

# Express Connect

## Product Introduction

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Express Connect creates private network channels between two VPCs and between a VPC and an on-premises IDC, enhancing the flexibility of network topology as well as the quality and security of cross-network communication. Express Connect also avoids unstable network quality common in public networks and prevents data leakage.

## Intranet communication between two VPCs

Express Connect supports intranet communication between two VPCs in the same region or different regions, and under the same account or different accounts.

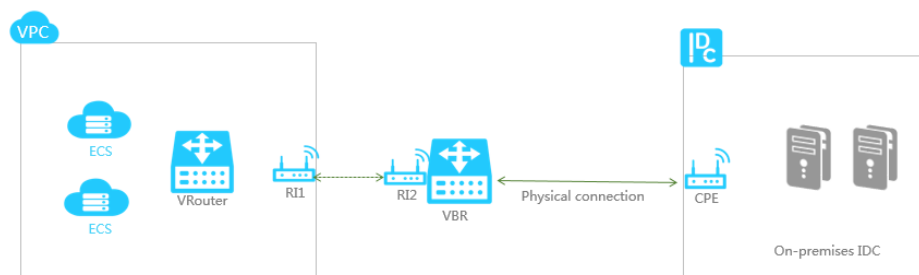
Alibaba Cloud creates a Route interface on the VRouter of each VPC. It then uses the two interfaces and its own backbone transmission network to build Express Connect, easily realizing secure, reliable, convenient, and fast communication between the two VPCs.

## Intranet communication between an on-premises IDC and a VPC

You can connect an on-premises IDC to a VPC through Physical connection on the physical layer, and create Virtual border router and Router interface to connect the on-premises IDC to the VPC.

## Logical architecture

Based on the layer-3 overlay technology and switch virtualization technology under the Software Defined Network (SDN) architecture, Alibaba cloud isolates the ports of the physical leased lines of a customer and abstracts the ports into virtual border routers (VBRs). Using main-stream tunneling technology, Alibaba Cloud encapsulates the packets of the customer in VSwitches and then uses the tunneling technology to further encapsulate the packets and transmit them to the VPC.



## Public network versus Express Connect

On Alibaba Cloud, each VPC is an isolated network environment. Communication between two VPCs and communication between a VPC and an on-premises IDC are completed by different networks.

The communication quality, cost, and security of the way by using a public network is inferior to those of the way by using Express Connect, as shown in the following table:

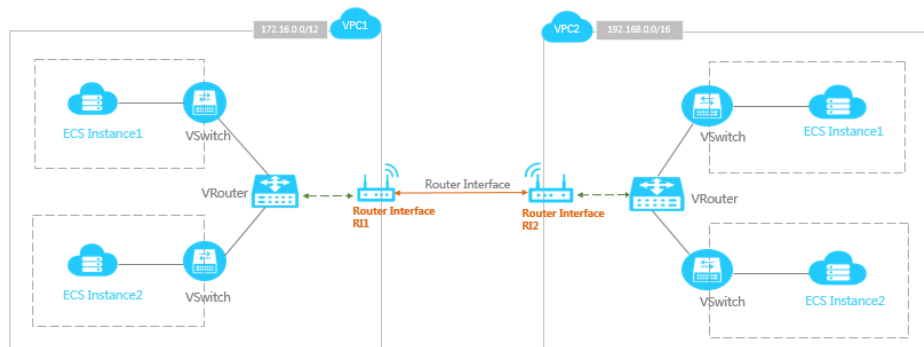
Comparison points	Public network	Express Connect
Communication quality and availability	The quality of long-distance public network communication is affected by a variety of factors, making it hard to ensure latency stability and low packet loss rate.	Alibaba Cloud's high-quality infrastructure delivers enhanced link quality and availability: <ul style="list-style-type: none"><li>- Delay jitter <math>\leq 20\%</math></li><li>- Encapsulation success rate <math>\geq 99.8\%</math></li><li>- Availability <math>\geq 99.95\%</math></li><li>- Packet loss rate <math>&lt; 0.2\%</math></li></ul>
Cost	You must pay traffic fee or bandwidth fee for using a public network.	The fee for cross-region communication is more affordable. Same-region VPC intercommunication is free of charge.
Security	There is risk of data leakage on a public network.	Based on the virtualization technology of Alibaba Cloud, Express Connect isolates different communication links, so the security is enhanced.

## What is a router interface?

A router interface is a virtual device with the ability to set up communication channels and control working status.

Express Connect builds an intranet communication channel between two VPCs by creating two router interfaces individually for the VRouter of the VPCs. The VRouters can send messages to each other through the channel after the connection between the two router interfaces is established. Therefore,

the resources in the two VPCs (such as ECS instances) can communicate over the intranet.



## Initiator and receiver

When two router interfaces are interconnecting, one plays the role of the connection initiator and the other plays the role of the connection receiver. Only the initiator router interface can initiate a connection; the receiver router interface must wait for the initiator to start a connection.

The initiator and receiver are only used to control the process of establishing connections. In the actual network communication, the communication link is bidirectional and there is no difference between the initiator and receiver.

For the VPC interconnection of a same account, Express Connect provides an option to create two router interfaces at the same time. In this situation, you do not need to manually initiate the connection, the system automatically initiates and establishes the connection. For the VPC interconnection of different accounts, you have to manually initiate a connection between the initiator router interface and the receiver router interface.

The following table compares the initiators and receivers.

Comparison points	Initiator router interfaces	Receiver router interfaces
Is the interface charged when connecting two VPCs in the same region?	No	No
Is the interface charged when connecting two VPCs in the different regions?	Yes	No
Is the peer router interface information required before initiating a connection?	Yes	Yes
Can the interface initiate a connection?	Yes	No
Can the interface actively send messages to the peer interface after the connection is established?	Yes	Yes
Can the role of router interfaces	No	No

be modified after the router interfaces are created?		
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## Connection process

The router interface connection process is as follows:

An initiator router interface initiates a connection.

The receiver router interface accepts the connection.

Establish the connection.

In different connection process and stage, the status of router interface is also different as shown in the following table. The initial state of the router interface after it is created is **Not connected**.

**Note:** If you select create the initiator and receiver router interfaces at the same time, the system automatically initiates and establishes a connection. In this situation, the status of the router interfaces directly change to **Activated**.

Connection process	Initiator router interface	Receiver router interface
An initiator router interface initiates a connection	Connecting	Accepting connection
Connection is established	Activated	Activated
Freeze a connection	Freezing	Freezing
Connection is disconnected	Frozen	Frozen
Activate a frozen connection	Activating	Activating
Connection is established	Activated	Activated

## Router interface specification

Express Connect provides three kinds of interface specifications: small (10 Mbps-50 Mbps), middle (100 Mbps-900 Mbps), and large (1 Gbps-4.5 Gbps).

The available router interface specifications are different in different connection scenarios and regions. Select an appropriate specification according to your configurations on the purchase page. The router interface specification used for same-region VPC interconnection is set to Large 2 (2 Gbps) by default.

## Limitations

Router interfaces have the following limitations:

Only one pair of router interface connection is allowed between two VPCs.

The connection role of a router interface cannot be modified after the router interface is created.

Virtual border routers (VBRs) always act as the connection initiator.

## What is a physical connection?

A physical connection is the abstraction of the network circuits established between an Alibaba Cloud access point and your on-premises data center.

To establish a physical connection, you have to apply for a leased line. A leased line is a cable rented from a network carrier that connects your on-premises network to an Alibaba Cloud access point.

With this leased line in place, you can create a virtual border router (VBR) to connect your on-premises IDC to Alibaba Cloud to build a hybrid cloud environment. Therefore, the cloud resources can access your on-premises network bypassing the Internet over a private network connection.

The physical connection does not go through the Internet. It is more secure, reliable, and fast with lower latencies than typical Internet connections.

## Features

The Express Connect physical connection has the following features:

### Multiple connectivity models

You can choose to use a point-to-point Ethernet connection or an MPLS VPN connection. Physical connection supports Ethernet RJ45 electrical ports and LC-mode optical ports with 1 Mbps - 10 Gbps transmission rate.

### Redundant connections

Physical connection uses the equal-cost multi-path routing (ECMP) to achieve redundancy of two leased lines:

If the two leased lines connect to different access points in a same region, then these two leased lines are redundant by default.

If the two leased lines connect to the same access point in a same region, you can select the first leased line as the redundant connection when applying for the second leased line.

## Limitation

The following are physical connection limitations:

Physical connections do not support SDH G.703 or V.35 interfaces.

Alibaba Cloud provides one or more access points in each accessible region. Different access points have different carrier restrictions. Before applying for leased line access, you must open a ticket to obtain the access point and carrier restriction information.

## What is a virtual border router

A virtual border router (VBR) is a product mapping of the leased line that you have applied to access a VSwitch. You can think of it as a router between your customer-premises equipment (CPE) and the VPC, which serves as a bridge for exchanging data between the on-premises IDC and the VPC.



## Functions

VBR provides following functions:

Exchange data between a VPC and an on-premises IDC as a router.

In the layer-3 subinterface mode, VBR can identify or bind VLAN tags.

Decide the port mode for the leased line: layer-3 interface or VLAN-based layer-3 subinterface.

Support BGP routing.

## Limitation

Each VBR have only one routing table.

The maximum number of custom routing entries in one routing table is 48.

Source address-based policy routing is not supported.

## Connect two VPCs

You can use Express Connect to achieve private-network communication between two VPCs. Express Connect can avoid the network instability caused by bypassing the public network and eliminate the risk of data theft during transmission. For more information, see [Establish an intranet connection between VPCs in different regions](#) and [Establish an intranet connection between VPCs under different accounts](#).

## Connect an on-premises IDC to a VPC through a physical connection

If your on-premises IDC needs to communicate with a VPC through a private network, you can use the physical connection function of Express Connect to implement private-network communication on both sides. You can build a physical connection by yourself or contact an Alibaba partner to help you build a physical connection. The communication between the on-premises IDC and the VPC by using the physical connection features high quality, high reliability, and high security. For more information, see [Access a VPC under the same account through a physical connection](#) and [Access a VPC under a different account through a physical connection](#).

## Two VPCs share a NAT gateway

If two VPCs need to use the same NAT gateway to access a public network, you can also use Express Connect.



## High-speed intercommunication

Powered by the network virtualization technology of Alibaba Cloud, Express Connect can connect different network environments so both sides can communicate with each other directly through the intranet and bypass public networks. Even when the connection sites are far away from each other, you can enjoy the low network latency and high bandwidth communication like the intranet communication.

## Stable and reliable communication

Powered by Alibaba Group's state-of-the-art infrastructure, Express Connect ensures stable and reliable communication between networks.

## Secure networks

Express Connect performs inter-network communication over the network virtualization layer, meaning all data is transmitted through Alibaba's own facilities. This removes the need for public networks and achieves multi-tenant isolation, reducing the risk of data theft during transmission.

## Flexible topology

No matter for multi-center deployment, hybrid networks, or multi-line disaster tolerance, Express Connect can provide flexible network topology.

## Ease of use

Express Connect replaces complex physical network configurations with a few simple operations. At the same time, you will have complete control over the communication bandwidth, operation status, and route configurations on both sides.

## Purchase on demand

A diverse range of specifications are available, providing different data transmission speeds. You can purchase only what is needed for your business to minimize costs.

The following are Express Connect limitations:

The router interfaces created for the same VRouter cannot be connected.

The router interface created for a virtual border router (VBR) must be the connection initiator.

The maximum number of VBRs per leased line: 50

The maximum number of router interfaces per account: 5

The maximum number of router interfaces per VRouter: 5

The maximum number of leased lines that an account can apply for an access point: 2

The maximum number of idle VBRs (the VBRs that have no router interfaces configured) per account: 2

Term	Description
Express Connect	A data transmission channel powered by Alibaba Cloud infrastructure. It provides secure and reliable intranet-like connections between different networks, such as between VPCs, or between VPCs and on-premises IDCs.
Virtual Private Cloud (VPC)	A customized private network established on Alibaba Cloud. VPCs are logically isolated from each other. You can create and manage instances, such as ECS, Server Load Balancer, and RDS instances, in a VPC.
Physical connection	The abstraction of a physical line used to directly connect an on-premises IDC to Alibaba Cloud. Each line a customer uses to access Alibaba Cloud corresponds to a physical connection object.
Access point	The geographical location of the end, to which the physical leased line connects, on Alibaba Cloud. An access point belongs to a certain region and has two access devices. When a single region has multiple access points, any of these can be used to access Alibaba Cloud VPCs.
VRouter	The hub of VPCs, connecting all VSwitches in a VPC and serving as a gateway device that connects the VPC to other networks. It forwards network traffic according to route entries.
Virtual boarder router (VBR)	You can create multiple virtual border routers on a physical connection. Each VBR is

	responsible for forwarding the data of a VLAN in Alibaba Cloud. With VBR, you can transmit your data directly to any region of Alibaba Cloud.
Router interface (RI)	A router interface (or VRouter interface) is a virtual network device. It can be attached to a VRouter to create an Express Connect with another VRouter interface, delivering an intranet connection between different networks.
Route table	A list of route entries on the VRouter.
Route entry	Each item in a route table is a route entry. It defines the next hop address of the network.