DigLogs

Test Case and Post Deployment Evaluation

5.2.2 Mobile Safety/Security Pilot

Responsible partner: UNITS Involved partners: All			
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1. Introduction

In order to prove the feasibility and effectiveness of mobile technology to improve onboard safety and security during ship evacuation, an experimental campaign has been planned on the RoPax ship GNV Bridge. A pilot system has been developed according to the pilot project plan and technical specifications. It is composed of a backend application running on a Raspberry Pi and a mobile APP running on wearable smartbands (LILYGO TTGO T-Wristband). The guidance and localization of devices have been carried out through Bluetooth beacons. The architecture of the pilot system is shown in Figure 1.

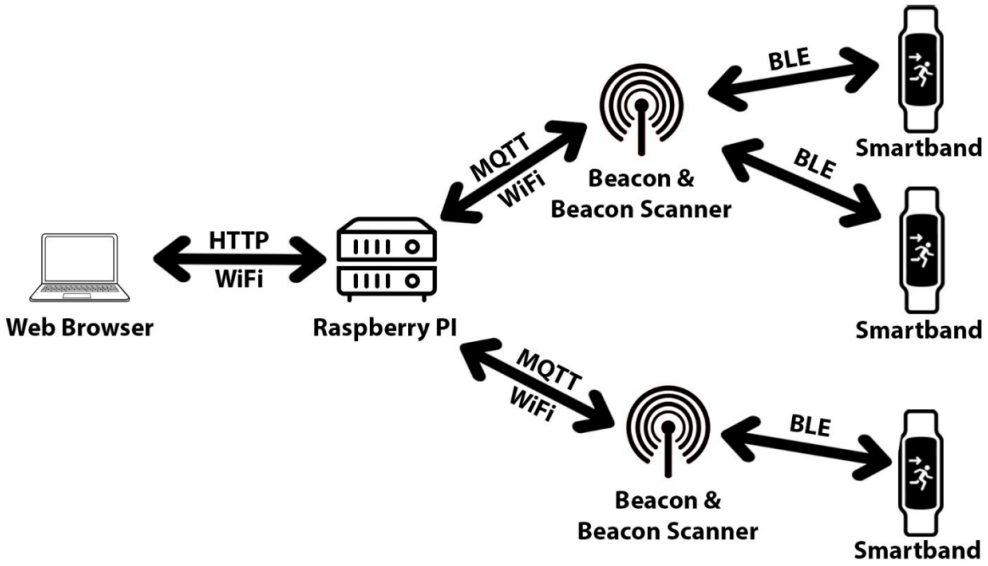

Figure 1. System architecture

2. Test Case

A significant onboard test area has been identified as test case comprising two public decks in the main vertical zone 3 of the GNV Bridge. In detail, it comprehends 2 cabins corridors on deck 6 and the main lounge at deck 5. The corridors and the lounge are connected by three staircases,

defining three alternative escape routes starting from cabins and arriving at the muster station in the main lounge. The test area is shown in Figure 2.

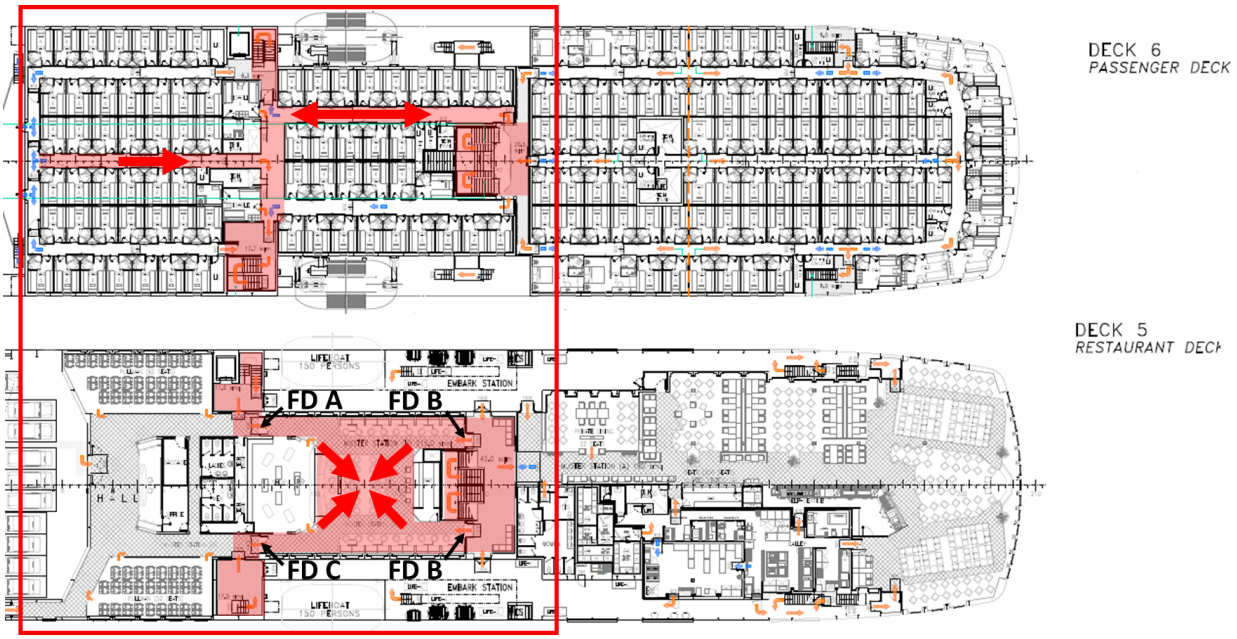

Figure 2 –The area (in red) used during the trials with the doors (FD) that can be closed to simulate the different scenarios

3. Results of the Trials

The trials have been carried out in April 2021 in Arsenale San Marco (Trieste). The system has been successfully set up in collaboration with the developer (ETEC Minds S.r.l.). The steel-made structures initially raised some issues due to signal shielding and reflection. The problem has been handled by keeping sending beacons signal strength as low as possible and limiting the number of active sending beacons in corridors. The configured system was considered suitable for trials with a sample population, thus it has been accepted by UNITS. The final configuration of the system for the test area is provided in Figure 3.

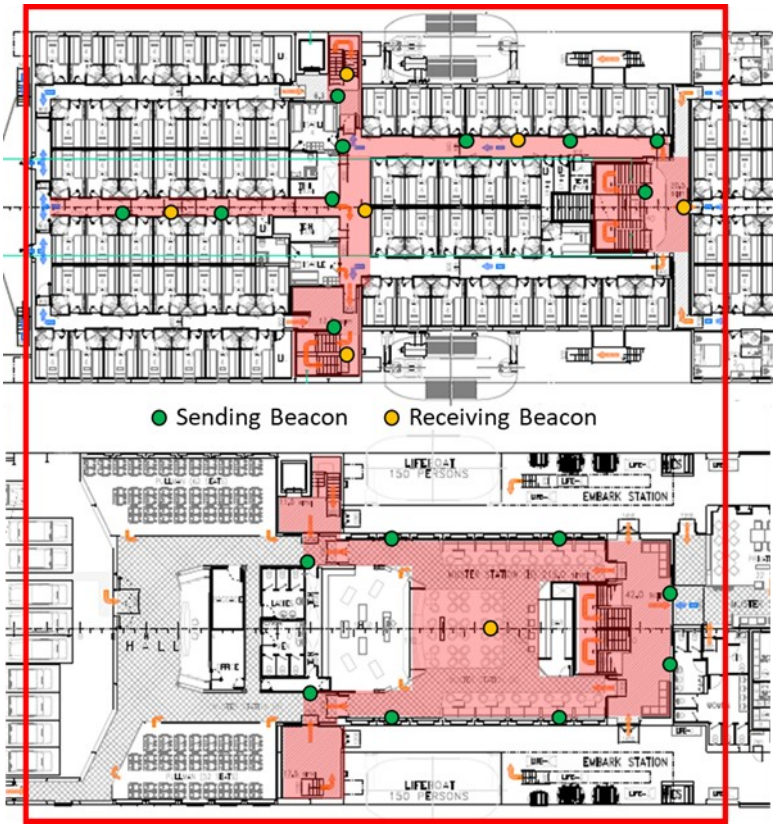

Figure 3 –Type and final position of the becons in the test area

A 37-persons sample population composed as shown in Figure 4 has been employed to test the pilot system functionality in several scenarios, including one or more blocked escape routes. The trials have been carried out with and without the guidance of the system. Due to the SARS-CoV-2 pandemic, the sample population recruitment was strongly limited, as well as the access onboard. The trials have been conducted according to a safety protocol developed to prevent infection from spreading.

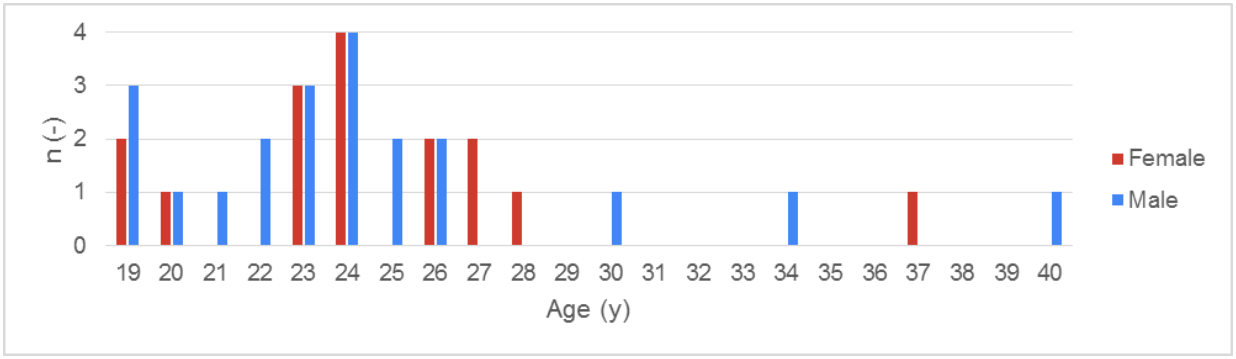

Figure 4 – Composition of the population employed during pilot system trials

The results of the trials for the tested scenarios are reported in Table 1. In general, the application of the pilot systems lead to a reduction of the evacuation time in all the scenarios involving at least one blocked escape route. When all the escape routes are available, a moderate increase in evacuation time was observed.

Table 1 – Results of the experimental campaign

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	-5.00%
02	open	open	blocked	114.5	81.0	33.5	29.26%
03	open	blocked	open	87.0	78.0	9.0	10.34%
04	open	blocked	blocked	124.0	104.0	20.0	16.13%
05	blocked	open	open	96.0	75.0	21.0	21.88%
06	blocked	open	blocked	106.0	103.0	3.0	2.83%
07	blocked	blocked	open	130.0	74.0	56.0	43.08%
mean				**108.2**	**88.6**	**19.6**	**16.93%**

After the trials, the system has been moved to the University of Trieste where it will be maintained after the DigLogs project conclusion.

4. Conclusions

After the deployment and test phase of the pilot system, the main goal is considered achieved. In fact, the application of mobile technology has been proved feasible in a teal operative environment. Furthermore, it has been proved capable to reduce the evacuation time in case of blocked escape routes. In these scenarios, passengers can be safely guided towards available escape routes, avoiding wasting time and removing the need to find out alternative routes when the main one, indicated by fixed onboard signalling, is unavailable for some reason.

The average reduction of evacuation time is 16.9 %. This is a remarkable result, considering that the tst area was limited and the escape routes were quite short. Thus, it is expected to obtain even better results in more complex environments, such as cruise vessels. In conclusion, the results of the pilot project are expected to foster the application of mobile technologies to improve the safety and security of ships. This objective can be more easily fulfilled if the mobile technology will be used onboard to provide additional commercial services onboard during the normal operation of the vessel.