
# D7.4
# Standardisation Activities Report – Issue 1

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# List of Acronyms

| | |
|---|---|
| AENOR | Spanish Association for Standardization and Certification |
| ANSI | American National Standards Institute |
| BS | British Standard |
| BSI | British Standards Institution |
| C&C | Command & Control Centre |
| CAP | Common Alerting Protocol |
| CEN | European Committee on Standardisation |
| COP | Common Operational Picture |
| DE | Distribution Element |
| DLR | Deutsches Zentrum für Luft- und Raumfahrt e.V. (German Aerospace Center) |
| DLR-DFD | Deutsches Zentrum für Luft- und Raumfahrt e.V.; German Remote Sensing Data Center |
| DLR-KN | Deutsches Zentrum für Luft- und Raumfahrt e.V.; Institute of Communications and Navigation |
| DRR | Disaster Risk Reduction |
| DS | Danish Standards Foundation |
| EC | European Commission |
| EDXL | Emergency Data Exchange Language |
| ELSI | Ethical, Legal and Social Issues |
| EM-TC | OASIS Emergency Management TC |
| EMS | Emergency Medical Services |
| EMTEL | Emergency Telecommunications |
| ETSI | European Telecommunications Standards Institute |
| EUW | End User Workshop |
| FBBR | Frederiksborg Brand og Redning (Frederiskborg Fire and Rescue Service) |
| FP6 | 6th Framework Programme of the EC |
| FP7 | 7th Framework Programme of the EC |
| FR | First Responder |
| GRAF | Support Group for Forest Interventions of INT-FRS |
| H2020 | Horizon 2020 Framework Programme of the EC |

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| HL7 | Health Level Seven International |
| I4CM | Innovation for Crisis Management |
| IC | Incident Commander |
| IFRC | International Federation and the International Committee of the Red Cross |
| IG | Information Gateway |
| INT | Departament d'Interior – Generalitat de Catalunya (Catalan Government – Department of Interior) |
| INT-FRS | Ministry of Home Affairs – Fire and Rescue Service |
| INT-PD | Ministry of Home Affairs – Police Department |
| ISO | International Organization for Standardisation |
| ITU | International Telecommunication Union |
| LBS | Location-based Services |
| LCMS | Dutch National Crisis Management System |
| LLF | Lessons Learned Framework |
| OASIS | Organization for the Advancement of Structured Information Standards |
| OENORM | Standard published by Austrian Standards International |
| OGC | Open Geospatial Consortium |
| PCF | Fundació d'Ecologia del Foc i Gestió d'Incendis Pau Costa Alcubierre (Pau Costa Foundation) |
| SC | Subcommittee |
| SITREP | Situation Reporting |
| SPH | Space Hellas S.A. |
| TC | Technical Committee |
| TOC | Table of Contents |
| UML | Unified Modeling Language |
| WCS | Web Coverage Service |
| WFS | Web Feature Service |
| WG | Working Group |
| WM | Web Map Service |
| WP | Work Package |
| WPS | Web Processing Service |

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# Executive Summary

The current report documents the series of activities performed so far by the HEIMDALL partners in order to foster the standardisation of project results. The content of the deliverable is the outcome of the activities carried out within the context of Task 7.2 (Standardisation) until M21 of the project.

The main objectives of the task are:

- Identification and analysis of relevant standardisation bodies and frameworks.
- Analysis of needs for standardization in the different stakeholder, ELSI and implementation work packages
- Application of existing standards which have the potential to serve the identified needs and identification of gaps
- Participation in relevant standardisation activities with the aim of contributing to existing standards and developing recommendations on standardization and standardization procurement.
- The HEIMDALL platform will make use of existing standards and those developed or extended in HEIMDALL, while the platform itself will not be subject to standardisation efforts.

Apart from Task 7.2, the outcome of discussions and studies performed in WP3 and the technical progress of the works carried out in WP 4, 5 and 6 have been used as basis to identify the relevant standards to be applied for devising an interoperable system.

The activities carried out within this task have been focused on two main areas: (i) the identification of relevant standards to be used in order to ensure system interoperability and flexibility; (ii) the identification of relevant standards, which could be updated/extended according to the HEIMDALL outcome. For the first area, the objective has been to identify and analyse the standards in order to include them in the HEIMDALL design and implementation activities, while in the second case, the consortium is intended to be active in proposing new updates or standards in the corresponding standardisation bodies and committees.

# 1 Introduction

Newly developed or improved products (such as space-based forecasting, monitoring and damage assessment methods developed in T5.1 or the disaster scenario data model format developed in collaboration of WP3 and WP6), innovative services (such as the simulators implemented in T5.5, impact assessment, situation assessment and reporting, decision support, scenario management and matching tools implemented in WP6) or advanced processes (such as the HEIMDALL decision making model and reference workflow developed in close interaction between the end user, ELSI and technical partners) are the outcomes and results of the HEIMDALL project. Standardization of these results is needed in order to make them sustainable and to promote them to the market or the industry even after the conclusion of the project. Nevertheless, existing standards are also an input for development work performed as HEIMDALL strives to be compatible with the current state-of-the-art in the field of strategic disaster response planning.

This deliverable leverages, besides the thorough standardization work conducted in the EC-funded PHAROS project (FP7) [1][2], the elaborate report of existing standards and standardization activities in crisis management generated in the EC-funded FP7 DRIVER+ project [3]. Hereinafter, the report will be referred to as ‘D955.11’.

First, D955.11 gives an overview of what standardisation is, how standards are developed, and how DRIVER+ results can contribute and/or use standardisation by presenting the international, European and national standardisation landscape. Second, thousand standardisation documents identified as possibly relevant for crisis management are referred to and listed in the annex of D955.11. This long list shall allow for considering a wide range of possible solutions selected for upcoming DRIVER+ trials. For example, HEIMDALL might be selected as a possible solution in a trial and as such, it would bring along a range of standardization possibilities. Therefore, the list contains a range of standardisation documents that could be relevant to HEIMDALL’s specific focus on response planning and scenario building. Third, the major part of D955.11 consists of a presentation of seventy of these standardisation documents that have been assessed regarding to their relevance for every subproject within DRIVER+ together with a description of the assessment methodology.

Following this methodology, Task 7.2 has analysed first the seventy standardisation documents, then the long list of possibly relevant documents listed in D955.11 regarding their relevance for HEIMDALL. Section 2 presents the results of the assessment in a short overview of standardization bodies, standards and standardization documents identified as relevant. Further standardization documents identified by T7.2 as relevant for the work in HEIMDALL, which have not been documented in D955.11, are listed afterwards. An overview of the Organization for the Advancement of Structured Information Standards (OASIS) and its relation to HEIMDALL concludes section 2.

The second major objective of Task 7.2 is the application of relevant standards, which have potential to serve needs for standardization identified in the different stakeholder, ELSI and implementation work packages. Referring to standards listed in the prior section, section 3 presents the results of work conducted so far in detail and highlights gaps with the aim of contributing to existing standards and developing recommendations on standardization.

Section 4 gives a summary of standardisation events attended and activities conducted during the first reporting period and provides and outlook on the activities planned for the second project reporting period. Finally, section 5 summarizes and concludes the document.

# 2 Overview of Standardization Bodies, Standards and Documents

Standardization in the area of crisis management is conducted on national (AENOR, ANSI, BSI, DIN, DS, etc.), European (CEN, ETSI) and international (ISO, ITU) levels in various technical committees (TC) and their working groups. In those working groups, experts from the associated fields develop the standards content, while members of the standardization bodies manage their discussion and results. D955.11 highlights that the most related topics to the DRIVER+ project are discussed on international level in ISO/TC 292 – Security and resilience and on European level in CEN/TC 391 – Social and Citizen Security. These TCs are also relevant to HEIMDALL.

ETSI, relevant ETSI committees, standards and their application in PHAROS have been described in detail in the PHAROS standardisation activity reports [1][2]. In general, these findings also apply to HEIMDALL. In particular, the activities carried out by the Special Committee on Emergency Communications (SC EMTEL) are relevant for HEIMDALL. SC EMTEL addresses a broad spectrum of aspects related to the use of telecommunications devices in emergency situations. Their experience with the drafting of technical reports regarding requirements for communication between authorities and citizens during emergencies and the use of Cell Broadcast for public alert purposes is of high value for task T4.4 working on multi-instance communication and information sharing. The application of ETSI standards in HEIMDALL can be grouped under the following HEIMDALL components:

- First Responder (FR) information and public warning services provided by the Information Gateway (IG);
- Communication networks used by HEIMDALL mobile users, in particular Ka-band satellite communications from the local HEIMDALL units to FRs in the field

As mentioned above, findings described in the PHAROS standardisation activity reports can be applied in most regards to HEIMDALL. Therefore, further details can be found in these reports.

This section is organised as follows. The first sub-section gives an overview of the standardization bodies, standards and standardization documents identified as relevant to HEIMDALL based on the assessment methodology introduced in D955.11. Detailed information on bodies, standards and documents mentioned above and in the first sub-section is provided in D955.11.

At service and product level, the most relevant standards are developed by the Open Geospatial Consortium (OGC) and by the Organization for the Advancement of Structured Information Standards (OASIS). OGC, relevant OGC committees, standards and their application in PHAROS have been described in detail in the PHAROS standardisation activity reports. As findings apply to HEIMDALL as well this deliverable does not provide any further details. OASIS has been described in the PHAROS reports as well. However, an update is provided in the second sub-section since the focus has shifted slightly in HEIMDALL towards different OASIS standards.

## *2.1 Relevant Standardisation Documents*

Based on the lists in D955.11 with the as most important identified standardisation documents for the DRIVER+ subprojects the following documents listed in Table 2-1 have been assessed by T7.2 and the end user partners as relevant for the work in HEIMDALL. Therefore, a grade of "1" has been used for less important standards up to a grade of "5" for very important standards. The following definitions adapted from D955.11 were used:

- 0 – The standard is not necessary for HEIMDALL.
- 1 – The project should be aware of the standard.

- 2 – A member of the consortium should briefly assess whether the standard should be investigated for further applicability to the project, and escalate to 3, 4 or 5 as needed.
- 3 – It is highly likely that this standard is relevant to HEIMDALL so must be further assessed by a member of the consortium, and escalated to 4 or 5 as needed.
- 4 – The standard should be read in detail and taken account of, during the work of the project.
- 5 – The work for the project must aim to comply with and/or plan to contribute to this standard

Table 2-1 has been reduced to standards addressed by an assessment of "3" or higher.

Table 2-1: Relevant standardisation documents based on D955.11

| Document No. | Title of the document | Abstract/Scope | Assess-ment |
|---|---|---|---|
| ISO Guide 73 | Risk management – Vocabulary | ISO Guide 73:2009 provides the definitions of generic terms related to risk management. It aims to encourage a mutual and consistent understanding of, and a coherent approach to, the description of activities relating to the management of risk, and the use of uniform risk management terminology in processes and frameworks dealing with the management of risk. | 5 |
| ISO 22300 | Security and resilience - Vocabulary | ISO 22300:2018 defines terms used in security and resilience standards. This edition cancels and replaces the first edition (ISO 22300:2012), which has been technically revised and ISO/DIS 22300:2016 | 5 |
| ISO/DIS 22320 | Security and resilience -- Emergency management -- Guidelines for incident management | This document provides guidance for organizations to improve their handling of all types of incidents (for example, emergencies, crisis, disruptions and disasters). The multiple incident management activities are often shared between organizations and agencies, with the private sector, regional organizations, and governments, have different levels of jurisdiction. Thus there is a need to guide all involved parties in how to prepare and implement incident management. | 4 |
| ITU-T X.1303bis | Common alerting protocol (CAP 1.2) | The Common Alerting Protocol (CAP) 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. CAP also facilitates the detection of emerging patterns in local warnings of various kinds, such as might indicate an undetected hazard or | 4 |

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| | | hostile act. And CAP provides a template for effective warning messages based on best practices identified in academic research and real-world experience. | |
| NFPA 1561 | Standard on Emergency Services Incident Management System and Command Safety | This standard contains the requirements to be used by emergency services for the structure and operations of an incident management system and the principles of command safety that are to be incorporated into all incidents, training or emergency, to ensure the safety of emergency responders and others on the scene of an incident. | 4 |
| ISO/TR 22351 | Societal security - Emergency management – Message structure for exchange of information | ISO/TR 22351:2015 describes a message structure for the exchange of information between organizations involved in emergency management. An organization can ingest the received information, based on the message structure, in its own operational picture.<br>The structured message is called Emergency Management Shared Information (EMSI).<br>ISO/TR 22351:2015 describes the message structure built in order to facilitate interoperability between existing and new information systems.<br>The intended audience of ISO/TR 22351:2015 is control room engineers, information systems designers and decision makers in emergency management. | 4 |
| EN ISO 19111 | Geographic information -- Spatial referencing by coordinates | SO 19111:2007 defines the conceptual schema for the description of spatial referencing by coordinates, optionally extended to spatio-temporal referencing. It describes the minimum data required to define one-, two- and three-dimensional spatial coordinate reference systems with an extension to merged spatial-temporal reference systems. It allows additional descriptive information to be provided. It also describes the information required to change coordinates from one coordinate reference system to another.<br>In ISO 19111:2007, a coordinate reference system does not change with time. For coordinate reference systems defined on moving platforms such as cars, ships, aircraft and spacecraft, the transformation to an Earth-fixed coordinate reference system can include a time element.<br>ISO 19111:2007 is applicable to | 4 |

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| | | producers and users of geographic information. Although it is applicable to digital geographic data, its principles can be extended to many other forms of geographic data such as maps, charts and text documents. | |
| EN ISO 19112 | Geographic information -- Spatial referencing by geographic identifiers | ISO 19112:2003 defines the conceptual schema for spatial references based on geographic identifiers. It establishes a general model for spatial referencing using geographic identifiers defines the components of a spatial reference system and defines the essential components of a gazetteer. | 3 |
| ISO 19118 | Geographic information -- Encoding | ISO 19118:2011 specifies the requirements for defining encoding rules for use for the interchange of data that conform to the geographic information in the set of International Standards known as the "ISO 19100 series".<br>ISO 19118:2011 specifies requirements for creating encoding rules based on UML schemas, requirements for creating encoding services, and requirements for XML-based encoding rules for neutral interchange of data. | 3 |
| ISO/IEC 19501 | Information technology -- Open Distributed Processing -- Unified Modeling Language (UML) Version 1.4.2 | ISO/IEC 19501:2004 describes the Unified Modeling Language (UML), a graphical language for visualizing, specifying, constructing and documenting the artifacts of a software-intensive system. The UML offers a standard way to write a system's blueprints, including conceptual things such as business processes and system functions, as well as concrete things such as programming language statements, database schemas, and reusable software components. | 3 |
| ISO 22319 | Security and resilience - Community resilience – Guidelines for planning the involvement of spontaneous volunteers | ISO 22319:2017 provides guidelines for planning the involvement of spontaneous volunteers (SVs) in incident response and recovery. It is intended to help organizations to establish a plan to consider whether, how and when SVs can provide relief to a coordinated response and recovery for all identified hazards. It helps identify issues to ensure the plan is risk-based and can be shown to prioritize the safety of SVs, the public they seek to assist and incident response staff. | 3 |
| ASTM F 1221 | Standard Guide for Interagency Information Exchange | This guide has been developed to facilitate communications between agencies involved in the delivery of emergency medical services (EMS). This guide is intended to be applied by | 3 |

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| | | agencies providing emergency medical services to improve their communications with EMS support agencies. It recommends necessary communication before, during, and after an EMS event. | |
| BS 11200 | Crisis management. Guidance and good practice | BS 11200:2014 Crisis management – Guidance and good practice offers guidance to help management plan, establish, operate, maintain and improve their organizations crisis management capability. | 3 |
| EN ISO 9241-303 | EN ISO 9241-303 Ergonomics of human-system interaction — Part 303: Requirements for electronic visual displays | ISO 9241-303:2011 establishes image-quality requirements, as well as providing guidelines, for electronic visual displays. These are given in the form of generic (independent of technology, task and environment) performance specifications and recommendations that will ensure effective and comfortable viewing conditions for users with normal or adjusted-to-normal eyesight. | 3 |
| OENORM S 2308 | Integrated disaster management - Tactical graphics | This OENORM specifies uniform signs for the location of damage events of different magnitudes, in particular for use in integrated bars in case of disaster. | 3 |
| EN ISO 9241-303 | Ergonomics of human-system interaction -- Part 303: Requirements for electronic visual displays | ISO 9241-303:2011 establishes image-quality requirements, as well as providing guidelines, for electronic visual displays. These are given in the form of generic (independent of technology, task and environment) performance specifications and recommendations that will ensure effective and comfortable viewing conditions for users with normal or adjusted-to-normal eyesight. | 3 |
| ISO/IEC 27035-2 | Information technology – Security techniques – Information security incident management – Part 2: Guidelines to plan and prepare for incident response | ISO/IEC 27035-2:2016 provides the guidelines to plan and prepare for incident response. The guidelines are based on the "Plan and Prepare" phase and the "Lessons Learned" phase of the "Information security incident management phases" model presented in ISO/IEC 27035‑1. | 3 |
| ISO 22398 | Societal security – Guidelines for exercises | ISO 22398:2013 recommends good practice and guidelines for an organization to plan, conduct, and improve its exercise projects which may be organized within an exercise programme. | 3 |
| ISO/IEC 27002 | Information technology – Security techniques – Code of practice for | ISO/IEC 27002:2013 gives guidelines for organizational information security standards and information security | 3 |

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| | information security controls | management practices including the selection, implementation and management of controls taking into consideration the organization's information security risk environment(s). | |
| EN ISO 7010/A5 | Graphical symbols - Safety colours and safety signs - Registered safety signs (ISO 7010:2011/Amd 5:2014); German version EN ISO 7010:2012/A5:2015 | In addition to DIN EN ISO 7010, this Amendment prescribes 10 safety signs for the purposes of accident prevention, fire protection, health hazard information and emergency evacuation. | 3 |
| OENORM S 2304 | Integrated disaster management - Terms and definitions | This OENORM defines terms for use in all areas of disaster management, but also the management of crises, large-scale incidents, emergencies and other damaging events in Austria, and also outside Austria to ensure the necessary interoperability. The target groups are all authorities, emergency organizations and institutions appointed to work in disaster management - especially those from research, teaching and business. | 3 |
| ANSI/APCO 2.103.1 | Public Safety Communications Common Incident Types for Data Exchange | To provide a comprehensive list of terms and associated acronyms that can be used to classify the situation (incident) that Public Safety Answering Points (PSAPs) and emergency responders are engaged in.<br>The list of terms, (Incident Type Codes) will encompass situations that involve a multi discipline combination of resources. The standardized Incident Types will be used whenever a PSAP shares incident information externally with other PSAPS, emergency service responders or other authorized agencies. | 3 |

Further standards not listed in D955.11 have been identified by T7.2 as relevant for the work in HEIMDALL. Table 2-2 lists those following the same table format as in Table 2-1. While collecting the standards, which are important for HEIMDALL, other relevant documents such as related books, papers and directives from the UN and committee specifications have been found. These documents should be further taken into account and are listed in italic.

Table 2-2: Further relevant standardisation documents

| **Document No.** | **Title of the document** | **Abstract/Scope** | **Assess-ment** |
|---|---|---|---|
| ISO 31000 | Risk management – Guidelines | ISO 31000:2018, Risk management – Guidelines, provides principles, framework and a process for managing risk. It can be used by any organization regardless of its size, activity or sector. | 5 |
| IEC 31010 | Risk management -- Risk | IEC 31010:2009 is a dual logo IEC/ISO, single prefix IEC, supporting standard | 5 |

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| | assessment techniques | for ISO 31000 and provides guidance on selection and application of systematic techniques for risk assessment. | |
| *EU Commission 2010* | *EU Commission Staff Working Paper - Risk Assessment and Mapping Guidelines for Disaster Management* | *The EU Guidelines were developed in response, to assist countries to further develop national approaches and procedures to risk management, taking into account the future impact of climate change. The focus of these guidelines is on the processes and methods of national risk assessments and mapping in the prevention, preparedness and planning stages, as carried out within the broader framework of disaster risk management. The guidelines are based on a multi-hazard and multi-risk approach. The guidelines take full account of existing EU legislation and Eurocodes (e.g. Directives on flood risks, protection of European Critical Infrastructures, Water Framework Directive (drought management), Eurocode 8 on building design standards for seismic risks, and prevention of forest fires).* | *5* |
| *UNISDR 2004* | *Living with risk: a global review of disaster reduction initiatives* | *The book provides guidance, policy orientation and inspiration, as well as serving as a reference for lessons on how to reduce risk and vulnerability to hazards and to meet the challenges of tomorrow. It is intended for people who have an interest in and practice disaster risk management and sustainable development.* | *5* |
| *UNISDR 2009* | *2009 UNISDR Terminology on Disaster Risk Reduction* | *The UNISDR Terminology aims to promote a common understanding and usage of disaster risk reduction concepts and to assist the disaster risk reduction efforts of authorities, practitioners and the public. The previous version 'Terminology: Basic terms of disaster risk reduction' was published in 'Living with risk: a global review of disaster risk reduction initiatives' in 2004. The following year, the Hyogo Framework for Action 2005-2015 requested the UNISDR secretariat to "update and widely disseminate international standard terminology related to disaster risk reduction, at least in all official United Nations languages, for use in programme and institutions development, operations, research, training curricula and public information programmes".* | *5* |
| *Sendai Framework 2015* | *Sendai Framework for Disaster Risk Reduction 2015-2030* | *The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) is the first major agreement* | *5* |

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| | | *of the post-2015 development agenda, with seven targets and four priorities for action.*<br><br>*It was endorsed by the UN General Assembly following the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR).* | |
| *Directive 2007/60/EC* | *The EU Floods Directive* | *Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007. This Directive now requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. With this Directive also reinforces the rights of the public to access this information and to have a say in the planning process.* | *5* |
| *Directive 2008/*114/*EC* | *The Directive on European Critical Infrastructures* | *Directive 2008/114/EC establishes a European Union (EU) process for identifying and designating European critical infrastructures (ECIs), and sets out an approach for improving their protection.* | *5* |
| *EDXL-DE 2.0 Specification* | *Emergency Data Exchange Language (EDXL) Distribution Element Version 2.0 [10]* | *The Distribution Element 2.0 (DE 2.0) specification describes a standard message distribution format for data sharing among emergency information systems. The DE 2.0 serves two important purposes:*<br><br>*(1) The DE 2.0 allows an organization to wrap separate but related pieces of emergency information, including any of the EDXL message types, into a single "package" for easier and more useful distribution; Non-EDXL structured messages can also be encapsulated such as EMSI described by ISO/TR 22351*<br><br>*(2) The DE 2.0 allows an organization to "address" the package to organizations or individuals with specified roles, located in specified locations or those interested in specified keywords.*<br><br>*EDXL-DE 2.0 is a stable, international, open industry committee specification.* | *5* |
| *EDXL-SitRep1.0 Specification* | *Emergency Data Exchange Language Situation Reporting (EDXL-SitRep) Version 1.0 [13]* | *The XML-based EDXL Situation Reporting specification describes a set of standard reports and elements that can be used for data sharing among emergency information systems, and that provide incident information for situation awareness on which incident* | *5* |

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| | | *command can base decisions.*<br>*EDXL-SitRep 1.0 is an international, open industry committee specification.* | |
| *EDXL-HAVE v2.0 Specification* | *EDXL Hospital Availability Exchange (EDXL-HAVE) v2.0 [11]* | *EDXL-HAVE is an XML messaging standard primarily for exchange of information related to health facilities in the context of emergency management. HAVE supports sharing information about facility services, bed counts, operations, capacities, and resource needs so first responders, emergency managers, coordinating organizations, hospitals, care facilities, and the health community can provide each other with a coherent view of the health system.*<br>*EDXL-HAVE v2.0 is an international, open industry committee specification.*<br>*The specification was approved as a Health Level Seven International (HL7) Informative Document by ballot in January 2018. Founded in 1987, HL7 is a not-for-profit, ANSI-accredited standards developing organization dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services.* | *4* |
| *EDXL-RM 1.0 Specification* | *EDXL Resource Messaging (EDXL-RM) 1.0 [12]* | *The XML-based Emergency Data Exchange Language (EDXL) Resource Messaging specification describes a suite of standard messages for data sharing among emergency and other information systems that deal in requesting and providing emergency equipment, supplies, people and teams.*<br>*EDXL-RM 1.0 is a stable, international, open industry committee specification.* | *4* |
| *EUFOFINET 2012* | *European Glossary for Wildfires and Forest Fires* [4] | *For effective collaboration across national borders on any technical or emergency issue, the establishment of a common language is crucial. The EUFOFINET partners identified during the early stages of the project that there was no existing European glossary of terminology for wildfires and forest fires and, therefore, no common language for the partners to use. This situation posed a problem to the partnership in terms of establishing a common understanding around technical and practical issues related to wildfires and forest fires.* | *4* |
| *IFRC 2009* | *Relief items catalogue of the IFRC [5]* | *The emergency items catalogue has been established by the International* | *4* |

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|---|---|---|---|
| | | *Federation and the International Committee of the Red Cross (IFRC), with the support of National Societies. Its aim is to standardize and harmonize the selection and procurement of relief items during emergency operations.* | |
| *F.I.R.E.4 2009* | *F.I.R.E.4 – Forest fire fighting terms handbook [6]* | *The EC-funded F.I.R.E. 4 project which started in 2006 aimed at creating a shared culture of European disaster management by promoting the cooperation among EU member states (France, Italy, Portugal and Spain). The handbook was conceived in the framework of the training activities foreseen by the F.I.R.E. 4 project in order to share a common language among the operational teams of different countries. The handbook was published thanks to the joint collaboration between the National Forest Corps and the Italian Civil Protection Department.* | *4* |
| ISO/IEC 23026 | Systems and software engineering -- Engineering and management of websites for systems, software, and services information | ISO/IEC/IEEE 23026:2015 defines system engineering and management requirements for the life cycle of websites, including strategy, design, engineering, testing and validation, and management and sustainment for Intranet and Extranet environments. | 3 |

The lists will be continuously updated when new documents are identified to be important, i.e., assessment of “3” or higher. Most of the assessed standardisation documents listed in Table 2-1 and Table 2-2 are relevant for more than one WP within HEIMDALL. The most relevant ones are:

- For WP1 Project Management, especially the terminology standards are important for the development of the HEIMDALL terminology e.g. ISO Guide 73 Risk management – Vocabulary, as well as ISO 22300 Security and resilience - Vocabulary, in which more than 270 terms are included.
- For WP3 Stakeholder Management, the terminology and emergency management standards and documents are of relevance for the collection and harmonization of case studies, response plans, reference workflows and procedures and the planning of demonstrations, e.g. ISO Guide 73, the standards series of ISO 310xx on Risk Management, the series of ISO 223xx on Societal security, the UN documents, EU directives and further terminology documents
- For the technically oriented WPs 2, 4, 5 and 6 the standards series of ISO 223xx on Societal security is relevant. Additionally, the message formats for the exchange of emergency information are important, e.g. ITU-T X.1303bis describing CAP, ISO/TR 22351 describing EMSI and the EDXL suite of standards. In order to design HEIMDALL components which are of use for the end user organizations technical partners have to consider also terminology and emergency management guidelines.

The application of standards and documents and gaps regarding to standardisation identified so far are described in more detail in section 3.

## *2.2 Organization for the Advancement of Structured Information Standards (OASIS)*

OASIS is a non-profit consortium that drives the development, convergence and adoption of open standards for the global information society [7]. The topics tackled by the OASIS standards include security, Internet of Things, cloud computing, energy, content technologies and emergency management, among others.

The OASIS Consortium is formed by more than 5000 participants representing over 600 organisations and individual members in more than 65 countries. Participants represent both the public and private sector technology leaders, users and stakeholders.

### 2.2.1 **Relevant Committees**

#### 2.2.1.1 Emergency Management Technical Committee

Among the different OASIS committees, the OASIS Emergency Management TC (EM-TC) is the relevant one for HEIMDALL. This committee is in charge of creating vendor-neutral and platform agnostic standards for organisations and agencies for easing the exchange of emergency information [8]. Within the EM-TC, the following subcommittees are relevant in the HEIMDALL context:

- EM CAP Profiles TC: designs, develops and releases XML-based standards and specifications as CAP profiles based on the CAP standard.
- EM CAP SC: Provides ongoing maintenance of the CAP standard and related work.
- EM Messages and Notification SC: Addresses procedures and formats for exchanging new and updated information related to functions including public safety, emergency response and homeland security. In particular, it provides ongoing maintenance of the EDXL-RM and EDXL-SitRep standards and related work.

The activities carried out by the committee are relevant for HEIMDALL since they provide several standards for information exchange on which some of the HEIMDALL tools are based. Particularly, the alerting service of the IG integrated within HEIMDALL is based on the use of CAP and the Situation Report Generation Service (SITREP) is based on the EDXL Situation Reporting (EDXL-SitRep) format.

### 2.2.2 **Relevant Standards**

At least, the following documents published by OASIS are relevant to the HEIMDALL project:

- EDXL Common Alerting Protocol (EDXL-CAP) [9] - used for exchanging all-hazard alerts and public warnings
- EDXL Distribution Element (EDXL-DE) [10] - used for packaging and routing XML-formatted messages over multiple warning systems
- EDXL Hospital Availability (EDXL-HAVE) [11] - used for sharing messages about a hospital's capacity and resources
- EDXL Resource Messaging (EDXL-RM) [12] - used for requests for equipment, supplies and personnel
- EDXL Situation Reporting (EDXL-SitRep) [13] used for sharing incident, situation assessment and decision support information

The EDXL-CAP 1.2 OASIS Standard has been published as ITU-T Recommendation X.1303bis (CAP).

### 2.2.3 **Application of OASIS standards in HEIMDALL**

The different identified OASIS standards are relevant in three different HEIMDALL areas:

- Public warning (CAP)
- Situation reporting and exchange of incident and scenario information
- System interoperability

In the first area, public warning, the alerting module of the IG integrated within the HEIMDALL system is designed in order to provide compatibility with CAP-based alerting systems. Given the importance of CAP as alerting format, providing CAP compatibility has been considered already in PHAROS as one of the important features to ensure compatibility with already existing alerting systems. In order to achieve this purpose, CAP is used as internal format for alert message storage. This way, on one hand, CAP-compatible alert messages provided by external systems could be processed and distributed by the IG in case the corresponding interface between systems was provided. On the other hand, CAP-compatible messages generated by HEIMDALL could be also provided for dissemination performed by other external systems.

In the second and third areas, the suite of EDXL standards has been analysed to assess the suitability of the proposed standards to define the data structure and format to be used for scenario management and exchange between HEIMDALL instances and between a HEIMDALL and a non-HEIMDALL emergency management system. Intermediate analysis results are documented in different parts of section 3.

### 2.2.4 **HEIMDALL activities and contributions to OASIS standards**

The application of OASIS standards and contributions performed in the first project period are described in different parts of section 3. Table 2-3 presents a summary of major activities and events related to OASIS standards.

Table 2-3: Activities and events related to OASIS standards

| **Activity or Event** | **Date and Location** | **Participating Partner(s)** |
|---|---|---|
| Participation in CAP Implementation Workshop | 20-21/09/2017 in Rome, Italy. | DLR |
| Presentation of webinar on lessons learnt from CAP Implementation Workshop and CAP/EDXL Standards-based Data Exchange | 10/10/2017 (webinar) | DLR |
| Participation in discussions raised by the CAP SC of the EM.-TC | Started in 12/2017 (mailing list) | DLR, end users |

Besides standards research and application and the participation in SC discussions, a research project such as HEIMDALL can eventually participate in the development of standards. D955.11 describes three possibilities a research project has to provide its ideas and results as first suggestion for a potential standard document:

1. Contribution to ongoing standardisation activities: Before a final approval, every standard is published in a draft version. In this stage, a research project can comment on the draft standard. Every comment must be taken into account by the standard developer.
2. Submission of a proposal for a new standardisation work: The research project submits a completed form for a new standardisation work to a standardisation body. As European research project in the area of crisis management, HEIMDALL would most likely hand in such a form to CEN.
3. Development of a CEN Workshop Agreement: A CEN Workshop Agreement (CWA) is a document developed by experts, who do not have to be member of a technical committee and published by CEN with a maximum lifetime of six years. It is open to

everyone interested in participating in the development of the document and needs to be approved only by the workshop member. It is a pre-standard and aims to be used as input for formal standards. Anyway, it may not conflict with European standards. More information regarding the development process can be found on the CEN website. A CWA developed in a project funded by the EC can be publicly available and free of charge. This makes a CWA a perfect tool for dissemination and exploitation.

In the case that extensions to a standard will be identified as necessary during the second project period T7.2 will look into these recommendations.

# 3 Standards Application, Standardisation Needs and Gaps Analysis

## *3.1 Standardisation of Scenarios*

HEIMDALL aims at improving immediate and long-term cooperative situation assessment and response planning activities. As response plans should be firmly based on scenarios of what is likely to happen HEIMDALL wants to support emergency services in the creation, analysis and exchange of realistic multi-disciplinary disaster scenarios. Therefore, Friedemann at al. [14] have examined (1) which activities in the response planning process for complex multi-hazard crisis situations, specifically weather related events, involve strategic planning scenarios and (2) which information needs to be represented in a scenario to improve these activities? Accordingly, the development of different possible views of the future and the analysis of their possible consequences has been identified as a major goal of scenario-based strategic planning. However, the information shared on situational status, possible future alternatives or strategical decisions was typically short unstructured messages with occasional tabular data, and often encoded as PDF or Microsoft Word documents. The two major challenges in the management of disasters lied in improving procedural/organizational and semantic interoperability.

### 3.1.1 **OASIS EDXL Suite of Standards for Situation Reporting**

Friedemann at al. found out that ontologies and emergency management message standards such as the EDXL group of standards have been used to overcome the problems of interoperability and semantic heterogeneity and to ensure the optimal provision of disaster-related information for fast decision-making in a highly coordinated manner. EDXL is a common integrated framework that is accepted and used in several applications dealing with disaster management [15]. It is consists of a range of emergency data exchange standards including CAP, EDXL EDXL-HAVE, EDXL-RM, and EDXL-SitRep, each of which is related to a particular aspect of the emergency domain.

Friedemann at al. state that while EDXL carried potential for the scenario-based response planning process it lacked research on process-specific knowledge to be used and adapted. They present first results on a mapping of the conceptual scenario model developed in HEIMDALL to the EDXL information structure. These results have been incorporated in the specification of the Situation Report Generation Service (SITREP) in D6.7 [16]. Figure 3-1 shows a summary of EDXL information concepts identified so far as useful. The mature message structure called EDXL-HEIMDALL will be specified in the final deliverable D6.8.


Figure 3-1: First version of EDXL-HEIMDALL concepts. Source: D6.7

In the meantime, the EDXL-HEIMDALL mapping has been refined in order to achieve a representation of all scenario information items planned for Release B. Scenario parameters will be mapped onto the elements of EDXL-DE and EDXL-SitRep standards outlined in Figure 3-2.

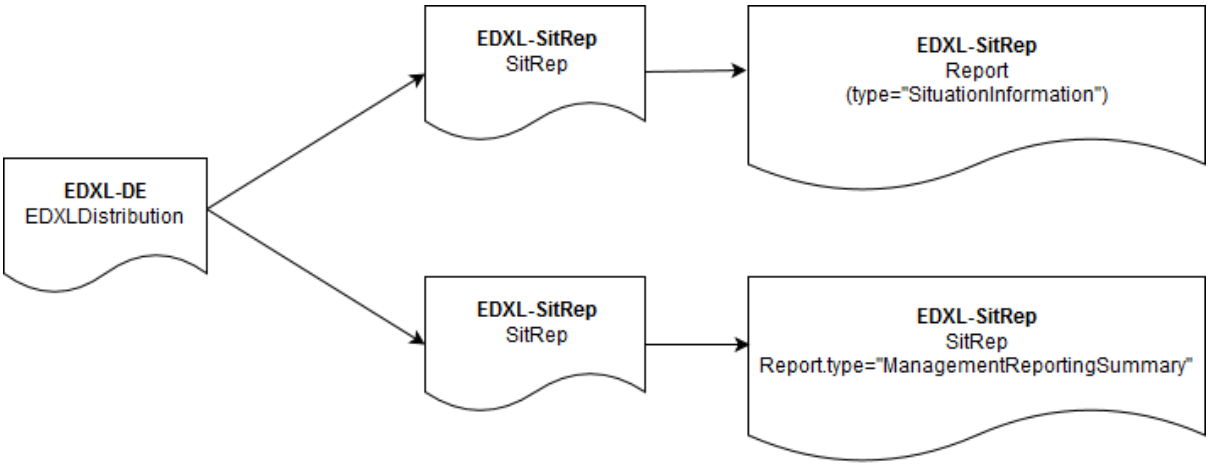


Figure 3-2: EDXL elements used for Release B

### 3.1.1.1 EDXL-DE

SITREP leverages the encapsulation and routing capabilities of the EDXL's Distribution Element (EDXL-DE) [10] as the module's top-level loose coupler and allows for processing of both non-XML and XML content payloads including EDXL-CAP, EDXL-HAVE, EDXL-RM) and EDXL-SitRep. EDXL-DE is being referred to as a loose coupler because it provides (a) a data structure that allows for packaging XML and non-XML payloads called content objects and (b) a standard set of header information that systems can use to make delivery decisions on the information contained in the content objects without having to examine the data in the content objects directly.

EDXL-DE is considered top-level because all interfaces and services within a messaging system can simply pass a single EDXL-DE message between them to perform data exchanges.

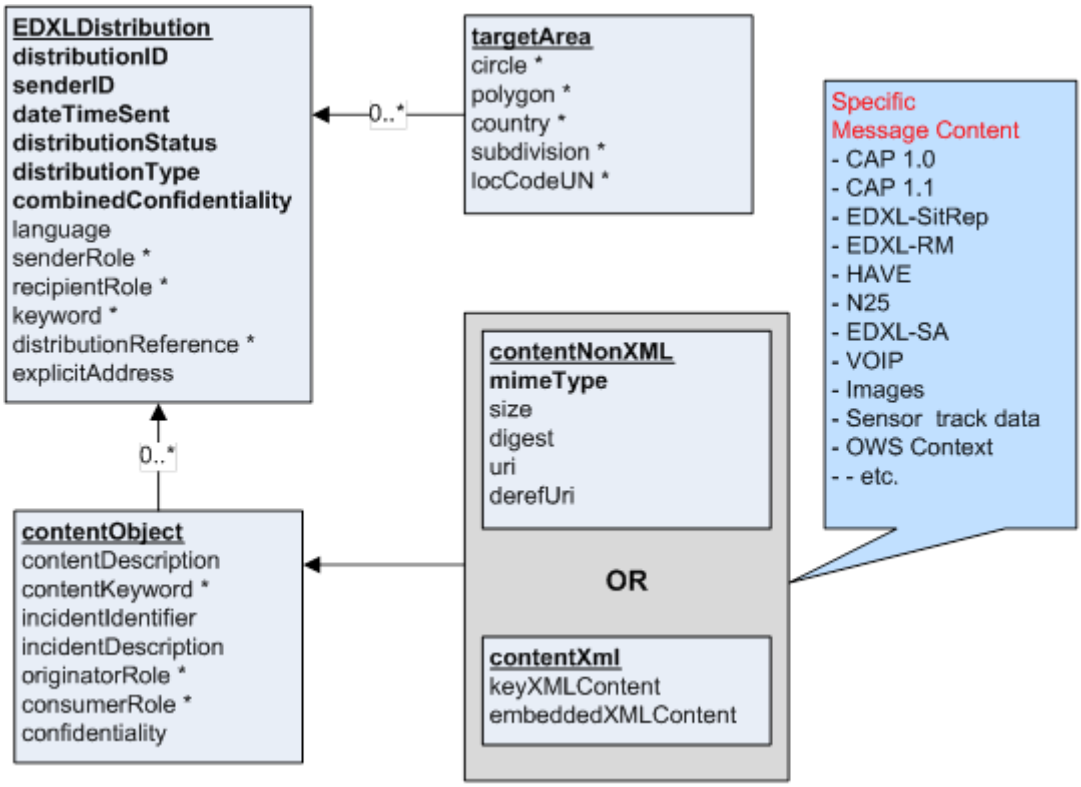


Figure 3-3: EDXL-DE general data structure. Source: EDXL-DE specification

### 3.1.1.2 EDXL-SitRep

The XML-based Emergency Data Exchange Language (EDXL) Situation Reporting specification [13] describes a set of standard reports and elements that can be used for data sharing among emergency information systems, and that provide information about the **current situation** ("Common Operating Picture") and current response and resources on which incident command can base decisions.

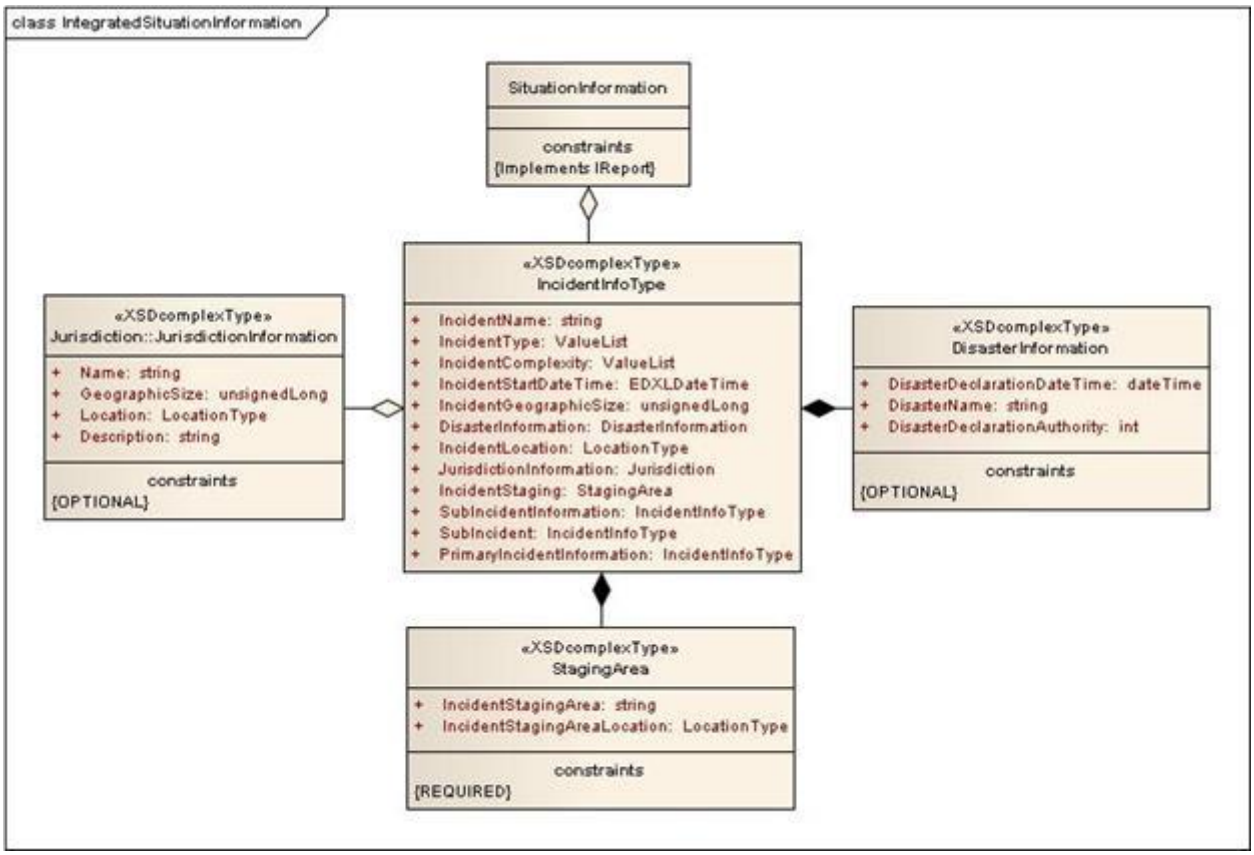


Figure 3-4: EDXL-SitRep SituationInformation facet. Source: EDXL-SitRep specification

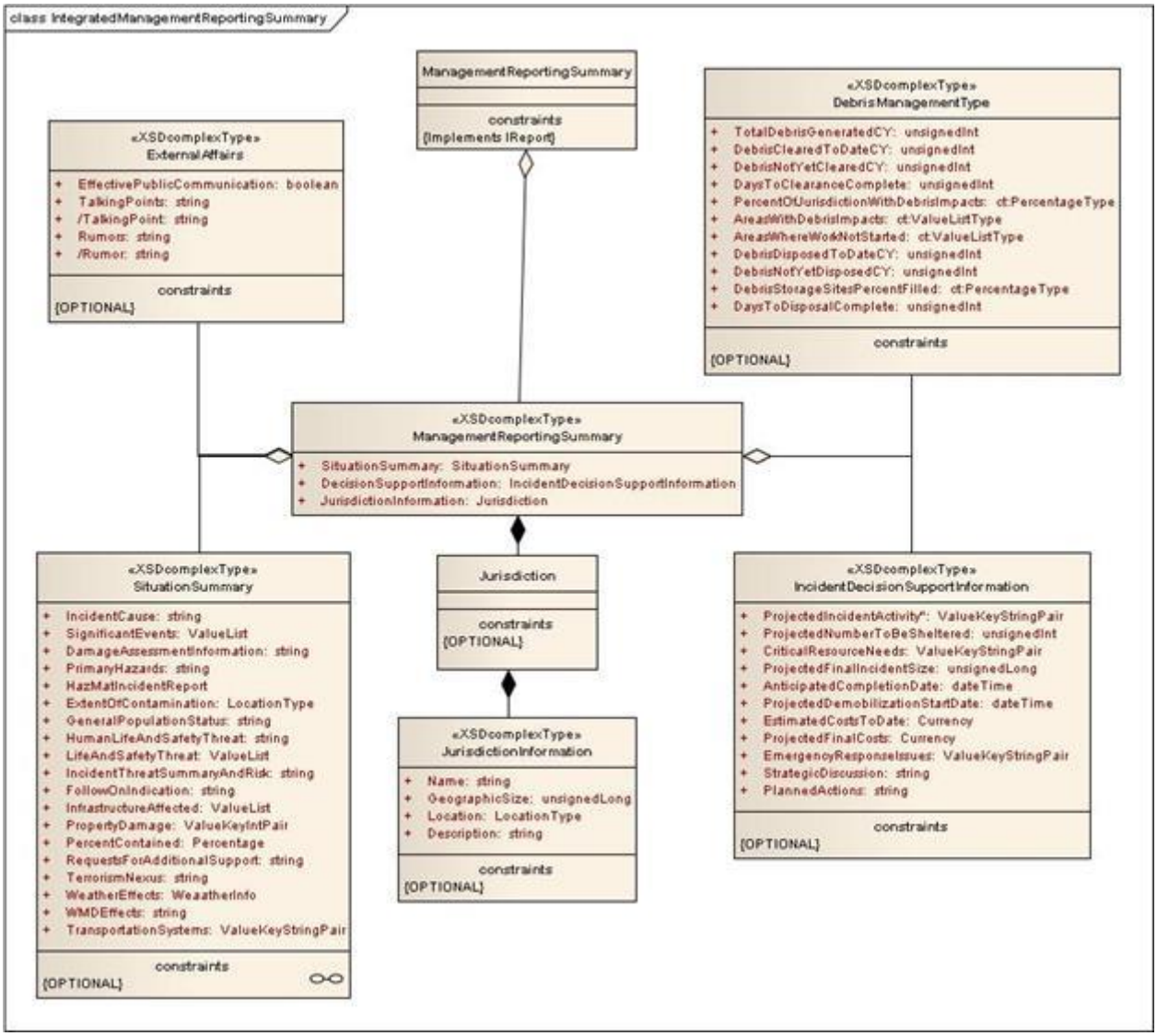


Figure 3-5: EDXL-SitRep ManagementReportingSummary facet. Source: EDXL-SitRep specification

**A first proof-of-concept implementation of the EDXL-based scenario description will be provided in Release B.** This implementation will undergo exercises in real-environment conditions at EUW2 giving us, the end users and the ELSI experts the possibility to reflect on the current solution, to validate it and to identify problems. We expect the acquired and evaluated data to be the basis for further refinements of the scenario data model.

### 3.1.1.3 EDXL-CAP

In the case that alerts shall be included in a situation report EDXL-CAP [9] can be utilized as an additional content attached to EDXL-DE.

The CAP SC of the EM-TC takes care of maintaining and optimizing the EDXL messaging standards. **HEIMDALL participates in the Subcommittee by attending and contributing to the emergency-dev mailing list:** an unmoderated, public mail list that provides an open forum for developers to exchange ideas and information on implementing the emergency OASIS Standards.

The SC has been discussing questions regarding the CAP Event Terms List that have been stated as follows:

1. There are widely used terms with naming conventions that conflict. For example, Warning is used for some events and not for others in the actual term. Or Severe

Thunderstorm when the actual event is a Thunderstorm, which may or may not be severe, or Extreme Fire Danger versus just Fire Danger. How do we reconcile this inconsistent naming?

2. There are some narrow terms that fall under several different broad terms. For example, Gale under Air Hazard and Gale under Marine Weather. Or Storm Surge on its own versus also part of a Tropical Storm. What is the feedback on either consolidating under a single broad term or allowing for the same narrow term to be repeated in multiple locations?
3. In attempting to develop the list we found there are a number of ambiguities between both the broad terms and narrow terms. In addition, there are also some ambiguities with the CAP categories. For example, Air Quality in the Canadian list falls into 4 CAP categories. How will the community address the problems of using a very short list of broad terms given these ambiguities? How can the list be made most useful to achieve the goals of an event list?

**Multiple HEIMDALL end users and DLR-DFD have contributed to the validation and refinement of the event terms list.** As a result, the following consolidated feedback has been provided to the Subcommittee (numbering corresponding to the number of the respective question):

1. A complete re-working of the list of terms with agreement from all users on the naming convention and parameters for use would be required. This would remove the subjectivity that currently exists in the list.
2. Consolidation would be our preferred option, as it would remove the confusion and misunderstanding that can come from using the same term in different scenarios with different meanings.
3. A short list with broad terms would not be ideal, as it would not give the required separation between categories. A standardized list with clear parameters on when the different terms should be used would be ideal. Where possible different categories should replicate the narrow terms, for example the terms “large, severe, extreme” in any category should have a similar meaning whether the category is flood, fire, landslip, weather, etc.

### 3.1.2 **Scenario Taxonomy**

The description of a disaster scenario using a common set of terms is crucial when talking about the situations in a larger group. In discussions between end user and technical partners at EUW 1 (July 2017) it turned out that the scope of a scenario varies depending from the end users’ jurisdictions, roles and experience. The mutual agreement on a flexible yet standards-based taxonomy for disaster scenarios in the HEIMDALL project proved to be the utmost objective. FBBR proposed a set of terms regarding Disaster Risk Reduction (DRR) related to the HEIMDALL project.

They emphasize as a starting point for the definition of terms regarding Disaster Risk Reduction (DRR) related to the HEIMDALL project that the definition of a common scenario taxonomy is a very complex subject that could very difficult satisfy all the expectations of the interested parts and actors. Therefore, it should be emphasized that the HEIMDALL project itself is important to highlight the context to which this project belongs as well as the most important factors affecting the definitions of terms that will be used in the project. The fact is that even scientists, researchers, experts, etc., do not agree on all aspects related to the definition of these terms.

In this connection, the agreement and development of a common terminology (i.e. the selection of DRR terms used in the HEIMDALL project) is a challenge for all project

participants where this terminology should be harmonized by the existing standards in the felt of DRR as well comparable when drawing the terminology in HEIMDALL participants exploitation and dissemination strategies. Thus, it is important to keep in mind the following:

- HEIMDALL is an EC-funded project
- Risk Assessment and Mapping Guidelines for Disaster Risk Reduction (DRR) (EU Commission 2010)
- Standards regarding DRR definitions like ISO 31000, IEC 31010, ISO Guide 73 etc.
- UNISDR Terminology on DRR (UNISDR 2004, UNISDR 2009 and newer additions)
- Sendai Framework for DRR 2015-2030 (Sendai Framework 2015)
- EU Flood directive (Directive 2007/60/EC and newer additions and proposals to it)
- EU Critical Infrastructure Directive (Directive 2008/114/EC and newer additions and proposals to it)
- HEIMDALL end user and other participants exploitation and dissemination strategies [17]
- Other EU relevant projects regarding DRR which are ongoing/finished

Bearing in mind the above, FBBR has presented a suggestion of terms to be used in the HEIMDALL project. After consolidation with the project partners, the following terms have been agreed:

Table 3-1: DRR terms used in HEIMDALL

| **Term** | **Definition** | **Remark** |
|---|---|---|
| Hazard | A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.<br>(Comment: Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydro-meteorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterised by its location, intensity, frequency and probability.<br>See other hazard-related terms in the Terminology: Biological hazard; Environmental hazard, Geological hazard; Hydro-meteorological hazard; Man-made hazard; Natural hazard; Socionatural hazard; Technological hazard.) | EU Commission, 2010;<br>UNISDR 2004, quoted in Sendai Framework 2015 |
| Natural Hazard | Natural hazard: Natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.<br>(Comment: Natural hazards are a sub-set of all hazards. The term is used to describe actual hazard events as well as the latent hazard conditions that may give rise to future events. Natural hazard events can be characterized by their magnitude or intensity, speed of onset, duration, and area of extent.) | EU Commission 2010;<br>UNISDR 2009 |
| Technological hazard | Technological hazard is a hazard originating from technological or industrial conditions, including accidents, dangerous procedures, infrastructure failures or specific human activities, that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, | EU Commission 2010;<br>UNISDR 2009 |

| | | |
|---|---|---|
| | or environmental damage. | |
| Risk | The combination of the probability of a hazardous event and its consequences which result from interaction(s) between natural or man-made hazard(s), vulnerability, exposure and capacity.<br>(Comment: Beyond expressing the probability of a hazardous event and its consequences, it is crucial to recognize that risks are inherent or can be created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying risk factors. Risk is a combination of the consequences (impact) of an event (hazard) and the associated likelihood/ probability of its occurrence (ISO)<br>Risk = $f$(probability, exposure, vulnerability) | EU-Commission 2010;<br>UNISDR 2004;<br>IEC 31010 |
| Disaster Risk | Risk is considered a function of hazard, exposure and vulnerability. It is normally expressed as a probability of loss of life, injury or destroyed or damaged assets that could occur to a system, society or a community in a specific period of time. | EU-Commission 2010;<br>UNISDR 2009;<br>UNISDR 2015 |
| Risk assessment | Risk assessment is the overall process of risk identification, risk analysis, and risk evaluation. (ISO 31010)<br>(Comment: Risk assessment = risk identification + risk analysis + risk evaluation) | EU-Commission 2010;<br>UNISDR 2009 |
| Risk Identification | Risk identification is the process of finding, recognizing and describing risks. (ISO 31010) | EU-Commission 2010;<br>UNISDR 2009 |
| Risk Analysis | Risk analysis is the process to comprehend the nature of risk and to determine the level of risk. (ISO 31010) | EU Commission 2010;<br>UNISDR 2009 |
| Risk Evaluation | Risk evaluation is the process of comparing the results of risk analysis with risk criteria to determine whether the risk and/or its magnitude is acceptable or tolerable. (ISO 31010) | EU Commission 2010;<br>UNISDR 2009+ |
| Risk Criteria | Risk criteria are the terms of reference against which the significance of a risk is evaluated. (ISO 31010) | EU Commission 2010;<br>UNISDR 2009+ |
| Risk Scenario | Risk scenario is a representation of one single-risk or multi-risk situation leading to significant impacts, selected for assessing in more detail a particular type of risk for which it is representative, or constitutes an informative example or illustration. | EU-Commission 2010 |
| Consequences | Consequences are the negative effects of a disaster expressed in terms of human impacts, economic and environmental impacts, and political/social impacts. (ISO 31010) | EU Commission 2010;<br>UNISDR 2009 |

| | | |
|---|---|---|
| Human impacts | Human impacts are defined as the quantitative measurement of the following factors: number of deaths, number of severely injured or ill people, and number of permanently displaced people. | EU Commission 2010;<br>UNISDR 2009 |
| Affected people | People who are affected by a hazardous event.<br>(Comment: People can be affected directly or indirectly. Affected people may experience short-term or long- term consequences to their lives, livelihoods or health and in the economic, physical, social, cultural and environmental assets.) | UNISDR - new July 2015 |
| Economic and environmental impacts | Economic and environmental impacts are the sum of the costs of cure or healthcare, cost of immediate or longer-term emergency measures, costs of restoration of buildings, public transport systems and infrastructure, property, cultural heritage, etc., costs of environmental restoration and other environmental costs (or environmental damage), costs of disruption of economic activity, value of insurance pay-outs, indirect costs on the economy, indirect social costs, and other direct and indirect costs, as relevant. | EU Commission 2010;<br>UNISDR 2009 |
| Political/Social impacts | Political/social impacts are usually rated on a semi-quantitative scale and may include categories such as public outrage and anxiety21, encroachment of the territory, infringement of the international position, violation of the democratic system, and social psychological impact22, impact on public order and safety, political implications, psychological implications, and damage to cultural assets23, and other factors considered important which cannot be measured in single units, such as certain environmental damage. | EU Commission 2010;<br>UNISDR 2009 |
| Disaster | A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.<br>A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk | EU Commission 2010;<br>UNISDR 2009 |
| Disaster Risk Reduction (DRR) | Disaster risk reduction is the policy objective aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contributes to strengthening resilience.<br>Comment: A global, agreed policy of disaster risk reduction set out in the United Nations' endorsed "Sendai Framework for Disaster Risk Reduction 2015-2030", adopted in March 2015, whose expected outcome over the next 15 years is: "The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries". | UNISDR - new July 2015 |
| Vulnerability | The conditions determined by physical, social, economic and environmental factors or processes, which increase | UNISDR - new July 2015 |

| | | |
|---|---|---|
| | the susceptibility of a community to the impact of hazards. | |
| Exposure | People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses | EU Commission 2010;<br>UNISDR 2009 |
| Critical infrastructure | The physical structures, facilities, networks and other assets that support services that are socially, economically or operationally essential to the functioning of a society or community.<br>(Comment: Critical infrastructures are elements of the infrastructure that support essential services in a society. They include electricity/power, water, transport systems, air and sea ports, communication systems, health and educational facilities (including hospitals, health centres, schools), as well as public administration services, financial services, centres for fire and police, etc. For the purpose of Sendai Framework, target 4 please also refer to basic services. ) | UNISDR - new July 2015<br>Directive 2008/114/EC |

The list above is not exhaustive or final. In addition to terminologies related to DRR, the following sources have been taken into account in the HEIMDALL data models and will be investigated further:

- Relief items catalogue of the IFRC (IFRC 2009)
- EUFOFINET – European Glossary for wildfires and forest fires (EUFOFINET 2012)
- F.I.R.E.4 – Forest fire fighting terms handbook (F.I.R.E.4 2009)

### 3.1.3 **DRIVER+ Scenario Description Standardisation Activities**

The main aim of DRIVER+ is to cope with current and future challenges due to increasingly severe consequences of natural disasters and terrorist threats by the development and uptake of innovative solutions that are addressing the operational needs of practitioners dealing with crisis management.

The DRIVER+ project strives to extensively promote its results through various standardisation activities. The activities are targeted to raise awareness within the DRIVER+ project about existing standards and standardisation activities in the field of crisis management and to identify standardisation needs of the project. The project has already identified some relevant standards. These standards reflect the state-of-the-art and build the basis for future standardisation ideas. Among the very standardisation activities, DRIVER+ plans to provide criteria on a scenario description. If a crisis management professional plans to test a particular solution, a crisis scenario providing the context in which the solution is intended to operate, is needed as basis for this test. Scenarios are developed both in many European funded research projects and by public safety organisations. However, they are not doing it in a consistent way and therefore the assessment of the solution, as well the results of this assessment, are not directly comparable.

Therefore, DRIVER+ partners propose standardising the requirements with respect to the development of such scenarios – and that enable the assessment of potential solutions in a realistic environment. This standard idea shall focus on the methodology of the scenario building and therefore plans to provide criteria on a scenario description and steps to be followed in a systematic way. The goal is to use this potential standard to improve comparability of solutions, because they would be all tested in the same way with the same criteria and features of a scenario if they follow this standard. This would enhance the shared understanding of different solutions in European CM area. Additionally it is planned to simplify the preparation of a Trial from a practitioner perspective, by providing the criteria in the form of a check-list.

DLR-DFD have recently contributed to DRIVER+' collection of requirements for a scenario description with the intention to (a) support DRIVER+ with user requirements collected within the HEIMDALL project and (b) to promote synergies between the projects as both have similar objectives with regard to scenario description standardisation.

### 3.1.4 **Dutch LCMS COP Standardisation Activities**

At the Innovation for Crisis Management (I4CM) event in September 2018 organized by DRIVER+ a **cooperation has been established between HEIMDALL experts and developers of the Landelijk Crisis Management Systeem (LCMS – National Crisis Management System) [18] focussed on the exchange of expertise and experience in the design and implementation of a interoperable Common Operational Picture (COP)**. LCMS as a netcentric information system aims at improving the situational awareness which can be achieved by a COP. In a netcentric concept information is shared throughout the organization and with other organizations, vertically and horizontally. People needing information to take a decision or fulfill an assignment have access to the information, even when it is provided by a person from another unit [19]. The LCMS provides means for sharing and integrating data provided by different safety regions in the Netherlands.

Discussed topics so far include the challenge of exchanging (textual) operational pictures between different systems, the lack of open standards to do that in a uniform way and possible solutions. In particular, T7.2 and LCMS are considering what payload is actually needed to exchange. This payload should be rather rich and should not only include COP content (or COP mutations) but also meta-information such as originator, date and time, whose perspective the information represents, confidentiality, etc. For the time being, the EDXL suite of standards has been identified as a potential solution with EDXL-DE as envelope for both the mentioned meta-information and payloads containing rich COP information. The next step will be to examine EDXL-DE capabilities whether they provide the needed level of detail or if further standardisation is needed.

## *3.2 Standardisation of Fire Types Concept*

When analysing historical fires it becomes obvious that under the same topography and weather (synoptic situation) conditions, fire spreads following similar spread schemes. In the scope of the EC-funded FP6 project Fire Paradox [20] an analytical approach to classify, organise and typify wildfires that occur in a specific area has been developed under the lead of the Support Group for Forest Interventions (GRAF) of INT-FRS [21]. The methodology simplifies the study of wildfires by establishing a set of different Fire Types. Each of these Fire Types has been linked to specific synoptic weather conditions with a set of meteorological parameters that determine fire behaviour. For a region like Catalonia, nine Fire Types have been identified that are based on common spread patterns and classified by characteristic factors. Table 3-2 lists the three main types of fire spread patterns that can be distinguished.

Table 3-2: Classification of fires according to spread pattern and the dominant factors

| **Classification according to spread patterns** | **Dominant factors** |
|---|---|
| Topographic fires | Local topographic winds, fuel heating and slope |
| Wind-driven fires | Wind speed and direction, as well as duration of the meteorological window that produces the fire conditions |
| Convection/Plume dominated fires | Accumulation of highly available fuel |

The methodology of the Fire Types Concept has been integrated into forest planning and wildfire prevention in Catalonia. Moreover, GRAF strives to provide a European perspective

on fire prevention considering the different fire regimes and vegetation structures as well as the heterogeneous socioeconomic conditions in Europe. In HEIMDALL, the Fire Types classification has been integrated into recommended fire behaviour variables to be collected in forest fires cases studies [22]. Furthermore, the classification will be included in HEIMDALL algorithms, for example in scenario matching.

## *3.3 Standardisation of Response Plans*

The Response Plan or Incident Action Plan is the formal product that collects and summarizes whole information produced during the response planning phase. Formally, it documents the overall incident management strategy and the strategic goals defined by the incident commander (IC). The RP also defines the different operational periods and associated operational period objectives, the general tactics to achieve goals and objectives within the overall strategy, while providing important information on event and response parameters. Because incident parameters evolve, the response plan must be revised on a regular basis (at least once per operational period) to maintain consistent, up-to-date guidance across the system.

WP3 has identified a response plan structure that is common to all end user organizations participating in the HEIMDALL project [22]. The structure is based on the widely used Incident Command System (ICS) forms, in particular on those ICS form elements that are used by the end user organizations in their very own response plans. These basic common items have been identified:

- Name of the incident
- Start date/time
- Map or sketch
- Situation summary
- Current weather and forecast
- Current and planned objectives
- Current and planned tactics
- Incident organization chart
- Resources summary
- Operational periods
- Assignments

HEIMDALL will make use of the identified structure and integrate it in the Scenario Management tool with the objective to make response plans accessible for the scenarios stored. In addition, EDXL SitRep, which intentionally includes concepts based on ICS, will be analysed for capabilities to map all of the common items to EDXL concepts.

## *3.4 Standardisation of Lessons Learnt*

Documenting lessons learnt is an opportunity for improvement, helping a team to identify either strengths or weaknesses from a specific incident. It is also an opportunity to carry out discussions about success and unintended outcomes and translate this into recommendations for others in similar situations. In HEIMDALL, WP3 has generalized the process to identify, discuss and debate about lessons learnt [23]. The process is composed of the five main steps: defining the project, collecting information, verifying applicability, storage, and dissemination. WP3 point out the importance of understanding the specific need and purpose for lessons learnt and all possible audiences that might have the repository of lessons, not only for HEIMDALL, but also for the possibility to share it with other projects with different stakeholders (e.g. different actors and authorities, etc.).

A product format commonly used in the emergency services community helps to foster interoperability. WP3 has agreed upon a common lessons learnt structure for all involved HEIMDALL partners and stakeholders [23]. Based on this data structure, HEIMDALL will allow end users to upload lessons learnt in the reviewing phase of an emergency, to associate them to specific scenarios. Lessons learnt stored for past scenarios help decision makers to identify possible response strategies, options and contingencies for an incident at hand.

In 2017, the EC-funded FP7 project DRIVER project has designed a harmonised Lessons Learned Framework (LLF) with the aim to increase the efficiency of crisis management in Europe [24]. The LLF is meant to function as an architecture for the development of processes and systems for lessons learnt in different types of organisations, acknowledging the differences in their roles, organisational structures and cultures. Furthermore, an example of how the LLF can be adapted to the context of crisis management in Europe is proposed. In the second half of the HEIMDALL project, synergies between work conducted by WP3 and the LLF will be investigated in order to harmonize the efforts.

Each single identified lesson learnt is an opportunity to improve for the emergency services community. The option and way to disseminate lessons learnt by HEIMDALL will be discussed in future steps of the project. Seeking for potential synergies with other Horizon 2020 projects to disseminate lessons learnt to can be considered as very positive.

## *3.5 Standardization of Meteorological Information*

According to deliverable D3.1 weather data (humidity, temperature, etc.) emergency services use weather information in all phases of disaster management. To collect meteorological information from the hours (or days) before the incident is as important as tracking the information during the incident. This applies to both, current weather and forecast. Examples for the usage of the meteorological information in HEIMDALL are the determination of the evolution of the atmosphere along the incident duration and the consequences to the evolution of the hazard behaviour (fire or flood), the comparison of current conditions with historic scenarios or the simulation of different possible weather changes and their consequences. For this purpose, meteorological information must be stored, related to a scenario and shared with others.

Weather information includes multiple typical parameters, including air temperature, atmospheric (barometric) pressure, humidity, precipitation, solar radiation and wind. Weather models and data access services such as those accessed by the HEIMDALL system usually provide these parameters. Emergency message formats provide data structures for conveying weather information, e.g. through EDXL-SitRep's WeatherEffects concept.

WP6 has identified in the EDXL message formats a lack of data elements and concepts to save complex information on changing weather conditions in a scenario [14]. For example, the use case of saving the evolution of weather conditions along an incident requires storing historic, current and future weather information for different points in time. Together with weather experts, the task must investigate if the concept WeatherEffects needs to be refined in order to give C&Cs a good overview on the current and future weather situation.

## *3.6 Standardisation of Building Function Taxonomy*

Usually, risk assessment for property is performed based on national building datasets, which are available for the inspected region. For example, T6.1 examined the following national datasets:

- National cadastral building dataset Germany: LoD-1 (Level of Detail- 1)
    - http://www.adv-online.de/AdV-Produkte/Weitere-Produkte/3D-Gebaeudemodelle-LoD/broker.jsp?uCon=37a705cc-190b-2941-44c9-10d7072e13d6&uBasVariant=11111111-1111-1111-1111-111111111111
- National cadastral building dataset Spain: Buildings (BU)

- https://www1.sedecatastro.gob.es/Cartografia/mapa.aspx?del=17&mun=93&refcat=9665906DG8996N0001RA&final=
- http://www.catastro.minhap.es/ayuda/vga/ayuda_ICUC.htm

When planning for or responding to complex disaster situations affecting multiple jurisdictions and countries cross-agency communication and collaboration requires interoperability at building dataset level. In HEIMDALL, classification of the building stock layer is done based on a hierarchical building function taxonomy developed within T6.1 and described in deliverable D6.1 [25]. The taxonomy was developed in order to provide a generic building function schema, which can be used to map the taxonomies used in external datasets to one generic schema. This allows the application of the developed methodological concepts using different building function taxonomies that may be present during a cross-border incident or through the integration of different building data sets.

As a starting point for the taxonomy, T6.1 has analysed the National building datasets listed above as well as existing overarching building schemes such as the building layer of OpenStreetMap (OSM) (https://wiki.openstreetmap.org/wiki/Key:building) and INSPIRE efforts for a European building theme standard: http://inspire.ec.europa.eu/draft-schemas/bu-ext2d/2.0/BuildingExtended2D.xsd.

Within the taxonomy, four hierarchical building function levels with different levels of aggregation are defined. Figure 3-6 shows four levels of the taxonomy, with the first level (Level_1) holding generalized function information separating residential from non-residential buildings. The fourth level (Level_4) holds the highest degree of information available in the building stock layer, showing for example the location of critical infrastructures like educational buildings (e.g. schools, universities, adult education centres). Information regarding critical infrastructures that are typically linked with buildings is stored in the building stock layer using the developed taxonomy. Unlike in the third level (Level_3), buildings with unspecified function information may be present in the fourth level. For example main residential buildings (Level_3) might not be specified further (Level_4) with regard to differentiation in single family or multifamily housings and are therefore unspecified in the fourth level.

Figure 3-6: Example building stock product classified according to the developed hierarchical building function taxonomy. Four levels of detail are holding information with increasing level of aggregation. Source: D6.1

The proposed building taxonomy provides through its hierarchical structure a greater degree of modularity. A building may be classified on a generalized level only as well as on a very detailed level with a complex hierarchical function specification that allows catering to different purposes and target groups and systems. For example if a complex building function is included in a shared emergency message the receiver side responder systems can stop reading down the structure at the level of detail which is useful for them. This allows an application to “know” only the part of the taxonomy which is interesting for it (it shall know at least the first level of the hierarchy).

The HEIMDALL building function hierarchy and its usability will be evaluated during the next months, e.g. in exercises involving inter-organisational collaboration at the upcoming end user workshops.

# 4 Summary of Standardisation Events and Outlook

This section summarizes the standardization events (meetings and teleconferences) carried out during the first reporting period and provides and outlook on the activities planned for the second project reporting period.

The summary of the standardisation events attended up to M21 of the project, according to the standardisation activities described in sections 2 and 3 are summarised in

Table 4-1: Standardisation activities and events

| Activity or Event | Date and Location | Participating Partner(s) |
|---|---|---|
| Participation in CAP Implementation Workshop | 20-21/09/2017 in Rome, Italy | DLR |
| Presentation of webinar on lessons learnt from CAP Implementation Workshop and CAP/EDXL Standards-based Data Exchange | 10/10/2017 (webinar) | DLR |
| Participation in discussions raised by the CAP Subcommittee of the EM-TC | Started in 12/2017 (mailing list) | DLR, end users |
| Participation in ETSI EMTEL Meeting | February, 2018 in Oberpfaffenhofen, Germany | DLR |
| Participation in the discussion on standardisation gaps in crisis management at the FIRE-IN Annual Consortium Meeting | 24-26/06/2018 in Rome, Italy | PCF, INT |
| Attendance at the I4CM event organized by DRIVER+ project with focus on standardization activities performed and planned in HEIMDALL; Identification of further applicable standardization activities | 03-04/09/2018 | DLR |
| Interaction with the developers of the LCMS on the challenge of exchanging (textual) operational pictures between different systems, the lack of open standards to do that in a uniform way and possible solutions | Started in October 2018 (telcos and e-mail discussions) | DLR |
| Participation in technical meeting of Spanish Incident Commanders and Fire Analysts and discussion on standardisation procedures and actions among different regions in Spain in case of forest fire and interregional aid | 09/11/2018 | PCF, INT |
| Attendance of Standardisation Governance Workshop at Community of Users (CoU) Meeting | 04/12/2018 in Brussels, Belgium | PCF |

In the following, an outlook of the planned standardisation activities for the second project reporting period is provided.

- Further cooperation and exchange with the DRIVER+ standardisation group

- Joining the CMINE - Crisis Management Innovation Network Europe initiated by DRIVER+ at: https://cmt.eurtd.com/groups/profile/213/crisis-management-innovation-network-europe-cmine. The CMINE is a Community of Practice in the field of Crisis Management, an umbrella network made to foster exchanges between diverse stakeholders who have a role to play in crisis management innovation in various domains such as wildfires, volunteer management and floods. The CMINE platform is structured in various spotlight sections - Capability gaps, Innovative solutions, Terminology, Trials and Demonstrations and Standardization. Furthermore, chaired themes with task groups have been setup to discuss how to tackle current and future challenges and to develop approaches aimed at resolving pressing issues of practitioners involved in crisis management.
- Further contribution to discussions raised by the CAP Subcommittee of the OASIS EM-TC
- Further interaction with stakeholders and developers of the LCMS system on the standards-based exchange of rich COP information
- Further application of the Fire Types concept developed by GRAF of INT-FRS in HEIMDALL case studies, methods and tools
- Investigation on standard formats for response plans
- Investigation on synergies between the LLF designed by the DRIVER project and the lessons learnt process and product format developed by HEIMDALL WP3
- Investigation of possibilities to model changing weather-related conditions in EDXL message formats together with weather experts in order to give C&Cs a good overview on the current and future weather situation.
- Attendance and participation in further ETSI EMTEL meetings and teleconferences, the first one held at the end of January 2019.

# 5 Conclusion

This deliverable presented the different standards that have been taken into account during the first HEIMDALL reporting period. The analysis of the already existing standards has driven HEIMDALL's design towards the use of standardised solutions and has allowed identifying areas where the project outcomes could be used to propose standard extensions or adaptations. The deliverable has identified the most relevant standardisation organisations together with the different standards and standardization documents which are relevant to the work conducted in the HEIMDALL project and has described the different activities associated with the project, which are generally: (i) the adoption of the standard within the system design; (ii) the triggering of actions for standardisation of the HEIMDALL outcomes.

The discussed standards and activities will be monitored during the second project period and new opportunities for standardisation of the HEIMDALL results will be analysed with the objective of improving interoperability and increase the system acceptance.

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