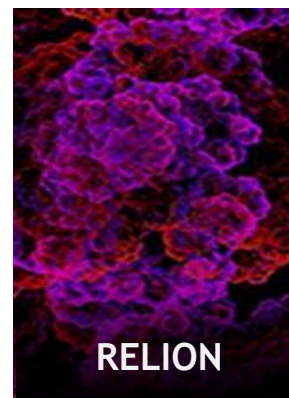
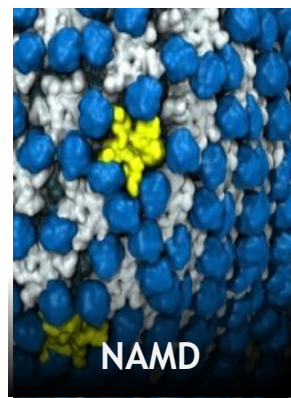
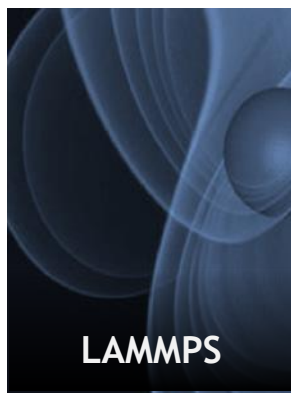
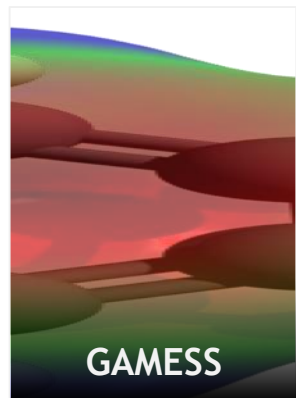
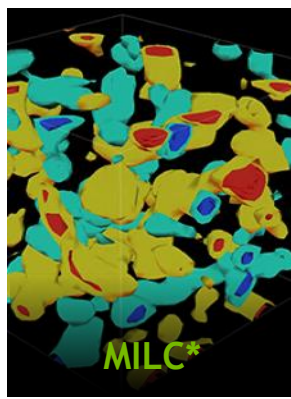
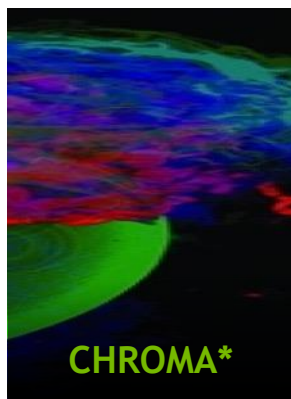




VISUALIZATION CONTAINERS

Peter Messmer, 6/15/2018

HPC APPS CONTAINERS ON NVIDIA GPU CLOUD

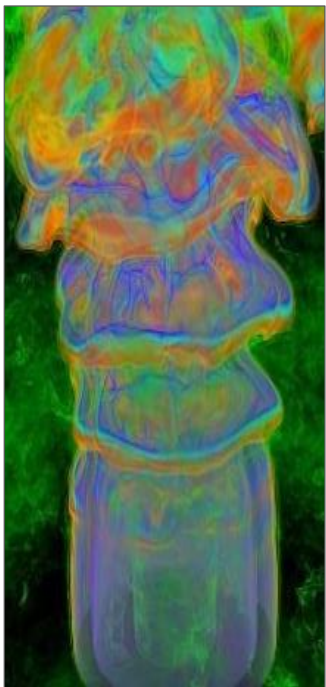


RAPID CONTAINER ADDITION



RAPID USER ADOPTION

NVIDIA GPU CLOUD FOR HPC VISUALIZATION



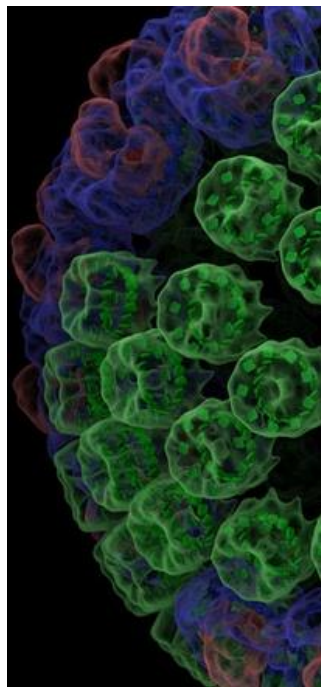
ParaView with
NVIDIA IndeX



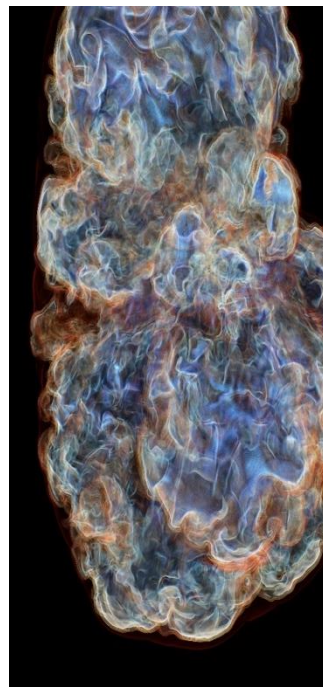
ParaView with
NVIDIA OptiX



ParaView with
NVIDIA Holodeck



VMD



IndeX

NEW CONTAINERS



CONTAINERS DRAMATICALLY SIMPLIFY APPLICATION DEPLOYMENTS



DIY Complexity

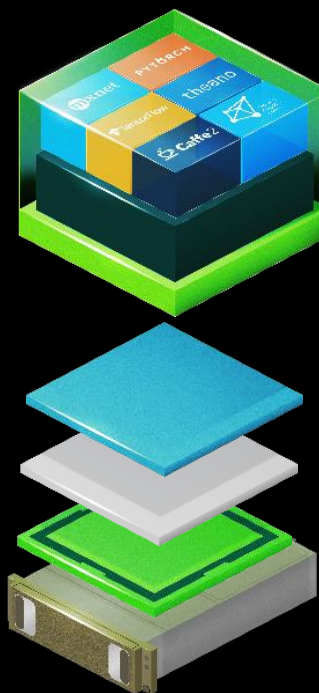
Open Source
Frameworks

Libraries and
Dependencies

NVIDIA Driver

Host OS

NVIDIA GPU



Container
Packaged with all the dependencies
to run an application

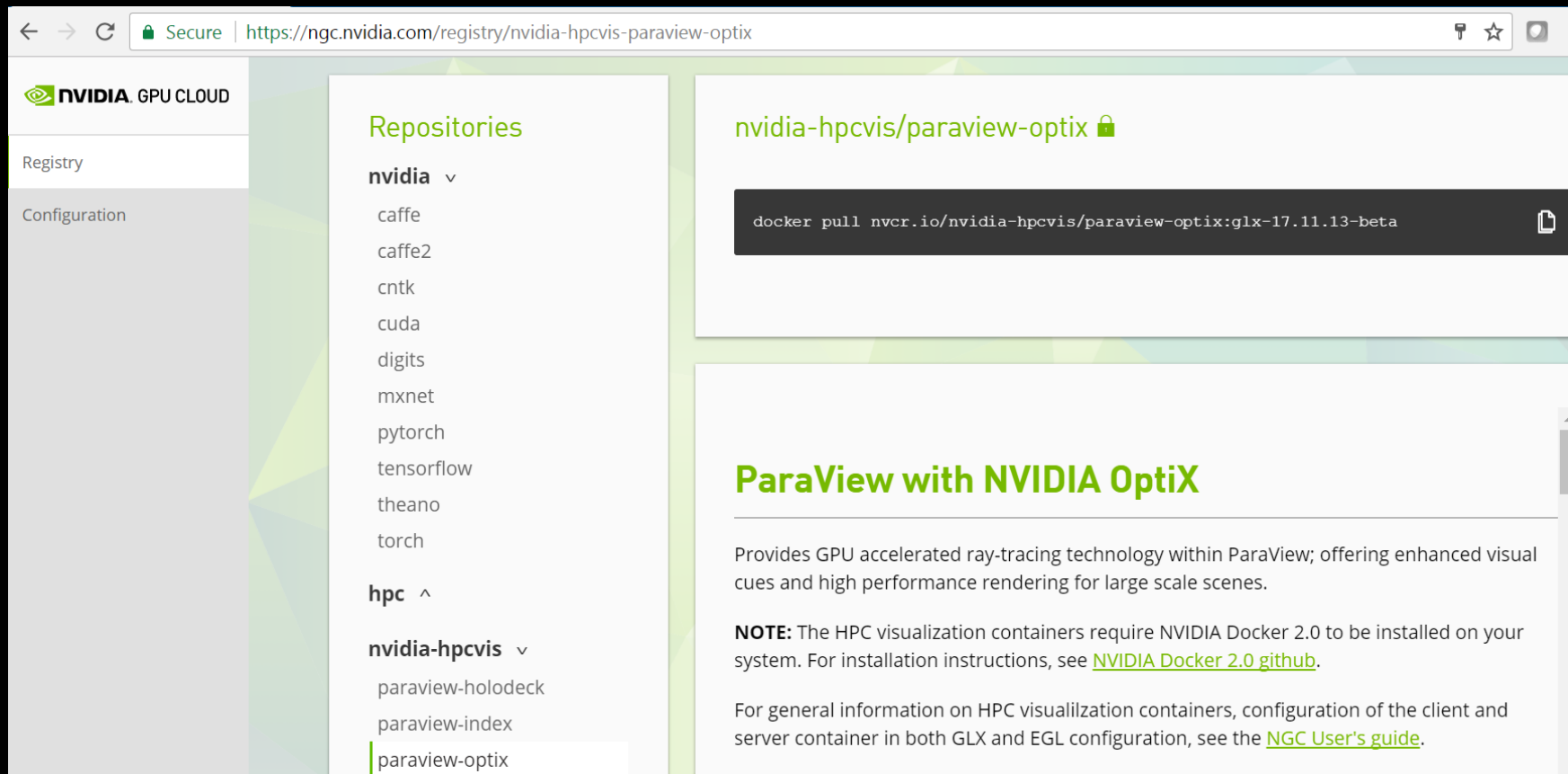
| Docker Engine

| Host OS

System Hardware

Container Simplicity

HPC VISUALIZATION CONTAINERS ON NGC



The screenshot shows the NVIDIA NGC website interface. The browser address bar displays the URL `https://ngc.nvidia.com/registry/nvidia-hpcvis-paraview-optix`. The left sidebar contains the NVIDIA GPU CLOUD logo and navigation links for Registry and Configuration. The main content area is divided into two columns. The left column, titled 'Repositories', lists various NVIDIA repositories under the 'nvidia' and 'hpc' categories. The 'nvidia-hpcvis' category is expanded, showing 'paraview-holodeck', 'paraview-index', and 'paraview-optix'. The right column displays the details for the 'nvidia-hpcvis/paraview-optix' repository, including a Docker pull command and a description of ParaView with NVIDIA OptiX.

Repositories

- nvidia** ▾
 - caffe
 - caffe2
 - cntk
 - cuda
 - digits
 - mxnet
 - pytorch
 - tensorflow
 - theano
 - torch
- hpc** ▴
 - nvidia-hpcvis** ▾
 - paraview-holodeck
 - paraview-index
 - paraview-optix

nvidia-hpcvis/paraview-optix 🔒

```
docker pull nvcr.io/nvidia-hpcvis/paraview-optix:glx-17.11.13-beta
```

ParaView with NVIDIA OptiX

Provides GPU accelerated ray-tracing technology within ParaView; offering enhanced visual cues and high performance rendering for large scale scenes.

NOTE: The HPC visualization containers require NVIDIA Docker 2.0 to be installed on your system. For installation instructions, see [NVIDIA Docker 2.0 github](#).

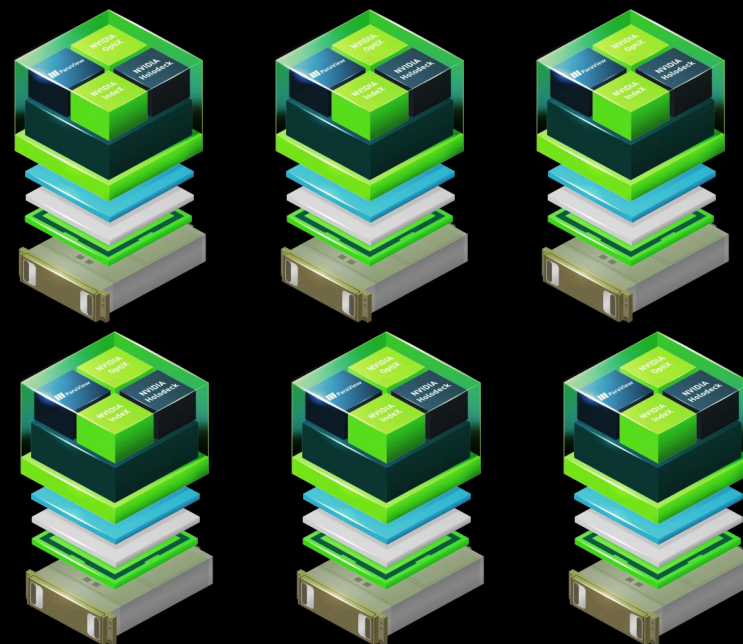
For general information on HPC visualization containers, configuration of the client and server container in both GLX and EGL configuration, see the [NGC User's guide](#).

CONTAINERS IN A DISTRIBUTED ENVIRONMENT



User Interface
Pre-packaged Plugins
GPU accelerated Encoding
GLX and EGL

Client Side Container



Server Side Container

WORKFLOW FOR HPC VIS CONTAINERS

SERVER CONTAINER (EGL)

Pull container

```
docker pull nvcr.io/nvidia-hpcvis/paraview-optix:egl-17.11.13-beta
```

Launch Container

```
docker run --runtime=nvidia -p 11111:11111 --rm -it \  
nvcr.io/nvidia-hpcvis/paraview-optix:egl-17.11.13-beta sh -c pvserver
```

Considerations: file system mount points, ports

WORKFLOW FOR HPC VIS CONTAINERS

CLIENT CONTAINER (GLX)

Pull container

```
docker pull nvcr.io/nvidia-hpcvis/paraview-optix:glx-17.11.13-beta
```

Grant access to X

```
XSOCK=/tmp/.X11-unix; XAUTH=/tmp/.docker.xauth;  
touch /tmp/.docker.xauth;  
xauth nlist :0 | sed -e 's/^....//ffff/' | xauth -f /tmp/.docker.xauth nmerge -
```

Launch Container

```
docker run --rm -it --runtime=nvidia \  
-v /tmp/.X11-unix:/tmp/.X11-unix -v /tmp/.docker.xauth:/tmp/.docker.xauth \  
-e XAUTHORITY=/tmp/.docker.xauth -e DISPLAY=:0 \  
nvcr.io/nvidia-hpcvis/paraview-optix:glx-17.11.13-beta \  
sh -c paraview\ --server-url=cs://your.server.address:11111
```


PARAVIEW WITH NVIDIA OPTIX

GPU RAYTRACING IN PARAVIEW

Based on VTK/OptiX backend

Seamless integration into ParaView



PARAVIEW WITH NVIDIA INDEX

PARALLEL VOLUME RENDERING

Large-scale Volumetric Rendering
Seamless integration with ParaView
Single node support packaged
Contact us for multi-node support



PARAVIEW WITH NVIDIA HOLODECK

HIGH END RASTERIZATION

Target: outreach, education

Advanced shaders, highly responsive interface

Seamless integration into ParaView workflow

Environment known to artists



The background of the slide features an abstract network visualization. It consists of numerous small, bright green circular nodes scattered across a dark, almost black, background. These nodes are interconnected by a dense web of thin, light green lines, creating a complex, web-like structure that suggests a network or data flow. The lines vary in length and orientation, some connecting nearby nodes while others span larger distances. The overall effect is a futuristic and technological aesthetic.

ADVANCED VISUALIZATION SAMPLES

OptiX for Visualization

VTK, ParaView

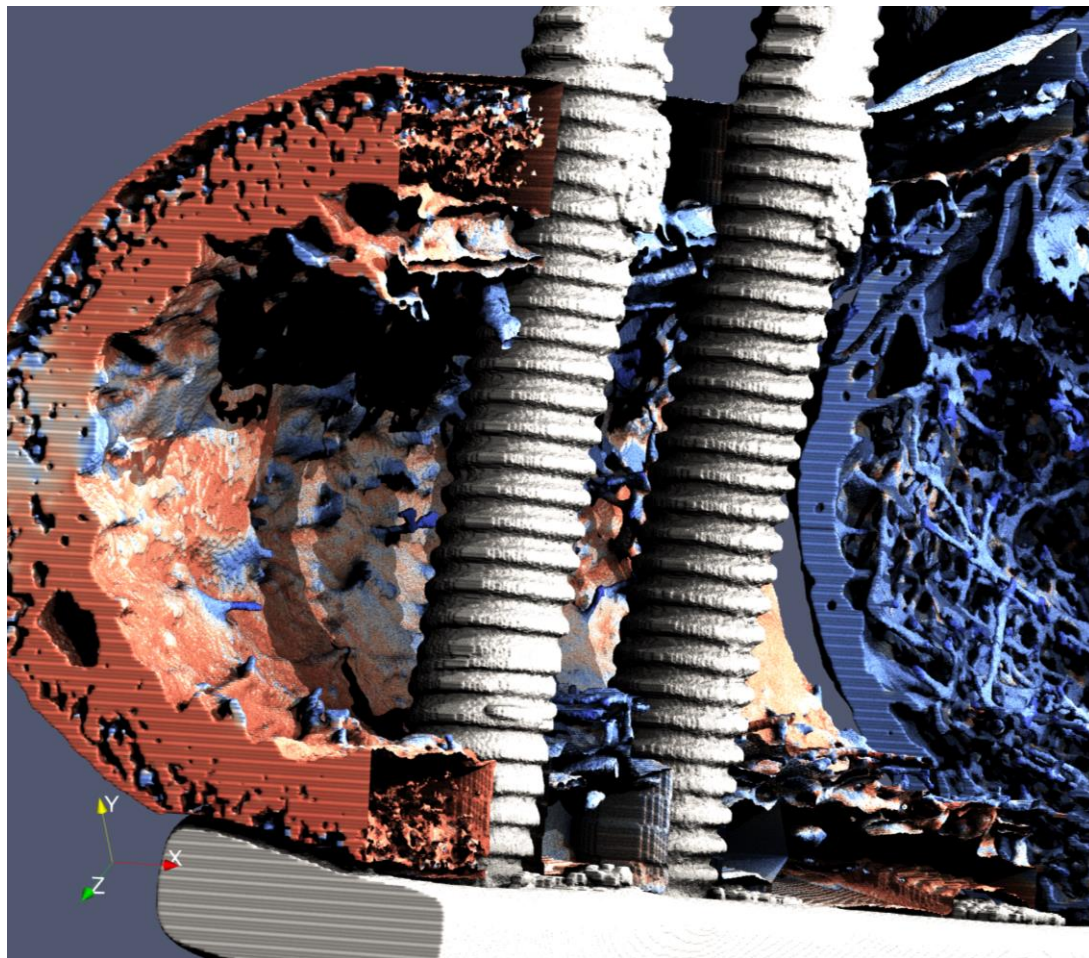
VMD

Sight (ORNL)

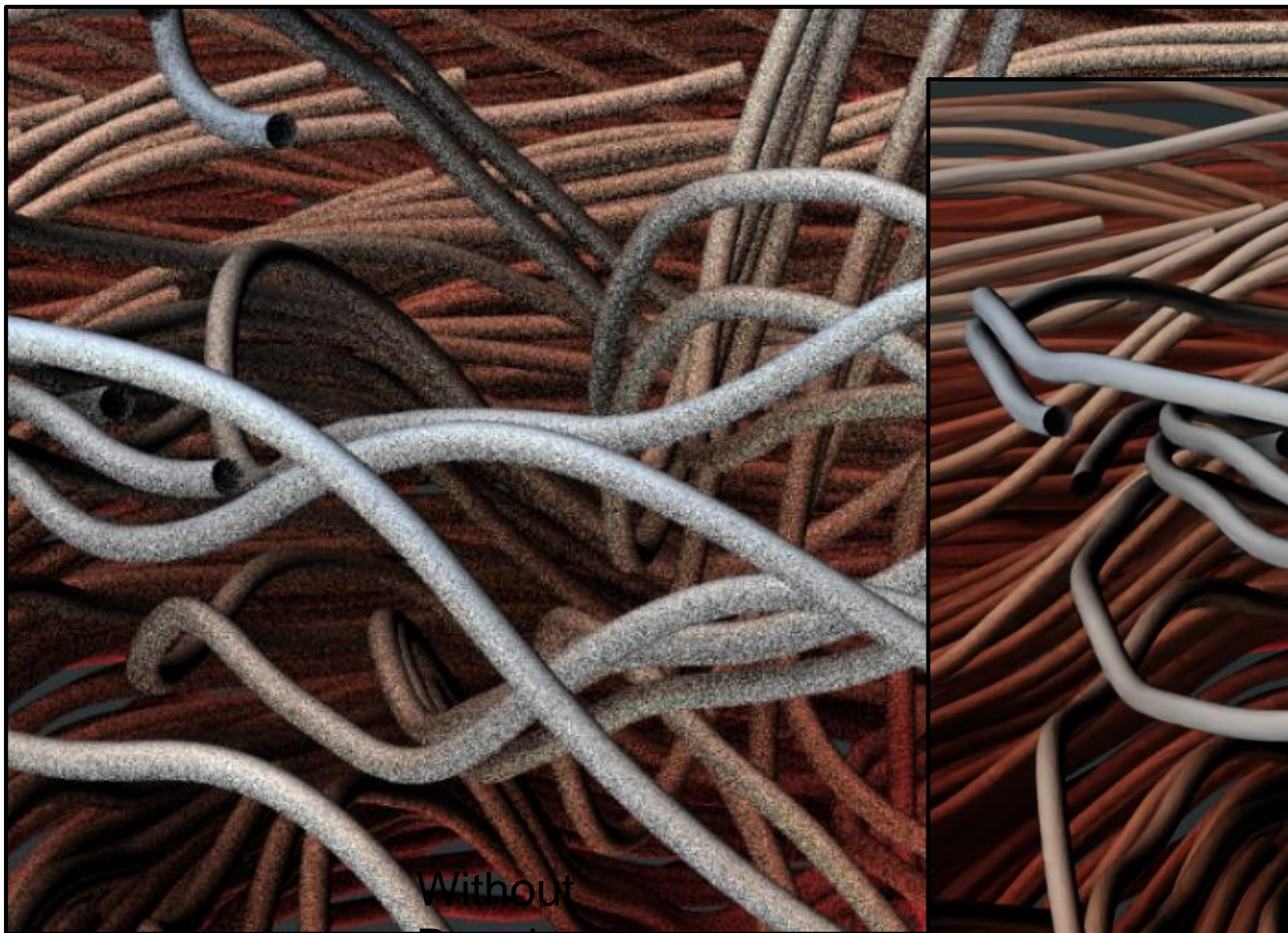
NVIDIA OptiX applications:

- Index unstructured volumes
- GVDB
- optixParticleVolumes

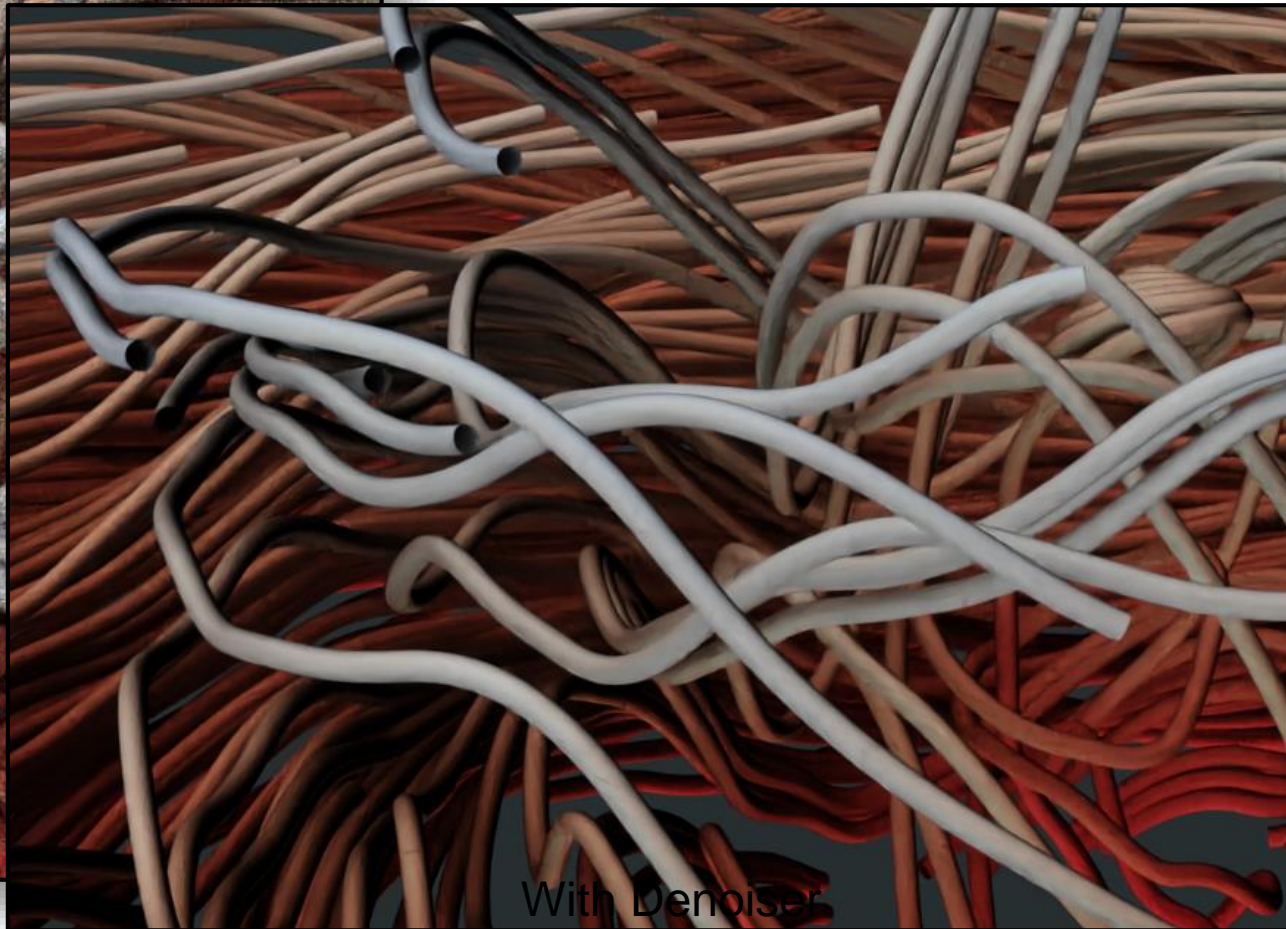
Works on Power9/Volta



OptiX Denoiser in ParaView



Without
Denoiser



With Denoiser

optixParticleVolumes sample



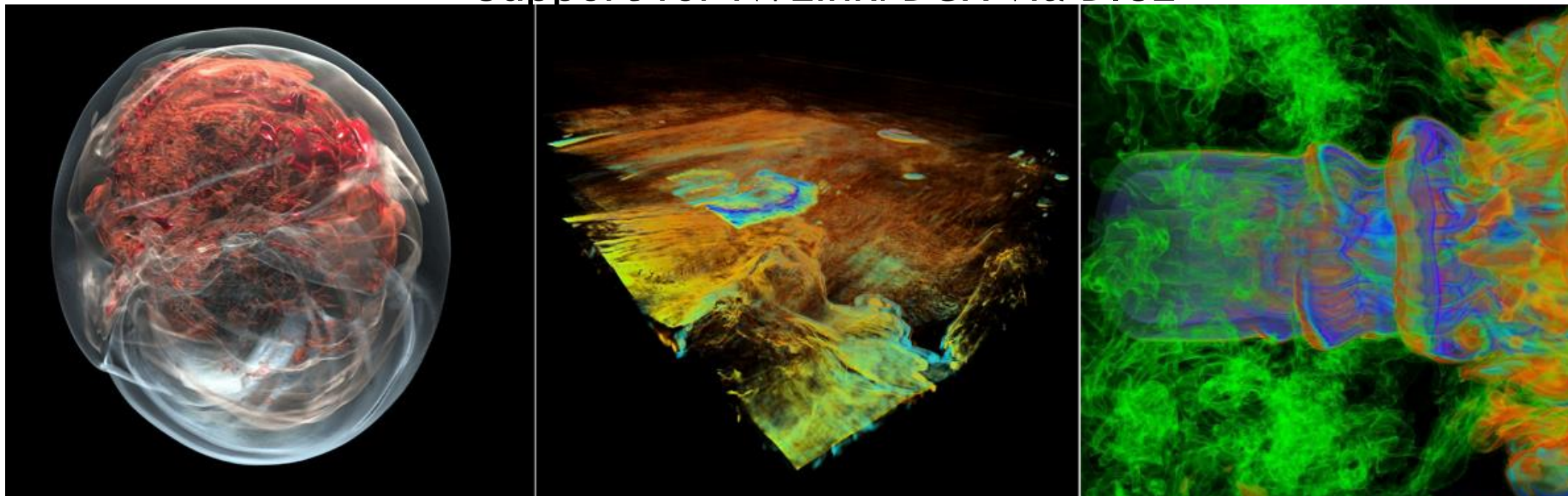
“splatting in three dimensions using a ray tracer”.

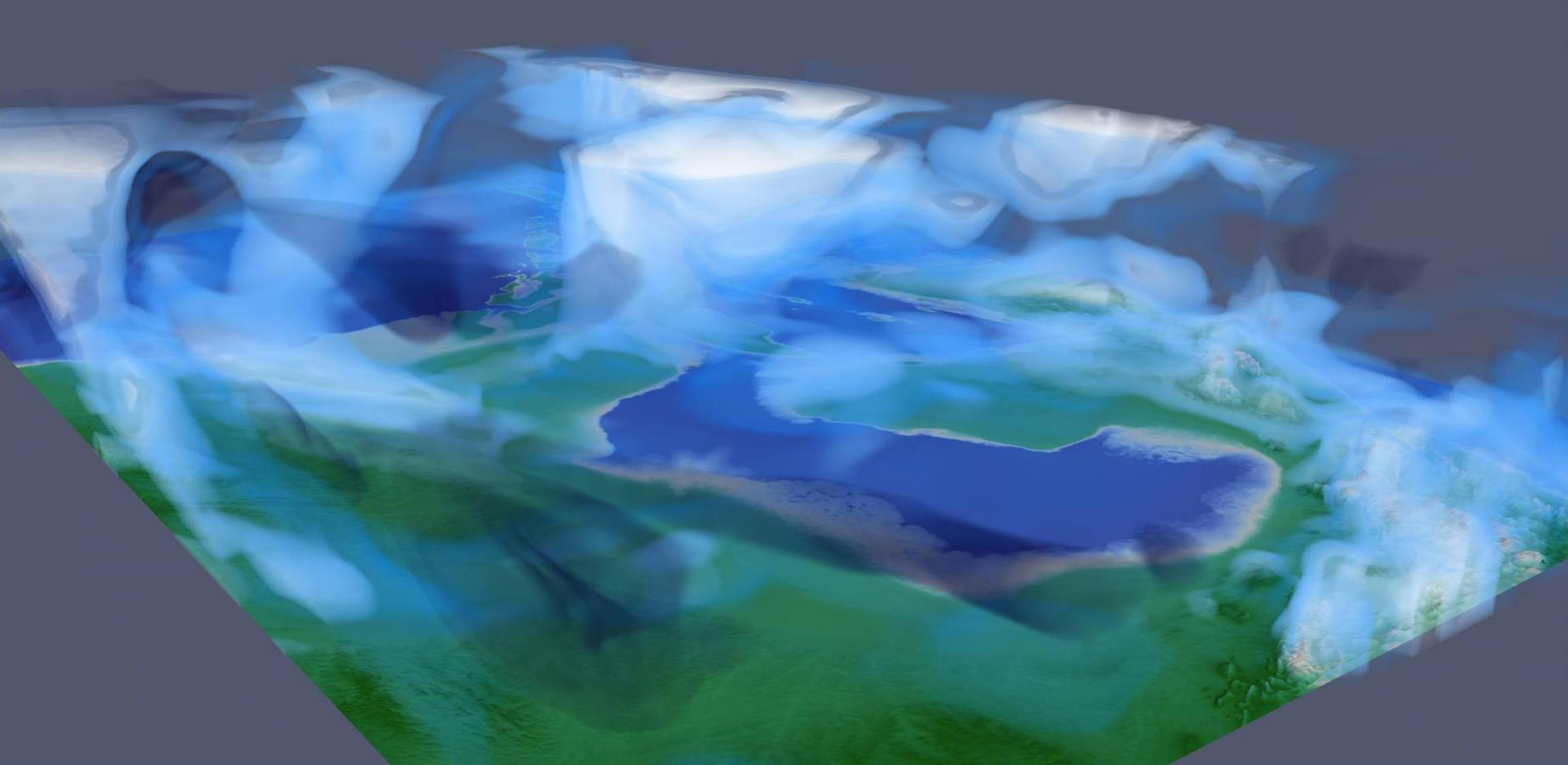
20 – 100 Mrays/s (4 fps at 4K on a Titan X Pascal) for RBF volume rendering 100M particles

https://github.com/nvpro-samples/optix_advanced_samples

NEW IN INDEX 2.0

- User-programmable kernel interface (ex: single scattering)
 - Unstructured (tet mesh) volumes using OptiX
 - Support for NVLink/DGX via DICE





VISUALIZATION
UFUK TURUNCOGLU, ISTANBUL TECHNICAL UNIVERSITY

