NE40E-X8A/X16A Universal Service Router

HUAWEI

Appearance

The NE40E series includes the NE40E-X16A, NE40E-X8A, satisfying the requirements for networks of various scales.

NE40E-X16A

NE40E-X8A

Product Overview

NetEngine40E Universal Service Routers (NE40Es) are high-end network products developed by Huawei. They mainly serve as edge nodes on IP backbone networks, IP metropolitan area networks (MANs), and large-scale IP networks. The NE40E and NE9000 can work together to provide a complete hierarchical IP network solution.
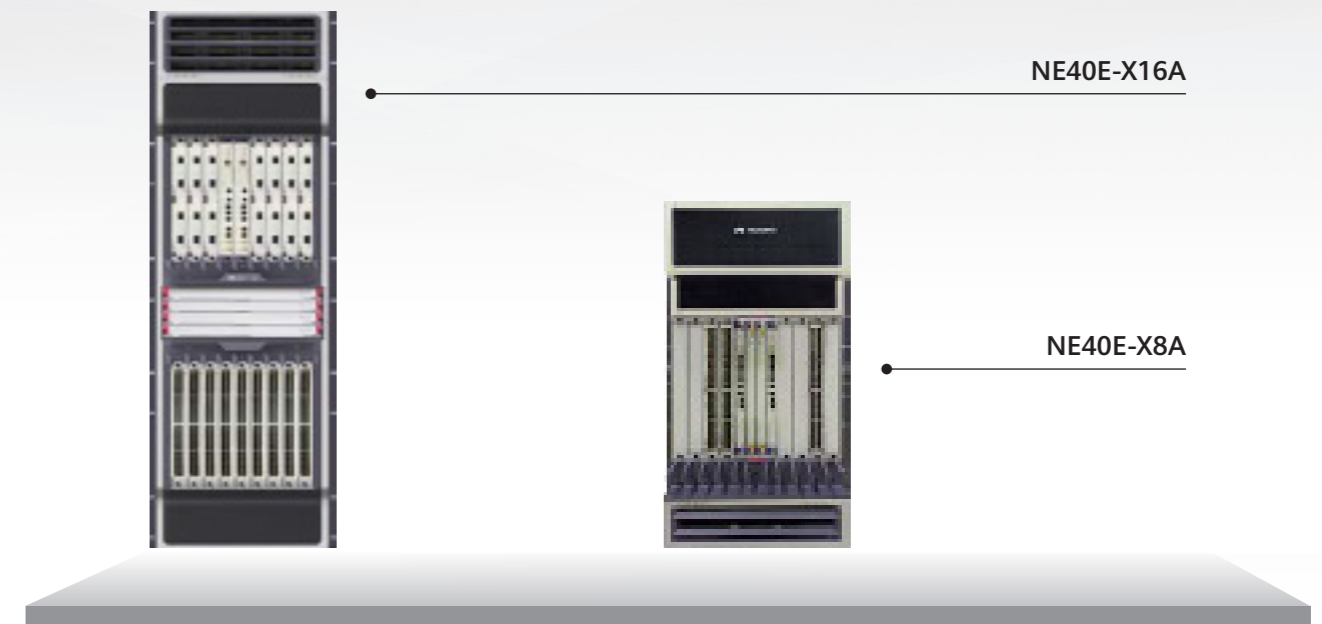
The NE40E uses NP chips and distributed hardware-based forwarding and non-blocking switching technologies of the CLOS distributed switching architecture. The NE40E has the following features:

- Line-rate forwarding capabilities, excellent scalability, a well-designed quality of service (QoS) mechanism, and strong service processing capabilities

- Powerful service access and aggregation capabilities as well as a host of other features, such as Layer 2 virtual private network (L2VPN), L3VPN, multicast, multicast VPN (MVPN), Multiprotocol Label Switching (MPLS) Traffic Engineering (TE), SRv6, and QoS, to ensure carrier-class service transmission reliability

- Various value-added services, such as Generic Routing Encapsulation (GRE) tunnel, IP security (IPsec) tunnel, and NetStream

- Support for IPv6 and smooth transition from IPv4 to IPv6

- User-specific management and control. User management, service control, and security control are integrated, contributing to a significant reduction in OPEX.

The NE40E can be flexibly deployed at the edge or core of IP/MPLS networks to simplify the network structure and provide an extensive range of services and reliable service quality. The NE40E increases the broadband capacities of IP/MPLS bearer networks and makes them more secure, intelligent, and service-oriented.

Product Features

Energy-Conserving Design	The NE40E is environmentally-friendly, saving energy and reducing emissions. • The NE40E has an industry-leading cooling and energy-saving system which includes an advanced ventilation and optimal heat dissipation design, intelligent fans, and a modular power supply distribution design. The NE40E can automatically detect and adjust the temperature within the unit, improving power supply utilization. • The NE40E can dynamically allocate and manage multi-core NP resources and automatically disable redundant or unused ports, buses, and chips. The NE40E also supports dynamic frequency adjustment and intelligent fan speed adjustment technologies, which significantly reduce power consumption, with less than 1 W for each gigabit, lowest in the industry.
Advanced 2T Platform	• The NE40E is developed based on the industry-leading 2T platform. 1T and 2T boards are provided, meeting future bandwidth increase requirements. The 1 Tbps and 400 Gbps line cards supported by the NE40E have both passed the 100% line rate tests of Tolly Group. Based on the existing VRP operating system, the NE40E is compatible with line cards currently in use, protecting carriers' investments to the largest extent.

Innovative SRv6 Technology	• The NE40E fully supports the next generation unified network SRv6 technology facing the future. It can realize the construction of various parts of the network such as IP Core, Metro, Mobile Backhaul and Data Center. It can be applied to 5G bearer, personal/enterprise cloud, cloud interconnection, Internet of Things (IOT), government-enterprise dedicated line, home-wide application, CDN and other applications as the basic bearer protocol of the whole network to achieve end-to-end full service. Comprehensive bearing capacity. SRv6 can realize protocol simplification, large-scale networking, seamless integration, high reliability, integrated business chain, Network + business programmable, all-ecological industrial system.
Powerful Service Support	• The NE40E provides powerful routing capabilities. It supports super large routing tables and Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Intermediate System-to-Intermediate System (IS-IS), Border Gateway Protocol 4 (BGP-4), and multicast routing protocols. The NE40E supports authentication in plaintext and ciphertext, as well as fast convergence. These NE40E features ensure network stability and security in complicated routing environments. • The NE40E provides strong service bearer capabilities. The NE40E can have L2VPN, L3VPN, and MVPN deployed at the same time, as networks require. The NE40E also supports TE, selective 802.1Q-in-802.1Q (QinQ), Dynamic Host Configuration Protocol (DHCP), IP over Ethernet (IPoE), IPsec, GRE, and multiple access modes, such as Inverse Multiplexing over ATM (IMA) E1, Time Division Multiplexing (TDM), Packet over SONET (POS), and Ethernet. The NE40E can provide access for both traditional and newly emerging services, satisfying the needs of multiple service environments. • The NE40E has powerful and expansible multicast capabilities. The NE40E supports IPv4/IPv6 multicast protocols, such as Protocol Independent Multicast - Sparse Mode (PIM-SM), PIM - Dense Mode (PIM-DM), PIM - Source Specific Multicast (PIM-SSM), Multicast Listener Discovery Version 1 (MLDv1), MLDv2, Internet Group Membership Protocol Version 3 (IGMPv3), multicast Call Admission Control (CAC), and IGMP snooping. The NE40E possesses the flexibility to carry video services, such as Internet Protocol Television (IPTV), and satisfy multicast service requirements on networks of any scale.
Leading Performance and Access Capabilities	• The NE40E supports PPPoE and IPoE for user access. It provides 400 Gbps broadband service access boards and 160 Gbps CGN service boards and supports 1 million concurrent access users. This allows the NE40E to keep up with the rapid development of carrier broadband services. The NE40E allows a maximum of 300 logins per second per slot and 800 logins per second per device. The large-capacity CGN service boards allow 2 million sessions to be established per second, guaranteeing a consistent user experience.
Well-Designed QoS Mechanism	The NE40E provides high-quality QoS. With an advanced queue scheduling algorithm and congestion control algorithm, the NE40E can carry out accurate multi-level scheduling for data flows. This meets the quality requirements of different users and different levels of services. The NE40E supports the following QoS scheduling mechanisms: • Five-level hierarchical QoS (HQoS) for the access side to satisfy the service requirements of access users at different levels in a differentiated and diversified manner • MPLS HQoS for the network side to provide QoS for MPLS VPN, VLL, and PWE3 services The well-designed QoS mechanism enables the NE40E to excel in network resource allocation. The NE40E can provide a network-wide QoS solution to meet the requirements of carrier-class services on networks.
High-Precision 1588v2 Clock Solution	• IEEE 1588v2 is a precise clock synchronization protocol for network measurement and control systems. It defines the Precision Time Protocol (PTP) for Ethernet networks, which can achieve time and frequency synchronization with a precision of sub-microseconds. • IEEE1588v2 time synchronization conforms to the G.813 template, and the 100 ns precision can meet the requirements of wireless and LTE networks. The jitter among multiple nodes (less than 30 nodes) is less than 1 μs, allowing for large-scale networking. External clock sources can be assigned different priorities to implement protection. A device selects an external clock source as its reference clock source based on the priorities of external clock sources and the number of hops between itself and 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. A device switchover can be completed within 200 ns, ensuring high reliability of clocks. • The NMS provides GUI-based clock management.

Various IPv6 Transition Technologies	• The NE40E provides complete IPv4-IPv6 solutions and supports IPv6 static routes and various IPv6 routing protocols, including OSPFv3, IS-ISv6, and BGP4+. In addition, the NE40E provides a large-capacity IPv6 FIB and supports IPv6 terminal access, IPv6 ACLs, and IPv6 policy-based routing. These features lay the foundation for a smooth transition from IPv4 to IPv6. The NE40E also supports IPv4/IPv6 dual stack and IPv4-to-IPv6 transition technologies, allowing communication between IPv4 and IPv6 networks and between IPv6 islands and enhancing network expansibility.
Comprehensive Reliability Solution	• The NE40E provides reliability protection at different levels, including the equipment level, network level, and service level. The NE40E offers a multi-level reliability solution that meets carrier-class reliability requirements. The NE40E lays the foundation for carrier-class services with a system availability of 99.999%. • The following describes the reliability protection levels that the NE40E provides:
Equipment-level reliability	• The NE40E provides redundancy backup for key components. These key components support hot swapping and hot backup. The NE40E also uses technologies, such as non-stop routing (NSR), non-stop forwarding (NSF), to ensure continuous service forwarding. The NE40E supports packet buffering of 200 ms, ensuring no packet loss in the case of burst traffic. This guarantees high-quality service experience of users.
Network-level reliability	• The NE40E uses the following technologies to provide network-level reliability: IP fast reroute (FRR), Label Distribution Protocol (LDP) FRR, VPN FRR, TE FRR, hot standby, fast convergence of Interior Gateway Protocols (IGP), BGP, and multicast routes, Virtual Router Redundancy Protocol (VRRP), Rapid Ring Protection Protocol (RRPP), trunk load balancing and backup, hardware-based Bidirectional Forwarding Detection (BFD) of 3.3 ms, MPLS OAM, Ethernet OAM, and routing protocol/port/VLAN damping. The NE40E provides an end-to-end protection switching speed of 200 ms with no service interruption.
Service-level reliability	• The NE40E uses the following technologies to provide service-level reliability for L2VPNs and L3VPNs: VPN FRR, E-VRRP, VLL FRR, Ethernet OAM, PW redundancy, and E-Trunk. These technologies ensure stable and reliable service operation with no service interruption. • Dual-device hot backup, IPoE/PPPoE users support 1+1 or 1:1 hot backup for unicast and multicast services. On the L2TP LAC side, IPv4 users support 1:1 hot backup.
Complete Range of OAM Technologies	• The NE40E supports a complete range of OAM technologies. Detection packets can be sent periodically or manually to detect network connectivity for network fault locating and diagnosis. P2P Ethernet in the First Mile (EFM), E2E Connectivity Fault Management (CFM), E2E Y.1731, and their combinations are used to provide a complete Ethernet OAM solution. • The NE40E supports a general flow test methodology in compliance with RFC 2544 for offline performance monitoring. RFC 2544 defines a set of standard methods for evaluating network performance, which can be used in various networking scenarios that have different packet formats. RFC 2544 tests are performed before service provisioning. During a test, a device simulates network packets and sends them to itself so that it can measure network performance. No tester is needed during this process. RFC 2544 tests can be used before service cutover for customers to evaluate whether the network performance indicators are ready. • The NE40E uses advanced hierarchical Layer 3 networking and HVPN for mobile bear networks, and is especially geared at future-oriented LTE networks, guaranteeing network efficiency, security, and reliability. The Layer 3 to the edge solution improves OAM efficiency, and Huawei innovative IP FPM allows for end-to-end and segment-by-segment fault locating. • At the same time, with the help of NCE and other performance management tools, and based on SDN, The NE40E supports IP network optimization , which provides visualization of network topology and link bandwidth utilization, traffic analysis and visualization, and traffic scheduling function. In addition, the BGP protocol is used to communicate with the forwarding equipment, which does not require major changes to the existing network equipment and protects the user's investment.

Product Specifications

Item	NE40E-X16A	NE40E-X8A
Switching capacity	81.92 Tbps	51.2 Tbps
Forwarding performance	14,464 Mpps	7232 Mpps
Number of slots	22 slots (for 16 LPUs, 2 MPUs, and 4 SFUs)	12 slots (for 8 LPUs, 2 SRUs, and 2 SFUs)
Dimensions (H x W x D)	1778 mm x 442 mm x 650 mm (40 U)	930 mm x 442 mm x 650 mm (21 U)
Power consumption (in full configuration)	22450 W(2T)	11690 W(2T)
Weight (in full configuration)	453.8kg(2T, DC)	242 kg (2T, DC)
Interface type	100GE 50GE 40GE 25G 10GE- LAN /WAN GE/FE	100GE 50GE 40GE 25GE 10GE- LAN /WAN GE/FE
IPv4	• Support for static routing as well as dynamic routing protocols, such as RIP, OSPF, IS-IS, and BGP-4 • Line rate forwarding on all interfaces in complex routing environments, for example, when route flapping occurs	
IPv6	• Various IPv4-to-IPv6 transition technologies: manual tunnel, automatic tunnel, 6to4 tunnel, GRE tunnel, and ISATAP tunnel • IPv4 over IPv6 tunnel and IPv6 Provider Edge (6PE) • IPv6 static routes • Dynamic routing protocols, such as BGP4+, RIPng, OSPFv3, and IS-ISv6 • IPv6 neighbor discovery, PMTU discovery, TCP6, ping IPv6, tracert IPv6, socket IPv6, static IPv6 DNS, IPv6 DNS server, TFTP IPv6 client, and IPv6 policy-based routing • Internet Control Message Protocol Version 6 (ICMPv6) Management Information Base (MIB), User Datagram Protocol Version 6 (UDP6) MIB, TCP6 MIB, and IPv6 MIB	
MPLS	• MPLS TE, P2MP TE/mLDP, and MPLS/BGP VPN, in compliance with RFC 2547 • Inter-AS VPN Option A, Option B, and Option C • Integration with Internet services • Martini and Kompella MPLS L2VPN • L2VPN techniques, such as VPLS and VLL • IP interworking over heterogeneous media • Multicast VPN • MPLS-TP • EVPN • Remote LFA	
SRv6	• SR MPLS，SR Policy • SR TI-LFA • L3VPN over SRV6 BE	
Layer 2 features	• IEEE 802.1Q, IEEE 802.1p, IEEE 802.3ad, and IEEE 802.1ab • STP, RSTP, and MSTP • EVC • VXLAN	

Reliability	• IP/LDP/VPN/TE/VLL FRR and IP/TE auto rerouting • IGP/BGP/ multicast route convergence, VRRP, RRPP, and IP-Trunk load balancing and backup • Hardware-based BFD of 3.3 ms, MPLS/Ethernet OAM, Y.1731, and routing protocol/port/VLAN damping • PW redundancy, E-Trunk, E-APS, and E-STP • In-service patching for smooth software upgrade • Passive backplane design • Redundancy backup for key components, such as route processing modules, SFUs, and power modules to guard against single points of failure • Switching between components that hot-back up each other, graceful restart (GR), NSF, NSR • Hot swap of all components
QoS	• Well-designed HQoS and advanced scheduling and congestion avoidance technologies on each LPU • Accurate traffic policing and traffic shaping • Complex rule definition and fine-grained flow identification • MPLS HQoS, ensuring QoS for MPLS VPN, VLL, and PWE3 services • QPPB • TE-tunnel-oriented QoS
Multicast	• IGMPv1, IGMPv2, and IGMPv3 • Multicast routing protocols, including PIM-DM, PIM-SM, PIM-SSM, Multicast Source Discovery Protocol (MSDP), and Multiprotocol BGP (MBGP) • Static multicast • Multicast CAC • Interoperability between multicast protocols • Processing of multicast policies (multicast routing protocols and multicast forwarding policies), multicast QoS, multicast replication for IPoE access users, and EMDI (enhanced media delivery index) • Two-level multicast replication on the SFUs and LPUs to optimize the multicast effect
Security	• ACL-based packet filtering • URPF • GTSM • DHCP snooping • ARP attack defense and DoS attack defense • MAC address limit and MAC-IP binding • Secure Shell (SSH) and SSH version 2 (SSHv2) • NetStream
Time synchronization	• Synchronous Ethernet • 1588v2 • Adaptive clock recovery (ACR)
IP RAN	• CSG plug-and-play • IP FPM • TWAMP • RFC 2544 • G.8032
Environment requirements	• Operating temperature: –5° C to +50° C • Temperature variation rate: 30° C/hour • Operating humidity: 5% to 95%, non-condensing • Operating altitude: ≤ 4000 meters

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