Enterprise Core Systems Engineering Reference Manual: Office Building Backbone Network Infrastructure Setup

PRODUCT IDENTIFICATION

This document serves as the definitive engineering reference for the deployment of high-performance, carrier-grade backbone network infrastructure within multi-tenant office buildings and enterprise campus environments. The referenced hardware portfolio is designed to function as the Layer 3 distribution and core aggregation layer, providing fault-tolerant, non-blocking connectivity between access switches, server farms, and wide-area edge routers.



CORE INTERNAL TOPOLOGY

The internal forwarding architecture leverages a fully distributed, non-blocking crossbar switching fabric. Unlike traditional bus-based designs, this system employs a cell-based switching engine with virtual output queueing (VoQ) to eliminate head-of-line blocking. The fabric modules operate in an N+1 or N+N redundancy model, ensuring that a single fabric module failure does not degrade system throughput. Critical components, including the Routing Engine (RE) and Power Supply Units (PSUs), are partitioned onto separate physical planes to isolate control, data, and management traffic.

KEY FEATURES

- Feature 1: Full Layer 3 Hardware Forwarding – All IPv4/IPv6 routes are resolved in the ASIC, achieving line-rate performance with sub-microsecond latency.
- Feature 2: Multi-Chassis Link Aggregation (MC-LAG) – Enables active-active links across two discrete chassis, providing sub-50ms failover without spanning tree convergence.
- Feature 3: In-Service Software Upgrade (ISSU) – Complete system software updates without traffic disruption, validated for BGP and OSPF graceful restart.
- Feature 4: Precision Time Protocol (PTP) – Industry-standard IEEE 1588v2 boundary clock support for financial and distributed antenna system (DAS) backhaul.
- Feature 5: Hardware-based sFlow/NetFlow – Real-time traffic sampling at

1:1000 ratio without CPU intervention, supporting third-party telemetry collectors.

OPERATIONAL ADVANTAGES

For the office building use case, this architecture reduces total cost of ownership by consolidating distribution and core functions into a single layer, eliminating an unnecessary hardware tier. The passive backplane and front-to-rear cooling design allow for zero-downtime maintenance and direct replacement of line cards, fabric modules, and power supplies. Hot-swappable fan trays with variable-speed fans maintain acoustic levels suitable for carpeted spaces while preventing thermal throttling under full load.

SPECIFICATION MATRIX

Platform Highlights:

- Switching Fabric Capacity: Up to 6.4 Tbps (non-blocking)
- Forwarding Rate: 4.2 Bpps (billion packets per second)
- MAC Address Table: 256,000 entries
- IPv4 Route Table (FIB): 2,000,000 routes
- IPv6 Route Table (FIB): 1,000,000 routes
- Jumbo Frame Support: 12,000 bytes

- Buffer Memory: 36 MB shared packet buffer

- Mean Time Between Failures (MTBF): 342,000 hours at 40°C ambient

Parameter	Specification
Form Factor	4RU Modular Chassis (7 slots) or 8RU High-Density Chassis (13 slots)
Switching Capacity	6.4 Tbps distributed, non-blocking fabric
Power Supply	Dual hot-swappable redundant AC (200-240V) or DC (-48V), up to 3+1 redundancy
Cooling	N+1 redundant fan tray with front-to-rear airflow, variable-speed fans
Interfaces Supported	1GbE/10GbE/25GbE/40GbE/100GbE (SFP, SFP+, SFP28, QSFP+, QSFP28)
Routing Protocols	BGP-4, OSPFv2/v3, IS-IS, EIGRP (optional), Static, Policy-Based Routing (PBR)
Operational Temperature	0°C to 45°C (standard), -5°C to 55°C (extended fan kit)
Management Ports	1x RJ45 Console, 1x USB Type-A

	(storage/zero-touch), 1x 1GbE MGMT

REGULATORY COMPLIANCE

All hardware modules comply with international safety and emissions standards, including IEC 60950-1 (Safety), EN 300 386 (Telecom EMC), GR-1089-CORE (NEBS Level 3), and RoHS-3 for hazardous substance reduction. The system is certified for deployment in building riser environments (UL 2043 plenum rating for empty chassis). Additionally, the power supplies carry 80 PLUS Titanium certification, achieving 96% efficiency at 50% load.

