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Contents

Intellectual Property Rights 7
Foreword 7
Modal verbs terminology 7
1 Scope 8
2 References 8
2.1 Normative references 8
2.2 Informative references 8
3 Definitions and abbreviations 9
3.1 Definitions 9
3.2 Abbreviations 12
4 MAMES Objectives and Operation 13
4.1 MAMES Objectives 13
4.2 Overview of MAMES Operation 13
4.2.1 MAMES Network Entities: MAMES Provider and MAMES Receiver 13
4.2.2 MAMES Operative Modes: Direct and Indirect MAMES Alerting 14
4.2.3 The MAMES Agents 15
4.2.3.1 MAMES Network Reference Model 15
4.2.3.2 MAMES Alerter-Side Agent 16
4.2.3.3 MAMES User-Side Agent 16
5 MAMES Architecture 16
5.1 Functional Architecture 16
5.2 Protocol Architecture 17
5.2.1 MAMES Positioning in a Protocol-stack Architecture 17
5.2.2 Protocol Architecture for Direct MAMES Alerting 19
5.2.2.1 Scenario A1 19
5.2.2.2 Scenario A2 20
5.2.3 Protocol Architecture for Indirect MAMES Alerting 21
5.2.3.1 Scenario B1 21
5.2.3.2 Scenario B2 22
6 MAMES Messages 23
6.1 Overall Structure 23
6.2 MAMES Message Types 24
6.2.1 Overview of MAMES Message Types 24
6.2.2 MAMES ALERT 25
6.2.3 MAMES Ultra-Short ALERT 26
6.2.4 MAMES UPDATE 26
6.2.5 MAMES CANCEL 27
6.2.6 MAMES ACK 27
6.3 MAMES Message Headers 28
6.3.1 MAMES Mandatory Headers 28
6.3.1.1 General Features 28
6.3.1.2 The ALERT Mandatory Header 28
6.3.1.3 The Ultra-Short ALERT Mandatory Header 28
6.3.1.4 The UPDATE Mandatory Header 29
6.3.1.5 The CANCEL Mandatory Header 29
6.3.1.6 The ACK Mandatory Header 29
6.3.2 MAMES Extension Headers 29
6.3.2.1 General Features 29
6.3.2.2 Alert and Response Type Header 30
6.3.2.3 Incident Header 30
6.3.2.4 Validity Header 30
6.3.2.5 Administrative Areas Header 31
6.3.2.6 Authentication/Integrity Header 31
6.3.2.7 Encryption Header 31

6.3.3 The Alert Message Header 32
6.3.4 MAMES Headers Concatenation Algorithm 32
6.4 MAMES Header Fields 33
6.4.1 Fields of Mandatory Headers 33
6.4.1.1 MAMES Protocol Version 33
6.4.1.2 MAMES Message Type 33
6.4.1.3 MAMES Message ID 33
6.4.1.4 MAMES Alert Provider ID 34
6.4.1.5 Notification Area 34
6.4.1.6 MAMES Transport Priority 34
6.4.1.7 ACK Request Indicator 34
6.4.1.8 Alert Issuer ID 35
6.4.1.9 Next Header Type 35
6.4.1.10 MAMES Reference 35
6.4.1.11 MAMES Receiver Location 36
6.4.1.12 MAMES Receiver ID 36
6.4.2 Fields of Alert and Response Type Header 36
6.4.2.1 MAMES Status 36
6.4.2.2 MAMES Alert Scope 37
6.4.2.3 MAMES Response Type 37
6.4.2.4 MAMES Event Category 38
6.4.3 Fields of Incident Header 38
6.4.3.1 MAMES Incident ID 38
6.4.3.2 Issuance Time 39
6.4.4 Fields of the Validity Header 39
6.4.4.1 MAMES Validity Start 39
6.4.4.2 MAMES Validity End 39
6.4.5 Fields of the Administrative Areas Header 40
6.4.5.1 Administrative Areas Header Version 40
6.3.5.2 Administrative Areas Coding 40
6.4.5.3 Number of Areas 40
6.4.5.4 Area IDs 40
6.4.6 Fields of the Authentication/Integrity Header 41
6.4.6.1 Authentication/Integrity Header Version 41
6.4.6.2 Authentication/Integrity Flag 41
6.4.6.3 Authentication/Integrity Algorithm ID 41
6.4.6.4 MAC Value Length 41
6.4.6.5 MAC Value 42
6.4.7 Fields of the Encryption Header 42
6.4.7.1 Encryption Header Version 42
6.4.7.2 Encryption Algorithm ID 42
6.4.7.3 Initialization Vector Length 42
6.4.7.4 Initialization Vector 42
6.4.7.5 Block Size 43
6.4.7.6 Number of Padding Bytes 43
6.4.8 Fields of the Alert Message Header 43
6.4.8.1 Alert Message Type 43
6.4.8.2 Language ID 44
6.4.8.3 Alert Message Length 44
6.4.8.4 More AMHs Flag 44

7 Behaviour of MAMES Agents 44
7.1 Identification of a Set of behaviours 44
7.2 MAMES Alert Provider Actions 45
7.2.1 Actions of MAMES Provider upon reception of an Alert Message from Alert Issuer (MAMES Composition Process) 45
7.2.2 Actions of MAMES Provider for declaring a previous transmitted MAMES Frame obsolete (MAMES Composition Process) 46
7.2.3 Actions of MAMES Provider upon reception of a MAMES ACK from MAMES Receiver (ACK Parsing Process) 47
7.3 MAMES Alert Receiver Actions 47

7.3.1 Actions of MAMES Receiver upon reception of a MAMES Frame (Parsing Process and MAMES ACK Composition Process) 47
7.3.2 Actions of MAMES Receiver upon reception of an Alert acknowledgement from an Alerting Device (MAMES ACK Composition Process) 49

Annex A (normative): MAMES Requirements 50

A.1 General Functional Requirements 50

A.2 MAMES Alerter-Side Agent Requirements 50

A.3 MAMES User-Side Agent Requirements 51

Annex B (normative): MAMES Frame Field Details 52

B.1 Mandatory Header Fields Details 52
B.1.1 Notification Area Field Details 52

B.2 Extension Header Fields Details 52
B.2.1 <Area IDs>: Administrative Area Codes Mapping 52

B.3 Alert Message Header Fields Details 53
B.3.1 <Language ID> Codes 53
B.3.2 <Alert Message Type>: Internet Media Type Mapping 56

Annex C (informative): MAMES Frames Examples 58

C.1 MAMES ALERT Frame 58

C.2 MAMES Ultra-short ALERT Frame 59

C.3 MAMES UPDATE Frame 59

C.4 MAMES CANCEL Frame 59

C.5 MAMES ACK Frame 60

Annex D (normative): MAMES Headers Concatenation 61

D.1 Adopted Notation: Headers Fields Numbering 61

D.2 Mandatory Headers Fields Positioning 62
D.2.1 General Features 62
D.2.2 ALERT MH 62
D.2.3 Ultra-Short ALERT MH 62
D.2.4 UPDATE MH 63
D.2.5 CANCEL MH 63
D.2.6 ACK MH 63

D.3 Extension Headers *non-rotated* and *rotated* Versions 63
D.3.1 General Features 63
D.3.2 Alert and Response Type Header 64
D.3.3 Incident Header 64
D.3.4 Validity Header 65
D.3.5 Administrative Areas Header 65
D.3.6 Authentication/Integrity Header 66
D.3.7 Encryption Header 66

D.4 Alert Message Header *Non-rotated* and *Rotated* Versions 67

Annex E (informative): Description of the Behaviour of the MAMES Agents 68

E.1 Adopted Notation 68

E.2 MAMES System and MAMES Blocks 69

E.3 MAMES Processes 70
E.3.1 Overview of the MAMES Processes and Corresponding Procedures 70
E.3.2 MAMES Alerter-Side Agent Processes 71

E.3.3 MAMES User-Side Agent Processes 73
History 75

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document establishes the specifications for the MAMES (Multiple Alert Message Encapsulation over Satellite) Protocol. Starting from an overview of the MAMES objectives and operations, the MAMES Architecture is presented: the MAMES functional entities are identified and the MAMES positioning in a protocol-stack architecture is provided by defining a set of MAMES operational scenarios.

The MAMES alert message encapsulation scheme is specified by defining the overall MAMES Message structure, the different types of MAMES messages and all MAMES Header fields.

The behaviour of the MAMES Agents responsible for the process of the MAMES Protocol is defined.

Guidelines for integrating the MAMES alert message encapsulation scheme into communications networks are provided in [i.1].

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] IETF RFC 2104: "HMAC: Keyed-Hashing for Message Authentication".

[2] IETF RFC 4868: "Using HMAC-SHA-256, HMAC-SHA-384, and HMAC-SHA-512 with IPsec".

[3] IETF RFC 4493: "The AES-CMAC Algorithm".

[4] IETF RFC 4494: "The AES-CMAC-96 Algorithm and Its Use with IPsec".

[5] IETF RFC 3602: "The AES-CBC Cipher Algorithm and Its Use with IPsec".

[6] IETF RFC 3686: "Using Advanced Encryption Standard (AES) Counter Mode With IPsec Encapsulating Security Payload (ESP)".

[7] Recommendation ITU-T X.1303: "Common alerting protocol (CAP 1.1)".

[8] OASIS Standard: "Common Alerting Protocol Version 1.2".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TR 103 338: "Satellite Earth Stations and Systems (SES); Satellite Emergency Communications (SatEC); Multiple Alert Message Encapsulation over Satellite (MAMES) deployment guidelines".

[i.2] ISO/IEC 27000:2014: "Information technology - Security techniques - Information security management systems - Overview and vocabulary".

[i.3] http://csrc.nist.gov/groups/ST/toolkit/index.html.

[i.4] NUTS (Nomenclature of Territorial Units for Statistics), by regional level, version 2010 (NUTS 2010).

NOTE: Available at: http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_CLS_DLD&StrNom=NUTS_33&StrLanguageCode=EN.

[i.5] NUTS - Nomenclature of territorial units for statistics, Local Administrative Units (LAU).

NOTE: Available at: http://ec.europa.eu/eurostat/web/nuts/local-administrative-units.

[i.6] ISO 3166-1: "Codes for the representation of names of countries and their subdivisions -- Part 1: Country codes".

[i.7] "Communication system for the dissemination of alert messages: Architecture and design document", Deliverable D3.6, Alert for All (A4A) project.

[i.8] ISO 639-1:2002: "Codes for the representation of names of languages -- Part 1: Alpha-2 code".

[i.9] Media Types.

NOTE: Available at http://www.iana.org/assignments/media-types/media-types.xhtml.

[i.10] IETF RFC 2046: "Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types".

[i.11] European Commission Mandate M/496 (2011): "Mandate Addressed to CEN, CENELEC and ETSI to Develop Standardization Regarding Space Industry (Phase 3 of the Process)".

[i.12] L. Franck, R. Suffritti, "Multiple Alert Message Encapsulation over Satellite", 1st International Conference on Wireless Communication, Vehicular Technology, Information Theory and Aerospace & Electronic Systems Technology, 2009, Wireless VITAE 2009, May 2009.

[i.13] ETSI TS 102 182: "Emergency Communications (EMTEL); Requirements for communications from authorities/organizations to individuals, groups or the general public during emergencies".

[i.14] ETSI TS 102 900: "Emergency Communications (EMTEL); European Public Warning System (EU-ALERT) using the Cell Broadcast Service".

[i.15] ETSI TS 122 268: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Public Warning System (PWS) requirements (3GPP TS 22.268 version 12.2.0 Release 12)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Alert Intermediary System: telecommunications network or node that is located at the user side of the Alert Network and that forwards alert-related (MAMES or non-MAMES) messages

Alert Issuer: entity that generates Alert Messages and forwards them to a MAMES Alert Provider for MAMES Encapsulation; more generally, entity that terminates an Alert Protocol at the alerter side of an Alert Network

NOTE: Depending on the Alert Protocol used, an Alert Issuer may be capable of updating or cancelling a previously issued Alert Message, and of requesting and accepting acknowledgement messages.

Alert Message: Alert Protocol Message containing data to alert and/or inform Alert Users about an impending or on-going emergency

Alert Network: in the context of the present document, telecommunications or navigation network that supports Alert Protocol Messages

Alert Protocol: protocol used to exchange Alert Protocol Messages

NOTE 1: In its most basic form, an Alert Protocol is a simple, mutually agreed rule for encoding alert-related information (e.g. by specifying an Internet media type).

NOTE 2: An advanced Alert Protocol typically includes, in addition to an Alert Message, other specially formatted messages for the purpose of updating, cancelling or acknowledging a previous Alert Protocol Message. An example of an advanced Alert Protocol is CAP.

NOTE 3: The termination points of an Alert Protocol are the Alert Issuer (at the alerter side) and the Alerting Device or the Mediation Device (at the user side).

Alert Protocol Message: message conforming to an Alert Protocol

NOTE: The term Alert Protocol Message comprises messages designed to alert or update Alert Users, as well as messages designed to cancel or acknowledge a previously transmitted Alert Protocol Message.

Alert User: entity that consumes the rendered content of an Alert Protocol Message

NOTE 1: A typical Alert User is a physical person that (e.g.) reads an Alert Message text on a display; an Alert User may also be a technical system that is triggered by the contents of an Alert Message to perform certain tasks (e.g. close a floodgate).

NOTE 2: Alerting Devices are not considered to be Alert Users, since they do not consume, but in fact render the contents of Alert Messages.

Alerting Device: device that receives an Alert (Protocol) Message and renders its content to one or more Alert User(s) according to its rendering capabilities; more generally, entity that terminates an Alert Protocol at the user side of an Alert Network

NOTE 1: Depending on the Alert Protocol used, an Alerting Device may be capable of returning acknowledgement messages.

NOTE 2: An Alerting Device contains one or more Alerting Function(s) and it may contain one or more Mediation Function(s).

NOTE 3: An example of an Alerting Device is a siren that activates the proper tone for alerting the population; another example is a smartphone that displays the Alert Message content.

Alerting Function: logical function within an Alerting Device that receives the alert indication or information and renders these data according to its capabilities

Alerting Services Regulator: authority that regulates the implementation and provision of alerting services within its area of authority

CAP Capable Device: Alerting Device or Mediation Device that is capable of processing a CAP-compliant Alert Protocol Message; more generally, device that terminates the CAP protocol at the user side of a CAP-based Alert Network

Direct MAMES Alerting: MAMES-based alerting scheme whereby the Satellite Terminal and the MAMES Receiver are co-located, i.e. either integrated into a single device or interconnected via a direct physical link

Indirect MAMES Alerting: MAMES-based alerting scheme whereby the Satellite Terminal and the MAMES Receiver are interconnected via a network, referred to as an Alert Intermediary System

MAMES Agent: software module that executes the MAMES Protocol

NOTE: Two types of MAMES Agents exist: The MAMES Alerter-Side Agent and the MAMES User-Side Agent.

MAMES Alert Provider: entity that generates MAMES Messages; more generally, entity that terminates the MAMES Protocol at the alerter side of a MAMES Network

NOTE: A MAMES Alert Provider is also capable of requesting and accepting MAMES-based acknowledgement (ACK) messages.

MAMES Alert Receiver: entity that is capable of receiving MAMES Messages; more generally, entity that terminates the MAMES Protocol at the user side of a MAMES Network

NOTE: A MAMES Alert Receiver is also capable of generating MAMES-based acknowledgement (ACK) messages.

MAMES Alerter-Side Agent: MAMES Agent serving the MAMES Alert Provider

MAMES Alerter-Side Controller: entity within the MAMES Alert Provider that configures, monitors and controls a MAMES Alerter-Side Agent

NOTE: The MAMES Alerter-Side Controller may be a software module operated by a physical person in charge of initiating and configuring a MAMES Alerter-Side Agent, and of controlling its operation in coordination with the Alert Issuer; alternatively, it may be an autonomous software algorithm performing these tasks.

MAMES Decapsulation: process of decapsulating a MAMES Frame to obtain the message(s) contained in the MAMES Payload

NOTE: Both the MAMES User-Side Agent and the MAMES Alerter-Side Agent are capable of MAMES Decapsulation.

MAMES Encapsulation: process of encapsulating one or more Alert Protocol Message(s) into a MAMES Frame

NOTE: Both the MAMES Alerter-Side Agent and the MAMES User-Side Agent are capable of MAMES Encapsulation.

MAMES Frame: used interchangeably with the term MAMES Message

MAMES Governing Body: authority that governs and regulates the operations and communications of all MAMES entities

MAMES Message: message conforming to the MAMES format

NOTE: MAMES Messages consist of a MAMES Header and (optionally) a MAMES Payload.

MAMES Network: Alert Network that supports the distribution and exchange of MAMES Messages

MAMES Payload: Alert Protocol Message(s) contained within a MAMES Frame

MAMES Protocol: Alert Protocol that supports the distribution and exchange of MAMES Messages

MAMES Provider: used interchangeably with the term MAMES Alert Provider

MAMES Receiver: used interchangeably with the term MAMES Alert Receiver

MAMES User-Side Agent: MAMES Agent serving the MAMES Alert Receiver

MAMES User-Side Controller: entity within the MAMES Alert Receiver that configures, monitors and controls a MAMES User-Side Agent

NOTE: Once initiated, the MAMES User-Side Controller is an autonomously running software algorithm.

Mediation Device: device hosting one or more Mediation Function(s)

Mediation Function: in the context of the present document, logical function that performs a protocol conversion between two different Alert Protocols

NOTE 1: A Mediation Function is required in cases when the Alerting Device (e.g. a siren) is not capable of processing the incoming Alert Message (e.g. a CAP message).

NOTE 2: A Mediation Function may be implemented as a stand-alone device (Mediation Device), or it may be embedded within an Alerting Device.

SatCom/SatNav/Com Network: communications network based on satellite communications, satellite navigation or terrestrial communications (wired, wireless, or mobile) technology

SatCom/SatNav/Com Regulator: authority that regulates the deployment and provision of SatCom/SatNav/Com Networks and services

SatCom/SatNav/Com Service Provider: entity that provides a satellite communications, a satellite navigation or a terrestrial communications service to its subscribers

SatCom/SatNav/Com Subscriber: entity that subscribes to and/or uses a satellite communications, a satellite navigation or a terrestrial communications service offered by a SatCom/SatNav/Com Provider

SatCom/SatNav/Com User Segment: satellite communications, satellite navigation or terrestrial communications subsystem that comprises all SatCom/SatNav/Com network entities at the user side of the SatCom/SatNav/Com Network

SatCom/SatNav Network: communications network based on satellite communications or satellite navigation technology

SatCom/SatNav Ground Segment: satellite communications or satellite navigation subsystem comprising all SatCom/SatNav network entities at the provider side of the SatCom/SatNav Network

SatCom/SatNav Space Segment: communications or navigation satellite(s)

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

A4A	Alert-For-All (Alert4All)
ACK	Acknowledgement
AES	Advanced Encryption Standard
AES-CBC	AES Cipher Block Chaining
AES-CTR	AES Counter
AM	Alert Message
AMH	Alert Message Header
ASN.1	Abstract Syntax Notation One
CAP	Common Alerting Protocol
CBRNE	Chemical, Biological, Radiological, Nuclear or high-yield Explosive threat or attack
CMAC	Cipher-based MAC
EH	Extension Header
EU	European Union
GNSS	Global Navigation Satellite System
HMAC	keyed-Hash Message Authentication Code
IP	Internet Protocol
ISO	International Organization for Standardization
ITU	International Telecommunications Union
JSON	JavaScript Object Notation
LAU	Local Administrative Unit
MAC	Message Authentication Code
MAMES	Multiple Alert Message Encapsulation over Satellite
MB	Megabyte
MH	Mandatory Header
NIST	National Institute of Standards and Technology
NUTS	Nomenclature of Units for Territorial Statistics
OASIS	Organization for the Advancement of Structured Information Standards
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
POCSAG	Post Office Code Standardization Advisory Group
SatCom	Satellite Communication
SatNav	Satellite Navigation

SDU	Service Data Unit
SHA	Secure Hash Algorithm
UTC	Coordinated Unviersal Time
XML	Extensible Markup Language

4 MAMES Objectives and Operation

4.1 MAMES Objectives

MAMES main objectives are:

- the definition of an encapsulation protocol for Alert Protocol Messages transport over satellite links, as well as over other terrestrial communication links, like GSM, LTE, etc.;
- the provision of a flexible and extensible encapsulation scheme;
- the encapsulation of a single or a concatenation of Alert Protocol Messages (e.g. CAP, unstructured text, image, paging protocols, etc.);
- the definition of additional (optional) functions for service extension and adaption towards specific crisis situations;
- the integration of the defined protocol with the main telecommunication satellite architectures (Galileo Public Regulated Service and Commercial Service data part; DVB-Suite, any IP-based satellite access, etc.) and with terrestrial communication networks.

MAMES is expected to be primarily used over satellite networks, but nothing prevents it to work over other terrestrial networks. The present document focuses on its use for satellite networks.

4.2 Overview of MAMES Operation

4.2.1 MAMES Network Entities: MAMES Provider and MAMES Receiver

The objective of this clause is to provide an overview of MAMES basic operation and introduce the MAMES network entities (MAMES Alert Provider and MAMES Alert Receiver).

Figure 4.1 illustrates the basic MAMES alerting operation, showing the network hierarchy of the alerting chain, the main involved entities, the links between them and exchanged messages.

The aim of Figure 4.1 is to give an overview of the basic MAMES operations and not to provide an exhaustive picture of the applicability of the MAMES protocol in terms of supported types of services.

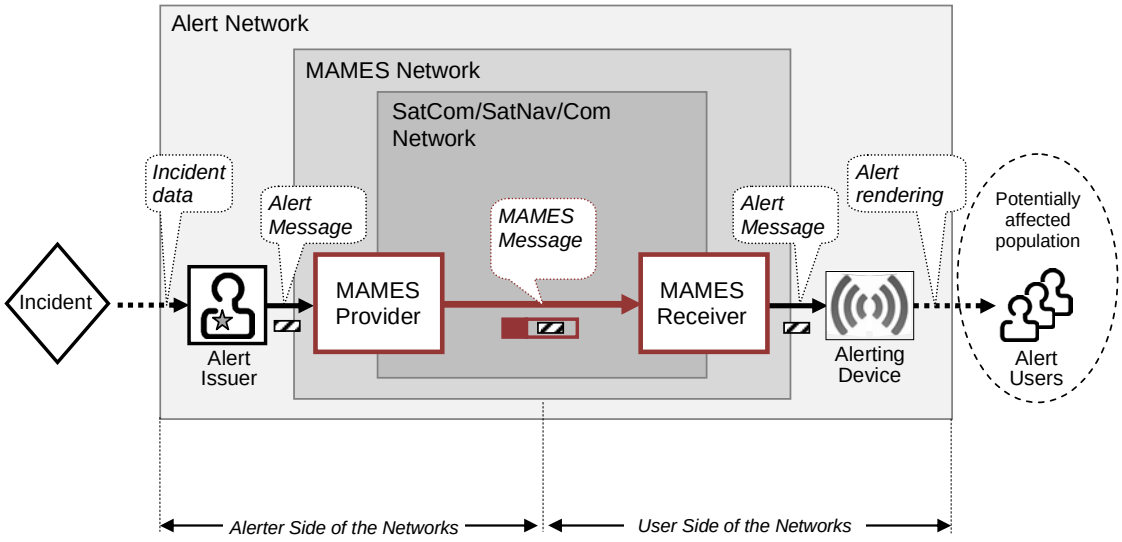

Figure 4.1: Overview of MAMES Operation