**Deployment Guide for the VR Biotech Lab Simulation**

**Overview**

This guide provides detailed instructions for deploying the VR lab training application on a Meta Quest 3 headset. It is tailored for IT staff or developers deploying the system to production environments for proper deployment configuration and verification. This guide assumes the Meta Quest Developer Hub (MQDH) and Unity are installed, and the device is in developer mode.

**Preparation**

**Dependencies and Tools**

**Unity Setup:** Ensure Unity Editor is installed with the following:

* + Android Build Support (SDK/NDK and JDK tools).
  + XR Plugin Management.

**Meta Quest Developer Hub (MQDH):**

* + Download and install MQDH from the [Meta Developers site](https://developer.oculus.com/downloads/).

**ADB (Android Debug Bridge):**

* + Install ADB Platform Tools from the [Android Developers site](https://developer.android.com/tools/adb)
  + Install Oculus ADB Drivers from the [Meta Developers site](https://developers.meta.com/horizon/downloads/package/oculus-adb-drivers/)

**Build Process**

**Configure Project Settings**

1. Open Unity and load the project.
2. Navigate to Edit > Project Settings > Player and:
   * Set the company name and product name appropriately.
   * Configure XR Plugin settings:
     + Enable OpenXR under XR Plugin Management.
     + Set the Target Device to Meta Quest.
3. In Other Settings (under Player settings):
   * Enable ARM64 architecture.
   * (Optional) Disable Auto Graphics API and select OpenGLES3.

**Set Build Target**

1. Go to File > Build Settings.
2. Select Android as the build platform.
3. Click Switch Platform (if not already selected).
4. Ensure all required scenes are added to the build.

**Build the APK**

1. Click Build and choose a directory to save the APK.
2. If deploying directly, select Build and Run to automatically install the APK on the connected headset.

**Deployment**

**Automatic Deployment via Unity**

1. Connect the Meta Quest 3 headset to your computer via USB.
2. Ensure the headset is detected in Unity (check MQDH or ADB for connectivity).
3. Use Build and Run in Unity to deploy and launch the application.

**Manual APK Installation**

1. Export the APK from Unity.
2. Open Meta Quest Developer Hub (MQDH) and connect your headset:
   * Go to Devices > Select your headset.
3. Install the APK:
   * Navigate to Manage > Applications.
   * Select Install APK, then locate and upload the exported APK.
   * Wait for the installation to complete.
4. Alternatively, use the ADB command:
   * adb install path/to/your-apk-file.apk
5. After installation, launch the application from Unknown Sources in the Meta Quest 3 apps menu.

**Verification**

**Verify Installation**

1. Put on the headset and navigate to Apps > Unknown Sources.
2. Launch the installed application.
3. Verify that:
   * The application launches without errors.
   * All scenes and functionality load correctly.
   * Controllers interact with objects as intended.

**System Test Checklist**

1. Validate object interactions (e.g., picking up and dropping objects).
2. Confirm movement functionality (e.g., teleportation and navigation).
3. Check for visual or performance issues (e.g., frame drops, graphical glitches).

**Troubleshooting Guide**

**Connection Issues**

* Problem: The headset is not detected by Unity or MQDH.
  + Solution:
    1. Ensure the device is in developer mode.
    2. Verify USB drivers are installed correctly (reinstall if necessary).
    3. Restart MQDH or reconnect the headset via USB.

**XR Plugin Errors**

* Problem: Unity reports errors related to XR Plugin Management.
  + Solution:
    1. Check that the OpenXR Plugin is installed and enabled under Project Settings > XR Plugin Management.

**Build Errors**

* Problem: Unity fails to build the APK.
  + Solution:
    1. Confirm Android Build Support, SDK/NDK, and JDK are installed under Unity Hub > Installs > Add Modules.
    2. Check that the Android platform is selected as the build target.

**Application Launch Issues**

* Problem: The app does not appear in Unknown Sources or fails to launch.
  + Solution:
    1. Reinstall the APK using MQDH or ADB.
    2. Verify the APK file is compatible with the Meta Quest platform.

**Maintenance and Updates**

* Use Unity to re-export updated APKs and redeploy using the steps above.
* Regularly check for Unity and Oculus plugin updates to maintain compatibility.

For further assistance, refer to the Unity documentation or contact the project sponsor.

**Future Suggestions**

* Implement Unity Events
* Use Meta Quest Hand Tracking
* Implement 2D overlays for Event notifications
* Add dynamic feedback to the Journal

For more information, refer to the Suggestions for Future Teams section on the Final Project Report.