

Coriant® Packet Optical Transport Solutions

Delivering End-to-end Packet Switching for Network Innovation and Seamless Transformation

The Coriant® Packet Optical Transport Solutions (POTS) offer integrated OTN switching and ROADM technologies with feature-rich WDM interfaces and a packet layer for seamless end-to-end service transport. The solutions efficiently meet the evolving demands of end-users for more bandwidth driven by mobile, video, cloud, and data center interconnect services. As shown in Figure 1, Coriant provides industry leading POTS with a full portfolio of products from access to core that are widely deployed in both large and small operator networks across the globe. This datasheet focuses on the packet aspect of the packet optical solution, which extends network capabilities with new functionalities to support a wide variety of available services and addresses the need for increased bandwidth with more flexibility, agility, scalability, and reliability in key applications, including Ethernet and cloud connect services, fixed broadband aggregation, mobile backhaul, and SONET/SDH migration. The Coriant POTS deliver packet-based granularity, oversubscription capabilities, and numerous per-flow traffic management options that enable service providers to cost effectively maintain high performance network requirements.

CORIAN PACKET OPTICAL SOLUTIONS PORTFOLIO

- **Coriant® 7090 Packet Transport Solutions** – The 7090 Series provides innovative, right-sized platforms including the 7090-M/CEM for MPLS-TP and 7090-CE for Carrier Ethernet (CE) to meet a wide variety of service needs from access to metro/regional networks. These solutions support switching and transport services designed to extend packet networks to the customer premises for any size packet transport applications.
- **Coriant® 7100 Packet Optical Transport Solutions** – The 7100 Series offers compact packet optical transport platforms with the Coriant® Pluggable Optical Layer, broadcast and select ROADM-on-a-blade, high-density cost optimized 10G/100G, and fabricless switching for SONET/SDH, OTN, and packet. Up to 1.2 Tbps of packet switching interfaces, including MEF-compliant Ethernet types, are supported per shelf including support for 100 GbE ports (grey or coherent DWDM).
- **Coriant® mTera® Universal Transport Platform** – The mTera UTP delivers an innovative universal switching concept along with route and select ROADM-on-a-blade that can groom traffic at any layer and direction irrespective of the physical interface. The mTera 14-slot shelf supports up to 7 Tbps of universal switching capacity, and the mTera 8-slot shelf supports up to 4 Tbps of universal switching capacity. Both shelves support sub-10G, 10G, 100G, and Coriant CloudWave™ Optics enabled flexi-rate (100G, 150G, and 200G) interfaces. The 14-slot chassis supports 12 Tbps of switching capacity with the dual shelf configuration.

BENEFITS OF THE CORIAN PACKET OPTICAL TRANSPORT SOLUTIONS

- **Provides** MEF CE 2.0 certified solutions including the first solution to achieve MEF CE 2.0 certified 100G for the mTera UTP OSM-2C and 7100 Series PSM-2C modules
- **Includes** a variety of form factors and port mixes, flexible system modularity, and support for Smart SFPs with multiple nodes for industry-leading next-generation packet optical networks
- **Offers** an advanced universal switching core providing agnostic technology for the network migration and transformation of legacy infrastructure to packet/OTN/WDM including numerous interfaces and the ability to map any packet interface to an ODUk/ODUflex on OTN ports or toward a native MPLS-TP circuit
- **Delivers** a cloud-scale solution that ranges from on-ramp devices with a GE uplink to a 10GE/100GE uplink, scalable from 1 Gbps up to 12 Tbps, providing future-proof investment protection to address the growth of cloud services
- **Enables** multi-layer and multi-vendor network control with the Coriant Transcend™ SDN Solution that extends the opportunity for network segmentation to serve network applications for next-generation service innovation
- **Differentiates** with the end-to-end control of TNMS architecture in a true multi-platform, state-of-the-art solution supporting deployments in different types of operating systems
- **Speeds** installation and flexible service provisioning for efficient use of network resources across layers leading to increased revenues

- **Coriant® Transport Network Management System (TNMS)** – TNMS is a single multi-layer network management system offering pay-as-you-grow flexibility, FCAPS functionality, and Zero Touch Provisioning (ZTP). With end-to-end service discovery, provisioning, and troubleshooting through consistent tools and workflows across both packet and optical transport technologies, TNMS gives network operators the tools to simplify provisioning and efficiently control a broad range of TDM and packet-based end-user services. Fast and efficient operational procedures in parallel with service lifecycle support from planning to maintenance accelerate time-to-service deployment and increase service competitiveness.
- **Coriant Transcend™ SDN Solution** – The Coriant Transcend™ SDN Solution is a centralized platform providing end-to-end service control and spanning multiple transport layer technologies including the optical DWDM layer, electrical ODU switching layer, Carrier Ethernet (CE), and MPLS-TP based packet layers. Coriant Transcend™ SDN combines the benefits of an open, programmable, and automated SDN architecture for end-to-end network control along with network management (NMS) and network planning and optimization tools. This technology enables efficient development of applications to bring new revenue-generating opportunities to market quickly and empowers more efficient network utilization with its fast and flexible service provisioning. The programmable capability of Coriant Transcend™ SDN offers a wide range of use cases, including bandwidth on demand, network slicing or defragmentation, and application based forwarding, which enable the end-user to reduce the overall TCO and ensure reliability with future-thinking innovation.

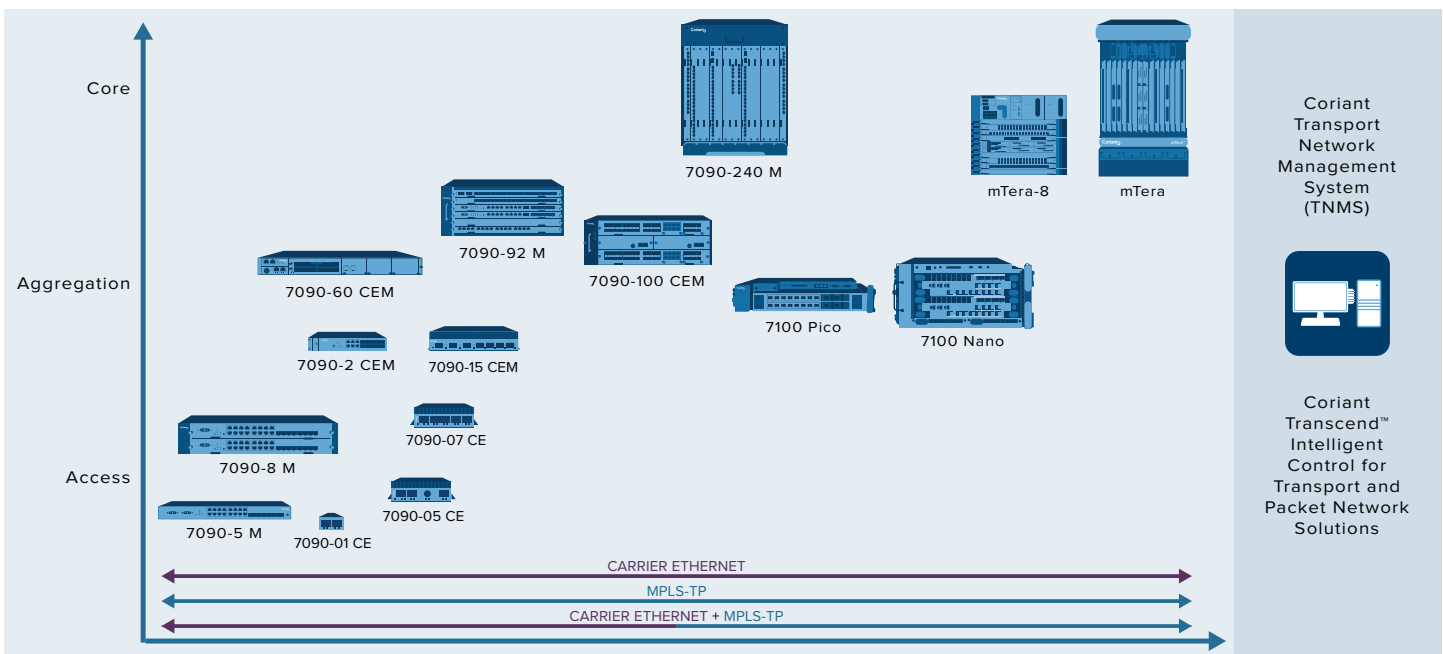


Figure 1: Coriant POTS Portfolio

INTEGRATING SOLUTIONS SEAMLESSLY FOR THE MOST EFFICIENT NETWORK MONETIZATION

Coriant offers future-proof solutions with integrated MPLS-TP capability (7090-M/CEM, 7100 Series, and mTera UTP in Figure 2) and Carrier Ethernet capability (7090-CE, 7100 Series, and mTera UTP in Figure 3) with optical transport capabilities (7100 Series and mTera UTP). The switching capacity of Coriant POTS have evolved from Mbps in access to Tbps in core. On the optical side, the DWDM per channel capacity of the mTera UTP, Coriant® 7100 Nano™ Packet Optical Transport Platform, and Coriant® 7100 Pico™ Packet Optical Transport Platform has evolved from 10G to 100G and beyond with the adoption of coherent receivers, polarization multiplexing, and advanced modulation including QPSK, 8QAM, and 16QAM. In addition to these features, the ROADM configuration has evolved from ROADM with fixed add/drop to flexi-grid and colorless directionless ROADM providing new levels of optical layer flexibility for the mTera UTP, 7100 Nano, and 7100 Pico.

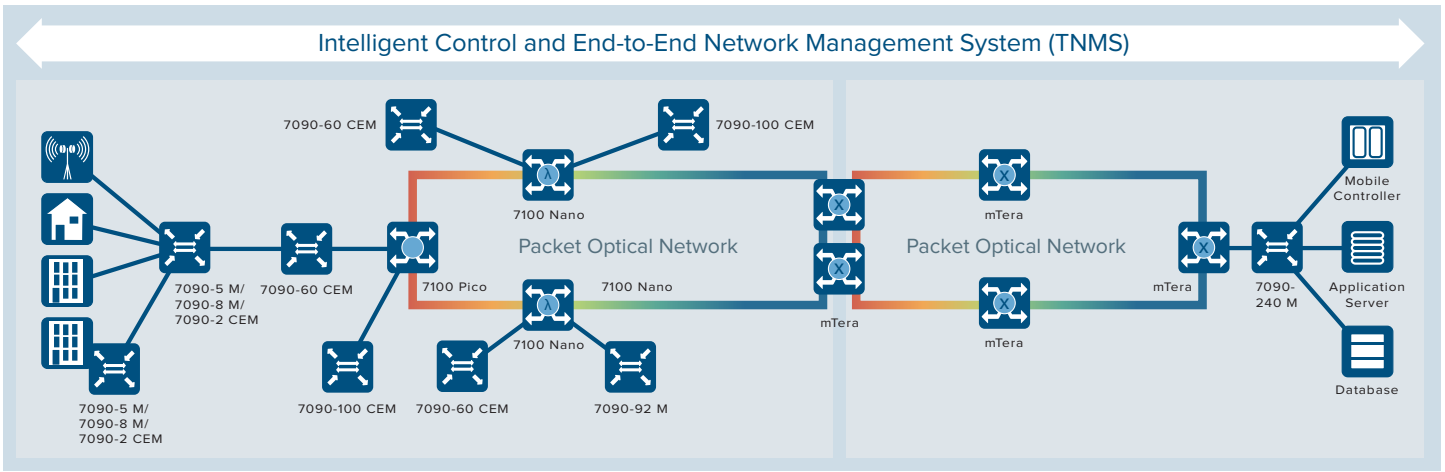


Figure 2: MPLS-TP End-to-end Packet Transport Scenario

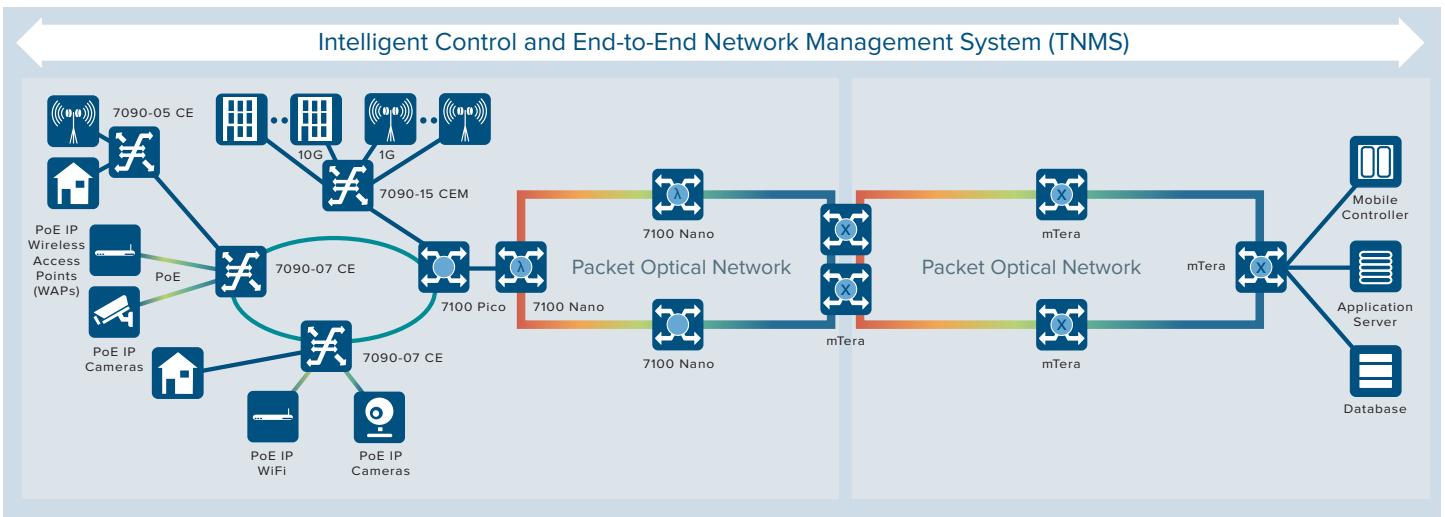


Figure 3: Carrier Ethernet End-to-end Packet Transport Scenario

FOUNDATIONAL	CARRIER ETHERNET 7090-CE 7100 mTera TNMS	MPLS-TP 7090-M 7100 mTera TNMS	CE + MPLS-TP 7090-CE 7100 mTera TNMS
Platforms	<ul style="list-style-type: none"> 7090-CE + 7100 + mTera 	<ul style="list-style-type: none"> 7090-M + 7100 + mTera 	<ul style="list-style-type: none"> 7090-CE + 7100 + mTera
Forwarding Plane	<ul style="list-style-type: none"> VLAN-based Provider Bridging 	<ul style="list-style-type: none"> PW, LSP, Static VPLS 	<ul style="list-style-type: none"> VLAN bridging, VLANXC, PW, LSP, Static VPLS
Service Types	<ul style="list-style-type: none"> Support all service types: E-Line, E-LAN, E-Tree, E-Access 	<ul style="list-style-type: none"> Support all service types: E-Line, E-LAN, E-Tree, E-Access 	<ul style="list-style-type: none"> Support all service types: E-Line, E-LAN, E-Tree, E-Access
OAM FM	<ul style="list-style-type: none"> 802.1ag/Y.1731 CC/LT/LB 	<ul style="list-style-type: none"> 802.1ag/Y.1731 CC/LT/LB PW OAM, LSP OAM 	<ul style="list-style-type: none"> 802.1ag/Y.1731 CC/LT/LB PW OAM, LSP OAM
OAM PM / SLA	<ul style="list-style-type: none"> Y.1731 PM 	<ul style="list-style-type: none"> Y.1731 PM 	<ul style="list-style-type: none"> Y.1731 PM
Protection	<ul style="list-style-type: none"> G.8031/RVT/G.8032 	<ul style="list-style-type: none"> G.8131 LSP 1:1/RMT 	<ul style="list-style-type: none"> G.8032/G.8131 LSP 1:1
Service Management	<ul style="list-style-type: none"> TNMS 	<ul style="list-style-type: none"> TNMS 	<ul style="list-style-type: none"> TNMS
MEF Certifications	<ul style="list-style-type: none"> Full MEF 2.0 certified 	<ul style="list-style-type: none"> Full MEF 2.0 certified 	<ul style="list-style-type: none"> Full MEF 2.0 certified

Figure 4: End-to-end Packet Solution Functional Highlights

TECHNICAL SPECIFICATIONS - 7090-CE

Traffic Management

- IEEE 802.1Q VLAN tagging and 802.1ad Q-in-Q VLAN stacking
- Service multiplexing of up to 256 EVCs
- User-configurable Ethernet type
- Ingress and egress traffic management
- CIR/EIR Color Aware “two rates, three colors” bandwidth profiles for ingress rate limiting with hierarchical policing
- Advanced Flow and CoS classification per Port, VLAN ID, PCP, IPv4/IPv6 (TOS/DiffServ) Priority, L2CP, MAC address, IP address, or TCP Port
- Layer 2 Protocol Tunneling (L2PT) to encapsulate STP, VTP, PVST, and CDP protocols
- All ports configurable as UNI or NNI
- Supports up to 10,056 byte frames
- IGMP Snooping per RFC 4541

Interfaces

- SFP and SFP+ transceivers for standard CWDM, DWDM, and Bidi wavelengths

Synchronization

- ITU-T G.8264 Synchronous Ethernet
- IEEE 1588v2 Boundary Clock, Transparent Clock, Slave Clock
- Network Time Protocol (NTP)

Protection and Redundancy

- ITU-T G.8031 Ethernet Linear Protection Switching
- ITU-T G.8032v2 Ethernet Ring

- Protection Switching with multi-ring protection and sub-ring support
- Sub-50 ms failover for G.8031 and G.8032v2
- Link failover 50 ms protection switching
- Rapid Spanning Tree
- Link modes for port-to-port and UNI-to-UNI failure propagation
- LACP LAG, A/A, A/S, and Static

Service OAM and Testing

- 802.3-2008 [3ah] – Ethernet First Mile
- IEEE 802.1ag Maintenance Intermediate Points (MIPs) for fault isolation
- ITU-T Y.1731 End-to-end Performance Monitoring and AIS
- Hardware-based delay and loopback measurement with nanosecond resolution
- Advanced classification and filtering of Layer 1, 2, 3, or 4 subscriber traffic as a EVC or CoS flow
- ITU-T Y.1731 threshold monitoring and threshold crossing alerts
- IEEE 802.3ah Ethernet Link OAM with dying gasp
- RFC 2544 Ethernet Service Activation testing with wirespeed, per flow testing of throughput, latency, jitter, and loss
- ITU-T Y.1564 Ethernet Service Activation testing with multi-flow testing of data rate, latency, jitter, and frame loss
- RFC 2544 and ITU-T Y.1564 test head

- support generation/reception of in-service and out-of-service L2, L3, and L4 frames
- Per-port and per-flow loopback with MAC swap
- Compatible with third-party in-band loopback testing
- Built-in UTP cable tester for troubleshooting through to the customer equipment
- TWAMP Reflector
- Synthetic Loss Measurement, Synthetic Loss Ratio

Network Management

- Built-in UTP cable tester for troubleshooting through to the customer equipment
- Remote management via TELNET, SNMP V1/V2c/V3, SSH, Craft Station, Coriant® 8000 Intelligent Network Manager (INM), and TNMS
- Zero Touch Provisioning (ZTP) (DHCP/TFTP)
- RADIUS
- Syslog
- Link Layer Discovery Protocol (LLDP)
- MEF 30 and 31 Service OAM Fault Management MIBs
- IP Access Control Lists
- 802.1X Port Authentication
- TACACS+
- DHCP Relay with Option 82

TECHNICAL SPECIFICATIONS - 7090-M

TDM CES Interface

- E1/DS1, DS3, STM-1
- Smart SFP STM-1/OC-3
- Smart SFP STM-4/OC-12
- Smart SFP STM-16/OC-48
- Clear channel and channelized OC-3/OC-12

Interfaces

- SFP and SFP+ transceivers for standard CWDM, DWDM, and Bidi wavelengths

Ethernet Functions

- VLAN (IEEE 802.1Q)
- Q-in-Q (IEEE 802.1ad)
- COS (IEEE 802.1P/IEEE 802.1Q)
- 9600 bytes jumbo frame
- VLAN manipulation: stack/switch/strip
- Link aggregation (IEEE 802.3ad)
- Flow control (IEEE 802.3x)

- IGMP snooping (V1/V2/V3)
- RSTP (IEEE 802.1w)
- Link Pass-Through (LPT)

OAM

- Ethernet service OAM (ITU-T Y.1731, IEEE 802.1ag)
- Ethernet link OAM (IEEE 802.3ah)
- MPLS-TP OAM (G.8113.1/G.8113.2)

Quality of Service (QoS) Classification Parameters

- L2: VLAN, PRI, MAC address, TPID
- L3: IP address, DSCP, port number, TOS
- CIR/EIR/CBS/EBS
- WRED
- 8 QoS classes
- Class-based queuing
- SP, DWRR, SP+DWRR
- Color aware and color blind mode

Protection

- LSP 1:1 linear protection
- LSP SNC protection
- LSP ring protection
- Link aggregation (inter and intra board, multi-chassis)
- UNI/NNI LAG 1:1 and load sharing
- Dual-homing/dual-star protection
- STM-1 MSP protection

Synchronization

- External clock 2MHz, 2MBit, 1PPS+TOD
- Synchronization Ethernet (G.8261, G.8262)
- IEEE 1588v2 (TC, OC, BC, TC+OC)

DCN

- In-band and out-band DCN
- OSPF Layer 3 DCN

TECHNICAL SPECIFICATIONS - 7100 Nano, 7100 Pico, mTera UTP

Timing

- Synchronous Ethernet (SyncE)
- IEEE 1588v2 hardware ready

General Features

- Integrated OTN encapsulation with enhanced FEC on 10GE and 100GE ports
- MEF Carrier Ethernet 2.0 Certified Services
- VLAN cross-connect: E-Line, E-LAN, E-Tree
- 802.3 MAC including Auto Negotiation, Flow Control, Link Level OAM, LAG, and RMON
- 802.1Q, 802.1ad with various bridge types

Interfaces

- SFP and SFP+ transceivers for standard CWDM, DWDM, and Bidi wavelengths

Static MPLS-TP Features

- P2P, bidirectional, co-routed LSPs
- Ethernet PW encapsulation (Terminating-PE)

- Multi-segment PWs (Switching-PE)
- LSP switching (P-Router)
- IETF-based LSP fault management (RFC6428, RFC6426)
- 1:1 linear LSP protection (RFC6378, G.8131)
- H-VPLS

Ethernet Protection Features

- 802.3ad LAG: active-active, active-standby modes
- RSTP, MSTP
- G.8031 1:1 linear VLAN protection
- G.8032 Ethernet ring protection

Ethernet OAM Features

- 802.3ah Link OAM
- 802.1ag Ethernet connectivity fault management
 - Continuity Check
 - RDI/AIS
 - Loopback
 - Link trace
- MPLS-TP fault management based on RFC 6427

- Y.1731 AIS and performance management
- Port/VLAN Mirroring
- RFC2544 benchmark test functions
- Link Layer Discovery Protocol (LLDP)
- In-band management VLAN

QoS and Traffic Management Features

- 8 queues per port, 4 queues per logical port (VLAN, LSP)
- Multi-level hierarchical scheduling and shaping
- MEF 10.2-based policing for Ethernet
- Hierarchical policing per MEF 10.3
- RED, WRED, and tail drop congestion avoidance
- WFQ and strict priority
- Performance monitoring on policers and shapers
- Classification based on Port and MAC, L2, L2.5, L3 headers
- P-bit manipulation (mark, override, regeneration)
- RFC 4115 and 2698-based policing

NETWORK ELEMENT SPECIFICATIONS

7090-CE Carrier Ethernet Series

Network Element	Form Factor	Switching Capacity (Gbps)	Maximum UNI/NNI Interface*	Max Power Consumption (W)	Packet Technologies
7090-01 CE	SFP NID	1	1 SFP	1.5	CE
7090-05 CE	<1 RU	3	2 x GE (SFP), 1 x GE (RJ45), 2 x FE (SFP), 2 x FX (RJ45)	18	CE
7090-07 CE	<1 RU	5	5 x GE (SFP), 5 x FE (SFP)	19.2	CE
7090-07 CE POE	<1 RU	5	2 x GE (SFP), 4 x GE (RJ45 POE), 2 x FE (SFP)	102 (3 ports)	CE
7090-15 CE	<1 RU	34	3 x 10GE (SFP+), 7 x GE (SFP), 4 x FE (SFP)	48	CE

* Maximum number of interfaces supported in the specific configuration

7090-M/CEM MPLS-TP Series

Network Element	Form Factor	Switching Capacity (Gbps)	Maximum UNI/NNI Interface*	Max Power Consumption (W)	Packet Technologies
7090-2 CEM	1 RU	14	10 x GE (SFP), 14 x GE (RJ45), 10 x FE (SFP), 14 x FX (RJ45), 2 x STM-1	40	MPLS-TP
7090-2 CEM/C	1 RU		4xGE (SFP) + 4xFE/GE (RJ45) + 4xE1	40	MPLS-TP
7090-2 CEM/B	1 RU		6xGE (SFP) + 8xFE/GE (RJ45)	40	MPLS-TP
7090-5 M	1 RU	5	4 x GE (SFP), 4 x GE (RJ45), 4 x FE (SFP), 4 x FX (RJ45), 16 x E1	33	MPLS-TP
7090- 8 M	2 RU	8	6 x GE (SFP), 6 x GE (RJ45), 8 x FE (SFP), 8 x FX (RJ45), 2 x STM-1, 32 x E1	70	MPLS-TP
7090-60 CEM	1 RU	60	4 x 10GE (SFP+), 30 x GE (SFP), 30 x GE (RJ45), 30 x FE (SFP), 30 x FX (RJ45), 2 x STM-1, 32 x E1	83	MPLS-TP
7090-92 M	3.5 RU	92	10 x 10GE (SFP+), 92 x GE (SFP), 92 x GE (RJ45), 92 x FE (SFP), 92 x FX (RJ45), 16 x STM-1, 32 x E1	320	MPLS-TP
7090-100 CEM (AC/DC)	4 RU	100	16 x 10GE (SFP+), 64 x GE (SFP), 64 x GE (RJ45), 64 x FE (SFP), 64 x FX (RJ45), 16 x STM-1, 64 x E1	210	MPLS-TP
7090-240 M	12.5 RU	240	22 x 10GE (SFP+), 220 x GE (SFP), 220 x GE (RJ45), 220 x FE (SFP), 220 x FX (RJ45), 88 x STM-1, 64 x E1	750	MPLS-TP
7090-240 M-1	12.5 RU	320	28 x 10GE (SFP+), 280 x GE (SFP), 280 x GE (RJ45), 280 x FE (SFP), 280 x FX (RJ45), 112 x STM-1, 64 x E1	920	MPLS-TP

* Maximum number of interfaces supported in the specific configuration

The 7090-M/CEM Series offers support for innovative smart SFP/SFP+ transceivers that provide T1, STM-4, STM-16, and DS3 interfaces.

mTera 14-slot Shelf and mTera 8-slot Shelf Universal Switching Modules

Modules	Form Factor	Switching Capacity (Gbps)	UNI/NNI	Max Power Consumption (W)	Packet Technologies
OSM-1S	Single Slot	40	32 x sub 10G any-rate SFP interfaces	159	MPLS-TP + CE
OSM-2S	Single Slot	200	20 x 10G SFP+	212	MPLS-TP + CE
OSM-2C	Single Slot	200	2 x 100G CFP	210	MPLS-TP + CE
OSM-4F	Single Slot	400	flexi-rate 2x100G/200G	429	MPLS-TP + CE
OSM-4C	Single Slot	400	4 x 100G CFP2-ACO	397	MPLS-TP + CE

7100 Nano/Pico Packet Modules

Modules	Form Factor	Switching Capacity (Gbps)	UNI/NNI	Max Power Consumption (W)	Packet Technologies
PSM-1S	Single Slot	92	4 x SFP+ supporting <ul style="list-style-type: none"> • 10 GbE • OTU2-wrapped 10GbE (G.709 GFEC, G.975.1 I.4 EFEC, or G.975.1 I.7 EFEC) • 88 channel tunable, fixed DWDM, CWDM, grey light 4 x SFP+ supporting <ul style="list-style-type: none"> • 10/100/1000M Ethernet • 10GbE 12 x SFP 1GbE	105	MPLS-TP + CE
PSM-2S	Single Slot	200	4 x SFP+ supporting either 10GE or OTU2 wrapped 10GE, fixed or tunable lasers, 16 x SFP/SFP+ supporting 10/100/1000, 100BASE-FX, GE, or 10GE	100	MPLS-TP + CE
PSM-2C	Single Slot	200	8 x SFP+ supporting either 10GE or OTU2-wrapped 10GE, 2 x SFP/SFP+ supporting 10/100/1000, 100BASE-FX, GE, or 10GE, 1 x CFP supporting 100GE or DWDM OTU4	103	MPLS-TP + CE

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