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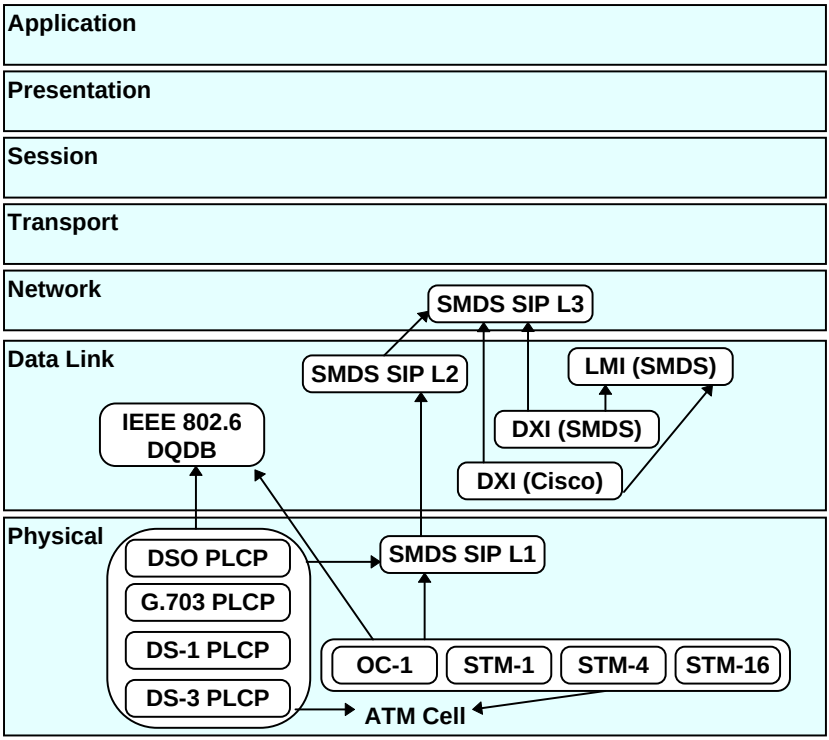
SMDS

SMDS (Switched Multimegabit Data Service) is a broadband networking technology developed by Bellcore. It is a subset of IEEE 802.6 DQDB (Distributed Queue Dual Bus) MAN technology which was developed to be a high-speed, connectionless, public, packet-switching service. SMDS currently offers access at rates up to DS-3 or 44.736 Mbps, with plans to increase these rates to 155.520 Mbps with OC-3c. It operates by accepting high-speed customer data in increments of up to 9,188 octets, and divides it into 53-octet cells for transmission through the service provider's network. These cells are reassembled, at the receiving end, into the customer data.

SIP is a three-level protocol that controls the customer's access to the network. SIP Level 3 receives and transports frames of the upper layer protocol information. SIP Level 2, based on IEEE 802.6 DQDB standard, controls access to the physical medium. SIP Level 1 includes the PLCP and the transmission system.

The following diagram shows SMDS in relation to the OSI model:



SMDS in relation to the OSI model

SIP Level 3

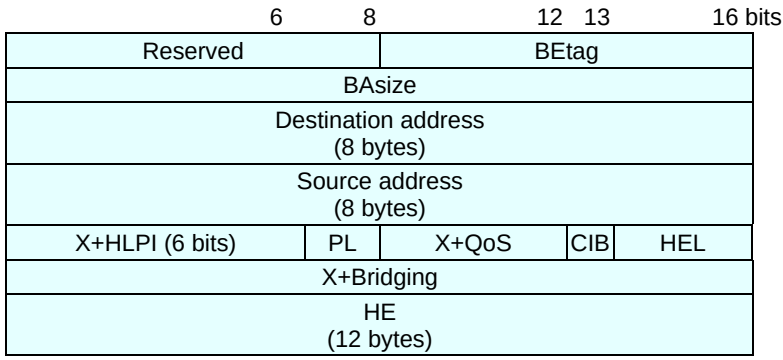
The SMDS SDU, which contains 9188 octets of information is passed from the upper layer protocols to the SIP Level 3 for transmission over the network. SIP Level 3 builds a L3 PDU which includes a header and trailer as shown below. The L3 PDU is then passed to SIP Level 2, where it is segmented into multiple L2 PDUs, each 53 octets in length. These PDUs are then passed to the PLCP and finally to the physical transmission medium.

The SIP Level 3 PDU is shown in the following diagram.

Header	Information	PAD	X + CRC32	Trailer	
36	≤ 9188	0-3	0,4	4	Bytes

SIP level 3 PDU

The format of the level 3 header is as follows:



SIP level 3 header structure

And the format of the level 3 trailer is as follows:

Reserved	Betag	BAsize
1 byte	1 byte	2 bytes

SIP level 3 trailer

The Level 3 PDU fields are described as follows:

Reserved
Reserved. A 1-octet field that the CPE and the SS fill with zeros.

BEtag
A 1-octet field that contains a beginning/end tag. This is a binary number with a value between 0-255 that forms an association between the first segment (containing the header) and the last segment (containing the trailer) of a Level 3 PDU.

BAsize
A 2-octet field containing the length in octets of the Level 3 PDU from the beginning of the Destination Address field and including the CRC32 field, if present.

Destination address
An 8-octet field containing the address of the intended recipient of this PDU. This field is divided into two subfields:

Address Type: 4 most significant bits indicate whether this is an Individual address (1100) or a Group address (1110).

Address: remaining 60 bits is the actual SMDS address.

Source address
An 8-octet field containing the address of the sender of this PDU. This field contains Address Type and Address subfields as described for Destination Address.

HLPI
Higher Layer Protocol Identifier. A 6-bit field that aligns the SIP and DQDB protocol formats.

PL
PAD Length. A 2-bit field that indicates the number of octets in the PAD field, which aligns the Level 3 PDU on a 32-bit boundary.

QoS
Quality of Service. A 4-bit field that aligns the SIP and DQDB protocol formats.

CIB
CRC32 Indication Bit. A 1-bit field that indicates the presence (1) or absence (0) of the CRC32 field.

HEL
Header Extension Length. A 3-bit field that indicates the number of 32-bit words in the Header Extension field.

Bridging
A 2-octet field that aligns the SIP and DQDB Bridging protocol formats.

HE
Header Extension. A 12-octet field that contains the version and carrier-selection information presented in a variable number of subfields:

Element Length: 1-octet subfield containing the combined length of Element Length, Element Type and Element Value fields, in octets.

Element Type: 1-octet subfield containing a binary value indicating the type of information found in the Element Value field.

Element Value: variable-length field with a value that depends on the Element Type and its function.

HE PAD: variable-length field, 0-9 octets in length, that assures the length of the HE field is 12 octets.

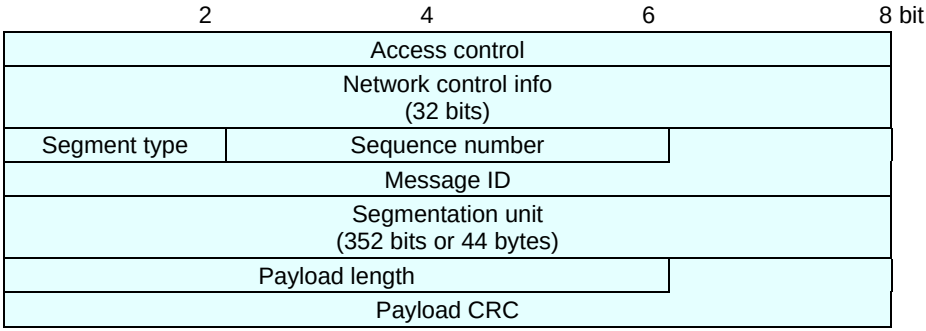
Information field
Variable-length field, up to 9,188 octets in length, that contains user information.

PAD
Variable-length field, 1-3 octets in length, filled with zeros aligning the entire PDU on a 32-bit boundary.

CRC32
2-octet field that performs error detection on the PDU, beginning with the DA field, up to and including the CRC32 field.

SIP Level 2

When the Level 3 PDU processing is complete, it is passed to the SIP Level 2 to create one or more Level 2 PDUs. The SIP Level 2 generates the 53-octet cells which are transmitted over the PLCP and physical transmission medium. The SIP Level 2 PDU contains a 5-octet header, a 44-octet Segmentation Unit (payload) and a 2-octet trailer as shown below.



SIP level 2 PDU

The Level 2 PDU fields are described as follows:

Access control

8-bit field that indicates whether the Level 2 PDU Access Control contains information (1) or is empty (0).

Network control info

4-octet field that determines whether Network Control Information of the Level 2 PDU contains information (FFFFF022H) or is empty (0).

Segment type

2-bit field that indicates how the receiver should process non-empty Level 2 PDUs. Possible values are:

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

Sequence number
4-bit number that verifies that all the Level 2 PDUs belonging to a single Level 3 PDU have been received in the correct order.

Message identifier
10-bit number that allows the various segments to be associated with a single Level 3 PDU.

Segmentation unit
44-octet field that contains a portion of the Level 3 PDU.

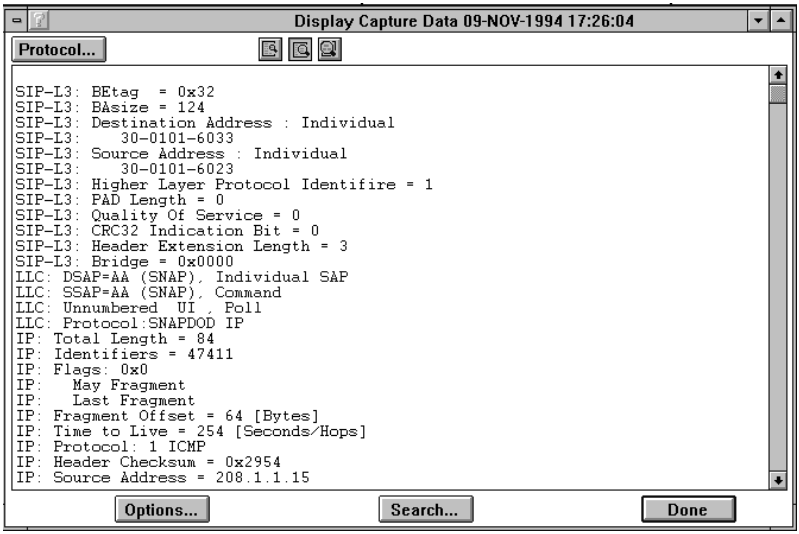
Payload length
6-bit field that indicates which of the 44 octets in the Segmentation Unit contain actual data. BOM and COM segments always indicate 44 octets. EOM segments indicate between 4 and 44 octets, in multiples of 4 octets. SSM segments indicate between 28 and 44 octets, in multiples of 4 octets.

Payload CRC
10-bit field that performs error detection on the Segment Type, Sequence Number, Message Identifier, Segmentation Unit, Payload Length and Payload CRC fields.

Once assembled, SIP Level 2 PDUs are passed to the PLCP and physical functions within SIP Level 1 for transmission.

SIP Level 1

The SIP Level 1 transmits the Level 2 PDUs generated at SIP Level 2. Transmission functions are divided into two sublayers, an upper PLCP sublayer and a lower transmission system sublayer. The PLCP sublayer interfaces to the SIP Level 2 functions and supports the transfer of data and control information. The transmission system sublayer defines characteristics such as the format and speed for transmitted data. The two most common implementations for this layer are based on DS-1 and DS-3 technologies and standards.



SMDS decode