

# 3932

## Service Delivery Switch



### Features and Benefits

- Offers Carrier Ethernet, multiservice capability with low TCO
- Features flexible port configurations:
  - 2 SFP+ NNI, 4 SFP/RJ-45 UNI,
  - 4 SFP UNI, 16 DS1/E1 UNI ports
- Addresses bandwidth-hungry 2G/3G/4G mobile backhaul, premium Ethernet business, and smart grid applications
- Complies with MEF CE2.0 specifications for E-Line, E-LAN, E-Tree, and E-Access services
- Incorporates flexible transport options including G.8032 rings, 802.1q VLANs, 802.1ad Provider VLANs (Q-in-Q), MPLS, MPLS-TP, and PBB-TE
- Provides highly accurate synchronization support with SyncE and 1588v2 PTP protocols, backed up by an onboard Stratum 3E oscillator
- Supports extended temperature range (-40C to +65C) ETSI-cabinet-compliant in a compact, 1RU configuration
- Includes onboard RFC 2544 performance benchmark testing capabilities, enabling end-to-end SLA verification

Ciena's 3932 Service Delivery Switch is an advanced Carrier Ethernet packet switch focused on high-bandwidth, multi-service applications requiring sophisticated Quality of Service (QoS) capabilities, including mobile backhaul, business services, and smart grid applications.

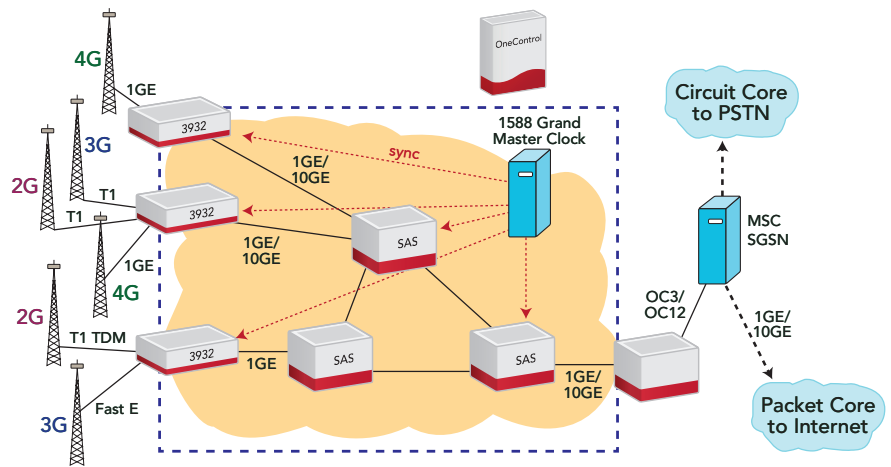


Figure 1. 2G/3G/4G Mobile Backhaul Applications

The 3932 is intended for use in 2G/3G mobile backhaul applications where legacy DS1s/E1s are required and pseudowire emulation is used to transport the TDM signals over the packet switched network. Its multiservice capability, alongside multiple timing synchronization options, provides the ideal solution for evolving legacy TDM-based services to a next-generation packet networking environment.

The 3932 features a high-capacity switching fabric, 2 NNI SFP+ ports that support 1GbE or 10GbE, 4 100/1000M SFP UNI ports, 4 dual-mode UNI ports (10/100/1000 RJ-45 and 100/1000 SFP), and 16 DS1/E1 UNI ports.

The 3932 software architecture is based on the common Service-Aware Operating System (SAOS) used in all Ciena service delivery and service aggregation switches to provide advanced Carrier Ethernet services, with consistent system attributes to improve operational efficiency. Ciena's SAOS delivers consistent benefits across all Ethernet applications, including:

- Rapid implementation of the latest advances in Ethernet technologies, as well as new services and standards proposed by the IEEE, IETF, MEF, and ITU
- Improved efficiency and cost savings resulting from a common deployment and service provisioning model
- Service offering ubiquity, permitting rapid rollout of new services across the entire network
- Complete MEF CE2.0-compliant Ethernet service offerings for E-Line, E-VPLane, EP-LAN, E-VPLAN, E-Tree, E-VPTree, and E-Access

The 3932 exemplifies Ciena's focus on Total Cost of Ownership (TCO) to deliver Carrier Ethernet services by supporting all the leading Operations, Administration and Maintenance (OAM) standards, including RFC 2544 performance benchmarking generation and reflection capabilities. This enables detailed Service Level Agreement (SLA)-conformance testing from the Network Operations Center (NOC) and dramatically lowers OPEX. In combination with the low-touch deployment methods provided by Ciena, operators can achieve a very profitable business case, even in highly competitive markets.

The 3932 incorporates a complete OAM suite of tools to support the network and service performance monitoring requirements of large-scale Ethernet deployments while reducing network operating costs. The 3932 builds on the power of Ciena's 3930 Service Delivery Switch for 1GE service delivery and 10GE aggregation by adding multi-service capabilities to create a new class of product for compact 10/100/1000 Ethernet plus multiservice aggregation into 10GE.

Ciena's portfolio has a strong OAM feature suite providing comprehensive link, service, and network monitoring and

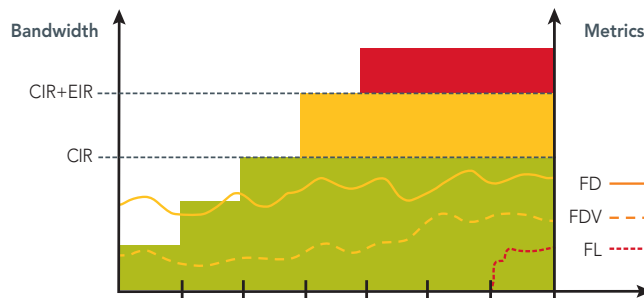


Figure 2. RFC 2544 performance benchmark testing and SLA verification

performance metrics. OAM features available today include:

- IEEE 802.1ag Connectivity Fault Management (CFM)
- IEEE 802.3ah Ethernet in the First Mile (EFM)
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
- ITU-T Y.1731 Performance Monitoring: Delay, Jitter, Loss
- IETF RFC 5618 TWAMP Sender and Responder for L3 SLA Monitoring
- IETF RFC 2544 Performance Benchmarking Test Generation and Reflection

The MEF CE2.0-compliant unit features a flexible virtual switching architecture that enables sophisticated service classification, traffic management, prioritization, protection, OAM, and network synchronization. The 3932 provides a temperature-hardened single rack unit form factor (1RU) with redundant AC or wide-range DC power supply modules.

### Multiservice Capable

In addition to its industry-leading Ethernet capabilities, the 3932 provides for multiservice transport over Ethernet networks, allowing traditional TDM, ATM, and native Ethernet traffic to be carried over metro backhaul and core data networks.

- Structure Agnostic TDM access (T1/E1 - SAToP),
- Structure Aware TDM access (nxDS0/E0 - CESoPSN)
- Full support of the IETF's Pseudowire Emulation Edge-to-Edge (PWE3) architecture over Ethernet and MPLS networks
- Support of MEF8 Circuit Emulation

## Fine-Grained SLA Monitoring and Enforcement

As end-customer applications become increasingly dependent on tight SLA guarantees, successful operators need to deliver advanced QoS offerings and accurately and efficiently monitor the health and performance of those services.

The 3932 implements carrier-class hierarchical QoS that permits delivery of a wide range of traffic types and rates over a single access infrastructure without interference or degradation. These capabilities enable greater revenue generation by utilizing available network resources efficiently while improving customer relations with enforceable and reliable SLAs.

## Synchronization and Timing

The cost-effectiveness and versatility of packet networking is driving the convergence of services and placing new network synchronization requirements onto the packet aggregation network. Provision of accurate frequency, phase, or time references from the network is also beginning to emerge as a service in its own right. The 3932 is designed to enable accurate and scalable delivery and distribution of frequency, phase, and time across the network to support applications such as LTE mobile backhaul, synchronization as a service, or smart grid aggregation. Support includes:

- ITU-T G.8262 Synchronous Ethernet on all Ethernet ports for frequency distribution and reference
- IEEE 1588v2 Precision Time Protocol (PTP), including Ordinary Clock and Boundary Clock support for frequency, phase, and time distribution
- Hybrid timing distribution model using synchronous Ethernet for frequency and PTP for phase and time
- A Stratum 3E oscillator provides exceptional accuracy and stability as a timing master or slave
- Dedicated external BITS, GPS, 1PPS, and ToD ports for local frequency, phase, and time references
- Dedicated hardware support for IEEE 1588v2 scalability and accuracy

These features enable carriers to provide SONET/SDH-like Layer 1 timing while decommissioning those expensive secondary networks. The need for accurate synchronization is most pronounced for mobile backhaul applications. The 3932 excels in mobile backhaul, addressing the needs of multiple generations of wireless technology and especially of LTE, where no TDM interfaces exist, but very accurate frequency and phase synchronization are mandatory.

## Flexible Deployment

The architecture of the 3932 provides flexibility to operators, enabling one platform to address a multitude of service applications and deployment environments without sacrificing service feature capabilities.

- Extended temperature rating (-40°C to +65°C) enables deployment in a wide variety of locations
- Universal power options for DC applications (+24/-24/-48V), AC applications (100-240V), and simplex or duplex powering

## OneControl Unified Management System

Ciena’s OneControl offers a unique and comprehensive solution to manage mission-critical networks that span across domains (access, metro, and core), with unprecedented visibility through protocol layers (packet as well as photonic and transport). With this innovative approach, OneControl returns network and services control to the operator.

OneControl unites the management of Ciena’s Packet Networking, Converged Packet Optical, and Optical Transport portfolios under a single solution. With its unique toolset of comprehensive management features, OneControl puts the control of critical networks at the operator’s fingertips. Through a unified GUI and common management model, NOC operators can rapidly deploy new service offerings that cut across domains (access, metro, and core) and coordinate across network protocol layers to ensure efficient use of critical network assets and bandwidth optimization.

This efficiency provides comprehensive management and control from the access customer hand-off points, through the metro, and into the network core. The OneControl GUI allows NOC personnel to create and activate end-to-end packet services. OneControl provides complete visualization of the entire end-to-end service multi-layer correlation, facilitating proactive root cause analysis and troubleshooting.

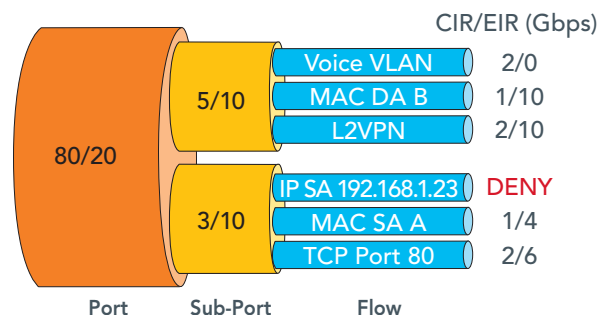


Figure 3. Granular classification and SLA enforcement

## Technical Information

---

### Interfaces

2 x 1/10G SFP+ NNI ports  
4 x 100/1000M SFP UNI ports  
4 x 10/100/1000M RJ-45; 100/1000M SFP UNI  
  combo ports  
16 DS1/E1 UNI  
1 x Console Port (RJ-45, EIA-561)  
16 x External Alarm Inputs  
1 x RJ-45 sync input/output port  
2 x SMB sync input/output ports

---

### Ethernet

IEEE 802.3 Ethernet  
IEEE 802.3u Fast Ethernet  
IEEE 802.3z Gigabit Ethernet  
IEEE 802.3-2008 10-Gigabit Ethernet  
IEEE 802.3ab 1000Base-T  
IEEE 802.1D MAC Bridges  
IEEE 802.1Q VLANs - Including .1p Priority  
IEEE 802.1ad Provider Bridging (Q-in-Q)  
  VLAN full S-VLAN range  
VLAN tunneling (Q-in-Q) for Transparent  
  LAN Services (TLS)  
Rapid / Multiple Spanning Tree (RSTP/MSTP)  
Per-VLAN MAC Learning Control  
Per-Port MAC Learning Control  
IEEE 802.3ad Link Aggregation Control  
  Protocol (LACP)  
ITU-T G.8032 Ethernet Ring Protection  
  Switching  
Jumbo Frames to 9216 bytes  
Layer 2 Control Frame Tunneling  
Private Forwarding Groups  
MEF CE 2.0 Compliant  
E-LINE: EPL, EVPL  
E-LAN: EP-LAN, EVP-LAN  
E-Access: Access EPL, Access EVPL  
E-Tree: EP-Tree, EVP-Tree

---

### Quality of Service

8 Hardware Queues per-Port  
Committed, Excess Information Rate (CIR,  
  EIR)  
Classification based on  
IEEE 802.1D priority  
VLAN, source port, destination port,  
TCP/UDP port  
IP Precedence and IPDSCP  
Layer 2, 3, 4 Quality of Service  
Ingress metering per-port  
Ingress metering per-port per-CoS  
Ingress metering per-port per-VLAN  
Up to 64 Ingress Meters per-port  
Up to 512 Ingress Meters per-system

C-VLAN Priority to S-VLAN Priority Mapping  
S-VLAN Priority based on C-VLAN ID  
Per-VLAN Classification, Metering, and  
  Statistics  
Per-port, per-VLAN QoS with CIR and EIR  
  traffic on Egress Queues

---

### Multicast Management

RFC 2236 IGMPv2 Snooping  
IGMP Domains  
IGMP Message Filtering  
IGMP Inquisitive Leave  
Broadcast/Multicast Storm Control  
Unknown Multicast Filtering  
Well-known Protocol Forwarding

---

### Multiservice Support

16 DS1 or E1  
SAToP (RFC4553)  
CESoPSN (RFC 5086)  
PWE3 Control Word (RFC 4385)  
CES over Ethernet per MEF8  
Dry-Martini Support

---

### Carrier Ethernet OAM

IEEE 802.1ag Connectivity Fault  
  Management (CFM)  
IEEE 802.3ah Ethernet in the First Mile (EFM)  
IEEE 802.1AB Link Layer Discovery Protocol  
  (LLDP)  
ITU-T Y.1731 Performance Monitoring  
RFC 2544 Performance Benchmarking Test  
  Generation and Reflection  
ITU-T Y.1564 Ethernet Service Activation  
RFC 5618 TWAMP Responder and Receiver  
TWAMP Sender  
TWAMP +/- 1ms timestamp accuracy  
Dying Gasp with Syslog and SNMP Traps

---

### Synchronization

ITU-T G.8262/G.8264 EEC option1  
  and option2  
ITU-T G.781  
IEEE 1588v2 (OC & BC\*)  
ITU-T G.8261  
ITU-T G.8265/G8265.1  
ITU-T G.8271  
ITU-T G.8275/G.8275.1/G.8275.2  
ITU-T G.823/G.824  
ITU-T G.813  
GR-1244  
Stratum3E oscillator

External Timing Interfaces  
BITS in or out (1.544MHz, 2.048MHz, 2Mbps,  
  64kcc/6312kcc)  
10MHz, 1.544MHz, 2.048MHz in or out  
GPS 1PPS in or out  
ToD in or out (NMEA 0183, MSTs)

---

### MPLS/VPLS

RFC 2205, 3031, 3036, 3985 MPLS PW3  
  Pseudowire Emulation Edge-to-Edge  
RFC 5654 MPLS-Transport Profile (TP)  
LSP Static provisioning  
  1:1 Tunnel protection  
  LSP BFD via GAI/GAch  
MPLS Virtual Private Wire Service (VPWS)  
RFC 4762 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 Multi-homing (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  
RFC 3209 RSVP-TE (for MPLS Tunnel  
  Signaling)  
RFC 3630 OSPF-TE (for MPLS Tunnel Routes)  
RFC 3784 IS-IS-TE (for MPLS Tunnel Routes)  
RFC 3036 LDP & Targeted LDP (for VPLS VC  
  signaling)  
RFC 4090 MPLS Fast ReRoute signaling  
LSP Ping & Traceroute

---

### PBB-TE (Provider Backbone Bridging - Traffic Engineering)

IEEE 802.1Qay PBB-TE  
IEEE 802.1ah PBB frame format  
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

---

## Network Management

Enhanced CLI  
CLI-based configuration files  
SNMP v1/v2c/v3  
SNMPv3 Authentication and Message Encryption  
RFC 1213 SNMP MIB II  
RFC 1493 Bridge MIB  
RFC 1643 Ethernet-like Interface MIB  
RFC 1573 MIB II interfaces  
RFC 1757 RMON MIB - including persistent configuration  
RFC 2021 RMON II and RMON Statistics Per-VLAN Statistics  
RADIUS Client and RADIUS Authentication  
TACACS + AAA  
RFC 2131 DHCP Client  
RFC 1305 NTP Client  
RFC 1035 DNS Client  
Telnet Server  
RFC 1350 Trivial File Transfer Protocol (TFTP)  
RFC 959 File Transfer Protocol (FTP)  
Secure File Transfer Protocol (SFTP)  
Secure Shell (SSHv2)  
Syslog with Syslog Accounting  
Port State Mirroring  
Virtual Link Loss Indication / Remote Link Loss Forwarding (VLLI/RLLF)  
Dual-Stack IPv4/IPv6 management plane  
Local Console Port  
Comprehensive Management via Ethernet Services Manager  
Remote Auto configuration via TFTP, SFTP  
Software upgrade via TFTP, SFTP

---

## Service Security

Common Criteria EAL2 compliant and certified  
IEEE 802.1X Port-Based Network Access Control (RADIUS/MD5)  
Egress Port Restriction  
Layer 2, 3, 4 Protocol Filtering  
Broadcast Containment  
User Access Rights  
Per-port or per-VLAN Service Access Control  
Hardware-based DOS Attack Prevention

---

## MAC Address Table Capacity

32,000 MAC addresses

---

## Power Requirements

DC Input: -48, -/+36, -/+24 VDC (nominal)  
AC Input: 100V, 240V AC (nominal)  
AC Frequency: 50/60 Hz  
Maximum Power Input: 120 W

---

## Agency Approvals

Agency Marks:  
NRTL (Canadian Standards Association)  
CE mark (European Union)  
EMC Directive (2004/108/EC)  
LVD Directive (2006/95/EC)  
RoHS2 Directive (2011/65/EU)  
Australia C-Tick (Australia/New Zealand)  
VCCI (Japan)  
Emissions:  
FCC Part 15 Class A  
Industry Canada ICES-003 Class A  
VCCI Class A  
CISPR 22 Class A  
GR-1089 Issue 6  
EN 55022  
Immunity (EMC):  
CISPR 24  
EN 55024  
GR-1089 Issue 6  
EN 300 386  
Power  
ETSI EN 300 132  
Safety  
EN 60950-1  
CAN/CSA C22.2 No. 60950-1-07  
UL 60950-1 2nd Ed  
Environmental:  
RoHS2 Directive (2011/65/EU)  
WEEE 2002/96/EC

---

## Environmental Characteristics

GR-63-CORE, Issue 4 – NEBS Level 3  
GR-1089 Issue 6 – NEBS Level 3  
GR-3108 Issue 2 Network Equipment in the Outside Plant (OSP) Class 2  
ETSI 300 019 Class 1.2, 2.2, 3.2  
Operating Temperature:  
-40°F to +149°F (-40°C to +65°C)  
Storage Temperature:  
-40°F to +158°F (-40°C to +70°C)  
Relative Humidity:  
5% to 90% (non-condensing)

---

## Physical Dimensions

Dimensions:  
17.5" (W) x 9.9" (D) x 1.75" (H);  
444mm (W) x 252mm (D) x 44mm (H)  
Weight:  
11.0 lbs; 5.0 kg

\* Denotes features available in a future release

---

Ciena may from time to time make changes to the products or specifications contained herein without notice. Copyright © 2013 Ciena® Corporation. All rights reserved. DS251A4 9.2013