iMaster NCE-Fabric Datasheet

Huawei iMaster NCE-Fabric is an autonomous driving network management and control system designed for data center network scenarios. It integrates management, control, analysis, and AI functions. It efficiently connects physical networks and business intentions, and provides full-lifecycle simplified deployment and intelligent O&M closed-loop management. Redefine service provisioning and O&M for the data center network.

Product Overview

With the advent of the 5G and cloud era, innovative services such as VR/AR, live broadcast, and unmanned driving emerge in large numbers. The increasing data volume and increasingly complex

The emergence of network threats is changing the data center technology landscape at an amazing speed. The boundary between users and service providers is being pulled as technology advances.

Recently, widely distributed applications and data have led to the rise of distributed computing models. In this environment, it is critical that data center network take a new approach to networking.

The current rigid and mostly manual approach to lifecycle management is no longer sustainable for deploying, maintaining, and updating the network and is difficult to scale to meet the growing
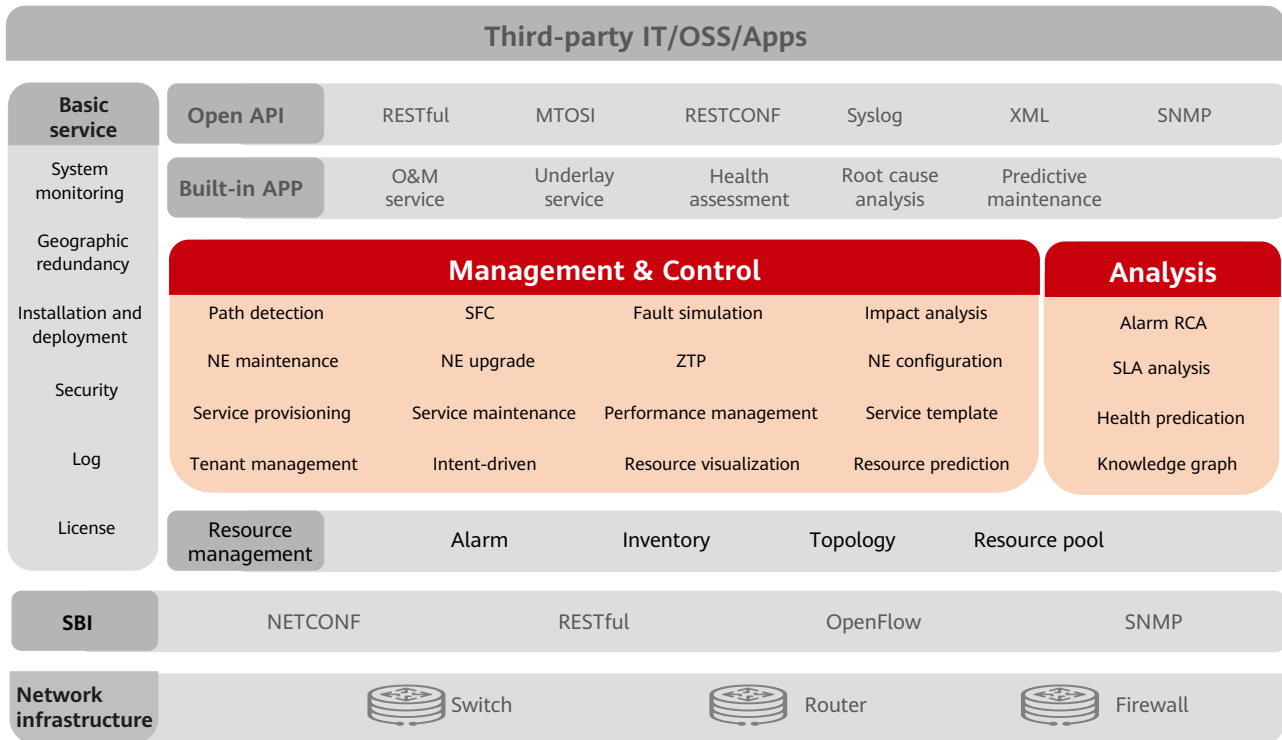
Complexity of growth. For organizations to thrive in the digital economy, data center network needs to be able to quickly adapt to changing business needs or "intents."

iMaster NCE-Fabric is an autonomous driving network that integrates management, control, analysis, and AI functions for data center network scenarios.

The management and control system provide cloud-based network resources, full-lifecycle network automation, and intelligent closed-loop capabilities driven by data analysis based on business and service intents,

The data center network service release and O&M efficiency is improved.

Architecture and Key Components

Third-party IT/OSS/Apps						

Basic service	Open API	RESTful	MTOSI	RESTCONF	Syslog	XML	SNMP
System monitoring	Built-in APP	O&M service	Underlay service	Health assessment	Root cause analysis	Predictive maintenance	

					Analysis
Geographic redundancy	**Management & Control**				
Installation and deployment	Path detection	SFC	Fault simulation	Impact analysis	Alarm RCA
Security	NE maintenance	NE upgrade	ZTP	NE configuration	SLA analysis
Log	Service provisioning	Service maintenance	Performance management	Service template	Health predication
	Tenant management	Intent-driven	Resource visualization	Resource prediction	Knowledge graph

License	Resource management	Alarm	Inventory	Topology	Resource pool

SBI	NETCONF	RESTful	OpenFlow	SNMP

Network infrastructure	Switch	Router	Firewall

Based on the cloud-native architecture, iMaster NCE uses the service-oriented module design and supports distributed virtualization deployment. The overall architecture consists of several modules, such as common services, management control and analysis, scenario-based apps, and southbound and northbound openness.

· Common service module: provides basic network services such as alarm and log services and product engineering capabilities such as disaster recovery and backup.

· Management, control, and analysis module: provides network management, service automation, analysis, and prediction capabilities by module.

· Scenario-based app module: provides service capabilities such as O&M services for different business scenarios.

· Southbound and northbound open module: provides northbound APIs to quickly interconnect with third-party applications or other management and control systems.

Product Highlights

Intent-driven, zero waiting time for service deployment

● Reduce the workload of O&M personnel, improve O&M personnel's work efficiency, and shorten the service deployment and rollout time.

During the simulation verification, the configuration change is 0 errors.

● Establish a technical mechanism to prevent accidents caused by operation errors, effectively prevent man-made accidents, improve work efficiency, and improve safety productivity.

Proactive prediction and zero interruption in intelligent O&M (1–3–5)

● Predict and prevent network quality deterioration and faults, prevent and handle network quality deterioration and faults in advance, and minimize problems. If a fault occurs, the fault can be quickly located and demarcated, and the fault can be rectified quickly and accurately, ensuring worry-free O&M.

Key Features

Automatic network E2E deployment

iMaster NCE-Fabric is dedicated to providing highly autonomous experience throughout the lifecycle of data center network planning, construction, maintenance, and optimization. It uses 21 types of network intent as input to implement intent-centric E2E highly automated capabilities. For example, in the planning phase, iMaster NCE-Fabric can design intelligent data center networks based on user intentions, recommend network design solutions, and integrate the design with network deployment, including automatic deployment and verification, to ensure that no mistakes are made in this phase. This greatly reduces the network construction time and costs and solves the problem of low efficiency.

If iMaster NCE-Fabric is flexibly used only in the network construction phase, iMaster NCE-Fabric provides ZTP one-click simplified deployment and flexible planning for basic underlay networks, meeting automatic network construction requirements. Rapid construction, upgrade, and capacity expansion of network infrastructure; Provides simplified drag-and-drop network design and automatic provisioning process for logical overlay networks. The provisioning efficiency is three times the industry average, facilitating service rollout in minutes.

Intent-driven network deployment

In traditional service deployment mode, service and network departments are transferred in the form of work orders. Then, the network departments design and deploy the network based on the work orders. The communication process takes a long time and is prone to missing requirements. AI is introduced in the intent-driven network deployment mode of iMaster NCE, which requires only three steps from service intent to successful network deployment.

· Understand and convert the service intent entered by the administrator into the network intent.

· Provides three preferred network models and deployment solutions based on AI model calculation and configuration plane simulation verification.

· Network deployment solutions are converted into NE configurations and automatically delivered to network devices.
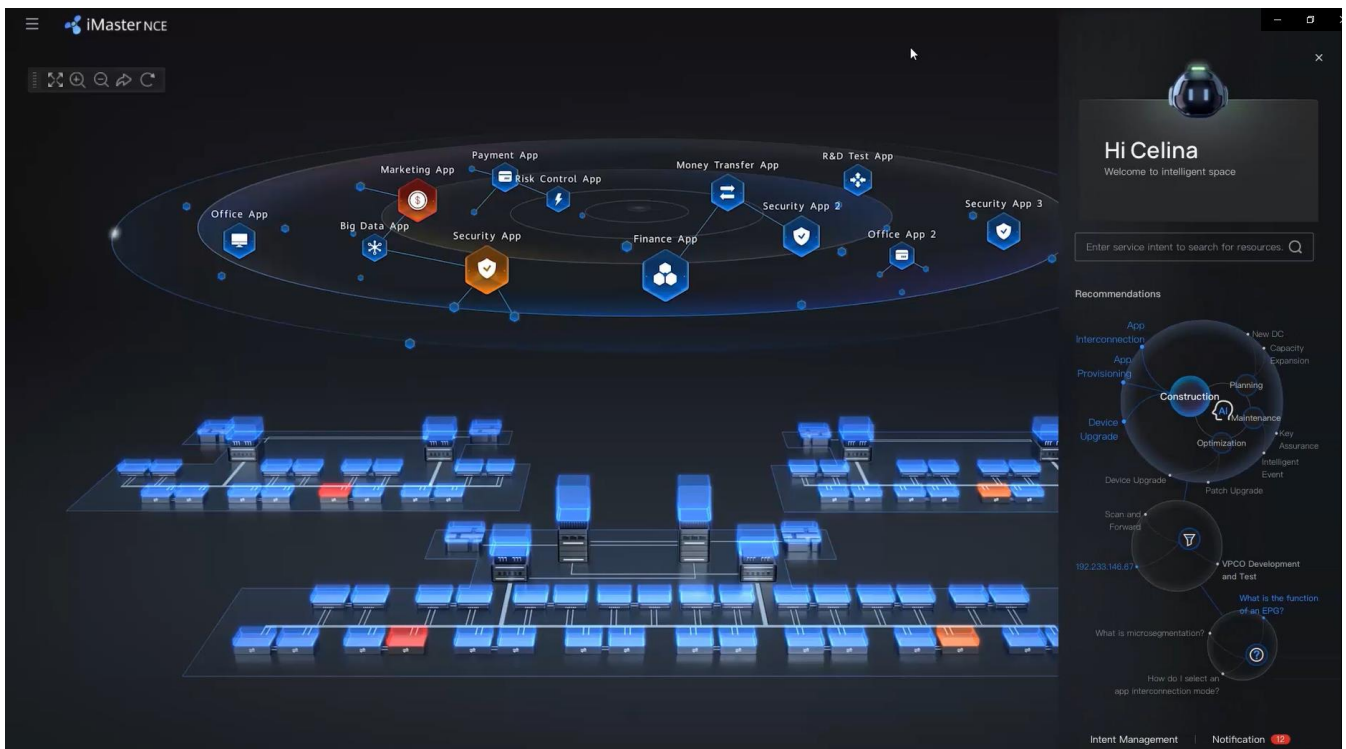
Pre-assessment of change risks

According to statistics, nearly 40% of network faults are caused by human errors, including network design logic vulnerabilities, administrator intention deviation, and operation errors. Before network changes and policy adjustment, a lot of experts have been spent on manual risk assessment.

iMaster NCE provides a simulation verification module. Based on the live network configuration, topology, and resources as input, iMaster NCE uses network modeling and formal verification algorithms to verify whether the remaining network resources are sufficient for simulation on the live network to display detailed connectivity and mutual access relationships. Analyze the impact of the configuration to be changed on the original services. Network engineers can use iMaster NCE to evaluate change risks in advance and solve human-made problems such as design logic vulnerabilities.

Container network on-demand deployment

With the rapid development of container technologies, containers are favored by users because of their lightweight, easy-to-deploy, and easy-to-port features. More and more users begin to deploy containers in data centers.

Currently, the network deployment mode of containers depends on the pre-deployment mode, which is separated from the traditional VM/BM network.

Inefficient dimension.

iMaster NCE-Fabric flexibly interconnects with the container orchestration system through plug-ins to implement on-demand container network deployment and unified management, improving O&M efficiency by more than 30%.
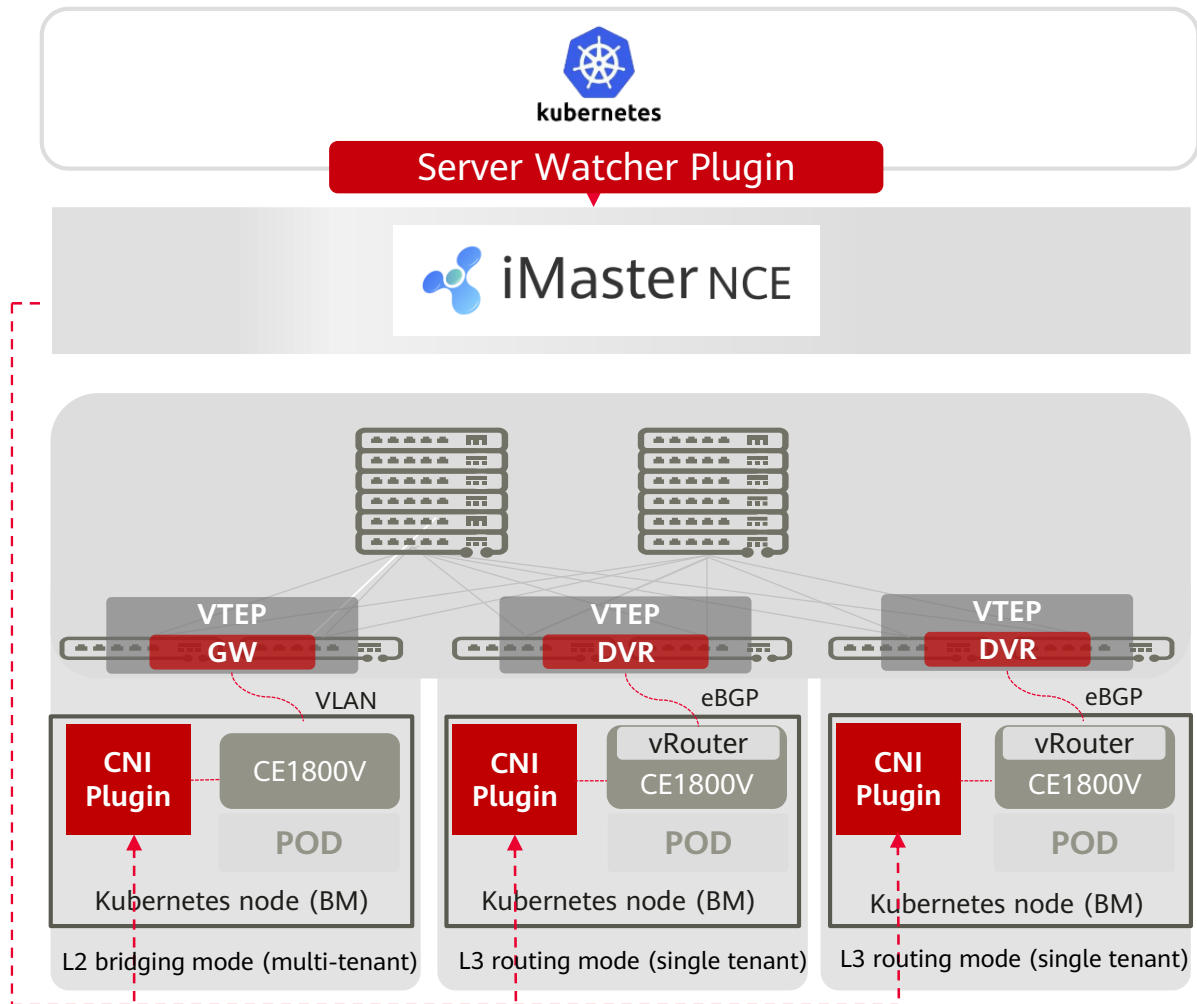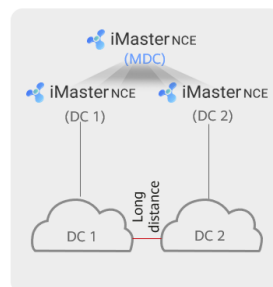
Unified management of multiple data centers

iMaster NCE-Fabric provides the MDC, that is, the Multi-Data Center Controller, for multi-cloud and multi-DC scenarios. The public cloud opens the service model in a unified way, implementing minute-level service provisioning. Supports graphical orchestration of cross-DC hybrid cloud services. Supports visualized O&M topology and intelligent multi-DC O&M, implementing quick fault demarcation and recovery. Verifying the connectivity of multiple private cloud data centers. This solution applies to distributed hybrid cloud deployment for internal and external customers. Provides flexible networking solutions to meet the requirements of automatic network construction in multi-DC hybrid cloud scenarios.
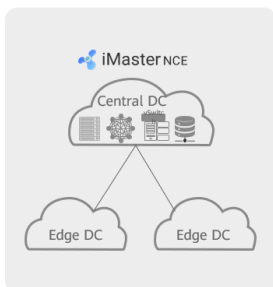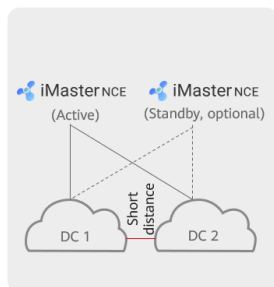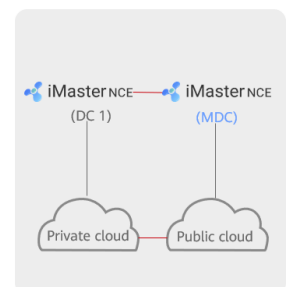

**Edge DC solution** **Multi-PoD solution** **Multi-site solution** **Multi-cloud hybrid solution**

Flexible orchestration of graphical network services

In the data center scenario, service operations are usually initiated by third-party work orders or network management systems, and services are delivered by calling northbound open APIs. Traditional workflows have many problems: frequent online and offline of new services, resulting in a large number of work orders of the same mode. The network O M personnel are overloaded and the efficiency is low. When the configuration is complex, users need to manually compile scripts, resulting in heavy design workload and poor maintainability. Traditional workflows cannot automatically perform dry run. The development and commissioning period of complex tasks is long, resource consumption is high, and task concurrency is low.

To solve the problems encountered by traditional standard workflows, Huawei iMaster NCE-Fabric encapsulates the framework and simplifies the design of the northbound open service. The runbook service designer orchestrates scattered atomic APIs into sequences to provide complete service-based functions.
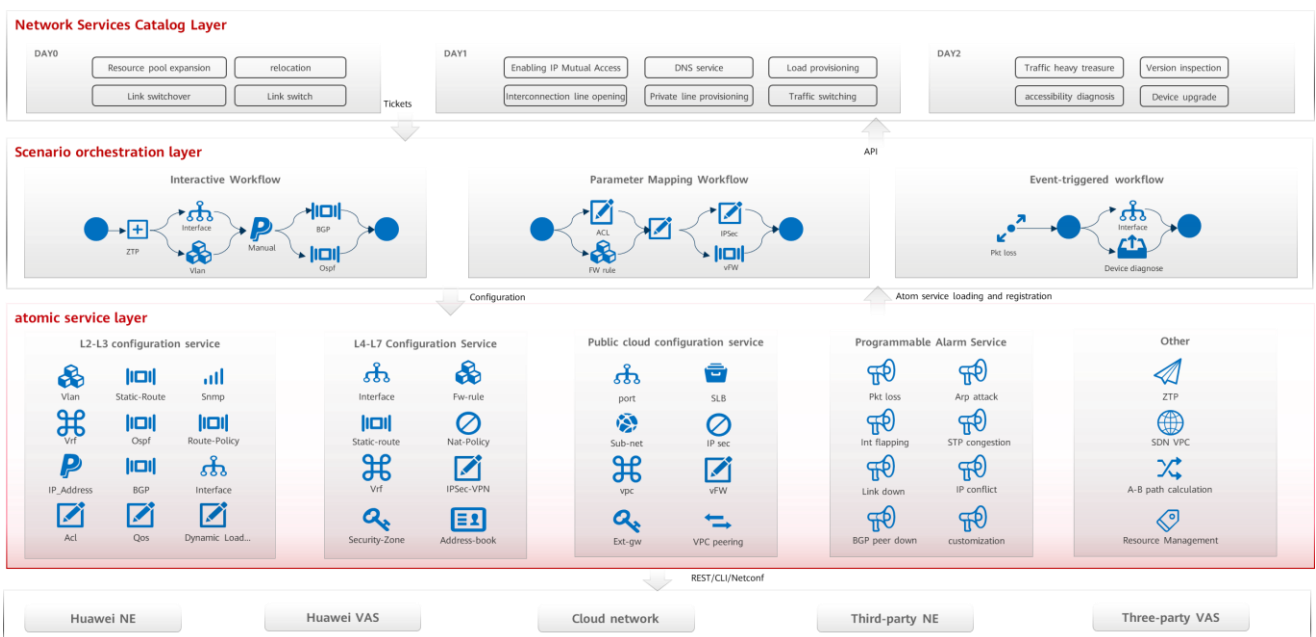

Network digital map

With the evolution of data center network, traditional network O&M is difficult to sustain. Traditional network O&M is based on static network topology drawing and display, which is prone to distortion, lack of necessary information, and difficult maintenance. As a result, refined O&M cannot be implemented. Traditional network O&M lacks a visualized application system. The invoking relationships between applications, networks through which services pass, and application paths are invisible, affecting O&M and troubleshooting efficiency. Traditional network O&M requires manual troubleshooting and troubleshooting when an application fault occurs. The process is time-consuming and inefficient, and relies heavily on expert experience. Therefore, there is no visualized foundation.

iMaster NCE-Fabric provides the digital map feature to support unified and visualized display of data center network. Digital maps support the following capabilities:

• Provides an open data collection framework to collect domain controllers, third-party systems, device configurations, and entries, and functions as the unified data foundation of the O&M system.

• Supports three-level network topologies: multi-DC topology, single-DC topology, and single-region topology. Displays the traffic and road conditions in the topology, queries topology statistics, and restores link information between devices by using topology restoration technologies to supplement the network topology.

• Supports the one-click search function of the unified data foundation. Users can search for devices such as switches, servers, and VMs and locate the devices on the digital map.

• Path restoration is supported. After the IP addresses of two VMs are entered, the traffic path between the two VMs is restored through simulation.
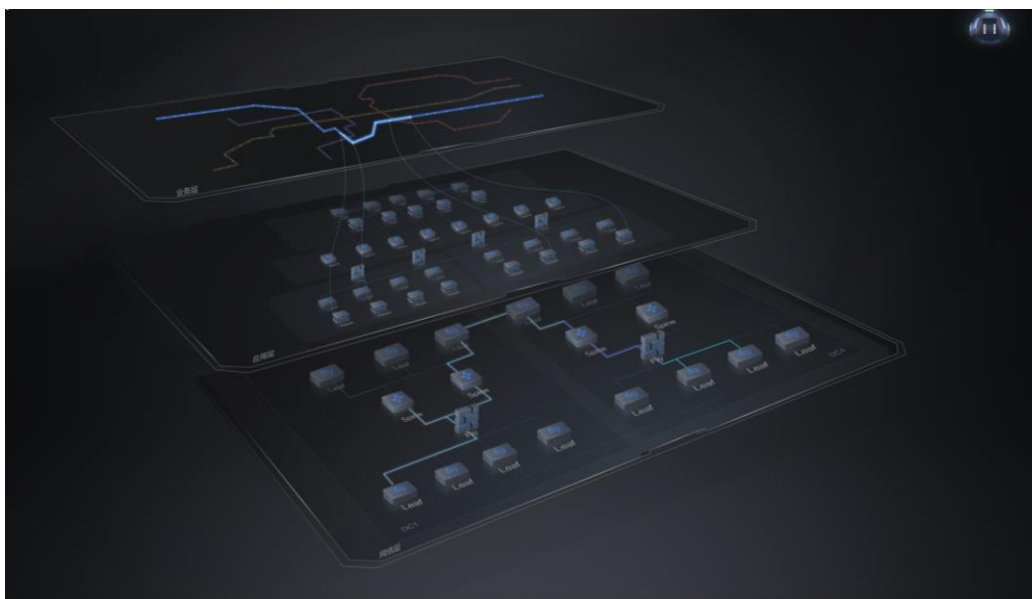
Troubleshooting of Typical Faults 1–3–5

A data center is not only a service support center, but also a value creation center. One hour of service interruption in 98% of enterprises will cause a loss of more than US$100,000. Customers have zero tolerance for network interruption. However, network O&M is mainly performed manually. Once a fault occurs on the network, manual fault locating is difficult and time-consuming, which severely affects service continuity. Based on the Telemetry technology, iMaster NCE-FabricInsight collects data on the management, forwarding, and data planes of the entire network in real time and detects faults in minutes from the perspective of service experience. In addition, based on Huawei's 30+ years of O&M experience and network fault scenarios of more than 9600 data center customers, we sorted out 75 fault types of 7 categories and continuously conducted fault drills within Huawei. Based on the AI-based network knowledge graph, we continuously improved fault locating efficiency. Currently, the root cause of typical faults can be located within 3 minutes. Supports intent-based closed-loop management, intelligent analysis of fault impact, and preferential troubleshooting plans recommended by iMaster NCE-Fabric. Typical faults can be quickly rectified within 5 minutes.

Specification List

Features	Feature Description
NE management and control	· NE FCAPS and basic network configuration are supported.
Network service provisioning	· Interconnects with mainstream OpenStack cloud platforms, Kubernetes container orchestration platforms, or third-party apps. The cloud platforms or third-party apps invoke standard interfaces to provision network services.
	· iMaster NCE-Fabric can independently provision IPv4/IPv6 network services at a time or in batches, implementing automatic network deployment.
	· Automatic deployment of multicast over VXLAN services
Zero Touch Provisioning	· Supports zero-configuration device go-online and automatic replacement when a fault occurs.
	· Automatically identifies and manages network devices.
Multi-cloud and multi-DC management	· iMaster NCE-Fabric MDC (Multi-DC Controller) can manage multiple NCE-Fabric domain controllers and manage multiple DC networks.
	· Hybrid cloud network orchestration: MDC can connect to AWS and HUAWEI CLOUD to provision cross-DC IPsec VPN and internal VPC services in public and private clouds.
	· Supports the mapping between service priorities and WAN-side tunnels in a DC by using the MDC component and iMaster NCE (IP Domain).
	· Hybrid cloud network topology display
Intent understanding simulation	· Supports automatic intention identification based on intelligent robots and intelligent recommendation of logical network solutions, eliminating the need for service orchestration.
	· Supports the logical network design mode in multi-cloud and multi-DC scenarios. Service orchestration and simulation evaluation can be performed without delivering configurations to devices.
	· Supports online simulation before configuration change in multi-cloud and multi-DC scenarios. Evaluates logical resource usage and service connectivity based on existing and new device configurations.
System security	· Micro segmentation
	· Supports role-based access control.
	· Local/Remote authentication (RADIUS, AD, and LDAP)
Service chain	· Traffic diversion by third-party firewalls and third-party load balancers
	· Support for the IETF standard service chain (SFC) model
O&M and fault locating	· Logical resource statistics
	· Application, logical, and physical network topologies can be displayed separately.
	· Displays the mapping between applications and logic and between logic and physical topologies.
	· Network detection tools: path detection, intelligent loop detection, and connectivity detection
	· O&M tools: southbound and northbound consistency reconciliation, emergency plan, intention verification, replacement/fault impact analysis, and one-click network-wide detection
Network digital map	· Provides an open data collection framework to collect domain controllers, third-party systems, device configurations, and entries, and functions as the unified data foundation of the O&M system.
	· Supports the one-click search function of the unified data foundation. Users can search for devices such as switches, servers, and VMs and locate them on the digital map.
	· Service path navigation is supported. After the IP addresses of two VMs are entered, the traffic path between the two VMs is restored through simulation.
	· Supports multi-DC, single-DC, and single-region three-level network topologies, displays the traffic and road conditions in the topology, queries topology statistics, and restores link information between devices using topology restoration technologies to supplement the network topology.
	· Interconnects with NSX-T and displays VM and virtual network information about NSX hosts, including virtual NICs, logical switches, uplinks, pNICs, TEPs, and their connections.
	· Third-party O&M systems can invoke the digital map level-3 network topology and service path navigation capabilities by invoking the SDK.
reliability	· Supports distributed cluster deployment, which is managed by different cluster member nodes. When a member node is faulty, the network devices managed by the member node

Features	Feature Description
	can be smoothly migrated to the other normal member nodes, ensuring that the management service is not interrupted.
	· Supports active/standby cluster deployment, implementing highly reliable remote disaster recovery.
	· Service rollback, tenant rollback, and network-wide rollback mechanisms are supported. Network services can be quickly recovered through snapshots.
	· Faults 1 to 3 to 5 are supported. For typical faults, the system intelligently recommends and evaluates the rectification solution. After the solution is selected, the system automatically delivers the rectification solution to complete the closed-loop rectification.
Openness	· Supports standard southbound protocols, such as SNMP, NETCONF, OpenFlow (1.3/1.4), OVSDB, JSON-RPC, and sFlow.
	· Supports the open programmable framework (AOC) in the southbound direction and quickly adapts to third-party devices by loading drivers.
	· Supports east-west interconnection with computing resource management systems, such as VMware vCenter, to implement network and computing resource collaboration.
	· The northbound service designer (Runbook) is supported. Users can customize service flows on the GUI to flexibly orchestrate complex network services. Manual switching nodes and service flow breakpoints can be flexibly set, meeting automatic interaction requirements in different scenarios.
	· Northbound interfaces, such as RESTful, Restconf, WebService, and Syslog, are supported.
Management capacity and performance	· Typical Configuration (Three-Node Cluster)
	Number of managed physical network devices: 1,800
	Number of managed physical servers: 9,000
	Number of managed VMs: 180,000
	VM online rate: 200 VMs per second
	· Typical Configuration (Five Node Cluster)
	Number of managed physical network devices: 3,000
	Number of managed physical servers: 15,000
	Number of managed VMs: 300,000
	VM online rate: 350 VMs/s

Ordering information

Module		Type	Description
Software subscription	Software license		
	NCE-Fabric-SPF	Mandatory.	iMaster NCE-Fabric software platform. The number of required software platforms is the same as the number of NCE cluster nodes (servers). At least three software platforms are required.
	NCE-Fabric-Mod	Mandatory.	Determined based on the number of CloudEngine series modular switches in the data center.
	NCE-Fabric-Fxd	Mandatory.	Select this item based on the number of fixed switches in the data center.

	Multi-cloud and multi-DC scenario package 1	Optional.	Mandatory license for iMaster NCE-Fabric MDC. Purchase the license based on the number of CloudEngine series switches in the data center.
	Digital map basic package 1	Optional.	Mandatory license for the iMaster NCE-Fabric network digital map. Purchase the license based on the number of CloudEngine series switches in the data center.
	Intent standard package 2	Optional.	Mandatory licenses for features such as the intent recommendation, simulation verification, and network-wide rollback of iMaster NCE-Fabric are used. Purchase licenses based on the number of fixed CloudEngine switches in the data center.
	Programmable Platform Pack 3	Optional.	Mandatory licenses for the iMaster NCE-Fabric service designer (Runbook) and open programmable platform (AOC) features. Purchase licenses based on the number of customized apps.
	NCE-Fabric-MC-Pkg	Optional.	This license is mandatory when iMaster NCE-Fabric MDC is used to interconnect with the public cloud. Purchase the license based on the number of cloud VMs in the public cloud.
SnS			
	NCE-Fabric-SPF-SnS	Mandatory.	Corresponds to NCE (Fabric-SPF) and the quantity is the same as that of NCE (Fabric-SPF).
	NCE-Fabric-Mod-SnS	Mandatory.	Corresponds to NCE (Fabric-Mod) and the quantity is the same as that of NCE (Fabric-Mod).
	NCE-Fabric-Fxd-SnS	Mandatory.	Corresponds to NCE (Fabric-Fxd) and the quantity is the same as that of NCE (Fabric-Fxd).
	Multi-Cloud and Multi-DC Scenario Package - SnS	Optional.	This package corresponds to the multi-cloud and multi-DC scenario package. The quantity is the same as that of the package.
	Digital Map Basic Package-SnS	Optional.	This package corresponds to the basic digital map package. The quantity is the same as that of the basic digital map package.
	Intent standard package-SnS	Optional.	Corresponds to the intention standard package, and the quantity is the same as the quantity.
	Programmable Platform Package-SnS	Optional.	Corresponds to the programmable platform package, and the quantity is the same as that of the package.
	NCE-Fabric-MC-VM-SnS	Optional.	Corresponds to NCE-Fabric-MC-PKG. The number is the same as that of NCE-Fabric-MC-PKG.
Hardware Ordering	Domain controller server	Optional.	Number of servers in the iMaster NCE-Fabric domain controller cluster. The default value is 3.

	MDC server	Optional.	Number of servers in the iMaster NCE-Fabric MDC cluster. The default value is 3.

iMaster NCE-Fabric supports the CloudFabric N1 business model. It packages the NCE controller, analyzer, and CloudEngine switch function software based on different typical scenarios to simplify transactions, providing customers with more functions and greater value. Software license migration protects customers' software investment.

1. This license is the N1 Add-on package of the CloudEngine switch in the data center. For details, contact the local product manager.

2. This license has been incorporated into the N1 Premium package of the CloudEngine switch in the data center. For details, contact the local product manager.

3. This license needs to be delivered with the service personnel. For details, contact the local product manager and service manager.

More information

For more information about Huawei iMaster NCE-Fabric, visit Huawei website.http://e.huawei.comor contact Huawei's local sales organization.

Huawei Technologies Co., Ltd.

Address: Huawei Headquarters Office Building, Bantian, Longgang District, Shenzhen

Postcode: 518129

Website: e.huawei.com