ANARI 1.0 Launch

The Industry's First Open Standard, Cross-platform 3D Rendering Engine API

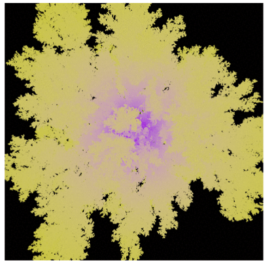
Press Pre-Briefing

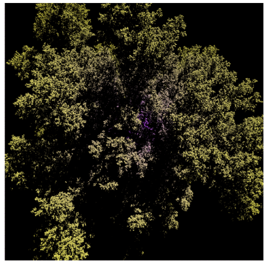
August 2023

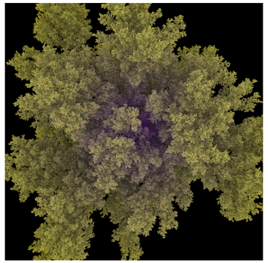
Visualization, Rendering and ANARI

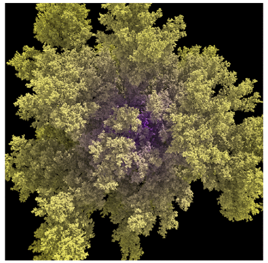
Many new 3D rendering technologies are available to scientific visualization applications

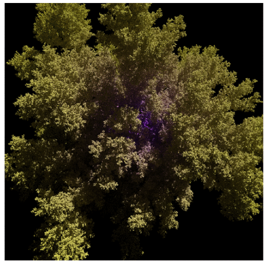
Techniques such as path tracing provide significant visualization enhancements

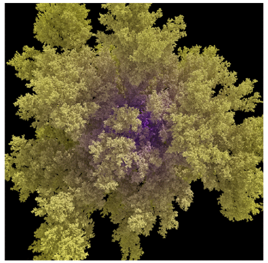

Ray casting of surface color


Directional lighting and shadows


Ambient occlusion lighting


Directional lighting with ambient occlusion


Directional lighting with path traced indirect lighting


Directional lighting with ambient occlusion and path traced indirect lighting

BUT can be complex and time-consuming for domain experts to use low-level rendering APIs

Rendering engines can hide that complexity - and a rich diversity of vendor and open-source rendering engines are now available - BUT every rendering engine uses a different API

ANARI™

Cross-Platform 3D Rendering Engine API
Simplified application development
Application portability to any engine supporting ANARI

ANARI 1.0 Launch

Simplified Application Development

High-level API to describe
WHAT is to be rendered not HOW

Application Portability

Common API for ANY rendering-engine
independent of vendor, platform or ecosystem

ANARI™

Cross-Platform 3D Rendering Engine API

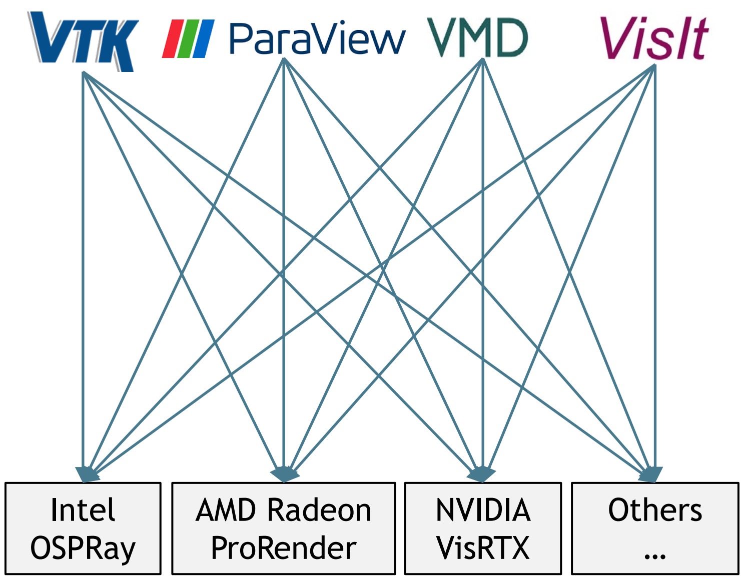
ANARI 1.0 Finalized

Multiple implementations shipping and
open-source SDK available

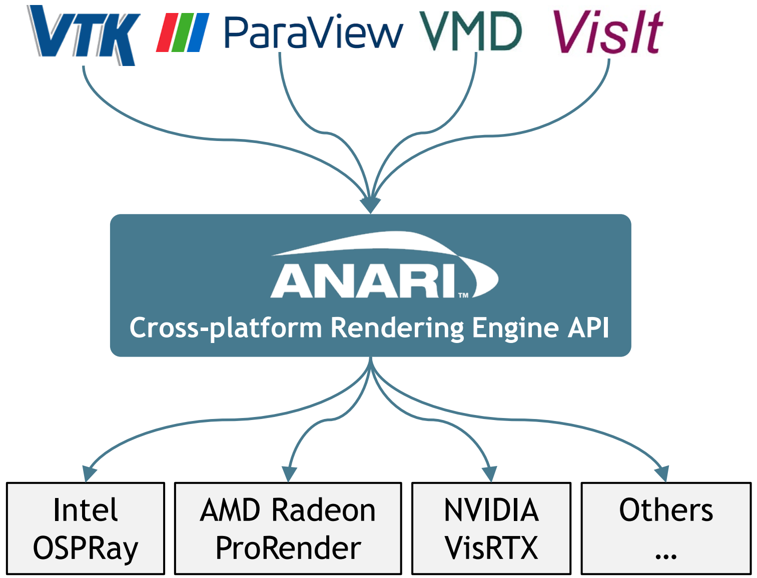
Scientific Visualization Beachhead

Many types of application
will benefit from ANARI

Scientific Visualization Before and After ANARI



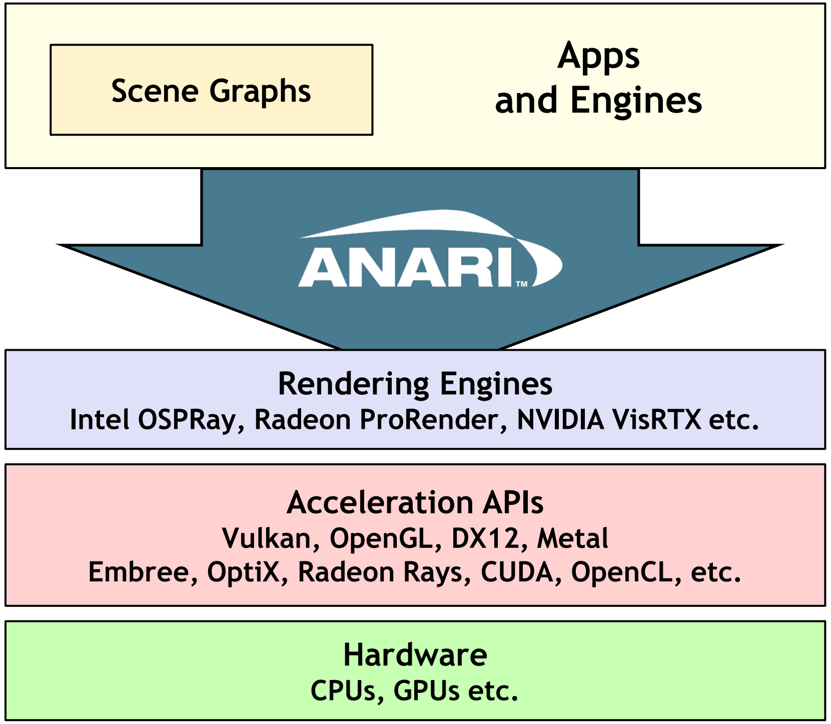
Before ANARI



After ANARI

ANARI applications are portable to any engine supporting the ANARI API
Independently of vendor, platform or ecosystem

ANARI Development Stack

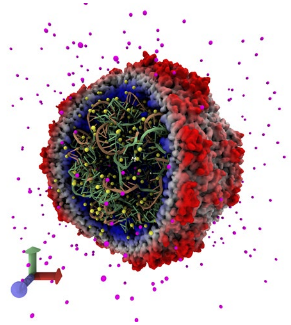

Scene Graphs
Apps and Engines
ANARI™
Rendering Engines
Intel OSPRay, Radeon ProRender, NVIDIA VisRTX etc.
Acceleration APIs
Vulkan, OpenGL, DX12, Metal
Embree, OptiX, Radeon Rays, CUDA, OpenCL, etc.
Hardware
CPUs, GPUs etc.

Processing to construct a scene description with application-specific structures, traversals, and metadata

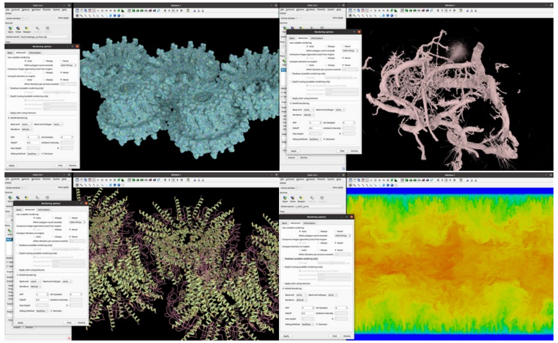
ANARI API used to build in-memory scene representation
NO rendering details prescribed
C99 frontend API dispatch library with C++ type-safe wrappers
Extensible API design with installable development layers
Asynchronous scene updates for low-latency interactivity

Engines use in-memory scene representation to drive rendering operations

Explicit control over hardware resources and operations

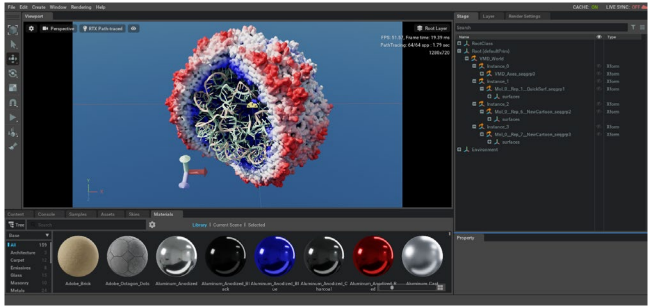

VMD Rendering using ANARI
Satellite Tobacco Mosaic Virus
1M atoms, U. Illinois

ANARI and Scientific Visualization Apps

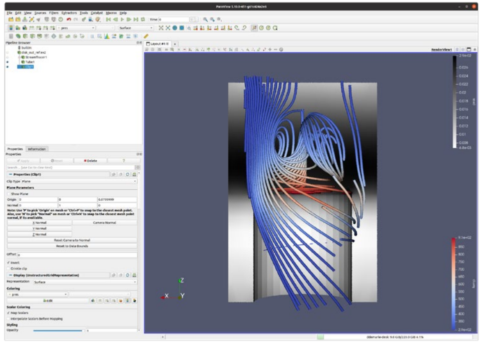

Visit Renderings with ANARI

VisIt

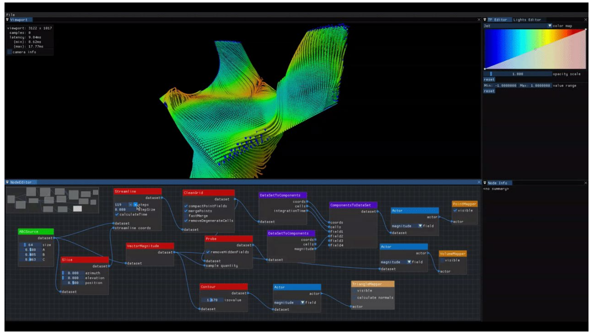
VMD


VMD Rendering with ANARI using NVIDIA ANARI-USD and Omniverse

ANARI integration with key open-source visualization applications


ParaView

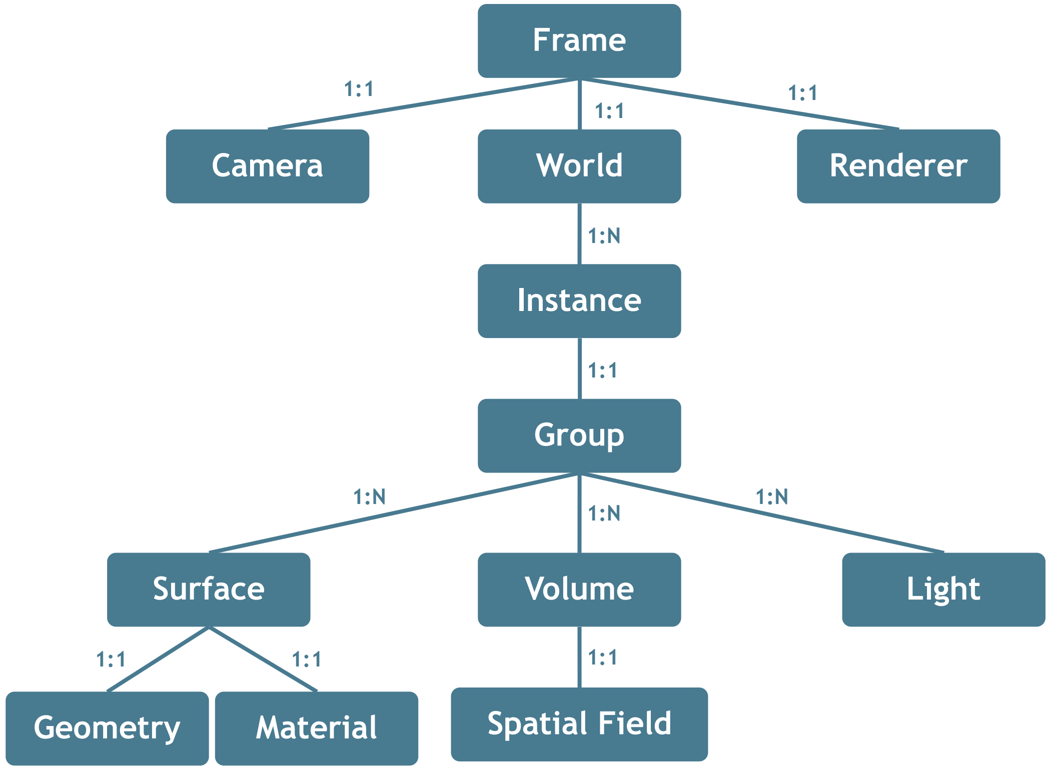
VTK



ParaView* visualization rendered with ANARI OSPRay backend
*ParaView ANARI integration in development

VTK-m for Real Time Filtering + Rendering with ANARI

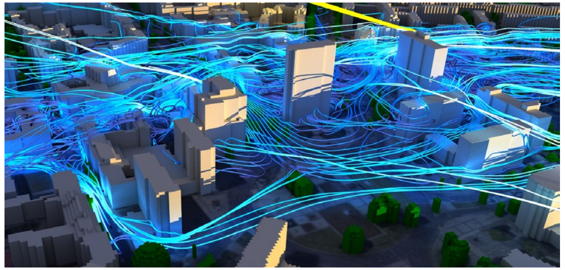
ANARI Scene Representation



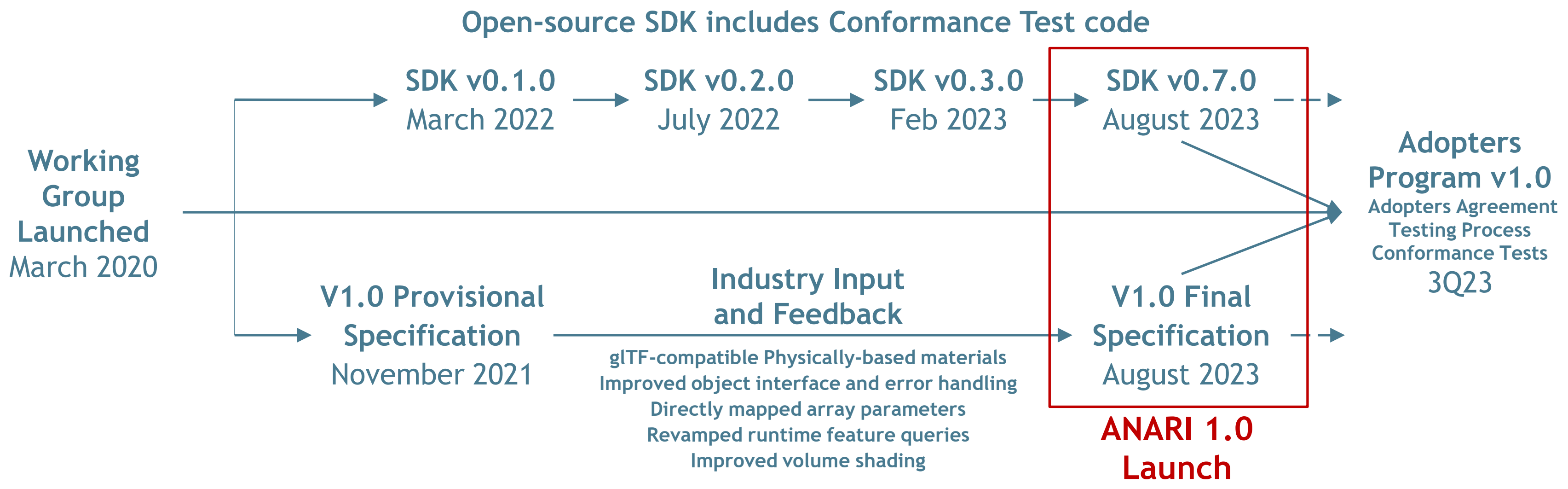
Hierarchical object tree that expresses the complete scene for a single frame

Sections of the tree can be re-used to optimize resource utilization

Scene representation can be used to drive any rendering backend - rasterization techniques are NOT prescribed



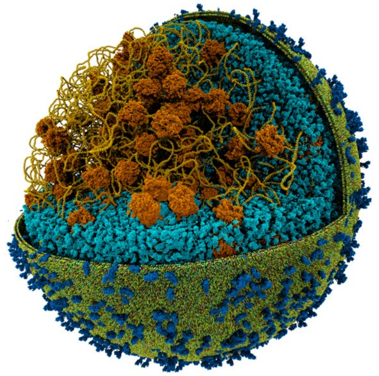
ANARI Timeline



All specification, SDK and Conformance Test development work in publicly accessible GitHub

ANARI SDK

- **Rendering engine backend layers**
  - Adopters can fully implement the API or use convenience layers that implement common functionality such as handling parameters or object lifetime
- **Loadable debug and trace layers**
  - Debugging layer for application API stream validation
  - Trace layer for API call tracing + replay
- **Conformance Test Suite based on Python**
  - Used in ANARI Adopters Program
- **‘Helide’ sample implementation**
  - Demonstrate possible API implementations choices
  - Shows how adopters can integrate with the SDK
- **Example applications demonstrating ANARI concepts**
  - Including simple interactive viewer
- **…and much more to come!**

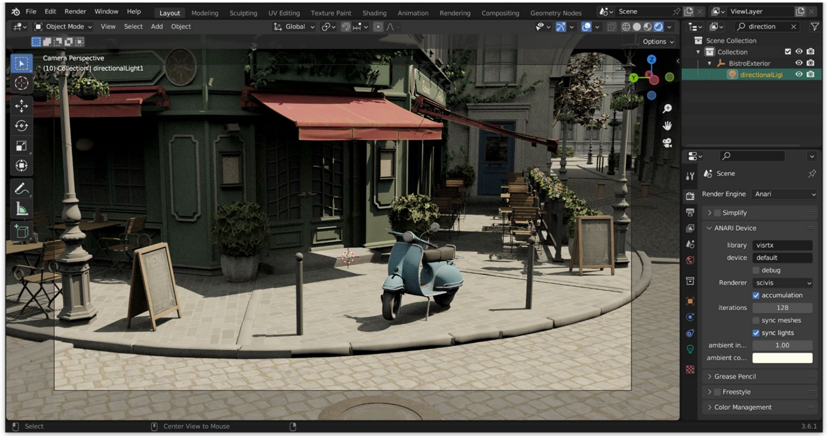

VMD Rendering using ANARI
Minimal Cell, 87M Beads
Martini v3 force field, U. Illinois

https://github.com/KhronosGroup/ANARI-SDK

Implementations Shipping Today

- **Khronos 'Helide' open-source sample implementation**
  - Ships with ANARI SDK
- **AMD Radeon ProRender**
  - https://github.com/GPUOpen-LibrariesAndSDKs/RadeonProRenderANARI
- **Intel OSPRay**
  - https://github.com/ospray/anari-ospray
- **NVIDIA VisRTX + VisGL**
  - https://github.com/NVIDIA/VisRTX
- **NVIDIA Omniverse**
  - https://github.com/NVIDIA-Omniverse/AnariUsdDevice
- **All implementations expected to be officially conformant**
  - When ANARI 1.0 Adopters Program released

ANARI Beyond Scientific Visualization



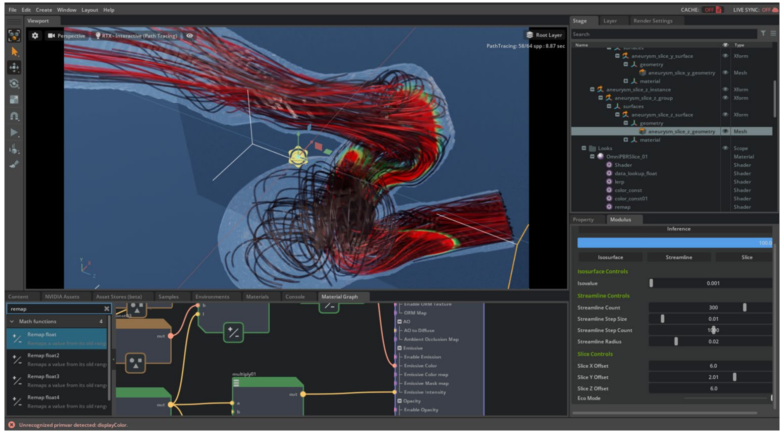
Render Engine: Anari

ANARI Device
- library: visrtx
- device: default
- debug: ☐
- Renderer: scivis
- accumulation: ✓
- iterations: 128
- sync meshes: ☐
- sync lights: ✓
- ambient in...: 1.00

Proof-of-concept Blender Add-On

Amazon Lumberyard Bistro

NVIDIA Open Research Content Archive (ORCA) 2017



Modulus — Inference

Isosurface Controls
- Isovalue: 0.001

Streamline Controls
- Streamline Count: 300
- Streamline Step Size: 0.01
- Streamline Step Count: 1000
- Streamline Radius: 0.02

Slice Controls
- Slice X Offset: 6.0
- Slice Y Offset: 2.01
- Slice Z Offset: 6.0

ANARI-USD Brings ANARI applications to USD/Omniverse

NVIDIA OmniGraph geometry processing

ANARI Beyond Scientific Visualization

ANARI with NVIDIA VisRTX Backend. San Miguel Scene © Guillermo M. Leal Llaguno

ANARI: A 3D Rendering Interface Standard. J. E. Stone, K. Griffin, J. Amstutz, D. DeMarle, W. Sherman, J. Günther. Computing in Science and Engineering, 2022

Get Involved!

Use ANARI in YOUR application

Multiple implementations and SDK shipping today

Send us your feedback and requirements on GitHub

What rendering features important to your application domain?

In what new application domains and use cases would you use ANARI

Join Khronos and the ANARI Working Group

Have a voice and a vote in the design of the ANARI specification

Fast track ANARI for your renderer or hardware

https://www.khronos.org/anari

https://github.com/KhronosGroup/ANARI-Docs

https://github.com/KhronosGroup/ANARI-SDK