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# Cloud Data Center Network Construction Based on Virtualization Technology

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**Abstract:** With the rapid development of information technology, the IT infrastructure in traditional data centers has high investment costs, low utilization rate, long application deployment period, and the difficulty of operation and maintenance increases with the increase of system and energy consumption. In order to solve the above problems, the article analyzes the current network virtualization technology and systematically studies the application scenarios of network virtualization technology, and proposes a cloud computing data center network construction scheme based on network virtualization technology.

**Keywords:** Virtualization technology, cloud data, network.

## Cloud data center network architecture

Traditional Data Center Network Architecture

The traditional data center network architecture is based on the CIOQ switching architecture, including one or more parallel working uncached chips, and each chip can realize the connection between the FA port of all inputs and the FA port of the output through the switching network port. The service scheduling generally connects the FA chips of all input and output terminals with the switching chip through a centralized puncher [1], and the FA chip reports the congestion of the port outlets to the centralized puncher. Traditional cloud data centers are mainly composed of networks, storage, and servers. Generally, operators use FCOE to implement network storage. The three-layer network of data centers mainly consists of access layer, aggregation layer, and core layer network. There is also a cross-data center network that enables data interaction in the data center. The data center network architecture is the access layer in the bottom-up order [2]. The access layer is mainly responsible for accessing the terminal equipment and accessing the aggregation layer equipment to the upper level. The aggregation layer is responsible for accessing multiple service switching devices to the lower access layer, and interconnecting the switching devices at the core layer. The core layer is the aggregation of the switching devices in the lower layer aggregation layer, and ensures that the switching devices at

the aggregation layer in the network implement high-speed switching and access the network egress. The role of cross-data center is mainly reflected in the emergence of cloud computing virtual technology, data interaction is very important in the era of big data.

#### *Cloud data center network architecture*

At the same time as the era of big data, cloud computing has been applied in data centers. Under the influence of factors such as technology and equipment, the traditional network architecture has gradually evolved from a three-layer network architecture to a two-layer network architecture, namely the access layer. And the core layer. The main reason is that the cloud computing server mainly accesses the Gigabit or 10 Gigabit network. The aggregation layer is mainly used as the link of the access layer device. It lacks certain significance under big data and gradually reduces the adoption of the aggregation layer. The network architecture of the new generation cloud data center is a switching architecture based on dynamic routing [3]. The switching architecture is also a multi-level architecture, in which the switching units in each level are connected to the next-level switching units. As a typical three-level switching architecture, it is mainly defined by two parameters, the parameter  $k$  is the number of intermediate-level switching units, and the parameter  $n$  is the number of switching units of the first-level and third-level, then the first-level and third-level It is composed of  $n \times k$  switching units, and the intermediate level is composed of  $k \times n$  switching units, forming a  $k \times n$  switching network, that is, having  $k$  under the network.  $n$  input ports and output ports. The network switching architecture of the next-generation cloud data center can be scalable, reconfigurable, and non-blocking, supporting the expansion of switch port system capacity, port speed, and number of switch ports.

### **Cloud data center network virtualization technology implementation**

#### *Control platform virtualization*

According to the control plane structure, it can be divided into vertical and horizontal directions. Vertical virtualization refers to the use of virtual technology to combine different levels of devices into one, similar to downstream is an interface expansion of upstream switch devices. After being virtualized, the control plane and the forwarding plane are centralized on one upstream device, while the downstream device is mainly responsible for some simple synchronization processing, and the upstream device is also responsible for packet forwarding, so this virtual technology can be regarded as one [4]. A centralized forwarding switch. Horizontal virtualization is the virtual integration of the same type of switch devices in the same level. The control plane work is regarded as a vertical process, which is implemented by one main body, but all the boxes and frames in the forwarding plane are Local forwarding and processing of traffic can be implemented, which is a typical distributed forwarding structure.

### *Data platform virtualization*

Both the control plane and the data plane are data communication dimensions, wherein the data plane is also the data forwarding plane. The implementation of data plane virtualization is implemented by two protocols, SPB and TRILL. These two protocols are used as a control protocol. The topology path is calculated in the device [5]. When forwarding, the outer layer of the original packet is encapsulated, and the different destination labels are forwarded in the protocol area. The virtual technology of the data plane is multi-discrete in a broad sense. When the Layer 2 network is forwarded, the scale range can be effectively extended. In the case where multiple nodes in the network node are virtualized as one node, the control plane is virtual. The virtualization still only stays at the ones or tens level, while the data plane virtualization has reached the hundredth level. At the same time, its shortcomings are particularly obvious. Packet processing for the control protocol is introduced in the data plane virtualization, which undoubtedly increases the complexity of the network. In the forwarding process, the data packets are also encapsulated and unpacked. Network forwarding efficiency is reduced.

### *Control plane is more than one*

IRF and VSS are a widely used control plane multi-virtual technology. The key to the two technologies lies in the following points [6]:

First, based on the engine's active and standby mode, the main control engines of the two technologies are on one master engine, and the other engines are used as backups. Work items such as table synchronization and protocol learning are independently completed in the main control engine. Virtual switching devices are usually distributed switching, and data forwarding is mainly done independently by the switching board.

Second, double live detection processing. After the link fails, two virtual physical devices with the same configuration have dual active nodes in the network, which causes IP gateway confusion on the upstream and downstream devices. If there are cross-device link aggregations on the network, VSS will extend the packets through LACP and perform mutual detection and notification. For example, if there are rich interfaces in the virtualized physical devices, they can be separately wired for monitoring. In the case of a dedicated link failure, the operation of the IRF and VSS is that the physical device is in the backup state, and all interfaces are closed until the link is restored and renegotiation is performed. It is important to note that the two virtualized technologies need to restart the physical device of the backup role to complete the virtual deployment.

### *Data plane is more than one*

The data plane is more imaginary. The packet of the Layer 2 network is encapsulated with a layer of identifiers, and then addressed and forwarded. Based on the outer identifier, multipath load balancing and loop avoidance

can be performed. The current public standard protocols are mainly SPB and TRILL. The SPB is a static planning forwarding path, which is difficult to be used for large-scale Layer 2 network expansion. The traditional network forwarding is still used in the SPB network. To ensure unicast load balancing and looping acyclic broadcast [7], the related software algorithms need to be performed. TRILL, also known as transparent multi-link interconnect, is a technology developed for data centers that solves multipath problems in large networks.

## **Cloud data center network virtualization technology application**

### *Server virtualization technology*

The server virtualization technology is essentially a decoupling technology. After separating the upper layer software, the basic physical device, and the operating system, the upper layer software, physical device, and operating system are placed in a portable virtual machine file to achieve unified management and speed up. System backup, deployment, and software release increase the coupling of the device, and the reliability of the system is significantly improved to achieve the sharing goal. In real life, cloud computing usually requires hardware device separation, virtual machine management, and resource scheduling by means of a virtual platform [7]. The server virtualization technology can not only realize rapid deployment of the system, but also real-time migration of the virtual machine. After the resource adjustment, the system scalability can be improved, the fault can be quickly recovered, and the reliability and security of the server are improved.

### *Resource storage virtualization technology*

The important foundation of its operation in the cloud computing process is the resource storage problem. The virtualization technology used is mainly represented by abstract hardware storage resources, that is, virtualized on multiple resource storage servers. The technology makes the underlying architecture simple and complex, and facilitates the separation between the logical image and physical storage of the resource, providing a simple and seamless virtual view for system administrators. The application of the virtualization technology in the storage of the cloud resources not only facilitates the storage and management of resources, but also enables simple allocation, so that the end users can also share the storage services without the terminal storage device, and the data resources are secure. Get a guarantee.

### **Network service virtualization technology**

Network service virtualization is to provide users with a network-style service to meet the needs of users' network services. Virtual technology can improve network service scalability and improve resource utilization efficiency. This is also the focus of cloud data center network research. Since

the virtualization of the cloud data network is composed of multiple layers, and there is a clear division of labor between the layers, such as the access layer, the core layer, and the virtual network exchange, it needs to be based on the needs of the huge cloud computing users, and Diversified intervention methods and a wide range of distribution, take certain measures to improve network access scalability and adaptability.

### **Conclusion**

In the era of big data, the realization and application of cloud data center network virtualization technology is the key research content in the industry, which not only helps to realize data information sharing, improve resource utilization rate, but also creates a certain economy for related industries and enterprises. Benefits drive the development of the industry.

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