Agenda

1. Overview of mental images integration
2. How this impacts what NVIDIA provides
3. Overview of our Advanced Rendering offerings
4. Roadmap for where each technology is going
5. Glimpse at what we’re building next
Advanced Graphics Always at its Core

Worldwide Leader in
GPU Development &
Professional Graphics
Advanced Rendering Commitment

World Leader in Photorealistic Rendering
for Companies wanting Integrated Solutions

Worldwide Leader in
GPU Development &
Professional Graphics
Multiple A.R. Commitments 2007 – 2011

mental images®
World Class Middleware for Developers to Exploit the GPU

Application Acceleration Engines
World Leader in Photorealistic Rendering for Companies wanting Integrated Solutions

DevTech: Pro Graphics & HPC
World Class Development Assistance for Companies to Exploit the GPU

Worldwide Leader in GPU Development & Professional Graphics
Consolidated A.R. Commitment  Today

Worldwide Leader in
GPU Development &
Professional Graphics

The “Center of Gravity” for
Advanced Rendering and
Professional Graphics
NVIDIA ARC: Integrating to Accelerate

Disciplines in mental images are now combined with their NVIDIA counterparts to merge expertise for:

- Ray Traced Rendering: NV Research, OptiX, mental ray, iray
- GPU computing: OptiX, CUDA, HPC, etc, iray, New Rendering
- Raster Rendering: OpenGL, Cg, Tegra, Interactive Rendering
- Scene Graphs: SceniX, Renderer Architectures
- Remoting: Monterey, Cloud Rendering
- Application Integration: DevTech, Rendering Integration
- Partner Engagements: Strategic Alliances, Business Development

The “mental images” name is respectively retired, with commercial contracts and copyrights now being with: NVIDIA ARC GmbH
NVIDIA ARC: Composition

+120 technical people worldwide, with Berlin as HQ

Comprised of cross-functional teams:

- **Rendering Dev.** Steven Parker
  includes: mental ray, iray, new renderers, OptiX, HPC DevTech

- **Core Dev.** Holger Kunz
  includes: neuray, Dice, RealityServer, SceniX, Monterey, WS DevTech

- **Products** Phillip Miller
  includes: product management, product marketing, productization

- **Business Dev.** Ludwig von Reiche
  coordinates with: Strategic Alliances under Andrew Cresci
NVIDIA ARC: Fitting in Well

- Managed within NVIDIA’s Professional Solutions Group
  - Serving the needs of professional graphics applications
  - Solving the world’s most challenging graphics problems
  - Common focus on: software tools, studios, manufacturing

- Graphics is Core to NVIDIA’s Foundation, and Advanced Rendering is Core to NVIDIA’s Future
  - GPU Computing a perfect match for Advanced Rendering
  - Cutting edge software development leads this effort
  - Influencing GPU architectures, languages, tools
NVIDIA ARC: Products and Middleware

**ARC Products** – licensed, complete rendering solutions
- Commercial components for professional rendering
- Good choice for companies wanting to add proven solutions to their products which are maintained and advanced for them
- Examples: mental ray, iray, etc.

**ARC Middleware** – free tools for exploiting the GPU
- SDKs and Libraries that are general, low level building blocks
- Good choice for developers with domain expertise needing custom solutions which they create and maintain
- Examples: OptiX, SceniX, CompleX, etc.
NVIDIA Goals for Advanced Rendering

- Make the GPU an essential part of **ALL advanced rendering**
- Create engines and libraries to make it easier for everyone to exploit the GPU (e.g., OptiX); *learning what’s needed for future GPU languages and architectures*
- Create compelling commercial offerings to spur GPU adoption (e.g., iray); *learning what’s needed for success, so to help other developers and improve the GPU platform for it*
- If you’re developing solutions for Advanced Rendering, **NVIDIA wants to help**
NVIDIA ARC: Rendering Options

- **mental ray** platform
  focusing on **Film Production** needs

- **iray** integration platform
  focusing on **Interactive Design** needs

- **OptiX** ray tracing framework
  focusing on **general** GPU ray tracing development

- Strong teams on each technology
NVIDIA ARC: mental ray platform

Image gallery removed to spare download times
NVIDIA ARC: mental ray platform

- Focusing on the needs of Film Production
  - Integral within most major Animation and CAD products
  - StandAlone (from Autodesk) for specialized studio pipelines
- Advancements Coming this year:
  - Production ready lights and materials (including BSDFs) for hair, skin, volumetric effects, and more
  - Fast and accurate motion blur with full ray tracing (vs. raster)
  - Fast, efficient, and noiseless GI for massive scenes
  - Improved rendering performance
- Soon gaining GPU acceleration in some areas
NVIDIA ARC: mental ray AO

- mental ray 3.9 code & pipeline accelerated w/ OptiX

+3 minutes 2 CPU
20 seconds 1 GPU

+18X

~21mil faces

Subsequent frames can be *far* faster yet...

Model courtesy NVIDIA Creative

Rendered with mental ray 3.9
NVIDIA ARC: iray integration platform

Image gallery removed to spare download times
NVIDIA ARC: iray integration platform

- Focusing on the needs of **Interactive Design**
  - Quick to integrate, and inherently interactive (Bunkspeed Shot & Move, Catia V6)
  - Options for Cluster Rendering and Multi-User
  - APIs for Remote/Internet Control & Manipulation

- Additional renderers can communicate with one another
- Additional renderers are straightforward for NVIDIA to add

**Demo** – the latest iray integration within 3ds Max
NVIDIA iray: roadmap

**iray 2**
- now
  - Layered Material Model
    (car paint, subsurface scattering, decals, etc.)
  - Increased Performance & Interactivity, Daylight Portals, Clipping Planes, more...

**iray 3**
- next year
  - Better convergence for more difficult lighting conditions
  - Increased interactivity...
  - Increased flexibility for production use cases...
  - Much more in the works...
NVIDIA ARC: OptiX ray tracing engine

Image gallery removed to spare download times
NVIDIA ARC: OptiX ray tracing engine

- A ray tracing framework for developers
  - Similar to OpenGL in doing the “heavy lifting” of ray tracing and leaving capability and technique to the developers
  - Very general and applicable to many markets
  - Proven to speed development as well as performance

- Being used by Adobe Research in our booth
- Being used internally in our commercial software
NVIDIA ARC: OptiX Roadmap

Version 2.5  later this year

- Out-of-core support, paging to system RAM
- A one time speed drop; results remain faster than multiple CPUs with 1 GPU

Version 3  first half of next year

- Optimized for Kepler GPU Architecture
- CPU fallback (for interactive rendering)

Why? - required by major commercial products (including NVIDIA ARC’s)
NVIDIA ARC: What’s Next

Expanding the iray integration platform with cooperating renderers giving continuous quality/speed tradeoffs:

<table>
<thead>
<tr>
<th>Real Time Raster Rendering</th>
<th>Interactive Ray Tracing</th>
<th>iray 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 FPS</td>
<td>20 FPS</td>
<td>10 FPS</td>
</tr>
<tr>
<td>Stereo</td>
<td>Accurate Reflections</td>
<td>Degraded</td>
</tr>
<tr>
<td>Game Title Quality</td>
<td>Accurate Shadows</td>
<td>Simplified</td>
</tr>
<tr>
<td></td>
<td>Glossy Reflections</td>
<td>Uncompromised Quality</td>
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<tr>
<td></td>
<td>Multi-Bounce Diffuse, etc.</td>
<td>Increased Flexibility</td>
</tr>
<tr>
<td>15 FPS*</td>
<td>0.5 FPS*</td>
<td>Minutes*</td>
</tr>
<tr>
<td>Multi-Pass Effects</td>
<td>Soft Shadows</td>
<td></td>
</tr>
<tr>
<td>Raster AO</td>
<td>Glossy Reflections</td>
<td></td>
</tr>
<tr>
<td>Soft Shadows, etc.</td>
<td>Multi-Bounce Diffuse, etc.</td>
<td></td>
</tr>
</tbody>
</table>

Strength: Very High Resolutions  Ray Tracing w/o Noise  Physically Correct
Weakness: Very Approximate     Not Physically Correct    Noisy while Resolving

Sharing data, memory, and material descriptions is key...
NVIDIA ARC: What’s Next

- Blending Quality & Speed
  - Smooth switching between rendering modes
  - Flexible APIs for controlling effects
  - Callable on actions, mouse events, or wait times

- Should be in Beta by next SIGGRAPH

Performance (FPS)

Realism

Size (Screen or Model)

- iray
- Interactive RT
- RT Raster
To learn more about:

- GPU ray tracing development considerations
- OptiX 2.5 and out-of-core rendering
- mental ray GPU usage
- new iray capabilities coming to 3ds Max

Come to today’s 4:30 PM session in this room
To learn more about:

- Trying NVIDIA OptiX
  Visit the Developer Zone on www.nvidia.com

- Licensing mental ray or iray
Contact either:
  - lreiche@nvidia.com  Ludwig von Reiche
  - pmiller@nvidia.com  Phillip Miller
Questions?

SIGGRAPH 2011 Vancouver
August 8th 2011
VISIT US!
Vancouver Convention Center Booth #453

LEARN MORE!

NVIDIA TECHNOLOGY THEATER
Tuesday, August 9th – Thursday, August 11th | NVIDIA Booth #453

The theater will feature talks and demos on a wide range of topics covering the latest in GPU game technology. Open to all attendees, the theater is located in the NVIDIA booth and will feature developers and industry leaders from film and game studios and beyond.

PRESENTATIONS AVAILABLE LATER THIS WEEK

DEVELOPER TOOLS & RESOURCES
http://developer.nvidia.com