Experience. Outcomes.

DATA SHEET

3926m

Service Delivery Platform

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

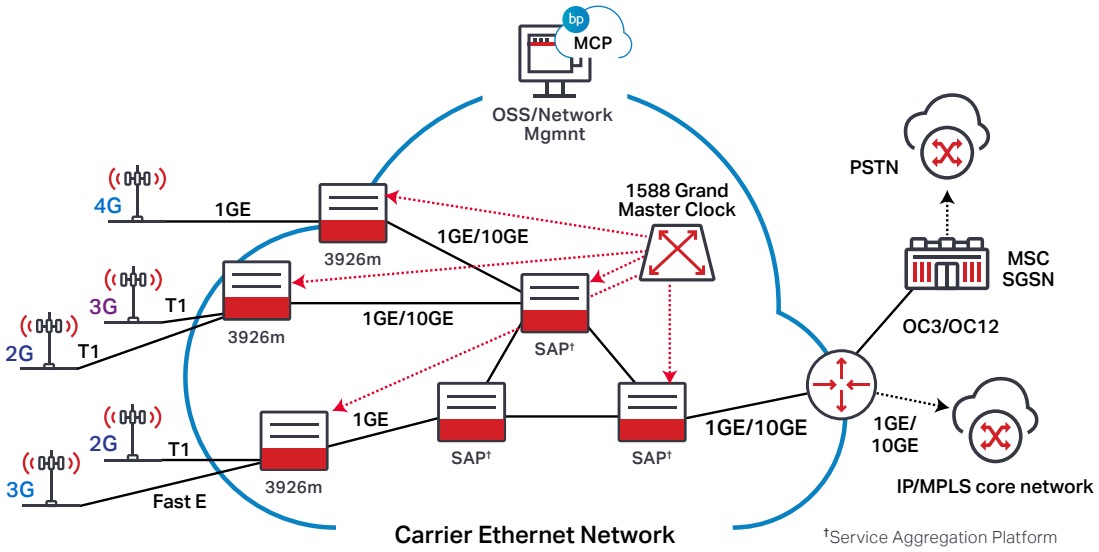

Figure 1. Sample mobile backhaul network

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).

DS1/E1 TDM Module	
Network Interface	16 ports via RJ-48 connector
Framing	DS1: unframed, super-frame (D4), or extended super frame E1: unframed, basic G.704 framed, or G.704 w/CRC-4 multi-frame
Line Coding	DS1: AMI, B8ZS E1: AMI, HDB3
Alarms	DS1: AF-PHY-0016.000 compliant E1: ITU G.703, G.704, G.706, G732

Figure 2. TDM module detail

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.

	Small*	Medium	Large
Processor	D-1508	D-1527	D-1548
Hyper Threaded Cores	2	4	8
Core Freq.	2.2GHz	2.2GHz	2.2GHz
RAM	8 GB	16 GB	32 GB
SSD	64 GB	120 GB	480GB
Target #VNFs	1	2-3	3+

Figure 3. Field-replaceable server modules

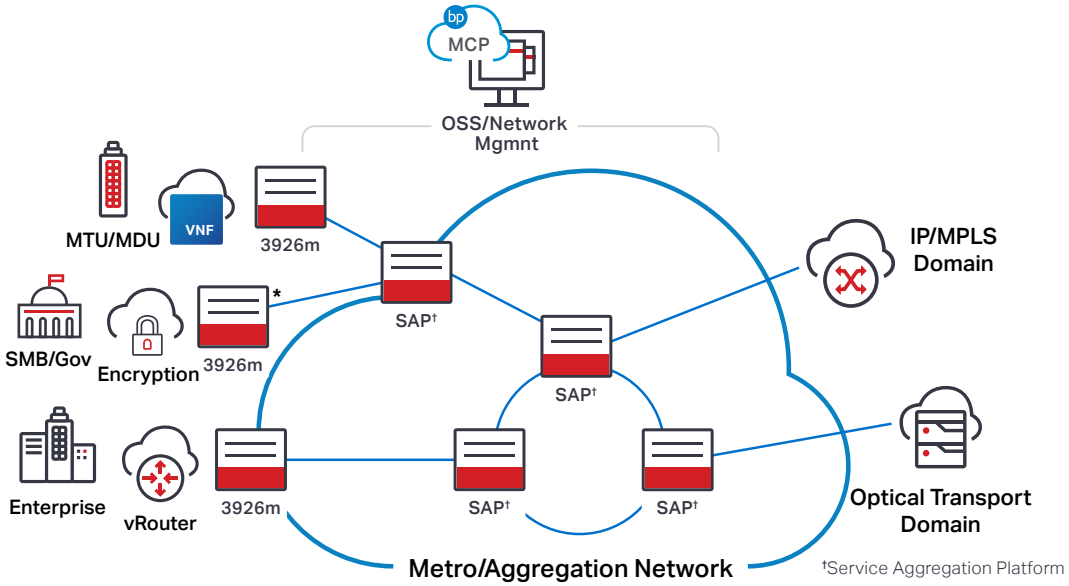

Figure 4. Typical D-NFV deployment with 3926m as smart CPE

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.

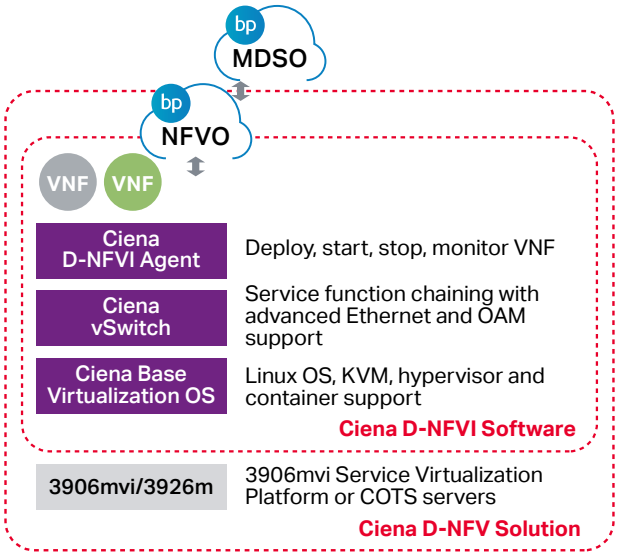

Figure 5. D-NFVI solution architecture

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 802.3z Gigabit 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 802.1ag 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
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 (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
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 Input: -125 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
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)

Ordering Information

Part Number	Description
170-3926-900	3926, (2)100M/1G SFP,(6)10/1G SFP+,(1)OPTION SLOT,EXTENDED TEMPERATURE,(2)SLOTS AC/DC PWR SUP
170-0013-900	3930/3932/5142, DC PLUGGABLE POWER SUPPLY, WIDE RANGE 24/48V
170-0014-900	3930/3932/5142, AC PLUGGABLE POWER SUPPLY, WIDE RANGE 120/240V
Field Replaceable Server Cards	
170-0131-900	3926 (16) DS1/E1 TDM MODULE
170-0121-900*	Small NFV Compute Server FRU - 2 Core
170-0122-900	Medium NFV Compute Server FRU - 4 Core
170-0128-900	Large NFV Compute Server FRU – 8 Core
Software	
S70-0042-900	SAOS ADVANCED ETHERNET & OAM PERPETUAL SOFTWARE LICENSE FOR 3926M
S70-0033-902	SAOS ADVANCED MPLS PERPETUAL SOFTWARE LICENSE FOR 3926M
S70-0042-903	SAOS ADVANCED SYNCHRONIZATION PERPETUAL SOFTWARE LICENSE FOR 3926M
S70-0042-905	SAOS ADVANCED 10G PERPETUAL SOFTWARE LICENSE FOR 3926M
S70-0042-906	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR 3926M
S70-0043-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3926M

*Small NFV server module is not yet generally available