

EXPRESSCLUSTER X 5.0

HA Cluster Configuration Guide for Microsoft Azure (Linux) Release 2

NEC Corporation

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CHAPTER

ONE

PREFACE

1.1 Who Should Use This Guide

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

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

1.2 Scope of application

This guide covers the following product versions.

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

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

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

1.3 How This Guide is Organized

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

1.4 EXPRESSCLUSTER X Documentation Set

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

EXPRESSCLUSTER X Getting Started Guide

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

EXPRESSCLUSTER X Installation and Configuration Guide

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

EXPRESSCLUSTER X Reference Guide

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

EXPRESSCLUSTER X Maintenance Guide

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

EXPRESSCLUSTER X Hardware Feature Guide

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

1.5 Conventions

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

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

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

See also:

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

The following conventions are used in this guide.

Convention	Usage	Example
Bold	Indicates graphical objects, such as	
	text boxes, list boxes, menu 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.

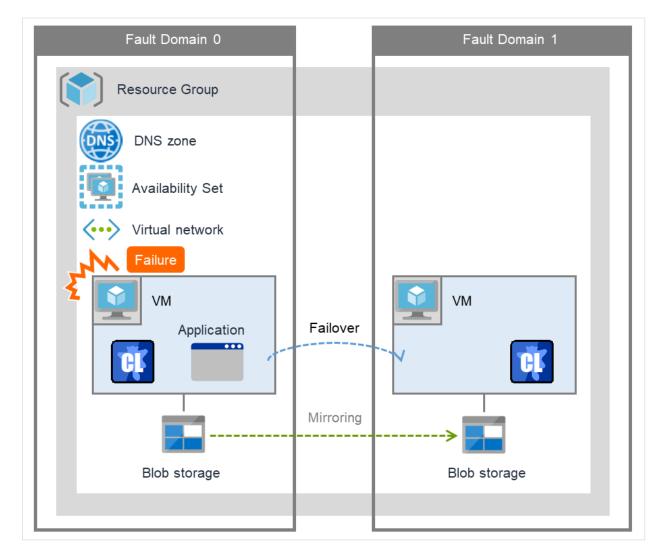


Fig. 2.1: HA Cluster on a Cloud Service (Using Azure DNS)

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	
configuretion	
(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/

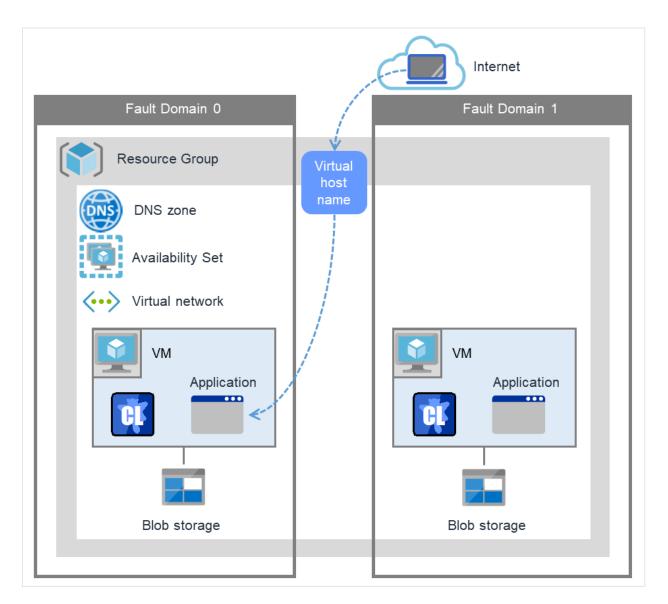


Fig. 2.2: HA Cluster Using Azure DNS

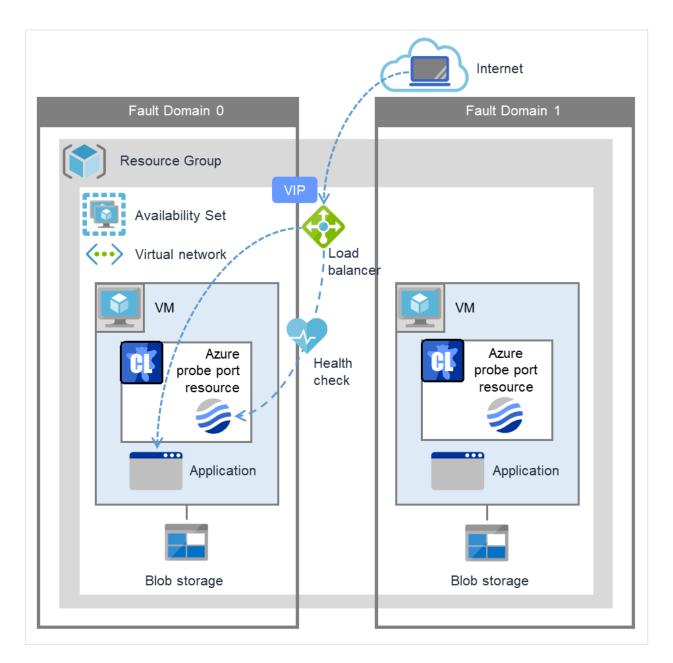
These two virtual machines use the same availability set to minimize the impact of planned maintenance or unplanned maintenance due to a physical hardware failure of the Microsoft Azure platform.

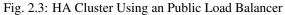
The cluster in Figure 2.2 HA Cluster Using Azure DNS is accessed by using the DNS name of the Azure DNS zone. EXPRESSCLUSTER manages record sets and DNS A records of the Azure DNS zone to find an IP address according to the DNS name. A client need not be conscious about the switching of virtual machines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

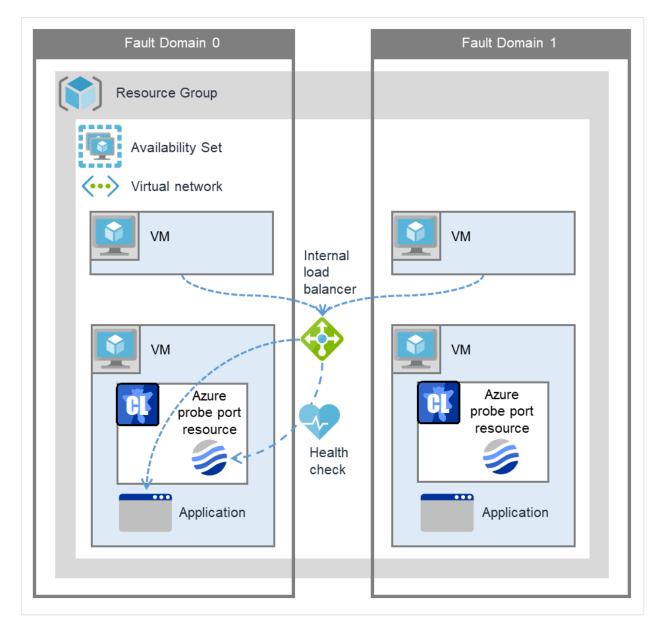


Fig. 2.4: HA Cluster Using the Internal Load Balancer

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.

Table 2.4 – continued from previous page			
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

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"	

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• 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.
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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-	Not required	
	chine		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
			Continued on next page

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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"

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Step No.	Procedure		On-p	oremise		Microsoft Azure
15	Installing CLUSTER	EXPRESS-	PRES the	"Installing SSCLUSTER" Installation	in and	Same as "On-premise"

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 resolution resolution 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.

Table 2.10 – continued from previous page

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 value		
Resource group setting		
TestGroup1		
(Asia Pacific) Japan East		
Virtual network setting		
Vnet1		
10.5.0.0/24		
Vnet1-1		
10.5.0.0/24		
TestGroup1		
(Asia Pacific) Japan East		
cluster1.zone		
TestGroup1		
test-record1		

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

Setting item	Setting value						
	node1	node2					
Virtual machine setting							
– Disk type	Standard HDD						
– User name	testlogin	testlogin					
– Password	PassWord_123	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	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	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-		
		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.

Microsoft Azure	, <i>P</i> Search resources, services, and docs (G+/)	≻_⊑	
Home > Resource groups			
Resource groups			\$
+ Add ≡≡ Edit columns 🕐 Refresh 🞍 E	port to CSV 🛛 🖉 Assign tags 🛛 🛇 Feedback		
Subscription == a	all) (Location == all ⓐ) (⁺ ∀ Add filter)		
howing 1 to 30 of 30 records.		No grouping	~
Name 1	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.

■ Microsoft Azure	,	>_	Ŗ	Q		٢	
Home > Resource groups > Cre	ate a resource group						
Create a resource group	,						
Basics Tags Review + cre	ate						
resources for the solution, or only	t holds related resources for an Azure solution. The resource group can include all the those resources that you want to manage as a group. You decide how you want to ups based on what makes the most sense for your organization. Learn more						
Project details							
Subscription *	\checkmark						
Resource group *	TestGroup1						
	· · · ·						
Resource details							
Region *	(Asia Pacific) Japan East 🗸 🗸						
Review + create < Pre	vious Next : Tags >						
ζ							1

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.

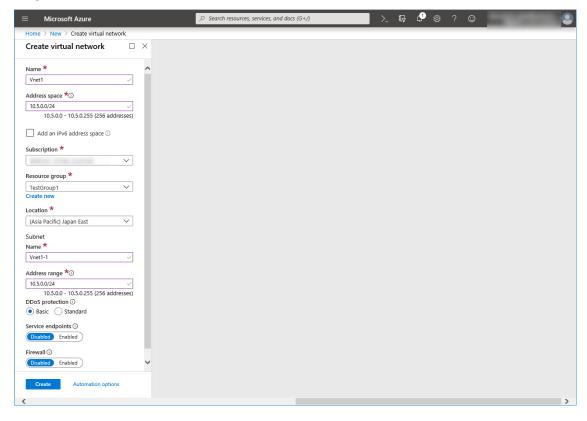
1. Select the **+Create a resource** icon on the upper part of the window.

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	
{··>								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										\times
Azure Marketplace See all	Featured	See all								
· · · · · · · · · · · · · · · · · · ·		Virtual network								
Get started		Quickstart tutorial								
Recently created										
AI + Machine Learning		Check Point CloudGuard IaaS R80.10 Cluster (preview)								
Analytics		Learn more								
Blockchain		Load Balancer								
Compute		Learn more								
Containers	_									
Databases		Application Gateway Learn more								
Developer Tools	v									
DevOps		Front Door								
Identity		Learn more								
Integration		Firewall								
Internet of Things		Learn more								
Media		Virtual WAN								
Mixed Reality	1	Learn more								
IT & Management Tools										
Networking		Network security group Quickstart tutorial								
Software as a Service (SaaS)										
	A	ExpressRoute								
Security	°°	Learn more								
Storage		Connection								
Web	$\langle \cdots \rangle$	Learn more								
										\sim

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.

+			.	†		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	sources								
	NAME			ТҮРЕ				LAST VIEWED	
~~>								22 min ago	
								24 min ago	
()								24 min ago	
								26 min ago	
								26 min ago	
••••								27 min ago	
••••								28 min ago	
5								28 min ago	
ONS								28 min ago	
.								29 min ago	
•								30 min ago	
8								32 min ago	
Navigate	oscriptions	() Resourc	e groups	All r	esources	Dasht	oard		

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

■ Microsoft Azure		> ₽ ₽ ◎ ? ◎
Home > New		
New		×
, ○ Search the Marketplace		ŕ
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 Quickstart tutorial	
Developer Tools	Gib Quickstart tutorial	
DevOps	Service Fabric Cluster	
Identity	Quickstart tutorial	
Integration	Web App for Containers	
-	Conception Containers	
Internet of Things		
Media	Function App Quickstart tutorial	
Mixed Reality		
IT & Management Tools	Batch Service	
Networking	Quickstart tutorial	
Software as a Service (SaaS)	Debian 9 "Stretch" with backports	
Security	kernel Learn more	
Storage		
Web	Ubuntu Server 16.04 LTS Ouickstart tutorial	

3. Select CentOS-based 7.6.

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Home > New > Create	Select an image		×
Create a virtual m			
	Marketplace My Items Prev	iew Items	^
Basics Disks Net	AI + Machine Learning		
Create a virtual machine	Analytics) General and a set	
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	CentOS-based 6.5 HPC	
Subscription *	DevOps	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 This distribution of Linux is based on CentOS and is provided by Roque Wave Software.	
Region *	Mixed Reality		
Availability options ①	Networking	CentOS-based 7.5 Rogue Wave Software (formerly OpenLogic)	
Availability set * ①	Security	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
Availability set "	Software as a Service (SaaS)	CentOS 7.6	
Image 📩	Storage	Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
indge ()	Web		
Azure 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.	
Size *		CentOS-based 6.8 HPC	
Bauian a anata		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.

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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 * 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						
	U TES VINO						
Size *	Standard D2s v3						`
	· ·	-					
Review + create	< Previous Next : Disks >						
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			docs (G+/)	>_ 🖓	₽®?©
Home > New > Create a virtu	al machine			Cre	eate new X
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 Networki	ng Management Advanced	Tags Review + create		Lear	n more
image.	eview + create to provision a virtual	je from Azure marketplace or use you machine with default parameters or r			ailabilitySet1 It 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		managed disks ③
Subscription *			\sim	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.	\checkmark		
Image * 0	CentOS-based 7.6 Browse all public and private ima	jes	\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 Azur	re			P Sec	arch resour	ces, services, ar	nd docs (G+/)		>_	Ģ	Ç2	ŝ	?	٢	1.0	-	
Home	e > New > Create	e a virtual ma	ichine															
Cre	ate a virtual m	nachine																\times
Bas	sics Disks Net		Management		_			ch additional	data disks.									
The s	size of the VM deter	mines the ty	pe of storage you	u can use	e and the num	ber of data	disks allowed	Learn more										
Disk	options																	
OS d	lisk type 📩	Sta	andard HDD						\sim									
	e Ultra Disk compa	atibility 🔿	Yes 💿 No															
0		Ultra	a Disk compatibi	lity is no	ot available for	this VM si	ize and locatio	n.										
Data	a disks																	
	can add and configu oorary disk.	ure additiona	al data disks for y	our virtu	al machine or	attach exist	ting disks. This	VM also com	es with a									
LU	JN Name		Size (Gi	B)	Disk type		Host ca	ching										
Creat	te and attach a new	disk Att	ach an existing d	isk														
\sim	Advanced																	
R	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	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 >.

\equiv Microsoft Azure			-/)	>_	Ŗ	£ 2 (8 î	° ©	1	1000	
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 * 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 2

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Home > New > Create a virtual machine								_
Create a virtual machine								\times
								~
Basics Disks Networking Managemen	t Advanced Tags Review + create							
Configure monitoring and management options fo	ir your VM.							
Azure Security Center								
Azure Security Center provides unified security mar Learn more	nagement and advanced threat protection across hybrid cloud workloads.							
Your subscription is protected by Azure Securi	ity Center basic plan.							
Monitoring								
Boot diagnostics On Off								
OS guest diagnostics O On O Off								
Diagnostics storage account * (new) testgroup1	1diag600 V							
Identity								
System assigned managed On On								
identity 🛈 🤍 🗸								
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Review + create < Previous	Next : Advanced >							
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Microsoft Azure Home > New > Create a virtual machine	<i>P</i> Search resources, services, and docs (G+/)	>_ 🛱	¢² ⊗	? Crea	© ate stor	age acc	ount	9 ×
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Home > New > Create a virtual machine Create a virtual machine Basics Disks Networking Managemen Configure monitoring and management options for Azure Security Center	t Advanced Tags Review + create or your VM.	≻_ ₽₽	© ©	Crea Name lest Acco	ate stor e * group1diag unt kind () rage (gene	enal purpose	.core.windows.n	et
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Home > New > Create a virtual machine Create a virtual machine Basics Disks Networking Managemen Configure monitoring and management options fo Azure Security Center Azure Security Center	t Advanced Tags Review + create or your VM. nagement and advanced threat protection across hybrid cloud workloads.) >_ 67	₽ ⊗	Crea Name kest Stor Stor Repli	e * group1diag unt kind (rrage (gene ormance () ndard Pro-	j600) eral purpose	.core.windows.n e v1) ~	et
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11. Click Next: Tags >.

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Add additional configuration, agents, scripts or applications via vir	tual machine extensions or cloud-init.							
Extensions								
Extensions provide post-deployment configuration and automatic	n.							
Extensions ① Select an extension to install								
Cloud init								
Cloud init is a widely used approach to customize a Linux VM as it packages and write files or to configure users and security. Learn								
The selected image does not support cloud init.								
Host								
Azure Dedicated Hosts allow you to provision and manage a phys Azure subscription. A dedicated host gives you assurance that onl 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 ① No host group found	\checkmark							
Dedicated hosts cannot be used with availability sets.								
Proximity placement group								
Proximity placement groups allow you to group Azure resources p	hysically closer together in the same region. Learn more							
Proximity placement group No proximity placement groups	found V							~
Review + create < Previous Next : Tag	\$>							
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12. Click Next: Review + create >.

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Home > New > Create a	virtual machine					
Create a virtual ma	achine					
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Tags are name/value pairs multiple resources and res	that enable you to categorize resources ar ource groups. Learn more about tags of	d view consolidated billing by applying the same tag to				
Note that if you create tag	s and then change resource settings on ot	ner tabs, your tags will be automatically updated.				
Name 🕕	Value 🕕	Resource				
	✓ :	✓ 11 selected ✓				
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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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Home > New > Create a virtual machine								
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by Microsoft	6.0500 JPY/hr							
Terms of use Privacy policy	Pricing for other VM sizes							
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authorize Microsoft to bill my current payment r my Azure subscription; and (c) agree that Micros	s and privacy statement(s) associated with the Marketplace offering(s) listed above; (b) nethod for the fees associated with the offering(s), with the same billing frequency as a cont may share my contact, usage and transactional information with the provider(s) of sactional activities. Microsoft does not provide rights for third-party offerings. See the							
Basics								
Subscription	MARCEL FOR LLEVE							
Resource group	TestGroup1							
Virtual machine name	node1							
Region	(Asia Pacific) Japan East							
Availability options	Availability set							
Availability set	(new) AvailabilitySet1							
Authentication type	Password							
Username	testlogin							
Azure Spot	No							
Disks								
OS disk type	Standard HDD							~
Create < Previ	ous 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.

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	
{··>								22 min ago	
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•								30 min ago	
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Navigate	scriptions	Resource	e groups	All r	esources	Dashi	ooard		

- 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 > TestGrou	p1		
FestGroup1			\$
	^K + Add $\equiv\equiv$ Edit columns 📋 Delete resource group 🖒 Refresh \rightarrow	Move 🛓 Export to CSV 🛛 🖉 Assign tage	s 🗊 Delete 🛛 ··· More
😥 Overview	Essentials	*	
 Activity log 	Filter by name Type == all () Location == all ()	⁺ _▼ Add filter	No grouping V
Access control (IAM)	Showing 1 to 13 of 13 records. Show hidden types		No 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
Export template		Network interface	Japan East
Cost Management		Disk	Japan East
Cost analysis		Disk	Japan East
S Cost alerts			
Sudgets		Storage account	Jupan Last
Advisor recommendations		Virtual network	Japan East
Advisor recommendations			
Monitoring			
Insights (preview)			
💵 Alerts			
Metrics			
Diagnostic settings	Previous Page 1 v of 1 Next >		
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4. Select Networking.

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Home > Resource groups > TestGro	up1			\$
Resource group	≪ + Add ≡≡ Edit columns	→ Move ↓ Export to CSV 🛛 🖗 Assign ta	gs 📋 Delete	··· More
Overview	Essentials	*		
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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	
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.

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Home > Resource groups > TestGroup1	> node1 - Networkin	ng > node1186 - I	P configurations	;							
node1186 - IP configuration	ons										×
	🕂 Add 🛛 🗟 Sav	ve 🗙 Discard									
 Overview Activity log Access control (IAM) Tags Settings 	IP forwarding set IP forwarding Virtual network IP configurations Subnet *	-		(Disabled Enabled) Vnet1 Vnet1-1 (10.5.0.0/24)							~
IP configurations				Vict i (10.5.0.0/24)							
DNS servers											
💎 Network security group	Name	IP Version	Туре	Private IP address			Pu	blic IP a	address		
HI Properties	ipconfig1	IPv4	Primary	10.5.0.4 (Dynamic)			-				
🔒 Locks											
👰 Export template											
Support + troubleshooting											
 Effective security rules Effective routes 											
Rew 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.

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Home	> Resource groups > TestGroup1 > node1 - Netw	vorking > node1186 - IP configuratio	ns > ipconfig1						
ipco node118	nfig1	□ ×							
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	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.

+	()			†		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								
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Navigate	scriptions	Resource	e groups	All r	esources	Dashl	poard		

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

Microsoft Azure			unu uocs (G+7)	1 42° (
lome > New					
New					
DNS zone		×			
DNS zone					
Private DNS zone					
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Recently created	Quickstart	utonal			
AI + Machine Learning		t CloudGuard IaaS R80.10			
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Blockchain	Load Balan	cer			
Compute	Learn more				
Containers		6 .			
Databases	Application				
Developer Tools					
DevOps	Front Door				
Identity	Lean nore				
Integration	Firewall Learn more				
Internet of Things	Learn more				
Media	Virtual WA	N			
Mixed Reality	Cearn more				
IT & Management Tools	Network se	curity group			
Networking	Quickstart t				
Software as a Service (SaaS)	ExpressRou	ite			
Security	Learn more				
Storage					
Web	Connection				

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

view+create. Then click Create.

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Hom	e > New > DNS zone >	Create DNS zone								
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Bas										
numl allow	per of DNS records such as s you to host your DNS zo	s 'mail.contoso.com' (for a mail serve	 h. For example, the domain 'contoso. r) and 'www.contoso.com' (for a web and provides name servers that will re 	site). Azure DNS						
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<										>

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.

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

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.

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 → 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

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 re Both IPv4 and IPv6 for IP address can When entering an IP address, the serve	solution is necessary. be used.
	OK Cancel
Cluster generation wizard Server Server Server Cluster ♥ → Basic Settings → Interconnect → NP Resolution NP Resolution	→ Group → Monitor
Add Remove	
Order Name	
Master server node1	
1 node2	
↑ ↓	
Server Group Definition	Settings
O Click "Add" to add servers constructing the duster. Click [♠] or [↓] to change the server priority. Click "Settings" to configure the server group when using the server group.	
	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**.

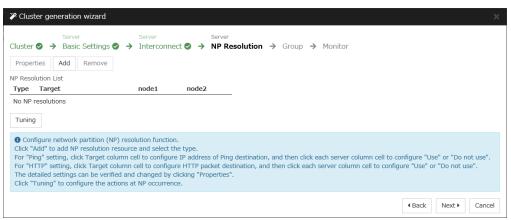
Cluster generation wizard				×
Server Cluster ♥ → Basic Settings ♥ → Properties Add Remove Interconnect List	Server Interconne	Server → NP Resolution → C	Group 🗲 Monitor	
Priority Type	MDC	node1	node2	
1 Kernel Mode V	mdc1 🗸	10.5.0.110	10.5.0.111	~
\uparrow \downarrow				
Only" setting, configure the route whic Configuring more than one routes is re For "Kernel mode" ", "User mode, "DIS For "Witness HB" setting, click each se Click " $\uparrow^* \circ r \downarrow$ " to configure the prior For "Mirror Communication Only" settii	", "DISK", "Witr h is used only for commended. 5K" and "COM" s rver column cell ty to preferentian ngs, click each se	ess HB" and "COM" settings, con r data mirroring communication. ettings, click each server column to set "Use" or "Do not use", and Ily use the LAN only for the comm rver column cell to configure IP a	figure the route which is user cell and set an IP address or then click "Properties" to set nunication among the cluster addresses.	ed for heartbeat. For "Mirror Communication device. et detailed settings.
				Gancel And the second se

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 O + Basic Settings O + Interconnect O + NP Resolution O + 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	
 Select group type. If using virtual machine resources to clust "Failover". If using server group, check the "Use Server 	ter virtual machines, select "Virtual machine" as the type. In other cases, select ver Group".
	Gancel A 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. Group Resource List is displayed.

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

Group Definition		failover 🗙
Basic Settings 오	→ Startup Servers ⊘ → Group Attributes ⊘ → Group	p Resource
Properties Add	Remove	
Group Resource List		
Name	Туре	
No resources		
Click "Add" to a Click "Properties" to	add resources. o configure the properties of the selected resource.	
		Back Finish Cancel

• Mirror disk resource

Create a mirror disk resource.

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

- 1. Click Add on the Group Resource List page.
- 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	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	1	md 🗙
Info ♥ → Dependency ♥ → Reco Common node1 node2	very Operation 🥑 🗦 Details	
Mirror Partition Device Name*	/dev/NMP1 🗸	
Mount Point*	/mnt/md	
Data Partition Device Name*	/dev/sdc2 V	
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 failover	-1	azuredns 🗙
Info → 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 failove	r1	azuredns 🗙
Info \bigcirc \rightarrow Dependency \oslash \rightarrow Reco	overy Operation 🤡 🔶 Deta	ails
Common node1 node2		
Record Set Name*	test-record1	
Zone Name*	cluster1.zone	
IP Address*	10.5.0.110	
TTL*	3600	sec
Resource Group Name*	TestGroup1	
Account		
User URI*	http://azure-test	
Tenant ID*	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		genw 🗙
Info → Monitor(common) → Mor	nitor(special) 🔶 Recovery Action	
Туре*	Custom monitor	
Name*	genw1	
Comment		
Get Licence Info		
3 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		
○ 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			
User ApplicationScript created with this product				
File	genw.sh			
		Edit	View	Replace
Monitor Type	 Synchronous Asynchronous 			
Wait a period of time for Application/Script monitor to start				
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	Execute only the final action \checkmark		
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		
		 ✓ Bac 	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	
	→ 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 2

Monitor Resource Definition		ipw 🗙
Info 🛛 🔸 Monitor(common) 🖉	→ Monitor(special) 🔮 → Reco	overy Action
Recovery Action	Execute only the final action	~
Recovery Target *	LocalServer	Browse
Recovery Script Execution Count	0 time	
Execute Script before Reactivation		
Maximum Reactivation Count	0 time	
Execute Script before Failover		
Execute migration before Failover		
Maximum Failover Count	0 time	
Execute Script before Final Action		
Final Action	No operation	~
		Script Settings
		Image: Back Finish Cancel

- 6. Click **Finish** to finish setting.
- 7. Then, create a monitor resource on the other server. Click Add on the Monitor Resource List page.
- 8. Select the monitor resource type (IP monitor) from the **Type** box and enter the monitor resource name (ipw2) in the **Name** box. Click **Next**.
- The Monitor (common) window is displayed. Confirm that Monitor Timing is Always. Select one available server for Choose servers that execute monitoring. Click Next.
- 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			Browse
Nice Value			0
Choose servers that execute monitoring	Server		
		▲ Back	Next

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	node2					
estlogin						
testlogin						
PassWord_123						
TestGroup1						
(Asia Pacific) Japan East						
ing 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.

+	[]	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								
	NAME			ТҮРЕ				LAST VIEWED	
<->								22 min ago	
								24 min ago	
()								24 min ago	
								26 min ago	
								26 min ago	
•••								27 min ago	
•••								28 min ago	
-								28 min ago	
<u></u>								28 min ago	
<u> </u>								29 min ago	
<u> </u>								30 min ago	
8								32 min ago	
Navigate	riptions	() Resource	e groups	All r	esources	🗔 Dashi	poard		

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

■ Microsoft Azure		. ק ב ווּ ? יים	
Home > Resource groups			
Resource groups			Ż
+ Add ≡≡ Edit columns 🕐 Refresh 🞍 Export to CSV	🖉 Assign tags 🛛 💙 Feedback		
Subscription == all Locati	on == all 💿 († 🕁 Add filter)		
howing 1 to 30 of 30 records.		No grouping	\sim
Name \uparrow_{\downarrow}	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.

■ Microsoft Azure			es, and docs (G+/)	>_	Ŗ	Ф @	?	٢	1000	
Home > Resource groups > 0	Create a resource group									
Create a resource grou	ир									>
Basics Tags Review +	create									
resources for the solution, or or	that holds related resources for an A nly those resources that you want to groups based on what makes the mo	manage as a group. You dec	ide how you want to							
Project details Subscription *			~							
Resource group *	TestGroup1		~							
Resource details										
Region *①	(Asia Pacific) Japan East		~							
Review + create <	Previous Next : Tags >									
<										

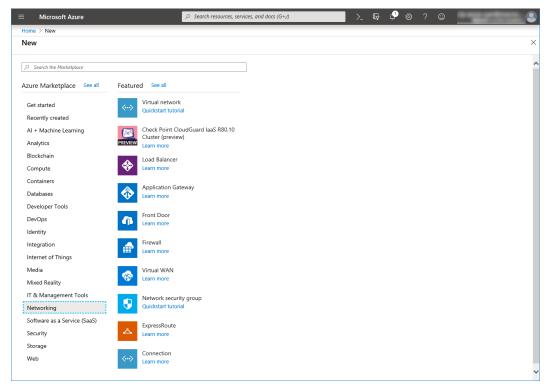
2. Creating a virtual network

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

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	
{·· >								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	
<u></u>								28 min ago	
<u>,</u>								29 min ago	
9								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 *	
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	
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Firewall ①	
Disabled Enabled	~
Create Automation options	

3. Creating a virtual machine

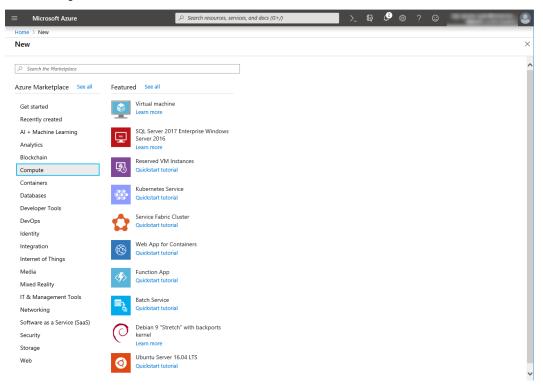
Log in to the Microsoft Azure portal (https://portal.azure.com/) and create virtual machines and disks following the steps below.

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.

1			P	<u> </u>			_	SQL	~
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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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T Subsci	ipuons	(🔊) Kesouro	e groups	All r	esonices	LTT Dasht	JUAIO		

2. Select Compute and then See all.



3. Select CentOS-based 7.6

Microsoft Azure			
Home > New > Create	Select an image		
Create a virtual m			
	Marketplace My Items Prev	view Items	
Basics Disks Net	AI + Machine Learning	Revenue de	_
reate a virtual machine	Analytics	CentOS-based	
nage.	Blockchain	CentOS-based 7.3 HPC	
omplete the Basics tab ustomization.		Rogue Wave Software (formerly OpenLogic)	
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	This distribution of chick is based on centos and is provided by Rogue Wave Software.	
		CentOS-based 6.5 HPC	
ubscription * ①	DevOps	Rogue Wave Software (formerly OpenLogic) This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
Resource group	Identity		
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		
/irtual machine name *	-	CentOS-based 7.7 Roque Wave Software	
	Media	This distribution of Linux is based on CentOS and is provided by Roque Wave Software.	
egion *①	Mixed Reality		
vailability options ①	Networking	CentOS-based 7.5 Rogue Wave Software (formerly OpenLogic)	
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	Software as a Service (SaaS)	CentOS 7.6 Rogue Wave Software (formerly OpenLogic)	
mage 📩	Storage	This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
	Web	CentOS-based 7 LVM	
Azure Spot instance ①		Rogue Wave Software (formerly OpenLogic)	
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ize *①		CentOS-based 6.8 HPC	
		Roque Wave Software (formerly OpenLogic)	
Review + create		This distribution of Linux is based on CentOS and is provided by Rogue Wave Software.	
Review + create		CentOS-based 7.1 HPC	
		Roque 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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Create a virtual machine	\times
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Project details	
Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all	
your resources.	
Subscription * 🖸 🗸	
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Create new	
Instance details	
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Availability options O Availability set	
Availability set * O No existing availability sets in current resource group and location. Create new Create new	
Image * O CentOS-based 7.6	
Browse all public and private images	
Azure Spot instance 🛈 💦 Yes 💿 No	
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Size *C Standard D2s v3	•
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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 virt	ual machine							_
Create a virtual mach	ine							×
Basics Disks Network	ing Management Advanced	I Tags Review + create						
	system disk and a temporary disk the type of storage you can use ar							
Disk options								
OS disk type ★	Standard HDD		\checkmark					
Enable Ultra Disk compatibilit	y 🔿 Yes 🖲 No							
0	Ultra Disk compatibility is not a	vailable for this VM size and loca	tion.					
Data disks								
You can add and configure ad temporary disk.	ditional data disks for your virtual n	nachine or attach existing disks. Th	his 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 : Ne	tworking >						
/								`

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	es and their features.		
Create a new disk to store	applications and data on your VM. Disk prici	Account type ①			
	of transactions. Learn more about Azure Ma	Standard HDD			~
Name *	node1_DataDisk_0	Size	Disk tier	Max IOPS	Max throughput
Source type 🔭	None (empty disk)	32 GiB	54	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			
				be charged the same rate for your p provisioned on a 256 GiB disk, so yo	provisioned disk, regardless of how much of
		provisioned.		,,	
		Custom disk size (GiB)	k .		
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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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Home > New > Create a virtu	al machine						
Create a virtual machi	ne						\times
Basics Disks Networking	ng Management Advanced	Tags Review + create					_
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.				
 Your subscription is protect 	ted by Azure Security Center basic	lan.					
Monitoring							
Boot diagnostics ①	● On 🔵 Off						
OS guest diagnostics ①	🔿 On 💿 Off						
Diagnostics storage account *	(new) testgroup1diag600 Create new		~				
Identity							
System assigned managed identity	🔿 On 💿 Off						
Azure Active Directory							- 1
Login with AAD credentials (Preview) 🛈	🔾 On 🖲 Off						
A This image does not supp	ort Login with AAD.						~
Review + create	< Previous Next : Adva	nced >					
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EXPRESSCLUSTER X 5.0 HA Cluster Configuration Guide for Microsoft Azure (Linux), Release 2

≡ Microsoft Azure		>_ 🗣 🗳 🐵	? 🙂 📃 🔍
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Create a virtual machine			
Basics Disks Networking Management Advanced Configure monitoring and management options for your VM. Azure Security Center Azure Security Center provides unified security management and a Learn more	-		Name * ketgroup1diag600 .core.windows.net Account kind ① Storage (general purpose v1) Performance ⑦ Standare Premium)
Your subscription is protected by Azure Security Center basic	plan.		Replication ① Locally-redundant storage (LRS)
Monitoring			
Boot diagnostics ①			
OS guest diagnostics ① On Off			
Diagnostics storage account * (new) testgroup1diag600 ① Create new	~		
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Azure Active Directory			
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11. Click Next: Tags >.

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Home > New > Create a virtual machine				
Create a virtual machine				×
Basics Disks Networking Management Advanced	Tags Review + create			^
Add additional configuration, agents, scripts or applications via virt	ual machine extensions or cloud-init.			
Extensions				
Extensions provide post-deployment configuration and automation	L			
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				
() 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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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		
✓ :	 ✓ 11 selected ✓ 		
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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Home > New > Create a virtual machine							
Create a virtual machine							\times
Validation passed							
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PRODUCT DETAILS							
Standard A1 v2	ubscription credits apply ${\mathbb O}$						
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						
Basics							
Subscription	PLUE _ 1114 _ 1.1110						
Resource group T	estGroup1						
Virtual machine name	ode1						
Region (Asia Pacific) Japan East						
Availability options A	vailability set						
Availability set (new) AvailabilitySet1						
Authentication type	assword						
Username t	estlogin						
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								
+	[💌		.	+		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								
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9								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.

\equiv Microsoft Azure			G+∕/	•	
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	*		
 Activity log 		Filter by name Type == all (Location	n == all 🕲 ⁺ 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	~				
					>

4. Select Networking.

Microsoft Azure			? ©	
Home > Resource groups > TestGro	up1			
Resource group				\$
	$^{<<}$ + Add ≡≡ Edit columns 🛍 Delete resource group \bigcirc Refres	h \rightarrow Move \downarrow Export to CSV $ $ \otimes Assign t	ags 🗐 Delete	··· More
() Overview	Essentials	*		
 Activity log 	Filter by name Type == all (Location == all	Add filter		~
Access control (IAM)	Showing 1 to 13 of 13 records. Show hidden types		No grouping	~
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	
Export template		Network interface	Japan East	
Cost Management		Disk	Japan East	
s Cost analysis		Disk	Japan East	
Cost alerts				
Budgets	0-	Storage account	Japan East	
Advisor recommendations		Virtual network	Japan East	
Advisor recommendations				
Monitoring				
Insights (preview)				
Alerts				
Metrics	Designer Designer and a Martin			
Diagnostic settings	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.

		>_ 🕼 🗳	© ? ©	
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 IP address. The network interface will be reprovision configuration settings, including secondary IP addresses, subter gateway, will need to be manually reconfigured within the virtua	ed and network masks, and default			
Public IP address settings Public IP address (Disabled) Enabled				
Private IP address settings Virtual network/subnet Vnet1/Vnet1-1				
Assignment Dynamic Static				
IP address * 10.5.0.110				
<				>

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

5. Configuring virtual machines

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

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

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

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

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

\$ cat	/proc/pa	rtitions	
major	minor #	blocks nar	ne
2	0	4	fd0
_	0	-	
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								
	NAME			TYPE				LAST VIEWED	
~~>								22 min ago	
								24 min ago	
()								24 min ago	
								26 min ago	
								26 min ago	
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8								28 min ago	
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<u> </u>								29 min ago	
<u>.</u>								30 min ago	
8								32 min ago	
N · · ·									
Navigate									
A	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.

\equiv Microsoft Azure	,0 Search resources, services, and docs (G+/)	\geq	Ģ			
Home > New > Create load ba	alancer					
Create load balancer						>
Basics Tags Review + c						
balancers uses a hash-based dis destination port, protocol type) accessible via public IP addresse	load balancer that distributes incoming traffic among healthy virtual machine instances. Load tributional algorithm by default, truss a 5-trule (source Pr. destination IP, hash to map traffic to available servers. Load balancers can either be internet-facing where it is so rinternal where it is only accessible from a virtual harbork. Azure load balancers also lation (NAT) 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 * 🕕	O Internal 💿 Public					
sku * 🛈	Basic Standard					
Public IP address						
Public IP address *	Create new Use existing					
Public IP address name *	TestLoadBalancerPublicIP 🗸					
Public IP address SKU	Basic					
Assignment *	O Dynamic 💿 Static					
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.

+				•				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								
N	AME			ТҮРЕ				LAST VIEWED	
<>								22 min ago	
								24 min ago	
()								24 min ago	
=								26 min ago	
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								28 min ago	
9								28 min ago	
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.								30 min ago	
8								32 min ago	
Navigate									
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.

\equiv Microsoft Azure P	Search resources, services, and docs (G+/)	D 🔂 🗘	† ? ⊙	
Home > Resource groups > TestG	roup1			
(ightarrow TestGroup1 Resource group				\$
	\ll + Add $\equiv\equiv$ Edit columns \square Delete resource group \circlearrowright Re	fresh \rightarrow Move \downarrow Export to CSV $ $ \otimes Ass	sign tags Delete $ \pm $ Export ter	nplate ···
 Overview 	Essentials	¥		
Activity log	Filter by name Type == all Location =	= all 🔹 + Y Add filter		
Access control (IAM)	Showing 1 to 18 of 18 records. Show hidden types ①		No grouping	\sim
Tags	Name ↑↓	Type ↑↓	Location ↑↓	
🗲 Events		Availability set	Japan East	
Settings		DNS zone	global	
📣 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	
Budgets		Network interface	Japan East	•••
Advisor recommendations		Disk	Japan East	•••
Monitoring		Disk	Japan East	
Insights (preview)		Storage account	Japan East	
💵 Alerts	TestLoadBalancer	Load balancer	Japan East	
Metrics		Dublic ID addrace	lanan Fact	
Diagnostic settings	Page 1 v of 1 Next >			
(

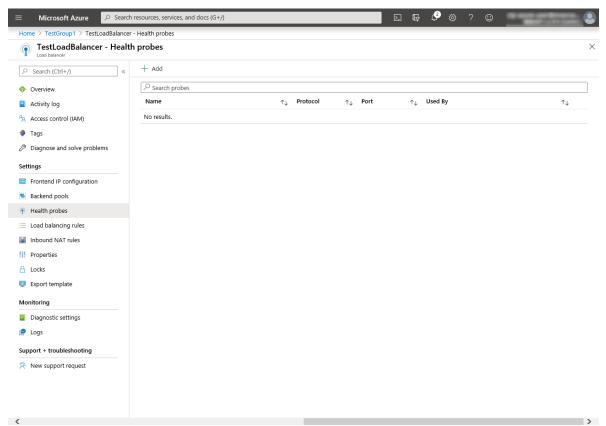
- 4. Select Backend pools.
- 5. Click Add.

Home > TestLoadBalancer - Backend p					
TestLoadBalancer - Bac	kend pools				
	+ Add 🖒 Refresh				
Overview					
 Activity log 	Virtual machine	Virtual machine status	Network interface	Private IP address	
Access control (IAM)	No results				
Tags					
Diagnose and solve problems					
Settings					
Frontend IP configuration					
Backend pools					
Health probes					
E Load balancing rules					
lnbound NAT rules					
Properties					
🖞 Locks					
Export template					
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 16 p @ ? ©
Home > TestGroup1 > TestLoadBalancer	- Backend pools	Add backend pool ×
TestLoadBalancer - Backe	nd pools	
	+ Add 💍 Refresh	Name *
Overview	Virtual machine Virtual machine status	Virtual network ①
Activity log	No results	Vnet1
Access control (IAM)	NO results	IP version
🔷 Tags		
Diagnose and solve problems		Associated to ① Virtual machine V
Settings		
Frontend IP configuration		Virtual machines
Backend pools		Virtual Machines must be in same location as Load Balancer. Only IP configurations that have
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.
📒 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		V
Support + troubleshooting		
Rew support request		
		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			₽	P	\$	٢	Conceptual and the second	
Hor	me > TestGroup1 > Test	LoadBalancer - Health probes > Add health probe							
Ac	ld health probe								×
Nar	me *								
Te	estHealthProbe	~							
Pro	tocol 🕕								
Т	3P	~							
Por	t * 0								
	5001								
Inte	erval * 🕕								
5									
		seconds							
	healthy threshold 🗙 🛈								
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>							
 Activity log 	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								
<								>

- 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 OUDP									
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 Active						
	A Groups		Resource Groups No results were found.					
Recent reso								
Name	Network Watcher							
🚸 TestLoadBala	The Host groups				in ago			
	(A) Management groups							
	(iii) Resource groups				go 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			
(3)		Net	twork interface	4 d a	ago			
6		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	Priority	Name	Port	Protocol	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						
 Subnets 	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), 🗣 д 🍩 ? 🙂 💶 🕘						
 Create a resource Home 	Home > Network security groups > NetSecGroup Network security grou 《 が X 認定のディレクトリ(WPEC)	NetSecGroup1 - Inbound sec	Image: Second security rule × MedicaGroup1 ★ Basic K						
Dashboard All services KAVORITES	Add EE Edit columns ···· More Filter by name	Search (Ctrl+/) Overview Activity log	* Source @ Any v						
All resources All resource groups App Services	0 til agentig blat 0 til agentig blat	Access control (IAM) Tags X Diagnose and solve problems	• •						
Gunction Apps SQL databases Azure Cosmos DB	0 magang pan 0 magang pan 0 managang pan	Settings to nbound security rules Outbound security rules	Cestination port ranges E080 Potocol Any TCP UDP						
Virtual machines Load balancers Storage accounts	tel terminet reg tel terminet reg tel terminet reg terminet reg		Any (CP UDP) * Action Allow Deny * Priority ●						
Virtual networks Azure Active Directory Monitor	NelSecGroup1 Identified	Locks Automation script	Name FestHTP						
 Advisor Security Center Cost Management + Bill 	constraints constraints constraints constraints	Monitoring Diagnostic settings NG flow logs	Description						
 Got management + Small Help + support Subscriptions App registrations 	contractificant reg contractificant reg contractificant reg contractificant contractificant	Support + troubleshooting Effective security rules 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.

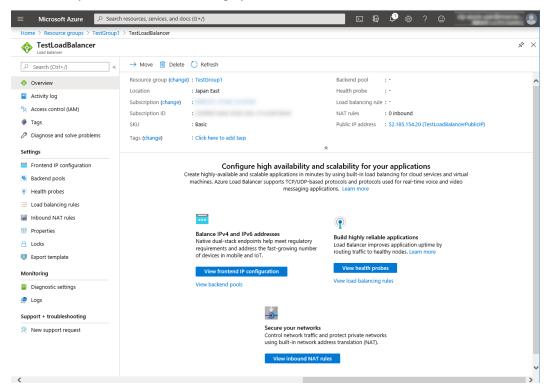
+	()		<u> </u>	1		۲		SQL	\rightarrow
Create a resource	Resource groups	Network security groups	Virtual machines	Subscriptions	All resources	App Services	Storage accounts	SQL databases	More services
Recent reso	urces								
	NAME			ТҮРЕ				LAST VIEWED	
~~>								22 min ago	
								24 min ago	
[)								24 min ago	
								26 min ago	
								26 min ago	
								27 min ago	
								28 min ago	
-								28 min ago	
								28 min ago	
<u>,</u>								29 min ago	
<u>,</u>								30 min ago	
8								32 min ago	
Navigate	riptions	Resource	e groups	All r	esources	Dasht	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.

Microsoft Azure P Se Microsoft Azure P Se Second a sec	earch resources, services, and docs (G+/)		\$? ©	
TestGroup1 Resource group	up :			Ŕ
P Search (Ctrl+/)	« + Add ≣≣ Edit columns 📋 Delete resource group Č) R	efresh \rightarrow Move \downarrow Export to CSV $ $ \otimes As	sign tags 📋 Delete 🕁 Export te	mplate ···
Overview	Essentials	*		
Activity log		== all 💿 (+ Add filter		
Access control (IAM)	Showing 1 to 18 of 18 records. Show hidden types ①		No grouping	~
🔶 Tags	□ Name ↑↓	Type \uparrow_{\downarrow}	Location \uparrow_{\downarrow}	
Events		Availability set	Japan East	
Settings		DNS zone	global	
🗳 Quickstart		Public IP address	Japan East	
Deployments		Public IP address	Japan East	
Policies		Virtual machine	Japan East	
E 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	
Alerts	C 🔷 TestLoadBalancer	Load balancer	Japan East	
Metrics	🔲 🚍 Tortt ood@alancor@ublict0	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 generation wizard Import Export Get the Configuration File Apply the Configuration File Update Server Data Check the Configuration File	

2. Cluster of Cluster generation wizard is displayed.

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

Cluster generation wizard	×				
Cluster → 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				

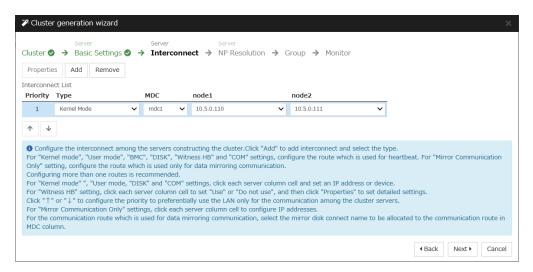
3. The **Basic Settings** window is displayed.

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**.

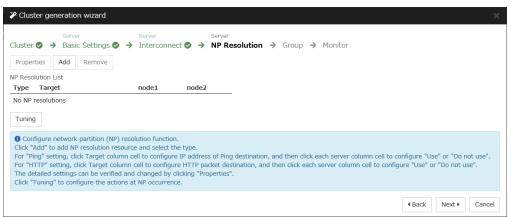


5. The NP Resolution window is displayed.

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	
 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	f	ailover 🗙
Basic Settings → Startup Servers	➔ Group Attributes ➔ Group Resource	
Туре*	failover 🗸	
Use Server Group Settings		
Name*	failover1	
Comment		
 Select group type. If using virtual machine resources to clust "Failover". If using server group, check the "Use Server gr	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.				
							 ▲ Back 	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	enter its name.			

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

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

Resource Definition of Group failover1 md 🗙					
Info ⊘ → Dependency ⊘ → Recovery Operation ⊘ → Details Common node1 node2					
Mirror Partition Device Name*	/dev/NMP1 🗸				
Mount Point*	/mnt/md				
Data Partition Device Name*	/dev/sdc2	~			
Cluster Partition Device Name*	/dev/sdc1	~			
File System*	ext4	~			
Mirror Disk Connect				Select	
Tuning					
			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 azurepp			
Info → Dependency → Recovery	Operation 🗲 Details		
Type*	Azure probe port resource \checkmark		
Name*	azurepp1		
Comment			
Get license information			
• Select the type of group resource and	enter its name.		
		Back Next Cancel	

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

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		
○ Active		
Target Resource		Browse
Nice Value		0
Choose servers that execute monitoring	Server	
		 ✓ Back Next ► Cancel

4. The Monitor (special) window is displayed.

Select Script created with this product.

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

#! /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	 Synchronous Asynchronous 			
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
				 ▲ 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	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			
 All servers Select Servers that can run the Group 		Available Servers	
Name node1	← 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 2

Monitor Resource Definition							ipw 🗙
Info 🛛 🔸 Monitor(common) 🖉	→	Monitor(special) 📀 🔸	Recovery A	ctior	ı		
Recovery Action		Execute only the final action	on				~
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
						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 Monitor Resources	mony 👽 🍎 Moni		Available Monitor Resources	
Monitor Resource	Туре	←	Monitor Resource	Туре
genw1	genw	Add	No Available Monitor Resources	
ipw1	ipw	<i>></i>		
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 Finish Cancel
		- 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					×
 User Application Script created with this presence of the second se	oduct				
File	preactio	n.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.

luster Name	Cluster1	
omment		
anguage	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	
T 70 4 1 1 • 44•	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	ng	
– 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)	1
– Account type	Standard HDD	
– Size	20	
L	1	

• 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	
60								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							×
resources for the solution, or or	hat holds related resources for an A: nly those resources that you want to	zure solution. The resource group can inclui manage as a group. You decide how you w st sense for your organization. Learn more	de all the ant to					
Resource group *	TestGroup1		~					
Resource details Region ★⊙	(Asia Pacific) Japan East		Y					
Review + create < P	Previous Next : Tags >							>
< c > 1								2

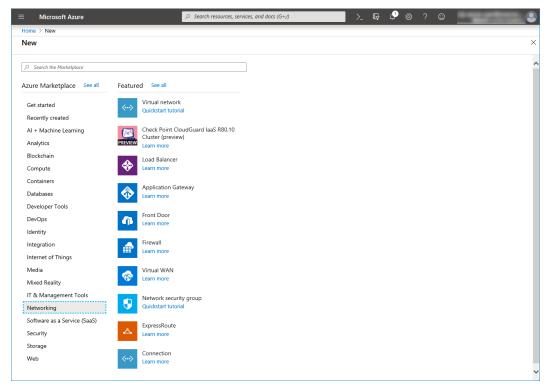
2) Creating a virtual network

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								
	NAME			ТҮРЕ				LAST VIEWED	
~>								22 min ago	
								24 min ago	
()								24 min ago	
								26 min ago	
								26 min ago	
•••								27 min ago	
•••								28 min ago	
-								28 min ago	
<u></u>								28 min ago	
Q								29 min ago	
.								30 min ago	
8								32 min ago	
Navigate									
-									

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	_
ome > New > Create virtual network	
reate virtual network \Box >	<
ame *	~
vnet1 v	
ddress space *①	
10.5.0.0/24 V	
10.5.0.0 - 10.5.0.255 (256 addresses)	
Add an IPv6 address space ①	
ubscription *	
esource group *	
TestGroup1 V	
eate new	
ocation *	
(Asia Pacific) Japan East 🗸 🗸	
ubnet	
ame★ √net1-1 ✓	
ddress range ★① 10.5.0.0/24	
10.5.0.0 - 10.5.0.255 (256 addresses)	
DoS protection () Basic () Standard	
-	
Prvice endpoints () Disabled Enabled	
rewall ①	
Disabled Enabled	~
Create Automation options	

3) Creating a virtual machine

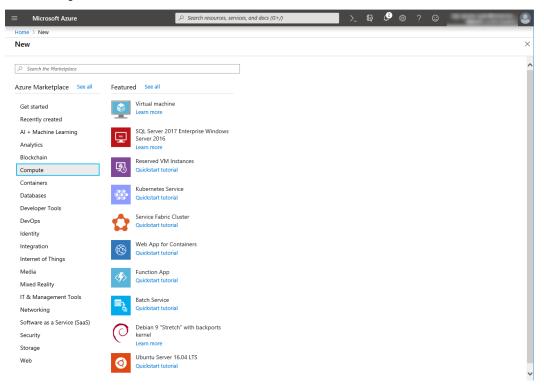
Log in to the Microsoft Azure portal (https://portal.azure.com/) and create virtual machines and disks following the steps below.

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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2. Select Compute and then See all.



3. Select CentOS-based 7.6.

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		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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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 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.					
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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** >

storage type, and number of transactions. Learn more about Azure Mar Indel_DataDisk_0 Standard HDD Source type ★○ None (empty disk) 32 GiB 54 500 60 Size ★○ 1024 GiB 510 500 60 60 128 GiB 510 500 60 <					Select a disk size	a virtual machine > Create a new disk	Home > New > Create
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16384 GiB570200050032767 GiB5802000500Create a custom sizeEnter the size of the didk you would like to create. You will be charged the same rate for your provisioned disk, regardless of how the disk space is being used For example, a 200 GiB disk is provisioned on a 256 GiB disk, so you would be billed for the 256 GiB provisioned.Custom disk size (GiB) *20		60	500	S50	4096 GiB		
322767 GiB 580 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 the disk space is being used For example, a 200 GiB disk is provisioned on a 256 GiB disk, so you would be billed for the 256 GiB provisioned. Custom disk size (GiB) * 20		300	1300	S60	8192 GiB		
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 the disk space is being used For example, a 200 GiB disk is provisioned on a 256 GiB disk, so you would be billed for the 256 GiB provisioned. Custom disk size (GiB) * 20		500	2000	S70	16384 GiB		
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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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Home > New > Create a virtu	al machine						
Create a virtual machi	ne						\times
Basics Disks Networking	ng Management Advanced	Tags Review + create					_
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.				
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Monitoring							
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EXPRESSCLUSTER X 5.0 HA Cluster Configuration Guide for Microsoft Azure (Linux), Release 2

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Create a virtual machine						
Basics Disks Networking Mr. Configure monitoring and management Azure Security Center Azure Security Center provides unified s Learn more			cloud workloads.		Name * kestgroup I diag600 Account kind ③ Storage (general purpo Performance ④ (Standard) Premium)	.core.windows.net ase v1) V
Your subscription is protected by A	zure Security Center basic pla	n.			Replication ①	
Monitoring					Locally-redundant stora	age (LRS) 🗸 🗸
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Azure Active Directory						
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11. Click Next: Tags >.

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Add additional configuration, agents, scripts or applications via virt	al machine extensions or cloud-init.			
Extensions				
Extensions provide post-deployment configuration and automation				
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	boots for the first time. You can use cloud-init to install hore			
() 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 ① No host group found	\checkmark			
Dedicated hosts cannot be used with availability sets.				
Proximity placement group Proximity placement groups allow you to group Azure resources pl	ysically closer together in the same region. Learn more			
Proximity placement group No proximity placement groups for	und V			~
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12. Click Next: Review + create >

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Home > New > Create a virtual machine			
Create a virtual machine			×
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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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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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Terms of use Privacy policy Price	ing for other VM sizes						
TERMS							
authorize Microsoft to bill my current payment methor my Azure subscription; and (c) agree that Microsoft ma	privacy statement(i) associated with the Marketplace offening(i) listed above (b) d for the fees associated with the offering(s), with the same billing frequency as go share my contact, usage and transactional information with the provider(s) of nal activities. Microsoft does not provide rights for third-party offerings. See the						
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						
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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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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	* *
 Resource group 	¬ ≪ + Add ≡≡ Edit columns ☐ Delete resource group	··· More
	Essentials	. more
Overview	^	
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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	
関 Export template	Network interface Japan East	
Cost Management		
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Cost allerts	Disk Japan East	
	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 >	
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4. Select Networking.

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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	
s Cost analysis		Disk	Japan East	
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Budgets	0-	Storage account	Japan East	
Advisor recommendations		Virtual network	Japan East	
Advisor recommendations				
Monitoring				
Insights (preview)				
Alerts				
Metrics	Designer Designer and the Number			
Diagnostic settings	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**.

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

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Home > Resource groups > TestGroup1 > node1 - Networking	> node1186 - IP configurations > ipconfig1										
ipconfig1											
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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	~										
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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		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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- 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 🗸							
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sku * ⊙	● 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	
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2. Select the resource group to which the created load balancer belongs from the resource group list.

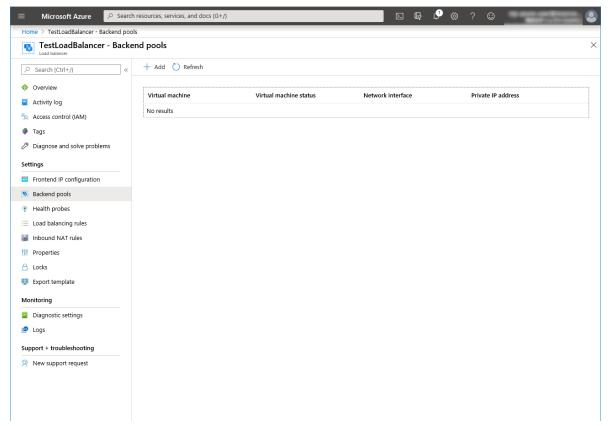
3. The summary of the selected resource group is displayed. Select the created load balancer from the item list.

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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
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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	
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Diagnostic settings	Previous Page 1 v of 1 Next >			

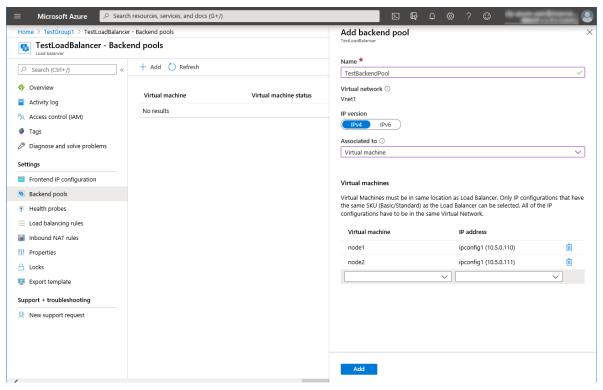
4. Select Backend pools.

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Hon	ne > TestLoadBalancer																		
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Q	Search (Ctrl+/)	«	\rightarrow Move	📋 Delete 🐧) Refresh														
•	Overview		Essentials																
	Activity log							Ih availability and scalability for your applications applications in minutes by using built-in load balancing for cloud services and virtual											
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	Frontend IP configuration				Balance IPv4 Native dual-sta			regulatory		d highly									
9	Backend pools				requirements a of devices in m	and address tl	the fast-grov			l Balance ing traffi									
Ŧ	Health probes							/iew hea	ith prof	es.									
8	Load balancing rules					tend IP config	guration												
	Inbound NAT rules				View backend	pools				View load balancing rules									
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Sup	port + troubleshooting							t-in network ac				1.5							
8	New support request						View i	inbound NAT r	rules										

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 > TestLoadBala	ancer - Health probes				
TestLoadBalancer - He	ealth probes				×
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Backend pools					
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Properties					
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Monitoring					
Diagnostic settings					
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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	~ ~						
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5							
	seconds						
Unhealthy threshold *							
2	consecutive failures						
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- 9) Configuring a load balancer (setting the load balancing rules)
- 1. Select Load balancing rules.

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Overview		2														ו
Activity log		Name		\uparrow_{\downarrow}	Load balancing rule	↑↓	Backend	pool			\uparrow_{\downarrow}	Hea	ilth probe	↑	Ļ	
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Health probes																
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Inbound NAT rules																
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Export template																
Monitoring																
Diagnostic settings																
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Support + troubleshooting																
📯 New 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.

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).)

E Microsoft Azure 🔑 Search resources, services	, and docs (G+/)		L G	P 👳	? ©	
Home > TestLoadBalancer - Load balancing rules > Add loa	d balancing rule					
Add load balancing rule						>
Name *						
TestLoadBalancingRule		~				
IP Version *						
IPv4 IPv6						
Frontend IP address * ①						
10.5.0.200 (LoadBalancerFrontEnd)	`	/				
Protocol						
TCP UDP						
Port *		_				
80						
Backend port *		_				
8080						
Backend pool ①						
TestBackendPool	```	/				
Health probe ①						
TestHealthProbe (TCP:26001)		/				
Session persistence ①						
None		/				
Idle timeout (minutes)						
0	4					
Floating IP (direct server return)						
Disabled Enabled						
ОК						
<						>

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 <clus< th=""><th>ster></th><th></th><th></th><th></th><th></th><th>🞤 Coni</th><th>îg mode 🗸</th><th>Ŧ</th><th>٩</th><th>ß</th><th>۶</th><th>i</th><th>?</th></clus<>	ster>					🞤 Coni	îg mode 🗸	Ŧ	٩	ß	۶	i	?
Cluster generation wizard	Import	Export	Get the Configuration File	Apply the Configuration File	Update Ser	ver Data	¢ Check the Config	guration 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 → 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 → MD Reso	Group -> Monitor
Order Name	
Master server node1	
↑ ↓	
Server Group Definition	Settings
● 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				×
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	~
\uparrow \downarrow				
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	C", "DISK", "Witr h is used only for commended. SK" and "COM" s rver column cell ity to preferentian ngs, click each se	ess HB" and "COM" settings, con r data mirroring communication. ettings, click each server column to set "Use" or "Do not use", and Ily use the LAN only for the com raver column cell to configure IP a	figure the route which is used cell and set an IP address or 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 ⊘ →	Server NP Resolution ightarrow Group	➔ Monitor	
Type Target	node1 node	2		
Ping 🗸 10.5.0.5	Use 🗸 Use	\sim		
Tuning				
Ocnfigure network partition (NP) rr Click "Add" to add NP resolution resor For "Ping" setting, click Target colum For "HTTP" setting, click Target colum The detailed settings can be verified a Click "Tuning" to configure the action	urce and select the type. n cell to configure IP addres nn cell to configure HTTP pa and changed by clicking "Pro	cket 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 I and the server Basic Settings I and the server Interconnect I and the server NP Resolution I and the server	→ Group → Monitor
Properties Add Remove	Group Resource
Group List	
Name	Туре
No groups	
 Configure failover group to be a unit of fail over. Click "Add" to add a group. Click "Properties" to configure the properties of the selected group. Click "Group Resource" to add resource to the selected group. 	
	Back Next Cancel

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	
 Select group type. If using virtual machine resources to clust "Failover". If using server group, check the "Use Server 	ter virtual machines, select "Virtual machine" as the type. In other cases, select ver Group".
	Gancel A 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	gs 🕗 🔸	➔ Startup	Servers 🛇	→ Gr	oup Attribu	tes 📀	→	Group Resource		
Properties	Add	Remove								
Group Resour	ce List									
Name						Туре				
No resources	5									
-		dd resources configure th	;. le properties d	of the sel	ected resourc	œ.				
								 ▲ Back 	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 failover	-1			md 🗙
Info \bigcirc \rightarrow Dependency \bigcirc \rightarrow Reco Common node1 node2	overy Operation 오	→ 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 the Reference Guide.

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

Resource Definition of Group failover1				
Info → Dependency → Recovery	Operation 🗲 Details			
Type*	Azure probe port resource \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 DSP, 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
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