

# 7090 M/CEM Packet Transport Platforms

*Scalable MPLS-TP for Ethernet and TDM Circuit Emulation, from 5 Gbps to 960 Gbps*

The Infinera 7090 M/CEM Packet Transport Solutions provide MPLS-TP enabled packet transport addressing a wide range of applications including Layer 2 enterprise services, mobile and fixed broadband backhaul, and TDM migration, either as a standalone solution or together with other platforms in the Infinera packet optical portfolio including the Infinera 7100 Packet Optical Transport Solutions and the Infinera mTera Universal Transport Platform (UTP). The 7090 M/CEM Series, 7100 Series, and mTera UTP can be managed by the Infinera network management system, Infinera Transcend Chorus for Transport.

## MPLS-TP ENABLED PACKET TRANSPORT FROM 5 GBPS TO 960 GBPS

MPLS-TP provides a scalable, transport-oriented option for packet switching. The 7090 M/CEM Series offers a range of platforms with capacities from 5 Gbps to 960 Gbps. 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, and 802.1 CFM OAM. 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.

## BENEFITS OF THE INFINERA 7090 M/CEM PORTFOLIO

- **Scale** MPLS-TP packet transport from 5 Gbps to 960 Gbps with a range of platforms optimized for different network locations and capacity requirements
- **Maximize** Ethernet service revenues with comprehensive quality of service and network protection capabilities
- **Migrate** a wide range of TDM services to MPLS-TP with support for both clear channel and aggregated interfaces
- **Backhaul** mobile traffic including LTE-TDD and LTE-Advanced with comprehensive synchronization support including Synchronous Ethernet and 1588v2 boundary clock
- **Reduce** operational costs and speed service activation with powerful end-to-end packet management enabled by the Infinera Transcend Chorus network management system

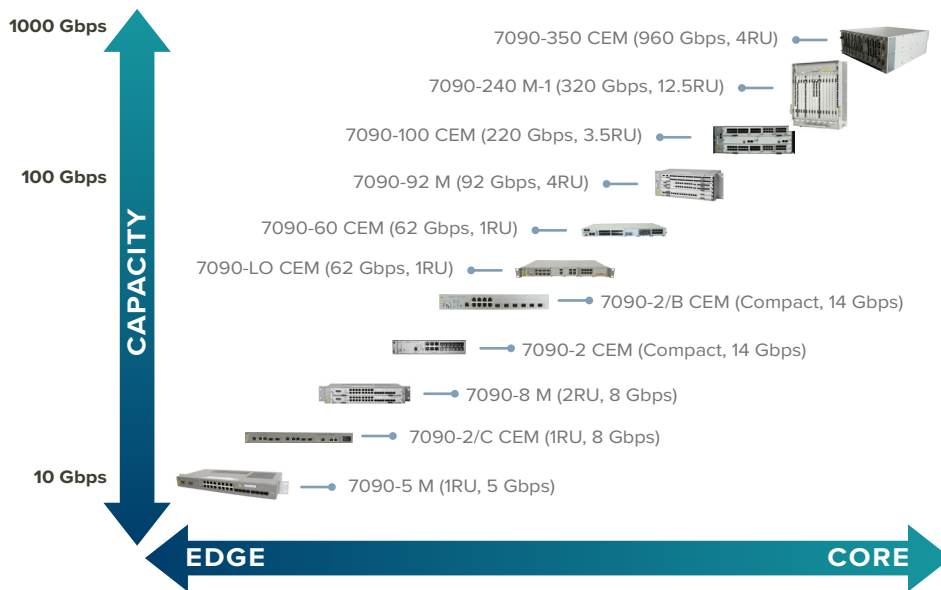


Figure 1: MPLS-TP Switching from 5 Gbps to 960 Gbps

## **MIGRATING TDM SERVICES TO PACKET TRANSPORT WITH CIRCUIT EMULATION**

The 7090 M/CEM Series provides a number of options for delivering TDM services over packet leveraging circuit emulation standards including RFC 4553 Structure-Agnostic TDM over Packet (SAToP), RFC 4842 SONET/SDH Circuit Emulation over Packet (CEP), and Transparent SONET/SDH over Packet (TSoP). Both clear channel and aggregated interfaces are supported. Integrated interface options include E1, T1, E3, DS3, STM-1, STM-4, and STM-16. Furthermore, Smart SFPs are available for E1, T1, DS3, STM-1/OC-3, STM-4/OC-12, and STM-16/OC-48 circuit emulation. 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.

## **MAXIMIZING ETHERNET SERVICE REVENUES WITH HARD QUALITY OF SERVICE AND A RANGE OF HIGH AVAILABILITY FEATURES**

The 7090 M/CEM Series 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.

## **FUTURE-PROOFING MOBILE BACKHAUL WITH COMPREHENSIVE SYNCHRONIZATION SUPPORT**

With comprehensive support for both frequency and phase synchronization, the 7090 M/CEM Series provides an ideal solution for mobile backhaul including LTE-TDD and LTE-Advanced functions such as Coordinated Multipoint (CoMP), Enhanced Inter-cell Interference Coordination (eICIC), and Multiple-input Multiple-output (MIMO). They support both frequency and phase synchronization over packet. Options for frequency synchronization include Synchronous Ethernet, 1588v2 frequency profile, and a hybrid option that combines Synchronous Ethernet and 1588v2. Additional 1588v2 phase/frequency synchronization options include boundary clock, transparent clock, and ordinary clock. Most members of the 7090 M/CEM Series also support external clock interfaces including 2 MHz and 2 Mbps (G.703) and 1PPS/ToD.

## **SIMPLIFYING THE DEPLOYMENTS OF SMALL CELLS, WI-FI 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, Wi-Fi 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 Infinera Transcend Software Suite includes the Infinera Transcend Chorus for network management and operations, the Infinera Transcend Symphony SDN controller, and the Infinera Transcend Maestro multi-domain orchestrator. The Transcend solution provides comprehensive end-to-end network management for the 7090 M/CEM Series and the other platforms within the Infinera packet optical transport portfolio, including the 7100 Series and mTera UTP. Key features include network inventory, capacity management, advanced troubleshooting, performance monitoring, service provisioning and supervision, and service and subscriber management. Open APIs enable end-to-end orchestration including a REST API (Presto) enabling support for the MEF's Lifecycle Service Orchestration (LSO). A local craft station option, the Infinera 7090 LCT NE Management System, is also available.

# TECHNICAL SPECIFICATIONS

Physical	7090-2	7090-2/B	7090-2/C	7090-5 M	7090-8 M	7090-LO CEM	7090-60 CEM	7090-92 M	7090-100 CEM	7090-240 M-1	7090-350 CEM
Height (RU)	1	1	1	1	2	1	1	4	3.5	12.5	4
Width (mm)	266	353	440	442	442	442	442	442	442	442	442
Depth (mm)	209	176	164	210	201	210	235	220	235	235	490
Fabric Capacity (Gbps)	14	14	8	5	8	62	62	92	220	320	960
Fixed/Modular	Fixed	Fixed	Fixed	Fixed	Modular	Fixed/Modular	Fixed/Modular	Modular	Fixed/Modular	Modular	Modular
Slots for Interface Modules	—	—	—	—	2	4	3	4	4	14	8
Equipment Protection	7090-2	7090-2/B	7090-2/C	7090-5 M	7090-8 M	7090-LO CEM	7090-60 CEM	7090-92 M	7090-100 CEM	7090-240 M-1	7090-350 CEM
Controller/Clock	—	—	—	—	1+1	—	—	1+1	1+1	1+1	1+1
Fabrics	—	—	—	—	1+1	—	—	1+1	1+1	1+1	1+1
Power	2 Feeds	2 Feeds	2 Feeds	2 Feeds	1+1	2 Feeds	2 Feeds	1+1	1+1	1+1	1+1
Fans	—	Fanless	Fanless	Fanless	—	N:1	—	N:1	N:1	N:1	N:1
Maximum Smart CES SFPs	7090-2	7090-2/B	7090-2/C	7090-5 M	7090-8 M	7090-LO CEM	7090-60 CEM	7090-92 M	7090-100 CEM	7090-240 M-1	7090-350 CEM
E1 (120 Ohm)	10	6	4	—	—	—	30	92	64	64	95
T1 (100 Ohm)	10	6	4	—	—	—	30	92	64	64	95
DS3	5	6	4	2	3	—	15	46	32	140	45
STM-1/OC-3	5	6	4	—	—	—	15	46	32	140	45
STM-4/OC-12	5	6	4	—	—	—	15	46	32	140	45
STM-16/OC-48	—	—	—	—	—	—	2	—	8	—	45
Maximum Interfaces	7090-2	7090-2/B	7090-2/C	7090-5 M	7090-8 M	7090-LO CEM	7090-60 CEM	7090-92 M	7090-100 CEM	7090-240 M-1	7090-350 CEM
100GE	—	—	—	—	—	—	—	—	—	—	8
10GE	—	—	—	—	—	4	4	10	16	28	95
GE (SFP)	10	6	4	4	6	22	30	92	64	280	95
GE (RJ45)	14	14	8	—	—	22	30	92	64	280	95
GE PoE (RF45)	—	8	—	—	—	—	—	—	—	—	—
100M (SFP)	10	6	4	4	8	22	30	92	64	280	—
100M (RJ45)	14	14	8	4	8	22	30	92	64	280	95
STM-16	—	—	—	—	—	4	2	—	8	—	45
OC-48	—	—	—	—	—	—	2	—	8	—	45
STM-4	5	6	4	—	—	8	15	46	32	140	45
OC-12	5	6	4	—	—	—	15	46	32	140	45
STM-1	7	6	4	—	2	16	17	56	48	196	45
OC-3	5	6	4	—	—	—	15	46	32	140	45
DS3	5	6	4	2	3	12	15	46	32	140	45
E1	10	6	8	16	32	64	48	106	92	128	45
T1	10	6	4	—	32	64	30	92	64	64	45
Power	7090-2	7090-2/B	7090-2/C	7090-5 M	7090-8 M	7090-LO CEM	7090-60 CEM	7090-92 M	7090-100 CEM	7090-240 M-1	7090-350 CEM
DC Power	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AC Power	External	External	✓	x	x	External	x	x	✓	x	x
Maximum Consumption (W)	40	<30 (no PoE)	<25	33	70	110	83	320	210	920	<700
Operating Temperature	7090-2	7090-2/B	7090-2/C	7090-5 M	7090-8 M	7090-LO CEM	7090-60 CEM	7090-92 M	7090-100 CEM	7090-240 M-1	7090-350 CEM
Minimum (°C)	-5	-5	-5	-5	-5	-5	-5 (or -40)	-5	-5	-5	-5
Maximum (°C)	+65	+65	+50 (AC), +65 (DC)	+55	+65	+65	+50 (or +65)	+55	+55	+55	+50

## TECHNICAL SPECIFICATIONS

### 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
- 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
- 8 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 Interface: G.703 2 MHz and 2 Mbps

### 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

- Clear Channel and Channelized Interfaces
- Integrated Interfaces: E1, T1, E3, DS3, STM-1, STM-4, STM-16

- Smart SFPs: E1, T1, DS3, STM-1/OC-3, STM-4/OC-12, STM-16/OC-48
- RFC 4553 Structure-Agnostic TDM over Packet (SAToP)
- RFC 4842 Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) Circuit Emulation over Packet (CEP)
- Transparent SONET/SDH over Packet (TSoP)

### Power over Ethernet (PoE)

- 8 ports (7090-2/B CEM)
- 802.3af (15.4 W)
- 802.3at (25.5 W)

### Management

- Infinera Transcend Software Suite
- Infinera 7090 LCT NE Management System
- In-band Management VLAN
- Out-band Management Interfaces (100M Ethernet, RJ45)
- OSPF Layer 3 DCN
- Zero Touch Provisioning (ZTP)
- SFTP
- SSHv2

### 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