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DATA SHEET

3938vi

Service Virtualization Switch

Ciena's 3938vi Service Virtualization Switch is a compact, smart CPE platform that delivers 10GbE service capability with Virtual Network Function (VNF) integration.

Virtualization enables agility and scalability that facilitates transformation of networks and the services they provide. The 3938vi enables this transformation by hosting multiple VNFs that in turn allow creation of a portfolio of value-added, carrier-managed services. The 3938vi is optimized for compact, high-performance Ethernet service delivery, including 10 Gb/s MEF CE2.0 services that require flexible rollout of virtual functions such as encryption, WAN optimization, and virtual enterprise router functionality in a 56G non-blocking architecture.

The 3938vi is a carrier-grade VNF host based on the Service-Aware Operating System (SAOS) used in all of Ciena's packet switches, providing operational efficiency and consistent system attributes. SAOS delivers benefits across all Ethernet access and aggregation 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
- MEF CE 2.0-compliant Ethernet service offerings for E-Line, E-LAN, E-Tree, and E-Access port-based and VLAN based variants

Features and Benefits

- Offers optimized VNF host for enterprise Customer Premises Equipment (CPE) deployment
- Features low-footprint packaging in a non-blocking architecture with:
  - Two 1GE/10GE RJ-45 ports
  - Two 1GE/10GE SFP+ ports
  - Eight 100M/1GE SFP ports
  - Eight 10/100/1000M RJ-45 ports
- Integrates an open x86 server for support of VNFs from Ciena or third-party developers, creating infinite opportunities for value-added services
- Offers dual AC power in an efficient, 1RU package
- Supports Zero-Touch Provisioning (ZTP) to minimize OPEX and accelerate service turn-up while providing line-rate, built-in service activation testing
- Complies with MEF CE2.0 specifications for E-Line, E-LAN, E-Tree, and E-Access services
- Includes on-board performance benchmark testing capabilities for end-to-end SLA verification
- Employs hardware-assisted OAM capabilities for comprehensive performance and fault management
- Features stringent clocking/synchronization support via BITS, Synch-E, or 1588v2 with external sync inputs

VNF Host Functionality

With the technology shift toward virtualized functions, the delivery model of these functions is becoming more fluid. Service providers have a new value-creation opportunity to roll out these key network functions to the edge of the network, often at the customer premises. Encryption, firewalls, enterprise routing tasks, and WAN optimization have been recognized as far more cost-effective if integrated into a virtual platform that avoids 'sheet metal' dedicated to each. This creates an opportunity for service providers to rapidly roll out new services to meet enterprise customer needs while benefiting from an improved cost model. Service providers can thus differentiate their service offerings, improving average revenue per user, minimizing churn, attracting new customers, and increasing their overall revenue through new partnerships.

Leveraging Consumption-based On-demand Services
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Ciena's 3938vi serves as a smart CPE for these deployments and complements other hosting capabilities offered in the central office, data center, or cloud deployments. In addition, future functions, some not even imagined yet, will be easily deployable with minimal intervention.

Ciena's Blue Planet software delivers carrier-grade NFV orchestration capabilities for instantiating, managing, and chaining VNFs. Blue Planet leverages an open and vendor-agnostic approach that allows network operators to use the VNFs and streamline the definition, creation, deployment, and ongoing management of innovative NFV-based services.

Extensive Carrier Ethernet Transport Options

The 3938vi provides unmatched flexibility to address multiple applications, networking models, and deployment environments without sacrificing service capabilities.

The 3938vi provides a variety of packet transport options for Ethernet services, including G.8032 rings, 802.1q VLANs, 802.1ad provider VLANs (Q-in-Q),and MPLS-TP.

Operators can use combinations of these capabilities to accommodate the specific needs of their packet network deployments. The platform supports interworking between these transport options via a sophisticated and scalable virtual switching architecture, leading to complete service flexibility and optimal utilization of network resources. With an extensive set of MPLS features, the solution also supports resilient L2VPNs and enables service providers to offer connection-oriented MPLS-TP-based services on metro networks, extending the functionality and scalability of existing MPLS networks to accommodate the behavior and operational practices of traditional transport networks.

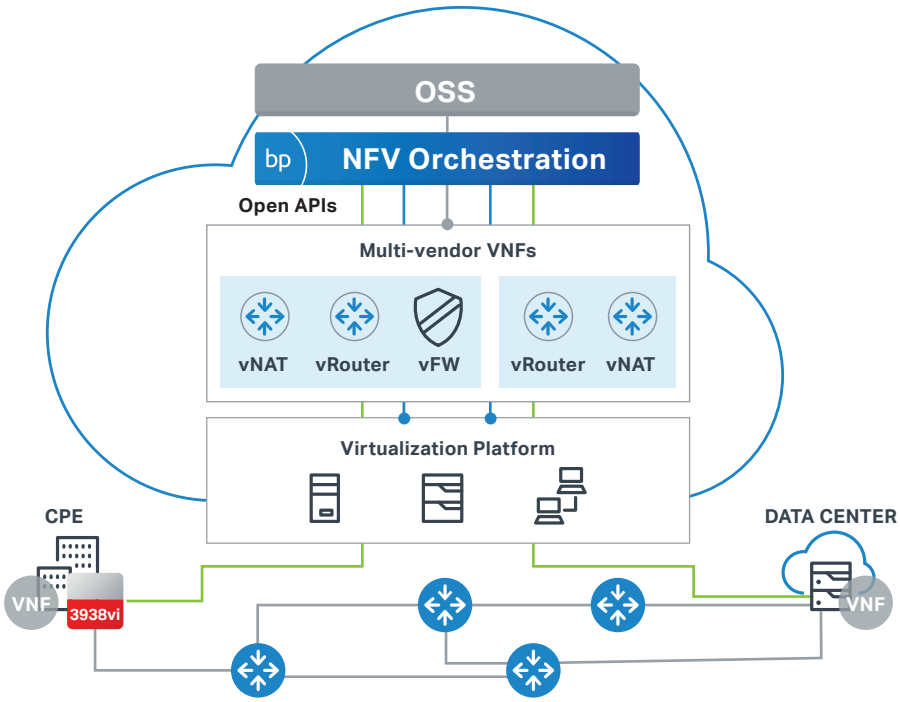

Figure 1. Blue Planet NFV Orchestration

Key protocol capabilities include:

- MPLS Pseudowire Emulation Edge-to-Edge (PWE3), which supports MPLS Virtual Private Wire Services (VPWS)
- Virtual Private LAN Services (VPLS) and Hierarchical-VPLS (H-VPLS) supporting L2VPNs
- MPLS label edge router functionality, enabling application as a VPLS/H-VPLS Provider Edge switch and an H-VPLS MTU-s customer edge switch
- Dynamic MPLS control plane, including Label Distribution Protocol (LDP) for VC signaling; OSPF-TE and IS-IS-TE for MPLS Tunnel Routes; and RSVP-TE for Label Switched Path (LSP) establishment

- MPLS-TP static bidirectional co-routed LSPs for deterministic traffic paths, with centralized service provisioning via Ciena's OneControl Unified Management System

- MPLS OAM capabilities, including LSP Ping and LSP traceroute, with support for MPLS-TP in-band GAL/GACH, and AIS/LDI enhanced fault detection

The design of the 3938vi also provides flexibility to enable deployment in a wide range of physical operating environments, supporting:

- Wide temperature range (0°C to +40°C)

- Fixed AC power options for high MTBF

Zero-Touch Provisioning

Ciena's ZTP simplifies system turn-up and enables device deployment, service turn-up, and Service Level Agreement (SLA) performance testing to be run from the Network Operations Center (NOC). This efficiency dramatically lowers OPEX, eliminating the need for on-site personnel or adjunct test equipment and ensuring consistent, reproducible test reports ready for immediate transmission to the customer for service acceptance. Operators can ramp service roll-outs faster, and at lower cost, because the minimized training requirement permits use of a wider pool of technicians.

The 3938vi includes a hardware engine to provide RFC2544 and Y.1564 performance benchmark testing, enabling full line-rate traffic measurements end-to-end across the Ethernet virtual circuit. This ability dramatically lowers OPEX by eliminating the need for on-site personnel or expensive test gear. This approach also improves end-customer satisfaction by enabling NOC personnel to proactively respond to network events and increasing performance visibility for end-customer SLA reporting.

Fine-grained SLA Monitoring and Enforcement

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

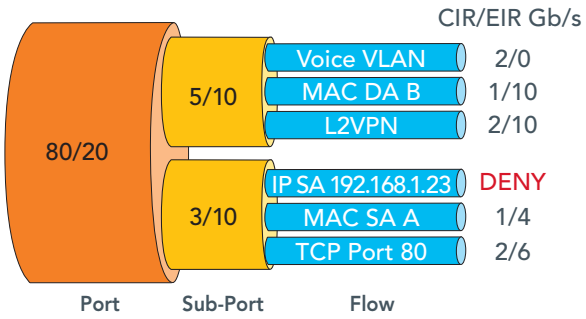

Figure 2. Granular classification and SLA enforcement

The 3938vi 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.

Ciena's portfolio incorporates an extensive Operations, Administration, and Maintenance (OAM) feature suite providing comprehensive link, service, and network monitoring and performance metrics.

The 3938vi's OAM features include:

- ITU-T Y.1731 performance monitoring for delay, jitter, and loss with hardware-assisted performance

- IEEE 802.1ag Connectivity Fault Management (CFM) with hardware-assisted performance

- IEEE 802. 3ah Ethernet in the First Mile (EFM)

- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)

- IETF RFC 5618 TWAMP sender and responder for L3 SLA Monitoring

- MPLS/MPLS-TP OAM suite (LSP ping, traceroute, etc.)

- Full line-rate, built-in RFC 2544/ITU-T Y.1564 performance benchmark test generation and reflection

Synchronization and Timing Distribution

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. Provisioning of accurate frequency, phase, or time references from the network is also beginning to emerge as a service in its own right. The 3938vi 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 for 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

Learn more about our
Packet Networking solution

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. 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, operators can rapidly deploy service offerings that cut across domains 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 multilayer correlation, facilitating proactive root cause analysis and troubleshooting.

Technical Information

Interfaces

2 x 10G RJ-45 ports
2 x 1/10G SFP+ ports
8x 10/100/1000M RJ-45 ports
8x 100/1000M SFP ports
1 x 10/100/1000M RJ-45 management port
1 x console port (RJ-45, EIA-561)

Ethernet

IEEE 802.3 Ethernet
IEEE 802.3-2008 10-Gigabit Ethernet
IEEE 802.3z Gigabit Ethernet
IEEE 802.3ab 1000Base-T
IEEE 802.3u 100Base-TX
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)
Per-Port MAC learning control
Rapid / Multiple Spanning Tree (RSTP/MSTP)
IEEE 802.3ad Link Aggregation Control Protocol (LACP)
Multi-Chassis LAG active/standby protection
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

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 up to 1GE
ITU-T Y.1564 Ethernet service activation test methodology
RFC 5618 TWAMP responder and receiver
TWAMP sender
TWAMP +/- 1ms timestamp accuracy

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
- IP Precedence and IP-DSCP

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 4,000 ingress meters per-port
Up to 4,000 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

MPLS/VPLS/MPLS-TP

RFC 2205, 3031, 3036, 3985 MPLS pseudowire Emulation Edge-to-Edge (PWE3)
RFC 5654 MPLS-Transport Profile (TP)
- LSP static provisioning
- 1:1 tunnel protection
- LSP BFD via GAL/GAch

MPLS Virtual Private Wire Service (VPWS)
RFC 4762 Virtual Private LAN Service (VPLS) 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
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 re-route signaling
LSP ping & traceroute

Multicast Management

RFC 2236 IGMPv2 snooping
IGMPv3 PDU support
IGMP domains
IGMP message filtering
IGMP inquisitive leave
Broadcast/multicast storm control
Unknown multicast filtering
Well-known protocol forwarding

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
RFC 2866 RADIUS accounting
TACACS + AAA
RFC 2131 DHCP client
RFC 3315 DHCP for IPv6 (DHCPv6)
RFC 6221 Lightweight DHCPv6 relay agent (LDRA)
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 download/upgrade via TFTP, SFTP

Service Security

Common Criteria EAL2 compliant and certified
Egress port restriction
IEEE 802.1X port-based network access control
(RADIUS/MD5)
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

NFV Host Processor

Intel® QuickAssist
8-core processor
16 GB RAM
200 GB SSD memory

Power Requirements

Two built-in redundant power supplies
AC Input: 100V, 240V AC (nominal)
AC Frequency: 50/60 Hz
Maximum Power Input: 150W

Agency Approvals

Agency Marks: NRTL
CE mark
EMC directive (2014/30/EU)
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
CISPR 32 Class A
GR-1089 Issue 6
EN 300 386
EN 55022
EN55032
Immunity (EMC):
CISPR 24
EN 55024
GR-1089 Issue 6
EN 300 386
Power:
ETSI EN 300 132-3
Safety:
EN 60950-1
IEC 60950-1
CAN/CSA C22.2 No. 60950-1-07
ANSI/UL 60950-1 2nd Ed 2007
Environmental:
RoHS2 Directive (2011/65/EU)

Environmental Characteristics

GR-63-CORE, Issue 4 – NEBS Level 3
GR-1089 Issue 6 – NEBS Level 3
ETSI 300 019 Class 1.2, 2.2, 3.2
Operating Temperature:
32°F to +104°F (0°C to +40°C)
Relative Humidity:
5% to 90% (non-condensing)

Physical Characteristics

Dimensions:
17.5" (W) x 16.5" (D) x 1.75"(H);
444mm (W) x 419mm (D) x 44mm (H)
Weight: 15 lbs.; 6.80kg
Mounting: 19" and 23" rack mount
optional wall mount brackets

Ordering Information	
Part Number	**Product Description**
170-3938-900	3938,(2)1G/10G SFP+,(2)100M/1G/10G RJ45,(8)10/100/1000M RJ45,(8)100M/1G SFP,SYNCE,1588V2,(2) AC PS
Software	
Required OS Base System Perpetual Software Licenses	
S70-0029-900	SAOS Advanced Ethernet Perpetual Software License for 3938
Optional OS Applications	
S70-0029-901	SAOS Advanced Oam Perpetual Software License For 3938
S70-0029-902	SAOS Advanced Mpls Application Perpetual Software License for 3938
S70-0029-903	SAOS Advanced Synchronization Perpetual Software License for 3938
S70-0029-904	SAOS Advanced 10G Perpetual Software License for 3938
170-0204-900	SAOS Advanced Security Perpetual Software License for Use with SAOS 6.X
ESM Related	
S70-0030-900	ESM Carrier ED Right to Manage Perpetual Software License for 3938
Cables	
CABL-PW01AU	AC Power Cord, IEC C13, Australia
CABL-PW01CH	AC Power Cord, IEC C13, Switzerland
CABL-PW01EU	AC Power Cord, IEC C13, Europe
CABL-PW01NA	AC Power Cord, IEC C13, North America
CABL-PW01UK	AC Power Cord, IEC C13, United Kingdom
CABL-PW01UN	AC Power Cord, C13, Universal
170-0044-900	AC Power Cord, IEC C13, 10FT, North America
Mounting and Brackets	
170-0602-903	19 Inches Rack Mount Ears, for Use w/1RU Chassis
170-0603-903	23 Inches Rack Mount Ears, for Use w/1RU Chassis
170-0023-900	Wall Mount Brackets, for Use with 1RU/2RU Chassis

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