

Next-Generation SS7 Networks with the Cisco IP Transfer Point

Introduction

Common Channel Signaling System 7 (SS7 C7) is a set of standards that define the protocols and information exchanges between network devices within the signaling networks of mobile operators. In effect, the SS7 network functions as the nerve center that controls all network services and functions. As such, there is no aspect of the telecommunications infrastructure that has a higher need for network manageability, scalability, and reliable traffic delivery.

Traditionally, the SS7 network has comprised an out-of-band series of dedicated links that are bidirectional 56- or 64-kbps channels. In addition to the basic call control functions, the SS7 network is responsible for subscriber authentication, message traffic delivery, and intelligent network functions such as number portability and enhanced calling services. Each new service offered to the subscriber places additional requirements and load on the SS7 network.

The short message service (SMS) is a prime example of the types of services that can be delivered to subscribers as “overlay” features in the SS7 transport network. Today, European and Asian service providers are realizing an increasingly significant percentage of their total revenue from data services. However, as operators

are well aware, this exciting growth in data services comes with advantages and disadvantages. Although the revenue stream generated by services is a positive influence on average-revenue-per-user (ARPU) metrics, the current volume of service traffic is overloading the traditional SS7 network. SS7 network protocols were not designed to accommodate the different network requirements of critical ISDN User Part (ISUP) traffic versus SMS traffic. The number of worldwide mobile subscribers has surpassed the one billion mark, and associated SMS traffic volume has increased dramatically. Without additional SS7 network capacity expansion, the incremental data traffic can affect traditional network operations. In this context, it is worth noting that given that there are no quality-of-service (QoS) features in a time-division multiplexing (TDM) network, capacity must be planned for peak traffic volume, a deployment scenario that is not cost-effective.



This paper describes the Cisco IP Transfer Point (ITP) technology and the Cisco ITP Series of products that provide the telecommunications industry with next-generation signaling transport. Cisco ITP provides:

- Full traditional signaling transfer point (STP) function with TDM or Internet Engineering Task Force (IETF) Standard SS7 over IP (SS7oIP) (STP or MTP2-User Peer-to-Peer Adaptation Layer [M2PA] feature set)
- IP-to-intelligent network gateway services (MTP3-User Adaptation [M3UA] or SCCP User Adaptation [SUA] signaling gateway feature set)
- Remote Access Dial-In User Service (RADIUS)-to- Mobile Application Part (MAP) gateway for subscriber identity module (SIM) authentication in wireless LAN (WLAN) or Universal Telecommunications System (UMTS) deployments (MAP gateway + SIM authentication feature set)
- Intelligent MAP or transaction capabilities application part (TCAP) level routing for efficient service deployment (MAP gateway + multilayer routing feature set)

Full Traditional STP Function with TDM or IETF Standard SS7oIP (STP and M2PA Feature Set)

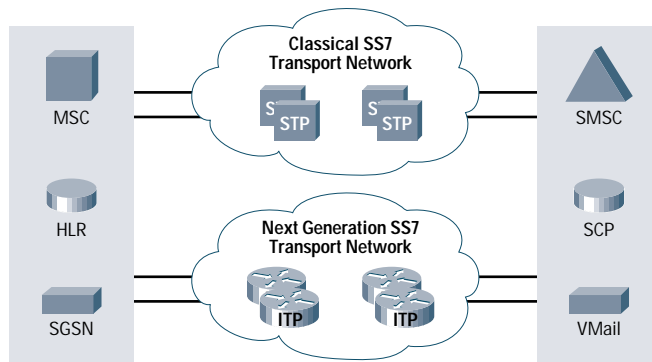
When additional SS7 network capacity is required, the Cisco ITP provides a reliable and cost-effective solution. The acceptance of IP for SS7 transport has forever changed the STP feature requirements and pricing models. Operators increasingly recognize that they cannot continue to purchase traditional STP equipment that does not provide the required IP functionality in a third-generation mobile network and next-generation wireline network architectures. Next-generation STPs are not defined as traditional STPs with an Ethernet interface card. Next-generation STPs are integrated SS7 and IP routing devices with support for IP routing protocols, IP WAN media such as ATM and optical, virtual-private-network (VPN) security such as IP Security (IPSec), firewall, and IP QoS support such as Multiprotocol Label Switching (MPLS) and IP Differentiated Services. In next-generation signaling networks, TDM A links are terminated on the network edge and IP is used as the core transport. The IP feature set becomes just as important, as is the ability to perform SS7 routing such as global title translation (GTT).

The benefits of deploying next-generation signaling transport infrastructure follow:

- No architecture changes—Cisco ITP supports pure TDM mode. When using SS7oIP, SS7 routing translations are the same for TDM or IP linksets.
- Flexibility—There is flexibility when adding capacity for new revenue-generating service deployment.
- Cost—Next-generation signaling transport lowers network capital and operational expenditures.
- Performance—Next-generation signaling transport increases the price for performance ratio per rack with a reduced footprint and reduced power consumption.
- Network efficiencies—Next-generation signaling transport takes advantage of investments in both TDM and IP network infrastructure.
- Intelligent network gateway—Next-generation signaling transport allows gateway function for integration between TDM and IP networks.
- Application layer routing—TCAP, MAP, and MAP-User routing enables efficient deployment of new services.
- Manageability—IP-based network monitoring and provisioning improve operation efficiencies.

Clearly, there is no single starting or ending point in the migration process. It is equally common to use the ITP as a pure-TDM STP, an STP with some SS7oIP link-sets for cost reduction, or an IP-to-intelligent network gateway. Now we investigate how to get started based on various business drivers.

Figure 1: Cisco ITP in an STP Mode



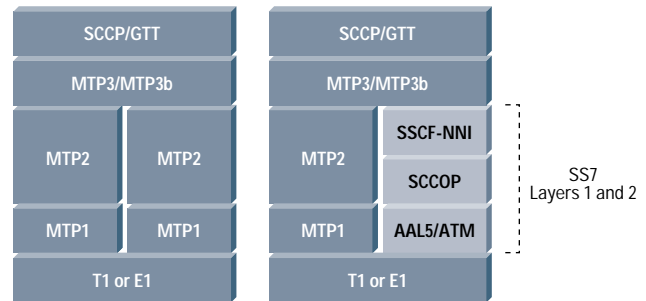
Core SS7 Transport Capacity Required

Whether subscriber growth or service introductions are driving increased capacity requirements, the Cisco ITP can provide a solution that minimizes capital expenditures (CapEx). Figure 1 shows a Cisco ITP deployed as a traditional STP. The Cisco ITP supports all traditional STP functions. Cisco ITP provides carrier-class reliability while delivering significant performance and cost-efficiencies (for example, less than \$1000 per low-speed link).

Flexible TDM Link-Type Offerings

For A-link through F-link use, the Cisco ITP supports low-speed 56- or 64-kbps DS0 links (low-speed signaling link [LSL]) or high-speed 1.544- or 2.0-Mbps unchannelized T1/E1 links (high-speed signaling link [HSL]). The SS7 protocol allows up to 16 links in a linkset between two adjacent nodes. For links to central resources such as home location registers (HLRs) and SMS centers (SMSCs), this SS7 defined linkset limitation has resulted in low-speed link bandwidth bottlenecks to these devices. To overcome the bandwidth restriction, an unchannelized 1.5-Mbps (American National Standards Institute [ANSI]) or 2.0-Mbps (International Telecommunication Union [ITU]) SS7 HSL may be used. A linkset may contain up to 16 high-speed links. An upgrade of low-speed links to high-speed links produces no SS7 network architectural changes. Message Transfer Part Layer 2 (MTP2) provides reliable and sequenced message-signal-unit (MSU) delivery for low-speed links. All routing and high-availability intelligence is located at the MTP3 layer. The migration from low-speed links to high-speed links is a simple Layer 1 and 2 substitution. HSL provides an effective way to increase the bandwidth to an edge node or to aggregate low-speed links from remote or regional sites to the signaling core. Figure 2 depicts the SS7 stack changes required to implement high-speed links.

Figure 2: SS7 Protocol Stack for TDM Low- or High-Speed Links



The Cisco ITP high-speed link capital costs per link (less than \$5000 per link) are typically a fraction of those found on a traditional STP. The introduction of a high-speed link as an access link to a service control point (SCP) or HLR can also improve the return on investment in the SCP or HLR by delivering more transactions to or from the device.

Migration Path to TDM and IP Convergence

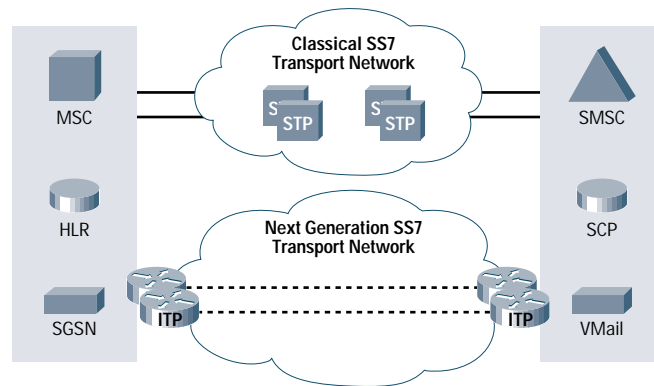
Operators typically identify several drivers for deploying IP links in the signaling core. One driver is convergence. In an ideal situation, operators would like to realize the operational efficiencies of running a single network for all subscriber services. As SS7-based messaging services expand and the third-generation cellular (3G) standards increasingly call for SS7oIP, it has become clear that the future will have all subscriber services running over an IP core network. Significant operational efficiencies can be achieved through such a migration. However, a gentle migration plan is required.

Another significant driver is that IP core transport is more efficient than TDM links. IP bandwidth can be shared by all traffic, whereas only two adjacent nodes can use TDM point-to-point facilities. If there are periods of low volumes of traffic between two nodes, the



TDM bandwidth is wasted. IP links can be used to carry any type of signaling traffic through the IP core. With IP QoS features, the timely delivery of critical traffic can be guaranteed. Some operators have seen up to 50-percent savings in leased-line costs by offloading SS7 traffic to IP links versus transporting over traditional TDM bandwidth. Figure 3 shows Cisco ITPs deployed at remote switch (end-node) sites. Operators can maximize use of their IP network by extending the use of IP transport out to the edge of the network. In this case, the TDM links (MTP2) are terminated at the end-node sites and only MTP3 MSUs flow over the wide-area network. Of course, Cisco ITPs can also be deployed at central sites by simply using IP for B and D links.

Figure 3: Migration to and IP Network

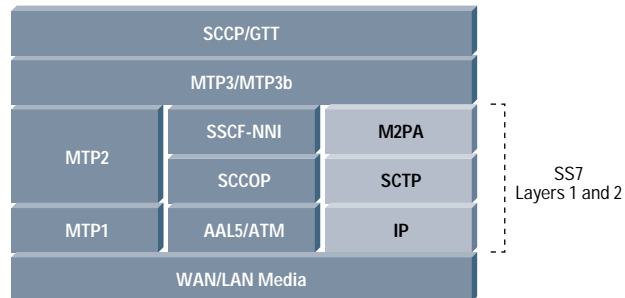


An IP Link is Just a very High-Speed Link - No effect on Translations

In 1999, the IETF Signaling Transport (SIGTRAN) Working Group was established. Its charter is to develop and standardize the messages and protocols necessary to carry mobile and public switched telephone network (PSTN) signaling over IP networks. For peer-to-peer transport between any two SS7 nodes, the IETF has defined the Stream Control Transmission Protocol (SCTP, RFC 2960) and the M2PA.

M2PA and SCTP work together to provide MTP3 with reliable transport-layer services equivalent to MTP2. Similar to the migration from low-speed to high-speed links, M2PA with SCTP and IP simply constitute an SS7 Layer 1 and 2 substitution. IP links may run over traditional T1 or E1 facilities, as well as Ethernet, ATM, optical, or other IP LAN or wide-area media types. Figure 4 shows the relationship between the M2PA protocol and the MTP layers.

Figure 4: M2PA, SCTP, and IP Layers Substituting for MTP2 and MTP1



As in the case of high-speed link introduction, the MTP3 layer is unaware whether a link is low speed, high speed, or IP. As such, all MTP3 high-availability features run equally over all link types. Congestion, Layer 2 failure detection, changeover, change-back, load balancing, screening, and other MTP3 features are preserved, thereby retaining the high-availability characteristics of the traditional SS7 protocol over any link type. It also follows that full GTT and signaling connection control part (SCCP) management are provided, independent of link type. Moreover, the provisioning and management of links, routes, and GTTs will be identical to a traditional TDM-only STP and also will be independent of link type. This minimizes operations, administration, and maintenance (OA&M) complexity for the network operations staff during initial Cisco ITP insertion.

Cisco ITP QoS

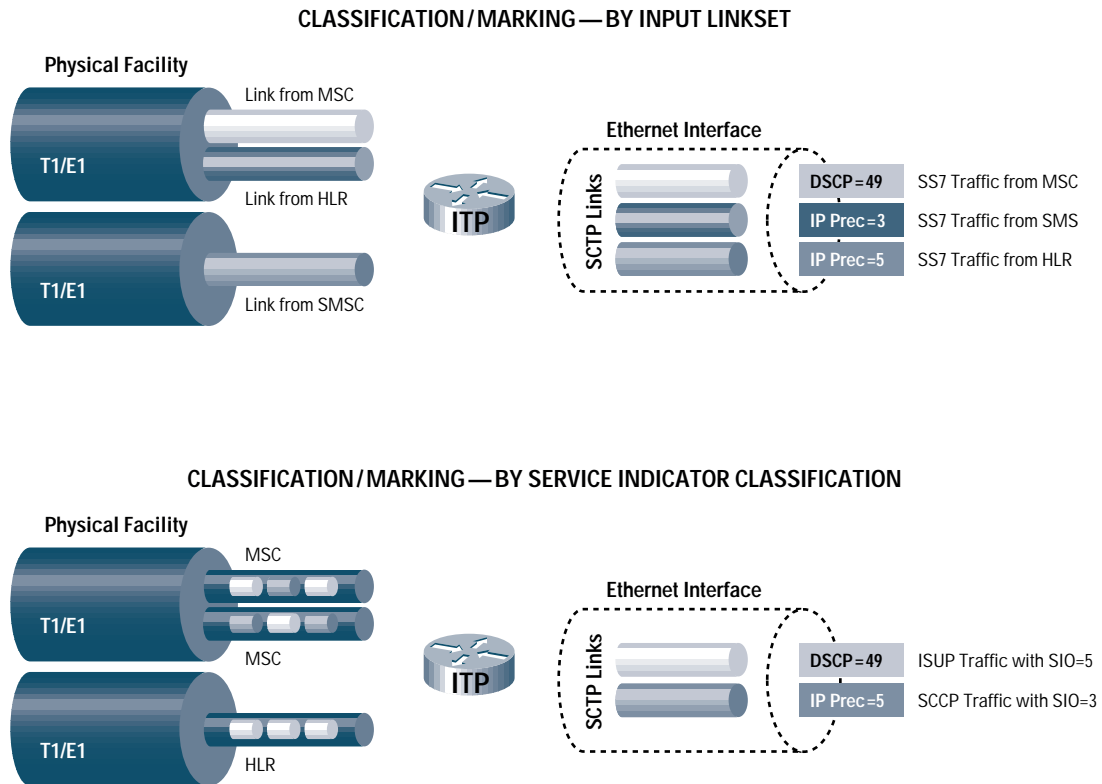
In addition to the demonstrable capital and operational expenditure savings produced by Cisco ITP when used to supplement traditional TDM bandwidth, a Cisco ITP SS7oIP network allows for robust traffic engineering and QoS features. This intelligent “steering” of traffic permits operators to identify, classify, and segregate SS7 and IP traffic according to the needs of individual traffic flows. Figure 5 demonstrates this important feature.

One of the key strengths of the Cisco ITP platform is its ability to make intelligent QoS classifications based on SS7 parameters by examining and decoding the contents of the SS7 packets. This information then allows the Cisco ITP to identify individual data flows (classes) and prioritize them in order to prevent congestion points for critical traffic. For instance, when using QoS in an SS7oIP network, it is important to discriminate between critical ISUP versus SMS traffic and provide different bandwidth and latency guarantees for each of these categories.

Ensuring end-to-end QoS involves essentially three steps. First, incoming MSUs must be classified as belonging to a particular class or flow of traffic (for example, ISUP, SMS, or location update). Second, if there is congestion in the IP network, the Cisco ITP must use the class of each MSU to determine which MSU to transmit next. Classes are defined so that the Cisco ITP guarantees bandwidth and sequenced delivery within a class. The type-of-service (ToS) bits in the IP header are marked based on the priority of the class. Lastly, intermediate IP core network nodes must examine the ToS bits in the IP packet header and preserve the relative QoS of the MSU flows.

Classification is the process of identifying which QoS class an MSU belongs to. Following are the match criteria available to place traffic into QoS classes:

Figure 5: QoS Using the Cisco ITP





- Input linkset classification (all MSUs arriving from a specified linkset)
- Destination point code (DPC) classification
- SCCP packet classification (per global title address [GTA] basis or GTT selector table)
- Service indicator field classification
- Access list classification (any combination of the above)

IP-Enabled End Nodes (ITPSG Feature Set)

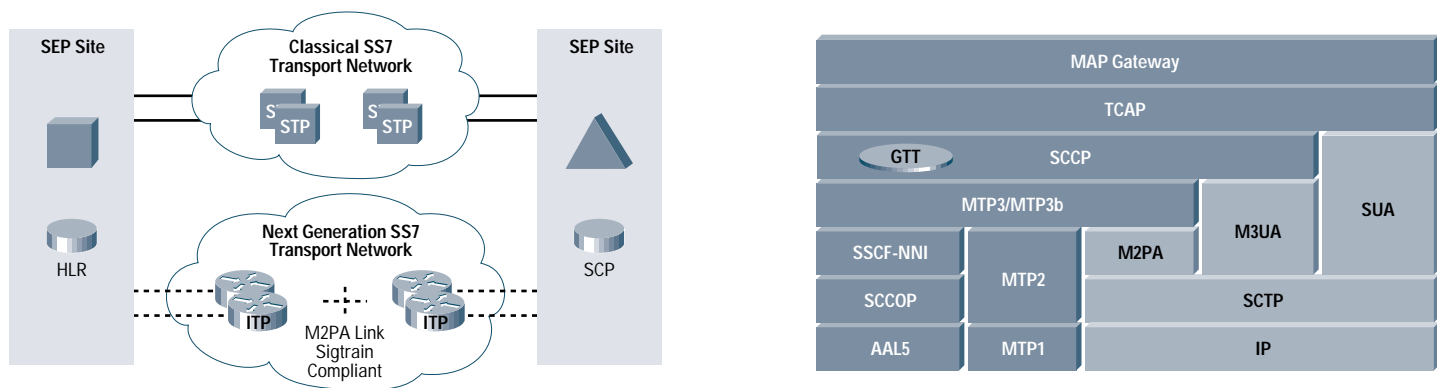
With the increase of service deployments via the SS7 network, the bandwidth required to signaling end points (SEPs) can constitute a significant cost when deploying the service. Additionally, the 16-link-per-linkset restriction can be a limiting factor. The types of IP-enabled service nodes and their associated business drivers are as follows:

- SCP billing—One driver is convergent billing services that allow for flexible pre- and postpaid service options.
- SCP applications—Examples include ring tones or intelligent network application part (INAP) or Customized Application for Mobile networks Enhanced Logic (CAMEL)-based intelligent network services.
- SMSC—In addition to the existing SMS traffic growth rate, audience interaction services (example, television or radio SMS voting) create burst periods of SMS traffic (example, last few minutes of a television show) upwards of 10,000 messages per second.
- HLR—Because the HLR is involved in most subscriber services, as the number of services and subscribers grows, increasing bandwidth to the HLR is required.

The IETF SIGTRAN Working Group also defined the M3UA (RFC 3332) and the SUA for STP (Cisco ITP) to service end-nodeS7oIP transport. M3UA and SUA run over SCTP, which provides the reliable MSU transport. Load balancing and availability features have been defined in M3UA and SUA for the clustering service end nodes. The Third-Generation Partnership Project (3GPP) has adopted SIGTRAN as the signaling transport standard for 3G wireless networks.

Cisco has interoperated with SIGTRAN IP-capable HLRs, SCPs, and SMSCs. Figure 6 shows SIGTRAN-enabled SEPs connecting to the Cisco ITP via M3UA or SUA over IP. Note than when using M2PA for B- or D-links, end-to-end QoS can be realized. Also shown in Figure 6 are the relevant protocol stacks.

Figure 6: IP-Enabled Service End - Nodes and Protocol Stacks



Cisco ITP Gateway Screening Capabilities

The Cisco ITP gateway screening feature is included in every Cisco ITP feature set. Gateway screening is a traditional STP function that allows operators to filter signaling traffic. Cisco ITP provides a full gateway screening function, which is implemented using traditional Cisco access lists. Access lists are sets of rules that are used to permit or deny traffic based on a series of MSU parameters. The access list is applied to either inbound or outbound traffic on a linkset. When an MSU arrives on an input link, it is compared with each line of the access list starting with the first rule defined.

Each rule can be significantly complex by adding additional parameters to the line. Following is the list of parameters that are currently supported:

MTP3 Screening

- DPC
- Origination point code (OPC)
- Service indicator

SCCP Screening

- Called party
- Global title indicator (GTI)
- Translation type
- Numbering plan
- Nature of address indicator (NAI)
- Encoding scheme
- Point code
- Subsystem number (SSN)

Calling party

- Point code
- Subsystem number (SSN)
- SCCP management screening

- Affected point code
- Affected subsystem number

General Screening

- Byte pattern and offset

RADIUS-to-MAP Gateway for SIM Authentication in WLAN or UMTS Deployments (MAP Gateway Base + SIM Authentication Feature Set)

WLAN allows hot-spot coverage with 11 Mbps of bandwidth to the user device. An increasing number of Global System for Mobile Communications (GSM) operators have begun deploying WLAN service within their access portfolios. Today, you will find WLAN coverage in airports, hotels, conference centers, and coffee shops to name a few. In traditional mobile operator networks, the HLR contains all subscriber service authentication and authorization information. Mobile operators want to retain all subscriber profiles in the HLR for the following reasons:

- Operators have well-established back-end HLR provisioning, customer service, and operations procedures and tools in place. The cost of training and developing new procedures is not desired.
- Although early market entry WLAN systems have based their authentication process upon username and password, typically using an IP RADIUS or Extensible Authentication Protocol (EAP), there is general agreement that such authentication schemes need to support the stronger security of shared secrets and encryption key exchange currently used within the GSM networks.

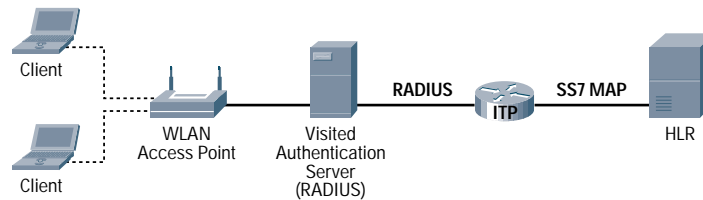
In WLAN networks, subscriber profiles are contained in a RADIUS authentication, authorization, and accounting (AAA) server.

Therefore, an IP-to-intelligent network gateway was needed to make these two authentication devices work together. As part of Cisco's



industry-leading WLAN product portfolio, Cisco has introduced the Cisco ITP MAP gateway function, in order to enable existing GSM service providers to fully integrate 802.11 technologies into their existing GSM network infrastructure (refer to Figure 7).

Figure 7: Cisco ITP MAP Gateway Provides RADIUS-to-MAP Conversion



The solution is that WLAN clients (personal computers, personal digital assistants [PDAs], etc.) are equipped with a SIM card and the appropriate SIM card reader. The SIM card reader can be the WLAN PC Card. When the WLAN client logs onto the network, the client sends an authentication request to the WLAN AAA server with the subscriber International Mobile Subscriber Identity (IMSI). The visited RADIUS AAA server realizes that the IMSI must be authenticated to a secondary AAA server and sends a RADIUS authentication request to the Cisco ITP. The Cisco ITP receives the RADIUS authentication request and generates a MAP SendAuthInfo Request to the HLR. The HLR returns a result to the Cisco ITP indicating the validity of the IMSI. The Cisco ITP can then optionally query the HLR to determine if this subscriber is authorized for WLAN service. The Cisco ITP performs this task by sending a MAP RestoreData Request to the HLR and obtaining the subscriber's profile. The Cisco ITP then returns a RADIUS result to the visited AAA server and the authentication process is complete.

The Cisco ITP MAP gateway operates in the IP and SS7 networks in a fully transparent way. No changes to the HLR are required. The HLR views the Cisco ITP as a Visitor Location Register (VLR). The visited AAA server performs a standard AAA proxy (forward) feature and views the Cisco ITP as a secondary AAA server.

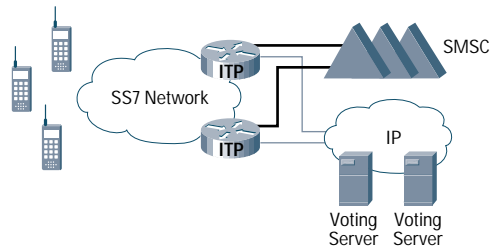
Cisco ITP SMS Multilayer Routing (MAP Gateway Base + MLR Feature Set;
Available 1Q '03)

New SMS applications such as audience interaction services (example: tele-voting) place an additional demand on the capacity of the traditional SS7 network infrastructure, as well as the SMSC servers. The need has arisen to intelligently route SMS messages based on the application or service to which they are destined. This allows new SMS applications to be inserted in an operator's network without significant upgrades being required to the existing SMSC. In typical cases, a new IP-capable SMSC is inserted into the network to handle all voting SMS traffic. The new SMSC can communicate with an ITP signaling gateway using Sigtran or traditional link types. Using Sigtran SUA, M3UA, or M2PA reduces the TDM hardware costs on the SMSC and provides virtually unlimited A-link bandwidth to the SMSC for maximum transaction rates.

Upon receiving SMS mobile originated messages, the Cisco ITP interrogates the SCCP, TCAP, MAP, and MAP-user payload in order to make a customizable routing decision based on the message A address, B address, destination SMSC address, protocol identifier, operation code, called party address, calling party address, or some combination of those parameters. The multilayer routing table then indicates how the message should be routed toward the selected SMSC, with modification to either the DPC or called party address (CDPA) GTT. The result may include

destinations found through all supported link types (LSL, HSL, M2PA, M3UA, and SUA). A Weighted Round Robin (WRR) distribution algorithm is implemented in order to properly balance SMS workload to servers of varying capacity. The initial Multi-Layer Routing (MLR) feature set will satisfy the basic requirements for routing GSM mobile originated SMS messages. Follow-on enhancements will satisfy ongoing customer requirements (refer to Figure 8).

Figure 8: Cisco ITP SMS Multilayer Routing for Tele-Voting



Mobile handsets will be programmed with a single Mobile Station ISDN Number (MSISDN) representing all the operator's SMSCs and voting servers. This is sometimes referred to as the virtual SMSC address. The SS7 network routes SMS mobile originated messages to the Cisco ITPs via intermediate or final GTT. The Cisco ITP then looks at the appropriate higher-layer MSU parameters and makes a routing and server load-balancing decision.

For example, a tele-voting advertisement may instruct subscribers to send an SMS message to short code 1234 to vote for a favorite TV music video. The Cisco ITP looks into the SMS payload of the MSU to identify the destination short messaging entity (SME) (B address). If the address is 1234, the message is classified as a voting message and is load balanced across the voting servers based on the defined capacity of each server. If the B address is not 1234, the messages are load balanced across the SMSCs.

Number Portability Design

Number portability is a network feature that provides consumers with the ability to change service providers, locations, or service types without changing their telephone numbers. Number portability is a requirement for both wireline and wireless operators. The heart of the network infrastructure required for number portability is a number portability database (logically a mobile SCP function). The number portability database provides routing addresses for ported numbers. Network devices query the number portability database to resolve numbers during a call or service transaction.

The standard adopted by most GSM operators, ETSI TS 123 066 V3.3.0 Support for Mobile Number Portability involves using the signaling relay function (SRF) to deliver MAP queries to a number

ported database. The SRF function queries the database and can route non-ported number queries to the appropriate HLR or return an acknowledgment to the originator (example, mobile switching center [MSC]) containing the location where the subscriber has been ported. The number ported database can exist in a centralized location, be distributed by regions, or can exist internally on the MSC or SMSC.

Many MSCs and SMSCs are capable of performing the SRF internally and will directly launch queries to a number portability database. In this case, the Cisco ITP performs standard MTP3 and GTT routing to deliver the queries to the number portability database.

Cisco is also developing the SRF in Cisco ITP products. This will allow the Cisco ITP to work in conjunction with an external number ported database to provide complete local number portability and mobile number portability solutions. Through a combination of GTT and the SRF function, the Cisco ITP intercepts and redirects MSUs requiring number portability to the number ported database. The database performs the translation and sends the MSU back through the Cisco ITP for routing (MTP3 or GTT). The number ported database can be connected to the Cisco ITP via TDM or IP links. Clearly, an IP-enabled number ported database is a key network element that can deliver significant benefits to operators.

When implementing number ported functions, operators must be wary of combining the STP and number ported function in one chassis because adverse performance effects are likely. Under normal network conditions, traditional STP networks are engineered to operate at 35-percent processor utilization. However, in many cases it has been seen that when a co-resident number ported database is activated in some STPs, the processor load approximately doubles. At 70-percent loading, the STP is not able to accommodate a mated-pair failure. However, by its very nature the number ported solution enabled by the Cisco ITP is not subject to these issues.

Reliability, Scalability, and Availability Metrics

The Cisco ITP product line is built on the proven Cisco 7500 Series Router hardware platform. Cisco 7500 Series routers are widely deployed in industry segments that require high reliability and availability—telecommunications, health care, banking, brokerage, aviation, and military installations. Single Cisco ITP availability is greater than "six nines," or 99.9999 percent. In a mated-pair configuration, the availability far exceeds 99.9999 percent.

Network Management

The Cisco ITP network management solution combines the Cisco Signaling Gateway Manager (SGM) with existing Cisco and third-party IP network management products. Cisco SGM, along with CiscoWorks, CiscoView, and ecosystem partner products such



as Agilent acceSS7 and HP OpenView, can provide end-to-end management suites for the Cisco ITP SS7 network—enabling network administrators to discover, manage, and troubleshoot Cisco ITP networks. In conjunction with leading management vendors of off-the-shelf SS7 network management applications for end-to-end call trace, packet analysis, and long-term trending and analysis, this management solution enables quick integration with existing SS7 network management applications.

Cisco SGM is a software application that enables network administrators to manage the SS7oIP layer of Cisco ITP networks. Key features provided by SGM include the following:

- Client-server architecture with Windows, Solaris, and Web-based clients
- Automatic SS7oIP network discovery from any Cisco ITP device
- SS7oIP device tabular and topology map with links to traditional SS7 devices
- Custom network views
- Status monitoring of all SS7oIP layer events via regular Simple Network Management Protocol (SNMP) polling and SNMP trap reception
- Investigative debugging for detected events
- Customizable real-time event detection and display
- Q.752-based link statistics and accounting reports
- Web-based network status viewing for monitoring current and historical status change and SNMP trap messages
- DPC route table configuration
- GTT table configuration
- Security services, including multilevel users, Secure Shell Protocol (SSH), Secure Sockets Layer (SSL), VPNs, and audit trails
- Integration options for CiscoWorks, CiscoView, and HP OpenView
- Web-based help

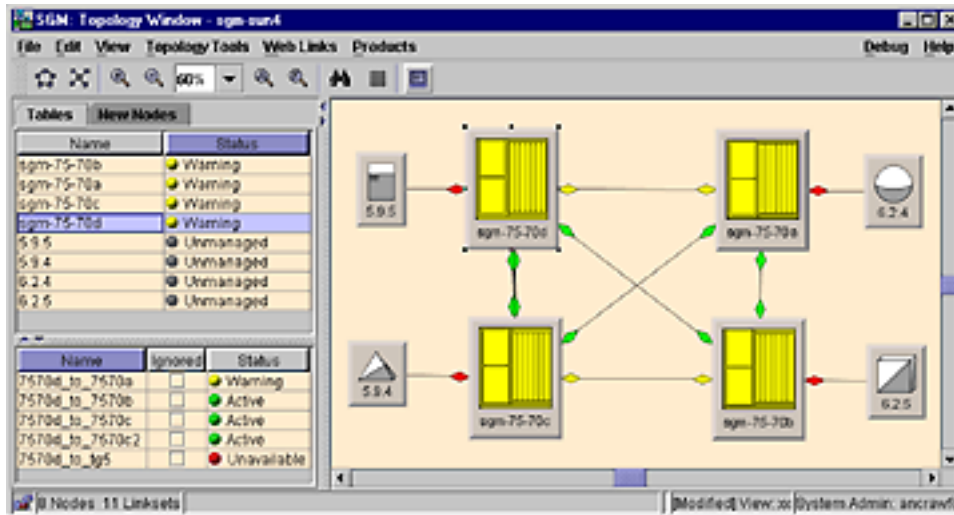
Cisco SGM provides the following carrier-class features:

- Scalability—Cisco SGM is designed to support large-scale networks of up to 200 nodes and 2000 links.
- Security—Cisco SGM has knowledge of users and maintains audit trails of critical application activity. Cisco SGM is also designed to be usable in firewall environments.
- Redundancy—More than one Cisco SGM server can be connected to the same SS7 network to provide redundant management.
- Failover—Cisco SGM clients can be configured to connect to either primary or backup Cisco SGM servers and switch automatically if connectivity to the server is lost.

Figure 9 illustrates the Cisco SGM topological display of a SS7oIP network.



Figure 9: Cisco SGM Topology Display



Agilent and Cisco have collaborated to ensure that Agilent's acceSS7 link-monitoring system is extended to manage SS7oIP transport in environments where the Cisco ITP gateway is used to route SS7 signaling through an IP network.

Table 1 gives a summary of Cisco ITP key features.

Table 1 Cisco ITP Features

Category	Available	Road Map
Cisco ITP Platforms	<ul style="list-style-type: none"> Cisco 2650 and 2651 multi-service platforms Cisco 7204VXR and 7206VXR routers <ul style="list-style-type: none"> Cisco NPE 400 Network Processing Engine Cisco 7507 and 7513 router 	
SS7 variants	<ul style="list-style-type: none"> ITU ANSI China 	Japan
TDM link types	<ul style="list-style-type: none"> T1 E1 V.35 EIA/TIA-449 HSL T1 HSL E1 	China HSL
SIGTRAN IP link types	<ul style="list-style-type: none"> M2PA M3UA SUA 	
Point codes	<ul style="list-style-type: none"> Flexible format and multiple point codes per Cisco ITP 	
MTP3 management	<ul style="list-style-type: none"> Full STP function 	



Table 1 Cisco ITP Features (Continued)

Category	Available	Road Map
MTP3 routing	<ul style="list-style-type: none"> Link-type independent switching; supports combined linksets, load balancing, summary and cluster routing 	
SCCP management	<ul style="list-style-type: none"> Full STP function 	
GTT	<ul style="list-style-type: none"> Full STP function, including mated applications, application groups, and SCCP Class 1 load balancing 	
Flexible numbering	<ul style="list-style-type: none"> GTA conversion before or after GTT 	
Dimensions for Cisco 7513 chassis (H x W x D)	<ul style="list-style-type: none"> 33.75 x 17.5 x 22 in. - less than 3 feet tall (85.73 x 44.45 x 55.88 cm) 	
Multiple network appearances	<ul style="list-style-type: none"> One network indicator per Cisco ITP 	<p>Q1 2003: 8 SS7 network domains) point codes, variants, network indicator combinations)</p> <p>Road Map: Conversion between network domains</p>
Performance for Cisco 7513	<ul style="list-style-type: none"> 30,000 MSUs with Route Switch Processor (RSP) 16 	<p>Q2 2003: 50,000 MSUs via software upgrade</p>
Link capacity for Cisco 7513	<ul style="list-style-type: none"> Up to 720 SS7 low-speed links 	
QoS	<ul style="list-style-type: none"> QoS per SCTP association with classification based on: <ul style="list-style-type: none"> Service indicator Point code Input linkset GTA Access Lists 	
Gateway screening	<ul style="list-style-type: none"> OPC DPC Service indicator SSN GTA Pattern Offset 	<p>Road Map: TCAP, MAP, MAP-user parameters</p>
IP media	<ul style="list-style-type: none"> 70 types, including: 10 and 100 MB and 1 Gigabyte Ethernet, statistical multiplexing (STM), optical, T1/T3, E1/E3, and Frame Relay 	



Table 1 Cisco ITP Features (Continued)

Category	Available	Road Map
IP routing protocols	<ul style="list-style-type: none"> • Border Gateway Protocol (BGP) • Exterior Gateway Protocol (EGP) • Enhanced Interior Gateway Routing Protocol (EIGRP) • Hot Standby Router Protocol (HSRP) • Open Shortest Path First (OSPF) • Routing Information Protocols (RIP) • Static routing 	
VPN	•	IPSec, MPLS
Single Cisco 7507 and 7513 availability	• High network availability of 99.9999 percent	
Mated-pair availability	• Exceeds 99.9999 percent	
Cisco ITP OA&M	• Cisco SGM: Industry-standard SNMP-based graphical user interface (GUI) network based on SS7 and SS7oIP Management Information Bases (MIBs)	
Network-wide monitoring and provisioning	• Interoperates with CiscoWorks, CiscoView, HP OpenView, and Agilent acceSS7	

Summary: Operators Believe the Time is Now

It is logical for Cisco Systems to provide MSU packet routing and gateway solutions with high availability, high density, and high capacity delivered at a low cost. Cisco is highly experienced and committed to delivering routing solutions while providing customers with support for their network infrastructure requirements, and enabling that infrastructure for next-generation networks. Cisco intends to continue to use this background to deliver the most competitive SS7 transport solution available in the industry today. The ability of the Cisco ITP platform to scale in terms of link density as well as processing power has allowed STP link prices to fall below the \$1000-per-link list price. Future enhancements will permit that benchmark pricing structure to be further improved. And, when STP TDM links are replaced by IP links, operators can reduce transmission facility costs by 50 percent or more.

Wireless operators have voted. They have deployed the Cisco ITP Series products in a variety of network scenarios, including STP capacity expansion, high-speed link transmission upgrades, and as an SS7oIP infrastructure platform—a platform on which they propose to build their next-generation SS7 network architecture. The deployment flexibility, high-availability characteristics, demonstrable CapEx and operating expenses (OpEx) savings, and the support for emerging SIGTRAN standards has earned the Cisco ITP solution the confidence and approval of SS7 operations staffs worldwide.



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