



Application Note

Mobile DTV
ATSC-M/H

M-EAS

**Mobile Emergency Alert System
Analysis & Monitoring**

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1	Overview.....	3
2	Introduction into M-EAS	3
2.1	What is M-EAS?	3
2.2	Why is M-EAS important?	3
2.3	Why is the monitoring of M-EAS important for broadcasters?	4
3	M-EAS Analysis and Monitoring	5
3.1	M-EAS Announcement and Signaling.....	5
3.2	M-EAS Service Data Transmission	5
3.2.1	M-EAS FLUTE Session Monitoring	6
3.2.2	M-EAS Visual Monitoring	6
3.3	M-EAS Remote Monitoring.....	6
3.4	atscSAM - M-EAS Analysis & Monitoring Solution	7
3.4.1	Service Announcement and Signaling Monitoring	9
3.4.2	M-EAS Service Data Monitoring	11
3.4.3	Visual Monitoring.....	12
3.4.4	Additional Functions.....	13
3.4.5	Remote Monitoring	15
3.4.6	Off-Line Data Analysis	16
4	Ordering Information	18

Figure 1	: atscSAM Components to analyze and monitor M-EAS.....	7
Figure 2	: SAMcorder – service detection, de-multiplexing and streaming.....	8
Figure 3	: SAMflute – FLUTE Analysis and Monitoring.....	8
Figure 4	: SAMcorder M-EAS Announcement	9
Figure 5	: M-EAS Real-Time Analysis and Monitoring.....	10
Figure 6	: M-EAS Message Tracer	10
Figure 7	: CAP Message Viewer	11
Figure 8	: SAMflute – FLUTE Analyzer	12
Figure 9	: SAMflute – File Viewer	13
Figure 10	: FLUTE file archive	13
Figure 11	: SAMflute - File Archive Manager	14
Figure 12	: FLUTE Packet Analyzer	14
Figure 13	: SAMager Console - M-EAS Status Monitoring.....	15
Figure 14	: SAMager Console – Visual M-EAS Monitoring	15
Figure 15	: SAMalyzer Application Window	16
Figure 16	: M-EAS Wake-Up	16
Figure 17	: M-EAS Service Announcement - SMT.....	17
Figure 18	: M-EAS Service Announcement - EAT	17

1 Overview

This application note describes how M-EAS – **M**obile **E**mergency **A**lert **S**ystem -services can be analyzed and monitored.

After a short introduction into M-EAS and why it is important, a solution gets presented, which allows to analyze M-EAS services in any regard, from top-level down to bit level, and to monitor such services 24/7 remotely via SNMP.

The solution addresses a wide range of users:

- (1) Broadcasters
- (2) Network-, service- and content providers
- (3) Manufacturers and developers of Mobile DTV products (ATSC-M/H)

2 Introduction into M-EAS

2.1 What is M-EAS?

[source: ATSC Newsletter 10/2012]

Based on the ATSC A/153 Mobile DTV Standard, M-EAS is a new technology that provides free, interactive, on-demand emergency information over live television on capable mobile DTV handsets. Specifically, M-EAS uses ATSC non-real time (NRT) datacast capabilities to deliver potentially life saving information to mobile devices via an over-the-air broadcast television signal. It requires no cell towers, no cell phone data plan and no Internet access. It is the only system that has the capacity to deliver on-demand emergency messages to so many people simultaneously. M-EAS has the potential to reach millions of people with a single digital TV broadcast. The system requires no additional radiofrequency spectrum and is an additional use of existing TV transmitters and towers. M-EAS can deliver enhanced alerts that include video files, audio files, images and even interactive html pages.

2.2 Why is M-EAS important?

[source: ATSC Newsletter 10/2012]

In times of crises, we need to be able to reach folks with vital information whenever and wherever they are. M-EAS enables this.

Local broadcasters provide the ability to deliver targeted alerts. They can be local, regional or national in scope.

Broadcasters provide the only truly scalable solution free of bottlenecks and queues. Alerts can instantly and simultaneously be delivered to millions of users. Broadcasters are reliable and have hardened infrastructure that is designed to run 24/7/365.

Broadcasters provide a redundant solution with several stations in each market.

M-EAS is content rich. It enables the delivery of several different media types (video, audio, graphics and HTML pages) so users can get the latest and most complete information without the need for an Internet connection. In contrast, the Commercial Mobile Alert System (CMAS) only provides 90 characters of text. That isn't even two-thirds of a tweet. These messages also regularly state, "check local media" for more information.

As the CMAS alerts indicate, and PEW research validates, people already turn to local television as their number one source for news, especially in times of emergency. This is important as it means there is no need to retrain people to use a new system. It builds on their natural habits and enables them to receive more information than ever before, and on their mobile devices.

Mobile devices run on batteries and can be recharged in the car, so information can be distributed even when the power goes out.

2.3 Why is the monitoring of M-EAS important for broadcasters?

As already noted, M-EAS is a new, outstanding technology which enables broadcasters to provide emergency messages and vital information for millions of people simultaneously. So it is a must for each broadcaster, service-, content- or network provider to guarantee that such services can be received at any time, reliable and correctly.

M-EAS service data get transmitted in a complex application layer, so that it is not sufficient to monitor the physical layer (RF) or the network layers (M/H, IP) to get information about the availability and correctness of the transmitted M-EAS data, but a specialized solution is required for doing this.

3 M-EAS Analysis and Monitoring

The analysis and monitoring of an M-EAS service can be divided in two parts:

1. M-EAS announcement and signaling
2. M-EAS data transmission, i.e. the appropriate FLUTE sessions

3.1 M-EAS Announcement and Signaling

An M-EAS service gets announced using the M/H Service Map Table (SMT), where it is specified by new defined M/H service category – 0x0F.

If an M-EAS service is announced then it does not necessarily mean that also M-EAS service data are currently transmitted, but it only means that M-EAS gets supported in the current broadcast, i.e. that emergency messages or vital information could be transmitted at any time. As long as no M-EAS data are transmitted the service sleeps.

To wake-up an M-EAS service a particular wake-up signal is sent in the Fast Information Channel (FIC). This signal also announces a new Emergency Alert Table (EAT).

The main task of the Emergency Alert Table (EAT) is to provide an EAS message. The EAS message itself is an XML structure which is specified by the Common Alerting Protocol (CAP) which was developed for exchanging public warnings and emergencies between alerting technologies.

A CAP message provides fundamental information for the current emergency event and can be used as initial indication. But M-EAS offers the possibility to provide a lot of additional and more detailed service information for a particular event, e.g.:

- Rules of conduct
- Forecasts
- Escape ways
- Specific regional information

The technology of transmission of such additional service information gets described in the following chapter.

3.2 M-EAS Service Data Transmission

M-EAS service data get transmitted within IP/UDP via FLUTE protocol - File Delivery over Unidirectional Transport – standardized by IETF (RFC 3926). FLUTE is a protocol which is used to deliver files of any kind, e.g. documents, images, audio/video clips. FLUTE can be used with both multicast and unicast User Datagram Protocol (UDP) delivery, but it is particularly suited to multicast networks. The FLUTE sender transmits all files in a data carousel.

A FLUTE session can consist of one or more channels, the file delivery sessions. A file delivery session consists of one file delivery table – FDT – and one or more files which have to be delivered.

The FDT provides a detailed description about the files which are to be delivered within the file delivery session. The FDT itself gets transferred as XML file.

3.2.1 M-EAS FLUTE Session Monitoring

Following parameters of a FLUTE session have to be monitored:

- (1) FDT (File Delivery Table)
 - the reception of a FDT for a file delivery session has to be monitored
 - the update cycle time of the FDT has to be measured
 - the FDT has to be analyzed against the specified XML schemas
- (2) File Delivery session
 - the completion time of a file delivery session has to be measured
- (3) File Delivery
 - the update time of all files of a file delivery session have to be measured

3.2.2 M-EAS Visual Monitoring

Beside the check of parameters and transmission monitoring the M-EAS service data should also be monitored visually, to check whether the transmitted files can actually be displayed correctly.

3.3 M-EAS Remote Monitoring

M-EAS services have to be monitored remotely at 24/7 via SNMP from a central place, the network operation center (NOC). Furthermore, the monitoring staff should also be able to monitor the M-EAS content visually, i.e. without having to log-in to the particular remote monitoring probe.

3.4 atscSAM - M-EAS Analysis & Monitoring Solution

atscSAM is a comprehensive software and turnkey solution for in-depth analysis and 24/7 SNMP based monitoring of mobile DTV (ATSC-M/H) and digital TV (ATSC/QAM) broadcasts on all technical layers.

atscSAM is currently used e.g. at more than 80 TV stations of the Mobile Content Venture, distributed throughout the entire United States, to monitor their live Mobile DTV (ATSC-M/H) broadcasts in real-time.

atscSAM version 3 adds complete M-EAS analysis and monitoring capabilities to atscSAM, both via SNMP as well as visually.

The following graphic shows which atscSAM components are involved in the M-EAS analysis and monitoring process and how these components interact.

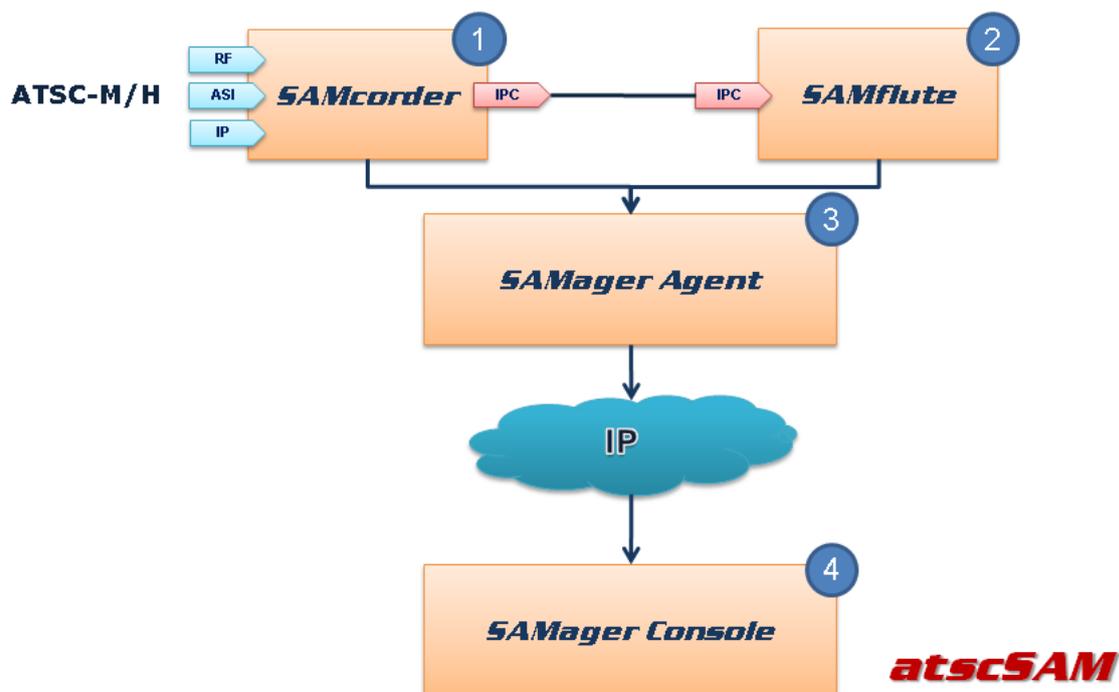


Figure 1 : atscSAM Components to analyze and monitor M-EAS

SAMcorder (1) receives the ATSC M/H broadcast via RF, IP or ASI input and detects all M/H services within this broadcast, including all M-EAS services. SAMcorder processes all M/H specific data including the M-EAS specific signaling data and analyzes the corresponding SI/PSI information. For in-depth analysis and monitoring of additional M-EAS service data SAMcorder de-multiplexes the M-EAS data and streams these data to SAMflute.

SAMcorder is also aware of the new descriptors and tables introduced with the Non-Real-Time Content Delivery standard **A/103** as well as with the upcoming **A/153-10** M-EAS standard.

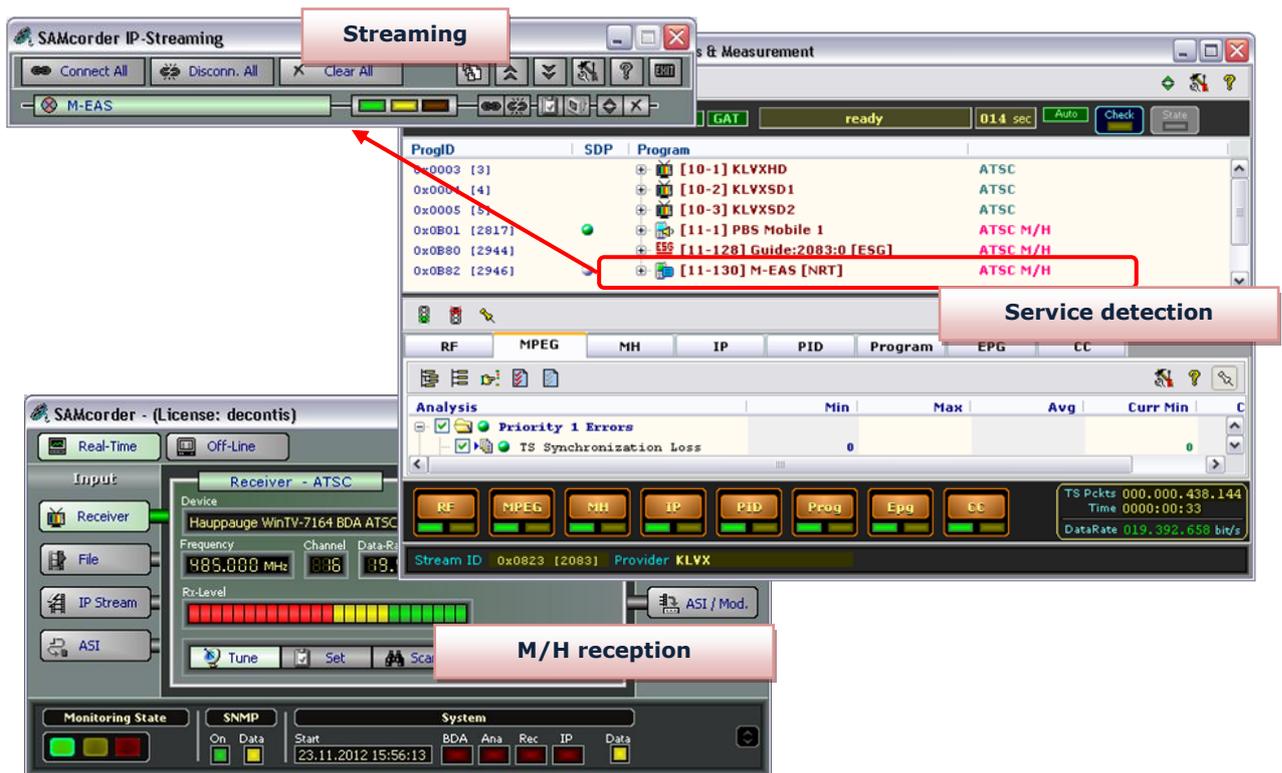


Figure 2 : SAMcorder – service detection, de-multiplexing and streaming

SAMflute (2) is the component within the **atscSAM** toolset which provides all features for the comprehensive analysis and monitoring of FLUTE sessions. SAMflute is able to analyze and monitor an unlimited number of FLUTE sessions simultaneously.

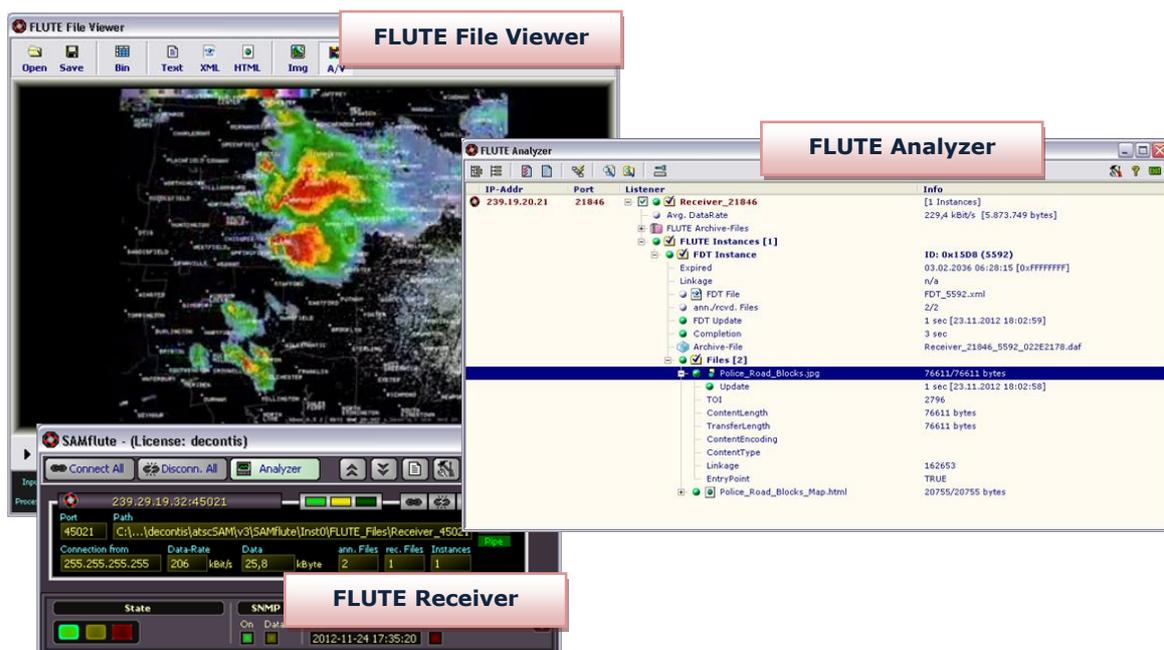


Figure 3 : SAMflute – FLUTE Analysis and Monitoring

SAMager Agent (3) and **SAMager Console (4)** are the SNMP components (Agent and Client) to realize the remote SNMP based monitoring.

3.4.1 Service Announcement and Signaling Monitoring

After scanning the current input channel SAMcorder detects the M-EAS services automatically and list these in the appropriate program list.



Figure 4 : SAMcorder M-EAS Announcement

As shown in the figure above, the M-EAS service is detected as FLUTE session. SAMcorder is able to de-multiplex the appropriate FLUTE data and can stream them to SAMflute for further analysis and monitoring.

The M/H data processor of SAMcorder analyzes all incoming M/H data in real-time, i.e.:

- Real-time analysis and monitoring of M/H signaling (TPC, FIC ...)
- Real-time analysis and monitoring of all SI/PSI tables

Especially for M-EAS services the M/H data processor provides following real-time analysis and monitoring capabilities:

- FIC EA-Signaling
- SI table repetition of NRT-EAT (Emergency Alert Table)
- M-EAS service monitoring
 - M-EAS wake-up monitoring
 - listing all M-EAS services all ensembles
 - listing al M-EAS messages

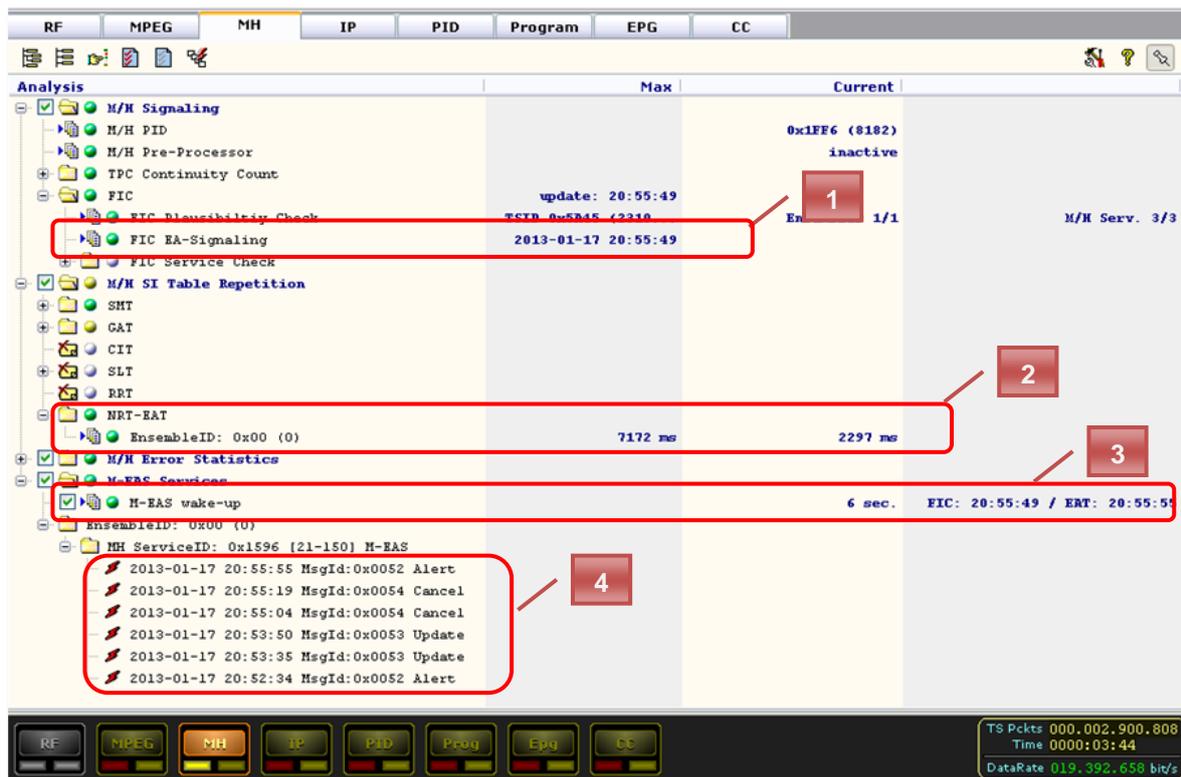


Figure 5 : M-EAS Real-Time Analysis and Monitoring

- (1) FIC EA-Signaling
- (2) NRT-EAT repetition monitoring
- (3) M-EAS wake-up
- (4) M-EAS messages

Furthermore SAMcorder provides an M-EAS message tracer where hundreds of M-EAS messages can be stored and analyzed.

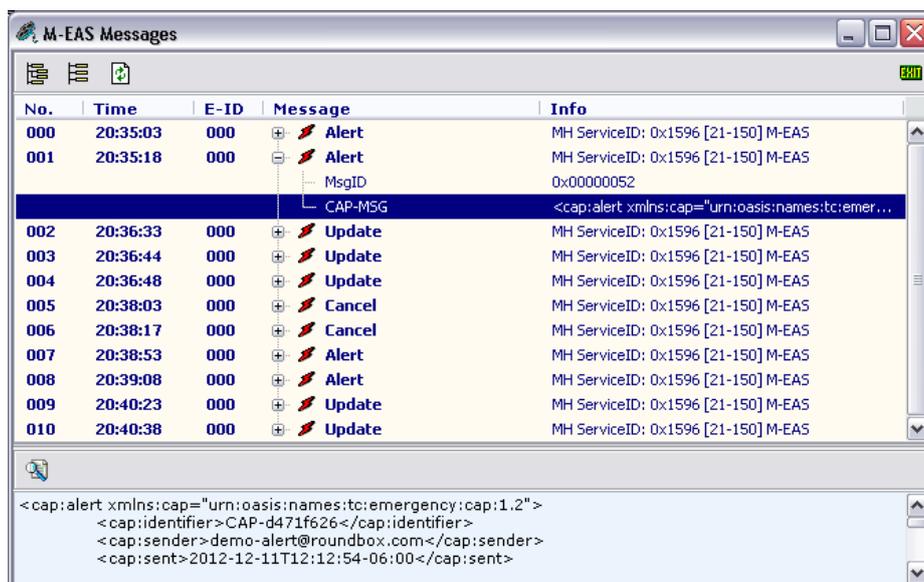


Figure 6 : M-EAS Message Tracer

The M-EAS CAP messages can be analyzed in comfortable GUI.

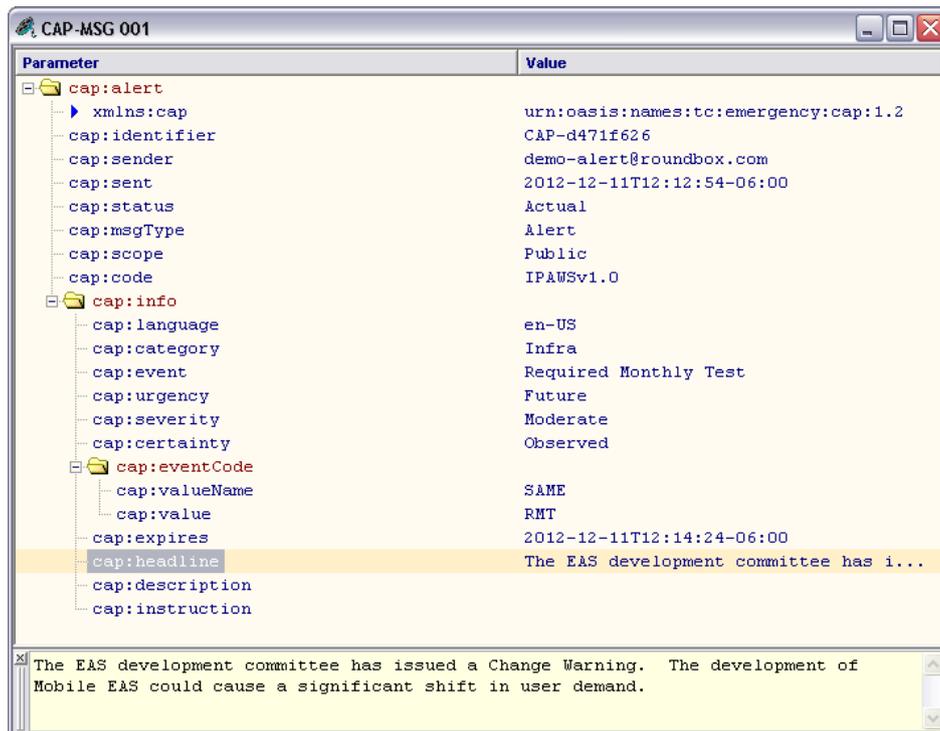


Figure 7 : CAP Message Viewer

3.4.2 M-EAS Service Data Monitoring

SAMflute provides a comprehensive FLUTE analyzer which is able to analyze and monitor all necessary parameters as described in chapter 3.2.1.

- FDT reception and update time
- FDT schema check
- file delivery completion and completion time
- update time for each single file of a particular file delivery session

Of course, for each monitoring parameter individual error and warning thresholds can be configured.

SAMflute is able to analyze and monitor an unlimited number of FLUTE sessions as well as all file delivery sessions simultaneously.

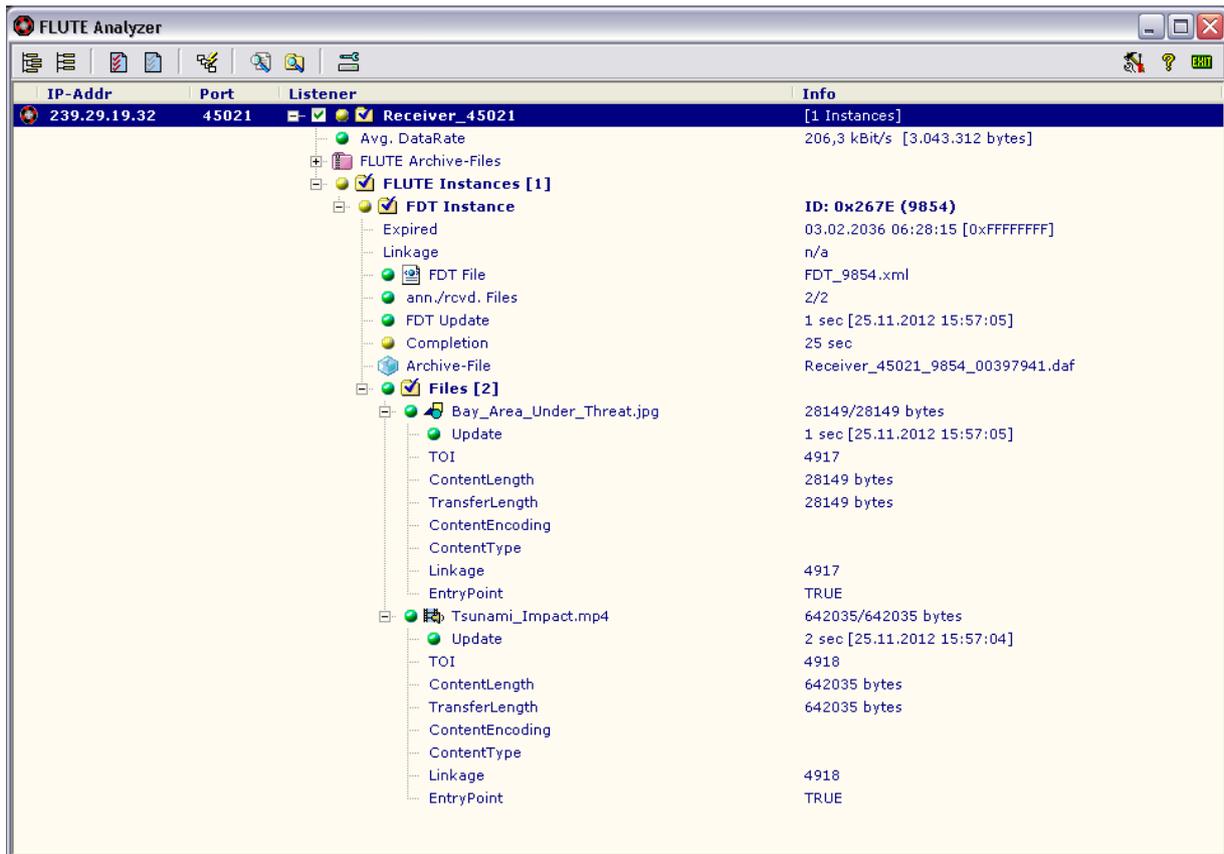


Figure 8 : SAMflute – FLUTE Analyzer

3.4.3 Visual Monitoring

Beside the FLUTE parameter monitoring, SAMflute provides an integrated and comfortable file viewer so that all files of a particular file delivery session can be monitored visually. The file viewer supports:

- Image files
- HTML files
- XML files (FDT)
- Audio/Video files
- Plain text files

With an integrated Hex-Viewer, all files can also be displayed in binary format. Compressed files are also supported and will be de-compressed automatically.

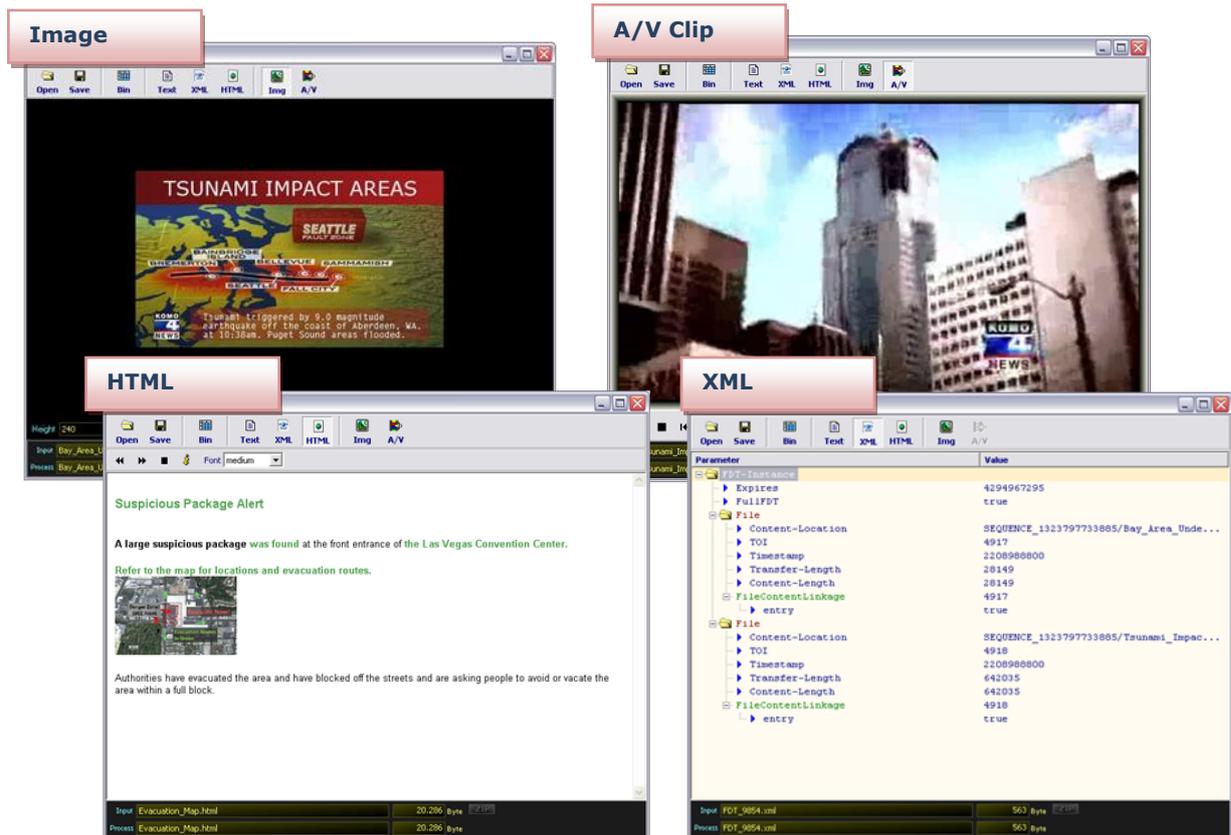


Figure 9 : SAMflute – File Viewer

3.4.4 Additional Functions

➤ File Archive

- all file delivery sessions can be saved and archived, even incomplete sessions
- the maximum disk space used for the archives is configurable



Figure 10 : FLUTE file archive

➤ File Archive Manager

- administration of the whole file archive
- integrated File Viewer

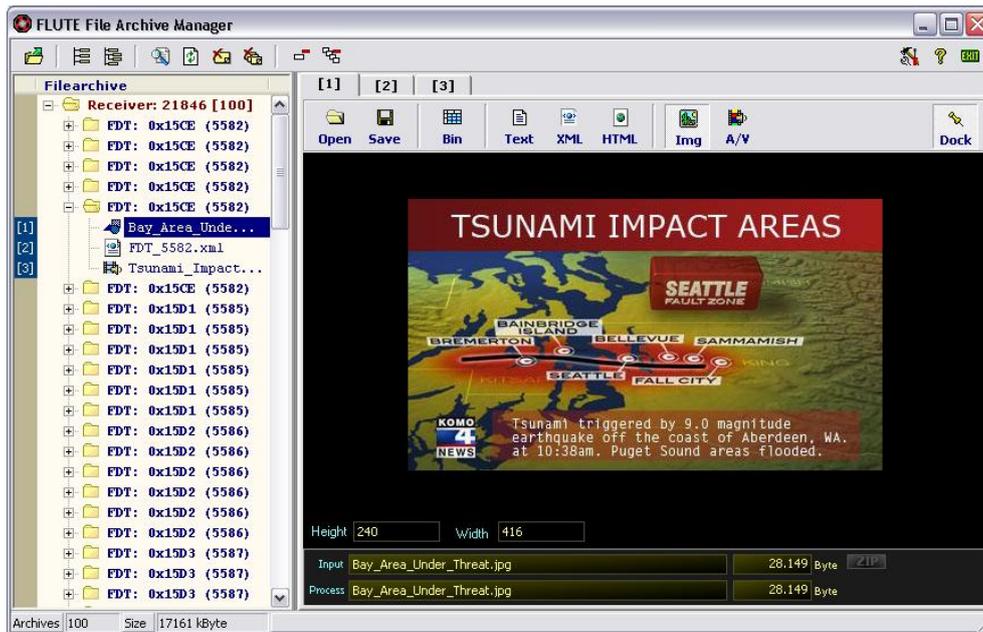


Figure 11 : SAMflute - File Archive Manager

➤ **In-depth FLUTE packet analyzer**

- creation of snapshots from the current FLUTE traffic
- each particular FLUTE packet can be analyzed up to the last bit

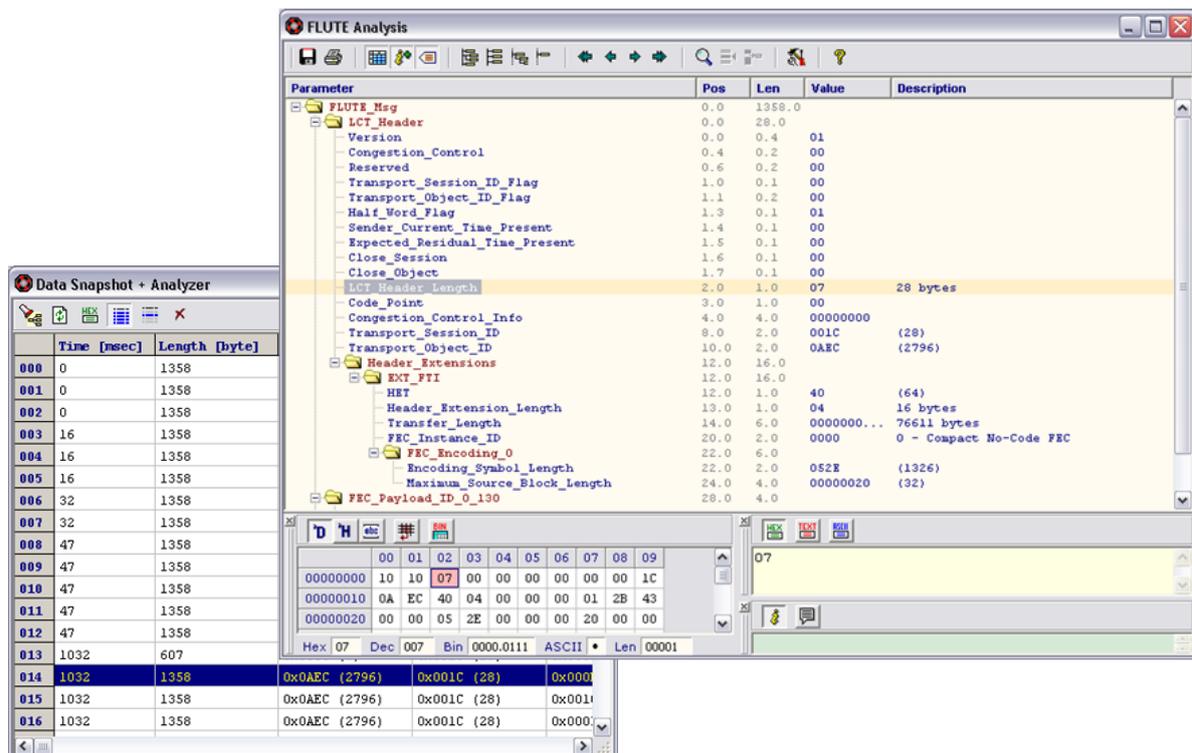


Figure 12 : FLUTE Packet Analyzer

3.4.5 Remote Monitoring

The **atscSAM** SNMP Client solution SAMager Console fully supports M-EAS monitoring, both regarding transmission parameters and visually. The current status of a M-EAS service can be visualized at one glance in a comfortable GUI.

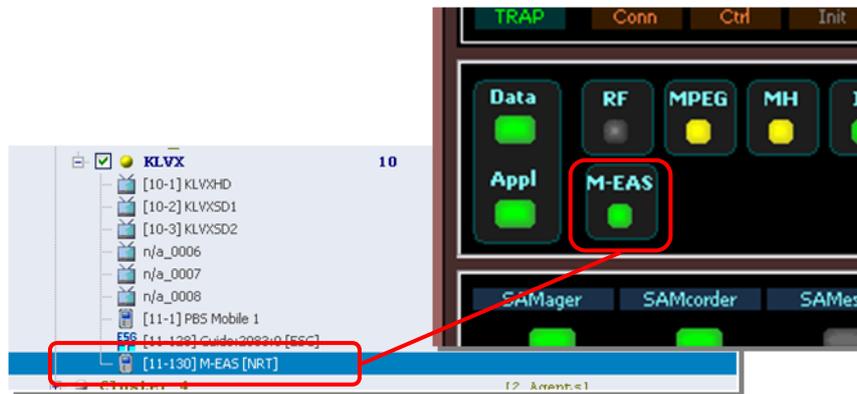


Figure 13 : SAMager Console - M-EAS Status Monitoring

SAMager Console enables the service staff in the NOC to transmit all files of the last FLUTE session of a particular M-EAS service from each monitoring probe within the monitoring network with only one click. By using the integrated FLUTE file viewer the M-EAS service can thereby also be monitored visually.



Figure 14 : SAMager Console – Visual M-EAS Monitoring

3.4.6 Off-Line Data Analysis

Beside the real-time analysis capabilities the **atscSAM** product line provides also a tool for in-depth analysis of recorded Transport Streams - SAMalyzer.

SAMalyzer supports the analysis of M-EAS services in any regard up to the last bit in a comfortable GUI.

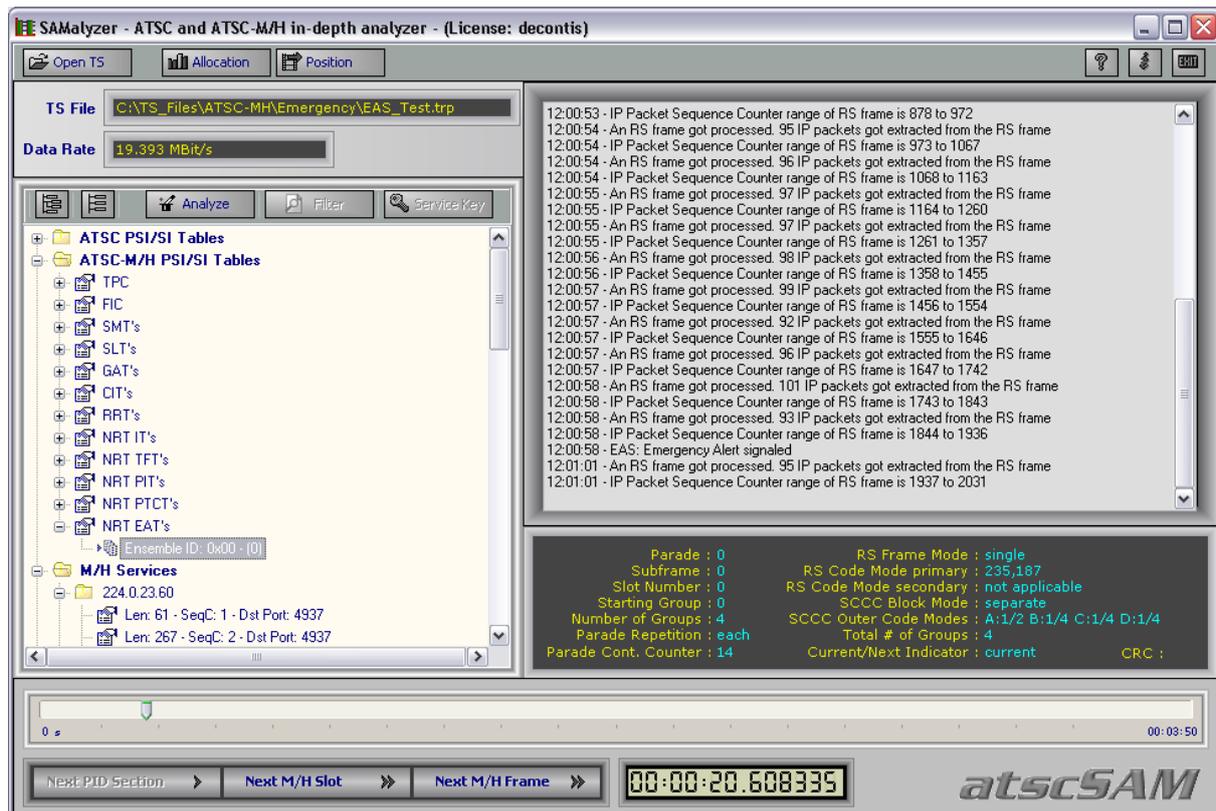


Figure 15 : SAMalyzer Application Window

- analysis of all ATSC M/H signaling information of each M/H slot: FIC including M-EAS extensions

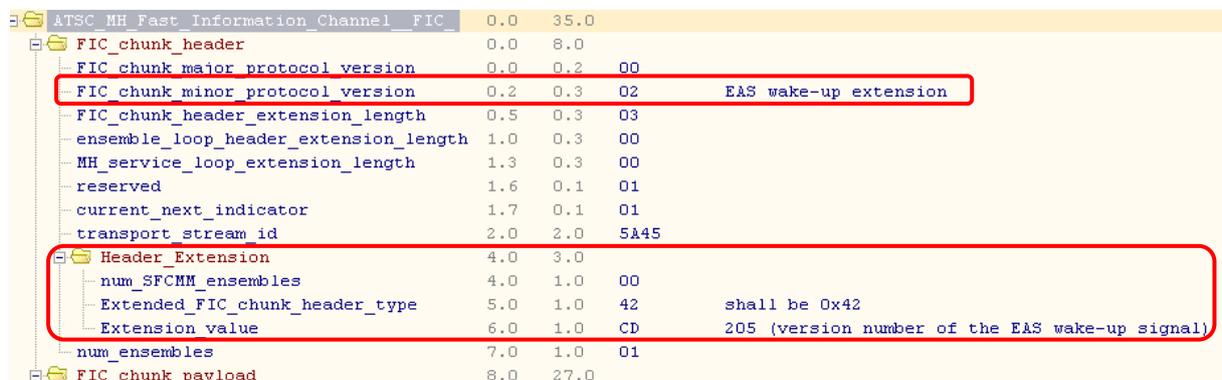


Figure 16 : M-EAS Wake-Up

- analysis of all ATSC M/H SI tables separately of each M/H ensemble and M/H parade including the M-EAS relevant tables SMT and EAT

ATSC_MH_Message	0.0	238.4		
Section_Header	0.0	8.0		
table_id	0.0	1.0	DB	Service Map Table
section_syntax_indicator	1.0	0.1	00	
private_indicator	1.1	0.1	01	
reserved	1.2	0.2	03	
section_length	1.4	1.4	00EC	
table_id_extension	3.0	2.0	0000	protocol version == 0; ensemble id == 0
reserved	5.0	0.2	03	
version_number	5.2	0.5	06	
current_next_indicator	5.7	0.1	01	PSIP_section is currently applicable
section_number	6.0	1.0	00	
last_section_number	7.0	1.0	00	
MH_Service_Map_Table	8.0	231.0		
num_MH_services	8.0	1.0	03	
MH_service	9.0	56.0		
MH_service	65.0	120.0		
MH_service	185.0	49.0		
MH_service_id	185.0	2.0	1596	
multi_ensemble_service	187.0	0.2	00	
MH_service_status	187.2	0.2	02	
SP_indicator	187.4	0.1	00	
short_MH_service_name_length	187.5	0.3	03	
short_MH_service_name	188.0	6.0	4D2D45415300	M-EAS
reserved	191.6	0.2	03	
MH_service_category	194.2	0.6	0F	Mobile Emergency Alert Service
num_components	195.0	0.5	01	
IP_version_flag	195.5	0.1	00	
service_source_IP_address_flag	195.6	0.1	01	
service_destination_IP_address_flag	195.7	0.1	01	
service_source_IP_address	196.0	4.0	0A0&0COF	10.10.12.15
service_destination_IP_address	200.0	4.0	EFO&0C13	239.10.12.19
component	204.0	19.0		
component_source_IP_address_flag	204.0	0.1	00	

Figure 17 : M-EAS Service Announcement - SMT

ATSC_MH_Message	0.0	518.0		
Section_Header	0.0	8.0		
table_id	0.0	1.0	EA	M-EAS Emergency Alert Table
section_syntax_indicator	1.0	0.1	00	
private_indicator	1.1	0.1	01	
reserved	1.2	0.2	03	
section_length	1.4	1.4	0203	
table_id_extension	3.0	2.0	0000	protocol version == 0; ensemble id == 0
reserved	5.0	0.2	03	
version_number	5.2	0.5	06	
current_next_indicator	5.7	0.1	01	PSIP_section is currently applicable
section_number	6.0	1.0	00	
last_section_number	7.0	1.0	00	
M-EAS_Mobile_Emergency_Alert_Table	8.0	510.0		
automatic_tuning_flag	8.0	0.1	00	
num_EAS_messages	8.1	0.7	01	
EAS_message	9.0	509.0		
EAS_message_id	9.0	4.0	00000052	
reserved	13.0	0.1	01	
EAS_IP_version_flag	13.1	0.1	00	IP v4
EAS_message_transfer_type	13.2	0.3	02	Alert message bytes shall be included in the EAT-MH.
EAS_message_encoding_type	13.5	0.3	02	Deflate
EAS_message	14.0	502.0		
reserved	14.0	0.4	0F	
EAS_message_length	14.4	1.4	01F4	
EAS_message_bytes	16.0	500.0	1F8B0...	<cap:alert xmlns:cap="urn:oasis:names:tc:emergency:c...
EAS_NRT_service_id	516.0	2.0	1596	

Figure 18 : M-EAS Service Announcement - EAT

4 Ordering Information

M-EAS Analysis and Monitoring is part of **atscSAM v3** and will be available in Q1/2013.
A live demonstration takes place at NAB 2013.

For more information please contact decontis:



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