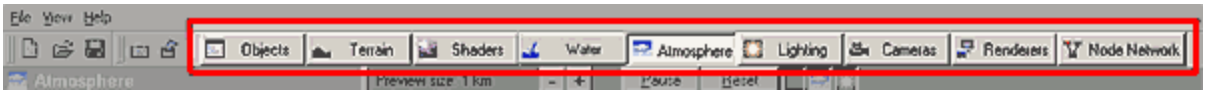
User Interface Overview

Welcome to the Terragen 2 (TG2) Technology Preview!

The first thing you've probably noticed is a new and very unfamiliar User Interface (UI) and no doubt you're wondering what everything does. So let's see take a look at the basic UI and see if we can learn a bit how Terragen 2 works.

The User Interface – First Impressions

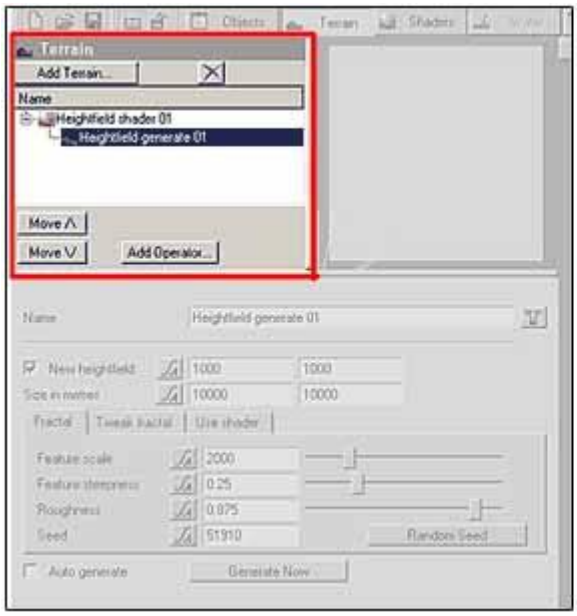
The Terragen 2 UI is based around a "tabbed layout" system, with tabs or buttons at the top that allow you to quickly access and edit the major areas of your scene. Each tab consists of a layout with tools and functionality specific to the area of the scene you are editing. The tab buttons have text labels that are self-explanatory for the most part; the two which may be confusing are Shaders, which in Terragen 2 terminology is essentially the same as surface mapping (although much more powerful) and Node Network, which we'll ignore for now. If you have clicked on any of the Layout Buttons then click on the Terrain button now to return to the Terrain layout.



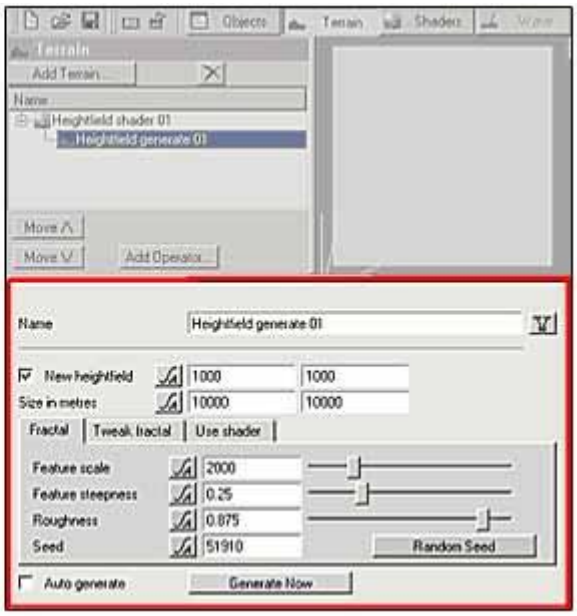
Each button accesses a layout tab to edit that specific part of the scene

Below the tabs on the left is the Node List which will show a Heightfield shader and Heightfield generator in the default scene (note: you may need to click the small "+" sign to expand the list and see the Heightfield generator). The Node List displays items (nodes) that are relevant to the current layout. In the Terrain Layout, for example, the Node List displays nodes that control the shape of the terrain, while in the Atmosphere Layout the list will contain nodes that define the

atmosphere and clouds. Nodes are displayed hierarchically, with child nodes indented and connected to their parents by a dashed line. This structure mirrors the structure of the Node Network, which we'll discuss later. Single-clicking on one of these nodes will bring up its settings below the list in the Parameter/Settings Pane.



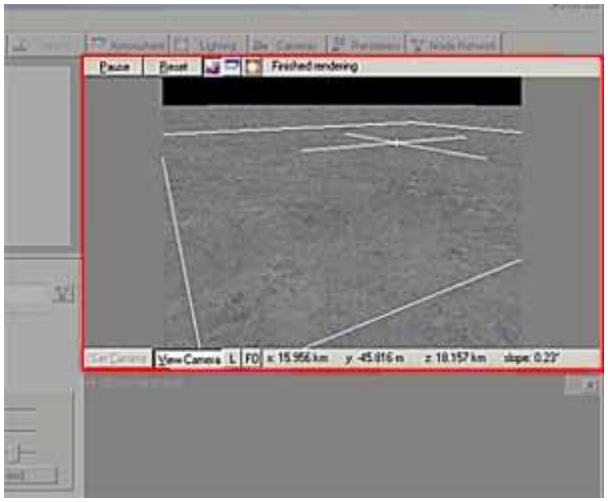
The Node List



The Parameter/Settings Pane

The configuration of the Node List will vary depending on the layout you are in but in most you will see a button at the top of the list to add additional nodes of appropriate type and in many cases there are buttons at the bottom to rearrange items in the list as well. Nodes at the top of the list will generally be "covered" or superseded by nodes further down. When dealing specifically with Surface Layers in the Shader Layout, parents are also covered by their children, but the children are limited to the coverage or area of affect of their parents. This is similar to how surface mapping in Terragen 0.9 works.

On the upper-right you will find the Realtime 3D Preview. This is a preview of your current scene which defaults to the view of the current camera. By default it shows all elements of the scene including surface mapping, sky and clouds, although it is customized for each layout for maximum efficiency. So for example in the Terrain Layout the atmosphere is disabled, which speeds up the preview and gives you a better view of your landscape.



The Realtime 3D Preview

You can easily move the view around the scene with the appropriate hotkeys. **Refer to the Help Menu under Mouse and Key settings for a list of current hotkeys for your platform. You can also select 1, 2, or 3 button mouse hotkey presets from Edit->Preferences->Mouse Settings.**

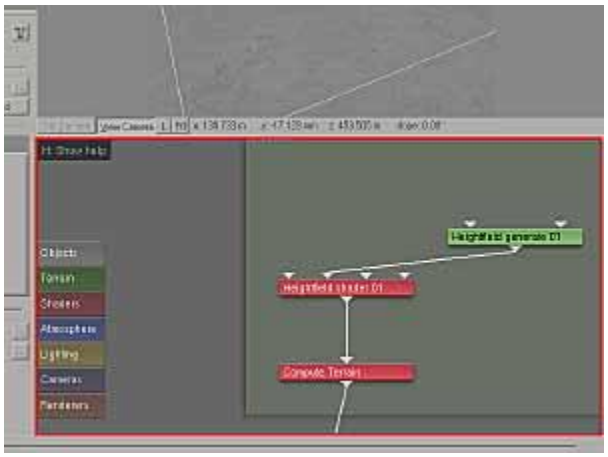
With the Windows defaults you can make adjustments by holding down Alt, clicking one of the mouse buttons in the 3D view and dragging across it to move the camera. Alt+Left mouse button controls Rotation ("Orbit"), the Middle mouse button controls Forward and Backward motion (like Zooming), and the Right button moves you Up and Down and Side-to side (a bit like “panning” or "translation").

However, changing the current view in this way will not change the current camera position and orientation. **The Set Camera button will transfer the current view position to the current camera.** This button will be greyed-out if the current view and current camera are the same. Pressing the View Camera button will show the current camera’s view and this button will be permanently depressed when the current view and camera view are the same.

Just below the preview window is a set of 4 numbers labelled “x”, “y”, “z”, and “slope”. The x, y, and z figures indicate the current position of the terrain under the mouse cursor in the 3D preview. Coordinates are measured in metric units, usually meters (‘m’) or kilometres (‘km’) and are relative to a customizable centre point. Slope indicates the slope of the terrain in that area and it is measured in degrees. Move the mouse around in the 3D preview and you will see the values update. These numbers can be extremely helpful in placing objects or fine-tuning surface mapping. The slope readout can be particularly useful in determining surface placement and

distribution.

Below the 3D preview is a view of the local Node Network, which shows all the nodes and connections local to the currently selected node, group, or layout. TG2's fundamental scene structure is based around the concept of "networking" separate pieces called Nodes to form a whole scene. This is a very powerful way to create scenes, but it's also quite complex and not immediately intuitive for many people. We'll ignore the Node Network for now since we can do everything we need to using the Node Lists. But it may be useful to watch how the node network changes as you manipulate things in the node lists. You will see that the network moves to show you the device you currently have selected in the node list and you can see how new devices are positioned and connected into the network.



The local Node Network view

You should now have a good basic understanding of the major user interface areas you see upon first opening Terragen 2. Read on in the User Guide to find out how to create your first scene.

Quick Start

For those pressed for time here is a quick step-by-step run-down of how to get a basic scene in the Terragen 2 Technology Preview. You can find details on how to create a nice, basic scene in "Creating Your First Scene". These are essentially the same steps that we go over in that section, however no explanation or detail is provided here. It is simply a series of steps to arrive at a basic scene for those who want a very quick overview and who prefer to experiment on their own from there. Feel free to explore and experiment but if you get lost don't forget that "Creating Your First Scene" offers a lot more detailed help and instruction.

1. Start TG2 Technology Preview
2. Switch to the Terrain layout if necessary by pressing the Terrain button at the top of the TG2 interface
3. Press the Add Terrain button and select Power Fractal from the drop-down list
4. Switch to the Shaders layout
5. Click on Base colours
6. Click on the Color tab
7. Change each color to a shade of brown by clicking on the colored square on the far right and selecting your color, then clicking OK
8. Now click Add Layer above the node list and select Surface Layer
9. Click on the newly created surface layer
10. Using the instructions above, change the default white colour to a greenish-yellow to represent grass
11. Click on the Altitude constraints tab
12. Turn on Limit maximum altitude using the check box, then set Maximum altitude to about 600 or until you start to see brown mountain tops in the preview
13. Click on the Slope constraints tab
14. Turn on Limit maximum slope and set the Maximum slope angle to about 25 with the Max slope fuzzy zone at about 10
15. Click on the Coverage and breakup tab
16. Set Coverage to 0.7
17. Set Fractal breakup to 1.0
18. You may want to do a test render to see how things look; press F3 to bring up the Render window then press the Render button
19. Add a Snow-like surface layer using what you have learned from adding the grass layer above
20. Switch to the Lighting layout
21. Click on the Sunlight 01 node to adjust the sunlight settings
22. Use the Heading and Elevation controls to find a lighting angle that you like – specifics will vary depending on the camera angle you have chosen and your particular random terrain
23. Switch to the Atmosphere layout
24. Click on the Atmosphere 01 node

25. Reduce Haze density to 3
26. Click on the Add Cloud Layer button above the node list and select Mid-level: Altocumulus (3D/Volumetric)
27. Do a render test to see how your scene is progressing
28. Click on the newly created cloud layer
29. Increase Cloud depth to 500
30. Reduce Coverage adjust to about -.25
31. Render your scene again to see how the clouds look and if you are satisfied, move on
32. Go to the Renderers layout
33. Click on Full Render in the node list
34. Set Image width to 800 and Image height to 600
35. Click on the Quality tab
36. Set Detail to 0.75
37. Click the Crop Region tab
38. Check the Do crop region box to turn the crop function on
39. Go to the Atmosphere layout
40. Click on the cloud layer you created earlier
41. Click the Quality tab
42. Increase Number of samples to 12
43. Do a final render
44. Save your image with the Save button

Creating Your First Scene

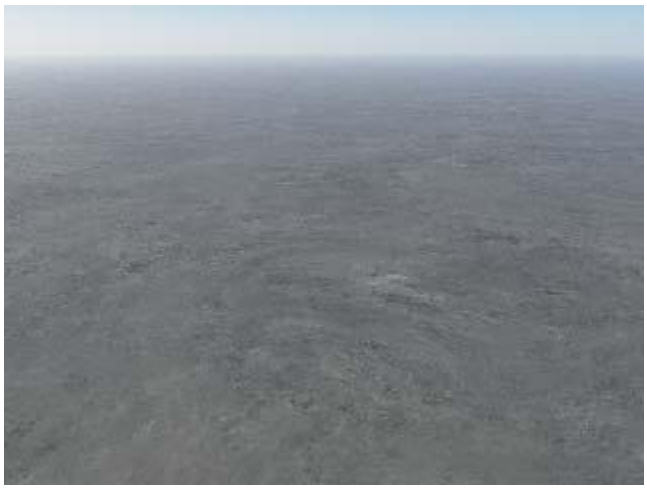
I: Introduction

Although you can theoretically build your scene in any order you choose, there is a basic logical approach that we will follow on this first outing to give us a good start-to-finish overview of the available tools and functions. We'll begin by creating a terrain, then try a little surface mapping, adjust the lighting, work a bit with the atmosphere, and finish up by rendering our scene at high resolution and quality.

For this basic overview it won't be necessary to use all the layouts. Techniques and controls such as camera movement will be introduced once when first needed, after which the operation will be referenced without repeating the instruction. If you need further information or practice with any specific function or feature you can refer to the in-depth sections in the User Guide.

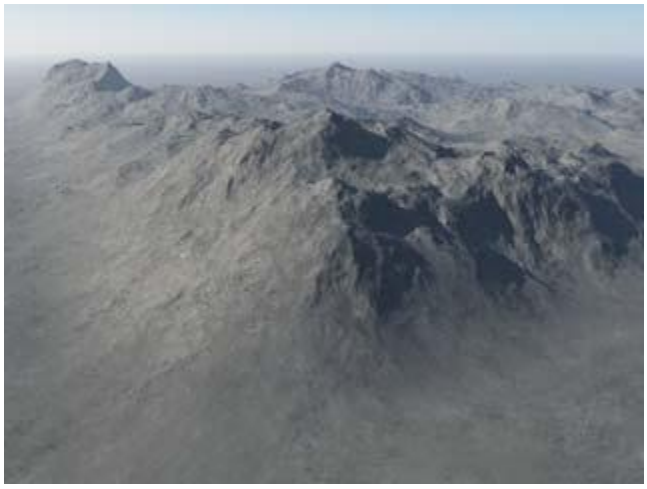
II: Terrain

When you start TG2 it takes you to the Terrain layout by default. The world in TG2 is based around a full globe, which starts out completely smooth. To create your landscape you will use procedurals and heightfields which are nodes that change the appearance of the surface of an object or some other part of the scene. Some nodes may add colour or texture to a surface, while others may change the shape of a surface through a technique known as displacement. TG2 supports both procedurals and heightfields (more on that in the next section) but by default there is a Heightfield generator in the scene with a Heightfield shader as its parent. Let's take a look at the generator node so we can start to create our world.



The default scene, a flat grey planet

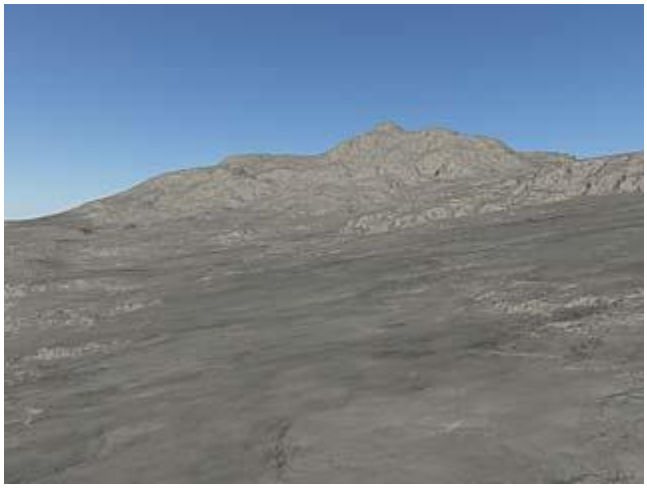
Left-click on the Heightfield generate node to bring up its settings below. At the bottom of the Heightfield generate node settings you will see the "Generate Now" button. Click it and wait for it to process – it should take less than a minute – and when it completes you should see the 3D preview update with a view of the newly generated terrain. You'll notice that the terrain seems a bit far off, sloping down toward the camera in the foreground. Let's move the camera over there for a closer look.



The heightfield has been generated

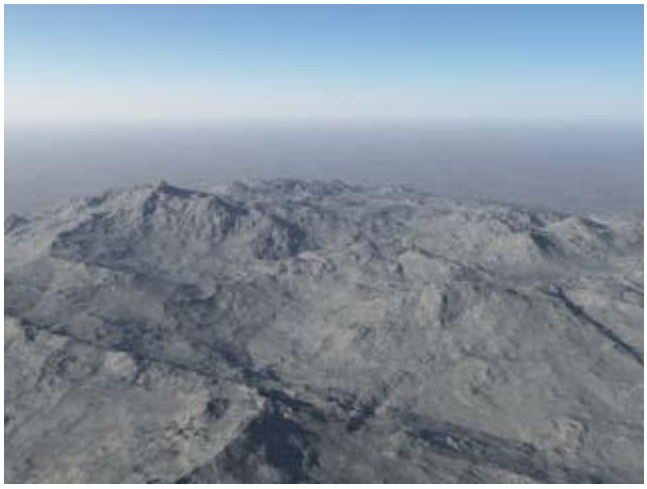
Now we'll move the camera a bit. Please refer to the Mouse and Key Settings under the Help menu for specific keys for your platform and settings. With the Windows defaults you can hold down the Alt button, Left-click and drag Upward in the 3D preview to move your view Down. You want to see just about half ground and half sky, but make sure you are still well above the surface of the planet itself. Now, still holding Alt, Middle-click and drag Down to move your camera Forward. Finally, Right-click and drag Up to move the camera Down into the terrain. You can fine-tune your view using these controls to find a perspective you like. Feel free to play with the camera, the specific position isn’t important.

Once you have found a position you like, hit the Set Camera button to set the current camera position to this view. If you don’t press Set Camera then the render will use the original camera position. Press the small R button in the top Toolbar (or press F3) to bring up the Render View then press the Render button in the upper-left. You are now rendering your first scene! It may take a few minutes to finish rendering. Wait for it to complete, then press the Save button and specify a location if you’d like to save it for posterity.



Not a bad view

Now let’s get a different perspective on our scene. Use the rotation and other camera movement controls to move your view up to a position fairly high above the terrain. You will notice that the mountains end abruptly in the distance. This is fine if you stay hidden inside the mountains here, but it’s clear there are limits to this Heightfield we have created. What of the promise of full planets? This is where procedurals come in and if we want an endless horizon of terrain, they are the best way to achieve it. You can also use more than one heightfield or increase the size of your heightfields, but we will explore those options later. So let’s get rid of this heightfield and start creating our global terrain.



The limitations of heightfields

Click on the Heightfield shader parent node in the Node List and then uncheck the checkbox next to “Enable” in the top-left of the parameter pane. This will disable the Heightfield shader. You will see the preview update and we’re back to a smooth world again. Now click the Add Terrain button and choose Power Fractal from the drop-down list. You should immediately see the preview update with your new terrain.

Let’s take a moment to name our new terrain node descriptively so we can keep track of it later – a name like “Mountains” seems appropriate. To rename a node simply click on it in the node list to bring up its settings then type the new name into the text box at the top, next to the Enable check box.

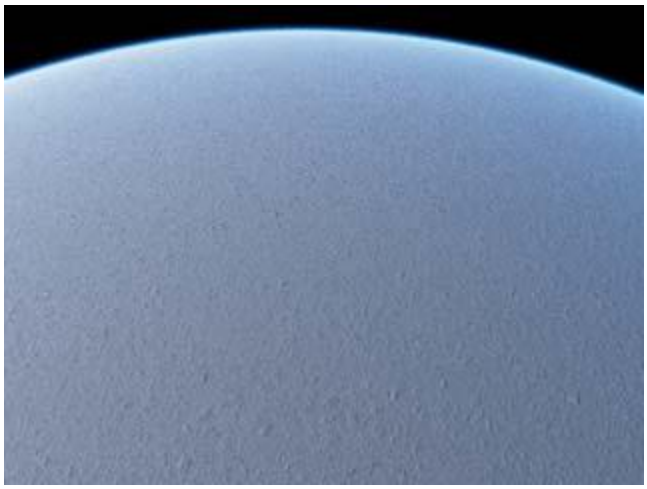
Mountains as far as the eye can see!

At this point you might notice the 3D preview isn’t rendering properly, with the bottom of the terrain cut off, or odd strips floating in the middle of the view. This will occur if your camera is under the terrain, which is usually the result of changing the terrain shape or scale while your camera is close to the ground. To check for this problem and resolve it hold down Alt and move your mouse over the 3D preview. Notice the 4 sets of numbers on the bottom of the preview window which we talked about earlier are now showing different values than before. “Vx”, “Vy”, and “Vz” now refer to the current position of your camera in X, Y, and Z coordinates, relative to the coordinate origin (remember that Terragen 2 uses Y = up).

The important value to look at is “Vheight” which gives you your height above the terrain. If it is a negative value then you are below the terrain. Move the camera up until the Vheight value is no longer negative and press Set Camera when you’re done. Note that TG2 uses a curve for

camera movement speed that is tied to terrain proximity, meaning that your movement adjustments are on a smaller scale when you're close to the terrain. This makes it easier to make precise adjustments where it matters most. Once you've made those adjustments the 3D preview should now be displaying properly and your camera is above the terrain where it should be. Next we'll move the camera to get a better view.

Tilt the camera's view down toward the terrain until you are looking more or less straight down, then begin zooming out by holding the Middle mouse button (or Alt+Shift and Left mouse button together) and dragging upwards. Do this a few times and soon you'll be high above your planet and if you give the preview a moment to update you can see your terrain covers the entire surface! This is the power of procedurals. Click the View Camera button to return to your previous view – that of the current camera.



A procedural planet

III: Surface mapping (Shaders)

Now that we have a terrain covering our world we need to give it some more interesting colour and texture. Click on the Shaders layout button to access the surface mapping functions. In Terragen 2 surface mapping is accomplished using "shaders". "Shader" is a general term for nodes which generate or manipulate data that can then be interpreted as colour, displacement, etc. This shader data is used to create features in your scene such as surface texture and colour.

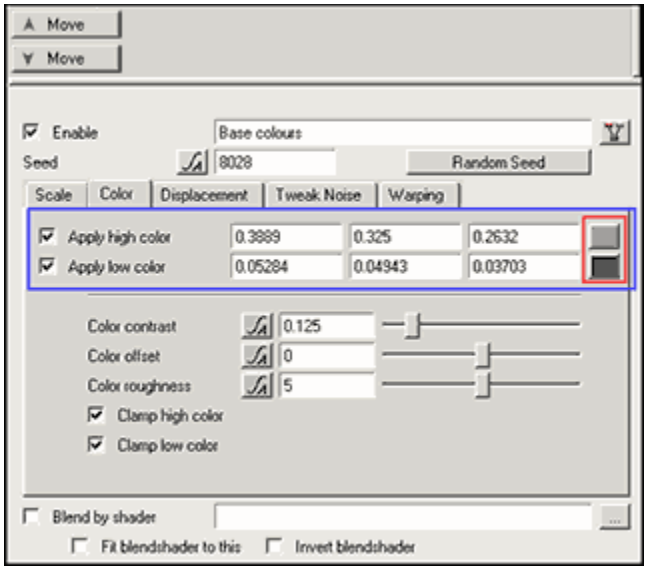
You will notice there is a single shader node to begin with which is logically named "Base

colours". This node will form the basis of most of your surface map systems, just as the "Surface Map" default layer was the basis for any Terragen 0.9 surface map tree. However, unlike the base layer in Terragen 0.9, the Base colours node has somewhat different settings from a typical surface layer. Let's click on Base colours and examine its settings for a moment. For now, we will only be paying attention to the most important things - you may jump to a more detailed explanation of these settings in the Surface Mapping section if you wish.

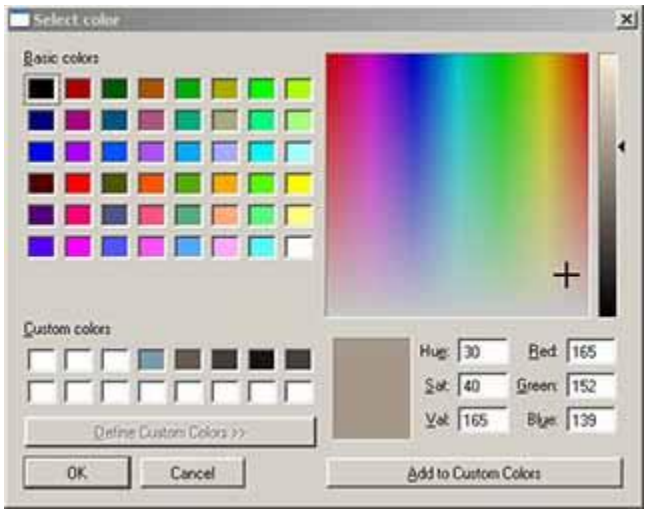
Most nodes are arranged in tabs to logically separate various related settings. The first tab of the Base colours node is Scale. Some of these controls behave differently in the Base Layer than in a normal Surface Layer, so we'll leave the settings default for now. You can read more about the settings on this tab and others in the detailed Surface Mapping section.

The main thing we want to do is adjust the base colour of the ground so click on the Colour tab and we'll see if we can create a more interesting and realistic base for our surface map. For the Base colours node there are two colours defined and you can adjust the way they interact or turn each one on and off separately. They are called "high colour" and "low colour", but their names may be a bit confusing. They do not correspond to the high and low points of the current terrain but rather to the "high" and "low" parts of the internal noise function used by the Base colours node. This is similar to the "fractal noise" setting in TG 0.9, although you have far more control in this case. For the time being we'll leave the other settings at the defaults and simply change the colours.

The "Apply high colour" and "Apply low colour" check boxes control whether each colour will be applied to the surface map and they also identify each colour control group, with high colour on the top and low colour below it. The three numbers next to each are settings for Red, Green, and Blue values respectively. The colour value can be numerically edited here, or you can use the colour box on the far right to interactively pick your colours. Click on the coloured box for high colour and you will see the standard colour picker pop up.



The Colour tab of the Base colours node. The high and low colour setting boxes are outlined in blue. Click the colour boxes on the right, outlined in red, to bring up an interactive colour picker.



The colour picker. The main colour swatch covers the full spectrum with highest saturation at the top and lowest at the bottom. The slider on the right adjusts brightness of the current colour.

Use the various controls to pick an appropriate colour, in this case a shade of brown to represent

the dirt that forms the base of our surfaces, then click OK. You will see the preview update with your new colour choice. Continue adjusting the colours of each until you are satisfied, then we'll move on to adding additional surface layers.

Click the Add Layer button at the top of the Node List and select Surface Layer from the drop-down menu. Surface layers default to having full coverage and a white colour, so your terrain will immediately turn completely white. Click on the Surface layer to bring up its settings, many of which will seem somewhat familiar if you are experienced with TG 0.9. There are a lot of settings in a Surface Layer but we want to keep things simple for now so first we'll adjust the colour and then the distribution to try to achieve a grass-like surface.

First let's change the name at the top to something descriptive, "Grass" for example. This will help us keep track of things when we add more layers later. Next we'll adjust the colour. The colour settings here work the same as in the Base colour node except that there is only one colour. Click the colour box to choose a new colour and pick something greenish-yellow with low-medium saturation.

Now we'll move down to the additional settings tabs. Leave Coverage and breakup the way it is for now and go to the Altitude constraints tab. Turn on Limit maximum altitude using the check box, then set Maximum altitude to about 600 or until you start to see brown mountain tops in the preview. Now move to the Slope constraints tab, turn on Limit maximum slope and set the Maximum slope angle to about 25 with the Max slope fuzzy zone at about 10. Altitude and fuzziness settings are all in meters, slope settings are in degrees. Adjust these settings to your preference. You may wish to open the Render View (F3) to test your settings in an actual render.

Although your grass surface is starting to look more natural now, you'll probably find it looks a bit too uniform. We will use Fractal breakup to address this, similar to adjusting Fractal Noise in TG 0.9's surface map layers. Move back to the Coverage and breakup tab. Coverage controls the amount of the underlying surfaces that will be covered by this layer. When Fractal breakup is enabled, values between 0.5 and 1 will control a blend between the full effect of Fractal breakup and full coverage of the surface layer. 0.5 Coverage corresponds to the full influence of Fractal breakup on the layer's distribution. Below .5 it will blend between zero coverage and full Fractal breakup.

The strength of the Fractal breakup setting itself can also be controlled. Values between 0 and 1 will tend to produce fairly natural results, with 0 being equivalent to turning off Fractal breakup entirely and 1 being a smooth Fractal breakup influence on the current layer's distribution. Values above 1 will make the effect sharper, very similar to turning up Fractal Noise in TG 0.9 surface layers. For now we will aim for a nice blend with a value of .7 for Coverage and 1.0 for Fractal breakup itself.

Do a render of the current scene to get an idea of where we're at so far. Now, before we move on to atmospherics add another layer on your own and try to make it look like snow. Imagine how you would use the controls you have learned to make a snow surface layer. Adjust it until you are satisfied with the effect, referring back to the other surface mapping paragraphs above as needed. Don't forget to give your snow layer an appropriate name. When you are satisfied, do another render and look at how far your scene has come already!

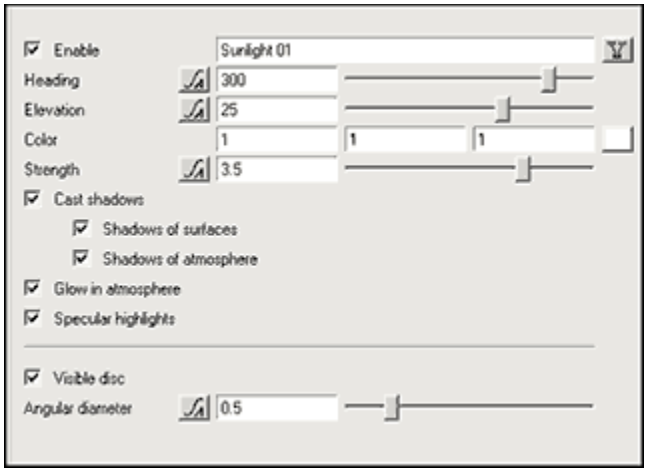
IV: Atmospherics and Lighting

We're moving on to the final elements of our basic scene here and it's time to work with some of the most exciting and impressive parts of TG2. Terragen 2's atmosphere system includes a full planetary atmosphere and fully 3D volumetric clouds which together can produce skies of unparalleled realism. We'll make minor adjustments to the default atmosphere and then add some high-level volumetric clouds to show off TG2's capabilities a bit.

We'll first need to adjust the light so we can test any atmosphere and cloud changes in the proper lighting environment. Although TG2's lighting functionality is fairly robust and versatile, our needs for this basic scene are quite simple. We'll just want to adjust the lighting so that it highlights our terrain nicely. So let's jump into the Lighting layout (click the Lighting tab at the top) for a moment and make a few changes.

TG2 currently defaults to a Global Illumination setup which uses a Sun light for primary illumination and an Enviro (Environment) Light for indirect lighting. You can also use a group of fill lights to simulate indirect lighting such as that from the overall sky - which often tints shadows blue. However there is currently no preset to create this so you'll have to work on your own if you prefer the fill light approach. Future versions will include multiple default light setups to choose from.

With Global Illumination active our lighting concerns are pretty simple. All we really need to do is adjust the sun angle, simply click on "Sunlight 01" at the bottom of the list to bring up its settings. Standard Light settings are fairly simple. Heading and Elevation control the position of the light source relative to the coordinate origin and they are both measured in degrees – 360 degrees for the Heading and 90 to -90 for the Elevation. A setting of 90 for Elevation corresponds to a light source directly overhead at the coordinate origin of 0,0, while -90 is directly below (and thus generally out of sight).

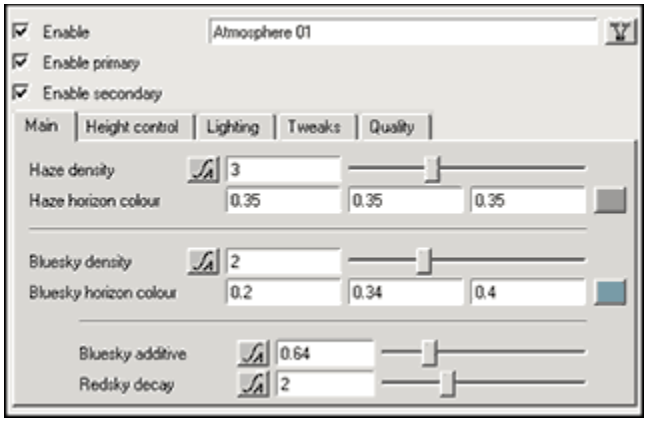


The sunlight settings panel

The lighting that works best for your particular terrain and camera angle will vary greatly, but I find a light behind and to the left of the camera often works fairly well. You may also want to reduce the sun elevation a bit. By adjusting Heading and Elevation and watching the 3D preview update you can quickly get an idea of which direction you need to move the sun to get the lighting angle you want. In the future there will be improved controls and visual feedback to help orient light sources more quickly.

Now that we've got the basic building block of our scene, let's move to the Atmosphere layout and fine-tune it. In the Atmosphere layout you'll see there is a single atmosphere node by default. Click on it to bring up its settings. The atmosphere settings can be some of the most difficult and most sensitive to change, so we'll just play with a few things for now.

On the first tab "Main" you'll find controls for Haze and Bluesky such as density and color, similar to Terragen 0.9's Atmosphere window. If you find your scene is a bit too hazy, you can reduce Haze density here to increase clarity. Be aware however that this can also reduce the sense of depth, scale, and ultimately realism in your scene. I find the default TG2 atmosphere to be a bit too hazy for my taste so let's reduce it just a bit - a conservative value of 3 should do for now.



The atmosphere settings panel

Try adjusting the Bluesky additive and Redsky decay settings at the bottom in small amounts. You will notice very large changes in the scene and it will take you quite a while to get familiar with a good range of values for these controls. Also notice that each change to these settings affects another setting on this tab – the atmosphere controls are highly interdependent. Bluesky density and Bluesky horizon color have similar effects on other settings when directly adjusted. For this simple daytime scene you will probably want to leave these at the defaults but you might want to play with them if you were working with the sun near or beyond the horizon, or were trying to create a more alien look to your landscape.

Once you have a satisfactory look to your sky, let’s finish up our scene by adding some nice clouds to add interest in our plain blue sky. Click on the Add Cloud Layer button above the node list and select Mid-level: Altocumulus (3D/Volumetric). Your sky should immediately be covered in some scattered high altitude three dimensional clouds. Try a render to see how they look. You should get something like this.

The defaults can look a bit flat, so let’s adjust things a little for a more dramatic effect. Click on the newly created Cloud Layer to bring up its settings. Although we’ll only be adding one cloud layer for this exercise, it’s still a good idea to name it descriptively, so take a moment to that first. On the Main tab you’ll see Cloud altitude, Cloud depth, and several other significant controls. You’ll notice the cloud depth is just 150 meters, realistic but a bit thin. Let’s increase that to about 500 for some added impact. Try another test render and see what you think. In my scene cloud coverage was also a bit high so we’ll adjust that parameter down near the bottom, just above Cloud colour. Reduce Coverage adjust to about -0.25 and render another preview.

That looks good to me, so let's finalize our scene!

V: Render Nodes and Quality Settings

You may have noticed in your preview renders that the detail wasn't quite up to par or that some areas were a bit grainy. That's fine for these preview renders while we're putting together our scene since the lower detail facilitates faster renders and quicker feedback. Naturally we can expect higher quality images to take a bit longer, but it will be worth the wait. Let's take a brief look at the available detail settings to improve the look of our scene and then we'll render a high quality final image.

Click on the Renderers layout and you will be presented with a list of render nodes. A render node works with a camera node; it defines important render-related settings including image resolution and format, overall quality, gamma correction, and contrast. You can use multiple render nodes to setup a variety of commonly used render types and settings and quickly switch between them. The two default renderers are good examples of this. The Quick Render is a low detail, fast rendering setup while the Full Render provides higher resolution and quality at the cost of additional render time. You have been using the Full Render by default but in the future you'll be able to get faster preview renders by using the Quick Render or a custom render node setup for this purpose.

We want to setup a high quality "final render" so we'll base it off the existing Full Render. First you'll notice the Image width and Image height which are set to 640 and 480 respectively. This is a standard render size but it's a bit small for our high quality final image so let's set that to 800 for the width and 600 for the height – just type the new values into the Image width and Image height fields. The rest of these settings you can leave alone, but you'll want to take a look at the Quality and Anti-aliasing controls at the top of the Quality tab.

In Terragen 2 the Quality settings allow much finer control than in previous versions. It also allows higher detail than ever before, essentially eliminating the need for the "downsample trick" of Terragen 0.9. You are likely to find that the default of 0.5 for Quality is actually very nice looking. You will probably want to use up to 1.0 for final quality renderings, and you may rarely wish to use even higher settings for really complex scenes, but even 0.5 provides greater quality than non-downsampled images from previous versions. For now we'll increase Quality to 0.75, striking a good balance between quality and render time.

Now we want to test our new quality settings. But who wants to wait for an entire render to finish before you can find out if the new settings are doing their job? Terragen 2 includes a Crop function that can easily facilitate the testing of new settings in small, faster rendering areas. Click on the Crop Region tab and we'll setup a small crop area to test our changes. First check the Do crop region box to turn the crop function on. You should see a red box appear around the borders of your 3D preview. This red box indicates the boundaries of your crop region.

The Crop sliders define how much of a given part of the image is cropped out. They essentially represent the edges of the crop region numerically in relation to the edge of the full image, where 0 is the top and left of the image and the values increase the further down and right you go. So increasing Crop left will remove progressively greater amounts from the left side of the render, reducing the width of the overall rendered area. Whereas decreasing Crop right will reduce the rendered area from the right side. Adjust all the sliders so that they define a small-ish area that incorporates both land and sky, preferably with some clouds included. Render a test and see how the new detail settings look in your Crop region.

The default cloud detail settings will probably still be a bit grainy for a final render. The quality of clouds is actually defined in the cloud layer itself by the Number of samples parameter. This allows different detail levels to be used for each cloud layer so that the detail can be used where it is most needed. For example taller cloud layers will tend to need more samples in order to be free of noise.

Click on the Atmosphere layout and then on the cloud layer you created earlier and finally click the Quality tab near the bottom. The Number of samples varies depending on the cloud preset that you use. The Altocumulus defaults to 6, but since we increased the depth of the clouds let's increase that to about 12 to reduce the noise a bit. That combined with the increased detail

should make for a great looking image. But let’s make sure of that with another crop render before we start on the full final render.

That looks pretty good so let’s start the final image render. Go back to the Renderers layout and click on the Full Render node. Click on the Crop Region tab and then uncheck Do crop region so we can render the full image. Now we’re ready to begin the final render. You can click the Render Image button in the render node to begin a render immediately or start the render as you did before, with the R button on the toolbar or F3. The render may take an hour or more so you’ll probably want to go grab a cup of coffee and maybe a newspaper. But when you come back you’ll have a great image…

You should end up with something like this. Congratulations, you've just created your first Terragen 2 scene! With the fundamentals under your belt you're ready to experiment on your own and learn the secrets of this new world. Or, if you prefer, read on in the User Guide for more detail about specific functions.

The Node Network

You have probably heard a lot about the node-based user interface (UI) that Terragen 2 is based around. Node-based interfaces are widely used today, especially in graphics software because they provide a very powerful, flexible, and in most cases intuitive way of working with complex functions and operations.

Inherent to the network-based approach is the presentation of a very informative overview of the layout of scene information. As long as you know how the data "flows" through the network

you can usually tell from a glance at the underlying network roughly how a particular scene is composed. This factor alone presents a very good argument for the use of network UI's. Since you can also control the scene characteristics from this overview, you get an amazingly powerful combination of information presentation and direct scene control. The user interface is essentially determined by the characteristics of your scene and information and control are presented in a single unified way. This has the potential to tremendously speed up the creation of complex scenes.

A node network in its simplest form consists of only a few major elements:

- A "workspace" – This is the area in which all major work takes place. Your nodes (also known as "devices" or "objects") will be placed here, connected to other nodes, and the output of these connected nodes will create your scene.
- 1 or more Nodes – A Node is simply a single object (a device) that performs a specific function. It is placed in the workspace and connected to other devices to perform its role in scene creation. It may have one or more inputs and outputs, depending on the use of the device. Most nodes also have settings that you can adjust to control their affect on the data they create or that passes through them. The connection of nodes forms a "network" of devices.
- 1 or more Node Connections – Node Connections (also known as "wires" or "connectors") allow data to flow through the network from one node to the next. A "connection" signifies a literal transmission of some form of data from one device to the next. Each node performs some action or function to manipulate the data in some way and then passes it on to the next device. The sum of these actions ultimately creates the scene.

Node Lists and the Node Network

Nodes in TG2 are displayed in both the Node Lists and the Node Network. By default both are visible in every layout. The Node List is in the upper-left of the UI and the Node Network occupies the lower-right. In general changes will be reflected in both views, however the relationships between nodes are displayed differently in each.

The node network displays all nodes as differently coloured boxes. Inputs and outputs are shown as triangular protrusions from the top and bottom of a node, respectively. Input goes into ports on the top of the device and flows out through ports on the bottom. Connections are represented with simple light-coloured lines.

The node network view is mostly "flat" in that almost all nodes are shown at once, on the same level. Unlike the Node Lists this includes those nodes that are "owned" or created by another, nodes inside of groups, and nodes that are above another node in a branch of the network. The

exceptions to this are Object and Population nodes. Object nodes often encapsulate other nodes, which are "contained" within the parent node. You can right-click an object node and go to Internal Network to view any devices inside it. This will take you into a view that shows only the nodes inside that particular object node. Right-click on an empty area of the workspace and choose Up One Level to return to the previous network view. Alternatively you can use the Up Level button which appears at the top of the bookmark list on the left whenever you are inside an "internal network".

The node list is designed to show a simplified view of the devices in a given layout. The display is a simple "ordered list", which roughly shows the "order of execution" of devices in the layout: in general a device above another device acts as the source for the device that follows. In most cases the nodes displayed are also limited to those of a specific type. For example in the Objects layout any textures assigned to your objects will not be shown because they are not Object nodes. Network connections are not shown directly in the node list but are usually represented by the list hierarchy. There are two primary node list views which communicate different hierarchical information. Each view is specific to particular layouts.

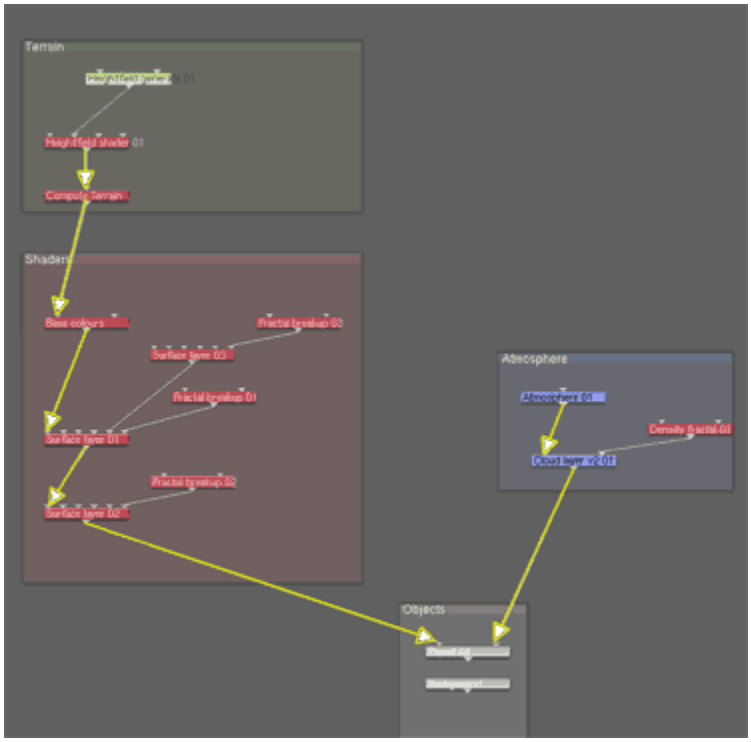
The Objects, Atmosphere, Lighting, Camera and Renderer layouts use a view that does not show network branching but does show "internal" devices. This view does not indent devices in the list and instead it uses forward slashes / to represent the node's "depth" in the network. At the top level all nodes are preceded by a single /, for example "/Atmosphere 01". Each sub-level is represented by an additional trailing /, much like a regular directory and sub-directory view in Windows. For example "/Pop Obj reader 01/Obj reader 01" shows an Object Reader node named "Obj reader 01" inside of a Population node named "Pop Obj reader 01".

The Terrain, Shader and Node Network layouts all use an indented, collapsible hierarchy view. This more directly shows the relationships between nodes in layouts where branching and greater network complexity are likely. The basic view shows nodes connected by dashed lines. By default only the top level of the network is visible. Nodes with network branches attached to one of their inputs, or which have devices inside of them (Object nodes), will have a + symbol to the left of the node which can be pressed to expand the view of the next level of the network. Different levels of the network will be indented to represent their "depth", either in a network branch or within another node. All nodes are connected by dashed lines which follow and illustrate the hierarchy of the network. Again this is very similar to the Windows Explorer interface.

Network Flow

In general data in the network "flows" from top to bottom - from an output port to an input port,

through a node, and again through the output port, and so on. Data tends to follow a single primary path for each input on the final node that interprets that data. In most cases this is the Planet object node. Planet nodes have 2 major inputs, Surface shader and Atmosphere shader. All other nodes which directly describe the elements that compose the planet connect to these two inputs.



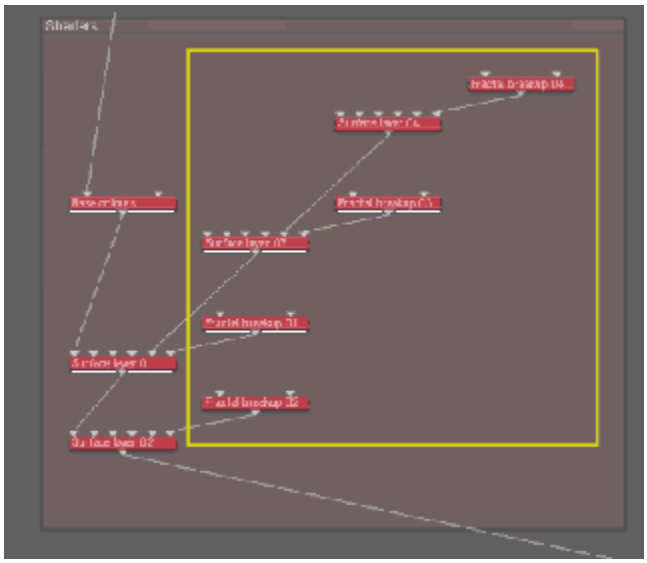
Primary data paths

There are nodes which do not connect to the Planet node and some which do not normally connect to any other node at all. These devices generate specific aspects or elements of the final scene, for example camera and lighting. Camera nodes do not normally take any inputs; their single output connects to a Render node to produce a final rendered image. Light nodes similarly don’t need to connect to any other node, yet they indirectly affect the final appearance of almost all nodes in the network. This clearly shows the difference between a direct data interaction - which is used for example in chaining nodes together to create surface texture and shape - and an indirect render-time interaction, for example the camera node acting on its settings for field of view, exposure, etc. to interpret the other nodes in the scene as seen through a virtual camera.

While most nodes simple generate or operate on data and pass data to the next node, certain

nodes in the network have special status. These nodes directly act on some significant element of the final rendered scene, for example defining the camera, or the lighting. In some cases they have no inputs at all, like the Camera, Background and Lighting nodes. Most nodes, even those that generate data, have an input of some kind, a blend shader for example. In the case of these specific nodes they lack inputs because they generate all data

Most data flows through the main inputs and outputs of the nodes in the network, but there are also many additional inputs on some nodes. Any nodes that connect to additional or alternate inputs will essentially comprise a "branch" of the network. This is most common with surface layers and child layers. Branches consist of one or more nodes which connect to a non-primary input on a node which is itself connected to the primary data path.



Network branches

Navigating The Node Network

Basic navigation of the Node Network is similar to camera movement1. Hold down the Alt key and click the left or right mouse button, then drag to pan around the workspace. This is like dragging a physical workspace across your view; drag down to move the network down, up to move it up. Alt+middle button mouse button (or both left and right together) controls zooming; down is zoom in, up is zoom out.

When you click on a device in the node list the node network view will automatically move to

show the selected device. Nodes stay selected in each layout even after you switch to a new layout, although the blue selected node highlight does not always show. Because of this you will find that after you have selected a device in a particular layout, when you switch back to that layout it will automatically jump to show that device.

Nodes can also be grouped together using special Group nodes. A Group node has very few properties – it can be set to one of a number of special (default) groups, it can be optionally added to the global network view bookmark list, and it can have a unique name and colour. Group nodes are used simply for grouping other nodes. There is no functional change to the network when nodes are put into a group; it is simply an organization and navigation aid.

To create a Group node, right-click on an empty area of the network view and on the pop-up menu choose Create Other and then Group. Your new group node will be created with a default name, size and colour. You can double-click a group node's title bar to bring up its settings such as colour and name. You can resize the group by dragging any of its edges or corners, just like a normal window. To add nodes to a group simply drag them onto the group node then right-click on the group's title bar and choose "Group: Capture Nodes". The "Group: Release Nodes" function does exactly the opposite – it removes all current nodes from the group. Groups can be enabled and disabled just like regular nodes. Using groups and selectively enabling or disabling them can be a good way to test the effects of different network branches independently.

Along the left side of the network view is a list of global bookmarks. These bookmarks are each associated with a node group. By default groups are created for each major scene element, which also corresponds to the layout types – Objects, Terrain, Shaders, and so on. Clicking these bookmarks will move the network view to the corresponding group. You can add your own custom bookmarks to any group you create. These bookmarks can be especially useful once you become more comfortable with the node network and you are relying on it more heavily for sophisticated scene development.

This is a brief overview of the Node Network. More detail will be provided in the User Guide soon.

Glossary

Displace (or Displacement) – Literally, to change the position of something. In graphics terminology to displace a surface is to modify its geometric (3D) structure using reference data of some kind. In Terragen 2 displacement is used to create all terrain by taking heightfield or procedural data as input and using it to displace the normally flat sphere of the planet.

Heightfield (also Heightmap, or Raster or Pixel Heightfield) – An array of height values, usually in a grid which describe the height at specific points in a defined area. Heightfields are used to represent real-world and virtual terrain in a specific, easily converted format. Most heightfields can be represented as simple image data in greyscale, with black being minimum height and white being maximum height.

Node – A single device in the node network which generates or modifies data and may accept input data or create output data or both, depending on its function. Nodes usually have their own settings which control the data they create or how they modify data passing through them. Nodes are connected together in a network to perform work in a network-based user interface. In Terragen 2 nodes are connected together to describe a scene.

Network – A group of connected devices or nodes. A user interface design based around the concept of data flowing between interconnected devices.

Pixel – A single element of an image which describes values for color and/or intensity, depending on the color system which the image uses. Groups of ordered pixels together form a cohesive image.

Procedural – In general a "procedure" is a series of steps that should result in a reproducible desired outcome. In Terragen 2 a "procedural" is a mathematical function describing output which may be visualized and sampled to create anything from terrain to clouds.

Raster, Raster Graphic – See Bit-mapped Image

Bit-mapped Image - A computer image that is stored and displayed as a set of colored points in a rectangular grid. Also called raster graphic. Bit-mapped image formats in Terragen include

raster heightfield terrains, image-based textures and masks, object textures, and rendered images saved to disk.

Sample - A sample refers to a value or set of values at a point in time and/or space. The defining point of a sample is that it is a chosen value out of a continuous signal. In Terragen 2 it is usually a mathematical (procedural) function that is being sampled.

Shader – A shader is a program or set of instructions used in 3D computer graphics to determine the final surface properties of an object or image. This can include arbitrarily complex descriptions of light absorption and diffusion, texture mapping, reflection and refraction, shadowing, surface displacement and post-processing effects. In Terragen 2 shaders are used to construct and modify almost every element of a scene.

Toolbar – In a graphical user interface on a computer monitor a toolbar is a row, column, or block of onscreen buttons or icons that, when clicked, activate certain functions of the program.