Distribution and Licensing

*Our Distribution & Licencing API is integrated with our core technology so users can become a part of our network.*

- This gives our Core users the ability to publish their applications on the Fundamental Surgery Hub. Providing simplified distribution and access to end users.

- Our unified Licensing Manager has an automated authentication system which regulates uploads and access of content. This is governed by a seat-specific valid licence, allowing users access to specific content.

- End Users will only be able to gain access to relevant content, predetermined by their license.

- Currently we support Unity builds, and Unreal will be supported in future versions.
Educational Module Framework

Our built in structure enables the easy-building of educational modules. Instantly structure content into a series of steps, giving the learner options to retry areas of difficulty, or skip through familiar content via a content navigation sidebar.

Users are assessed at different levels in the framework, with substeps acting as a tool for developers to make it easier and simpler to create great training products - providing a deep-dive tool to create specific content at a granular level.

- A content navigation sidebar allows users to jump directly to the content that is most relevant to them when in practice mode, saving time.
- Only basic Unity experience is needed to configure and arrange content and try out different groupings.
- An overview exists in the Editor to rearrange step ordering, and the naming and grouping of Units and Modules, allowing for fast generation of content without making restrictive decisions or risking bugs and inconsistencies with manually duplicating information.
Admin Overview

**Dashboard Admins** are able to have an aerial view of the results and progress of all of the users in their team, with the same granular level of drill-down functionality that individual users get.
Data Collection

The Core ensures instant data capture, providing the user with the ability to easily collect and store data generated by end users, allowing immediate access to data feedback.

- Automated default data logging includes the user name, interaction time & dates of the end user so that users can quickly identify the individual sessions to be assessed.
- Our user-friendly dashboard displays live metrics and recordings for prompt reporting. Making it quick and easy to review past sessions and reveal valuable trends and insights by application administrators and end users.
Online Results Dashboard

Cumulative results collected from all completed sessions can be viewed via the Fundamental Surgery Dashboard.

Results can be viewed at the procedure level and drilled down all the way to the individual step level including, passes, fails and **Independent Practice Grade**.
Realtime Results

Results from a session can be viewed at the end of a playthrough whilst still in VR, so users can decide if they want to go again and try for a better Fundamental Score, all without having to take off their headset.

Users are able to access their results straight after the module has finished, both in VR and through the Data Dashboard:

- View independent practice grade and pass/fail result
- See assessment at a step level and score information
- Scroll functionality
- Elapsed time per step/module
- Total number of steps passed
- Which mode they attempted the session on and step info (assessed/not assessed)
- Fundamental Score (average of all step scores)
- Results page can be customised for different display layouts
Scoring system

Developed in conjunction with surgical education experts, using an advanced weighted factors system.

**Surgical Objectives** – step or group of steps that achieve a goal during a procedure

**Adverse Events** – actions contrary to the best outcome for a patient

**Per step and per session scoring** – granular scoring for each step of the procedure
Extended Lobby Functionality

Alongside additional information about the module - you can now access your module from a screen in the lobby, view results and an assessment breakdown.

**Module Selection** – Select your module from a screen in the lobby.

**Results** – Access the results page from within VR
Help System

Users can select supplementary help in the form of additional visual guidance aids, audio and text-based support.

Use of the help system can also be assessed and contribute to the overall score for a session in the form of our unique ‘Independent Practice Grade’.
User Interface Toolkit

A complete VR-Ready User Interface System that contains our easily configurable prebuilt UI template allowing users to create personalised, brandable content immediately, avoiding the need for costly UX research and development of a VR interface.

Use these templates or build your own from the easy-to-use components:

- Our standard UI panel is pre-built and controls the navigation between steps so users can create, rearrange and make content instantly.

- Popup Labels for information, warning, error, and success events are provided, enabling you to guide users to the relevant content easily.

- All UI interactions are connected to our core technology which works out of the box, soon to be pre-connected to our assessment framework following the next release. Automation allows the user to get a head start in the content creation process.

- A simple Lobby screen and environment are provided as a working example to get you started and create a reference for training, so users can easily learn and grow with their development.
VR Headset Agnostic

Our SDK is all about inclusion, that’s why the Core supports many different VR headsets.

- All interactions can be driven Point-and-Click type interactions, refined and honed with our many years of VR design experience.
- Point-and-Click is the default interaction method for Mobile VR, shown on the right.
- Gaze-Click is defined as a cursor locked to the center of the user’s vision, ideal for Haptic-driven simulations (coming in 1.2)

We will continue to support a wide range of headsets including enabling you to easily switch between platforms as required:
  - HP Reverb
  - Quest 2
  - Focus 3
Medical Environments

The Core comes complete with three individually customisable medical environments with different styles and sizes for you to build your simulation upon. These are customisable and can be easily modified using a widget.

- Three empty, optimised, pre-built environments are provided to enable faster content authoring.
- These simulation environments have been designed based on real-life medical counterparts enabling a lifelike training experience for the end user.
- Our branding system can be adapted and applied to any other environment you might prefer to build and use.
- All environments are fully brandable, an example branded to FVR styling is on the right.
Multi-user Functionality

Multi-user simulation (aka. ‘Multi User Simulation Experience,’ or MUSE for short)

Allowing multiple users from anywhere around the world, to simultaneously engage in group training, discussion and collaborative activities, in a shared virtual space, offering a unique and engaging experience.
A multi-user surgical setting in VR would not be complete without surgeon avatars. Simulating a surgical setting has to take into consideration real-world nonverbal communication that takes place during a real life procedure.

High levels of nonverbal communication are possible due to the precise tracking behaviors such as head movement and hand gestures, alongside user identification.

- Avatars help creating a presence of the end user experience, premade and ready to be used
- Hand gestures such as thumbs up can be shown to reduce voice interaction which can reduce the use of sound, so the end user can focus on their session.
- Player names appear above their assigned avatars so members of the session can easily identify each other within the room
Create and Join Rooms

Our SDK is all about inclusion. This easy set up is vital for any multi-user experience, allowing the user instant access to remote collaboration with the ability to join premade rooms.

● Create new rooms, or join existing rooms, allowing instant access to your global network
● Different environments are available to host your room in
Teleporting enables your end users to move around and explore the multi-user environment without needing to move in the real-world. Regardless of the size or limitations of their real-world environment, users are able to make the most of the space and freedom afforded to them in the virtual environment. (Can also be used in non-networked spaces).

- Visible Teleporting points appear in front of the user which can be selected easily to be instantly transported to the point
- Intuitive and easy to learn controls allow users to navigate the multi-user environment with comfort and ease
Wrist Menu

The wrist menu provides easy access to multiple functions at the end of a virtual fingertip. This feature can enable a quick start up for a multi-user product without creating extra buttons or configurations.

- Easily accessible, with the lift of the wrist, users have instant access to the main functions during a session.
- Allowing users to mute/unmute themselves at will, enabling a more immersive experience by giving members more control over their presence in the environment.
Voice Communication

As players have an Avatar to embody them in VR, they also have a voice. Voice communication can be one of the most effective ways of communicating in the surgical VR space, coupled with the use of hand gestures, direct and detailed feedback can be given to all members of the room.

- Users can mute and unmute their voices easily via the wrist menu
- Users are able to identify those who are speaking, in real time, thanks to the avatar speaker highlight
- Real-time voice communication drives the immersive and collaborative experience of multi-user VR
Ease of Use

One of the Core’s constant key focuses is the developer’s user experience. The goal is always to simplify the building process, reducing time needed to deliver high-quality surgical simulations.

- The workflow for a content author has been designed to minimise the need for coding where possible by using our node editor.
- Tooltips are provided in-editor to assist authors with their understanding of functionality
- Common use cases such as changing colours on user interfaces have been designed for a fast workflow
- A readme has been created for developers to get started with.
Build System

Designed for developers to create their own custom configurations, allowing them to quickly build applications for different platforms (PC, Quest, Focus 3).
Brand Builder

All UI elements in the toolkit come with attractive Fundamental Surgery branding by default. However, this can be easily customised via a central widget, allowing users to play with new branding schemes and personalise the UI to their own company colours.

- Seamless integration of your brand into our system enables the creation of a tailor-made VR simulation for your company’s needs. Branding in VR can suffer from inaccurate colour representation or a need to be creative with brand guidelines. Our system, allows for faster iteration, resulting in a better brand experience.

- Fonts can be replaced, as can styling options and the number of colours per palette, using a predefined layout built for VR. What used to take a UI artist and a developer days, can be done in minutes.

- Changes can be made once and applied anywhere, saving users time and enabling changes during the process with minimal upheaval.
Haptic Toolkit

The Core brings the prolific capabilities to build no-code haptic interactions rapidly. It contains the building blocks needed to produce surgical simulations in the fields of orthopedics, ophthalmology, urology and more.

We currently support the Geomagic Touch from 3D systems.

- A Playground scene is provided for demonstrating what is possible. Developers can easily implement interactions with no complex coding required.
- The necessary drivers are packaged as part of the Core, minimising configuration requirements
- Interactive, animated haptic arm assets are included inside Unity, enabling a 1-1 match between real life and the simulation.
- Developers can use an intuitive system of rules and behaviours to simulate physical interactions.
- Customisation and setup is achieved through simple drag-and-drop assignment in the Unity editor, no coding knowledge is required.
- Other supported hardware to follow in future releases.
User Authentication

Users of the Core are able to easily integrate and implement our secure Fundamental Surgery authentication system into their applications ensuring that only authorised individuals get access.

- The **Registration and login** functionality feature allows the user to access their account with an email address and password. Removing the need to set up and manage complicated authentication systems, users can rely on our backend to provide a seamless login experience.

- Password authentication and reset. Our built-in authentication system secures user access and allows users to reset their passwords if needed - providing more time to developers for building and deploying projects, and less time worrying about storing sensitive data and authenticating users.

- User Management allows admins to review user data on a dedicated page, easily accessible from the Fundamental Surgery Data Dashboard.
Multiple Language Support

Surgical training is an international affair and our SDK contains the capabilities for as many languages as you require. This allows users to create a more global product that can be deployed quickly.

- Currently supports English & German
- More languages can be added upon request
Multiple Module Support

Each application can now contain multiple modules, simplifying the distribution of complex content.

Creating new modules can be done without writing a single line of code, and the process is easy and intuitive.
Quick Start Examples

Our pre-configured sample scenes give users a recommended workflow, showing how components fit together.

- Users can create content immediately with some of our automated, pre-existing scenes and features - such as; Licence Authentication, Session Assessment Confirmation, User-inactivity timeout, and Functional User Login and Recovery.

- Users can customise the example UI to their liking, so they can create great looking products with ease.

- Our centralised service systems allow users to set + gain vital information about their product - such as the product name, procedure codes, platform type (PC/Mobile) and whether they are haptically enabled. This information can also be professionally presented to the end user.

- Our integrated service systems allow more advanced users to integrate their own platform-specific functions or modify pre-existing universal features, enabling the SDK to expand with the user’s knowledge.
Working Examples

Five additional example scenes, making it easy to learn and grow with the latest feature additions.

With our sample unity project, you can instantly kick start your surgical simulation build with the help of the following scenes:

Working example of an end to end experience, everything you need to get up and running.

- Examples for best practices on how to set up and configure the Unity scene are provided, leading to more effective authoring and a reduced risk of bugs so users can create their own products effectively.
VR Keyboard

VR Keyboards are notoriously tricky to work with, however, Fundamental Core comes with one, designed in-house by us, from the ground up. This allowed us to keep both the end user and developer experience in mind.

- Text input can often be frustrating and awkward in VR, rely on our experience with common issues and minimise friction for users.
- Improved usability and customisation, with special consideration for usage in VR such as the inclusion of a tab key to switch input fields.
- The keyboard can be used with any scene in the SDK, working out of the box with all text entry fields.
- Keyboard can easily be configured to any symbols or languages, including shortcuts to company email logins. E.g. @fundamentalvr.com