Carrier-Grade NAT (CGNAT) Hardware Port Block Allocation Strategies - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

The Carrier-Grade NAT (CGNAT) Hardware Port Block Allocation Strategies platform represents a purpose-built, high-density network address translation solution engineered for Tier-1 ISPs, mobile operators, and large enterprise edge deployments. This OEM-grade hardware appliance delivers deterministic port-block allocation, line-rate translation throughput, and carrier-class redundancy to address IPv4 address exhaustion while preserving subscriber session integrity and regulatory logging compliance. The system supports centralized and distributed CGNAT architectures, offering flexible port-block sizing, deterministic and dynamic allocation algorithms, and full NetFlow/IPFIX logging for lawful intercept and abuse traceability.



ARCHITECTURE & CHASSIS DESIGN

The CGNAT hardware platform is built on a modular, non-blocking switch fabric architecture with dedicated service processing modules. The chassis supports redundant control plane modules and hot-swappable line cards, enabling in-service capacity expansion and hitless software upgrades. Port Block Allocation is implemented in hardware-accelerated forwarding ASICs, ensuring line-rate performance even under full subscriber load. The system employs a distributed port-block management scheme where each service module maintains a synchronized view of allocated blocks, preventing collisions and ensuring deterministic mapping of internal subscriber IP:port tuples to external public IP:port tuples.

HARDWARE FEATURES

Key hardware capabilities include: hardware-assisted port-block allocation with configurable block sizes (e.g., 256, 512, 1024, 2048 ports per block); support for deterministic, dynamic, and hybrid allocation policies; per-subscriber and per-service port-block quotas; real-time port-block utilization monitoring; hardware-based session tracking with millions of concurrent translations; redundant 1+1 power supplies (AC/DC); front-to-back airflow for datacenter thermal compliance; and hot-swappable fan trays. The platform also integrates a dedicated logging offload engine that exports NetFlow v9/IPFIX records without impacting forwarding performance.

COMPLIANCE & STANDARDS

The system complies with relevant carrier-grade standards including NEBS Level 3, ETSI EN 300 019, and FCC Part 15 Class A. It supports RFC 4787 (NAT Behavioral Requirements), RFC 5382 (NAT for TCP), RFC 5508 (NAT for ICMP), and RFC 6888 (CGNAT Requirements). Regulatory logging conforms to ETSI TS 103 120 and 3GPP TS 33.108 for lawful intercept. The hardware is RoHS compliant and supports SNMPv3, syslog, and TACACS+ for management security.

TECHNICAL SPECIFICATIONS

The following table summarizes the core hardware and performance parameters of the CGNAT Port Block Allocation platform.

Parameter	Specification
Form Factor	2RU / 4RU modular chassis
Switching Capacity	Up to 32 Tbps non-blocking
Port Block Allocation Rate	Up to 1.2 million blocks per second
Concurrent Translations	Up to 100 million per chassis
Port Block Sizes	256 / 512 / 1024 / 2048 ports (configurable)
Allocation Modes	Deterministic, Dynamic, Hybrid
Power Supply	1+1 redundant AC (100-240V) or DC (-48V)
Airflow	Front-to-back or back-to-front (order option)
Management Interfaces	SNMPv3, CLI, NETCONF, TACACS+
Logging	NetFlow v9 / IPFIX hardware offload
Operating Temperature	0°C to 40°C (NEBS short-term -5°C to 55°C)
Compliance	NEBS Level 3, ETSI EN 300 019, FCC Part 15 Class A, RoHS

ORDERING OPTIONS

Available configurations include 2RU and 4RU chassis variants, with options for 8, 16, or 32 service processing modules. Port-block allocation capacity scales from 10 million to over 100 million concurrent translations. Redundant AC or DC power options, front-to-back or back-to-front airflow, and a range of interface modules (100GE, 40GE, 10GE) are available. Software licenses for deterministic, dynamic, and hybrid allocation modes are ordered separately.

