

# 英伟达在VR应用制作领域的最新探索

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# 概要

- VRWorks Audio
- VRWorks 360 Video
- Project Holodeck



# NVIDIA VRWorks

针对VR开发者的综合性SDK

## GRAPHICS



LENS MATCHED  
SHADING



SINGLE PASS  
STEREO



MULTIRES  
SHADING



VR SLI

## HEADSET



CONTEXT  
PRIORITY



DIRECT  
MODE



FRONT BUFFER  
RENDERING

## PHYSICS & TOUCH



PHYSX

## PROFESSIONAL



WARP &  
BLEND



SYNCHRONIZATION



GPU  
AFFINITY

## AUDIO



VRWORKS  
AUDIO

## 360 VIDEO



VRWORKS  
360 VIDEO



GPUDIRECT  
FOR VIDEO



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# VRWorks Audio



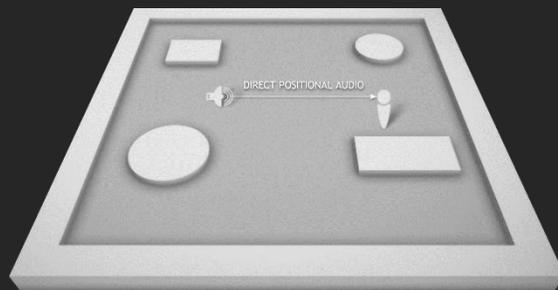
# 在VR中模拟声音效果

## 综合各种音源



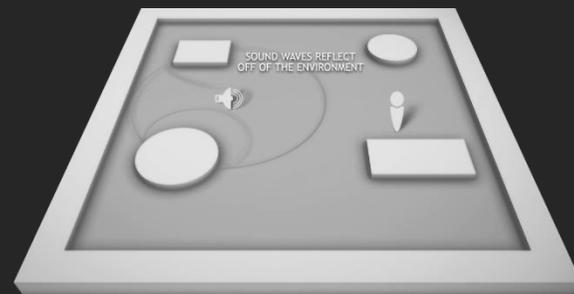
创建各种音源

## 方向



传入的声音的方位

## 传播



声音如何在空间里传播



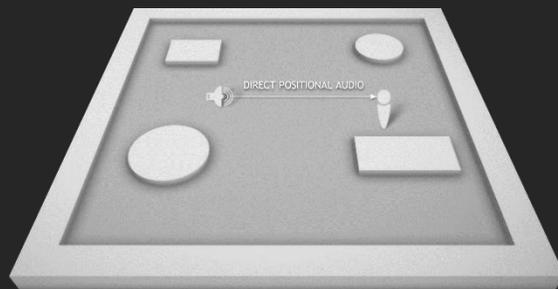
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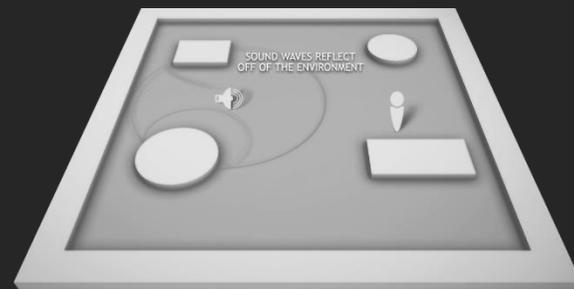
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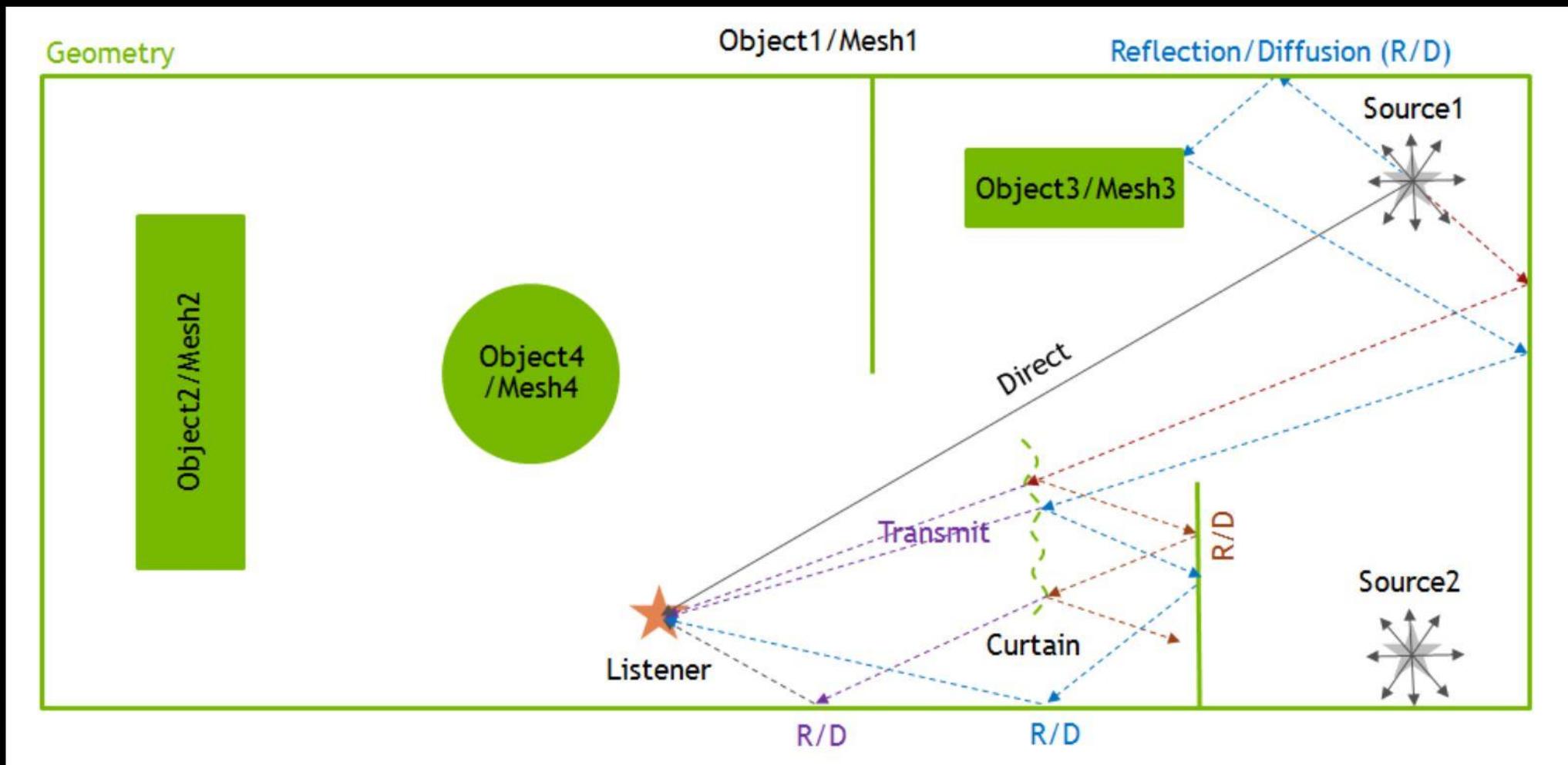


# NVIDIA VRWorks Audio

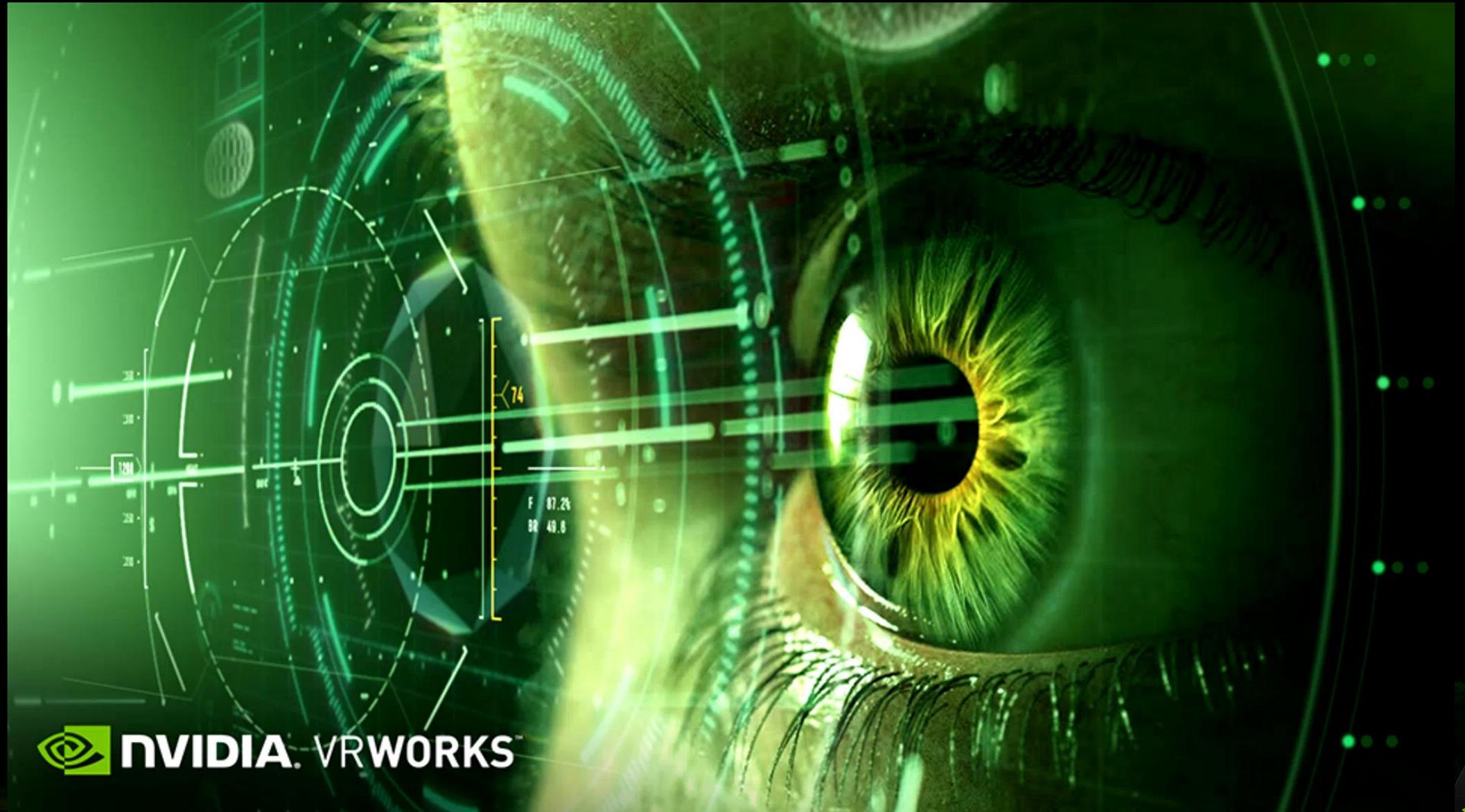
- 目前唯一完全支持硬件加速和路径追踪的声音效果解决方案
- 实时模拟声音在环境中的传播效果
  - 不需要任何预先烘焙(Pre-baked)工作
  - 减少游戏开发的工作量
- 英伟达声学光线追踪器( NVIDIA Acoustic Raytracer / NVAR )
  - 使用 CUDA 和 NVIDIA OptiX 光线追踪引擎实现



# Audio Path-tracing



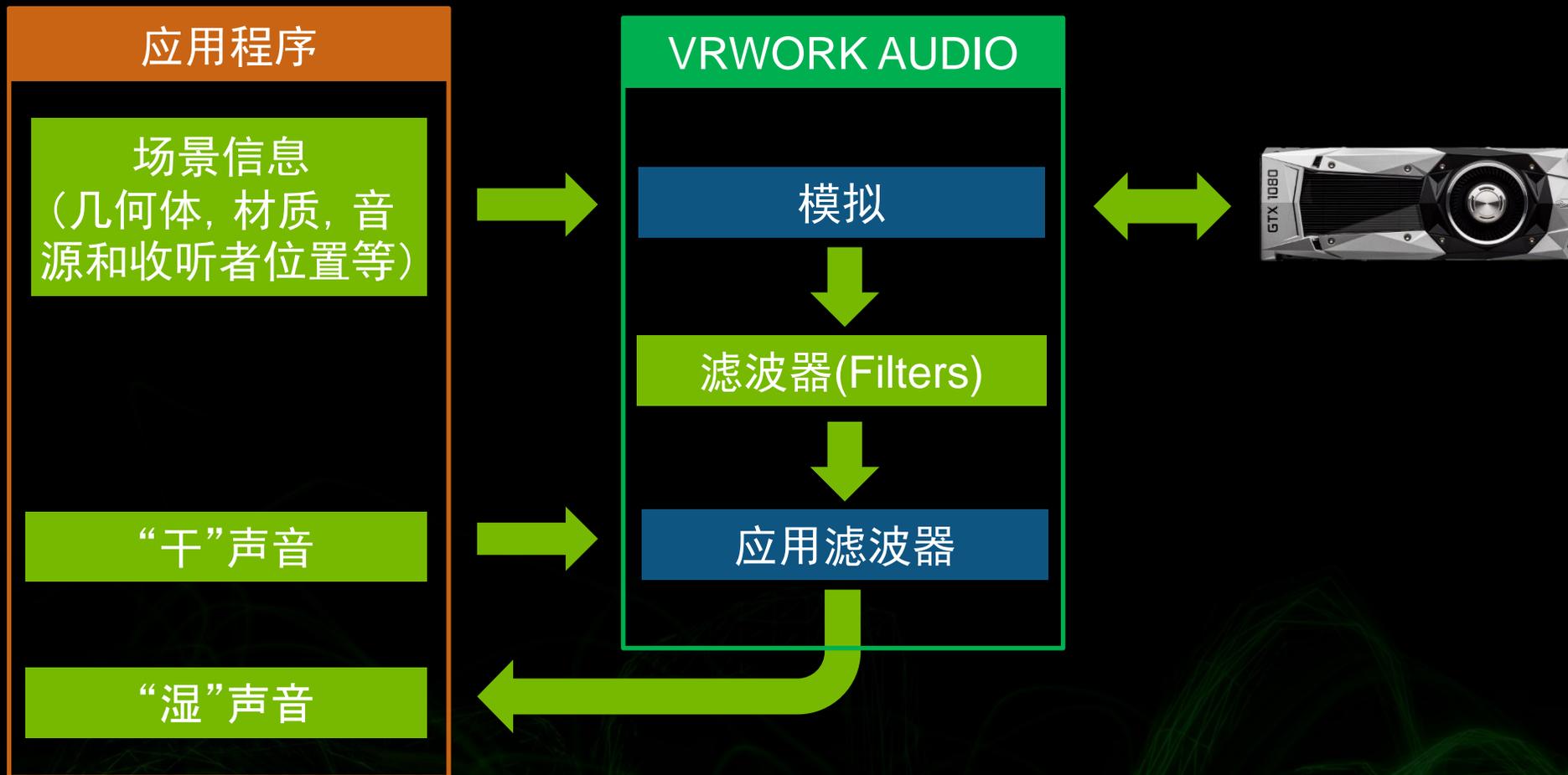
Video: <https://youtu.be/Ozhywx2YbzM>



 **NVIDIA. VRWORKS™**



# VRWorks Audio 的工作管线



# VRWorks Audio 生成的滤波器

- 生成卷积滤波器(Convolution Filter), 左右耳分开
- 一个滤波器针对一个 音源/收听者 组合
- 每个滤波器中都包含了方向, 混响, 衍射, 遮挡等效果



# VRWorks Audio 的应用

- 提供了 VRWorks Audio SDK 开发包
  - 包含了相关的库文件, API函数, 说明文档及例程

✓ VRWorks Audio	1.0.1	2017/06/29
<p>VRWorks Audio SDK is a set of library, APIs, documentation and sample applications aimed at game and application developers for creating a fully immersive audio experience in 3D space. With support for effects such as directionality, reverbs, occlusion, transmission etc., VRWorks Audio allows the developers to add real-time, GPU-accelerated path-traced audio to their applications, games, and virtual reality experiences.</p> <p><a href="#">More Information &gt;</a></p>	<p>DOWNLOADS</p> <ul style="list-style-type: none"><li><a href="#">🔒 VRWorks Audio 1.0.1</a></li><li><a href="#">📄 VRWorks Audio SDK Overview</a></li><li><a href="#">📖 Documentation</a></li></ul>	



# VRWorks Audio 的应用

- 提供了UE4的插件(基于UE4.15)
  - <https://developer.nvidia.com/nvidia-vrworks-and-ue4>

## Access UE4 GameWorks Integration:

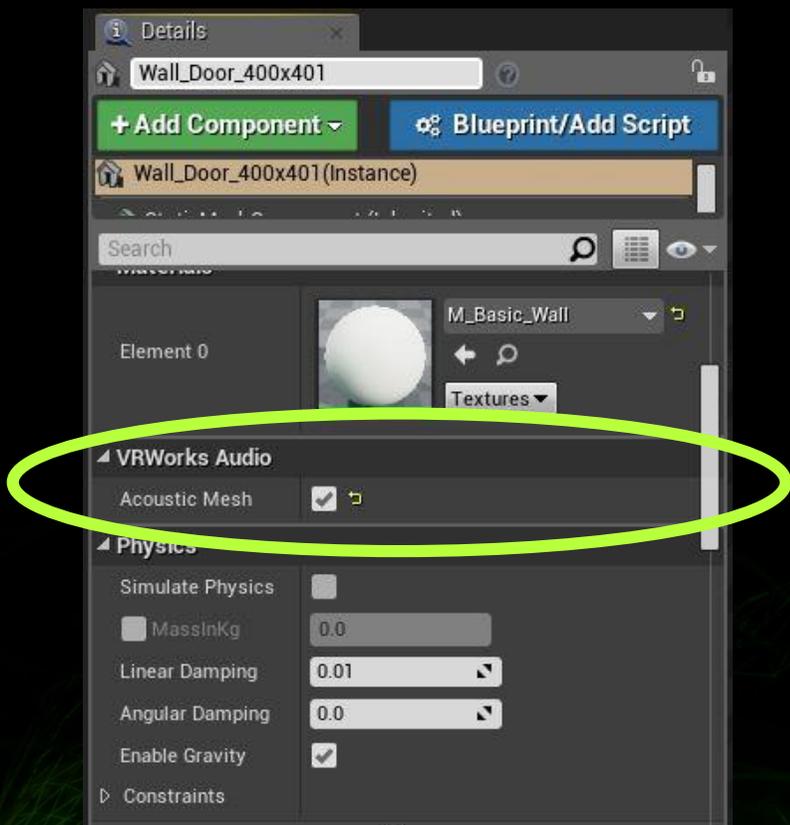
In order to access the UE4 GameWorks integrations, you will need a [UE4 / GitHub subscription](#).

- [Multi-Res Shading UE4.11](#)
- [Multi-Res Shading UE4.12](#)
- [Full VRWorks Graphics UE4.12](#) (Includes Multi-Res shading, VR SLI, Single Pass Stereo and Lens Matched Shading)
- [Multi-Res Shading UE4.13](#)
- [Full VRWorks Graphics UE4.13](#) (Includes Multi-Res shading, VR SLI, Single Pass Stereo and Lens Matched Shading)
- [Full VRWorks Graphics UE4.14](#) (Includes Multi-Res shading, VR SLI, Single Pass Stereo and Lens Matched Shading)
- [Full VRWorks Graphics UE4.15](#) (Includes Multi-Res shading, VR SLI, Single Pass Stereo and Lens Matched Shading)
- [Full VRWorks Graphics UE4.16](#) (Includes Multi-Res shading, VR SLI, Single Pass Stereo and Lens Matched Shading)
- [VRWorks Audio UE4.15](#)



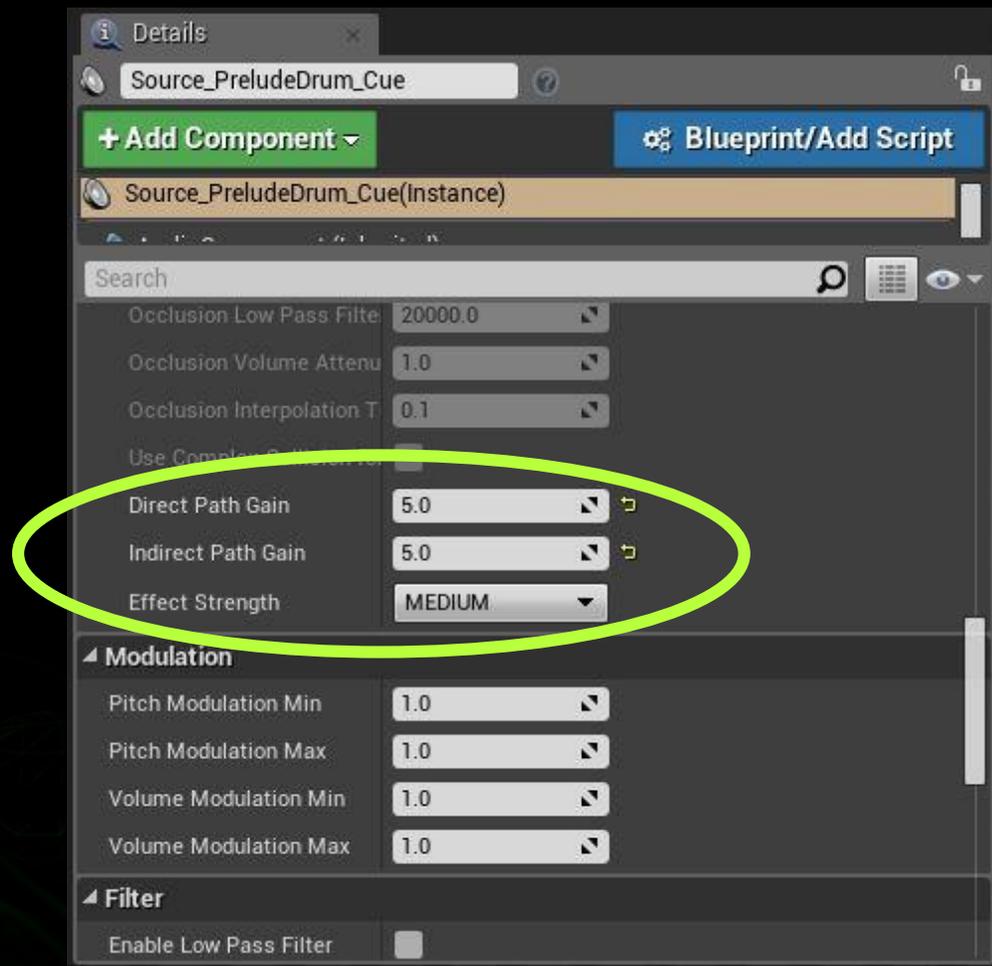
# VRWorks Audio 在UE4中的使用

- 设置那些几何体参与声音效果的模拟，以及这些几何体的材质属性
  - 典型的物体为，墙，地板，天花板，门，家具等



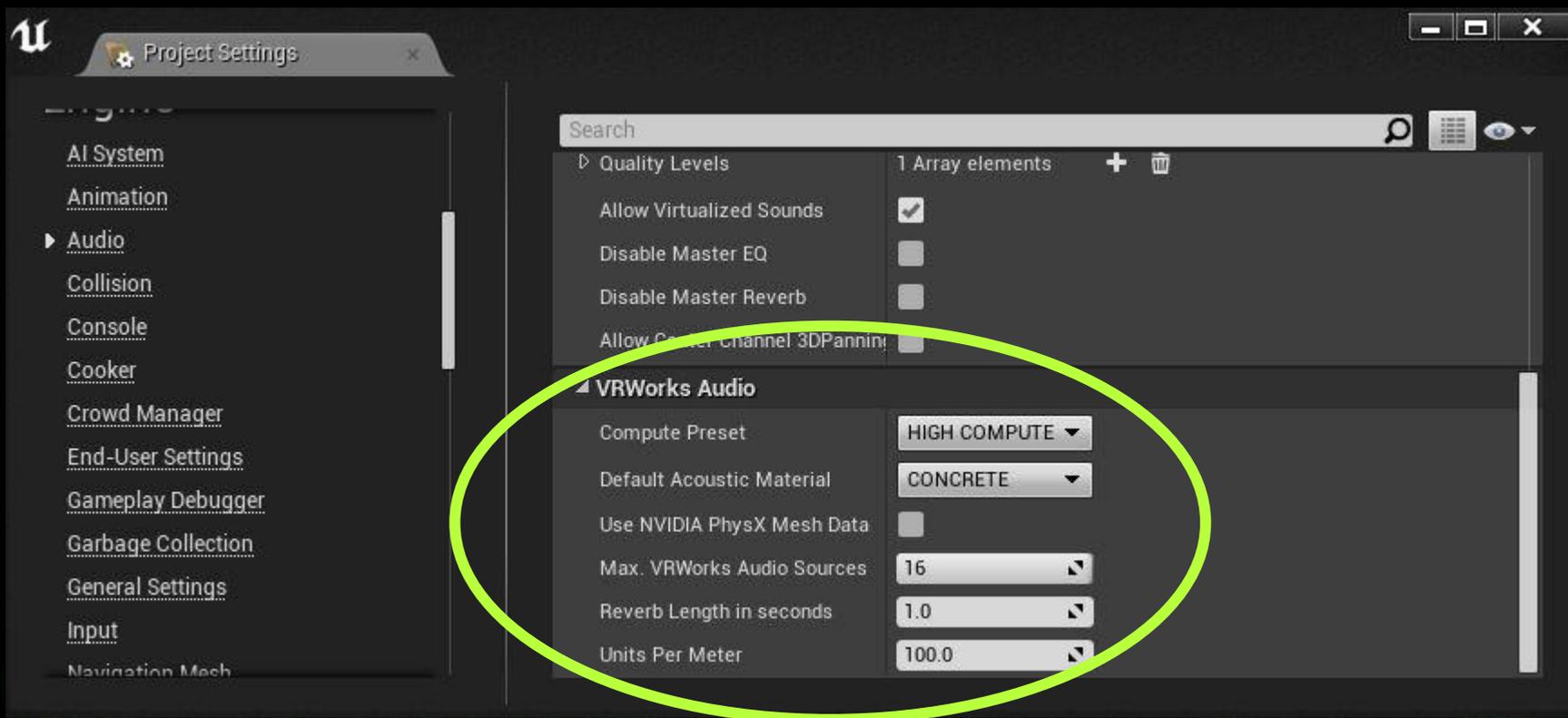
# VRWorks Audio 在UE4中的使用

- 设置音源的属性
  - 如效果的强度，直接和间接路径对最终效果的影响程度



# VRWorks Audio 在UE4中的使用

- 在项目设置中设置整体的属性



# VRWorks 360 Video

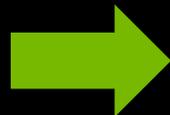


# 制作360度全景视频涉及巨大的计算量



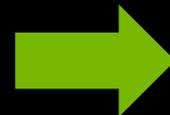
图像捕获

4k 相机



拼接(Stitch)

解码→校准→均衡化→拼接→编码



显示

单个 360 视频



# VRWORKS 360 VIDEO 介绍

实时捕获，拼接及流化360°全景视频

- 实时和离线拼接4k相机组的数据
- GPU加速的视频解码，校准，均衡化，拼接，及编码
- 对立方图(cube-map)和等距圆柱全景图(equi-rectangular panorama)做360度投影
- 与GPUDirect视频技术一同工作可获取低延迟的视频摄取



“捕获和拼接360度视频十分耗时且有大量的计算需求。NVIDIA的VRWorks 360 Video SDK有助于加速STRIVR的工作流程，提供实时的，高质量的360视频。”

— Masaki Miyanohara, CTO, STRIVR

# VRWorks 360 Video

- 输入数据: MP4 文件, RGBA 文件, 或者 RGBA CUDA 数组
- 拼接方式: 羽化(Feathering) 和 多波段融合(Multiband blending)

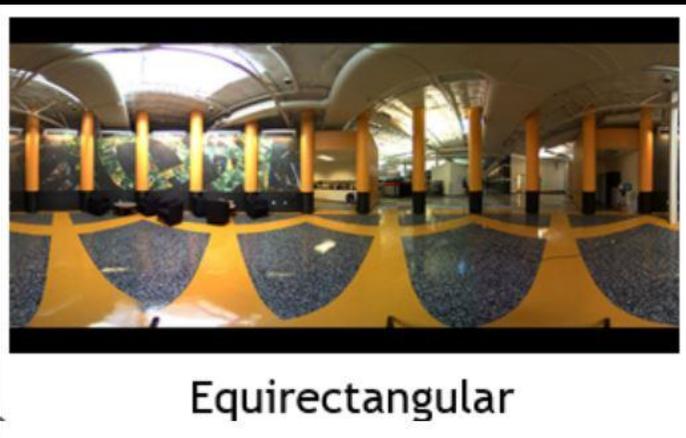


Multiband blending



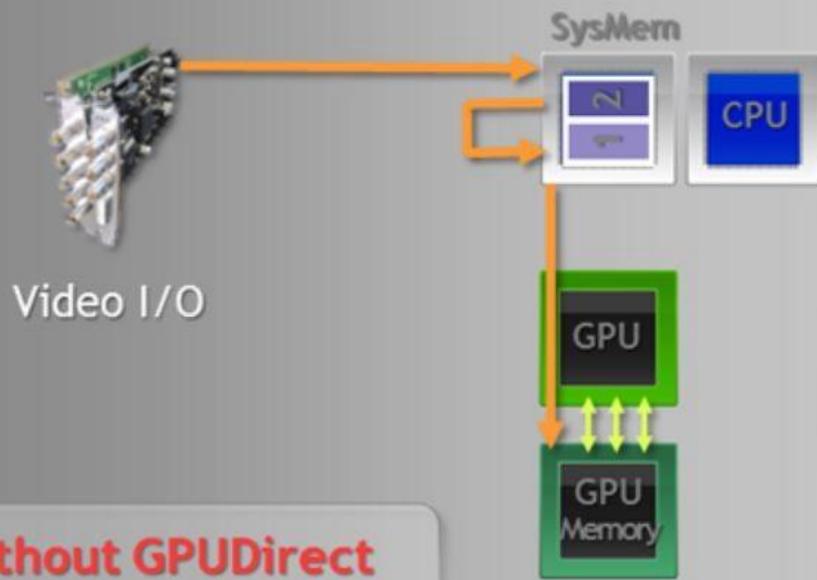
# VRWorks 360 Video

- 输出数据：MP4 文件, RGBA 文件, 或者 RGBA OpenGL 贴图

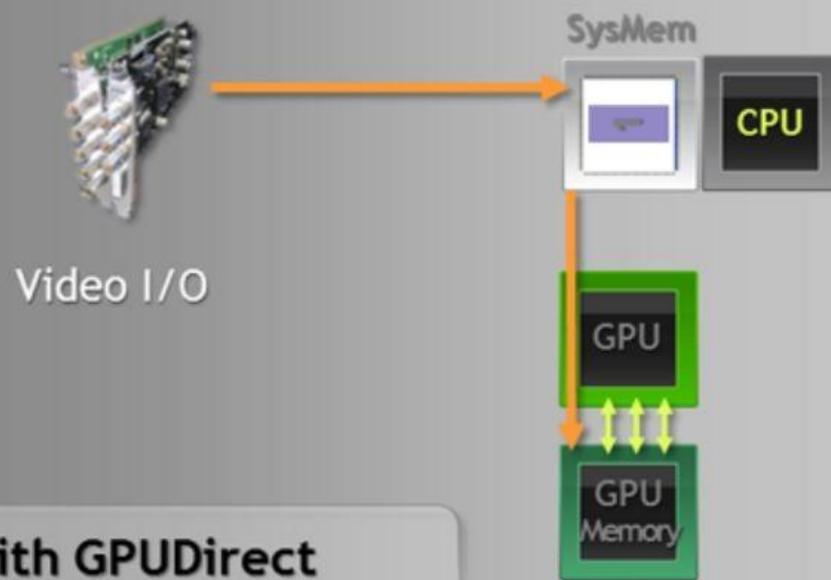


# GPUDirect For Video

- CPU Manages Data Transfers Between Devices
- No Synchronization Between Devices
- Smallest Transfer Size is a Field



- CPU overhead is Minimized
- Transfers are Synchronized
- Smallest Transfer Size Smaller than a Field



# GPUDirect For Video

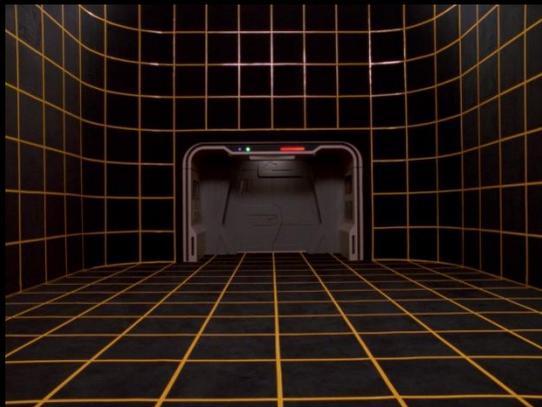
- 降低数据传输的延迟
- 输入输出设备数据和GPU及CPU完全同步
  - 最小化设备间进行数据拷贝的开销
- 可以同 360 Video SDK 一起使用, 加快数据输入的效率
- 需要 Quadro GPU



# Project Holodeck



# 科幻片中的 Holodeck

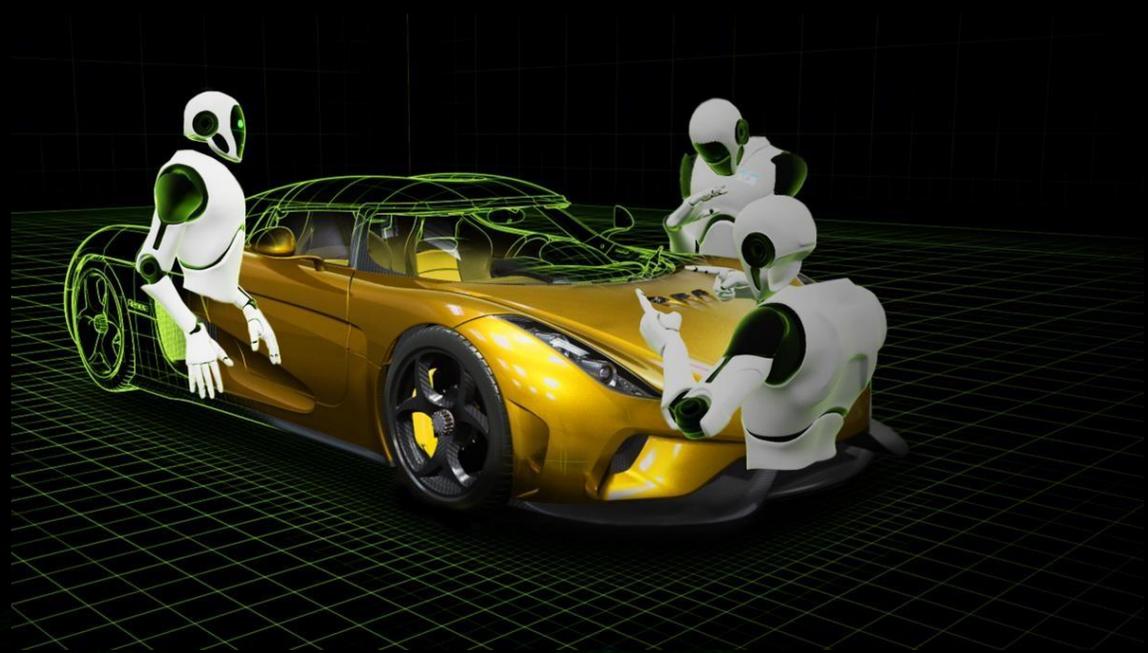


\* 图片来源于谷歌图片搜索



# NVIDIA Holodeck 简介

- 极其逼真的可供协同工作的虚拟现实环境，从视觉，听觉和触觉等方面入手，共同营造一个与真实世界无二的体验感受
- 使用者可以在VR环境中引入高仿真的全精度模型与同事和朋友分享并协同工作，从而使得设计工作更加方面快捷



Video: <https://youtu.be/hUsP7fsjrdg>



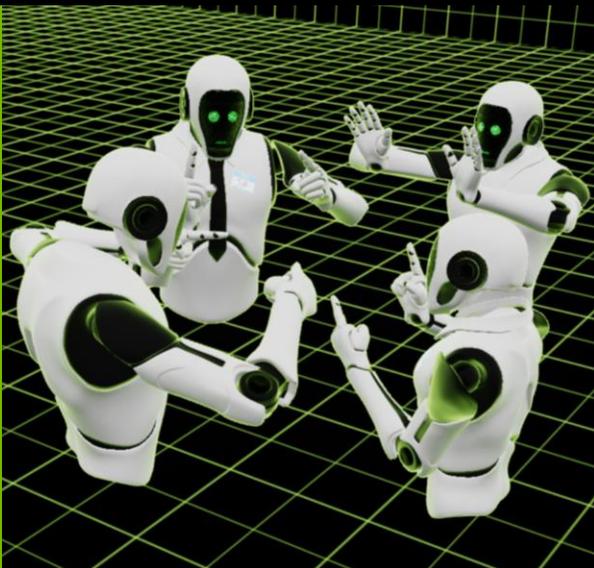
# NVIDIA Holodeck 简介

- 基于UE4的增强版
- 包含 [NVIDIA GameWorks](#), [VRWorks](#) 及 [Design Works](#)

照片般真实的模型



协同合作



可交互的物理模拟



# 总结



# 总结

- VRWorks Audio可以帮助开发者从听觉方面营造更加真实的虚拟现实环境
  - 不仅仅限于VR游戏，普通3D游戏也可以从中受益
- VRWorks 360 Video让VR开发者和内容制作者用离线或实时的方式高效地捕获，拼接和流化360度全景视频
- NVIDIA Project Holodeck集英伟达的尖端技术于一体，开创了全新的设计制作环境，将科幻变成了现实
- 英伟达将不断探索更新更尖端的技术，“To boldly go where no man has gone before”(勇踏前人未至之境)



谢谢！

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