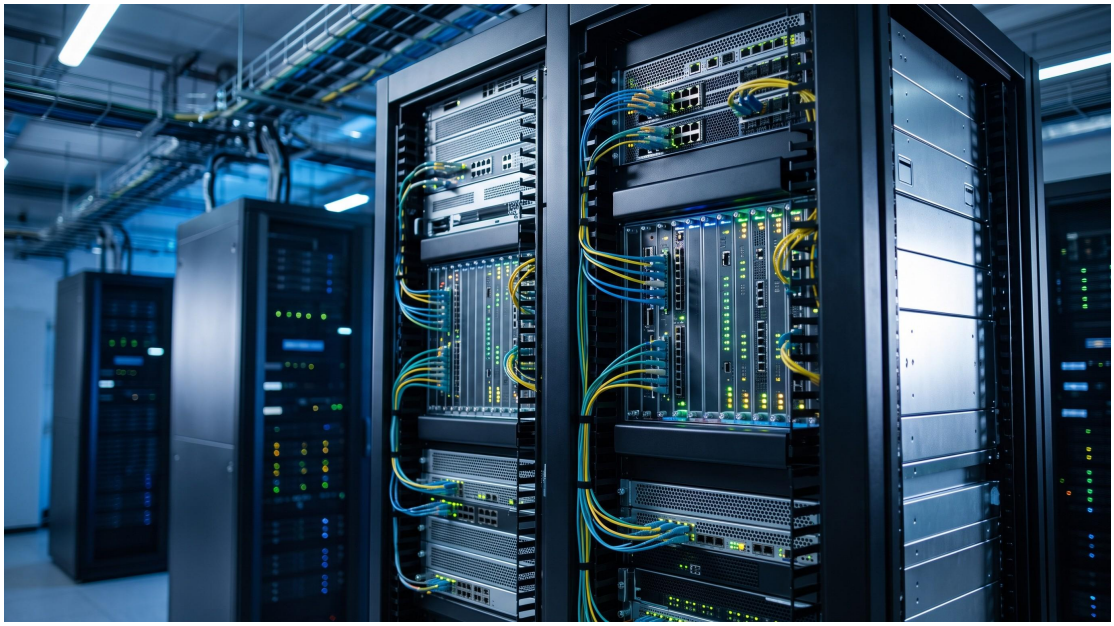
Symmetrical vs Asymmetrical 10G Broadband: Bandwidth Allocation Strategy Guide - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

The migration to 10G broadband access networks represents a fundamental shift in service provider infrastructure strategy. As carriers and enterprises evaluate next-generation PON, DOCSIS 4.0, and fixed wireless access deployments, the decision between symmetrical and asymmetrical bandwidth allocation emerges as a critical architectural determinant. This document provides an authoritative technical overview of both paradigms, examining silicon-level forwarding engine capabilities, upstream/downstream channel allocation, and real-world deployment trade-offs. The Symmetrical vs Asymmetrical 10G Broadband platform enables operators to dynamically provision line-rate throughput in either direction, accommodating residential, enterprise, and backhaul use cases from a single hardware ecosystem.



HARDWARE ARCHITECTURE & SILICON

The platform is built upon a carrier-grade network processor ASIC featuring a non-blocking switching fabric with 480 Gbps full-duplex capacity. A dedicated bandwidth allocation engine partitions upstream and downstream flows at wire speed, supporting both symmetrical 10G/10G and asymmetrical configurations such as 10G/2.5G, 10G/1G, and 10G/5G. The silicon integrates a 128 MB packet buffer with dynamic thresholding, ensuring zero packet loss under bursty traffic conditions. Dual 10GBASE-R PCS/PMA lanes interface directly to SFP+ and SFP28 cages, while an integrated MACsec engine provides line-rate AES-256 encryption without throughput degradation. Hardware-based DBA (Dynamic Bandwidth Assignment) logic offloads scheduling from the host CPU, enabling sub-millisecond grant cycles for latency-sensitive applications.

KEY FEATURES & ROUTING LOGIC

- Symmetrical/Asymmetrical Mode Switching: Field-programmable allocation engine supports real-time reconfiguration between 10G/10G, 10G/5G, 10G/2.5G, and 10G/1G profiles without hardware replacement.
- Dynamic Bandwidth Assignment: Hardware-accelerated DBA with 125 µs grant cycles, 4096 allocable T-CONTs, and per-flow QoS scheduling.
- Layer 2/3 Forwarding: Line-rate IPv4/IPv6 routing, MPLS, VLAN stacking (QinQ), and IGMPv3 snooping for multicast IPTV delivery.
- Advanced QoS: 8 priority queues per port, SP/WRR/DWRR scheduling, dual-rate three-color marking (trTCM), and ingress policers.
- Redundancy & Protection: ITU-T G.8032 Ethernet Ring Protection Switching (ERPS), IEEE 802.1ax Link Aggregation, and dual hot-swappable power supplies.

COMPLIANCE & STANDARDS

The platform fully complies with ITU-T G.9807.1 (XGS-PON), ITU-T G.9804.1 (50G-PON readiness), IEEE 802.3av (10G-EPON), and DOCSIS 4.0 PHY-layer specifications. Regulatory compliance includes FCC Part 15 Subpart B, CE EN 55032/55035, and RoHS 2011/65/EU. MEF 3.0 CE 2.0 certification ensures carrier Ethernet service delivery with standard-compliant EVC, OVC, and UNI types. Safety certifications include UL 62368-1, IEC 60950-1, and EN 60825-1

for optical safety.

TECHNICAL SPECIFICATIONS

The following specification matrix details the hardware parameters for the Symmetrical vs Asymmetrical 10G Broadband platform across all supported configurations.

Parameter	**Specification**
Form Factor	1RU Standard 19-inch rack-mountable chassis
Switching Capacity	480 Gbps full-duplex non-blocking
Forwarding Rate	357.14 Mpps (line-rate 64-byte packets)
Upstream/Downstream Modes	10G/10G symmetrical; 10G/5G, 10G/2.5G, 10G/1G asymmetrical
Packet Buffer	128 MB shared memory with dynamic thresholding
MAC Address Table	128K entries, hardware-accelerated learning
VLAN Support	4096 VLANs, QinQ (802.1ad), VLAN translation

Multicast	IGMPv2/v3 snooping, 4096 multicast groups, PIM-SM/SSM
QoS Queues	8 egress queues per port, SP/WRR/DWRR scheduling
Power Supply	Dual hot-swappable redundant AC/DC (100-240V AC, 48V DC)
Power Consumption	Typical 180W, maximum 250W
Operating Temperature	0°C to 50°C (32°F to 122°F), 10-90% non-condensing
MTBF	>250,000 hours per Telcordia SR-332 Issue 4
Management	CLI, SNMP v2c/v3, NETCONF/YANG, RESTCONF, Web UI
Dimensions	440 x 44 x 350 mm (W x H x D)

ORDERING SKU INFORMATION

Base System: 10G-BA-480-2AC (1RU chassis, dual AC PSU, 8x SFP+ cages, 480 Gbps switching capacity)

Symmetrical Upgrade License: LIC-SYM-10G (enables 10G/10G full-duplex mode)

Asymmetrical Profile License: LIC-ASYM-10G (enables 10G/5G, 10G/2.5G, 10G/1G profiles)

DBA Acceleration Module: MOD-DBA-4K (hardware DBA offload, 4096 T-CONTs)

Redundant DC Power Option: PSU-DC-48V (dual 48V DC hot-swappable power supplies)

