



Dialogic[®] DSI Signaling Protocols

M3UA Programmer's Manual

March 2012

U02STN

www.dialogic.com

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Revision History

Issue	Date	Description
7	30-Mar-12	Addition of 8-bit SLS rotation option and Daud_cong timer.
6	15-Jul-10	Heartbeats and SNMP added
5	01-Feb-10	Addition sections added to General Description discussing association activation, throughput monitoring and load sharing.
4	11-Nov-09	Updates to support Automatic ASP and AS Activation Added new message definitions: <ul style="list-style-type: none">• M3U_MSG_ACTIVATE• M3U_MSG_DEACTIVATE• M3U_MSG_CNF_TIMERS• MNG_MSG_THR_ALARM• MTP_MSG_UPDATE_L4
3	25-Jun-09	Updated to include M3UA IPSP additions and DAUD operation. General updates to message formats. Update options in M3U_MSG_CONFIG (0x72c0) Added new parameter to M3U_MSG_CNF_INT_NA (0x72c4)
2	19-Jun-03	Branding changed and description of module expanded.
1	28-Jun-02	Initial Release

Note: The current version of this guide can be found at:
<http://www.dialogic.com/support/helpweb/signaling>

1 Introduction

The Dialogic® DSI M3UA module is a software implementation of the IETF SIGTRAN, SS7 MTP3 User Adaptation Layer (M3UA). This Programmer's Manual is intended for users choosing to develop their own application programs that will interface with and use the functionality provided by the M3UA module.

The module uses the services provided by the Stream Control Transmission Protocol (SCTP) to exchange signaling messages with M3UA Signaling Gateway Processes (SGP), M3UA Application Server Processes (ASP) or M3UA IP Signaling Processes (IPSP). It can be used as part of an ASP or IPSP system.

The M3UA module is part of the Dialogic® DSI Signaling Protocol product range and is implemented in a similar message based, event driven manner to the other protocols in the product range. It is intended to be used in conjunction with other DSI Signaling Protocols SCTP, ISUP and SCCP either as part of a pre integrated systems product or integrated with third party applications and hardware. However, the well-defined message interface allows the M3UA module to be used with alternative implementations if required.

This manual provides an overview of the internal operation of the M3UA module and defines the message based APIs for configuration, management and applications to use.

1.1 Abbreviations

Abbreviation	Description
AS	Application Server
ASP	Application Server Process
IETF	The Internet Engineering Task Force
IPSP	IP Signaling Point
ISUP	ISDN User Part
ITU	The International Telecommunication Union (Previously CCITT)
M3UA	SS7 MTP3 User Adaptation Layer
MTP2	Message Transfer Part Layer 2
MTP3	Message Transfer Part Layer 3
DPC	Destination Point Code
OPC	Originating Point Code
SCCP	Signaling Connection Control Part
SCTP	Stream Control Transmission Protocol
SG	Signaling Gateway
SGP	Signaling Gateway Process
SNMP	Simple Network Management Protocol

Abbreviation	Description
SP	Server Process
SIGTRAN	The IETF Signaling Transport Group
SS7	Signaling System Number 7

1.2 Related Documentation

- [1] IETF RFC 4666 MTP3-User Adaptation Layer
- [2] IETF RFC 2960 Stream Control Transmission Protocol
- [3] Dialogic® DSI SS7 Programmer's Manual for SIGTRAN Host Software
- [4] Dialogic® DSI SCTP Programmer's Manual
- [5] Dialogic® DSI Software Environment Programmer's Manual
- [6] Enabling Dual-Chassis Fault Tolerance with Dialogic® SIGTRAN Protocols

1.3 Feature Overview

Key features of the M3UA module include:

- Implementation of IETF MTP3 User Adaptation Layer RFC 3332 and RFC 4666 [1]
- Message based interface common with other Dialogic® DSI Signaling Protocols
- May be used as part of an ASP or IPSP
- May be used as part of a single AS
- Fully automatic or full user control of ASP / AS Activation as required.
- Supports Single Exchange Activation
- Supports 14, 16 and 24 bit Point Codes
- Supports MTP3 User interface to route messages based on DPC
- Load-shares across two Signaling Gateways (STPs)
- Load-shares across ASPs within an AS and SGPs within an SG
- Load-shares across multiple streams within an SCTP Association
- Buffers messages while rerouting
- Supports connections to multiple peer ASs
- Diagnostic tracing of messages exchanged with SCTP and MTP3 User
- Supports SNMP for Links, RAS and Routes

2 General Description

2.1 Module Overview

The M3UA module implements the SS7 MTP3-User Adaptation Layer as defined in the IETF RFC 4666. The module interface is message based. The module reads messages from a single message input queue and sends responses and indications to the message input queues of other modules in the system.

The M3UA module interfaces with SCTP using the User Primitives defined in the Dialogic® DSI SCTP Programmer's Manual.

2.1.1 ASP and IPSP Operation

When used as part of an ASP or IPSP, M3UA offers a primitive interface to its Users identical to that of MTP3. This allows M3UA to interface directly to protocols that interface with MTP3 and for systems that currently use MTP3 to be easily modified to use M3UA.

The M3UA module allows MTP Tx Indications to be forwarded to signaling end points, either directly in an IPSP configuration or via STPs in an ASP – SGP configuration. When M3UA receives a Tx Request from the User it forwards it based on the DPC in the routing label and configured routes.

When M3UA connects to a peer M3UA it must first establish its SCTP association, following that it must bring the ASP up and then before sending traffic it must activate the AS. This process may be automated by M3UA or controlled step by step over the M3UA Management Interface.

M3UA distributes messages received from the network based on the Service Indicator in the MTP Routing Label.

2.2 Module Configuration

The Configuration interface uses the same message passing environment as the User and Management API. The full list of configuration messages is defined in Section 6.3. Each configuration message will instantiate a new element and set its configuration parameters as requested, this will include a logical id for the element. Where one element references another the referenced element must have been previously configured.

The first configuration message sent to the module must be the module configuration message M3U_MSG_CONFIG. This tells M3UA where its SCTP module is, where to send maintenance messages and where to send management messages.

It is recommended that lower layer protocols are configured first. E.g. configure SCTP before M3UA before ISUP or SCCP etc.

2.3 System Activation

Once configured the system associations and servers must be brought into service before traffic can be sent and received. This can be easily achieved by sending an M3U_MSG_ACTIVATE request message for each association which has been configured. M3UA will then

1. Activate the association
2. Wait for the association to come into service (this is indicated to Layer Management with the M3U_MSG_ASS_STATUS_IND message)
3. Send an ASP UP Request to the peer SG or IPSP
4. Wait for an ASP UP Acknowledgement or retransmit the ASP UP request (ASP UP is indicated to Layer Management with the M3U_MSG_ASP_UP_CON or M3U_MSG_ASP_UP_IND message).
5. Send an ASP Activate Request to the peer SG or IPSP
6. Wait for an ASP Active Acknowledgement or retransmit the ASP Activate Request (ASP Active is indicated to Layer Management with the M3U_MSG_ASP_ACT_CON or M3U_MSG_ASP_UP_IND message).
7. The Association is now ready to handle SS7 messages.

If M3U_MSG_ACTIVATE is used to activate the system then should the association fail M3UA will automatically, without the need for further requests, reactivate the association.

Some systems require the association to be activated and the ASP to be brought up without immediately activating the ASP. Should this be the case then the user can manually activate the association and bring the ASP UP as follows.

1. Activate association by sending M3U_MSG_ACT_ASSOC
2. Wait for the association to come into service (this is indicated to Layer Management with the M3U_MSG_ASS_STATUS_IND message)
3. Send an ASP UP Request to the peer by sending M3U_MSG_ASP_UP_REQ
4. Wait for an ASP UP Acknowledgement or retransmit the ASP UP request (ASP UP is indicated to Layer Management with the M3U_MSG_ASP_UP_CON or M3U_MSG_ASP_UP_IND message).

Note: Activation can pause at this point indefinitely. M3UA will be notified about changes in the availability of any dual partner units and the distributed service it is part of and may choose to become fully active as required. This is achieved by taking the following steps.

5. Send an ASP Activate Request by sending M3U_MSG_ASP_ACT_REQ.
6. Wait for an ASP Active Acknowledgement or retransmit the ASP Activate Request (ASP Active is indicated to Layer Management with the M3U_MSG_ASP_ACT_CON or M3U_MSG_ASP_UP_IND message).

If associations are activated manually as above it may be desirable to have M3UA automatically return the association to it's previous activation state following a network failure. Options are available on the ASP UP and ASP Activate request messages to request this.

Associations can be deactivated by sending the M3U_MSG_DEACTIVATE message.

2.4 Throughput Monitoring

The M3UA license model allows specific data throughput rates to be used. The available M3UA licenses and the capability of each are detailed in the table below:

Description	Throughput	Max Associations	TDM Link Equivalents*
SS7SBHSTM3UAU	312kb/s	4	4
SS7SBHSTM3UAS	1,232kb/s	16	16
SS7SBHSTM3UAR	2,464kb/s	32	32
SS7SBHSTM3UAL	4,920kb/s	64	64
SS7SBHSTM3UAK	9,832kb/s	128	128
SS7SBHSTM3UAJ	19,664kb/s	256	256

*This comparison assumes the use of 64kb/s links at a maximum loading of 0.6 Erlang. Individual user deployments may exhibit different characteristics from this in which case it may be necessary to provision more or less capacity accordingly

When the module starts it reads its license to determine exactly what data rate it can use. To support this M3UA provides the following mechanisms to ensure good visibility and control of the system.

2.4.1 Read current rate and read peak rate.

M3UA supports message type MGT_MSG_R_LIC_STATUS which returns licensing information about the current state of the system including the licensed data rate expressed in Kbytes/s. It also supports message type MGT_MSG_R_THR_STATS which returns the maximum throughput experienced by the module since the last Restart or Stats Reset. In addition it reports the total amount of Data transmitted and received. These messages can be used to see the average and peak throughputs.

The peak and current rates allow users to see what proportion of their systems throughput capacity is being used.

2.4.2 Notification when license limit exceeded.

If the system exceeds its licensed limit then the system will issue a warning indication using message type MGT_MSG_LIC_EVENT. This will alert the user offering an opportunity to throttle the throughput rate. If the throughput rate continues to exceed the licensed limit then M3UA will issue a subsequent indication indicating that M3UA is now throttling the rate. Once the rate has abated below the licensed limit then M3UA will indicate this with a further MGT_MSG_LIC_EVENT indication.

These indications allow the Customer Application to dynamically throttle the throughput to stay within the licensed limit.

2.4.3 Notification when 80% of license limit exceeded.

An additional indication is made available when the peak throughput exceeds 80% of the licensed limit. When this happens a MGT_MSG_LIC_EVENT is generated.

This indication can be used by system administrators to help identify systems coming close to their rated throughput and which may require a license upgrade. The alarm will persist until the throughput level drops below 40% of the licensed limit.

2.5 Load Sharing

M3UA data messages sent from a User Part to M3UA for transmission are formatted starting with the MTP3 Routing Label. This contains a field called the Signaling Link Selector (SLS) which is used by the SS7 network for load-sharing of messages through the network. M3UA also uses this for load sharing of messages. Messages from MTP3 Users are expected to have an approximately even distribution of SLS values allowing a deterministic spread of messages through the network.

When transmitting messages to the SS7 network via Signaling Gateways M3UA will perform the following load sharing steps:

1. Select between two Signaling Gateways using the highest bit in the SLS.
2. Select between up to four SGPs in the SG using the lowest two bits in the SLS.
3. Select an SCTP Stream in the Association using the lowest bits in the SLS.

When transmitting messages to an IPSP system which has registered, or is configured, to operate in load share mode, then the following steps are taken:

1. Select between up to four ASPs in the AS using the lowest two bits in the SLS
2. Select an SCTP Stream in the Association using the lowest bits in the SLS.

2.6 Dual Resilient Systems

Details of how to configure and use M3UA as part of a Dual Resilient system may be found in [6] Enabling Dual-Chassis Fault Tolerance with Dialogic® SIGTRAN Protocols, available from the Dialogic Web Site.

3 Configuration Model

This section describes the configurable entities supported by the M3UA module. This description is intended to assist the user in understanding the operation of the module. It is not necessary to acquire detailed knowledge of these entities in order to use the module.

3.1 System Configuration

The M3UA module exists in a message passing environment and has a small number of parameters controlling how it communicates with other modules. The first configuration message to be sent to the module must be the module configuration message (M3U_MSG_CONFIG) which configures these essential parameters.

In addition M3UA must also be configured with the Routing Label Format to be used for messages sent to the local User Parts. This is done using the Network ID configuration message (M3U_MSG_CNF_INT_NA). Only a single Point Code format is supported on Application Hosts which must use a Network_ID of Zero.

M3UA uses a small number of Timers controlling aspects of it's behavior. These take default values as suggested by the M3UA specifications or otherwise. Should it be necessary these default timer values may be changed using the timer configuration message (M3U_MSG_CNF_TIMERS). This changes the M3UA timer values used throughout the module.

3.2 Association

M3UA makes use of SCTP Associations for it's transport layer connecting it to peer M3UA Nodes. M3UA requires an association configuration message for each association used by the system. This message tells M3UA how to communicate with the SCTP module concerning this Association and whether the local and remote nodes are Signaling Gateways or Application Hosts.

An SCTP association is similar in concept to a TCP connection. It makes use of IP and offers a reliable sequenced delivery. Unlike TCP, SCTP is designed to pass packets as opposed to streaming data. SCTP has been designed by the IETF for the transport of telecoms signaling.

An Application Host may have associations connecting it to one or more Signaling Gateway through which it connects to the SS7 network. It may also have associations connecting it to one or more peer application hosts which terminate SS7 traffic directly.

At run time each SCTP association must be established and then the M3UA peers must start communication by sending M3UA UP and receiving UP Ack messages across each association.

Sometimes the peer may use the optional Network Appearance parameter in certain messages. Should this be the case then M3UA will require a configuration message for each association on which the Network Appearance is used (M3U_MSG_MAP_NA).

3.3 Server

A Server is a logical entity which controls the routing of SS7 traffic between a Signaling Gateway and an SS7 Point Code, or for IPSPs, between two different SS7 Point Codes.

Once M3UA peers have established communication by sending and receiving UP requests, Application End Points and Signaling Gateways indicate they are ready to send and receive SS7 Data traffic by activating Servers. If a Server is active then M3UA peers can send and receive SS7 traffic relating to the server configured for their use.

An Application Host will configure a server for each Signaling Gateway it connects to. When that server is active it can send traffic to the Signaling Gateway; when Inactive it can not. An Application Host connecting to IPSP Hosts will configure a Server for each Remote Point Code the peer hosts support.

A Server may use more than one Association. A separate configuration message is used to map the Server to each association it uses and at the same time to specify the Routing Context, if any, to be used between the peers during Server activation.

Note: Each Server configuration message controls how messages received from the network are passed to the local User Parts. The message contains an array of module ids controlling how messages are locally distributed based on the Service Indicator in the message.

3.4 Routes

A Route maintains the availability status of a remote Point Code in the SS7 network via one or more Signaling Gateways. Application Hosts connecting to Signaling Gateways will require the configuration of Routes for each Remote Signaling Point Code they wish to communicate with.

The configuration of routes uses two message types; one to declare a new Remote Point Code and one to add a Signaling Gateway to the list of Signaling Gateways used to reach the Point Code.

Application Hosts automatically synchronize their Route State with the Signaling Gateways and generate PAUSE and RESUME primitive indications to their User Parts.

3.5 Connecting via Signaling Gateways

This example shows the M3UA entities configured when connecting an M3UA application Host to an SS7 network via a pair of Signaling Gateways as shown in Figure 1. This shows the M3UA Application Host being configured, two Signaling Gateways, two SCTP Associations used to connect to each Signaling Gateway and a number of Destination Point Codes (DPCs) beyond the Signaling Gateways.

Note: This example only concerns itself with M3UA entities. It is expected that additional configuration is required for User Parts (ISUP / SCCP), SCTP and other system elements but this is beyond the scope of this example.

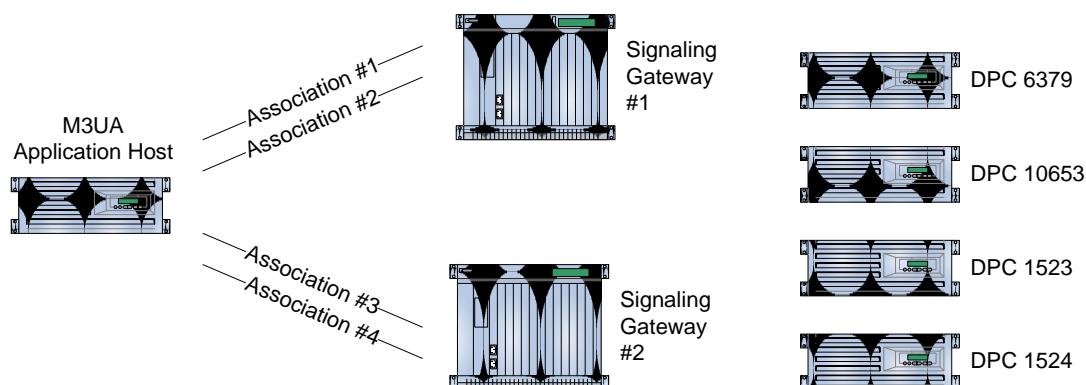


Figure 1: Connecting via SGs

This example requires the following M3UA configuration:

3.5.1 System Configuration

- Configuration of Module IDs using `M3U_MSG_CONFIG`
- Configuration of SS7 Routing Label Format using `M3U_MSG_CNF_INT_NA`

In the event that default timer values require changing then this can be done at this point.

3.5.2 Association Configuration

- Configuration of Association #1 using `M3U_MSG_CNF_ASSOC`
- Configuration of Association #2 using `M3U_MSG_CNF_ASSOC`
- Configuration of Association #3 using `M3U_MSG_CNF_ASSOC`
- Configuration of Association #4 using `M3U_MSG_CNF_ASSOC`

For all associations set the Host to be an ASP and the peer to be an SGP.

3.5.3 Server Configuration

- Configuration of Signaling Gateway #1 using `M3U_MSG_CNF_SERVER`
- Configuration of Signaling Gateway #2 using `M3U_MSG_CNF_SERVER`

For all Servers set the Host to be an AS and the peer to be an SG. Set the server to use multiple users and specify the Module IDs of the User Parts used on the system. Also set the DAUD option to automatically synchronize routing tables. Set the default peer traffic mode to load share and the local traffic mode to load share (unless override or broadcast is required). The Point Code may be set to zero.

- Add Association #1 to Signaling Gateway #1 using `M3U_MSG_ADD_SERV_ASSOC`
- Add Association #2 to Signaling Gateway #1 using `M3U_MSG_ADD_SERV_ASSOC`

- Add Association #3 to Signaling Gateway #2 using M3U_MSG_ADD_SERV_ASSOC
- Add Association #4 to Signaling Gateway #2 using M3U_MSG_ADD_SERV_ASSOC

If The Signaling Gateway Expects a Routing Context then this is specified at this point. If not then set the option to say no routing context is being used.

3.5.4 Route Configuration

- Configuration of Route to DPC 6379 using M3U_MSG_CNF_ROUTE
- Configuration of Route to DPC 10653 using M3U_MSG_CNF_ROUTE
- Configuration of Route to DPC 1523 using M3U_MSG_CNF_ROUTE
- Configuration of Route to DPC 1524 using M3U_MSG_CNF_ROUTE

Set the Routes to loadshare between the Signaling Gateways.

- Add Route 6379 to Gateway #1 using M3U_MSG_ADD_ROUTE_SERV
- Add Route 6379 to Gateway #2 using M3U_MSG_ADD_ROUTE_SERV
- Add Route 10653 to Gateway #1 using M3U_MSG_ADD_ROUTE_SERV
- Add Route 10653 to Gateway #2 using M3U_MSG_ADD_ROUTE_SERV
- Add Route 1523 to Gateway #1 using M3U_MSG_ADD_ROUTE_SERV
- Add Route 1523 to Gateway #2 using M3U_MSG_ADD_ROUTE_SERV
- Add Route 1524 to Gateway #1 using M3U_MSG_ADD_ROUTE_SERV
- Add Route 1524 to Gateway #2 using M3U_MSG_ADD_ROUTE_SERV

Note: If the Destination Point Code of a Route is the Point Code of the Signaling Gateway itself then it may be necessary to set the option to presume the route is available as soon as the Server becomes active without receiving a DAVA message.

3.6 Connecting directly to Peer Applications

This example shows the M3UA entities configured when connecting an M3UA application Host directly to peer applications without the use of Signaling Gateways as shown in Figure 2: Connecting to Peer Applications without Signaling Gateways. This shows the M3UA Application Host being configured, two Application Servers, two SCTP Associations used to connect to each Application Server.

Note: Again this example only concerns itself with M3UA entities. It is expected that additional configuration is required for User Parts (ISUP / SCCP), SCTP and other system elements but this is beyond the scope of this example.

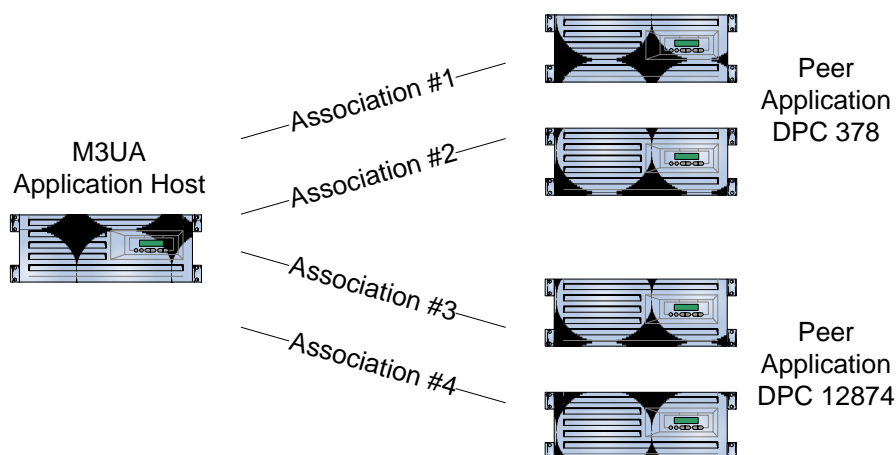


Figure 2: Connecting to Peer Applications without Signaling Gateways

This example requires the following M3UA configuration:

Note: There is no Route Configuration required.

3.6.1 System Configuration

- Configuration of Module IDs using M3U_MSG_CONFIG
- Configuration of SS7 Routing Label Format using M3U_MSG_CNF_INT_NA

In the event that default timer values require changing then this can be done at this point.

3.6.2 Association Configuration

- Configuration of Association #1 using M3U_MSG_CNF_ASSOC
- Configuration of Association #2 using M3U_MSG_CNF_ASSOC
- Configuration of Association #3 using M3U_MSG_CNF_ASSOC
- Configuration of Association #4 using M3U_MSG_CNF_ASSOC

For all associations set both the Host and Peer to be ASPs.

3.6.3 Server Configuration

- Configuration of Application Server #1 using M3U_MSG_CNF_SERVER
- Configuration of Application Server #2 using M3U_MSG_CNF_SERVER

For all Servers set both the Host and Peer to be an AS. Set the server to use multiple users and specify the Module IDs of the User Parts used on the system. The DAUD option should not be set. Set the default peer traffic mode to load share and the local traffic mode to load share (unless override or broadcast is required). The Point Codes must be set to the point code of the peer server.

- Add Association #1 to Application Server #1 using M3U_MSG_ADD_SERV_ASSOC
- Add Association #2 to Application Server #1 using M3U_MSG_ADD_SERV_ASSOC
- Add Association #3 to Application Server #2 using M3U_MSG_ADD_SERV_ASSOC
- Add Association #4 to Application Server #2 using M3U_MSG_ADD_SERV_ASSOC

If the Application Server expects a Routing Context then this is specified at this point. If not then set the option to say no routing context is being used.

4 Interface to system services

4.1 System Functions

In addition to the primitive interface and the management interface to the M3UA module (which is described in Section 6: Message Reference), the module requires a few basic system services to be supplied by the underlying operating system. This functionality is usually supplied by the appropriate Dialogic® DSI Development package.

The following functions are required for inter-task communication:

Function	Description
GCT_send	Sends a message to another task.
GCT_receive	Accepts next message from input event queue, blocking the task if no message is ready.
GCT_grab	As for GCT_receive but not blocking if no message is ready.

The following functions are required for allocation of inter-task messages:

Function	Description
getm	Allocates a message.
relm	Releases a message.

4.2 Timer Operation

In order to provide internal implementation of the M3UA protocol timers the module needs to receive a periodic timer tick message. This is provided by the tick and time processes which send a timer tick message to M3UA every 100ms.

5 External Message Definitions: SCTP

The Dialogic® DSI M3UA module is intended to interface to the Dialogic® DSI SCTP module. However it can interface with any other implementation of SCTP which satisfies the SCTP / User interface defined in the SCTP Programmer's Manual. For example this may include operating system specific SCTP implementations interfaced using the Dialogic® DSI SCTPN interface module included in the Dialogic® DSI development packages for Linux and Solaris.

The following primitives are used:

Table 1. Primitives from M3UA to SCTP

SCTP Activate association (0x728a)	Servers wait for incoming assoc / Client attempt association
SCTP Shutdown association (0x728b)	Gracefully close down association
SCTP Data transfer request (0xc280)	Transmit a data packet
SCTP Abort association (0x728c)	Initiate the abortion of an association

Table 2. Primitives from SCTP to M3UA

SCTP Status change (0x028d)	Association status change
SCTP Data transfer indication (0x8281)	Received data packet
SCTP Congestion status (0x028f)	Change in the congestion status of the association
SCTP Network status (0x028e)	Status of a network address within an association has changed

6 Message Reference

6.1 User Interface

The interface to the user application is a superset of messages defined for the MTP3 User interface. These use information in the MTP Routing Label to route messages. Additional messages allow ASP or Server Ids to be specified for routing to peer ASPs or ASs.

6.1.1 API_MSG_TX_REQ

Synopsis

Message issued by the User Part to M3UA to invoke the Message Transfer Request service.

Message Format

Message Header		
Field Name	Meaning	
type	API_MSG_TX_REQ (0xcf00)	
id	0 (Network_ID)	
src	Sending module id	
dst	M3UA module id	
rsp_req	0	
hclass	0	
status	0	
err_info	0	
len	Number of octets in MSU	
Parameter Area		
Offset	Size	Name
0	len	data

Description

This message is part of the MTP3 User interface. It is used to pass User Part Data to M3UA for routing to the network. The destination to which the message is sent will depend on the DPC in the MTP Routing Label, previously configured routes and the network state,

Parameters

Network_ID

When used on an ASP or IPSP configuration, this field must be set to Zero..

data

MSU data in binary format commencing with the Service Indicator Octet (SIO) and Routing Label.

6.1.2 API_MSG_RX_IND**Synopsis**

Message issued to the User Part by M3UA to indicate reception of a Message Signal Unit.

Message Format

Message Header		
Field Name	Meaning	
type	API_MSG_RX_IND (0x8f01)	
id	0 (Network_ID)	
src	M3UA module id	
dst	User Part module id	
rsp_req	0	
hclass	0	
status	0	
err_info	0	
len	Number of octets in MSU	
Parameter Area		
Offset	Size	Name
0	len	data

Description

This message is sent to an M3UA User when a data packet has been received. It is locally distributed based on the MTP SI.

Parameters**Network_ID**

On an ASP or IPSP configuration this is set to Zero. The ID field identifies which Network the message is associated with.

data

MSU data in binary format commencing with the Service Indicator Octet (SIO) and Routing Label.

6.1.3 MTP_MSG_PAUSE

Synopsis

Message issued to the User Part by M3UA to indicate the total inability of providing MTP service to the specified destination.

Message Format

Message Header		
Field Name	Meaning	
type	MTP_MSG_PAUSE (0x8403)	
id	User Part Reference	
src	M3UA module id	
dst	User Part module id	
rsp_req	0	
hclass	0	
status	0	
err_info	0	
len	4	
Parameter Area		
Offset	Size	Name
0	4	dpc

Parameters

dpc

Destination Point Code of the affected signaling point.

6.1.4 MTP_MSG_RESUME

Synopsis

Message issued to the User Part by M3UA to indicate to the user the ability of providing MTP service to the specified destination.

Message Format

Message Header	
Field Name	Meaning
type	MTP_MSG_RESUME (0x8404)
id	User Part Reference
src	M3UA module id
dst	User Part module id
rsp_req	0

Message Header		
hclass	0	
status	0	
err_info	0	
len	4	
Parameter Area		
Offset	Size	Name
0	4	dpc

Parameters**dpc**

Destination Point Code of the affected signaling point.

6.1.5 MTP_MSG_STATUS**Synopsis**

Message issued to the User Part by M3UA to indicate to the user the partial inability of providing MTP service to the specified destination.

Message Format

Message Header		
Field Name	Meaning	
type	MTP_MSG_STATUS (0x8405)	
id	User Part Reference	
src	M3UA module id	
dst	User Part module id	
rsp_req	0	
hclass	0	
status	One of the following * 1 = Remote User Availability * 2 = Signaling Network Congestion	
err_info	0	
len	6 or 8	
Parameter Area		
Offset	Size	Name
0	4	Affected destination point code

Parameter Area		
Offset	Size	Name
4	2	<p>Congestion Status (if status = 0x02).</p> <p>This field is set to the current congestion level in the range 0 to 3, where 0 means no congestion and 3 means maximum congestion.</p> <p>Many networks use only a single level of congestion (that is, 1).</p>
6	2	<p>Unavailability cause (if status = Remote User Unavailable(1))</p> <p>The unavailability cause may be one of the following:</p> <ul style="list-style-type: none">0 = Unknown1 = Unequipped User2 = Inaccessible User

6.2 Management Interface

All primitives at the M3UA / management interface are passed by sending messages between the modules. Primitives generated by the M3UA module are sent to the management module specified in the M3U_MSG_CONFIG message.

If the sending module's `rsp_req` bit is set, then the M3UA module confirms receipt of the message by clearing the `REQUEST` bit in the message type and sending the message back to the module identified in the `src` field of the message header (For further information see [5]).

6.2.1 ASP UP Request

Synopsis

Sent by Layer Management to start ASP UP procedures.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_ASP_UP_REQ (0x72d4)	
id	Association ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	2	
Parameter Area		
Offset	Size	Name
0	2	options

Description

Used by layer management to request M3UA bring the ASP UP. On reception of this message M3UA will generate an M3UA ASPSM UP request to the peer. The peer can respond with an ASPSM UP ack after which M3UA will send an M3U_MSG_ASP_UP_CON message to Layer Management.

If the peer does not respond before the 'acknowledgement' timer `T(ack)` expires then M3UA will either send an M3U_MSG_ASP_UP_CON message with a non-zero status, or if the 'Auto' flag is set resend the ASPSM UP request to the peer and restart `T(ack)`.

Parameters

Options

Option	Value	Description
M3UOP_ASP_UP_AUTO	0x0001	Request M3UA to automatically bring up the ASP and generate ASPSM UP messages

6.2.2 ASP DOWN Request**Synopsis**

Sent by Layer Management to start ASP DOWN procedures.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_ASP_DOWN_REQ (0x72d7)
id	Association ID
src	Management Entity
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Non zero on error
err_info	0
len	2

Description

Used by Layer Management to request M3UA take the ASP DOWN. On reception of this M3UA will send an ASPSM DOWN request to the peer and starts the acknowledgement timer T(ack). On reception of an ASPSM DOWN ack message from the peer a M3U_MSG_ASP_DOWN_CON message is sent to Layer Management and T(ack) is stopped.

If T(ack) expires then an M3U_MSG_ASP_DOWN_CON message is sent with a non-zero status value, or if the AUTO flag is set, will resend ASPSM DOWN and restart T(ack).

If the AUTO flag has been set then M3UA will reject peer requests to bring the ASP UP. If the AUTO flag is not set then M3UA will automatically accept peer requests to bring the ASP UP.

Parameters

Options

Option	Value	Description
M3UOP_ASP_DOWN_AUTO	0x0001	Request M3UA to automatically maintain the ASP in state DOWN

6.2.3 ASP ACT Request

Synopsis

Sent by Layer Management to initiate AS Activation procedures for a specific association. Once the ASP is active traffic can be sent across it.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_ASP_ACT_REQ (0x72da)	
id	Association ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	134	
Parameter Area		
Offset	Size	Name
0	1	options
1	1	tr_mode
2	4	num_rc
6	128	route_ctxt

Description

On reception of this message M3UA will send an ASPTM Activate Req to the peer and start the acknowledgement timer T(ack). On reception of an ASPTM Activate Ack from the peer an M3U_MSG_LM_ASP_ACT_CON message is sent to Layer Management and T(ack) is stopped.

If T(ack) expires then an M3U_MSG_LM_ASP_ACT_CON message is sent to Layer Management with a non-zero status, or if the AUTO activate option is set M3UA will resend ASPTM Activate Req and restart T(ack).

Note: the parameters `tr_mode`, `num_rc` and `route_ctxt` are optional and not intended for use by new applications. The traffic mode and routing context used in the ASPTM Activate Req are those previously configured in the Server configuration message `M3U_MSG_CNF_SERVER`.

Parameters

Association ID

The Association ID of the SGP to become Active on.

options

Option	Value	Description
<code>ASP_ACT_REQ_OPT_AUTO</code>	0x01	Request M3UA to automatically maintain the ASP in state ACTIVE

`tr_mode`

Traffic mode in which the AS will attempt to activate.

If the traffic mode is set to `M3U_TRAFFIC_DEFAULT`, the ASP will attempt to activate in either the default mode of the server or in a mode compatible with the currently active ASPs within the server.

Mnemonic	Value	Usage
<code>M3U_TRAFFIC_DEFAULT</code>	0x0000	Activate ASP in the servers currently active traffic mode
<code>M3U_TRAFFIC_OVERRIDE</code>	0x0001	Override
<code>M3U_TRAFFIC_LOADSHARE</code>	0x0002	Loadshare
<code>M3U_TRAFFIC_BROADCAST</code>	0x0003	Broadcast

`num_rc`

Number of routing contexts included in the message. This is an optional parameter. If no routing contexts are included, then the routing context for the first server configured on this association will be used if present; otherwise, no routing context will be used.

`route_ctxt`

Up to 32 32-bit routing contexts may be included in the message.

6.2.4 ASP INACT Request

Synopsis

Sent by Layer Management to initiate Deactivation Procedures for a specific association. Once the ASP is INACTIVE it can no longer carry User Data.

Message Format

Message Header	
Field Name	Meaning
type	<code>M3U_MSG_ASP_INACT_REQ</code> (0x72dd)

Message Header		
id	Association ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	132	
Parameter Area		
Offset	Size	Name
0	2	Options
2	2	num_rc
4	128	route_ctxt

Description

On reception of this message M3UA will send an M3UA ASPTM INACTIVE Req message to the peer and start the acknowledgement timer T(ack). On reception of an ASPTM INACTIVE Ack from the peer an M3U_MSG_LM_ASP_INACT_CON message is sent to Layer Management and T(ack) is stopped.

If T(ack) expires then an M3U_MSG_LM_ASP_INACT_CON message is sent to Layer Management with a non-zero status, or if the AUTO activate option is set M3UA will resend ASPTM INACTIVE Req and restart T(ack).

Note: the parameters num_rc and route_ctxt are optional and not intended for use by new applications. The routing context used in the ASPTM INACTIVE Req are those previously configured in the Server configuration message M3U_MSG_CNF_SERVER.

Parameters

Association ID

The ID of the association between the ASP and SGP.

options

Option	Value	Description
ASP_INACT_REQ_OPT_AUTO	0x01	Request M3UA to automatically maintain the ASP in state INACTIVE

num_rc

Number of routing contexts included in the message.

route_ctxt

Up to 32 32-bit routing contexts may be included in the message.

6.2.5 SS7 Signaling Network Management Event Request

Synopsis

This message is used to request the transmission of an M3UA signaling network management message, DAVA, DUNA, DAUD or DRST.

Note: M3UA will automatically generate DAUD messages meaning it is not expected this message will be needed on an ASP system.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_SSNM_EVENT (0xc2e5)	
id	Event type	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	74	
Parameter Area		
Offset	Size	Name
0	2	options
2	2	serv_id
4	2	network_id
6	2	num_pc
8	64	pc_start
72	2	ass_id

Description

This message causes an M3UA SSNM message to be generated. There MUST be at least 1 point code specified within the message and all point codes are supplied with an 8bit mask field as described in the M3UA RFC. The message can be sent to a specific ASP / SGP using the Association ID or an AS or SG using the Server ID.

Parameters**Event type**

Indicates the type of the event to send to the peer.

Value	Description
M3U_SSNM_EVT_DUNA (0x0000)	Destination Unavailable
M3U_SSNM_EVT_DAVA (0x0001)	Destination Available
M3U_SSNM_EVT_DAUD (0x0002)	Destination State Audit
M3U_SSNM_EVT_DRST (0x0003)	Destination Restricted

Options

Optional parameters present bitmask (see below).

Value	Description
M3U_SSNM_OPT_SERV_ID_PRESENT (0x0001)	Server ID present
M3U_SSNM_OPT_ASS_ID_PRESENT (0x0008)	Association ID present

serv_id

Optional Server ID affected by the event.

Network_id

Network id of the following point codes.

num_pc

Number of valid point codes to follow.

pc_start

Upto 16 32bit point codes including the M3UA 'mask' field.

ass_id

Optional association ID affected by the event.

6.2.6 SS7 Network Congestion State**Synopsis**

This message causes M3UA to generate an SS7 network congestion state message.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_SSNM_SCON (0xc2e6)
id	0
src	Management Entity

Message Header		
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	82	
Parameter Area		
Offset	Size	Name
0	2	options
2	2	serv_id
4	2	Network_id
6	4	congestion
10	2	num_apc
12	64	apc_start
76	4	cpc
80	2	ass_id

Description

This message results in a signaling congestion message (SCON) being sent from an ASP. If used on an ASP, then similarly messages are sent to either a specific SG or to all. The message can identify up to 16 Point Codes that are congested.

The affected point codes are all supplied with an 8 bit point code mask field as described in the M3UA RFC.

Parameters

options

Optional parameters present bitmask (see below).

Value	Description
M3U_SSNM_OPT_SERV_ID_PRES (0x0001)	Server ID present
M3U_SSNM_OPT_CONG_PRES (0x0002)	Congestion parameter present
M3U_SSNM_OPT_CPC_PRES (0x0004)	Concerned point codes present
M3U_SSNM_OPT_ASS_ID_PRES (0x0008)	Association ID present

serv_id

Server ID affected.

Network_id

Network id the affected Point Codes belong to.

congestion

Network congestion level.

Value	Description
0	No congestion or undefined
1	Congestion Level 1
2	Congestion Level 2
3	Congestion Level 3

num_apc

Number of valid Affected Point Codes to follow.

apc_start

Affected Point Code. This field identifies the Point Codes that have become congested. Up to 16 32bit point codes may be identified each including the M3UA 'mask' field.

cpc

Concerned Point Code. When sent from an ASP this identifies the Point Code of the originator of the event.

6.2.7 Activate Association

Synopsis

Sent to the M3UA module to activate an SCTP association to a peer.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_ACT_ASSOC (0x72ce)
id	Association ID
src	Originating module
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Non zero on error
err_info	0
len	0

Description

This causes M3UA to send an SCTP Activate Association message to SCTP and to wait for SCTP to establish the association. Initially M3UA will send an M3U_MSG_ASS_STATUS_IND message with status 'M3U_ASS_STATUS_DOWN' and if the Association succeeds in being activated another indication with status 'M3U_ASS_STATUS_UP' will be sent.

M3UA will continue to retry to activate the association until it succeeds or until it receives an M3U_MSG_DEACT_ASSOC request or M3U_MSG_DEACTIVATE request.

Parameters

Association ID

The logical ID of the concerned Association.

6.2.8 Deactivate Association

Synopsis

Sent to the M3UA module to deactivate an association.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_DEACT_ASSOC (0x72cf)	
id	Association ID	
src	Originating module	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	2	
Parameter Area		
Offset	Size	Name
0	2	options

Description

Causes the SCTP association to be closed down and to enter the deactivated state.

Graceful deactivation utilizes the SCTP shutdown primitive so all outstanding data between the host and peer must be acknowledged before the association can be shutdown. Thus the notification of deactivation provided by the M3U_ASS_STATUS_IND message with a status of deactivated, may be delayed due to network conditions.

Immediate deactivation utilizes the SCTP abort primitive, so all outstanding data between the host and peer is lost. The user **MUST** still wait for a status change message to be received before assuming the association has been deactivated.

Due to the underlying transport mechanism, between the time the user sends this message and the returning M3U_ASS_STATUS_IND message, data from the peer may still be received.

Parameters

The logical ID of the concerned Association.

Options

Value	Description
M3UOP_DEACT_IMMEDIATE (0x0001)	Abort association as opposed to the default to shutdown

6.2.9 M3U_MSG_ACTIVATE Request

Synopsis

One shot message to activate an Association, bring the ASP UP across the Association and activate the AS across the Association. This command will also set the ASP and AS AUTO Activate options causing the ASP and AS to return to an Active state following network failures.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_ACTIVATE (0x72f5)
id	Association ID
src	Management Entity
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Non zero on error
err_info	0
len	0

6.2.10 M3U_MSG_DEACTIVATE Request

Synopsis

One shot message sent to the M3UA module to deactivate an SCTP association and clear the ASP and AS Auto Activate flags.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_DEACTIVATE (0x72f8)
id	Association ID
src	Management Entity
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Non zero on error
err_info	0
len	0

6.2.11 ASP UP Indication**Synopsis**

Indicates that the peer ASP specified by the association id is UP.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_ASP_UP_IND (0x02d5)
id	Association ID
src	M3U Module
dst	Management Module
rsp_req	0
hclass	0
status	Non zero on error
err_info	0
len	0

Description

Sent by the M3UA module to indicate the peer ASP is UP. When UP M3UA peers can exchange management messages.

Parameters**Association ID**

The logical ID of the concerned Association.

6.2.12 ASP UP Confirmation

Synopsis

ASP Up confirmation received from peer ASP.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_ASP_UP_CON (0x02d6)
id	Association ID
src	M3U Module
dst	Management Module
rsp_req	0
hclass	0
status	Non zero on error
err_info	0
len	0

Description

Sent by the M3UA module to indicate the peer ASP has confirmed the local M3UA has change to the UP State. If the status field is non-zero then the ASP UP Request has been rejected by the peer or T(ack) has expired.

Parameters

Association ID

The logical ID of the concerned Association.

6.2.13 ASP DOWN Indication

Synopsis

Peer ASP is now DOWN.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_ASP_DOWN_IND (0x02d8)
id	Association ID
src	M3U Module
dst	Management Module
rsp_req	0

Message Header	
hclass	0
status	Non zero on error
err_info	0
len	0

Description

Sent by the M3UA module to indicate the peer ASP is now DOWN.

Parameters**Association ID**

The logical ID of the concerned Association.

6.2.14 ASP DOWN Confirmation

Synopsis

Peer ASP has confirmed the local M3UA is now DOWN.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_ASP_DOWN_CON (0x02d9)
id	Association ID
src	M3U Module
dst	Management Module
rsp_req	0
hclass	0
status	Non zero on error
err_info	0
len	0

Description

Sent by the M3UA module to indicate the peer ASP has confirmed the local M3UA is now DOWN. If the status field is non-zero then the ASP DOWN Request has been rejected by the peer or T(ack) has expired.

Parameters**Association ID**

The logical ID of the concerned Association.

6.2.15 ASP ACT Indication

Synopsis

This message indicates a peer ASP has asked for an AS to become active and that the AS is now available to receive Data.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_ASP_ACT_IND (0x02db)	
id	Association ID	
src	M3U Module	
dst	Management Module	
rsp_req	0	
hclass	0	
status	Non zero on error	
err_info	0	
len	4	
Parameter Area		
Offset	Size	Name
0	2	server_id
2	2	tr_mode

Description

This message is sent once for every server that has become active.

Parameters

Association ID

The logical ID of the concerned Association.

server_id

The logical ID of the Server that has become Active.

tr_mode

Indicates the traffic mode of the newly activated AS.

Value	Description
M3U_TRAFFIC_OVERRIDE (0x0001)	Override
M3U_TRAFFIC_LOADSHARE (0x0002)	Loadshare
M3U_TRAFFIC_BROADCAST (0x0004)	Broadcast

6.2.16 ASP ACT Confirmation

Synopsis

This message indicates the peer has responded to our request for the Application server process to be made active.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_ASP_ACT_CON (0x02dc)	
id	Association ID	
src	M3U Module	
dst	Management Module	
rsp_req	0	
hclass	0	
status	Non zero on error	
err_info	0	
len	4	
Parameter Area		
Offset	Size	Name
0	2	server_id
2	2	tr_mode

Description

This message is sent once for every server ID that has become active. If the status field is non-zero then the ASP ACT Request has been rejected by the peer or T(ack) has expired.

Parameters

Association ID

The logical ID of the concerned Association.

server_id

The Logical ID of the Server that has become Active.

tr_mode

Indicates the traffic mode of the newly activated AS.

Value	Description
M3U_TRAFFIC_OVERRIDE (0x0001)	Override
M3U_TRAFFIC_LOADSHARE (0x0002)	Loadshare
M3U_TRAFFIC_BROADCAST (0x0004)	Broadcast

6.2.17 ASP INACT Indication

Synopsis

This message indicates the peer ASP has asked for an Application Server process to be made inactive.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_ASP_INACT_IND (0x02de)	
id	Association ID	
src	M3U Module	
dst	Management Module	
rsp_req	0	
hclass	0	
status	Non zero on error	
err_info	0	
len	2	
Parameter Area		
Offset	Size	Name
0	2	server_id

Description

This message is sent once for every server ID that has become inactive.

Parameters

Association ID

The logical ID of the concerned Association.

server_id

Server affected by the deactivation of the ASP.

6.2.18 ASP INACT Confirmation

Synopsis

This message indicates the peer has responded to the request for the Application Server process to be made inactive.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_ASP_INACT_CON (0x02df)	
id	Association ID	
src	M3U Module	
dst	Management Module	
rsp_req	0	
hclass	0	
status	Non zero on error	
err_info	0	
len	2	
Parameter Area		
Offset	Size	Name
0	2	server_id

Description

This message is sent once for every server ID that has become inactive. If the status field is non-zero then the ASP INACT Request has been rejected by the peer or T(ack) has expired.

Parameters**Association ID**

The logical ID of the concerned Association.

server_id

Server affected by the deactivation of the ASP.

6.2.19 AS ACT Indication**Synopsis**

Indicates an Application server has become active.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_AS_ACT_IND (0x02e0)
id	Server ID
src	M3U Module
dst	Management Module

Message Header		
rsp_req		0
hclass		0
status		status
err_info		0
len		2
Parameter Area		
Offset	Size	Name
0	2	tr_mode

Description

Generated by M3UA whenever the Server moves from the inactive to the active state.

Parameters**server ID**

The logical ID of the Server.

status

Indicates the current status of the server with respect to the number of ASPs currently active within the server.

Value	Description
M3U_AS_STATUS_ACTIVE (0x00)	AS is active
M3U_AS_STATUS_ACTIVE_INSUFF_ASP (0x01)	AS has activated but has an insufficient number of ASPs currently available

tr_mode

Indicates the traffic mode under which that the server is currently working.

Value	Description
M3U_TRAFFIC_OVERRIDE (0x0001)	Override
M3U_TRAFFIC_LOADSHARE (0x0002)	Loadshare
M3U_TRAFFIC_BROADCAST (0x0004)	Broadcast

6.2.20 AS INACT Indication**Synopsis**

This message indicates an Application server has become inactive.

Message Format

Message Header	
Field Name	Meaning
Type	M3U_MSG_AS_INACT_IND (0x02e1)
Id	Server ID
Src	M3U Module
Dst	Management Module
rsp_req	0
Hclass	0
Status	Non zero on error
err_info	0
Len	0

Description

Received by the management entity whenever the peer AS moves to the inactive state.

Parameters

None

6.2.21 Association Status Indication**Synopsis**

Indicates the status of an Association has changed.

Message Format

Message Header	
Field Name	Meaning
Type	M3U_MSG_ASS_STATUS_IND (0x02e2)
Id	Association ID
Src	M3U Module
Dst	Management Module
rsp_req	0
Hclass	0
Status	Association status (see below)
err_info	0
Len	0

Description

Generated by M3UA when the Association changes state. M3UA receives status updates from SCTP which triggers a status update from M3UA to the Management Module.

Parameters**status**

Current status of the association.

Value	Description
M3U_ASS_STATUS_DEACTIVATED (0x01)	Association is deactivated
M3U_ASS_STATUS_UP (0x02)	Association is up
M3U_ASS_STATUS_DOWN (0x03)	Association is down
M3U_ASS_STATUS_CONG_ABATE (0x04)	Association has stopped experiencing congestion
M3U_ASS_STATUS_CONG_ONSET (0x05)	Association is experiencing congestion
M3U_ASS_STATUS_CONG_DISCARD (0x06)	Association is experienced extreme congestion

6.2.22**Route Status Indication****Synopsis**

Indicates the status of a Route has changed.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_ROUTE_STATUS_IND (0x02e3)	
id	Route ID	
src	M3U Module	
dst	Management Module	
rsp_req	0	
hclass	0	
status	Route status (see below)	
err_info	0	
len	6	
Parameter Area		
Offset	Size	Name
0	2	0 (network_id)
2	4	point_code

Description

The message provides an update following a change of route state. The new route status is indicated by the status field.

Note: Route Status indications are only provided for Destination Point Codes configured with the M3U_MSG_CFG_ROUTE command. The status of Destination Point Codes configured with the M3U_MSG_CFG_SERVER command is indicated using the AS ACT and INACT messages.

Parameters**Status**

Current status of the route.

Value	Description
M3U_ROUTE_UNAVAILABLE (0x00)	Route is unavailable
M3U_ROUTE_AVAILABLE (0x01)	Route is available
M3U_ROUTE_CONGESTED (0x02)	Route is available but currently congested
M3U_ROUTE_RESTRICTED (0x03)	Route is available but restricted

Network_id

The Logical Network ID that the Route belongs to.

point_code

Destination Point Code of the route.

6.3 Non-primitive Interface

In addition to protocol primitives defined for the M3UA to User Part interface and the M3UA to Layer Management interface, the M3UA module supports a non-primitive interface for configuration and management.

The non-primitive interface is used to by the user for configuration and diagnostic purposes and to allow M3UA to report protocol based and software error events to the local system management module.

This section describes the formats of all the messages used in the non-primitive interface.

When sending layer management requests to M3UA, the user should ensure that the message is sent to the correct **module_id**. The default **module_id** for M3UA is **M3UA_TASK_ID** (0xd2). However, host-based M3UA is capable of running at different module IDs. The user should ensure that the correct M3UA module ID is written to the **hdr->dst** field of the message.

Care should be taken to correctly populate the **hdr->id** field as different messages require different parameters.

The **hdr->rsp_req** field may optionally be used to request a confirmation. If requested, the M3UA module confirms acceptance of the primitive by sending the message back to its originator with bit 14 cleared in the type field of the message. This mechanism is described in detail in the *Software Environment Programmer's Manual*. Messages intended to read back information from M3UA must use this mechanism, otherwise M3UA will not respond to the request.

When the M3UA module returns a confirmation message containing a status value, the status will be one of the following:

Table 3. Status return code

Mnemonic	Value	Description
NONE	0x00	Success
M3UE_BAD_ID	0x81	Inappropriate or invalid id in request message
M3UE_BAD_MSG	0x85	Inappropriate or unrecognized message type.
M3UE_BAD_PARAM	0x86	Invalid parameters contained in message.
M3UE_BAD_TYPE	0x87	Invalid configuration option selected.
M3UE_LIC_ERR	0x88	No license found or license capabilities exceeded

6.3.1 Configure M3UA Module

Synopsis

Sent to the M3UA module to configure global parameters.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_CONFIG (0x72c0)	
id	0	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	9 or 15	
Parameter Area		
Offset	Size	Name
0	1	mn_mod_id
1	1	trace_mod_id
2	1	maint_mod_id
3	2	max_assocs
5	2	max_servers
7	2	max_routes
9	2	max_throughput (optional)
11	4	func options (optional)

Description

This message should be the first message sent to the module.

Parameters**mn_mod_id**

Module ID for the Management Module.

trace_mod_id

Module ID for the Trace Module.

maint_mod_id

Module ID for the Maintenance Module.

max_assocs

Maximum number of Associations the module will be required to handle.

max_servers

Maximum number of Servers the module will be required to handle.

max_routes

Maximum number of Routes the module will be required to handle.

max_throughput

Maximum throughput required

func_options

Subject to licensing capabilities, this parameter is used to enable the IPSP or Signaling Gateway functionality in the M3UA module or to fine tune the behavior of the M3UA load-sharing feature.

Option	Description
M3UA_IPSP_ENABLED (0x00000001)	Enable IPSP functionality
M3UA_SGW_ENABLED (0x00000002)	Enable Signaling Gateway functionality
M3UA_SG_LSH_BIT (0x00000004)	Select the lowest bit of the SLS value to determine which Signaling Gateway to route traffic to. If not set, the highest bit of the SLS value is used.
M3UA_NO_STREAM_LSH (0x00000008)	By default, data traffic is load-shared across the SCTP streams based on the SLS value. When set, this option forces the M3UA module to use only stream 1 for transmitting data.

6.3.2 Configure M3UA Association

Synopsis

Sent to the M3UA module to configure an Association.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_CNF_ASSOC (0x72c1)	
id	Association ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	13	
Parameter Area		
Offset	Size	Name
0	2	options

Parameter Area		
Offset	Size	Name
2	2	sctp_ass_id
4	2	sctp_ass_inst
6	1	sctp_mod_id
7	2	def_net_id
9	4	asp_id

Description

This message is used in conjunction with SCTPs association configuration message to configure M3UA with an association to an IPSP or SG. This includes details about the SCTP Association ID to use with SCTP for this association and optionally the M3UA asp_id used by M3UA in communication with the peer.

Parameters

options

Options for the association.

Option	Description
M3UOP_ASSOC_SGP_TO_ASP (0x0001)	Association is on a SGP connect to an ASP.
M3UOP_ASSOC_ASP_TO_SGP (0x0002)	Association is on an ASP connected to an SGP.
M3UOP_ASSOC_ASP_TO_ASP (0x0003)	Association is on an ASP connected to an ASP (IPSP)
M3UOP_ASSOC_RSP_STATUS (0x0004)	User parts require RSP Status messages
M3UOP_ASSOC_INT_NA_PRESENT (0x0008)	Default Network ID present
M3UOP_ASSOC_ASP_ID (0x0010)	Optional ASP ID present
M3UOP_ASSOC_AUTO_ACT (0x0020)	Automatically activate association
M3UOP_ASSOC_BEAT_TX (0x0040)	Enable M3UA Heartbeats for this association
M3UOP_ASSOC_SNMP (0x0080)	Enable SNMP indications for this association

sctp_ass_id

Logical ID of the Association used by this ASP or SGP.

Sctp_ass_inst

SCTP instance number for the association used by the ASP or SGP.

Sctp_mod_id

SCTP module ID for the association used by the ASP or SGP.

Def_net_id

Default Network ID to pass to the user if a Data Message is received from a peer without explicitly stating to which Server it belongs.

Asp_id

Optional ASP identifier.

6.3.3 Configure M3UA Server

Synopsis

Sent to the M3UA module to configure a new Server entity.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_CNF_SERVER (0x72c2)	
id	Server ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	32	
Parameter Area		
Offset	Size	Name
0	2	options
2	2	Network id
4	4	pc
8	2	def_tr_mode
10	2	tr_mode
12	2	num_asp
14	16	user_mod_ids
30	2	lcl_tr_mode

Description

This command configures M3UA with a new Server, either a peer SG or IPSP. When configuring an SG the PC is optional though may be used to record the local Point Code. If the peer is an AS then the PC is used for routing messages to the Server.

Parameters**options**

Options for the server.

Option	Description
M3UOP_SERVER_PEER_AS (0x0001)	The peer is an Application Server (default is Signalling Gateway)
M3UOP_SERVER_HOST_AS (0x0002)	The local host is an Application Server (default is Signalling Gateway)
M3UOP_SERVER_AS_STATUS (0x0004)	Generate M3U_PAUSE / RESUME messages informing M3UA users of Server state changes.
M3UOP_SERVER_SPMC_ALL (0x0008)	SPMC is marked down if any ASP is inactive
M3UOP_SERVER_MULTIPLE_USERS (0x0010)	Server routes data based on SI
M3UOP_SERVER_DAUD (0x0020)	DAUD messages are generated and transmitted to this remote Signaling Gateway
M3UOP_SERVER_SNMP (0x0040)	Enable SNMP indications for the RAS (IPSP mode only)

Network_id

Logical Network ID for the server.

PC

Point Code for the server – only used if the M3UOP_SERVER_PEER_AS option is set.

def_tr_mode

Default traffic mode for routing messages to the peer. This will be used if an explicit traffic mode has not been requested by the peer during activation in the ASPTM ACT REQ message.

tr_mode

Permitted peer traffic modes. This defines which traffic modes will be permitted in ASPTM ACT REQ messages received from the peer.

Value	Description
M3U_TRAFFIC_OVERRIDE (0x0001)	Override
M3U_TRAFFIC_LOADSHARE (0x0002)	Loadshare
M3U_TRAFFIC_BROADCAST (0x0004)	Broadcast

num_asp

Number of ASPs the AS must be simultaneously registered as Active on for normal operation. If the number of ASPs falls below this number M3UA will Notify other ASPs with the expectation an INACTIVE ASP may then choose to become ACTIVE.

user_mod_ids

User Part module IDs. If multiple User Parts are not required, all data is sent to the User Part identified by the first user module ID.

Lcl_tr_mode

The traffic mode M3UA uses in ASPTM ACTIVE REQ messages sent to it's peer. This tells the peer how it should route messages back to this server. This parameter is only used if the M3UOP_SERVER_HOST_AS option is set.

Value	Description
M3U_TRAFFIC_OVERRIDE (0x0001)	Override
M3U_TRAFFIC_LOADSHARE (0x0002)	Loadshare
M3U_TRAFFIC_BROADCAST (0x0004)	Broadcast

6.3.4 Configure M3UA Route

Synopsis

Sent to the M3UA module to configure a Destination Point Code that messages will be routed to.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_CNF_ROUTE (0x72c3)	
id	Route ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	8	
Parameter Area		
Offset	Size	Name
0	2	options
2	4	dpc
6	2	network_ID

Description

Issued by the management entity to configure a route to a specific point code. The format of the point code is inferred by the Network ID.

Once the route has been configured with a Point Code, it can be added to a Signaling Gateway server to indicate messages for the point code can be reached via the server.

Parameters**options**

Options for the route.

Option	Description
M3UOP_ROUTE_ASSUME_AVAIL (0x0001)	Route is assumed to be available
M3UOP_ROUTE_LOADSHARE (0x0002)	Route load-shares between all server in the route
M3UOP_ROUTE_DEFAULT (0x0004)	Route used as Default Route if no explicit Route found for a Point Code.
M3UOP_ROUTE_SNMP (0x0008)	Enable SNMP indications for this route

dpc

Destination point code associated with the route.

network_id

Logical Network ID the Destination Point Code is in.

6.3.5 Configure Network ID

Synopsis

Declares a new Network with Network ID, Point Code format and Options.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_CNF_INT_NA (0x72c4)
id	Network_ID
src	Management Entity
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Non zero on error
err_info	0
len	4

Parameter Area		
Offset	Size	Name
0	2	pc_format
2	2	options

Description

Message used to declare an MTP Network to which M3UA will be interfacing.

Parameters**Network_ID**

Logical Identifier used in other messages to identify this Network. On an ASP or IPSP, this must be set to Zero.

pc_format

Point code format.

Option	Description
M3U_ITU_14 (0x0000)	ITU-14 format routing label
M3U_ANSI_24 (0x0001)	ANSI-24 format routing label
M3U_ITU_24 (0x0002)	ITU-24 format routing label
M3U_ITU_16 (0x0003)	ITU-16 format routing label

Options

Option	Description
M3U_INT_NA_OPT_SLS_ROTATION (0x0001)	Enable SLS bit rotation
M3U_INT_NA_OPT_SLS_ROT8 (0x0002)	Enable 8-bit rotation (ANSI only) when combined with bit 0 above

6.3.6 Add Server to an Association

Synopsis

Declares an ASP or SGP that an AS or SG can run on.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_ADD_SERV_ASSOC (0x72c5)
id	Association ID
src	Management Entity
dst	M3U Module
rsp_req	Used to request a confirmation

Message Header		
hclass	0	
status	Non zero on error	
err_info	0	
len	10	
Parameter Area		
Offset	Size	Name
0	2	srv_id
2	4	route_ctxt
6	4	options

Description

This message may be used to configure which associations belong to which SGs or IPSP. A peer SG or IPSP may be distributed over a number of Associations and this message performs the mapping.

Before this message can be used, both the Server and Association must have been successfully configured.

Parameters**Association ID**

The Logical ID of the Association used to communicate with the ASP or SGP.

srv_id

The Logical ID of the AS or SG that will run on the ASP or SGP.

route_ctxt

M3UA Routing Context used by M3UA peers to identify a particular AS. If either M3UOP_SERV_ASSOC_NO_RC or M3UOP_SERV_ASSOC_FORCE_NO_RC options are set then the value used here will have no effect on the system.

Note: If no Routing Context is specified in this message, then one may still be specified and used in the M3U_MSG_ASP_ACT_REQ message at run time.

options

Mnemonic	Value	Description
M3UOP_SERV_ASSOC_NO_RC	0x0001	No Routing Context is configured for use for this AS on this Association.
M3UOP_SERV_ASSOC_FORCE_NO_RC	0x0002	No Routing Context is configured for this AS on this Association and any Routing Context included in the ASP_ACT_REQ should be ignored.

6.3.7 Add Route to a Server.

Synopsis

Identify an SG that a previously configured Route may use to forward messages.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_ADD_ROUTE_SERV (0x72c6)	
id	Server ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	6	
Parameter Area		
Offset	Size	Name
0	2	route_id
2	4	options

Description

Send to the M3UA module by the management entity to add a Signaling Gateway to the list of SGs that can be used to routing messages to a particular Destination Point Code.

The Route identified by the route ID must have previously been configured.

Parameters

server_id

The Logical ID of the SG that is to be added to the route.

route_id

The Logical ID of the Route that is to have the SG added to the list of SGs it can use.

Options

Mnemonic	Value	Description
M3UOP_ROUTE_SERV_ASSUME_AVAIL	0x0001	Once the Server is available presume the Route is available via the server.

6.3.8 Map Network ID to Network Appearance

Synopsis

Create a mapping between Network ID and M3UA Network Appearance.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_MAP_NA (0x72c7)	
id	Association ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	6	
Parameter Area		
Offset	Size	Name
0	2	Network ID
2	4	NA

Description

M3UA can use SCTP Associations to carry messages for multiple Networks. Peer M3UAs communicate which Network a message pertains to by using the Network Appearance (NA) Parameter. The scope of a NA does not extend beyond a particular Association.

This message is used by Layer Management to configure a mapping between a Network ID and a Network Appearance to be used on a particular Association.

If an Association only handles messages for one Network, then the use of NAs is optional and M3UA peers can be configured with a default Network ID to use with messages from this Association. If M3UA is unable to find an appropriate mapping for a message, then no Network Appearance parameter is used.

Parameters

Association ID

Logical ID of the Association this mapping applies to.

Network ID

Logical ID of the Network to be mapped.

Network Appearance

Network Appearance used between ASP and SGP to refer to the Network.

6.3.9 M3UA Timer Configuration Message

Synopsis

This message is used to configure the M3UA timer values to values other than their default values. The new timer values take effect when the timer is next started.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_CNF_TIMERS (0x72fc)	
id	0	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	0	
err_info	0	
len	10	
Parameter Area		
Offset	Size	Name
0	2	Ack – T(ack)
2	2	Recovery – T(r)
4	2	Daud – T(daud)
6	2	Heartbeat – T(beat)
8	2	Daud_cong

Parameters

Ack

The acknowledgement timer, T(ack), in the M3UA specification is used by the ASP and AS state machines to wait for a response from the peer.

Recovery

The recovery timer, T(r), offers a period of time for inactive ASPs to become active in the event of another ASP becoming inactive before making the AS inactive.

Daud

The Daud timer is used when periodically polling the signalling gateway routing table by generating a Destination Audit message (DAUD).

Heartbeat

Optional heartbeat, sent every T(beat) seconds if enabled.

Daud_cong

The Daud_cong timer is used in the same way as the Daud timer above, except it has a shorter duration and is used when a destination is congested (i.e. following the reception of SCON).

Default values and permitted ranges are shown below. Specifying 0 for a parameter value will set that timer back to its default value.

Timer Name	Default Value	Max Value	Min Value
Ack / ms	2000	20,000	200
Recovery / ms	1000	20,000	200
Daud / s	30	1,200	1
Heartbeat / s	30	1,200	1
Daud_cong / ms	2500	3000	2000

6.3.10 Remove M3UA Association**Synopsis**

Sent to the M3UA module to remove the configuration of an association.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_REM_ASSOC (0x72c8)
id	Association ID
src	Management Entity
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Non zero on error
err_info	0
len	0

Description

Association MUST be removed from all connections to servers before it can be removed.

Association must be in the deactivated state before it can be removed.

6.3.11 Remove M3UA Server**Synopsis**

Sent to the M3UA module to remove the configuration of a server.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_REM_SERVER (0x72c9)
id	Server ID
src	Management Entity
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Non zero on error
err_info	0
len	0

Description

Server MUST be removed from all associations before it can be removed.

6.3.12 Remove M3UA Route**Synopsis**

Sent to the M3UA module to remove the configuration of a route.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_REM_ROUTE (0x72ca)
id	Route ID
src	Management Entity
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0

Message Header	
status	Non zero on error
err_info	0
len	0

Description

Route MUST be removed from all connections to servers before it can be removed.

6.3.13 Remove Network ID**Synopsis**

Sent to the M3UA module to request the removal of a Network ID and its associated Point Code format.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_REM_INT_NA (0x72f1)
id	Network ID
src	Management Entity
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Non zero on error
err_info	0
len	0

Description

Before the Network ID can be removed, all references to it must be removed including moving any associations that use the Network ID.

6.3.14 Remove Server from an Association**Synopsis**

Request to remove a Server from an Association.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_REM_SERV_ASSOC (0x72cb)

Message Header		
id	Association ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	2	
Parameter Area		
Offset	Size	Name
0	2	srv_id

Description

Sent to the M3UA module to remove a Server from an Association.

Parameters**srv_id**

Identifier of the server to remove from the association.

6.3.15 Remove Route from a Server

Synopsis

Sent to the M3UA module to remove an SG from a Route.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_REM_ROUTE_SERV (0x72cc)
id	Server ID
src	Management Entity
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Non zero on error
err_info	0
len	2

Parameter Area		
Offset	Size	Name
0	2	route_id

Description

Removes the SG from the list of possible SGs that form the Route.

If the server was the only server through which the route could be reached and the server is currently available, the user will be informed of the unavailability of the routes destination point code.

Parameters**route_id**

Identifier of the route to remove from the server.

6.3.16 Remove Network ID to Network Appearance Mapping

Synopsis

Used to remove the mapping between a Network ID and Network Appearance used on a particular link.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_UNMAP_NA (0x72cd)	
id	Association ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	2	
Parameter Area		
Offset	Size	Name
0	2	Network ID

Description

Removes the M3UA Network Appearance mapping for the specified Association.

Parameters**Association ID**

Association ID of mapping to remove.

Network ID

Network ID of mapping to remove.

6.3.17 Read Association Statistics**Synopsis**

Retrieve the statistics kept on a per association basis.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_R_ASSOC_STATS (0x62d0)	
id	Association ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Set to 1 to reset stats	
err_info	0	
len	160	
Parameter Area		
Offset	Size	Name
0	4	data_tx
4	4	asp_up_tx
8	4	asp_up_ack_tx
12	4	asp_dn_tx
16	4	asp_dn_ack_tx
20	4	asp_ac_tx
24	4	asp_ac_ack_tx
28	4	asp_ia_tx
32	4	asp_ia_ack_tx
36	4	error_tx
40	4	notify_tx
44	4	duna_tx
48	4	dava_tx

Parameter Area		
Offset	Size	Name
52	4	daud_tx
56	4	scon_tx
60	4	dupu_tx
64	4	drst_tx
68	4	beat_tx
72	4	beat_act_tx
76	4	data_rx
80	4	asp_up_rx
84	4	asp_up_ack_rx
88	4	asp_dn_rx
92	4	asp_dn_ack_rx
96	4	asp_ac_rx
100	4	asp_ac_ack_rx
104	4	asp_ia_rx
108	4	asp_ia_ack_rx
112	4	error_rx
116	4	notify_rx
120	4	duna_rx
124	4	dava_rx
128	4	daud_rx
132	4	scon_rx
136	4	dupu_rx
140	4	drst_rx
144	4	beat_rx
148	4	beat_act_rx
152	4	period
156	4	beat_failure

Description

Allows the user to retrieve statistics on the traffic carried on a per association basis.

Counts supplied are unsigned incrementing counters that wrap after 32bits.

Parameters**data_tx**

Number of data packets transmitted through this association.

asp_up_tx

Number of ASP UP messages transmitted through this association.

asp_up_ack_tx

Number of ASP UP ACK messages transmitted through this association.

asp_dn_tx

Number of ASP DOWN messages transmitted through this association.

asp_dn_ack_tx

Number of ASP DOWN ACK messages transmitted through this association.

asp_ac_tx

Number of ASP ACTIVE messages transmitted through this association.

asp_ac_ack_tx

Number of ASP ACTIVE ACK messages transmitted through this association.

asp_ia_tx

Number of ASP INACTIVE messages transmitted through this association.

asp_ia_ack_tx

Number of ASP INACTIVE ACK messages transmitted through this association.

error_tx

Number of ERROR messages transmitted through this association.

notify_tx

Number of NOTIFY messages transmitted through this association.

duna_tx

Number of DUNA messages transmitted through this association.

dava_tx

Number of DAVA messages transmitted through this association.

daud_tx

Number of DAUD messages transmitted through this association.

scon_tx

Number of SCON messages transmitted through this association.

dupu_tx

Number of DUPU messages transmitted through this association.

drst_tx

Number of DRST messages transmitted through this association.

beat_tx

Number of BEAT messages transmitted through this association.

beat_ack_tx

Number of BEAT ACK messages transmitted through this association.

data_rx

Number of data packets received through this association.

asp_up_rx

Number of ASP UP messages received through this association.

asp_up_ack_rx

Number of ASP UP ACK messages received through this association.

asp_dn_rx

Number of ASP DOWN messages received through this association.

asp_dn_ack_rx

Number of ASP DOWN ACK messages received through this association.

asp_ac_rx

Number of ASP ACTIVE messages received through this association.

asp_ac_ack_rx

Number of ASP ACTIVE ACK messages received through this association.

asp_ia_rx

Number of ASP INACTIVE messages received through this association.

asp_ia_ack_rx

Number of ASP INACTIVE ACK messages received through this association.

error_rx

Number of ERROR messages received through this association.

notify_rx

Number of NOTIFY messages received through this association.

duna_rx

Number of DUNA messages received through this association.

dava_rx

Number of DAVA messages received through this association.

daud_rx

Number of DAUD messages received through this association.

scon_rx

Number of SCON messages received through this association.

dupu_rx

Number of DUPU messages received through this association.

drst_rx

Number of DRST messages received through this association.

beat_rx

Number of BEAT messages received through this association.

beat_ack_rx

Number of BEAT ACK messages received through this association.

period

The time period over which these statistics have been gathered. Units of seconds.

beat_failure

Number of M3UA heartbeat failures on this association.

6.3.18 Read Server Statistics

Synopsis

Retrieve the statistics kept for a specific Server.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_R_SERVER_STATS (0x62d1)	
id	Server ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Set to 1 to reset stats	
err_info	0	
len	8	
Parameter Area		
Offset	Size	Name
0	4	data_tx
4	4	period

Description

Allows the user to retrieve statistics on the traffic experienced on a per server basis.

Parameters

data_tx

Number of data packets transmitted through this server.

period

The time period over which these statistics have been gathered. Units of seconds.

6.3.19 Read Route Statistics

Synopsis

Retrieve the statistics kept for a specific Route.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_R_ROUTE_STATS (0x62d2)	
id	Route ID	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Set to 1 to reset stats	
err_info	0	
len	8	
Parameter Area		
Offset	Size	Name
0	4	data_tx
4	4	Period

Description

Allows the user to retrieve statistics on the traffic experienced on a per route basis.

Parameters

data_tx

Number of data packets transmitted for this route.

period

The time period over which these statistics have been gathered. Units of seconds.

6.3.20 Trace Mask Configuration Request

Synopsis

Configure M3UA to trace the specified messages and events.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_TRACE_MASK (0x52d3)	
id	0	
src	Management Entity	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero on error	
err_info	0	
len	8	
Parameter Area		
Offset	Size	Name
0	4	op_evt_mask
4	4	ip_evt_mask

Description

Message can be sent to the M3UA module to configure or change the configuration of tracing within the module. The mask values will permit selective tracing of different events or messages.

Parameters**op_evt_mask**

The output event mask. This is a 32bit value with bits set to 1 to cause a trace message to be sent to the system management module whenever a message is issued by M3UA for the event indicated.

Bit-number	Mnemonic	Description
0	M3U_EVTO_ASP_UP_IND	ASP up indication
1	M3U_EVTO_ASP_UP_CON	ASP up confirmation
2	M3U_EVTO_ASP_DOWN_IND	ASP down indication
3	M3U_EVTO_ASP_DOWN_CON	ASP down confirmation
4	M3U_EVTO_ASP_INACT_IND	ASP inactive indication
5	M3U_EVTO_ASP_INACT_CON	ASP inactive confirmation
6	M3U_EVTO_ASP_ACT_IND	ASP active indication
7	M3U_EVTO_ASP_ACT_CON	ASP active confirmation
8	M3U_EVTO_AS_ACT_IND	AS active indication
9	M3U_EVTO_AS_INACT_IND	AS inactive indication
10	M3U_EVTO_ASS_STATUS_IND	Association status indication

11	M3U_EVTO_ROUTE_STATUS_IND	Route status indication
12	M3U_EVTO_RSP_STATUS_IND	RSP status indication
13	M3U_EVTO_LIC_STATUS_IND	License indication
14	M3U_EVTO_SNMP_DSA	DSA SNMP indication
15	Reserved	Should be set to zero
16	M3U_EVTO_SS7_RX_IND	SS7 Data Transfer Indication
17	M3U_EVTO_MTP_PAUSE	SS7 Point code unavailable
18	M3U_EVTO_MTP_RESUME	SS7 Point code available
19	M3U_EVTO_MTP_STATUS	SS7 point code status change
20	M3U_EVTO_M3U_PAUSE	M3UA server unavailable
21	M3U_EVTO_M3U_RESUME	M3UA server available
22	M3U_EVTO_M3U_STATUS	Change in M3UA server status
23	M3U_EVTO_NOTIFY_IND	M3UA notify message received
24	M3U_EVTO_AUDIT_DEST	DAUD message received
25-27	Reserved	Should be set to zero
28	M3U_EVTO_ACTIVATE_REQ	SCTP activation request
29	M3U_EVTO_SHUTDOWN_REQ	SCTP shutdown request
30	M3U_EVTO_ABORT_REQ	SCTP abort request
31	M3U_EVTO_DATA_REQ	SCTP data transfer request

ip_evt_mask

The input event mask. This is a 32bit value with bits set to 1 to cause a trace message to be sent to the system management module whenever a message is received by M3UA for the event indicated.

Bit-number	Mnemonic	Description
0	M3U_EVTI_ASP_UP_REQ	ASP up request
1	M3U_EVTI_ASP_DOWN_REQ	ASP down request
2	M3U_EVTI_ASP_ACT_REQ	ASP activate request
3	M3U_EVTI_ASP_INACT_REQ	ASP inactivate request
4	M3U_EVTI_ACT_ASSOC	Association request
5	M3U_EVTI_DEACT_ASSOC	Association deactivation request
6-27	Reserved	Should be set to zero
28	M3U_EVTI_NETWORK_STATUS	SCTP network status change
29	M3U_EVTI_STATUS_CHANGE	SCTP association status change

30	M3U_EVTI_CONG_STATUS	SCTP congestion status change
31	M3U_EVTI_DATA_IND	SCTP data transfer indication

6.3.21 M3UA Application Server Process Status

Synopsis

Returns the current status of the specified ASP / SGP.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_R_RSP_STATUS (0x62e8)
id	Association ID
src	User module
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Status
err_info	0
len	0

Description

Allows the user to poll the status of a particular remote ASP or SGP.

This allows modules, to keep track of the status of the various remote signal processes in the system.

Parameters

Association ID

The Logical ID of Association identifying the ASP or SGP.

Status

Current status of the remote server process.

Value	Description
M3U_STATE_RSP_UNCONFIGURED (0x00)	RSP is un-configured
M3U_STATE_RSP_DEACTIVATED (0x01)	RSP is configured but not active
M3U_STATE_RSP_ASS_UNAVAILABLE (0x02)	RSP is attempting to activate association
M3U_STATE_RSP_WAIT_UP (0x03)	RSP is awaiting UP signal from peer
M3U_STATE_RSP_AVAILABLE (0x04)	RSP is available for data transfer
M3U_STATE_RSP_WAIT_CLOSED (0x05)	RSP is closing association

6.3.22 M3UA Server Status

Synopsis

Returns the status of the specified AS or SG. Includes overall status and status on a specific ASP or SGP.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_R_RS_STATUS (0x62e9)	
id	Server ID	
src	User module	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Server status (see below)	
err_info	0	
len	8	
Parameter Area		
Offset	Size	Name
0	2	ass_id (input)
2	2	ass_status
4	4	tr_mode

Description

The Status field of the returned message holds the status of the complete server and the ass_status field holds the status of the server on a particular ASP or SGP.

If an Invalid ass_id is passed to M3UA, it returns an ass_status of M3U_STATE_RS_UNCONFIGURED.

In addition to the Server status, if the Server is available the Traffic Mode is also returned.

Parameters

status

Current status of the remote server.

Value	Description
M3U_STATE_RS_UNCONFIGURED (0x00)	The server is not being configured
M3U_STATE_RS_UNAVAILABLE (0x01)	The server is currently unavailable
M3U_STATE_RS_AVAILABLE (0x02)	The server is currently available

M3U_STATE_RS_AVAILABLE_INSUFF_RSP (0x03)	The server is available but has an insufficient number of RSPs active.
--	--

ass_id

Association ID status is requested for.

ass_status

Status of server with respect to a specific association ID.

Value	Description
M3U_ASP_STATUS_UNCONNECTED (0x00)	The SCTP layer to the server process is currently unavailable
M3U_ASP_STATUS_DOWN (0x01)	The server process is marked as unavailable
M3U_ASP_STATUS_INACTIVE (0x02)	The server process is available but has not been activated
M3U_ASP_STATUS_ACTIVE (0x03)	The server process is active
M3U_ASP_STATUS_STANDBY (0x04)	The server process is in standby

tr_mode

Traffic mode in which the server process is currently active.

Value	Description
M3U_TRAFFIC_OVERRIDE (0x0001)	Override
M3U_TRAFFIC_LOADSHARE (0x0002)	Loadshare
M3U_TRAFFIC_BROADCAST (0x0004)	Broadcast

6.3.23 M3UA Route Status

Synopsis

Returns the current overall status of the specified route.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_R_ROUTE_STATUS (0x62ea)
id	Route ID
src	User module
dst	M3U Module
rsp_req	Used to request a confirmation
hclass	0
status	Server status (see below)
err_info	0

Message Header		
len		6
Parameter Area		
Offset	Size	Name
0	2	Network ID
2	4	point_code

Description

Sent by a user module to retrieve the status of a route and configuration information. The Route ID is passed to M3UA and the Network ID, Point Code and status are returned.

Parameters**Status**

Value	Description
M3U_ROUTE_UNAVAILABLE (0x00)	Route is unavailable for transfer of traffic
M3U_ROUTE_AVAILABLE (0x01)	Route is available for transfer of traffic
M3U_ROUTE_CONGESTED (0x02)	Route is available but currently congested
M3U_ROUTE_RESTRICTED (0x03)	Route is available but restricted

Network ID

Logical ID of the Network the route is in.

Point Code

Destination Point Code for the route.

6.3.24 M3UA Error Indication**Synopsis****Message Format**

Message Header	
Field Name	Meaning
type	M3U_MSG_M3U_ERROR (0x02ef)
id	error_id
src	M3U Module
dst	Management Module
rsp_req	0
hclass	0
status	error_type

Message Header		
err_info	0	
len	9	
Parameter Area		
Offset	Size	Name
0	1	instance
1	4	err_val1
5	4	err_val2

Description

Indicates to management that an error has occurred within the M3UA module.

Parameters

error_id

Identifier connected with error

error_type

Error number

Error type	Value	Description
M3Ue_BAD_STATE	0	A message has been received by an RSP/server that is invalid for its current state
M3Ue_CONFIG	1	The action cannot be performed with the current configuration.
M3Ue_RESOURCE	2	Request cannot be satisfied due to a lack of internal resources.
M3Ue_TIMER_TICK	3	An internal timer has expired in an invalid state
M3Ue_LMSG_ALLOC	4	M3UA has tried and failed to allocate a long message.
M3Ue_MSG_FMT	5	M3UA has received an incorrectly formatted message from the M3UA User

instance

Error instance

err_val1

Error value depending on error_id, defined in the table below.

err_val2

Error value depending on error_id, defined in the table below.

Error type	Error Id	Instance	err_val1	err_val2	Description
0	Signal type	15	Signal id		Invalid signal type

Error type	Error Id	Instance	err_val1	err_val2	Description
0	Association ID	16	Association state = 0 (unconfigured)		Cannot remove unconfigured association from server
0	Association ID	17	Association state = 0 (unconfigured)		Cannot activate unconfigured association
0	Association ID	19	Association state		Cannot activate unconfigured ASP
0	Association ID	21	Association state = 0 (unconfigured)		SCTP close received in unconfigured state
0	Association ID	23	Association state		SCTP connected received in invalid state
0	Association ID	25	Association state		ASP UP received from peer in invalid state
0	Association ID	26	Association state		ASP UP ACK received from peer in invalid state
0	Association ID	27	Association state		ASP DOWN received from peer in invalid state
0	Association ID	30	Association state		ASP ACTIVE ACK or ASP INACTIVE ACK received from peer in invalid state
0	Server state = 0 (unconfigured)	33	Server state = 0 (unconfigured)		Server in SPMC is unconfigured
0	0	34	Server state = 0 (unconfigured)		Server in R_RS_STATUS request unconfigured
0	Association ID	36	Association state		ASP UP ACK received from peer unexpectedly
0	Route ID	37	Network ID	Point code	No server available for Route
1	Network ID	0			Point code format cannot be determined for the Network ID
1	0	1	Network ID	Point code	Route cannot be found to point code
1	Server ID	2			Data cannot be routed to the peer as no ASP is active

Error type	Error Id	Instance	err_val1	err_val2	Description
1	Server ID	3	Network ID		Data cannot be routed to the peer as the Network ID is invalid.
1	Network ID	4			Point code format cannot be determined for the Network ID
1	Number of associations required	5	Number of associations supported		Limit of number of associations supported is exceeded
1	Number of servers required	6	Number of servers supported		Limit of number of servers supported is exceeded
1	Number of routes required	x [Note 1]	Number of routes supported		Internal error
2	0	x [Note 1]			Internal SDL error
2	Timer ID	5	Timer period		Internal timer conflict
3	x [Note 1]	x [Note 1]			Internal timer error
4	0	0			Long message allocation failure
5	0	1	Message Type	Message Length	TX data msg length is invalid
5	0	2	Message Type	Message Length	M3UA formatted msg length invalid

Note 1: This value varies depending on the internal error that has been encountered

6.3.25 M3UA Event Indication

Synopsis

Signals an internal event warning to management.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_M3U_EVENT (0x02ee)
id	event_id
src	M3U Module
dst	Management Module
rsp_req	0

Message Header		
hclass	0	
status	event_type	
err_info	0	
len	9	
Parameter Area		
Offset	Size	Name
0	1	instance
1	4	err_val1
5	4	err_val2

Description

Signals an unusual event has occurred in the operation of M3UA. These events include errors with the incoming M3UA data stream.

Parameters**event_id**

Identifier connected with event.

event_type

Event number.

Event type	Value	Description
M3Uv_PROTOCOL	0	An M3UA protocol violation has occurred.
M3Uv_M3UA_ERROR	1	Reception of M3UA ERROR message from the M3UA Peer
M3Uv_HEARTBEAT_FAILURE	2	M3UA Heartbeats have failed

instance

Event instance.

evt_val1

Event value depending on event_id.

evt_val2

Event value depending on event_id.

Event type	Event Id	Instance	evt_val1	evt_val2	Description
0	Assoc ID	2 (0x2)	TLV type	TLV length	Invalid TLV for ASPSM down
0	Assoc ID	6 (0x6)	TLV type	TLV length	Invalid TLV for ASPSM down ack
0	Assoc ID	8 (0x8)	TLV type	TLV length	Runt TLV

Event type	Event Id	Instance	evt_val1	evt_val2	Description
0	Assoc ID	9 (0x9)	TLV type	TLV length	Duplicate tag in ASPSM heartbeat
0	Assoc ID	10 (0xa)	TLV type	TLV length	Invalid TLV in ASPSM heartbeat
0	Assoc ID	12 (0xc)	TLV type	TLV length	Invalid TLV
0	Assoc ID	13 (0xd)	TLV type	Error code	Invalid Error code TLV
0	Assoc ID	14 (0xe)	TLV type	TLV length	Invalid TLV in management error
0	Assoc ID	15 (0xf)	TLV type	TLV length	Missing error code TLV in management error
0	Assoc ID	16 (0x10)	TLV type	TLV length	Invalid TLV
0	Assoc ID	17 (0x11)	TLV type	TLV length	Duplicate tag in management notify
0	Assoc ID	18 (0x12)	TLV type	TLV length	Runt TLV
0	Assoc ID	19 (0x13)	TLV type	TLV length	Duplicate tag in management notify
0	Assoc ID	20 (0x14)	TLV type	TLV length	Oversized TLV
0	Assoc ID	21 (0x15)	TLV type	TLV length	Invalid tag in management notify
0	Assoc ID	22 (0x16)	TLV type	TLV length	Missing status type TLV in management notify
0	Assoc ID	23 (0x17)	TLV type	TLV length	Invalid TLV
0	Assoc ID	24 (0x18)	TLV type	TLV length	Duplicate network appearance TLV in M3UA data message
0	Assoc ID	25 (0x19)	TLV type	TLV length	Runt protocol data TLV
0	Assoc ID	26 (0x1a)	TLV type	TLV length	Duplicate data section in M3UA data message
0	Assoc ID	27 (0x1b)	Network Appearance		Invalid network appearance TLV in M3UA data
0	Assoc ID	28 (0x1c)			No default network appearance for association
0	Assoc ID	29 (0x1d)	TLV type	TLV length	Invalid TLV in M3UA data
0	Assoc ID	30 (0x1e)	TLV type	TLV length	Missing TLV in M3UA data
0	Assoc ID	31 (0x1f)	TLV type	TLV length	Invalid Traffic Mode TLV

Event type	Event Id	Instance	evt_val1	evt_val2	Description
0	Assoc ID	32 (0x20)	TLV type	TLV length	Duplicate TLV in ASPTM active or ASPTM active acknowledge
0	Assoc ID	34 (0x22)	TLV type	TLV length	Duplicate routing context TLV in M3UA data message
0	Assoc ID	36 (0x24)	TLV type	TLV length	Invalid TLV for ASPTM active
0	Assoc ID	39 (0x27)	TLV type	TLV length	Duplicate routing context TLV found in ASPTM inactive or ASPTM inactive acknowledge
0	Assoc ID	41 (0x29)	TLV type	TLV length	Invalid TLV for ASPTM inactive or ASPTM inactive acknowledge
0	Assoc ID	42 (0x2a)			Unhandled RKM registration request
0	Assoc ID	43 (0x2b)			Unhandled RKM registration response
0	Assoc ID	44 (0x2c)			Unhandled RKM deregistration request
0	Assoc ID	45 (0x2d)			Unhandled RKM deregistration response
0	Assoc ID	46 (0x2e)	Length		Runt packet
0	Assoc ID	47 (0x2f)	Version		Invalid M3UA header version
0	Assoc ID	48 (0x30)	TLV type	TLV length	Invalid M3UA TLV
0	Assoc ID	49 (0x31)	Class	Type	Invalid message Class
0	Assoc ID	50 (0x32)	Class	Type	Invalid message type
0	Assoc ID	51 (0x33)			DUNA received in invalid state
0	Assoc ID	53 (0x35)	TLV type	TLV length	Duplicate NA TLV in SSNM destination unavailable
0	Assoc ID	54 (0x36)	TLV type	TLV length	Duplicate affected point code TLV in SSNM destination unavailable
0	Assoc ID	57 (0x39)	TLV type	TLV length	Invalid TLV in SSNM destination unavailable
0	Assoc ID	58 (0x3a)	TLV type	0	Missing affected point code TLV for SSNM destination unavailable
0	Assoc ID	60 (0x3c)	TLV type	TLV length	Duplicate NA TLV in SSNM congestion

Event type	Event Id	Instance	evt_val1	evt_val2	Description
0	Assoc ID	61 (0x3d)	TLV type	TLV length	Duplicate affected point code TLV in SSNM congestion
0	Assoc ID	65 (0x41)	TLV type	TLV length	Invalid TLV
0	Assoc ID	66 (0x42)	TLV type	TLV length	Invalid TLV
0	Assoc ID	67 (0x43)	TLV type	TLV length	Duplicate congestion indication TLV in SSNM SCON
0	Assoc ID	68 (0x44)	TLV type	TLV length	Invalid TLV in SSNM congestion
0	Assoc ID	69 (0x45)	TLV type	TLV length	Missing affected point code TLV in SSNM SCON
0	Assoc ID	70 (0x46)	Network Appearance		Invalid NA TLV in SSNM SCON
0	Assoc ID	71 (0x47)			No default network appearance for SSNM SCON
0	Assoc ID	72 (0x48)	TLV type	TLV length	Duplicate TLV in SSNM DUPU
0	Assoc ID	73 (0x49)	TLV type	TLV length	Duplicate TLV in SSNM DUPU
0	Assoc ID	75 (0x4b)	TLV type	TLV length	Invalid user cause TLV
0	Assoc ID	76 (0x4c)	TLV type	TLV length	Duplicate TLV in SSNM DUPU
0	Assoc ID	77 (0x4d)	TLV type	TLV length	Invalid TLV in SSNM DUPU
0	Assoc ID	78 (0x4e)	TLV type		Missing TLV in SSNM DUPU
0	Assoc ID	79 (0x4f)	Network Appearance		Invalid Network appearance TLV in SSNM DUPU
0	Assoc ID	80 (0x50)			No default network appearance for SSNM DUPU
0	Assoc ID	81 (0x51)	TLV type	TLV length	Duplicate TLV in SSNM DAVA
0	Assoc ID	82 (0x52)	TLV type	TLV length	Duplicate TLV in SSNM DAVA
0	Assoc ID	85 (0x55)	TLV type	TLV length	Unexpected TLV in SSNM DAVA
0	Assoc ID	86 (0x56)	Network appearance		Invalid NA TLV in SSNM DAVA / DUNA / DRST

Event type	Event Id	Instance	evt_val1	evt_val2	Description
0	Assoc ID	87 (0x57)	Status Type	Status Information	Invalid values for Status parameter in Notify MGMT message
0	Assoc ID	88 (0x58)			ASPTM active received whilst ASP down
0	Assoc ID	89 (0x59)			ASPTM received in incorrect ASP state
0	Assoc ID	90 (0x5a)			M3UA data message received in invalid state
0	Assoc ID	91 (0x5b)			No default NA for SSNM DAVA / DUNA / DRST
0	Assoc ID	92 (0x5c)	TLV type	TLV length	Invalid TLV for ASPSM up
0	Assoc ID	93 (0x5d)	TLV type	TLV length	Invalid TLV for ASPSM up ack
0	Assoc ID	94 (0x5e)	TLV type	TLV length	Duplicate tag in management error
0	Assoc ID	95 (0x5f)	TLV type	Traffic mode	Invalid traffic mode
0	Assoc ID	97 (0x61)	TLV type	TLV length	Duplicate TLV in ASPTM inactive ack
0	Assoc ID	98 (0x62)	TLV type	TLV length	Invalid TLV in ASPTM inactive ack
0	Assoc ID	99 (0x63)	cause	user	Invalid cause/user TLV
1	Assoc ID	0	error	0	MGMT Error message received from peer
2	Assoc ID	0	Total of Heartbeat failures	0	Heartbeat failure

6.3.26 M3UA Notify Indication

Synopsis

Indicates the change in state of a peer server.

Message Format

Message Header	
Field Name	Meaning
type	M3U_MSG_NOTIFY_IND (0x02f0)
id	Association ID
src	M3U Module
dst	Management Module
rsp_req	0

Message Header		
hclass	0	
status	0	
err_info	0	
len	140	
Parameter Area		
Offset	Size	Name
0	2	options
2	2	status_type
4	2	status_info
6	4	asp_id
10	2	num_rc
12	128	Routing contexts

Description

The management module on an ASP host should decode the notify messages to track the current state of the peer server and react to state changes as required. For example, activating an inactive server process when the peer server moves into the pending state. This action may be taken unilaterally by each ASP host or after communication with other ASP hosts present within the network. The communication method between ASP hosts is host specific and not covered by this document.

Parameters**options**

Optional fields present. Always 0x0000

status_type

Type of notify message.

Value	Description
1	Application Server State Change
2	Other

status_info

More detailed information for the notification (dependant on the status_type).

Application Server State Change

Value	Description
1	Reserved
2	Application Server Inactive
3	Application Server Active

4	Application Server Pending
---	----------------------------

Other

Value	Description
1	Insufficient ASP Resources Active in AS
2	Alternate ASP Active

num_rc

Number of routing contexts affected.

asp_id

Optional identifier of the ASP causing the notify to be issued.

routing_contexts

Routing contexts.

6.3.27 M3UA Audit Destination Indication

Synopsis

This message is only supported when the Signaling Gateway option is enabled. It indicates the peer requires an update of the status of a destination point code.

Message Format

Message Header		
Field Name	Meaning	
type	M3U_MSG_AUDIT_DEST_IND (0x02f3)	
id	Association ID	
src	M3U Module	
dst	Management Module	
rsp_req	0	
hclass	0	
status	0	
err_info	0	
len	132	
Parameter Area		
Offset	Size	Name
0	2	Network_ID
2	2	num_pc
4	128	apc

Description

Sent by m3ua to Layer Management in response to the reception of a DAUD request from the peer. Will be used to allow the peer to determine the status of point code availability.

Parameters**Network ID**

The Logical ID of the Network of the Point Codes to audit.

num_pc

Number of Point Codes to audit.

apc

Array of point codes requiring an audit.

6.3.28 MTP_MSG_UPDATE_L4 – Update Level 4 Request**Synopsis:**

Message sent to M3UA to request a broadcast of current route status to all (local) user parts for a specified destination.

Message Format:

Message Header		
Field Name	Meaning	
type	MTP_MSG_UPDATE_L4 (0x731f)	
id	0	
src	Sending module id	
dst	M3U Module	
rsp_req	Used to request a confirmation	
hclass	0	
status	Non zero to reset	
err_info	0	
len	4	
Parameter Area		
Offset	Size	Name
0	4	Dpc

Description

This message is sent to the MTP3 module to request that all user parts are notified of the current route status for the given destination using the normal MTP-PAUSE, MTP-RESUME and MTP-STATUS primitives.

The message is intended for use after new routes have been configured or following additional user part configuration on a live system (for example the addition of a new ISUP circuit group). It allows the user to ensure that the user part is updated with the current accessibility of the destination.

The confirmation message will indicate success or failure in the status field of the header (success = 0).

Parameters

dpc

The destination point code for which a status broadcast is requested

7 Example Message Trace

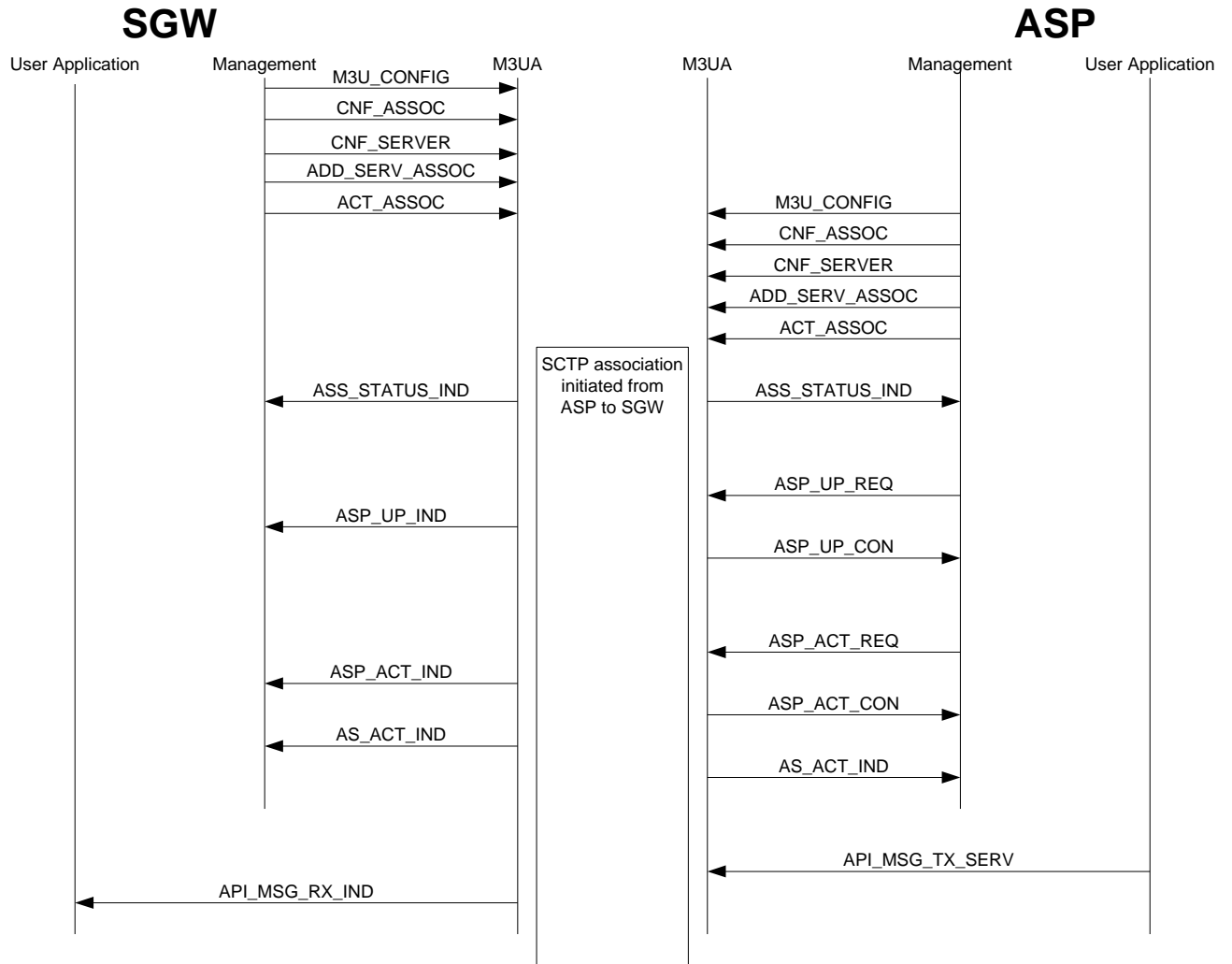


Figure 3: Connection traces for a single SG and ASP connection.

Appendix A. Message Types

A.1 Message Type Table

The following table lists, by message type, the messages described in this manual.

Message Type	Mnemonic	Description
0x02d5	M3U_MSG_ASP_UP_IND	ASPUP indication
0x02d6	M3U_MSG_ASP_UP_CON	ASPUP confirmation
0x02d8	M3U_MSG_ASP_DOWN_IND	ASPDOWN indication
0x02d9	M3U_MSG_ASP_DOWN_CON	ASPDOWN confirmation
0x02db	M3U_MSG_ASP_ACT_IND	ASP ACT indication
0x02dc	M3U_MSG_ASP_ACT_CON	ASP ACT confirmation
0x02de	M3U_MSG_ASP_INACT_IND	ASP INACT indication
0x02df	M3U_MSG_ASP_INACT_CON	ASP INACT confirmation
0x02e0	M3U_MSG_AS_ACT_IND	Remote server activation indication
0x02e1	M3U_MSG_AS_INACT_IND	Remote server deactivation indication
0x02e2	M3U_MSG_ASS_STATUS_IND	Change in state of a remote server process.
0x02e3	M3U_MSG_ROUTE_STATUS_IND	Change in state of a route.
0x02ee	M3U_MSG_M3U_EVENT	M3UA event indication
0x02ef	M3U_MSG_M3U_ERROR	M3UA error indication
0x02f0	M3U_MSG_NOTIFY_IND	M3UA notify indication
0x02f2	M3U_MSG_RSP_STATUS_IND	Change in state of a remote server process indicator.
0x02f3	M3U_MSG_AUDIT_DEST_IND	Request for the status of a destination.
0x52d3	M3U_MSG_TRACE_MASK	Set message trace masks
0x62d0	M3U_MSG_R_ASSOC_STATS	Read statistics on a per server process basis.
0x62d1	M3U_MSG_R_SERVER_STATS	Read statistics on a per server basis.
0x62d2	M3U_MSG_R_ROUTE_STATS	Read statistics on a per route basis.
0x62e8	M3U_MSG_R_RSP_STATUS	Read remote server process status
0x62e9	M3U_MSG_R_RS_STATUS	Read remote server status
0x62ea	M3U_MSG_R_ROUTE_STATUS	Read route status
0x72c0	M3U_MSG_CONFIG	Configure the M3UA module
0x72c1	M3U_MSG_CNF_ASSOC	Configure a link to a remote server process
0x72c2	M3U_MSG_CNF_SERVER	Configure a remote server
0x72c3	M3U_MSG_CNF_ROUTE	Configure a route to a point code
0x72c4	M3U_MSG_CNF_INT_NA	Configure a Network ID

Message Type	Mnemonic	Description
0x72c5	M3U_MSG_ADD_SERV_ASSOC	Add a server to the list of those available via the server process
0x72c6	M3U_MSG_ADD_ROUTE_SERV	Add a route to the list of those available via the server
0x72c7	M3U_MSG_MAP_NA	Map a Network ID to a M3UA Network Appearance.
0x72c8	M3U_MSG_REM_ASSOC	Remove the configuration of a remote server process link.
0x72c9	M3U_MSG_REM_SERVER	Remove the configuration of a remote server.
0x72ca	M3U_MSG_REM_ROUTE	Remove the configuration of a route .
0x72cb	M3U_MSG_REM_SERV_ASSOC	Remove a server from the list of those served by the server process.
0x72cc	M3U_MSG_REM_ROUTE_SERV	Remove a route from those accessible via a server.
0x72cd	M3U_MSG_UNMAP_NA	Remove the mapping from Network ID and the M3UA Network Appearance parameter.
0x72ce	M3U_MSG_ACT_ASSOC	Activate an association
0x72cf	M3U_MSG_DEACT_ASSOC	Deactivate an association
0x72d4	M3U_MSG_ASP_UP_REQ	ASPUP request
0x72d7	M3U_MSG_ASP_DOWN_REQ	ASPDOWN request
0x72da	M3U_MSG_ASP_ACT_REQ	ASP ACT request
0x72dd	M3U_MSG_ASP_INACT_REQ	ASP INACT request
0x72f1	M3U_MSG_REM_INT_NA	Remove the configuration of a Network ID.
0x82eb	M3U_MSG_M3U_PAUSE	Server pause indication (SGP only)
0x82ec	M3U_MSG_M3U_RESUME	Server resume indication (SGP only)
0x82ed	M3U_MSG_M3U_STATUS	Server status indication (SGP only)
0x8403	MTP_MSG_PAUSE	Server pause indication
0x8404	MTP_MSG_RESUME	Server resume indication
0x8405	MTP_MSG_STATUS	Server status indication
0x8f01	API_MSG_RX_IND	indicate reception of a Message Signal Unit.
0xc2e4	M3U_MSG_TX_SERV	Transmit data to a specified remote server.
0xc2e5	M3U_MSG_SSNM_EVENT	Generate SSNM event
0xc2e6	M3U_MSG_SSNM_SCON	Generate SCON event
0xc2e7	M3U_MSG_SSNM_DUPU	Generate DUPU event
0xcf00	API_MSG_TX_REQ	Transmit data to a specified remote server.

Appendix B. Additional Services

This appendix contains information about Licensing Services.

B.1 Licensing

B.1.1 Request Licensing State

Synopsis:

Sent by Layer Management to request the current license state.

Message Format:

Message Header		
Field Name	Meaning	
type	MGT_MSG_R_LIC_STATUS (0x6f22)	
id	0	
src	Layer Management	
dst	M3U Module	
rsp_req	Set appropriate response required bit	
hclass	0	
status	Set to 1 if module not enforcing licensing	
err_info	0	
len	60	
Parameter Area		
Offset	Size	Name
0	4	Version
4	4	Licensed Protocol
8	4	Licensed Throughput Rate
12	4	Licensed Links
16	4	Licensed Sessions
20	4	Licensed Options
24	4	Configured Throughput Rate
28	4	Configured Maximum Links
32	4	Configured Maximum Sessions
36	4	Configured Options
40	4	Current Throughput Credit
44	4	Current Active Links
48	4	Current Active Sessions

Parameter Area		
Offset	Size	Name
52	4	Cong State
56	4	Throughput Alarm State

Parameters

The version parameters and licensed protocol parameters should be set by the user. The rest of the parameters are set by the module in the reply.

Version

Set to 0.

Licensed Protocol

Identifies the protocol being licensed. For M3UA, set to 2.

Licensed Throughput

The throughput permitted by the installed license(s) (Units Kbytes/s).

Licensed Links

Number of links or associations permitted by the installed license(s).

Licensed Sessions

Number of simultaneous sessions or dialogs permitted by the installed license(s). (Note: This is not used by M3UA).

Licensed Options

Which M3UA options have been licensed for use as defined in the module configuration message.

Configured Throughput

Maximum throughput requested in the MST_CONFIG message.

Configured Maximum Links

The peak number of associations configured in M3UA.

Configured Maximum Sessions

Not used by M3UA.

Configured Options

The options selected for use at configuration time.

Current Throughput Credit

Number of Octets that can be received from the network or from the M3UA Users before enforcement mechanisms are triggered (Units of Bytes).

Current Active Links

The number of licensed links currently in use.

Current Active Sessions

Not used by M3UA.

Throughput Congestion State

Value	State
0	Uncongested
1	Congested

Throughput Alarm State

Value	State
0	Inactive
1	Active

B.1.2 License Event Indication

Synopsis:

Sent from M3UA to Layer Management to indicate a license-related event. In the case of throughput, it indicates throughput congestion onset, abatement, or the beginning of enforcement.

Message Format:

Message Header		
Field Name	Meaning	
type	MGT_MSG_LIC_EVENT (0x0f23)	
id	0	
src	M3U Module	
dst	Layer Management	
rsp_req	0	
hclass	0	
status	0	
err_info	0	
len	8	
Parameter Area		
Offset	Size	Name
0	4	Protocol Type
4	2	Event Type
6	2	Event Indication

Parameters

Event Type

Value	Type
0	Undefined
1	Congested Throughput
2	Link/Associations
3	Session/Dialog
4	Throughput Alarm

Throughput Event indication

Value	Type
0	ABATE
1	CONGESTION
2	ENFORCEMENT

Throughput Alarm Event indication

Value	Type
0	Alarm Inactive
1	Alarm Active

Link/Associations

None currently defined

Session/Dialog

None currently defined

B.1.3 Request Throughput Statistics**Synopsis:**

Sent by Layer Management to request the current throughput statistics.

Message Format:

Message Header	
Field Name	Meaning
type	MGT_MSG_R_THR_STATS (0x6f21)
id	0
src	Layer Management
dst	M3U Module
rsp_req	Set appropriate response required bit
hclass	0
status	Non zero to reset
err_info	0
len	42

Parameter Area		
Offset	Size	Name
0	4	Version – Must be set to zero
4	4	Protocol
8	4	Time Period
12	4	RX Data
16	4	TX Data
20	4	RX_rate_peak
24	4	Tx rate_peak
28	4	Rate_peak
32	2	Congestion Count
34	2	Enforcement Count
36	2	Alarm Count
38	4	Alarm Duration

Parameters

The version parameters and Licensed protocol parameters should be set by the user. The other parameters are set by the module in the reply.

Licensed Protocol

Identifies the protocol being licensed. For M3UA set to 2.

Time Period

Updated by the module to show the time since start-up or since the last statistics reset (Units of Seconds).

RX Data

Amount of counted data - measured in Kbytes - received by the module from the network since the last statistics reset.

TX Data

Amount of counted data - measured in Kbytes - sent by the User module since the last statistics reset.

RX rate peak

The peak Rx data rate averaged over a rolling thirty second time window (Units of Bytes / Second).

TX rate peak

The peak Tx data rate averaged over a rolling thirty second time window (Units of Bytes / Second).

Rate peak

The peak data rate for both Tx and Rx data averaged over a rolling thirty second time window (Units of Bytes / Second).

Congestion Count

Number of times the congestion state has been entered since the last statistics reset.

Enforcement Count

Number of times the congestion state has been entered since the last statistics reset.

Alarm Count

Number of times the throughput alarm has fired.

Alarm Duration

The length of time the throughput has exceeded the alarm threshold. Units of Seconds.

B.1.4 Throughput Alarm Set**Synopsis:**

Sent by Layer Management to set the throughput alarm thresholds.

Message Format:

Message Header		
Field Name	Meaning	
type	MGT_MSG_SET_THR_ALARM (0x5f27)	
id	0	
src	Layer Management	
dst	M3U Module	
rsp_req	Set appropriate response required bit	
hclass	0	
status	Non zero to reset	
err_info	0	
len	2	
Parameter Area		
Offset	Size	Name
0	1	Onset threshold
1	1	Abate threshold

Description

The Throughput Alarm provides an indication to Layer Management that the data throughput has exceeded a certain percentage of its licensed limit. The generation of a throughput alarm active indication is purely for information and does not indicate any action taken by M3UA to restrict the message throughput or otherwise change the behavior of the module.

Throughput alarm indications can be used to receive an early warning that the system is reaching its maximum capacity and a larger license may be required.

Note: The licensed throughput can be determined using the License Status message **MGT_MSG_R_LIC_STATUS** (0x6f22)

Parameters

Onset threshold

The percentage of the licensed throughput at which the alarm should trigger (default 80%).

Abate threshold

The percentage of the licensed throughput at which the alarm should abate (default 40%).