DIGLOGS Final Event

Digitalization of evacuation on passengers ships in the framework of DigLogs project

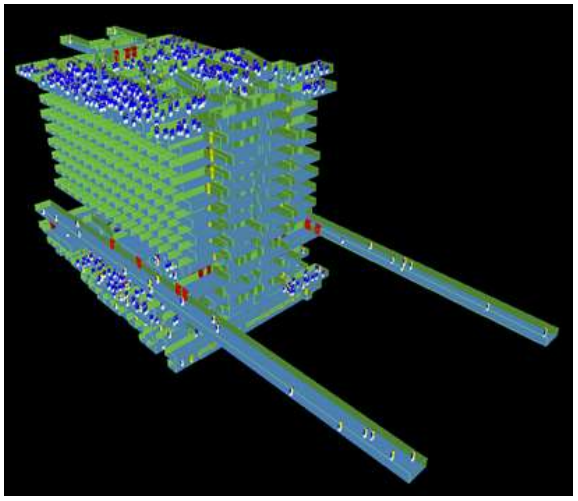
DigLogs| Dip. di Ingegneria e Architettura | UniTS

Evento Finale| Mestre (VE)| 01 Dicembre 2021

European Regional Development Fund

Mobile Security Pilot

During **emergencies** on board passenger ships, escape routes might be blocked due to fire or flooding. A **mobile application**, guiding passengers through the proper direction in the current situation, might reduce evacuation problems and congestions. Such a technology shall be based on the **localization of passengers** by means of an infrastructure sustained by a ship emergency grid and/or an independent source of power. **Bluetooth beacons** can be adopted, designing a net capable to localize the passenger through the connections to the nearest beacons.

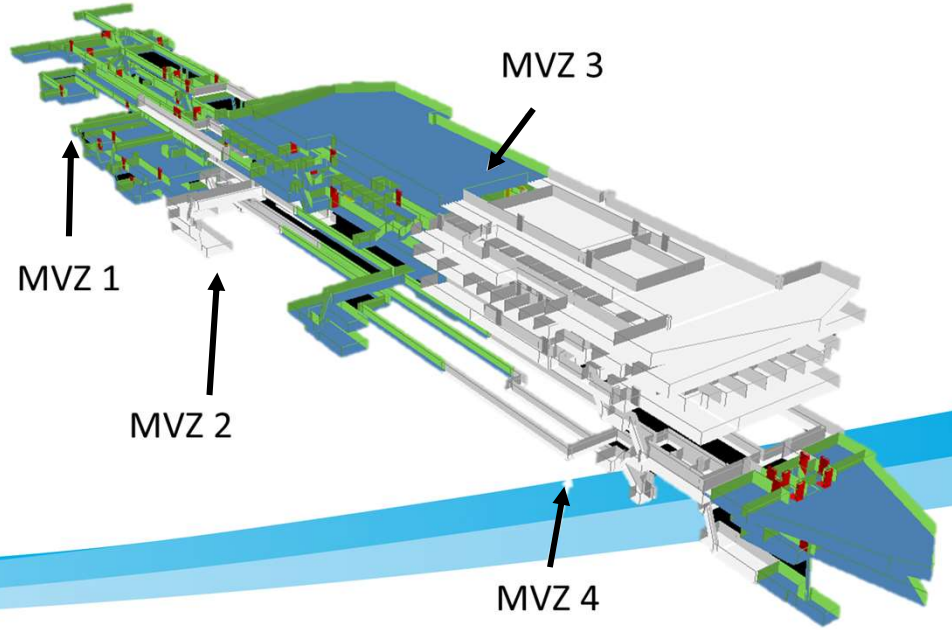


Pilot Project Goals

MAIN GOAL: *test the effectiveness of mobile technologies to increase safety/security on passenger vessels*

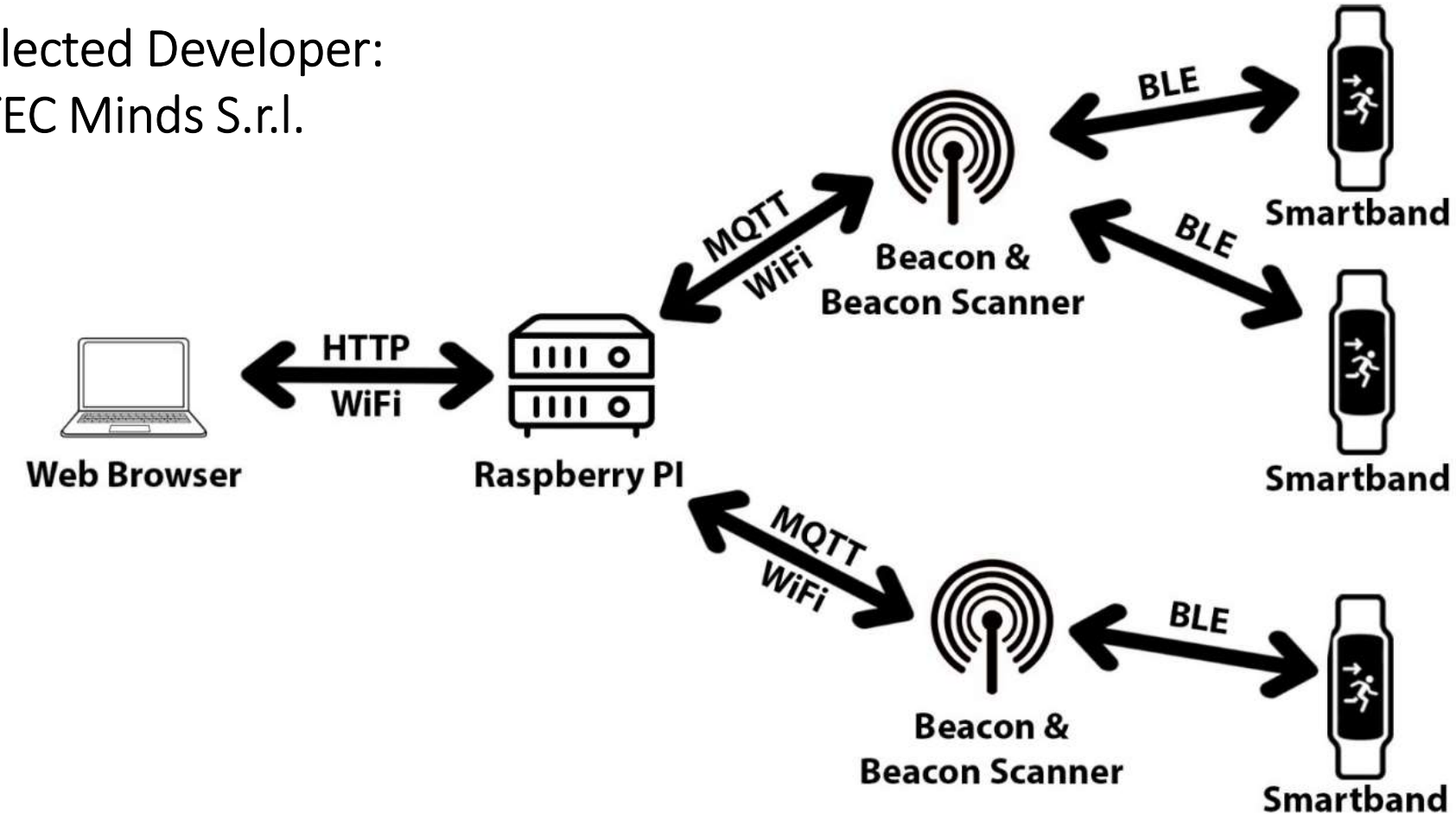
- *Focus on* ***ship evacuation***
- *Development of mobile* ***guidance system***
  - *Mobile app*
  - *Backend*
- *Reduction of* ***evacuation time***
- *Test in challenging environment*

LONG TERM*: foster the deployment of the mobile technologies for onboard safety and security purposes*



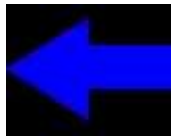
Pilot Project Detailed Design

Selected Developer:
ETEC Minds S.r.l.

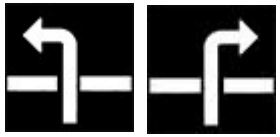


Experimental Campaign (Device guidance)

LILYGO TTGO T-Wristband. Istruzioni fornite dall'app:

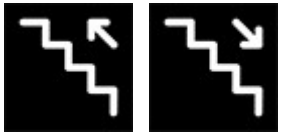


Direction (rotating)



Turn left/right after the door

Turn left or right, then come back

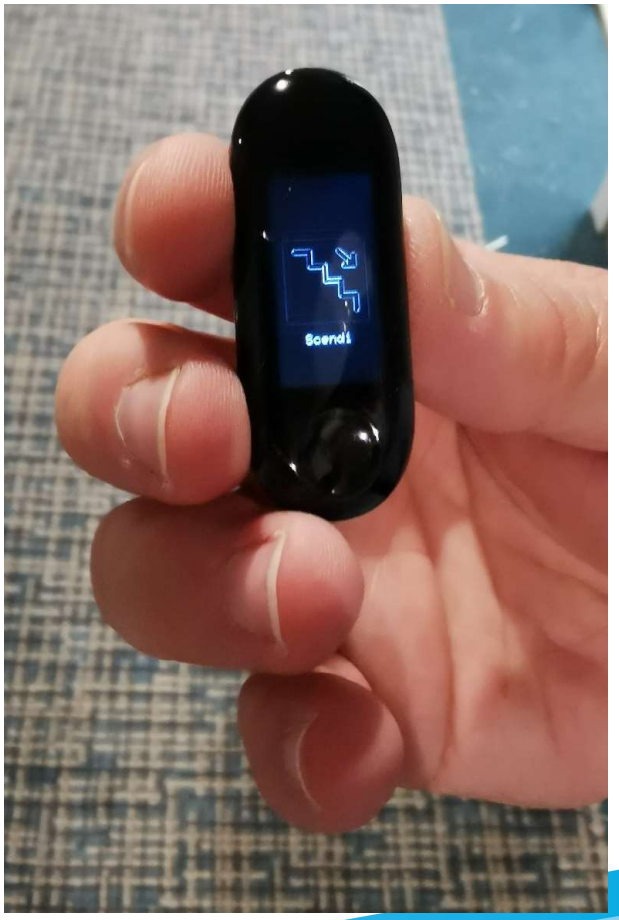


Proceed upstairs/downstairs

Destination reached

Wrong direction, come back

WARNING! Wait the new signal



Experimental Campaign (GNV Bridge)

The system has been tested onboard with 37 persons sample population at Arsenale San Marco (Trieste) on 8th April 2021

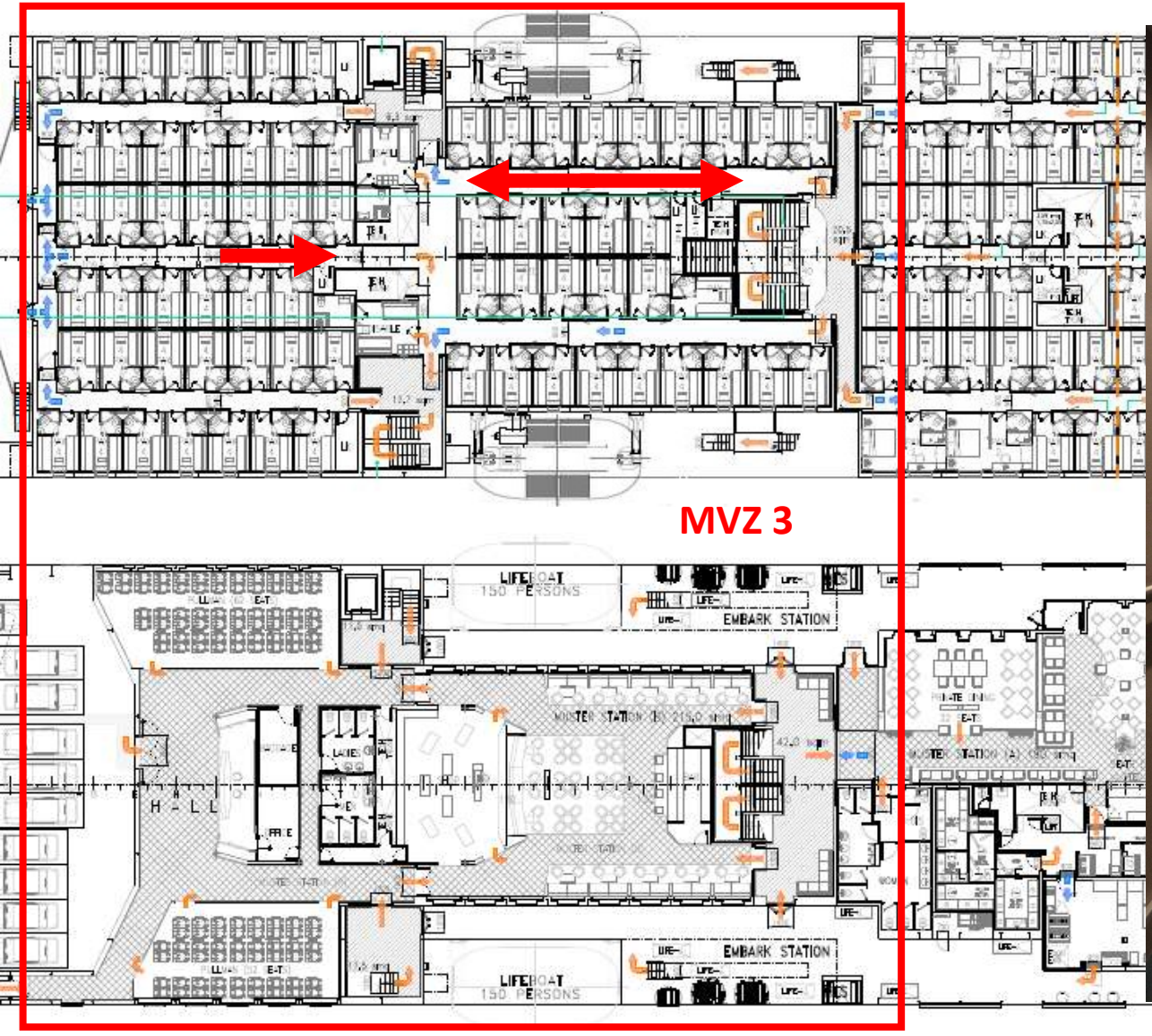
GNV Bridge

RORO PAX built at **Visentini** Shipyard (RO)

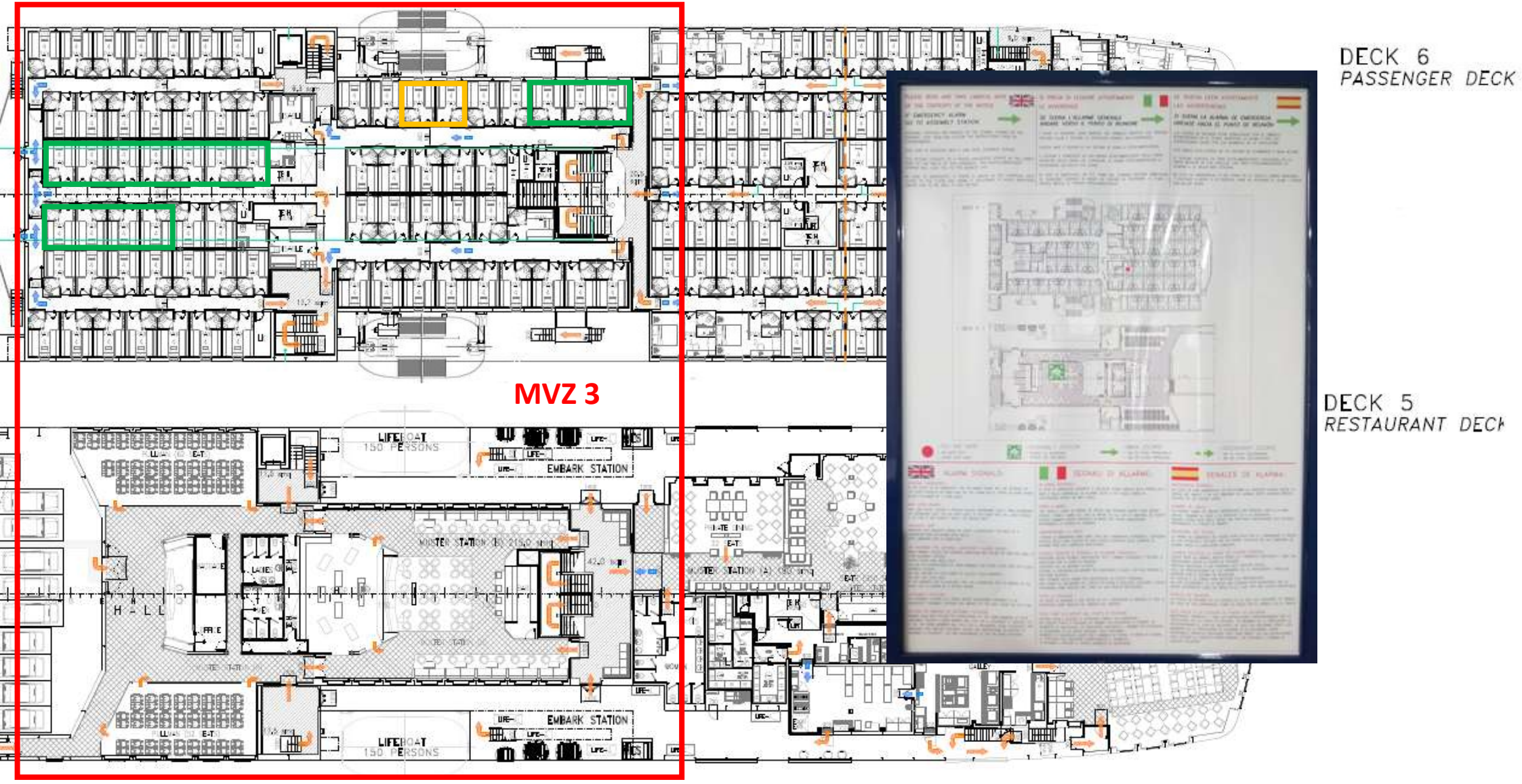
LOA	203.28 m
LPP	194.20 m
B	25.60 m
D	15.00 m

Persone a bordo: 1000

Experimental Campaign (Test Area)



Experimental Campaign (Test Area)



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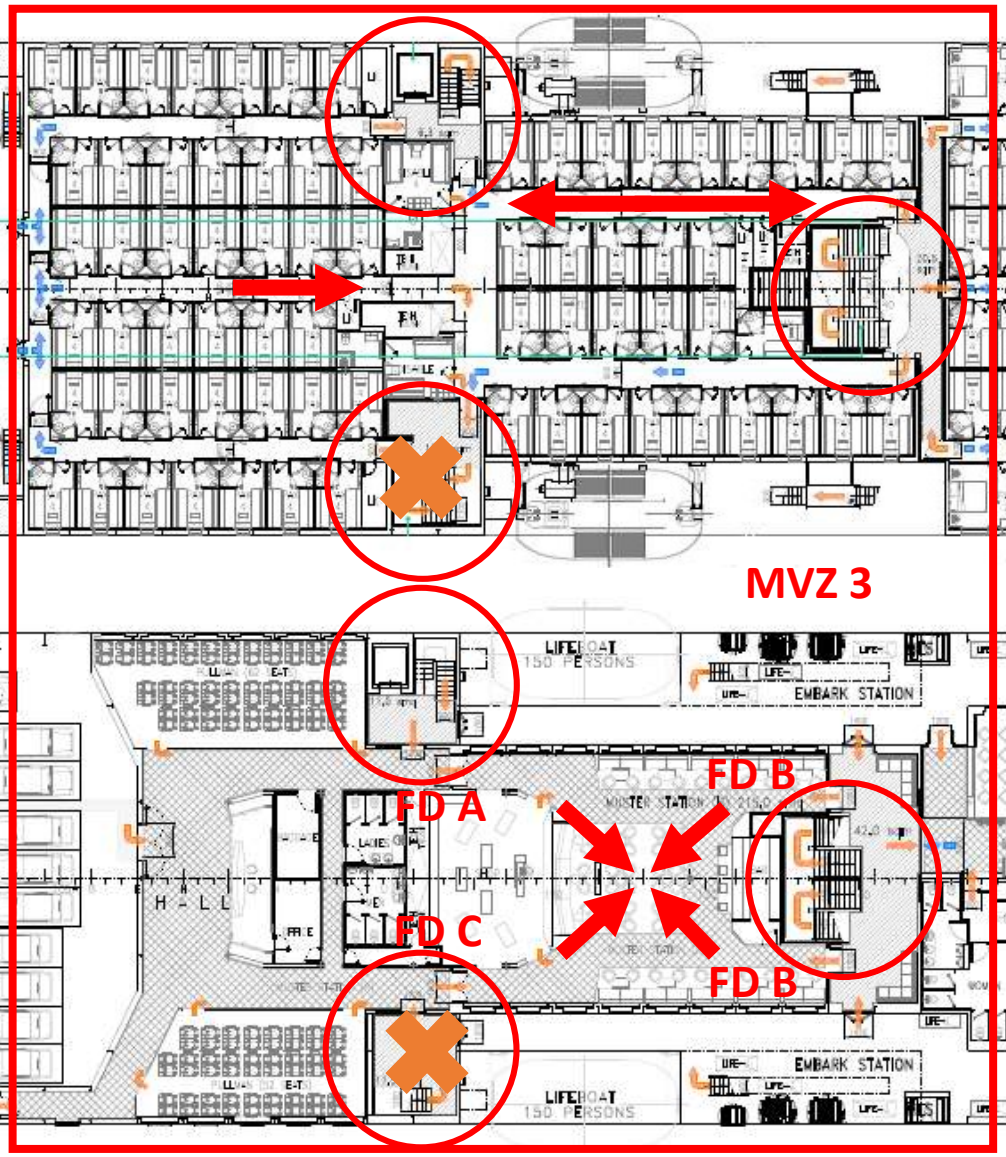
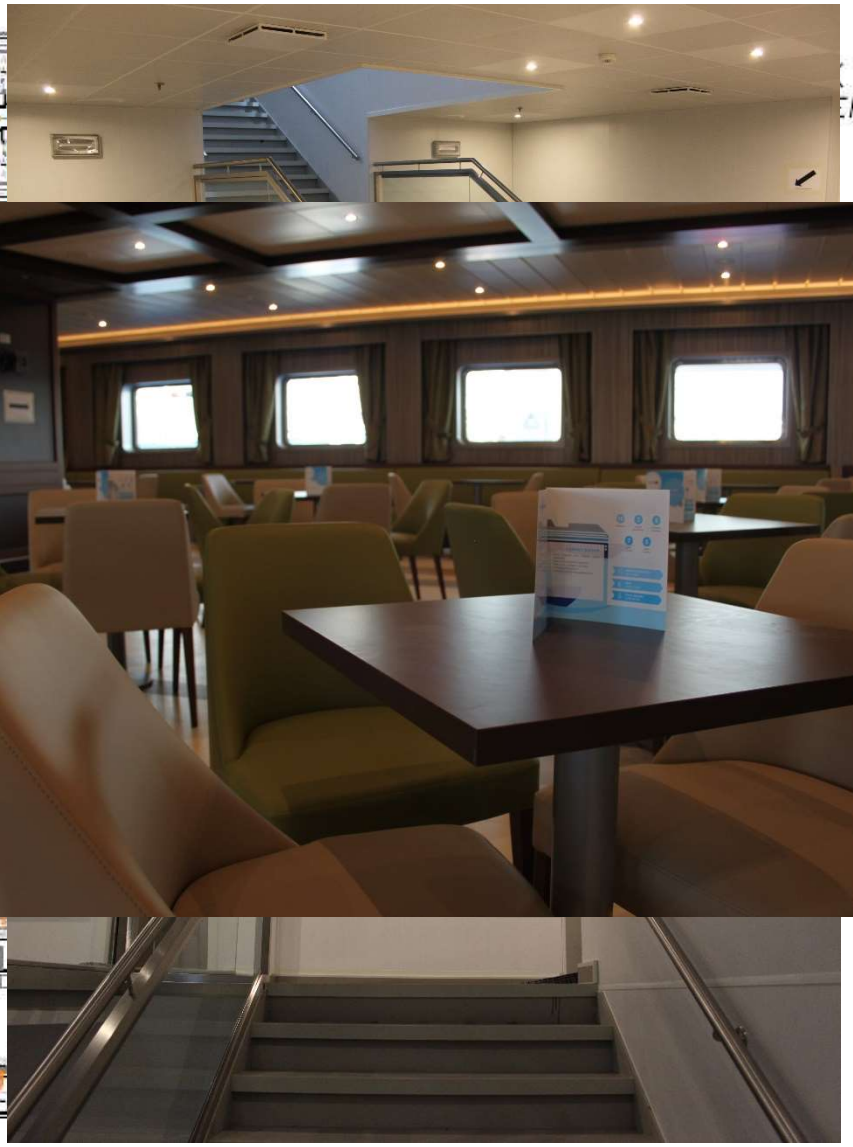
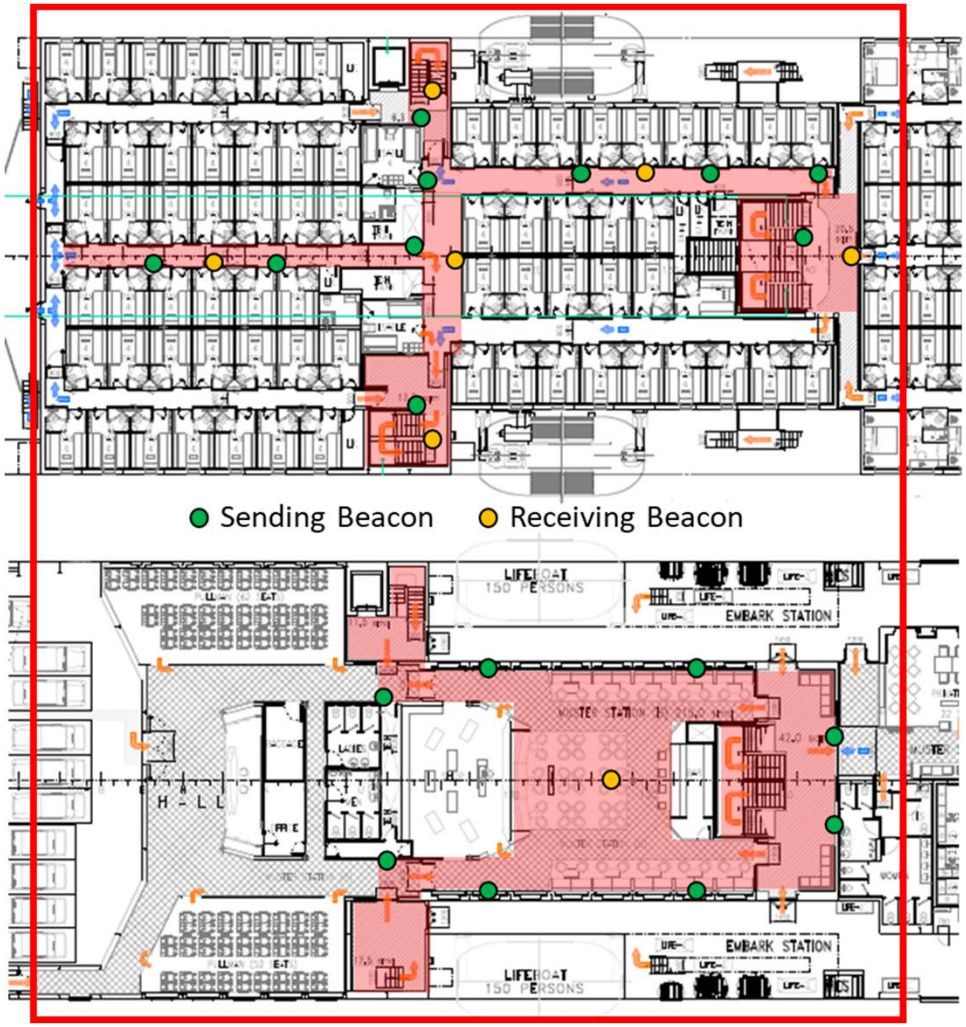
ISD LAB
INTEGRATED SHIP DESIGN

Experimental Campaign (Test Area)



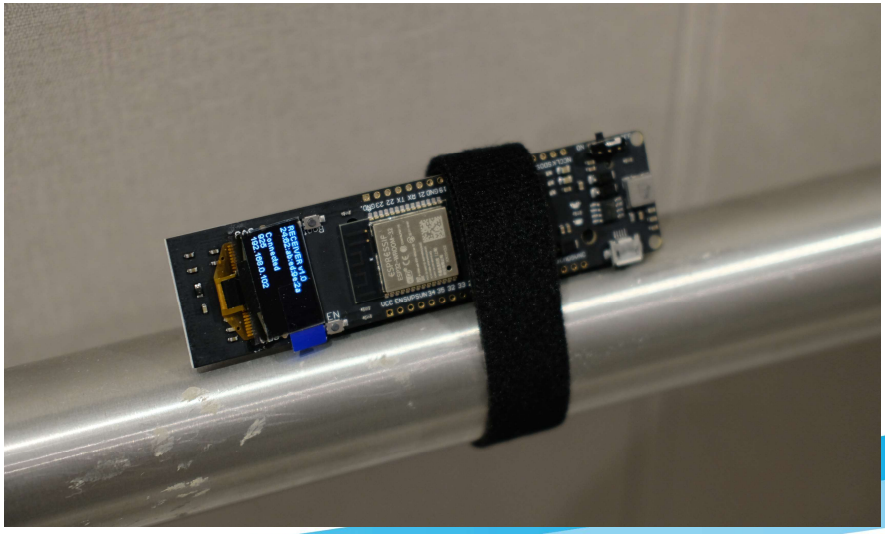


Experimental Campaign (Test Area)



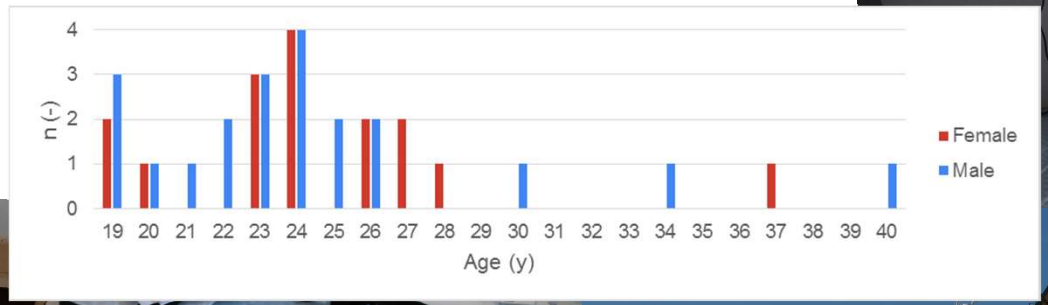
The area has been equipped with sending and receiving Bluetooth beacons

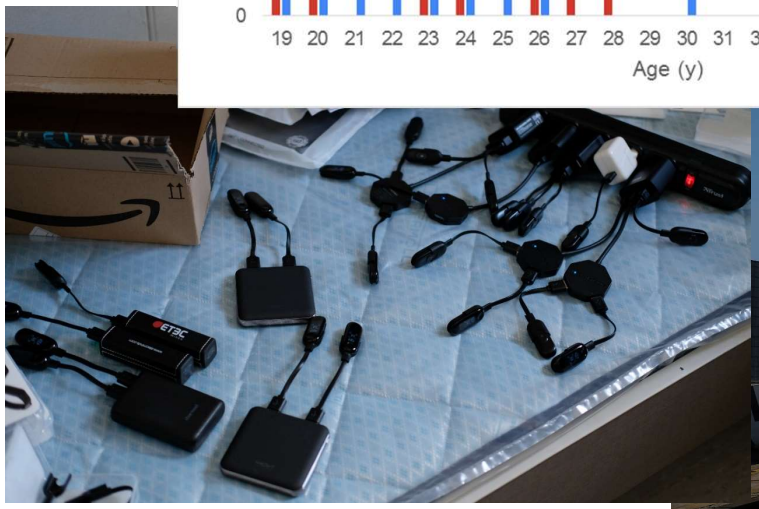
- Still-made structures (signal reflection/shielding)
- Reduction of signal strength



Experimental Campaign (Trials)

The trials have been carried out considering **multiple scenarios** (open/blocked doors, with/without guidance) in **random order**



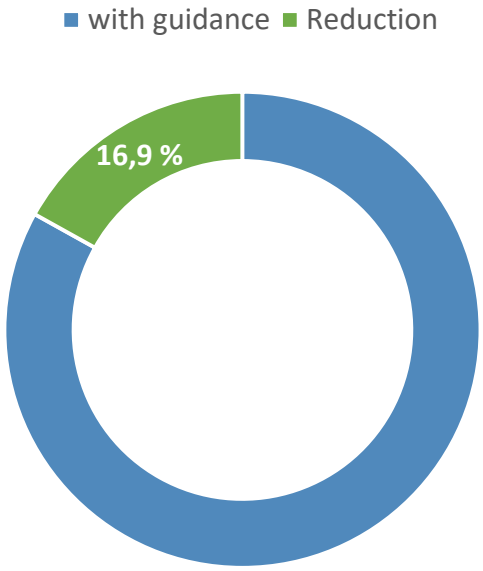


Experimental Campaign (Trials)

Pilot Project Results

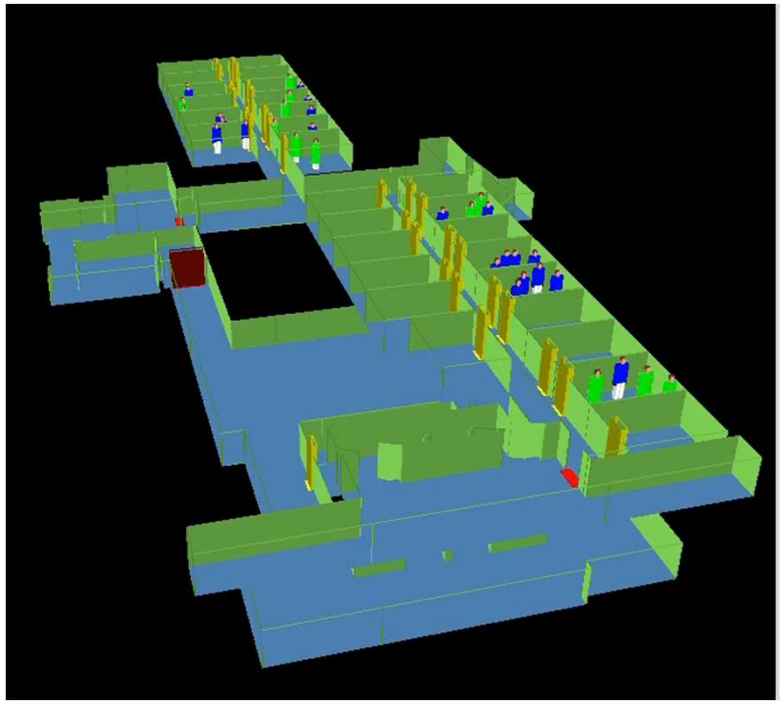
Thanks to the **smartbands guidance**, a significant **reduction of evacuation time** has been observed for all the scenarios having one or more **blocked escape routes**

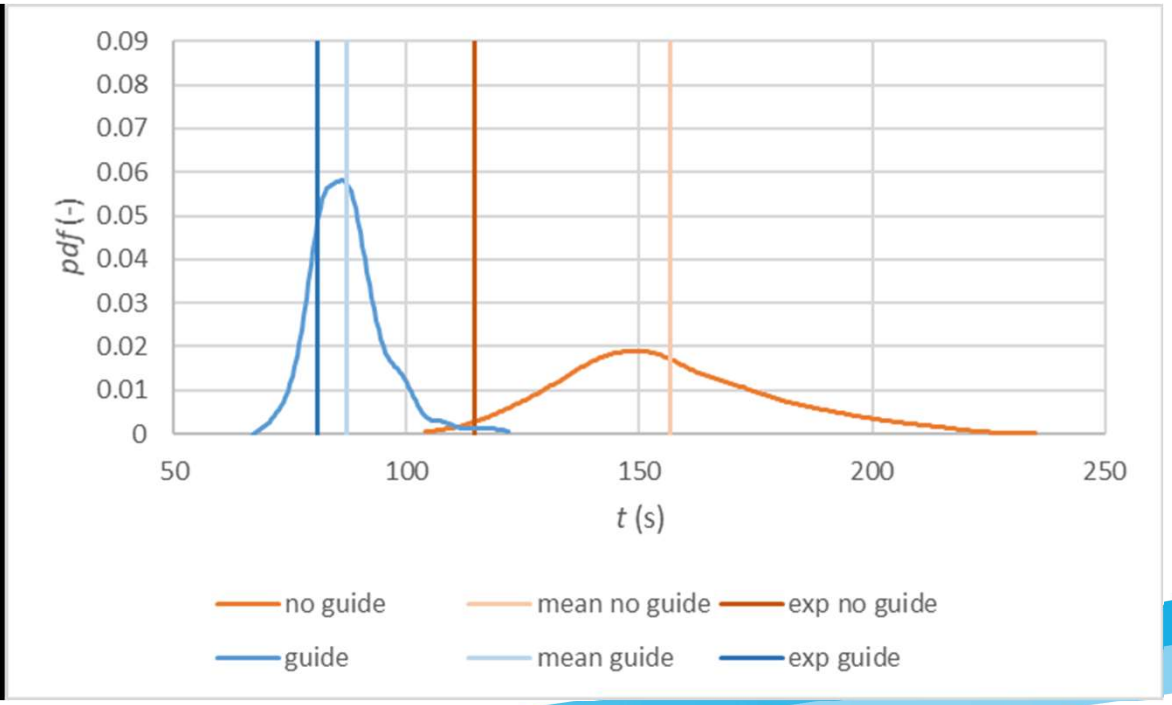
id	FD A	FD B	FD C	duration (s)		diff (s)	diff (%)
				no guide	guide		
01	open	open	open	100.0	105.0	-5.0	-5.0 %
02	open	open	blocked	114.5	81.0	33.5	29.3 %
03	open	blocked	open	87.0	78.0	9.0	10.3 %
04	open	blocked	blocked	124.0	104.0	20.0	16.1 %
05	blocked	open	open	96.0	75.0	21.0	21.9 %
06	blocked	open	blocked	106.0	103.0	3.0	2.8 %
07	blocked	blocked	open	130.0	74.0	56.0	43.1 %
mean				**108.2**	**88.6**	**19.6**	**16.9 %**



Pilot Project Results

A **methodology** has been developed to **reproduce trials** results with **evacuaion simulations**. The methodology can be used to evaluate **system benefits** if applied on **other geometries** (e.g. large passenger vessels)



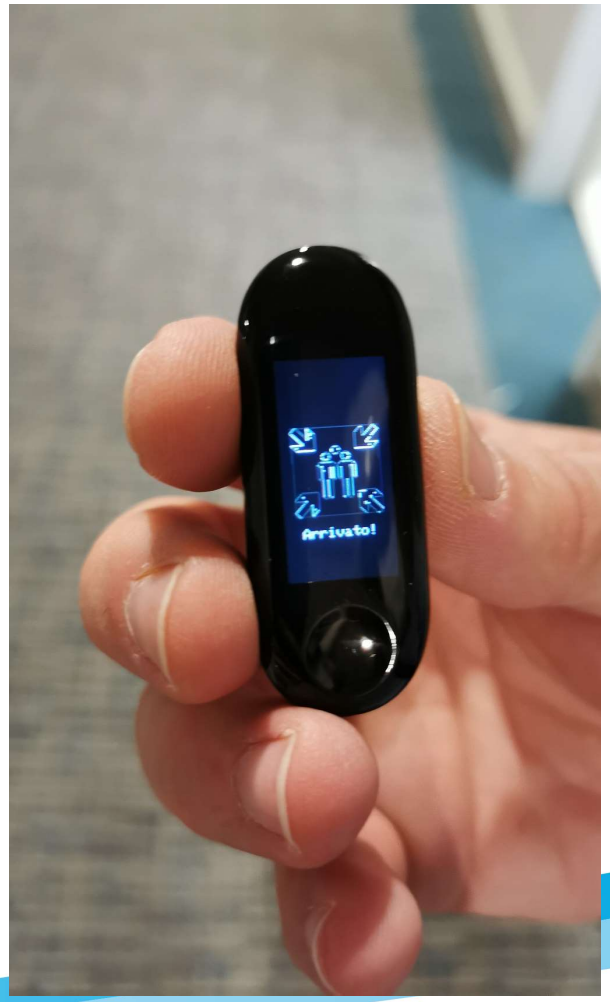


SWOT Analysis

STRENGTHS	WEAKNESSES
- Significant **reduction of evacuation time** in case of blocked escape routes - **Passenger localisation** data can help to better manage ship evacuation - Chosen system architecture and hardware assure **guidance** even in case of WiFi connection failure - The system can be **easily scaled**	- **Steel-made environment** impede the use of the compass and causes reflection of Bluetooth signals - The current solution is **WiFi based** (hence, WiFi shall be available at least at the beginning of an emergency) - Developed for **specific hardware** (smartbands) - Smartbands **battery capacity**
OPPORTUNITIES	**THREATS**
- Improved **safety of passenger vessels** (image return for shipping companies) - Localisation data can be used for **commercial purposes** too - **Additional information/services** for passengers	- Possible **privacy issues** related to localisation data - Too much **reliance** on technologies

Conclusions

- The plot project provided **expected results** (**reduction** of ship **evacuation time** through the application of mobile technology)
- For the test environment (restricted dimensions, short escape routes) obtained reductions are **significant** (average **16.9 %**)
- Gained experience in the real environment will help to p**revent and mitigate** the reported **issues** in the future
- These **encouraging results** and the employment of localisation data for **commercial purposes** is expected to foster the adoption of **mobile technologies** to improve ship **safety**



Thank you!

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