nVIDIA

Advanced Rendering

SIGGRAPH 2011 Vancouver

August 8th 2011

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 &
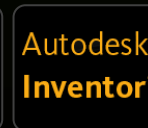Professional Graphics
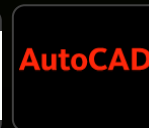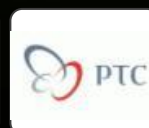
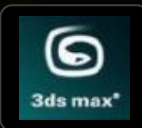# Advanced Rendering Commitment   2007

NVIDIA

mental images®

Worldwide Leader in
GPU Development &
Professional Graphics

World Leader in Photorealistic Rendering
for Companies wanting Integrated Solutions

Maya | 3ds max® | SOFTIMAGE|XSI | 3DS CATIA | PTC | AutoCAD® | Autodesk Inventor® | Autodesk Revit®

Multiple A.R. Commitments   2007 – 2011

NVIDIA

Worldwide Leader in
GPU Development &
Professional Graphics

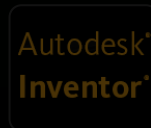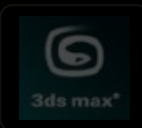## mental images®

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

Maya   3ds max   SOFTIMAGE|XSI   CATIA   PTC   AutoCAD   Autodesk Inventor   Autodesk Revit

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

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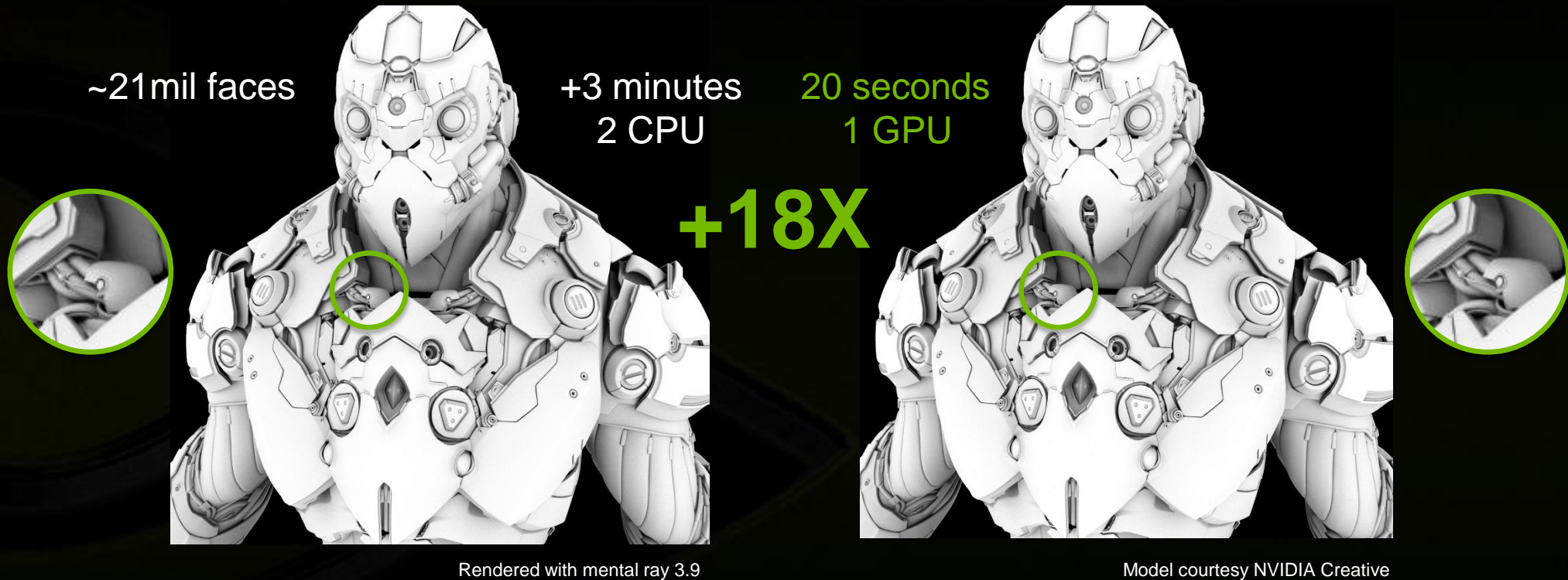times

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

~21mil faces

+3 minutes
2 CPU

20 seconds
1 GPU

+18X

Rendered with mental ray 3.9

Model courtesy NVIDIA Creative

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

NVIDIA ARC: iray integration platform

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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 straight forward 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

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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 NVDIA ARC's)

NVIDIA ARC: What's Next

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

Real Time Raster Rendering	Interactive Ray Tracing	iray 3
120 FPS ←→ 15 FPS*	20 FPS ←→ 0.5 FPS*	10 FPS ←→ Minutes*
Stereo Multi-Pass Effects	Accurate Reflections Soft Shadows	Degraded Uncompromised Quality
Game Title Quality Raster AO	Accurate Shadows Glossy Reflections	Simplified Increased Flexibility
Soft Shadows, etc.	Multi-Bounce Diffuse, etc.	
Strength: Very High Resolutions	Ray Tracing w/o Noise	Physically Correct
Weakness: Very Approximate	Not Physically Correct	Noisy while Resolving

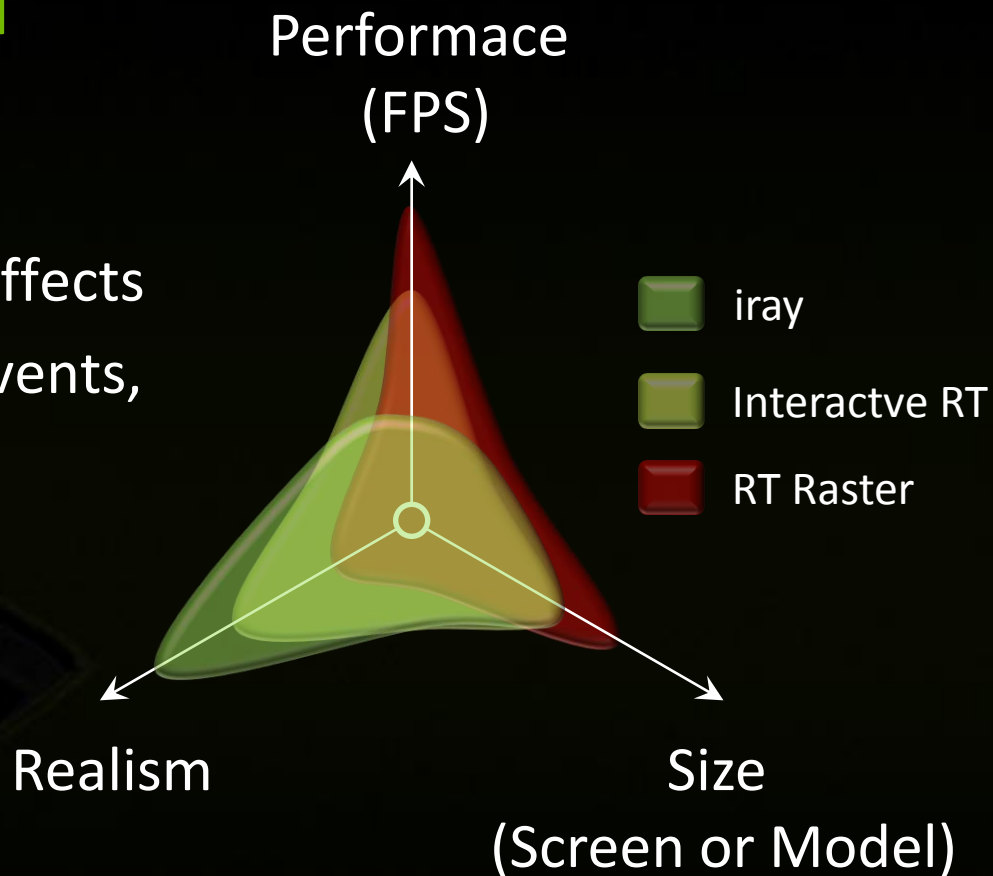- Sharing data, memory, and material descriptions is key...

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

Performace (FPS)

iray

Interactve RT

RT Raster

Realism

Size (Screen or Model)

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 8th2011

NVIDIA

NVIDIA @ SIGGRAPH 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
http://www.nvidia.com/siggraph2011

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