

OPERATOR'S TECHNICAL MANUAL

Proto STEAM

An educational mixed-reality museum experience

Prepared by: Enversed Studios

Client: Proto Invention Factory

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Audience: Museum operators and on-site support staff

Purpose of this document

This is a technical manual. It explains how the Proto STEAM app is installed, configured, and operated on-site. It does not cover the educational workshop flow, the storytelling beats, or the pedagogical content.

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1. Introduction

This manual is the technical reference for operators of the Proto STEAM experience. It is intended to be read and used by staff at the Proto Invention Factory who are responsible for setting up the hardware, starting the app on tablets and headsets, and resolving common technical issues during a session.

1.1 Purpose

The purpose of this document is to give an operator everything they need to:

- Install the application on all required devices.
- Connect every device to the correct network.
- Configure the session through the operator settings screen.
- Start a multiplayer session including mixed reality (MR) test flights.
- Diagnose and resolve the most common technical issues without contacting development support.
- Know when and how to escalate an issue to Enversed Studios.

1.2 What this manual does not cover

This manual deliberately excludes:

- The educational/workshop flow (what the children do, what the host explains, the order of physical challenges in the museum).
- Narrative, character storytelling, and quiz content.
- Source-code-level development or modification of the application.

1.3 The full museum experience - short description

Proto STEAM is a hybrid physical/digital experience for groups of museum visitors (typically children with their family, school class, or friends). Each team receives one tablet. Teams move through the museum, scanning QR codes at five physical challenge stations, answering quiz questions on the tablet, and unlocking design options for a virtual airship.

In parallel, two Meta Quest 3 headsets are available at a fixed mixed reality (MR) station. When a team's airship design is ready, they take a test flight in MR: the airship they designed on the tablet appears on a 3D diorama in the room, and one or two players fly it through a mini-game scenario (race, cleaning, or tour). The result is sent back to the team's tablet and converted into points.

The full experience runs across three coordinated software layers: the tablet quest application (Android), the MR airship game (Meta Quest 3), and a Windows PC running the session server. All three communicate over the same local Wi-Fi network.

2. System Overview

Proto STEAM is built on three software components that must run together for a complete session. They are independent applications and can fail independently.

2.1 Components

Component	Role
Tablet quest app	Android app installed on every team tablet. Drives team selection, mission selection, challenge unlocks, the quiz UI, the airship configurator, and the trigger for sending a team's design to MR.
Airship configurator	Part of the tablet app. Lets players choose hull and components for their airship. Computes scores, weight, and budget. The current design is what gets sent to the MR headsets when 'test flight' is pressed.
Mixed-reality flight station	Two Meta Quest 3 headsets running the Proto STEAM VR/MR application. Renders the diorama on a real-world table via passthrough and runs the chosen mini-game (Racing / Cleaning / Tourism).
Session server (Windows PC)	A dedicated Windows machine that runs the tablet session server. Tracks which team holds which challenge, distributes state between tablets, and brokers communication between the tablet network and the MR headsets via beacons.
Network (Wi-Fi)	Local Wi-Fi network that all tablets, all headsets, and the server share.

2.2 High-level flow between components

A simplified flow overview of how a session goes:

1. Operator confirms the PC is on the correct (WiFi-)network. Then launch the server app on the Windows PC.
2. Operator starts the tablet app on each tablet, sets a unique team number, and configures session settings. Apply the settings and search for the server on each tablet.
3. Operator starts the MR app on each Meta Quest 3 headset, and goes through the game's calibration to set the MR's world position and scale.
4. The operator sets up the session on one headset, and joins the created session on the other headset.
5. During play, the tablet app keeps the server informed about challenge ownership ("team 2 is now doing challenge C").
6. When a team presses Test Flight, the tablet sends the airship configuration through the server.
7. When the test flight is active, it can be started in the MR app by entering the corresponding team number and searching for a tablet session.
8. When a session is found the game spawns the configured airship at the corresponding

diorama for the challenge selected (racing, cleaning, tour).

9. When the MR mini-game ends, the MR app sends the result back to the tablet app.

2.3 Core requirements and limitations

Network requirements

All tablets, both headsets, and the server PC must be on the same local network. A mix of ethernet and WiFi is supported as long as all devices are on the same subnet. Broadcast traffic is used for session discovery and must not be filtered or blocked. For similar reasons, any settings like 'client isolation' must also be disabled.

There is no offline fallback for multi-device communication. If a tablet disconnects, it can recover its progression for the same team number, but it cannot join an MR test flight while disconnected.

Once the apps are installed, the experience runs entirely on the local network. The session server does not call out to the internet. This is intentional for a museum environment.

Player and team counts

- **Max number of teams:** up to 5 teams playing in parallel, because the museum has 5 challenge stations and a challenge can only be occupied by one team at a time.
- **Tablets:** 1 per team. Up to 5 active tablets in a session is the validated configuration.
- **MR headsets: up to 2** Meta Quest 3 headsets at the mixed reality station. The mini-game supports up to 2 players in MR at the same time (one team's test flight).
 - It's possible to have more than one mixed reality station, if the station uses its own session and is assigned to a different team.
- **Session server:** 1 Windows PC. This must be running before any tablet or headset is started.

Other constraints

- The session server is the single point of truth for which team owns which challenge. If the server is restarted mid-session, all tablets will need to reconnect.
- Spatial anchors for the MR diorama are stored per-headset. If a headset's Guardian boundary is re-drawn, the anchors are invalidated and must be set again.

Other info

- English and Estonian are supported. The language toggle is per-tablet and per-headset; it does not propagate between devices.
It can be changed at any point by clicking on the county's flags (UK flag or Estonian flag)

3. Hardware & Physical Setup

The following physical equipment is required for one complete museum-ready setup. Quantities assume the full validated configuration of 5 teams.

3.1 Required equipment

Item	Specification / Quantity
Team tablets	Samsung Galaxy Tablet S10. Validated on S10. One per team, so up to 5 units. Plus at least one spare. Android version 16, kernel version: 6.1.128-android14-11-32532371-abX210RXXS6BZBE
Mixed-reality headsets	2x Meta Quest 3. Fully charged. Controllers paired and charged batteries inserted. Hand-strap optional.
Session server	1x Windows 11 Pro PC. Wired or Wi-Fi connection to the same network as tablets and headsets. Display, keyboard and mouse for operator use.
Wi-Fi access point	Local-only Wi-Fi router or access point. 2.4 GHz and 5 GHz both fine. The network must allow client-to-client traffic (no client isolation or broadcast filtering).
QR codes	5 printed challenge QR codes (A–E), one per physical challenge station. Provided in the appendix of this document.
MR play space	A flat, well-lit area large enough for the diorama and for 2 players wearing headsets. See section 3.3 for exact requirements.

3.2 Tablet physical setup

- Each tablet should be charged to at least 80% before a session and ideally remain plugged in between sessions.
- Tablets must have camera permission enabled - this is required for QR code scanning. The app will request it on first launch. If permissions are blocked, you can grant it manually in the Android system settings.
- Tablets must have location permission enabled - this is required by Android to read the connected Wi-Fi SSID, which the operator screen uses to confirm the right network is selected.
- Tablets should not auto-rotate. Lock orientation to landscape. The app is designed for landscape only.

3.3 MR flight station setup

The MR station is the most space-sensitive part of the experience. It must be set up before the first session of the day.

Play space

- Minimum 2 m × 2 m of clear floor space per active headset.
- Recommended 3 m × 3 m shared area for both Quest 3 players when both are active

in the same scene.

- No reflective glass, mirrors, or moving patterned surfaces in the immediate Guardian zone - these adversely affect the headset's inside-out tracking.
- Consistent lighting. Avoid direct sunlight on the headsets' cameras and lenses to avoid burn-in.
- A physical table or fixed surface with a diorama anchor marker. The anchor's height defines the diorama's height in the virtual world.

Headset preparation

- Each Quest 3 must be set up with a Meta account that has Developer Mode enabled (required to sideload the project APK).
- Guardian / Boundary must be drawn at the MR station once. Re-drawing it later will invalidate spatial anchors - see Known Issues.
- Controllers must be paired and charged. Each player needs both controllers (left and right). Controllers are paired to one specific headset and cannot be mixed between headsets.

3.4 Network setup

- Set up a dedicated, single network for the museum experience. Do not put it on a shared corporate network.
- The WiFi-network should be secured using at least WPA2. Avoid open networks.
- Disable client isolation / AP isolation on the access point. Devices must be able to reach each other directly.
- Make sure traffic between the server PC and the tablet / headset IPs is unrestricted on the local network. The application uses Unreal's beacon and replication systems on default Unreal ports – all firewall requests should be allowed.

4. Game Setup

This section describes how the operator brings the system from a powered-off state to a ready-to-play state. Follow the steps in order. Once the system is running, an experienced operator should be able to complete this in roughly 10 minutes.

4.1 Installing from the game package

The delivery contains three packaged builds:

- **Server build** - a Windows executable plus its data folder, for the session server PC.
- **Tablet build** - an Android .apk for the Samsung Galaxy tablets.
- **MR build** - an Android .apk for the Meta Quest 3 headsets.

Server installation

1. Copy the server build folder to the Windows PC.
2. Confirm the PC is connected to the museum Wi-Fi (or wired to the same network).
3. Create a shortcut to the server's main .exe file and place it in a convenient location (e.g. Desktop).
4. Right click the shortcut, and go to properties
5. In the 'Shortcut' tab, edit the 'Target' field (where the location of the .exe is referenced) by adding the following text (without quotation marks) " -log" and apply the changes.
6. Run this shortcut for the server. A blank console window should appear and stay open.
 - When searching for the server tablets will discover it automatically as long as they share the same network.

Tablet installation

1. Make sure the tablet is connected to the correct Wi-Fi network. The tablet is now ready.
2. Connect the tablet to a computer with USB and transfer the apk to the tablet, or copy the .apk to the tablet via a USB stick or SD card.
3. On the tablet, open the file manager and navigate to the .apk file.
4. Tap the .apk to install. The first install on a tablet may require Android to ask you to allow installs from this source - accept this.
5. Open the app once after install. The OS will ask for camera and location permission. Grant both.

Meta Quest 3 installation

1. Make sure the headsets are on the correct network.
2. Connect the headset to a computer via USB-C.
3. Execute the provided 'Install_EnversesFramework-Android-Shipping-arm64.bat' file to install the application.

- If the installation fails because no device was found, look in the headset if a "Allow USB debugging" prompt is showing and accept it, then repeat step 2.
 - If no USB debugging prompt is showing, first try plugging the headset in again.
 - If there is still no prompt, use the Meta Quest Horizon mobile app (logged in using the same account as the headsets) to disable and re-enable developer mode on the affected headset's settings, then repeat step 2.
4. After install, the app appears under "Unknown Sources" in the headset library. Launch once to verify it starts and shows the lobby scene.
 5. Repeat for the second headset.

4.2 Signing in on Wi-Fi

Each device must be connected to the same network. The tablet app's operator screen displays the SSID of the currently connected network so the operator can verify this at a glance.

1. On each tablet: Open Android Settings → Wi-Fi, connect to the museum SSID.
2. On each Quest 3: Open Settings → Wi-Fi, connect to the same SSID.
3. On the server PC: Connect to the same SSID (or use a wired connection on the same subnet).
4. Launch the tablet app. The operator screen displays the connected SSID (see section 4.3). Confirm it matches the museum SSID on every tablet before pressing Start.

If the SSID displays as "<Unknown SSID>"

The tablet does not have location permission. The Android Wi-Fi API requires ACCESS_FINE_LOCATION to read the SSID name. Open Android Settings → Apps → Proto STEAM → Permissions and enable Location. Restart the tablet app.

4.3 Operator settings - first screen on the tablet

The tablet app boots into the operator settings screen. This screen is intended for staff only. It is the only place where the team number and session parameters are configured. Settings are stored locally on each tablet.

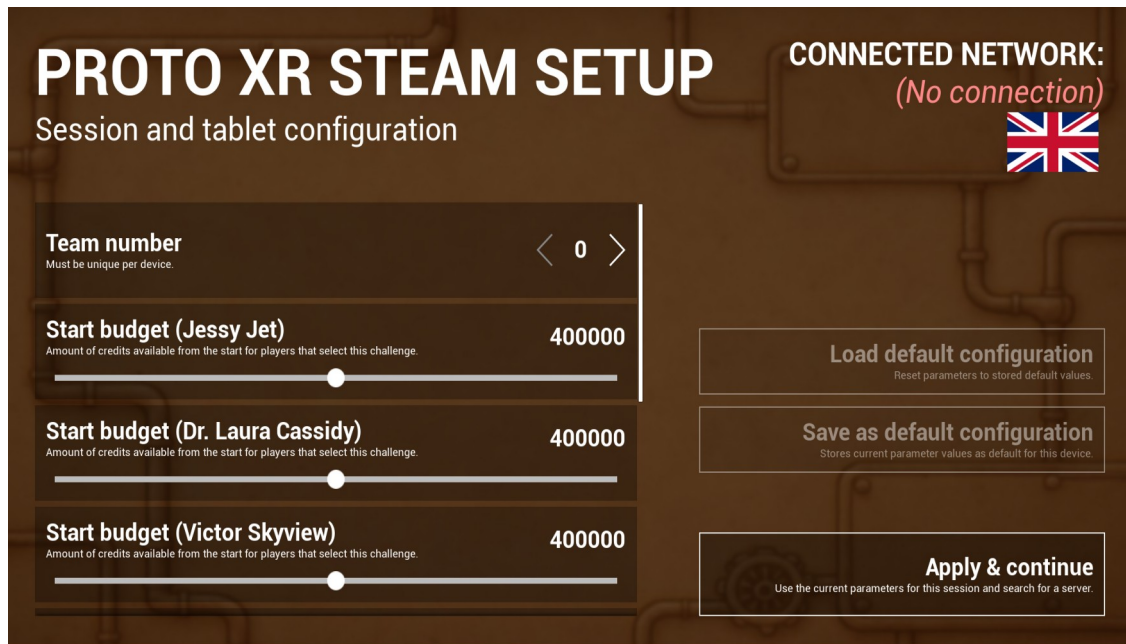


Figure 4.1 - The session configurator screen.

Available settings

Setting	Description
Team number	Integer set with two < > buttons. Must be unique across all tablets in the session. The operator is responsible for not duplicating values. Used to identify the tablet in the server and to associate the tablet with a headset slot in MR.
Start budget (per character)	Slider, 10 000 increments, max 800 000, default 400 000. Currency available to the team for buying airship components.
Required challenge amount	Number of challenges (out of 5) the team must complete before the remaining ones auto-complete. Set lower to shorten play time. Default 5 (all required). Minimum of 1 required
Challenge QR scan duration	Maximum time (in minutes) between a team selecting a challenge on the tablet and scanning the QR code at the physical location. Prevents delays from failing to scan the QR code.
Challenge duration	Maximum time (in minutes) the team has to complete the physical challenge once the QR is scanned. After this, the quiz can be started without the challenge code to prevent delays.
Skip introduction videos	Checkbox. Skips intro and configurator-intro videos. Useful for short sessions.
Skip challenge videos	Checkbox. Skips per-challenge intro videos. Useful for repeat groups.
Connected Wi-Fi Network	Read-only. Shows the SSID of the network the tablet is currently connected to.
Language toggle	A flag for the currently selected language. Tapping the language immediately switches to the other language. Default English, optionally can use Estonian. (This button is also available after this menu)

Three buttons at the bottom

- **Apply & Continue** - Attempts to connect to the server. Once connected the tablet leaves the operator screen with the current settings and shows mission select menu.
- **Save configuration** - Saves the current settings as the new default. Every time the app is opened from now on, these settings will be loaded.
- **load configuration** - Restores the last saved default, not the developer-set factory default.

Recommended workflow

Set the desired team number, budget, and timers on the first day. Press Save configuration. From then on, each session only needs the team number adjusted per tablet, and Start application pressed.

This has to be done on every tablet, as the settings are not shared between the tablets.

Lost connection

When the tablet loses connection to the server the app may appear unresponsive during the time-out period. After the time-out period has passed and connection hasn't been re-established the tablet will return to the operator settings screen.

4.4 Mixed reality setup and anchors

The diorama in the MR game is placed in the real world using a spatial anchor. The anchor must be set once per headset, on the table or surface where you want the diorama to appear.

Setting the anchor

1. Launch the MR app on a Quest 3, both controllers will be required for calibration.
2. Once the app has started the app will prompt the operator to calibrate the app before proceeding to the lobby/session select. (optionally it can be cancelled/skipped)
3. A hologram of the diorama will be displayed. This hologram can be moved, rotated, and scaled to where you want the diorama anchor to sit (typically the centre of the MR table).
4. Attached to the left controller is a menu for scaling, and for switching between moving and rotating the diorama. Once satisfied press the confirmation button to place the anchor. The anchor is then saved to the headset's local anchor store.
5. Repeat on the second headset, matching the placement of the diorama at the same physical point. Each headset has its own copy of the anchor - they must both be placed at the same spot for the diorama to align.

Re-orienting after a headset reset

- If a player presses and holds the Oculus / Meta button, the headset performs a recenter. This can rotate the diorama relative to the player. The MR app re-orientes the player back to the anchor automatically after a recenter, but the anchor itself must already be valid.
 - Just pressing the meta button once opens the meta menu.

- If the Guardian boundary is redrawn at the OS level, the anchors are invalidated - see Known Issues.

4.5 Starting multiplayer sessions - step by step

This is the core start-of-session procedure. It must be followed in this order for tablets and headsets to find each other and for test flights to work.

1. Launch the Proto STEAM server on PC.
2. Power on the two Meta Quest 3 headsets. Confirm they are connected to the museum Wi-Fi.
3. On Headset 1: launch the Proto STEAM MR app. Perform the calibration.
4. Once done the lobby should be visible. From here a session can be created.
5. Create a session on the first headset, once the headset shows the team selection screen similar to the menu on the tablet this headset is now ready.
6. On Headset 2: launch the Proto STEAM MR app. Perform the calibration, and join the session created by headset 1.
7. On each tablet (1 per team): launch the Proto STEAM tablet app. The operator screen appears. Verify the SSID is correct. Set a unique team number (1, 2, 3, ...) and change or load the desired settings. Press "Apply & Continue" and wait for the tablet to find a server.
8. Once the tablet finds a server, the player can pick their mission and continues into the airship configurator. From here challenges can be started, or if less than the maximum number of challenges is required some pieces of the airship can already be configured
9. Once all the challenges are completed, and the airship is configured sufficiently to match the Client's needs the test flight can be started by the tablet player(s)
10. In each headset, a small menu allows the MR player to pick a team number to associate the headset with. Once a team number is selected, that headset is linked to that team's tablet. And the configured ship dat should be received in the MR session, for players to use the created airship in the test flight

Order matters

Always start in this order: Server on PC first then the Headsets and Tablets. Starting tablets before the server is up may cause them to fail to connect, and the connection retry can occasionally hang.

During the session

- A challenge can be occupied by only one team at a time. The tablet UI greys out occupied challenges and shows a 'another team is doing this challenge' message.
- If a tablet disconnects from Wi-Fi briefly, its team's progress is recovered when it reconnects, including the team's airship design and any captured logo photo. Held challenges are released on the server after a short timeout.
- The Test Flight button on the tablet is only enabled once the team's airship meets the client's requirements. While a test flight is active, the button displays "test flight in

progress". Once completed the button shows "test flight finished".

- If there's an issue with the positioning of the level the anchor can be re-set by opening the world config menu. This can be done by pressing and holding the right thumbstick for 2.5 seconds.

5. Airship Configurator

The airship configurator is part of the tablet app. From a technical operator's perspective, the configurator matters mostly for one reason: it is the gateway to Mixed Reality. The Test Flight button is in the configurator, and it only becomes available under specific conditions.



Figure 5.1 - The airship configurator screen.

5.1 When is a test flight available?

Three conditions must all be true:

1. The team must have completed at least one challenge. The configurator itself is only unlocked after the first completed challenge - before that, players see a screen prompting them to do a challenge.
2. The team's airship design must meet all (10) client requirements. For each completed challenge 2 client requirements are unlocked and shown.
3. There must not already be a test flight in progress for this team. The Test Flight button is disabled while a flight is active and shows "In progress".

When all three are true, the Test Flight button is fully active and labelled "Test Flight Available". Pressing it sends the current airship design to MR.

5.2 What to do if the test flight does not start

The most common operator-reported issue is: the player presses Test Flight and nothing happens in MR. Work through the checklist below in order.

Checklist

1. **Confirm the headsets are running the MR app.** A Quest 3 idling on the home screen will not receive test flight data. The MR app must be in the lobby scene or in a running

mission scene.

2. **Confirm a headset is assigned to this team.** In the lobby, each headset must have selected the team number that matches the tablet that sent the test flight. If no headset is linked to the team, the test flight has nowhere to go.
3. **Confirm the server PC is still running and reachable.** The tablet → MR communication goes via the server. If the server has been closed or its PC is asleep, all communication is dropped.
4. **Confirm the tablet is on the same Wi-Fi network.** Re-open the operator settings on the tablet (full app restart) and check the SSID indicator. If the tablet has drifted onto a guest or mobile network, it cannot reach the server. Forget any undesired WiFi networks in Android system settings to prevent this from happening again.
5. **If everything looks correct, ask the player to wait 10 seconds and try again.** There is a known intermittent issue where the first beacon connection can take more than one attempt - see Known Issues.
6. **If still nothing, restart the MR app on the headset.** On launch it re-establishes its beacon connection. The team's design will be re-sent on the next Test Flight press.

5.3 How to play the test flight in MR

Once the test flight starts, one or both players take a Quest 3 and play the mini-game appropriate for the team's selected mission:

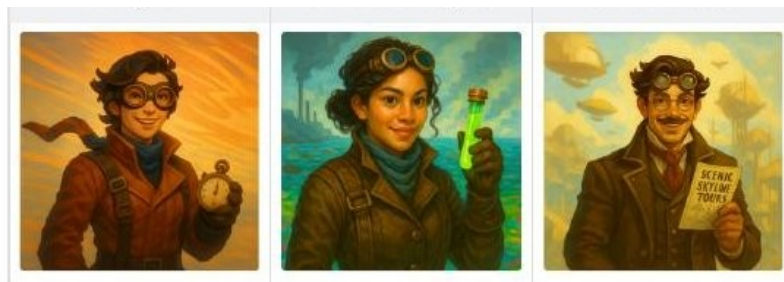


Figure 5.2 - The three mission characters and their corresponding MR mini-games.

Mission	What the player does in MR
Racing (Jessy Jet)	Fly through checkpoints in order. Only the next 3–4 checkpoints are visible. Pressing the Special Action (X button on left controller) triggers a temporary speed/maneuverability boost. The race ends at the final checkpoint.
Cleaning (Dr. Laura Cassidy)	Pick up pollution patches on the water surface using the cleaning ring under the airship. The ring fills up and must be emptied at the cleaning factory. The mission ends when all pollution is cleared or time runs out. Pressing the Special Action (X button on left controller) triggers the cleaning rig to pick up the pollution.
Tourism (Victor Skyview)	Visit tourist checkpoints – this mission not available yet in the current version of the application

Default controls

Action	VR Input
Move forward	Right trigger
Move backward	Right grip
Move up	Left trigger
Move down	Left grip
Rotate airship	Right thumbstick
Special action (e.g. boost)	X button (left controller)
Re-orient to anchor	Meta / Oculus button
Menu interaction	Aim at menu option with the controller and press the A button (right controller)
Open world configuration	Press and hold right thumbstick for 2.5 seconds

6. Support and Escalation

This section defines the boundary between operator-side resolution and developer-side support, and how to report issues so they can be fixed quickly.

6.1 What operators can resolve themselves

The following should always be attempted on-site before contacting Enversed:

- Tablet not on the correct Wi-Fi → reconnect via Android Settings.
- "<Unknown SSID>" shown on the operator screen → grant location permission to the app.
- Tablet does not connect to the server → check if the tablet and PC are on the same network. Check if the PC has network/firewall permissions enabled to allow the app to connect with other devices on the network
- Tablet camera does not start when scanning a QR code → grant camera permission to the app, then restart the app.
- Tablet stuck or unresponsive → restart the tablet app. Team progress is preserved as long as the same team number is re-entered.
- Test flight does not arrive in MR → follow the checklist in section 5.2.
- Headset diorama is in the wrong position → re-place the spatial anchor (section 4.4).
- Test flight button stays "In progress" after the mini-game ends → close and re-open the MR app on the assigned headset. The next test flight will reset the state.
- A headset's controllers desync → check the battery level, and if needed repair from Quest Settings → Devices.
- When failing to connect make sure that all devices use the same build version (delivered in the same package by Enversed.) Versions mismatched may not connect or have other issues.

6.2 When to contact Enversed support

Contact technical support if any of the following occurs and is not resolved by the steps above:

- The session server crashes on launch and will not start.
- Tablets repeatedly fail to connect to the server across multiple retries (more than 3 in a row, on different tablets).
- A headset cannot place an anchor at all, even after a Guardian reset.
- Any in-game data corruption (e.g. saved settings unreadable, missing components, missing missions in selection).
- Any crash that produces a system-level error dialog on the server PC or on a Quest 3.

Contact details

Channel	Value	Use for
E-mail Enversed support		Default channel for all technical issues. Include logs and the report template from section 6.3.
Phone (during agreed support window)		Only for issues that block the current session and cannot wait. Always follow up by e-mail with the report template.

Please confirm contact details with Enversed

Enversed will provide the specific support e-mail address, phone number, and the agreed support window separately. Insert them in the table above before distributing this document to operator staff.

6.3 How to report an issue

To make an issue actionable for the development team, please include the following when reporting:

1. Date and time of the issue (local time, including time zone).
2. Which build version is installed.
3. Which device(s) were affected (tablet team number, headset 1 or 2, server PC).
4. What was happening just before the issue ("team 3 pressed Test Flight", "team 2 was on challenge B", etc.).
5. What the operator saw (error message, frozen screen, unexpected behaviour). A photo of the screen is very helpful.
6. What the operator tried (which checklist steps were followed) and the outcome of each.
7. Number of teams active, number of headsets active, and roughly how long into the session the issue occurred.

6.4 Responsibility matrix

Issue category	Responsible party
Hardware faults (broken tablet, broken Quest 3, broken controller)	Museum / Proto Invention Factory. Replace from spares.
Wi-Fi network outage	Museum IT. Re-establish the network. Then operator restarts the server and re-launches devices in order (see section 4.5).
Application bug or crash	Enversed Studios. Report via e-mail with the template in section 6.3.
Operator misconfiguration (e.g. duplicate team numbers, wrong SSID)	Operator. Resolve on-site by following section 4.
Content corrections (text, translations, video content)	Enversed Studios via Product Owner. Report through the PO.
Damaged or lost printed QR codes	Museum. Reprint from the appendix of this manual.

7. Known Issues

This section lists known issues present at delivery of project version V1.0. Each entry includes a short description, a reproduction or trigger condition, and the operator's recommended workaround. These items are tracked and either scheduled for a future update or accepted as known limitations of V1.0.

7.1 Connectivity and session

Issue	Description / Reproduction	Workaround
Intermittent tablet → server connection failure	When multiple tablets attempt to connect to the session server at the same time, one of them will occasionally fail and need to retry. Behaviour is non-deterministic.	Restart the tablet app. Connect tablets one at a time, with a few seconds between each. If the failed tablet had unsaved operator settings, re-enter them - they may have been reset to the previous saved default.
Operator settings reset on failed connect	If a tablet fails to find the session and operator settings were not saved as default, the values are reset to the saved default rather than retained.	Always press Save configuration after setting timers and budgets. Then changes to team number only need to be re-entered after a failed retry.
Ghost VR session appears	After a headset disconnects unexpectedly (battery dies, OS crash), the session server can briefly keep the team's slot marked as occupied.	Wait roughly 30 seconds for the server-side timeout to release the slot, then reconnect the headset and re-select its team number.

7.2 Mixed reality

Issue	Description / Reproduction	Workaround
Anchors invalidated by Guardian redraw	If a player or operator redraws the Guardian boundary on a Quest 3, all previously placed spatial anchors are invalidated. The diorama will not appear or will appear in the wrong place on that headset.	Treated as user error in V1.0. Do not redraw Guardian mid-session. If it happens, re-place the anchor via the world config menu.
Anchor in the wrong place after level switch / config menu	Re-opening the world config menu can clear an anchor unexpectedly, and after a level switch the diorama orientation can shift.	Re-place the anchor. If the diorama looks tilted after a level switch, ask the player to press the Meta button to recenter; the app will re-orient to the anchor.
Test Flight pop-up always reads "Put on your headset"	The tablet's in-progress label does not change once a flight is actually running in MR.	Cosmetic only. The button will switch to "Flight finished" once the mini-game ends.
Level loading shows only passthrough	During the loading transition to a mini-game level, the fade is transparent and	Cosmetic only. No operator action needed.

Issue	Description / Reproduction	Workaround
	the player just sees passthrough.	

7.3 Tablet app

Issue	Description / Reproduction	Workaround
"Place to navigate" image disappears once scan is pressed	When a player presses Scan before they have actually arrived at the QR code location, the location guidance image hides itself.	Tell players to scan only once they are physically at the station.
If the app is closed and the session is rejoined the stats display is broken	When the app is closed mid play, and restarted with the same team the character stats are gone. Tracked issue, will be fixed later	Try to avoid having to restart the app during play. And if possible when it does happen pick a different team.
If Test Flight is pressed before a headset is linked to the team	If the tablet sends a test flight before any headset has selected this team's number in the MR lobby, the MR scene does not appear.	Assign a headset to the team first before starting test flight from the tablet.

7.4 Cosmetic / minor

Issue	Description / Reproduction	Workaround
Lighting flat in ship configurator	The 3D ship preview in the configurator can appear evenly lit, losing some of the intended depth.	No operator workaround.
Speed boost has no audio/visual feedback	Pressing the Special Action button in the Racing mission gives a boost but no clear feedback that it has been used or is on cooldown.	Tell players the boost is on a short timer; they can simply press the button again after a couple of seconds.

7.5 Items deliberately accepted in V1.0

- Two teams cannot share a single challenge.
- Character videos cannot be skipped
(There's "skip introduction videos" operator toggle which skips them all).
- The team best time in the Racing mission is not persistent between attempts.
Suggested for a later update.

Appendix A - Challenge QR Codes and Solution Codes

These QR codes correspond to the five physical challenge stations. Print them and place them at each station. The codes printed below the QR codes are the alphanumeric solution codes a team must enter on the tablet after completing the physical challenge. Codes are case-insensitive.

Challenge A



Challenge B



Challenge C



Challenge D



Challenge E

*Figure A.1 - the full list of challenge QR codes.*

Challenge	QR encodes / Solution code
Challenge A	31452
Challenge B	SUNDAY (Estonian: PÜHAPÄEV)
Challenge C	39,5
Challenge D	1895
Challenge E	53241

Appendix B - Document control

Document title

Operator's Technical Manual - Proto STEAM

Document version

1.0

Project version

V1.0 - Final Delivery

Prepared by

Enversed Studios

Audience

On-site operators at the Proto Invention Factory

Out of scope

Educational flow, workshop scripting, source code