

# 7090 CE Packet Transport Solutions

*Intelligent Carrier Ethernet Platforms for Next-Generation Networks*

## ADDRESSING NETWORK GROWTH WITH PACKET TRANSPORT SOLUTIONS

Network traffic continues to grow exponentially due to expanding mobile networks and the rise of data center applications and cloud-based computing. In addition, network services are becoming increasingly dynamic with rapidly changing requirements.

To meet these evolving industry needs, the Infinera portfolio of innovative solutions includes a packet transport component that provides network operators with unprecedented levels of scalability, efficiency, and flexibility. With packet-based granularity, oversubscription capabilities, and numerous per-flow traffic management options, service providers can cost effectively maintain high performance network requirements.

## COST EFFECTIVELY ENABLING NEW CE SERVICES AND EXTENDING PACKET TRANSPORT NETWORKS

The Infinera 7090 Carrier Ethernet (CE) Packet Transport Solutions offer a full packet access portfolio that provide a complete end-to-end CE solution together with the Infinera 7100 Pico Packet Optical Transport Platform and Infinera 7100 Nano Packet Optical Transport Platform. The 7090 CE Series offers Carrier Ethernet technology supporting different types of products including the Infinera 7090-01 CE SFP-NID, Infinera 7090-05 CE Packet Transport Platform, Infinera 7090-07 CE Packet Transport Platform, Infinera 7090-07 PoE CE Packet Transport Platform, and Infinera 7090-15 CE Packet Transport Platform.

The 7090 CE Packet Transport Solutions are an integral component of the Infinera comprehensive end-to-end transport portfolio and work seamlessly with the Infinera 7100 Packet Optical Transport Solutions, the Infinera mTera Universal Transport Platform (UTP), the Infinera hiT 7300 Multi-Haul Transport Platform, and the Infinera 8600/8800 Smart Router Series, as shown in Figure 1. The Infinera Transcend Chorus for Transport network management system and the Infinera Transcend Chorus for Packet network management system can manage all 7090 CE platforms as part of a complete Infinera solution. This enables end-to-end network provisioning and maintenance from a single management system. The Infinera portfolio provides flexible and reliable transport solutions that meet a wide variety of service needs from the access to metro/regional networks.

The introduction of the 7090-01 CE SFP-NID in the 7090 CE Series enables service providers to deliver low-latency, SLA-guaranteed business Ethernet, 4G/LTE macro cell, and metro/small cell backhaul services. The 7090-01 CE can be installed directly into a switch, router, or small cell and saves CapEx by eliminating the need for a standalone demarcation device. Ideally suited for applications with space constraints, the 7090-01 CE can be deployed in locations where a standard NID or an additional power run would be impossible to install. The 7090-01 CE protects investment in the existing install base by adding the latest Layer 2 SLA capabilities to legacy switches/routers.

## BENEFITS OF INFINERA 7090 CE PACKET TRANSPORT SOLUTIONS

- **Grow revenue** by providing cost-effective feature-rich Carrier Ethernet services
- **Improve network efficiency** with packet-based transport
- **Upgrade existing networks** to more cost-effective, scalable packet solutions
- **Increase network visibility** with certified Carrier Ethernet OAM features
- **Future proof** using 1G/10G and 100M/1G transceivers without forklift upgrades
- **Extend the powerful networking capabilities** of Infinera 7100, mTera UTP, and hiT 7300 Packet Optical Transport Solutions
- **Accelerate service activation** with Zero Touch Provisioning

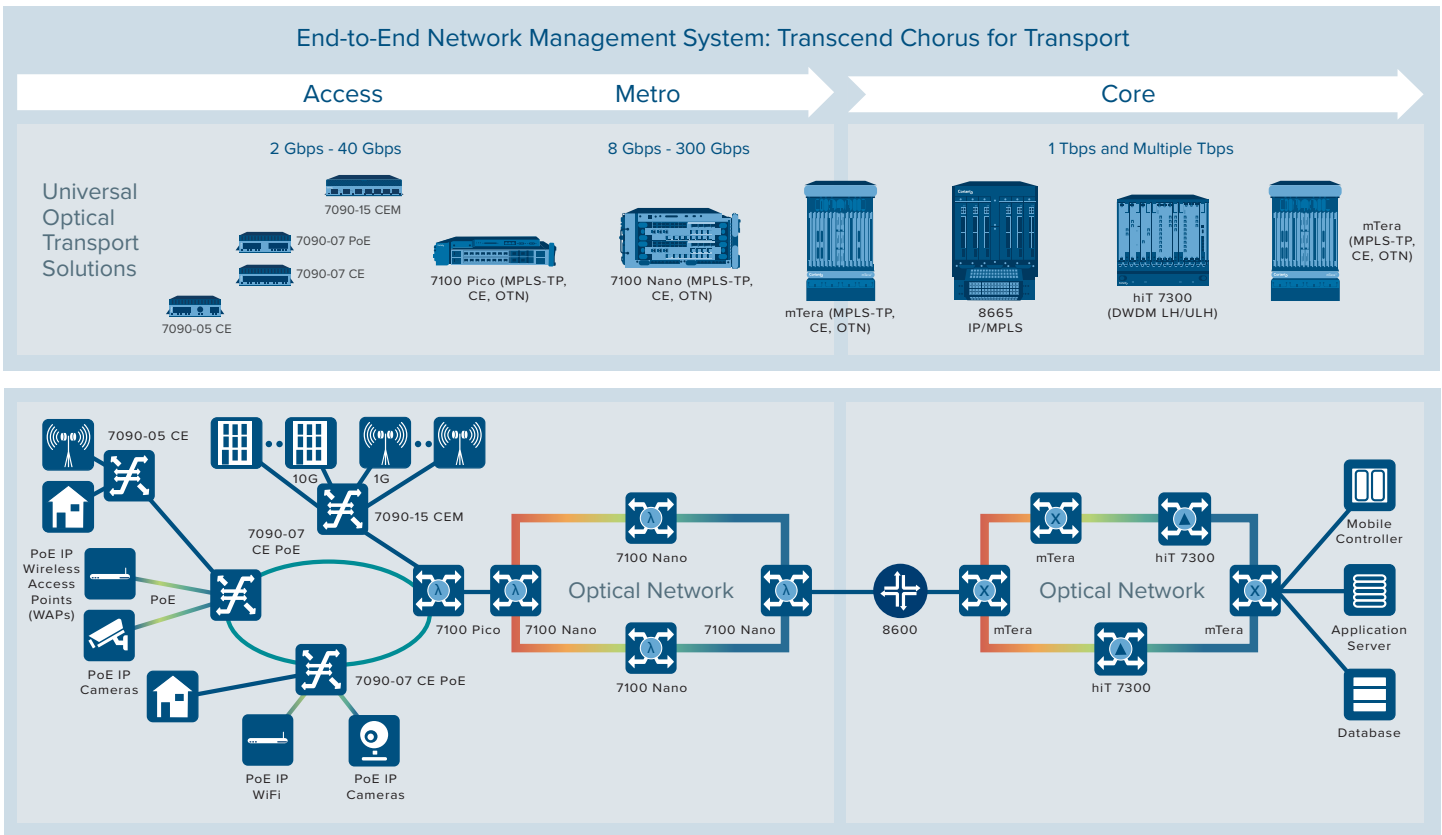


Figure 1: Infinera End-to-end Transport Networking Portfolio

The Infinera Transcend Solution supports the 7090 CE product portfolio for network control and management. The Infinera Transcend Symphony for Packet multi-vendor SDN controller plays an integral role in the SDN solution by serving as a single platform for multi-vendor control over Carrier Ethernet and IP/MPLS networks, as shown in Figure 2.

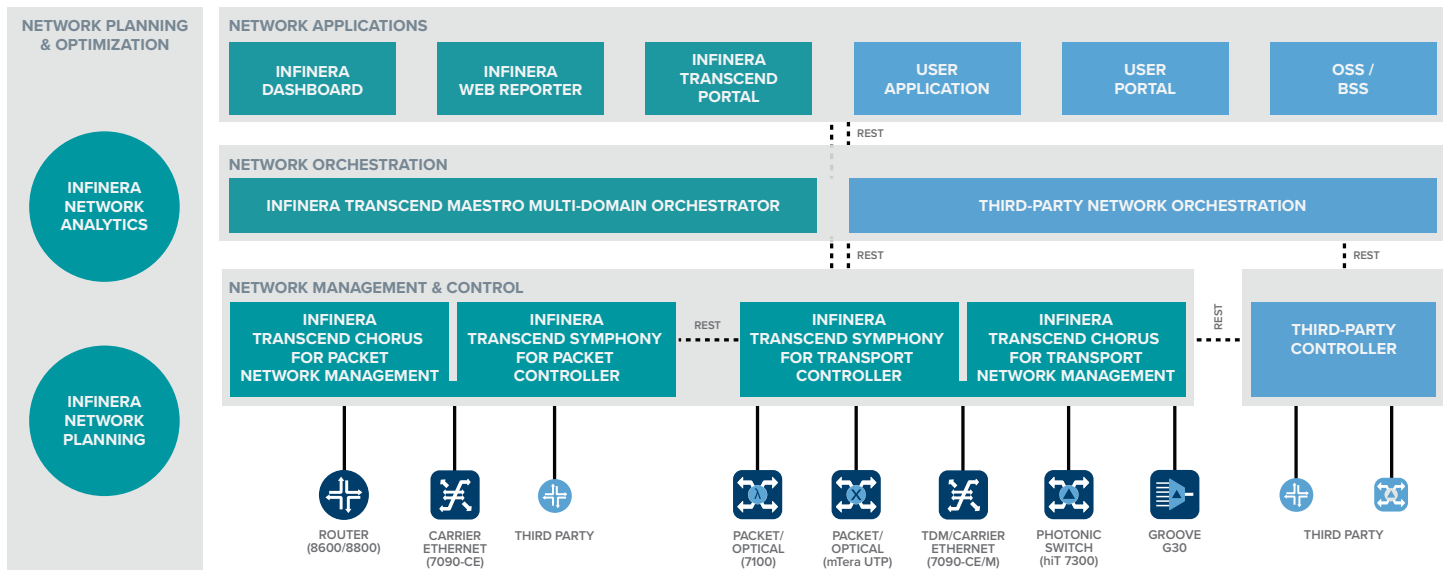


Figure 2: Infinera Transcend SDN Solution Architecture

## PROVIDING EFFICIENCIES FOR INSTALLATION, PERFORMANCE, AND PROTECTION

The 7090 CE platforms, as shown in Figure 3, are MEF CE 2.0 certified and provide a comprehensive feature set to accelerate service activation and enable service providers to offer assured wholesale and retail business Ethernet services as well as mobile backhaul, small cell, and WiFi access point services. Zero Touch Provisioning eliminates dependency on expert personnel to perform the initial system installation and commissioning and ensures that personnel without extensive system knowledge can install and commission the NIDs. By supporting rapid fault detection and simplifying fault isolation, the 7090 CE platforms can reduce expensive truck rolls to remote sites. The 7090 CE platforms offer a comprehensive timing solution ideal for mobile backhaul applications. In addition, the 7090 CE solutions provide carrier-class sub 50 ms protection for Ethernet services using industry standard protection mechanisms.

The 7090 CE Network Interface Device (NID)/Customer Premises Equipment (CPE) platforms are offered with options for AC/DC power, standard or extended operating temperatures, and single or dual power supplies. These features deliver flexibility to service providers and enable solutions tailored to specific requirements.

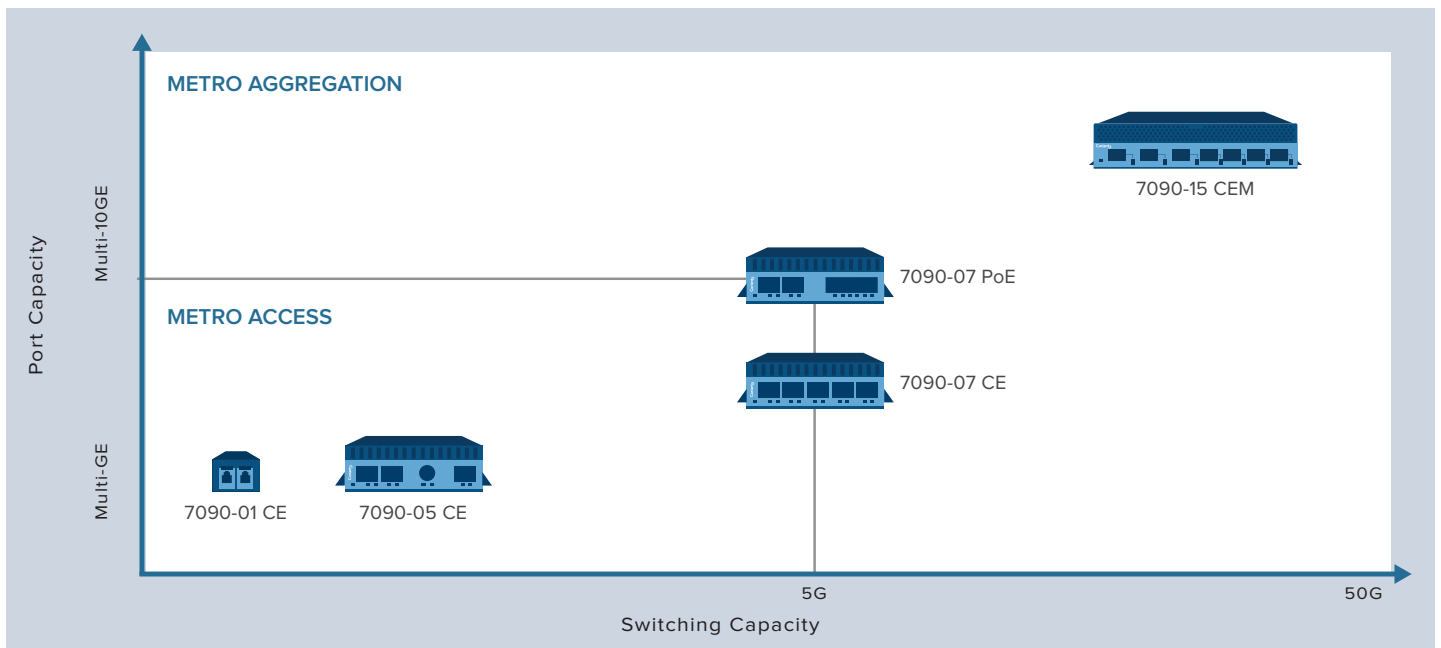


Figure 3: 7090 CE Packet Transport Solutions

## 7090 CE APPLICATIONS

Key target applications for the 7090 CE solutions include:

- High-density aggregation Ethernet services from access devices such as DSLAMs, GPON/EPON, and OLTs at the network edge
- Ethernet business services
- Wholesale access services
- Mobile backhaul services for small cell and 3G/4G
- Edge aggregation and switching applications in metro networks
- WiFi access point services using PoE
- Small cell services using PoE
- Security camera applications using PoE
- Multicast Ethernet services

## DELIVERING THE BENEFITS OF CE PACKET TRANSPORT

As service providers are embracing a packet-based future, CE is the preferred transport technology to support business services and mobile backhaul services and to replace legacy SONET/SDH technology. The 7090 CE platforms offer an intelligent access and aggregation solution that integrates seamlessly into any CE OAM landscape. The 7090 CE solutions deliver numerous benefits including:

- Provide a lineup of size optimized aggregation switches and NIDs/CPEs to flexibly deploy the optimal solution for each application
- Incorporate industry standard OAM functionality and a common management infrastructure to provide a reliable Ethernet network with the adaptability to support a variety of services
- Support business Ethernet services including mobile backhaul and video distribution
- Offer scalability, resiliency, service assurance, and monitoring while maintaining the efficiency of a packet network
- Leverage a high-density design that consumes minimal power for an efficient and cost-effective solution
- Feature temperature hardened equipment to perform at optimum capacity even in the most demanding environments
- Deliver Power over Ethernet (PoE) sourcing of 802.3af (15.40 W), 802.3at (34.20 W), and up to 60 W

### TECHNICAL SPECIFICATIONS

#### Ethernet

- Three-port, five-port, and seven-port configurations support redundant access link or multi-customer applications
- Interfaces
  - 7090-01 CE
    - 10 km and 34 km variants
      - 1000Base-LX (LC)
      - 1000Base-EX (LC)
  - 7090-05 CE
    - 1 x 10/100/1000 Mbps electrical (RJ45)
    - 2 x 100/1000 Mbps optical (SFP)
  - 7090-07 CE
    - 5 x 100/1000 Mbps optical (SFP)
    - 10/100/1000 Mbps optical (RJ45 SFP)
  - 7090-07 CE PoE
    - 1/2 x 100/1000 Mbps optical (SFP)
    - 3/4 x 10/100/1000 Mbps electrical (RJ45)
  - 7090-15 CE
    - 3 x 10 Gigabit Ports: 10GBASE-R SFP+; ports can be configured as 1 Gigabit with GE SFP
    - Up to 4 x 1 Gigabit Ports: 1000BASE-X/100BASE-FX fiber SFP or 10/100/1000BASE-T RJ45 copper
- All ports are configurable as NNI or UNI
- SFP/SFP+ transceivers for standard or CWDM/DWDM wavelength

- Media conversion for connectivity to customer equipment
- Supports 10,240 byte jumbo frames

#### Fault Management

- Supports a variety of link fault detection and fault propagation features
  - Link fault notifications
  - Link/VLAN RDI (T-RDI and 802.1ag RDI)
  - Link fault propagation over port level service via automatic laser shut off
- 802.3ah Link OAM
  - Link loopback
  - Unidirectional link fault detection
  - Threshold-based monitoring and notification
  - Dying gasp
- 802.1ag and Y.1731 end-to-end Service OAM and CFM
  - Supports eight levels of Maintenance domains and Maintenance End Points (MEPs)
  - 256 Maintenance Associations
  - 256 Maintenance Intermediate Points (MIPs)
  - Connectivity Check Messages (CCMs)
  - Remote Defect Indication (RDI)
  - Link Trace
  - Diagnostic loopback (Layer 2 ping)
- Y.1731 Alarm Indication Signal (AIS)
- Sub 50 ms failover protection switching
- IEEE 802.1AX/802.3ad LAG with LACP

#### Traffic Management

- Service mapping to enable multiple services per UNI
  - IEEE 802.1Q VLAN tagging
  - 802.1ad Provider Bridge VLAN stacking (Q-in-Q)
  - Service multiplexing for E-line, E-LAN, E-Tree, and E-Access Services
    - 7090-05/07 CE: Up to 256 Ethernet Virtual Connections (EVCs)
    - 7090-15 CE: Up to 1024 Ethernet Virtual Connections (EVCs)
  - Layer 2 Control Protocol policy (L2CP) management
  - Layer 2 Protocol Tunneling (L2PT)
- Traffic policing and shaping
  - Granular rate limiting
  - CIR/EIR and CS/EBS
  - Hierarchical Rate Limiting with two level color aware policing
- Ingress and egress traffic management
- CIR/EIR Color Aware “two rates, three colors” bandwidth profiles for ingress rate limiting with hierarchical policing
- CoS based on 802.1p QoS prioritization
- CoS L1, L2, L3, L4 filtering
- L2CP CoS subtypes
- IGMP Snooping per RFC4541
- IPv4 or IPv6 for management access
- Advanced Flow and CoS classification per Port, VLAN ID, PCP, IPv4/IPv6 (TOS/DiffServe) Priority, L2CP, MAC address, IP address, or TCP Port

## TECHNICAL SPECIFICATIONS

### Protection

- ITU-T G.8031 Ethernet Linear Protection Switching
- ITU-T G.8032 Ethernet Ring Protection Switching
- Sub 50 ms failover for G.8031 and G.8032v2
- Active/Standby LACP LAG
- Static LAG without LACP
- LACP A/A LAG
- 802.1w - Rapid Spanning Tree

### Node Management and Security

- Flexible management tools:
  - Command Line Interface (CLI)
  - Craft station GUI (Infinera 7191 Craft Station interface)
  - Infinera Transcend Chorus for Transport network management system
  - Infinera Transcend Chorus for Packet network management system
- Secure Shell (SSH)
- Remote management
  - In-band VLAN
  - SNMP V1/V2c/V3
  - Telnet
  - IP-less 802.3ah OAM extensions
- Local management via serial console port
- Public (non-proprietary) 802.1ag CFM SNMP MIBs
  - Easy third-party SNMP management software integration
- Zero Touch Provisioning (DHCP/TFTP)
- DHCP Relay with Option 82
- 802.1x, ACL, RADIUS, TACACS+
- Link Layer Discovery Protocol (LLDP)

### Performance Testing and Monitoring

- Y.1731 Performance Monitoring
  - Frame delay (one way and two way)
  - Frame loss
  - Synthetic loss
  - Service availability
- IETF RFC 2544 with built-in Test-head (Initiator/Responder)
- ITU-T Y.1564 service activation tests (Initiator/Responder)
- Third-party remote tester loopback support
- TWAMP
- Per-port and per-flow loopback with MAC swap
- Built-in UTP cable tester for troubleshooting through to the customer equipment

### Synchronization

- ITU-T G.8262 Synchronous Ethernet
- IEEE 1588v2
  - 7090-05/07 CE: Transparent Clock (One Step)
  - 7090-15 CE: Boundary Clock, Transparent Clock, Slave Clock
- Network Time Protocol (NTP)

### Physical and Environmental

- Dimensions
  - 25 x 97 x 122 mm / 1.0 x 3.8 x 4.8 in (H x W X D) (7090-05 CE)
  - 34 x 122 x 152 mm / 1.325 x 4.8 x 6.0 in (H x W X D) (7090-07 CE/PoE)
  - 41.4 x 185.17 x 232.41 mm / 1.63 x 7.29 x 9.15 in (H x W X D) (7090-15 CE)
- Weight
  - 1.5 lb (0.68 kg), including AC power adapter (7090-05 CE)
  - 2.0 lb (0.91 kg), including AC power adapter (7090-07 CE)

- 2.5 lb (1.13 kg), including AC power adapter (7090-07 CE PoE)
- 3.24 lb (1.47 kg) (7090-15 CE)
- Temperature and Humidity
  - Available for normal and extended operating temperature range environments
  - 0°C to 50°C (7090-05A/C, 7090-07C, 7090-07 PoE, 7090-15)
  - -40°C to 75°C (7090-05B/D, 7090-07D, 7090-07 PoE, 7090-15)
  - Note: 7090-07 CE PoE AC to DC power supply operates only in commercial temperature
- Storage Temperature: -40°C to 80°C
- Humidity: 5% to 95% (non-condensing)

### Power Specifications

- 3.3V DC (7090-01 CE), 8-32V DC (7090-05A/B CE), 8-60V DC (7090-05C/D CE), 11-60V DC (7090-07C/D CE), 48-57V DC (7090-07 CE PoE), 12V DC (7090-15 CE with 2.5 mm barrel connector), +/- 20 to 60V DC (7090-15 CE with 3-pin terminal)
- 100-240V AC (50 - 60Hz) with adapter (included)
- Dual power inputs (7090-07 CE, 7090-15 CE)

### Regulatory and Standards Compliance

- FCC Part 15, Class A
- UL 60950 1st Edition
- IEC 60950
- CSA C22.2 60950
- NEBS Level 3 Compliant
- RoHS2
- WEEE
- REACH
- MEF Carrier Ethernet 2.0 Certified (E-LAN, E-Line, E-Access, and E-Tree)