

Cisco 10720 Internet Router

The industry's first router combining IP, resilient packet ring, and Ethernet technologies optimized for high-speed multitenant Internet services.

The high-performance Cisco 10720 Internet Router is a principle building block in the next-generation metro IP network. The Cisco 10720 Internet Router (Figure 1) enables service providers to offer innovative and differentiated IP services to their customers at optical speeds. Equipped with Ethernet technology for customer access and the innovative Dynamic Packet Transport (DPT) technology for metro optical connectivity, the Cisco 10720 allows service providers to offer IP services closer to the user, enabling them to better control admission to network resources.

Powered by Cisco IOS[®] Software and Parallel Express Forwarding (PXF) technology, the Cisco 10720 is a cost-effective, reliable platform that not only supports the full suite of IP routing protocols such as Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF) and Border Gateway Protocol (BGP), but also enables value-added services. Use the Cisco 10720 to efficiently introduce advanced features such as virtual private networks (VPNs), voice over IP (VoIP), and transparent LAN services (TLS) without compromising on performance.

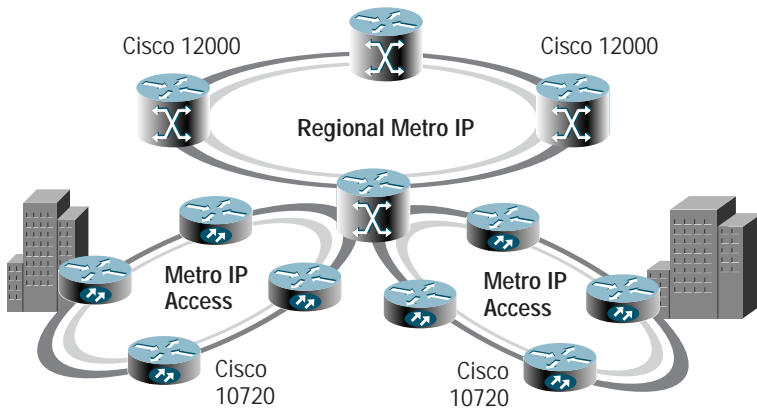
With the rapid growth in bandwidth-intensive applications on the Internet, the demand for Internet connectivity has grown exponentially in the past few years. Service providers are seeking ways to offer Internet access at ever-faster speeds and to differentiate themselves from competitors by offering value-added services to their customers. Traditional optical networking products, such as Synchronous Optical Network (SONET) add-drop multiplexers (ADMs), are only optimized for voice services delivery. To deliver high-speed Internet access, service providers are required to deploy an overlay IP network, which is complex, bandwidth inefficient, and difficult to manage. The Cisco 10700 Series can be deployed directly over fiber, enabling service providers to offer IP+Optical access without the need for a SONET or Synchronous Digital Hierarchy (SDH) optical transport infrastructure, but maintaining carrier-class SONET/SDH characteristics for management and restoration.

Figure 1
Cisco 10720 Internet Router



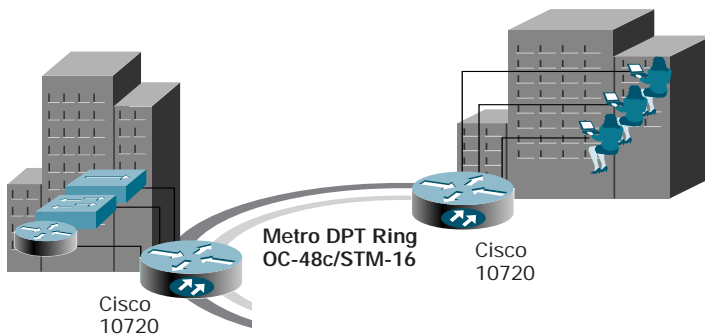
The Cisco IP+Optical architecture, incorporating Cisco 12000 Series Internet routers in the core and at the provider edge and the Cisco 10720 for metro access (Figure 2), provides a unique solution to service providers. This solution is applicable to both new service providers who are looking to build networks that deliver data, voice, and video services over IP and traditional service providers who want to optimize and extend their IP network infrastructures.

Figure 2
Metro IP Architecture



The Cisco 10720 Internet Router is equipped with three types of 24-port or 4 GE+8FE Ethernet access modules and four versions of optical-reach DPT or POS uplink modules. The uplink module is equipped with two physical OC-48/STM-16 ports. With two rack units, the Cisco 10720 is suitable for deployment in office buildings and business parks. The flexible Ethernet options support either of these options. When deployed in multitenant units (MTUs), the Cisco 10720 allows service providers to offer direct Ethernet access using in-building Category 5 wiring (Figure 3). Alternatively, the Cisco 10720 can aggregate wireless or Long-Reach Ethernet (LRE) implemented over the existing telephone wiring, using complementary Cisco technologies such as Aironet[®] wireless devices and Catalyst[®] switches.

Figure 3
Business-Class Multitenant Ethernet Access



The DPT uplink allows service providers to deploy Cisco 10720 Internet routers in metro architectures directly over fiber. DPT is the market-leading resilient packet ring (RPR) solution based on the Cisco developed, MAC-layer Spatial Reuse Protocol (SRP). SRP is open and freely available as IETF Informational RFC 2892. Additionally, Cisco has submitted SRP to the IEEE 802.17 RPR Working Group for consideration as the industry standard. DPT combines the intelligence of IP routing with the bandwidth efficiencies of optical rings. Designed primarily for metropolitan area networks (MANs), DPT enables service providers to construct highly reliable, cost-effective optical infrastructures for scalable Internet service delivery.

Key Benefits

Building Block for Metro Optical Internet

The product's architecture and on-board DPT optical uplink support allow service providers to offer high-speed IP services at the network edge. The platform uses Ethernet technology for simple, cost-effective customer access and DPT for metro network connectivity. This allows service providers to bypass traditional DS1 and DS3 access options. The dual-counter rotating ring technology of DPT is cost effective because it uses both rings and can be deployed over dark fiber while maintaining the less than 50 ms restoration common in SONET/SDH systems. For multiservice applications, DPT can also be deployed over traditional SONET/SDH ADMs and wavelength-division multiplexing (WDM) systems.

Ethernet Customer Connectivity

The various versions of the Ethernet modules available for the Cisco 10720 provide flexible deployment options. The copper (TX) and the fiber multimode (FX-MM) versions accommodate copper or multimode fiber deployments within MTUs and the FX single mode (SM) allows for deployment of the Cisco 10720 in a central location covering Ethernet connectivity to buildings located up to 15 km away. Similarly, the SX and LH versions of pluggable optics for the Gigabit Ethernet ports provide coverage up to 10 km.

High-Performance IP Routing

The Cisco 10720 Internet Router is a fully functional router powered by Cisco IOS Software and the PXF technology. It supports all unicast and multicast IP routing protocols, advanced buffering and scheduling mechanisms, and the capability to store up to 250,000 routes. It also supports a forwarding rate of approximately 2 mpps with IP services enabled.

Metro Networking Solutions

The Cisco 10720 Internet Router is designed to ideally support services to the metro with its RPR architecture for optimal fiber connectivity as well as features such as IP class of service, TLS, VoIP, and VPN services.

Comprehensive IP Class-of-Service Features

The Cisco 10720 Internet Router software is based on industry-leading Cisco IOS Software. IP forwarding as well as the following advanced IP quality-of-service (QoS) features are performance optimized to ensure highest possible throughput in every port. These features allow service providers to offer differentiated service (such as gold, silver and bronze) to their customers via the various QoS features that allow bandwidth control and prioritization of traffic:

- *Modular quality-of-service (QoS) command-line interface (CLI) (MQC)*—A framework that allows configuration of QoS features:
 - Versatile traffic management system (VTMS), the latest scheduling technique for servicing output queues based on traffic classes and controlling the order and frequency that output queues are serviced based on their configuration
 - Committed access rate (CAR) to classify and rate-limit IP flows
 - Weighted Random Early Detection (WRED) for Transmission Control Protocol (TCP) congestion avoidance on both the Ethernet and the OC-48 uplink ports
- *Turbo access control lists (ACLs)*—Access list processing without affecting performance

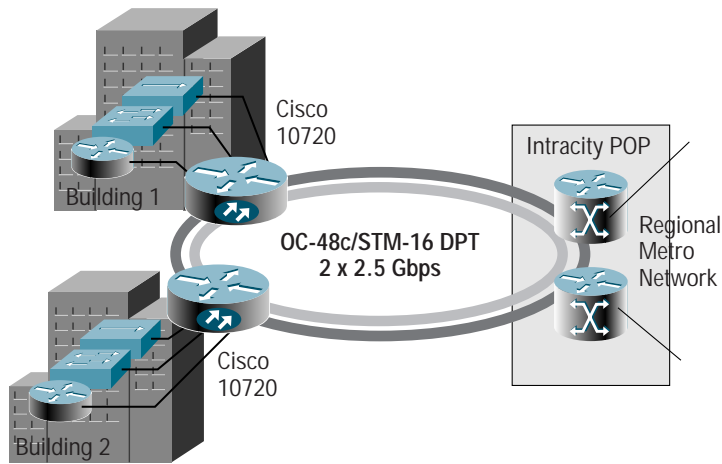
Adaptive Network Processing for Future IP Service Enhancements

The Cisco 10720's central processing engine consists of two sets of PXF network processors—an array of individual, programmable subprocessors. This architecture not only allows for parallel processing of 32 packets, but it also allows new features to be developed in microcode and implemented efficiently with a simple software download. Unlike the traditional designs based on application-specific integrated circuits (ASICs), which require a hardware change for introducing new features, the PXF-based architecture allows for value-added service features such as IP VPNs and TLS to be developed in short timeframes and implemented in new releases of Cisco IOS Software without sacrificing performance.

Cisco 10720 Internet Router Solutions

Although primarily designed for high-speed Internet services for multitenant and business-park applications in the metro, the Cisco 10720 Internet Router is also suitable for a range of other applications such as: Internet data center applications, intrapoint of presence (POP) aggregation, and VoIP aggregation.

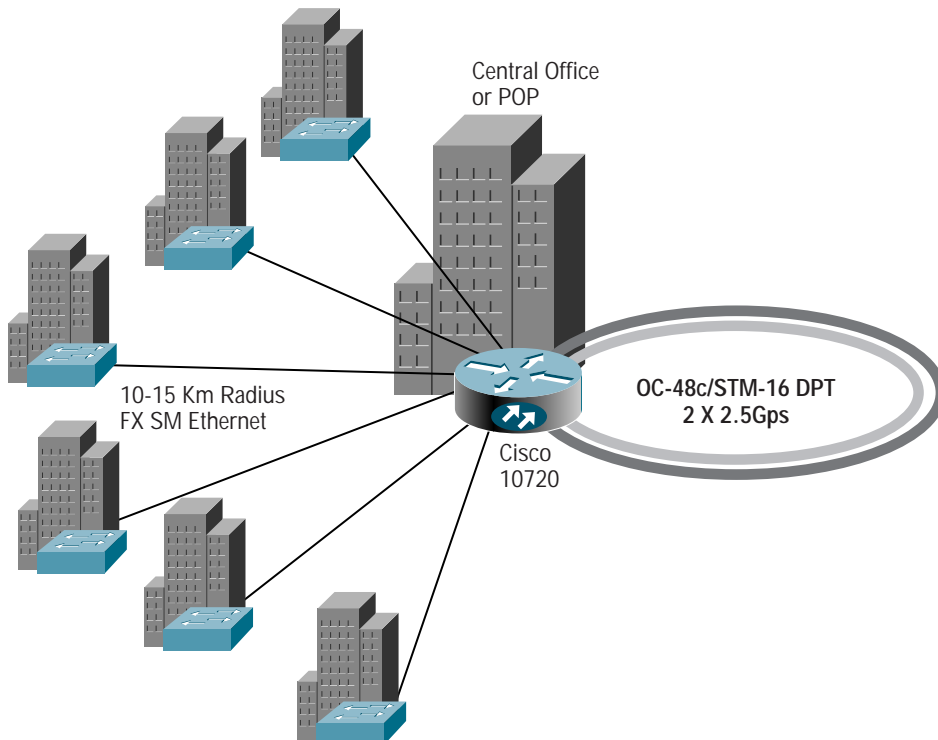
Figure 4
Multitenant Internet Access



Multitenant Internet Access

Cisco 10720 Internet Routers can be deployed in different buildings within the metro on a DPT ring, providing differentiated services to various customers within the buildings (Figure 4).

Figure 5
Business Park Internet Access-Option 1

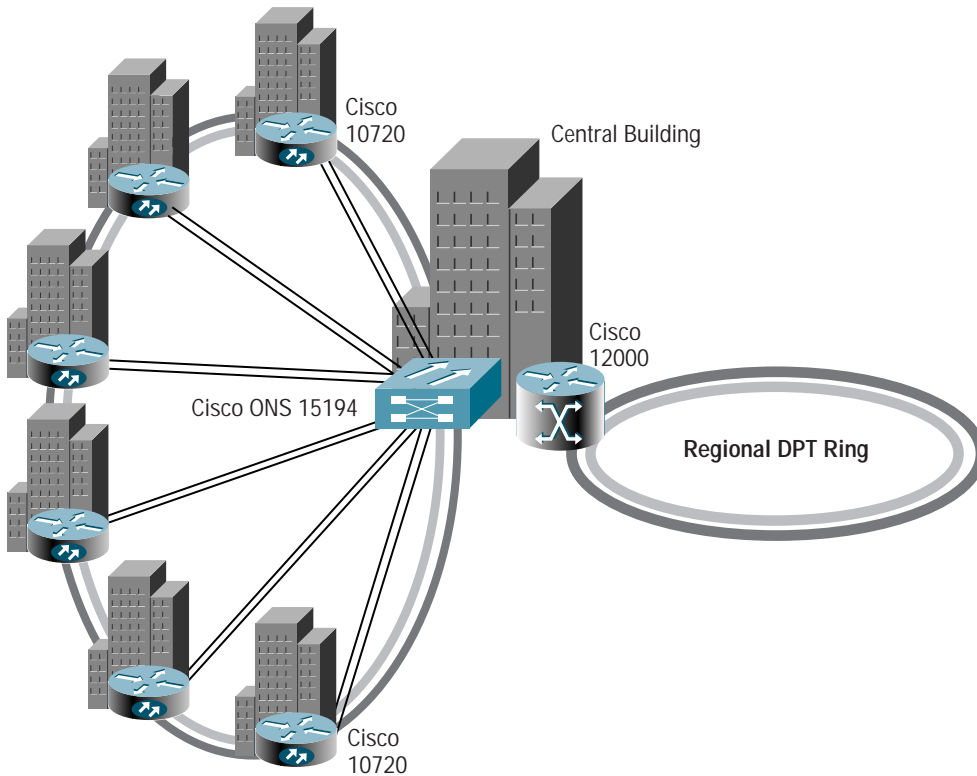


Business Park Internet Access

The single-mode FX Ethernet option allows deployment of the Cisco 10720 Internet Router in a central building within a business park and the ability to serve up to 24 different buildings within a 15-km radius (Figure 5).

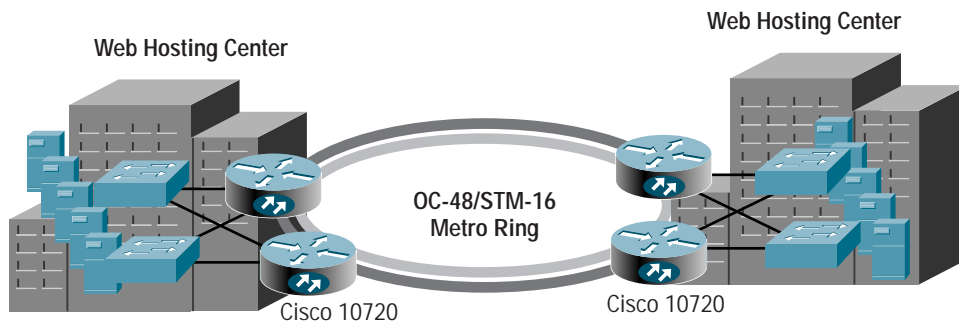
A second business park deployment application shows the Cisco 10720 coupled with the Cisco ONS 15194 to star wire campus buildings. The Cisco 10720 Internet Router is used to connect each building to the DPT ring, as shown in Figure 6.

Figure 6
Business Park Internet Access-Option 2



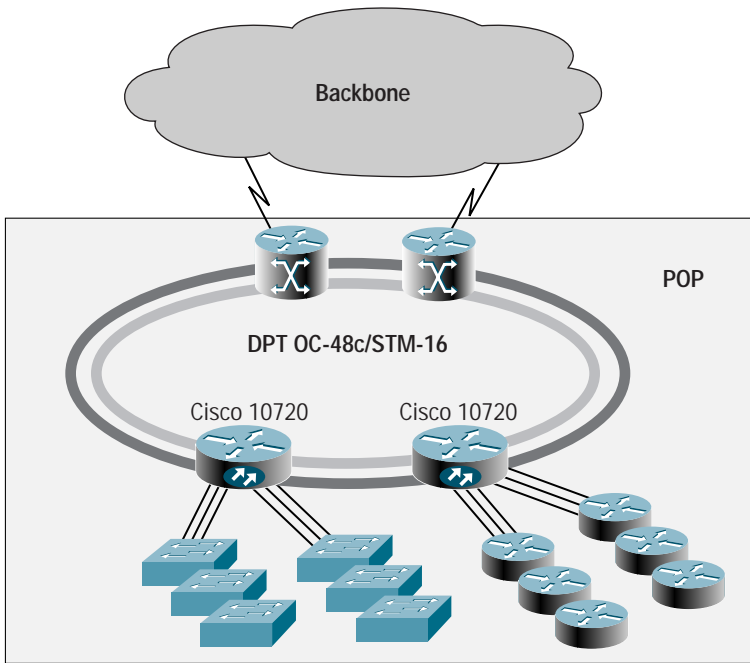
Internet Data Center Figure 7 illustrates redundant load sharing using the Cisco 10720 Internet Router in Web farms.

Figure 7
Internet Data Center



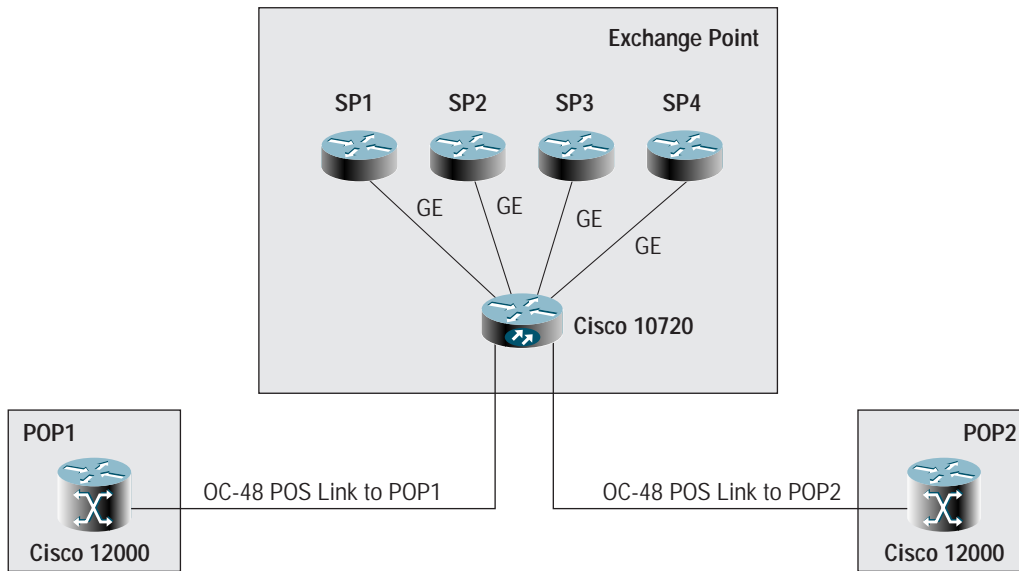
IntraPOP Aggregation The Cisco 10720 can also be deployed within a POP to aggregate access devices as shown in Figure 8.

Figure 8
IntraPOP Aggregation



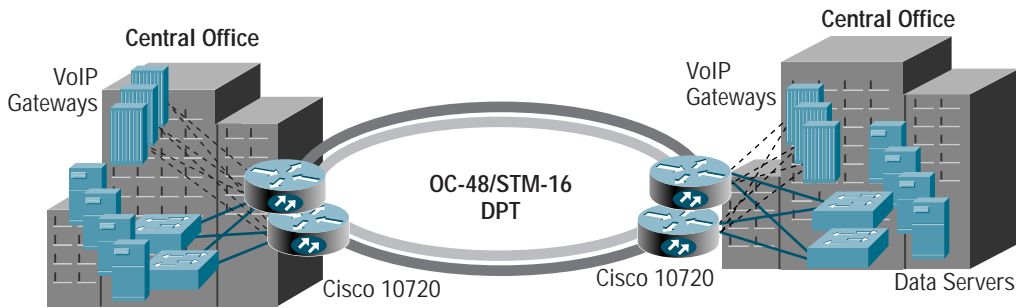
The support for POS functionality on the OC-48 ports (Figure 9) allows service providers to offer IP Transit/Co-location services.

Figure 9
IP Transit/Co-location Services



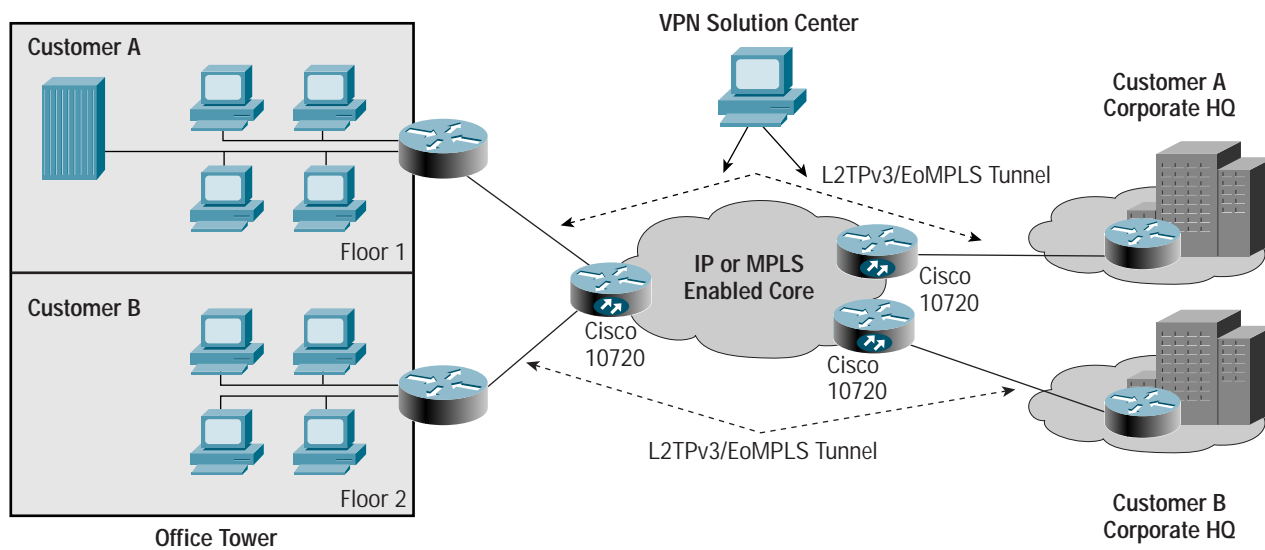
VoIP Aggregation The Cisco 10720 can aggregate voice traffic from VoIP gateway servers and other data servers in a location over a metro DPT ring, as in Figure 10. It can prioritize traffic to provide optimal QoS for voice.

Figure 10
VoIP Aggregation



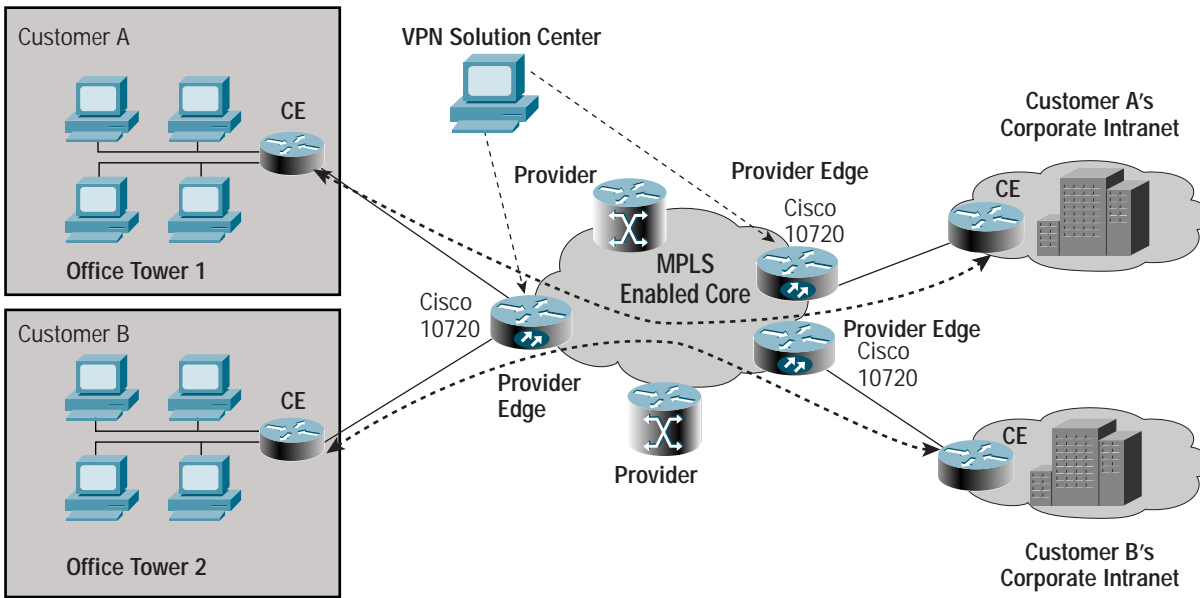
Transparent LAN Services Support of the Layer 2 Tunneling Protocol Version 3 (L2TPv3) and Ethernet-over-MPLS (EoMPLS) feature in the Cisco 10720 allows service providers to offer transparent LAN services to their customers by extending their Ethernet or VLAN from one location to the other using one of these tunneling mechanisms. L2TPv3 is used over an IP backbone and EoMPLS over an MPLS core (Figure 11).

Figure 11
Transparent LAN Services



IP VPN Services Support of MPLS provider and provider edge functionality allows service providers to offer IP VPN services to customers (Figure 12).

Figure 12
IP VPN over MPLS Backbone



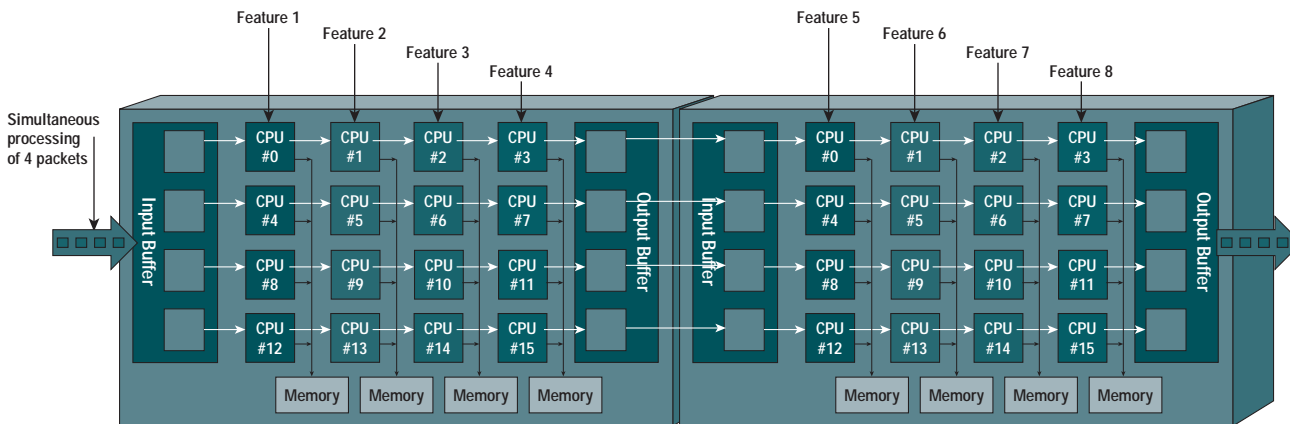
Features at a Glance

Hardware Features

Central Processing Engine

The central processing engine consists of two sets of processors that manage the control plane and data plane traffic. The PXF network processors manage the data plane and support IP forwarding as well as advanced QoS features. The multiple processors in the PXF process packets simultaneously at the rate of approximately 2 mpps (Figure 13).

Figure 13
PXF Processing



Redundant Power Supply

The Cisco 10720 Internet Router is equipped with a dual power supply by default. Both AC and DC power supplies are supported as options.

Interface Modules

The Cisco 10720 Internet Router has two dedicated slots for interface modules (modules are not interchangeable or hot swappable):

- Upper slot is dedicated for a console/auxiliary module or a DPT or POS (Packet Over SONET) uplink module equipped with two physical ports of OC-48c/STM-16c.
 - *DPT/POS uplink module*—This module provides an aggregate bandwidth of approximately 5 Gbps. The cards are available in four versions of optics—Short Reach (SR), Intermediate Reach (IR), Long Reach 1 (LR1) (40 km) and Long Reach 2 (LR-2) (80 km) with two small form-factor OC-48 ports with LC connectors (Figure 14). All uplink modules also have one console port and one auxiliary port for management purposes, both with RJ-45 connectors.
 - *Console/auxiliary module*—This module has only the console and auxiliary ports and no OC-48c/STM-16c ports. (Figure 15).

Figure 14
OC-48c/STM16c SR, IR, LR1, or LR2



Figure 15
Console/Auxiliary Module



- Lower slot is dedicated for either a 24-port Fast Ethernet module or a combined 4-port Gigabit Ethernet and 8-port Fast Ethernet module
 - *24-port Fast Ethernet module*—This module is available in TX (100-m reach) as in Figure 15, FX-MM (2-km reach) or FX-SM (15-km reach) as in Figure 16 and 17. The TX module is equipped with RJ-45 connectors while the FX-SM and FX-MM modules are equipped with MT-RJ connectors.
 - *4-Port Gigabit Ethernet + 8-port Fast Ethernet module*—The Gigabit Ethernet ports are equipped with small-form-factor pluggable (SFP) optics that are available in SX (2-km reach) or LH (10-km reach) optics (Figure 18).

Figure 16
24-Port 10/100 TX



Figure 17
24-Port 100-Mbps FX-SM or FX-MM



Figure 18
4-Port Gigabit Ethernet + 8-Port 10/100 TX



Software Features

- *SRP features*—IPS with less than 50-ms restoration time and SRP Management Information Base (MIB) support
- *IP routing protocols including IS*—IS, OSPF, and BGP
- Multicast support including protocol-independent multicase (PIM) sparse mode (SM), PIM dense mode (DM), Multiprotocol BGP
- *L2VPN*—L2TPv3 or EoMPLS for Ethernet based Layer 2 VPN services
- *L3VPN*—MPLS provider and provider edge functionality
- *QoS features*—Modular QoS CLI, CAR, WRED, versatile traffic-management system (VTMS) traffic shaping, and access lists
- *Ethernet features*—10/100 speed autonegotiation, HDX-FDX negotiation and time domain reflectometry (TDR) for 10/100BaseTX, Hot Standby Routing Protocol (HSRP)/Multiple HSRP
- Security including authentication, authorization, and accounting (AAA); RADIUS authentication; TACACS+, encrypted passwords; and so on

Management and Administration

- Cisco IOS CLI
- TACACS+ and RADIUS
- Configuration and administration features including Telnet and Cisco Discovery Protocol
- Serial (auxiliary) and console ports for local and remote administration
- Remote software download via Trivial File Transfer Protocol (TFTP) and Remote Copy Protocol (RCP)
- IP over data communication channel (DCC) for remote management of the Cisco ONS 15104 OC-48/STM-16 Optical Regenerator, where applicable
- 64-MB built-in Flash memory for software and configuration load
- Optical receive power monitoring support on OC-48/STM-16 and GE interface
- Supported MIBs include Simple Network Management Protocol (SNMP), SRP, SONET, Etherlike, and OSPF
- Autoinstall feature support for remote deployments

Specifications

Physical

- Weight: 34 lb (15.3 kg)
- Dimensions (H x W x D): 3.5 x 17.25 x 18.25 in. (8.9 x 43.81 x 46.35 cm)
- Mounting options: 19 in., 23 in., 24 in. EIA; ETSI; front-, mid-, or rear-rack mounting; wall mounting; table mounting

Upper Slot Modules

- Two-port single-mode OC-48c/STM-16c SRP or POS:
 - SR 2 km (1.2 miles)
 - IR 15 km (9.3 miles)
 - LR1 40 km (25 miles)
 - LR2 80 km (50 miles)
 - Weight: 3.0 lb (1.35kg)
 - Dimensions (H x W x D): 0.96 x 13.16 x 8.55 in. (2.44 x 33.43 x 21.71 cm)
 - LEDs: Overtemp, cardfail, system status, power, active, carrier, receive packet, SRP wrap, and SRP passthrough
- Console/Auxiliary Module
 - Console and Auxiliary ports
 - Weight 2.4 lbs (1.09 kg)
 - Dimensions (H x W x D): 0.96 x 13.16 x 8.55 in. (2.44 x 33.43 x 21.71 cm)
 - LEDs: Overtemp, cardfail, system status, and power

Lower slot module

- 24-port 10/100Base-TX access module:
 - Weight: 2.8 lb (1.26 kg)
 - Dimensions (H x W x D): 1.49 x 13.16 x 8.55 in. (3.78 x 33.42 x 21.71 cm)
 - LEDs: Cardfail, power, error (R), link/active (G), and 100 Mbps
 - Connectors: RJ-45
- 24-port 100Base-FX access module (FX-SM or FX-MM):
 - Weight: 3.2 lb (1.44 kg)
 - Dimensions (H x W x D): 1.49 x 13.16 x 8.55 in. (3.78 x 33.42 x 21.71 cm)
 - LEDs: error (R), link (G), active, cardfail, power
- 4-Port 1000Base-FX + 8-port 10/100Base-TX access module:
 - Weight: 2.8 lb (1.26 kg)
 - Dimensions (H x W x D): 1.49 x 13.16 x 8.55 in. (3.78 x 33.42 x 21.71 cm)
 - LEDs: Cardfail, power, error (R), link/active (G), and 100Mbps

Environmental

- Temperature:
 - Operating: 32 to 104 F (0 to 40 C)
 - Nonoperating: -4 to 149 F (-20 to 65 C)
- Relative humidity:
 - Operating: 10 to 85 percent noncondensing
 - Nonoperating: 5 to 95 percent noncondensing
- Altitude:
 - Operating: 0 to 10,000 ft (0 to 3000 m)
 - Nonoperating: 0 to 15,000 ft (0 to 4570 m)
- Heat dissipation:
 - Max DC: 500W or Max AC: 500W
- Shock:
 - Operating (half sine): 21 in. per sec (0.53 m per sec)
 - Nonoperating (trapezoidal pulse): 20 G¹, 52 in. per sec (1.32 m per sec)
- Acoustic noise: Max 60dBa
- Vibration:
 - Operating: 0.35 Grms² from 3 to 500 Hz
 - Nonoperating: 1.0 Grms from 3 to 500 Hz

Safety Compliance

- ACA TS 001
- AS/NZS 3260
- EN/IEC 60825 Laser Safety
- CSA C22.2 No. 950 ~ UL 1950
- IEC60950 second edition with A1-A4
- EN60950 second edition with A1-A4

1. G is a value of acceleration, where 1 G equals 32.17 ft/sec (9.81 m/sec)

2. Grms is the root mean square value of acceleration

Immunity Compliance

- EN 300 386/EN 300 386-2
- EN55024
- EN50082-1

Electromagnetic Emissions Certification

- AS/NZS 3548 - Class A
- FCC Part 15 (47CFR15 Subpart B) - Class A
- EN 300 386/EN 300 386-2 - class A/B³
- EN55022 class A/B³
- EN61000-3-2
- EN61000-3-3
- ICES-003 - Class A
- VCCI - Class A
- CISPR 22 -Class A/B³
- BSMI (Taiwan) - Class A⁴

Immunity Tests

- EN/IEC-61000-4-2: ESD
- EN/IEC-61000-4-3: Radiated immunity
 - EN/IEC-61000-4-4: EFT
 - EN/IEC 61000-4-5: Surge
 - EN/IEC-61000-4-6: Conducted immunity
 - EN/IEC-61000-4-11: Voltage dips and sags

Network Equipment Building Systems (NEBS3)

Designed to meet Telcordia (Bellcore) NEBS:

- GR-1089-CORE
- GR-63-CORE

Power

Dual DC power supply:

- Total DC input power: 200 to 300W (measured max)
- Heat dissipation: 500W
- Input voltage: -48/-60VDC nominal
- Maximum input current: 9.0A
- Typical input current: 3.0 to 4.0A

Dual AC power supply:

- Total AC input power: 200 to 300W (measured max)
- Heat dissipation: 500W
- Input voltage: 100 to 240VAC

3. Class B with shielded Ethernet cable (CAT5); Class A with unshielded Ethernet cable (CAT5)

4. Requires the use of shielded (CAT 5) Ethernet cable on the Fast Ethernet TX ports for 10720-FE-TX and 10720-GE-FE-TX; not applicable for 10720-GE-FE-TX-B

- Input line frequency: 50/60 Hz
- Input current: 2.5 to 5.0A

Software

Cisco IOS Software Release 12.0(19)SP or 12.0(21)ST or later

Optics

Table 1

OC-48c/STM-16c Single-Mode DPT Uplink Module Optics

	SR	IR	LR1	LR2
Connector type	LC duplex	LC duplex	LC duplex	LC duplex
Operating wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Transmit power				
Minimum	-10 dBm	-5 dBm	-2 dBm	-2 dBm
Maximum	-3 dBm	0 dBm	3 dBm	3 dBm
Receive sensitivity				
Minimum	-18 dBm	-18 dBm	-27 dBm	-28 dBm
Maximum	-3 dBm	0 dBm	-9 dBm	-9 dBm
Rated distance (dispersion-unshifted single-mode fiber per GR-20-CORE)	2 km	15 km	40 km	80 km

Table 2

100-Mbps FX Ethernet Module Optics

	FE-FX-MM	FE-FX-SM
Connector type	MT-RJ	MT-RJ
Operating wavelength	1310 nm	1310 nm
Transmit power		
Minimum	-23.5 dBm min	-20.0 dBm min
Maximum	-14.0 dBm max	-14.0 dBm max
Receive sensitivity		
Minimum	-31.0 dBm min	-31.0 dBm min
Maximum	-14.0 dBm max	-8 dBm max
Rated distance (dispersion-unshifted single-mode fiber per GR-20-CORE)	2 km	15 km

Table 3

1000Mbps Gigabit Ethernet SFP optics

Feature	SFP-SX	SFP-LH/LX	SFP-ZX
Connector type	LC duplex	LC duplex	LC Duplex
Operating wavelength -TX	850nm VCSEL	1310nm Fabry-Perot Laser	1550 nm
Transmit power			
Minimum	-9.5 dBm	-9.5 dBm	0 dBm
Maximum	-4 dBm	-3 dBm	5 dBm
Receiver sensitivity			
Minimum	-18 dBm	-19 dBm	-23 dBm
Maximum	-4 dBm	-3 dBm	-3 dBm
Rated distance (50/125um MMF)	500 to 550m	—	—
Rated distance (62.5/125um MMF)	220 to 275m	—	—
Rated distance (9/125um SMF)	—	10 km	70 km

Table 4

Ordering Information

Part number	Description
CISCO10720-AC-A	Cisco 10720 Internet Router with dual AC power supply—Rev A
CISCO10720-DC-A	Cisco 10720 Internet Router with dual DC power supply—Rev A
10720-FE-TX	24-port 10/100 Ethernet Access Module—RJ-45 connectors
10720-FE-FX-MM	24-port 100-Mbps Multimode Fiber Ethernet Access Module 2 km—MTRJ connectors
10720-GE-FE-TX	4-Port GE 8-Port 10/100 Ethernet RJ45
10720-GE-FE-TX -B	4-Port GE 8-Port 10/100 Ethernet RJ45-Revision B
10720-GE-SFP-SX	GE SFP—Short Reach 550M LC connectors
10720-GE-SFP-LH	GE SFP—Intermediate Reach 10KM LC connectors
GLC-ZX-SM	GE SFP—Long Reach 70KM LC connectors
10720-SR-LC	OC-48c/STM-16c SRP Short Reach (2 km) Uplink Module—LC connectors
10720-IR-LC	OC-48c/STM-16c SRP Intermediate Reach (15 km) Uplink Module—LC connectors
10720-LR1-LC	OC-48c/STM-16c SRP Long Reach (40 km) Uplink Module—LC connectors
10720-LR2-LC	OC-48c/STM-16c SRP Long Reach (80 km) Uplink Module—LC connectors
10720-SR-LC-POS	OC-48c/STM-16c POS Short Reach (2 km) Uplink Module—LC connectors
10720-IR-LC-POS	OC-48c/STM-16c POS Intermediate Reach (15 km) Uplink Module—LC connectors
10720-LR1-LC-POS	OC-48c/STM-16c POS Long Reach (40 km) Uplink Module—LC connectors
10720-LR2-LC-POS	OC-48c/STM-16c POS Long Reach (80 km) Uplink Module—LC connectors
10720-CON-AUX	Console/Auxiliary Module

For additional information, please go to: <http://www.cisco.com/go/metroip>.



Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

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