



## PROJECT DELIVERABLE REPORT



Introducing advanced ICT  
and Mass Evacuation Vessel design  
to ship evacuation and rescue systems

### **D3.6 PALAEMON VR Glasses component**

A holistic passenger ship evacuation and rescue ecosystem

MG-2-2-2018

Marine Accident Response



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## Abbreviations

AAA	Authentication, authorization, and accounting networking
AAD	Azure Active Directory
AC	Alternating current
AD	Active Directory
AIS	Automatic Identification system
AR	Augmented Reality
BLE	Bluetooth Low Energy
BP	Blood Pressure
DFB	Data Fusion Bus
DSS	Decision Support System
DSS	Decision Support System
EAP	Extensible Authentication Protocol
EMM	enterprise mobility management
FCC	Federal Communications Commission
FIDO2	Fast Identity Online
GDPR	General Data Protection Regulation
GPS	Global Positioning System
GPS	Global Positioning System
HEX	Hexadecimal Number String
HR	Heart Rate
HW	Hardware
ICT	Information and Communication Technology
IoT	Internet of Things
IPv4	Internet Protocol version 4
IT	Information technology
JSON	JavaScript Object Notation
LRS/LMS	Learning Record Store/ Learning Management System
MAC	Media Access Control address
MDM	Mobile Device Management
MEE	Maritime Emergency Evacuation
MEV	Massive Evacuation Vessel

MOB	Man Overboard
MR	Mixed Reality
MSA	Microsoft Service Accounts
NTLM	Network LAN Manager
OOBE	Out of the box experience
PaMEAS	Passengers Mustering and Evacuation Process Automation System
PIMM	PALAEMON Incident Management module
RF	Radio Frequency
RTLS	Real-Time Location System
SB	Smart Bracelet
SC	Smart Cameras
SEM	Smart Evacuation Management
SHM	Structural Health Monitoring
SMS	Safety Management System
SRAP	Smart Risk Assessment Platform
SSID	Service Set Identifier
SSS	Ship Stability toolkit
SST	Ship Stability Toolkit
URL	Uniform Resource Locator
VR	Virtual Reality
WCD	Windows Configuration Designer
WU	Windows Update

## 0 Executive summary

Within the PALAEMON project, virtual reality (VR) technologies along with the AR systems, will have the unique mission to enhance staff training and awareness and to facilitate knowledge transfer and best practices standardization. VR users will have the ability to safely drill various passenger safety related scenarios. The VR technology will allow therefore a full immersion of the users enabling first hand cooperation between trainees and subject matter experts.

This guide will allow provide users with an overview on the VR headset Oculus Quest to be used in the PALAEMON project.

The first chapter of this guide will provide an overview of the VR within the PALAEMON project. Technical specifications of the Oculus Quest will be detailed in the second chapter. In the third chapter, this guide will provide details on configuring and using the VR headset. VR technology comes with an array of health and safety warnings, indications that will be addressed in chapter four.

The guide will conclude with an overview on the VR implications, risk and recommendations within the PALAEMON project.

## 1 VR Glasses Component Introduction and Overview

### 1.1. VR Introduction

Virtual reality VR is a term used for computer generated environments that allow the user to enter and interact with alternate realities. The users are able to immerse themselves to varying degrees in the artificial world which may either be a simulation of some form of reality or the simulation of complex data.

Throughout the environment simulation, the focus is on reproducing its aspects as accurately as possible to create the illusion of an alternate reality. This can involve not only the 3D images but also 3D sound and various other inputs and effects.<sup>1</sup>

### 1.2. Overview within PALAEMON

Within the PALAEMON ecosystem, the VR technology plays along with the AR devices a crucial role in the training component and remote monitoring. VR training system is providing the chance to do “on sight” training and evacuations in a virtual environment with full free degree of movement. The PALAEMON Academy will therefore employ VR technology to train the handling of people with special needs in crisis situation, transport handling of special gear, general evacuation, civil crowd control, use of VR Training systems, AR training onsite and first aid for special situations and triage on rescue elements.

Some of the specific tasks that can be conducted in the PALAEMON with the help of VR:

- Training of staff;
- Assessment of staff;

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1

W. Sherman and A. Craig- *Understanding Virtual Reality: Interface, Application and Design*. Morgan Kaufmann Publishers, 2003

- Drill scenarios development;
- Continuous improvement of safety procedures;

The VR hardware to be used within the PALAEMON is Oculus Quest.

## 2 Visualization on VR glasses: GUI and menus

This chapter will describe the technology associated with PALAEMON Academy to understand the context for the implemented GUI elements and hardware used. Oculus Quest offer a completely egocentric representation of a simulated virtual environment. Here we will present the main interface and sections for the PALAEMON Academy Application.

Unlike other VR devices, the Oculus Quest headsets provide a seamless way of experiencing virtual reality environments. Headsets allow crew members to freely move within a simulated 3D world, move their hands in by using the headset controls and also have the possibility to move and interact with objects within the environment and virtual characters.

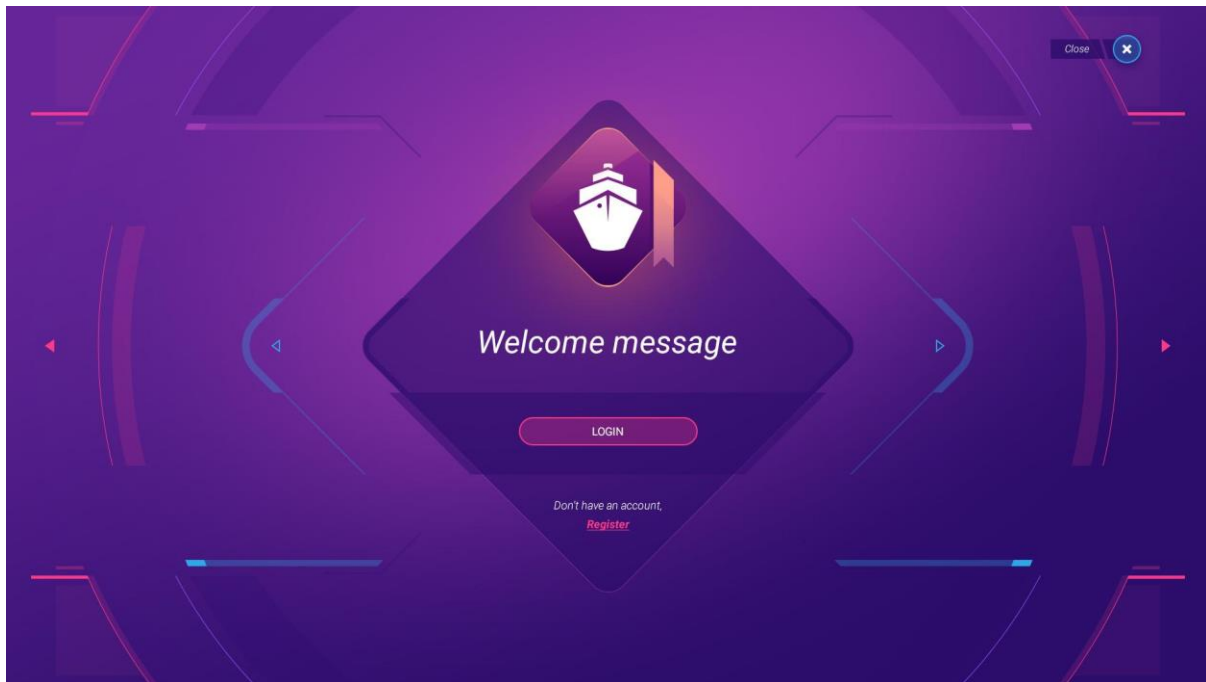
### 2.1. Main menu

As any other software program, the PALAEMON Academy application will be deployed on the headset. By launching the application a personalized loading screen will appear. The loading screen will be displayed until the application resources will be loaded. To lower loading times, the application was split in several modules, called Scenes. The first scene is the main menu scene which includes the loading screens, main menu of the application, the settings and the documentation needed within the simulations.



*Figure 1: Loading Screen*

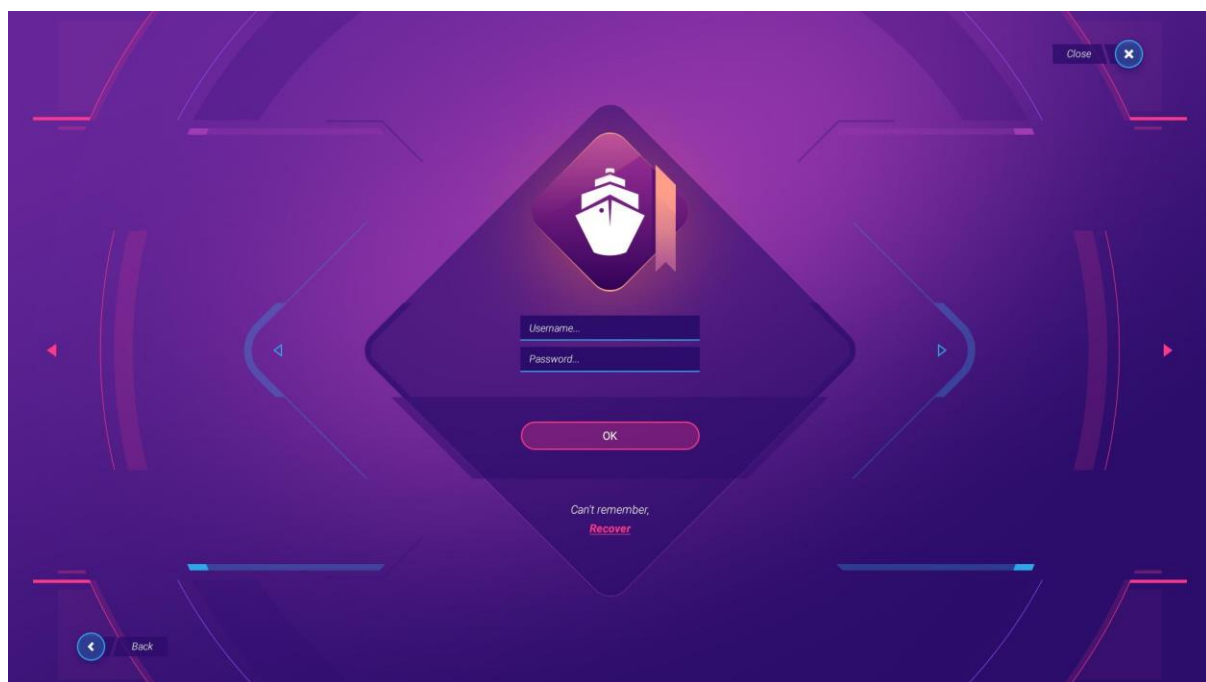
After the loading process completes, the login screen of PALAEMON Academy will be presented.



*Figure 2: Welcome message*

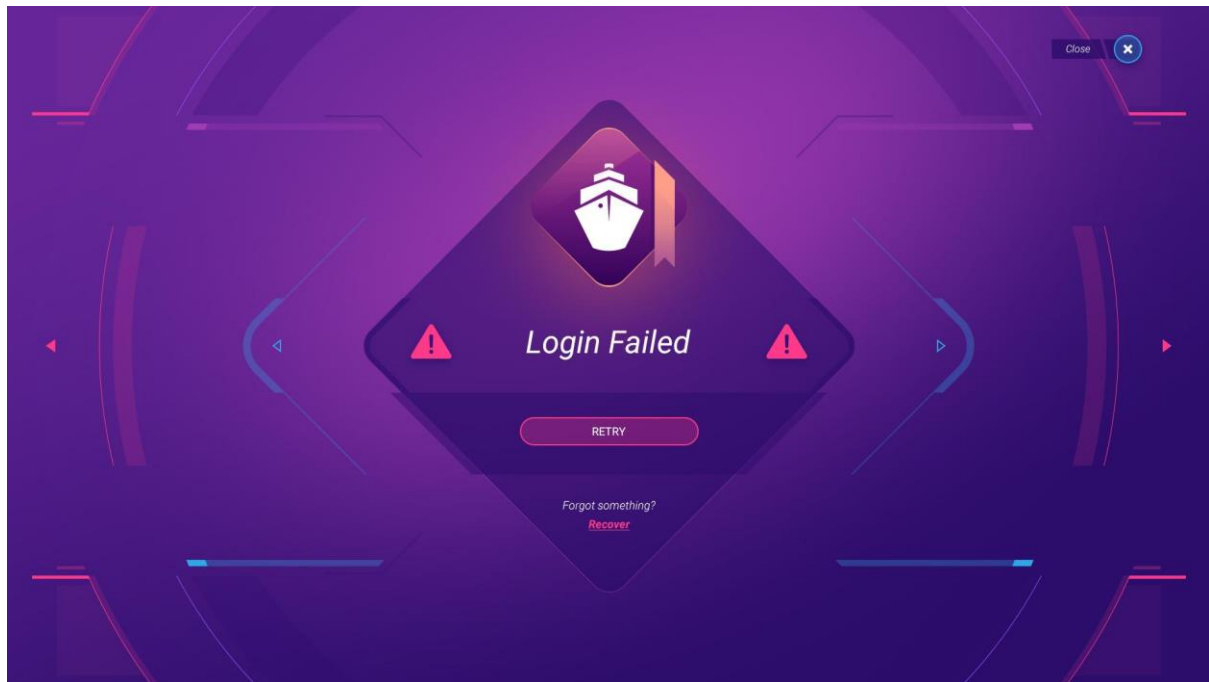
In this screen you will have the possibility to login with an existing account or to register for a new account.

After you press the **login button** the following screen will be presented:



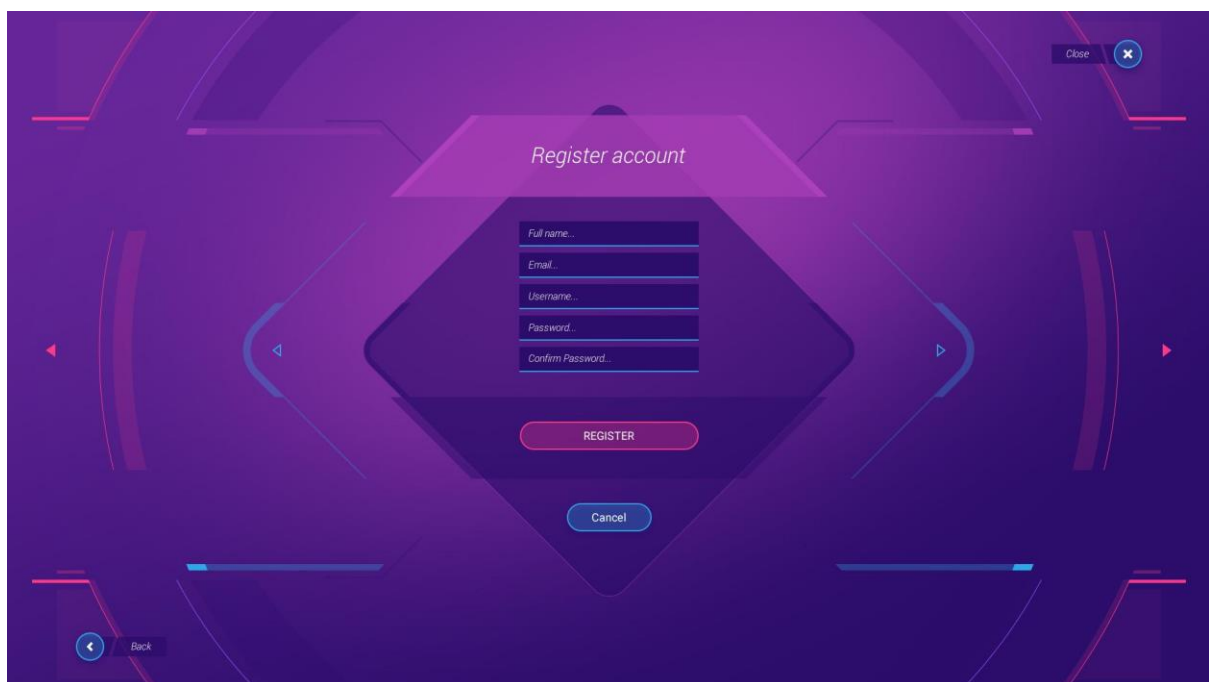
*Figure 3: Login*

You will need to provide the username and password.



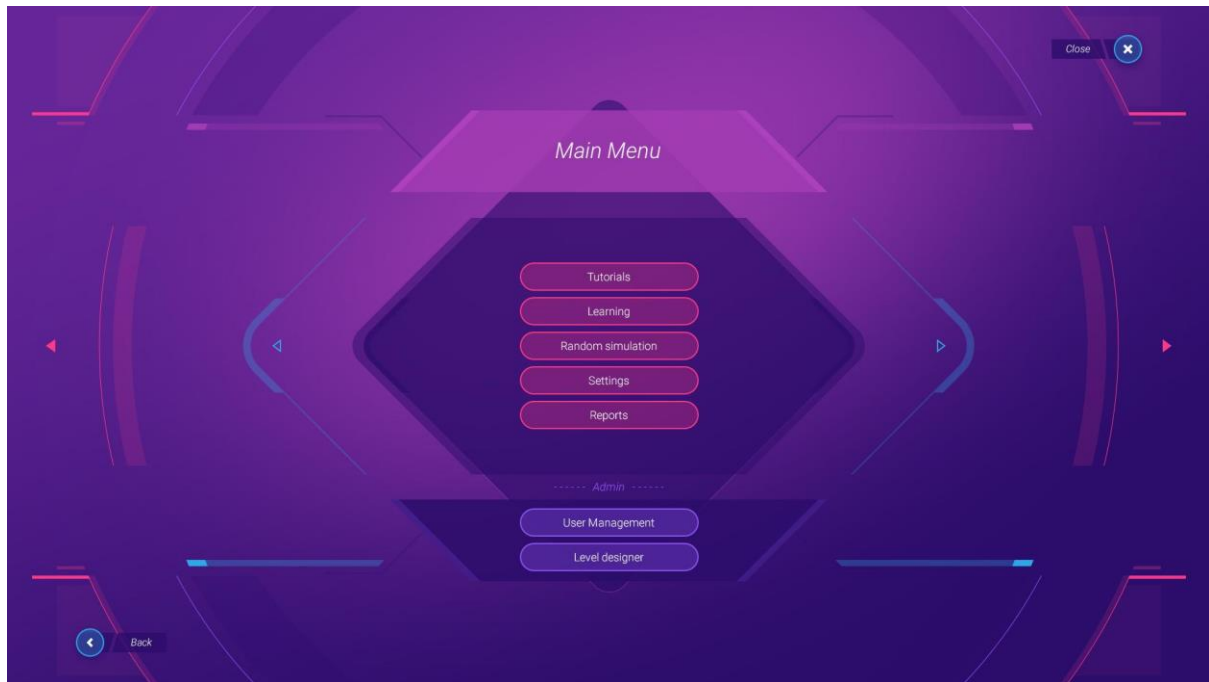
*Figure 4: Login Failed*

The application also embeds a Password recovery option in case you forget your credentials. If you don't have an account you can apply for a new one at any time by pressing the Register button.



*Figure 5: Register account*

The account registration is required to persist user data and to assure a progress report. Once you managed to Login or Register, the Main menu will be presented:



*Figure 6: Main Menu*

Within the main menu we have:

**Tutorials** - this section allows the user to perform several short tutorials to get used to the VR world, controls and navigation. The tutorials will be progressive. The crew members will need to start from the navigation tutorials until they are allowed to play the scenarios.

## **2.2. Authoring Tool**

The authoring tool is built as a complementary solution for customizing the existing scenarios and creating new ones. The virtual world is big enough and include different room types, corridors, tight spaces, stores, service areas, staircases, decks and other environment elements to allow the simulation of different scenarios. The Authoring Tool will allow the editors to place virtual objects, zone markers, apply simple objectives, to add hazards and select their intensity. The application will also include a planning of events. The editor will be able to try a scenario before saving it. The Authoring tool will be able for the users with Editor Role. The Authoring Tool won't be available for the actual crew members.

The Editor provides a simplified GUI, as shown in Figure 6.



*Figure 7: GUI*

On the top left, there will be the close button to get back to the main menu.

On the middle top of the screen there will be a special menu to add the interactive and static elements to the actual screen.



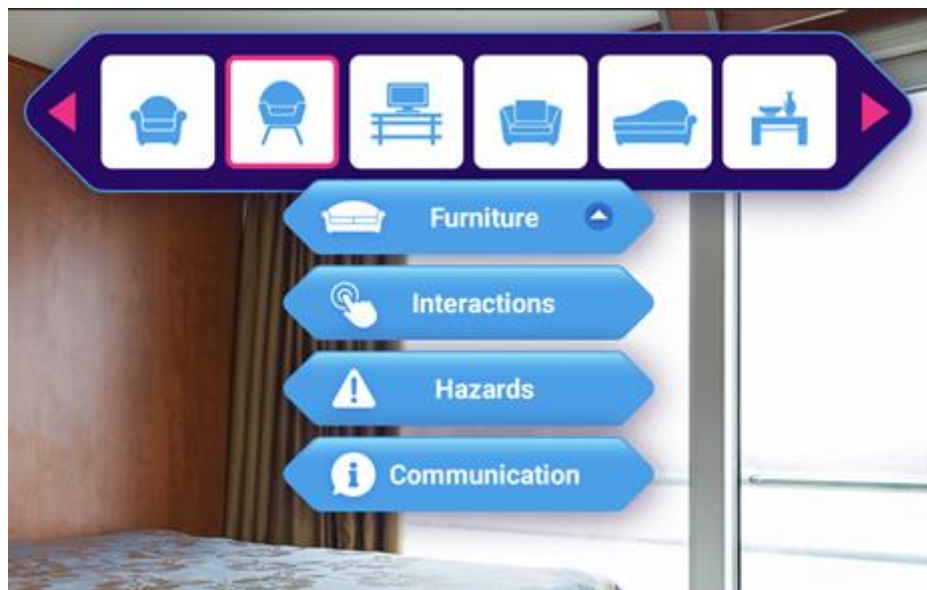
*Figure 8: Special Menu*

Those buttons will open a horizontal scrollbar from which the editor can choose several objects types:



*Figure 9: Categories*

Once the category is selected, the user is able to select one of the objects within the scroll or to change the category by pressing the drop down menu below the scroll:



*Figure 10: Dropdown categories*

The interactive elements are grouped in several categories:

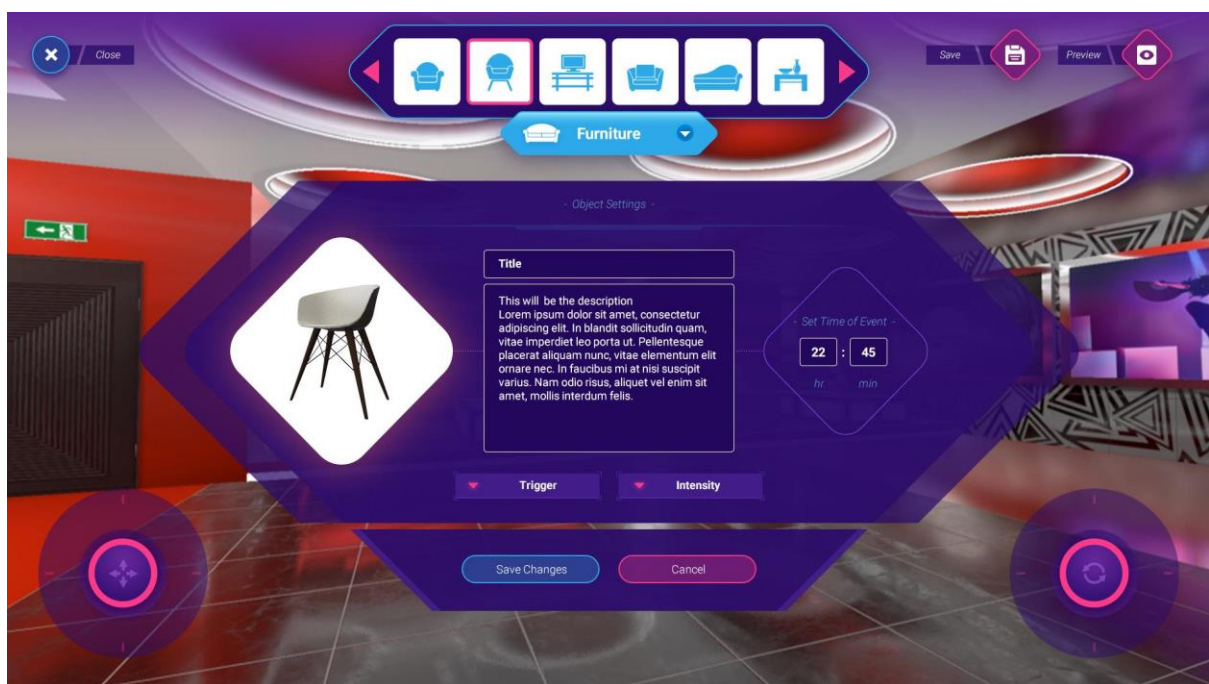
Furniture- allows placing furniture items:



*Figure 11: Interactive Elements*

The placing menu allows the user to Edit the description of the object, delete the object, rotate it and move it once it is pressed.

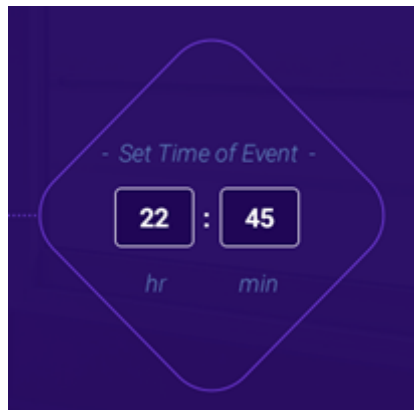
The edit window will look similar to the below image:



*Figure 12: Edit menu*

It allows the editor to add a description of the object, to add an interactive trigger group (perform a predefined action) and to select the intensity level of that trigger. Certain triggers will have several intensity levels.

Also, the editor is able to plan an action by using the time menu on the right, if a certain element, animation or hazard must be triggered at a certain point by planning the time.



*Figure 13: Animation timer*

Once the editor is happy with the description and the triggers, they must save the changes by pressing the designated button to persist the data within the scenario.



*Figure 14: Save changes*

Other interactive objects planned to be developed are:

- Hazards such as fires, smoke, flood;
- interactive objects such as extinguishers, blocked doors, first aid kits;
- Interactions - such as placing jammed doors, blown fuse box, burn wires;
- Communication - virtual messages that will appear once they perform an action or they reach a milestone.

### **2.3. Scenario simulation**

The simulation represents the main function of the application. Once the users access this section, the app will try to connect to the PALAEMON System to retrieve actual ship data.



Figure 15: Simulation System

The interface is configurable and it is comprised of 4 main zones:

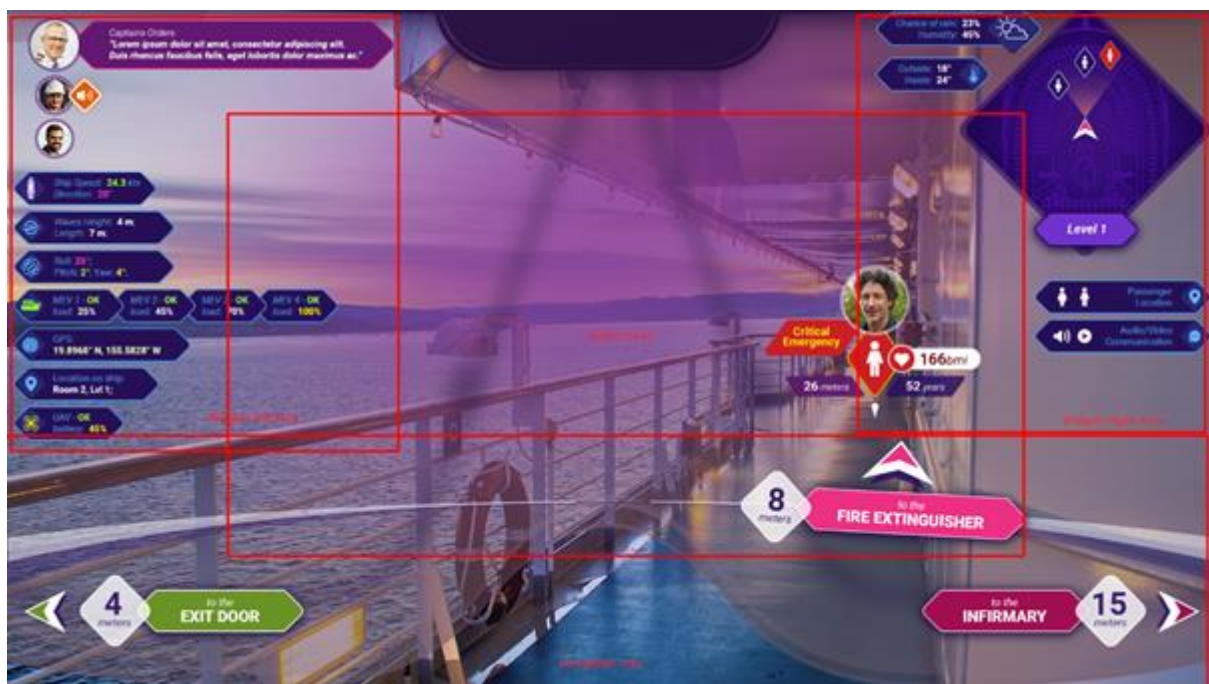
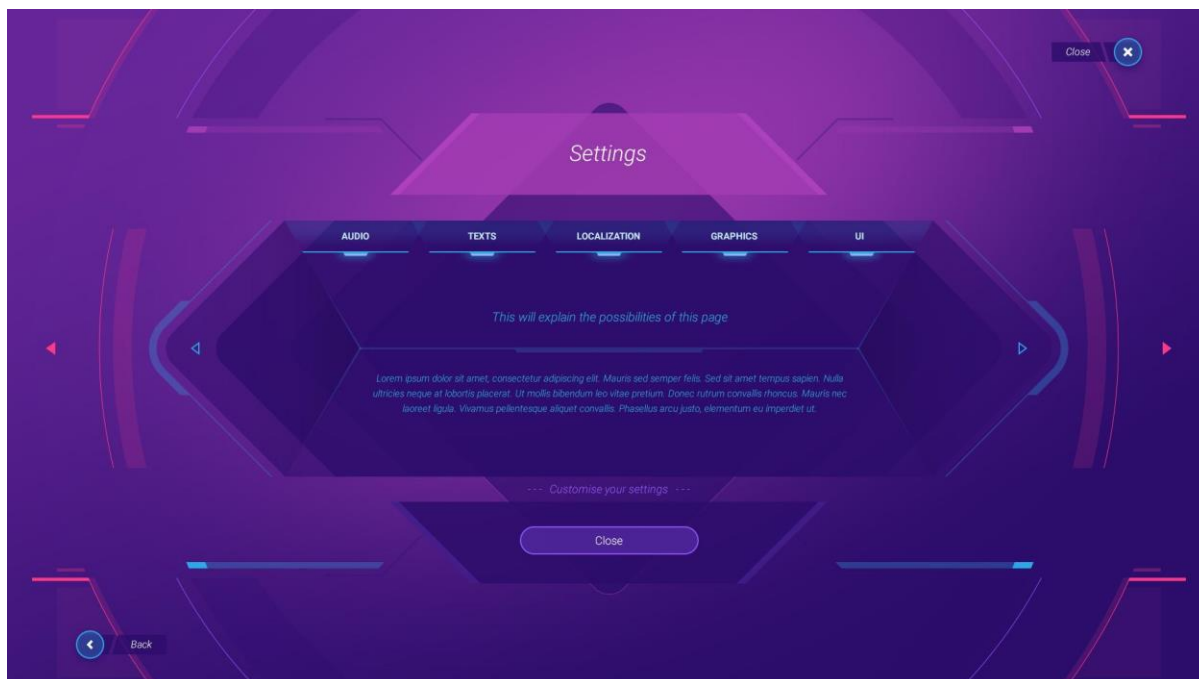


Figure 16: Simulation interface

The Left and Right zones are reserved for the widgets. They can be activated/deactivated or repositioned.

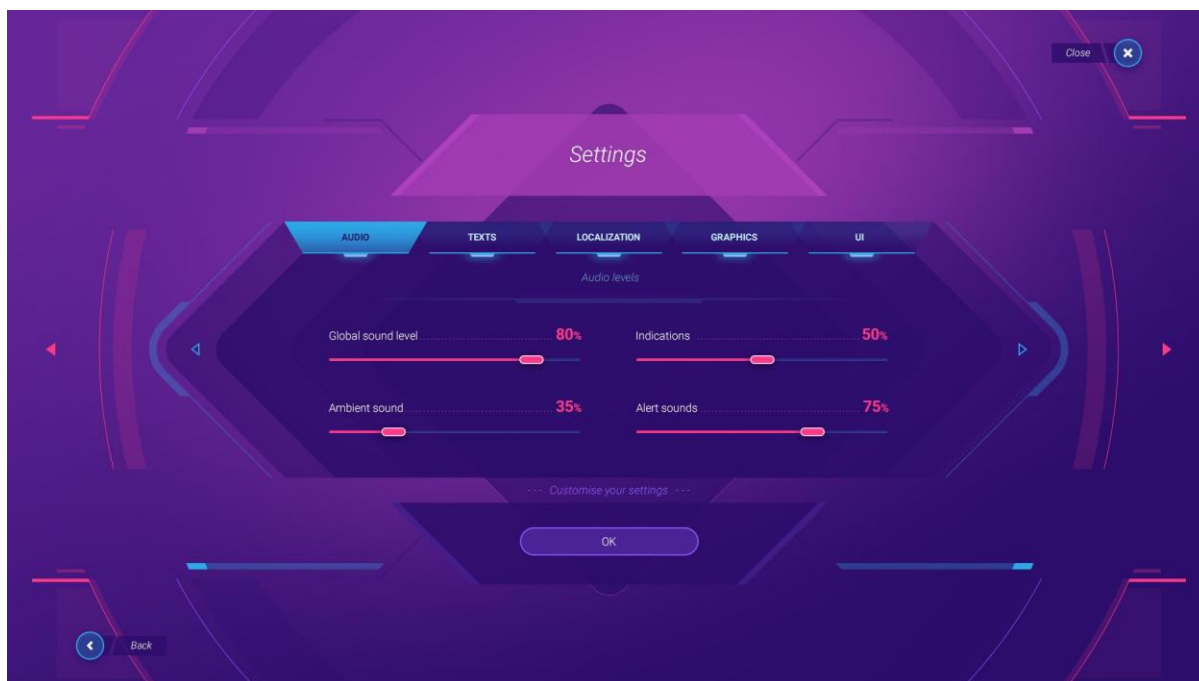
The Center Area - this area is reserved for displaying critical information, waypoints to passengers with emergencies. The bottom area, which is reserved for providing guidance to the main Points of Interest (POIs).

## 2.4. Settings section



*Figure 17: Settings section*

This section will allow the user to change the Audio settings:



*Figure 18: Audio settings*

The user will be able to customize the sound level for the alerts, for the indications, the global app sound level and ambient sounds (within rooms). The settings will be stored within the device.

## 2.5. The texts

This tab within the screen will provide support for changing the text size within the interface. The texts will have preview areas and the users will be able to see the modifications in real time:



Figure 19: Text size

The same will be for the widgets and alerts texts. The users will be able to customize and view in real time the text dimensions:



Figure 20: Temperature sensor

To persist the settings, the users must click the confirmation button at the bottom.

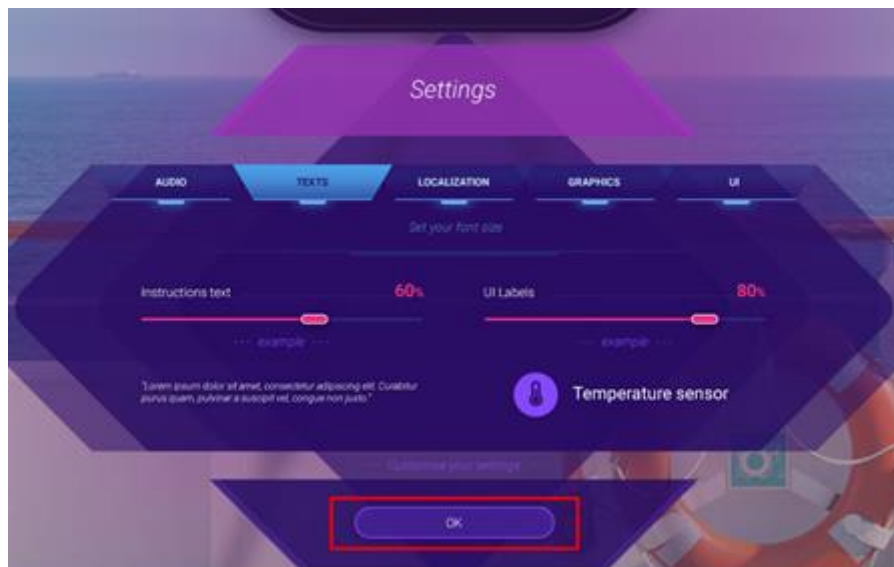
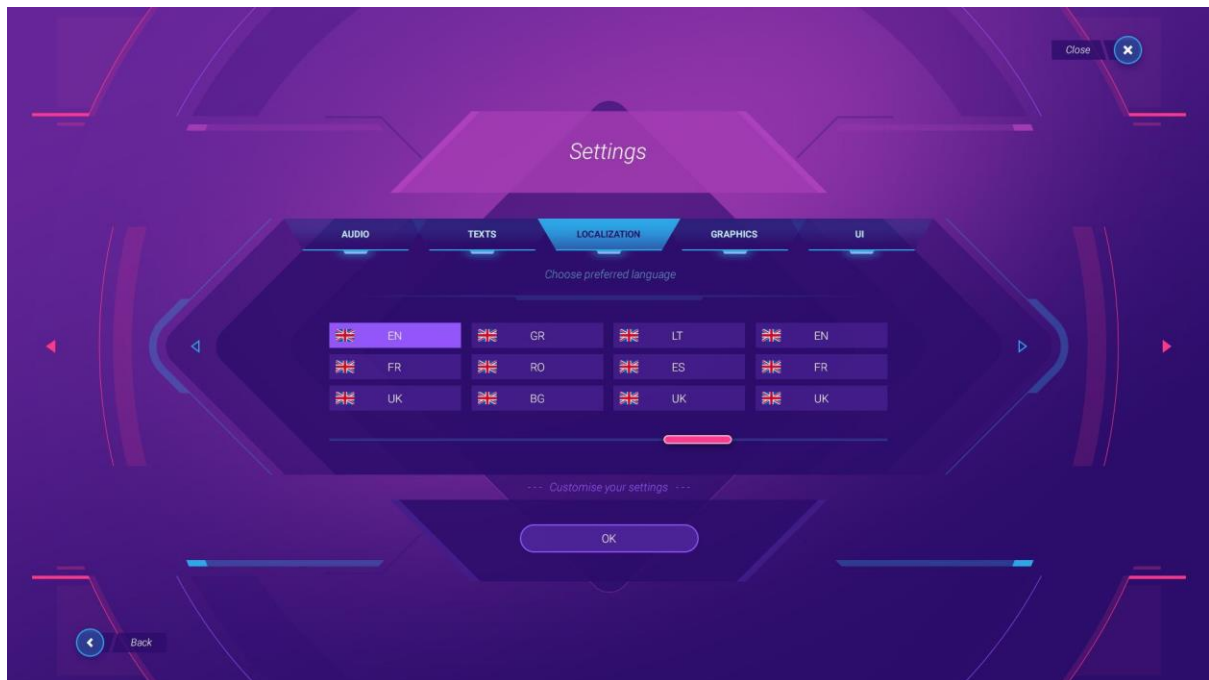


Figure 21: Settings confirmation

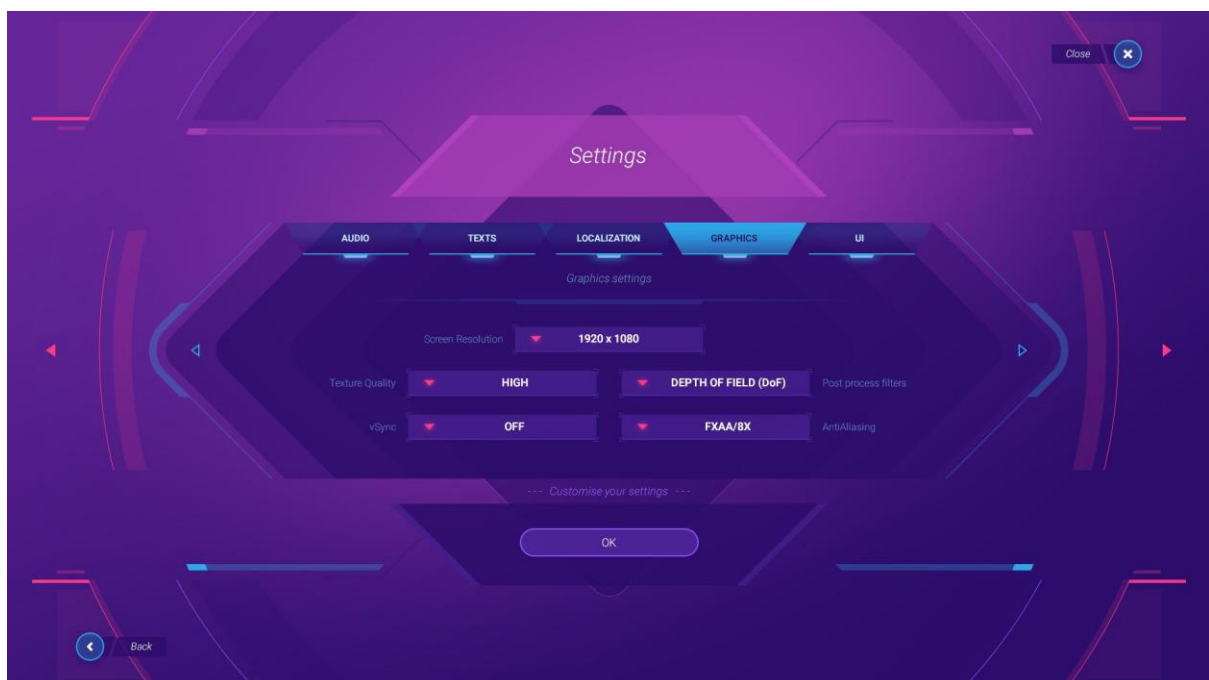
## 2.6. The localization tab



*Figure 22: Localization Settings*

Within the localization tab, the user will be able to change the content UI language by simply clicking the desired language button. To persist the data, the confirmation button below the language selector must be pressed.

## 2.7. Graphic settings



*Figure 23: Graphics settings*

The graphics tab will allow the user to customize the quality of the overlaid 3D objects, processing filters, and be used to activate vertical sync and the antialiasing level. Some of the settings might change within the final version of the app due to hardware limitations.

## 2.8. UI and Widget area

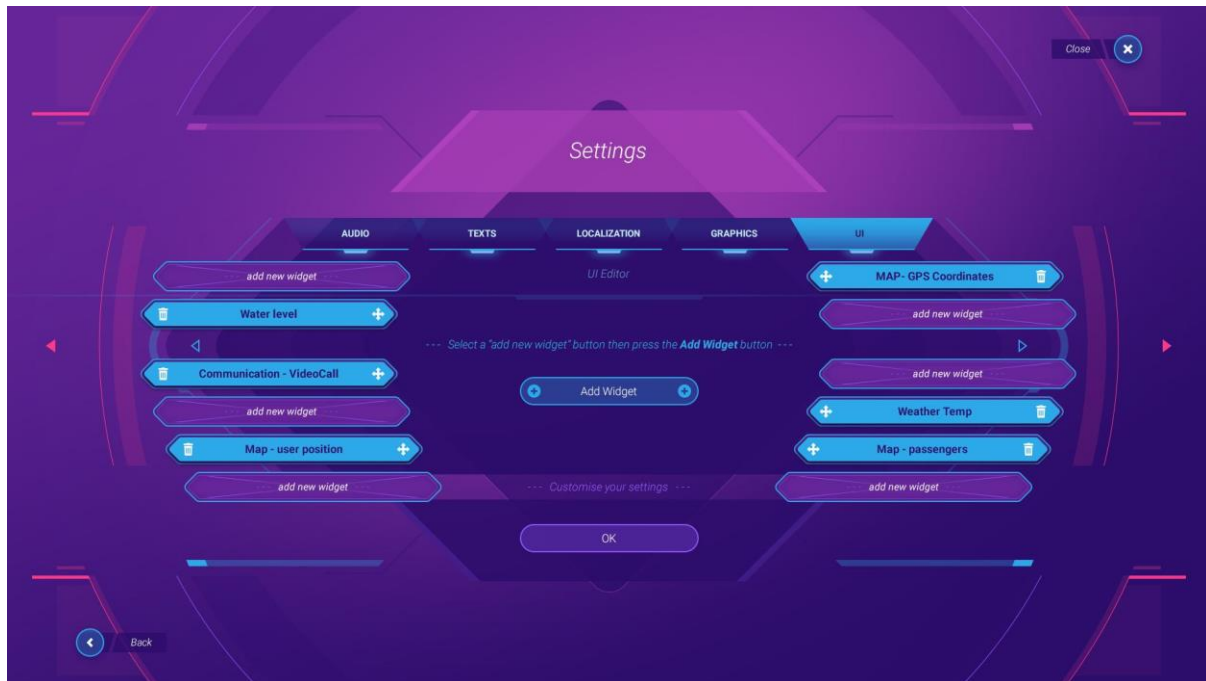


Figure 24: UI Settings

Within this tab, the users will be able to customize the widgets they see within the headset.

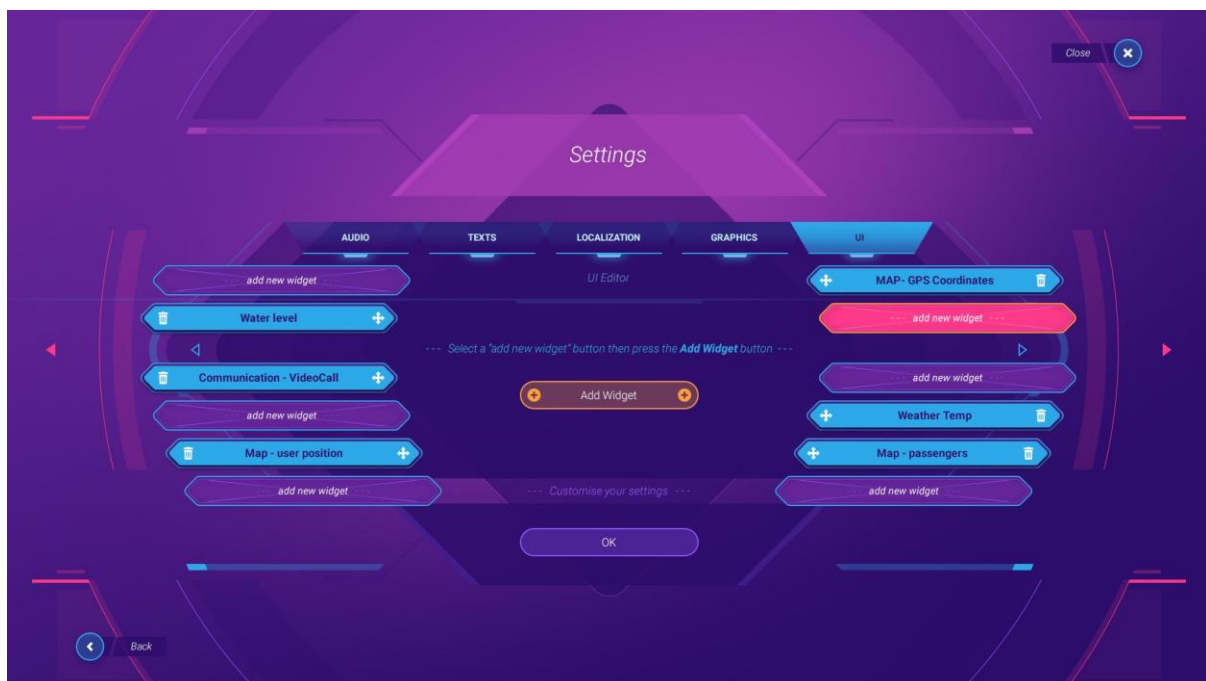


Figure 25: Widget settings

They will need to select a zone for the widget (where they will be displayed no.1) then to press the Add Widget button (no2.) to open the widget selection window:

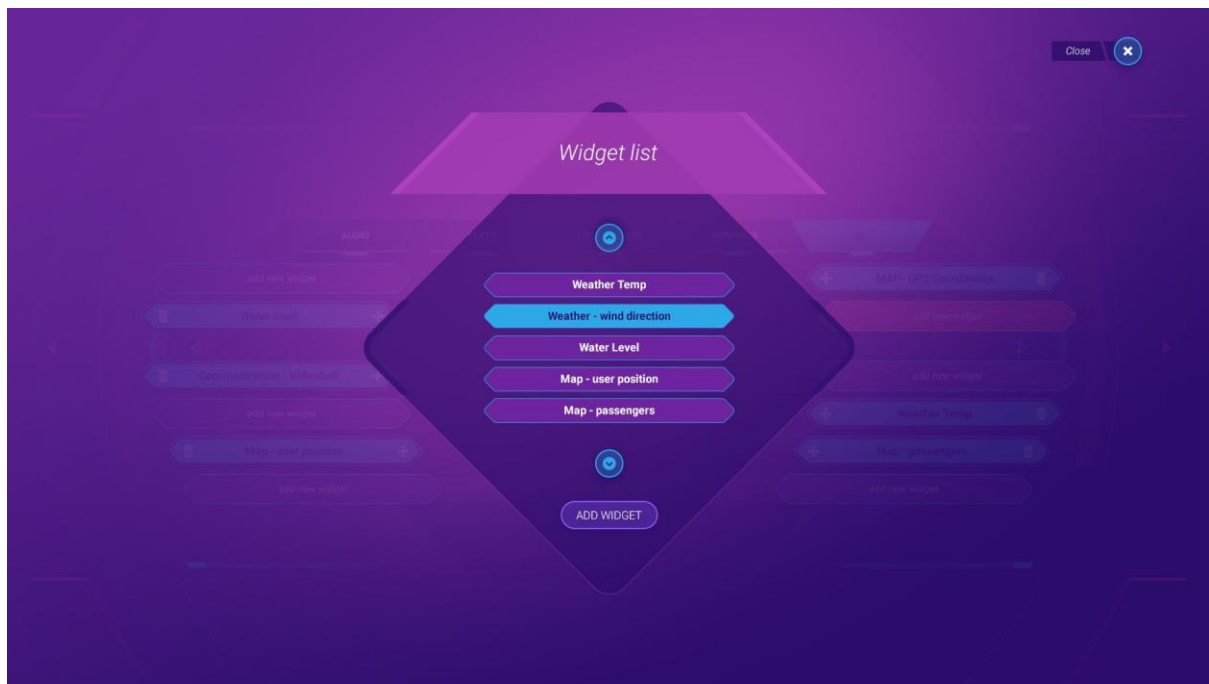


Figure 26: Widget list

Within the popup above, the user will be able to select the desired widget.

A customized GUI might look similar to:

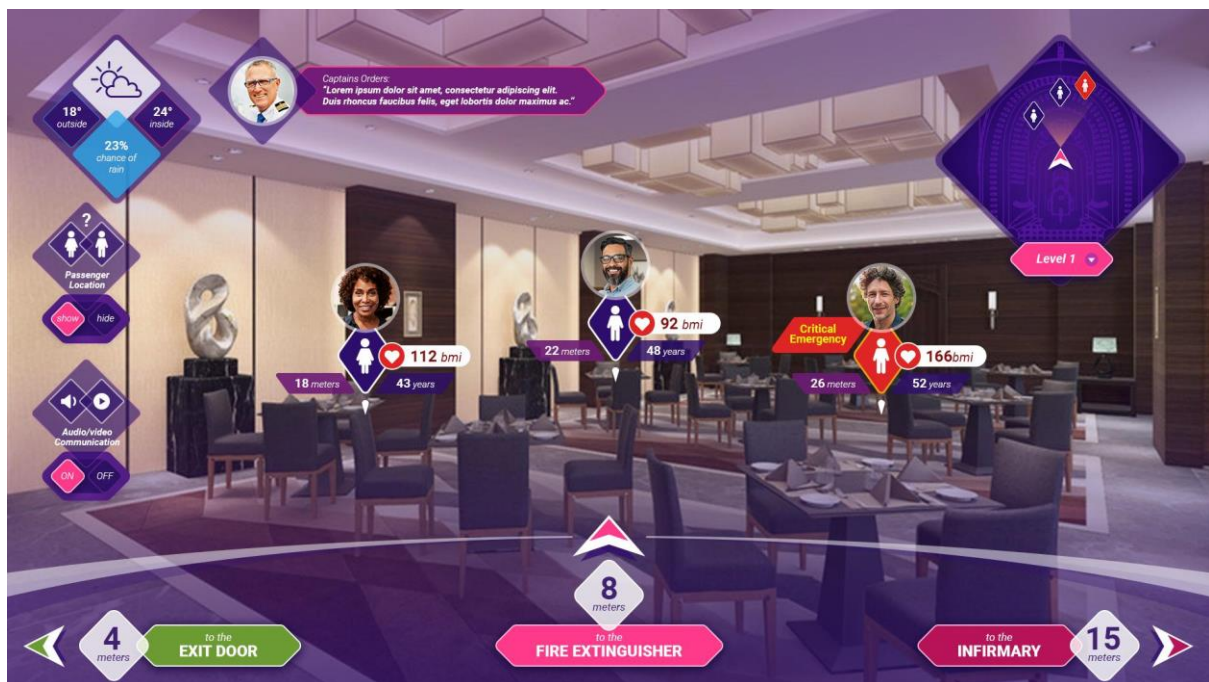
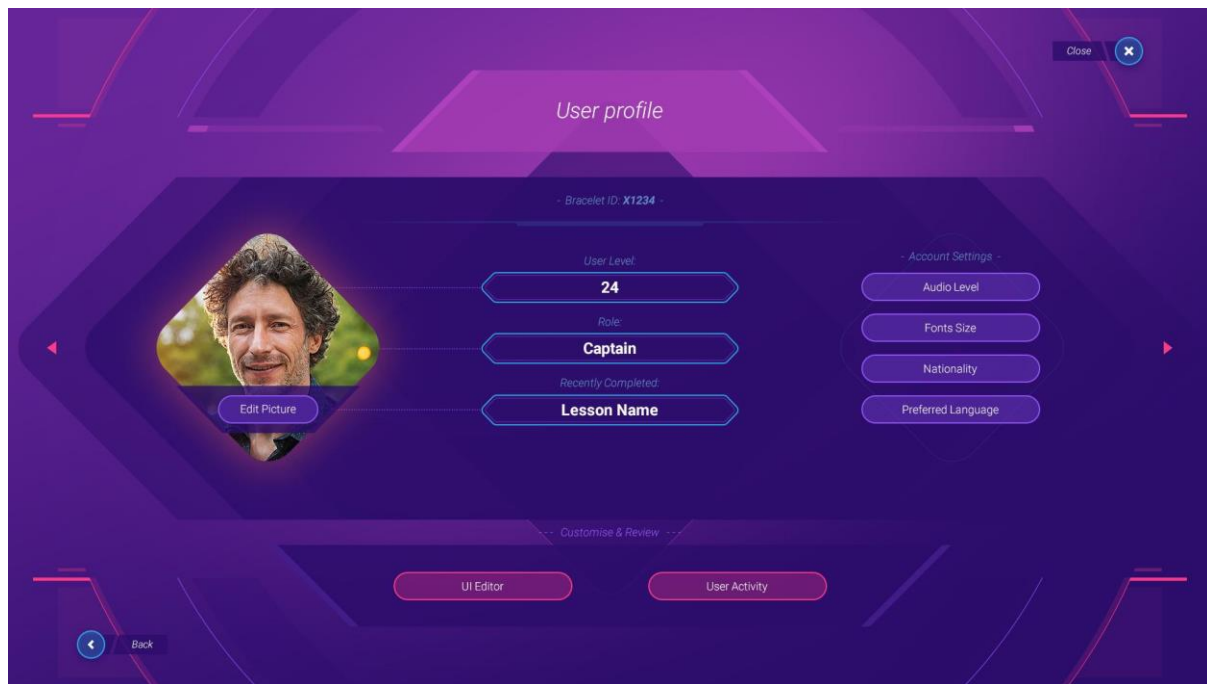


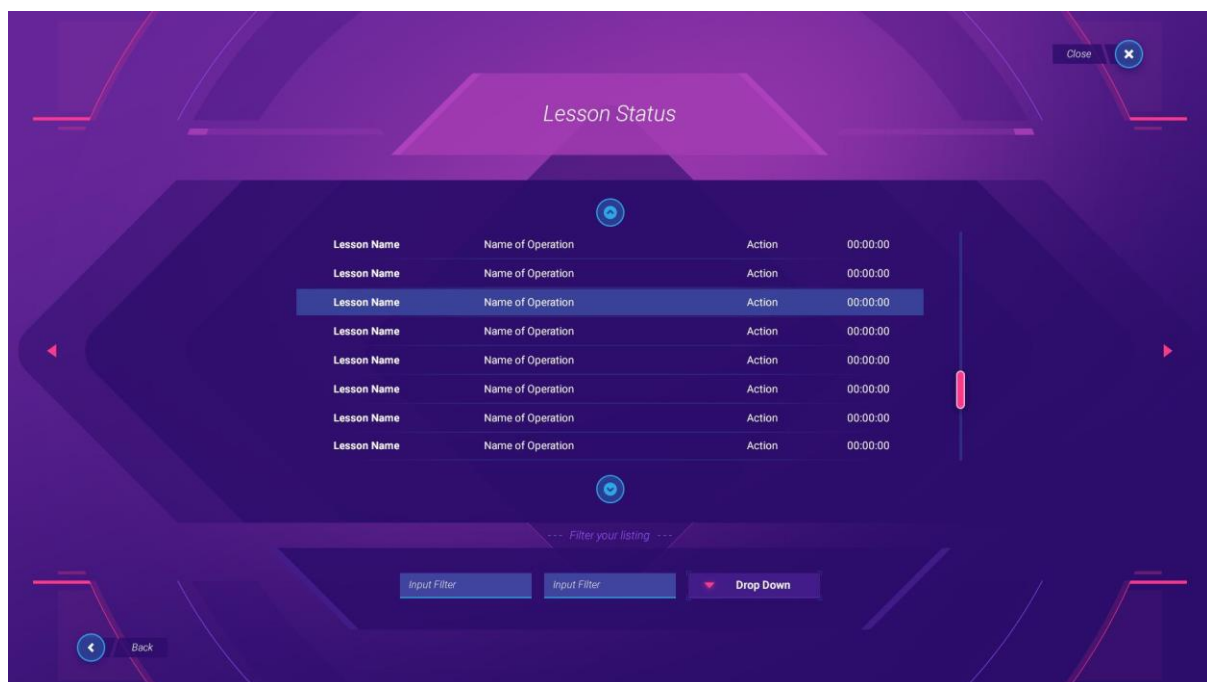
Figure 27: Customized GUI

The user profile will display the current user information.



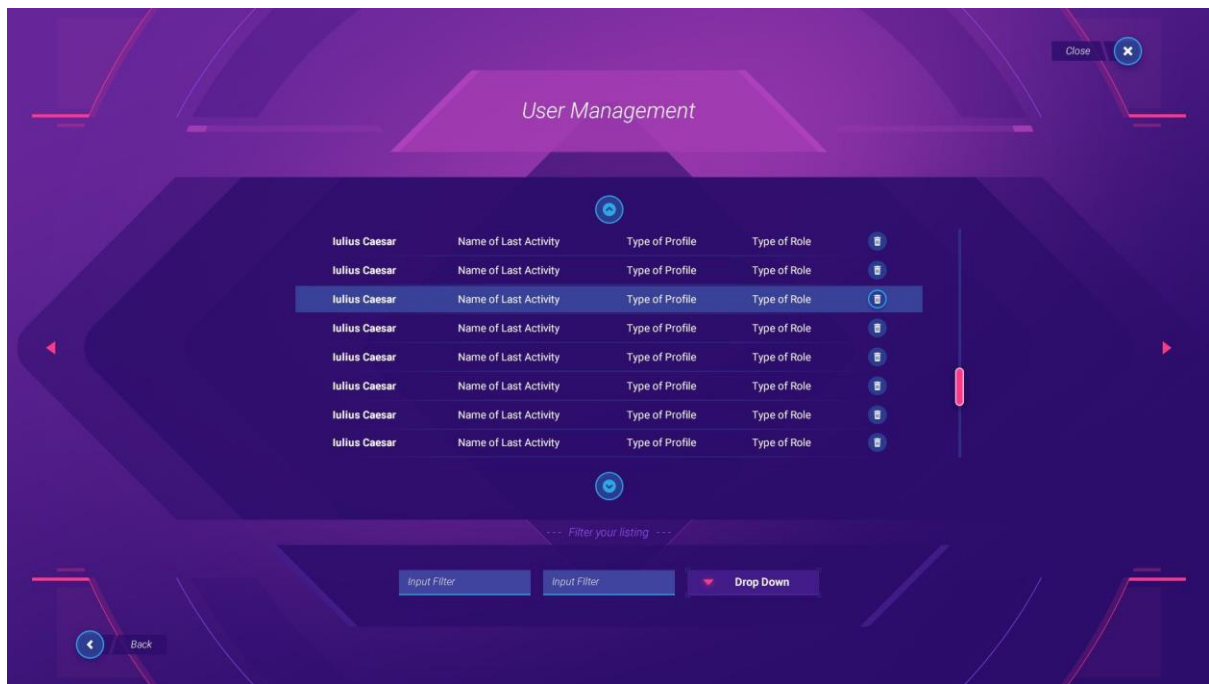
*Figure 28: User Profile*

The user will be able to view it's activity by pressing the User Activity button:



*Figure 29: Lesson Status*

The administrator account will be able to view several users activities



*Figure 30: User Management*

Within the actual scenarios, the user might encounter several icon sets:



*Figure 31: Jammed doors*



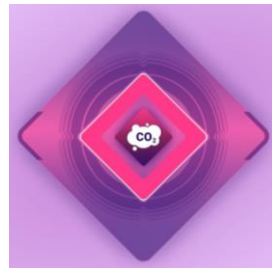
*Figure 32: Exit Area*



*Figure 33: Fire hazard*



*Figure 34: Medical emergency*



*Figure 35: Low oxygen level*

## 2.9. VR Widgets

The widgets are a graphical representation of the information provided by the simulated external modules.

### 2.9.1. Communication Module

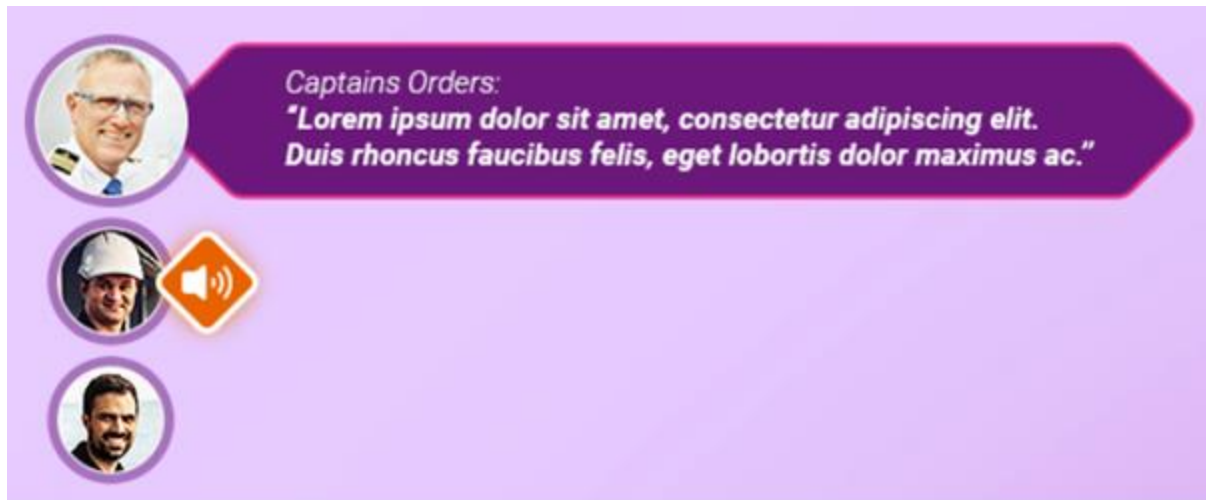


Figure 36: Communication module

The communication module will allow the crewmembers to get information from virtual characters. The interface will display a virtual crewmember image. When the virtual crew member will announce an issue, a small text bubble will appear on his right. The interface will allow the users to chat with the virtual crew members.

From an architecture point of view, the widgets standalone micro apps. They don't actually link with the Pameas modules but certain parameters and values might be used for the reports.

### 2.9.2. Ship speed/direction



Figure 37: Ship speed/direction

This module will display simulated information about the actual ship speed and direction of the virtual ship.

### 2.9.3. Waves height/length



Figure 38: Waves height/length

This information will be simulated and will display data about waves, in terms of length and height. Depending on scenarios general parameters, the actual simulated waves will be linked to this widget values.

#### 2.9.4. Ship roll/pitch/yaw

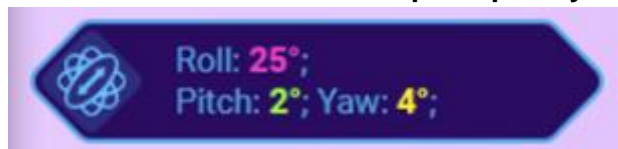


Figure 39: Ship roll/pitch/yaw

The widget will show simulated information about the ship's roll, pitch and yaw. Within the captain's deck levels, these information will be updated depending on the actions performed by the Captain.

#### 2.9.5. MEV status

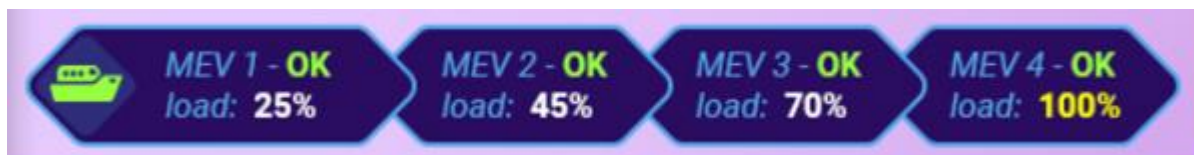


Figure 40: MEV status

Within some scenarios, the MEV might suffer damage and the users might need to divert the passengers on the other ones. The MEV will become full at some point and the crew members will need to redirect the people.

#### 2.9.6. GPS coordinates



Figure 41: GPS coordinates

This widget will display the simulated GPS coordinates. In the scenarios that involve the Deck level, if a user changes the ship speed direction, these coordinates will change.

#### 2.9.7. Wind speed



Figure 42: Wind speed

This widget will display exterior wind direction and Speed. This information will be simulated and adjustable in the general scenario parameters. These values will influence the fire spread direction and speed.

#### 2.9.8. Location within ship

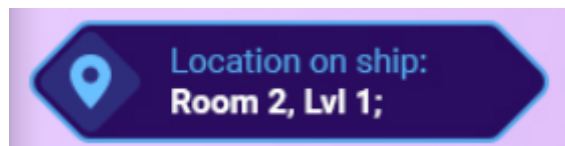
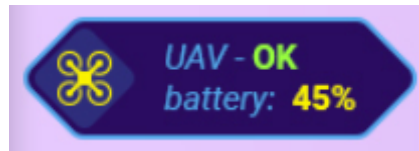


Figure 43: Location within ship

This widget will display the location of the crewmember within the virtual ship.

### 2.9.9. UAV status



*Figure 44: UAV status*

The widget will allow the Captain to view technical data related to the UAV. The widget will simulate a UAV video transmission.

### 2.9.10. Weather report



*Figure 45: Weather report*

This widget will display the weather forecast. This information will be simulated and adjustable in the general scenario parameters. These values will influence the fire spread direction, speed, passengers speed and MEV loading times. Having a wet deck might increase the chances of injuries.

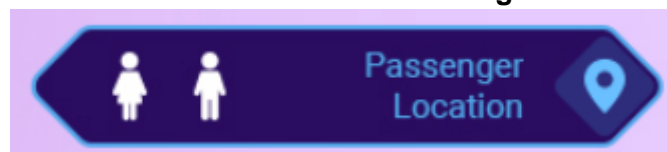
### 2.9.11. Outside/inside ship temperature



*Figure 46: Outside/inside ship temperature*

This widget will display the weather forecast. This information will be simulated and adjustable in the general scenario parameters. These values will influence passengers speed, injury occurrence, random hazard chances.

### 2.9.12. Passenger location



*Figure 47: Passenger location*

The widget will allow the crewmember to spot the passengers through walls. It will display the nearest passengers within the ship and will highlight the ones that might have injuries. The

crewmembers will use this widget as a toggle.



Figure 48: Nearest passengers

### 2.9.13. Map

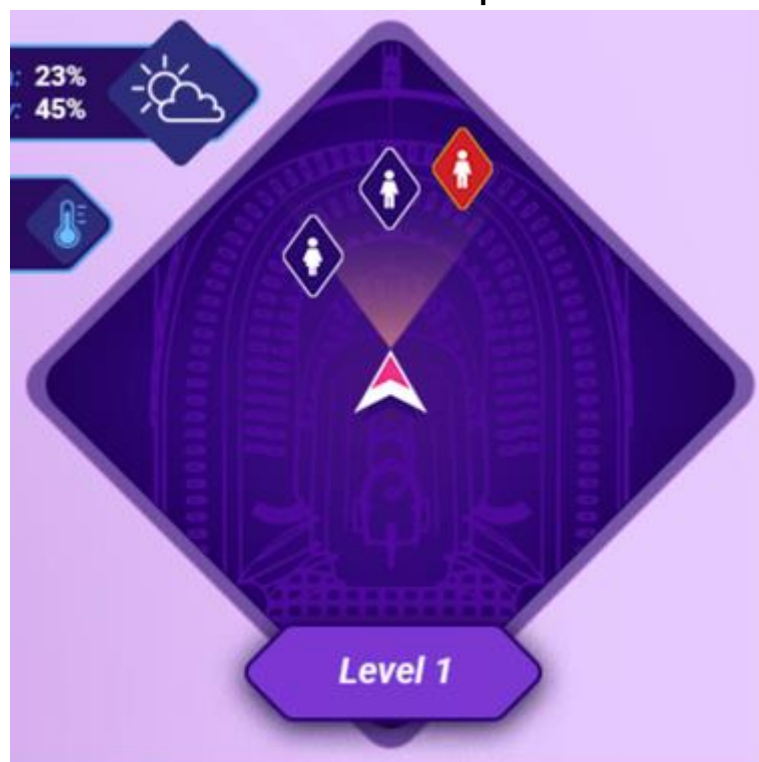


Figure 49: Map

The map module allows the crewmember to better view the passenger location within the map. The zoom level will be adjustable. The map information will be embedded within the app and the passenger location will be simulated. The map will be available for both the captain and the crew members. The crewmembers will be able to view on the map the injured passengers and hazards.

## 2.10. VR Glasses Component Technical Specifications Technical specifications

Oculus Quest set contains 1x Oculus Quest 4 GB; 2x Touch controllers; 2x AA battery; 1x USB 3.0 type C cable and 1x 15 W Power Adapter<sup>2</sup>

The device has the following features and components:



Figure 50: Oculus Quest Technical Specifications



Figure 51: Touch controllers Technical Specifications

### Technical Specifications

- 1) Panel Type: Dual OLED 1600x1440
- 2) Supported Refresh Rate: 72Hz (default), can be configured to 60Hz in some cases

<sup>2</sup>

<https://vr-expert.io/wp-content/uploads/2020/05/Oculus-Quest-64GB-VR-Expert-Product-Guide>

- 3) Default SDK Color Space: Rec.2020 gamut, 2.2 gamma, D65 white point
- 4) CIE 1931 xy color-primary values:
- 5) Red : (0.708, 0.292)
- 6) Green: (0.17, 0.797)
- 7) Blue : (0.131, 0.046)
- 8) White: (0.3127, 0.3290)
- 9) USB Connector: 1x USB 3.0
- 10) Tracking: Inside out, 6DOF
- 11) Audio: Integrated, in-strap
- 12) CPU: Qualcomm® Snapdragon 835
- 13) CPU Notes: Developers have access to 3 gold cores that can run at a max frequency of 2.3 ghz
- 14) GPU: Qualcomm® Adreno™ 540 GPU
- 15) GPU Notes: The GPU availability is capped at 710 MHz if Guardian is on automatically, otherwise capped at 670 MHz. The TimeWarp, Guardian System, and application will have access to the GPU. However, TimeWarp and Guardian System will have priority and take approximately 2 milliseconds per frame to process.
- 16) Memory: 4GB total
- 17) Lens Distance: Adjustable<sup>3</sup>

## 2.11. Getting started with the VR set

### 2.11.1. Wearing the Oculus Quest headset.

#### Putting on the Device

1. Loosen the side straps and then the top strap.
2. Starting from the back, put on your headset.
  - Make sure to pull the back strap down until it cradles the base of your head.
  - If you're wearing glasses, put on the headset from the front first.
3. Tighten the side tabs and then top strap.
  - Make sure that the straps aren't too tight.
4. The headset should fit comfortably and not apply too much pressure on your face and head.<sup>4</sup>

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<https://www.oculus.com/quest/>

4

<https://amazevr.nl/wp-content/uploads/2020/04/Oculus-Quest-Tutorial-ENG.pdf>

### Adjusting the view of the device

With your hands holding both sides of your headset, slowly move your Oculus Quest up and down until the picture is clear and the headset feels comfortable.



*Figure 52: Adjusting the view of the device*

- If you wear glasses, insert the glasses spacer into your Oculus Quest headset prior to using it.
- If the image in your headset isn't clear, you can use your left thumb to move the image slider on the left of the bottom of your headset to the left and right until the image is clear.

### Inserting the glasses spacer.

- 1) Carefully remove the lens rings and put them to one side
- 2) Place your headset face down on a flat, clean surface.
- 3) Hold the headset still with one hand, and pull upwards from the outer edge of the lens ring until it comes loose. Repeat this step for the other lens ring.
- 4) Remove the facial interface foam.
- 5) Insert the glasses spacer and gently press the spacer into place. When the glasses spacer is correctly set, it should not move or fall out of the headset easily.
- 6) Re-insert the facial interface foam.
- 7) Using your fingers, carefully press the lens rings back in place until they click<sup>5</sup>

### Controllers

The Oculus Quest Touch controllers are a pair of tracked controllers that give you hand presence—the feeling that your virtual hands are actually your own.

Touch controllers feature traditional action buttons, thumb-sticks and analog triggers that add familiarity to new experiences.

You can use your controller to interact with the environment, using the buttons on your controller to do the following:

**Trigger:** A and X buttons - Press to select things:

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<sup>5</sup>

<https://amazevr.nl/wp-content/uploads/2020/04/Oculus-Quest-Tutorial-ENG.pdf>

**B and Y:** Press to go back to the previous screen or menu.

**Oculus button:** Press to go back to Oculus Home or press and hold to reset your controller orientation.

**Grip button:** Press to grab objects or make a fist when using your virtual hands. **Menu button:** Press the menu button from Oculus Home to bring up the menu.

Press any button to wake the controller after you turn on your headset.

**Unpair your controller:**

- 1) Open the Oculus app on your phone.
- 2) Tap Settings from the bottom menu.
- 3) Tap the Oculus Quest headset you currently have paired.
- 4) Tap Controller, then tap the controller you want to unpair.
- 5) Tap Unpair Controller.

**Connect the lanyards to the Oculus Quest controllers:**

- 1) Pick up one of the controllers and remove the magnetic battery cover by lightly sliding the thumb down the battery door until it comes loose.
- 2) On the inside edge of your controller below the open battery compartment, you'll see a circular cut-out. Slide the plastic end of your lanyard into the small hole in the centre of the circular cut-out. When the lanyard is seated correctly, the plastic piece sits entirely inside the hole.
- 3) Slide the string of the lanyard downwards so that it's sitting in the lanyard cut-out at the bottom of the controller. If it's seated correctly, it won't obstruct the battery door cover you removed in step one.
- 4) Slide the magnetic battery door cover back into place until it clicks and sits flush against the controller.
- 5) Before using, pull down on the lanyard to ensure that it's securely connected to the controller and doesn't unseat the battery cover<sup>6</sup>

**Remove the battery from the Oculus Quest controller**

- 1) Remove the battery cover of your controller by gently sliding the thumb downwards along the battery door until it unclicks and comes loose.
- 2) Remove the battery from the bottom end of the controller and replace the battery so that it matches the direction shown inside the battery compartment. (<https://www.oculus.com/quest/>)

## 2.12. Using the Oculus Quest VR

### Install the Oculus Quest

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<https://amazevr.nl/wp-content/uploads/2020/04/Oculus-Quest-Tutorial-ENG.pdf>

Put on the headset and press the “Power Button” for approximately 3 seconds.

The instructions of the headset will start automatically:

- 1) Download the Oculus app on the phone. (Both IOS and Android versions available)
- 2) Create an Oculus Account
- 3) In the Oculus application after logging in, choose Oculus Quest on the phone
- 4) Follow the tutorial on your phone.
- 5) The phone will search for your Oculus Quest automatically.
- 6) If the phone does not find the Oculus Quest headset, you will be asked to enter a figure code, which appears at the screen of the headset. This is a unique link number.
- 7) Next you can connect the headset to your Wi-Fi - choose the selected Wi-Fi and enter the password.
- 8) Prepare your Controllers by putting in the battery and the Lanyards through the bottom of the “Controller-Clip”.
- 9) Confirm the instructions. The Oculus Quest Headset will be automatically updated.<sup>7</sup>

#### **Connect the Wi-Fi.**

- 1) Click on ‘Settings’ in the task bar.
- 2) Click on ‘Wi-Fi’
- 3) Choose the Wi-Fi you want to connect with and select it.
- 4) Enter the password of the selected Wi-Fi and click connect.

#### **Navigating Main Menu in the device**

- 1) Select Task bar of the Menu ? Here you will find the most common functions/symbols. (Navigate - Social - Sharing -Notifications - Settings)
- 2) Home ? The last used application and the most popular Oculus applications are displayed here.
- 3) Oculus Store ? Search and download new Applications.

#### **Download applications from the Oculus store.**

Click on ‘Oculus Store’ in the Oculus Quest main menu.

- 1) Search for the desired application in the Oculus store or search for the application manually with the search function. (Navigate -> Search)
- 2) Click on the desired application and then press on ‘download’ or ‘buy’.
- 3) After downloading, the application will appear in your Oculus library.

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<https://sidequestvr.com/setup-howto>

### Setting up the VR Guardian.

If setting up Guardian with the Quest for the first time, follow the on-screen instructions. Guardian Sizes Guardian lets you create boundaries in VR that appear when users get too close to the edge of the activity area.

When setting up your Guardian, the activity area will appear as one of these sizes:

- 1) Below Minimum: If the activity area is below minimum, it doesn't meet the 1 by 1 metre requirement to use Guardian.
- 2) Minimum: There is enough space for the minimum required playing area, but some apps and settings may recommend at least 2 by 2 metres for the best experience.
- 3) Recommended: The recommended playing area for Roomscale experiences. This means that the activity area meets or exceeds the 2 by 2 meters space needed to set up the Guardian system.<sup>8</sup>

### Reset the VR Guardian.

- 1) Select Settings from the bottom toolbar.
- 2) Select Guardian in the left menu.
- 3) Click Set Up Guardian.
- 4) Follow the on-screen instructions to reset your Guardian.

### Updating Oculus Quest software

The Oculus Quest headset will be updated automatically when connected to Wi-Fi and turned on. To make sure that your Oculus Quest software updates automatically, make sure that:

The headset is charged, turned on and connected to Wi-Fi; allow the headset to sit on a flat surface without moving the headset or blocking the inside sensor for an extended period of time; software updates are turned on in the Oculus app on the phone.<sup>9</sup>

To do this:

1. Open the Oculus app on your phone.
2. Select Oculus Quest in the top-left corner of your app.
3. Tap Settings in the bottom-right corner of the app.
4. Tap your Oculus Quest listed under your name and email address.
5. Tap More Settings.
6. Tap Advanced Settings.
7. Make sure that the Update Software Automatically toggle is blue to indicate that the setting is turned on.

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<sup>8</sup>

<https://support.oculus.com/1217524098600450>

<sup>9</sup>

<https://support.oculus.com/598094234193602>





### 3 Oculus Quest VR headset safety warnings<sup>10</sup>

#### Before Using Your VR System

Read and follow all setup and operating instructions provided with the headset, including hardware and software recommendations. Risk of discomfort may increase if the recommended hardware and software are not used.

Further health and safety guidance is available at Oculus Quest support page. <https://support.oculus.com/3036997806429220/>

To reduce the risk of discomfort, the headset should be balanced and centered, and the distance between the lenses (the intra-axial distance, or IAD) should be appropriately set for each user.

Adjust the rear and top straps to ensure comfortable placement of the headset.

Adjust the IAD for each user by moving the eyecups directly to whichever of positions 1, 2, or 3 provides the clearest image. When properly adjusted, the headset should fit comfortably and the user should see a single, clear image. Re-check the settings before resuming use after a break to avoid any unintended changes to any adjustments.

#### Risks Associated with Freedom of Movement

Oculus Quest headset is designed to track your movement during use and model your actions in the virtual world as you move in the real world, all without requiring wires or cables connected to a personal 6dof computer. This freedom of movement means that the user must take appropriate action to have a safe experience.

#### Set Up and Use Only in a Safe Environment

The headset produces an immersive experience that can distract the user and can completely block the real perception of the actual surroundings.

#### Setting Up Your Safe Play Space<sup>11</sup>

Always be aware of your surroundings before starting and while

using the headset. Use caution to avoid injury. Ease into using the headset to allow users to adjust both to the headset and the specific experience.

The Guardian system works best in a cleared space with walls and surroundings that create different patterns for the sensors to track. The Guardian system will only alert you to the boundary of the activity space. It cannot prevent the users from moving out of the activity space or other objects from entering the activity space.

#### Headset Battery and Charging

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<sup>10</sup>

Guide

<sup>11</sup>

<https://www.oculus.com/legal/health-and-safety-warnings/>



Oculus Quest headset contains a rechargeable Lithium-Ion battery and may come with a power adapter (charger) and charging cable. Improper use of the battery or power adapter may result in a fire, explosion, battery leakage, or other hazard. Follow these instructions to reduce the risk of injury or damage to the product.

The battery in the Oculus Quest headset is not user replaceable or serviceable.

Do not attempt to open the headset to access the battery, or to open, repair, or replace the battery.

### Headset Temperature

It is important to check the temperature of the headset as some contact points including front surfaces may get hot. It is normal for the headset to feel warm to the touch while in use or while charging.

### Electrical Shock

To reduce risk of electric shock:

- Do not modify or open any of the components provided.
- Do not charge this device if any part of the provided or approved AC Adapter cable is torn, any wires are exposed, or battery compartment damaged.
- Do not insert any metal, conductive, or any foreign objects into the charging port.
- Do not expose the device to water or fluid.
- ONLY use provided AC Adapter with your device (or other authorized adapter if one was not provided with your device).

## 4 Conclusions

Along with the AR technology, the VR will support various immersive activities that will enable unprecedented training and development on passenger safety and evacuation scenarios.

Users will be able to share best practices and communicate in real time solutions to a variety of cases that could potentially arise on such environment.

However, compared to AR, the VR technology will require longer accommodation and setup time.<sup>12</sup>

It is of paramount importance that the VR users understand the implications, benefits and constraints of this evolving technology. This guide underlined some of the safety hazards that could occur during the use of Oculus Quest. Further information on the device can be found at <https://support.oculus.com/quest>.

It is recommended that the users and participants in the VR activities should further explore the conditions under which this technology can be successfully used with minimal risks.

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<sup>12</sup>

<https://enterprisersproject.com/article/2019/10/ar-vs-vr-whats-difference>

## 5 References

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