RenderWare Graphics

Artist Guide

3ds max™ Tutorials

Contact Us

Criterion Software Ltd.

For general information about RenderWare Graphics e-mail info@csl.com.

Developer Relations

For information regarding Support please email devrels@csl.com.

Sales

For sales information contact: rw-sales@csl.com

Acknowledgements

With thanks to RenderWare Graphics development and documentation teams.

Table of Contents

1. Introduction

RenderWare Graphics is a 2D and 3D graphics engine used to create real-time 3D graphics applications, such as computer games and simulations.

RenderWare Graphics has a high performance, flexible and feature-rich exporter tool chain that includes viewers for previewing artwork on the target platform. The exporters enable artists to quickly and easily prepare high quality, game-ready assets.

You can use 3ds max, Character Studio, and Maya to create worlds, objects and animations. A RenderWare Graphics exporter plugin - native to each package - converts and optimizes all of your data from these modeling packages into a compressed, optimal format that the RenderWare Graphics run-time engine can handle efficiently.

1.1 Tutorials

The tutorials are designed to enable artists to design and export their 3ds max artwork into RenderWare Graphics using the RenderWare Graphics exporter. The exporter has been designed to easily integrate max artwork with RenderWare Graphics and a working game.

The tutorials are written from an artist's perspective. Intermediate knowledge of 3ds max is assumed. RenderWare Graphics tutorials are not intended to teach you how to use 3ds max, but to show you how to obtain the most from your 3ds max artwork.

This document is organized around a series of tutorials that take you through the basics of exporting and viewing 3ds max artwork exported using the RenderWare Graphics exporter.

3ds max Tutorials

The tutorials in this document are:

- Basics - Basic introduction to Visualizer and exporting
- Customizing Assets – Introduction to customizing, creating and exporting assets.
- Textures – Exporting and viewing textures
- Vertex Lighting – Exporting and viewing vertex lighting
- Camera Usage – Using cameras in Visualizer

- Character Studio – Exporting character studio artwork
- Export Templates – Creating and editing export templates
- Hints and Partitions- Controlling static world sectorization.
- Skin Weights – A comparision of different skin weights.
- Coordinate Systems - Coordinate systems used in 3ds max and RenderWare Graphics
- Batch Exporting – exporting batches of multiple scene files

Workflow

The general workflow for artists in RenderWare Graphics is:

1. Create in 3ds max
2. View in Visualizer
3. Modify in 3ds max
4. View in Visualizer
5. Go to Step 3 until artwork is perfect.
6. Export in RenderWare Graphics format

The goal of the workflow process is to export your scene, animated characters, etc. so that your programmers can place your models into a working game.

RenderWare Graphics is not 3ds max

This is obvious, but not everything you can do in 3ds max translates to your game. It's worth testing before spending excessive amounts of time on a great animation only to discover that it does not export as expected.

Before you begin

Before you begin these tutorials you will need to setup RenderWare Visualizer for your target platform. RenderWare Visualizer is a viewer used for previewing your artwork on your target platform. Setup details are explained in `docs\viewers\RenderWareVisualizer.pdf` in your RenderWare Graphics directory.

Examples folder

The example 3ds max scene files used in this tutorial can be found in your `docs\exporters\artists\examples\max` in your RenderWare Graphics directory. Examples are saved in 3ds max 4.3 format.

1.2 Other documentation

For further information on RenderWare Graphics refer to:

- Viewer Documentation – RenderWare Visualizer, Clump View and World View Viewers
- RenderWare Graphics 3ds max Reference Guide (3dsmaxReferenceGuide.pdf in `\docs\exporters\artists` in your RenderWare Graphics directory).
- RenderWare Graphics Artist Guide Glossary
- The conversion document ConvertingExportsFrom34.pdf for artists upgrading from 3.4 to this version of RenderWare Graphics.
- RenderWare Graphics has a range of documentation material aimed mainly at developers but still useful for the artist. After installation, take a look at additional documents in the `docs` directory. The User Guide in particular should be useful to you as it covers a lot of material relevant to the artist.
- your customer account on RenderWare Graphics' Fully Managed Support System (FMSS) https://support.renderware.com; its searchable knowledge base and downloadable examples

PDF format

Most RenderWare Graphics documents are in PDF format, which is a self-contained document format from Adobe. You'll need to install the (free) Acrobat Reader to view and print these. In some cases the quality is better in the printed form than on-screen.

The RenderWare Graphics PDF documents have been designed to be printed double-sided.

2. Basics

This tutorial introduces the Visualizer, understanding the controls and how it can be used to view your artwork.

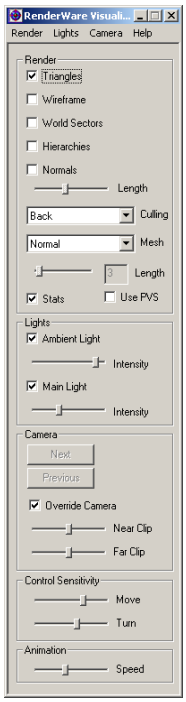
This tutorial will explain:

- What the Visualizer is
- How to setup Visualizer for use with 3ds max
- Visualizer basics for the PC
- How to view your artwork in Visualizer
- Exporting basics
- How to automatically create and manage assets

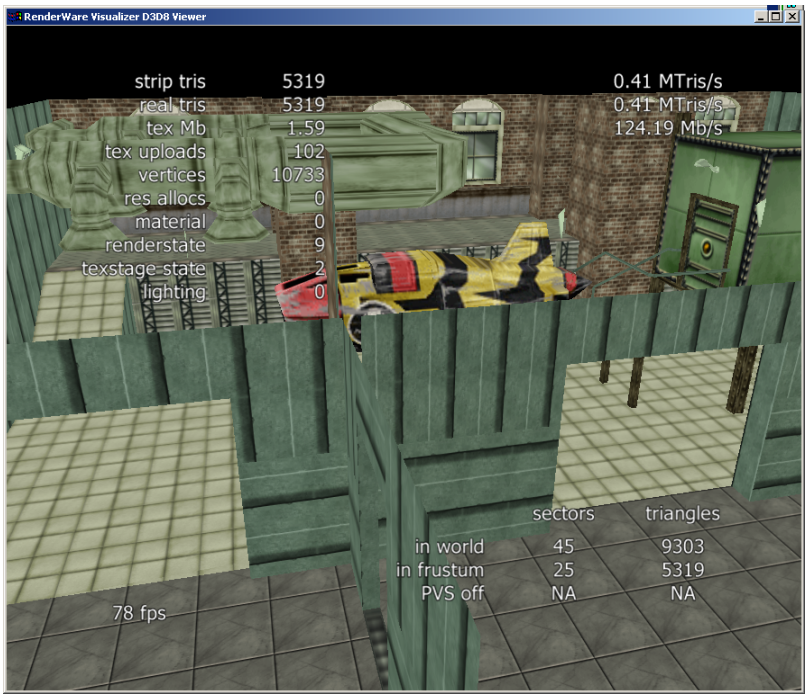
2.1 Visualizer basics

What is Visualizer?

RenderWare Visualizer is a suite of applications that can be used to view resources on different platforms. It can be run as a stand-alone application or directly from 3ds max. We'll have a look at viewing artwork directly from 3ds max.



Control Panel



Viewer

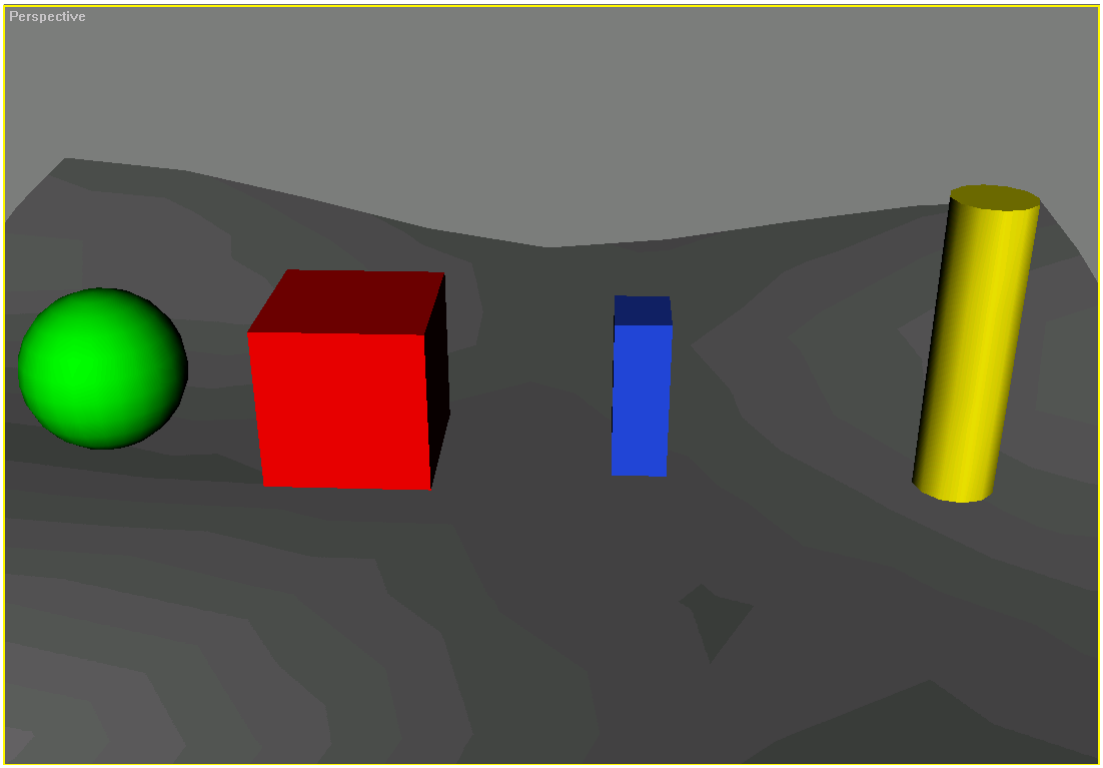
Setting up Visualizer on all platforms is explained in detail in `RenderWareVisualizer.pdf`. This tutorial explains setting up Visualizer on the PC.

Using the Visualizer

We'll take an existing file and look at viewing the file in Visualizer.

1. Load the max file: `exporterbasics.max`.

The example 3ds max scene files used in this tutorial can be found in your `docs\exporters\artists\examples\max` in your RenderWare Graphics directory. Examples are saved in 3ds max 4.3 format.

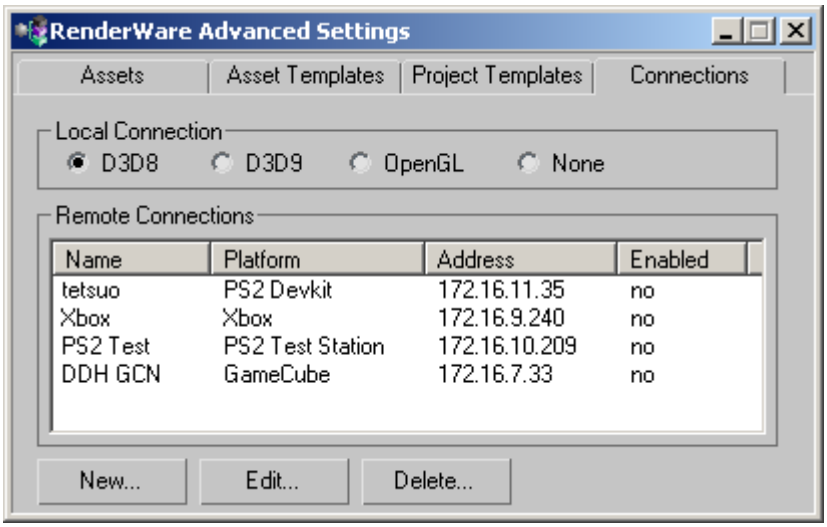


You will see four discreet objects: a green sphere, red cube, blue rectangle and yellow cylinder. They all rest above a gray 'ground plane'.

Move the Time Slider. Each object is animated in a different fashion: the sphere translates, the cube rotates, the rectangle morphs and the cylinder is skinned. The ground plane is static.

The RenderWare Graphics exporter can be used to view this artwork in RenderWare Visualizer and to export artwork to file.

2. Open the RenderWare Advanced Settings window *RenderWare→Advanced Settings…*



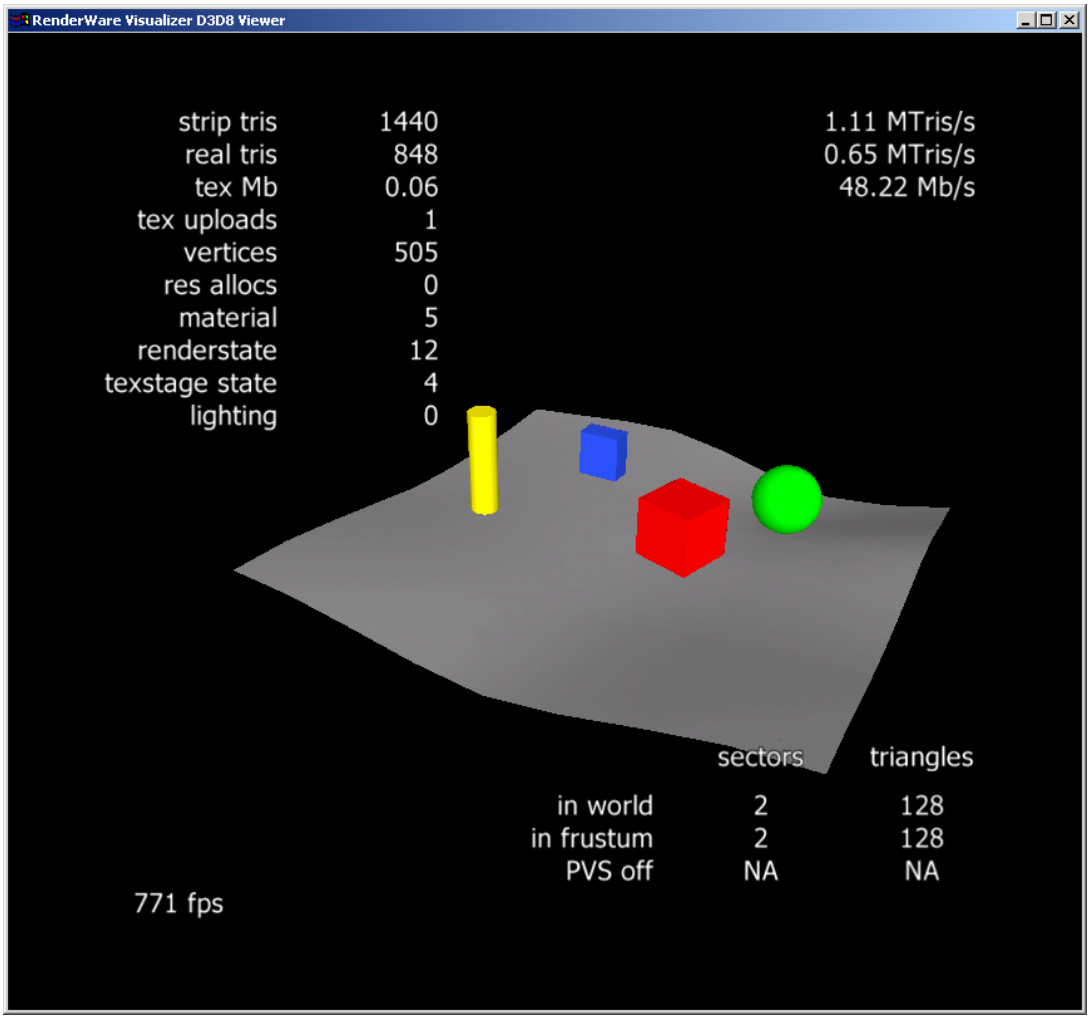
3. Click on the *Connections* tab to setup your connections for RenderWare Visualizer.

4. Select D3D8 local connection, if you have DirectX8 installed on your machine, else select OpenGL.

5. Close the Advanced Settings window.

6. Click *RenderWare→View* to view the artwork

RenderWare Visualizer comprises of a viewer and a control panel. The viewer is displayed below.



RenderWare Visualizer Viewer

Navigation Controls on PC

left click & drag	Mouse Look - position static, but changing view position
right click	Activates and deactivates orbit mode. To activate orbit mode, depress the right mouse button and keep it depressed. Move the mouse or use the keyboard for navigation. Release the right mouse button to deactivate orbit mode.
→ or D	Strafe Left
← or A	Strafe Right
↑ or W	Forward
↓ or S	Backward
Esc	Exit application if in the Viewer window

The navigation controls for other platforms are stated in `RenderWareVisualizer.pdf`.

To reset the artwork, deselect *Override Camera* in the Control Panel. Toggling this option enables and disables navigation in the Viewer window.

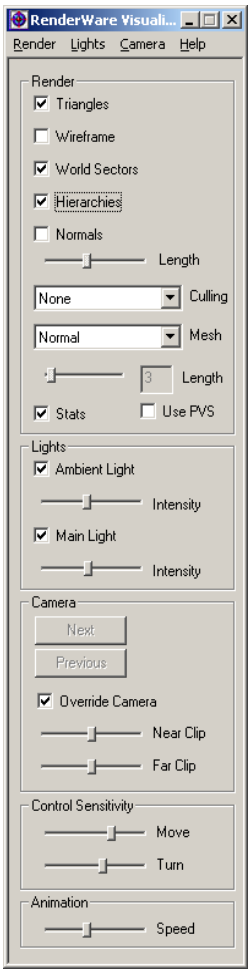
Viewing artwork in the Visualizer directly from 3ds max gives the artist an idea what the artwork will look like when it is rendered. However, it is not designed to give an optimized view of your artwork. To obtain this you will need to customize the scene assets.

7. Select *Hierarchies* in the Control Panel. This will display the hierarchies for the green sphere and the yellow cylinder. You can see the green sphere and the yellow cylinder moving using hierarchies.

8. Select World Sectors to display the world sectors. Notice how the statistics changes when options are selected in the Control Panel.

9. Have a look at the other options in the Visualizer; in particular the Render options to see what they do.

10. Close the *Control Panel*. Closing the Control Panel will also close the viewer.



Control Panel

The statistics displayed on the screen can be turned on and off by selecting Stats on the floating Control Panel. The statistics can be divided into two sections. At the top of the screen are platform specific statistics and at the bottom of the screen are the platform dependent statistics.

2.2 Exporting Basics

The exporter enables the artist to create worlds, objects and animations in 3ds max; view the artwork using Visualizer and export the artwork to RenderWare Graphics. RenderWare Graphics converts and optimizes all of the data into a compressed optimal format that the RenderWare Graphics run-time engine can handle efficiently.

The exporters have the following file export formats:

- .rws can contain multiple Animation, Static World, Animated Hierarchy and Spline assets in any combination. Can also contain embed textures and material effects.

- .rf3 an un-optimized version of the .rws file in the XML standard.

and legacy files

- .anm for Animation information

- .bsp for Static World information

- .dff for Animated Hierarchical information

- .spl for Spline information

Why are there different file export formats?

There are different file export formats because artwork can be manipulated in different ways depending on the type of objects used.

Detailed description of file export formats

RWS

A .rws file stores all export formats. This means that it can store Static Worlds, Animations, Splines and Animated Hierarchies at the same time, which means that you're able to view your entire scene in one instance. Texture libraries and Material effects are embedded in .rws files.

RF3

From RenderWare Graphics 3.5 a new type of file format, the .rf3 file is supported. The .rf3 file format is an XML based editable file, which contains all the raw exported data. Unlike the .rws files, which are RenderWare Graphics optimized binary files, .rf3 files contain no rendering optimizations, and are simply a snapshot of the raw 3D data. Using the rf3cc compiler tool, users can compile these .rf3 file into optimized platform specific RenderWare Graphics binary files. Textures and material effect are referenced from their original location.

Legacy Files: ANM, DFF, BSP and SPL

The file formats .anm .dff, .bsp, .spl are now considered legacy and may be removed in future releases. It is therefore recommended that you export to .rws files.

What are Assets?

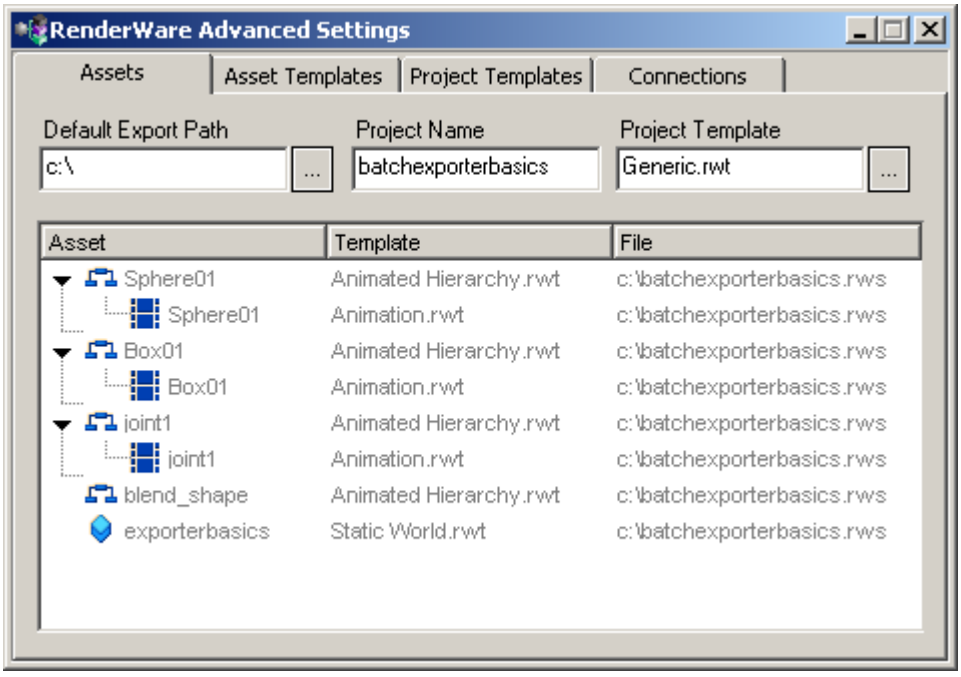
Assets are created in the Assets tab to export and view different types of objects. All assets can be viewed using the *View* menu option or individually by right clicking on the individual asset in the Assets tab. Assets are created so that they can be exported and viewed individually. Programmers will likely want to use the assets separately in the game engine.

There are four types of Assets, Animated Hierarchy, Animation, Static World and Spline. These assets export to the selected export file type selected within the project template. The default is a `.rws` file.

Automatically Managing Assets

Automatically managing assets is an easy way to export and view the scene assets. Assets are managed automatically by default when a scene is first created; each time an object is added to the scene it is automatically added to the Assets tab's list of assets.

1. Click *RenderWare→Advanced Settings…* Click the Assets tab, this displays the Assets tab.



2. Assets have been created for all four objects (the first bone in the case of the cylinder) and an export node for the gray plane. Assets are automatically given a name from the name of the object.

2.3 Summary

This tutorial has explained the basics required to setup and view artwork using RenderWare Visualizer. It has also explained an overall explanation of what types of assets there are and how to use the Assets tab to automatically create assets for different scene objects.

3. Customizing Assets

This tutorial is an introduction to customizing Assets. Assets are, by default, created automatically using the Assets tab. However, the assets may need tweaking. Assets can be created manually based on your selection.

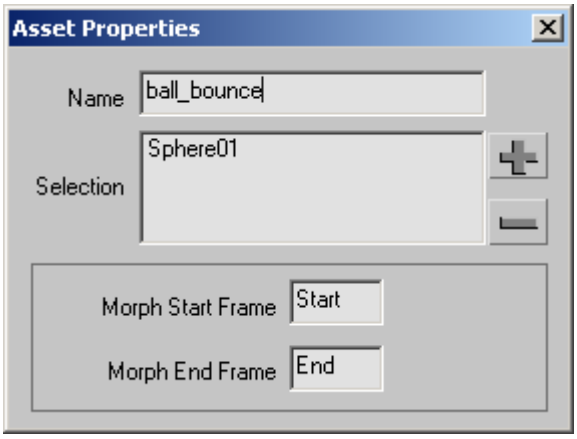
This tutorial will explain:

- renaming assets
- modifying assets
- RenderWare Output Window basics
- exporting assets
- using RenderWare Visualizer Launcher
- simple animation

3.1 Assets

Modifying and renaming assets is explained below.

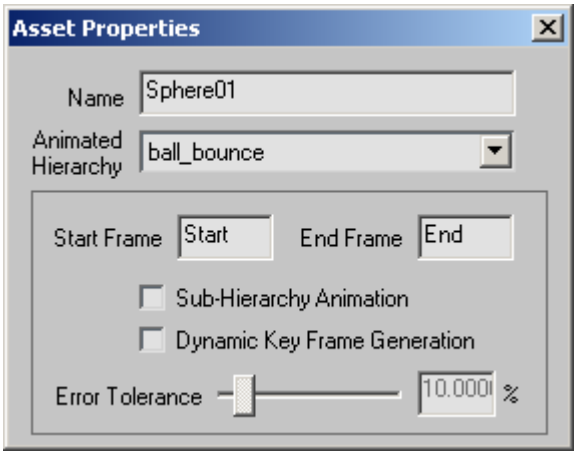
1. Open `exporterbasics.max`.
2. Open the Assets tab
   *RenderWare→Advanced Settings…*the assets are currently grayed out, showing that the assets are managed automatically.
3. Right Click on the Window and Select *Customize*. This turns off the automatic asset management.
4. Select Sphere01 and Right Click→*Properties*. This will display the Asset Properties dialog for the green sphere.
5. Rename this Asset to ball_bounce by changing the Name field.



When you create an asset, it will detect when there are keyframes associated with the object. If the object is dynamic it will automatically be defined as an Animated Hierarchy.

6. Close *Asset Properties*. When viewed in Visualizer the green sphere is bouncing.

7. Select the child Animation asset of ball_bounce and Right Click→ *Properties*. This will display the Asset Properties dialog for the green sphere's animation.



8. Change the End Frame value to 15, about half way though the animation.

9. Again, close the *Asset Properties dialog* . When viewed in Visualizer the green sphere is now only bouncing up and not down.

10. Save `exporterbasics.max`.

3.2 RenderWare Output Window

To use the asset ball_bounce in RenderWare Graphics you will need to export it as a `.rws` file. When a scene or an individual asset is viewed using *the Visualizer a* temporary `.rws` file is created. This is shown in the RenderWare Output Window.

1. Right Click the ball_bounce asset from within the Assets tab.

2. Select *View*, to view only the selected asset.

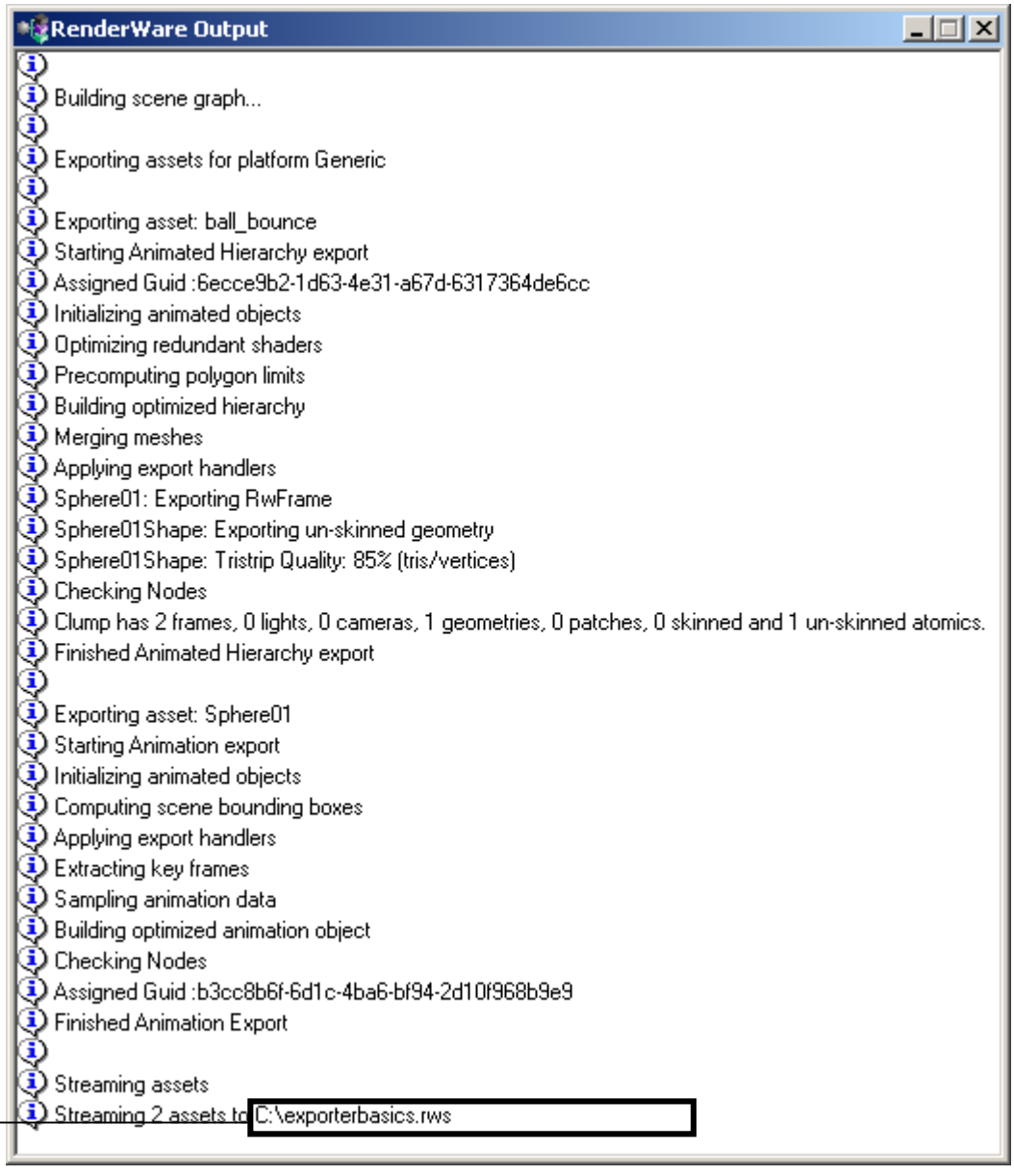
The ball_bounce asset has been exported to a temporary `.rws` file so that it can be viewed in Visualizer.

To use the ball_bounce asset file in your game, you will need to export it to a permanent file.

3. Again, in the Assets tab, right click the ball_bounce asset and select *Export* to export the file.

The first time an export is performed, the Export Wizard will run, asking the user to enter the export path and the project template to use. For the purposes of these tutorials the project template should be set to `Generic.rwt`. The `Generic.rwt` template, by default exports to an `.rws` file which can be viewed on a PC platform.

4. The RenderWare Output Window displays the name of the exported `.rws` file.



Exported `.rws` file

To view the exported file in Visualizer you will need to use the Launcher.

The path and filename of the `.rws` file are set in the Project Name and Export Path boxes of the Advanced Settings dialog.

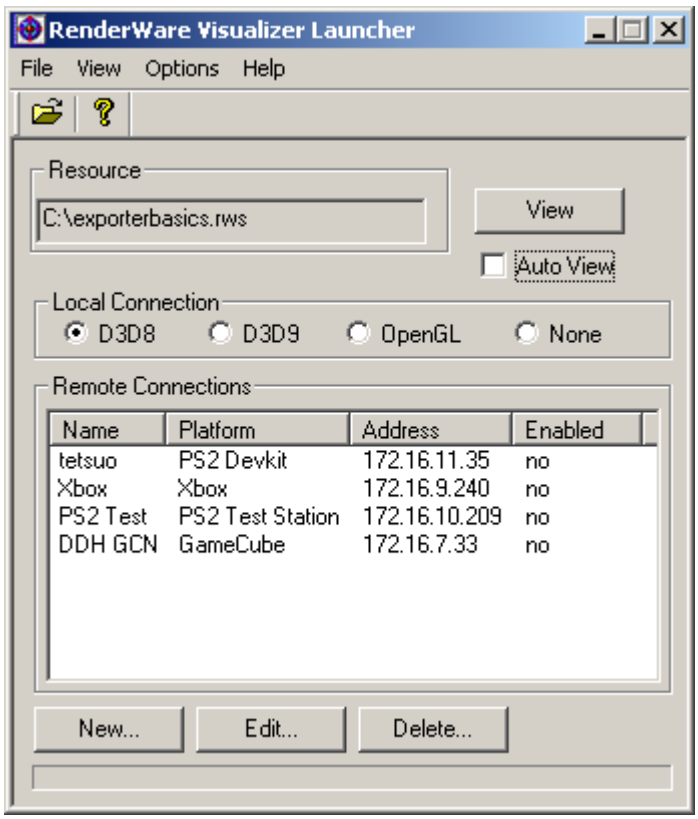
3.3 Launcher

RenderWare Visualizer Launcher loads exported resources saved as `.rws`, `.rf3` and legacy files `.dff` or `.bsp` and retains the *File* history for easier access to files. The Launcher sends the files to viewers for viewing on different platforms.

1. Open Launcher
   Start→Program Files→RenderWare→Graphics→ Visualizer

2. From the Launcher menu, *File→Open*

3. Open `exporterbasics.rws`.



4. Click *View* to view `exporterbasics.rws` in Visualizer.

RenderWare Visualizer Launcher

Drag and drop can be used to drag a file into the *Resource* area.

Enable *Auto View* to automatically view a file after it has been opened or dragged and dropped in the Resource area.

3.4 The Export Path

The name of the asset is set in the *Asset Properties*. So that all files for these tutorials can be found easily we'll create a directory to contain all the exported files.

1. In Windows Explorer create a directory called `rwproject` on the `C:\` drive.
2. In the Assets tab, set the Export Path field to c:\rwproject\
3. Close the Assets tab.
4. Export the assets into the new directory *RenderWare→Export*.

3.5 Morphing

RenderWare Graphics distinguishes between static objects like walls and floors and dynamic objects like characters. Rotating, translating, or blending between morph targets can animate dynamic objects. They can also be smooth-skinned and animated using joints.

1. For the simple animation we will continue to use the `exporterbasics.max` file.
2. Select the Box02 asset in the Advanced Settings dialog.
3. Right click the Box02 asset to open the Asset Properties dialog.
4. Change the *Name* to box_morph.
5. Right click → *View Box02* to view the morphing box in *RenderWare Visualizer*.

The *Enable DMorph Support* option in the Asset Template should only be used with skinning as it is too slow for in-game art.

3.6 Skinning

RenderWare Graphics exports animated skin and bones for use in your games. The `exporterbasics.max` displays a cylinder.

Bendy Cylinder

1. Using the `exporterbasics.max` file, select the yellow cylinder.
2. Open the Assets tab.

3. You will notice that the Bone01 asset contains one of the bones in the cylinder skeleton. When exporting skinned objects you need to select a bone from the skeleton and not the geometry mesh as the exporter will try to export rigid geometry.

Note that 3ds max bones are not renderable by default and they will not be exported as geometry. If you use cubes, other types of geometries or Character Studio bipeds as bones for skinning, you can exclude them from being exported as geometry by setting Renderable state in the *Edit→Object Properties* or by hiding them.

4. Rename the asset to `cylinder`

5. Right click → *View Bone01* to view the skinned joint in *RenderWare Visualizer*.

Bone number: RenderWare has a limit of 64 bones per skin on PlayStation 2. See your target platform RenderWare Graphics API Reference for the number of bones supported. Using more than 64 bones will cause the skin to be split. (*Modules→Geometry→Skinning→RpSkin→<target platform>→ Restrictions→Bone Limit*).

No negative scaling: In cases where you need two symmetrical models like arms or legs, don't be tempted to duplicate and use negative scaling. For more information see *Negative Scaling* in the *Modeling Reference* section of 3dsmaxReferenceGuide.pdf.

3.7 Summary

This tutorial has explained renaming and modifying assets; exporting assets basics and viewing exported assets using the RenderWare Visualizer Launcher. It has also covered exporting files containing simple animation including morphing and skinned joints.

4. Textures

To be able to use your artwork in a game, the artwork needs to be exported. As explained in the previous tutorial there are several different export file formats that can be used. This tutorial adds textures to artwork and explains how to view and export files with and without textures using different file export formats.

This tutorial will explain:

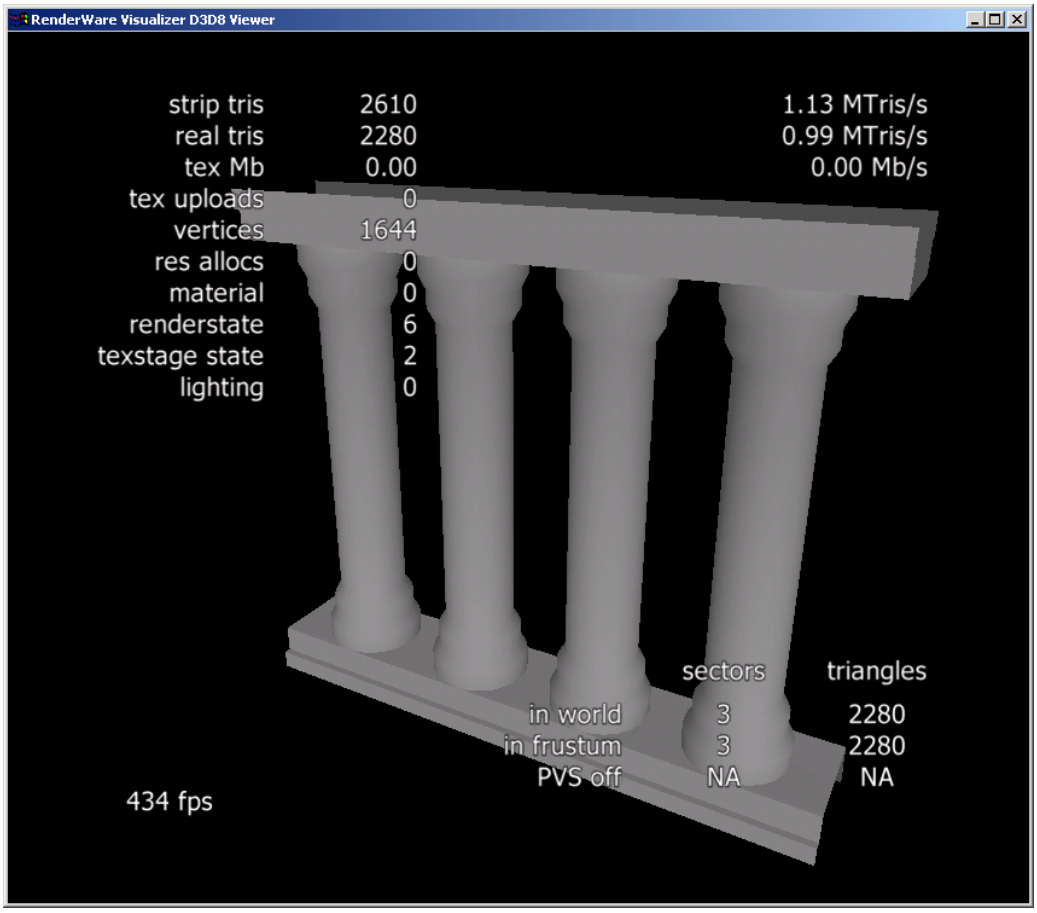
- embedding textures in `.rws` files
- using `RwMaterial` textures

4.1 Textures and the Visualizer

Textures are embedded in `.rws` files as platform independent texture dictionaries. When you click on *View* a temporary `.rws` file is created. V*iew* is a good starting point to see what your artwork will look like when it's exported. The 3ds max example file used does not contain textures.

1. Open `pillars.max`.

2. *RenderWare→View* to view the file in Visualizer.



3. Close Visualizer

4. In 3ds max, press M on the keyboard to open the Material Editor.

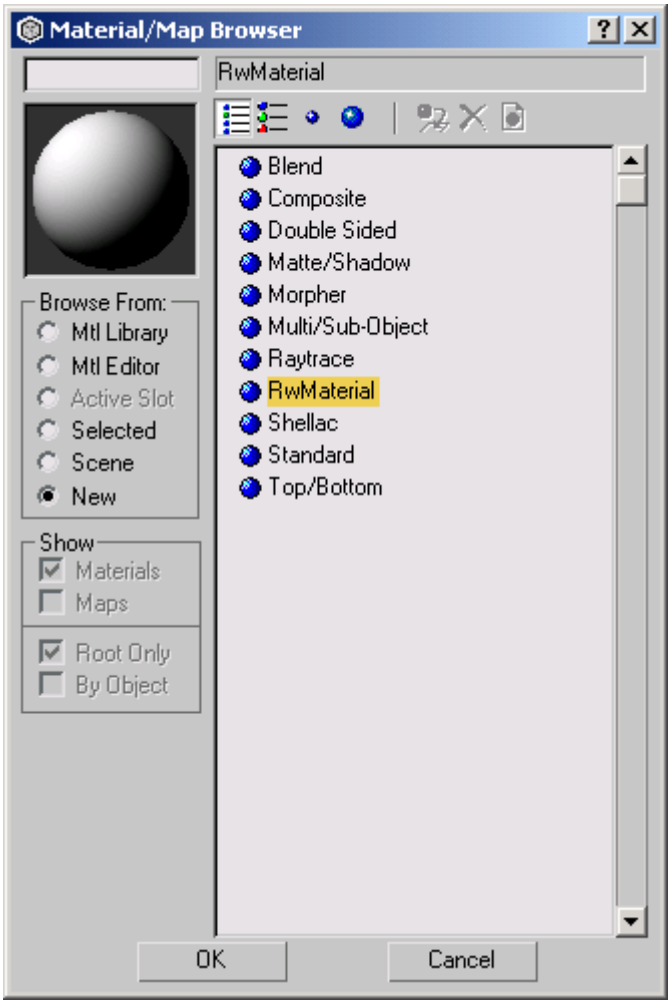
Bump mapping is now supported in RenderWare Graphics. It can be used to simulate rough surfaces such as stone, or tree bark.

On the PC, D3D8, D3D9 and OpenGL targets support bump mapping and are achieved in either multi-pass or multi-texture in some instances of D3D8 and D3D9 (if the video card driver supports multi-texturing).

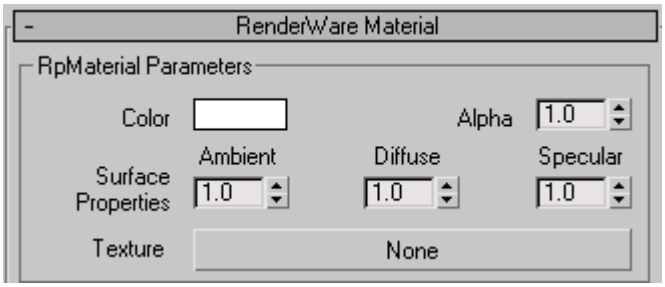
It is recommended that you use `RwMaterial`. It provides direct settings for the RenderWare Graphics `RpMaterial` object and no translation of these settings is performed when exporting.

5. Select the first material and click *Standard*

6. Select *RwMaterial*, and click *OK*.



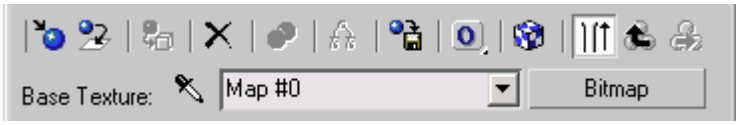
7. In *RpMaterial Parameters*, click *None* to the right of Texture.



8. Select Bitmap, and click OK.

9. Select `wall53S.bmp` in the textures sub directory and click OK.

The bitmap base texture settings are now displayed.



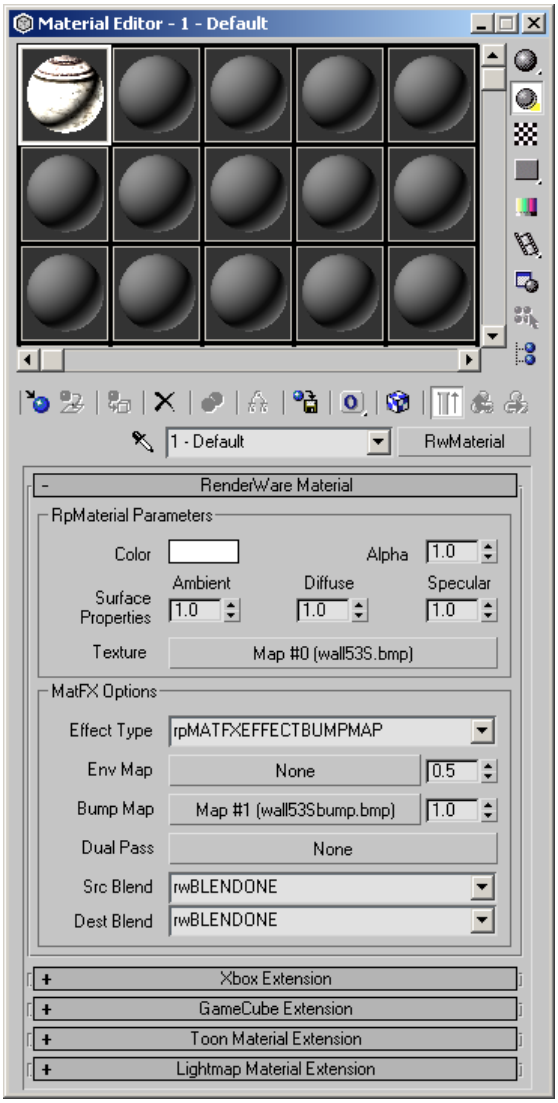
10. To return to the RwMaterial settings, click the "Go to parent" button  .

11. In MatFX Options, change the Effect type to `rpMATFXEFFECTBUMPMAP`

12. Click *None* to the right of Bump Map.

13. Select Bitmap, click OK

14. Select `wall53Sbump.bmp` and click OK.



The filenames for textures should not exceed 31 characters. The exporters will warn if this limit is exceeded and truncate the name on export.

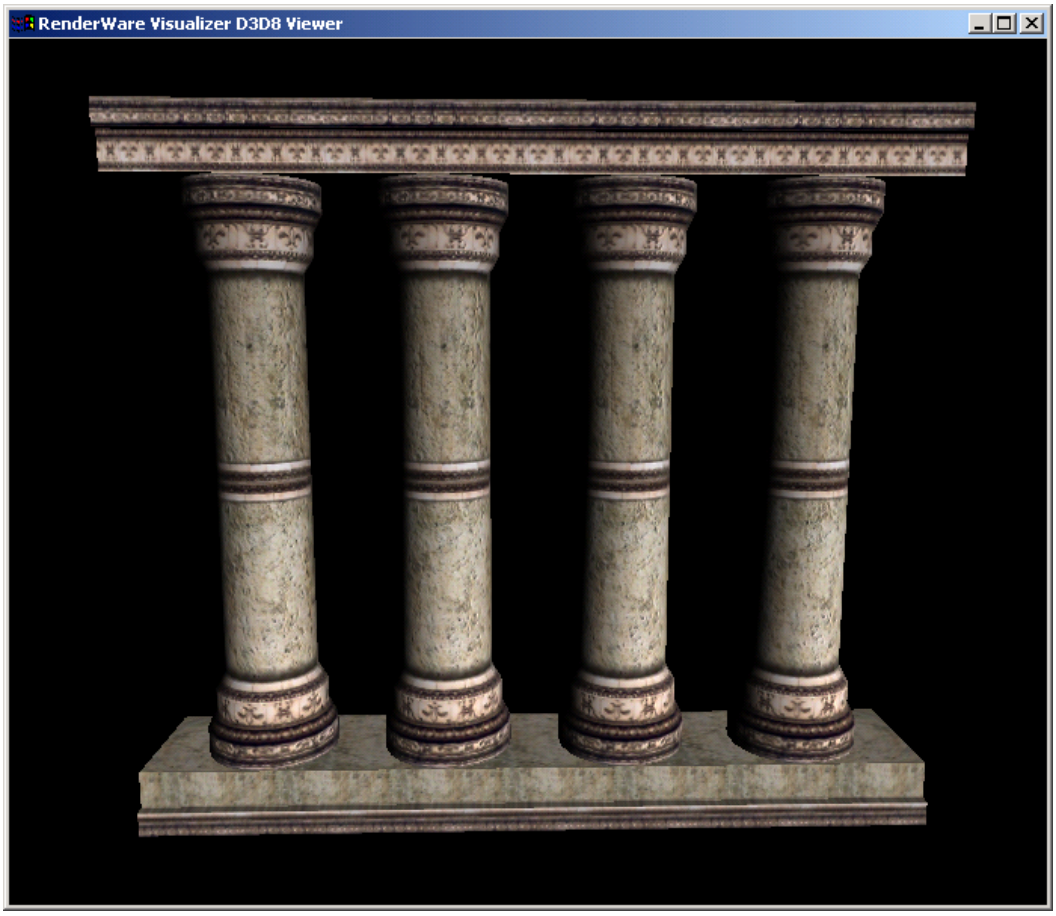
15. Set the *Bump Map* value to1.0. The default value is 0.5, which gives moderate amounts of bump mapping. In the case of the columns we have given them a value of 1.0. (Clearly a value of zero would provide no bump mapping at all). Whilst it is possible to apply values greater than 1.0 you will find increasing amounts of distortion the higher the value gets.

16. Select the pillars in the viewport

17. In the Material Editor, select the material and click the *Assign Material to Selection* button  . The textures are applied to the pillars in 3ds max. If you are unable to see the textures. If you're unable to see the textures in the viewport, click the *Show Map in Viewport* button  in the Material Editor.

For maximum speed of loading, textures should be square and a 'power of two' number of pixels, for example. 32x32, 64x64, etc.

18. *RenderWare*→ *View* to view the pillars in Visualizer.



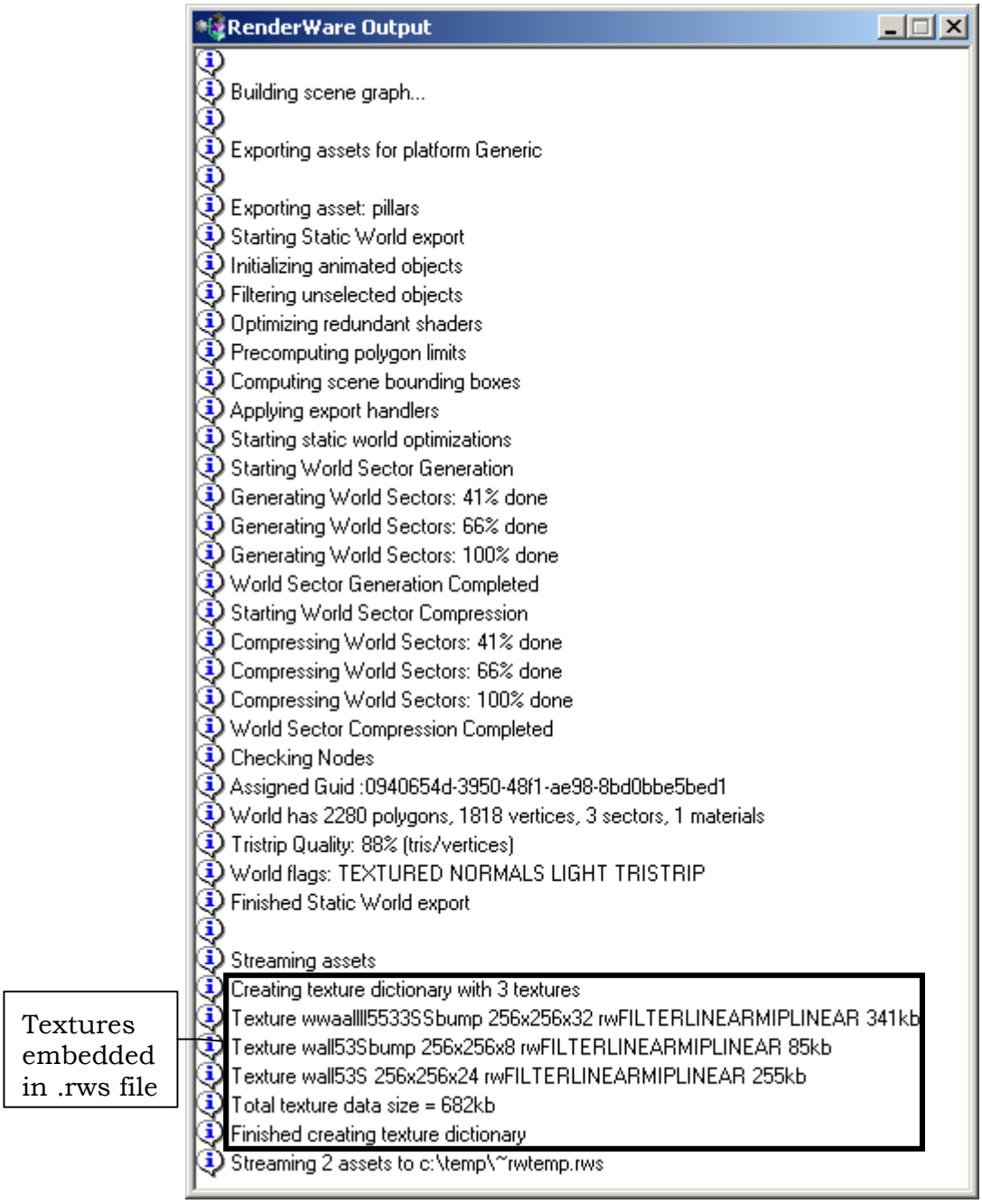
The textures have been applied to the pillars are displayed in Visualizer.

19. Close Visualizer and save `pillars.max`.

4.2 Exporting Textures

When you view a scene using V*iew* a temporary `.rws` file is created and the textures are embedded in this. The textures embedded are listed in the Output Window.

Textures are embedded in `.rws` files if the Embed Texture Dictionary flag is set in the Active Project Template.



RenderWare Output Window displaying "Medium" verbosity.

Conclusion

Textures are embedded in `.rws` files. Textures should be saved as `.bmp` or `.png` files.

It is recommended that when materials are set up in the Material Editor, `RwMaterial` is used. This provides direct settings to RenderWare Graphics.

4.3 Summary

This tutorial has explained the steps required to export and view `.rws` files containing textures. Artwork needs to be exported into a RenderWare Graphics compatible file format in order to be compatible with the RenderWare Graphics SDK.

5. Vertex Lighting

Vertex lighting (or pre-lighting) world geometry is a useful technique commonly used in games to simulate complicated lighting setups which would require impractical amounts of real-time lights. The vertex solution though, is only as accurate as the tessellation of the geometry allows it to be. There is always a trade-off between fidelity and triangle count.

Setting Up

Firstly light your scene in 3ds max. For this tutorial we'll use `vertexlightworld.max`. In this example only Omni lights have been used. This is not a restriction of vertex lighting; any 3ds max light type can be used.

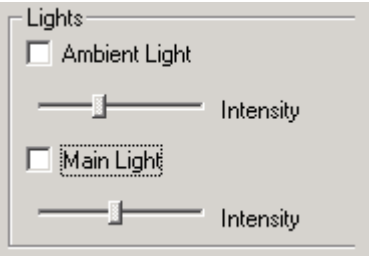
Vertex lighting is a very efficient way to bake lighting into a scene's geometry. Effectively the lighting is an extra piece of information stored in the geometry's vertices.

First we'll have a look at this scene without vertex lighting and then after adding vertex lighting we'll have view the scene again.

1. Open `vertexlightworld.max`. This world does not contain vertex lighting.

2. View the scene in the Visualizer, *RenderWare→View*.

3. In Visualizer, if you had vertex lights, you could display them by disabling the lighting options in the control panel.

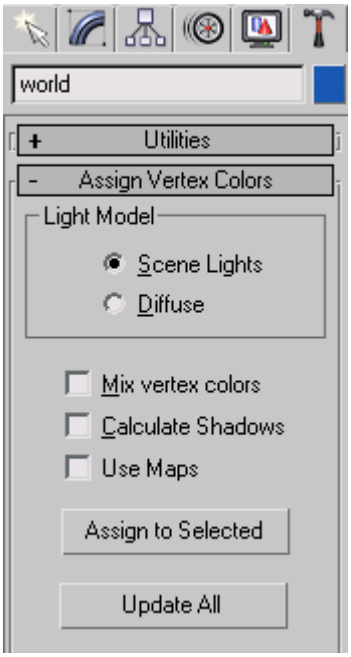


4. Close Visualizer.

5. In 3ds max, select the "world" object. We'll now add vertex lighting to our scene.

6. In the Utilities panel, open the *Assign Vertex Colors* utility.

7. Use the following settings:



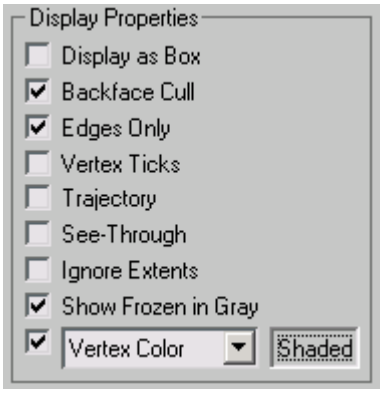
The *Calculate Shadows* could be used if your lights are set to cast shadows but the solution would not be as accurate as a render because of the geometry tessellation.

8. Click *Assign to Selected* to apply the solution.

The more complex your world and lighting setup the longer it will take to calculate vertex lights.

9. To view the results in the 3ds max viewports, with the "world" object selected, right click in the viewport and choose Properties.

10. Select *Vertex Color* and depress the *Shaded* button in the *Display Properties* section.



11. Click OK. Vertex lighting will now be displayed in the viewport.

Vertex lighting and pre-lighting are synonymous.

Exporting Vertex Lighting

There are two modes of operation for asset generation. When the Customize option is disabled the exporter analyses your scene and generates assets automatically for you. As objects are added or deleted in your scene the assets are automatically updated. When the Customize option is enabled you have manual control over how assets are created. In a new scene the default mode is non-customized assets. This scene has been setup with Customize disabled.

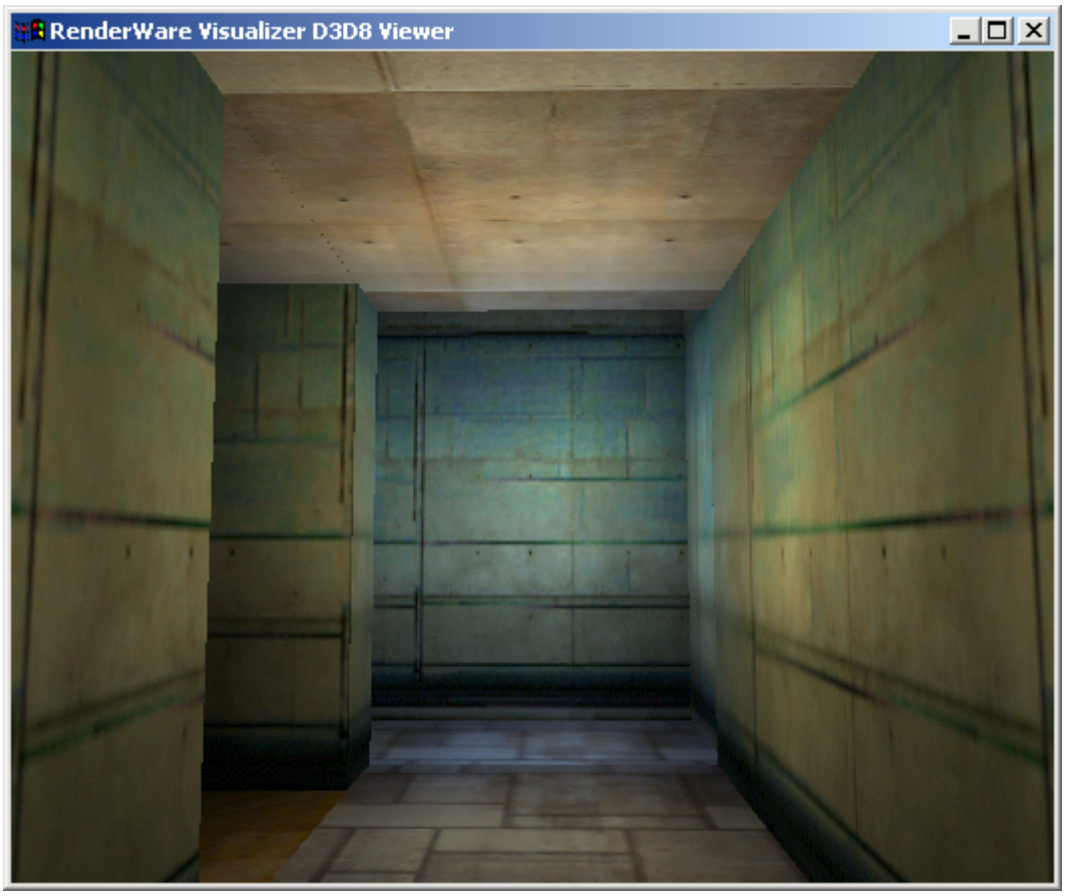
To export the vertex lighting:

1. *RenderWare→Export* to export the vertexlight_world asset.

The first time an export is performed, the Export Wizard will run, asking the user to enter the export path and the project template to use. For the purposes of these tutorials the project template should be set to `Generic.rwt`. The `Generic.rwt` template, by default exports to an `.rws` file which can be viewed on a PC platform.

2. Using the Launcher, view the `.rws` file in Visualizer.

3. Disable the real-time lighting in the control panel of Visualizer to check if vertex lighting exists.



5.1 Summary

This tutorial has explained the steps required to export and view vertex lighting (or pre-lighting).

6. Camera Usage

Generally, in a game the programmer sets up the camera. For an artist the use of cameras is limited to the viewers.

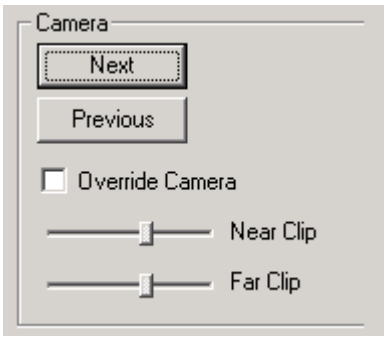
Any cameras in the scene will be handled in the same as any other asset. Both perspective and orthographic cameras are supported. The camera parameters exported by RenderWare Graphics are animation, projection type and clipping planes.

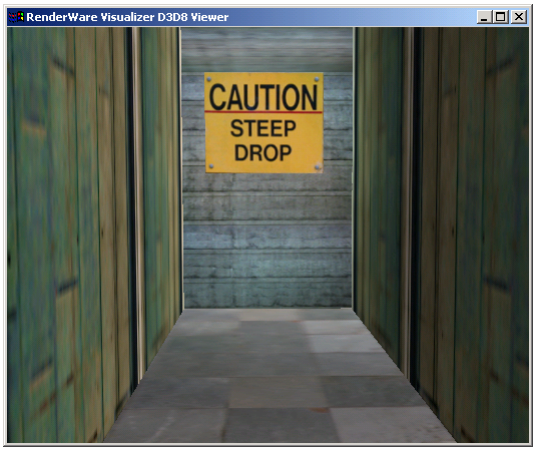
Multiple cameras can be displayed in Visualizer. For example you might want to show your colleagues (producers etc) key parts of a world, so you could set up cameras and using Visualizer cycle through the cameras instead of navigating between certain points in a scene.

1. Open `multicameras.max`. In 3ds max you will see that there are three cameras.

2. To view these cameras in Visualizer *RenderWare→View*

3. In RenderWare Visualizer use the *Next* and *Previous* buttons to switch between cameras.





Displaying Multiple Cameras in Visualizer

4. The *Override Camera* option allows you to move independently of the exporter cameras.

Prelighting has been added to this scene.

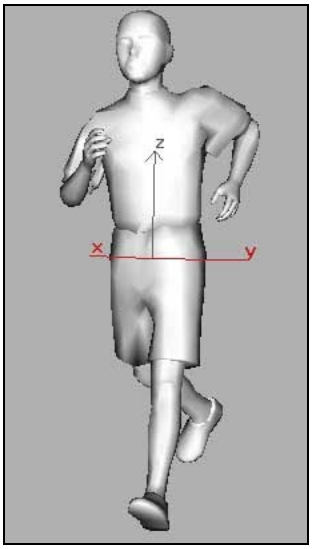
6.1 Summary

This tutorial has explained the steps required to uses cameras in the Visualizer Viewer.

7. Character Studio

This tutorial will explain:

- creating and editing a bone hierarchy using Biped
- attaching a skin to the skeleton using Physique
- editing the skin's vertex assignments
- animating and export the skin to RenderWare Graphics



This tutorial is designed as an introduction to getting started with the 3ds max Character Studio export functions in RenderWare Graphics. It will show you how to:

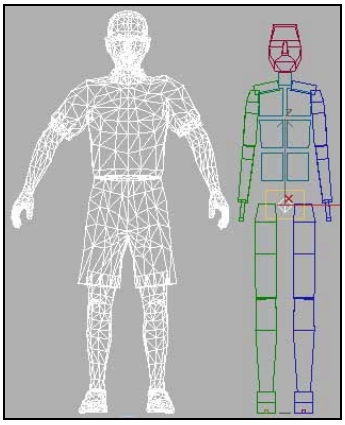
The techniques work with 3ds max release 4.x or 5, and Character Studio 3.0.

The complete files are available in Character Studio 3.0 format as `boyrunner.max` and can be found in `docs\exporters\artists\examples\max` in your RenderWare Graphics directory.

7.1 Creating the Skeleton

1. Open your mesh character skin in 3ds max. Ideally this should be in a reference or neutral pose.

2. Create the Character Studio biped roughly the same size and orientation as the skin.



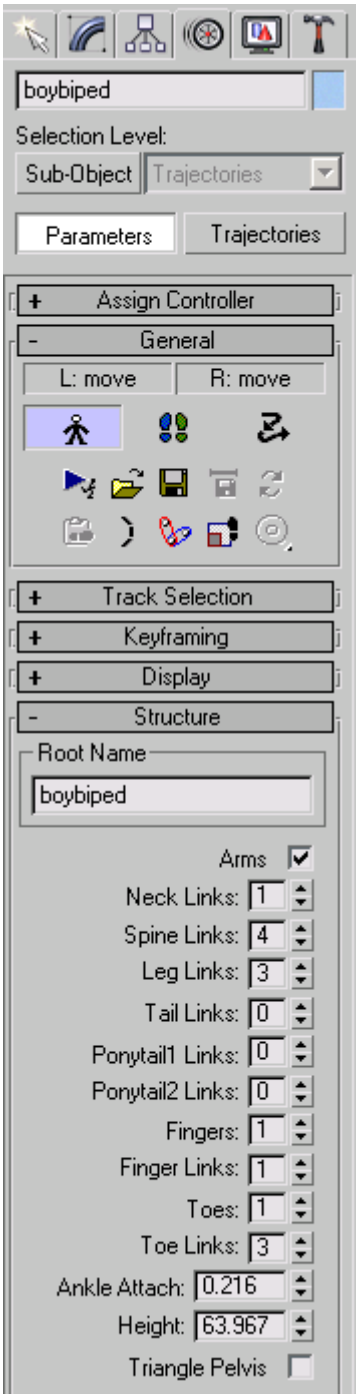
3. Adjust the biped settings.

The biped settings you use are up to you. However, if you're not animating hands there is really no point having fingers and you probably don't need toes. Also, three spine links are usually adequate for most purposes.

Note that under RenderWare Graphics on PlayStation 2 there is a limit of 64 bones per skin and the default biped has more than this! During export any character skin containing more than 64 bones will be split into multiple skins.

In a biped's structure, "Triangle Pelvis" is an option you should not use. It creates two links that extend from the legs to the lowest biped spine object plus a link from the biped pelvis to the lowest spine object. This can result in wrong animation if you have rotation on the spine link, since Character Studio does not fully obey the rules of hierarchical animation. This is commonly characterized by the feet appearing to "drift" when they should be stationary.

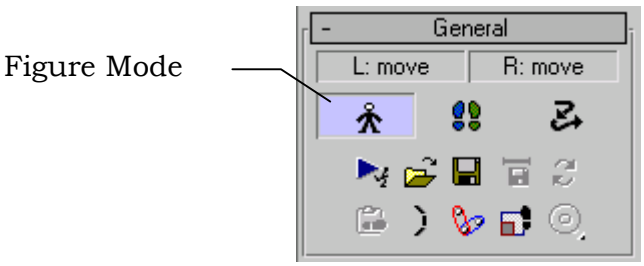
If you do use "Triangle Pelvis" and have rotation on the spine link, then you'll probably have to turn on the *3ds max Filter Biped Keys* in the *Animation Asset Template* options, see Export Templates. It will add extra keyframes and fix animation but will generate a much larger file.



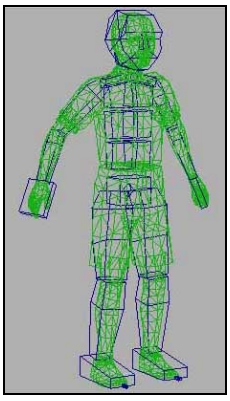
4. At this point, give your biped a root name (*boybiped* in this case).

This is the bones hierarchy that RenderWare Graphics refers to. No further tagging of geometry is needed.

5. Next, with *boybiped* selected, go to the Motion panel and select *Figure Mode*.



6. Adjust the biped's position so the center of mass is positioned in the crotch of the skin. Then use the rotate and scale tools to get the various bones to fit within. Make sure that the skin's joints line up with the biped's as shown below. Ensure that the biped links are centered in the mesh and the bounding boxes closely fit the skin.



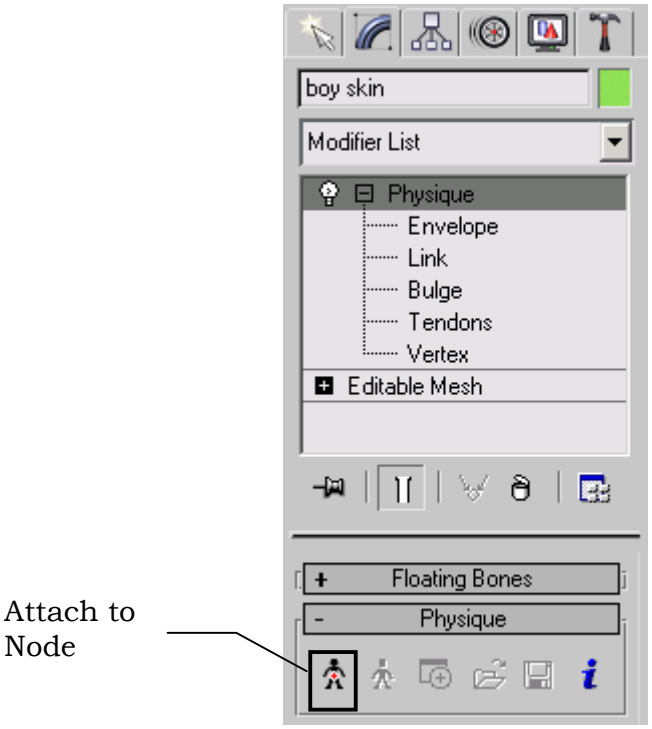
7. Once this stage is completed, save your work. You are now ready to assign the skin to the biped.

7.2 Attach the Skin to the Skeleton

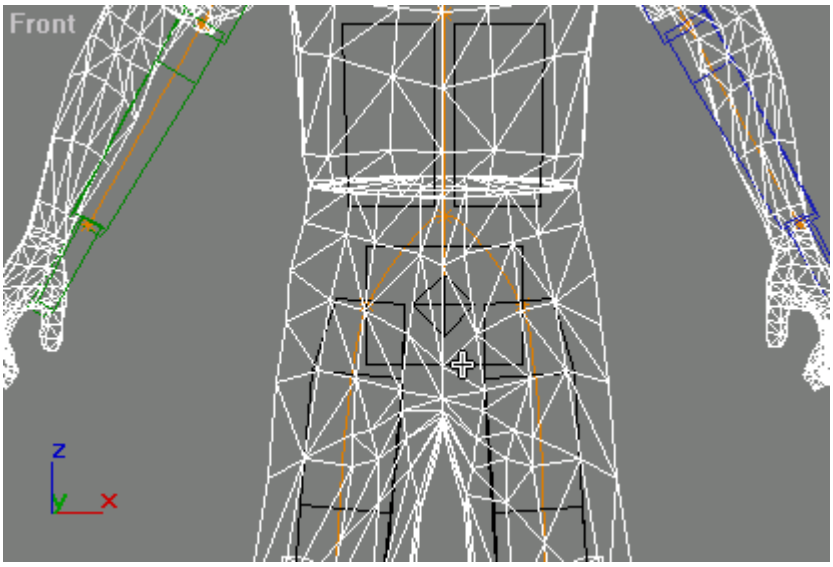
1. Select the skin object then, on the Modify panel in the Modifiers List rollout, select and apply a Physique modifier. This is the part of Character Studio which manages vertex assignments and weighting.

This tutorial uses physique skinning. Bones pro or 3ds max native skinning are also supported. Native skinning is recommended.

2. To attach the skin to the biped click on *Attach to Node* icon in the Physique rollout.

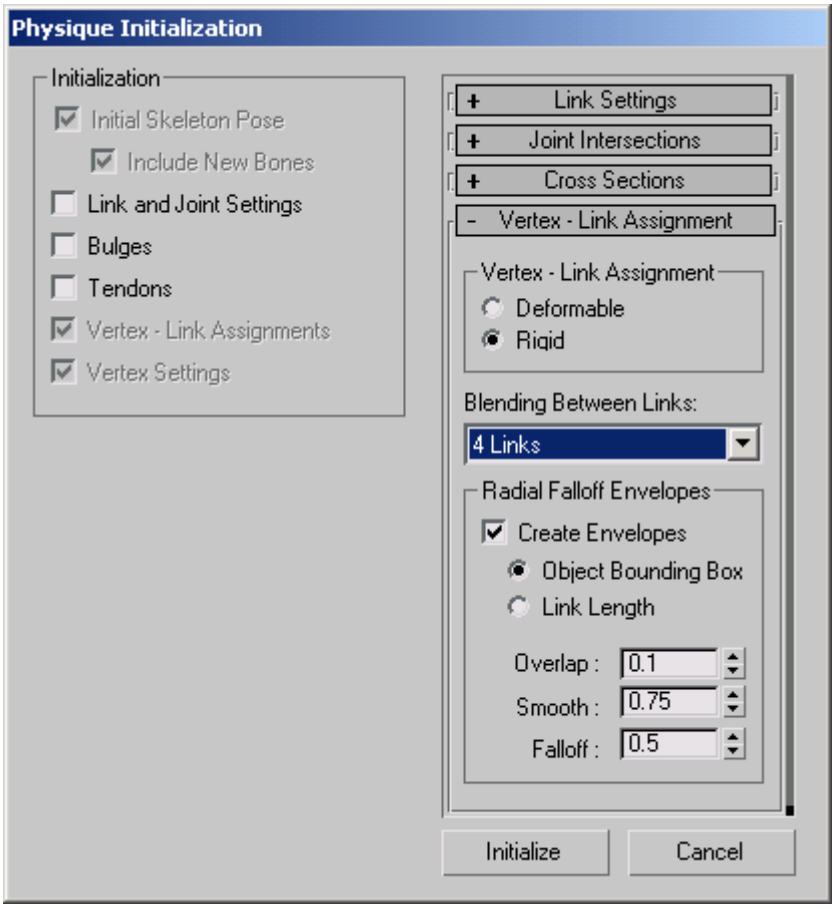


Now, as you move your cursor over the pelvis object it will change to a cross shape.



3. Click the pelvis object to attach the skin to the skeleton. (Alternatively, while in pick mode, you can select the pelvis from the *Select by Name* dialogue.)

The *Physique Initialization* dialog should appear.



Rigid assignments and blending between links: Currently, RenderWare Graphics supports only rigid vertex assignment and blending up to four weights. Besides setting the link assignment to *Rigid* in the *Physique Initialization* dialog, you should set *Skin Update* also to *Rigid* in the *Physique Level of Detail* rollout, so you can be sure what you see in 3ds max is exactly what you'll get in RenderWare Graphics. Generally, fewer weights mean faster processing although at the expense of lesser quality in some cases. Experiment!

Do not use Bulges or Tendons as RenderWare Graphics does not support these.

7.3 Exporting the Skin and Animation data

1. To export from 3ds max first select the root of the hierarchy, in this case, *boybiped.*

2. *RenderWare→View* to view the animated character in RenderWare Visualizer.

Exporting Dummies: Character Studio dummies are optimized out if hidden, don't have children and don't affect skin weighting. This is because Character Studio automatically tacks on dummy objects at the end of each limb and the head, which don't affect animation and can not be removed.

7.4 Summary

This tutorial has explained creating and editing a bone hierarchy using Biped. It has also explain attaching, editing, animating and exporting a skin using Physique and vertex assignments.

8. Export Templates

This tutorial introduces the concept of Export Templates. The previous tutorials have introduced the idea of creating, viewing, exporting and modifying assets. There are also a number of other options that can affect the way in which assets are exported. These options are stored in Export Templates. There are two types of Template: Asset Templates and Project Templates.

- Before you use this tutorial, you should be familiar with the RenderWare Graphics export process, and know how to create an `.rws` file from a scene.

This tutorial will explain:

- What is an Export Template?
- Creating a new Asset Template
- Editing Asset Templates
- Editing Project Templates

8.1 What is an Export Template?

An Export Templates contains the options settings for exporting assets in a particular format. All templates are stored in `.rwt` files and can be edited using the template editor, a standard XML editor or a text editor

Each asset in the Assets tab is associated with an Asset Template and each Asset Template can be shared by multiple assets. Asset Templates contain various options that affect the way in which the assets are to be exported, for example, tri-stripping info, skinning info, etc.. Project Templates on the other hand affect the global setting for the all assets to be exported, for example, file format, pre instance, etc..

Export templates contain many options that are specific to RenderWare Graphics. It is therefore recommend that only technical artists and programmers create and edit the Template files. After the template files have been created and setup it is expected that the artist will then use these templates to create and export their artwork.

There are four default Asset Templates which you can use or create your own. The default templates are read-only and we recommend that you set up your own templates based on the default templates. The default templates are:

- `Animated Hierarchy.rwt` - exports a single hierarchy within a scene as a RenderWare Graphics container object, called `RpClump`.

- `Animation.rwt` - exports animation data. Animated assets only contain animation data and require an animated hierarchy asset to contain the geometry.

- `Spline.rwt` - exports spline data and requires an animated hierarchy asset to contain the world.

- `Static World.rwt` - exports worlds. Worlds do not contain any hierarchy or animation information and are typically used for static level geometry in a game. They are automatically split into sections (PVS world sectors) that RenderWare Graphics uses to speed up the rendering process.

There are four default Project Templates, each one fine tuned for each specific platform. Please note that these are only suggested settings that can always be customized for a specific project. Each default project template is named after the target platform that it is tuned for, and only has its platform option enabled in the platform section. Users should also take note, that although these default project templates only enable one platform, it is possible to enable and specify settings for all the platforms within a project template.

- `Generic.rwt` used for exporting files to the PC (e.g. D3D8, D3D9 or OpenGL), exports files with the extension `.rws`.

- `GameCube.rwt` used for exporting files to GameCube exports files with the extension `.rg1`.

- `PS2.rwt` used for exporting files to PlayStation 2 exports files with the extension `.rp2`.

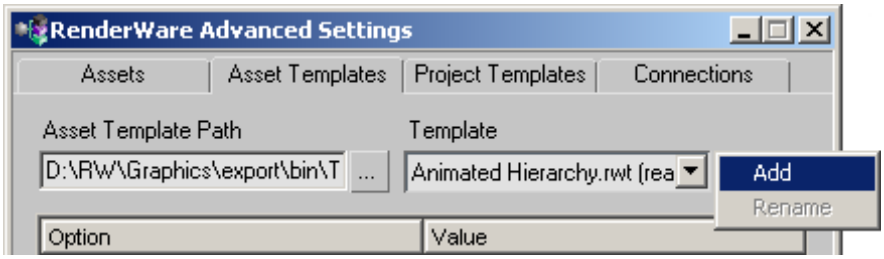
- `Xbox.rwt` used for exporting files to Xbox exports files with the extension `.rx1`.

- See TechnicalArtistGuide.pdf for a detailed description of Project and Asset Templates.

8.2 Creating a new Asset Template

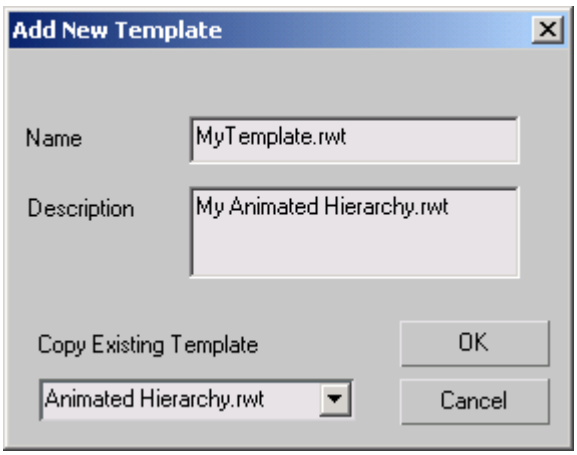
The following section will step though the stages required to create a new Asset Template. Project Template are also created in exactly the same way from the Project Templates tab.

3. Open the Advanced Settings window. *RenderWare→Advanced Settings…* Select the *Asset Templates* tab. This will display the Asset Template Editor.



4. Click on the *Options* button to the right of the Template field. Select the *Add* option from the menu.

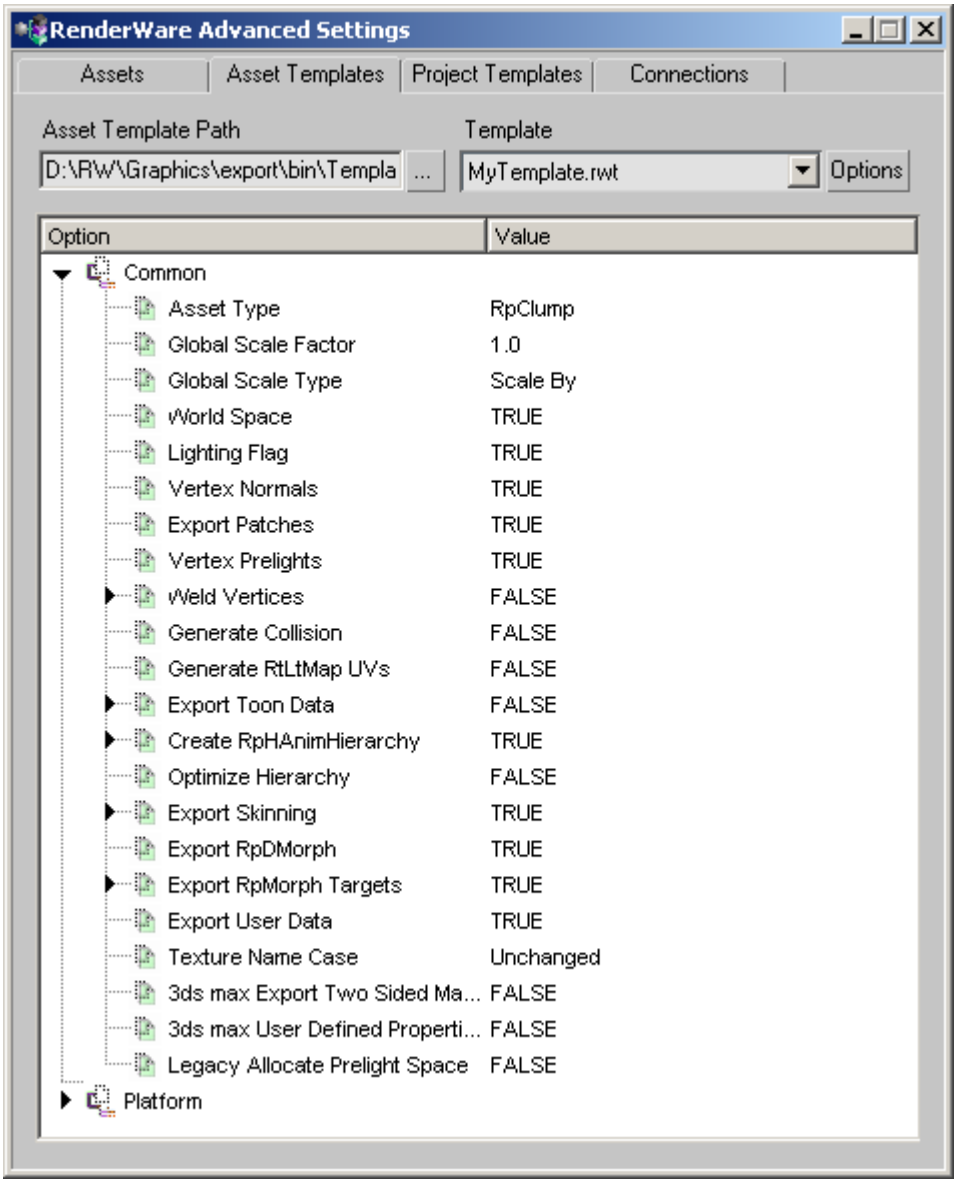
5. The *Add New Template* dialog will be displayed. Change the *Name* field to `MyTemplate.rwt` and change the *Copy Existing Template* drop down selection box to `Animated Hierarchy.rwt`. Click OK to create a new Asset Template.



Once the new template has been created it can be assigned to assets from within the Assets tab by selecting an asset and clicking the browse button in the template column. This will display a dialog from which to select the new template.

8.3 Editing Asset Templates

Each asset template contains 2 sections: Common and Platform. The Common section contains all of the export options that are common to all platforms. The Platform section contains options that are specific to only specific platforms. Each option is in the form of a key pair value, a name and a value. Each option can also contain sub options which can be edited in the same way.

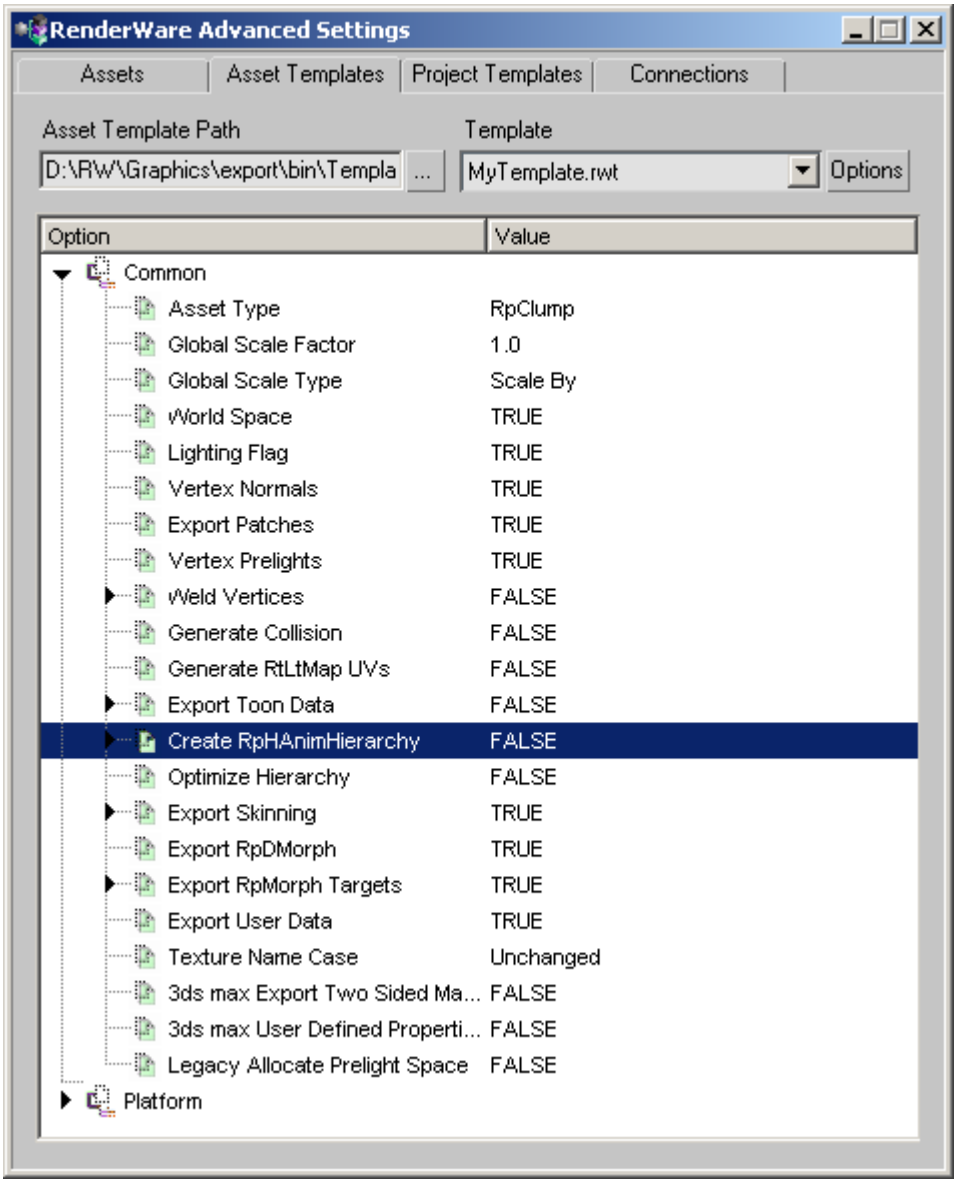


Each option can be edited by clicking on the value and selecting or typing in the appropriate value.

1. Open the `exporterbasics.max` example.

2. Open the Asset Templates tab. Select the '`MyTemplate.rwt`' Template from the Template field. You will see that this template contains a property called 'Create RpHAnimHierarchy'

3. Change the 'Create RpHAnimHierarchy' property to FALSE by clicking on the TRUE value.



4. In the Assets tab Right the ball_bounce asset and click *View*

5. In Visualizer you should see that the ball is static and is not animated. Setting *Create RpHAnimHierarchy* to TRUE will ensure that the hierarchy is exported. The green sphere will then bounce and the red hierarchy path will be displayed in Visualizer when *Hierarchy* is selected in Visualizer's control panel.

6. Save `exporterbasics.max`.

8.4 Creating a new Project Template

The following section will step though the stages required to create a new Project Template.

1. Open the Advanced Settings window. *RenderWare→Advanced Settings…* Select the *Project Templates* tab. This will display the Project Template Editor.

2. Click on the *Options* button to the right of the Template field. Select the *Add* option from the menu.

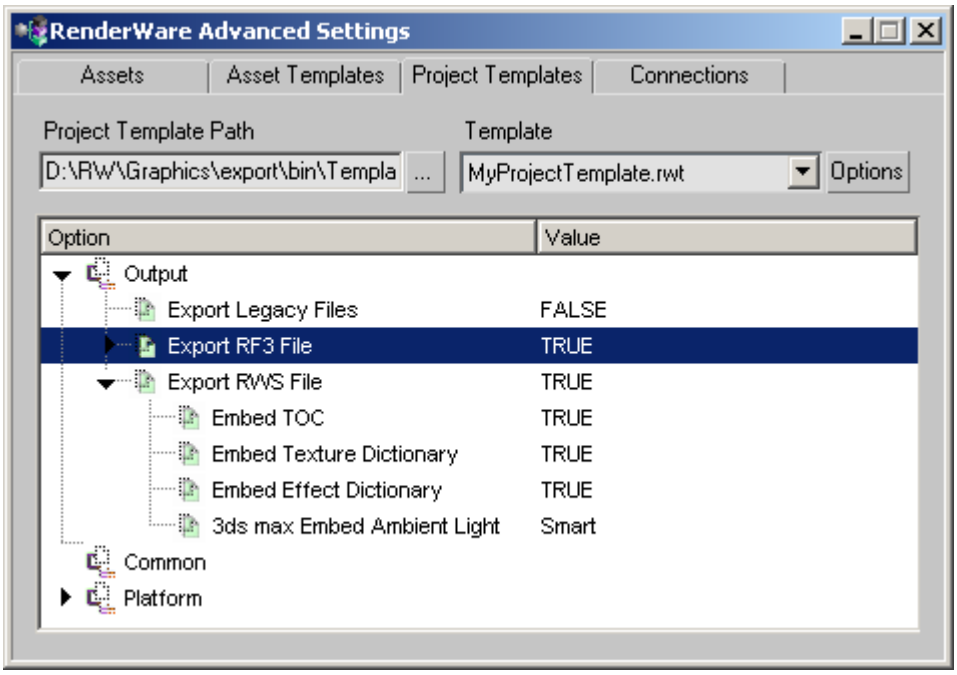
3. The *Add New Template* dialog will be displayed. Change the *Name* field to `MyProjectTemplate.rwt` and change the *Copy Existing Template* drop down selection box to `Generic.rwt`. Click OK to create a new Project Template.

Once the new template has been created it can be used to change the output format and other settings in Project Templates.

8.5 Editing Project Templates

This section is a brief introduction to the Editing Project Templates. The Project Templates tab dialog is explained in more detail in the exporter section of `\docs\exporters\artists\3dsmaxReferenceGuide.pdf` in your RenderWare Graphics directory.

1. In the *Advanced Setting Window* click on the *Project Templates* Tab.



Options in the Project Templates are edited in the same way as the Asset Templates.

2. Set the Export RF3 flag to TRUE. This enables the export of RF3 files in addition to the RWS files.

The Main Project Template options

The Project Template options are briefly explained below.

Export Legacy Files: exports assets as legacy files bsp, dff, anm, etc.

Export RF3 File: exports all data from all/selected assets into one `.rf3` file. The filename used will be that of the Project Name given in the Assets tab.

Export RWS File: exports all data from all/selected assets into one `.rws` file. The filename used will be that of the Project Name given in the Assets tab.

Embed TOC: embeds separate data at the beginning of the `.rws` file and creates a table of contents listing all assets.

Embed Texture Dictionary: embeds the texture dictionary at the start of a `.rws` file.

Embed Effect Dictionary: controls whether to generate a `RpMatFX` effect dictionary for all RenderWare shaders produced during export.

3ds max Embed Ambient Light: creates and embeds an extra `RpLight` for the ambient light.

The Project Template options are explained fully in the TechnicalArtistGuide.pdf

8.6 Summary

This tutorial has given a brief overview of what Export Templates are and explains how to create and edit Export Template files.

9. Hints and Partitions

This tutorial introduces the two closely related topics of Hints and Partitions.

- Before you use this tutorial, you should be familiar with the RenderWare Graphics export process, and know how to create an `.rws` file from a scene.

This tutorial will explain:

- the relationship between hints and partitions
- visualizing the results of an export with the partitions
- manipulating hints to adjust the results of the partitions

9.1 What are hints?

Hints are a special type of primitive that affect the sectorization of the scene on export but do not get exported as geometry to the final model.

Just a few hints placed strategically in the scene can significantly improve the sectorization, and they provide a way to affect the partitioning more controllably than before.

The hints are used in conjunction with the automatic partitioning of a scene.

9.2 What are partitions?

Partitions are a result of exporting a world; they define the Sectors in the world. However, in this tutorial, we refer to partitions as their visualization using the partition object.

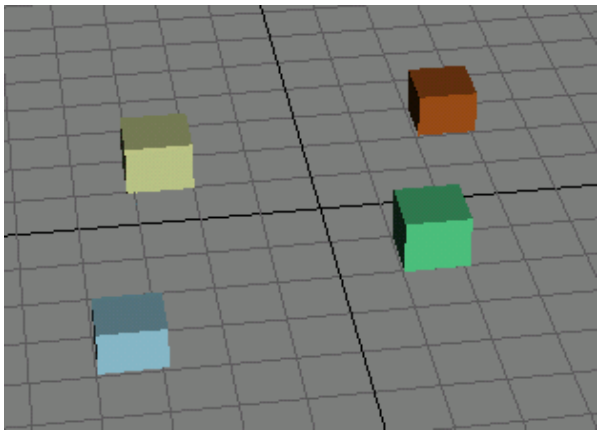
9.3 How they fit together

Hints are input to the export process, and affect the way the world is partitioned; partitions are the output/result of the world. Simply put, hints can affect partitions but not vice versa.

9.4 Visualizing partitions

To visualize the partitions in a simple scene, follow these steps:

1. Create a simple scene comprising of four boxes

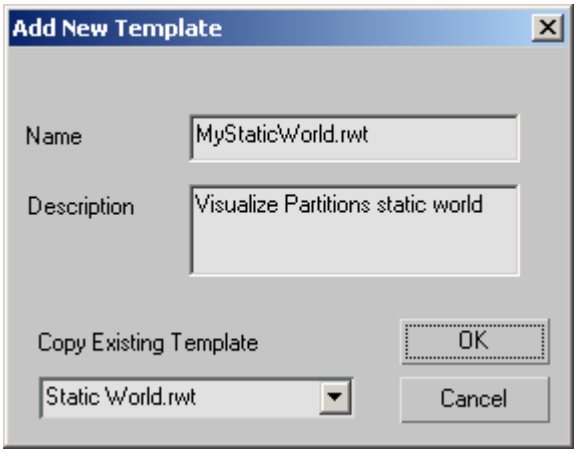


Next we need to create an asset template based on `Static World.rwt` and reduce the maximum number of polygons per world sector.

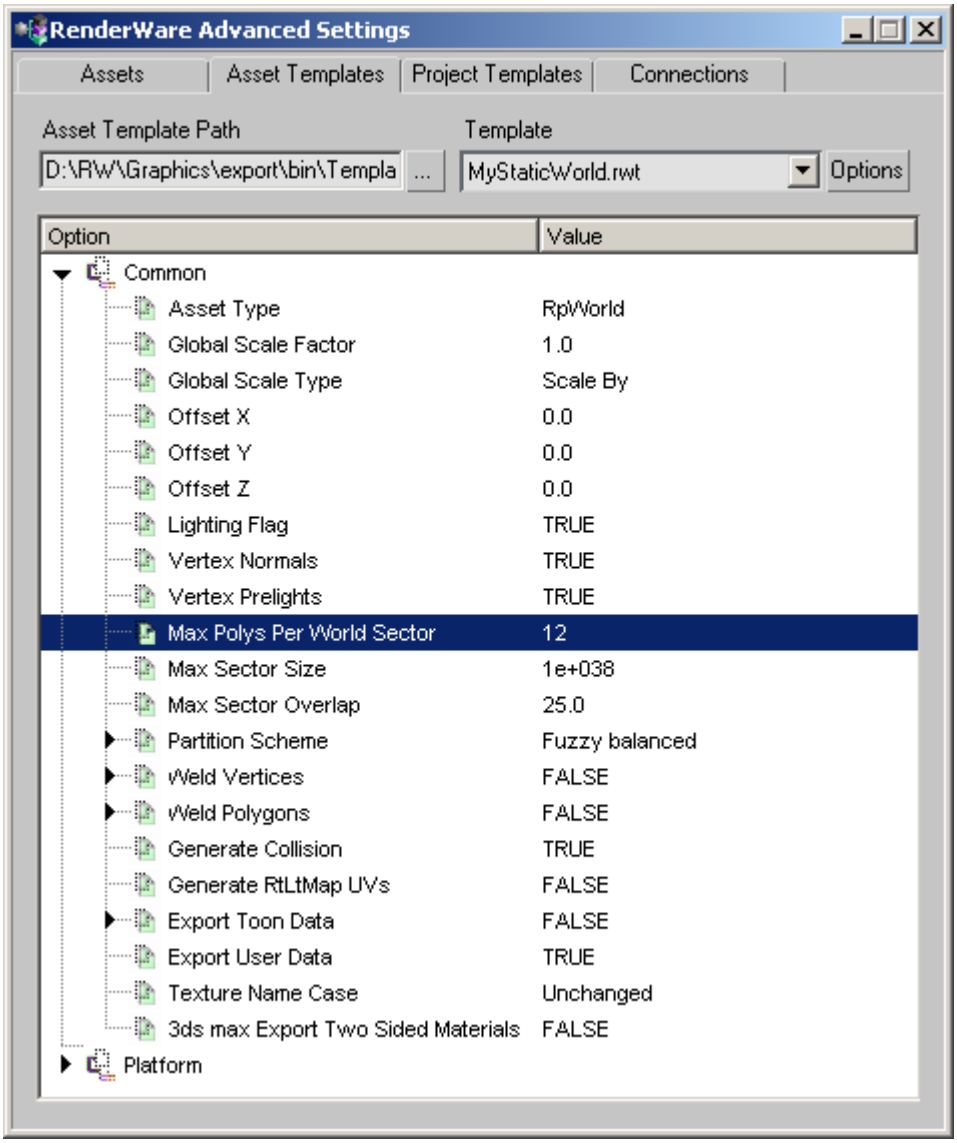
2. From the menu open the Advanced Settings window.
   RenderWare→Advanced Settings…

3. Select the Asset Templates tab, click the *Options* button and choose *Add*.

4. Create a new template based on the existing template
   `Static World.rwt`



5. In your new template change the Max Polys Per World Sector to 12 so that the export world contains several sectors and partitions.



Next, we need to assign out newly created template and enable the *Visualize Partitions* option.

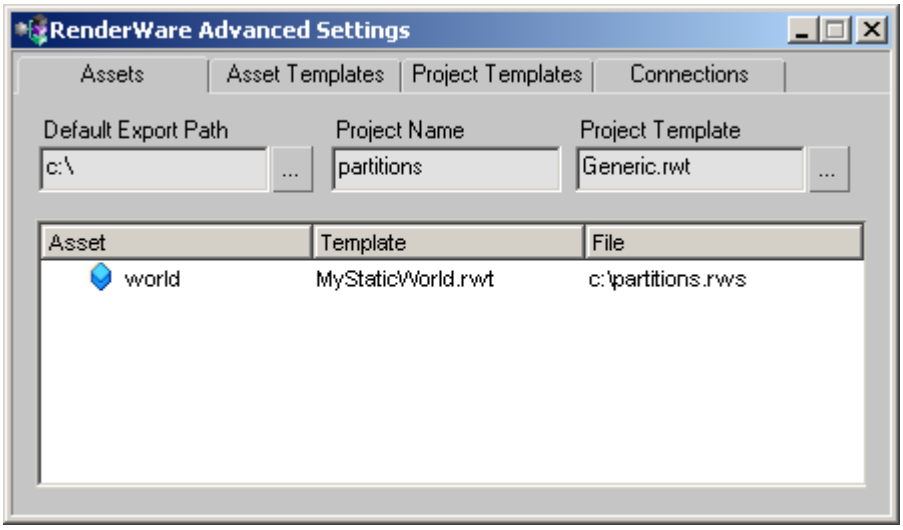
6. Select the Assets tab.

7. Right click in the Assets area and choose *Customize*. The asset properties can now be modified.

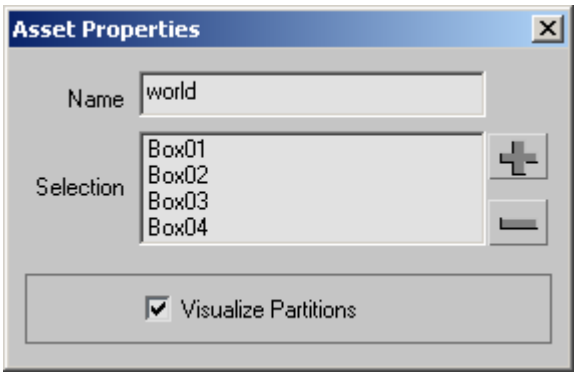
8. Double click the "untitled" asset to open the Asset Properties dialog.

9. Name the asset "world".

10. Assign the "world" asset's template to "MyStaticWorld.rwt".

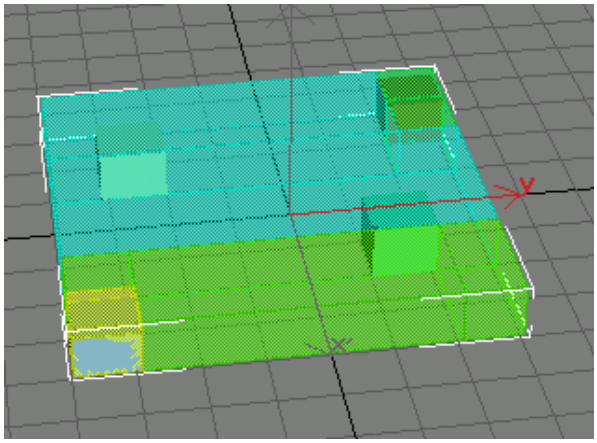


11. Edit the world Asset and enable the *Visualize Partitions* option.



12. Close the Advanced Settings window.

13. Export the world, *RenderWare→Export.*

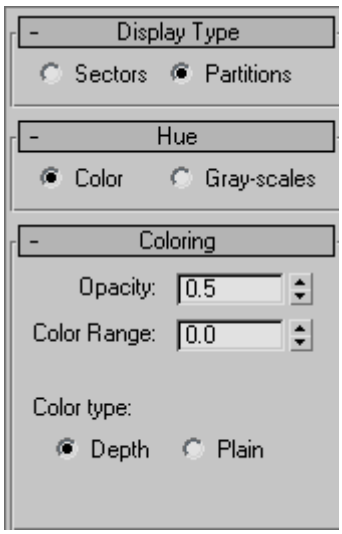


The scene's sectors are now displayed.

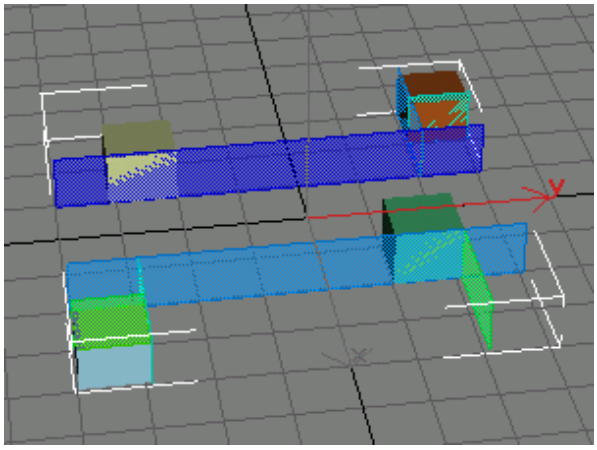
14. Select the RenderWarePartition object.

15. Select the Modify Command Panel

16. Select the *Partitions* option in *Display Type*.



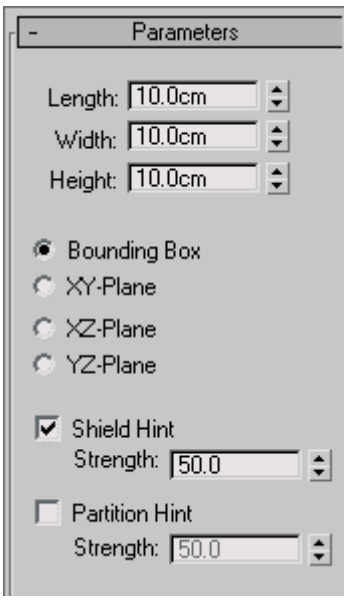
The partitions are now displayed



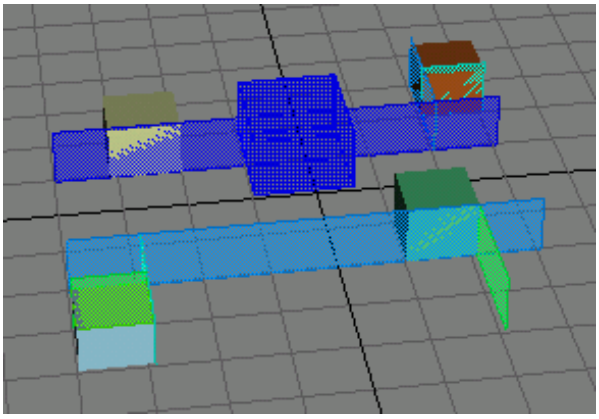
9.5 Adding hints to a scene

This section shows how hints affect a scene.

1. In the Create Command Panel, choose *RW Sectorization Hint*
2. Click *Add Hint* to create a hint:

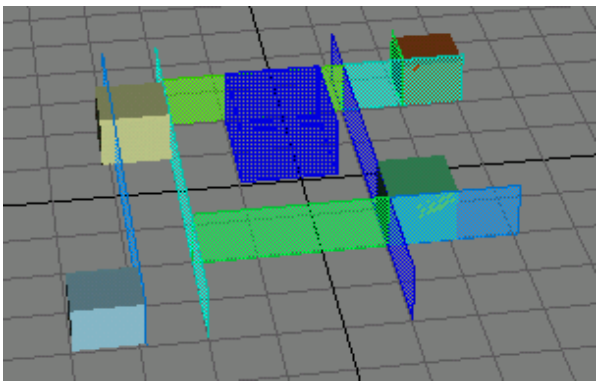


3. Draw a box roughly the same size as the cubes in the scene. Position it so that it straddles the dark-blue partition this is the root partition. (Partitions near the root of the tree or colored towards the blue end of the spectrum.)



Shield hints are color coded blue.

4. Export the world *RenderWare→Export*

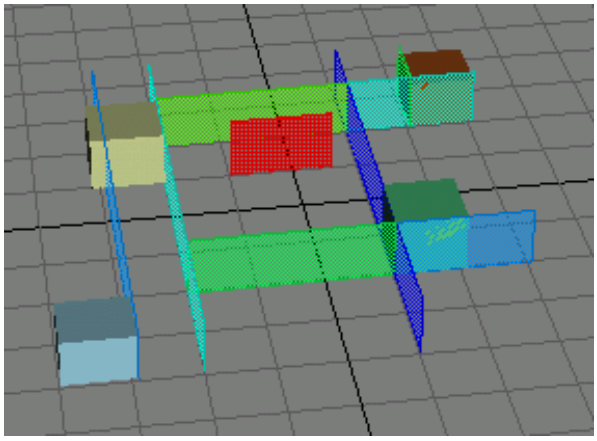


The partitioning has changed. The algorithm has considered the hint – a shield hint – and avoided cutting through it.

5. Select the hint
6. In the Modify Command Panel
7. Deselect the Shield Hint check box
8. Select the Partition Hint check box.

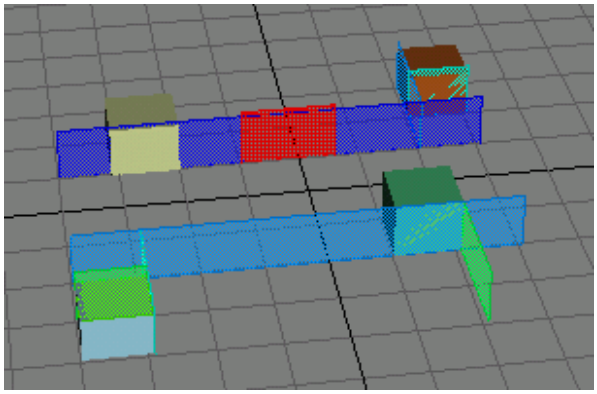
Partition hints are color coded red.

9. Change the hint to one of the Plane types, for example, XZ Plane



10. Export the world

This time, the blue, root partition will run parallel to the hint. This type of hint tells the export process where to place hints, and these (usually) override automatic ones.



9.6 Further exercises

To become more familiar with hints and partitions:

- Try adding more hints, each a different type
- Experiment with the strengths of each hint, especially partition hints.
- Add some hints to a larger scene, and see how much you can affect the partitioning of the world
- Try some different schemes from the partition schemes option.

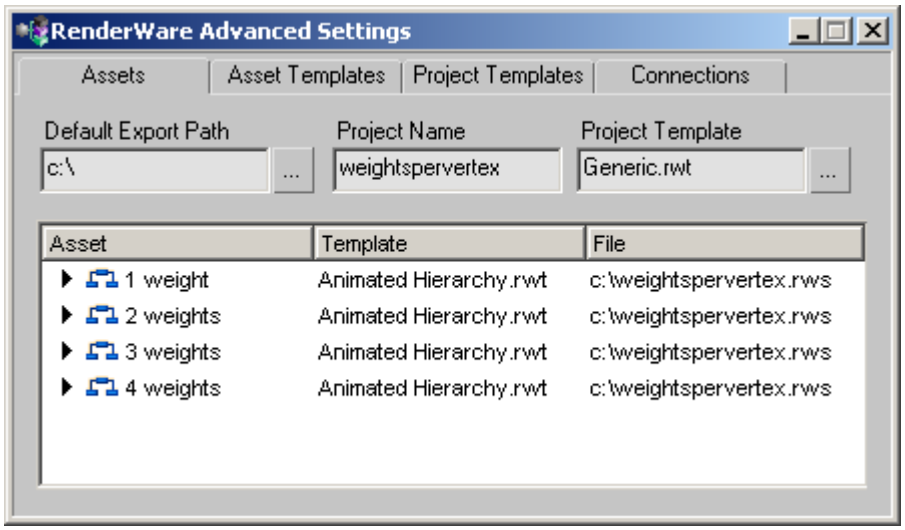
10. Skin Weights

RenderWare Graphics skinning supports up to 4 weights per vertex. Whilst this is ample for the majority of skinning operations it may be desirable in some circumstances to have fewer weights per vertex. For example, you may have many characters which are viewed from a distance in a team game. The example file `weightspervertex.max` shows the difference between using different weights.

10.1 Comparing Skin weights per vertex

1. Open `weightspervertex.max`

2. Open the Assets tab
   RenderWare→AdvancedSettings…, Click the *Assets* tab

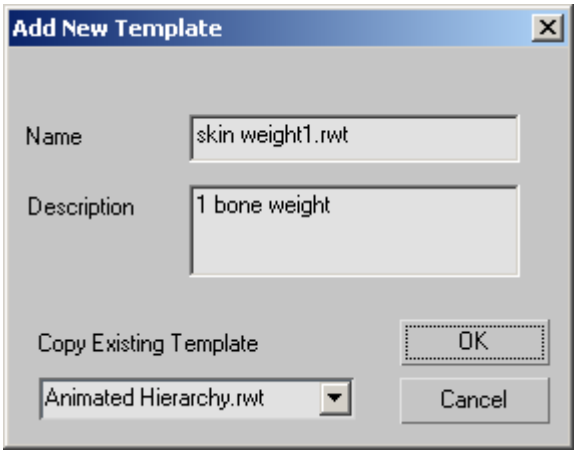


In the Assets tab there are four assets which have already been set up. We shall set these assets up so that they have a difference number of bone weights per vertex. To achieve this we will create 4 asset templates, each using a different number of bone weights.

3. Open the Asset Templates tab, Click *Asset Templates* tab.

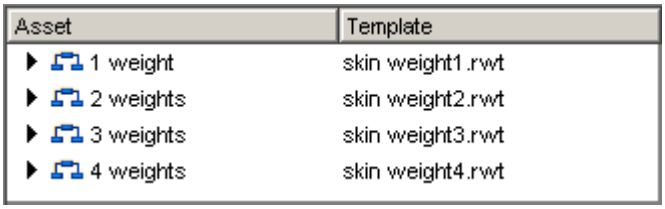
4. Create a new Animated Hierarchy Asset Template. Click *Options* and Select *Add*.

5. The Add New Template dialog is displayed. Set the name to *skin weight 1.rwt* and copy the default *Animated Hierarchy.rwt* template.

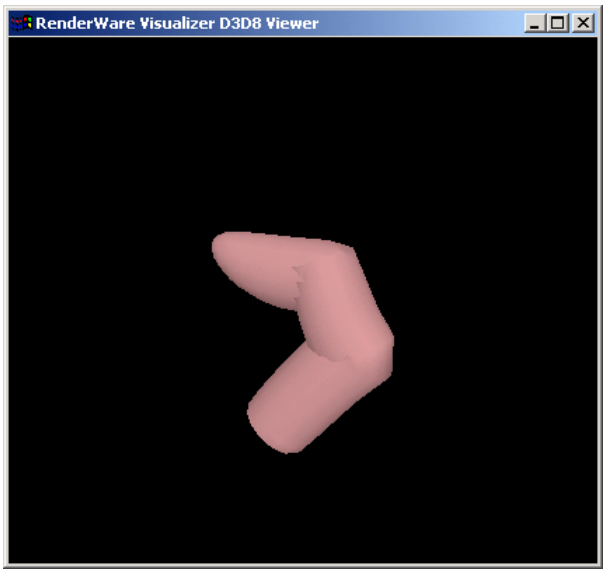


6. Create a further three templates. For each of the new templates set the *Max Skin Weight Per Vertex* value to the appropriate amount.

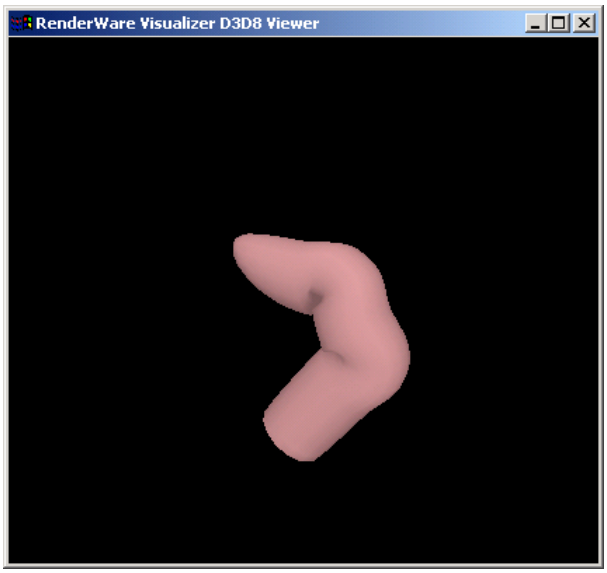
7. Go back to the Assets tab and assign each asset to a different asset template.



8. View each asset in turn to see the difference. *Right click asset → View.*

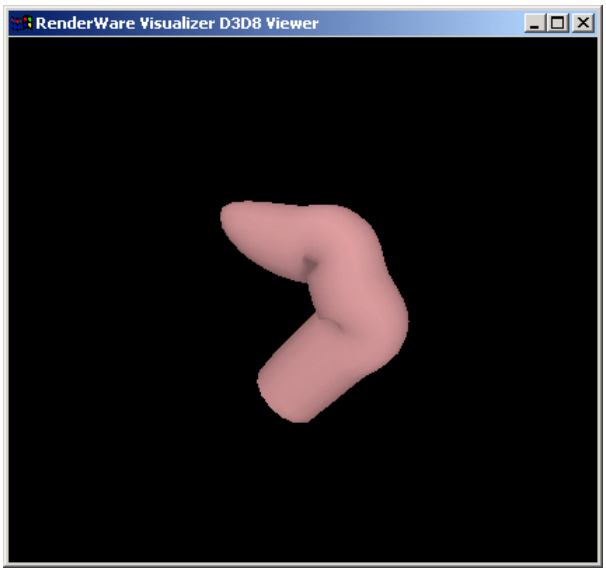


1 weight per vertex

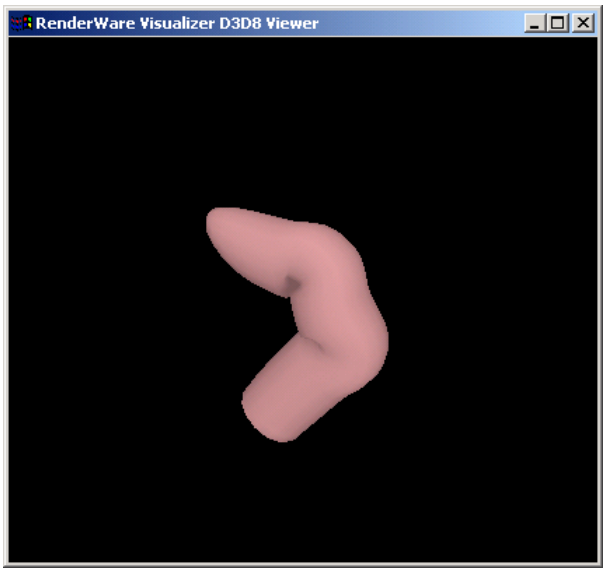


2 weights per vertex

Using either 1 or 2 weights can be acceptable in certain circumstances and can offer significant performance improvements in most applications.



3 weights per vertex



4 weights per vertex

The difference between 3 and 4 weights per vertex is very slight.

A choice between speed and quality has to be made on a case by case basis.

RenderWare Graphics supports up to four bone weights per vertex. Using less than four bones can offer significant performance improvements.

10.2 Summary

This tutorial has covered the use of bone weights in detail.

11. Coordinate Systems

You may have noticed that your artwork does not always view as expected. RenderWare Graphics and 3ds max use different coordinate systems. This tutorial explains how you can work in 3ds max and manipulate your coordinate system to work out how it will be displayed as in RenderWare Graphics.

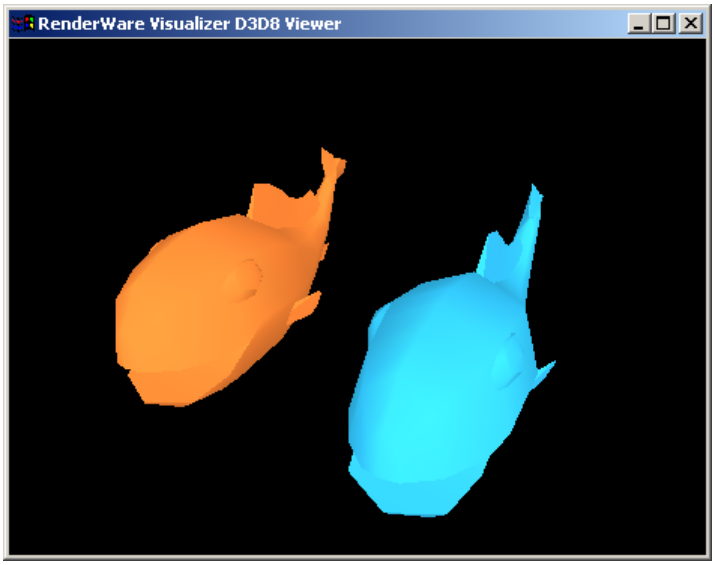
This tutorial explains:

- world coordinate systems in RenderWare Graphics and 3ds max
- changing the coordinate system in 3ds max
- world space and object space

11.1 World Space

We'll have a look at the coordinate system using the fish example. We'll start by having a look at the *World Space* flag in the Animated Hierarchy asset template. By default this flag is set to TRUE.

1. Open `fish.max`.
2. Open the Asset Templates tab
   RenderWare→Advanced Settings…
3. Select the `Animated Hierachy.rwt` Template and make sure the *World Space* flag is set to TRUE. By default this flag is set to TRUE.
4. Close the *Advanced Settings* window and view the fish in the *Visualizer RenderWare→View.*



5. Close Visualizer

11.2 Object Space

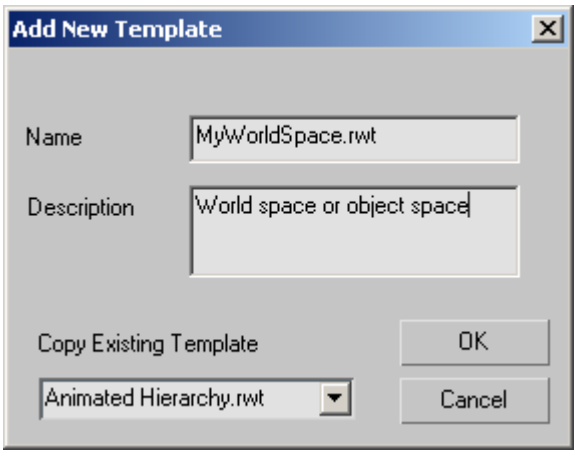
We'll now have a look at viewing the same fish assets in Object Space.

Again we'll use *View* to look at these fish. This time we will set export the fish into Object Space.

1. *RenderWare→Advanced Settings…*

2. Click the *Options* button and select *Add*.

3. Create a new template based on `Animated Hierarchy.rwt`.

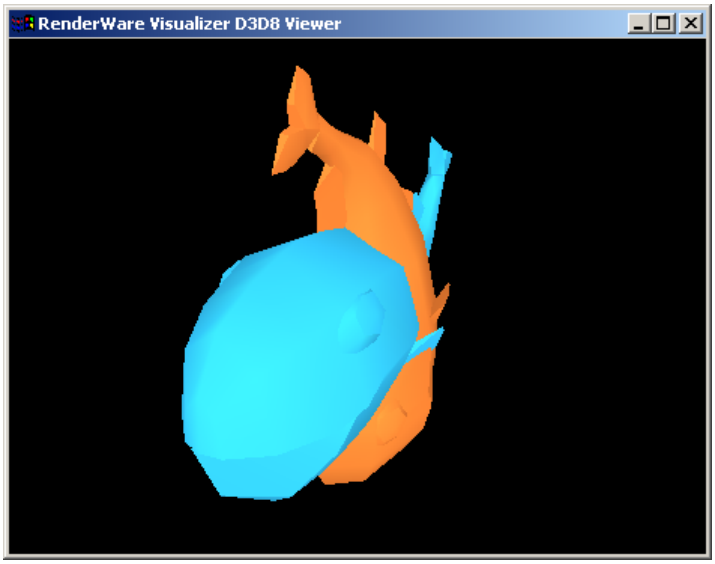


4. Set the *World Space* flag to FALSE. When the fish are exported they will be exported into Object Space.

5. Go back to the Assets tab and assign each asset your new template.

Asset	Template
blue fish	MyWorldSpace.rwt
goldfish	MyWorldSpace.rwt

6. Right click in the area below the assets and select *View All*.



The blue fish and the goldfish are facing different directions because their axis rotations are different. The two fish have been exported in object space and are therefore exported on top of each other.

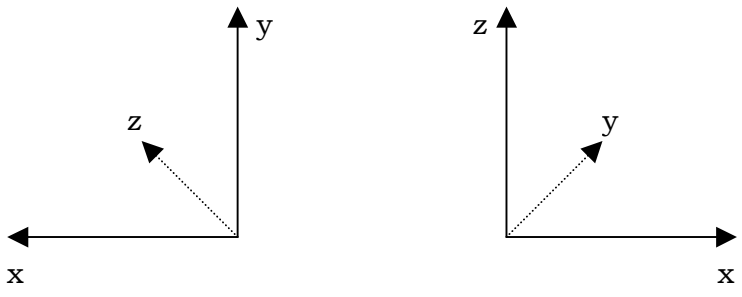
World space removes all translation and rotation data from the root of an object hierarchy. In other words if an object is upside down in 3ds max it will appear the right way up when exported. This displays the object with the same orientation when exported.

7. Close Visualizer

11.3 World Coordinate Systems

We need to ensure that the coordinate system used in 3ds max is set to "world". This is important because the world coordinate system uses a right-handed coordinate system but the orientation is different to RenderWare Graphics'.

RenderWare Graphics and 3ds max use different conventions, which are shown below:



RenderWare Graphics *3ds max*

- RenderWare Graphics' virtual camera points into the screen along the positive *z axis* and the positive *x axis* points to the left.

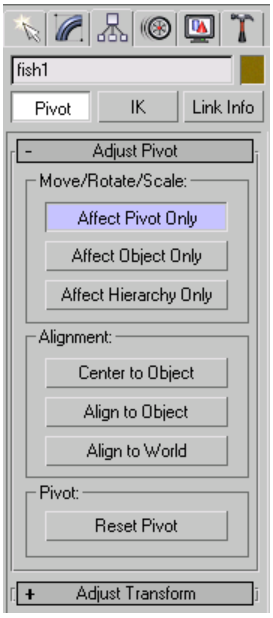
- 3ds max world coordinates system points into the screen along the positive *y axis* and the positive *x axis* points to the right.

We'll now have a look at how the coordinate systems impact the way artwork is displayed in 3ds max and how this can be changed.

1. Change the reference coordinate system in 3ds max to "World" using the button on the toolbar.

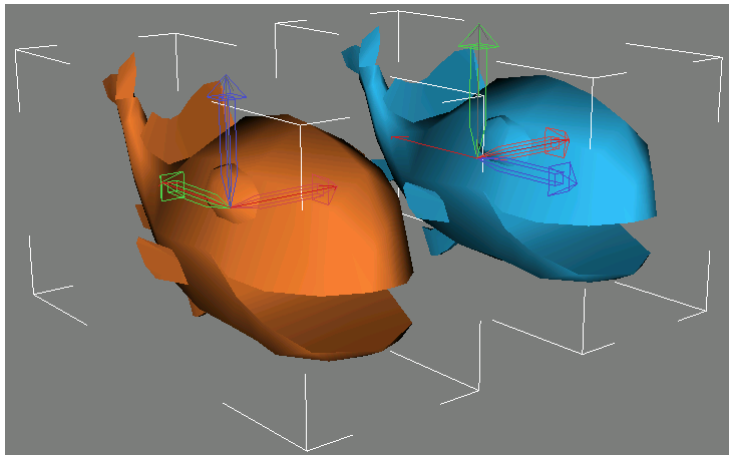
2. To change the orientation of the goldfish, in 3ds max, select the goldfish.

3. In the hierarchy panel, select *Pivot* and select *Affect Pivot Only*. The correct orientation of the goldfish is set by rotating the pivot.



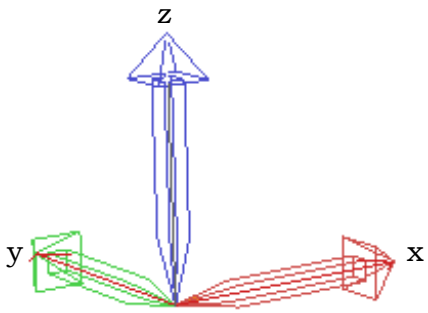
You should now be able to see the orientation of the goldfish. The goldfish is using the default 3ds max world coordinate system.

4. Holding down Ctrl, select the blue fish. The orientation used is different.

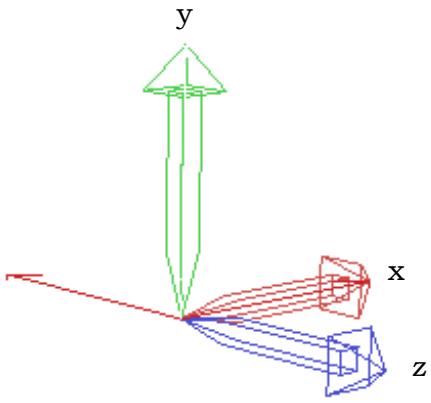


Fish displaying differing coordinate system rotations.

Orientation: *x=red, y=green, z=blue*



goldfish



blue fish

The goldfish is using the 3ds max world coordinate system with the positive *y axis* pointing into the screen, the positive *x axis* pointing to the right and the *z axis* pointing upwards.

The blue fish is using RenderWare Graphics' coordinate system with the positive *z axis* pointing into the screen and the positive *x axis* pointing to the left.

5. Using the select and rotate button  , select the goldfish and change the *x axis* of the goldfish to 90 degrees.

6. Click *View* to view the fish in Visualizer. You will only be able to see the goldfish as the fish are now exporting to the same position in object space. To view both fish at the same time you will need to change the World Space flag back to TRUE

7. Close Visualizer and save `fish.max`.

11.4 World Space and Object Space

Exporting objects is used for positioning objects in a game. Objects can be exported into world or object space.

Object space is normally used when objects requiring artist positioning are exported, for example, characters.

World space is used for static objects such as static walls and floors which are part of a world.

To work out which "space" you should be using think about the following:

- What objects does your game position? (object space)
- What objects does the artist position? These are objects added to a world, rendered and always appearing in the same position. (world space)

11.5 Summary

This tutorial has shown the differences between 3ds max and RenderWare Graphics' coordinate systems. To view the coordinate systems from a specific viewpoint in Visualizer, a camera can be added to 3ds max. When exporting files to use within a game, it has to be remembered that the coordinate systems that RenderWare Graphics and 3ds max use are different and the orientation in 3ds max has to be changed to obtain the expected results.

12. Batch Exporting

This tutorial will explain:

- exporting multiple scenes using the batch exporter.

12.1 The Batch Export Tool

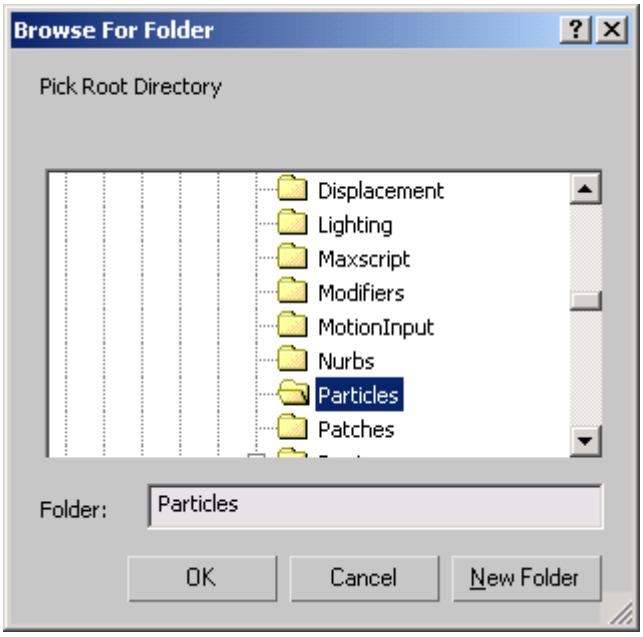
So far you've exported one scene at a time. This works for simple examples but in a working situation you are likely to have complex scenes with elements that need different export settings spread across many file.

The RenderWare Graphics exporter has a batch tool that enables the export of multiple scene files automatically.

1. Select the Batch Exporter from *RenderWare→Tools→Batch Exporter*

2. Select either Yes or No from the Recursive Export? dialog that appears. If you choose recursive every scene file in every child directory will be processed, otherwise only the scene files in the selected directory will be processed.

3. From the browse dialog select the directory from which the batch export will be performed and Click OK. The batch export process will begin.



12.2 Summary

This tutorial has shown how the Batch Exporter tool can be used to export multiple scene files.

13. Appendix

The example 3ds max scene files used in this tutorial can be found in your `docs\exporters\artists\examples\max` in your RenderWare Graphics directory.

The files used in these tutorials are associated with the following texture files:

multicameras.max

`cncr215.bmp`

`cncr255.bmp`

`flagstone.bmp`

`metal.bmp`

`wal011s.bmp`

`wal156S.bmp`

pillars.max

`wall53S.bmp`

`wall53Sbump.bmp`

vertexlightworld.max

`flagstone.bmp`

`floor1.bmp`

`litwal.bmp`

`metal.bmp`