BVI V0.9.4

INSTALLATION/CONFIGURATION

INSTRUCTIONS

CM ID: 23360803-178
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1 INTRODUCTION

Battlespace Visualization and Interaction (BVI) is a research project investigating different methods for visualizing and interacting with complex battlespace information. It is being developed as an effective low-cost distributed training platform that integrates a traditional sand table with commercially available off-the-shelf (COTS) technologies in image projection, virtual reality (VR), augmented reality (AR), and machine vision. These technologies improve the interactive nature of the sand table by projecting information onto the sand/floor and providing the ability to interact with the display using tracked controllers, mobile devices, AR/VR devices and sand movement. With BVI, multiple users can coordinate virtually over a network using a range of supported devices from tablets to AR headsets. The BVI platform incorporates the best aspects of the traditional sand table and enables new possibilities in scaling, collaboration, and simulation.

1.1 RELATED DOCUMENTS

- BVI_User_Instructions.pdf
- Google_And_Bing_Maps_API_Key_Configuration_Guilde.pdf

1.2 MINIMUM HARDWARE SPECIFICATIONS

The tables below contain the hardware specifications specific to each modality for running and testing the BVI system.

Note: If specifications are drastically lower than the minimum hardware specifications below, contact bvi-team@dignitastech.com before proceeding.

Sandtable

Table 1 Hardware Specifications - 7ft Table

	Hardware Specifications
RAM	32GB of RAM
Power Supply	950W+
CPU	Intel (R) Core (TM) i5-10400X 3.7GHz,(4.3GHz Turbo, 6Core, 12MB Cache, HT, (65W), DDR4-2666 Non-ECC)
GPU	Dedicated GPU such as RTX A2000, GeForce 3050, etc.
SSD	1 x TB of Storage
HD	Dell M.2 carrier
OS	Windows 10 Pro or greater

Floor Projection

Table 2 Hardware Specifications - Floor Projection

	Hardware Specifications
RAM	64GB
Power Supply	950W+
CPU	Intel (R) Core (TM) i7-1255UL 3.9GHz,(4.7GHz Turbo, 10Core, 12MB Cache, HT, (28W), DDR4-3200 Non-ECC)
GPU	2 x Nvidia RTX A2000 or greater
SSD	1 x TB of Storage

HD	Dell M.2 carrier
OS	Windows 10 Pro or greater

AR/VR

Table 3 Hardware Specifications - Mixed Reality

	Hardware Specifications
RAM	64GB
Power Supply	950W+
CPU	Intel (R) Core (TM) i5-10400X 3.7GHz,(4.3GHz Turbo, 6Core, 12MB Cache, HT, (65W), DDR4-2666 Non-ECC)
GPU	Dedicated GPU such as RTX A2000, GeForce 3050, etc.
SSD	1 x TB of Storage
HD	Dell M.2 carrier
OS	Windows 10 Pro or greater

Mobile AR/VR

Table 4 Hardware Specifications - Mobile AR/VR

	Hardware Specifications
RAM	16 GB, LPDDR5, 4800 MT/s
Power Supply	90WHr, 6-Cell Battery
CPU	13th Gen Intel® Core™ i7-13620H (24 MB cache, 10 cores, 16 threads, up to 4.90 GHz Turbo)
GPU	NVIDIA RTX4050, 6GB GDDR6
SSD	1 TB, M.2, PCIe NVMe, SSD
OS	Windows 10 Pro or greater

WTP

Table 5 Hardware Specifications - WTP

	Hardware Specifications
Environment	64-bit processor and operating system
CPU	Intel (R) Core (TM) i5-10400X 3.7GHz,(4.3GHz Turbo, 6Core, 12MB Cache, HT, (65W), DDR4-2666 Non-ECC)
RAM	16GB
GPU	Dedicated GPU such as RTX A2000, GeForce 3050, etc.
SSD	1 x TB of Storage
HD	Dell M.2 carrier
OS	Windows 10 Pro or greater

1.3 RECOMMENDED HARDWARE SPECIFICATIONS

Sandtable

Table 6 Hardware Specifications - 7ft Table

	Hardware Specifications
RAM	64GB, 2x32GB, DDR4 UDIMM non-ECC memory
Power Supply	950W+
CPU	Intel (R) Core (TM) i9-10900X 3.7GHz,(4.7GHz Turbo, 10C, 19.25MB Cache, HT, (165W), DDR4-2933 Non-ECC)
GPU	Nvidia RTX A4500 (Or comparable)
SSD	1 x M.2 4TB PCIe NVMe Class 40 Solid State Drive
HD	Dell M.2 carrier
OS	Windows 10 Pro or greater

Floor Projection

Table 7 Hardware Specifications - Floor Projection

	Hardware Specifications
RAM	64GB, 2x32GB, DDR4 UDIMM non-ECC memory
Power Supply	950W+
CPU	Intel (R) Core (TM) i9-10900X 3.7GHz,(4.7GHz Turbo, 10C, 19.25MB Cache, HT, (165W), DDR4-2933 Non-ECC)
GPU	2 x Nvidia RTX A4500 (Or comparable)
SSD	1 x M.2 4TB PCIe NVMe Class 40 Solid State Drive
HD	Dell M.2 carrier
OS	Windows 10 Pro or greater

AR/VR

Table 8 Hardware Specifications - Mixed Reality

	Hardware Specifications
RAM	64GB, 2x32GB, DDR4 UDIMM non-ECC memory
Power Supply	950W+
CPU	Intel (R) Core (TM) i9-10900X 3.7GHz,(4.7GHz Turbo, 10C, 19.25MB Cache, HT, (165W), DDR4-2933 Non-ECC)
GPU	Nvidia RTX A4500 (Or comparable)
SSD	1 x M.2 4TB PCIe NVMe Class 40 Solid State Drive
HD	Dell M.2 carrier
OS	Windows 10 Pro or greater

Mobile AR/VR

Table 9 Hardware Specifications - Mobile AR/VR

	Hardware Specifications
RAM	32 GB, 2x16GB, DDR5, 5200 MT/s
Power Supply	90WHr, 6-Cell Battery

CPU	13th Gen Intel Core I9-13900HX (36 MB cache, 24 cores, 32 threads, up to 5.4 GHz Turbo)
GPU	NVIDIA® GeForce RTX™ 4070, 8 GB GDDR6
SSD	2 x 1 TB PCIe M.2 SSD
OS	Windows 10 Pro or greater

WTP

Table 10 Hardware Specifications - WTP

	Hardware Specifications
Environment	64GB, 2x32GB, DDR4 UDIMM non-ECC memory
CPU	950W+
RAM	Intel (R) Core (TM) i9-10900X 3.7GHz,(4.7GHz Turbo, 10C, 19.25MB Cache, HT, (165W), DDR4-2933 Non-ECC)
GPU	Nvidia RTX A4500 (Or comparable)
SSD	1 x M.2 4TB PCIe NVMe Class 40 Solid State Drive
HD	Dell M.2 carrier
OS	Windows 10 Pro or greater

2 INSTALL/CONFIGURE BVI

The following sections detail the procedures to install and configure BVI.

2.1 INSTALL BVI

2.1.1 INSTALL THIRD-PARTY APPLICATIONS

BVI depends on several third-party applications that are pre-packaged with the BVI software and do not need to be individually installed. However, a specific Kinect driver is required for the software if installing on a Sand Table machine.

2.1.1.1 INSTALL KINECT AND USBDK DRIVERS INSTALL KINECT AND USBDK DRIVERS

Note: If the Azure Kinect is being used, no additional installations are needed since the streamer comes with the .dll files needed to run.

To install the Xbox V2 Kinect for Windows SDK and UsbDk:

1. Download the third-party application installers:
    a. Download the **Xbox Kinect for Windows SDK** installer by visiting: Xbox Kinect for Windows SDK Installer.
    b. Download the **UsbDk** installer by visiting: UsbDk Installer.

    Note: If there are issues obtaining these installation files, please contact bvi-support@dignitastech.com
2. Ensure the Xbox One Kinect is plugged into a USB 3.0 port on the BVI computer and wait for Windows to finish automatically setting it up. *Note:Windows will attempt to update the driver automatically if connected to the Internet*.
3. Launch the **Xbox Kinect for Windows SDK** installer and follow the prompts.
4. Uninstall the default Kinect driver from **Device Manager**:
    a. Press **Windows Key + R** to open Windows Run prompt.
    b. Type **devmgmt.msc** and press **Enter**. The Device Manager window will open.
    c. Under **Kinect sensor devices,** right-click **WDF KinectSensor Interface 0** and click **Uninstall device** and check the box to delete the driver software from the BVI computer.

    *Note: If drop-down arrow is not seen for **Kinect sensor devices**, look under **Other devices** and uninstall the device named **Xbox NUI Sensor.***

    d. Run the **UsbDk** installer to install UsbDk and the proper Kinect driver onto the BVI computer.

Kinect for Windows SDK and **UsbDk** should now be installed, and the Xbox Kinect is ready for use with BVI.

2.1.1.2 INSTALL FIREFOX BROWSER

To install the Firefox browser:

1. In a browser (e.g., Google Chrome or Microsoft Edge), navigate to: https://www.mozilla.org.
2. In the upper-right corner, select **Download Firefox**.
3. Run the Firefox browser executable once the application is downloaded.

2.1.2 INSTALL BVI SOFTWARE

To install the BVI software:

1. Copy the **ares-<version>.exe** file and corresponding ***.bin** files to a local drive (e.g., **C:\ drive**).
2. Run the **ares-<version>.exe** to begin installation.
3. Install BVI to a local drive and follow the installation prompts.
4. Once BVI is finished installing, navigate to: **<local drive>\ARES\ARES-<version>\ares.manager\config**
5. Open the **env.yml** file using a text editor (e.g., Notepad, Notepad++).
6. Obtain the IP address of the BVI computer:
   a. Press **Windows Key + R** to launch the Windows run command UI (see Figure 1):

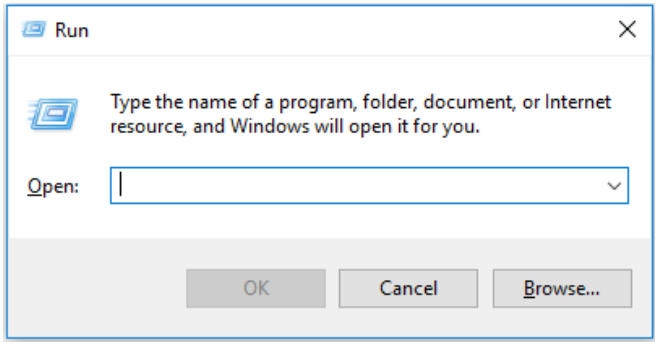

Figure 1 Windows Run Command UI

   b. Type **cmd** and press **OK**.
   c. In the Windows command prompt, type: **ipconfig**
   d. Press **Enter** and note the **IPv4 Address** attribute (see Figure 2):

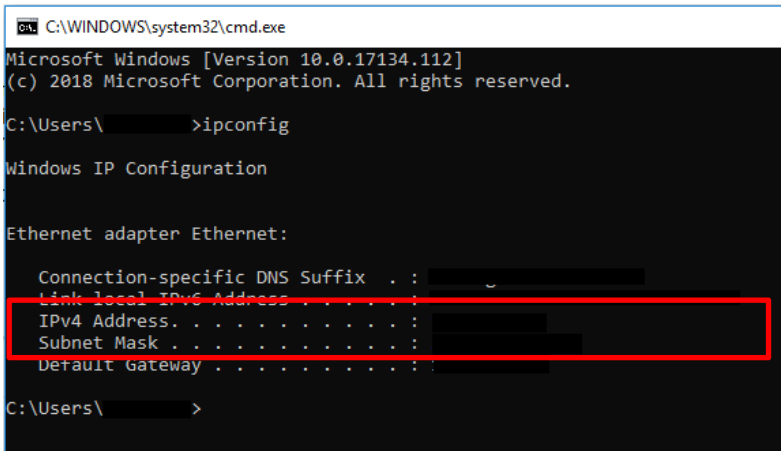

Figure 2 Windows Command Prompt displaying IP Address

7. Set the **ares_discovery_ip** to the IP address of the BVI machine found in Step 6 (see Figure 3):

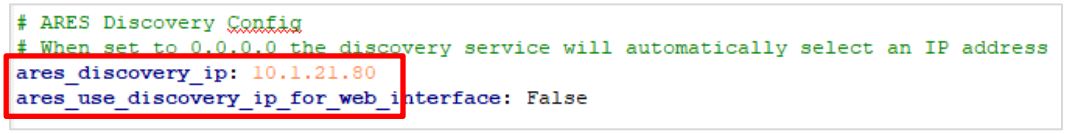

Figure 3 BVI Discovery Config

A desktop shortcut will be created and the BVI software is installed.

2.2 INSTALLING TERRAIN DATABASES (IF PROVIDED)

To view the terrain data for a given scenario in BVI XR or Web Tactical Planner, the terrain databases for the specified scenario region must be loaded onto the BVI computer.

To install the terrain databases for BVI XR or Web Tactical Planner:

1. Obtain the ***.7z** file of the desired terrain.
   Note: Request terrain database files by contacting bvi-team@dignitastech.com.
2. Open a File Explorer and navigate to the **C:\ drive**.
3. In the File Explorer, select **View** and check the **Hidden Items** box (see Figure 4). The hidden **\ProgramData** folder is now visible.

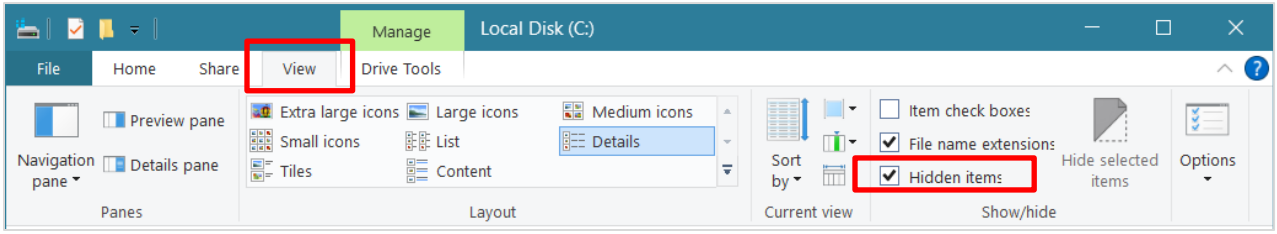

Figure 4 Hidden Items Checkbox

4. Copy and extract the **<terrain_database>.7z** into the **\shared** folder located at:
   C:\ProgramData\ARES\terrain_databases\shared
   Note: Once the terrain database is extracted, "glb" and "webveritas" folders will appear (see Figure 5).

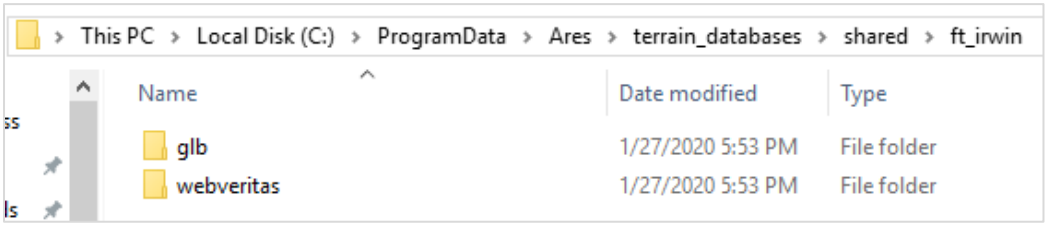

Figure 5 \shared Folder

The terrain data will now be available to use in the BVI XR and WTP when loading a scenario using the specified terrain region.

2.3 CONFIGURE THE WIRELESS ROUTER

BVI utilizes a wireless network to handle communications with mobile devices used to build BVI scenarios. Note that the router is not used to provide internet connections to attached devices.

If the ASUS RT-AC66u router is being used, follow the steps outlined in the wireless router's manual (pages 13-23) to properly configure the router for use with the BVI software and mobile application.

If the ASUS RT-AC66u router is *not* being used, ensure the following:

- Router is configured in wireless router mode and not as an access point.
- Router uses a DHCP server.
- Router is not assigning static IPs to attached devices.
- It is possible to use static IPs with BVI if it is necessary for the network, but extra steps must be taken to ensure that the mobile devices and the BVI computer are operating on the same subnet.

2.4 CONNECT A MOBILE DEVICE

An Android-compatible Mobile Tactical Planner (MTP) application allows users to create and interact with scenarios in the same way as is currently being done with terrain kits (i.e., notecards, yarn, sticks, etc.). Any Android tablet running Android 5.0 (Lollipop) or later is sufficient.

Note: Proceed only after the BVI software is installed and running and the wireless router is configured.

2.4.1 DOWNLOAD MOBILE TACTICAL PLANNER APPLICATION

To download the Mobile Tactical Planner application:

1. Ensure that the mobile device is connected to the BVI wireless network (the same wireless network the BVI computer is connected to).

   Note: The wireless network for each table is different; if the network is unknown, contact the local system administrator or email bvi-team@dignitastech.com.

2. Obtain the IP address of the BVI computer:
   a. Press **Windows Key + R** to launch the Windows run command UI (see Figure 6):

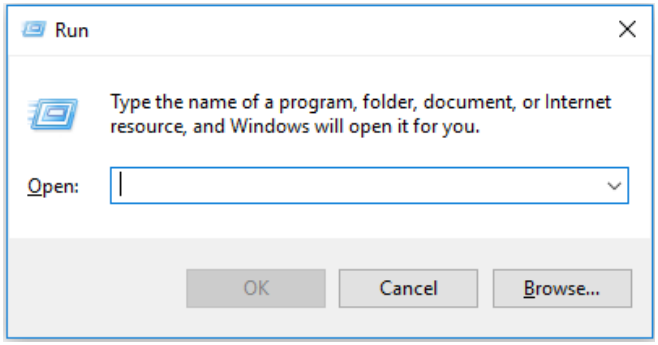

Figure 6 Windows Run Command UI

   b. Type **cmd** and press **OK**.
   c. In the Windows command prompt, type: **ipconfig**.
   d. Press **Enter** and note the **IPv4 Address** attribute (see Figure 7):

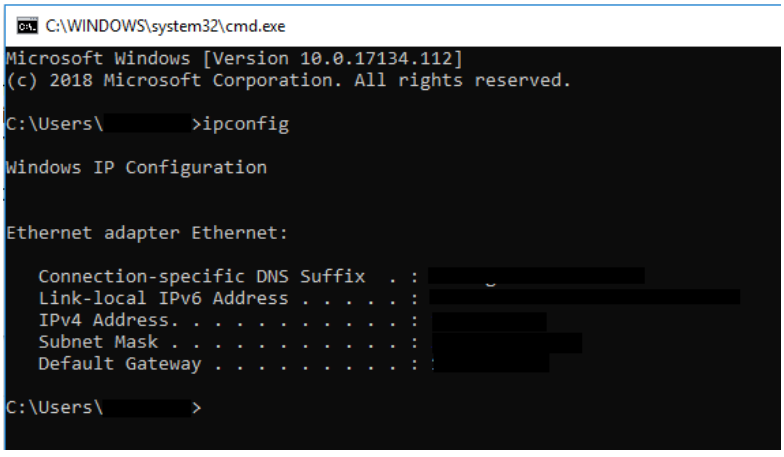

Figure 7 Windows Command Prompt displaying IP Address

3. Open a browser window on the Android tablet.
4. Type the following into the address bar (URL bar): **<IP address of BVI computer>:9080**.

For example, if the BVI computer's IP address is 192.168.1.1, use the browser to navigate to **192.168.1.1:9080**. The BVI Table Manager should load in the browser.

5. Tap on the BVI mobile application download link on the landing page of the BVI Table Manager labeled **Tactical Planner Android APK**. The BVI mobile application should proceed to download locally onto the mobile device.
6. At the bottom of the browser window, tap **Open** next to the APK download and then tap **Install**
   Note: If the APK fails to install, it may be necessary to modify the device settings to allow the installation of third-party applications before installing the BVI APK.
   a. On a new device, a notification may appear requiring a change to the device's security settings prior to allowing any apps outside of the Google Play store to be installed. Follow the steps below to allow applications from unknown sources:
      i. Click the link to go to the settings menu.
      ii. Select to **allow installation of apps from unknown sources**.
      Note: The actual text of this setting may vary depending on the model of the device.

BVI APK should now be successfully installed on the mobile device.

2.4.2 CONNECT DEVICE TO BVI

Before using the tablet to interact with BVI, it needs to be properly configured to connect to the local BVI computer (see previous Section 2.4.1). This section will assume that these steps have already been done.

To connect the device to BVI:

1. Launch the BVI app on the Android tablet.
2. Tap **Allow** for any permissions the application requests (if a permission pop-up appears).
3. Press the **Start** button on the bottom portion of the screen. The device will begin to search for any BVI tables that are within the local network.
   Note: It may take several seconds before any tables are located. Once one or more BVI tables are found, they will be displayed, along with their name.
4. Tap on the **thumbnail image** representing the desired table to select it.
5. To connect the tablet to the table, tap the **Connect** ( ) button on the top-right side of the window.

2.5 VIRTUAL REALITY (VR) SETUP

The HTC Vive and Oculus Quest were integrated with BVI to serve as a means for viewing BVI scenarios in 3D virtual reality space. This mode allows users to view terrain data and tactical units in a virtual setting while manipulating tactical symbols and viewing visual effects unique to VR.

2.5.1 HTC VIVE SETUP

The following sections detail the setup and configuration process for the HTC Vive to be used with the BVI system.

Note: If the HTC Vive system is already setup and configured, skip this Section 2.5.1.

2.5.1.1 SOFTWARE SETUP (HTC VIVE)

SteamVR is required to use the HTC Vive. To create a Steam account and download SteamVR, follow the steps below:

1. Create a free Steam account at https://store.steampowered.com/join/ (if you do not already have one).
2. Download the free Steam client by clicking the green **Install Steam** button at the top-right of the page (see Figure 8).

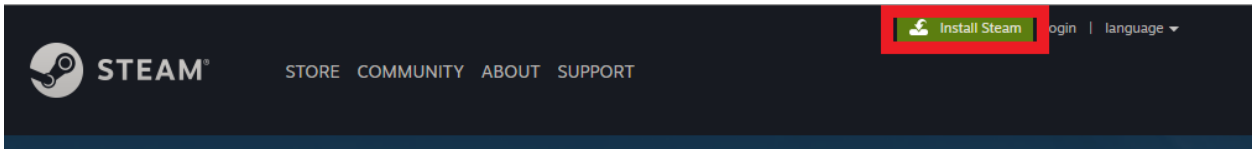

Figure 8 Steam Client Install Button

3. Install and launch **SteamVR** from the **Steam** store to complete configuration.

2.5.1.2 HARDWARE SETUP (HTC VIVE)

The following sections detail the hardware setup of the HTC Vive for the sand table and floor projection.

2.5.1.2.1 HARDWARE SETUP FOR SAND TABLE

1. Mount the two Vive sensors onto their sensor stands.
   Note: These are separate camera stands that do not come packaged in a retail Vive box.
2. Place the Vive stands behind the sand table at the relative locations (see Figure 9). Angle the sensors slightly inward as indicated by the red arrows.

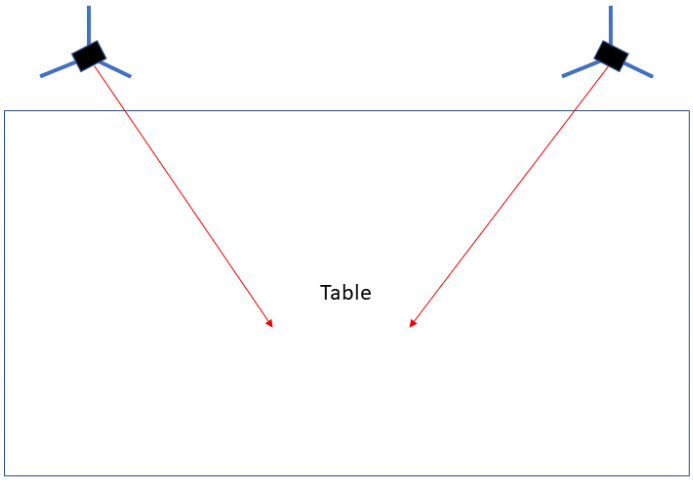

Figure 9 Vive Sensor Stand Placement and Orientation

3. Use the supplied power cables to power each sensor on.
   Note: If using version 2 of the sensors, steps 4 and 5 do not apply.
4. Use the supplied Vive sync cable to connect the two sensors to one another.
5. Push the mode buttons on the back of each sensor so that the left sensor reads **A**, and the right sensor reads **B**. Sensor lights should now be solid green.

2.5.1.2.2 HARDWARE SETUP FOR FLOOR PROJECTION

1. Mount the two Vive sensors onto their sensor stands.
   Note: These are separate camera stands that do not come packaged in a retail Vive box.
2. Place the Vive stands diagonal from one another at opposite corners of the floor space at the relative location (see Figure 10). Angle the sensors toward each other as indicated by the red arrows.

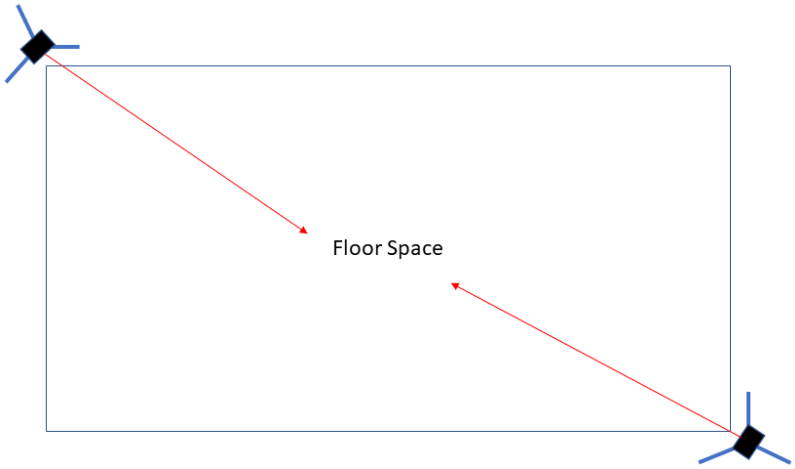

Figure 10 Vive Sensor Stand Placement and Orientation

3. Use the supplied power cables to power each sensor on.
   Note: If using version 2 of the sensors, step 4 does not apply.
4. Push the mode buttons on the back of each sensor so that one sensor reads **B,** and the other sensor reads **C**. Sensor lights should now be solid green.

2.5.1.2.3 HEADSET SETUP (HTC VIVE)

To setup and configure the headset for the Vive:

1. Connect Vive Link Box to the BVI computer:
   a. Verify that the following components are included with the Vive Link Box (see Figure 11):

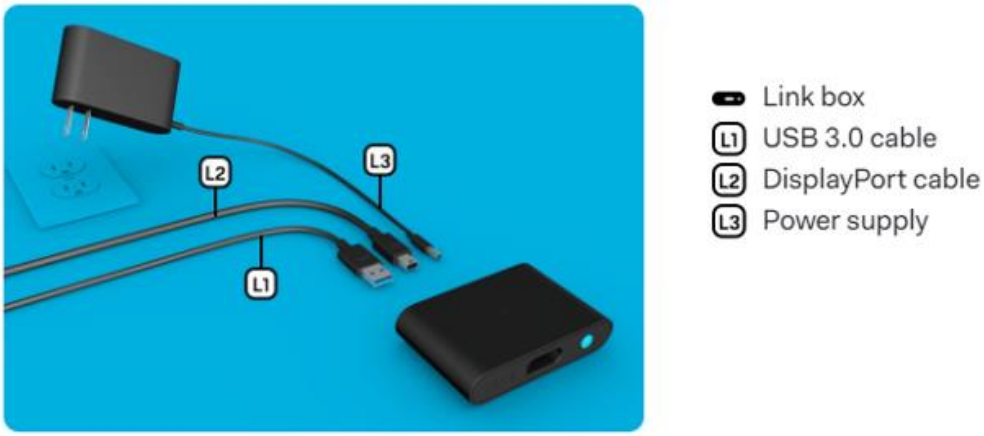

Figure 11 Link Box Components (HTC Vive)

   b. Connect the USB 3.0 cable (L1), DisplayPort cable (L2), and power cable (L3) to the Link Box and to a power outlet (see Figure 12).

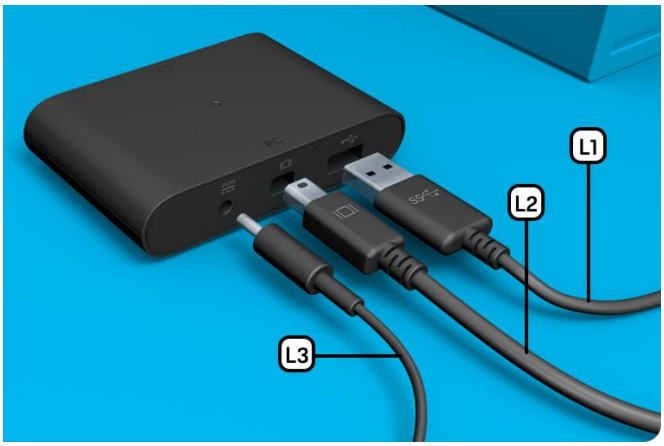

Figure 12 Connect Cables to Link Box (HTC Vive)

   c. Connect the USB 3.0 cable (L1) to a USB port on the BVI computer.
   d. Connect the DisplayPort cable (L2) to DisplayPort slot on the BVI computer (see Figure 13).
   Note: The DisplayPort cable must connect to the same graphics card that is connected to your monitor.

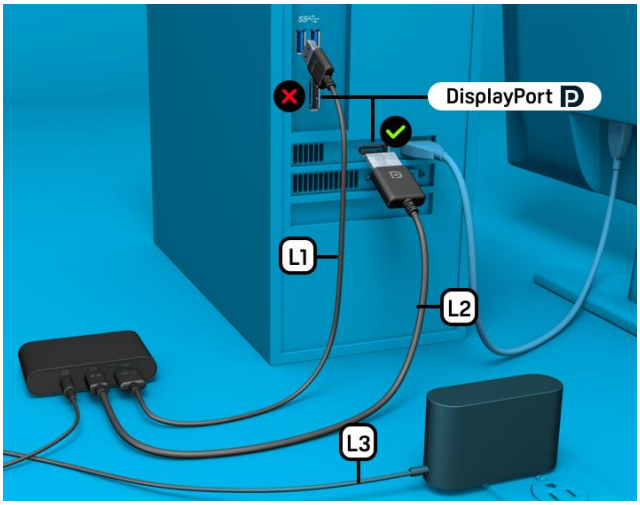

Figure 13 Connect Link Box to BVI computer

e. Allow the BVI computer to install all required drivers once all cables are connected.

2. Connect Vive headset to the Link Box:
   a. Plug the headset cable into the Link Box (see Figure 14).
   b. Press the power button on the Link Box (blue button). The Link Box LED light will turn green. Drivers will be installed once the headset is connected.

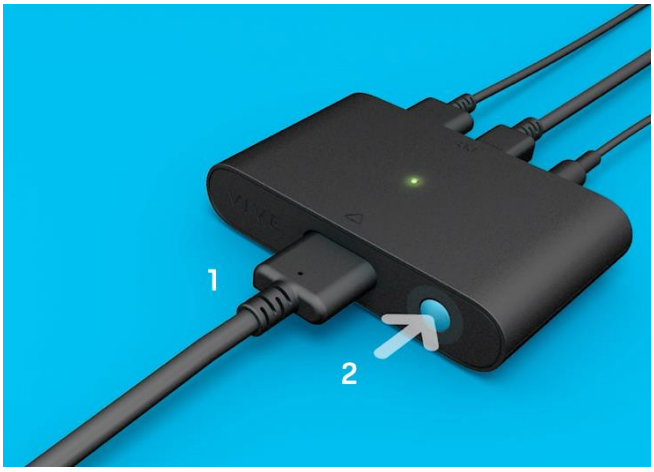

Figure 14 Connect Headset to Link Box (HTC Vive)

3. Launch Steam VR by clicking on the **VR** button that appears in the top-right corner of the Steam client.

4. Power on the controllers by pressing the **System** button ( ) on each controller. Controllers should auto-pair to the headset when turned on for the first time.
   LED Status Lights:

   - **Green:** On and Ready
   - **Blinking Red:** Low Battery
   - **Blinking Blue:** Pairing Mode
   - **Solid Blue:** Searching for connection

   If the controllers display gray icons in the SteamVR Status window, right-click on the gray controller icon, select **Pair Controller**, and follow instructions.

5. Run the SteamVR Room Setup from the SteamVR Status panel and set up Vive for **Standing Only** mode.

2.5.1.3 CONFIGURING MODEL SERVER FOR VIVE (IF PROVIDED)

To configure 3D models for the HTC Vive, follow the steps below:
Note: if the models.7z file has already been extracted, skip Step 1.

1. Copy and extract the **models.7z** file to: **C:\ProgramData\Ares.**
    a. If the **\ProgramData** folder is not visible, follow the steps below:
        i. In the file explorer, select **View**. A toolbar will appear.
        ii. Check the **Hidden Items** box. The **\ProgramData** folder will appear.
2. Launch **BVI XR v0.9.4** desktop shortcut on the BVI computer (see Figure 15).

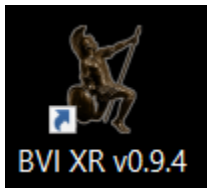

Figure 15 BVI XR Desktop Shortcut

3. In a browser, navigate to: **<IP address of the machine running BVI>:4321**.
4. Set the **model server** IP address:
    a. Expand the **Scenario** setting by selecting the arrow to its left (see Figure 16):

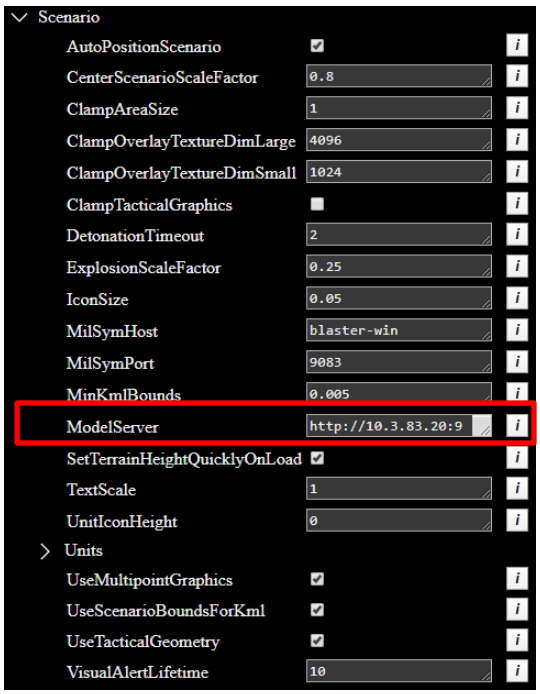

Figure 16 Scenario Settings in BVI XR Vive Interface

    b. Change the IP address of the **ModelServer** value to:
    http://<IP Address of machine running BVI>:9080/services/models/glb/2.0/models/
    c. Press **Enter**.

3D models and the model server for the HTC Vive are now configured.

2.5.2 OCULUS QUEST 2/QUEST PRO SETUP

The following sections detail the setup and configuration process for the Oculus Quest 2/Quest Pro to be used with the BVI system. The Oculus Quest 1 is no longer supported with BVI v0.9.3 or later.

2.5.2.1 HARDWARE SETUP (OCULUS QUEST 2/QUEST PRO)

To setup and configure the Oculus Quest 2/Quest headset and controllers:

1. Power on the Oculus Quest headset.
2. Follow the manufacturer provided instructions for initial startup.
3. Continue through the on-screen instructions to pair the Oculus controllers with the headset.

2.5.2.1 SOFTWARE SETUP (OCULUS QUEST 2/QUEST PRO)

The following sections provide instructions for installing and configuring the BVI software onto the Oculus Quest 2/Quest Pro.

2.5.2.1.1 INSTALLING BVI XR QUEST APP THROUGH ANDROID TOOLS

To install the BVI XR application for the Oculus Quest 2/Quest Pro:

1. Connect the Quest to the same Wi-Fi network as the dedicated BVI machine.
2. Download and connect the Oculus application to the Quest headset:
    a. On a phone or tablet, download the **Oculus** app:
        i. Open the **Play Store** or the dedicated application store on your device.
        ii. Search for **Oculus** in the search bar and select the app.
        iii. Select **Install** to download and install the app to your device.
    b. Create a free Oculus account if one does not already exist.
    c. Follow the on-screen instructions to connect your device to the Quest headset.
3. Enable **Developer Mode** for the Quest:
    a. Select **Menu** from the bottom ribbon.
    b. Select **Devices** (see Figure 17).

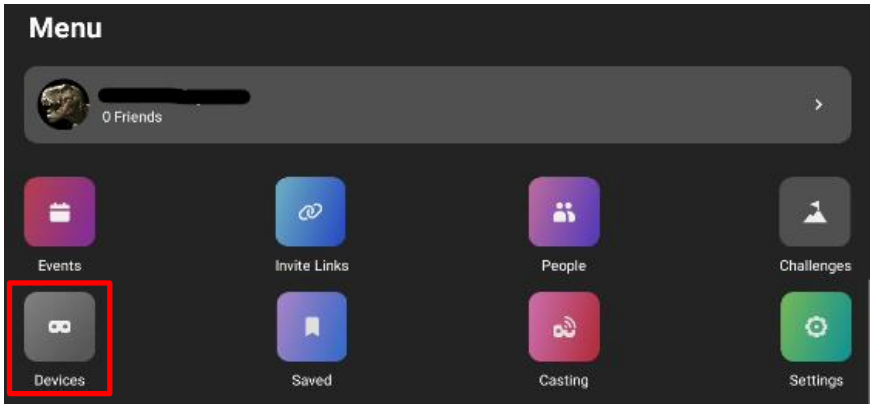

Figure 17 Oculus App Menu

    c. Press the drop-down arrow to show the available Oculus Quest headsets (see Figure 18).

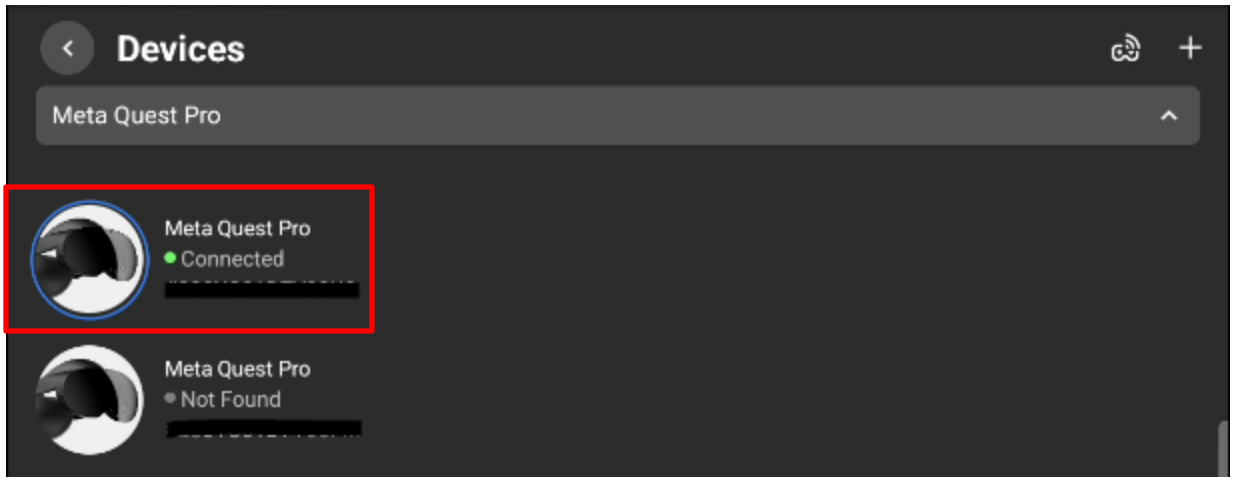

Figure 18 Available Quest Headsets

d. Verify that the headset is paired to the device by observing the device connected status.
e. Set the Quest headset to Developer Mode:
    i. Under **Headset Settings**, tap on **Developer Mode**
    ii. **Select the toggle** to turn on Developer Mode

4. Connect the Oculus Quest to the BVI PC using a USB-C cable:
    a. Click through any prompts about setup
    b. If prompted for **Allow USB Debugging**, check **Always allow from this computer** and select **OK**
    c. If prompted for using **Oculus Link**, select **Not Now**
    d. If prompted for transferring data, select **Yes**
5. Install the Oculus Quest APK:
    a. Double-click the **BVI Android Tools <version>** shortcut on the desktop to open the **\ares.android_utils** folder
    b. Open a file explorer and navigate to: **C:\Program Files\ARES\Ares-<version>\ares.xr\Quest**
    c. Click and drag the **AresXR_<version>_Quest.apk** onto the **install_apk.bat** file (see Figure 19)

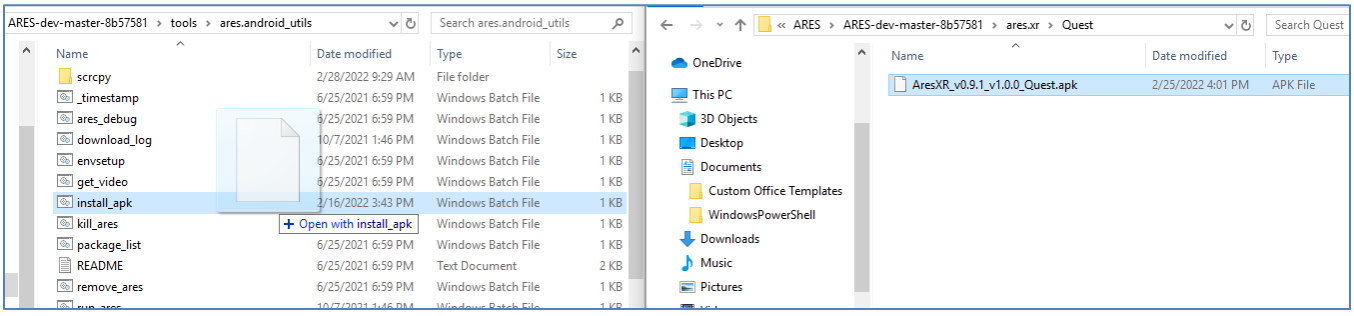

Figure 19 Install Oculus Quest APK

The BVI XR application is now installed on the Oculus Quest 2/Quest Pro.

2.5.2.1.2 INSTALLING BVI XR QUEST APP THROUGH DEVELOPER HUB

To install BVI XR through the Meta Quest Developer Hub:

1. Install **Meta Quest Developer Hub (MQDH)** on the BVI computer (https://developer.oculus.com/meta-quest-developer-hub/?intern_source=devblog&intern_content=meta-quest-developer-hub-mqdh-3-2)
2. Follow **steps 1-4** in the section above (*Section 2.5.2.1.1*)
3. Open **MQDH**
4. Select **Continue** and log in with the **same Meta account** used to setup the Oculus Quest
    a. When a prompt appears to open the odh link with Meta Quest Developer Hub, check the box next to **Always allow** and select **Open Link**.
5. Select **Continue**.
6. In the left menu, select **Device Manager**.
7. In the top right menu, select the device drop-down menu and choose **the Oculus Quest device**. Once the device has been selected, it will appear as Active.

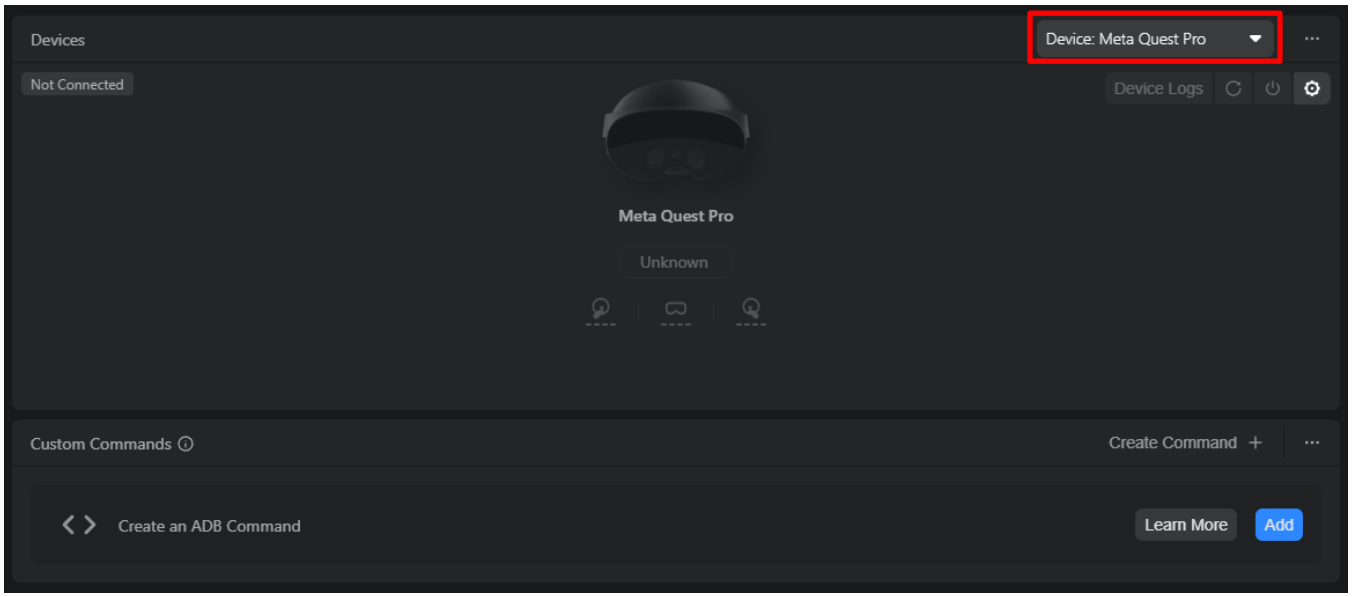

Figure 20 Device Drop-Down Menu

8. Select **Add Build**

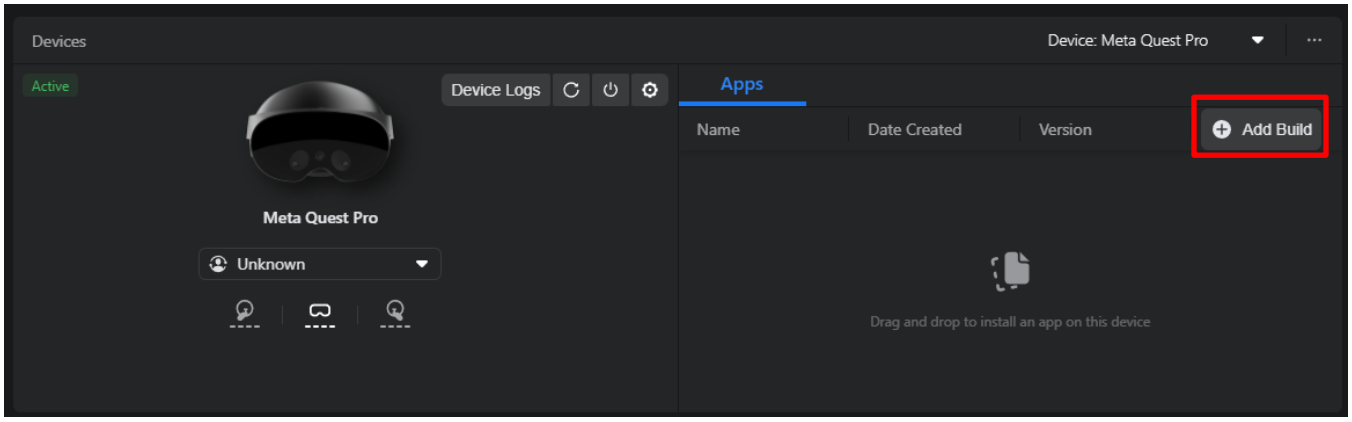

Figure 21 Add Build Button

9. In the File Explorer, navigate to the **Quest.apk** file (C:\Program Files\ARES\<BVI_Build>\ares.xr\Quest) Open the **Quest.apk** file.

   The BVI XR application is now installed on the Oculus Quest 2/Quest Pro.

2.5.2.1.3 CONFIGURING OCULUS QUEST 2/QUEST PRO FOR BVI

To configure the Oculus Quest2/Quest Pro for BVI, follow the steps below:

1. Obtain the IP address of the computer running the BVI software:
   a. Select the **Windows** logo ( ) or press the **Windows** key
   b. Type **cmd, and press enter** to open a command prompt
   c. In the command prompt, type: **ipconfig** and select the enter key
   d. Note the **IPv4 address** of the BVI computer
2. Obtain the IP address of the Oculus Quest headset:
   a. Double-click the **BVI Android Tools <version>** shortcut on the computers desktop to open the **\ares.android_utils** folder.
   b. Double-click the **wifi_status.bat** file (see Figure 22). A command prompt will run.

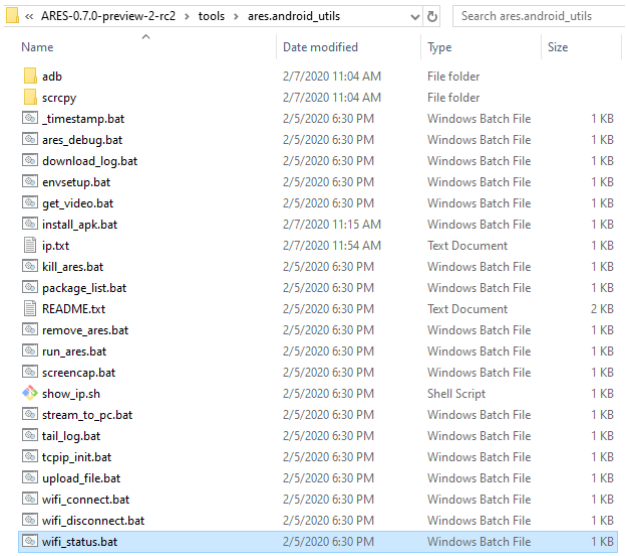

Figure 22 wifi_status.bat File

   c. Note the IP address that appears in the command prompt. In this example the IP address is 10.3.83.7 (see Figure 23).

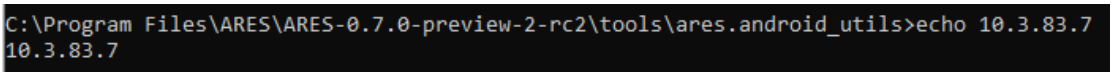

Figure 23 IP Address of Quest Headset

   d. If the command prompt does not display the device's IP address, then follow the steps below to obtain it manually:
      i. In the headset, select **Quick Settings** (see Figure 24.)

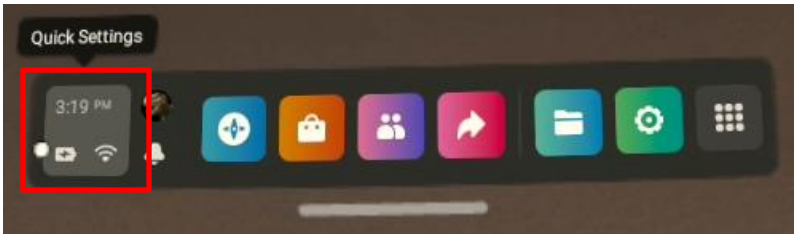

Figure 24 Oculus Quest Menu

ii. Select **Wi-Fi** and select the device's connected Wi-Fi (see Figure 25).

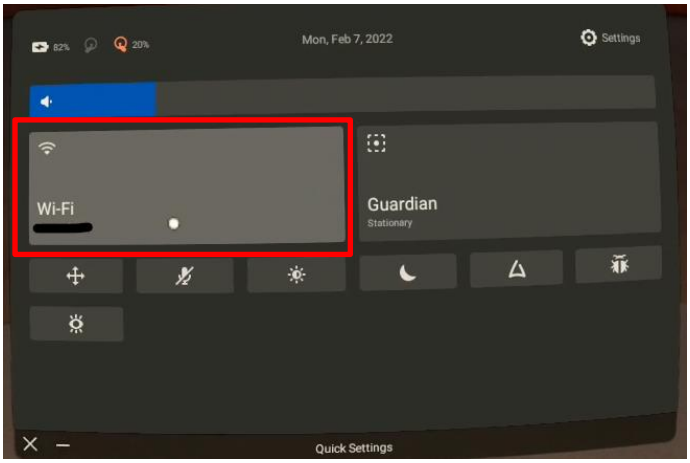

Figure 25 Wi-Fi Panel in 'Quick Settings'

iii. Scroll to the end of the page and select **Advanced Settings**

iv. Note the IP address displayed at the bottom

3. Launch the BVI XR app:

   a. In the Quest, point the cursor at **Apps** and press the trigger on the controller to select it (see Figure 26).

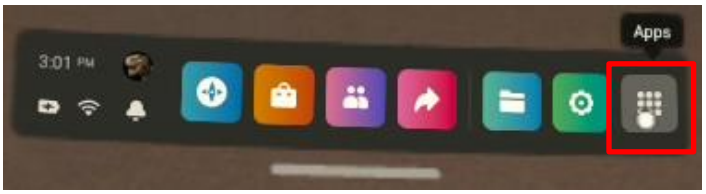

Figure 26 Apps Menu in Quest

   b. Select **Unknown Sources** from the drop-down menu.

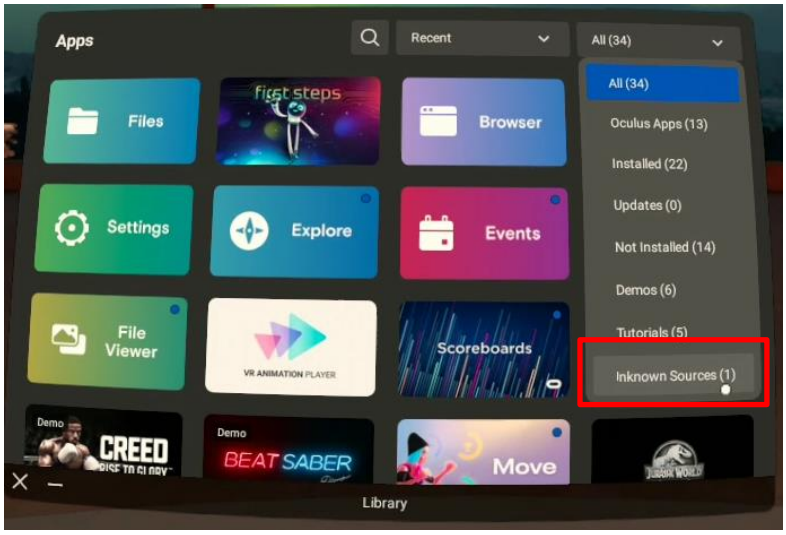

Figure 27 'Unknown Sources' Tab

c. Select the **BVI XR** app (see Figure 28). The application begins to load, and the virtual room will appear.

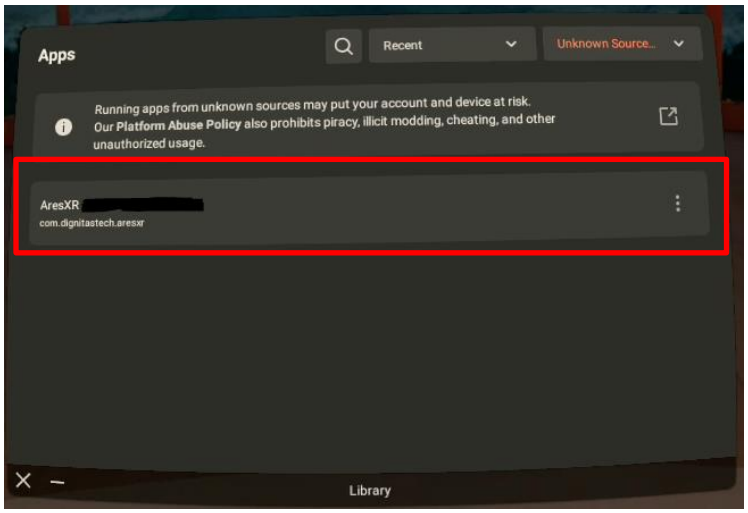

Figure 28 BVI XR Application in Quest

4. Open the Oculus Quest preferences UI:
   a. On the BVI machine, open a browser and navigate to: **<IP Address of the Oculus Quest>:4321**
   b. The Oculus Quest preferences UI will open and look similar to the following (see Figure 29):

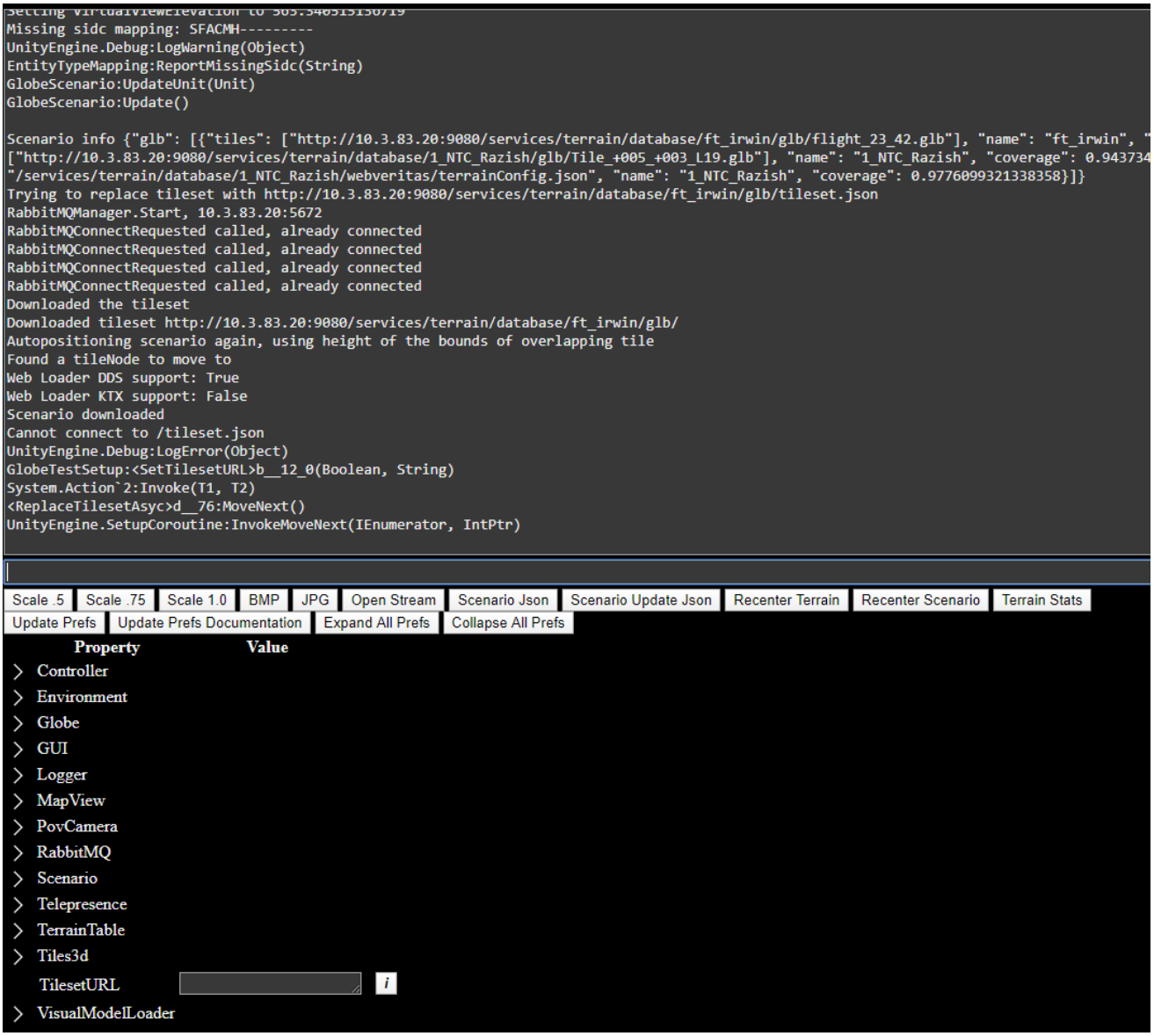

Figure 29 BVI XR Preferences UI - Oculus Quest

5. Set the **RabbitMQ** IP address:
    a. Expand the **RabbitMQ** setting by selecting the drop-down arrow to its left (see Figure 30).

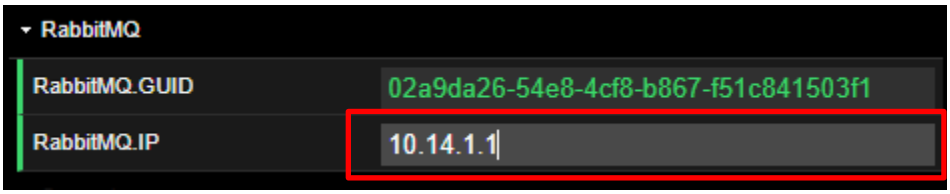

Figure 30 RabbitMQ IP Address Change

    b. Change the IP address to the IP address of the machine running BVI.
    c. Press **Enter**.
6. Set the **milsym** server:
    a. Navigate to and expand the **Scenario** settings by selecting the drop-down arrow to its left (see Figure 31).

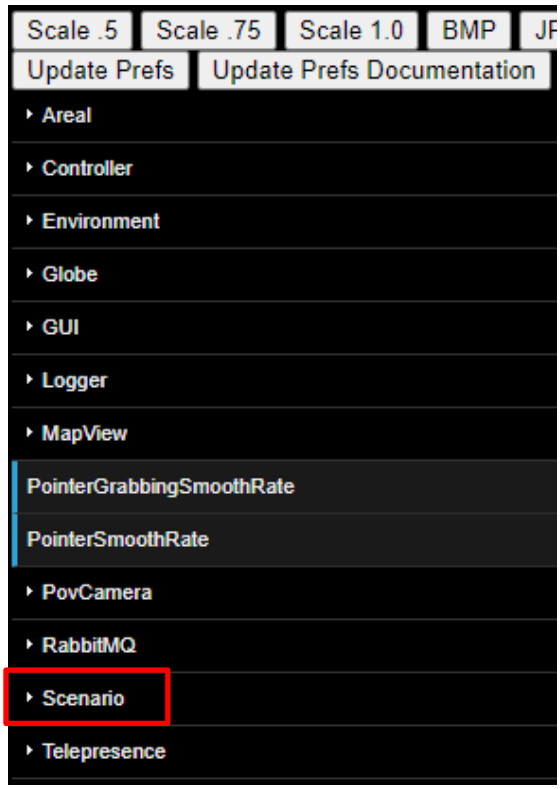

Figure 31 Scenario Settings

b. Change the IP address of the **MilSymHost** to the IP address of the machine running BVI (see Figure 32):

Figure 32 MilSymHost and MilSymPort Fields

c. Set the **MilSymPort** to **9080**
d. Press **Enter**.

The Oculus Quest is now ready to be used in conjunction with the BVI system.

2.5.2.2 CONFIGURING MODELS FOR OCULUS QUEST (IF PROVIDED)

To configure 3D models for the Oculus Quest, follow the steps below:

Note: if the models.7z file has already been extracted, skip Step 1.

1. Copy and extract the **models.7z** file to: **C:\ProgramData\Ares.**
    a. If the **\ProgramData** folder is not visible, follow the steps below:
        i. In the file explorer, select **View**. A toolbar will appear.
        ii. Check the **Hidden Items** box. The **\ProgramData** folder will appear.
2. Open a browser and navigate to the Quest preferences UI: **<IP Address of the Oculus Quest>:4321**
   Note: BVI XR must be running to access the Oculus Quest preferences UI.
3. Set the **model server**:
    a. Expand the **Scenario** settings by selecting the drop-down arrow to its left (see Figure 33).

Figure 33 Scenario Settings

    b. Change the IP address of the **ModelServer** to **http://<IP address of machine running BVI>:9080/services/models/glb/2.0/models/** (see Figure 34):

Figure 34 Setting ModelServer for Oculus Quest

    c. Press **Enter**.

This completes the installation and configuration for the Oculus Quest devices, terrains, symbols, and 3D models can now be viewed through the BVI XR application. The 3D models and the model server are now configured for the Oculus Quest and ready to be used in BVI XR.

2.6 AUGMENTED REALITY (AR) SETUP

The Microsoft HoloLens 2 AR headset and the Magic Leap were integrated with BVI to serve as a means for viewing BVI scenarios in 3D augmented reality space. This mode allows users to view terrain data and tactical units as a 3D hologram projection onto real-world objects and spaces. For example, a HoloLens or Magic Leap user can place the current configuration of the sand table/floor as a hologram on top of a conference table and walk around and interact with units in the scenario.
Note: The Magic Leap is not supported with BVI v0.9.4. Future releasees of BVI will integrate the Magic Leap 2.

2.6.1 BVI HOLOLENS 2 SETUP

The following sections provide instructions on installing the BVI XR app and configuring the HoloLens 2 for use with the BVI system.

2.6.1.1 OBTAINING HOLOLENS IP ADDRESS

To obtain the HoloLens 2 IP address:

1. Power on the HoloLens 2 by pressing the power button on the back right-side of the headband (see Figure 35):

Figure 35 Microsoft HoloLens 2

2. Put the HoloLens on and adjust the overhead strap if necessary (see Figure 36).

Figure 36 Microsoft HoloLens 2 - Adjust Overhead Strap

3. Tighten the headband using the fit-adjustment spinner located on the back of the headset.
4. Open the menu using the **Open Start Menu** gesture. Hold out one hand with the palm facing up and look at your wrist. Using the index finger of your other hand, touch the holographic Windows logo that appears (see Figure 37).

Figure 37 HoloLens 2 Menu Using "Open Start Menu" Gesture

5. Use the **Air Tap** gesture to click and select objects in the HoloLens 2 (see Figure 38):

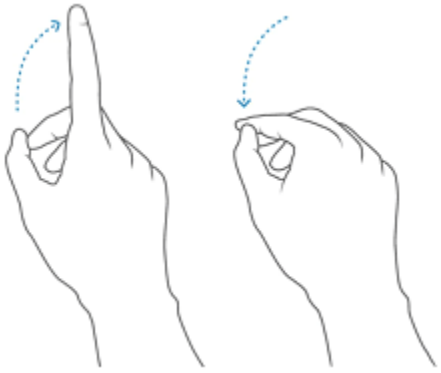

Figure 38 HoloLens 2 "Air Tap" Hand Gesture

6. Click on **Settings** -> **Network and Internet** using the **Air Tap** hand gesture.
7. Scroll to the bottom of the **Wi-Fi** networks list by tapping, holding, and pulling upward.
8. Tap on **Adapter Properties** at the bottom of the **Wi-Fi** networks list.
9. Note the HoloLens **IPv4 address** on display.

2.6.1.2 INSTALLING BVI XR HOLOLENS APP

The BVI XR HoloLens app is required to use the HoloLens 2 with an associated BVI computer running BVI. To install BVI XR onto the HoloLens 2:

1. Ensure BVI is installed on the dedicated BVI computer.
2. Navigate and log into the HoloLens 2 interface:
    a. Open a new browser tab (e.g., Chrome, Internet Explorer) on the BVI computer and type in the **IP address of the HoloLens 2**
    b. Click to proceed through the unsecure site (i.e., advance through the SSL certificate error)
3. On the Windows Device Portal HoloLens dashboard in the browser, navigate to **Views** -> **Apps**.
4. If applicable, uninstall previous BVI XR HoloLens app(s):
    a. At the top of the screen under **Installed apps**, select the **BVI XR <version>** app from the drop-down menu.
    b. Click **Remove** and follow the prompts. Previous BVI XR app will be uninstalled.
5. Deploy the BVI XR app:
    a. At the top of the screen under **Deploy apps**, check **allow me to select framework packages**
    b. Select **Choose File** and navigate to:
    C:\Program Files\ARES\ARES-v0.9.4\ares.xr\HoloLens2\Dependencies\ARM64
    c. Select the **AresXR v0.9.4_1.0.1.0_ARM64.appx** file (see Figure 39):

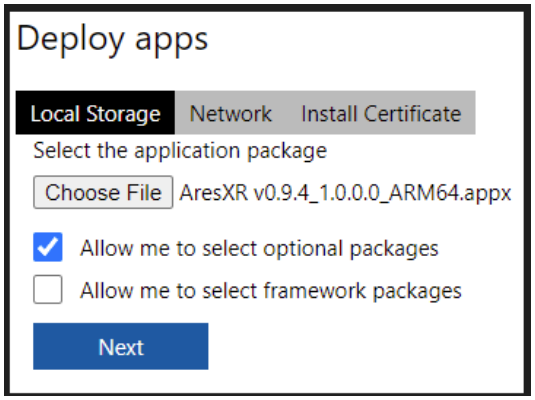

Figure 39 Deploy Apps in HoloLens 2

    d. Click **Next** to proceed to dependencies selection.
    e. Select **Choose File** and navigate to:
    C:\Program Files\ARES\ARES-v0.9.4\ares.xr\HoloLens2\Dependencies\ARM64
    f. Select the **Microsoft.VCLibs.ARM64.14.00.appx** file (see Figure 40):

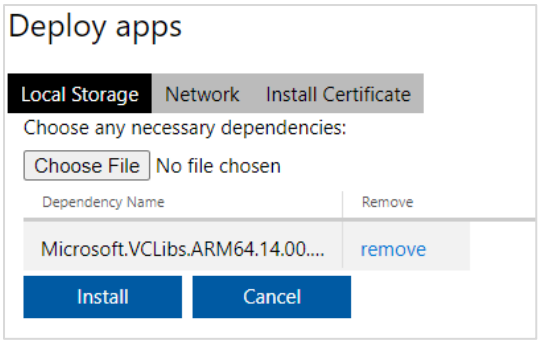

Figure 40 HoloLens 2 App Dependencies

    g. Click **Install**.

The BVI XR HoloLens app will begin the installation process.

2.6.1.3 CONFIGURING HOLOLENS FOR BVI

The following steps outline the process for creating a connection between the HoloLens 2 and BVI computer:

1. Obtain the IP address of the computer running the BVI software:
    a. Select the **Windows** logo or press the **Windows** key.
    b. Type **cmd** to open a command prompt.
    c. Type **ipconfig** in the command prompt.
    d. Note the **IPv4 address** of the BVI computer.
2. Launch the BVI XR HoloLens application:
    a. Ensure that the BVI software is running.
    b. In the HoloLens, open the menu using the **Open Start Menu** hand gesture (see Figure 41):

Figure 41 HoloLens 2 Menu

3. Select **All Apps** by poking it with an index finger (see Figure 42).

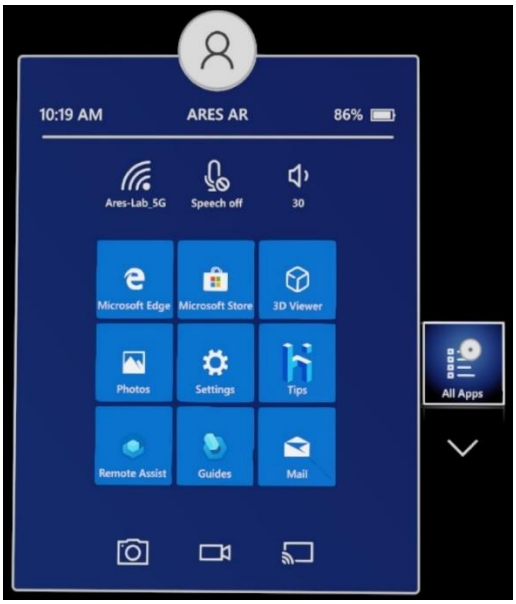

Figure 42 HoloLens 2 - "All Apps" Tile using "Poke" Gesture

4. Start the **BVI XR** app within the HoloLens 2 using **Poke** gesture (see Figure 43).

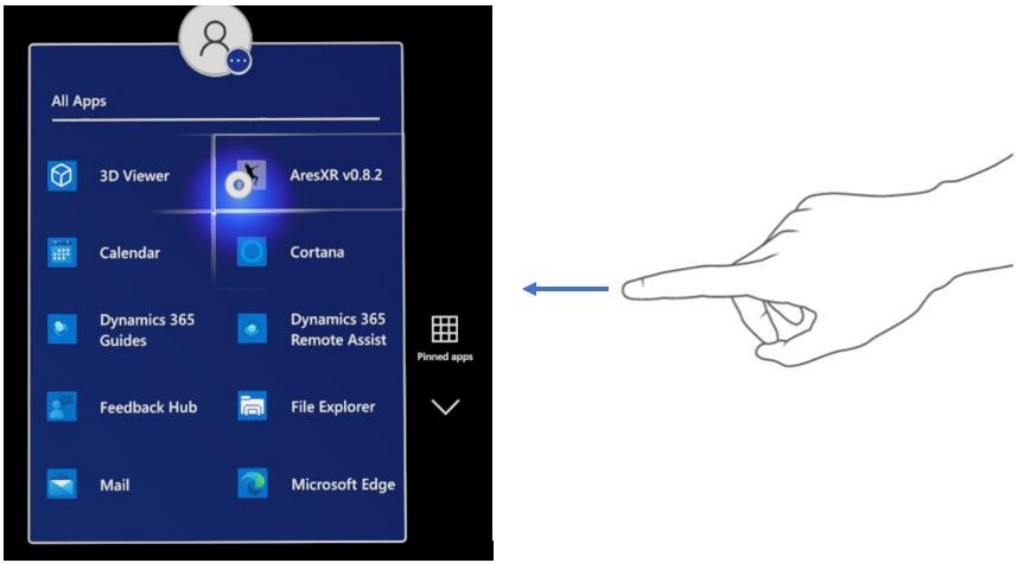

Figure 43 BVI XR App Selection in HoloLens 2

5. Navigate to the HoloLens interface:
    a. On the BVI PC, open a browser and navigate to: **<IP Address of the HoloLens>:4321**
    If the IP address of the HoloLens is unknown, refer to *Section 2.6.1.1*.
    b. Click to proceed through the unsecure site (i.e., advance through the SSL certificate error). A popup login window will appear behind the screen prompting for credentials. The BVI HoloLens interface will look similar to the interface below (see Figure 44):

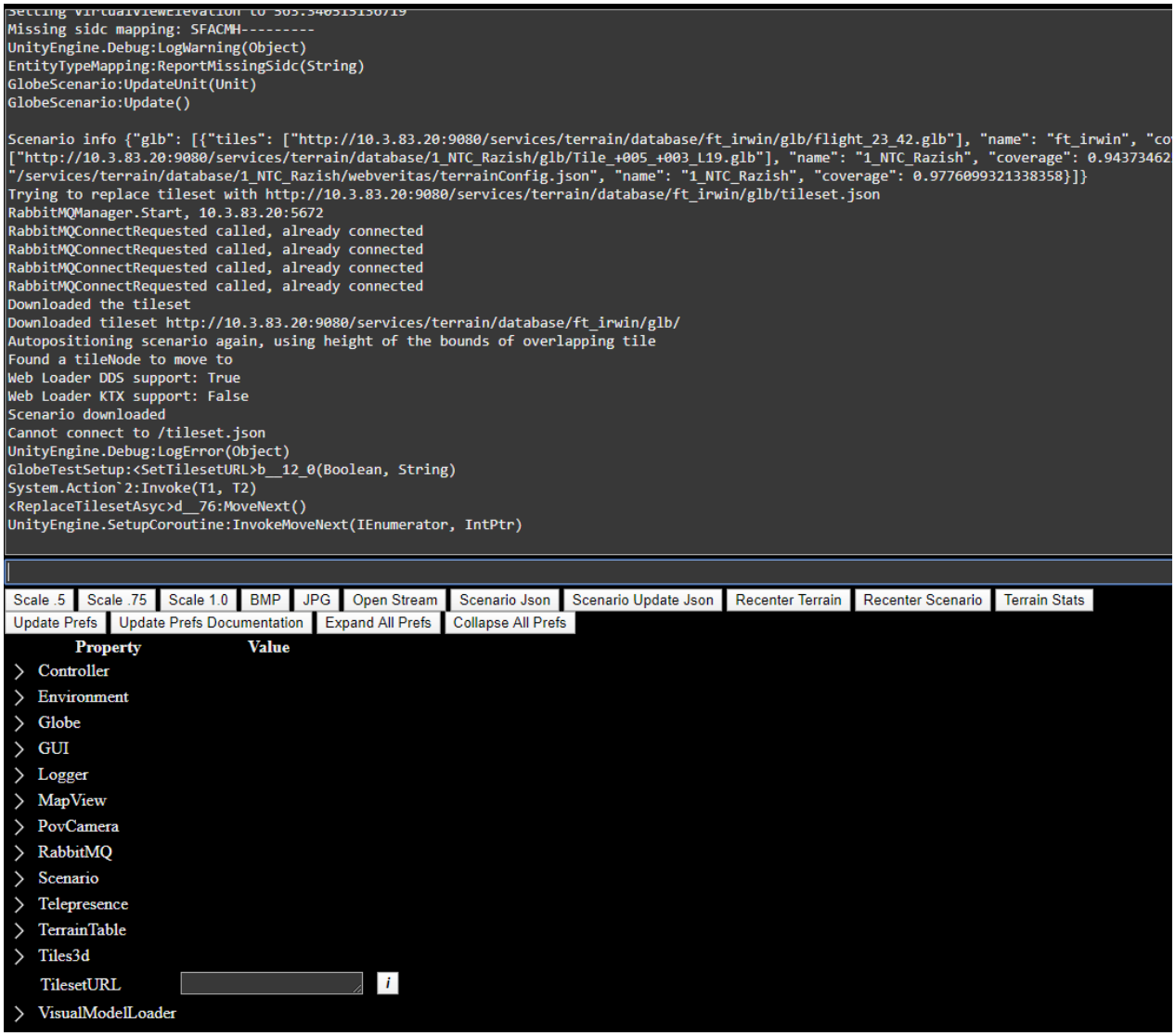

Figure 44 BVI HoloLens 2 Interface

6. Set the **RabbitMQ** IP address:
    a. Expand the **RabbitMQ** setting by selecting the arrow to its left (see Figure 45):

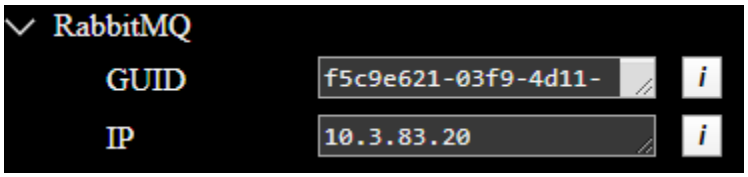

Figure 45 RabbitMQ IP Address Change

    b. Change the IP to the IP address of the machine running BVI obtained in Step 1.
    c. Press **Enter**.
7. Set the **Scenario.MilSymHost** server IP address:
    a. Expand the **Scenario** setting by selecting the arrow to its left.
    b. Change the IP to the IP address of the machine running BVI obtained in Step 1.
    c. Press **Enter**.
    d. Set the port to **9080**.

e. Press **Enter**.

The HoloLens 2 is now ready to be used in tandem with the BVI sand table/floor or as a standalone unit without a physical sand table or floor projection setup.

2.6.1.4 CONFIGURING 3D MODELS FOR HOLOLENS

To configure 3D models for the HoloLens 2, follow the steps below:

Note: if the models.7z file has already been extracted, skip Step 1.

1. Copy and extract the **models.7z** file to: **C:\ProgramData\Ares.**
   a. If the **\ProgramData** folder is not visible, follow the steps below:
      i. In the file explorer, select **View**. A toolbar will appear.
      ii. Check the **Hidden Items** box. The **\ProgramData** folder will appear.
2. Navigate to the BVI HoloLens interface:
   a. Open a browser and navigate to: **<IP Address of the HoloLens>:4321**
   Note: The BVI XR application must be running to access the URL.
      i. If the IP address of the HoloLens is unknown, refer to Section 2.6.1.1.
   b. Click to proceed through the unsecure site (i.e., advance through the SSL certificate error). A popup login window will appear behind the screen prompting for credentials:
   c. Enter the provided HoloLens username and password.
   Note: If the HoloLens credentials are unknown, contact bvi-team@dignitastechnologies.com
3. Set the **model server** IP address:
   a. Expand the **Scenario** setting by selecting the arrow to its left (see Figure 46):

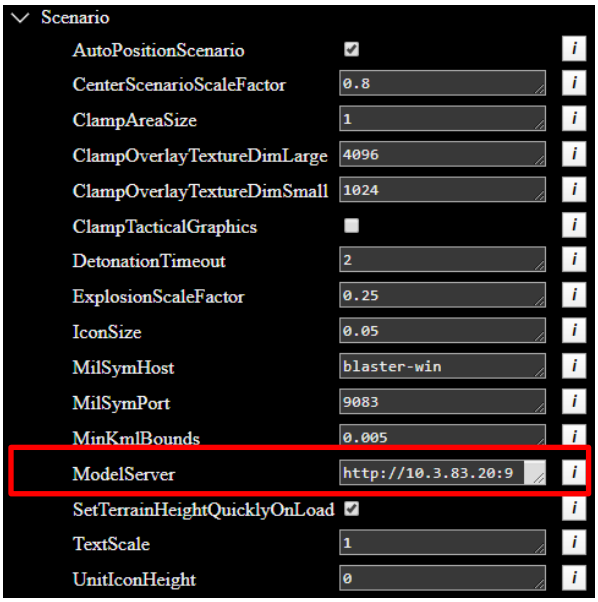

Figure 46 Scenario Settings in HoloLens 2 Interface

   b. Change the IP address of the **ModelServer** to:
   http://<IP address of machine running BVI>:9080/services/models/glb/2.0/models/
   c. Press **Enter**.

2.6.1.5 AUGMENTED FLOOR SETUP

To setup the Augmented Floor, follow the steps below:
Start BVI XR in the HoloLens 2 (refer to section 2.6.1.3).

1. Navigate to the HoloLens 2 interface:
    a. On the BVI PC, open a browser and navigate to: **<IP Address of the HoloLens>:4321**
        i. If the IP address of the HoloLens 2 is unknown, refer to Section 2.6.1.1.
2. Select **Expand All Prefs**.
3. Set the **Anchors.AzureAccount** preference to the **Azure Account Key**.
4. Set the **Environment.StartingARScene** preference to **AugmentedFloor** (see Figure 47).

Figure 47 Environment.StartingScene Preference

5. At the top of the debug menu, select the **Toggle AR Floor Placement** button (see Figure 48).

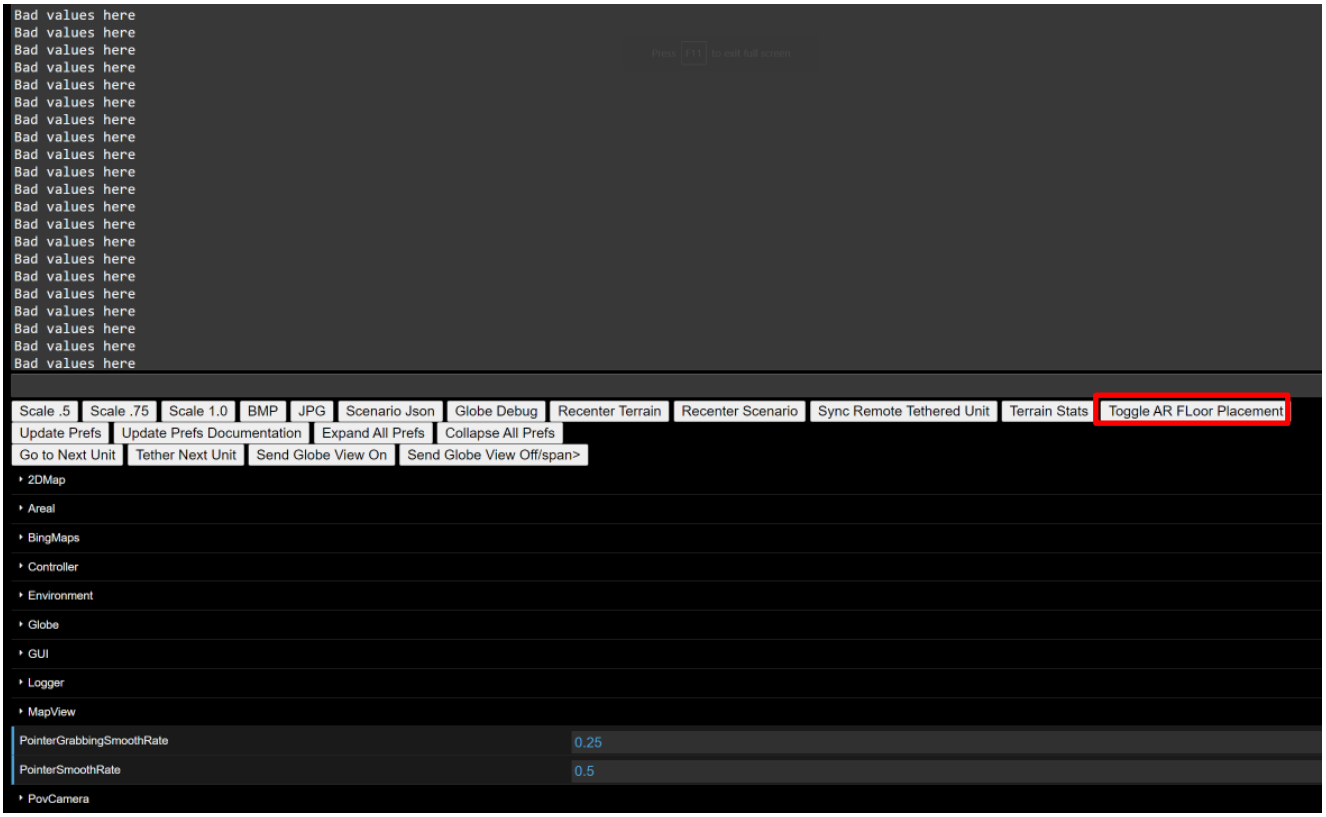

Figure 48 AR Floor Placement Button

6. Within the HoloLens 2, using the "Tap and Hold" gesture, set the bounds of the white box to roughly the size of the floor projection tiles.

   Tip: The Augmented Floor is set to a 16:9 ratio by default. Stand at a corner of the Floor Projection when lining up the Augmented Floor so that a whole line segment is in view.

7. Select the **Toggle AR Floor Placement** button again to set the Augmented Floor bounds in place.
   a. Once the bounds have been set, the bounds will be maintained when the BVI XR application is started again.
8. Select **Re-Center Scenario**.

2.6.2 BVI MAGIC LEAP SETUP

The following sections provide instructions on installing the BVI XR app and configuring the Magic Leap for use with the BVI system.

2.6.2.1 OBTAINING MAGIC LEAP IP ADDRESS

To obtain the Magic Leap IP address:

1. Powering on and wearing the Magic Leap headset:
   a. Power on the Magic Leap by pressing and holding the power button (see Figure 49). The Lightpack will power on and rainbow lights will circulate in the LED indicator:

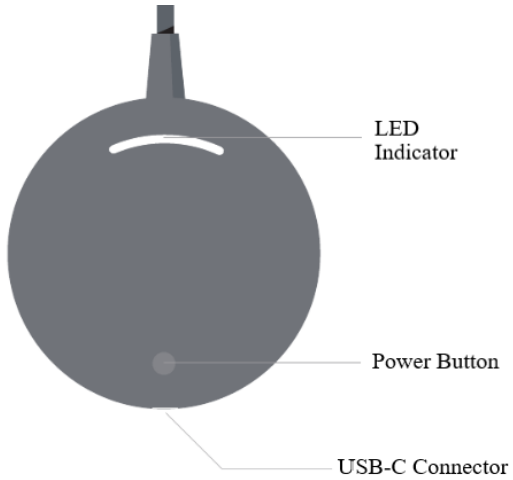

Figure 49 Magic Leap Lightpack Diagram

   b. Power on the Magic Leap controller by pressing and holding the **Home Button** (see Figure 50 Magic Leap Controller Diagram). The LED indicator surrounding the touchpad will light up.

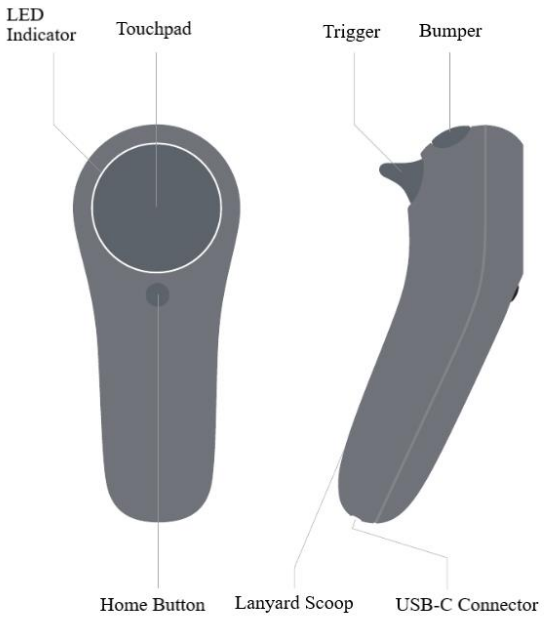

Figure 50 Magic Leap Controller Diagram

c. Attach the Lightpack to a pocket until it moves past the clip (see Figure 51).
Note: Do not put the Lightpack entirely into a pouch or pocket while in use. This can block the vents and reduce performance.

Figure 51 Lightpack Diagram Side View

d. Adjust the headset by holding the device near the back and stretching the band until it is wide enough for your head (see Figure 52).

Figure 52 Magic Leap Headset Adjustment

e. Rest the device around the widest part of your head and leave a gap between your ears and the headset.

2. In the application menu of the headset, select **Settings** at the top (gear icon) using the Magic Leap controller.
3. Select **Connectivity** and verify that the Magic Leap is connected to Wi-Fi.
4. Next to the connected Wi-Fi, select **Advanced** ('I' icon).
5. Note the Magic Leap **IPv4 Address**.

2.6.2.2 ESTABLISHING MAGIC LEAP CONNECTION TO BVI PC

To install BVI onto the Magic Leap, the Magic Leap must be connected wirelessly to the BVI PC. Follow the instructions below to connect the Magic Leap to the PC:

1. Connect the Magic Leap to the PC using a **USB-C to USB-A** cable or **USB-C to USB-C cable**.
2. Open a file explorer and navigate to the **MagicLeapTools** file path to access the **MagicLeapTools**.
3. Double-click **wifi_status.bat** file to test the connection:
    a. If **IpAddr** does not have an IP, set up Wi-Fi on the device, then run this command again.
    b. Check the **ml_ip.txt** file and ensure the IP address listed matches the one listed under **IpAddr** from the output above.
4. Double-click **wifi_connect.bat** to establish a wireless connection from the PC to the Magic Leap:
    a. A prompt for allowing for USB debugging may appear in the Magic Leap. If so, select **Allow.**
    b. Unplug the Magic Leap from the PC.
    c. Verify that the device can maintain a wireless connection to the PC by running **wifi_status.bat** again.

2.6.2.3 INSTALLING BVI XR MAGIC LEAP APP

To use the Magic Leap with the BVI system, the BVI XR app must be installed onto the device.
To install the BVI XR app onto the Magic Leap:

1. Ensure BVI is installed on the dedicated PC.
2. Set the Magic Leap into **Developer Mode**:
    a. In the Magic Leap menu, select **Settings** at the top (gear icon).
    b. Select **Device**, then select **Developer** on the left side menu.
    c. Toggle **Developer Mode** on.
3. In a File Explorer, open the **MagicLeapTools**.
4. Uninstall previous BVI XR Magic Leap app(s), if applicable:

a. In the **MagicLeapTools** file, select **remove_ares**.

5. Install the BVI XR app:
   a. Open the file location for BVI on the dedicated PC (**C:\Program Files\ARES\ARES-dev-master-<version>**).
   b. In a separate File Explorer, navigate to **\ares.xr\MagicLeap**"and locate the BVI XR ***.mpk** file: **com.dignitastech.aresxr.mpk**
   c. Click and drag the BVI XR ***.mpk** file to the **push_package.bat** file in the **MagicLeapTools**.

   The app is now installed and accessible through the Magic Leap home screen.

6. Grant **Local Area Network** permissions to access the BVI XR Magic Leap preferences UI:
   Note: Permission must be granted every time a build is installed on the Magic Leap.
   a. If the message is not seen, ensure that it is enabled in the **Privacy** settings:
      i. Select **Privacy** (see Figure 53).

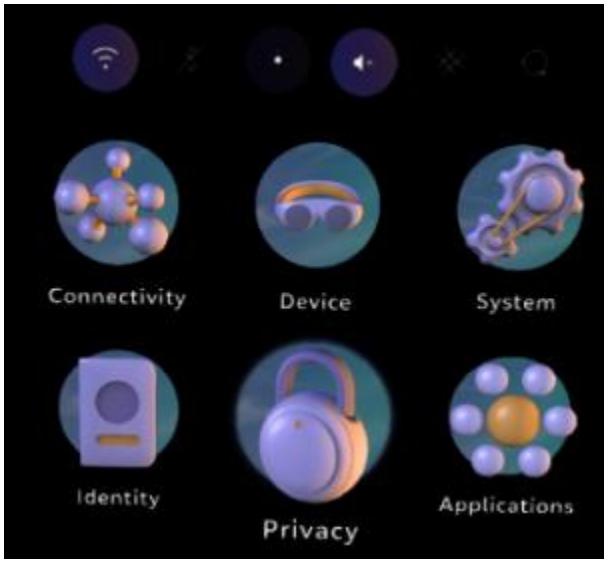

Figure 53 Settings Menu - Magic Leap

      ii. Select **View** under **Local Area Network** (see Figure 54).

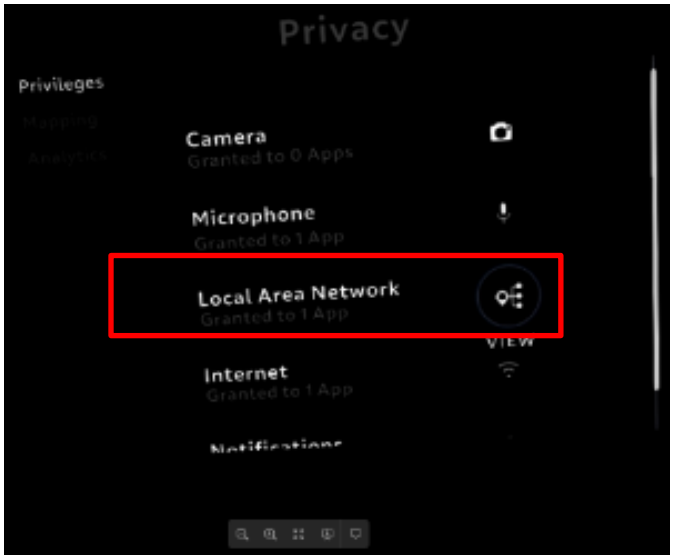

Figure 54 Privacy Settings - Magic Leap

iii. Verify that **AresScenario** is enabled under **APPS THAT USE LOCAL AREA NETWORK** (see Figure 55).

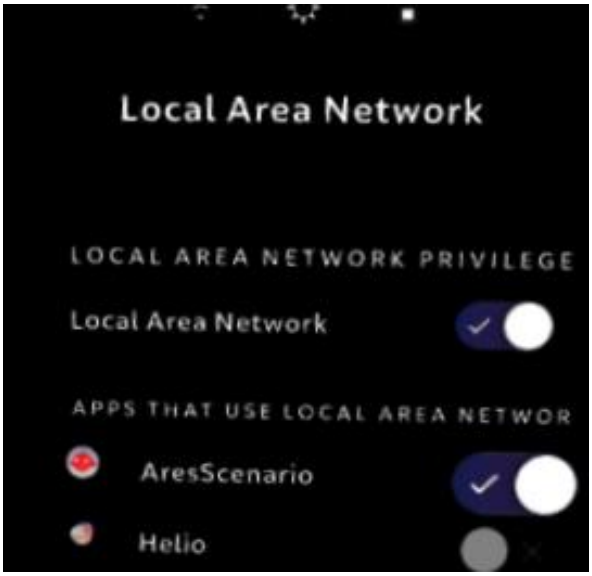

Figure 55 Local Area Network Verification - Magic Leap

BVI XR is now installed onto the Magic Leap.

2.6.2.4 INSTALLING BVI XR MAGIC LEAP APP

The following steps outline the process for configuring the Magic Leap for use with the BVI system:

1. Obtain the IP address of the BVI machine:
    a. Select the **Windows** logo or press the **Windows** key.
    b. Type **cmd** to open a command prompt.
    c. In the command prompt, type: **ipconfig**
    d. Note the **IPv4 address** of the BVI computer.
2. Launch the BVI XR Magic Leap application:
    a. Ensure that the BVI software is running on the BVI PC.
    b. In the Magic Leap, open the menu using the **Home Button** on the controller
    c. Select the **BVI XR application** by pressing the trigger.
        i. If the BVI XR application is not appearing in the menu, select **All Apps**.
3. Navigate to the Magic Leap preferences UI:
    a. On the BVI PC, open a browser and navigate to: **<IP Address of the Magic Leap>:4321**
        i. If the IP address of the Magic Leap is unknown, refer to Section 2.6.2.1.
    b. Click to proceed through the unsecure site (i.e., advance through the SSL certificate error). A popup login window will appear behind the screen prompting for credentials.
    c. The BVI Magic Leap preferences UI will look similar to the interface below in Figure 56:

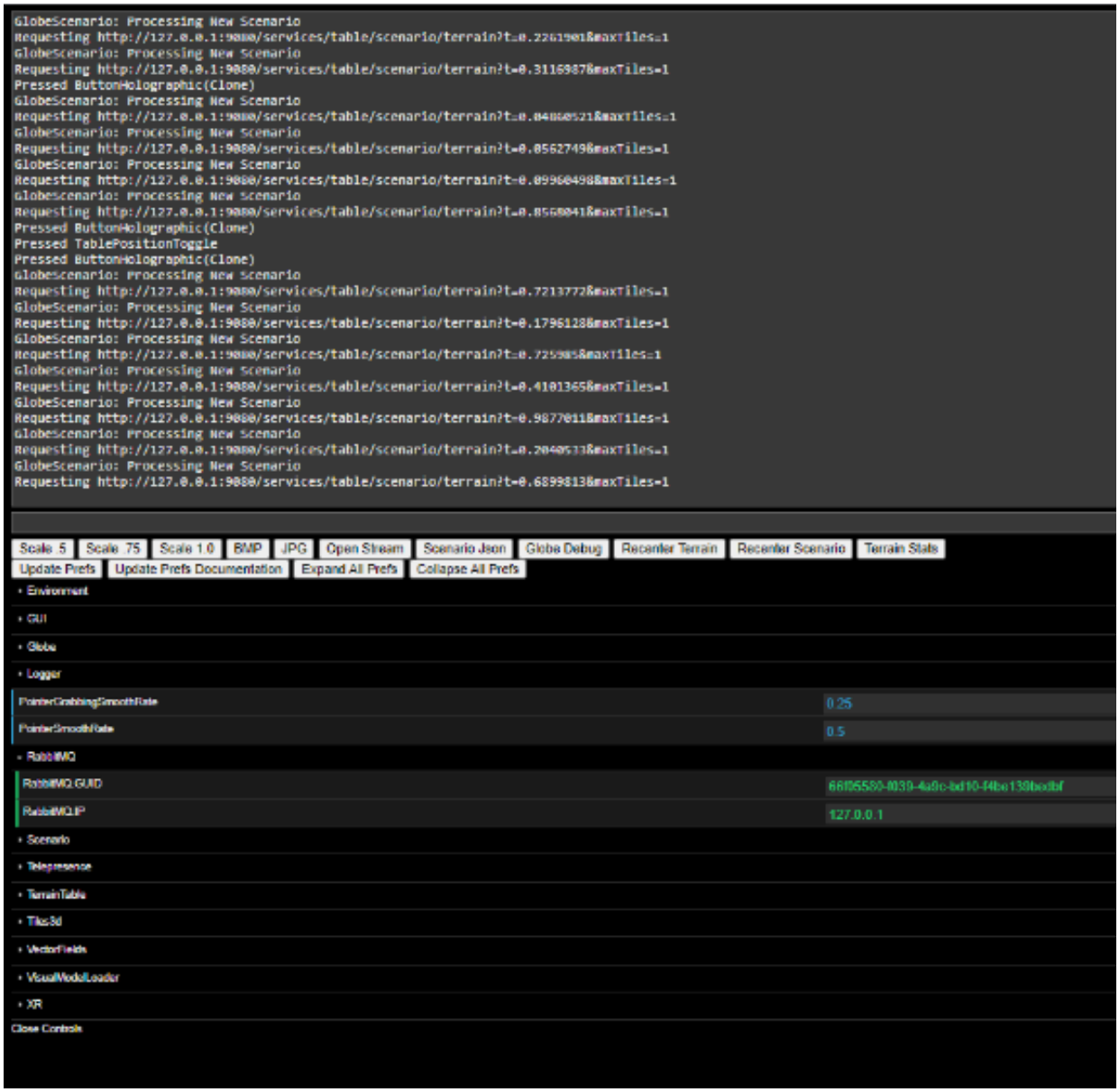

Figure 56 Magic Leap Preferences UI

4. Set the **RabbitMQ** IP address:
    a. Expand the **RabbitMQ** setting by selecting the drop-down arrow to its left (see Figure 57):

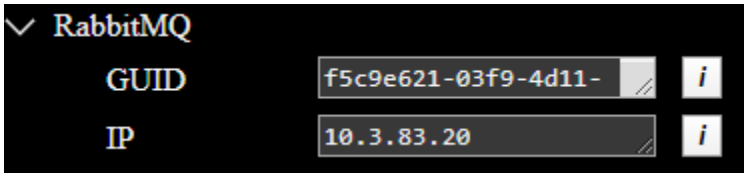

Figure 57 RabbitMQ Settings - Magic Leap

    b. Change the IP to the IP address of the machine running BVI obtained in Step 1.
    c. Press **Enter**.
5. Set the **milsym** server IP address:
    a. Expand the **milsym** setting by selecting the drop-down arrow to its left.

b. Change the IP to the IP address of the machine running BVI obtained in Step 1.
c. Press **Enter**.
d. Set the port to **9080**.
e. Press **Enter**.

The Magic Leap is now ready to be used in tandem with the BVI sand table/floor or as a standalone unit without a physical sand table or floor projection setup.

2.6.2.5 CONFIGURING 3D MODELS FOR MAGIC LEAP (IF PROVIDED)

To configure 3D models for the Magic Leap, follow the steps below:

Note: if the models.7z file has already been extracted, skip Step 1.

1. Copy and extract the **models.7z** file to: **C:\ProgramData\Ares.**
    a. If the **\ProgramData** folder is not visible, follow the steps below:
        i. In the file explorer, select **View**. A toolbar will appear.
        ii. Check the **Hidden Items** box. The **\ProgramData** folder will appear.
2. Navigate to the BVI Magic Leap preferences UI:
    a. Open a browser and navigate to: **<IP Address of the Magic Leap>:4321**
    Note: the BVI XR application must be running to access the URL.
        i. If the IP address of the Magic Leap is unknown, refer to *section.*
3. Set the **model server** IP address:
    a. Expand the **Scenario** setting by selecting the drop-down arrow to its left (see Figure 58).

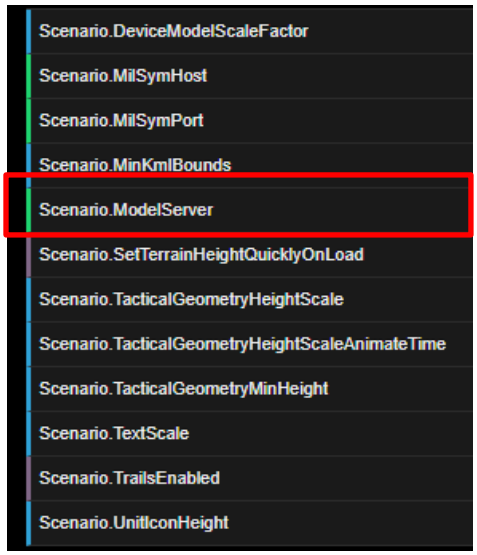

Figure 58 Scenario Settings - Magic Leap

    b. Change the IP address of the **ModelServer** to:
    http://<IP address of machine running BVI>:9080/services/models/glb/2.0/models/
    c. Press **Enter**.

3D models and the model server are now configured for the Magic Leap to be used with BVI.

2.7 MAPPING DIS TRAFFIC

BVI allows the user to customize the DIS entities and display any symbol and model. This section provides instructions for how to customize DIS entities.

2.7.1 SET BVI TO DEBUG MODE

To see entity DIS enumerations, BVI must be set to **Debug** mode.

To set BVI to **Debug** mode:

1. Open a File Explorer and navigate to:
   C:\Program Files\ARES\<version>\ares.manager\config\table_manager
2. Open the **table_manager.yml** file using a text editor (e.g., Notepad, Notepad++)
3. Scroll to **line 103** and locate **debug_show_entity_info: False**
4. Change the value to **True** (see Figure 59):

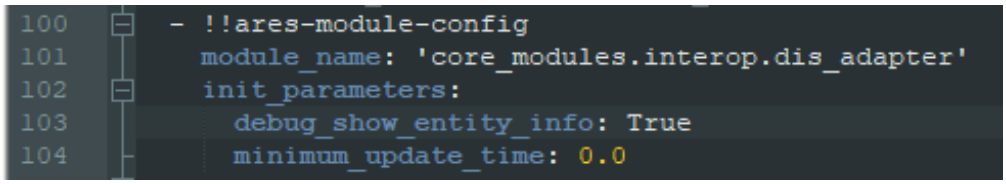

Figure 59 table_manager.yml - Debug Mode

5. Save the file.

BVI is now in **Debug** mode and will display DIS enumerations for any detected DIS traffic in a scenario.

2.7.2 MAPPING DIS ENUMERATIONS

To map DIS enumerations to 2525C entities, follow the instructions below:

1. Start the BVI software.
2. Load a scenario in the geographic location of the DIS traffic.
3. Open a File Explorer and navigate to: **C:\Program Files\ARES\<ARES version> \ares.manager\config**
4. Open the **dis_mappings.yml** file using a text editor (e.g., Notepad, Notepad++).
5. Note the **DIS enumeration** for the intended entity from the used modality (e.g., Viewer, WTP)
6. If the DIS enumeration already exists in **dis_mappings.yml**, then edit the attributes below the DIS enumeration. Otherwise, create a new section for the new DIS enumeration.
   - **description:** User-readable description of the DIS enumeration
   - **model_id:** Unique identifier for 3D models
   - **sidc:** Symbol identification code for entities from the 2525C symbol library
   - **standard**: Enter **MIL_STD_2525C**
   - **modifiers:** custom additions to 2525C symbols (see Figure 60)
     - { badgeCount: '1' }
     - { badgeAsDiamond: 'true' }
     - { 'badgeCountOverride: 'true' }
     - { customText: 'NAME', customTextHeader: 'HDR', customTextFooter: 'FTR' }

Example of Modifiers:
{ badgeCount: '[1, 2, 3, 4, 5, 16]', customText: 'NAME', customTextHeader: 'TextHeader', customTextFooter: 'TextFooter', badgeCountOverride: 'true' }

Figure 60 Example modifiers

3 CONTACTS

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