



Real-Life Visualization of JT Data in Real-Time

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RTT - Realtime Technology

Company Profile – <http://www.rtt.ag>

_ Industry Focus (Industrial Design)

_ Automotive, Aerospace, Manufacturing, Consumer Goods

_ Design, Development, Sales and Marketing

_ Offerings

_ Real-time Software Tools

_ Digital Content Production

_ Professional Services / Consulting

_ Focus

_ Visual quality, Speed, Ease of Use

_ Produce tangible benefits – time to market, process improvement, quality



RTT - Realtime Technology Business Model



RTT Software

photorealistic 3D visualization in real time

asset management of design data



RTT Services

content creation

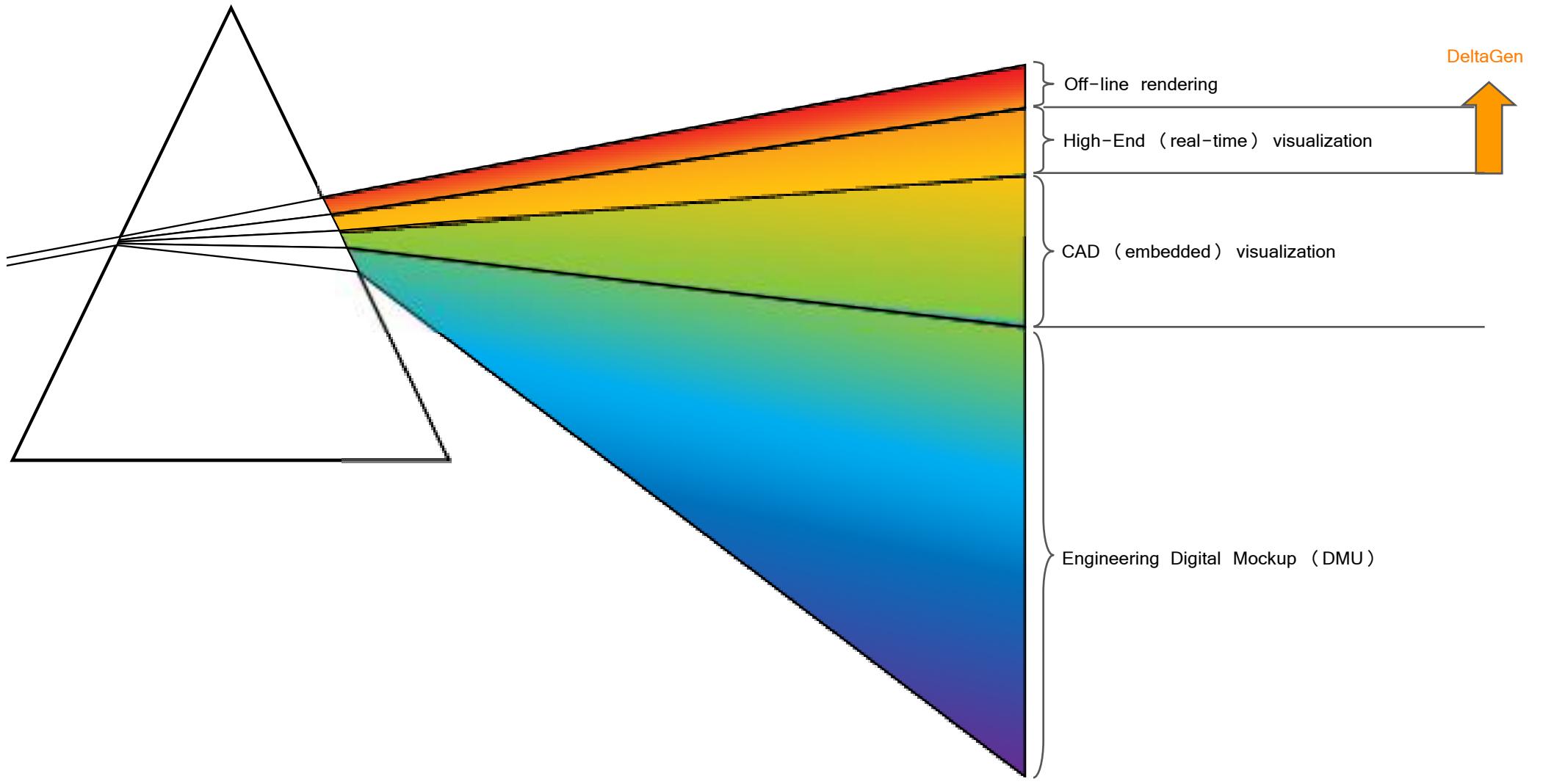
CGI (Film/Print), web. configuration systems, etc.

consulting

process consulting, optimization concepts,

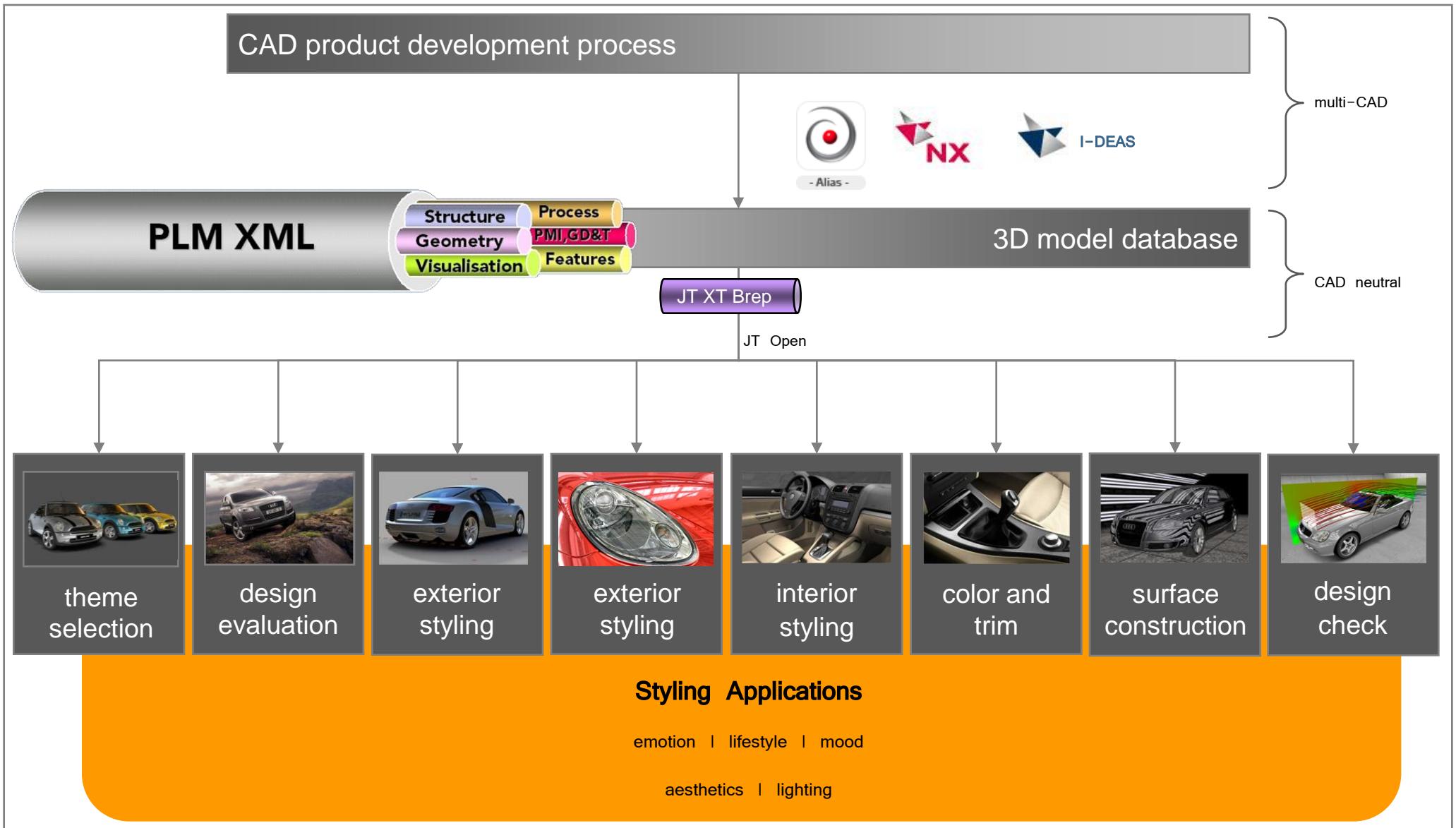
Case Study

High-end visualization using JT



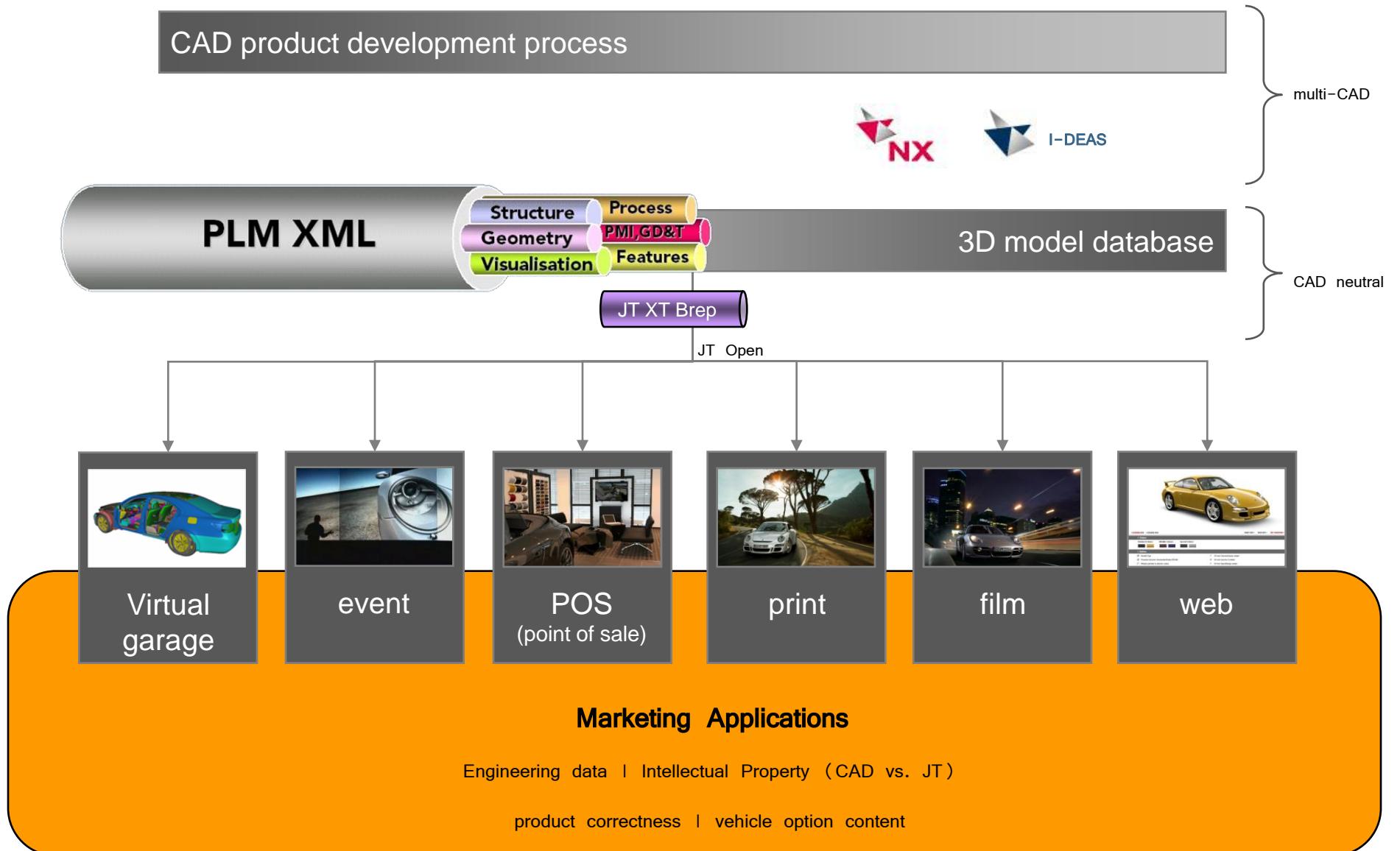
Case Study (Virtual prototyping)

High-end visualization using JT



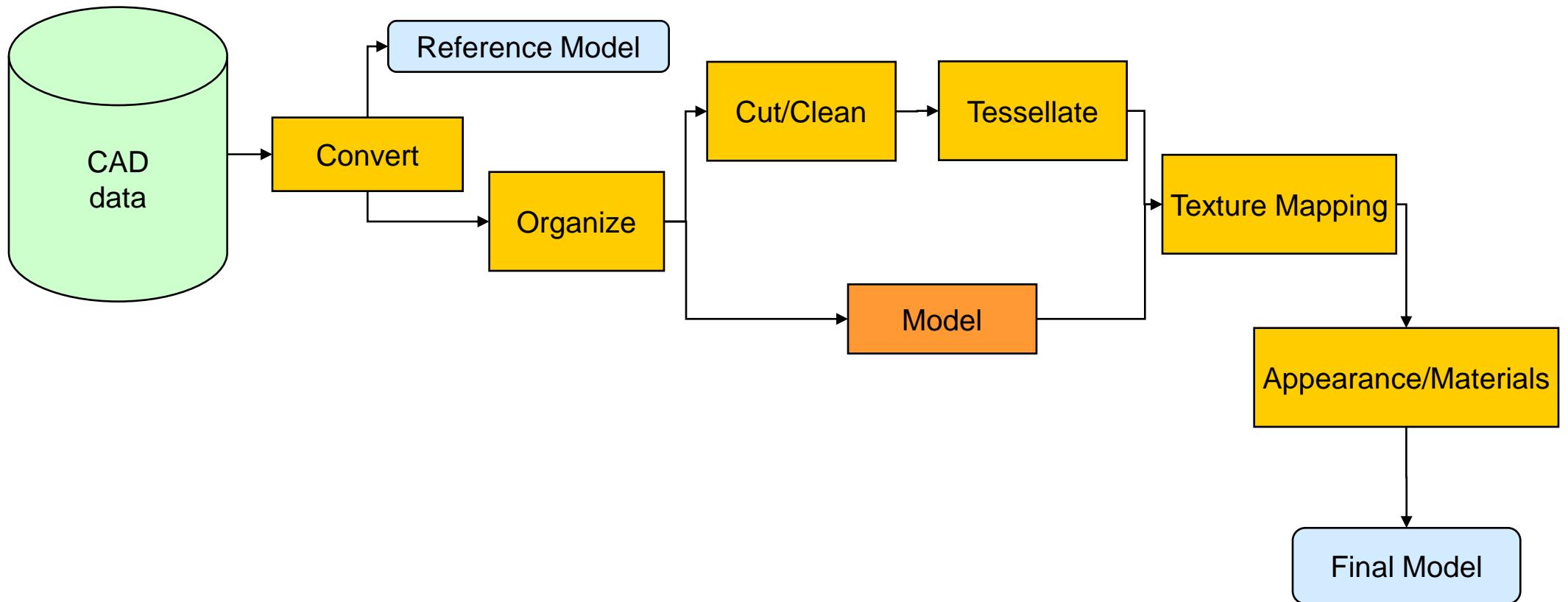
Case Study (Virtual marketing)

High-end visualization using JT



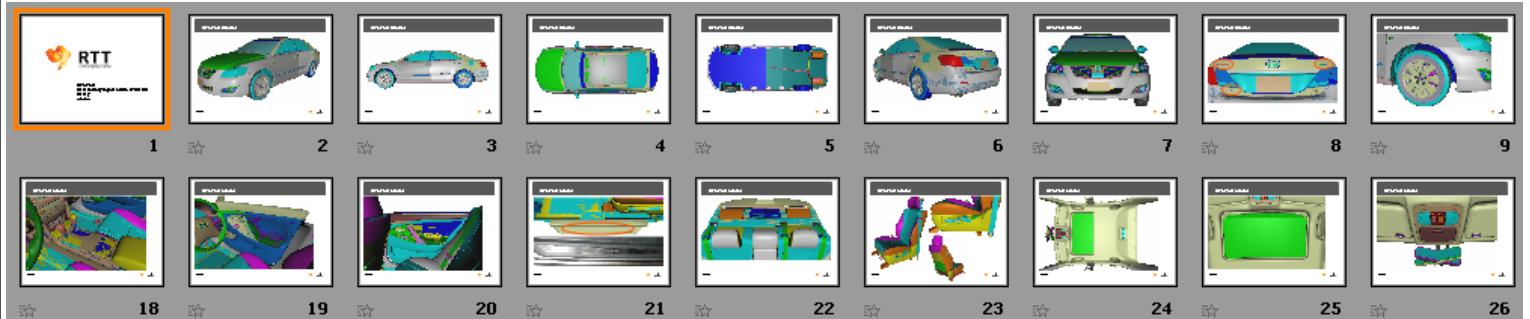
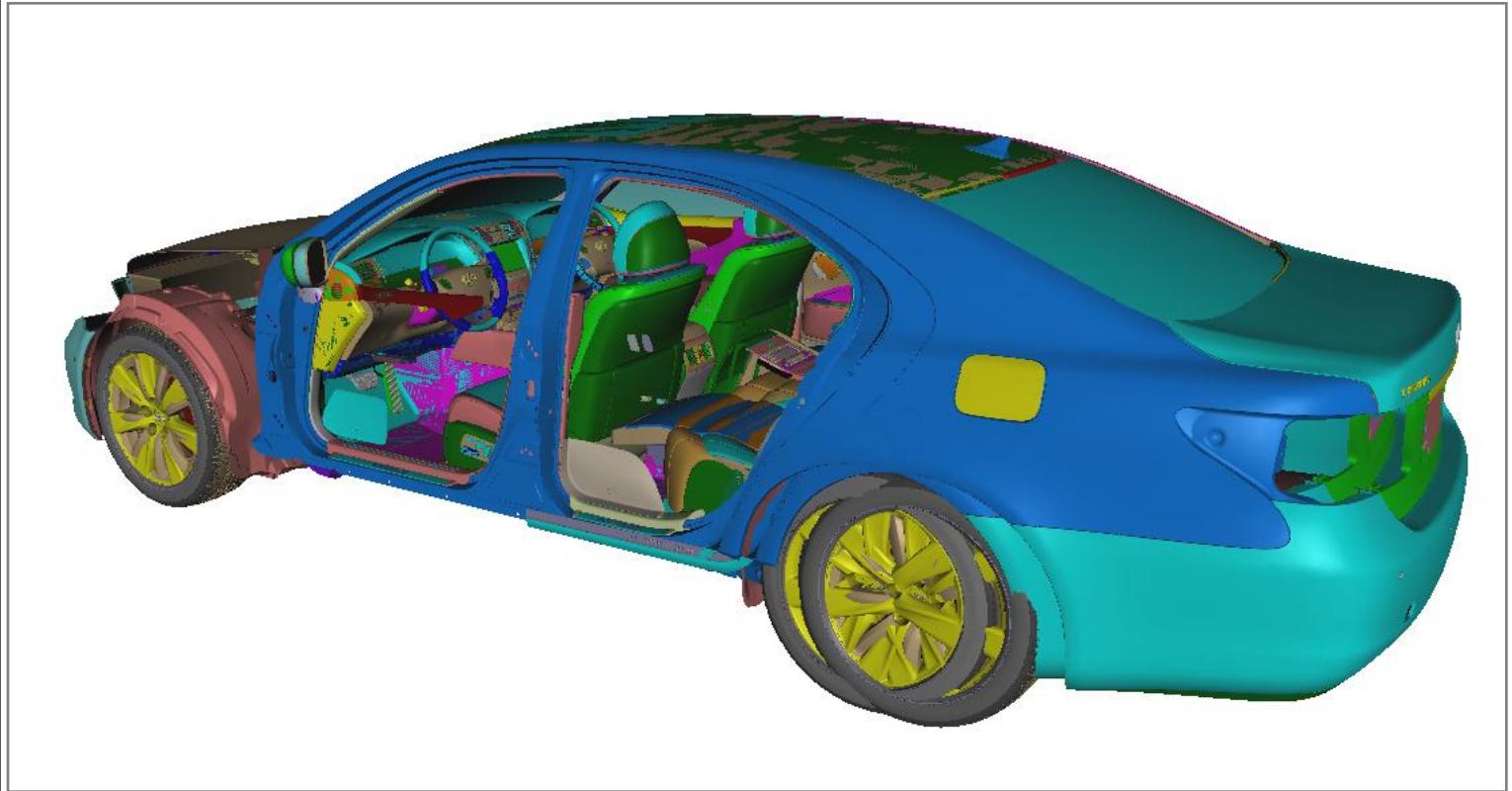
Process Overview

CAD to CGI



Model Conversion Data Gathering

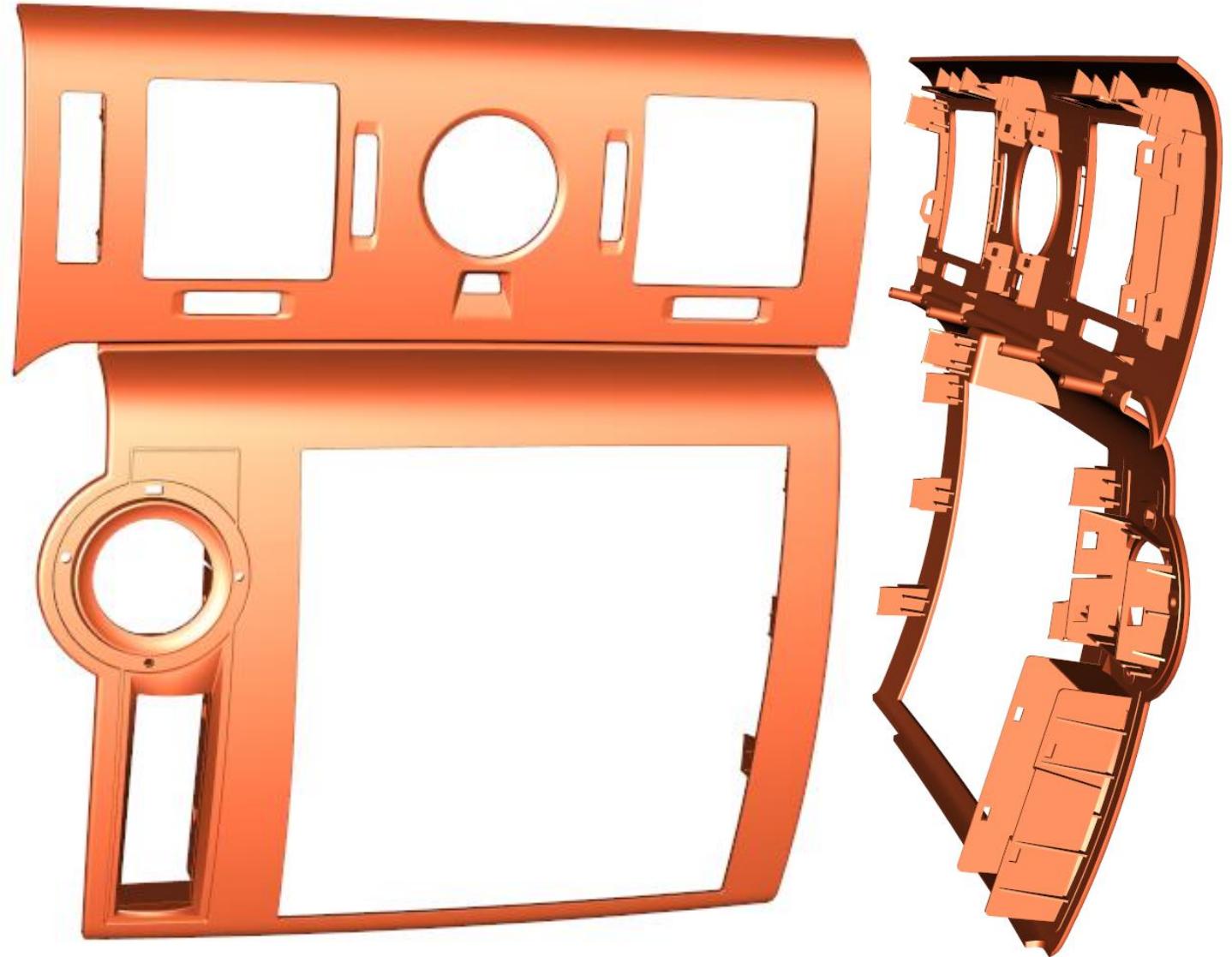
- _ Creative Brief
- _ Reference (photos, material samples)
- _ Coordination (Engineering, Design, Marketing)
- _ PLM export/revisions
- _ Product completeness
- _ Product correctness
- _ Reference model



Model Conversion

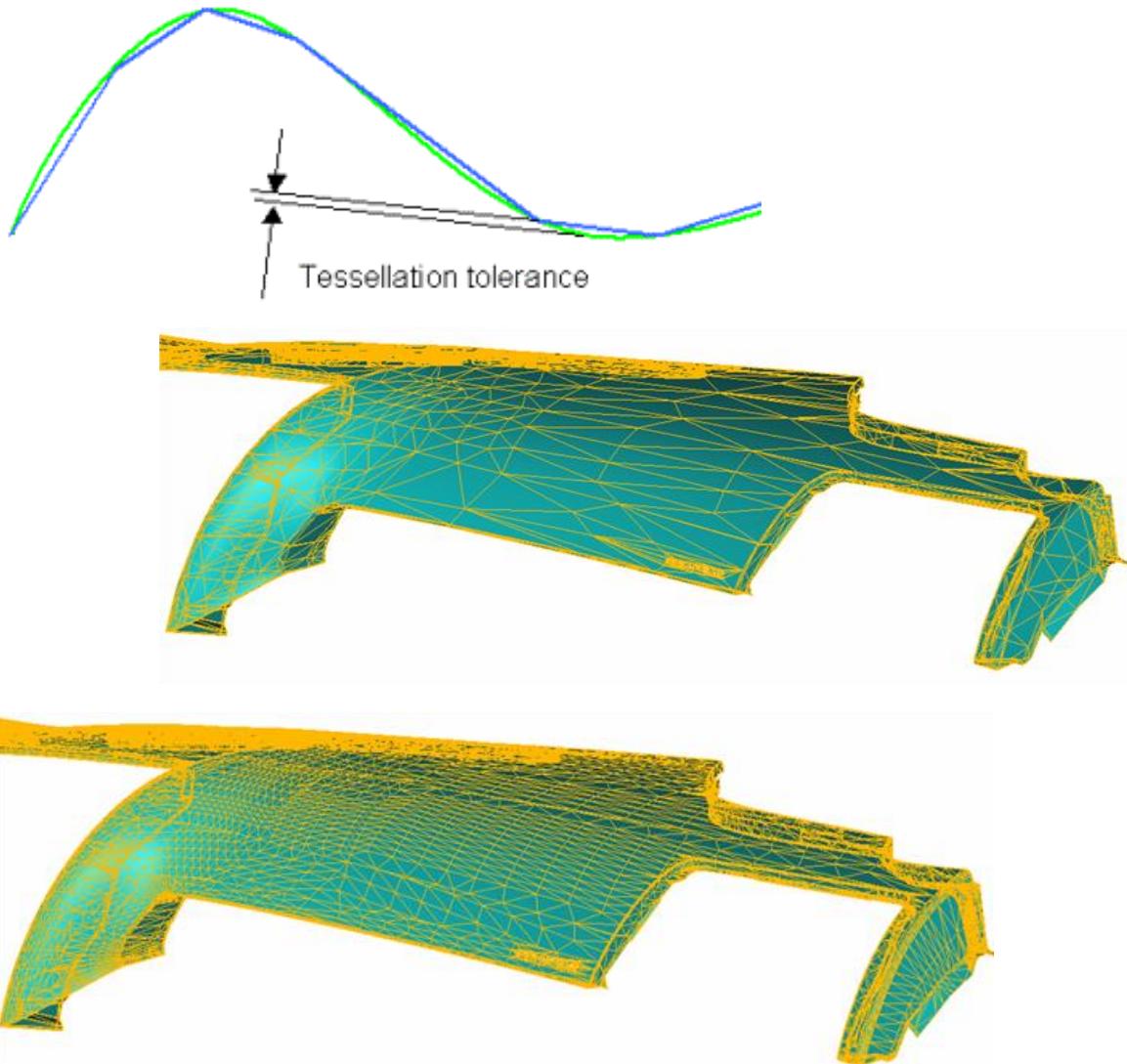
Cut/Clean – engineering detail

- _ Engineering parts are needed for product correctness
- _ Engineering detail is too much for most production render firms
- _ Many components don't contribute to overall rendering
- _ Visibility culling
- _ Automated simplification



Model Conversion

Tessellation



Geometry is converted to a polygon mesh

Further preserves IP when model is distributed to production render firms

Quality control is essential and directly linked to production goal:

- _ internet → low res
- _ animated movie → med res
- _ dealer configurator → med res
- _ print image → high res

Tessellation attributes:

- _ surface smoothness (diffuse, reflective)
- _ accuracy (chordal tolerance)
- _ patch topology (crack-free)

Model Conversion Modeling



All parts that are missing or differ to the CAD have to be modeled:

- _ seat upholstery
- _ leather door panels
- _ seams & stitching
- _ leather bags for gear shift and handbrake
- _ icons for controls or scales
- _ soft tops for convertibles
- _ emblems



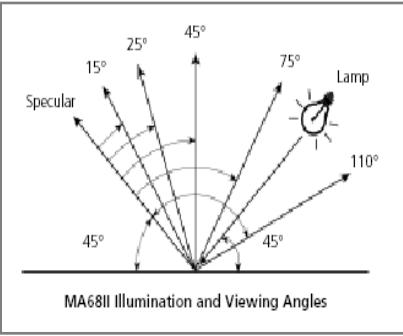
Real-Life Visualization of JT Data in Real-Time

Appearance

Basic Lighting

Color

- _ Simple
- _ Measured

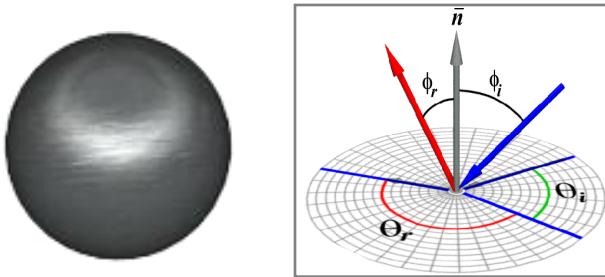


MA68II Illumination and Viewing Angles

The diagram shows a light source (Lamp) at an angle of 110° from the surface normal. Several viewing directions are shown at angles of 15°, 25°, 45°, 75°, and 110° from the surface normal. A 'Specular' reflection is indicated at a 45° angle from the normal. The surface is represented by a horizontal line.

Reflectance

- _ Lambert – diffuse
- _ Phong/Blinn – specular
- _ Anisotropy – non-uniform highlights



The left image shows a sphere with a horizontal highlight. The right image is a diagram of a sphere's surface with a normal vector \vec{n} . A red vector ϕ_r and a blue vector ϕ_f are shown. The angle between the normal and the red vector is θ_r , and the angle between the normal and the blue vector is θ_i . The angle between the red and blue vectors is ϕ .

Appearance

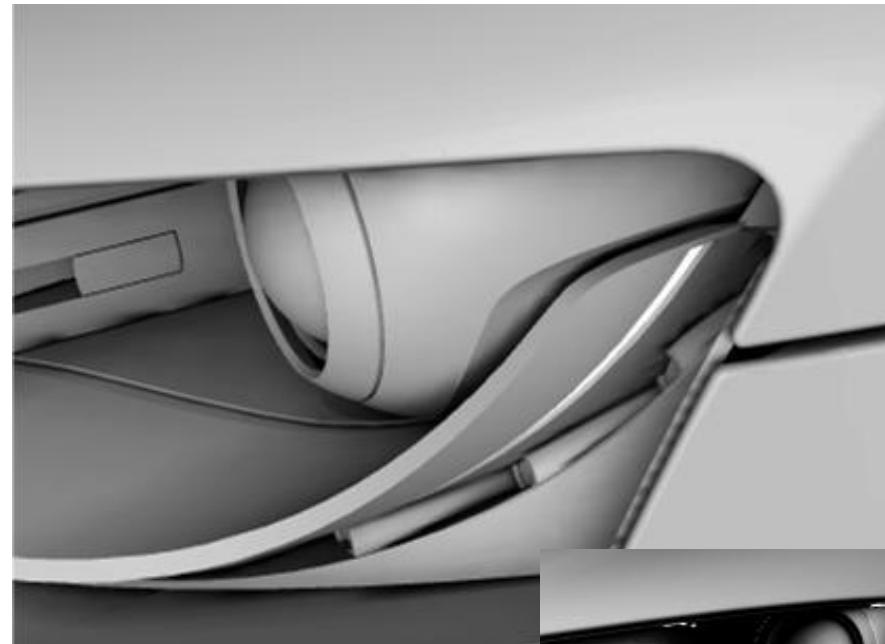
Advanced lighting

Illumination

Lighting plays important role in image quality

Resulting image - blend between pre-computed and real-time results

- _ Global Illumination
- _ Image Based Lighting (IBL)
- _ Shadows
 - Ambient occlusion
 - Ground-effect shadow
 - Soft shadows (direct illumination)



Materials

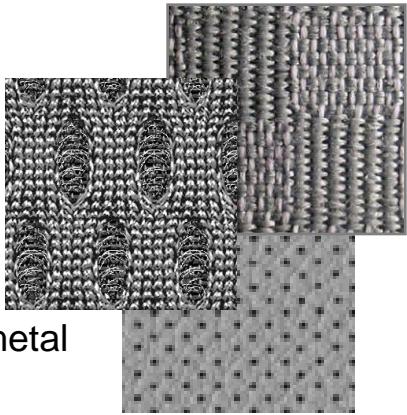
Material

_ Leather

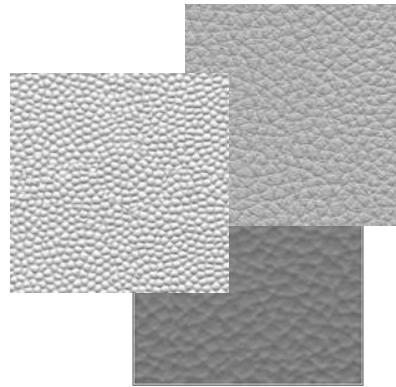
_ Cloth

_ Plastic

_ Sheet metal



Emboss

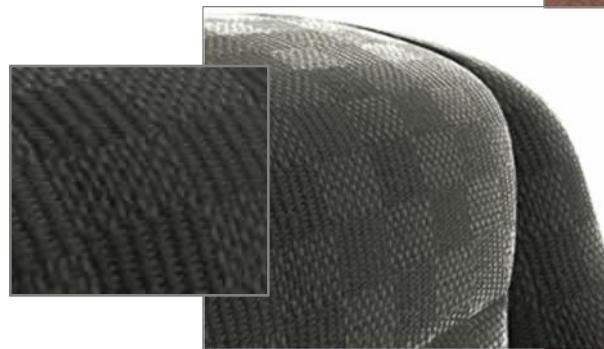
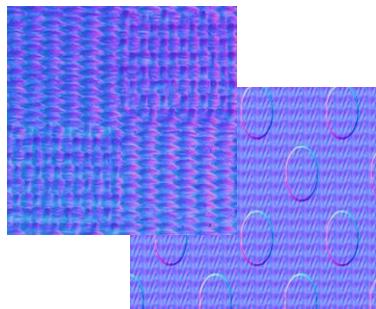


Treatment

_ Clear coat

_ Fresnel

_ gloss

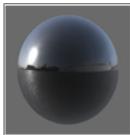


Environment Effects

HDRI, Fresnel, Surroundings

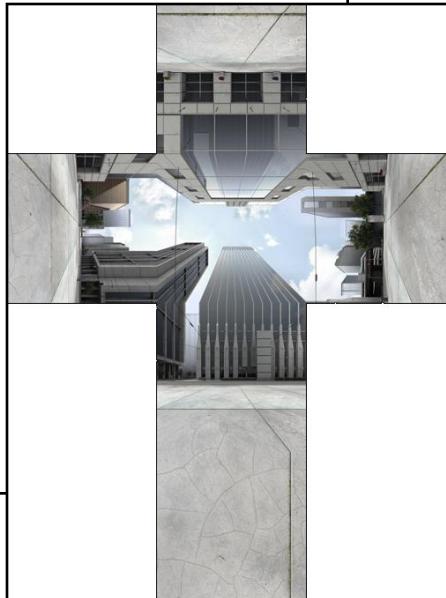
Environment

- _ High-dynamic range imaging
Greater dynamic range of exposures
Wide range of intensity levels



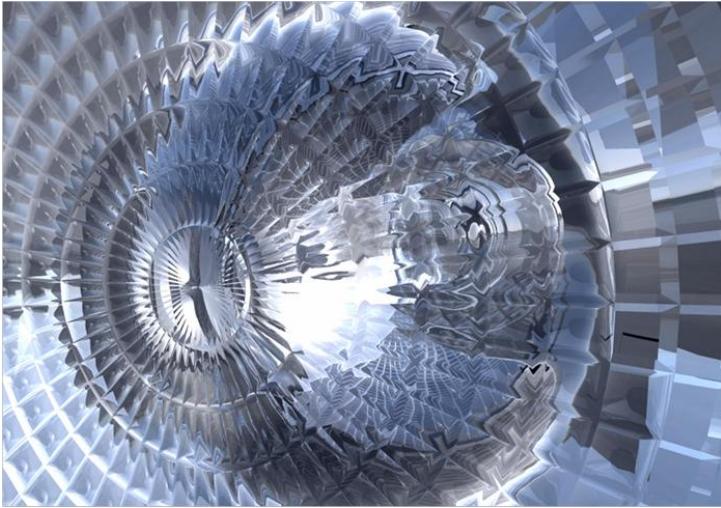
- _ Fresnel

- _ Reflections
Approximated



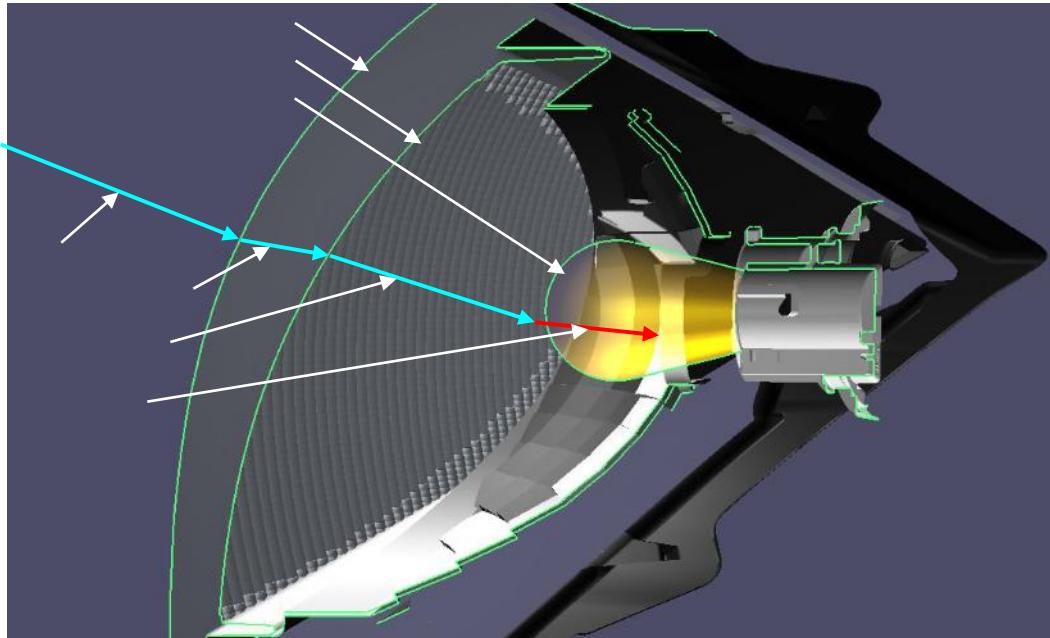
Reflections/Refractions

Real-time raytracing



Real-time ray tracing is employed to render object-to-object interactions and various optical effects such as

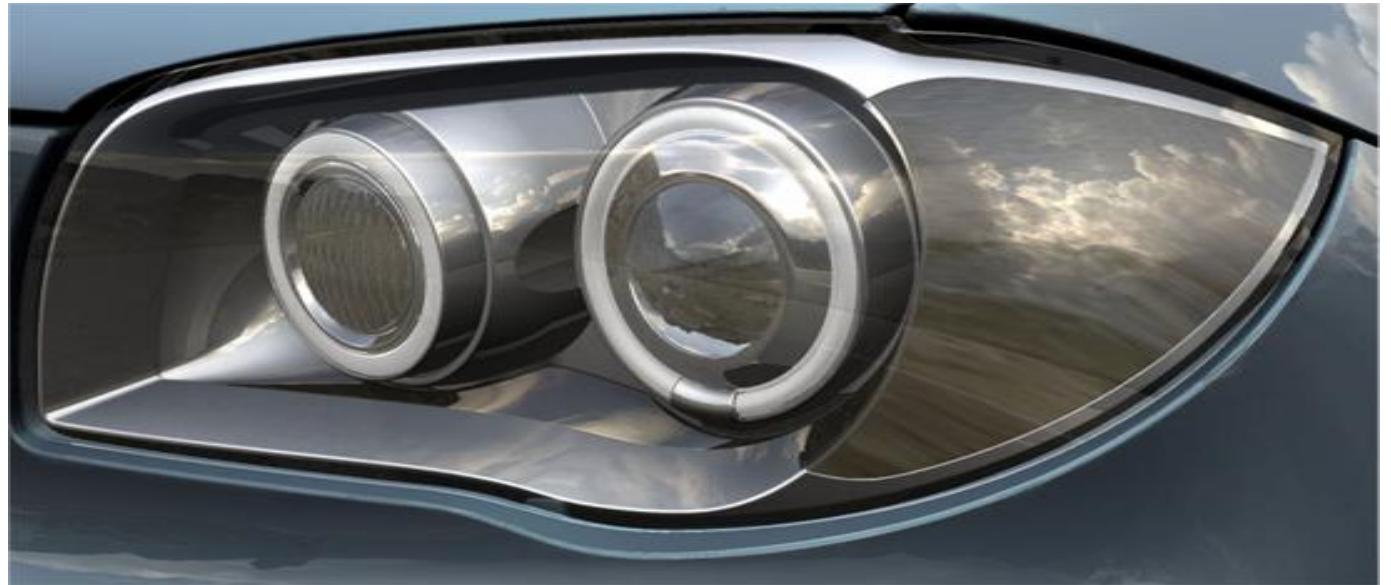
- _ reflection
- _ refraction
- _ absorption



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Real-time ray tracing Results

Max. Depth 1:

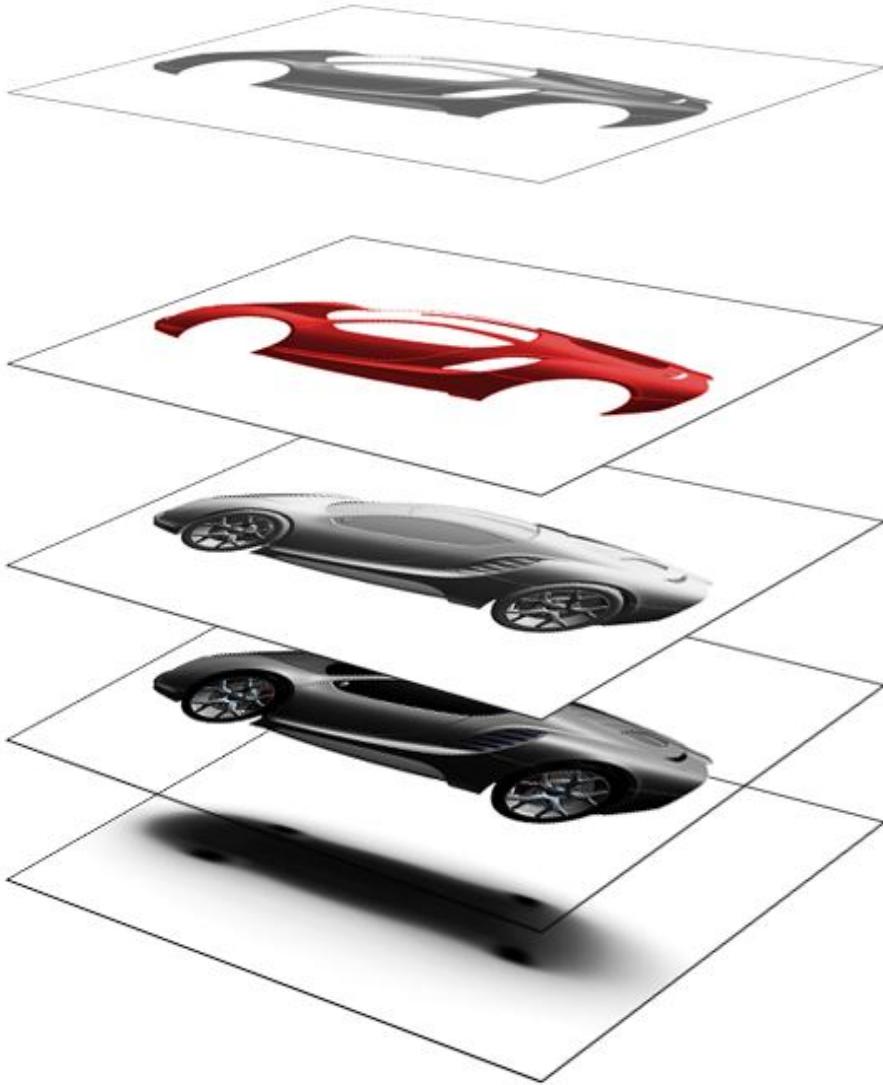


Max. Depth 4:



Image Creation

Layer-based rendering



- _ Rendering layers rather than full images yields more control in final image creation.
- _ Supports flexibility in post-production.
- _ Generated layers can be dropped into existing images for quick changes by using masks and alpha channels



Compositing

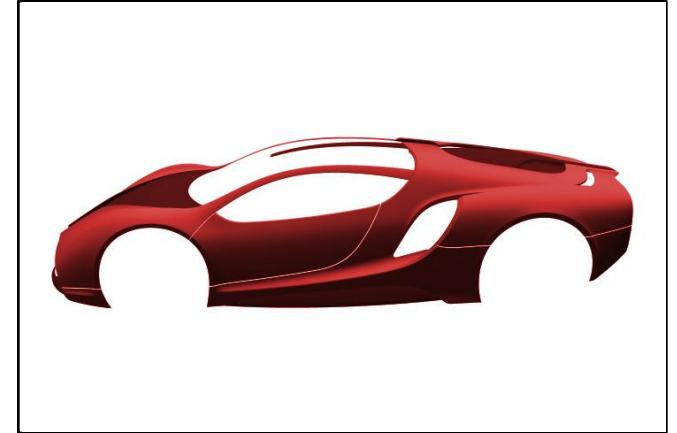
Sample Layer Generation



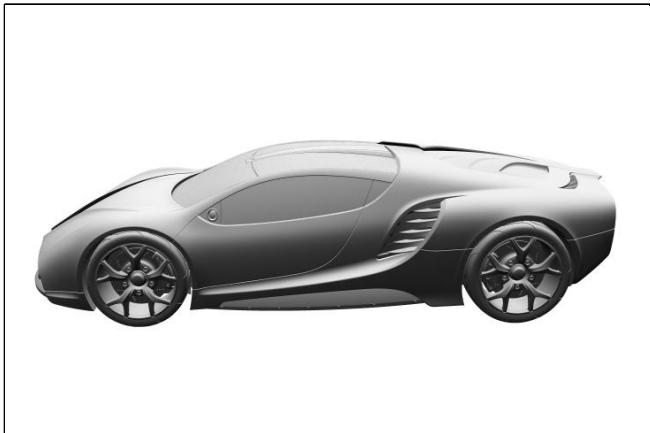
Background



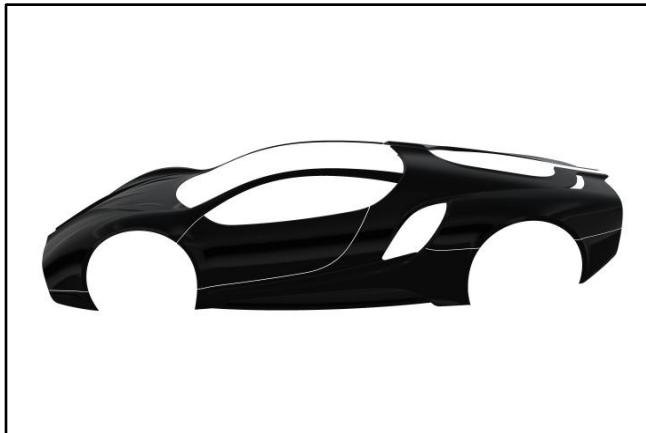
Beauty Pass



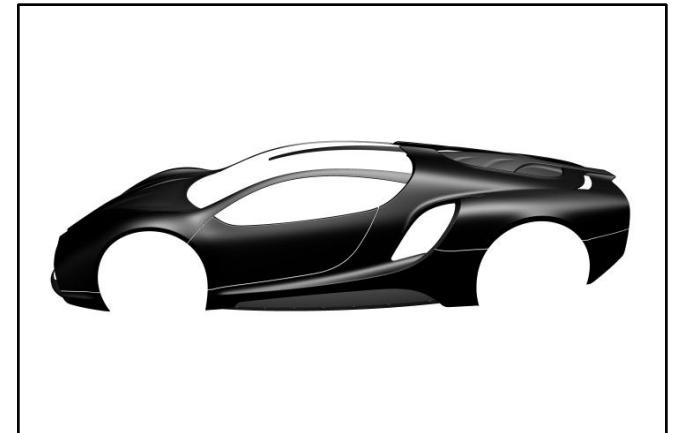
Diffuse pass



Occlusion



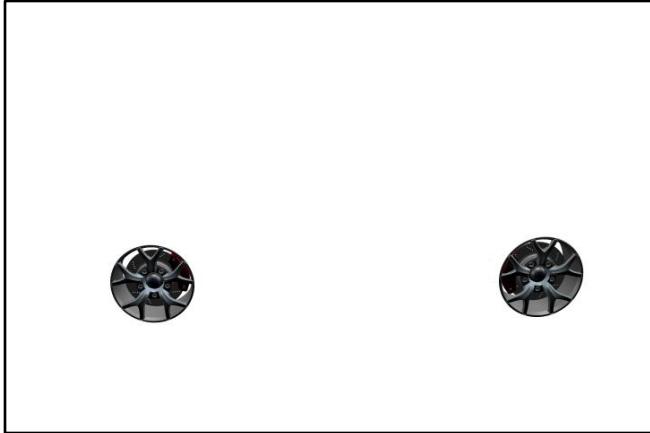
Reflection



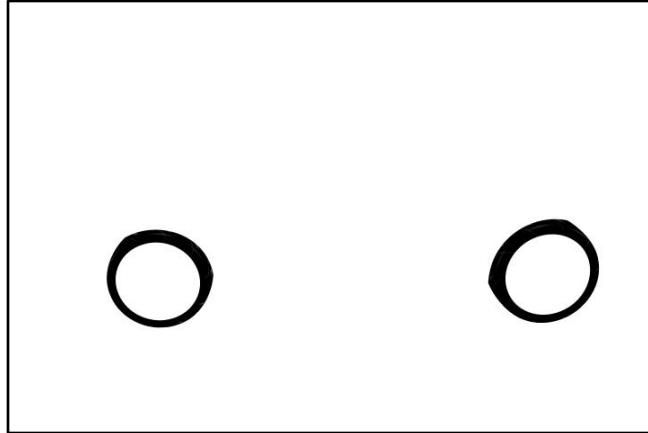
Specular

Compositing

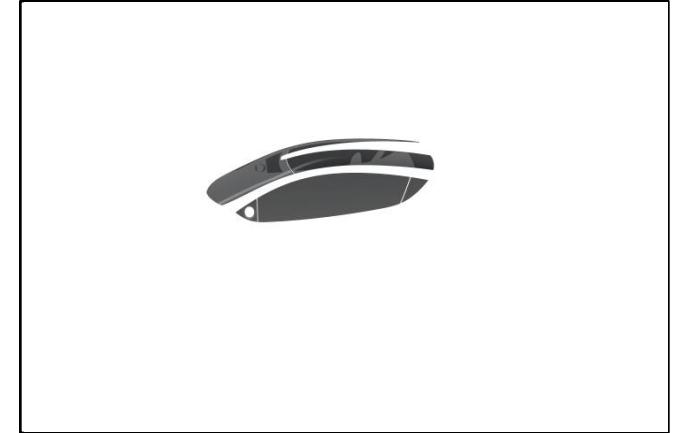
Sample Layer Generation



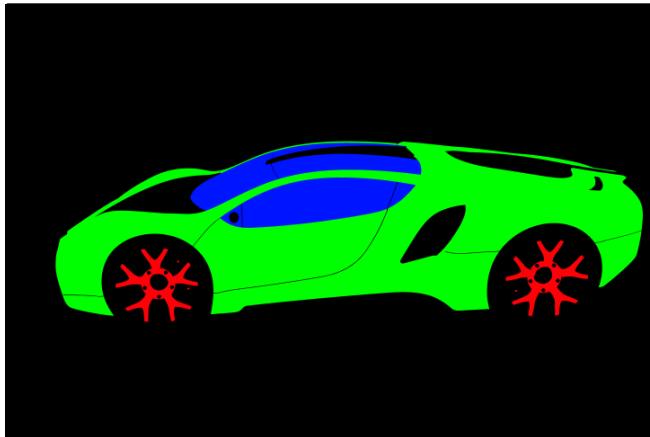
Wheels



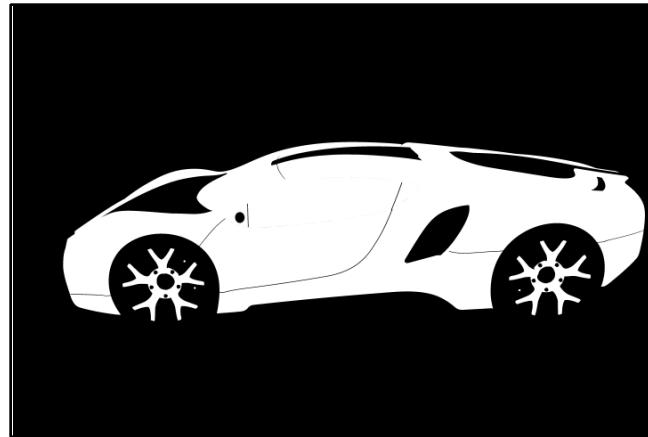
Tires



Glass



Masks



Alpha Channels



Results



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RTT

Results



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Results



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Results

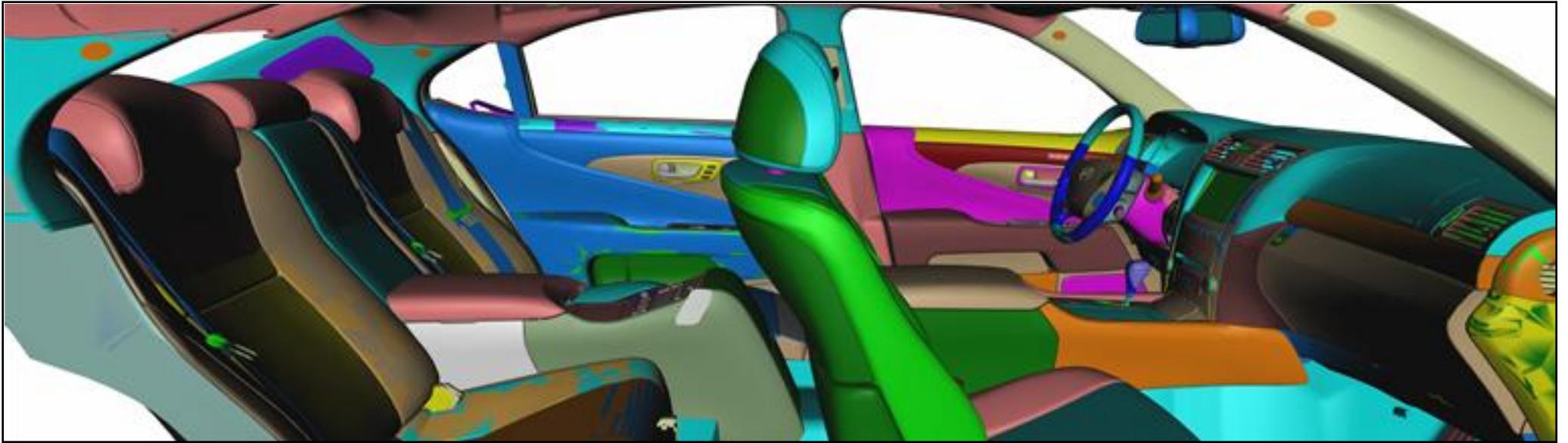


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Results

From JT to CG



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Parting thoughts

- _ JT Open - simplifies multi-CAD issues
- _ JT Open - as a 3D interchange format, protects IP
- _ Accommodate 3D (refined) visualization assets in data management solutions
 - _ Record of product portfolio
 - _ Record of design decisions