

Technical Report: Preparatory Research on VR and AR Environment Configuration

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1. Mobile VR Foundation: Google Cardboard

Based on the *Google Cardboard Quickstart for Unity*, the project focused on enabling VR capabilities for budget-friendly mobile devices.

1.1. Key Concepts

- **Stereoscopic View:** Dividing the screen into two viewports with a slight horizontal offset to simulate binocular vision.
- **Head Tracking (IMU):** Utilizing the device's Inertial Measurement Unit to map physical movement to the virtual camera's rotation.
- **Lens Distortion Correction:** Applying a shader-based distortion to counteract the physical magnification of VR lenses.

1.2. Technical Configuration Steps

1. **SDK Integration:** The Google Cardboard XR Plugin was added via the Package Manager using the Git URL provided in the documentation.
2. **Graphics API Setup:** In Player Settings, the Graphics API was restricted to *OpenGL ES3* to ensure stable performance across Android devices.
3. **Scripting Backend:** The project was switched from *Mono* to *IL2CPP* to enable *ARM64* support, which is mandatory for modern mobile high-performance applications.
4. **XR Plugin Management:** The "Cardboard" provider was enabled in the XR Plug-in Management tab to override the default main camera logic.

2. AR Environment Setup: Unity AR Foundation

Following the *Configure your AR Development Environment* tutorial from Unity Learn, the focus shifted towards a unified workflow for mobile sensors.

2.1. Key Concepts

- **AR Foundation Framework:** A multi-platform API that allows a single Unity project to run on both ARCore (Android) and ARKit (iOS).

- **XR Plugin Management:** A centralized system to toggle different XR providers without modifying the scene's internal logic.
- **Device Calibration:** The process of syncing virtual coordinates with the real-world physical space through "Developer Mode" debugging.

2.2. Technical Configuration Steps

1. **Module Installation:** Through the Unity Hub, the *Android Build Support* and *OpenJDK* modules were installed.
2. **Project Templating:** Utilization of the *AR Mobile Core* template to automatically include essential packages like `com.unity.xr.arfoundation`.
3. **Provider Assignment:** Configuration of the *Google ARCore* plug-in provider within the Project Settings to allow depth sensing and camera access.
4. **Build Validation:** Use of the *Project Validation* tool to identify and fix common configuration errors (such as incompatible color spaces or missing camera usage descriptions).