The 5305 Ethernet/MPLS service aggregation switch is purpose-built for Carrier Ethernet to deliver cost-effective capacity, scalability, and resiliency. With this switch, service providers can keep pace with the constantly increasing demand for bandwidth and next-generation services that support business, mobile backhaul, transport, and residential applications in metro networks.

The 5305 is a modular, chassis-based system optimized for metro-edge deployments in a wide variety of network topologies, including fiber and microwave rings, point-to-point fiber, microwave mesh, and fiber or copper to the subscriber. The switch supports high-density Gigabit Ethernet (GbE) connectivity to the subscriber edge and high-performance 10GbE uplinks to the metro core, with fully redundant commons and a distributed switch fabric for five-9s reliability and service continuity.

The 5305 is based on Ciena’s field-proven True Carrier Ethernet ® technology, deployed by dozens of network operators in tens of thousands of points of presence, central offices, businesses, office parks, cell sites, remote terminals, and residences. It combines the low cost and high capacity of Ethernet with the reliability, management, and service quality usually associated with SONET/SDH networking systems. The 5305 software is based on an advanced service-aware operating system—used in all Ciena service delivery and aggregation switches—which provides consistent system and service attributes and a common operator interface, provisioning, and management capabilities. These features leverage customer investment in training and operational procedures, provide significant operational cost savings, enhance service creation velocity for faster time-to-revenue, and deliver synergy with Ciena’s best-in-class portfolio of right-sized service aggregation and service delivery Carrier Ethernet systems.

The 5305 incorporates the latest innovations in Ethernet switching technology and control plane protocols and utilizes high-performance programmable processors to deliver new features and functionality through simplified software upgrades with minimal disruption.
to customer traffic. This programmable architecture keeps capital and operating costs to a minimum and simplifies the migration to emerging standards and services, maximizing revenue potential and providing superior flexibility and investment protection.

The 5305 provides unparalleled support for carrier-grade MPLS/ VPLS and Ethernet Layer 2 Virtual Private Networks (L2VPNs) thanks to a state-of-the-art feature set that includes sophisticated hierarchical Quality of Service (QoS), advanced Virtual LAN (VLAN) and virtual switching, comprehensive MPLS/VPLS/H-VPLS, resilient PBB-TE connection-oriented Ethernet, and robust Carrier Ethernet management and performance monitoring capabilities.

The 5305 is the only Carrier Ethernet switch in the industry to support interworking between Q-in-Q VLANs, MPLS/VPLS/ HVPLS, and PBB-TE encapsulation formats. By enabling Ethernet and MPLS VPN and connectivity services to seamlessly traverse multiple domains and transmission facilities— each with its own encapsulation and transport— Ciena’s 5305 creates interworking functionality that supports complete service flexibility and maximum optimization of network resources and traffic engineering architectures.

Compact Modular Scalable System Design

The 5305 delivers optimal density and service flexibility by combining a compact chassis size with high port scalability for GbE and 10GbE interfaces. The seven-slot chassis can support up to 120 GbE ports or ten 10GbE ports in a space-efficient 6 RU (10.5 inches/ 266.7 mm). Two slots in the 5305 chassis support optionally redundant control modules. The other five slots are reserved for GbE and/or 10GbE line modules:

- The 5305 GbE line module supports 24 SFP fiber GbE ports (100/1000 Mb/s); these ports can also accommodate RJ-45 copper SFPs and 10/100/1000 Mb/s data rates
- The 5305 10GbE line module supports two 10GbE ports (XFP fiber)
- Each line module includes a fully distributed switch fabric and functions as an independent switching system, ensuring resiliency and supporting incremental growth

High- Availability Hardware Architecture

The 5305 features a highly available hardware architecture with fully redundant common equipment and distributed control processors and switch fabric:

- 1:1 dual redundant system control modules guarantee continuous system operation
- 1:1 redundant field-replaceable fan trays provide resilient cooling
- Front-mounted redundant load-sharing AC or DC power supply modules ensure uninterrupted power
- CPU and switch fabric on each line module ensure uninterrupted traffic forwarding during software upgrades and control module switchover and/or replacement
- Distributed switch fabric on each line module and dedicated control interfaces between the control modules and each line module prevent disruption to other line modules or to the control modules in the event of failure of a single line module
- A passive backplane provides full mesh connectivity for nonblocking switching
- Removable CompactFlash® on the control modules provides fast access to the base operating system kernel, load modules, alternate images, and system-specific configuration files

Software Reliability and Resiliency

The 5305’s high availability hardware design is complemented by a modular operating system and advanced software resiliency features, as described below:

- Modular operating system software has a real-time kernel and is distributed across control and line modules, providing protection against complete system failures
- Carrier Ethernet OAM features, including IEEE 802.1ag Connectivity Fault Management (CFM), monitor physical and logical link status and support 50 ms link and service restoration from fault conditions
- MPLS OAM capabilities monitor link status and MPLS Fast Re-Route (FRR) supports 50 ms link and service restoration
- PBB-TE dual homing and backup tunnels support immediate service switchover in event of primary tunnel failure
Advanced optimization of the IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) delivers sub-50 ms failover times for selected configurations.

Support for link aggregation and IEEE 802.3ad Link Aggregation Control Protocol (LACP) ensures customer traffic is not disrupted by the failure of one or more physical ports.

### Carrier-Class Quality of Service

The 5305 implements MEF-14-compliant hierarchical QoS capabilities that support a wide range of traffic types and rates over Carrier Ethernet network infrastructures, without interference or degradation. This granular traffic management enables GbE and 10GbE ports and links to accommodate hundreds of individual services and ensures that Service Level Agreement (SLA) requirements for throughput, latency, jitter, and loss are met even under heavy traffic load conditions. These QoS mechanisms include the following:

- Rich classification of traffic flows based on L1 through L4 parameters, including physical port, MAC address, VLAN tag, and IP or L4 port addresses
- Flexible priority resolution for Class of Service (CoS) mapping based on priority settings contained in IP packet headers and VLAN, MPLS, and PBB-TE tags
- Sophisticated hierarchical ingress metering for Committed Information Rate (CIR), Excess Information Rate (EIR), Committed Burst Size (CBS), and Excess Burst Size (EBS)
- Two-rate Three-Color Marking (TrTCM) and Weighted Random Early Drop (WRED) for sophisticated congestion handling
- Hierarchical shaping and queue scheduling, including Strict Priority (SP), Weighted Round Robin (WRR), and a mix of SP and WRR scheduling modes
- Eight hardware queues per port, with over 8,000 virtual output queues per system

5305 QoS mechanisms, as shown in Figure 2, support enhanced revenue generation by ensuring the efficient utilization of available network resources, and delivers customer satisfaction based on enforceable and reliable SLAs.

### Advanced MPLS Functionality

The 5305 offers a comprehensive set of MPLS, VPLS, and H-VPLS features that support resilient MPLS L2VPNs and enable service providers to offer MPLS-based connectivity services on metro Ethernet networks, extending the functionality and scalability of MPLS core networks. These MPLS features include:

- **MPLS Pseudowire Emulation Edge-to-Edge (PWE3)**, which supports MPLS Virtual Private Wire Services (VPWS), sometimes called MPLS Virtual Leased Lines. VPWS enables the provisioning of MPLS-based Ethernet Virtual Circuits (EVCs) and supports MPLS-based Ethernet Private Line and Ethernet Virtual Private Line services.
- **Virtual Private LAN Services (VPLS) and Hierarchical-VPLS (H-VPLS)** based on MPLS Label Switched Paths (LSPs) and MPLS Virtual Circuits (VCs). 5305 VPLS capabilities support Layer 2 VPNs that are based on Ethernet transport with the benefits of an MPLS/VPLS control plane. This control plane includes Label Distribution Protocol (LDP) for VPLS VC signaling; OSPF-TE and IS-IS-TE for MPLS Tunnel Routes; and RSVP-TE for the establishment of the LSPs that constitute the VPLS.
- **MPLS label edge router functionality**, which enables the 5305 to function as a VPLS/H-VPLS Provider Edge switch (PE-rs) and as an H-VPLS MTU-s customer edge switch. The 5305 also supports H-VPLS Dual Homing, which provides resiliency by enabling spoke connections from an MTU-s to two different PE Hub switches. For additional flexibility, H-VPLS spoke connections can be implemented using MPLS pseudowires (VCs), Q-in-Q Ethernet VLAN Virtual Circuits, Ethernet Private Lines, Ethernet Virtual Private Lines and PBB-TE service instances.
- **MPLS tunnel groups** can be configured on the 5305 to support LSP redundancy.
MPLS FRR further enhances resiliency for MPLS/VPLS services by enabling LSPs to be restored within 50 ms in case of physical or logical link failure.

MPLS OAM capabilities include LSP Ping and LSP Traceroute, which can be used to verify the LSP status and topology.

The 5305’s MPLS/VPLS capabilities are complemented by the MPLS/VPLS features on the LE-311v Service Delivery Switch, allowing network operators to deploy a cost-effective mix of LE-311v and 5305 systems within their network infrastructures to support carrier-grade VPLS, H-VPLS, VPWS, and MPLS interworking services, as shown in Figure 3.

Industry-leading Interworking Capabilities

In addition to the MPLS/VPLS/H-VPLS/VPWS features noted above, the 5305 supports the interworking of customer and provider (Q-in-Q) VLAN services and EVCs with MPLS pseudowires and VPLS VPN services. This enables network operators to deploy VPWS, H-VPLS, and/or VPLS VPN services to targeted customers while providing Ethernet VLAN and VPN services on the same 5305 platform. The 5305 also supports the interworking of MPLS LSPs, pseudowires, and VPLS VPNs with PBB-TE service instances and tunnels, including support for PBB-TE spokes to interwork with VPLS mesh LSPs.

The breadth and sophistication of the 5305’s MPLS/VPLS features and its support for the interworking of MPLS/VPLS, PBB-TE, and VLAN/Q-in-Q services firmly establishes the 5305 as the industry-leading Carrier Ethernet service delivery and aggregation platform. No other product currently supports MPLS/VPLS, VLAN, EPL/EVPL/ELAN/E-Tree, and PBB-TE services on one system, and no other product supports interworking between all these connection types over its Ethernet interfaces, as shown in Figure 4.

PBB-TE: Connection-Oriented Carrier Ethernet Transport

PBB-TE is an innovative technology that extends and adapts Ethernet to provide carrier-grade transport over Metro and Wide Area Networks (MANs and WANs). PBB-TE has been standardized as IEEE 802.1Qay, and the 5305 is fully compliant with this new industry standard.

The 5305’s advanced PBB-TE feature set delivers a reliable, resilient, and cost-effective connection-oriented Ethernet transport solution, ideal for delivering a variety of new services to a fast-growing customer base. The 5305 PBB-TE implementation has the following elements:

- IEEE 802.1ah PBB MAC-MAC frame format, including backbone VLAN IDs for tunnel routing, and a service instance field that can support up to 16 million individual services within a single PBB-TE network
- PBB-TE tunneling protocol with built-in backup tunnels and a dual homing tunnel option
- PBB-TE tunnel monitoring and 50 ms failover via IEEE 802.1ag Continuity Check Messages (CCMs)
- Advanced management mechanisms that support the provisioning of PBB-TE service instances and enable provider networks to deliver point-to-point services with high levels of scalability, reliability, manageability, and security

As mentioned above, the IEEE 802.1Qay PBB-TE specification includes support for built-in backup tunnels to ensure the availability of a predictable tunnel route over the backbone, with normal and failover paths. The 5305’s PBB-TE implementation uses 802.1ag CFM mechanisms to detect faults and achieve 50 ms service restoration times comparable to those available with SONET/SDH.

Figure 5 illustrates a typical PBB-TE application with tunnel and path redundancy; the tunnels are explicitly routed, which ensures
superior management visibility and enhanced fault isolation. A broad array of Ciena Carrier Ethernet switches can be utilized to build PBB-TE networks, including the 5305, the 3960, the 3940, the 5140, and the LE-311v.

Based on extensions to current Ethernet standards, PBB-TE-enabled products maintain compatibility with existing Ethernet deployments, which means that the 5305 can deliver resilient PBB-TE connection-oriented Ethernet services with guaranteed QoS to thousands of customers while interoperating seamlessly with an installed base of multi-vendor switching and routing systems that do not support PBB-TE. Because the advantages of PBB-TE are available without changes to existing network equipment or architectures, the 5305 can provide PBB-TE resiliency and traffic engineering benefits while ensuring superior investment protection.

Flexible VLAN and MEF Services

In addition to the comprehensive MPLS/VPLS and PBB-TE capabilities noted above, the 5305 has a robust Ethernet L2VPN feature set that includes 802.1Q VLANs, 802.1ad Provider Bridging (Q-in-Q VLANs), and advanced VLAN tag manipulation and mapping capabilities. These VLAN features enable provisioning of MEF-standard Ethernet Private Line, Ethernet Virtual Private Line, Ethernet-LAN (E-LAN), Ethernet Virtual Private LAN (EVP-LAN), and Ethernet-Tree (E-Tree) services.

The 5305’s highly flexible VLAN tag manipulation and mapping includes VLAN ID translation, dual-tag insertion, removal, and marking (sometimes called “push-pop-stamp”), CoS marking and re-marking, L2 to L3 and L3 to L2 CoS mapping and re-marking, and the ability to perform push, pop, and stamp operations for two or more levels of VLAN tags.

Sophisticated Virtual Switch Architecture

The 5305 has a sophisticated virtual switching architecture that enables every port to be an independent VLAN, MAC, and IP address domain, and allows overlapping VLAN and IP addresses to be configured on different 5305 ports. In addition, each virtual switch is an independent switching and bridging domain.

This enables customers to maintain private VLAN and IP addressing schemes and insures security and separation of customer traffic for L2VPNs (E-LAN, E-Tree) and EVCs (EPL, EVPL). This arrangement enables the 5305 to support VLANs from many customers on each physical port, up to 4,094 VLANs on each Virtual Switch, and up to 30,000 VLANs per 5305 system, for unparalleled service scalability and flexibility. The 5305 architecture and system resources can also support up to 500,000 unique MAC addresses per line module and up to two million MAC addresses per system.

Carrier-Class Ethernet OAM

The 5305 supports a rich set of OAM features defined in the latest versions of IEEE, ITU, and IETF standards, including:

- IEEE 802.3ah EFM physical layer OAM, including link events and remote loopback
IEEE 802.1ag CFM, including CCMs, MAC Ping, MAC Traceroute, Maintenance Domains, Maintenance Endpoints (MEPs), Maintenance Intermediate Points (MIPs), and more

ITU Y.1731 L2 performance management capabilities, including packet jitter, latency, delay, and throughput measurements

IETF Two-Way Active Management Protocol (TWAMP) that supports end-to-end performance measurement for connections that traverse L3 core networks

These capabilities enable the 5305 to monitor the status of system and network links; confirm link and service throughput and quality conform to SLAs; measure the performance of customers’ Ethernet services; and distribute this management information across point-to-point, point-to-multipoint, and multipoint-to-multipoint connections.

Field-Proven Service-Aware Operating System

The 5305 software architecture is based on a service-aware operating system used in all Ciena service delivery and aggregation switches. Efficient, resilient, and modular, this operating system is purpose-built to support demanding service provider network environments. The system is multi-layered, allowing for the separation of management, control, and data planes to ensure intelligent fault recovery. The real-time kernel and distributed-processing architecture delivers reliability and high availability by protecting against complete operating system and module failures, while conforming to stringent uptime and service continuity requirements.

Ciena’s service-aware operating system provides an expandable carrier-class software infrastructure that integrates tightly with the 5305’s virtual switching architecture to support comprehensive Carrier Ethernet features and consistent services across all access and aggregation platforms and applications. Benefits include:

- Rapid implementation of the latest advances in Ethernet technologies and new features, services and standards as proposed by the IEEE, IETF, and MEF

- Improved efficiency and cost savings resulting from a common deployment and service provisioning model and reduced need for hybrid network architectures

- A common management interface that supports rapid service creation and offers improved productivity by leveraging existing personnel training

- Interoperability with Ethernet equipment from other vendors

- Consistent service offerings across all Ciena Carrier Ethernet switches, permitting rapid service rollout across an entire network

Ethernet Services Manager (ESM)

Ciena’s ESM is a groundbreaking carrier-grade, automated service activation, creation, and management platform for service delivery and aggregation networks. The ESM allows users to build and deploy large-scale Carrier Ethernet networks quickly and easily—cutting time to market for new services; accelerating service revenue; maximizing service availability; assuring service quality; leveraging existing systems; and enabling subscriber-managed services. These functions combine to cut total cost of ownership for increased revenue and competitiveness.
Technical Information

Interfaces
24 x 100/1000M SFP NNI/UNI ports per GbE Line Module
- 0-5 GbE line modules per system
- 0/24/48/96 or 120 x GbE ports per system
2 x 10GbE XFP NNI/UNI ports per 10GbE Line Module
- 0-5 10GbE line modules per system
- 0/2/4/8 or 10 x 10GbE ports per system
1 x 10/100/1000M RJ-45 Management port per Control Module
1 x Console Port (RS-232) per Control Module

MAC Address Table Capacity
750,000 MAC addresses

Ethernet
IEEE 802.3 Ethernet
IEEE 802.3u Fast Ethernet
IEEE 802.3z GbE
IEEE 802.1d MAC Bridges
IEEE 802.1Q VLANs - Including 1p Priority
IEEE 802.1ad Provider Bridging (Q-in-Q)
- VLANs with full 3-S-VLAN range
- 4,094 Simultaneous VLANs per port
- 30,000 Simultaneous VLANs per system
- Single and double VLAN tag push and pop on ingress and egress
- Single and double VLAN tag translations on ingress and egress
- Private Forwarding Groups/Private VLANs
- Virtual pipe/2-port VLAN
- Per Virtual Switch MAC Learning Control
- Per VLAN MAC Learning Control
81-00, 91-00, 88-a8 Ethertype Support
IEEE 802.3x Ethernet Flow Control
IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) - now in 1D
RSTP Path Cost & Self Disable
- Spanning Tree Domains
IEEE 802.3ad Link Aggregation Control Protocol (LACP)
- Manual Link Aggregation (LAG)
- N+N Protection LAG
- Jumbo Frames to 9216 bytes
- Layer 2 Control Frame Tunneling
- MEF 9 Ethernet Private Line
- MEF 9 Ethernet Private LAN
- MEF 9 Ethernet Virtual Private Line
- MEF 9 Ethernet Virtual Private LAN
- MEF 9 Ethernet Tree
- MEF 14 Traffic Management

Carrier Ethernet OAM
IEEE 802.1ag Connectivity Fault Management (CFM)
- Distributed Connectivity Fault Management
- CFM over Q-in-Q
- CFM for PBB-TE Tunnel Monitoring
- IEEE 802.3ah Ethernet in the First Mile (EFM)
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
- Y.1731 Performance Monitoring
- Ingress Port Mirroring with Port State Mirror Groups

MPLS/VPLS
MPLS Pseudowire Emulation
- Edge-to-Edge (PWE3)
- MPLS Virtual Private Wire Service (VPWS)
- VPLS (Virtual Private LAN Service) and Hierarchical VPLS (H-VPLS)
- Provider Edge (PE-s) Functionality for VPLS and H-VPLS
- VPLS with multiple VPLS Mesh Virtual Circuits
- H-VPLS with Hub and Spoke Virtual Circuits
- MTU-s Functionality for H-VPLS deployment
- MTU-s Multihoming (redundant VCs to different PE-s switches)
- MPLS Virtual Circuit as H-VPLS spoke Virtual Circuit
- PBB-TE Service Instance as H-VPLS spoke Virtual Circuit
- Q-in-Q Ethernet Virtual Circuit as H-VPLS spoke Virtual Circuit
- MPLS Label Switch Path (LSP) Tunnel Groups
- MPLS Label Switch Path (LSP) Tunnel Redundancy
- Layer 2 Control Frame Tunneling over MPLS Virtual Circuits
- RSVP-TE (for MPLS Tunnel Signaling)
- OSPF-TE (for MPLS Tunnel Routes)
- IS-IS-TE (for MPLS Tunnel Routes)
- LDP & Targeted LDP (for MPLS VC signaling)
- MPLS Fast ReRoute (via RSVP-TE)
- MPLS Performance Monitoring
- LSP Ping
- LSP Traceroute
- MPLS SNMP support

PBB-TE
IEEE 802.1Qay PBB-TE
IEEE 802.1ah PBB-TE frame format
- PBB-TE Backup Tunnels
- PBB-TE tunnels on Link Agg Logical Ports
- PBB-TE Multi-homed Protection Failover
- IEEE 802.1ag CFM for PBB-TE Tunnels
- IEEE 802.1ag CFM for PBB-TE Service Interfaces
- PBB-TE Full B-VID & I-SID address ranges
- PBB-TE Tunnel & Service metering

MPLS/VPLS, VLAN/Q-in-Q, PBB-TE Interoperability
MPLS/VPLS/H-VPLS interoperability with VLAN/Q-in-Q
- MPLS/VPLS/H-VPLS interoperability with PBB-TE PBB-TE interoperability with VLAN/Q-in-Q
- Switching between MPLS Virtual Circuits and PBB-TE Service Instances
- Switching between MPLS Virtual Circuits and Q-in-Q Ethernet Virtual Circuits
- Switching between PBB-TE Service Instances and Q-in-Q Ethernet Virtual Circuits

Quality of Service
8 Hardware Queues per Port
- Committed and Excess Information Rate (CIR and EIR)
- Per-port QoS with CIR and EIR traffic on Egress Queues
- Hierarchical Ingress metering: per-port/per-VLAN/per-PCP
- 30,000 Hierarchical Ingress Meters per System
- Per-Port/per-PCP Priority Oversubscription
- Two-Rate Three-Color Marking
- Classification on IEEE 802.1D priority
- Classification on IEEE 802.1ad PCP priority
- Classification on IEEE 802.1Qay PCP priority
- Classification on IP Precedence, IP Diffserv Code Point (DSCP)
- Classification on MPLS EXP-PCP
- Classification on PBB-TE ISID-PCP
- Classification on MAC SA/MAC DA
- Classification on Ethertype
- Classification on VLAN ID and source port
- Layer 2 – Layer 3 Class of Service Mapping/Marking/Re-marking
- Layer 3 – Layer 2 Class of Service Mapping/Marking/Re-marking
- Per-Port and per-Subport WRED Egress Queuing
- Configurable WRED profiles
- Hierarchical Egress Shaping and Scheduling
- Configurable Scheduler Policy
- User-definable Frame to Resolved CoS mappings

Multicast Management
IGMPv2 with IGMP Snooping (RFC 2236)
IGMP Domains
IGMP Message Filtering
IGMP Inquisitive Leave
IGMP Query Engine
- Broadcast/Multicast Storm Control
- Unknown Multicast Filtering
- Well-known Protocol Forwarding
- Broadcast/Multicast Containment Statistics

Multicast Management
IGMPv2 with IGMP Snooping (RFC 2236)
IGMP Domains
IGMP Message Filtering
IGMP Inquisitive Leave
IGMP Query Engine
- Broadcast/Multicast Storm Control
- Unknown Multicast Filtering
- Well-known Protocol Forwarding
- Broadcast/Multicast Containment Statistics
Network Management
Enhanced CLI
CLI-based configuration files
Management VLAN
SNMP v1/v2c/v3
SNMPv3 Authentication & Message Encryption
SNMP MIB II (RFC 1213)
Bridge MIB (RFC 1493)
Ethernet-like Interface MIB (RFC 1643)
MIB II interfaces (RFC 1573)
IEEE 802.1AB-2005 LLDP-MIB ITU X.733 / RFC 3877 Alarm Reporting MIB
RMON MIB (RFC1757) - inc. persistent configuration
RMON II (RFC 2021)
RMON Statistics
Per-VLAN Statistics
RADIUS Client & RADIUS Authentication
TACACS + AAA
DHCP Client (RFC 2131)
DHCP Relay
NTP Client (RFC 1305)
DNS Client (RFC 1035)
Telnet Server
Secure File Transfer Protocol (SFTP)
Trivial File Transfer Protocol (TFTP)
Secure Shell (SSHv2)
Syslog with Syslog Accounting
CPU Load Query
Device Archive
Local Console Port
Alarm management with audible and visible alarm outputs
User configuration (including escalation policies*) of event/alarm information
Fault log for Fault Policy Management
Log events to FLASH, compact-FLASH or internal memory (RAM)
Local management interface
Physical Interface Performance Monitoring
Logical Interface Performance Monitoring
Logical Interface Port & Subport Statistics
Logical & Physical Port RMON Statistics
Remote management interface
Comprehensive Management via Ethernet Services Manager

Service Security
Per-port Service Access Control (ACLs)
Per-VLAN Service Access Control (ACLs)
Per-flow Service Access Control (ACLs)
Layer 2, 3 & 4 Access Policies
Egress Port Restriction
Layer 2, 3, 4 Protocol Filtering
Broadcast Containment
User Access Rights

System High Availability
1:1 Dual Redundant System Control Modules
1:1 Redundant Fan Trays provide resilient cooling
All Modules Hot Swappable & Field Replaceable
Front-mounted redundant load sharing AC or DC power supply modules
CPU and switch fabric on each line module
Distributed Switch Fabric on each line module
Passive backplane provides full mesh connectivity for non-blocking switching
Dedicated control interfaces between Control Modules and each Line Module
Boot from compact FLASH: operating system kernel, load modules, alternate images, configuration files
Alarm Module with interface to external alarms

Power Requirements
AC Voltage Input Range: 100V to 240V AC
AC Line Frequency Input Range: 50Hz to 60 Hz
Maximum Power Input: 1000 Watts
DC Voltage Input Range: -40V to -59V DC
Redundant hot-swappable AC or DC power supplies

Agency Approvals
Safety Certifications:
NRTL (TUV Rheinland)
European Union, CE mark (Declaration of Conformity)
UL 60950-1 (US)
IEC 60950-1 (International)
EN 60950-1 (EU)
CAN/CSA 22.2 No. 60950-1-03 (Canada)
NEBS:
Level 3 Compliant & Certified

Emissions:
FCC 47CFR Part 15 Class A
FCC Part 15.1998 Class A
ENS5022 (1994) Class A
ENS5022 (2006) Class A;
ETSI/EN 300 386-V1.3.2 (2003-05) (EU Telecommunication Emissions and Immunity)

Immunity:
ETSI/EN 300 386-V1.3.2 (2003-05) (EU Telecommunication Emissions and Immunity)

Environmental:
RoHS 2002/95/EC
WEEE 2002/96/EC

Laser Safety:
LCDRH Letter of Approval (US FDA Approval)
FCC 21 CFR subpart (J) (Safety of Laser Products)

Environmental Characteristics
Operating Temperature: +32°F to +104°F (0°C to +40°C)
Storage temperature: -13°F to +158°F (-25°C to +70°C)
Relative Humidity: 5% to 90% Non-condensing Side-to-side air flow

Physical Characteristics
Dimensions: 10.5” (H) x 17.6 (W) x 15.75” (D)
266.7 mm (H) x 447 mm (W) x 400 mm (D)
Weight: 88 lbs; 39.9 kg (fully loaded)

Ciena® Corporation. All rights reserved. DS141 7.2011

Ciena may from time to time make changes to the products or specifications contained herein without notice. Copyright © 2011 Ciena® Corporation. All rights reserved. DS141 7.2011

Networks that change the way you compete.

1201 Winterson Road
Linthicum, MD 21090
1.800.207.3714 (US and Canada)
1.410.865.8671 (outside US and Canada)
+44.20.7012.5555 (international)
www.ciena.com