



AUTODESK®
VRED™ PROFESSIONAL 2015



DOCUMENTATION

VRED Professional 2015 Documentation
Simple UI

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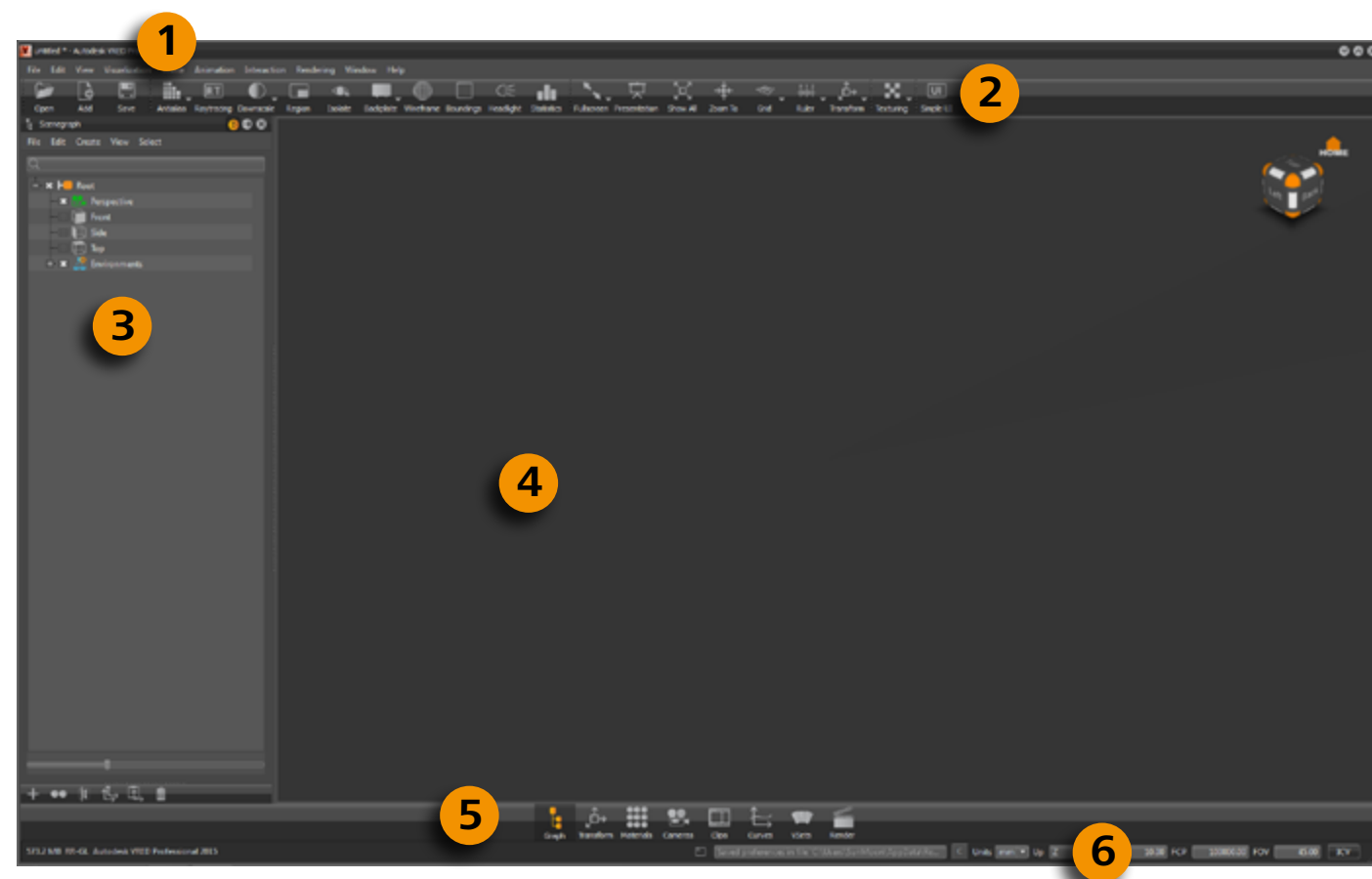
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SIMPLE UI

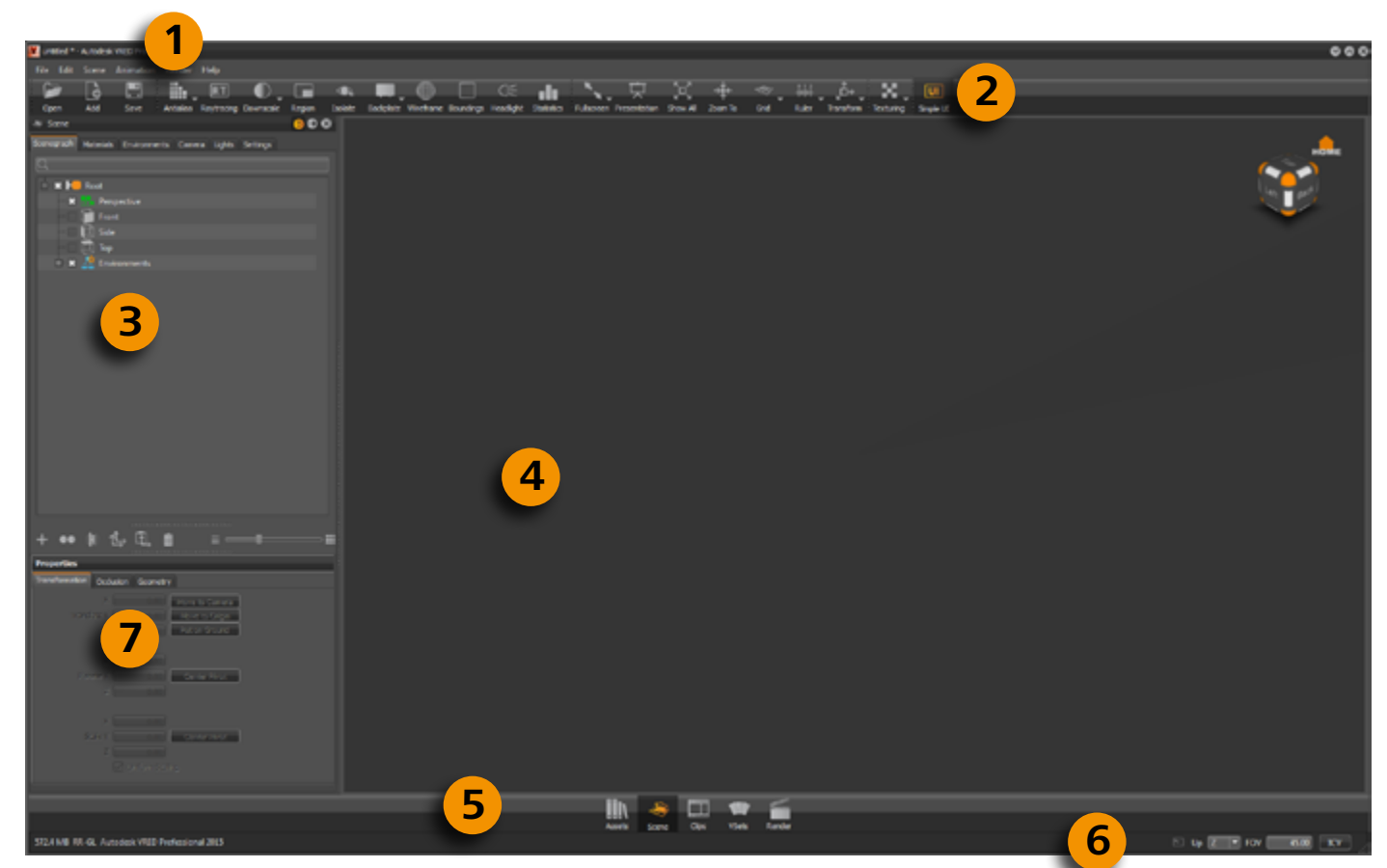
The main intention was to reduce the functionalities to a minimum viable amount. The new simple user interface enables a user to create image content very quickly. It is specially designed for casual users, who are not very familiar with visualization tools.

VRED PROFESSIONAL STANDARD UI



- 1 Menu bar
- 2 Icons bar
- 3 Scenegraph
- 4 Renderview
- 5 Quick access bar
- 6 Statusline

VRED PROFESSIONAL SIMPLE UI



- 1 Menu bar
- 2 Icons bar
- 3 Scenegraph
- 4 Renderview
- 5 Quick access bar
- 6 Statusline
- 7 Properties window

LETS START WITH SIMPLE UI

All usual functionality is furthermore available at anytime. A switch back to standard UI enables the user to setup settings that are not available via the simple UI of VRED. The toggle button for enabling/disabling the simple UI is located on the right side of the icons bar.

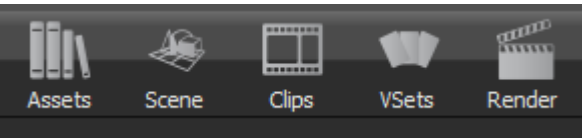


The state indication follows the standard scheme in VRED

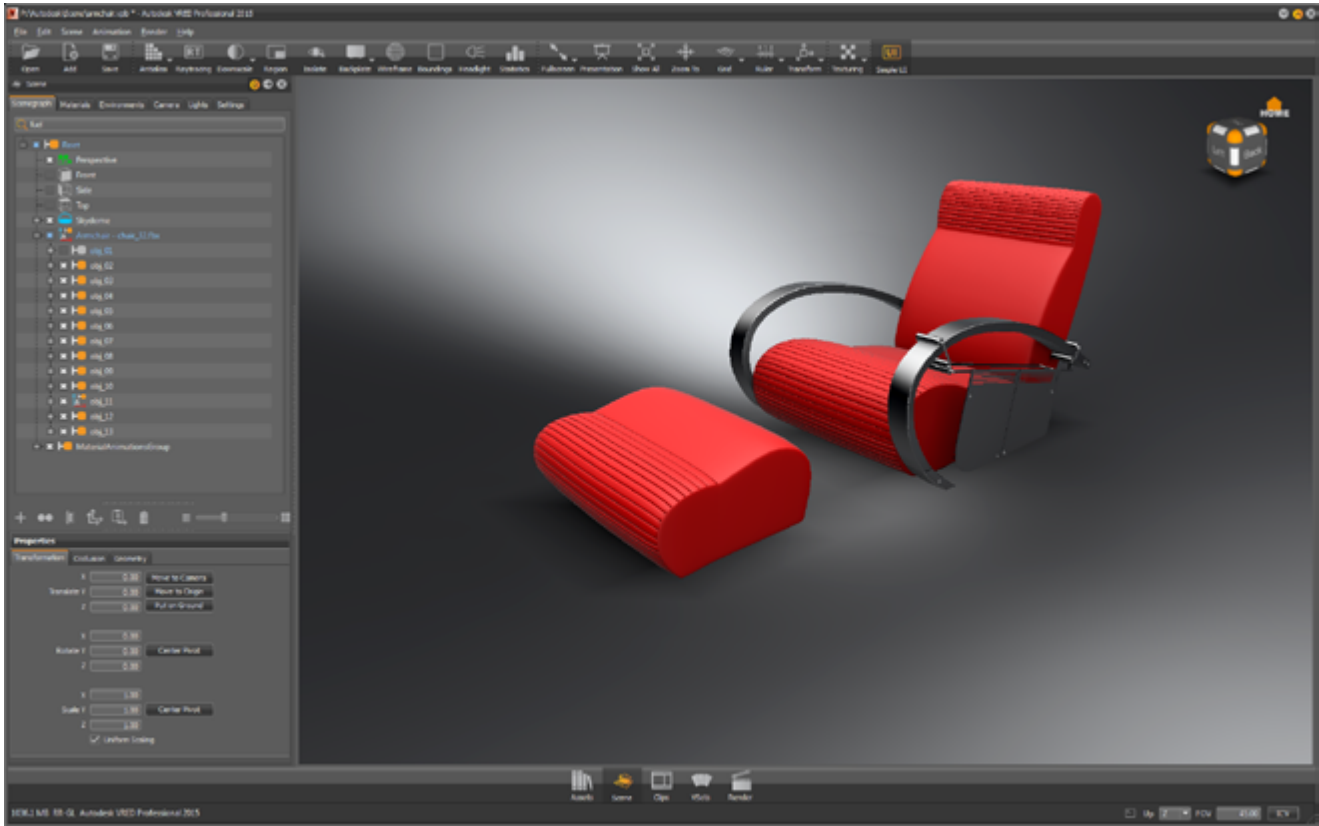
Simple UI enabled Simple UI disabled







After it's activation the layout of the quick access bar changes to a reduced version that makes common modules and settings accessible. All that modules and dialogues had been re-designed and simplified, too.



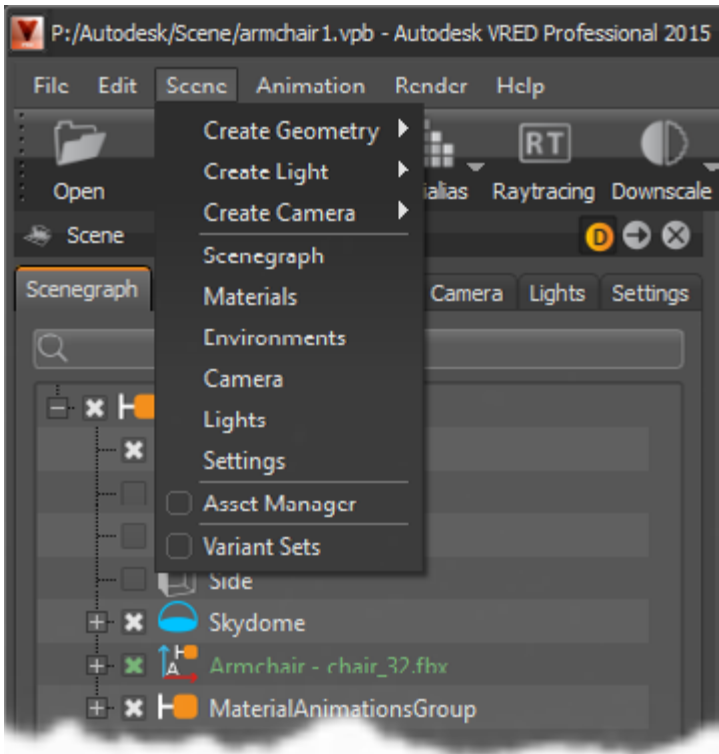
If simple UI is enabled it comes up with the scene module pre-selected as shown below.



All modules could be arranged or docked in the usual way already known from previous versions. To do so, a module can be picked with left mouse button in the title bar, held down and dragged to the window's outer edge of the target's location. A dotted line represents the location where the module would be docked when the mouse button will be released. Releasing modules from main windows works vice versa. An icon  at top of the module could be used also to dock/undock it.

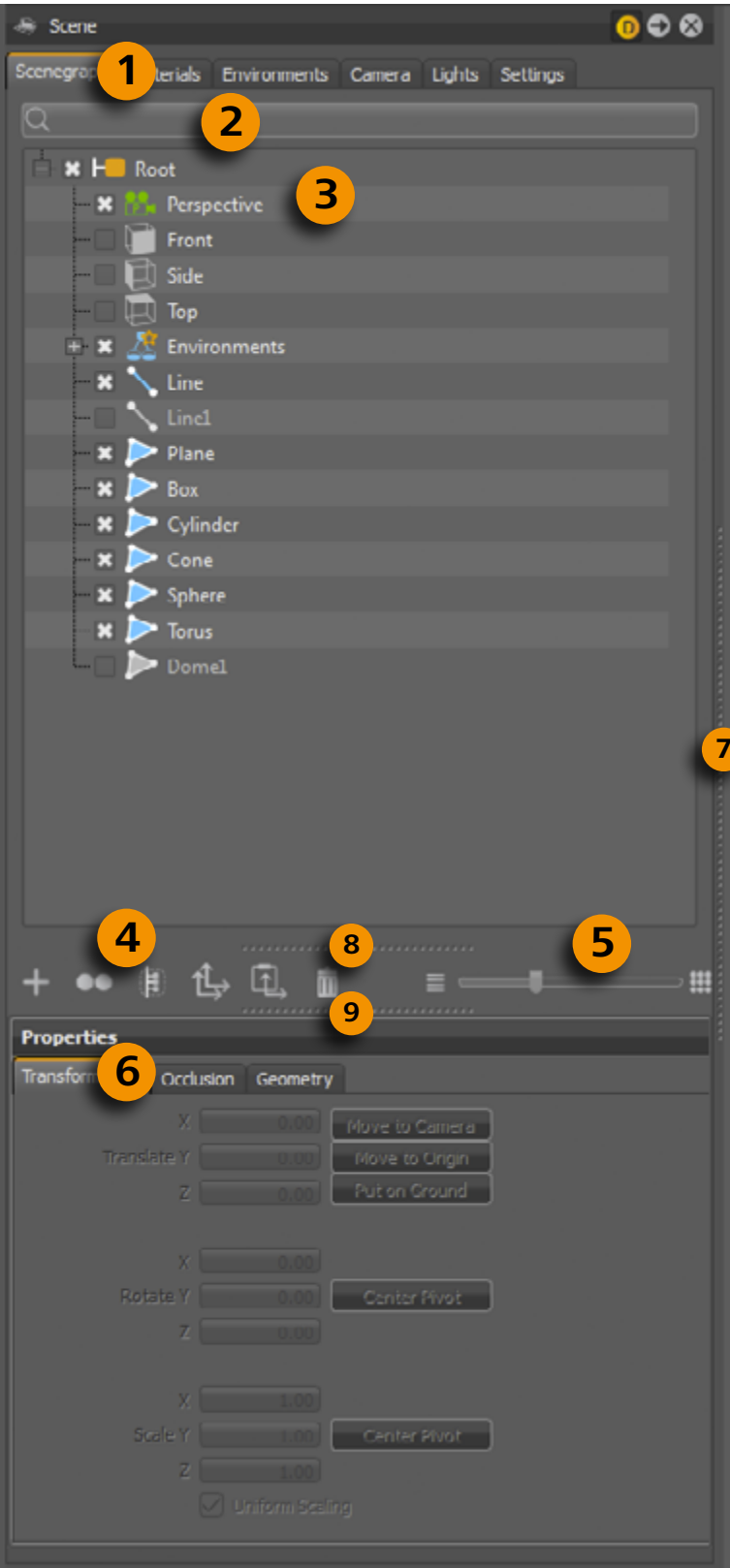
To avoid docking on module movement, the  button has to be unselected; the button color change to gray  .  closes the related module.

To open up a module it is also possible to chose the corresponding entry from the „Scene“ menu in the menu bar.



SCENE MODULE - SCENEGRAPH TAB

The Simple UI offers now a new Scene module, which contains all scene elements, like geometries, materials, environments, cameras, lights and render settings on different tabs at the top of the window.



1 Tabs

2 Search field

3 Scene tree

4 Properties element with tabs

5 Scene module slider

6 Properties element with tabs

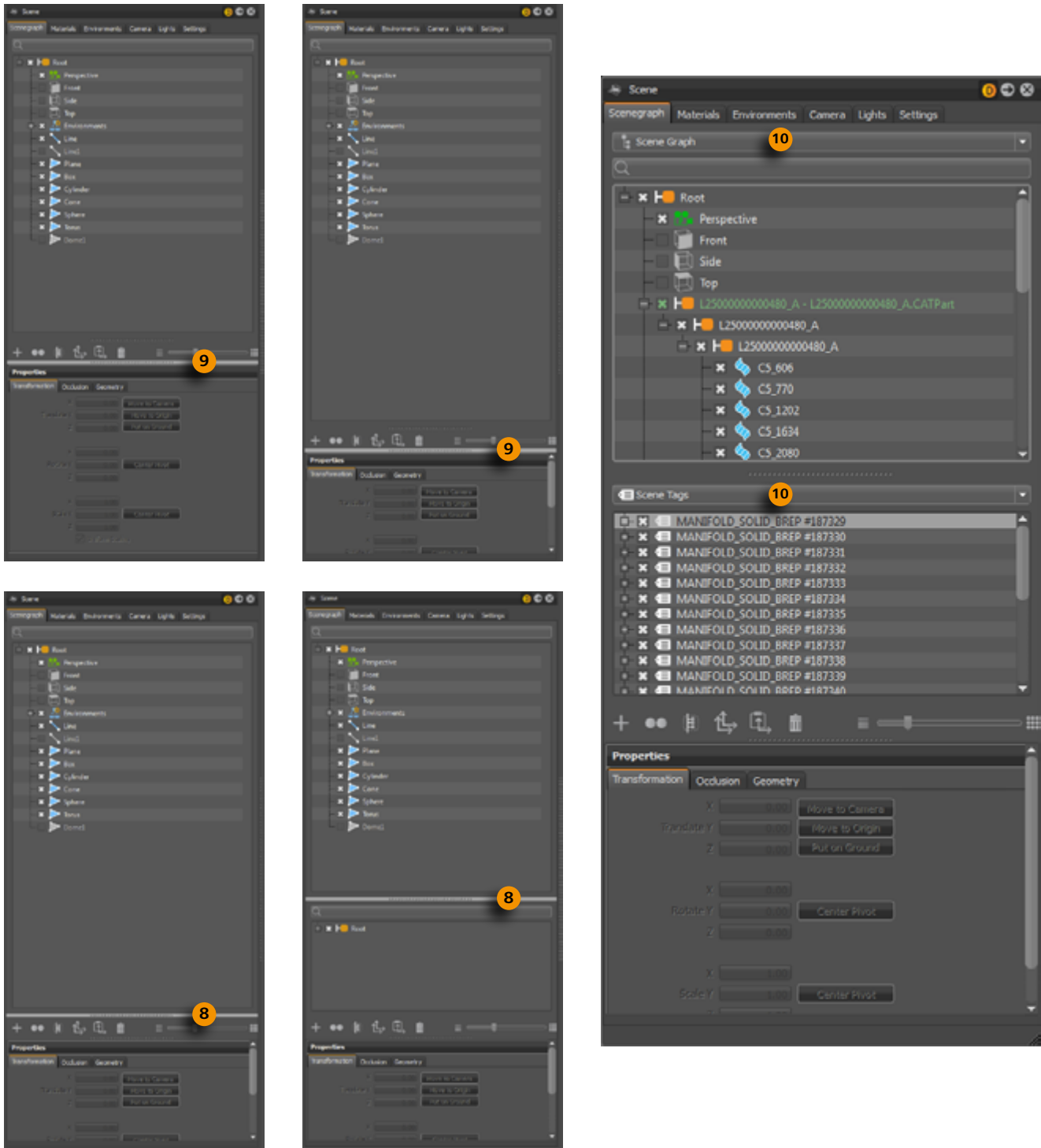
7 Width adjustment

8 Second scene tree (meta tags)

9 Window splitting adjustment

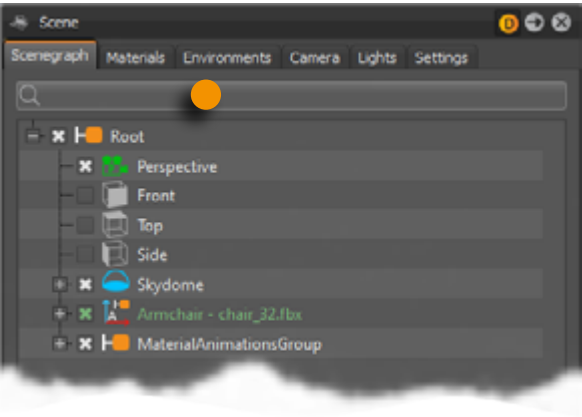
The upright dotted line (7) is to resize windows in the width. The dotted cross line over the properties window (9) is to resize the windows splitting size a second dotted cross line over the icons bar and slider (8) can be used to open up a second scenegraph; this is helpful to arrange scene objects within large scene trees.

If NURBS data exist within the scene there is the possibility to show/edit scene tags. Above the middle window and above the search field a drop down field (10) appears to chose which window should show tags and/or scenetree.



SEARCH FIELD

The search field provides live-search capabilities for scenegraph objects. This is helpful on identifying known components in complex scenes in a quick way without browsing the scenegraph structure. It is located below the module tabs. Only single search terms are supported.



Live check on search can be avoided by pasting the search term from clipboard

SCENEGRAPH TREE

All scene relevant objects that had been setup or imported are present and accessible within the scene tree. The usage is familiar to file browsers - a plus in front of a node indicates that something is located below. Either a click onto the plus or a double click with left mouse button onto the node toggles the extension of the hierarchy up to the next level. The slider located underneath enables a fast way to extend sub-structure of selection or multi-selection.

When the checkbox in front of a node is checked the object is visible in render view. Unchecked objects were illustrated in grey color.

Left mouse button selects an item; right click opens the [context menu](#). Single left mouse click on a selected item enables renaming.

- Multi-selection of nodes could be done in two different ways by scenegraph interaction.
- Either it is done through the control key [ctrl] held down while left mouse click - this makes related object selected additionally to selection before.
 - Or it is done through the shift key held down while second single left mouse click - this results in a selection of the appropriate nodes itself and everything that is located in between.

The scenegraph supports drag & drop operations for structural re-arrangement. This means moving the mouse with left mouse button held down moves selection inside the tree.

CONTEXT MENU WITHIN SCENEGRAPH MODULE

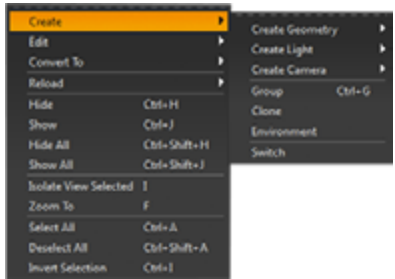
The minimized context menu from simple UI continues the thread of simplification. Common usual features like create or edit are directly available, uncommon features are stripped off to keep it clear. A switch back to the standard UI brings them back whenever required. Right mouse click inside the scene tree opens the context menu.



Single left mouse button click on the top of the context menu (dotted line) releases it to an independent window. This works also on sub menus.

CREATE (SUB MENU)

The create sub menu provides functionality to generate and add nodes to the scene. Newly created nodes will appear under the group node that was selected on creation. If a node without grouping characteristic was selected on creation, then the node will be appear besides the selection. If nothing was selected on creation then the root group node will be used as parent node.

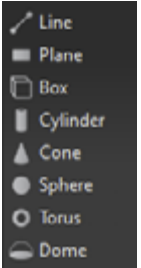


CREATE GEOMETRY



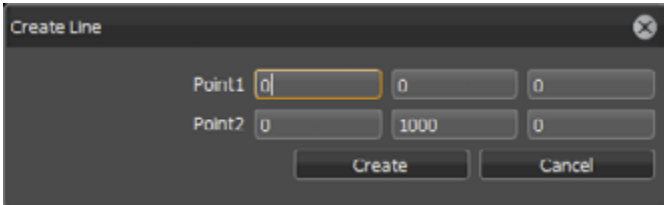
Scenegraph icons for line and polygonal shapes (active and inactive)

VRED supports creation of the following geometric standard primitives. The layout from numerical input dialogue depends on the use case, it enables accurate object creation. Inputs values have to align system unit setting (Standard UI – status line) to create objects in right dimension. All dialogs and their settings are described below. Objects will be generated by clicking the “Create” button.



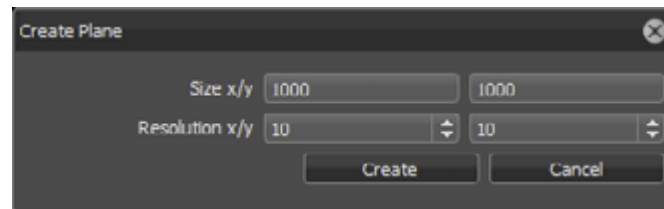
All object creation except “Line” feature results in triangulated polygonal shapes nodes.

- **Line**
A line is the connection of two points. Every point has X, Y and Z coordinates for it’s positioning in 3D space. The representation of a line object in render view depends on the active render engine. This means that in OpenGL mode a line is represented as a line but in Raytracing mode it is represented as a tube capped with half spheres on both ends. The radius of the representation in that case will be controlled by the material setting “Line Tube Radius” – accessible within the standard UI.



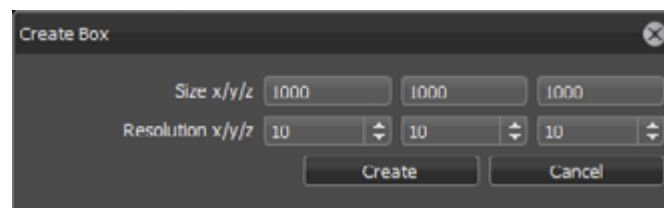
- **Plane**

A plane is a flat quadratical face often used to place object shadows onto the ground below. It has X and Y dimensions and it requires input for the number of sub-divisions for both axes.



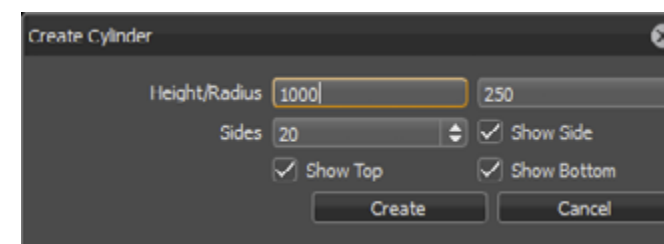
- **Box**

A box describes a quadratic, three dimensional room also known as cube. It has X, Y and Z dimensions and it requires input for the amount of sub-divisions for all axes.



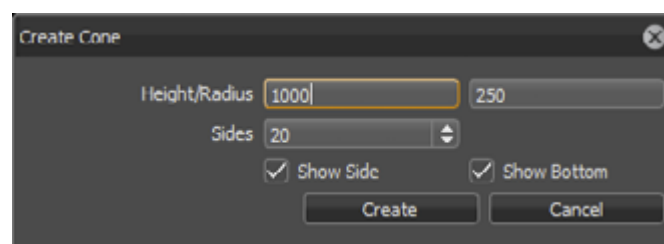
- **Cylinder**

A cylinder is an object that has two circular ends with same radius parallel to each other. A cover wrapped around the distance between (height) builds the outer skin of the primitive. Increasing the number of sides makes the object look less faceted. Faces for top, bottom or side were only created when related checkboxes were selected on creation.



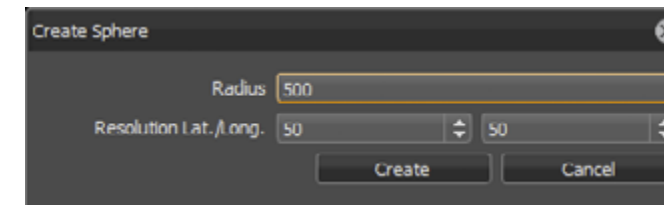
- **Cone**

A cone is very similar to a cylinder. It has also a circular base at the bottom but it's top end is a single point instead of a circular face. Due to this an object with conical shape results. Faces for bottom or side were only created when related checkboxes were selected on creation.



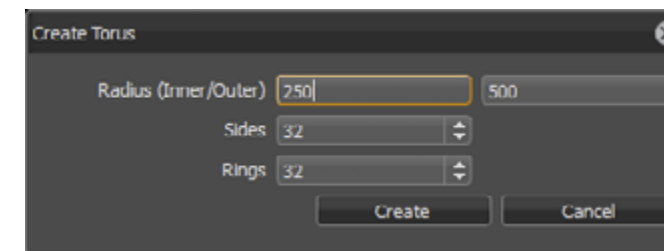
- **Sphere**

Sphere is the distinguishing name for a three-dimensional primitive in form of a ball. Every point on the surface has the same distance to the center point. This distance is adjusted within the dialogue by the radius value. The values for latitude and longitude resolution results in amount of horizontal and vertical sub-divisions.



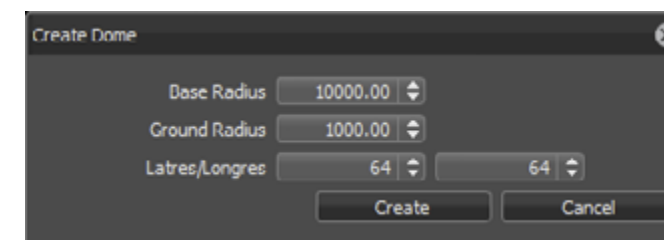
- **Torus**

A torus is an object that's shape equals a donut. A section cut would show a circular profile limited by the inner and outer radius. Imagine on creation the profile will be taken and rotated around the perpendicular axis in the center of the object. The value for rings controls the number of sub-divisions along that rotation, sides controls the quantity of horizontal sub-divisions.



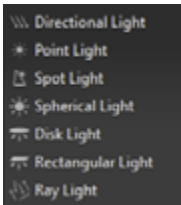
- **Dome**

A dome has a flat circular surface at the bottom and a half sphere on the top, also known as hemisphere. The border edge to the bottom surface is created chamfered. The Base Radius value on creation dialogue controls the dimension of the half sphere, Ground Radius controls chamfer creation. Setting for Latres results in number of perpendicularly sub-divisions, Longres controls amount of sub-divisions around the perpendicular axis.



CREATE LIGHT

VRED supports creation of the following light sources as nodes.



- **Directional light**

Light rays from directional light sources are parallel like sunlight. A Directional light represents a distant light source and has no position only a direction that affects how the scene will be illuminated. Directional lights always create hard shadows.



Point light

Point light rays start at a single point and emit radially. In Raytracing mode the point light generates a hard shadow in OpenGL a point light shows no shadow.



Spot light

Spot light rays follow a beam cone. They start at a single point and spot in a circled area on the object. It is often used to emphasize an object or surface.



- **Spherical light**

Spherical light rays beam like from a glowing ball. Spherical light generates diffuse light and soft shadows. It is an indirect lighting and more atmospheric than point light.



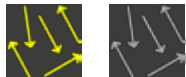
- **Disk light and Rectangular light**

The disk or rectangular light rays are created a light source appearing like from a dropped ceiling – either like from a circle (disk) or from a square (rectangular)



- **Ray light**

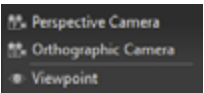
Ray light files contain the simulated spatial and angular distribution as well as photometric or spectral information of emitted light from a complex light source.



The shadows generated by more than one light source on an object will add up where they overlap. Similar to a new geometry, the newly created light source is located at (0,0,0) by default, no matter if an object was selected or not. Location, size, angle etc. can be modified by using the Transform Manipulator

CREATE CAMERA

VRED supports creation of the following cameras.



- **Perspective camera**

Setting this node creates a camera with a perspective view. Perspective View: A view similar to the view of human eyes: Objects further away seem smaller than objects right in front. Original parallel lines appear centric to a single point a long distance off. This view is the default for file output (see Render Settings)



- **Orthographic camera**

Setting this node creates a camera with an orthographic view. Orthographic View: A view where all objects have the same size irrespective of distance. Each object's actual height and width is shown and parallel lines remain parallel.



- **Viewpoint**

This function creates a new fixed point of view from the actual distance and angle to a scene or object.



CREATE FUNCTIONAL SCENEGRAPH NODES

- **Group (Ctrl + G)**

A group node supports the user on structurization of everything scene related that is present within the tree. Grouping of nodes has no influence to the graphical representation within the render view.



- **Clone**

A clone node duplicates and references all child nodes of the node that is dropped onto it. All nodes contained at that moment will be considered. Referenced means that any change on these objects (e.g. transforming, assigning material etc.) will also affect the duplicated instance and vice versa. Referenced nodes are illustrated underlined within the scenegraph.



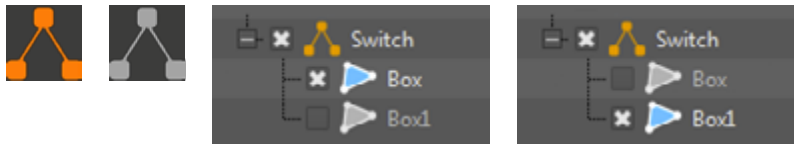
• Environment

An Environment node provides a textured surrounding with shadow plane on its ground. It's texture affects the representation of all scene related materials. The creation dialogue asks for this texture. It generates the dome and shadow plane automatically.



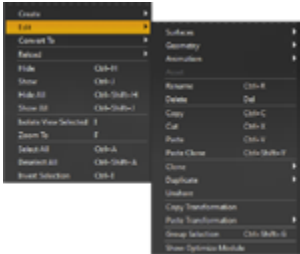
• Switch

A switch node groups different child nodes and it switches the visibility of them within the render view. Only one of the child nodes is visible at the same time. Due to this, the checkboxes and therefore the visibility of all other child nodes will be automatically unselected when another checkbox is selected.



EDIT (SUB MENU)

Geometrical object properties, transformations and animations are accessible and customizable within the edit sub menu. The mouse pointer has to be placed above an editable node on opening the context menu. All following instructions are affecting that node.



EDIT SURFACES

VRED's trueNURBS concept provides the usage of CAD NURBS data directly within the scene. Features for editing geometrical properties of NURBS objects or their polygonal representation are available here.

• Tessellate Surfaces

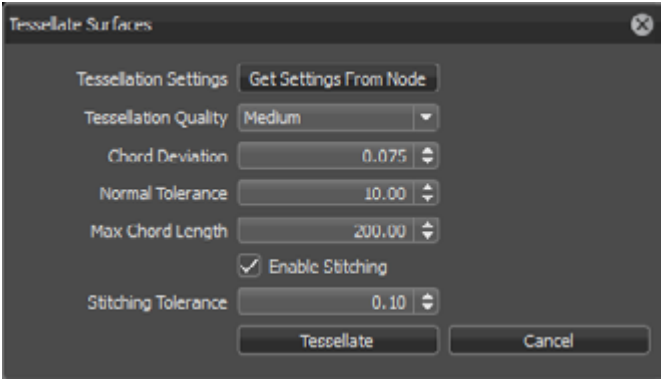
CAD generated construction data is mathematically precise; exact defined by a technique called Bezier curves. VRED's directNURBS Raytracing mode is able to represent NURBS data without any preparation.

OpenGL mode requires generating a polygonal representation before. This process is called tessellation. It enables changing the complexity/amount of polygons of an object at anytime. NURBS data coexists besides polygonal data (same node object within scenegraph); this enables re-tessellation without reloading the files before.

A polygonal representation will never be as precise as the source NURBS data. The higher the precision the more polygons will be generated.

• **Tessellation Settings - Get Settings From Node:** Reads the settings that was used last time this object was tessellated.

• **Tessellation Quality:** Different pre-sets help casual users on choosing reasonable settings.



	Coarse	Low	Medium	High
Chord deviation	1.00	0.15	0.075	0.0375
Normal tolerance	30.00	20.00	10.00	7.50
Max chord length	400.00	300.00	200.00	100.00
Enable stitching	yes	yes	yes	yes
Stitching tolerance	0.10	0.10	0.10	0.10

• **Chord Deviation:** Describes the maximum deviation between the NURBS surface and the tessellated surface. A low value results in more accurate polygon model but it also increases the number of triangles.

• **Normal Tolerance:** The normal tolerance is the allowed normal deviation between the normals on the ends of a tessellated edge

• **Max Chord Length:** Defines the maximum edge length of the generated polygons. Long polygon edges are not shaded smooth within the render view; this setting is helpful to avoid such faceted effects.

• **Enable Stitching:** This feature enabled on tessellation re-builds existing topology - it makes edges of selected shells align to each other. It avoids ragged edges on tessellated representation within the Stitching Tolerance.

• Create Shell From Selection

Combines selected NURBS components to one contiguous NURBS shell. The discontinuous condition is furthermore accessible at anytime via the standard UI of VRED.

• Convert To Mesh

Deletes the NURBS information that is stored beside the tessellated object. Due to this memory consumption of the scene will be reduced but re-tessellation of that object won't be possible anymore.

Undo for this action is not available.

EDIT GEOMETRY

Features for editing geometrical properties of polygonal objects are available here. This is useful for splitting or merging objects

- **Merge Geometry (Ctrl + Shift + M)**

Merges polygonal objects with same material to one contiguous object. This feature is usable on a group node as well. This works also when NURBS data exists besides the polygonal representation.

Undo for this action is not available.

- **Split Geometry**

Splits selected polygonal object into fragments. The dialogue asks for a value that determines the maximum number of triangles a splitted object should contain. If you got for example an object with 1000 polygons and you split it into fragments with a maximum amount about 100 polygons you will get 10 objects.

Undo for this action is not available.

- **Split Into Primitives (Ctrl + T)**

Execution converts object to a group node that is named like the object before. The group node contains single triangles for every polygon of the source object.

Undo for this action is not available.

- **Unsplit Geometry with One Triangle (Ctrl + Shift + T)**

Merges single triangles to one object. o combine a number of polygons this way, they should be grouped and this functionality used on the group node. Material from the first node below the parent group will be applied to the merged object.

Undo for this action is not available.

- **Subdivide Geometry**

Subdivides existing polygon mesh into smaller triangles. Ambient occlusion calculation for example requires a fine mesh resolution for shadowed areas to avoid ragged edges on shadow illustration. This feature is helpful when NURBS data for re-tesselation is not available but a re-fined mesh is be required.

Two different subdivide methods are present:

- **Standard:** Each polygon is subdivided until each edge length is below the maximum edge length threshold entered on creation.
- **Phong Interpolation:** Each polygon will be subdivided into a specific amount of triangles depending on the selected iteration value selected on creation (see table).

Iteration	Triangles/Polygon
1	4
2	16
3	64
4	256

Undo for this action is not available.

EDIT ANIMATION

This menu contains a feature to create turntable animations quickly. Furthermore it provides commands to handle already created animations for duplication or cloning purposes.

- **Load Animation To Nodes**

An already created and saved transformation animation could be loaded and assigned to the selected node.

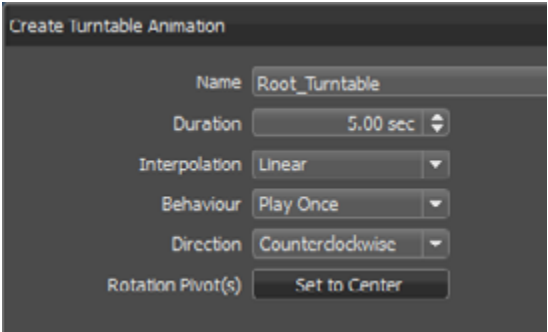
- **Load Animations To Materials**

An already created and saved material animation could be loaded and assigned to the selected node.

- **Create Turntable Animation**

This dialogue supports the user on creation of turntable animations. The object will be rotated about 360° around the perpendicular axis. These kinds of animations are e.g. used for product presentation within virtual showrooms.

- **Name:** Declares the name that will be used for the representation of the animation sequence within the Curve Editor.
- **Duration:** Threshold defines the length of the animation in seconds.
- **Interpolation:** Determines object velocity on animation playback. **Linear** results in a constant rotation of the object; **Ease In/Out** reduces velocity on beginning or/and at the end of the animation.



- **Behavior:** **Play Once** replays animation one time; **Loop** replays animation looped; **Oscillate** plays the animation forwards and backwards.
 - **Direction:** Affects the replay direction; could be set to **Clockwise** or **Counterclockwise**.
 - **Rotation Pivot: Set to Center** moves the rotation center of the object to the center of its bounding box. This is helpful if the animated object had custom pivot point settings that effect in side motion on object rotation.
 - **Preview:** Replays the animation one time for preview purposes related to the settings above.
-
- **Copy Animations**
The animation can be copied to the clipboard by selecting an already animated object and executing this command.
 - **Paste Animation**
Pastes animation from clipboard to the selected node.
 - **Paste Clone Animation**
Pastes animation from clipboard to the selected node in a referenced way. This means that any change on animation will affect the cloned instance and vice versa.

EDIT ASSET

The [asset management module](#) supports the user on the usage of external file references. These files are imported to the scenegraph and present within its structure. Sub menu provides commands to edit such kind of references.

- **Save in Asset Manager**
Saves selection within the asset manager.
- **Find in Asset Manager**
Select related asset within the asset manager.
- **Reload from Asset Manager...**
Updates the selected asset from the asset manager.
- **Remove Reference**
Removes the reference connection to the asset manager. The asset itself won't be deleted this way.

EDIT MENU COMMANDS

- **Rename (Ctrl + R)**
Renames selected node; same behavior like single left mouse button click on selection.
- **Delete (Del)**
Deletes selected nodes.
- **Copy (Ctrl + C)**
Copies selected nodes and structure to clipboard.
- **Cut (Ctrl + X)**
Cuts selection and stores it to clipboard.
- **Paste (Ctrl + V)**
Pastes clipboard contained nodes to an independent instance within the scenegraph.
- **Paste Clone (Ctrl + Shift +V)**
Pastes clipboard contained nodes to an automatically created group node in a referenced way. Referenced nodes are illustrated underlined within the scenegraph.
- **Clone**
Groups the edit menu commands **copy and paste clone** to a single action. The use of one of the mirror commands creates a referenced and mirrored instance from the source object or structure..
 - **Clone (Ctrl + Shift +D):** Creates a cloned instance of the source selection at same position in 3D.
 - **Clone Mirror X/Y/Z:** Creates a cloned instance of the source selection mirrored on related axis.
-

• Duplicate

Groups the edit menu commands **copy and paste** to a single action. The duplicated instance here won't be referenced to source object and structure.

- **Duplicate (Ctrl +D):** Creates an independent instance of the source selection at same position in 3D.
- **Duplicate Mirror X/Y/Z:** Creates an independent instance of the source selection mirrored on related axis.
- **Duplicate Mirror X/Y/Z Flush:** Creates an independent instance of the source selection mirrored on related axis. This command flushes also the transformation from sub tree to the object nodes.

• Unshare

Removes the reference connection between source and cloned instance. Referenced nodes are illustrated underlined within the scenegraph. A later change on them doesn't affect the other instance anymore.

• Copy Transformation

A transformation contains information about the position and the orientation of an object within 3D space. It provides also information about the position and orientation of the objects coordination system. This command copies all that kind of information from the selected node to clipboard.

• Paste Transformation

Adopts transformations from clipboard to a selection.

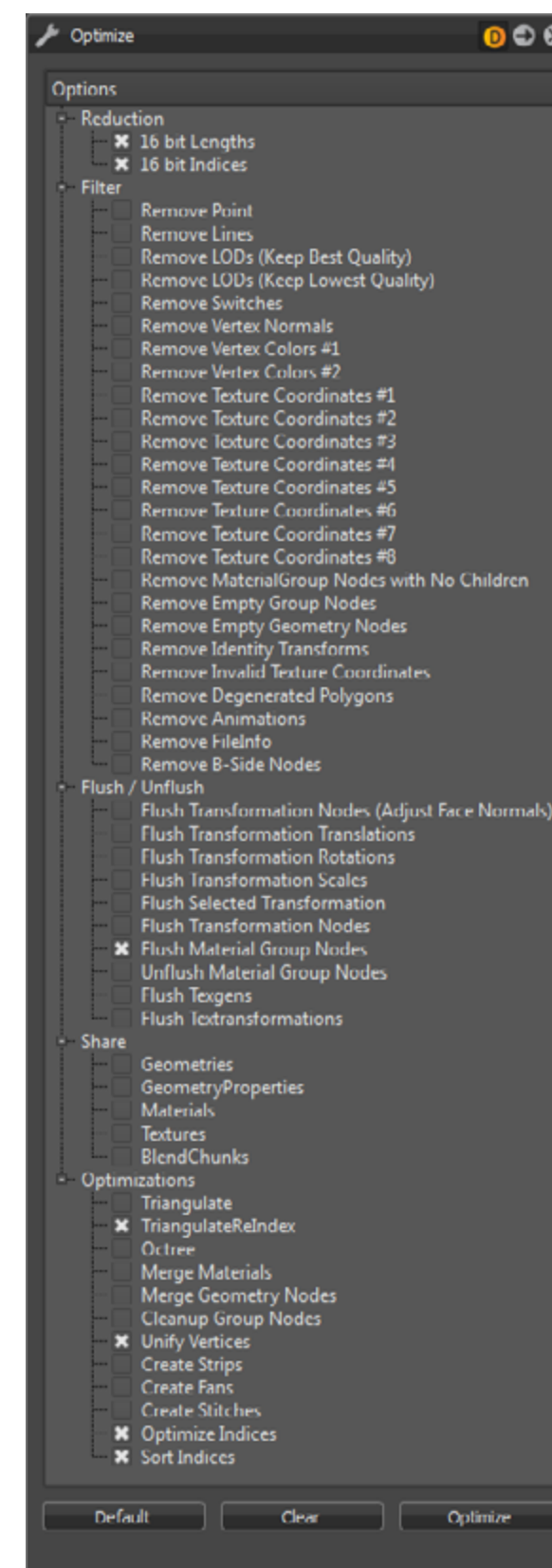
- **Paste All:** This command adopts all types of transformation information (translation, rotation, scale, pivot) from clipboard.
- **Paste Translation:** Pastes translation threshold from clipboard to selected node.
- **Paste Rotation:** Adopts rotation from clipboard.
- **Paste Scale:** Adopts scale settings from clipboard.
- **Paste Pivot:** Adopts location and orientation for the objects local coordination system from clipboard.

• Group selection

Creates a group node and moves all selected nodes into it.

SHOW OPTIMIZE MODULE

Opens the module that provides further operations e.g. geometrical optimizations, sharing and so on. Default activates a recommended selection that could increase render performance; Clear unselects all selected modules; Optimize executes selected optimization commands. All operations will be applied recursively. Multi-selection is supported on execution. Undo for all that kind of actions is not available.



- **Reduction**

- **16 bit Lengths, 16 bit indices:** Changes the lengths and/or indices from selection to a 16 bit data type.

- **Filter**

- **Remove Point:** Deletes all point objects within selection.
- **Remove Lines:** Deletes all line objects within selection.
- **Remove LODs (Keep Best Quality):** Deletes all LOD's nodes within selection; command execution keeps child instance with highest mesh resolution and replaces the LOD node with it.
- **Remove LODs (Keep Lowest Quality):** Deletes all LOD's nodes within selection; command execution keeps child instance with lowest amount of polygons and replaces the LOD node with it.
- **Remove Switches:** Removes all switch nodes within selection; command execution keeps last child instance and replaces the switch node with it.
- **Remove Vertex Normals:** Deletes all existing vertex normals from selection.
- **Remove Vertex Colors #1 and #2:** Imported objects could contain in maximum two different RGB values for every vertex point (edge point of polygons) - this technique is called vertex color. The feature removes existing vertex color information from shape nodes.
- **Remove Texture Coordinates #1 - #8:** Deletes existing texture coordinates from related channel. Channel #1 - #6 are relaying to UVW mapped texture coordinates; channel #7 and #8 are containing ambient occlusion calculated shadow information.
- **Remove Material Group Nodes with no children:** Deletes all materials within Materials module that hadn't been assigned to an object.
- **Remove Empty Group Nodes:** Deletes group nodes that contain no child nodes.
- **Remove Empty Geometry Nodes:** Incorrect usage on external geometry editors could generate shape nodes that contain no polygons. This kind of shape nodes imported to VRED could decrease runtime stability. Feature provides the ability to delete such kind of shape nodes.
- **Remove Identity Transforms:** Deletes identity transform nodes within selection.
- **Remove Invalid Texture Coordinates:** Imported objects could contain invalid texture coordinates. Feature helps to delete that kind of information.
- **Remove Degenerated Polygons:** Removes shape nodes that cannot be drawn from the render engine.
- **Remove Animations:** Deletes existing animation from selection.
- **Remove FileInfo:** Removes the informations from a file
- **Remove B-Side Nodes:** B-Sides definition is comparable with no show feature from CAD software. Execution removes shapes and components that had been set as a B-Side.

- **Flush / Unflush**

Object transformation could be realized in two different ways within the scenegraph. Either the transformation is stored within the object itself (flushed) or the related information is stored within group nodes on a higher hierarchy level above (unflushed). Nodes that contain transformations got a symbol of an axis in front of its icon. Several transformations on different levels are accumulated.

- **Flush Transformation Nodes (Adjust Face Normals):** Moves transform information from transform nodes to the geometry nodes on lowest level. Recalculates face normals additionally on execution.
- **Flush Transformation Translation:** Moves translation related transform information of selected sub-tree to the geometry nodes on lowest level.
- **Flush Transformation Rotation:** Moves rotation related transform information of selected sub-tree to the geometry nodes on lowest level.
- **Flush Transformation Scales:** Moves scale related transform information of selected sub-tree to the geometry nodes on lowest level.
- **Flush Selected Transformation:** Flushes transform information from selected node.
- **Flush Transformation Nodes:** Moves transform information of the selected sub-tree to the geometry nodes on lowest level.
- **Flush Material Group Nodes:** Material assignment in VRED could be done also by assignment to the object itself or to a material group node on a higher hierarchy level. Execution moves unflushed material definition from material group node the object.
- **Unflush Material Group Nodes:** Creates a material group node above each geometrical node within selection and moves material definition there.
- **Flush Texgens:** Converts TexGenChunk information to texture coordinates within the object on the level below.
- **Flush Textransformations:** Converts TextureTransformChunk information to texture coordinates within the object on the level below.

- **Share**

Sharing improves OpenGL render and Raytracing performance because required objects are not present several times within system memory. Shared instances are indicated by an underlined node description inside the scene tree. Any change on a shared object affects the cloned instance and vice versa.

- **Geometries:** Looks for identical objects (identical polygon mesh) within selection and references all occurrences.
- **GeometryProperties:** References all occurrences of duplicated geometry properties.
- **Materials:** References all occurrences of duplicated materials.
- **Textures:** References all occurrences of duplicated textures.
- **BlendChunks:** References all occurrences of duplicated Blend Chunks.

• Optimizations

- **Triangulate:** Converts all kind of polygon meshes into triangles. Faces with four and more edges are split into the appropriate number of triangles.
- **TriangulateReIndex:** Indices of vertices had to be defined in a counterclockwise order on creation. Following this rule increases runtime stability and render performance. Feature execution converts also all kind of polygon meshes into triangles and it applies the re-generation of all vertex indices additionally.
- **Octree:** Is a kind of tree structure that provides constant branches within the scene tree - every node had to contain eight or no child nodes. Execution restructures scene tree in that way.
- **Merge Materials:** Merges identical materials to one.
- **Merge Geometry Nodes:** Merges geometrical nodes to one contiguous object. Regarding objects had to be unshared, identical material had to be assigned and all objects that should be combined had to be located within same group node.
- **Cleanup Group nodes:** CAD generated data contains sometimes very deep branches on their created trees. A group node contains a group node that contains a group node and so on; at the end there is one shape node in a nested arrangement of group nodes. Feature helps to delete this kind of nested groups automatically without removing the shape nodes itself. Group nodes that contains two or less shapes are considered on execution.
- **Unify Vertices:** Every triangulated polygon got three vertices; one in every edge. Polygons located directly beside to each other should share as much vertices as possible to increase render performance. Command looks for identical, not shared vertices and combines them.
- **Create Fans / Create Stitches:** Connects triangles to fans and/or stitches.
- **Optimize Indices:** Tries to improve vertex cache efficiency by reordering indices.
- **Sort Indices:** Sorts indices from selection.

CONVERT TO (SUB MENU)

Contains commands to convert a group node into a switch node (**Switch**) and vice versa (**Group**).

RELOAD (SUB MENU)

The **Reload menu** in the scenegraph is not related to the asset manager but to nodes with external file references (the name of such nodes is marked green in the scenegraph and the file path of the file is displayed after the node name. A node with external file reference is created when importing a file, e.g. by using „File > Add...“).

OTHER SCENEGRAPH CONTEXT MENU COMMANDS
(BESIDES SUB MENUS)

• **Hide/Show**

Hides/shows selection within render view. Hidden nodes are indicated by the unchecked box in front of it and by an uncolored icon. (Hotkeys Ctrl + H / Ctrl + J)

• **Hide All/Show All**

Hides/shows all scene objects within render view. (Hotkeys Ctrl + Shift + H / Ctrl Shift + J)

• **Isolate View Selected**

Hides/shows everything unselected. The visibility of Environments is not affected. This feature was known from previous releases by dragging a node from scenegraph into render view - both works. (Hotkey I)

Zoom To

Moves the Camera to a position that fits the bounding box dimensions from selection into the field of view. (Hotkey F)

• **Select All**

Selects all nodes contained within scenegraph exclude root node. (Ctrl + A)

• **Deselect all**

Deselects everything. (Ctrl + Shift + A)

• **Invert Selection**

Selects all unselected nodes and vice versa. (Ctrl + I)

ICONS BAR AND SLIDER WITHIN SCENEGRAPH MODULE

Often required commands are accessible by an icon located directly below the scene tree.



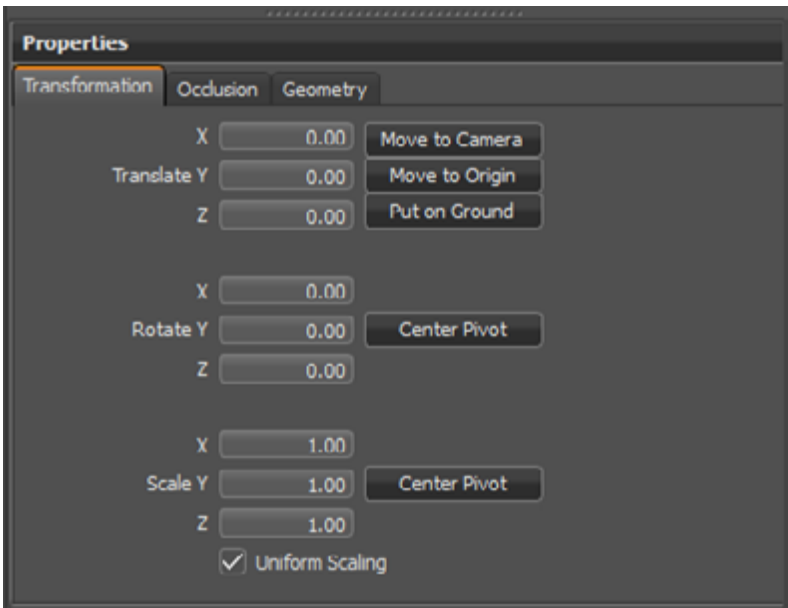
- Create**
Opens sub menu that contain all node types that could be generated within VRED. the following links can be used to get a detailed description for all available node types: [Create Geometry](#), [Create Light](#), [Create Camera](#), [Group](#), [Clone](#), [Environment](#), [Switch](#).
- Duplicate**
Creates an independent instance from selection (Hotkey Ctrl +D). [detailed featured description can be found HERE](#).
- Group selection**
Creates a group node and moves all selected nodes into it (Hotkey Ctrl + Shift + G).
- Copy Transformation**
Copies all kind of transform (translation, rotation, scale, pivot) information from the selected node to system clipboard. [detailed featured description can be found HERE](#).
- Paste Transformation**
Pastes all kind of transform information from system clipboard to transform properties of the selected node. [detailed featured description can be found HERE](#).
- Delete**
Deletes selected nodes and its child nodes (Hotkey Del).
- Slider**
Extends or folds sub-structure of selection or multi-selection on its usage.

OBJECT PROPERTIES

Object properties like position, pre-calculated shadows and normal settings (affects shading within OpenGL render view) are available at tabs on the bottom of the scenegraph module.

TRANSFORMATION

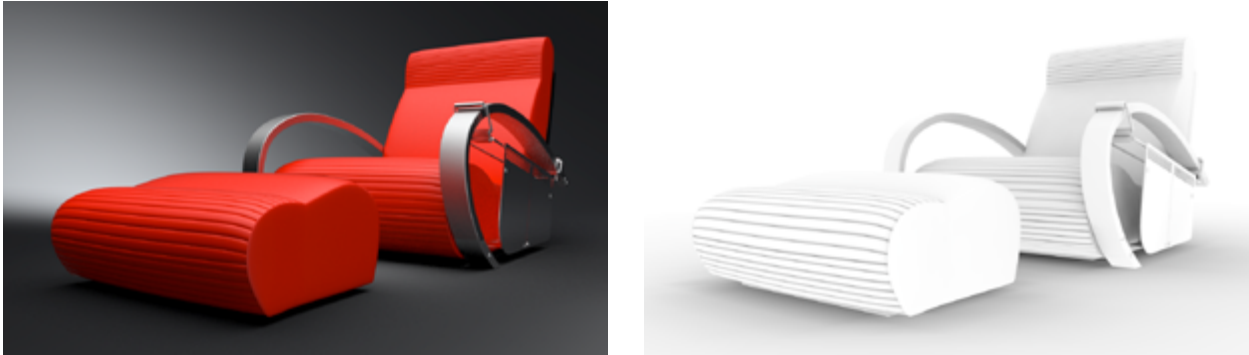
A transformation contains information about the position and the orientation of an object within 3D space. It provides also information about the position and orientation of the objects coordination system.



- Translate X/Y/Z**
Moves selection at related axis depending on unit setting (mm, cm, m). **Move to Camera** moves the selection to the same position in 3D space where the camera is located; **Move to Origin** moves the selection to the position of its pivot point; **Put on Ground** makes selection move to environment floor height.
- Rotate X/Y/Z**
Rotates selection on related axis in degrees. The **Center Pivot** button on the right moves objects local rotation axis to the center of its bounding box.
- Scale X/Y/Z**
Scales selection at related axis depending on unit setting. Enabling checkbox for **Uniform Scaling** restricts execution to set new value also on other related axes. The **Center Pivot** button on the right moves objects local scale pivot to the center of its bounding box.

OCCCLUSION

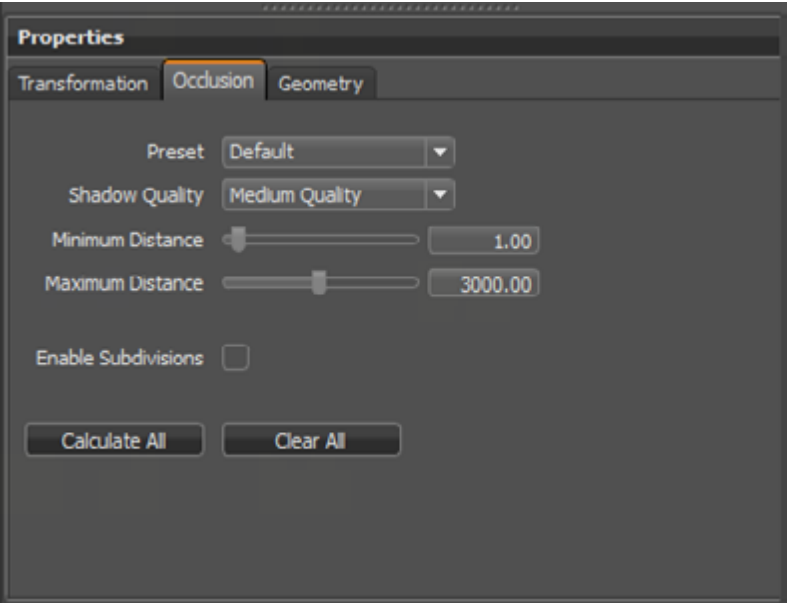
Ambient occlusion calculation – is also known as soft global illumination. It generates shadows on gaps and corners; this makes scene illustration become more realistic within OpenGL render mode.



The scene will be illuminated on calculation by the HDR file from within the environment node; it works without any other light source within the scene. All objects that are hidden in the moment of calculation will be darkening.

The Ambient Occlusion calculation is a pre-process and takes place during data preparation. Calculated Ambient Occlusion results are baked on the geometry’s vertices – stored within texture coordinates #7 and #8.

The smoothness of the calculated shadow depends on the polygon mesh resolution. Therefore VRED offers several ways to increase the quality on low quality models, like subdividing and predefined quality presets.

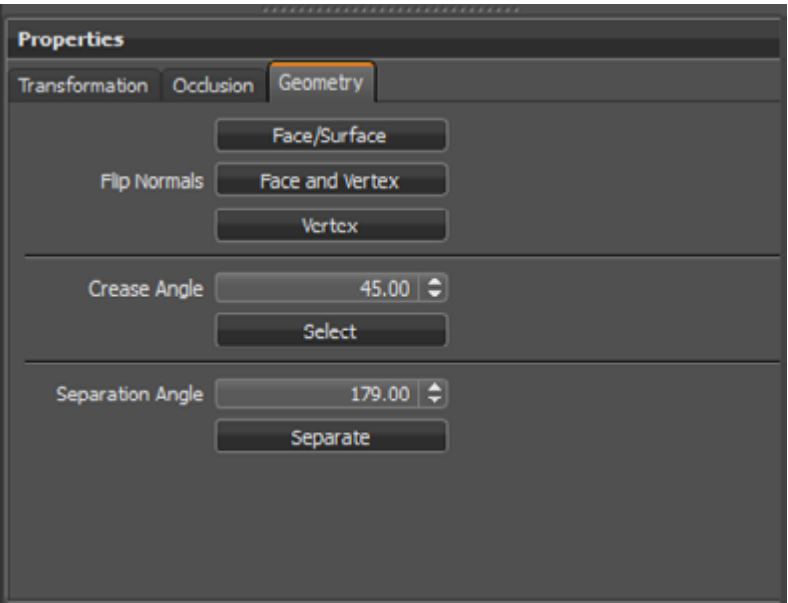


- Preset**
Presets are containing all shadow calculation related settings within one setting. The drop down menu provides quick access to all available calculation presets that had been saved from Ambient Occlusion module within standard UI.
- Shadow Quality**
Ambient Occlusion is a specific not-physically-accurate rendering trick. It basically samples a hemisphere around each point on the face, sees what proportion of a hemisphere is occluded by other geometry and shades the pixel accordingly.
 - Preview Quality:** 8×8 hemisphere samples (per vertex)
 - Low Quality:** 16×16 hemisphere samples
 - Medium Quality:** 32×32 hemisphere samples
 - High Quality:** 48×48 hemisphere samples
 - Highest Quality:** 64×64 hemisphere samples
 - Ultra High Quality:** 128×128 hemisphere samples
- Minimum Distance**
Defines the minimum distance (mm) between objects that to should be taken into account for the calculation of Ambient Occlusion shadows. This value defines total black areas where full occlusion takes place.
- Maximum Distance**
Defines the maximum distance (mm) between objects that to should be taken into account for the calculation of Ambient Occlusion shadows. This value defines areas where no occlusion takes place.
- Enable Subdivisions**
Subdivides existing polygon mesh into smaller triangles. This option should be turned on to avoid ragged edges on shadow illustration. This feature is helpful when NURBS data for re-tesselation is not available but a re-fined mesh is be required. Subdividing generates more complex objects - it should only be used when really required. [Subdivide Geometry](#) (edit menu from context menu of scenegraph) provides more settings to control this process.

Important: Only shadows for selected objects will be calculated on execution. All visible objects in the scene are taken into account on calculation!

GEOMETRY

The Geometry editor from simple UI contains commands to turn polygon normals, vertex normals and operations that affect the shaded illustration of the object within the OpenGL render mode.



- **Flip Normals**

Polygons got a front-face and a back-face; the face normal is located centered and in right angle to the front-face. For Ambient occlusion calculation it is strongly required to have polygons turned to the right direction. Otherwise calculation will provide undesirably darkening effects where normals where turned. Every polygons vertex got also a normal that affects shading. **Face/Surface** turns all face normals of selection into the other direction. **Face and Vertex** turns both kinds of normals from selection. **Vertex** affects only normals from polygons vertices.

Vertex/Face Normal Rendering mode available on settings tab of scene module from simple UI gives visual feedback about the orientation and it enables the adjustment of objects that contain inconsistent normals.

- **Crease Angle**

Threshold defines an angle that will be considered on shading illustration; all object edges that got a lower angle to the face beside will be drawn smooth. Object edges with a higher angle than threshold will be illustrated faceted.

A value of 45 degrees let objects appear smooth.

- **Separation Angle**

Defines the angle between the vertex normals. Needed in case of merged objects for example.

B-SIDES

On 3D data preparation sometimes it is not clear if a part of an object will be required for the scene or for the scene or is it hidden by another object. To avoid reloading the file it is recommended to define regarding shapes and components as B-Sides. These elements are not visible within the render view; the scene tree icons are illustrated a little bit more dark than the standard icons.

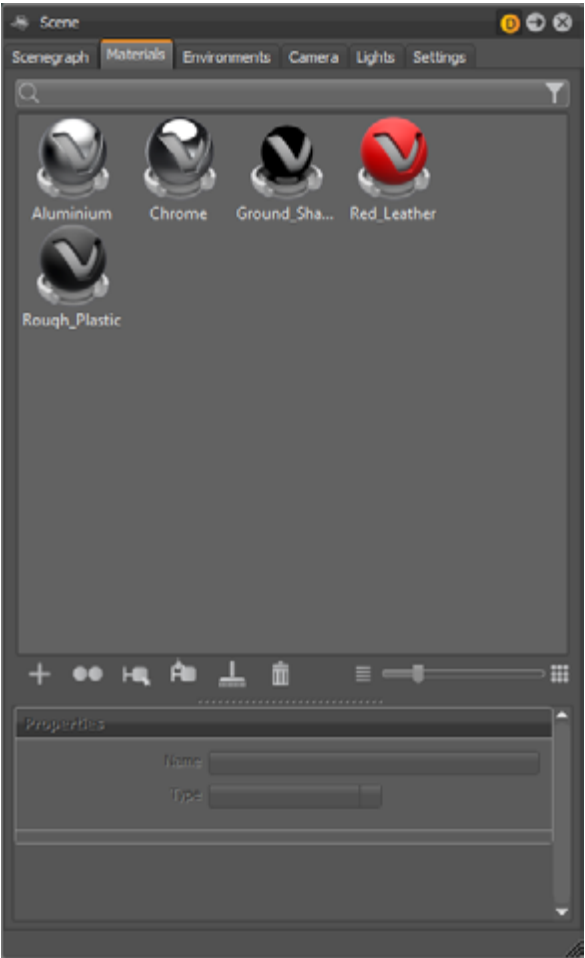


Scenegraph icons for B-Side line and polygonal shapes (active and inactive)

SCENE MODULE - MATERIAL TAB

The Material module from simple UI continues reducing dialogues to the minimum of applicable settings. It gives a non-experienced user to possibility to create and assign materials in a very simple and fast way.

Extended drag and drop operations and the new preview feature on material assignment saves time on scene setup.



SEARCH FIELD

This search field provides live-search capabilities within the materials module. Entering one character hides all materials beginning with other characters. It is located on top of the materials module - below the module tabs. Only single search terms are supported.



MATERIAL PREVIEW LIST

Every scene related material got its representation within the material preview list. Switches, layered- and multipass materials are indicated by an additional icon on lower left corner.

Left mouse button selects a material; right button opens the [context menu](#). Single left mouse button on a selected material enables renaming.

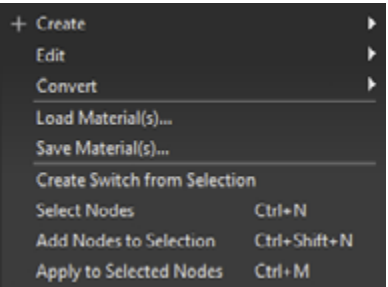
Material can be assigned by drag and drop to objects within the render view. In addition to that common features like e.g. replacing all occurrences of a material is contained by now.

- **Left mouse button:** Replaces material from a single object.
- **Middle mouse button:** Replaces material from all objects that got to be replaced material assigned.
- **Right mouse button:** Converts material to material switch or multipass material. An upcoming menu let the user choose the desired type. Both materials - before assigned and dragged one - will be present within the new created material.

Preview on material assignment is a new feature that gives visual feedback before the material is dropped onto an object. This avoids miss-assignment on drag and drop operation.

CONTEXT MENU

The context menu provides commands to create, change or convert materials or its properties. Once the setup has been done, load and save feature enables and eases the re-usage within other scenes. Selection and assignment completes the scope of operation here.



CREATE (SUB MENU)

VRED provides lots of different material node types that support the user creating every kind of material he can imagine. The properties dialogue settings for the different node types are depending on its use case; they are located on the bottom of the module.

The creation of photorealistic materials requires sometimes the ability to use custom graphic files for its definition - these graphic files are called textures. Textures can be assigned within the most material types, directly below the material property settings. All usual 2D file formats are supported.

Using textures implies a mechanism that tells the render engine about the position, orientation and scale of an image. All these information will be generated automatically in the background on texture assignment within simple UI. Features to change these kinds of settings are accessible from standard UI and by using the texture manipulators in Texturing mode (this is the recommended way to change texture settings in the simple UI).

- **Name:** A material naming scheme with clear identifiers enables the live-search to find materials within complex scenes or libraries very quickly.
- **Type:** Changing the material node type could be done by the drop down menu on top of the properties dialogue. All adoptable property settings will be adopted automatically.

VRED MATERIAL TYPES AND ITS PROPERTIES

PHONG

Phong shading is a historical technique that describes the way a surface reflects light. It generates diffuse reflections from rough surfaces and specular reflections from shiny surfaces - based on the fact that shiny surfaces have small intense specular highlights, while dull surfaces have large highlights that fall off more gradually.



- **Diffuse Color:** This attribute defines the base color and thereby the main characteristic of the material. The slider enables changing the brightness; a click on the color field on the right opens the color chooser. Assigning a texture to the diffuse color, projects it onto the surface. The look representation is a combination of the defined color and the assigned texture.
- **Glossy Color:** Sets the material's color for surfaces glossy reflections. The slider enables changing the brightness; a click on the color field on the right opens the color chooser. Assigning a texture to the glossy channel defines areas in which different gloss intensities appear with help of a texture. The glossy color depends finally on both - the defined color and the possibly assigned texture file.
- **Roughness:** The roughness parameter controls light refractions on top of the surface. The higher the value the rougher the microscopic structure on top of the surface and the more diffuse are the reflections.
- **Bump:** Bump mapping enables the creation of structure to the materials surface. The Bump slider controls the height of that effect. A higher value results in more depth structure. If a texture is assigned to the bump map channel, it will be used as a pattern figure on surface illustration. If no texture is assigned, a default noise map will be used instead; Structure size affects the scale.

PLASTIC

Plastic is suitable to simulate shiny or glossy surfaces from objects that are made of synthetic materials.



- **Diffuse Color:** This attribute defines the base color and thereby the main characteristic of the material. The slider enables changing the brightness; a click on the color field on the right opens the color chooser. Assigning a texture to the diffuse color, projects it onto the surface. The look representation is a combination of the defined color and the assigned texture.
- **Glossy Color:** Sets the material's color for surfaces glossy reflections. The slider enables changing the brightness; a click on the color field on the right opens the color chooser. Assigning a texture to the glossy channel defines areas in which different gloss intensities appear with help of a texture. The glossy color depends finally on both - the defined color and the possibly assigned texture file.
- **Roughness:** The roughness parameter controls light refractions on top of the surface. The higher the value the rougher the microscopic structure on top of the surface and the more diffuse are the reflections.
- **Reflectivity:** Controls the intensity of reflection on the surface. The higher the value the more the influence from environment and objects around.
- **Bump:** Bump mapping enables the creation of structure to the materials surface. The Bump slider controls the height of that effect. A higher value results in more depth structure. If a texture is assigned to the bump map channel, it will be used as a pattern figure on surface illustration. If no texture is assigned, a default noise map will be used instead; Structure size affects the scale.

TRIPLANAR

Contrary to all other materials that could have textures assigned, the Triplanar node type enables the user to have a custom mapping on different object sides within one material definition. Features to adjust these settings are accessible from standard UI. This type is recommended to create e.g. leather, fabric and diffuse plastic materials.



- **Diffuse Color:** This attribute defines the base color and thereby the main characteristic of the material. The slider enables changing the brightness; a click on the color field on the right opens the color chooser. Assigning a texture to the diffuse color, projects it onto the surface. The look representation is a combination of the defined color and the assigned texture.

- **Glossy Color:** Sets the material's color for surfaces glossy reflections. The slider enables changing the brightness; a click on the color field on the right opens the color chooser. Assigning a texture to the glossy channel defines areas in which different gloss intensities appear with help of a texture. The glossy color depends finally on both - the defined color and the possibly assigned texture file.
- **Roughness:** The roughness parameter controls light refractions on top of the surface. The higher the value the rougher the microscopic structure on top of the surface and the more diffuse are the reflections.
- **Reflectivity:** Controls the intensity of reflection on the surface. The higher the value the more the influence from environment and objects around.
- **Bump:** Bump mapping enables the creation of structure to the materials surface. The Bump slider controls the height of that effect. A higher value results in more depth structure. If a texture is assigned to the bump map channel, it will be used as a pattern figure on surface illustration. If no texture is assigned, a default noise map will be used instead; Structure size affects then scale.

REFLECTIVE PLASTIC

Reflective Plastic is also suitable to simulate shiny or glossy surfaces from objects that are made of synthetic materials. It adds the ability to have a mirror image reflection of everything around on its surface.



- **Diffuse Color:** This attribute defines the base color and thereby the main characteristic of the material. The slider enables changing the brightness; a click on the color field on the right opens the color chooser. Assigning a texture to the diffuse color, projects it onto the surface. The look representation is a combination of the defined color and the assigned texture.
- **Specular Color:** Sets the material's color for surfaces specular reflections. The slider enables changing the brightness; a click on the color field on the right opens the color chooser. Assigning a texture to the glossy channel defines areas in which different gloss intensities appear with help of a texture. The glossy color depends finally on both - the defined color and the possibly assigned texture file.
- **Reflectivity:** Controls the intensity of reflection on the surface. The higher the value the more the influence from environment and objects around.
- **Bump:** Bump mapping enables the creation of structure to the materials surface. The Bump slider controls the height of that effect. A higher value results in more depth structure. If a texture is assigned to the bump map channel, it will be used as a pattern figure on surface illustration. If no texture is assigned, a default noise map will be used instead; Structure size affects then scale.

REFLECTIVE TRIPLANAR

This node type provides the triplanar mapping feature in combination with mirror reflections from everything around on its surface.



- **Diffuse Color:** This attribute defines the base color and thereby the main characteristic of the material. The slider enables changing the brightness; a click on the color field on the right opens the color chooser. Assigning a texture to the diffuse color, projects it onto the surface. The look representation is a combination of the defined color and the assigned texture.
- **Specular Color:** Sets the material's color for surfaces specular reflections. The slider enables changing the brightness; a click on the color field on the right opens the color chooser. Assigning a texture to the glossy channel defines areas in which different gloss intensities appear with help of a texture. The glossy color depends finally on both - the defined color and the possibly assigned texture file.
- **Reflectivity:** Controls the intensity of reflection on the surface. The higher the value the more the influence from environment and objects around.
- **Bump:** Bump mapping enables the creation of structure to the materials surface. The Bump slider controls the height of that effect. A higher value results in more depth structure. If a texture is assigned to the bump map channel, it will be used as a pattern figure on surface illustration. If no texture is assigned, a default noise map will be used instead; Structure size affects then scale.

CHROME

The Chrome material node type should be used for all kinds of chromic and metallic materials. When more control about scale and orientation of the surface structure is required, it is recommended to use brushed metal instead. A lot of metal type presets are available within the properties dialogue.



- **Metal Type:** High reflective chrome material, aluminum, amorphous carbon, silver, gold, cobalt, copper, chromium, lithium, mercury, nickel, potassium, platinum, iridium, silicon, amorphous silicon, sodium, rhodium, tungsten, vanadium and iron.
- **Reflection Color:** The higher the brightness the higher the reflection on the surface. Black means no reflection; white gives full reflection. A click on the color field on the right opens the color chooser; when the chrome reflection is colored, reflected objects will also be colored.
- **Roughness:** The roughness parameter controls light refractions on top of the surface. The higher the value the rougher the microscopic structure on top of the surface and the more blurred are the reflections.

BRUSHED METAL

The brushed metal material node type is able to simulate any kind of metal; it gives full control about the scale and orientation of the surface structure. A lot of metal type presets are available within the properties dialogue.



- **Metal Type:** Custom reflectivity, aluminum, amorphous carbon, silver, gold, cobalt, copper, chromium, lithium, mercury, nickel, potassium, platinum, iridium, silicon, amorphous silicon, sodium, rhodium, tungsten, vanadium and iron.
- **Glossy Color:** The higher the brightness the higher the reflection on the surface. Black means no reflection; white gives full reflection. A click on the color field on the right opens the color chooser; when the glossy reflection is colored, reflected objects will also be colored.
- **Brush Mapping:** This Property setting belongs to the brush orientation; planar, radial and triplanar options are available to generate the desired surface structure.
- **Roughness UV:** The roughness parameter controls light refractions on top of the surface. The higher the value the rougher the microscopic structure on top of the surface and the more blurred are the reflections. Different values for horizontal and vertical roughness provide every kind of refraction behavior that is well known from metallic surfaces.

- **Size UV:** Affects scale and direction of the surface structure when no texture is assigned to the bump map channel.
-
- **Bump:** Bump mapping enables the creation of structure to the materials surface. The Bump slider controls the height of that effect. A higher value results in more depth structure. If a texture is assigned to the bump map channel, it will be used as a pattern figure on surface illustration. If no texture is assigned, the structure results from property setting Size U and Size V.

UNICOLOR CARPAINT

Generates a single-colored car lacquer material with customizable coating effect on the top of the surface.



- **Base Color:** This attribute defines the basic color and thereby the main characteristic of the material. The slider enables changing the brightness; a click on the color field on the right opens the color chooser.
- **Clear Coat Color:** Changing the brightness relays to the reflection intensity of the clear coat effect. It possibly adds a color to the glossy effect of the coated surface.

METALLIC CARPAINT

A metallic carpaint material got additionally small particles made of metal (flakes) on top of its lacquer layer. Those particles increase the brightness within the angle of incidence. Color and size of flakes is customizable.



- **Base Color:** This attribute defines the basic color and thereby the main characteristic of the material. The slider enables changing the brightness; a click on the color field on the right opens the color chooser.
- **Flake Color:** The setting defines the color of the metallic particles on top of the lacquer layer.
- **Clear Coat Color:** Changing the brightness relays to the reflection intensity of the clear coat effect. It possibly adds a color to the glossy effect of the coated surface. The checkbox below enables to deactivate the coating effect.
- **Roughness:** The roughness parameter controls light refractions on top of the surface. The higher the value the rougher the microscopic structure on top of the surface and the more blurred are the reflections.

- **Reflectivity:** Controls the intensity of reflection on the surface. The higher the value the more the influence from environment and objects around.
- **Flake Size:** Belongs to the size of the metallic particles on top of the lacquer layer.

FLIPFLOP CARPAINT

This kind of carpaint material provides two layers of flakes on top of the base color. Its appearance depends extremely on the viewing angle between surface and observer. The effect is usually known from show cars and toy cars.



- **Base Color:** This attribute defines the basic color. The slider enables changing the brightness; a click on the color field on the right opens the color chooser.
- **Flake One Color:** The setting defines the color of the metallic particles on top of the lacquer layer.
- **Flake Two Color:** The setting defines the color of the metallic particles on the second layer of flakes.
- **Clear Coat Color:** Changing the brightness relays to the reflection intensity of the clear coat effect. It possibly adds a color to the glossy effect of the coated surface.
- **Roughness:** The roughness parameter controls light refractions on top of the surface. The higher the value, the more rough the microscopic structure on top of the surface and the more diffuse the reflections.
- **Reflectivity:** Controls the intensity of reflection on the surface. The higher the value the more the influence from environment and objects around.
- **Flake Size:** Belongs to the size of the metallic particles on top of the lacquer layer.

GLASS

Glass material is used for all different kinds of transparent materials like e.g. glass, acrylic glass, diamond and so on. It provides furthermore the ability to simulate liquids. Presets help on quick setup.

- **Medium:** Presets for all kinds of transparent materials and liquids.

- **Transparency:** Changes the level of transparency. A click onto the color field on the right opens the color chooser; it enables changing the base color of the glass material.
- **Specular Color:** Sets the material’s color for surfaces glossy reflections. The slider enables changing the brightness; a click on the color field on the right opens the color chooser.
- **Reflectivity:** Controls the intensity of reflection on the surface. The higher the value the more the influence from environment and objects around.
- **Roughness:** The roughness parameter controls light refractions on top of the surface. The higher the value, the more rough the microscopic structure on top of the surface and the more diffuse the reflections.

CARBON / CARBON 2D

Carbon is a fiber material with typical pattern and coating on the top. It is often used to decrease the weight of sport vehicles to the minimum.



Carbon is a triplanar shader; Carbon 2D uses the UV layout of an object.

- **Diffuse Color:** This attribute defines the base color of the material. The slider enables changing the brightness; a click on the color field on the right opens the color chooser.
- **Glossy Color:** Sets the material’s color for surfaces glossy reflections. The slider enables changing the brightness; a click on the color field on the right opens the color chooser.
- **Clear Coat Color:** Changing the brightness relays to the reflection intensity of the clear coat effect. It possibly adds a color to the glossy effect of the coated surface. The checkbox below enables to deactivate the coating effect.
- **Roughness:** The roughness parameter controls light refractions on top of the surface. The higher the value, the more rough the microscopic structure on top of the surface and the more diffuse the reflections.
- **Reflectivity:** Controls the intensity of reflection on the surface. The higher the value the more the influence from environment and objects around.
- **Pattern:** All typical patterns are included within VRED.
- **Pattern Size:** Scales applied pattern.

TIRE

Tire material supports different textures for rim and profile within one node. Rubber shading rounds off whole thing.

- **Diffuse Color:** This attribute defines the base color. The slider enables changing the brightness; a click on the color field on the right opens the color chooser.
- **Glossy Color:** Sets the material's color for surfaces glossy reflections. The slider enables changing the brightness; a click on the color field on the right opens the color chooser.
- **Roughness:** The roughness parameter controls light refractions on top of the surface. The higher the value, the more rough the microscopic structure on top of the surface and the more diffuse the reflections.
- **Reflectivity:** Controls the intensity of reflection on the surface. The higher the value the more the influence from environment and objects around.
- **Bump:** Bump mapping enables the creation of structure to the materials surface. The Bump slider controls the height of that effect. A higher value results in more depth structure.
- **Textures:** Markings textures relating to rim; profile belongs to the pattern of the running surface.



VELVET

The velvet material mimics the reflection behavior of velvet by darkening the regions of an object where the surface points almost directly to the viewer and brightening its edges up (where the surface is viewed at grazing angles).

- **Diffuse Color:** This attribute defines the base color. The slider enables changing the brightness; a click on the color field on the right opens the color chooser.
- **Glossy Color:** Sets the material's color for surfaces reflections. The slider enables changing the brightness of that reflections; a click on the color field on the right opens the color chooser.
- **Darkening:** Controls the intensity of the diffuse component. The default value is 1.0; everything above darkens the material, a value below lightens it up.



WOVEN CLOTH

Woven cloth material contains presets for all usual types of fabric. The properties dialogue enables casual users on setting up customized cloth material without using an external image-processing tool like e.g. Photoshop.

- **Cloth Preset:** Various fabric presets are shipped with VRED.
- **Diffuse Color:** This attribute defines the base color of the material. The slider enables changing the brightness; a click on the color field on the right opens the color chooser.
- **Yarn Colors:** Enables to customize the color of the yarns. The sliders changing the brightness; a click on the color field on the right opens the related color chooser.
- **Darkening:** Controls the intensity of the diffuse component. The default value is 1.0; everything above darkens the material, a value below lightens it up.
- **Texture Mode:** UV coordinates is used if the object already contains an UV mapping. Triplanar generates mapping new from scratch.
- **Pattern Size:** Adjusts the scale of the fabric pattern.



LINE CHROME

The Line Chrome Material is a special variant of the chrome materials for line geometries. This material does not work on triangle based or NURBS geometry.

- **Reflection Color:** the Specular Reflection color
- **Use Roughness:** Turns the material to be glossy instead of specular
- **Line Width:** The width of the line geometry



MEASURED

VRED supports the usage of measured materials. Those kinds of materials contain inter alia surface reflection information that considers reflection behavior from different viewing angles - it ensures an absolutely photo-realistic illustration within the render view.

- **Measurement:** Loads the BTF measurement file.
- **Exposure:** Controls the representation intensity of the measured material. A threshold about 1.0 gives the optimal result.



MEASURED CARPAINT

This material type aligns to the measured material described above. It additionally enables adjusting the refraction index of the scanned material within its properties.

- **Measurement:** Loads BTF measurement.
- **Exposure:** Controls the representation intensity of the measured material. A threshold about 1.0 gives the optimal result.
- **Fresnel IOR:** Controls the refraction index of the clear coat layer. When loading a BTF measurement it is initialized to the measured refraction index.



OFFICE COLOR SCIENCE (OCS) MATERIAL

The Office Color Science (OCS) Material allows to load BRDF files exported from CI- Navigator. The CI-Navigator is a software system by Office Color Science Co., Ltd. that calculates metallic and pearlescent paint formulations from measurements of given target paint samples. The BRDFs of those measurements and simulations can be exported by CI-Navigator in a VRED compatible BRDF file format (*.pbrdf).

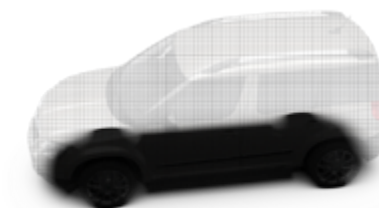
- **OCS BRDF:** Loads a BRDF file.
- **Exposure:** Controls the representation intensity of the measured material. A threshold about 1.0 gives the optimal result.
- **Clearcoat:** Checkbox provides the ability to disable coating.



SHADOW

Shadow material is transparent by default. It will only be shaded where pre-calculated ambient occlusion shadows take place.

- **Occlusion intensity:** Controls the intensity of shadowed areas.
- **Occlusion Color:** Sets the color for ambient occlusion shadows.
- **Shadow Color:** Sets the color for shadows from light sources (like point lights, etc).



MULTI PASS

Multi Pass materials can display multiple materials in different layers on top of each other. It enables the user to setup dirt, promotion labels and other kind of complex materials.

It can be created in two different ways; the first one works on drag and drop assignment within the render view. Right mouse button clicked on operation brings up a dialogue that provides the ability to select "Add as Multi Pass". Both materials - before assigned and dragged one - will be present within the new created material as different layers. The second creation method is done by the related create context menu entry. The node will be created and all materials that should be present within the layers are also assignable by drag and drop but this has here to be done within the material preview list itself.

Changing the drawing order of layers could be done by drag and drop or via context menu within the **Multipass Material** in „Material Name,, section under the icon bar and slider which will appear when a Multi Pass material is selected.



LAYERED

A layered material allows to stack multiple materials on top of each other. Unlike the multipass material the order of traversal is determined by the normal of the geometry. This allows it to use the layered material as a two-sided material.

Additionally glass materials are handled in a special way. If two glass materials are added to the layered material the index of refraction of these glass materials will be adjusted in a way that allows to use them in a glass-on-glass contact situations. If more than two glass materials are added, only the index of refraction of the first and last glass material will be considered, all other glass materials will get an Index of Refraction of 1.0 and will act as a color filter if material density is turned off.



Changing the drawing order of layers could be done by drag & drop or via context menu within the **Layers in „Material Name,,** section under the icon bar and slider which will appear when a Layered material is selected.

SWITCH

A switch material can contain several materials but only one of them is visible at the same time. The creation is done on the same ways already known from the creation of multipass or layered materials. Either on drag and drop operation within the render view - “Create Switch Material” has to be selected or on drag and drop within the material preview list. If several material variants should be assigned on creation they should be selected and then the context menu command “Create Switch from Selection” can be executd.

If a switch material is selected all the material variants are present within the “Switch Choice” section below the material preview list. A single left mouse button click on a child material opens its properties below. A double click with left mouse button on a child material activates it.

LIGHT PORTAL

A light portal is a guide for photons coming from the environment. The bounding box around all light portals in the scene will be used as a target for photon emission from an environment. This allows the user to limit the photons to certain areas of the scene instead of shooting many more photons.

During still frame antialiasing all light portal materials are set to invisible in raytracing mode.

- **Visibility:** Sets the opacity of the material. This is useful for placing the light portal

EDIT (SUB MENU)

The edit sub menu provides features to replicate materials or to adopt its settings to other existing materials.

- **Copy:** Copies the selected material to the system clipboard.
- **Paste:** Pastes the clipboard contained material into the preview list.
- **Paste Attributes:** Pastes all settings from clipboard contained material to the selected.
- **Duplicate:** Creates an independent copy of the selected material.
- **Delete:** Removes the selected material from the preview list when it’s not in use.

- **Lock/Unlock:** Avoids any change on the material. Property settings from locked materials are not accessible within the properties dialogue until the material has been unlocked again. The Name of locked materials is illustrated with italic style.

ASSET (SUB MENU)

Asset management module supports the user on the usage of external file references. These files are imported in a referenced way to the material module. Any change on an external file reference will be present within the scene after reloading affected file. Sub menu provides features to reload such file references.

- **Unlock to Edit:** Unlocks the referenced material to change settings
- **Find in Asset Manager:** Selects the corresponding directory within the file browse tree inside materials tab from the asset manager.
- **Reload from Asset Manager:** Reloads related material and adopt updates when changes had been done on it. Material can be choose from appearing window.
- **Remove Reference:** Removes all references from material and makes it unique. No asset manager link available anymore.

CONVERT (SUB MENU)

There are different classes of materials supported within VRED. Truelight materials (described above) provide a photorealistic representation; this kind of material is required for ambient occlusion calculation. Geometry that has been newly imported to VRED contains standard OpenGL Phong material that doesn’t support ambient occlusion calculation. The convert sub menu helps either to convert a kind of Truelight material into another kind of Truelight material or it helps to convert standard OpenGL Phong materials into Truelight Phong materials.

- **To Truelight Material:** Has the same behavior than using the “Type” drop down menu within the materials properties. It converts the selected Truelight material into another kind of Truelight material; all adoptable property settings will be adopted automatically.
- **All to Phong Truelight Material:** Converts all scene contained standard OpenGL Phong materials into Truelight Phong materials.

OTHER MATERIAL CONTEXT MENU COMMANDS (BESIDES SUB MENUS)

- **Load / Save Material(s)**
Enables the reuse of materials within other VRED projects. Save is available when materials have been selected before; the dialogue asks for a folder within the file system that will be used to store before selected materials in OSB file format. Every material will be selected as a single OSB file. Load has to be used to import a saved material into the material preview list.
- **Create Switch from Selection**
Creates a switch material node and applies selected materials to it.
- **Select Nodes (Hotkey Ctrl +N)**
Selects all geometrical objects that have the selected material assigned.
- **Add Nodes to Selection (Hotkey Ctrl + Shift + N)**
Adds all objects that have the selected material assigned to the current selection of geometrical objects.
- **Apply to Selected Nodes(Hotkey Ctrl + M)**
Applies selected material to the selected objects.

ICONS BAR AND SLIDER WITHIN MATERIAL MODULE



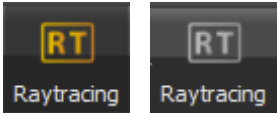
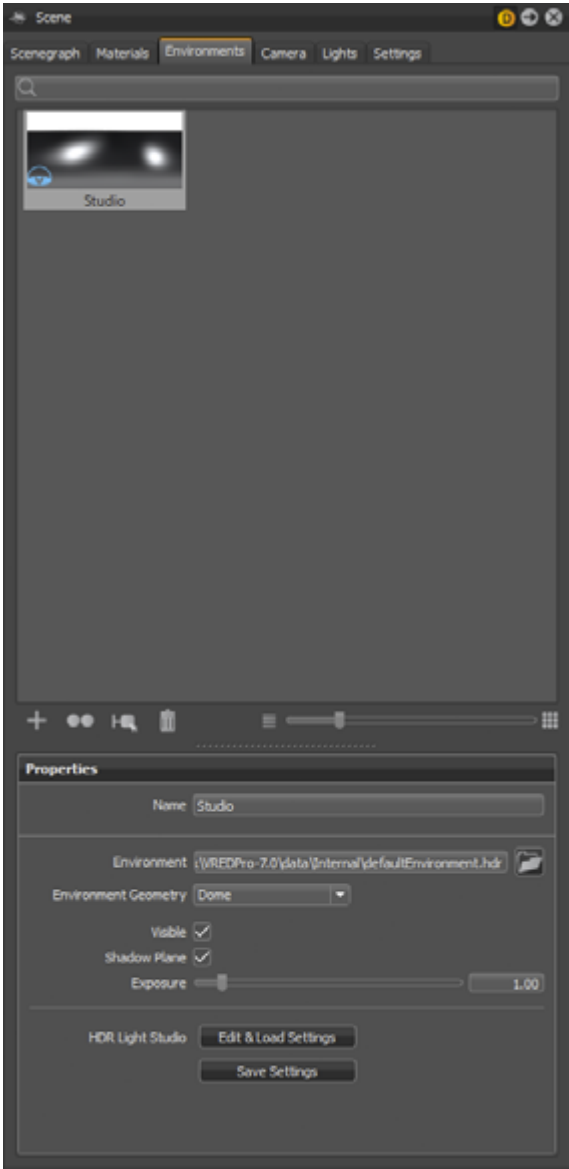
- Often required commands are accessible by an icon located directly below the material preview list.
- **Create**
Opens sub menu that contain all material node types VRED is able to create. Detail description for every material type is located [here](#).
 - **Duplicate**
Creates an independent copy of the selected material.
 - **Select Nodes**
Selects all geometrical objects that have the selected material assigned.
 - **Apply to Selected Nodes**
Applies selected material to the selected objects.
 - **Remove unused**
Deletes all materials from the preview list that are not applied to any object.
 - **Delete**
Removes the selected material from the preview list when it's not in use.
 - **Slider**
Scales the material preview representations inside the preview list.

MATERIAL PROPERTIES

Object property settings and texture assignment takes place here. All property descriptions are available within the [create](#) section above.

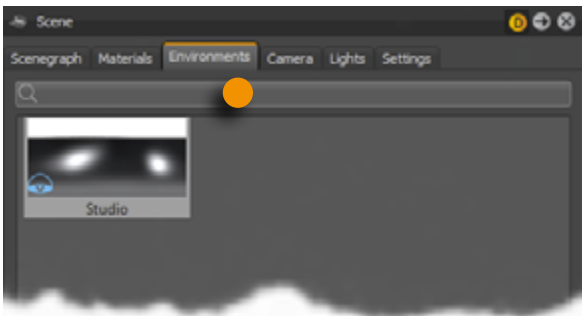
SCENE MODULE - ENVIRONMENTS TAB

An Environment is used for the surrounding of the scene. It contains a textured geometrical object that on the one hand is used for lighting the scene and on the other hand it avoids presenting an endless 3D space to the observer. A shadow plane on its ground stores pre-calculated ambient occlusion data and is also able to illustrate shadows on the floor when Raytracing mode is activated.



SEARCH FIELD

The search field provides live-search capabilities within the environment module. Entering one character hides all environments beginning with other characters. It is located on top of the module - below the module tabs. Only single search terms are supported.



ENVIRONMENT PREVIEW LIST

Every environment that is contained within the project file got its representation within the environment preview list.

Left mouse button selects an environment; right button opens the [context menu](#). Single left mouse button on a selected environment enables renaming. Double left mouse button sets the selected environment material to be used as current.

CONTEXT MENU

The context menu provides commands to create, edit or convert environments.

CREATE (SUB MENU)

VRED provides two different kinds of environment nodes. One gets its representation and lighting behavior from a texture file and the other one simulates the position of the sun depending on world time and location.

- **Environment**

An environment node provides a textured surrounding with shadow plane on its ground. Its texture affects the representation of all scene related materials. The creation dialogue asks for this texture. It generates the dome and shadow plane automatically.

- **Environment:** A click onto the folder icon on the right opens the file browse dialogue that enables assigning a texture. When a texture is assigned the path and filename are present in the field on the left.

- **Environment Geometry:** Selects the geometrical form for the current environment. Dome, sphere and cube shapes are available as presets; custom enables to load an external geometry file.

- **Visible:** Controls the visibility of the environment within the render view. A hidden environment but activated environment will furthermore influence all scene contained objects regarding its look and appearance.

- **Shadow Plane:** Checkbox to enable or disable the shadow plane on the ground.

- **Exposure:** Enables to control the influence about lighting and reflection from the environment node to any object within the scene. A threshold from 1.0 interprets the texture exactly like it is; a value below/above darkens/lightens all objects.
- **Skylight**

A skylight environment provides physical correct simulated lighting depending on world time and location.

 - **Location:** A click on the map adopts the position that has been set to the sunlight simulation. An orange point on top of the map indicates selection. Another possibility to define this location is given by the text field directly below the map. It requires a city name on live-search supported input. A yellow point on the map previews occurrence. Confirming input converts the yellow point to orange when the simulation has adopted the new location.
 - **Time / Date:** Provides the ability to set time and date of the simulation. Today changes the date to today; now changes day and time to now.
 - **Sky Model:** Choose between two different sky models: „Realistic“ and „Artistic“. The artistic sky model produces more reddish and colorful skies; especially for sunrise/sunsets.
 - **Exposure:** Enables to control the influence about lighting and reflection from the environment node to any object within the scene. A threshold from 1.0 interprets the texture exactly like it is; a value below/above darkens/lightens all objects.
 - **Sky Turbidity:** The lower the value the more clear blue is the sky. An increased threshold adds dust to the sky.
 - **Sun Scale:** Sunlight generated shadows appear with hard edges near to the object that casts it. The more the distance from the object the more soft are the shadow’s edges. Reducing sun scale extends the distance on that shadows appear hard edged.
 - **Ground color:** Slider changes the brightness from ground surface. A click onto the color field on the right opens the color chooser; it enables to define a custom color.

EDIT (SUB MENU)

The edit sub menu provides features to duplicate or delete an environment material.

- **Duplicate**

Creates an independent copy of the selected material.

- **Delete**

Removes the selected material from the preview list when it’s not in use.

OTHER MATERIAL CONTEXT MENU COMMANDS (BESIDES SUB MENUS)

- **Convert to Environment/Skylight**

This entry depends on the type of environment material that is selected on opening the context menu. If a skylight is selected it offers to convert it to an environment and vice versa.
- **Select Environment node**

Selects the corresponding environment shape that has related material assigned.
- **Set**

Sets the selected environment material to be used as current.

ICONS BAR AND SLIDER WITHIN ENVIRONMENT MODULE



Often required commands are accessible by an icon located directly below the environments preview list.

- **Create**

Opens sub menu that provide the ability to create either an [environment](#) or a [skylight](#) material.
- **Duplicate**

Creates an independent copy of the selected material.
- **Select Environment Node**

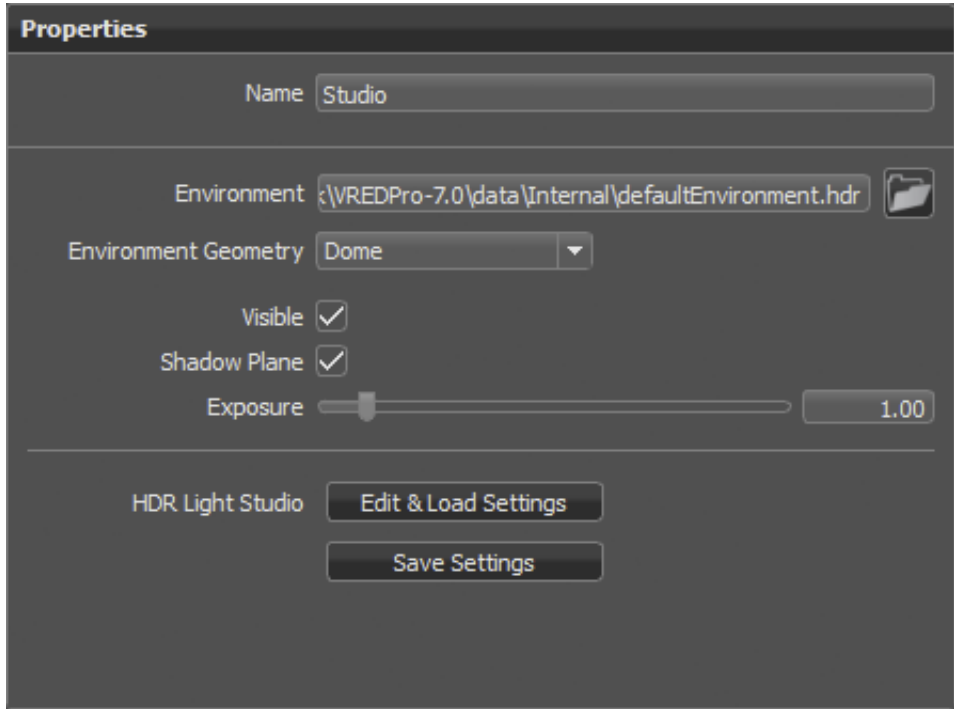
Selects the corresponding environment shape that has related material assigned.
- **Delete**

Removes the selected material from the preview list when it’s not in use.

- Slider**
Scales the material preview representations inside the preview list.

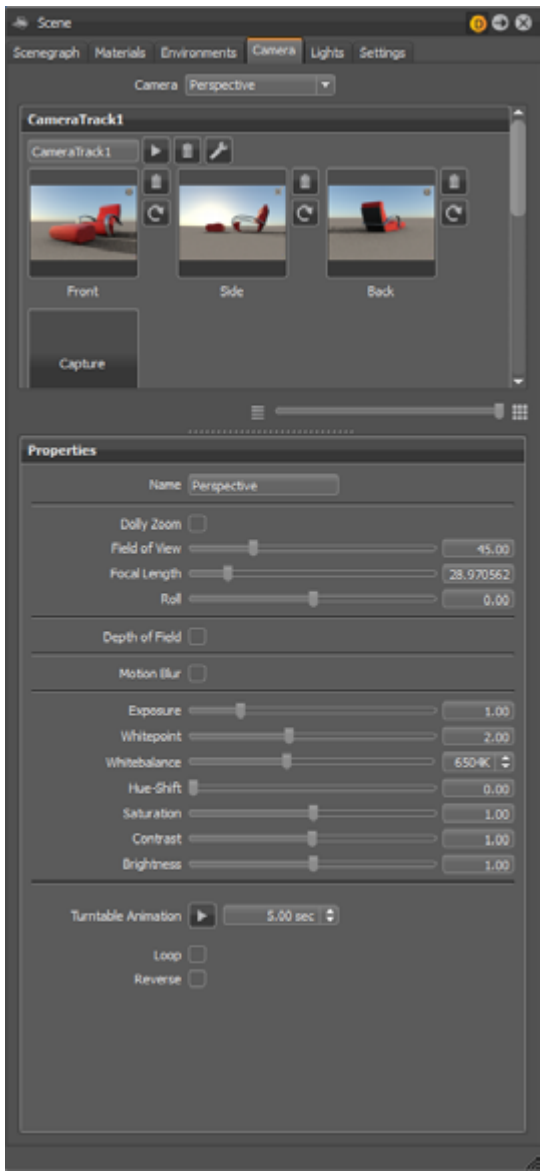
ENVIRONMENTS PROPERTIES

All environment property settings take place here. Detailed descriptions are available within the create section above.



SCENE MODULE - CAMERA TAB

The Camera Editor from simple UI makes all camera related property settings accessible and in addition to that it supports on creation of viewpoints and track animations. To keep simple UI clear advanced features like lens attributes, clipping and so on are furthermore exclusive accessible from the standard UI.

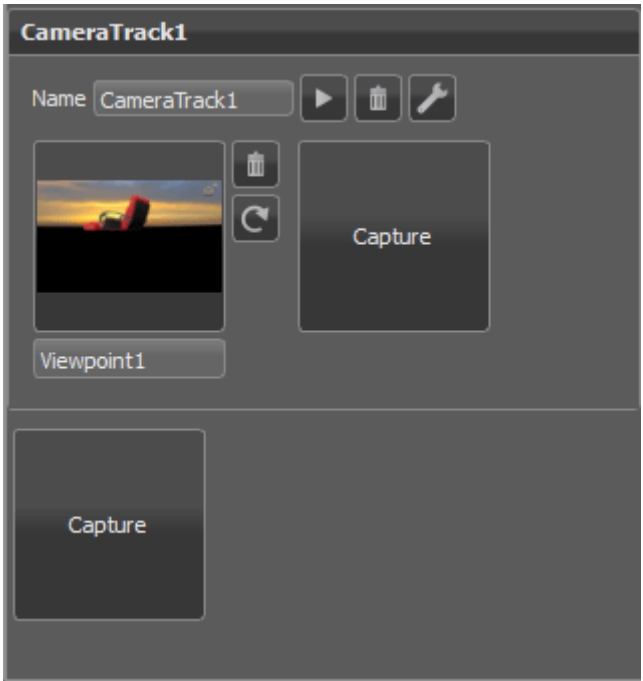


CAMERA DROP-DOWN MENU

All settings configured within that module affect the camera that is selected within the drop down menu on top of the module. All scene contained perspective cameras are available here.

CAMERA TRACKS / CAPTURE

Viewpoints and settings for the animation interpolation in between are stored within the camera track section; every camera got its own track. A double click on a track name collapses or expands it.



A viewpoint is easily created by a single left mouse click on the “Capture” button. The current position and orientation of the active camera are stored within it. If no camera track already exist in the moment of the viewpoint creation it will be generated automatically. A thumbnail image helps to distinguish different viewpoints at a glance.

For the creation of further viewpoints it is either possible to use the “Capture” button inside the camera track, that appends it to the current track; or by the usage of the “Capture” button below the camera tracks, that creates a new track and adds the viewpoint to it.

Both names - the name of the camera track and the name of the viewpoint are adjustable by the related input fields.

Single left mouse click on a viewpoint makes the current camera adopting its position and orientation from the viewpoint. Drag and drop enables to rearrange existing viewpoints. Right mouse click on a viewpoint opens its context menu.

CONTEXT MENU FROM VIEWPOINTS

- **Recapture**

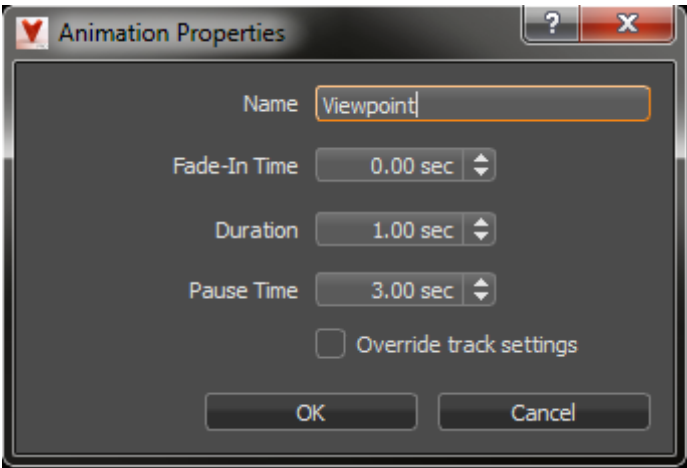
Overwrites viewpoint with current position and orientation from render view's camera. An icon right besides the viewpoint thumbnail provides quick access to command.

- **Delete**

Removes the current viewpoint from the camera module. An icon right besides the viewpoint thumbnail provides quick access to command.

- **Animation Properties**

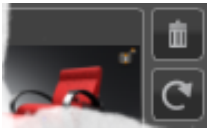
Opens a dialogue that enables to set the animation behavior settings of the camera when a viewpoint is selected.



- **Name:** Enables to rename the viewpoint.
- **Fade-In Time:** On replay a viewpoint possibly starts with fading from a complete black screen to the colored image. The threshold defines the time that is used for the moment of fading. A value from 0.00 disables feature.
- **Duration:** This value controls the time the camera animation uses to move from its current position to the one that is stored within the viewpoint. A duration value of 0.00 seconds gives a hard cut. The viewpoint duration doesn't affect the track duration.
- **Pause Time:** A moment that will be waited before camera movement to the related viewpoint is done.
- **Overwrite track settings:** Adjusted settings from viewpoint are adapted to the animation track properties on ok confirmation.

BUTTONS RIGHT BESIDES TO THE VIEWPOINT THUMBNAILS

These buttons are hidden on lower zoom levels than maximum.



- **Delete**

Removes viewpoint from the camera module.

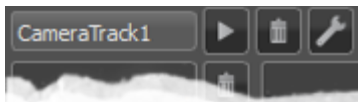
- **Recapture**

Overwrites viewpoint with current position and orientation from render view's camera.

BUTTONS RIGHT BESIDES TO THE TRACK TITLE

- **Play**

Plays (and stops on replay) current camera track within the render view.

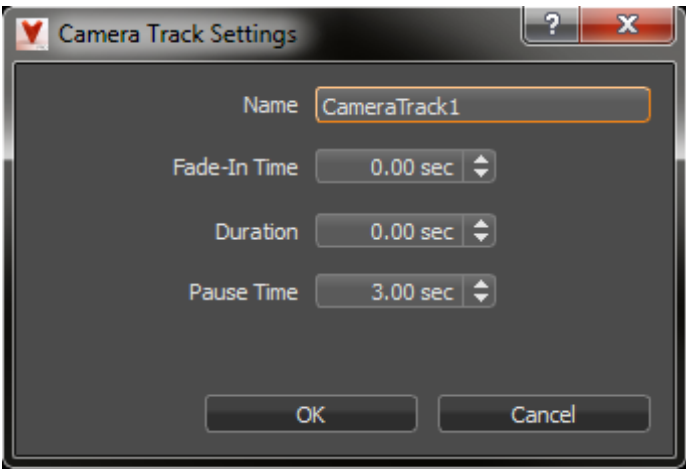


- **Delete**

Removes complete track and its related viewpoints from camera module.

- **Animation Properties**

Opens the following dialogue to set replay behavior settings for the camera track.



- **Name:** Enables to rename the camera track.

- **Fade-In Time:** On replay a viewpoint possibly starts with fading from a complete black screen to the colored image. The threshold defines the time that is used for the moment of fading. A value from 0.00 disables feature.
- **Duration:** This value controls the time the camera animation uses to move from one viewpoint to another. A duration value of 0.00 seconds corresponds to a hard cut; this means no animation between different viewpoints.
- **Pause Time:** Time the animation waits after it arrives at a viewpoint before it goes on to the next.

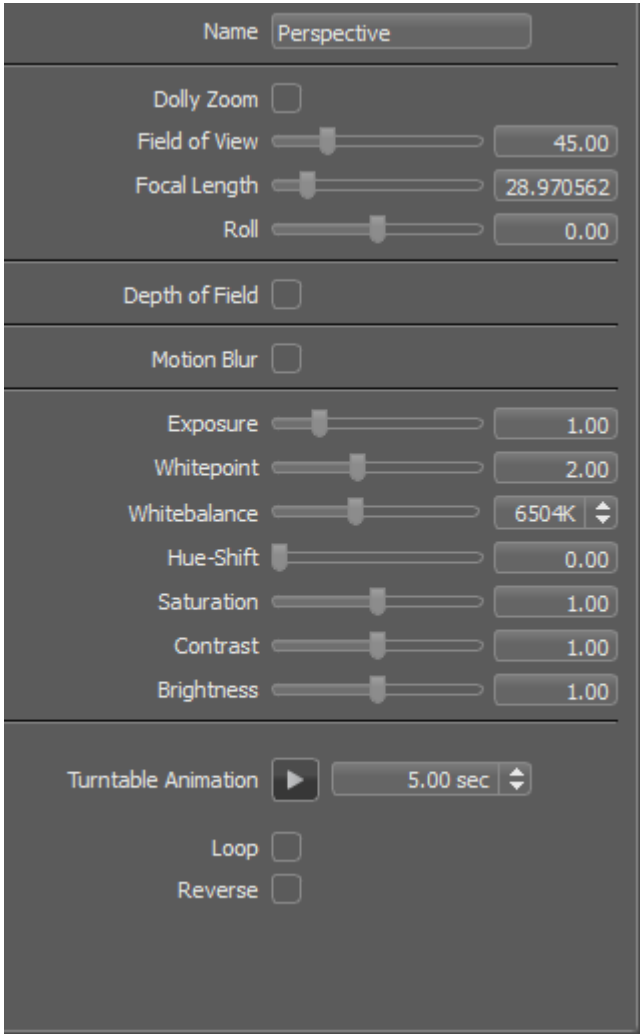
SLIDER WITHIN CAMERA MODULE

At the bottom of the Camera Track window there is a slider that gives the opportunity to zoom in and out of the preview thumbnails.

PROPERTIES

The property settings dialogue on the bottom of the module makes all customizable settings from the related viewpoint accessible.

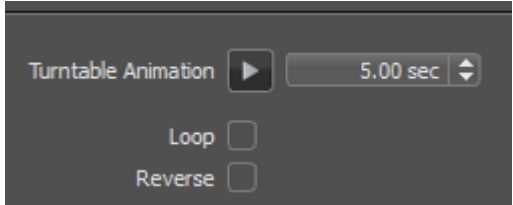
- **Name:** Enables to rename the current camera.
- **Dolly Zoom:** Checkbox belongs to the behavior that is given on changing “Field of View” and “Focal Length” below. This feature enabled belongs only to the current focused object within the render view (double right mouse click on objects surface). The effect changes the focal length and the field of view in combination with moving the camera; this makes the observer feel that the focused object stays still in the center of interest and everything around it moves.



- **Field of View:** This function sets the camera’s angle of view and is measured in degrees. The field of view angle is directly interrelated with the focal length.
- **Focal Length:** This function affects zooming – it sets the focal length, measured in millimeters. The focal length is directly interrelated with the field of view.
- **Roll:** This option adjusts the camera rotation angle (degrees) about its line of sight.
- **Depth of Field:** The depth of Field simulates blurring of everything that is in front or in the background of the focused object. It requires defining the focal aperture (F-Stop) that is used for the calculation.
- **Motion Blur:** Motion blur is the streaking of an object that appears because of rapid movement or long exposure. The shutter setting controls the strength of the effect.
- **Exposure:** This option affects the illumination behavior from the environment texture on the usage of the related camera. A threshold from 1.0 interprets the HDR environment texture exactly like given within its environmental property settings. A value below/above darkens/lightens the illustration from that camera.
- **Whitepoint:** The whitepoint defines the tone above everything should be shown as white.
- **Whitebalance:** This option adjusts the color temperature of the image. It is measured in Kelvin. 6500 Kelvin is used as standard for video productions.
- **Hue-Shift:** This option shifts all colors uniformly towards a color shade.
- **Saturation:** This option sets the intensity of the color values.
- **Contrast:** This option separates the light and dark color values further from each other.
- **Brightness:** This option increases or decreases lightness for the scene.

TURNTABLE ANIMATION

Creates an animation that rotates the camera about 360° counterclockwise around the perpendicular axis of the focused object. Replay starts on pressing the “Play”-button. The duration of the 360° rotation can be set in the field next to the play button.



When “**Loop**” is checked, the animation will continue until the user stops it. “**Reverse**” plays animation in a clockwise rotation.

SCENE MODULE - LIGHTS TAB

The Lights tab from Scene module lists all scene contained light sources, enables its creation and makes property settings accessible. Group nodes and a tree structure that’s alike but independent from the scenegraph help to keep the overview.



Head light active / inactive



Directional light active / inactive



Point light active / inactive



Spot light active / inactive



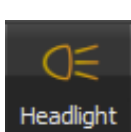
Spherical light active / inactive



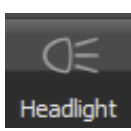
Disk light active / inactive



Rectangular light active / inactive



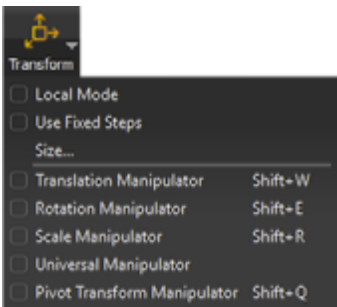
Menu bar icon Headlight active



Menu bar icon Headlight inactive

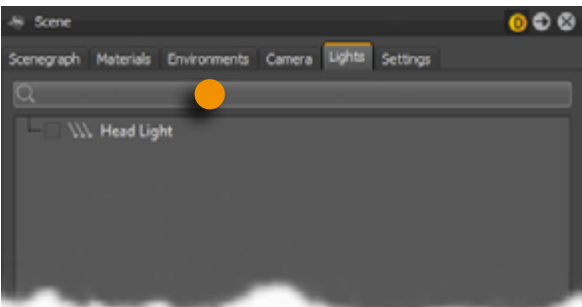
One of the light sources is generated by default and can’t be created afterwards – the headlight. Its orientation aligns to the active camera view like an on-camera light source. The kind of light source type can be chosen within its properties dialogue.

The transformation gizmo’s accessible by the related icon from the main icons bar enables to transform and rotate the light source by mouse interaction within the render view. Numerical input to change the orientation or position could be addressed within the properties settings on scenegraph tab from simple UI’s scene module.



SEARCH FIELD

The search field provides live-search capabilities within the lights module. Entering one character hides all light sources beginning with other characters. It is located on top of the module - below the module tabs. Only single search terms are supported.



SCENE LIGHTS

Navigation within the scene lights tree is equal to the scene module. The plus in front of a group node or a double left mouse button onto it, fold or unfold the current level of hierarchy; rearrangement is done by drag and drop. A light sources can be switched on/off by the checkbox in front of the node.

Left mouse button selects a light source; right button opens the [context menu](#). Single left mouse button on a selected light source enables renaming. A double left mouse button click selects corresponding node within the scenegraph.

CONTEXT MENU

Like already known from other modules the context menu provides commands to create, edit, save or load light sources.

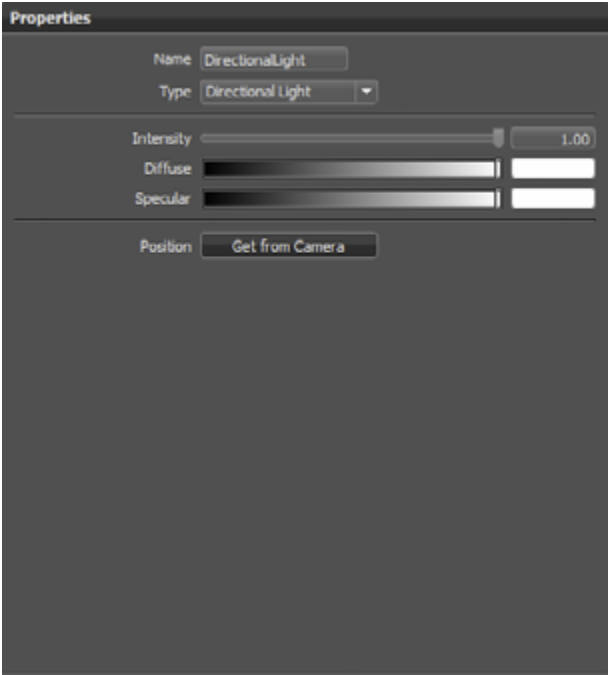
CREATE (SUB MENU)

VRED provides several kinds of light sources that help on lighting the scene. Advanced settings like realtime shadow intensity and its map resolution are available within the lights editor from standard UI. The name and type of a light source is adjustable on top of its properties dialogue.

• Directional Light

Light rays from directional light sources are parallel like sunlight. A Directional light represents a distant light source and has no position only a direction that affected how the scene will be illuminated. Directional lights always create hard shadows.

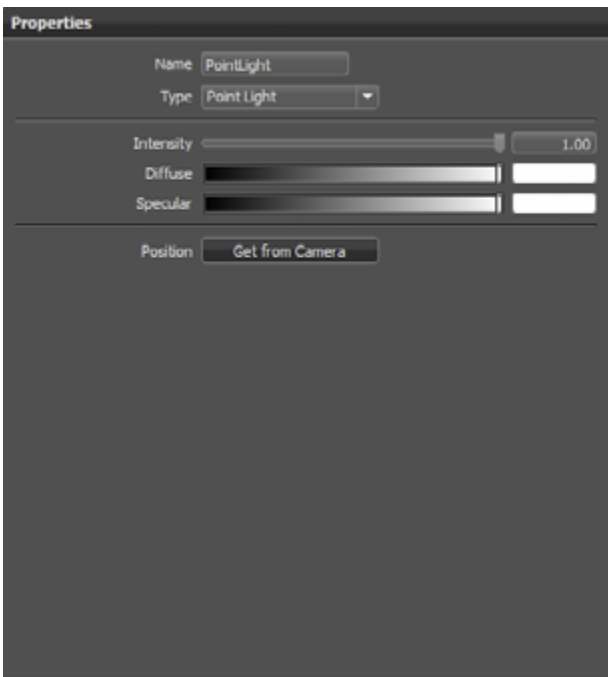
- **Intensity:** Changes the light intensity; higher values result in brighter lighting.
- **Diffuse:** The diffuse color defines the color of light that is shown on illuminated objects diffuse surface reflection.
- **Specular:** Specular color is the color of the light that appears on shiny surfaces.



• Point Light

Point light rays start at a single point and emit radially. In Raytracing mode the point light generates a hard shadow in OpenGL a point light shows no shadow.

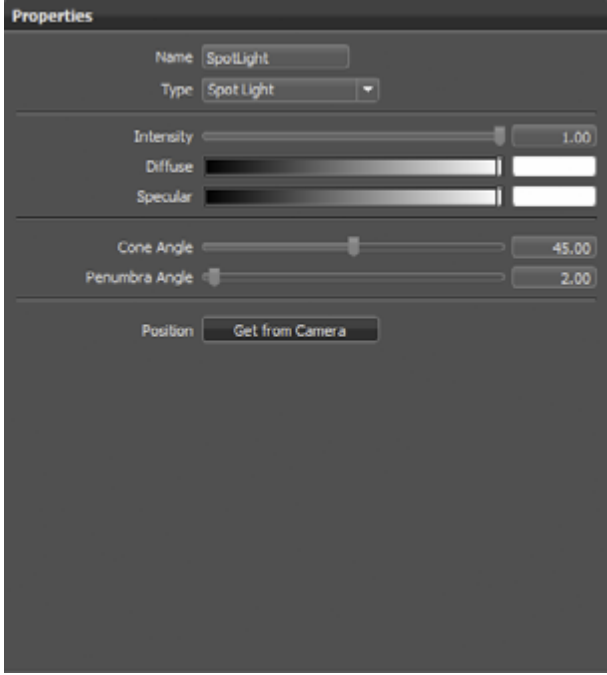
- **Intensity:** Changes the light intensity; higher values result in brighter lighting.
- **Diffuse:** The diffuse color defines the color of light that is shown on illuminated objects diffuse surface reflection.
- **Specular:** Specular color is the color of the light that appears on shiny surfaces.
- **Position:** "Get from camera" moves light source to the position of the active camera.



• Spot Light

Spot light rays follow a beam cone. They start at a single point and spot in a circled area to the direction it is oriented. An area around the hotspot defined by the penumbra property setting is where the light falls off to dark. The spot light is often used to emphasize an object or a surface.

- **Intensity:** Changes the light intensity; higher values result in brighter lighting.
- **Diffuse:** The diffuse color defines the color of light that is shown on illuminated objects diffuse surface reflection.
- **Specular:** Specular color is the color of the light that appears on shiny surfaces.
- **Cone / Penumbra Angle:** Cone angle controls the size of the spot; penumbra angle belongs to the falloff area that is added around the spot.

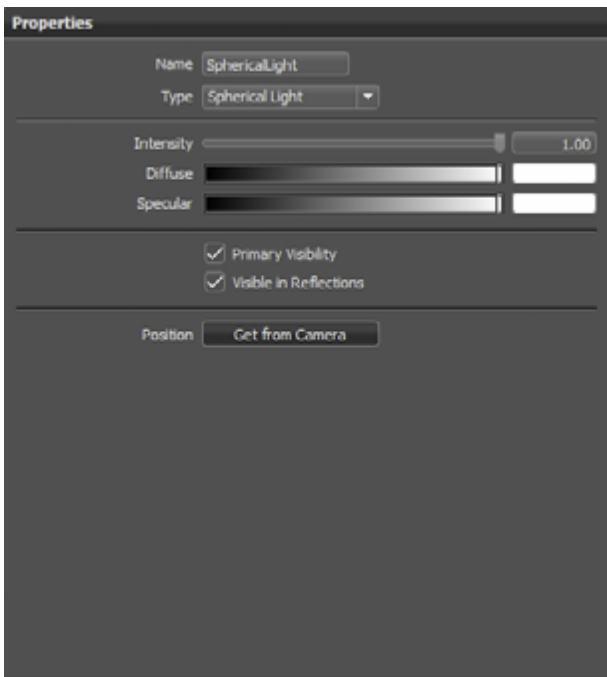


- **Position:** "Get from camera" moves light source to the position of the active camera.

• Spherical Light

Spherical light rays beam like from a glowing ball. Spherical light generates diffuse light and soft shadows. It provides a kind of indirect lighting and it is more atmospheric than a point light.

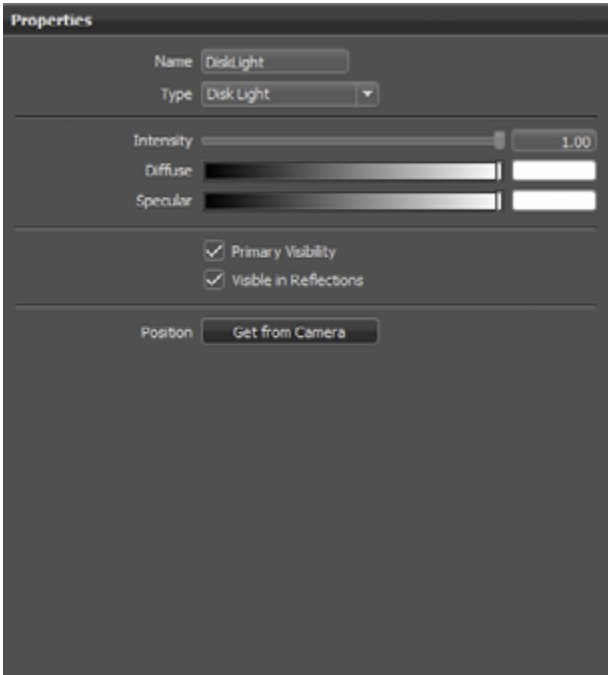
- **Intensity:** Changes the light intensity; higher values result in brighter lighting.
- **Diffuse:** The diffuse color defines the color of light that is shown on illuminated objects diffuse surface reflection.
- **Specular:** Specular color is the color of the light that appears on shiny surfaces.
- **Position:** "Get from camera" moves light source to the position of the active camera.



- **Disk Light / Rectangular Light**

Light rays from disk and rectangular light sources appear “like from a dropped ceiling” – either like from a circle (disk) or from a square (rectangular) shape form.

- **Intensity:** Changes the light intensity; higher values result in brighter lighting.
- **Diffuse:** The diffuse color defines the color of light that is shown on illuminated objects diffuse surface reflection.
- **Specular:** Specular color is the color of the light that appears on shiny surfaces.
- **Position:** “Get from camera” moves light source to the position of the active camera.



- **Group**

The group node enables to create a tree structure within the lights module that is independent from geometrical scenegraph tree. It helps to keep scene-contained light sources clear arranged.

EDIT (SUB MENU)

The edit sub menu provides features to rename, duplicate, delete or group selected light sources.

- **Rename**
Changes the name of the light source.
- **Duplicate**
Creates an independent copy of the selected light source.
- **Delete**
Removes the selected light source from the scene.
- **Group selection**
Creates a new group node within the light module and moves before selected light sources to it.

CONVERT TO (SUB MENU)

The “Convert To” sub menu provides features to change the light source type; this is an additional way to the possibility that’s contained within the light source properties.

OTHER LIGHT SOURCE CONTEXT MENU COMMANDS (BESIDES SUB MENUS)

- **Switch On / Switch Off / Toggle**
Switches a light source on or off.
- **Select Nodes**
Selects the corresponding light source representation within the scenegraph.
- **Select All / Deselect All / Invert selection**
Usual selection commands.
- **Save Selected Lights / Load**
Features that enable the reuse of light setups from other scenes.
- **Validate**
Validates all lights and updates all light sources within the scenegraph.

ICONS BAR FROM LIGHT MODULE



Often required commands are accessible by an icon located directly below the tree of light sources.

- **Create**
Opens sub menu that provide the ability to create any light source.
- **Duplicate**
Creates an independent copy of the selected light source.
- **Delete**
Removes the selected light source from the scene.

- **Toggle**
Switches the selected light source on or off.

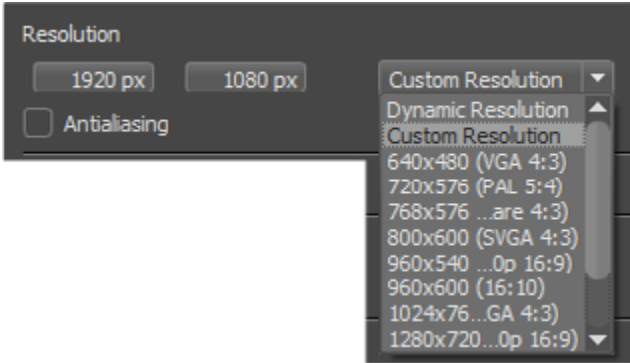
LIGHT SOURCES PROPERTIES

All light source property settings take place here. Detailed descriptions are available within the [create](#) section above.

SCENE MODULE - SETTINGS TAB

• Resolution

Changes the resolution from the render view. The final size on setting "Dynamic" depends on the window size from VRED, all docked modules and their dimensions. Presets help on quick setup for all kind of usual resolution like VGA, PAL, HD720, HD1080 and so on. Custom supports the user on setting up any size that is required.



• Antialiasing



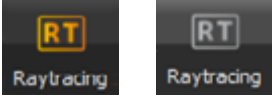
Antialiasing off



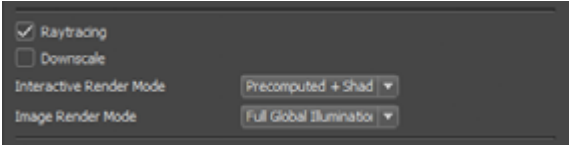
Antialiasing on

Computer screens are made of small pixel; this is why illustration of round objects or curved surfaces appears faceted at its edges. Antialiasing is a technique that makes the edges from rendered objects less pixelated. The checkbox enables/disables feature - it corresponds to the toggle functionality of the regarding button within the main icons bar. After its activation the calculation starts when the camera position won't be changed for more than a second (Still Frame AA default setting within preferences dialogue). The progress will be shown in a clockwise growing circle around the mouse pointer; if the circle is complete and closed the calculation is finished.

• Raytracing



Raytracing is a module that generates absolutely physical correct illustration. This means all light sources are sending rays to any point within its area of influence and the image generator considers reflections and refraction of every ray on its calculation. The checkbox enables/disables feature - it corresponds to the toggle functionality of the regarding button within the main icons bar. Fewer rays will be sent from the light sources on camera movement to enable smooth navigation within the render view. Enabling (Still Frame) Antialiasing affects not only smoothes the illustration of edges, it increases also the amount of rays and the number of reflections that are considered on image calculation. The more time calculation gets the less noise within the image.



• **Downscale:** Reduces the preview quality on interactive work Enables a smoother navigation within complex scenes. Different level presets help on feature usage.

• **Interactive Render Mode / Image Render Mode:** VRED has various illumination modes that are described below. Different settings for interactive rendering and still frame are available. This allows working in a precomputed mode for fast interaction and it allows switching to full global illumination on still frame rendering. Five modes are available:

• **CPU Rasterization:** This is a Raytracing mode that is generally comparable to the standard OpenGL rendering mode. This mode can be applied when an appropriate graphics card is not available.

• **Precomputed Illumination:** Adds pre-calculated ambient occlusion shadows to the rendering that is comparable to the standard OpenGL rendering mode.

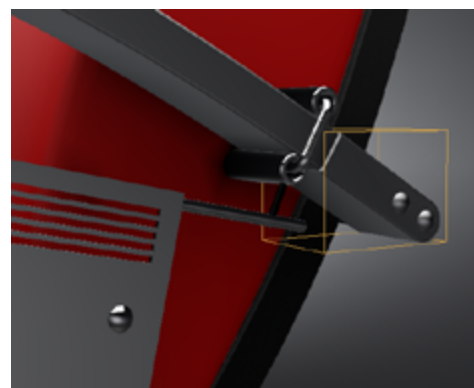
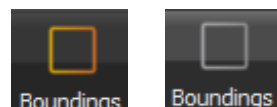
• **Precomputed + Shadows:** Uses image based lighting and indirect illumination from pre-calculation and combines it with realtime shadows.

• **Precomputed + IBL:** Uses pre-calculated indirect illumination in combination with image-based lighting from the current environment and shadows that are calculated in realtime.

• **Full Global Illumination:** Provides image-based lighting, full indirect illumination and shadows; everything generated in realtime.

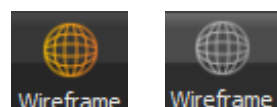
• Bounding Box

The bounding box is an orange and quadric wireframe object that frames the selection. Checkbox toggles its visibility within the render view; it corresponds to the icon within the main icons bar.



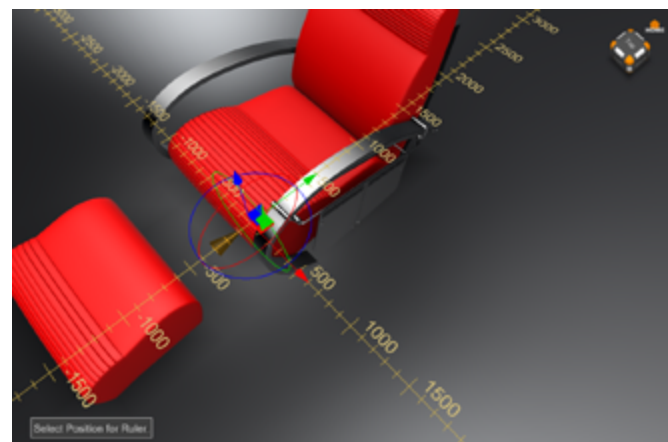
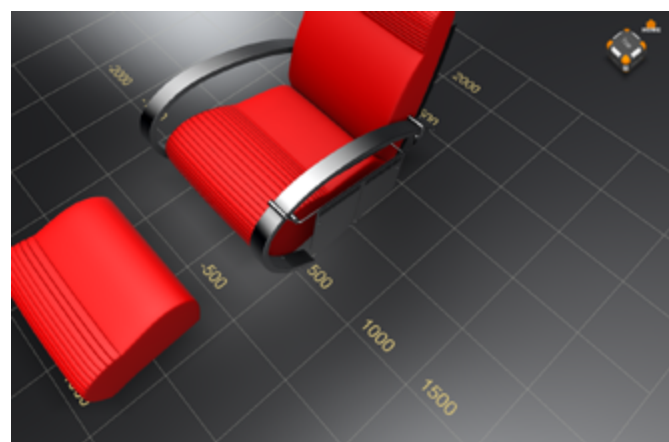
• Wireframe

Shows the polygonal mesh of the selected objects highlighted in orange color. The mesh will be shown additionally to the shaded illustration. Other objects can hide it until the regarding option “Always in Front” within preferences isn’t enabled. The checkbox corresponds to the icon within the main icons bar.



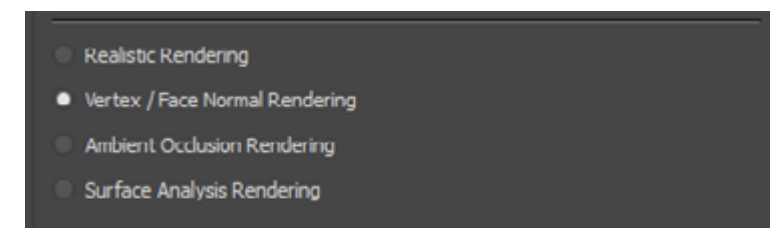
• Grid / Ruler

Checkbox toggles the visibility within the render view. Enabling gives a grid /axis on the floor that helps on estimating distances. The feature here corresponds to the icons within the main icons bar. The drop down button there helps on customization.



RENDER MODE

VRED supports different render modes that help on scene setup and data preparation.



• Realistic Rendering

Provides a colored and textured illustration within OpenGL or Raytracing. It enables everything that is required to generate photorealistic output.

• Vertex / Face Normal Rendering

Render mode that gives visual feedback about the orientation of vertex and face normals; it provides the capability to align inconsistent normal orientations very easily.

Four colors are used to indicate different normal orientation:

- **Green:** Face and vertex normals are consistent and point towards the camera.
- **Blue:** Face and vertex normals are consistent and point away from the camera.
- **Gold:** Face and vertex normals are inconsistent. Face normals point away from the camera; vertex normals point towards the camera.
- **Magenta:** Face and vertex normals are inconsistent. Face normals point towards the camera; vertex normals point away from the camera.



When the whole shape is affected, the best way to turn face or vertex normal orientation is to use the geometry editor from standard UI.

Inconsistent normals within one shape require pressing the ALT key in combination with right mouse button onto affected area. This aligns the orientation of face/vertex normals belonging to the orientation of the faces and vertices around it. If all normals are consistent on operation it enables to turn them completely.

• Ambient Occlusion Rendering

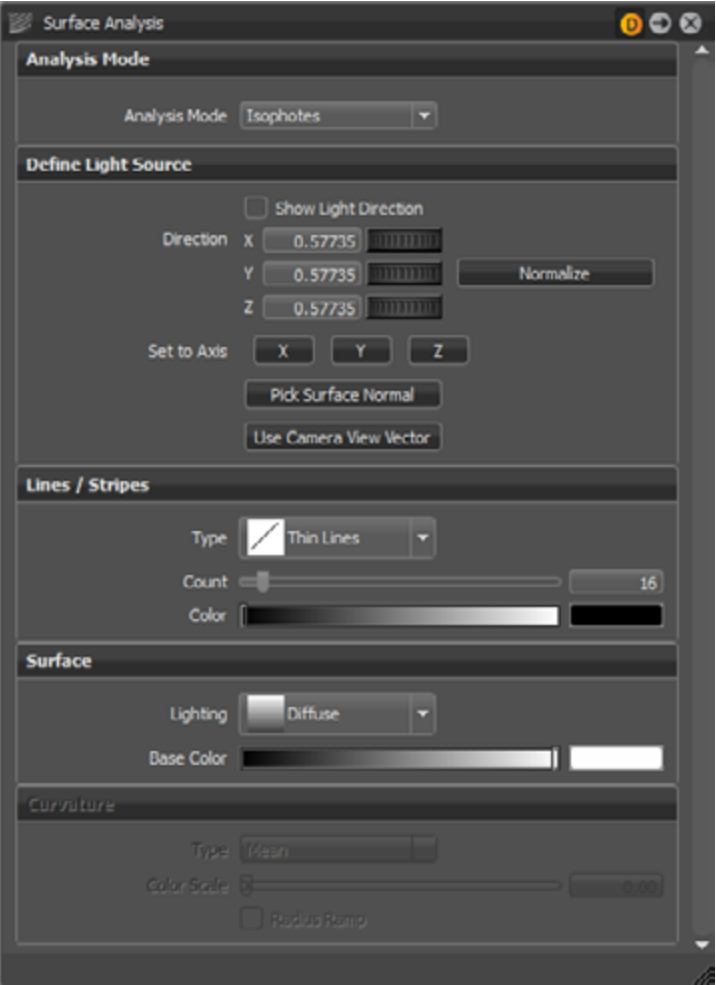
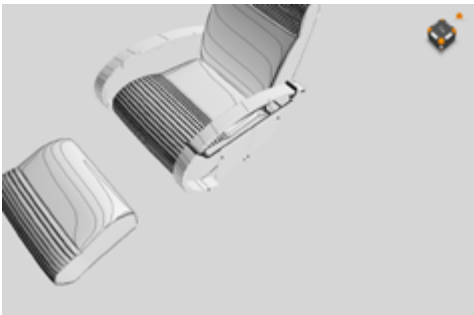
The Ambient Occlusion rendering mode gives a gray scale rendering, in which the pre-calculated ambient occlusion data is shown exclusively. This is useful to evaluate precomputed shadows.



• **Surface Analysis Rendering**

This is a rendering mode that helps on evaluating surfaces. The user can examine the continuity of different types of virtual lines that are projected onto the objects surfaces. Discontinuities can be detected very easily this way. This render mode supports polygonal as well as NURBS data.

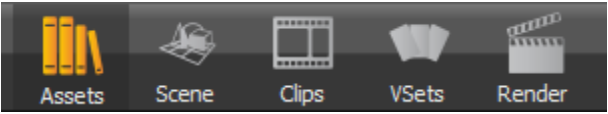
The modules window opens automatically on activation.



A detail description for all settings can be found within the module description from standard manual of VRED.

THE ASSET MANAGER MODULE

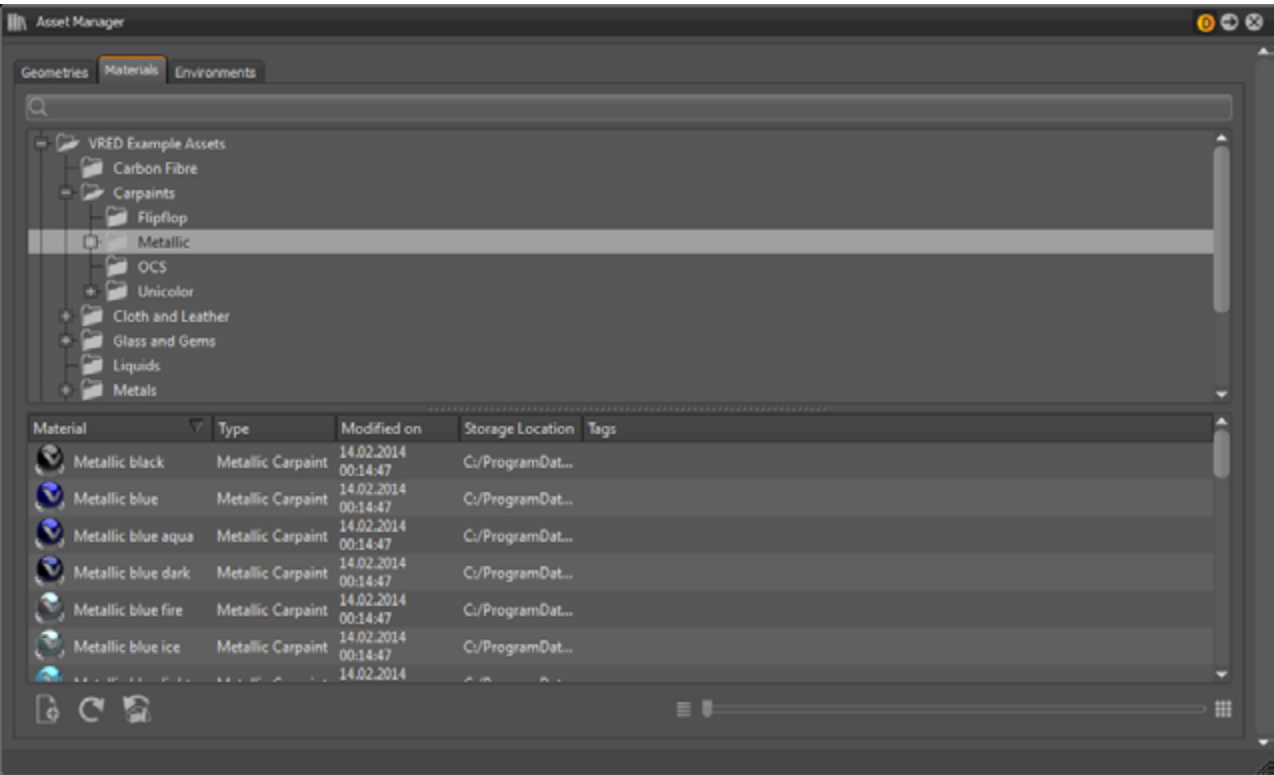
Its button from the Quick Access Bar can enable the Asset Manager module from simple UI:






The Asset Manager helps to manage items like geometries, environments and materials beyond a single project. Several global assets stored anywhere in the network can be accessed like from a local directory. That supports standardization throughout several projects or even across multiple departments within the company.

On the other hand, the user can have an individual asset locally stored as well. When the module is activated the first time, a path to the user’s local directory is already specified. As a result, the user can start establishing a library immediately.

The “Asset Manager” section from VRED’s preferences dialogue provides the ability to setup asset paths either for complete assets or for geometries, materials and environments individually.



All items within the Asset Manager module are externally referenced files from preset libraries. These items are called assets. A geometry asset contains geometry; material and environment assets contain their kind of content. After import from the asset manager the geometry asset is present within the scenegraph as a node or a sub structure. When an object is referenced to the Asset Manager its icon switches from the blue shape icon to an inverted green shape icon  / . The material and environment representation from referenced assets gets an additionally green indication in the lower left corner .

Preferences from such indicated assets are locked after its creation. A modify button that is located below the modules icons bar unlocks the asset and enables to edit it. A click on save adopts new settings to the references within the asset manager.



Any external change on a referenced asset will be adapted to the scene after reloading the affected asset. The context menu within the scenegraph provides features to [reload](#) such references

TABS

At the top of the Asset Manager Module window, three tabs are located to switch easily between managing assets for geometry, materials and environments. Every tab has the same structure: Tab with name, file search, library directory tree, list of components and a zoom slider.

SEARCH FIELD

The live search considers current tab; it requires selecting a folder within the library directory tree on that the search will be executed. An entered search string hides all assets that don’t contain the string.

LIBRARY DIRECTORY TREE

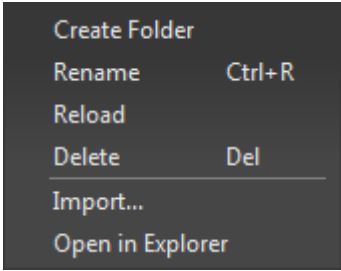
All in preferences configured asset paths appear here. A folder has to be selected to be able either to import an asset from there or to store an asset there.

CONTEXT MENU FROM LIBRARY DIRECTORY TREE

Right mouse click on the folder structure in the upper part of the module opens a context menu that is the same in every tab:

• **Create Folder**

Create Folder builds a new directory or subfolder into the selected library. This is a tab-specific functionality: The new folder will be created automatically into the subfolder of “Materials”, “Geometries” or “Environments” of the selected library. If the subfolder does not exist it will be created as well.



• **Rename**

Rename is the command to change the name of the selected subfolder.

• **Delete**

Removes the selected folder and all contained files.

• **Reload Directory**



Reloads the content or structure of the selected subfolder.

• **Reload all directories**

Reloads content from all asset manager paths.

• **Update Assets in Scene**



Updates all assets (geometry, materials and environments) that are contained within the scene.

• **Import...**



This command imports external files into the selected folder. One of the shortcut icons located at the bottom of the module makes same feature quick accessible.

• **Open in Explorer**

Opens the selected folder within the Windows Explorer.

• **Apply Materials To Scene by Name (folder context menu)**

- Materials in the scene are replaced by equally-named material assets from the selected folder in the Asset Manager.

If there are no matching material names nothing will happen.

Example: There is a material named “Red Plastic” in the scene, and a “Red Plastic” is also inside the selected material assets folder. Then the material “Red Plastic” in the scene will be replaced by the “Red Plastic” material from the Asset Manager.

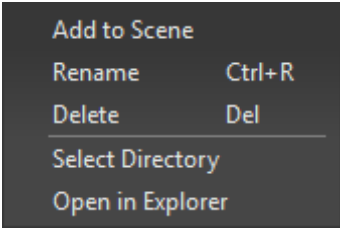
LIST OF COMPONENTS

The list of components contains thumbnails and detail information about the modification date, name, tags and so on.

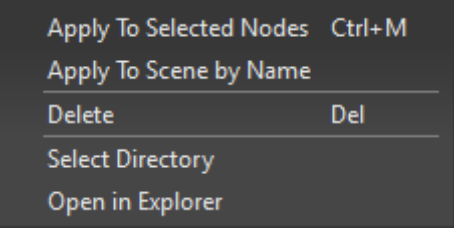
Left mouse button selects an asset; right button opens the [context menu](#). Drag and drop with left mouse button hold down has to be used to get components from the asset manager to the related module from simple UI.

CONTEXT MENU FROM LIBRARY DIRECTORY TREE

Right mouse click on one of the listed items at the lower part of the Asset Manager Module opens a context menu that is slightly different per tab.



For “Geometries” and “Environments”



For “Materials”

• **Add to Scene**

The selected asset will be added as a node directly below the current scene root. Drag and drop enables adding it to a custom location within the scenegraph.

• **Rename**

This is the same functionality like single left mouse click on a selected item. It enables renaming to change the name of a subfolder.

“Add to Scene” and “Rename” can only be found in the context menu for Geometries or Environments.

• **Apply to Selected Node**

This functionality uses the selected material on the previously marked node in the Scenegraph.

• **Apply to Scene by Name (item context menu)**

See above: Materials in the scene are replaced by the selected material assets if they are equally named.

Only the materials tab provides the features “Apply to Selected Node” and “Apply to Scene by Name”.

- **Delete**
Removes the selected item directly from library.

Undo for this action is not available.
- **Select Directory**
The corresponding folder of the asset’s location will be selected in the upper directory tree.
- **Open in Explorer**
Opens the selected folder within the Windows Explorer.

ICONS BAR FROM ASSET MODULE

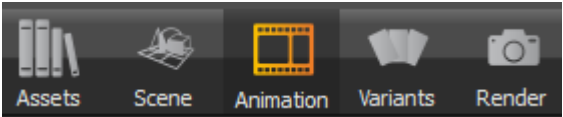


At the bottom of the module window are three buttons: Import, Reload and Check for new versions.

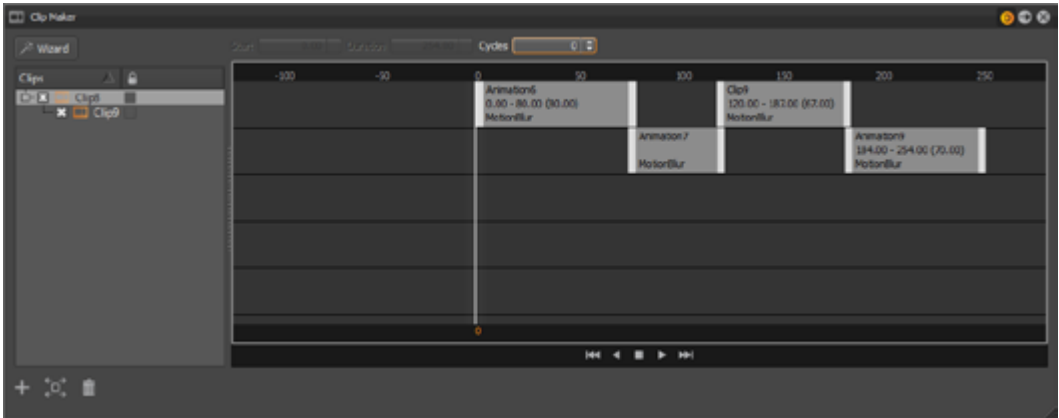
- **Import:** Opens file browse dialogue to import a new asset.
- **Reload Directory:** If there were changes on any external asset library a click adopts them.
- **Update Assets in Scene:** Updates all assets that are contained within the scene.
- **Slider:** Scales thumbnails.

THE ANIMATION MODULE

The animation module supports the user on managing and on the creation of animation sequences within VRED. It is accessible from its related button within the quick access bar.



After activation it comes up with the clip maker window that is tiled into two main areas. On the left side there is a list of all clips contained in the scene. When a clip is selected in the list view, it shows a block within the timeline on the right.



An animation wizard is located on top of the left side; it helps to create object and material animations very easily.

WIZARD

The animation wizard provides help in three different self-explaining modes.

- **Object**
- **Material**
- **Object and Material**

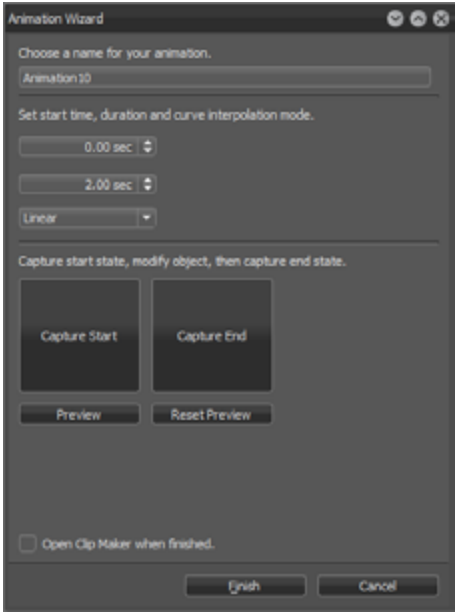
Before clicking on the “NEXT” button the appropriate node that should be animated has to be selected within the scenegraph or/ and the material module. If nothing is selected a warning appears.



On top the animation wizard’s main window, it’s possible to rename the animation.

Below the animation title the start time, duration and the interpolation mode could be set for the current animation.

- **Start time:** Sets the moment the animation starts on replay within the clip maker.
- **Duration:** Controls the total length of the animation.
- **Interpolation Mode:** Determines velocity on animation playback. **Linear** results in a constant animation; **Ease In/Out** reduces velocity on beginning or/and at the end of the animation.



The initial state of the animation is captured on clicking the “Capture start” button. A thumbnail image helps to distinguish the different states at a glance. After either the geometry has been moved or the material has been changed a click on “Capture End” stores the final state of the animation.

The preview button enables replaying the animation within the render view. Reset preview sets the animation to the initial state.

“Open Clip Manager when finished” checked opens the clip manager automatically on finish confirmation.

ANIMATION PARAMETERS

Numerical input fields on top of the timeline enable to adjust the moment of start, the length of the animation and how often is has to be repeated on replay. These settings are adopted on duplicated clips.

LIST VIEW

All animation clips (also camera animations from its module) are present within the list on the left side of the window. The checkbox in front of every item activates/deactivates the clip.

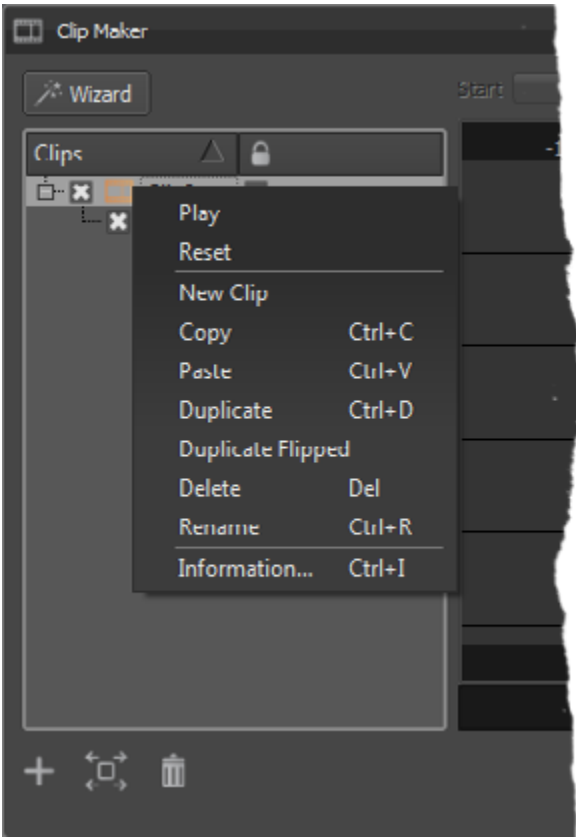
A single left mouse button click selects a clip and shows it within the timeline. A double click with left mouse button enables renaming. Drag and drop enables to rearrange clips within the list.

To lock settings against any change the checkbox right besides the clip name has to be checked.

CONTEXT MENU FROM LIST VIEW

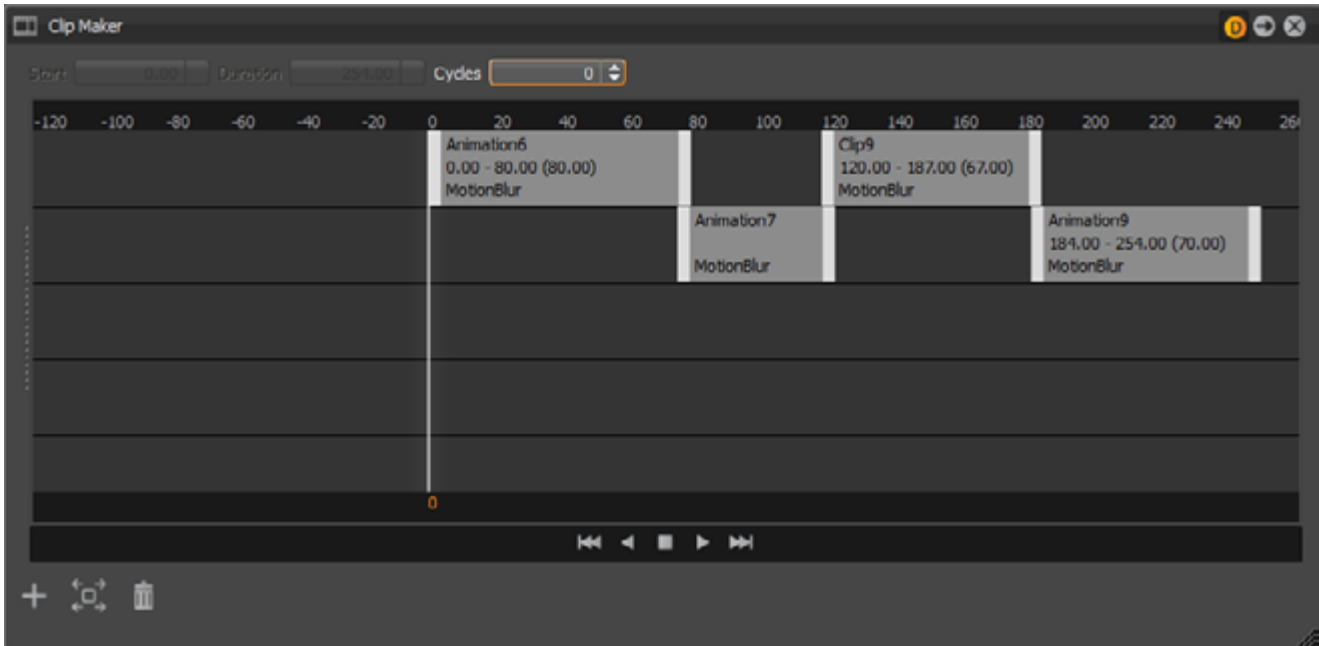
The context menu from the list view of the clips provides several commands like copy, paste, duplicate and so on:

- **Play**
Starts to replay the animation.
- **Reset**
Sets animation’s objects to its initial state.
- **New clip**
Executed on an existing clip it’s creates a new sub clip below the selection. If no clip is selected on execution the new clip appear on top level.
- **Copy**
Copies the selected clip to clipboard.
- **Paste**
Pastes clipboard contained clip into the desired location.
- **Duplicate**
Creates an independent copy of the clip.
- **Duplicate Flipped**
Same as duplicate in addition with reversing the animation clip.
- **Delete**
Removes the selected clip.
- **Rename**
Enables to rename the clip.
- **Information**
Provides further clip information.



TIMELINE VIEW

The timeline view provides several tracks for the arrangement of animation clips. Every block represents one animation sequence; they can be rearranged within the timeline by drag and drop. Areas at the beginning and at the end of every block enable to shift the related moment within the timeline. The mouse wheel enables to zoom in and out of the timeline.



CONTEXT MENU FROM TIMELINE VIEW

Right mouse click on a clip within the timeline opens its context menu:

- **Play**
Starts to replay the animation.
- **Reset**
Sets animation’s objects to its initial state.
- **Active**
Animation clips with checkbox enabled are considered on replay.
- **Lock**
To lock the animation’s settings and movements against any change the checkbox has to be enabled.
- **Flipped**
Reverses the related clip on animation replay.
- **Motion Blur**
Motion blur is the streaking of an object that appears because of rapid movement or long exposure. Feature is enabled by default.
- **Duplicate**
Generates an independent copy of the selected clip. It pastes the new clip into the track that is located below the track that contains the source clip. The moment when the animation starts and the duration are adopted by the numerical input fields on top of the module.
- **Duplicate Flipped**
Same behavior like duplicate but it reverses the animation clip on replay.
- **Delete**
Removes the related clip from the module.
- **Show source**
Shows associated animation curves in the curve editor.
- **Info**
Provides further clip information.

ICONS BAR WITHIN THE ANIMATION MODULE

At the lower left corner of the module’s window three buttons provide quick access to usual commands:

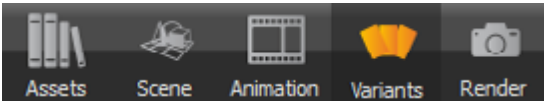


- **Plus**
Opens create menu that provides features to create a new clip, an animation or a variant. The creation and functionality of a variant itself is described within the [regarding chapter](#). The usage of a variant inside the animation module enables to switch to another state of a variant in an appropriate moment within the timeline. Only pre-configured variants from the variants module are selectable on creation.
- **Frame objects in window**
Maximizes the Zooms factor to show all animations from the before selected clip completely within the timeline view.
- **Delete**
Removes the before selected clip from the animation module.

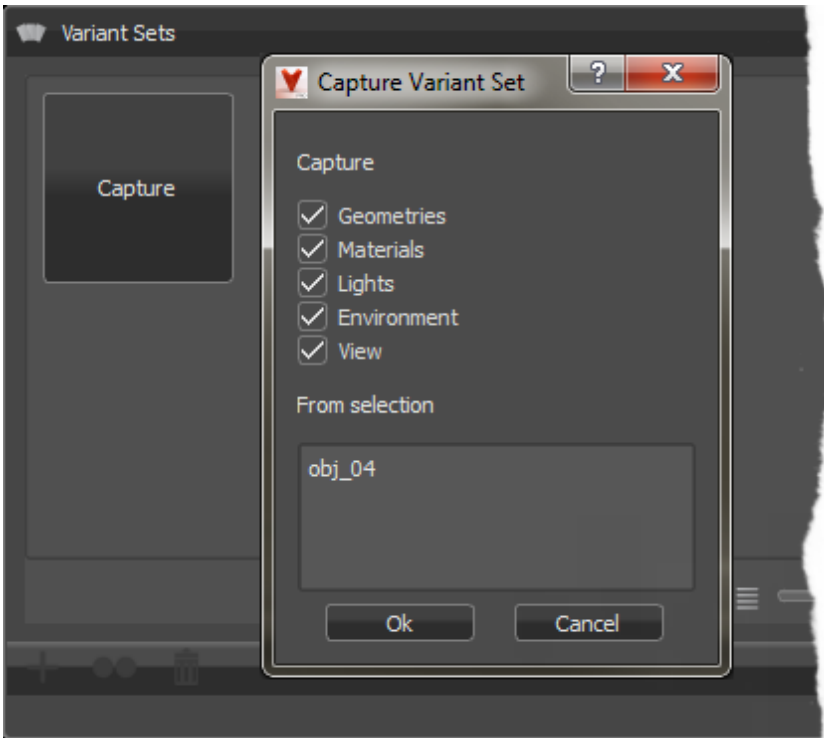
VARIANT SETS MODULE

This module makes different variants of e.g. object’s material, its visibility state, lights, environments and viewpoint accessible by one click.

The Variant Sets Module can be enabled via the button from the Quick Access Bar:



A variant is easily created by a single left mouse click on the “Capture” button. The following dialogue box enables the selection of what should be stored inside the variant.



VARIANT GROUPS

Variants could be grouped together to keep things clear. If no variant group already exist in the moment of the variant creation it will be generated automatically. A thumbnail image helps to distinguish the different variants at a glance. The slider located on the bottom provides the ability to zoom in or out of the thumbnails.

All scene contained variants are represented as a thumbnail image that helps to distinguish different variants at a glance. A single left mouse button click on the group title collapses or expands its representation. Drag and drop enable the rearrangement of variants within its group.

For the creation of further variants it is either possible to use the “Capture” button inside the variant group, that appends it to this group; or by the usage of the “Capture” button below the existing variant groups, that creates a new group and adds the current variant to it.



ICON BESIDES THE VARIANT GROUP TITLE

- **Delete**
Removes the current variant group and its contained variants from the module.

ICON BESIDES VARIANT THUMBNAILS

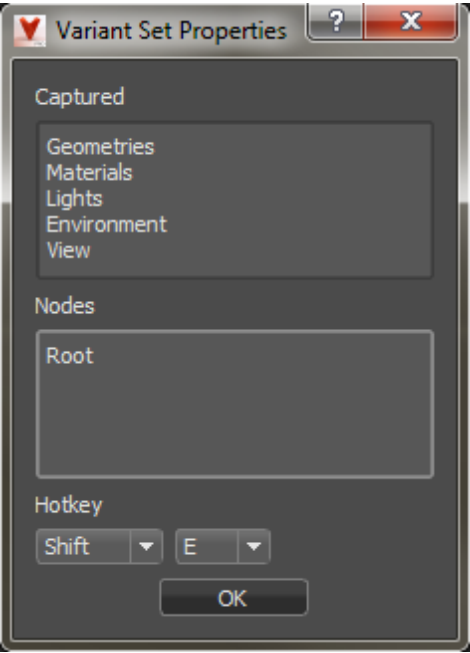
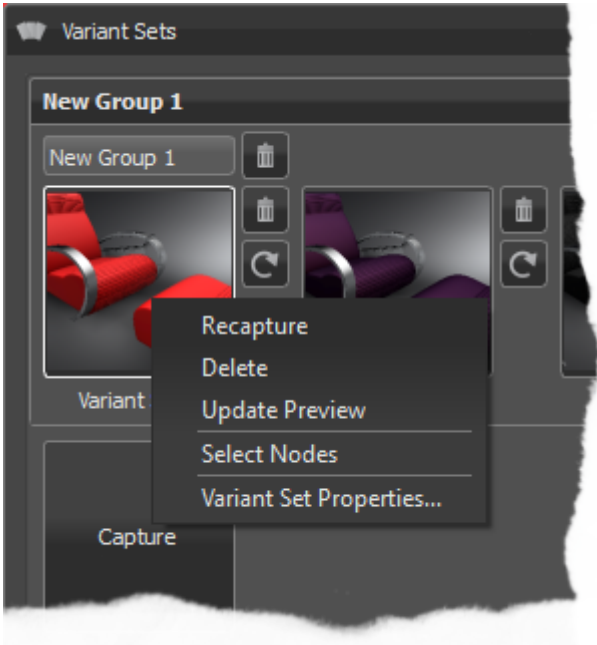
These buttons are hidden on lower zoom levels than maximum.

- **Delete**
Removes the current variant from its related variant group.
- **Recapture and overwrite current set**
Updates variant contained information with current settings.

CONTEXT MENU OF VARIANT THUMBNAILS

The context menu of the variants preview image provides usual commands for the work with variants.

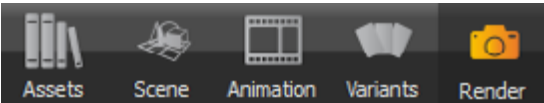
- **Recapture**
Updates variant contained information with current settings.
- **Delete**
Removes the current variant from group.
- **Update Preview**
Updates the thumbnail preview image.
- **Select Nodes**
Command selects all geometrical nodes within the scenegraph that relays to the variant.
- **Variant Set Properties**
Opens a sub menu that provides the ability to assign a hotkey to the related variant.



After recapturing the variant set the hotkey has to be set again!

RENDER MODULE

The render module allows to make all usual settings to create images or movies from all available sources. It is accessible from the quick access bar.



After its activation it comes up with the following window.

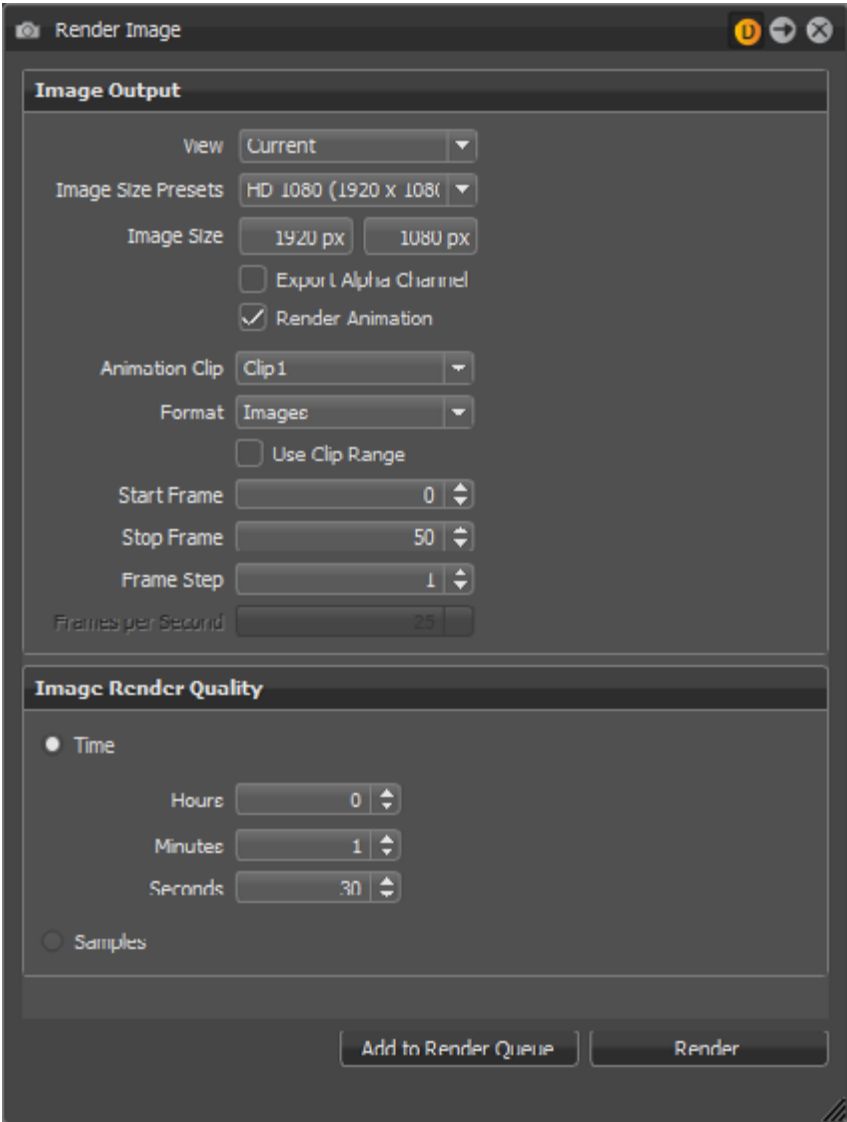


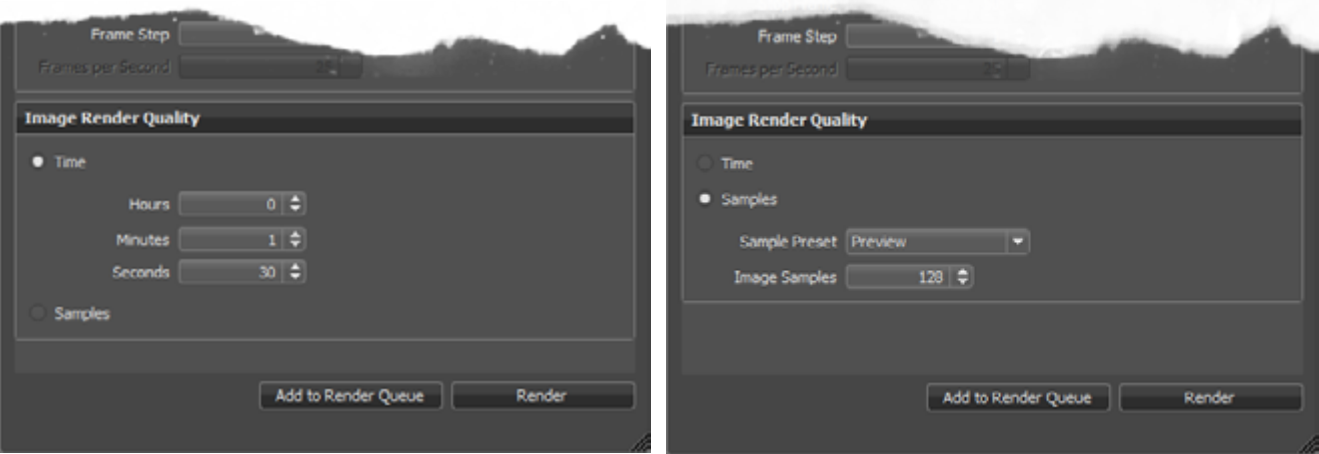
IMAGE OUTPUT

- **View**
On top of the module the view that will be used for image calculation has to be selected. All viewpoints, pre-defined camera track animations or variants (if camera was active on its creation) can be selected from the drop-down menu. If a track is chosen all contained viewpoints will be rendered automatically.
- **Image Size Presets**
The drop-down menu offers presets for all usual resolutions like PAL, NTSC, HD 720, HD 1080, 4K and so on.
- **Image Size**
If a preset from above is used the corresponding number of pixel for horizontal and vertical resolution are filled out automatically. Numerical input enables to setup any resolution, in that case the "Image Size Preset" changes to custom.
- **Export Alpha Channel**
Enables to export additional information about transparent areas within the image that is used in post-production processes. This requires that the target file format support alpha channels also.
- **Render Animation**
Activation makes animation related settings accessible; it provides the possibility to render an animation clip or only a part of it.
 - **Animation Clip:** This option is only accessible when no camera track animation or variant is selected within the view menu on top of the module. A clip has to be selected here.
 - **Format-Selection:** Image generates a picture for every frame. Movie provides the output within a single AVI movie file. Video file compression settings are available in a later step after initializing the render process.
 - **Use Clip Range:** To render the whole clip checkbox has to be enabled. To render only a sequence from the selected clip it has to be disabled; in that case the first and the last image of the sequence has to be defined below (Start Frame/Stop Frame). "Frame Step" helps when not every frame of an animation sequence should be generated. Frame step setting of "3" e.g. makes VRED to render every third image of the sequence. The default value "1" generates one image per frame.
 - **Frames per Second:** This option sets the frame rate for the output movie.

IMAGE RENDER QUALITY

In this section the image quality can be set by time or samples

- **Time**
Threshold sets the maximum duration for creating a single image.
- **Samples**
Sets the number of samples taken for the calculation of an image. Higher values produce a cleaner result while lower values reduce the render time.

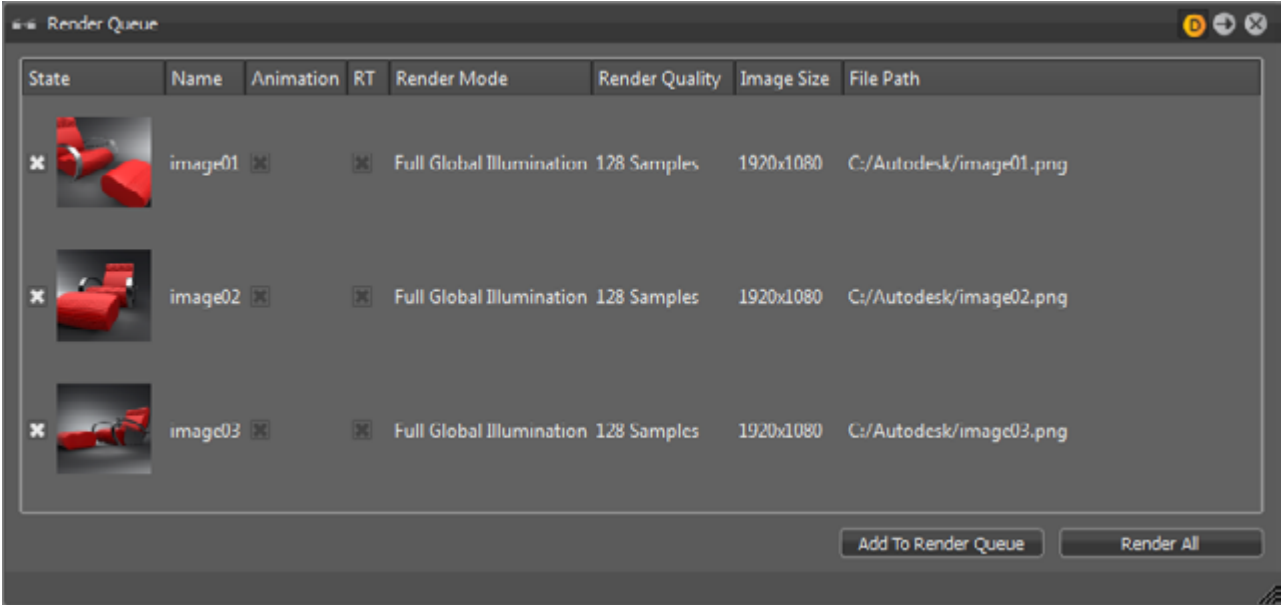


START IMAGE CALCULATION

After configuration is done the calculation could be either added to the render queue or started immediately by executing the render button. Each option opens the file browser to choose the destination folder and file format.

RENDER QUEUE

Module window opens after selecting the destination folder and file format when “Add to Render Queue” was used on initialization.



Every line within that queue represents a job that has to be calculated.

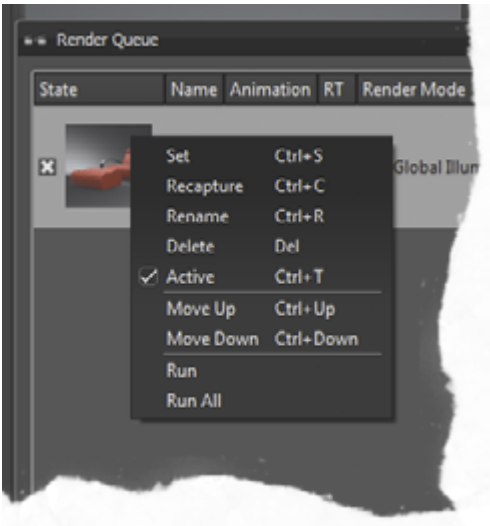
- **State**
Checkbox controls job consideration on rendering. A preview image helps to identify each job within the queue.
- **Name**
Shows the name that was chosen on file browse dialogue before.
- **Animation**
Indicates the type of job. Checkbox is enabled on animations.
- **RT**
Indicates the type of the renderer; enabled on Raytracing or disabled for OpenGL.
- **Render Mode**
Setting is adapted from the scene module settings tab. The selected image render mode that is configured there will be used to create the output.
- **Render Quality / Image Size**
Shows the settings that was set during job creation.

- **File Path**
Shows image name an full path.

CONTEXT MENU

Single right mouse click into the list opens this context menu.

- **Set**
Sets the current camera (render view) to the job initial position.
- **Recapture**
Captures the current camera view and overwrites settings from selected job.
- **Rename**
Enables to rename the job name within the render queue.
- **Delete**
Removes the selected render job.
- **Active**
Checkbox controls job consideration on rendering.
- **Move Up/Down**
Used to rearrange jobs inside queue. Calculation will perform jobs from top to bottom.
- **Run**
Starts rendering the selected job immediately.
- **Run All**
Processes all jobs. Same behavior like “Render All” button below.



START IMAGE CALCULATION

- **Add to Render Queue**
Creates a job from current camera view and adopts last settings from the render module.
- **Render**
Processes all jobs