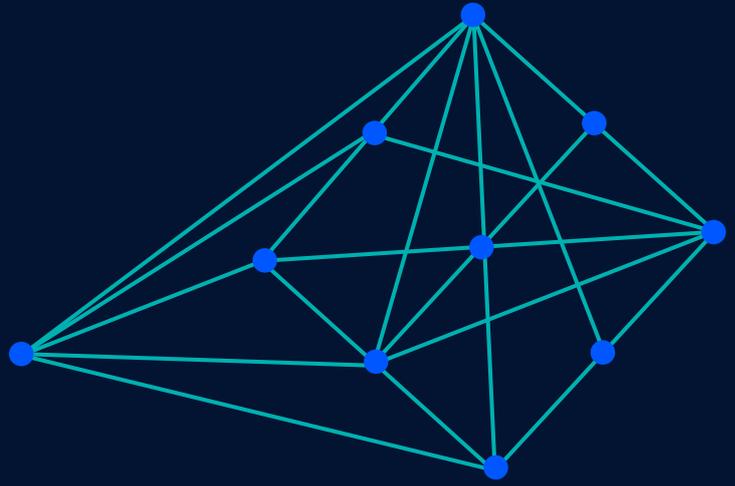


# APOLLO FAMILY

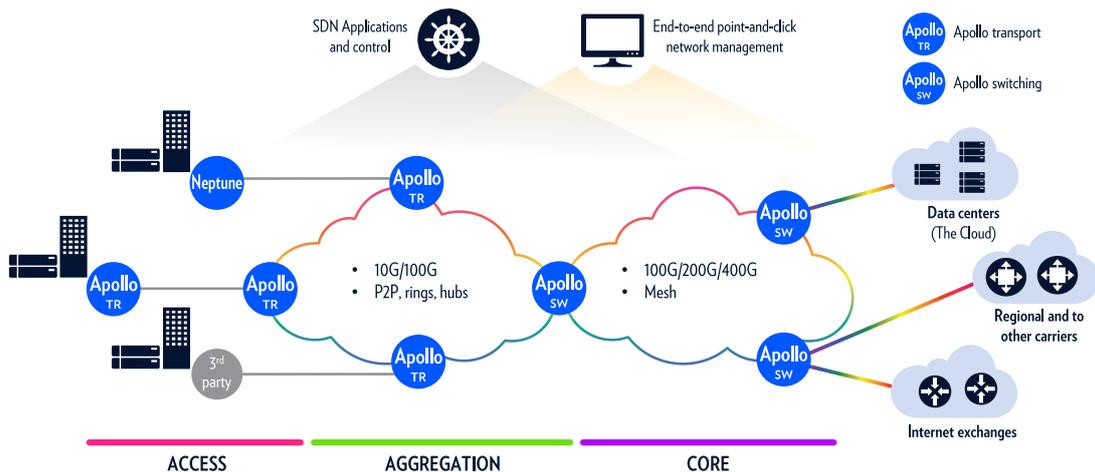
## OPTICAL TRANSPORT AND SWITCHING SYSTEM



## ELASTIC OPTICAL TRANSPORT FROM THE ACCESS TO THE CORE

Oceans of ultra-low cost photonic bits provide the foundation of our global Internet economy. Apollo enables services providers to deploy optical networks that continue lowering the cost per bit, while simultaneously providing packet services, high efficiency end-to-end operations, and SDN applications. Apollo accomplishes this through its family of optical transport and switching platforms that interwork seamlessly to provide scalable, high-density, and energy-efficient solutions from the access to the core. CPE platforms extend solutions to the network edge. Adaptive 400G transmission and 16T OTN/packet switching, based on a universal fabric, can handle and groom even the heaviest traffic loads. ASON and WSON dynamic restoration assures continuous availability.

<p><b>Any topology</b> Access to core, linear, ring, mesh</p>	<p><b>Integrated multilayer switching</b> Wavelength, OTN, Ethernet, MPLS</p>	<p><b>Embedded intelligence</b> Unprecedented visibility and control</p>	<p><b>SDN Applications</b> Immediate savings and new revenue generation</p>
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# Transparent low-latency multiservice transport

Apollo provides transparent low-latency transport for the broadest array of client interfaces to support all service transport needs. These include Ethernet from 1GbE to 100GbE, Fibre Channel from FC1 to FC16, SDH/SONET to SDH64/OC192, multiple video interfaces, as well as OTN optical pipes from 1G to 100G.

## Any topology

Apollo is at home with all topologies, including point-to-point, hub-and-spoke, ring, and mesh networks. By combining OTN transport, OTN switching, and flexible grid CDC ROADMs, Apollo can craft and optimize solutions for a specific geographic domain or across multiple geographies with different traffic mixes and densities.

## Blazing speed

Apollo wins the race every time with 400G transmission, featuring rate adaptation according to distance and line conditions. Moreover, Apollo has established its path to 1T. For a more modest solution at the network edge, Apollo also provides high-density metro-optimized 100G.

## Groom everything

With up to 16T of OTN switching in a single rack, Apollo has the capacity to groom every service passing through the metro core, maximizing wavelength use and service provisioning flexibility.

## Maximum fiber capacity

Apollo is an Olympic lifter with the ability to transmit 25.6T on a single fiber, the highest capacity in the industry. This is based on 128 flexible grid channels, each carrying 200G.

## Integrated packet services

To respond to the rapid growth in packet services, Apollo integrates L2 statistical multiplexing and packet switching services, side-by-side, with L1 transparent transport for true high-efficiency packet-optical networking. Apollo can deliver all MEF Carrier Ethernet 2.0 services including E-Line, E-Lan, and E-Tree, with SLA guarantees based on MPLS-TP. For different-sized L2 solutions Apollo supports both a switch-on-a-blade and stand-alone switch, featuring up to 16T capacity using a universal packet/OTN fabric.

## Unprecedented visibility

Apollo offers unprecedented insight into the network's health at all times, by integrated OSNR measurements, PRBS generation and detection, and optional OTDR modules. Managed by LightPULSE™, this unique capability allows operators to maintain their network proactively, eliminating the need for costly external test equipment, and reducing field maintenance.

## High-speed encryption

In a world of ever-increasing cyber threats, encryption at the optical layer provides the most secure way to transfer information via fiber optics. Apollo offers L1 encryption with 100% throughput from 10G to 100G. Apollo's unique per-service encryption is available on even higher-speed links.



	OPT9603	OPT9608	OPT9624	OPT9904X	OPT9914	OPT9932
Maximum capacity (client + line)	2.4T	6.4T	19.2T	2T	5.6T	16T
Transponders and muxponders	✓	✓	✓	-	-	-
Switching (ODU-XC + packet/L2)	-	-	-	✓	✓	✓
Layer 2	Stand-alone blade			Fabric interface blades		
Photonics	Amplifiers, ROADMs					
Height	2U	5U	15U	5U	22U	FR

# Supremely-configurable hardware

Each Apollo transponder and muxponder is designed for multiple uses to reduce the need to carry multiple cards in inventory and spares. Multi-port cards include integrated cross-connect capabilities so that they can be reconfigured as protected, unprotected, and multicast. Multi-service ports can be provisioned to a wide variety of protocols and speeds. 100G client interfaces can even be configured at 10x10G, 2x40G, or 1x100G without changing the pluggable optics. All of this configurability leads to a greatly reduced capital cost of operations.

# Lowest TCO

Apollo's low Total Cost of Ownership (TCO) is achieved through a life-cycle approach to operations, including:

- Optimized initial cost, based on the LightPLAN™ planning tool “what if” scenario generation
- Low-cost installation using plug-and-play provisioning
- Low-cost service provisioning using LightSoft® E2E intuitive network management
- Low-cost maintenance using LightPulse integrated performance monitoring that eliminates the need to dispatch technicians
- Low-cost service downtime with dynamic ASON- and WSON-based service restoration
- Low-cost fault isolation and repair with integrated OTDR capability.

## Apollo Powerful Elastic Optical Networking

Layer	Apollo Elastic Capability	Description	Applications and Benefits
Packet (L2)	Integrated L2 packet services	MEF Carrier Ethernet 2.0 services including E-Line, E-Lan, and E-Tree, with SLA guarantees based on MPLS-TP	Integrate L2 packet services efficiently on top of high performance L1 optical transport
OTN (L1)	Embedded optical encryption	Encrypts traffic being carried over the optical link using most advanced AES-256 encoding	Offer value-added service to protect client traffic from fiber tapping interception
	ODU Flex	Adjusts bandwidth of an OTN pipe allocated to a client interface in 1.25Gbps increments, non-traffic affecting resizing	<ul style="list-style-type: none"> <li>• Create multiple service rates for packet interfaces</li> <li>• Maximize wavelength fill</li> </ul>
	OTN Switching	Flexibly packs and unpacks multiple clients onto network interfaces	<ul style="list-style-type: none"> <li>• Maximize wavelength fill through grooming</li> <li>• Dynamically restore services at level of client interfaces</li> </ul>
	Rate adaptive client interfaces	A single client interface supports multiple service rates (e.g. 1 x 100GE, 2 x 40GE, 10 x 10GE)	<ul style="list-style-type: none"> <li>• Reuse a transponder (or muxponder) to support different clients as the traffic mix changes</li> </ul>
	Rate adaptive network interfaces	A single network interface supports multiple modulations and line rates (e.g. 100Gbps, 200Gbps)	<ul style="list-style-type: none"> <li>• Maximize the speed of an optical link based on distance and link conditions</li> </ul>
WDM (L0)	LightPULSE™ real-time performance monitoring	Provides accurate OSNR, power, PMD, CD, Latency, and other measurements in real-time along the optical link.	<ul style="list-style-type: none"> <li>• Be performance-aware at all times for SLA management and dynamic restoration</li> </ul>
	Tunable optics	A single network interface can be tuned to any wavelength across the entire spectrum	<ul style="list-style-type: none"> <li>• Tune a transponder (or muxponder) to use any available wavelength</li> </ul>
	CDC ROADMs (Colorless-Directionless-Contentionless) from 2 to 20 degrees	Route any wavelength originating at or entering a node to any direction leaving	<ul style="list-style-type: none"> <li>• Easily provision E2E all-optical links (without need for expensive electronic conversion)</li> <li>• Dynamically restore services at level of entire wavelengths</li> </ul>
	Flexible spectrum	Allocate only spectrum necessary to support an optical signal (e.g. 200Gbps in 37.5GHz)	<ul style="list-style-type: none"> <li>• Maximize fiber capacity (and avoid adding new fibers)</li> </ul>

# Technical specifications

Topologies	Mesh, hub, ring, linear, point-to-point
Transport platforms	OPT9624 - 9.6T client capacity (19.2T total capacity) OPT9608 - 3.2T client capacity (6.4T total capacity) OPT9603 - 1.2T client capacity (2.4T total capacity)
Switching platforms	OPT9932 - 16T switching capacity OPT9914 - 5.6T switching capacity OPT9904X - 2T switching capacity
Spectrum	Extended C-band Fixed grid 50GHz 96ch and 100GHz 48ch Flexible grid with 37.5GHz granularity
Fiber link capacity	25.6 Tbps (128 ch x 37.5 GHz x 200 Gbps)
Service (client) interfaces	Ethernet (1GbE, 10GbE, 40GbE, 100GbE) SDH/SONET (STM-1, 4, 16, 64/OC-3, 12, 48, 192) SAN (FC-1, 2, 4, 8, 16) Video (DVB-ASI, SDI 270, HD-SDI 1.5G/3G) OTU (1, 2, 2e, 4)
Encryption	AES256-GCM with Diffie-Hellman group 5 key exchange
Layer 2 services	MEF Virtual LAN services MPLS-TP connection-oriented transport Statistical multiplexing transport aggregation
Network (line) interfaces	OTU1 (2.5 Gbps)      OTU3e (40 Gbps)      OTUC2 (200 Gbps) OTU2/2e (10 Gbps)      OTU4 (100 Gbps)
Optical add/drop multiplexers	2-, 4-, 9- and 20-degree ROADMs (fixed grid and flexible grid) with automatic power equalization and Colorless, Directionless, and Contentionless (CDC) wavelength routing Fixed OADM 100% add/drop capacity M x N ROADMs (4 x 16, 6 x 14, 8 x 12)
Amplification	EDFA, Raman, Hybrid EDFA/Raman, with embedded optical leveling control Output power from 16 dBm to 26 dBm Gain up to 40 dB with 10 dB midstage
Protection	OCH 1 + 1, OLP, OMSP, Y Protection, 1 + n optical, DRI/DNI/SNCP
Restoration	Wavelength Switched Optical Network (WSON) - wavelength level Automatic Switched Optical Network (ASON) - service level 1 + 1, 1 + 1 forever, preplanned/dynamic protection
HW redundancy	All common units/cards: power supply, controllers, fan units
Power input	-40.5 VDC to -75 VDC; OPT9603 also AC mains
Environmental	OPT96XX operating temperature: -5° C to +55° C OPT99XX operating temperature: -5° C to +45° C Relative humidity: 5% to 90% (non-condensing)
SDN	MUSE™ applications (e.g. Bandwidth on Demand, Scheduled Services)
Network management	LightSOFT® end-to-end, point-and-click network management
Performance monitoring	LightPULSE™ integrated real-time OSNR and other parameters

Specifications subject to change without notice

## Contact us to find out how our ELASTIC networks can help you grow

### ABOUT ECI



ECI is a global provider of ELASTIC network solutions to CSPs, utilities as well as data center operators. Along with its long-standing, industry-proven packet-optical transport, ECI offers a variety of SDN/NFV applications, end-to-end network management, a comprehensive cyber security solution, and a range of professional services. ECI's ELASTIC solutions ensure open, future-proof, and secure communications. With ECI, customers have the luxury of choosing a network that can be tailor-made to their needs today - while being flexible enough to evolve with the changing needs of tomorrow. For more information, visit us at [www.ecitele.com](http://www.ecitele.com)