

Network Working Group

R. Mukundan
Wipro Technologies
Ken Morneault
Cisco Systems
N. Mangalpally
A Vydyam
Nortel Networks
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DPNSS/DASS 2 extensions to the IUA protocol
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Abstract

This document defines a mechanism for backhauling of DPNSS [2] and DASS2 [3] messages over IP by extending the ISDN User Adaptation Layer Protocol [1]. This document aims to become an Appendix to IUA [1] and to be the base for a DPNSS/DASS User Adaptation (DUA) implementation.

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[1.0](#) Introduction

This document describes a method of implementing DPNSS [[2](#)] and DASS 2 [[3](#)] backhaul messaging over IP using a modified version of the ISDN User Adaptation Protocol (IUAP) [[1](#)]. The DPNSS/DASS User Adaptation (DUA) builds on top of IUA by defining the necessary extensions to IUA for a DPNSS/DASS2 implementation.

[1.1](#) Scope

There is a need for Switched Circuit Network (SCN) signaling protocol delivery from a DPNSS Signaling Gateway (SG) to a Media Gateway Controller (MGC). The delivery mechanism should support the following protocols:

- DPNSS (Digital Private Network Signaling System) [[2](#)]
- DASS 2 (Digital Access Signaling System Number 2) [[3](#)]

Unless specifically mentioned, the details in this document are applicable to both DPNSS and DASS 2.

[1.2](#) Terminology

Data channel (D-channel) - A 64 kbit/s time slot which functions as a common signaling channel on a 2048 kbits/s interface or a 1544 kbits/s interface which is provisioned to carry DPNSS signaling.

DPNSS channel - Time slots 1 to 15 and 17 to 31 on a 2048 kbits/s interface or Time slots 1 to 23 on a 1544 kbits/s interface are termed as DPNSS channels. These are the traffic channels which carry voice or data traffic.

- DPNSS supports 60 Channels (30 Real and 30 Virtual)
- DASS2 supports 30 Channels (All Real)

Data Link Connection(DLC) - A DLC is the level 2 process that controls the transfer of level 3 messages on behalf of one DPNSS channel. A DLC uniquely identifies one DPNSS channel.

- DPNSS supports 60 DLCs (30 Real and 30 Virtual)
- DASSII supports 30 DLCs (All Real)

DPNSS Link - A logical collection of the D-channel and the associated DPNSS channels in a 2048 kbits/s interface or a 1544 kbits/s interface is called a "DPNSS Link".

[1.3](#) DPNSS Overview

DPNSS is an industry standard interface (reference BTNR 188) [2] defined between a PBX and an Access Network (AN). DPNSS extends facilities normally only available between extensions on a single PBX to all extensions on PBXs that are connected together in a private network. DPNSS was originally derived from BT's Digital Access Signaling System I (DASS I) enhanced where necessary to meet the private network requirements. Some of these enhancements were incorporated in DASS 2 [3]. DPNSS uses a 2048 kbits/s or 1544 kbits/s Digital Transmission System Interface as shown in Figure 1 below.

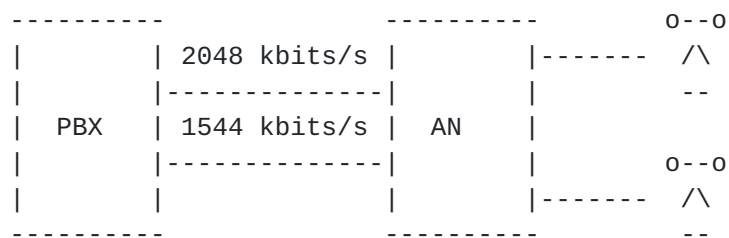
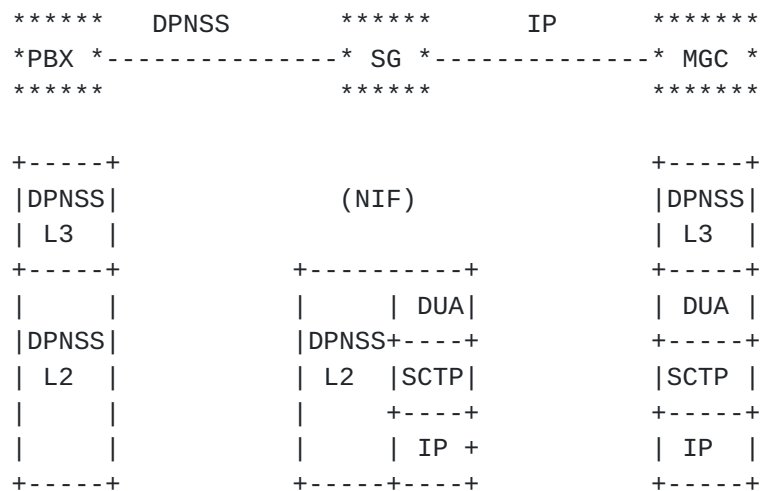


Figure 1

Channel 16 on a 2048 kbits/s interface and channel 24 on a 1544 kbits/s interface is reserved for data communication between LE and AN. The channels reserved for data are called "Data Channels" or "D-Channels."

The D-Channels are the physical media to exchange data between the DPNSS protocol peer entities. A logical collection of the D-channel and the associated DPNSS channels is called a "DPNSS Link".

1.4 Proposed DPNSS Backhaul Architecture



NIF - Nodal Interworking function
 SCTP - Stream Control Transmission Protocol
 DUA - DPNSS User Adaptation Layer Protocol

2.0 Changes from IUA

This section outlines the differences between DUA and IUA.

2.1 New Message Class for DUA

The DPNSS/DASS2 Layer 2 to Layer 3 primitives [2] [3] need to be uniquely identifiable from IUA boundary primitive transport messages and the boundary primitive transport messages of other IUA extensions (i.e. V5 or GR-303). Therefore, it is necessary to use a different message class parameter for DUA messages.

For all DPNSS/DASS2 interface boundary primitives, a new Message Class is introduced:

11 DPNSS/DASS2 Boundary Primitives Transport Messages
 (DPTM)

Similar to IUA, other valid message classes for DUA are:

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

2.2 Message Header

IUA Message header [[1](#)] has the format as shown in Figure 2 below.

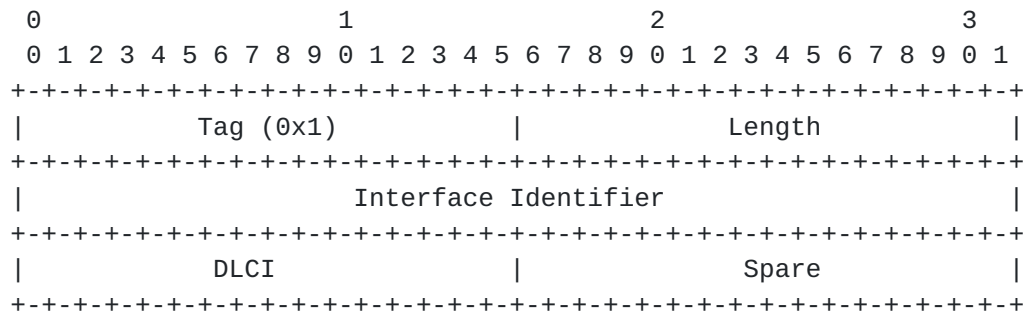
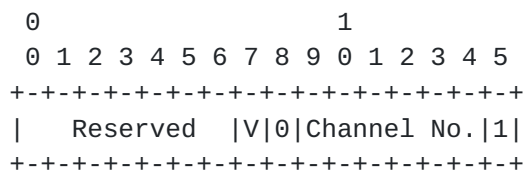


Figure 2 IUA Message Header

In DUA header DLCI field has a different format in accordance with the BTNR 188 [2].



Reserved: 7 bits

Should be set to all '0's and ignored by the receiver.

V-bit: 1 bit

The V-bit is used to determine whether the message is for a particular DLC or it is applicable for all the DLCs in the carrier. The possible values of the V-bit are listed below:

Value	Description
0	Action is to be performed on all DLCs Channel number parameter is ignored.
1	Action is to be performed on a single DLC specified by channel number.

This V-bit value is used only by the Establish and Release messages. Data messages should ignore this value. This indicator is provided so that a single command can be issued to establish or release all the DLCs in one DPNSS Link.

For Channel Number (Channel No.), the valid values are 0 to 63 for DPNSS and 0 to 31 for DASS 2. This is because DASS 2 does not

support virtual DLCs and hence has only 32 DLCs.

2.3 Unit Data Message

DPNSS layer 2 does not have a unit data primitive and hence the

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Unit Data Messages (Request, Indication) are invalid for a DUA application. The Data Request and Indication messages (message types 1 and 2 respectively) will be used with DUA.

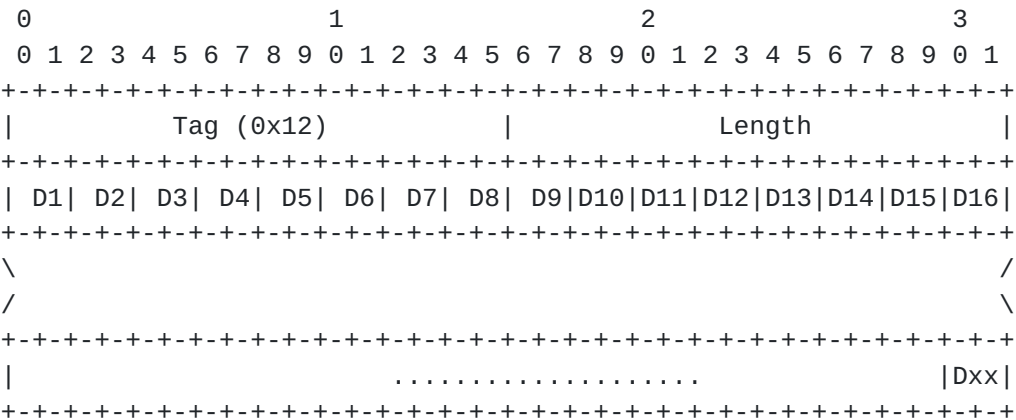
2.4 DLC Status Message

For DUA, a new message is necessary to carry the status of the DLCs. This message will be a Management message (i.e. its message class will be a value of 0 for Management). The following message types will be used for these messages:

- 5 DLC Status Request
- 6 DLC Status Confirm
- 7 DLC Status Indication

The DLC Status messages are exchanged between IUA layer peers to request, confirm and indicate the status of the DLCs. The DLC Status messages contain the common message header followed by IUA message header as described in [section 2.1](#).

In addition, the DLC Status Confirm and Indication messages will contain the following new parameter:



The parameter carries the status of DLCs using two bits for each DLC.

The possible values for the two bits are shown below:

Value	Description
00	Out Of Service
01	Reset Attempted
10	Reset Completed
11	Information Transfer

For DASS 2 the value 00 (Out Of Service) is invalid since the DASS 2 DLC does not have this state. In addition, the Idle state is a transient state local to the DLC so a value is not allocated for it.

For DASS 2 there are no virtual DLCs and hence information about only 32 DLCs need to be carried. Therefore the status message will have a length of 12 for a DASS 2 DLC Status message.

2.5 Management (MGMT) Messages

Only the Notify and Error messages are valid for DUA. The TEI Status messages are not used.

2.5.1 Error Message

The ERR message is sent when an invalid value or unrecognized message is found in an incoming message.

The Error Code parameter indicates the reason for the Error Message. These are the supported values in IUA.

Invalid Version	0x01
Invalid Interface Identifier	0x02
Unsupported Message Class	0x03
Unsupported Message Type	0x04
Unsupported Traffic Handling Mode	0x05
Unexpected Message	0x06
Protocol Error	0x07
Unsupported Interface Identifier Type	0x08
Invalid Stream Identifier	0x09
Unassigned TEI	0x0a
Unrecognized SAPI	0x0b
Invalid TEI, SAPI combination	0x0c
Refused - Management Blocking	0x0d
ASP Identifier Required	0x0e
Invalid ASP Identifier	0x0f

In DUA, the error codes 0x0a, 0x0b and 0x0c are invalid as they are specific to ISDN.

The following additional error codes are supported in DUA:

Channel Number out of range	0x1b
Channel Number not configured	0x1c

The "Channel Number out of range" error is sent if a message is received with a channel number greater than 63 for DPNSS or 31 for DASS 2.

The "Channel Number not configured" error is sent if a message is received with a channel number that is not configured.

3.0 IANA Considerations

A request will be made to IANA to assign a DUA value for the SCTP Payload Protocol Identifier field used in SCTP Payload Data chunks. The following value for the SCTP Payload Protocol Identifier field

SHOULD be used for DUA:

SCTP Payload Protocol ID = 10

However, the IUA SCTP Payload Protocol ID can also be used.

The SCTP Payload Protocol Identifier is included in each SCTP Data chunk, to indicate which protocol the SCTP is carrying. 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 whether the message is for IUA or DUA.

4.0 Message Sequence in DUA

An example of the message flows for establishing a data link on a signaling channel, passing PDUs and releasing a data link on a DPNSS channel is shown below. An active association between MGC and SG is established prior to the following message flows.

[4.1](#) Resetting of single DLC

i) Successful

PBX	SG	MGC
<----- SABMR	<-----	Est Req(Ind=1)
UA ----->	Est Cfm ----->	(DLC in RC State)
	Ind=1)	

ii) Unsuccessful(Link Failure)

PBX	SG	MGC
<----- SABMR	<-----	Est Req(Ind=1)
Retransmissions over		
NT1 and NT2 expired		
	Rel Ind ----->	(DLC in RA state)
	(RELEASE_OTHER, Ind=1)	

[4.2](#) Resetting all DLCs in a link

PBX	SG	MGC
<----- SABMR(1)	<-----	Est Req(Ind=0)
<----- SABMR(2)		
<----- SABMR(3)		
.....		
<----- SABMR(N)		
In each DLC either		
UA is received or		
NT1/NT2 is expired		
	Est Cfm ----->	(Status of DLCs
	(Ind=0)	are not updated)
	<-----	Status Req
	Status cfm ----->	(Mark DLC status
		based on
		status bits)

[4.3](#) Information Transfer on a DLC

PBX	SG	MGC
<----- UI(C)	<-----	Data Req
UI(R)----->	Data Ind ----->	

[4.4](#) Link Takedown(Single DLC)

PBX	SG	MGC
(For DPNSS, mark DLC as OOS)	<-----	Rel Req
(For DASSII, mark DLC as RA)		(RELEASE_MGMT,
		Ind=1)
	Rel Cfm ----->	
	(Ind=1)	

[4.5 Link Takedown\(All DLCs\)](#)

```

PBX                                SG                                MGC
  (For DPNSS, mark all DLCs as OOS) <----- Rel Req
  (For DASSII, mark DLC as RA)                                (RELEASE_MGMT,
                                                                Ind=0)
                                Rel Cfm ----->
                                (Ind=0)

```

[4.6 Getting link Status](#)

```

PBX                                SG                                MGC
                                <----- Stat Req
                                Stat Cfm -----> (Mark DLC status
                                                                based on
                                                                status bits)

```

[4.7 Error conditions](#)

```

PBX                                SG                                MGC
                                Invalid Message <-----Est/Rel/Data/-
                                                                Stat Req
                                Error Ind ----->
                                (Error Code)

```

[5.0 Glossary of terms](#)

Real channel : The signalling channel with associated traffic channel (TS).

Virtual channel: The signalling channel with no associated traffic channel.

NT1 : Retransmission period of 500msec.

NT2 : Recommended value is 64.

[6.0 Security Considerations](#)

The security considerations discussed for the ISDN User Adaptation Protocol (IUAP) [[1](#)] [Section 6.0](#) apply to this document as well.

[7.0 References](#)

[7.1 Normative References](#)

- [1] Morneault, et al., "ISDN Q.921-User Adaptation Layer", [RFC 3057](#), February 2001.
- [2] BTNR (British Telecom Network Requirements) 188 Issue 6 Digital Private Network Signaling System 1.

[3] BTNR (British Telecom Network Requirements) 190 Issue 2
Digital Access Signaling System No 2

[4] IUA ([RFC3057](#)) Implementors Guide, [draft-ietf-sigtran-ua-imp-guide-01.txt](#), Oct 2002

7.2 Informative References

[5] ETS 300 167 (08/1993) : Transmission and Multiplexing;
Functional characteristic of 2048 kbits/s interfaces
(Standard is based on G.704, G.706).

8.0 Acknowledgments

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9.0 Author's Addresses

Authors : Ranjith Mukundan, Ken Morneault, Narsimuloo Mangalpally and Anil Vydyam

All correspondence regarding this draft should be sent to the following addresses :

Ranjith Mukundan	Phone +91-80-8520408
Wipro Technologies	Email ranjith.mukundan@wipro.com
72, Electronics City,	
Hosur Main Road,	
Bangalore 561229	
India	

Ken Morneault	Phone: +1-703-484-3323
Cisco Systems Inc.	EMail: kmorneau@cisco.com
13615 Dulles Technology Drive	
Herndon, VA. 20171	
USA	

