GTE North
Exh. 4

BEFORE THE
PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of AT&T Communications of Ohio, Inc.'s Petition for Arbitration of Interconnection Rates, Terms and Conditions and Related Arrangements with GTE North Incorporated.	:	Case No. 96-832-TP-ARB

DIRECT TESTIMONY OF

RALPH DIGIOVANNI

FILED ON BEHALF OF GTE NORTH INCORPORATED

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Ralph Anthony DiGiovanni. My business address is 700 Hidden Ridge, Irving, TX 75038.

Q. BY WHOM ARE YOU EMPLOYED AND WHAT IS YOUR POSITION?

A. I am employed by GTE Telephone Operations as Network Planning Manager - Product Planning.

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATION AND WORK EXPERIENCE?

A. I hold a B.A. degree in Management from the University of Redlands, an A.A. degree in Data Processing from Fullerton J.C., and an Associate Technical degree which was awarded by GTE.

I began my career in telephony in 1971 as a Central Office Equipment Installer with New England Telephone in Boston, MA. In 1977 I accepted a similar position with the then GTE California Company. In 1981 I was promoted to Traffic Engineer and held subsequent positions of Central Office Design Engineer, Supervisor-Traffic Engineering, and Section Manager-Network Operations Planning. In 1989 I accepted a position with GTE Telops as a Senior Staff Engineer-Traffic Engineering in Irving, Texas where my primary responsibility was SS7 support for GTE Regional Traffic Engineering Operations. In 1993 I was named Staff Manager-Traffic Operations, and

in the same year I accepted a position as Staff Manager- Network Planning. In 1994 I assumed my current position as Network Planning Manager-Product Planning.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to explain GTE North's position regarding Signaling System 7 ("SS7").

Q. ARE YOU FAMILIAR WITH THE REPORT ON SS7 THAT WAS FILED WITH THE GTE NORTH RESPONSE IN THIS PROCEEDING?

A. Yes.

Q. IS THE INFORMATION CONTAINED IN THAT REPORT TRUE AND CORRECT TO THE BEST OF YOUR KNOWLEDGE?

A. Yes.

Q. DO YOU ADOPT THAT REPORT AS PART OF YOUR DIRECT TESTIMONY HEREIN?

A. Yes.

Q. DOES THAT CONCLUDE YOUR TESTIMONY?

A. Yes.

SS7 Unbundling

SS7

The Telecommunications Act of 1996 (the Act) requires incumbent local exchange carriers (ILECs) to provide, on an unbundled basis, nondiscriminatory access to network elements at any technically feasible point. In its First Report and Order, the FCC interpreted the Act's unbundling provisions to require ILECs to provide unbundled access to Signaling Links (SLs) and Signaling Transfer Points (STPs). AT&T requests that GTE unbundle its SLs, STPs and Service Control Points (SCPs). However, the only physical point at which interconnection with an SS7 network is technically feasible without risking harm to the reliability and security of the network is the STP. SLs can be provided on an unbundled basis by interconnecting AT&T's Service Switching Points (SSPs) or STPs to GTE's signaling network at the STP.

This Report states GTE's position on the unbundling of SS7.[1] Section A of this Report describes SS7. Section B restates the relevant provisions of the Act. Section C summarizes the list of issues to be arbitrated and the parties' positions on each. Section D sets forth in detail GTE's position on unbundling SS7.

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[1] As explained in Part III, which discusses the Advanced Intelligent Network (AIN), SS7 is fundamentally different from AIN.

A. What Is SS7?

1. Signaling and its Functions

Signaling is the transmission of information required to direct and control the setup, administration and disconnection of a voice circuit. In other words, it is the communication of control information between elements of a communications network using a standard protocol understood by all signaling elements involved. Signaling functions include: (1) supervising (i.e., initiating a request for service such as on-hook or off-hook); (2) alerting (i.e., notification of activity on the circuit such as ringing); and (3) addressing (i.e., information provided to the communications system concerning the destination of the call, such as calling number via dial pulse, dual tone multi-frequency, or multi-frequency).

2. Traditional Signaling

Traditional signaling, shown in Attachment 1, carries signals between network nodes in the same circuit as the related voice conversation, and is referred to as "in-band" signaling. The signaling itself is carried by the voice circuit in the form of tones or other changes in electrical characteristics. Because the signaling and conversation cannot be transmitted at the same time, the signaling occurs before or after the conversation, or interrupts the conversation while it is in progress.

Some of the shortcomings of traditional signaling include its slow speed, its ability to transfer only limited information and long call set-up time, all of which result in

an inefficient use of facilities and signaling equipment. Also, this type of signaling creates an opportunity for fraud because changes in the tones and electrical characteristics can be inserted into the circuit and affect the routing or content of other signaling information.

3. Common Channel Signaling

The problems with traditional or "in-band" signaling have been overcome by the development of common channel signaling (CCS). As illustrated in Attachment 2, CCS is a technique of signaling which uses a common channel or network, separate from the voice channels used to transmit signals. This is called "out-of-band" signaling because the signaling and voice paths use separate networks or facilities. The advantages of "out-of-band" signaling over "in-band" signaling include the ability to handle a greater volume of signaling information, reduced call set-up times, more efficient trunk usage, and fraud reduction. These advantages result in more efficient and faster connections, and facilitate the provision of new services for subscribers.

4. "Out-of-Band" Signaling and Its Relationship to SS7

SS7 is a standardized network architecture and protocol used by the international telecommunications industry to accomplish CCS (or "out-of-band" signaling). The SS7 network architecture and protocol were adopted by international and United States standards-setting bodies many years ago, and have been used in providing services or applications since their adoption.

5. The Role of Industry Standards

Industry standards developed by United States standards bodies (e.g., American National Standards Institute or ANSI), and those developed by industry agreement (e.g., Bellcore), are developed in open fora with the participation of manufacturers, service providers, end users, government and other interested parties. The standards thus developed are recommended; there is no requirement or implementation schedule imposed on the user of the standards. The benefit of establishing standards is that participants in the network can reference a detailed description of a particular standard and understand what to expect from implementation of the standard. However, because other companies may have implemented other proprietary or non-standard approaches, this Report addresses what can be accomplished within the GTE network and/or within current industry standards.

6. SS7 Standardized Network Architecture

The SS7 network architecture, which is illustrated in Attachment 3, includes the following components:

- Signaling Point (SP). The Signaling Point is any node on an SS7 network (e.g., STP, SCP, end office, access tandem or operator system). SPs have SS7 signaling capabilities, but not necessarily the application software needed to provide services to end-users.

- Service Switching Points (SSPs). Service Switching Points are SPs (end office, access tandem or operator system) which have both SS7 signaling capabilities and application-specific software to perform end-user services.

- Signaling Transfer Points (STP). The Signaling Transfer Point is a highly-reliable packet switch which is unique in the network in that it

mediates, translates and routes signaling messages appropriately. STPs are provisioned in pairs to ensure reliability, redundancy and diversity. Each STP handles one-half of the signaling traffic so that if a link is damaged, the other STP in the mated pair is able to take over the signal switching and routing functions without compromising network reliability.

- Service Control Point (SCP). The Service Control Point is a computer system which is linked to its primary STP pair and provides access to the SCP's related database or databases.

There also are multiple links within the SS7 network, as shown in Attachment 3. These links can be described as follows:

- A-Links. A-Links, or Access links, are two links (one to each STP in the mated pair) from an SP or SSP to its primary STP pair.

- B-Links. B-Links, or Bridge Links, are four links between two mated STP pairs at the same levels of the signaling network hierarchy.

- C-Links. C-Links, or Cross Links, may be as few as one link between STPs of a mated pair.

- D-Links. D-Links, or Diagonal links, are four links between two mated STP pairs at different levels of the signaling network hierarchy.

- E-Links. E-Links, or Extension Links, are two links from an SP or SSP to its secondary STP pair. E-Links are generally not implemented in GTE's SS7 network.

- F-Links. F-Links, or Fully Associated Links, may be as little as one direct link between two SPs or SSPs. F-links are generally not implemented in GTE's SS7 network.

The original distinctions between B-Links and D-Links have faded with the development of gateway screening and increased signaling network interconnection. Because B-Links and D-Links perform the same functions (i.e., interconnecting two STP pairs), the terms B-Link and D-Link are often used interchangeably.

7. SS7 Network Protocol

A protocol is a formal set of rules for the exchange of information between networks or among network facilities. Protocols insure that a sender and receiver of information are compatible and that communication between the two will be intelligible. A protocol also includes procedures for establishing and maintaining the communication path, and provides error detection, correction and retransmission, if required. Lastly, protocols consist of procedure definitions to establish the appropriate communications and definitions of messages and message exchanges.

As illustrated in Attachment 4, the SS7 protocol has five major sub-protocol layers -- the Message Transfer Part (MTP); the Signaling Connection Control Part (SCCP); the ISDN (Integrated Services Digital Network) User Part (ISUP); the Transaction Capabilities Application Part (TCAP); and the Operations and Maintenance Application Part (OMAP).

ISUP and TCAP are the higher-level service or application interface components of the SS7 protocol. MTP provides functions for basic routing of signaling messages between signaling points. SCCP provides additional routing and management functions for transfer of messages other than call set-up between signaling points. ISUP provides for transfer of call set-up signaling information between signaling points. TCAP provides transfer of non-circuit related information between signaling points. OMAP provides the functions, test procedures and protocols for the operation, maintenance, administration and provisioning of the CCS signaling network and switching offices.

ISUP, TCAP and OMAP are often referred to as the higher layers of the protocol, since they use the other, or lower layers. The lower layers are used by the higher layers of the protocol to ensure reliable message transport, error detection, error correction, retransmission and destination translation and routing.

Services or applications which use MTP, SCCP, ISUP, TCAP and/or OMAP must use defined portions of the protocol in the provision of the service or application. Services or applications may use multiple sub protocols. Messages and procedures must be defined and standardized for each service or application. There are error detection and correction messages, as well as operations, maintenance and administrative messages transversing the signaling network at any particular time. Uses of the individual messages and the message lengths vary significantly. For example, TCAP messages start at the overhead level of 21 bytes, and may be as long as approximately 272 bytes. A single service may require multiple messages of various lengths, multiple uses of multiple protocol layers and multiple retries to attempt or complete a service.

8. SS7 and CLASS Services.

SmartCall services, which is the GTE trademark for a family of services, including services commonly referred to as CLASS (Custom Local Area Signaling Service), are performed by the end office switch in which the call is terminated. SS7 simply carries the calling party number in the transport of call set-up messages from the originating switch to the terminating switch. The terminating switch performs the

SmartCall function subscribed to by the end user based on the calling party number transported by the SS7 network. The SS7 network does not perform CLASS services, but only carries calling party number information from the originating switch to the terminating switch, and the CLASS services are performed by the terminating switch.

B. **Unbundling Under The Telecommunications Act of 1996**

The Act provides that each incumbent local exchange carrier (ILEC) has the following duties:

> UNBUNDLED ACCESS. -- The duty to provide, to any requesting telecommunications carrier for the provision of a telecommunications service, nondiscriminatory access to network elements on an unbundled basis at any technically feasible point. . .

47 U.S.C. § 251 (c)(3) (1996). The Act further provides that,

> [i]n determining what network elements should be made available for purposes of subsection (c)(3), the [FCC] shall consider, at a minimum, whether --
>
> (A) access to such network elements as are proprietary in nature is necessary; and
>
> (B) the failure to provide access to such network elements would impair the ability of the telecommunications carrier seeking access to provide the services that it seeks to offer.

47 U.S.C. § 251(d)(2)(1996).

The FCC has interpreted these provisions to require ILECs to provide access to SS7 by purchasing local switching services from the ILEC or by unbundling signaling links and STPs. See In re Implementation of the Local Competition Provisions

in the Telecommunications Act of 1996, First Report and Order, CC Docket No. 96-98, FCC 96-325 (released Aug. 8, 1996) (the Order) ¶¶ 479-83.

C. **The Issues Presented and the Positions of the Parties**

The issues presented in this arbitration flow predominately from the parties' differing views of the purposes and requirements of the Act. Notwithstanding GTE's willingness to interconnect SS7 networks at the STP and to provide database access at the STP, GTE is not required to unbundle SCPs. The issues about which the parties disagree are as follows:

1. *Is it technically feasible to unbundle GTE's SCP?*

   AT&T's Position: Unbundling of all signaling elements, including the SCP, is technically feasible.

   GTE's Position: Although access to the databases related to GTE's SCP may made through a query to the SCP via interconnection with the corresponding STP pair, it is not currently technically feasible to provide SCPs on an unbundled basis.

2. *Is it technically feasible to unbundle GTE's STPs?*

   AT&T's Position: Unbundling of all signaling elements, including the STPs, is technically feasible.

   GTE's Position: Although interconnection between signaling networks is accomplished at GTE's STPs, it is not currently technically feasible to provide STPs on an unbundled basis.

3. *Is it technically feasible to unbundle GTE's signaling links?*

AT&T's Position: Unbundling of all signaling elements, including the SLs, is technically feasible.

GTE's Position: It is not currently technically feasible to unbundle SLs within the GTE signaling network. Interconnection with GTE's signaling network is possible, however, via unbundled signaling links connecting the AT&T switch (SSP) or STP to GTE's STP.

4. *Is it technically feasible to directly interconnect with GTE's SCPs?*

AT&T's Position: Direct interconnection with GTE's SCPs is technically feasible.

GTE's Position: Access to the databases related to GTE's SCP may made only through a query to the SCP via interconnection with the corresponding STP pair. Interconnection to the SCP directly, however, is not technically feasible.

D. **Explanation of GTE's Position on the Disputed Issues**

1. Interconnection and Unbundling

Although interconnection with and access to the SS7 network is currently possible through the STP, it is not currently technically feasible to provide unbundled access to all elements of the SS7 network, or to allow direct interconnection with SCPs.

Today, interconnection with an SS7 network occurs at the STP, which was designed to be the entry point to an SS7 network and to provide access to all SS7 functions. The STP is the only physical point at which interconnection is technically feasible. The STP directs SS7 message flow and provides the necessary mediation functions by preventing passage of inexecutable or dangerous messages to the SCPs, rejecting inconsistent messages regarding the same end user, and preventing unauthorized

access to proprietary information. Neither the SCP nor any other point in the SS7 network can perform these functions.[2] In addition, the SCP is not technically capable of routing SS7 messages to multiple STP pairs. Access to the SCP and its associated databases is technically feasible only through the STP pair associated with that SCP, whether the SCP is owned by the ILEC or another entity.

This does not mean that other carriers are unable to access GTE's databases -- it only means that they have to do so through the STP. Unbundled access to GTE's 800 and LIDB databases is provided to other carriers today. This access requires interconnection to a GTE SS7 STP, using either GTE-provided links or links constructed by another provider. Providing direct access to the database or SCP raises network reliability issues due to the lack of industry standards. Standard interfaces exist for STP interconnection, but not for direct SCP interconnection. Interconnection to SCPs is a highly controversial issue at this time. Until appropriate mediation techniques and the associated software and hardware are developed to safeguard the network, access to SCPs or databases is not technically feasible.

With regard to providing elements of the SS7 network on an unbundled basis, the ability of GTE to provide such elements is necessarily limited by the way the SS7 network is designed. Unbundling GTE's SS7 signaling network suggests that SLs,

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[2] The FCC has acknowledged that "STPs perform important network screening functions," which should not be "decentralized" and performed at every switch. *Expanded Interconnection with Local Telephone Company Facilities*, 9 FCC Rcd 2718, 2725 (1994).

STPs, and/or SCPs within the GTE signaling network could be purchased and/or provisioned independent of each other. This implies, for example, that SLs could be provisioned independently, and by multiple providers, without regard to purchase, or ownership, of the signaling node to which it connects. Similarly, this implies that a signaling node could be provided independent of other nodes and the links between them.

However, it is generally not possible to unbundle SLs, STPs and/or SCPs because it is not possible for CLECs to self provision, either singly or in combination, SLs, STPs, and/or SCPs within the GTE signaling network.

a. Signaling Links

It is not possible for a CLEC to self-provision a signal link for routing its own signaling messages within the GTE signaling network. As described earlier, signaling links within the GTE network connect signaling nodes (e.g., SSP, STP and SCP) to one another. Current industry standards, in the interest of maintaining an efficient network structure, give various elements of the network specific functions which are not resident in others. These standards do not support the unbundling of the signaling link connecting a GTE SSP or SCP to its primary GTE STP pair as neither the SSP nor the SCP can perform appropriate screening, routing or translation functions necessary to separately distinguish and route messages to multiple links. Each GTE SSP and SCP relies upon the STPs to perform these functions and properly route messages throughout the GTE signaling network and on to interconnected signaling networks.

Similarly, it is not possible to allow a third party to provide the signal link between an SCP and its primary STP pair. As described earlier, the SCP is not capable of providing various screening and routing functions necessary to distinguish links of multiple providers and must rely upon its primary STP pair for these functions. Therefore, the signaling links must be provided between the STP pair and the SCP.

b. SCPs

It is not possible to provide SCPs on an unbundled basis. As discussed above, the SCP cannot perform screening and routing functions necessary to distinguish links and/or STPs of multiple providers. The SCP relies upon its primary STP pair for this capability. Under current standards and within GTE's network the SCP must therefore be provided in conjunction with an associated link and primary STP pair -- the SCP cannot be unbundled and independently provided. Thus, access to the SCP is gained through the primary STP pair and the associated links.

c. STPs

Moreover, it is not possible to provide STPs on an unbundled basis, since the STP pair was designed to be the point of interconnection to SS7 networks. Access at other points of the SS7 network is not technically feasible. Only the STP directs message flow and provides necessary network mediation functions. These functions are not performed at other points in the GTE SS7 network.

Nevertheless, in some situations it is feasible for a CLEC to self-provision these components and interconnect to the GTE signaling network, creating a "network of networks." This can be accomplished in a variety of ways, depending upon the CLEC's choice of network elements and providers. There are two options for interconnection of a CLEC SS7 capable switch with the GTE signaling network. The first option is for a CLEC SS7 capable switch (SSP) to connect directly to a GTE STP pair. The GTE STP pair would then provide all of the screening, routing and translation functions for the *CLEC SSP, just as it does today for GTE's SSPs. The second option is for a CLEC SSP* to connect to a CLEC STP pair or to an STP pair provided by a third party. The CLEC or the third party STP pair would then establish an interconnection with the GTE network at an appropriate STP pair. These interconnections would be accomplished by interconnecting the two signaling nodes via SLs. The signaling link could be provisioned in a variety of ways, including:

- self-provisioned by the CLEC via collocation;
- purchased from GTE as special access lines (SALs);
- provisioned over jointly constructed facilities; or
- provisioned in other methods that may be identified as local interconnections are discussed and negotiated.

2. Interconnection at the STP and Mediation

However, as has been indicated above, interconnection with the SS7 network requires mediation in order to safeguard the integrity of the SS7 network. Mediation refers to a number of functions. In this discussion, mediation refers to the STP functions of gateway screening.[3] Mediation may also refer to intermediate interface with other network elements to address security and reliability issues. The gateway screening functions of the STP include screening to prevent passage of inexecutable or dangerous messages to the SCP, rejecting inconsistent messages and preventing unauthorized access to proprietary information. Neither the SCP nor any other point in the SS7 network can perform these functions. Also, access to the SCP or its associated database(s) is technically feasible only through the STP pair associated with that SCP, whether the SCP is owned by the incumbent LEC or another entity. Therefore, the SCP cannot be unbundled from the associated STPs.

GTE provides STP interconnection for call setup, access to the 800 data base and access to GTE's LIDB. STP interconnection for call setup and for DB800 queries takes place at the local STP pairs serving the LATA or LATAs in which the message is originated. DB800 queries are directed to the DB800 database from an appropriately-equipped end office or access tandem in the local exchange network to determine the appropriate carrier for routing an 800/888 dialed call. All switches which

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[3] AIN mediation is another aspect of mediation, and is addressed in Part III regarding AIN.

are equipped to perform this function (i.e., SSP functionality) must have access to a DB800 database. Offices which are not equipped to perform this function must route all 800/888 dialed calls to a switch which can perform this function. Interconnection for access to GTE's line information database (LIDB) takes place through the regional STP pair associated with the SCP and LIDB database in Indiana (local STPs in the network are connected to regional STP pair). Queries are directed and processed according to industry standards for calling card verification, third-party and reverse billing of operator-assisted calls.

Interconnection at the STP pair will provide CLECs with the ability to establish service and compete in the local service arena, since CLECs can obtain access to all SS7 functions at the STP pair. With interconnection at the STP, CLECs will also have access to all GTE databases needed for call routing and completion. Failure to obtain access to GTE's SS7 network at other points will not impair the CLEC's ability to provide their subscribers with any SS7 service equivalent to that offered by GTE today to GTE's subscribers.

Setting aside that technical standards do not presently exist for interconnection at points other than the STP pair and that no standards have been established and accepted for direct interconnection into the SCP, if direct interconnection at the SCP were accomplished the consequences could be extreme and wide-ranging. Even if a resourceful engineer were able to modify the hardware and logic of an SCP to

accomplish such an interconnection, several undesirable events are possible, depending on the quality of the design and software development.

- Customer proprietary network information (CPNI) contained in the SCP could be compromised thereby resulting in improper disclosure and/or modification of private customer information by unauthorized persons, entities or "hackers." Access to such information could not be prevented, controlled or managed as it is with STP mediation.

- Other interconnected SS7 networks might not be able to appropriately route messages to the correct destination.

- Without mediation by the STP, the SCP would not be capable of distinguishing potentially conflicting instructions for the same customer, originating from two different networks.

- Maintenance, operational and administrative messages from the interconnecting SS7 network could affect the network of the owner of the SCP and potentially, some or all of the SS7 networks interconnected with the SS7 network of the SCP owner.

If any of the above-referenced events were to happen, customer service would be affected, ranging from minor impact (e.g., routing of calls to the wrong destination) to catastrophic (e.g., isolating a number of switching offices, or disabling portions of an SS7 network).

The conditions that have been discussed in regard to SS7 network unbundling and interconnection are not unique to the GTE signaling network. The GTE signaling network is designed to conform with current industry standards. The types of screening, routing and translation capabilities needed to provide for third party access to individual network nodes, i.e., SSPs and SCPs, are not supported by current standards.

3. GTE Proposals

GTE proposes the following options for CLEC interconnection through the STP to GTE's SS7 network. The options for interconnection are limited by the technological and network reasons discussed above.

Component	Options
SLs to the STP	• SLs may be self provisioned by the CLEC via collocation; or • SLs may be purchased from GTE as special access lines; or • SLs may be provisioned over jointly constructed facilities; or • SLs may be established by other methods which are identified as local inter-connections are discussed and negotiated.
STP Port	• Access to GTE's SS7 system is provisioned only through the STP Port according to GTOC1.
Database queries	• Requires STP port interconnection. • LIDB queries provisioned under terms and conditions reflected in GTOC1, GTE's Federal access tariff. • DB800 queries provisioned under the terms and conditions reflected in GTE's Carrier Selection Service, which is offered to all LECs. • Provisioning of other database queries will be established as such databases are developed.

These options are diagrammed in Attachment 5.

Pricing for CLEC interconnection to GTE's signaling SS7 signaling network will be as follows:

Component	Options
Links to STP:	• Pricing for the individual link "pieces" negotiated for the interconnection will be at the state tariffed rate for these "pieces" (e.g., collocation, special access facilities, etc.); or • If the CLEC wishes GTE to provide the signaling link to GTE's STP pair(s), GTE will provide Dedicated Switched Access Line (DSAL) and Dedicated Switched Access Termination (DSAT) facilities from the Customer Designated Location (CDL), with pricing from GTOC1, GTE's Federal access tariff.
STP Ports:	• The pricing for STP Ports will be the STP Port rate referenced in GTOC1, GTE's Federal access tariff.
Databases:	• Pricing for database queries will be either: (1) from GTOC1, GTE's Federal access tariff (in the case of LIDB); or (2) at the current pricing for GTE's services offered to other LECs (in the case of DB800/Carrier Selection Service).

GTE proposes the above-referenced arrangements for SS7 network interconnection instead of an all-inclusive tariff arrangement, since SS7 network interconnections are complex and not reducible to a single element. A "one-size-fits-all" approach is not well-suited for establishing SS7 interconnection. Contractual arrangements in regard to interconnection of the link between the CLECs to a GTE STP can be established at the time of negotiation of an overall interconnection agreement. Depending upon the manner in which the CLECs are linked, certain GTE tariffs will

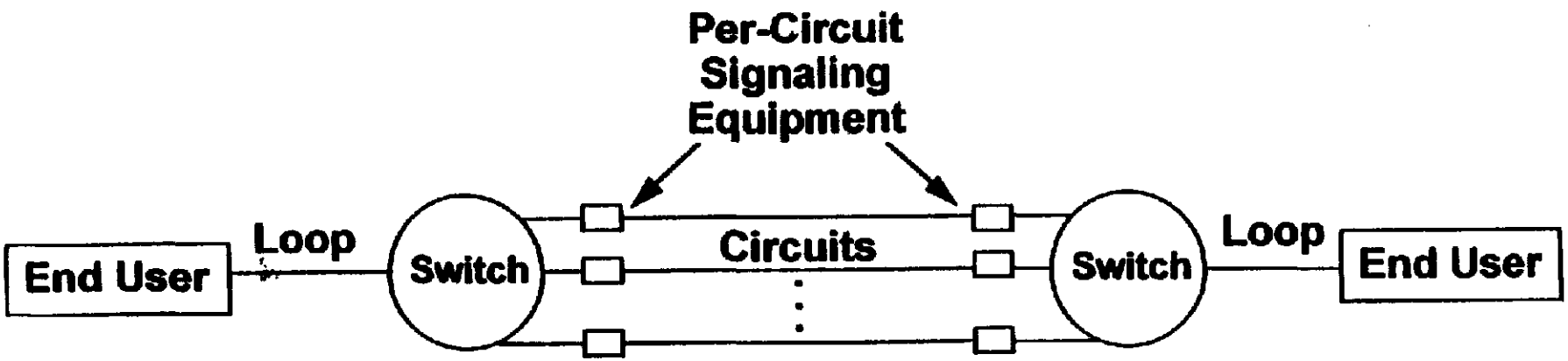
apply. GTE believes that this manner of establishing interconnection will provide the most efficient, most effective, and lowest cost solution for the CLEC.

Conclusion

In summary, GTE's SS7 network cannot be unbundled at this time to permit physical interconnection at any point other than the STP, which provides a vital role in safeguarding network reliability and integrity. Access at the STP pair will enable the CLECs to obtain access to any SS7 service equivalent to that offered by GTE today. GTE will charge its federally tariffed prices for interconnection into the SS7 network except where contractual negotiation is better suited to meet the needs of the CLECs in regard to the provision of particular interconnection links to the STP. Where negotiation results in provision of facilities covered by state tariffs, the state tariff rate or rates will be applicable.

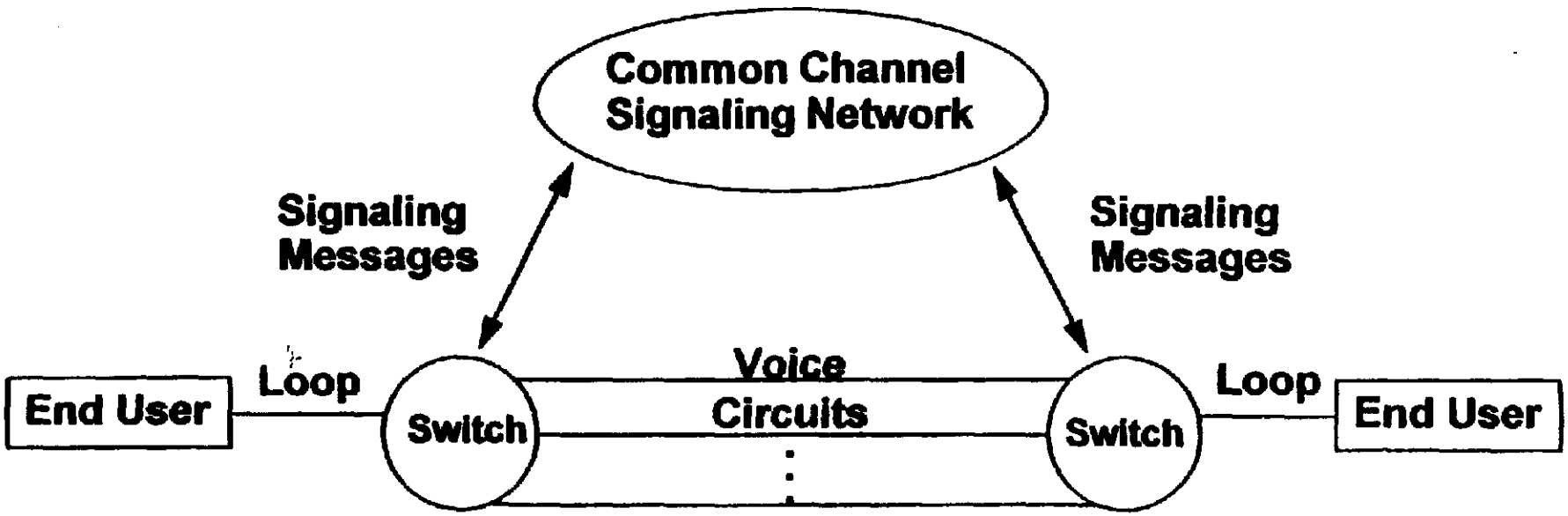
ATTACHMENT 1

ATTACHMENT 1 – TRADITIONAL SIGNALING



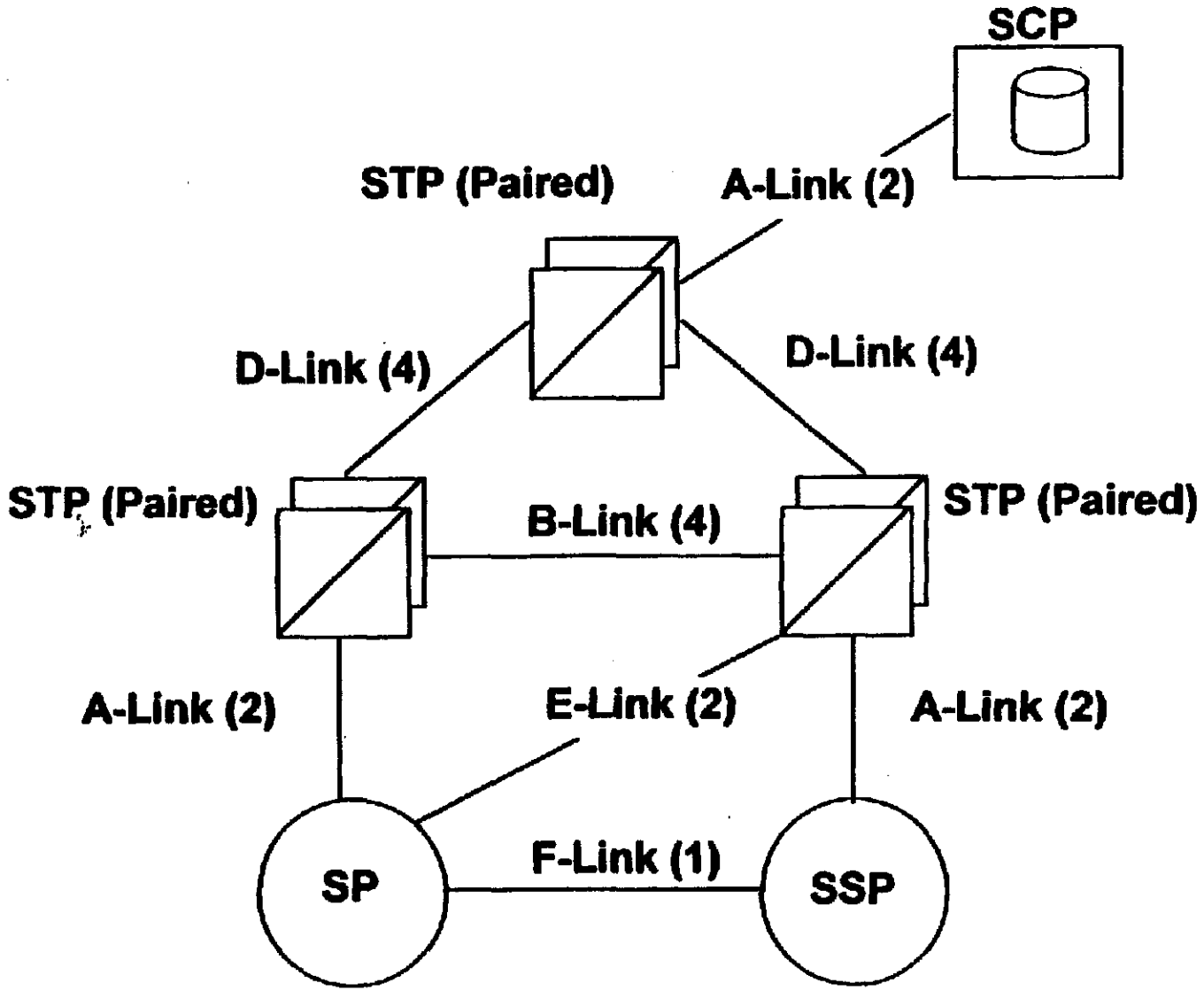
ATTACHMENT 2

ATTACHMENT 2 -- COMMON CHANNEL SIGNALING



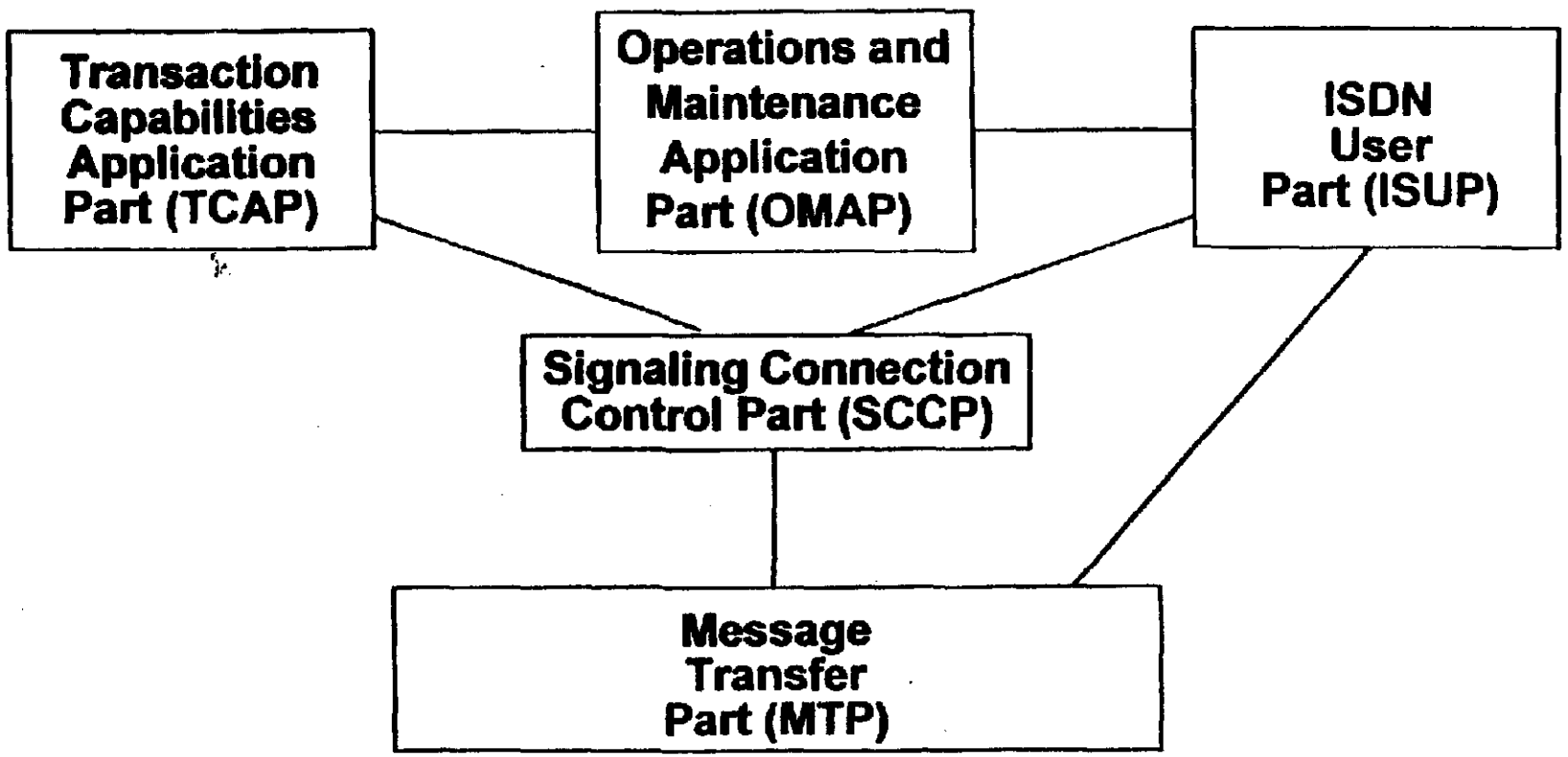
ATTACHMENT 3

ATTACHMENT 3 -- SS7 NETWORK ARCHITECTURE



ATTACHMENT 4

ATTACHMENT 4 -- SS7 PROTOCOL STRUCTURE



ATTACHMENT 5

ATTACHMENT 5 -- LOCAL INTERCONNECTION STRUCTURE