EXPRESSCLUSTER® X 4.1

HA Cluster Configuration Guide for Microsoft Azure (Linux)



Revision History

Edition	Revised Date	Description
1st	Apr 10, 2019	New guide

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Preface

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.

Scope of application

This guide covers the following product versions.

- EXPRESSCLUSTER X 4.1 for Linux (Internal version: 4.1.0-1)
- CentOS 7.5
- Microsoft Azure portal: Environment as of January 31, 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.

How This Guide is Organized

Chapter 1	Overview: Describes the functional overview.
Chapter 2	Operating Environments: Describes the tested operating environment of this function.
Chapter 3	Cluster Creation Procedure: Describes the procedure to create an HA cluster using Azure DNS.
Chapter 4	Cluster Creation Procedure: Describes the procedure to create an HA cluster using an public load balancer.
Chapter 5	Cluster Creation Procedure: Describes the procedure to create an HA cluster using an internal load balancer.
Chapter 6	Error Messages: Describes the error messages and solutions.
Chapter 7	Notes and Restrictions: Describes the notes and restrictions on creating and operating a cluster.

EXPRESSCLUSTER X Documentation Set

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

Getting Started Guide

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

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.

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*.

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.

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*.

Legacy Feature Guide

This guide is intended for administrators and for system engineers who want to build EXPRESSCLUSTER-based cluster systems. The guide describes EXPRESSCLUSTER X 4.0 WebManager and Builder.

Conventions

In this guide, Note, Important, Related Information 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.

Related Information: 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 <i>host_name</i>]
#	Prompt to indicate that a Linux user has logged on as root user.	# clpstat
Monospace (Courier)	Indicates path names, commands, system output (message, prompt, etc.), directory, file names, functions and parameters.	/Linux
Monospace bold (Courier)	Indicates the value that a user actually enters from a command line.	Enter the following: # clpcl -s -a
Monospace italic (Courier)	Indicates that users should replace italicized part with values that they are actually working with.	# ping <ip address=""></ip>

Contacting NEC

For the latest product information, visit our website below:

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

Chapter 1 Overview 1.1 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.



Figure 1-1 HA Cluster on a Cloud Service (Using Azure DNS)

Operational availability can be increased by clustering virtual machines (VMs in Figure 1-1) 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

1.2 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

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/



Figure 1-2 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 1-2 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 Internet Fault Domain 1 Fault Domain 0 Resource Group 🔯 Availability Set Virtual network oad Balancer Application e port resource C EXPRESSCLUSTER X EXPRESSCLUSTERX VM VM 01 Blob Storage Blob Storage

Figure 1-3 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 1-3 is accessed by specifying a global IP address of the Microsoft Azure Load Balancer (Load Balancer in Figure 1-3).

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.



Figure 1-4 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 " Chapter 4 Cluster Creation Procedure (for an HA Cluster Using an Public Load Balancer)" in this guide.
Publishing operations within the Microsoft Azure network	Internal load balancer (ILB)	See " Chapter 5 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
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.	an external network. 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

1.3 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.wind ows.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	НТТР	HTTP network partition resolution resource

For details about NP resolution, see the following:

• Chapter 5, "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).

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 "3.3 Configuring the EXPRESSCLUSTER settings."

Options	-h hostname	Specify the determining server as <i>hostname</i> (by using an FQDN name or IP address). This option cannot be omitted.
	-p port	Specify the determining port number as <i>port</i> (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)

1.4 Differences between on-premises and Microsoft Azure

The following table describes the functional differences of EXPRESSCLUSTER between onpremises and Microsoft Azure. "Y" indicates that the relevant function can be used and "N" indicates that the relevant function cannot be used.

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

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.

Step No.	Procedure	On-premise	Microsoft Azure		
	Before installing EXPRESSCLUSTER				
1	Creating a resource group	Not required	See "3.2 Configuring Microsoft Azure" in this guide.		
2	Creating a virtual network	Not required	See "3.2 Configuring Microsoft Azure" in this guide.		
3	Creating a virtual machine	Not required	See "3.2 Configuring Microsoft Azure" in this guide.		
4	Setting a private IP address	Not required	See "3.2 Configuring Microsoft Azure" in this guide.		
5	Adding Blob storage	Not required	See "3.2 Configuring Microsoft Azure" in this guide.		
6	Creating a DNS zone	Not required	See "3.2 Configuring Microsoft Azure" in this guide.		
7	Setting up the DNS server	See the manual provided with an OS or DNS server such as <i>Red Hat Enterprise Linux 7</i> <i>Network Guide</i> .	Not required		
8	Setting a partition for the mirror disk resource	 See the following: "Settings after configuring hardware" in Chapter 1, "Determining a system configuration" in the <i>Installation and</i> <i>Configuration Guide</i> "Understanding mirror disk resources" in the <i>Reference</i> <i>Guide</i>. 	See "3.2 Configuring Microsoft Azure" in this guide.		

Step No.	Procedure	On-premise	Microsoft Azure
9	Adjusting the OS startup time		
10	Checking the network setting	See "Settings after configuring	
11	Checking the root file system	hardware" in Chapter 1, "Determining a system	Same as "On-premise"
12	Checking the firewall setting	configuration" in the Installation and Configuration Guide.	
13	Synchronizing the server time	and Conngulation Guide.	
14	Checking the SELinux setting		
15	Installing the Azure	Not required	See "3.2 Configuring Microsoft Azure" in this guide.
16	Registering the service principal	Not required	See "3.2 Configuring Microsoft Azure" in this guide.
17	Installing EXPRESSCLUSTE R	See Chapter 3, "Installing EXPRESSCLUSTER" in the Installation and Configuration Guide.	Same as "On-premise"
		After installing EXPRESSCLUST	TER
18	Registering the EXPRESSCLUSER license	See Chapter 4, "Registering the license" in the <i>Installation</i> 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 Chapter 5, "Creating the cluster configuration data" in the <i>Installation and</i> <i>Configuration Guide</i> .	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 Chapter 5, "Creating the cluster configuration data" in the Installation and Configuration Guide. Chapter 5, "Network partition resolution resources details" in the Reference Guide. 	See "3.3 Configuring the EXPRESSCLUSTER settings" in this guide.
21	Creating a cluster: Creating a failover group and monitor resource	See "Creating the configuration data of a 2-node cluster" in Chapter 5, "Creating the cluster configuration data" in the <i>Installation and</i> <i>Configuration Guide</i> .	 In addition to the references for on-premises, see the following: > "Understanding Azure DNS resources" in the <i>Reference</i> <i>Guide</i>. > "Understanding Azure DNS monitor resources" in the <i>Reference Guide</i>. > "3.3 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.

Step No.	Procedure	On-premise	Microsoft Azure		
	Before installing EXPRESSCLUSTER				
1	Creating a resource group	Not required	 See either of the following depending on the load balancer to use: "4.2 Configuring Microsoft Azure" in this guide "5.2 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: "4.2 Configuring Microsoft Azure" in this guide "5.2 Configuring Microsoft Azure" in this guide 		
3	Creating a virtual machine	Not required	 See either of the following depending on the load balancer to use: "4.2 Configuring Microsoft Azure" in this guide "5.2 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: "4.2 Configuring Microsoft Azure" in this guide "5.2 Configuring Microsoft Azure" in this guide 		
5	Adding Blob storage	Not required	 See either of the following depending on the load balancer to use: "4.2 Configuring Microsoft Azure" in this guide "5.2 Configuring Microsoft Azure" in this guide 		
6	Setting a partition for the mirror disk resource	 See the following: "Settings after configuring hardware" in Chapter 1, "Determining a system configuration" in the <i>Installation and</i> <i>Configuration Guide</i>. "Understanding mirror disk resources" in the <i>Reference</i> <i>Guide</i>. 	 See either of the following depending on the load balancer to use: "4.2 Configuring Microsoft Azure" in this guide "5.2 Configuring Microsoft Azure" in this guide 		
7	Creating and configuring a load balancer	Not required	See either of the following depending on the load balancer to use: • "4.2 Configuring Microsoft Azure" in this guide		

Step No.	Procedure	On-premise	Microsoft Azure
			 "5.2 Configuring Microsoft Azure" in this guide
8	Setting the inbound security rules	Not required	 "4.2 Configuring Microsoft Azure" in this guide
9	Adjusting the OS startup time		
10	Checking the network setting	See "Settings after configuring	
11	Checking the root file system	hardware" in Chapter 1, "Determining a system	Same as "On-premise"
12	Checking the firewall setting	configuration" in the Installation and Configuration Guide.	
13	Synchronizing the server time	and configuration calact	
14	Checking the SELinux setting		
15	Installing EXPRESSCLUSTE R	See Chapter 3, "Installing EXPRESSCLUSTER" in the Installation and Configuration Guide.	Same as "On-premise"
	•	After installing EXPRESSCLUS	ER
16	Registering the EXPRESSCLUSER license	See Chapter 4, "Registering the license" in the <i>Installation</i> 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 Chapter 5, "Creating the cluster configuration data" in the <i>Installation and</i> <i>Configuration Guide</i> .	The COM heartbeat, BMC heartbeat, and DISK heartbeat cannot be used.
18	Configuration Guide. The network partition resolution resource is used. See the following: • "Creating the configuration data of a 2-node cluster" in Chapter 5, "Creating the cluster configuration data" in the Installation and Configuration Guide. • Chapter 5, "Network partition resolution processing		 See either of the following depending on the load balancer to use: See "4.3 Configuring the EXPRESSCLUSTER settings" in this guide. See "5.3 Configuring the EXPRESSCLUSTER settings" in this guide.
19	Creating a cluster: Creating a failover group and monitor resource	See "Creating the configuration data of a 2-node cluster" in Chapter 5, "Creating the cluster configuration data" in the <i>Installation and</i> <i>Configuration Guide</i> .	 See the following in addition to the description of "On-premise." "Understanding Azure probe port resources" in the <i>Reference Guide</i>. "Understanding Azure probe port monitor resources" in the <i>Reference Guide</i>. "Understanding Azure load balance monitor resources" in the <i>Reference Guide</i>.

Step No.	Procedure	On-premise	Microsoft Azure
			 See either of the following depending on the load balancer to use: See "4.3 Configuring the EXPRESSCLUSTER settings" in this guide. See "5.3 Configuring the EXPRESSCLUSTER settings" in this guide.

Chapter 2 Operating Environments 2.1 HA cluster using Azure DNS

See the following:

 "Getting Started Guide" > "Chapter 3, Installation requirements for EXPRESSCLUSTER" > "Operation environment for Azure DNS resource and Azure DNS monitor resource"

x86_6	;4
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NOO_04	
OS	CentOS 7.5
EXPRESSCLUSTER	EXPRESSCLUSTER X 4.1 for Linux (Internal version: 4.1.0-1)
Microsoft Azure	Resource Manager
deployment model	
Location	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?view=azure-cli-latest

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/

2.2 HA cluster using a load balancer

See the following:

"Operation environment for Azure probe port resource, Azure probe port monitor resource, Azure load balance monitor resource" in Chapter 3, "Installation requirements for EXPRESSCLUSTER" in the *Getting Started Guide*.

Chapter 3 Cluster Creation Procedure (for an HA Cluster Using Azure DNS)

3.1 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	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	Japan East	
DNS zone setting		
Name	cluster1.zone	
Resource group	TestGroup1	
Resource group location	Japan East	
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	Japan East	
Network security group sett	ing	
Name	NetSecGroup1	
Availability set setting		
Name	AvailabilitySet1	
Update domains	5	
Fault domains	2	
Diagnostics storage account setting		
Name Automatically generated (testgroup1diag679)		
Replication	Locally-redundant storage (LRS)	
IP configuration setting	setting	
IP address	10.5.0.110 10.5.0.111	
Blob storage setting		
Name	Node1Blob1	Node2Blob1
Source type	None (empty disk)	
Account type	Standard HDD	

• EXPRESSCLUSTER settings (cluster properties)

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

• EXPRESSCLUSTER settings (failover group)

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

•	EXPRESSCLUSTER settings	(monitor resource)	
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Monitor resource name	Setting item	Setting value
Mirror disk monitor	-	-
resource		
Azure DNS monitor	Name	azurednsw1
resource		
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
	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	Name	mtw1
resource	Monitor resource list	genw1
		ipw1
		ipw2
	Recovery Action	Execute only the final action
	Recovery Target	LocalServer

3.2 Configuring Microsoft Azure

1) Creating a resource group

2.

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

1. Select **Resource groups** or the resource group icon in the menu on the left side of the window. If there are existing resource groups, they are displayed in a list.



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



2) Creating a virtual network

2.

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

1. Select +Create a resource or the + icon in the menu on the left side of the window.



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



3) Creating a virtual machine

2.

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 +Create a resource or the + icon in the menu on the left side of the window.

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	-		2 h ago	designing applications.	,
Monitor	•	Virtual machine (classic)	14 h ago	Discover Azure products [2]	
Advisor		Resource group	14 h ago	Explore Azure offers that help t on support, training, and pricin	urn ideas into solutions, and get info g.
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Azure Cosmos DB	Web	Learn more			
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Load balancers	Containers	Windows Server 2016			
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Virtual networks	Analytics	SUSE software purchase			
Azure Active Directory	AI + Machine Learning	Learn more			
Monitor	Internet of Things	Service Fabric Cluster Quickstart tutorial			
Advisor	Mixed Reality				
Security Center	Integration	Web App for Container			
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3. Select CentOS-based 7.5.

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App registrations	Developer Tools	•	

4. Confirm that **Resource Manager** is selected for **Select a deployment model** at the bottom of the window, and click **Create**.

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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 the Create new blade appears, specify the settings of Name, Fault domains, and Update domains. Then click OK.

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

From the list, choose a size (A1 - Standard 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 >**

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When the **Disks** tab appears, go through the following steps to add a blob to be used for a mirror disk (cluster partition or data partition).
 From the **DATA DISKS** list, click **Create and attach a new disk**.

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* FAVORITES	the VM determines the type of storage you can use and the number of data disks allowed. Learn more	
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 The Create a new disk blade appears.
 Specify the settings of Disk type, Name, Size (GiB), and Source type. Then click OK. Click Next: Networking >

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9. The **Networking** tab appears.

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

Click Create new under the Configure network security group field to display the Create network security group blade. Specify the setting of Name and then click OK. Click Next: Management >.

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10. The Management tab appears.

Click Create new under the Diagnostics storage account field to display the Create storage account blade.

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: Guest config >.

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

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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 **Resource groups** or the resource group icon in the menu on the left side of the window.

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

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🧾 Dashboard	, Search (Ctrl+/)	Attach network	interiace - Detach network	nterrace					
E All services	👰 Overview 🍵	Network Inter			Topology				
TAVORITES	Activity log	Virtual network/subr	et: Vnet1/Vnet1-1 Public IP: N	one Private IP:	10.5.0.4 Acce	elerated networking: D	isabled		
All resources	 Access control (IAM) 	Inbound port ru	les Outbound port rules	Application securit	y groups Loa	d balancing			
📦 Resource groups	🖉 Tags	Network secur	ity group NetSecGroup1 (attaci	ed to network in	terface: pode128)		Add inbound por	d and a
🔇 App Services	X Diagnose and solve problems		s, 1 network interfaces			,		Add Indound por	TTURE .
Function Apps	Settings	PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION	
🗧 SQL databases	Networking	1000	A default-allow-ssh	22	TCP	Any	Any	Allow	
💇 Azure Cosmos DB	🛎 Disks	65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwor	k 🗳 Allow	
Virtual machines	💭 Size	65001	AllowAzureLoadBalancerInBound	Anv	Any	AzureLoadBalan	Anv	Allow	
🔶 Load balancers	Security	65500	DenyAllinBound	Any	Any	Any	Any	O Deny	
Storage accounts	Extensions	63300	DenyAllinBound	мау	Алу	Any	Any	O Deny	
Virtual networks	🐔 Continuous delivery (Preview)								
Azure Active Directory	Availability set								
Monitor	Configuration								
Advisor	💲 Identity								
Security Center	Properties								
O Cost Management + Bill	Locks								
Help + support	Automation script								
? Subscriptions	Operations								
App registrations									

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

6. <u>Select</u> IP configurations.

Microsoft Azure	P Sear	ch resources, services, and docs	.>. ₽ 0	@ ? © 💶 💽				
*	Home > Resource groups > TestGroup1	> node1 - Networking > node128 - IP co						
+ Create a resource	node128 - IP configuratio	ons		×				
🔶 Home	network interface	🕂 Add 🕞 Save 🗶 Discard						
Dashboard								
i∃ All services	Overview Overview	rview IP forwarding settings IP forwarding Deather Enabled						
+ FAVORITES	Activity log	IP forwarding	Disabled Enabled					
All resources	Access control (IAM)	Virtual network	Vnet1					
🜍 Resource groups	🖉 Tags	IP configurations						
S App Services	Settings	* Subnet	Vnet1-1 (10.5.0.0/24)	~				
Function Apps	IP configurations							
🗧 SQL databases	DNS servers							
🧟 Azure Cosmos DB	Network security group		PE PRIVATE IP ADDRESS	PUBLIC IP ADDRESS				
Virtual machines	Properties	ipconfig1 IPv4 Pr	imary 10.5.0.4 (Dynamic)	·				
🔶 Load balancers	Locks							
Storage accounts	Automation script							
Virtual networks	Support + troubleshooting							
Azure Active Directory	Effective security rules							
Monitor	Effective routes							
🔷 Advisor	New support request							
Security Center								
Ost Management + Bill								
Help + support								
Subscriptions								
👪 App registrations								

- 7. Only ipconfig1 is displayed in the list. Select it.
- 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		𝒫 Search resources, services, and docs			Ð			
	Home > Resource groups > 1	festGroup1 > node1 - Networking > node128 - IP c	onfigurations > ipc	onfig1				
+ Create a resource	ipconfig1		\Box \times					
🔶 Home	Redetzs							
🔜 Dashboard								
i≡ All services	Public IP address settings							
🛨 Favorites	Public IP address Disabled Enabled							
🗰 All resources 📫	Private IP address settings							
🕄 Resource groups	Virtual network/subnet							
🔇 App Services	Vnet1/Vnet1-1							
Function Apps	Assignment Dynamic Static							
🗃 SQL databases	IP address							
🧟 Azure Cosmos DB	10.5.0.110							
Virtual machines								
💠 Load balancers								
Storage accounts								
↔ Virtual networks								
Azure Active Directory								
Monitor								
今 Advisor								
🏮 Security Center								
O Cost Management + Bill								
🔒 Help + support								
? Subscriptions								
😽 App registrations								

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

5) Creating a DNS zone

2.

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

1. Select +Create a resource or the + icon in the menu on the left side of the window.



3. The Create DNS zone blade is displayed. Specify Name, Subscription, and Resource group, and click Review+create.

Microsoft Azure	P se	arch resources, services,	and docs			R			8.00 CONTRACTOR	
« Hon	me > New > Create DNS zone									
+ Create a resource Cre	eate DNS zone									\times
🛧 Home										
🔲 Dashboard 🛛 🛛 🖪	asics Tags Review + create									
E All services	NS zone is used to host the DNS record	s for a particular domain.	For example, the domain 'contoso	.com' may contain a numb	ber of					
DNS	S records such as 'mail.contoso.com' (fo S zone and manage your DNS records, a									
All resources	ords that you create. Learn more.									
Nesource groups	DJECT DETAILS									
Su App Services	ubscription	week of the size			~					
Function Apps	 Resource group 	TestGroup1			~					
🗃 SQL databases		Create new								
🥂 Azure Cosmos DB	TANCE DETAILS									
Virtual machines	lame	cluster1.zone			~					
💠 Load balancers	ource group location ()	Japan East			~					
🧰 Storage accounts										
Virtual networks										
Azure Active Directory										
Monitor										
🔷 Advisor										
🟮 Security Center										
Ost Management + Bill										
Help + support										
📍 Subscriptions	Review + create Previous	Next : Tags >	Download a template for automat	tion						
Registrations										Þ

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 Blob storage. 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 "4.Partition settings for mirror disk resource (when using Replicator)" in "Settings after configuring hardware" in Chapter 1, "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

8	16	73400320	sdb
8	17	73398272	sdb1
8	0	31459328	sda

- 8 1 31456256 sda1
- 8 32 20971520 sdc
- 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. The following is an example of creating one partition including all areas of /dev/sdc.
 \$ sudo fdisk /dev/sdc

Device contains neither a valid DOS partition table, nor Sun, SGI or OSF disklabel Building a new DOS disklabel with disk identifier 0xe3c83b13. Changes will remain in memory only, until you decide to write them.

After that, of course, the previous content won't be recoverable.

Warning: invalid flag 0x0000 of partition table 4 will be corrected by w(rite)

The device presents a logical sector size that is smaller than the physical sector size. Aligning to a physical sector (or optimal I/O) size boundary is recommended, or performance may be impacted.

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to switch off the mode (command 'c') and change display units to sectors (command 'u').

Command (m for help): n Command action e extended p primary partition (1-4) p Partition number (1-4): 1 First cylinder (1-2610, default 1): Using default value 1

Last cylinder, +cylinders or +size{K,M,G} (1-2610, default 2610): +1G

Command (m for help): p

Disk /dev/sdc: 21.5 GB, 21474836480 bytes 255 heads, 63 sectors/track, 2610 cylinders Units = cylinders of 16065 * 512 = 8225280 bytes Sector size (logical/physical): 512 bytes / 4096 bytes I/O size (minimum/optimal): 4096 bytes / 4096 bytes Disk identifier: 0xe29ed566

Device Boot	Start	End	Blocks	Id System
/dev/sdc1	1	132	1060256+	83 Linux

Partition 1 does not end on cylinder boundary. Partition 1 does not start on physical sector boundary. Command (m for help): n Command action e extended p primary partition (1-4) p Partition number (1-4): 2 First cylinder (132-2610, default 132): Using default value 132 Last cylinder, +cylinders or +size{K,M,G} (132-2610, default 2610): Using default value 2610 Command (m for help): p

Disk /dev/sdc: 21.5 GB, 21474836480 bytes 255 heads, 63 sectors/track, 2610 cylinders Units = cylinders of 16065 * 512 = 8225280 bytes Sector size (logical/physical): 512 bytes / 4096 bytes I/O size (minimum/optimal): 4096 bytes / 4096 bytes Disk identifier: 0xe29ed566

Device BootStartEndBlocksIdSystem/dev/sdc111321060256+83LinuxPartition 1 does not end on cylinder boundary.Partition 1 does not start on physical sector boundary./dev/sdc213226101990453783Linux

Command (m for help): w The partition table has been altered!

Calling ioctl() to re-read partition table. Syncing disks.

 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 Chapter 1, "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?view=azure-cli-latest

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/InstallAzireCli | 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?view=azure-cli-latest Create an Azure service principal with Azure CLI: https://docs.microsoft.com/en-us/cli/azure/create-an-azure-service-principal-azure-cli?view=azure-cli-latest

- \$ 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 environment configuration file. In the following example, a service principal is created in /root/examplecert.pem.

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.
    Γ
     {
       "cloudName": "AzureCloud",
       "id": "xxxxxxxx-xxxx-xxxx-xxxx-xxxxx,",
       "isDefault": true,
       "name": "xxxxxxxxx",
       "state": "Enabled",
       "tenantId": "xxxxxxxx-xxxx-xxxx-xxxx-xxxx,",
       "user": {
         "name": "http://azure-test",
         "type": "servicePrincipal"
       }
     }
   1
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.

3.3 Configuring the EXPRESSCLUSTER settings

For the Cluster WebUI setup and connection procedures, see Chapter 5, "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 i	Config mode - 🙎 🛈 🖅 🎽 1 🕈 🖷
Cluster generation wizard File	Update Server Data

2. The **Cluster** window on the **Cluster Generation Wizard** is displayed. Enter a desired name in **Cluster Name**. Select an appropriate language in **Language**. Click **Next**

Server Server	nnect → NP Resolution → Group → Monitor
Cluster Name*	Cluster1
Comment	
anguage*	English 🗸
Ianagement IP Address	
If using the integrated WebManager to manager	inguage (locale) of the environment that runs WebManager. ge multiple dusters, specify a unique duster name to identify the duster. ddress used for a WebManager connection. If establishing connections by specifying each server IP omitted.

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 resol Both IPv4 and IPv6 for IP address can be When entering an IP address, the server n	used.	acquired.						
OK Cancel								
Cluster generation wizard			×					
Server Definitions Server Definitions Name	→ Group → Monitor							
Master server node1								
1 node2 ↑ ↓								
Server Group Definition ● Click "Add" to add servers constructing the duster. Click 「↑」 or 「↓」 to change the server priority. Click "Settings" to configure the server group when using the server group.	Settings							
		Back Nex	t • Cancel					

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 Server uster ⊘ → Basic Settings (Server	Server nect → NP Resol	lution 🔶 Group 🔶 Monitor	г.
roperties Add Remove				
erconnect List				
riority Type	MDC	node1	node2	
1 Kernel Mode	✓ mdc1 ✓	10.5.0.110	✓ 10.5.0.111	~
	"BMC", "DISK", "W	itness HB" and "COM'		l select the type. h is used for heartbeat. For "Mirror
or "Witness HB" setting, click ea	, "DISK" and "COM" ch server column ce the priority to prefe	ell to set "Use" or "Do erentially use the LAN	erver column cell and set an IP add not use", and then click "Propertie only for the communication amon configure IP addresses.	s" to set detailed settings.
or the communication route which communication route in MDC colu		mirroring communicat	ion, select the mirror disk connect	name to be allocated to the

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). Additionally, you can use

network partition resolution resources for NP resolution. Click **Next**.

Cluster generation wizard	
Server Server Cluster Server Server Cluster	
• Configure network partition (NP) resolution function. Click "Add" to add NP resolution resource and select the type. For "Ping" setting, click Ping target column cell to configure IP address of Ping destination, and then click each server column cell to configure "Use" of "Do not use". For "HTTP/HTTPS" setting, click target column cell to configure HTTP packet destination, and then click each server column cell to configure "Use" or "Do not use". For "HTTP/HTTPS" 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.	
Back Next Can	cel

2) Adding a group resource

Defining a group

Create a failover group.

1. The $\ensuremath{\textbf{Group List}}$ window s displayed.

Click Add.	
Cluster generation wizard	×
Server Server Server Cluster O + Basic Settings O + Interconnect O + NP Resolution O + Group + Monitor Properties Add Group List	Group Resource
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. 	
	Back Next Cancel

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
Туре*	failover 🗸
Use Server Group Settings	
Name*	failover1
Comment	
 Select group type. If using virtual machine resources to clust "Failover". If using server group, check the "Use Server 	er virtual machines, select "Virtual machine" as the type. In other cases, select ver Group".
	Back Next Cancel

- 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 Definition	failover 🗙
Basic Settings ⊘ → Startup Servers ⊘ → Group Attrib	utes 📀 🔶 Group Resource
Properties Add Remove	
Group Resource List	
Name	Туре
No resources	
• Click "Add" to add resources. Click "Properties" to configure the properties of the selected resources.	irce.
	Back Finish Cancel

• 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.
- 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 md

Info → Dependency → Recovery	Operation 🗲 Details		
Type*	Mirror disk resource		
Name*	md		
Comment			
Get license information			
Select the type of group resource and	enter its name.		
		Previous Next Cancel	

- 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				md 🗙	
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				Select	
Tuning					
				ish Cancel	

• 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**.

Resource Definition of Group failover1 azuredns X				
Info → Dependency → Recovery	Operation 🔶 Details			
Туре*	Azure DNS resource			
Name*	azuredns1			
Comment				
Get license information				
• Select the type of group resource and	enter its name.			
		Gack Next ► Can	cel	

- 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.

Resource Definition of Group failove	er1		azuredns 🗙
Info ⊘ → Dependency ⊘ → Rec	overy Operation 🤡 🔶 Deta	ails	
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*	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		
File Path of Service Principal*	/root/examplecert.pem		
Thumbprint of Service Principal			
Azure CLI File Path*	usr/bin/az		
Delete a record set at deactivation			
Tuning			
		Back Fin	sh 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				
Туре*	Custom monitor			
Name*	genw1			
Comment				
Get Licence Info				
• Select the type of monitor resource an	d enter its name.			
		Back Next Cancel		

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	
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	Server		
		Gack Next Next	Cancel

4.	The Monitor (special) window is displayed. Select Script created with this product . The following shows the sample of a script to be created.					
	<pre>#! /bin/sh <expresscluster-installation-path \$?<="" -p="" 443="" exit="" management.core.windows.net="" pre=""></expresscluster-installation-path></pre>	'n>∕bin/clpazure_p	ort_chec	ker –	h	
	Select Synchronous for Monitor Type	e. Click Next .				
	Monitor Resource Definition				genw 🗙	
	Info 📀 🔶 Monitor(common) 📀 🔶 Monitor(specia) → Recovery Action				
	O User Application					
	\ensuremath{ullet} Script created with this product					
	File					
			Edit	View	Replace	
	Monitor Type	 Synchronous Asynchronous 				
	Wait a period of time for Application/Script monitor to start					
	Log Output Path					
	Rotate Log					
	Rotation Size					
	Normal Return Value*	0				
	Wait for activation monitoring to stop before stopping the cluster					
			A Back Back Compared Co	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.

Recovery Action	Execute o	nly the final action		•
Recovery Target *	LocalServe	er	Browse	
Recovery Script Execution Count		time		
Execute Script before Reactivation				
Maximum Reactivation Count		time		
Execute Script before Failover				
Execute migration before Failover				
Maximum Failover Count		time		
Execute Script before Final Action				
Final Action	No operat	ion	~	
				Script Settings

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

• IP monitor resource

3.

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(s	pecial) → Recovery Action	
Type* IP m	onitor 🗸	
Name* ipw1		
Comment		
Get Licence Info		
• Select the type of monitor resource and enter	r its name.	
The Monitor (common) windo Confirm that Monitor Timing is	w is displayed.	ack Next Cancel
Monitor Resource Definition		ipw 🗙
Info 📀 🔶 Monitor(common) 🔶 Monito	or(special) 🔶 Recovery Action	
Interval*	30 sec	
Timeout*	30 sec	
Collect the dump file of the monitor process at occurrence	timeout	
Do Not Retry at Timeout Occurrence		
Do Not Execute Recovery Action at Timeout Oc	currence	
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	Server	
	 ▲ Balance 	ack Next Cancel
elect one available server for		te meniterirer

○ All servers ● Select			
Servers that can run the Group Name node1	← Add	Available Servers Name node2	
	→ Remove		
			OK Cancel Apply

4. The Monitor (special) window is displayed.

Monitor Resource Definition	ipw 🗙
Info 📀 🔶 Monitor(common) 📀 🔶 Monitor(special) 🄶 Recovery Action	
Common node1 node2	
Edit Add Remove	
IP Address List	
IP Address	
No Ip Address	
<pre></pre>	Cancel

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 Settings		
IP Address*	10.5.0.111]
		OK Cancel
Monitor Resource Definition		ipw 🗙
Info → Monitor(common) → Common node1 node2 Edit Add Remove	Monitor(special) → Recovery Action	
IP Address List IP Address 10.5.0.111		
		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		ipw 🗙
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.

- 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**.
- 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

3.

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	mtw 🗙
Info → Monitor(common) → Monitor	(special) > Recovery Action
Туре*	ulti target monitor 🗸
Name* mi	w1
Comment	
Get Licence Info	
• Select the type of monitor resource and er	ter its name.
	Back Next Cancel
The Monitor (common) wind Confirm that Monitor Timing Monitor Resource Definition	
Info ♥ → Monitor(common) → Mor	
Interval*	30 sec
Timeout*	30 sec
Collect the dump file of the monitor process occurrence	at timeout
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	Server

- 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	on			mtw 🗙
Info 🤡 🔶 Monitor(com	mon) 🥑 🔶 Moni	tor(special) 🔶 Re	ecovery Action	
Monitor Resource List			Available Monitor Resources	
Monitor Resource	Туре	←	Monitor Resource	Туре
genw1	genw	Add	No Available Servers	
ipw1	ipw	\rightarrow		
ipw2	ipw	Remove		
Tuning				
			 ✓ Back 	Next • Cancel

- 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	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	Stop the cluster service and shutdown OS	•		
		Script Settings		
		Back Finish Cancel		

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.

· · ·					
Info Interconnect NP Resolution T Alert Service WebManager Alert Log		Port No.(Mirror) Mirror Agent Mi	(b)	Monitor tension	Recovery
Cluster Name	Cluster1				
Comment					
Language	English 🗸				
				OK Cance	Apply

 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.

Cluster Properties Cluster1				
Info Interconnect NP Resolution Ti Alert Service WebManager Alert Log		No. Port No.(Mirror) Port No.(Lo ing Mirror Agent Mirror Driver	g) Monitor Recove Extension	ery
Server Sync Wait Time*	5	min		
Heartbeat				
Interval*	3	sec		
Timeout*	120	sec		
Server Internal Timeout*	180	sec		
Initialize				
			OK Cancel A	Apply

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* \rightarrow How to create a cluster

3.4 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**.
- Log in to the Microsoft Azure portal, select cluster1.zone on the DNS zone blade, 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).
- 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>
- 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 blade, 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**.
- 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 4 Cluster Creation Procedure (for an HA Cluster Using an Public Load Balancer)

4.1 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.

Setting item	Setting value	
Resource group setting		
Resource group	TestGroup1	
Region	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	Japan East	
Load balancer setting		
Name	TestLoadBalancer	
Туре	Public	
Public IP address: Name	TestLoadBalancerPublicIP	
Public IP address:	Static	
Assignment		
Resource group	TestGroup1	
Region	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	
Protocol	ТСР	
Destination Port range	8080 (Port number offering the operation)	

• Microsoft Azure settings (common to node1 and node2)

Setting item		Setting value	
	node1	node2	
Virtual machine setting			
Disk type	Standard HDD		
User name	testlogin	testlogin	
Password		PassWord_123	
Resource group		TestGroup1	
Region	Japan East	Japan East	
Network security group setting			
Name	NetSecGroup1	NetSecGroup1	
Availability set setting			
Name	AvailabilitySet1	AvailabilitySet1	
Update domains	5	5	
Fault domains	2	2	
Diagnostics storage account setting			
Name	Automatically generated (testgroup1diag679)		
Replication	Locally-redundant storage (LRS)		
IP configuration setting			
IP address	10.5.0.110	10.5.0.111	
Blob storage setting			
Name	Node1Blob1	Node2Blob1	
Source type	None (empty disk)	None (empty disk)	
Account type	Standard HDD		

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

• EXPRESSCLUSTER settings (cluster properties)

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

• 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	/dev/sdc2	
	Device Name		
	Details Tab: Cluster Partition	/dev/sdc1	
	Device Name		
	Details Tab: File System	ext4	
	Mirror Tab: Execute the initial	On	
	mirror construction		
	Mirror Tab: Execute initial mkfs	On	
Azure probe port resource	Name	azurepp1	
	Probe port	26001 (Value specified for Port	
		of Health probe)	

Monitor resource name	Setting item	Setting value	
Mirror disk monitor	-	-	
resource			
Azure probe port monitor	Name	azureppw1	
resource	Recovery Target	azurepp1	
Azure load balance	Monitor resource name	aurelbw1	
monitor resource	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	
	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	Name	mtw1	
resource	Monitor resource list	genw1	
		ipw1	
		ipw2	
	Recovery Action	Execute only the final action	
	Recovery Target	LocalServer	
	Execute Script before Final	On	
	Action		
	Timeout	30	

• EXPRESSCLUSTER settings (monitor resource)

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 **Resource groups** or the resource group icon in the menu on the left side of the window. If there are existing resource groups, they are displayed in a list.



2. Select +Add at the upper left of the window.

licrosoft Azure	, P Search resources, services, and a	docs >_ 🕞	0 🔅 ? 🙄 📕	
	Home > Resource groups			
Create a resource	Resource groups 既定のディレクトリ(WPEC)			\$7
Home	Add	↓ Export to CSV		
Dashboard	Subscriptions:	- capacito cav		
All services				
FAVORITES	Filter by name	All locations .	✓ All tags ✓ No groupin	g ~
All resources	a 23 items			
Resource groups	NAME 🗘	SUBSCRIPTION	LOCATION 14	
App Services		CONTRACT, CONTRACTOR	1000 CT	1
Function Apps		1998 (P. 1998), 1998 (P. 1998)	10.01 (0.010)	
SQL databases		1998 (P. 1998) (P. 1998)	terrar destruction	
⁷ Azure Cosmos DB		1998 (P. 1998) (P. 1998)	And Mark	
Virtual machines		1000 (0.1000), 0.000 (0.000)	Territory.	
Load balancers		and a second second second	The Party State of the	
Storage accounts		and the second second	10.0100000000	
Virtual networks		and the second sec	mark Arrays	
Azure Active Directory		and the second sec	the state of the state of the	
Monitor		1998 (P. 1998, 1998)	(and (second))	
Advisor		1998 (P. 1998), 100 (P. 1998)	-100 Mil	
		1990 (P. 1990) (P. 1990)	Test with	
Security Center		1990 (P. 1990) (P. 1990)	Jacob Section 1	
Cost Management + Bill		1770 (D. 1770), 101 (D. 1770)	100 101	
Help + support		1990 C. 1997 C. 1997	0000 000	
Subscriptions		1990 C 1990 C 1990	Jacob Section 1	

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

Microsoft Azure	∠ Search resource	ces, services, and docs >_ 💀 🗘 🌚 📕 💽
×	Home > Resource groups > Create a resource gro	oup
+ Create a resource	Resource groups ペ ダ × 歴史のディレクトリ(WPEC)	Create a resource group $\qquad \qquad \qquad$
🛧 Home	+ Add III Edit columns ···· More	
🛄 Dashboard		Basics Tags Review + Create
E All services	Filter by name	Resource group - A container that holds related resources for an Azure solution. The resource group can include all the
- * FAVORITES	NAME 🗇	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 🗅
🛄 All resources		PROJECT DETAILS
🜍 Resource groups		* Subscription 🕐
🔇 App Services		★ Resource group
Function Apps		
👼 SQL databases		RESOURCE DETAILS * Region Ulanan East
🬌 Azure Cosmos DB		* Region 🛛 Japan East 🗸 🗸
Virtual machines		
🚸 Load balancers		
🧮 Storage accounts		
Virtual networks		
Azure Active Directory	(*)	
😁 Monitor		
🔷 Advisor		
Security Center		
Oost Management + Bill		
Help + support		
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😽 App registrations	••••	Newiew + Create Invext : lags

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.

- Microsoft Azure >_ ------ Home
 Dashboard () Choose your default view + Create a resource Azure services See all (+100) > 📴 Dashboard ٢ **(P**) 2 $\langle \!\!\!/ \rangle$ 8 SQL 47 E All services SQL databases Azure Database Azure Cosmos for PostgreSQL DB Function Apps Azure Databricks Virtual machines Storage accounts App Services Kubernetes services Cognitive Services 🛨 FAVORITES -All resources Make the most out of Azure 😵 Resource groups Services M <u>(</u> 0 -. Function Apps Connect to Azure via an authenticated browser-based shell SQL databases Learn Azure with free online courses by Microsoft Monitor your apps and infrastructure Secure your apps and infrastructure Optimize performance, eliability, security, and costs 🬌 Azure Cosmos DB Azure Advisor > Cloud Shell > Microsoft Learn 🖄 Azure Monitor > Security Center > Virtual machines 🚸 Load balancers Recent resources See all your recent resources See all your resources Useful links Storage accounts Get started or go deep with technical docs. [2] Our articles include everything from quickstarts, samples, and tutorials to help you get started, to SDKs and architecture guides for designing applications. NAME TYPE LAST VIEWED Virtual networks Azure Active Directory • Virtual machine (classic) 2 h ago . Monitor Virtual machine (classic) 14 h ago Discover Azure products 12 🔷 Advisor (*) Resource group 14 h ago Explore Azure offers that help turn ideas into solutions, and get info on support, training, and pricing. 🙆 Security Center ø Cloud service (classic) 21 h ago Keep current with Azure updates [2] Learn more and what's on the roadmap and subscribe to notifications to stay informed. Azure-Source wraps up all the news from last week in Azure. Ost Management + Bill.. Q Virtual machine 3 d ago 🔒 Help + support (*) Resource group 3 d ago **Ŷ** Subscriptions Virtual machine News from the Azure team IZ Hear right from the team developing features that help you solve problems in the Azure blog. 3 d ago 😽 App registrations Virtual machine 3 d ago 2. Select Networking and then Virtual network. <u>></u>Б-С-Ф?© Microsoft Azure Create a resource New $\Box \times$ 🛖 Home , Search the Marketplace 📴 Dashboard Azure Marketplace See all Featured See all 🛨 FAVORITES -Get started $\langle \cdots \rangle$ Virtual network Quickstart tutorial All resources Recently created 😭 Resource groups Compute Networking Load Balancer 🔇 App Services Storage Application Gateway 👼 SQL databases Web 🧟 Azure Cosmos DB Mobile /irtual network gateway Virtual machines Containers 🚸 Load balancers Databases 🧮 Storage accounts Virtual WAN Analytics 1 ··· Virtual networks AI + Machine Learning 🚸 Azure Active Dire Internet of Things DNS zone Quickstart tutorial 6 Monitor Mixed Reality 🏟 Advisor Integration Cisco ASAv - BYOL 4 NIC (preview) Security Center Security Ost Management + Bill. Identity Citrix ADC 12.0 VPX Enterprise Edition - 200Mbps (preview) 🔒 Help + support Developer Tools Learn more **9** Subscriptions Management Tools Network security group 😽 App registratio Software as a Service (SaaS) Quickstart tutoria
- 1. Select +Create a resource or the + icon in the menu on the left side of the window.

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



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 +Create a resource or the + icon in the menu on the left side of the window.



2.
3. Select CentOS-based 7.5.

Microsoft Azure		, ⊃ Search resourc	es, services, and docs	>_ 167 Q (\$		And in case of
	6 Home > New > Marketplace	> Compute				
Create a resource	Marketplace	\$ X	Compute			1
🕈 Home	My Saved List 🧿	*	PRIVATE You have private offers available. Click here to s			
Dashboard	My Saved List		The second secon	ee. 7		
All services	Everything		,O Rogue Wave Software			×
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Resource groups			Results			
App Services	Storage		NAME	PUBLISHER	CATEGORY	
Function Apps	Web		-			
SQL databases	Mobile		CentOS-based 7 LVM	Rogue Wave S	oftware (form Recomme	nded
🕈 Azure Cosmos DB			CentOS-based 7.4 HPC	Rogue Wave S	oftware (form Recomme	nded
Virtual machines	Containers		CentOS-based 7.1 HPC	Rogue Wave S	oftware (form Recomme	nded
Load balancers	Databases		CentOS-based 6.10			
Storage accounts	Analytics		CentOS-based 6.10	Rogue Wave S	oftware (form Recomme	nded
Virtual networks	AI + Machine Learning	_	CentOS-based 7.3 HPC	Rogue Wave S	oftware (form Recomme	nded
Azure Active Directory			E CentOS-based 6.5 HPC	Rogue Wave S	oftware (form Recomme	nded
Monitor	Internet of Things		EcentOS-based 7.5	Denne Maria C	oftware (form Recomme	
Advisor	Mixed Reality		-	Kogue Wave S	ortware (rorm Kecomme	naea
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Oost Management + Bill	- · · · · · · · · · · · · · · · · · · ·		CentOS-based 6.8 HPC	Rogue Wave S	oftware (form Recomme	nded
Help + support	Security					
Subscriptions	Identity					
App registrations	Developer Tools	-				

4. Confirm that **Resource Manager** is selected for **Select a deployment model** at the bottom of the window, and click **Create**.

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+ Create a resource		☆ ×	CentOS-based 7.5 x 🗆 ×
♠ Home Dashboard Dashb	Publisher Partners Partners Extraore Rogue Wave Software (form Recommended Rogue Wave Software (form Recommended	×	This databution of Linux is based on CertOS version 7.3 and is provided by Rogue Wave Software (formerly OperLogic). It contains an installation of the Basic Server packages. (BI13) Legal Terms By clicking the Ceasts botton, I acknowledge that I are getting this coftware from Rogue Wave Software (formerly OperLogic) and that the logal Terms' operLogic and that the logal Terms' operLogic and the the logal
Monitor Advisor Security Center	Rogue Wave Software (form Recommended Rogue Wave Software (form Recommended	- 1	Select a software plan Cent05-based 7.5 This distribution of Linux is based on Cent05 and is provided by Rogue Wave Software.
Cost Management + Bill Help + support	Rogue Wave Software (form Recommended		Select a deployment model () Resource Manager
Subscriptions App registrations			Crewe Want to deploy programmatically? Get started →

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 the Create new blade appears, specify the settings of Name, Fault domains, and Update domains. Then click OK.

Microsoft Azure	,₽ Sear	ich resources, services, and docs	R L @ ? © 💶 🙆
×	Home > New > Marketplace > Compu	te > CentOS-based 7.5 > Create a virtual machine	Create new ×
+ Create a resource	Create a virtual machine		Group two or more VMs in an availability set to ensure that at least one
🛧 Home			is available during planned or unplanned maintenance events. Learn more
Dashboard	Basics Disks Networking Mar	agement Guest config Tags Review + create	
i≣ All services		indows. Select an image from Azure marketplace or use your own customized image.	* Name AvailabilitySet1
- 👷 FAVORITES	Complete the Basics tab then Review + creati customization.	noows, select an image from Azure marketpiace or use your own customized image. to provision a virtual machine with default parameters or review each tab for full	
All resources	Looking for classic VMs? Create VM from Az	ure Marketplace	Fault domains ()
Resource groups	PROJECT DETAILS		Update domains ()
S App Services	Select the subscription to manage deployed resources.	resources and costs. Use resource groups like folders to organize and manage all your	update domains 0
Function Apps			Use managed disks ()
SQL databases	 Subscription () 		No (Classic) Yes (Aligned)
2 Azure Cosmos DB	 Resource group () 	TestGroup1 v	
Virtual machines		Create new	
Load balancers	INSTANCE DETAILS		
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All resources	customization. Looking for classic VMs? Create VM from Az		
	PROJECT DETAILS		
Resource groups	Select the subscription to manage deployed	resources and costs. Use resource groups like folders to organize and manage all your	
App Services	resources.		
Function Apps	* Subscription ()	weight dissipation	
SQL databases	* Resource group 🛛	TestGroup1 V	
Azure Cosmos DB		Create new	
Virtual machines	INSTANCE DETAILS		
Load balancers	* Virtual machine name ()		
Storage accounts	* Region 🛛	Japan East 🗸 🗸	
Virtual networks	Availability options		
Azure Active Directory			
Monitor	 Availability set O 	(new) AvailabilitySet1	
		Create new	
🔷 Advisor	* Image Ø	Create new	
Advisor Security Center	* Image 🛛	Ereate new CentOS-based 7.5 Browse all images and disks]

te Previous Next : Disks >

6. Click Change size to display the Select a VM size blade.

From the list, choose a size (A1 - Standard 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 >

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+ Create a resource Creat	×									
1 Home custom		-	× Restore default	t filters						
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E All services	Showing 191	VM sizes.	Subscription: WPEC07_11	TSW_CLUSTER	Region:	Japan East	Current size: Standa	rd_A1		
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🔇 App Services										
Function Apps	A1	Standard	General purpose	1	1.75	2	2x500		No	¥6,748
🗧 SQL databases 🔹 Virtua	A1	Basic	General purpose	1	1.75	2	2x300		No	¥2,671
Cosmos DB	A1_v2	Standard	General purpose	1	2	2	2x500		No	¥4,501
Virtual machines	A2	Standard	General purpose	2	3.5	4	4x500		No	¥13,511
💠 Load balancers	A2	Basic	General purpose	2	3.5	4	4x300		No	¥9,092
Storage accounts	A2_v2	Standard	General purpose	2	4	4	4x500		No	¥9,419
Virtual networks Image	A2m_v2	Standard	General purpose	2	16	4	4x500		No	¥12,752
Azure Active Directory	A3	Standard	General purpose	4	7	8	8x500		No	¥27,007
Monitor	A3	Basic	General purpose	4	7	8	8×300		No	¥23.012
Advisor	A4	Standard	General purpose	8	14	16	16x500		No	¥54.014
Security Center				8	14	16	16x300		No	
O Cost Management + Bill_ Authent		Basic	General purpose	8	14	10	16x300		NO	¥46,009
Help + support										
💡 Subscriptions	Select		sented are estimates in yo software costs. View Azur						scription and location. The	prices don't include any
Not the second s		аррисари	sontware costs. View Azur	re pricing calc	unator, Final cha	rges will appear in	i your local currency	in cost analysis and bill	ing mens.	

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

From the	e DATA	DISKS li	st, click	Create and	attach a	new disk.
----------	--------	----------	-----------	------------	----------	-----------

Microsoft Azure	\mathcal{P} . Search resources, services, and docs	>_	G	Q	۲	?	٢	
	Home > New > Marketplace > Compute > CentOS-based 7.5 > Create a virtual machine							
Create a resource	Create a virtual machine							×
🕈 Home								
Dashboard	Basics Disks Networking Management Guest config Tags Review + create							
All services	Azure VMs have one operating system disk and a temporary disk for short-term storage. You can attach additional data di	sks. The size o	ŧ					
+ FAVORITES	the VM determines the type of storage you can use and the number of data disks allowed. Learn more							
All resources	DISK OPTIONS							
Resource groups	* OS disk type 🜒 Standard SSD	`	/					
App Services	Enable Ultra SSD compatibility (Preview) Vies No Ultra SSD compatibility is not available for this VM size and location.							
Function Apps								
SQL databases	DATA DISKS You can add and configure additional data disks for your virtual machine or attach existing disks. This VM also comes with							
🖉 Azure Cosmos DB	tou can add and comigure additional data disks for your virtual machine or attach existing disks. This vivi also comes with disk.	a temporary						
Virtual machines	LUN NAME SIZE (GIB) DISK TYPE HOST CACHING							
Load balancers	Create and attach a new disk Attach an existing disk							
Storage accounts								
Virtual networks	✓ ADVANCED							
Azure Active Directory	 Figure 1 in Figure 							
Monitor								
Advisor								
Security Center								
Ocost Management + Bill								
Help + support								
Cubscriptions	Review + create Previous Next : Networking >							
App registrations								

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

Microsoft Azure	.P Search resources, services, and docs	>_	₽ (0	?	٢	*
	Home > New > Marketplace > Compute > CentOS-based 7.5 > Create a virtual machine > Create a new disk						
+ Create a resource	Create a new disk						×
🔶 Home							
Dashboard	Create a new disk to store applications and data on your VM. Disk pricing varies based on factors including disk size, storage type, and number of transactions. Learn more about Azure Managed Disks						
E All services							
🚽 🛨 FAVORITES ————————————————————————————————————	* Disk type 🛛 Standard HDD 🗸						
III resources	▲ * Name Node1Blob1 ✓	·					
😰 Resource groups	* Size (GiB) 💿 20 🗸	•					
🔇 App Services	* Source type 🛛 None (empty disk)						
Function Apps							
🧧 SQL databases	ESTIMATED PERFORMANCE						
🬌 Azure Cosmos DB	IOPS limit 500 Throughput limit (MB/s) 60						
Virtual machines	inroughput limit (Me/s) 60						
💠 Load balancers							
Storage accounts							
Virtual networks							
Azure Active Directory							
Monitor							
🔷 Advisor							
🏮 Security Center							
O Cost Management + Bill							
Help + support							
💡 Subscriptions	ок						
App registrations	* 4				-		

9. The **Networking** tab appears.

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

Click Create new under the Configure network security group field to display the Create network security group blade. Specify the setting of Name and then click OK. Click Next: Management >.

Microsoft Azure	P Search resources, services, and docs			· · · · · · · · · · · · · · · · · · ·
	Home > New > Marketplace > Compute > CentOS-based 7.5 > Create a virtual machine > Create network security group			
+ Create a resource		×	Cr	eate network security g 🗆
🛧 Home				
Dashboard	t Guest config Tags Review + create		_	ame ode1-nsg
E All services	/ configuring network interface card (NIC) settings. You can control ports, inbound	_		
* FAVORITES	r place behind an existing load balancing solution. Learn more		Inb	1000: default-allow-ssh
All resources				Any 🗸 SSH (TCP/22)
📦 Resource groups	vill be created for you.			+ Add an inbound rule
🔕 App Services			Out	bound rules 🛛
🎺 Function Apps				No results
🥫 SQL databases	-1 (10.15.0.0/24)			+ Add an outbound rule
🬌 Azure Cosmos DB	a subnet configuration			
🛄 Virtual machines	×			
🔶 Load balancers	new			
Storage accounts	ne 🔵 Basic 💿 Advanced			
Virtual networks	node1-nsg V			
Azure Active Directory	new			
Monitor	Off The selected VM size does not support accelerated networking.			
🗣 Advisor				
Security Center	of an existing Azure load balancing solution. Learn more			
Oost Management + Bill	No			
Help + support				
💡 Subscriptions	Next : Management >			ок
Registrations				UK

10. The **Management** tab appears.

Click Create new under the Diagnostics storage account field to display the Create storage account blade.

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: Guest config >.

AUTO-SHUTDOWN

Enable backup @

○ On ● Off

Previous Next : Guest config >

OK

Microsoft Azure	,P Sea	ch resources, services, and docs	>_ ⊑ ♀ ∅	? 😐 🔔
«	Home > New > Marketplace > Compu	te > CentOS-based 7.5 > Create a virtual machine		
+ Create a resource	Create a virtual machine			×
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🧮 Dashboard	Basics Disks Networking Mar	agement Guest config Tags Review + create		
E All services	Configure monitoring and management opti	nes for your VM		
+ FAVORITES	MONITORING			
III All resources	Boot diagnostics ()	• On Off		
🕄 Resource groups				
S App Services	OS guest diagnostics ()	On Off		
Function Apps	 Diagnostics storage account () 	testgroup1diag210 Create new	\checkmark	
SQL databases		Create new		
2 Azure Cosmos DB	IDENTITY	0.0		
Virtual machines	System assigned managed identity 🛛	On (Off		
Load balancers	AUTO-SHUTDOWN			
Storage accounts	Enable auto-shutdown 🚯	On Off		
Virtual networks	BACKUP			
Azure Active Directory	Enable backup 🕖	On Off		
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Microsoft Azure	,P Sea	rch resources, services, and docs	>_ 167 Q @	? 🙂 📃 💽
*	Home > New > Marketplace > Compu	te > CentOS-based 7.5 > Create a virtual machine		Create storage account ×
+ Create a resource	Create a virtual machine			-
🔶 Home				* Name
🛄 Dashboard	Basics Disks Networking Mar	nagement Guest config Tags Review + create		testgroup1diag679 .core.windows.net
E All services	Configure monitoring and management opti	ons for your VM.		Account kind ()
🔶 🖈 FAVORITES	MONITORING			Storage (general purpose v1) 🗸 🗸
III resources	Boot diagnostics	● On ○ Off		Performance 🛛
📦 Resource groups	OS quest diagnostics			Standard Premium
🔇 App Services				Replication Cocally-redundant storage (LRS)
Function Apps	 Diagnostics storage account () 	testgroup1diag210 Create new	~	www.g. resumant storage (Lna)
🥫 SQL databases				
2 Azure Cosmos DR	IDENTITY			

11. Click Next: Tags >.



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		Ð			
« Hom	ne > New > Marketplace > Compute > CentOS-based 7.5 > Create a virtual machine					
+ Create a resource Cre	eate a virtual machine					×
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	sits blaks intervienting management Guest coming lags nevrew + create					
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Function Apps By cl	licking "Create", I (a) agree to the legal terms and privacy statement(s) associated with the Marketplace offering(s) listed	above;				
	(b) agree that Microsoft may share my contact, usage and transactional information with the provider(s) of the offering sort, billing and other transactional activities. Microsoft does not provide rights for third-party offerings. See the Azure	(s) for				
	ketplace Terms for additional details.					
Virtual machines						
Load balancers						
Storage accounts	scription Surce group TestGroup1					
	Jal machine name node1					
Azure Active Directory	ion Japan East					
	lability options Availability set					
Avail	lability set AvailabilitySet1					
	sentication type Password					
Security Center	rname testlogin					
O Cost Management + Bill	lic inbound ports None					
Help + support	3					v
🕈 Subscriptions	Create Previous Next Download a template for automation					
👪 App registrations 🗸 4						Þ

4) Setting a private IP address

2.

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 **Resource groups** or the resource group icon in the menu on the left side of the window.

Microsoft Azure	٩	Search resources, services, and docs			? 🙂
	Choose your default view	Home Oashboard	Save		
Create a resource					
숨 Home	Azure services See all (+10	0) >			
🗔 Dashboard		s =	A t	aa 🥂	•
All services		SQL SQL	(1)		> 40
	Virtual Storage machines accounts		Azure Database Azure Cosmos for PostoreSOL DB	Kubernetes Function Apps services	Azure Cognitive Databricks Services
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	Make the most out of Az	ure			
🕅 Resource groups					
S App Services	4		A		
Function Apps					
👼 SQL databases	Learn Azure with free online	Monitor your apps and	Secure your apps and	Optimize performance,	Connect to Azure via an
🝠 Azure Cosmos DB	courses by Microsoft	infrastructure	infrastructure	reliability, security, and costs	authenticated browser-based shell
Virtual machines	Microsoft Learn 🗹	Azure Monitor >	Security Center >	Azure Advisor >	Cloud Shell >
Load balancers					
Storage accounts	Recent resources See all y	our recent resources > See all your	resources >	Useful links	
Virtual networks	NAME	TYPE	LAST VIEWED	Get started or go deep with tec	
				Our articles include everything	
Azure Active Directory		Virtual machine (classic)	2 h ago	designing applications.	, to solid and architecture guides to
Monitor	Q	Virtual machine (classic)	14 h ago	Discover Azure products 🗹	
Advisor		Resource group	14 h ago	Explore Azure offers that help to on support, training, and pricing	urn ideas into solutions, and get info
Security Center	Ø 10 mm	Cloud service (classic)	21 h ago		
Cost Management + Bill	Q	Virtual machine	3 d ago	Keep current with Azure update Learn more and what's on the r	
Help + support		Resource group	3 d ago	notifications to stay informed. A from last week in Azure.	zure.Source wraps up all the news
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3. The summary of TestGroup1 is displayed. Select virtual machine node1 or node2 from the item list.

Microsoft Azure	و م	earch resources, services, and docs	
	Home > Resource groups > TestGro	μ ρ 1	
Create a resource	TestGroup1		\$?
🛧 Home			
Dashboard	, Search (Ctrl+/)		
All services	(C) Overview	Subscription (change) Deployments 2 Succeeded	
* FAVORITES	Activity log	Subscription ID	
All resources	 Access control (IAM) 	Taos (change)	
🕄 Resource groups	🖉 Tags	Click here to add tags	
🔇 App Services	🗲 Events	A	
Function Apps	Settings	Filter by name All types V All locations V No grouping V	
🥫 SQL databases	duickstart	8 items Show hidden types 🛛	
Azure Cosmos DB	Deployments	NAME TO TYPE TO LOCATION TO	
Virtual machines	Policies	AvailabilitySet1 Availability set Japan East	
Load balancers	Properties	NetSecGroup1 Network security group Japan East	
Storage accounts	Locks	I I Virtual machine Japan East	
Virtual networks	Automation script	node1 OsDisk 1 71486cd179fe4c7783627bb925385b6b Disk Japan East	
Azure Active Directory	Cost management	node128 Network interface Japan East	
Monitor	to Cost analysis	nodetBlob1 Disk Japan East	
🔷 Advisor	3 Budgets	Execution Storage account Japan East	
Security Center	Advisor recommendations	Virtual network Japan East	
Oost Management + Bill		Viitual netvork Japan East	
Help + support	Monitoring	S node2_0sDisk_1 bf9c3te2cfb44f0398bfd67ced7f9atf Disk Japan East	
Subscriptions	Insights (preview)	Indez Joseph Andread State Cline House State Cline State Stat	
App registrations	Alerts	network interface Japan East	

4. Select Networking.

Microsoft Azure	P Sear	ch resources, services, an	d docs		>_ 🖓			1.00 CO	
	Home > Resource groups > TestGroup1	> node1 - Networking							
Create a resource	node1 - Networking								
🛧 Home		Attach network	interface 🔹 Detach network	interface					
Dashboard									
E All services	Q Overview	Network Inter			opology				
* FAVORITES	Activity log	Virtual network/subn	et: Vnet1/Vnet1-1 Public IP: N	one Private IP: 1	10.5.0.4 Acc	elerated networking: E	isabled		
All resources	 Access control (IAM) 	Inbound port rul	es Outbound port rules	Application security	groups Loa	d balancing			
📦 Resource groups	🛷 Tags	Network securi	v group NetSecGroup1 (attac	hed to network int	erface: node12	5)		Add inbound por	rt rule
🔇 App Services	X Diagnose and solve problems	Impacts 0 subnets	1 network interfaces					ridd sabound por	
🐓 Function Apps	Settings	PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION	
🗧 SQL databases	A Networking	1000	A default-allow-ssh	22	TCP	Any	Any	Allow	
🬌 Azure Cosmos DB	S Disks	65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwo	rk 🗢 Allow	
Virtual machines	🐖 Size	65001	AllowAzureLoadBalancerInBound	Anv	Any	AzureLoadBalan	Anv	Allow	
💠 Load balancers	C Security		DenyAllInBound		,		,	O Deny	
Storage accounts	Extensions	63500	DenyAllinBound	Any	Any	Any	Any	U Deny	
Virtual networks	🐔 Continuous delivery (Preview)								
Azure Active Directory	Availability set								
Monitor	Configuration								
🔷 Advisor	💲 Identity								
🟮 Security Center	Properties								
O Cost Management + Bill	Locks								
Provident Help + Support	Automation script								
💡 Subscriptions	Operations								
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5. Select a network interface displayed in the list. The network interface name is generated automatically.

6. Select IP configurations.

Microsoft Azure Create a resource Create a resource Create a resource Create a resource Dashboard Dashboard An resource An resource An resource groups Create a resource Create a resource An resource groups Create a resource An resource groups Create a resource Create a resource	Second Home > Resource groups > TetGroup1	ns			ns λ	©? ©	· · · · · · · · · · · · · · · · · · ·
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Resource groups App Services		in formationing			Disabled Briddles		
S App Services	Access control (IAM)	Virtual network			Vnet1		
	🖉 Tags	IP configuration	15				
4 Augustus August	Settings	* Subnet			Vnet1-1 (10.5.0.0/24)		~
Function Apps	IP configurations						
🥫 SQL databases	DNS servers	√ Search IP con					
🧷 Azure Cosmos DB	Network security group	NAME	IP VERSION	TYPE	PRIVATE IP ADDRESS	PUBLIC IP ADDRESS	
Virtual machines	Properties	ipconfig1	IPv4	Primary	10.5.0.4 (Dynamic)		
💠 Load balancers	Locks						
Storage accounts	Automation script						
Virtual networks	Support + troubleshooting						
Azure Active Directory	Effective security rules						
Monitor	Effective routes						
🔷 Advisor	New support request						
Security Center	 New support request 						
O Cost Management + Bill							
🔒 Help + support							
💡 Subscriptions							
Registrations							

- 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		, P Search resources, services, and	l docs		₽Ç-			
«	Home > Resource groups > 1	estGroup1 > node1 - Networking	> node128 - IP configurations	> ipconfig1				
+ Create a resource	ipconfig1		\Box \times					
🔶 Home	node128							
Dashboard								
E All services	Public IP address settings Public IP address							
🕂 🛨 Favorites	Disabled Enabled							
III resources	Private IP address settings							
🕄 Resource groups	Virtual network/subnet							
🔇 App Services	Vnet1/Vnet1-1							
Function Apps	Assignment Dynamic Static							
🧧 SQL databases	IP address							
🧟 Azure Cosmos DB	10.5.0.110							
Virtual machines								
💠 Load balancers								
🚾 Storage accounts								
😔 Virtual networks								
Azure Active Directory								
🔗 Monitor								
🔷 Advisor								
🟮 Security Center								
O Cost Management + Bill								
🔒 Help + support								
Ŷ Subscriptions								
Registrations								

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 Blob storage. 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 "4.Partition settings for mirror disk resource (when using Replicator)." in "Settings after configuring hardware" in Chapter 1, "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

8	16	73400320	sdb
8	17	73398272	sdb1
8	0	31459328	sda
8	1	31456256	sda1

- 8 32 20971520 sdc
- 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. The following is an example of creating one partition including all areas of /dev/sdc.
 \$ sudo fdisk /dev/sdc

Device contains neither a valid DOS partition table, nor Sun, SGI or OSF disklabel Building a new DOS disklabel with disk identifier 0xe3c83b13. Changes will remain in memory only, until you decide to write them.

After that, of course, the previous content won't be recoverable.

Warning: invalid flag 0x0000 of partition table 4 will be corrected by w(rite)

The device presents a logical sector size that is smaller than the physical sector size. Aligning to a physical sector (or optimal I/O) size boundary is recommended, or performance may be impacted.

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to switch off the mode (command 'c') and change display units to sectors (command 'u').

Command (m for help): n Command action e extended p primary partition (1-4) p Partition number (1-4): 1 First cylinder (1-2610, default 1): Using default value 1

Last cylinder, +cylinders or +size{K,M,G} (1-2610, default 2610): +1G

Command (m for help): p

Disk /dev/sdc: 21.5 GB, 21474836480 bytes 255 heads, 63 sectors/track, 2610 cylinders Units = cylinders of 16065 * 512 = 8225280 bytes Sector size (logical/physical): 512 bytes / 4096 bytes I/O size (minimum/optimal): 4096 bytes / 4096 bytes Disk identifier: 0xe29ed566

Device Boot Start End Blocks Id System /dev/sdc1 1 132 1060256+ 83 Linux

Partition 1 does not start on physical sector boundary. Command (m for help): n Command action e extended p primary partition (1-4) p Partition number (1-4): 2 First cylinder (132-2610, default 132): Using default value 132 Last cylinder, +cylinders or +size{K,M,G} (132-2610, default 2610): Using default value 2610 Command (m for help): p

Disk /dev/sdc: 21.5 GB, 21474836480 bytes 255 heads, 63 sectors/track, 2610 cylinders Units = cylinders of 16065 * 512 = 8225280 bytes Sector size (logical/physical): 512 bytes / 4096 bytes I/O size (minimum/optimal): 4096 bytes / 4096 bytes Disk identifier: 0xe29ed566

Partition 1 does not end on cylinder boundary.

Device BootStartEndBlocksIdSystem/dev/sdc111321060256+83LinuxPartition 1 does not end on cylinder boundary.Partition 1 does not start on physical sector boundary./dev/sdc213226101990453783Linux

Command (m for help): w The partition table has been altered!

Calling ioctl() to re-read partition table. Syncing disks.

 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:

•

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

1. Select +Create a resource or the + icon in the menu on the left side of the window.



- 3. The Create load balancer blade is displayed. Specify Name. Select Public for Type and Basic for SKU, respectively.
- 4. Specify Create new, Name and Assignment for Public IP address.

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

Microsoft Azure	,⊅ Sear	ch resources, services, and docs	>_	Ş	Q I	© ?	٢	*********************			
«	Home > New > Create load balancer										
+ Create a resource	Create load balancer							×			
合 Home								*			
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∃ All services	Azure load balancer is a layer 4 load balancer	that distributes incoming traffic among healthy virtual machine instances. Load b	alancers								
* FAVORITES		uses a hash-based distribution algorithm. By default, it uses 5 -tuple (source IP: source port, destination IP, destination ont, protocol type) hash to may farfic to available servers. Load balancers can either be internet-facing where it is accessible via public IP addresses, or									
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🔇 App Services	* Subscription	WOLDERSON AND A STREET AND A ST	~								
Function Apps	* Resource group	TestGroup1	~	-							
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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 Resource groups or the resource group icon in the menu on the left side of the window.

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Create a resource	Choose your default view	Home ODashboard	Save		
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📦 Resource groups					
S App Services	<u>A</u>			-	
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SQL databases	Learn Azure with free online courses by Microsoft	Monitor your apps and infrastructure	Secure your apps and infrastructure	Optimize performance, reliability, security, and costs	Connect to Azure via an authenticated browser-based
Azure Cosmos DB	Microsoft Learn [2]	Azure Monitor >	Security Center >	Azure Advisor >	shell
Virtual machines Output: A second	Microsoft Learn Es	Azure Monitor 7	Security Center 2	Azure Advisor 7	Cloud Shell 7
Storage accounts	Recent resources See all yo	ur recent resources > See all your	resources >	Useful links	
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Azure Active Directory	0	Virtual machine (classic)	2 h ago		from quickstarts, samples, and d, to SDKs and architecture guides for
Monitor		Virtual machine (classic)	14 h ago	designing applications.	
of Advisor		Resource group	14 h ago	Explore Azure offers that help t	turn ideas into solutions, and get info
Security Center		Cloud service (classic)	21 h ago	on support, training, and pricin Keep current with Azure updat	·
Ost Management + Bill	Q	Virtual machine	3 d ago	Learn more and what's on the	roadmap and subscribe to
Help + support		Resource group	3 d ago	notifications to stay informed. from last week in Azure.	Azure.Source wraps up all the news
Subscriptions	Q ====	Virtual machine	3 d ago	News from the Azure team 🗹	
App registrations		Virtual machine	3 d ago	Hear right from the team devel problems in the Azure blog.	loping features that help you solve

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

rosoft Azure	⇒ Search resources, services, and docs	>_ 🖓	0 @ ? ©	
«	Home > Resource groups			
Create a resource	Resource groups			\$2 >
lome	+ Add III Edit columns ひ Refresh ● Assign tags ↓ Export to CSV			
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elp + support		and a second second	- age and the st	
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App registrations		and a second second second	Appendix and	••• •

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

Microsoft Azure	,P Searc	h resources, services, and docs >_ ₽₽ Ω @ ? Θ	- •
«	Home > Resource groups > TestGroup1		
+ Create a resource	TestGroup1		\Rightarrow ×
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🖈 FAVORITES	Activity log	Subscription ID	
III resources	Access control (IAM)	Tags (change)	
😵 Resource groups	🛷 Tags	Click here to add tags	
🔇 App Services	🗲 Events -	۸	
Function Apps	Settings	Filter by name All types All locations V	
🧧 SQL databases	4 Quickstart	8 items Show hidden types ()	
🧟 Azure Cosmos DB	📩 Deployments	NAME TO TYPE TO LOCATION TO	
Virtual machines	Policies	AvailabilitySet1 Availability set Japan East	
💠 Load balancers	Properties	NetSecGroup1 Network security group Japan East	
Storage accounts	🔒 Locks	Virtual machine Japan East	
Virtual networks	Automation script	S node1_OsDisk_1_71486cd179fe4c7783627bb925385b6b Disk Japan East	
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Monitor	2 Cost analysis	🗧 😤 nodetBlob1 Disk Japan East	
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🏮 Security Center	Advisor recommendations	↔ Vnet1 Virtual network Japan East	
O Cost Management + Bill	Manifestar	Virtual machine Japan East	
😫 Help + support	Monitoring	s node2_OsDisk_1_bf9c31e2cfb44f0398bfd67ced7f9a1f Disk Japan East	
? Subscriptions	Insights (preview)	node231 Network interface Japan East	
😽 App registrations	👎 Alerts 👻		

4. Select Backend pools.



5. Click Add.



- 6. The Add backend pool blade is displayed. Specify Name.
- 7. For Associated to, select Availability set.
- 8. Specify Availability set.
- 9. Click Add a target network IP configuration.
- 10. Specify the target virtual machine for Target virtual machine and Network IP configuration.
- 11. Repeat steps 9 and 10 as many times as the number of target virtual machines.
- 12. Click **OK**.

8) Configuring a load balancer (configuring a health probe)
1. Select Health probes.

Microsoft Azure	,₽ Searc	ch resources, services, and docs		
«	Home > Resource groups > TestGroup1	> TestLoadBalancer - Health probes		
+ Create a resource	TestLoadBalancer - Healt	h probes		×
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🔤 Dashboard				
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- 🛧 FAVORITES	Activity log	NAME °↓ PROTOCO	OL TO PORT TO USED BY	
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😵 Resource groups	🛷 Tags			
🔇 App Services	X Diagnose and solve problems			
Function Apps	Settings			
🧧 SQL databases	Frontend IP configuration			
🬌 Azure Cosmos DB	Backend pools			
Virtual machines	🕴 Health probes			
🚸 Load balancers	듣 Load balancing rules			
Storage accounts	Inbound NAT rules			
Virtual networks	Properties			
Azure Active Directory	Locks			
Onitor	Automation script			
🔶 Advisor	Monitoring			
Security Center	Diagnostics logs			
Ost Management + Bill				
Help + support	Support + troubleshooting			
Ŷ Subscriptions	New support request			
4 App registrations				

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

Microsoft Azure		♀ Search resources, services,	and docs		> Q	Q	ŵ	? 🙂	•
«	Home > Resource groups > 1	festGroup1 > TestLoadBalancer		robe					
+ Create a resource	Add health probe								
🛧 Home	TestLoadBalancer			-					
🖪 Dashboard	* Name TestHealthProbe		~						
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Function Apps	* Interval @		· · · ·						
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Virtual machines	* Unhealthy threshold 2								
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- 9) Configuring a load balancer (setting the load balancing rules)
 1. Select Load balancing rules.

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	Home > Resource groups > TestGroup1	> TestLoadBalancer - Load balanc	ing rules			
+ Create a resource	TestLoadBalancer - Load b	alancing rules				×
🛧 Home		+ Add				
🔲 Dashboard						
i∃ All services	💠 Overview	\wp Search load balancing rules				
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🔇 App Services	X Diagnose and solve problems					
Function Apps	Settings					
👼 SQL databases	Frontend IP configuration					
🬌 Azure Cosmos DB	Backend pools					
Virtual machines	🕴 Health probes					
🚸 Load balancers	😑 Load balancing rules					
🧮 Storage accounts	Inbound NAT rules					
🐡 Virtual networks	Properties					
Azure Active Directory	Locks					
🕒 Monitor	Automation script					
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- 2. 3. Click Add.
- The Add load balancing rule blade is displayed. Specify Name. Specify Port and Backend port, and click OK.
- 4.

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«	Home > Resource groups > TestGroup1 > TestLoadBalancer - Load balancing rule	es > Add load balancing rule	e			
+ Create a resource	Add load balancing rule					
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🛄 Dashboard	TestLoadBalancingRule	_				
E All services	* IP Version	_				
- 🛨 Favorites	IPv4 IPv6					
🛗 All resources 🔒	* Frontend IP address 🕒					
🜍 Resource groups	(LoadBalancerFrontEnd)	~				
🔇 App Services						
Function Apps	* Port					
👼 SQL databases	80					
🜌 Azure Cosmos DB	* Backend port 🔀					
Virtual machines	8080	✓				
🚸 Load balancers	Backend pool 🜒					
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Azure Active Directory	TestHealthProbe (TCP:26001)	<u> </u>				
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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. Select **All services** in the menu on the left side of the window.
- 2. Select Network security groups.

Microsoft Azure	م ا	Search resources, services, and docs		>_ 🗣 🗘 🎯 ? 🙄	Real Contractory
Create a resource	All services P Search Net	vorking			
Home					
Dashboard	Everything	NETWORKING (27)			
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★ FAVORITES	Networking	Virtual network gateways	*	Local network gateways	*
All resources	Storage	Virtual network gateways	*	V Local network gateways	*
🕄 Resource groups	Web	ONS zones	*	CDN profiles	*
🔕 App Services	Mobile	🐯 Traffic Manager profiles	*	A ExpressRoute circuits	*
Function Apps	Containers	Network Watcher	*	Network security groups	
🧧 SQL databases	Databases	Network Watcher	*	 Network security groups 	*
🦉 Azure Cosmos DB	Analytics	Network security groups (classic)	*	Network interfaces	*
Virtual machines	· · · · · · · · · · · · · · · · · · ·	Public IP addresses	*	Public IP Prefixes	PREVIEW *
	AI + machine learning	Reserved IP addresses (classic)	*	S Connections	*
Storage accounts	Internet of things	Réserved IP addresses (classic)	*	Connections	*
Virtual networks	Integration	🧔 On-premises Data Gateways	*	🕍 Route tables	*
	Identity	Route filters	*	Application security groups	*
Azure Active Directory	Security				
Monitor	DevOps	DDoS protection plans	*	💣 Firewalls	*
🗣 Advisor	Migrate	Front Doors	PREVIEW *	Service endpoint policies	PREVIEW *
🟮 Security Center	Management + governance	🔅 Virtual WANs	*		
O Cost Management + Bill	intune	C. LICON TRONG	<u>^</u>		
🔒 Help + support	Other				
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3. Select NetSecGroup1 from the network security group list.

icrosoft Azure	, P Search resources, services, and docs		>_ 67 ♀ ∅	? 🙂	- 6
	Home > Network security groups				
Create a resource	Network security groups				*
Home	Add Edit columns C Refresh				
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4. The summary of NetSecGroup1 is displayed.

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🗧 SQL databases	📩 Inbound security rules	Click	here to add ta	35		\$					
🧟 Azure Cosmos DB	📩 Outbound security rules	Inb	ound secur	ity rules							1
Virtual machines	Network interfaces	PRI	ORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION		
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5. Select Inbound security rules.

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Il resources	· · · · · · · · · · · · · · · · · · ·	Access control (IAM)	65000	AllowVnetInBound	Anv	Any	VirtualN	VirtualN	Allow	
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- 6. Click Add.
- 7. The Add inbound security rule blade is displayed. Specify Name.
- 8. Specify Destination port range and Protocol, and click OK.



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 **Resource groups** or the resource group icon in the menu on the left side of the window.

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Function Apps				×	
SQL databases	Learn Azure with free online	Monitor your apps and	Secure your apps and	Optimize performance,	Connect to Azure via an authenticated browser-based
Azure Cosmos DB	courses by Microsoft	infrastructure	infrastructure	reliability, security, and costs	shell
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	Microsoft Learn 🖸	Azure Monitor >	Security Center >	Azure Advisor >	Cloud Shell >
- Load balancers		Azure Monitor >		Useful links	
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2. Select the resource group to which the created load balancer belongs from the resource group list.

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Advisor	CA SHALL DO LOD AN TAX AN		CONTRACTOR OF A DESCRIPTION	100.000	
Security Center	i dendi		1998-1997, 1998, 2012 (March 1997)	incer last	
Ocst Management + Bill	national and			- 1000 1001	
Help + support			Contraction of the Contraction of the		
Y Subscriptions	1.00		Contraction of the second second	- April 201	
🐫 App registrations			State of the state of the state	An and the state	

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

Microsoft Azure	٩,	Search resources, services, and docs	
	Home > Resource groups > TestGr	oup1	
Create a resource	TestGroup1		*
🕈 Home		« + Add III Edit columns III Delete resource group U Refresh → Move ● Assign tags III Delete 🛓 Export to CSV	
Dashboard	, Search (Ctrl+/)		
	(🔊) Overview	Subscription (change) Deployments 2 Succeeded	
+ FAVORITES	Activity log	Subscription ID	
All resources	📫 Access control (IAM)	Taos (change)	
Resource groups	🛷 Tags	Click here to add tags	
S App Services	🗲 Events	Â	
Function Apps	Settings	Filter by name All types V All locations V No groupingV	
SQL databases	4 Quickstart	8 items Show hidden types 🗨	
Azure Cosmos DB	in Deployments	NAME 12 TYPE 12 LOCATION 12	
Virtual machines	Policies	AvailabilitySet1 Availability set Japan East	
Load balancers	E Properties	NetSecGroup1 Network security group Japan East	
Storage accounts	Locks	I node1 Virtual machine Japan East	
Virtual networks	Automation script	Rodel OsDisk 1.71486cd179fe4c7783627bb925385b6b Disk Japan East	
Azure Active Directory	Cost management	nodet28 Network interface Japan East	
Monitor	St. Cost analysis	S node18lob1 Disk Japan East	
Advisor	Budgets	testgroup1diag679 Storage account Japan East	
Security Center	Advisor recommendations	Vnet1 Virtual network Japan East	
Cost Management + Bill	Advisor recommendations	Virtual metricitic Japan East	
Help + support	Monitoring	virtual machine Japan East Se node2. OsDisk 1 bf9c31e2cfb44f0398bfd67ced7f9a1f Disk Japan East	
Subscriptions	Insights (preview)		
App registrations	🔱 Alerts	node231 Network interface Japan East	



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

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 Chapter 1, "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.

4.3 Configuring the EXPRESSCLUSTER settings

For the Cluster WebUI setup and connection procedures, see Chapter 5, "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 WebOI Cluster	1			Coning mode •	- in the second	0 0	·	
Cluster generation wizard	Import	Get the Configuration File	Apply the Configuration File	Update Server Data				

2. The Cluster window on the Cluster Generation Wizard is displayed. Enter a desired name in **Cluster Name**.

Cluster generation wizard	· · · · · · · · · · · · · · · · · · ·
Server Server	server nect → NP Resolution → Group → Monitor
ister Name*	Cluster1
mment	
nguage*	English 🗸
nagement IP Address	
using the integrated WebManager to manage	guage (locale) of the environment that runs WebManager. multiple clusters, specify a unique cluster name to identify the cluster. dress used for a WebManager connection. If establishing connections by specifying each server IP mitted.

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 reso Both IPv4 and IPv6 for IP address can be When entering an IP address, the server	used.	acquired.
		OK Cancel
Cluster generation wizard		×
Cluster	→ Group → Monitor	
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.	Settings	Back Next Cancel

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 Cluster Server Basic Settings Settings	Server Interconne	Server → NP Resolution → C	Group 🔿 Monitor	
Priority Type	MDC	node1	node2	
1 Kernel Mode 🗸	mdc1 🗸	10.5.0.110	10.5.0.111	•
Configure the interconnect among the For "Kernel mode", "User mode", "BMC Communication Only" setting, configure Configuring more than one routes is re- For "Kernel mode", "User mode, "DIS For "Witness HB" setting, click each set Click "Up" or "Down" to configure the p For "Mirror Communication Only" settin For the communication Conter which is to communication route which is to communication route in MDC column.	", "DISK", "Witr the route whic commended. K" and "COM" s ver column cell riority to prefer gs, click each se	hess HB" and "COM" settings, con h is used only for data mirroring. ettings, click each server column to set "Use" or "Do not use", and entially use the LAN only for the erver column cell to configure IP a	figure the route which is used fi communication. cell and set an IP address or de I then click "Properties" to set d communication among the clust addresses.	or heartbeat. For "Mirror wice. etailed settings. er servers.

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 onpremise environment (for example, using a dedicated line). Additionally, you can use network partition resolution resources for NP resolution.



2) Adding a group resource

• Defining a group

Create a failover group.

1. The Group List window s displayed.

Click Add .		
Cluster generation wizard		
Server Cluster ♥ → Basic Settings ♥	Server Server → Interconnect ♥ → NP Resolution ♥ → Group → Monitor	
Properties Add Remove		Group Resource
Group List		
Name	Туре	
No groups		
Configure failover group to be a Click "Add" to add a group. Click "Properties" to configure the p Click "Group Resource" to add resource	properties of the selected group.	
	4 Back N	lext Cancel

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

Group Definition				fa	ailover 🗙
Basic Settings → Startup Servers	\rightarrow Group Attributes \rightarrow	Group Resource			
Туре*	failover 🗸				
Use Server Group Settings					
Name*	failover1				
Comment					
 Select group type. If using virtual machine resources to clust "Failover". If using server group, check the "Use Sen 		irtual machine" as t	he type. In o	ther cases,	, select
				Next ►	Cancel
Click Next without specifyir The Group Attributes wind Click Next without specifyir The Group Resource wind On this page, add a group bill	dow is displayed. ng anything. dow is displayed.	the preced	urahak		
On this page, add a group	resource following	g the proced			ailover 🗙
Basic Settings ⊘ → Startup Servers Properties Add Remove	Group Attributes →	🕏 🔶 Group R	esource		
Group Resource List	_				
Name No resources	Тур	e			
Click "Add" to add resources. Click "Properties" to configure the propert	ies of the selected resource.				
			 Back 	Finish	Cancel

Mirror disk resource

Create a mirror disk resource.

For details, see "Understanding mirror disk resources" in Chapter 4, "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 Tailover1							
Info → Dependency → Recovery Operation → Details							
Туре*	Mirror disk resource \checkmark						
Name*	md						
Comment							
Get license information							
• Select the type of group resource and	enter its name.						
			Next ►	Cancel			

- 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 failover	-1			md 🗙
Info \bigcirc \rightarrow Dependency \bigcirc \rightarrow Reco	overy Operation 🤡 🔶 🗖	etails		
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				Select
Tuning				
			Back Finish	Cancel

• 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 Chapter 4, "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 failover	1	azurepp 🗙
Info → Dependency → Recovery	Operation 🔶 Details	
Type*	Azure probe port resource \checkmark	
Name*	azurepp1	
Comment		
Get license information		
Select the type of group resource and	enter its name.	
		Back Next Cancel

- 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).

Info \bigcirc \rightarrow Dependency \bigcirc	→ Reco	overy Operation 🤣 🔶 Details		
Probeport*		26001		
Tuning				
			Back Finish	Cancel

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		genw 🗙
Info → Monitor(common) → Mor	itor(special) → Recovery Action	
Type*	Custom monitor	
Name*	genw1	
Comment		
Get Licence Info		
Select the type of monitor resource an	nd enter its name.	

Confirm that Monitor Timing is Alway Monitor Resource Definition	3 and ch		genw 🗙
Info 📀 🔶 Monitor(common) 🄶 Monitor(special)	→ Recover	y 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	Server		
		▲ B	ack Next Cancel

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

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 443exit \$?

Select Synchronous for Monitor Type. Click Next.

Monitor Resource Definition			genw 🗙
Info 💿 🔶 Monitor(common) 📀 🌛 Monitor(special)	→ Recovery Action		
○ User Application			
File			
		Edit View	Replace
Monitor Type	 Synchronous Asynchronous 		
Wait a period of time for Application/Script monitor to start			
Log Output Path			
Rotate Log			
Rotation Size			
Normal Return Value*	0		
Wait for activation monitoring to stop before stopping the cluster			
	4	Back Next 🕨	Cancel

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.

Recovery Action	Execute only the final action	Execute only the final action			
Recovery Target *	LocalServer	Browse			
Recovery Script Execution Count	0 time				
Execute Script before Reactivation					
Maximum Reactivation Count					
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

3.

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 A	ction	
Type* IP	monitor 🗸		
Name* ip	w1		
Comment			
Get Licence Info			
Select the type of monitor resource and er	iter its name.		
Confirm that Monitor Timing Monitor Resource Definition Info ⊘ → Monitor(common) → Mo		ny Action	ipw 🗙
Interval*	30	sec	
Timeout*	30	sec	
Collect the dump file of the monitor process occurrence	at timeout		
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			
O Active			
Target Resource			
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		Available Servers	
Name	←	Name	
node1	Add	node2	
	→ Remove		
			OK Cancel Apply



4. The Monitor (special) window is displayed.

Monitor Resource Definition	ipw 🗙
Info ⊘ → Monitor(common) ⊘ → Monitor(special) → Recovery Action	
Common node1 node2	
Edit Add Remove	
IP Address List	
IP Address	
No Ip Address	
Gack Next Next	Cancel

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 Settings		
IP Address*	10.5.0.111	
		OK Cancel
	Monitor(special) Recovery Action	ipw 🗙
Common node1 node2 Edit Add Remove IP Address List IP Address		
10.5.0.111		
The Percevery Action wir		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.

Recovery Action	Execut	Execute only the final action		
Recovery Target *	LocalSe	erver	Browse	
Recovery Script Execution Count		time		
Execute Script before Reactivation				
Maximum Reactivation Count		time		
Execute Script before Failover				
Execute migration before Failover				
Maximum Failover Count		time		
execute Script before Final Action				
Final Action	No ope	ration	~	

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**.
- 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

3.

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	mtw 🗙
Info → Monitor(common) → Monitor	r(special) → Recovery Action
Type*	Multi target monitor 🗸
Name* m	ntw1
Comment	
Get Licence Info	
• Select the type of monitor resource and e	enter its name.
	Back Next ► Cancel
The Monitor (common) wind	dow is displayed
Confirm that Monitor Timing	
Monitor Resource Definition	mtw 🗙
Info 📀 🔶 Monitor(common) 🔶 Mo	nitor(special) 🔶 Recovery Action
Interval*	30 sec
Timeout*	30 sec
Collect the dump file of the monitor process occurrence	s at timeout
Do Not Retry at Timeout Occurrence	
Do Not Execute Recovery Action at Timeout	t 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	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(com	mon) 🥑 🔶 Moni	tor(special) 🔶 R	ecovery Action	
Monitor Resource List			Available Monitor Resources	
Monitor Resource	Туре	←	Monitor Resource	Туре
genw1	genw	Add	No Available Servers	
ipw1	ipw	>		
ipw2	ipw	Remove		
Tuning				
			 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, 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					mtw 🗙
Info ⊘ → Monitor(common) ⊘	 Monitor(special) 	⊘ → Re	covery Actio	on	
Recovery Action	Execute only the	final action			~
Recovery Target *	LocalServer			Browse	
Recovery Script Execution Count					
Execute Script before Reactivation					
Maximum Reactivation Count					
Execute Script before Failover					
Execute migration before Failover					
Maximum Failover Count					
Execute Script before Final Action					
Final Action	No operation		~		
					Script Settings
					Finish Cancel

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 "3.1 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.

Edit Script		×
O User Application		
 Script created with this 	product	
File	preaction.sh	
		Edit View Replace
Timeout*	15 sec	
		OK Cancel Apply
Click Finish to finish setti	ng.	

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.

Info Interconnect NP Resolution T	imeout Port No.	Port No.(Mirror)	Port No.(Lo	og) Monitor	Recovery
Alert Service WebManager Alert Log	Delay Warning	Mirror Agent M	irror Driver	Extension	
Cluster Name	Cluster1				
Comment					
Language	English 🗸				
				OK Can	cel Apply

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.

Cluster Properties Cluster1					
Info Interconnect NP Resolution Ti Alert Service WebManager Alert Log		No. Port No.(Mirror) Port No.(Lo ing Mirror Agent Mirror Driver	g) Mo Extensio		covery
Server Sync Wait Time*	5	min			
Heartbeat					
Interval*	3	sec			
Timeout*	120	sec			
Server Internal Timeout*	180	sec			
Initialize					
			ОК	Cancel	Apply

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* \rightarrow How to create a cluster

4.4 Verifying the created environment

Verify whether the created environment works properly by generating a (dummy) 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 5 Cluster Creation Procedure (for an HA Cluster Using an Internal Load Balancer)

5.1 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 (co	,
Setting item	Setting value
Resource group setting	
Resource group	TestGroup1
Region	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	Japan East
Load balancer setting	
Name	TestLoadBalancer
Туре	Internal
Virtual network	Vnet1
Subnet	Vnet1-1
IP address assignment	Static
Private IP address	10.5.0.200
Resource group	TestGroup1
Region	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:	TestLoadBalancingRule
Name	
Load balancing rule: Port	80 (Port number offering the operation)
Load balancing rule: Backend port	8080 (Port number offering the operation)
Dackena por	

• Microsoft Azure settings (common to node1 and node2)

• 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	Japan East					
Network security group set	ing					
Name	NetSecGroup1					
Availability set setting						
Name	AvailabilitySet1					
Update domains	5					
Fault domains	2					
Diagnostics storage accour	nt setting					
Name	Automatically generated (testgr	oup1diag679)				
Performance	Standard	Standard				
Replication	Locally-redundant storage (LRS	5)				
IP configuration setting						
IP address	10.5.0.110 10.5.0.111					
Blob storage setting						
Name	Node1Blob1 Node2Blob1					
Source type	None (empty disk)					
Account type	Standard HDD					

• EXPRESSCLUSTER settings (cluster properties)

Setting item	Settin	g value		
	node1	node2		
Cluster Name	Cluster1			
Server Name	node1	node2		
NP Resolution Tab: Type	Ping			
NP Resolution Tab: Ping	10.5.0.5			
Target				
NP Resolution Tab: <server> column</server>	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	/dev/sdc2					
	Device Name						
	Details Tab: Cluster Partition	/dev/sdc1					
	Device Name						
	Details Tab: File System	ext4					
	On						
	mirror construction						
	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		
Azure probe port monitor	Name	azureppw1
resource	Recovery Target	azurepp1
Azure load balance	Name	aurelbw1
monitor resource	Recovery Target	azurepp1

5.2 Configuring Microsoft Azure

1) Creating a resource group

2.

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

1. Select **Resource groups** or the resource group icon in the menu on the left side of the window. If there are existing resource groups, they are displayed in a list.



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



2) Creating a virtual network

2.

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

1. Select +Create a resource or the + icon in the menu on the left side of the window.



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



3) Creating a virtual machine

2.

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 +Create a resource or the + icon in the menu on the left side of the window.



3. Select CentOS-based 7.5.

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🔇 App Services	Storage		NAME PUBLISHER CATEGORY
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🗟 SQL databases	Mobile		
🦉 Azure Cosmos DB	Containers	_	S CentOS-based 7.4 HPC Rogue Wave Software (form Recommended
Virtual machines			🗲 CentOS-based 7.1 HPC Rogue Wave Software (form Recommended
💠 Load balancers	Databases		E CentOS-based 6.10 Rogue Wave Software (form Recommended
Torage accounts	Analytics		
Virtual networks	Al + Machine Learning	_	EentOS-based 7.3 HPC Rogue Wave Software (form Recommended
Azure Active Directory			🚁 CentOS-based 6.5 HPC Rogue Wave Software (form Recommended
Monitor	Internet of Things		E CentOS-based 7.5 Rogue Wave Software (form Recommended
🔷 Advisor	Mixed Reality		
Security Center	Integration		CentOS 7.6 Rogue Wave Software (form Recommended
O Cost Management + Bill	Security		SentOS-based 6.8 HPC Rogue Wave Software (form Recommended
Help + support			
? Subscriptions	Identity		
😽 App registrations	Developer Tools	-	

4. Confirm that **Resource Manager** is selected for **Select a deployment model** at the bottom of the window, and click **Create**.

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A Home lable. Click here to see. →				
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Ξ All services		×	Legal Terms	
AWORITES Operating System	Publisher		By clicking the Create button, I acknowledge that I am getting this s	
All resources	✓ Partners	~	Software (formerly OpenLogic) and that the legal terms of Rogue W OpenLogic) apply to it. Microsoft does not provide rights for third-p	
😂 Resource groups				
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SQL databases	Rogue Wave Software (form Recommended		USEFUL LINKS Learn more	
Azure Cosmos DB	Rogue Wave Software (form Recommended		Pricing details	
💻 Virtual machines	Rogue Wave Software (form Recommended			
🕈 Load balancers	Rogue Wave Software (form Recommended	- 1		
Storage accounts	Rogue wave software (form Recommended	- 1		
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O Cost Management + Bill	Rogue Wave Software (form Recommended		Select a deployment model 🚯 Resource Manager	~
Help + support		- 1	nesource manager	~
Subscriptions			Create	
App registrations		-	Want to deploy programmatically? Get started →	

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 the Create new blade appears, specify the settings of Name, Fault domains, and Update domains. Then click OK.

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6. Click Change size to display the Select a VM size blade.

From the list, choose a size (A1 - Standard 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 >**

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E All services	Showing 191	/M sizes.	Subscription: WPEC07_11	TSW_CLUSTER	Region:	Japan East	Current size: Standard_A1		
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🚱 Resource groups	AD	Basic	General purpose	1	0.75	1	1x300	No	¥1.838
🔇 App Services									
Function Apps INSTANCE	A1	Standard	General purpose	1	1.75	2	2x500	No	¥6,748
SQL databases • Virtual	A1	Basic	General purpose	1	1.75	2	2x300	No	¥2,671
Azure Cosmos DB Region	A1_v2	Standard	General purpose	1	2	2	2x500	No	¥4,501
Virtual machines	A2	Standard	General purpose	2	3.5	4	4x500	No	¥13,511
💠 Load balancers	A2	Basic	General purpose	2	3.5	4	4x300	No	¥9,092
Storage accounts	A2_v2	Standard	General purpose	2	4	4	4x500	No	¥9,419
Virtual networks • Image	A2m_v2	Standard	General purpose	2	16	4	4x500	No	¥12,752
Azure Active Directory	A3	Standard	General purpose	4	7	8	8x500	No	¥27.007
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7. When the **Disks** tab appears, go through the following steps to add a blob to be used for a mirror disk (cluster partition or data partition).

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 The Create a new disk blade appears.
 Specify the settings of Disk type, Name, Size (GiB), and Source type. Then click OK. Click Next: Networking >

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9. The **Networking** tab appears.

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

Click Create new under the Configure network security group field to display the Create network security group blade. Specify the setting of Name and then click OK. Click Next: Management >.

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10. The **Management** tab appears.

Click Create new under the Diagnostics storage account field to display the Create storage account blade.

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: Guest config >

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11. Click Next: Tags >.



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

te Previous Next : Review + create >

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«	Home > New > Marketplace > Compute > Cent	OS-based 7.5 > Create a virtual machine					
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🧟 Azure Cosmos DB	Marketplace Terms for additional details.	oft does not provide rights for third-party offerings, see the Azure					
Virtual machines							
🔶 Load balancers	BASICS						
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Virtual networks	Virtual machine name node1						
Azure Active Directory	Region Japan E	52					
Monitor	Availability options Availabil						
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v							•

4) Setting a private IP address

Azure Active Director

Monitor

Advisor

a Security Center

🔒 Help + support

O Cost Management + Bill.

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.

Microsoft Azure 1 Choose your default view

Home Dashboard Create a resource Azure services See all (+100) > 🛧 Home 📴 Dashboard ŷ ۲ SQL **QP** 2 430 8 ∃ All services App Services SQL databases Azure Database Azure Cosn for PostgreSQL DB Kubernetes services Function Apps Azure Databricks Cognitive Services Virtual machines Storage accounts TES All resources Make the most out of Azure 📦 Resource gro 🔕 App A 0 . -Eunction Apps 👼 SQL d Connect to Azure via an uthenticated browser-based Learn Azure with free online courses by Microsoft Monitor your apps and infrastructure Secure your apps and infrastructure Optimize performance, liability, security, and costs au shell Azure Advisor > Cloud Shell > Microsoft Learn Azure Monitor > Security Center > 🚸 Load bal Recent resources See all your recent resources > See all your resources > Useful links Storage accounts Get started or go deep with technical docs [2] Our articles include everything from quickstarts, samples, and tutorials to help you get started, to SDKs and architecture guides for designing applications. Virtual networks NAME TYPE LAST VIEWED

2 h ago

14 h ago

14 h ago

21 h ago

3 d ago

3 d ago

Discover Azure products [2] Explore Azure offers that help turn ideas into solutions, and get info on support, training, and pricing.

Keep current with Azure updates [2] Learn more and what's on the roadmap and subscribe to notifications to stay informed. Azure-Source wraps up all the news from last week in Azure.

News from the Azure team [2] Hear right from the team developing features that help you solve problems in the Azure blog.

1. Select **Resource groups** or the resource group icon in the menu on the left side of the window.

💡 Subscriptions • Virtual machine 3 d ago **1** 😽 App regi: Virtual machine 3 d ago

2. Select TestGroup1 from the resource group list.

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Microsoft Azure	\wp Search resources, services, and o	50CS	>_ ₽	₽ @ ? ©	***************
«	Home > Resource groups				
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? Subscriptions		19810-198		April Bart	
Kapp registrations		1998 (P. 1998)		Approx Deck	

Virtual machine (classic)

Virtual machine (classic)

Resource group

Virtual machine

Resource group

Cloud service (classic)

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

Microsoft Azure	ې م	arch resources, services, and docs	
	Home > Resource groups > TestGroups	p1	
Create a resource	TestGroup1		Ŕ
🕈 Home		🗴 🕂 Add 🖽 Edit columns 🏛 Delete resource group 👌 Refresh 🔿 Move 🛛 🖗 Assign tags 🏛 Delete 🛛 🛓 Export to CSV	
Dashboard	,P Search (Ctrl+/)		
All services	(n) Overview	Subscription (change) Deployments 2 Succeeded	
* FAVORITES	Activity log	Subscription ID	
All resources	Access control (IAM)	Taos (change)	
Resource groups	🖉 Tags	Click here to add tags	
App Services	🗲 Events	A	
Function Apps	Settings	Filter by name All types V All locations V No grouping	
👼 SQI. databases	4 Quickstart	8 items Show hidden types 0	
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Virtual machines	Policies	AvailabilitySet1 Availability set Japan East	
Load balancers	E Properties	Network security group Japan East	
Storage accounts	Locks	Virtual machine Japan East	
Virtual networks	Automation script	Senode1 OsDisk 1 71486cd179fe4c7783627bb925385b6b Disk Japan East	
Azure Active Directory	Cost management	nodet28 Network interface Japan East	
Monitor	Scost analysis	nodetBlob1 Disk Japan East	
Advisor	(3) Budgets	testgroup1diag679 Storage account Japan East	
Security Center	Advisor recommendations	··· Vnet1 Virtual network Japan East	
Oost Management + Bill_		Virtual machine Japan East	
Help + support	Monitoring	Senode2_OsDisk 1 bf9c31e2cfb44f0398bfd67ced7f9a1f Disk Japan East	
Subscriptions	Insights (preview)	Network interface Japan East	
App registrations	Alerts		

4. Select Networking.

Microsoft Azure	,P Search	h resources, services, and docs		>_ 🖓			 And the second se	
	Home > Resource groups > TestGroup1	> node1 - Networking						
Create a resource	node1 - Networking							
🕈 Home		Attach network interface	Detach naturalk interface					
Dashboard		Augur neurork interace	Setach network interface					
All services	Q Overview	Network Interface: node128	Effective security rules	Topology				
FAVORITES	Activity log	Virtual network/subnet: Vnet1/Vnet1-1	Public IP: None Private	e IP: 10.5.0.4 Acc	elerated networking: D	isabled		
All resources	Access control (IAM)	Inbound port rules Outbound	port rules Application sec	curity groups Loa	d balancing			
Resource groups	🛷 Tags	Network security group NetSecurity	Group1 (attached to network	k interface: pode12	8)		Add inbound port	
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Function Apps	Settings	PRIORITY NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION	
SQL databases	A Networking	1000 🔺 default-allow-	ssh 22	TCP	Any	Any	Allow	
Azure Cosmos DB	🛎 Disks	65000 AllowVnetInBoun	d Any	Any	VirtualNetwork	VirtualNetwork	k 🙁 Allow	
Virtual machines	😨 Size	65001 AllowAzureLoadE	lalancerInBound Any	Any	AzureLoadBalan	Any	Allow	
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Advisor	😢 Identity							
Security Center	Properties							
Cost Management + Bill	Locks							
Help + support	Automation script							
Subscriptions	Operations							
App registrations	- vperations							

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

6. Select IP configurations.

Microsoft Azure	,P Searc	h resources, services, and docs		>_ 177 Q	@?©	
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+ Create a resource	node128 - IP configuratio	ns				×
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i≡ All services	Overview	IP forwarding settings				
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III resources	Access control (IAM)	Virtual network		Vnet1		
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🔇 App Services	Settings	* Subnet		Vnet1-1 (10.5.0.0/24)		~
Function Apps	IP configurations					
🗟 SQL databases	DNS servers					
🧟 Azure Cosmos DB	Network security group	NAME IP VERSION	TYPE	PRIVATE IP ADDRESS	PUBLIC IP ADDRESS	
Virtual machines	Properties	ipconfig1 IPv4	Primary	10.5.0.4 (Dynamic)		
💠 Load balancers	Locks					
Storage accounts	Automation script					
🐡 Virtual networks	Support + troubleshooting					
Azure Active Directory	Effective security rules					
Monitor	Effective routes					
🔷 Advisor	New support request					
Security Center						
Ost Management + Bill						
Help + support						
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- 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		$\mathcal P$ Search resources, services, and de	0C5		Ð			
	Home > Resource groups >	TestGroup1 > node1 - Networking >	node128 - IP configuration	us > ipconfig1				
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All resources	Private IP address settings							
📦 Resource groups	Virtual network/subnet							
🔇 App Services	Vnet1/Vnet1-1							
Function Apps	Assignment Dynamic Static							
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🧟 Azure Cosmos DB	10.5.0.110							
Virtual machines								
💠 Load balancers								
🧮 Storage accounts								
Virtual networks								
Azure Active Directory								
Monitor								
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🏮 Security Center								
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Ŷ Subscriptions								
App registrations								

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 Blob storage. 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 "4.Partition settings for mirror disk resource (when using Replicator)" in Chapter 1, "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

8	16	73400320	sdb
8	17	73398272	sdb1
8	0	31459328	sda
8	1	31456256	sda1
8	32	20971520	sdc

 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. The following is an example of creating one partition including all areas of /dev/sdc.
 \$ sudo fdisk /dev/sdc

Device contains neither a valid DOS partition table, nor Sun, SGI or OSF disklabel Building a new DOS disklabel with disk identifier 0xe3c83b13. Changes will remain in memory only, until you decide to write them. After that, of course, the previous content won't be recoverable.

Warning: invalid flag 0x0000 of partition table 4 will be corrected by w(rite)

The device presents a logical sector size that is smaller than the physical sector size. Aligning to a physical sector (or optimal I/O) size boundary is recommended, or performance may be impacted.

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to switch off the mode (command 'c') and change display units to sectors (command 'u').

Command (m for help): n Command action e extended p primary partition (1-4) p Partition number (1-4): 1 First cylinder (1-2610, default 1): Using default value 1

Last cylinder, +cylinders or +size{K,M,G} (1-2610, default 2610): +1G

Command (m for help): p

Disk /dev/sdc: 21.5 GB, 21474836480 bytes 255 heads, 63 sectors/track, 2610 cylinders Units = cylinders of 16065 * 512 = 8225280 bytes Sector size (logical/physical): 512 bytes / 4096 bytes I/O size (minimum/optimal): 4096 bytes / 4096 bytes Disk identifier: 0xe29ed566

Device Boot Start End Blocks Id System

/dev/sdc1 132 1060256+ 83 Linux 1 Partition 1 does not end on cylinder boundary. Partition 1 does not start on physical sector boundary. Command (m for help): n Command action e extended p primary partition (1-4) p Partition number (1-4): 2 First cylinder (132-2610, default 132): Using default value 132 Last cylinder, +cylinders or +size{K,M,G} (132-2610, default 2610): Using default value 2610 Command (m for help): p

Disk /dev/sdc: 21.5 GB, 21474836480 bytes 255 heads, 63 sectors/track, 2610 cylinders Units = cylinders of 16065 * 512 = 8225280 bytes Sector size (logical/physical): 512 bytes / 4096 bytes I/O size (minimum/optimal): 4096 bytes / 4096 bytes Disk identifier: 0xe29ed566

Device BootStartEndBlocksIdSystem/dev/sdc111321060256+83LinuxPartition 1 does not end on cylinder boundary.Partition 1 does not start on physical sector boundary./dev/sdc213226101990453783Linux

Command (m for help): w The partition table has been altered!

Calling ioctl() to re-read partition table. Syncing disks.

 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 an internal load balancer following the steps below.

For details, see the following websites:

Load Balancer:

•

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

1. Select +Create a resource or the + icon in the menu on the left side of the window.



- 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**. Deploying the load balancer starts. This processing takes several minutes.

Microsoft Azure	₽ Sear	ch resources, services, and docs	>_	Ð	Q 4	≥ ?	٢	-
«	Home > New > Create load balancer							
+ Create a resource	Create load balancer							×
🛧 Home	uses a hash-based distribution algorithm. By o	lefault, it uses a S-tuple (source IP, source port, destination IP, destination port, pro	otocol					A.
🖪 Dashboard	internal where it is only accessible from a virtu	oad balancers can either be internet-facing where it is accessible via public IP add al network. Azure load balancers also support Network Address Translation (NAT)		r				
i≡ All services	traffic between public and private IP addresse	s. Learn more.						
+ FAVORITES	PROJECT DETAILS							
All resources	* Subscription	web/, riscip/la	~					
Resource groups	* Resource group	TestGroup1	~					
S App Services		Create new						
Function Apps	INSTANCE DETAILS							
SQL databases	* Name	TestLoadBalancer	~	·				
Azure Cosmos DB	* Region	Japan East	~					
Virtual machines	* Type 🛛	Internal Public						
🚸 Load balancers	* SKU 👩	Basic Standard						
Storage accounts	CONFIGURE VIRTUAL NETWORK.							
••• Virtual networks	* Virtual network	Vnet1	~	1				
Azure Active Directory	-			-				
😬 Monitor	* Subnet	Vnet1-1 (10.5.0.0/24) Manage subnet configuration	~					
🔷 Advisor	* IP address assignment	Static O Dynamic						
Security Center	* Private IP address			-				
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Help + support								٣
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App registrations		·						F

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

 Associate a virtual machine registered to the availability set to the load balancer. After the load balancer has been deployed, select Resource groups or the resource group icon in the menu

 on the left side of the window.

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— 🛨 FAVORITES	machines accounts		for PostgreSQL DB	services	Databricks Services
All resources	Make the most out of Az	ure			
📦 Resource groups					
🔇 App Services	A NI		(1)		
Function Apps					
👼 SQL databases	Learn Azure with free online	Monitor your apps and	Secure your apps and	Optimize performance,	Connect to Azure via an authenticated browser-based
🧟 Azure Cosmos DB	courses by Microsoft	infrastructure	infrastructure	reliability, security, and costs	authenticated browser-based shell
Virtual machines	Microsoft Learn 🖾	Azure Monitor >	Security Center >	Azure Advisor >	Cloud Shell >
💠 Load balancers					
Storage accounts	Recent resources See all yo	our recent resources > See all your r	resources >	Useful links	
••• Virtual networks	NAME	TYPE	LAST VIEWED	Get started or go deep with ter Our articles include everything	
Azure Active Directory		Virtual machine (classic)	2 h ago		d, to SDKs and architecture guides for
😁 Monitor	<u>.</u>	Virtual machine (classic)	14 h ago	Discover Azure products	
🔷 Advisor		Resource group	14 h ago	Explore Azure offers that help t	urn ideas into solutions, and get info
Security Center	ø	Cloud service (classic)	21 h ago	on support, training, and pricin	·
O Cost Management + Bill		Virtual machine	3 d ago	Keep current with Azure updat Learn more and what's on the	roadmap and subscribe to
Help + support	(*)	Resource group	3 d ago	notifications to stay informed. from last week in Azure.	Azure.Source wraps up all the news
? Subscriptions	Q	Virtual machine	3 d ago	News from the Azure team 🗵	
Registrations		Virtual machine	3 d ago	Hear right from the team devel problems in the Azure blog.	loping features that help you solve
Calast the seas			امبا اد مبا اد م		

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

list.					
Microsoft Azure	P Se	arch resources, services, and docs	>_ 15	₽ @ ? ©	
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Help + support			Contraction, and the second second	1912 102	
Subscriptions			1000 (C. 1000) (C. 1000)	April 101	
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Appregistations					

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

Microsoft Azure	, Р Sea	rch resources, services, and docs \succ $\$ \square \square \square \square \square \square \square	_ •
	Home > Resource groups > TestGroup		
+ Create a resource	TestGroup1		\$2 >
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🧾 Dashboard	, Search (Ctrl+/)		
≣ All services	(*) Overview	Subscription (change) Deployments 4 Succeeded	
+ FAVORITES	Activity log	Subscription ID	
III resources	 Access control (IAM) 	Taos (chanoe)	
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🔇 App Services	Events	*	
Function Apps	Settings	Filter by name All types All locations No grouping	
👼 SQL databases	4 Quickstart	9 items Show hidden types O	
🬌 Azure Cosmos DB	Deployments	NAME ↑↓ LOCATION ↑↓	
👰 Virtual machines	Policies		
🚸 Load balancers	Properties	Virtual machine Japan East	
🚾 Storage accounts	Locks	Senode-1_OsDisk_1_71486cd179fe4c7783627bb925385b6b Disk Japan East	
Virtual networks	Automation script	node-1176 Network interface Japan East	
🚸 Azure Active Directory	Cost management	Since-1Blob1 Disk Japan East	
Monitor		Virtual machine Japan East	
🔷 Advisor	a Cost analysis	S node-2_OsDisk_1_bf9c31e2cfb44f0398bfd67ced7f9a1f Disk Japan East	
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Help + support	Monitoring	Storage account Japan East	
Subscriptions	Insights (preview)	🛛 💠 TestLoadBalancer Load balancer Japan East	
App registrations	I Alerts	Vnet1 Virtual network Japan East	

4. Select Backend pools.

Microsoft Azure	P Sea	rch resources, services, and docs		Ŗ				ALC: NOT THE OWNER.	
«	Home > Resource groups > TestGroup	> TestLoadBalancer							
- Create a resource	TestLoadBalancer								$\not\approx \times$
🛧 Home		→ Move 💼 Delete 💍 Refresh							
🗔 Dashboard	, Search (Ctrl+/)								
i≡ All services	💠 Overview	Resource group (change) TestGroup1		Backen	d pool				
🛧 FAVORITES	Activity log	Location Japan East		Health	probe				
All resources	Access control (IAM)	Subscription (change)		Load b	alancin	g rule			
📦 Resource groups	🛷 Tags	weight, when carries		-					
🔇 App Services	X Diagnose and solve problems	Subscription ID		NAT rui 0 inbou					
Function Apps	Settings	SKU Basic		Private 10.5.0.2		ress			
👼 SQL databases	Frontend IP configuration	Tags (change)							
🥭 Azure Cosmos DB	Backend pools	Click here to add tags	*						
Virtual machines	Health probes		~						
🚸 Load balancers	😑 Load balancing rules								
Storage accounts	Inbound NAT rules								
··· Virtual networks	Properties								
Azure Active Directory	Locks								
😁 Monitor	Automation script								
今 Advisor	Monitoring								
Security Center	Diagnostics logs								
0 Cost Management + Bill									
P Help + support	Support + troubleshooting								
? Subscriptions	New support request								
ttps://portal.azure.com/?l=en.en-us#create	e/hub								÷

5. Click Add.



- 6. The Add backend pool blade is displayed. Specify Name.
- 7. For Associated to, select Availability set.
- 8. Specify Availability set.
- 9. Click Add a target network IP configuration.
- 10. Specify the target virtual machine for Target virtual machine and Network IP configuration.
- 11. Repeat steps 9 and 10 as many times as the number of target virtual machines.
- 12. Click OK.

8) Configuring a load balancer (configuring a health probe) 1. Select Health probes.

Microsoft Azure	₽ Searc	h resources, services, and docs		>_ ₽	Q 6	≩ ?	٢	A ADDRESS OF TAXABLE	
«	Home > Resource groups > TestGroup1	> TestLoadBalancer - Health probes							
Create a resource	TestLoadBalancer - Health	n probes							\times
🟫 Home		+ Add							
🔲 Dashboard									_
E All services	💠 Overview								
- 🛧 FAVORITES	Activity log	NAME	PROTOCOL	↑↓ PORT	°3 US	ED BY			
🗰 All resources 🔶	Access control (IAM)	No results.							
😵 Resource groups	🧳 Tags								
🔇 App Services	X Diagnose and solve problems								
Function Apps	Settings								
👼 SQL databases	Frontend IP configuration								
🧟 Azure Cosmos DB	Backend pools								
Virtual machines	Health probes								
🚸 Load balancers	😑 Load balancing rules								
🧮 Storage accounts	Inbound NAT rules								
Virtual networks	Properties								
Azure Active Directory	Locks								
😁 Monitor	Automation script								
🔷 Advisor	Monitoring								
Security Center	Diagnostics logs								
Ocst Management + Bill									
Help + support	Support + troubleshooting								
💡 Subscriptions	New support request								
😽 App registrations	4								ł

- 2. Click Add.
- The Add health probe blade is displayed. Specify Name.
 Specify Protocol and Port, and click OK.

Microsoft Azure	$\mathcal P$ Search resources, services, and docs		\rightarrow G	¢	ø	? (9
«	Home > Resource groups > TestGroup1 > TestLoadBalancer - Health probes > Add he	ealth probe					
+ Create a resource	Add health probe						
🛧 Home	* Name						
🛄 Dashboard	TestHealthProbe	✓					
∃ All services	IP version						
- * FAVORITES	IPv4						
All resources	Protocol 🛛	_					
📦 Resource groups		<u>~</u>					
🔇 App Services	* Port 26001	~					
Function Apps		<u> </u>					
👼 SQL databases	* Interval 🕖						
🬌 Azure Cosmos DB	seco	onds					
Virtual machines	* Unhealthy threshold 2	_					
🚸 Load balancers	2 consecutive fails	ures					
Storage accounts							
··· Virtual networks							
Azure Active Directory							
😁 Monitor							
今 Advisor							
Security Center							
Ost Management + Bill							
Help + support							
? Subscriptions	ок						
Registrations							

9) Configuring a load balancer (setting the load balancing rules)
 1. Select Load balancing rules.

Microsoft Azure	₽ Searc	ch resources, services, and docs	>_ 17 ₽ @	? 🙂 🔛 🕘
«	Home > Resource groups > TestGroup1	TestLoadBalancer - Load balancing rules balancing rules		×
♠ Home ■ Dashboard	Search (Ctrl+/)	+ Add		
i∃ All services → Favorites	 Overview Activity log 	P Constraint NAME □ LOAD BALANCING RULE	SACKEND POOL	14 HEALTH PROBE 14
 All resources Resource groups 	Access control (IAM) Tags	No results.		
S App Services	 Diagnose and solve problems Settings 			
SQL databases	Frontend IP configuration			
Virtual machines 4 Load balancers	Health probes Load balancing rules			
Storage accounts	Inbound NAT rules			
 Azure Active Directory Monitor 	 Locks Automation script 			
Advisor Security Center	Monitoring			
 Cost Management + Bill Help + support 	Support + troubleshooting			
 Subscriptions App registrations 	New support request			•

- 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					\rightarrow	Ę	Ģ	Ö	? 😊	
«	Home > Resource groups > TestGroup1 > TestLoadBalancer - Load balanci	ng rules > Ac	d load l	balancing rul	e					
+ Create a resource	Add load balancing rule		\times							
🛧 Home	TestLoadBalancer									
🛅 Dashboard	* Name TestLoadBalancingRule	~								
i∃ All services	* IP Version									
- 🛨 FAVORITES	IP Version IPv4 IPv6									
III All resources	* Frontend IP address (
Resource groups	40.115.190.6 (LoadBalancerFrontEnd)	~								
App Services	Protocol									
Function Apps	0 0									
👼 SQL databases	* Port 80									
🬌 Azure Cosmos DB	* Backend port @									
Virtual machines	8080	~								
-	Backend pool 🗿									
Storage accounts	TestBackendPool (2 virtual machine)	~								
Virtual networks	Health probe 👩									
Azure Active Directory	TestHealthProbe (TCP:26001)	~								
Monitor	Session persistence 🛛									
Advisor	None	~								
Advisor Security Center	Idle timeout (minutes)									
	0	4								
Oost Management + Bill	Floating IP (direct server return) 💿									
Help + support	Disabled Enabled		Ψ.							
💡 Subscriptions	ок									
Registrations										

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 Chapter 1, "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.

5.3 Configuring the EXPRESSCLUSTER settings

For the Cluster WebUI setup and connection procedures, see Chapter 5, "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 Clust	er1			🖋 Config mode 🗸	T.	(1)	3	۶	i ?	=
Cluster generation wizard	Import Export	Get the Configuration File	Apply the Configuration File	Update Server Data						

 The Cluster window on the Cluster Generation Wizard is displayed. Enter a desired name in Cluster Name. Select an appropriate language in Language. Click Next.

Cluster generation wizard		×
Server Server Cluster > Basic Settings > Interconnect	Server ★ NP Resolution → Group → Monitor	
Cluster Name*	Cluster1	
Comment		
Language*	English 🗸	
Management IP Address		
If using the integrated WebManager to manage m	ige (locale) of the environment that runs WebManager. ultiple dusters, specify a unique cluster name to identify the cluster. ss used for a WebManager connection. If establishing connections by specifying each server IP red.	
	Back Next Ca	ncel

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 resol Both IPv4 and IPv6 for IP address can be When entering an IP address, the server r	used.	acquired.	
		ОК Са	ancel
Cluster generation wizard			×
Server Server Server Server Cluster Image: Server Server NP Resolution Add Remove Server Server	→ Group → Monitor		
Order Name Master server node1			
1 node2			
\uparrow \downarrow			
Server Group Definition	Settings		
 Olick "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. 			
		Back Next	Cancel

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**.

Priority Type MDC node1 node2 1 Kernel Mode mdc1 10.5.0.110 10.5.0.111 ↑ ↓ O Configure the interconnect among the servers constructing the cluster. Click "Add" to add interconnect and select the type. For "Kernel mode", "User mode", "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.	
 Configure the interconnect among the servers constructing the duster. Click "Add" to add interconnect and select the type. Terr 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. Terr Kernel mode", "User mode, "DISK" and "COM" settings, click each server column cell and set an IP address or device. 	
or "Kernel mode", "User mode", "BMC", "DISK", "Witness HB" and "COM" settings, configure the route which is used for heartbeat. For "Mirrol 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.	
lick "Up" or "Down" to configure the priority to preferentially use the LAN only for the communication among the cluster servers. or "Mirror Communication Only" settings, click each server column cell to configure IP addresses. or the communication route which is used for data mirroring communication, select the mirror disk connect name to be allocated to the ommunication 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 Ne	ext.		
🌮 Cluster ge	eneration wizard		
Properties	Server → Basic Settings ⊘ - Add Remove		Server NP Resolution Group Monitor
NP Resolution Type	Target	node1	node2
Ping	✓ 10.5.0.5	Use 🗸	Use V
Tuning			
Click "Add" t For "Ping" se "Do not use" For "HTTP/H "Do not use" The detailed	". ITTPS" setting, click target ".	rce and select the type. umn cell to configure IP add column cell to configure H1 nd changed by clicking "Proj	ddress of Ping destination, and then click each server column cell to configure "Use" or HTTP packet destination, and then click each server column cell to configure "Use" or roperties".
			Back Next Cancel

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 Server → Interconnect ② → NP Resolution ③ → Group → Monitor	Group Resource
Name	Туре	
No groups		
• Configure failover group to be a u Click "Add" to add a group. Click "Properties" to configure the pr Click "Group Resource" to add resour	operties of the selected group.	
		Back Next Cancel

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

Group Definition		failover
Basic Settings → Startup Serv	ightarrow Group Attributes $ ightarrow$ Group Resource	
Туре*	failover 🗸	
Use Server Group Settings		
Name*	failover1	
Comment		
"Failover". If using server group, check the "Use	e cluster virtual machines, select "Virtual machine" as the type. In oth	
	 ✓ Back 	Next Cance
Click Next without spe The Group Attributes v Click Next without speci	cifying anything. window is displayed. ifying anything.	
The Group Attributes v Click Next without speci The Group Resource v	cifying anything. window is displayed. ifying anything.	<i>N</i> .
Click Next without spe The Group Attributes v Click Next without spec The Group Resource v	cifying anything. window is displayed. ifying anything. window is displayed.	
Click Next without spe The Group Attributes w Click Next without spec The Group Resource w On this page, add a grou Group Definition	cifying anything. window is displayed. ifying anything. window is displayed.	
Click Next without spe The Group Attributes w Click Next without spec The Group Resource w On this page, add a grou Group Definition	cifying anything. window is displayed. ifying anything. vindow is displayed. up resource following the procedure below	N. failover
Click Next without spec The Group Attributes of Click Next without spec The Group Resource w On this page, add a grou Group Definition Basic Settings • → Startup Se	cifying anything. window is displayed. ifying anything. vindow is displayed. up resource following the procedure below	
Click Next without spec The Group Attributes w Click Next without spec The Group Resource w On this page, add a grou Group Definition Basic Settings ♥ → Startup Se Properties Add Remove Group Resource List Name	cifying anything. window is displayed. ifying anything. vindow is displayed. up resource following the procedure below	
Click Next without spec The Group Attributes of Click Next without spec The Group Resource of On this page, add a grou Group Definition Basic Settings ♥ → Startup Se Properties Add Remove Group Resource List	cifying anything. window is displayed. ifying anything. window is displayed. up resource following the procedure below rvers ♥ → Group Attributes ♥ → Group Resource	
Click Next without spec The Group Attributes of Click Next without speci The Group Resource of On this page, add a grou Group Definition Basic Settings ♥ → Startup Se Properties Add Remove Group Resource List Name No resources	rvers ♥ → Group Attributes ♥ → Group Resource	
Click Next without spec The Group Attributes of Click Next without spec The Group Resource of On this page, add a grou Group Definition Basic Settings ♥ → Startup Se Properties Add Remove Group Resource List Name No resources	rvers ♥ → Group Attributes ♥ → Group Resource	

Mirror disk resource

Create a mirror disk resource.

For details, see "Understanding mirror disk resources" in Chapter 4, "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 failover	1		md 🗙
Info → Dependency → Recovery	Operation 🔶 Details		
Туре*	Mirror disk resource \checkmark		
Name*	md		
Comment			
Get license information			
• Select the type of group resource and	enter its name.		
		Next 🕨	Cancel

- 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 failover	1		md 🗙
Info ⊘ → Dependency ⊘ → Reco	very Operation 🛛 \rightarrow	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			Select
Tuning			
			Cancel

• 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**.

1 azurepp	
Operation 🗲 Details	
Azure probe port resource \checkmark	
azurepp1	
l enter its name.	
	el
,	azurepp1

- 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).

Info ⊘ → Dependency ⊘ →	failover1 → Recovery Operation ◇ → Details	azurepp 🗙
Probeport*	26001	
Tuning		Back Finish Cancel

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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* \rightarrow How to create a cluster

5.4 Verifying the created environment

Verify whether the created environment works properly by generating a (dummy) 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 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.

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

Chapter 6 Error Messages

For the error messages related to resources and monitor resources, see the following: • Chapter 9, "Error messages" in the *Reference Guide*.

Chapter 7 Notes and Restrictions

7.1 HA cluster using Azure DNS

7.1.1 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.

7.1.2 Notes on EXPRESSCLUSTER

Please refer the following for notes for EXPRESSCLUSTER on Azure: *EXRESSCLUSTER X Getting Started Guide*

- "Communication port number" in Chapter 5, "Notes and Restrictions"
- "Azure DNS resources" in Chapter 5, "Notes and Restrictions"
- "Setting up Azure DNS resources" in Chapter 5, "Notes and Restrictions"
- EXRESSCLUSTER 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:

EXRESSCLUSTER X Getting Started Guide

- "Adjusting OS startup time" in Chapter 5, "Notes and Restrictions" EXRESSCLUSTER X Reference Guide
- "Timeout tab"
- "Monitor tab"

7.2 HA cluster using a load balancer

7.2.1 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.

7.2.2 Notes on EXPRESSCLUSTER

Please refer the following for notes for EXPRESSCLUSTER on Azure: EXRESSCLUSTER X Getting Started Guide

- "Communication port number" in Chapter 5, "Notes and Restrictions"
- "Azure probe port resources" in Chapter 5, "Notes and Restrictions"
- "Setting up Azure probe port resources" in Chapter 5, "Notes and Restrictions"
- "Setting up Azure load balance monitor resources" in Chapter 5, "Notes and Restrictions" EXRESSCLUSTER 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

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EXRESSCLUSTER X Getting Started Guide

• "Adjusting OS startup time" in Chapter 5, "Notes and Restrictions" EXRESSCLUSTER X Reference Guide

- "Timeout tab"
- "Monitor tab"