REDSHIFT

Production-quality, final-frame rendering on the GPU
What is Redshift?

• Not “just another GPU renderer”
  – Final-frame production quality
  – Features and flexibility of biased CPU renderers
  – Viable and practical for professionals
• High performance
  – Many times faster than CPU renderers
• Great scalability
  – 10s of millions of triangles in under GB of VRAM
  – Limited available VRAM not a problem...
• Deep DCC integration
2015 was a great year for Redshift!!

- Won 1st place in CGAwards “New Application” category
- Several great reviews!
- Market expansion:
  - 2014: Mostly freelancers, small 5-20 employee studios
  - 2015: A good few 100+ employee studios
  - 2016: In talks with several big-name studios
- Market types:
  - 2014/2015: Marketing, engineering
  - 2016: Netflix/Amazon original productions, feature-length productions
Redshift and the GPU in the industry

• Convincing the sceptics
  – “Are they going to be there next year?”
  – “Can the GPU render at the same quality as the CPU?”
  – “Can the GPU render large scenes?”
  – “Are there still tons of features missing - compared to a CPU renderer?”

• The tides are turning!
  – We’re seeing large companies reevaluating their assumptions about GPU rendering
  – Trojan horse
    • “Let’s try it on a few small projects” becomes
    • “Let’s make it our main renderer”
  – It’s a matter of time before GPU rendering dominates the industry
Last year

- Redshift 1.0 features
  - Round corners
  - 3-layer skin shader
  - Bicubic texture
  - Hair min pixels
  - Maya: Shave
  - Maya: Xgen shader
    - Xgen archives
  - VR: Stereo spa
    - Cubic comix
  - Linux support
    - Renders fast
  - SDK
  - redshiftCommandLine
  - Tons of performance/
Redshift 2.0 (1)

• Goal: close the CPU-GPU feature gap
  – Almost there!

• Done:
  – Multiple dome-lights
  – Baking light-maps
  – Improved model for SSS
  – Single Scattering
  – Ray marched volumetrics (OpenVDB, etc)
  – RS Procedural API
  – Nested Dielectrics
    • No need for complex IOR ratios anymore
Redshift 2.0 (2)

• New shading technology
  – Preparation for new Redshift Material
  – GGX and Cook-Torrance BRDFs
  – Physically-correct Fresnel
    • Correct for rough materials
    • Energy conserving
  – ‘alSurface’ shader emulation
Redshift 2.0 (3)

• Just around the corner:
  – Automatic VRAM management

• Coming soon:
  – Custom AOVs
  – Per-light AOVs
  – Ray-traced SSS
In More Detail: Redshift Material (2)

- Simpler layout
  - Advanced features kept separate
- Let's get rough!
  - Two reflection layers (Base and Coating)
    - Fake transmission between Base and Coating layer
    - Separate Coating bump
  - Flexible Fresnel reflectivity modes
    - Better metals
    - Correct dielectric edge color
    - ‘Metalness’ option for ‘PBR’ workflow
  - ‘PBR’ texture-ready with linear roughness/glossiness
In More Detail: Redshift Material (3)

- Sub-Surface Scattering
  - Multiple-scattering
    - 3 layer model for skin
  - Single scattering
    - Adds extra sub-surface lighting detail
    - Completes the sub-surface equation

- Dispersion / Chromatic Aberration
  - Not “poor man’s” three color hack
  - Rainbows are pretty!
In More Detail: Ray Marched Volumes (1)

- Homogeneous volumetric lighting is easy
  - Works great in Redshift!

- Ray marched volumetrics are harder

- Challenges:
  - Storage
  - Kernel execution
  - Importance sampling
  - Shading
In More Detail: Ray Marched Volumes (2)

- Storage:
  - Sparse tree
  - Quantization/dithering
  - LOD

- Execution incoherency:
  - Ray sorting / scheduling
  - Redshift is great at that!
In More Detail: Ray Marched Volumes (3)

– Importance-sampling

  • Naive solution
    – Sample based on grid density
    – Noisy results, unless you only have distant lights in your scene

  • Better solution:
    – Sample based on grid density and light BRDF
    – Tricky, requires special data structures
    – Much cleaner (and, therefore, faster) results!
In More Detail: Ray Marched Volumes (4)

– Shading
  • Many grid traversals during ray marching
    – Tens to hundreds
    – ...which means many shader executions!
    – Slow!
  • Solution: Limit shading capabilities
    – Expand it later
The Future

• New platforms
  – SideFX Houdini – just entered alpha!
  – Maxon Cinema4D. Alpha in a few months
  – Currently investigating MODO and Katana support

• More features
  – Shader SDK
  – Toon shading
  – Redshift custom viewport
  – Distributed/remote rendering
  – Optimized particle rendering
  – Custom per-object shading properties
  – Trace sets
  – Barndoor lighting
  – XGen instances
  – Maya curve support
Thanks!

• For more information, please contact us at info@redshift3d.com
• Or meet us right after this presentation (booth #377)!