



# Moving Web 3d Content into GearVR

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# Samsung GearVR s/w development goals

- Build GearVRf (framework)
  - GearVR Java API to build apps (also works with JavaScript)
- Play nice with other devices
  - Wands, Controllers, I/O devices
  - GearVR apps run on Google Daydream !
- Performance, New Features
  - Fight for every Millisecond:
    - Android OS, Oculus, GPU, CPU, Vulkan
    - Unity, Unreal, GearVRf (framework)
- Enable content creation
  - Game developers, 3D artists, UI/UX people, Web designers





# Content Creation for GearVR

- 360 movies
- Game Editors: Unity, Unreal
- GearVRf (framework)
  - Open source Java api, JavaScript bindings
- WebVR
  - WebGL; frameworks: A-frame, Three.js, React, X3Dom
- 3d file formats
  - Collada, .FBX, gltf, .OBJ &.mtl, etc. using Jassimp
    - Java binding for Assimp (Asset Import Library)
  - **X3D**



# Why implement X3D in GearVR

- Samsung began this effort February, 2016
- X3D is a widely supported file format
  - Exported by 3DS Max, Blender, Maya, Moto
    - Or exports VRML and converts to X3D
- No other file format had similar capabilities.
  - Interactivity via JavaScript
  - Declarative format easy to edit / visualize the scene.
- GearVR is not just a VR game console like Sony PSVR
  - We are a phone, web access device, camera, apps platform
  - X3D enables web applications:
    - Compliments the game influence in GearVR from Unity, Unreal.
    - Enables new VR web apps including: Google Maps, Facebook, Yelp JavaScript API's.

# GearVR app



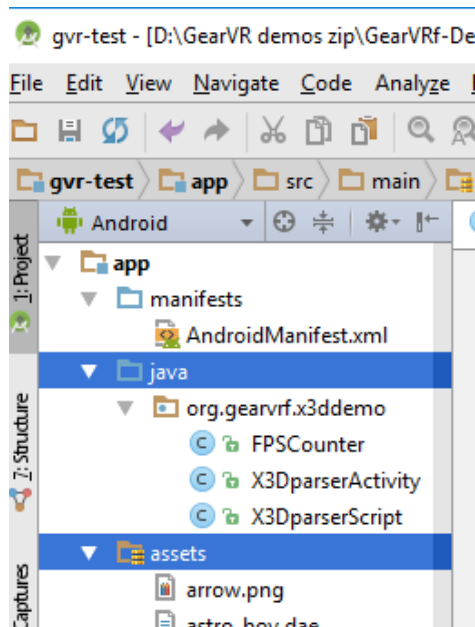
## Build

### Android Studio

Assets folder

.png, .jpg  
.dae, .fbx, .gltf, .obj & .mtl, .x3d

Java code



## Runtime

Jassimp loader  
.dae, .fbx, .gltf, .obj

X3D parser  
.x3d file

### GVRf Rendering Engine

- GearVRF Java classes for Android
- Java Native Interface
- GearVR Native Library

### Uber Shader

### Oculus Native Library

- Oculus SDK for mobile

### Daydream Native Library

- Daydream SDK

# Live Demo

*Very daring for the presenter who possesses no art skills.*



- 3ds Max
  1. Animated textured objects
  2. Export VRML97, Convert with “Instant Reality” to X3D
- Android Studio
  1. Drop x3d file and texture maps into the *assets* folder
  2. Modify 1 line of code in X3DParserActivity to refer to new file name
  3. Build the application
    - Only need to build once for each new file.
  4. Run it!

*GearVR scene is less than 5 minutes!*

# Current X3D implementation in Samsung GearVR



- Transform, Group
  - Shape
    - Primitives (Box, Cone, Cylinder, Sphere)
    - Text & FontStyle
    - IndexedFace Sets
      - Coordinate, Normal, TextureCoordinate
  - Appearance:
    - Material: diffuse, emissive, specular
    - ImageTexture
- Lights
  - Directional, PointLight, SpotLight
    - attenuation, beamWidth, cut-off-angle, color

# Current X3D implementation in GearVR



Continued

## ■ Script /JavaScript

- Interactivity Single Field values
  - SFBoolean, SFColor, SFFloat, SFInt32, SFRotation, SFVec3f
- Per Frame scripting, supporting procedural animation & collision detection.

## ■ ROUTE

- Animations:
  - PositionInterpolator, OrientationInterpolator
- Sensors
  - TimeSensors, TouchSensors
- Level-of-Detail, Inline, Switch
- Text & FontStyle
- Background
  - Including cube textures for a real 360 view



# X3D Issues in VR



## ■ Cameras / Viewpoint node

- Do not animate between Viewpoints
  - Moving the scene without user moving can cause that 'VR motion sickness'.
- Ignore orientation parameter
  - Camera always points straight ahead, never rotated to the side.
  - Let the user rotate their head to move the camera around
- Ignore fov (field of view) parameter.
  - Also causes that VR dizziness



# Future X3D implementation in GearVR

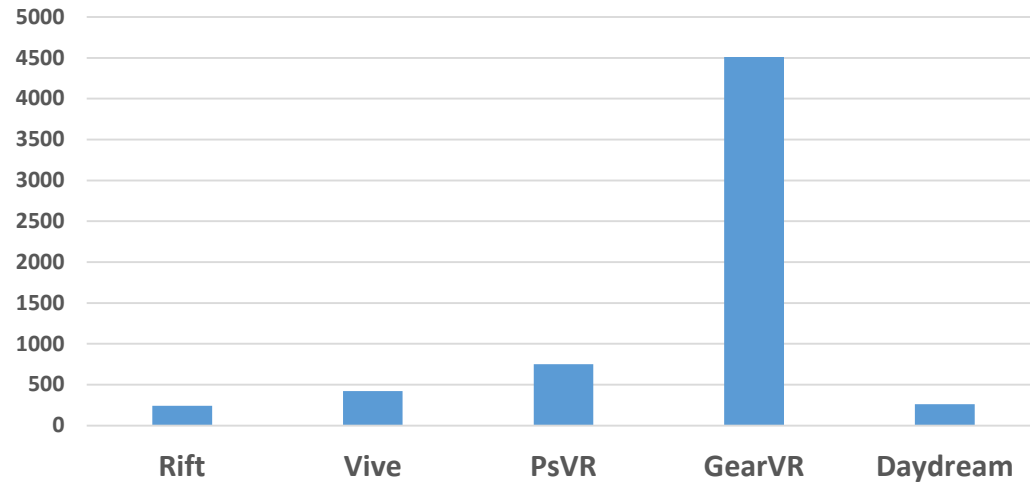
- Movie Texture
- Render-to-Texture
- Sphere Sensor, Visibility Sensor, Proximity Sensor, Cylinder Sensor
- Multi-texture
- Shaders
- Indexed Line Set
- Texture Transform
- Indexed Line Set
- 2 million vertices
  - No more 32k vertex/mesh limit.
- Color (perVertex)
- X3D data types
  - MF data types
    - JavaScript programming the above.
- Audio ?



# VR Market

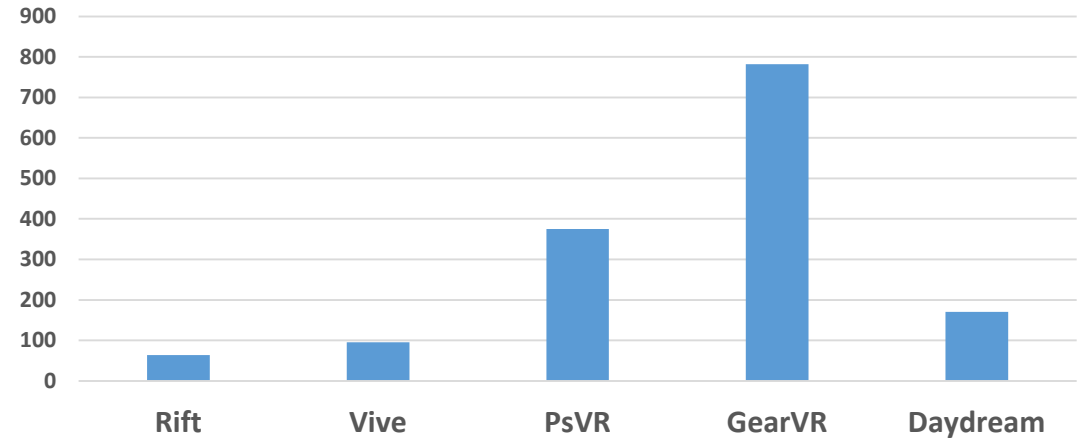


2016 VR headset sales  
(in thousands)



<https://uploadvr.com/report-6-3-million-virtual-reality-headsets-shipped-2016/>  
Rift: 240k; Vive: 420k; PSVR: 750k; GearVR: 4.51 million; Daydream: 260k

2017 1Q headset sales  
(in thousands)



<https://venturebeat.com/2017/05/09/vive-outsells-rift-but-mobile-and-console-vr-oussell-both/>  
Rift: 64k; Vive: 95k; PSVR: 375k; GearVR: 782k; Daydream: 170k

Devices running X3D: 4.75 million in 2016\*  
.95 million added 1Q 2017\*

\* - GearVR + Daydream

Samsung s8 has since launched with new GearVR controller.

# Conclusions



- X3D benefits to GearVR

1. X3D Spec. has provided guidance.
2. Brought us closer to content creators
3. Internal testing
  1. Quickly edit X3D file for testing and performance
4. Opening new markets
  1. X3D printing, Web, U.I. development,

- Challenges

- X3D + VR: AR (augmented reality) extensions
- More features to come: Shaders, Multi-textures, Sensors
- GUI tools to create JavaScript / <SCRIPT> nodes



# X3D, GearVR questions

- Gear VR:

- <https://github.com/gearvrf/GearVRf-Tests/>
- <https://github.com/gearvrf/GearVRf-Demos/>
- [https://resources.samsungdevelopers.com/Gear\\_VR/020\\_GearVR\\_Framework\\_Project/020\\_Get\\_Started](https://resources.samsungdevelopers.com/Gear_VR/020_GearVR_Framework_Project/020_Get_Started)
- <https://github.com/Samsung/GearVRf>

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- Mobile VR BOF (birds of a feather)

- SIGGRAPH, Wed. Aug. 2, noon-1pm

*Thanks Web 3D &  
SIGGRAPH*