Enterprise Core Systems Engineering Reference Manual: OEM 48-Port High-Density Ethernet Aggregation Switch Frame Size Latency Matrix

PRODUCT IDENTIFICATION

The OEM 48-Port High-Density Ethernet Aggregation Switch is a carrier-grade, purpose-built platform engineered to serve as the cornerstone of modern enterprise campus backbones, data center leaf-spine fabrics, and metropolitan Ethernet aggregation networks. This system delivers a non-blocking switching architecture optimized for high-throughput traffic consolidation. Central to this document is the detailed Frame Size Latency Matrix, which quantifies the switch's deterministic, low-latency forwarding performance across all packet sizes, establishing it as an authoritative reference for network architects and procurement specialists.



CORE INTERNAL TOPOLOGY

The switching architecture is built around a high-performance, merchant-silicon-based forwarding engine with a fully shared packet buffer. The internal topology is segmented into three primary planes: Data Plane, Control Plane, and Management Plane.

DATA PLANE: Utilizes a 1.28 Tbps switch fabric, providing line-rate Layer 2 switching and Layer 3 routing. The fabric operates in a cut-through forwarding mode by default, dynamically transitioning to store-and-forward under congestion events to ensure data integrity.

CONTROL PLANE: Powered by a multi-core ARM Cortex-A72 processor complex running a hardened carrier-grade operating system (OS). It handles all routing protocol updates, topology state synchronization, and network management functions without impacting data plane performance.

MANAGEMENT PLANE: Features a dedicated out-of-band management port, a serial console interface, and a USB port for emergency system recovery and software image upgrades.

SWITCHING SUBSYSTEM CAPABILITIES

- Total Switching Capacity: 1.28 Tbps

- Forwarding Rate: 960 Mpps (million packets per second)

- Port Configuration: 48 x 10G SFP+ ports + 4 x 40G QSFP+ uplink ports (compatible with 100G via breakout cables)

- Latency (64-byte frames): Sub-microsecond (< 600 ns) in cut-through mode

- Jumbo Frame Support: Up to 9,216 bytes

- MAC Address Table: 288,000 entries

- IPv4 Routing Table: 128,000 prefixes

- IPv6 Routing Table: 64,000 prefixes

OPERATIONAL ADVANTAGES

The OEM 48-Port Switch provides distinct operational advantages for demanding aggregation environments. Its front-to-back airflow design ensures optimal cooling in hot-aisle/cold-aisle containment data center layouts. Comprehensive hardware-level redundancy, including dual, hot-swappable power supplies and field-replaceable fan trays, guarantees 99.999% availability (Five Nines). The platform incorporates advanced traffic management features such as Priority Flow Control (PFC, IEEE 802.1Qbb) and Explicit Congestion Notification (ECN, RFC 3168) to support lossless Ethernet for storage and high-performance computing workloads.

SPECIFICATION MATRIX

The core forwarding performance is a function of frame size. The Frame Size Latency Matrix details the switch's consistent, ultra-low latency across the entire Ethernet frame size spectrum.

Frame Size (Bytes)	Forwarding Latency (µs)	Max Throughput (Gbps)	Non-Blocking
64	< 0.6 µs	480.0	Yes
128	< 0.8 µs	960.0	Yes
256	< 1.2 µs	1280.0	Yes
512	< 1.8 µs	1280.0	Yes
1024	< 2.5 µs	1280.0	Yes
1518	< 3.0 µs	1280.0	Yes
9216 (Jumbo)	< 6.5 µs	1280.0	Yes

REGULATORY COMPLIANCE

- Safety Standards: IEC 60950-1 / IEC 62368-1, UL/CSA 60950-1, EN 60950-1

- EMC Standards: EN 55032, CISPR 32, FCC Part 15B Class A, VCCI Class A,

AS/NZS CISPR 32

- Environmental Standards: RoHS (EU 2015/863), REACH, WEEE

- ITU-T & IEEE: Compliant with IEEE 802.1D, 802.1w, 802.1s, 802.1Q, 802.3ab, 802.3ae, 802.3ba, 802.1AX (LACP), 802.1Qau (ECN).

- Carrier Ethernet: MEF 9, 14, 23, and 26 compliant for E-LAN, E-LINE, and E-TREE services.



ORDERING INFORMATION & LIFECYCLE

The OEM 48-Port High-Density Aggregation Switch is available as a fixed-configuration chassis. A comprehensive suite of spare parts, including transceiver modules (SR, LR, BIDI) and power supplies, is available through authorized OEM partners, ensuring seamless integration and long-term operational support.