Non-Blocking Switching Engine Capabilities Blueprint: understanding layer 3 switching processing capacity

NON-BLOCKING SWITCHING ENGINE CAPABILITIES BLUEPRINT: UNDERSTANDING LAYER 3 SWITCHING PROCESSING CAPACITY

EXECUTIVE SUMMARY

This document serves as the definitive technical reference for the next-generation enterprise switching platform, focusing on the core performance metric that defines modern network infrastructure: Layer 3 switching processing capacity. As network perimeters dissolve and East-West traffic patterns dominate datacenter and campus environments, the ability to perform wire-speed, non-blocking routing at the access and aggregation layers is no longer a luxury—it is a fundamental operational requirement.

The platform detailed herein is engineered to deliver a paradigm shift in price-performance, offering a carrier-grade feature set with a forwarding engine optimized for both IPv4 and IPv6 routing at scale. This blueprint outlines the hardware architecture, forwarding logic, and real-world operational advantages of a system designed to handle the most demanding unified threat management and high-density virtualized workloads without compromising line-rate performance.



HARDWARE ARCHITECTURE & SILICON

At the heart of this system lies a purpose-built, programmable forwarding ASIC (Application-Specific Integrated Circuit) that decouples the control plane from the data plane. This architecture ensures that routing table lookups, ACL processing, and QoS (Quality of Service) queuing occur in hardware at wire speed, bypassing the CPU bottleneck associated with legacy router-on-a-stick designs.

The switching fabric employs a shared-memory architecture with a dedicated high-speed packet buffer, providing a deep burst-absorption capacity crucial for microburst mitigation in converged networks. The system logic supports a cut-through forwarding mode, reducing latency to sub-microsecond levels for delay-sensitive traffic, while simultaneously offering store-and-forward capabilities for enhanced error checking.

KEY FEATURES & ROUTING LOGIC

- Non-Blocking Architecture: Guarantees line-rate forwarding across all ports simultaneously. The switching capacity matches the maximum theoretical throughput of all active interfaces, eliminating packet loss due to fabric oversubscription.

- Advanced Layer 3 Engine: Supports static routing, RIP, OSPF, BGP-4, and ISIS. The hardware natively handles policy-based routing (PBR) and VRF-lite (Virtual Routing and Forwarding), enabling multi-tenant isolation without dedicated hardware.

- Carrier-Grade Reliability: Incorporates ISSU (In-Service Software Upgrade), redundant hot-swappable power supplies, and N+1 fan tray redundancy, ensuring an MTBF (Mean Time Between Failures) exceeding 300,000 hours at 40°C ambient temperature.

- Flow-Based QoS: Granular classification based on 802.1p, DSCP, or IP precedence, with 8 hardware queues per port supporting strict priority and Weighted Random Early Detection (WRED) for congestion avoidance.

COMPLIANCE & STANDARDS

The platform adheres to the rigorous standards required for deployment in both enterprise and service-provider environments. Compliance includes IEEE 802.3az (Energy Efficient Ethernet), IEEE 1588v2 (Precision Time Protocol), and

ITU-T G.8262 for Synchronous Ethernet. Security certifications include FIPS 140-2 Level 2 validation for cryptographic modules and complete conformance with the IPv6 Ready Logo Program Phase 2.

TECHNICAL SPECIFICATIONS

- Switching Capacity: Up to 2.56 Tbps (Terabits per second) depending on the modular line card configuration.
- Forwarding Rate: Up to 1.44 Bpps (Billion packets per second) for 64-byte frames, ensuring wire-speed performance at any packet size.
- MAC Address Table Size: 256,000 entries.
- IPv4 Routing Table (FIB): 512,000 routes.
- IPv6 Routing Table (FIB): 256,000 routes.
- Jumbo Frame Support: 9,216 bytes.
- Stacking Bandwidth: 480 Gbps (virtual chassis stacking) for unified management across up to 10 units.

Parameter	**Specification**
Form Factor	Modular Chassis (4RU / 8RU / 13RU Options)
Switching Capacity	Up to 2.56 Tbps (Non-Blocking)
Forwarding Rate	Up to 1.44 Bpps (64-Byte Packets)
Power Supply	Dual Hot-Swappable Redundant

	AC/DC (1+1 Redundancy)
Operating Temperature	0°C to 45°C (Short-term up to 55°C)

ORDERING SKU INFORMATION

Base Chassis: Includes 4 fan trays and 2 power supply slots (PSUs sold separately).

Controller Module: Dual-core 1.2 GHz CPU, 8 GB DDR3 RAM, 4 GB NAND Flash. (Part Number: CTL-3G-X8).

Line Card Options: 48 x 10G SFP+, 48 x 10GBase-T, and 4 x 40G/100G uplink modules.

Transceiver Compatibility: Supports industry-standard SFP+, SFP28, QSFP+ (40G), and QSFP28 (100G) optics.

