

Huawei Cloud Fabric Data Center Network Solution







Cloud Fabric

Data Center Network Solution

— Enable Data Center Networks to Be More Agile for Cloud Services

Background and Challenges

A data center is an integrated Information and Communications Technology (ICT) application environment resulting from data concentration. By combining data computing, network transmission, and storage, a data center functions as the most critical infrastructure for enterprise business operations. In an era of cloud computing, enterprises and carriers have begun focusing on how to build data center infrastructure that supports sustainable cloud service development.

Cloud computing is capable of assisting enterprises in lowering Operating Expense (OPEX) and improving Operation and Maintenance (O&M) efficiency. By leveraging cloud computing technology, enterprises can maximize returns while minimizing resources. According to Forrester Research, a world-renowned research and advisory firm, global cloud computing applications are being carried out on a grand scale. Market share for cloud computing applications will reach US\$241 billion by the end of 2020, up from US\$4.07 billion in 2011. The global market of Infrastructure as a Service (IaaS) is expected to garner US\$5.9 billion in total revenue by the end of 2014. In addition, the global market share of Software as a Service (SaaS) will skyrocket from US\$21.2 billion in 2011 to US\$92.8 billion by the end of 2016. Meanwhile, the ecological web of cloud computing services matures day by day. For example, 400,000 or more commercial accounts, including The New York Times and the National Association of Securities Dealers Automated Quotation (NASDAQ), have already deployed Amazon Web Services (AWS) in over 190 countries and regions across the globe.

Cloud computing technology uses an innovative computing model that allows users to obtain nearly infinite computing capability and a wide variety of information services through networks at any time. This innovative business model provides on-demand computing and services, with charges based on quantity. While cloud computing applications are scaling up, cloud computing services continue to advance data centers towards Big Data, virtualization, and the Internet. As a result, cloud computing services pose new challenges for cloud data centers and their network architecture.

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Trend 1: Big Data Leads to Exponential Network Traffic Growth.

Big Data is a massive, diversified information asset with a high rate of growth. Stronger decision-making and insight as well as higher process optimization capabilities are achieved by leveraging new processing models. Big Data is characterized by huge volume, broad variety, high velocity, and significant value. There are four typical Big Data service architectures: distributed architecture, server cluster, parallel computing, and social media application. Recent years have seen unprecedented development for Big Data. According to the International Data Corporation (IDC), a famous market research, analysis, and advisory firm, total Internet traffic will increase fourfold by 2015. Gartner, the world's leading information technology research and advisory firm, predicts that the average data traffic volume of enterprises around the globe in the next five years will grow to 800% of current levels. Gartner also forecasts that the Average Annual Growth Rate (AAGR) of global data center IP traffic will be 33%, and the world's total data will reach 4.8 ZB by 2016.

As Big Data results in exponential traffic growth, 10GE servers in data centers have become mainstream servers, and interfaces connecting data center networks have evolved to 40GE/100GE. A data center's internal traffic is absolutely the main data traffic. To adapt to this trend, data centers have an urgent need for flattened, scalable network architecture that provides non-blocking, high-speed packet forwarding capability.

Trend 2: Virtualization Demands Strong Resource Integration Capability.

Virtualization logically abstracts and uniformly represents ICT resources, and plays a significant role in the construction of large data centers. In 2013, millions of cloud computing users carried out various services using a virtualized cloud computing platform. Server virtualization proportion has increased to more than 70%, and network function virtualization has become an industry trend.

In this era of cloud computing, enterprises require that data centers have a stronger virtualized resource integration capability to improve resource use efficiency and collaboration efficiency. Virtualized architecture of data centers encompasses server virtualization, storage virtualization, network virtualization, and network Value-Added Service (VAS) virtualization. Functioning as the bearer of all ICT resources, a data center network must integrate various computing, storage, and network resources in the data center to implement on-demand utilization and scheduling of ICT resources.

Trend 3: Accelerated Internet Innovation Demands Programmable Networks.

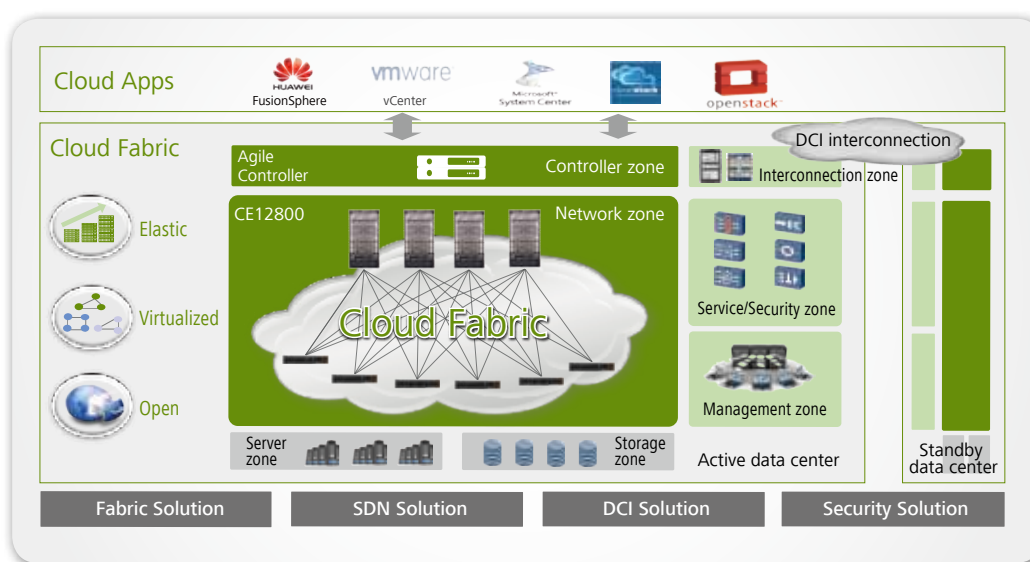
Information Technology (IT) service innovation has new requirements for Communications Technology (CT) networks. For example, Google conducts customized development of network forwarding paths, increasing its bandwidth use efficiency from 30% to nearly 100%. In another example, a large Internet company in China wants to build larger and more reliable networks by self-defining and optimizing network protocols inside a data center.



Functions of traditional data center networks are hardware-based and evolve slowly. To deploy new services and functions, existing network devices must be replaced. The existing network devices cannot quickly adapt to the new services. Consequently, service provisioning efficiency is low, and the commercial use speed of networks is far slower than that required by the new services. How do we make an enterprise ICT system more competitive? How can we quickly introduce new services and functions? How do we enable network administrators to focus more on user experience and service innovation without the constraint of complicated and tedious network device faults? The answer is Software Defined Networking (SDN), that is, programmable network.

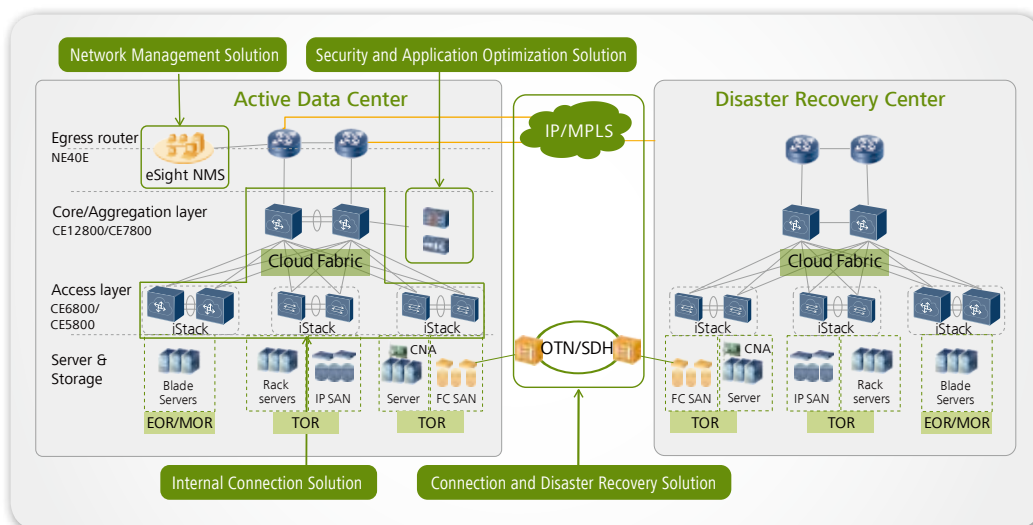
The Big Picture: Huawei Cloud Fabric Data Center Network Solution

To help its customers quickly adapt to changes in cloud computing services, Huawei has put forth an innovative, next-generation cloud computing data center. The aim of Huawei Cloud Fabric is to build an elastic, virtualized, and open cloud data center network for customers and to provide support for the sustainable cloud service development of enterprises. Huawei CloudEngine (CE) series data center switches lead the industry in high-performance data center switches. Based on Huawei's next-generation Versatile Routing Platform version 8 (VRP8), Huawei CE provides ample features for data center services. Agile Controller is Huawei's cloud data center network controller, which can uniformly control and schedule ICT resources and quickly deploy cloud services. Huawei Cloud Fabric supports multiple mainstream cloud platforms in the industry and can bear a broad variety of cloud services and applications. The Huawei Cloud Fabric Data Center Network Solution applies to the Internet, financial, and energy industries, government sector, large enterprises, and carriers.



The Huawei Cloud Fabric Data Center Network Solution provides multi-layered network products to provision one-stop-shop services for users and to simplify customer data center network construction. By leveraging Huawei CE12800 series flagship core switches, which have the world's highest configuration, and high-performance CE7800/CE6800/CE5800 series, this solution provides highly scalable networks that interconnect with each other inside a data center. Taking advantage of its full-series transport, routing, security, and Network Management System (NMS) product families, Huawei provides the ultimate data center network solution. In terms of network architectures and functionalities, the Huawei Cloud Fabric Data Center Network Solution consists of the following sub-solutions:

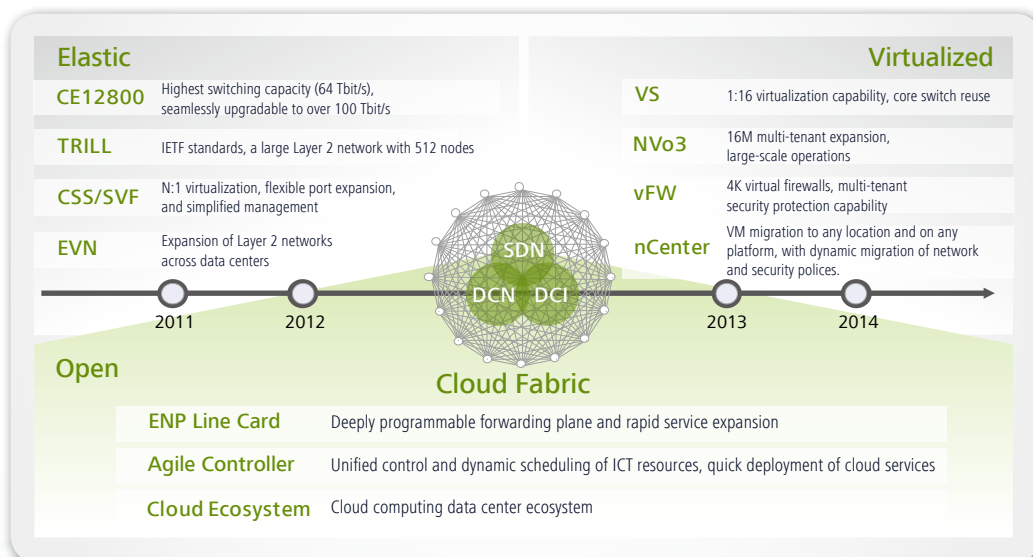
- Intra-data center connection solution
- Inter-data center connection and disaster recovery solution
- Data center security and application optimization solution
- Data center network management solution



Customer Benefits

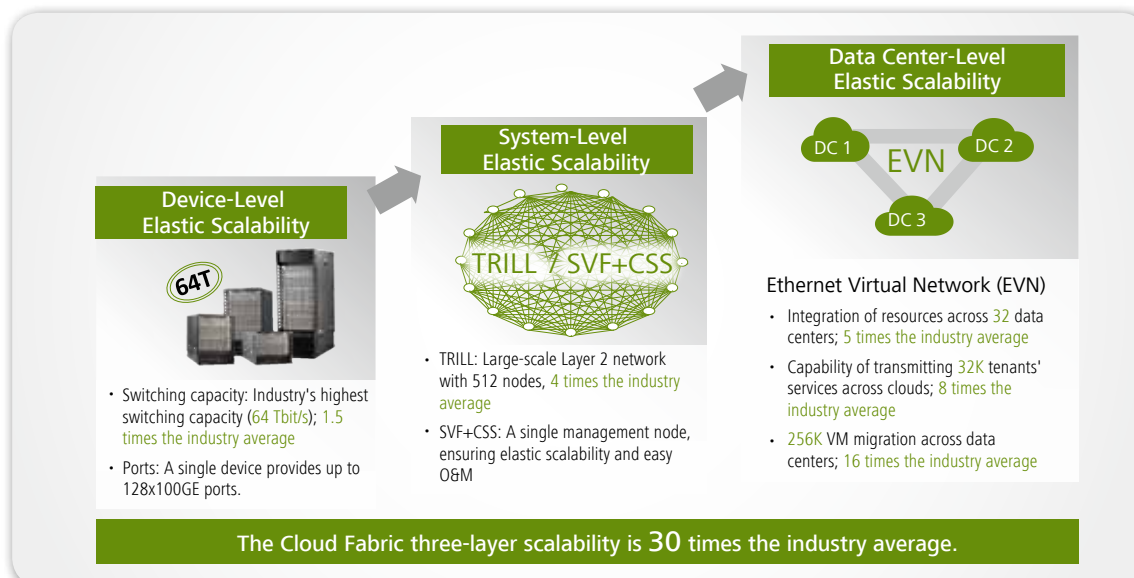
Huawei Cloud Fabric leverages an industry-leading architecture that can help customers build an elastic, virtualized, and open data center. This architecture also provides an agile solution innovation capability, adapts to fast-changing cloud services, and supports continuous cloud service development.

Huawei Cloud Fabric: Industry-Leading Architecture, Continuously Innovative Solution



Elastic Fabric: Supporting Flexible Expansion of Cloud Services More Agilely

Three-layer elastic scalability: Huawei Cloud Fabric provides device-level, system-level, and data center-level elastic scalability for data center networks, satisfying the high-speed development requirement of enterprise cloud services for the next ten years or more.



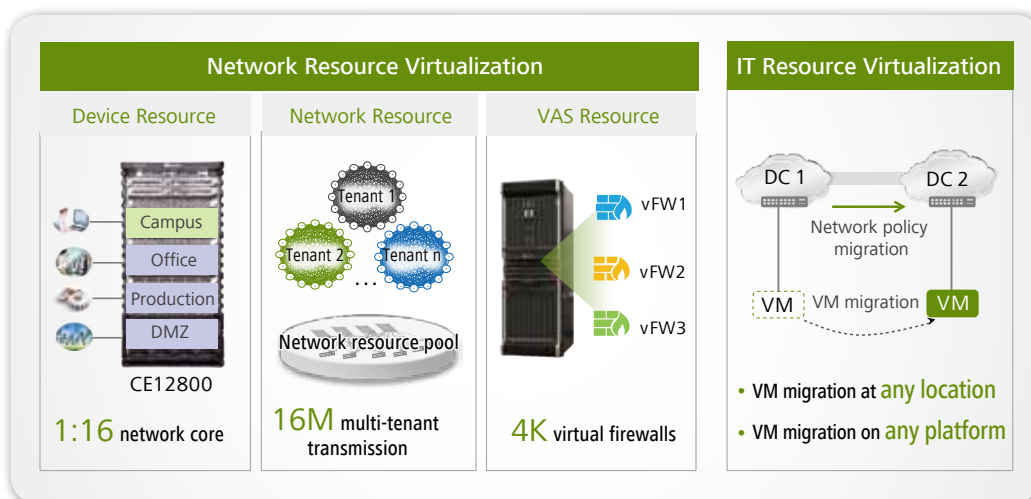
Device-Level Elastic Scalability: Huawei Cloud Fabric provides data center network products that feature super large switching capacities and continuous, seamless capacity expansion capabilities. As a result, data center equipment rooms require no remodeling during device replacement. Huawei CE12800 series data center core switches have the industry's highest switch capacity (64 Tbit/s), which can be seamlessly upgraded to over 100 Tbit/s. A single line card of the CE12800 has a T-bit forwarding capacity. The CE12800 supports 12x100GE super high performance line cards, providing a continuously stable switching core for users. Huawei USG9500 series data center security gateways are based on the industry-leading "NP + multi-core + distributed" architecture. A single card of the USG9500 supports 160Gbit/s application-layer firewall throughput capacity. Throughput of the whole device reaches 1 Tbit/s. A maximum of 960 million concurrent connections are supported.

System-Level Elastic Scalability: Huawei Cloud Fabric seamlessly supports Transparent Interconnection of Lots of Links (TRILL), a standard IETF protocol. The typical TRILL network using core and TOR switches helps build a large Layer 2 network with over 512 nodes. Over 18,000 10GE servers can be deployed on a TRILL network. Huawei Cloud Fabric provides a combined solution of Huawei's proprietary Cluster Switch System (CSS) and Super Virtual Fabric (SVF). This combined solution virtualizes multiple homogeneous or heterogeneous physical switches into one virtual switch, simplifying network management and improving network reliability. CSS is core switch cluster technology that horizontally (east-west) virtualizes multiple core switches into one core switch. SVF expands heterogeneous core switches innovatively and vertically (north-south). Multiple Leaf switches are virtualized into remote line cards of a Spine switch, which flexibly expands interfaces and simplifies cable layout and device management in equipment rooms. Huawei SVF is the only technology that implements local forwarding on Leaf switches. Since a majority of the data center traffic is east-west traffic, SVF can maximize forwarding efficiency and reduce network latency.

Data Center-Level Elastic Scalability: Huawei Cloud Fabric provides highly efficient, three-layer connections among data centers, satisfying the interconnection requirement of Layer 2, Layer 3, and Storage Area Network (SAN) layer services. This solution supports the industry-leading Layer 2 interconnection solution Ethernet Virtual Network (EVN), implementing cross-region service expansion for 32 data centers by traversing the IP WAN. EVN integrates resources of multiple data centers into a super large IT resource pool. This not only allows server clusters across multiple data centers, but also supports smooth migration of 256K Virtual Machines (VMs) across data centers. In addition, by leveraging Huawei 400G core routers and 100G Wavelength Division Multiplexing (WDM) products, Huawei Cloud Fabric provides a highly reliable "IP+OTN" disaster recovery solution, ensuring uninterrupted data center service traffic forwarding.

Virtual Fabric: Implementing Dynamic Deployment of Virtual Resources More Agilely

Full-Scale Virtual Resource Integration: Huawei Cloud Fabric fully supports data center virtualization, including IT resource virtualization and network resource (device, network, and VAS resources) virtualization, holistically integrating ICT resources of data centers, improving network O&M efficiency, and reducing TCO.



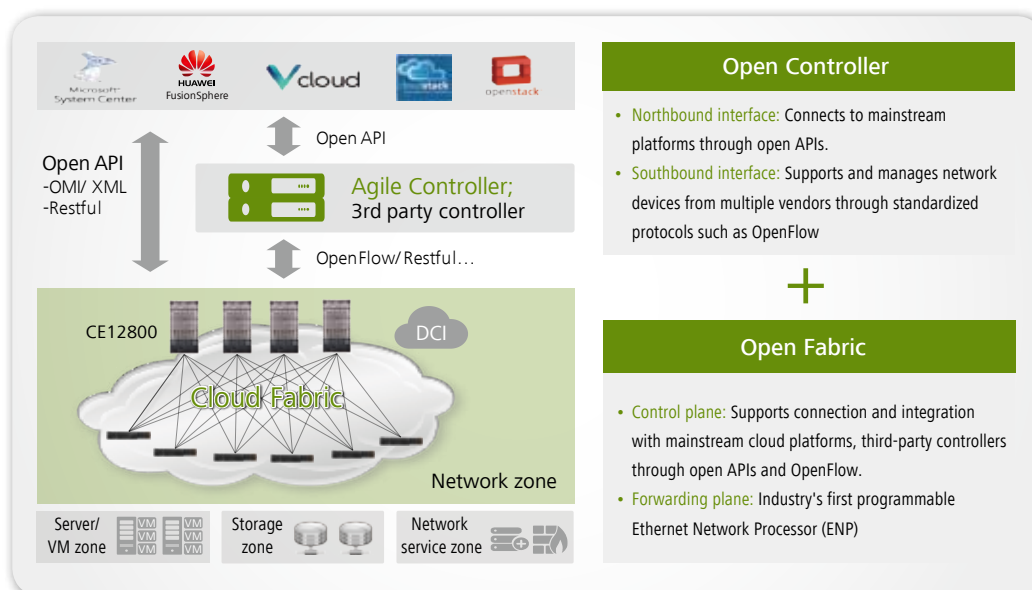
IT Resource Virtualization: Huawei Cloud Fabric provides diversified Ethernet Fabric technologies that implement large Layer 2 network transmission from a Point of Delivery (POD), a single data center, to multiple data centers. This enables VMs to migrate within any scope, and IT resources can be easily scheduled. Huawei Cloud Fabric also enables dynamic collaboration between data center networks and mainstream VM platforms. During VM migration, network policies can dynamically migrate at a speed 10 to 20 times the industry average.

Network Resource Virtualization: Huawei Cloud Fabric enables in-depth virtualization of various network resources. Multiple services, departments, and tenants can securely share network resources. By leveraging Virtual System (VS) technology, Huawei CE12800 data center switches provide the industry's highest device virtualization capability (1:16). That is, one physical device can serve as 16 logical devices, accommodating multiple services for core switch sharing. Huawei Cloud Fabric also provides multi-tenant network solutions such as NVO3/VXLAN/NVGRE and TRILL (FGL). Functioning as a high-performance, virtualized hardware gateway, the CE12800 supports large-scale data center operations for up to 16M tenants. Huawei Cloud Fabric also provides a high-performance VAS resource pool. For example, Huawei USG9500 supports 4K virtual firewalls and an Intrusion Prevention System (IPS), providing customized security protection for tenants.



Open Fabric: Accelerating Cloud Service Innovation More Agilely

Full-Scale Open Network: To adapt to fast-changing cloud services, Huawei Cloud Fabric implements full-scale network openness, providing an open fabric, an open controller, and an open ecosystem. This allows a more agile adaptation to cloud service innovation and quick provisioning of new services.



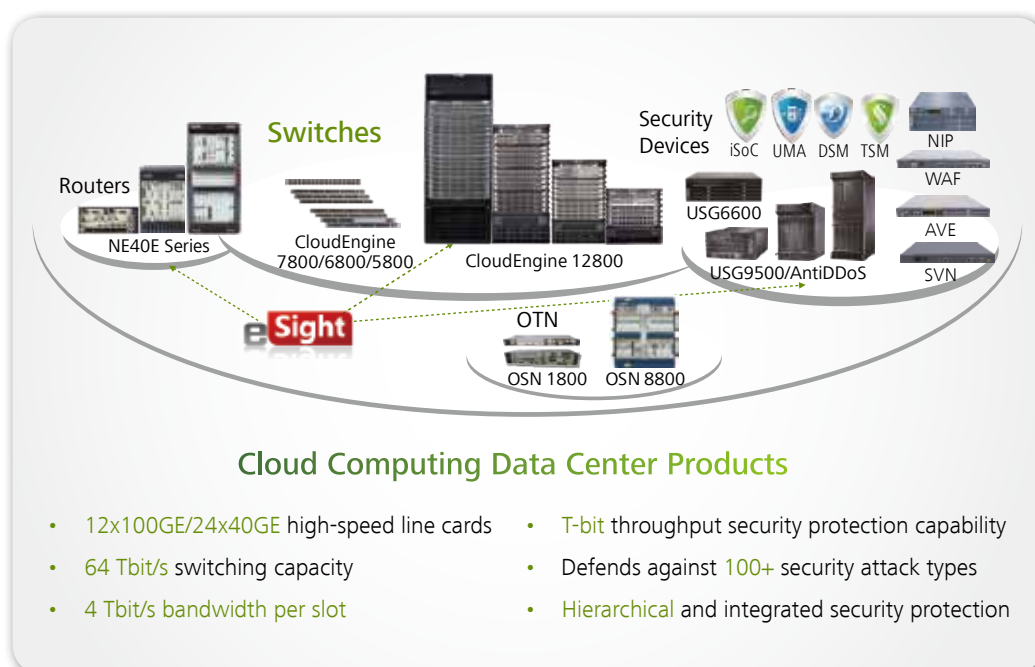
Open Fabric: Huawei Cloud Fabric provides full-scale forwarding plane and control plane programmability. Huawei CloudEngine series data center switches support high-performance programmable line cards through expansion. By leveraging Huawei's proprietary programmable Ethernet Network Processor (ENP) chips, this solution implements software-defined network functions and rapid expansion, making networks more open and allowing ubiquitous service innovation. Huawei Cloud Fabric also provides abundant open Application Programming Interfaces (APIs) such as Python/XML/Restful/OMI and standardized protocols such as OpenFlow. Data center networks can connect to third-party controllers to implement open, controllable networks. Based on the fully programmable network using ENP chips, Huawei Cloud Fabric helps customers quickly innovate and deploy new services, at a speed four times faster than the industry average.

Open Controller: Huawei Agile Controller is a cloud data center network controller that integrates multi-tenant network management, automatic orchestration of service chains, and VM access control. Huawei Agile Controller implements unified control and dynamic scheduling of ICT resources, as well as quick cloud service deployment. The Huawei Agile Controller features superior openness. Its northbound interfaces can connect to mainstream cloud platforms in the industry, allowing a cloud platform to easily deliver and adjust network policies. Taking advantage of Open APIs and OpenFlow, southbound interfaces of the Huawei Agile Controller can control and manage Huawei and third-party network devices. The open controller not only improves user service delivery efficiency, but also allows network customization based on service characteristics. The result is seamless convergence of networks and services, that is, true cloud and network integration.

Open Ecosystem: With its customer-centric focus, Huawei is proactive in building a cloud computing data center ecosystem through its Cloud Ecosystem plan. Huawei has partnered with multiple world-renowned IT device vendors representing cloud platform, virtualization, server, and storage device sectors. Huawei teamed up with Microsoft to launch the Hybrid network virtualization solution. This solution uses CE12800 series data center switches as hardware virtualization gateways to provide high-performance communication between Microsoft VMs and campus and branch users, and between Microsoft VMs and VMs and physical servers from other vendors. Additionally, Huawei is China's first Gold member of the OpenStack Foundation and is committed to promoting SDN industry chain development.

Product Portfolios

As shown in the following figure, the Huawei Cloud Fabric Data Center Network Solution provides multi-layered network products:



Network Location	Device Model	Description
Data center switches	CE12800 series	Industry-leading data center switches
	CE7800 series	High-density 40GE core/aggregation switches
	CE6800 series	High-density 10GE access box switches, connecting to 40GE uplink devices
	CE5800 series	High-density GE access box switches, connecting to 10GE or 40GE uplink devices
Data center security products	USG9500	High-performance firewalls
	USG6000	Next-Generation Firewalls (NGFWs)
	AntiDDoS series	DDoS attack defense
Routers	NE40E series	Egress routers for data centers
Optical Transport Network (OTN) products	OSN series	OTN devices for data centers
Data center intelligent NMS	eSight	Visible intelligent network management platform
	nCenter	VM migration management software
Data center network controller	Agile Controller	Data center network controller

Why Huawei ?

Huawei is proudly backed by 20 years of experience in the IP field and an outstanding series of network products and solutions. Recognized as one of the world's leading network solution providers, Huawei has an excellent long-term plan for network development and a firm determination to invest in the network field. Most importantly, Huawei's world-class research capabilities and experts offer unparalleled experience with network standards and chip development.

As a member of ONF, IETF, and IEEE, Huawei participated in SDN standards research, contributing greatly in areas of network migration to SDN, including product development and improvement in customization capability. Huawei remains committed to providing intelligent, programmable, and open networks to customers through its accumulated carrier-grade network experience and innovative products.



For more information, please visit: <http://enterprise.huawei.com/>.



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HUAWEI TECHNOLOGIES CO.,LTD.
Huawei Industrial Base
Bantian Longgang
Shenzhen 518129,P.R.China
Tel: +86 755 28780808

www.huawei.com