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SMDS
Network Interface Specifications

Technical
Reference

NOTICE

This Technical Reference describes the Network Interface (NI) specifications for BellSouth's Switched Multi-megabit Data Service (SMDS). SMDS is a high-speed connectionless packet switched service that can be used to connect customer's Local Area Networks (LAN's) or other customer networks and equipment across metropolitan or wide areas.

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SMDS NETWORK INTERFACE SPECIFICATIONS

CONTENTS

SMDS NETWORK INTERFACE SPECIFICATIONS

1. GENERAL

This Technical Reference describes the Network Interface (NI) specifications for BellSouth's Switched Multi−megabit Data Service (SMDS). SMDS is a high−speed connectionless packet switched service that can be used to connect customers' Local Area Networks (LAN's), or other customer networks and equipment across metropolitan or wide areas. This document is intended to be used with other references, as noted throughout the text.

1.1 BellSouth SMDS Service

1.1.1 Background

SMDS is a switched, connectionless data service. Connectionless service implies that there is no call set−up or tear−down phase, and each packet contains all the information necessary for the network to route it to its final destination. This is in contrast to connection−oriented services, such as Frame Relay service, which entail a call setup phase, data transfer phase and termination phase for each session. As a switched service, SMDS allows an end user, using a single SMDS local access facility, to connect with any other authorized SMDS customer located anywhere on the SMDS network.

SMDS was developed to accommodate the needs of large and advanced data customers. Dedicated point−to−point digital services may not be viable customer solutions for connecting multiple locations because of cost, data throughput rate and limited networking flexibility. SMDS, Frame Relay service and Broadband ISDN are emerging broadband services which provide solutions to the Local Area Network (LAN) interconnection and high performance data needs of BellSouth customers. These services can allow end users to access databases, file servers, printers, etc. and transfer large data files at high speed between geographically separated locations, in a manner comparable to performing those functions within the local LAN.

1.1.2 SMDS Protocols

SMDS comprises a three−level packet protocol. Level 1 of the protocol specifies the electrical and physical characteristics of the service at the Subscriber Network Interface (SNI). SMDS level 2 provides framing and bit error detection. For some types of SMDS access, level 2 functions may also include level 3 packet segmentation and reassembly, and traffic prioritization. Level 3 is the highest of the SMDS protocol levels. The level 3 variable−length packets contain SMDS source and destination addresses necessary for routing through the network. Other level 3 functions include address screening and packet−level error checking.

1.1.3 SMDS Addressing

Ten−digit numbers consistent with ITU−T (formerly CCITT) Recommendation E.164 are used for the SMDS addressing. The SMDS addresses of both the caller, and of the called party are contained in SMDS level 3 packets.

At this time, there is no national agreement regarding an SMDS numbering/addressing plan. However, BellSouth plans to implement a numbering plan in which SMDS addresses are assigned using the same North Americal Numbering Plan (NANP) Numbering Plan Area (NPA) location in which the customer is geographically located. For example, all SMDS customers in the NPA 404 area will be assigned addresses using the format 404−NXX−XXXX. BellSouth will assign central office codes (i.e., SMDS address digits 4, 5 and 6) such that there is no duplication of numbers between SMDS addresses and the NANP in the BellSouth region.

SMDS supports both individual and group addressing. Each SMDS customer is assigned a unique individual address, and that address is associated with one particular SNI. Additionally, group addressing may be used by customers to send copies of SMDS packets to multiple individual SMDS addresses, which may involve several SNIs. An individual address may be included in several group addresses. When utilized, group addresses are defined by the customer, and implemented by the network that serves as the Group Address Agent for SMDS. The implementation of new group addresses and changes made to the list of individual SMDS addresses associated with an existing group address are made by BST, upon customer request. This address management function is completely separate from the SNI specifications; that is, all assignment of SMDS addresses, or modification of group addresses, is performed manually through external customer/BST agreement.

Nested group addressing is not currently supported by BellSouth. Nested group addresses are particular to SMDS interfaces between carriers (i.e., BST and Interexchange Carriers). Nested group addressing pertains to those addresses which are a part a group address, and are served directly from the network originating the group−addressed packet, when the originating network is not the Group Address Agent. Nested group addressing provides the capability to reduce the SMDS traffic to the IC, in some cases.

1.1.4 Security and Address Screening

Security and address screening is integral to SMDS. The SMDS local loop facility is always dedicated, and the only current access to SMDS is via an SNI − there is no direct dial−up SMDS capability. Further, the BellSouth network verifies that the source address contained in each level 3 packet is legitimately assigned to the originating SNI.

SMDS screening capabilities allow customers to restrict access to the SNI based upon SMDS source addresses and/or destination addresses. Both individual and group address screening is available with SMDS. Individual address screening is used for screening destination individual addresses of packets sent by the CPE and source individual addresses of packets to be delivered to the CPE. Group address screening allows screening of destination group addresses of packets sent by the CPE. For individual and group screening, the customer must provide BST a set of either allowed, or disallowed addresses at subscription time. BST will implement the screening table based upon this customer−provided information.

1.1.5 SMDS Local Loop Access

The end user is required to lease a dedicated digital facility from the SNI at the customer location to the local SMDS switch. However, there are no other dedicated BellSouth network circuits required for any individual SMDS customer. Currently, SMDS access is available at data rates of 56 kilobits per second (kb/s), 64 kb/s, 1.544 megabits per second (mb/s), and 44.736 mb/s. DS1 and DS3 SMDS can also be transported via Asynchronous Mode Transfer (ATM) transport using Synchronous Optical Network (SONET) facilities operating at the 155.52 mb/s or 655 mb/s rates.

1.1.6 Unique SMDS Characteristics

SMDS differs significantly from BellSouth's other traditional circuit switched data services, both in higher transmission speeds and in network error correction philosophy. Typical SMDS transmission speeds are much higher than those for other data switched services, and the SMDS protocol does not include any error correction capability.

This lack of network error correction contrasts with PulseLink® service, which is BellSouth's lower speed public packet switching service based upon ITU−T (CCITT) X.25[2] protocols. PulseLink service protocols include extensive procedures and overhead for error correction by the BellSouth network. Since SMDS includes no network error correction capability, it is the responsibility of the SMDS customer and customer applications to detect and correct transmission errors, including those caused by the network.

Being a connectionless service, there is no network flow control for SMDS. There will, therefore, be instances in which customer data units will be discarded due to network congestion. An example of such an instance would be the case in which the composite data rate being transmitted to a SMDS customer exceeds the capacity of the receiving customer's circuit bandwidth. (e.g., several other SMDS customers simultaneously transmitting data to the same customer, etc.). In this instance, if there is not sufficient flow control performed by higher−level customer protocols, data will be lost. It is then the responsibility of the customer to detect data loss and to invoke appropriate procedures for its recovery.

1.2 BellSouth SMDS Service Types

SMDS is available to both end users and Interexchange Carriers (ICs). The network interfaces for these two categories of SMDS are located at the end user's premises and at the IC's Point of Presence (POP), respectively.

End user SMDS access types currently offered by BellSouth are:

- DS1 and DS3 access based upon the IEEE Standard 802.6, "Distributed Queue Dual Bus (DQDB) Subnetwork of a Metropolitan Area Network (MAN)"[3]. This type of SMDS is referred to in this Technical Reference as "DQDB−based SMDS". The reference sources for BellSouth's DQDB−based SMDS are Bellcore documents TR−TSV−000772 and TR−TSV−000773[4].
- 56 kilobits kb/s, 64 kb/s and DS1 access based upon the Data Exchange Protocol (DXI), as described in the SMDS Interest Group documents SIG−TS−001/1991[5] and SIG−TS−005/1993. BellSouth's SMDS−like service type based upon this protocol is referred to as Connectionless Data Service ("CDS"). The reference source for CDS is Bellcore document TA−TSV−001239[6].
- SMDS access using Asynchronous Transfer Mode (ATM) transport and ATM Adaptation Layer (AAL) Type 3/4 procedures. This type of access is not described in depth by this document, since it is more closely associated with BellSouth's ATM service offerings.

IC SMDS access types currently offered by BellSouth are:

- InterLATA exchange access SMDS access utilizing DS3−based facilities. This type access utilizes an implementation which differs somewhat from the standard, but is also based upon IEEE Standard 802.6 DQDB protocol. This access type is referred to as Exchange Access Switched Multi−megabit Data Service ("XA−SMDS").
- InterLATA exchange access SMDS via ATM transport. This access type is referred to as BISDN Inter Carrier Interface (B−ICI) access. There is no in−depth discussion of B−ICI access in this document, as it is more closely associated with BellSouth's ATM service offerings.

2. DOCUMENT CONTENTS

Section 3 of this document provides the protocol models for the various BellSouth SMDS service types.

Section 4 describes DQDB−based SMDS. The network interface for DQDB−based SMDS is the Subscriber Network Interface (SNI) located at the customer's premises.

Section 5 describes SA−SMDS. The network interface for this service is between the BellSouth network and an Interexchange Carrier (IC), at the IC's Point of Presence (POP).

Section 6 describes the CDS. The network interface for CDS is the DXI/SNI located at the customer's premises.

Section 7 addresses SMDS performance parameters. The significant SMDS performance parameters are discussed, and BellSouth objectives are specified in this section.

Section 8 is a list of the documents referenced in this Technical Reference.

3. PROTOCOL MODEL

Each of the types of SMDS access offered by BellSouth requires that Customer Premises Equipment (CPE) be compatible with the SMDS transport layer protocols supported by BellSouth. Figure 1 illustrates the relationship of these SMDS protocols described in this Technical Reference. The protocol layers shown in the figure do not correspond to the layers in the Open Systems Interconnection (OSI) protocol reference model.

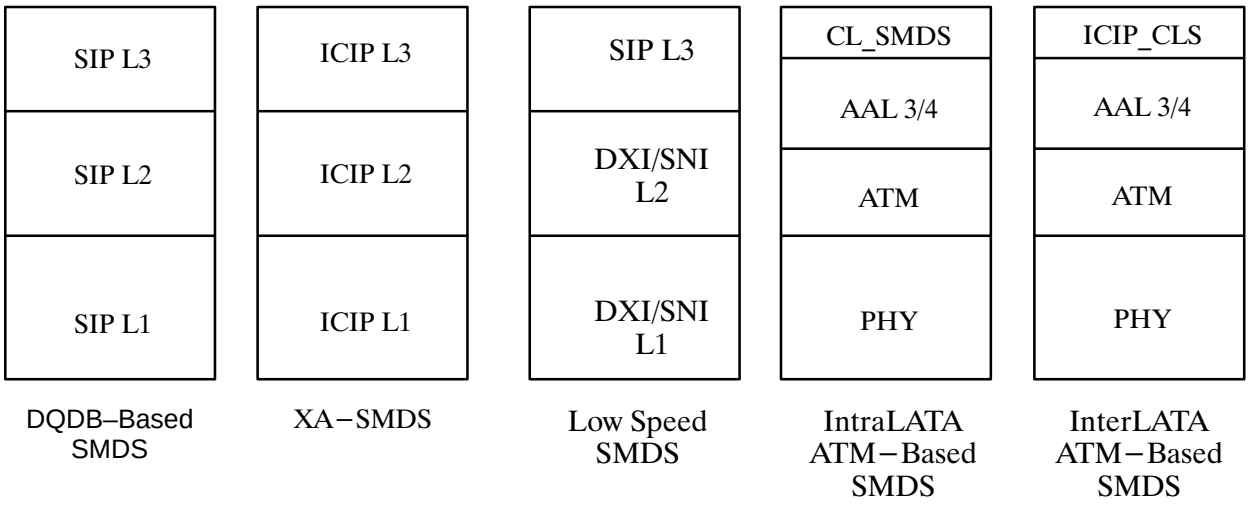

Figure 1 – SMDS Protocol Layers

4. DS1 AND DS3 DQDB–BASED INTRALATA SMDS

BellSouth's DQDB–based intraLATA SMDS is based upon Bellcore TR–TSV–000772, "Generic System Requirements in Support of Switched Multi–megabit Data Service"[4] (TR772) and Bellcore TR–TSV–000773, "Local Access System Generic Requirements, Objectives, and Interfaces in Support of Switched Multi–megabit Data Service"[5] (TR773). BellSouth supports all the current Requirements of TR772 and TR773.

4.1 DQDB–based SMDS Interface Protocol

IEEE Standard 802.6 is used as the basis of the SMDS Interface Protocol (SIP). SIP comprises three protocol layers: SIP Level 1, SIP Level 2 and SIP Level 3, whose functions include addressing, framing, error detection and physical transport.

4.1.1 SIP Level 1

SIP Level 1 specifies the physical layer requirements for SMDS, and is described in TR773. There are two sublayers in SIP Level 1: (1) the Transmission System Sublayer and (2) the Physical Layer Convergence Procedure (PLCP) Layer.

4.1.1.1 DS1 SIP Level 1

This section describes the specifications of the DS1 SMDS Transmission System Sublayer and PLCP Layer.

4.1.1.1.1 DS1 SIP Level 1 Transmission System Sublayer

The Transmission System Sublayer is the lower of the two SIP 1 sublevels. It specifies both the format and characteristics of bit transmission across the physical medium, and the method of attachment to the medium. Interconnection at the SNI is via a four−wire interface utilizing one of four Universal Service Order Code (USOC) connectors. These connectors are: RJ48C, RJ48X, RJ48M or RJ48H.

The required local loop facility between the SNI and local central office is available through BellSouth's MegaLink℠ service tariff. Alternatively, dedicated DS1 service suitable for SMDS DS1 transport is also available through BellSouth's LightGate® service tariff, or SMARTRing℠ service tariff.

The DS1 facility must be provisioned with B8ZS and Extended Superframe Format (ESF). The ESF Data Link is required for SMDS to carry performance report information and to pass unscheduled messages.

Complete specifications for MegaLink service are contained in BellSouth Technical Reference TR 73525, Issue B, "MegaLink℠ and MegaLink℠ Channel Service Exchange Network Interface Specifications"[6]. Physical specifications for DS1 LightGate service are contained in BellSouth TR 73501, Issue C, "LightGate Service Channel Interface Specifications"[7].

4.1.1.1.2 DS1 SIP Level 1 PLCP Layer

The DS1 PLCP is the higher SIP 1 sublayer and provides a method of mapping SIP Level 2 data and SIP Level 1 Control Information into a DS1 ESF format. Detailed specifications of the DS1 PLCP format and requirements for its implementation are contained in TR773.

4.1.1.2 DS3 SIP Level 1

This section describes the Transmission System Sublayer and PLCP Layer requirements for DS3 SIP Level 1. The BellSouth implementation of DS3 SIP Level 1 is based upon TR773.

4.1.1.2.1 DS3 SIP Level 1 Transmission System Sublayer

Interconnection at the DS3 NI is provided by two 75 ohm, threaded, coaxial, TNC, jack and plug connectors. The USOC assignment for this arrangement is SJA 44.

A dedicated fiber optic facility (or its equivalent) is required between the SNI and the local central office. This facility is available through BellSouth's LightGate service tariff. Complete physical specifications for LightGate service are contained in Bellsouth TR 73501, Issue C, "Lightgate® Service Channel Interface Specifications".

4.1.1.2.2 DS3 SIP Level 1 PLCP Layer

The DS3 PLCP provides the method of mapping SIP Level 2 and SIP Level 1 Control Information into a DS3 framing format. Detailed specifications of the DS3 PLCP format and requirements for its implementation are contained in TR773.

4.1.2 SIP Level 2

DQDB−based SMDS SIP Level 2 functionality includes the segmentation and reassembly of the higher layer variable−length SIP Level 3 data units. Additional SIP Level 2 functions include error checking and framing. The SIP Level 2 Protocol Data Unit (SIP L2_PDU) always comprises 53 octets. SIP Level 2 requirements for DQDB−based DS1 and DS3 SMDS are contained in Section 4 of TR772.

Figure 2 illustrates the SIP Level 2 protocol format. Descriptions of the SIP L2_PDU fields are contained in Section 4.1.2.1.

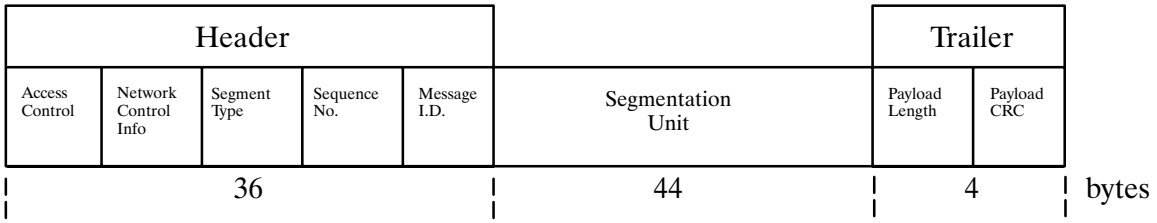

Figure 2 − SIP Level 2 Protocol Data Unit Format

4.1.2.1 SIP L2_PDU Fields

This section contains a listing and description of the SIP L2_PDU fields.

4.1.2.1.1 Access Control Field (ACF)

The ACF is used to indicate whether the SIP_L2 PDU contains data or is empty, and to allow prioritization of bandwidth by end users in the CPE−to−network direction.

In the direction from the end user CPE to the BellSouth network, the 8−bit field comprises the following format:

BUSY	XXXX	REQ_2	REQ_1	REQ_0
1	4	1	1	1

No. of bits

The BUSY bit indicates whether the L2_PDU contains information (BUSY = 1), or whether it is empty (BUSY = 0). The four "X" bits are ignored by the network. The last three bits in the ACF format are used by the customer to allocate (prioritize) bandwidth from the network in the CPE to network direction of transmission. The DQDB−based queuing procedures described in TR772 utilizes these last three Request bits. For single CPE access arrangements, the three Request bits should be set to zeros.

In the network−to−CPE direction, the 8−bit ACF format is the following:

BUSY	0000000
1	7

No. of bits

The BUSY bit indicates whether the L2_PDU contains information (BUSY = 1), or whether it is empty (BUSY = 0). The remaining seven bits are always set to 0 by the BST network.

4.1.2.1.2 Network Control Information Field

This 32−bit field is also used to indicate whether the L2_PDU contains information or is empty. For L2_PDUs containing information, the field is populated with the value 11111111111111111111000000100010. For empty L2_PDUs, the field is populated with all zeros.

4.1.2.1.3 Segment Type Field

This 2−bit field indicates how a non−empty L2_PDU shall be processed by the receiving entity. The four possible values are shown below.

Value	Meaning
00	Continuation of Message (COM)
01	End of Message (EOM)
10	Beginning of Message (BOM)
11	Single Segment Message (SSM)

4.1.2.1.4 Sequence Number

This 4−bit field is used in reassembling a L3_PDU to ensure all L2_PDUs associated with the L3_PDU have been received in the correct sequence, using modulo 16.

4.1.2.1.5 Message Identifier (MID)

The MID field is used to associate multiple segments of L3_PDUs (these segments are contained in the Segmentation Unit field of non−empty L2_PDUs) for reassembly. The field is populated with zeros for empty L2_PDUs and for Single Segment Messages (SSMs). For non−empty L2_PDUs that are not SSMs, the same MID is used for all those L2_PDUs associated with a particular L3_PDU. In the CPE−to−network direction, the MID number will be in the range from 1 to 511. For the network−to−CPE direction, the MID number will be in the range from 512 to 1023.

4.1.2.1.6 Segmentation Unit

This 44−octet field is the information field, and contains a segment of a higher−level L3_PDU. For empty L2_PDUs, this field is populated with all zeros.

4.1.2.1.7 Payload Length Field

This 6−bit field indicates how many of the Segmentation Unit field octets contain actual data. This field will be populated with zeros for empty L2−PDUs.

4.1.2.1.8 Payload CRC Field

This 10−bit field provides error detection by performing a Cyclic Redundancy Check on all L2_PDU fields (including the Payload CRC field), except the Access Control and Network Control Information fields. For empty L2_PDUs, this field is populated with all zeros.

4.1.3 SIP Level 3

SIP Level 3 provides SMDS addressing information, error checking and detection of lost SIP Level 2 data units. The SIP Level 3 Protocol Data Unit (L3_PDU) is a variable−length unit based upon the DQDB protocol format. In fact, several SIP L3_PDU fields exist solely for alignment with the DQDB Initial MAC Protocol Data Unit (IM_PDU) format. SIP Level 3 requirements for DQDB−based SMDS are contained in TR772.

Individual and Group addresses are assigned by BellSouth to SMDS customers at the time of service subscription. Address screening and Access Class selection are also negotiated and determined at the time of service subscription.

Figure 3 illustrates the protocol format of SIP Level 3. Descriptions of the SIP L3_PDU fields are contained in Section 4.1.3.1.

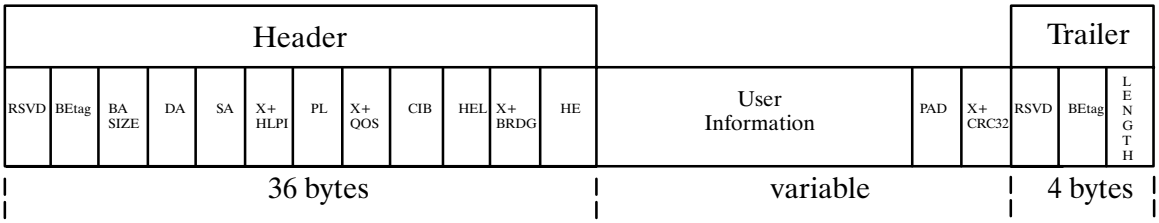

Figure 3 − SMDS SIP Level 3 Protocol Data Unit (SIP L3_PDU) Format

4.1.3.1 SIP L3_PDU Fields

This section contains a listing and description of the SIP L3_PDU fields.

4.1.3.1.1 Reserved Field

There are two 1−octet Reserved fields in the L3_PDU format. Both fields are always populated with all zeros.

4.1.3.1.2 BEtag Field

There are two 1−octet BEtag fields in all L3_PDUs. These fields are used as beginning and ending tags in the header and trailer, respectively. The BEtag fields form an association between the first and last segments of a particular L3_PDU. The fields contain a value within a range of 0 to 255, and both BEtag fields in a valid L3_PDU must contain the same value. In the next L3_PDU sent, both value in both fields are incremented by one, using modulo 8.

4.1.3.1.3 BAsize Field

This 2−octet field indicates the length, in octets, of the L3_PDU from the beginning of the Destination Address field to the end of the CRC32 field.

4.1.3.1.4 Destination Address (DA) Field

The DA field contains the SMDS address of the customer to whom the L3_PDU is being routed. This 8−octet field contains two subfields − a 4−bit Address_Type subfield, followed by a 60−bit Address subfield.

The Address_Type subfield contains the value 1100 when the associated Address subfield is an individual SMDS address, and the value 1110 when the associated Address subfield is a group address.

The Address subfield contains the value 0001 in the first 4 bits, followed by 40 bits containing the BCD value of the SMDS destination address, and ends with all 1's in the last 16 bits of the subfield.

4.1.3.1.5 Source Address (SA) Field

The SA field contains the SMDS address of the customer sending the L3_PDU. The SA field has the same format as the DA field, above. The 4−bit Address_Type subfield contains the value 1100, indicating its associated Address subfield contains an individual SMDS source address. Any other value in the Address_Type subfield is invalid. The Address subfield is the same as that for the DA Address subfield.

4.1.3.1.6 Higher Layer Protocol Identifier (HLPI) Field

This 6−bit field exists only to align the L3_SIP format with the standard DQDB Initial MAC Protocol Data Unit format. The field is required for SMDS, but it's contents are ignored by the network. The "X+" designation in Figure 3 indicates that the field is not processed by the network.

4.1.3.1.7 PAD Length (PL) Field

This 2−bit field indicates the size, in octets, of the PAD field.

4.1.3.1.8 Quality of Service (QOS) Field

This 4−bit field exists only to align the L3_SIP format with the standard DQDB Initial MAC Protocol Data Unit format. The field is required to be present for SMDS, but it's contents are ignored by the network. The "X+" designation in Figure 3 indicates that the field is not processed by the network.

4.1.3.1.9 CRC32 Indication (CIB) Field

The purpose of this 1−bit field is to indicate the presence or absence of the CRC32 field. A CIB bit set to "1" indicates the CRC32 calculation has been generated and is present; otherwise, the CIB is set to zero.

4.1.3.1.10 Header Extension Length (HEL) Field

The HEL field is used to indicate the number of 32−bit words in the Header Extension field, and for SMDS is always populated with the value 011.

4.1.3.1.11 Bridging (Brdg) Field

This 2−octet field is required for SMDS, but is present only to ensure alignment with the standard DQDB Initial MAC Protocol Data Unit format. The field's contents are ignored by the network. The "X+" designation in Figure 3 indicates that the field is not processed by the network.

4.1.3.1.12 Header Extension (HE) Field

This 12−octet field contains information regarding the version of SMDS being used by the customer generating the L3_PDU, and contains subfields associated with the IC Overriding Carrier Selection feature utilized by XA−SMDS (Section 5, below). Currently, there is only one version of SMDS, designated by a 1 in the appropriate HE subfield. A detailed explanation of the HE field is contained in TR772.

4.1.3.1.13 Information Field

This variable−length field contains the user data. The Information field can vary from a length of 0 to 9188 octets.

4.1.3.1.14 PAD Field

This variable−length field is used to make the entire L3_PDU 32−bit aligned. Its length can vary from 0 to 3 octets, and is consistent with the value contained in the PAD Length field described in Section 4.1.3.1.7, above.

4.1.3.1.15 CRC32 Field

This 4−octet field may be present or absent, as indicated by the CIB field described in Section 4.1.3.1.8, above. When present, the CPE must calculate the Cyclic Redundancy Check calculation as per IEEE Standard 802.6, Section 6.5.6.1. If present, the CRC32 field contains the result of that calculation. This field is implemented by the user, and the network will deliver its contents unchanged. The "X+" designation in Figure 3 indicates that the network ignores the contents of the field.

4.1.3.1.16 Length Field

The 2−octet Length field contains the length value as found in the BAsize field.

4.1.4 SIP Levels 2 and 3 Functionality

The encapsulation of user information by SIP levels 2 and 3 are illustrated by Figure 4, below.

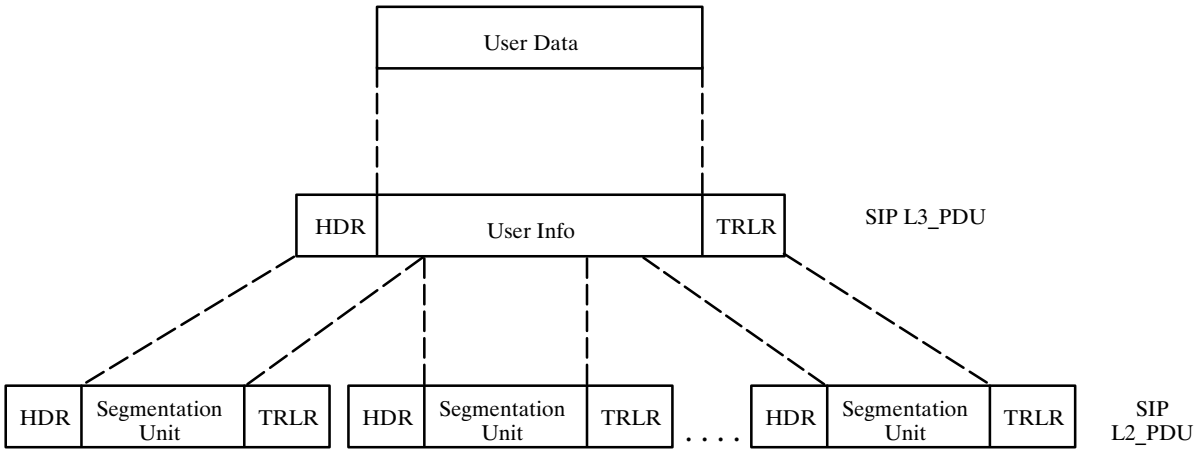

Figure 4 − SIP Level 2 and Level 3 Functionality

5. EXCHANGE ACCESS SMDS (XA−SMDS)

This section describes interLATA DQDB−based Exchange Access SMDS, referred to as XA−SMDS. BellSouth XA−SMDS is based upon Bellcore TR−TSV−001060, Issue 1, "Switched Multi−Megabit Data Service Generic Requirements for Exchange Access and Intercompany Serving Arrangements"[8] (TR1060). NI specifications are contained in Sections 3, 5, 6 and 7. Currently, BellSouth cannot support all of the Requirements contained these sections of TR1060. However, it is BellSouth's intent to evolve to full compliance with Sections 3, 5, 6 & 7 of TR1060, and to support future reissues of the document. There has been no timeframe established for this evolution.

The attached BellSouth XA−SMDS requirements list contains detailed BellSouth compliance information to the Section 3, 5, 6 & 7 Requirements. This attachment will be updated as our products evolve to full compliance.

5.1 XA−SMDS Service Definitions

XA−SMDS addressing, carrier selection, validation and screening are based upon the Requirements in Section 3 of TR1060. Addressing and Carrier Selection are determined at the time of service subscription.

5.2 Inter−Carrier Interface Protocol

XA−SMDS utilizes a DQDB−based protocol referred to as the Inter−Carrier Interface Protocol (ICIP). Like DQDB−based SMDS, ICIP is a three−level protocol based upon IEEE Standard 802.6. Section 5 of TR1060 describes the protocol, and contains the Requirements relating to the ICIP format and for SIP interworking.

5.2.1 ICIP Level 1

Currently, XA−SMDS is only available over single, non−channelized DS3 facilities. The ICIP Level 1 requirements are those of the SIP Level 1 DS3 requirements at the SNI contained in Section 4 of TR773.

5.2.2 ICIP Level 2

The ICIP Level 2 format is based upon IEEE Standard 802.6, and aligns with the 53−octet DQDB PDU Slot format, and the DQDB SMDS SIP L2_PDU format. ICIP Level 2 format specifications and requirements are contained in Section 5.6 of TR1060.

Figure 5 illustrates the ICIP Level 2 protocol format. Description of the ICIP L2_PDU fields are contained in Section 5.2.2.1.

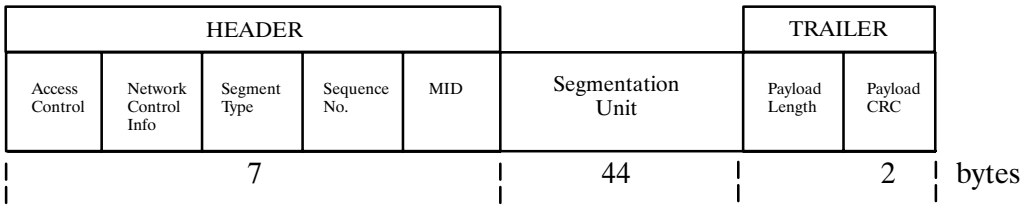

Figure 5 − ICIP Level 2 Protocol Data Unit Format

5.2.2.1 ICIP L2_PDU Fields

This section contains a listing and description of the ICIP L2_PDU fields.

5.2.2.1.1 Access Control Field

This 1−octet field indicates whether the L2_PDU contains information, or is empty. If the L2_PDU does contain information, the field is populated with a value of 10000000. An empty L2_PDU is indicated by the field being populated with all zeros.

5.2.2.1.2 Network Control Information Field

This 4−octet field also indicates whether the L2_PDU contains information, or is empty. If it contains information, the field will be populated with the value 11111111111111111111000000100010. The field will be populated with all zeros if the L2_PDU is empty.

5.2.2.1.3 Segment Type Field

This 2−bit field indicates how a non−empty L2_PDU should be processed by the receiving entity. The four possible values are shown below.

Value	Meaning
00	Continuation of Message (COM)
01	End of Message (EOM)
10	Beginning of Message (BOM)
11	Single Segment Message (SSM)

5.2.2.1.4 Sequence Number Field

This 4−bit field is used in reassembling L2_PDUs into L3_PDUs, by allowing verification that all L2_PDU Segmentation Units have been received in order, using modulo 16.

5.2.2.1.5 Message Identifier (MID) Field

The 10−bit MID field is used by the receiving entity to correlate multiple L2_PDUs with their associated L3_PDU. The MID field values range from 1 to 1023, and will be the same for all L2_PDUs associated with any particular L3_PDU.

5.2.2.1.6 Segmentation Unit

This 44−octet field contains a portion of the ICIP L3_PDU, or is empty. If empty, it contains all zeros. If it is the last L2_PDU associated with the L3_PDU, it may not be full. In this case, the remainder of the field will be padded with zeros.

5.2.2.1.7 Payload Length (PL) Field

The 6−bit PL field indicates how much of the Segmentation Unit contains actual data. The field's value ranges from 4 to 44, indicating how many octets of data are contained in the Segmentation Unit field.

5.2.2.1.8 Payload CRC Field

This 10−bit field provides for ICIP level 2 error detection. The Cyclic Redundancy Check method contained in Section 6.5.2.2.2 of IEEE Standard 802.6 is used for checking the contents of all the L2_PDU fields (including the Payload CRC field), except the Access Control and Network Control fields.

5.2.3 ICIP Level 3

Section 5.5 of TR1060 describes the ICIP Level 3 specifications and requirements. ICIP Level 3 is, like SIP Level 3, based upon the IEEE Standard 802.6 IM_PDU. A significant difference between the ICIP Level 3 PDU format and the SIP L3_PDU format is the ICIP format's additional eight−byte Service Specific Information field. Descriptions of the ICIP L3_PDU fields are contained in Section 5.2.3.1.

The ICIP−User Data field of the ICIP_CLS_PDU contains one customer SIP L3_PDU, minus the four−byte SIP L3_PDU trailer.

Figure 6 illustrates the protocol format of ICIP Level 3.

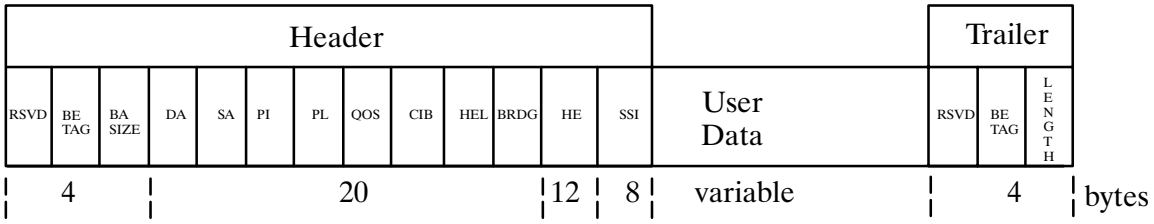

Figure 6 − ICIP Level 3 Protocol Data Unit Format

5.2.3.1 ICIP L3_PDU Fields

This section contains a listing and description of the ICIP Level 3 PDU format fields.

5.2.3.1.1 Reserved Fields

There are two 1−octet Reserved fields in the ICIP L3_PDU. For BST SMDS service, both fields are always populated with zeros.

5.2.3.1.2 Beginning−End Tag (BE Tag)

There are two 1−octet BE Tag fields in a L3_PDU − one in the header and one in the trailer. The two fields are used to establish a relationship between the Beginning of Message (BOM) and End of Message (EOM) ICIP L2_PDUs derived from the same L3_PDU for error checking.

5.2.3.1.3 Buffer Allocation Size (BA Size)

The 2−octet BA Size field indicates the length, in octets, of the portion of the L3_PDU from the Destination Address field up to and including the ICIP−User Data field.

5.2.3.1.4 Destination Address (DA) Field

The 64−bit DA field contains the SMDS address for which the SIP L3_PDU contained in the ICIP End−User Data field is intended. The DA field contains a 4−bit Address Type subfield followed by a 60−bit Address subfield.

The Address Type subfield contains the value 1100 for public individual addresses, and contains the value 1110 for public group addresses.

The Address subfield identifies the destination address. Addressing convention is that the first four bits of the subfield contain the E.164 Country Code, the next 40 bits contain the BCD value of the address, and the last 16 bits contain all 1's. For international service, when available, all 60 bits of the field may be used for SMDS addressing.

5.2.3.1.5 Source Address (SA) Field

The 64−bit SA field contains the SMDS Individual Address that originated the SIP L3_PDU in the ICIP End−User Data field. The SA is copied from the Source Address field of the SIP L3_PDU.

The SA field comprises the same two subfields and format as the DA field described in Section 5.2.3.1.4, above.

5.2.3.1.6 Protocol Identification (PI) Field

This 6−bit field identifies the type of ICIP user. Currently, four types of users are defined in TR1060. These are shown in the following list:

ICIP User	PI Value (In Decimal)
Originating XA−SMDS	50
Terminating XA−SMDS	51
BCC−ILEC Serving Arrangements	52
System Management	60

5.2.3.1.7 Pad Length

This 2−bit field is used to ensure 32−bit word alignment. For PI field values of 50, 51 and 52, the field contains the value 00.

5.2.3.1.8 Quality of Service (QOS) Field

The 4−bit QOS field always contains the value 0000 for XA−SMDS.

5.2.3.1.9 CRC 32 Indicator Bit (CIB) Field

This 1−bit field is used to indicate whether the 32−bit IEEE Standard 802.6 Cyclic Redundancy Check is used. For XA−SMDS, the CIB is set to 0, indicating to CRC is used.

5.2.3.1.10 Header Extension Length (HEL) Field

This 3−bit field is always encoded with the value 011, indicating a 12−octet Header Extension field.

5.2.3.1.11 Bridging Field

This 2−octet field is always populated with zeros.

5.2.3.1.12 Header Extension (HE) Field

The 12−octet ICIP HE field is identical to the SIP HE field. For PI field values of 50,51 and 52, the entire 12 octets of the SIP L3_PDU Header Extension field is copied unchanged into the ICIP HE field.

5.2.3.1.13 Service Specific Information (SSI) Field

This 8−octet field provides information necessary to support XA−SMDS serving arrangements. The SSI field contains a 1−octet ICIP Version subfield, followed by a 2−octet Carrier subfield and a 1−bit Explicit Selection subfield. The remaining 39 bits are set to all zeros.

The ICIP Version subfield is set to 00000001 for XA−SMDS, indicating ICIP Version 1.

The Carrier subfield utilizes 4 BCD digits, and contains the 3 or 4 digit SMDS Carrier Identification Code (CIC).

The Explicit Selection subfield indicates whether the originator has explicitly selected its preferred IC, in which case the subfield bit is set to 1. If an explicit selection is absent, the subfield bit is set to 0.

5.2.3.1.14 User Data Field

For XA−SMDS, the variable−length ICIP User Data field contains the sending end−user's SIP L3_PDU, without its SIP L3−PDU Trailer.

5.2.3.1.15 Length Field

The 2−octet Length field contains the same length value as is contained in the BA Size field.

5.3 ICIP Level 2 and Level 3 Functionality

Figure 7, below, illustrates the encapsulation of user data using ICIP Level 2 and 3 procedures.

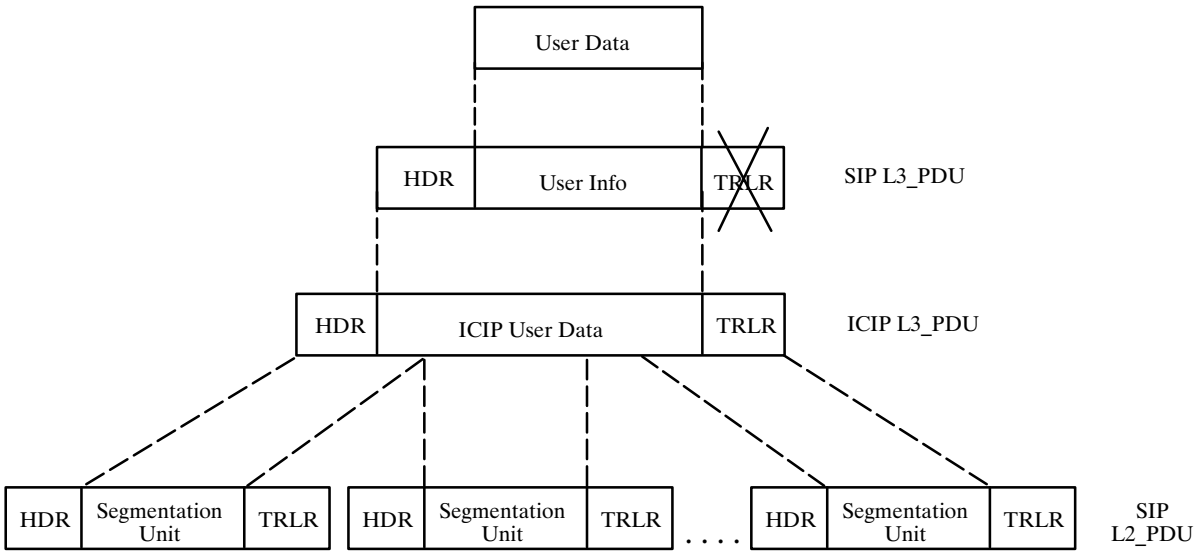

Figure 7 − SIP Level 2 and Level 3 Functionality

6. CONNECTIONLESS DATA SERVICE

Connectionless Data Service (CDS) is BellSouth's low−speed SMDS−like service offering. CDS is an intraLATA service alternative to DQDB−based SMDS, and is based upon the Data Exchange Interface (DXI) protocol specified in SIG−TS−001/1991[9] and SIG−TS−005/1993[12]. CDS allows customers with low traffic volumes to more economically access the BellSouth SMDS network. The network interface for CDS is referred to as the Data Exchange Interface/Subscriber−Network Interface (DXI/SNI), and is located at the customer's premises. DXI/SNI protocol is utilized to access CDS at the DXI/SNI.

Network Interface specifications for CDS are contained in Bellcore TR−TSV−001239, "Generic Requirements for Low Speed SMDS Access"[10].

DXI protocol was developed as a CPE−to−CPE protocol and is typically used between the customer's SMDS router and the customer's SMDS Data Service Unit (DSU) for DQDB SMDS. The router performs the SIP Level 3 functionality, and the SMDS DSU performs the SIP Level 2 functionality. DXI is based upon High−level Data Link Control (HDLC) procedures, in which a SIP L3_PDU is encapsulated within a DXI frame. For CDS, this DXI frame is delivered to the physical layer (in lieu of a SIP L2_PDU, for DQDB SMDS) for transport across the NI. A standard DSU can be used for Low Speed SMDS, since the BellSouth network provides SIP Level 2 functionality.

6.1 DXI/SNI Level 1

BellSouth CDS is available at the 56 kilobit per second (kb/s), 64 kb/s and DS1 data rates.

6.1.1 56 kb/s and 64 kb/s Access

Interconnection at the SNI is via a four−wire interface utilizing a RJ48S or RJ48T USOC connector. The local loop transport for 56 kb/s and 64 kb/s CDS is via a dedicated, digital facility. This type facility is available through BellSouth's Digital Data Access Service (DDAS), or SynchroNet® service tariffs. Network Interface specifications for SynchroNet service are contained in BellSouth Technical Reference 73545, Issue C, "SynchroNet Service Network Interface Specifications"[11] (TA1239). As an alternative 56 kb/s and 64 kb/s CDS is available on a multiplexed basis through any BellSouth higher−order channelized facilitiies (e.g., MegaLink service, etc.)

6.1.2 DS1 Access

For DS1 CDS, the local loop transport also requires a dedicated facility. The required facility for DS1 access is available through BellSouth's MegaLink service tariff. Network Interface specifications for MegaLink service are contained in BellSouth Technical Reference 73525, Issue B[6]. The DS1 facility must be provisioned with B8ZS and Extended Superframe Format.

6.2 DXI/SNI Level 2

DXI/SNI Level 2 protocol is based upon High Level Data Link Control (HDLC) procedures, and is functionally equivalent to SIP Level 2. DXI/SNI Level 2 is the principal difference between DQDB SMDS and CDS protocols. Unlike the fixed−size SIP L2_PDUs, CDS DXI/SNI L2_PDUs can vary in length up to a size of 9232 octets.

The DXI/SNI Level 2 protocol is specified in TR1239, and requires implementation of the DXI Data Link protocol contained in SIG−TS−001/1991.

Figure 8 illustrates the CDS DXI/SNI Level 2 Protocol Data Unit.

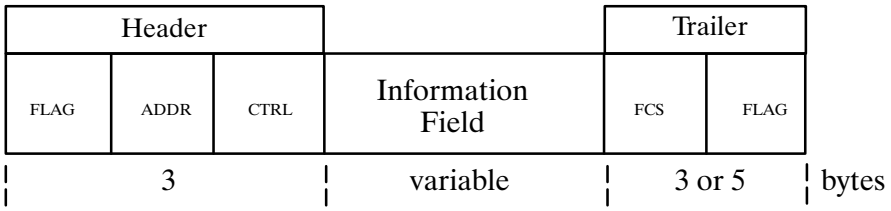

Figure 8 − DXI/SNI Level 2 Frame Format

SIG−TS−001/1991 currently defines two types of DXI logical links. These two types are the Data Logical Link and the Management Logical Link. The Address Field (see Section 6.2.1.2, below) of the Level 2 frame indicates its logical link type. The Data Logical Link provides for transport of the SIP L3_PDU between the CDS customer and the BST network. The Management Logical Link provides communication status, control and diagnostic information regarding the connection. Except for two specific Management Logical Link test sequences, no MLI procedures are implemented for CDS.

6.2.1 DXI/SNI Level 2 Fields

This section contains a listing and description of the fields contained in a CDS DXI/SNI Level 2 frame. The right−most, or least significant bit is the first bit of each field to be transmitted.

6.2.1.1 Flag Field

The 8−bit Flag field is used to indicate the beginning and ending of a frame. The one valid Flag sequence is 01111110. All frames must begin and end with this sequence, although when multiple frames are being sent, a single 8−bit sequence is used as both the closing flag of one frame and the opening flag of the next frame.

The transmitter of the frames must insert (“stuff”) a 0 bit after all sequences of five continuous 1 bits between the Flag sequences. The receiver of the frames must therefore remove the 0 bit after any five continuous 1 bits between Flag sequences.

Flags are also used for inter−frame fill.

6.2.1.2 Address Field

The 8−bit Address field is used to indicate if the frame is a command or response, its direction of transmission, and the logical link type.

Below are the valid CDS Address field sequences.

Frame Type	Sequence
Command (Contains SIP L3_PDU)	00000101
Test Command	00001101
Test Response	00001111

6.2.1.3 Control Field

This 8−bit field identifies whether the frame is an Un−numbered Information (UI) frame or a TEST frame. UI Data Logical Link frames are used to transport SIP L3_PDUs. Test frames are used to implement the Heart Beat Poll described in Section 6.2.2, below.

Below are the valid CDS Control field sequences.

Frame Type	Sequence
UI	00000011
TEST	11110011

Therefore, for CDS, the only valid Address Code and Control field combinations are:

Frame Type	Address Field Sequence	Control Field Sequence
Information	00000101	00000011
Test Command	00001101	11110011
Test Response	00001111	11110011

6.2.1.4 Information Field

This section describes the Information field for both Data Logical Link frames and for the TEST frames.

6.2.1.4.1 Data Logical Link Frame Information Field

For Data Logical Link frames, this variable−length field is used to encapsulate the entire SIP L3_PDU for transport across the NI. The field comprises a 2−octet Header subfield, followed by a variable−length (0 − 9232 octets) Data subfield.

The Header subfield format is shown below.

The Reserved fields are not examined by the network, but should be set to zero for future compatibility.

The Congestion field, when set to 1, is used in the network−to−CPE direction to indicate that the customer may encounter congested network resources. In the CPE−to−network direction, the Congestion field must be populated with a zero.

The Information Data subfield for a Data Logical Link frame contains one entire SIP L3_PDU. A null Data subfield may be sent by the network if no L3_PDUs are ready to be transported, but the network will not send a second null PDU without first sending a SIP L3_PDU or TEST frame, to prevent CPE overloading with null frames.

6.2.1.4.2 TEST Frame Information Field

For TEST frames, there is no restriction on the content of the Information field.

6.2.1.4.3 Frame Check Sequence (FCS) Field

The 16−bit or 32−bit FCS field contains either the 16−bit or 32−bit the Cyclic Redundancy Check (CRC) described in SIG−TS−001/1991, respectively. CPE must be capable of using the 16−bit CRC. Use of the 32−bit CRC is optional.

6.2.2 Heart Beat Poll (HBP) Procedures

HBP procedures allow either the network or the CPE to periodically determine the status of the link by sending a TEST command, and receiving a TEST response. A counter called the HBP NA, and a HBP timer, are implemented by the network. The HBP NA is incremented if a TEST response is not received before the HBP timer expires. The HBP NA counter is set for a threshold. When the threshold is violated, an internal network alarm is sent (the alarm is not indicated at the NI).

The network HBP timer and threshold values are selected at the time the circuit is initially configured. There is a configuration option that allows the HBP procedures to be disabled.

6.3 DXI/SNI Level 3

DXI/SNI Level 3 protocol is exactly the same as the DQDB SMDS SIP Level 3 protocol described in Section 4.1.3 of this document, and in Bellcore TA772, Section 4. BellSouth conforms to all current requirements of TA772, including those contained in Section 4.

6.4 DXI/SNI Level 2 and Level 3 Functionality

Figure 9, below, illustrates the encapsulation of user data using CDS DXI/SNI procedures. Unlike SIP Level 2 and ICIP Level 2, DXI/SNI Level 2 does not involve the segmentation and reassembly of Level 3 PDUs using fixed−length Level 2 PDUs.

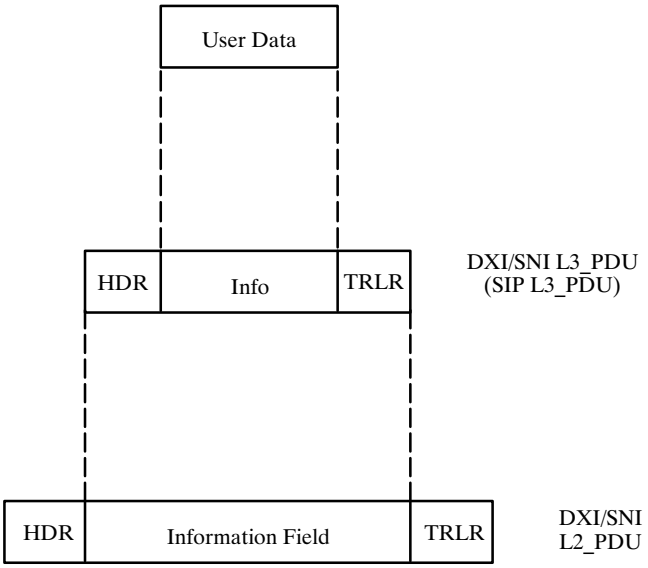

Figure 9 − CDS DXI/SNI Level 2 and Level 3 Functionality

7. SMDS PERFORMANCE

There are no service performance guarantees associated with BellSouth SMDS. SMDS performance parameters are currently under industry study. As SMDS is more widely deployed and performance data can be collected, BellSouth service performance requirements may be further developed.

7.1 Performance Parameters

This section contains performance parameters and BST performance objectives for DQDB−based SMDS, XA−SMDS and CDS.

7.1.1 Availability Objectives

Service availability is the long term average of the ratio of actual service time to scheduled service time. For local exchange access (DQDB−based SMDS and CDS), availability is measured on an SNI−to−SNI basis. For XA−SMDS, availability is measured on an SNI−to−ICI basis.

7.1.1.1 Scheduled Service Time

Scheduled Service Time is the length of time the BST network is expected to provide service.

Scheduled Service Time **should** be 24 hours per day, 7 days per week.

7.1.1.2 Service Availability

Service Availability is the long term average of the ratio of actual service time to scheduled service time.

For DQDB−based SMDS and CDS, Service Availability **should** be 99.9%, and for XA−SMDS **should** be 99.675%.

7.1.1.3 Mean Time Between Service Outages

The Mean Time Between Service Outages (MTBSO) is the average duration of any continuos interval during which the service is available.

For DQDB−based SMDS and CDS, the MTBSO **should** be no less than 3500 hours, and for SA−SMDS **should** be no less than 8757 hours.

7.1.1.4 Mean−Time−To−Restore

The mean−time−to−restore (MTTR) a service is the average elapsed time from the moment a loss of service is detected to the moment service is fully restored. MTTR is a measure of the unavailability of service, from the perspective of the NI, caused by a malfunction of the BST network.

The MTTR **should** be no more than 3.5 hours for DQDB−based SMDS and CDS, and 3.0 hours for XA−SMDS.

7.1.2 BST Accuracy Objectives

Accuracy parameters are those associated with the BST network error performance during user data transfer, when the network is available. The accuracy parameters are defined relative to the delivery or non−delivery of level 3 packets across the NI. These packets are L3_PDUs for DQDB−based SMDS and CDS, and ICIP L3_PDUs for XA−SMDS. The L3_PDUs are either individually addressed or group addressed level 3 data units.

7.1.2.1 Errored L3_PDU Ratio

The Errored L3_PDU Ratio is the ratio of the number of incorrect L3_PDUs delivered across the NI to the total number of L3_PDUs delivered across the NI. An errored L3_PDU is one which contains one or more bit errors, including bit repetitions and lost bits. The ratio does not include lost, network−discarded L3_PDUs, or errored L3_PDUs discarded by CPE due to bit errors.

The BST objective is that for DQDB−based SMDS, XA−SMDS and CDS, the Errored L3_PDU Ratio should be less than $5X10^{-13}$.

7.1.2.2 Misdelivered L3_PDU Ratio

The Misdelivered L3_PDU Ratio is the ratio of the number of misdelivered L3_PDUs to the total number of L3_PDUs delivered across the NI. A L3_PDU is considered misdelivered when it is determined that the L3_PDU delivered across the NI was actually intended for delivery across a different NI.

The BST objective is that the Misdelivered L3_PDU Ratio should be less than $5X10^{-8}$ for DQDB−based SMDS, XA−SMDS and CDS.

7.1.2.3 L3_PDU Not Delivered Ratio

The L3_PDU Not Delivered Ratio is the ratio of the number of lost L3_PDUs to the total number of L3_PDU;s delivered across the NI. Lost L3_PDUs are those that are not delivered to the intended NI, because of a fault of the BST network. These include errored L3_PDUs delivered to the NI and discarded by the CPE. L3_PDUs not delivered as a result of conditions not the fault of the BST network (e.g., non−delivery due to Access Class enforcement, address screening, etc.) are excluded from this ratio.

The BST objective is that the L3_PDU Not Delivered Ratio should be less than $1X10^{-4}$ for DQDB−based SMDS, XA−SMDS and CDS.

7.1.2.4 Duplicated L3_PDU Ratio

The Duplicated L3_PDU Ratio is the ratio of the number of duplicated L3_PDUs to the total number of L3_PDUs delivered across the NI. Duplicated L3_PDUs caused by user actions such as retransmission are excluded from this ratio.

The BST objective is that the Duplicated L3_PDU Ratio should be less than $5X10^{-8}$ for DQDB−based SMDS, XA−SMDS and CDS.

7.1.2.5 Mis−sequenced L3_PDU Ratio

The Mis−sequenced L3_PDU Ratio is the ratio of the number of mis−sequenced L3_PDUs to the total number of L3_PDUs delivered across the NI. Mis−sequenced L3_PDUs are only relevant to individually addressed data units. A L3_PDU is considered mis−sequenced when: (1) It is sent across the ingress NI without any interleaved L2_PDUs from other L3_PDUs with the same source and destination addresses, and (2) The EOM (or SSM) segment of the L3_PDU is delivered to its destination NI after a BOM (or SSM) segment of another L3_PDU that was sent later with the same source and destination addresses.

The BST objective is that the Mis−sequenced L3_PDU Ratio should be less than $1X10^{-9}$ for DQDB−based SMDS, XA−SMDS and CDS. The Mis−sequenced L3_PDU Ratio for SMDS over ATM is under study.

7.1.3 L3_PDU Delay Objectives

L3_PDU Delay is the amount of time required to transfer a L3_PDU from the ingress NI to the egress NI. This delay only applies to the cases in which L3_PDUs are transferred across the BST network in contiguous L2_PDUs, and there is no contention between the BST network and the CPE for available bandwidth.

L3_PDU Delay is the time elapsed between the transmission of the first bit of an L3_PDU and the originating NI to the receipt of the last bit of that same L3_PDU at the destination NI. For group addressed L3_PDUs, delay for each delivered copy is the time elapsed between the transmission of the first bit of the group addressed L3_PDU at the originating NI to the delivery of a single copy of a that L3_PDU at the destination NI. The lengths of L3_PDUs may be distributed in any manner, including the case in which all the L3_PDUs are the maximum size of 9188 octets of user data.

Since BST customers may use either a DS3 or DS1−based access path, L3_PDU delay objectives are specified for three possible combinations: (1) CPE using a DS3−based access path exchanging information with another CPE (or with an IC) using a DS3−based access path, (2) CPE using a DS1−based access path exchanging information with another CPE (or with an IC) using a DS3−based access path and (3) CPE using a DS1−based access path exchanging information with another CPE using a DS1−based access path.

7.1.3.1 Delay for Indivdually Addressed L3_PDUs

The delay objectives in this section apply to L3_PDUs whose destination address is an individual address.

The BST objective is that for 95% of all L3_PDUs delivered, the L3_PDU delay for two CPE (or one CPE and an IC) using DS3−based access paths should be less than 20 msec.

For 95% of all L3_PDUs delivered, the L3_PDU delay for two CPE (or one CPE and an IC), one CPE (or IC) of which utilizes a DS3−based access path and the other which utilizes a DS1−bsed access path, should be less than 80 msec.

For 95% of all L3_PDUs delivered, the individually addressed L3_PDU delay for two CPE using DS1−based access paths should be less than 140 msec.

7.1.3.2 Delay for Group Addressed L3_PDUs

The delay objectives in this section apply to L3_PDUs whose destination is a group address.

For 95% of all L3_PDUs delivered, the L3_PDU delay for two CPE (or one CPE and an IC) using DS3−based access paths should be less than 100 msec.

For 95% of all L3_PDUs delivered, the L3_PDU delay for two CPE (or one CPE and an IC), one CPE (or IC) utilizeing a DS3−based access path and the other CPE utilizing a DS1−based access path, should be less than 160 msec.

For 95% of all L3_PDUs delivered, the L3_PDU delay for two CPE using DS1−based access paths should be less than 200 msec.

7.2 SMDS Performance Reference Documents

7.2.1 DQDB−based IntraLATA SMDS Performance

Section 5 of TR772 contains general performance objectives for DQDB−based SMDS availability, accuracy and delay parameters.

7.2.2 XA−SMDS Performance

The XA−SMDS requirements list included with this Technical Reference provides BellSouth conformance to the TR1060 Requirements, including those in Section 6 relating to performance. Although compliance to the Section 6 Requirements is a BellSouth objective, there are no performance guarantees for the service.

7.2.3 CDS Performance Requirements

CDS performance objectives are contained in Bellcore TA1239. It is BellSouth's intention to meet these objectives, but like the other BellSouth SMDS offerings, there are no service performance guarantees associated with CDS.

8. REFERENCES

The following documents are referenced in this TR.

1. ITU−T Rec. I.164 — CCITT Blue Book, Vol. VII − Fascicle II.2, 1988. "Numbering Plan for the ISDN Era".[1]

2. ITU−T Rec. X.25 — CCITT Blue Book, Vol. VIII − Fascicle VIII.2, 1988. "Interface Between Data Terminal Equipment (DTE) and Data Circuit−Terminating Equipment (DCE) for Terminals Operating in the Packet Mode and Connected to Public Data Networks By Dedicated Circuit".[1]

3. IEEE Std 802.6 — IEEE Std 802.6−1990. "Distributed Queue Dual Bus (DQDB) Subnetwork of a Metropolitan Area Network (MAN)".[2]

4. Bellcore TR772 — TR−TSV−000772, Issue 1, May 1991. "Generic System Requirements in Support of Switched Multi−megabit Data Service".[3]

5. Bellcore TR773 — TR−TSV−000773, Issue 1, June 1991; Revision 1, January, 1993. "Local Access System Generic Requirements, Objectives, and Interfaces in Support of Switched Multi−megabit Data Service".[3]

6. BellSouth TR 73525 — TR 73535, Issue B, September 1992. "MegaLink and Megalink℠ Channel Service Exchange Network Interface Specifications".[4]

7. BellSouth TR 73501 — TR 73501, Issue C, November, 1990. "LightGate® Service Channel Interface Specifications".[4]

8. Bellcore TR1060 — TR−TSV−001060, Issue 1, December, 1991; Revision 1, August, 1992; Revision 2, March, 1993. "Switched Multi−Megabit Data Service Generic Requirements for Exchange Access and Intercompany Serving Arrangements".[3]

9. SIG−TS−001/1991 — SMDS Interest Group Technical Specification SIG−TS−001/1991, "SMDS Data Exchange Interface Protocol", Revision 3.2, October 22, 1991.[5]

10. Bellcore TR1239 — TR−TSV−001239, Issue 1, December, 1993. "Generic Requirements for Low Speed SMDS Access".[3]

11. BellSouth TR 73545 — TR 73545, Issue C, November, 1992. "SynchroNet® Service Network Interface Specifications".[4]

12. SIG−TS−005/1993 — SMDS Interest Group Specification SIG−TS−005/1993, "Frame Based Interface Protocol for SMDS Networks − Data Exchange Interface/Subscriber Network Interface", Revision 1.0, February 2, 1993.[5]

Footnotes

1. This document can be ordered from the International Telecommunication Union, General Secretaritat, Sales Service, Place des Nations, CH−1211, Geneva 20, Switzerland.

2. This document can be ordered from IEEE Customer Service Department, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ, 08855−1331. Telephone 1−800−678−IEEE.

3. This document is available from Bellcore Customer Relations, 8 Corporate Place, Piscataway, NJ, 08854−4156. Telephone 1−800−521−CORE.

4. This document can be ordered by using the form included in this Technical Reference, or from BellSouth Documentation Service Center, North N5A1, 3535 Colonnade Parkway, Birmingham, AL, 35243. Telephone (205) 977−8800.

5. This document is available from the SMDS Interest Group, 480 San Antonio Road, Suite 100, Mountain View, CA, 94040. Telephone (415) 962−2590.

BELLSOUTH XA–SMDS REQUIREMENTS LIST

TR−TSV−001060 Requirements

This document is associated with BellSouth TR73581, and provides information regarding BellSouth's support of the XA−SMDS requirements contained in TR1060.

Since BellSouth deploys two different vendors' equipment for XA−SMDS, neither of which currently completely conform to TR1060, there are two sets of conformance tables for the service. The BellSouth network will eventually support all the Requirements (not necessarily Optional or Conditional requirements) in TR1060, as vendor equipment development and deployment schedules allow. XA−SMDS NI specifications for any particular location is dependent upon the BellSouth network equipment used in the area, but one of the two tables listed in this appendix will apply. BellSouth can provide information, upon request, regarding which table applies for a specific location.

Customer equipment must support the requirements as indicated in one of the following tables, as appropriate for the specific NI. In the tables, S = Support required, NS = No support, and P = Support is required, but BellSouth requirements differ from that of the literal TR1060 Requirement wording.

Table 1 Type 1 Requirements

TR1060 Req. No.	NI Requirement	Description
R 3−1	S	
R 3−2	S	
R 3−3	S	
R 3−4	S	
R 3−5	NS	
R 3−6	S	
R 3−7	NS	
R 3−8	S	
R 3−9	NS	
R 3−10	S	
R 3−11	S	
R 3−12	S	
R 3−13	NS	
R 3−14	NS	
R 3−15	S	
R 3−16	NS	
R 3−17	NS	
R 3−18	NS	
R 3−19 (Rev.1)	P	The use of External SACS is not supported on the initial service.
R 3−20	NS	
R 3−21	S	
CR 3−1	NS	
CR 3−2	NS	
CR 3−3	NS	
CR 3−4	NS	
CR 3−5	NS	
CR 3−6	NS	
CR 3−7	NS	
R 3−22	S	
R 3−23	S	
R 3−24	S	
O 3−1	NS	
O 3−2	NS	
O 3−3	NS	
O 3−4	NS	
O 3−5	NS	
O 3−6	NS	
R 3−25	S	
R 3−26	S	
R 3−27	S	
R 3−28	S	
R 3−29	S	
O 3−7	NS	
O 3−8	NS	
O 3−9	NS	
R 3−30	S	
R 3−31	S	
R 3−32	S	
O 3−10	NS	
O 3−11	NS	
R 3−33	S	
R 3−34	S	
R 3−35	S	
R 3−36	S	
O 3−12	NS	
O 3−13	NS	
R 3−37	S	
O 3−14	NS	
O 3−15	NS	
O 3−16	NS	
O 3−17	NS	
O 3−18	NS	
R 3−38	S	
O 3−19	NS	
R 3−39 (Rev.1)	S	

TR1060 Req. No.	NI Requirement	Description
O 3−20 (Rev.1)	NS	
R 3−40	P	SNI shall be identified by up to 8 group addresses.
O 3−21	NS	
R 3−41(Rev.1)	NS	
R 3−42(Rev.1)	NS	
R 3−43	S	
R 3−44	S	
R 3−45	S	
R 3−46	S	
R 3−47	S	
R 5−1	S	
R 5−2	S	
R 5−3	S	
R 5−4 (Rev.2)	S	
R 5−5	S	
R 5−6	S	
R 5−7	S	
R 5−8	S	
R 5−9	S	
R 5−10	S	
R 5−11	S	
R 5−12	S	
R 5−13 (Rev.2)	S	
R 5−14	S	
R 5−15	S	
R 5−16	S	
R 5−17	S	
R 5−18	S	
R 5−19	S	
R 5−20	S	
R 5−21	S	
R 5−22	S	
R 5−23	S	
R 5−24	S	
R 5−25	S	
R 5−26	S	
R 5−27	S	
R 5−28	S	
R 5−29 (Rev.2)	S	
R 5−30	NS	
R 5−31	NS	
R 5−32	S	
R 5−33	S	
R 5−34	NS	
R 5−35	S	
R 5−36 (Rev.2)	S	
R 5−37	S	
R 5−38	S	
R 5−39	S	
R 5−40 (Rev.2)	S	
R 5−41	S	
R 5−42	S	
R 5−43	S	
R 5−44	S	
R 5−45 (Rev.)	S	
R 5−46	S	
R 5−47	S	
R 5−48	S	
R 5−49	NS	
R 5−50 (Rev.2)	NS	
R 5−51	S	
R 5−52	S	
R 5−53	S	
R 5−54	S	
R 5−55	S	
R 5−56	S	
R 5−57	S	
R 5−58	S	
R 5−59	S	
R 5−60 (Rev.2)	S	
R 5−61	S	
R 5−62	S	
R 5−63	S	
R 5−64	S	
R 5−65 (Rev.1)	S	
R 5−65a (Rev.1)	NS	
R 5−65b (Rev.1)	S	
R 5−66a (Rev.1)	NS	
R 5−66b (Rev.1)	S	
R 5−67	S	
R 5−68	S	
R 5−69	S	
R 5−70	S	
R 5−71	S	
R 5−72	S	
R 5−73	S	
R 5−74	S	
R 5−75	S	
R 5−76	S	
R 5−77	S	
R 5−78	S	
R 5−79	S	
R 5−80	S	
R 5−81	S	
R 5−82	S	
R 5−83	S	
R 5−84	S	
R 5−85	S	
R 5−86	S	
R 5−87	S	
O 6−1	P	See Note 1
O 6−2	P	See Note 1
O 6−3	P	See Note 1
O 6−4	P	See Note 1
O 6−5	P	See Note 1
O 6−6	P	See Note 1
O 6−7	P	See Note 1
O 6−8	P	See Note 1
O 6−9	P	See Note 1
O 6−10	P	See Note 1
O 6−12	P	See Note 1
O 6−13	P	See Note 1
O 6−14	P	See Note 1
R 7−1	NS	
R 7−2	NS	
R 7−3	NS	
R 7−4	NS	
R 7−5	NS	
R 7−6	NS	

TR1060 Req. No.	NI Requirement	Description
R 7−7	NS	
R 7−8	NS	
R 7−9	NS	
O 7−1	NS	
O 7−2	NS	
R 7−10	NS	
R 7−11	NS	
R 7−12	NS	
CR 7−1	NS	
R 7−13	NS	
R 7−14	NS	
R 7−15	NS	
R 7−16	NS	
R 7−17	NS	
R 7−18	NS	
R 7−19	NS	
R 7−20	NS	
R 7−21	NS	
R 7−22	NS	
R 7−23	NS	
CR 7−2	NS	
R 7−24	NS	
R 7−25	NS	
R 7−26	NS	
R 7−27	NS	
CR 7−3	NS	
O 7−3	NS	
R 7−28	NS	
R 7−29	NS	
R 7−30	NS	
R 7−31	NS	
R 7−32	NS	
R 7−33	NS	
R 7−34	NS	
CR 7−4	NS	
R 7−35	NS	
R 7−36	NS	
R 7−37	NS	
CR 7−5	NS	
R 7−38	NS	
R 7−39	NS	
CR 7−6	NS	
R 7−40	NS	
R 7−41	NS	
R 7−42	NS	
R 7−43	NS	
R 7−44	NS	
R 7−45	NS	
R 7−46	NS	
R 7−47	NS	
R 7−48	NS	
CR 7−7	NS	
R 7−49	NS	
CR 7−8	NS	
R 7−50	NS	
O 7−4	NS	
R 7−51	NS	
R 7−52	NS	
R 7−53	NS	
R 7−54	NS	
R 7−55	NS	
R 7−56	NS	
R 7−57	NS	
R 7−58	NS	
R 7−59	NS	
R 7−60	NS	
R 7−61	NS	
R 7−62	NS	
R 7−63	NS	
R 7−64	NS	
R 7−65	NS	
O 7−5	NS	
R 7−66	NS	
R 7−67	NS	
O 7−6	NS	
R 7−68	NS	
O 7−7	NS	
R 7−69	NS	
R 7−70	NS	
R 7−71	NS	
R 7−72	NS	
O 7−8	NS	

Note 1: **There are no performance guarantees associated with SMDS. Compliance to Requirements O 6−1 through O 6−14 is a BellSouth objective.**

Table 2. Type 2 Requirements

TR1060 Req. No.	NI Requirement	Description
R 3−1	S	
R 3−2	S	
R 3−3	S	
R 3−4	S	
R 3−5	P	May not be supported initially by BellSouth, but will be supported in the near future.
R 3−6	NS	
R 3−7	S	
R 3−8	S	
R 3−9	P	Not initially supported by BellSouth, but will be implemented in the near future.
R 3−10	NS	
R 3−11	S	
R 3−12	S	
R 3−13	NS	
R 3−14	NS	
R 3−15	S	
R 3−16	NS	
R 3−17	NS	
R 3−18	NS	
R 3−19 (Rev.1)	S	
R 3−20	S	
R 3−21	NS	
CR 3−1	S	
CR 3−2	NS	
CR 3−3	NS	
CR 3−4	NS	
CR 3−5	S	
CR 3−6	S	
CR 3−7	NS	
R 3−22	S	
R 3−23	S	
R 3−24	S	
O 3−1	NS	
O 3−2	NS	
O 3−3	NS	
O 3−4	NS	
O 3−5	NS	
O 3−6	NS	
R 3−25	S	
R 3−26	S	
R 3−27	S	
R 3−28	S	
R 3−29	S	
O 3−7	S	
O 3−8	S	
O 3−9	S	
R 3−30	S	
R 3−31	S	
R 3−32	S	
O 3−10	S	
O 3−11	S	
R 3−33	S	
R 3−34	S	
R 3−35	S	
R 3−36	S	
O 3−12	S	
O 3−13	S	
R 3−37	S	
O 3−14	S	
O 3−15	S	
O 3−16	S	
O 3−17	S	
O 3−18	S	
O 3−19	S	
R 3−38	S	
R 3−39 (Rev.1)	S	
O 3−20 (Rev.1)	S	
R 3−40	S	
O 3−21	S	
R 3−41 (Rev.1)	S	
R 3−42 (Rev.1)	NS	
R 3−43	S	
R 3−44	P	Initial deployment does not completely conform to TA−TSV−001059 requirements
R 3−45	S	
R 3−46	P	Initial deployment does not completely conform to TA−TSV−001059 requirements
R 3−47	S	
R 5−1	S	
R 5−2	S	
R 5−3	S	
R 5−4 (Rev.2)	S	
R 5−5	S	
R 5−6	S	
R 5−7	S	
R 5−8	S	
R 5−9	S	
R 5−10	S	
R 5−11	S	
R 5−12	S	
R 5−13 (Rev.2)	S	
R 5−14	S	
R 5−15	S	
R 5−16	S	
R 5−17	S	
R 5−18	S	
R 5−19	S	
R 5−20	S	
R 5−21	S	
R 5−22	S	
R 5−23	S	
R 5−24	S	
R 5−25	S	
R 5−26	S	

TR1060 Req. No.	NI Requirement	Description
R 5−27	S	
R 5−28	S	
R 5−29 (Rev.2)	S	
R 5−32	S	
R 5−33	S	
R 5−34	S	
R 5−35	S	
R 5−36 (Rev.2)	S	
R 5−37	S	
R 5−38	S	
R 5−39	S	
R 5−40 (Rev.2)	S	
R 5−41	S	
R 5−42	S	
R 5−43	S	
R 5−44	S	
R 5−45 (Rev.)	S	
R 5−46	S	
R 5−47	S	
R 5−48	S	
R 5−49	S	
R 5−50 (Rev.2)	S	
R 5−51	S	
R 5−52	S	
R 5−53	S	
R 5−54	S	
R 5−55	S	
R 5−56	S	
R 5−57	S	
R 5−58	S	
R 5−59	S	
R 5−60 (Rev.2)	S	
R 5−61	S	
R 5−62	S	
R 5−63	S	
R 5−64	S	
R 5−65 (Rev.1)	S	
R 5−65a (Rev.1)	S	
R 5−65b (Rev.1)	S	
R 5−66a (Rev.1)	S	
R 5−66b (Rev.1)	S	
R 5−67	S	
R 5−68	S	
R 5−69	S	
R 5−70	S	
R 5−71	S	
R 5−72	S	
R 5−73	S	
R 5−74	S	
R 5−75	S	
R 5−76	S	
R 5−77	S	
R 5−78	S	
R 5−79	S	
R 5−80	S	
R 5−81	S	
R 5−82	S	
R 5−83	S	
R 5−84	S	
R 5−85	S	
R 5−86	S	
R 5−87	S	
O 6−1	P	See Note 1
O 6−2	P	See Note 1
O 6−3	P	See Note 1
O 6−4	P	See Note 1
O 6−5	P	See Note 1
O 6−6	P	See Note 1
O 6−7	P	See Note 1
O 6−8	P	See Note 1
O 6−9	P	See Note 1
O 6−10	P	See Note 1
O 6−12	P	See Note 1
O 6−13	P	See Note 1
O 6−14	P	See Note 1
R 7−1	NS	
R 7−2	NS	
R 7−3	NS	
R 7−4	NS	
R 7−5	NS	
R 7−6	NS	
R 7−7	NS	
R 7−8	NS	
R 7−9	NS	
O 7−1	NS	
O 7−2	NS	
R 7−10	NS	
R 7−11	NS	
R 7−12	NS	
CR 7−1	NS	
R 7−13	NS	
R 7−14	NS	
R 7−15	NS	
R 7−16	NS	
R 7−17	NS	
R 7−18	NS	
R 7−19	NS	
R 7−20	NS	
R 7−21	NS	
R 7−22	NS	
R 7−23	NS	
CR 7−2	NS	
R 7−24	NS	
R 7−25	NS	
R 7−26	NS	
R 7−27	NS	
CR 7−3	NS	
O 7−3	NS	
R 7−28	NS	
R 7−29	NS	
R 7−30	NS	
R 7−31	NS	
R 7−32	NS	
R 7−33	NS	
R 7−34	NS	
CR 7−4	NS	
R 7−35	NS	
R 7−36	NS	
R 7−37	NS	

TR1060 Req. No.	NI Requirement	Description
CR 7−5	NS	
R 7−38	NS	
R 7−39	NS	
CR 7−6	NS	
R 7−40	NS	
R 7−41	NS	
R 7−42	NS	
R 7−43	NS	
R 7−44	NS	
R 7−45	NS	
R 7−46	NS	
R 7−47	NS	
R 7−48	NS	
CR 7−7	NS	
R 7−49	NS	
CR 7−8	NS	
R 7−50	NS	
O 7−4	NS	
R 7−51	NS	
R 7−52	NS	
R 7−53	NS	
R 7−54	NS	
R 7−55	NS	
R 7−56	NS	
R 7−57	NS	
R 7−58	NS	
R 7−59	NS	
R 7−60	NS	
R 7−61	NS	
R 7−62	NS	
R 7−63	NS	
R 7−64	NS	
R 7−65	NS	
O 7−5	NS	
R 7−66	NS	
R 7−67	NS	
O 7−6	NS	
R 7−68	NS	
O 7−7	NS	
R 7−69	NS	
R 7−70	NS	
R 7−71	NS	
R 7−72	NS	
O 7−8	NS	

Note 1: **There are no performance guarantees associated with SMDS. Compliance to Requirements O 6−1 through O 6−14 is a BellSouth objective.**