AUTODESK UNIVERSITY 2014

Go with the Flow! Common Workflow Process in VRED Professional software

Renu Muthoo – ASCENT - Center for Technical Knowledge

ID6079-P This class teaches the common workflow process used in VRED Professional software to create high-quality, real-time renderings that realistically visualize design ideas. The class will begin by opening a native VRED (.vpb) design model as a real-time rendering in the default OpenGL render method. Students will learn to optimize the model by fixing the geometry and using Scenegraph to organize the parts. We will assign VRED Professional software materials and we will modify them to dress up the geometry so that the visual display is enhanced and the realism is improved. Finally, we will modify the render setting options to obtain a high-quality rendering, and then we will create an image for presentation. The class will finish with a brief discussion about the raytracing render method and how it creates renderings with physically correct lighting, reflections, refractions, and shadows.

Learning Objectives

At the end of this class, you will be able to:

- Work with Scenegraph and optimize the model geometry
- Learn how to assign and modify materials
- Learn how to apply an HDR image and set it as a background environment
- Learn how to work with different render setting options in OpenGL rendering method and create an image

About the Speaker

Renu Muthoo is an Instructional Designer with the Rand Worldwide Company, ASCENT-Center for Technical Knowledge. Her main role is to produce a variety of documentation, which includes developing and writing training courseware for 3ds Max Design software, Showcase software, VRED Professional software, and various industry-specific AutoCAD software products such as AutoCAD Electrical software. She has worked with Autodesk, Inc., products for the past 15 years, focusing mainly on design visualization software. Using her engineering background and expertise in Autodesk products, she has co-authored a number of books for various audiences on 3ds Max software and AutoCAD software. She has extensive experience in creating photorealistic scenes using 3ds Max Design software, and she has extended her knowledge into the automotive visualization/presentation field using VRED Professional software. She is proficient in using materials and textures, illuminating scenes by providing optimum lighting, and using renderers to create believable and high-quality visualizations.

 *rmuthoo@rand.com*

 *@ASCENT_CTK*

 *ASCENTed.com (Blog)*

Autodesk VRED Professional Introduction

The Autodesk® VRED™ Professional software is a visualization, analysis, and presentation tool for automotive and industrial designs. The high quality, real-time renderings enable you to realistically visualize, evaluate, and review your design ideas. The completed models can be used to produce imagery that can be used to showcase design prototypes, in presentations, or for marketing material.

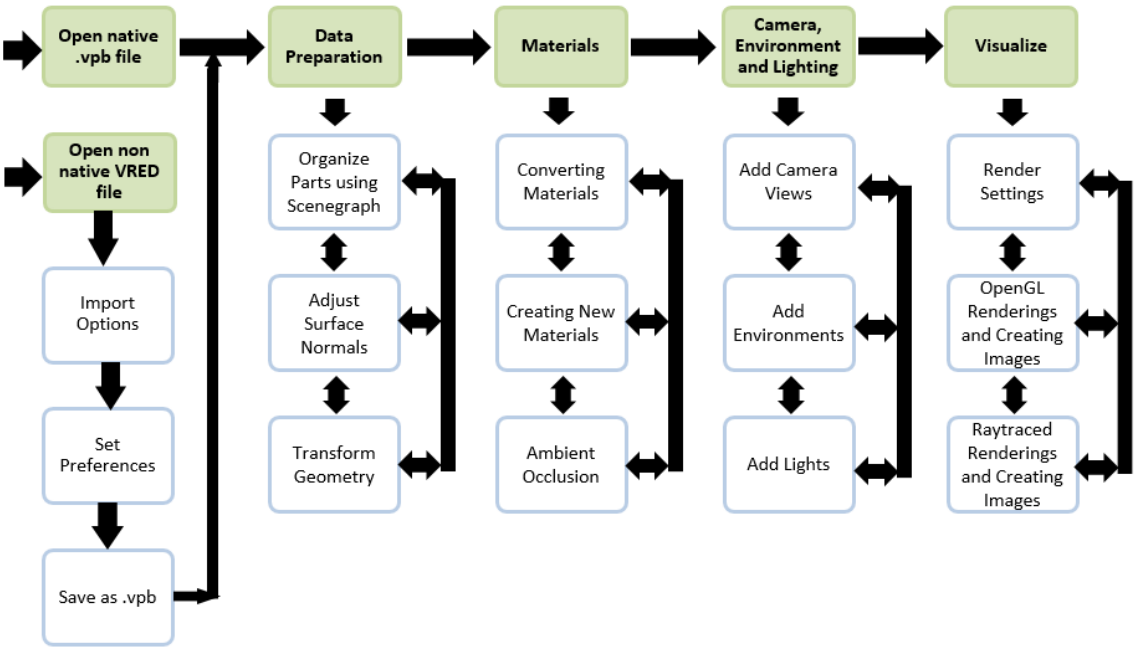
Raytraced rendered image

OpenGL rendered image

The Mainville auto design is courtesy of Marc Mainville.

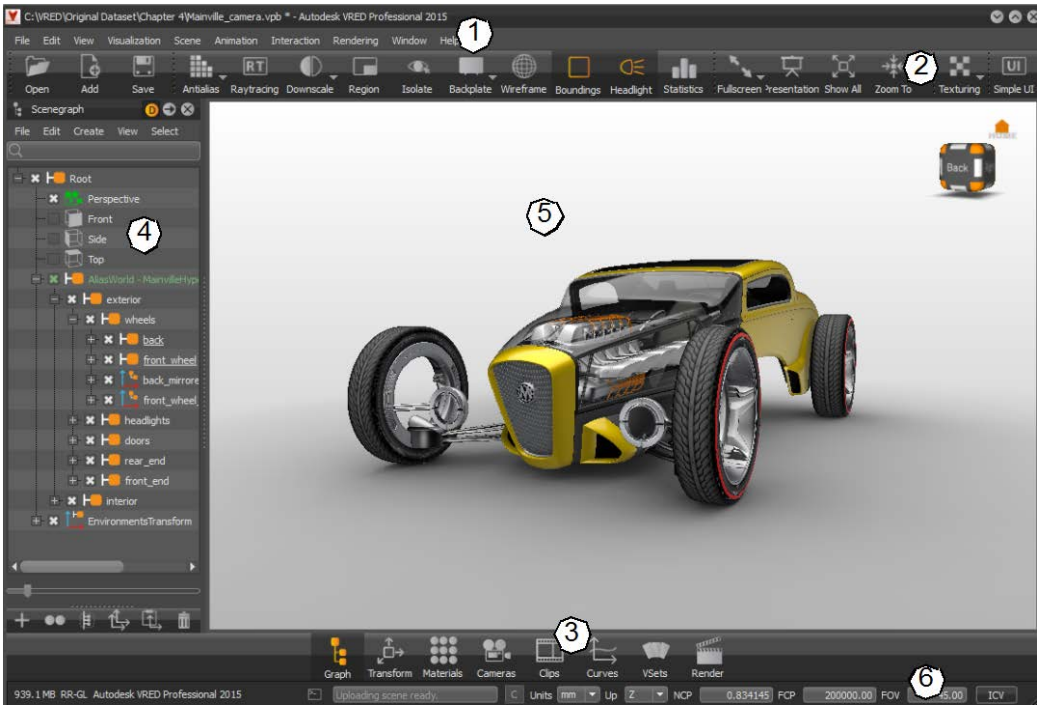
Workflow

The overall suggested workflow for creating an image for presentation or when using the real-time renderer to convey your design intent is provided below:



Quick Overview of the Interface

Once you open the Autodesk VRED Professional software, the screen consists of the main rendering window, with the interface tools along the top and the bottom of the application screen. The Autodesk VRED Professional interface is designed for intuitive and efficient access to commands and actions.



Interface Components

The components of the interface are:

1. Menu Bar
2. Icons Bar
3. Quick Access Bar
4. Modules
5. Render Window
6. Status Bar

Input into Autodesk VRED Professional

As Autodesk VRED Professional is a visualization software and not a modeling tool, the initial creation of the geometry is always an imported 3D CAD data. The 3D CAD data files can be imported into the Autodesk VRED Professional software from multiple data sources, including:

- AutoCAD® drawing files (.DWG and .DXF), including objects created in vertical applications, such as the AutoCAD® Architecture software.
- Autodesk® Inventor® files (.IPT and .IAM).
- Autodesk® Alias® files (.WIRE).
- Scene files from the Autodesk® Maya® (.MA, .MB), Autodesk® Showcase® (.A3S), Autodesk® 3ds Max®, or Autodesk® 3ds Max® Design (.3DS) applications.

- Autodesk® Revit® or Autodesk® Simulation designs, must be exported as .FBX files before they can be imported into the Autodesk VRED Professional software.
- Other major CAD data applications and visualization software, such as CATIA, Creo Elements/Pro, SolidWorks, STEP, IGES, Deltagen, and Stereolithography (.STL) files.
- Exchange files format, such as .OBJ and .FBX.

How To: Open a Scene

1. Click  (Open) in the Icons Bar, or select **File>Open**.
2. In the Open File dialog box, locate the required folder.
3. Select a file from the list.
4. Click  or double-click on the file.
5. If the type of file that you selected is not a VRED native file type (i.e., .VPB, .VPE, or .VPF), then the Import Options dialog box opens. Specify your options and click **OK**.
6. Save the scene as a native .vpb file.

How To: Set the Import Options

The Import Options dialog box enables you to set options so that the software can convert and correctly process a 3D data file. The dialog box is only available for files that are not a native Autodesk VRED file format. Suggested options to be used while importing include:

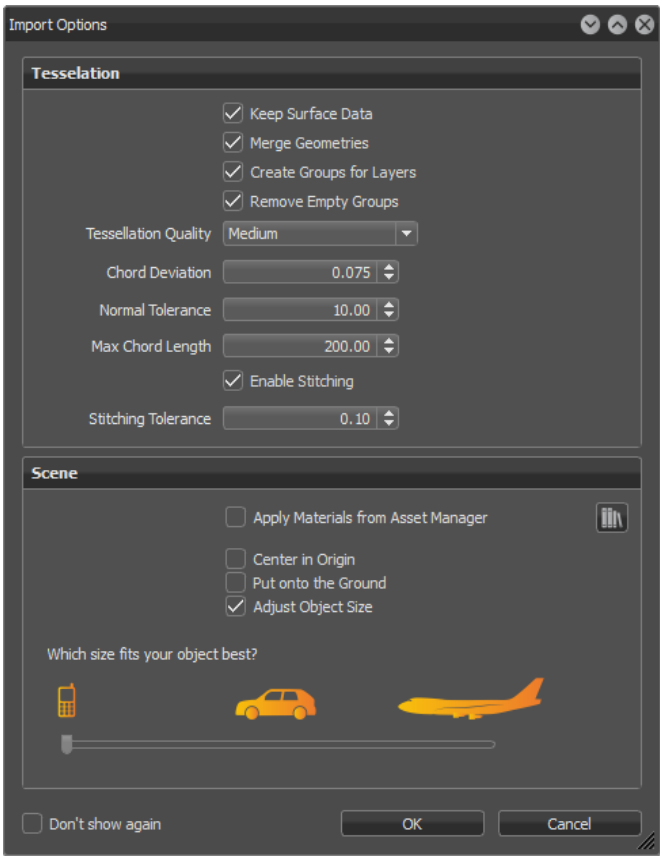
- In the Scene rollout, verify that **Apply Materials from Asset Manager** is cleared.

HINT: By default, all imported materials are converted into VRED plastic materials. This option is set in FileIO tab of the Preferences dialog box. The VRED materials display the best shader quality in OpenGL and Raytracing render modes.

- Select **Center in Origin**, **Put onto the Ground**, and **Adjust Object Size**.

*TIP: If you are expecting additional parts to be added to the model at a later stage, then leave the **Center in Origin**, **Put onto the Ground**, and **Adjust Object Size** options cleared. This will ensure that any additional parts fit perfectly with the model, as they are built using the original point of origin.*

- For **Which size fits your object best?**, drag the slider under the appropriate picture that indicates the relative model size.
- In the Tessellation rollout, in *Tessellation Quality*, select **High** for a good quality rendering.



Import Options dialog box

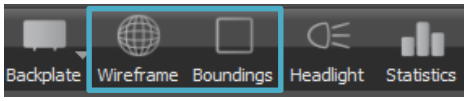
- Ensure that the first four options (**Keep Surface Data**, **Merge Geometries**, **Create Groups for Layers**, **Remove Empty Groups**) are selected.
- Leave all other options at the default settings which are set for optimum results.

Selecting Objects

- **Mouse**: <Shift> + click
- **Window**: <Shift> + click (left) and drag (right) to create a window
- **Crossing**: <Shift> + click (right) and drag (left) to create a window
- **Scenegraph**: Select object name

Selection Display Styles

When you select an object, either or both display options, **Wireframe** and **Boundings** (located in the Icons Bar) must be active to display the selected objects in the Render Window.



Selection display styles

Objective: Work with Scenegraph and optimize the model geometry

Data Preparation

- Organize and optimize the parts using Scenegraph
- Adjust Geometry by fixing the surface normals
- Transform Geometry

Scenegraph

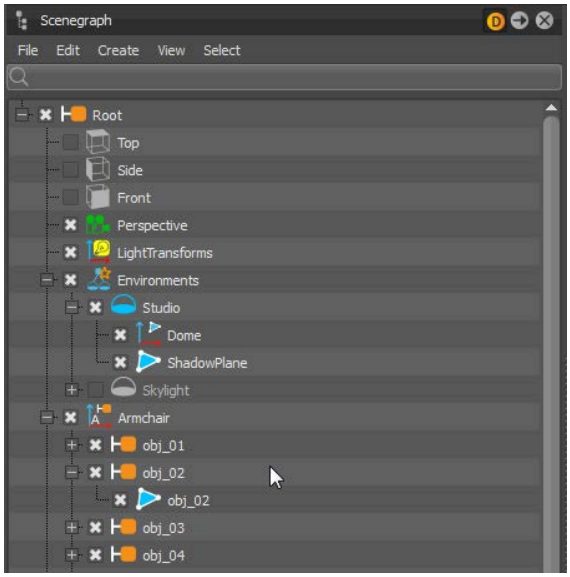
Access: Quick Access Bar>  (Graph); **Scene>Scenegraph**; Shortcut menu>**Scenegraph**

When you import a file from another CAD application, there might be a large number of nodes present in the Scenegraph. Use the Scenegraph to sort and group the objects together, complete the model by cloning objects, and optimize the geometry.

The Scenegraph lists all of the parts and geometry that are present in the scene. The list is organized in the form of a hierarchical tree structure and each geometric part is called a node.

TIP: Reduce the number of levels of hierarchy and have fewer number of overall nodes. Also, sort and group geometry together under relevant group nodes.

TIP: Simplify the nodes to reduce the amount of data.



Scenegraph

Scenegraph hierarchy

By default, the **Root** node lists the four camera views (Top, Side, Front, and Perspective) and the **Environments** node. Once you open a scene or import geometry into an empty scene, another node is added to the Root node which lists all the geometry in the scene. An icon besides each node indicates the characteristics of the node.

Node Types

Icon	Description
 **(Regular group node)**	A group of objects is placed inside this node.
 **(Cloned group node)**	An exact copy of the parent regular group node's contents. If any changes are made to the group node, it is reflected in its cloned group node as well.
 **(Transform group node)**	A transformation (i.e., move, rotate, or scale) has been applied to the objects in this node.
 **(Material node)**	Contains material information.
 **(Animation group node)**	Animation has been applied to the objects in this node.
 **(Geometry node)**	The polygonal geometry inside of a group node. The geometry is the last hierarchy node of a group and is the simplest form of node.
 **(Geometry node with Transformation)**	Transformation has been applied to the geometry only.
 **(Nurbs geometry node)**	A nurbs geometry inside a group node. **HINT**: You can reduce the amount of data to improve performance by converting the nurbs surface into polygons.
 **(Environment node)**	Contains information about the environment used in the scene.
 **(Light Transform node)**	Enables you to add transformations to light sources that have been created in a scene.

Scenegraph Shortcut Menu

The Scenegraph shortcut menu is used to create, edit, and modify the nodes. Right-click on a node and select an option in the shortcut menu; the selected action is performed on all of the subordinate nodes of the selected node.

Working in Scenegraph

Selecting and Isolating Parts

In the Scenegraph, select the object or objects and view them in the Render Window (Boundings and/or Wireframe selected). To display individual objects separately, drag and drop them into the Render Window, or right-click on the selected object and select **Isolate View Selected**, or after selecting an object, click  (Isolate) in the Icons Bar, or press <I>.

***TIP:** While working in a large and complex scene with overlapping geometry, it is useful to isolate objects so that you can work on them separately.*

Reorder Nodes and Objects

After importing a file from another CAD application, there might be a large number of nodes haphazardly present in the Scenegraph. For easily locating the parts, organize and group the nodes in a logical manner. Click and drag nodes to a new location as well as move subordinate geometry from one node to another by dragging and dropping it into another node.

Group Objects

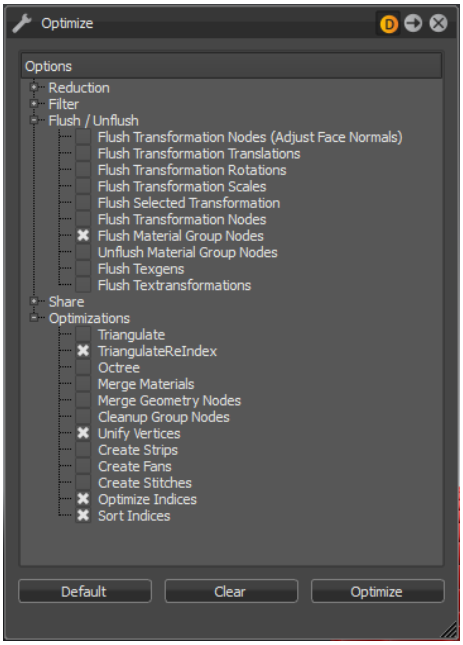
Grouping enables multiple objects to be treated as a single unit, but still retain the ability to control each object separately. In the Scenegraph, right-click on the node and select **Create>Group** (<Ctrl>+<G>). Rename the new group logically and drag and drop the nodes.

Optimize Module

Access: Right-click node>**Edit>Show Optimize Module**; **Scene>Optimize**; Shortcut menu>**Optimize**

Optimizing the model enhances the render capabilities and speeds up the rendering process. Using the default settings does not make any significant difference to the Scenegraph, but improves back end calculations and rendering speed. Some of the options include:

- **Cleanup Group Nodes** – Removes empty nodes.
- **Merge Geometry Nodes** – Consolidates the extra nodes.
- **Flush Transformation Nodes**- Converts Transformation group nodes to regular group nodes.
- **Flush Material Group Nodes** – Converts Material group nodes to regular group nodes.



Optimize Module

Adjust Geometry

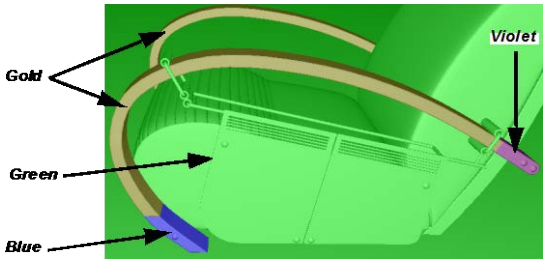
After importing the objects into the scene, there might be some discrepancies in the geometry that need to be fixed before you modify or manipulate the design for presentation. For the geometry to render properly, the surface normals should always be facing towards the camera. If the normals are reversed, shadowing effects are created and the rendering is flawed.

Checking geometry

Access: **Visualization>Vertex/Face Normal Rendering**; <F5>

To visually inspect the orientation of the normals, change to the **Vertex/Face Normal mode** where the geometry is displayed in different colors. Each color indicates a specific orientation of the face and vertex normals. The colors indicate:

- **Green:** Face and vertex normals facing correctly. All the geometry should be green.
- **Blue:** Normals reversed for both faces and vertices.
- **Gold:** Face normals reversed, vertex normals correct.
- **Violet:** Face normal correct but vertex normals reversed.



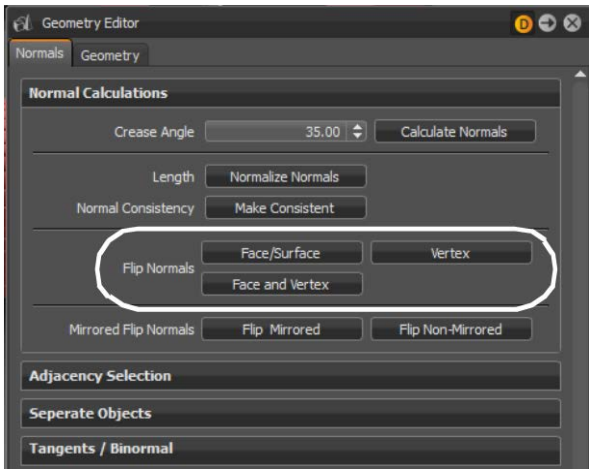
Vertex/Face Normal Mode

Fixing Geometry

Access: **Scene>Geometry Editor**; Shortcut menu>**Geometry Editor**

To correct the orientation of the surface normal, use the options in the *Normals* tab>Normal Calculations rollout>*Flip Normals* area of the Geometry Editor Module. The options are:

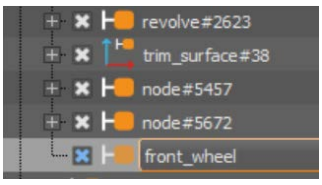
- Face and Vertex - Repairs blue surfaces
- Face/Surface - Repairs gold surfaces
- Vertex - Repairs violet surfaces
- If a few surfaces of a selected part require to be repaired, hold <Alt> and right-click on the individual surface.



Geometry Editor>Flip Normals

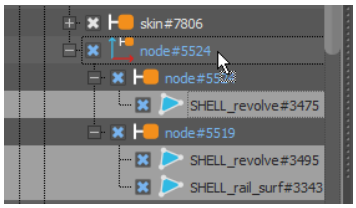
How to: Prepare the Data

1. Open the Scenegraph module.
2. Investigate the hierarchy of the nodes and also investigate the listed node types by expanding the nodes using +/- and the slider bar.
3. Using the Scenegraph, sort and group the objects together. Right-click on a node and select **Create>Group**, rename the newly created Group node, and drag and drop the required geometry nodes into the new group node.

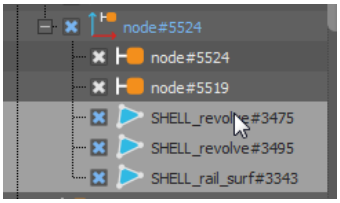


Create/Rename Group node

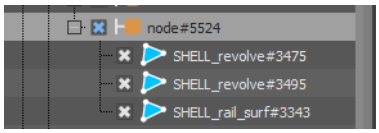
4. Logically consolidate the geometry nodes under a single group node. Remove any empty group node using the Optimize module (**Cleanup Group Nodes**).



Original hierarchy

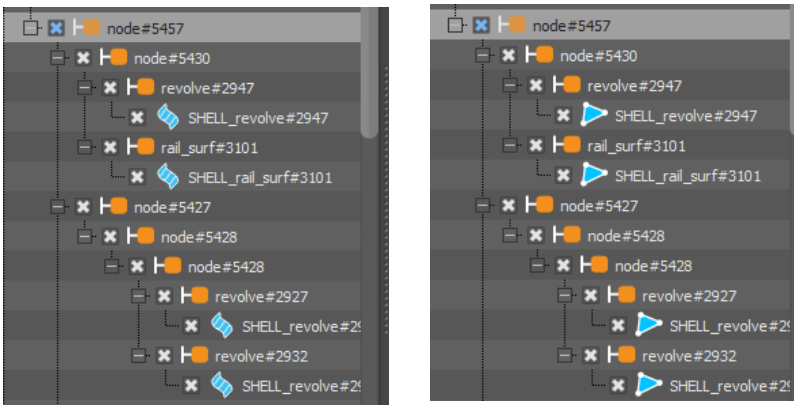


Consolidating by drag and drop



Optimize (Cleanup Group Node)

5. Reduce the complexity of the models by changing (Nurbs Geometry) and (Material) nodes to simple (Geometry) nodes.
   a. Set **Flush Material Group Nodes** option in the Optimize module to simplify (Material) node.
   b. Right-click on the group node containing (Nurbs Geometry) and select **Edit>Surfaces>Convert to Mesh** to simplify it.



Nurbs geometry nodes converted to simple geometry nodes

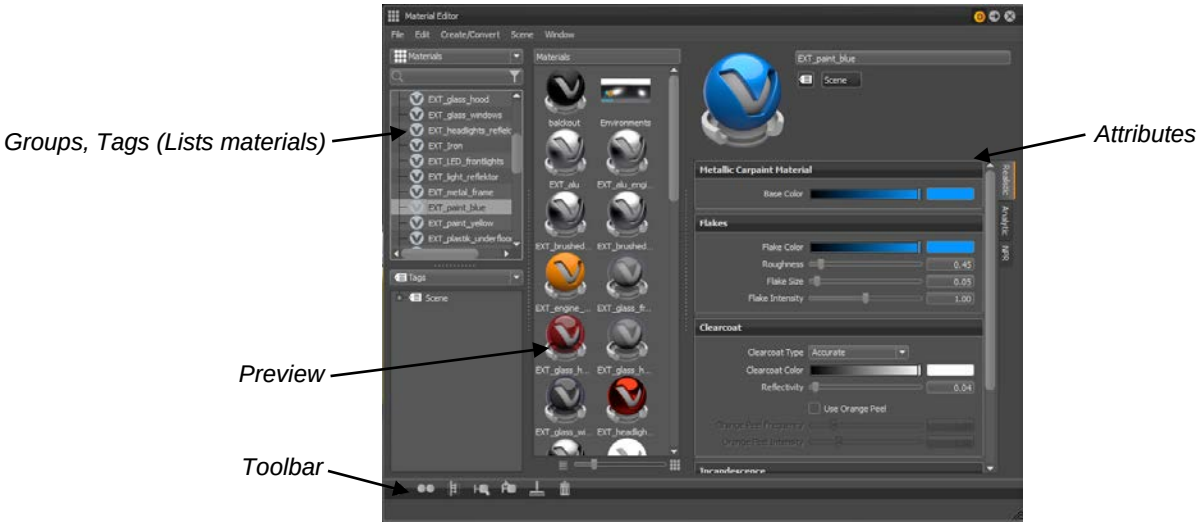
6. After simplifying nodes, sort, consolidate, and optimize the nodes again.
7. Visually check the normals by selecting **Visualization>Vertex/Face Normal Rendering**, or press <F5> to enter the Vertex/Face Normal rendering mode.
8. In the Render Window, select the geometry that is not green in color.
9. Depending on the color, click on the appropriate button in the in the *Flip Normals* area of Geometry Editor Module to make them green (correct orientation). If a portion of a single object needs correction, use the <Alt> + right-click option.
10. Select **Visualization>Realistic Rendering,** or press <F3> to return to the Realistic Rendering mode.

Objective: Learn how to assign and modify materials

Material Editor

Access: Quick Access Bar>  (Materials); **Scene>Material Editor**; Shortcut menu>**Materials**

The Material Editor is an interface for listing, creating, converting, modifying, and assigning materials. It enables you to create a new material by modifying the attributes of an Autodesk VRED Truelight material. There are 17 pre-defined Truelight materials available in the software. These are designed specifically for automobile visualization. Each material contains attributes that are specific to the selected material for detail enhancement. Each material can be modified by adjusting its attributes. The Material Editor also enables you to convert the imported materials to VRED Truelight materials and modify them as required.

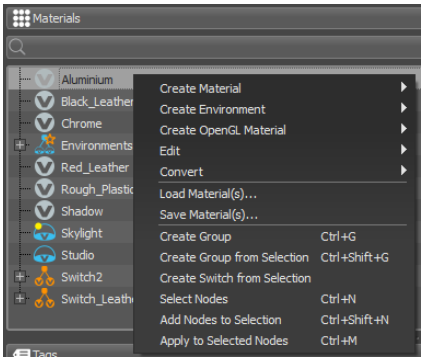


Material Editor Sections

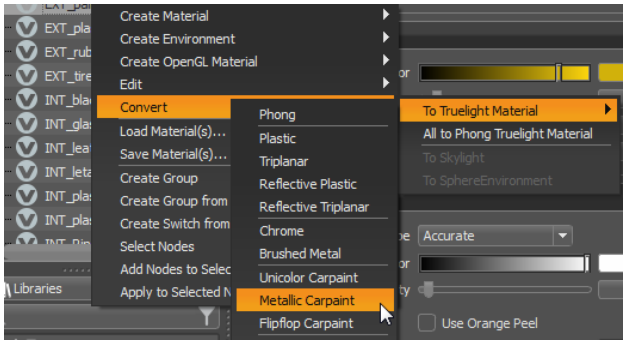
Groups, Tags Section

The Groups, Tags section contains a list of all the materials that are present in the scene. Right-click anywhere in this section to open the materials shortcut menu which provides you with the following options:

- **Create Material**: Contains a list of Truelight materials that can be customized, as needed.



Create Material

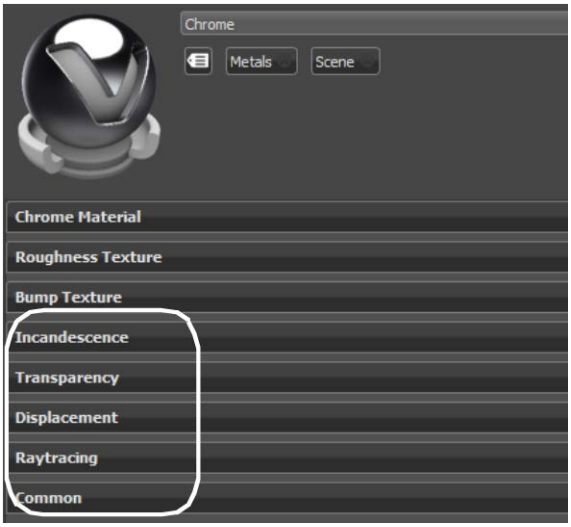


Convert>To Truelight Material

- **Convert>To Truelight Material**: Converts the imported materials to Truelight material.
- **Create Environment**: Creates a new environment, skylight, or an environment switch.

Attributes Section

The attributes for a material are grouped in rollouts. The first few rollouts provides attributes that are specific to the Truelight material that was used as a base material (Chrome material), while others are common to all of the Truelight materials.

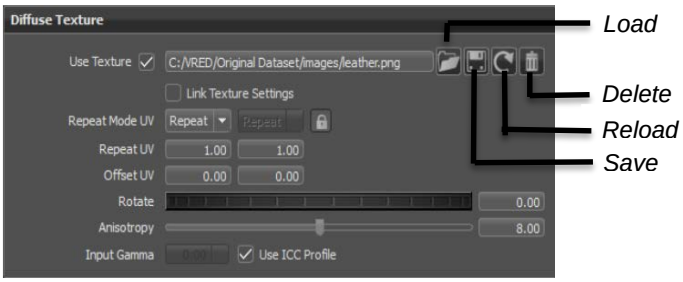


Material Attributes

- **Incandescence**: Sets properties like color and intensity for self-illumination.
- **Transparency**: Sets transparency. For complete transparency use See Through option.
- **Displacement**: Sets the height information for 2D images.
- **Raytracing**: Options for raytracing.
- **Common**: Options for Occlusion color, intensity, and lighting mode.

In addition to the common attributes, each material has its own specific attributes. Some of the specific attributes are as follows:

- **Texture Channels**: Depending on the material, texture channels might be available. Sets texture maps in four channels (Diffuse, Glossy, Roughness, and Bump).



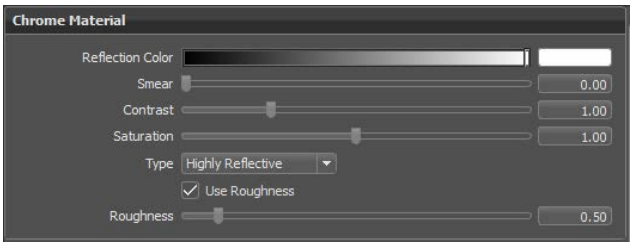
Diffuse Texture Attributes

- **Use Structure**: For some materials (Brushed Metal, Plastic), the **Use Structure** options (generally in the *Bump Texture* rollout) can be used to create an inbuilt texture and bump effect. It provides you with options to set the direction and the depth of the metal grain.

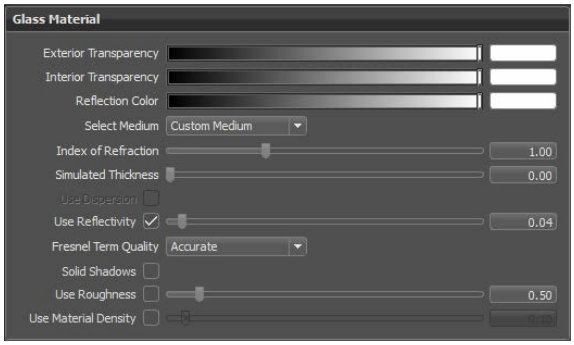
TIP: *You can achieve high-quality renderings using the Truelight materials as they have the capability of generating accurate lighting effects.*

Some VRED Truelight Materials

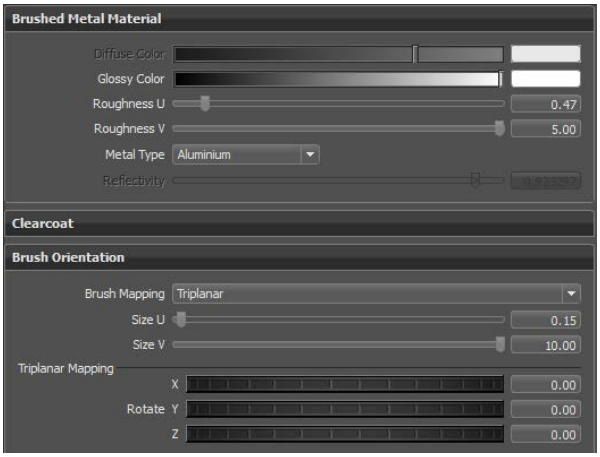
- **Chrome**: Reflective metallic surfaces.
- **Brushed Metal**: Less reflective metal surfaces (wheel rims).
- **Glass**: Transparent or frosted glass material.
- **Metallic Carpaint**: Highly reflective metallic painted surfaces (car bodies).
- **Flipflop Carpaint**: Color variation based on the viewing angle.
- **Triplanar**: Surfaces with texture mapping (leather or fabric surfaces: car seats).
- **Tire**: Textures for treads and sidings.



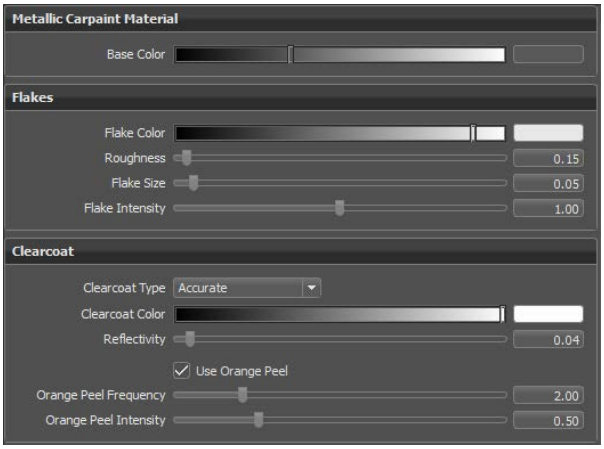
Chrome Material



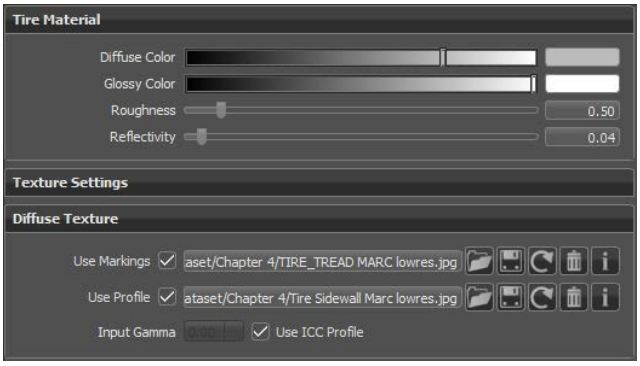
Glass Material



Brushed Metal Material



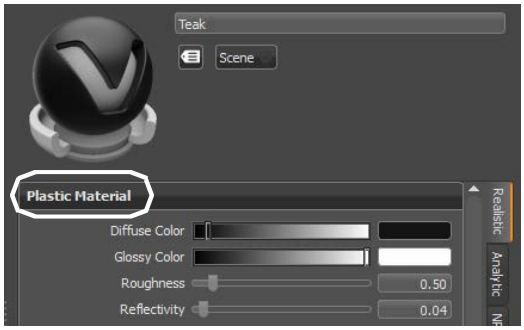
Metallic Carpaint Material

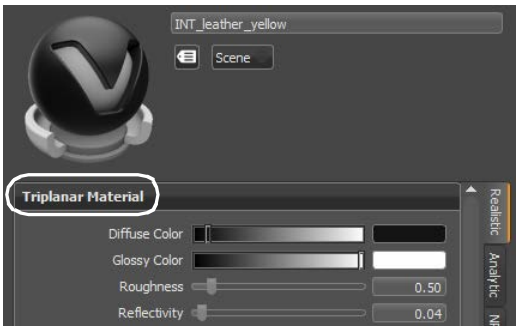


Tire Material

How to: Convert Material

1. Open the Material Editor.
2. In the *Groups, Tags* section, select a material which needs to be converted. (By default, while importing models, the materials are converted to plastic material)
3. In the Render Window, identify the parts that have the selected material and determine the material that is appropriate for the parts.
4. Rename the material to be converted. Right-click on the material and select **Convert>To Truelight material>new material**.
5. In the *Attributes* section, modify the settings as per your requirements.

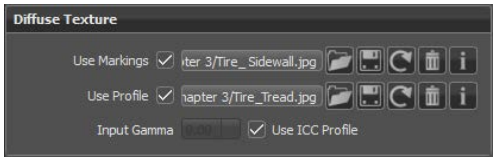


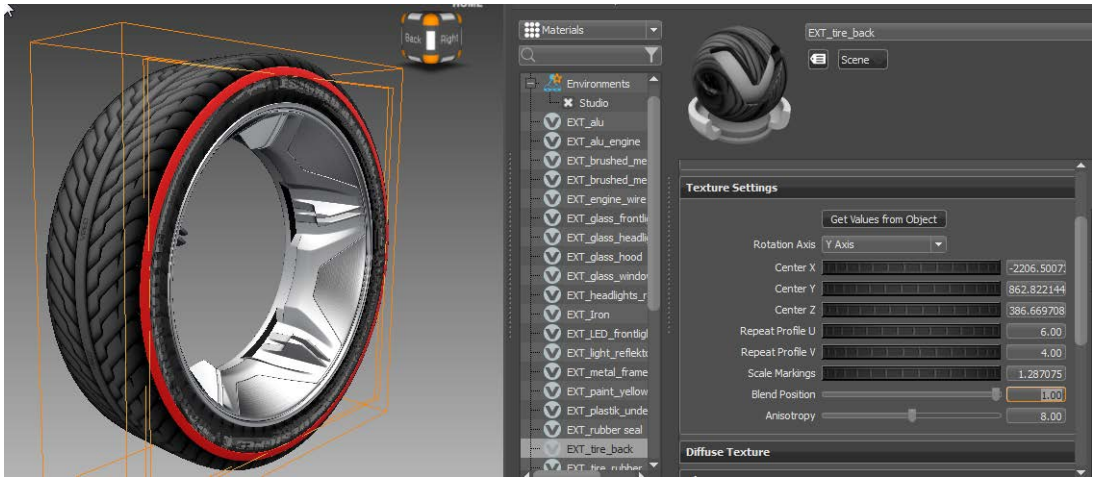


Plastic Material with the name Teak *Renamed to INT_leather_yellow and converted to Triplanar*

How to: Create and Assign Material

1. Open the Material Editor.
2. In the *Groups, Tags* section, right-click anywhere and select **Create Material>new material**. Rename the new material, as needed.
3. Select the parts that require the new material. In the Material Editor, in the *Groups, Tags* section, right-click on the new material and click **Apply to Selected Nodes**.
4. In the *Attributes* section, modify the settings as per your requirements.



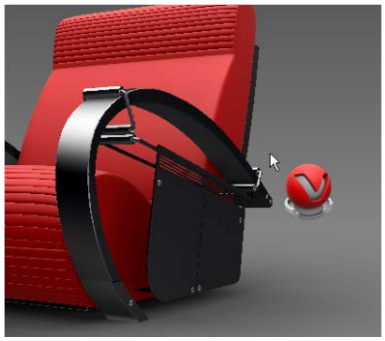


New material EXT_tire_back using the Tire Truelight as its base material; using textures for Markings and Profile

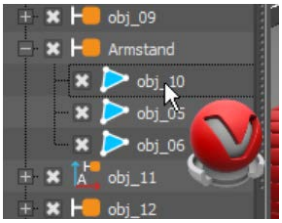
Assign Materials

After materials have been created, you need to assign them to the geometry so that they are visible in the Render Window. Methods of assigning materials to the geometry:

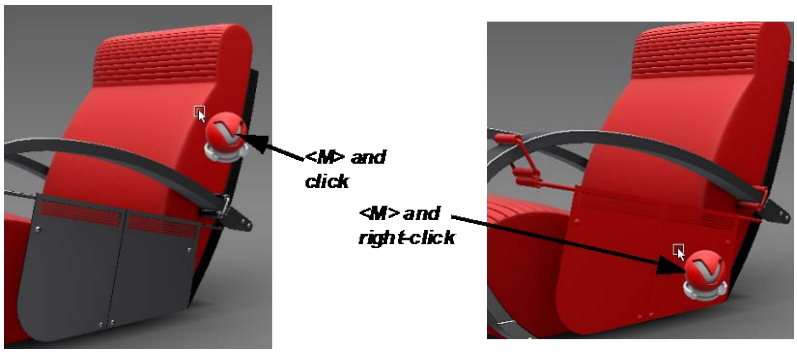
- Dragging from the Material Editor and dropping in the Render Window.
- Dragging from the Material Editor and dropping in the Scenegraph.
- Copying and pasting material. <M>+click to copy and <M>+right-click to paste.
- Using the Material Editor (Shortcut menu>**Apply to Selected Nodes**; Toolbar> ).



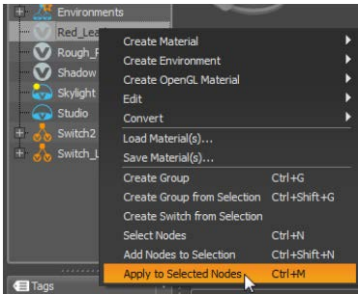
Drag/drop in the Render Window



Drag/drop in Scenegraph



Copy and Paste material



Using Material Editor

Ambient Occlusion

- The Autodesk VRED Professional software uses Ambient Occlusion (AO) to simulate shadows. AO uses shaders to calculate the extent to which an area is inhibited by incoming light, thus enhancing the detail in dark crevices, cracks, and along edges.
- AO is NOT physically accurate and is not based on any physically accurate light. It imitates the effects of light and approximates shadows.
- AO is created separately and its calculations are used to define the shadows with the OpenGL rendering mode, as well as some options in the Raytracing rendering mode.

TIP: For high quality rendering, the result with AO should be smooth and is dependent on the level of detail of the selected geometry. The higher the density of the wire mesh of the geometry, the better the quality of shadow using AO.

Checking AO

Access: **Visualization>Ambient Occlusion Rendering**; <F7>

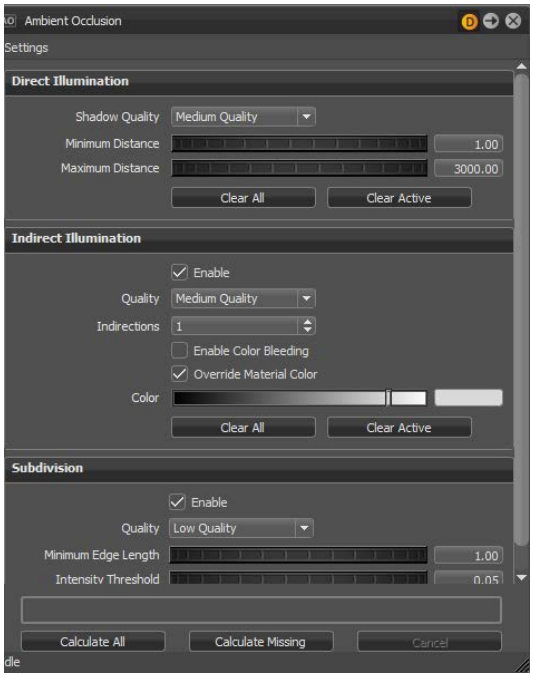
To visually examine if the shadows have been calculated using AO or if the calculated shadows are smooth, change to the **Ambient Occlusion visualization mode**. In this mode, the geometry is displayed without any materials, making it easier to examine the quality of the shadows.

Calculating AO

Access: **Scene>Ambient Occlusion**; Shortcut menu>**Ambient Occlusion**

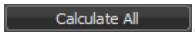
To calculate the shadows or to improve the quality of already calculated shadows, use the options in the Ambient Occlusion module. The sections include:

- **Direct Illumination**: Sets the shadow quality. The higher the quality, more samples are created.
- **Indirect Illumination**: Sets indirect illumination.
- **Subdivision**: Sets the quality of Subdivisions. To improve the quality, increase the subdivisions.

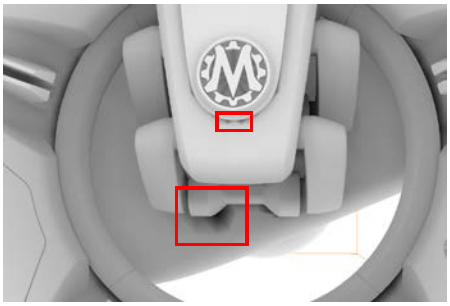


Ambient Occlusion Module

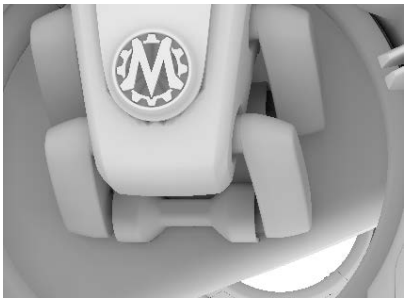
How to: Calculate Ambient Occlusion

1. Select the geometry for which you need to calculate Ambient Occlusion.
2. Open the Ambient Occlusion module (**Scene>Ambient Occlusion**).
3. In the Direct Illumination rollout, select the Shadow Quality as required.
4. In the Indirect Illumination rollout, select **Enable**, and then select the Quality required.
5. Click 

.
6. To examine the AO in the Render Window, change to the Ambient Occlusion rendering mode. (**Visualization>Ambient Occlusion Rendering**; <F7>).
   - The results in the Ambient Occlusion rendering mode display without the materials and should be smooth without any blotchiness.
7. Return to the OpenGL rendering mode (**Visualization>Realistic Rendering**; <F3>).



AO calculated with problem areas



Applied Subdivision and problem areas fixed

Objective: Learn how to apply an HDR image and set it as a background environment

Environments

Access: Quick Access Bar>  (Materials); **Scene>Material Editor**; Shortcut menu>**Materials**

The Autodesk VRED Professional software uses a default environment (named Studio) for all new scenes. The environment consists of a background image, along with its associated lighting, shadows, highlights, and reflections. The environment acts to enhance the visual display of a model and improve realism. The background of an environment is a High Dynamic Range (HDR) image. To add, remove, or modify the environment use the Material Editor. Select the environment in the *Material* section to display its attributes and modify as required. The rollouts include:

- **Environment Material**: Enables you to load, save, and reload the HDR image. You can use the **Is Visible** option to remove the HDR image and use a simple background color.

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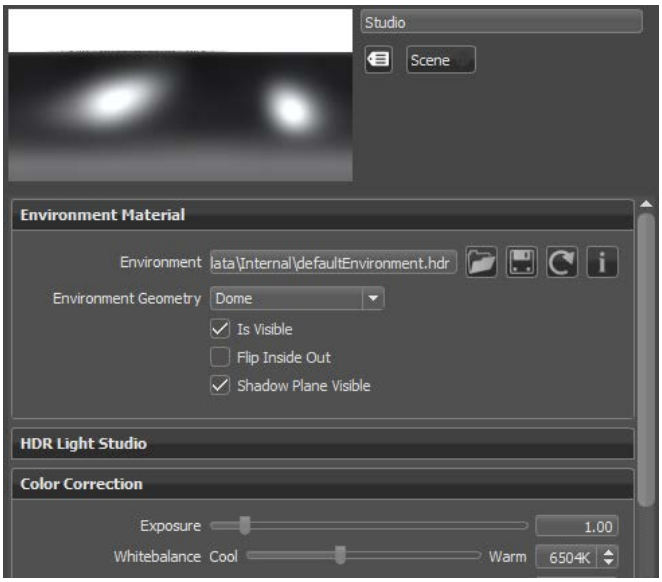
*HINT: If **Is Visible** is cleared and the background color is used, the lighting from the HDR image is still used although the image is not visible.*

- **HDR Light Studio**: Enables you to load and save the current HDR Light Studio Project. A separate HDR Light Studio plugin is required for additional options.
- **Color Correction**: Enables you to work with values for exposure levels, hue color, contrast/brightness and other color related options.
- **Transformation**: Enables you to reposition the HDR image.
- **Raytracing Settings**: (Available in Raytrace rendering mode.) Enables you to set the illumination modes for still frame and interactive raytrace renderings.

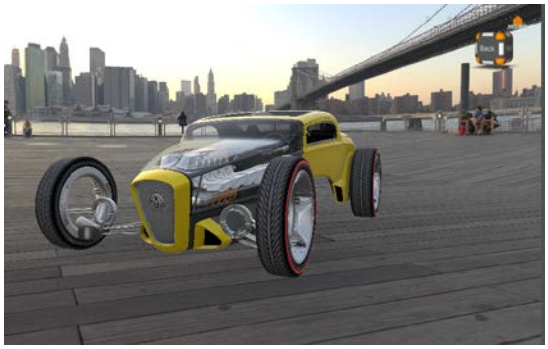


Material Editor> Environment Attributes

How to: Create a new environment with a new HDR image

1. Open the Material Editor.
2. Right-click anywhere in the *Groups, Tags* section and select **Create Environment>Sphere Environment**.
3. In the Load Environment Image dialog box, open the hdr image.
4. In the *Groups, Tags* section, the new material node is created with the  icon indicating that it is an environment. Select the new environment to display its attributes.
5. Make the color corrections or reposition the image.

Initial position of the environment



Environment repositioned to display the buildings as backdrop

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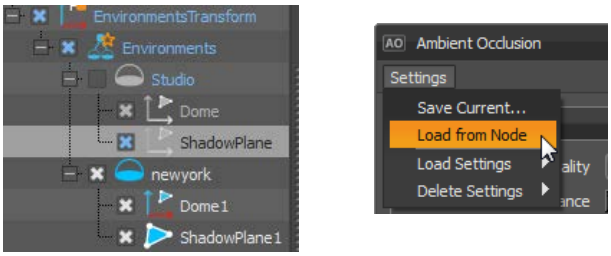
TIP: *Every new environment uses a unique shadow plane. Shadows of the geometry with the ground must be calculated for each environment used.*

How to: Calculate the Ambient Occlusion for the new shadow plane

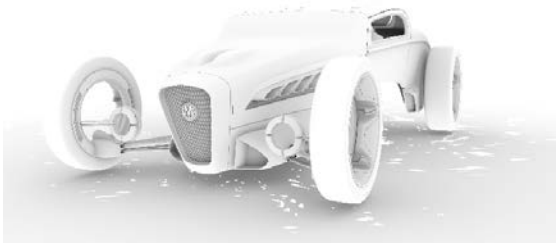
1. In the Ambient Occlusion rendering mode (**Visualization>Ambient Occlusion**;<F7>), visually check that there are no shadows with the new environment.
2. Open the Scenegraph and expand the **EnvironmentsTransform>Environments**. Expand both the **Studio** and the newly created environment.
3. Open the Ambient Occlusion module.
4. In the Scenegraph, select **Studio>ShadowPlane**.
5. In the Ambient Occlusion module, select **Settings>Load from Node**. This automatically loads the settings of the selected shadow plane which is the Studio Shadow Plane.



Loading Studio Shadow Plane Settings

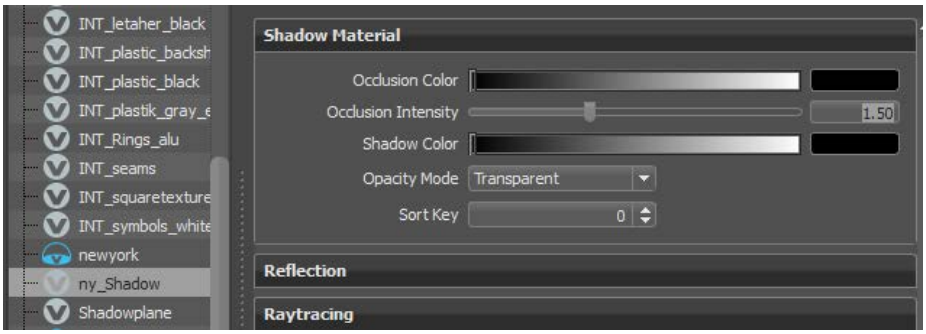
6. In the Scenegraph, select the new shadow plane geometry. In the Ambient Occlusion module, click **Calculate All**.
7. In the Ambient Occlusion rendering mode notice the shadows of the geometry with the plane.

No AO for the new shadow plane



AO calculated for the new shadow plane

8. Select shadow plane in the Scenegraph and in the Material Editor, right-click, **Create material>Shadow**. The new shadow plane material is created in the Material Editor.
9. Modify the shadow plane material settings.



Shadow Plane Attributes

Objective: Learn how to work with render setting options in OpenGL rendering method and create an image

Rendering

By default, the view that is displayed in the Render Window is interactively being rendered using the OpenGL render mode. Two rendering methods are available in the software: **OpenGL** rendering and **Raytracing**.

- **OpenGL render method**- Uses the GPU (Graphics Processing Unit) to render calculations, resulting in a fast response time rendering.

  Access (if Raytracing is on): Icons Bar> clear  (Raytracing); clear **Visualization>Toggle Raytracing**; <F3>
- **Raytracing**- Uses the CPU (Central Processing Unit) and can be used to calculate physically correct lighting, reflections, refractions, and shadows. It can affect the speed and performance of the software.

  Access: Icons Bar>  (Raytracing); **Visualization>Toggle Raytracing**; <F4>
- The rendering mode that is currently used is indicated in the Status Bar as **RR-GL**: OpenGL or **RR-RT**: Raytracing.

Status Bar-Render Modes

Render Settings

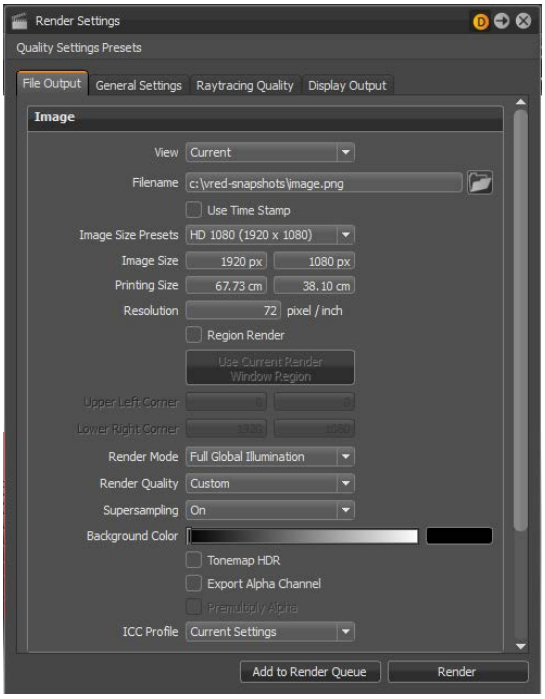
Access: Quick Access Bar>  (Render); **Rendering>Render Settings**; Shortcut menu>**Render Settings**

Before you save a rendered image, review and adjust the render settings for the scene using the Render Settings module. The various tabs are:

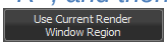
File Output tab

Commonly used options:

- **View**: Sets the Camera view for rendering.
- **Filename**: Sets the location for saving the rendering.
- **Image Size Presets**: Sets the size for the rendered image.
- **Printing Size**: Sets the size for printing the image.
- **Resolution**: Image resolution (pixels per inch).
- **Region Render**: (Available with Raytracing.) Sets the region for rendering.



Render Settings>File Output

HINT: Using the cursor to define the region, click  (Region) in the Icons Bar, press <R>, and then use the cursor to create a window. Click  to activate the selected area.

- **Render Mode**: Sets the *Illumination modes* for still frame rendering. The modes are **CPU Rasterization**, **Precomputed Illumination**, **Precomputed + Shadow**, **Precomputed + IBL**, and **Full Global Illumination**.
- **Render Quality:** Sets the render quality (i.e., **Draft**-32 image samples. **Preview**-128. **Production**: 512, **Production Interieur**-2048, **Custom**- any user defined number).

General Settings tab

The options in this tab are used to adjust the quality of the image by smoothing the edges (antialiasing). The options are used to adjust the quality of image while antialiasing.

Antialiasing

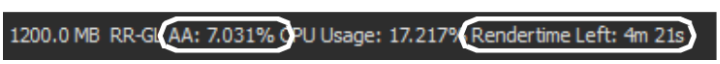
Access: Icons Bar>  (Antialias); **<SpaceBar>**

Antialiasing is the process of smoothing edges and removing jagged diagonal lines that display in the Render Window. This process improves the display quality of a scene substantially.

Without Antialiasing

With Antialiasing

- If Antialiasing is activated, the smoothing of edges starts as soon as you stop navigating (release the mouse button) in the Render Window. The start of antialiasing is indicated by the percentage calculation wheel attached to the cursor. If you click in the model, the antialiasing is aborted and restarts as soon as you release the mouse button.
- The percentage of antialiasing that is completed, along with the render time remaining, is displayed in the Status Bar and is also attached to the cursor.



Status Bar- Antialiasing percent

Cursor- Antialiasing percent

Raytracing Quality tab

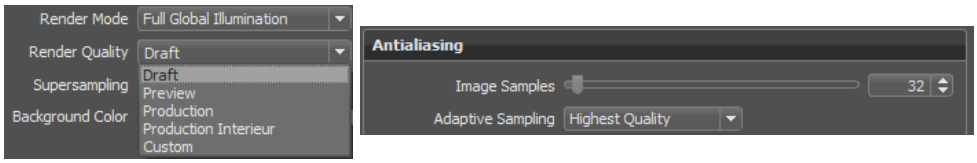
This tab provides you with options to set the raytracing settings.

How to: Create a Rendered Image in OpenGL

1. Set the orientation of the scene for creating an image.
2. Review the scene and check if the edges of the geometry are all smooth. To improve the visual display, activate antialiasing.
3. Once the antialiasing is complete, without clicking anywhere, review the scene and ensure the edges have been smoothed.
4. Open the Render Settings module.
5. Set the size for the image using Image Size Presets. (*File Output* tab>Image rollout)

6. Set the *Render Quality* to **Production** for the final image. Otherwise use a lower quality if you are at the checking stage.

HINT: The selected option in the Render Quality is reflected in the General Settings *tab>Image Samples as* Render Quality *and* Image Samples *are interdependent. For example, if you select* ***Draft*** *as Render Quality, the Image Samples are automatically set as* ***32*** *and vice versa. Similarly, changing the Render Quality to* ***Preview*** *sets the Image Samples as* ***128*** *and so on.*



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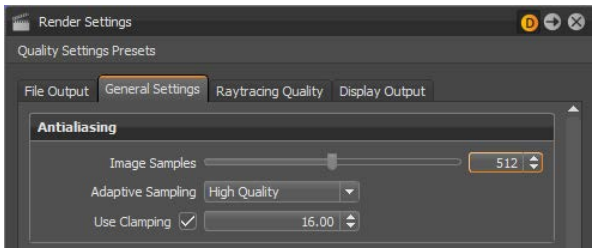
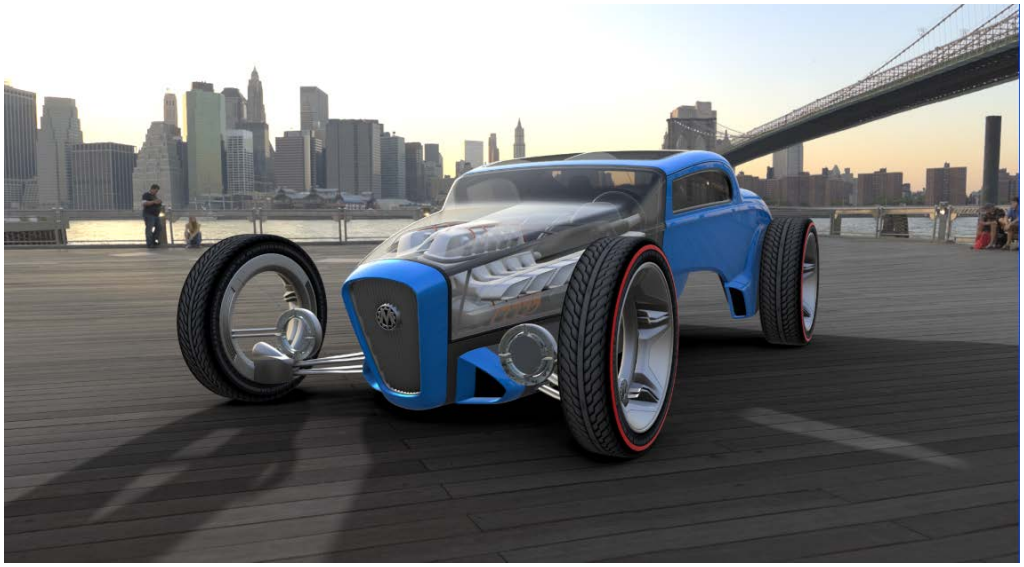
7. In the *General Settings* tab, set Adaptive Sampling to **High Quality** for the final image.



Adapdive Sampling: High Quality

8. Ensure that the rendering looks as required and then click Render.
9. In the Save Rendering dialog box, save the image as a .png file.
10. Open the rendered image to review it.



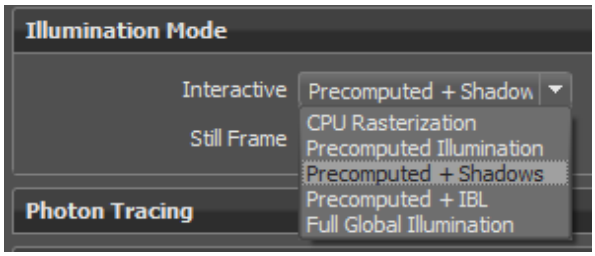
Rendered Image using OpenGL

Additional Information

Illumination modes in Raytracing

In the Render Settings Module, the *Raytracing Quality* tab provides you with options to set the raytracing settings.

The *Illumination Mode* rollout provides you with different types of illumination options that can be used when rendering with Raytracing. These illumination modes can be set for both *Interactive* or *Still Frame* rendering.



Illumination modes

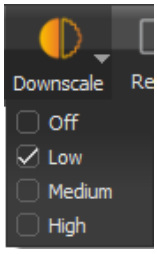
CPU Rasterization	Works similar to the OpenGL mode, but the computation processes are handled by the CPU. This illumination mode can be used for huge datasets, or when your graphic card performance is not sufficient for the kind of scene you want to render. It does not compute direct reflection or refraction, and therefore is not used for photorealistic visualizations.
Precomputed Illumination	Uses the Ambient Occlusion (AO) shadows that are baked on the geometry, along with precomputed indirect illumination. It only calculates the reflections, refractions, and correct shadows from the light sources that are present in the scene.
Precomputed + Shadows	Uses the precomputed Image Based Lighting (IBL) and indirect illumination. This mode does not use the precalculated AO, but calculates the shadows from the currently active scene environment.
Precomputed + IBL	Uses the precomputed illumination, but calculates the IBL. In addition, this mode calculates and generates glossy reflections.
Full Global Illumination	Global Illumination (GI) algorithms describes how the interaction of the light is physically correct with multiple surfaces. As the name specifies, Full Global Illumination computes complete illumination in the scene, and thus produces high quality realistic images.

Downscale

During Raytracing, the rendering calculations are performed by the CPU. To ensure efficient navigation in the Render Window, the display quality should be reduced using Downscale.

Access: Icons Bar>  (Downscale);

- Levels of downscale - Low, Medium, or High.



Downscale levls

Low Downscale

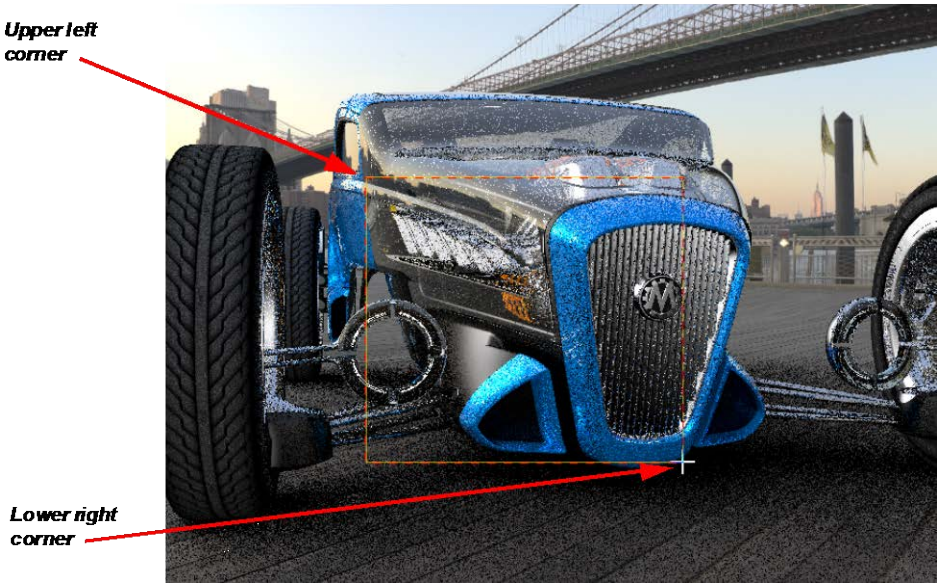
High Downscale

HINT: *Downscale is available while using Raytracing render mode because the performance is significantly dependent on the number of pixels to be rendered. In OpenGL, reducing the number of pixels has virtually no effect on performance.*

How to: Create a Rendered Image of a Region in Raytracing

1. Open the Render Settings Module. In the Raytracing tab, set both *Interactive* and *Still Frame* to **Precomputed Illumination**.
2. In the Icons Bar, click  (Raytracing). Wait till the Raytracing calculations are complete.
3. Orbit around and ensure that the scene is at the final stage of display and no changes are required.
4. In the Render Settings module, in the *Raytracing Quality* tab, in the Illumination Mode rollout, set *Interactive* to **Full Global Illumination**.
5. Orbit around the Render Window and notice how hard it is to navigate. Select **Downscale** and use different levels of downscale till you can navigate around efficiently.
6. Set the point of view of the scene for creating an image.
7. Set the size for the image using Image Size presets. (*File Output* tab>Image rollout)
8. Set the *Render Quality* to **Production** for the final image.

9. Enable Render Region by selecting it.
10. Toggle off Downscale.
11. In the Icons Bar, click  (Region). Press <R>, and then using your cursor, click and drag to define the upper left and lower right corners to create a window.



Creating Region Window

12. In the Render Settings module, in the *File Output* tab, click 

to activate it. The coordinates in the **Upper Left Corner** and the **Lower Right Corner** are automatically calculated as per the created window.
13. Render the image for the region and save.
14. Open the image to review it. Notice the physically accurate reflections created near the front and along the bottom of the grill.

Raytraced image

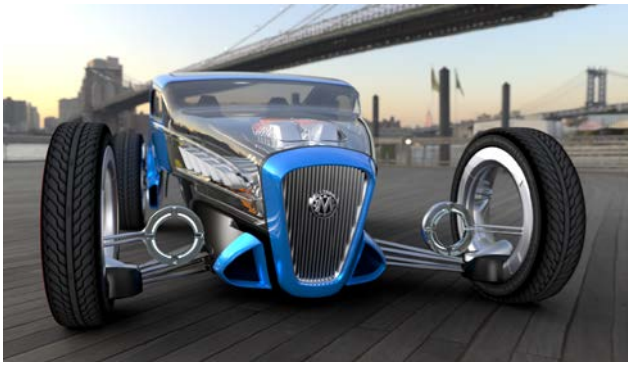
OpenGL image

Conclusion

The Autodesk VRED Professional software enables you to create high-quality realistic images for presentation, or use the real-time renderer (either OpenGL or Raytracing) to convey your design intent. As the software renders in real-time, it enables you to realistically visualize, evaluate, review, and then successfully present your design ideas.

OpenGL: As the scene is being rendered interactively in real-time, in the default OpenGL renderer, it is easier to navigate in the scene, transform the geometry, modify materials or cameras, and then output images. The renderings created in this render mode are near photorealistic and are calculated quickly, thus making it easier to work with.

Raytracing: Raytracing is used to calculate physically correct lighting, reflections, refractions, and shadows. Depending on the illumination mode you are using, you can add realistic shadows and reflections to the scene to produce very high-quality, photorealistic visualizations.



Raytraced rendered image

OpenGL rendered image