

# **EXPRESSCLUSTER X 5.0**

# HA Cluster Configuration Guide for Microsoft Azure (Linux) Release 3

**NEC Corporation** 

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### CHAPTER

ONE

### PREFACE

### 1.1 Who Should Use This Guide

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

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

### 1.2 Scope of application

This guide covers the following product versions.

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

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

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

## 1.3 How This Guide is Organized

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

# **1.4 EXPRESSCLUSTER X Documentation Set**

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

#### EXPRESSCLUSTER X Getting Started Guide

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

#### EXPRESSCLUSTER X Installation and Configuration Guide

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

#### EXPRESSCLUSTER X Reference Guide

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

#### EXPRESSCLUSTER X Maintenance Guide

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

#### EXPRESSCLUSTER X Hardware Feature Guide

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

# **1.5 Conventions**

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

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

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

#### See also:

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

The following conventions are used in this guide.

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



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

# 1.6 Contacting NEC

For the latest product information, visit our website below: https://www.nec.com/en/global/prod/expresscluster/

#### CHAPTER

### **OVERVIEW**

## 2.1 Functional overview

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

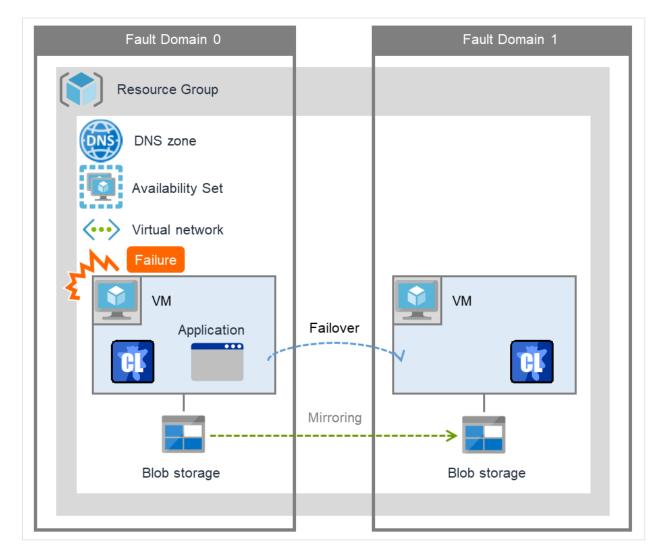


Fig. 2.1: HA Cluster on a Cloud Service (Using Azure DNS)

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

• Microsoft Azure region

Physical and logical units called a Microsoft Azure region are provided.

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

• Availability set

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

For details about an availability set, see the following website:

Manage the availability of Linux virtual machines:

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

# 2.2 Basic configuration

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

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

#### HA cluster using Azure DNS

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

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

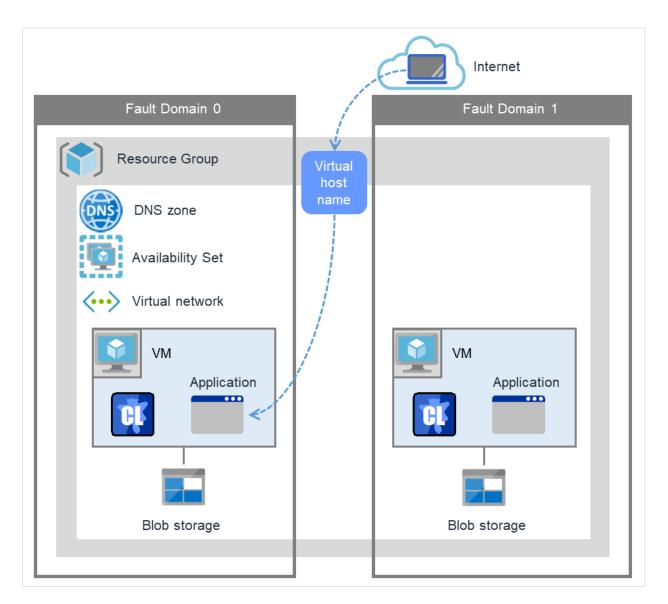


Fig. 2.2: HA Cluster Using Azure DNS

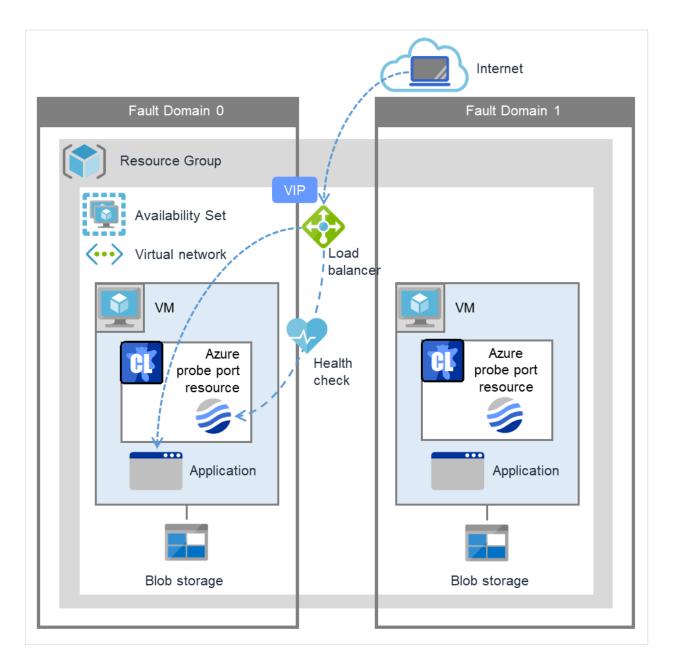
These two virtual machines use the same availability set to minimize the impact of planned maintenance or unplanned maintenance due to a physical hardware failure of the Microsoft Azure platform.

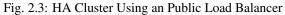
The cluster in Figure 2.2 HA Cluster Using Azure DNS is accessed by using the DNS name of the Azure DNS zone. EXPRESSCLUSTER manages record sets and DNS A records of the Azure DNS zone to find an IP address according to the DNS name. A client need not be conscious about the switching of virtual machines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

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

Resource or monitor resource type	Description	Setting
Azure DNS resource	Manages the record sets (A records) of the Azure DNS zone to find an IP address ac- cording to the DNS name.	Required
Azure DNS monitor resource	Monitors that the results of name resolu- tion 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 net- work.	When an public load balancer is used, required to monitor communication be- tween clusters that are configured with virtual machines, and also to monitor health of communication with an internal network.
Custom monitor resource	Monitors communication between clus- ters that are configured with virtual ma- chines, and also monitors health of com- munication with an internal network.	When an public load balancer is used, re- quired to monitor whether communication with the Microsoft Azure Service Man- agement API is possible, and also to mon- itor health of communication with an ex- ternal network.
Multi target monitor resource	Monitors the statuses of both the IP moni- tor 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 reso- lution) is described is executed.	When an public load balancer is used, re- quired to monitor health of communica- tion between an internal network and ex- ternal network.
Other resources and mon- itor re- sources	Depends on the configuration of applica- tion, such as a mirror disk, that is used in an HA cluster.	Optional

HA cluster using a load balancer





A client application can connect a virtual machine on an availability set in a Microsoft Azure environment to a cluster node by using frontend IP address. By using a VIP (Virtual IP), a client need not be conscious about the switching of virtual machines upon failover occurrence or group migration. A cluster built in a Microsoft Azure environment in Figure 2.3 HA Cluster Using an Public Load Balancer is accessed by specifying a global IP address of the Microsoft Azure Load Balancer (Load Balancer in Figure 2.3 HA Cluster Using an Public Load Balancer).

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

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

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

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

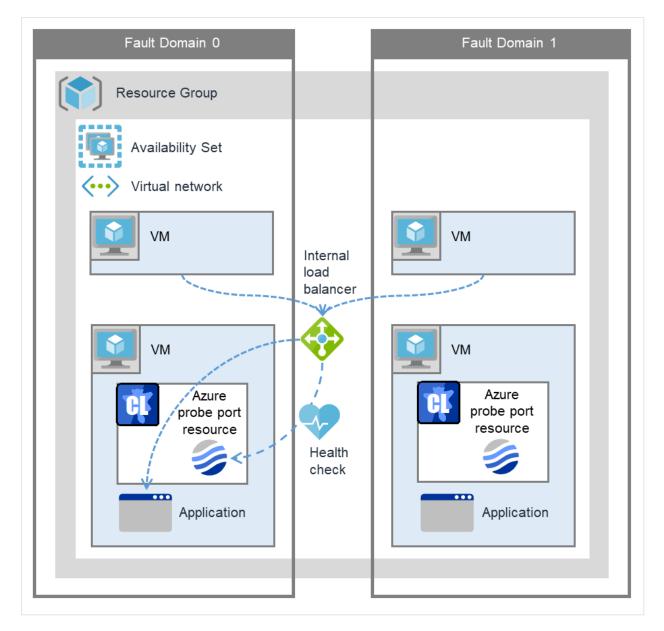


Fig. 2.4: HA Cluster Using the Internal Load Balancer

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

Purpose	Load balancer to use	Creating procedure
Disclosing operations outside	Public load balancer	See "5. Cluster Creation Proce-
the Microsoft Azure network		dure (for an HA Cluster Using a
		Public Load Balancer)" in this
		guide.
Publishing operations within	Internal load balancer (ILB)	See "6. Cluster Creation Proce-
the Microsoft Azure network		dure (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 re- source 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 re- source	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 communica- tion 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 clus- ters that are configured with vir- tual machines, and also to mon- itor health of communication with an external network.
Custom monitor resource	Monitors communication be- tween clusters that are config- ured with virtual machines, and also monitors health of commu- nication with an internal net- work.	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.

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

Table 2.4 – continued from previous page

### 2.3 Network partition resolution

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

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

The access destination in the following table are used as ping devices for Microsoft Azure. (\*) A private IP address of an internal load balancer (ILB) cannot be used because it does not reply to ping.

Scope of disclosure	access destination	Procedure	EXPRESSCLUSTER resources, monitor resources, and com- mands to be used for NP resolution
Outside the Mi-	Microsoft Azure	Checking a LISTEN	
crosoft Azure Virtual	Service Manage-	port	Custom monitor
network	ment API (manage-		resource
	ment.core.windows.net)		clpazure_port_checker
			command
	each cluster server	Ping	IP monitor resource
Inside the Microsoft	Servers, excluding a	Ping	PING network par-
Azure Virtual net-	cluster server, that ex-		tition resolution
work	ist within the Microsoft		resource
	Azure network(*)		
	Web servers that ex-	HTTP	HTTP network par-
	ist within the Microsoft		tition resolution
	Azure network		resource

For details about NP resolution, see the following:

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

#### Setting the NP resolution destination

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

#### How to judge the network partition status

EXPRESSCLUSTER provides the clpazure\_port\_checker command to check the TCP port listening status. Use this command as **Script created with this product** of the custom monitor resource or multi target monitor resource. For details about the clpazure\_port\_checker command, see the following subsections.

#### Checking the TCP port listening status (clpazure\_port\_checker command)

#### clpazure\_port\_checker

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

Command line clpazure\_port\_checker -h hostname -p port

#### Description

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

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

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

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

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

#### Options

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

#### **Return values**

- 0 Normal
- **1** Error (communication error)
- 2 Error (timeout)
- **3** Error (invalid argument or internal error)

### 2.4 Differences between on-premises and Microsoft Azure

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

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

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

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

#### HA cluster using Azure DNS

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

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

• Before Installing EXPRESSCLUSTER

Step No.	Procedure	On-premise	Microsoft Azure
1	Creating a resource	Not required	See "4.2. Configuring
	group		Microsoft Azure" in this
			guide.
2	Creating a virtual net-	Not required	See "4.2. Configuring
	work		Microsoft Azure" in this
			guide.
3	Creating a virtual ma-	Not required	See "4.2. Configuring
	chine		Microsoft Azure" in this
			guide.
4	Setting a private IP ad-	Not required	See "4.2. Configuring
	dress		Microsoft Azure" in this
			guide.
5	Adding a disk	Not required	See "4.2. Configuring
			Microsoft Azure" in this
			guide.
6	Creating a DNS zone	Not required	See "4.2. Configuring
			Microsoft Azure" in this
			guide.
		·	Continued on next page

Table         2.7 – continued from previous page			
Step No.	Procedure	On-premise	Microsoft Azure
7	Setting up the DNS server	See the manual provided with an OS or DNS server such as Red Hat Enterprise Linux 7 Net- work Guide.	Not required
8	Setting a partition for the mirror disk resource	See the following: "Settings after configuring hardware" in Determining a system configuration in the Installation and Configuration Guide "Understanding Mirror disk resources" in the Reference Guide.	See "4.2. <i>Configuring</i> <i>Microsoft Azure</i> " in this guide.
9	Adjusting the OS startup time	See "Settings after configuring hardware" in Determining a sys- tem configuration in the Installation and Configuration Guide.	Same as "On-premise"
10	Checking the network setting	See "Settings after configuring hardware" in Determining a sys- tem configuration in the Installation and Configuration Guide.	Same as "On-premise"
11	Checking the root file system	See "Settings after configuring hardware" in Determining a sys- tem configuration in the Installation and Configuration Guide.	Same as "On-premise"
12	Checking the firewall set- ting	See "Settings after configuring hardware" in Determining a sys- tem configuration in the Installation and Configuration Guide.	Same as "On-premise"
13	Synchronizing the server time	See "Settings after configuring hardware" in Determining a sys- tem configuration in the Installation and Configuration Guide.	Same as "On-premise"

Table 2.7 – continued from previous page

	Table 2.7 – continued from previous page		
Step No.	Procedure	On-premise	Microsoft Azure
14	Checking the SELinux setting	See "Settings after configuring hardware" in Determining a sys- tem configuration in the Installation and Configuration Guide.	Same as "On-premise"
15	Installing the Azure CLI	Not required	See "4.2. Configuring Microsoft Azure" in this guide.
16	Registering the service principal	Not required	See "4.2. Configuring Microsoft Azure" in this guide.
17	Installing EXPRESS- CLUSTER	See "Installing EX- PRESSCLUSTER" in the Installation and Configuration Guide.	Same as "On-premise"

#### Table 2.7 – continued from previous page

### • After Installing EXPRESSCLUSTER

Step No.	Procedure	On-premise	Microsoft Azure
18	Registering the EX- PRESSCLUSER license	See Registering the li- cense in the Installation and Configuration Guide.	Same as "On-premise"
19	Creating a cluster: Set- ting the heartbeat method	See "Creating the con- figuration data of a 2- node cluster" in Creat- ing the cluster configu- ration data in the Instal- lation and Configuration Guide.	The COM heartbeat, BMC heartbeat, and disk heartbeat cannot be used.
20	Creating a cluster: Setting the NP resolution processing	The network partition resolution resource is used. See the following: "Creating the configuration data of a 2-node cluster" in Creating the cluster configuration data in the Installation and Configuration Guide. "Network partition resolution resources details" in the Reference Guide.	See "4.3. Configuring the EXPRESSCLUSTER settings" in this guide.

Step No.	Procedure	On-premise	Microsoft Azure
21	Creating a cluster: Creating a failover group and monitor resource	See "Creating the configuration data of a 2-node cluster" in Creating the cluster configuration data in the Installation and Configuration Guide.	In addition the references for on-premises, see the following: "Understanding Azure DNS resources" in the Reference Guide. "Understanding Azure DNS monitor resources" in the Reference Guide. "4.3. Configuring the EXPRESSCLUSTER settings" in this guide.
1	1		

Table 2.8 – continued from previous page

#### HA cluster using a load balancer

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

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

• Before Installing EXPRESSCLUSTER

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

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

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

Table	2.9 - continued	from	previous page

			<u> </u>			
Step No.	Procedure		On-p	premise		Microsoft Azure
15	Installing	EXPRESS-	See	"Installing	EX-	Same as "On-premise"
	CLUSTER		PRES	SSCLUSTER"	in	
			the	Installation	and	
			Conf	iguration Guide	e.	

Table 2.9 – continued from previous page

#### • After Installing EXPRESSCLUSTER

Step No.	Procedure	On-premise	Microsoft Azure
16	Registering the EX- PRESSCLUSER license	See Registering the li- cense in the Installation and Configuration Guide.	Same as "On-premise"
17	Creating a cluster: Set- ting the heartbeat method	See "Creating the con- figuration data of a 2- node cluster" in Creat- ing the cluster configu- ration data in the Instal- lation and Configuration Guide.	The COM heartbeat, BMC heartbeat, and DISK heartbeat cannot be used.
18	Creating a cluster: Setting the NP resolution processing	The network partition resolution resource is used. See the following: "Creating the configuration data of a 2-node cluster" in Creating the cluster configuration data in the Installation and Configuration Guide. "Network partition resolution resolution resources details" in the Reference Guide.	See either of the following depending on the load balancer to use: See "5.3. Configuring the EXPRESSCLUS- TER settings" in this guide. See "6.3. Configuring the EXPRESSCLUS- TER settings" in this guide.

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

### CHAPTER

### THREE

### **OPERATING ENVIRONMENTS**

### 3.1 HA cluster using Azure DNS

Supports the OS versions listed in the following manuals:

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

Its operation has been verified in the following environments.

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

#### x86\_64

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

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

Get started with Azure CLI:

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

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

Python is bundled with Linux OS.

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

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

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

# 3.2 HA cluster using a load balancer

Supports the OS versions listed in the following manuals:

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

Its operation has been verified in the following environments.

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

#### x86\_64

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

### CHAPTER

FOUR

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

### 4.1 Creation example

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

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

• Microsoft Azure settings (common to node1 and node2)

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

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

Setting item	Setting value	
	node1	node2
Virtual machine setting		
– Disk type	Standard HDD	
– User name	testlogin	
– Password	PassWord_123	
– Resource group	TestGroup1	
– Region	(Asia Pacific) Japan East	
Network security group setting	ng	
– Name	node1-nsg	node2-nsg
Availability set setting		
– Name	AvailabilitySet1	
– Update domains	5	
– Fault domains	2	
Diagnostics storage account s	etting	
– Name	Automatically generated	
– Performance	Standard	
– Replication	Locally-redundant storage (	LRS)
IP configuration setting		
– IP address	10.5.0.110	10.5.0.111
Disk setting		1
– Name	node1_DataDisk_0	node2_DataDisk_0
– Source type	None (empty disk)	
– Account type	Standard HDD	
– Size	20	
·	1	

• EXPRESSCLUSTER settings (cluster properties)

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

• EXPRESSCLUSTER settings (failover group)

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

# • EXPRESSCLUSTER settings (monitor resource)

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

Continued on next page

Tuc	$10^{10} + .2^{10} = 0000000000000000000000000000000000$	page		
Monitor resource name	Setting item	Setting value		
	Recovery Target	LocalServer		
IP monitor resource	Name	ipw1		
	Server to monitor	node1		
	IP Address	10.5.0.111		
	Recovery Action	Execute only the final action		
	Recovery Target	LocalServer		
IP monitor resource	Name	ipw2		
	Server to monitor	node2		
	IP Address	10.5.0.110		
	Recovery Action	Execute only the final action		
	Recovery Target	LocalServer		
Multi target monitor resource	Name	mtw1		
	Monitor resource list			
		genw1		
		ipw1		
		ipw2		
		I ···		
	Recovery Action	Execute only the final action		
	Recovery Target	LocalServer		

Table 4.2 – continued from previous page

# 4.2 Configuring Microsoft Azure

### 1) Creating a resource group

=

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

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

ervices

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

Home > Resource groups			
Resource groups			\$
+ Add ≡≡ Edit columns 💍 Refresh 🞍 Export to	o CSV   ⊘ Assign tags   ♡ Feedback		
Subscription == all	Location == all  Add filter		
nowing 1 to 30 of 30 records.		No grouping	~
Name ↑↓	Subscription $\uparrow_{\downarrow}$	Location ↑↓	
		Japan East	
		Southeast Asia	
		West US	
		South Central US	
		South Central US	
		Japan West	
		East Asia	
		South Central US	
		South Central US	
()		North Europe	
()		South Central US	
		South Central US	
		Central US	
		Japan East	
		West India	
		Japan East	•
		Japan East	•
		Japan East	•
		· - ·	

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

ubscription * O v Resource group * O TestGroup1 v kesource details	Microsoft Azure			and docs (G+/)	>_	Ŗ	Q		٢	
Batic: Tgg:   Review + create   escource group - A container that holds related resources for an Azure solution. The resource group can include all the sources for the solution, or only those resources that you want to manage as a group. You decide how you want to the solution. The resource group and the solution. The resource group and the solution is the solution. The resource group and the solution is the solution. The resource group and the resources the solution. The resource group and t	Home > Resource groups > C	reate a resource group								
Exercise group - A container that holds related resources for an Ažure solution. The resource group can include all the isources for the solution, or only those resources that you want to manage as a group. You decide how you want to isolater resources groups based on what makes the most sense for your organization. Learn more that holds related resources for an Ažure solution. The resource group can include all the isolater resources groups based on what makes the most sense for your organization. Learn more can be approved by the resource groups based on what makes the most sense for your organization. Learn more can be approved by the resource group can include all the isolater resources groups based on what makes the most sense for your organization. Learn more can be approved by the resource group can be approved	Create a resource grou	qı								;
<pre>securces for the solution, or only those resources that you want to manage as a group. You decide how you want to likeate resource resource groups executed on what makes the most sense for your organization. Learn more weicription *\office</pre>	Basics Tags Review + o	create								
ubscription * i Testoroup1 · · · · · · · · · · · · · · · · · · ·	resources for the solution, or or	nly those resources that you want to	manage as a group. You decid	how you want to						
Resource group *	Project details									
tesource details legion ☆○ (Asia Pacific) Japan East ✓	Subscription *			$\sim$						
lesource details egion <sup>*</sup> ⊙  (Asia Pacífic) Japan East ✓	Resource group *	TestGroup1		~						
agion * C (Asia Pacífic) Japan East										
Review + create       < Previous	Resource details									
	Region *	(Asia Pacific) Japan East		$\sim$						
	Review + create < F	Previous Next : Tags >								

2) Creating a virtual network

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

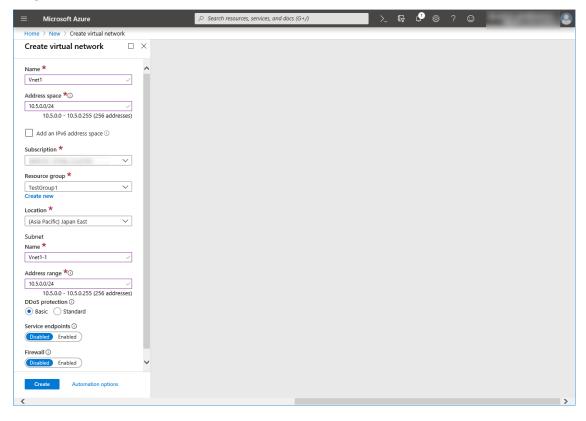
1. Select the **+Create a resource** icon on the upper part of the window.

Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
Recent res	ources								
	NAME			TYPE				LAST VIEWED	
<b>{··&gt;</b>								22 min ago	
								24 min ago	
()								24 min ago	
								26 min ago	
								26 min ago	
								27 min ago	
•••								28 min ago	
-								28 min ago	
DNS								28 min ago	
<u>•</u>								29 min ago	
<u>,</u>								30 min ago	
8								32 min ago	
Navigate	scriptions	() Resourc	e groups	All r	esources	Dasht	oard		

2. Select Networking and then Virtual network.

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Home > New								
New								×
								^
Azure Marketplace See all	Featured	See all						
Get started		rtual network uickstart tutorial						
Recently created								
AI + Machine Learning		neck Point CloudGuard IaaS R80.10						
Analytics	CI	uster (preview) arn more						
Blockchain		ad Balancer						
Compute		arn more						
Containers								
Databases		oplication Gateway arn more						
Developer Tools		anniore						
DevOps		ont Door						
Identity	<b>UP</b> Le	arn more						
Integration	Fir	rewall						
Internet of Things	E Le	arn more						
Media	16	rtual WAN						
		arn more						
Mixed Reality								
IT & Management Tools		etwork security group uickstart tutorial						
Networking		lickstart tutonar						
Software as a Service (SaaS)	Ex	pressRoute						
Security	ے۔ Le	arn more						
Storage	Ca	onnection						
Web		arn more						
								~

3. Specify Name, Address space, Subscription, Resource group, Location, Name of Subnet, and Address range of Subnet, 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 the **Create a resource** icon on the upper part of the window.

Create a	Resource	Network	Virtual	Subscriptions	All resources	App Services	Storage	SQL databases	More services
resource	groups	security groups	machines	Subscriptions	All resources	App services	accounts	SQL Galabases	MOTE SELVICES
Recent res	sources								
	NAME			TYPE				LAST VIEWED	
<b>~</b> •>								22 min ago	
								24 min ago	
[1]								24 min ago	
								26 min ago	
								26 min ago	
•••								27 min ago	
••••								28 min ago	
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<u>,</u>								29 min ago	
<u>,</u>								30 min ago	
8								32 min ago	
Navigate	oscriptions	() Resourc	e groups	All r	esources	Dasht	ooard		

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

≡ Microsoft Azure		resources, services, and docs (G+/)	> 💀 🗘	‡ ? ☺	
Home > New					
New					×
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Azure Marketplace See all	Featured See all				
Get started	Virtual machine				
Recently created	Learn more				
AI + Machine Learning	SQL Server 2017 Enterprise	Windows			
Analytics	Server 2016				
Blockchain					
Compute	Reserved VM Instances Quickstart tutorial				
Containers					
Databases	Kubernetes Service				
Developer Tools	Quickstart tutorial				
	Service Fabric Cluster				
DevOps	Quickstart tutorial				
Identity					
Integration	Web App for Containers Quickstart tutorial				
Internet of Things					
Media	Function App				
Mixed Reality	Quickstart tutorial				
IT & Management Tools	Batch Service				
Networking	Quickstart tutorial				
Software as a Service (SaaS)					
Security	Debian 9 "Stretch" with bac kernel	kports			
Storage	Learn more				
Web	Ubuntu Server 16.04 LTS				
	Quickstart tutorial				~
					*

# 3. Select CentOS-based 7.6.

Home > New > Create	Select an image		×
Create a virtual m			
	Marketplace My Items Previe	w Items	^
Basics Disks Net	AI + Machine Learning		1
Create a virtual machine	Analytics		ʻ –
image. Complete the Basics tab	Blockchain	CentOS-based 7.3 HPC Rogue Wave Software (formerly OpenLogic)	
customization. Looking for classic VMs?	Compute	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
	Containers	CentOS-based 7.6	
Project details Select the subscription to	Databases	Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
your resources.	Developer Tools		
Subscription *	DevOps	CentOS-based 6.5 HPC Rogue Wave Software (formerly OpenLogic)	
	Identity	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
Resource group	Integration	CentOS-based 7.4 HPC	
	Internet of Things	Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
Instance details	IT & Management Tools	CentOS-based 7.7	-
Virtual machine name *	Media	Rogue Wave Software	
Region *	Mixed Reality	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
Availability options ①	Networking	CentOS-based 7.5	
	Security	Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
Availability set * 🛈	Software as a Service (SaaS)	CentQS 7.6	-
		Rogue Wave Software (formerly OpenLogic)	
Image *	Storage	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
	Web	CentOS-based 7 LVM	
Azure Spot instance 🕕		Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
Size *①		CentOS-based 6.8 HPC	
Review + create		Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
Keview + create		CentOS-based 7.1 HPC	
<		Rogue Wave Software (formerly OpenLogic)	~

4. Click Create.

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

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

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Home > New > Create a virtu	al machine						
Create a virtual machin	ne						×
Basics Disks Networkin	ng Management Advanced Ta	gs Review + create					,
	ns Linux or Windows. Select an image fr	m Azure marketplace or use you	ur own customized				
customization.	eview + create to provision a virtual mac	nine with default parameters or r	review each tab for full				
Looking for classic VMs? Create	e VM from Azure Marketplace						
Project details							
Select the subscription to mana your resources.	ge deployed resources and costs. Use re	ource groups like folders to org	anize and manage all				
Subscription *			$\sim$				
Resource group *	TestGroup1		$\sim$				
	Create new						
Instance details							
Virtual machine name 📩	node1		~				
Region <b>*</b> ①	(Asia Pacific) Japan East		~				
Availability options ①	Availability set		~				
Availability set 🗙	No existing availability sets in current . Create new	esource group and location.	$\sim$				
Image *							
image "U	CentOS-based 7.6 Browse all public and private images		$\checkmark$				
Azure Spot instance 🕕	○ Yes ● No						
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Home > New > Create a virtu	al machine			Cre	eate new $ imes$
Create a virtual machi	ne				up two or more VMs in an availability set to ensure that at least is available during planned or unplanned maintenance events.
Basics Disks Networkir	ng Management Advanced	Tags Review + create		Lear	n more
image.	eview + create to provision a virtua	ge from Azure marketplace or use you machine with default parameters or r		Ava	t domains ① 2
Project details				Upd	late domains 🛈
Select the subscription to mana your resources.	ge deployed resources and costs. U	se resource groups like folders to org	anize and manage all	Use	managed disks ③
Subscription *			$\checkmark$	0	No (Classic) ( Yes (Aligned)
Resource group *	TestGroup1 Create new		$\checkmark$		
Instance details					
Virtual machine name 📩	node1		$\checkmark$		
Region *	(Asia Pacific) Japan East		$\checkmark$		
Availability options ①	Availability set		$\checkmark$		
Availability set *	No existing availability sets in cur Create new	rent resource group and location.	~		
Image <b>*</b> ①	CentOS-based 7.6 Browse all public and private ima	ges	$\checkmark$		
Azure Spot instance ①	🔿 Yes 💿 No				
Size *①	Standard D2s v3				
Review + create	< Previous Next : Disk	\$ >			ОК

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

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

Regarding the **Virtual machine name**, node1 is for node1, and node2 is for node2. Click **Next: Disks >** 

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

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

=	Microsoft Azure		,⊃ Se	arch resources	s, services, and docs (	G+/)		>_	Ŗ	Ļ2	ŝ	?	٢	1.00	
Home	> New > Create a virtu	al machine													
Crea	te a virtual machi	ne													×
Basic	VMs have one operating	ng Management	orary disk for short-t	erm storage. '	You can attach addit	ional data disks.									
	ze of the VM determines	the type of storage you	an use and the num	ber of data di	isks allowed. Learn r	nore									
	options						-								
OS dis	sk type <b>*</b> ①	Standard HDD				~									
Enable	e Ultra Disk compatibility	Yes 💿 No													
0		Ultra Disk compatibilit	y is not available for	this VM size	and location.										
_															
Data o															
	an add and configure add orary disk.	itional data disks for you	r virtual machine or	attach existin	g disks. This VM also	comes with a									
LUN	N Name	Size (GiB)	Disk type		Host caching										
Create	and attach a new disk	Attach an existing disl													
$\sim$ /	Advanced														
Rev	view + create	< Previous	Next : Networking >												
			,												

# 8. Create a new disk appears.

Specify the settings of **Name**, **Source type**, and **Size**. Then click **OK**. Click **Next: Networking** >

Home > New > Create a	a virtual machine > Create a new disk	Select a disk size					
Create a new disk to store	e applications and data on your VM. Disk pricin of transactions. Learn more about Azure Mai	Browse available disk size	es and their features.				
Name *		Standard HDD					
Name **	node1_DataDisk_0	Size	Disk tier	Max IOPS	Max throughput		
Source type 📩	None (empty disk)	32 GiB	S4	500	60		
Size *①	1024 GiB	64 GiB	S6	500	60		
	Standard SSD	128 GiB	S10	500	60		
	Change size	256 GiB	S15	500	60		
		512 GiB	S20	500	60		
		1024 GiB	S30	500	60		
		2048 GiB	S40	500	60		
		4096 GiB	S50	500	60		
		8192 GiB	S60	1300	300		
		16384 GiB	S70	2000	500		
		32767 GiB	S80	2000	500		
			sed For example, a 200 GiB disk is	be charged the same rate for your p provisioned on a 256 GiB disk, so yo	rovisioned disk, regardless of how much of u would be billed for the 256 GiB		
ОК		ОК					

9. The Networking tab appears.

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

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

Click Next: Management >.

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Home > New > Create a virt	ual machine										
Create a virtual mach	ine										×
Define network connectivity fo		Tags Review + create g network interface card (NIC) settings. You ca g, or place behind an existing load balancing :									
Network interface											
When creating a virtual maching	ne, a network interface will be create	for you.									
Virtual network <b>*</b> ③	Vnet1 Create new		$\checkmark$								
Subnet *	Vnet1-1 (10.5.0.0/24) Manage subnet configuration		$\sim$								
Public IP 🛈	None Create new		$\sim$								
NIC network security group (		iced									
Configure network security group *	(new) node1-nsg Create new		$\sim$								
Accelerated networking ①	🔿 On 💿 Off										
		selected VM size does not support accelerat	ed networking.								
Load balancing											
You can place this virtual mach	nine in the backend pool of an existin	g Azure load balancing solution. Learn more									
Place this virtual machine behind an existing load balancing solution?	🔿 Yes 💿 No										
Review + create	< Previous Next : Man	agement >									
<											>

10. The **Management** tab appears.

Click **Create new** under the **Diagnostics storage account** field to display **Create storage account**. Specify the settings of **Name**, **Account kind**, and **Replication**. Then click **OK**. In the **Diagnostics storage account** field, the default value is automatically generated and entered.

In the **Diagnostics storage account** field, the default value is automatically generated and Click **Next: Details** >.

# EXPRESSCLUSTER X 5.0 HA Cluster Configuration Guide for Microsoft Azure (Linux), Release 3

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Automation   Image: Control protection   Image: Control protection<		ected by Azure Security Center basic	plan.					
		,,						
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13. The Review + create tab appears. Check the contents. If there is no problem, click Create. The deploy-

ment 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 the **Resource groups** icon on the upper part of the window.

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

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③ Budgets		Virtual network	Japan East	
<ul> <li>Advisor recommendations</li> </ul>		VIItual network	Japan Last	
Monitoring				
Insights (preview)				
💵 Alerts				
Metrics	< Previous Page 1 V of 1 Next >			
Diagnostic settings				
(				>

4. Select Networking.

Microsoft Azure	,> Search resources, services, and docs (G+/)	> ଜ 4 ◎	? 😳	
Home > Resource groups > TestGro	up1			\$
Resource group	≪ + Add ≡≡ Edit columns	→ Move ↓ Export to CSV 🛛 🖗 Assign ta	gs 📋 Delete	··· More
Overview	Essentials	*		
<ul> <li>Activity log</li> </ul>	Filter by name     Type == all ( Location == all ( Loca	● <sup>+</sup> <sub>7</sub> Add filter		
Access control (IAM)	Showing 1 to 13 of 13 records.  Show hidden types		No grouping	~
Tags	Name ↑↓	Туре ↑↓	Location $\uparrow \downarrow$	
Events		Availability set	Japan East	
		Virtual machine	Japan East	
Settings		Network security group	Japan East	
Quickstart		Network interface	Japan East	
Deployments		Disk	Japan East	
Policies		Disk	Japan East	
😂 Properties		Virtual machine	Japan East	
🔒 Locks		Network security group	Japan East	
Export template		Network interface	Japan East	
Cost Management		Disk	Japan East	
a Cost analysis		Disk	Japan East	
S Cost alerts		Storage account	Japan East	
③ Budgets		Virtual network	Japan East	
Advisor recommendations		VILUALITEWORK	Japan Last	
Monitoring				
Insights (preview)				
Alerts				
Metrics	< Previous Page 1 V of 1 Next >			
Diagnostic settings	V			

- 5. Select a network interface displayed in the list. The network interface name is generated automatically.
- 6. Select IP configurations.

≡ Microsoft Azure				and docs (G+/)	>_ 6	. ¢	0	? ©	1.0	Topologica -	
Home > Resource groups > TestGroup1	I > node1 - Networki	ng > node1186 - I	P configurations								
node1186 - IP configurati	ions										×
,     Search (Ctrl+/)	🕂 Add 🛛 🗟 Sar	ve 🗙 Discard									
<ul> <li>Overview</li> <li>Activity log</li> <li>Access control (IAM)</li> <li>Tags</li> </ul>	IP forwarding set IP forwarding Virtual network IP configurations	-		(Disabled Enabled) Vnet1							
Settings	Subnet *			Vnet1-1 (10.5.0.0/24)							$\sim$
IP configurations											
DNS servers	Search IP con	figurations IP Version	Type	Private IP address			Durk	lic IP addre			
💎 Network security group	ipconfig1	IPv4	Primary	10.5.0.4 (Dynamic)			Pub		55		
Properties	ipconing i	1994	Primary	10.5.0.4 (Dynamic)							
🔒 Locks											
🛂 Export template											
Support + troubleshooting											
Effective security rules											
Effective routes											
New support request											
<											>

- 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		es, and docs (G+/)	>_ (	3 (	e @	٢	and the second little	
Home	> Resource groups > TestGroup1 > node1 - Netw	vorking > node1186 - IP configuratio	ns > ipconfig1						
ipco node118	nfig1	□ ×							
🔚 Sar	we X Discard								
	The virtual machine associated with this network interfar new private IP address. The network interface will be rep configuration settings, including secondary IP addresses gateway, will need to be manually reconfigured within th	rovisioned and network subnet masks, and default							
Public	c IP address settings								
	: IP address								
Disal	bled Enabled								
Privat	e IP address settings								
	l network/subnet /Vnet1-1								
Assign									
Dyna	amic Static								
IP add	dress *								
10.5.0	0.110	~							
<									>

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

## 5) Creating a DNS zone

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

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

+	()			<b>†</b>		٢		SQL	$\rightarrow$
Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
Recent res	ources								
	NAME			TYPE				LAST VIEWED	
<b>~~&gt;</b>								22 min ago	
								24 min ago	
[]								24 min ago	
								26 min ago	
								26 min ago	
***								27 min ago	
•••								28 min ago	
-								28 min ago	
ONS								28 min ago	
<b>.</b>								29 min ago	
<b>.</b>								30 min ago	
8								32 min ago	
Navigate	scriptions	Resource	e groups	All r	esources	Dashl	poard		

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

Microsoft Azure		ho Search resources, services, and docs (G+/)	>_	R Q ∅	? 🙂	and the second division of the
ome > New						
New						
DNS zone		×				
DNS zone						
Private DNS zone						
Get started	Virtuar net					
Recently created	Quickstart t	utorial				
AI + Machine Learning		t CloudGuard IaaS R80.10				
Analytics	PREVIEW Learn more					
Blockchain						
Compute	Load Balan					
Containers						
Databases	Application					
Developer Tools	Learn more					
DevOps	Front Door					
Identity	Learn more					
Integration	Firewall					
Internet of Things	Learn more					
Media	Virtual WA	N				
Mixed Reality	Learn more					
IT & Management Tools						
Networking	Quickstart t	curity group utorial				
Software as a Service (SaaS)						
Security	Learn more					
Storage	continore					
Web	Connection					
1120	Learn more					

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

view+create. Then click Create.

	Microsoft Azure			docs (G+/)	>_	Ģ	۵ ۵	?	٢	-	
Home	e > New > DNS zone >	Create DNS zone									
Cre	ate DNS zone										×
Bas	ics Tags Review +	create									
numt allow	per of DNS records such as s you to host your DNS zo	s 'mail.contoso.com' (for a mail serve	<ul> <li>h. For example, the domain 'contoso.</li> <li>r) and 'www.contoso.com' (for a web and provides name servers that will re</li> </ul>	site). Azure DNS							
Proje	ect details										
Subs	cription *			$\sim$							
	– Resource group *	TestGroup1		$\sim$							
		Create new									
Insta	ince details										
Nam	e *	cluster1.zone		~							
Reso	urce group location ①	(Asia Pacific) Japan East		$\checkmark$							
R	eview + create	< Previous Next : Tags >	Download a template for automation								
<											>

#### 6) Configuring virtual machines

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

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

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

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

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

\$ cat	/proc/partitions						
major	minor	#blocks	nar	ne			
2	0		4	fd0			
8	0	31457	280	sda			
8	1	512	2000	sda1			
8	2	30944	256	sda2			
8	16	73400	320	sdb			
8	17	73398	3272	sdb1			
8	32	20971	520	sdc			

- 2. Create a cluster partition and data partition in the added disk by using the fdisk command. Allocate 1 GB (1\*1024\*1024\*1024 bytes) or more to a cluster partition. (If the size is specified as just 1 GB, the actual size will be larger than 1 GB depending on the disk geometry difference. This is not a problem.) Also, do not create a file system in a cluster partition.
- 3. If you select Execute initial mkfs when creating the cluster configuration data by using Cluster WebUI,

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

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

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

#### 8) Installing the Azure CLI

Install the Azure CLI.

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

Install the Azure CLI:

https://docs.microsoft.com/en-us/cli/azure/install-azure-cli

Log in to the created node1 and node2 and install the Azure CLI following the procedure below. Be sure to use the following installation procedure. If the Azure CLI is installed in other ways, Azure DNS resource will not work properly.

```
$ sudo yum check-update; sudo yum install -y gcc libffi-devel python-devel_

openssl-devel
$ curl -L https://aka.ms/InstallAzureCli | bash -
$ exec -1 $SHELL
```

#### 9) Creating a service principal

Create a service principal using the Azure CLI.

Azure DNS resource performs login to Microsoft Azure and DNS zone registration and monitoring. When logging in to Microsoft Azure, Azure login with a service principal is used.

Please note that certificates have an expiration date.

For more details, see the --years option of az ad sp create-for-rbac.

https://docs.microsoft.com/en-us/cli/azure/ad/sp?view=azure-cli-latest#az-ad-sp-create-for-rbac

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

Sign in with Azure CLI:

https://docs.microsoft.com/en-us/cli/azure/authenticate-azure-cli

Create an Azure service principal with Azure CLI:

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

1. Log in with an organizational account.

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

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

3. Log out.

\$ az logout --u <account\_name>

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

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

The following is displayed upon successful sign-in.

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

5. Log out.

\$ az logout --username <name\_value\_in\_step\_4>

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

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

### 10) Installing EXPRESSCLUSTER

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

# 11) Registering the EXPRESSCLUSER license

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

# 4.3 Configuring the EXPRESSCLUSTER settings

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

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

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

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

#### 1) Creating a cluster

Start the Cluster generation wizard to create a cluster.

- · Creating a cluster
  - 1. Access Cluster WebUI, and click Cluster generation wizard.

Cluster WebUI <cluster></cluster>			🔎 🗲 Conf	fig mode 🗸	🛓 🕓	3	P i	? 📑
Cluster generation wizard	Export Get the Configuration File	↑ Apply the Configuration File	Update Server Data	Check the Configu	uration File			

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

Cluster generation wizard	×
Server     Server       Cluster →     Basic Settings →	Server → NP Resolution → Group → Monitor
Cluster Name*	Cluster1
Comment	
Language*	English 🗸
Management IP Address	
	(locale) of the environment that runs WebManager. le clusters, specify a unique cluster name to identify the cluster. sed for a WebManager connection. If establishing connections by specifying each server IP address, the

3. Basic Settings is displayed.

The instance connected to Cluster WebUI is displayed as a registered master server. Click **Add** to add the remaining instances (by specifying the private IP address of each instance). Click **Next**.

Add server	×
Server Name or IP Address* 10.5.0.111	
<ul> <li>Enter an IP address or a server name.</li> <li>When entering a server name, name resolution is necessary.</li> <li>Both IPv4 and IPv6 for IP address can be used.</li> <li>When entering an IP address, the server name is automatically acquired</li> </ul>	ed.
ОК	Cancel
Cluster generation wizard       Server     Server       Cluster ♥ → Basic Settings →     Interconnect → NP Resolution → Group → Monitor       Add     Remove       Server Definitions     Ventor	×
Order         Name           Master server         node1	
1 node2 ↑ ↓ Server Group Definition Settings	
<ul> <li>O Click "Add" to add servers constructing the cluster.</li> <li>Click 「↑」 or 「↓」 to change the server priority.</li> <li>Click "Settings" to configure the server group when using the server group.</li> <li><b>4</b> Back</li> </ul>	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**.

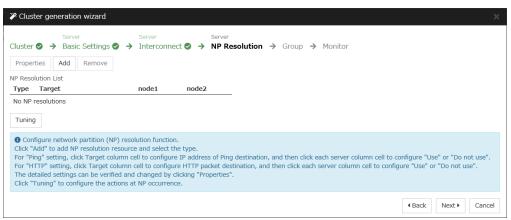
Cluster generation wizard				×
Cluster Server Properties Add Remove Interconnect List	Server Interconne	Server → NP Resolution → C	Group 🗲 Monitor	
Priority Type	MDC	node1	node2	
1 Kernel Mode 🗸	mdc1 🗸	10.5.0.110 ~	10.5.0.111	~
↑ <b>↓</b>				
Only" setting, configure the route whic Configuring more than one routes is re For "Kernel mode" ". "User mode, "DIS For "Witness HB" setting, click each se Click "1" or "1" to configure the prior For "Mirror Communication Only" setti	", "DISK", "Witr h is used only for commended. 5K" and "COM" s rver column cell ty to preferentian ngs, click each se	hess HB" and "COM" settings, con r data mirroring communication. ettings, click each server column to set "Use" or "Do not use", and Illy use the LAN only for the com rever column cell to configure IP a	figure the route which is use cell and set an IP address or then click "Properties" to se nunication among the cluster addresses.	d for heartbeat. For "Mirror Communication device. t detailed settings.
				Back Next      Cancel

5. The NP Resolution window is displayed.

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

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





#### 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     Server     Server       Cluster ♥ →     Basic Settings ♥ →     Interconnect ♥ →     NP Resolution ♥ →     Group →     Monitor       Properties     Add     Remove	Group Resource
Group List Name Type	
No groups	
Configure failover group to be a unit of fail over.     Click "Add" to add a group.     Click "Properties" to configure the properties of the selected group.     Click "Group Resource" to add resource to the selected group.	

# 2. The Group Definition window is displayed.

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

Group Definition	failover 🗙
Basic Settings → Startup Servers	➔ Group Attributes ➔ Group Resource
Туре*	failover 🗸
Use Server Group Settings	
Name*	failover1
Comment	
<ul> <li>Select group type.</li> <li>If using virtual machine resources to clust "Failover".</li> <li>If using server group, check the "Use Server gr</li></ul>	ter virtual machines, select "Virtual machine" as the type. In other cases, select ver Group".

- 3. The **Startup Servers** window is displayed. Click **Next** without specifying anything.
- 4. The **Group Attributes** window is displayed. Click **Next** without specifying anything.
- 5. Group Resource List is displayed.

On this page, add a group resource following the procedure below.

Group Defini	ition								f	ailover	
Basic Setting	js 📀 🚽	<ul> <li>Startup</li> </ul>	Servers 📀	→	Group Attrib	utes 오	→	Group Resource			
Properties	Add	Remove									
Group Resourc	ce List										
Name						Туре					
No resources	;										
-		d resources configure th		of the	e selected resour	rce.					
								<ul> <li>▲ Back</li> </ul>	Finish	Cance	:1

• Mirror disk resource

Create a mirror disk resource.

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

- 1. Click Add on the Group Resource List page.
- 2. The Resource Definition of Group | failover1 window is displayed.

Select the group resource type (Mirror disk resource) from the **Type** box and enter the group name (md) in the **Name** box. Click **Next**.

Resource Definition of Group   failover1 r						
Info → Dependency → Recovery Operation → Details						
Туре*	Mirror disk resource $\checkmark$					
Name*	md					
Comment						
Get License Info						
• Select the type of group resource and	l enter its name.					

- 3. The **Dependency** window is displayed. Click **Next** without specifying anything.
- 4. The **Recovery Operation** window is displayed. Click **Next**.
- 5. The **Details** window is displayed.

Enter the device name of the partition created in "6. Configuring virtual machines" in Data Partition Device Name and Cluster Partition Device Name. Specify Mount Point and File System. Click Finish to finish setting.

Resource Definition of Group   failover	r1			md 🗙
Info ♥ → Dependency ♥ → Reco Common node1 node2	overy Operation 🔗 🗲	Details		
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 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				
<b>Info →</b> Dependency → Recovery	Operation 🔶 Details			
Туре*	Azure DNS resource			
Name*	azuredns1			
Comment				
Get License Info				
• Select the type of group resource and	enter its name.			

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

Resource Definition of Group   failover1					
Info $\bigcirc$ $\rightarrow$ Dependency $\bigcirc$ $\rightarrow$ Recovery Operation $\bigcirc$ $\rightarrow$ Details					
Common node1 node2					
Record Set Name*	test-record1				
Zone Name*	cluster1.zone				
IP Address*	10.5.0.110				
TTL*	3600	sec			
Resource Group Name*	TestGroup1				
Account					
User URI*	http://azure-test				
Tenant ID*	XXXXXXX-XXXX-XXXX-XXXX-XXX				
File Path of Service Principal*	/home/testlogin/tmpbyJ1cK.				
Thumbprint of Service Principal					
Azure CLI File Path*	/usr/bin/az				
Delete a record set at deactivation	$\checkmark$				
Tuning					
		Back Finish Cancel			

#### 6. Click Finish.

#### 3) Adding a monitor resource

• Azure DNS monitor resource

The mechanism to check the record sets registered to the Azure DNS and whether the name resolution is available is provided.

For details about Azure DNS monitor resources, see "Reference Guide" > "Understanding Azure DNS monitor resources"

Adding one Azure DNS resource creates one Azure DNS monitor resource automatically.

• Custom monitor resource

Sets a script to monitor whether communication with the Microsoft Azure Service Management API is possible, and also to monitor health of communication with an external network.

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

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

Monitor Resource Definition				
Info → Monitor(common) → Mor	nitor(special) 🔶 Recovery Action			
Туре*	Custom monitor			
Name*	genw1			
Comment				
Get Licence Info				
<b>3</b> Select the type of monitor resource a	nd 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		
O Active		
Target Resource		Browse
Nice Value		0
Choose servers that execute monitoring	Server	

4. The **Monitor (special)** window is displayed. Select **Script created with this product**.

The following shows the sample of a script to be created.

Select Synchronous for Monitor Type. Click Next.

Monitor Resource Definition				genw 🗙
Info 📀 🔶 Monitor(common) 📀 🔶 Monitor(special	) → Recovery Action			
<ul><li>User Application</li><li>Script created with this product</li></ul>				
File	genw.sh			
		Edit	View	Replace
Monitor Type	<ul> <li>Synchronous</li> <li>Asynchronous</li> </ul>			
Wait a period of time for Application/Script monitor to start				
Log Output Path				
Rotate Log				
Rotation Size		byte		
Normal Return Value*	0			
Wait for activation monitoring to stop before stopping the cluster				
	•	Back	Next 🕨	Cancel

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

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

Monitor Resource Definition		genw 🗙
Info 🛛 🔶 Monitor(common) 🛇 🚽	Monitor(special) 🤡 🔶 Recovery Actio	n
Recovery Action	Execute only the final action	~
Recovery Target *	LocalServer	Browse
Recovery Script Execution Count	0 time	
Execute Script before Reactivation		
Maximum Reactivation Count	0 time	
Execute Script before Failover		
Execute migration before Failover		
Maximum Failover Count	0 time	
Execute Script before Final Action		
Final Action	No operation	
		Script Settings
		Back Finish Cancel

- 6. Click **Finish** to finish setting.
- IP monitor resource

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

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

Monitor Resource Definition		ipw 🗙
Info → Monitor(common) → Mor	itor(special) 🔶 Recovery Action	
Туре*	IP monitor 🗸	
Name*	ipw1	
Comment		
Get Licence Info		
• Select the type of monitor resource an	nd enter its name.	
		Back     Next     Cancel

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

Monitor Resource Definition			ipw 🗙
Info 🛇 🔶 Monitor(common) 🌛 Monitor(special)	→ Recovery	Action	
Interval*	30	sec	
Timeout*	30	sec	
Collect the dump file of the monitor process at timeout occurrence			
Do Not Retry at Timeout Occurrence			
Do Not Execute Recovery Action at Timeout Occurrence			
Retry Count*	0	time	
Wait Time to Start Monitoring*	0	sec	
Monitor Timing			
Always			
○ Active			
Target Resource			Browse
Nice Value			0
Choose servers that execute monitoring	Server		
		<ul> <li>▲ Bac</li> </ul>	ck Next  Cancel

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	
	<b>→</b> Remove		
			OK Cancel Apply

# Click Next.

4. The Monitor (special) window is displayed.

I Back

Next 🕨

Cancel

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	

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 IP Address List IP Address	Monitor(special) → Recovery Action	
10.5.0.111		
		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.

## EXPRESSCLUSTER X 5.0 HA Cluster Configuration Guide for Microsoft Azure (Linux), Release 3

Monitor Resource Definition					ipw 🗙
Info 🥑 🔶 Monitor(common) 🔗	→	Monitor(special) 📀 🔶 Rec	covery Actior	ı	
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	~	• Back	Script Settings 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.
- 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.
- The Recovery Action window is displayed.
   Select Execute only the final action for Recovery Action, LocalServer for Recovery Target, and No operation for Final Action.
- 12. Click Finish to finish setting.
- Multi target monitor resource

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

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

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

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

Monitor Resource Definition		mtw 🗙
Info → Monitor(common) → Mon	itor(special) → Recovery Action	
Туре*	Multi target monitor	
Name*	mtw1	
Comment		
Get Licence Info		
• Select the type of monitor resource an	nd 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					mtw 🗙
Info 🛇 🔶 Monitor(common) 🄶 Monitor(special)	→ Recovery	Action			
Interval*	30	sec			
Timeout*	30	sec			
Collect the dump file of the monitor process at timeout occurrence					
Do Not Retry at Timeout Occurrence					
Do Not Execute Recovery Action at Timeout Occurrence					
Retry Count*	0	time			
Wait Time to Start Monitoring*	0	sec			
Monitor Timing					
Always					
○ Active					
Target Resource				Bro	wse
Nice Value					0
Choose servers that execute monitoring	Server				
			<ul> <li>▲ Back</li> </ul>	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	on			mtw 🗙
Info 🥑 🔶 Monitor(com	mon) 🥑 🔶 Moni	tor(special) → R	lecovery Action	
Monitor Resources Monitor Resource	Туре	←	Available Monitor Resources Monitor Resource	Туре
genw1	genw	Add	No Available Monitor Resources	
ipw1	ipw	→		
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		mtw 🗙
Info 🛛 🔸 Monitor(common) 🛇 -	→ Monitor(special)  → Recovery Actio	on
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 $\checkmark$	
		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.

Cluster Name	Cluster1
Comment	
Language	English 🗸

- 2. Select the **Timeout** tab. For **Timeout** of **Heartbeat**, specify a value calculated by "A+B+C" as described below.
  - A: **Interval** of the monitor resource being monitored by the multi target monitor resource for NP resolution x (**Retry Count**+1)

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

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

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

Server Sync Wait Time*	5	min	
Heartbeat			
Interval*	3	sec	
Timeout*	120	sec	
Server Internal Timeout*	180	sec	
Initialize			
			OK 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 -> How to create a cluster

## 4.4 Verifying the created environment

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

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

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

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

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

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

## 5.1 Creation example

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

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

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

• Microsoft Azure settings (common to node1 and node2)

Continued on next page

TestLoadBalancer
Public
TestLoadBalancerPublicIP
Static
TestGroup1
(Asia Pacific) Japan East
TestBackendPool
Availability set
node1 node2
10.5.0.110 10.5.0.111
TestHealthProbe
26001
TestLoadBalancingRule
80 (Port number offering the operation)
8080 (Port number offering the operation)
1
TestHTTP

Table 5.1 – continued from previous page

Continued on next page

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

## Table 5.1 – continued from previous page

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

node1 Standard HDD restlogin	node2					
estlogin						
PassWord_123						
TestGroup1						
(Asia Pacific) Japan East						
g node1-nsg node2-nsg						
AvailabilitySet1						
5						
2						
Automatically generated						
Standard						
Locally-redundant storage (LRS)						
10.5.0.110	10.5.0.111					
node1_DataDisk_0	node2_DataDisk_0					
None (empty disk)						
Standard HDD						
20						
	FestGroup1   Asia Pacific) Japan East   node1-nsg   AvailabilitySet1   AvailabilitySet1   5   2   Automatically generated   Standard   Locally-redundant storage (LRS)   10.5.0.110   node1_DataDisk_0   None (empty disk)   Standard HDD					

• EXPRESSCLUSTER settings (cluster properties)

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

• EXPRESSCLUSTER settings (failover group)

Resource name	Setting item	Setting value
Mirror disk resource	Name	md
	Details Tab: Mount Point	/mnt/md
	Details Tab: Data Partition Device	/dev/sdc2
	Name	
	Details Tab: Cluster Partition De-	/dev/sdc1
	vice 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)

## • EXPRESSCLUSTER settings (monitor resource)

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

Continued on next page

	Cetting item	, <u> </u>
Monitor resource name	Setting item	Setting value
	Recovery Target	LocalServer
IP monitor resource	Name	ipw2
	Server to monitor	node2
	IP Address	10.5.0.110
	Recovery Action	Execute only the final action
	Recovery Target	LocalServer
Multi target monitor resource	Name	mtw1
	Monitor resource list	
		genw1
		ipw1
		ipw2
	Recovery Action	Execute only the final action
	Recovery Target	LocalServer
	Execute Script before Final Ac-	On
	tion	
	uon	

Table 5.3 – continued from previous page

# 5.2 Configuring Microsoft Azure

## 1. Creating a resource group

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

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

+	[]		<u> </u>	+		۲		SQL	$\rightarrow$
Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
Recent reso	urces								
	NAME			TYPE				LAST VIEWED	
$\leftrightarrow$								22 min ago	
								24 min ago	
()								24 min ago	
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<u></u>								28 min ago	
<b>9</b>								29 min ago	
<b>9</b>								30 min ago	
8								32 min ago	
Navigate	riptions	() Resource	e groups	All r	esources	Dashi	ooard		

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

Microsoft Azure	,○ Search resources, services, and docs (G+/)	<u>&gt;</u> ק ב ⊗ ? ☺	
Home > Resource groups			
Resource groups			Ŷ
+ Add     ≡≡ Edit columns	Assign tags		
Subscription == all Location	n == all 🔕 ( + Add filter )		
howing 1 to 30 of 30 records.		No grouping	$\sim$
Name 🛧	Subscription $\uparrow_{\downarrow}$	Location $\uparrow_{\downarrow}$	
		Japan East	
		Southeast Asia	
		West US	
		South Central US	
		South Central US	
		Japan West	
		East Asia	
		South Central US	
		South Central US	•
		North Europe	•
		South Central US	•
		South Central US	
		Central US	
		Japan East	•
		West India	•
		Japan East	•
		Japan East	••
		Japan East	
		· - ·	

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

$\equiv$ Microsoft Azure		resources, services, and docs (G+/)	>_ 😡	Q 🕸	? 😊	1000	
Home > Resource groups > C	reate a resource group						
Create a resource grou	ıp						$\times$
resources for the solution, or or	reate hat holds related resources for an Azure solution. ly those resources that you want to manage as a roups based on what makes the most sense for y	group. You decide how you want to					
Project details							
Subscription *		$\sim$					
Resource group *	TestGroup1	$\checkmark$					
Resource details Region *①	(Asia Pacific) Japan East	~					
	(Asia Pacific) Japan cast	· · ·					
Review + create <	Next : Tags >						
<							>

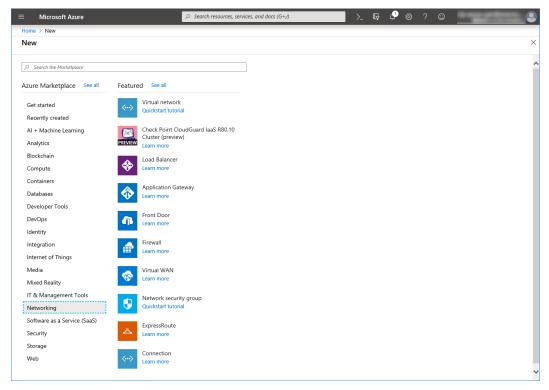
2. Creating a virtual network

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

Create a	() Resource	Network	Virtual	Subscriptions	All resources	App Services	Storage	SQL databases	More services
resource	groups	security groups	machines	Subscriptions	, in resources	hpp octrices	accounts	ode adiabases	
Recent reso	urces								
1	NAME			TYPE				LAST VIEWED	
<b>{··</b> >								22 min ago	
								24 min ago	
()								24 min ago	
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<u>,</u>								29 min ago	
<b>9</b>								30 min ago	
8								32 min ago	
Navigate									
<u> </u>	iptions	Resource	e groups	All	esources	Dasht	aard		

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

2. Select Networking and then Virtual network.



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

■ Microsoft Azure	
ome > New > Create virtual netwo	
Create virtual network	
Name *	^
Vnet1	~
Address space *	
10.5.0.0/24	~
10.5.0.0 - 10.5.0.255 (256 addre	esses)
Add an IPv6 address space 🛈	
ubscription *	
and the second	$\sim$
Resource group 🕇	
TestGroup1	~
Create new	
.ocation * (Asia Pacific) Japan East	$\sim$
Subnet Name <b>*</b>	
Vnet1-1	~
Address range 🏷	_
10.5.0.0/24	~
10.5.0.0 - 10.5.0.255 (256 addre	esses)
DDoS protection 🛈 Basic 🚫 Standard	
Service endpoints ①	
Disabled Enabled	
Firewall ①	
Disabled Enabled	~
Create Automation options	

#### 3. Creating a virtual machine

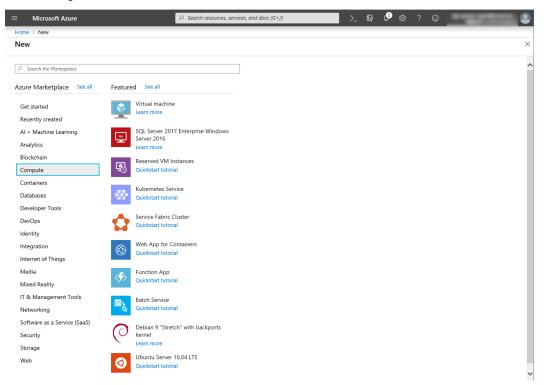
Log in to the Microsoft Azure portal (https://portal.azure.com/) and create virtual machines and disks following the steps below.

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

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

	( )	-		•			_	_	
+	[>]			<b>.</b>		۲		SQL	$\rightarrow$
Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
Recent resc	ources								
	NAME			ТҮРЕ				LAST VIEWED	
<b>{··&gt;</b>								22 min ago	
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•								29 min ago	
•								30 min ago	
8								32 min ago	
Navigate	criptions	() Resource	e groups	All r	esources	Dashb	poard		

2. Select Compute and then See all.



#### 3. Select CentOS-based 7.6

Microsoft Azure		
Home > New > Create	Select an image	
Create a virtual n		
	Marketplace My Items Previ	ew Items
Basics Disks Net	Al + Machine Learning	
reate a virtual machine	Analytics	/ Carros based
nage. omplete the Basics tab	Blockchain	CentOS-based 7.3 HPC Rogue Wave Software (formerly OpenLogic)
ustomization. ooking for classic VMs?	Compute	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
-	Containers	CentOS-based 7.6
roject details	Databases	Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
elect the subscription to our resources.	Developer Tools	
ubscription *	DevOps	CentOS-based 6.5 HPC Rogue Wave Software (formerly OpenLogic)
	Identity	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
Resource group	Integration	CentOS-based 7.4 HPC
	Internet of Things	Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
nstance details	IT & Management Tools	CentOS-based 7.7
'irtual machine name *	Media	Rogue Wave Software
egion *0	Mixed Reality	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
vailability options ①	Networking	CentOS-based 7.5 Rogue Wave Software (formerly OpenLogic)
	Security	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
vailability set *	Software as a Service (SaaS)	CentOS 7.6
nage <b>*</b> ①	Storage	Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
	Web	
zure Spot instance ①		CentOS-based 7 LVM Rogue Wave Software (formerly OpenLogic)
		This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
ize *①		CentOS-based 6.8 HPC
		Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.
Review + create		CentOS-based 7.1 HPC
		Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on ContOS and is provided by Bogue Wave Software

- 4. Click Create.
- 5. When the Basics tab appears, specify the settings of Subscription, Resource group, Virtual

machine name, Region, Image, Size, Username, Password, and Confirm password. Select Availability set from Availability options, and click Create new under the Availability set field. When Create new appears, specify the settings of Name, Fault domains, and Update domains. Then click OK.

$\equiv$ Microsoft Azure			$\rightarrow$	_ 🖟 🖓 🐵 ? 🙄 🛀 🔤 👘	
Home > New > Create a virtu	modine				
Create a virtual machi	ne				$\times$
					~
Basics Disks Networki	ng Management Advanced	Tags Review + create			- 1
Create a virtual machine that ru image.	ins Linux or Windows. Select an imag	e from Azure marketplace or use your own customiz	ed		
Complete the Basics tab then R customization.		machine with default parameters or review each tab	for full		
	e vin nom Azare markeiplace				
Project details Select the subscription to mana your resources.	age deployed resources and costs. U	e resource groups like folders to organize and mana	ge all		
Subscription *					
			~		
Resource group *			$\checkmark$		
Instance details					
Virtual machine name <b>*</b> ①	node1		$\overline{}$		
Region *					
-					
Availability options ①			~		
Availability set <b>*</b> ①	No existing availability sets in curr Create new	ent resource group and location.	$\sim$		
Image 📩	CentOS-based 7.6		$\sim$		
Azure Spot instance ①	Ves  No	5			
Size ×①	Standard D2s v3				~
Review + create	< Previous Next : Disks	>			
<					>
Microsoft Azure		Search resources, services, and docs (G+/)			
Microsoft Azure     Home > New > Create a virtu	al machine	${\cal P}$ Search resources, services, and docs (G+/)			<b>9</b> ×
Microsoft Azure     Home > New > Create a virtu     Create a virtual machi		$\mathcal P$ Search resources, services, and docs (G+,)		Create new	×
Home > New > Create a virtu		$\mathcal{P}$ . Search resources, services, and docs (G+/)		Create new Group two or more VMs in an availability set to ensure that at le one is available during planned or unplanned maintenance even	
Home > New > Create a virtu	ne		>>	Create new Group two or more VMs in an availability set to ensure that at le one is available during planned or unplanned maintenance even Learn more	
Home > New > Create a virtu Create a virtual machi Basics Disks Networkin Create a virtual machine that ru	ne 1g Management Advanced	Tags Review + create		Create new Group two or more VMs in an availability set to ensure that at le one is available during planned or unplanned maintenance even Learn more Name *	nts.
Home > New > Create a virtue Create a virtual machi Basics Disks Networkii Create a virtual machine that ru image. Complete the Basics tab then R	ne ng Management Advanced ns Linux or Windows. Select an imag	Tags Review + create from Azure marketplace or use your own customiz	ed	Create new Group two or more VMs in an availability set to ensure that at le one is available during planned or unplanned maintenance even Learn more Name * AvailabilitySet1	nts.
Home > New > Create a virtual machi Create a virtual machi Basics Disks Networkii Create a virtual machine that ru image.	ne ng Management Advanced ns Linux or Windows. Select an imag eview + create to provision a virtual	Tags Review + create from Azure marketplace or use your own customiz	ed	Create new Group two or more VMs in an availability set to ensure that at le one is available during planned or unplanned maintenance even Learn more Name * AvailabilitySet1 Fault domains ()	its.
Home > New > Create a virtual           Create a virtual machi           Basics         Disks           Networkin           Create a virtual machine that ru image.           Complete the Basics tab then R customization.           Looking for classic VMs?	ne ng Management Advanced ns Linux or Windows. Select an imag eview + create to provision a virtual	Tags Review + create from Azure marketplace or use your own customiz	ed	Create new Group two or more VMs in an availability set to ensure that at le one is available during planned or unplanned maintenance even Learn more Name * AvailabilitySet1 Fault domains ①	its.
Home > New > Create a virtual Create a virtual machine Basics Disks Networkii Create a virtual machine that ru image. Complete the Basics tab then R customization. Looking for classic VMs? Creat Project details Select the subscription to mana	ne Management Advanced ns Linux or Windows. Select an imag eview + create to provision a virtual e VM from Azure Marketplace	Tags Review + create from Azure marketplace or use your own customiz machine with default parameters or review each tab	ed for full	Create new Group two or more VMs in an availability set to ensure that at le one is available during planned or unplanned maintenance even Learn more Name * AvailabilitySet1 Fault domains ① Update domains ①	2 2
Home > New > Create a virtual Create a virtual machin Basics Disks Networkii Create a virtual machine that ru image. Complete the Basics tab then R customization. Looking for classic VMs? Creat Project details Select the subscription to mana your resources.	ne Management Advanced ns Linux or Windows. Select an imag eview + create to provision a virtual e VM from Azure Marketplace	Tags Review + create from Azure marketplace or use your own customiz machine with default parameters or review each tab	ed for full ge all	Create new Group two or more VMs in an availability set to ensure that at le one is available during planned or unplanned maintenance even Learn more Name * AvailabilitySet1 Fault domains ① Update domains ① Udse managed disks ①	2 2
Home > New > Create a virtual machi Create a virtual machine Basics Disks Networkii Create a virtual machine that ru image. Complete the Basics tab then R customization. Looking for classic VMs? Creat Project details Select the subscription to mana your resources. Subscription *⊙	ne  Management Advanced  Ins Linux or Windows. Select an imag eview + create to provision a virtual evM from Azure Marketplace Inge deployed resources and costs. Us	Tags Review + create from Azure marketplace or use your own customiz machine with default parameters or review each tab	ed for full ge all	Create new Group two or more VMs in an availability set to ensure that at le one is available during planned or unplanned maintenance even Learn more Name * AvailabilitySet1 Fault domains ① Update domains ① Udse managed disks ①	2 2
Home > New > Create a virtual Create a virtual machin Basics Disks Networkii Create a virtual machine that ru image. Complete the Basics tab then R customization. Looking for classic VMs? Creat Project details Select the subscription to mana your resources.	ne Management Advanced ns Linux or Windows. Select an imag eview + create to provision a virtual e VM from Azure Marketplace ge deployed resources and costs. Us 	Tags Review + create from Azure marketplace or use your own customiz machine with default parameters or review each tab	ed for full ge all	Create new Group two or more VMs in an availability set to ensure that at le one is available during planned or unplanned maintenance even Learn more Name * AvailabilitySet1 Fault domains ① Update domains ① Udse managed disks ①	> 2
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6. Click Change size to display Select a VM size.

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

Regarding the **Virtual machine name**, node1 is for node1, and node2 is for node2. Click **Next: Disks >** 

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

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

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Azure The si	VMs have one operatin ize of the VM determine	g system disk and a temporary s the type of storage you can u	disk for short-term stora se and the number of da	age. You can attach additional data disk ata disks allowed. Learn more	5.							
Disk	options											
OS di	isk type <b>*</b> ①	Standard HDD		· · · · · · · · · · · · · · · · · · ·	$\sim$							
Enabl	le Ultra Disk compatibili	ity 🔿 Yes 💿 No										
		Ultra Disk compatibility is n	ot available for this VM	size and location.								
You c	disks an add and configure ac orary disk.	dditional data disks for your virt	ual machine or attach ex	visting disks. This VM also comes with a								
LU		Size (GiB)	Disk type	Host caching								
Creat	e and attach a new disk	Attach an existing disk										
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#### 8. Create a new disk appears.

Specify the settings of **Name**, **Source type** and **Size**. Then click **OK**. Click **Next: Networking** >.

Home > New > Create a	virtual machine > Create a new disk	Select a disk size						
Create a new disk								
	applications and data on your VM. Disk pricir of transactions. Learn more about Azure Ma							
Name *		Standard HDD			~			
Name	node1_DataDisk_0	Size	Disk tier	Max IOPS	Max throughput			
Source type 📩	None (empty disk)	32 GiB	S4	500	60			
Size *	1024 GiB	64 GiB	S6	500	60			
	Standard SSD Change size	128 GiB	S10	500	60			
	Change size	256 GiB	S15	500	60			
		512 GiB	S20	500	60			
		1024 GiB	S30	500	60			
		2048 GiB	S40	500	60			
		4096 GiB	S50	500	60			
		8192 GiB	S60	1300	300			
		16384 GiB	S70	2000	500			
		32767 GiB	S80	2000	500			
		Create a custom size						
		Enter the size of the disk you would like to create. You will be charged the same rate for your provisioned disk, regardless of how mur the disk space is being used For example, a 200 GiB disk is provisioned on a 256 GiB disk, so you would be billed for the 256 GiB provisioned.						
		Custom disk size (GiB) *			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
ОК		ок						

9. The **Networking** tab appears.

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

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

Click **Next: Management >**.

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Home > New > Create a virt	ual machine						
Create a virtual mach	ine						×
Define network connectivity fo	r your virtual machine by configuring	network interface card (NIC) settings. You can cor	itrol				
ports, inbound and outbound Learn more	connectivity with security group rules	or place behind an existing load balancing solution	on.				
Network interface							
When creating a virtual maching	ne, a network interface will be created	for you.					
Virtual network *	Vnet1		$\sim$				
	Create new						
Subnet 📩	Vnet1-1 (10.5.0.0/24)		$\sim$				
	Manage subnet configuration						
Public IP 🕕	None		$\sim$				
	Create new						
NIC network security group	) 🔿 None 🔿 Basic 💿 Advan	ed					
Configure network security	(new) node1-nsg		$\sim$				
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	The s	gement       Advanced       Tags       Review + create         machine by configuring network interface card (NC) settings. You can control					
Load balancing							
You can place this virtual mach	nine in the backend pool of an existing	Azure load balancing solution. Learn more					
Place this virtual machine behind an existing load balancing solution?	🔿 Yes 💿 No						
Review + create	< Previous Next : Mana	gement >					>

10. The Management tab appears.

Click **Create new** under the **Diagnostics storage account** field to display **Create storage account**. Specify the settings of **Name**, **Account kind**, and **Replication**. Then click **OK**.

In the **Diagnostics storage account** field, the default value is automatically generated and entered. Click **Next: Details >**.

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Configure monitoring and man	agement options for your VM.						
Azure Security Center							
Azure Security Center provides Learn more	unified security management and a	ivanced threat protection across hybrid	cloud workloads.				
<ul> <li>Your subscription is protect</li> </ul>	ted by Azure Security Center basic	lan.					
Monitoring							
Boot diagnostics ①	● On ○ Off						
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Diagnostics storage account *	(new) testgroup1diag600 Create new		~				
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Azure Active Directory							- 1
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## EXPRESSCLUSTER X 5.0 HA Cluster Configuration Guide for Microsoft Azure (Linux), Release 3

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## 11. Click Next: Tags >.

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Create a virtual machine				×
Basics Disks Networking Management Advanced	Tags Review + create			
Add additional configuration, agents, scripts or applications via virt	ual machine extensions or cloud-init.			
Extensions				
Extensions provide post-deployment configuration and automation	1.			
Extensions ① Select an extension to install				
Cloud init				
Cloud init is a widely used approach to customize a Linux VM as it I packages and write files or to configure users and security. Learn r				
1 The selected image does not support cloud init.				
Host Azure Dedicated Hosts allow you to provision and manage a physic Azure subscription. A dedicated host gives you assurance that only choose VMs from your subscription that will be provisioned on the of the host. Learn more	VMs from your subscription are on the host, flexibility to			
Host group () No host group found	$\vee$			
Dedicated hosts cannot be used with availability sets.				
Proximity placement group Proximity placement groups allow you to group Azure resources pl	vsically closer together in the same region. Learn more			
Proximity placement group  No proximity placement groups for	ound V			· · · · · · · · · · · · · · · · · · ·
Review + create < Previous Next : Tags	>			
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12. Click **Next: Review + create >**.

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Home > New > Create a virtual machine			
Create a virtual machine			×
Basics Disks Networking Management	Advanced Tags Review + create		
Tags are name/value pairs that enable you to catego	prize resources and view consolidated billing by applying the same tag to		
multiple resources and resource groups. Learn more	about tags of		
Note that if you create tags and then change resource	ce settings on other tabs, your tags will be automatically updated.		
Name 🕕 Value 🔅	Resource		
✓ :	<ul> <li>✓ 11 selected ✓</li> </ul>		
Review + create < Previous	Next : Review + create >		
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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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Create a virtual machine							$\times$
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by Microsoft	6.0500 JPY/hr						
Terms of use   Privacy policy	Pricing for other VM sizes						
TERMS							
authorize Microsoft to bill my current payment m my Azure subscription; and (c) agree that Microso	and privacy statement(s) associated with the Marketplace offering(s) listed above. (b) ethod for the fees associated with the offering(s), with the same billing frequency as ft may share my contact, usage and transactional information with the provider(s) of actional activities. Microsoft does not provide rights for third-party offerings. See the						
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Availability set (	new) AvailabilitySet1						
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Azure Spot	lo						
Disks							
OS disk type	tandard HDD						~
Create < Previo	us Next > Download a template for automation						
<							>

4. Setting a private IP address

Log in to the Microsoft Azure portal (https://portal.azure.com/) and change the private IP address setting following the steps below. Since an IP address is initially set to be assigned dynamically, change the

setting so that an IP address is assigned statically. Change the settings of node1 and then node2.

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

Azure servi	ces								
+	()			<b>†</b>		۲		SQL	$\rightarrow$
Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
Recent reso	ources								
	NAME			TYPE				LAST VIEWED	
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<b>9</b>								29 min ago	
<u>•</u>								30 min ago	
8								32 min ago	

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

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Home > Resource groups > Test	Group1				
FestGroup1					\$ ×
	«		) Refresh $\rightarrow$ Move $\downarrow$ Export to CSV $\left  \ensuremath{ \oslash} \ensuremath{ Assign} \ensuremath{ tags} \right $	Delete	··· More
(i) Overview	^	Essentials	*		
<ul> <li>Activity log</li> </ul>		Filter by name Type == all ( Location	n == all 🕲 <sup>+</sup> Add filter		
Access control (IAM)		Showing 1 to 13 of 13 records. 🗌 Show hidden types 🛈		No grouping	$\sim$
Tags		Name ↑↓	Туре ↑↓	Location $\uparrow \downarrow$	
Events			Availability set	Japan East	
			Virtual machine	Japan East	
Settings			Network security group	Japan East	
Quickstart			Network interface	Japan East	
Deployments			Disk	Japan East	
Policies			Disk	Japan East	
🛜 Properties			Virtual machine	Japan East	
🔒 Locks			Network security group	Japan East	
Export template			Network interface	Japan East	
Cost Management			Disk	Japan East	
🙇 Cost analysis			Disk	Japan East	
Cost alerts			Storage account	Japan East	
(§) Budgets			Virtual network	Japan East	
Advisor recommendations			The second second	Jupan case	
Monitoring					
Insights (preview)					
Alerts					
Metrics		< Previous Page 1 V of 1 Next >			
Diagnostic settings	~				
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4. Select Networking.

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Home > Resource groups > TestGro	up1			
FestGroup1				Ŕ
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<ul> <li>Activity log</li> </ul>	Filter by name Type == all   Location == a	all 🕲 (+ Add filter		~
Access control (IAM)	Showing 1 to 13 of 13 records.  Show hidden types		No grouping	
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Events		Availability set	Japan East	
		Virtual machine	Japan East	
Settings		Network security group	Japan East	
Quickstart		Network interface	Japan East	
Deployments		Disk	Japan East	
Policies		Disk	Japan East	
Properties		Virtual machine	Japan East	
🗄 Locks		Network security group	Japan East	
Export template		Network interface	Japan East	
Cost Management		Disk	Japan East	
🗙 Cost analysis		Disk	Japan East	
Cost alerts		Storage account	Japan East	
Budgets		Virtual network	Japan East	
Advisor recommendations	_			
Monitoring				
Insights (preview)				
Alerts				
Metrics				
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- 5. Select a network interface displayed in the list. The network interface name is generated automatically.
- 6. Select **IP configurations**.

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Home > Resource groups > TestGroup1	> node1 - Networkir	ng 🗧 node1186 - IF	o configurations					_	
node1186 - IP configuratio	ons								×
	+ Add 🛛 Sav	ve 🗙 Discard							
Overview	IP forwarding set	ttings							
Activity log	IP forwarding			Disabled Enabled					
Access control (IAM)	Virtual network			Vnet1					
Tags	IP configurations	5							
Settings	Subnet *			Vnet1-1 (10.5.0.0/24)					$\sim$
IP configurations									
DNS servers	Search IP con	IP Version	Туре	Private IP address		D	ublic IP address		
💎 Network security group		IPv4	Primary	10.5.0.4 (Dynamic)			ablic IP address		
Properties	ipconfig1	IPV4	Primary	TU.5.0.4 (Dynamic)		-			
🔒 Locks									
🖳 Export template									
Support + troubleshooting									
📩 Effective security rules									
Effective routes									
📯 New support request									
<									>

- 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.

	$\mathcal{P}$ Search resources, services, and docs (G+/)	🗳 🐵 ? 😊	9
Home > Resource groups > TestGroup1 > node1 - Networking	> node1186 - IP configurations > ipconfig1		
ipconfig1			
🔚 Save 🗙 Discard			
The virtual machine associated with this network interface will be new private II address. The network interface will be reprovision configuration settings, including secondary IP addresses, subtra- gateway, will need to be manually reconfigured within the virtual	d and network masks, and default		
Public IP address settings Public IP address Pub			
Private IP address settings Virtual network/subnet Vnet1/Vnet1-1			
Assignment Dynamic Static P address *			
10.5.0.110	~		
<			>

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

#### 5. Configuring virtual machines

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

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

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

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

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

\$ cat	/proc/pa	rtitions	
major	minor #	blocks nar	ne
2	0	4	fd0
8	0	31457280	sda
8	1	512000	sda1
8	2	30944256	sda2
8	16	73400320	sdb
8	17	73398272	sdb1
8	32	20971520	sdc

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

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

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

#### 6. Configuring a load balancer

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

For details, see the following websites:

• Load Balancer documentaion:

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

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

Create a	Resource	Network	Virtual	Subscriptions	All resources	App Services	Storage	SQL databases	More services
resource	groups	security groups	machines	Subscriptions	Antessarees	App sciffics	accounts	SQL GUIDDISCS	more services
Recent re	sources								
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8								32 min ago	
<b>N</b> · · ·									
Navigate									
<u> </u>	oscriptions	Resource	e groups	All r	esources	Dasht			

- 2. Select Networking and then Load Balancer.
- 3. The **Create load balancer** blade is displayed. Specify **Name**. Select **Public** for **Type** and **Basic** for **SKU**, respectively.
- 4. Specify Create new, Public IP address Name and Assignment for Public IP address.
- 5. Specify **Subscription**, **Resource group**, and **Region**, and click **Review+create**. Then click **Create**. Deploying the load balancer starts. This processing takes several minutes.

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Home > New > Create load balance	r								
Create load balancer									$\times$
balancers uses a hash-based distribut	alancer that distributes incoming traffic among healthy virtual machine instances. Load on algorithm. By default, it uses a 5-tuple (source IP, source port, destination IP, on ang traffic to available servers. Load balancers can enther be internet-fairing where it is								^
accessible via public IP addresses, or i	(NAT) to route traffic between public and private IP addresses. Learn more.								
Project details									
Subscription *	۱. V								
Resource group *	TestGroup1 V								
	Create new								
Instance details									
Name *	TestLoadBalancer 🗸								
Region *	(Asia Pacific) Japan East								
Туре 🕇 🛈	O Internal   Public								
ѕки *⊙	Basic      Standard								
Public IP address									
Public IP address *	Create new      Use existing								
Public IP address name *	TestLoadBalancerPublicIP 🗸								
Public IP address SKU	Basic								
Assignment *	O Dynamic 💿 Static								~
Review + create < Previ	ous Next : Tags > Download a template for automation								
<									>

- 7. Configuring a load balancer (configuring a backend pool)
- 1. Associate a virtual machine registered to the availability set to the load balancer. After the load balancer has been deployed, select the **Resource groups** icon on the upper part of the window.

+				•				SQL	$\rightarrow$
Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
Recent resou	rces								
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languto									
🔶 Subscri	otions	Resource	e groups	All r	esources	📊 Dashi	oard		

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

Search (Ctt+/) <ul> <li>← Add file Edit columns in Delete resource group in Refresh → Mow is Export to CSV in Assign tags in Delete is Export template in Esertials             </li> <li>Orenow</li></ul>	≡ Microsoft Azure <mark>🔎 S</mark>	earch resources, services, and docs (G+/)	E & ¢	¢ ? ©	
Image and the second of th	Home > Resource groups > TestGro	oup1			
Image: Section of the section of th	Resource group				\$ ×
Overview   Activity log   Activity log   Pacess control (IAM)   Tags   Showing 1 to 18 of 18 records.   Show hidden types 0   Tags   Page   Page   Tags   Name 1,   Type 1,   Costains 1,   Name 1,   Type 1,   Costains 2,   Name 1,   Type 1,   Costains 2,   Settings   Deployments   Polic IP address   Japan East   Polic IP address   Polic IP address   Polic IP address   Japan East   Polic IP address   Japan East  <		$_{\ll}$ + Add $\equiv\equiv$ Edit columns 📋 Delete resource group 💍 Refresh	$ ightarrow$ Move $\downarrow$ Export to CSV $ $ $\oslash$ Ass	sign tags 🗊 Delete 🛓 Export te	nplate ···
i Activity log       Filter by name       (type == all @)       (tocation == all @)       (tryp Add filter)         i Access control (IAM)       Showing to 18 of 18 records.       Show hidden types ©)       No grouping         i Tags       I Name f.µ       Type f.µ       Location f.µ         i Events       I apan East       III         i Outkstart       I i i i i i i i i i i i i i i i i i i i	<ul> <li>Overview</li> </ul>		*		
Tags       Image: Tags       Image: Tags       Type f.↓       Location f.↓         Image: Tags       Image: Tags       Availability set       Japan East       Image: Tags         Settings       Image: Tags       Image: Tags       Japan East       Image: Tags         Image: Tags       Image: Tags       Image: Tags       Japan East       Image: Tags         Image: Tags       Image: Tags       Image: Tags       Japan East       Image: Tags         Image: Tags       Image: Tags       Image: Tags       Japan East       Image: Tags         Image: Tags       Image: Tags       Image: Tags       Japan East       Image: Tags       Image: Tags         Image: Tags       Imag	<ul> <li>Activity log</li> </ul>		I 🕲 († Add filter		
* Events       Name 1, *       iype 1, *       isotation 1, *         * Events       Image: Settings       Japan East       -         * Deployments       Image: Settings       Japan East       -         * Locks       Image: Settings       Japan East       -         * Locks       Image: Settings       Japan East       -         Image: Settings       Image: Settings       Japan East<	Access control (IAM)	Showing 1 to 18 of 18 records. Show hidden types ①		No grouping	$\sim$
• Events           • Availability set        Japan East             • Quickstart           • Onlogic Paddress        Japan East             • Deployments           • Onlogic Paddress        Japan East             • Deployments           • Onlogic Paddress        Japan East             • Deployments           • Onlogic Paddress        Japan East             • Policies           • Onlogic Paddress        Japan East             • Policies           • Onlogic Paddress        Japan East             • Policies           • Onlogic Paddress        Japan East             • Cost Amagement           • Onlogic Paddres        Japan East             • Cost analysis           • Onlogic Paddres        Japan East	🔷 Tags		Turne 1	Losation 🛧	
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A Locks       I G G       Network interface       Japan East          B Locks       I G G       Disk       Japan East          Cost Management       I G G       Disk       Japan East          S Cost analysis       I G G       Virtual machine       Japan East          S Cost alerts       I G G       Network interface       Japan East          S Budgets       I G G       Network interface       Japan East          Advisor recommendations       I G G       Disk       Japan East          Monitoring       I G G       Storage account       Japan East          I herts       I Tott onde blaccorth datian       Dusk/recet       Japan East          Mid Metrics       I Tott onde blaccorth datian       Dusk/recet       Japan East			Virtual machine	Japan East	•••
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Image: Cost alerts       Image: C	🙊 Cost analysis		Virtual machine	Japan East	
Image: Second secon	Cost alerts		Network security group	Japan East	
Advisor recommendations     Disk     Japan East       Monitoring     Disk     Japan East       Image: Storage account     Japan East     Image: Storage account       Image: Alerts     Image: Storage account     Japan East       Image: Monitoring     Image: Storage account     Japan East       Image: Storage account     Japan East     Image: Storage account       Image: Alerts     Image: Storage account     Japan East       Image: Monitoring     Image: Storage account     Japan East       Image: Storage account     Japan East     Image: Storage account       Image: Storage account     Image: Storage account     Japan East       Image: Storage account     Dublic ID addrace     Japan East	③ Budgets		Network interface	Japan East	
Monitoring     Control       ♥ Insights (preview)     Image: Storage account     Japan East       Image: Alerts     Image: Storage account     Japan East       Image: Monitoring     Image: Storage account     Japan East	Advisor recommendations	Sector Sector Sector S	Disk	Japan East	
Image: Storage account       Japan East          Image: Insights (preview)       Image: Im	Monitoring		Disk	Japan East	
Alerts     Alert			Storage account	Japan East	
Metrics     □ Image: Text outBalance/flublicith     Dublic ID addresse     Lanan Fast     •••       Mi Metrics     < Previous		C 🔷 TestLoadBalancer	Load balancer	Japan East	
< Previous Page 1 V of 1 Next >		Tortl and Polonear Dublic D	Dublic ID addrace	Ianan Fact	
Diagnostic settings		< Previous Page 1 V of 1 Next >			
	Diagnostic settings	·			

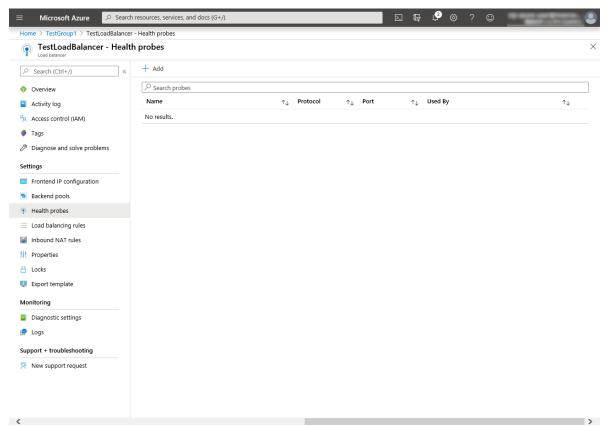
- 4. Select Backend pools.
- 5. Click Add.

	h resources, services, and docs (G+/	0		\$\$ ? ©	
Home > TestLoadBalancer - Backend po					
TestLoadBalancer - Back	end pools				
	🕂 Add 💍 Refresh				
<ul> <li>Overview</li> <li>Activity log</li> </ul>	Virtual machine	Virtual machine status	Network interface	Private IP address	
Access control (IAM)	No results				
Tags					
Diagnose and solve problems					
Settings					
<ul> <li>Frontend IP configuration</li> <li>Backend pools</li> </ul>					
Health probes					
Load balancing rules					
Inbound NAT rules					
Properties					
<ul> <li>Locks</li> <li>Export template</li> </ul>					
Monitoring					
Diagnostic settings					
📮 Logs					
Support + troubleshooting					
Rew support request					

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

$\equiv$ Microsoft Azure $\checkmark$ Search	resources, services, and docs (G+/)	D 🗣 ¢ 🔅 ? 😊 🔍
Home > TestGroup1 > TestLoadBalancer ·	- Backend pools	Add backend pool ×
TestLoadBalancer - Backer	nd pools	
	+ Add 🖒 Refresh	Name * TestBackendPool
Overview     Activity log	Virtual machine Virtual machine status	Virtual network ① Vnet1
Access control (IAM)	No results	IP version
<ul> <li>Tags</li> </ul>		IPv4 IPv6
Diagnose and solve problems		Associated to ①
Settings		Virtual machine V
Frontend IP configuration		Virtual machines
Sackend pools		Virtual Machines Virtual Machines must be in same location as Load Balancer. Only IP configurations that have
P Health probes		the same SKU (Basic/Standard) as the Load Balancer can be selected. All of the IP configurations have to be in the same Virtual Network.
듣 Load balancing rules		-
Inbound NAT rules		Virtual machine IP address
Properties		node1 ipconfig1 (10.5.0.110)
🔒 Locks		node2 ipconfig1 (10.5.0.111)
Export template		
Support + troubleshooting		
		Add

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



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

≡	Microsoft Azure		Ŀ	₽_	₽		0	O PERSONAL PROPERTY.	
Hor	me > TestGroup1 > Test	LoadBalancer - Health probes > Add health probe							
Ac Test	ld health probe								$\times$
Nai	me *								
Te	estHealthProbe	~ 							
Pro	tocol ①								
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Por	rt <b>*</b> ①								
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5		seconds							
11-1	healthy threshold <b>*</b> 🛈	seconds							
2									
		consecutive failures							
	ОК								
									`

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

$\equiv$ Microsoft Azure $\checkmark$ Search	n resources, services, and docs (G	+/)		Ç (	÷	? 🙂	the same low to same	
Home > TestGroup1 > TestLoadBalancer								
TestLoadBalancer - Load	balancing rules							×
	+ Add							
Overview	<u>م</u>							
<ul> <li>Activity log</li> </ul>	Name	$\uparrow_{\downarrow}$ Load balancing rule	$\uparrow_{\downarrow}$ Backend pool		$\uparrow_{\downarrow}$	Health probe	• ↑↓	
Access control (IAM)	No results.							
🔶 Tags								
Diagnose and solve problems								
Settings								
Frontend IP configuration								
Backend pools								
Health probes								
😑 Load balancing rules								
Inbound NAT rules								
III Properties								
🔒 Locks								
🖳 Export template								
Monitoring								
Diagnostic settings								
🧐 Logs								
Support + troubleshooting								
Rew support request								
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- 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		vices, and docs (G+/)			Ģ	l 🖓	?	$\odot$	
Hom	ne > TestGroup1 > Test	tLoadBalancer - Load balanc	ng rules > Add load bala	ncing rule						
Ad Test	d load balancing r	rule								$\times$
Nan	ne *									
Te	stLoadBalancingRule			~						
IP V	rersion *									
	IPv4 O IPv6									
Fror	ntend IP address *									
52	.185.154.20 (LoadBalancer	erFrontEnd)		$\sim$						
	tocol									
۲	TCP 🔘 UDP									
Port										
80	)									
	kend port *									
80	180			~						
	kend pool ①									
Te	stBackendPool			$\sim$						
Hea	lth probe 🕕									
Te	stHealthProbe (TCP:26001	1)		$\sim$						
Sess	sion persistence 🛈									
No	one			$\sim$						
Idle	timeout (minutes) 🕕									
0				4						
Floa	ating IP (direct server retu	um) 🛈								
Di	isabled Enabled									
	ок									
<										>

## 10. Setting the inbound security rules

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

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

	Microsoft Azure	P Network secuity group		× D G 4	e 🗧	? ©	100 C			
	Azure servic		See all	Marketplace				~		
		Network security groups		Network security group						
	+	🜍 Network security groups (classic)		Azure Network Security Group Analytics		SQL	$\rightarrow$			
	Create a resource	Virtual networks		Documentation		atabases	More services			
	resource	Application security groups		Deploy Azure Multi-Factor Authentication - Azure Activ	/e					
		A Groups		Resource Groups						
	Recent reso			No results were found.						
Name		Atwork Watcher								
	🚸 TestLoadBala	The Host groups				in ago				
		(A) Management groups				go				
		[i] Resource groups				go				
	-	Resources				-				
	AvailabilitySe	No results were found.				go				
	cluster1.zone	Searching all subscriptions. Change				go				
	[iii] TestGroup1		Res	ource group	1 h a	ago				
	TestLoadBala	ncerPublicIP	Pub	olic IP address	1 h a	ago				
	😨 (		Virt	ual machine	4 d a	ago				
	📮 :		Virt	ual machine	4 d a	ago				
	📮 :		Virt	ual machine	4 d a	ago				
	<b>(3</b> )		Net	twork interface	4 d a	ago				
	<b>6</b>		Net	work interface	4 d a	ago				
	Navigate	ions () Resource groups		All resources	Dashboard	d				
	Tools							~		

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

	ch resources, services	5, and docs (G+/)	_		D 🖟 🗳 🚳	?©	A 100		
Home > Network security groups > not node1-nsg	de1-nsg							ŵ	
Network security group	→ Move	Delete 🜔 Refresh							
	Essentials								
🖻 Overview	Inbound secur	ity rules							
Activity log				Protocol	I Source Destination Action				
Access control (IAM)	1000	A default-allow-ssh	22	TCP	Any	Any	Allow		
Tags	1010		22	TCP	Any	Any	Allow		
Diagnose and solve problems	65000	AllowVnetinBound	Any		VirtualNetwork	VirtualNetwork	Allow		
ettings	65000	AllowAzureLoadBalancerinBound	Any	Any	AzureLoadBalancer				
Inbound security rules	65500	DenyAllinBound		Any			Allow     Deny		
Outbound security rules	65500	DenyAlimbound	Any	Any	Any	Any	• Deny		
Network interfaces	Outbound sec	urity rules							
<ul> <li>Subnets</li> </ul>	Priority	Name	Port	Protocol	Source	Destination	Action		
Properties	65000	AllowVnetOutBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow		
Locks	65001	AllowinternetOutBound	Any	Any	Any	Internet	Allow		
Export template	65500	DenyAllOutBound	Any	Any	Any	Any	Oeny		
Monitoring									
Diagnostic settings									
Logs NSG flow logs									
NSG TOW logs									
support + troubleshooting									
Effective security rules									
Rew support request									

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

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

Microsoft Azure		ces, services, and docs	) 🖓 Ф 🕸 ? 🙂 💶 🥥						
← Create a resource ↑ Home	Home > Network security groups > NetSecGroup NetWork security grou 《 ポ × 副意のティレクトリ(WRG) + Add   Edit columns  ・・・ More	1 - Inbound security rules VetSecGroup1 - Inbound sec Network security group	Image: Add inbound security rule     ×       Medicalmost     ★       Basic     ★						
Dashboard     All services     All vorites	Filter by name	<ul> <li>Overview</li> <li>Activity log</li> </ul>	• Source () Any ~ • Source port ranges ()						
All resources     Resource groups     App Services     Function Apps	Image: state state state       Image: state state state	Access control (IAM)     Tags     Diagnose and solve problems     Settings	Destination @     Any     Costination port ranges @						
SQL databases Azure Cosmos DB Virtual machines		settings	880 • Protocol Any TCP UDP • Action						
Load balancers     Storage accounts     O Virtual networks	V NetSecGroup1	<ul> <li>Subnets</li> <li>Properties</li> <li>Locks</li> </ul>	Allow Deny  Priority  Toto						
<ul> <li>Azure Active Directory</li> <li>Monitor</li> <li>Advisor</li> </ul>	0 si ingenitiens 0 sensemens 0 sensemens	Automation script Monitoring     Jiagnostic settings	Vane     FetHTP     V  Description						
Security Center     Cost Management + Bill     Help + support     Subscriptions	anti-antificant reg     anti-antificant reg     anti-antificant reg     org     mains more remains	NSG flow logs Support + troubleshooting  Effective security rules							
App registrations		New support request	Add						

Then, check <*Load\_balancer\_frontend\_IP(public\_IP\_address)*> specified in the script before recovery action of the multi target monitor resource that is set in "3. Adding a monitor resource". Write down the confirmatory result.

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

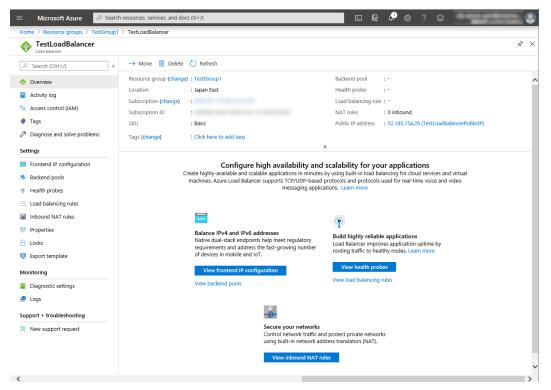
+	[]	ę	<b>.</b>	+		۲		SQL	$\rightarrow$
Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
Recent res	ources								
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Navigate									
<b>J</b>									
🔶 Sub:	scriptions	Resource	e groups	All	resources	🗔 Dashi	poard		

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

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

Home > Resource groups > TestGro	1000	D &	\$ ? ☺	
FestGroup1				Ń
	« + Add ≡≡ Edit columns 🗊 Delete resource group Č	Refresh $\rightarrow$ Move $\downarrow$ Export to CSV $ $ $\otimes$ As	ssign tags 🗊 Delete 🞍 Export te	mplate   ···
<ul> <li>Overview</li> </ul>	Essentials	*		
<ul> <li>Activity log</li> </ul>		on == all 🕲 (* Add filter		
Access control (IAM)	Showing 1 to 18 of 18 records. Show hidden types ①		No grouping	~
🔶 Tags	□ Name ↑↓	туре ↑↓	Location ↑↓	
Events		Availability set	Japan East	
Settings		DNS zone	global	
ڬ Quickstart		Public IP address	Japan East	
Deployments		Public IP address	Japan East	
Policies		Virtual machine	Japan East	
Properties		Network security group	Japan East	
🔒 Locks		Network interface	Japan East	
Export template		Disk	Japan East	
Cost Management		Disk	Japan East	
a Cost analysis		Virtual machine	Japan East	
Cost alerts		Network security group	Japan East	
Budgets		Network interface	Japan East	
Advisor recommendations		Disk	Japan East	
Monitoring		Disk	Japan East	
Insights (preview)		Storage account	Japan East	
<ul> <li>Insignts (preview)</li> <li>Alerts</li> </ul>	C 🔷 TestLoadBalancer	Load balancer	Japan East	
Metrics	Tortt oodPalancorDublictD	Dublic ID addrace	Ionon Fact	
Diagnostic settings	< Previous Page 1 V of 1 Next >			

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 "Determining a system configuration" in the Installation and Configuration Guide.

### 12. Installing EXPRESSCLUSTER

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

## 13. Registering the EXPRESSCLUSER license

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

# 5.3 Configuring the EXPRESSCLUSTER settings

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

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

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

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

### 1) Creating a cluster

Start the Cluster generation wizard to create a cluster.

- Creating a cluster
  - 1. Access Cluster WebUI, and click Cluster generation wizard.

Cluster WebUI <cluster></cluster>			P Col	nfig mode 🗸	🛃 🕓	<b>G</b> 👂	i	? ≝
Cluster generation wizard	Export Get the Configuration File	Apply the Configuration File	Update Server Data	Check the Configu	ration File			

2. Cluster of Cluster generation wizard is displayed.

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

Cluster generation wizard	×						
Server     Server       Cluster     →       Basic Settings     →       Interconnect     →	Server ▶ NP Resolution → Group → Monitor						
Cluster Name*	Cluster1						
Comment							
Language*	English 🗸						
Management IP Address							
Start generating the cluster.     Enter the cluster name, and then select the language (locale) of the environment that runs WebManager.     If using the integrated WebManager to manage multiple clusters, specify a unique cluster name to identify the cluster.     The management IP address is a floating IP address used for a WebManager connection. If establishing connections by specifying each server IP address, the     management IP address can be omitted.     To continue, click [Next].							
	Back Next      Cancel						

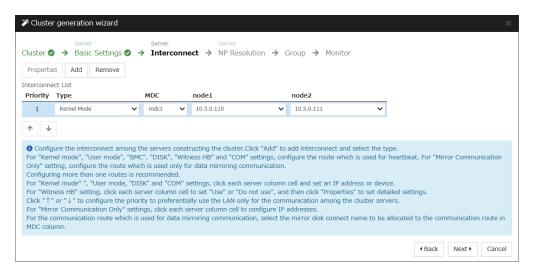
3. The **Basic Settings** window is displayed.

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 r	used.	
		ОК Са	incel
	Cluster generation wizard Server Server Server uster ♥ → Basic Settings → Interconnect → NP Resolution → (	Sroup -> Manitar	×
Se	Add Remove		
_	Vrder         Name           faster server         node1		
1			
•	↓ 1		
Se	erver Group Definition	Settings	
0	⑦ Click "Add" to add servers constructing the cluster. Lick 「↑」 or 「↓」 to change the server priority. Lick "Settings" to configure the server group when using the server group.		
		4 Back Next I	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**.

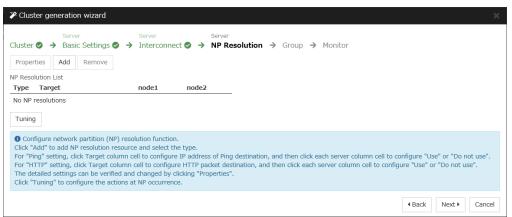


5. The NP Resolution window is displayed.

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

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





### 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     Server     Server       Cluster ♥ →     Basic Settings ♥ →     Interconnect ♥ →     NP Resolution ♥       Properties     Add     Remove	→ Group → Monitor Group Resource
Group List Name	Туре
No groups	
<ul> <li>Configure failover group to be a unit of fail over.</li> <li>Click "Add" to add a group.</li> <li>Click "Properties" to configure the properties of the selected group.</li> <li>Click "Group Resource" to add resource to the selected group.</li> </ul>	

2. The Group Definition window is displayed.

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

Group Definition	f	ailover 🗙
Basic Settings → Startup Servers	➔ Group Attributes ➔ Group Resource	
Туре*	failover 🗸	
Use Server Group Settings		
Name*	failover1	
Comment		
<ul> <li>Select group type.</li> <li>If using virtual machine resources to clust "Failover".</li> <li>If using server group, check the "Use Server gr</li></ul>	ter virtual machines, select "Virtual machine" as the type. In other cases ver Group".	, select
	4 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 Defin	ition							fa	ailover 🗙
Basic Setting	gs 🛇 🔶 S	tartup Se	rvers 🛇	➔ Group	Attributes 📀	→	Group Resource		
Properties	Add Re	emove							
Group Resour	ce List								
Name					Туре				
No resources	5								
-	dd" to add res rties" to config		operties of	the selecte	d resource.				
							<ul> <li>▲ Back</li> </ul>	Finish	Cancel

• Mirror disk resource

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

- 1. Click Add on the Group Resource List page.
- 2. The Resource Definition of Group | failover1 window is displayed.

Select the group resource type (Mirror disk resource) from the **Type** box and enter the group name (md) in the **Name** box. Click **Next**.

Resource Definition of Group   failover1					
<b>Info</b> → Dependency → Recovery	Operation 🗲 Details				
Туре*	Mirror disk resource $\checkmark$				
Name*	md				
Comment					
Get License Info					
• 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. 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 Common node1 node2	overy Operation $\oslash$ $\rightarrow$	Details		
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 "Group resource details" in the Reference Guide.

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

Resource Definition of Group   failover1 azurep				
<b>Info</b> → Dependency → Recovery	Operation 🔶 Details			
Type*	Azure probe port resource $\checkmark$			
Name*	azurepp1			
Comment				
Get license information				
<b>3</b> 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).

Resource Definition of Group   failover1			
Info $\bigcirc$ $\rightarrow$ Dependency $\oslash$ $\rightarrow$ Rec	overy Operation 🤣 🔶 Details		
Probeport*	26001		
Tuning			
		Back Finish Cancel	

6. Click Finish.

#### 3) Adding a monitor resource

• Azure probe port monitor resource

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

Azure load balance monitor resource

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

• Custom monitor resource

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

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

Monitor Resource Definition		genw 🗙
Info → Monitor(common) → Mon	itor(special) → Recovery Action	
Туре*	Custom monitor 🗸 🗸	
Name*	genw1	
Comment		
Get Licence Info		
• Select the type of monitor resource an	nd enter its name.	
		Gack     Next      Cancel

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     Alw		
○ Active		
Target Resource		Browse
Nice Value		0
Choose servers that execute monitoring	Server	

4. The Monitor (special) window is displayed.

# Select Script created with this product.

The following shows the sample of a script to be created.

#! /bin/sh

```
<EXPRESSCLUSTER_installation_path>/bin/clpazure_port_checker ?h_

management.core.windows.net -p 443

exit $?
```

## Select Synchronous for Monitor Type. Click Next.

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

5. The Recovery Action window is displayed.

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

Monitor Resource Definition					genw 🗙
Info 🛛 🔸 Monitor(common) 🖉 🔿		Monitor(special) 📀 🔶 Re	covery Action	ı	
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
				<ul> <li>▲ Back</li> </ul>	Finish Cancel

- 6. Click **Finish** to finish setting.
- IP monitor resource

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

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

Monitor Resource Definition		ipw 🗙
Info → Monitor(common) → Mor	nitor(special) 🔶 Recovery Action	
Туре*	IP monitor	
Name*	ipw1	
Comment		
Get Licence Info		
• Select the type of monitor resource a	nd enter its name.	

3. The Monitor (common) window is displayed.

Confirm that Monitor Timing is Always.

Monitor Resource Definition			ipw 🗙
Info 🛇 🔶 Monitor(common) 🄶 Monitor(special)	→ Recovery	Action	
Interval*	30	sec	
Timeout*	30	sec	
Collect the dump file of the monitor process at timeout occurrence			
Do Not Retry at Timeout Occurrence			
Do Not Execute Recovery Action at Timeout Occurrence			
Retry Count*	0	time	
Wait Time to Start Monitoring*	0	sec	
Monitor Timing			
Always			
○ Active			
Target Resource			Browse
Nice Value			0
Choose servers that execute monitoring	Server		
		▲ Back N	ext   Cancel

Select one available server for Choose servers that execute monitoring.

Failure Detection Server			
<ul> <li>All servers</li> <li>Select</li> <li>Servers that can run the Group</li> </ul>		Available Servers	
Name node1	<b>←</b> Add	Name node2	
	→ Remove		
			OK Cancel Apply

# Click Next.

4. The Monitor (special) window is displayed.

I Back

Next 🕨

Cancel

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	

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 🗙
Common node1 node2 Edit Add Remove IP Address List IP Address	→ Monitor(special) → Recovery Action	
10.5.0.111		

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.

# EXPRESSCLUSTER X 5.0 HA Cluster Configuration Guide for Microsoft Azure (Linux), Release 3

Monitor Resource Definition					ipw 🗙
Info ⊘ → Monitor(common) ⊘ →		Monitor(special) 📀 🔶 Rec	covery Actior	ı	
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	~	• Back	Script Settings 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.
- 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.
- The Recovery Action window is displayed.
   Select Execute only the final action for Recovery Action, LocalServer for Recovery Target, and No operation for Final action.
- 12. Click **Finish** to finish setting.
- Multi target monitor resource

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

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

Monitor Resource Definition		mtw 🗙
Info → Monitor(common) → Mor	itor(special) 🔶 Recovery Action	
Туре*	Multi target monitor	
Name*	mtw1	
Comment		
Get Licence Info		
• Select the type of monitor resource an	nd 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		mtw 🗙
Info 🛇 🔶 Monitor(common) 🔶 Monitor(special)	→ Recovery	/ Action
Interval*	30	sec
Timeout*	30	sec
Collect the dump file of the monitor process at timeout occurrence		
Do Not Retry at Timeout Occurrence		
Do Not Execute Recovery Action at Timeout Occurrence		
Retry Count*	0	time
Wait Time to Start Monitoring*	0	sec
Monitor Timing		
Always		
○ Active		
Target Resource		Browse
Nice Value		0
Choose servers that execute monitoring	Server	

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**.

info 🥏 🔶 Monitor(com 1onitor Resources	mon) 🤍 🤿 Moni	tor(special) →	Available Monitor Resources	
Monitor Resource	Туре	←	Monitor Resource	Туре
genw1	genw	Add	No Available Monitor Resources	
ipw1	ipw	<b>→</b>		
ipw2	ipw	Remove		
Tuning				

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)   → Recovery A	ction
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	$\checkmark$
		Script Settings
		- Back Calicel

6. The script editing dialog box is displayed.

Select **Script created with this product** and click **Edit** to edit the script. The following shows the sample of a script to be created.

Specify the following by referring to "4.1. Creation example" The ports differ depending on operations.

- Load balancing rule > Backend port of the load balancer

- Load balancing rule > Port of the load balancer

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

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

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

Edit Script					×
<ul> <li>User Application</li> <li>Script created with this presence of the second se</li></ul>	oduct				
File	preaction.sh				
			Edit	View	Replace
Timeout*	5	sec			
			OK	Cancel	Apply

7. Click Finish to finish setting.

# 4) Setting the cluster properties

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

• Cluster properties

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

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

Comment		
Language	English 🗸	

- 2. Select the **Timeout** tab. For **Timeout** of **Heartbeat**, specify a value calculated by "A+B+C" as described below.
  - A: Interval of the monitor resource being monitored by the multi target monitor resource for NP resolution x (Retry Count+1)
    - \* Among three monitor resources, select the monitor resource whose calculation result is the largest.
  - B: Interval of the multi target monitor resource x (Retry Count+1)
  - C: 30 seconds (Waiting time for heartbeat not to time out before the multi target monitor resource detects an error. The time can be changed accordingly.

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

Server Sync Wait Time*	5	min	
Heartbeat			
Interval*	3	sec	
Timeout*	120	sec	
Server Internal Timeout*	180	sec	
Initialize			
			OK 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 -> How to create a cluster

# 5.4 Verifying the created environment

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

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

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

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

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

# 6.1 Creation example

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

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

• Microsoft Azure settings (common to node1 and node2)

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

Continued on next page

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

## Table 6.1 – continued from previous page

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

Setting item	Setting value				
	node1	node2			
Virtual machine setting	Standard HDD				
– Disk type	Standard HDD				
– User name	testlogin				
– Password	PassWord_123				
– Resource group	TestGroup1				
– Region	(Asia Pacific) Japan East				
Network security group setting					
– Name	node1-nsg	node2-nsg			
– Availability set setting					
– Name	AvailabilitySet1				
– Update domains	5				
– Fault domains	2				
Diagnostics storage account setti	ing				
– Name	Automatically generated				
– Performance	Standard				
– Replication	Locally-redundant storage (LRS)				
IP configuration setting					
– IP address	10.5.0.110	10.5.0.111			
Disk setting					
– Name	node1_DataDisk_0	node2_DataDisk_0			
– Source type	None (empty disk)	1			
– Account type	Standard HDD				
– Size	20				

• EXPRESSCLUSTER settings (cluster properties)

Setting item	Setting value	
	node1	node2
– Cluster Name	Cluster1	
– Server Name	node1	node2
– NP Resolution Tab: Type	Ping	
– NP Resolution Tab: Ping Target	10.5.0.5	
– NP Resolution Tab: <server> column</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 Device	/dev/sdc2
	Name	
	Details Tab: Cluster Partition De-	/dev/sdc1
	vice 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)
Exec resource (for DSR)	Name	exec1

# • EXPRESSCLUSTER settings (monitor resource)

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

# 6.2 Configuring Microsoft Azure

# 1) Creating a resource group

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

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

+	[>]	V		+		۲		SQL	$\rightarrow$
Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
Recent reso	urces								
I	NAME			ТҮРЕ				LAST VIEWED	
$\Leftrightarrow$								22 min ago	
								24 min ago	
()								24 min ago	
								26 min ago	
								26 min ago	
								27 min ago	
•••								28 min ago	
9								28 min ago	
<b>60</b>								28 min ago	
•								29 min ago	
•								30 min ago	
8								32 min ago	
Navigate									
ivavigate									
🔶 Subsci	riptions	Resource	e aroups	All r	esources	Dashi	oard		

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

■ Microsoft Azure		>_ 16, ₽ @ ? ☺	
Home > Resource groups			
Resource groups			\$
+ Add ≡≡ Edit columns 🕐 Refresh 🞍 Export to CSV	🕅 Assign tags 🛛 🛇 Feedback		
Subscription == all	cation == all		
Showing 1 to 30 of 30 records.		No grouping	$\sim$
Name ↑↓	Subscription $\uparrow_{\downarrow}$	Location ↑↓	
		Japan East	
		Southeast Asia	
		West US	
		South Central US	
		South Central US	•••
		Japan West	
		East Asia	
		South Central US	
		South Central US	
		North Europe	
		South Central US	
		South Central US	
		Central US	
		Japan East	
		West India	
		Japan East	
		Japan East	
		Japan East	

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

$\equiv$ Microsoft Azure		$\mathcal P$ Search resources, services, and docs (G	î+/)	>_ 🛱	0 Ø	? 😳	1000	
Home > Resource groups > C	Create a resource group							
Create a resource grou	qu							×
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Resource details Region ★⊙	(Asia Pacific) Japan East		Y					
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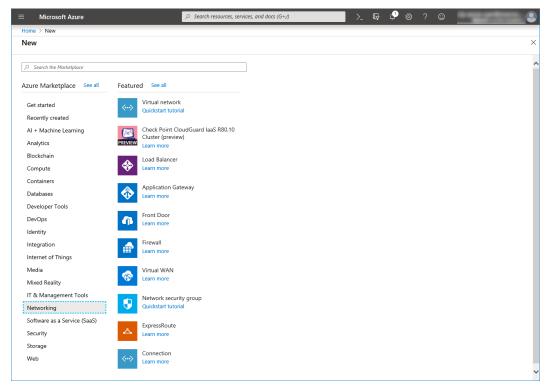
2) Creating a virtual network

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

Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
Recent reso	ources								
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1. Select the Create a resource icon on the upper partof the window.

2. Select Networking and then Virtual network.



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

≡ Microsoft Azure	_
Home > New > Create virtual network	
Create virtual network	×
Name *	~
Vnet1 🗸	
Address space *	
10.5.0.0/24	
10.5.0.0 - 10.5.0.255 (256 addresses)	
Add an IPv6 address space 🕕	
ubscription *	
Resource group *	
TestGroup1	
Create new	
Location *	
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Subnet	
Name * Vnet1-1	
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10.5.0.0 - 10.5.0.255 (256 addresses)	
DDoS protection ① ● Basic   Standard	
Service endpoints ① Disabled Enabled	
Firewall ①	
Disabled Enabled	~
Create Automation options	

### 3) Creating a virtual machine

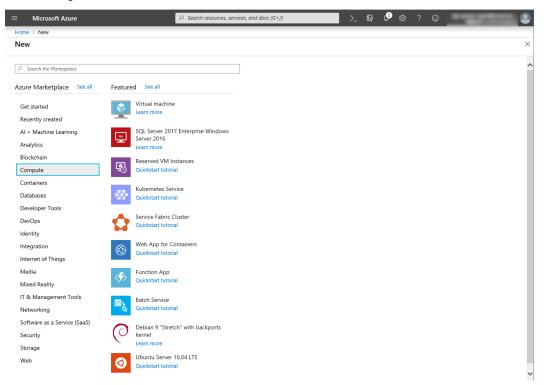
Log in to the Microsoft Azure portal (https://portal.azure.com/) and create virtual machines and disks following the steps below.

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

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

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Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
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2. Select Compute and then See all.



#### 3. Select CentOS-based 7.6.

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Create a virtual m			
	Marketplace My Items Prev	iew Items	
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ustomization. ooking for classic VMs?	Compute	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
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Resource group	Identity	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
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	Internet of Things	Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
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'irtual machine name *	Media	Rogue Wave Software This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
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vailability options ①	Networking	CentOS-based 7.5 Rogue Wave Software (formerly OpenLogic)	
vailability set <b>*</b> ①	Security	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
valiability set	Software as a Service (SaaS)	CentOS 7.6	
nage <b>*</b> ©	Storage	Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Roque Wave Software.	
5 -	Web	CentOS-based 7 LVM	
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Review + create		CentOS-based 7.1 HPC	
		Rogue Wave Software (formerly OpenLogic)	

- 4. Click Create.
- 5. When the Basics tab appears, specify the settings of Subscription, Resource group, Virtual

machine name, Region, Image, Size, Username, Password, and Confirm password. Select Availability set from Availability options, and click Create new under the Availability set field. When Create new appears, specify the settings of Name, Fault domains, and Update domains. Then click OK.

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	teview + create to provision a virtual	machine with default parameters or review each tab for full		
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Region *①	(Asia Pacific) Japan East	~		
Availability options 🕕	Availability set	~		
Availability set <b>*</b> ①	No existing availability sets in curr	ent resource group and location.		
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6. Click Change size to display Select a VM size.

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

Regarding the **Virtual machine name**, node1 is for node1, and node2 is for node2. Click **Next: Disks >** 

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

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

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Home > New > Create a vir	tual machine								
Create a virtual mach	ine								×
Basics Disks Network	ing Management Advar	iced Tags Review	+ create						
Azure VMs have one operatin The size of the VM determine	g system disk and a temporary o s the type of storage you can us	lisk for short-term storag e and the number of data	e. You can attach additional data d disks allowed. Learn more	sks.					
Disk options									
OS disk type 📩	Standard HDD			$\checkmark$					
Enable Ultra Disk compatibili ①	ty 🔿 Yes 💿 No Ultra Disk compatibility is no	ot available for this VM s	ize and location.						
Data disks									
You can add and configure ad temporary disk.	lditional data disks for your virtu	al machine or attach exis	ting disks. This VM also comes with	a					
LUN Name	Size (GiB)	Disk type	Host caching						
Create and attach a new disk	Attach an existing disk								
✓ Advanced									
Review + create	< Previous Next	Networking >							
/									\ \

## 8. Create a new disk appears.

Specify the settings of **Name**, **Source type** and **Size**. Then click **OK**. Click **Next: Networking** >

Home > New > Create a	virtual machine > Create a new disk	Select a disk size			
Create a new disk		Browse available disk siz			
	applications and data on your VM. Disk prici of transactions. Learn more about Azure Ma	Account type ①	es and their reatures.		
Name *	node1_DataDisk_0	Standard HDD			~
	hode I_DataDisk_0	Size	Disk tier	Max IOPS	Max throughput
Source type *	None (empty disk)	32 GiB	S4	500	60
Size *	1024 GiB	64 GiB	S6	500	60
	Standard SSD	128 GiB	S10	500	60
	Change size	256 GiB	S15	500	60
		512 GiB	S20	500	60
		1024 GiB	S30	500	60
		2048 GiB	S40	500	60
		4096 GiB	S50	500	60
		8192 GiB	S60	1300	300
		16384 GiB	S70	2000	500
		32767 GiB	S80	2000	500
		Create a custom size			
		Enter the size of the disk	you would like to create. You will	be charged the same rate for your p	provisioned disk, regardless of how much of
			sed For example, a 200 GiB disk is	provisioned on a 256 GiB disk, so y	ou would be billed for the 256 GiB
		provisioned.			
		Custom disk size (GiB)	k		
		20			~
ОК		ОК			

9. The Networking tab appears.

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

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

Click **Next: Management >**.

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Home > New > Create a virt	ual machine						
Create a virtual mach	ine						×
Define network connectivity fo	ing Management Advanced	network interface card (NIC) settings. You can cor	itrol				
ports, inbound and outbound Learn more	connectivity with security group rules	or place behind an existing load balancing solution	on.				
Network interface							
When creating a virtual maching	ne, a network interface will be created	for you.					
Virtual network *	Vnet1		$\sim$				
	Create new						
Subnet 📩	Vnet1-1 (10.5.0.0/24)		$\sim$				
	Manage subnet configuration						
Public IP 🕕	None		$\sim$				
	Create new						
NIC network security group	) 🔿 None 🔿 Basic 💿 Advan	ed					
Configure network security	(new) node1-nsg		$\sim$				
group *	Create new						
Accelerated networking ①	🔿 On 💿 Off						
	The s	elected VM size does not support accelerated ne	tworking.				
Load balancing							
You can place this virtual mach	nine in the backend pool of an existing	Azure load balancing solution. Learn more					
Place this virtual machine behind an existing load balancing solution?	🔿 Yes 💿 No						
Review + create	< Previous Next : Mana	gement >					>

10. The Management tab appears.

Click **Create new** under the **Diagnostics storage account** field to display **Create storage account**. Specify the settings of **Name**, **Account kind**, and **Replication**. Then click **OK**.

In the **Diagnostics storage account** field, the default value is automatically generated and entered. Click **Next: Details >** 

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Configure monitoring and man	agement options for your VM.						
Azure Security Center							
Azure Security Center provides Learn more	unified security management and a	ivanced threat protection across hybrid	cloud workloads.				
<ul> <li>Your subscription is protect</li> </ul>	ted by Azure Security Center basic	lan.					
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Boot diagnostics ①	● On ○ Off						
OS guest diagnostics ①	🔿 On 🖲 Off						
Diagnostics storage account *	(new) testgroup1diag600 Create new		~				
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# EXPRESSCLUSTER X 5.0 HA Cluster Configuration Guide for Microsoft Azure (Linux), Release 3

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Tags are name/value pairs that enable you to catego	prize resources and view consolidated billing by applying the same tag to		
multiple resources and resource groups. Learn more	about tags of		
Note that if you create tags and then change resource	ce settings on other tabs, your tags will be automatically updated.		
Name 🕕 Value 🛈	Resource		
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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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Basics							
Subscription	E. (1998) (1.179)						
Resource group TestG	roup1						
Virtual machine name node1							
Region (Asia I	Pacific) Japan East						
Availability options Availa	bility set						
Availability set (new)	AvailabilitySet1						
Authentication type Passw	ord						
Username testlo	gin						
Azure Spot No							
Disks							
OS disk type Stand	ard HDD						~
Create < Previous	Next > Download a template for automation						
<							>

4) Setting a private IP address

Log in to the Microsoft Azure portal (https://portal.azure.com/) and change the private IP address setting following the steps below. Since an IP address is initially set to be assigned dynamically, change the

setting so that an IP address is assigned statically. Change the settings of node1 and then node2.

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

+			•	•			-	SQL	$\rightarrow$
Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
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- 2. Select TestGroup1 from the resource group list.
- 3. The summary of TestGroup1 is displayed. Select virtual machine node1 or node2 from the item list.

Microsoft Azure		
Home > Resource groups > TestG	roup1	* *
<ul> <li>Resource group</li> </ul>	\[	··· More
	Essentials	. more
<ul><li>Overview</li></ul>	^	
Activity log	Filter by name	o grouping V
Access control (IAM)	Showing 1 to 13 of 13 records. Show hidden types	s grouping V
Tags	Name ↑↓     Type ↑↓     Location ↑	`↓
Events	Availability set Japan East	
	Virtual machine Japan East	
Settings	Network security group Japan East	
Quickstart	Network interface Japan East	
Deployments	Disk Japan East	
Policies	Disk Japan East	
🐲 Properties	Virtual machine Japan East	
🔒 Locks	Network security group Japan East	
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Cost Management		
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	Storage account Japan East	
Budgets	Virtual network Japan East	•
Advisor recommendations		
Monitoring		
Insights (preview)		
Alerts		
Metrics		
Diagnostic settings	Previous Page 1 v of 1 Next >	
		>

4. Select Networking.

Microsoft Azure		> ☞ ்	? ©	
Home > Resource groups > TestGro	up1			
FestGroup1				Ŕ
	≪ + Add ≡≡ Edit columns	resh $\rightarrow$ Move $\downarrow$ Export to CSV $\mid$ $\otimes$ Assign	n tags 🛛 🗐 Delete	··· More
<ul> <li>Overview</li> </ul>	Essentials	*		
<ul> <li>Activity log</li> </ul>	Filter by name Type == all   Location == a	all 🕲 (+ Add filter		~
Access control (IAM)	Showing 1 to 13 of 13 records.  Show hidden types		No grouping	
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		Virtual machine	Japan East	
Settings		Network security group	Japan East	
Quickstart		Network interface	Japan East	
Deployments		Disk	Japan East	
Policies		Disk	Japan East	
Properties		Virtual machine	Japan East	
🗄 Locks		Network security group	Japan East	
Export template		Network interface	Japan East	
Cost Management		Disk	Japan East	
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Cost alerts		Storage account	Japan East	
Budgets		Virtual network	Japan East	
Advisor recommendations	_			
Monitoring				
Insights (preview)				
Alerts				
Metrics				
	< Previous Page 1 V of 1 Next >			

- 5. Select a network interface displayed in the list. The network interface name is generated automatically.
- 6. Select **IP configurations**.

$\equiv$ Microsoft Azure			ources, services,	and docs (G+/)	>_ 🛱	¢ 🖗			100	
Home > Resource groups > TestGroup1	> node1 - Networkir	ng 👌 node1186 - IP	configurations	;						
node1186 - IP configuratio	ons									$\times$
	🕂 Add  🗄 Sav	ve 🗙 Discard								
Overview	IP forwarding set	ttings								
Activity log	IP forwarding			Disabled Enabled						
Access control (IAM)	Virtual network			Vnet1						
Tags	IP configurations									
Settings	Subnet *			Vnet1-1 (10.5.0.0/24)						$\sim$
IP configurations										
DNS servers	Name	IP Version	Type	Private IP address			Public IP ad	dress		
💎 Network security group	ipconfig1	IPv4	Primary	10.5.0.4 (Dynamic)			-	ancos		
Properties	ipconing i	12.14	Phillidiy	10.5.0.4 (Dynamic)						
🔒 Locks										
🖳 Export template										
Support + troubleshooting										
📩 Effective security rules										
Effective routes										
📯 New support request										
<										>

- 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.

	$\mathcal{P}$ Search resources, services, and docs (G+/)	🗳 🐵 ? 😊	9
Home > Resource groups > TestGroup1 > node1 - Networking	> node1186 - IP configurations > ipconfig1		
ipconfig1			
🔚 Save 🗙 Discard			
The virtual machine associated with this network interface will be new private II address. The network interface will be reprovision configuration settings, including secondary IP addresses, subtra- gateway, will need to be manually reconfigured within the virtual	d and network masks, and default		
Public IP address settings Public IP address Pub			
Private IP address settings Virtual network/subnet Vnet1/Vnet1-1			
Assignment Dynamic Static P address *			
10.5.0.110	~		
<			>

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

#### 5) Configuring virtual machines

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

Set a partition for the mirror disk resource. Create a file system in the added disk. Secure an area in the added disk by using the fdisk command and then create a file system.

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

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

	/proc/p minor				ne	
2	C	1		4	fd0	
8	C		31457	280	sda	
8	1		512	000	sda1	
8	2		30944	256	sda2	
8	16	;	73400	320	sdb	
8	17		73398	272	sdb1	
8	32		20971	520	sdc	

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

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

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

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

#### 6) Configuring a load balancer

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

• Load Balancer documentaion:

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

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

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Azure serv	rices									
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📍 Sub	scriptions	Resourc	e groups	All r	esources	Dashl	board			
Tools										
10015										

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

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Home > Create load balancer								
Create load balancer								×
balancers uses a hash-based distribution a destination port, protocol type) hash to m accessible via public IP addresses, or inter	icer that distributes incoming traffic among healthy virtual machine instances. Load algorithm. By default, it uses a 5-tuple (source IP, source port, destination IP, ap traffic to available servers. Load balancers can either be internet-facing where it is an where it is only accessible from a virtual network. Azure load balancers also 1) to route traffic between public and private IP addresses. Learn more.							
Project details								
Subscription *	۱							
Resource group *	TestGroup1 V							
	Create new							
Instance details								
Name *	TestLoadBalancer 🗸							
Region *	(Asia Pacific) Japan East							
Туре * 🛈	Internal      Public							
sku <b>*</b> ⊙	● Basic ○ Standard							
Configure virtual network.								
Virtual network *	Vnet1 ~							
Subnet *	Vnet1-1 (10.5.0.0/24)							
	Manage subnet configuration							
IP address assignment *	Static O Dynamic							
Private IP address *	10.5.0.200 🗸							~
Review + create < Previous	Next : Tags > Download a template for automation							

- 7) Configuring a load balancer (configuring a backend pool)
- 1. Associate a virtual machine registered to the availability set to the load balancer. After the load balancer has been deployed, select the **Resource groups** icon on the upper part of the window.

Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	CO App Services	Storage accounts	SQL databases	
Recent reso		security groups	machines				accounts		
	NAME			TYPE				LAST VIEWED	
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2. Select the resource group to which the created load balancer belongs from the resource group list.

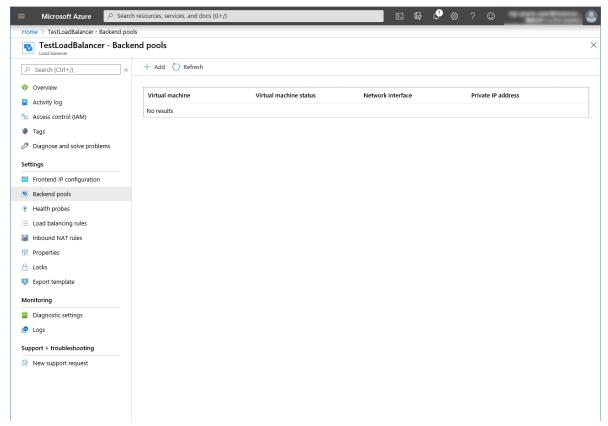
3. The summary of the selected resource group is displayed. Select the created load balancer from the item list.

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Home > Resource groups > TestGro	pup1			
FestGroup1				\$
	$_{\ll}$ + Add $\equiv\equiv$ Edit columns 📋 Delete resource group 🖒 Refresh	$\rightarrow$ Move $\downarrow$ Export to CSV $\mid$ $\oslash$ As	sign tags  🛍 Delete 🛓 Export to	emplate 🛛 \cdots
<ul> <li>Overview</li> </ul>	Essentials	*		
<ul> <li>Activity log</li> </ul>	Filter by name Type == all  Cocation == all	Image: Second state of the second state of		
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Settings		DNS zone	global	
ڬ Quickstart		Public IP address	Japan East	
Deployments		Public IP address	Japan East	
Policies		Virtual machine	Japan East	
Properties		Network security group	Japan East	
🔒 Locks		Network interface	Japan East	•••
Export template		Disk	Japan East	
Cost Management		Disk	Japan East	
🙇 Cost analysis		Virtual machine	Japan East	
Cost alerts		Network security group	Japan East	
③ Budgets		Network interface	Japan East	•••
Advisor recommendations		Disk	Japan East	
Monitoring		Disk	Japan East	
Insights (preview)		Storage account	Japan East	
Alerts	C 🔷 TestLoadBalancer	Load balancer	Japan East	
Metrics	Tottl and Palancer BublielD	Dublic ID addrace	Janan Fact	•••
Diagnostic settings	Previous Page 1 v of 1 Next >			

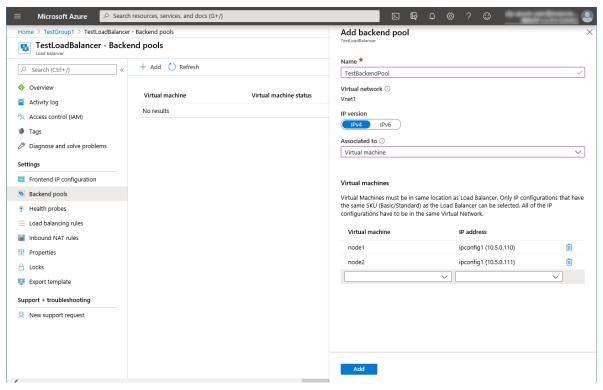
4. Select Backend pools.

≡ Microsoft Azure 🔎 Searc	ch resources, services, and docs (G+/)	📃 d tr 🖓 🌼 ? 😊 📃 🔍
Home > TestLoadBalancer		
TestLoadBalancer Load balancer		\$ ×
	$\rightarrow$ Move $\hat{\blacksquare}$ Delete $\bigcirc$ Refresh	
Overview	Essentials ×	
Activity log	Configure high availability and so	
Access control (IAM)	Create highly-available and scalable applications in minutes by machines. Azure Load Balancer supports TCP/UDP-based protocol	Is and protocols used for real-time voice and video messaging
Tags	applications. L	Learn more
Diagnose and solve problems		
Settings		<b>P</b>
Frontend IP configuration	Balance IPv4 and IPv6 addresses Native dual-stack endpoints help meet regulatory	- Build highly reliable applications
Backend pools	requirements and address the fast-growing number of devices in mobile and IoT.	Load Balancer improves application uptime by routing traffic to healthy nodes. Learn more
Health probes		View health probes
E Load balancing rules	View frontend IP configuration	View load balancing rules
Inbound NAT rules	View backend pools	
H Properties		
🔒 Locks	-ð-	
Export template	Secure your networks Control network traffic and p	nrotect nrivate networks
Support + troubleshooting	using built-in network addre	
📯 New support request	View inbound NAT rules	s

5. Click Add.



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



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

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Home > TestGroup1 > TestLoadBalance	er - Health probes			
TestLoadBalancer - Heal	th probes			×
. ○ Search (Ctrl+/)	+ Add			
Overview	Search probes			
Activity log	Name $\uparrow_{\downarrow}$ Pr	otocol ↑↓ Port	↑↓ Used By	$\uparrow_{\downarrow}$
Access control (IAM)	No results.			
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Diagnose and solve problems				
Settings				
Frontend IP configuration				
Backend pools				
Health probes				
📒 Load balancing rules				
Inbound NAT rules				
H Properties				
🔒 Locks				
🖳 Export template				
Monitoring				
Diagnostic settings				
: Logs				
Support + troubleshooting				
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- 2. Click Add.
- 3. Add health probe is displayed. Specify Name.
- 4. Specify **Protocol** and **Port**, and click **OK**.

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	stLoadBalancer - Health probes > Add health probe						
Add health probe							>
Name *							
TestHealthProbe	~ ~						
Protocol 🕕							
ТСР	~						
Port *							
26001	~ 						
Interval <b>*</b> ①							
5							
	seconds						
Unhealthy threshold *							
2	consecutive failures						
ок							
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- 9) Configuring a load balancer (setting the load balancing rules)
- 1. Select Load balancing rules.

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er - Load balancing rules								
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+ Add								
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Name	$\uparrow_{\downarrow}$ Load balancing rule	$\uparrow_{\downarrow}$ Backend	pool		↑↓ Н	lealth probe		¢↓
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	r - Load balancing rules balancing rules + Add Name	r - Load balancing rules balancing rules + Add ♪ Name ↑↓ Load balancing rule	r - Load balancing rules balancing rules + Add P Name ↑↓ Load balancing rule ↑↓ Backend	r - Load balancing rules balancing rules + Add [♡] Name ↑↓ Load balancing rule ↑↓ Backend pool	r - Load balancing rules balancing rules + Add ▷ Name ↑↓ Load balancing rule ↑↓ Backend pool	r - Load balancing rules balancing rules + Add [♡] Name ↑↓ Load balancing rule ↑↓ Backend pool ↑↓ H	r - Load balancing rules balancing rules + Add Name ↑↓ Load balancing rule ↑↓ Backend pool ↑↓ Health probe	r - Load balancing rules balancing rules + Add ▷ Name ↑↓ Load balancing rule ↑↓ Backend pool ↑↓ Health probe

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

For DSR, specify **Port** and **Backend port** to same port number, enable to **Floating IP(Direct Server Return)**, and click **OK**.

(Specify the port number used to connect to the application (example.80).)

■ Microsoft Azure	E & ? ©
Home > TestLoadBalancer - Load balancing rules > Add load balancing rule	
Add load balancing rule	×
Name *	
TestLoadBalancingRule 🗸	
IP Version *	
● IPv4 ○ IPv6	
Frontend IP address * 🛈	
10.5.0.200 (LoadBalancerFrontEnd)	
Protocol	
● TCP ◯ UDP	
Port *	
80	
Backend port * ①	
8080	
Backend pool	
TestBackendPool V	
Health probe $\odot$	
TestHealthProbe (TCP:26001)	
Session persistence $\bigcirc$	
None	
Idle timeout (minutes) ①	
O 4	
Floating IP (direct server return) ①	
Disabled Enabled	
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10) Adjusting the OS startup time, checking the network setting, checking the root file system, checking the firewall setting, synchronizing the server time, and checking the SELinux setting.

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

### 11) Installing EXPRESSCLUSTER

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

### 12) Registering the EXPRESSCLUSER license

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

# 6.3 Configuring the EXPRESSCLUSTER settings

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

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

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

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

### 1) Creating a cluster

Start the Cluster generation wizard to create a cluster.

- Creating a cluster
  - 1. Access Cluster WebUI, and click Cluster generation wizard.

Cluster WebUI <clust< th=""><th>ter&gt;</th><th></th><th></th><th></th><th></th><th>🗲 Conf</th><th>fig mode 🗸</th><th>Ł</th><th>3</th><th>ß</th><th>۶</th><th>i</th><th>? 🗉</th></clust<>	ter>					🗲 Conf	fig mode 🗸	Ł	3	ß	۶	i	? 🗉
Cluster generation wizard	Import E	Export	Get the Configuration File	Apply the Configuration File	Update Ser	) ver Data	Check the Config	uration File	L				

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

Cluster generation wizard	×
Server         Server           Cluster         →         Basic Settings         →         Interconnect         →	Server → NP Resolution → Group → Monitor
Cluster Name*	Cluster1
Comment	
Language*	English 🗸
Management IP Address	
	(locale) of the environment that runs WebManager. le clusters, specify a unique cluster name to identify the cluster. sed for a WebManager connection. If establishing connections by specifying each server IP address, the
	Back     Next     Cancel

3. Basic Settings is displayed.

The instance connected to Cluster WebUI is displayed as a registered master server. Click **Add** to add the remaining instances (by specifying the private IP address of each instance). Click **Next**.

Add server	×
Server Name or IP Address*	10.5.0.111
• Enter an IP address or a server name When entering a server name, name res Both IPv4 and IPv6 for IP address can be When entering an IP address, the server	olution is necessary. e used.
	OK Cancel
Cluster generation wizard	×
Server → MP Resolution → M2 Add Remove Server Definitions	Group -> Monitor
Order Name	
Master server node1	
↑ ↓	
Server Group Definition	Settings
O 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.	
	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				×
Server Cluster ♥ → Basic Settings ♥ + Properties Add Remove Interconnect List	Server	server ect → NP Resolution → 0	Group ᢣ Monitor	
Priority Type	MDC	node1	node2	
1 Kernel Mode 🗸	mdc1 🗸	10.5.0.110	10.5.0.111	~
$\checkmark$				
Only" setting, configure the route whic Configuring more than one routes is re For "Kernel mode" ", "User mode, "DI For "Witness HB" setting, click each se Click " 1" or " 4" to configure the prior For "Mirror Communication Only" setti	C", "DISK", "Witr ch is used only for ecommended. SK" and "COM" s erver column cell rity to preferentia ngs, click each s	hess HB" and "COM" settings, cor r data mirroring communication. ettings, click each server column to set "Use" or "Do not use", anu Illy use the LAN only for the com erver column cell to configure IP	figure the route which is used cell and set an IP address or o I then click "Properties" to set nunication among the cluster addresses.	d for heartbeat. For "Mirror Communication device. t detailed settings.

5. The NP Resolution window is displayed.

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

Click Next.

Cluster generation wizard				×
Cluster I I I I I I I I I I I I I I I I I I I	Server → Interconnect ② →	Server ► NP Resolution → Group	➔ Monitor	
Type Target	node1 nod	le2		
Ping 💙 10.5.0.5	Use 🗸 Us	e 🗸		
Tuning				
O configure network partition (NP) re Click "Add" to add NP resolution resou For "Ping" setting, click Target column For "HTTP" setting, click Target colum The detailed settings can be verified a Click "Tuning" to configure the actions	urce and select the type. n cell to configure IP addre nn cell to configure HTTP p and changed by clicking "Pr	acket destination, and then click e		
				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	×
Server     Server     Server     Server       Cluster O +     Basic Settings O +     Interconnect O +     NP Resolution O	→ Group → Monitor
Properties Add Remove	Group Resource
Group List	
Name	Туре
No groups	
<ul> <li>Configure failover group to be a unit of fail over.</li> <li>Click "Add" to add a group.</li> <li>Click "Properties" to configure the properties of the selected group.</li> <li>Click "Group Resource" to add resource to the selected group.</li> </ul>	
	Back Next      Cancel

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

Smaaifre o fo		failourn1) for Nama	Clipte Nort
specify a la	ulover group name (	failover1) for <b>Name</b> .	CHCK INEXI.

Group Definition	failover
Basic Settings → Startup Servers	➔ Group Attributes ➔ Group Resource
Туре*	failover 🗸
Use Server Group Settings	
Name*	failover1
Comment	
<ul> <li>Select group type.</li> <li>If using virtual machine resources to clust "Failover".</li> <li>If using server group, check the "Use Ser</li> </ul>	ter 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 Defini	ition							f	ailover 🗙
Basic Setting	js 📀 🕒	> Startup	Servers 🛇 🔸	➔ Group Attri	ibutes 📀	→	Group Resource		
Properties	Add	Remove							
Group Resource Name	ce List				Туре				
No resources	;								
-		ld resources configure th		the selected reso	ource.				
							<ul> <li>Back</li> </ul>	Finish	Cancel

• Mirror disk resource

Create a mirror disk resource.

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

- 1. Click Add on the Group Resource List page.
- 2. The Resource Definition of Group | failover1 window is displayed.

Select the group resource type (Mirror disk resource) from the **Type** box and enter the group name (md) in the **Name** box. Click **Next**.

Resource Definition of Group   failover1					
Info → Dependency → Recovery	Operation 🗲 Details				
Туре*	Mirror disk resource $\checkmark$				
Name*	md				
Comment					
Get License Info					
• Select the type of group resource and	l 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. The **Details** window is displayed.

Enter the device name of the partition created in "5) **Configuring virtual machines**" in **Data Partition Device Name** and **Cluster Partition Device Name**. Specify **Mount Point** and **File System**. Click **Finish** to finish setting.

Resource Definition of Group   failover1 r							
Info ♥ → Dependency ♥ → Reco Common node1 node2	overy Operation 🥏	→ Details					
Mirror Partition Device Name*	/dev/NMP1 🗸						
Mount Point*	/mnt/md						
Data Partition Device Name*	/dev/sdc2	$\checkmark$					
Cluster Partition Device Name*	/dev/sdc1	$\checkmark$					
File System*	ext4	$\sim$					
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 the Reference Guide.

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

Resource Definition of Group   failover1 azurepp		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.		

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

Resource Definition of Group   failover1 azurepp		
Info $\bigcirc$ $\rightarrow$ Dependency $\oslash$ $\rightarrow$ R	Recovery Operation 📀 🔶 Details	
Probeport*	26001	
Tuning		
		Back Finish Cancel

- 6. Click Finish.
- EXEC resource(for DSR)

EXPRESSCLUSTER provides a mechanism to add / remove front-end ip address as the load balancer switches. For details about the EXEC resources", see "Understanding EXEC resources" in the Reference Guide.

- 1. Click Add on the Group Resource List page.
- 2. The **Resource Definition of Group | failover1** window is displayed. Select the group resource type (EXEC resource) from the **Type** box and enter the group name (exec1) in the **Name** box.
- 3. Click Next.

- 4. The Dependency window is displayed. Click Next without specifying anything.
- 5. The Recovery Operation window displayed. Click Next.
- The Details window displayed. Select the start.sh. Click Edit. The following script is a sample script. Customize it to change your environment.

(Example: sample script of start.sh)

```
# Server1
SERVER1_NAME="server1" # hostname
SERVER1_NIC="lo" # Interface name for local loopback
# Server2
SERVER2_NAME="server2" # hostname
SERVER2_NIC="lo" # Interface name for local loopback
# VIP Address
VIP=10.5.0.200 # Load balancer front-end IP address
NETMASK=255.255.255.255 # Front-end IP address netmask
# HostName
CURRENT_HOSTNAME=`hostname`
if [ $CURRENT_HOSTNAME = $SERVER1_NAME ]; then
     NIC=$SERVER1_NIC
elif [ $CURRENT_HOSTNAME = $SERVER2_NAME ]; then
    NIC=$SERVER2_NIC
else
    echo "SERVER is not found."
    exit 1
fi
# Add IP Address
ip addr add $VIP/$NETMASK brd + dev $NIC
RET=$?
if [ $RET = 0 ]; then
    exit O
else
    echo "Failure to add IP Address"
    exit 1
fi
```

7. The Details window displayed. Select the stop.sh. Click Edit.

The following script is a sample script. Customize it to change your environment.

(Example: sample script of stop.sh)

```
# Server1
SERVER1_NAME="server1" # hostname
SERVER1_NIC="lo" # Interface name for local loopback
# Server2
SERVER2_NAME="server2" # hostname
SERVER2_NIC="lo" # Interface name for local loopback
# VIP Address
VIP=10.5.0.200 # Load balancer front-end IP address
NETMASK=255.255.255.255 # Front-end IP address netmask
```

(continues on next page)

(continued from previous page)

```
# HostName
CURRENT_HOSTNAME=`hostname`
if [ $CURRENT_HOSTNAME = $SERVER1_NAME ]; then
   NIC=$SERVER1_NIC
elif [ $CURRENT_HOSTNAME = $SERVER2_NAME ]; then
   NIC=$SERVER2 NIC
else
   echo "SERVER is not found."
   exit 1
fi
# Del IP Address
ip addr del $VIP/$NETMASK brd + dev $NIC
RET=$?
if [ $RET = 0 ]; then
   exit 0
else
   echo "Failure to del IP Address"
   exit 1
fi
```

### 8. Click Finish.

### 3) Adding a monitor resource

• Azure probe port monitor resource

The port monitoring mechanism for alive monitoring is provided for the node in which the Microsoft Azure probe port resource is running.

For details about the Azure probe port resources", see "Understanding Azure probe port resources" in the Reference Guide.

Adding one Azure probe port monitor resource creates one Azure probe port monitor resource automatically.

Azure load balance monitor resource

The mechanism to monitor whether the port with the same port number as the probe port is open or not is provided for the node in which the Microsoft Azure probe port resource is not running.

For details about the Azure load balance resource, see "Understanding Azure load balance monitor resources" in the Reference Guide.

Adding one Azure probe port resource creates one Azure load balance monitor resource automatically.

### 4) Applying the settings and starting the cluster

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

# 6.4 Verifying the created environment

Verify whether the created environment works properly by generating a monitoring error to fail over a failover group.

If the cluster is running normally, the verification procedure is as follows:

Start the failover group (failover1) on the active node (node1). In the Status tab on the Cluster WebUI, confirm that Group Status of failover1 of node1 is Normal.
 When using DSR perform packet capture and confirm that communication is being performed with the in

When using DSR, perform packet capture and confirm that communication is being performed with the ip address of the client and the front-end IP address of the load balancer.

- 2. Change Operation Mode to Verification Mode from the WebManager pull-down menu.
- 3. In the Status tab on the Cluster WebUI, click the Enable dummy failure icon of azureppw1 of Monitors.
- 4. When the time specified for Interval elapses, the failover group (failover1) enters an error status and fails over to node2. In the Status tab on the Cluster WebUI, confirm that Group Status of failover1 of node2 is Normal. Also, confirm that access to the frontend IP and port of the Azure load balancer is normal after the failover. When using DSR, perform packet capture and confirm that communication is being performed with the ip address of the client and the front-end IP address of the load balancer.

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

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## CHAPTER

# SEVEN

# **ERROR MESSAGES**

For the error messages related to resources and monitor resources, see the following:

• "Error messages" in the Reference Guide.

## CHAPTER

## NOTES AND RESTRICTIONS

## 8.1 HA cluster using Azure DNS

### 8.1.1 Notes on Microsoft Azure

- There is a tendency for the performance difference (performance deterioration rate) to increase in a multitenant cloud environment compared to a physical environment or general virtualization environment (non-cloud environment). Therefore, pay careful attention to this point when designing a performance-oriented system.
- Even if a virtual machine is just shut down, its status is **Stopped** and billing continues. Execute **Stop** on the virtual machine setting window of the Microsoft Azure portal to change the virtual machine state to **Stopped** (**Deallocated**).
- An availability set can be set only when creating a virtual machine. To move a virtual machine to and from the availability set, it is necessary to create an availability set again.
- To set up EXPRESSCLUSTER to work with Microsoft Azure, a Microsoft Azure organizational account is required. An account other than the organizational account cannot be used because an interactive login is required when executing the Azure CLI.

### 8.1.2 Notes on EXPRESSCLUSTER

Please refer the following for notes for EXPRESSCLUSTER on Azure:

EXPRESSCLUSTER X Getting Started Guide

- "Communication port number" in "Notes and Restrictions"
- "Azure DNS resources" in "Notes and Restrictions"
- "Setting up Azure DNS resources" in "8. Notes and Restrictions"

EXPRESSCLUSTER X Reference Guide

- "Notes on Azure DNS resources"
- "Notes on Azure DNS monitor resources"

Virtual machines are paused for up to 30 seconds for Azure memory preserving maintenance. Please refer the following for details about memory preserving maintenance.

https://docs.microsoft.com/en-us/azure/virtual-machines/linux/maintenance-and-updates

Therefore, it is recommended to set **Heartbeat Timeout** parameter on **Timeout** tab in **Cluster Properties** more than 30 sec.

In addition to Heartbeat Timeout, please also note the following.

- Please set Heartbeat Timeout parameter less than OS reboot time.
- When changing **Shutdown Monitor Timeout** parameter on **Monitor** tab in **Cluster Properties** from the default value (Use Heartbeat Timeout), please set the parameter less than **Heartbeat Timeout**.

Please refer the following about the above:

### EXPRESSCLUSTER X Getting Started Guide

• "Adjusting OS startup time" in "Notes and Restrictions"

### EXPRESSCLUSTER X Reference Guide

- "Timeout tab"
- "Monitor tab"

# 8.2 HA cluster using a load balancer

## 8.2.1 Notes on Microsoft Azure

- There is a tendency for the performance difference (performance deterioration rate) to increase in a multitenant cloud environment compared to a physical environment or general virtualization environment (non-cloud environment). Therefore, pay careful attention to this point when designing a performance-oriented system.
- Even if a virtual machine is just shut down, its status is **Stopped** and billing continues. Execute **Stop** on the virtual machine setting window of the Microsoft Azure portal to change the virtual machine state to **Stopped** (**Deallocated**).
- An availability set can be set only when creating a virtual machine. To move a virtual machine to and from the availability set, it is necessary to create an availability set again.

## 8.2.2 Notes on EXPRESSCLUSTER

Please refer the following for notes for EXPRESSCLUSTER on Azure:

EXPRESSCLUSTER X Getting Started Guide

- "Communication port number" in "Notes and Restrictions"
- "Setting up Azure probe port resources" in "8. Notes and Restrictions"
- "Setting up Azure load balance monitor resources" in "Notes and Restrictions"

EXPRESSCLUSTER X Reference Guide

- "Notes on Azure probe port resources"
- "Notes on Azure probe port monitor resources"
- "Note on Azure load balance monitor resources"

Virtual machines are paused for up to 30 seconds for Azure memory preserving maintenance.

Please refer the following for details about memory preserving maintenance.

https://docs.microsoft.com/en-us/azure/virtual-machines/linux/maintenance-and-updates

Therefore, it is recommended to set **Heartbeat Timeout** parameter on **Timeout** tab in **Cluster Properties** more than 30 sec.

In addition to Heartbeat Timeout, please also note the following.

- Please set **Heartbeat Timeout** parameter less than OS reboot time.
- When changing **Shutdown Monitor Timeout** parameter on **Monitor** tab in **Cluster Properties** from the default value (Use Heartbeat Timeout), please set the parameter less than **Heartbeat Timeout**.

Please refer the following about the above:

EXPRESSCLUSTER X Getting Started Guide

• "Adjusting OS startup time" in "Notes and Restrictions"

EXPRESSCLUSTER X Reference Guide

• "Timeout tab"

• "Monitor tab"

### CHAPTER

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## CHAPTER

# **REVISION HISTORY**

Edition	Revised Date	Description
1st	Apr 08, 2022	New Guide
2nd	Jul 29, 2022	Corrected typographical errors.
3rd	Feb 17, 2023	Corrected typographical errors.

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