OEM 2.5G Ethernet ONU Port Speed Negotiation Interoperability with Enterprise Switches - Official Technical Overview & Hardware Datasheet

PRODUCT IDENTIFICATION

This document serves as the definitive technical reference for the OEM 2.5G Ethernet Optical Network Unit (ONU) series, specifically detailing its advanced port speed negotiation and interoperability capabilities when deployed within heterogeneous enterprise switching environments. As a carrier-grade customer premises equipment (CPE) solution, this ONU platform is engineered to bridge the gap between next-generation Passive Optical Network (PON) infrastructures and existing enterprise Local Area Network (LAN) ecosystems, ensuring seamless, auto-adaptive connectivity across diverse network topologies.



CORE INTERNAL TOPOLOGY

The internal architecture of the OEM 2.5G Ethernet ONU is built around a high-performance system-on-chip (SoC) that integrates a robust network processor with a dedicated Ethernet media access controller (MAC) and a physical layer (PHY) transceiver capable of supporting multiple line rates. The topology is designed as a non-blocking, store-and-forward switching fabric that facilitates wire-speed processing across all interfaces. The primary data plane consists of a 2.5G Ethernet port, which incorporates an advanced auto-negotiation engine compliant with IEEE 802.3bz standards, enabling seamless fallback to 1G and 100M speeds. The control plane is managed by a separate ARM-based management core, running a streamlined network operating system that handles protocol termination, Operations, Administration, and Maintenance (OAM), and quality of service (QoS) scheduling, thus isolating management traffic from high-speed data forwarding to ensure deterministic latency.

SWITCHING SUBSYSTEM CAPABILITIES

The switching subsystem is the heart of the ONU's interoperability prowess. It employs a sophisticated link training and auto-negotiation algorithm that actively probes the link characteristics and capabilities of connected enterprise

switches. This process involves a four-pair negotiation for 2.5G/5G/10GBase-T, but is specifically calibrated to prioritize 2.5G operation while offering backward compatibility to 1000Base-T and 100Base-TX. The subsystem supports parallel detection, allowing it to identify the speed and duplex mode of legacy enterprise switching ports. Furthermore, the ONU implements a media-dependent interface (MDI) and media-dependent interface crossover (MDI-X) auto-detection, eliminating the need for crossover cables and simplifying field deployments. The platform also features a comprehensive packet buffer of up to 2 MB, which is dynamically allocated to manage micro-bursts and ensure lossless data transmission during rate transitions, thereby maintaining network stability.

OPERATIONAL ADVANTAGES

The primary operational advantage of this ONU is its plug-and-play nature for network administrators. The device eliminates the complexity of manual speed and duplex configuration on enterprise switches, drastically reducing deployment time and misconfiguration risks. By auto-adapting to the highest common speed supported by the enterprise switch — whether 2.5G, 1G, or 100M — it ensures optimal utilization of the enterprise's existing cabling infrastructure (Cat5e or better) without requiring expensive upgrades. The robust negotiation protocol also provides high immunity to electromagnetic

interference and ensures stable link establishment across varying cable lengths. Additionally, the device integrates a hardware-based energy-efficient Ethernet (EEE) mechanism, which significantly reduces power consumption during low link utilization periods, contributing to a lower total cost of ownership (TCO) and aligning with green network initiatives.

SPECIFICATION MATRIX

- Interface: 1x 2.5G/1G/100M Auto-Negotiating Ethernet RJ45 Port, 1x SC/APC or SC/UPC PON Interface
- Auto-Negotiation: Support for 2500/1000/100BASE-T, Full/Half Duplex, MDI/MDI-X Auto Crossover
- Forwarding Rate: Up to 2.5 Gbps wire-speed forwarding
- Packet Buffer Memory: 2 MB dynamic buffer allocation
- Flow Control: IEEE 802.3x full-duplex and back-pressure half-duplex
- Quality of Service (QoS): 4 queues with Strict Priority (SP) and Weighted Round Robin (WRR) scheduling
- VLAN Support: 802.1Q VLAN tagging, VLAN transparent mode, and QinQ
- Management: OMCI (ITU-T G.988), TR-069, Telnet, Web UI, SNMP v1/v2c/v3
- Power Supply: 12V DC external power adapter (5W typical consumption)

Parameter	**Specification**

Form Factor	Desktop/Mini-Format (Wall-Mountable Bracket Optional)
Network Ports	1x 2.5G/1G/100M Auto-Negotiating Ethernet RJ45, 1x GPON or XGS-PON Interface
Switching Capacity	5 Gbps (Full-Duplex Non-Blocking)
Power Supply	12V DC External Adapter (5W Typical Power Consumption)
Operating Temperature	0°C to +50°C (32°F to 122°F)
MTBF	> 150,000 hours at 25°C

REGULATORY COMPLIANCE

The OEM 2.5G Ethernet ONU is designed and validated to meet the stringent requirements of global telecommunications standards. It carries the CE mark, indicating conformity with the European Union's health, safety, and environmental protection standards. It is fully compliant with the RoHS directive, ensuring the restriction of hazardous substances in its manufacturing process. The device also meets the FCC Part 15 Class B requirements for electromagnetic emissions, guaranteeing its suitability for residential and enterprise environments. For carrier-grade deployments, the ONU adheres to

the ITU-T G.984 and G.987 series standards for GPON and XGS-PON, respectively, ensuring seamless integration with major OLT platforms. Additionally, the interface is compliant with the IEEE 802.3 standard, specifically the 2.5G/5GBASE-T clause, and has undergone extensive interoperability testing with leading enterprise switch vendors such as Cisco, Juniper, Arista, and HPE Aruba.

