

eNewsletter

May 2017

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Our thanks to:

Dimitris Petrantonakis,
Vitrociset Team



HIGHLIGHT

eVAMAPP Missing Person Mobile App

For the pilot exercise at STX, a new mobile App has been developed and demonstrated to the End-Users. Use on board of this App can guarantee, if necessary, fast identification of passengers and their actual positioning. In addition to evacuation operations and related to detection devices (such as RFID tags), it can also be used to identify children or passengers with disabilities that might be lost in large cruise ships.

[Read more p. 2](#)



NEWS FROM PILOTS

3rd pilot exercise at STX Shipyard, St. Nazaire, France in March 2017

In the Shipyard of STX in St. Nazaire (France), the majestic cruiser ship MSC Meraviglia, commissioned by MSC Crociere, for the purpose of our needs in order to install and demonstrate our platform.

Only some numbers to describe this monster of technology: 315 meters of length, 43 meters of width and 65 meters of height, 167.600 tons of gross tonnage, around 5.000 passengers and 1.500 of crew. Really impressive!!!

[Read more p. 3](#)



HOW Evacuate WORKS

The main sub-systems

Now we continue to explore the various components of the system, with the objective to describe the main features of each of them.

In the previous part we listed all the components of the eVACUATE system and described how COP (Common Operational Picture) and AER (Active Evacuation Route in Strategic Spatial Evacuation) work and now we are exploring it deeply, through the other components.

[Read more p. 5](#)



NOT TO BE MISSED

eVACUATE project results @ IDEF'17, Istanbul, May 9-12, 2017

IDEF'17, 13th International Defence Industry Fair, was held between May 9-12, 2017 under the auspices of the Presidency of the Republic of Turkey and hosted by the Ministry of National Defence and under the management and responsibility of Turkish Armed Forces Foundation (TAFF) and, once again, has played an essential role on the development of friendship and cooperation between participant countries.

[Read more p. 9](#)



FORTHCOMING APPOINTMENTS

POLITECNICO DI TORINO presents eVACUATE project at EMI 2017 in San Diego, USA, June 4-7, 2017
Prof. Nicola Bellomo will deliver a Keynote Lecture entitled "From Crowd to Swarm Dynamics: Modeling and Computing Fluid-Obstacles Interactions" at the 2017 Engineering Mechanics Institute Conference (EMI 2017), the premier annual US-based conference.

eVACUATE Final Review Meeting in Brussels, Belgium, June 27, 2017

Our project has arrived to the final appointment: the Final Review Meeting, which will take place in the offices of the European Community, in the presence of the Project Officer and the 2 Official Reviewers.

It's time to pull the sums of 4 years of work ... and satisfaction!



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HIGHLIGHT

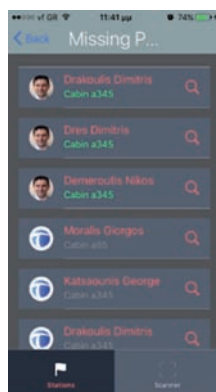
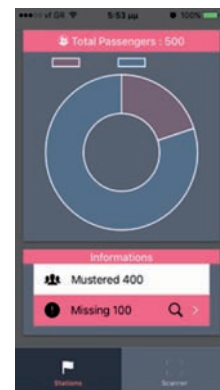
eVAMAPP Missing Person Mobile App

For the pilot exercise at STX, a new mobile App has been developed and demonstrated to the End-Users.

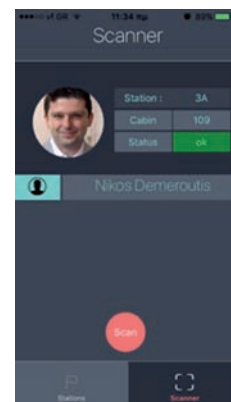
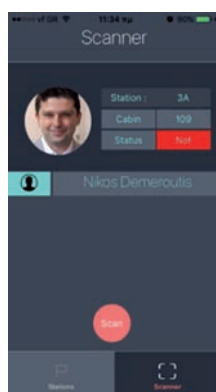
This application is able to provide information about all available muster stations existing on the ship and, for each specific muster station, the following information are also given:

- how many people are expected;
- number of people already mustered;
- number of people who should be in another station.

By selecting the "Missing" tab, the Security personnel is able to see the full list of missing people and, for each of them, the personal information (thumbnail photo, name, cabin number, etc.).



Last but not least, a QR Code scanner is used within this application to scan the QR Code existing in passenger's ticket and, based on the data sets stored in the Cabin Management System (Fidelio legacy system for MSC Meraviglia), provides a status update about the specific passenger, indicating that the person is or not in the correct muster station.



Use on board of this App can guarantee, if necessary, fast identification of passengers and their actual positioning. In addition to evacuation operations and related to detection devices (such as RFID tags), it can also be used to identify children or passengers with disabilities that might be lost in large cruise ships.

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NEWS FROM PILOTS

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Only some numbers to describe this monster of technology: 315 meters of length, 43 meters of width and 65 meters of height, 167.600 tons of gross tonnage, around 5.000 passengers and 1.500 of crew.

Really impressive !!!



The ships buildings activities were in full swing when we performed the pilot demonstration. However, thanks to STX for being such a good host to us and the excellent teamwork between partners, we achieved to finalize all preparations on time and demonstrate successfully our system in front of 100 volunteers, invited end-users and the European

During the course of 4 days prior to the pilot, the partners worked closely to:



- Fine tune the system components;
- Achieve response to real-time events (projected scenarios);
- Ensure that all subsystems are interoperating and during the pilot day are functioning properly calculating as such the necessary Active Evacuation Route to passengers;
- Ensure that the Presentation Layer, Decision Layer and field of view of the sensors were all synced;
- Successfully integrate eVACUATE platform with STX's legacy systems (ships smoke alarm system, public announcement, CCTV, DECT phones etc.).

In the day of 17th March the pilot started officially, with a set of exercise loops including decks 5/6/7/8 using around 100 volunteers provided by STX.



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This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 313161

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The Presentation Layer was setup to give to the COP operator a view of the affected operational area, whilst allowing for immediate response to potentially life-threatening situations.

In the Decision Layer, all physical spaces were analysed in real time, gathering data from all sensors and actuators: eVACUATE consists of (fixed and mobile) including the Digital signs, Environmental WSN sensors, MobiMesh network, RFID Tags (incl Disabled person alerting system based on RFIDs), Active Exit signs and Media signs, 3 Smartphone applications (eVAMAPP, FR app and Missing person App.), iSAFETY system, Social Media and unusual behaviour analytics, Hyperspectral and thermal cameras, all being interconnected under eVACUATE platform through eVACUATE's customized communication network.



We divided the (ca. 100) volunteers into four groups and we started each run in the same position. We did four evacuation runs and measured the time needed for the evacuation (The evacuation time noted is the maximum evacuation time of the four groups, i.e. we measure the slowest evacuation time).

Each group experienced a blocking of the evacuation route only once, therefore the different runs are comparable. Of course, after the first run the volunteers are familiar with the evacuation setup, resulting in a, considered small effect, of learning (and therefore faster evacuation time).

Without blockages the evacuation times are comparable, which is to be expected since everyone knows the route from the way up and the signals are not really needed.

In case of blocking the route on one side the evacuation time increases (mainly because the route is longer), but with signals **the evacuation time is about 25% faster.**

The system was demonstrated to the following stakeholders who were present:

- The EU Project Officer;
- STX-FR's End Users;
- STX Safety and Security managers;
- STX Electrical and ICT department manager;
- STX ICT manager;
- Firemen Brigade managers;
- 2 persons from Bureau Veritas classification society.

For more information

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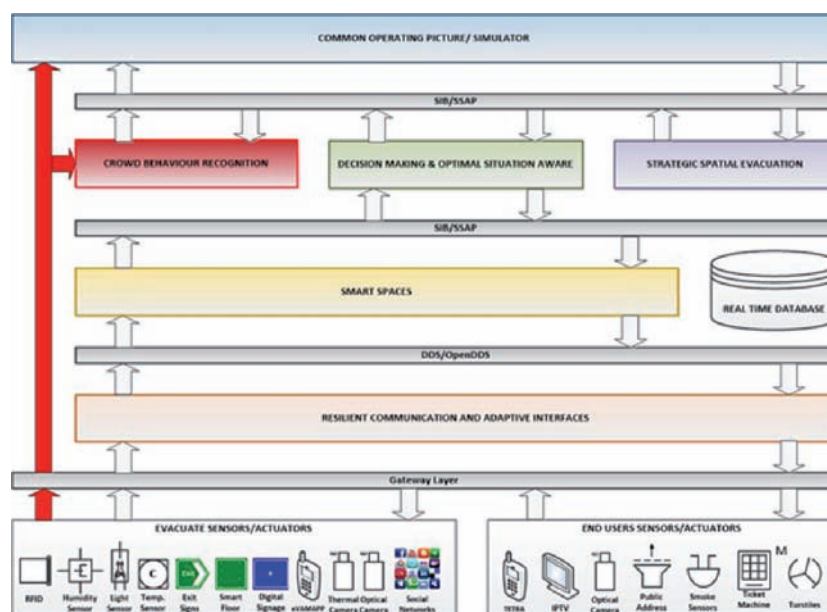
HOW eVACUATE WORKS

The main sub-systems

Now we continue to explore the various components of the system, with the objective to describe the main features of each of them.

In the previous part we listed all the components of the eVACUATE system and described how **COP (Common Operational Picture)** and **AER (Active Evacuation Route in Strategic Spatial Evacuation)** work.

The following figure shows the functional architecture of the whole system and now we are exploring it deeply, through the other components.



The eVACUATE system is implemented on **SOFIA2 framework**, the evolution of SOFIA platform born in a precedent European project.

This platform, conceived for Big Data, includes a **Semantic Information Broker (SIB)**, a component that use a publish/-subscribe communication subsystem based on MQTT protocol, a **Real Time Database** based on MongoDB and a **Complex Event Processing (CEP)** based on WSO2 Siddhi platform.

SOFIA2 offers a smart SDK to implement **Knowledge Processors** (agent process used for exchange messages/events from/to SIB) and a large set of APIs (C, Java, Javascript) that may use different connection protocols (MQTT real time, HTTP RESTful for simple operations).

The platform provides also a smart web console interface for configure processes, design data ontologies, create and modeling and monitoring CEP process (Groove language).

Crowd Behaviour Recognition component implements cameras video-analysis algorithms in real-time. It is a functional component and its main purpose is to perform video analysis in order to provide a set of Vectors/Features related to Unusual Behaviour for adjacent components, like **Strategic Spatial Evacuation** and **Decision Making & OSA**.

All data related to the analysis performed by this component pass through Smart Spaces to be published on SIB while the video feeds will go directly to the video demanding components operating in the **Common Operational Picture**.

Decision Making & Optimal Situation Aware component implements multi sensors data fusion and performs inference on data in order to create and publish on SIB a large set of events, alarms, features and decisions.

It is based on JDL DFIG model step 6 and all outcomes are based on Dasarthy model classification. The alarm management uses **AdaBoost** (Adaptive Boosting) classification for accuracy and gravity.

This component is entirely inside the SOFIA2 framework: it uses Knowledge Processors developed with SOFIA2 SDK using MQTT protocol to capture events provided by adjacent components and uses SOFIA2 CEP in order to provide inference on data fused with a set of rules.

It is integrated with a mediation layer that performs space/time correlation using 2D map shared with **Strategic Spatial Evacuation** component and 3D map of the **Common Operational Picture** component.



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Smart Spaces component implements the SOFIA concept of Smart Spaces. It is constituted by a series of Knowledge Processors developed within the SOFIA SDK. The main purpose is to publish all data received from the Communication Layer and its DDS (Data-Distribution Service) communication module to the SIB using a SSAP protocol, and publish all data received from SIB communication module on DDS using DDS APIs.

The **Resilient Communication and Adaptive Interfaces** component implements the communication with all the external world of eVACUATE system, connecting with different gateways and using different protocols. It enables eVACUATE system to communicate with a large set of sensors/actuators such as Wireless Sensor Network, Exit Signs, Multimedia Devices, RFID and all legacy systems provide by the end-users. This Communication Layer uses DDS publish/subscribe to send/receive messages from/to eVACUATE components, mainly Smart Spaces.

Smart Spaces and **Resilient Communication and Adaptive Interfaces** represent the gate of eVACUATE to the external world, but we'll talk about this aspect when we describe sensors and actuators of eVACUATE system.

All of these components work together with a sophisticated real-time orchestration, able to detect incidents and manage their evolution and the evacuation of the affected areas.

eVACUATE system is specialized in managing evacuations of high-crowd density sites but, first of all, it's a surveillance system.

With this aim, eVACUATE manages a wide range of types of incidents and, for each typology, exists a set of dedicated rules to be used.

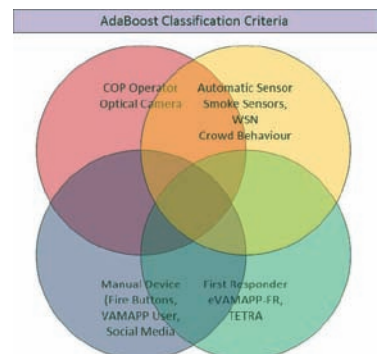
Incident	Category	General/Specific	Incident Code
Fire	Localised	General	1060206-ACC26
Suspect package	Localised/Wide Area	General	1110100-HLP1
Invisible gas or smell	Wide Area	General	1040100-GAS1
Structural Damage	Localised	General	1060200-ACC2
Bad human behaviour	Dynamic	General	1120401-CRI41
Explosion (LNG)	Localised	General	1060207-ACC27
Bomb threat	Wide area	General	1030301-EXP31
Terrorist attack	Localised/Wide area	General	1121001-CRI101
Rush of people	Localised/Wide area	ANOETA	1120400-CRI04
Police charges with hooligans	Localised/Wide area	ANOETA	1120400-CRI04
Serial/moving threats	Localised/Wide area	AIA	1121102-CRI112
Ship listing/tilting	Wide Area	STX	1060303-ACC33
Flooding	Localised	STX	1020101-FLOO11
Collision	Localised	STX	1060301-ACC31
Grounding	Wide area	STX	1060304-ACC34
Overcrowded platforms	Localised	METB	1120403-CRI043
People Struggling	Localised	METB	1060105-ACC15
Person falling on the track	Localised	METB	1110102-HLP12
Train accident	Localised	METB	1060201-ACC21
Explosion in the train or station	Localised	METB	1060207-ACC27
Unusual Behaviour	Localised	Video Analysis	1120408-CRI048
Transportation Halted	Localised/Wide area	First Responder	1050000-TRA
Obstacle	Localised	First Responder	1120406-CRI046
Hijacking	Dynamic	First Responder	1121001-CRI101
Looting	Dynamic	First Responder	1120404-CRI044
Rioting	Dynamic	First Responder	1120400-CRI04
Flood	Localised	First Responder	1020100-FLOO1
Smoke	Localised	First Responder	1010301-FIRE3
Disturbance	Dynamic	First Responder	1121103-CRI113

Incident Detection

Detection of incident in a venue is a combination of one or multiple events. Sensors, First Responders or even **COP** operator can contribute to create/verify a Notification Alert in eVACUATE system.

The **Decision Making & OSA** component uses AdaBoost method in order to give a best classification of the event.

The Alert created includes not only the typology of incident but also the accuracy and gravity of the event, that depend from the its source. A sensor that sends a fire alarm (Fire Push Button pressed) has a determinate weight; a combination of heterogeneous multi sensors (Temperature Humidity Smoke Detector), in the same area, has more weight than a single sensor; **COP** operator, using direct streaming cameras, or First Responders in the same area of the incident have an accuracy more elevate.



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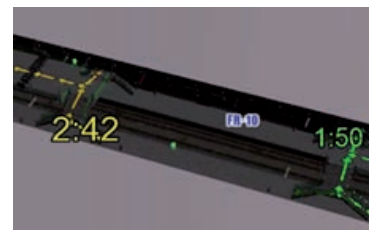
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This is the method used for reduce false alarm and contemporary produce an early warning for manage an incident before it can become a big problem.

When the system detects incidents produced by a single sensor the accuracy of the event is low, the **Decision Making & OSA** includes suggestions inside the Notification Alert and indicates to **COP** operator, that manages the alert with threat management function, the list of cameras in the same area of the incident and the list of the First Responders near the area (typically around 20 meters from the incident).

Anyway **COP** operator has available the list of active First Responders (updated every 5 seconds) and can display them on **COP** because the system is able to receive the telemetries (name and geo position) of the FR App Mobile.



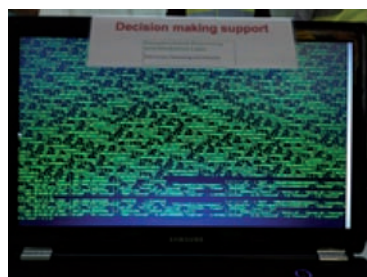
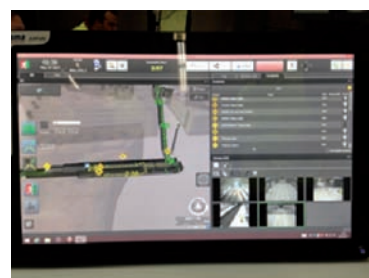
Incident Evolution

When **COP** operator manages the incident, the system starts to record all regarding it (events, status, resources, decisions), in order to be analyzed in a second time.

Excluding particulars incident which have the effect of evacuating the site (bomb threat, terrorist attack, structural failure), an incident can evolve with positive ending (a little fire is extinguished) or with negative consequences (the fire is increased and it affects more areas that before).

The system is able to predict and notify to the **COP** operator all possible hazardous areas near the incident that can make the situation worst or cut down the available resources.

A good management of a threat can avoid that a little incident turns in a catastrophe using the right resources, quickly. So the correlation of fire with fuel depot or electric cabin with flood water can generate specific predictions included into the Notification Alert, indicating the **COP** operator a future danger.



The system applies a continuous monitoring of the incident and analyzes all the affected areas searching for potential hazardous spaces. Inflammable or chemical materials, important areas like Data Center, Electric Cabins and Control Rooms are listed in the map, and an algorithm checks them when an incident occurs and until the end of threat.

When a danger approaches less than a predetermined distance, the Alert Notification evolves inserting in the predictions the area affected, the type of use and possible dangers (explosion, chemical pollution, resource lost etc.)

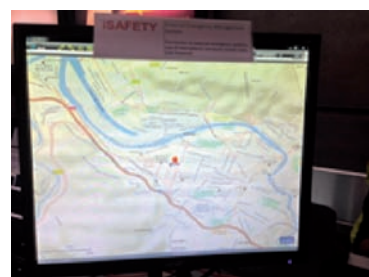
Evacuation Management

Evaluated the criticality of the incident, the **COP** operator starts the evacuation of the venue disposing the staff in the critical points. The system receives the command from **COP** operator, and the **Decision Making & OSA** starts the automatic procedures to manage the evacuation.

The automatic procedure of evacuation includes task of actuators and sends an alarm message to **iSafety**, the system that harmonises the intervention of the public forces (police, fire brigades, red cross, bomb squad, etc.).

The alarm indicate the type of incident, where it happened and thorough the **COP** organize the logistic (the best position to place the first intervent groups)

The components **Strategic Spatial Evacuation** and **Decision Making & OSA** continue to elaborate the route and density until the end of evacuation or an eventually modification due to a unattended obstacles or bottle necks in the flows.



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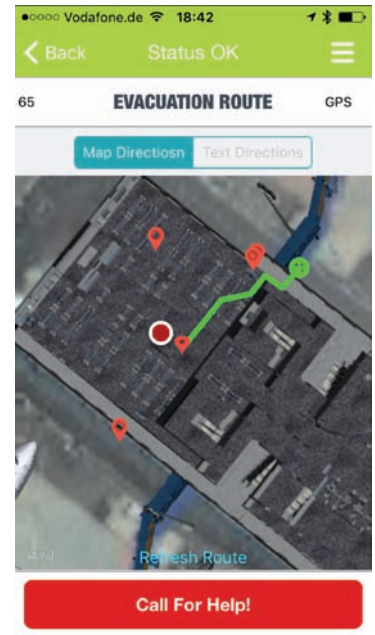
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Contemporary the **Decision Making & OSA** turns on all Exit Signs and Multimedia devices respecting the route directions and produces geo routes data for the users' mobile Apps, that can display the best route to reach the safest exit way.

In case of route modification, during the evacuation, the component Strategic Spatial Evacuation publishes the new routes and **Decision Making & OSA** changes the direction of Smart Signage.

When the staff confirm the complete evacuation of the venue, the COP operator sends to the system the End of Evacuation event and the **Decision Making & OSA** stops all the actuators.



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IDEF is the biggest defence industry fair in Eurasian region and one of the top five in the world with an increasing trend in terms of the number of participating countries, delegations and companies.

As usual, Vitrociset has been present with its own exhibition space.

During the 4-days-fair, Mr. Paolo Fella, Defence & Security International Business Development Manager presented the eVACUATE project results both to ordinary customers and to new visitors who stopped at the stand.

The focus of the presentation was mainly based on the contribution that the experience of eVACUATE project can bring for the security of large spaces such as airports and military bases where, especially during this period, the topic is very hot.



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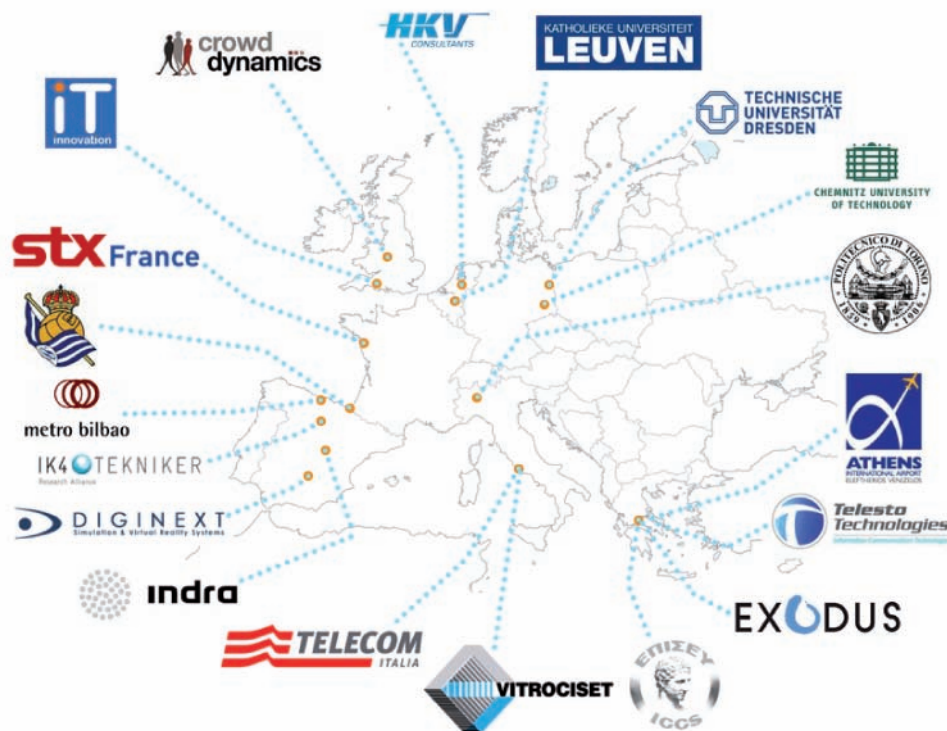


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CONSORTIUM

The eVACUATE Consortium has been carefully selected forming a balanced consortium concerning all aspects including R&D, public entities, large companies and SMEs. Furthermore, the partnership structure is based on complementarity, transnationality and multidisciplinary.



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