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prCWA Requirements for acquiring digital information from victims during Search and Rescue operations

ICS:

CCMC will prepare and attach the official title page.

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European foreword

This document (prEN :) has been prepared by Technical Committee CEN/TC "", the secretariat of which is held by .

This document is currently submitted to the CEN Enquiry.

This document will supersede EN :.

In comparison with the previous edition, the following technical modifications have been made:

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Introduction

A MCI usually resulted to tenths or hundreds of victims. When responding to MCI all FRs and MERs are faced with a number of competing challenges and responsibilities to take control of the situation and deal effectively and efficiently with the wounded and deceased. As healthcare resources are limited or strained due to the number of injured individuals, digital victim tracking systems are implemented to offer the greatest good to the greatest amount of people.

The goal is to determine as quickly as possible the priority of victims' treatment based on the severity of their condition, and to move patients away from the incident toward resources that offer comprehensive care. Primary victim tracking system, which includes triage, is designed to identify the health status of the patients at the scene to allow healthcare providers to administer treatment to the most serious cases. The FRs, who doesn't necessarily need to be a medic, sets up a fast labelling system to allow others to complete medical intervention or evacuation to hospital.

A complete digital victim tracking system consists of a digital victim tracking Tag, a digital victim software and digital victim supportive services.

In the document is used for a:

- requirement is used the verbal form “shall”,
- recommendation using the verbal form “should”
- permission using the verbal form “may.

1 Scope

This CEN Workshop agreement specifies requirements for digital victim tracking systems used for acquiring digital information from victims during a Search and Rescue (SaR) operation.

The CEN Workshop agreement is applicable to Search and Rescue and emergency response equipment manufacturers and developers of digital victim tracking systems.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviations

3.1 Terms

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

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3.1.1

Digital victim tracking system

A system that supports the digitization, distribution and visualization of information related to victim tracking during a medical emergency response. It consists of physical devices (Digital victim tracking Tags), software (Digital victim software) and supportive services (Digital victim supportive services).

3.1.1.1

Digital victim tracking Tag

A wearable hardware device used for victim tracking procedures that is attached by the MERs to the victim.

3.1.1.2

Indicator

A component that indicates the triage category of the victim.

Note 1 to entry: This can be done both visually, with sound or any other signal.

3.1.1.3

Digital victim software

A software used for collecting, processing, storing, distributing and visualizing victim tracking information but not limited to the triage category.

3.1.1.4**Victim tracking**

A process of collecting information about victim identification, triage category, medical assistance and transportation by MERs.

3.1.1.5**Digital victim supportive services**

A set of digital services enabling the communication exchange of information between digital victim tracking tag and digital victim software.

3.2 Abbreviations**Table 1**

Abbreviation	Description
App	Application
FRs	First Responders
LAN	Local Area Network
MCI	Mass Casualty Incident
MEC	Medical Emergency Commanders
MEO	Medical Emergency Officers
MER	Medical Emergency Responder
PAN	Personal Area Network
SaR	Search and Rescue
SW	Software
UI	User Interface
WAN	Wide Area Network

4 Requirements for Digital victim tracking system**4.1 Functional requirements**

Subclauses 4.1.1, 4.1.2 and 4.1.3 specifies functional requirements for digital victim tracking tag, digital victim software and digital victim supportive services.

4.1.1 Digital victim tracking tag

Subclauses 4.1.1.1 to 4.1.1.7 specifies functional requirements for the Digital victim tracking tag.

4.1.1.1 Unique ID

A unique ID for each victim's digital victim tracking tag and for each incident shall be created to ensure that any data entry will not be duplicated within the life cycle of the search and rescue operation.

NOTE An example on how to create a unique ID for digital victim tracking tag is presented in A.

4.1.1.2 Selection of Triage category

It shall be possible to select and insert triage category directly into the digital victim tracking tag.

4.1.1.3 Functional status of the digital victim tracking tag

The digital victim tracking tag shall have an indication to illustrate its functional status, functioning or not functioning.

NOTE The functioning can be indicated by a color based system.

4.1.1.4 Indication of triage category

The digital victim tracking tag shall have an indicator for displaying the triage category.

NOTE A color based example is given in B.

4.1.1.5 Communication

The digital victim tracking tag shall be able to communicate with digital victim software wired or wireless (e.g PAN, LAN, WAN).

The digital victim tracking tag shall be able to communicate with 3rd party electronic medical devices for vital signs acquisition.

4.1.1.6 Power supply

The digital victim tracking tag shall be equipped with a battery to power the electronic components. The duration of the battery shall be capable to support one rescue operation during 24h. Power on/off shall be visible at the digital victim tracking tag.

Low battery shall be indicated on the digital victim tracking tag through an indicator such as led, screen, sound or vibration.

NOTE The 24 h time frame is based on US coast guards statistics [1]<https://www.bts.gov/content/us-coast-guard-search-and-rescue-statistics-fiscal-year>

4.1.1.7 Attachment to victim

The digital victim tracking tag shall be possible to be attached to the victim through a strap or brachlet at neck or hand. The attachment shall be secure to guarantee that it cannot be removed and reused in the same search and rescue operation. In case of removal of the digital victim tracking tag a sound or vibration or any other indication shall inform the medical emergency responders and officers.

4.1.2 Digital victim software

Subclauses 4.1.2.1 to 4.1.2.6 specifies functional requirements for the Digital victim software.

4.1.2.1 User Interfaces of SW application for MER, MEO and MEC

The digital victim software shall be possible to run in portable devices (mobile, tablet, laptop). The digital victim software shall provide at least two different roles (type of users), one for the MER and one for the MEO and MEC.

The role for MER shall be able to register victims and to add information. The role for MEO and MEC shall be able to view all the information of the SaR operation.

4.1.2.2 Communication

The digital victim software shall be able to communicate with digital victim tracking tag wired or wireless (e.g PAN, LAN, WAN).

4.1.2.3 Reading Unique ID

The digital victim software shall be capable to read the unique ID for each victim's digital victim tracking tag and for each incident.

4.1.2.4 Insert and update triage category

It shall be possible to select and insert triage category into the digital victim software.

It shall be possible to update the information of the triage category through the digital victim software.

NOTE An example of a color based systems is presented in B.

4.1.2.5 Retrieve victim tracking information

The digital victim software shall be able to retrieve victim tracking information registered by MERs.

4.1.2.6 Insert and update victim tracking information

The digital victim software shall be able to insert and update victim tracking information.

4.1.3 Digital victim supportive services

Subclauses 4.1.3.1 to 4.1.3.2 specifies functional requirements for the victim supportive services.

4.1.3.1 Data distribution

The digital victim supportive services shall be able to support the data distribution within the digital victim tracking system.

4.1.3.2 Data distribution with 3rd party systems

The digital victim supportive services shall be able to support the data distribution to 3rd party systems.

NOTE An example of JSON messages is presented in C.

4.2 Non-Functional requirements of Digital victim tracking system

Subclauses 4.2.1 to 4.2.4 specifies non-functional requirements for the Digital victim tracking system.

4.2.1 Usability

The UI of the Digital victim tracking tag and the digital victim software shall be:

- verified as user friendly through trials with end users
- manageable with few clicks and through drop down menu

4.2.2 Security

The communication shall be encrypted with secure certifications.

4.2.3 Performance

The digital victim tracking system shall have high availability with uptime of 99,99 %.

4.2.4 Interoperability

The digital victim tracking system should ensure technical, syntactic and semantic interoperability with:

- ISO 22300:2018 "Security and resilience - Vocabulary".
- ISO 22320:2018 "Security and resilience - Emergency management -Guidelines for incident management".
- Emergency Data Exchange Language (EDXL) Tracking of Emergency Patients (TEP) of Advancing Open Standards for the Information Society (OASIS).
- real time connection with the system.

Annex A

Examples of how to create a Unique ID for the digital victim tracking tag

A static or a dynamic process can guarantee the unique IDs assignment.

Static procedure for creating unique IDs can follow the steps below:

- 2 letters used for the county (XX)
- 3 letters used for the agency using the digital victim tracking system (YYY)
- 6 numbers serial number of the digital victim tracking tag (ZZZZZZ)

Format: XXYYYYZZZZZZ

Example: EKAB which is the Greek Emergency Response Team to triage victims during operations use GREKB000001, GREKB000002, ..., GREKB999999 IDs predefined and associated to the victims.

Dynamic procedure for creating unique IDs can follow the steps below:

- Use the current value of the date of the SaR operation response (YMMDD)
- Use the starting time of the digital victim tracking tag (HHMM)
- Use the MAC address of the digital victim tracking tag (XXXXXXXXXXXX)

Format: YMMDDHHMMXXXXXXXXXXXX

Example: Responding to an operation on 7th of September 2022 and the start time of the digital victim tracking tag is 21:15 with MAC address 00:00:5e:00:53:af will create the unique id220907211500005e0053af.

Annex B

Example of triage category

According to Smith¹ and Gao et al.², the classes are correlated to color categories as follows:

- *Red Category (Critical)*: The victim is highly injured, and if he/she is not immediately transported to the hospital is going to die very soon.
- *Yellow Category (Serious)*: Their condition is stable for the moment but requires possibly re-examination and re-triaging after some time.
- *Green Category (minor injuries)*: The doctor's care is required in several hours or days but not immediately.
- *Black Category (No Priority)*: The victim is dead or has have such extensive injuries that he cannot be saved with the limited resources available.

For a single led light the color based code and the status classes are correlated to color categories should be:

- *Led color - Red (Critical) / Status*: The victim is highly injured, and if he/she is not immediately transported to the hospital is going to die very soon.
- *Led color - Yellow (Serious) / Status*: Their condition is stable for the moment but requires possibly re-examination and re-triaging after some time.
- *Led Color - Green (minor injuries) / Status*: The doctor's care is required in several hours or days but not immediately.
- *Led color - Black (No Priority)* / Status*: The victim is dead or has have such extensive injuries that he cannot be saved with the limited resources available.

Table B.1 — Color codes for a led light

Status	Color	RGB code
<i>Critical</i>	<i>Red</i>	(255,0,0)
<i>Serious</i>	<i>Yellow</i>	(255,255,0)
<i>Minor injuries</i>	<i>Green</i>	(0,128,0)
<i>No Priority</i>	<i>Black/Purple^{a)}</i>	(128,0,128)
^{a)} With a single led light it is not possible to emit black light because (black = absence of light)		

1 Smith Wayne, "Triage in mass casualty situations", *Continuing Medical Education*, vol. 30, no. 11, pp. 413-415, 2012.

2 T. Gao et al., "The advanced health and disaster aid network: A lightweight wireless medical system for triage", *IEEE Transactions on biomedical circuits and systems*, vol. 1, no. 3, pp. 203-216, 2007.

Table B.2 — Color codes for monitors

Status	Color	RGB code
<i>Critical</i>	<i>Red</i>	(255,0,0)
<i>Serious</i>	<i>Yellow</i>	(255,255,0)
<i>Minor injuries</i>	<i>Green</i>	(0,128,0)
<i>No Priority</i>	<i>Black</i>	(0,0,0)

Table B.3 — Example of 6 status triage color based system

Priority	Status	Color	Description
Priority 1	Critical	Red	Victim in critical condition with life threatening injuries requires immediate support
Priority 2	Serious	Yellow	Treatment maybe delayed for a limited period
Priority 3	Minor injuries	Green	Victims with minor injuries whose treatment may be delayed
Priority 4	Expectant	Blue	Victims who have injuries requiring extensive treatment.
Non Priority	Deceased	Black*/Purple	State that the victim rescued is dead
Null	Available device	White	State that the digital triage indicator is power on and ready to be used but not triaged yet (without data)

*Due to the reason it is no possibility to emit black light (black = absence of light) we should use a dark color such as purple.

Annex C

Example of JSON messages

The digital victim supportive services for accessing or updating victims details and incidents can use the proposed messages.

Message for retrieving the victims tracking information of specific incident:

This web service is proposed for retrieving all the information concerning the victims of a specific incident through an HTTP GET method. The “incident_id” which is used to define the specific incident for which the client wants to get the victims. Firstly the client has to pass Request for security reasons. The key “fields” of the json holds a list (of type string) that specifies the victim attributes (e.g. name, Surname, Sex, Age, etc.). The key “data” of the json holds a list with the actual values of the aforementioned attributes for all victims (the order of the attributes specifies the order of the actual values). However, these values are separated in different lists according to the specific victim. This means that the key “data” holds a list of lists (the embedded lists hold info for a specific victim). Moreover, the values of the attribute “Images” is a list that holds the images IDs for a specific victim (if there is no image for the victim, the list is empty). The image ID is useful in order for the client to be able to retrieve through pertinent service an image of a victim. If there is no data, the corresponding attribute value is null.

Message for retrieving the victims of a specific incident

This web service is used for retrieving all the information concerning the victims of a specific incident through an HTTP GET method. There is one path parameter named “incident_id” which is used to define the specific incident for which the client wants to get the victims. The client has to pass Request Cookies for security reasons, as shown in the table below. The response of this service is a json. The key “fields” of the json holds a list (of type string) that specifies the victim attributes (e.g. name, Surname, Sex, Age, etc.). The key “data” of the json holds a list with the actual values of the aforementioned attributes for all victims (the order of the attributes specifies the order of the actual values). However, these values are separated in different lists according to the specific victim. This means that the key “data” holds a list of lists (the embedded lists hold info for a specific victim). Moreover, the values of the attribute “Images” is a list that holds the images IDs for a specific victim (if there is no image for the victim, the list is empty). The image ID is useful in order for the client to be able to retrieve through pertinent service an image of a victim. If there is no data, the corresponding attribute value is null. An example of a response is shown in the following table.

Message for retrieving a specific victim of a given incident

This method is used for retrieving the full information of a given victim that belongs to a given incident. There are two path parameters for this method: “victim_id” which is the ID of the victim that the client needs info, and “incident_id” which is the ID of the relevant incident. The client has to pass Request Cookies for security reasons, as shown in the table below. The response of this service is a json. The keys of the JSON are the victim attribute names (e.g. Vector, Transport, Surname, etc.). It has to be noted that the value of the JSON key “Images” is always a list that contains the IDs of the images of this victim (in the case there are no images, this list is empty). The image ID can be used by the client at a later stage so as to retrieve either the thumbnail or the full image.

Message for retrieving a thumbnail of a specific victim

This method is used for retrieving a given thumbnail of a victim (a victim may have many thumbnails). A thumbnail is a compressed preview image of the original that is used as a placeholder. The biggest advantage of thumbnail images is their reduced file size compared to the original image, and because of this, the triage front-end has significantly faster loading times in the part of the site that has image content (victim images). The “image_id” which is the URL path parameter, can be obtained from the response of the service that fetches victims info of a given incident. More specifically, the IDs of the images of the victim are contained in the relevant list inside the victim info list.

Message for updating victim tracking details

This service is used for updating the attributes of a given victim (e.g. name, age, address, etc.). The new values of the victim attributes are included in the request body in JSON format as shown in the table below. The incident and the victim IDs that are included in the JSON payload of this service identify the exact victim that is already stored in the back-end and that has to be updated.

WebSocket for getting notifications concerning a victim update

The Triage makes use of a WebSocket which is a computer communications protocol, providing full-duplex communication channels over a single TCP connection. To this end, the Triage front-end is able through the WebSocket to get notifications for a specific incident in the case of any victim update so as to refresh the page accordingly in real time. The incident to which the front-end listens for victim updates is specified in the URL path parameter of the WebSocket. This means that the triage front-end listens for victim updates only when in the page a specific incident has been selected. In this case the front-end indicates intention to get any notifications about victim updates for the selected incident. The notification received from the server is always in JSON format that contains the new status of the victim along with the incident and victim IDs.

Bibliography

- [1] <https://www.bts.gov/content/us-coast-guard-search-and-rescue-statistics-fiscal-year>