

Network Working Group
Request for Comments: 3807
Updates: 3057
Category: Standards Track

E. Weilandt
N. Khanchandani
S. Rao
Nortel Networks
June 2004

V5.2-User Adaptation Layer (V5UA)

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Copyright Notice

Copyright (C) The Internet Society (2004).

Abstract

This document defines a mechanism for the backhauling of V5.2 messages over IP using the Stream Control Transmission Protocol (SCTP). This protocol may be used between a Signaling Gateway (SG) and a Media Gateway controller (MGC). It is assumed that the SG receives V5.2 signaling over a standard V5.2 interface.

This document builds on the ISDN User Adaptation Layer Protocol (RFC 3057). It defines all necessary extensions to the IUA Protocol needed for the V5UA protocol implementation.

Table of Contents

1.	Introduction	2
1.1.	Scope	3
1.2.	Terminology	3
1.3.	V5.2 Overview	5
1.4.	Distribution of responsibilities between MGC and SG	7
1.5.	Client/Server Model	7
1.6.	Addition to boundary primitives	7
1.6.1.	V5 specific boundary primitives	7
2.	Conventions	9
3.	SCTP Stream Management	10
4.	Proposed V5.2 Backhaul Architecture	10
4.1.	V5UA Message Header	11
4.2.	V5 Naming Conventions for Interface Identifier	12
4.3.	V5 Additions to IUA Boundary Primitives	13
4.4.	Link Status Messages	14
4.5.	Sa-Bit Messages	16
4.6.	Error Indication Message	17
5.	Procedures	18
5.1.	V5 Layer 1 failure	18
5.2.	Loss of V5UA peer	19
5.3.	C-channel overload on SG	19
6.	Examples	20
6.1.	Link Identification Procedure (successful)	20
7.	Security Considerations	21
8.	IANA Considerations	21
8.1.	SCTP Payload Protocol Identifier	21
8.2.	V5UA Port Number	22
9.	Acknowledgements	22
10.	References	22
10.1.	Normative References	22
10.2.	Informative References	23
11.	Authors' Addresses	23
12.	Full Copyright Statement	24

1. Introduction

This document describes a method of implementing V5.2 backhaul messaging over IP using a modified version of the ISDN User Adaptation Layer Protocol (IUAP) [1]. V5UA builds on top of IUA, defining the necessary extensions to IUA for a V5.2 implementation.

Since V5UA is meant to be an extension to IUAP, everything defined in [1] is also valid for V5UA unless otherwise specified in this document.

This document does not describe the V5 standard itself. The V5 protocol is defined by ETSI standards [2,3]. Any description of the V5 protocol in this document is meant to make the text easier to understand.

1.1. Scope

There is a need for Switched Circuit Network (SCN) signaling protocol delivery from a V5.2 Signaling Gateway (SG) to a Media Gateway Controller (MGC), analogous to the implementation of the ISDN Q.921 User Adaptation Layer (IUA) as described in [1].

This document supports analog telephone access, ISDN basic rate access and ISDN Primary rate access over a V5.2 interface.

Since the V5.2 Layer 2, and especially Layer 3, differs from the Q.921 [4] and Q.931 Adaptation layer, the IUA standard must be extended to fulfil the needs for supporting V5.2.

1.2. Terminology

Bearer Channel Connection (BCC) protocol - A protocol which allows the Local Exchange (LE) to instruct the Access Network (AN) to allocate bearer channels, either singularly or in multiples, on demand.

Communication channel (C-channel) - A 64 kbit/s time slot on a V5.2 interface provisioned to carry communication paths.

Communication path (C-path) - Any one of the following information types:

- The layer 2 data link carrying the Control protocol
- The layer 2 data link carrying the Link Control protocol
- The layer 2 data link carrying the PSTN signaling
- Each of the layer 2 data links carrying the protection protocol
- The layer 2 data link carrying the BCC protocol
- All the ISDN Ds-type data from one or more user ports
- All the ISDN p-type data from one or more user ports
- All the ISDN t-type data from one or more user ports

Note: This definition includes the possibility that there may be more than one C-path of the same information type, each allocated to a different logical C-channel.

Envelope Function Address (EFA) - 13 bit number, ranging from 0 to 8191 (decimal). An EFA uniquely identifies one of the five V5.2 protocols, or an ISDN agent attached to an AN. The following list contains the possible values for the EFA:

Definition	Value
-----	-----
ISDN_PROTOCOL	0 - 8175
PSTN_PROTOCOL	8176
CONTROL_PROTOCOL	8177
BCC_PROTOCOL	8178
PROT_PROTOCOL	8179
LINK_CONTROL_PROTOCOL	8180
RESERVED	8181 - 8191

Layer 1 Functional State Machine (L1 FSM) - Functional State Machine in V5 System Management that tracks and controls the states of the physical E1 links on the interface.

Logical Communication channel (Logical C-channel) - A group of one or more C-paths, all of different types, but excluding the C-path for the protection protocol.

Multi-link - A collection of more than one 2048 kbit/s link which together make up a V5.2 interface.

Multi-Slot - A group of more than one 64kbit/s channels providing 8Khz and time slot sequence integrity, generally used together within an ISDN Primary Rate Access (ISDN-PRA) user port, in order to supply a higher bit-rate service.

Physical Communication Channel (Physical C-channel) - A 64kbit/s time slot on a V5.2 interface which has been assigned for carrying logical C-channels. A physical C-channel may not be used for carrying bearer channels.

Primary Link - A 2048 kbit/s (E1) link in a multi-link V5.2 interface whose physical C-channel in time slot 16 carries a C-path for the protection protocol and, on V5.2 initialization, also the C-path for the control protocol, link control protocol, and the BCC protocol. Other C-paths may also be carried in the time slot 16.

Secondary Link - A 2048 kbit/s (E1) link in a multi-link V5.2 interface whose time slot 16 carries a C-path for the protection protocol, and, on V5.2 initialization, acts as the standby C-channel for the control protocol, link control protocol, and BCC protocol and any other C-paths initially carried in time slot 16 of the primary link.

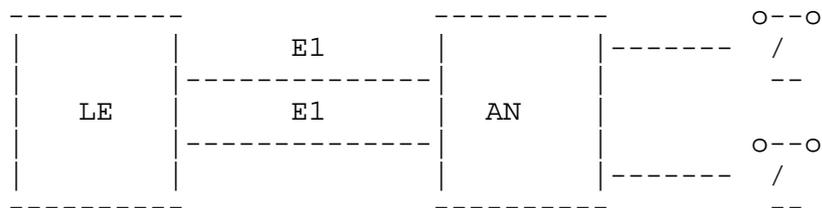
V5 Link - A 2048 kbits/s E1 (PCM30) link used on a V5 interface. A V5 interface may use up to 16 V5 links.

1.3. V5.2 Overview

V5.2 is an industry standard ETSI interface (reference ETS 300 347-1 [3]) defined between a Local Exchange (LE) and an Access Network (AN) providing access to the following types:

- Analog telephone access
- ISDN Basic rate access
- ISDN Primary Rate access
- Other analog or digital accesses for semi-permanent connections without associated outband signaling information

The original V5 specification (V5.1 [2]) uses 2048 kbps links in a non-concentrating fashion. In contrast, V5.2 may use up to 16 such interface links and supports concentration.



The LE and AN are connected with up to 16 E1 (PCM30) links. Channels 16, 15 and 31 on any E1 link can be reserved for data communication between LE and AN. The channels reserved for data are called "Communication Channels" or "C-channels."

The C-channels are the physical media that exchange data between the V5.2 protocol peer entities, as well as transfer the ISDN BRI D-channel messages between the terminals and the LE. A logical communication path between two peer entities for one protocol is called a "C-path".

The signaling information in V5.2 are defined as:

- Analog signals are carried by means of the V5 PSTN protocol (L3)
- ISDN/analog ports are controlled by the V5 Control protocol (L3)
- ISDN protocol messages are mapped to LAPD frames, which are carried by means of LAPV5-EF sublayer (L2)
- V5 protocol messages are mapped to LAPV5-DL frames, which are carried by means of LAPV5-EF sublayer (L2)

In order to support more traffic and dynamic allocation of bearer channels, the V5.2 protocol has several additions:

- A bearer channel connection protocol establishes and disestablishes bearer connections on demand, as determined by the signaling information, under the control of the Local Exchange.
- A link control protocol is defined for multi-link management to control link identification, link blocking and link failure conditions.
- A protection protocol, operating on two separate V5 data links is defined to manage the protection switching of communication channels in case of link failures.

The following protocols are defined for the various protocol layers:

Layer 2:

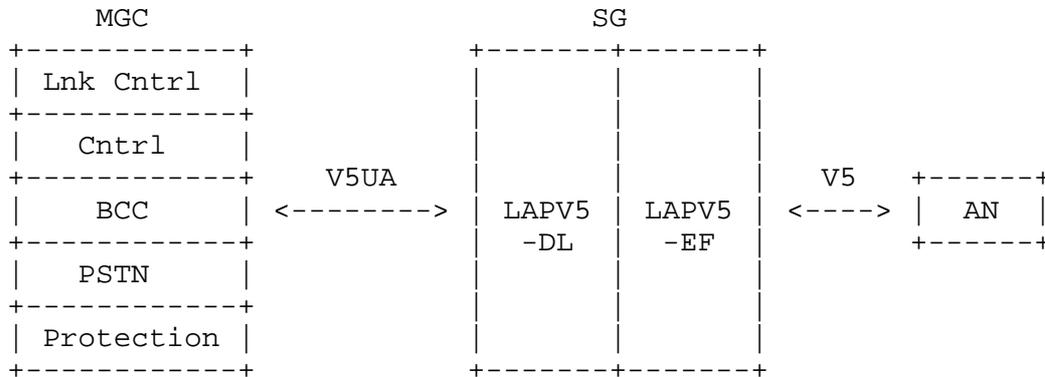
- LAPV5-EF
- LAPV5-DL

Layer 3:

- V5-Link Control
- V5-BCC
- V5-PSTN
- V5-Control
- V5-Protection

1.4. Distribution of responsibilities between MGC and SG

In the V5UA backhaul architecture, the V5 protocol entities SHALL be distributed over SG and MGC as shown below.



V5 System Management SHALL be located on the MGC. The V5 L1 Functional State Machine (FSM) SHALL be located on the SG.

Dynamic TEI Management for V5 BRI over V5UA SHALL be located on the MGC.

1.5. Client/Server Model

The Client/Server Model for V5UA shall follow the model as defined for IUAP.

The SCTP [6] (and UDP/TCP) registered User Port Number Assignment for V5UA is 5675.

1.6. Addition to boundary primitives

1.6.1. V5 specific boundary primitives

Extending IUAP to V5UA to support V5.2 backhaul requires the introduction of new boundary primitives for the Q.921/Q.931 boundary, in accordance with the definitions in the V5 standards.

V5UA reuses some IUA primitives from the Q.921/Q.931 boundary: the DL-DATA primitive and the DL-UNIT DATA primitive. The DL-DATA primitive is used for the transportation of both V5 Layer 3 messages and V5 ISDN Layer 3 messages. The DL-UNIT DATA primitive is only used for V5 ISDN messages and is used and defined as described for IUAP.

In the V5 standards, V5 system management is responsible for establishing and releasing data links. Therefore, for V5UA the DL-Establish and DL-Release primitives defined in IUAP are replaced by new primitives between system management and the data link layer in accordance with the definitions in [2]:

MDL-ESTABLISH

The MDL-Establish primitives are used to request, indicate and confirm the outcome of the procedures for establishing multiple frame operation.

MDL-RELEASE

The MDL-Release primitive is used to indicate the outcome of the procedures for terminating multiple frame operation.

In contrast to ISDN, the V5 standards demand that V5.2 system management interacts directly with V5.2 layer 1. Since V5.2 Layer 1 (including the L1 FSM) and parts of V5 system management are physically separated in a V5 backhaul scenario, V5UA must support some services for the communication between these two entities. Specifically, these services include an indication of the status of a specific link, and messages to support the link identification procedure defined by the V5 standards.

The new primitive are defined as shown below:

MPH-LINK STATUS START REPORTING

The MPH-LINK STATUS START REPORTING primitive is used by V5 system management to request that a link be brought into service for use in a V5 interface. On reception of this message, the L1 FSM on the SG SHALL start reporting the status of the V5 link to the MGC. This primitive is used similarly to the MPH-proceed primitive defined by V5.2, but it has a more extended meaning than MPH-proceed.

MPH-LINK STATUS STOP REPORTING

The MPH-LINK STATUS STOP REPORTING primitive is used by V5 system management to request that a link be taken out of service on a V5 interface. On reception of this message, L1 FSM on the SG SHALL stop reporting the status of the V5 link to the GWC. This primitive is used similarly to the MPH-stop primitive defined by V5.2, but it has a more extended meaning than MPH-stop.

MPH-LINK STATUS INDICATION

The MPH-LINK STATUS INDICATION primitive is used by L1 FSM on the Signaling Gateway to report the status (operational/non-operational) of a V5 link to V5 system management. This primitive is equivalent to the MPH-AI and MPH-DI primitives in V5.2.

MPH-SA-BIT SET

The MPH-SA-BIT SET primitive is used by system management to request that the L1 FSM in the SG sets or resets the value of a specified Sa bit on the requested link. The SG uses it to report the successful setting or resetting of this bit back to system management. For V5, this message is used for the V5 specific Link Identification procedure to set/reset the value of the Sa7 bit, or to confirm the successful setting of the Sa bit. The MPH-SA BIT SET REQUEST is equivalent to the MPH-ID and MPH-NOR primitives in V5.2.

MPH-SA-BIT STATUS

The MPH-SA-BIT STATUS primitives are used by system management in the MGC to request that the L1 FSM in the SG reports the status of a specified Sa bit on the requested link. The SG uses it to report (indicate) the status of this bit back to system management. For V5, these messages are used for the V5 specific Link identification procedure to request or report the status of the Sa7 bit. This is equivalent to the MPH-IDR, MPH-IDI or MPH-Elg primitives in V5.2.

Due to the separation of V5 System Management and V5 Layer1/Layer2 in the V5UA backhaul architecture, it may be necessary to report error conditions of the SG's V5 stack to V5 System Management. For this purpose, a new primitive is defined:

MDL-ERROR INDICATION

The MDL-ERROR INDICATION primitive is used to indicate an error condition to V5 System Management. The only valid reason for this primitive is 'Overload', indicating an overload condition of the C-channel on the SG. This reason is not defined in the V5/Q.921 standards.

2. Conventions

The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, NOT RECOMMENDED, MAY, and OPTIONAL, when they appear in this document, are to be interpreted as described in [7].

4.1. V5UA Message Header

The original IUA message header must be modified for V5UA. The original header for the integer formatted Interface Identifier is shown below:

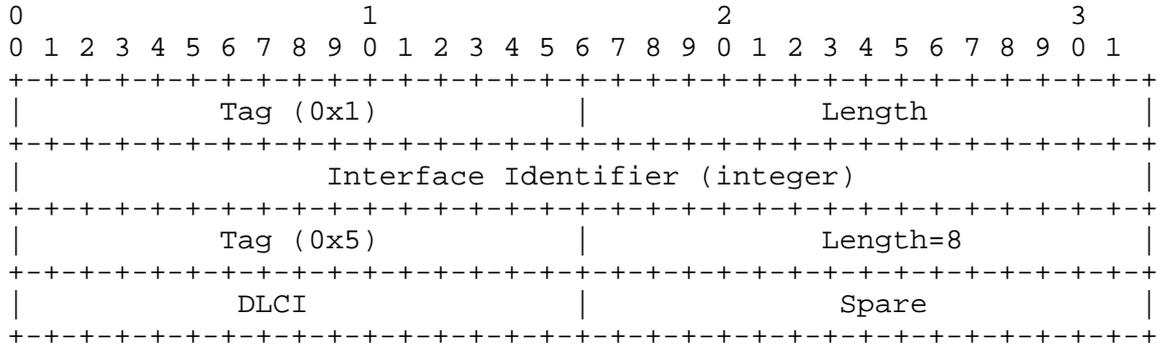


Figure 2: Original IUA Message Header

V5UA extends the IUA Message Header by including the Envelope Function Address (EFA) in the Spare field. The V5UA format for the integer formatted Interface Identifier is shown below:

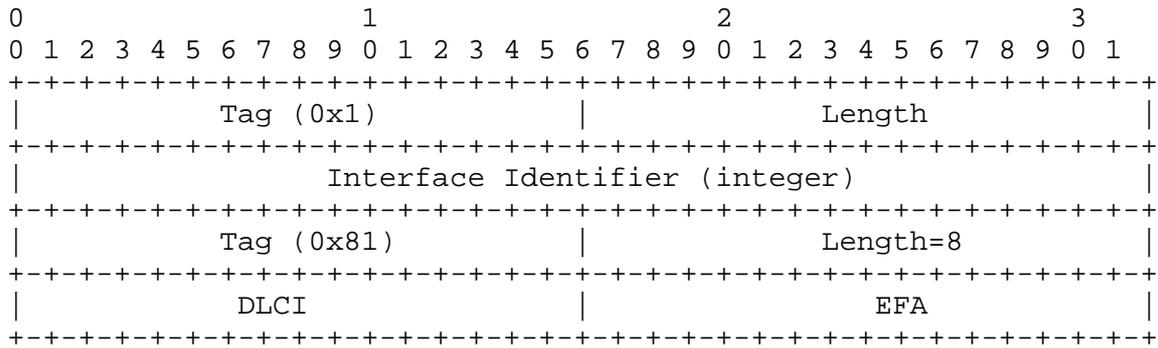


Figure 3: V5UA Message Header (Integer-based Interface identifier)

The EFA is defined by the V5 standard. It identifies a C-path, which is a 13-bit number, ranging from 0 to 8191 (decimal). An EFA uniquely identifies one of the five V5.2 protocols, or an ISDN agent attached to an AN. The following list contains the possible values for the EFA as defined by V5:

Definition	Value
-----	-----
ISDN_PROTOCOL	0 - 8175
PSTN_PROTOCOL	8176
CONTROL_PROTOCOL	8177
BCC_PROTOCOL	8178
PROT_PROTOCOL	8179
LINK_CONTROL_PROTOCOL	8180
RESERVED	8181 - 8191

For MPH messages which do not use DLCI and EFA, SAPI, TEI and EFA SHALL be set to ZERO and SHALL be ignored by the receiver. For all other messages, the DLCI SHALL be set as defined in the V5.2 standard [2].

The Interface Identifier SHALL follow the naming conventions for the Interface Identifier as defined below.

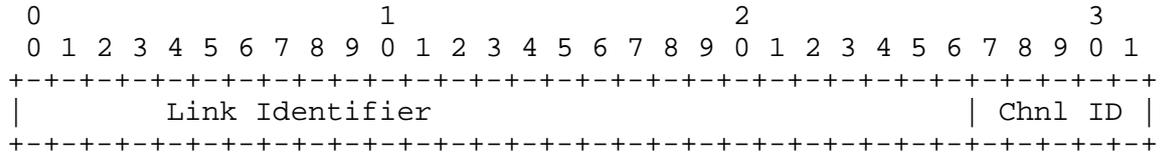
4.2. V5 Naming Conventions for Interface Identifier

The V5 standard demands that V5 System Management keep track of the states of all links on a V5 interface. To perform tasks like protection switching and bearer channel allocation on the V5 links, it is necessary that system management has the full picture of the signaling and bearer channels located on each link.

The IUA protocol identifies C-channels by endpoints without a defined association with a specific link. Since no naming convention exists, there is no guarantee that a C-channel is actually located at the link it claims to be. Furthermore the V5 standard requires that the MGC receives reports of the status of all links, and it defines a link identification procedure to ensure that AN and LE are referencing the same link when they address a link with a Link Control Protocol message.

It would clearly be against the concept of V5.2 if there was no clear association between E1 links and channels. To solve this problem, a naming convention MUST be used for V5UA.

The format of the integer formatted Interface Identifier is shown below:



Link Identifier - Identifier for an E1 link on the SG (27 bits). MUST be unique on the SG. This Link Identifier MUST match the Link Identifier used in the Link Management Messages defined later in this document.

Chnl ID - Channel Identifier (5 bits). This is equal to the time-slot number of the addressed time slot. Possible values are 15, 16 and 31 representing the possible time slots for C-channels on a V5 interface. For Link Management Messages, the Chnl ID MUST be set to 0. All other values are reserved for future use.

If used, the text formatted interface identifier SHALL be coded as the hex representation of the integer formatted interface identifier, written as a variable length string.

4.3. V5 Additions to IUA Boundary Primitives

Some primitives for the V5 interface boundaries are similar to the Q.921/Q.931 boundary primitive messages defined in IUA, but they need to be handled in a different way. Therefore it is necessary to distinguish between these two message types by means of the Message Class parameter.

For all V5 interface boundary primitives, a new Message Class is introduced:

- 14 V5 Boundary Primitives Transport Messages (V5PTM)

Other valid message classes for V5UA, which are also used by IUA, are:

- 0 Management (MGMT) Message
- 3 ASP State Maintenance (ASPSM) Messages
- 4 ASP Traffic Maintenance (ASPTM) Messages

Q.921/Q.931 boundary primitive messages reused by V5.2 as V5PTM messages are:

1	Data Request Message	(MGC -> SG)
2	Data Indication Message	(SG -> MGC)
3	Unit Data Request Message	(MGC -> SG)
4	Unit Data Indication Message	(SG -> MGC)
5	Establish Request	(MGC -> SG)
6	Establish Confirm	(SG -> MGC)
7	Establish Indication	(SG -> MGC)
8	Release Request	(MGC -> SG)
9	Release Confirm	(SG -> MGC)
10	Release Indication	(SG -> MGC)

All these messages are defined similarly to the QPTM messages. In addition, new boundary primitive messages are defined:

11	Link Status Start Reporting	(MGC -> SG)
12	Link Status Stop Reporting	(MGC -> SG)
13	Link Status Indication	(SG -> MGC)
14	Sa-Bit Set Request	(MGC -> SG)
15	Sa-Bit Set Confirm	(SG -> MGC)
16	Sa-Bit Status Request	(MGC -> SG)
17	Sa-Bit Status Indication	(SG -> MGC)
18	Error Indication	(SG -> MGC)

4.4. Link Status Messages (Start Reporting, Stop Reporting, Indication)

The Link Status Messages are used between V5 System Management on the MGC and the L1 FSM on the SG to track the status of a particular E1 link. This is required whether or not the E1 link carries C-channels.

All Link Status Messages contain the V5UA Message Header. The Link Identifier portion of the Interface Identifier identifies the physical link on the SG addressed by the message. For all link status messages, the Chnl ID SHALL be set to '0' and SHALL be ignored by the receiver.

The integer value used for the Link Identifier is of local significance only, and is coordinated between the SG and MGC. It MUST be unique for every V5 link on the SG.

As defined by the V5 standards, V5 System Management must know the status of the links on all active V5 interfaces. The Link Status Start Reporting Message is used by V5 System Management on the MGC to request that the L1 FSM on the SG starts reporting the status of a particular link.

V5 system management SHALL send this Message on interface activation for all links on the interface. The SG SHALL respond immediately to this request with a Link Status Indication message, and it SHALL then send a Link Status Indication message on all subsequent changes of the link status. Since the SG has no other way to determine whether a link is on an active interface or not, this message SHALL always be sent on interface startup.

If the L1 FSM in the SG receives a Link Status Start Reporting Message for a link that is already active (the link status is reported to System Management), the SG SHALL immediately report the actual status of this link by sending a Link Status Indication Message. The SG SHALL then proceed with the automatic link status reporting as described above.

To stop this reporting of the status of a link, e.g., at interface deactivation, System Management sends a Link Status Stop Reporting Message to the L1 FSM. The SG will then immediately stop reporting the status of the particular link and will assume the link to be out of service. It MUST NOT respond in any way to this message.

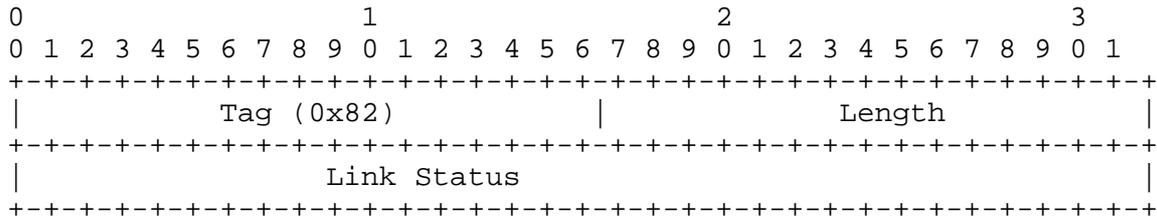
Since there is no other way for the SG to know that an interface has been deactivated, this message SHALL be sent on interface deactivation for all links on the interface. On reception of this message, the SG SHALL take L2 down on this link.

If the L1 FSM in the SG receives a Link Status Stop Reporting Message for a link that is not active (the link status is not reported to System Management), the SG SHALL ignore the message.

The Link Status Start/Stop Reporting Messages contain the common message header followed by the V5UA message header. They do not contain any additional parameters.

The Link Status Indication Message is used by L1 FSM in the SG in response to a Link Status Start Reporting Message to indicate the status of the particular link. After a Link Status Start Reporting Message has been received by the L1 FSM, it SHALL automatically send a Link Status Indication Message every time the status of the particular link changes. It SHALL not stop this reporting until it receives a Link Status Stop Report Message from System Management.

The Link Status Indication Message contains the common message header followed by the V5UA message header. In addition, it contains the following link status parameter:



The valid values for Link Status are shown in the following table:

Define	Value	Description
OPERATIONAL	0x0	Link operational
NON-OPERATIONAL	0x1	Link not operational

4.5. Sa-Bit Messages (Set Request, Set Confirm, Status Request, Status Indication)

The Sa-Bit Messages are used between V5 System Management in the MGC and the L1 FSM in the SG to set and read the status of Sa bits on the E1 links. For V5, it is only required to set and read the status of the Sa7 bit that is used for the Link Identification procedure as described by the V5 standards [3].

All Sa-Bit Messages SHALL contain the V5UA message header. The Link Identifier portion of the Interface Identifier identifies the physical link on the SG addressed by the message. For all link status messages, the Chnl ID SHALL be set to '0' and SHALL be ignored by the receiver.

The Link Identifier MUST be the same as used in the Interface Identifier to identify on which link a C-channel is located.

The Sa-Bit Set Request message is used to set the value of the specified Sa-Bit on the defined link. The value of the Sa7 bit in normal operation is ONE. For the Link Identification procedure, it is set to ZERO.

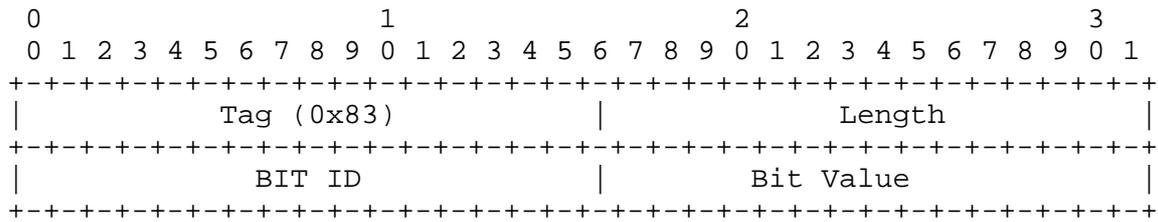
The Sa-Bit Set Request message for the Sa7 bit with Bit Value ZERO corresponds to the V5 defined primitive MPH-ID. The Sa-Bit Set Request message for the Sa7 bit with Bit Value ONE corresponds to the V5 defined primitive MPH-NOR.

The SG MUST answer a Sa-Bit Set Request message with a Sa-Bit Set Confirm message when the setting of the bit is complete. This message does not correspond to a V5 defined primitive.

The Sa-Bit Status Request message is used by system management to request the status of the specified Sa-Bit on the defined link from L1 FSM. The Sa-Bit Status Request message for the Sa7 bit corresponds to the V5 defined primitive MPH-IDR.

L1 FSM answers the Sa-Bit Status request message by a Sa-Bit Status Indication message in which the current setting of the bit will be reported. The Sa-Bit Status Indication message for the Sa7 bit with Bit Value ZERO corresponds to the V5 defined primitive MPH-IDI. The Sa-Bit Status Indication message for the Sa7 bit with Bit Value ONE corresponds to the V5 defined primitive MPH-Elg.

All Sa-Bit Messages contain the following additional parameter:



The valid values for Bit Value are shown in the following table:

Define	Value	Description
ZERO	0x0	Bit value ZERO
ONE	0x1	Bit value ONE

The valid value for BIT ID is shown in the following table:

Define	Value	Description
Sa7	0x7	Addresses the Sa7 bit

There are no other valid values for V5UA. All other values are reserved for future use.

For the Sa-Bit Status Request and Set Confirm messages, the BIT Value SHALL be set to '0' by the sender and SHALL be ignored by the receiver.

4.6. Error Indication Message

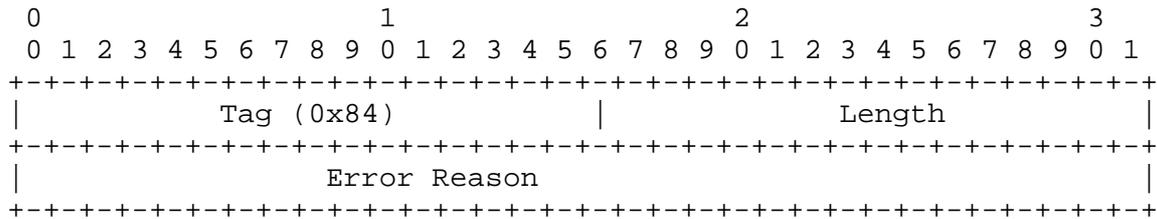
The Error Indication Message is used between the V5 stack on the SG and the V5 System Management in the MGC to indicate an error condition at the SG.

The only valid reason for the Error Indication Message is Overload. The SG SHOULD issue such an Error Indication with reason Overload for a C-channel if it is not able to process all Layer 3 messages on this C-channel in a timely manner (overload condition of the C-channel).

The Error Indication message SHALL contain the V5UA message header.

The Interface Identifier indicates the affected C-channel. SAPI, TEI and EFA SHALL be set to '0' and SHALL be ignored by the receiver.

The Error Indication message contains the following additional parameter:



The valid values for Error Reason are shown in the following table:

Define	Value	Description
OVERLOAD	0x1	C-channel is in overload state

There are no other valid values for V5UA. All other values are reserved for future use.

5. Procedures

5.1. V5 Layer 1 failure

The normal way to handle a V5 Layer 1 failure is described in the V5 standards[2,3] as follows:

- The L1 FSM detects the V5 Layer 1 failure. It reports this to V5 System management by sending a MPH-DI primitive for the affected link.
- V5 System management notifies V5 Layer 2 of the V5 Layer 1 outage by sending a MPH-Layer_1 Failure Ind primitive.

Since V5 Layer1/2 and V5 System Management are no longer co-located in the backhaul architecture, it does not make sense to notify V5 Layer 2 about V5 Layer 1 failure via V5 system management. Instead, V5 Layer 2 SHALL be notified directly by V5 Layer 1 on the SG. V5

Layer 1 SHALL report the outage to V5 system management by sending a Link Status Indication message with status NON-OPERATIONAL, corresponding to an MPH-DI primitive as defined by the V5.2 standard. V5 system management SHALL NOT send an MPH-Layer_1 Failure Ind primitive to V5 Layer 2 in response to this message.

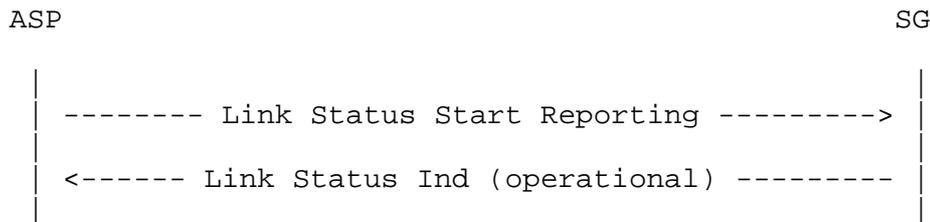
5.2. Loss of V5UA peer

If SCTP failure is detected or the heartbeat is lost, the following procedure SHALL be performed:

When loss of V5UA peer is reported to the V5UA layer, the ASP SHALL behave as if it had received a Link Status Indication (non-operational) for all links on this SG.

The ASP SHALL attempt to re-establish the connection continuously. When the connection is re-established, the ASP SHALL send a Link Status Start Reporting message to the SG for all links on active V5 interfaces on the SG.

An example for the message flow for re-establishment of the connection is shown below for one active link on the SG:



If the association can be re-established before the V5UA layer is notified, communication SHALL proceed as usual and no other action SHALL be taken by the ASP.

5.3. C-channel overload on SG

If the SG detects an overload condition on a C-channel, it SHOULD indicate this by sending an Error Indication message, with the reason Overload to the MGC. The MGC SHOULD then take appropriate actions to clear this overload condition.

The SG SHALL resend the Error Indication message with the reason Overload as long as the overload condition persists. An interval of 120 seconds for resend of this message is RECOMMENDED.

6. Examples

6.1. Link Identification Procedure (successful)

The Link Identification Procedures themselves are described by the V5.2 standard [3].

A message flow example for an LE initiated Link Identification procedure over V5UA is shown below. An active association between ASP and SG is established prior to the following message flows, and the V5 interface is already in service:

ASP	SG
----- Data Request (LnkCtrl: FE-IDReq) ----->	
<--- Data Indication (LnkCtrl Ack: FE-IDReq) ---	
<----- Data Indication (LnkCtrl: FE-IDAck) -----	
---- Data Request (LnkCtrl Ack: FE-IDAck) ---->	
----- Sa-Bit Status Request (Sa7) ----->	
<--- Sa-Bit Status Indication (Sa7, ZERO) ---	
----- Data Request (LnkCtrl: FE-IDRel) ----->	
<--- Data Indication (LnkCtrl Ack: FE-IDRel) --	

The next example also shows a Link Identification procedure, but this time it is initiated by the AN. Again, the ASP association and the V5 interface are already in service:

```

ASP                                                    SG
|
|  <----- Data Indication (LnkCtrl: FE-IDReq) ----->
|  -- Data Request (LnkCtrl Ack: FE-IDReq) ----->
|
|  ----- Sa-Bit Set Req ( Sa7, ZERO ) ----->
|  <----- Sa-Bit Set Conf (Sa7) ----->
|
|  ----- Data Request (LnkCtrl: FE-IDAck) ----->
|  <-- Data Indication (LnkCtrl Ack: FE-IDAck) --->
|
|  <----- Data Indication (LnkCtrl: FE-IDRel) ----->
|  ----- Data Request (LnkCtrl Ack: FE-IDRel) ----->
|
|  ----- Sa-Bit Set Req ( Sa7, ONE ) ----->
|  <----- Sa-Bit Set Conf (Sa 7) ----->
|

```

7. Security Considerations

The security considerations discussed for the 'Security Considerations for SIGTRAN Protocols' [5] document apply to this document.

8. IANA Considerations

8.1. SCTP Payload Protocol Identifiers

IANA has assigned a V5UA value for the Payload Protocol Identifier in the SCTP DATA chunk. The following SCTP Payload Protocol identifier is registered:

```
V5UA      "6"
```

The SCTP Payload Protocol identifier value "6" SHOULD be included in each SCTP DATA chunk to indicate that the SCTP is carrying the V5UA protocol. The value "0" (unspecified) is also allowed but any other values MUST not be used. This Payload Protocol Identifier is not directly used by SCTP but MAY be used by certain network entities to identify the type of information being carried in a Data chunk.

The User Adaptation peer MAY use the Payload Protocol Identifier as a way of determining additional information about the data being presented to it by SCTP.

8.2. V5UA Port Number

IANA has registered SCTP (and UDP/TCP) Port Number 5675 for V5UA.

9. Acknowledgements

The authors would like to thank Fahir Ergincan, Milos Pujic, Graeme Currie, Berthold Jaekle, Ken Morneault and Lyndon Ong for their valuable comments and suggestions.

10. References

10.1. Normative References

- [1] Morneault, K., Rengasami, S., Kalla, M. and G. Sidebottom, "ISDN Q.921-User Adaptation Layer", RFC 3057, February 2001.
- [2] ETSI EN 300 324-1 (1999): V interfaces at the digital Local Exchange (LE); V5.1 interface for the support of Access Network (AN); Part 1: V5.1 interface specification.
- [3] ETSI EN 300 347-1 (1999): V interfaces at the digital Local Exchange (LE); V5.2 interface for the support of Access Network (AN); Part 1: V5.2 interface specification.
- [4] ETSI ETS 300 125 (1991) : DSS1 protocol; User-Network interface data link layer specification; (Standard is based on : ITU Q.920, Q.921).
- [5] Loughney, J., Tuexen, M., Ed. and J. Pastor-Balbas, "Security Considerations for Signaling Transport (SIGTRAN) Protocols", RFC 3788, May 2004.

10.2. Informative References

- [6] Stewart, R., Xie, Q., Morneault, K., Sharp, C., Schwarzbauer, H., Taylor, T., Rytina, I., Kalla, M., Zhang, L. and V. Paxson, "Stream Control Transmission Protocol", RFC 2960, October 2000.
- [7] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

11. Authors' Addresses

Dr. Eva Weilandt
Conti Temic microelectronic GmbH
An der B31
88090 Immenstaad
Germany

Phone: +49 7545 8-2917
EMail: eva.weilandt@temic.com

Sanjay Rao
Nortel Networks
35 Davis Drive
Research Triangle Park, NC 27709
USA

Phone: +1-919-991-2251
EMail: rsanjay@nortelnetworks.com

Neeraj Khanchandani
Nortel Networks
35 Davis Drive
Research Triangle Park, NC 27709
USA

Phone: +1-919-991-2274
EMail: neerajk@nortelnetworks.com

12. Full Copyright Statement

Copyright (C) The Internet Society (2004). All Rights Reserved.

Copyright (C) The Internet Society (2004). This document is subject to the rights, licenses and restrictions contained in BCP 78, and except as set forth therein, the authors retain all their rights.

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Intellectual Property

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in BCP 78 and BCP 79.

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at ietf-ipr@ietf.org.

Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.

