

Review of Emergency Management Information Standards

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1. Introduction

This document is a first attempt to review and analyse the current state-of-the-art in vocabularies used in emergency management information standards. It will facilitate emergency information sharing and interoperability across different systems, organizations and countries.

The following lists the standards reviewed by this document,

- Common Alerting Protocol (CAP)
- Emergency Data Exchange Language – Distribution Element (EDXL-DE)
- Emergency Data Exchange Language – Resource Messaging (EDXL-RM)
- Emergency Data Exchange Language – Hospital Availability Exchange (EDXL-HAVE)
- Cyclone Warning Markup Language (CWML)
- Tsunami Warning Markup Language (TWML)

All of the above standards aim to build on XML-based standard messages for emergency information systems. However, because of diverse intentions and application areas, these standards support overlapping semantics and different structures.

2. Overview

Among the standards, EDXL-DE focuses on the information to distribute and route the emergency messages, rather than the semantics of the message itself. Contrarily, the other standards pay more attention to “content” of the message, such as the emergency hazard, the community situation or the system response. Thus, EDXL-DE may be thought of as a “container” for emergency messages. It provides the information to route “payload” message sets (ie the other standards), by including key routing information such as distribution type, geography, incident, and sender/recipient IDs.

CAP, CWML and TWML are all standards to describe emergency alerts or advisories. CAP is intended to provide a simple but general format for exchanging *all-hazard emergency alerts* and public warnings over all kinds of networks. Whereas, CWML is specially designed for describing cyclone warnings and TWML is for tsunami bulletins. CWML and TWML have common similarities as they were developed in close cooperation.

EDXL-RM defines separate and specific message types supporting the major communication requirements for allocation of resources across the emergency

incident life-cycle. EDXL-HAVE is an XML specification that allows the communication of the status of a hospital, its services, and its resources (eg beds). Both EDXL-RM and EDXL-HAVE belong to the category of emergency response messages.

3. Common Concepts in Emergency Management Information

As all standards are proposed for emergency management systems, it is not uncommon that they contain some similar and overlapping concepts/elements. The following is a non-exhaustive list.

3.1 Message ID

Message ID is the unique number or string to identifying a message. It is essential for information sharing and referencing. As there are plenty of messages committed during an emergency event, rules should be made to ensure the ID is unique and represents some metadata of this message (a typical example is the structure of the WMO Communication Header).

Standards	Related Element	Comment
EDXL-DE	distributionID	
CAP	identifier, reference	
CWML	adviceNum	
TWML	Header	<i>Header:</i> - <i>WMOHeader</i> - <i>productID</i>
EDXL-RM	MessageID, <i>RecalledMessageID</i> , <i>OriginatingMessageID</i> , <i>PrecedingMessageID</i>	
EDXL-HAVE	N/A	

3.2 Sender

As various organizations cooperate together during disasters and emergencies, the sender of emergency must be clearly indicated. Moreover, on account of security and privilege, *Sender* should have sub-elements such as *role*, *organization*, and *electronic-signature* etc. To ensure timely communication, *Sender* should also have contact information such as *telephone number*, *facsimile number*, *email* etc.

Standards	Related Element	Comment
EDXL-DE	senderID, senderRole	<i>senderID</i> – the unique identifier of the sender, <i>senderRole</i> – the functional role of the sender
CAP	sender, senderName, contact	<i>sender</i> - the identifier of the sender <i>senderName</i> – the text naming the originator of the alert message <i>contact</i> – the text describing the contact for follow-up and confirmation of the alert message

CWML	issuedBy, nextIssuedBy	The organization that issued the advisory.
TWML	issuedBy	The tsunami warning centre that issued the bulletin
EDXL-RM	ContactInformation	This XML structure includes: <ul style="list-style-type: none"> - <i>ContactDescription</i> - <i>ContactRole</i> - <i>ContactLocation</i> - <i>AdditionalContactInformation</i> and sub-elements: <ul style="list-style-type: none"> - <i>Sender</i> - <i>Requester</i> - <i>Subject Matter Expert</i> - <i>Approver</i> - <i>Owner</i>
EDXL-HAVE	N/A	

3.3 Recipient

Corresponding to *Sender*, the scope of recipient is also an essential part of an emergency message.

Standards	Related Element	Comment
EDXL-DE	recipientRole, explicitAddress	<i>recipientRole</i> - the functional role of the recipient, <i>explicitAddress</i> – the identifier of an explicit recipient
CAP	audience, addresses	<i>audience</i> - the text describing the intended audience of the alert message <i>addresses</i> – the group listing of intended recipients of the private alert message
CWML	N/A	
TWML	N/A	
EDXL-RM	ContactInformation	This XML structure includes: <ul style="list-style-type: none"> - <i>ContactDescription</i> - <i>ContactRole</i> - <i>ContactLocation</i> - <i>AdditionalContactInformation</i> and sub-elements: <ul style="list-style-type: none"> - <i>Sender</i> - <i>Requester</i> - <i>Subject Matter Expert</i> - <i>Approver</i> - <i>Owner</i>
EDXL-HAVE	N/A	

3.4 Date and Time

The date and time are frequently used in emergency messages.

Suggestion: adopting the uniform data and time format, such as <gml:timePosition> to represent it.

Standards	Related Element	Comment
EDXL-DE	dateTimeSent	
CAP	sent, effective, onset	
CWML	issuedDateTime, nextDateTime, dateTime	
TWML	issuedDateTime, originTime, dateTime,	
EDXL-RM	SentDateTime, DateTime,	
EDXL-HAVE	LastUpdateTime,	

3.5 Location/Area

Location and Area are frequently used in emergency messages.

Suggestion: Uniform representations of Location and Area. Some standards may be used for reference, such as GML.

Standards	Related Element	Comment
EDXL-DE	targetArea	<i>targetArea</i> sub-elements <ul style="list-style-type: none"> - <i>circle</i> - <i>polygon</i> - <i>country</i> - <i>subdivision</i> - <i>locCodeUN</i>
CAP	area	<i>area</i> sub-elements <ul style="list-style-type: none"> - <i>areadesc</i> - <i>polygon</i> - <i>circle</i> - <i>geocode</i> - <i>altitude</i> - <i>ceiling</i>
CWML	area	CWML defines an <i>area</i> with a choice of the four representations: <ul style="list-style-type: none"> - <i>Position</i> - <i>Location</i> - <i>locationDescription</i> - <i>centreLocation</i>
TWML		
EDXL-RM	LocationTypePackage	<i>LocationTypePackage</i> sub-elements

		<ul style="list-style-type: none"> - <i>LocationDescription</i> - <i>Address</i> - <i>TargetAddress</i>
EDXL-HAVE	OrganizationLocation, OrganizationGeoLocation	

3.6 Measure

The emergency messages should adopt uniform measure units to describe disaster observations and resources. As the related elements are too miscellaneous, we do not list them in this document.

3.7 Emergency ID/Emergency Description

Emergency ID is the unique number or string to identifying an Emergency incident. Emergency Description is the human-readable text describing the Emergency incident.

Standards	Related Element	Comment
EDXL-DE	incidentID, incidentDescription	
CAP	Incidents,	
CWML	productID	?
TWML	N/A	
EDXL-RM	IncidentID, IncidentDescription	
EDXL-HAVE	N/A	

3.8 Urgency/Priority/Certainty

Standards	Related Element	Comment
EDXL-DE	confidentiality	
CAP	urgency, severity, certainty	<p><i>urgency</i> Code Values:</p> <ul style="list-style-type: none"> - "Immediate" - "Expected" - "Future" - "Past" - "Unknown" <p><i>severity</i> Code Values:</p> <ul style="list-style-type: none"> - "Extreme" - "Severe" - "Moderate" - "Minor" - "Unknown" <p><i>certainty</i> Code Values:</p> <ul style="list-style-type: none"> - "Observed" - "Likely" - "Possible" - "Unlikely" - "Unknown"

CWML	Media, Priority, Wind.possibility, Rain.possibility, Floor.possibility,	<i>Media.broadcast</i> Code Value: <ul style="list-style-type: none"> - “immediately” - “within the hour” - “regularly” <i>Media.warningSignal</i> : use /not use <i>prority</i> Code Value: <ul style="list-style-type: none"> - “PRIORITY” - “TOP PRIORITY”
TWML	Watch.status Warning.status predictionStatus	<i>Watch.status/Warning.status</i> Code Values: <ul style="list-style-type: none"> - “current” - “end” <i>predictionStatus</i> Code Values: <ul style="list-style-type: none"> - “already arrived” - “addition” - “revision”
EDXL-RM	?	
EDXL-HAVE	N/A	

4. Polysemant

Polysemant – a word having more than one meaning. It may cause the confusing and misunderstanding in information sharing.

4.1 Resource

In EDXL-RM, ‘resource’ means something that can be used for support or help among emergency, such as emergency equipment, supplies, people and teams. Thus, *EDXL-RM.Resource* segment includes the following sub-elements,

- *ResourceID*
- *Name*
- *TypeStructure*
- *Keyword*
- *Description*
- *Credentials*
- *Certifications*
- *SpecialRequirements*.

In CAP, *resource* segment provides an optional reference to additional information related to *info* segment within which it appears in the form of a digital asset such as an image or audio file. The following is the sub-elements of *Cap.resource*,

- *resourceDesc*
- *contentType*
- *size*
- *uri*
- *derefUri*
- *digest*

4.2 Address

In CAP, *addresses* is the group listing of intended recipients of the alert message. Similarly, *EDXL-DE.explicitAddress* is the identifier of an explicit recipient. The contents of the two elements are more likely to be the 'address' on the Internet (e.g. email account) rather than the 'address' of a place. Although currently no standards use 'address' as a key word to describe location, this point still needs to be noted.