



Project. RELAR (REmote Learning and examination based on AR)

Grant Agreement n. 2020-1-NL01-KA226-VET-083043

Output 02 Task 5



Co-funded by the
Erasmus+ Programme
of the European Union

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1. O2T5 – Development of a Trainer RELAR pack would be developed by various partners.

This task will include:

- A. Information on how to set up and use the hardware and SOPs on how to use the software
- C. Scenario-specific info

2. Information on how to set up and use the hardware and SOPs on how to use the software

This section outlines the main guidelines for the RELAR project. It details the main ways for sharing content in an educational environment between instructors and students. The purpose of the document is not to replace the HMT-1 official documentation, but to provide guidelines as to how Assisted Reality and specifically the HMT-1 can be used in this specific context. In the educational environment the main needs that have emerged after consultations with end users include:

1. **Share data FROM endpoint TO the HMT-1** - i.e., how to send various types of files (DOC, PDF, PPT etc) from one endpoint (e.g. a computer) to the HMT-1.
2. **Share data FROM HMT-1 TO an endpoint** - i.e., how to send files (photos and videos) taken from the HMT-1 to another endpoint (e.g. a computer).
3. **Leverage the use of QR Codes** - i.e., how the HMT-1 user can easily scan appropriate QR codes and automatically open files and/or URLs.

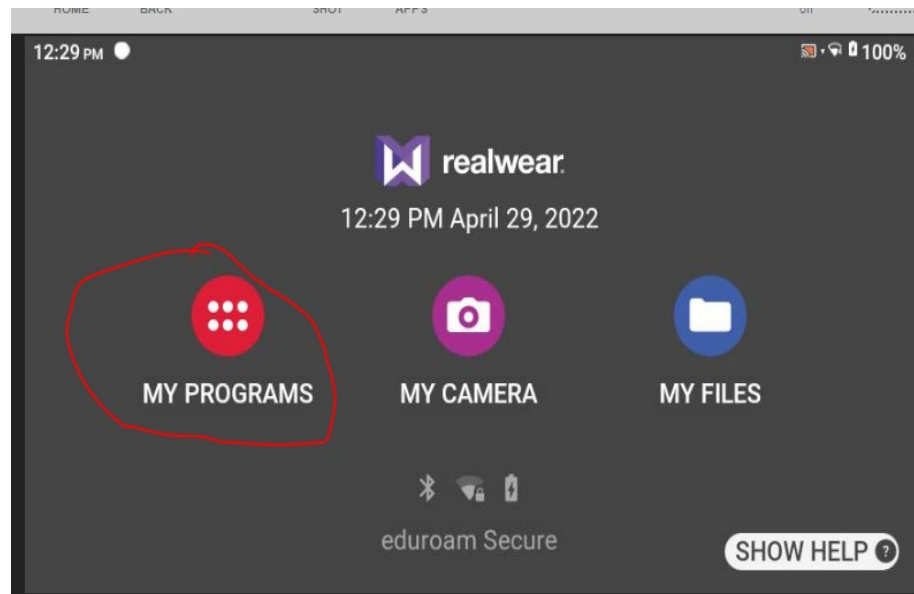
2.1 Important initial steps, device configuration

There are some important configuration steps that need to be taken before the HMT-1 can be fully utilized within any given scenario. This section outlines this necessary fine-tuning of the device, before its scenario usage.

2.1.1 Set date & time to be automatically updated via the network.

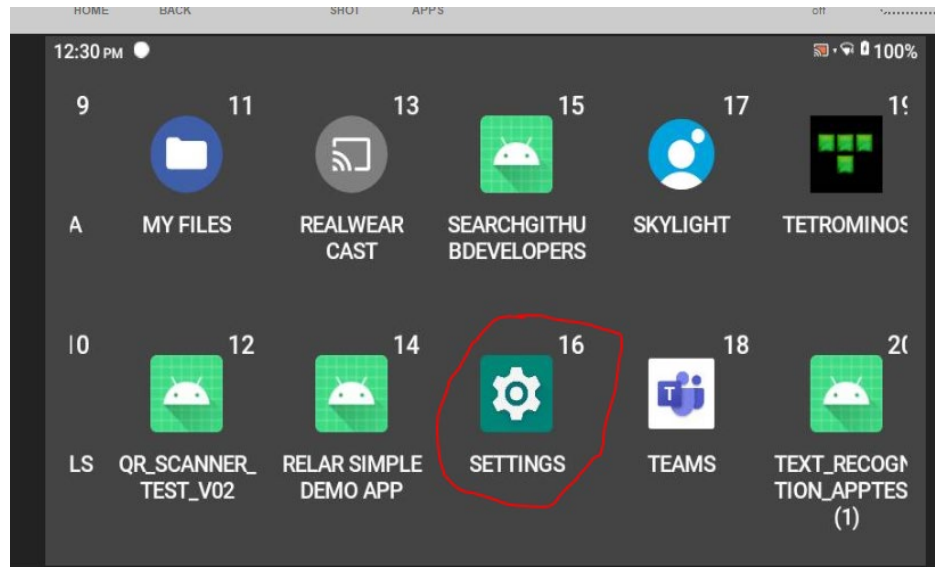
Accurate date & time is crucial for the proper functioning of some applications (even for successful login attempts), hence It's an important prerequisite to setup date and time to be automatically updated whenever the HMT-1 is connected to the internet. In order to do this, please perform the following:

From initial screen, choose **My Programs**



Step 1 - Choose MY PROGRAMS from the HMT-1 Home Screen

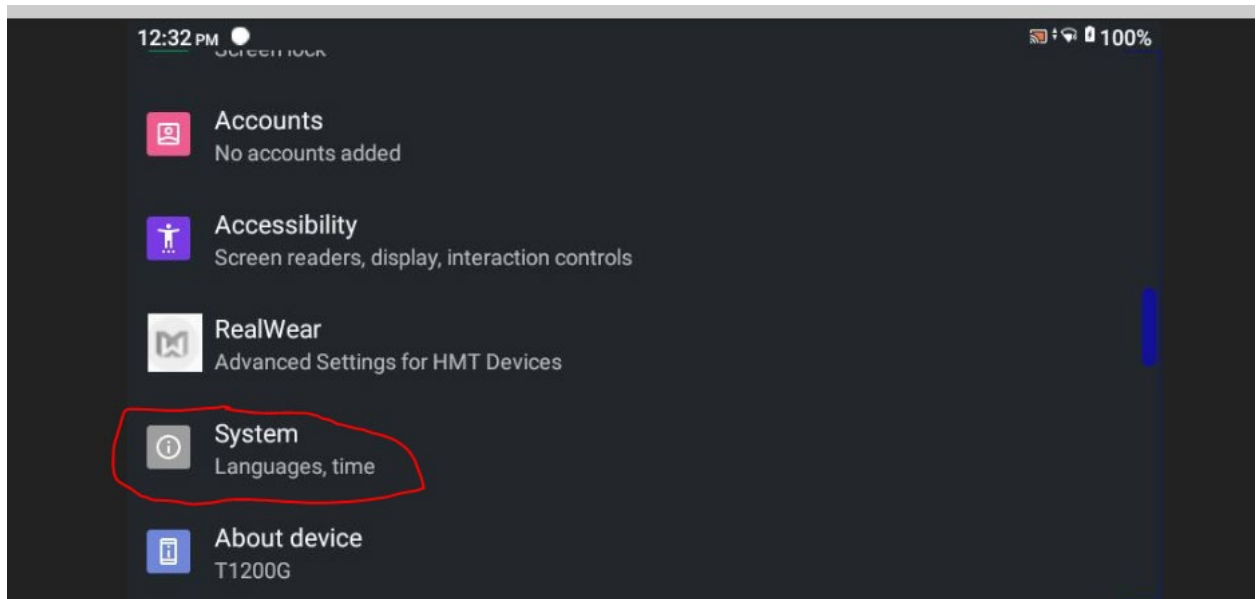
Choose **Settings**



Step 2 - Choose SETTINGS

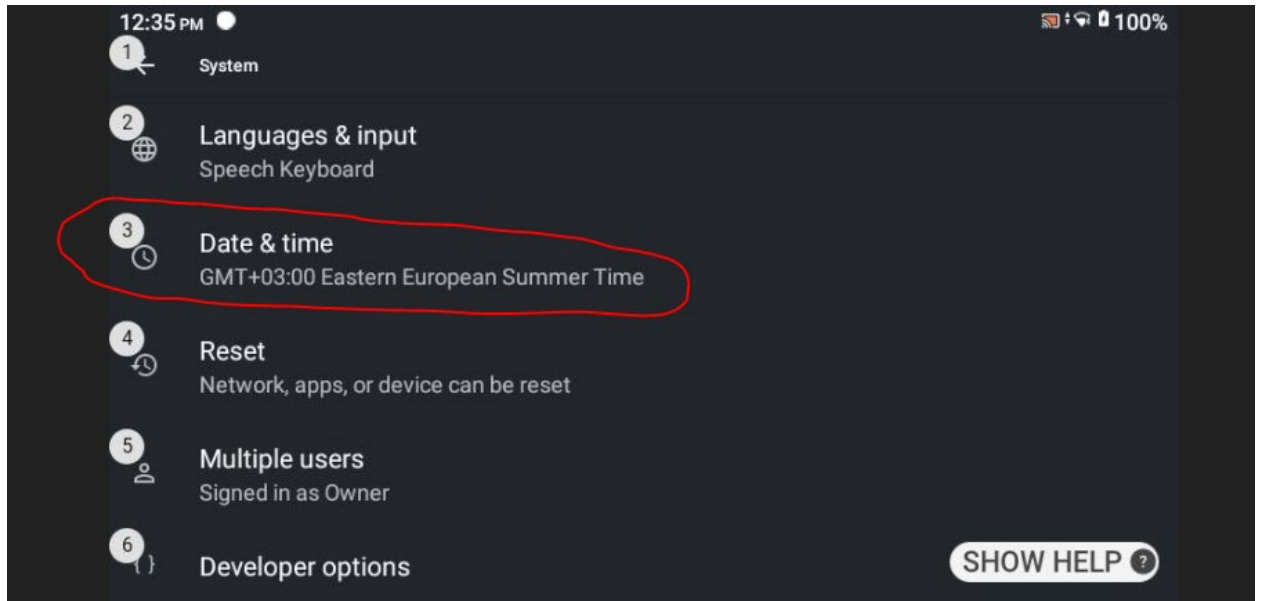
Browse to the bottom end of the list (either by vocal command **Page Down**, or by using the bottom arrow key if the HMT-1 is connected to a PC and controlled via RealWear Explorer).

Select SYSTEM.



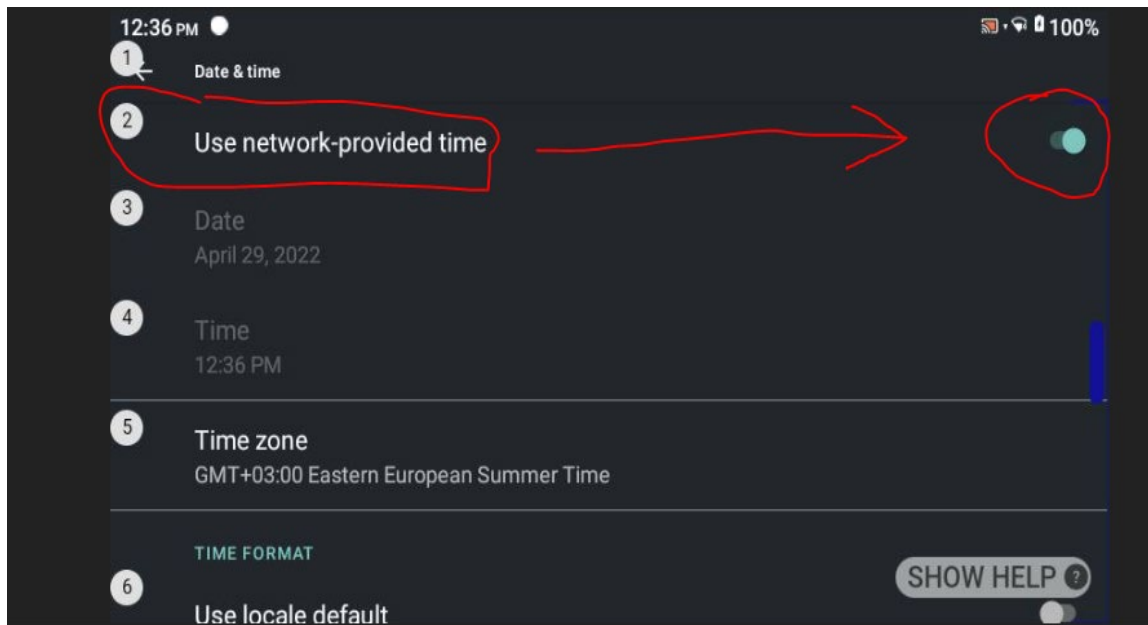
Step 3 - Select System

Choose **Date & Time**, either by vocal command **Date & Time**, or **Select Item 3**, or by clicking with the mouse, if using RealWear Explorer).



Step 4 - Select Date & Time

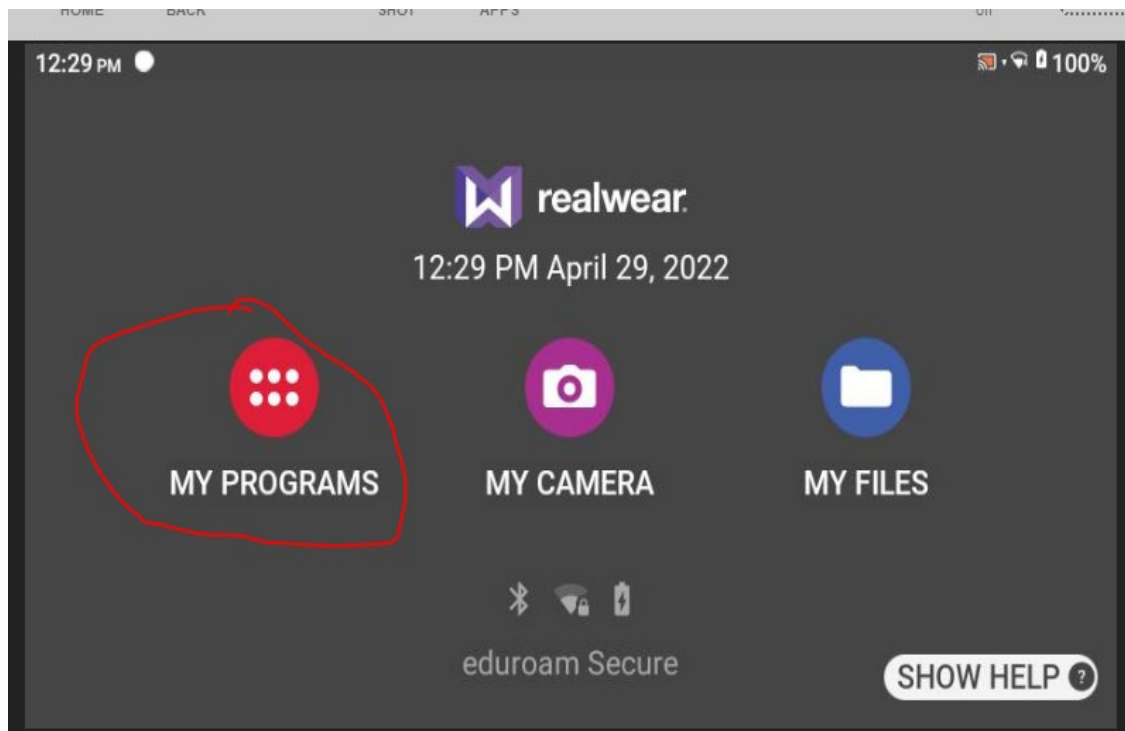
Make sure the toggle on item 2 is turned ON. You can either use the vocal command `Use network provided time`, or select Item 2 to turn the toggle ON/OFF. Correct Time zone should be set automatically.



Step 5 (final) - Make sure 'Use network-provided time' toggle is turned ON

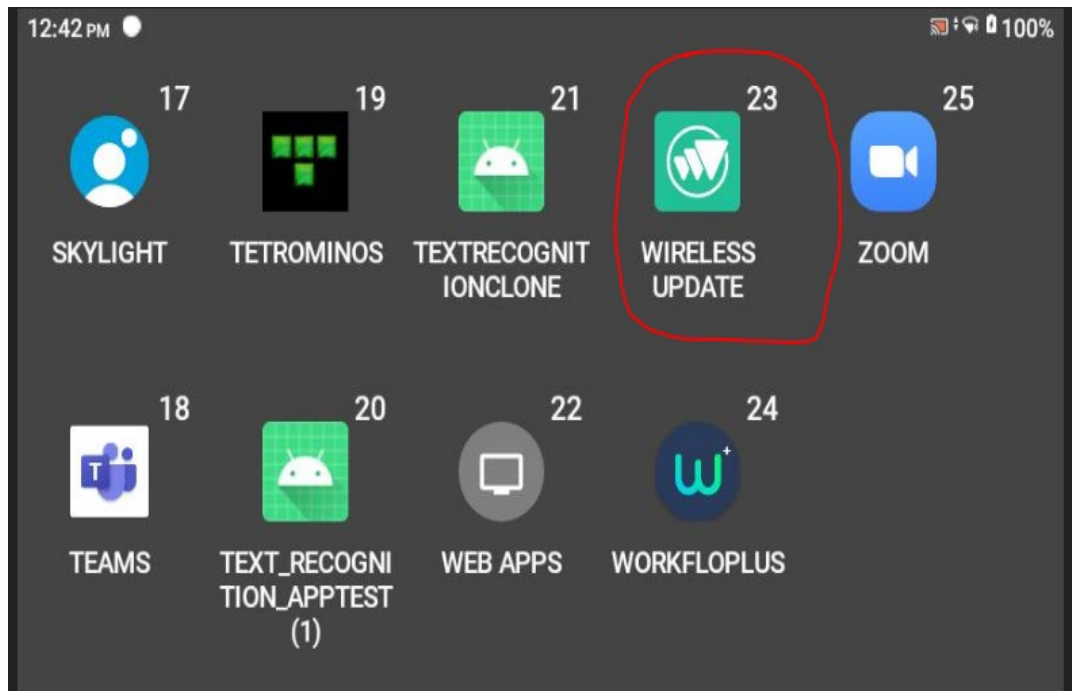
2.1.2 Make sure the HMT-1 runs the latest firmware

There are frequent updates to the device's firmware. In order to have a common ground and to benefit from recent bug fixes and enhancements, we should make sure to run the latest operating system for the device. In order to do this, from the home screen select My Programs.



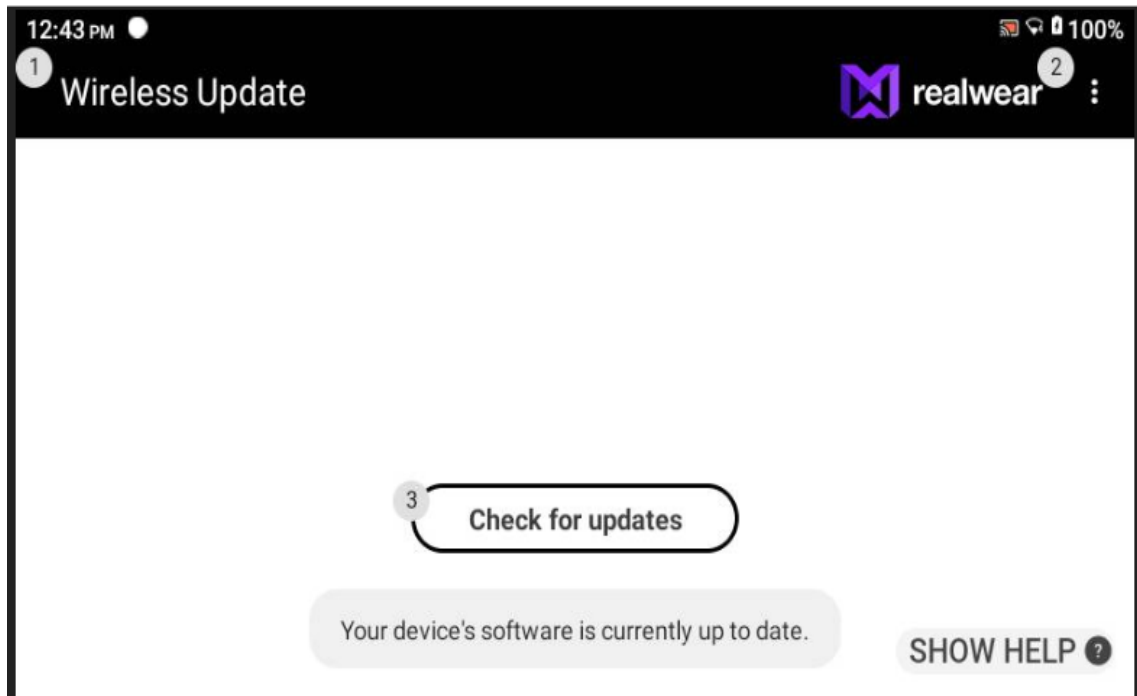
Step 1 - Select MY PROGRAMS from the HMT-1 Home Screen

Scroll all the way to the right, either by turning your head (if wearing the device) or using the right arrow key multiple times if using RealWear explorer. Select Wireless Update.



Step 2 - Select WIRELESS UPDATE

There will be an initial check, and If the device is currently running the latest firmware version, you should see this message:



Screenshot of device running latest firmware

Important notice:

If there are updates to install, you should see an appropriate message asking you to first download the next firmware version, and then install it.

The update is a straight-forward procedure that only takes a few minutes. Make sure to have a stable internet connection and either have sufficient battery charge (at least 30%) on the HMT-1 or have it connected and charging via USB.

Follow the screen messages to download and install the updates - bear in mind that the HMT-1 will reboot in the process so RealWear Explorer connection will be lost (but can resume after successful boot).

Also, note that updates are incremental - this means for example that if you have version 12.1 installed, and the current latest version is 12.3, you will need to perform the procedure twice, going from 12.1 to 12.2, and then from 12.2 to 12.3.

So after each update, you are advised to go through Wireless Update and check if you have the latest version installed.

2.2 Sharing files FROM the cloud TO the HMT-1.

2.2.1 Introduction

There are several ways to share documents from an arbitrary endpoint (e.g. a desktop computer, laptop, mobile device, in essence any device that has internet connectivity) to the HMT-1. Most of them include either the use of a dedicated App (e.g. an email client) or sharing within the confines of an App that is already running (e.g. via MS Teams) or creating and using a dedicated QR code that “sends” the HMT-1 user to a URL where the file is available for download.

However, after testing various of the aforementioned methods, and after consulting with RealWear support, we conclude that at the time being, **the easiest and more flexible way of sharing different types of documents with the HMT-1 is by taking advantage of the recent built-in CLOUD SYNC app that should exist in all devices¹** and allows for seamless connection and sync with Microsoft’s OneDrive online cloud storage service.

2.2.2 Pros and Cons

The major advantage, and essentially the deciding factor in suggesting CLOUD SYNC, is the fact that multiple different files can be shared easily and at once using this method, and the necessary app (CLOUD SYNC) is readily available as part of the device’s standard software configuration (following OS version 11.2).

The disadvantage is that currently only Microsoft’s OneDrive is supported and offline availability of files is not yet available (thus a cloud sync must be performed each time before accessing files on the HMT-1). However active development towards solving these issues is currently being

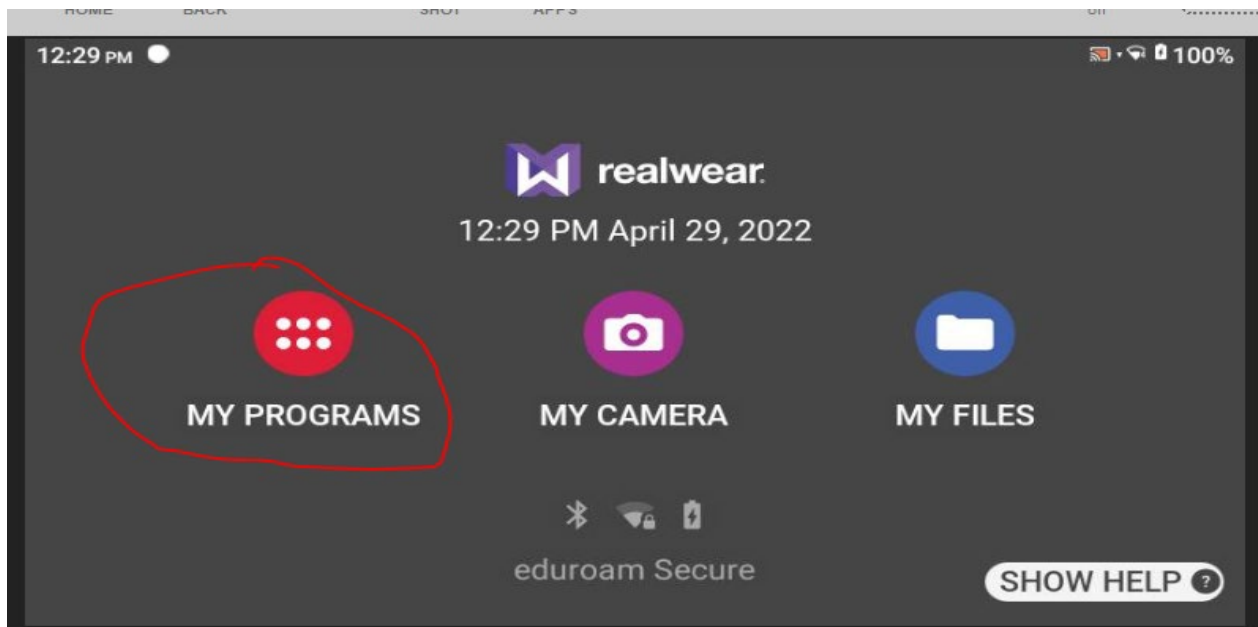
¹ CLOUD SYNC is included on HMT-1 starting with Release 11.2. At the time of writing (April 2022), HMT-1 runs release version 12.3.

performed at RealWear so there is good reason to utilize CLOUD SYNC and benefit from future enhancements².

2.2.3 Setting up CLOUD SYNC for the first time (needed only once, for a particular account)

The first time we use the CLOUD SYNC app on the HMT-1, we need to connect it to an account in OneDrive. Once this connection is established, CLOUD SYNC will be automatically linked to that account unless we decide to sign off. Following are the steps needed for the one-off connection:

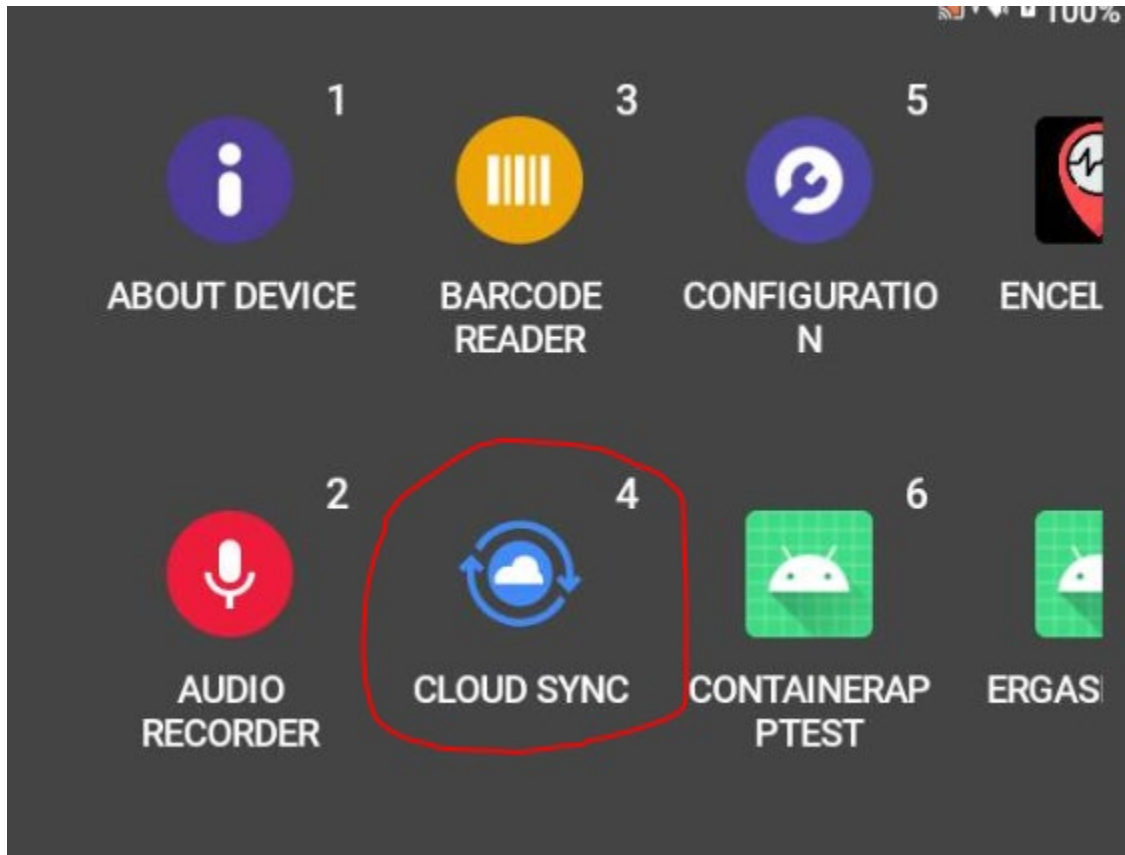
From the HOME SCREEN, select MY PROGRAMS:



Step 1 - Select MY PROGRAMS from the HMT-1 Home Screen

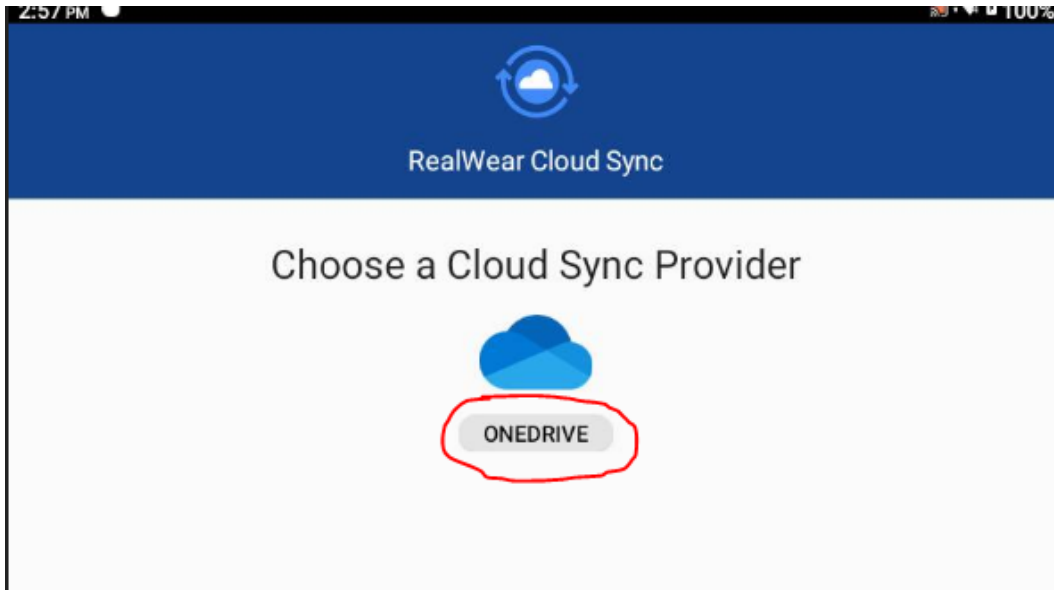
² More specifically, from the official RealWear website: “Currently it is only possible to browse OneDrive files while connected to the internet. These are not yet synced and available offline. We are evaluating features such as download and the ability to support other cloud storage drives like Dropbox, Box and Google Drive as part of our device software roadmap”. See <https://support.realwear.com/knowledge/cloud-sync> for more information.

Scroll to the left and choose CLOUD SYNC:



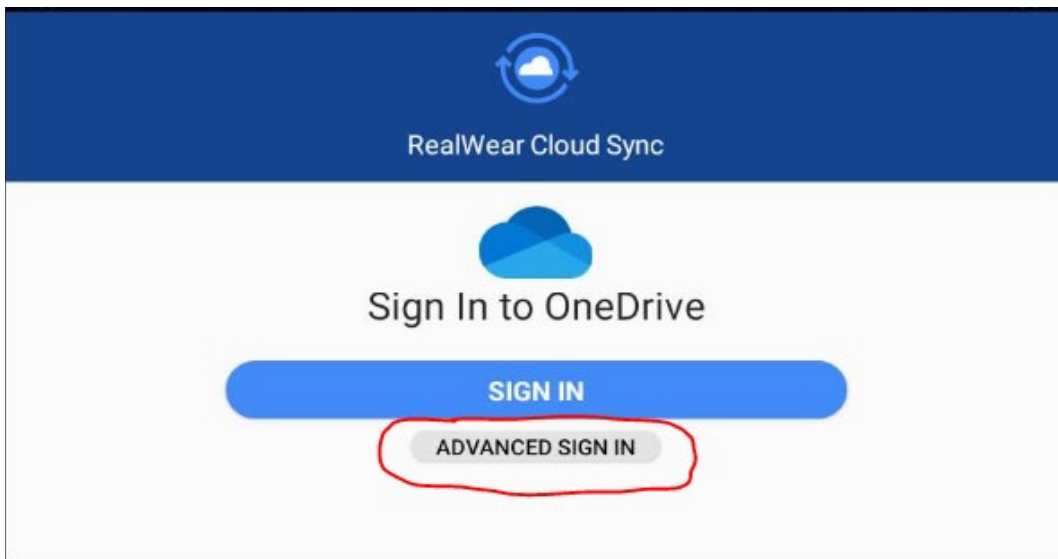
Step 2 - Select CLOUD SYNC

Select ONEDRIVE



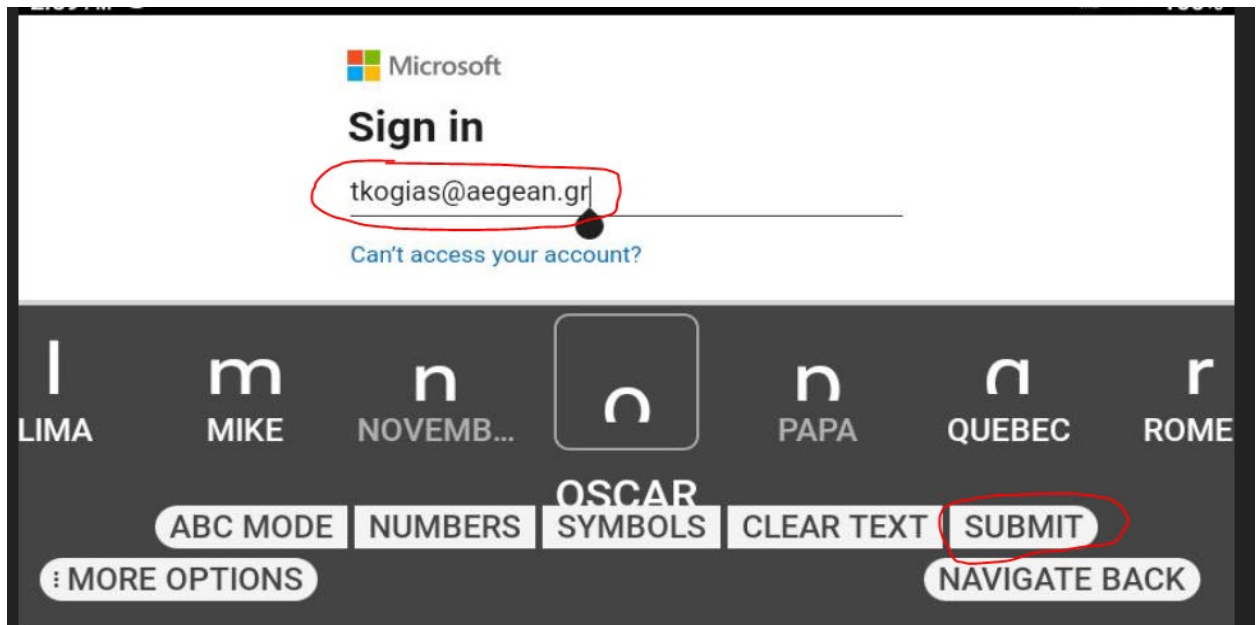
Step 3 - Select ONEDRIVE

Select ADVANCED SIGN IN



Step 4 - Select ADVANCED SIGN IN

Enter the email of the OneDrive account:



Microsoft

Sign in

tkogias@aegean.gr

[Can't access your account?](#)

LIMA MIKE NOVEMB... OSCAR PAPA QUEBEC ROME

ABC MODE NUMBERS SYMBOLS CLEAR TEXT **SUBMIT**

: MORE OPTIONS NAVIGATE BACK

Step 5 - Enter the full login for your microsoft account

Select **SUBMIT** or **NEXT** (depending on what screen you see).

Depending on your account, you might be asked to provide credentials on a dedicated page, probably belonging to your organization. This is the case in our example, since the OneDrive account used belongs to a member of the University of the Aegean. The user is transferred to the organization's Central Authentication Service to provide credentials.

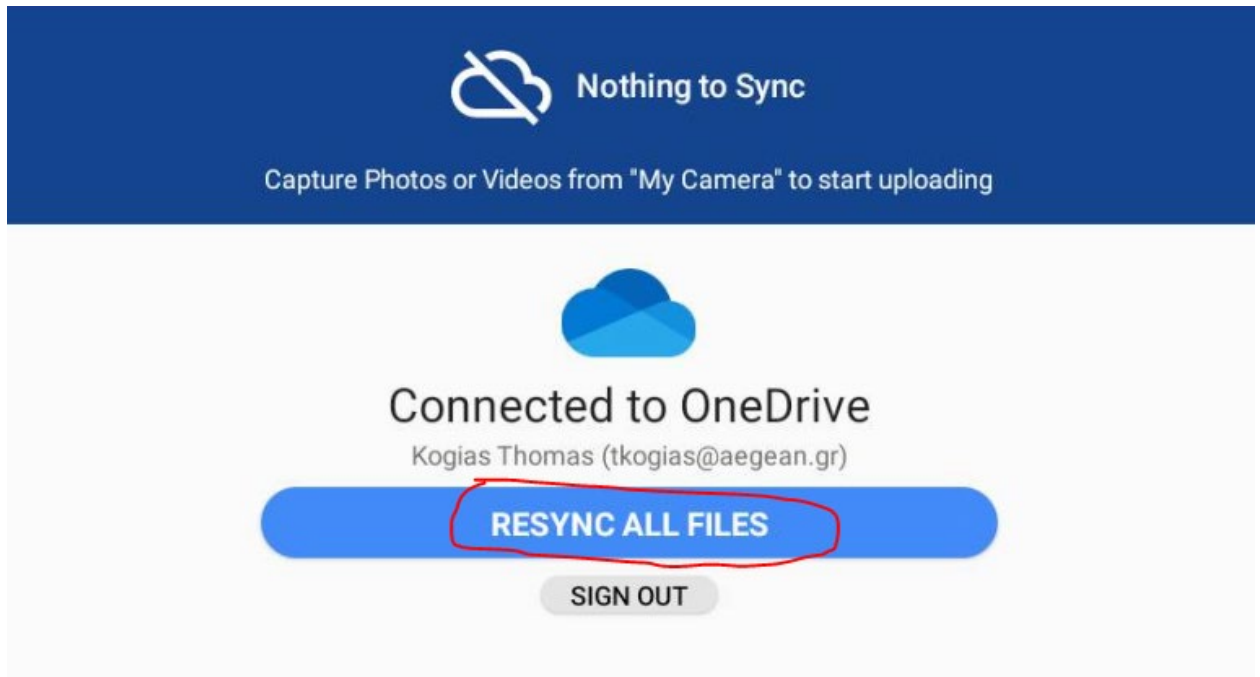
Step 6 (optional) - Use your organization's central authentication service

Note: It could be easier to provide such information using RealWear explorer as one can readily type characters in a computer keyboard.

2.2.5 Sharing files from OneDrive to HMT-1

Once a successful login is made, from now on **CLOUD SYNC** on the HMT-1 is connected to that account and can readily share documents back and forth.

Select **RESYNC ALL FILES**

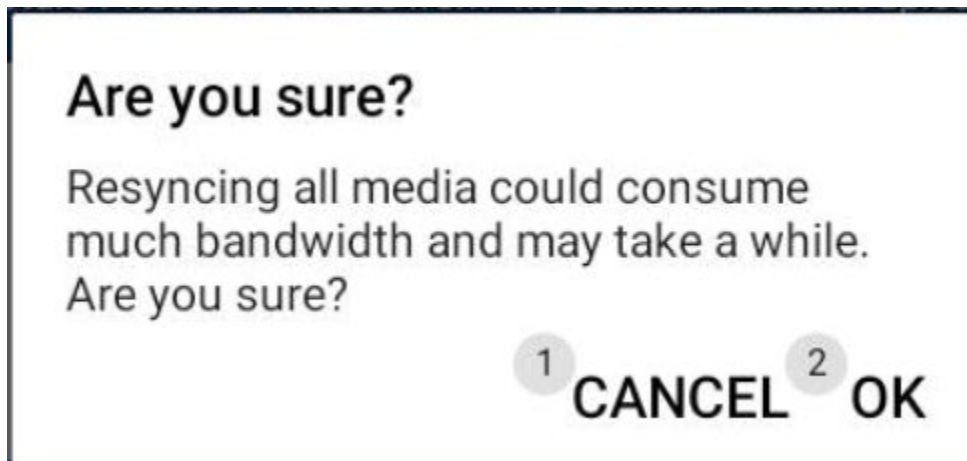


Step 7 - Select RESYNC ALL FILES

Selecting **RESYNC ALL FILES** will download all files from that account onto the HMT-1 and vice versa (uploading photos/videos taken with the HMT-1).

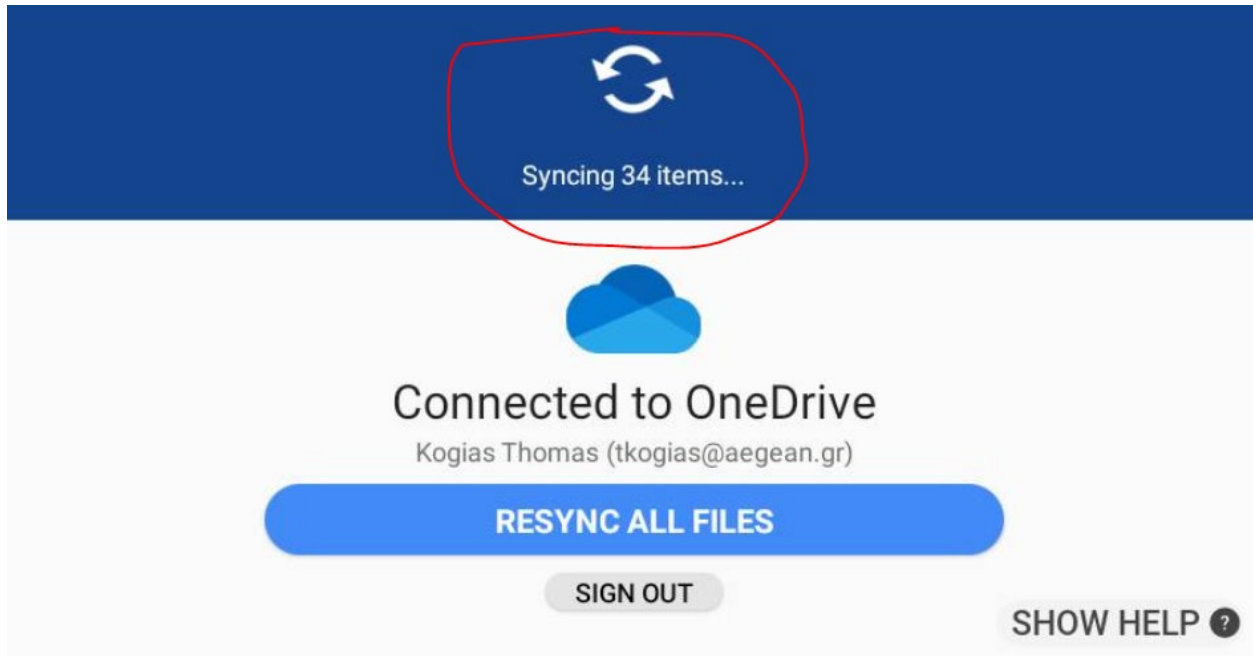
Please bear in mind that depending on the total size of files shared within OneDrive, this procedure might take too long and/or fill up HMT-1 storage with unnecessary files. **You are strongly advised to either use an account specifically designated for the HMT-1 or one that simply does not have too many files stored.**

Once **RESYNC ALL FILES** is clicked, you are asked for confirmation:



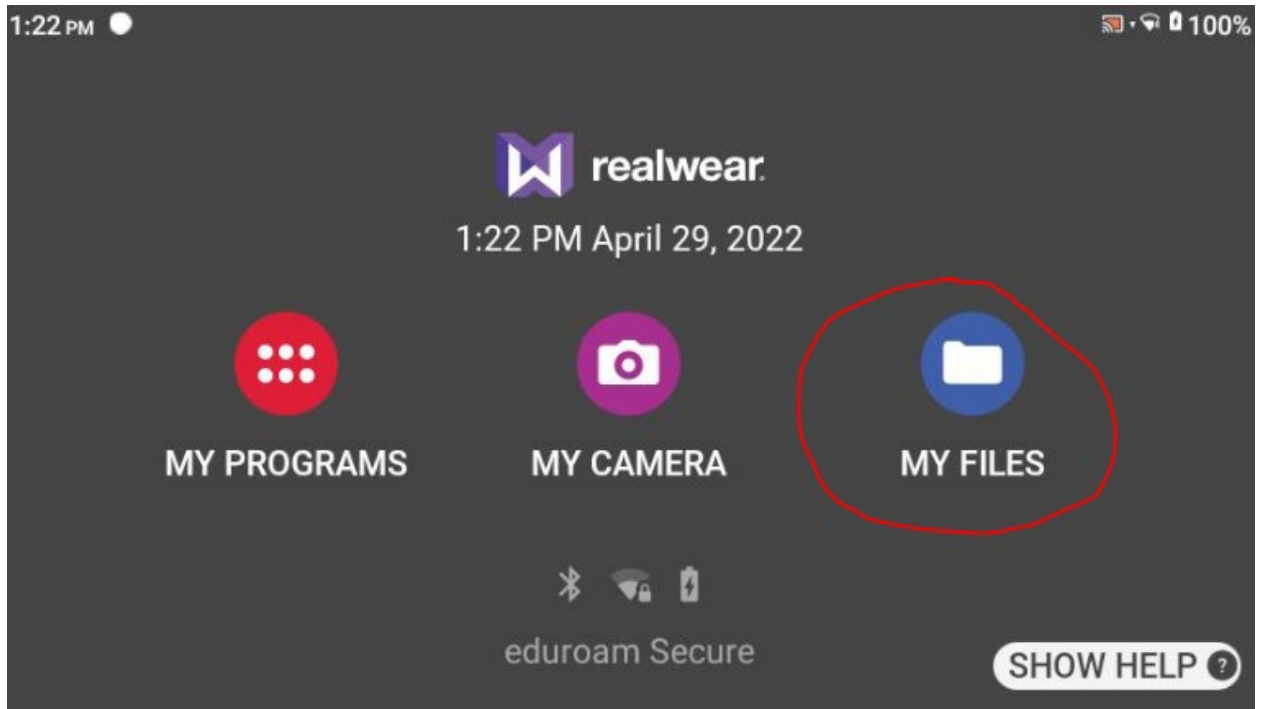
Step 8 - Select OK

Click OK and transfer of files will begin:



Step 9 - Syncing files

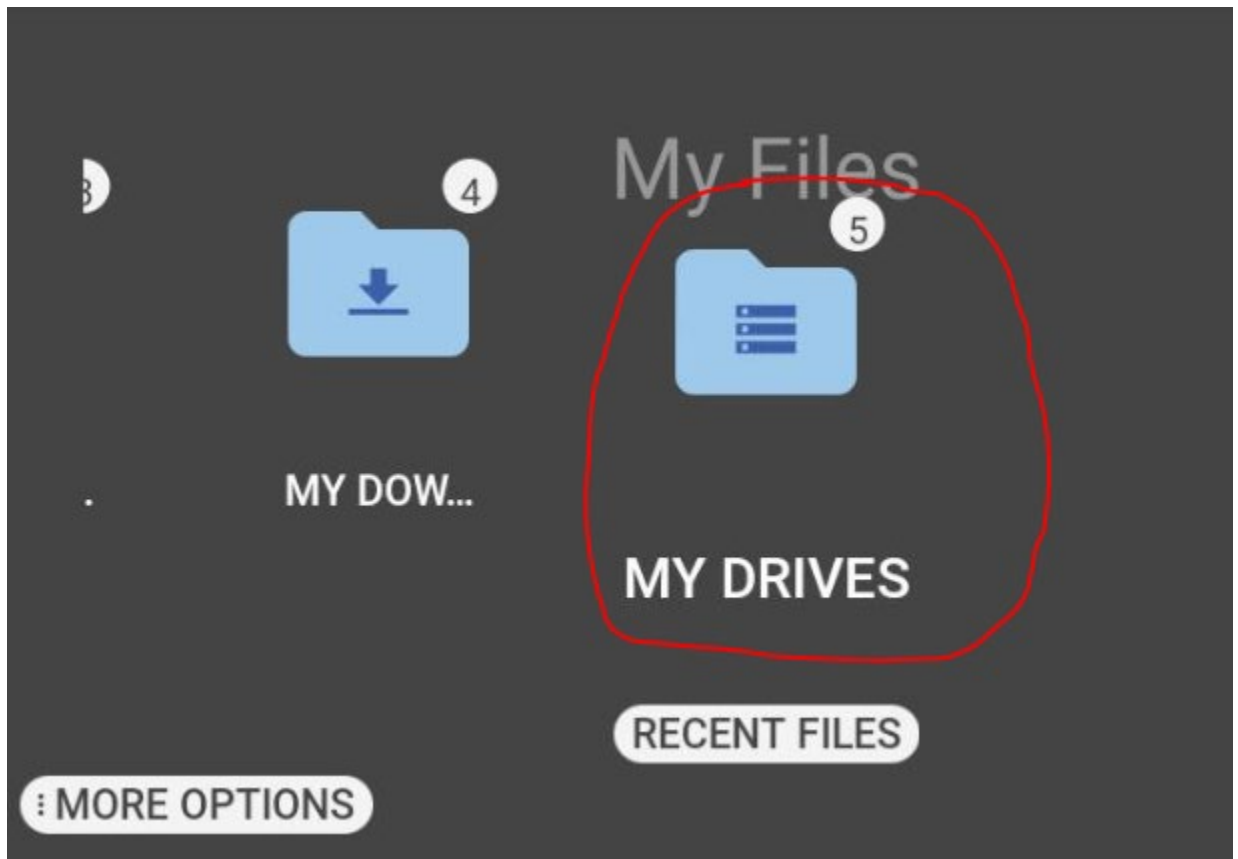
Once transfer is complete, you can return to the HMT-1 HOME screen and click on MY FILES.



Step 10 - Select MY FILES from the HMT-1 HOME screen

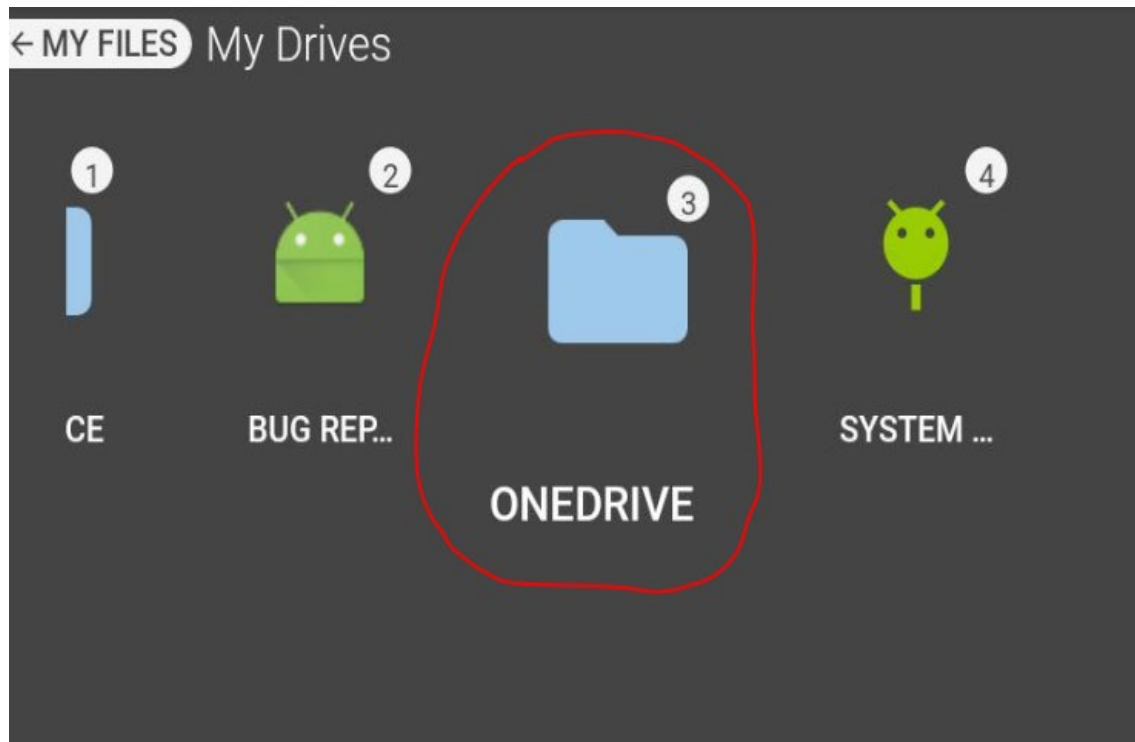
Now you will be browsing the files in HMT-1. Depending on whether you have opened up 'MY FILES' before, you will be either in the root folder, or whatever folder you have browsed before. Let's suppose you start on the root folder.

Scroll to the right and choose the folder MY DRIVES.



Step 11 - Select MY DRIVES

Select ONEDRIVE



Step 12 - Select ONEDRIVE

Select MY DRIVE



Step 13 - Select MY DRIVE

You should now be browsing the OneDrive root folder.

In the example OneDrive account used for this technical paper, a folder named RELAR-TEST-SHARE-DOCS has been created, containing PDF, PPTX and DOCX files. Here is the folder seen from a PC web browser:

	Name ▾	Modified ▾	Modified By ▾	File size ▾	Sharing
	RealWear Cloud Sync	Thursday at 4:16 πμ	Kogias Thomas	2 items	Private
	RELAR	Thursday at 4:11 πμ	Kogias Thomas	3 items	Private
	RELAR-TEST-SHARE-DOCS	Friday at 3:01 πμ	Kogias Thomas	3 items	Shared
	Book.xlsx	February 12, 2021	Kogias Thomas	11.0 KB	Private
	cs_lecture12.pptx	December 17, 2018	Kogias Thomas	5.03 MB	Private
	poi hmata1.docx	November 10, 2018	Kogias Thomas	251 KB	Private
	Presentation 1.pptx	December 16, 2018	Kogias Thomas	27.0 KB	Private
	Presentation 2.pptx	December 17, 2018	Kogias Thomas	27.0 KB	Private
	Presentation.pptx	May 11, 2018	Kogias Thomas	27.0 KB	Private
	wp-seminar2.pptx	May 13, 2018	Kogias Thomas	4.00 MB	Private

RELAR-TEST-SHARE-DOCS OneDrive folder, seen from a computer web interface

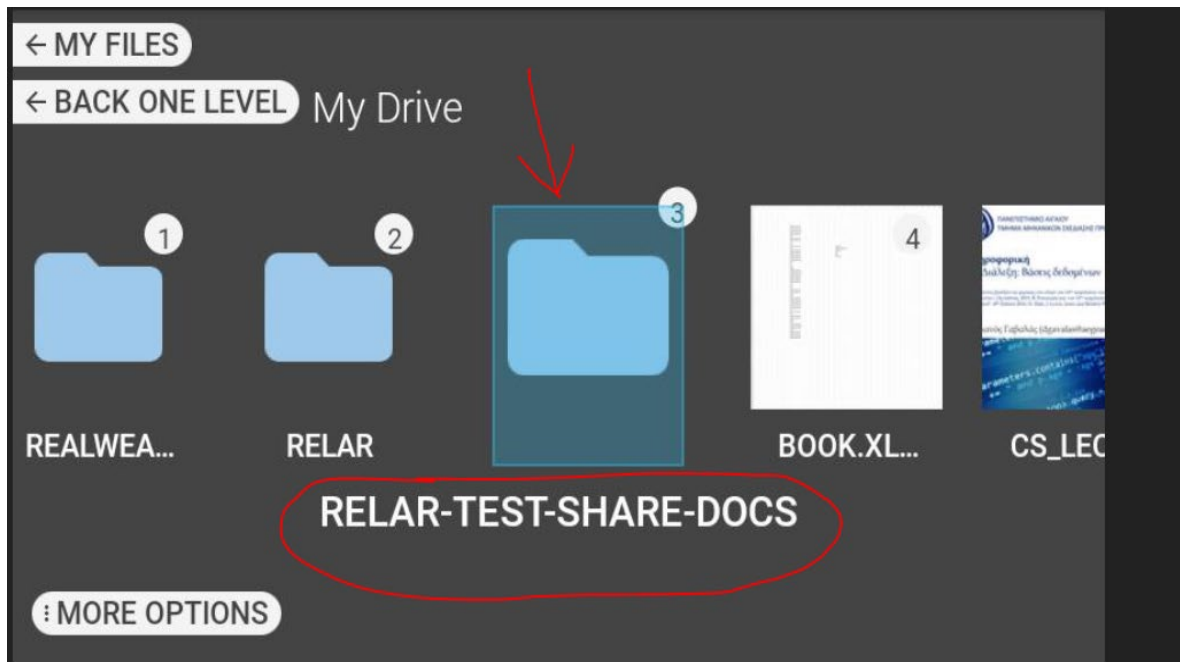
Within this example folder:

My files > **RELAR-TEST-SHARE-DOCS** 

	Name ▾	Modified ▾	Modified By ▾
	HMT-1 Introduction.pdf	Friday at 3:10 πμ	Kogias Thomas
	Presentation-RELAR-Kickoff-TheVision.pptx	Friday at 3:09 πμ	Kogias Thomas
	Virtual meeting Feb. 24th agenda RELAR.concept.doc	Friday at 3:09 πμ	Kogias Thomas

Contents of RELAR-TEST-SHARE-DOCS folder

Back onto the HMT-1, the user selects the same folder (in this example, easiest method of selection is by voice command, **SELECT ITEM 3** - or by clicking appropriately if using the RealWear explorer.



Select appropriate folder

Selecting the particular folder will open up its contents - in this particular example, we see the files (DOC, PDF, PPTX) readily available for browsing through the HMT-1.



Folder contents seen from the HMT-1 User Interface

Using the vocal command “select item #”, the user can open up each document.

Following is a screenshot of HMT-1 browsing a DOC document, with the option SHOW HELP turned on:



Viewing a PPTX presentation through the HMT-1, with zoom level 2 applied

Users can similarly browse all different files - successful tests have been made with PDF, DOC, PPT files.

2.2.7 Sharing files from an arbitrary Gmail user to the HMT-1.

In the previous section, sharing files from a **specific** OneDrive account to the HMT-1 was demonstrated. However, it is possible to leverage the use of OneDrive **in order to share files from an arbitrary endpoint to the HMT-1**.

In the following section, the use of an arbitrary Gmail account will be demonstrated:

The basic necessary step is to share a particular folder from the OneDrive User Interface, and give editor rights to an arbitrary Gmail user (in this example, tkogias@gmail.com).

Then that particular Gmail user will be notified via email, and will be given a link to upload files onto the designated folder. Once this is done, those files will be accessible on the HMT-1 after a successful `RESYNC ALL FILES` through the `CLOUD SYNC` app.

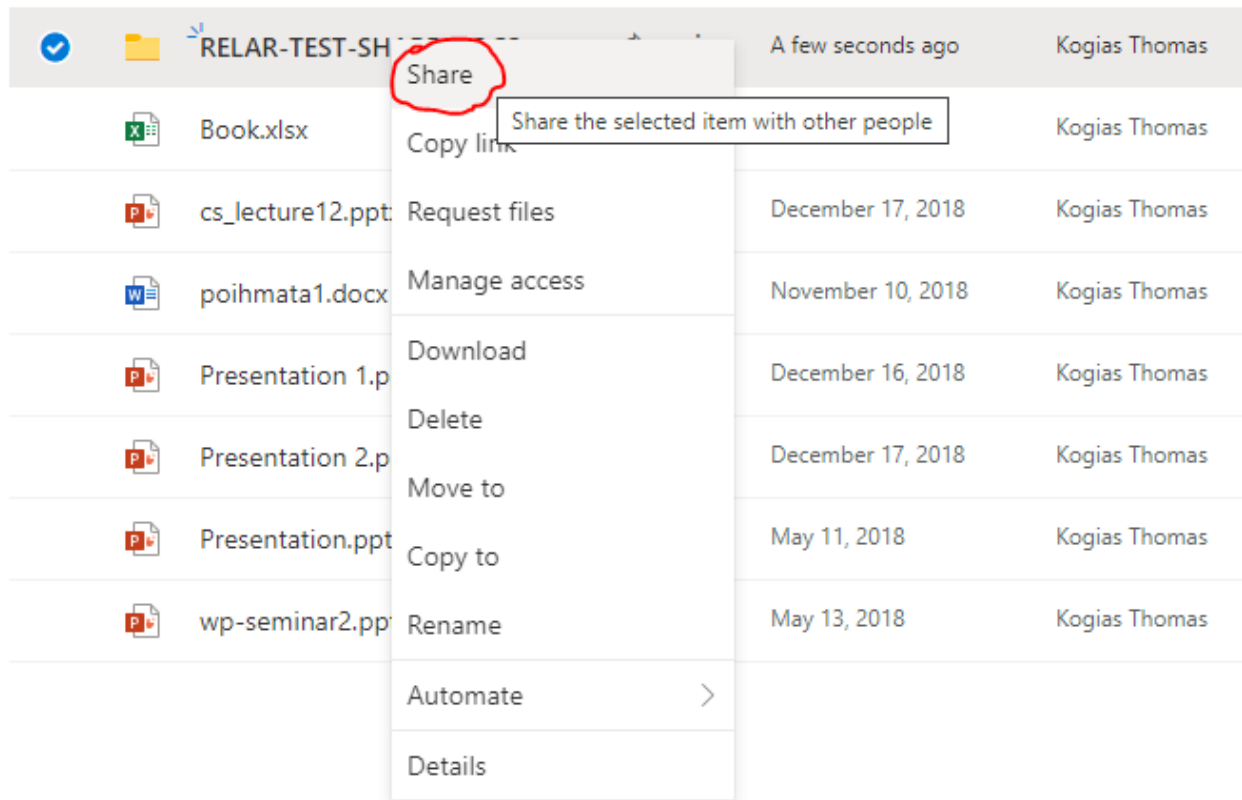
The procedure is highlighted below:

Right click folder within OneDrive, in order to give permissions to an arbitrary Gmail user:

 Name ▾	Modified ▾	Modified By ▾	File size ▾	Sharing
 RealWear Cloud Sync	Yesterday at 4:16 πμ	Kogias Thomas	2 items	Private
 RELAR  	Yesterday at 4:11 πμ	Kogias Thomas	3 items	Private
 RELAR-TEST-SHARE-DOCS	A few seconds ago	Kogias Thomas	0 items	Private
 Book.xlsx	February 12, 2021	Kogias Thomas	11.0 KB	Private
 cs_lecture12.pptx	December 17, 2018	Kogias Thomas	5.03 MB	Private
 poihamata1.docx	November 10, 2018	Kogias Thomas	251 KB	Private
 Presentation 1.pptx	December 16, 2018	Kogias Thomas	27.0 KB	Private
 Presentation 2.pptx	December 17, 2018	Kogias Thomas	27.0 KB	Private
 Presentation.pptx	May 11, 2018	Kogias Thomas	27.0 KB	Private
 wp-seminar2.pptx	May 13, 2018	Kogias Thomas	4.00 MB	Private

Right-click folder within OneDrive

Choose 'Share'



Select Share option

Enter the email of the person you intend to share the folder with (here a personal Gmail account - tkogias@gmail.com is used as an example). Once the recipient's email is entered, click **Send**.

Send link

RELAR-TEST-SHARE-DOCS

 Anyone with the link can edit >

 tkogias@gmail.com 

Add another

 tkogias@gmail.com is outside of your organization.

Message...

Send

Copy link

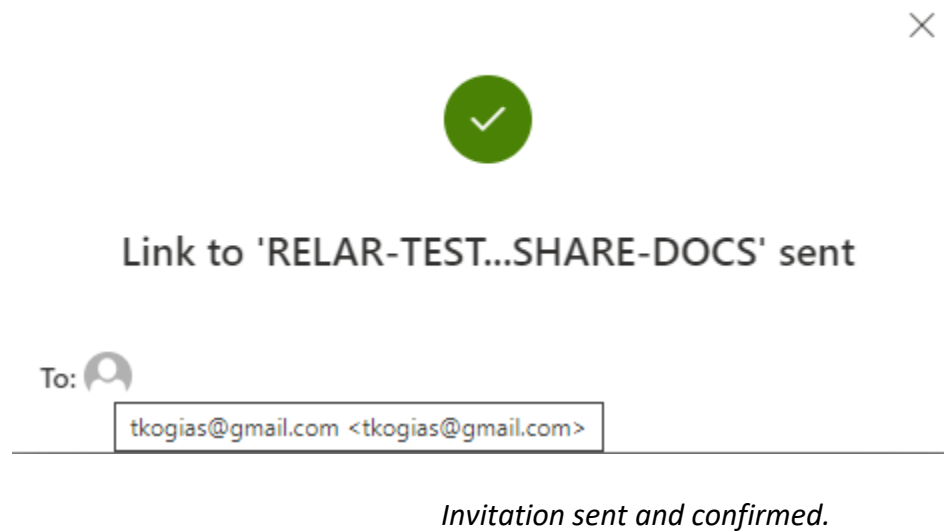
 Anyone with the link can edit >

Copy

*Enter recipient account email, click **Send**.*

35

Once Send button is clicked, the invitation is confirmed:



Now the recipient of the email can click on the link and be presented with a web User Interface for OneDrive, where documents can be uploaded.

As a test, a new PDF file is uploaded (filename: dummy.pdf).

My files > RELAR-TEST-SHARE-DOCS 

 Name ▾	Modified ▾
 dummy.pdf	A few seconds ago
 HMT-1 Introduction.pdf	Friday at 3:10 πμ
  <u>Presentation-RELAR-Kickoff-TheVision.pptx</u>  	Friday at 3:09 πμ
 Virtual meeting Feb. 24th agenda RELAR.concept.doc	Friday at 3:09 πμ

A new PDF file (dummy.pdf) is uploaded to the shared OneDrive folder.

In order to access the newly uploaded file, the HMT-1 user must do the following:

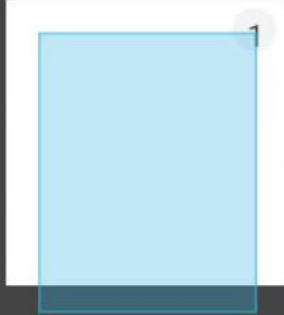
Select HOME SCREEN -> CLOUD SYNC -> RESYNC ALL FILES

Then select MY FILES and open the right folder, where the recently uploaded file (by an arbitrary Gmail user) is there to be browsed within the HMT-1:

← MY FILES

← BACK ONE LEVEL

RELAR-TEST-SHARE-DOCS



DUMMY.PDF



HMT-1 IN...



PRESENT.

⋮ MORE OPTIONS

2.2.8 Sharing files (images and videos) from HMT-1 to an arbitrary endpoint

In order to share files created by the HMT-1 user (images and videos captured with the device), the preferred way is again by **taking advantage of the recent built-in CLOUD SYNC app that should exist in all devices.**

The procedure is documented below, from the ground up:

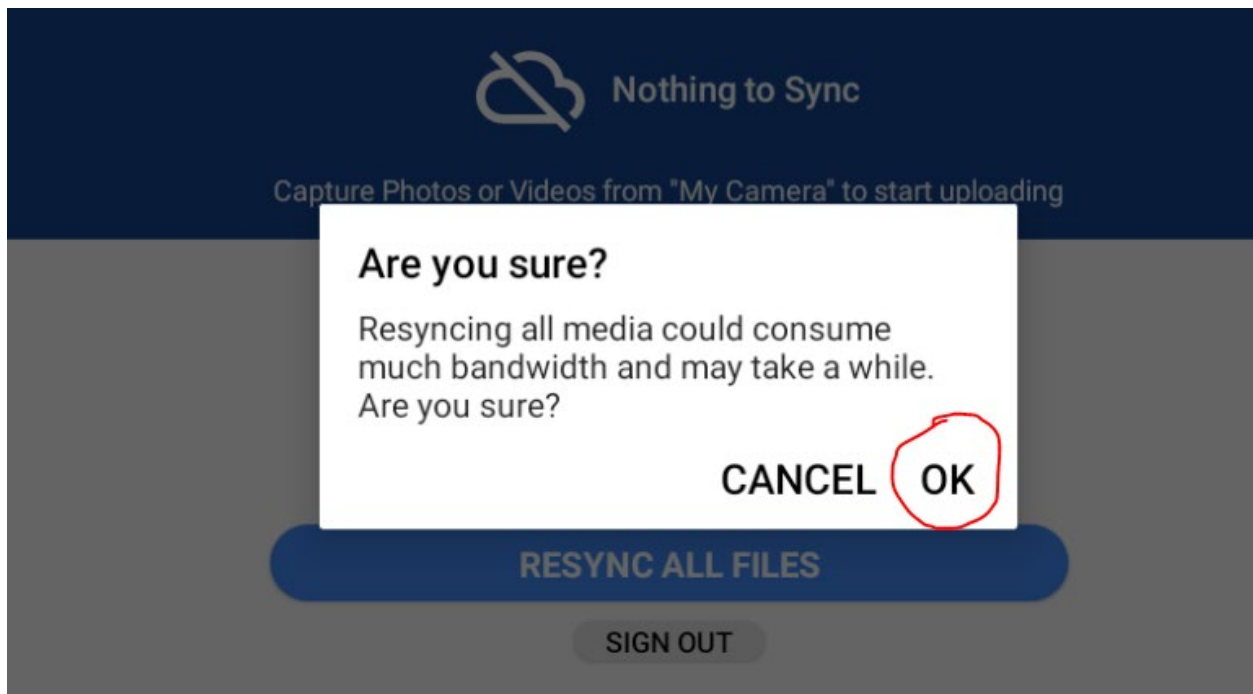
Select HOME SCREEN -> MY PROGRAMS -> CLOUD SYNC.



CLOUD SYNC app's first page

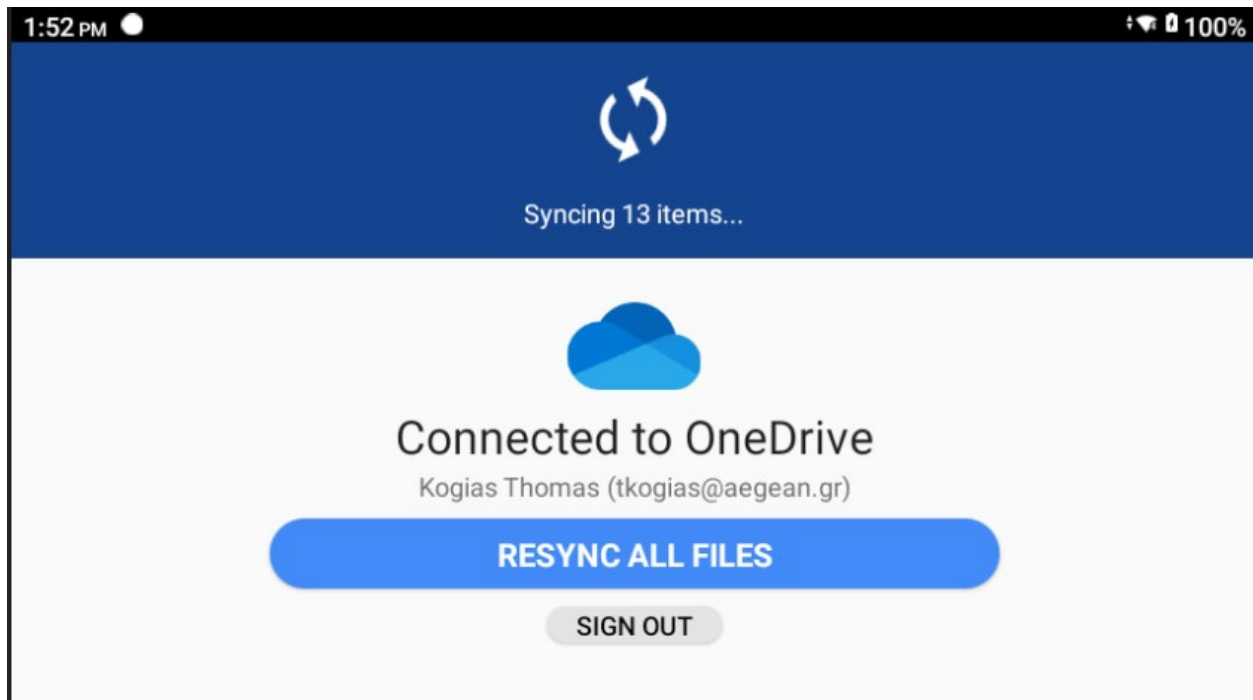
Select RESYNC ALL FILES

A message pops up, informing us that the procedure might consume significant bandwidth, as all media files will be uploaded. Select OK.



Select OK (time taken will depend on number/size of media files and available bandwidth).

Syncing starts:



Media files are being uploaded (syncing)

Important notice - First time use:

If this is the first time uploading media files from the HMT-1 to the specific OneDrive account linked with the device, an appropriate folder named “RealWear Cloud Sync” will automatically be created in the root folder structure of the OneDrive account. The screenshot below, captured from OneDrive’s web interface confirms the folder creation:

My files

	Name ▾		Modified ▾	Modified By ▾	File size ▾	Sharing
	RealWear Cloud Sync	 	About a minute ago	Kogias Thomas	2 items	Private
	RELAR		April 28	Kogias Thomas	3 items	Private
	RELAR-TEST-SHARE-DOCS		April 29	Kogias Thomas	4 items	Shared
	Book.xlsx		February 12, 2021	Kogias Thomas	11.0 KB	Private
	cs_lecture12.pptx		December 17, 2018	Kogias Thomas	5.03 MB	Private

Root OneDrive folder as seen from a WEB UI. Folder automatically created.

Once syncing completes, media files are split into videos and images, and are available (shared) with the OneDrive user:

My files > RealWear Cloud Sync

	Name ▾		Modified ▾	Modified By ▾	File size ▾
	Photos	 	8 minutes ago	Kogias Thomas	12 items
	Videos		7 minutes ago	Kogias Thomas	1 item

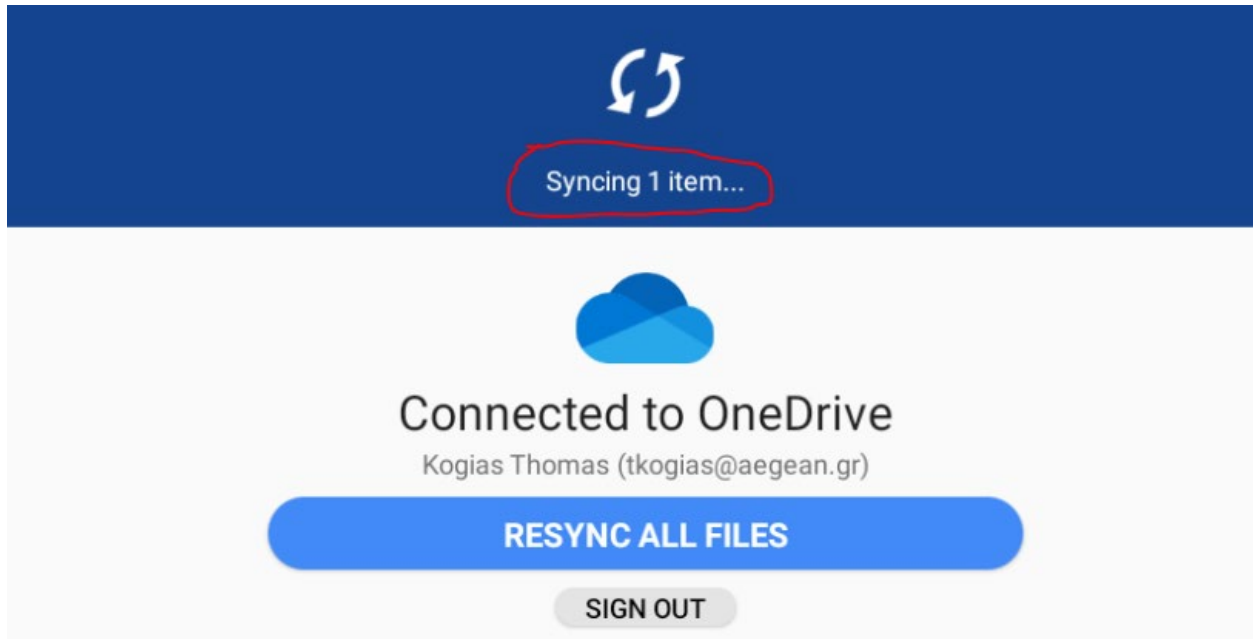
Media files (photos & videos) have been uploaded and are now shared within OneDrive

Subsequent uploads are automatic:

Please note, that re-syncing all files is not necessary for subsequent uploads to the specific OneDrive account linked with the Device. As the CLOUD SYNC app notifies the user, nothing is left to Sync, and the user may simply **“capture photos or videos from ‘My Camera’ to start uploading”**.

As an example, open up HOME SCREEN -> MY CAMERA and then select TAKE PHOTO to capture an image.

Once a photo is taken and saved in the device, uploading to the designated OneDrive folder begins automatically in the background. To confirm this, user may open up the CLOUD SYNC app and (if uploading has not completed yet) an appropriate message is showing that 1 item is being synced:



Automatic upload of newly captured image has already begun

Indeed, the recent photo is automatically shared within OneDrive (inside RealWear Cloud Sync - > Photos):

My files > RealWear Cloud Sync > Photos

	Name ▾	Modified ↓ ▾	Modified By ▾
	IMG20220519_144104.jpg	A few seconds ago	Kogias Thomas
	IMG20220519_143316.jpg	8 minutes ago	Kogias Thomas
	IMG20210927_230544.jpg	16 minutes ago	Kogias Thomas
	IMG20210927_230803.jpg	17 minutes ago	Kogias Thomas
	IMG20210927_224704.jpg	17 minutes ago	Kogias Thomas
	IMG_20210512_131959.jpg	18 minutes ago	Kogias Thomas

Once HMT-1 is linked to a specific OneDrive account, and once an initial sync has taken place, new images and videos taken with that device will automatically be shared in the designated OneDrive folder and can be thereafter utilized in multiple ways.

2.2.9 Custom RELAR app - leveraging the use of QR Codes using the HMT-1

After consultation with the scenario building partners, it was decided that a custom app for the HMT-1 would be very beneficial in order to further facilitate the use of the device in remote training scenarios. We have developed RELARSCANNER, an app that facilitates the use of QR codes as an easy shortcut to a list of PDF files and services such as ZOOM meeting links and Youtube videos. The list can either be saved offline or can be re-generated through a new QR code scan. The list is automatically created from a suitable Google Sheet which acts as a 'backend' data repository.

Some of the benefits of RELARSCANNER are:

- Free online tools (e.g. www.qr-code-generator.com) to easily create custom QRc for any scenario.
- QR codes are convenient to use in a plethora of scenarios as they can be printed onto paper and/or stickers to be used in labs/classrooms etc.
- Google Sheet as a backend allows for very easy manipulation of possible links as 'destinations' for the list items.
- Offline saving of list allows for quick use of the app; no need to re-scan unless the list has changed.

Some current limitations of RELARSCANNER:

- Whereas PDF files open in native viewer on the HMT-1 which allows zooming among other features, other files (such as powerpoint) open in web app with limited functionality. This behaviour is not reproduced in android phones. Further investigation and consultation with RealWear is needed.
- Files currently need to exist in a publicly available http URL. Cannot handle Google drive links and/or OneDrive links. Further investigation and testing is needed.

2.2.10 How to install and use the RELARSCANNER app (detailed videos):

Following consultation with the scenario building partners, four separate, detailed videos have been created, in order to demonstrate the installation and use of the RELARSCANNER app. You can find them here:

1. [Installing RELARSCANNER](#)
2. [Setting up Google Sheet as a repository](#)
3. [Using the app](#)
4. [Uninstalling the app](#) (needed in case a new version is created)

2.2.11 How to use ZOOM on the HMT-1

A new video was created in order to specifically demonstrate how to use Zoom on the HMT-1:

- [How to use Zoom on the HMT-1](#) (through the use of RELARSCANNER app)

2.2.12 References

HMT-1 general documentation:

- HMT Setup guide - <https://support.realwear.com/knowledge/hmt-setup-guide>
- RealWear explorer - <https://support.realwear.com/knowledge/realwear-explorer>
- Cloud Sync APP - <https://support.realwear.com/knowledge/cloud-sync>
- Using the HMT-1 - <https://support.realwear.com/knowledge/using-the-hmt>
- Latest firmware release notes - <https://support.realwear.com/knowledge/release-12.2-firmware-release-notes>

HMT-1 app development documentation:

- HMT development examples - <https://support.realwear.com/knowledge/hmt-development-examples>
- WearML embedded - <https://support.realwear.com/knowledge/wearml-embedded-tutorial>
- WearML embedded API - <https://support.realwear.com/knowledge/wearml-embedded-api>
- ZXing library - <https://github.com/zxing/zxing>

3. Scenario-specific info

3.1 Scenario 1: Shipyard Technician

3.1.1 Lesson Plan

Title of Scenario: <i>Engineering Dynamics / Tractive force against friction</i>	
Partner Leading Scenario	Malta College of Arts, Science & Technology
Partner Supporting Scenario	Aegean University
Scenario	Shipyard Technician
Programme	Diploma in Marine
Subject	Engineering Dynamics
EQF Level	ME-DME-4.1A / Level 4
Title of Lecture:	Tractive force against friction
Time/Duration	3 sessions of 3 hrs each
Aim (s) • To investigate the effect on tractive force due to friction between surfaces on a horizontal and an inclined plane. • To investigate the effect of varying angles of the incline	

- To investigate the effect of varying coefficient of friction between surfaces.

-

Objective (s)

To determine the friction coefficients on an inclined surface. Demonstrate the effect of varying angles of incline. Eventually finding the point of equilibrium of forces on an incline due to frictional forces and the transition from static to dynamic friction

Finally verifying the correlation between the calculated and experimental values for friction.

Resources

Gunl TM225 - Friction on an incline plane experimental setup

This equipment is equipped with multiple varying variables, mainly:

- Testing at different angles of incline of the plane
- Testing different frictional coefficient materials.
- Testing at different load forces



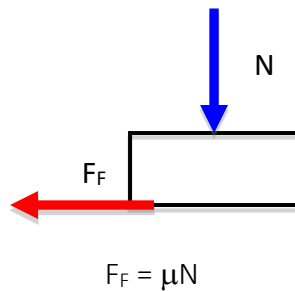
HMT AR Headset to be used to demonstrate the capability of remote learning by the user with a closed loop feedback to the accessor.

During the session the



Introduction of Lecture (Duration: 120 minutes)

Friction is the external force that always acts to oppose motion, due to contact with solid, liquids and / or gases. Example friction force between the car wheels and the road helps it move forward. In real cases the effect of friction must be taken into consideration



Where F_F is the frictional force due to force N

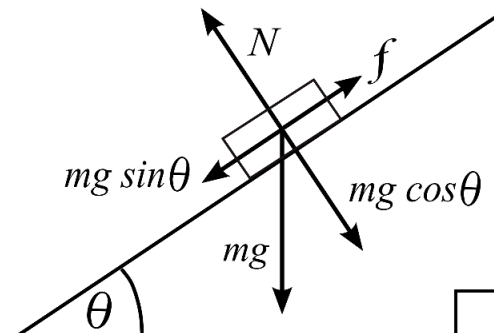
N force being exerted on the box

μ Coefficient of friction

Thus when a body is accelerated, the force causing acceleration is the **NET FORCE**.

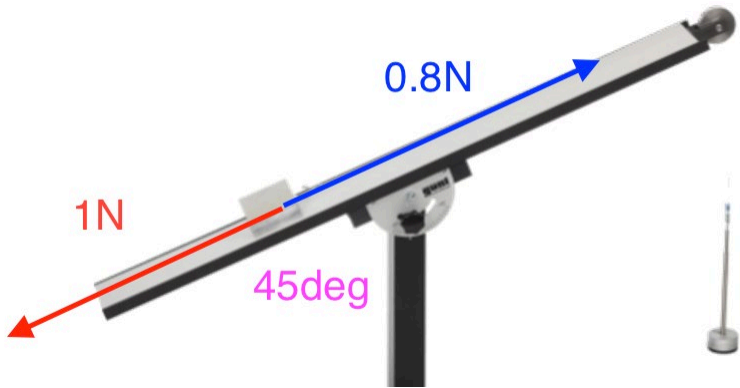
$$\text{Net Force} = \text{Applied Force} - \text{Friction Force}$$

Friction on an incline will vary due to the varying component of the Normal force pushing the object on the incline as seen in the figure below.



Steps in developing Lecture including methodology as well as time allocated per activity

Task/Activity	Time allocated
Explanation of the theory of linear friction	20 minutes
Explanation of the theoretical effect of friction, linearly and on an incline	20 minutes
Present the students with the friction plane and various materials and loading forces to experiment with.	20 minutes
Setup the experiment with the incline plane	
Input the varying parameters such as: • mass • angle • coefficient parameters through voice command and/or using input HMT AR systems (<i>To be confirmed by the ICT team</i>). The application will then show these values at the side of the screen or superimposed	30 minutes

			
	Start experimenting with different materials on a flat plane to determine the frictional coefficient according to the instructions given on the Headset screen	30 minutes	
	Vary the inclined angle of the friction plane to determine the effect on the frictional forces according to the Headset screen instructions	30 minutes	
Conclusion of Lecture (Duration: 120 minutes total) Students will be able to distinguish the effect of the varying angle of the incline on the friction force acting against the tractive effort. This can be thus compared to the values that they are given in their headsets. Thus, the students will be able to demonstrate that the friction coefficient can be attained experimentally and thus compare the results attained to the values inputted by the lecturer on the Relar Headset, in the answers section. Students will be made thus aware of the relationship between different frictional material and their respective coefficients.			

3.1.2 System Architecture

For the scenario to be applied for the HMT-1, a custom “launcher app” was developed. The app is to do the following:

- Accept pre-defined voice commands.
- Scan a single QR code.
- Load data from a Google Sheet.
- Join a ZOOM video call.

Digital Workflow

As discussed in several RELAR meetings, the concept of a digital workflow is highly recommended for the application of this scenario with AR. What is understood by the term digital workflow, in this use case, are “step-by-step” instructions presented in a digital manner that a learner can follow to achieve a specific learning goal. It is highly recommended that the duration of the activity with the HMT-1 does not last very long to reduce eye strain and fatigue caused by prolonged use (Waard et al., 2020).

- *QR Code Scanning*

The idea for QR code scanning is for the app to be able to identify which learning scenario to load. The QR code has an embedded URL redirecting to the Google Sheet.

- *Public Resource Repository*

A resource repository allowing lecturers to create virtually unlimited learning scenarios without any intervention from the developer is highly recommended. This can be achieved with minimal complexity but using a pre-existing platform that lecturers are comfortable using, such as Moodle. Moodle is licensed as free software (GNU General Public License, 1999) used by

many universities and vocational institutions around the world and can easily be used as a resource repository. Lecturers can be allowed to create their own accounts and have access to the public

resources already available and add their own. Restrictions to account creation can be applied to email addresses containing the .edu prefix.

- *Resources*

It is recommended that text in the resources should be a minimum of 18px – 24px to be easily readable by the user (Introduction to Designing for the RealWear HMT-1 and HMT-1Z1, 2018). Any images used for the HMT-1 should have a resolution of 854 x 480 pixels (“RealWear HMT-1 Data Sheet,” 2018). **Error! Reference source not found.** shows a sample image that can be used as part of the digital workflow.

- *Video Recording*

Triggering video recording can be automated the moment a QR code is scanned. A configuration file containing a Boolean (True/False) value can be set in the resource repository and set to off by default. A lecturer can opt to use video recording when students are using the device for assessment purposes.

- *Video Calling*

Video calling a pre-defined person can be triggered by clicking the device’s “action” button. The person whom to call and whether this feature is active or not should also be set in the configuration file mentioned in the previous section.

3.1.3 Proposed System Manual

The system is very easy to use both from a student's perspective but also from a lecturer's perspective.

- *Setting Up The Application*

Step 1 (Optional Step): Transfer the APK file on the device

Step 2: Register for Google Develop account.

Step 3: Obtain API key,

Step 4: Create a config file with the API key on the device as follows:

API_KEY: NULL

- *Creating A New Learning Scenario*

Step 1: Create Google Sheet from template.

Step 2: Include the links to the resources.

Step 3: Copy the URL of the Google Sheet and use it to generate a QR code.

Step 4: Print the QR code or make it available digitally during the lecture.

- *Using The Container Application*

Step 1: Switch on the application by calling the application name.

Step 2: Start the application.

Step 3: Scan QR code

Step 4: Navigate through the resources by using voice commands.

Optional Step: Call the respective lecturer by speaking “*Call Lecturer*”.

3.1.4 Wearing the HMT device

Step 1: The HMT-1 can be positioned in a way that the display and camera are placed on the left or right side of the head. It is suggested that the screen is displayed in front of the user’s dominant eye to provide better visuals and more comfortable use. . Eye dominance refers to the eye that provides a slightly greater degree of input to the visual part of your brain and more accurately relays information about the location of objects. Hence, before wearing the HMT device, the user should determine his/her eye dominance. There are several simple tests online, which can help the user determine his/her dominant eye. One simple test is as follows:

1. Extend your arms out in front of you and create a triangular opening between your thumbs and forefingers by placing your hands together at a 45-degree angle (see animation).
2. With both eyes open, centre this triangular opening on a distant object — such as a wall clock or doorknob.
3. Close your left eye.
4. If the object stays centred, your right eye (the open one) is your dominant eye. If the object is no longer framed by your hands, your left eye is your dominant eye.

Step 2: Once the dominant eye is identified, the HMT’s display and camera were adjusted accordingly. For the shipyard technician scenario, no head mounting accessories such as hardhat, caps or other accessories were used.

Subsequently, the lecturer was asked to put on the HMT. The head strap was adjusted and positioned along the temple area. Following this, the display screen was adjusted to ensure an optimal fit for the user.

Step 3: Once the HMT was positioned and adjusted over the user’s head, the device was switched on by pressing the button located on the same side of the display monitor. Once the screen is on, the user carried out final fine-tuning to have clear visibility of the home screen.

3.1.5 Scenario Validation

This section aims to present a number of photos showing the testing of the ‘Shipyard Technician’ scenario. A laptop of the side shows what the user is seeing through the HMT-1 device. Figure 4 – 8 shows the lecturer giving specific commands to the HMT-1.



Figure 1: Physical setup with the QR code.



Figure 2: The lecturer determining his dominant eyes so the display screen is positioned in front of the user's dominant eye to provide better visuals and more comfortable use.



Figure 3: The user adjusting the HMT's display and camera



Figure 4: Voice Command to access the main menu: My Programs



Figure 5: Voice Command to access the Relar Scanner app: Relar Scanner 2



Figure 6: Voice Command to load lab sheet 1. Lab sheet 1 is a pdf document, which contains information on the laboratory experiment to assist the students explore the scientific concept of friction.



Figure 7: Voice Command to adjust the resolution: Zoom Level 3 and freeze window are two commands to zoom further into the document and lock the screen respectively.



Figure 8: The user carrying out the experiment using the physical setup by going through the instructions displayed on the HMT-1 device.



Figure 9: Another photo of the user carrying out the experiment.

The following are the steps that will be followed during the 30-minute experimental session using the HMT-1:

1. Release the Graduated angle screw (4).
2. Setup the inclined plane (1) horizontally for this experiment.
3. Use a spirit level to confirm that the inclined plane is truly horizontal.
4. Place the sliding object (6) on the horizontal plane. Four friction surfaces combinations are provided:
 - Polypropylene/Resopal
 - Steel/Resopal
 - Aluminium/Resopal
 - Brass/Resopal
5. Start your experiment with the Polypropylene
6. Attach the weights hanger (7) using the rope provided over the pulley (5) and with the sliding object (6).
7. Load the weight hanger (7) with the weights provided until the sliding object (6) tends to start moving.
8. Note down the weight (force) of the load and compare it to the experimental results provided.
9. Repeat the experiment with the remaining three material combinations

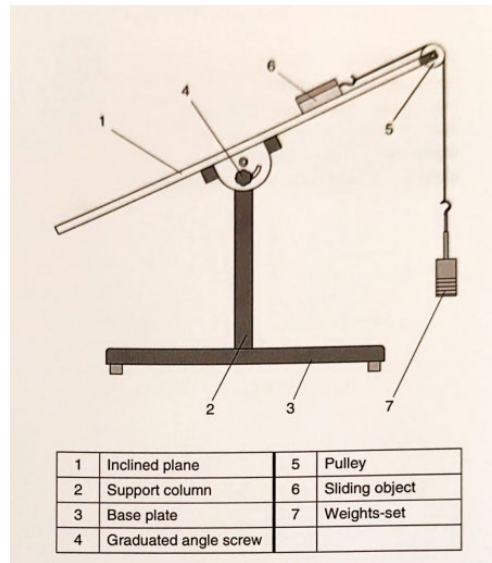


Figure 10: Diagram illustrating the different parts of the equipment used.



Figure 11: Voice Command to go back to the main menu and access the tutorial video: Control Window, Navigate back, Inclined plane video

Figure 12 shows the user recording the session whilst carrying out the experiment. Such session allows the students to record themselves carrying out the experiments. Such tool is useful for the lecturer to eventually assess the students' knowledge on the subject.

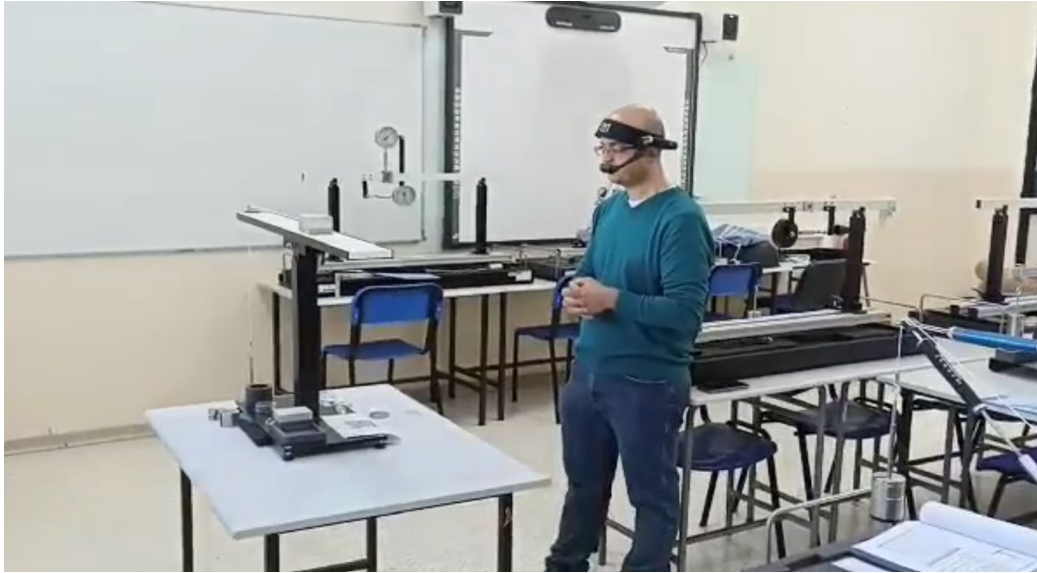


Figure 12: Voice Command to start recording the session from the HMT-1's camera. The commands given are 'start recording', 'record video' and 'stop recording'.

3.2 Scenario 2: Marine Engineering

3.2.1 Lesson Plan

Title of Scenario: Basic Cooling Systems Operation and Troubleshooting	
Partner Leading Scenario	Universidad de La Laguna
Partner Supporting Scenario	STC group
Scenario	Marine Engineering
Programme	Degree in Marine Technology
Subject/Course	Cooling and refrigeration systems.3rd year
Title of Lecture	Basic Cooling Systems Operation and Troubleshooting
EQF Level	4
Date	During the 1st semester, 1 Lecture/week

Time/duration	10 classroom hours and 15 self-study hours
Aim(s)	The unit prepares the student to perform basic operation and troubleshooting procedures in a cooling plant, including: normal start and stop, defrosting, long term stopping process, and the investigation and fixing procedures for the most malfunctioning problems.
Key Learning Objectives: After completing this unit, the student will be able to: • (1) understanding how a cooling system works, • (2) operating a cooling plant for regular starting, stopping and defrosting, • (3) preparing a cooling system for a long-term stop, • (4) investigating common alarms in a cooling system, and • (5) fixing common malfunctions of a cooling system.	
Resources Needed: • Cooling plant • LMS system • Electronic unit documents • HMT-1 head mounted tablet	
Knowledge, Skills and Competencies: • Knowledge: Architecture, working principles and control strategies of a cooling system. Basic operation and troubleshooting procedures of a cooling system. • Transferable skills: Analytical thinking, problem solving, and troubleshooting linked to industrial systems, assisted reality operation of systems.	
Teaching and Learning Content: - Description of a cooling system.	

- Operation of a cooling system at operation level. - Maintenance of a cooling system at operation level.		
Steps in developing Lecture including methodology as well as time allocated per activity		
<i>Task/Activity description</i>	<i>Type [Guided; Unguided; Assessment]</i>	<i>Time allocated</i>
I. Prior knowledge activation about cooling physics. Students' presentation of cooling physics based on previous knowledge and written contents given by the instructor. Self evaluation test and feedback from the instructor.	Guided	1 hour
II. Hardware architecture of a cooling system. Physical description of a real cooling plant by the instructor. Self evaluation test and feedback from the instructor.	Guided	1 hour
III. Control architecture of a cooling system. Physical description of the control board and its components. Self evaluation test and feedback from the instructor.	Assessment	1 hour
IV. Description of a cooling system at operation level. Students should discuss the function of each human-machine interface component and matching them in the control schematics. Self evaluation test and feedback from the instructor.	Assessment	1 hour
V. Starting, stopping, and defrosting procedures. Students will be given a written procedure. They should follow it in a real cooling plant with a HTM-1 headset. Instructor will assist the student remotely	Assessment	1 hour

	during the operation. Briefing and debriefing processes can be included as part of the learning process.		
VI.	Long-term stopping procedure. Students will be given a written procedure. They should follow it in a real cooling plant with a HTM-1 headset. Instructor will assist the student remotely during the operation. Briefing and debriefing processes can be included as part of the learning process.	Assessment	<i>2 hours</i>
VII.	Alarms and safety controls of a cooling system. Students will be given a safety diagram of the cooling plant. During teaching hours, and with the assistance of the instructor, students will elaborate the catalogue of alarms of a real cooling plant.	Assessment	<i>1 hour</i>
VIII.	Fixing common faults and alarms. Students will be exposed to alarms during their operation procedure with HTM-1 headset. Students should use written instructions to fix the problem. Instructor will assist the student remotely during the operation. Briefing and debriefing processes can be included as part of the learning process.	Assessment	<i>2 hours</i>
Use of Headmounted tablet: Exercises V, VI and VIII. Remote assistance, workflow creation and workflow testing			
Further remarks:			

3.2.2 Digital Active Learning Process

The pedagogical framework for Demo Scenario design is based on active learning and remote learning. The instructor's role during the process is to guide and facilitate the learners through their actions and to give feedback when it is needed. Considering it necessary for proper active learning, the activation of previous knowledge is fundamental, where wrong concepts and misconceptions are corrected and helps to relate previous experiences to a new situation. Creating new knowledge and competencies, and consolidating them are the next steps, always considering the learner's motivation for the optimal autonomous learning process.

The *Digital Active Learning process* incorporates two different actions for remote instruction called *Expert Coaching* and *Digital Workflow*.

During *Expert Coaching*, learners receive instant feedback through selected technology while they are taking their own actions and decisions.

Digital Workflow contemplates asynchronous formative assessment to consolidate learning.

HMT-1 features allow the instructor to follow the user's view using a video call, capable to maintain a synchronous connection for immediate feedback or recording the action for asynchronous review, helping in *Expert Coaching* and *Digital Workflow* respectively.

From the learner's point of view, the device can be used as a tool for viewing documentation related to their actions or as a guide to follow previously generated workflows.

Learner side requirements (HMT-1 user)

RELAR scanner App for HMT-1

In this scenario is used the same “launcher app”, called *RELAR Scanner* than in the Shipyard Technician scenario. The app is used to do the following:

- Scan a QR code
- Load data from a Google Sheet
- Join a Zoom videocall for *Expert Coaching*
- Download PDF for *Digital Workflow*
- (Optional) Watch a YouTube video

[Zoom for HMT-1](#)

During the *Expert Coaching* process, video calls will be used for remote instruction. It is used with the device to share the user's POV. It can be also used for sharing screen view.

[Scene-oriented camera \(optional\)](#)

It gives a wide view of the working area. Used to follow the learners’ steps and possible future debriefing if recorded.

Instructor side requirements (Windows or Mac computer)

[RELAR Scanner Google sheet](#)

For giving easy access to new resources as PDF files, images, YouTube videos, and Teams or Zoom previously prepared videocall. After every change in the Google Sheet, the HMT-1 user must scan the QR code.

[Workflow](#)

A simple step-by-step workflow made in PowerPoint and exported as a PDF file. Each page is a step, explained with a simple sentence and a photo. This file must be uploaded to a physical URL to be downloadable using the RELAR Scanner app.

Zoom for PC

Used to make videocalls and share screen with the HMT-1 users for *Expert coaching* remote instruction or following the HMT-1 user interaction with the device.

Working area photos or presentation

Used by the instructor to share with the HMT-1 user and being able to give image-based instructions. For this testing a genial.ly presentation was made and can be found in the following link: [Cooling system](#) (Acevedo-Reveron, A. 2021)

Tablet (optional)

Used during a video call for sharing images and having the possibility to draw over them.

RealWear Explorer (optional)

Used to follow the HMT-1 user interaction with the device. It must be previously connected to the computer via cable to establish a wireless connection while in the same subnet.

3.2.3 Wearing the HMT-1 device

Instructions for first time user were generated using a genial.ly presentation. It is linked to RealWear HMT-1 Setup Guide videos, such as Dominant eye, Adjusting Device and Voice Commands, steps to start “My training” in the HMT-1 device and connection to Wi-Fi. Figure 2-1 shows one of the presentation slides with links to the different videos. The presentation can be found in the following link: [ASSISTED REALITY WITH HMT-1](#) (Waszink, F. 2022)

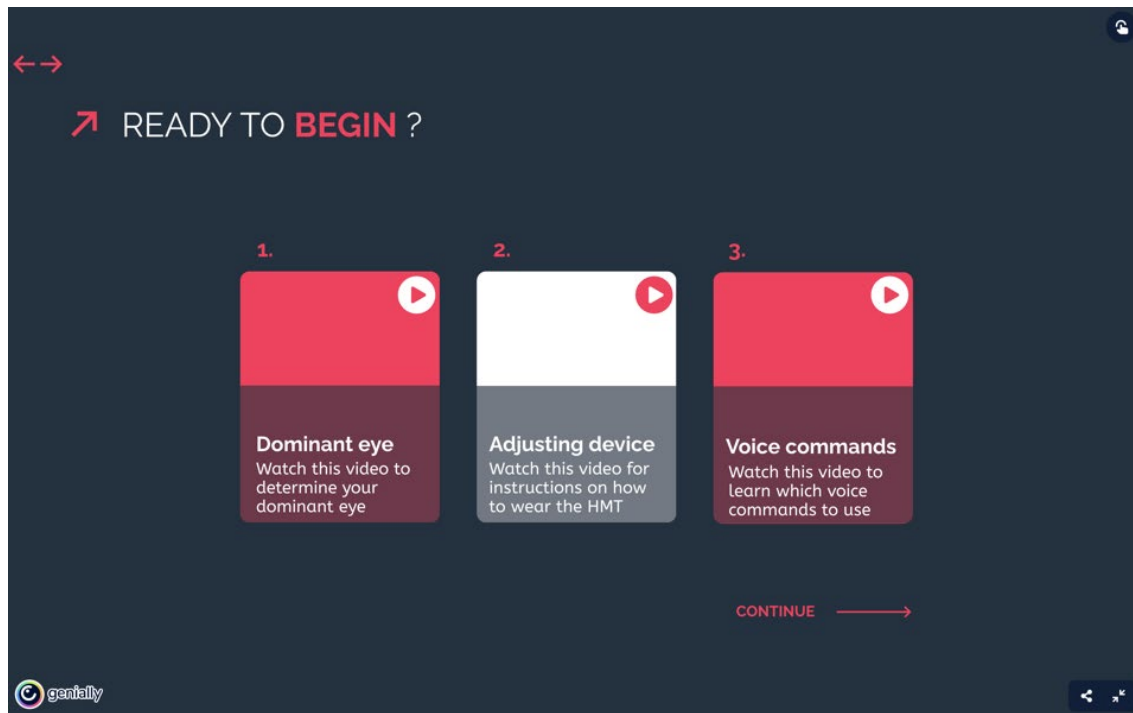


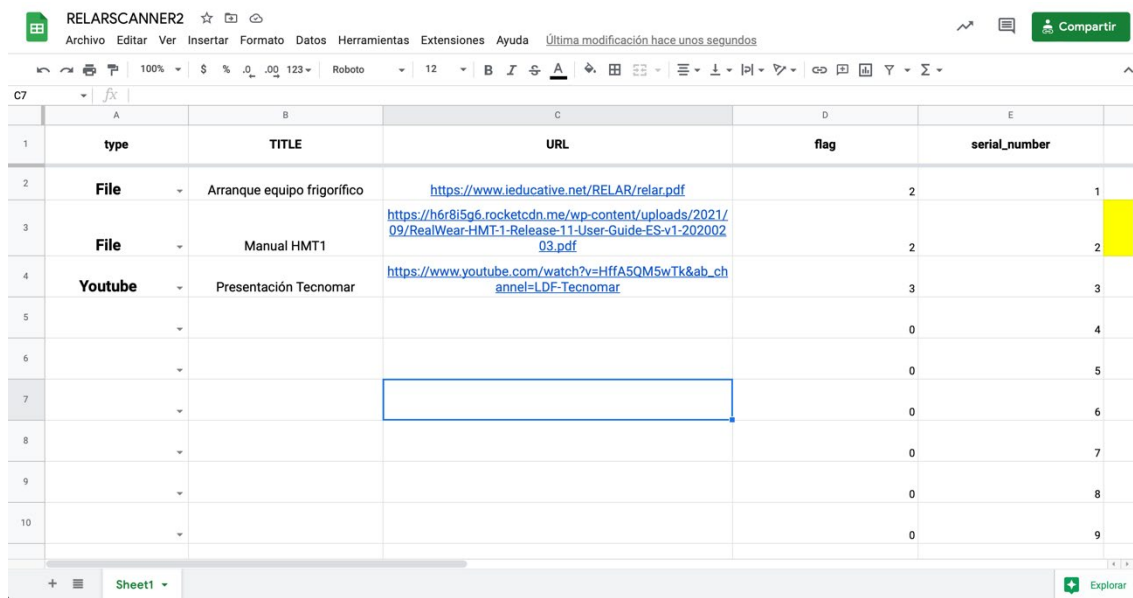
Figure 13: Presentation for HMT-1 user first-time training

3.2.4 Testing of Scenario

In this section, a series of photos and screenshots are presented to explain the testing of the Marine Engineering scenario. The scenario is divided into 2 different areas, the first, where the HMT-1 user is in the Working area, and the second, where the instructor can follow the user's steps through the RealWear Explorer and a scene-orientated camera. The HMT-1 user was connected by phone and in constant communication with the instructor just to follow short commands and to check that everything works during the experience. Scenario testing was recorded and uploaded to YouTube. It can be found in the following link: [Emisión en directo de LDF-Tecnomar](#) (made with a 360 camera, click and drag in the screen to change the view)

Digital Workflow

After preparing a workflow and making everything accessible via RELAR Scanner, with the QR code printed and placed somewhere visible in the working area. The learner can access the working area, open the RELAR Scanner apk, scan the QR code, and start working on the workflow. More instructions for the use of RELAR Scanner apk can be found in [RELAR ScannerApp - Manual & Videos](#) (Kogias, T. 2021).



	A	B	C	D	E
	type	TITLE	URL	flag	serial_number
2	File	Arranque equipo frigorifico	https://www.ieducative.net/RELAR/relar.pdf	2	1
3	File	Manual HMT1	https://h6r8l5g6.rocketcdn.me/wp-content/uploads/2021/09/RealWear-HMT-1-Release-11-User-Guide-ES-v1-20200203.pdf	2	2
4	Youtube	Presentación Tecnomar	https://www.youtube.com/watch?v=HffA5QM5wTk&ab_channel=LDF-Tecnomar	3	3
5				0	4
6				0	5
7				0	6
8				0	7
9				0	8
10				0	9

Figure 14. RELAR Scanner Google Sheet



Figure 15. Learner in the working area using the HMT-1 device

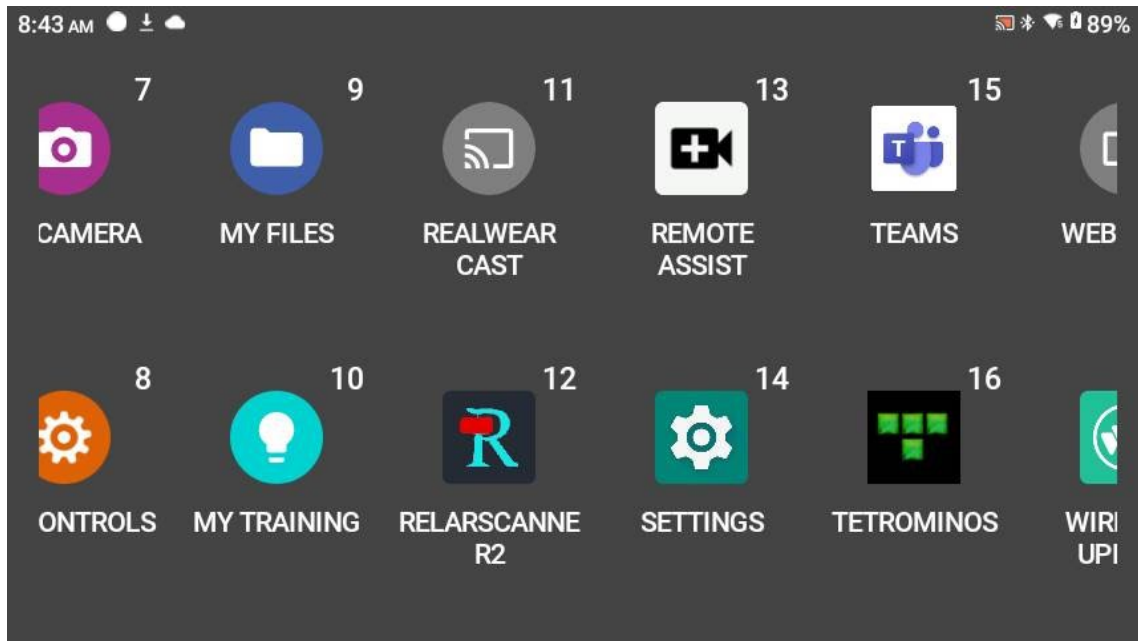


Figure 16. RELAR Scanner apk in the HMT-1 device

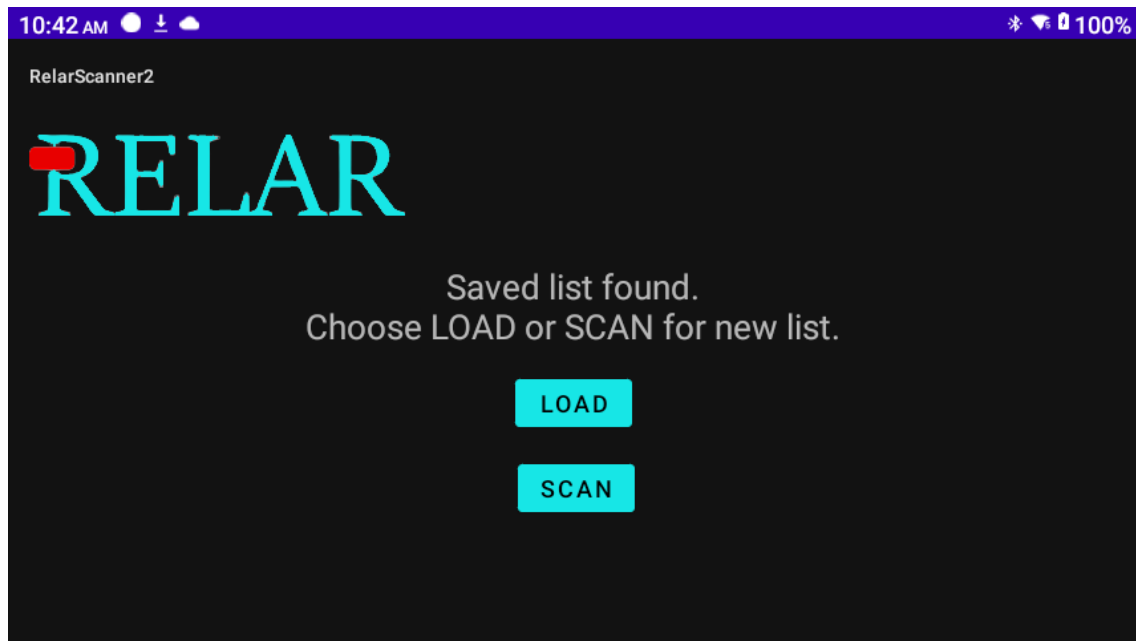


Figure 17. RELAR Scanner main menu



Figure 18. Learner scanning the QR code in the Working area

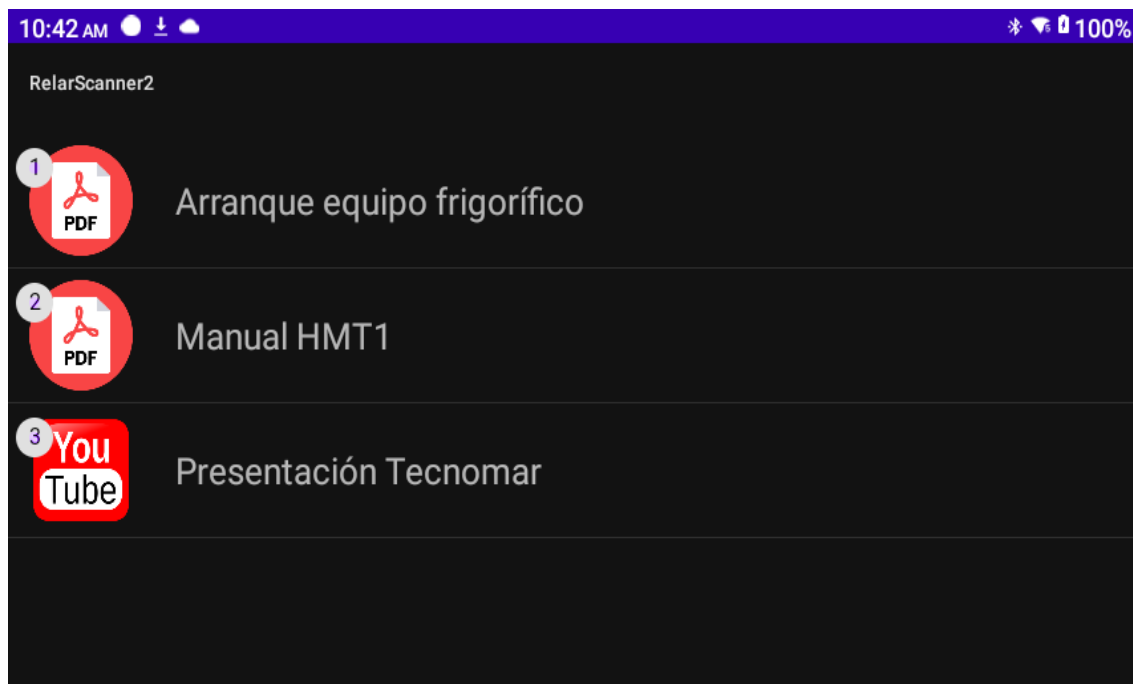


Figure 19. Available links from the RELAR Scanner apk



Figure 20. Step 1 in the workflow



Figure 21: Step 3 in the workflow



Figure 22. Learner performing step 3 in the workflow

The steps the learner had to follow during the *Digital Workflow* are enumerated below:

1. Operate the main switchboard to feed the electrical system
2. Check that the electrical supply is ON, at the control board
3. The compressor oil level must be above its half
4. Set the 'run switch' in position RUN (MARCHA)
5. Check the following items:
 - A. the compressor is running and the corresponding green led is ON
 - B. the oil level can be seen through the glass level
 - C. the condenser fans are ON, as indicated by a led at the control board
6. Be sure the oil level is above the minimum after starting
7. Low and high pressures should stabilize around 2 and 15 bar
8. Check the temperature value of the thermostatic controller goes down:
 - vegetables store temperature should reach +5°C
 - meat and fish store should reach -18°C

Remote coaching

For this mode, a videocall via Zoom is performed from the instructor side. It can be used to see POV of the learner or to share screen and navigate through previously prepared presentation.



Figure 23. Learner Zoom screenshot when the instructor is sharing screen. Mainly shared screen with small screen with PC camera view.



Figure 24. Learner Zoom screenshot. Mainly PC camera view with small screen with view of the learner's POV.

3.3 Scenario 3: Logistics/Fleet Assistance

3.3.1 Lesson Plan

Title of Scenario: Inspection of shipping container of hazardous chemical (Hydrochloric Acid).	
Institute:	
Partner Leading Scenario	Satakunta University of Applied Sciences, School Center Nova Gorica
Partner Supporting Scenario	SAMK
Scenario	Logistics/Fleet Assistance
Programme	Logistics technician
Subject	Logistics of traffic flows
EQF Level	4
Credits	3 ECTS
Title of Lecture	HMT-1
Date:	March 4 th 2022
Time/Duration:	25 hours, a four day delivery
Aim (s): Theoretical understanding of the hazardous chemical container inspection in general context. Practical understanding of the entry level inspection of a hazardous chemical container inspection.	

Objective (s):

Limited cognitive and practical skills to safely conduct the inspection of a hazardous chemical container.

Ability to work independently with foreseeable tasks with limited changes in working environment and related regulatory framework and rules.

Partial ability to supervise routine tasks conducted by others.

Resources Needed:

HMT-1 glasses

Internet connection

European Chemicals Agency Material Safety Data Sheet writing notes

UN number of hydrochloric acid

Medical first aid instructions

Fire safety data sheet

Hazardous Container Inspection Checklist

Container with Hydrochloric Acid

Knowledge, Skills and Competencies:**Competency:**

A competent person possesses general training for the safe inspection of hazardous chemicals. The level of competence required for the inspection of the container does not embed the competency to physically handle the chemical in bulk form.

Knowledge:

A competent person is knowledgeable of the key regulations related to the storage and handling of the chemical. He/she is able to recognize, assess and manage the risks related to the inspection of the cargo container containing hazardous chemical.

Skills

A competent person possesses necessary skills to utilize the HMT-1 glasses including connecting the HMT-1 glasses to internet. He/she possesses skills to interpret the material safety data sheet and cargo container safety labels. He/she possesses skills to identify leakages, bruises, dents,

overheating, freezing, fire and related emergency situations. He/she knows how to act as a first responder and is familiar with the emergency notification procedure.

Steps in developing Lecture including methodology as well as time allocated per activity

Task/Activity	Methodology	Time allocated	Course day
Introduction of the course syllabus, pre-requisites, and course schedule.	Interactive Lecture, contact Lecture.	1h	1
Student familiarization with the HMT-1 capabilities.	Interactive Lecture, contact Lecture.	1h	1
Basic use of the glasses including different applications.	Directed instruction, contact Lecture.	3h	1
Connecting the HMT-1 online.	Directed discussion, contact Lecture.	1h	1
Use of online meeting applications with the HMT-1.	Directed instruction, contact Lecture.	2h	2
Material safety data sheets and container labelling.	Interactive Lecture using HMT-1.	1h	2

Safe handling of chemicals.	Interactive Lecture using HMT-1.	2h	2
Risk management.	Interactive Lecture using HMT-1.	1h	2
Emergency preparedness.	Interactive Lecture using HMT-1.	2h	3
Conducting an inspection, use case approach on site.	Interactive Lecture, contact Lecture.	4h	3
Conducting an inspection, use case approach on site.	Interactive Lecture using HMT-1.	4h	4
Debriefing session.	Interactive Lecture, contact Lecture.	1h	4
Self-assessment	Interactive Lecture using HMT-1.	1h	4
Assessment	Interactive Lecture using HMT-1.	1h	4

Conclusion of Lecture

- The instructor was well prepared for Lectures.
- The instructor communicated clearly and was easy to understand.
- The instructor encouraged student participation in discussions.
- The instructor presented course material in a clear manner.
- I learned new things in this course.
- Course contents met my expectations.

Other Remarks:

Reading List:

- Risk management study material
- Chemical handling study material
- Chemical container inspection check list
- Emergency procedures
- Safety data sheet for hydrochloric acid
- Firefighting measures
- First aid measures

Web sites with useful information:

https://beta-static.fishersci.com/content/dam/fishersci/en_US/documents/programs/education/regulatory-documents/sds/chemicals/chemicals-h/S25358.pdf

<https://support.realwear.com/knowledge/realwear-hmt-1-product-overview>

Assessment Criteria (if applicable):

1-2 Satisfactory

Holding common level of skills and knowledge. Student manages basic contents without solid ability to connect various items and learning outcomes together.

3-4 Good

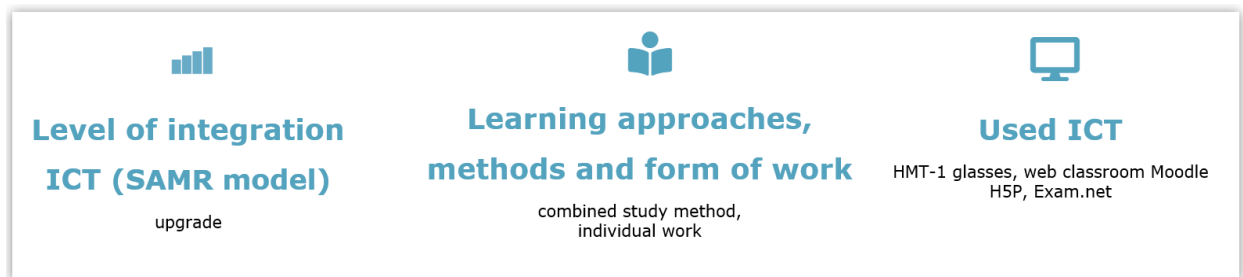
Holding level of skills and knowledge above medium level. Student acceptably manages working situations with multiple occurrences connected together.

5 Excellent

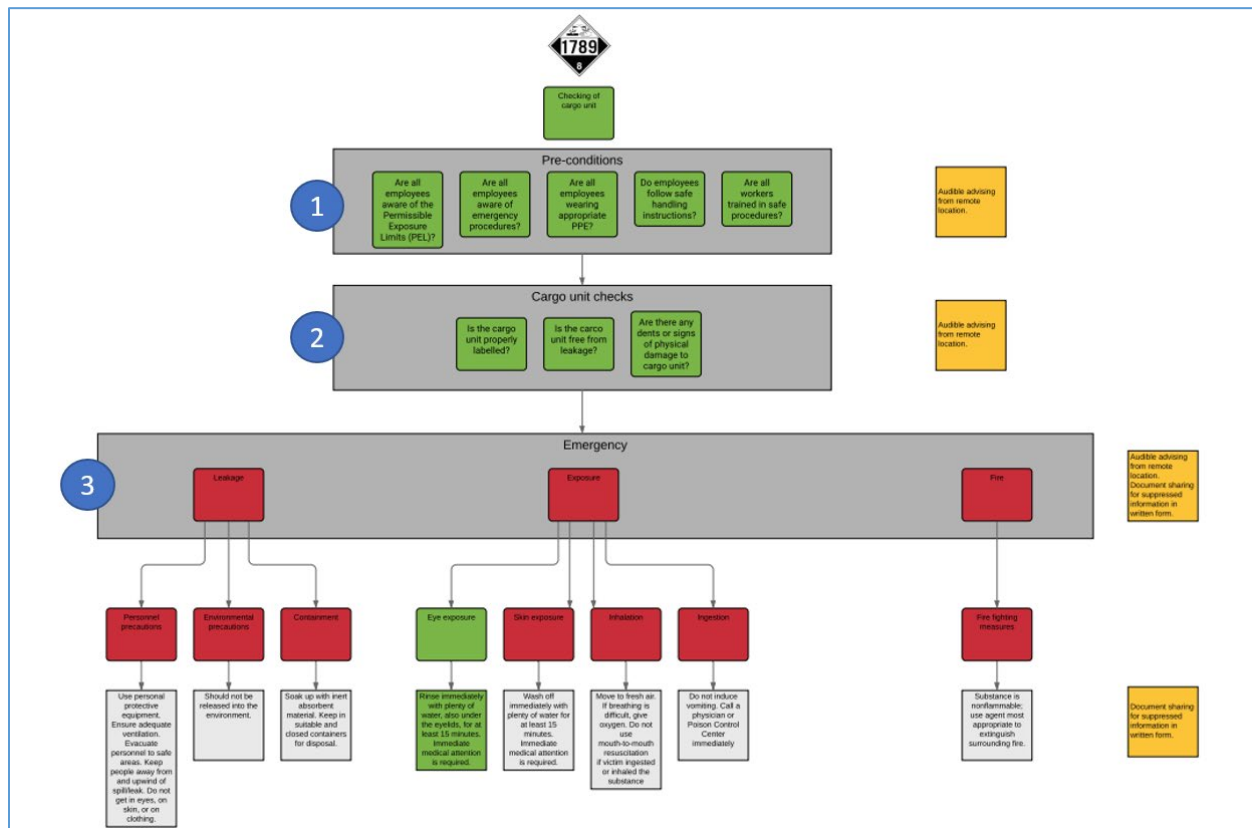
Holding excellent level of skills and knowledge. Student effortlessly manages working situations with multiple occurrences connected. The student demonstrates an analytical approach to problems utilizing resources to find the answer. He co-exists and communicates proactively and seamlessly with other team members.

3.3.2 System Architecture

For the scenario to be applied for the HMT-1, a custom H5P Platform is intend to use.



The Flowchart define the steps/procedures needed to execute the task – cargo unit inspection.



The whole procedure process is divided into 3 sections:

- Pre-conditions
- Cargo unit check
- Emergency

Each section is sliced into detailed parts student/lecturer needs to follow/be aware of.

RELAR

WELCOME TO THE RELAR PROJECT

Pre-conditions

- Are all employees aware of the **Permissible Exposure Limits (PEL)**
- Are all employees aware of **Emergency procedures**
- Are all employees wearing appropriate **PPE**
- Do employees follow **safe handling instructions**
- Are all workers trained in **safe procedures**

Hydrochloric Acid
UNCLASIFIED HYDROCHLORIC ACID
1789
8

Concentrated Hydrochloric Acid
HAZARD
Corrosive severe skin burns and eye damage. May cause respiratory irritation. May be corrosive to metals.
PREVENTION
Do not breathe mist. Use only outdoors or in a well-ventilated area. Wash skin and eyes thoroughly after handling. Wear protective gloves and clothing, and eye and face protection. Keep only in original container.
RESPONSE
If swallowed: Rinse mouth. Do NOT induce vomiting.
If in eyes: Flush cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue flushing.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Flush contaminated clothing before reuse.
If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a doctor in other medical personnel.
STORAGE
Store in corrosion resistant container with a resistant inner liner. Store locked up. Keep container tightly closed.
DISPOSAL
Disposal of contents to an EPA permitted facility.

Safe Handling Instructions
THIS PRODUCT WAS PREPARED FROM INSPECTED AND PASSED MEAT AND/OR POULTRY. SOME FOOD PRODUCTS MAY CONTAIN BACTERIA THAT COULD CAUSE ILLNESS IF THE PRODUCT IS MISHANDLED OR COOKED IMPROPERLY FOR YOUR PROTECTION, FOLLOW THESE SAFE HANDLING INSTRUCTIONS.
KEEP REFRIGERATED OR FROZEN.
THAW IN REFRIGERATOR OR MICROWAVE.
KEEP RAW MEAT AND POULTRY SEPARATE FROM OTHER FOODS. WASH WORKING SURFACES (INCLUDING CUTTING BOARDS), UTENSILS AND HANDS AFTER TOUCHING RAW MEAT OR POULTRY.
COOK THOROUGHLY.
KEEP HOT FOOD HOT. REFRIGERATE LEFTOVERS IMMEDIATELY OR DISCARD.

Safe Work Procedures
UNSW

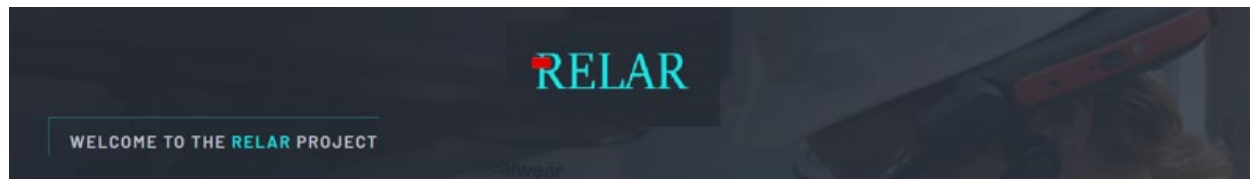
1. Pre-conditions are precautions and measures student/lecturer must be aware off before executing the operation (task).

To each of the active button (numbered from 1 to 5) we added relevant documents and instructions (images and PDF's):

1. Permissible Exposure Limits (PEL)
2. Emergency Procedures
3. Personal Protective Equipment (PPE)
4. Safe Handling Instructions
5. Safe Work Procedures

2. Cargo Unit Check

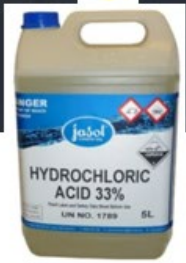




Cargo unit check

Is the cargo unit properly labeled?

1



Is the cargo unit free from leakage?

2



Are there any dents or signs of physical damage to cargo unit?

3



This section is divided into 3 parts:

1. Properly labelled cargo unit
2. Leakage free cargo
3. Physical damaged cargo check

The students/lecturers are checking cargo units based on certain cargo type, packing and volume.

3. Emergency

RELAR

WELCOME TO THE RELAR PROJECT

Emergency

Leakage

1

Exposure

2

Fire

3

This section is also divided into three parts based on possible dangerous situation that may occur.

1. Leakage
2. Exposure
3. Fire

		HCA by itself is not flammable but in contact with certain metals (Mg, Al) cause a reaction.
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When exposed with Hydrochloric Acid certain measures are necessary:

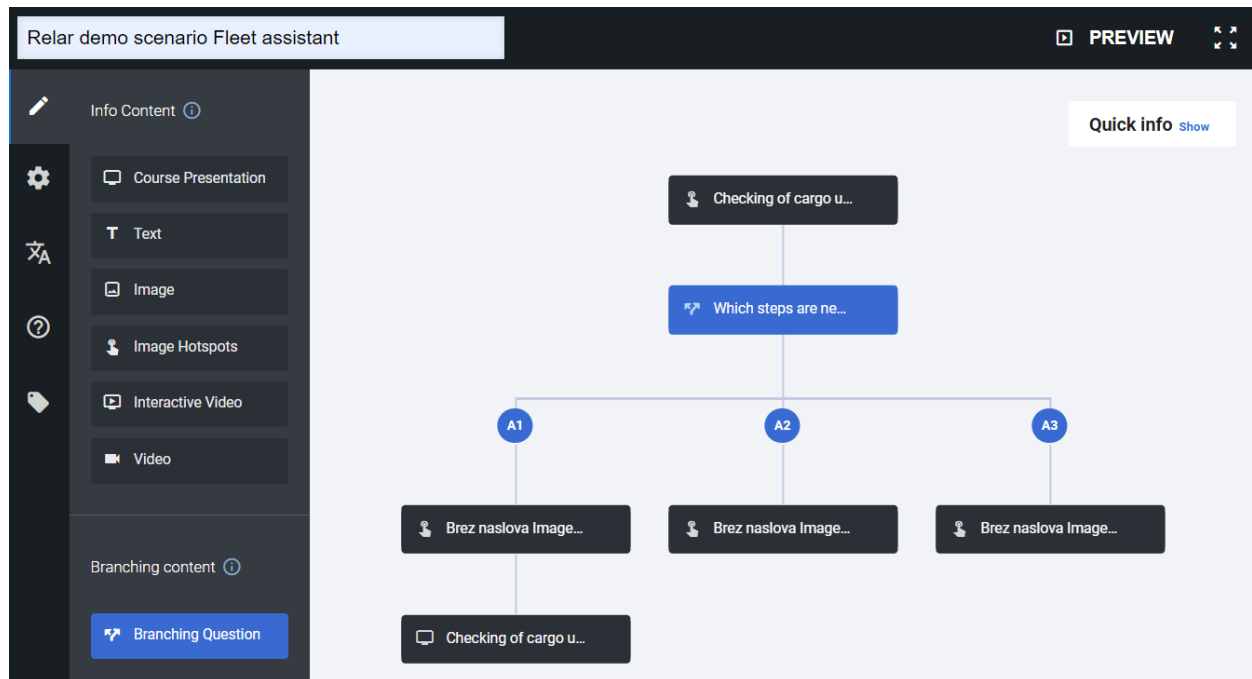
Eyes washing	Shower (whole body/skin)	Inhalation (oxygen) mask
		

In every operation there must be always two persons in operation so in case of emergency one calls an ambulance or firefighters and first secure and help exposed person.

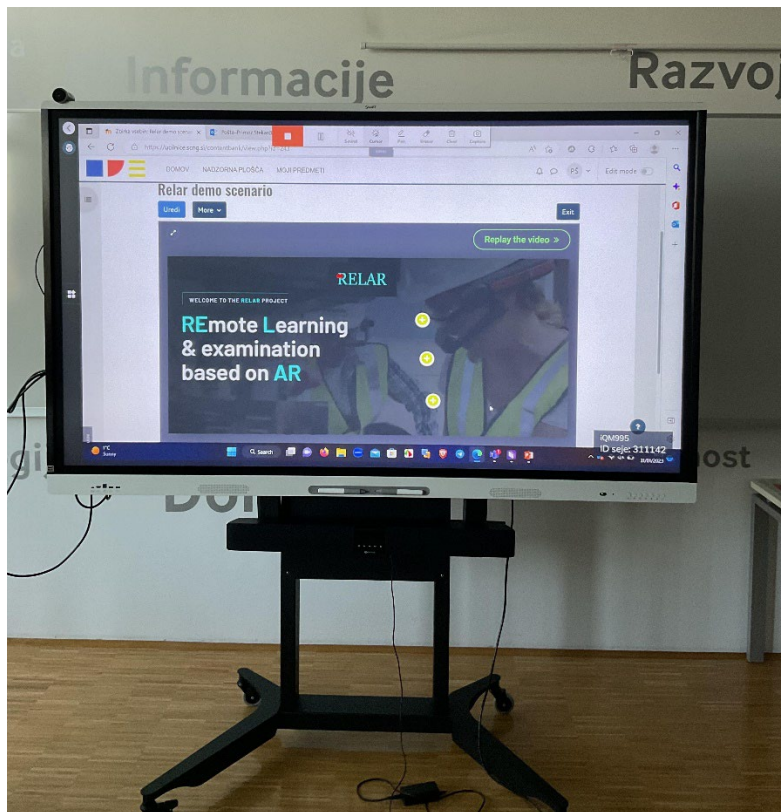
Digital Workflow

Based on technical issues we faced during the testing of HMT-1 glasses and connections through Foresight we decide to use open source Platform – H5P and build a branching scenario.

At the moment this seems like acceptable and suitable solution.



We are still working on reshaping the content look and functionality.



We tested the branching scenario in the classroom.



Using H5P within the Moodle environment we solve the problem with app code scanning.

Opening the active repository is indeed with the voice command; Mouse click but that not appear as a problem in executing the process.

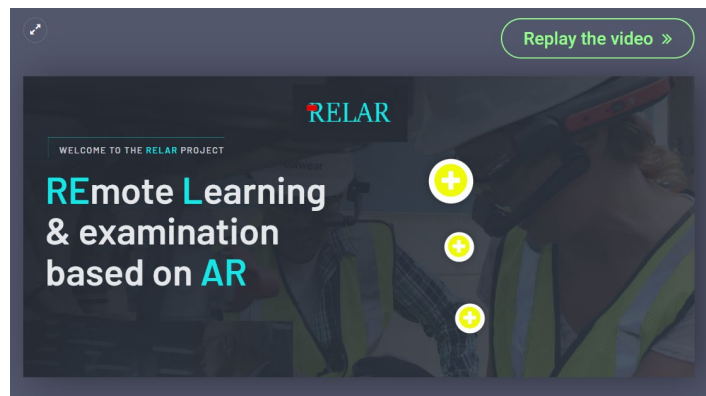
- *Public Resource Repository*

Since many public educational institutions on different levels have access to a Moodle Platform that ease the process of creating content for those teachers and lecturers that will be interested and have the motivation.

- *Resources*

Guides and instructions on Building branching scenario in H5P

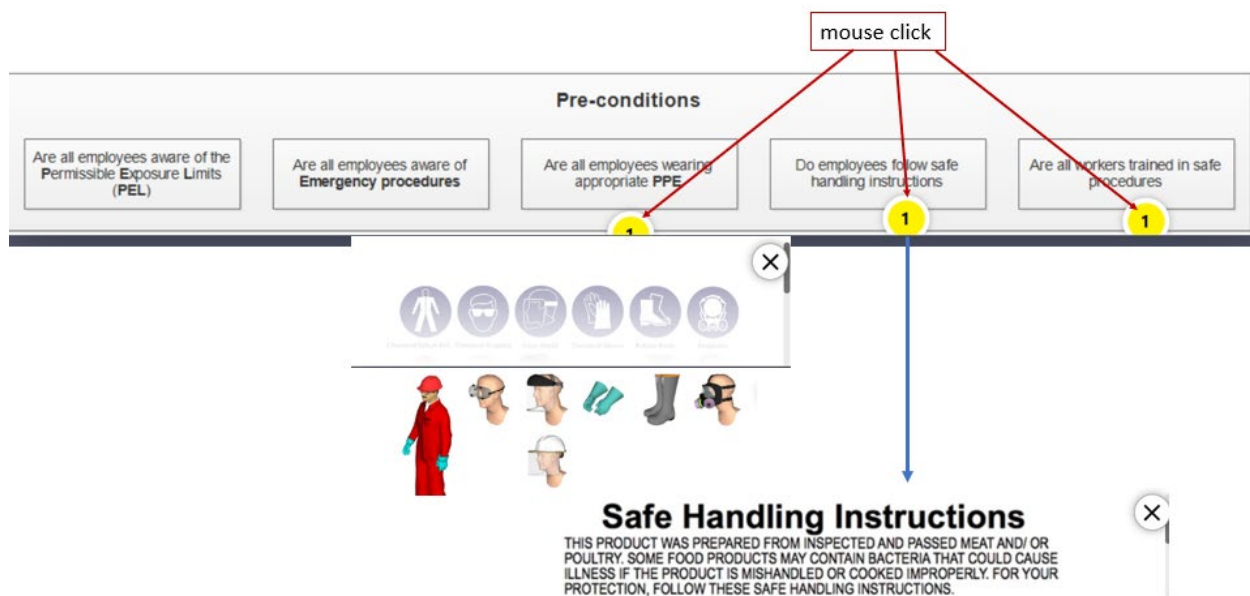
3.3.3 Testing of Scenario



Interactive points – indicate the content.



Each section is later divided into individual steps:



At the moment we are in the phase to agree with one of our partner companies to test the scenario on the field – truck or container inspection and to make a movie – use case of inspection procedure.

3.3.4 Lessons learned Train the Trainer Rauma

During our Train the Trainer session in Rauma at the end of March 2023 students, lecturers and project partners came together to explore the potential and possibilities of using the developed AR scenarios in a classroom setting.

The goal was to define human behavioural aspects and didactical aspects that should be taken into account when using AR and the developed RELAR scenarios during training sessions. The scope was to foster sustainable training abilities, attitude, skills and competencies that include the psychology of learning and training within the use of new technology in the learning program.

The program of the workshop was to be an interactive session in which all the participants could share knowledge and learn from each other on how to use AR and what the benefits and limitations are for using AR in a didactical program.

Program workshop

Time (CET+1)	Title	Author
09.00 - 9.15	Welcome and coffee	All
9.15 - 9:30	Introduction to Workshop 3	STC/Ceronav/SAMK
9:30 - 11:00	Workshop 3. Interactive group assignment. Didactics in AR Maritime Education: preparing a lesson with AR. 1. What? 2. How? 3. Why? Preparing a lesson based on one of the AR scenarios in which the learning goals and an introduction according to Gagne is prepared.	Scenario working groups 1-3
11.00 - 12:00	Lunch	SAMK/ALL
12:00 - 13:00	Presentation of Workshop 3 results.	Scenario working groups 1-3
13:00 - 14:00	Evaluation of the Train the Trainer Event	Scenario leaders
14:00 - 14:30	Closing of Train the Trainer Event	SAMK/All/Guests

During the workshop an interactive group assignment was formulated to prepare an opening to a lesson based on one of the developed RELAR scenario's and present this to the other participants. In the picture below an example of the second scenario is presented.

Scenario 2: Shipyard Technician

Step 1: Together think about how you could create a lesson by means of AR and this scenario

- What are advantages/disadvantages/difficulties
- How would this lesson look like

Step 2: Prepare an introduction towards this lesson based on Gagne in order to create an open mindset for active learning.

Step 3: Prepare this presentation for delivery to the other 2 groups

GAINING ATTENTION	
→	Dance
→	Inquire
→	Animate
→	Fast
→	Listen
→	Appeal
→	Question
→	Shock
→	Zoo
→	Listen
→	Act
→	Facile
→	Stimulate

Next to that the groups were asked to think about and discuss the following questions:

Discussion: Benefits of AR/VR

What are the benefits?

- How can VR/AR increase learning?
- How do our scenarios benefit from using VR/AR?
- Do our scenarios include these human elements?
- Can you come up with a scenario that includes human elements?
- What are pedagogical hindrances?



How to enlarge immersive learning?

- What are aspects which can lead to an enhancement of learning when using smart glasses?
- What are aspect which can lead to a more narrow focus?
- What could we do to prevent this narrow focus?
- How to enhance a challenge and response environment when wearing Smart Glasses?
- How can the smartglasses and new technologies help the humans

At the end of the workshop an evaluation was conducted to check the quality of the workshop and 19 participants filled in the questionnaire in Microsoft Forms with the following positive outcomes.

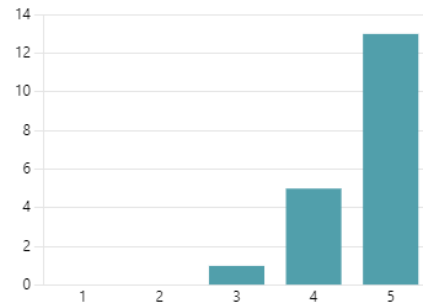
3. Overall satisfaction with the Train the Trainer event of RELAR project in Rauma (1 meaning low level of satisfaction and 5 meaning high level of satisfaction).

[Meer details](#)

[Inzichten](#)

4.63

Gemiddelde beoordeling



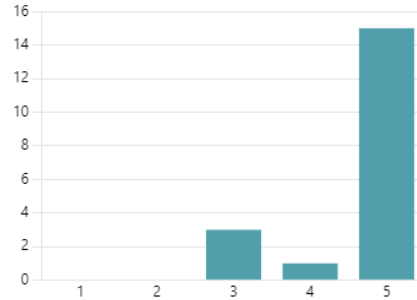
4. How did you find the content presented during the TtT? (0 punt)

[Meer details](#)

[Inzichten](#)

4.63

Gemiddelde beoordeling



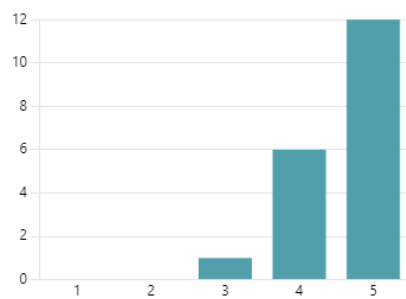
5. How did you find the presentation of the content presented? (0 punt)

[Meer details](#)

[Inzichten](#)

4.58

Gemiddelde beoordeling



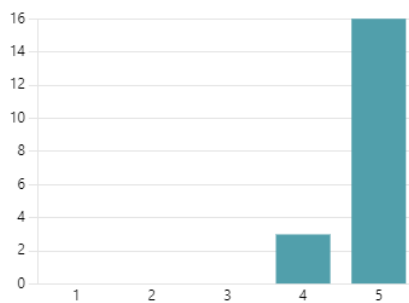
6. There was enough time for discussions/questions & answers? (0 punt)

[Meer details](#)

[Inzichten](#)

4.84

Gemiddelde beoordeling



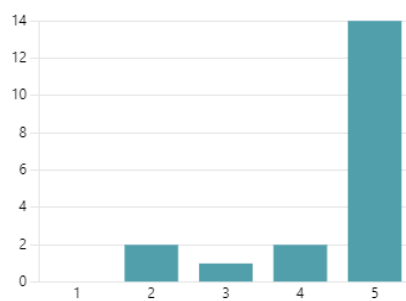
7. How did you find the structure of the event? (0 punt)

[Meer details](#)

[Inzichten](#)

4.47

Gemiddelde beoordeling



The key take aways that were mentioned were the fact that the participants learned a lot about how using new technology in a classroom setting, that it was nice to experiment together and to experience multiple functionalities and working together with students and lecturers, that they gained a brighter understanding of augmented reality and that opened up possibilities to explore more and that the interaction between each other and sharing knowledge and learning from each other was an important part of the positive experience.

The students were very positive about the fact that they were involved in thinking about the future of their education and how the lecturers could use the smart glasses and the developed scenarios in a classroom setting and they found it interesting to come up with new usability of the smart glasses in education.