SS7 MTP3-User Peer-to-Peer Adpatation Layer Procedures (M3PA)
for
SS7 MTP3-User Adaptation Layer (M3UA)
<draft-bidulock-sigtran-m3pa-00.ps>

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Abstract

This Internet-Draft describes SS7 MTP3-User Peer-to-Peer Adaptation Layer Procedures (M3PA) to support peer-to-peer operation for SS7 MTP3-User Adaptation Layer [M3UA] in support of MTP3 [Q.704] users in an all IP network. These procedures permit the seamless operation of SS7 MTP3-User in an all-IP environment, while not requiring (but allowing) interworking to the SS7 network. This permits the implementation of all-IP solutions for SS7 signalling between MTP3-Users.

Contents

A complete table of contents, list of illustrations, list of table and change history appear at the end of this document.

1. Introduction

1.1. Scope

The Internet-Draft describes **SS7 MTP3-User Peer-to-Peer Adaptation Layer (M3PA)** procedures to support peer-to-peer SS7 MTP signalling between IP nodes in an IP network in extension to the messages and procedures provided for SS7 MTP3-User Adaptation Layer [M3UA]. These extensions provide seamless operation of the MTP3-User interface [Q.704] between M3UA endpoints (SGP and ASP) across an IP network. Interworking between **M3PA** endpoints supporting these procedures and SS7 SGs is also provided.

In addition, this I-D describes extension messages and procedures which are required to permit **M3PA** endpoints to act as relay points to other **M3PA** nodes, providing the Signalling Transfer Point (STP) [Q.705] capabilities contained within an IP network.

M3UA implementations providing the **M3PA** extension procedures and messages are intended to be compatible with M3UA implementations not supporting these extensions; however, the full benefits acheived by **M3PA** procedures will not be realized unless implementations at both endpoints implement **M3PA**.

1.2. Abbreviations and Terminology

1.2.1. Abbreviations

AS —Application Server.
ASP —Application Server Process.
DPC —Destination Point Code
I-D —Internet-Draft.
IP —Internet Protocol.
IPSP —IP Signalling Point.
ITU —International Telecommunications Union.
M3PA —SS7 MTP3-User Peer-to-Peer Adaptation Layer.
M3UA —SS7 MTP3-User Adaptation Layer.
MTP2 —MTP Level 2.
MTP3 —MTP Level 3.
MTP —Message Transfer Part.
PC —Point Code
SCTP —Stream Control Transmission Protocol.
SEP —Signalling End Point.
SG —Signalling Gateway.
SGP —Signalling Gateway Process.
SLS —Signalling Link Selection
SPMC —Signalling Point Mangement Cluster.
SS7 —Signalling System No. 7.
STP —Signalling Transfer Point.

1.2.2. Terminology

M3PA supplements the terminology used in M3UA [M3UA] by adding the following terms:

Changeover –

Changeback –

Controlled Rerouting –

Forced Rerouting –

Signalling Endpoint (SEP) – in this document, a *Signalling Enpoint* is an SS7 SEP [Q.700] or an Application Server.

Signalling Peer Process (SPP) – refers to an ASP, SGP or IPSP.

Time-controlled Changeover – the MTP3 [Q.704] procedure for diverting signalling traffic from a failed primary linkset to an alternate linkset where sequence number information cannot be exchanged between signalling points or where it is undesirable to use the normal changeover procedures.

1.3. Overview

The purpose of **M3PA** protocol is to increase inter-IP {Tolga: or intra-IP?} communication capabilities of M3UA peers and to allow SS7 signalling backhauling between SS7 nodes over IP.

In the configuration in *Figure 1* SGs act as transfer points between ASP clouds. Their functionality is similar to the STP functionality in SS7 network. The communication between ASPs and SGs is as defined in M3UA.

_____

```
                 -----                 -----
                //     \\             //      \\
               |  ASP    |           |  ASP     |
               |  Cloud 1|           |  Cloud 2|
                \\     //             \\      //
                 --+--                 --+--
                   |                     |
                   |                     |
               +--+--+               +--+--+
               | SG1 +-----------+ SG2 |
               +--+--+               +--+--+
                  |                     |
                  |                     |
                  |                     |
                  |     +-----+         |
               +-----+ SG3 +------+
                     +--+--+
                        |
                        |
                      --+--
                    //      \\
                   |  ASP     |
                   |  Cloud 2|
                    \\      //
                     -----
```
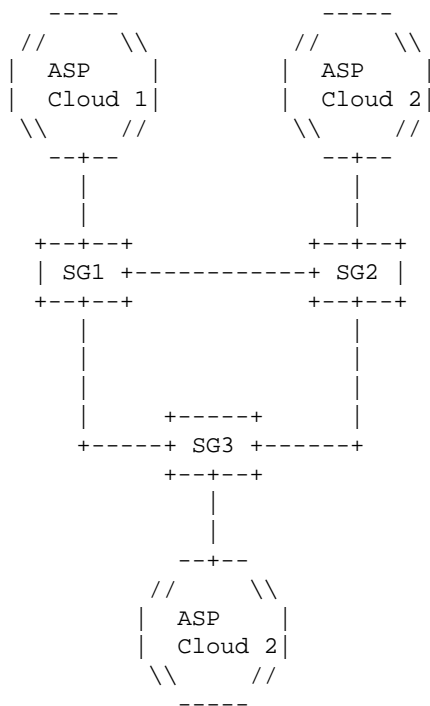
Figure 1. Inter-IP communication useing **M3PA**

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In the configuration in *Figure 2* SGs act again as transfer points, but this time for SS7 nodes.

M3PA management is based mainly on SSNM as defined in M3UA, with some additional messages to handle startup {Tolga: another term might be better}, changeover and congestion as defined in MTP3 [Q.704].

Communication of peers using **M3PA** is on PC granularity.
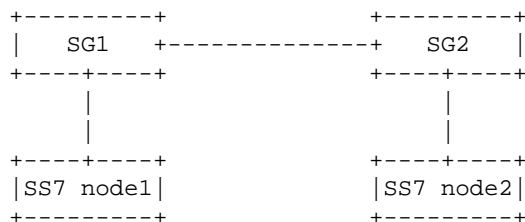
1.4. Sample Configurations

_____

```
          +---------+              +---------+
          |  SG1    +-------------+  SG2    |
          +----+----+              +----+----+
               |                        |
               |                        |
          +----+----+              +----+----+
          |SS7 node1|              |SS7 node2|
          +---------+              +---------+
```

Figure 2. SS7 Signalling Backhauling with **M3PA**

_____

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 [RFC 2119].

3. Functional Areas

3.1. Signalling Point Code Representation

SGs should control SPMCs as a whole. When a SPMC becomes unavailable, SG will broadcast DUNA to all SGs, it has an association with. Similarly when a SPMC becomes available DAVA and when a SPMC becomes restricted DRST will be sent.

3.2. Routing Context and Routing Keys

Unlike M3UA, there is no Routing Context/Routing Key concept present in **M3PA**.

3.3. Network Appearance

NA is not used in **M3PA**. So, one SCTP association should carry traffic belonging to one specific network only and this should be coordinated among peers via configuration.

3.4. SCTP Association Establishment

There is no client/server relationship between peers in **M3PA**. SCTP associations might be initiated from any side.

After a SCTP association is established, SGs will exchange SSNM to update the remote peer about the status of the PCs, which are by configuration declared as reachable via them. Unless a corresponding message is received, all PCs are assumed as accessible via the remote peer. Each SG will send DUNA for not available PCs and DRST for restricted PCs after the establishment of the association. The end of this unavailable/restricted PC announcement procedure is marked with a TAL(Traffic Allowed) {Tolga: This is the message corresponding to TRA} message. A SG should not start sending DATA to a peer, unless TAL is received.

4. Protocol Elements

The following subsections describe the parameters which are added by this extension, their format and the message in which they are used.
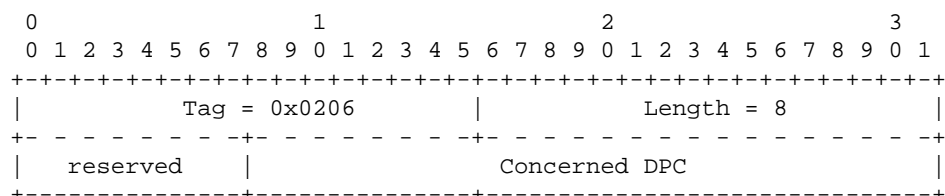
4.1. Parameters

M3PA supplements the following parameters:

4.1.1. Concerned Destination

M3PA supplements the *Concerned Destination* parameter of M3UA [M3UA] by allowing the parameter to be included in the **DUPU** message. When the *Concerned Destination* parameter is included in the **DUPU** message it is used to indicate the Signalling End Point (SEP) to which the indication of User Part Unavailability needs to be given. When included in the **SCON** message, the interpretation of the *Concerned Destination* parameter is as given in M3UA [M3UA].

The *Concerned Destination* parameter is formatted as follows:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           Tag = 0x0206         |           Length = 8          |
+- - - - - - -+- - - - - - -+- - - - - - - - - - - - - - - -+
|   reserved    |                Concerned DPC                  |
+---------------+---------------+-------------------------------+
```

The *Concerned Destination* parameter contains the following fields:

Reserved: 8-bits
Reserved bits are reserved for future use and MUST be coded all zeroes (0).

Concerned DPC field: 24-bits
The *Concerned DPC* field is a three-octet parameter to allow for 14-, 16- and 24-bit binary formatted SS7 Point Codes. A *Concerned DPC* that is less than 24-bits is padded to the left to the 24-bit boundary.

The format of the 14-bit point code is as follows:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   reserved    |0 0 0 0 0 0 0 0 0 0|      14-bit Point Code    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The format of the 16-bit point code is as follows:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   reserved    |0 0 0 0 0 0 0 0|      16-bit Point Code        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The format of the 24-bit point code is as follows:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   reserved    |                 24-bit Point Code             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

4.2. Messages

M3PA uses DATA and SSNM messages as defined in M3UA. RC and NA fields in messages are not used,i.e. they MUST not be filled.
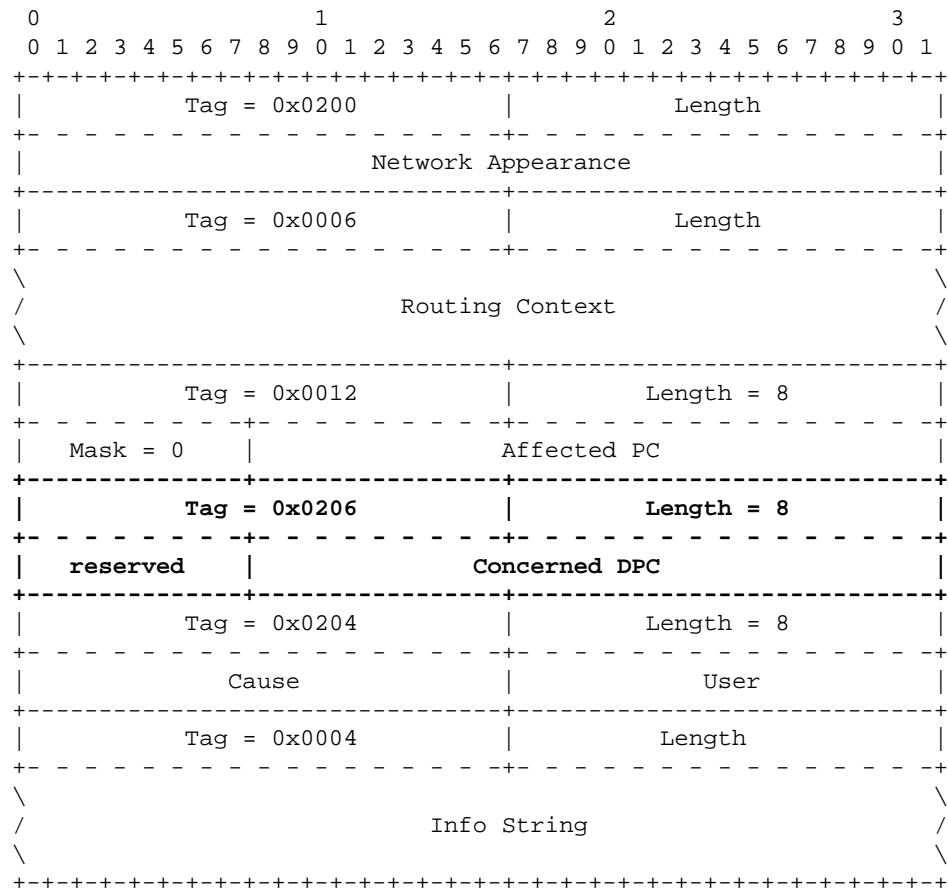
4.2.1. Destination User Part Unavailable (DUPU)

M3PA supplements the **DUPU** message by permitting the following optional parameters the included in the message:

Extension Parameters	
Concerned Destination	Optional

The format of the resulting *DUPU* message is as follows:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|            Tag = 0x0200           |            Length            |
+- - - - - - - - - - - - - - - - -+- - - - - - - - - - - - - - -+
|                      Network Appearance                        |
+---------------------------------+----------------------------+
|            Tag = 0x0006           |            Length            |
+- - - - - - - - - - - - - - - - -+- - - - - - - - - - - - - - -+
\                                                                \
/                        Routing Context                         /
\                                                                \
+---------------------------------+----------------------------+
|            Tag = 0x0012           |           Length = 8         |
+- - - - - - - -+- - - - - - - - -+- - - - - - - - - - - - - - -+
|   Mask = 0    |                 Affected PC                    |
+---------------+-----------------+----------------------------+
|            Tag = 0x0206           |          Length = 8          |
+- - - - - - - -+- - - - - - - - -+- - - - - - - - - - - - - - -+
|   reserved    |                 Concerned DPC                  |
+---------------+-----------------+----------------------------+
|            Tag = 0x0204           |          Length = 8          |
+- - - - - - - - - - - - - - - - -+- - - - - - - - - - - - - - -+
|              Cause               |             User            |
+---------------------------------+----------------------------+
|            Tag = 0x0004           |            Length            |
+- - - - - - - - - - - - - - - - -+- - - - - - - - - - - - - - -+
\                                                                \
/                         Info String                            /
\                                                                \
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
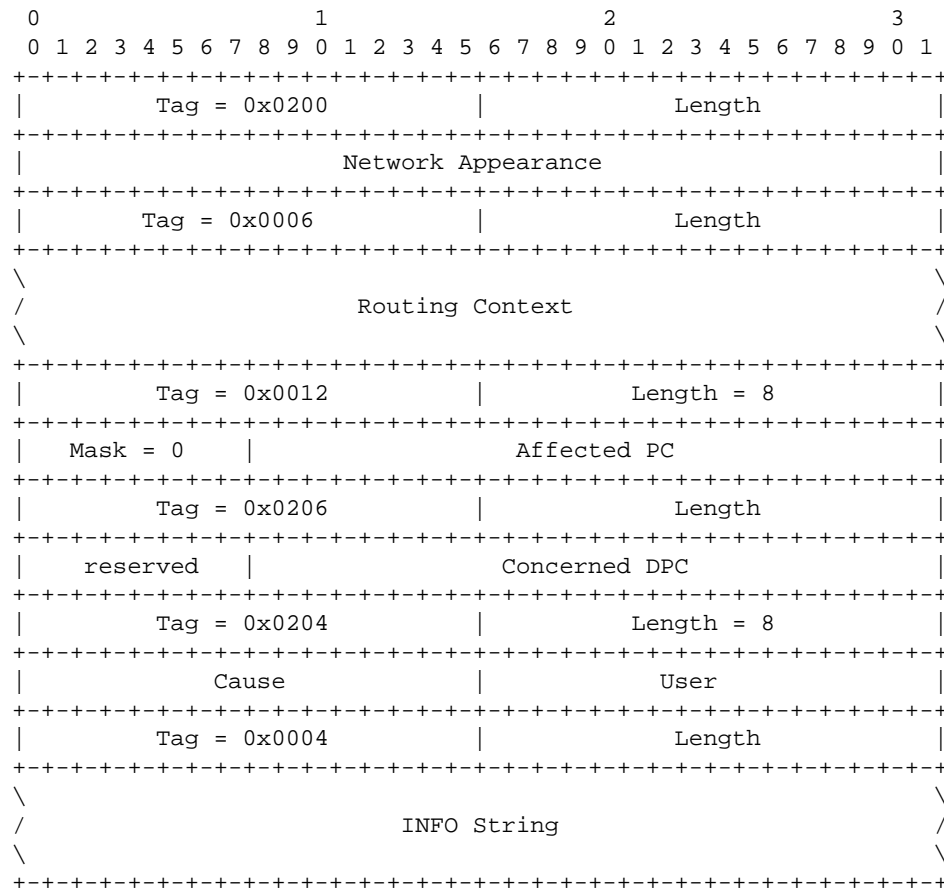
Concerned Destination: 32-bits

The optional *Concerned Destination* parameter is used if the SCON message is sent from and IPSP with the relay capability. The Concerned Destination parameter contains one Concerned Destination Point Code field, a three-octet parameter to allow for 14-, 16- and 24-bit binary formatted SS7 Point Codes. A *Concerned Point Code* that is less that 24-bits is padded to the left to the 24-bit boundary.

A new field is introduced to DUPU.

Concerned PC: Destination PC, which has caused DUPU to be generated. This parameter is mandatory.

The format for DUPU message parameters is as follows:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Tag = 0x0200         |             Length            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Network Appearance                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Tag = 0x0006         |             Length            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
\                                                               \
/                       Routing Context                        /
\                                                               \
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Tag = 0x0012         |           Length = 8          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Mask = 0    |                 Affected PC                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Tag = 0x0206         |             Length            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    reserved   |                Concerned DPC                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Tag = 0x0204         |           Length = 8          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|            Cause              |              User             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Tag = 0x0004         |             Length            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
\                                                               \
/                         INFO String                          /
\                                                               \
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

4.2.2. Congestion Test Message (CGT)

<TBD>

4.2.3. Traffic Allowed (TAL)

<TBD>

4.2.4. Changeover Mechanism Related Messages

_____

```
       +-----+              +-----+
       |STP1 +-----X------+ SG2 |
       +--+--+              +--+--+
          |                    |
          |                    |
          |                    |
          |                    |
          |      +-----+       |
          +-----+ SG1 +-------+
                 +-----+
```
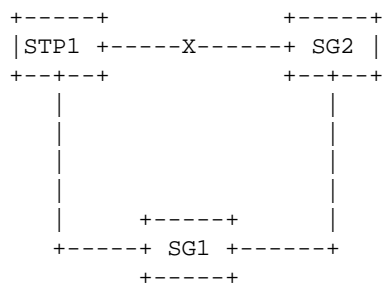
Figure 3. SG1 relaying changeover messages

_____

<TBD>

5. Procedures

M3PA provides for a set of procedures which are suited to peer-to-peer operation which are based on the procedures of M3UA [M3UA]. **M3PA** provide supplementary use of the *Concerned Destination* parameter in the **DUPU** message, as well as providing additional procedures for M3UA [M3UA] messages.

5.1. Establishment of SCTP Associations

An SCTP [RFC 2960] Association between two IPSPs is treated as equivalent to a "Signalling Route" as defined in the MTP specifications [1]. Therefore, an SCTP [RFC 2960] Association form a signalling relation between two ISPSs acting as Signalling Points.

Whenever an SCTP [RFC 2960] Association is formed between two IPSPs, and the IPSPs have exchanged ASPUP and ASPUP Ack messages, the signalling relation is deemed to be available between the two IPSPs. Whether messages can be transferred between the IPSPs is then determined by the exchange of SNMM messages between the IPSPs.[2]

5.2. Routing of Messages

An IPSPs MAY be composed of multiple SPPs. There MAY be more than one SCTP Association between two IPSPs, but there MUST only one SCTP association between two SPPs. Each IPSP MUST represent one or more SPMCs (Signalling Point Management Clusters) identified by a unique Signalling Point Code.

For each DATA message which is sent by an IPSP, the sending IPSP selects the outgoing SCTP Association on the basis of the Destination Point Code (DPC) and the Signalling Link Selection (SLS) in the message. The Destination Point Code (DPC) is used to identify the destination of the message and is used to select the next hop IPSP which has a route to the indicated destination or a final hop to the destination IPSP. The Signalling Link Seletion (SLS) field in the DATA message is used to select one of multiple SCTP Associations that may exist between the sending IPSP and the next or final hop IPSP.

5.3. IPSP State

Notes for §5

[1]   For a definition of *"Signalling Route"*, see the pertinent MTP specifications, such as the ITU specifications [Q.704].

[2]   **NOTE:-** In contrast to the procedures and messages of M3UA [M3UA] there is no need for IPSPs to exchange ASPTM or RKM messages. These are backhaul messages and there is no need to use them for peer-to-peer operation. IPSPs exchange SNMM messages to query or indicate the availability, congestion and restriction status of both adjacent and remote destinations.

6. Examples

A. Security

B. IANA Considerations

0. Revision History

The current revision is $Revision: 0.8.2.1 $ $Date: 2003/07/29 02:02:37 $.

0.1. Changes from Version 0.0 to Version 0.1

0.0. Version 0.0

0.0.0. Change Log

```
$Log: draft-bidulock-sigtran-m3pa-01.me,v $
Revision 0.8.2.1  2003/07/29 02:02:37  brian
Updated formatting.

Revision 0.8  2003/02/22 22:14:12  brian
Added m2pa files.
```

R. References

R.1. Normative References

[**M3UA**]   Sidebottom, G., Morneault, K. and Pastor-Balbas, J., (eds), *"Signaling System 7 (SS7) Message Transfer Part 3 (MTP3) - User Adaptation Layer (M3UA),"* **RFC 3332**, Internet Engineering Task Force - Signalling Transport Working Group (September, 2002).

[**RFC 2119**]   Bradner, S., *"Key words for use in RFCs to Indicate Requirement Levels,"* **RFC 2119 - BCP 14**, The Internet Society (March 1997).

[**RFC 2960**]   Stewart, R., Xie, Q., Morneault, K., Sharp, C., Schwarzbauer, H. J., Taylor, T., Rytina, I., Kalla, H., Zhang, L. and Paxson, V., *"Stream Control Transmission Protocol (SCTP),"* **RFC 2960**, The Internet Society (February 2000).

R.2. Informative References

[**Q.704**]   ITU, *"Message Transfer Part − Signalling Network Functions and Messages,"* **ITU-T Recommendation Q.704**, ITU-T Telecommunication Standardization Sector of ITU, Geneva (March 1993). *(Previously "CCITT Recommendation")*

[**Q.705**]   ITU, *"Signalling System No. 7 − Signalling Network Structure,"* **ITU-T Recommendation Q.705**, ITU-T Telecommunication Standardization Sector of ITU, Geneva (March 1993). *(Previously "CCITT Recommendation")*

[**Q.700**]   ITU, *"Introduction to CCITT Signalling System No. 7,"* **ITU-T Recommendation Q.700**, ITU-T Telecommunication Standardization Sector of ITU, Geneva (March 1993). *(Previously "CCITT Recommendation")*

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List of Illustrations

Table of Contents

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