Carrier-Grade Routing Solution Brief: Deploying Layer 3 Interface IP Routing Configuration

CARRIER-GRADE ROUTING SOLUTION BRIEF: DEPLOYING LAYER 3 INTERFACE IP ROUTING CONFIGURATION

TARGET NETWORK POSITIONING

This document provides an authoritative technical overview of the Layer 3 Interface IP Routing Configuration capabilities inherent to the next-generation carrier Ethernet switching platform. Designed for service provider aggregation, data center leaf-spine fabrics, and large enterprise campus cores, this architecture enables dynamic, hardware-accelerated IP routing directly on physical and virtual Layer 3 interfaces. The system eliminates the need for an external router by implementing a full-featured IPv4/IPv6 unicast and multicast routing stack within the switching silicon, delivering line-rate performance with deterministic sub-microsecond latency.



HARDWARE-LEVEL FAILOVER REDUNDANCY

Routing resilience is anchored in the physical hardware design. The platform supports dual, hot-swappable routing engine modules (active/standby) with stateful failover for routing protocols, ARP tables, and forwarding information bases (FIB). Redundant AC/DC power supplies and N+1 fan trays further ensure continuous routing operation. Link-level redundancy is achieved via IEEE 802.3ad Link Aggregation Groups (LAG) and Virtual Router Redundancy Protocol (VRRP) hardware offload, allowing sub-50ms convergence upon link or node failure. The backplane provides non-blocking communication between line cards and routing engines, ensuring protocol hellos and updates never experience head-of-line blocking.

PROTOCOL SUPPORT MATRIX

The Layer 3 Interface IP Routing Configuration engine fully supports the following protocol suite, all implemented in hardware for wire-speed forwarding:

- IPv4 Static Routing and Default Route Injection

- IPv6 Static Routing with Neighbor Discovery (ND)

- OSPFv2 (Open Shortest Path First) and OSPFv3

- IS-IS (Intermediate System to Intermediate System) for service provider cores

- BGP-4 (Border Gateway Protocol) with IPv4/IPv6 unicast address families

- PIM-SM (Protocol Independent Multicast - Sparse Mode) for IP multicast routing

- IGMPv2/v3 and MLDv1/v2 snooping with proxy routing

- Policy-Based Routing (PBR) based on ACLs, DSCP, or source/destination ports

Core parameters: Maximum ECMP (Equal-Cost Multipath) paths = 32; Maximum FIB entries = 256,000 (IPv4) / 128,000 (IPv6); Maximum number of VLAN routing interfaces = 4,096.

CORE PARAMETERS

Parameter	**Specification**
Form Factor	1RU (Fixed) or 4RU (Modular Chassis

	with 6 line card slots)
Switching Capacity	2.56 Tbps (non-blocking, full duplex)
Forwarding Rate (64-byte packets)	1,904 Mpps
Power Supply	Dual Hot-Swappable Redundant AC (100-240V) or DC (-48V), 550W each
Layer 3 Interface Routing Capacity	4,096 routed VLAN interfaces (SVIs); 2,000 physical routed ports
Hardware FIB (IPv4)	256,000 entries (shared with IPv6)
Max ECMP Paths	32 paths per route
Jumbo Frame Support	Up to 12,000 bytes MTU on routed interfaces
CPU (Routing Engine)	Quad-core x86 @ 2.4 GHz, 16 GB DDR4 RAM, 64 GB SSD
Operating Temperature	-5°C to 55°C (23°F to 131°F)

LIFECYCLE ASSURANCE (MTBF)

Calculated per Telcordia SR-332 Issue 4, the platform achieves a Mean Time Between Failures (MTBF) of > 450,000 hours for the fixed configuration chassis and > 310,000 hours for the modular system with dual supervisors. The hardware architecture utilizes commercial temperature range components (-5°

C to 55 °C operational) with advanced thermal monitoring that dynamically adjusts fan speed. Mean Time To Repair (MTTR) is estimated at 30 minutes for field-replaceable units (power supplies, fans, transceivers) and 2 hours for supervisor modules.

TARGET BACKBONE TOPOLOGIES

Layer 3 Interface IP Routing configuration is validated for the following reference designs:

- Collapsed Core/Distribution: Single device acting as routed backbone and VLAN gateway
- Leaf-Spine Fabric: 16-way ECMP across spine switches with BGP unnumbered
- Metro Ethernet Aggregation: OSPF area border router (ABR) between access rings and core
- Multi-site WAN Edge: VRRP-enabled default gateway with BGP peering to MPLS provider

