

# eVACUATE

FP7-313161

*A holistic, scenario-independent, situation-awareness and guidance system for sustaining the Active Evacuation Route for large crowds*

## RECOMMENDATIONS FOR STANDARDS



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## **1. Executive summary**

This deliverable describes which standards and regulations have been observed within the eVACUATE project.

We have divided the document in three main parts, referred in the mentioned chapters:

- Technical Standardization procedures observed for the technical work performance.
- Emergency and Security related procedures followed during the design, implementation and demonstration phase of the project.
- eVACUATE contribution to standardization.

This deliverable is a documental report scheduled for Month 50 of the eVACUATE project and is envisioned as one of the results of “Task 11.5 – Standardization Issues”.

The deliverable in itself is restricted and should only be read by members of the project’s consortium or any other authorized party.

## 2. Introduction

### 2.1 eVACUATE Project

eVACUATE is a four-year venture starting in April 2013, and ending in May 2017. eVACUATE's consortium is made up of more than twenty partners from eight European countries. The project's coordinator is the Greek company EXODUS.

Both the project's technical coordination and the coordination of T11.5 (of which this deliverable is a result) were assigned to the Spanish IT company Indra Sistemas, S.A.

eVACUATE aims to address the needs of the safety of citizens during complex evacuation processes following normal and abnormal events (crises) towards the creation of a holistic system that, a) will enhance the effectiveness of complex evacuation operations at any type of venue or infrastructure, b) adapt evacuation plans to the current conditions, c) dynamically survey how an evacuation is evolved and d) support civil protection authorities. eVACUATE framework employs all key elements in the design and operation of the envisaged system; the **eVACUATE Crowd Models**, the **Simulator Tools**, the **Emergency Operations Control Centre** and finally the major constituent of all proposed work, which is the **Smart Spaces**.

### 2.2 eVACUATE Pilots

The eVACUATE system's performance and scalability will be validated in **four distinct scenarios** involving incidents with large crowd at various venues with the requirements of evacuation time reductions and increases of safety and security.

The pilots are the following:

- 1) **Evacuation of a Soccer Stadium** - Real Sociedad de Futbol S.A.D (Anoeta Stadium, San Sebastian, Spain)
- 2) **Airport evacuation** - Athens International Airport (Airport Shuttle Terminal, Athens, Greece)
- 3) **Mustering and evacuation of passenger cruise ship** - STX-FRANCE (St. Nazaire, France)
- 4) **Metro station evacuation** – Metro Bilbao S.A (San Mamés Metro Station, Bilbao, Spain)

### 2.3 Relationship to other eVACUATE Documents

This document is highly related to the architecture of smart spaces description deliverables (D7.2), communications gateway description (D6.2) and exploitation plans (D12.3)

### 3. Overview of the Relevant Standardization bodies

A standard is a document designed for common and repeated use, to be used as a rule, guideline or definition. Standards are voluntary, consensus-based and as such do not impose any regulations. They provide test specifications and test methods (interoperability, safety, quality, etc.). The benefit of standardization lies in increased product safety and quality for consumers and in lower transactions costs and prices within the European market for manufacturers. The three European standardization organizations are:

- **CEN, the European Committee for Standardization,**

European Committee for Standardization supports the aims and policy of the European Union and European Economic Area by preparing voluntary technical standards promoting free trade, safety of both workers and consumers, interoperability of networks, environmental protection, exploitation of research and development activities, and also public procurement.

<https://www.cen.eu/Pages/default.aspx>

- **CENELEC, the European Committee for Electrotechnical Standardization**

The European Committee for Electrotechnical Standardisation (Comité Européen de Normalisation Électrotechnique) has developed activities in the ICT field and has set up an ICT Unit. This Unit works in close collaboration with CEN and ETSI

<https://www.cenelec.eu/>

- **ETSI, the European Telecommunications Standards Institute**

The European Telecommunication Standards Institute is a non-profit organization for production of the telecommunications standards that will be used throughout Europe and beyond.

<http://www.etsi.org/>

The international standardizations organizations are:

- **ISO, the International Standardization Organization**

Is a worldwide federation of national standards bodies from some 140 countries, one from each country. ISO represents a special position between the public and private sectors. Its members are part of the governmental structures and other members work in the private sector. From this reason, ISO is able to offer solutions that meet the requirements of business and the broader needs of society as well.

<https://www.iso.org/home.html>

- **IEEE**

The IEEE name was originally an acronym for the Institute of Electrical and Electronics Engineers, Inc. Today, the organization's scope has expanded. The IEEE is a leading developer of international standards of telecommunications, information technologies and power generation products and services.

<https://www.ieee.org/index.html>

- **WCO**

World Customs Organization has defined a framework of standards called SAFE Framework that focuses on securing the international trade supply chain against the effect of terrorism and other forms of trans-national crime. This is created by defining of a set of standards that shall be followed in the Customs-to-Customs network and also in the Customs-to-Business relationships

<http://www.wcoomd.org/>

- **OASIS**

The Organization for the Advancement of Structured Information Standards (OASIS) is a global nonprofit consortium that works on the development, convergence, and adoption of standards for security, Internet of Things, energy, content technologies, emergency management, and other areas.

<https://www.oasis-open.org/>

In Spain, it must be highlighted the association for standardization AENOR:

- **IMO**

IMO – the International Maritime Organization – is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships.

As a specialized agency of the United Nations, IMO is the global standard-setting authority for the safety, security and environmental performance of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and universally implemented.

<http://www.imo.org>

- **NFPA**

The National Fire Protection Association (NFPA) is a global nonprofit organization, established in 1896, devoted to eliminating death, injury, property and economic loss due to fire, electrical and related hazards.

NFPA delivers information and knowledge through more than 300 consensus codes and standards, research, training, education, outreach and advocacy; and by partnering with others who share an interest in furthering our mission. NFPA membership totals more than 60,000 individuals around the world.

<http://www.nfpa.org>

- **AENOR**

The Spanish Association for Standardization and Certification (AENOR) is a private not-for-profit organisation that was created in 1986.

Its activity contributes to improving the quality and competitiveness of companies, their products and services. AENOR helps organizations to generate one of the values most appreciated in the current economy: the confidence.

<http://www.en.aenor.es/aenor/inicio/home/home.asp>

### 3.1 Importance of standards

A standard is a document that sets out requirements for a specific item, material, component, system or service, or describes in detail a particular method or procedure. Standards facilitate international trade by ensuring compatibility and interoperability of components, products and services. They bring benefits to businesses and consumers in terms of reducing costs, enhancing performance and improving safety.



**Figure 1. Standardisation process**

Standards and standardization processes serve a number of different purposes and their importance to industry and society can be seen from several different perspectives. Some of the more important objectives of standardization are the establishment of compatibility and interoperability, the removal of trade barriers through harmonisation, and the safety and health of citizens. As a consequence, the



three groups of stakeholders primarily benefiting from standardization processes are industry, consumers and governments.

Standardization supports the dissemination and upgrading of the eVACUATE project, it widens the exploitation potential of project output, and it provides access to a large pool of external expertise. Moreover, developing new standards can help to build a competitive advantage and it can create the ability to test according to internationally agreed principles. In addition, participating in standardization processes may bring projects higher international recognition and new opportunities for collaboration.

Standardization plays a key role in the industrial and trade environment. Standards are strategic tools for reducing costs, minimizing errors and increasing productivity. Standards solve issues ranging from product compatibility to addressing consumer safety and health concerns. Standards also simplify product development and reduce non-value-adding costs thereby increasing a user's ability to compare competing products.

## 4. eVACUATE subjects for technical standardization

As any other technological project, accomplishment of the technical standards during the design, execution, and implementation of the different elements of the project must be a priority.

Standardization of technology is a common part of IT architecture projects. A standardized technology reduces complexity and offers benefits such as cost savings through economy of scale, ease of integration, improved efficiency, greater support options, and simplification of future control. Main common targets for standardization are the hardware and software.

The following table presents the main existing standards followed from the technical point of view during the development of the eVACUATE project:

Main standards	WP	Relevance of the standard for the component	Standard Status (existing or proposed)	Overview of market expectations
OpenCV	WP3	High	De facto	Computer vision algorithms
MATLAB	WP3	High	Existing	Computer vision algorithms
CUDA	WP3	Medium	Existing	Computer vision algorithms
PMG	WP3	High	Existing	Image format
JPEG	WP3	High	Existing	Image format
MP4 (H.264)	WP3	High	Existing	Video format

Main standards	WP	Relevance of the standard for the component	Standard Status (existing or proposed)	Overview of market expectations
Apache Storm	WP3	Medium	Existing	Auto-scaling and topology specification for events processing
Puppet	WP3	Medium	Existing	Configuration management tool
ZeroMQ	WP3	Medium	Existing	Real-time messaging library
OWL	WP3	High	Existing	Ontology web language
SPIN	WP3	Medium	De facto	Sparql inferencing notation
SWRL	WP3	High	Existing	Semantic web rule language
Sesame	WP3	High	De facto	Triplestore for managing rdf content

Main standards	WP	Relevance of the standard for the component	Standard Status (existing or proposed)	Overview of market expectations
SPARQL	WP3	High	Existing	Rdf query language
XML	WP4	High	Existing	Data Structure Format
CrowdNetworkML	WP4	High	Proposed	XML Schema for describing crowd/pedestrian networks
ESRI SHP	WP5	Medium	De facto	as a GIS file format
WMS	WP5	Medium	Existing	as a protocol for requesting GIS map images
WFS	WP5	Medium	Existing	as a protocol to work on GIS features
WMTS	WP5	Medium	Existing	as a protocol for requesting GIS tiled map images
KML	WP5	Medium	Existing	as a markup language for expressing geographic annotations
GML	WP5	Medium	Existing	as a markup language for expressing geographical features
CityGML	WP5	Medium	Existing	as a markup language for expressing 3D urban languages

Main standards	WP	Relevance of the standard for the component	Standard Status (existing or proposed)	Overview of market expectations
Collada	WP5	Medium	Existing	as a 3D scene file format
Data Distribution Service (DDS) Formal Version 1.2	WP6	High	Existing	as real-time publish/subscribe mechanism for gateway implementation
The Real-time Publish-Subscribe Wire Protocol DDS Interoperability Wire Protocol (DDSI-RTPS) Formal Version 2.1	WP6	Medium	Existing	as interoperability wire protocol
DDS Security Specification (DDS-SECURITY)	WP6	Low	Proposed/in process version1	As security model definition for DDS
IDL Interface Description Language	WP6	Low	Existing	Language for specifying properties of structured data and used for describing software component's interfaces.
SWE Common Data Model	WP6	Low	Existing	Defines low level data models for exchanging sensor related data.
Wi-Fi IEEE 802.11	WP7	High	Existing	Wireless LAN protocol
XML	WP7	High	Existing	Data and metadata Structure base Format

Main standards	WP	Relevance of the standard for the component	Standard Status (existing or proposed)	Overview of market expectations
Data Distribution Service (DDS) Formal Version 1.2	WP7	High	Existing	As real-time publish/subscribe mechanism for communication with gateway
The Real-time Publish-Subscribe Wire Protocol DDS Interoperability Wire Protocol (DDSI-RTPS) Formal Version 2.1	WP7	Medium	Existing	As interoperability wire protocol with gateway
DDS Security Specification (DDS-SECURITY)	WP7	Low	Proposed/in process version1	As security model definition for dds
OGC® SensorML	WP7	High	Existing	Discovery, exchange, and processing of sensor observations
W3C SSN	WP7	High	Proposed	Extension of sensorml for ontology definition
OWL	WP7	High	Existing	Ontology description language and format
SOFIA	WP7	High	Proposed	As interoperability framework.
JSON	WP7	Medium	Existing	As application communication level data format with sofia

Main standards	WP	Relevance of the standard for the component	Standard Status (existing or proposed)	Overview of market expectations
MQTT	WP7	Medium	De facto	As communication protocols for kp's (connectors for bidirectional communications & limited devices)
JDL/DFIG Data Fusion Model	WP8	High	Existing	Reference model for data fusion
RDF Model	WP8	High	Existing	Rdf triplets representation events
OGC® SensorML	WP8	High	Existing	Discovery, exchange, and processing of sensor observations
XML	WP8	Medium	Existing	Data structure format
Siddhi CEP (WSO2 CEP)	WP8	Medium	De facto	Inference Rules on Data Fusion Real Time Flows
Groovy	WP8	Medium	Existing	Scripting Object Oriented language for Programming Rules
Dasarathy's Classification	WP8	High	De facto	(Methods and algorithms) Data Association, State Estimation, and Decision Fusion
AdaBoost	WP8	High	De facto	(Adaptive Boosting) Decision Trees and Weighted Accuracy Classification Events
Conventional Terrain System WGS84	WP8	High	Existing	Space Correlation

Main standards	WP	Relevance of the standard for the component	Standard Status (existing or proposed)	Overview of market expectations
UTM WGS84	WP8	High	Existing	Cartography Map
CAP Event	WP8	High	De facto	Common Alerting Protocol
KML	WP8	Medium	Existing	Keyhole Markup Language 2D Map management
CrowdNetworkML	WP8	High	De facto	XML Schema for describing crowd/pedestrian networks
SOFIA	WP9	High	Proposed	As interoperability framework. This technology is currently used in projects and implemented.
Apache CXF	WP9	Medium	De facto	As a standard for: rest/web services support library
HTML5	WP9	Medium	Existing	As markup language
iCore4TR	WP9	Medium	De facto	As technical architecture
JMX & REST	WP9	Medium	De facto	As monitoring protocols
JSON	WP9	Medium	Existing	As documentary storage
MongoDB	WP9	Medium	De facto	As real-time database



Main standards	WP	Relevance of the standard for the component	Standard Status (existing or proposed)	Overview of market expectations
DWR	WP9	Medium	De facto	As communication protocols for kp's (connectors for javascript clients & smartphones)
MQTT	WP9	Medium	De facto	As communication protocols for kp's (connectors for bidirectional communications & limited devices)
Web services/JMS	WP9	Medium	De facto	As communication protocols for kp's (connectors for corporate applications)
MySQL & JDBC database	WP9	Medium	De facto	As configuration database
Siddhi CEP (WSO2 CEP)	WP9	Medium	De facto	As embedded cep (complex event processing)
Spring 3.X	WP9	Medium	De facto	As glue layer
Spring MVC & Thymeleaf	WP9	Medium	De facto	As web console's web framework
EDXL -CAP	WP9	High	Existing	Protocol to exchange emergency messages
ETHERNET	WP10		Existing	Network protocols
TCP	WP10		Existing	Network protocols

Main standards	WP	Relevance of the standard for the component	Standard Status (existing or proposed)	Overview of market expectations
UDP	WP10		Existing	Network protocols
IP	WP10		Existing	Network protocols
MODBUS	WP10		Existing	Network protocols
RSTP	WP10		Existing	Network protocols
MPEG2 TS	WP10		Existing	Network protocols
SIP	WP10		Existing	Network protocols
NTP	WP10		Existing	Network protocols
SNMP	WP10		Existing	Network protocols

**Table 1. Components requested to contribute to development of existing standards**

## 5. Emergency & Security Procedures and Regulations Compliance

During the development of the project in order to make eVACUATE a tool that can be installed into real environments and scenarios, many procedures and regulations have been observed to fit the technology into the generic and specific normative of appliance.

In this chapter we try to focus in the most important ones related to emergency systems and evacuation procedures.

We can divide our work into the general purpose normative that were mainly observed during the platform definition and the eVACUATE development and the venue specific procedures, that were mainly observed during the phases of design of the pilots and the adaptation of the technological platform to every one of them.

### 5.1 General Purpose Emergency and evacuation Standards

These are the general evacuation standards followed in the design of our platform:

Standard	Description
<b>ISO 22315:2014: Societal security -- Mass evacuation -- Guidelines for planning</b>	Provides guidelines for mass evacuation planning in terms of establishing, implementing, monitoring, evaluating, reviewing, and improving preparedness. It establishes a framework for each activity in mass evacuation planning for all identified hazards. It will help organizations to develop plans that are evidence-based and that can be evaluated for effectiveness.
	This ISO is intended for use by organizations with responsibility for, or involvement in, part or all of the planning for mass evacuation. It is applicable to all types and sizes of organizations that are involved in the planning for mass evacuation, such as local, regional, and national governments; statutory bodies; international and non-governmental organizations; businesses; and public and social groups
	This ISO also covers planning for mass evacuation in order to gain a more effective response during the actual evacuation. It will assist organizations to meet their obligation of saving human life and reducing suffering.
	does not cover activities to stabilize the affected area after an evacuation, protect property, and preserve the environment.

<b>AENOR, AEN/CTN 178 – Smart Cities</b>	The requirements, guidelines, techniques, indicators and tools that contribute to the development of communities towards intelligent communities, covering the concept of community to any finite unit of a local entity.
<b>ISO 23601:2009, Safety identification – Escape and evacuation plan signs</b>	Establishes design principles for displayed escape plans that provide information vital to fire safety, escape, evacuation and rescue of a facility's occupants.
	The purpose of escape plans is to help people orient themselves in relation to the planned escape route. In this way, the escape plan complements the facility's safety exit guidance system. These plans, which may be displayed as signs in work places and in public areas, may also be used by fire, rescue and medical teams, as well as by intervention forces in the case of terrorist attack.

	The standard has been developed because there is a need to harmonize on an international scale a system of communicating escape routes in facilities that relies as little as possible on the use of words to get the message through. With an increasingly mobile world population and ever-greater opportunities for international trade, graphical symbols are an essential tool for concisely conveying messages to users independently of language. Where safety signs are concerned, ease and speed of recognition are vital to help save people from injury and death.
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**Table 2. ISO and AENOR Standards**

### **OASIS EDXL Compliance**

The Organization for the Advancement of Structured Information Standards (OASIS) is a global nonprofit consortium that works on the development, convergence, and adoption of standards for security, Internet of Things, energy, content technologies, emergency management, and other areas.

The Emergency Data Exchange Language (EDXL) is a suite of XML-based messaging standards that facilitate emergency information sharing between government entities and the full range of emergency-related organizations. EDXL standardizes messaging formats for communications between these parties. EDXL was developed as a royalty-free standard by the OASIS International Open Standards Consortium.

EDXL was designed to enable information about life-saving resources to be shared across local, state, tribal, national and non-governmental organizations. Implementation of EDXL standards aims to improve the speed and quality of coordinated response activities by allowing the exchange of information in real time.

EDXL is advanced by the OASIS Emergency Management Technical Committee.

EDXL-DE was approved as an OASIS Standard in 2006; EDXL-RM and –HAVE were approved as OASIS Standards in 2008.

Implementation of EDXL is promoted by the OASIS Emergency Management Adoption Committee, which was formed in 2009.

EVACUATE platform was conceived as an isolated platform without capabilities for connecting with third party emergency management systems. Nowadays, the global trend in Emergency Management Systems is information sharing in order to take advantage of the different agencies that can be involved in the emergency resolution process.

Thus, we considered that providing standard integration capabilities to the eVACUATE platform (as the OASIS standard integration developed (Common Alerting Protocol, CAP)) and allowing eVACUATE to be coordinated with any standard compliant emergency system is something that can serve as a key factor when trying to use it as a solution in the market, rather than another third party sensor connectivity.

In the next paragraphs we'll describe which security normative have been taken into account in every one of the venues.

## 5.2 Venue Specific Standards

One of the main challenges in the eVACUATE project has been to adapt its technology to the regulations and compliances that every venue participating in the project had to be compliant to. So at every pilot the system should be compliant with the specific regulations at every industry segment.

In this chapter we'll make a review of the different normative observed while adapting the technology and designing the pilots to demonstrate the holistic nature of the created platform.

For all the pilots in which we worked we had to make distinction between the evacuation normative and the technical system installation normative. We focused in the first set of regulations due to the impossibility of installing in an appropriate way the hardware infrastructure of the project (because of the non-permanent nature of the pilot).

### 5.2.1 Anoeta Stadium Real Sociedad

The ASRS pilot has been one of the most regulated ones, as it has to observe different statements' regulations, as:

- **FIFA Stadium Safety and Security Regulations**<sup>1</sup>: The eVACUATE platform can fit in several parts of this normative, such as:
  - Chapter 9: Stadium contingency plans: *"The stadium safety and security management team, in conjunction with relevant expert agencies and organisations, should assess the risk of any incident occurring at the stadium which might prejudice safety and security or disrupt normal operations. In conjunction with local authorities, contingency plans shall be developed to determine specific actions and/or the mobilisation of specialist or additional resources."*  
eVACUATE provides a tool to achieve this objective.
  - Chapter 23.4 and 23.5: In this points it has been defined how to measure the evacuation times in stadiums and which constraints take into consideration.
  - Chapter 56: *"Emergency evacuation and places of safety"* we took this info to define the secure exit place for the demonstration.
  - Chapter 57: *"Emergency evacuation of spectators with disabilities: Contingency plans for emergency evacuation must take into account the special needs of spectators with disabilities."*  
The eVACUATE systems helps the disabled people with specific information for them and the capacity of informing the control room of their location in the stadium.
  - The recommended action described in page 92 of the document: *"If evacuation is considered or implemented, then a search of the assembly areas, the routes to them and the surrounding area should also be made prior to evacuation."* May take too long to be implemented without using advance Evacuation Management Systems, as eVACUATE.
- **UEFA Guide for Quality Stadiums**<sup>2</sup>: The eVACUATE platform can help in improving some security aspects highlighted in this document, such as::

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<sup>1</sup> [https://www.fifa.com/mm/document/tournament/competition/51/53/98/safetyregulations\\_e.pdf](https://www.fifa.com/mm/document/tournament/competition/51/53/98/safetyregulations_e.pdf)

<sup>2</sup> [http://www.uefa.org/MultimediaFiles/Download/EuroExperience/competitions/General/01/74/38/69/1743869\\_DOWNLOAD.pdf](http://www.uefa.org/MultimediaFiles/Download/EuroExperience/competitions/General/01/74/38/69/1743869_DOWNLOAD.pdf)

- Chapter D2: *Controlling Circulation: It is of great importance to carefully select the best method of entry to the stadium, and the procedure by which spectator access will be controlled.*  
The eVACUATE systems helps to control the access per categories to the stadium and to control the people density in each area of it
- Chapter D2: *“Signage: Clear and adequate signage is an essential requirement in any major building that will be used by large numbers of people and that has different points of access”*  
The eVACUATE systems improves the signalling capacity and adapts it to the ongoing circumstances.
- Chapter D4: *“Facilities for disabled fans: Modern buildings should offer unrestricted disabled access. In general, stadium designers should take care to include adequate access points, safe evacuation areas, etc”*  
The eVACUATE systems helps the disabled people with specific information for them and the capacity of informing the control room of their location in the stadium.
- **General Rule Book of the Spanish National Football League<sup>3</sup>:** This rule book aims to adapt the Spanish Law 10/19904 through its Royal Decree 769/19935.  
All these regulations have been observed while implementing the eVACUATE solution into the Anoeta Stadium

## 5.2.2 Athens International Airport

Two main specific regulations have been taken into consideration while designing the implementation of the eVACUATE project into the AIA venue:

- **NFPA415: Standard on Airport Terminal Buildings, Fuelling Ramp Drainage, and Loading Walkways<sup>6</sup>:** This normative provide guidelines to implement correct designs for terminal buildings, including the location of the signals.  
The eVACUATE systems improves the signalling capacity and adapts it to the ongoing circumstances.
- **NFPA424: Airport/Community Emergency Planning<sup>7</sup>:** This normative provide a very important information about the procedures of actuation between different security actors when an emergency occurs.  
These operational procedures has been observed when implementing the pilot script and in the demonstration we tried to reflect the appliance procedures that the NFPA suggest in situations as the ones we emulated in the airport terminal.

## 5.2.3 STX “Meraviglia” Cruise Ship

The maritime systems are very restrictive with the security and safety measures and use to have its own specific legislation, as we can see in the different ones which we have been studying in the eVACUATE maritime adoption

<sup>3</sup>[http://www.apmae.net/uploads/6/9/0/7/6907416/reglamento\\_general\\_de\\_la\\_liga\\_nacional\\_de\\_futbol\\_profesional.pdf](http://www.apmae.net/uploads/6/9/0/7/6907416/reglamento_general_de_la_liga_nacional_de_futbol_profesional.pdf)

<sup>4</sup>[http://www.csd.gob.es/csd/estaticos/info-inst/ley\\_deporte\\_10\\_1990\\_15\\_octubre.pdf](http://www.csd.gob.es/csd/estaticos/info-inst/ley_deporte_10_1990_15_octubre.pdf)

<sup>5</sup>[http://www.belt.es/legislacion/vigente/sp\\_pcivil/spublica/pdf/rd\\_769\\_1993.pdf](http://www.belt.es/legislacion/vigente/sp_pcivil/spublica/pdf/rd_769_1993.pdf)

<sup>6</sup><http://hamyarenergy.com/static/fckimages/files/NFPA/Hamyar%20Energy%20NFPA%20415%20-%202002.pdf>

<sup>7</sup><http://hamyarenergy.com/static/fckimages/files/NFPA/Hamyar%20Energy%20NFPA%20424%20-%202002.pdf>

- **SOLAS – International Convention for the Safety of Life at Sea<sup>8</sup>**: This is the basic document for maritime safety purposes and it provides guidelines for designing, operating, and working in all safety and security aspects in a ship. Several points in this document have been observed, from the evacuation and fire zones definition to the procedures in case of an evacuation.
- **IMO FSS Code (International Code for Fire Safety Systems)<sup>9</sup>**: This normative defines aspects to design the ships to allow evacuation. eVACUATE has used this standard when designing the evacuation routes available in the system

## 5.2.4 San Mamés Metro Bilbao Station

Apart from the generic regulations, one specific one has been observed during the implementation and during the exercise preparation in the metro station:

- **NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems<sup>10</sup>**: This normative defines several aspects to decide aspects of the implementation of eVACUATE in the Metro:
  - Paragraph 5.5.6: “*Number and capacity of Means of Egress*” In this points it is defined the acceptable evacuation times to a safe place inside the station and to a safe point outside. eVACUATE can help Security Operators to check if these values are being kept during the operation.  
These figures has been observed in detailing the colour codes in the exercise.
  - Paragraph 5.7.2: “*Emergency Communications*” eVACUATE improves the communication between Metro Staff and passengers, improving the Public Address System demanded with mobile applications and SMS messages.
  - Paragraph 6.2.8: “*Directional Signs*” The eVACUATE systems improves the signalling capacity and adapts it to the ongoing circumstances.
  - Paragraph 9.6: “*Operations Control Center (OCC)*” The eVACUATE systems improves functionalities described in this paragraph.

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<sup>8</sup>[http://www.mar.ist.utl.pt/mventura/Projecto-Navios-I/IMO-Conventions%20\(copies\)/SOLAS.pdf](http://www.mar.ist.utl.pt/mventura/Projecto-Navios-I/IMO-Conventions%20(copies)/SOLAS.pdf)

<sup>9</sup><http://www.imo.org/en/Publications/Documents/Newsletters%20and%20Mailers/Mailers/IB155E.pdf>

<sup>10</sup><http://hamyarenergy.com/static/fckimages/files/NFPA/Hamyar%20Energy%20NFPA%20130%20-%202007.pdf>



## 6. eVACUATE's Contribution to standardization

Dissemination of eVACUATE project results through standards bodies in general brings projects higher international recognition, collaboration opportunities, and the ability to cooperate with a variety of specialists, thus benefiting from their collective expertise. This may be specifically relevant when standardization work proves to be expensive and time consuming, and cooperation with outside experts may provide projects the leverage needed when budgets are constrained.

### 6.1 CEN CENELEC Liaison Agreement

CEN produces voluntary European Standards (ENs). These standards have a unique status since they are also national standards in each of CEN's 31 member countries. With one common standard in all these countries and every conflicting national standard withdrawn, a product can reach a far larger market with much lower development and testing costs.

One of the objectives of the eVACUATE Project is to support the standardisation activities of "CEN/TC 391 - Societal and Citizen Security" by taking into account the different approaches and local specificities which exist and provide input to European harmonisation activities.

The main objective of CEN/TC 391 is to elaborate a family of European standards, standard-like documents (e.g. procedures, guidelines, best practices, minimal codes of practice and similar recommendations) in the Societal and Citizen Security sector including aspects of prevention, response, mitigation, continuity and recovery before, during and after a destabilising or disruptive event. Verification and training will also be considered. CEN/TC 391 will not deal with issues already dealt in other TCs.

Concerning technology, CEN/TC 391 may identify needs in product standardisation, but this will not lead to direct action by this CEN/TC. These issues shall be communicated to those CEN, ISO or other TCs working within the framework of these specific products.

Where other TCs do not address the identified areas, then CEN/TC 391 will develop the standard(s) or proposed deliverables where appropriate. The standardisation activities will consider the following main issues related to Societal and Citizen Security:

- Products and services (equipment, communication, information, goods, transport, energy, cultural inheritance and properties);
- Infrastructures (roads, ports, airports, rail stations, bridges, factories...); - Stakeholder needs and requirements, potential conflicts;
- Relationship (cultural and geographical diversity);
- Citizen requirements and vulnerabilities, including privacy.

As it can be seen there are several common objectives between the work being developed in the CEN Technical Committee and the work performed in eVACUATE. Based on this fact, meetings have been taken place between this CEN group and eVACUATE members in order to align strategies and works.



Under this perspective, some mutual benefits have been received, some of the most important are:

- To have the possibility of assisting to official meetings of the CEN/TC 391, being able to extract important information of great help in the eVACUATE development.
- To being able of presenting our eVACUATE project to the CEN Technical Committee, giving them information about new technologies applied into the standardization object.

**As a result of this contribution, some of the eVACUATE approaches related to emergency and evacuation will be included hopefully in the document “prEN ISO 22315 (WI=00391015) Societal security - Mass evacuation - Guidelines for planning (ISO 22315:2014), document in status of “Under Enquiry” (its forecasted voting for approval date is February 2018)**

[ISO 22315:2014 will provide guidelines for mass evacuation planning in terms of establishing, implementing, monitoring, evaluating, reviewing, and improving preparedness. It aims to establish a framework for each activity in mass evacuation planning for all identified hazards, so it will help organizations to develop plans that are evidence-based and that can be evaluated for effectiveness.

ISO 22315:2014 is intended for use by organizations with responsibility for, or involvement in, part or all of the planning for mass evacuation. It will be applicable to all types and sizes of organizations that are involved in the planning for mass evacuation, such as local, regional, and national governments; statutory bodies; international and non-governmental organizations; businesses; and public and social groups.

ISO 22315:2014 covers planning for mass evacuation in order to gain a more effective response during the actual evacuation. It will assist organizations to meet their obligation of saving human life and reducing suffering. ISO 22315:2014 does not cover activities to stabilize the affected area after an evacuation, protect property, and preserve the environment.]

## 7. Conclusions

The work done in eVACUATE towards standardization can be considered in two different strands:

- As pre-normative work that principally matched already existing standards as candidates for further investigation and as baseline version for the development of novel standards. Concrete steps towards standardization were out of scope in the eVACUATE project, the objective was to identify relevant existing normative requirements, mainly in two aspects:
  - Technological aspects: By using different standards for the design and development of the project.
  - Emergency and Safety aspects: By adapting our project to the general standards and also to the specific ones in every pilot of the project.
- To prepare the introduction of some principles that are useful into the future documents on normative requirements. eVACUATE has identified and taken the required steps as mentioned in previous chapters and prepared the ground for the development of a standard, based on CEN CENELEC European standards.

## 8. List of Acronyms

Acronym	Meaning
API	Application Programming Interface
AENOR	Spanish association for Standardization and Certification
ANSI	American National Standards Institute
BSI	British Standards Institution
CAN	Canadian Standards Association
CAP	Common Alerting Protocol
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CWA	CEN Workshop Agreement
DDS	Data Distribution Service
DoA	Description of Action
DWR	Direct Web Remoting
EN	European Standard
EDXL	Emergency Data Exchange Protocol
ETSI	European Telecommunications Standards Institute
EOC	Emergency Operation Center
FIFA	Fédération Internationale de Football Association
GML	Geographic Markup Language
IDL	Interface Description Language
IEC	International Electrotechnical Commission
IEEE	The Institute of Electrical and Electronics Engineers, Inc
IP	Internet Protocol
IMO	International Maritime Organization
ISO	International Organization for Standardization
IWA	International Workshop Agreement – ISO
JPG	(lossy compressed 24 bit color image storage format developed by the Joint Photographic Experts Group)
JSON	Javascript Object Notation
JTC	Joint Technical Committee
KML	Keyhole Markup Language
KP	Knowledge Processor
MP4	Moving Picture Expert Group Format File
NFPA	National Fire Protection Association
NTP	Network Time Protocol
OASIS	Organization for the Advancement of Structured Information Standards
OWL	Online Writing Lab
PMG	Pagemaker Group File
PPP	Public Private Partnership
RSTP	Rapid Spanning Tree Protocol
SIB	Semantic Information Broker
SIP	Session Initiation Protocol
SNMP	Simple Network Management Protocol
SOFIA	Smart Objects For Intelligent Applications

SOLAS	The International Convention for the Safety of Life at Sea
SOTA	State of the art
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
UEFA	Union of European Football Associations
WG	Working Group
WMS	Web Map Service
WFS	Web Feature Service
WMTS	Web Map Tile Service
XML	Extensible Markup Language

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