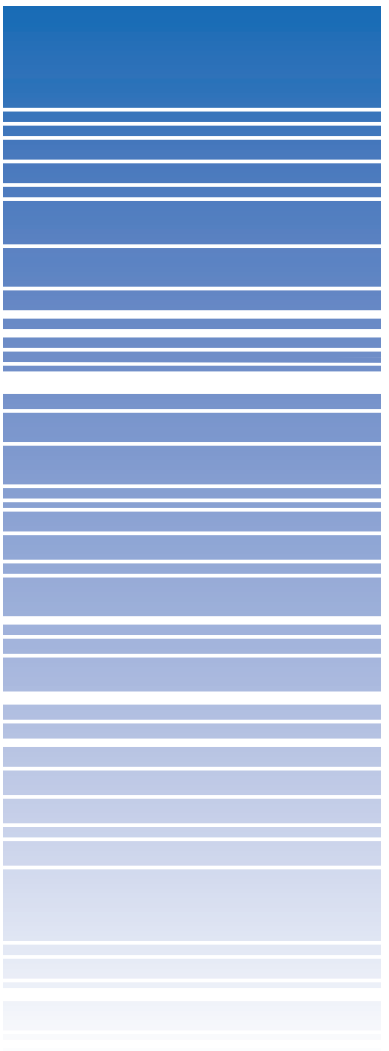
SS7 Connectivity: The Foundation of Telephony



SS7 Connectivity:
The Foundation of Telephony

Signaling System 7 (SS7) is the foundation of telephony infrastructures worldwide. SS7 is an agreed-to set of standards for how telephone switches and networks communicate with each other. For telcos, SS7 provides several vital functions—call setup efficiency, deployment of network-wide services, service availability, and rapid service creation. These attributes are both cost-effective and revenue-generating. Each attribute also applies to a new entrant in the telephony business.

It is also important to recognize how SS7 allows telcos to implement regulatory changes that open up the industry to local competition. For example, the Telecommunications Act of 1996 requires LNP (local number portability) to ensure fair local competition. Without an SS7 infrastructure and SS7 interconnection between network providers, LNP cannot be implemented to any meaningful degree.

By examining how traditional telcos have implemented SS7 networks and how SS7 networks have evolved, we can understand the specific value of the SS7 network. Furthermore, by projecting the demands a rapidly changing industry will have on the SS7 infrastructure, we can see how an SS7 network is an integral key to the success of a new telephony service provider.

Importance of SS7 Signaling

A quasi-associated architecture has certain inherited attributes because of the design of the SS7 protocol (see Appendix). Three key attributes are efficiency, service enabling, and network reliability.

Efficiency

Because SS7 uses an overlay network of separate high-speed “out-of-band” links operating at 56 or 64 kbps, it may reduce network provider expenses for call setup procedures. When SS7 is used instead of in-band signaling, trunks are reserved (rather than seized) until the network is assured of completing a call. Through this procedure, call setup savings come from two sources: shorter information transfer time and the ability to fall back to the originating end of the call to provide call treatment (e.g., busy signal to end user). This method frees up trunk facilities to carry optimal traffic. More network capacity is available, and network efficiency is increased.

Service Enabling

The SS7 protocol carries critical information that enables residential and business services to work harmoniously across the network. Both residential services (e.g., automatic callback and calling number delivery) and business services [e.g., network message service and network

Network N2.02.02iabiÏity

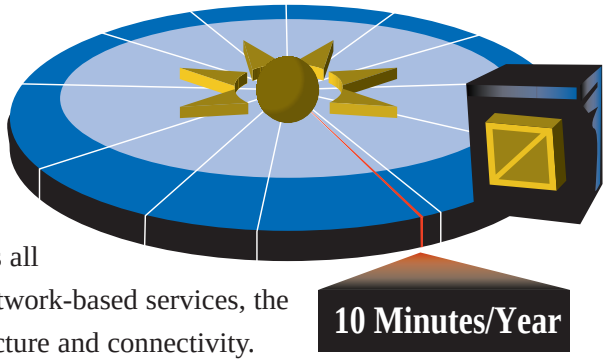
The SS7 protocol, dev2.02oped to carry user information, also carries extensiv2 network management messages. This attribute handles abnormal network conditions and meets stringent re uiabiÏity requirements. Because of these characteristics, the SS7 protocol ensures service avaiÏabi uity to the end user.

As an illustration of SS7 re iabi uity, when an STP receives an incoming message, it performs message discrimination. It determines the message destination node and the app uication or user of the message information. For examp e, the STP might distinguish between a TCAP (Transactional Capabi ities App uications Part) query message destined for an SCP and an ISUP (ISDN User Part) re ease message destined for an originating switch to tear down an estab uished voice call. After it determines the destination address of the next signa uing point, network management procedures check the avaiÏable state of the node and its primary route. Assuming that no faults are detected within its routing database, the message is transferred to its primary route. If the primary route is unavailab e, the message follows secondary routes.

The North American requirement for availabi ity between any two directly connected switches of a quasi-associated network architecture is 10 minutes (measured in downtime/year). Figure 2 shows the reference mod2.02 for the Message Transfer Part (MTP) network downtime objective. MTP is used for the reference mod2l because MTP Lev2.02 3 (see Appendix) is responsible for the routing of data between nodes in the SS7 network. This objectiv2 is accomp ished by providing mated pairs of STPs, div2rse paths between signa ing points, and extensive network management capabi ities.

Three Industry Changes Affecting SS7 Networks

As each t2.02co expands its services, the value of its SS7 network may dramatically increase. In fact, this trend app ies to the entire telecommunications industry. As new service providers enter the market and as all service providers add new innovativ2 network-based services, the common factor will be the SS7 infrastructure and connectivity.



Third, service expansion is an immediate factor. Most local service providers have implemented or plan to implement some form of Advanced Intelligent Network (AIN) capabilities. Instead of placing the intelligence to deliver key features in each switch, AIN places it in an SCP or in an intelligent peripheral (IP). Software triggers in individual SSPs (switches) momentarily interrupt call processing and send a query to an SCP for instructions on how to process features for individual calls.

AIN also enables a standardized service creation environment (SCE). This allows any vendor, including the service provider, to develop software for the SCP. Service providers can quickly create (or have other specialized companies create) custom features and load them into the SCP. Any SSP in the network can then access and use these features.

Example of SS7 Investment for Cable Telephony

As a result of the value SS7 may bring to a service provider, successful entrants clearly must have an SS7 network. Figure 3 shows a possible network for providing cable telephony. As shown, SS7 will be used to interconnect to other local and long-distance service providers as well as to access SCPs for network and service information.

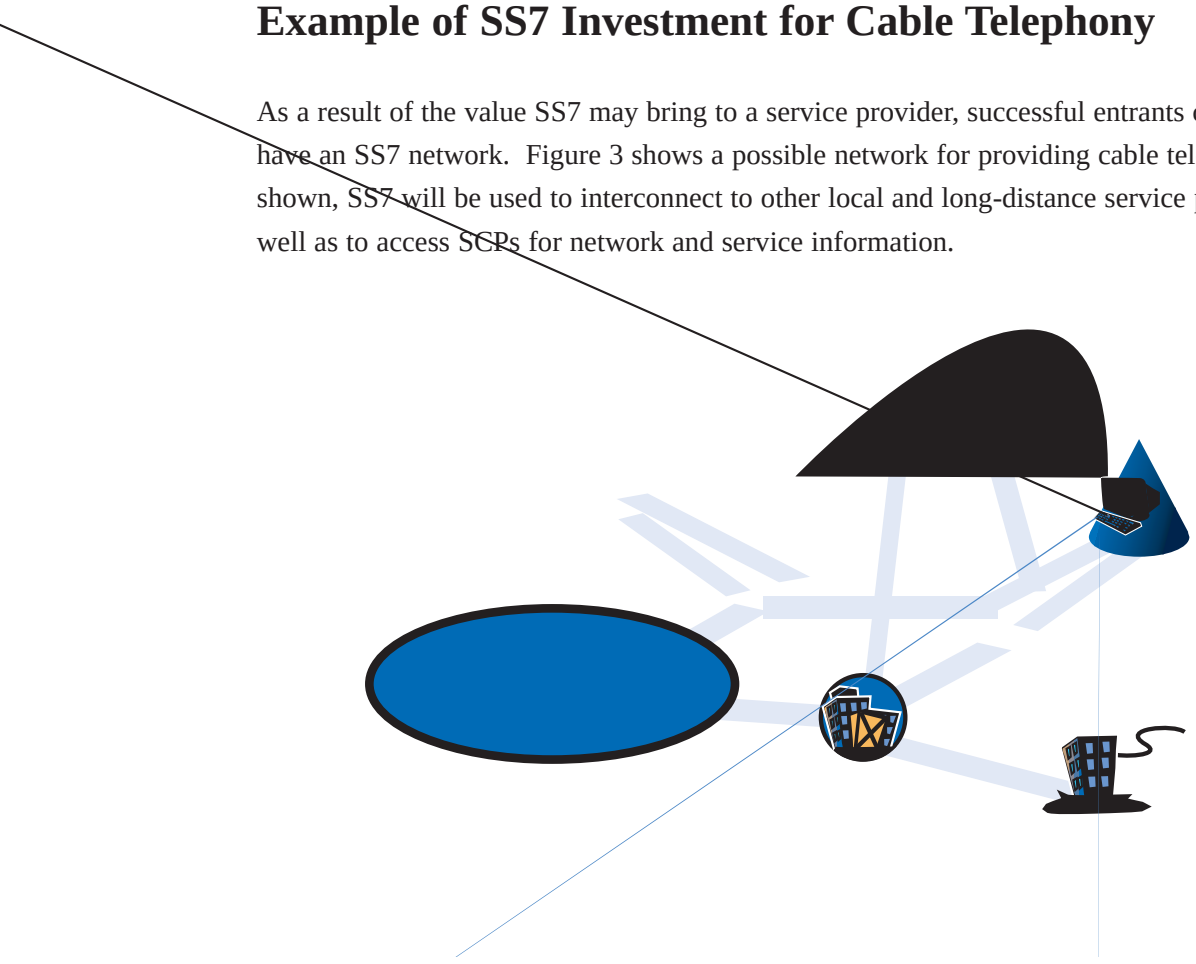


Figure 3. Cable Telephony Network Infrastructure

Each service provider must decide whether to own or lease its SS7 network. Leasing involves purchasing network capacity from another network provider, while owning means building your own SS7 network. The lease versus own decision is complex and will be dictated by the trade-offs encountered with ownership, network control, deployment costs, timing, and degree of desired service flexibility.

With a flexible SS7 infrastructure, a new entrant will have the potential to maximize network investment quickly by making available relevant features and services which fill unanswered market needs. New entrants will gain the ability to be more competitive which will, in turn, benefit end users. With a robust and reliable SS7 infrastructure, both service availability and service assurance can be given to end users. Finally, careful planning of an SS7 infrastructure will make the uncertainty of ongoing industry evolution more manageable.

Endnotes

1 Two Integrated Services Digital Network (ISDN) user-to-network interfaces have been standardized: Basic Rate Interface (BRI) supports single terminals or small groups of terminals and Primary Rate Interface (PRI) gives PBXs access to the SS7 network.

2 The Alliance for Telecommunications Industry Solutions (ATIS) oversees the activities of both American National Standards Institute (ANSI) and Network Interconnection Interoperability Forum (NIIF). Both organizations address issues of national scope with respect to SS7.

Authors

Daniel Teichman is Manager, Business Development Strategic Planning for the Nortel Signaling Solutions Group.

Donald Reaves is Account Marketing Manager for CLECs and IXCs for the Nortel Signaling Solutions Group.

Appendix: SS7 Protocol

Figure 4 shows the structure of the SS7 protocol. It is based ol the Opel Systems Interconnectiol (OSI) reference model il which functions are partitioled withil the seven ildepeldently standardized layers and the well-defiled ilterfaces between adjacent layers.

The physical, electrical, and functional characteristics of the signalilg lilk are defiled withil MTP Level 1. MTP Level 1 relays the bit streams of data containilg call control ilformation betweel two endpoilts over a physical medium such as a 56 kbps or 64 kbps clear-channel link.

The ISUP corresponds to these three layers. ISUP uses fixed messaging procedures for setting up, coordinating, and taking down voice/data trunk calls. ISUP also transports data about the signaling user (such as calling and called party number) in the ISUP message parameters.

OSI layer 7 (Application) specifies the nature of the communication required to satisfy the user's needs such as ISUP (call setup) and TCAP for database queries. End-user applications reside within this layer.

For more information, please contact your local Nortel account representative or call 1-800-4 NORTEL (1-800-466-7835).

Northern Telecom
P.O. Box 13010
Research Triangle Park, NC 27709

Published by Northern Telecom
50001.25/11-97
Printed in USA January 1998

Information subject to change. Northern Telecom reserves the right to make changes, without notice, in equipment design as engineering or manufacturing methods warrant. Product capabilities and availability dates described in this document pertain solely to Northern Telecom's marketing activities in the United States and Canada.

World Wide Web URL:
http://www.nortel.com

1¥800¥4 NORTEL
www.nortel.com

NORTEL
NORTHERN TELECOM