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Huawei NetEngine 8000 Series All-scenario Intelligent Routers

HUAWEI

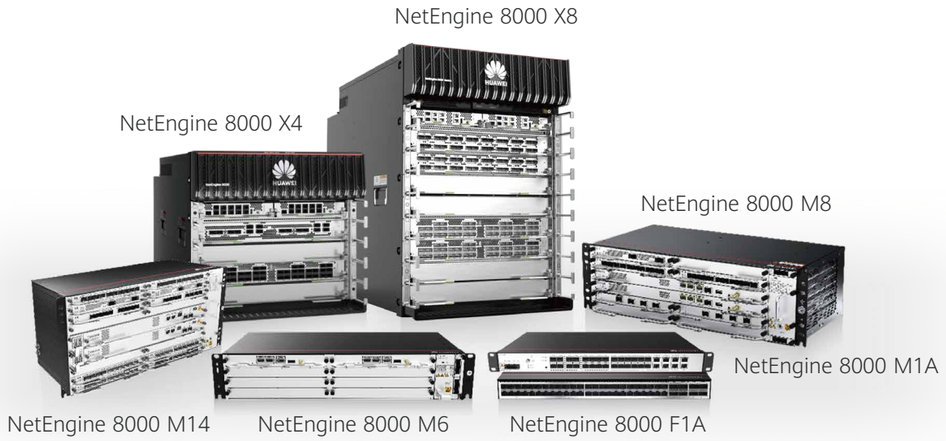
PRODUCT DESCRIPTION

Huawei NetEngine 8000 series routers (hereinafter referred to as the NetEngine 8000) are Huawei's next-generation, high-end intelligent routers for all scenarios. They are predominantly suited to scenarios including access and aggregation, private line, inter-national gateway (IGW), data center-gateway (DC-GW), and data center interconnect (DCI) to help build intent-driven IP bearer networks that feature a simplified architec-ture, intelligent connections, and high availability.

The NetEngine 8000 series features an ultra-broadband network platform, SRv6-based intelligent connections, and full-lifecycle automation. It provides rich service types and high-reliability SLA quality, making it the best choice for enterprise customers in digital transformation.

Product Appearance

The NetEngine 8000 consists of the X, M, and F series, including the NetEngine 8000 X8, NetEngine 8000 X4, NetEngine 8000 M14, NetEngine 8000 M8, NetEngine 8000 M6, NetEngine 8000 M1A, and NetEngine 8000 F1A, applicable to networks of different scales.



Highlights

Industry-Leading Ultra-Broadband Platform

The ultra-broadband converged bearer platform supports up to 14.4T per slot, more than 1.5 times the industry average, meeting enterprises' requirements for full-scenario and large-capacity service access. This enables converged full-service bearing and smooth evolution to higher bandwidth. The high-density, large-capacity, and compact fixed-configuration routers supporting flexible cards help enterprises to save equipment room space and electricity, hence reducing operations and maintenance (O&M) costs.

SRv6-Powered Intelligent Connections

IPv6 Segment Routing (SRv6) is a future-oriented, next-generation simplified protocol that inherently supports IPv6, facilitating the access of numerous terminals, while simplifying protocols and configurations. SRv6 and iMaster NCE enable network resource adjustment in accordance with changes on the cloud, one-hop access to the cloud, and service provisioning within minutes. SRv6 can identify applications and tenants to implement intelligent traffic steering based on latency and bandwidth, ensuring Service Level Agreements (SLAs). Huawei's continuous innovations make it a leader in the SRv6 field. Huawei has participated in the development of more than 75% of SRv6 standards and led the large-scale commercial use of SRv6 in the finance and over-the-top (OTT) industries. Huawei will continue to lead future SRv6 evolution and innovation.

Full-Lifecycle Automation

iMaster NCE, the "intelligent brain", enables real-time visualization of the whole network and full-lifecycle automation. iMaster NCE and In-situ Flow Information Telemetry (iFIT) allow real-time visualization of service quality and fault locating within minutes. Huawei proprietary Routing Optimization Algorithm based on Matrix (ROAM) algorithm enables intelligent traffic steering and optimization, improving network utilization by over 20%. AI algorithms for alarm compression reduce the number of alarms by 99% and improve O&M efficiency by 90%, helping enterprises move towards autonomous driving wide area networks (WANs).

Strong Service Support Capabilities

The NetEngine 8000 supports diverse features and provides powerful service processing capabilities to meet the service requirements of metro networks, vertical networks, DCI networks, and campus or DC gateways. See below for some of these capabilities.

- **Powerful routing capabilities:** The NetEngine 8000 supports super large routing tables and diverse routing protocols including Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Intermediate System to Intermediate System (IS-IS), Border Gateway Protocol Version 4 (BGPv4), and broadcast, unknown-unicast and multicast traffic (BUM) routing. In addition, the NetEngine 8000 supports both simple and ciphertext authentication and fast convergence to ensure network stability and security in complicated routing environments.
- **Strong service bearing capabilities:** IP, Multiprotocol Label Switching (MPLS), and SRv6 can be deployed on the NetEngine 8000 as required. The NetEngine 8000 supports Layer 2 virtual private network (L2VPN), L3VPN, multicast VPN (MVPN), and Ethernet VPN (EVPN) services, traffic engineering (TE), flexible 802.1Q in 802.1Q (QinQ), and Generic Routing Encapsulation (GRE). The NetEngine 8000 supports traditional access, emerging services, and multi-service bearing.
- **Powerful expandable multicast capabilities:** The NetEngine 8000 supports various IPv4/IPv6 multicast protocols, such as Protocol Independent Multicast - Sparse Mode (PIM-SM), PIM - Source Specific Multicast (PIM-SSM), Multicast Listener Discovery Version 1 (MLDv1), MLDv2, Internet Group Membership Protocol Version 3 (IGMPv3), IGMP snooping, and MLD snooping. The NetEngine 8000 can flexibly carry video services, such as Internet Protocol Television (IPTV), and satisfy multicast service requirements on networks of various scales.

Comprehensive Network Slicing Functions

The NetEngine 8000 provides comprehensive network slicing functions to meet the differentiated SLA requirements of different services and enterprises. Quality of Service (QoS) ensures service isolation and pipe statistical multiplexing. Flexible Ethernet (FlexE) sub-interfaces implement service protection based on queue isolation. Timeslot-based FlexE slicing provides SLA assurance for super services through physical isolation.

High-quality QoS capabilities, advanced queue scheduling algorithms and congestion control algorithms, as well as a five-level hierarchical QoS (HQoS) scheduling mechanism, meet the service requirements of diverse users on the access side in a differentiated manner. The NetEngine 8000 supports MPLS HQoS on the network side. QoS can be deployed on the network side to provide QoS for MPLS VPN, virtual leased line (VLL), and pseudo-wire emulation edge to edge (PWE3) services. The NetEngine 8000 performs precise multi-level scheduling of data flows, meeting the quality requirements of different users and services of different classes.

Future-Oriented IPv6 Solution

The NetEngine 8000 supports IPv6 static routes and various IPv6 routing protocols, including OSPFv3, IS-ISv6, and Border Gateway Protocol for IPv6 (BGP4+). In addition, it provides a large-capacity IPv6 forwarding information base (FIB) and supports IPv6 terminal access, IPv6 Access Control Lists (ACLs), IPv6 policy-based routing, and SRv6. These features lay the foundation for a smooth transition from IPv4 to IPv6. The NetEngine 8000 also supports IPv4/IPv6 dual stack and IPv4-to-IPv6 transition technologies for both communication between IPv4 and IPv6 networks and between separate IPv6 networks to enhance network scalability.

High-Precision 1588v2 Clock Solution

IEEE 1588v2 refers to the IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems. The 1588v2 standard defines a Precision Time Protocol (PTP), which can achieve time and frequency synchronization with an accuracy of sub-microseconds.

The 1588v2 standard enables time and frequency synchronization to meet the requirements of the G.813 template. Moreover, an accuracy of 100 ns meets the requirements of wireless and Long Term Evolution (LTE) networks, and the time jitter between multiple nodes (under 30 nodes) is less than 1 µs, allowing for large-scale networking. The external clock sources can be assigned different priorities. The NetEngine 8000 automatically selects an external clock source as its reference clock source based on parameters such as the priorities of external clock sources and the number of hops between itself and the external clock sources. If the best external clock source fails, the device automatically selects the second-best external clock source as its reference clock source. Service switching can be completed within 200 ns, ensuring high clock reliability. In the meantime, iMaster NCE provides GUI-based clock management.

All-Round Reliability Solution

The NetEngine 8000 provides reliability protection at different levels, including the device level, network level, and service level. The NetEngine 8000 can provide a network-wide reliability solution that comprehensively meets the reliability requirements of diverse services. These reliability features lay the foundation for reliable enterprise service interconnection with a system availability of 99.999%.

- **Device-level reliability:** The NetEngine 8000 provides redundancy backup for key components. Key components also support hot swap and hot backup. Furthermore, the NetEngine 8000 leverages Non-Stop Routing (NSR) and Non-Stop Forwarding (NSF) technologies to ensure uninterrupted service transmission.
- **Network-level reliability:** The NetEngine 8000 uses multiple technologies to ensure network-wide reliability and provide end-to-end protection switching within 50 ms for uninterrupted services. These technologies include: IP fast reroute (FRR), Label Distribution Protocol (LDP) FRR, VPN FRR, TE FRR, hot standby, and fast convergence of Interior Gateway Protocol (IGP), BGP, and multicast routes. Other technologies used by NetEngine 8000 to ensure reliability include Virtual Router Redundancy Protocol (VRRP), trunk load balancing and backup, bidirectional forwarding detection (BFD), Ethernet operation, administration and maintenance (OAM), routing protocol/port/VLAN damping, Topology-Independent Loop-free Alternate FRR (TI-LFA), and egress protection through mirror segment IDs (SIDs).

- **Service-level reliability:** The NetEngine 8000 uses technologies such as VPN FRR, E-VRRP, VLL FRR, Ether net OAM, pseudo wire (PW) redundancy, and enhanced trunk (E-Trunk) to provide service-level redundancy for L2VPNs and L3VPNs, ensuring stable, reliable, and uninterrupted services.
- **Dual-device hot backup:** The NetEngine 8000 provides 1+1 or 1:1 hot backup for multicast services.

Comprehensive OAM Technologies

The NetEngine 8000 provides point-to-point Ethernet fault management in compliance with IEEE 802.3ah and supports connectivity fault management (CFM) OAM for end-to-end fault detection and locating. The NetEngine 8000 provides Ethernet performance management in compliance with ITU-T Y.1731. By inserting a timestamp into 802.1ag loopback (LB) messages, the NetEngine 8000 can measure performance indicators, such as latency, jitter, and packet loss rate. Performance measurement can be configured as a scheduled task, and performance statistics reports are output through collaboration with iMaster NCE.

iFIT can collect SLA information in real time, upload this information to iMaster NCE for intelligent analysis, control, and management, and deliver service policies. If a fault occurs, iFIT enables fault locating within minutes, implementing a SLA-based closed-loop. In the meantime, data is sent to the AI cloud platform for training and self-learning to match more service types and fault models. This makes the "network brain" smarter and enables WANs to move toward becoming autonomous driving networks.

Energy-Conserving Design

The NetEngine 8000 boasts an environmentally friendly design with energy saving features.

- The NetEngine 8000 is equipped with an industry-leading powerful heat dissipation system. The system is powered by multiple cutting-edge technologies, including an aerospace-grade mixed-flow fan, carbon nanotube thermal pad, vapor chamber liquid cooling radiator, and board-specific floating heat dissipation. The optimal head dissipation design greatly improves heat dissipation efficiency while reducing the power consumption of the entire system.
- Equipped with Huawei-developed Solar R chips, the NetEngine 8000 leverages leading nanotechnologies in combination with chip-level dynamic frequency adjustment and intelligent fan speed adjustment technolo gies to significantly reduce power consumption. In this way, the NetEngine 8000 is optimized for energy conservation.

Technical Specifications

Parameter	NetEngine 8000 X8	NetEngine 8000 X4	NetEngine 8000 M14	NetEngine 8000 M8	NetEngine 8000 M6	NetEngine 8000 M1A	NetEngine 8000 F1A
Switching Capacity	83.78 Tbps	41.89 Tbps	4 Tbps	2.4 Tbps	320 Gbps	352 Gbps	2.4 Tbps
Forwarding Performance	14,496 Mpps	7,248 Mpps	906 Mpps	453 Mpps	72Mpps	72 Mpps	453 Mpps
Max. Capacity of a Board	4 Tbps	4 Tbps	200 Gbps	200 Gbps	50 Gbps	Fixed-configuration router not supporting flexible cards	Fixed-configuration router not supporting flexible cards
Capacity Density (G/U)	2025	1633	400	400	80	176	1200
IPU	2 , 1:1	2 , 1:1	2 , 1:1	2 , 1:1	2 , 1:1	Fixed-configuration router not supporting flexible cards	Fixed-configuration router not supporting flexible cards
SFU	8 , 7+1	8 , 7+1	2 , 1:1 (integrated)	2 , 1:1 (integrated)	2 , 1:1 (integrated)	Fixed-configuration router not supporting flexible cards	Fixed-configuration router not supporting flexible cards
Processing Board/ Subcard	8	4	14 (DC) 10 (AC)	8 (DC) 6 (AC)	6 (DC) 4 (AC)	Fixed-configuration router not supporting flexible cards	Fixed-configuration router not supporting flexible cards
Power Supply Module	Max 10, N+1	Max 6, N+1	2 , 1+1(DC) 4 , 2+2(AC)	2 , 1+1	2 , 1+1	2 , 1+1(DC)	2 , 1+1
Fan Module	12 , 11+1	6 , 5+1	4 , 3+1	2 , 1+1	2 , 1+1	3 (integrated)	4 , 3+1
Dimensions (H x W x D)	442 mm x 861.4 mm x 702.3 mm (15.8U)	442 mm x 861.4 mm x 435.6 mm (9.8U)	442 mm x 220 mm x 222 mm (5U)	442 mm x 220 mm x 132.6 mm (3U)	442mm x 220mm x 88.9mm (2U)	442 mm x 220 mm x 44.45 mm (1U)	442 mm x 420 mm x 43.6 mm (1U)
Typical Power Consumption	11,017 W	5,913 W	1,270 W	485 W	220 W	75 W	350 W
Weight (in Full Configuration)	296.6 kg	186.2 kg	27.4 kg	16.5 kg	3.52 kg	3.4 kg	7.25 kg

Feature Specifications

Interface types	100GE/50E/40GE/25GE/10GE/GE/FE/E1/Channelized STM-1c/OC-3c/STM-1c
Layer 2 Ethernet protocols	G.8032, STP/RSTP, MSTP, BPDU, and LACP Transparent transmission of Layer 2 protocols
Ethernet services	VLAN and bridge domain
Routing protocols	Routing protocols such as RIP, RIPng, OSPF, OSPFv3, IS-IS, IS-ISv6, BGP, BGPv6, IPv4 multicast, IPv6 multicast, static routes, and multicast static routes
IPv4	TCP/IP protocol suite, including ICMP, IP, TCP, UDP, socket (TCP/UDP/RAW IP), and ARP Static DNS DNS client FTP server FTP client TFTP client DHCP relay and DHCP server Ping Tracert NQA IP policy-based routing Flow-based next hop IP policy-based routing for load balancing QinQ interfaces (QinQ termination and dot1q termination interfaces) supporting IPv4 load balancing Interface board-specific fast ping reply Egress protection through mirror SIDs for MPLS-in-UDP tunnels
IPv6	IPv6 (ND) Path MTU (PMTU) TCP6 Ping IPv6 Tracert IPv6 Socket IPv6 DHCPv6 relay Static IPv6 DNS TFTP IPv6 client IPv6 policy-based routing ND fast reply
L2VPN	PWE3/VLL、VPLS、EVPN、EVPN L3VPN、VxLAN
L3VPN	CE access to an L3VPN through a Layer 3 interface Support for static, BGP, RIP, OSPF, and IS-IS routes between CEs and PEs Inter-AS VPN, including RFC 2547 bis option A Inter-AS VPN, including RFC 2547 bis option B Inter-AS VPN, including RFC 2547 bis option A NG MVPN IPv6 VPN HoVPN Seamless MPLS BGP LSP entropy label Redirection to a VPN L3VPN PIPE/uniform mode (unified and separate configuration for upstream and downstream traffic) L3VPN traffic statistics collection
SRv6	SRv6 BE, SRv6 TE Policy, and SRv6 egress protection
Clock	Physical layer synchronization and 1588v2
OAM	iFIT IP FPM NQA TWAMP BFD MPLS OAM MPLS TP OAM VRRP Ethernet OAM 802.3ah Y.1731 Ethernet LPT Bit error-triggered switching
QoS	QPPB, Differ-Serv, HQoS, and redirection