Enhancing the efficiency of alerting systems through personalized, culturally sensitive multi-channel communication

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Section I.: API Opti-Alert Message Repository

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1. Introduction

In this document a detailed description of the application programming interface of the alert message repository, developed within the Opti-Alert project, will be given. This encompasses accessibility of the repository, supported operations and web interface and underlying data exchange format.

The alert message repository provides a central storage for alert messages as part of a distributed warning system. The repository on the one hand permits communications with alert message producers (clients) to receive new alert messages, message updates and other types of alert messages conforming to the Common Alerting Protocol (CAP). On the other hand alert messages can be retrieved by privileged distribution systems for the dissemination of the messages to the recipient groups, addressed within the alert message. For this purpose the repository provides a search interface to query for messages by a selection of message attributes.

2. Data Exchange Format

The data format used for the communication between message repository and clients, but also for the storage of the messages within the repository, is an adapted version of CAP. CAP is an XML-based data format and protocol for the transmission and dissemination of emergency alerts and warnings. Hereby the default CAP-profile has been extended and adapted for the specific requirements of the Opti-Alert project. The details of this data format are described in the separate CAP-OAP document.

3. Message Repository Interface

The message repository supports two main operations, which are creating new message resources and retrieving messages. The privileges differ by operation type and are based on an access level. Creating new messages requires a higher access level than retrieving messages. Write access hereby implies read access, whereas read access in contrast does not include any other operations.

3.1 Create Alert Message

This interface is dedicated to the creation of alert messages within the message repository. In the repository any kind of operation will be reflected as individual message resource. This encompasses new *alert* messages, message *updates*, *cancellations*, *acknowledgements* and *error* messages for message rejection.

- *Alert*: New alert messages can be submitted to the repository by specifying within the element <msgType> the value "alert". A new alert message must always contain at least one <info>block with the audience reference value representing the audience group "all", which is used for base messages. For each additional audience group to be addressed, a separate <info> block is required.
- *Update*: To update a previous message the element <msgType> has to be set to "update". An update message always refers to an earlier message, which has to be specified within the element <references>. All referenced messages will be invalidated automatically in the repository and will be ignored by the search interface.
- *Cancel*: Similar to the update operation a cancel-message always refers to a previous message. The identifier of the message to be cancelled has to be specified again within the <references> element. Cancel messages do not require an <info> element as part of the message body.
- *Clear*: Clear messages are a specific form of update messages. Hence clear messages require the <msgType> element to be set to "update". Additionally the attribute <responseType> must be set to "allClear".

For authentication and authorisation valid user credentials are required, which can be specified as HTTP request headers. The credentials include a username, a Base64 encoded password and the organisation name.

Create			
Request Type	POST		
Request Path	{base uri}/alerts		
Request Headers	Content-Type: application/xml Accept: application/xml username: string password: base64-encoded string organisation: string		
Response Headers			
Response Status	201, 400, 403, 406, 409, 415, 500		
Request Message Body			
Property Name	Data Type	Description	Occurrence
alerts	complexType	Container for "alert" components	required
Response Message Body			
Property Name	Data Type	Description	Occurrence

3.2 Search Messages by Attributes

Alert messages can be retrieved from the repository via the interface specified below. There are a variety of attributes, which can be included to narrow the search result. If no attributes are specified, there will be the following default values applied:

- language: *en-GB*
- status: *actual*
- validity: *valid* (internal value)

The default language is set to British English (en-GB); the message status is set to "actual". In order to search for messages with non-default values, the parameters can be overwritten.

In addition only valid messages will be considered in the result set. Messages that were replaced by an "update" message for instance are invalidated automatically and will therefore not be retrieved.

To specify the search parameters "language" and "homeCountry" the corresponding identifiers from the reference standards ISO3166-1 and RFC 3066 have to be selected respectively.

Search	
Request Type	GET
Request Path	{base uri}/alerts?parameter=value&…
Request Parameters	msgType (optional) language (optional, default=*en-GB*) severity (optional) status (optional, default=*actual*) category (optional) certainty (optional) homeCountry (optional) expiryFrom (optional) expiryTo (optional) sentFrom (optional) sentTo (optional) The date has to be specified in the following format: *"2012-12-11T15:00:11%2B01:00"* (the + sign must be encoded in hexadecimal format: *%2B*)
Request Headers	Accept: application/xml username: string password: base64-encoded string organisation: string
Response Headers	Content-Length Content-Type
Response Status	200, 204, 400, 403, 500

Request Message Body			
Property Name	Data Type	Description	Occurrence
Response Message Body			
Property Name	Data Type	Description	Occurrence
alerts	complexType	Container for “alert” components	optional

3.3 Search Message by Identifier

Alternatively to the search via search filter it is possible to retrieve a specific alert message from the repository directly by message identifier as described below.

Search by Identifier			
Request Type	GET		
Request Path	{base uri}/alerts/{*id*}		
Request Parameters			
Request Headers	Accept: application/xml username: string password: base64-encoded string organisation: string		
Response Headers	Content-Length Content-Type		
Response Status	200, 204, 400, 403, 500		
Request Message Body			
Property Name	Data Type	Description	Occurrence
Response Message Body			
Property Name	Data Type	Description	Occurrence
alerts	complexType	Container for “alert” components	optional

4. Message Components

Alert messages are represented by the CAP adapted profile format CAP-OAP. All elements comprising alert messages are described in detail within the CAP-OAP profile document.

5. Status Codes

Code	Status Name	Status Description
200	OK	The request was successful.
201	Created	The request was successful and the resource was created.
204	No Content	The server has fulfilled the request but does not need to return an entity-body.
400	Bad Request	The request could not be understood by the server due to malformed syntax.
403	Forbidden	The request was missing the user credentials or the application-id.
404	Not Found	The server has not found anything matching the Request-URI.
406	Not Acceptable	The resource identified by the request is only capable of generating response entities which have content characteristics not acceptable according to the accept headers sent in the request.
409	Conflict	The request was sent correctly, but data could not be updated.
415	Unsupported Media Type	The entity of the request is in a format not supported by the requested resource for the requested method
500	Internal Server Error	The server encountered an unexpected condition, which prevented it from fulfilling the request.

Section II.: Opti-Alert Profile for the Common Alerting Protocol (CAP-OAP)

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1 Introduction

The WP5 of Opti-Alert deals with the implementation of a software prototype for a socio-culturally sensitive presentation producer and the specification of an interface for the integration of third party legacy alerting systems. The producer and the interface are parts of the personalized and adaptive multi-channel alerting system that will be the final outcome of Opti-Alert. As described in the system design document (ESPRI, 2012), an important part of the design phase is the specification of the message format used for the warnings description and of the protocol used by the interface for communicating these messages among the producer, the middleware, and the distribution systems.

The goal of this document is to outline the existing alerting standards, justifying why the use of the Common Alerting Protocol (CAP) is the best choice. Furthermore, the document aims at explaining the use of a CAP profile in order to adapt CAP to the application's specific needs and to Opti-Alert, in particular.

2 Alerting Standards

The Organization for the Advancement of Structured Information Standards (OASIS, 2012), a not-for-profit consortium that drives the development, convergence and adoption of open standards for the global information society, is active in the area of alerting standards. More precisely, the OASIS Emergency Management Committee (Emergency Management TC, 2012) deals with enabling information exchange to advance incident preparedness and response to emergency situations. Main goal of the OASIS Emergency Management TC is to create incident and emergency-related standards for data interoperability. Interesting outcomes of this activity include the Emergency Data Exchange Language (EDXL) and Common Alerting Protocol (CAP).

EDXL (EDXL, 2006) is an expanded family of data formats and data communication standards for exchanging operational emergency information. EDXL facilitates emergency information sharing and data exchange across the local, state, tribal, national and non-governmental organizations of different professions that provide emergency response and management services. The focus of EDXL is on the standardization of specific messages (messaging interfaces) to facilitate emergency communication and coordination.

2.1 Common Alerting Protocol (CAP)

CAP (CAP, 2010), an XML-based data format, is a simple but general format for exchanging all-hazard emergency alerts and public warnings over all kinds of networks. CAP allows a consistent warning message to be disseminated simultaneously over many different warning systems, thus increasing warning effectiveness while simplifying the warning task. The CAP message format can be converted to and from the native formats of all kinds of alerting technologies, forming a basis for a technology-independent national and international warning message.

CAP provides an open, non-proprietary digital message format for all types of alerts and notifications. It does not address any particular application or transmission method. It offers enhanced capabilities, such as flexible geographic targeting using latitude-longitude pairs and other geospatial representations in three dimensions, multilingual and multi-audience messaging, enhanced message update and cancellation features, template support, facility for digital images and audio.

Given the fact that extensibility and interoperability among different alerting technologies are strongly required in Opti-Alert's, in combination with the fact that CAP is standardized, has already been adopted by many organizations worldwide, such as weather and disaster alerting systems of public organizations in the USA and Asia, and is extensible (XML-based) it is considered a proper and suitable option.

2.2 CAP Profiles

In order to achieve interoperability among different alerting systems with a single message format and enable the automation of further message processing, given the high flexibility presented by CAP which is, partially, enabled through the use of free-text input fields, CAP profiles are introduced. Profiles provide limitations on the interpretation of a CAP alert message. They apply additional semantics apart from the standard information contained in a CAP alert message. They contain collections of rules, managed lists, and references. They provide context to the process of alerting within a country or a system. For instance, Canada has designed a new CAP Profile the CAP-CP (CAPAN, 2012), which is used by the Canada's warning system to standardize the way national particularities, such as language and location terminology will be addressed in the process of describing an event.

A message that conforms to a CAP profile should be a fully valid CAP message and should make at least basic sense to recipients that are unaware of the profile restrictions. On the other hand, recipients that enforce a CAP profile should be designed to "fail gracefully" when presented with valid CAP messages that don't implement that profile. A CAP message that conforms to a particular profile should be understandable by everybody, even to entities unaware of the profile's semantics. An important point is that the concept and objectives of CAP must always be maintained. Therefore, a CAP profile must not make a CAP message so specialized that it is not possible to fully interoperate with other CAP implementations.

3 Opti-Alert Profile of the Common Alerting Protocol (CAP-OAP)

In order to standardize the warning message exchange in Opti-Alert, by taking into account the special requirements and needs of Opti-Alert, a profile of CAP must be specified. The following subsections present the particular Opti-Alert requirements and their translation to the rules composing the CAP-OAP.

3.1 Opti-Alert requirements of the CAP interface

This subsection explains the particular requirements introduced in Opti-Alert that should be taken into account when specifying the CAP-OAP. In the following the requirements are conceptually grouped to allow for better understanding.

General rules

The Opti-Alert Profile of CAP (CAP-OAP) consists of an extension of the CAP version 1.2 standard. Consequently, each CAP-OAP-compatible message must also be a CAP version 1.2-valid message and if not, it should not be CAP-OAP-valid at all. Moreover, each CAP-OAP message must specify the version of the CAP-OAP that it conforms to.

As specified by the CAP standard, each CAP-OAP message must have an identifier, which is unique for each warning message and for each message originator. An extended message identifier consists of the sequence *[sender, identifier, sent]* and it uniquely refers to a message. The message identifier is not related to the event that is the source of the alert. Nevertheless, each CAP-OAP message relates to a single event. Therefore, the system internally can keep a relation between the event and the alert messages, but this information is not necessary for the recipient of the CAP message and should, therefore, not be included in the CAP-OAP message.

Alert event information rules

An alert message that transmits a new alert should contain all the necessary information that describes the event causing this alert. An alert message transmitting an update to a previous alert serves as a complete replacement for the earlier messages and should, therefore, also have all the necessary information. For alert messages that cancel a previous alert, however, it is not required to supply all the information describing the event. These messages have no new information for the event.

Single hazard per alert message rule

The Reference Standard allows for the inclusion of none, one, or many subject event types in a single alert message, but only one unique message identifier. An update to the information of any one of the events would appear as an update to the information of all the other event types, when that may not be the case. To facilitate the process of alert updating or cancelling and to avoid any potential confusion the CAP-OAP limits each message to one single event type, e.g., an earthquake, or a thunderstorm.

Nevertheless, it is possible that a message contains two alerts against the same event type, e.g., thunderstorm, but in totally different areas of a country (different “logical” events). It is also possible that a message contains two alerts against different hazards that are caused by the same event. For instance, a fire can result in an alert against approaching the location of the fire and one against a traffic jam caused by possible traffic changes. These two alerts relate to different hazards caused by the same logical event.

In order to ensure that each alert message contains non conflicting information and that it can be uniquely identified in order to get updated, canceled, or cleared avoiding any unwanted side effects, the CAP-OAP applies further limitations to the alerts contained in a CAP message. The CAP-OAP requires that each alert message is limited, not only to a specific event type, but also to a single logical event and, furthermore, to a single hazard.

Event description rules

The Reference Standard requires that a human-readable value describing the subject event for an alert message exists, but it does not offer suggestions or a recognized list of events. Given the fact that in Opti-Alert event descriptions in multiple languages are required and that the goal is to achieve interoperability among different warning systems, it becomes clear that a standard reference and pre-translated list of event subjects and codes should be specified. This list composes the Opti-Alert Event Reference List (4.1) and is managed separately from the main body of the CAP-OAP, as it is expected to change more frequently than the other components of the profile.

Instructions rules

Similar to the subject event of an alert message, the CAP standard requires that in case instructions are available they consist of a human-readable text, without specifying standard instruction alternatives. Given the fact that in Opti-Alert instructions in multiple languages are required and that interoperability among different warning systems plays a vital role, it becomes clear that a standard reference and pre-translated list of possible instruction texts should be predefined. This list composes the Opti-Alert Instructions Reference List (4.2) and is managed separately from the main body of the CAP-OAP, as it is expected to change more frequently than the other components of the profile.

Language rules

The Reference Standard identifies a language value as an optional element. When no value is specified the US English is assumed by the standard. In Opti-Alert multilingualism is a very important issue because interoperability among alerting systems from different countries and targeting of international population play a vital role. Therefore, the language information is necessary in each CAP-OAP message. In order to support multi-lingual messages, when necessary, a single message will be able to carry all the information translated in all necessary languages. Furthermore, to support this functionality the warning texts and the event description texts should be made available in all necessary languages.

Location rules

The Reference Standard identifies the alert area as optional information in a message. In Opti-Alert, however, it is of high importance to identify the exact location of an event when an alert is created or updated as well. Since this information has to be shared with other warning systems, the location format should be interoperable. Therefore, a free text description of the location is not adequate. The CAP-OAP specifies that each message that creates or updates an alert should contain information on the event's location. Additionally, the location information should be in the form of either a set of geographical coordinates forming a polygon or a circle, or a set of geographical codes such as zipcodes. In case geographical coordinates are used as the location input form, the coordinates should be expressed in the World Geodetic System 1984 (WGS84, 2010), equivalent to EPSG European Petroleum Survey Group, code 4326 (2 dimensions). Warning messages of other types, such as cancel, do not need to contain location information.

Alert credibility rules

In accordance with the results of the Opti-Alert's design phase, the alert publishing entity, shown to the users, influences the credibility of the message. Therefore, the CAP-OAP requires a human-readable name of the alert's sender in each message. The name of the sender must be appropriately translated to match the language of the corresponding message part.

Contact rules

Similarly, the CAP-OAP strongly recommends that each message contain information on a contact point or contact person for follow-up information and confirmation of the alert. The contact information must be appropriately translated to match the language of the corresponding message part.

Rules for update and cancel alert messages

Update or Cancel alert messages should include a reference to the last valid message. In a chain of update messages always the last received message is the valid one. A reference to the last valid message by an update or a cancel alert message ensures that only the necessary information for the update is communicated. Consequently, any messages that may still be used are properly superseded by the most recent update or cancel.

A clear alert message is a special case of an update message. Consequently, all rules that are applicable for update alerts are also valid for clear alerts. The whole set of event information, including location, is necessary as it is possible that an alert is partially cleared, in which case the alert is no more valid for a subarea of the initially warned area.

Expiration time rule

The CAP-OAP strongly recommends that each alert message contain expiration information. The expiry time of the alert message is important in order to determine its validity.

Alert text rules

The CAP-OAP provides headline, description, and a short-text as textual information for each message. Furthermore, the CAP-OAP profile specifies that the short-text information should have a constrained length, so that it is suitable for use in sms. All texts should be human-readable and appropriately translated to match the language of the corresponding message part.

Rules for alerting specific target groups

To fulfill Opti-Alert's requirements concerning special message customization when targeting particular target groups, the CAP-OAP specifies how the all adapted warning texts for the same event should be organized and sent in the same message. Each part of the message should specify the target group to which it targets. To facilitate interoperability and standardization a target group reference list (0) with the available target groups and their identifiers is defined. The CAP-OAP also provides for custom properties where special characteristics of the target group could be specified such as nationality, disability type, and age group. These properties are optional. Similarly, reference lists for the available age groups and disability types are defined (0).

3.2 CAP-OAP rules

This section identifies specific requirements, constraints, and recommendations associated with the CAP-OAP. Reference standard content is included for reference and comparison only. All the specifications of the reference standard that are not specialized or constrained here hold as they are. The rules specifications are also here conceptually grouped, as in the previous subsection, for better understanding.

General rules

I.1	CAP v1.2 – Validity
Description: All alert messages must be compatible with the CAP version 1.2. They must be structured and formatted according to the guidelines set out by the Reference Standard. Messages that do not conform to this standard are considered invalid CAP-OAP messages as well.	

I.2	CAP-OAP version required
Description: Every <alert> block must contain a <code> element with the value profile:CAP-OAP:0.1, in order to specify the used CAP-OAP version.	
Changes from CAP v.1.2:	

Element	**Use**	**Notes or values area**
code	CAP v1.2	
	OPTIONAL	1. Any user-defined flag or special code used to flag the alert message for special handling. 2. Multiple instances MAY occur.
	CAP - OAP	
	REQUIRED	1. Value: “profile:CAP-OAP:0.1” 2. Additional code element can be used for other purposes, e.g., layer identification.

I.3	The CAP-OAP <valueName> schema
Description: CAP-OAP uses various reference lists, e.g., for the description of event types. In order to correctly interpret the contents of the <value> elements as well as to ensure interoperability the <valueName> elements should uniquely identify the reference lists being used. CAP-OAP adopts a URN[1] scheme for creating valueNames, as it is described in (Moats, IETF, 1997). The following format will be used to create CAP-OAP valueNames: <type> ":" <identifier> ":" <specific string> As an example, an event category from the event reference list (4.1) will be described as follows: <valueName>profile:CAP-OAP:Event:0.1</valueName> <value>1001</value>	

Alert event information rules

II.1	Info block required when message is of type alert or update
Description: An alert message with <msgType> "alert" or "update" requires an <info> block with information describing the event. An update message serves as a complete replacement for the earlier messages (referenced in the <references> element). Therefore, it should have all the information, including complete Info and Area elements, not just the updated information. For alert messages with a <msgType> of "Cancel", "Ack", or "Error", an info block is not required, because these messages respectively negate, acknowledge, or report an error concerning the alert referenced in the <references> element and have, as a consequence, no new information for the event. In case of an <error> alert message an explanation should appear in <note> element.	

[1] <URN> ::= "urn:" <NID> ":" <NSS> where <NID> is the Namespace Identifier, and <NSS> is the Namespace Specific String.

Changes from CAP v.1.2:

Element	Use	Notes or values area
info	CAP v1.2	
	OPTIONAL	1. Multiple occurrences are permitted within a single <alert>. If targeting of multiple <info> blocks in the same language overlaps, information in later blocks may expand but may not override the corresponding values in earlier ones. Each set of <info> blocks containing the same language identifier SHALL be treated as a separate sequence. 2. In addition to the specified sub-elements, MAY contain one or more <resource> blocks and/or one or more <area> blocks.
	CAP - OAP	
	CONDITIONAL	1. An alert message with <msgType> “alert” or “update” requires an <info> block with information describing the event. 2. For alert messages with a <msgType> of “Cancel”, “Ack”, or “Error”, an info block is not required. 3. Apart from the above constraints the <info> element should be consistent with the normative copy of the Reference Standard.

Language rules

III.1	Language required

Description:

Each <info> block in an alert message must contain a <language> element.

Multi-language alerts should contain an <info> block for each language.

Changes from CAP v.1.2:

Element	Use	Notes or values area
language	CAP v1.2	
	OPTIONAL	1. Code Values: Natural language identifier per (RFC3066, 2001). 2. If not present, an implicit default value of "en-US" SHALL be assumed. 3. A null value in this element SHALL be considered equivalent to “en-US.”
	CAP - OAP	
	REQUIRED	1. Value denoting the language of the content of the <info> block per (RFC3066, 2001). 2. The value cannot be null.

Single hazard per alert message rule

IV.1	Use one event subject per alert message
Description: The Reference Standard allows for the inclusion of none, one, or many subject event types in a single alert message, but only one unique message <identifier>. An update to the information of any one of the events would appear as an update to the information of all the other event types, when that may not be the case. A practical method of validating this rule is to ensure that all <info> blocks in an alert message have the same <eventCode> values.	

IV.2	Single hazard per alert message
Description: This rule makes sure that each CAP message contains alert(s) for a single logical event and a single hazard. Given the IV.1 rule a CAP message can contain alerts concerning a single event type, e.g., an earthquake, or a thunderstorm. Nevertheless, it is possible that a message contains two alerts against the same event type, e.g., thunderstorm, but in totally different areas of a country (different “logical” events). It is also possible that a message contains two alerts against different hazards that are caused by the same event. For instance, a fire can result in an alert against approaching the location of the fire and one against a traffic jam caused by possible traffic changes. These two alerts relate to different hazards caused by the same logical event. In order to ensure that each alert message contains non conflicting information and that it can be uniquely identified in order to get updated, canceled, or cleared avoiding any unwanted side effects, the CAP-OAP applies further limitations to the alerts contained in a CAP message. The CAP-OAP requires that each alert message is limited, not only to a specific event type, but also to a single logical event and, furthermore, to a single hazard.	

Event description rules

V.1	Use established event values

Description:

The content of the <event> element should be an event type included in the events reference list (4.1). The event should be translated in the language specified in the <language> element.

Changes from CAP v.1.2:

Element	Use	Notes or values area
event	CAP v1.2	
	REQUIRED	
	CAP - OAP	
	REQUIRED	An event from the events reference list (4.1) of the CAP-OAP translated in the language specified in the <language> element.

V.2	Recognized event code required

Description:

Each <info> block in an alert message must contain an <eventCode> element with the following form:

```
<eventCode>
  <valueName>profile:CAP-OAP:Event:0.1</valueName>
  <value>Event ID</value>
</eventCode>
```

The “Event ID” is an identifier from the events reference list (4.1).

Given the rules IV.2 and IV.2 each alert message is constrained to a specific event. Consequently, the identifier contained in the <eventCode> block must correspond to the event type in the <event> element as defined in the events reference list. Moreover, all <eventCode> blocks with the same <valueName> elements in all <info> blocks of the alert must have the same <value>.

Changes from CAP v.1.2:

Element	Use	Notes or values area
eventCode	CAP v1.2	
	OPTIONAL	1. Any system-specific code for event typing, in the form: <eventCode> <valueName>valueName</valueName> <value>value</value> </eventCode> where the content of “valueName” is a user-assigned string designating the domain of the code, and the content of “value” is a string (which may represent a number) denoting the value itself (e.g., valueName ="SAME" and value="CEM"). 2. Values of “valueName” that are acronyms SHOULD be represented in all capital letters without periods (e.g., SAME, FIPS, ZIP). 3. Multiple instances MAY occur within an <info> block.
	CAP - OAP	
	REQUIRED	1. A [<valueName>, <value>] pair for the identifier from the event reference list (4.1) that is specified in the <event> element, in the form: <valueName> profile:CAP-OAP:Event:0.1 </valueName> <value>Event ID</value> 2. There is a limit of one <eventCode> value from the CAP-OAP event references list per alert message, even though multiple occurrences of the element <eventCode> may appear in an alert message. 3. In order to ensure backwards compatibility event identifiers from event reference lists of previous CAP-OAP versions are also acceptable in [<valueName>, <value>] pairs of <eventCode> blocks. Nevertheless, the event identifier used should match the event type specified in the <event> element. 4. Additional <eventCode> blocks that serve other purposes can precede this <eventCode> block.

Event instructions rules

VI.1	Use established instruction values

Description:

Each <info> block in an alert message can contain an <instruction> element. The content of this element is a comma-separated list of instructions taken from the instructions reference list (4.2). The text should be translated in the language specified in the <language> element.

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
instruction	CAP v1.2	
	OPTIONAL	An extended human readable instruction to targeted recipients. If different instructions are intended for different recipients, they should be represented by use of multiple <info> blocks.
	CAP - OAP	
	OPTIONAL	1. Comma-separated list of instruction texts from the instructions reference list (4.2) of the CAP-OAP translated in the language specified in the <language> element. 2. For each instruction specified a parameter as described in the VI.2 rule should be added. 3. If different instructions are intended for different recipients, they should be represented by use of multiple <info> blocks (see for instance rule XIV.1).

VI.2	Recognized instruction parameter required

Description:

In case text in the <instruction> element is specified then the alert message must contain one <parameter> element for each instruction from the reference list contained in the <instruction> element. The parameter should have the following form:

```
<parameter>
  <valueName>profile:CAP-OAP:Instruction:0.1</valueName>
  <value>Instruction ID</value>
</parameter>
```

The “Instruction ID” is an identifier from the instructions reference list (4.2).

Changes from CAP v.1.2:

Element	Use	Notes or values area
parameter	CAP v1.2	
	OPTIONAL	1. Any system-specific datum, in the form: <parameter> <valueName>valueName</valueName> <value>value</value> </parameter> where the content of “valueName” is a user-assigned string designating the domain of the code, and the content of “value” is a string (which may represent a number) denoting the value itself (e.g., valueName ="SAME" and value="CIV"). 2. Values of “valueName” that are acronyms SHOULD be represented in all capital letters without periods (e.g., SAME, FIPS, ZIP). 3. Multiple instances MAY occur within an <info> block.
	CAP - OAP	
	REQUIRED	1. A parameter with <valueName> “profile:CAP-OAP: Instruction:0.1” should be included in alert messages for each instruction specified in the <instruction> element. This parameter has the form: <parameter> <valueName> profile:CAP-OAP:Instruction:0.1 </valueName> <value>Instruction Id</value> </parameter> 2. This parameter contains an identifier from the instructions reference list (4.2) corresponding to one of the instructions specified in the <instruction> element. 3. Other instances of the parameter element with different <valueName> are allowed as defined by the normative copy of the Reference Standard.

Location rules

VII.1	Warning targeted area required

Description:

Each <Info> block of an alert message with <msgType> of “Alert” or “Update” must contain an <area> block.

The standard specifies that the location information can be in the form of a set of geographical coordinates forming a polygon or a circle, or a set of geographical codes such as zipcodes. In case geographical coordinates are used as the location input form, the coordinates should be expressed in the World Geodetic System 1984 (WGS84, 2010), equivalent to EPSG European Petroleum Survey Group, code 4326 (2 dimensions).

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
area	CAP v1.2	
	OPTIONAL	1. Multiple occurrences permitted, in which case the target area for the <info> block is the union of all the included <area> blocks. 2. MAY contain one or multiple instances of <polygon>, <circle> or <geocode>. If multiple <polygon>, <circle> or <geocode> elements are included, the area described by this <area> block is represented by the union of all the included elements.
	CAP - OAP	
	CONDITIONAL	1. Each <info> block in an alert message with <msgType> of “Alert” or “Update” must contain an <area> block. 2. In an <info> block multiple occurrences of <area> blocks are permitted, in which case the target area for the <info> block is the union of all the included <area> blocks. 3. An <area> block must contain at least a <geocode>, a <polygon>, or a <circle> element. 4. The area described by an <area> block is represented by the union of all the included <geocode>, <polygon>, and <circle> elements. 5. In case geographical coordinates are used as the location input form, the coordinates should be expressed in the World Geodetic System 1984 (WGS84, 2010), equivalent to EPSG European Petroleum Survey Group, code 4326 (2 dimensions).

VII.2	Area definition required

Description:

Each <area> block must contain at least one of the following elements: <geocode>, <polygon>, <circle>.

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
geocode	CAP v1.2	
	OPTIONAL	
	CAP - OAP	
	CONDITIONAL	It is not required only one of the following elements is already declared: • <polygon> • <circle>

Element	**Use**	**Notes or values area**
polygon	CAP v1.2	
	OPTIONAL	
	CAP - OAP	
	CONDITIONAL	It is not required only one of the following elements is already declared: • <geocode> • <circle>

Element	**Use**	**Notes or values area**
circle	CAP v1.2	
	OPTIONAL	
	CAP - OAP	
	CONDITIONAL	It is not required only one of the following elements is already declared: • <geocode> • <polygon>

VII.3	Recognized geo code value name for zipcode required

Description:

In case a <geocode> block with a zipcode is included in an <area> block, its value element should have the following form:

```
<geocode>
  <valueName>profile:CAP-OAP:Geocode:Zipcode:0.1</valueName>
  <value>”Zipcode”</value>
</geocode>
```

The “Zipcode” value is the corresponding zipcode, e.g., D-22399.

Changes from CAP v.1.2:

Element	Use	Notes or values area
geocode	CAP v1.2	
	OPTIONAL	1. Any geographically-based code to describe a message target area, in the form: <geocode> <valueName>valueName</valueName> <value>value</value> </geocode> where the content of “valueName” is a user-assigned string designating the domain of the code, and the content of “value” is a string (which may represent a number) denoting the value itself (e.g., valueName ="SAME" and value="006113"). 2. Values of “valueName” that are acronyms SHOULD be represented in all capital letters without periods (e.g., SAME, FIPS, ZIP). 3. Multiple instances MAY occur within an <area> block. 4. This element is primarily for compatibility with other systems. Use of this element presumes knowledge of the coding system on the part of recipients; therefore, for interoperability, it SHOULD be used in concert with an equivalent description in the more universally understood <polygon> and <circle> forms whenever possible.
	CAP - OAP	
	OPTIONAL	1. Consistent with the normative copy of the Reference Standard. 2. In case a <geocode> block with a zipcode is included in an <area> block, its value element should have the following form: <geocode> <valueName>profile:CAP-OAP:Geocode:Zipcode:0.1</valueName> <value>”Zipcode”</value> </geocode> The “Zipcode” value is the corresponding zipcode.

Alert credibility rules

VIII.1	Warning entity required

Description:

Each <info> block must contain the <senderName> element. The content of this element should be the warning authority name that is chosen as appropriate and credible by the system, in a human-readable format.

The name of the authority must be translated in the language specified in the <language> element of the <info> block.

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
senderName	CAP v1.2	
	OPTIONAL	The human-readable name of the agency or authority issuing this alert.
	CAP - OAP	
	REQUIRED	1. A human-readable format of the warning authority name. 2. The name of the authority must be translated in the language specified in the <language> element of the <info> block.

Contact rules

IX.1	Contact entity strongly recommended

Description:

It is strongly recommended that each <info> block contain a <contact> element. The content of this element should contain a contact person or contact point for follow-up and confirmation of the alert.

The contact information must be translated in the language specified in the <language> element of the <info> block.

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
contact	CAP v1.2	
	OPTIONAL	
	CAP - OAP	
	OPTIONAL	1. It is strongly recommended that each <info> element contain a <contact> element with contact information for follow-up and confirmation of the alert. 2. The contact information must be translated in the language specified in the <language> element of the <info> block.

Rules for update and cancel alert messages

X.1	Update or Cancel alert messages should include references to the last valid message

Description:

Update or Cancel alert messages should include a reference to the last valid message. In a chain of update messages always the last received message is the valid one. By referencing this message in an update or a cancel alert message it is ensured that only the necessary information for the update is communicated.

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
references	CAP v1.2	
	OPTIONAL	1. The extended message identifier(s) (in the form [sender, identifier, sent]) of an earlier CAP message or messages referenced by this one. 2. If multiple messages are referenced, they SHALL be separated by whitespace.
	CAP - OAP	
	CONDITIONAL	1. Consistent with the normative copy of the Reference Standard, <references> are required with <msgType> values of “Update”, “Cancel”, “Ack”, and “Error”. 2. Further, CAP-OAP requires a reference to the last valid message whose status is affected by the new message.

Rules for clearing alert messages

XI.1	Clear alert messages are a special case of update alerts.

Description:

A clear alert message is a special case of an update message. Consequently, all rules that are applicable for update alerts are also valid for clear alerts (rules II.1, VII.1, and X.1).

Further, clear alerts should specify the value “allClear” in the <responseType> element, which in this case should be required.

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
responseType	CAP v1.2	
	OPTIONAL	1. Code Values: “Shelter” – Take shelter in place or per <instruction> “Evacuate” – Relocate as instructed in the <instruction> “Prepare” – Make preparations per the <instruction> “Execute” – Execute a pre-planned activity identified in <instruction> “Avoid” – Avoid the subject event as per the <instruction> “Monitor” – Attend to information sources as described in <instruction> “Assess” – Evaluate the information in this message. (This value SHOULD NOT be used in public warning applications.) “AllClear” – The subject event no longer poses a threat or concern and any follow on action is described in <instruction> “None” – No action recommended 2. Multiple instances MAY occur within an <info> block.
	CAP - OAP	
	OPTIONAL	1. A clear alert message is a special case of an update message. Consequently, all rules that are applicable for update alerts are also valid for clear alerts (rules II.1, VI.1, and IX.1). 2. Further, clear alerts should specify the value “allClear” in the <responseType> element, which in this case should be required. 3. The <responseType> element should be consistent with the normative copy of the Reference Standard in all other cases.

Expiration time rule

XII.1	Expires time is strongly recommended

Description:

It is strongly recommended that each <info> block contains an <expires> element. The content of this element should contain the expiry time of the information of the alert message.

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
expires	CAP v1.2	
	OPTIONAL	1. The date and time SHALL be represented in the DateTime Data Type format (e.g., "2002-05-24T16:49:00-07:00" for 24 May 2002 at 16:49 PDT). 2. Alphabetic timezone designators such as "Z" MUST NOT be used. The timezone for UTC MUST be represented as "-00:00". 3. If this item is not provided, each recipient is free to set its own policy as to when the message is no longer in effect.
	CAP - OAP	
	OPTIONAL	1. It is strongly recommended that each <info> element contains an <expires> element with the expiry time of the information of the alert message. 2. Only proper date and time formatted values (based on CAP standard specifications) should be used. No default values, empty strings, or null entries should be used. 3. To avoid misinterpretation, if the <expires> time is not known, the <expires> element should not be included in the CAP message at all.

Alert text rules

XIII.1	Short text of constrained length optional

Description:

Apart from the headline and description elements the CAP-OAP provides an additional custom parameter for a short alert text. CAP-OAP profile specifies that the short-text information should have a constrained length of 80 characters, so that it is suitable for use in sms. The short alert text should be human-readable and appropriately translated to match the language of the corresponding message part.

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
parameter	CAP v1.2	

	OPTIONAL	1. Any system-specific datum, in the form:
		`<parameter>`
		`<valueName>valueName</valueName>`
		`<value>value</value>`
		`</parameter>`
		where the content of “valueName” is a user-assigned string designating the domain of the code, and the content of “value” is a string (which may represent a number) denoting the value itself (e.g., valueName ="SAME" and value="CIV").
		2. Values of “valueName” that are acronyms SHOULD be represented in all capital letters without periods (e.g., SAME, FIPS, ZIP).
		3. Multiple instances MAY occur within an <info> block.

	CAP - OAP	

	OPTIONAL	1. A parameter with <valueName> “profile:CAP-OAP:ShortText:0.1” can be included in alert messages to provide a short alert text. This parameter has the form:
		`<parameter>`
		`<valueName>`
		`profile:CAP-OAP:ShortText:0.1`
		`</valueName>`
		`<value>Short Alert Text</value>`
		`</parameter>`
		and it contains a short alert text.
		2. Further, CAP-OAP specifies that the short alert text should have a maximum length of 80 characters.
		3. The short alert text must be translated in the language specified in the <language> element of the same <info> block.

Rules for alerting specific target groups

XIV.1	Alerts for specific target groups are sent in the same alert message

Description:

Alerts for the same event that target specific user groups should be sent in the same alert message but in separate <info> blocks.

Each target group-specific <info> block should specify the target group identifier in the <audience> element. The values of the target group identifiers are taken from the target group identifier reference list (4.3).

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
audience	CAP v1.2	
	OPTIONAL	
	CAP - OAP	
	OPTIONAL	1. Alerts for the same event that target specific user groups should be sent in the same alert message but in separate <info> blocks. 2. Each target group-specific <info> block should specify the target group identifier in the <audience> element. The values of the target group identifiers are taken from the target group identifier reference list (4.3).

XIV.2	A specific homeCountry can be specified for a specific target group

Description:

A target group-specific <info> block that contains an alert adapted to the homeCountry of the group members could contain an element specifying the homeCountry. This element should be of the following form:

```
<parameter>
   <valueName>profile:CAP-OAP:HomeCountry:0.1</valueName>
   <value>HomeCountry</value>
</parameter>
```

The “HomeCountry” is an identifier corresponding to the homeCountry as defined by the ISO standard for country codes (ISO3166-1)

Changes from CAP v.1.2:

Element	**Use**	**Notes or values area**
parameter	CAP v1.2	

	OPTIONAL	1. Any system-specific datum, in the form:
		`<parameter>`
		`<valueName>valueName</valueName>`
		`<value>value</value>`
		`</parameter>`
		where the content of “valueName” is a user-assigned string designating the domain of the code, and the content of “value” is a string (which may represent a number) denoting the value itself (e.g., valueName ="SAME" and value="CIV").
		2. Values of “valueName” that are acronyms SHOULD be represented in all capital letters without periods (e.g., SAME, FIPS, ZIP).
		3. Multiple instances MAY occur within an <info> block.

	CAP - OAP	

	OPTIONAL	1. A parameter with <valueName> “profile:CAP-OAP:HomeCountry:0.1” can be included in alert messages for a particular target group. This parameter has the form:
		`<parameter>`
		`<valueName>`
		`profile:CAP-OAP:HomeCountry:0.1`
		`</valueName>`
		`<value>HomeCountry</value>`
		`</parameter>`
		2. This parameter contains an identifier corresponding to the homeCountry as defined by the ISO standard for country codes (ISO3166-1).
		3. Other instances of the parameter element with different <valueName> are allowed as defined by the normative copy of the Reference Standard.

XIV.3	A specific disability type can be specified for a specific target group

Description:

A target group-specific <info> block that contains an alert adapted to the disability type of the group members could contain an element specifying the disability type. This element should be of the following form:

```
<parameter>
    <valueName>profile:CAP-OAP:Disability:0.1</valueName>
    <value>Disability</value>
</parameter>
```

The “Disability” is an identifier that corresponds to the disability type taken from the disabilities reference list (4.3).

Changes from CAP v.1.2:

Element	Use	Notes or values area
parameter	CAP v1.2	

	OPTIONAL	1. Any system-specific datum, in the form:
		`<parameter>`
		`<valueName>valueName</valueName>`
		`<value>value</value>`
		`</parameter>`
		where the content of “valueName” is a user-assigned string designating the domain of the code, and the content of “value” is a string (which may represent a number) denoting the value itself (e.g., valueName ="SAME" and value="CIV").
		2. Values of “valueName” that are acronyms SHOULD be represented in all capital letters without periods (e.g., SAME, FIPS, ZIP).
		3. Multiple instances MAY occur within an <info> block.

	CAP - OAP	

	OPTIONAL	1. A parameter with <valueName> “profile:CAP-OAP:Disabilty:0.1” can be included in alert messages for a particular target group. This parameter has the form:
		`<parameter>`
		`<valueName>`
		`profile:CAP-OAP:Disability:0.1`
		`</valueName>`
		`<value>Disability</value>`
		`</parameter>`
		2. This parameter contains an identifier that corresponds to the disability type taken from the disabilities reference list (4.3).
		3. Other instances of the parameter element with different <valueName> are allowed as defined by the normative copy of the Reference Standard.

XIV.4	A specific age group can be specified for a specific target group

Description:

A target group-specific <info> block that contains an alert adapted to the age group of the group members could contain an element specifying the age group. This element should be of the following form:

```
<parameter>
    <valueName>profile:CAP-OAP:Age:0.1</valueName>
    <value>Age</value>
</parameter>
```

The “Age” is an identifier that corresponds to the age group taken from the age group reference list (4.3).

Changes from CAP v.1.2:

Element	Use	Notes or values area
parameter	CAP v1.2	

	OPTIONAL	1. Any system-specific datum, in the form:
		`<parameter>`
		`<valueName>valueName</valueName>`
		`<value>value</value>`
		`</parameter>`
		where the content of “valueName” is a user-assigned string designating the domain of the code, and the content of “value” is a string (which may represent a number) denoting the value itself (e.g., valueName ="SAME" and value="CIV").
		2. Values of “valueName” that are acronyms SHOULD be represented in all capital letters without periods (e.g., SAME, FIPS, ZIP).
		3. Multiple instances MAY occur within an <info> block.

	CAP - OAP	

	OPTIONAL	1. A parameter with <valueName> “profile:CAP-OAP:Age:0.1” can be included in alert messages for a particular target group. This parameter has the form:
		`<parameter>`
		`<valueName>`
		`profile:CAP-OAP:Age:0.1`
		`</valueName>`
		`<value>Age</value>`
		`</parameter>`
		2. This parameter contains an identifier that corresponds to the age group taken from the age group reference list (4.3).
		3. Other instances of the parameter element with different <valueName> are allowed as defined by the normative copy of the Reference Standard.

4 Appendix

This section contains the definition of the various reference lists that accompany the specification of the CAP-OAP.

4.1 Events Reference List

Identifier	Event Type	Warning Text / Instruction	Event Description
…			

4.2 Instructions Reference List

Identifier	Instruction	Instruction (English)	Instruction (German)
…			

4.3 Target Groups Reference Lists

Target Group Reference List

Identifier	Target Group Description
100	Anybody
101	Families with children
102	Disabled people
103	Senior Citizens
104	Immigrants, tourists

Disability Type Reference List

Identifier	Disability Type Description
201	Vision Disibility
202	Hearing Disability
203	Mobility Disability
204	Brain Disability

Age Group Reference List

Identifier	Age Group Description
301	1 – 20 years old
302	20 – 60 years old
303	Above 60 years old

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