

A decorative graphic on the left side of the page, consisting of a network of light blue lines connecting various sized dots, creating a mesh-like structure that tapers towards the right.

# Affinity Group Tutorial

Version: ZStack 3.10.0

Issue: V3.10.0

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# 1 Overview

An affinity group is a simple orchestration policy designed for IaaS resources to ensure your business high performances or high availability.

## Affinity Group Policy

Currently, ZStack provides two affinity group policies to better manage VM instances and hosts: anti-affinity group (soft) and anti-affinity group (hard).

- Anti-affinity group (soft):

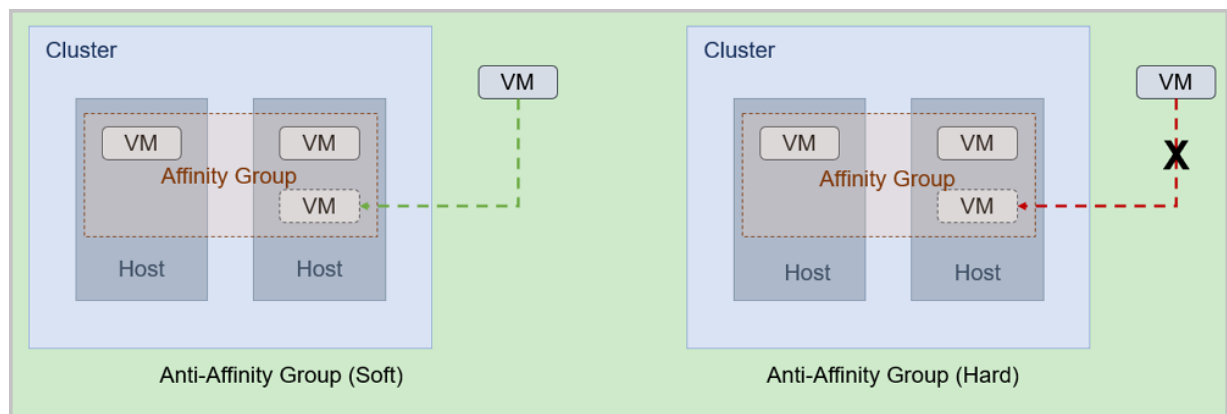
Allocate VM instances in the affinity group to different hosts as much as possible. If no more hosts are available, the VM instances will be allocated randomly.

- Anti-affinity group (hard):

Strictly allocate VM instances in the affinity group to different hosts. If no more hosts are available, the allocation fails.

The logic of these two anti-affinity groups is shown in [Figure 1-1: Anti-Affinity Group \(Soft\) and Anti-Affinity Group \(Hard\)](#).

**Figure 1-1: Anti-Affinity Group (Soft) and Anti-Affinity Group (Hard)**



## Usage Scenario

This section provides some usage examples of anti-affinity group (soft) and anti-affinity group (hard) policies.

- Anti-affinity group (soft):

You might want to deploy nodes with different Hadoop roles on different hosts to improve the overall system performance.

- For example, when you deploy a Hadoop system, you might find it difficult to calculate the exact number of nodes of different roles such as NameNode, DataNode, JobTracker, and TaskTracker. However, you might know that deploying these nodes on different hosts is more effective. With the anti-affinity group (soft) policy, you can deploy Hadoop clusters on different hosts as much as possible, which relieves the I/O pressure and improves the overall performance of the system.
- Anti-affinity group (hard):

You might want to deploy two VM instances that run an active and a standby database on different hosts to ensure high availability.

- For example, you deploy two business VM instances to run an active and a standby MySQL database respectively, and requires that the active and standby databases cannot be down at the same time. Therefore, you must deploy these two VM instances on different hosts. Due to deployment automation, you might not predict which hosts have sufficient resources . With the anti-affinity group (hard) policy, you can choose two different hosts to run these two VM instances respectively, which ensures the high availability.

## 2 Prerequisite

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In this tutorial, assume that you installed the latest version of ZStack, and completed initializing the Cloud, including adding a zone, cluster, host, backup storage, primary storage, and other basic resources. For more information, see installation and deployment topics and wizard configuration topics in the [User Guide](#).

This tutorial mainly describes how to use two types of affinity group policy to better manage VM instances and hosts.

## 3 Usage Method

To use affinity group policies for better managing VM instances and hosts, follow the two usage methods below:

- **Resource Pool > Affinity Group**
- **Resource Pool > VM Instance**

### 3.1 Affinity Group

This topic mainly describes how to use affinity groups to better manage VM instances and hosts via the method from **Resource Pool > Affinity Group**.

#### Affinity Group Management Page

In the navigation pane of the ZStack Private Cloud UI, choose **Resource Pool > Affinity Group** to enter the **Affinity Group** management page.

On the **Affinity Group** management page, you can view the information of all currently existing affinity groups, including the affinity group name, specified policy, binding VM count, affinity group type, owner, and creation time. Also, more operations are supported, such as creating, enabling, and disabling an affinity group, as shown in [Affinity Group Management Page](#).

**Figure 3-1: Affinity Group Management Page**

|                          | Name                  | Policy               | VM Instance Count | State   | Type | Owner | Creation Time       |
|--------------------------|-----------------------|----------------------|-------------------|---------|------|-------|---------------------|
| <input type="checkbox"/> | Affinity Group (hard) | Anti-affinity (hard) | 1                 | Enabled | HOST | admin | 2020-06-11 13:22:53 |
| <input type="checkbox"/> | Affinity Group (soft) | Anti-affinity (soft) | 1                 | Enabled | HOST | admin | 2020-06-11 13:22:34 |

#### Create Affinity Group

On the **Affinity Group** management page, click **Create Affinity Group**. On the displayed **Create Affinity Group** page, set the following parameters:

- **Name:** Enter a name for the affinity group.
- **Description:** Optional. Enter a description for the affinity group.
- **Policy:** Select an affinity group policy.

Currently, ZStack provides the following two types of affinity group policy to better manage VM instances and hosts.

- Anti-affinity group (soft):

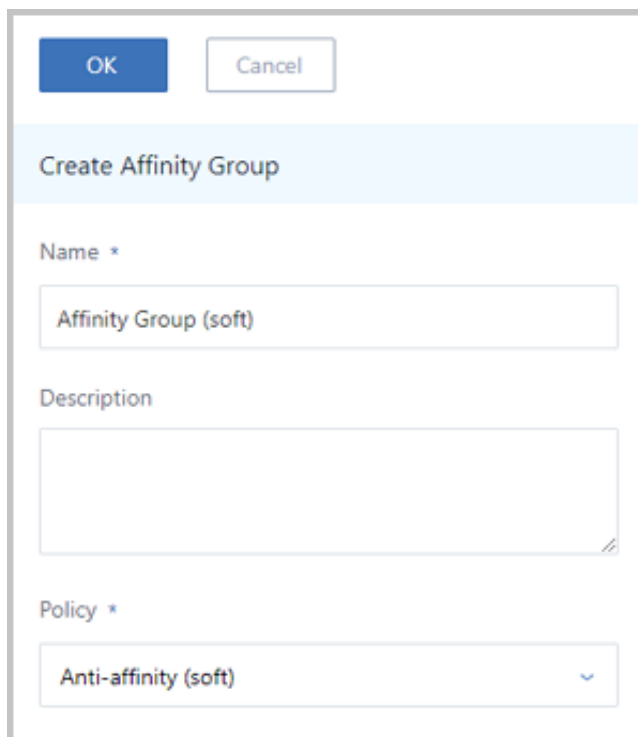
Allocate VM instances in the affinity group to different hosts as much as possible. If no more hosts are available, the VM instances will be allocated randomly.

- Anti-affinity group (hard):

Strictly allocate VM instances in the affinity group to different hosts. If no more hosts are available, the allocation fails.

You can create an anti-affinity group, as shown in [Create Anti-Affinity Group \(Soft\)](#).

**Figure 3-2: Create Anti-Affinity Group (Soft)**



The screenshot shows a 'Create Affinity Group' dialog box. At the top are 'OK' and 'Cancel' buttons. Below the title bar, there are three input fields: 'Name \*' containing 'Affinity Group (soft)', 'Description' (empty), and 'Policy \*' with a dropdown menu showing 'Anti-affinity (soft)'.

## Affinity Group Operations

You can perform the following operations on an affinity group:

- Create: Create a new affinity group in the current zone.
- Enable: Re-enable the selected affinity group to check whether VM instances within the affinity group can satisfy the affinity group policy. If the affinity group policy is met, the affinity group will be enabled successfully, or vice versa.



- **Disable:** Disable the affinity group that you selected. Then, VM instances within the group will stop following the affinity group policy.
- **Bind VM instance:** Bind new VM instances to the affinity group. Then, the affinity group policy will take effect immediately.
- **Unbind VM instance:** Unbind VM instances from the affinity group. Then, the affinity group policy will take effect immediately.
- **Change owner:** Change an owner for the affinity group.
- **Delete:** Delete the affinity group that you selected. Then, VM instances within the group will no longer follow the affinity group policy when starting next time.

### Constraints

- Currently, the affinity group policy supports two types of affinity group: affinity group (soft) and affinity group (hard). These two types support the HOST type, which means that an affinity relationship between VM instances and hosts can be formed.
- The number of VM instances that an affinity group can bind is not limited. In addition, the affinity group does not have quota limits, indicating that you can create limitless affinity groups.
- The scope of an affinity group is the entire zone where the effect object is all hosts that meet the constraints.
- One VM instance can be bound by only one affinity group at a time.
- To change an affinity group to which a VM instance belongs, make sure that this VM instance is in the running state or stopped state.
- After you change an affinity group for a VM instance on a local storage, the VM instance will be preferentially started on the host where the VM instance is running last time without following the new group policy. This helps to avoid unnecessary migrations.
- After you change an affinity group for a VM instance on a shared storage, the VM instance will be started according to the new group policy.
- If you bind or unbind a VM instance, the affinity group policy will take effect immediately. Only when you bind VM instances that are in the stopped state on a shared storage to an affinity group, the group policy takes effect when the VM instances are started next time.
- Migrating VM instances will also follow an affinity group policy.
- By default, all vRouters and VPC vRouters belong to one affinity group, known as system affinity group, where anti-affinity group (soft) is adopted. Specifically, this affinity group only allows you to perform enabling and disabling operations except for other operations.
- Admin accounts and regular accounts are all allowed to create affinity groups.

- Admin accounts can manage all affinity groups, while regular accounts can only manage the affinity groups owned by themselves.

## 3.2 VM Instance

This topic mainly describes how to use affinity groups to better manage VM instances and hosts via the usage method from **Resource Pool > VM Instance**.

### Create VM Instance with Affinity Group

In the navigation pane of the ZStack Private Cloud UI, choose **Resource Pool > VM Instance**.

On the **VM Instance** management page, click **Create VM Instance**. On the displayed **Create VM Instance** page, set the following parameters:

- **Add Type**: Select single.
- **Name**: Enter a name for the VM instance.
- **Description**: Optional. Enter a description for the VM instance.
- **Instance Offering**: Select an appropriate instance offering.
- **Image**: Select an image for the VM instance.
- **Network**: Select a network for the VM instance.
- **Advanced**: Optional. Customize your advanced settings for the VM instance as needed.

If you want the VM instance to follow an affinity group policy, select an affinity group as follows:

- **Affinity Group**: Select an existing affinity group. Make sure that you specify an affinity group policy and a type for the affinity group.

Create a V instance with an anti-affinity group, as shown in [Create VM Instance with Affinity Group](#).

**Figure 3-3: Create VM Instance with Affinity Group**

OK

Cancel

Create VM Instance

Add Type

☐ Single

☒ Multiple

Name \*

VM Instance

Description

Instance Offering \*

Instance Offering-1

Image \*

Image-1

Network

Network Address Type \*

IPv4

IPv6

Double Stack

L3 Network \*

L3 Network-1

☒ Private L3 Network

Default Network

VM NIC Setting

☐ Enable SR-IOV

+ Add More Network

The screenshot shows the 'Advanced' settings panel for a VM instance. It contains three sections:

- Data Disk Offering:** A text input field with a blue '+' icon on the right.
- Storage Allocation Policy:** A dropdown menu currently showing 'System allocation' with a blue '-' icon on the right.
- Affinity Group:** A dropdown menu currently showing 'Affinity Group (hard)' with a blue '-' icon on the right.

## VM Operations on Affinity Group

A VM instance allows you to perform the following operations on an affinity group:

- Create VM instance by specifying affinity group: Specify an affinity group when you create a VM instance. Then, the VM instance will be created based on the specified affinity group policy.
- Clone VM instance by specifying affinity group: Specify an affinity group when you clone a VM instance. Then, the VM instance will be cloned based on the specified affinity group policy.
- Bind affinity group: Bind the VM instance to the affinity group. Then, the affinity group policy will take effect for the VM instance.
- Unbind affinity group: Unbind the VM instance from the affinity group. Then, the affinity group policy will take effect immediately for the VM instance.

## Constraints

When you create a VM instance, if you specify an affinity group and a host simultaneously via the VM advanced settings, note the following:

- With an anti-affinity group (soft),
  - When the specified host satisfies the condition to create VM instances, but does not meet the specified anti-affinity group policy (soft), you can create these VM instances successfully.
  - When the specified host does not satisfy the condition to create VM instances, you fail to create these VM instances.
- With an anti-affinity group (hard),

- When the specified host satisfies the condition to create VM instances, but does not meet the specified anti-affinity group (hard), you fail to create these VM instances.
- When the specified host does not satisfy the condition to create VM instances, you fail to create the VM instance.

## 4 Scenario Practice

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This chapter mainly describes the scenario practice of two affinity group policies to better manage VM instances and hosts.

- Anti-affinity group (soft) for VM instances and hosts
- Anti-affinity group (hard) for VM instances and hosts

### 4.1 VM Instance | Host Anti-Affinity Group (Soft)

#### Context

This topic mainly describes the scenario practice of the anti-affinity group (soft) to better manage VM instances and hosts.

Scenario: In a cluster environment, you have four business VM instances, and want to deploy these VM instances dispersedly on three different hosts.

#### Procedure

1. Create an anti-affinity group (soft).
2. Create four business VM instances by specifying this anti-affinity group.
3. Verify that these four business VM instances are dispersedly deployed on three different hosts as much as possible.

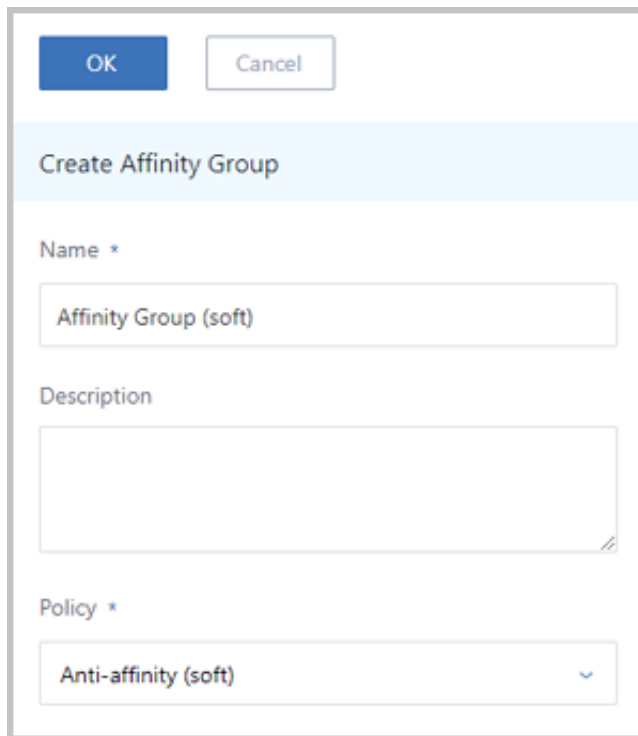
#### Procedure

1. Create an anti-affinity group (soft).

In the navigation pane of the ZStack Private Cloud UI, choose **Resource Pool > Affinity Group**. On the **Affinity Group** management page, click **Create Affinity Group**. On the displayed **Create Affinity Group** page, set the following parameters:

- **Name:** Enter a name for the affinity group, such as anti-affinity group (soft).
- **Description:** Optional. Enter a description for the affinity group.
- **Policy:** Specify an affinity group policy: anti-affinity group (soft).

Create an anti-affinity group (soft), as shown in [Create Anti-Affinity Group \(Soft\)](#).

**Figure 4-1: Create Anti-Affinity Group (Soft)**

OK Cancel

Create Affinity Group

Name \*

Affinity Group (soft)

Description

Policy \*

Anti-affinity (soft)

2. Create four business VM instances by specifying this affinity group.

In the navigation pane of the ZStack Private Cloud UI, choose **Resource Pool > VM Instance**. On the **VM Instance** management page, click **Create VM Instance**. On the displayed **Create VM Instance** page, set the following parameters:

- **Add Type:** Select Multiple.
- **Create Count:** Enter the number of VM instances to be created, for example, 4.
- **Name:** Enter a name for the VM instance.
- **Description:** Optional. Enter a description for the VM instance.
- **Instance Offering:** Select an appropriate instance offering.
- **Image:** Select an image for the VM instance.
- **Network:** Select a network for the VM instance.
- **Advanced:** Optional. Customize your advanced settings for the VM instance as needed. In this scenario practice, set the following parameters:
  - **Affinity Group:** Select an existing affinity group (soft), as shown in [Create VM Instance with Affinity Group](#).

**Figure 4-2: Create VM Instance with Affinity Group**

OK

Cancel

Create VM Instance

Add Type

☐ Single ☒ Multiple

Name \*

VM Instance

Description

Instance Offering \*

Instance Offering-1

Image \*

Image-1

Network

Network Address Type \*

IPv4

IPv6

Double Stack

L3 Network \*

L3 Network-1

☒ Private L3 Network

Default Network

VM NIC Setting

☐ Enable SR-IOV

+ Add More Network



Advanced ▾

Data Disk Offering

Storage Allocation Policy

System allocation ▾

Affinity Group

Anti-affinity (soft) ▾

3. Verify that these four business VM instances are dispersedly deployed on three different hosts as much as possible.

On the **VM Instance** management page, view that four business VM instances are dispersedly deployed on three different hosts and the affinity group (soft) takes effect, as shown in [Verify Anti-Affinity Group \(Soft\)](#).

**Figure 4-3: Verify Anti-Affinity Group (Soft)**

| <input type="checkbox"/> | Name                   | Tag(Admin) ▾ | CPU | Memory | Default IP     | Host IP      | Cluster(All) ▾ | State(All) ▾ | Owner |
|--------------------------|------------------------|--------------|-----|--------|----------------|--------------|----------------|--------------|-------|
| <input type="checkbox"/> | Business VM Instance-1 | None         | 1   | 1 GB   | 192.168.82.251 | 10.0.41.182  | Cluster-1      | ● Running    | admin |
| <input type="checkbox"/> | Business VM Instance-2 | None         | 1   | 1 GB   | 192.168.82.119 | 10.0.235.164 | Cluster-1      | ● Running    | admin |
| <input type="checkbox"/> | Business VM Instance-3 | None         | 1   | 1 GB   | 192.168.82.205 | 10.0.41.182  | Cluster-1      | ● Running    | admin |
| <input type="checkbox"/> | Business VM Instance-4 | None         | 1   | 1 GB   | 192.168.82.161 | 10.0.55.46   | Cluster-1      | ● Running    | admin |

## 4.2 VM Instance | Host Anti-Affinity Group (Hard)

### Context

This topic mainly describes the scenario practice of the anti-affinity group (hard) to better manage VM instances and hosts.

Scenario: In a cluster environment, you have three business VM instances, and want to deploy these VM instances dispersedly on three different hosts.

### Procedure

1. Create an anti-affinity group (hard).
2. Create three business VM instances by specifying this anti-affinity group.

3. Verify that these three business VM instances are dispersedly deployed on three different hosts as much as possible.

## Procedure

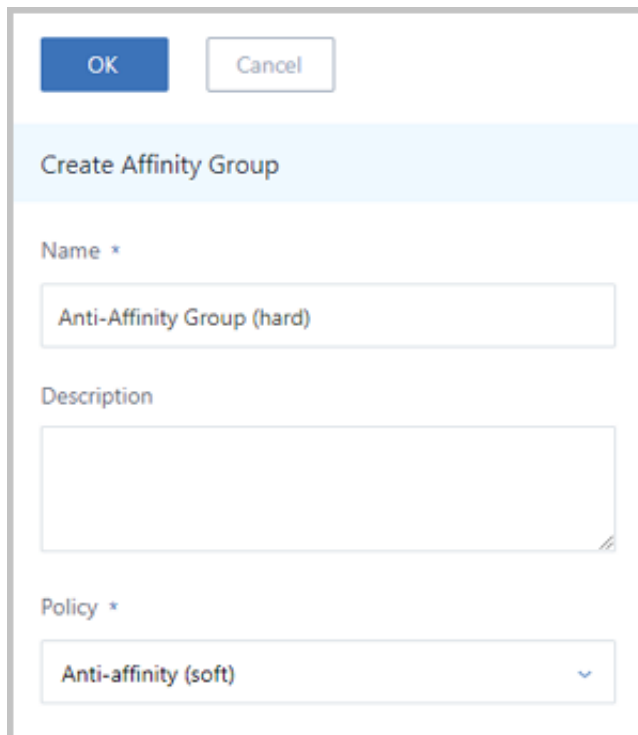
1. Create an anti-affinity group (hard).

In the navigation pane of the ZStack Private Cloud UI, choose **Resource Pool > Affinity Group**. On the **Affinity Group** management page, click **Create Affinity Group**. On the displayed **Create Affinity Group** page, set the following parameters:

- **Name:** Enter a name for the affinity group, such as anti-affinity group (hard).
- **Description:** Optional. Enter a description for the affinity group.
- **Policy:** Specify an affinity group policy: anti-affinity group (hard).

Create an anti-affinity group (hard), as shown in [Create Anti-Affinity Group \(Hard\)](#).

**Figure 4-4: Create Anti-Affinity Group (Hard)**



The screenshot shows a 'Create Affinity Group' dialog box. At the top are 'OK' and 'Cancel' buttons. Below the title bar, there are three fields: 'Name \*' with the value 'Anti-Affinity Group (hard)', 'Description' (empty), and 'Policy \*' with a dropdown menu showing 'Anti-affinity (soft)'.

2. Create three business VM instances by specifying this anti-affinity group.

In the navigation pane of the ZStack Private Cloud UI, choose **Resource Pool > VM Instance**. On the **VM Instance** management page, click **Create VM Instance**. On the displayed **Create VM Instance** page, set the following parameters:

- **Add Type:** Select Multiple.

- **Create Count:** Enter the number of VM instances to be created, for example, 3.
- **Name:** Enter a name for the VM instance.
- **Description:** Optional. Enter a description for the VM instance.
- **Instance Offering:** Select an appropriate instance offering.
- **Image:** Select an image for the VM instance.
- **Network:** Select a network for the VM instance.
- **Advanced:** Optional. Customize your advanced settings for the VM instance as needed. In this scenario practice, set the following parameters:
  - **Affinity Group:** Select the existing affinity group (hard), as shown in [Create VM Instance with Affinity Group](#).

**Figure 4-5: Create VM Instance with Affinity Group**

OK

Cancel

Create VM Instance

Add Type

☐ Single ☒ Multiple

Name \*

VM Instance

Description

Instance Offering \*

Instance Offering-1

Image \*

Image-1

Network

Network Address Type \*

IPv4

IPv6

Double Stack

L3 Network \*

L3 Network-1

☒ Private L3 Network

Default Network

VM NIC Setting

☐ Enable SR-IOV

+ Add More Network

Advanced ▾

Data Disk Offering

Storage Allocation Policy

System allocation ▾

Affinity Group

Affinity Group (hard) ▾

- Verify that these three business VM instances are dispersedly deployed on three different hosts to the greatest extent.

On the **VM Instance** management page, view that four business VM instances are dispersedly deployed on three different hosts and the affinity group (hard) takes effect, as shown in [Verify Anti-Affinity Group \(Hard\)](#)

**Figure 4-6: Verify Anti-Affinity Group (Hard)**

| <input type="checkbox"/> | Name                   | Tag(Admin) ▾ | CPU | Memory | Default IP     | Host IP      | Cluster(All) ▾ | State(All) ▾ | Owner |
|--------------------------|------------------------|--------------|-----|--------|----------------|--------------|----------------|--------------|-------|
| <input type="checkbox"/> | Business VM Instance-1 | None         | 1   | 1 GB   | 192.168.82.237 | 10.0.41.182  | Cluster-1      | • Running    | admin |
| <input type="checkbox"/> | Business VM Instance-2 | None         | 1   | 1 GB   | 192.168.82.211 | 10.0.55.46   | Cluster-1      | • Running    | admin |
| <input type="checkbox"/> | Business VM Instance-3 | None         | 1   | 1 GB   | 192.168.82.84  | 10.0.235.164 | Cluster-1      | • Running    | admin |

## What's next

So far, we have introduced how to use these two affinity group policies for VM instances and hosts

# Glossary

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## Zone

A zone is a logical group of resources such as clusters, L2 networks, and primary storages. Zone is the largest resource scope defined in ZStack.

## Cluster

A cluster is a logical group of analogy hosts (compute nodes). Hosts in the same cluster must be installed with the same operating system, have the same network configuration, and be able to access the same primary storage. In a real data center, a cluster usually maps to a rack.

## Management Node

A management node is a host with operating system installed to provide UI management and Cloud deployment.

## Compute Node

A compute node is a physical server (also known as a host) that provides VM instances with compute, network, and storage resources.

## Primary Storage

A primary storage is a storage server used to store disk files in VM instances. Local storage, NFS, Ceph, Shared Mount Point, and Shared Block are supported.

## Backup Storage

A backup storage is a storage server used to store image template files. ImageStore, SFTP (Community Edition), and Ceph are supported. We recommend that you deploy backup storage separately.

## ImageStore

ImageStore is a type of backup storage. You can use ImageStore to create images for VM instances that are in the running state and manage image version updates and release.

ImageStore allows you quickly upload, download, export images, and create image snapshots as needed.

## VM Instance

A VM instance is a virtual machine instance running on a host. A VM instance has its own IP address to access public network and run application services.

## Image

An image is an image template used by a VM instance or volume. Image templates include system volume images and data volume images.

## Volume

A volume can either be a data volume or a root volume. A volume provides storage to a VM instance. A shared volume can be attached to one or more VM instances.

## Instance Offering

An instance offering is a specification of the VM instance CPU and memory, and defines the host allocator strategy, disk bandwidth, and network bandwidth.

## Disk Offering

A disk offering is a specification of a volume, which defines the size of a volume and how the volume will be created.

## L2 Network

An L2 network is a layer 2 broadcast domain used for layer 2 isolation. Generally, L2 networks are identified by names of devices on the physical network.

## L3 Network

An L3 network is a collection of network configurations for VM instances, including the IP range, gateway, and DNS.

## Public Network

A public network is generally allocated with a public IP address by Network Information Center (NIC) and can be connected to IP addresses on the Internet.

## Private Network

A private network is the internal network that can be connected and accessed by VM instances.

## **L2NoVlanNetwork**

L2NoVlanNetwork is a network type for creating an L2 network. If L2NoVlanNetwork is selected, VLAN settings are not used for host connection.

## **L2VlanNetwork**

L2VlanNetwork is a network type for creating an L2 network. If L2VlanNetwork is selected, VLAN settings are used for host connection and need to be configured on the corresponding switches in advance.

## **VXLAN Pool**

A VXLAN pool is an underlay network in VXLAN. You can create multiple VXLAN overlay networks (VXLAN) in a VXLAN pool. The overlay networks can operate on the same underlay network device.

## **VXLAN**

A VXLAN network is a L2 network encapsulated by using the VXLAN protocol. A VXLAN network belongs to a VXLAN pool. Different VXLAN networks are isolated from each other on the L2 network.

## **vRouter**

A vRouter is a custom Linux VM instance that provides various network services.

## **Security Group**

A security group provides L3 network firewall control over the VM instances. It can be used to set different security rules to filter IP addresses, network packet types, and the traffic flow of network packets.

## **EIP**

An elastic IP address (EIP) is a method to access a private network through a public network.

## **Snapshot**

A snapshot is a point-in-time capture of data status in a disk. A snapshot can be either an automatic snapshot or a manual snapshot.