Infinera®

7090 Series M/CEM Packet Transport Platforms

Scalable MPLS-TP Platform for TDM Migration and Ethernet Services

The Infinera 7090 Series M/CEM Packet Transport Solutions provide MPLS-TP-enabled packet transport addressing a wide range of applications, including TDM migration, Ethernet business services, and mobile backhaul. They can operate as standalone solutions or form part of a solution together with other platforms in the Infinera packet optical portfolio, including the 7100 Packet Optical Transport Solutions, XTM Series Packet Optical Transport Platform, and mTera Universal Transport Platform (UTP), with end-to-end management provided by the Infinera Transcend Network Management System (NMS), as shown in Figure 1.
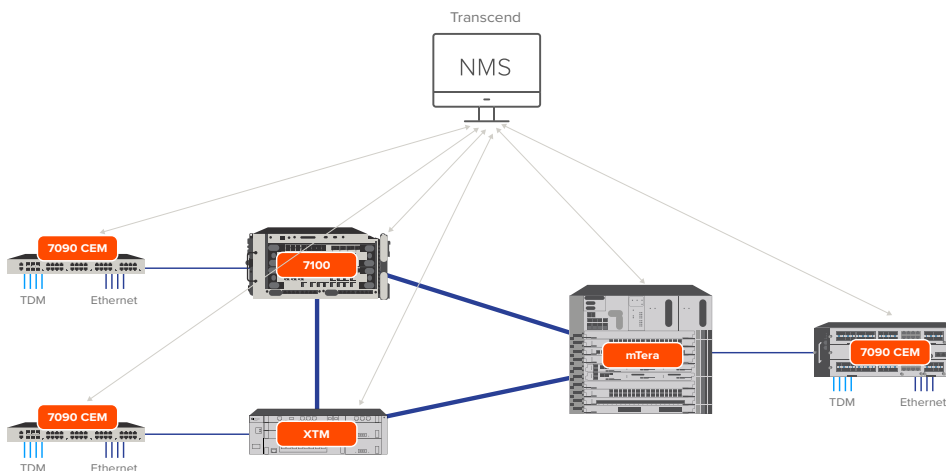

Figure 1: End-to-end packet optical solution: 7090 M/CEM with 7100, XTM, and mTera

BENEFITS OF THE INFINERA 7090 SERIES M/CEM PORTFOLIO

- **Scale** MPLS-TP packet transport from 8 Gb/s to 960 Gb/s with a range of platforms optimized for different network locations and capacity requirements

- **Migrate** a wide range of TDM services to MPLS-TP with support for clear-channel interfaces, aggregated interfaces, and VC-n cross-connection

- **Assure** TDM service quality with Synchronous Ethernet, 1588v2 frequency profile, and a hybrid option that combines Synchronous Ethernet and 1588v2

- **Maximize** Ethernet service revenue with comprehensive quality of service and network protection capabilities

- **Reduce** operational costs and speed service activation with powerful end-to-end packet management enabled by the Infinera Transcend NMS

MPLS-TP-ENABLED PACKET TRANSPORT FROM 8 GB/S TO 960 GB/S

MPLS-TP provides a scalable, transport-oriented option for packet switching. The 7090 Series M/CEM offers a range of platforms with capacities from 8 Gb/s to 960 Gb/s. Comprehensive MPLS-TP support includes static LSPs, single-segment and multi-segment pseudowires, Virtual Private LAN Service (VPLS), and Hierarchical Virtual Private LAN Service (H-VPLS). MPLS-TP OAM includes G.8113.1 and G.8113.2. Additional Ethernet OAM capabilities include Y.1731, 802.3 Link OAM, 802.1 CFM OAM, and RFC 2544 Ethernet service activation testing. MPLS-TP protection features include 1:1 LSP protection, LSP SNC, MPLS-TP ring protection, MPLS-TP dual homing and dual star protection, and both 1:1 single-segment and 1:1 multi-segment pseudowire protection.
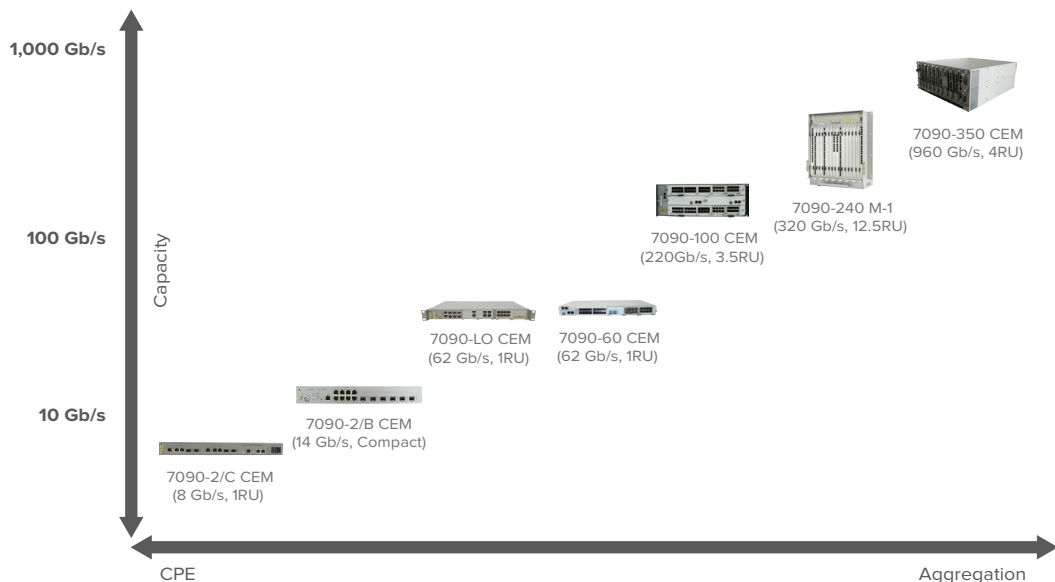
Figure 2: MPLS-TP switching from 8 Gb/s to 960 Gb/s

MIGRATE TDM SERVICES TO PACKET TRANSPORT WITH CIRCUIT EMULATION

The 7090 M/CEM provides flexible and efficient platforms for migrating TDM to packet. Integrated TDM interfaces support RFC 4553 Structure-Agnostic TDM over Packet (SAToP), providing VC-11 and VC-12 circuit emulation of T1 and E1 interfaces, and the aggregation of multiple VC-12/VC-11 circuits on high-speed channelized interfaces.

Integrated TDM interfaces on the 7090-LO CEM and 7090-100 CEM-1 also support RFC 4842 SONET/SDH Circuit Emulation over Packet (CEP) with support for VC-11, VC-12, VC-3, and VC-4 circuit emulation. In addition to T1 (VC-11), E1 (VC-12), E3 (VC-3), DS3 (VC-3), and STM-1(VC-4) interfaces, VC-n level switching enables aggregation of these circuits natively on STM interfaces including STM-1, STM-4, STM-16, and STM-64. The 7090-LO CEM and 7090-100 CEM-1 also provide the option of IEEE C37.94-compliant optical E1 interfaces (SFP) for electricity grid control and protection switching, and support E1 Y-cable protection.

Smart SFPs are also available that leverage Transparent SONET/SDH over Packet (TSoP) to provide clear-channel support for E1, T1, DS3, STM-1/OC-3, STM-4/OC-12, and STM-16/OC-48 interfaces.

ASSURE TDM QUALITY WITH COMPREHENSIVE SYNCHRONIZATION SUPPORT

TDM quality is assured by frequency synchronization over packet options, including Synchronous Ethernet, 1588v2 frequency profile, and a hybrid option that combines Synchronous Ethernet and 1588v2. Phase synchronization with 1588v2 transparent clock/boundary clock is also supported for mobile backhaul applications. Most members of the 7090 Series M/CEM also support external clock interfaces including 2 MHz and 2 Mb/s (G.703) and 1PPS/ToD.

MAXIMIZE ETHERNET SERVICE REVENUES WITH HARD QUALITY OF SERVICE AND A RANGE OF HIGH-AVAILABILITY FEATURES

The 7090 Series M/CEM offers MEF CE 2.0-certified platforms with support for Ethernet connectivity services including E-Line, E-LAN, E-Tree, and E-Access. Quality of service mechanisms include Layer 2 and Layer 3 classification, policing, and shaping. Eight service levels with strict priority and deficit-weighted round robin scheduling algorithms are supported. Hierarchical QoS is supported for pseudowires and LSPs. Unintentional overbooking is prevented by connection admission control (CAC) in the network management system, enabling hard QoS. In addition to the MPLS-TP protection mechanisms described previously, 802.1AX Link Aggregation on both client (UNI) and network (NNI) interfaces, including multi-chassis LAG on the client (UNI) side, are supported. Equipment protection features include 1+1 redundant controllers, clocks, and fabrics; dual power feeds; and redundant load-sharing fans, depending on the platform.

SIMPLIFYING THE DEPLOYMENT OF SMALL CELLS, WIFI HOTSPOTS, AND VIDEO SURVEILLANCE WITH POWER OVER ETHERNET

The 7090-02/B CEM provides the option of Power over Ethernet (PoE) on its eight 100M/1000M RJ45 ports. PoE enables it to deliver both Layer 2 connectivity services and power to devices, such as small cells, WiFi hotspots, and surveillance cameras, simplifying deployment and reducing operational costs. Both 802.3af (15.4 W) and 802.3at (25.5 W) standards are supported.

REDUCING OPEX WITH POWERFUL END-TO-END PACKET MANAGEMENT

The Transcend Network Management System (NMS) provides comprehensive end-to-end network management for the 7090 M/CEM and other Infinera platforms. Key features include network inventory, capacity management, advanced troubleshooting, performance monitoring, service provisioning and supervision, and service and subscriber management. The 7090 M/CEM is also supported by the Transcend Controller, a multi-vendor SDN controller, with open APIs enabling end-to-end orchestration, including a REST API (Presto) enabling support for MEF's Lifecycle Service Orchestration (LSO). A local craft station option, the Infinera 7090 LCT NE Management System, is also available.

TECHNICAL SPECIFICATIONS

	7090-2/B	7090-2/C	7090-LO CEM	7090-60 CEM	7090-100 CEM-1	7090-240 M-1	7090-350 CEM
Physical							
Height (RU)	1	1	1	1	3.5	12.5	4
Width (mm)	353	440	442	442	442	442	442
Depth (mm)	176	164	210	235	235	235	490
Fabric Capacity (Gb/s)	14	8	62	62	220	320	960
Fixed/Modular	Fixed	Fixed	Fixed/Modular	Fixed/Modular	Fixed/Modular	Modular	Modular
Slots for Interface Modules	-	-	4	3	4	14	8
Equipment Protection							
Controller/Clock	-	-	-	-	1+1	1+1	1+1
Fabrics	-	-	-	-	1+1	1+1	1+1
Power	2 Feeds	2 Feeds	2 Feeds	2 Feeds	1+1	1+1	1+1
Fans	Fanless	Fanless	N:1	-	N:1	N:1	N:1
Maximum Smart CES SFPs							
E1 (120 Ohm)	6	4	-	30	64	64	95
T1 (100 Ohm)	6	4	-	30	64	64	95
DS3	6	4	-	15	32	140	45
STM-1/OC-3	6	4	-	15	32	140	45
STM-4/OC-12	6	4	-	15	32	140	45
STM-16/OC-48	-	-	-	2	8	-	45
Maximum Interfaces							
100 GbE	-	-	-	-	-	-	8
10 GbE	-	-	4	4	16	28	95
STM-64	-	-	2	-	4	-	-
GbE (SFP)	6	4	22	-	64	280	95
GbE (RJ45)	14	8	22	30	64	280	95
GbE PoE (RF45)	8	-	-	-	-	-	-
100M (SFP)	6	4	22	30	64	280	-
100M (RJ45)	14	8	22	30	64	280	95
STM-16	-	-	4	2	8	-	45
OC-48	-	-	-	2	8	-	45
STM-4	6	4	8	15	32	140	45
OC-12	6	4	-	15	32	140	45
STM-1	6	4	16	17	48	196	45
OC-3	6	4	-	15	32	140	45
DS3	6	4	12	15	32	140	45
Optical E1 (C.37.94)	-	-	16	-	16	-	-
E1	6	8	64	48	92	128	45
T1	6	4	64	30	64	64	45
Power							
DC Power	✓	✓	✓	✓	✓	✓	✓
AC Power	External	✓	External	x	✓	x	x
Maximum Consumption (W)	<30 (no PoE)	<25	110	83	210	920	<700
Operating Temperature							
Minimum (°C)	-5	-5	-5	-5 (or -40)	-5	-5	-5
Maximum (°C)	+65	+50 (AC), +65 (DC)	+65	+50 (or +65)	+55	+55	+50

MPLS-TP
- Static LSPs
- Static single-segment (SS) pseudowires
- Static multi-segment (MS) pseudowires
- VPLS/H-VPLS

OAM
- MPLS-TP OAM (G.8113.1/G.8113.2)
- ITU-T Y.1731 End-to-end Performance Monitoring and AIS
- 802.3 Link OAM
- 802.1 CFM OAM
- Hardware-based delay and loopback measurement with nanosecond resolution

Network Protection
- LSP 1:1 linear protection
- LSP SNC protection
- LSP ring protection
- Single-segment (SS) pseudowire 1:1 protection
- Multi-segment (MS) pseudowire 1:1 protection
- Dual homing/dual star
- 802.1AX Link Aggregation (UNI/NNI) with LACP
- 1:1 Multi-chassis LAG with LACP (UNI)
- MSP 1+1/1:1 (STM-1)
- E1 tributary protection switching
- E1 Y-cable protection (7090-LO CEM and 7090-100 CEM-1)
- RSTP (IEEE 802.1Q)
- Link pass-through (LPT)

Quality of Service and Traffic Management
- L2 classification: VLAN, PRI, MAC address, TPID
- L3 classification: IP address, DSCP, port number, TOS
- Connection admission control (CAC)
- Policing (CIR, CBS, EIR, and EBS; color-blind mode and color-aware mode)
- Shaping
- Congestion avoidance: WRED
- Eight service classes
- Scheduling: SP, DWRR, SP+DWRR

Timing and Synchronization
- Synchronous Ethernet (G.8261, G.8262)
- IEEE 1588v2:
  - Boundary clock, transparent clock, ordinary clock (G.8275.1, 8275.2)
  - Frequency Profile (G.8265.1)
- External clock interfaces: G.703 2 MHz and 2 Mb/s

Ethernet Functions
- VLAN (IEEE 802.1Q)
- Q-in-Q (IEEE 802.1ad)
- 9600 bytes jumbo frame
- VLAN manipulation: stack/switch/strip
- Flow control (IEEE 802.3x)
- IGMP snooping (V1/V2/V3)

TDM CES Interfaces
- Integrated interfaces (7090-2/C CEM, 7090-60 CEM, 7090-240 M-1)
  - E1, T1, E3, DS3, STM-1, STM-4, STM-16, STM-64
  - RFC 4553 Structure-Agnostic TDM over Packet (VC-11, VC-12)
- Integrated interfaces (7090-LO CEM and 7090-100 CEM-1):
  - E1 (RJ-45 and IEEE C37.94-compatible optical) T1, E3, DS3, STM-1, STM-4, STM-16, STM-64
  - SAToP: RFC 4553 Structure-Agnostic TDM over Packet (VC-12)
  - CEP: RFC 4842 Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) Circuit Emulation over Packet (VC-11, VC-12, VC-3 and VC-4)
- Smart CES SFPs (7090-2/B CEM 7090-2/C CEM, 7090-60 CEM , 7090-100 CEM-1, 7090-240 M-1, 7090-350 CEM):
  - E1, T1, DS3, STM-1/OC-3, STM-4/OC-12, STM-16/OC-48
  - TSoP: Transparent SONET/SDH over Packet (clear channel)

Power over Ethernet (PoE)
- Eight ports (7090-2/B CEM)
- 802.3af (15.4 W)
- 802.3at (25.5 W)

Management
- Infinera Transcend NMS
- Infinera Transcend Controller (SDN)
- Infinera 7090 LCT NE Management System
- In-band management VLAN
- Out-of-band management interfaces (100M Ethernet, RJ45)
- OSPF Layer 3 DCN
- Zero-touch provisioning (ZTP)
- SFTP
- SSHv2
- Syslog
- RFC 2544 Ethernet Service Activation Testing

Certifications
- MEF CE 2.0-certified: E-Line, E-LAN, E-Tree, E-Access
- ETSI 300 019
- ETSI EN 300 386 V1.6.1/EN 55022(2010)
- EN 60950-1: 2006+A11: 2009+A1:2010+A12:2011