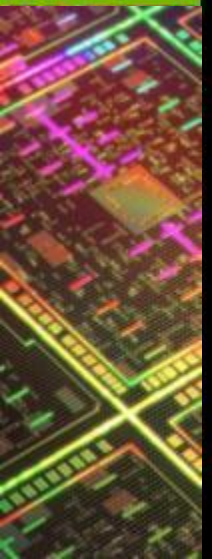
S0604 - NVIDIA Advanced Rendering Solutions

The full range of advanced rendering solutions and frameworks from NVIDIA will be explored in this insightful product and technology discussion and demonstration. Come learn about the latest possibilities involving advanced rendering techniques and how they integrate within commercial products – from production ray tracing to volumetric and distributed rendering.

Topic Areas: Ray Tracing
Session Level: Beginner

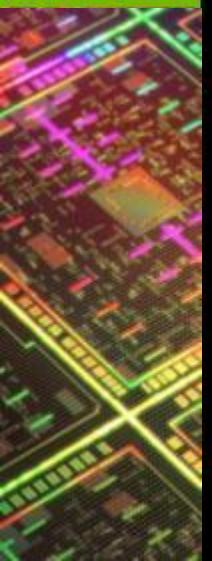
NVIDIA Advanced Rendering Solutions

May 14, 2012



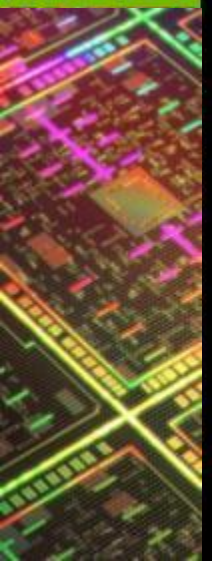
Agenda - Advanced Rendering

- Increasing need for better rendering (high level)
- What we build – mental ray and iray
- Performance / Realism Trends (high level)
- Introduction to NVIDIA iray®



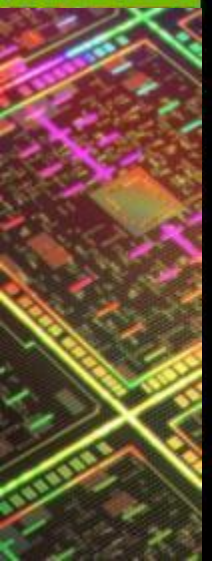
NVIDIA Ray Tracing Options

- **CUDA** – language and computing platform
  - The basic choice for building *entirely custom solutions from scratch*
- **OptiX** – middleware for ray tracing developers
  - Good choice for developers *with domain expertise* building *custom solutions* which prefer *leaving GPU issues to NVIDIA*
- **mental ray & iray** – a licensed rendering products
  - Good choice for companies wanting a *ready-to-integrate solution* which is *maintained and advanced for them*



NVIDIA 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



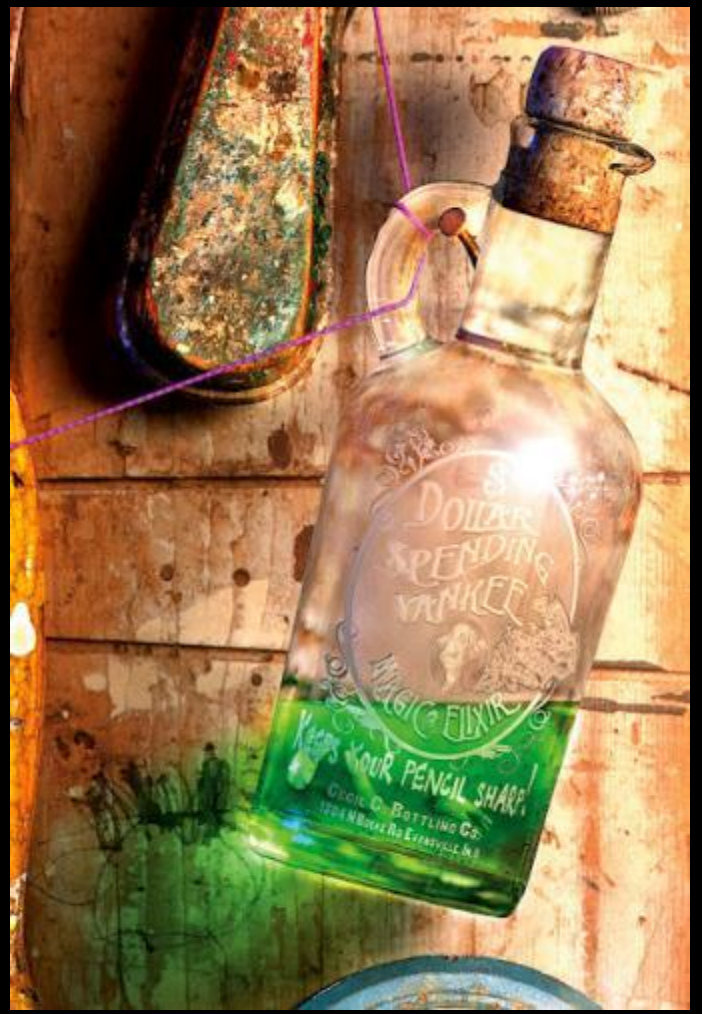
NVIDIA mental ray

- Images removed for file size

mental ray Art

- By:
  Shawn Rinehart
- From:
  Full Sail
  Staff 3D Arts Show
- April 16, 2012
- 12900 x 6933 pixels

Art Details



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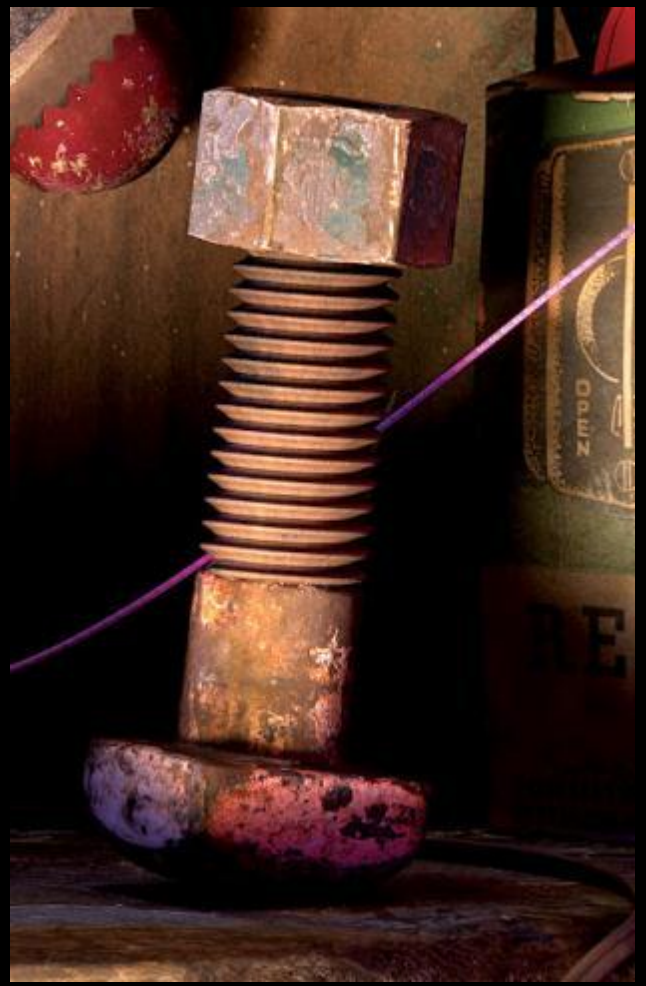


Art Details

NVIDIA mental ray

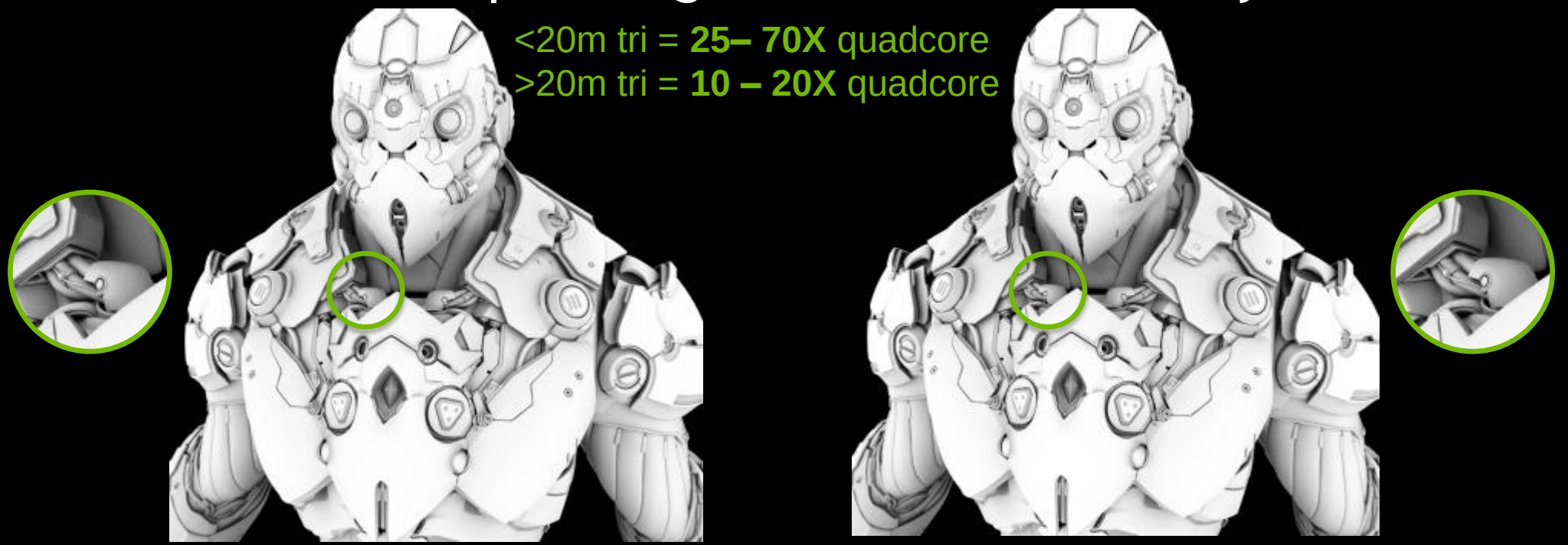
- Shipping as an integrated component in key applications

- Used in leading studios for demanding ray tracing production

- Available in Standalone form from Autodesk
  - Version 3.10 recently available
  - Ideal for production pipelines and Linux render farms
  - Gives access to full functionality *(majority of features from past 5 years lack an interface from 3ds Max, Maya, or Softimage)*

GPU Acceleration for Ambient Occlusion

- Planned for an upcoming version of mental ray*



- 1.5sec HLBVH build + 15sec vs. 20 minutes on CPU

*no availability information announced yet for this functionality in mental ray version

Case Study - using iray via 3ds Max

- Production:
  Delta Tracing
  (near Venice)

- Client:
  DVO
  (Della Valentina
  Office SpA)

- Virtual Catalouges

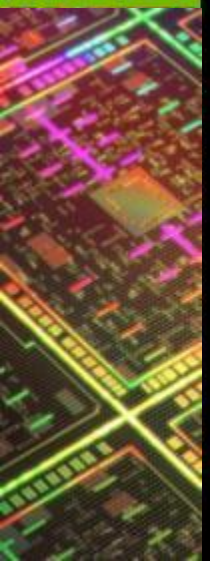
Rendering

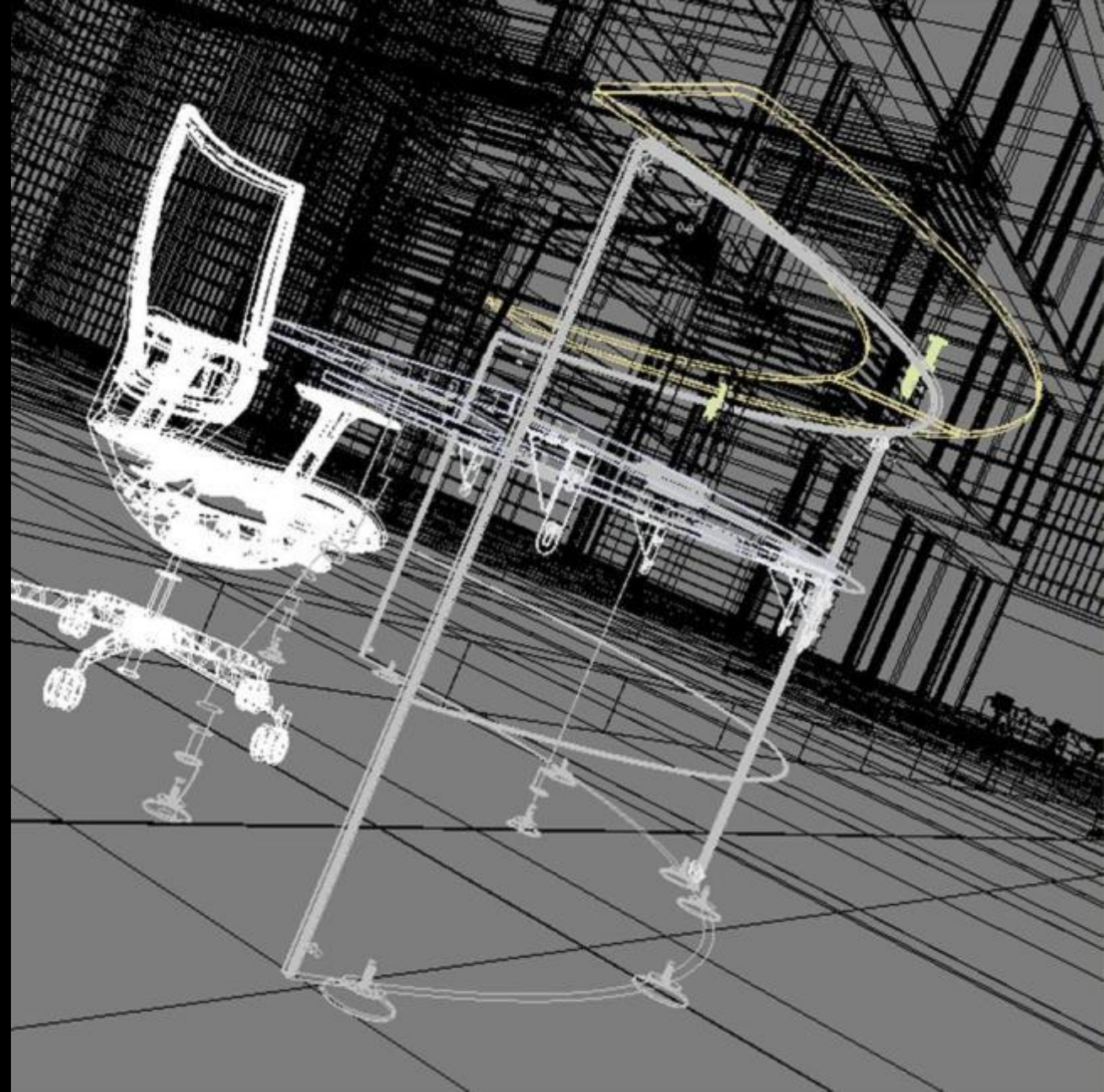
- Goal –
  Life like images
- In a reasonable amount of time

- Be an asset to the Design Process rather than a task

Preview

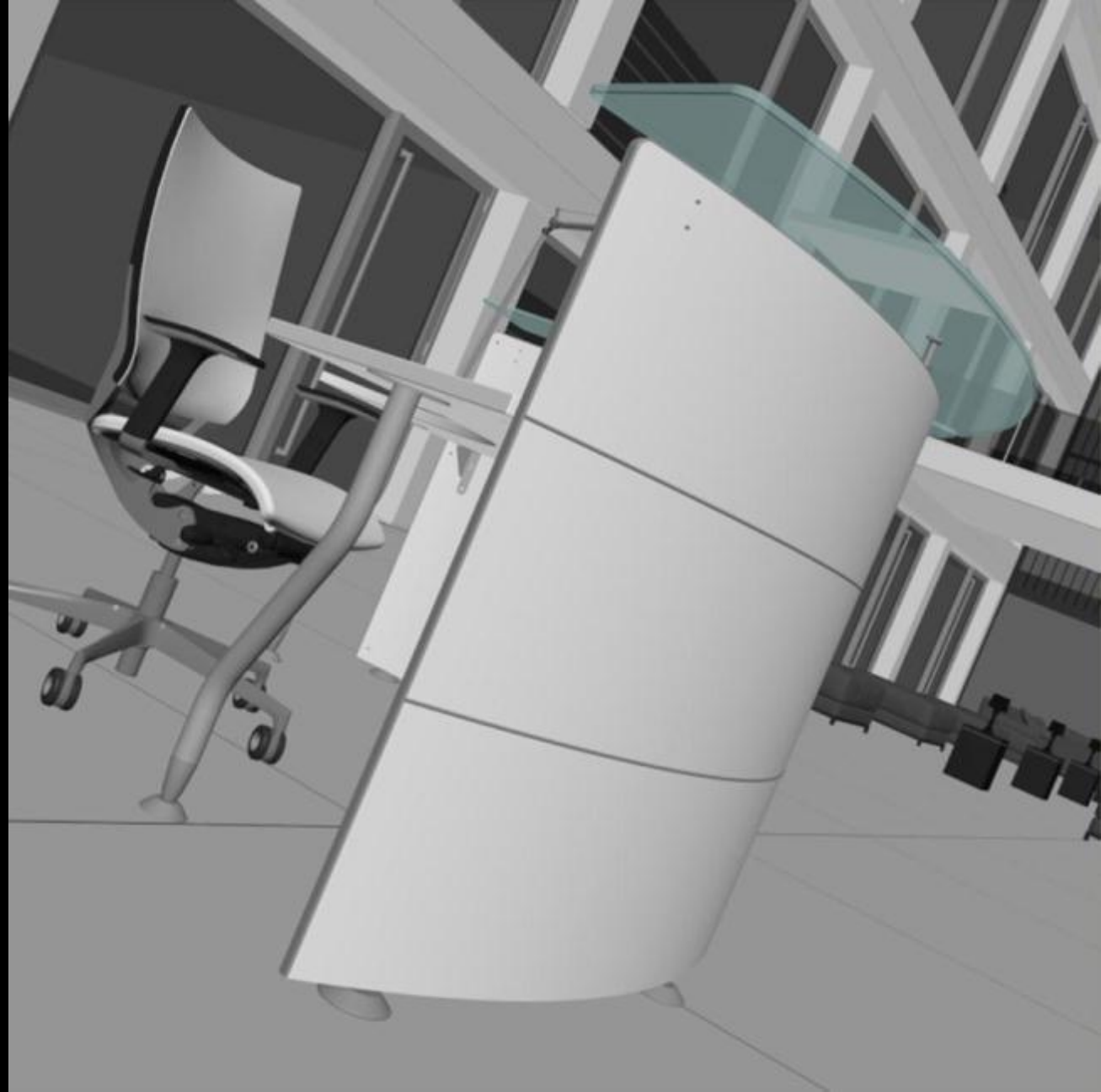
- Viewport Wireframe





Preview

- Viewport Shaded with Default Lighting



Preview

- Viewport
  Shaded with Textures
  and Default Lighting

Rendering

- Biased Rendering with Multiple Light Sources
- Render Time: 15 minutes (2 quad-core)

Rendering

- Biased Rendering with Final Gathering

- Render Time:
  1 hour
  (2 quad-core)

iray

- UnBiased Rendering using just the sky
- Render time: 10 minutes (2 GPUs)

iray

- Impressive results from every angle
- Still a single sky system light source

iray

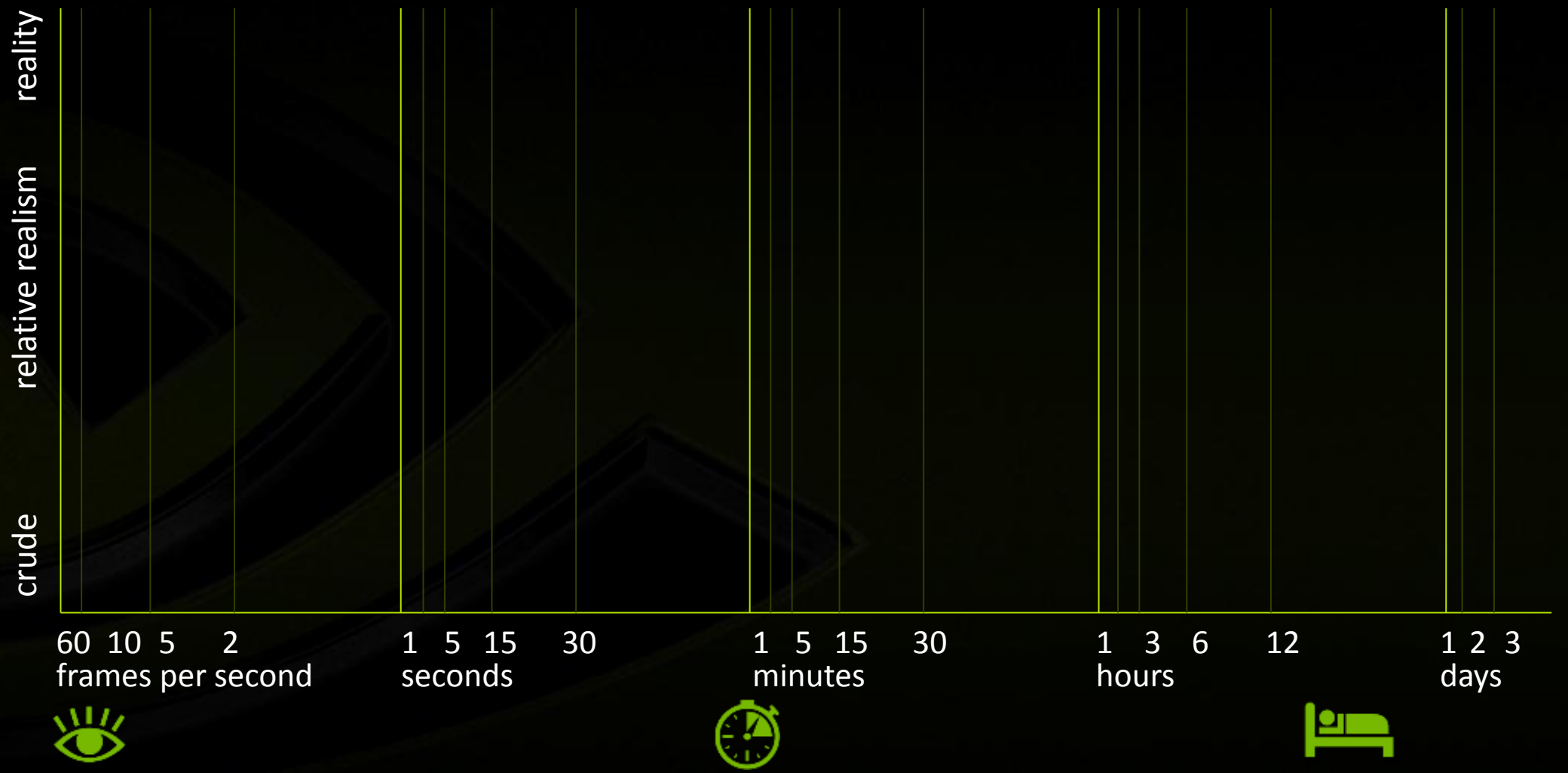
- Impressive results from every angle
- Still a single sky system light source

iray

- Impressive results from every angle
- Still a single sky system light source

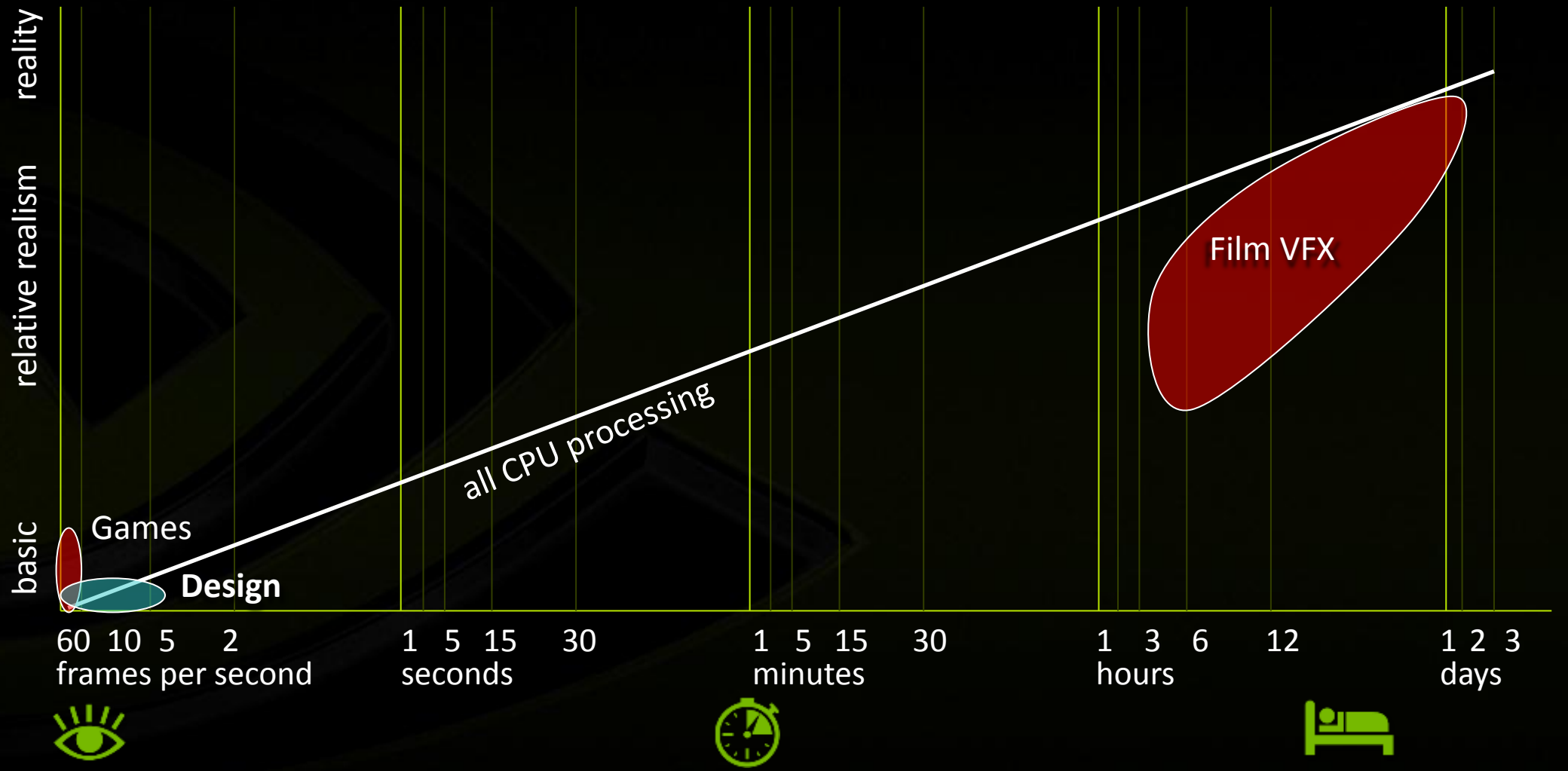
Rendering Realism

Premise



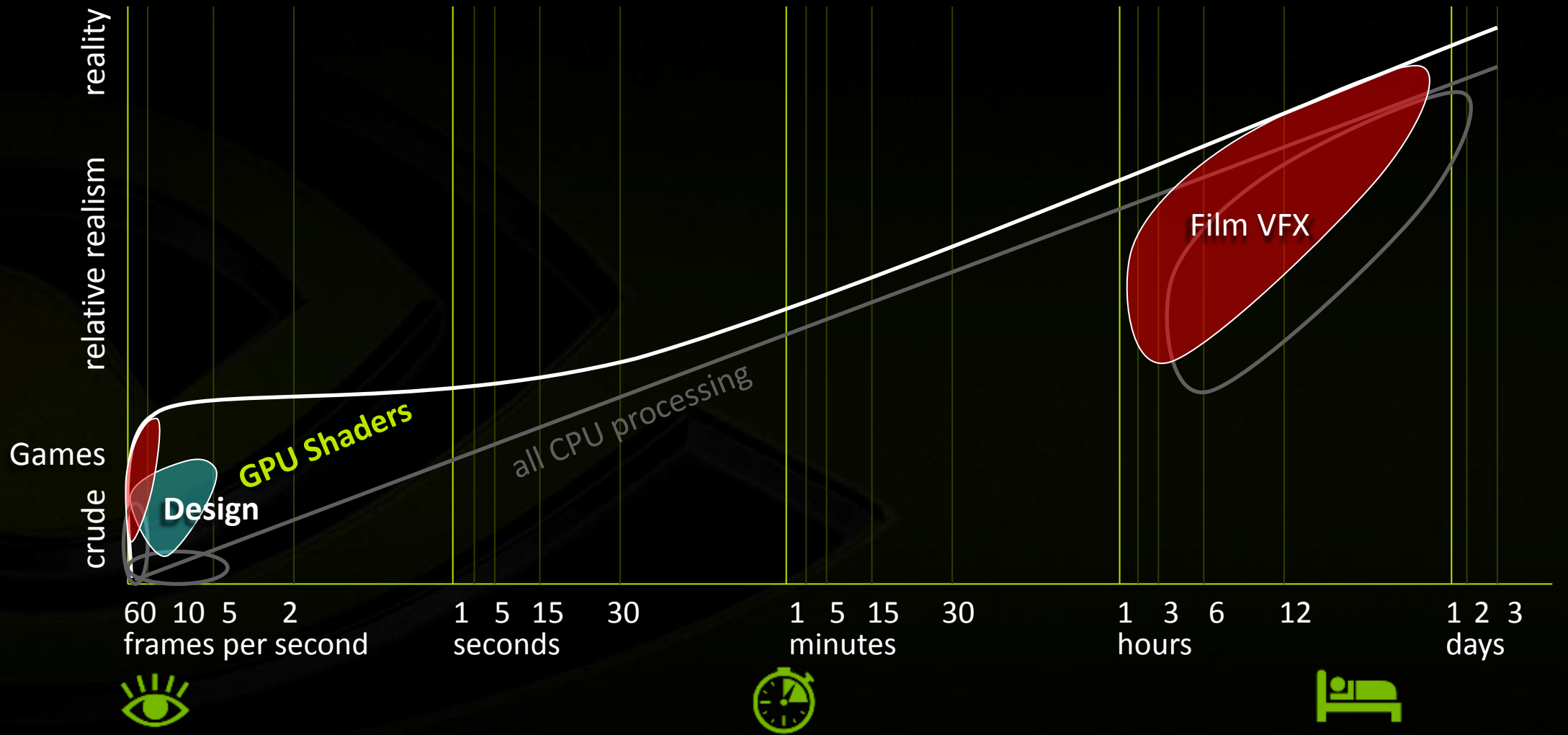
Rendering Realism

Baseline (1990's)



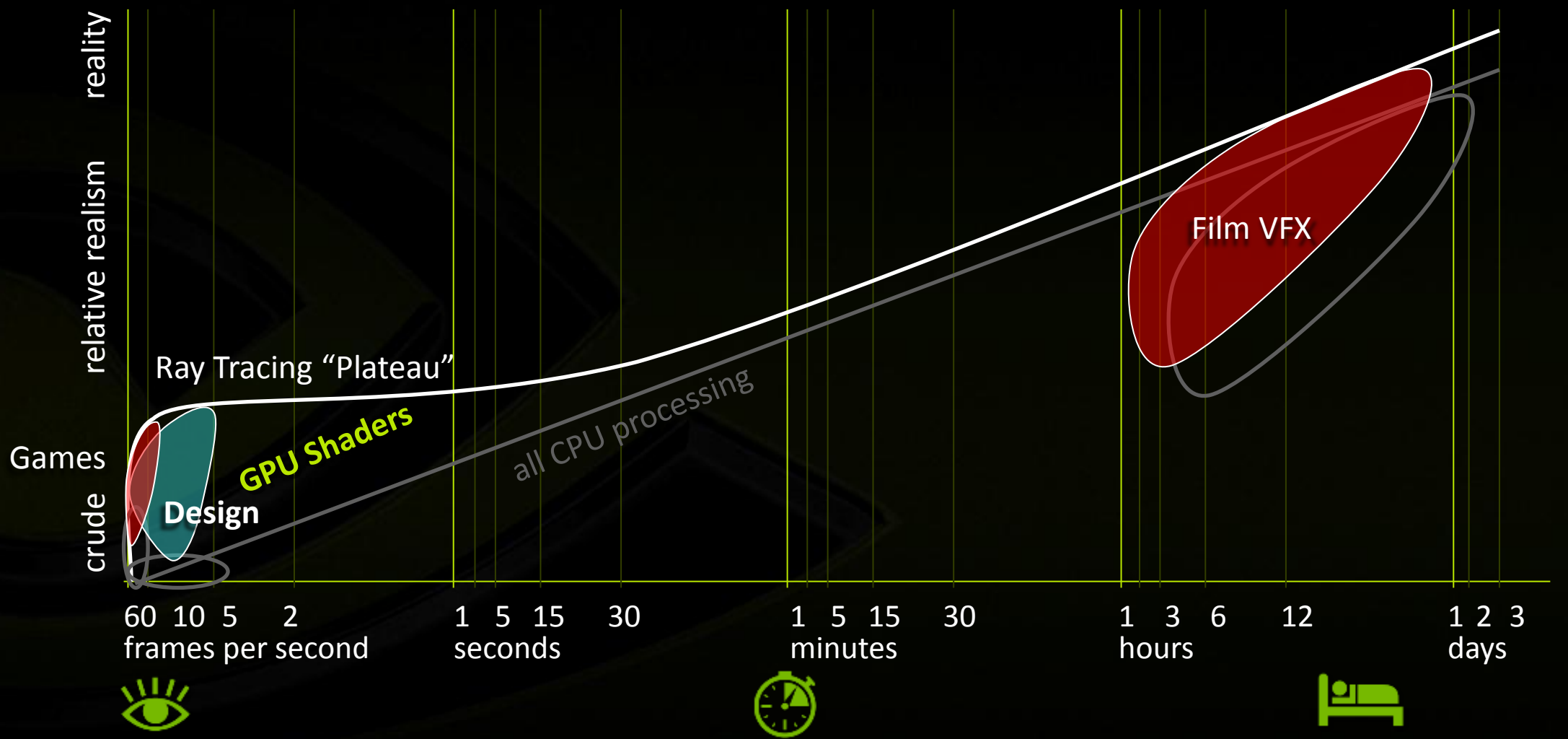
Rendering Realism

GPU Shader Impact

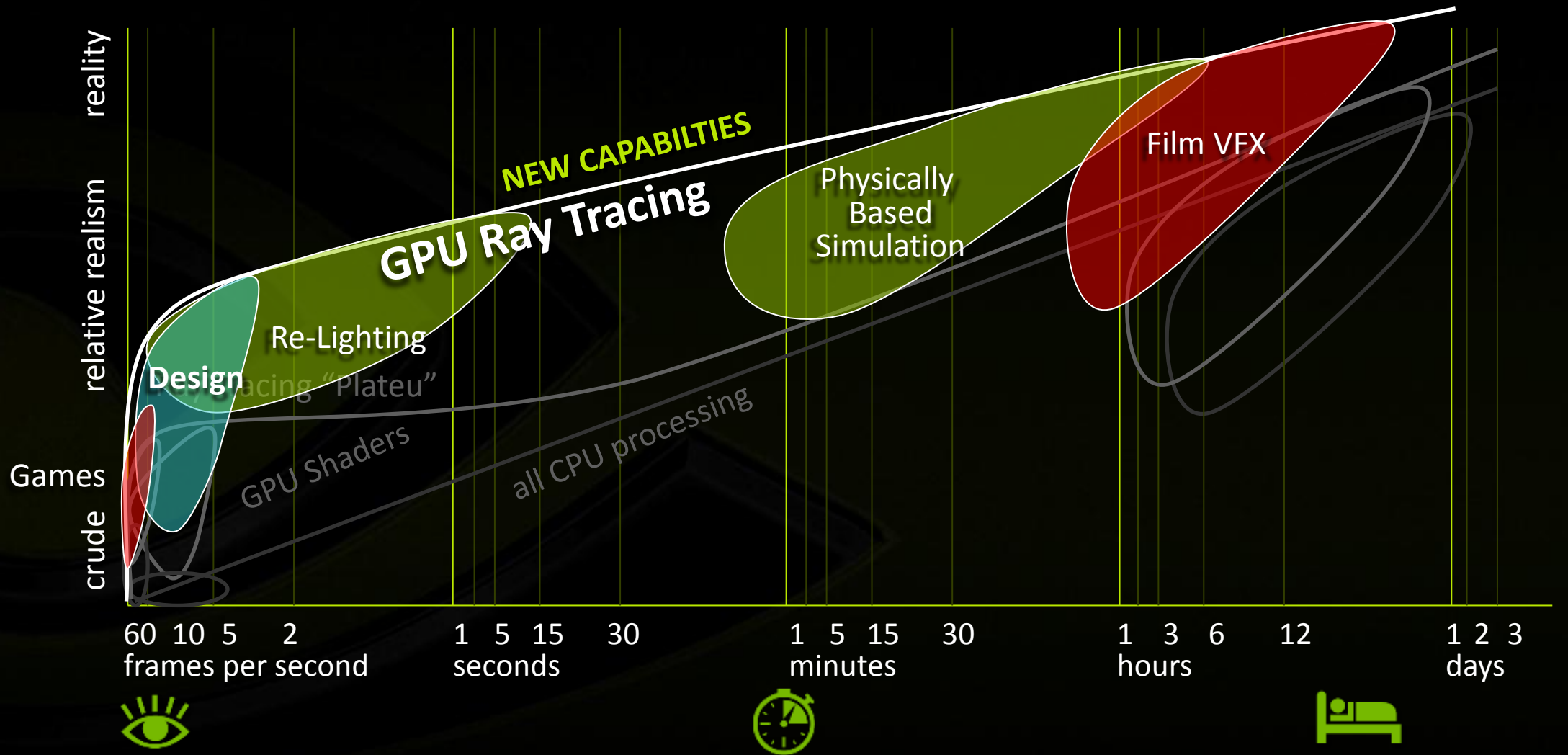


Rendering Realism

GPU Shader Limit



Rendering Realism GPU Ray Tracing Impact



Simple Lighting = Fast Rendering

- Image based lighting
- Mostly convex hull surfaces

Interior Rendering = Longer Rendering

- Lots of indirect lighting
- Concave surfaces
- Render times increase
- Scene setup is constant

Lighting Studies with iray

- The physically-based nature of iray materials and lighting delivers these results in a nearly automatic, “push button” manner.



Lighting Studies with iray

- Simple adjustment of Sun & Sky model, and turning on lights defined by the architectural plan



Consistent Material Model = Ease of Design

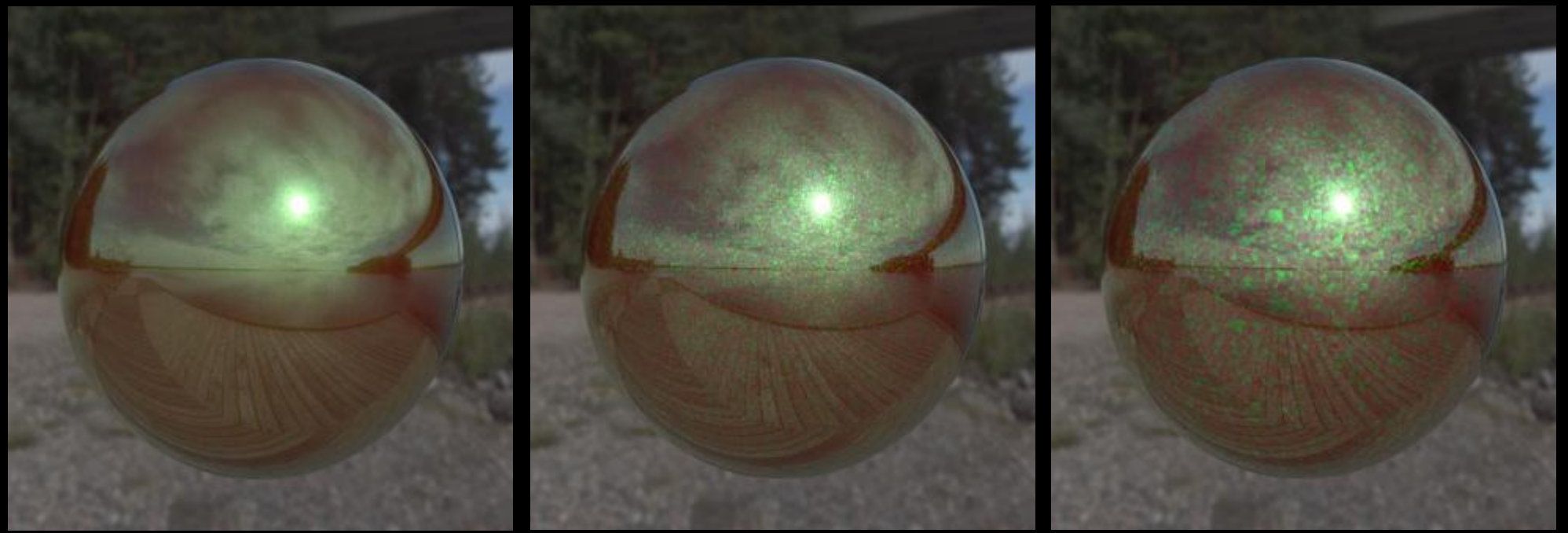
- Internally a BSDF model

Consistent Material Model = Ease of Design

Results from Catia Live Rendering

Layered Materials with iray 2.5

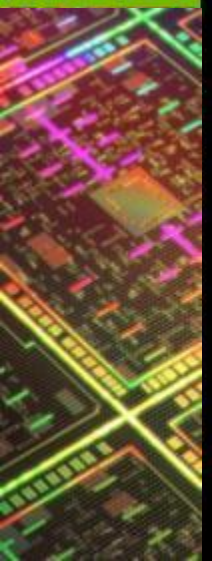
- Car Paint Example (3 Layers, from top to bottom)
  - Clear coat layer with Fresnel reflection
  - Green metallic flake layer (varying flake sizes shown below), including interference effects
  - Red diffuse reflection layer



NVIDIA Iray

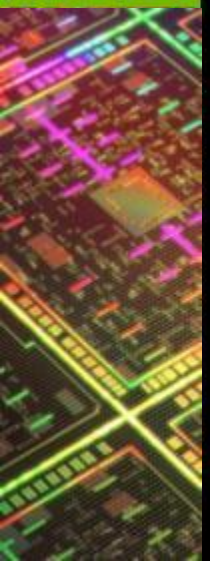
- For Product Developers – the Iray Integration Framework
  - Freely available SDK
  - Includes **Iray Viewer** example application

- For End Users – iray enabled products:
  - Autodesk **3ds Max** & **3ds Max Design**
  - Dassault Systèmes **Catia V6**
  - Bunkspeed **SHOT**, **MOVE**, **PRO**



NVDIA iray - in products

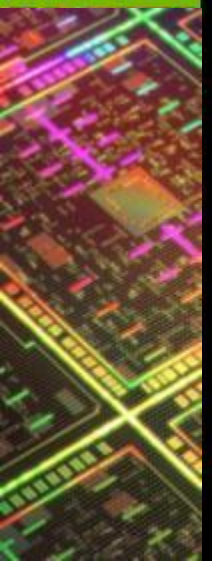
- Catia V6
  - Uses new iray framework, cluster rendering supported
  - Highly interactive, integral workflow within Catia's Shape module
- Bunkspeed SHOT, MOVE, PRO
  - Uses new iray framework, cluster rendering supported
  - Highly interactive, dedicated rendering product
- Autodesk 3ds Max and 3ds Max Design
  - Using iray on the mental ray platform (now with motion blur)
  - Production frame rendering, and interactive with Active Shade feature



NVIDIA Iray Integration Framework

- For Software Developers wanting to add iray rendering to their applications

- Procedure:
  1. Register your interest at www.mentalimages.com
     http://www.mentalimages.com/products/iray/iray-integration-framework/software-download.html
  2. Download the SDK
  3. Integrate it with your Application
  4. Once satisfied, obtain a commercial license key from NVIDIA
  5. Ship it!



NVIDIA Iray - Application Requirements

- The Iray Integration Framework provides both the renderer and rich APIs for interfacing with it.

- The application must provide:
  - Rendering Workflow (e.g., material assignment, material editing, light and camera objects, etc.)
  - Rendering Data (e.g., UVW coordinates, material IDs, etc.)
  - Triangular representation for rendering
  - Animation Results (if desired)

Differences Between SDK and Licensed

Feature	SDK	Licensed
▪ Watermark	Yes	No
▪ GPU	Pro Only 2GB+	Any NVIDIA GPU
▪ Multi-GPU	Yes	Yes
▪ CPU	No	Yes
▪ GPU + CPU	No	Yes*
▪ Cluster	No	Additional License

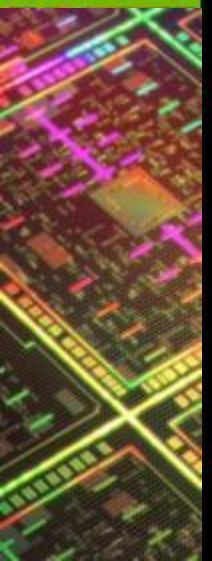
*greatly diminishing returns with newer GPUs

Expanding Iray's Interactive Reach

- Currently In Development – no availability announcement yet
- Different rendering modes providing a quality/speed continuum

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

- APIs for which to use, with what features, what to do on mouse-up, etc. enable custom personalities for behavior and look



Questions?

- See mentalimages.com for more information on iray and its framework for integration
- See blog.irayrender.com for the latest information from the iray development team

End