

Cisco IP Transfer Point

The Cisco® IP Transfer Point (ITP) is a comprehensive and flexible solution for transporting Signaling System 7 (SS7) traffic over traditional time-division multiplexing (TDM) networks or next-generation SS7-over-IP (SS7oIP) networks. The Cisco IP Transfer Point supports traditional, next-generation, and combined traditional/next-generation networks, so mobile and fixed telecom operators can migrate to more cost-efficient IP networks that support their business goals.

The Cisco ITP offers the complete feature set found in traditional signaling transfer points (STPs). When operating in a TDM environment, the Cisco ITP provides superior value for transporting SS7 traffic over traditional TDM networks.

Using the standards developed by the IETF's Signaling Transport (SIGTRAN) working group, in an SS7oIP environment, the Cisco ITP connects to traditional SS7 nodes or IP-enabled signaling nodes and offloads this SS7 traffic to reliable and cost-efficient IP networks, thus freeing capacity and ports on the existing and costly SS7 network. The Cisco ITP is also capable of operating in an environment that interworks between TDM and SS7oIP.

Additionally, by incorporating the SIGTRAN working group's Message Transfer Part Layer 3 (MTP3) User Adaptation Layer (M3UA) and Signaling Connection Control Part (SCCP) User Adaptation Layer (SUA) standards, the Cisco ITP provides complete signaling gateway functions between traditional TDM networks and IP-enabled signaling endpoints.

In this capacity, the Cisco ITP enables a smooth migration to next-generation IP-based technologies. The Cisco ITP is fully compliant with Telecoms & Internet converged Services & Protocols for Advanced Networks (TISPAN) and IP Multimedia Subsystem (IMS) Signaling Gateway specifications. It has also been deployed in numerous voice-over-broadband (VoBB) networks enabling VoIP telephony networks to interconnect with the public switched telephony network (PSTN). The Cisco ITP's underlying capabilities with regards to IP routing, advanced SS7 routing features, and SIP capabilities are essential in providing telecom operators a smooth migration toward next-generation telephony networks based on SIP.

The Cisco ITP thus provides superior value over traditional SS7 transport solutions while providing the infrastructure for the next generation of signaling transport.

Important features and benefits of the Cisco ITP include:

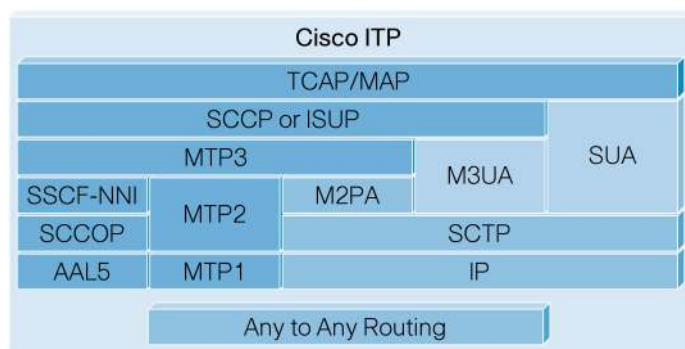
- Signaling infrastructure cost reduction
- Superior value and flexible scalability for signaling-capacity expansion, for TDM or IP
- Integrated, industry-leading IP routing, including IP WAN media support and a breadth of quality-of-service (QoS) features
- Reliability and performance characteristics demanded by signaling infrastructures
- High-speed link (HSL) support
- Traditional STP feature set, including global title translation (GTT) and gateway screening
- Open industry standards: Message Transfer Part 2 (MTP2) User Peer-to-Peer Adaptation Layer (M2PA), M3UA, and SUA

- Portfolio of industry-leading traditional SS7 and SS7oIP solution partners
- Mobile Application Part (MAP) gateway services for wireless LAN (WLAN) subscriber identity module (SIM) authentication and authorization
- Advanced origination and destination SS7 routing with Gateway Screening and multilayer routing features
- Gateway STP functions, including concurrent multiple variants and conversion between variants

Protocol Specifications and Compliance

Figure 1 shows the basic protocol architecture of a Cisco IP Transfer Point and its any-to-any switching capability.

Figure 1. Cisco IP Transfer Point Protocol



Cisco IP Transfer Point Architecture

- AAL5 – ATM Adaptation Layer 5
- GTT – Global Title Translation
- MAP – Mobile Application Part
- MTP – Message Transfer Part
- MTP1 – Message Transfer Part Layer 1
- MTP2 – Message Transfer Part Layer 2
- MTP3 – Message Transfer Part Layer 3
- M2PA – MTP2-User Peer-to-Peer Adaptation Layer
- M3UA – MTP3-User Adaptation Layer
- SCCP – Signaling Connection Control Part
- SCCOP – Service-Specific Connection-Oriented Protocol
- SCTP – Stream Control Transmission Protocol
- SSCF-NNI – Service-Specific Coordination Function for Network Node Interface
- SUA – SCCP User Adaptation Layer
- TCAP – Transaction Capabilities Application Part

Tables 1 through 8 provide more information about the Cisco ITP. Specifically:

- Table 1 describes protocol compliance

- Table 2 outlines the general platform specifications
- Table 3 describes SS7 interface support
- Table 4 details the Cisco ITP capacity and performance
- Table 5 describes Cisco ITP SS7oIP features
- Table 6 lists the IP routing protocols supported
- Table 7 describes Cisco IOS® Software features
- Table 8 lists Cisco Mobile Wireless Transport Manager 6.0 Features

Table 1. Protocol Compliance

Protocol	Specifications
Message Transfer Part (MTP) 1,2,3	ITU-T Q.701-Q.709 White 1996 (interworks with Blue), ANSI 2 T1.111-1996, China SS7, Japan TTC, JT-Q704 (v3 2002/5/30), JT-Q703(v3 1994/4/27), JT-Q702 (v1 1987/4/28), JT-Q701 (v2 1990/11/28)
SCCP	ITU-T Q.711-Q.719 White 1996 (interworks with Blue), ANSI T1.112-1996
TCAP	ANSI TCAP – T1.114 1996, ITU-T Q771–775 (White book, June 1997)
High-speed link (ATM over T1 or E1)	Q.2100, Q.2140, Q.2110, Q.2210, Q.2144, JT-Q2210, JT-Q2140, JT-Q2110, JT-I363.5/JT-QI361, GR-2878, I.363.5, I.361
High-speed link (nonchannelized T1 or E1)	Q703 Annex A
MTP2-User Peer-to-Peer Adaptation Layer (M2PA)	IETF RFC 4165: SIGTRAN SS7 MTP2–User Peer-to-Peer Adaptation Layer
M3UA	IETF RFC 4666: SIGTRAN SS7 MTP3–User Adaptation Layer
SUA	IETF RFC 3868: SIGTRAN SS7 SCCP–User Adaptation Layer
SCTP	IETF RFC 2960: Stream Control Transmission Protocol IETF RFC 3309: Stream Control Transmission Protocol Checksum Change
MAP	03.40 ETSI Document TS 100 901 v7.5.0

The ITP MTP2 and MTP3 layers have been tested for STP conformance by Telcordia Technologies.

Platform Specifications

The Cisco IP Transfer Point is implemented on the Cisco 2600XM Series Router¹ (Cisco 2650XM and 2651XM), the Cisco 2811 Router, the Cisco 7200 Series Router (Cisco 7204VXR and 7206VXR), the Cisco 7301 Router, the Cisco 7500 Series Router² (Cisco 7507 and 7513) and the Cisco 7600 Series Router. All hardware models function similarly by performing MTP3 and Signaling Connection Control Part (SCCP) routing over SS7 TDM links or over an IP (or dual IP) network.

This data sheet discusses the ITP implementation on the Cisco 2811, 7200VXR, and 7301 platforms. Separate data sheets are available for the Cisco 2600XM, 7500, and 7600 Series-based implementations.

Note: RAM and Flash memory requirements are determined by operational requirements for maximum capacity. Cisco IOS Software images, routing tables, Global Title Translations (GTTs), and run-time data structures consume memory.

¹ The Cisco 2600XM Series Router reached end-of-sale as of March 27, 2007.

² The Cisco 7500 Series Router will reach end-of-sale effective December 15, 2007.

Table 2. General Platform Specifications

Attribute	Cisco 2811	Cisco 7200VXR/G1	Cisco 7200VXR/G2	Cisco 7301
Dimensions (H x W x D)	1.7 x 17.5 x 16.4 in. (4.3 x 44.5 x 42 cm)	5.25 x 16.8 x 17 in. (13.34 x 42.67 x 43.18 cm)	5.25 x 16.8 x 17 in. (13.34 x 42.67 x 43.18 cm)	1.73 x 17.3 x 13.87 in. (4.39 x 43.9 x 35.23 cm)
Rack units (RU)	1 RU	3 RU	3 RU	1 RU
Dual processor	No	No	No	No
Dual power	Yes, external	Yes	Yes	Yes
Network Equipment Building Standards (NEBS) 3	Yes	Yes	Yes	Yes
Main processor requirements		Cisco 7200 Series NPE-400 and NPE-G1 network processing engines	Cisco 7200 Series NPE-G2 network processing engine	
Main processor RAM	256 MB	256 MB	1GB	256 MB
Main processor Flash memory	32 MB	128 MB Flash disk	256 MB	128 MB Flash disk

Table 3. SS7 Interface Support by Platform (interface card part numbers shown below)

Interface Type	Cisco 2811	Cisco 7200VXR/G1	Cisco 7200VXR/G2	Cisco 7301
Channelized T1/DS-0 and E1	VWIC-2T1/E1-RAN	PA-MCX-8TE1-M	PA-MCX-8TE1-M	PA-MCX-8TE1-M
High-speed links (ATM over T1/E1)		PA-A3-8T1IMA and PA-A3-8E1IMA	PA-A3-8T1IMA and PA-A3-8E1IMA	PA-A3-8T1IMA and PA-A3-8E1IMA
High-speed links (Q703 unchannelized T1/E1)*			PA-MCX-4TE1-Q	
STM-1 via ATM		PA-A6-OC3 (MM, SMI, and SML)	PA-A6-OC3 (MM, SMI, and SML)	PA-A6-OC3 (MM, SMI, and SML)

Note: WAN interface card = WIC, Voice WIC = VWIC, Port adapter = PA, Electrical Interface Assembly/Telecommunications Industry Alliance = EIA/TIA

T1 Compliance

- ANSI T1.403
- United States (UL 1950, 1459, T1)
- Federal Communications Commission (FCC) Part 68
- Canada (C1950, T1)
- Unites States (FCC part 15J Class A, T1)
- United Kingdom (BS6301, EN60950, EN41003)
- Canada (CSA C108.8 Class A, T1)
- Bellcore-AT&T Accunet (62411)
- ATT 54016
- Japan (VCCI Class 2, T1)

E1 Compliance

- Germany (TUV GS)
- Germany (VDE 0878 part 3 and 30)
- France (NFC98020)
- France (EN60950, EN41003)
- Sweden (SS447-2-22)

- Europe (EN55022 Class B, EN55102-1, EN55102-2)
- CCITT/ITU G.703, G.704, I.431
- ETSI NET5, ETS300156
- CTR-4, CTR-12
- TBR-13
- ETS 300011
- ITU I.431

IP Media Support

- T1
- E1
- Ethernet, Fast Ethernet, Gigabit Ethernet
- ATM over T1, E1, OC-3 single mode, OC-3 multimode

Note: SS7 over IP (SCTP, M2PA, M3UA, SUA) is supported over T1, E1, Ethernet, Fast Ethernet, Gigabit Ethernet, and ATM OC-3 single mode and ATM OC-3 multimode. Support for other media types can be considered upon request.

Capacity and performance notes:

- Performance data is based on Cisco IOS Software Release 12.4(11)SW for the Cisco ITP.
- Individual links are capable of running at 1.0 Erlang.
- Performance data listed in Table 4 is based on 100 byte average MSU size.
- For the purposes of estimating message signal units (MSUs)-per-second performance, a packet that enters and then exits the ITP is counted as a single MSU (not as two MSUs). Performance data in Table 4 reflects this methodology.
- Multilayer routing introduces a typical 10 percent processor overhead.
- GTT introduces up to 20 percent processor overhead.
- For maximum performance, SCTP bundling should be enabled (default configuration).
- For GSM TCAP-segmented messages that require MO-Proxy for MLR operations, extrapolation based on the percentage of traffic that requires MO-Proxy is used to estimate the performance impact. MO Proxy performance shown in Table 4 is based upon 100% of SMS traffic requiring TCAP segmentation.

Table 4. Cisco IP Transfer Point Features and Performance

Maximum	Cisco 2811	Cisco 7301, 7200VXR/G1	Cisco 7200VXR/G2
Low-speed TDM links	16	48	192
M2PA links	1000	1000	1000
HSLs	–	8	16
LSL <-> M2PA routed MSUs per second (total switched [Tx+Rx])	1600	7500* (with Global Title Translation [GTT])	13,000 (without GTT) 10,500 (with GTT)
LSL <-> M3UA routed MSUs per second (total switched [Tx+Rx])	1600	7500* (with GTT)	13,000 (without GTT) 10,500 (with GTT)
LSL <-> SUA routed MSUs per second with GTT (total switched [Tx+Rx])	1000	7500* (with GTT)	9500 (with GTT)

Maximum	Cisco 2811	Cisco 7301, 7200VXR/G1	Cisco 7200VXR/G2
HSL <-> M2PA routed MSUs per second (total switched [Tx+Rx])	–	12,000 (without GTT) 9500 (with GTT)	20,000 (without GTT) 16,000 (with GTT)
HSL <-> M3UA routed MSUs per second (total switched [Tx+Rx])	–	12,000 (without GTT) 9500 (with GTT)	20,000 (without GTT) 16,000 (with GTT)
HSL <-> SUA routed MSUs per second (total switched [Tx+Rx])	–	8000 (with GTT)	14,000 (with GTT)
Q.703 HSL <-> M2PA routed MSUs per second (total switched [Tx+Rx])	–	–	16,000 (without GTT) 13,000 (with GTT)
Q.703 HSL <-> M3UA routed MSUs per second (total switched [Tx+Rx])	–	–	16,000 (without GTT) 13,000 (with GTT)
Q.703 HSL <-> SUA routed MSUs per second (total switched [Tx+Rx])	–	–	10,500 (with GTT)
MAP gateway SIM authentication transactions per second	–	1200	1800
MAP gateway SIM authentication plus authorization transactions per second	–	240	360
MO Proxy/SMSNOT	–	1500 SMS per second	2500 SMS per second
Latency (MTP3 and GTT routed MSUs)	5–40 ms	5–40 ms	5–40 ms
Entries in routing table	1000	10,000	10,000
SCTP associations	1000	1000	1000
Entries in GTT table	150,000	500,000	500,000
M3UA/SUA routing keys	1000	10,000	10,000

* Maximum MSUs-per-second performance is determined by link capacity.

Cisco IP Transfer Point Features

Table 5. Cisco IP Transfer Point SS7oIP Features

Category	Cisco IP Transfer Point Capability
SS7 routing	SCCP, GTT, and MTP3 any-to-any routing between all link types
QoS	QoS per SCTP association with classification based on: <ul style="list-style-type: none"> • Service indicator • Point code • Input link set • Global title address • Access lists • M3UA/SUA routing key
GTT support	Full traditional SCCP and GTT support Address translation

Category	Cisco IP Transfer Point Capability
Gateway screening	<p>The ITP Gateway Screening is a process that checks the contents of an incoming/outgoing message and either allows or rejects the message based on provisioned screening. Screening rules are specified in tables and are applied to an inbound or outbound linkset or an application server. If the incoming message is allowed, it is further processed. If the outgoing message is allowed, it is routed to the specified destination.</p> <p>Gateway screening tables are identified by the type of screening to be applied. Each gateway screening table consists of two types of information:</p> <ul style="list-style-type: none"> • Screening information: screening parameters • Structural information: next screening steps <p>Screening rules are chained to indicate the next screening steps. The final result is either to allow the message for further routing or to discard the message.</p> <p>Supports full traditional STP screening capability, including the MTP3- and SCCP-layer screening using access lists for any combination of the following MSU parameters:</p> <p>MTP3 screening</p> <ul style="list-style-type: none"> • Origination point code • Destination point code • Service indicator • Affected PC in management messages <p>SCCP screening</p> <ul style="list-style-type: none"> • Called party <ul style="list-style-type: none"> ◦ Global title indicator ◦ Translation type ◦ Numbering plan ◦ Nature of address indicator ◦ Encoding scheme ◦ Point code ◦ Subsystem number • Calling party <ul style="list-style-type: none"> ◦ Global title indicator ◦ Translation type ◦ Numbering plan ◦ Nature of address indicator ◦ Encoding scheme ◦ Point code ◦ Subsystem number • SCCP management screening <ul style="list-style-type: none"> ◦ Affected point code ◦ Affected subsystem number • ISUP <ul style="list-style-type: none"> ◦ ISUP message type <p>General screening</p> <ul style="list-style-type: none"> • Byte-pattern and offset <p>Multilayer routing-based screening features are also supported; see multilayer routing feature description in table further below</p>
SS7 load sharing	Complete MTP3 and SCCP load sharing for links, link sets, and combined link sets for any link types. Enhanced load sharing feature supports load sharing based on OPC and DPC which can provide a more even load distribution among available links.
Multiple point codes	Primary, secondary, and capability point codes and M3UA/SUA routing keys: Up to 32 TDM links to adjacent nodes
Multiple instances	<p>The Multiple Instance feature enables multiple variant and network indicator combinations to run concurrently on one Cisco ITP. Up to 8 instances can be configured. Each instance is a separate domain with a defined variant, network indicator, Cisco ITP point code, optional capability point code, and optional secondary point code.</p> <ul style="list-style-type: none"> • Instance Translation – This Cisco ITP feature enables the conversion of packets between instances of the same variant. • Instance Conversion – This Cisco ITP feature enables conversion between ITU and ANSI instances for point code and global title.

Category	Cisco IP Transfer Point Capability
Multilayer Routing (MLR)	The ITP MLR feature helps enable intelligent routing of all SS7 messages at the MTP or SCCP layer based on a flexible schema including OPC-DPC-SI and CdPa and CgPA parameters. Additionally, MLR allows for TCAP-layer routing of SMS mobile-originated/mobile-terminated (MO/MT) messages based on the application or service from which they originated or to which they are destined. The MLR feature can make SMS message-routing decisions based on information found in the TCAP, MAP, and MAP-user layers. Advanced routing capabilities are based on parameters such as SMS A-address, B-address, destination SMSC, and origination MSC. Also supports IS-41 SMS message routing.
MAP gateway SIM authentication and authorization	SIM-based authentication and authorization using RADIUS vendor-specific attributes interface.
MO Proxy	Enables the ability to route segmented GSM MAPv2 and higher messages based on application-layer parameters by terminating the MO dialogue. This capability ensures that the SMS MO dialogues for a given B-address are handled by the same SMSC. MO-Proxy is incompatible with the MMSC Gateway feature.
Preventive Cyclic Redundancy (PCR)	The Cisco ITP supports this additional MTP2-layer error correction algorithm which is often used for satellite-based SS7 links where one-way propagation delays can exceed 40ms.
Network management and monitoring	Simple Network Management Protocol (SNMP)-based network management for nodes, links, and routes (using a GUI); interoperates with CiscoWorks, CiscoView, HP OpenView products.

Table 6. IP Routing Protocols

Protocol	Definition
BGP	Border Gateway Protocol
EGP	Exterior Gateway Protocol
EIGRP	Enhanced Interior Gateway Routing Protocol
HSRP	Hot Standby Routing Protocol
IGRP	Interior Gateway Routing Protocol
NHRP	Next Hop Resolution Protocol
OSPF	Open Shortest Path First
RIP	Routing Information Protocol
Static Routing	Provision static routes

Table 7. Cisco IOS Software Features in the Cisco ITP

Feature	Description
AAA	Authentication, authorization, and accounting
Access lists	Access lists
Cisco Discovery Protocol	Cisco Discovery Protocol
IPSec/GRE	Supported on the Cisco 2811 platform
NTP	Network Time Protocol
RADIUS	Remote Authentication Dial-In User Service
SNMP	SNMPv3
TACACS	Terminal Access Controller Access Control System, TACACS SENDAUTH function, TACACS single connection

Cisco Mobile Wireless Transport Manager

Cisco Mobile Wireless Transport Manager (MWTM) Release 6.0 provides monitoring and management capabilities to the Cisco ITP solutions. Cisco MWTM addresses the element-management requirements of mobile operators and provides fault, performance, configuration, and troubleshooting capability as mobile operators make the transition from first-generation fixed, leased-line networks to a converged IP-based infrastructure.

Features

Table 8 includes a list of new features available with the Cisco MWTM 6.0 release.

Table 8. Cisco Mobile Wireless Transport Manager 6.0 Features

Features	Description
Extensive Cisco ITP support	Supports all Cisco ITP platforms: <ul style="list-style-type: none"> • Cisco 2650 and 2651 Multiservice Platforms • Cisco 2811 Integrated Services Router • Cisco 7204VXR and 7206VXR Routers • Cisco 7301 Router • Cisco 7507 and 7513 Routers • Cisco 7600 Series Routers
Event monitoring	Displays a real-time event list that supports acknowledgement, annotation, customized filtering, and field viewing that conform to ITU-T X.733 standards. Receives native traps from hardware devices in the Cisco ITP solutions and uses Simple Network Management Protocol (SNMP) polling to identify the status of each managed Cisco ITP device and the status of links and link sets. Cisco MWTM uses easy-to-recognize color-coded icons to report the status.
Wizard-based provisioning	Assists in provisioning destination point code (DPC) route tables, global title translation (GTT) tables, multilayer routing (MLR) address tables, application servers, application server processes, interfaces, links, and link sets by providing GUI-based editing; reduces errors by checking syntax and semantics before deploying the tables to the Cisco ITP device.
Performance reporting	Provides extensive Web-based accounting and network statistics reports. Displays real-time data rate and usage line graphs. Includes network efficiency and detailed interface-level statistics as well as Q.752-based statistics reports, point code inventory reports including Message Transfer Part Level 3 (MTP3), GTT, MTP3 User Adaptation (M3UA) or Signaling Connection Control Part (SCCP) SCCP User Adaptation (SUA), Message Signal Unit (MSU), and multilayer routing reports.
Autodiscovery and topology	Discovers the entire Cisco ITP network and displays each network element, neighboring equipment, and physical/logical connectivity in a network topology drawing that users can customize.
Troubleshooting	Customizable troubleshooting tools aid in reducing the total time to resolution of network/device problems.
OSS integration	Receives SNMP traps and generates Cisco MWTM-specific traps for forwarding to external SNMP-based network management applications such as Cisco Info Center or IBM Tivoli Netcool. Statistics are stored in comma-separated value (CSV) format files for extracting performance and Key Performance Indicator (KPI) metrics information. Northbound: Cisco ITP Extensible Markup Language (XML)/Simple Object Access Protocol (SOAP) APIs for events, traps, and inventory allow third-party OSSs to programmatically manage events by retrieving a list of events or providing access to inventory data. Northbound: Cisco ITP Provisioning XML/SOAP APIs allow third-party OSSs to programmatically configure Cisco ITP tables and objects.
Security	Supports multiple user-authentication methods—OS-based and standalone Optional SSL-based encryption between client and server supports optional Secure Shell (SSH) Protocol-based encryption between server and network element
Client/server architecture and OS support	Based on client/server architecture, Cisco MWTM supports Windows and Solaris clients and Solaris and Linux servers and provides data access through a Web browser.

For more information on Cisco MWTM, please visit: www.cisco.com/go/mwtm.

For More Information

In addition to this data sheet, separate Cisco ITP data sheets for the Cisco 7600 IP Transfer Point and the Cisco 2600XM and 7500 Series IP Transfer Point are available at:

http://www.cisco.com/en/US/products/sw/wirelssw/ps1862/products_data_sheets_list.html.

For more information regarding Cisco ITP, please visit:

<http://www.cisco.com/en/US/products/sw/wirelssw/ps1862/index.html>.

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