

5410

Packet-Optical Platform



Ciena's 5410 Packet-Optical Platform is part of a family of multi-terabit packet-optical switching platforms that transform networks into scalable, flexible, cost-reduced, service-enabling infrastructures to meet the monumental traffic growth challenges of the 21st century.

The 5410 features a unified SONET/SDH/OTN/packet switch fabric, intelligent control plane, and compact design with 5.0 Tb/s switch capacity in a single bay. The 5410 uses Ciena's FlexiPort technology to offer unprecedented flexibility and investment protection, with programmable interfaces for switching SONET/SDH, OTN, and Ethernet. Part of a family of products that includes the 15 Tb/s 5430 and architected to support speeds ranging from 155M to 200G in a high-density, energy-efficient platform, the 5410 is a compelling solution for metro and core networks.

The 5410 is optimized for cost-effective, next-generation bandwidth management, enabling efficient aggregation, grooming, and forwarding of multiple traffic types. The system employs Ciena's world-renowned control plane—shared with the 5430 and 6500 Family—to automate labor-intensive operations including planning, provisioning, and topology and inventory management. FastMesh® algorithms also enable the control plane to provide the highest availability networks—measured in the field at over six-9s—for mission-critical services.

The unified OTN/packet switch fabric enables all traffic to be forwarded over the most efficient and economical network layer, as shown in Figure 1, minimizing Total Cost of Ownership (TCO). Converging the optical and packet layers onto one platform enables the network operator to optimize the network for any traffic mix, reconfigure the network instantly for changing demands, and provide scalability for unpredictable traffic growth. The 5410 also enables new on-demand services with dynamic bandwidth provisioning and maximizes network efficiency with a range of grooming options at the SONET/SDH, OTN, and packet traffic.

Layer 2 Packet Capabilities

The Ethernet Service Line Module (eSLM Flex 100G) leverages field-proven, full-featured Service-Aware OS (SAOS) packet software. The eSLM Flex 100G provides

Features and Benefits

- Offers a 5.0 Tb/s switch matrix with I/O modules supporting up to 500 Gb/s per slot
- Allows users to select the most flexible networking model for packet, optical, and/or OTN redundancy options as needed
- Provides more reliable, deterministic transport of packet services
- Retains full mesh connectivity while most efficiently transporting Ethernet and other services over a DWDM optical network
- Enables intelligent automated provisioning, planning, and protection/restoration via Ciena's intelligent control plane
- Consolidates SONET/SDH, OTN, and Ethernet/MPLS networks
- Reduces sparing and eases provisioning with programmable SONET/SDH/OTN/Ethernet line modules, fully interoperable with 5430
- Supports STS-1/VC3, ODU-0,1,2,3,4 and ODU-Flex transport containers for efficient service delivery, maximizing bandwidth utilization
- Transforms networks to scalable, cost-efficient service delivery systems via OTN/packet switching, enabling IP router offload and minimizing CAPEX outlays
- Utilizes Ciena WaveLogic™ technology for coherent DWDM optical interfaces

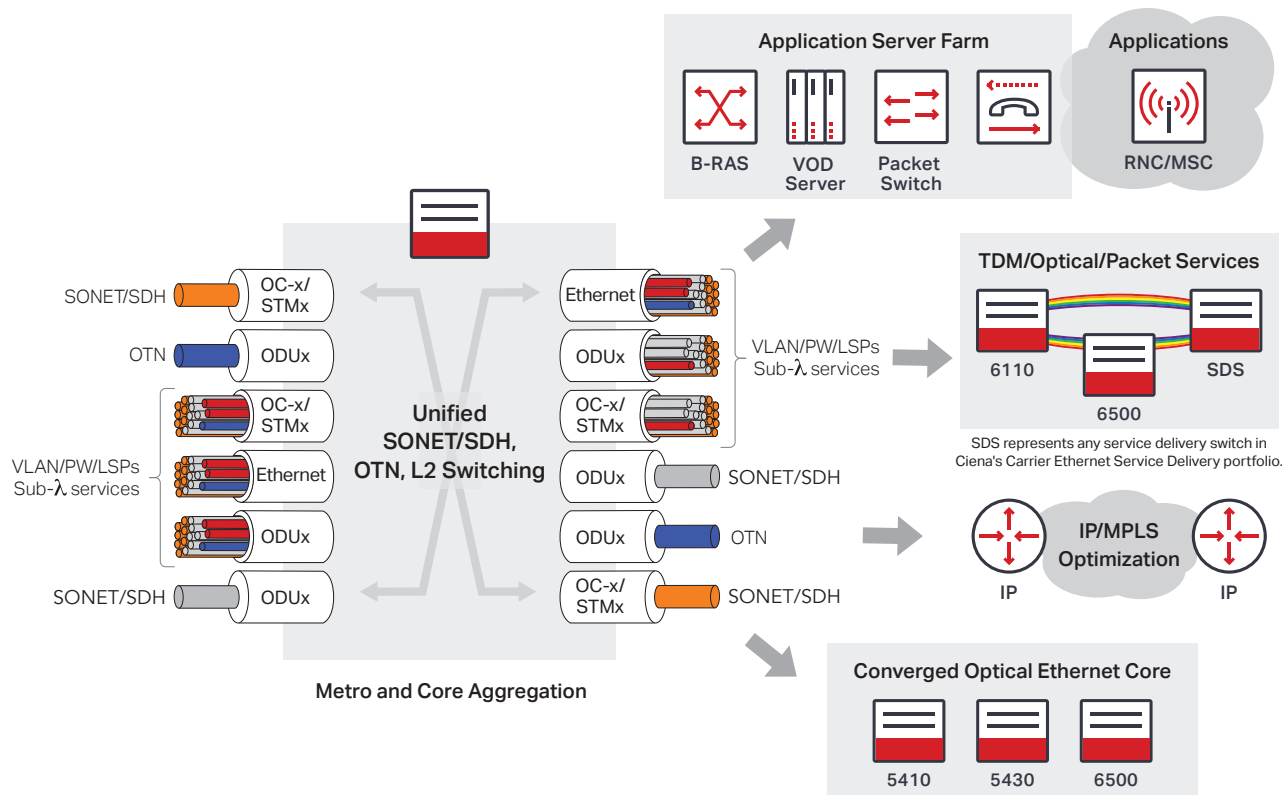


Figure 1. Converged unified switching for optimized bandwidth management

Layer 2 switching and mapping of Ethernet services into an OTN network. It supports up to 120G of Ethernet Interfaces (faceplate) for aggregation into the packet switch fabric and encapsulation into the 100G OTN backplane interface, which may be switched to/from the module via the fabric, in addition to ODU switching capacity.

The 100G OTN backplane interfaces allow Ethernet traffic to be mapped into the OTN's payload with ODUk (k=0, 1, 2, 3, 4) containers. The faceplate interfaces are: 10GbE and 100GbE, and include OTN OTU2e wrapped 10GbE services. The eSLM Flex 100G supports MPLS-TP and G.8032 rings in addition to a full suite of Ethernet performance, protection, and traffic management capabilities. The eSLM Flex 100G helps operators scale swiftly and cost-effectively to manage the surging demand for Ethernet service connectivity from the network access to the core, using a cohesive converged packet-optical approach that yields substantial savings in equipment and operating costs.

The eSLM Flex 100G circuit pack provides the ability to:

- Groom partially filled 10GbE and 100GbE ports to more efficiently transport packet traffic across fewer connections using less network bandwidth
- Provide more reliable, deterministic transport of packet services
- Allow users to select the most flexible networking model for packet, optical, and/or OTN redundancy options as needed
- Retain full mesh connectivity while most efficiently transporting Ethernet and other services over a DWDM optical network

[Learn more about the 5400 family](#)



Technical Information

Intelligent Control Plane

ITU-T ASON/GMPLS SONET/SDH Control Plane
ITU-T ASON/GMPLS OTN Control Plane
Point-and-click auto-provisioning
Automatic path computation
Auto-discovery of network resources
Link bundling for large network scalability
Multiple protection/restoration service classes
Administrative weight routing
Latency routing
Local Span Mesh Restoration (LSMR)
(SONET/SDH/OTN)
1+1 Mesh Restorable SNCP (MR-SNCP) for rapid protection and ultra-survivability

I/O Modules Programmable FlexiPort

Formats

TSLM-48

48 multi-rate (155M to 2.7G) Ports:

OC-3/STM-1 — 155.52 Mb/s

OC-12/STM-4 — 622.08 Mb/s

OC-48/STM-16 — 2.488 Gb/s

OTU1 — 2.666 Gb/s

GbE — 1 Gb/s

(Numerous SFP-supported interfaces)

SONET/SDH (SSLM-48) and OTN (OSLM-48)
optimized versions also available

TSLM-12

12 10G Ports:

OC-192/STM-64 — 9.953 Gb/s

10GbE — 10.3 Gb/s

OTU2 — 10.709 Gb/s

OTU2e — 11.095 Gb/s

(Numerous XFP-supported interfaces
including tunable C-Band XFPs)

SONET/SDH (SSLM-12) and OTN (OSLM-12)
optimized versions also available

OSLM-2 Flex-3 WL3

Two Flex3 WL3 DWDM ports with WaveLogic
3 Extreme chipset (same used in the 6500
platform)

Each port can be individually programmable
by software to operate in any one of following
modulation formats:

2 x 100G DP-QPSK

2 x 200G 16QAM

Mix of 1x 100G DP-QPSK and 1x 200G
16QAM

OSLM-5-100G

Five individual programmable optical ports
(OTN and Ethernet interface) with unique data
rates ranging from 40G to 100G/
100GE/OTU4 mapping into ODU4

OSLM-5-WL3n

Five pluggable CFP2-ACO 100G C-Band
tunable coherent DWDM ports with
WaveLogic 3 Nano chipset (same chipset
used in the 6500 platform), supporting:

CFP2-ACO optics

5 x 100G DP-QPSK

100G OTU4 per wavelength per port

OSLM-50-10G

An OTN switch with 50 individual
programmable optical ports (OTN,
SONET/SDH and Ethernet interface) with a
unique data rates ranging from 1 to 10G

OSLM-1

1 x OTU4

1 x 100GbE (Transparent Mapping)

TSLM-1

1 x OTU4

SONET/SDH capabilities such as up to 10x
10G Embedded SONET/SDH over ODU2 with
STS/VC switching

TSLM-1-D/OSLM-1-D with WaveLogic 3

100 Gb/s line rate with DWDM and coherent
technology

OTU4 SONET/SDH Capabilities (up to 10x 10G
Embedded SONET/SDH over ODU2 with STS/
VC Switching - TSLM-1-D only)

Five variants: Regional, Metro, Enhanced,
Premium and Submarine

TSLM-3

3 40G Ports:

OC-768/STM-256 — 39.813 Gb/s

OTU3 — 43.018 Gb/s

40GbE — 41.25 Gb/s

(Numerous types of CFPs)

OSLM-3 — OTN optimized variant

Embedded SONET/SDH capabilities (up to
12x 10G Embedded SONET/SDH over ODU2
with STS/VC switching)

TSLM-2-DWDM

2x40G C-Band Tunable Coherent

DWDM with colored and colorless Ciena
WaveLogic technology

SONET/SDH capabilities such as up to 8x
10G Embedded SONET/SDH over ODU2 with
STS/VC switching

TSLM-12-DWDM ULH

6xSFP+ with 6dB, 8dB, SFEC, and TriFEC support

6x AM-XFP support for interoperability with
legacy equipment (OC-192 Classic and
Connect DX)

Ethernet Service Line Module (eSLM Flex 100G):

Leverages Ciena's field-proven, full-featured
SAOS packet software.

Layer 2 switching and mapping of Ethernet
services into an OTN network.

Supports up to 120G of Ethernet Interfaces
(faceplate) for aggregation into the packet
switch fabric and encapsulation into 100G
OTN backplane

Traffic mapping into OTN's payload

Supported faceplate interfaces are: 10GbE
and 100GbE and include OTN OTU2e.

MPLS-TP

G.8032 Rings

Software Features

Packet Transport: GbE into SONET/SDH with VCAT

Packet Transport: 10GbE into SONET/SDH
with VCAT or STS192c/VC-4-64c

Embedded SONET/SDH on TSLM-2 and
TSLM-3 (4xSTM64/OC192 > ODU2 > ODU3)"

Embedded SONET/SDH on TSLM-1 and
TSLM-1-D (10x STM64/OC192 > ODU2 > ODU4)

OSI over DCC

Configurable OTN/SONET/SDH OAM

SONET-SDH Gateway

SONET/SDH – OTN Gateway

OTN/SONET/SDH Multicast

Automated Link Grooming

Intelligent Control Plane

Packet Switching: E-PL, E-LAN, E-TREE,
EVP-L, EVP-LAN, EVP-TREE, MPLS-TP, G.8032

Optical Protection and Restoration Options

FastMesh connection-level end-to-end
reroute restoration

SONET/SDH & OTN SNCP

APS/MSP (1+1), MR-SNCP

APS/MSP 1:N & N+1

4F BLSR/MS-SPRing with 16 and 24 node
support

4F VLSR

2F BLSR/MS-SPRing

UPSR/SNCP

G.8032 rings

Timing Support

1.544 Mb/s/2.048 Mb/s BITS/Station Clock
inputs and outputs, line timing

SSM support

AIS thresholds

Stratum 3E/G.812 Type III node clock hold-
over timing (G.813 option also available)

Technical Information continued

Element and Network Management

Standards-based CORBA IDL interfaces
TMN-based architecture and information models
TL-1 craft interface for operational familiarity
IP over DCC/GCC and OSI over DCC extensions for management of subtended network elements
5410 Node Manager for GUI-based element management
OneControl Unified Management System across the comprehensive Ciena product portfolio
Universal OSS Gateway compliant with TMF-814 for operations integration

Equipment Protection

Shelf Controller: Redundant
Power Distribution Units: Redundant
Switch Modules: 1:3 redundant switch fabric
Fan Trays: 4x4 internally redundant, hot swappable

Agency Approvals

NEBS Level 3: SR 3580, GR-63-CORE, GR-1089-CORE
Safety: EN 60950-1, UL 60950-1, CSA 22.2 No. 60950-1, IEC 60950-1
EMC/Immunity: GR-1089-CORE, EN 300-386/EN 55022, FCC Part 15, Class A; VCCI Class A, ICES-003 Class A

Environmental Characteristics

Operating Temperature:
+5° C to +40° C (+41° F to +104° F) up to 1800 m
-5° C to +50° C (+23° F to +122° F) short term
-5° C to +40° C (+23° F to +104° F) short term with fan fail
Relative Humidity: 5% to 85% (non-condensing) 5% to 90% short term
Altitude: up to 13,000 ft (4000 m) at 30° C
Fire Resistance: NEBS GR-63-CORE, ANSI T1.319-2002, UL-94-1996
Earthquake: NEBS GR-63-CORE Zone 4

Physical Characteristics

Shelf Dimensions:
38.5" (H) x 19" (W) x 23.6" (D)
978mm (H) x 483mm (W) x 600mm (D)
Line Module Dimensions:
20.0" (H) x 1.35" (W) x 18.1" (D)
508mm(H) x 34.3mm(W) x 460mm(D)
I/O Slots: 10 slots, 500 Gb/s capacity each

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