Alibaba Cloud
Server Load Balancer

Product Introduction

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Generic conventions

Table -1: Style conventions

Style	Description	Example
	This warning information indicates a situation that will cause major system changes, faults, physical injuries, and other adverse results.	 **Danger:** Resetting will result in the loss of user configuration data.
	This warning information indicates a situation that may cause major system changes, faults, physical injuries, and other adverse results.	 **Warning:** Restarting will cause business interruption. About 10 minutes are required to restore business.
	This indicates warning information, supplementary instructions, and other content that the user must understand.	 **Note:** Take the necessary precautions to save exported data containing sensitive information.
	This indicates supplemental instructio ns, best practices, tips, and other content that is good to know for the user.	 **Note:** You can use **Ctrl** + **A** to select all files.
>	Multi-level menu cascade.	**Settings** > **Network** > **Set network type**
Bold	It is used for buttons, menus, page names, and other UI elements.	Click **OK**.
`Courier font`	It is used for commands.	Run the `cd /d C:/windows` command to enter the Windows system folder.
`Italics`	It is used for parameters and variables.	`bae log list --instanceid` *`Instance_ID`*
[] or [a|b]	It indicates that it is a optional value, and only one item can be selected.	`ipconfig` *`[-all|-t]`*
{} or {a|b}	It indicates that it is a required value, and only one item can be selected.	`swich` *`{stand | slave}`*

Contents

1 What is Server Load Balancer?

Overview

Server Load Balancer (SLB) is a traffic distribution control service that distributes the incoming traffic among multiple ECS instances according to the configured forwarding rules. SLB expands application service capabilities and enhances application availability.

By setting a virtual service address, SLB virtualizes the added ECS instances into an application service pool with high-performance and high availability, and distributes client requests to ECS instances in the server pool based on forwarding rules.

SLB also checks the health status of the added backend servers, and automatically isolates abnormal ECS instances to eliminate single point of failure (SPOF), improving the overall service capability of your application. Additionally, working with Alibaba Anti-DDoS, SLB is able to defend DDoS attacks.

Components

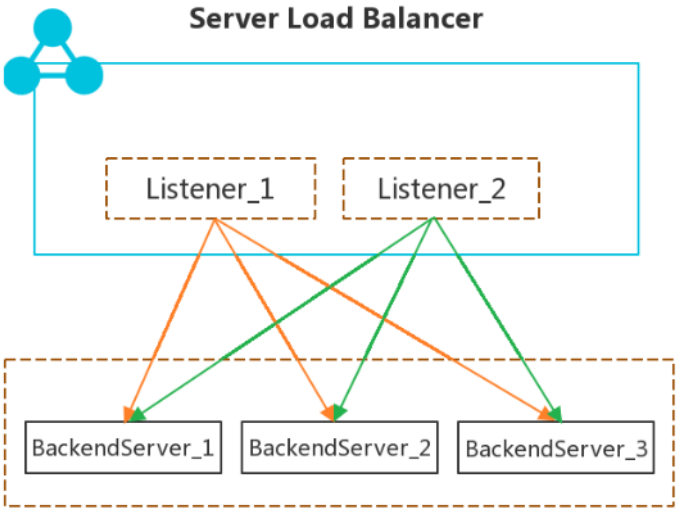
SLB consists of the following components:

- SLB instances

  An SLB instance is a running load balancing service that distributes incoming traffic to backend servers. To use the load balancing service, you must create an SLB instance, and then configure the instance with at least one listener and backend server.
- Listeners

  A listener checks client requests and forwards the requests to the backend servers according to the configured rules. It also performs health check on backend servers.
- Backend Servers

  Backend servers are the ECS instances added to a SLB instance to process the distributed requests. You can add ECS instances to the default server group, a VServer group, or an active/standby server group to process distributed requests.



Benefits

- High available

  Server Load Balancer is designed to work in the full-redundancy mode without SPOF. Server Load Balancer supports local and cross-region disaster tolerance. When Server Load Balancer is used together with DNS, the service availability is up to 99.95%.

  You can scale your service based on the application load, without interrupting services continuity.

- Scalable

  You can increase or decrease the number of backend servers as needed to expand the service capabilities of your applications.

- Low cost

  Compared with the traditional hardware load balancing system, Server Load Balancer reduces the cost by 60%.

- Secure

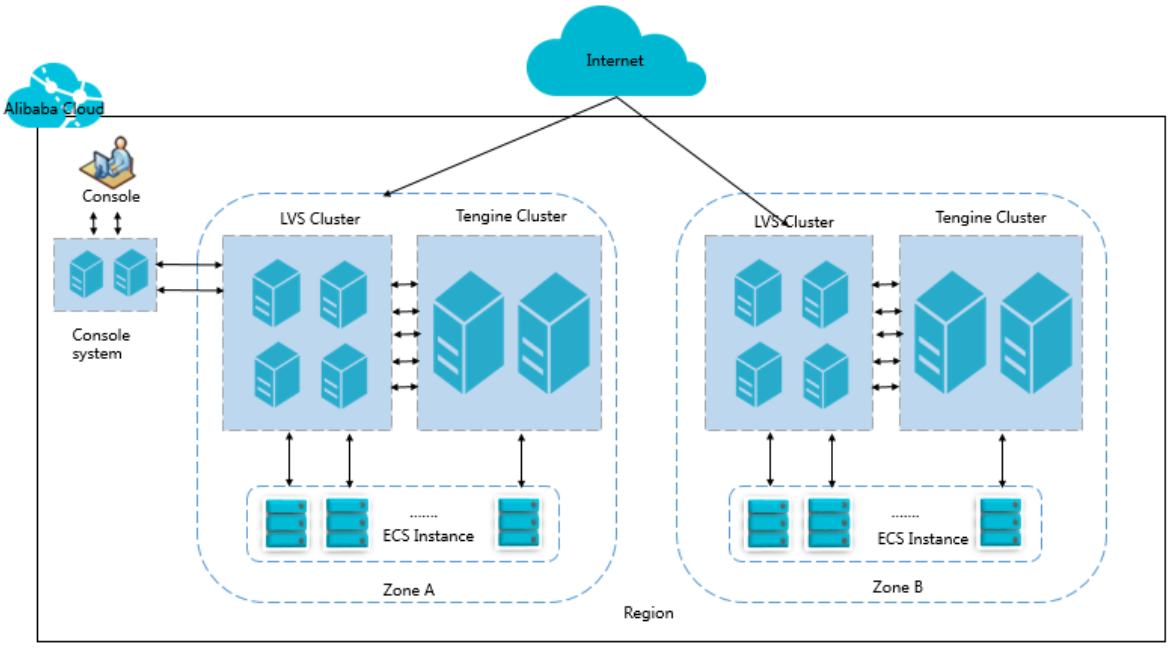
  Combined with Alibaba Cloud Security, Server Load Balancer can defend against up to 5 Gbps DDoS attacks, such as HTTP flood and SYN flood attacks.

2 Architecture

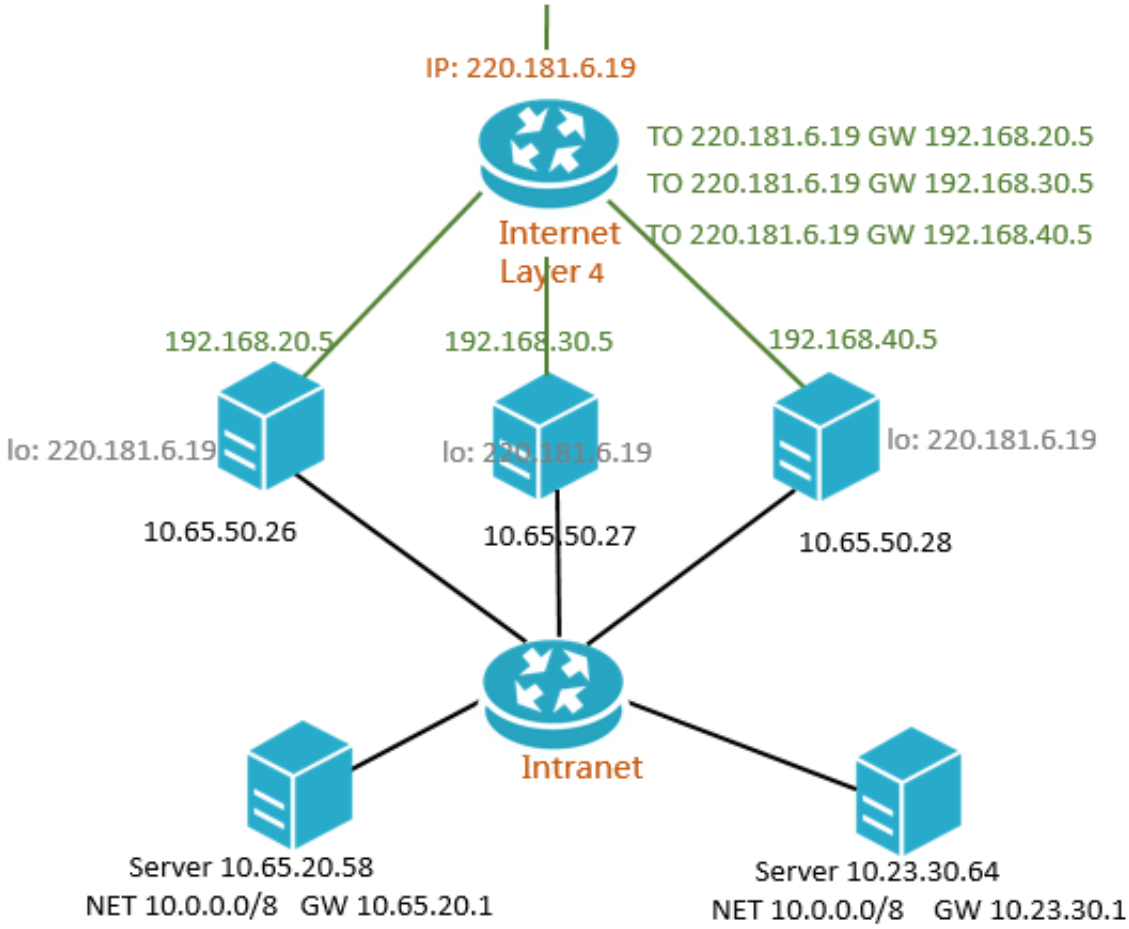
Server Load Balancer is deployed in clusters. The cluster deployment model eliminates Single Point of Failures of backend servers, improves redundancy and increases service stability.

Alibaba Cloud provides Layer-4 (TCP protocol and UDP protocol) and Layer-7 (HTTP protocol and HTTPS protocol) load balancing services.

- Layer 4 uses the open source software Linux Virtual Server (LVS) with Keepalived to achieve load balancing, and also makes some customization to it according to the cloud computing requirements.
- Layer-7 SLB uses Tengine to achieve load balancing. Tengine is a Web server project launched by Taobao. Based on Nginx, it adds a wide range of advanced features dedicated for high-traffic websites.



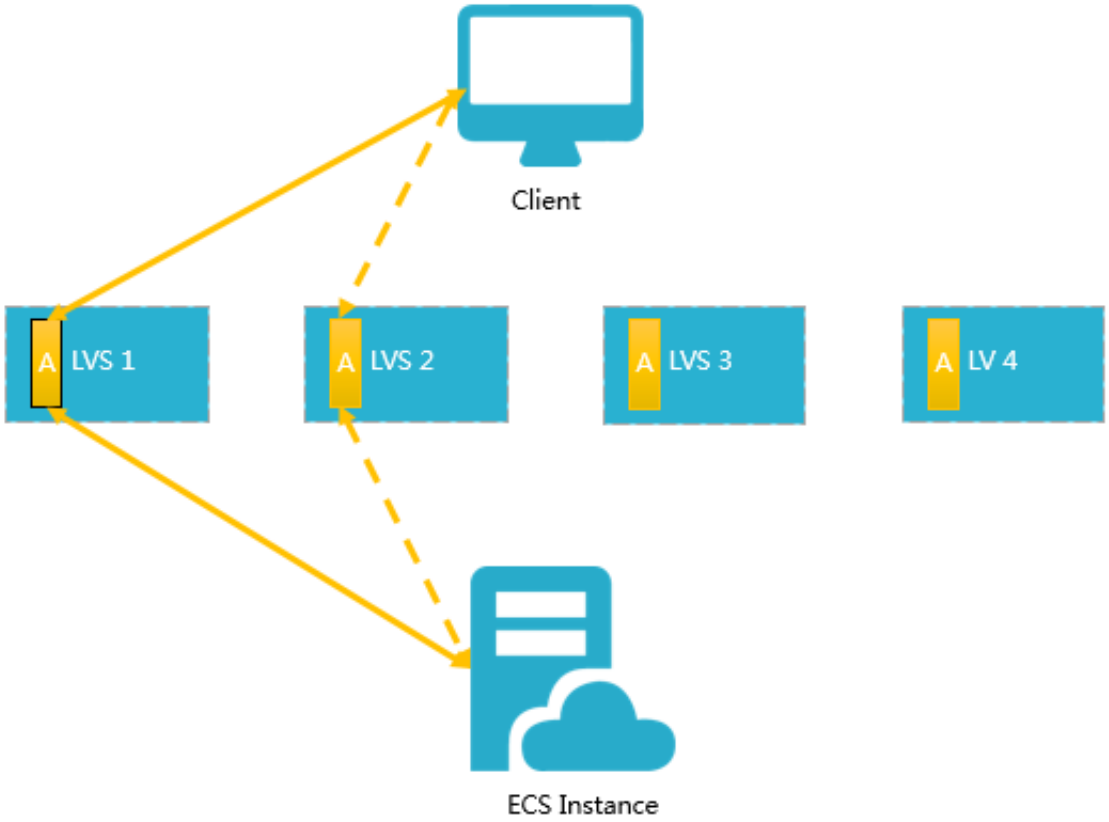
As shown in the following figure, Layer-4 Server Load Balancer in each region is actually run in a cluster of multiple LVS machines. The cluster deployment model strengthens the availability, stability, and scalability of the load balancing services in abnormal circumstances.



Additionally, the LVS machine in the LVS cluster uses multicast packets to synchronize sessions to other LVS machines. As shown in the following figure, the session A established on LVS1 is synchronized to other LVS machines after three packets are transferred. In normal situations, the session request is sent to LVS1 as the solid line shows. If LVS1 is abnormal or being maintained, the session request will be sent to other normally working machines as the dotted line shows. Therefore, SLB clusters support hot upgrade, and machine failure or system maintenance will not affect your business.

Note:

If a connection is not established (three-way handshake is not completed), or a connection has been established but the session synchronization is not triggered, the hot upgrade does not guarantee that the connection is not interrupted and the client needs to re-initiate the connection.


Client
A LVS 1
A LVS 2
A LVS 3
A LV 4
ECS Instance

3 Features

Alibaba Cloud provides Layer-4 and Layer-7 load balancing services, and other functions such as health check, session persistence, domain forwarding and so on to ensure high availability of your applications.

Feature	Layer-4 SLB	Layer-7 SLB
Scheduling algorithm Server Load Balancer supports three scheduling algorithms: round robin , weighted round robin (WRR), and weighted least connections (WLC).	✓	✓
Health check Server Load Balancer checks the health status of backend servers. If a backend server is declared unhealthy, Server Load Balancer will distribute incoming traffic to other healthy backend servers and stop distributing traffic to it until it returned to the healthy status.	✓	✓
Session persistence Server Load Balancer supports session persistence. In a session, Server Load Balancer can distribute requests from the same client to a same backend server.	✓	✓
Access control Server Load Balancer support adding whitelists and blacklists to control the access to your applications.	✓	✓
High availability Server Load Balancer can forward incoming traffic to backend servers in different zones. Additionally, Server Load Balancer is deployed in the active/standby mode in most regions. Server Load Balancer will automatically switches to the standby zone to provide the load balancing service if the primary zone is unavailable.	✓	✓
Security Combined with Alibaba Cloud Security, Server Load Balancer can defend against up to 5 Gbps DDoS attacks.	✓	✓
Internet and internal load balancing Server Load Balancer provides both Internet-facing and internal load balancing services. You can create a private SLB instance to balance traffic going through in your VPC network, or create an Internet SLB instance to balance traffic coming from the Internet.	✓	✓
Monitoring	✓	✓

Feature	Layer-4 SLB	Layer-7 SLB
With the CloudMonitor service, you can view the number of connections , and other traffic information of SLB listeners.		
IPv6 support Server Load Balancer support forwarding requests from IPv6 clients.	✓	✓
Access logs With Log Service, you can analyze access logs of an SLB instance to understand the behavior and geographical distribution of client users, troubleshoot problems and so on.	—	✓
Health check logs Server Load Balancer stores health check logs of backend servers in three days by default. You can store all health check logs in OSS for troubleshooting.	✓	✓
Domain/URL forwarding Layer-7 Server Load Balancer supports configuring domain/URL forwarding rules to forward requests from different domains or URLs to different backend servers.	—	✓
Certificate management Server Load Balancer provides a centralized certificate management service for applications using HTTPS protocols. You do not need to upload certificates to backend servers. Deciphering is performed on Server Load Balancer to reduce the CPU usage of backend servers.	—	✓
SNI support Server Load Balancer supports configuring multiple certificates in an HTTPS listener to distribute requests from different domains to different backend servers.	—	✓
Redirection Server Load Balancer supports redirecting HTTP requests to HTTPS requests.	—	✓
WS/WSS support WebSockets is a new HTML protocol. It provides bi-directional communication channels between a client and a server, saving server resources and bandwidth and achieving real-time communication.	—	✓
HTTP/2 support HTTP/2 is the second version of Hypertext Transfer Protocol. It is backward compatible with HTTP1.X and significantly improves performance by allowing multiple requests to be sent to on the same connection.	—	✓

4 Scenarios

Server Load Balancer is suitable for applications with high traffic, improving the availability and reliability.

Load balance your applications

Server Load Balancer can automatically distribute incoming traffic across multiple backend servers (ECS instances). Additionally, the requests from the same client can be distributed to the same backend server by configuring session persistence.

Scale your applications

To meet the demand of your customers, you can increase the number of the backend servers at any time to scale your applications. Integrated with Auto Scaling, your applications can always be extensible if one of your backend server exceeds the preconfigured threshold.

Protect your applications from single point of failures

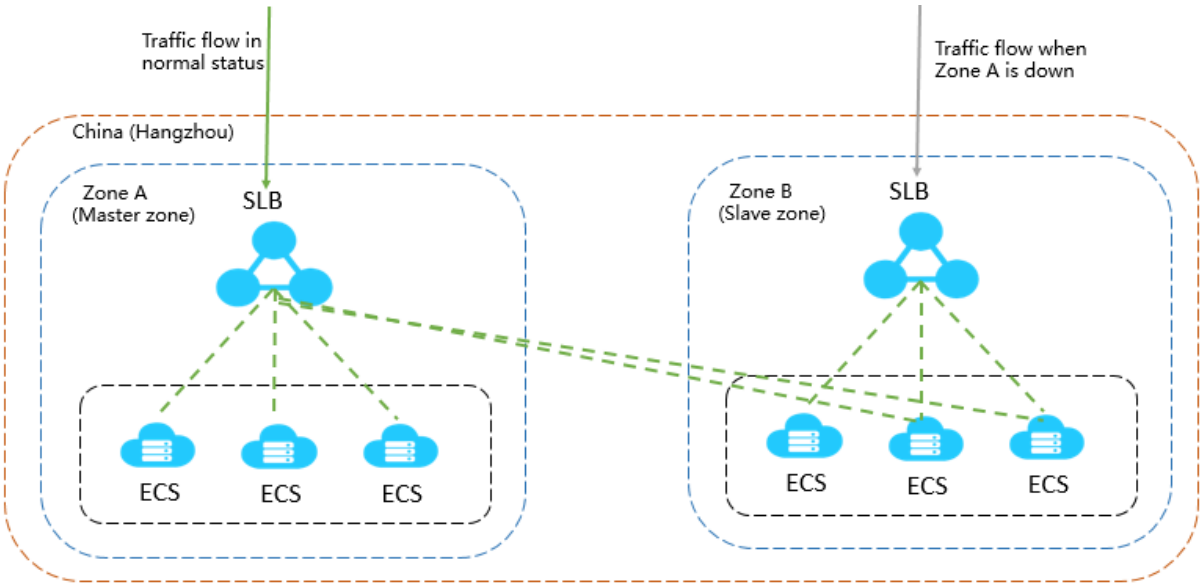
You can add multiple backend servers to an SLB instance. If some of the backend servers are unhealthy, Server Load Balancer will stop distributing incoming traffic to them and distribute the traffic to the healthy ones. Once the backend servers become healthy, Server Load Balancer will automatically resume distributing traffic to them.

Achieve better disaster tolerance in multiple zones

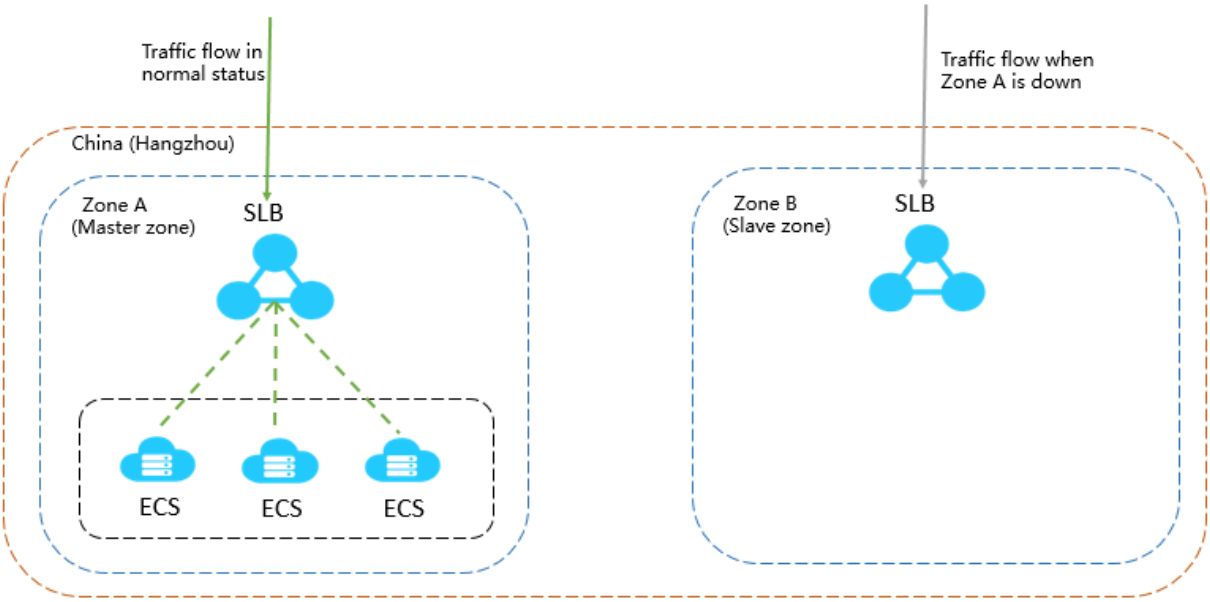
To provide more reliable services, Server Load Balancer is deployed in multiple zones in most regions. If the primary zone becomes unavailable, Server Load Balancer in the standby zone is capable to take over the load balancing service in 30 seconds. Once the primary zone becomes available, Server Load Balancer automatically switches back to the primary zone.

It is recommended that you create a Server Load Balancer instance in a region with multiple zones deployed. Additionally, you also need to consider the deployment of backend servers. It is recommended that you add at least one backend server in each zone to achieve the best efficiency.

As shown in the following figure, ECS instances in different zones are added to an SLB instance . In normal situation, Server Load Balancer will distribute incoming traffic to the ECS instances in the primary zone (Zone A). Once the primary zone is unavailable, the incoming traffic will be distributed to the ECS instances in standby zone. This avoids service interruption caused by the failure of a single zone, and also reduces latency between cloud resources.

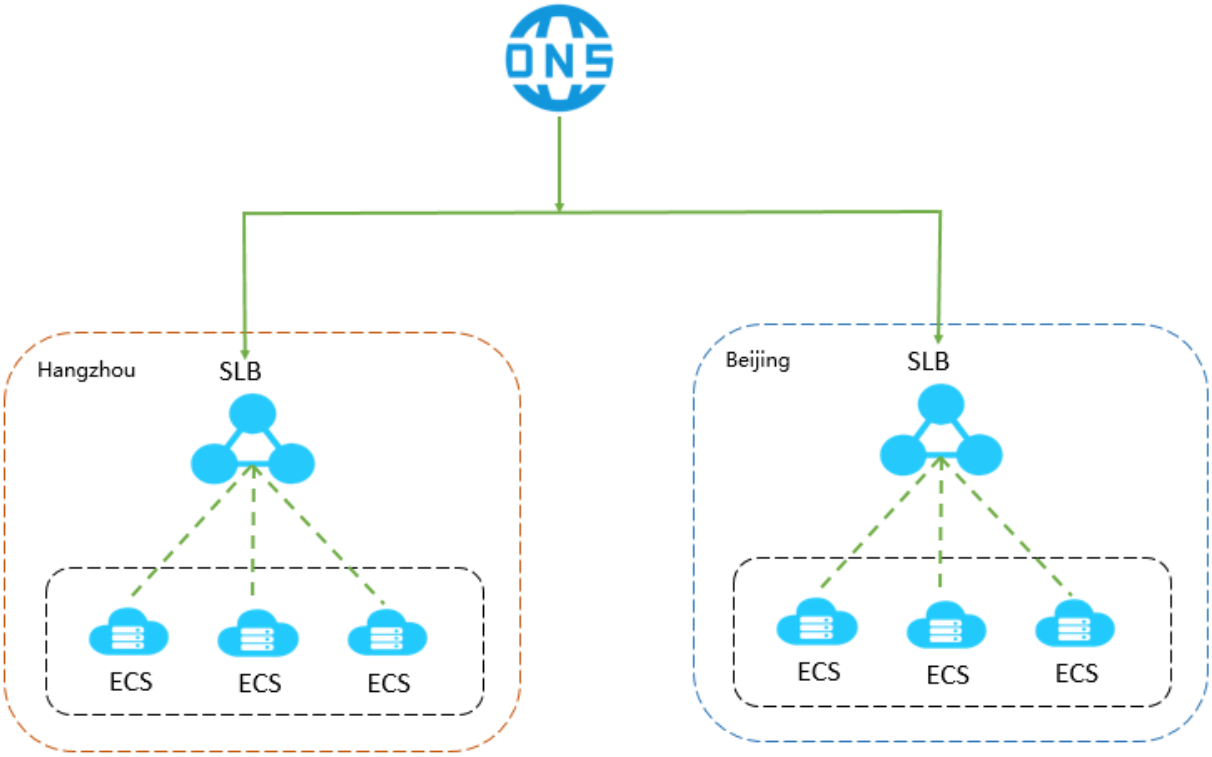


However, if you deploy all ECS instances to the primary zone and have no ECS instances deployed in the standby zone. Your service may be interrupted when the primary zone is unavailable, because no ECS instances are available to handle the distributed requests in the standby zone. This deployment takes low latency at the expense of high availability.



Achieve better disaster tolerance cross regions

You can create multiple SLB instances in different zones and add ECS instances in the corresponding region as the backend servers. Then, use Alibaba Cloud DNS to resolve a domain to the IP addresses of the created SLB instances. When a region becomes unavailable, DNS will automatically resolve the domain to the standby Server Load Balancer.


DNS
Hangzhou
SLB
ECS
ECS
ECS
Beijing
SLB
ECS
ECS
ECS

5 Limits

基本限制

Server Load Balancer provides an API to query the default limits of an SLB instance. For more information, see *Query Quota-DescribeSlbQuotas*.

Resource	Default limits
Limits on SLB instances	
Number of SLB instances per account	60
Number of times that an ECS instance can be added to SLB instances	50
Number of backend servers that can be added to an SLB instance	200
Number of listeners that can be added to an SLB instance	50
Number of domain /URL forwarding rules that can be added to a Layer-7 listener	20
Number of domain name extensions that an HTTPS listener can create	3
Number of API calls per an AccessKey	5,000 times/day
Frontend/backend port range used by a listener	1-65535
Frontend/backend port range used by a listener (Financial Cloud)	80, 443, 2800-3300, 5000-10000, 13000-14000
Limits on certificates	
Number of server certificates that can be uploaded in a region	1,000
Number of CA certificates that can be uploaded in a region	100
Limits on access control lists	
Number of access control lists that can be created in a region	50
Number of access control entries that can be added to an access control list	300
Number of IP entries that can be added to an access control list in an API call	50

Resource	Default limits
Number of times that an access control list can be added to listeners	50

带宽限制

SLB采用分布式高可靠部署架构，因此当客户端数量太少时无法达到实例的带宽上限。 如需要满速压测，客户端数量至少在5台以上。

6 Concepts

Term	Description
Server Load Balancer	Alibaba Cloud Server Load Balancer (SLB) is a traffic distribution control service that distributes the incoming traffic among multiple Elastic Compute Service (ECS) instances according to the configured forwarding rules.
Server Load Balancer instance	A Server Load Balancer instance is a running entity of the Server Load Balancer service. To use Server Load Balancer, you must first create a Server Load Balancer instance.
Service address	An IP address allocated to an SLB instance. According to the instance type, the IP address is either a public IP or a private IP. You can resolve a domain to a public IP address to provide external services.
Listener	A listener defines how incoming requests are distributed. An SLB instance must contain at least one listener.
Backend server	The ECS instances that are added to an SLB instance to respond to the distributed requests.
Default server group	A group of ECS instances that process the distributed requests. If a listener does not configure a VServer group, nor an active/standby server group, the default server group will be used. Incoming traffic will be distributed to the ECS instances in the default server group.
VServer group	A group of ECS instances that process the distributed requests. Different listeners or forwarding rules can configure different VServer groups to distribute different requests to different backend servers.
Active/standby server group	An active/standby server group contains only two ECS instances. One is the active server and the other one is the standby server. An active /standby server group can only be used in TCP and UDP listeners. When the health check of the active server fails, Server Load Balancer will automatically route traffic to the standby server.