VR-TAK 5.5.0

2025-08-08

Installation and Operation Manual

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1. Introduction

This document is a user manual for the Virtual Tactical Assault Kit (VR-TAK).

VR-TAK is a Government off-the-shelf (GOTS) Virtual Reality (VR) tool used for mission planning and situational awareness during mission execution. VR-TAK is interoperable with the TAK software suite and can share data between other TAK devices via TAK Server. Feedback on bugs or issues as well as feature requests are handled at the Community Forum at https://tak.gov.

2. Hardware

VR-TAK runs on Windows machines. It is primarily designed for VR, but it can also run in Desktop Mode, without any VR Hardware.

VR-TAK is VR hardware agnostic, supporting as many virtual reality systems as feasible. Currently, VR-TAK supports the HTC VIVE, VIVE Pro, Quest, Quest 2, Quest 3, Varjo, and Valve Index. HTC Vive, VIVE Pro, and Valve Index are supported by the provided offline SteamVR installer.

This manual assumes the use of the HTC VIVE hardware.

VR is a very graphics-card-intensive process. Before you invest in a VR system, use this online tool to test if your computer is VR ready: https://www.vive.com/us/ready/

3. Installation

VR-TAK does not natively include any models (such as 3D models of cities or buildings) nor connections to external servers. However, external models and connections can be imported into VR-TAK for use. See the Importing Files section of this document for more details.

VR-TAK natively includes DTED 0 (Digital Terrain Elevation Data), which provides terrain height for every location in the world. Additionally, basic terrain tile imagery is included with VR-TAK. The source of terrain tile imagery can be set through the 4.8.9 Toolbar Editor

Allows for switching what toolbar layout is being used and gives access to the Toolbar Editor. The toolbar editor is only available in Desktop mode in the current version.

The Toolbar Editor is where you can modify the layout of the toolbar. You can add, remove, rename, and reorder tabs and categories, and drag to move the toolbar buttons between them, alongside many other functions. To remove buttons from the toolbar so they no longer appear in-app or delete tabs/categories, simply drag and drop them into the section marked “Removed Items”.

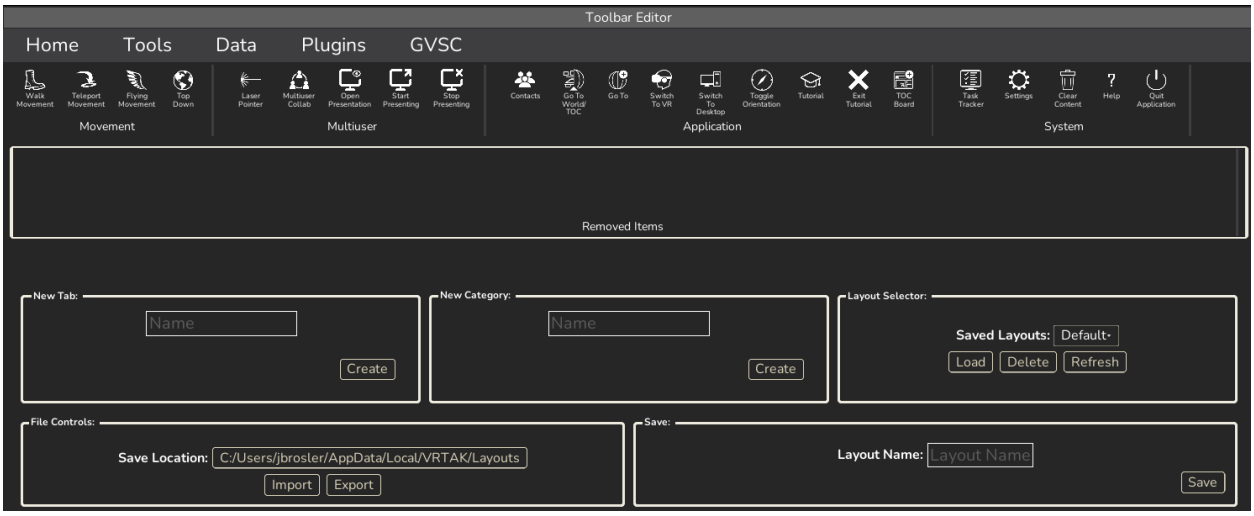


FIGURE 63. TOOLBAR EDITOR

The Layout Selector section allows you to change what layout you're editing or delete saved layouts. The file controls section can copy layout files to or from other folders on your computer to make it easier to share layouts with others. To rename an existing tab or category, double-click it and fill out the pop-up that appears.

There are a few restrictions to make sure everything works as intended:

- Default is a reserved name for layouts. It cannot be deleted or saved to. However, you can save it under a different name to use it as a baseline for editing.
- Tab names must be unique (case insensitive)
- Category names must be unique within their respective tab (case insensitive)
- The "Settings" button must be accessible somewhere on the toolbar, otherwise the layout cannot be saved.

4.8.10 Advanced Settings menu. More information on both terrain tile imagery and terrain tile height can be found in the Map Source section of this document.

The installer will automatically uninstall previous builds, so you do not need to manually run the VR-TAK uninstaller. The installer will also give the option to remove old plugins in C:\ProgramData\VRTAK\ExtPlugins\ExtPluginDirectories. Old plugins are not guaranteed to run in newer VR-TAK builds, so removing old plugins is recommended.

3.1 VR Software

For VR-TAK to use VR capabilities, the user must install the software that goes along with a particular VR hardware. The software installation guides can be found below.

3.1.1 SteamVR Offline

To support operating VR-TAK in VR with a computer that cannot connect to the internet, two installers are provided. One is an offline SteamVR installer. It is recommended to run this before attempting to use VR-TAK in VR. This installer is not required to use VR-TAK in Desktop mode.

You can download the VIVE VR software from the following site: https://www.vive.com/us/setup.

> NOTE: If the offline SteamVR installer is used and later the manufacturer's version of Steam is installed on the computer, SteamVR may no longer function properly without

> an internet connection. Uninstalling Steam is required to regain normal functionality offline.

3.1.2 Installation Steps

1) Double click "VR-TAK_SteamVR_setup.exe."

FIGURE 1. VR-TAK STEAMVR INSTALLER

2) Select the desired installation directory (or use the default) and click "Next."

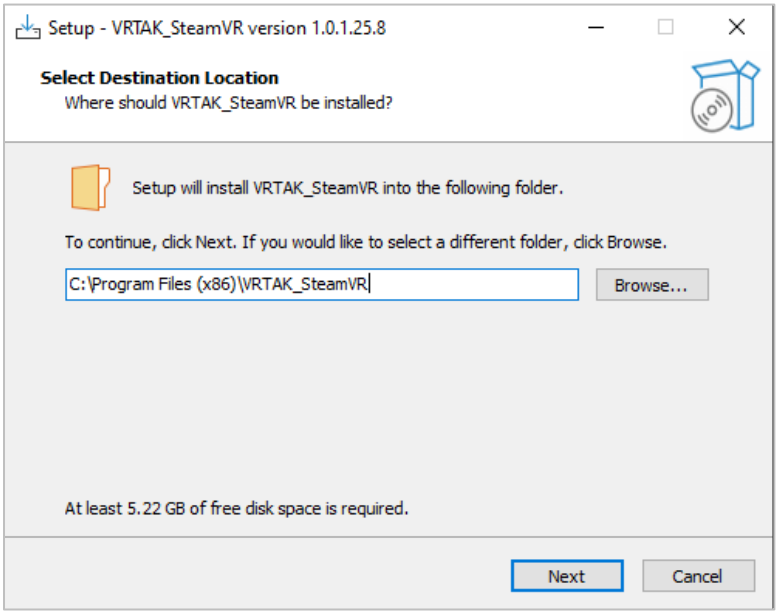


FIGURE 2. VR-TAK STEAMVR INSTALLATION DIRECTORY

3) Select the start menu folder (or use the default) and click "Next."

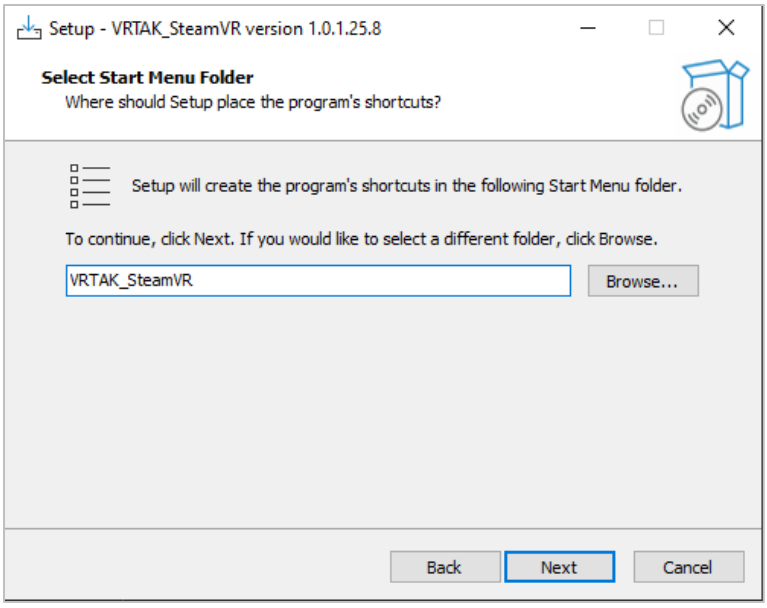


FIGURE 3. VR-TAK STEAMVR START MENU SHORTCUT

4) Select the check box to create a desktop shortcut and click "Next."

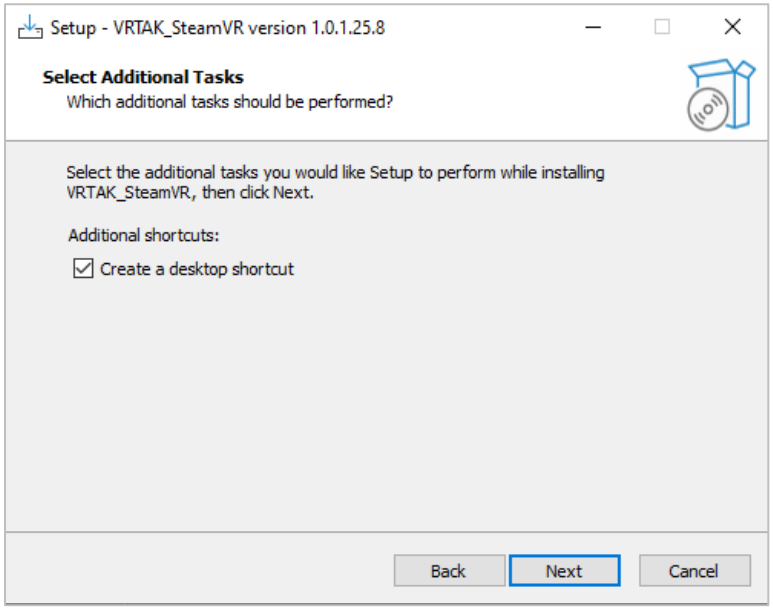


FIGURE 4. VR-TAK STEAMVR DESKTOP SHORTCUT

5) Click "Install."

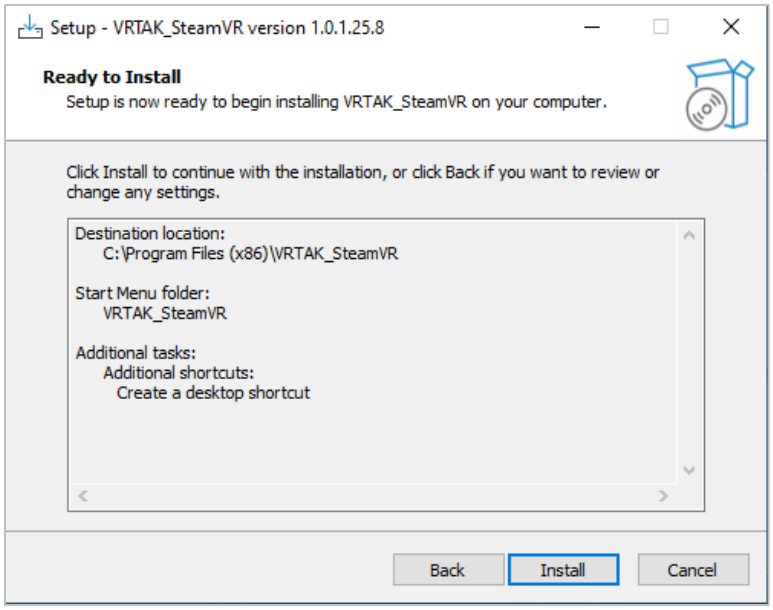


FIGURE 5. VR-TAK STEAMVR INSTALLATION

6) Wait for the installation to complete.

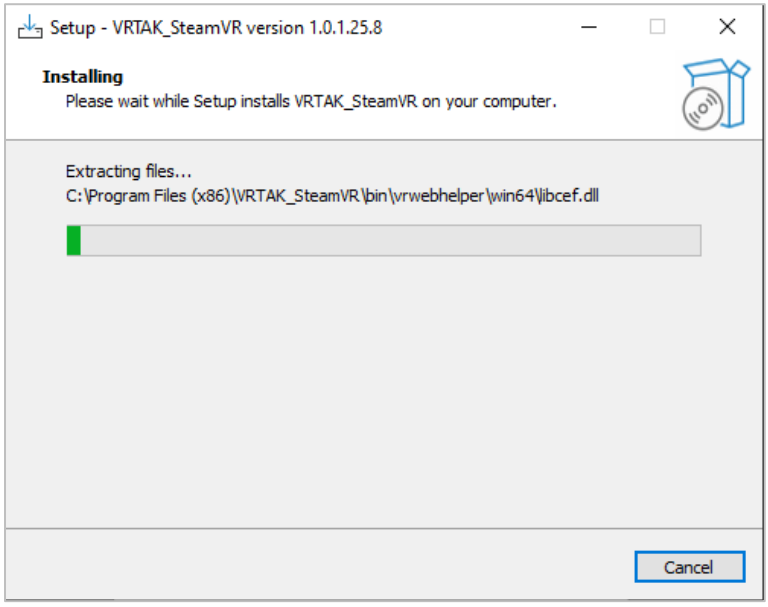


FIGURE 6. VR-TAK STEAMVR INSTALLATION IN PROGRESS

7) Uncheck “Launch VR-TAK_SteamVR” and click “Finish.”

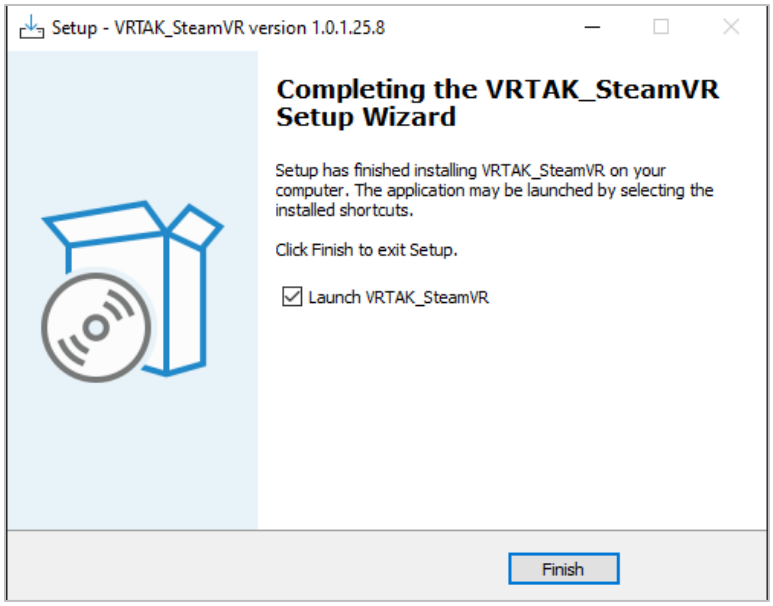


FIGURE 7. VR-TAK STEAMVR INSTALLATION COMPLETE

3.1.3 Oculus

To use the Oculus software and headset, the user must install the Oculus software via an internet connection. There is no offline installer for the Oculus software. However, the user only needs to be connected to the internet and install the software once. Afterward, the user can use the Oculus software offline.

You can download the Oculus VR software from the following site: https://www.oculus.com/setup.

> NOTE: An update may be required for the Oculus software if the Oculus software is not compatible with the Unreal Engine 5 version that VR-TAK is currently using. In that case, you will be required to update the Oculus software so that it will support VR-TAK. However, older build versions of VR-TAK may be used if the Oculus software is out of date with newer versions.

1) Start the Oculus software installation by double clicking the setup executable.

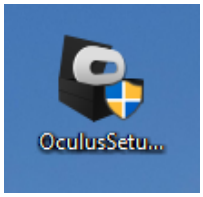


FIGURE 8. OCULUS SETUP SHORTCUT

2) Select “Get Started” to begin installation.

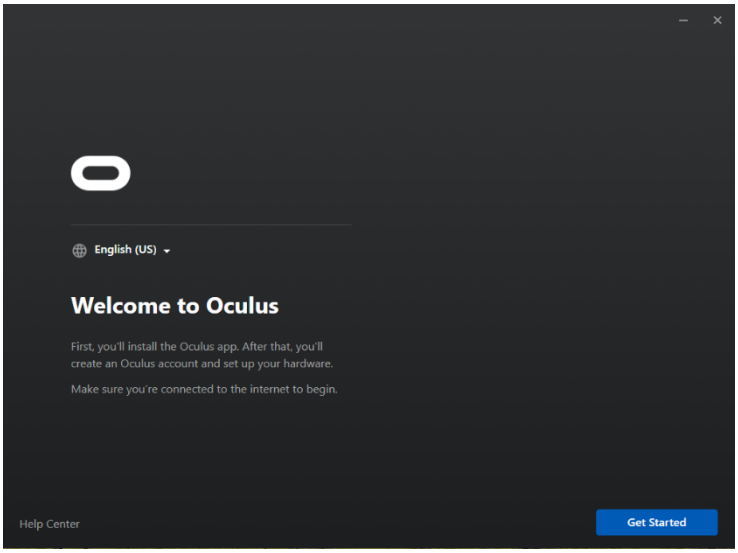


FIGURE 9. OCULUS WELCOME PAGE

3) Select where you would like to install the Oculus software and then select “Install Now.”

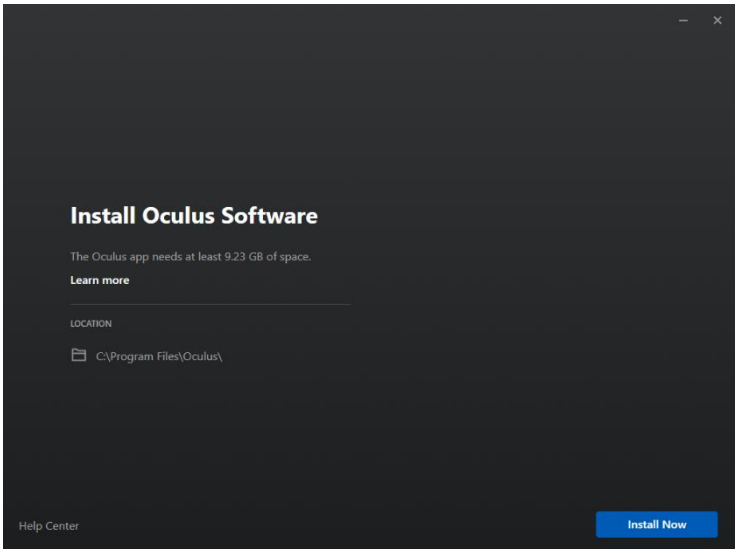


FIGURE 10. OCULUS DIRECTORY INSTALLATION PAGE

4) Wait for the Oculus software to download the necessary files.

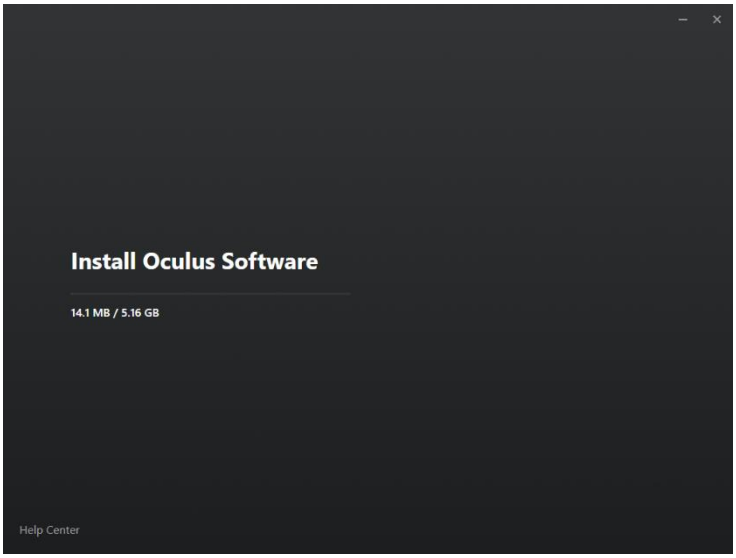


FIGURE 11. OCULUS DOWNLOAD PAGE

5) After the necessary files are downloaded, the installation will begin.

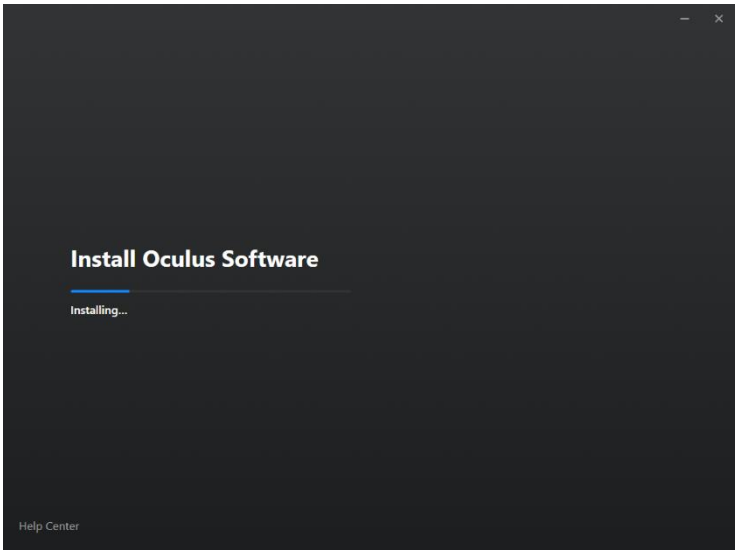


FIGURE 12. OCULUS DOWNLOAD PAGE

6) Once the software is installed, your Oculus software installation is complete! Click “Next” to continue to sign in and set up your Oculus hardware with the Oculus software. You can also scroll down to section 4.0 in this document to be instructed how to set up your Oculus hardware with the Oculus software.

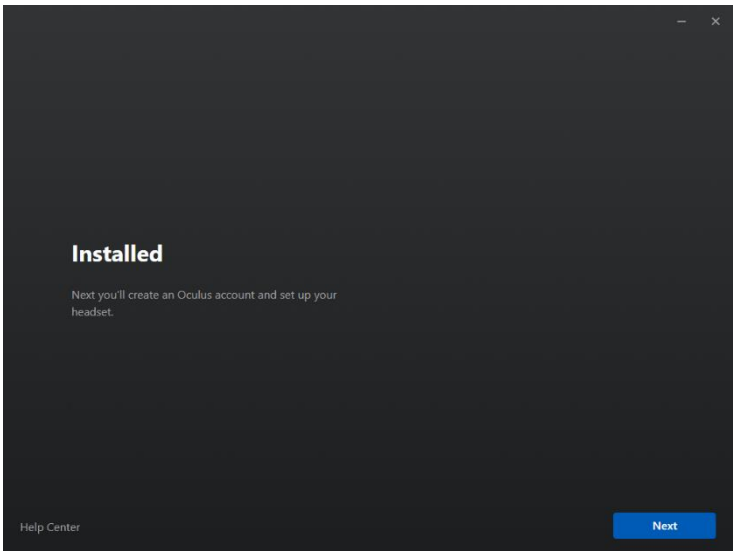


FIGURE 13. OCULUS COMPLETITON PAGE

3.2 VR-TAK

1) Uninstall any previously installed versions of VR-TAK.
2) Double click the VR-TAK setup executable.

Select which plugins you would also like to install. These add extra functionality beyond the base features of VR-TAK and are documented separately.

a. Once installed, plugins can be managed in game through the Plugin Manager.

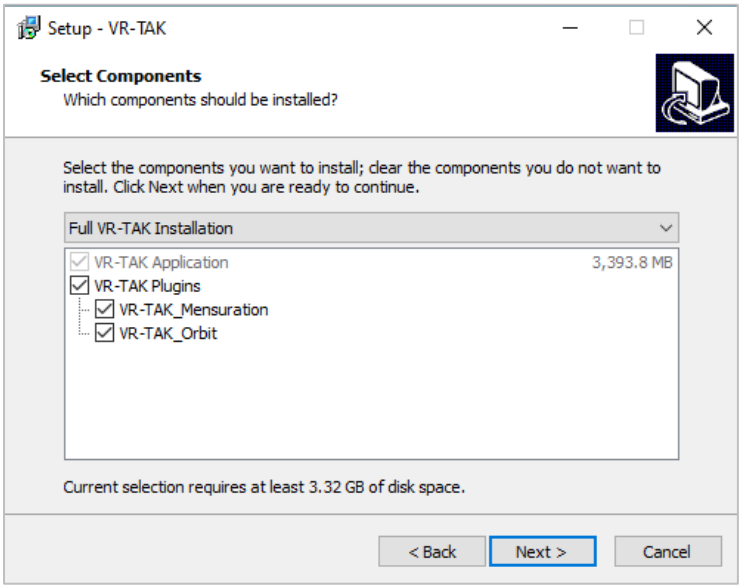


FIGURE 14. VR-TAK INSTALLATION PLUGINS

3) Select the check box to create a desktop shortcut and click “Next.”

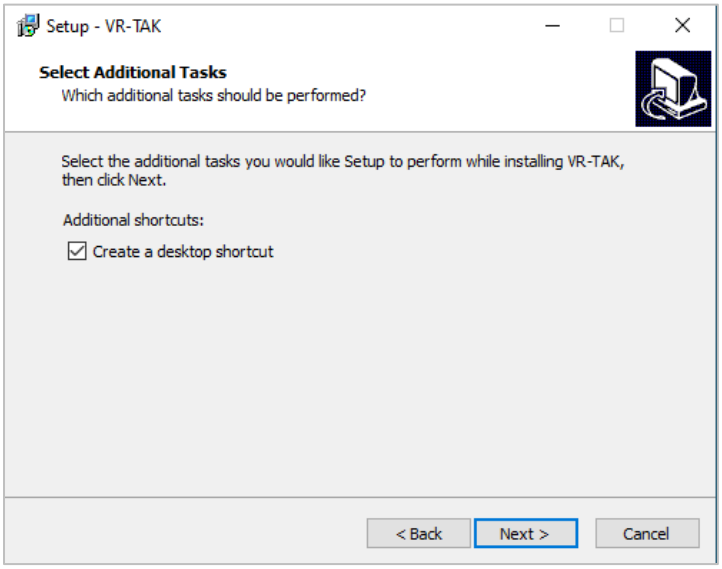


FIGURE 15. VR-TAK INSTALLATION DESKTOP SHORTCUT

4) Click “Install.”

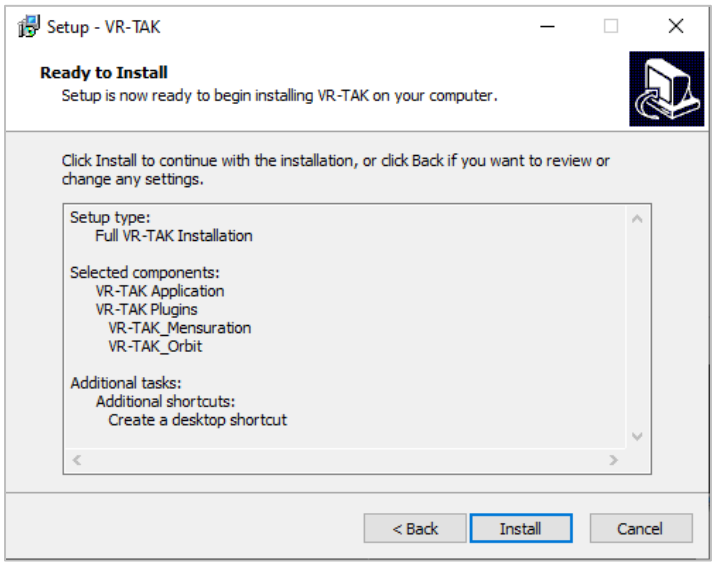


FIGURE 16. VR-TAK INSTALLATION

5) Wait for the installation to complete.

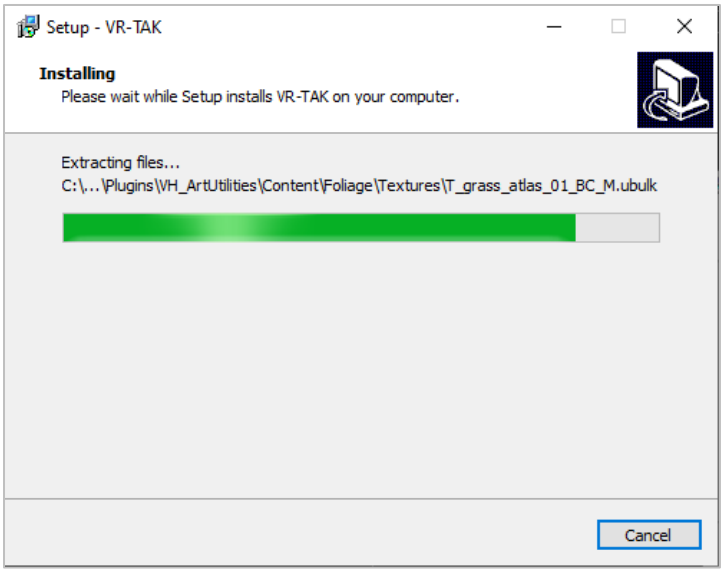


FIGURE 17. VR-TAK INSTALLATION IN PROGRESS

6) Uncheck “Launch VR-TAK” and click “Finish.”

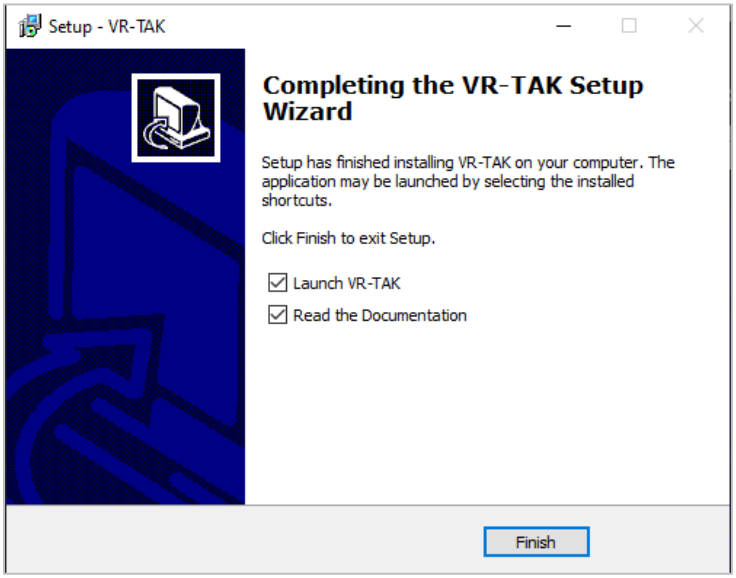


FIGURE 18. VR-TAK INSTALLATION COMPLETE

4. Operation

This section will describe the basic setup and operation of VR-TAK.

4.1 VR Hardware Setup

This section will describe how to set up VR hardware with VR-TAK.

4.1.1 Steam VR Setup

> NOTE: You may skip this step if you do not intend to use VR.

1) Double click the VR-TAK Steam VR shortcut.

FIGURE 19. VR-TAK STEAMVR SHORTCUT

2) If a Bluetooth driver error occurs, dismiss this error and continue. If other errors occur, check all power and hardware connections, and select "restart Steam VR."
3) Select "Room Setup" from the Steam VR menu and follow the on-screen dialog.

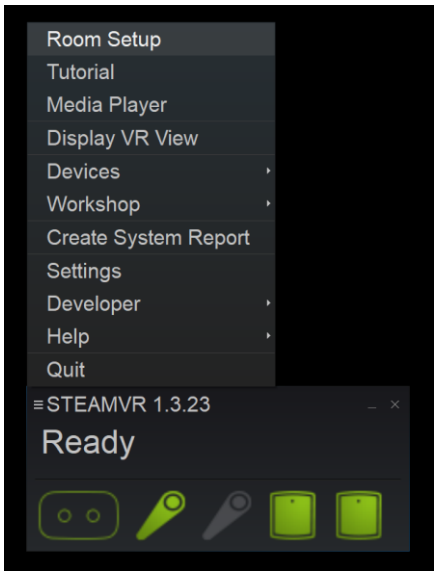


FIGURE 20. STEAMVR ROOM SETUP

4.1.2 Oculus Setup

> NOTE: You may skip this step if you do not intend to use VR.

1) Start the Oculus software.

FIGURE 21. OCULUS SOFTWARE SHORTCUT

2) Create or log in to your Oculus software.

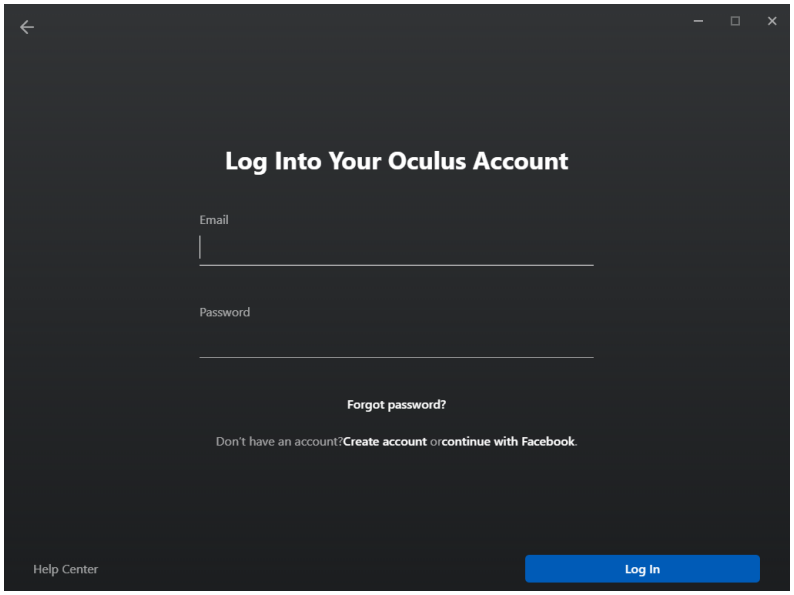


FIGURE 22. OCULUS LOGIN PAGE

3) Select "Devices" on the left-hand menu.

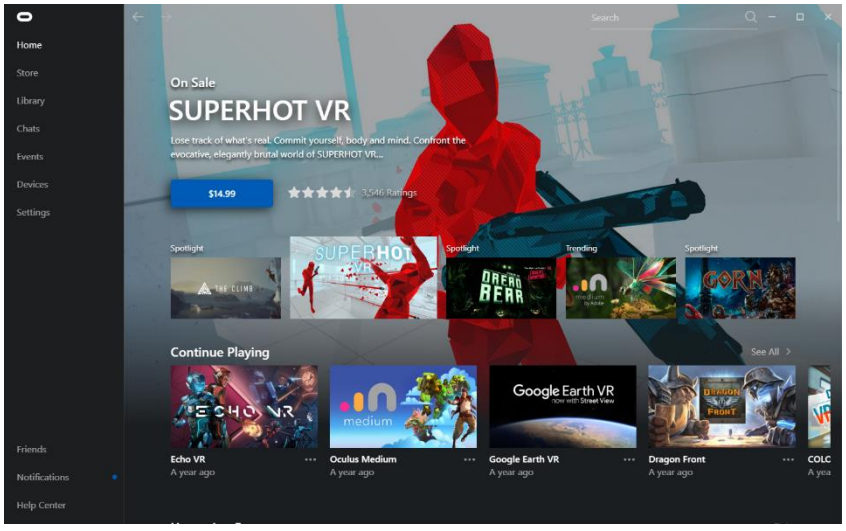


FIGURE 23. OCULUS HOME PAGE

4) Select your Oculus hardware.

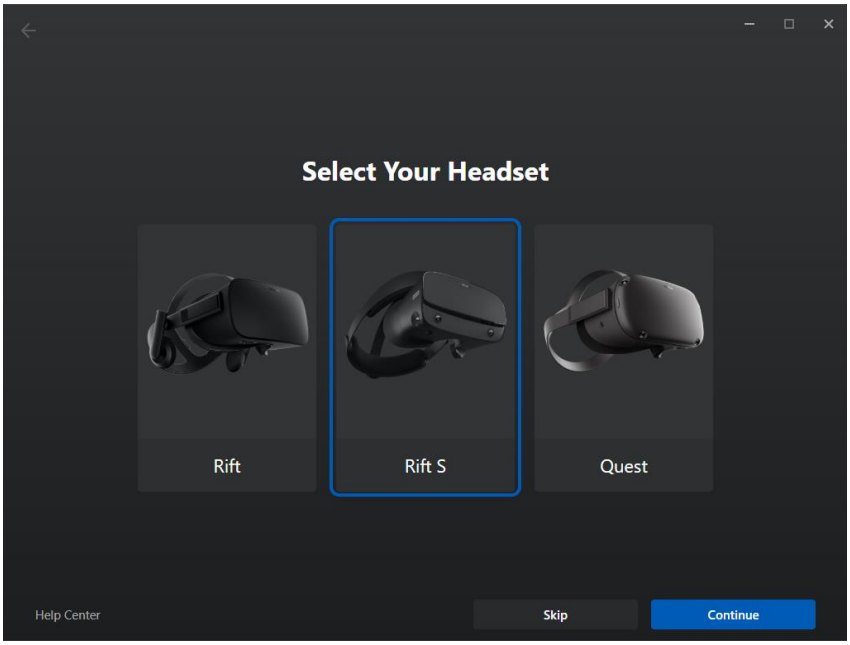


FIGURE 24. DEVICE SELECTION PAGE

5) Ensure that your Oculus hardware is connected to your PC via the proper cables.

> NOTE: Some of these prompts may not show up if the software already detects the hardware that it is looking for.

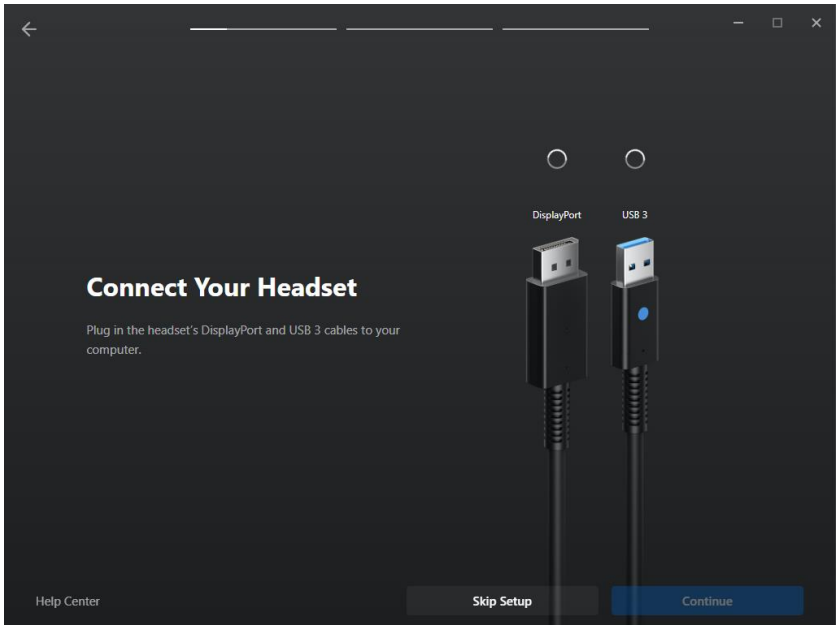


FIGURE 25. CABLE CONNECTION PAGE

6) Wait until the software detects the headset sensor. This may fail if the headset is in a dark room.

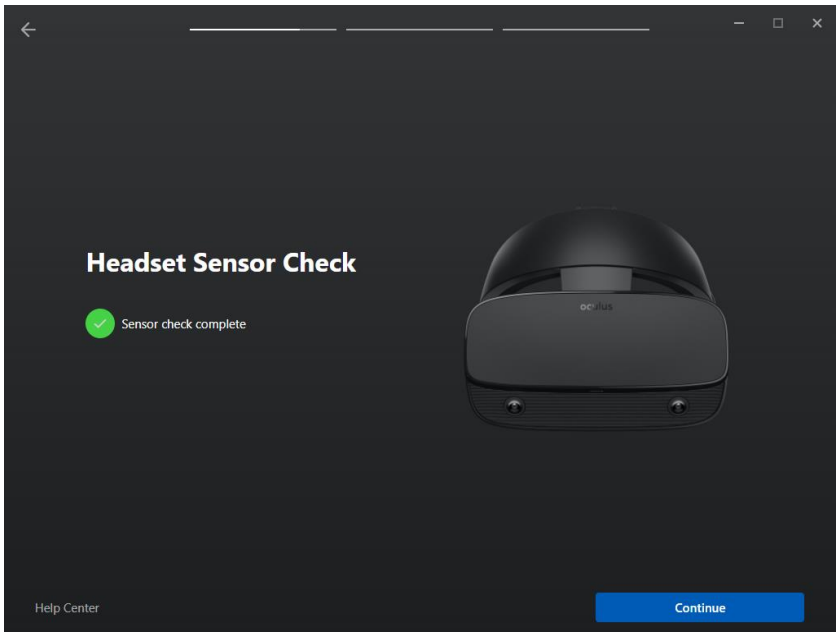


FIGURE 26. HEADSET SENSOR CHECK PAGE

7) Insert batteries into the controllers by following the on-screen instructions.

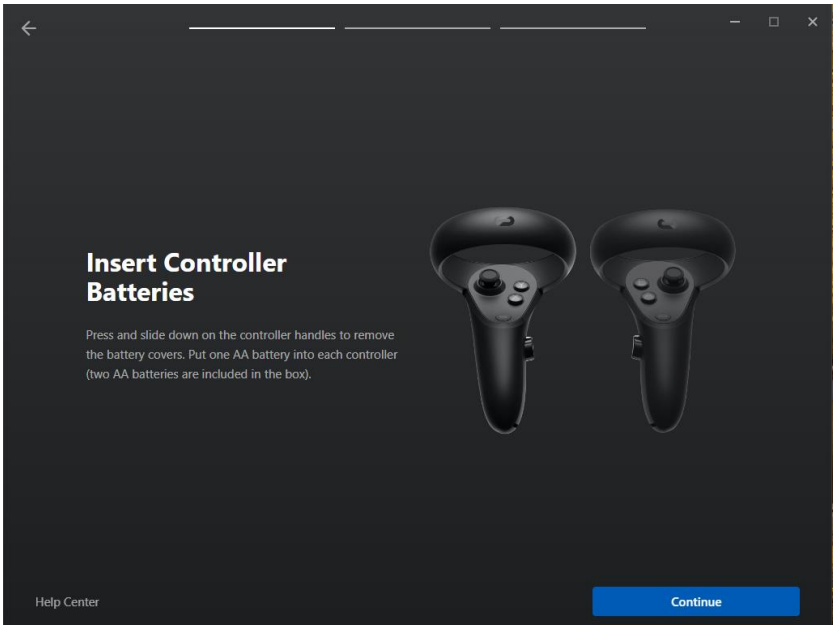


FIGURE 27. INSERT CONTROLLER BATTERIES PAGE

8) Pair your left controller by performing the on-screen instructions.

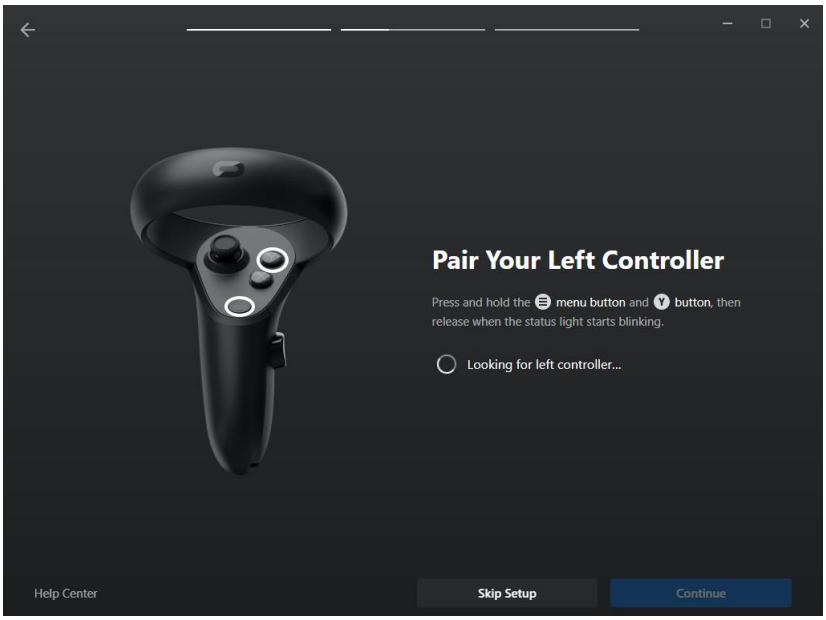


FIGURE 28. PAIRING LEFT CONTROLLER PAGE

9) Pair your right controller by performing the on-screen instructions.

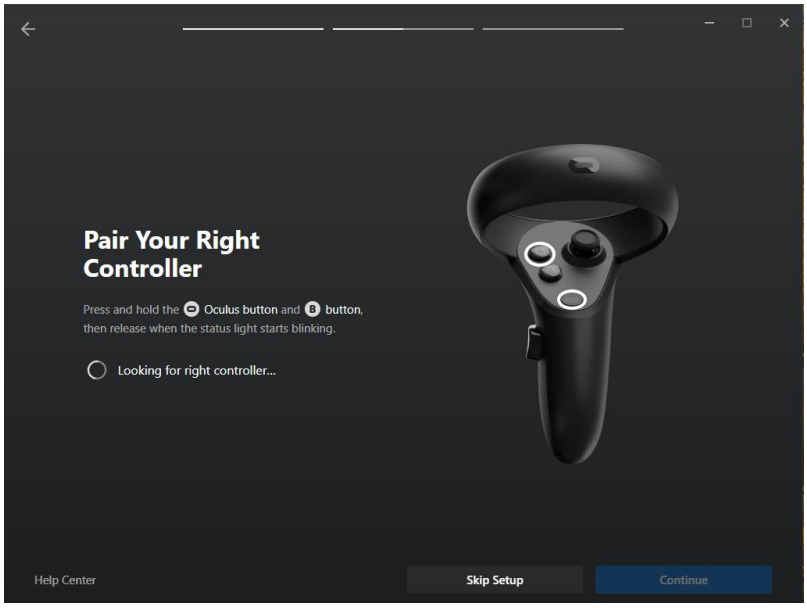


FIGURE 29. PAIRING LEFT CONTROLLER PAGE

10) Watch and wait until the video is over to continue with instructions.

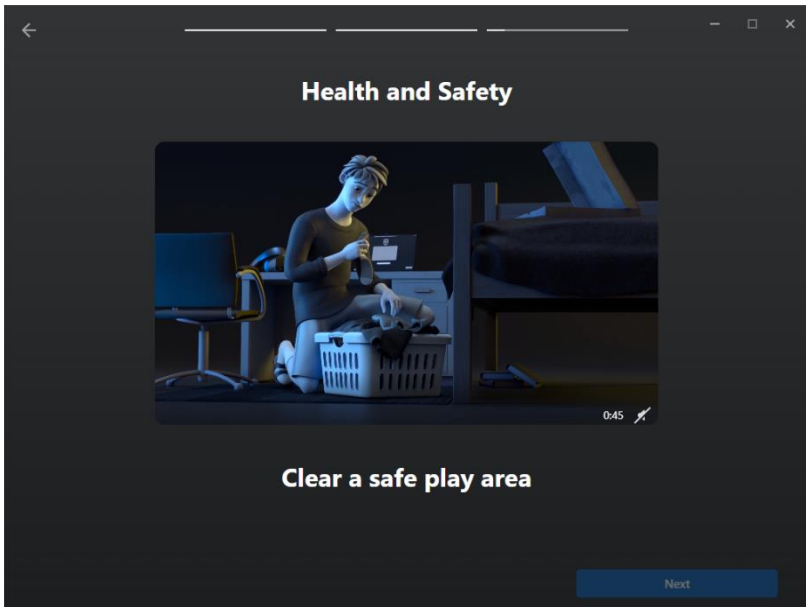


FIGURE 30. HEALTH AND SAFETY PAGE

11) Select “Acknowledge” to accept the Oculus health and safety warnings.

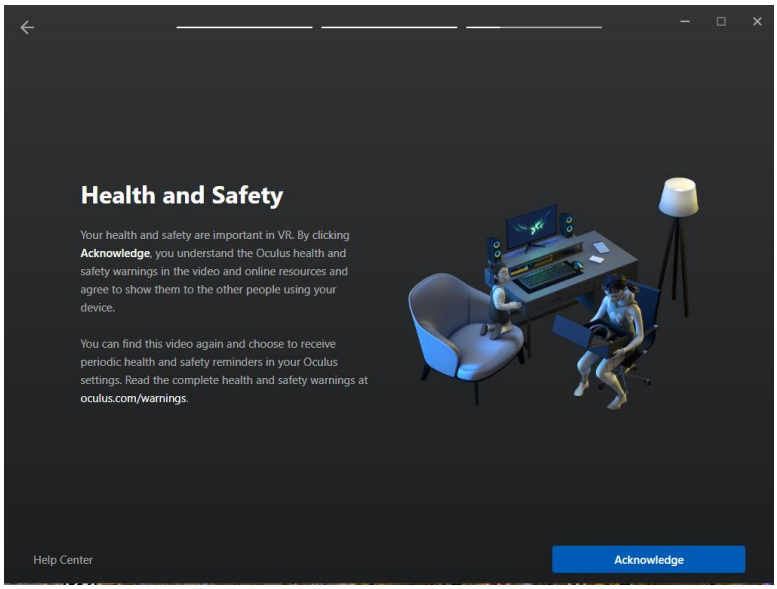


FIGURE 31. HEALTH AND SAFTEY ACKNOWLDGEMENT PAGE

12) Press continue on the “Clear Your Play Area” page.

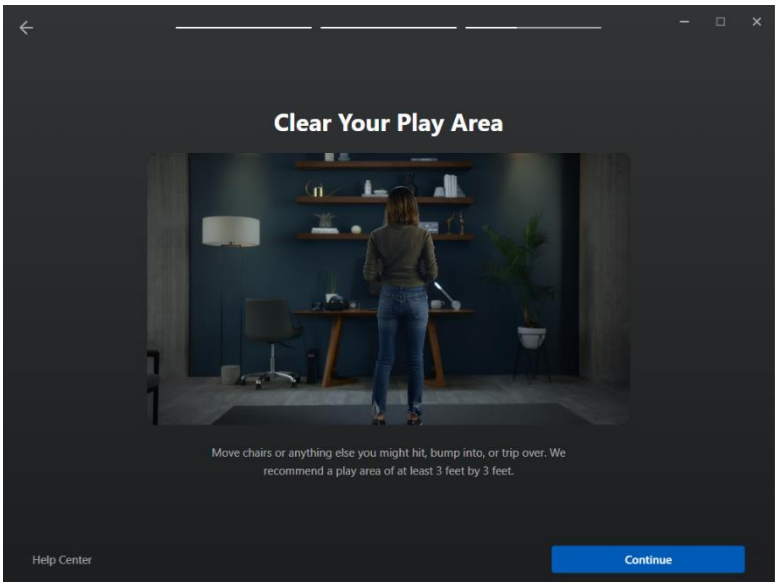


FIGURE 32. CLEAR YOUR PLAY AREA PAGE

13) Press continue on the “Put on Your Controllers and Headset” page.

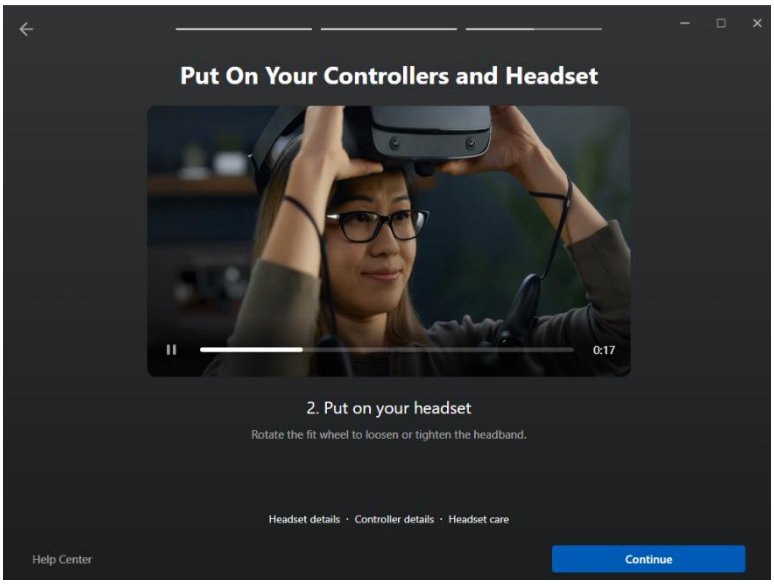


FIGURE 33. HEADSET INSTRUCTIONS PAGE

14) Put on your headset and follow the instructions if you would like to learn how to use the headset. Alternatively, if you are familiar with VR hardware or the Oculus, you can simply close the software on your desktop.

FIGURE 34. IN-HEADSET SETUP PAGE

4.2 Launching VR-TAK

1) Double click the VR-TAK shortcut to launch VR-TAK.

> NOTE: If you're planning to use VR, it is recommended that SteamVR or your Oculus software be started prior to starting VR-TAK. If not, VR-TAK may need to be restarted.

FIGURE 35. VR-TAK SHORTCUT

2) The user will start in the Virtual TOC.

FIGURE 36. VIRTUAL TOC

4.3 First Time User Experience

This section covers the FTUE (First Time User Experience). This feature helps a new user gain a fundamental understanding of VR-TAK controls and interactions.

4.3.1 First launch

When the user launches VR-TAK for the first time they will be prompted with the option to start a guided tour of the following topics:

Topic	Description
Camera Controls	How the user will view the 3d space using PC controls
Movement Controls	How the user will move in the 3d space using PC controls
Toolbar Menu	How the user will interact with the toolbar menu
TOC (Tactical operations Center)	How to use and access the TOC and the tables
Object Placement	How the user will interact with object menu to place something
Context Menu	How to use an objects context menu

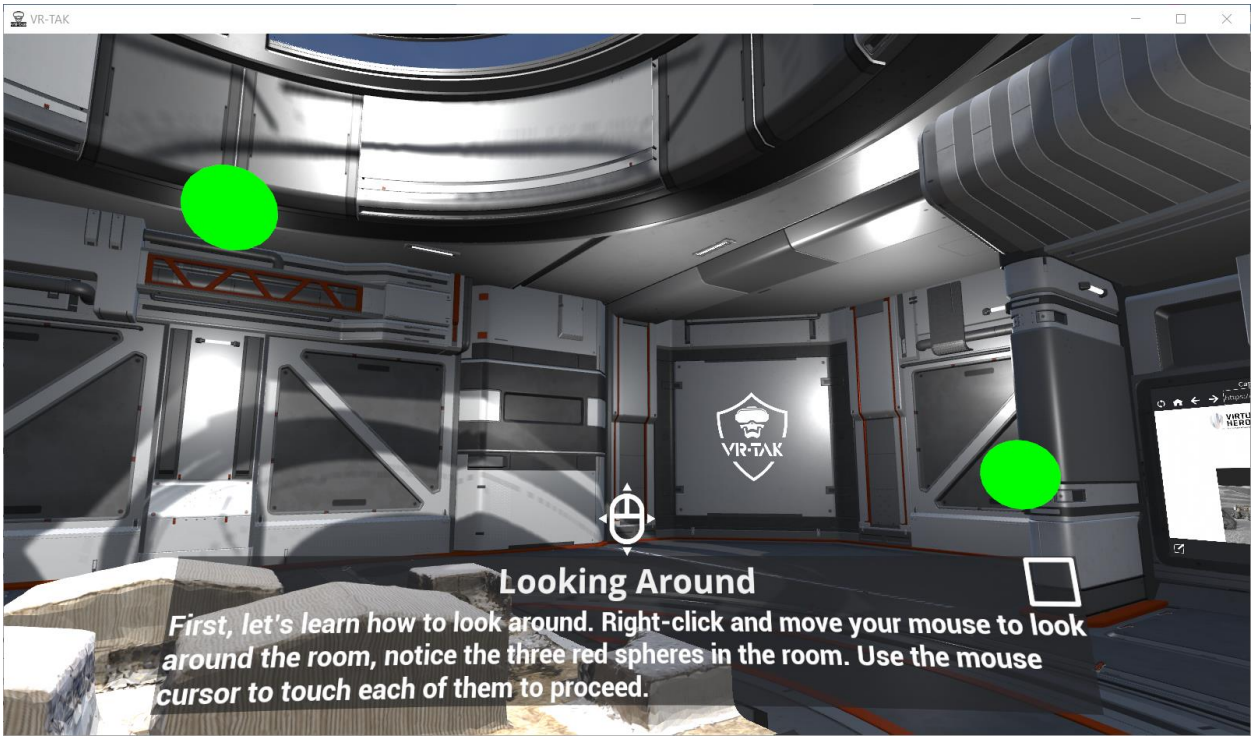


FIGURE 37. THE USER IS TASKED WITH FEATURE FAMILIARIZATION TASKS.

4.3.2 Post First Launch

After the user has either launched or skipped the tutorial, the pop up will not show again. The tutorial can be accessed from the **Toolbar Menu** via the **System Tab**.

FIGURE 38. THE TUTORIAL BUTTON IS HIGHLIGHTED. USER CAN ACCESS THE TUTORIAL FROM THE SYSTEM TAB

4.4 Controls

VR-TAK can be used with or without VR.

While in VR, the application is controlled using VR motion controllers. While in Desktop mode, the application is controlled using a standard mouse and keyboard. There is also limited support for a gamepad in Desktop mode.

By default, the application opens in Desktop mode, and a button on the toolbar is used to switch to VR, or back to Desktop mode.

Each mode has its own set of controls. All features are available in both modes.

FIGURE 39. TOOLBAR BUTTONS TO TOGGLE VR/DESKTOP MODE

4.4.1 VR Headset

In VR mode, the user wears a VR headset and uses tracked motion controllers.

To open the toolbar menu, press the menu button on the controller or press [M] on the keyboard.

After choosing a tool on the toolbar, click the downward facing arrow on the toolbar button to open any options for the chosen tool. For example, the Point Tool Menu has an option to set the type of point it will place.

Most menus are displayed in virtual windows, which float near the user and can be repositioned. See Section 4.8 for more details.

The following diagrams show controls on HTC Vive and Oculus Quest 2 controllers:

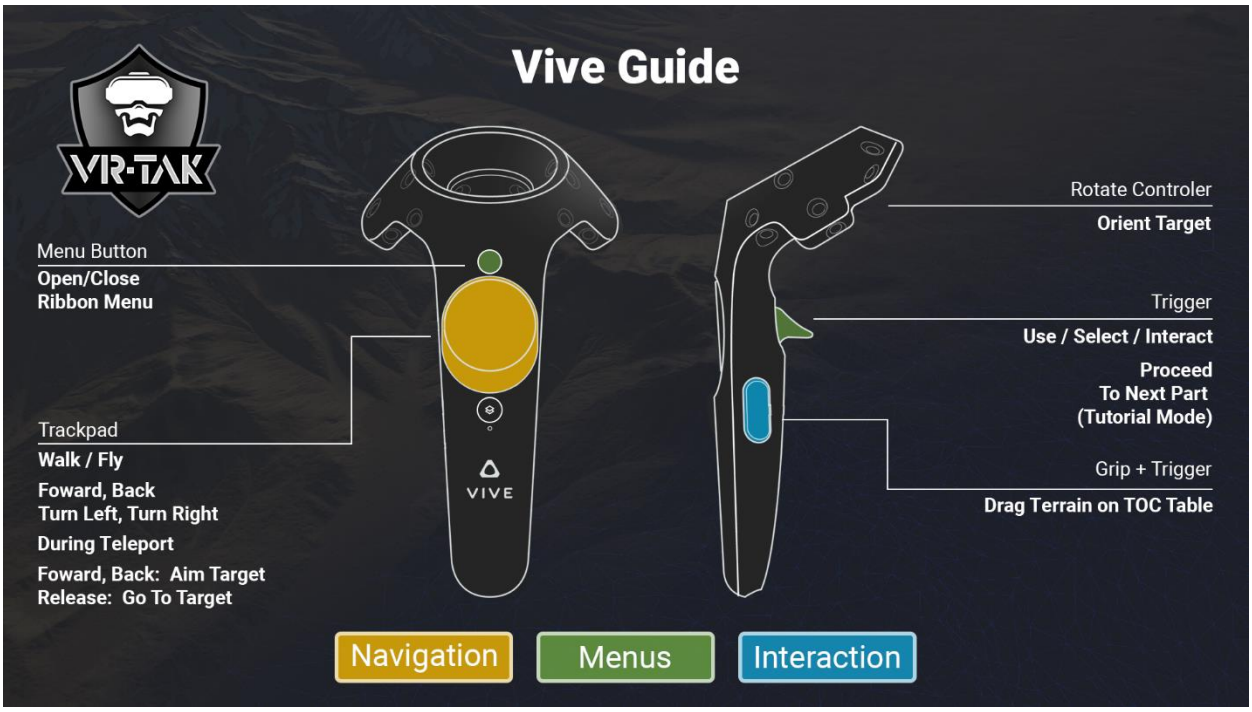


FIGURE 40. HTC VIVE AND HTC VIVE PRO VR-TAK CONTROLS

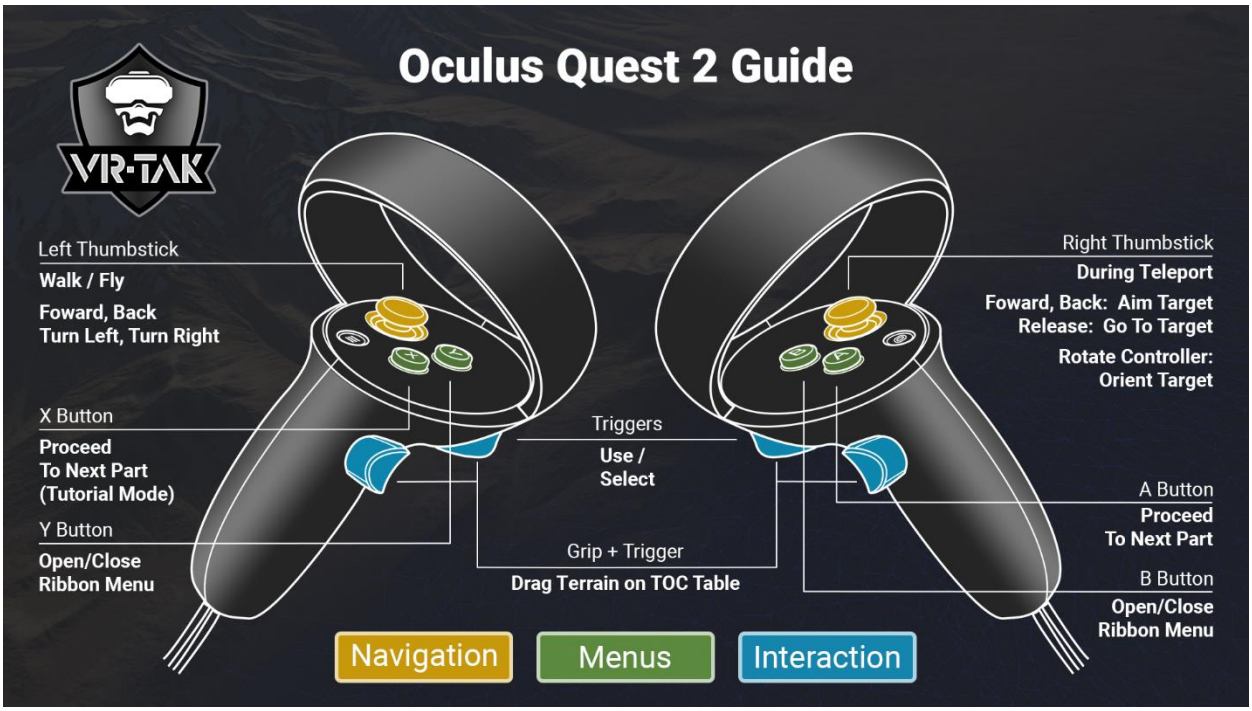


FIGURE 41. OCULUS QUEST 2 VR-TAK CONTROLS

4.4.2 Desktop

In desktop mode, input occurs with mouse and keyboard.

By default, the cursor can be used to select things and interact with menus by left clicking. While in this mode, you can look around by pressing and holding the right mouse button.

A reticle in the center of the screen can be used to look around and select items in the world.
The reticle can be toggled on and off. While the reticle is on, you will be unable to interact with the Toolbar.

FIGURE 42. RETICLE (LEFT) INTERACTING WITH THE TOC TABLE AND MOUSE CURSOR (RIGHT) SELECTING TOOLS ON THE TOOLBAR

Most menus are held within popped-out desktop windows, which allow you to close or minimize them. When VR-TAK is closed, all menu windows will also close.

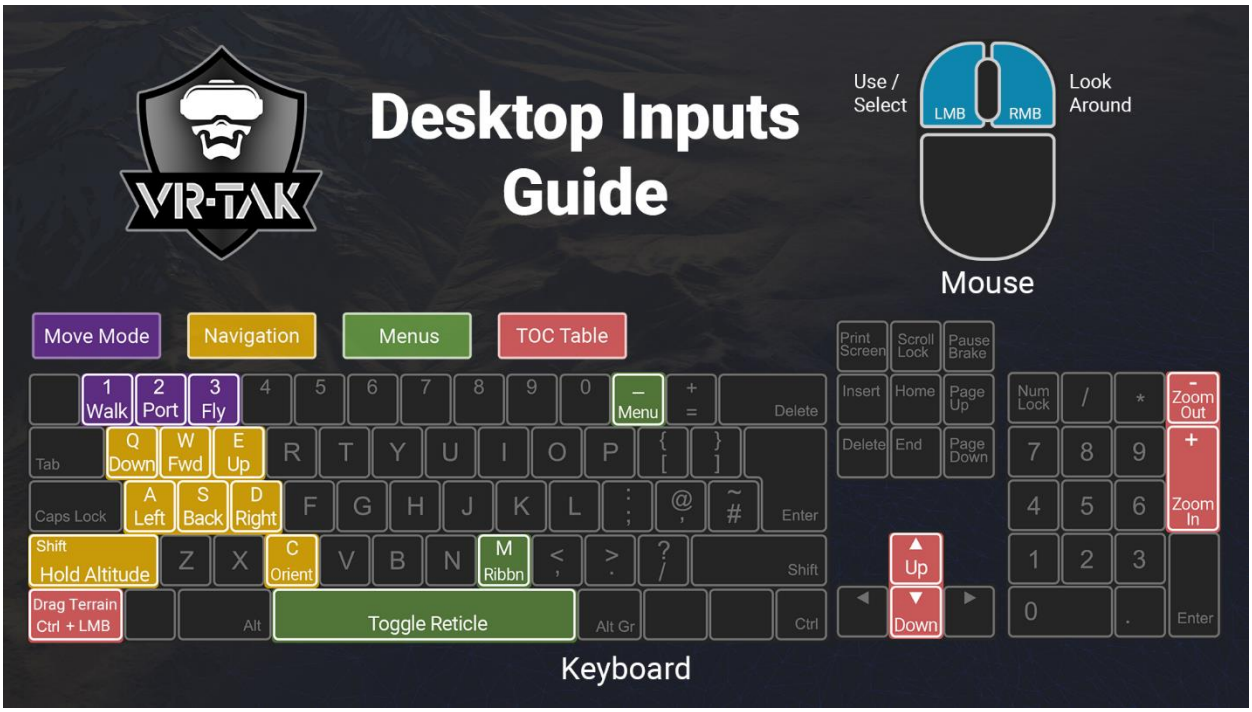


FIGURE 43. DESKTOP INPUTS FOR VR-TAK
* M KEY ALWAYS OPENS THE TOOLBAR MENU
** - KEY BEHAVES LIKE THE MENU BUTTON ON A VR CONTROLLER

4.4.3 Game Controller

While in Desktop mode, a game controller may be used for a limited set of actions, such as moving around the Virtual Tactical Operations Center (TOC) and World. Even with a game controller connected, a mouse and keyboard are still necessary to interact with menus.

A Gamepad can be used for looking around, moving, and placing points. The right control stick can be inverted under Interface Settings.

The "Menu" button on a game controller operates the same way as the menu buttons on VR Controllers; it opens the Toolbar Menu.

FIGURE 44. GAMEPAD CONTROLS SHOWN ON A MICROSOFT XBOX ONE CONTROLLER

4.4.5 Toolbar Menu

Most tools and menus in VR-TAK are accessible through the toolbar menu. The toolbar menu can be opened or hidden at any time, and it will automatically follow the user. The toolbar has multiple pages that can be switched between using the tabs on the top. Tabs may be added for any plugins you have installed.

Desktop: In Desktop mode, use the [M] key to open & close the toolbar menu. It will appear at the top of the screen, and you can click on it with the mouse.

VR: In VR mode, use the VR Controller's Menu button to open and close the toolbar. It will appear in the air in front of you and will rotate around you when you turn towards a different direction. Aim the VR controllers at it and use the triggers to interact with it.

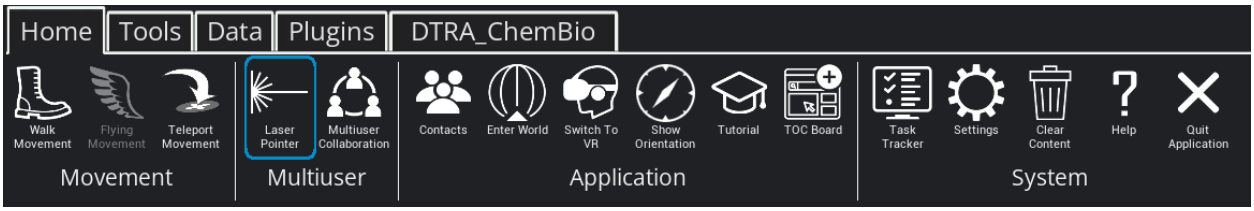


FIGURE 45. VR-TAK TOOLBAR MENU

4.5 Working with Menus

VR-TAK menus generally pop out into their own windows. Some menus will appear as tabs and can share a window. Menus that do not tab will always open in their own window.

Click any tab on a tabbed window to bring it into focus. If you have a menu open in another tab and try to open it again, that tab will become focused.

4.5.1 Desktop Windows

In desktop mode, menus will pop out into desktop windows that can be minimized, closed, resized, and moved like normal windows. They will open on top of the main VR-TAK Window.

> **NOTE:** To resize a window, place the mouse cursor on its edge or corner. You will see it change to a double arrow, then change back to a normal cursor. Just because it has changed back to a normal cursor does not mean you cannot resize the window. If you are close enough to its edge, it will resize.

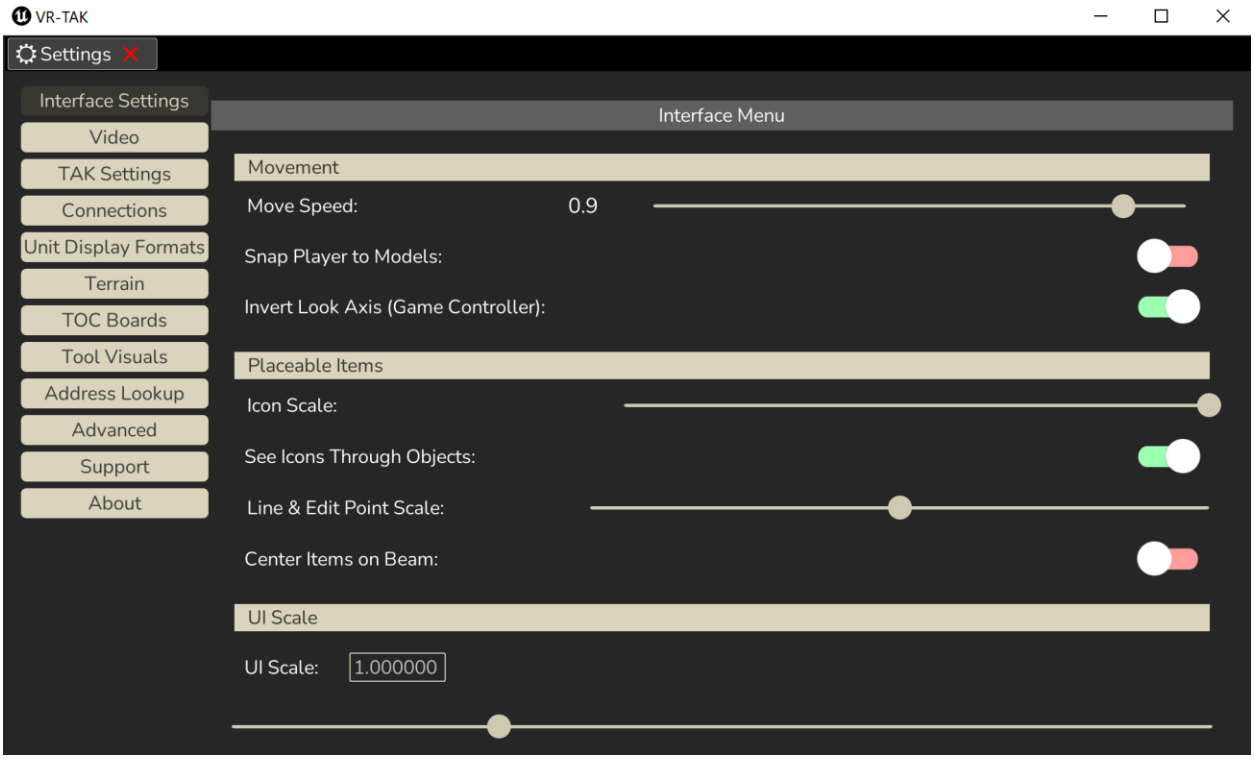


FIGURE 46. MENUS ON DESKTOP WINDOWS

If a menu is minimized, trying to open the same menu will restore that window.

4.5.2 VR Windows

In VR mode, menus will open in the virtual environment on 3D planes. VR menus look similar to desktop windows and can be moved, resized, pinned to the world, and closed.

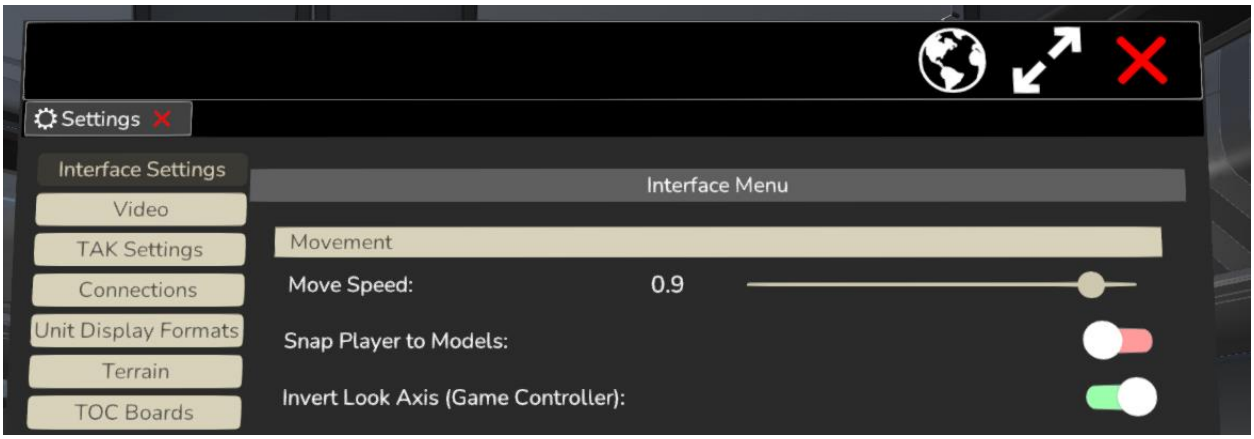


FIGURE 47. EXAMPLE WINDOW

Menus are resized by selecting and holding the double arrow button in the top right and then dragging the menu to a larger or smaller size.

Menus can toggle between pinned to world or pinned to player by clicking the icon to the left of the resizing icon.

Menus are closed by clicking the red X in the top right of the menu.

Menus can be moved towards or away from the user by holding the trigger button of the left VR controller on the top black area of the UI. While holding the trigger button, use the forward and backward navigation controls of the left VR controller to adjust the menu position. Default open position (relative to the user) can be adjusted in the Settings.

4.5.3 Text Input

4.5.3.1 Desktop

In desktop mode anything that requires text input can be clicked on with the mouse cursor or reticle and then typed into normally using the keyboard.

Use CTRL + V to paste text. In the case of MGRS or Geodetic coordinates, pasted content will be transferred to appropriate text boxes once you stop entering text.

To stop entering text, you can cancel your new text with the escape key or submit it using the enter key. You may also use Tab or click somewhere else to stop entering text.

While entering text, the keyboard will not work for other input such as movement.

4.5.3.2 Virtual Keyboard

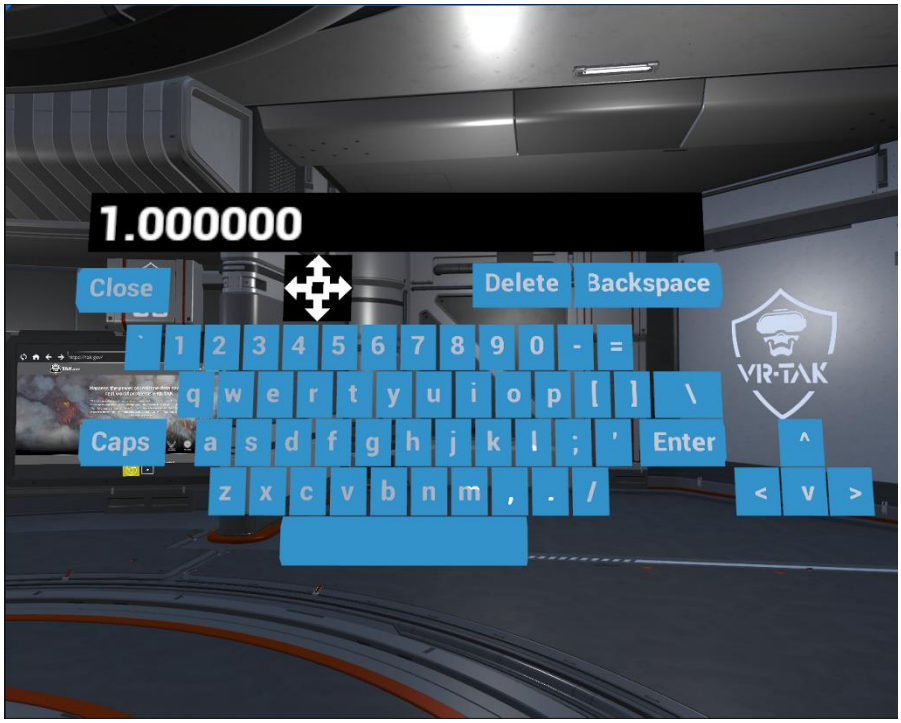


FIGURE 48. VIRTUAL KEYBOARD IS LAID OUT MUCH LIKE A STANDARD KEYBOARD

In VR, using your controller beam to interact with something that requires text input will open the virtual keyboard, which is based on a standard American QWERTY keyboard.

While the keyboard is open, the user may not interact with any other menus or items in VR-TAK.

Currently entered text appears above the keyboard and in the selected text box. To close the keyboard, press the "Close" key.

Users can choose between the regular keyboard and drum keyboard in the Settings.

4.5.3.2.1 Special Keys

- **Caps**: Emulates holding or releasing Shift key
- **Arrows**: Move input cursor left or right.
- **Backspace**: Remove character to the left of cursor.
- **Delete**: Remove character to the right of cursor.

4.5.4 TOC Board Screens

In the VTOC, there are several interactive screens around the room. They can display web sites or videos.

Along the bottom, there are two buttons to switch between Web Browser (Chromium) and the Video Player. These menus behave identically to the Web and Video Player menus which can be opened from the Toolbar Menu.

At the bottom left, there is a "Pop out" button.
Desktop: The Pop Out button will pop out a Desktop window showing the contents of the TOC Screen. It can be popped back in through the icon on the bottom left.
VR: The Pop Out button will pop out a floating VR Window with the contents of the web board, which can be repositioned like any other window. It can be popped back in through an icon on the bottom left.

FIGURE 49. TOC SCREEN CAN DISPLAY DIFFERENT WEB SITES AND VIDEO STREAMS

While in the TOC, you may select anywhere on the TOC Screen to interact with it using any tool, and it will behave as if you clicked with a mouse.

Web Board: Click on the URL bar to input any URL, and it will behave like a normal text input. Clicking on a text box on a web page (e.g., login box, search bar, etc.), will behave like a normal text input.

After being clicked on in Desktop Mode, the web board will receive keyboard and mouse inputs, resulting in inability to move around. **To stop interacting with the web board and restore your regular controls, click outside of it.**

Clicking on the border of the TOC Board will prompt a context menu to appear

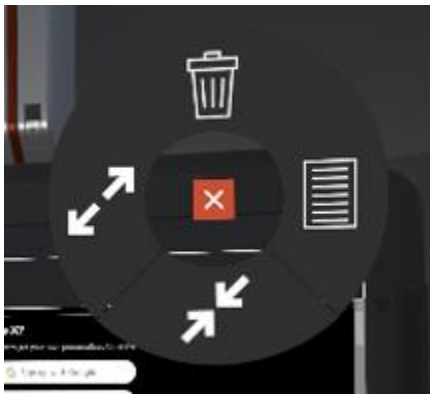


FIGURE 50. TOC BOARD CONTEXT MENU. CLOCKWISE FROM THE TOP: DELETE, DETAILS, SHRINK, EXPAND

The TOC board's expand and shrink options change the size by a specific predetermined amount. The details menu opens up location, rotation, and scale fields that can be manually edited, as well as a field for editing the URL.

Drag Manipulation: Alternatively, the TOC boards can be dragged by clicking the edges of the boards and holding down the left mouse button. This movement incorporates physics and will also rotate the board to be flesh with whatever is behind it based on a certain distance relative to how far away it is from the user. If there is nothing behind the board, then it will rotate to always face the user. Additionally, scrolling with the mouse wheel adjusts the distance the board hovers in front of the user.

4.6 Importing Files

To import a file found on the local PC or a mapped network drive, perform the steps below. Note that, importing a file will register its contents with the application, but does not change the position of the user. The user must move within the configured View Distance for objects to show in the virtual environment. For example, while in the virtual TOC, a user imports a model of Range 74. Range 74 is now registered with the application, but the user must move to within their configured View Distance of Range 74 before the model will show in the virtual environment. Users can move to objects from the Overlay Manager or the GoTo toolbar button.

1) Open the toolbar menu.
2) Click the Import Manager button.
3) Browse to the file you would like to import and select "Import Selected File". Note the Include Archives checkbox at the bottom, which is checked by default. When unchecked, zip archives will not show in the file browser.

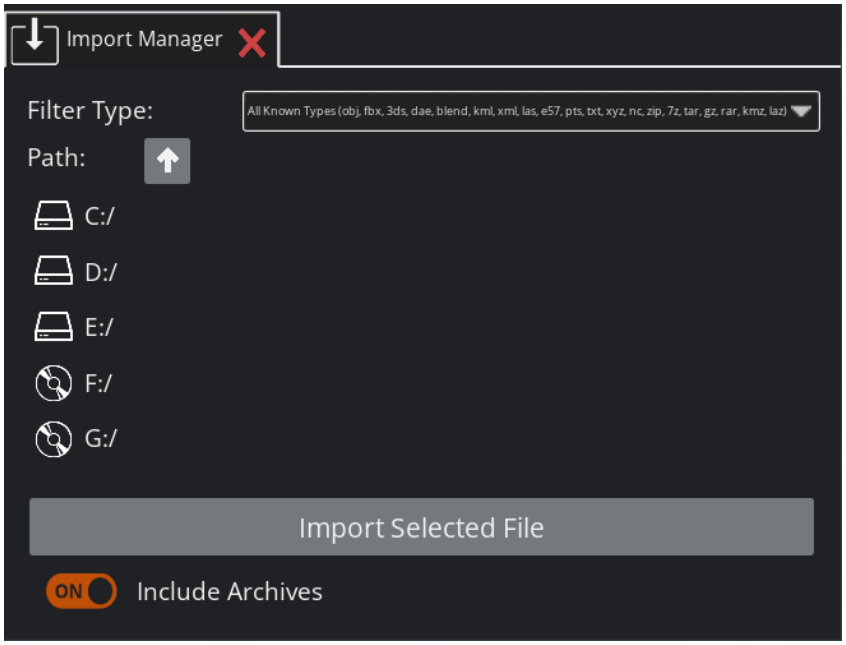


FIGURE 51. IMPORT MANAGER – IMPORT FILE

4.6.1 Connecting to a TAK Server

The easiest way to connect to a TAK server is to import a data package. If you have a data package for your TAK Server connection (i.e. one that you could import into ATAK to automatically setup the connection), simply use Import Manager in VR-TAK.

You can also create a connection via the Connection UI; see section 4.7.3.

4.6.2 Dataset Organization

This section discusses VR-TAK's core import logic. Plugins add additional handlers so support additional file types and/or add logic to handling file types mentioned below.

4.6.2.1 Zip Archives (ex: 7z, zip, kmz)

VR-TAK uses the following logic when importing zip archives (ex: 7z, zip, kmz):

1) Extract the files to the OS's temp directory. Once extracted, recursively extract all zip archives within the extracted files. For example, suppose the file models.zip contains range74.zip and range68.zip. At the end of the extraction step, there would be [OS temp directory]\VR-TAK\models\range74 and [OS temp directory]\VR-TAK\models\range68.
    a. On Windows 7, the temp directory is C:\Users\[username]\AppData\Local\Temp
    b. If extracted files are deleted from the temp directory, they will be re-extracted from the original zip archive location by VR-TAK.
2) Import the root extracted directory (e.g. [OS temp directory\VR-TAK\models) and all child directories. See 4.5.2.2 for details on importing directories.

4.6.2.2 Directories

VR-TAK uses the following 2-pass approach when importing a directory:

1) First pass looks for XML and KML files in the root directory and sub-directories.
    a. If an XML or KML file is found, that directory and all child directories are marked as imported. See section 4.5.2.3 and 4.5.2.4 for details on importing datasets via KML and XML.
2) Second pass looks for all supported model types in directories and subdirectories not marked as imported in step 1. See section 4.5.2.5 for details on importing datasets via model files.

4.6.2.3 KML

VR-TAK reads references to models and geolocation for each model from a KML file. If a KML file is found, it's assumed all files in the KML's directory and child directories are handled via the KML file.

4.6.2.4 XML

VR-TAK read geolocation only from XML file. The XML file must have a ModelMetadata node with an SRS node inside it. The SRS node gives the latitude and longitude. The XML file can optionally have an ENU node with a SRSOrigin child node. The Z component of the SRSOrigin is the altitude in meters MSL.

For example:

```
<?xml version="1.0" encoding="utf-8"?>

<ModelMetadata version="1">
        <SRS>ENU:33.0291,-118.59703</SRS>
        <SRSOrigin>0,0,0</SRSOrigin>
</ModelMetadata>
```

4.6.2.5 Models

VR-TAK supports obj, dae, and fbx models. In order to load a model, VR-TAK looks for geolocation information in the model's current directory, then the model's parent directory, and so on up to the root drive (ex: C:\). Geolocation information is either an XML file with the format described in 4.5.2.4 or a combination of prj and xyz/ofs files.

The prj file should start with PROJCS[, then have a section for UTM zone. N refers to northern hemisphere, S refers to southern hemisphere. For example:

PROJCS["WGS 84 / UTM zone 17N"

The xyz/ofs file should have three numbers with a space between each number. The first number is the UTM northing, the second number is the UTM easting, and the third number is HAE in meters.

4.6.3 Plugin Manager

Importing and managing plugins in VR-TAK can be done through the Plugin Manager. Note that importing a plugin does not automatically enable and load it for use. Plugins must be enabled through the Plugin Manager, which will then restart VR-TAK to apply the changes. After VR-TAK boots back up, the changes will take effect, and the plugins will be enabled and fully loaded into VR-TAK. The same goes for other plugin modifications such as *deletion* and *disabling*.

From the Plugin Manager, users can:

1) Import plugins.
2) Modify plugin states. Currently, users can enable, disable, and delete plugins.

To Import a Plugin:

1) Open the toolbar menu.
2) Click on the Plugin Manager toolbar button. The below menu should pop up.

FIGURE 52. PLUGIN MANAGER UI. VR-TAK MENSURATION IS FULLY INSTALLED AND ENABLED, WHILE VR-TAK ORBIT IS CURRENTLY DISABLED. ADDITIONALLY, VR-TAK ORBIT WAS FOUND TO BE OUTDATED AND HAS BEEN MARKED AS SUCH

3) Click the Import Plugins icon near the top, which will open a file browser popup. Navigate to the packaged plugin.

NOTE: Plugins must be packaged or zipped otherwise the file browser will not show them. The list of supported plugin package extensions is shown at the top of the file browser.

4) Selecting a packaged plugin will highlight it. Once it has been selected, click the accept button at the bottom of the file browser popup and the plugin will appear in the list of Installed Plugins in the Plugin Manager and can be managed like any other plugin.
   a. Plugins will stay installed in VR-TAK until they are deleted through the Plugin Manager.
5) Plugins will always be imported in a disabled state and cannot immediately be used. Follow the instructions below to enable and load them into VR-TAK for use.

> NOTE: Attempting to import a plugin with the same name as an already installed plugin will fail. A warning message will be written to the log, and the newly imported plugin will not appear in the Plugin Manager. The old plugin must first be deleted before the new plugin can be imported.

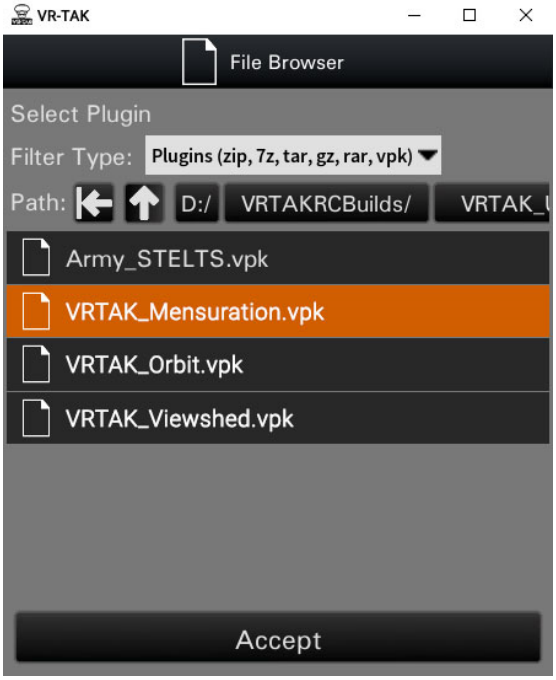


FIGURE 53. PLUGIN MANAGER IMPORT BROWSER UI

To Manage a Plugin:

1) Once a plugin is installed, a plugin entry will appear in the Plugin Manager as shown in Figure 54.
   a. A plugin entry contains the plugin's name, a short description of the plugin, the plugin's author, and the plugin's version number.

FIGURE 54. PLUGIN ENTRY UI. (A) IS THE ENABLE/DISABLE CHECKMARK AND (B) IS THE DELETE PLUGIN BUTTON

2) The right of the plugin entry shows different actions that can be applied to the plugin.

a. Enable/Disable: toggle to enable or disable a plugin.
b. Delete: press this to mark a plugin for deletion. Press it again to unmark. Plugins that have already been enabled and loaded can still be marked for deletion; VR-TAK will disable them before deleting them.

3) Making a change to the plugin entry will cause a popup at the bottom of the Plugin Manager UI with an Apply button. Clicking Apply will restart VR-TAK and apply the requested plugin changes.

a. Note that the Apply button popup will not appear until changes to the plugin entry have been detected (enabling, disabling, deleting, etc.).

FIGURE 55. PLUGIN MANAGER UI. VR-TAK MENSURATION HAS BEEN MARKED FOR DELETION AND WILL BE REMOVED WHEN THE APPLY BUTTON IS CLICKED. ADDITIONALLY, VR-TAK ORBIT HAS BEEN ENABLED AND WILL BE LOADED INTO VR-TAK WHEN THE APPLY BUTTON IS CLICKED

4) When VR-TAK fully restarts, the requested plugin changes will be implemented.

Note that importing and enabling an outdated plugin will result in the plugin entry being marked with either an Outdated status marker or an Unknown Load Error status marker. In either case, the plugin will show up in the Plugin Manager but will fail to load.

4.6.3.1 Advanced Usage and Troubleshooting

By default, imported plugins are stored in [*C:\ProgramData\VR-TAK\ExtPlugins*]. On startup, plugins found here will be installed in VR-TAK and enabled if the plugin has been configured correctly.

Plugin installation can be done by manually copying plugins into this directory before starting VR-TAK; this is not an officially supported method and may cause issues with plugin loading.

If problems arise with the in-game Plugin Manager UI and with plugin loading in general, manually deleting all the plugins from this directory can aid with restoring VR-TAK to a clean state and help isolate the problem.

4.6.4 Point Clouds

VR-TAK supports point clouds with the following extensions: xyz, txt, pts, and las. Point cloud files are imported via the Import Manager.

Once imported, point cloud objects' details can be reached through the Overlay Manager or context options of the point cloud.

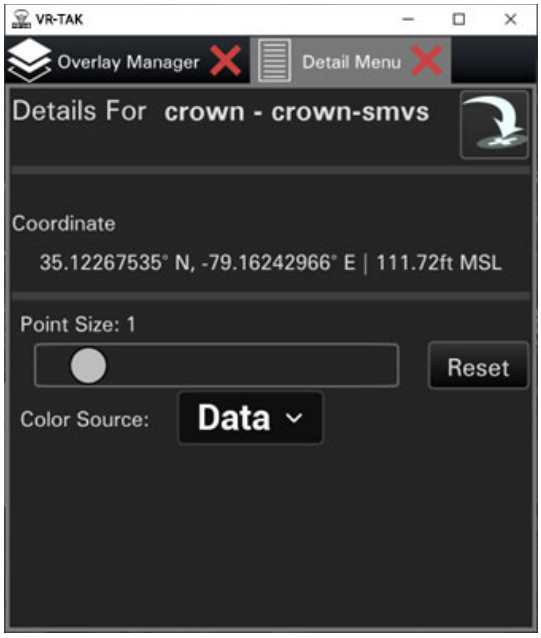


FIGURE 56. POINT CLOUD DETAIL MENU

The point cloud detail menu enables users to adjust the point size and color source for the point cloud. Color source options include:

- None: points are white
- Data: points are colored based on colors designated in the source file
- Elevation: points are colored based on altitude
- Position: points are colored based on longitude and latitude
- Classification: points are colored based on the classification included within the source file

4.6.5 Gridded Reference Graphics

VR-TAK supports importing 3D Gridded Reference Graphic (GRG)s built as file format KML.

When a GRG is shown in the virtual environment, it is "draped" over the top of the model at its location. In some cases, this causes distortion of the GRG and some loss in quality of the 3D mesh. Additionally, since GRGs do not follow one standard, all variants of GRGs are not currently supported.

FIGURE 57. 2D GRG LOADED ON RANGE 74

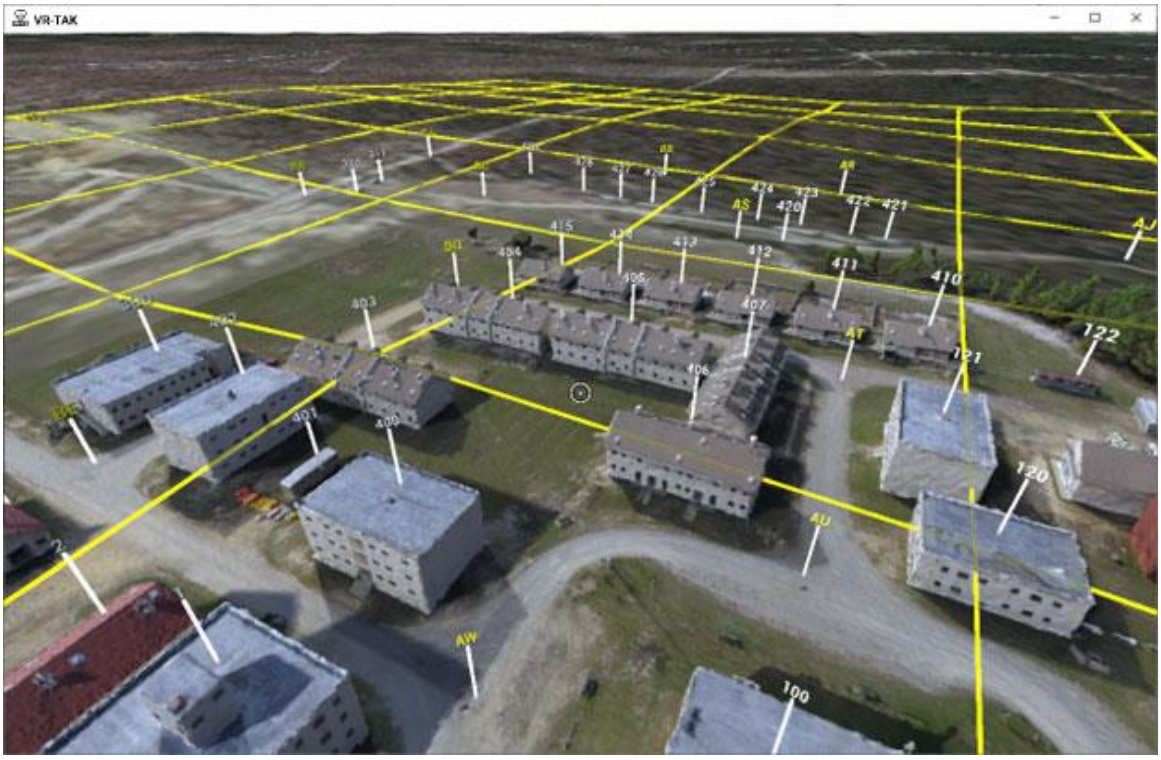


FIGURE 58. 3D GRG LOADED ON RANGE 74

4.7 Changing Movement Modes

1) Open the Toolbar Menu
2) Select the 'Other' tab
3) Select Walk Movement, Fly Movement*, or Teleport Movement.

*Note that Fly Movement can only be used when outside the Virtual TOC and will not be available when inside it.

While teleporting in VR, rotate your controller to spin your target position.
Additionally, Desktop mode has hotkeys for switching movement modes.

4.8 Settings

VR-TAK settings are divided into several sections, which may be accessed by selecting them along the left side.

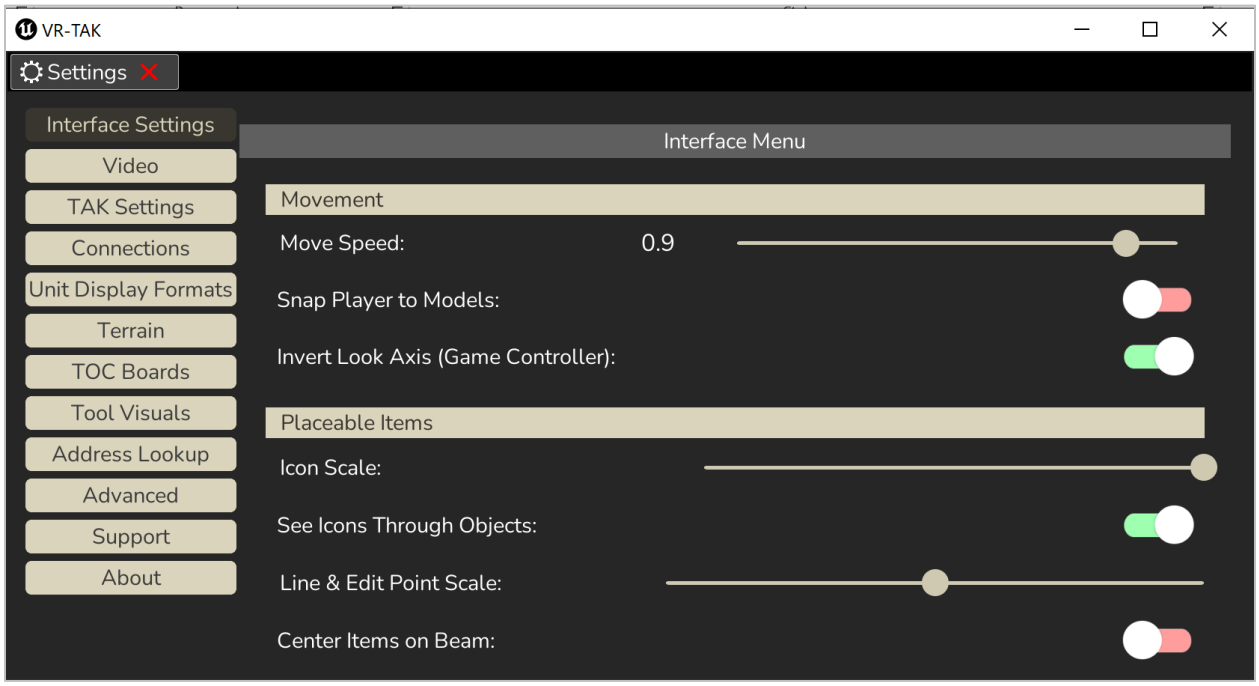


FIGURE 59. VR-TAK INTERFACE SETTINGS

4.8.1 Interface Settings

Interface Settings consists of the following:

1) Movement
    a. Move Speed: Used to adjust user's speed for Walk and Fly Movement.
    b. Snap Player to Models: Toggles whether the user will snap to the top of 3D models that are slightly above them. Can make movement smoother but makes navigating models with interiors difficult.
    c. Invert Look Axis (Game Controller): Toggles whether moving the controller thumb stick up makes the user look up or down.
2) Placeable Items
    a. Icon Scale: Changes the size of CoT Icons.
    b. See Icons Through Objects: Provides the ability to disable or enable whether drawings; routes and icons are visible through occluding 3D objects in the virtual space.
    c. Line & Edit Point Scale: Adjusts the size of lines and edit points from Routes, Drawing Tool, or Range & Bearing Tool.

d. Center Items on Beam: By default, if a user selects part of a 3D object such as a vehicle, the object will be connected to the user's controller beam at the spot selected. If this setting is enabled, the object will center on the beam once selected.

3) UI Scale
   a. UI Scale: scales all UI elements
4) VR
   a. VR UI offset from user: Distance from user UIs (except toolbar) will open in VR
   b. VR toolbar offset from user: Distance from user the toolbar will open in VR
   c. VR Beam End Visual: Adds a visual indicator at end of tool beam
5) Performance
   a. Object View Distance: Determines how far from the user objects (except terrain tiles) will load in and out. Reducing view distance will increase performance but will only show nearby objects.

4.8.2 Video Settings

1) Frame Rate Limit: Sets a limit to frames per second
2) VSync: Limits frames per second based on maximum frames per second that user's monitor can output. Enabling VSync can prevent screen tearing.
3) Anti-Aliasing: Smooths edges of objects. Higher levels generally look better at the cost of performance.
4) Shadow Quality: Visual quality of shadows. Higher levels generally look better at the cost of performance.
5) Texture Quality: Visual quality of textures. Higher levels generally look better at the cost of performance.

4.8.3 TAK Settings

1) Callsign: Allows user to change their TAK callsign, which identifies them to other TAK users.
2) Color: Sets the color that is used when displaying your callsign to other VR-TAK users in Multi-User Collaboration (MUC).
3) Broadcast VR Ghost: Whether the user should broadcast a ghost icon in their current position to other TAK users. In the TOC, the ghost will appear above the map's current location.

4.8.4 Connections

Displays the current TAK Server connection status for each known TAK server.

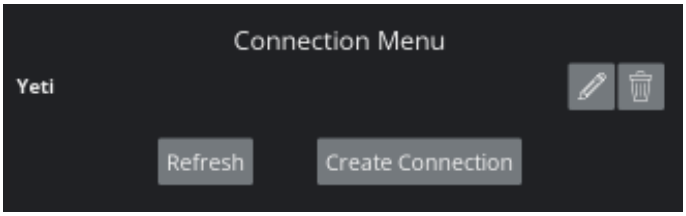


FIGURE 60. VR-TAK CONNECTION SETTINGS

4.8.4.1 Connecting & Disconnecting

TAK Server connections are shown in a list. Select a server's name to attempt to connect to it. A red dot will appear to indicate that a connection is being attempted.

If the server is connected, a green dot will appear next to its name, and you may select the server again to disconnect from it.

4.8.4.2 Adding Connections

There are two ways to add TAK Server connections in VR-TAK.

1) Click the "Create Connection" button in the Connections tab of the Settings menu. A menu will be shown with all options necessary for a TAK Server connection. Fill out the menu and press "Submit" at the bottom.
2) Using the toolbar, open the Import Manager. Use the Import Manager to import the connection for your server (usually a compressed folder containing a *.p12 digital certificate and a *.PREF file with connection details). See section 4.5.1 for more info on the Import Manager.

Once added, the connection will appear in the Connection Menu.

> NOTE: If the connection does not immediately appear in the Connection Menu, press Refresh to update the UI.

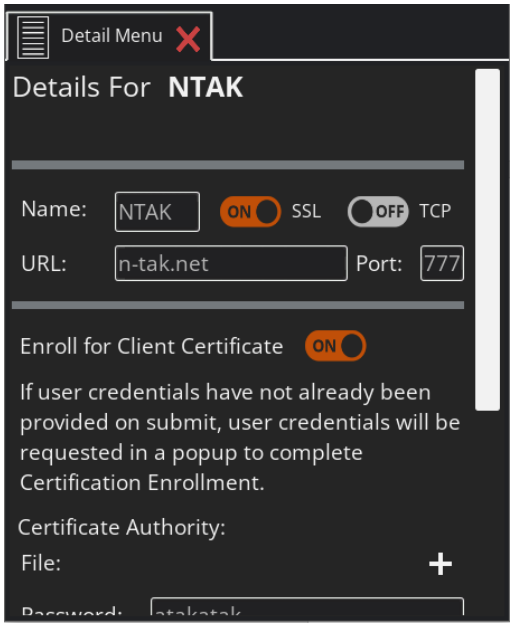


FIGURE 61. VR-TAK CONNECTION DETAIL MENU

4.8.4.3 Editing & Deleting Connections

To view and edit connection details, select the pencil icon to the right of its name.

To delete a connection, select the trash can icon to the right of its name.

4.8.4.4 Enrolling for Client Certificate

Certain connection packages will not contain valid client certificates and will instead begin enrolling for a client certificate. If this is the case, on the connection details menu, the Enroll For Client Certificate checkmark will be

checked off and a popup requesting LDAP credentials will appear shortly after the connection package has been imported. This popup will not appear if the connection has been bundled with valid credentials.

FIGURE 62. LDAP CREDENTIALS POPUP

The connection will not be established until valid LDAP credentials have been supplied to the server, and the server has given VR-TAK a valid client certificate.

A similar situation occurs when creating a new connection – if a user wishes to have the server supply the client certificate for a new connection, follow the below steps:

1) Create a new connection.
2) Check the Enroll For Client Certificate checkmark.
3) Complete the other fields, leaving Client Certificate blank.
4) Check the Use Authentication checkmark, which will open up a new section of the menu. Supply a valid username and password.

If the last step was not completed, and a valid username and password was not supplied, the LDAP credentials popup will appear requesting credentials.

Note that if the connection already has a valid client certificate, the Enroll For Client Certificate checkmark will do nothing. No LDAP credentials popup will appear as the connection already has a client certificate.

4.8.5 Unit Display Formats

Allows for the choice of the preferred unit to be displayed whenever a measurement of the specific type is shown.

For example, setting Nautical Miles as the unit for the Range category will automatically convert any numerical display for entities in the Range category to the equivalent value in nautical miles. The Range category will include the range and bearing tool and the orientation display.

Note that the range settings Miles and Kilometers will convert down to Feet and Meters respectively in some places to show better precision.

4.8.6 Terrain

1) Performance
    a. Enable Terrain Tiles: Toggles terrain tiles. Terrain tiles pull heightmap and imagery data from the source(s) chosen in the "Set Streaming Source" menu accessed with the Set Streaming Source button.
    b. Tile View Distance: Determines how far terrain tiles are shown from the player position.
2) Zoom Level Settings: Terrain consists of up to two tiles. One tile is from 0 – 7.5km from the user's position. The other tile is from 7.5km – 50km from the user's position. The outer tile uses the min zoom level while the inner tile uses the max zoom level. If the Tile View Distance is 7.5km or less, only the inner tile will show.
    a. Minimum Imagery Zoom Level: imagery zoom level for 7.5km – 50km
    b. Maximum Imagery Zoom Level: imagery zoom level for 0 – 7.5km
    c. Minimum Heightmap Zoom Level: heightmap zoom level for 7.5km – 50km; not applicable to all heightmap sources (e.g. DTED)
    d. Maximum Heightmap Zoom Level: heightmap zoom level for 0 – 7.5km; not applicable to all heightmap sources (e.g. DTED)
3) Source: Configures imagery directories and open the Map Source menu.

4.8.7 TOC Boards

Allows saving and loading of TOC board configurations. Configuration includes board position and scale as well as URL for each board.

4.8.8 Tool Visuals

Configures tool mesh, beam offset, beam scale, beam rotation, and beam color.

4.8.9 Toolbar Editor

Allows for switching what toolbar layout is being used and gives access to the Toolbar Editor. The toolbar editor is only available in Desktop mode in the current version.

The Toolbar Editor is where you can modify the layout of the toolbar. You can add, remove, rename, and reorder tabs and categories, and drag to move the toolbar buttons between them, alongside many other functions. To remove buttons from the toolbar so they no longer appear in-app or delete tabs/categories, simply drag and drop them into the section marked "Removed Items".

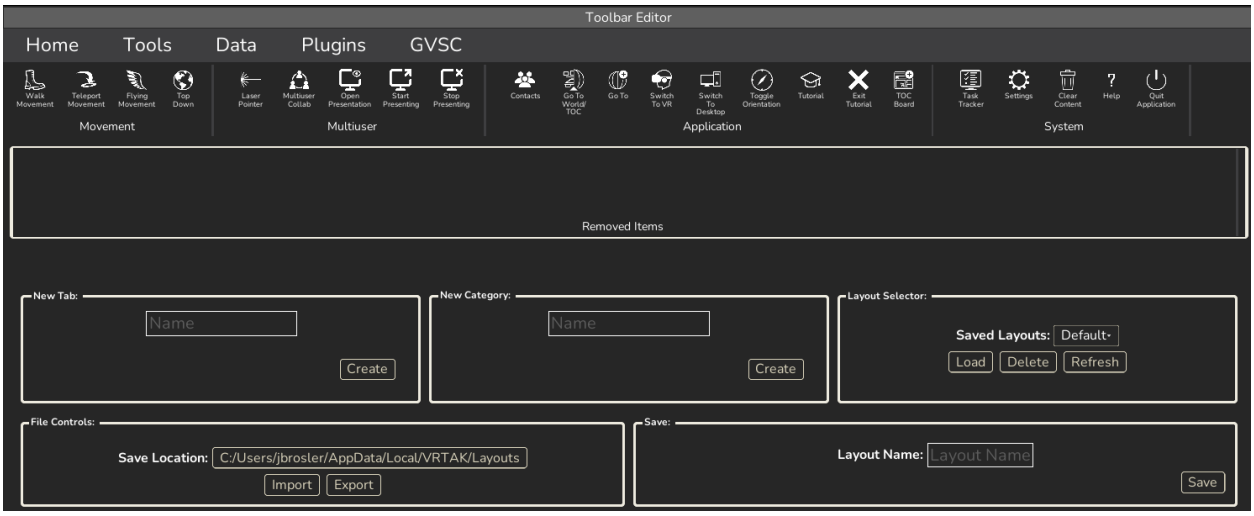


FIGURE 63. TOOLBAR EDITOR

The Layout Selector section allows you to change what layout you're editing or delete saved layouts. The file controls section can copy layout files to or from other folders on your computer to make it easier to share layouts with others. To rename an existing tab or category, double-click it and fill out the pop-up that appears.

There are a few restrictions to make sure everything works as intended:

- Default is a reserved name for layouts. It cannot be deleted or saved to. However, you can save it under a different name to use it as a baseline for editing.
- Tab names must be unique (case insensitive)
- Category names must be unique within their respective tab (case insensitive)
- The "Settings" button must be accessible somewhere on the toolbar, otherwise the layout cannot be saved.

4.8.10 Advanced Settings

Contains advanced streaming settings for Terrain Tiles and Models. Terrain tiles and models are made up of multiple components. Each component has a certain number of triangles.

1) Cache Management: The location that VR-TAK stores data on a user's computer. The web cache is for data from the TOC boards while the object cache relates to most other in app objects. Clearing these caches removes content and hard resets the app to its original state, which can sometimes help stop crashes.

2) Triangles Per Component: More triangles per component can reduce the time to render a full mesh but can increase time to create collision for a component.

2) Seconds Between Component Create: Reducing the time between component creation reduces the time to render a full mesh but can cause framerate drops.

3) Max Vertices Per Component: Increasing number of vertices per component reduces time to render a full mesh but can increase the time to create collision for each component.

4) Texture Render Distance: the distance between user and model when textures are unloaded for a component of the model.

5) Immediately Destroy Components: Destroying components conserves RAM but is less visually pleasing when rebuilding models after a user's location changes.

4.8.11 Support

1) Information: Links to an online source to get more information on VR-TAK and other TAK applications.
2) Documentation: Links to this User Manual.
3) Logging Preferences: When "Collect Metrics" is toggled on, VR-TAK will automatically collect data. If this option is not toggled on, crash logs will still be generated, but will only be saved locally.

4.8.12 About

Displays information about the current VR-TAK version.

4.9 Enter TOC / Enter World

A user may exit the virtual environment and return to the virtual Tactical Operations Center (TOC) by using the "Enter TOC" button on the toolbar.

This button is always visible unless the user is already in the virtual TOC.

While in the virtual TOC, users can go to the location currently shown on the table by clicking the "Enter World" button on the toolbar.

While in the world in top-down mode using mouse and keyboard:

- [W] moves the user north
- [S] moves the user south
- [A] moves the user west
- [D] moves the user east
- [Q] zooms the user in
- [E] zooms the user out
- [Mouse Wheel] zooms the user in and out
- [Control] + [Left Mouse] pans the globe

While in the world in first person mode using mouse and keyboard:

- [W] move the user forward
- [S] moves the user backward
- [A] moves the user left
- [D] move the user right
- [Q] moves the user towards the ground
- [E] moves the user away from the ground

While in the world in top-down mode in VR:

- [Movement] zooms the user's camera in and out
- [Grip] + [Trigger] pans the globe

While in the world in first person mode in VR:

- [Movement] moves the user relative to the VR controller

4.10 VR-TAK Tools

Tools allow you to mark up the terrain in VR-TAK. In Desktop Mode, one tool may be selected at a time. In VR Mode, one tool may be held in each controller. To deselect a tool, click on the tool's button on the toolbar.

Every tool allows you to point at items (such as points, vehicles, Range & Bearings) and select them. When you select something with any tool, that item's context menu will be displayed and will allow you to perform actions depending on what item you have selected.

FIGURE 64. CONTEXT OPTIONS SHOWN FOR A 2525 POINT. OPTIONS ARE TO (CLOCKWISE) DELETE, SEND, SHOW DETAILS, CHANGE TYPE, PLACE SPI, AND TRANSLATE (MOVE)

If you point at an item that can be dragged and then hold down the select/use button, you will grab that item, allowing you to drag it to another location.

If you press the Select/Use button while aiming at terrain, the tool will activate, and perform a specified action dependent on the tool selected. The below subsections describe the usage of various tools.

4.10.1 Laser Pointer

The default tool in VR-TAK is the Laser Pointer, which does not place anything on the terrain.

When activated, it displays a beam of your player color that other Collaboration Group Members can see. For more info on Collaboration Groups, see the Multi-User Collaboration section.

4.10.2 Mark (a.k.a. Red-X)

The Mark Tool allows a user to quickly determine the location (MGRS or Lat/Lon) and range, bearing, and elevation relative to the user's position. The Red-X also shows the source DTED level if applicable.

1) Select the Mark tool from the Main Menu.
2) Click and hold to move the red X.

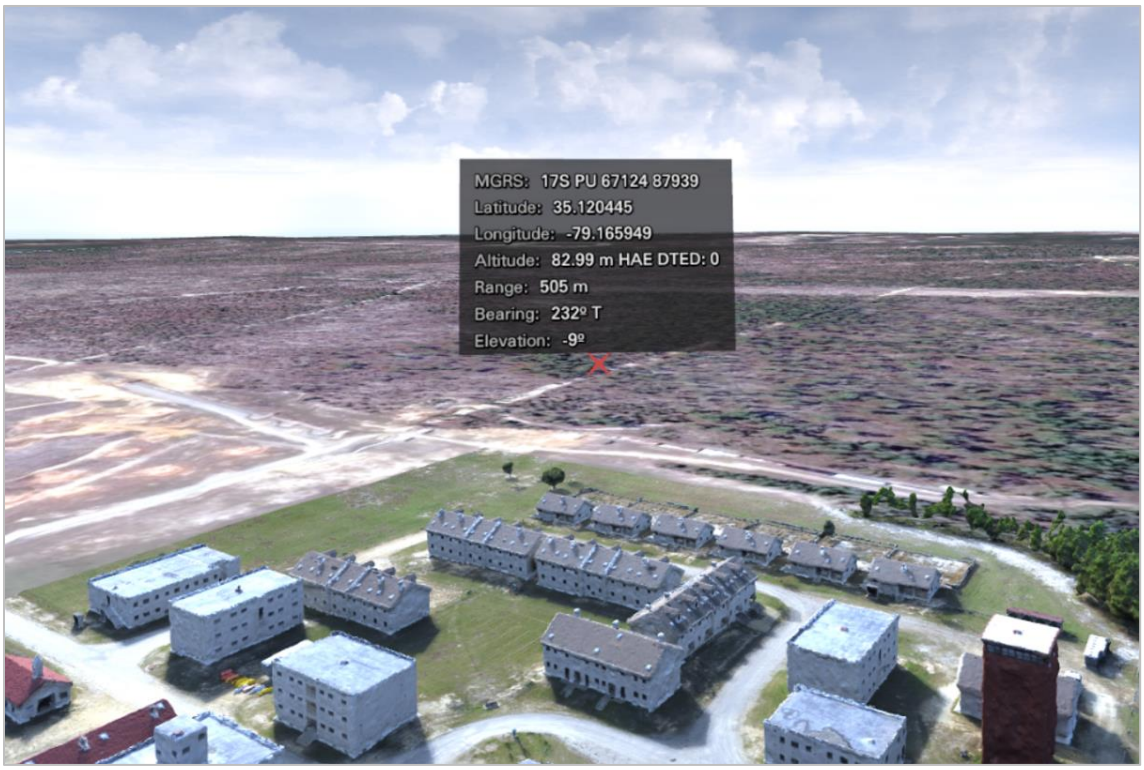


FIGURE 65. VR-TAK MARK (RED-X) TOOL

Clicking on the red X will open a context menu with options as shown below. From top, going clockwise, the options are: Delete and Teleport To.

- The Teleport To option allows the user to instantly move to the red X's current location.

FIGURE 66. CONTEXT MENU FOR RED X

4.10.3 Bloodhound

The Bloodhound tool will provide a range and bearing as well as an Intercept time for two items.

1) Select the Bloodhound tool from the Main Menu and select a FROM and TO item, then select OK.

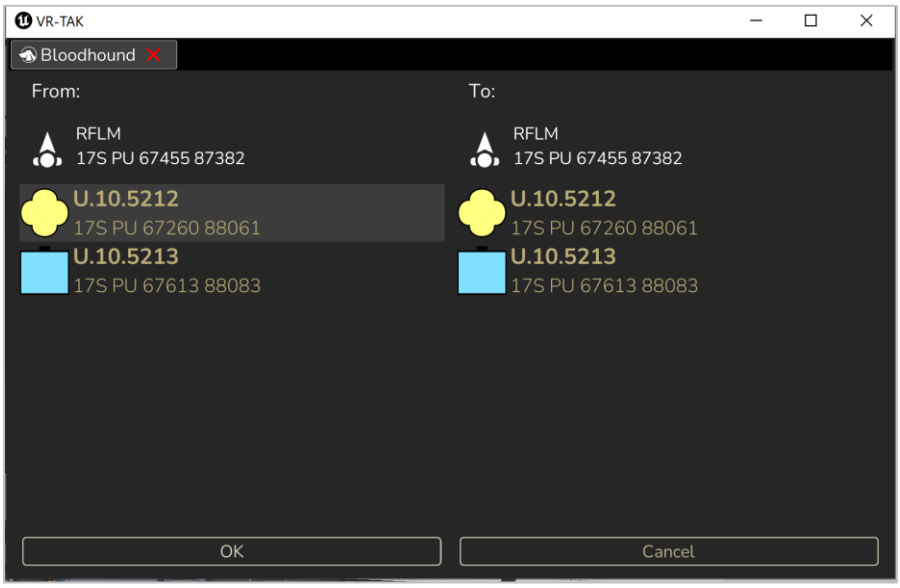


FIGURE 67. BLOODHOUND (FROM AND TO)

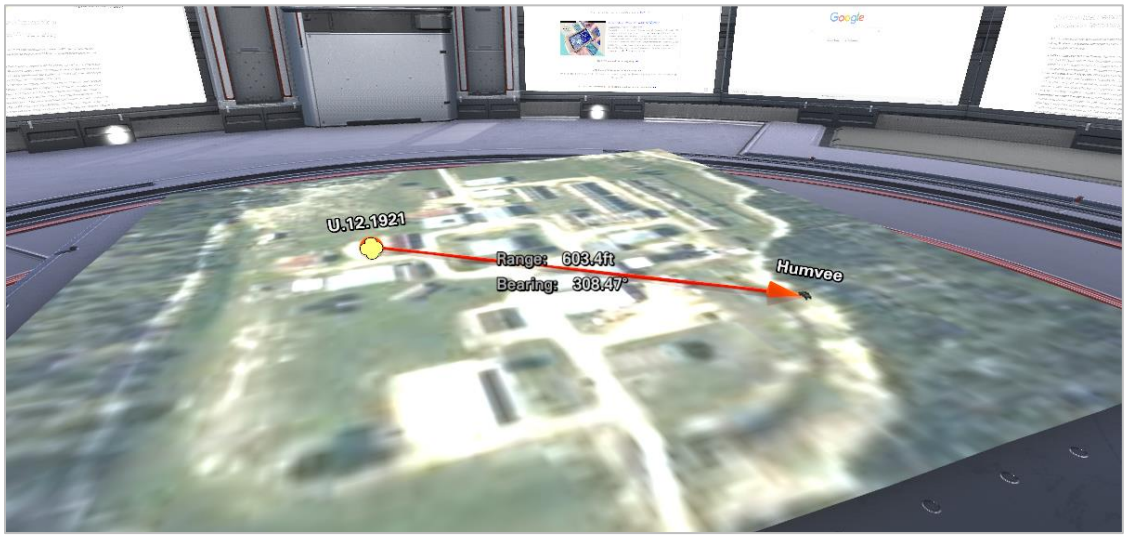
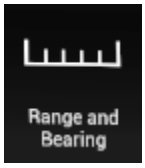


FIGURE 68. BLOODHOUND (CHASER LINE)

Since bloodhounds are dependent on two other items, the bloodhound will page in when both items are present, and page out when either one is not present. If either item is deleted permanently, the bloodhound will be deleted permanently as well. Bloodhounds pointing to a player will never be displayed in TOC.



4.10.4 Range & Bearing

The Range & Bearing Tool allows for measuring the range and bearing between any two points. For example, this tool can measure the height of buildings or the dimensions of a landing zone. Follow these steps to create a Range & Bearing.

1) Select the Range & Bearing tool from the toolbar.
   a. Optionally, users can set the color of subsequent drawings by using the dropdown on the Range & Bearing button on the toolbar.
   b. The color chosen will be applied to subsequent drawings until the user selects a new tool.
2) Point and click to create a start point, then continue holding and drag to the end point. After initial placement, the end point can be adjusted by selecting and dragging it.

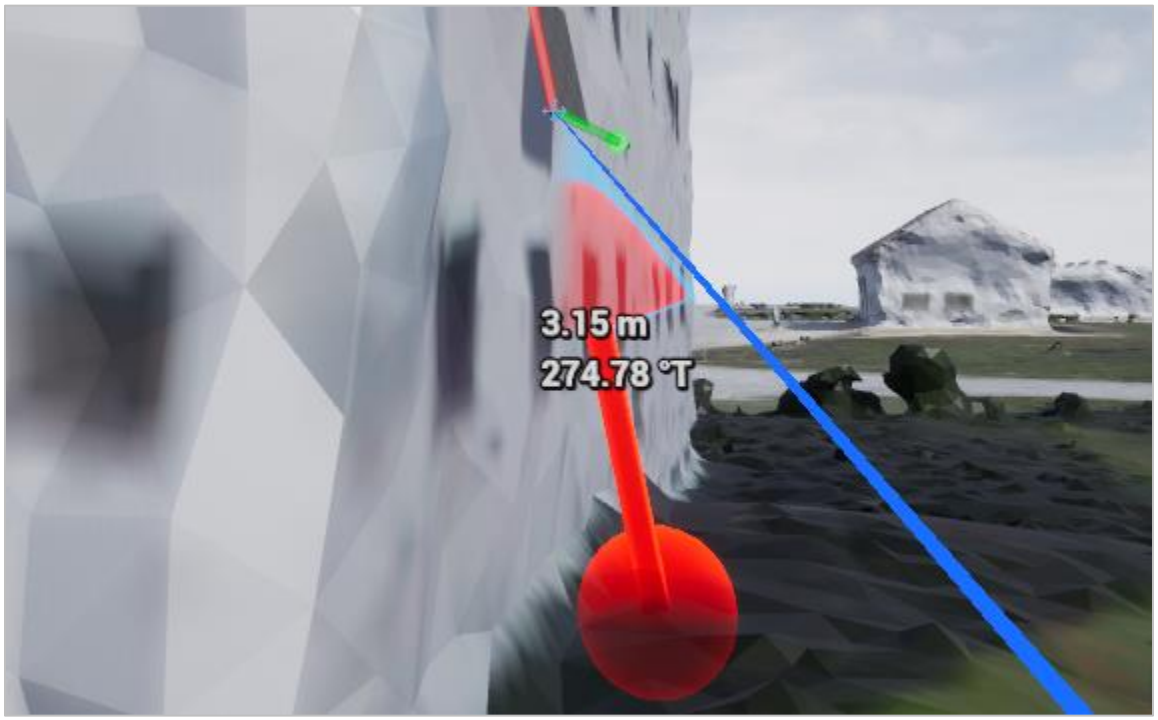


FIGURE 69. RANGE & BEARING

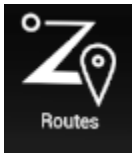
The units displayed on a Range & Bearing can be changed in the Unit Display Formats settings menu.

Selecting a Range & Bearing point will open a context menu with the following options, from top and going clockwise: Delete, Change Color, Send, Get Point Details, and Translate.

Selecting the Range & Bearing line will open a context menu with the following options, from top and going clockwise: Delete, Change Color, Send, and Get Range & Bearing Details.

NOTE: Where applicable, the details pane for a point will differ from the details pane for a line. The line detail pane will provide info for the whole entity, while the point detail pane will provide info for that edit point only.

FIGURE 70. RANGE & BEARING CONTEXT MENUS FOR POINTS (LEFT) AND FOR LINES (RIGHT)



4.10.5 Routes

The Route tool allows users to create and modify routes. Routes can be created in VR-TAK or received from other TAK applications. Follow these steps to create a route:

1) Select the Routes Tool from the Toolbar menu.
   a. Optionally, users can set the color of subsequent drawings by using the dropdown on the Routes button on the toolbar.
   b. The color chosen will be applied to subsequent drawings until the user selects a new tool.
2) Click a start point for the route.

FIGURE 71. ROUTES (START POINT)

3) Continue clicking points on the route to the desired end point.

FIGURE 72. ROUTES (DRAW OUT THE ROUTE)

4) Once all checkpoints are set and the route is adjusted properly, select the route and then through the context options, the Finish Edit option.

FIGURE 73. COMPLETED ROUTE

- Select a point along the route to open a context menu with the following options, from top and going clockwise: Delete, Finish Edit/Begin Edit, Insert Route Point at Position, Get Point Details, and Manipulate.
- Select a line along the route to open a context menu with the following options, from top and going clockwise: Change Color, Delete Route, Finish Edit/Begin Edit, Send, and Get Route Details.
- The Finish Edit context option will hide any non-checkpoint points and prevent any further continuation of the route until edit mode is reentered again.
- To reenter edit mode, either click on the route checkpoint or line, and through the opened context menu, select Edit.

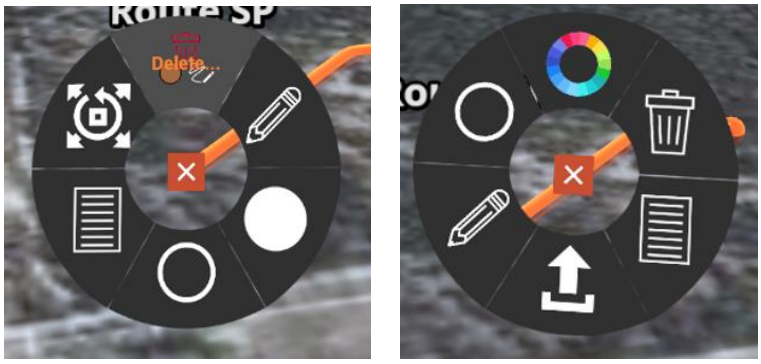


FIGURE 74. CLOSE UP OF ROUTES CONTEXT MENU, FOR POINTS (LEFT) AND FOR LINES (RIGHT)

4.10.6 Line of Sight

The Line of Sight (LOS) Tool allows a user to quickly determine if there is a clear line of sight between one point and many other points. This can be useful for planning hasty sniper position or LOS communications links. Follow these steps to create a LOS:

1) Select the Line of Sight tool from the Toolbar menu.
2) Click on a location to place a “sniper” model.

FIGURE 75. LINE OF SIGHT TOOL WITH SNIPER MODEL

3) Subsequent clicks place “viewpoints” linked to the sniper model previously placed.

FIGURE 76. LINE OF SIGHT TOOL AND ASSOCIATED VIEWPOINTS

> NOTE: A line is drawn between each viewpoint and the sniper. A green line indicates a clear line of sight between the two points. A red/orange line indicates that there is a line of sight blockage.

FIGURE 77. CONTEXT MENU FOR LINE OF SIGHT (LOS)

Selecting the sniper will provide options as shown in the figure above (from top, going clockwise) to Set Stance, Finish Editing, Delete, Get LOS Details, and Translate.

- Set stance allows users to change the sniper's model, opening a new context menu that provides options to set the sniper to be Prone, Standing, or Kneeling.
- Finish Editing will allow the user to stop placing further connected viewpoints and allow the placement of more snipers.

After placing the sniper model, click the dropdown arrow at the bottom of the button on the toolbar to access further options:

- Place a viewpoint at the user's current location, associated with the last placed sniper model.
- Delete all placed sniper models and associated viewpoints.

4.10.7 Point Dropper / Vehicle Dropper

The Point Dropper Tool allows for placing standard 2525B CoT markers. 3D scale vehicle models can be placed in the virtual environment with the Vehicle Dropper tool. The CoT markers and vehicles can be sent to other TAK devices. Follow these steps to drop points:

1) Select the Point Dropper Tool or the Vehicle Dropper tool from the Toolbar.
2) Optionally, click the dropdown on the Point Dropper Tool or the Vehicle Dropper Tool to assign a point type or a vehicle model type. Subsequent placements will use the selected icon or model for as long as the tool is selected. To reset it, simply select another tool.

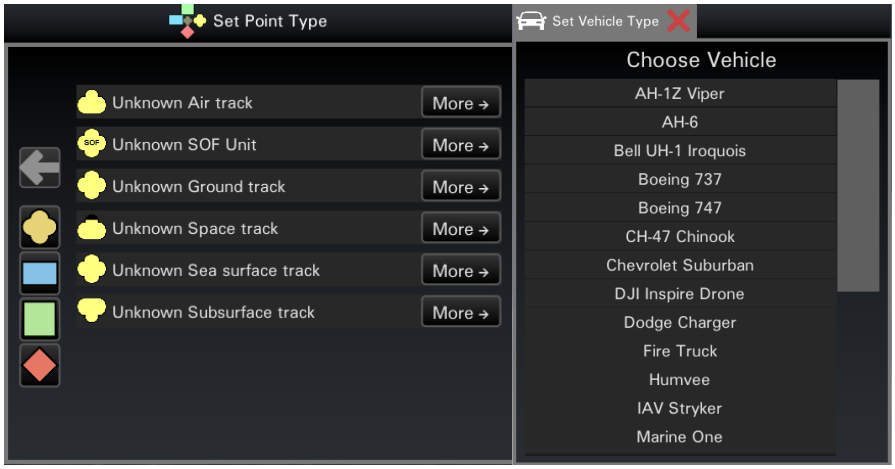


FIGURE 78. POINT DROPPER AND VEHICLE SELECTION MENU

> NOTE: Set Default Type currently only applies to 2525B markers and allows users to set the 2525B type of marker (e.g., friendly, hostile) to drop by default. For vehicles, Assign Vehicle operates in a similar fashion.

3) Select a location to drop a point and click to place the marker or 3D model.

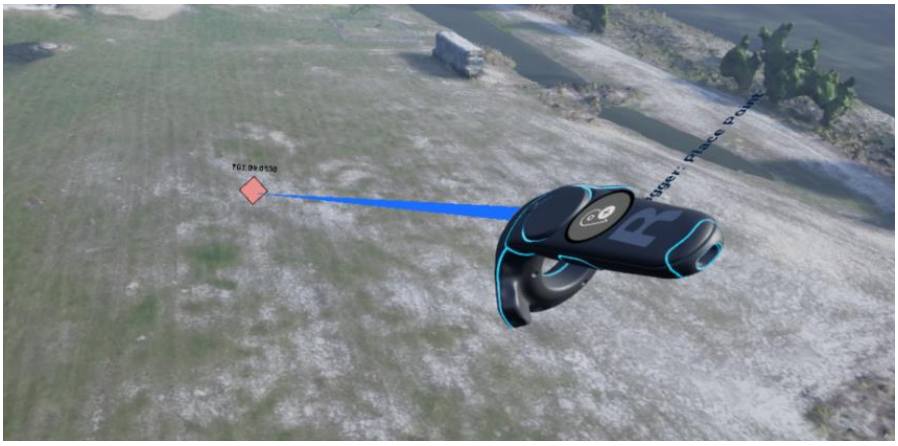


FIGURE 79. POINT DROPPER

4) The point/vehicle can be moved by selecting and holding the controller trigger or mouse button and dragging the point/vehicle to a new location.

5) Select the point or vehicle to access the context menu.

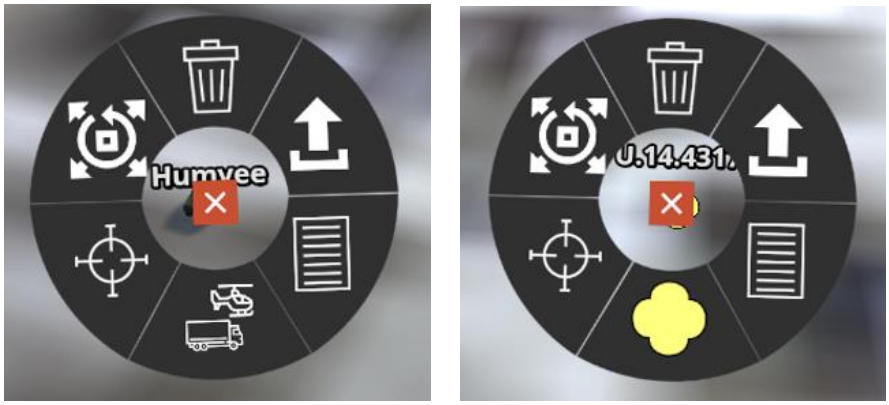


FIGURE 80. MARKER OPTIONS FOR VEHICLES (LEFT) AND FOR 2525B POINTS (RIGHT)

- In the figure above, from top and moving clockwise, the context options are Delete, Send, Get Details, Change Icon/Model, Place a SPI at Point Location, and Manipulate/Translate.

4.10.8 Orientation Display

The orientation display can be enabled for a quick summary of your position.

It can be toggled using the C key (for “Compass”), or by using a button on the toolbar.

It includes the user’s bearing, cardinal direction, and pitch while the user is in the VTOC. If the user is in the virtual world, it will also display Altitude and the distance from the center of the screen until the nearest terrain/object.

In VR, the orientation display is attached to the right-handed VR controller, and all information displayed is relative to the controller’s current position. As a result, location and altitude shown may be different than what is shown on the toolbar.

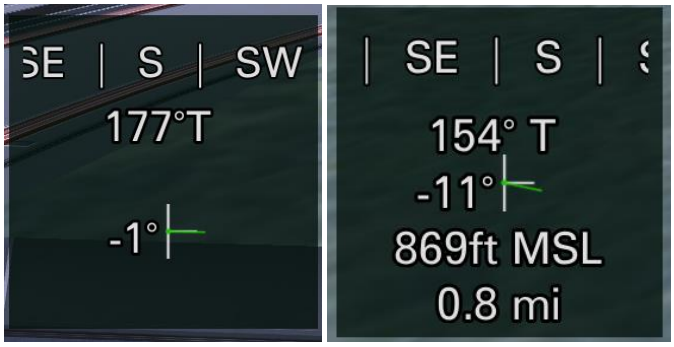


FIGURE 81. THE ORIENTATION DISPLAY, SHOWN IN TOC AND IN WORLD.

4.10.9 Transform Tools

Several tools are included to assist in the repositioning of vehicles, points, and other objects. To access these tools, perform the following steps:

1) Click on an existing object in the scene. From the ensuing radial menu, select the Manipulate option. Some entities may only have the Translate context option.
2) From the radial menu that follows, select the Translate or Rotate option.
3) To translate, click and drag the arrows to move the object along individual axes, or click and drag the squares to move the object freely in the horizontal and vertical planes.
    a. Note that some entities may have restricted movement along certain axes.
4) To rotate, click and drag on the rings to rotate the object around individual axes.

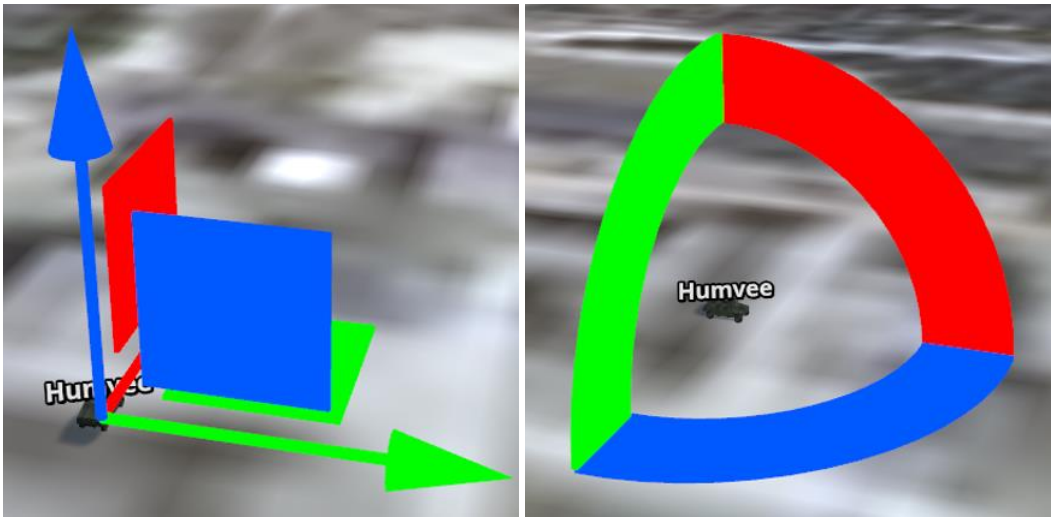
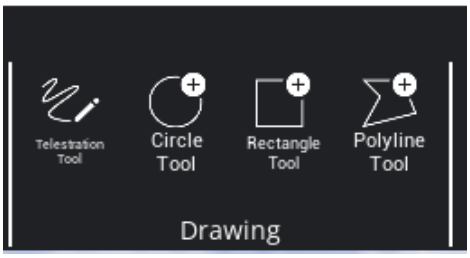


FIGURE 82. THE TRANSLATION AND ROTATION TOOLS



4.10.10 Drawing Tools

4.10.10.1 Telestration

The Telestration Drawing Tool is a free drawing tool for any purpose.

1) Select the "Telestration" option from the dropdown.
2) Click and drag to add points to an individual line. Repeat this process any number of times to draw multiple lines for a single object.

FIGURE 83. TWO TELESTRATION DRAWINGS BELONGING TO THE SAME OBJECT

3) When done, click on any of the object's lines and select the Finish Edit option.
4) Select the drawing to open a context menu. The options as shown in the figure, from top going clockwise, are as follows: Finish Edit/Begin Edit, Delete Object, Change Color, and Send.

- Of note, the Delete context option will delete all lines associated with a particular elastration object, regardless of whether they are physically connected.

FIGURE 84. CONTEXT MENU FOR TELESTRATION

4.10.10.2 Circle

The Circle Drawing Tool creates one or more concentric rings with a defined radius.

1) Select the "Circle" option from the dropdown.

2) Click your preferred location for the center point and drag out the desired radius.

FIGURE 85. A CIRCLE IN THE MIDST OF BEING DRAWN

3) From the circle details pane, users can:

   a. Adjust the radius more accurately.
   b. Set the number of concentric rings.
   c. Add a height and generate 3D cylinders.

FIGURE 86. A CIRCLE WITH A CYLINDRICAL HEIGHT ADDED VIA THE DETAILS MENU

Selecting the circle's center point will open a context menu with options as depicted below, from top going clockwise: Get Circle Details, Set Color, Send, Delete Circle, and Translate.

Selecting the circle's concentric rings will open a context menu with options as depicted below, from top going clockwise: Get Circle Details, Set Color, Send, Delete Circle.

- Note that deleting the circle will delete all entities associated with that circle, including the center edit point and all connected concentric rings.
- Set Color will also change the color of all connected concentric rings, even if only one ring was selected.
- In the case of the center edit point, the Details context option for the center point will show the details pane for the circle, and not the point.

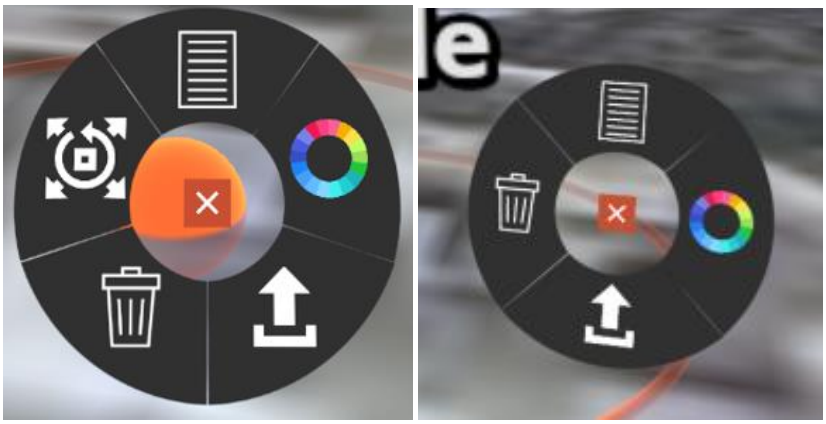
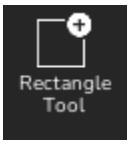


FIGURE 87. CONTEXT MENU FOR CIRCLE CENTER POINT (LEFT) AND CIRCLE LINE (RIGHT)



4.10.10.3 Rectangle

The Rectangle drawing tool creates a rectangle by defining two opposite corners.

1) Select the "Rectangle" option from the dropdown.
2) Click your preferred location for your starting corner, and then drag to the desired location of the opposite corner. All rectangles created in this way will be aligned to latitude and longitude lines.

FIGURE 88. A RECTANGLE BEING DRAGGED DURING CREATION

3) To further refine the rectangle, drag any of its points to a new desired location, and its neighboring points will update accordingly. When done, select the Finish Edit context option on either the rectangles' lines or points, and the edit points, excluding the center point, will be hidden.
4) From the rectangle details pane, users can:
   a. Change height of rectangle and generate 3D rectangular prisms.

FIGURE 89. A RECTANGLE WITH HEIGHT

Clicking on the rectangles' lines or points will open their context menus.

For rectangle points, the context menu will have options as depicted below, from top going clockwise: Finish Edit/Begin Edit, Get Point Details, Change Color, Send, Delete Rectangle, Translate.

- In the case of the center edit point, the Details context option for the center point will show the details pane for the rectangle, and not the point.

For rectangle lines, the context menu will have options as depicted below, from top going clockwise: Finish Edit/Begin Edit, Get Rectangle Details, Change Color, Send, Delete Rectangle.

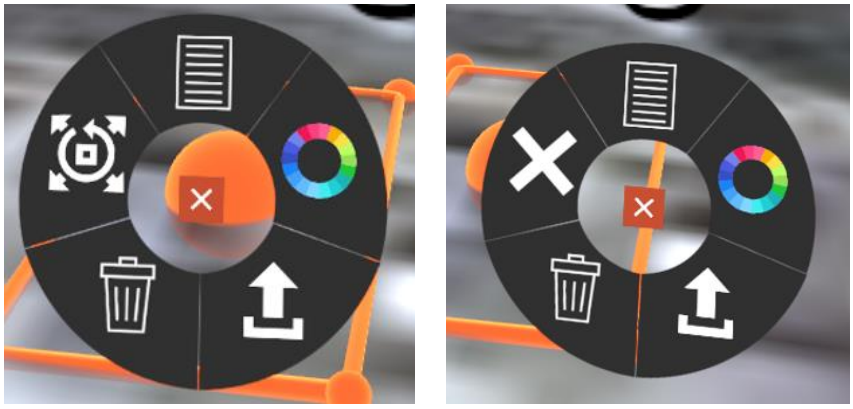


FIGURE 90. CONTEXT MENUS FOR RECTANGLE POINTS (LEFT) AND RECTANGLE LINES (RIGHT)

4.10.10.4 Polyline

The polyline creates straight lines between defined points. It does not create closed polygons.

1) Select the "Polyline" option from the dropdown.
2) Click once to establish the base point, then click any number of additional times to create lines extending from the previous end point to a new point generated at the cursor.

FIGURE 91. A POLYLINE

3) When done, click on any of the object's points or lines and select Finish Edit from the context menu.
4) To create additional points, select the Edit context menu option. The first new line will be made from the last created edit point.

The context menu, for a polyline line segment, includes options as seen in the figure below; clockwise from the top: Finish/Begin Edit, Delete Polyline, Change Color, Send, and Get Polyline Details.

The context menu for a polyline points includes options as seen in the figure, clockwise from the top: Finish/Begin Edit, Delete Polyline, Send, Insert Point at Position, Get Point Details, and Manipulate.

FIGURE 92. CONTEXT MENU FOR POLYLINE LINES (LEFT) AND POINTS (RIGHT)

4.10.11 SPI Dropper

The Strategic Point of Interest (SPI) dropper allows users to designate a point of interest in an extremely visible manner. SPIs are displayed as pulsing points with beams of light that project into the air above them, making them visible to other users even from far away.

FIGURE 93. TWO SPIS BEING USED TO DESIGNATE LOCATIONS

SPIs will display the callsign of the user that created them, as well as an index to differentiate between SPIs from the same user.

SPIs are especially useful when used in a Multi-User Collaboration (MUC) session with a large number of users. Each user can drop up to three SPIs.

4.10.12 Lasso

The Lasso allows selection of multiple entities via a drawn shape. Selected entities are shown in the Selection List UI.

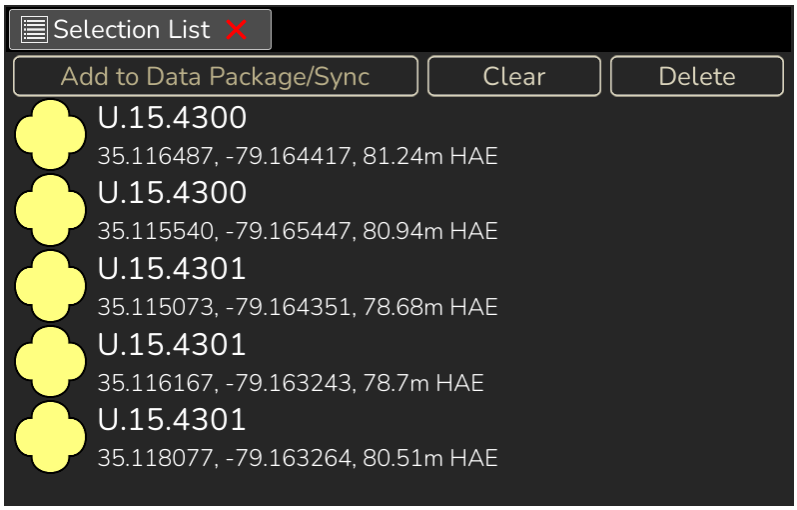


FIGURE 94. SELECTION LIST

4.11 VR-TAK Menus

There are many menus built in to VR-TAK, Accessible through the Menus tab under “Core” on the Toolbar.

Plugin Menus will show up under “Plugins” or under the tab for that specific plugin.

See Working with Menus for basic information on interacting with menus.

4.11.1 Data Package

Imported and received data packages showin the Data Package menu. This menu is accessed by clicking the Data Package button in the toolbar.

From the Data Package menu, users can:

1) Download data packages from connected TAK servers.
2) Add a new local data package.
3) See existing local data packages and their content.
4) Add content to local data packages.
5) Delete content from local data packages.
6) Delete local data packages.
7) Send local data packages to a TAK server or contact.

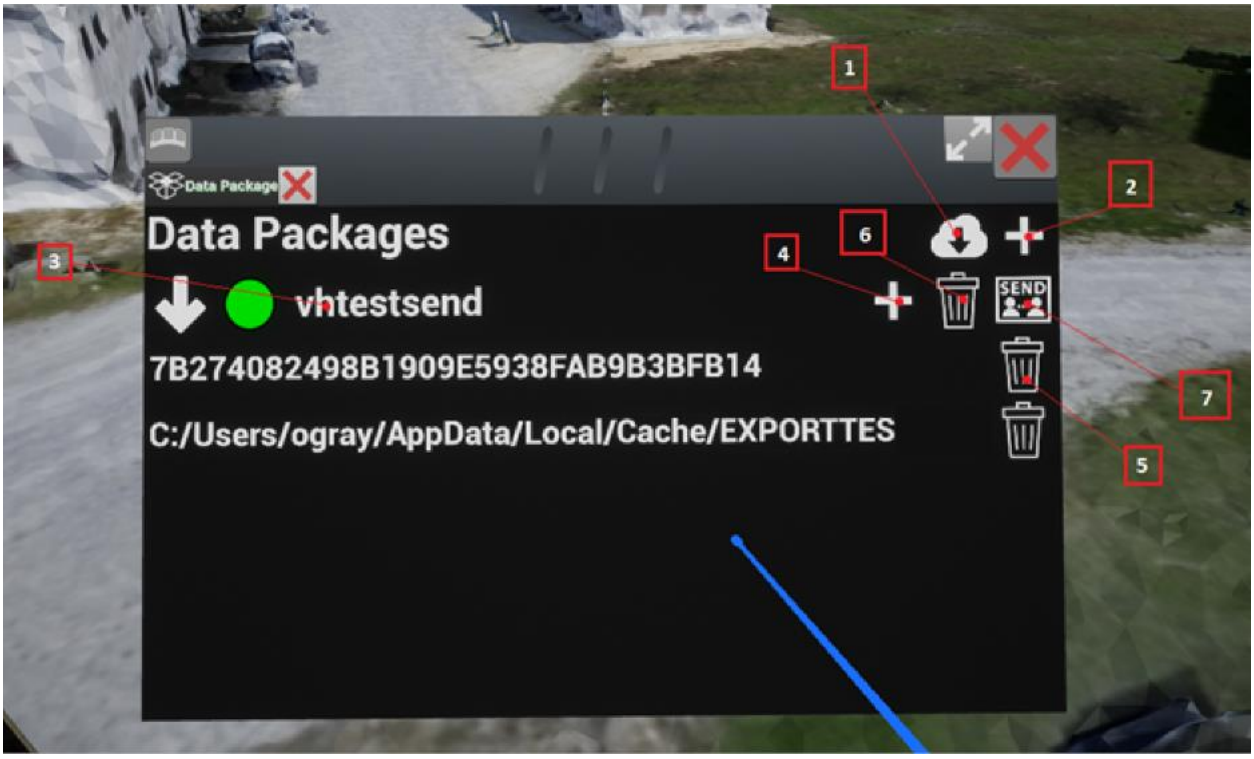
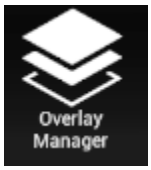


FIGURE 95. DATA PACKAGE MENU

Each local data package has a red or green circle. If the circle is red, it either means the contents of the data package have not been registered with the application or the contents have been registered but are hidden. If the circle is green, it means the contents of the data package are both registered and not hidden.



4.11.2 Overlay Manager

The Overlay Manager shows all objects registered with the application. All objects in the Overlay Manager may not show in the virtual environment. The configured View Distance, the user's location, and an object's visibility determine when an object is shown in the virtual environment.

From the Overlay Manager, users can:

1) Make a particular object or all objects in a category visible or hidden.
2) View all registered objects organized by category.
3) Go to an object.
4) Open an object's detail panel, allowing many parameters specific to the object to be viewed or edited.
5) Unregister an object from the application (i.e., delete an object).
6) Open the selection list.

FIGURE 96. OVERLAY MANAGER

4.11.2.1 Selection List

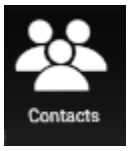
The selection list allows the selection of multiple objects at once so that the user can add multiple objects to a data package or delete multiple objects.

FIGURE 97. OVERLAY MANAGER WITH SELECTION LIST

While the selection list is open, the overlay manager's visibility toggle is replaced with a checkbox that allows the user to add any object or group of objects to the selection.

When "Selecting in World" is checked, any object under your beam when you pull the trigger will get added to the Selection List. Note that if the user attempts to use any drawing tool, Selecting in World mode will end. All items previously selected will remain in the Selection List.

To deselect an object and remove it from the Selection List, either uncheck the checkbox in the Overlay Manager or, if in Selecting in World mode, select the object again.



4.11.3 Contacts

The Contacts List is opened through the toolbar. It provides a list of known TAK contacts. In the above figure, there are four sections, one fixed to the top left corner of the window and three sections in each item entry. Going from left to right, the sections are:

1) Sorting Method: The method by which the contacts are sorted. Clicking it cycles between methods. Contacts can be sorted alphabetically, by proximity to you, their online status or by how many unread messages they have sent you on Geochat.
2) Callsign: Callsign of contact. List updates when it is opened.
3) Details Button: Open details menu for this contact.
4) Geochat Button: Opens Geochat with this contact.

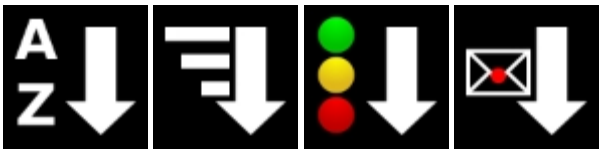
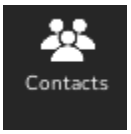


Figure 98. Sorting Methods. Left to right: alphabetic, proximity, online connection, unread messages



4.11.3.1 Geochat

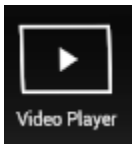
Pressing the Geochat button for a contact opens the Geochat window. Messages are shown in chronological order with oldest on top.

To begin typing a message, select the input box at the bottom of the window. The Virtual Keyboard will open. Pressing Enter will immediately send the current typed message.

FIGURE 99. GEOCHAT

4.11.4 Import Manager

See the Importing Files section for information about the Import Manager toolbar option.



4.11.5 Video Player

The Video Player provides the user the ability to stream local or networked video sources to the user in VR-TAK. The user can also pull all videos from any connected TAK servers. The user is also able to input a URL so they can add streams without the need for them to be on a given TAK server.

Videos are given basic video controls. The user can pause and play videos. The user can also play multiple videos by popping out the videos with the “pop-out button” in the top right corner.

AN OVERVIEW OF THE VIDEO PLAYER INTERFACE IS SHOWN BELOW:

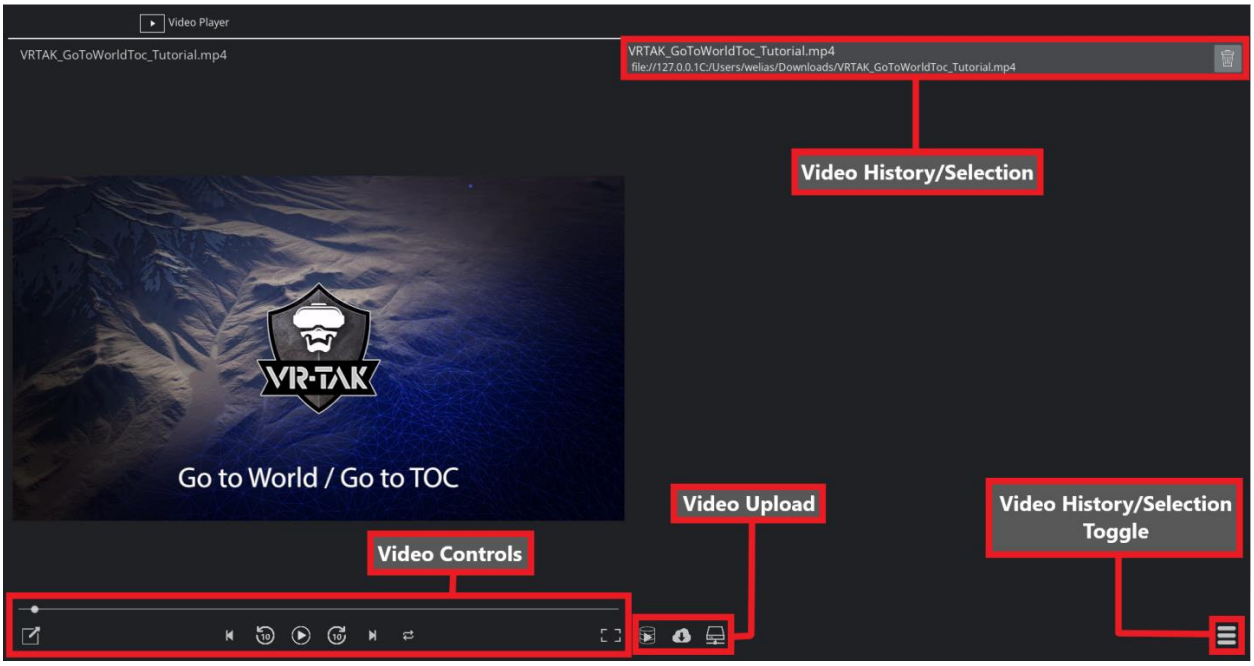


FIGURE 100. VIDEO PLAYER LABELED

a. Video Upload Buttons

- File Browser
  i. This feature will allow the user to search their computer directory to find compatible local videos to be played.
- Video Pulldown Button
  i. This will allow the user to pulldown all video URLs from all connected TAK servers. The video URLs will be placed in the **video history/selection menu** described below. The button will turn Yellow to indicate that it is currently creating a connection to the TAK server/s to pull down the URLs. The icon will turn Red to indicate that the user was unable to create a connection, mostly caused by not being connected to a TAK server.
- URL Entry
  i. Selecting this button will allow the user to enter custom URLs.

b. Video History/Selection

- When the user pulls down certain videos and selects the videos, enters videos from the **URL Entry** (described below), and selects videos from the **local file** browser, they will be added to the Video History/Selection menu.

c. Video Control Panel

- The video control panel provides functionality for pausing and unpausing videos, skipping forward and backwards ten seconds, cycling through videos in the video history, as well as setting the current video to loop.
- The menu also has a button at the very left of the control panel to allow the user to pop out a currently selected video into another window. This will allow the user to play multiple videos simultaneously. If there is currently no video playing or loaded, the user will be unable to pop-

out a video

d. Video Title
   - In the top left of the menu is the title of the video. It will be changed once the user selects a video. Videos will automatically be given a title if a TAK server does not provide a video title.

A basic overview and step-by-step process of how to use the Video Player will be described below.

1) Open the Video Player from the Main Menu.

FIGURE 101. VIDEO PLAYER

2) Select the **Videos Pulldown Button** to see a list of videos available on the TAK Server.

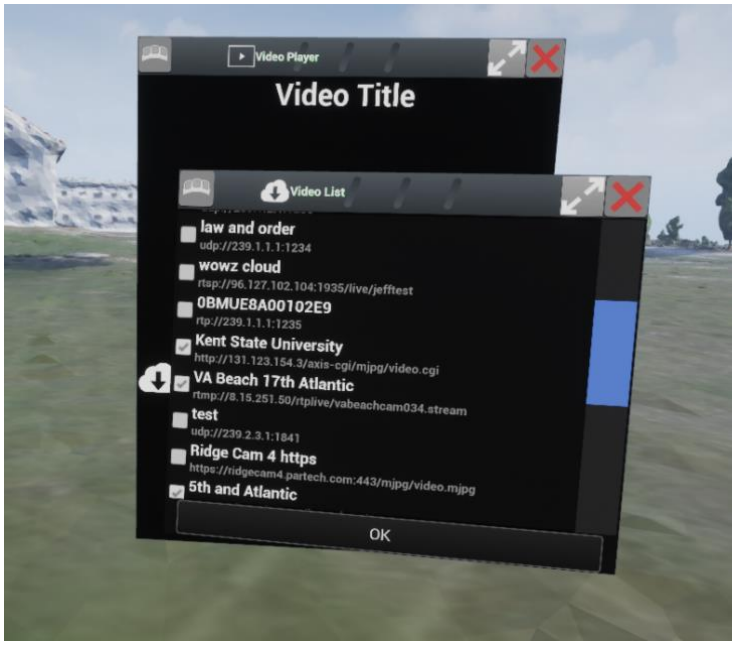


FIGURE 102. TAK SERVER VIDEOS

3) Select check boxes for each video to add to your **Video History/Selection Menu**.

FIGURE 103. LOCAL FILE BROWSER MENU

4) The user can also select a video from the **Local File Button.**

5) The user can also select a video from the **URL Entry Button.**

FIGURE 104. VIDEO PLAYER WITH PLAYLIST

6) After the user has selected a video from one of the choices above, the user can select a video from the **Video History/Selection Menu** to play the video.

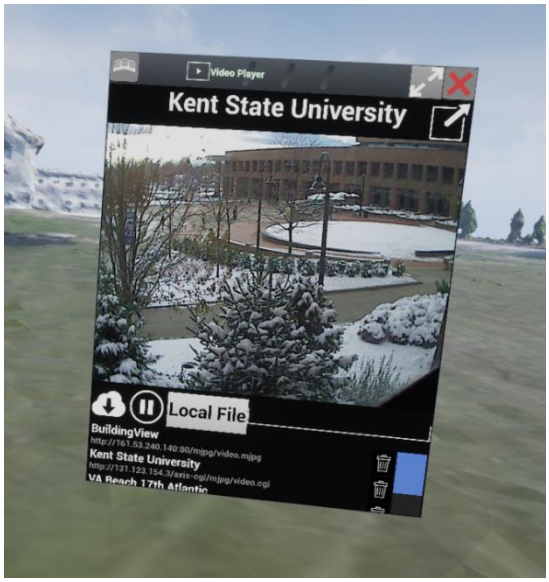
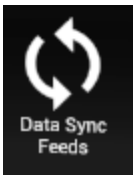


FIGURE 105. PLAYING A VIDEO

7) Selecting the pop-out button in the upper right corner will allow a user to open the video that is being played in another window allowing for multiple videos to be simultaneously played.

FIGURE 106. VIDEO IN NEW WINDOW



4.11.6 Data Sync

The Data Sync menu allows users to interact with data syncs. This menu is accessed by clicking the Data Sync toolbar button. Subscribed data syncs will stay up-to-date based on changes made to the data sync on its TAK server. Adding or removing content from a data sync will add or remove corresponding content on the TAK server. Note that modification of properties in an object added to a data sync (e.g. location of an added point) will not be reflected in the TAK server until the data sync is re-sent.

From the data sync menu, users can:

- View, filter, and sort data syncs hosted on connected TAK servers.
- Create a new data sync.
- Subscribe to a data sync.
- View details of a subscribed data sync.
- Delete a data sync (locally or from its TAK server).

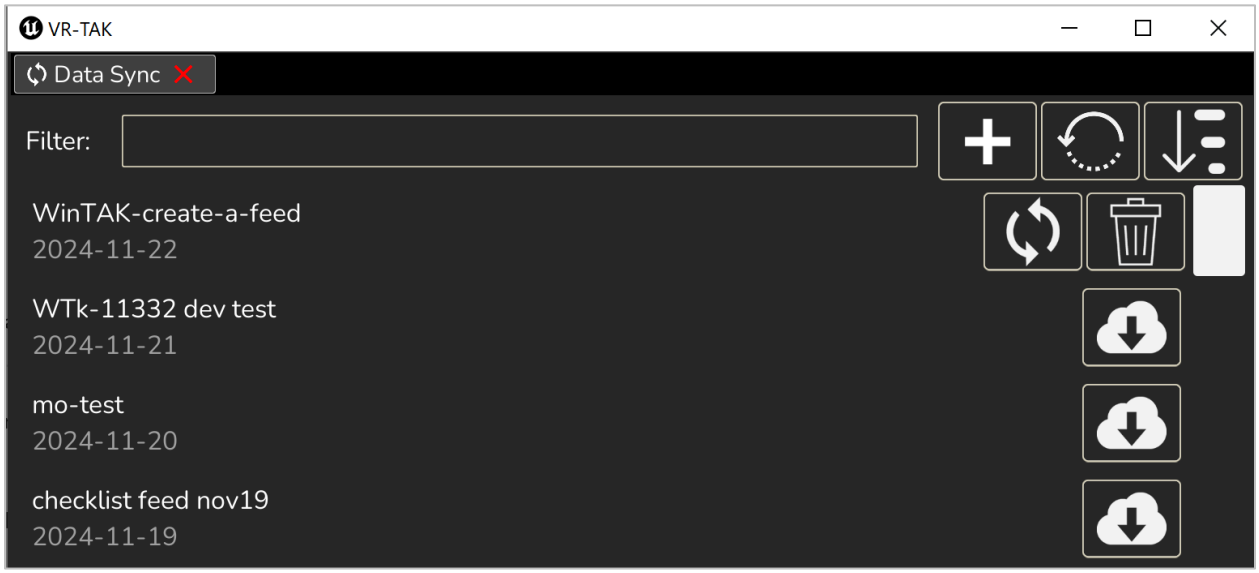


FIGURE 107. DATA SYNC MENU

From the data sync Details menu, users can:

- See map items, files and logs contained in the data sync.
- Add and remove content to the data sync.
- Export the data sync to a data package.
- Sync to all content of a data sync.

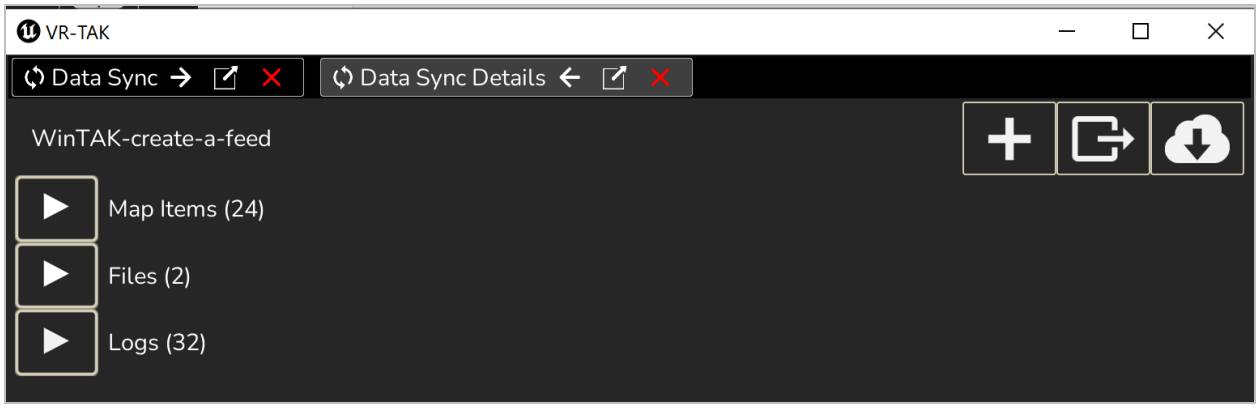


FIGURE 108. DATA SYNC DETAILS MENU

4.11.7 GoTo

GoTo allows a user to instantly move to a specified position in the world. If the user is in the VTOC, this will move the table to view the specified location, otherwise it will move the user to the location.

The method for specifying a location can be changed by pressing one of the buttons along the top of the menu. ADDR allows users to convert addresses to geodetic values.

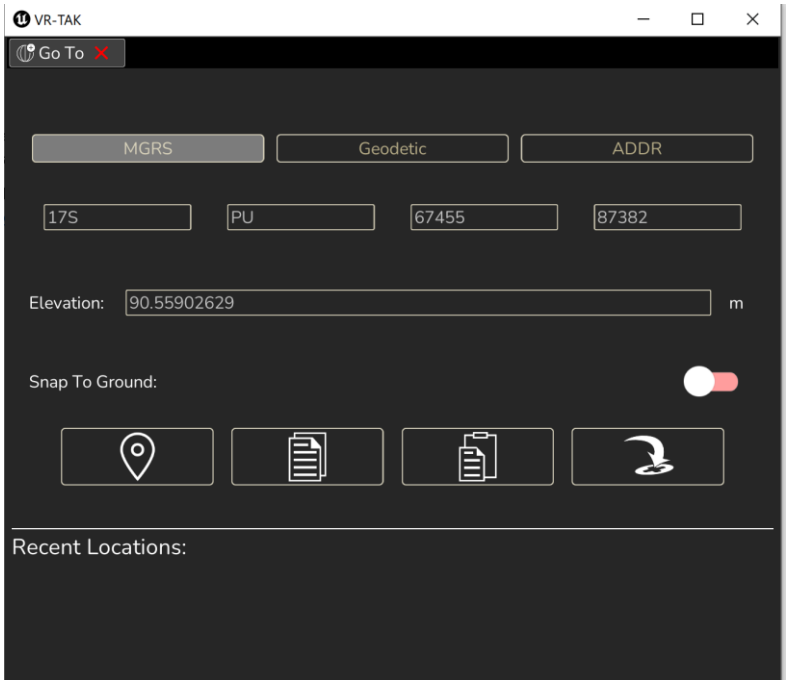
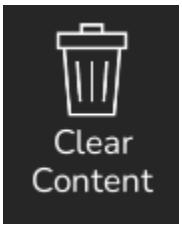
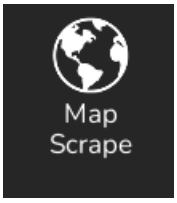


FIGURE 109. GO TO MENU



4.11.8 Clear Content

The Clear Content option unregisters all objects registered with the application.



4.11.9 Map Scrape

Map Scrape allows users to download and cache imagery for a specified area. The imagery source captured is the selected imagery source in the Terrain Sources UI.

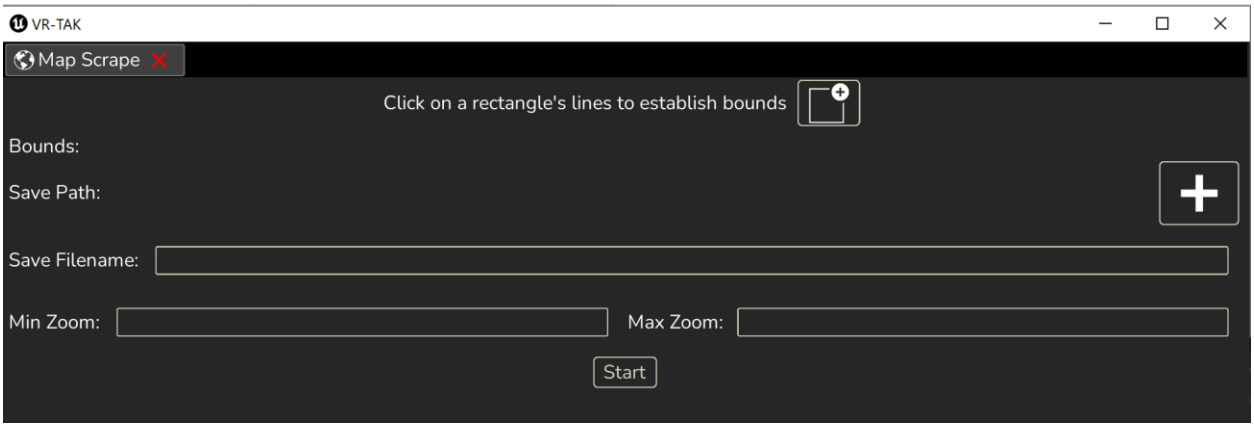


FIGURE 110. MAP SCRAPE

The rectangle button allows users to draw a rectangle or select and existing rectangle to be the boundary for caching. Save Path is the directory to create the imagery database. Filename is the name of the imagery database. Min Zoom and Max Zoom designate zoom levels to scrape.

4.11.10 Task Tracker

VR-TAK has a variety of processes that run in the background such as terrain streaming and model loading. The task tracker is used to show the status of these background tasks.

The Active Tasks button will show tasks that are currently running in the background. It lists the name of each task as well as the percentage of completion.

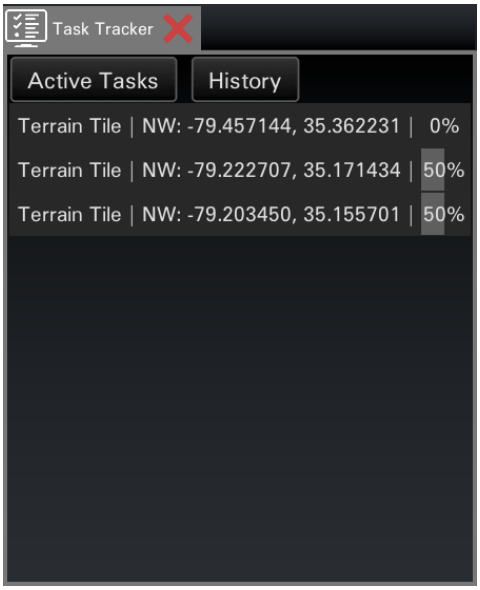


FIGURE 111. TASK TRACKER ACTIVE TASKS

The history tab shows a list of notable tasks that have recently been completed or cancelled. If a task failed, additional information may be displayed here.

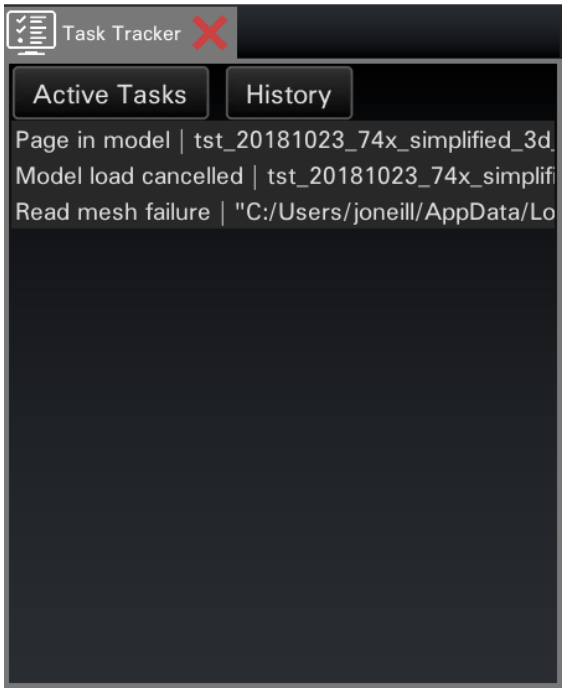


FIGURE 112. TASK TRACKER HISTORY

VR-TAK also features a loading indicator that displays when background tasks are taking place. This appears in the top right corner of the toolbar or in the top right corner of the screen if in desktop mode.

FIGURE 113. LOADING INDICATORS

4.11.11 Rubbersheet

Rubbersheet is accessed from the details pane of 3D models, indicated by a rolled sheet icon.

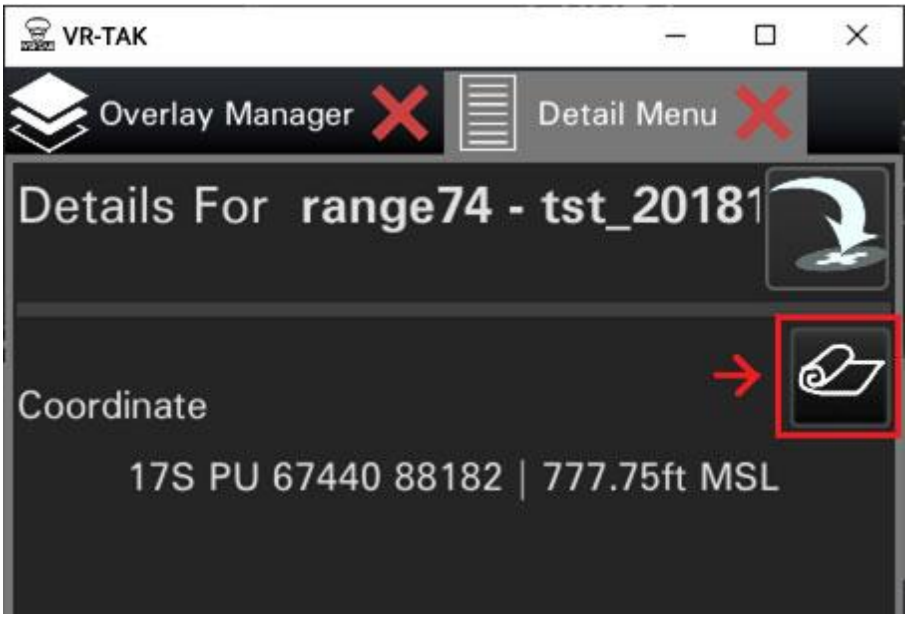


FIGURE 114. PRESS THE RUBBERSHEET ICON TO ACCESS THE RUBBERSHEET MENU

When the icon is pressed, a rubbersheet UI will appear around the 3D model with the same interface as the rectangle tool. As long as the rubbersheet window remains open, users can manipulate the rectangle's height, length and width, and rotation, which will all be saved for future sessions. To end manipulation, either close the rubbersheet window or use the "Finish Edit" context option from any of the rubbersheet rectangle's lines or points.

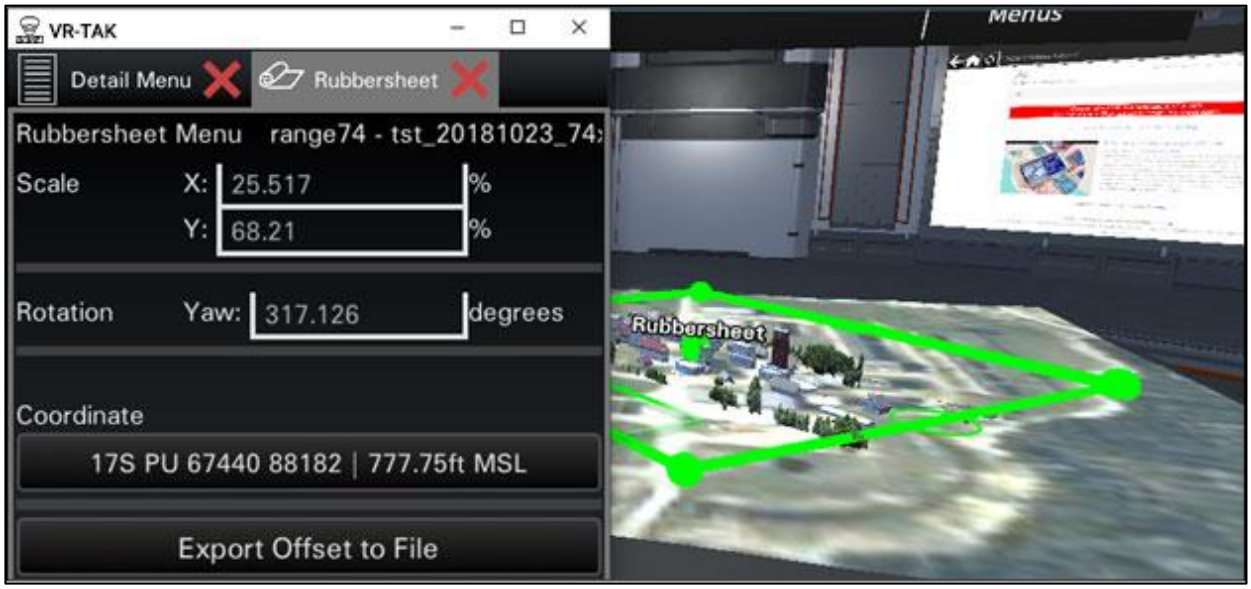


FIGURE 115. RUBBERSHEET MENU IN ACTION

Users can also modify the rubbersheet from the rubbersheet menu. Changing the scale, rotation, or coordinate location will save these characteristics with the model.

The Export Offset to File button can be used to generate .prj and .xyz files, allowing the 3D model's position in the world to be saved in a format readable by other applications. After clicking the button, enter a filename and a path on disk. A .zip file will be created at that location with the model, along with the new .prj and .xyz files.

4.11.12 Web Browser

VR-TAK comes with an integrated web browser, based on Chromium. It is suitable for viewing and interacting with basic web pages. It can be opened through the Web (Chromium) Icon on the Toolbar Menu.

There are buttons at the top to return to the previous web page, return to Home Page, and Reload the web page. A URL can be typed into the text entry box at the top of the menu.

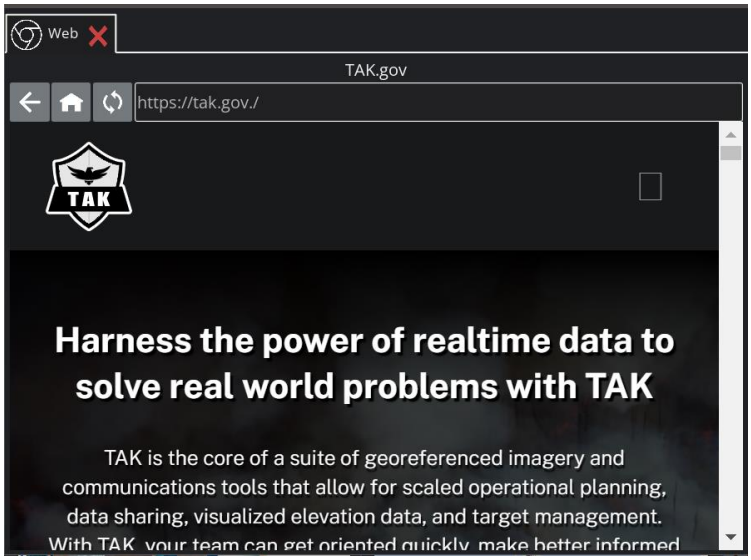
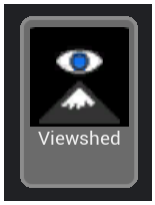


FIGURE 116. WEB BROWSER MENU

VR: Clicking on a text input box will open the VR Keyboard for typing. Once entered, text will be submitted automatically.

While interacting with the web browser, movement inputs may stop working. This is not an error; this happens because key presses are being routed to the web browser. This allows the user to type in the web browser and scroll up and down the page using the keyboard. Click on an area outside of the web browser (in the VR-TAK 3D world) to release inputs from the web browser and restore regular control of VR-TAK.

There are six TOC Screens around the room in the Virtual TOC which can be configured to show different web pages.



4.11.13 Viewshed

The Viewshed button on the toolbar opens a Viewshed UI that allows users to generate a viewshed based on different parameters. The viewshed is visual representation of line of sight from a given location. Green dots indicate clear LOS, red dots indicate blocked LOS.

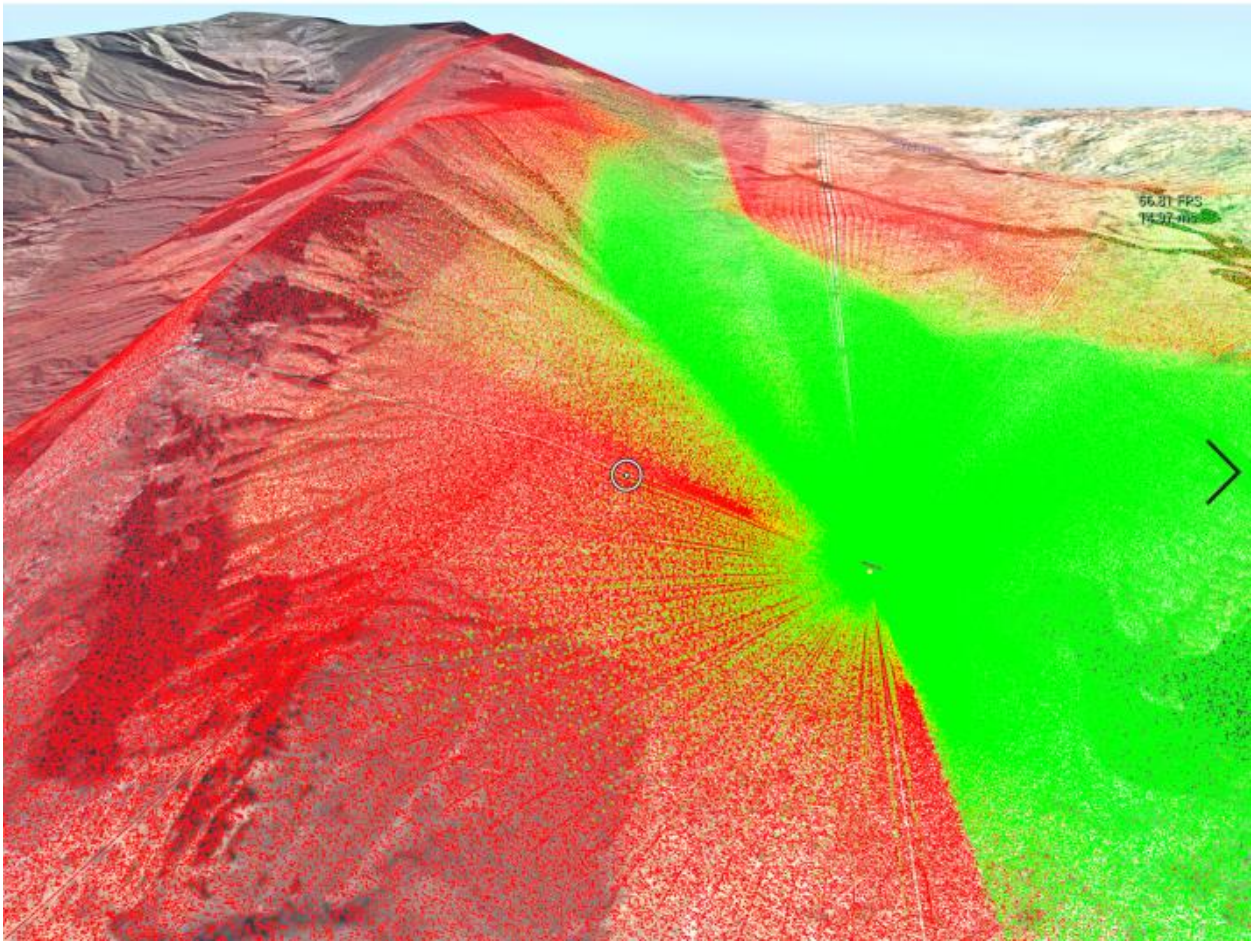
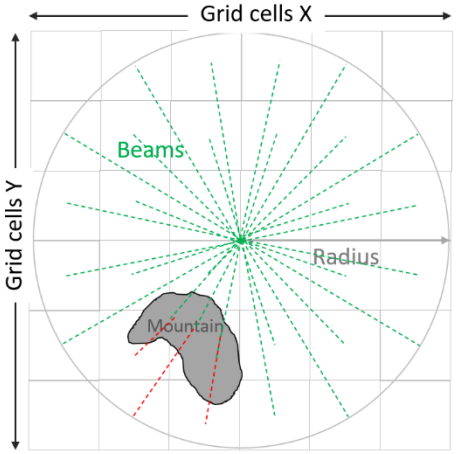


FIGURE 117. VIEWSHED

The Viewshed UI has the following parameters:



- **Grid Cells X and Y:** number of columns (X) and rows (Y) to be created in the area of interest. Because the viewshed beams are drawn from the specified location to the center point of each square in the grid, this defines the number of beams, the point cloud will draw.
    - For example: a 25 x 25 grid will draw 625 beams, a 250 x 250 grid will draw 62,500 beams. The more beams being drawn, the more hardware demanding the process will be.
- **Radius:** distance from the center to the outer edge of the viewshed.
- **Points Per Beam:** number of points per beam. The higher the number of points, the more solid the beam will be.
- **Point size:** how big or small each individual point should be
- **Coordinate:** the center point of the viewshed defaults to user position in the virtual world. The user can select to define that point in MGRS, Geodetic, or ADDR values.
- **Elevation:** If Snap to Ground is turned on, then the viewshed will use the terrain's elevation at the designated coordinate to draw the beams. If Snap to Ground is turned off, the user can then use this text entry field to define the viewshed elevation.
- **Snap to Ground:** toggle on/off

- The user can also utilize his **current location** as the center location of the point cloud, **paste coordinates** from a different application, or copy the location from VR-TAK to be pasted into another application.

- **Delete:** clears the viewshed points
- **Generate Viewshed:** creates the viewshed based on the parameters defined

4.11.14 Help System

The Help System provides videos demonstrating how to use different tools and systems. Videos can be installed through a separate help video installer or streamed if the user has access to tak.gov.

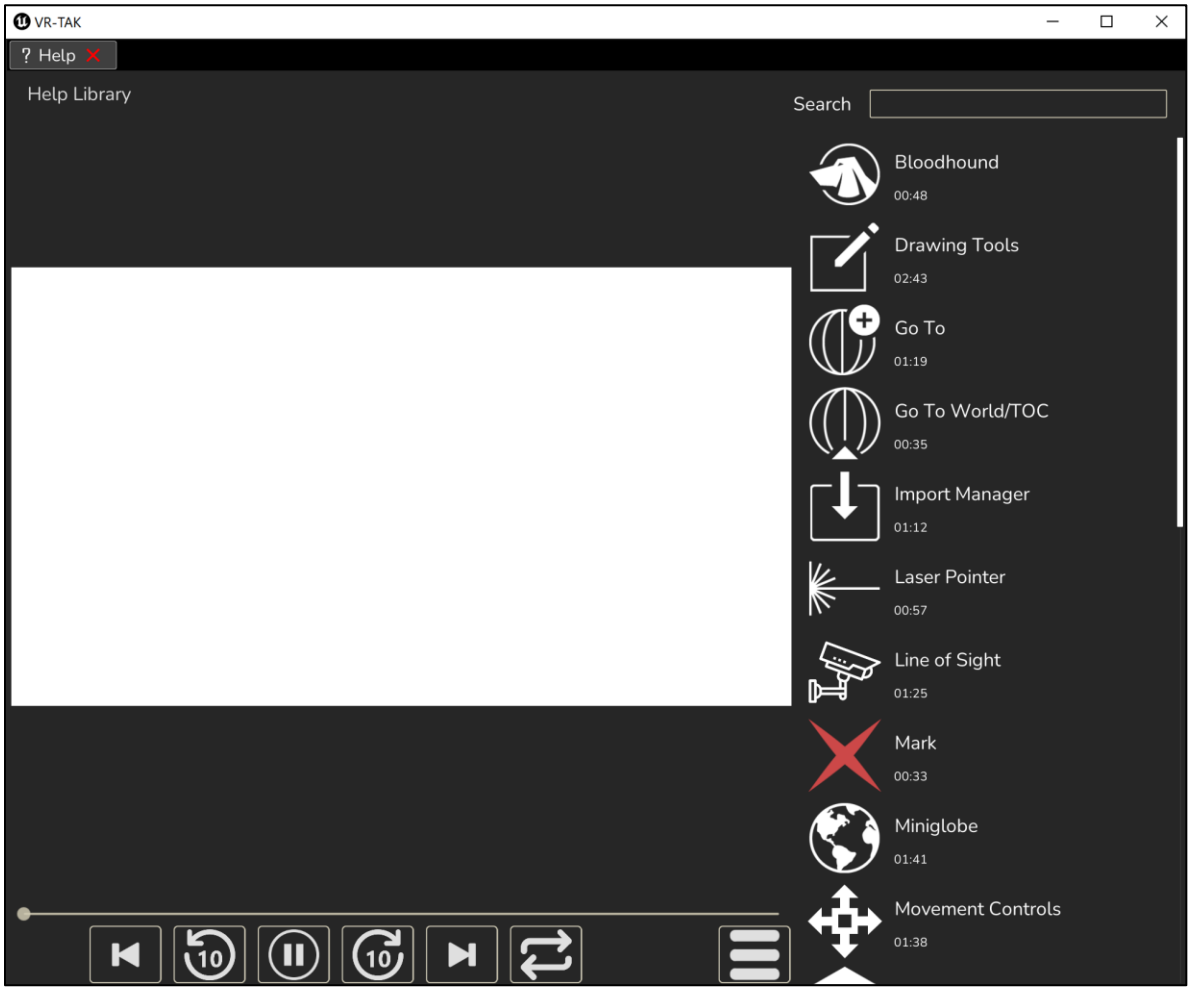


FIGURE 118. HELP SYSTEM UI

4.11.15 Operation Planner

The Operation Planner allows the user to create several operations for the world which are set on specific dates and times. These can be exported to screenshots that showcase the plan with multiple perspectives to easily share, or they can be sent to a database that can be loaded within VR-TAK. For example, if a route is set up in the world and then an operation is created, then the route can be shared as screenshots or a database to other users.

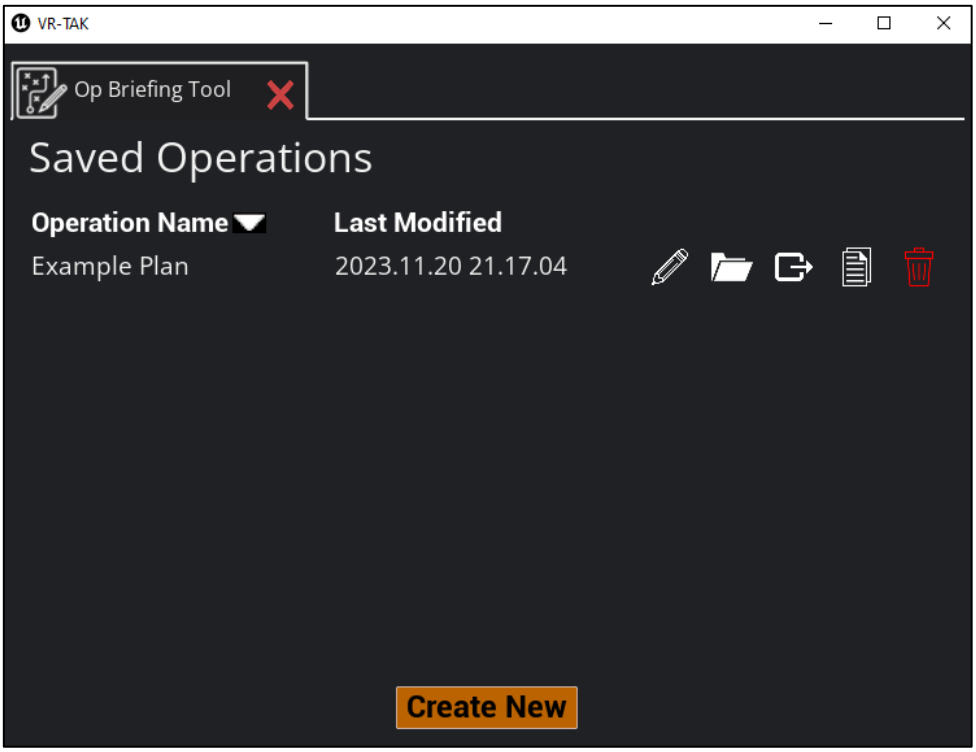


FIGURE 119. OPERATION PLANNER UI

4.11.16 Presenter Mode

Presenter mode gives users the ability to share their screens with other participants of a MUC session. Only one user can share their screen at a time, though the presenting user can be seamlessly swapped with another at any time.

When another user begins sharing, a message will pop up for everyone else in the MUC session asking if they want to start watching.

FIGURE 120. PRESENTER MODE VIEWER CONFIRMATION POPUP

If yes is selected, a window will open with the presenting user's view. This window can be opened at any time from the button on the toolbar while the presentation is ongoing. In this window, the presenter can lock presenting to

prevent others from taking over the presenter role or stop presenting at any time, while viewers can take over an unlocked presenting session or teleport to the presenter.

FIGURE 121. PRESENTATION WINDOW WITH PRESENTER CONTROLS

4.12 Virtual TOC

The virtual TOC has interactive TOC Screens and a scaled down view of a specified location on its central table. Certificates and other security settings are not currently functional on the Web Boards. Currently the contents of Web Boards are not shared across a Multi-User Collaboration Group (MUC) and are only available in the VTOC.

FIGURE 122. TABLE IN THE VIRTUAL TOC

The table defaults to Range 74 in Fort Bragg, but it can be directed to any location. The table's location is controlled via the GoTo buttons on the Overlay Manager and the GoTo menu on the toolbar. In addition, the table contains a quick-access control toolbar that rotates to face the user. Through this toolbar, the terrain location displayed on the table can be zoomed in and out and moved in discrete increments along all six axes.

FIGURE 123. TOC TABLE CONTROL TOOLBAR

Each corner of the TOC table has a handle that can be clicked and dragged to resize the TOC table.

FIGURE 124. HANDLE TO RESIZE TOC TABLE

The contents of the TOC table can be dragged with mouse and keyboard controls by holding [Left Control], then left mouse down on the TOC table contents and move the mouse. The contents of the TOC table can be dragged with VR controls by holding [Grip], then trigger down on the TOC table contents and move the VR controller.

4.13 Map Source

The map source menu allows you to configure settings for terrain tiles, an optional feature that will show terrain imagery and heightmap tiles when enabled.

FIGURE 125. TERRAIN TILE OF COLORADO USING GOOGLE HYBRID AND DTED0

Terrain tiles consist of both an imagery and heightmap component. Imagery refers to what texture the terrain tiles will use to render the terrain, while heightmap data is used to define the topology of the terrain.

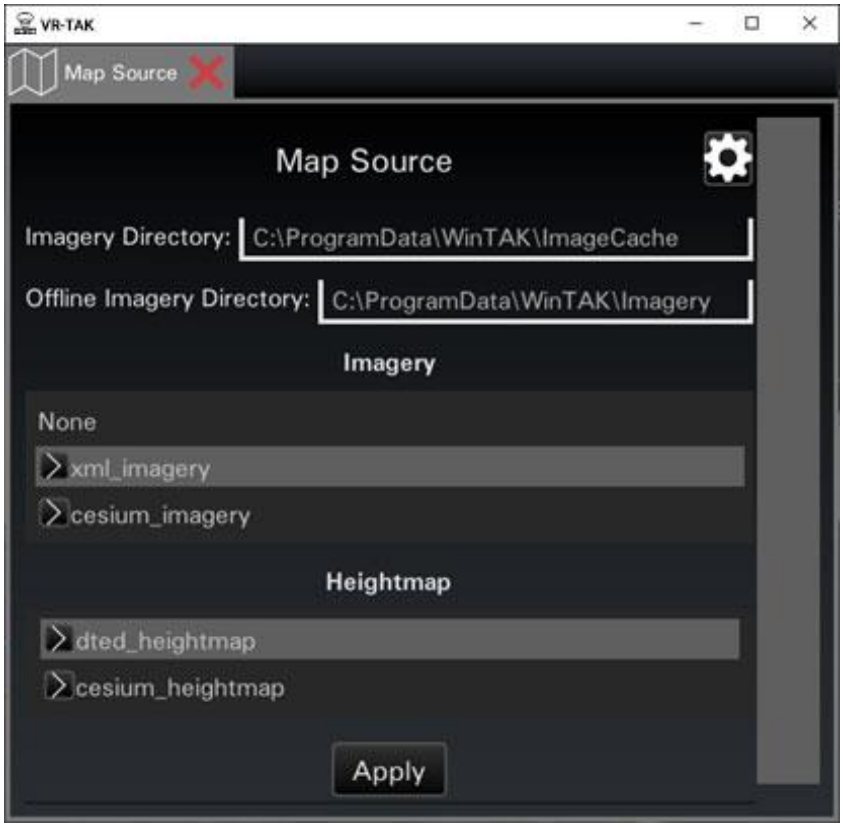


FIGURE 126. MAP SOURCE UI

Imagery data can be pulled from online servers or from SpatiaLite databases on your local machine. These SpatiaLite databases contain imagery indexed by quadkeys that specify their location and zoom levels. The imagery directory specifies the location that imagery pulled from external sources should be stored at, while the offline imagery directory specifies where VR-TAK can find any local databases you have.

VR-TAK currently supports imagery pulled from web servers as specified in XML files or imagery streamed from Cesium Ion. Heightmaps can also be pulled from Cesium Ion, or from DTED files on your local computer. Other sources for imagery and heightmap data can be added by plugins.

4.13.1 XML Imagery

The xml_imagery dropdown shows additional settings. By default, VR-TAK will only look in its TerrainXML folder for XML files, but other directories can be added by pressing the + button in the Paths to Imagery XMLs section. The Imagery Source section allows you to select which of the found sources you would like to use. This should include all valid XML files within the specified directories along with any offline databases found in the Offline Imagery Directory. Offline sources are prefixed with “offline.*”.

Whenever imagery fails to load the terrain will instead render in a solid color. When the ‘None’ option is selected the terrain will appear solid black. When an imagery source is specified but it does not contain valid imagery for your current location the terrain will appear in a red color.

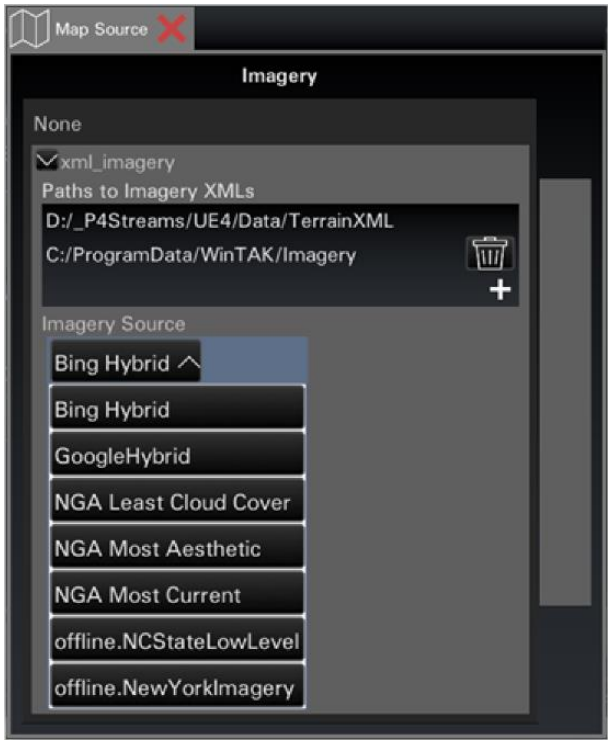


FIGURE 127. ADDITIONAL XML_IMAGERY OPTIONS

4.13.2 TAK-TICS Imagery

Users can copy and paste WMTS links from the TAK-TICS website to VR-TAK. VR-TAK will download and load imagery for the area around the user based on the copied link.

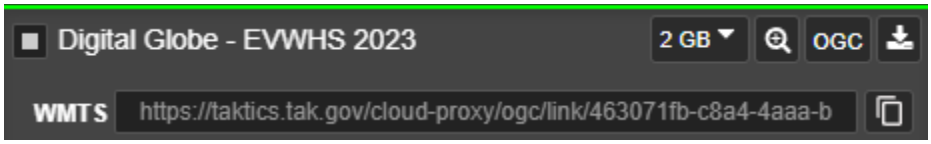


FIGURE 128. WMTS LINK FROM TAK-TICS WEBSITE

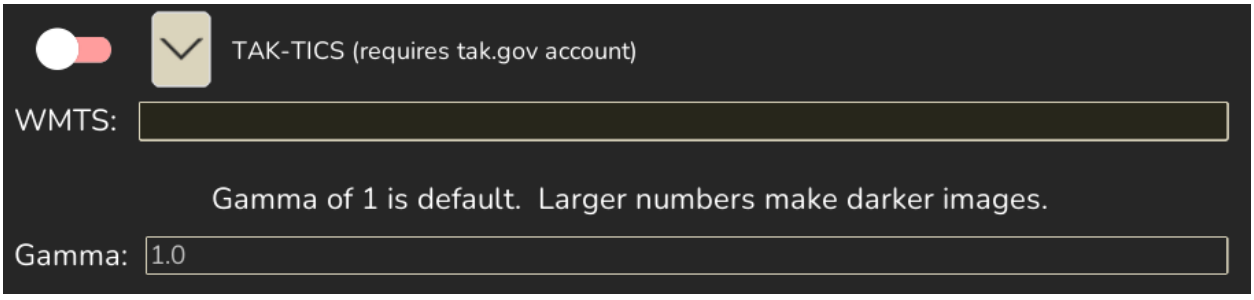


FIGURE 129. TAK-TICS SETTINGS IN VR-TAK

FIGURE 130. TAK-TICS IN VR-TAK

4.13.3 DTED Heightmaps

VR-TAK ships with DTED level 0 data for the entire globe located at C:/ProgramData/VR-TAK/dted. Clicking the arrow next to the dted_heightmap option will allow you to add additional directories for VR-TAK to find DTED information at. VR-TAK will always look through all available directories for heightmap data and prioritize using the highest level available for a given location.

If VR-TAK cannot pull a valid height from any of the DTED directories it will fail to render the terrain.

4.13.4 Cesium Ion Support

Cesium ion is a service for storing geospatial data, including heightmaps and terrain imagery that can be used by VR-TAK. Both cesium_imagery and cesium_heightmap require a Cesium access token and an asset ID. You can get a cesium access token by logging on to your cesium account at https://cesium.com/ion/tokens and selecting any token with the asset:read scope.

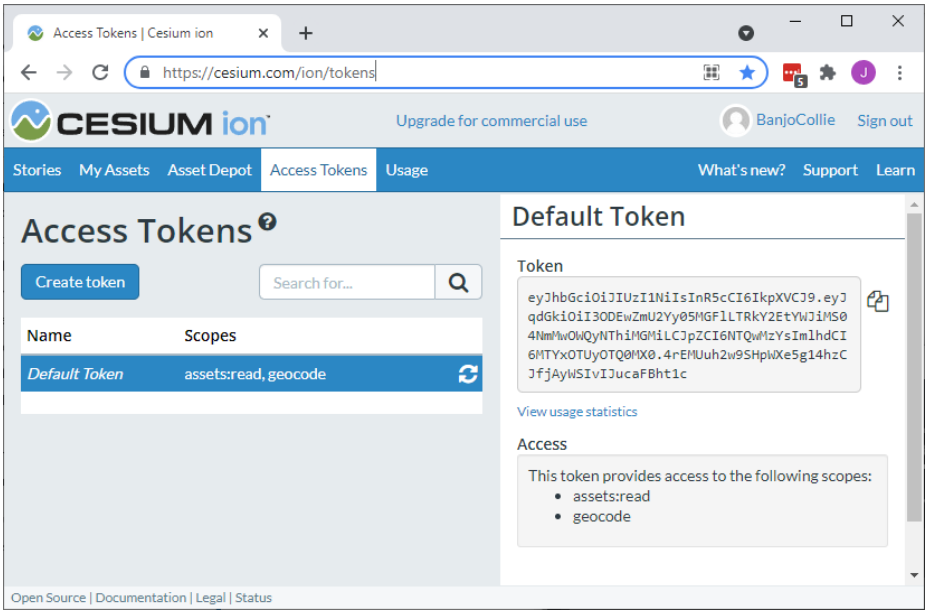


FIGURE 131. CESIUM ION ACCESS TOKEN

The asset ID field allows you to specify which asset in Cesium ion you would like to use. You can get these by logging on to your Cesium account at https://cesium.com/ion/assets. Here you can see a list of all the assets you have imported to your account or added from the asset depot. If you click on an asset, details on the asset will display on the right of your screen. You can find the IDs of your asset here (highlighted in **Error! Reference source not found.** 156). Cesium_heightmap requires that the asset be of the Terrain type and cesium_imagery requires that the asset be of the Imagery type. Note that VR-TAK cannot currently use Cesium ion imagery assets from Bing, though you are able to pull Bing imagery via an XML document.

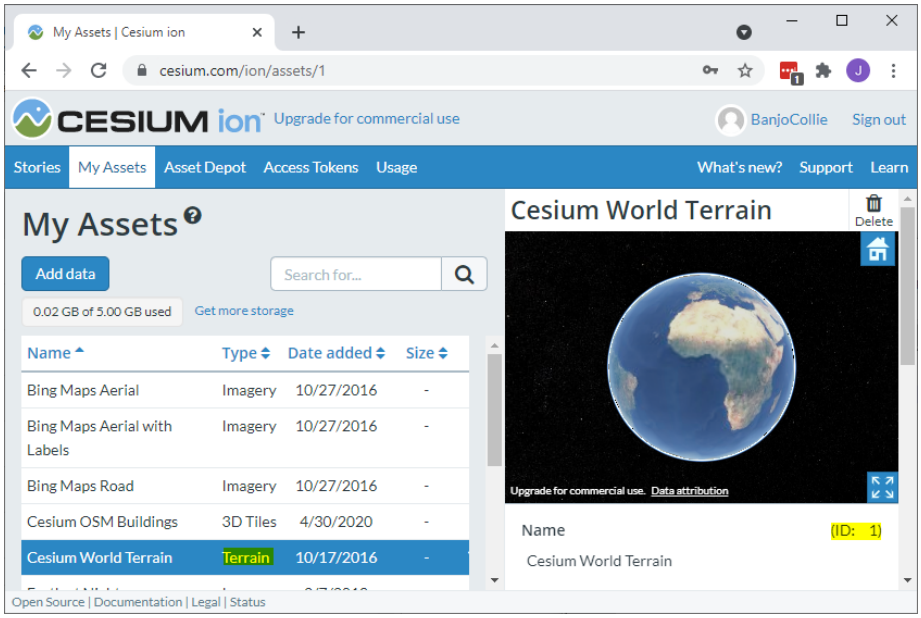


FIGURE 132. CESIUM ION ASSET ID

4.13.5 3D Tiles Support

VR-TAK has limited support for 3D Tiles datasets. VR-TAK can ingest the format but does not have support for all model types. To access 3D Tile support, click Settings -> Terrain -> Set Terrain Tile Source in order to open the Terrain Tile Sources UI. Scroll down and click the dropdown for 3D Tiles.

FIGURE 133. 3D TILES UI

In this UI, you can choose multiple local 3D Tiles datasets or one remote 3D Tiles dataset hosted on Cesium Ion. To view local datasets, point to multiple tileset.json files of each dataset. To view a remote dataset, enter your Cesium Ion Token and Asset ID. For both local and remote tilesets, the geometric error is used to determine detail level shown within 1000 meters and outside of 1000 meters. Check Reverse Vert Order to reverse the vertex order used when procedurally generating the meshes of the dataset.

4.13.6 NGA GRiD Support

The National Geospatial-Intelligence Agency (NGA) contains a Geospatial Repository and Data Management (GRiD) system for terrain modeling. VR-TAK users with a GEOAxIS account can utilize the GRiD API to source 3D terrain models for use in VR-TAK.

To obtain a GEOAxIS account, use the CAC / GEOAXIS SIGNUP / LOGIN button available on the NGA GRiD homepage: Home – GRiD (nga.mil).

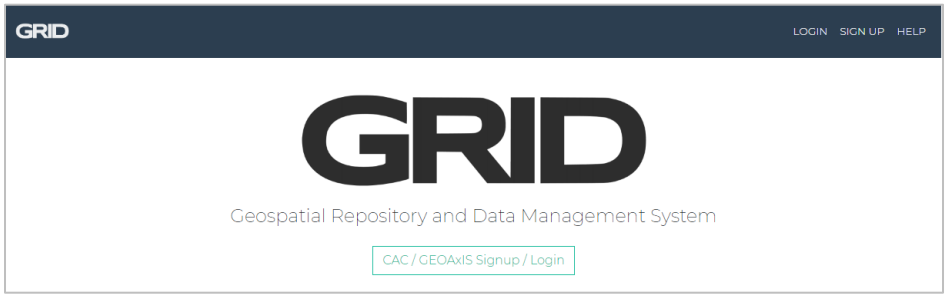


FIGURE 134. NGA GRID HOMEPAGE

You can request authentication using either a PKI Certificate or an ID.me identify. You are required to use one of these methods in order to obtain a GEOAxIS account. A DoD PKI Certificate is stored in your

browser and generated using a Common Access Card (CAC), so if you don't already have one or cannot obtain one easily, ID.me verification will be needed.

You can create an ID.me account using their homepage: [Digital Wallet, Identity Verification, and More | ID.me](ID.me).

Once you have a PKI Certificate or ID.me account, return to the NGA GRiD homepage and attempt to login, selecting your verification method of choice.

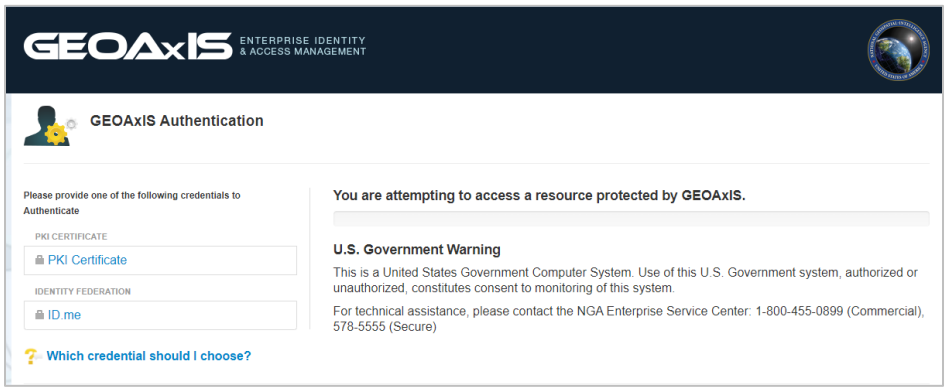


FIGURE 135. GEOAXIS ACCOUNT LOGIN PAGE

To generate a GRiD API Token, navigate to the API home menu using the dropdown menu.

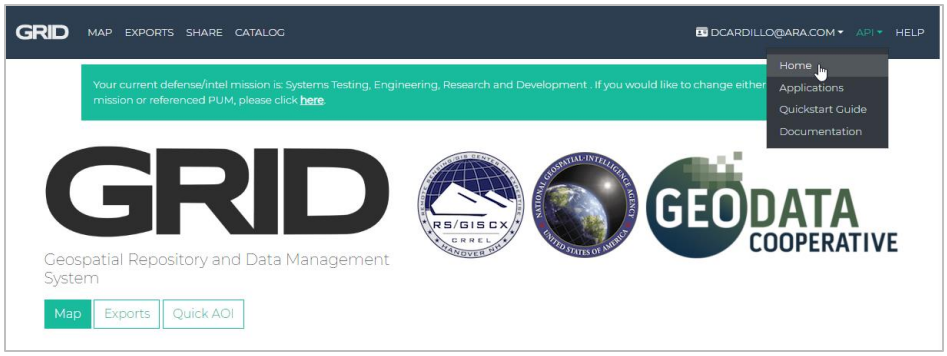


FIGURE 136. NGA GRID API MENU

Then, click the 'Manage Tokens' tab on the left sidebar.

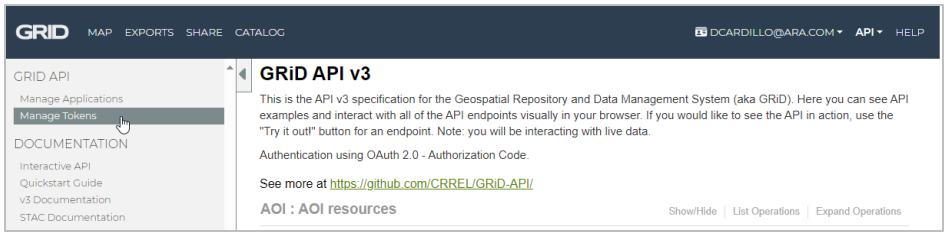


FIGURE 137. NGA GRID TOKEN MANAGEMENT

Generate a new token using the 'Generate new token' button on this page. The 'Access Token' value will be used by VR-TAK to access the API.

Be sure to take note of this value, as you will enter it into VR-TAK later.

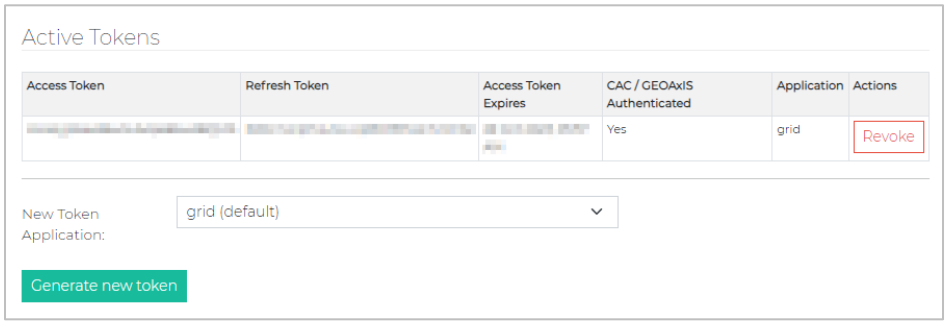


FIGURE 138. NGA GRID TOKEN CREATION

To find supported terrain tiles, click the 'Map' tab or button on the NGA GRiD homepage.

FIGURE 139. NGA GRID MAP MENU

From the map view, click on the 'Data' tab on the sidebar, and ensure only the 'Meshes' option is selected. This is currently the only data format that supports real-time streaming from NGA GRiD. The terrain that is supported by this data format will be highlighted in orange in the map view.

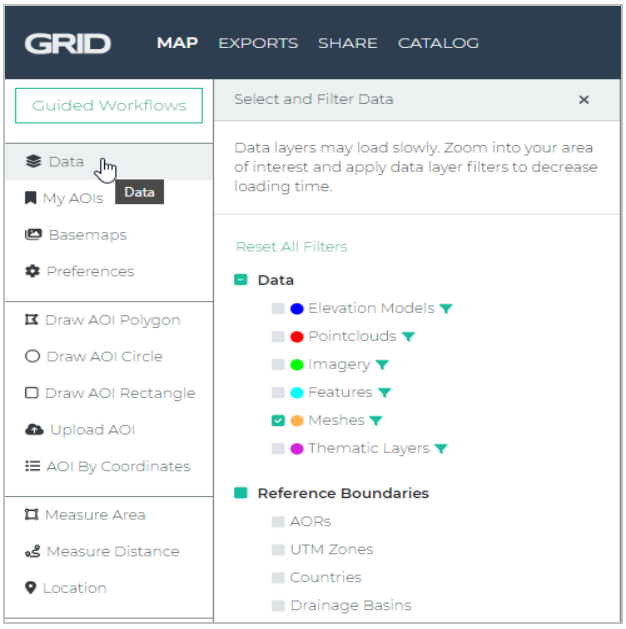


FIGURE 140. NGA GRID MAP FILTERS

You can now navigate to a section of terrain that is highlighted in orange, indicating that it contains 3D mesh data. Then, you can select one of the Area of Interest (AOI) drawing tools to create an AOI shape for the region you'd like to query.

FIGURE 141. NGA GRID AOI TOOL

Tilesets that intersect your AOI will appear highlighted, and the associated data streams will be visible in the bottom panel.

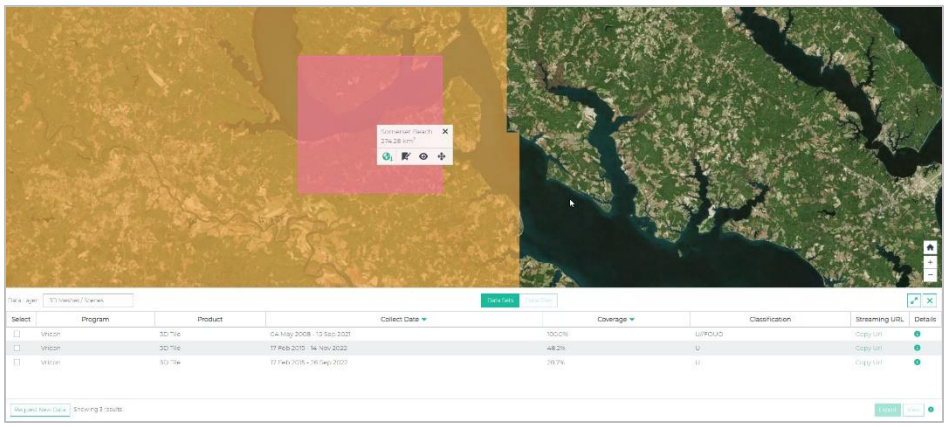


FIGURE 142. NGA GRID AOI QUERY RESULTS

Use the 'Copy URL' button next to the tileset you want to stream. Paste this into a text editor so you can reference it later.

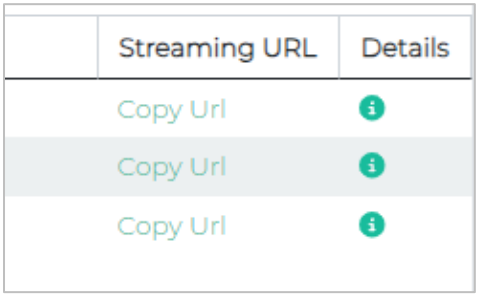


FIGURE 143. NGA GRID STEAMING URL FIELD

To use NGA GRiD terrain in VR-TAK, open the map sources panel in VR-TAK, located on the 'Tools' tab.

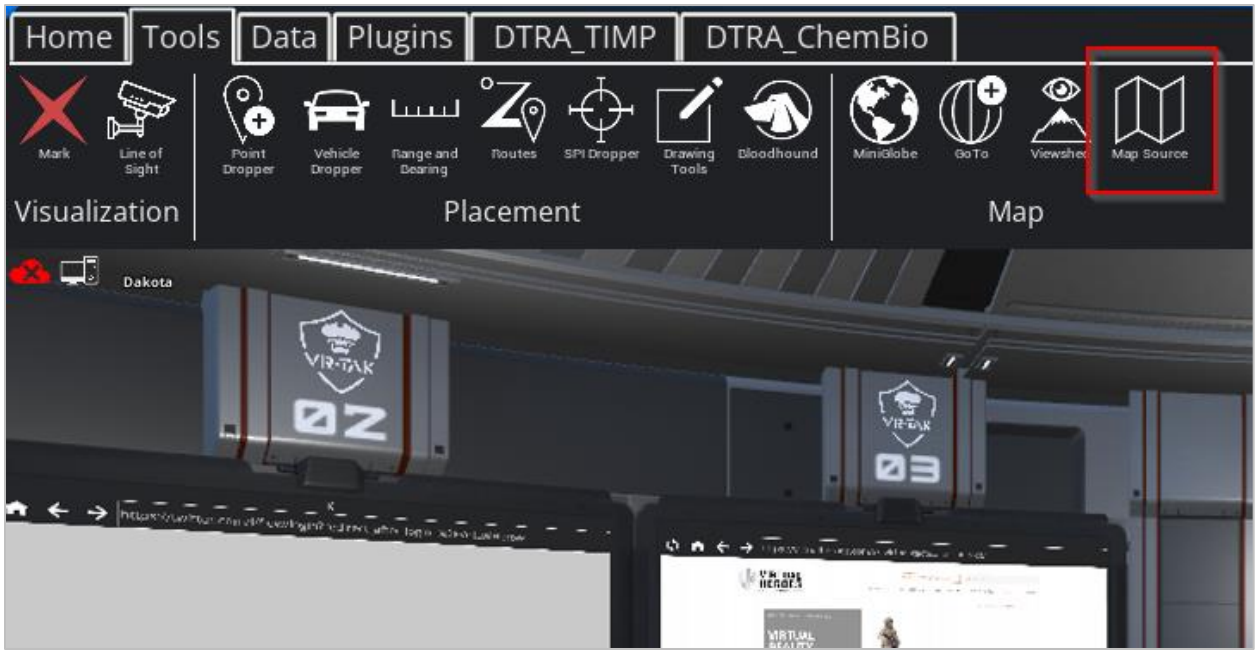


FIGURE 144. VR-TAK MAP SOURCES MENU

FIGURE 168. VR-TAK MAP SOURCES MENU

In the options menu that appears, uncheck all other sources and check the source for 'nga_grid'. Click the drop-down arrow to expand the fields and paste your Access Token into the 'Access Token' field. Then, enter the Asset ID from the streaming URL for the tileset you wish to view into the 'Asset ID' field. Finally, check the 'Reverse Vert Order' button, as the mesh won't render properly without it. Apply your changes and close the window. The mesh should display at the appropriate latitude and longitude.

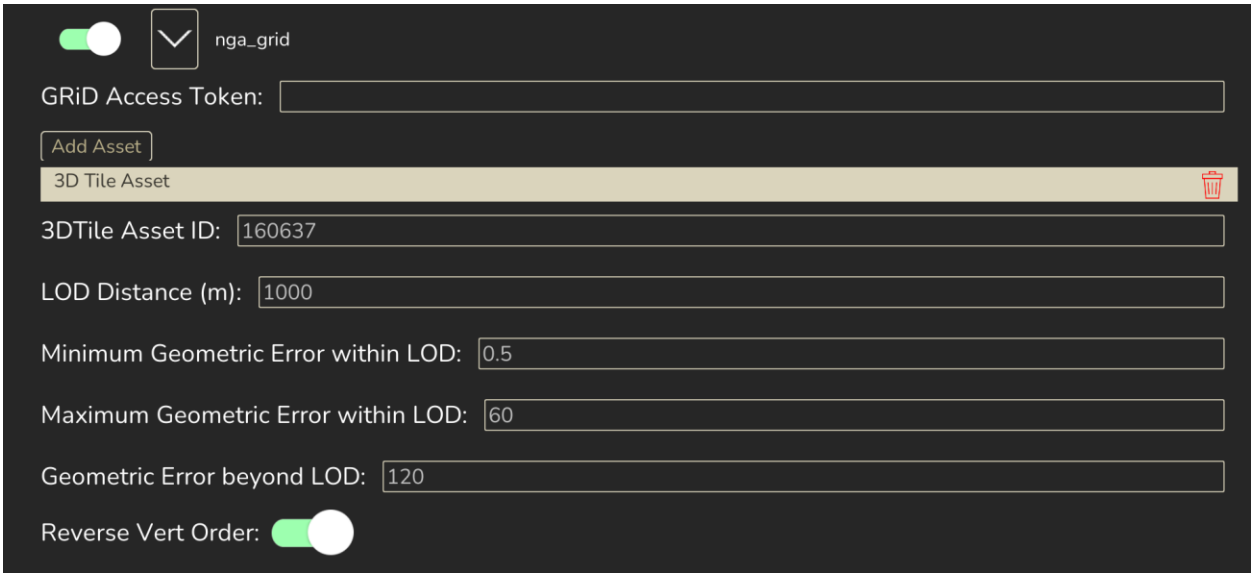


FIGURE 145. MAP SOURCES OPTIONS WINDOW

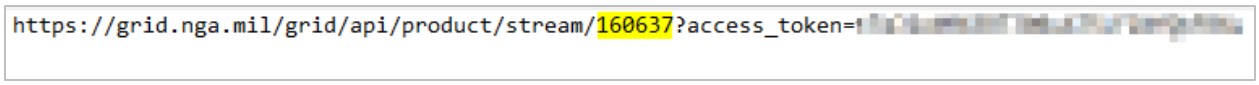


FIGURE 146. ASSET ID LOCATED IN STREAMING URL

4.13.7 Vector Tiles Support

VR-TAK has limited support for Vector Tile datasets. VR-TAK can ingest the format but only supports the "buildings" layer types. To access Vector Tile support, click Settings -> Terrain -> Set Terrain Tile Source to open the Terrain Tile Sources UI. Scroll down and click the dropdown for MapBox Vector Tiles.

MapBox Vector Tiles require an access token, which you can find in your MapBox account at: https://www.mapbox.com/.

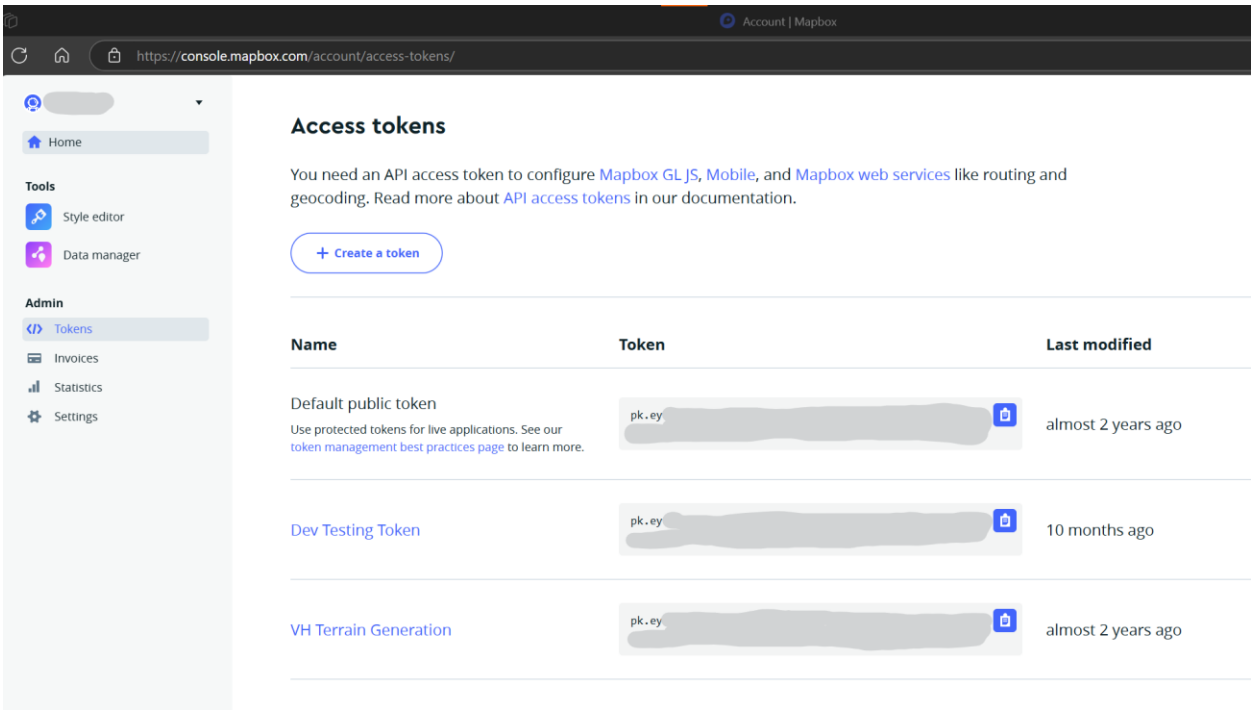


FIGURE 147. MAPBOX ACCESS TOKEN

4.14 Multi-User Collaboration (MUC)

Multi-User Collaboration (MUC) allows multiple VR-TAK users to work together with a common set of data in real-time, as if they were working together in the same room. Edits are seen immediately by all members of a MUC Session. It is similar to multiplayer in a commercial video game, or real-time collaboration in Google Docs.

The MUC UI can be found on the Toolbar:

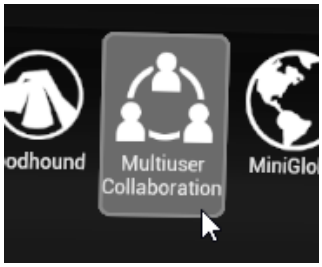


FIGURE 148. ADDITIONAL XML_IMAGERY OPTIONS

One user (the host) starts a Multi-User Collaboration session (MUC session), which others (clients) may find and join.

The host starts a session by entering a session name, then pressing the Create Session button. Clients join an existing session by clicking on the session, then clicking Join Session.

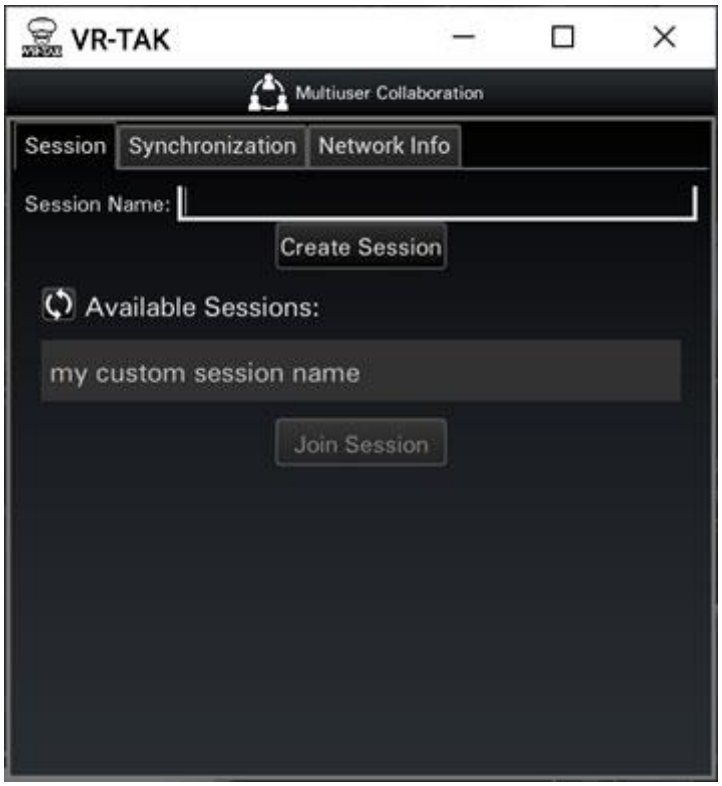


FIGURE 149. SESSION TAB WHEN DISCONNECTED FROM MUC SESSION

> NOTE: The current network connection of both the host and client must be the same computer network (LAN). See Troubleshooting for more details.

While in a session, hosts and clients can see a list of other users in the session. As long as a microphone is present, users can speak to each other during a MUC session. Each client can toggle their own mute status. Hosts can mute and lock clients. Hosts end the session by clicking the End Session button.

After a MUC session ends, the host retains all changes made to their world during the MUC session, even after the session is over. If the host needs to send information from the session to other users, the host may zip data into a Data Package, add items to a Data Sync, or use the Send context menu option for items.

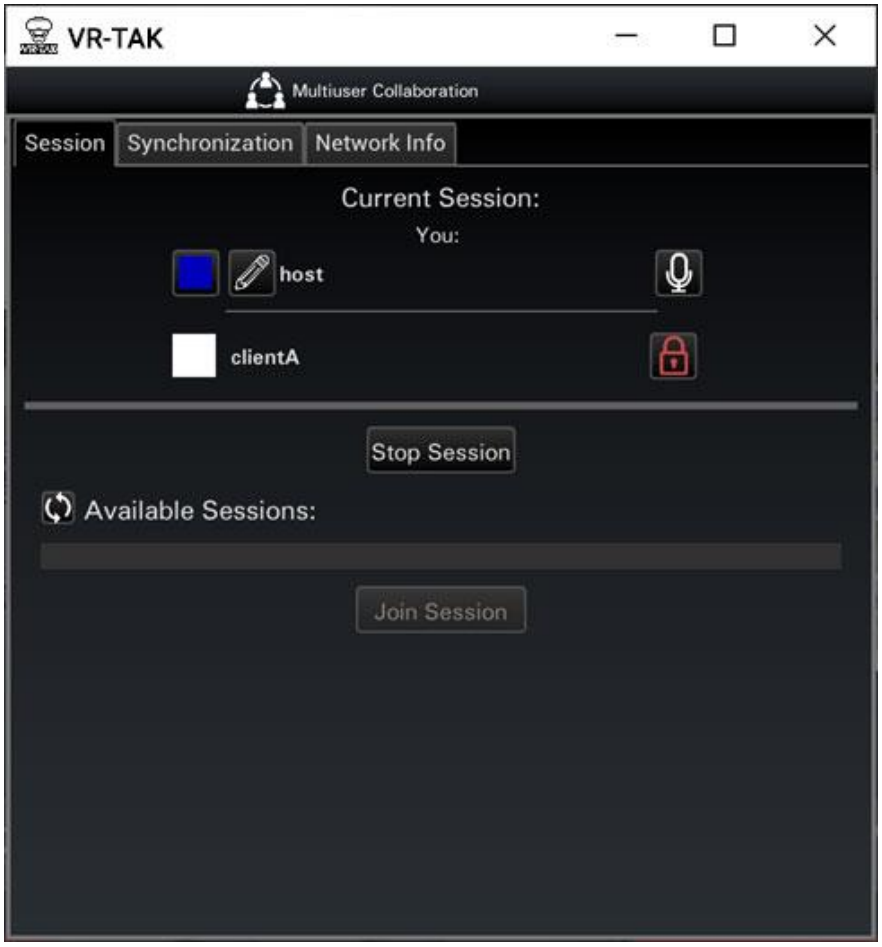


FIGURE 150. HOST SESSION TAB WITH FORCE MUTED CLIENT

Clients no longer see the contents of their own database. Instead, they will see the contents of the host's database that the host has shared with that client. The host chooses which entities to share with each client from the Synchronization tab in the MUC UI.

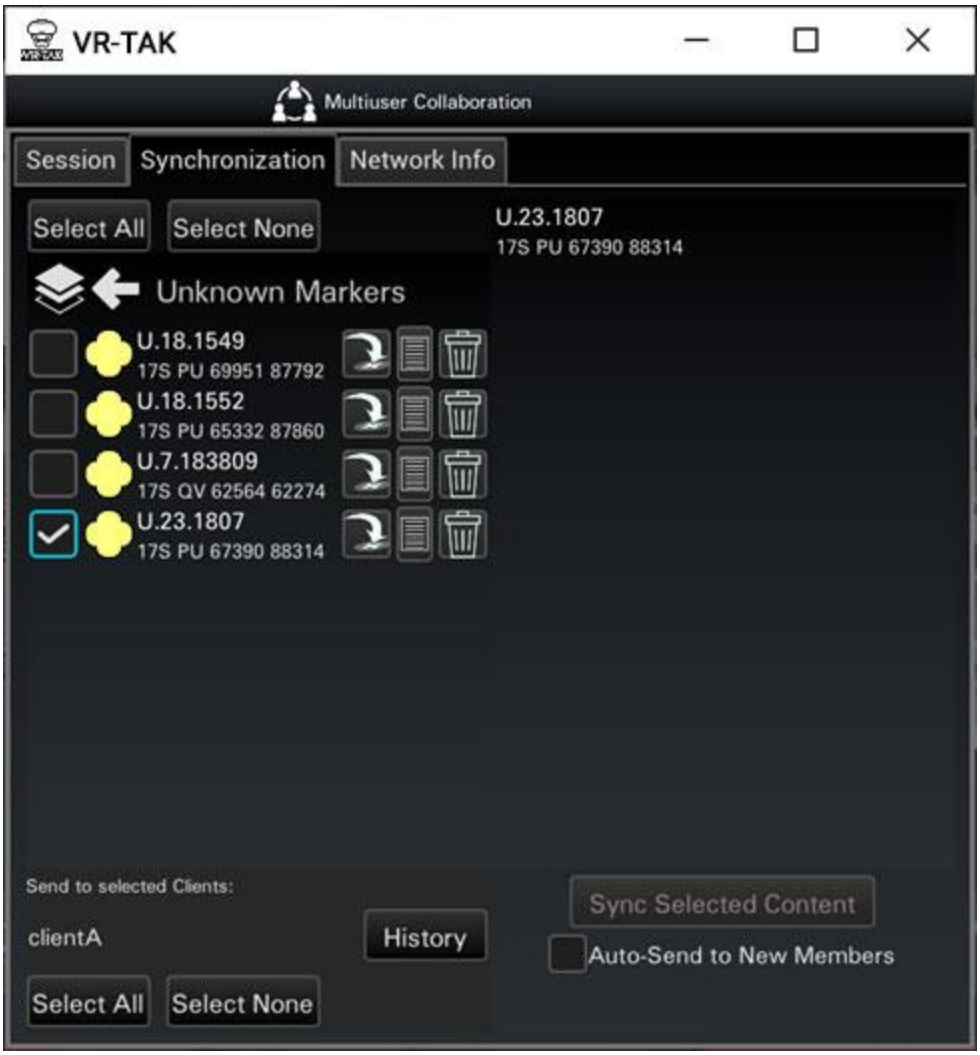


FIGURE 151. HOST SYNCHRONIZATION TAB

The host's Synchronization tab allows the host to choose which data to share with each client. The top part of the tab shows a list of all entities in the host's database. Once the host chooses entities to share, the next step is to choose which client(s) should receive the entities. The bottom part of the tab shows a list of all connected clients. The host can click on a client, then click Sync Selected Content to send the selected entities to that client.

> NOTE: The Synchronization tab is for sharing entities that already exist prior to a MUC session. Any entity that is created or edited during a MUC session is automatically sent to all other users in the session. All changes are stored on the host's database.

Each client has a History button that shows all sent and received entities from that client.

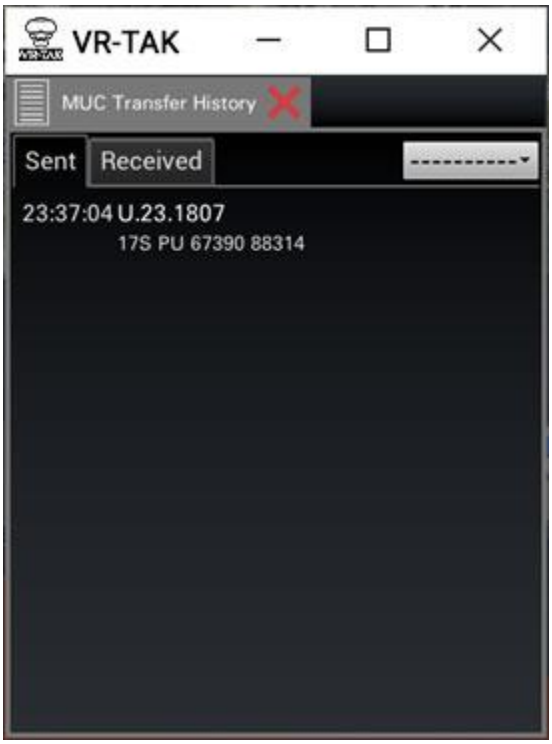


FIGURE 152. TRANSFER HISTORY

Auto-Send to New Members means the host will automatically send the selected entities to joining clients.

Certain entities (e.g. 3D models) are associated with large files. Transfer progress for these files is shown in the Synchronization tab.

Certain things are not sent across MUC sessions, including streamed terrain tiles, contacts, chat messages, and user settings (including server connections).

Users can see helpful network information in the Network Info tab.

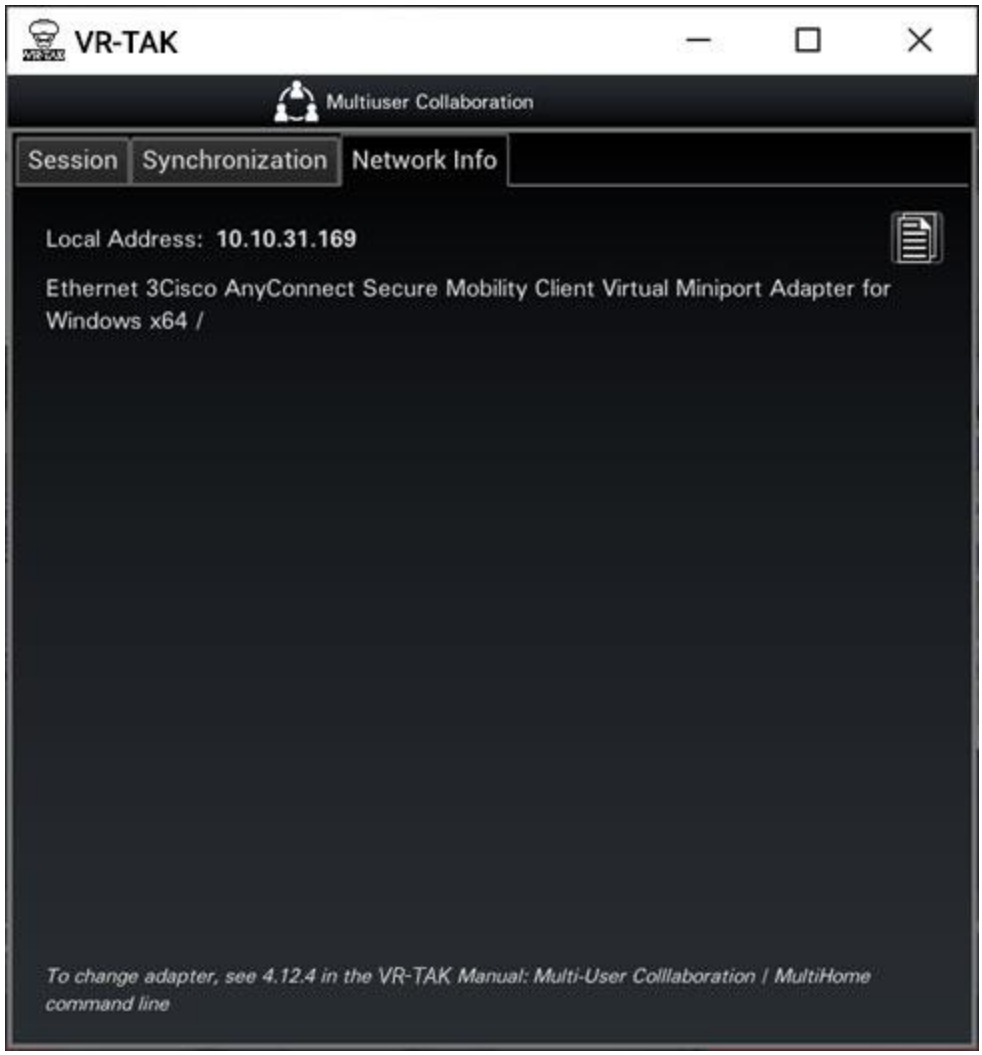


FIGURE 153. NETWORK INFO TAB

4.14.1 While in a MUC Session

All MUC session members can see each other in both the TOC and the world. The Laser Pointer Tool provides a quick way to point out things to other members, since all members can see the beam of the Laser Pointer Tool.

FIGURE 154. A MUC SESSION MEMBER POINTS TO A BUILDING USING THE LASER TOOL

All objects placed and edits made are seen immediately by all members.

4.14.1.1Colors

To help identify group members, each one is given a unique color as they join the collaboration group. This color will show up on the user's name, and it will be the color of their laser beam. This color may be changed under TAK Settings in the Settings menu.

4.14.1.2 Sending and Receiving COT

If someone outside of the collaboration group needs to see something, group members may use the "Send" and "Broadcast" features, and they will work as usual.

If an in-world item is sent to the host of a collaboration group, all members of the group will be able to see it. If it is sent to a member of the collaboration group who is not the host, it will be added to that member's local database. It will not appear for that member until they leave the collaboration group.

4.14.1.3 Deleting items

When someone in a collaboration group tries to delete an item, they will see sub-options to delete the item locally or for everyone.

If an item is deleted locally, it will disappear for the person who deleted the item, but it will still exist for everyone else. Clients in the collaboration group can only delete items locally, unless they are the one who placed the item.

4.14.1.4 Item Visibility

If one member of a collaboration group sets the visibility of an item or set of items using the Overlay Manager, it will affect visibility for all group members.

4.14.1.5 Bandwidth

MUC sessions create network traffic between each client and the host. This causes the host's bandwidth needs to increase per connected client, while client's bandwidth needs remain fixed. During a MUC session, database updates, voice traffic, and file updates are active between the host and clients. Voice and database updates are prioritized over file updates.

While a user is speaking, voice traffic uses around 100 kilobytes/second per user.

Database updates typically use 1 – 10 kilobytes per update.

File updates use a percentage of available bandwidth without overflowing the connection.

4.14.2 Multihome Command Line

VR-TAK will attempt to choose a valid network adapter at initialization. Users can see the chosen network adapter in the Multiuser Collaboration UI. Users can override the default network adapter by using the multihome command-line option. To use the multihome command-line option, add –multihome=ip. For example, if an adapter had an IP address of 1.2.3.4, then the multihome command-line is:

-multihome=1.2.3.4

4.14.3 Ports

Multiuser Collaboration requires port 7777 to be open on the host and each client for both TCP and UDP traffic.

4.15 Troubleshooting

4.15.1 Clearing Local Caches

VR-TAK uses multiple local disk locations to cache files.

4.15.1.1 Object Cache

The object cache holds files related to entities in the virtual environment. It is located at *C:\Users\[username]\Local\AppData\VR-TAK\Cache*. It can be cleared by going to *Settings -> Advanced*, then clicking on *[Clear Object Cache]*. This will also clear objects from the local database and the directory for extracted files. The local database is a SpatiaLite database and is located at *C:\Users\[username]\Local\AppData\VR-TAK\Databases\EntityDB.sqlite*. The directory for extracted files is *C:\Users\[username]\Local\AppData\VR-TAK\Temp*.

4.15.1.2 Web Cache

The web cache stores data used by the web browser in VR-TAK. It is located at *C:\Users\[username]\Local\AppData\VR-TAK\Game\Saved\webcache*.

4.15.2 Strange Control Behavior

4.15.2.1 Joining a Multiuser Collaboration Session in Desktop Mode with an HMD Connected

If all of the following is true:

- There is a VR Head-Mounted Display connected to your PC.
- You are in Desktop Mode.
- You connect to someone else's Multiuser Collaboration session.

The controls may become erratic or unresponsive. To work around this issue, perform either of the following:

- Disconnect the VR Headset from your PC.
- Go into VR Mode before joining the Multiuser Collaboration session.