STEAMVR™ HARDWARE

Ben Jackson
Agenda

• Lighthouse SteamVR™ Tracking Overview
• Technology Update
• Growing the Audience
• Licensing program and training class
• OpenVR
SteamVR™ Tracking

System Overview

Host

Applications
OpenVR Client API
SteamVR™
OpenVR Driver API
driver
others

Basestation

Sensors

Electronics
How it Works

**Basestation**

- Plugs into your wall, not your PC.
- Everyone can share
- **120° Field of View**
Standalone is Important

- Autonomous
- Enables Backpack PCs for VR
- Mobile VR
- Scalability
Look with an IR Sensitive Camera
Turning Time into Angle

For Each Rotor
- A long flash is seen by all
- That starts the time
- Time is equivalent to angle
- Laser turns on and sweeps across the room
- Individual sensors measure the time, known own angle
Advantages

• Accuracy is only limited by timing accuracy
• Range is only limited by brightness and accuracy
• Unlimited users and objects
• No trick to identifying sensors – they identify themselves
On the Host

• Sensor angles and IMU data sent with low latency
• Driver uses OpenVR API
With Great VR comes Great Responsibility
TECHNOLOGY UPDATE

BASESTATIONS – SENSORS – ELECTRONICS
Technology Goals

• Make everything better
• Make standard components available
• Don't be a bottleneck
• Support licensees
• Reach a wider audience
Basestation: 2014

- Hand machined by Valve
- About 50 ever made
- Built with surplus parts
Basestation: GDC 2015

- Synapse built about 400
- Hand Calibrated
- Used in GDC 2015 for the demo booths where we revealed the Vive
- Used up all the motors and lasers
Basestation: 2015 Dev Kit

- Many thousand shipped to developers!
- Off the shelf components pressed into service
Basestation: HTC Vive

- Custom motors, lasers, and optics
- Many thousands have shipped
Basestation: Future

• Research platform
• Earlier version became HTC Vive base
• At right: Single rotor!
Single Rotor Visualized
Sensors

- Top right, the “gumstick” board that powered the 2015 dev kits.
- About 40 components.
- Bottom right, the same design in an early Vive faceplate
Sensor ASIC

- Application-specific integrated circuit
- High up-front cost, low unit cost
- Reduces component count dramatically.
- It’s the TS3633 Light to Digital Converter for SteamVR™ Tracking!
Triad Semiconductor

Working with Valve since 2014 to build custom silicon for sensors.

www.triadsemi.com
TECHNOLOGY UPDATE

BASESTATIONS – SENSORS – ELECTRONICS
Watchman V1: Early 2014

- Individual connectors
- Good for HMDs, bad for controllers
- FPGA, MCU, and IMU
Watchman V2: Late 2014

• Mass produced for Mr Hat and dev kit Vives
• Still only tracking
Watchman V3?

• Small form factor
• Modular
• Combine tracking, radio, and controller input
Watchman V3: 2016

- Tiny!
- Upgrades everything
- Includes radio, controller
- Fits in a controller handle
- Powers the HDK
EXPANDING THE AUDIENCE
**Basestations**

• Critical to tracking quality

• Key to compatibility

• Valve will manufacture and OEM a basestation to enable hardware partners of all scales
Sensors

The TS3633 is available now from Triad Semiconductor in prototype and production quantities.
STEAMVR™ TRACKING CLASS
Valve is now making SteamVR™ Tracking fully available to other companies, without licensing fees.

We provide a reference object, electronics, documentation, and training. You provide the inspiration!
Sign Up and Get Started

• Over 300 companies have signed up
• About 100 slots are available in scheduled classes between now and the end of the year
• http://steamvr.com/tracking
Synapse

• Synapse has been working with us on VR since 2014.
• They designed and manufactured the reference design for the class.
• They can help you do the same with your project.
What the Class Covers

• SteamVR™ System Overview
• Object Design Criteria
• Development Tools
• Sensor Placement
• Sensor Covering
• Rapid Prototyping

• Test and Calibration
• The Render Model
• Tracking Evaluation
• Electrical System
• Firmware
• HDK
By Engineers, For Engineers

• Bring a mechanical engineer
• Bring an electrical engineer
• Bring an industrial designer if you can
Get Answers to your Questions

• Attend the class and get access to the forum
• [http://steamcommunity.com/app/507090/discussions/](http://steamcommunity.com/app/507090/discussions/)
• Readable by everyone
• Get answers from other licensees, from Valve, and from Synapse
Reference Hardware

Licensee Dev Kit
Hardware Development Kit

• Everything needed to track controllers or an HMD
• Supports trackpads, haptics, and buttons
• Wired or wireless operation
• Can be battery or USB powered
• Includes quick prototyping options
CONNECT YOUR THING TO EVERYTHING WITH OPENVR
The difference between SteamVR™ and OpenVR API

- API for application developers
- API hardware developers
- SteamVR is the runtime
- Versioning and services to tie everything together
SteamVR™ Tracking

Licensees

Oculus
Razer Hydra
Leap Motion
OSVR
VRidge
Others...
Open Source

Razer Hydra Driver

• We shipped an open source Razer Hydra driver.
• Turned into a product by András Beck
• There are 28 forks of that on github, including a driver for Leap Motion.
• These drivers are bringing the tracked controller experience to all supported HMDs.
OpenVR for Low Level Developers

• Available under the 3-clause BSD license on github

• [https://github.com/ValveSoftware/openvr](https://github.com/ValveSoftware/openvr)

• Good example usage: Our Unity plugin (using the C# binding), the Hydra driver (and its forks), and open source engines like jMonkeyVR.
OpenVR for Game Developers

• Already integrated in popular game engines.
• Backwards compatibility is designed in, so you don’t have to worry about chasing driver versions.
Future Proofing

• Your game is going to keep working on future hardware.
• Our APIs will help you make that experience just as good as it is on the hardware you used to develop it
• Render models, button coordinates, hand assignments
OpenVR for Hardware Developers

• We’re happy to ship your drivers on Steam
• Driver version compatibility since the beginning of 2016
• We want your driver to be a success
Extending the API

• If you’re building something exotic enough that it’s not covered by the API, reach out to us
• A common API means a single target for developers
Beyond Cubes

• Bring up your OpenVR driver early
• Playtest with real content
GIVE US YOUR FEEDBACK!

benj@valvesoftware.com
This is why we have happy hour

**Talk to Each Other!**

- This year we invited all the tracking licensees
- Talk about what hardware would enable great new experiences
- Pitch your hardware idea and find people enthusiastic to build demo content