

# Express Connect

## Product Introduction

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## Express Connect overview

Express Connect enables the creation of private network channels between different network environments, with more flexible topology, higher communication quality, and enhanced security.

Network environments include:

- Intranet communication between Virtual Private Clouds (VPC)
- Intranet communication between physical IDCs and VPCs, also known as a hybrid network

Express Connect offers an intranet-like connection regardless of distance. Whether in the same or different regions, data can easily be transmitted through the intranet over long distances.

Furthermore, Express Connect offers a flexible and convenient cooperative development, even across different accounts.

## Public network vs. Express Connect

On Alibaba Cloud, each VPC is an isolated network from the external environment by two layers of security.

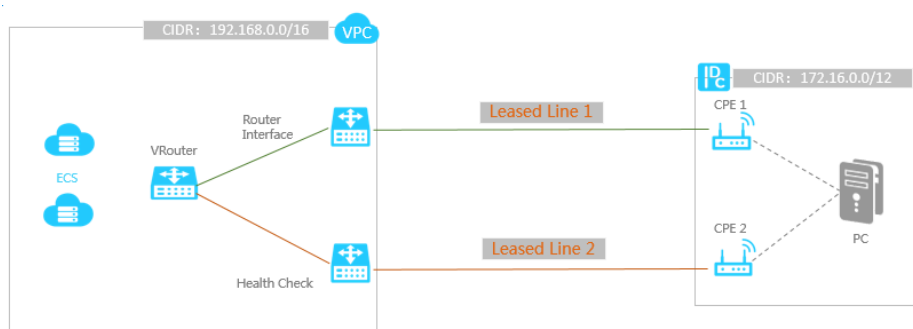
Network communication between VPCs and between VPCs and physical IDC machine rooms is referred to as across-network communication. Express Connect helps interconnect networks through the intranet. Without Express Connect, cross-network communication can only be achieved through the public network. The following table details feature comparisons between a public network and Express Connect:

Comparisons	Public network	Express Connect
Communication quality and availability	Long-distance public network communication is affected by a variety of factors that make it hard to ensure latency stability and low packet loss rates.	Alibaba Cloud's high-quality infrastructure delivers enhanced link quality and availability: Delay Variation $\leq 20\%$ Packet Success Rate $\geq 99.8\%$ Availability $\geq 99.95\%$ Packet Loss Rate $< 0.2\%$
Cost	You must pay traffic and bandwidth fees for using public networks.	Alibaba Cloud provides free bandwidth, and virtual devices can be purchased on demand at affordable prices.

Security	Communication data is at a risk of being monitored or stolen on public networks.	Express Connect isolates different communication links to enhance security.
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## Express Connect logical architecture

Based on the 3-Layer overlay and switch virtualization technology in the Software Defined Network (SDN) architecture, customers' physical leased line interfaces are isolated and abstracted into virtual border routers (VBRs). Alibaba Cloud uses tunneling technology to encapsulate customers' packets in a VSwitch and applies tunnel encapsulation to the leased line, transmitting the packets to target VPC router. The data is then transmitted to the VPC.



## Express Connect advantage

### High-speed intercommunication

Powered by Alibaba Cloud network virtualization technology, Express Connect can bridge different network environments so both sides can communicate directly through the intranet and bypass public networks. Furthermore, Express Connect offers features inherent to intranet communication, such as low latency and high bandwidth, across long distance.

### 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

Whether for multi-center deployment, hybrid networks, or multi-line disaster tolerance, Express Connect provides flexible network topology.

### Ease of use

With just a few simple operations, complex physical network configurations can be replaced. At the same time, you will have complete control over Express Connect's communication bandwidth, operation statuses, 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.

## **Application scenarios**

### **VPC private intercommunication within a region**

VPCs in the same region can request to access the other's resources through network communication. Express Connect enables private network communication between VPCs, which avoids unstable public networks and reduces the risk of data theft during transmission.

### **Cross-regional VPC private intercommunication**

VPCs can request to access to other VPCs in different regions. Express Connect enables private network communication between VPCs, which avoids unstable public networks and reduces the risk of data theft during transmission.

### **Cross-account VPC private intercommunication**

VPCs can request to access other VPCs under different accounts. Express Connect enables private network communication between VPCs, which avoids unstable public networks and reduces the risk of data theft during transmission.

### **Access to VPC through physical connection**

With physical connection in place, you can create private network connections between your on-premises IDC and VPC, which avoids unstable public networks and reduces the risk of data theft during transmission.

### **Access to VPC through our partners**

Alibaba's partners can help create private network connections between our on-premises IDC and VPC, which avoids unstable public networks and reduces the risk of data theft during transmission.

## Two VPCs share a self-built SNAT gateway

VPC 1 has a self-built SNAT gateway that enables ECSs in VPC 1 to access public networks. With Express Connect connecting VPC 1 and VPC 2, instances in VPC 2 can also access public networks using the self-built SNAT gateway.

Express Connect provides a fast, stable, secure and dedicated network communication between different cloud environments, including VPC intranet intercommunication and dedicated leased line connection to the on-premises data center.

Express Connect provides the following functions to achieve this:

### Router interface

A router interface is a virtual device used to set up a communication channel and control the working status.

Express Connect abstracts the process of building intranet communication channels by creating two router interfaces on both sides of the VRouter in the VPCs and these two router interfaces are interconnected. Therefore, the interconnection between two VPCs is achieved.

If you want to connect two VPCs, you have to create a router interface for each VPC. For more details, refer to [Create a router interface](#).

### Physical connection

A physical connection, known as a leased line, is a cable rented from a carrier. It achieves the physical connection between the on-premises IDC and the VPC.

If you want to connect a VPC with an on-premises IDC, you have to apply for a leased line firstly. For more details, refer to [Apply for leased line access](#).

### Virtual border router

Virtual border router (VBR) works as a router between the on-premises IDC and cloud-based VPC VRouter. It serves as a bridge for forwarding your data from your VPC to IDC.

After applying for a leased line, you have to create a VBR to connect the IDC, then create a router interface for the VBR to connect the router interface of the peer VPC. For more details, refer to [Create a virtual border router](#).

# Physical Connection

A physical connection, known as a leased line, is a cable rented from a carrier.

A physical leased line is exclusive and private and it is characterized by features including low latency and stable quality. Using a physical connection, personal resources can connect with Alibaba Cloud resources to construct a hybrid architecture, turning a cloud environment into an intranet environment. This satisfies complex business needs, such as resizing your business, implementing remote disaster tolerance, and enhancing business services across multiple regions.

## Functions

### Low latency, high stability

Customers can select a carrier to provide physical leased line access on their own. Or, they can consult Alibaba Cloud and select an Alibaba Cloud partner carrier to provide MPLS VPN or a bare optical fiber line, as well as a 10 gigabit interface and redundancy solution. This ensures the stability, security, and high-availability of businesses using leased lines.

### Various access methods

Customers can select point-to-point mode or MPLS VPN mode lines. These support Ethernet RJ45 electrical ports and LC-mode optical ports. The range of supported speeds is 1Mbps - 10Gbps.

### Support for line redundancy

Upon agreement, Alibaba Cloud uses equivalent routing mode to provide dual-physical line redundancy:

- Two leased lines access the same access point in a single region. When applying for a second physical leased line, customers can go to the "Console > Apply for Physical Leased Line > Redundant Physical Leased Line" and select a redundant line.
- Two leased lines access different access points in a single region. In this case, the two lines are naturally redundant.

## Restrictions

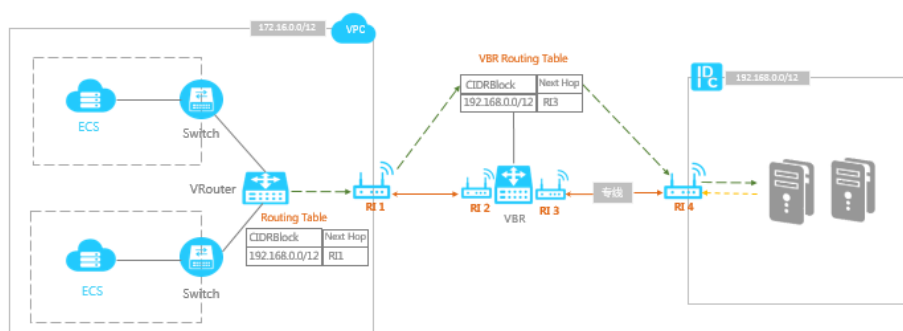
- Alibaba Cloud provides one or more access points in each accessible region. However, different access points have different carrier restrictions. Before applying for leased line access, you can submit a ticket to obtain access point and carrier restriction information.
- Physical leased lines do not support SDH G.703 or V.35 interfaces.

## Mutual resource access between VPC and IDC

- Physical machines in IDCs support direct access to resources in the VPC, such as ECS and Server Load Balancer instances. If you need to access a service with the address 10.10.10.1, you will need to submit a ticket.
- When ECS instances in the VPC access IDC resources through the leased line, and the IDC resource IP address is a non-private IP, you must submit a ticket for special configuration.

## Virtual Border Router

Virtual border router (VBR) works as a router between the CPE (Customer Premise Equipment) and cloud-based VPC VRouter. It serves as a bridge for forwarding your data from your VPC to IDC.

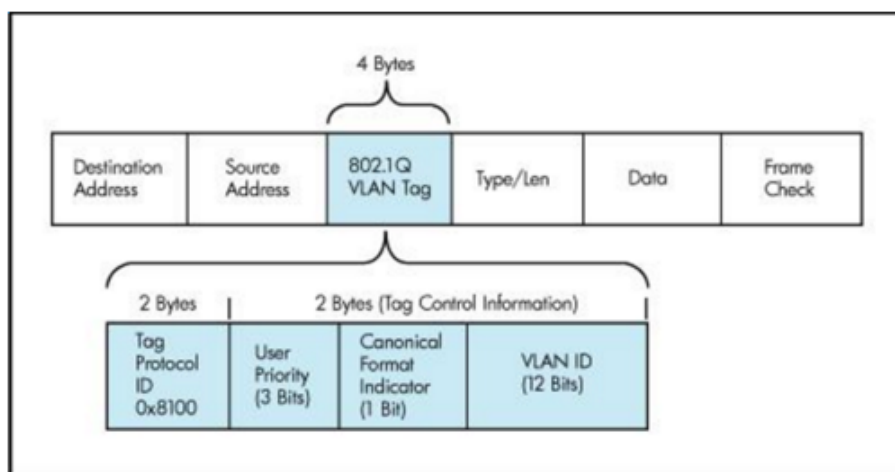


## Functions

- The product determines physical leased line port mode: Layer-3 router port or VLAN-based Layer-3 sub-interface.
- In Layer-3 sub-interface mode, the product can identify or attach VLAN tags.
- The product works as an intermediate router between cloud-based networks and non-cloud networks, performing packet switching.
- As a leased line static routing gateway, the product performs routing for packets sent between non-cloud networks and cloud-based networks.

## Key parameter

**VLAN tags:** Header tags in VLAN IEEE 802.1q encapsulation format added to the data frame. The VBR's physical switch port views these VLAN tags to differentiate the data of different customers. The VLAN ID range is 1 - 2999. When the VLAN ID is 0, the VBR's physical switch port uses Layer-3 router port mode instead of VLAN mode (untagged). The VLAN format in IEEE 802.1q protocol is as following:



**IP address and mask:** IP addresses are divided into Alibaba Cloud-side interconnected IPs and customer-side interconnected IPs. Respectively, these act as routing gateways from the VPC to the IDC and from the IDC to the VPC. The following are recommendations for these IP addresses:

- There cannot be a conflict between IP addresses in the VPC and those in the IDC.
- Using private IP segments.
- As only two available IP addresses are required, the mask does not need to be too large. We recommended that a 28 or 29-bit is used.

## VBR routing table

Similar to VRouters in VPCs, VBRs also manage a routing table. Routing entries are configured in this routing table to manage the traffic forwarded by the VBR.

## Restrictions

- Each VBR must have only one routing table.
- The maximum number of custom routing entries in one routing table is 48.
- Source address policy routing is not supported.
- VBRs only support static routing.

## Router Interface

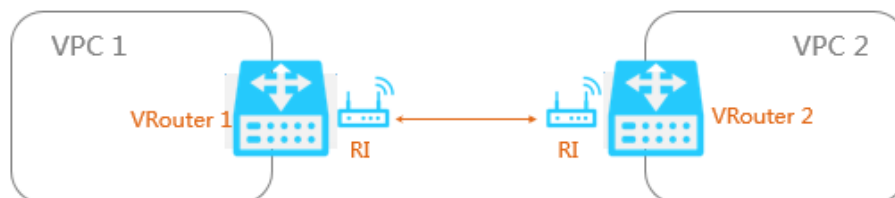
## What is Express Connect router interface?

Express Connect router interface is a virtual device used to set up a communication channel and



control the working status.

Express Connect abstracts the process of building intranet communication channels between networks by creating and connecting router interfaces on the VRouter of both networks. This allows both VRouters to send messages to each other through the channel, and the resources in two VPCs (such as ECS instances) can communicate through the intranet.



## Initiator and receiver

When two router interfaces are connected, one serves as the Initiator and the other as the Receiver. The Initiator and Receiver concepts are only used to control connection setup. In actual communication between networks, communication takes place in both directions and there is no difference between the initiator and receiver.

The similarities and differences between initiator and receiver are shown in the table below:

Point of comparison	Connection initiator	Connection receiver
Bill for VPC intercommunication in the same region	Fees collected	Free of charge
Bill for VPC intercommunication across different regions	Fees collected	Free of charge
Configure information of peer interface before creating a connection	Required	Required
Initiate a connection in the connection process	Yes	No
Send messages to the peer interface after the connection is established	Yes	Yes
Modify roles after the connection is established	No	No

## Restrictions

- VBR must serve as the Initiator.

- Only one pair of connected router interfaces can exist between two VPCs.
- You cannot modify the role once the router interface is created. Before you establish Express Connect, plan well the role of each router interface.
- The receiver must be purchased in Pay-As-You-Go billing method.

## Initiate a connection

After you create a pair of router interfaces, the initiator performs the "Initiate Connection" operation. Only interfaces serving as initiator can initiate connections. Interfaces serving as the receiver automatically receive the connections.

Note that you only need to initiate a connection for router interfaces under different accounts. The system automatically initiates a connection for router interfaces under the same account.

## Connection process

Let's take interconnection between VPCs under different accounts as example:

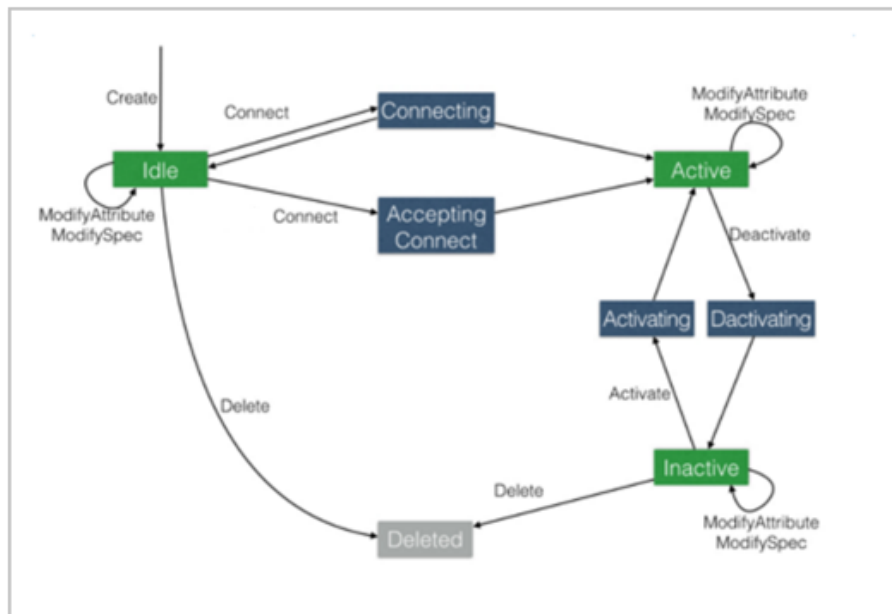
**Create a router interface for each VPC > Add peer router interface info > Initiate a connection > Configure route > Connected**

For detail process, refer to [Establish an intranet connection between VPCs under different accounts](#).

## Router interface finite status machine

A green status indicates that the interface is stable. In this status, various operations can be performed.

A blue status is an intermediate status indicating an operation is in progress. In this status, no operations can be performed.



## Router interface specification

The specification and optional range of initiating side router interface are as follows:

Specification	Maximum data forwarding amount per second(MB)	Maximum data forwarding amount per hour(MB)	Maximum data forwarding amountper day(MB)
Small.1	1.25	4500	108000
Small.2	2.5	9000	216000
Small.5	6.25	22500	540000
Middle.1	12.5	45000	1080000
Middle.2	25	90000	2160000
Middle.5	62.5	225000	5400000
Large.1	125	450000	10800000
Large.2	256	900000	21600000

The specification and data transmitting bandwidth of receiving side router interface are as follows:

Specification	Data transmitting bandwidth
Negative	Depends on the peer router interface specification.

# Restrictions

The following are the restrictions for Express Connect:

- Maximum number of VRouter interfaces a user can have at one time: 5.
- Maximum number of VRouter interfaces a VRouter can have at one time: 5.
- Maximum number of physical leased lines a user can connect to a single access point: 2.
- Maximum number of VBRs a single physical leased line can have at one time: 50.
- Maximum number of idle VBRs (with no interfaces) a user can have at one time: 2.
- VRouter interfaces on the same VRouter cannot be interconnected.
- VRouter interfaces on VBRs can only work as connection initiators.
- Only one pair of VRouter interfaces can connect a single pair of VPC instances at one time.

## Glossary

Term	Description
Access Point	The geographical location of the physical leased line end on Alibaba Cloud side. 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 with Alibaba Cloud VPC products.
Express Connect	A data transmission channel powered by the Alibaba Cloud infrastructure. It provides secure and reliable intranet-like connections between different networks. For example, between VPCs, or between VPCs and IDC machine rooms.
Virtual Private Cloud(VPC)	A customized private network based on Alibaba Cloud that is logically isolated from other networks. Users can create and manage cloud product instances within VPCs, such as ECS, Server Load Balancer, and RDS.
Physical Connection	The abstraction of a physical line used to directly connect a customer to Alibaba Cloud. Every connection a customer uses to access Alibaba Cloud is considered as a physical connection object under the customer's name.
VRouter	The VPC network hub, 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 specific route entries.
Virtual Boarder Router(VBR)	Customers can create multiple virtual border

	routers on a physical connection. Each VBR is responsible for forwarding the data of one VLAN on a physical line. With VBR, customers can transmit their 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.