### **Elastic Load Balance**

# **Getting Started**

Issue 04

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## **Security Declaration**

#### Vulnerability

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https://www.huawei.com/en/psirt/vul-response-process

For vulnerability information, enterprise customers can visit the following web page:

https://securitybulletin.huawei.com/enterprise/en/security-advisory

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# 1 Overview

To use ELB to distribute traffic across backend servers, you need to create a dedicated load balancer or a shared load balancer.

Two examples are given to show how you can quickly create a shared load balancer to distribute incoming traffic across backend servers.

• **Entry level**: An application deployed on separated ECSs needs to handle a large number of requests. Health checks are required to monitor the health of the servers to ensure that incoming traffic is routed only to healthy servers to eliminate SPOFs and improve service availability.

VPC

VPC

Listener listener-HTTP (HTTP/80)

ECS01

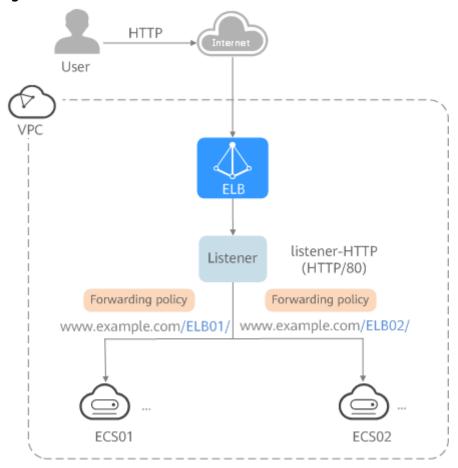
ECS02

Figure 1-1 Entry level

As the incoming traffic increases, you can add more backend servers to balance the load.

Advanced level: An application deployed on separated servers uses one
domain name but different URLs to provide services, and requests are routed
to different servers based on the URLs. Forwarding policies are required to
forward requests from different URLs to the servers in the corresponding
backend server groups.

Figure 1-2 Advanced level

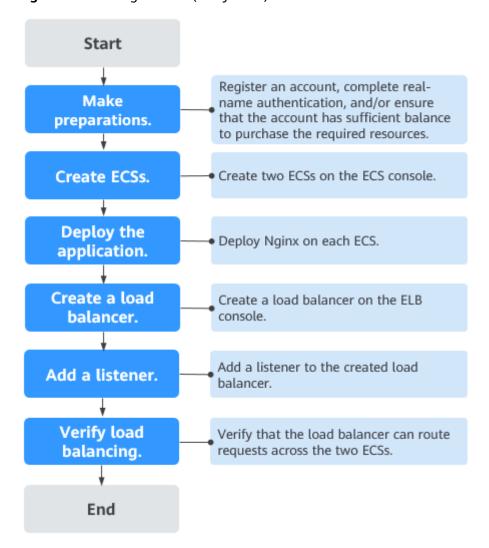


As the incoming traffic increases, you can add more backend servers to the two backend server groups. You can also configure health checks to monitor the health of backend servers to ensure that incoming traffic is routed only to healthy backend servers.

# 2 Process Flowchart

**Figure 1** shows how you can use basic functions of ELB to route requests when you are still new to ELB, and **Figure 2** shows how you can use ELB to route requests based on domain names or URLs more efficiently.

Figure 2-1 Getting started (entry level)



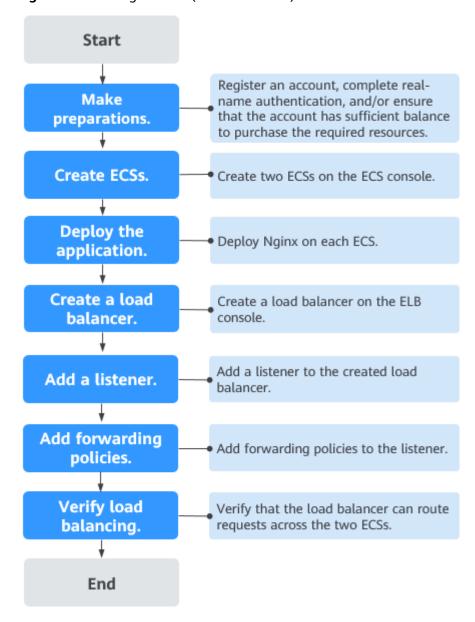


Figure 2-2 Getting started (advanced level)

# 3 Preparations for Using ELB

Before using ELB to route requests, you need to make some preparations.

- Signing Up with Huawei Cloud and Completing Real-Name Authentication
- Topping Up Your Account
- Creating an IAM User

#### Signing Up with Huawei Cloud and Completing Real-Name Authentication

If you already have a Huawei Cloud account and completed real-name authentication, skip this part. If you do not have a Huawei Cloud account, perform the following steps to register one:

- 1. Visit the **Huawei Cloud official website** and click **Sign Up**.
- Register an account as prompted.
   If the registration is successful, the system automatically redirects you to your personal information page.
- 3. Complete real-name authentication by following the instructions in **Individual Real-Name Authentication**.

#### **Topping Up Your Account**

For billing details about shared load balancers, **Billing (Shared Load Balancers)** 

Dedicated load balancers are not free and can be purchased in the pay-per-use billing mode. For details, see **Billing (Dedicated Load Balancers)**.

Ensure that your account has sufficient balance to buy the resources you need.

To top up an account, see **Topping Up an Account**.

#### Creating an IAM User

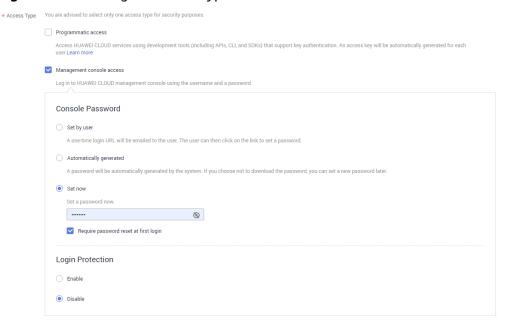
If you want to allow multiple users to manage your resources without sharing your password or private key, you can create IAM users and grant permissions to the users. These users can use specified links and their own accounts to access the cloud platform and help you manage resources efficiently. You can also configure security policies to ensure the security of these accounts.

If you have registered an account, you can create an IAM user on the IAM console.

For example, to create an ELB administrator, perform the following steps:

- 1. Enter your account name and password to log in to the management console.
- 2. In the upper right corner of the page, hover the mouse over the username and select **Identity and Access Management**.
- 3. In the navigation pane on the left, choose **Users**. In the right pane, click **Create User**.
- 4. Enter the user information on the **Create User** page.
  - Username: Enter elb administrator.
  - Email Address: Email address bound to the IAM user. This parameter is mandatory if the access type is specified as Set by user.
  - (Optional) Mobile Number: Mobile number of the IAM user.
  - (Optional) **Description**: Enter a description, for example, **ELB** administrator.
- Select Management console access for Access Type and Set now for Password. Enter a password, and click Next.

Figure 3-1 Selecting the access type



#### 

An ELB administrator can log in to the management console and manage users. It is good practice to select **Set now** for **Password** when you create an ELB administrator for yourself. If you create an ELB administrator for another user, select **Set by user** for **Password** so that the user can set their own password.

6. (Optional) Add the user to the **admin** user group and click **Create**.

User group **admin** has all the permissions. If you want to grant fine-grained permissions to IAM users, see **Creating a User and Granting Permissions**.

Check whether the IAM user is displayed in the user list. You can click the IAM user login link above the list and use the created user to log in to the console.

# 4 Using Shared Load Balancers (Entry Level)

#### Scenarios

You have a web application, which often needs to handle heavy traffic and is deployed on two ECSs for load balancing.

You can create a load balancer to distribute traffic evenly across the two ECSs, which eliminates SPOFs and makes your application more available.

#### **Prerequisites**

To ensure normal communications between the load balancer and backend servers, you need to check the security group rules and network ACL rules configured for the backend servers.

When backend servers receive requests from the load balancer, source IP addresses are translated into those in 100.125.0.0/16.

- Security group rules must allow traffic from the 100.125.0.0/16 to backend servers.
- Network ACL rules are optional for subnets. If network ACL rules are configured for the backend subnet of the load balancer, the network ACL rules must allow traffic from the backend subnet of the load balancer to the backend servers.

#### □ NOTE

If **Transfer Client IP Address** is enabled for the TCP or UDP listeners, network ACL rules and security group rules will not take effect. You can use access control to limit which IP addresses are allowed to access the listener.

#### **Creating ECSs**

ECSs are used as backend servers.

Each ECS needs an EIP for accessing the Internet, and the EIP is used for configuring the application on the ECS. You can determine whether to bind an EIP to the load balancer based on your requirements.

For details, see Purchasing an ECS.

- 1. Log in to the management console.
- 2. In the upper left corner of the page, click of and select the desired region and project.
- 3. Hover on in the upper left corner to display **Service List** and choose **Compute** > **Elastic Cloud Server**.
- 4. Click **Buy ECS**, configure the parameters, and click **Next**.

The following table lists the specifications of the two ECSs.

Table 4-1 ECS specifications

Item	Example Value
Name	ECS01 and ECS02
OS	CentOS 7.2 64bit
vCPUs	2
Memory	4 GiB
System disk	40 GiB
Data disk	100 GiB
Bandwidth	5 Mbit/s

5. Submit your request.

#### **Deploying the Application**

Deploy Nginx on the two ECSs and edit two HTML pages so that a page with message "Welcome to ELB test page one!" is returned when ECS01 is accessed, and the other page with message "Welcome to ELB test page two!" is returned when ECS02 is accessed.

- 1. Log in to the ECSs.
- 2. Install and start Nginx.
  - a. Run the **wget** command to download the Nginx installation package for your operating system in use. CentOS 7.6 is used as an example here. wget http://nginx.org/packages/centos/7/noarch/RPMS/nginx-release-centos-7-0.el7.ngx.noarch.rpm
  - b. Run the following command to create the Nginx yum repository: rpm -ivh nginx-release-centos-7-0.el7.ngx.noarch.rpm
  - c. Run the following command to install Nginx: yum -y install nginx
  - d. Run the following commands to start Nginx and configure automatic Nginx enabling upon ECS startup:

    systemctl start nginx
    systemctl enable nginx

e. Enter http://EIP bound to the ECS in the address box of your browser. If the following page is displayed, Nginx has been installed.

Figure 4-1 Nginx installed successfully



#### Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to <u>nginx.org</u>. Commercial support is available at <u>nginx.com</u>.

Thank you for using nginx.

3. Modify the HTML page of ECS01.

Modify the **index.html** file in the default root directory of Nginx **/usr/share/nginx/html** to identify access to ECS01.

- a. Open the index.html file.
  - vim /usr/share/nginx/html/index.html
- b. Press i to enter editing mode.
- c. Modify the index.html file to be as follows:

- d. Press **Esc** to exit editing mode. Then, enter :**wq** to save the settings and exit the file.
- 4. Modify the HTML page of ECS02.

Modify the **index.html** file in the default root directory of Nginx **/usr/share/nginx/html** to identify access to ECS02.

a. Open the **index.html** file.

#### vim /usr/share/nginx/html/index.html

- b. Press i to enter editing mode.
- c. Modify the **index.html** file to be as follows:

- d. Press **Esc** to exit editing mode. Then, enter :**wq** to save the settings and exit the file.
- 5. Use your browser to access http://ECS01 EIP and http://ECS02 EIP to verify that Nginx has been deployed.

If the modified HTML pages are displayed, Nginx has been deployed.

- HTML page of ECS01

Figure 4-2 Nginx successfully deployed on ECS01

## Welcome to **ELB** test page one!

This page is used to test the ELB!

```
ELB test (page one)!

ELB test (page one)!

ELB test (page one)!
```

HTML page of ECS02

Figure 4-3 Nginx successfully deployed on ECS02

# Welcome to **ELB** test page two!

This page is used to test the ELB!

```
ELB test (page two)!

ELB test (page two)!

ELB test (page two)!
```

#### Creating a Load Balancer

The load balancer needs an EIP to access the application deployed on the ECSs over the Internet. You can determine whether to bind an EIP to the load balancer

based on your requirements. For details, see **Load Balancing on a Public or Private Network**.

- 1. In the upper left corner of the page, click  $\bigcirc$  and select the desired region and project.
- 2. Hover on in the upper left corner to display **Service List** and choose **Networking** > **Elastic Load Balance**.
- 3. Click **Buy Elastic Load Balancer** and then configure the parameters.
- 4. Click Next.
- 5. Confirm the configuration and submit your request.
- 6. View the newly created load balancer in the load balancer list.

#### Adding a Listener

Add a listener to the created load balancer. When you add the listener, create a backend server group, configure a health check, and add the two ECSs to the created backend server group.

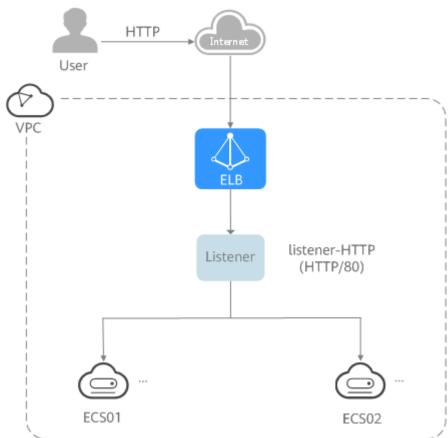


Figure 4-4 Traffic forwarding

1. Hover on in the upper left corner to display **Service List** and choose **Networking** > **Elastic Load Balance**.

- 2. Locate the created load balancer (elb-01) and click its name.
- 3. Under **Listeners**, click **Add Listener**.
- 4. Configure the parameters as follows:
  - **Name**: Enter a name, for example, **listener-HTTP**.
  - **Frontend Protocol**: Select a protocol, for example, **HTTP**.
  - Frontend Port: Enter a port, for example, 80.
- 5. Click **Next: Configure Request Routing Policy**, select or create a backend group, and select a load balancing algorithm.
  - Backend Server Group: Select Use existing or Create new.
     Here we create a backend server group named server\_group-ELB.
  - Load Balancing Algorithm: Select an algorithm that the load balancer will use to route requests, for example, Weighted round robin.
- 6. Click Next: Add Backend Server and enable the health check.

Configure the health check as follows:

- Protocol: Select a protocol for the load balancer to perform health checks on backend servers. If the load balancer uses TCP, HTTP, or HTTPS to receive requests, the health check protocol can be TCP or HTTP. Here we use HTTP as an example.
- Domain Name: Enter a domain name that will be used for health checks, for example, www.example.com.
- **Health Check Port**: Enter a port for the load balancer to perform health checks on backend servers, for example, **80**.
  - If you do not specify a health check port, the backend port will be used for health checks by default. If you specify a port, it will be used for health check.
- 7. Click **Next: Confirm**, confirm the configurations, and click **Submit**.
- 8. On the **Listeners** tab, locate the target listener. In the **Default Backend Server Group** column, click **View/Add Backend Server**.
- 9. On the **Backend Servers** tab, click the **Backend Servers** tab and click **Add** on the top right.
- 10. Select the servers you want to add, set the backend port, and click **Finish**.
  - Backend servers: Select ECS01 and ECS02.
  - Backend port: Set it to 80. Backend servers will use this port to communicate with the load balancer.

#### **Verifying Load Balancing**

After the load balancer is configured, you can access the domain name to check whether the two ECSs are accessible.

 Modify the C:\Windows\System32\drivers\etc\hosts file on your PC to map the domain name to the load balancer EIP.

View the load balancer EIP on the **Summary** page of the load balancer.

#### Figure 4-5 hosts file on your PC

2. On the CLI of your PC, run the following command to check whether the domain name is mapped to the load balancer EIP:

#### ping www.example.com

If data packets are returned, the domain name has been mapped to the load balancer EIP.

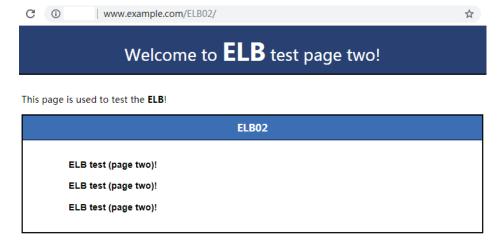
3. Use your browser to access **http://www.example.com**. If the following page is displayed, the load balancer has routed the request to ECS01.

Figure 4-6 Accessing ECS01



4. Use your browser to access **http://www.example.com**. If the following page is displayed, the load balancer has routed the request to ECS02.

Figure 4-7 Accessing ECS02



# 5 Using Shared Load Balancers (Advanced Level)

#### **Scenarios**

You have two web applications that are deployed on separated ECSs but use the same domain name for access. You can set different URLs to process requests.

To forward requests based on URLs, you need to create a load balancer, add an HTTP or HTTPS listener, and add forwarding policies to specify the URLs.

An HTTP listener is used as an example to describe how to route requests from two URLs (/ELB01 and /ELB02) of the same domain name (www.example.com) to different backend servers.

#### **Prerequisites**

To ensure normal communications between the load balancer and backend servers, you need to check the security group rules and network ACL rules configured for the backend servers.

When backend servers receive requests from the load balancer, source IP addresses are translated into those in 100.125.0.0/16.

- Security group rules must allow traffic from the 100.125.0.0/16 to backend servers.
- Network ACL rules are optional for subnets. If network ACL rules are configured for the backend subnet of the load balancer, the network ACL rules must allow traffic from the backend subnet of the load balancer to the backend servers.

#### **◯** NOTE

If **Transfer Client IP Address** is enabled for the TCP or UDP listeners, network ACL rules and security group rules will not take effect. You can use access control to limit which IP addresses are allowed to access the listener.

#### **Creating ECSs**

ECSs are used as backend servers to process requests. Each ECS needs an EIP for accessing the Internet and configuring the application on the ECS.

- 1. Log in to the management console.
- 2. In the upper left corner of the page, click and select the desired region and project.
- 3. Hover on in the upper left corner to display **Service List** and choose **Compute** > **Elastic Cloud Server**.
- 4. Click **Buy ECS**, configure the parameters, and click **Next**.

The following table lists the specifications of the two ECSs.

Table 5-1 ECS specifications

Item	Example Value
Name	ECS01 and ECS02
OS	CentOS 7.2 64bit
vCPUs	2
Memory	4 GiB
System disk	40 GiB
Data disk	100 GiB
Bandwidth	5 Mbit/s

5. Submit your request.

#### **Deploying the Application**

Deploy Nginx on the two ECSs and edit two HTML pages so that a page with message "Welcome to ELB test page one!" is returned when ECS01 is accessed, and the other page with message "Welcome to ELB test page two!" is returned when ECS02 is accessed.

- 1. Log in to the ECSs.
- 2. Install and start Nginx.
  - a. Run the **wget** command to download the Nginx installation package for your operating system in use. CentOS 7.6 is used as an example here. wget http://nginx.org/packages/centos/7/noarch/RPMS/nginx-release-centos-7-0.el7.ngx.noarch.rpm
  - b. Run the following command to create the Nginx yum repository: rpm -ivh nginx-release-centos-7-0.el7.ngx.noarch.rpm
  - c. Run the following command to install Nginx: yum -y install nginx
  - d. Run the following commands to start Nginx and configure automatic Nginx enabling upon ECS startup:

    systemctl start nginx
    systemctl enable nginx
  - e. Enter **http://**EIP bound to the ECS in the address box of your browser. If the following page is displayed, Nginx has been installed.

Figure 5-1 Nginx installed successfully



#### Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to <u>nginx.org</u>. Commercial support is available at <u>nginx.com</u>.

Thank you for using nginx.

3. Modify the HTML page of ECS01.

Move the **index.html** file from the default root directory of Nginx **/usr/share/ nginx/html** to the **ELB01** directory and modify the file to identify access to ECS01.

- a. Create the ELB01 directory and copy the index.html file to this directory: mkdir /usr/share/nginx/html/ELB01
   cp /usr/share/nginx/html/index.html /usr/share/nginx/html/ELB01/
- b. Open the index.html file.vim /usr/share/nginx/html/ELB01/index.html
- c. Press i to enter editing mode.
- d. Modify the index.html file to be as follows:

- e. Press **Esc** to exit editing mode. Then, enter **:wq** to save the settings and exit the file.
- 4. Modify the HTML page of ECS02.

Move the **index.html** file from the default root directory of Nginx **/usr/share/nginx/html** to the **ELB02** directory and modify the file to identify access to ECS02.

- a. Create the ELB02 directory and copy the index.html file to this directory: mkdir /usr/share/nginx/html/ELB02
  - cp /usr/share/nginx/html/index.html /usr/share/nginx/html/ELB02/
- b. Open the **index.html** file.
  - vim /usr/share/nginx/html/ELB02/index.html
- c. Press i to enter editing mode.

d. Modify the index.html file to be as follows:

- e. Press **Esc** to exit editing mode. Then, enter :**wq** to save the settings and exit the file.
- 5. Use your browser to access http://ECS01 EIP/ELB01/ and http://ECS02 EIP/ELB02/ to verify that Nginx has been deployed.

If the modified HTML pages are displayed, Nginx has been deployed.

HTML page of ECS01

Figure 5-2 Nginx successfully deployed on ECS01

## Welcome to **ELB** test page one!

This page is used to test the ELB!

```
ELB test (page one)!

ELB test (page one)!

ELB test (page one)!
```

HTML page of ECS02

Figure 5-3 Nginx successfully deployed on ECS02

### Welcome to **ELB** test page two!

This page is used to test the ELB!

```
ELB test (page two)!

ELB test (page two)!

ELB test (page two)!
```

#### Creating a Load Balancer

The load balancer needs an EIP to access the application deployed on the ECSs over the Internet. You can determine whether to bind an EIP to the load balancer based on your requirements. For details, see **Load Balancing on a Public or Private Network**.

- 1. In the upper left corner of the page, click  $\bigcirc$  and select the desired region and project.
- 2. Hover on in the upper left corner to display **Service List** and choose **Networking** > **Elastic Load Balance**.
- 3. Click **Buy Elastic Load Balancer** and then configure the parameters.

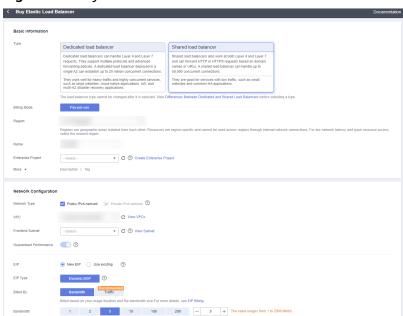


Figure 5-4 Buy Elastic Load Balancer

- 4. Click **Next**.
- 5. Confirm the configuration and submit your request.
- 6. View the newly created load balancer in the load balancer list.

#### Adding a Listener

Add a listener to the created load balancer. When you add the listener, create a backend server group, configure a health check, and add the two ECSs to the created backend server group.

Configure two forwarding policies to forward HTTP requests to the two ECSs, for example, requests from **www.example.com/ELB01/** to ECS01, and those from **www.example.com/ELB02/** to ECS02.

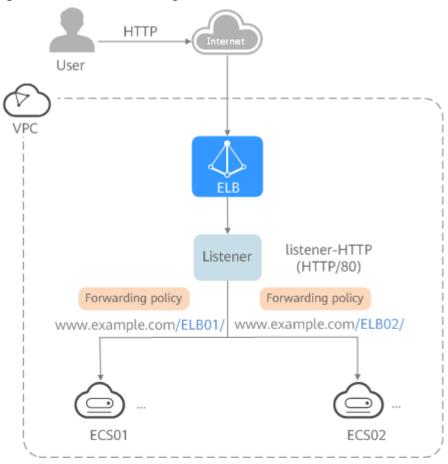


Figure 5-5 Traffic forwarding

- Hover on in the upper left corner to display Service List and choose Networking > Elastic Load Balance.
- 2. Locate the created load balancer and click its name.
- 3. Under Listeners, click Add Listener.
- 4. Configure the parameters as follows:
  - Name: Enter a name, for example, listener-HTTP.
  - Frontend Protocol: Select a protocol, for example, HTTP.
  - Frontend Port: Enter a port, for example, 80.
- 5. Create a backend server group, configure a health check, and click **Finish**.
  - Backend server group
    - Name: Enter a name, for example, server\_group-ELB.
    - Load Balancing Algorithm: Select an algorithm that the load balancer will use to route requests, for example, Weighted round robin.
  - Health check
    - Protocol: Select a protocol for the load balancer to perform health checks on backend servers. If the load balancer uses TCP, HTTP, or HTTPS to receive requests, the health check protocol can be TCP or

- HTTP. Here we use HTTP as an example. Note that the protocol cannot be changed after the listener is added.
- **Domain Name**: Enter a domain name that will be used for health checks, for example, www.example.com.
- **Health Check Port**: Enter a port for the load balancer to perform health checks on backend servers, for example, **80**.

#### Add a Forwarding Policy

- Locate the newly added listener and click Add/Edit Forwarding Policy in the Forwarding Policies column.
- 2. Click **Add Forwarding Policy** and configure a forwarding policy.
  - Name: Enter a forwarding policy name, for example, forwarding\_policy-ELB01.
  - Domain name: Enter a domain name that will be used to forward the requests, for example, www.example.com. The domain name in the request must exactly match that specified in the forwarding policy.
  - URL: You can also specify a URL to forward the requests, for example, / ELB01/.
  - URL matching rule: Select a rule for matching the specified URL string with the URL in the request. Three options are available, Exact match, Prefix match, and Regular expression match. Exact match enjoys the highest priority, and Regular expression match the lowest priority. Select Exact match here.
  - Action: Select Forward to a backend server group.
  - Backend Server Group: Select Create Backend Server Group.
- 3. Create a backend server group and configure a health check.
  - Backend server group
    - Name: Enter a name, for example, server\_group-ELB01.
    - Load Balancing Algorithm: Select an algorithm that the load balancer will use to route requests, for example, Weighted round robin.
  - Health check
    - Protocol: Select a protocol for the load balancer to perform health checks on backend servers. If the load balancer uses TCP, HTTP, or HTTPS to receive requests, the health check protocol can be TCP or HTTP. Here we use HTTP as an example. Note that the protocol cannot be changed after the listener is added.
    - **Domain Name**: Enter a domain name that will be used for health checks, for example, **www.example.com**.
    - Health Check Port: Enter a port for the load balancer to perform health checks on backend servers, for example, 80.

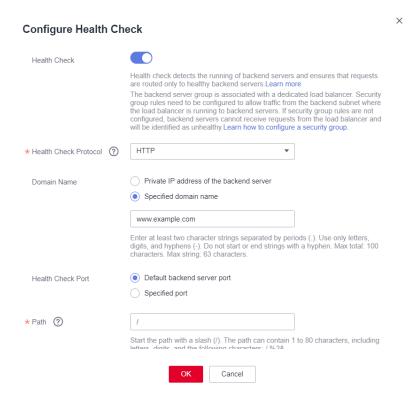


Figure 5-6 Configuring a health check

- 4. Click the name of the backend server group configured for the newly added forwarding policy.
- 5. On the **Backend Servers** tab, click the **Backend Servers** tab and click **Add**.
- 6. Select the server you want to add, set the backend port, and click **Finish**.
  - Backend server: ECS01
  - Backend port: Set it to 80. Backend servers will use this port to communicate with the load balancer.
- 7. Repeat the preceding steps to add another forwarding policy, create a backend server group, and add ECS02 to the backend server group.

#### **Verifying Load Balancing**

After the load balancer is configured, you can access the domain name or the specified URL to check whether the two ECSs are accessible.

1. Modify the C:\Windows\System32\drivers\etc\hosts file on your PC to map the domain name to the load balancer EIP.

View the load balancer EIP on the **Summary** page of the load balancer.

#### Figure 5-7 hosts file on your PC

2. On the CLI of your PC, run the following command to check whether the domain name is mapped to the load balancer EIP:

#### ping www.example.com

If data packets are returned, the domain name has been mapped to the load balancer EIP.

3. Use your browser to access <a href="http://www.example.com/ELB01">http://www.example.com/ELB01</a>. If the following page is displayed, the load balancer has routed the request to ECS01.

Figure 5-8 Accessing ECS01

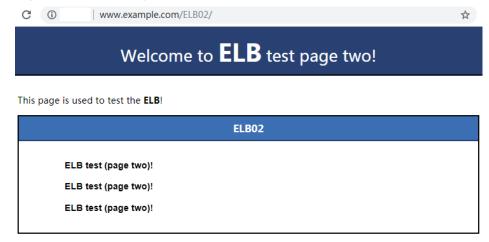


#### 

**ELB01/** indicates that the default directory named **ECS01** is accessed, while **ELB01** indicates the file name. Therefore, the slash (/) following **ELB01** must be retained.

4. Use your browser to access <a href="http://www.example.com/ELB02">http://www.example.com/ELB02</a>. If the following page is displayed, the load balancer has routed the request to ECS02.

Figure 5-9 Accessing ECS02



# 6 Change History

Released On	Description
2022-02-11	This issue is the fourth official release, which incorporates the following changes:  Added the following sections:
	Process Flowchart
	Preparations for Using ELB
2020-05-30	This issue is the third official release, which incorporates the following changes:  Changed the name of enhanced load balancers to shared load balancers.
2018-12-30	This issue is the second official release, which incorporates the following changes:  Modified some parameters based on the latest console.
2018-11-21	This issue is the first official release.