Huawei NetEngine NE40E CGNAT Static Port Block Allocation Command Guide - Official Technical Overview & Hardware Datasheet

PRODUCT IDENTIFICATION

The Huawei NetEngine NE40E series represents a carrier-class edge routing platform designed for the rigorous demands of modern IP networks. This document serves as a comprehensive technical datasheet and command guide for the Carrier-Grade Network Address Translation (CGNAT) Static Port Block Allocation feature, a critical function for IPv4 address conservation and IPv6 transition strategies. The NE40E, with its advanced hardware architecture, provides line-rate performance, high availability, and granular traffic management capabilities essential for Tier 1 and Tier 2 Internet Service Providers (ISPs), enterprise WAN edge deployments, and mobile backhaul networks.

This guide focuses on the operational deployment and command-line interface (CLI) syntax required to implement static port block allocation. This methodology assigns a fixed range of source ports to a subscriber's private IP address, ensuring deterministic NAT behavior. This is paramount for applications that require persistent session states, such as IP telephony, online gaming, and peer-to-peer services, as well as for lawful interception and logging requirements. The NE40E's CGNAT implementation leverages its

powerful NP (Network Processor) to handle millions of sessions with minimal latency, providing a robust solution for large-scale subscriber management.



CORE INTERNAL TOPOLOGY

The NE40E is built upon a modular, high-availability architecture, utilizing a distributed forwarding plane. At its heart, the system is composed of several key hardware components that enable its CGNAT capabilities. The primary processing engine is the integrated NP and TCAM (Ternary Content-Addressable Memory) complex, which is responsible for high-speed packet processing, including NAT translations. The control plane is managed by a separate CPU complex running the Huawei-proprietary VRP (Versatile Routing Platform) operating system. Data flow is managed through a sophisticated switching fabric, ensuring non-blocking performance across all line cards. For

CGNAT, traffic is intelligently steered to the NP, where sessions are created and matched based on pre-configured rules, all performed in hardware to guarantee wire-speed throughput.

- Control Plane: Manages routing protocols, system configuration, and CGNAT policy definitions.
- Forwarding Plane: Executes high-speed packet forwarding and NAT translations using dedicated hardware.
- Service Processing Cards (SPCs): Hardware modules optimized for service-intensive functions like NAT, ensuring scalability.
- Switch Fabric Units (SFUs): Provide high-bandwidth, non-blocking interconnectivity between all line cards and processing modules.

SWITCHING SUBSYSTEM CAPABILITIES

The NE40E's switching fabric is designed for carrier-grade resilience and massive throughput. It supports modular SFUs that can be configured in N+1 or N+N redundancy models, guaranteeing uninterrupted operation even during unit failure. The fabric operates at speeds of up to hundreds of gigabits per second, or terabits per second for higher-end chassis, providing a wire-speed, non-blocking environment that is crucial for CGNAT traffic, which can generate a significant number of small packets. This robust backplane

allows for the seamless integration of the CGNAT service cards, ensuring that all traffic remains local to the card, eliminating unnecessary backplane traversal and minimizing latency.

OPERATIONAL ADVANTAGES

Deploying the NE40E for CGNAT provides several distinct advantages for network operators. The platform's high density and low power consumption per gigabit make it an efficient solution for scaling subscriber services. Its modular design allows for pay-as-you-grow expansion, protecting capital investment. The advanced CGNAT feature set, including Static Port Block Allocation, ensures seamless IP address transition and a consistent user experience. Key features include:

- Static Port Block Allocation: Pre-allocating a fixed, non-overlapping range of ports to each subscriber, eliminating port contention and ensuring that applications requiring persistent sessions function flawlessly.
- Carrier-Grade NAT (CGNAT): Allows the conservation of public IPv4 addresses while enabling connectivity for a large number of private IP users.
- High Availability: Hardware redundancy, in-service software upgrades (ISSU), and fast failover mechanisms ensure 99.999% availability.
- NAT Logging: Detailed session logging for lawful interception and subscriber

accounting meets regulatory compliance requirements.

- IPv6 Transition Support: Facilitates DS-Lite, NAT64, and other transition mechanisms in addition to CGNAT.

SPECIFICATION MATRIX

The following specification matrix details the hardware capabilities pertinent to the CGNAT deployment, focusing on the components that influence port block allocation performance and scale.

Parameter	**Specification**
Form Factor	Modular Chassis (e.g., 5U, 10U, 20U depending on model)
Switching Fabric Capacity	Up to 1 Tbps per chassis (model dependent, scalable via SFUs)
NAT Sessions	Up to 16 Million (dependent on SPC/NP hardware)
Port Block Size	User-configurable (e.g., 256, 512, 1024, 2048 ports per block)
CPS (Connections Per Second)	Up to 400,000 (model and configuration dependent)
Power Supply	Dual Hot-Swappable Redundant

	AC/DC (-48V)

REGULATORY COMPLIANCE

The Huawei NetEngine NE40E is engineered to meet or exceed a comprehensive array of international and industry-specific regulatory standards. This compliance is fundamental to its deployment in global telecommunications infrastructures. Key certifications include:

- Safety Standards: Fully compliant with IEC 62368-1, UL 62368-1, and other applicable regional safety directives, ensuring safe operation in all environments.
- EMC Standards: Meets FCC Part 15 (Class A), EN 55032, EN 55024, and CISPR 32 standards for electromagnetic compatibility, mitigating interference risks.
- Environmental Standards: Designed to operate within a wide temperature and humidity range, adhering to ETSI 300 019 and NEBS GR-63-CORE standards for telecommunication equipment.
- Telecom Specific: Compliant with carrier-grade requirements as defined by major standards bodies, including MEF (Metro Ethernet Forum) and IETF. The CGNAT implementation follows best practices and RFC compliance for NAT (e.g., RFC 4787, RFC 5382, RFC 5508).

