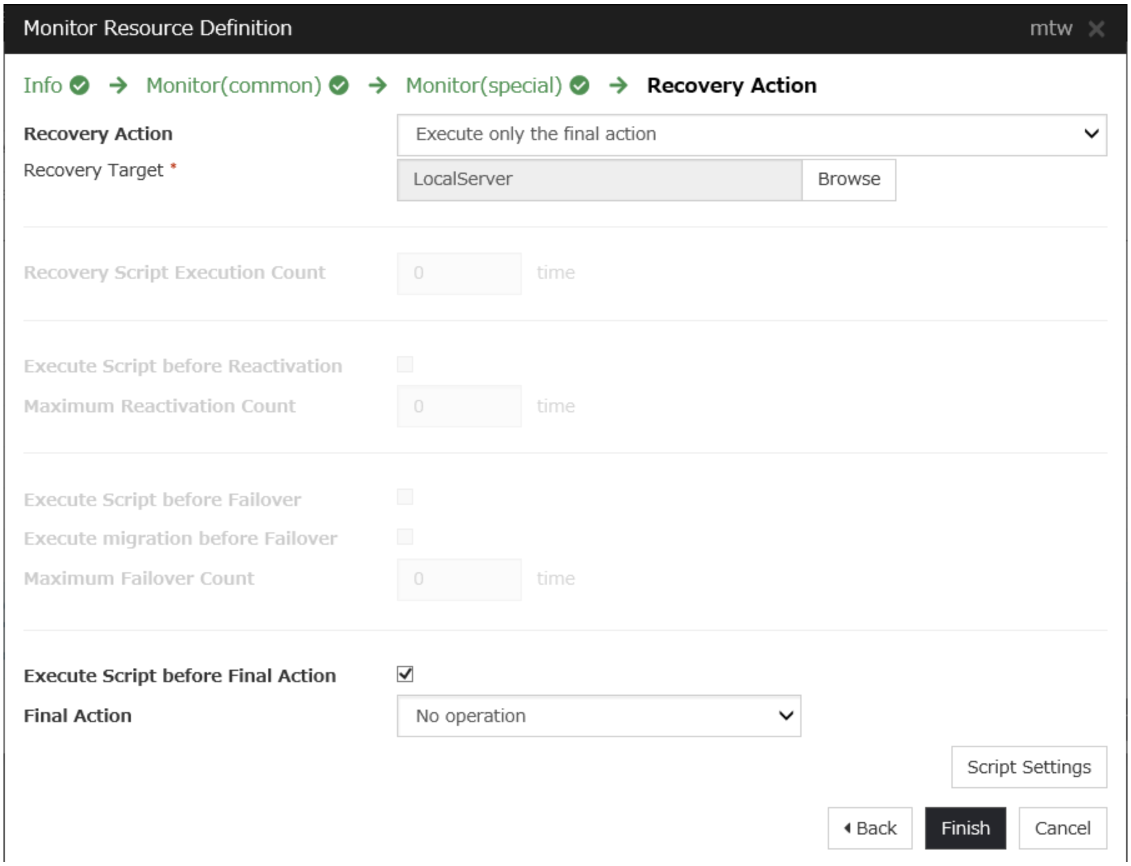
Monitor Resources

Monitor Resource	Type
genw1	genw
ipw1	ipw
ipw2	ipw

Available Monitor Resources

Monitor Resource	Type
No Available Monitor Resources	

5. The **Recovery Action** window is displayed.
   Select **Execute only the final action** for **Recovery action**, **LocalServer** for **Recovery Target**, and **No operation** for **Final action**, and select the **Execute Script before Final Action** check box.
   Click **Script Settings** and create a script to be executed when the multi target monitor resource detects an error.



Monitor Resource Definition

Info → Monitor(common) → Monitor(special) → **Recovery Action**

Recovery Action: Execute only the final action

Recovery Target *: LocalServer

Recovery Script Execution Count: 0 time

Execute Script before Reactivation: □

Maximum Reactivation Count: 0 time

Execute Script before Failover: □

Execute migration before Failover: □

Maximum Failover Count: 0 time

Execute Script before Final Action: ☑

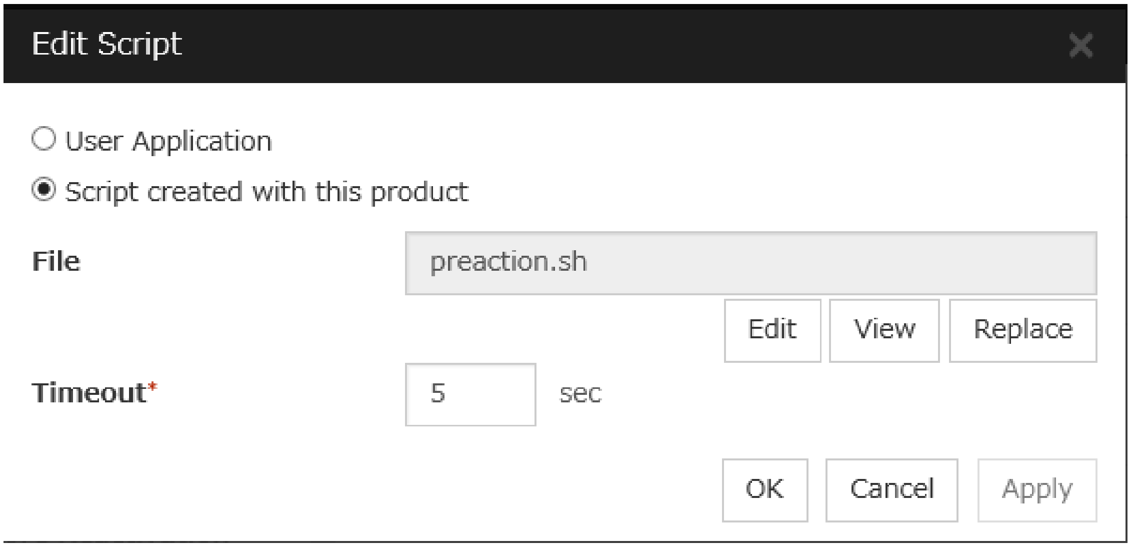
Final Action: No operation

6. The script editing dialog box is displayed.
   Select **Script created with this product** and click **Edit** to edit the script. The following shows the sample of a script to be created.
   Specify the following by referring to "4.1. *Creation example*" The ports differ depending on operations.
   - **Load balancing rule > Backend port** of the load balancer

- **Load balancing rule > Port** of the load balancer
Set the public IP address that you wrote down in "10) Setting the inbound security rules" to the following:
- **Frontend IP** (public IP address) of the load balancer

```
#! /bin/sh
<EXPRESSCLUSTER_installation_path>/bin/clpazure_port_checker -h 127.0.
↪0.1 -p <Backend_port_of_the_load_balancer_of_Load_balancing_rule>
if [ $? -ne 0 ]
then
    clpdown
    exit 0
fi
<EXPRESSCLUSTER_installation_path>/bin/clpazure_port_checker -h
↪<Frontend_IP(public_IP_address)_of_the_load_balancer> -p <Port_of_
↪the_load_balancer_of_Load_balancing_rule>
if [ $? -ne 0 ]
then
    clpdown
    exit 0
fi
```

For **Timeout**, specify a value larger than the timeout value of clpazure_port_checker (fixed to five seconds). In the case of the above sample script, it is recommended to set a value larger than 10 seconds in order to execute clpazure_port_checker twice.
Click **OK**.



Edit Script

○ User Application
● Script created with this product

File: preaction.sh

Timeout*: 5 sec

7. Click **Finish** to finish setting.

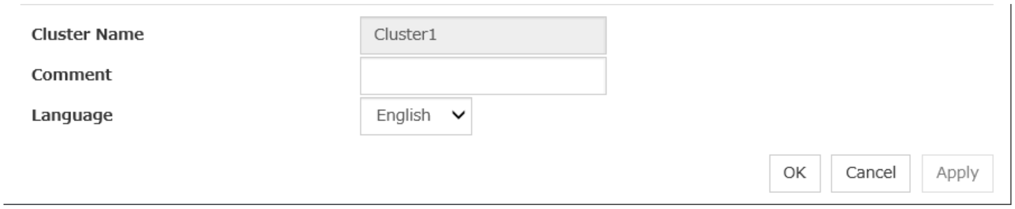
4) **Setting the cluster properties**

For details about the cluster properties, see "Cluster properties" in the Reference Guide.

- Cluster properties

  Configure the settings in **Cluster Properties** to link Microsoft Azure and EXPERSSCLUSTER.

  1. Enter **Config Mode** from Cluster WebUI, click the property icon of the cluster name.



Cluster Name	Cluster1
Comment	
Language	English

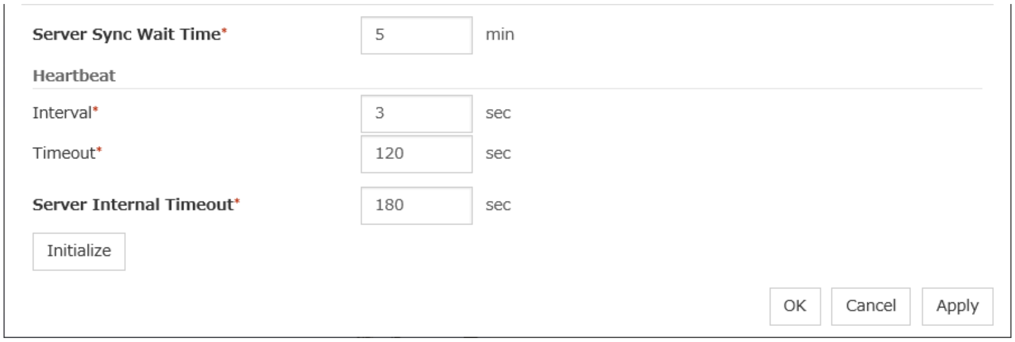
2. Select the **Timeout** tab. For **Timeout** of **Heartbeat**, specify a value calculated by "A+B+C" as described below.

   - A: **Interval** of the monitor resource being monitored by the multi target monitor resource for NP resolution x (**Retry Count**+1)

     * Among three monitor resources, select the monitor resource whose calculation result is the largest.

   - B: **Interval** of the multi target monitor resource x (**Retry Count**+1)
   - C: 30 seconds (Waiting time for heartbeat not to time out before the multi target monitor resource detects an error. The time can be changed accordingly.

Note: If **Timeout** of **Heartbeat** is shorter than the time that the multi target monitor resource requires to detect an error, a heartbeat timeout will be detected before starting the NP resolution processing. In this case, the same service may start doubly in the cluster because the service also starts on the standby server.



Server Sync Wait Time*	5	min
Heartbeat		
Interval*	3	sec
Timeout*	120	sec
Server Internal Timeout*	180	sec

3. Click **OK**.

5) **Applying the settings and starting the cluster**

1. Click **Apply the Configuration File** on the **File** in the config mode of Cluster WebUI.
   If the upload succeeds, the message saying "The application finished successfully."
2. Select the **Operation Mode** on the drop down menu of the toolbar in Cluster WebUI to switch to the operation mode.
3. The procedure depends on the resource used. For details, refer to the following:Installation and Configuration Guide -> How to create a cluster

5.4 Verifying the created environment

Verify whether the created environment works properly by generating a monitoring error to fail over a failover group. If the cluster is running normally, the verification procedure is as follows:

1. Start the failover group (failover1) on the active node (node1). In the **Status** tab on the Cluster WebUI, confirm that **Group Status** of failover1 of node1 is **Normal**.
2. Change **Operation Mode** to **Verification Mode** from the Cluster WebUI pull-down menu.
3. In the **Status** tab on the Cluster WebUI, click the **Enable dummy failure** icon of azureppw1 of Monitors.
4. After the Azure probe port resource (azurepp1) activated three times, the failover group (failover1) becomes abnormal and fails over to node2. In the **Status** tab on the Cluster WebUI, confirm that **Group Status** of failover1 of node2 is **Normal**.

Also, confirm that access to the frontend IP and port of the Azure load balancer is normal after the failover.

Verifying the failover operation in case of a dummy failure is now complete. Verify the operations in case of other failures if necessary.

CHAPTER

SIX

CLUSTER CREATION PROCEDURE (FOR AN HA CLUSTER USING AN INTERNAL LOAD BALANCER)

6.1 Creation example

This guide introduces the procedure for creating a 2-node unidirectional standby cluster using EXPRESSCLUSTER. This procedure is intended to create a mirror disk type configuration in which node1 is used as an active server.

The following tables describe the parameters that do not have a default value and the parameters whose values are to be changed from the default values.

- Microsoft Azure settings (common to node1 and node2)

Setting item	Setting value
Resource group setting	
Resource group	TestGroup1
Region	(Asia Pacific) Japan East
Virtual network setting	
Name	Vnet1
Address space	10.5.0.0/24
Subnet Name	Vnet1-1
Subnet Address range	10.5.0.0/24
Resource group	TestGroup1
Location	(Asia Pacific) Japan East
Load balancer setting	
Name	TestLoadBalancer
Type	Internal
Virtual network	Vnet1
Subnet	Vnet1-1
IP address assignment	Static
Private IP address	10.5.0.200
Resource group	TestGroup1
Region	(Asia Pacific) Japan East
Backend pool: Name	TestBackendPool
Associated to	Availability set
Target virtual machine	node1 node2

Continued on next page

Table 6.1 – continued from previous page

Setting item	Setting value
Network IP configuration	10.5.0.110 10.5.0.111
Health probe: Name	TestHealthProbe
Health probe: Port	26001
Load balancing rule: Name	TestLoadBalancingRule
Load balancing rule: Port	80 (Port number offering the operation)
Load balancing rule: Backend port	8080 (Port number offering the operation)

- Microsoft Azure settings (specific to each of node1 and node2)

Setting item	Setting value	
	node1	node2
Virtual machine setting		
– Disk type	Standard HDD	
– User name	testlogin	
– Password	PassWord_123	
– Resource group	TestGroup1	
– Region	(Asia Pacific) Japan East	
Network security group setting		
– Name	node1-nsg	node2-nsg
– Availability set setting		
– Name	AvailabilitySet1	
– Update domains	5	
– Fault domains	2	
Diagnostics storage account setting		
– Name	Automatically generated	
– Performance	Standard	
– Replication	Locally-redundant storage (LRS)	
IP configuration setting		
– IP address	10.5.0.110	10.5.0.111
Disk setting		
– Name	node1_DataDisk_0	node2_DataDisk_0
– Source type	None (empty disk)	
– Account type	Standard HDD	
– Size	20	

- EXPRESSCLUSTER settings (cluster properties)

Setting item	Setting value	
	node1	node2
– Cluster Name	Cluster1	
– Server Name	node1	node2
– NP Resolution Tab: Type	Ping	
– NP Resolution Tab: Ping Target	10.5.0.5	
– NP Resolution Tab: <server> column	Use	Use

- EXPRESSCLUSTER settings (failover group)

Resource name	Setting item	Setting value
Mirror disk resource	Name	md
	Details Tab: Mount Point	/mnt/md
	Details Tab: Data Partition Device Name	/dev/sdc2
	Details Tab: Cluster Partition Device Name	/dev/sdc1
	Details Tab: File System	ext4
	Mirror Tab: Execute the initial mirror construction	On
	Mirror Tab: Execute initial mkfs	On
Azure probe port resource	Name	azurepp1
	Probe port	26001 (Value specified for Port of Health probe)
Exec resource (for DSR)	Name	exec1

- EXPRESSCLUSTER settings (monitor resource)

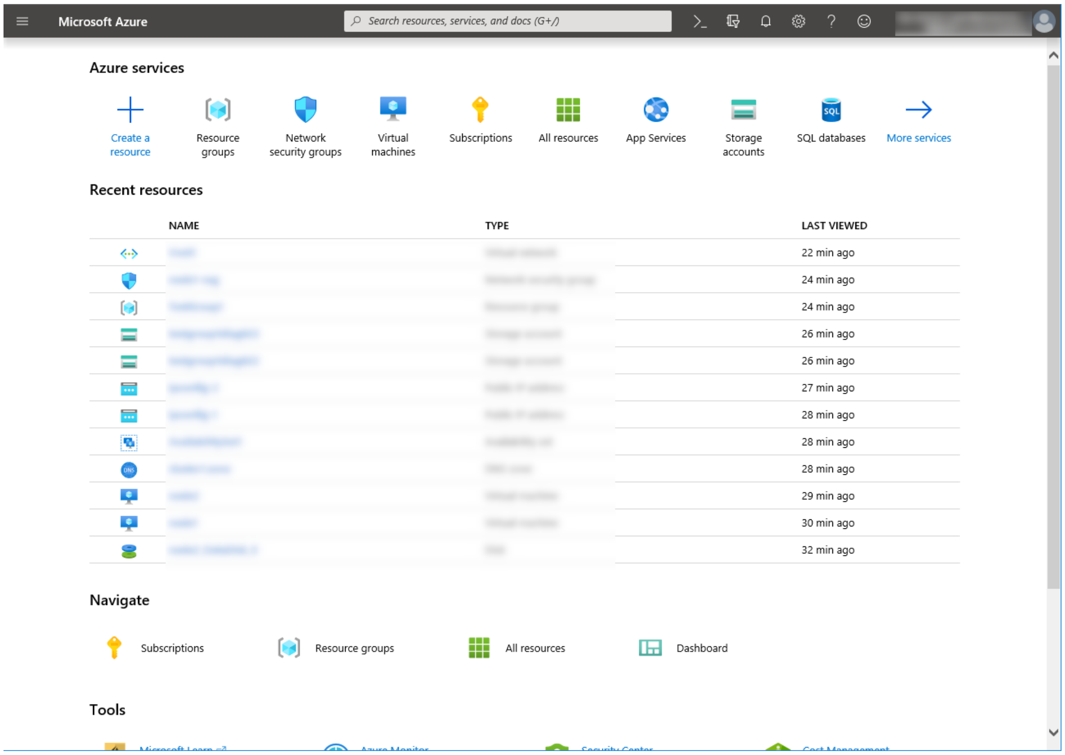
Monitor resource name	Setting item	Setting value
Mirror disk monitor resource	Name	mdw1
Azure probe port monitor resource	Name	azureppw1
	Recovery Target	azurepp1
Azure load balance monitor resource	Name	aurelbw1
	Recovery Target	azurepp1

6.2 Configuring Microsoft Azure

1) **Creating a resource group**

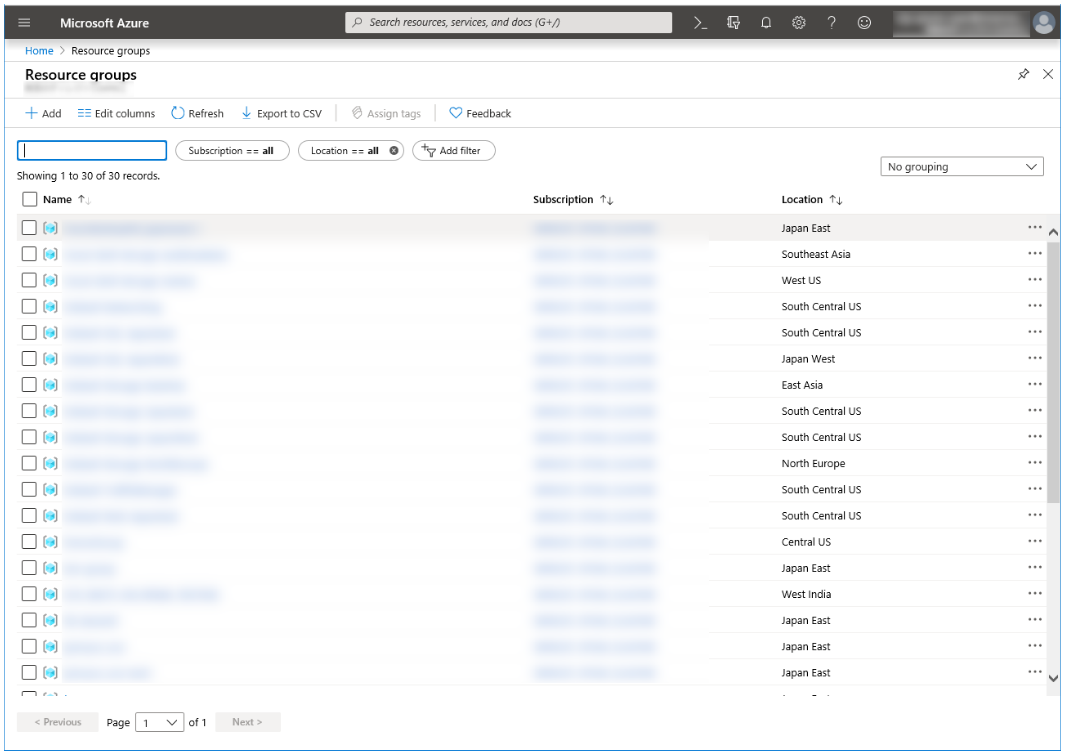
Log in to the Microsoft Azure portal (https://portal.azure.com/) and create a resource group following the steps below.

1. Select the **Resource groups** icon on the upper part of the window. If there are existing resource groups, they are displayed in a list.



	NAME	TYPE	LAST VIEWED
	[redacted]	[redacted]	22 min ago
	[redacted]	[redacted]	24 min ago
	[redacted]	[redacted]	24 min ago
	[redacted]	[redacted]	26 min ago
	[redacted]	[redacted]	26 min ago
	[redacted]	[redacted]	27 min ago
	[redacted]	[redacted]	28 min ago
	[redacted]	[redacted]	28 min ago
	[redacted]	[redacted]	28 min ago
	[redacted]	[redacted]	29 min ago
	[redacted]	[redacted]	30 min ago
	[redacted]	[redacted]	32 min ago

2. Select **+Add** at the upper part of the window.

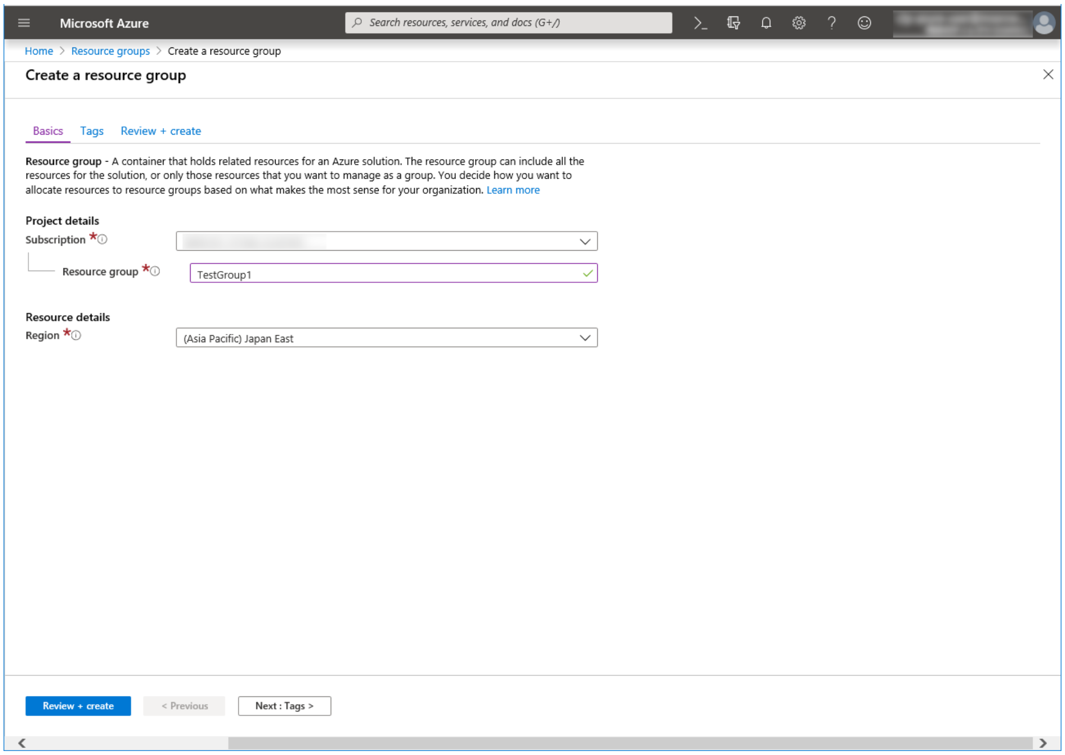


Resource groups

Showing 1 to 30 of 30 records.

Name	Subscription	Location
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	Southeast Asia
[redacted]	[redacted]	West US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	Japan West
[redacted]	[redacted]	East Asia
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	North Europe
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	South Central US
[redacted]	[redacted]	Central US
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	West India
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	Japan East
[redacted]	[redacted]	Japan East

3. Specify **Subscription**, **Resource group**, and **Region**, and click **Review+Create**.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > Resource groups > Create a resource group
Basics
Tags
Review + create
Review + create
< Previous
Next : Tags >

Create a resource group

Resource group - A container that holds related resources for an Azure solution. The resource group can include all the resources for the solution, or only those resources that you want to manage as a group. You decide how you want to allocate resources to resource groups based on what makes the most sense for your organization. Learn more

Project details

Subscription *: [redacted]

Resource group *: TestGroup1

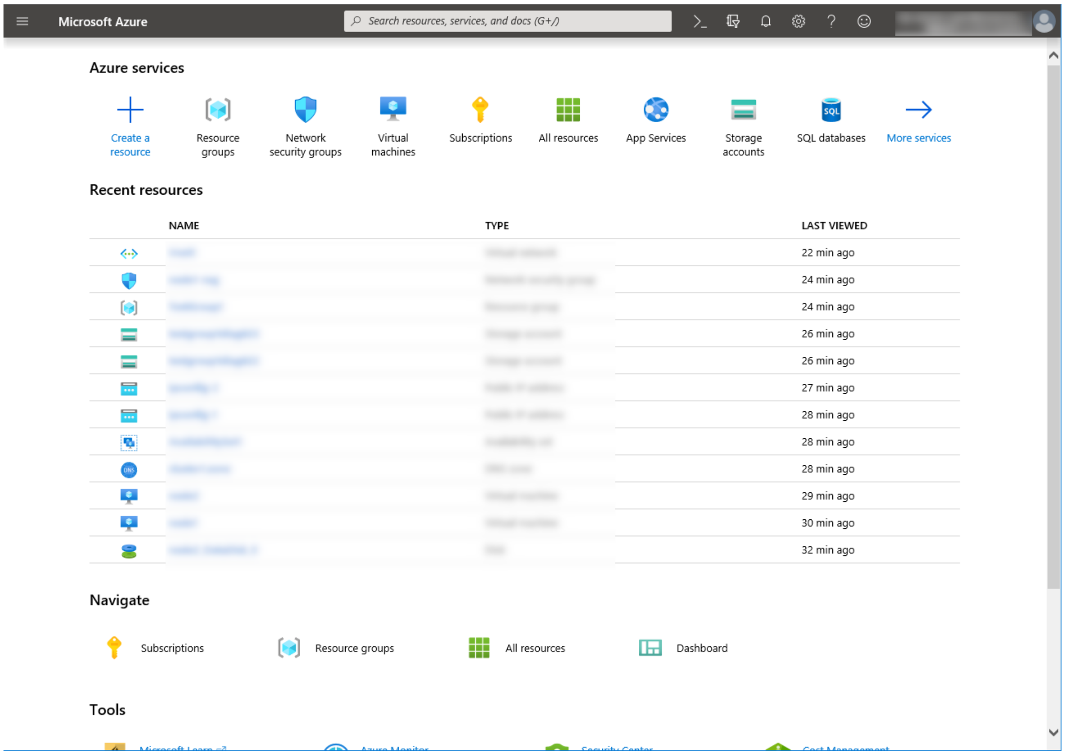
Resource details

Region *: (Asia Pacific) Japan East

2) **Creating a virtual network**

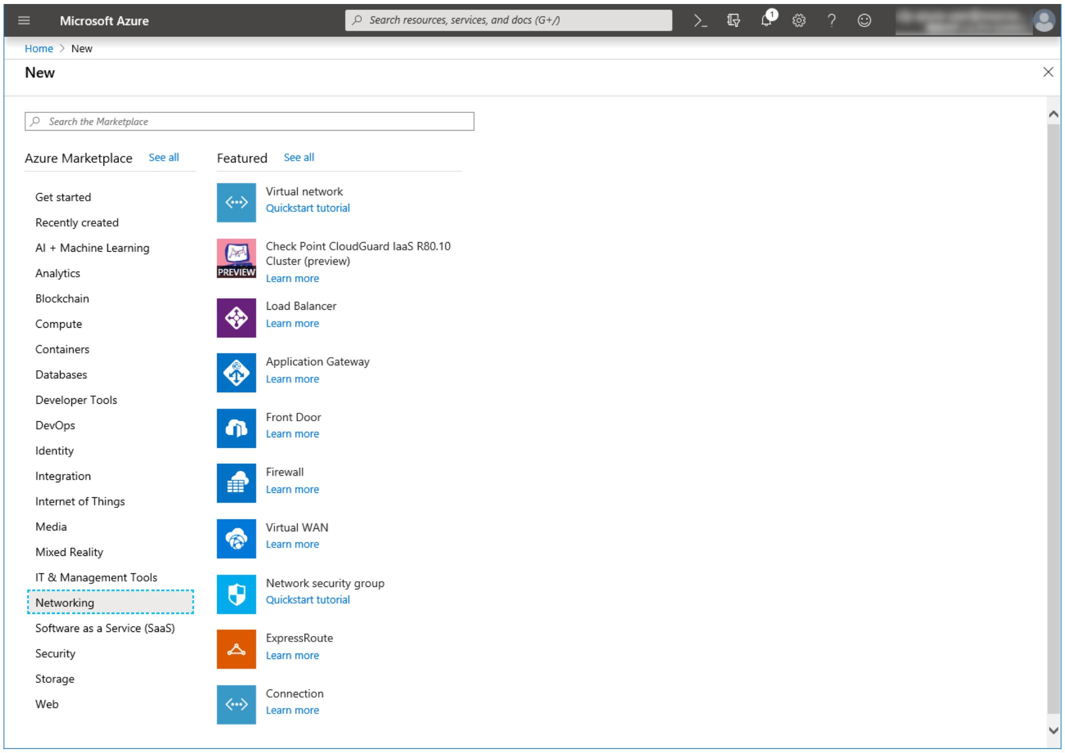
Log in to the Microsoft Azure portal (https://portal.azure.com/) and create a virtual network following the steps below.

1. Select the **Create a resource** icon on the upper partof the window.

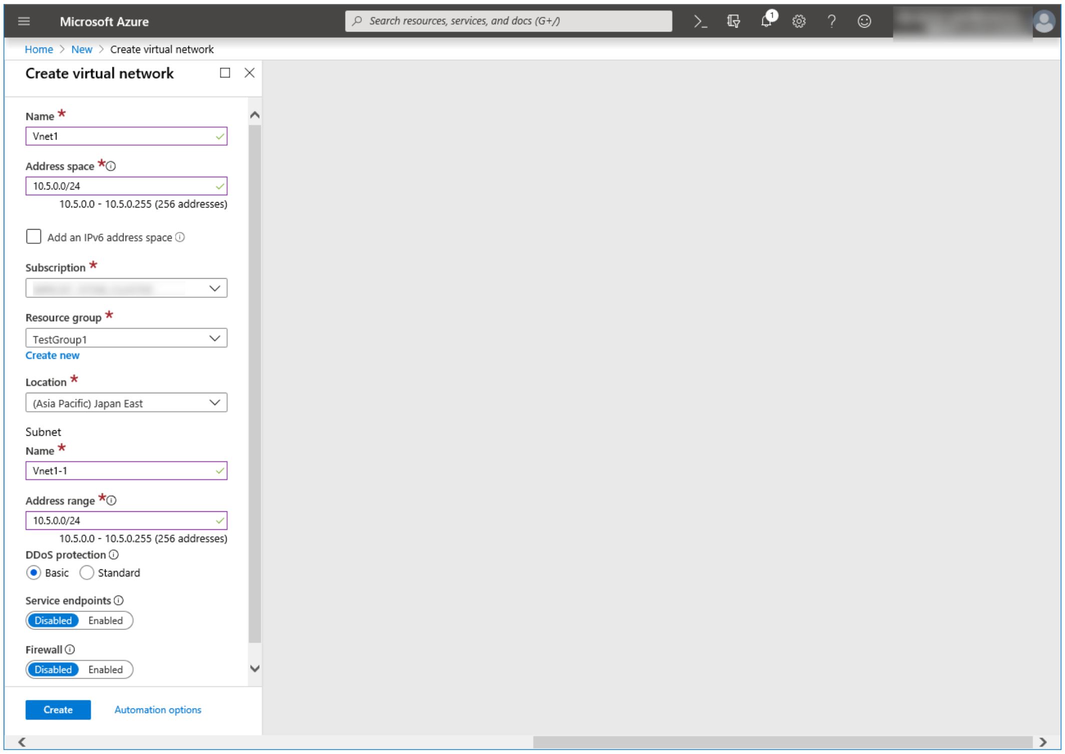


NAME	TYPE	LAST VIEWED
[redacted]	[redacted]	22 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	27 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	29 min ago
[redacted]	[redacted]	30 min ago
[redacted]	[redacted]	32 min ago

2. Select **Networking** and then **Virtual network**.



3. Specify **Name**, **Address space**, **Subscription**, **Resource group**, **Location**, **Name** of Subnet, and **Address range** of Subnet, and click **Create**.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create virtual network
Create virtual network

Name *
Vnet1

Address space * ⓘ
10.5.0.0/24
10.5.0.0 - 10.5.0.255 (256 addresses)

□ Add an IPv6 address space ⓘ

Subscription *
[redacted]

Resource group *
TestGroup1
Create new

Location *
(Asia Pacific) Japan East

Subnet
Name *
Vnet1-1

Address range * ⓘ
10.5.0.0/24
10.5.0.0 - 10.5.0.255 (256 addresses)

DDoS protection ⓘ
● Basic ○ Standard

Service endpoints ⓘ
Disabled | Enabled

Firewall ⓘ
Disabled | Enabled

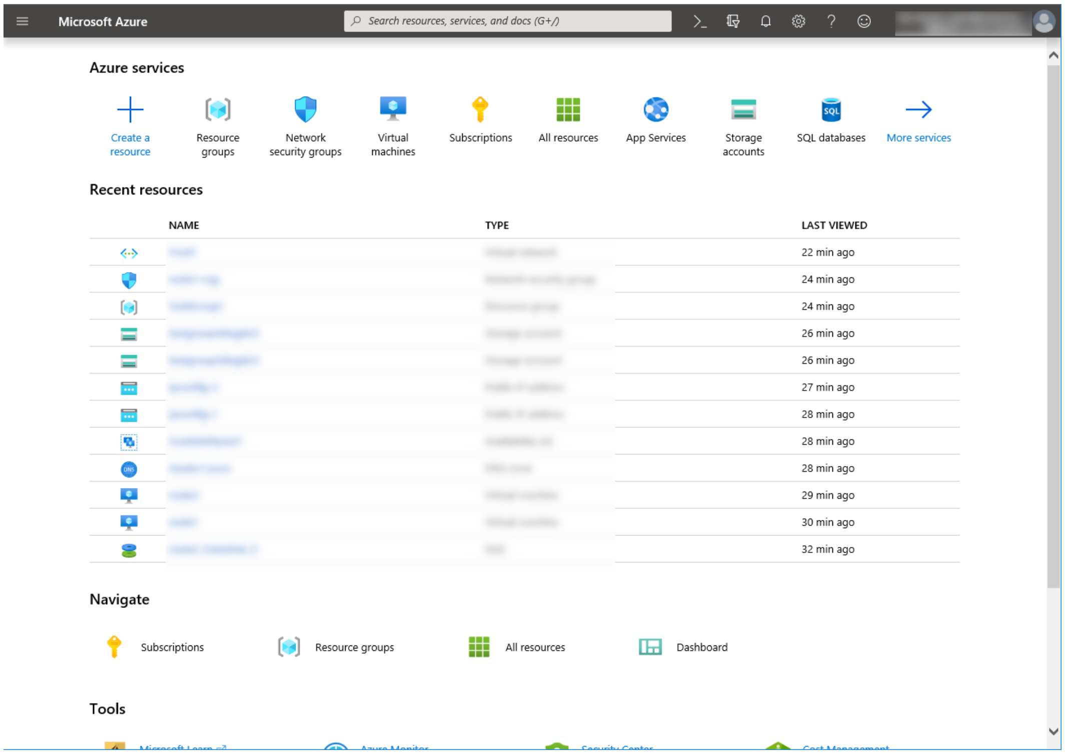
Create
Automation options

3) **Creating a virtual machine**

Log in to the Microsoft Azure portal (https://portal.azure.com/) and create virtual machines and disks following the steps below.

Create as many virtual machines as required to create a cluster. Create node1 and then node2.

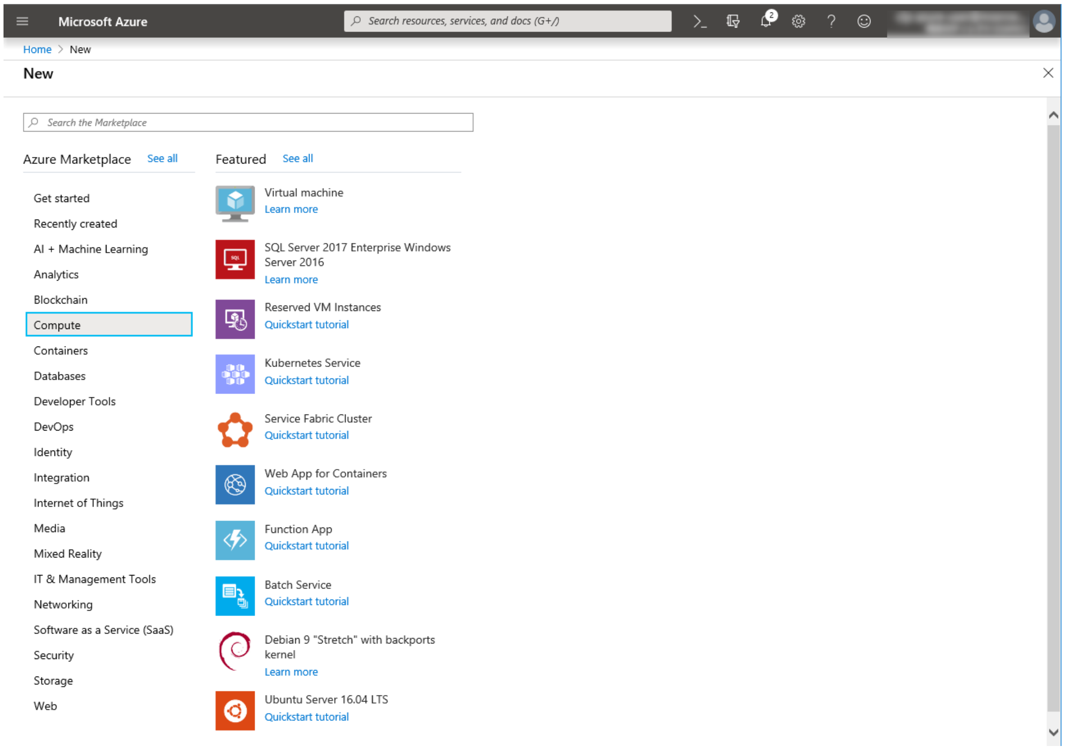
1. Select the **Create a resource** icon on the upper part of the window.



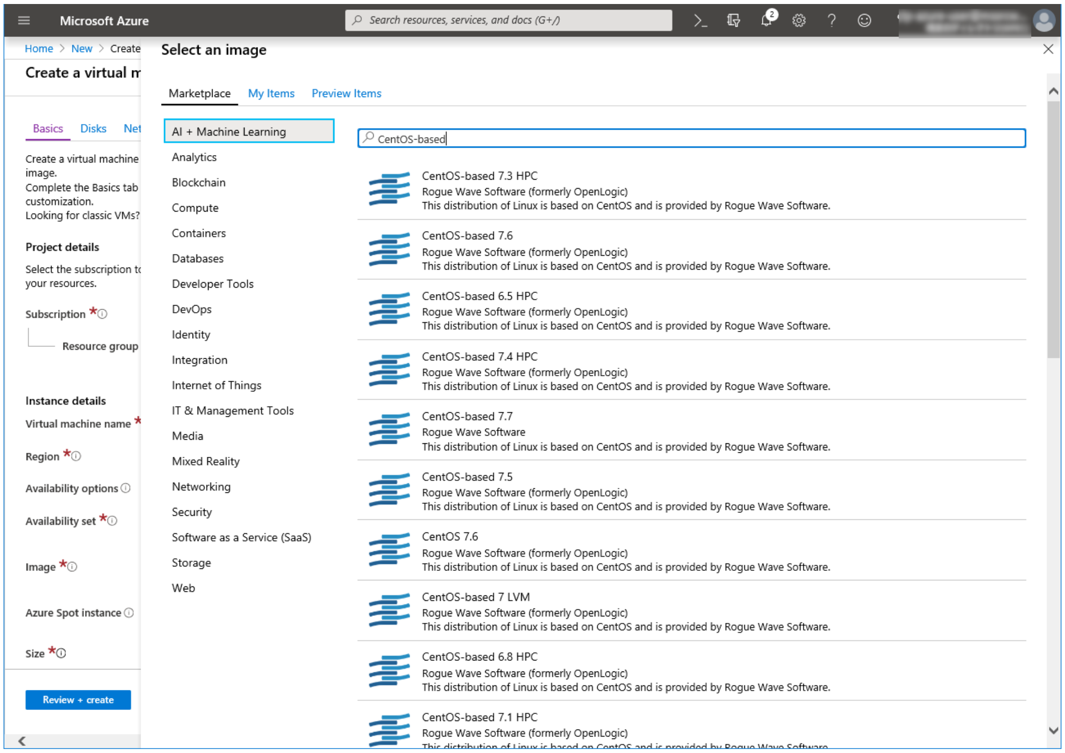
Recent resources

NAME	TYPE	LAST VIEWED
[redacted]	[redacted]	22 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	27 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	29 min ago
[redacted]	[redacted]	30 min ago
[redacted]	[redacted]	32 min ago

2. Select **Compute** and then **See all**.



3. Select **CentOS-based 7.6**.



Create a virtual machine
image.
Complete the Basics tab
customization.
Looking for classic VMs?

Select the subscription t
your resources.

CentOS-based

CentOS-based 7.3 HPC
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 7.6
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 6.5 HPC
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 7.4 HPC
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 7.7
Rogue Wave Software
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 7.5
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS 7.6
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 7 LVM
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

CentOS-based 6.8 HPC
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

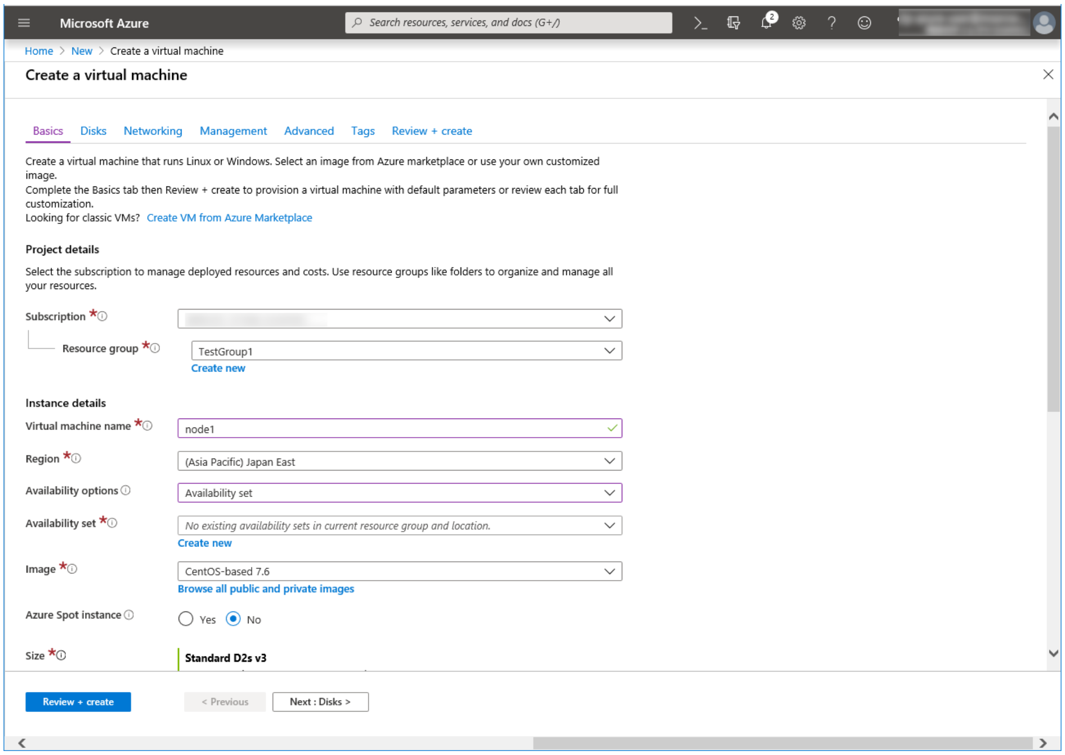
CentOS-based 7.1 HPC
Rogue Wave Software (formerly OpenLogic)
This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.

4. Click **Create**.

5. When the **Basics** tab appears, specify the settings of **Subscription**, **Resource group**, **Virtual**

machine name, **Region**, **Image**, **Size**, **Username**, **Password**, and **Confirm password**.

Select **Availability set** from **Availability options**, and click **Create new** under the **Availability set** field. When **Create new** appears, specify the settings of **Name**, **Fault domains**, and **Update domains**. Then click **OK**.



Microsoft Azure   Search resources, services, and docs (G+/)   [redacted]

Home > New > Create a virtual machine

Create a virtual machine

Basics | Disks | Networking | Management | Advanced | Tags | Review + create

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image.
Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization.
Looking for classic VMs? Create VM from Azure Marketplace

Project details

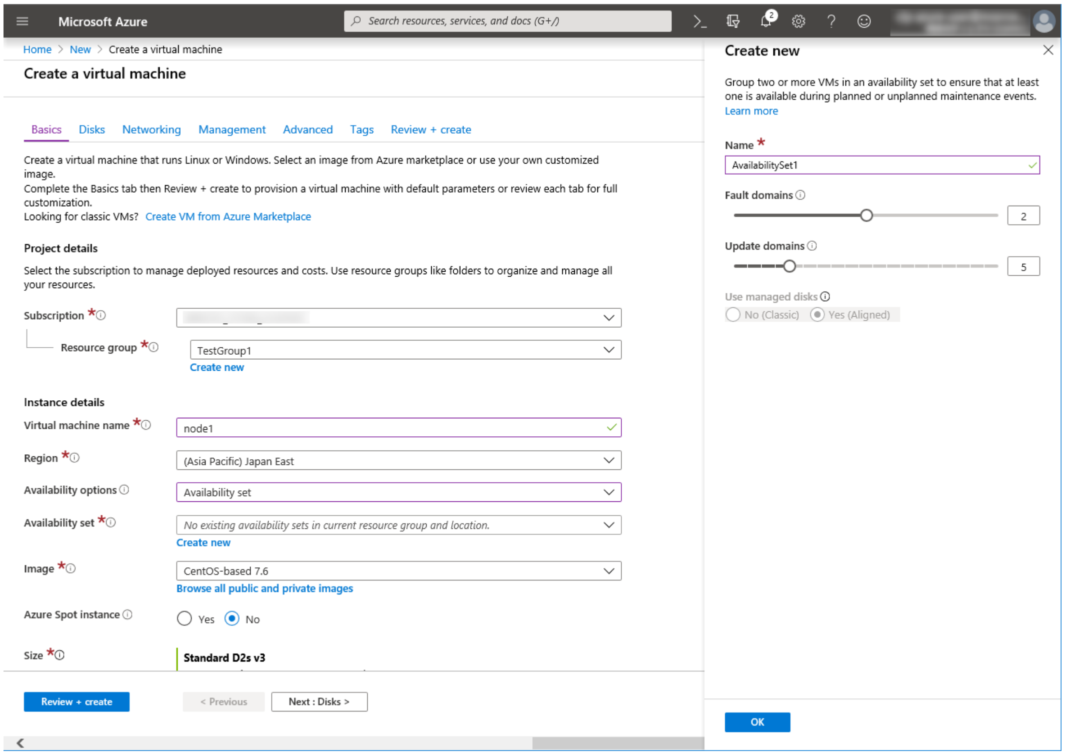
Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * [redacted]
Resource group * TestGroup1
Create new

Instance details

Virtual machine name * node1
Region * (Asia Pacific) Japan East
Availability options Availability set
Availability set * No existing availability sets in current resource group and location.
Create new
Image * CentOS-based 7.6
Browse all public and private images
Azure Spot instance ○ Yes ● No
Size * Standard D2s v3

Review + create   < Previous   Next : Disks >



Microsoft Azure   Search resources, services, and docs (G+/)   [redacted]

Home > New > Create a virtual machine

Create a virtual machine

Basics | Disks | Networking | Management | Advanced | Tags | Review + create

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image.
Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization.
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Project details

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

Subscription * [redacted]
Resource group * TestGroup1
Create new

Instance details

Virtual machine name * node1
Region * (Asia Pacific) Japan East
Availability options Availability set
Availability set * No existing availability sets in current resource group and location.
Create new
Image * CentOS-based 7.6
Browse all public and private images
Azure Spot instance ○ Yes ● No
Size * Standard D2s v3

Review + create   < Previous   Next : Disks >

Create new

Group two or more VMs in an availability set to ensure that at least one is available during planned or unplanned maintenance events.
Learn more

Name * AvailabilitySet1
Fault domains 2
Update domains 5
Use managed disks ○ No (Classic) ● Yes (Aligned)

OK

6. Click **Change size** to display **Select a VM size**.

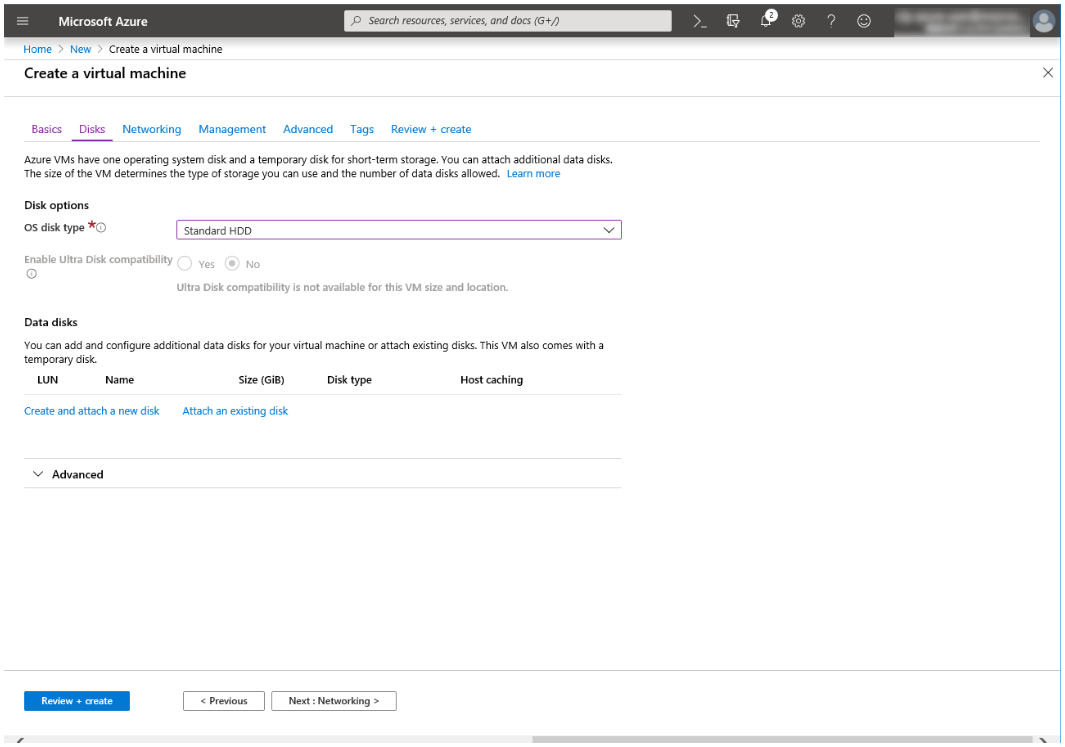
From the list, choose a size (**Standard - A1** in this guide) suitable for your virtual machine and click **Select**.

Regarding the **Virtual machine name**, node1 is for node1, and node2 is for node2.

Click **Next: Disks >**

7. When the **Disks** tab appears, go through the following steps to add a disk to be used for a mirror disk (cluster partition or data partition).

   From the **DATA DISKS** list, click **Create and attach a new disk**.



Create a virtual machine

Azure VMs have one operating system disk and a temporary disk for short-term storage. You can attach additional data disks. The size of the VM determines the type of storage you can use and the number of data disks allowed.

Disk options

OS disk type *: Standard HDD

Enable Ultra Disk compatibility: ○ Yes ● No

Ultra Disk compatibility is not available for this VM size and location.

Data disks

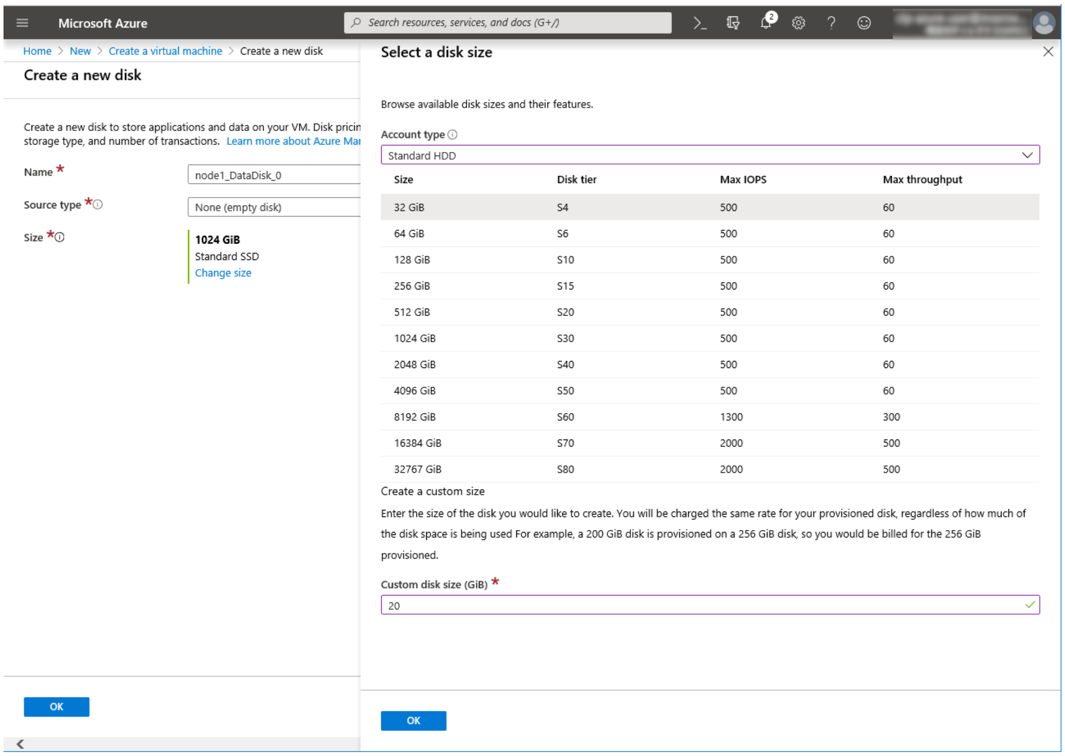
You can add and configure additional data disks for your virtual machine or attach existing disks. This VM also comes with a temporary disk.

LUN	Name	Size (GiB)	Disk type	Host caching

8. **Create a new disk** appears.

   Specify the settings of **Name**, **Source type** and **Size**. Then click **OK**.

   Click **Next: Networking >**


Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > Create a virtual machine > Create a new disk

Create a new disk

Create a new disk to store applications and data on your VM. Disk pricin storage type, and number of transactions. Learn more about Azure Mar

Name * node1_DataDisk_0

Source type * None (empty disk)

Size * 1024 GiB Standard SSD Change size

Select a disk size

Browse available disk sizes and their features.

Account type: Standard HDD

Size	Disk tier	Max IOPS	Max throughput
32 GiB	S4	500	60
64 GiB	S6	500	60
128 GiB	S10	500	60
256 GiB	S15	500	60
512 GiB	S20	500	60
1024 GiB	S30	500	60
2048 GiB	S40	500	60
4096 GiB	S50	500	60
8192 GiB	S60	1300	300
16384 GiB	S70	2000	500
32767 GiB	S80	2000	500

Create a custom size

Enter the size of the disk you would like to create. You will be charged the same rate for your provisioned disk, regardless of how much of the disk space is being used For example, a 200 GiB disk is provisioned on a 256 GiB disk, so you would be billed for the 256 GiB provisioned.

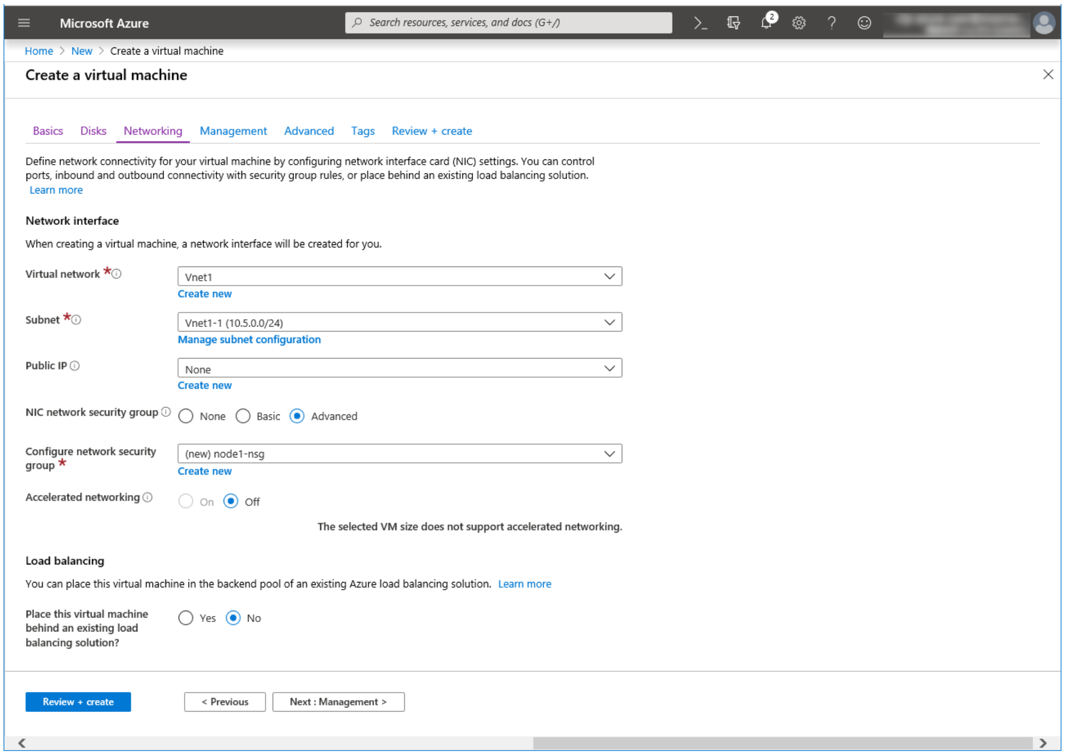
Custom disk size (GiB) * 20

9. The **Networking** tab appears.

   Specify the settings of **Virtual network**, **Subnet**, **NIC Network security group**, and **Configure network security group**.

   Click **Create new** under the **Configure network security group** field to display **Create network security group**. Specify the setting of **Name** and then click **OK**.

   Click **Next: Management >**.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create a virtual machine

Create a virtual machine

Basics Disks Networking Management Advanced Tags Review + create

Define network connectivity for your virtual machine by configuring network interface card (NIC) settings. You can control ports, inbound and outbound connectivity with security group rules, or place behind an existing load balancing solution.
Learn more

Network interface

When creating a virtual machine, a network interface will be created for you.

Virtual network * Vnet1
Create new

Subnet * Vnet1-1 (10.5.0.0/24)
Manage subnet configuration

Public IP None
Create new

NIC network security group ○ None ○ Basic ● Advanced

Configure network security group * (new) node1-nsg
Create new

Accelerated networking ○ On ● Off

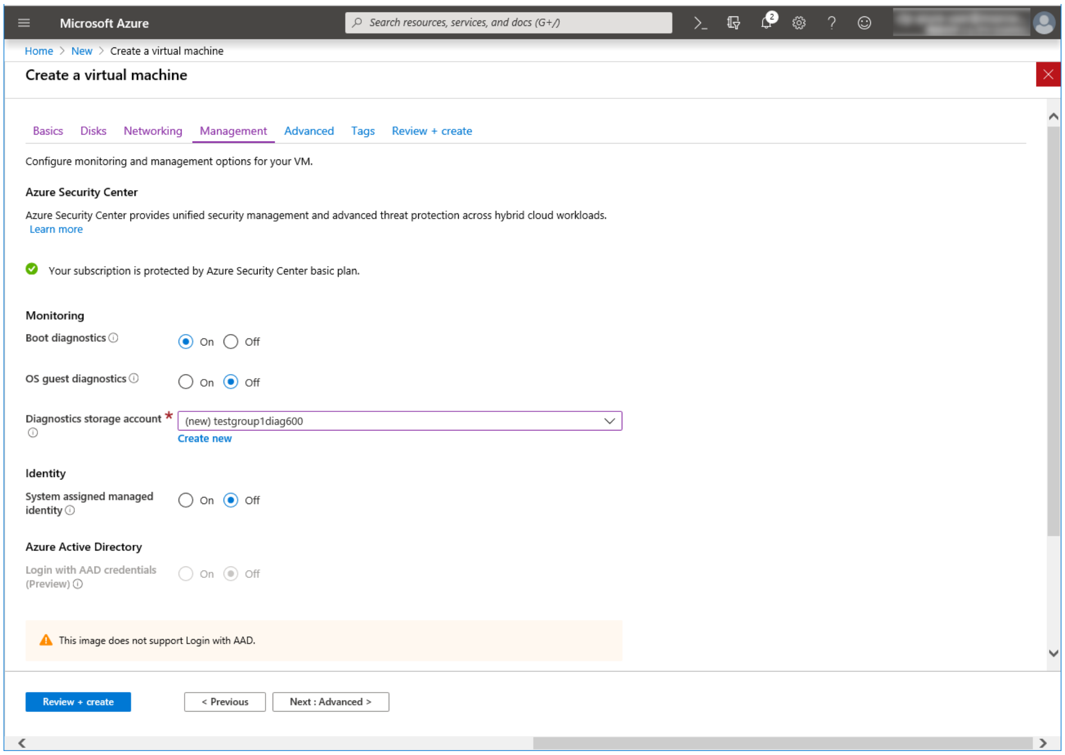
The selected VM size does not support accelerated networking.

Load balancing

You can place this virtual machine in the backend pool of an existing Azure load balancing solution. Learn more

Place this virtual machine behind an existing load balancing solution? ○ Yes ● No

10. The **Management** tab appears.
Click **Create new** under the **Diagnostics storage account** field to display **Create storage account**.
Specify the settings of **Name**, **Account kind**, and **Replication**. Then click **OK**.
In the **Diagnostics storage account** field, the default value is automatically generated and entered.
Click **Next: Details >**


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create a virtual machine

Create a virtual machine

Basics Disks Networking Management Advanced Tags Review + create

Configure monitoring and management options for your VM.

Azure Security Center

Azure Security Center provides unified security management and advanced threat protection across hybrid cloud workloads.
Learn more

✓ Your subscription is protected by Azure Security Center basic plan.

Monitoring

Boot diagnostics ● On ○ Off

OS guest diagnostics ○ On ● Off

Diagnostics storage account * (new) testgroup1diag600
Create new

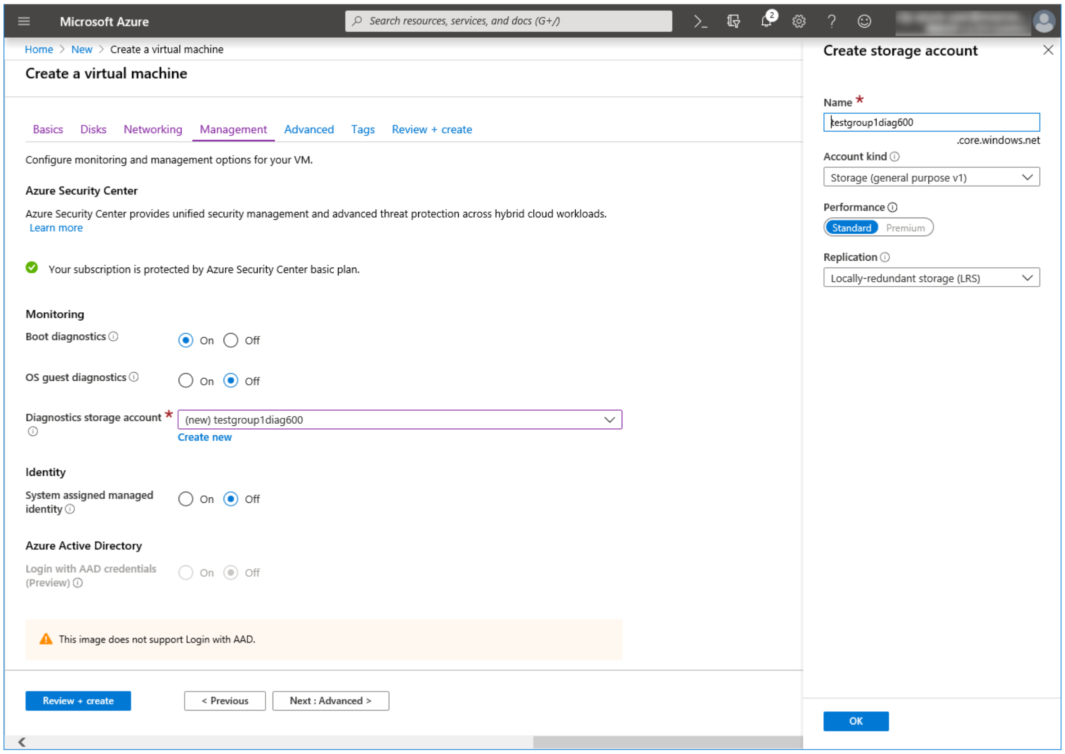
Identity

System assigned managed identity ○ On ● Off

Azure Active Directory

Login with AAD credentials (Preview) ○ On ● Off

⚠ This image does not support Login with AAD.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create a virtual machine

Create a virtual machine

Basics | Disks | Networking | Management | Advanced | Tags | Review + create

Configure monitoring and management options for your VM.

Azure Security Center

Azure Security Center provides unified security management and advanced threat protection across hybrid cloud workloads. Learn more

✓ Your subscription is protected by Azure Security Center basic plan.

Monitoring

Boot diagnostics ● On ○ Off

OS guest diagnostics ○ On ● Off

Diagnostics storage account * (new) testgroup1diag600
Create new

Identity

System assigned managed identity ○ On ● Off

Azure Active Directory

Login with AAD credentials (Preview) ○ On ● Off

⚠ This image does not support Login with AAD.

Create storage account

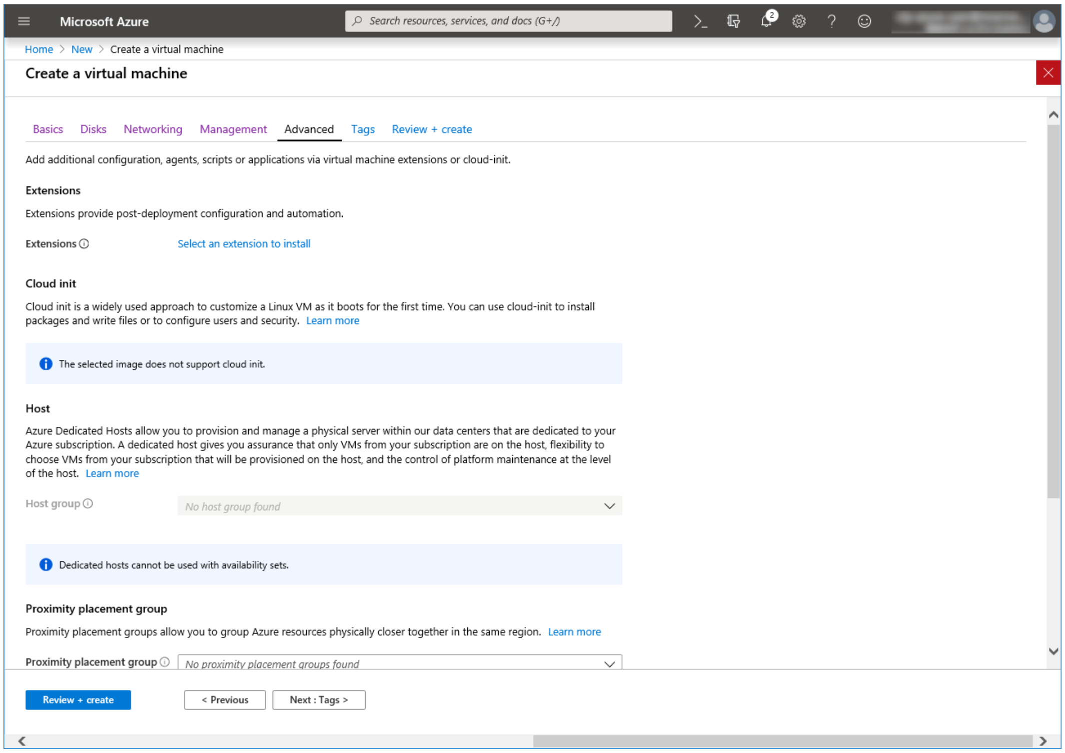
Name * testgroup1diag600 .core.windows.net

Account kind: Storage (general purpose v1)

Performance: [✓ Standard] Premium

Replication: Locally-redundant storage (LRS)

11. Click **Next: Tags >**.


Microsoft Azure
Search resources, services, and docs (G+/)
[redacted]
Home > New > Create a virtual machine

Create a virtual machine

Basics | Disks | Networking | Management | Advanced | Tags | Review + create

Add additional configuration, agents, scripts or applications via virtual machine extensions or cloud-init.

Extensions

Extensions provide post-deployment configuration and automation.

Extensions: Select an extension to install

Cloud init

Cloud init is a widely used approach to customize a Linux VM as it boots for the first time. You can use cloud-init to install packages and write files or to configure users and security. Learn more

ⓘ The selected image does not support cloud init.

Host

Azure Dedicated Hosts allow you to provision and manage a physical server within our data centers that are dedicated to your Azure subscription. A dedicated host gives you assurance that only VMs from your subscription are on the host, flexibility to choose VMs from your subscription that will be provisioned on the host, and the control of platform maintenance at the level of the host. Learn more

Host group: No host group found

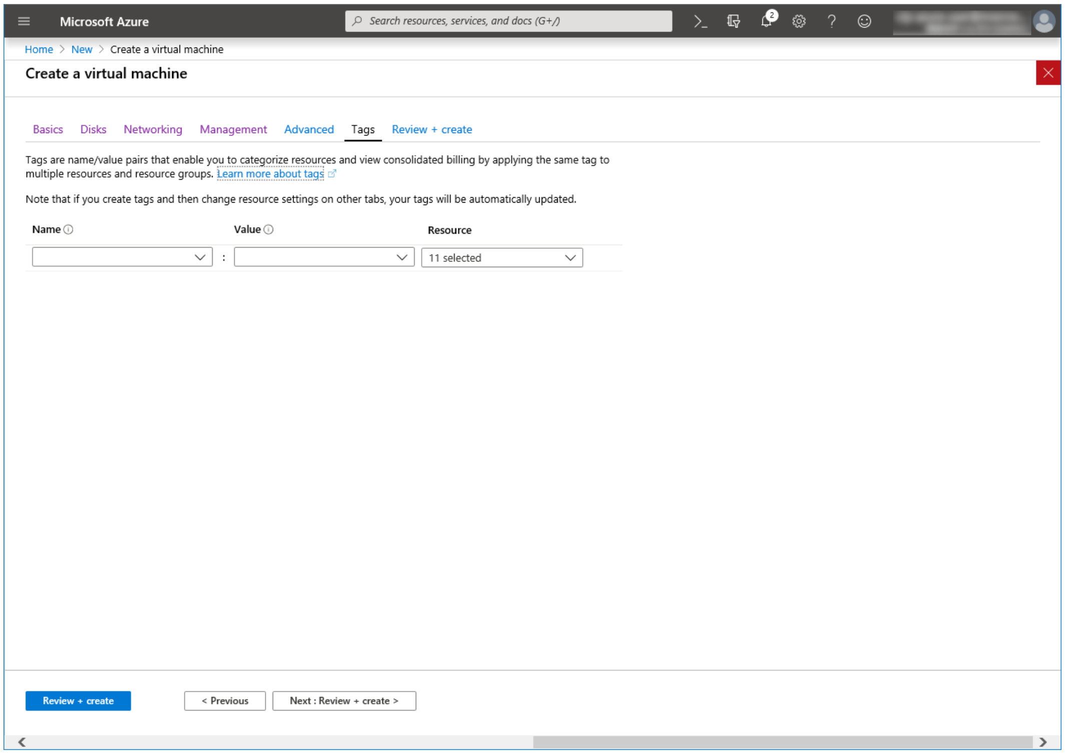
ⓘ Dedicated hosts cannot be used with availability sets.

Proximity placement group

Proximity placement groups allow you to group Azure resources physically closer together in the same region. Learn more

Proximity placement group: No proximity placement groups found

12. Click **Next: Review + create >**

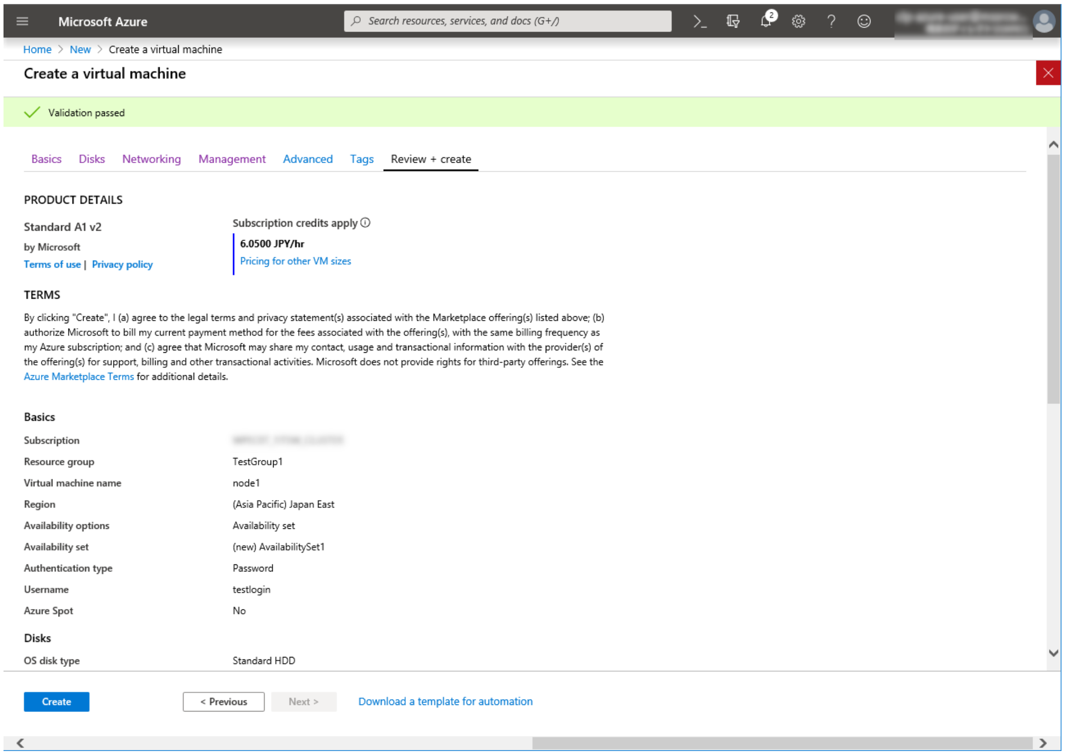


Tags are name/value pairs that enable you to categorize resources and view consolidated billing by applying the same tag to multiple resources and resource groups. Learn more about tags

Note that if you create tags and then change resource settings on other tabs, your tags will be automatically updated.

Name		Value	Resource
	:		11 selected

13. The **Review + create** tab appears. Check the contents. If there is no problem, click **Create**. The deployment starts and takes several minutes.



Validation passed

PRODUCT DETAILS

Standard A1 v2
by Microsoft
Terms of use | Privacy policy

Subscription credits apply
6.0500 JPY/hr
Pricing for other VM sizes

TERMS

By clicking "Create", I (a) agree to the legal terms and privacy statement(s) associated with the Marketplace offering(s) listed above; (b) authorize Microsoft to bill my current payment method for the fees associated with the offering(s), with the same billing frequency as my Azure subscription; and (c) agree that Microsoft may share my contact, usage and transactional information with the provider(s) of the offering(s) for support, billing and other transactional activities. Microsoft does not provide rights for third-party offerings. See the Azure Marketplace Terms for additional details.

Basics

Subscription	[redacted]
Resource group	TestGroup1
Virtual machine name	node1
Region	(Asia Pacific) Japan East
Availability options	Availability set
Availability set	(new) AvailabilitySet1
Authentication type	Password
Username	testlogin
Azure Spot	No

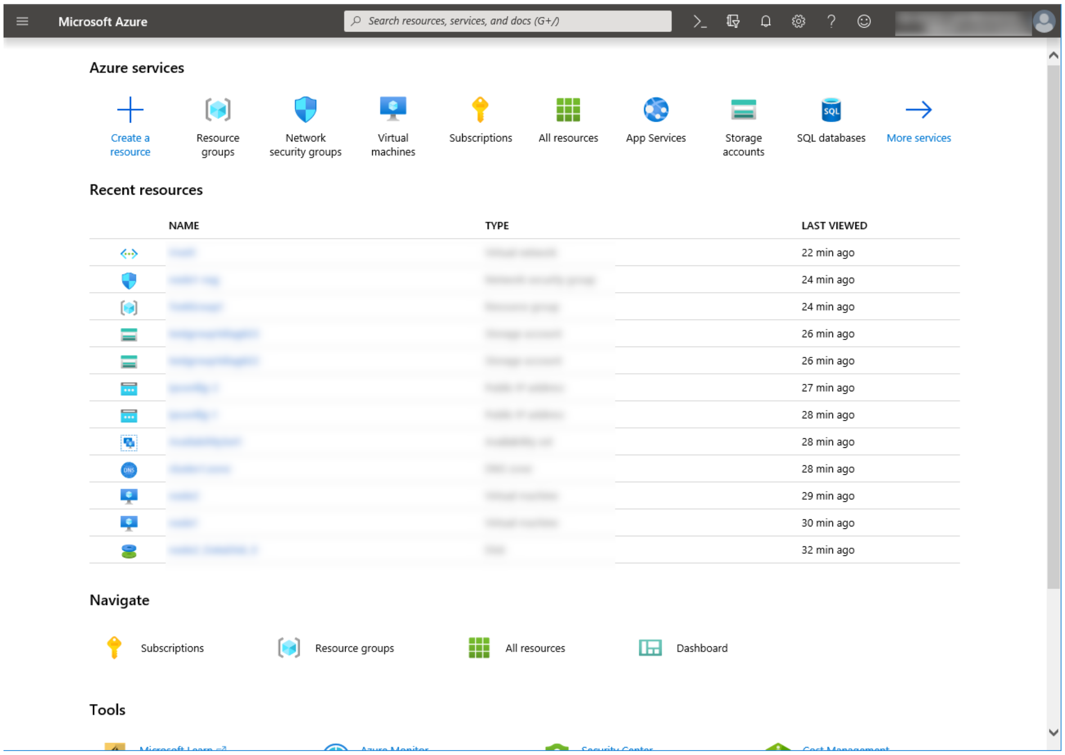
Disks

OS disk type	Standard HDD

4) **Setting a private IP address**

Log in to the Microsoft Azure portal (https://portal.azure.com/) and change the private IP address setting following the steps below. Since an IP address is initially set to be assigned dynamically, change the setting so that an IP address is assigned statically. Change the settings of node1 and then node2.

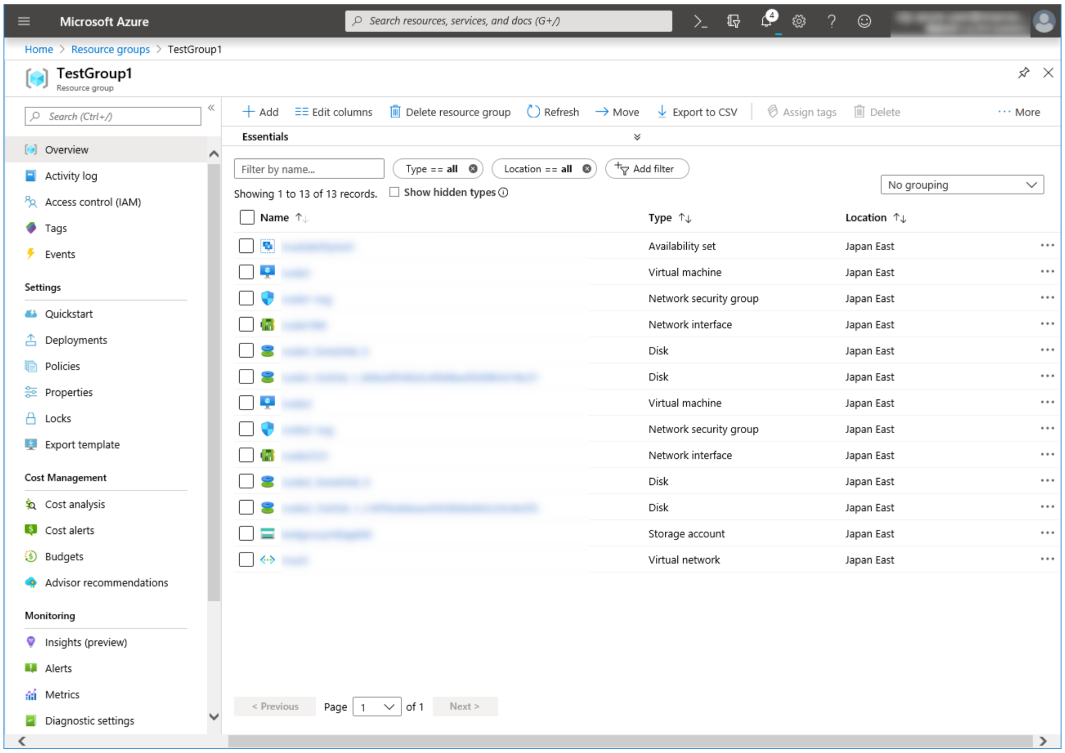
1. Select the **Resource groups** icon on the upper part of the window.



NAME	TYPE	LAST VIEWED
[redacted]	[redacted]	22 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	27 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	29 min ago
[redacted]	[redacted]	30 min ago
[redacted]	[redacted]	32 min ago

2. Select TestGroup1 from the resource group list.

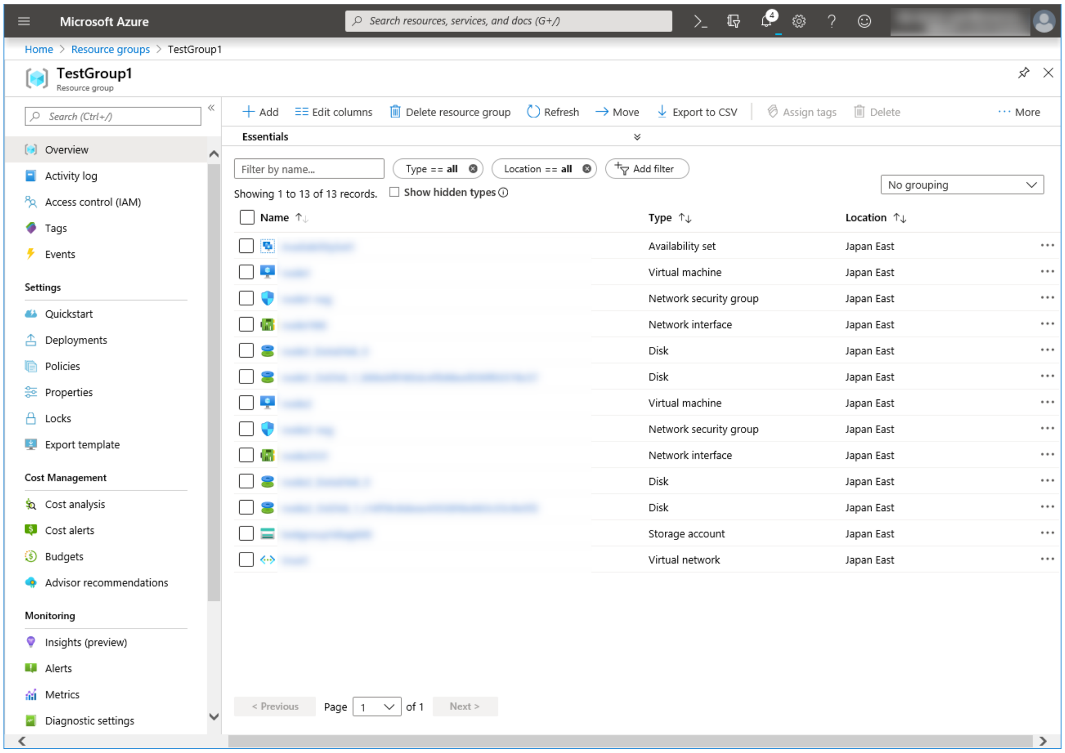
3. The summary of TestGroup1 is displayed. Select virtual machine node1 or node2 from the item list.



Showing 1 to 13 of 13 records. □ Show hidden types

Name	Type	Location
[redacted]	Availability set	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Storage account	Japan East
[redacted]	Virtual network	Japan East

4. Select **Networking**.

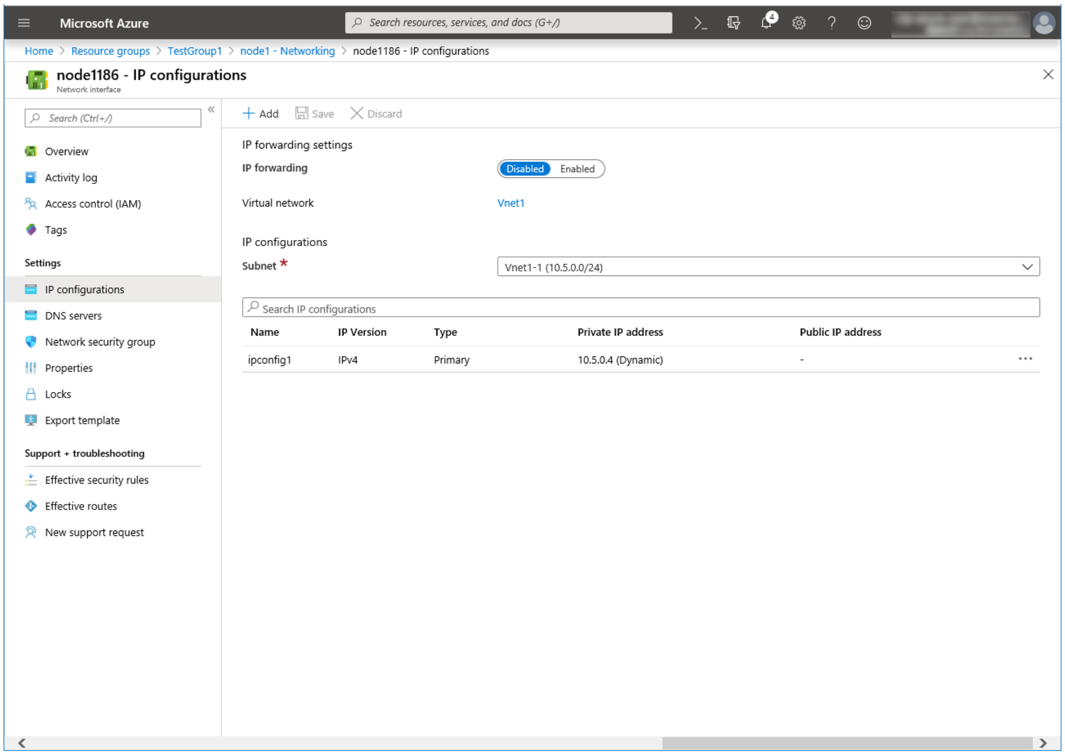


Showing 1 to 13 of 13 records.

Name	Type	Location
[redacted]	Availability set	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Virtual machine	Japan East
[redacted]	Network security group	Japan East
[redacted]	Network interface	Japan East
[redacted]	Disk	Japan East
[redacted]	Disk	Japan East
[redacted]	Storage account	Japan East
[redacted]	Virtual network	Japan East

5. Select a network interface displayed in the list. The network interface name is generated automatically.

6. Select **IP configurations**.



IP forwarding settings

IP forwarding: [✓ Disabled] Enabled

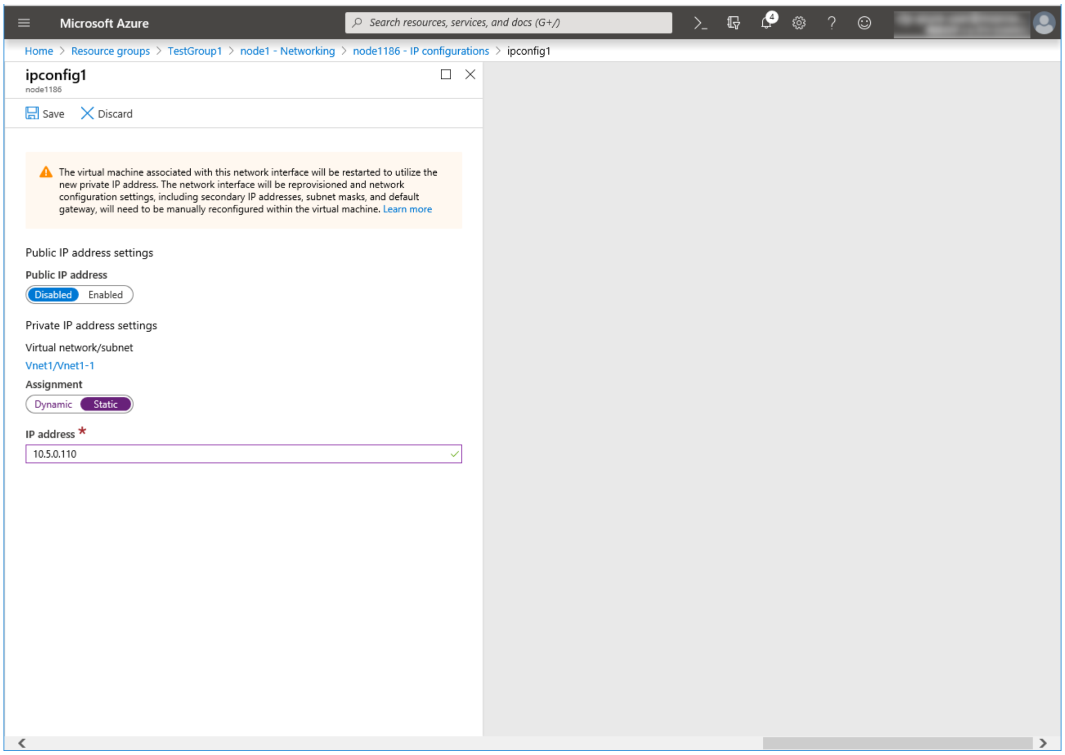
Virtual network: Vnet1

IP configurations

Subnet *: Vnet1-1 (10.5.0.0/24)

Name	IP Version	Type	Private IP address	Public IP address
ipconfig1	IPv4	Primary	10.5.0.4 (Dynamic)	-

7. Only ipconfig1 is displayed in the list. Select it.
8. Select **Static** for **Assignment** under **Private IP address settings**. Enter the IP address to be assigned statically in the **IP address** text box and click **Save** at the top of the window. The IP address of node1 is 10.5.0.110. The IP address of node2 is 10.5.0.111.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > Resource groups > TestGroup1 > node1 - Networking > node1186 - IP configurations > ipconfig1
ipconfig1
node1186
Save
Discard

The virtual machine associated with this network interface will be restarted to utilize the new private IP address. The network interface will be reprovisioned and network configuration settings, including secondary IP addresses, subnet masks, and default gateway, will need to be manually reconfigured within the virtual machine. Learn more

Public IP address settings

Public IP address: [✓ Disabled] Enabled

Private IP address settings

Virtual network/subnet: Vnet1/Vnet1-1

Assignment: Dynamic [✓ Static]

IP address *: 10.5.0.110

9. The virtual machines restart automatically so that new private IP addresses can be used.

5) **Configuring virtual machines**

Log in to the created node1 and node2 and specify the settings following the procedure below.
Set a partition for the mirror disk resource. Create a file system in the added disk.
Secure an area in the added disk by using the fdisk command and then create a file system.
For details about the partition for the mirror disk resource, see "Settings after configuring hardware" in "Partition settings for Mirror disk resource (when using Replicator)" in "Determining a system configuration" in the Installation and Configuration Guide

1. Check the partition list. In the following example, the last line shows the added disk.

```
$ cat /proc/partitions
major minor  #blocks  name

   2        0          4 fd0
   8        0   31457280 sda
   8        1     512000 sda1
   8        2   30944256 sda2
   8       16   73400320 sdb
   8       17   73398272 sdb1
   8       32   20971520 sdc
```

2. Create a cluster partition and data partition in the added disk by using the fdisk command. Allocate 1 GB (1*1024*1024*1024 bytes) or more to a cluster partition. (If the size is specified as just 1 GB,

the actual size will be larger than 1 GB depending on the disk geometry difference. This is not a problem.) Also, do not create a file system in a cluster partition.

3. If you select **Execute initial mkfs** when creating the cluster configuration data by using Cluster WebUI, EXPRESSCLUSTER creates a file system automatically. Note that existing data in the partition will be lost.

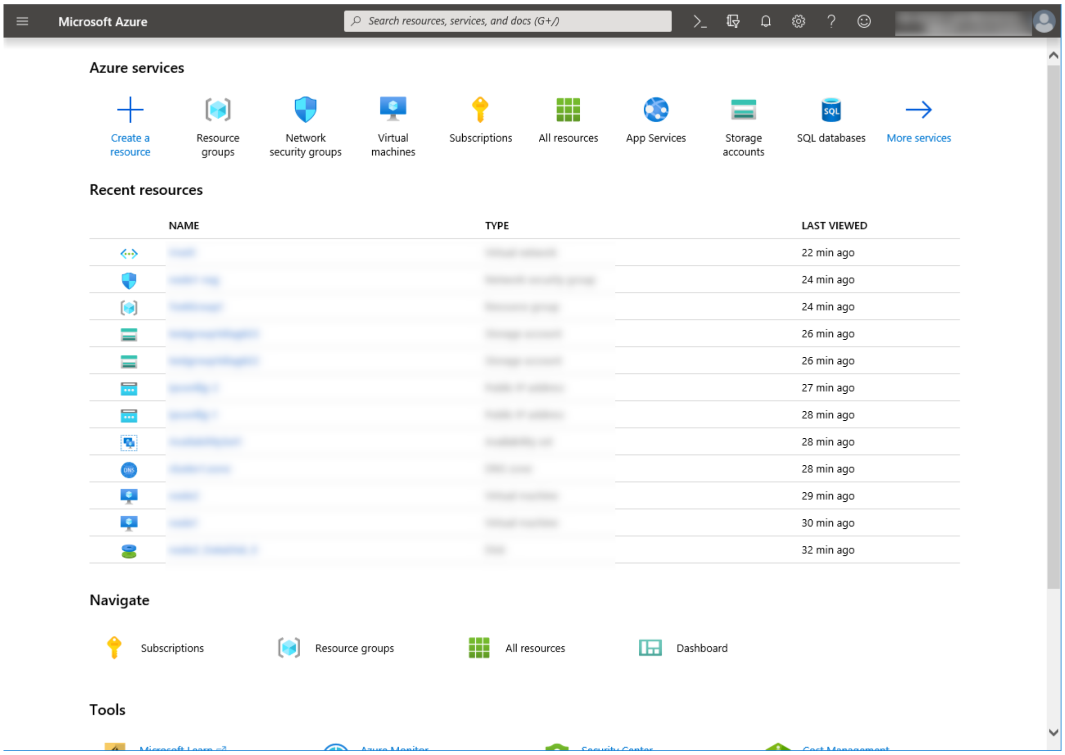
   For DSR, add a Loopback Adapter in each node configuring a cluster.

6) **Configuring a load balancer**

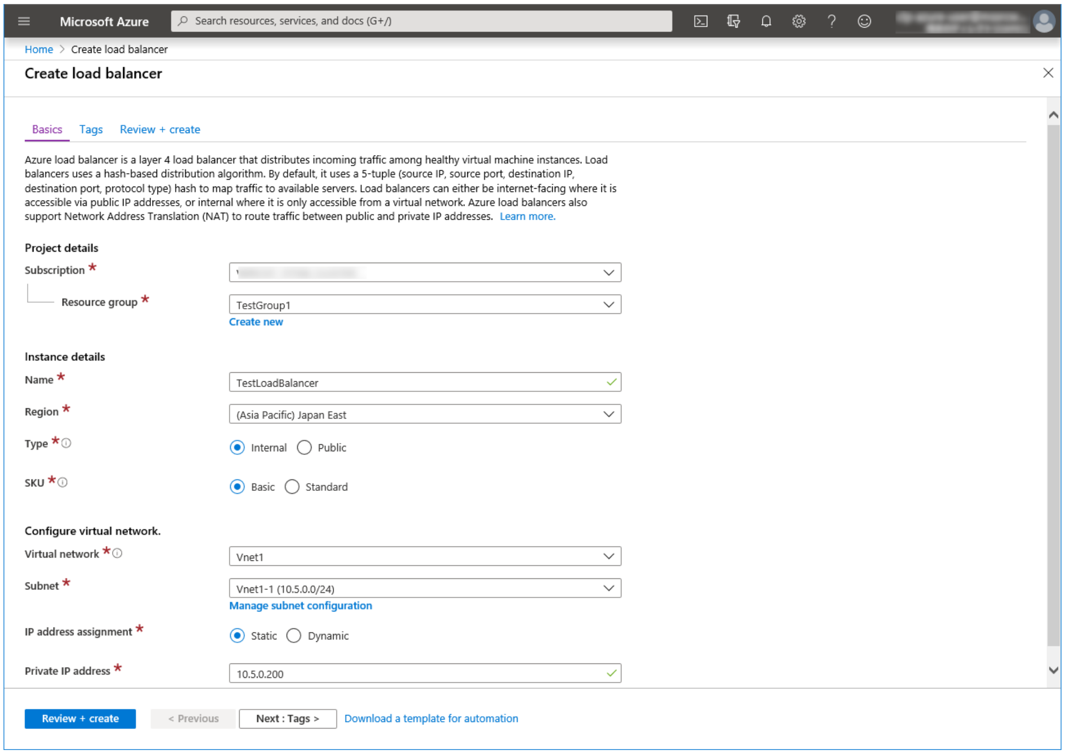
Log in to the Microsoft Azure portal (https://portal.azure.com/) and add an internal load balancer following the steps below. For details, see the following websites:

- Load Balancer documentaion:
  https://docs.microsoft.com/en-us/azure/load-balancer/

1. Select the **Create a resource** icon on the upper part of the window.



2. Select **Networking** and then **Load balancer**.
3. The **Create load balancer** blade is displayed. Specify **Name**. Select **Internal** for **Type** and **Basic** for **SKU**, respectively.
4. For **Virtual network** and **Subnet**, select the virtual network and subnet created in "2) Creating a virtual network."
5. Specify **Subscription**, **Resource group**, and **Region**, and click **Review+create**. Then click **Create**. Deploying the load balancer starts. This processing takes several minutes.


Microsoft Azure
Search resources, services, and docs (G+/)
Home > Create load balancer

Create load balancer

Basics
Tags
Review + create

Azure load balancer is a layer 4 load balancer that distributes incoming traffic among healthy virtual machine instances. Load balancers uses a hash-based distribution algorithm. By default, it uses a 5-tuple (source IP, source port, destination IP, destination port, protocol type) hash to map traffic to available servers. Load balancers can either be internet-facing where it is accessible via public IP addresses, or internal where it is only accessible from a virtual network. Azure load balancers also support Network Address Translation (NAT) to route traffic between public and private IP addresses. Learn more.

Project details

Subscription *

Resource group * TestGroup1

Create new

Instance details

Name * TestLoadBalancer

Region * (Asia Pacific) Japan East

Type * ● Internal ○ Public

SKU * ● Basic ○ Standard

Configure virtual network.

Virtual network * Vnet1

Subnet * Vnet1-1 (10.5.0.0/24)

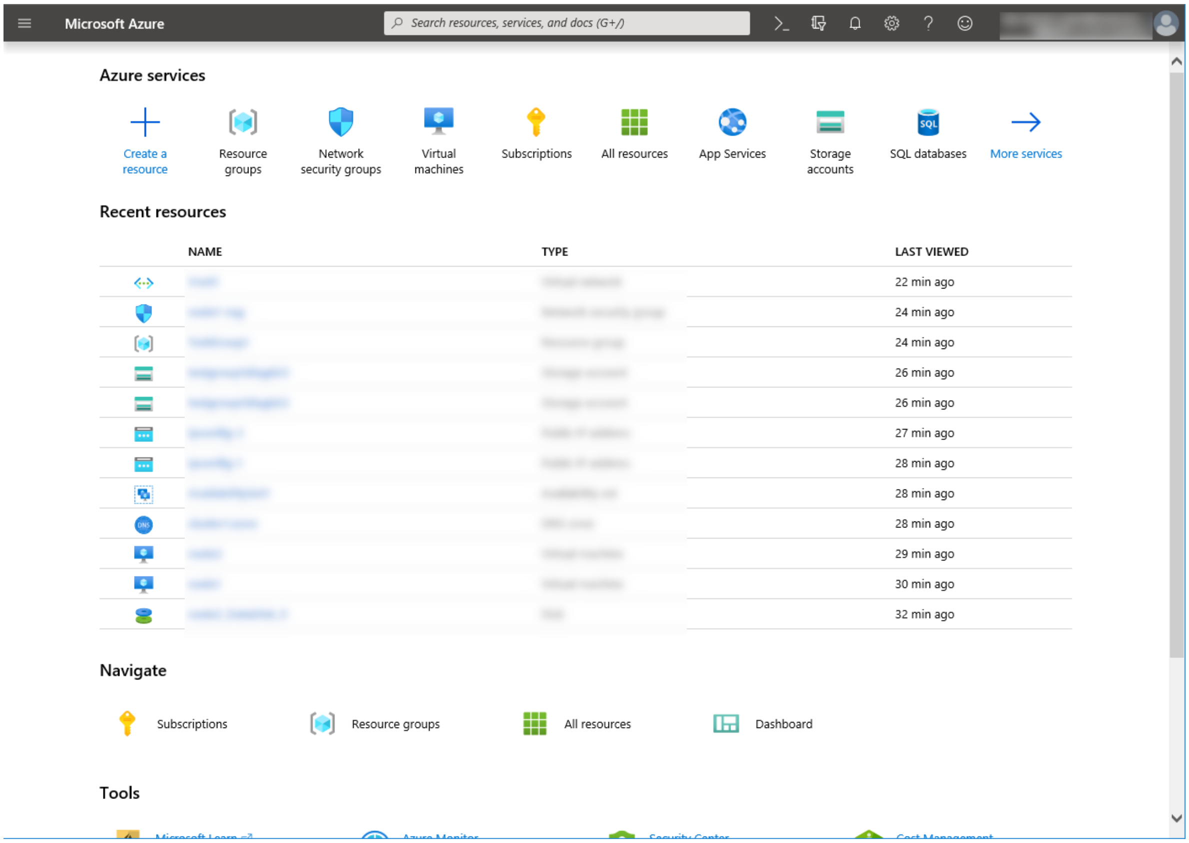
Manage subnet configuration

IP address assignment * ● Static ○ Dynamic

Private IP address * 10.5.0.200

7) **Configuring a load balancer (configuring a backend pool)**

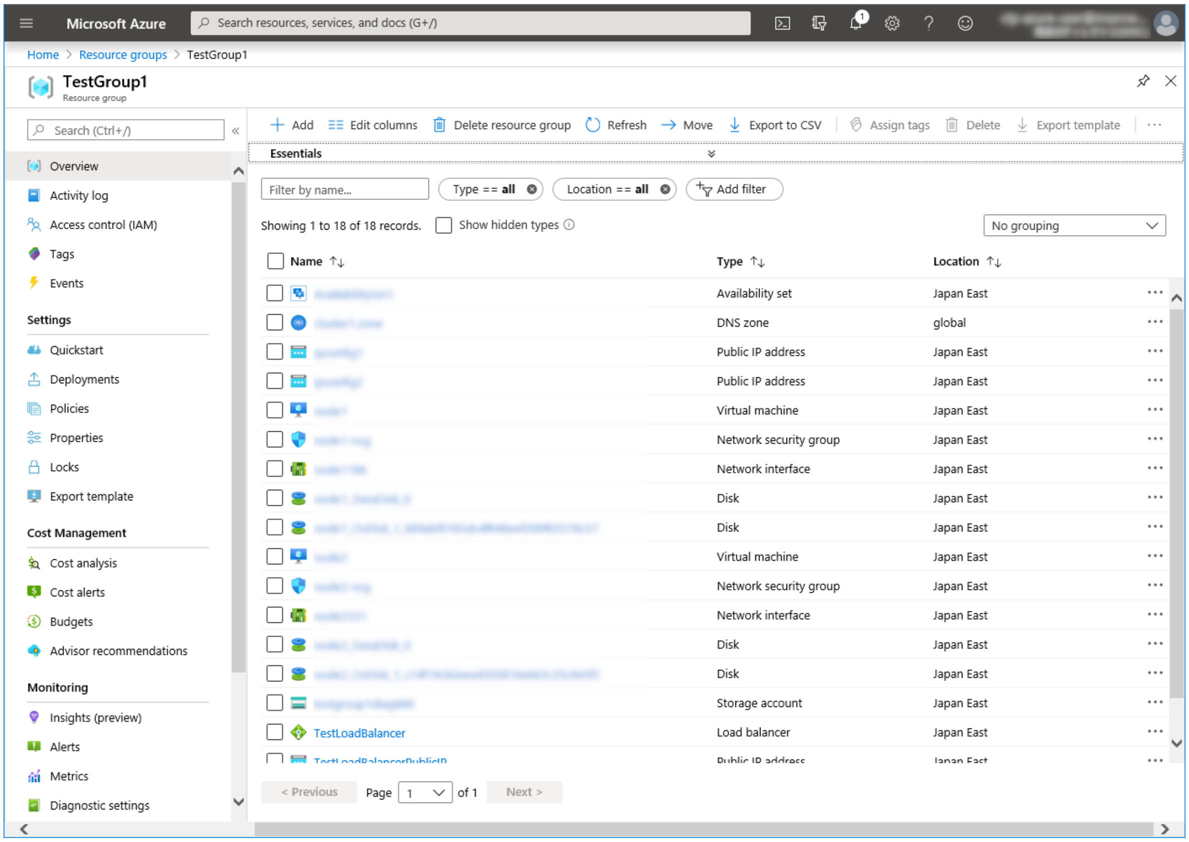
1. Associate a virtual machine registered to the availability set to the load balancer. After the load balancer has been deployed, select the **Resource groups** icon on the upper part of the window.



NAME	TYPE	LAST VIEWED
[redacted]	[redacted]	22 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	24 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	26 min ago
[redacted]	[redacted]	27 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	28 min ago
[redacted]	[redacted]	29 min ago
[redacted]	[redacted]	30 min ago
[redacted]	[redacted]	32 min ago

2. Select the resource group to which the created load balancer belongs from the resource group list.

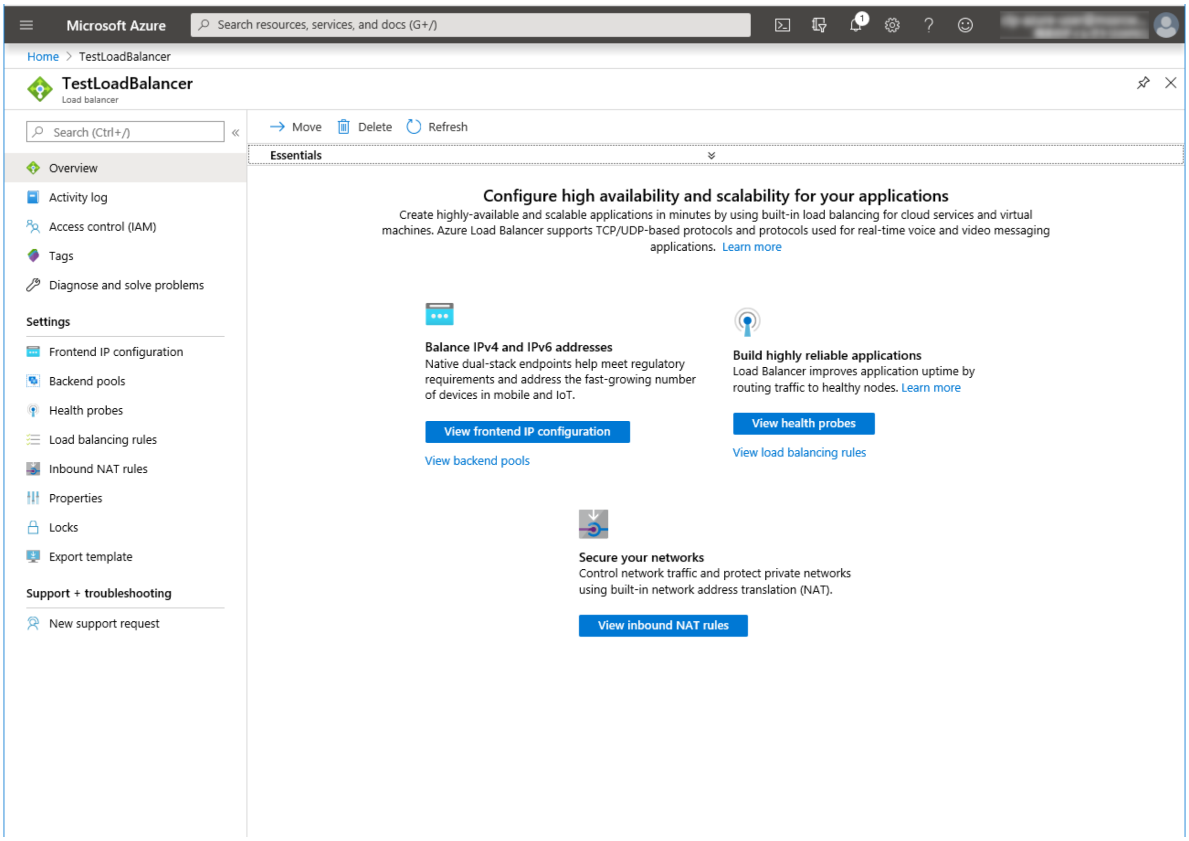
3. The summary of the selected resource group is displayed. Select the created load balancer from the item list.



Showing 1 to 18 of 18 records. □ Show hidden types

□ Name ↑↓	Type ↑↓	Location ↑↓
□ [redacted]	Availability set	Japan East
□ [redacted]	DNS zone	global
□ [redacted]	Public IP address	Japan East
□ [redacted]	Public IP address	Japan East
□ [redacted]	Virtual machine	Japan East
□ [redacted]	Network security group	Japan East
□ [redacted]	Network interface	Japan East
□ [redacted]	Disk	Japan East
□ [redacted]	Disk	Japan East
□ [redacted]	Virtual machine	Japan East
□ [redacted]	Network security group	Japan East
□ [redacted]	Network interface	Japan East
□ [redacted]	Disk	Japan East
□ [redacted]	Disk	Japan East
□ [redacted]	Storage account	Japan East
□ TestLoadBalancer	Load balancer	Japan East
□ TestLoadBalancerPublicIP	Public IP address	Japan East

4. Select **Backend pools**.



Configure high availability and scalability for your applications

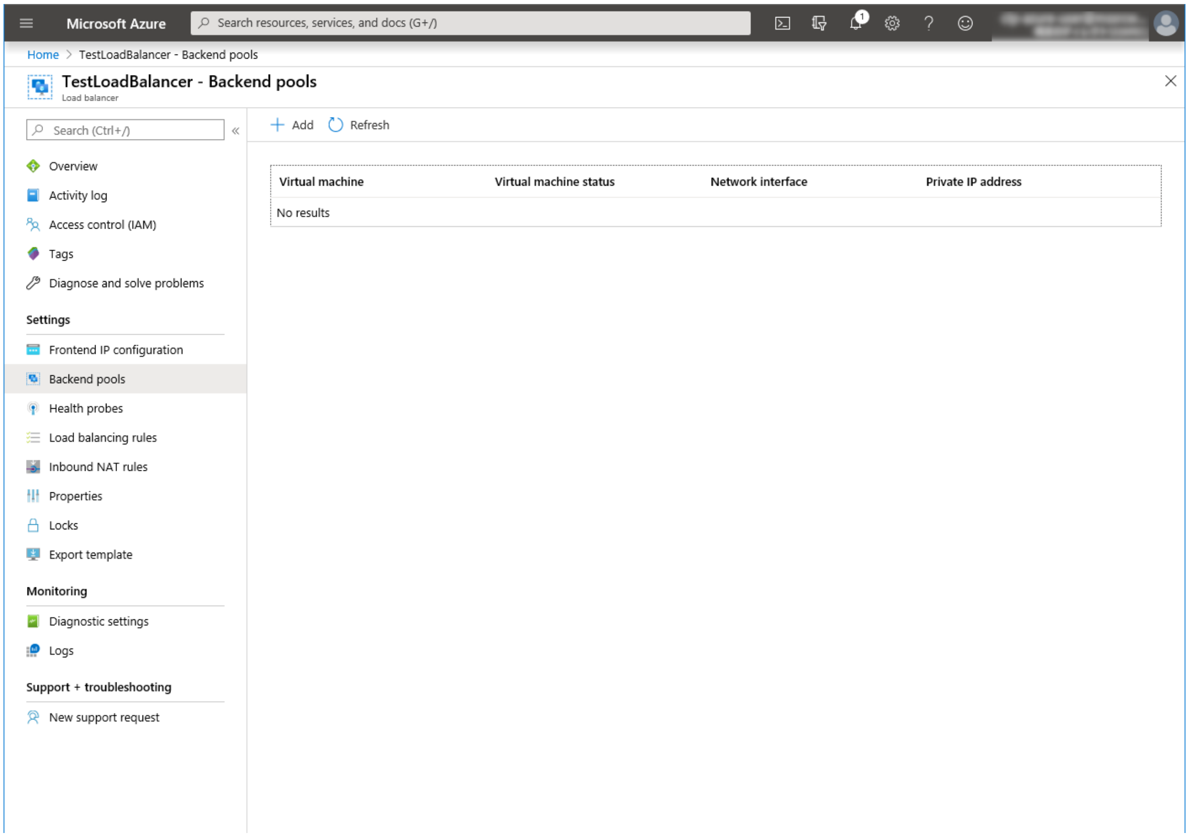
Create highly-available and scalable applications in minutes by using built-in load balancing for cloud services and virtual machines. Azure Load Balancer supports TCP/UDP-based protocols and protocols used for real-time voice and video messaging applications. Learn more

Balance IPv4 and IPv6 addresses
Native dual-stack endpoints help meet regulatory requirements and address the fast-growing number of devices in mobile and IoT.

Build highly reliable applications
Load Balancer improves application uptime by routing traffic to healthy nodes. Learn more

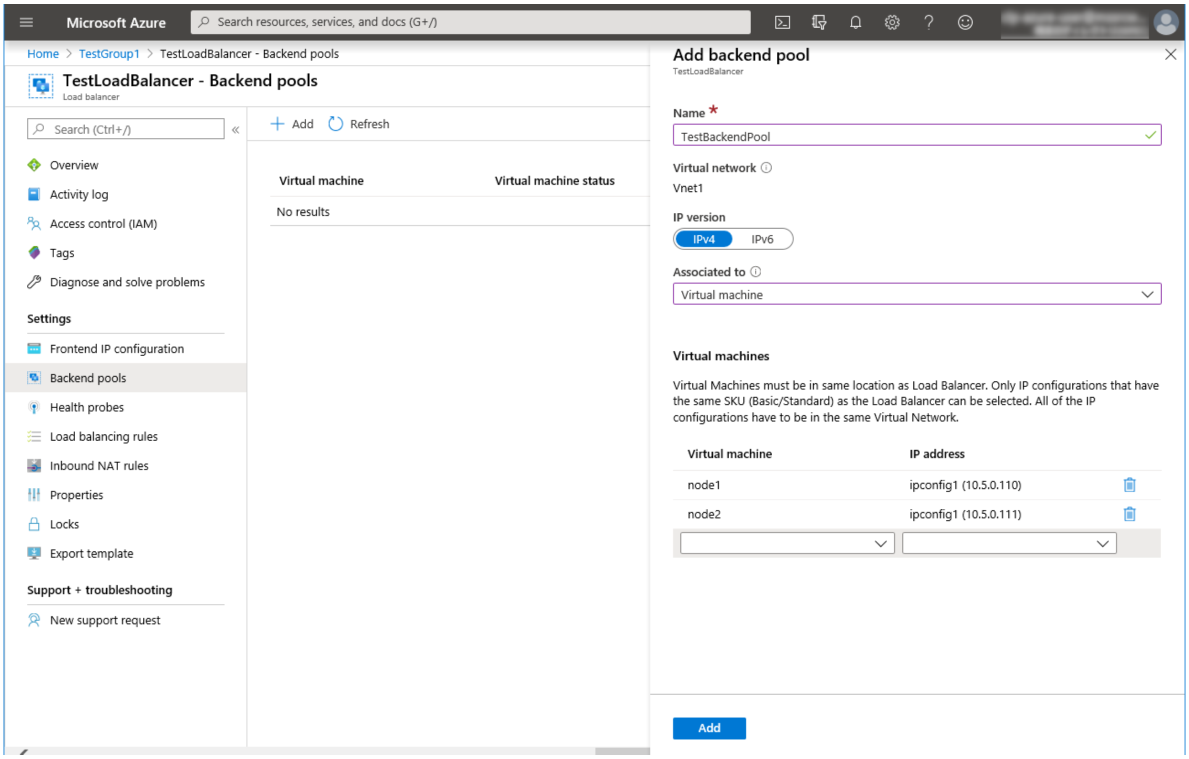
Secure your networks
Control network traffic and protect private networks using built-in network address translation (NAT).

5. Click **Add**.



Virtual machine	Virtual machine status	Network interface	Private IP address
No results			

6. **Add backend pool** is displayed. Specify **Name**.
7. Select **Virtual machine** for **Associated to**.
8. Specify **Virtual machine** and **IP address** for the virtual machine you want to associate. Repeat this procedure for the rest of such virtual machines.
9. Then click **Add**.



Name *: TestBackendPool

Virtual network: Vnet1

IP version: IPv4 (selected) / IPv6

Associated to: Virtual machine

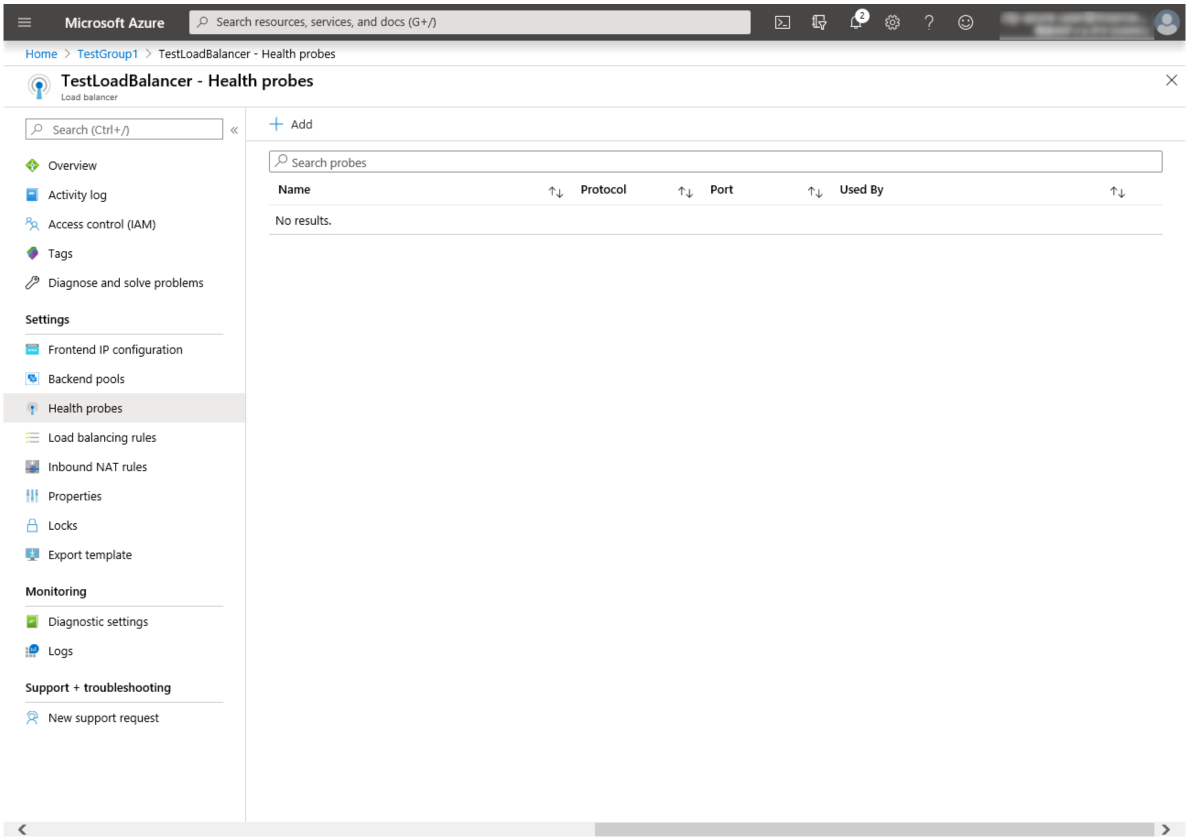
Virtual machines

Virtual Machines must be in same location as Load Balancer. Only IP configurations that have the same SKU (Basic/Standard) as the Load Balancer can be selected. All of the IP configurations have to be in the same Virtual Network.

Virtual machine	IP address
node1	ipconfig1 (10.5.0.110)
node2	ipconfig1 (10.5.0.111)

8) **Configuring a load balancer (configuring a health probe)**

1. Select **Health probes**.

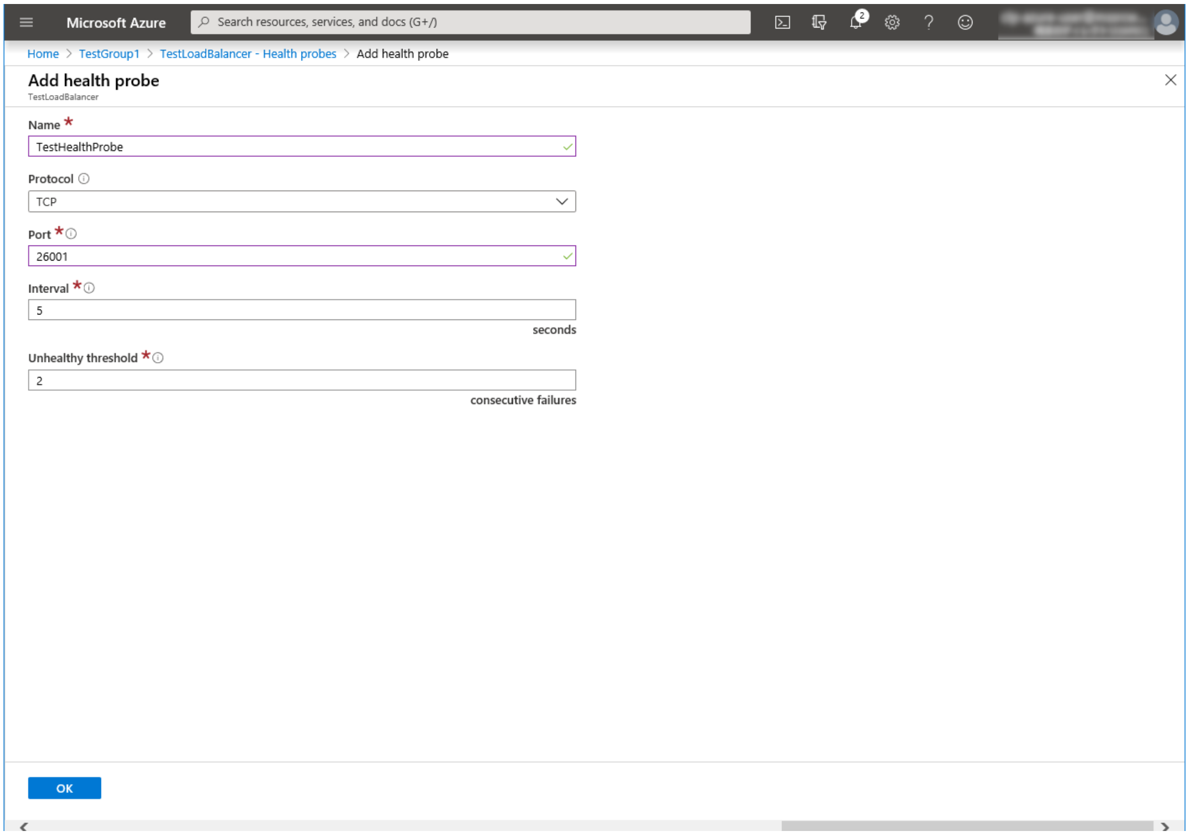


Name	Protocol	Port	Used By
No results.			

2. Click **Add**.

3. **Add health probe** is displayed. Specify **Name**.

4. Specify **Protocol** and **Port**, and click **OK**.



Microsoft Azure
Search resources, services, and docs (G+/)
Home > TestGroup1 > TestLoadBalancer - Health probes > Add health probe

Add health probe

TestLoadBalancer

Name * : TestHealthProbe

Protocol : TCP

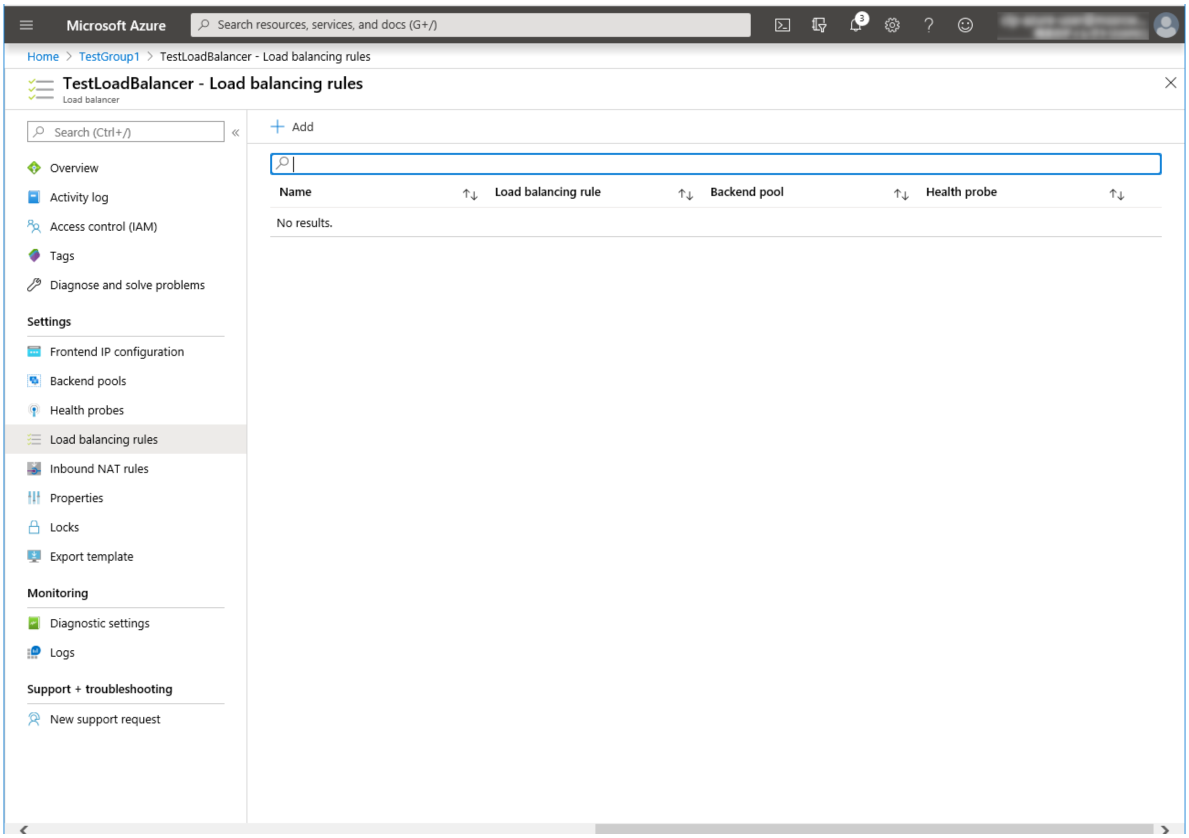
Port * : 26001

Interval * : 5 seconds

Unhealthy threshold * : 2 consecutive failures

9) **Configuring a load balancer (setting the load balancing rules)**

1. Select **Load balancing rules**.

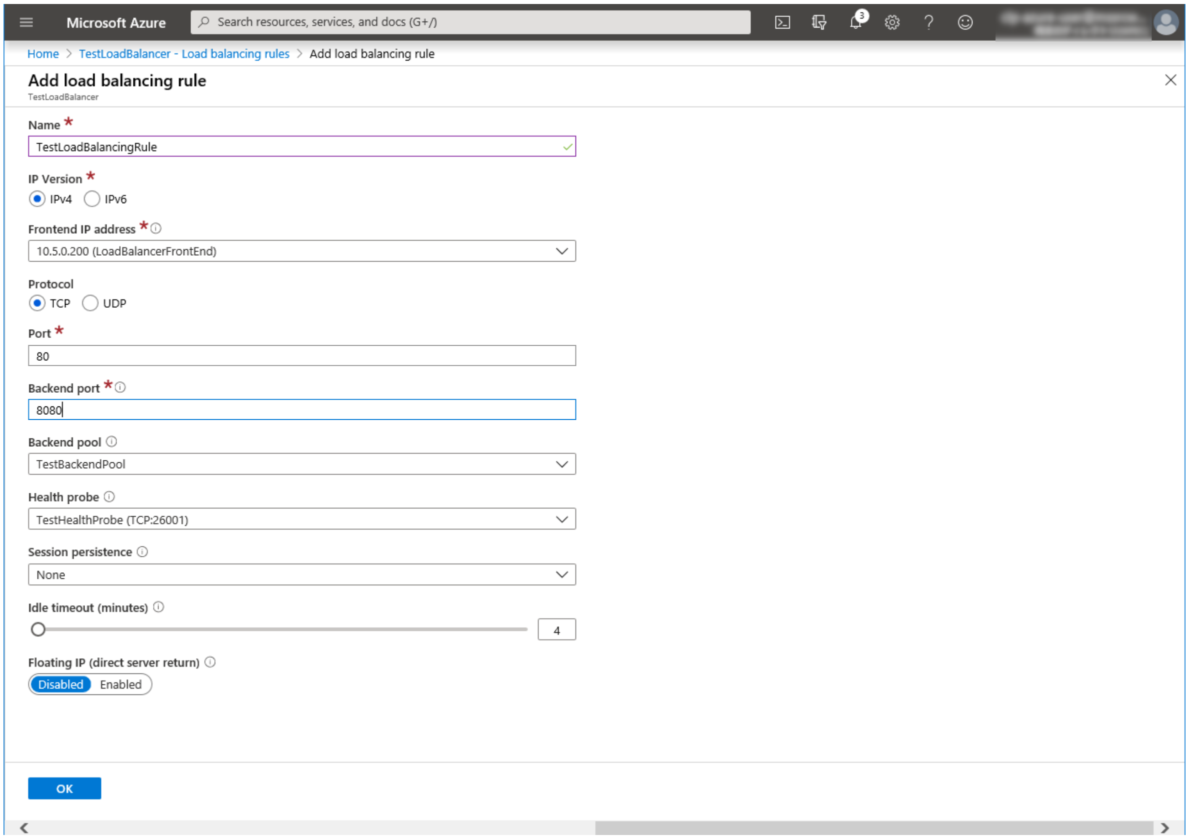


Name	Load balancing rule	Backend pool	Health probe
No results.			

2. Click **Add**.

3. The **Add load balancing rule** blade is displayed. Specify **Name**.

4. Specify **Port** and **Backend port**, and click **OK**.
   For DSR, specify **Port** and **Backend port** to same port number, enable to **Floating IP(Direct Server Return)**, and click **OK**.
   (Specify the port number used to connect to the application (example.80).)



Microsoft Azure
Search resources, services, and docs (G+/)
Home > TestLoadBalancer - Load balancing rules > Add load balancing rule

Add load balancing rule
TestLoadBalancer

Name * TestLoadBalancingRule

IP Version * ● IPv4 ○ IPv6

Frontend IP address * 10.5.0.200 (LoadBalancerFrontEnd)

Protocol ● TCP ○ UDP

Port * 80

Backend port * 8080

Backend pool TestBackendPool

Health probe TestHealthProbe (TCP:26001)

Session persistence None

Idle timeout (minutes) 4

Floating IP (direct server return) [✓ Disabled] Enabled

10) **Adjusting the OS startup time, checking the network setting, checking the root file system, checking the firewall setting, synchronizing the server time, and checking the SELinux setting.**

    For each procedure, see "Settings after configuring hardware" in "Determining a system configuration" in the Installation and Configuration Guide.

11) **Installing EXPRESSCLUSTER**

    For the installation procedure, see the Installation and Configuration Guide.
    After installation is complete, restart the OS.

12) **Registering the EXPRESSCLUSER license**

    For the license registration procedure, see the Installation and Configuration Guide.

6.3 Configuring the EXPRESSCLUSTER settings

For the Cluster WebUI setup and connection procedures, see "Creating the cluster configuration data" in the Installation and Configuration Guide.

This section describes the procedure to add the following resources and monitor resources:

- Mirror disk resource
- Azure probe port resource
- Azure probe port monitor resource
- Azure load balance monitor resource
- PING network partition resolution resource (for NP resolution)

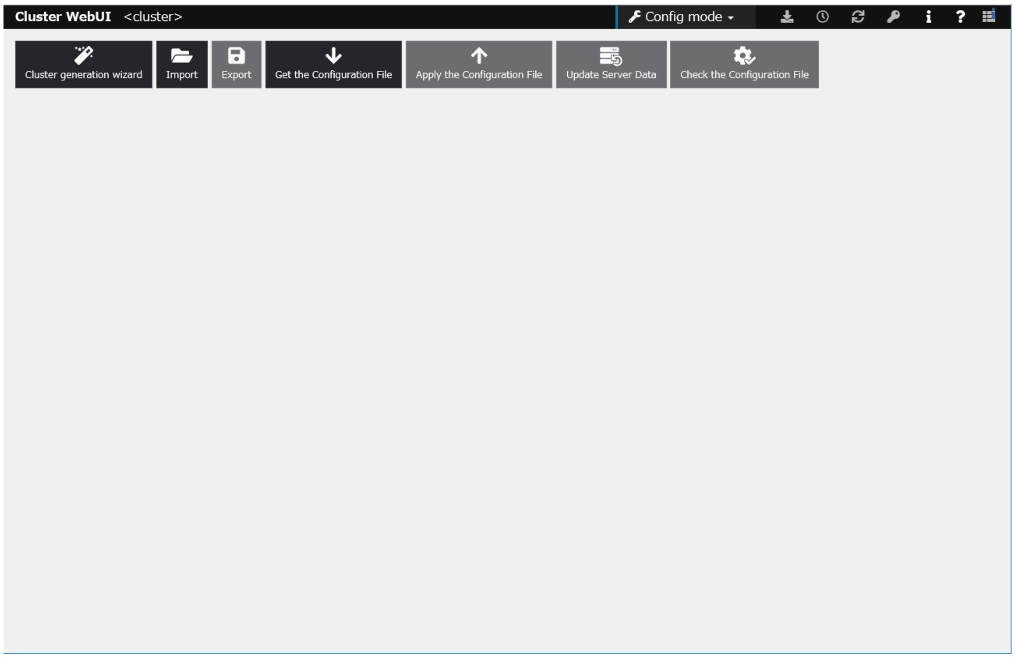
For the settings of other resources and monitor resources, see the Installation and Configuration Guide and the Reference Guide.

1) **Creating a cluster**

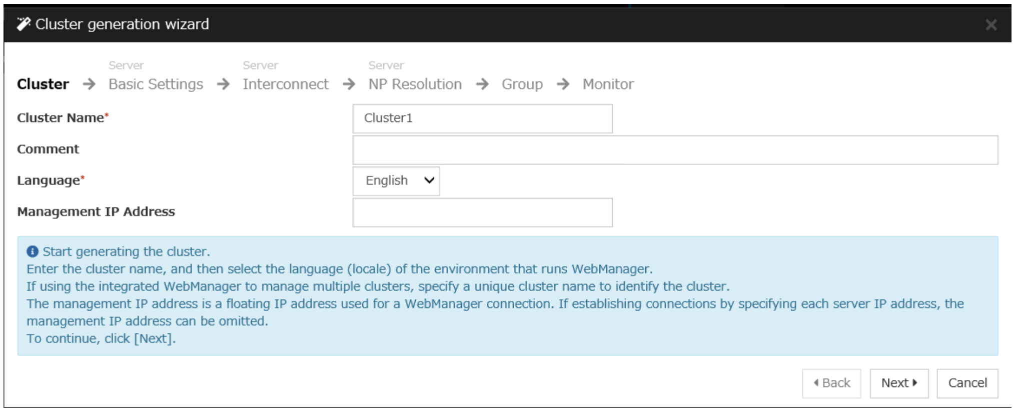
   Start the Cluster generation wizard to create a cluster.

   - Creating a cluster

     1. Access Cluster WebUI, and click **Cluster generation wizard**.


Cluster WebUI <cluster>
Config mode
Cluster generation wizard
Import
Export
Get the Configuration File
Apply the Configuration File
Update Server Data
Check the Configuration File

     2. **Cluster** of **Cluster generation wizard** is displayed.
        Enter a desired name in **Cluster Name**.
        Select an appropriate language in **Language**. Click **Next**.



Cluster generation wizard

Cluster → Server Basic Settings → Server Interconnect → Server NP Resolution → Group → Monitor

Cluster Name* Cluster1

Comment

Language* English

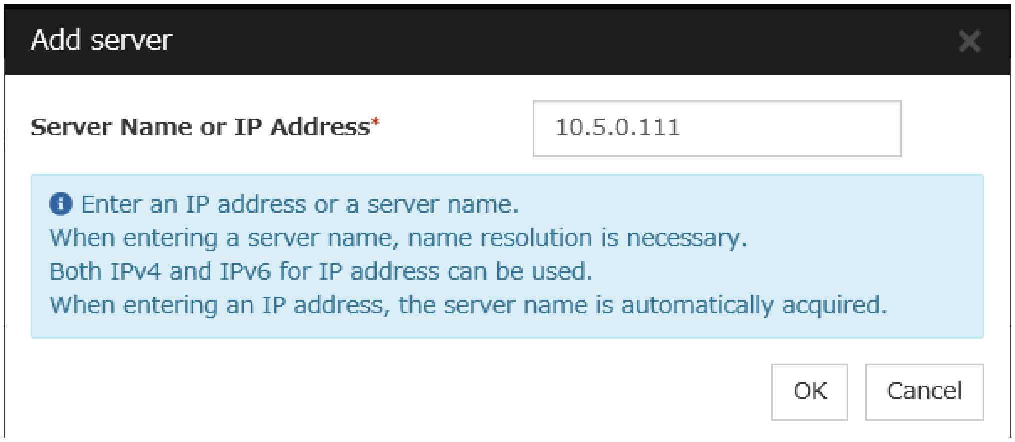
Management IP Address

Start generating the cluster.
Enter the cluster name, and then select the language (locale) of the environment that runs WebManager.
If using the integrated WebManager to manage multiple clusters, specify a unique cluster name to identify the cluster.
The management IP address is a floating IP address used for a WebManager connection. If establishing connections by specifying each server IP address, the management IP address can be omitted.
To continue, click [Next].

3. **Basic Settings** is displayed.

   The instance connected to Cluster WebUI is displayed as a registered master server.

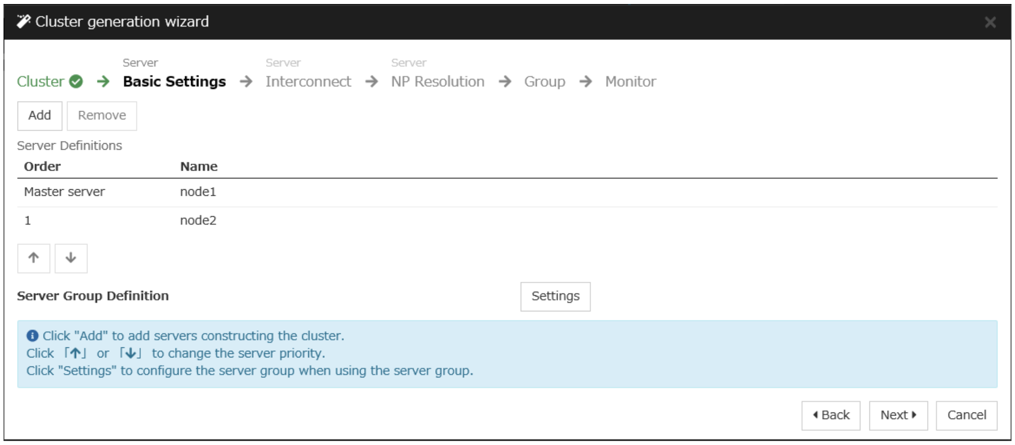
   Click **Add** to add the remaining instances (by specifying the private IP address of each instance). Click **Next**.



Add server

Server Name or IP Address* 10.5.0.111

Enter an IP address or a server name.
When entering a server name, name resolution is necessary.
Both IPv4 and IPv6 for IP address can be used.
When entering an IP address, the server name is automatically acquired.



Cluster generation wizard

Cluster → Server Basic Settings → Server Interconnect → Server NP Resolution → Group → Monitor
Add
Remove

Server Definitions

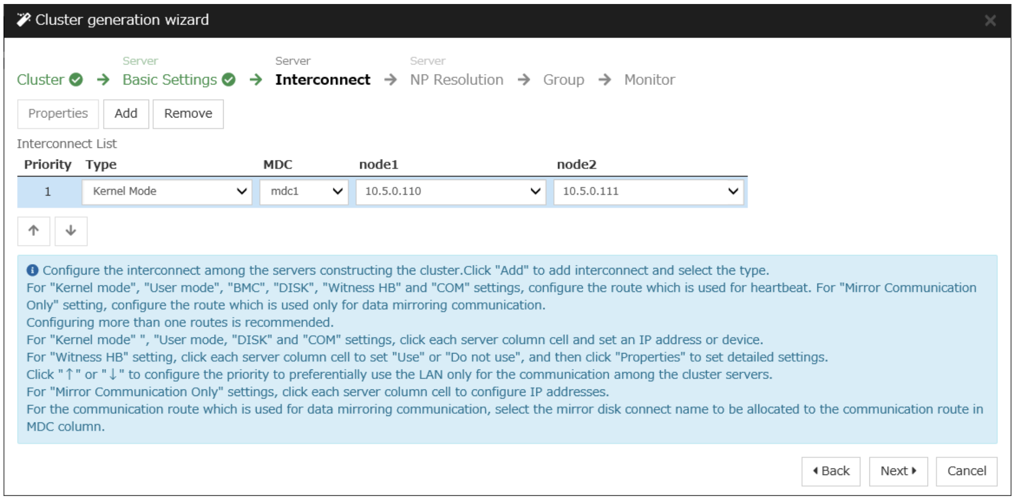
Order	Name
Master server	node1
1	node2

Server Group Definition

Click "Add" to add servers constructing the cluster.
Click 「↑」 or 「↓」 to change the server priority.
Click "Settings" to configure the server group when using the server group.

4. The **Interconnect** window is displayed.

   Specify the IP addresses (IP address of each instance) to be used for interconnect. In addition, select mdc1 for **MDC** as a communication path of a mirror disk resource to be created later. Click **Next**.



Interconnect List

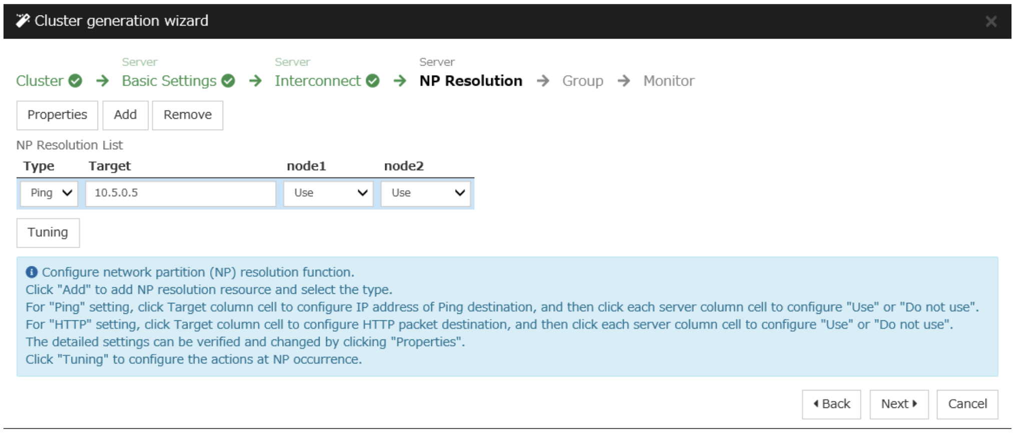
Priority	Type	MDC	node1	node2
1	Kernel Mode	mdc1	10.5.0.110	10.5.0.111

Configure the interconnect among the servers constructing the cluster.Click "Add" to add interconnect and select the type.
For "Kernel mode", "User mode", "BMC", "DISK", "Witness HB" and "COM" settings, configure the route which is used for heartbeat. For "Mirror Communication Only" setting, configure the route which is used only for data mirroring communication.
Configuring more than one routes is recommended.
For "Kernel mode" ", "User mode, "DISK" and "COM" settings, click each server column cell and set an IP address or device.
For "Witness HB" setting, click each server column cell to set "Use" or "Do not use", and then click "Properties" to set detailed settings.
Click "↑" or "↓" to configure the priority to preferentially use the LAN only for the communication among the cluster servers.
For "Mirror Communication Only" settings, click each server column cell to configure IP addresses.
For the communication route which is used for data mirroring communication, select the mirror disk connect name to be allocated to the communication route in MDC column.

5. The **NP Resolution** window is displayed.

   To execute NP resolution by using a ping, click **Add** to add a line to the NP resolution list. Click a cell of the **Type** column and select **Ping**. Click the cell of the **Ping target** column and set the IP address of the device to which to send a ping. Be sure to specify the IP address of a server other than cluster servers within the Microsoft Azure network. Click a cell of each server column and select **Use** or **Not use**.

   Click **Next**.



NP Resolution List

Type	Target	node1	node2
Ping	10.5.0.5	Use	Use

Configure network partition (NP) resolution function.
Click "Add" to add NP resolution resource and select the type.
For "Ping" setting, click Target column cell to configure IP address of Ping destination, and then click each server column cell to configure "Use" or "Do not use".
For "HTTP" setting, click Target column cell to configure HTTP packet destination, and then click each server column cell to configure "Use" or "Do not use".
The detailed settings can be verified and changed by clicking "Properties".
Click "Tuning" to configure the actions at NP occurrence.

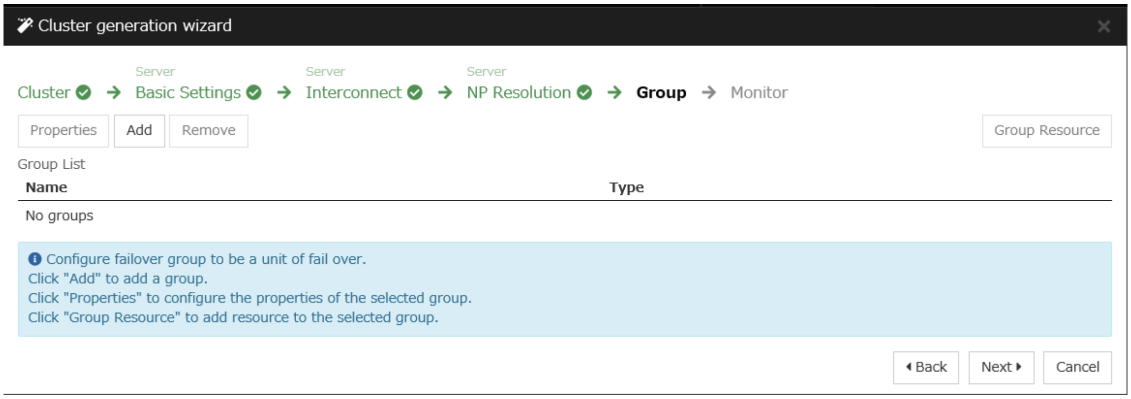
2) Adding a group resource

- Defining a group

  Create a failover group.

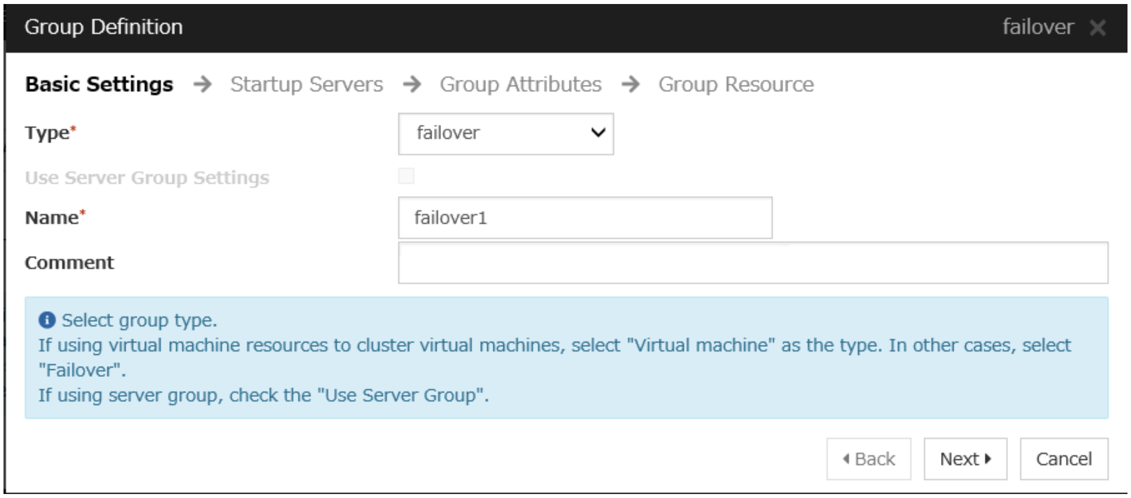
  1. The **Group List** window s displayed.

     Click **Add**.



Configure failover group to be a unit of fail over.
Click "Add" to add a group.
Click "Properties" to configure the properties of the selected group.
Click "Group Resource" to add resource to the selected group.

2. The **Group Definition** window is displayed.
   Specify a failover group name (failover1) for **Name**. Click **Next**.



Type* : failover

Use Server Group Settings : □

Name* : failover1

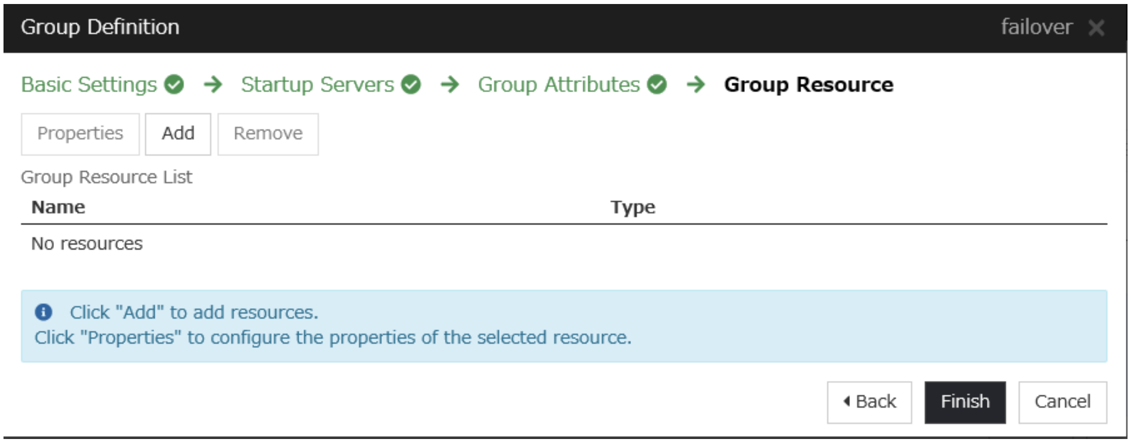
Comment :

Select group type.
If using virtual machine resources to cluster virtual machines, select "Virtual machine" as the type. In other cases, select "Failover".
If using server group, check the "Use Server Group".

3. The **Startup Servers** window is displayed.
   Click **Next** without specifying anything.

4. The **Group Attributes** window is displayed.
   Click **Next** without specifying anything.

5. The **Group Resource** window is displayed.
   On this page, add a group resource following the procedure below.

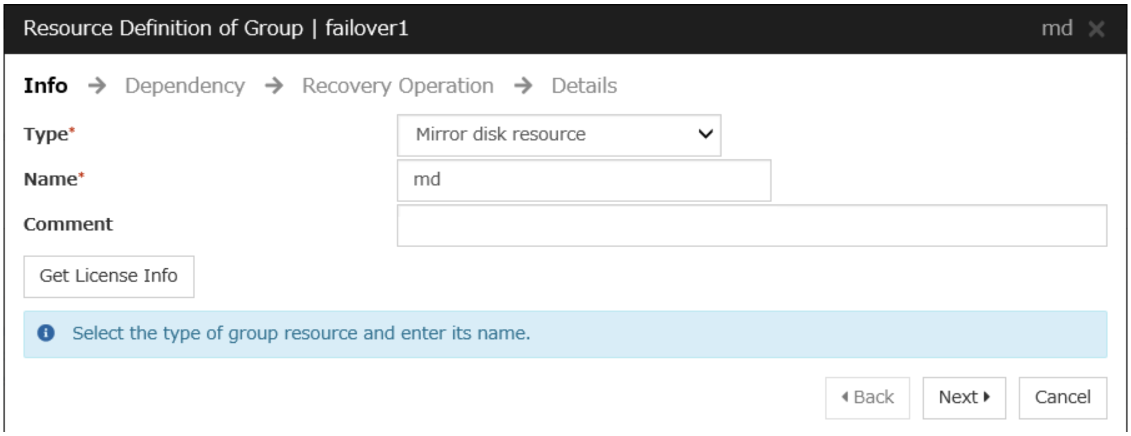


Click "Add" to add resources.
Click "Properties" to configure the properties of the selected resource.

- Mirror disk resource

Create a mirror disk resource.
For details, see Understanding Mirror disk resources in "Group resource details" in the Reference Guide.

1. Click **Add** on the **Group Resource List** page.
2. The **Resource Definition of Group | failover1** window is displayed.
   Select the group resource type (Mirror disk resource) from the **Type** box and enter the group name (md) in the **Name** box. Click **Next**.

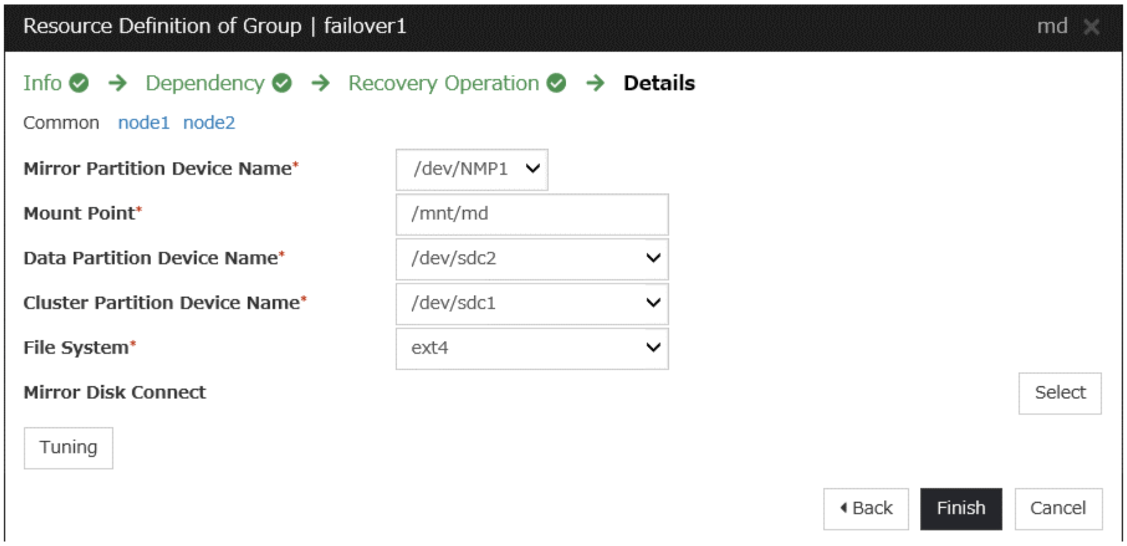


Resource Definition of Group | failover1

Type*: Mirror disk resource
Name*: md
Comment:

Select the type of group resource and enter its name.

3. The **Dependency** window is displayed.
   Click **Next** without specifying anything.
4. The **Recovery Operation** window is displayed.
   Click **Next**.
5. The **Details** window is displayed.
   Enter the device name of the partition created in "5) **Configuring virtual machines**" in **Data Partition Device Name** and **Cluster Partition Device Name**. Specify **Mount Point** and **File System**. Click **Finish** to finish setting.



Resource Definition of Group | failover1

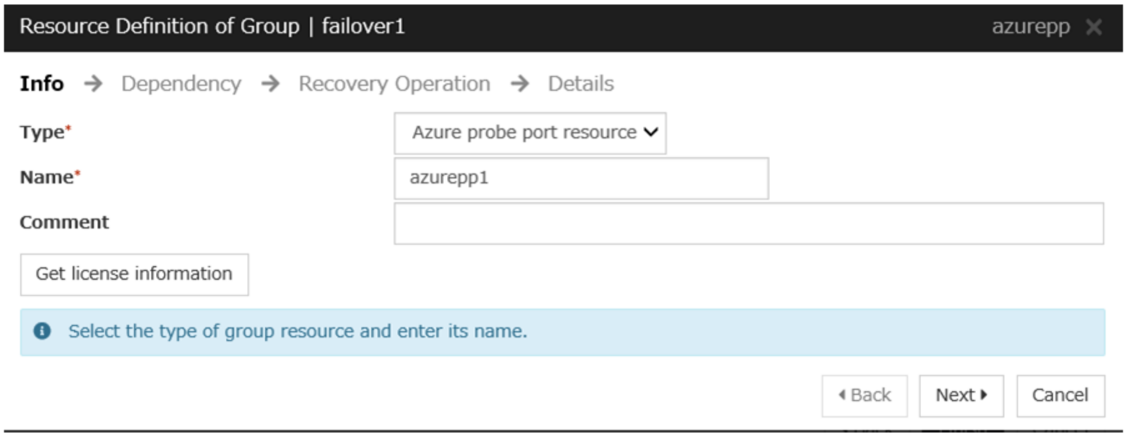
Mirror Partition Device Name*: /dev/NMP1
Mount Point*: /mnt/md
Data Partition Device Name*: /dev/sdc2
Cluster Partition Device Name*: /dev/sdc1
File System*: ext4
Mirror Disk Connect

- Azure probe port resource

  When EXPRESSCLUSTER is used on Microsoft Azure, EXPRESSCLUSTER provides a mechanism to wait for alive monitoring from a load balancer on a port specific to a node in which operations are running.

  For details about the Azure probe port resources", see "Understanding Azure probe port resources" in the Reference Guide.

  1. Click **Add** on the **Group Resource List** page.
  2. The **Resource Definition of Group | failover1** window is displayed. Select the group resource type (Azure probe port resource) from the **Type** box and enter the group name (azurepp1) in the **Name** box. Click **Next**.



Resource Definition of Group | failover1

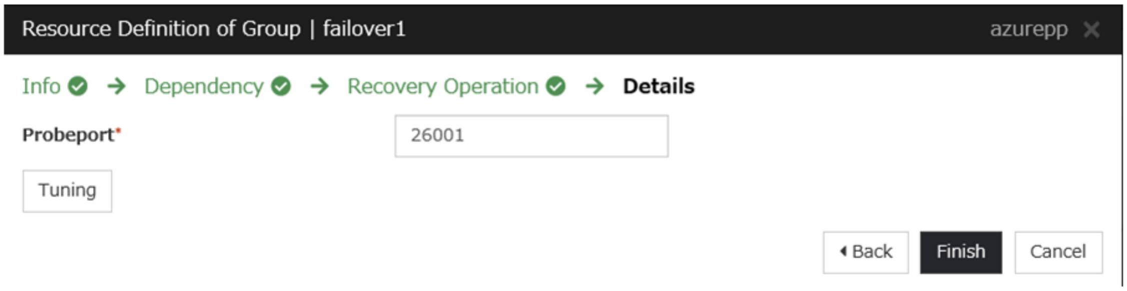
Type*: Azure probe port resource

Name*: azurepp1

Comment:

Select the type of group resource and enter its name.

  3. The **Dependency** window is displayed. Click **Next** without specifying anything.
  4. The **Recovery Operation** window displayed. Click **Next**.
  5. For **Probeport**, enter the value specified for **Port** when configuring a load balancer (configuring health probe).



Resource Definition of Group | failover1

Probeport*: 26001

  6. Click **Finish**.

- EXEC resource(for DSR)

  EXPRESSCLUSTER provides a mechanism to add / remove front-end ip address as the load balancer switches. For details about the EXEC resources", see "Understanding EXEC resources" in the Reference Guide.

  1. Click **Add** on the **Group Resource List** page.
  2. The **Resource Definition of Group | failover1** window is displayed. Select the group resource type (EXEC resource) from the **Type** box and enter the group name (exec1) in the **Name** box.
  3. Click **Next**.

4. The **Dependency** window is displayed. Click **Next** without specifying anything.
5. The **Recovery Operation** window displayed. Click **Next**.
6. The **Details** window displayed. Select the start.sh. Click **Edit**.
   The following script is a sample script. Customize it to change your environment.

   (Example: sample script of start.sh)

```
# Server1
SERVER1_NAME="server1" # hostname
SERVER1_NIC="lo" # Interface name for local loopback

# Server2
SERVER2_NAME="server2" # hostname
SERVER2_NIC="lo" # Interface name for local loopback

# VIP Address
VIP=10.5.0.200 # Load balancer front-end IP address
NETMASK=255.255.255.255 # Front-end IP address netmask

# HostName
CURRENT_HOSTNAME=`hostname`

if [ $CURRENT_HOSTNAME = $SERVER1_NAME ]; then
     NIC=$SERVER1_NIC
elif [ $CURRENT_HOSTNAME = $SERVER2_NAME ]; then
     NIC=$SERVER2_NIC
else
     echo "SERVER is not found."
     exit 1
fi

# Add IP Address
ip addr add $VIP/$NETMASK brd + dev $NIC
RET=$?
if [ $RET = 0 ]; then
     exit 0
else
     echo "Failure to add IP Address"
     exit 1
fi
```

7. The **Details** window displayed. Select the stop.sh. Click **Edit**.
   The following script is a sample script. Customize it to change your environment.

   (Example: sample script of stop.sh)

```
# Server1
SERVER1_NAME="server1" # hostname
SERVER1_NIC="lo" # Interface name for local loopback

# Server2
SERVER2_NAME="server2" # hostname
SERVER2_NIC="lo" # Interface name for local loopback

# VIP Address
VIP=10.5.0.200 # Load balancer front-end IP address
NETMASK=255.255.255.255 # Front-end IP address netmask
```

(continues on next page)

(continued from previous page)

```
# HostName
CURRENT_HOSTNAME=`hostname`

if [ $CURRENT_HOSTNAME = $SERVER1_NAME ]; then
    NIC=$SERVER1_NIC
elif [ $CURRENT_HOSTNAME = $SERVER2_NAME ]; then
    NIC=$SERVER2_NIC
else
    echo "SERVER is not found."
    exit 1
fi
# Del IP Address
ip addr del $VIP/$NETMASK brd + dev $NIC
RET=$?
if [ $RET = 0 ]; then
    exit 0
else
    echo "Failure to del IP Address"
    exit 1
fi
```

8. Click **Finish**.

3) **Adding a monitor resource**

- Azure probe port monitor resource

The port monitoring mechanism for alive monitoring is provided for the node in which the Microsoft Azure probe port resource is running.
For details about the Azure probe port resources", see "Understanding Azure probe port resources" in the Reference Guide.
Adding one Azure probe port monitor resource creates one Azure probe port monitor resource automatically.

- Azure load balance monitor resource

The mechanism to monitor whether the port with the same port number as the probe port is open or not is provided for the node in which the Microsoft Azure probe port resource is not running.
For details about the Azure load balance resource, see "Understanding Azure load balance monitor resources" in the Reference Guide.
Adding one Azure probe port resource creates one Azure load balance monitor resource automatically.

4) **Applying the settings and starting the cluster**

1. Click **Apply the Configuration File** on the **File** in the config mode of Cluster WebUI.
   If the upload succeeds, the message saying "The application finished successfully."
2. Select the **Operation Mode** on the drop down menu of the toolbar in Cluster WebUI to switch to the operation mode.
3. The procedure depends on the resource used. For details, refer to the following:Installation and Configuration Guide -> How to create a cluster

6.4 Verifying the created environment

Verify whether the created environment works properly by generating a monitoring error to fail over a failover group.

If the cluster is running normally, the verification procedure is as follows:

1. Start the failover group (failover1) on the active node (node1). In the **Status** tab on the Cluster WebUI, confirm that **Group Status** of failover1 of node1 is **Normal**.

   When using DSR, perform packet capture and confirm that communication is being performed with the ip address of the client and the front-end IP address of the load balancer.

2. Change **Operation Mode** to **Verification Mode** from the WebManager pull-down menu.

3. In the **Status** tab on the Cluster WebUI, click the **Enable dummy failure** icon of azureppw1 of Monitors.

4. When the time specified for **Interval** elapses, the failover group (failover1) enters an error status and fails over to node2. In the **Status** tab on the Cluster WebUI, confirm that **Group Status** of failover1 of node2 is **Normal**.

   Also, confirm that access to the frontend IP and port of the Azure load balancer is normal after the failover.

   When using DSR, perform packet capture and confirm that communication is being performed with the ip address of the client and the front-end IP address of the load balancer.

Verifying the failover operation in case of a dummy failure is now complete. Verify the operations in case of other failures if necessary.

CHAPTER

SEVEN

ERROR MESSAGES

For the error messages related to resources and monitor resources, see the following:

- "Error messages" in the Reference Guide.

CHAPTER

EIGHT

NOTES AND RESTRICTIONS

8.1 HA cluster using Azure DNS

8.1.1 Notes on Microsoft Azure

- There is a tendency for the performance difference (performance deterioration rate) to increase in a multi-tenant cloud environment compared to a physical environment or general virtualization environment (non-cloud environment). Therefore, pay careful attention to this point when designing a performance-oriented system.
- Even if a virtual machine is just shut down, its status is **Stopped** and billing continues. Execute **Stop** on the virtual machine setting window of the Microsoft Azure portal to change the virtual machine state to **Stopped (Deallocated)**.
- An availability set can be set only when creating a virtual machine. To move a virtual machine to and from the availability set, it is necessary to create an availability set again.
- To set up EXPRESSCLUSTER to work with Microsoft Azure, a Microsoft Azure organizational account is required. An account other than the organizational account cannot be used because an interactive login is required when executing the Azure CLI.

8.1.2 Notes on EXPRESSCLUSTER

Please refer the following for notes for EXPRESSCLUSTER on Azure:

EXPRESSCLUSTER X Getting Started Guide

- "Communication port number" in "Notes and Restrictions"
- "Azure DNS resources" in "Notes and Restrictions"
- "Setting up Azure DNS resources" in "8. *Notes and Restrictions*"

EXPRESSCLUSTER X Reference Guide

- "Notes on Azure DNS resources"
- "Notes on Azure DNS monitor resources"

Virtual machines are paused for up to 30 seconds for Azure memory preserving maintenance.
Please refer the following for details about memory preserving maintenance.

https://docs.microsoft.com/en-us/azure/virtual-machines/linux/maintenance-and-updates

Therefore, it is recommended to set **Heartbeat Timeout** parameter on **Timeout** tab in **Cluster Properties** more than 30 sec.

In addition to **Heartbeat Timeout**, please also note the following.

- Please set **Heartbeat Timeout** parameter less than OS reboot time.
- When changing **Shutdown Monitor Timeout** parameter on **Monitor** tab in **Cluster Properties** from the default value (Use Heartbeat Timeout), please set the parameter less than **Heartbeat Timeout**.

Please refer the following about the above:

EXPRESSCLUSTER X Getting Started Guide

- "Adjusting OS startup time" in "Notes and Restrictions"

EXPRESSCLUSTER X Reference Guide

- "Timeout tab"
- "Monitor tab"

8.2 HA cluster using a load balancer

8.2.1 Notes on Microsoft Azure

- There is a tendency for the performance difference (performance deterioration rate) to increase in a multi-tenant cloud environment compared to a physical environment or general virtualization environment (non-cloud environment). Therefore, pay careful attention to this point when designing a performance-oriented system.
- Even if a virtual machine is just shut down, its status is **Stopped** and billing continues. Execute **Stop** on the virtual machine setting window of the Microsoft Azure portal to change the virtual machine state to **Stopped (Deallocated)**.
- An availability set can be set only when creating a virtual machine. To move a virtual machine to and from the availability set, it is necessary to create an availability set again.

8.2.2 Notes on EXPRESSCLUSTER

Please refer the following for notes for EXPRESSCLUSTER on Azure:

EXPRESSCLUSTER X Getting Started Guide

- "Communication port number" in "Notes and Restrictions"
- "Setting up Azure probe port resources" in "8. *Notes and Restrictions*"
- "Setting up Azure load balance monitor resources" in "Notes and Restrictions"

EXPRESSCLUSTER X Reference Guide

- "Notes on Azure probe port resources"
- "Notes on Azure probe port monitor resources"
- "Note on Azure load balance monitor resources"

Virtual machines are paused for up to 30 seconds for Azure memory preserving maintenance.
Please refer the following for details about memory preserving maintenance.

https://docs.microsoft.com/en-us/azure/virtual-machines/linux/maintenance-and-updates

Therefore, it is recommended to set **Heartbeat Timeout** parameter on **Timeout** tab in **Cluster Properties** more than 30 sec.

In addition to **Heartbeat Timeout**, please also note the following.

- Please set **Heartbeat Timeout** parameter less than OS reboot time.
- When changing **Shutdown Monitor Timeout** parameter on **Monitor** tab in **Cluster Properties** from the default value (Use Heartbeat Timeout), please set the parameter less than **Heartbeat Timeout**.

Please refer the following about the above:

EXPRESSCLUSTER X Getting Started Guide

- "Adjusting OS startup time" in "Notes and Restrictions"

EXPRESSCLUSTER X Reference Guide

- "Timeout tab"

- "Monitor tab"

CHAPTER

NINE

LEGAL NOTICE

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CHAPTER

TEN

REVISION HISTORY

Edition	Revised Date	Description
1st	Apr 08, 2022	New Guide
2nd	Jul 29, 2022	Corrected typographical errors.