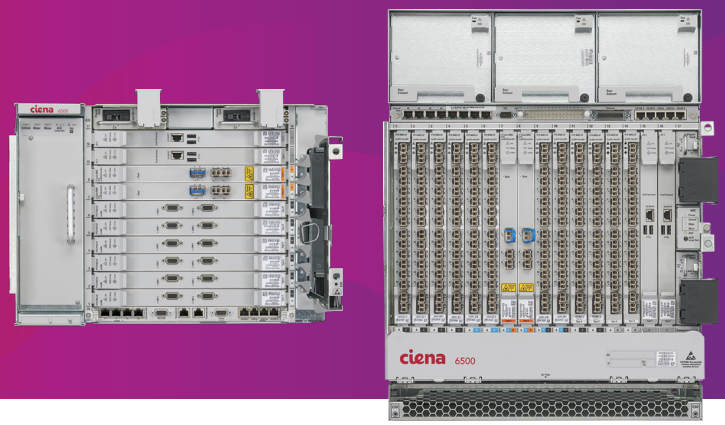
Experience. Outcomes.

DATA SHEET

6500 PTS

Packet Transport System



Ciena's 6500 Packet Transport System (PTS) addresses the growing need to maintain profitable delivery of TDM services while future-proofing investments toward an all-packet network modernization.

To this day, network providers continue to add to their Time Division Multiplexing (TDM) infrastructure—an investment that is getting more expensive to run and operate. Clearly doing more of the same only increases OPEX due to expensive spares and higher maintenance, hard-to-find legacy skill sets, and manual operations.

Today's operators have transitioned toward packet-based architectures as the means to access and scale connectivity to legacy services. This is becoming critical to maintaining productivity while reducing costs.

As service providers approach the end-of-life of their legacy equipment, one clear objective is to maintain the profitable delivery of TDM services.

The 6500 PTS is purpose-built to save significant central office footprint and power and maintain substantial customer mission-critical private line services. It enables new IP and Carrier Ethernet services and allows simple customer TDM-to-Ethernet service migration as needed, without having to replace the platform or the transport network.

Ciena's 6500 PTS enables network providers to consolidate Digital Access Cross-connect System (DACS), Multi-Service Provisioning Platforms (MSPPs), and packet switching and transport functions, all in the same platform.

Enabling packet and TDM over the same network

Migration of TDM services can be complex and difficult, as not all TDM services can be replaced or shut down. In some cases, regulatory restrictions may exist for critical

Features and Benefits

- Exceptional DS1, DS3, E1, E3, OC-3/12/48/192, STM-1/4/16/64, and 10/100/1GbE/10GbE, 40GbE/100GbE density to address space constraints
- Preserves TDM service, no change to customer end or revenue, customer experience, and tariffs
- Launches new Packet and CE services, including MEF CE 3.0-certified for E-Tree, E-Line, E-LAN, E-Access, and E-Transit
- Features hardware-assisted packet OAM capabilities for guaranteed SLA differentiation
- Offers Zero-Touch Provisioning (ZTP) for rapid, secure, and error-free turn-up of packet services
- Includes advanced packet synchronization
- Integrates line-rate Service Activation Testing capabilities
- Includes Ciena's Blue Planet® MCP multi-layer provisioning support for end-to-end network management control and planning
- Offers flexible low-power configuration options with redundant power supply (DC) and fan modules

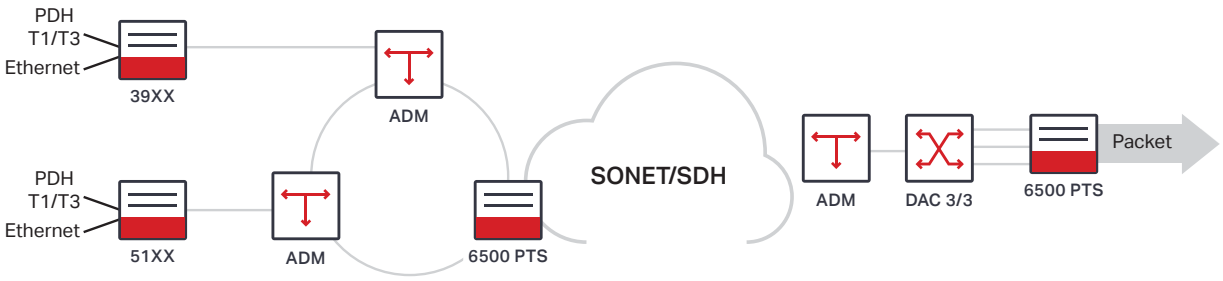


Figure 1. 6500 PTS TDM and multi-service packet delivery

services, and in other cases, end-customers are reluctant to migrate even in the face of rising costs. Maintaining contractual and regulatory commitments while meeting new packet-based demand using two different networks is inefficient and adds cost.

With massive and unpredictable bandwidth demands, network operators need to manage, consolidate, and modernize TDM assets (Figure 1).

Ciena's 6500 PTS effortlessly supports replacement of massive legacy 3/1 DACS, enabling DS1 and VT1.5 level switching through a packet fabric. The same fabric also allows operators to replace and consolidate MSPP SONET/SDH platforms, with the ability to transport circuit-switched Ethernet services using a variety of encapsulation protocols.

Multiple Add-Drop Multiplexer (ADM) rings are also supported on the 6500 PTS, saving even more space and power.

As an MPLS switch, network operators can modernize their TDM network, enabling migration of TDM services to an MPLS-protected core network. In addition, the 6500 PTS operates as a standard MPLS switch for transport and switching of Ethernet services and a pathway to future IP services.

Scalable, dense capacity

Native TDM networks are becoming obsolete, operationally expensive, difficult to maintain, power- and space-inefficient, and unable to handle packet traffic efficiently.

Using 6500 PTS provides a high-density TDM and native Ethernet on-ramp to a next-generation packet optical network. As services transition from TDM to packet, the same 6500 PTS can be used to support packet services and seamlessly transport the legacy TDM services.

Addressing TDM migration by expanding the use of legacy equipment is not a sustainable business model. As shown in

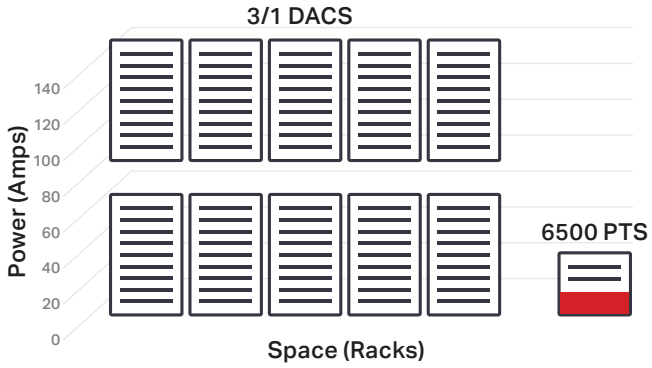


Figure 2. Power and space usage in DACS versus 6500 PTS

Figure 2, traditional legacy 3/1 DACS equipment can take up to ten times the space and five times the power as the 6500 PTS.

Using advanced packet technology and packet switching fabric, the 6500 PTS delivers unprecedented scale and density.

Differentiation through service velocity

Service velocity has become a critical competitive advantage for network operators. In many cases, service velocity is the determining factor in winning new service sales. The 6500 PTS implements Ciena's unique and secure Zero-Touch Provisioning (ZTP) capabilities, allowing network operators to rapidly deploy packet-based services in a completely automated manner. With no human intervention required, manual provisioning errors are eliminated. Most importantly, ZTP improves service deployment velocity and offers significant competitive advantages.

Rich packet OAM capabilities

As network operators and their customers increasingly rely on new packet-based networks, providers must maintain the reliability and deterministic behavior of the legacy TDM services. Packet networks must support a broad array of packet Operations, Administration, and Maintenance (OAM)

capabilities to ensure network operators can proactively and reactively maintain and report on the ongoing health of their metro Ethernet networks and services. The 6500 PTS supports a comprehensive set of hardware-assisted packet OAM capabilities—including per-service Ethernet fault (IEEE 802.1ag) and performance monitoring (ITU-T Y.1731 and TWAMP), and embedded line-rate Service Activation Test (RFC2544 and Y.1564 KPI's)—to help guarantee and manage strict, market-differentiating SLAs.

Link Aggregation Group (LAG), Distributed-LAG (D-LAG), MPLS-TP, or MPLS alternate path capabilities provide redundancy and resilience by addressing single-point-of failure concerns and maintaining high levels of customer satisfaction.

Simplified multilayer management and control

Ciena's Blue Planet Manage, Control and Plan (MCP) software suite offers a unique and comprehensive solution for the administration of mission-critical networks that span access, metro, and core domains, and provides unprecedented multi-layer visibility from the photonic to the packet layers. With this innovative management approach, Blue Planet MCP returns control of the metro packet network and services directly to the network operator. By providing a unified view of the network from the photonic layer to the packet layer, Blue Planet MCP ensures network operations are simple, secure, and highly cost-effective.

Advanced timing and synchronization options

The heartbeat of any circuit-based network is timing. The 6500 PTS supports a flexible arrangement of timing modes of operation including an internal clock, BITS, Line, Synchronous Ethernet, and 1588v2-Grand Master, boundary, and ordinary clock support.

Flexible service delivery configurations

The 6500 PTS supports a flexible menu of service offerings ranging from MEF-compliant E-Line/E-LAN/E-Tree/E-Access/E-Transit, to L3 services over a carrier-class, connection-oriented infrastructure using MPLS, MPLS-TE, and MPLS-TP.

Advanced QoS support

The 6500 PTS supports fine-grained SLA monitoring and enforcement techniques to help operators deliver successfully on tight SLA guarantees. Hierarchical QoS permits delivery of a wide range of traffic types including management, timing/synchronization, multiple customer-prioritized, and best-effort service traffic, without interference or degradation. These capabilities enable greater revenue generation by utilizing available network resources more efficiently.

Sophisticated VLAN tag manipulation and control allow innovative customer traffic separation approaches and a rich set of classification of service flows through the switch. Hierarchical ingress metering can be configured for sub-port services, offering the ultimate in flexible flow control based on L2, L3, and L4 classification. In addition, egress bandwidth shaping on a per-EVC basis is built to allow fine-tuning delay and buffering efficiency within the device.

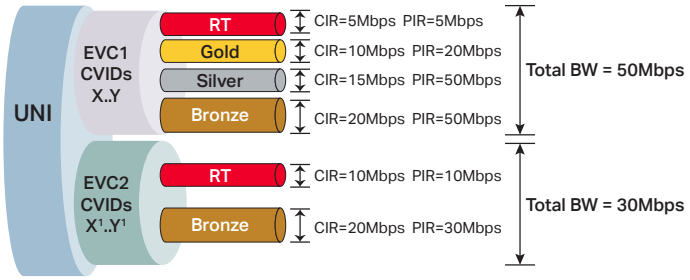


Figure 3. Hierarchical QoS supports multiple services

Multiservice-capable circuit emulation

In addition to its industry-leading Ethernet capabilities, the 6500 PTS supports multiservice transport over Ethernet networks, allowing traditional TDM, ATM, and native Ethernet traffic to be carried over metro backhaul and core data networks.

- Structured Agnostic TDM access (T1/E1 – SAToP)
- Structured Aware TDM access (nxDS0/E0- CESoPSN)
- Full support of IETF Pseudowire Emulation Edge-to-Edge (PWE3) over Ethernet and MPLS networks
- MEF8 Circuit Emulation

The 6500 PTS takes circuit emulation to the next level, allowing the service to be carried as a co-routed, route-diverse protected service adhering to strict deterministic and restoration needs.

Future-proof service delivery

Making liberal use of a packet fabric to support TDM circuit emulation Ethernet, IP, and MPLS technologies, the 6500 PTS can support any number of new network architectures like seamless MPLS or Segment Routing to create a modern-scale adaptive packet network.

Technical Information

Description	6500-S8	6500-S14
H x W x D (mm)	7U 310 x 440.5 x 281	13U 577.1 x 440.5 x 280
H x W x D (inches)	7U 12.2 x 17.3 x 11.1	13U 22.7 x 17.3 x 11.0
Chassis Per Rack	6	3
Weight (Max)	33Kg	56Kg
DC Input	1x 50A	2x 50A
Power Consumption (Watts@ 25deg C/-48vDC, no optics)	1333W (Typical)	1960w (Typical)
Operating Temp.	Normal: 41deg F to 104deg F (5deg C to 40deg C)	
Storage Temp.	-40deg F to 158deg F (-40deg C to 70deg C)	
Relative Humidity	5% to 85% RH (normal operating humidity)	
Air Flow	Front to back, front to front, and right to left	Front to front, and front to back

Tributary Service Interfaces

PDH Modules:

PTS PDH I/F 2xDIM: 168xDS1/E1 ports or 48xDS3/E3/EC1 CEM

PTS PDH I/F 10X DIM 1:N PROTECTION: up to 1:5 PDH protection

84xDS1/E1 DIM

24xDS3/E3/EC1 DIM

unprotected, 1:1 protection or 1:5 protection

MRO Module:

- PTS MRO I/F 2xSFP+/14xSFP: 16x SFP (16xOC-3/12/STM-1/4, 8xOC-48/STM-16, 2x OC192/STM-64, or 16x100FX/GbE (10/100/1000BaseT), or 2x10GbE ports

Ethernet Module:

PTS ETH I/F 40G 16 PORT (4X SFP+/16X CSFP) CIRCUIT PACK

- 4xSFP+ (4x10GE)
- 16xSFP (16x 10/100BaseT/ 100FX/ GE)
- 16xCSFP (32 GE ports)

PTS ETH I/F 100G 12 Port (2x QSFP28/10xSFP+) Circuit Pack

- 1xQSFP+ (1x40GE, 4x10GE)
- 1xQSFP+/QSFP28 (1x100GE, 1x40GE, 4x10GE)
- 10xSFP+ (10x10GE)

DWDM Module:

OTR WL3n Enh: 1xQSFP28

Any module; any slot

Control Timing & Fabric Switch Modules

Shelf Processor

SP2: local craft access, security, event history, alarms, and controls

Fabric switch

X-CONN 800G PTS: 1x QSFP28/QSFP+, 2x SFP+

Ethernet

Hierarchical Quality of Service (HQoS) including Ingress Metering/Egress shaping

IEEE 802.1ad Provider Bridging (Q-in-Q) VLAN full S-VLAN range

IEEE 802.1 D MAC Bridges

IEEE 802.1p Class of Service (CoS) prioritization IEEE 802.1Q VLANs

IEEE 802.1Q VLANs

IEEE 802.3 Ethernet

IEEE 802.3ab 1000Base-T via Copper SFP

IEEE 802.3ad Link Aggregation Control Protocol (LACP)

IEEE 802.3ba-2010 40Gbe & 100GbE

IEEE 802.3u Fast Ethernet

IEEE 802.3z Gigabit Ethernet

Jumbo Frames to 9,600 bytes

Layer 2 Control Frame Tunneling

Link Aggregation (LAG): Active/Active; Active/ Standby

MEF 10.2 Egress Bandwidth Shaping per EVC per COS

Multi Chassis-LAG (MC-LAG): Active/Active

Per-VLAN MAC Learning Control

Private Forwarding Groups

VLAN tunneling (Q-in-Q) for Transparent LAN Services (TLS)

MEF CE 3.0 Compliant

E-Transit: Transit E-LINE, Transit E-LAN

E-Access: Access EPL, Access EVPL

E-LAN: EP-LAN, EVP-LAN

E-LINE: EPL, EVPL

E-Tree: EP-Tree, EVP-Tree

Carrier Ethernet OAM

EVC Ping (IPv4)

IEEE 802.1ab Link Layer Discovery Protocol (LLDP)

IEEE 802.1ag Connectivity Fault Management (CFM)

IEEE 802.3ah EFM Link-fault OAM

ITU-T Y.1564 Ethernet Service Activation Test Methodology

ITU-T Y.1731 Performance Monitoring (SLM; DM)

RFC 2544 Benchmarking Methodology for Network Interconnect Devices

RFC 5618 TWAMP Responder and Receiver TWAMP Sender

Synchronization

GR-1244

ITU-T G.781

ITU-T G.813

ITU-T G.823/G.824

ITU-T G.8262 Synchronous Ethernet

ITU-T G.8262/G.8264 EEC option1 and option2

ITU-T G.8261

Stratum 3

Line Timing Interfaces:

- 1GbE/10GbE/40GbE/100GbE In and Out
- OC-n/STM-n In and Out

External Timing Interfaces:

- BITS in or out (T1: 1.544Mb/s, E1: 2.048MHz and 2.048Mb/s, 64kHz CC (SDH-J)

Networking Protocols

Alarm Indication Signaling (AIS) with Link Down Indication (LDI) and Remote Defect Indication (RDI)

Automatic Pseudowire Reversion

Layer 2 Control Frame Tunneling over MPLS Virtual Circuits

MPLS Label Switch Path (LSP) Tunnel Groups

MPLS Label Switch Path (LSP) Tunnel Redundancy

MPLS Multi-Segment Pseudowires

MPLS Virtual Private Wire Service (VPWS) OSPF/IS-IS for Dynamic MPLS-TP Control Plane RFC 2205 RSVP

RFC 3031 MPLS architecture

RFC 3209 RSVP-TE: Extensions to RSVP for LSP

RFC 3630 OSPF-TE

RFC 4447 Pseudowire Setup & Maintenance using Label Distribution Protocol (LDP)

Networking Protocols continued

RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks (PW over MPLS)
RFC 4664 Framework of L2VPN (VPLS/VPWS)
RFC 4665 Service Requirement of L2 VPN
RFC 4762 VPLS (Virtual Private LAN Service) and Hierarchical VPLS (H-VPLS)
RFC 5654 MPLS-Transport Profile (TP)
- LSP Static provisioning
- LSP Dynamic provisioning
- 1:1 Tunnel protection
RFC 5884 LSP Bidirectional Forwarding Detection (BFD) via GAL/G-Ach channels
RFC 6215 MPLS Transport Profile User-to- Network and Network-to-Network Interfaces
RFC 6426 MPLS On-demand Connectivity Verification and Route Tracing
RFC 6428 LSP and PW Connectivity Verification and Trace Route
Static ARP and MAC Destination Address Resolution
VCCV (Virtual Circuit Continuity Check) Ping and Trace Route
Multicast
IGMP over MPLS-TP
IGMPv3 with SSM
Circuit Emulation:
RFC 4553 Structure Agnostic TDM over Packet
RFC 4842 SONET/SDH Circuit Emulation over Packet
RFC 5086 Circuit Emulation Service over Packet Switched Network
MEF 3 Circuit Emulation Service Definitions, Framework and Requirements in Metro Ethernet Networks
MEF 8 Implementation Agreement for the Emulation of PDH Circuits over Metro Ethernet Networks

Network Management

Alarm Management & Monitoring Configuration
Comprehensive Management via OneControl Enhanced CLI
Integrated Firewall
IPv4 & IPv6 Management Support Local Console Port
Per-VLAN Statistics Port State Mirroring
RADIUS Client and RADIUS Authentication
Remote Auto configuration via TFTP, SFTP
Remote Link Loss Forwarding (RLLF)
RFC 959 File Transfer Protocol (FTP)
RFC 1035 DNS Client
RFC 1213 SNMP MIB II
RFC 1493 Bridge MIB
RFC 1573 MIB II interfaces
RFC 1643 Ethernet-like Interface MIB
RFC 1757 RMON MIB - including persistent configuration
RFC 2021 RMON II and RMON Statistics
RFC 2131 DHCP Client
RFC 3877 Alarm MIB
RFC 4291 – IPv6 addressing (for Management Plane)
RFC 4443 – ICMPv6
RFC 4862 – Stateless address auto-configuration
RFC 5905 NTP Client
RFC 1350 Trivial File Transfer Protocol (TFTP)
Secure File Transfer Protocol (SFTP)
Secure Shell (SSHv2)
SNMP v1/v2c/v3
SNMP v3 Authentication and Message Encryption
Software upgrade via FTP, SFTP
Syslog with Syslog Accounting
TACACS + AAA
Telnet Server
Virtual Link Loss Indication (VLLI)
Zero Touch Provisioning

Service Security

Broadcast Containment Egress Port Restriction
Hardware-based DOS Attack Prevention Layer 2, 3, 4 Protocol Filtering
User Access Rights

Agency Approvals

- Australia C-Tick (Australia/New Zealand) CE mark (EU)
- EMC Directive (2014/30/EU)
- LVD Directive (2006/95/EC)
- RoHS2 Directive (2011/65/EU)
ETSI 300 019 Class 1.2, 2.2, 3.1E
GR-1089 Issue 6 – NEBS Level 3
GR-63-CORE, Issue 4 – NEBS Level 3, Zone 4 Earthquake
NRTL (NA)
VCCI (Japan)

Standards Compliance

Emissions:
CISPR 22 Class A
CISPR 32 Class A
EN 300 386
EN 55022
EN 55032
FCC Part 15 Class A
GR-1089 Issue 6
Industry Canada ICES-003 Class A
VCCI Class A
Environmental:
RoHS2 Directive (2011/65/EU)
Immunity (EMC):
CISPR 24
EN 300 386
EN 55024
GR-1089 Issue 6
Power:
ETSI EN 300 132-2
ETSI EN 300 132-3
Safety:
ANSI/UL 60950-1 2nd edition 2007
CAN/CSA C22.2 No. 60950-1-07
EN 60950-1
IEC 60825-1 2nd edition (2007)
IEC 60825-2 3rd edition (2004)
IEC 60950-1

Visit the Ciena Community
Get answers to your questions

Ciena may make changes at any time to the products or specifications contained herein without notice. Ciena and the Ciena Logo are trademarks or registered trademarks of Ciena Corporation in the U.S. and other countries. A complete list of Ciena's trademarks is available at www.ciena.com. Third-party trademarks are the property of their respective owners and do not imply a partnership between Ciena and any other company. Copyright © 2019 Ciena® Corporation. All rights reserved. DS328 3.2019