Ciena’s 3926m Service Delivery Platform is a compact, smart CPE that delivers gigabit Ethernet service capability with ultimate flexibility for modular, add-on network functions that eliminate unnecessary costs and add service agility.

The device allows the creation of value-added business or mobile backhaul services that combine connectivity with in-demand Virtual Network Functions (VNFs), as well as support for legacy TDM services. The 3926m can address today’s most challenging network scenarios, providing flexibility and future-proof attributes that de-risk business decisions while allowing for fast time to market.

With the use of optional field-replaceable modules, operators can limit the endless upgrade cycles that only add cost and inefficiency to the network infrastructure. Network Functions Virtualization (NFV) enables agility and scalability to facilitate transformation of networks by hosting multiple VNFs at the customer premises or network edge.

A set of x86 Intel-based server modules (low-end, mid-range, and high-end) can host a wide range of functions required at the network edge such as encryption, service activation testing, virtual routing, and firewalls. Sized according to the number and nature of the VNFs, the server modules can accommodate functions that can be chained, remotely provisioned, upgraded, maintained, and managed with no truck rolls. Thus, the 3926m offers a virtually limitless set of service combinations quickly and reliably.

Similarly, a TDM Circuit Emulation module can be field deployed to carry up to 16 DS1 or E1 services where such legacy services are still required. Reliable timing distribution and synchronization eliminate the need to maintain expensive gear simply for transporting these still-valuable, revenue-generating services across the packet network.

Features and Benefits

- Offers 82 Gb/s of non-blocking switching capacity in a compact service demarcation device, running Ciena’s SAOS for advanced OAM and QoS functions
- Low-footprint packaging in a non-blocking architecture with
  - 6 x 1GbE/10GbE SFP+ ports
  - 2 x 100M/1GbE ports
- Allows a field replaceable module for distributed VNF hosting on an Intel x86 server module or for TDM service support of up to 16 DS1/E1 services
- Benefits from Ciena’s Blue Planet MCP multilayer provisioning support for end-to-end network management control and planning
- Allows for orchestration via Ciena’s Blue Planet MDSO or a third-party solution; a truly open platform for integration of best-in-breed software functions
- Supports zero-touch provisioning to minimize OPEX and accelerate service turn-up while providing line-rate, built-in service activation testing
- Hot-swappable AC or DC power supplies with extended temperature support (-40°C to +65°C)
- Complies with MEF CE 2.0 specifications for E-Line, E-LAN, E-Tree, and E-Access services
The 3926m is a carrier-grade platform based on the Service-Aware Operating System (SAOS) used in all Ciena Packet Networking products. SAOS delivers benefits across all Ethernet access and aggregation platforms, with a field-proven and extensive set of features.

**Carrier Ethernet transport options**

The 3926m provides unmatched flexibility to address multiple applications, business models, and deployment environments without sacrificing service capabilities or Quality of Service (QoS). To accomplish this, it employs a variety of packet transport options for Ethernet services, including G.8032 rings, MPLS-TP, 802.1q VLANs, and 802.1ad provider VLANs (Q-in-Q).

<table>
<thead>
<tr>
<th>DS1/E1 TDM Module</th>
<th>Network Interface</th>
<th>16 ports via RJ-48 connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framing</td>
<td>DS1: unframed, super-frame (D4), or extended super frame</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E1: unframed, basic G.704 framed, or G.704 w/CRC-4 multi-frame</td>
<td></td>
</tr>
<tr>
<td>Line Coding</td>
<td>DS1: AMI, BBZS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E1: AMI, HDB3</td>
<td></td>
</tr>
<tr>
<td>Alarms</td>
<td>DS1: AF-PHY-0016.000 compliant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E1: ITU G.703, G.704, G.706, G732</td>
<td></td>
</tr>
</tbody>
</table>

Operators can use combinations of these capabilities to address the specific needs of their packet network deployment. Multi-Chassis Link Aggregation (MC-LAG), G.8032 Ethernet ring protection, or MPLS-TP alternate path capabilities provide redundancy and resilience by addressing single-point-of failure concerns and maintaining high levels of customer satisfaction. The platform supports interworking between these transport options via a flexible and scalable switching architecture, leading to complete service ingenuity and optimal utilization of network resources.

The 3926m is equipped with a single expansion slot capable of receiving a growing selection of field-replaceable modules. The TDM emulation module supports 16x T1/E1 services to support legacy services such as 2G/3G mobile backhaul applications, where legacy DS1s/E1s would be accepted and pseudowire emulation used to transport the TDM signals over the packet-switched network.

NFV server modules are intended to run a variety of VNF applications in small*, medium, and large configurations, using a multi-core Intel Xeon D-1500 processor for VNF hosting and control. Their capacities support multiple VNFs with different performance requirements driven by user demand and targeted cost points.

<table>
<thead>
<tr>
<th>Small*</th>
<th>Medium</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>D-1508</td>
<td>D-1527</td>
</tr>
<tr>
<td>Hyper Threaded Cores</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Core Freq.</td>
<td>2.2GHz</td>
<td>2.2GHz</td>
</tr>
<tr>
<td>RAM</td>
<td>8 GB</td>
<td>16 GB</td>
</tr>
<tr>
<td>SSD</td>
<td>64 GB</td>
<td>120 GB</td>
</tr>
<tr>
<td>Target #VNFs</td>
<td>1</td>
<td>2-3</td>
</tr>
</tbody>
</table>
The platform serves as a smart CPE, complementing other hosting approaches offered in central office, data center, or cloud deployments.

**Distributed NFV Software (optional)**

The server modules can be deployed with or without Ciena’s D-NFVI Software, which addresses key challenges of distributed NFV in a large-scale network, allowing for rapid implementation of the latest advances in NFV technology. The solution provides flexibility in addressing key concerns with scale, security, lifecycle orchestration, vendor lock-in, and cost challenges.

Ciena’s D-NFVI Software comprises three main components:

- Ciena’s Base Virtualization OS includes an environment with kernel, user space, and application runtime framework, as required by the VNFs to be deployed.
- Ciena’s vSwitch is a Data Plane Development Kit (DPDK)-based switch that provides service function chaining as well as Ethernet and OAM functions.
- Ciena’s NFVI Agent allows operators to configure and chain VNFs by means of a NETCONF/YANG API.

**Secure zero-touch provisioning**

Ciena’s Zero-Touch Provisioning 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. This efficiency can significantly lower OPEX, eliminating the need for on-site personnel or adjunct test equipment and ensuring consistent, reproducible test reports made available to the end-user. Operators can ramp service roll-outs faster, and at lower cost, as the minimized training requirement permits use of a wider pool of technicians.

**Fine-grained SLA monitoring and enforcement**

The 3926m includes a hardware engine to provide RFC2544 and Y.1564 service activation testing, enabling line-rate traffic measurements end-to-end across the Ethernet virtual circuit. This approach can improve end-customer satisfaction, enabling operations personnel to proactively respond to network events and increasing performance visibility for end-customer SLA reporting.
As end-customer applications become increasingly dependent on tight SLA guarantees, successful operators need to deliver advanced QoS offerings and accurately monitor the health and performance of those services.

The 3926m implements Hierarchical QoS (HQoS) 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.

**Comprehensive OAM functions**

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

The 3926m'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
- Full line-rate, built-in RFC 2544/ITU-T Y.1564 performance benchmark test generation and reflection

**Simplified multilayer management and control**

Ciena’s Blue Planet Manage, Control, and Plan (MCP) software 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 to the network from the photonic to the packet, network operations are simple, secure, and highly cost-effective.

With the addition of Blue Planet Multi-Domain Service Orchestration (MDSO) capabilities, operators can leverage an advanced software architecture and open design concept to deliver a single comprehensive platform that can be tailored to meet customers’ SDN, NFV, and service orchestration use cases. These can be deployed across multi-vendor and multi-domain environments and scaled on demand. The result is a dramatic transformation of how services are delivered and how networks are operated.

**Flexible deployment options**

The design of the 3926m also provides flexibility to enable deployment in a wide range of physical operating environments supporting:

- Extended temperature range (-40°C to +65°C)
- Hot-swappable dual power supply options for higher reliability with support for 110/220 Universal AC, -24, +24 and -48 VDC mobility and telecoms powering and 125 VDC smart grid power
- Timing distribution and synchronization
Technical Information

Interfaces
- 6 x 1G/10G SFP+ ports
- 2 x 100M/1G SFP ports
- 16 x DS1/E1 UNI
- 1 x RJ-45 sync input/output port
- 2 x SMB sync input/output ports
- 1 x 10/100/1000M RJ-45 mgmt port
- 1 x serial console (RJ-45, EIA-561)
- USB 2.0

Ethernet
- IEEE 802.3 Ethernet
- IEEE 802.3u Fast Ethernet
- IEEE 802.3-2008 10-Gigabit Ethernet
- IEEE 802.3ab 1000Base-T via copper SFP
- IEEE 802.1ad Provider Bridging (Q-in-Q) VLAN full S-VLAN range
- IEEE 802.1D MAC Bridges
- IEEE 802.1p Class of Service (CoS) prioritization
- IEEE 802.1Q VLANs
- IEEE 802.3ad Link Aggregation Control Protocol (LACP)
- Hierarchical Quality of Service (HQoS) including Ingress Metering/Egress shaping
- Layer 2 Control Frame Tunneling
- Link Aggregation (LAG): Active/Active; Active/ Standby
- Multi-chassis LAG (MC-LAG) active/standby
- Jumbo frames to 9216 bytes
- MEF 10.2 Egress Bandwidth Shaping per EVC per CoS
- MEF 10.3 Excess/Uncoupled Bandwidth Sharing (Token Cascading)
- MEF 10.3/35.1 Performance Monitoring KPIs
- Per-VLAN MAC Learning Control
- Private Forwarding Groups
- VLAN tunneling (Q-in-Q) for Transparent LAN Services (TLS)
- MSTP/RSTP

MEF CE 2.0 Compliance
- 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 802.1aq Connectivity Fault Management (CFM)

IEEE 802.3ah EFM Link-fault OAM
- ITU-T Y.1564 Ethernet Service Activation Test Methodology
- Generation and Reflection at 10GbE
- RFC 2544 Benchmarking Methodology for Network Interconnect Devices
- ITU-T Y.1731 Performance Monitoring (SLM, DM)
- Y.1731 Client Signal Fail (CSF)
- RFC 5618 TWAMP Responder and Receiver TWAMP Sender
- Dying Gasp with Syslog and SNMP Traps

Synchronization
- ITU-T G.8262 Synchronous Ethernet EEC
- ITU-T G.8264 for SyncE ESMC/SSM
- ITU-T G.781
- GR-1244
- ITU-T G.813
- ITU-T G.823/G.824 Stratum 3E oscillator
- External Timing Interfaces:
  - BITS in or out (1.544Mb/s, 2.048MHz and 2 Mb/s)
  - GPS in or out (1.544MHz, 2.048MHz, and 10MHz)
  - 1pps and ToD in or out (NMEA 0183, MSTS)
- Line Timing Interfaces:
  - 1GbE/10GbE In and Out

Networking Protocols
- Alarm Indication Signaling (AIS) with Link Down Indication (LDI) and Remote Defect Indication (RDI)
- Automatic Pseudowire Reversion
- ITU-T G.8032 v1, v2, v3 Ethernet Ring Protection Switching
- Layer 2 Control Frame Tunneling over MPLS Virtual Circuits
- MPLS Label Switch Path (LSP) Tunnel Groups
- MPLS Label Switch Path (LSP) Tunnel
- 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 Tunneling
- RFC 3630 OSPF-TE
- RFC 4447 Pseudowire Setup & Maintenance using Label Distribution Protocol (LDP)
- RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks
- 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 5554 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
- DHCPv4 Relay Agent with Option 82
- G.8032/IGMP interworking
- IGMP over MPLS-TP
- IGMPv3 with SSM

Agency Approvals
- Australia RCM (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, 3.2
- GR-1089 Issue 6 – NEBS Level 3
- GR-63-CORE, Issue 4 – NEBS Level 3, Zone 4
- Earthquake
- NRTL (NA)
- VCCI (Japan)
- NOM (Mexico)

Network Management
- Alarm Management & Monitoring Configuration
- Comprehensive Management via 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)
Technical Information

Network Management (Continued)
- 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
- Access Control Lists (ACLs) on data ports and management communication
- Broadcast Containment
- Egress Port Restriction
- Hardware-based DOS Attack Prevention
- Layer 2, 3, 4 Protocol Filtering
- User Access Rights

Power Requirements
- DC Input: -24, +24, -48 VDC (nom)
- DC max power consumption 90W
- AC Input: 100V, 240V AC (nom)
- AC max power consumption 90W

Physical Characteristics
- Dimensions: 17.5” (W) x 9.9” (D) x 1.75” (H);
  444mm (W) x 252mm (D) x 44mm (H)
- Environmental Characteristics
  - NEBS Level 3 compliant
  - ETSI Class A compliant
  - 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)

Standards Compliance

Emissions:
- CISPR 22 Class A
- CISPR 32 Class A
- EN 300 386
- 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)
- WEEE 2002/96/EC

Immunity (EMC):
- GR-1089 Issue 6
- CISPR 24
- EN 300 386
- EN 55024

Power:
- ETSI EN 300 132-2
- EN 300 132-3

Safety:
- ANSI/UL 60950-1 2nd edition 2007
- CAN/CSA C22.2 No. 60950-1-07
- EN 60950-1

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>170-0013-900</td>
<td>3930/3932/5142, DC PLUGGABLE POWER SUPPLY, WIDE RANGE 24/48V</td>
</tr>
<tr>
<td>170-0014-900</td>
<td>3930/3932/5142, AC PLUGGABLE POWER SUPPLY, WIDE RANGE 120/240V</td>
</tr>
</tbody>
</table>

Field Replaceable Server Cards

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>170-0131-900</td>
<td>3926 (16) DS1/E1 TDM MODULE</td>
</tr>
<tr>
<td>170-0121-900*</td>
<td>Small NFV Compute Server FRU - 2 Core</td>
</tr>
<tr>
<td>170-0122-900</td>
<td>Medium NFV Compute Server FRU - 4 Core</td>
</tr>
<tr>
<td>170-0128-900</td>
<td>Large NFV Compute Server FRU - 8 Core</td>
</tr>
</tbody>
</table>

Software

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>S70-0042-900</td>
<td>SAOS ADVANCED ETHERNET &amp; OAM PERPETUAL SOFTWARE LICENSE FOR 3926M</td>
</tr>
<tr>
<td>S70-0033-902</td>
<td>SAOS ADVANCED MPLS PERPETUAL SOFTWARE LICENSE FOR 3926M</td>
</tr>
<tr>
<td>S70-0042-903</td>
<td>SAOS ADVANCED SYNCHRONIZATION PERPETUAL SOFTWARE LICENSE FOR 3926M</td>
</tr>
<tr>
<td>S70-0042-905</td>
<td>SAOS ADVANCED 10G PERPETUAL SOFTWARE LICENSE FOR 3926M</td>
</tr>
<tr>
<td>S70-0042-906</td>
<td>SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR 3926M</td>
</tr>
<tr>
<td>S70-0043-900</td>
<td>ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3926M</td>
</tr>
</tbody>
</table>

*Small NFV server module is not yet generally available