SGI® FusionVUE™ User's Guide

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About This Guide

SGI FusionVUE allows you to ingest heterogeneous media streams (local and remote) into a central server, render the streams into a 3D landscape you specify, and manipulate the landscape contents interactively or with scripts. This guide describes the architecture and general operation of SGI FusionVUE. For initial setup and configuration, see the companion manual *SGI FusionVUE Installation and Configuration*.

Audience

This guide is written for the operator of the SGI FusionVUE environment; that is, the person who will select, ingest, and otherwise manipulate the various media streams and their collective display. You should have a working knowledge of the various media formats, network technology, and scripting.

Chapter Descriptions

The following topics are covered in this guide:

- Chapter 1, “Overview” describes the features of FusionVUE, its architecture, and current limitations.
- Chapter 2, “Getting Started” describes setting up your file environment, other environment variables, and required passwords.
- Chapter 3, “Launching the FusionVUE Environment” describe how you launch and shutdown the FusionVUE environment.
- Chapter 4, “Viewer Portals and Pixel Streams” describe how you populate the FusionVUE VUESpace with viewer portals and pixel streams and how you manipulate them.
- Chapter 5, “Templates,” describes how you load and populate templates with viewers.
- Chapter 6, “Navigation” describes how you navigate about the VUESpace entities.

- Chapter 7, “Troubleshooting” provides troubleshooting hints for common problems.
- Appendix A, “Keyboard Controls,”describe operations you can control via keyboard commands.
- Appendix B, “Supported Media Formats,” lists the various formats FusionVUE supports for each media type.
- Appendix C, “VNC Server Configuration on Windows,” describes the configuration of a TightVNC server on a Windows system for use with FusionVUE.

Related Publications

The following SGI documents might be helpful:

- *SGI FusionVUE Installation and Configuration*, publication number 007-5543-00*x*
- *SGI InfiniteStorage* series documentation
- Man pages (online)

You can obtain SGI documentation, release notes, or man pages in the following ways:

- Refer to the SGI Technical Publications Library at http://docs.sgi.com. Various formats are available. This library contains the most recent and most comprehensive set of online books, release notes, man pages, and other information.
- You can also view man pages by typing **`man`** <*title*> on a command line.

SGI systems include a set of Linux® man pages, formatted in the standard UNIX® “man page” style. Important system configuration files and commands are documented on man pages. These are found online on the internal system disk (or DVD-CD) and are displayed using the `man` command. For example, to display the man page for the `xscsidisktest` command, type the following on a command line:

```
man xscsidisktest
```

For additional information about displaying man pages using the `man` command, see `man(1)`.

In addition, the `apropos` command locates man pages based on keywords. For example, to display a list of man pages that describe disks, type the following on a command line:

```
apropos disk
```

For information about setting up and using `apropos`, see `apropos(1)`.

Conventions

The following conventions are used throughout this document:

Convention	Meaning
`Command`	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
variable	The italic typeface denotes variable entries and words or concepts being defined. Italic typeface is also used for book titles.
`user input`	This bold fixed-space font denotes literal items that the user enters in interactive sessions. Output is shown in nonbold, fixed-space font.
[ ]	Brackets enclose optional portions of a command or directive line.
...	Ellipses indicate that a preceding element can be repeated.
`man page`(*x*)	Man page section identifiers appear in parentheses after man page names.
GUI element	This font denotes the names of graphical user interface (GUI) elements such as windows, screens, dialog boxes, menus, toolbars, icons, buttons, boxes, fields, and lists.

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Overview

This overview describes the features of FusionVUE, its architecture, and current limitations.

FusvionVUE Features

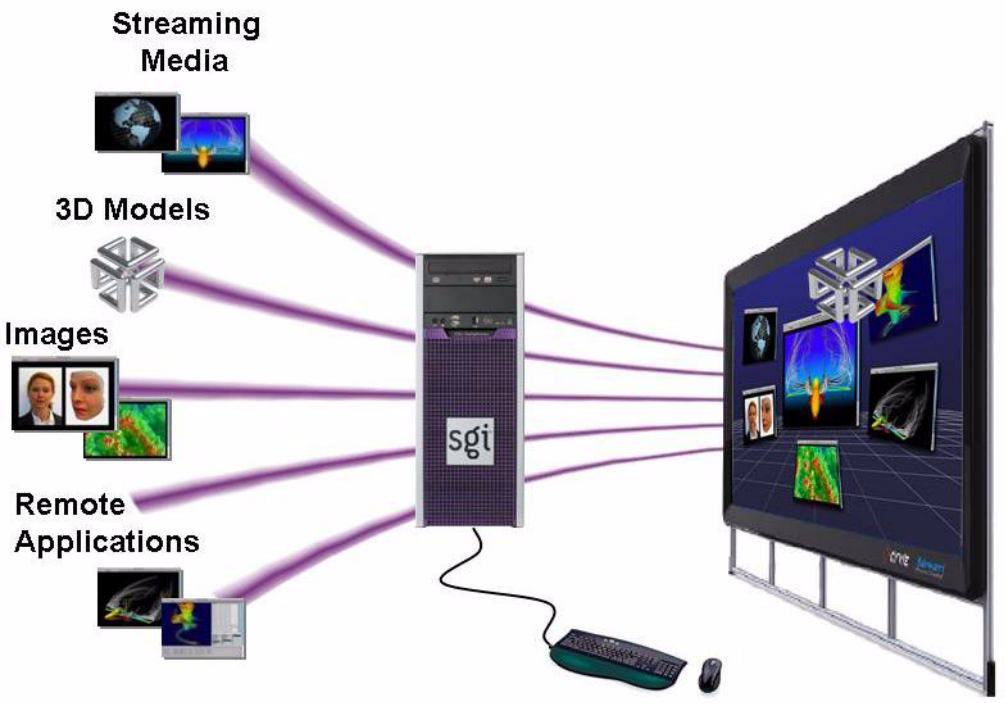


Figure 1-1 FusionVUE Stream Sources and a Sample VUESpace

As shown in Figure 1-1, the FusionVUE environment provides a persistent user interface that can integrate a wide range of media streams, assets, and applications in a 3D context, termed *VUESpace*. You can control this environment interactively using the mouse and keyboard. The

FusionVUE environment provides a simple, smooth, intuitive interface to complex environments and data. FusionVUE enables you to work with multiple remote systems that are three-dimensionally arranged for optimal comprehension.

The input streams, which can be local or remote, can include assets like the following:

- 3D models
- Images
- Movies
- Applicatons from PC/Linux/Macintosh desktops

The FusionVUE Architecture

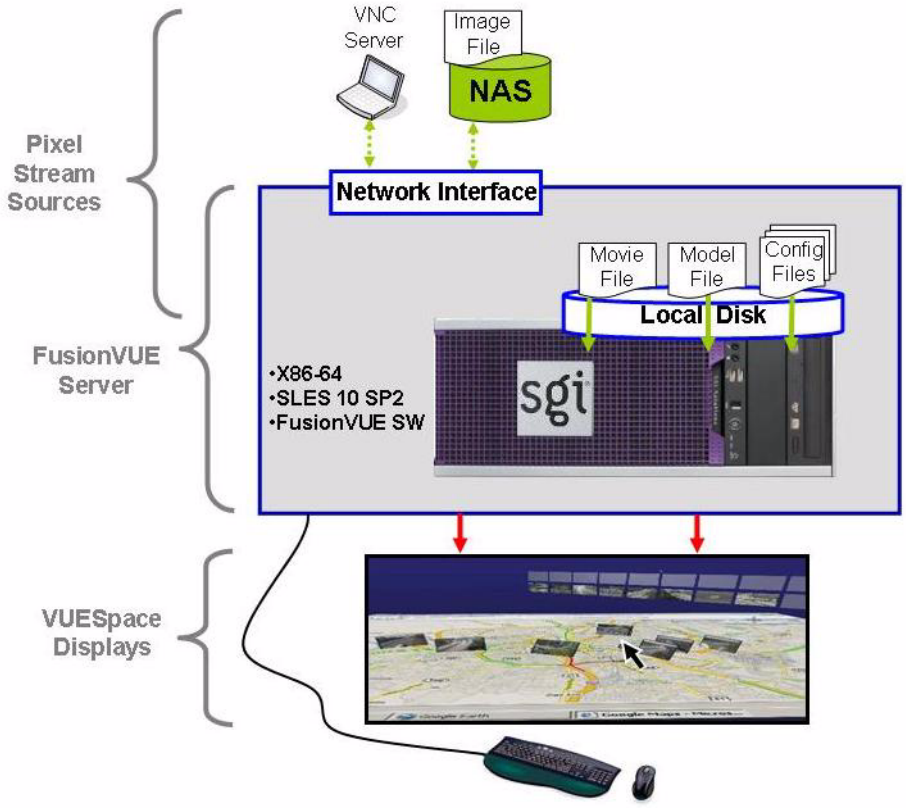


Figure 1-2 FusionVUE Architecture

Figure 1-2 illustrates a simplified FusionVUE architecture. One or more pixel streams are ingested via the network or from local storage. The pixel streams are rendered into a 3D environment by the VUESpace Graphics Engine running on the FusionVUE server. The results are shown on one or more VUESpace displays, where users interact with the streams and environment using the attached mouse and keyboard.

The major components of a FusionVUE system are the stream modules, the VUESpace Graphics Engine, and the display system. Each is described in the following list:

Component	Description
Stream modules	There are a variety of stream modules, each capable of ingesting a particular type of media-handling, stream-specific user input. Stream types include images, movie files, 3D models, or remote desktops connected via network-attached VNC servers.
VUESpace Graphics Engine	The VUESpace Graphics Engine reads pixel streams into a 3D VUESpace. Users interact via the mouse and keyboard to navigate through the VUESpace and to manipulate individual streams.
Display system	The display system may be as simple as a single desktop monitor or a room-sized, multiple-channel-blended projection system.

Limitations

This release of FusionVUE has noteworthy limitations in the following areas:

- Maximum image resolution
- VNC servers
- Display output channels
- Audio support

See the *FusionVUE 1.x Release Notes* in your installation media for other additional notes.

Maximum Image Resolution

The maximum area of a single pixel stream is currently limited to 5 megapixels with a maximum horizontal width of 4096 pixels and a maximum vertical height of 3072 pixels.

For example, the following image resolutions are supported:

- 2048x2560
- 3072x1706
- 4096x1280

Note: Larger images may be viewed within FusionVUE by first opening the image using an image-roaming application (such as ImageMagick `display`) rendered into a VNC server display, then ingesting the VNC display into FusionVUE.

Appendix B, “Supported Media Formats,” lists the supported image, movie, and 3D model formats.

VNC Servers

Two notes:

- The supported servers include TightVNC and TurboVNC.
- Multi-channel VNC servers are supported up to 2560x2048.

Display Output Channels

FusionVUE supports one or two channels from a single GPU.

Note: Multiple-GPU support is available now through SGI Professional Services and will be made standard in a future release.

Audio Support

Currently, there is no support for audio streams or audio tracks in movies.

Getting Started

The FusionVUE environment is highly configurable. Initial setup and configuration, which is described in the *SGI FusionVUE Installation and Configuration Guide*, establishes reasonable defaults for many of the configurable elements. The configurables extend beyond the tasks associated with VUEspace configuration to items like the location of startup scripts, log files, and other FusionVUE files. For your convenience, FusionVUE has encapsulated many of the configurable items in global environment variables that span all FusionVUE components.

This chapter describes the following:

Setting up Your File Environment

Before launching FusionVUE, you need to set up an appropriate file environment for both FusionVUE files and your assets.

Directory Structure

The FusionVUE server directory structure is organized to provide storage for the core server software, configuration files, sample media assets (movies, images, models), user-provided media assets, and log files that are generated by the application. The directory structure is described in Table 2-1 and illustrated in the Figure 2-1).

Table 2-1 FusionVUE File Directories

Type of Files	Location	Description
Software and config files	`/opt/sgi/vue/fusionvue`	Core software and default configuration files are stored here.
Temporary files	`/var/tmp`	Temporary file workspace. Sometimes useful when debugging.
Log files	`/var/log`	Log files. Prime debugging resource.
SGI media files	`/usr/share/sgi/vue/fusionvue`	A small static collection of sample images, movie clips, and 3D models intended for illustration and diagnostic testing.
Your media files	separate filesystem	Probably a large set of media assets that require room to grow.

Storing Your Media Assets

To allow for growth, store your media assets on a filesystem separate from the main OS. You might want to use one of the following:

- A dedicated partition separate from the main OS
- A separate writeable disk drive
- An external Network Attached Storage (NAS) filesystem mounted to the FusionVUE Server

Example:

```
/data_drive/assets
```

Within this directory structure, create a structure similar to the following:

```
/data_drive/assets/shared/images
/data_drive/assets/shared/movies
/data_drive/assets/shared/models
```

You may also want to organize media files by individual projects, as shown in the following:

```
/data_drive/assets/project1/images
/data_drive/assets/project1/movies
/data_drive/assets/project1/models
```

Though not explicitly required, this organization will make it easier to browse and select content when using the FusionVUE interfaces.

File-Related Environment Variables

FusionVUE environment variables are used to specify important parameters, directory paths, and filenames required by the FusionVUE server software to configure itself during startup.

First-time users should initially operate with the default values, which are sufficient for most situations. Customizations can be introduced to accommodate site requirements or personal preferences. For example, if multiple users need access to FusionVUE at different times, it may be desirable for the users to have their own specifications for `FUSIONVUE_ASSET_DIR` to point the file browser to the preferred default content repository.

Table 2-2 lists the environment variables related to directory paths or filenames (whether absolute or relative paths) along with their default values.

Table 2-2 File-Related Environment Variables

Variable	Default Value
FUSIONVUE_ROOT	/opt/sgi/vue/fusionvue
FUSIONVUE_TMP_DIR	/var/tmp
FUSIONVUE_LOG_DIR	/var/log
FUSIONVUE_BIN_DIR	$FUSIONVUE_ROOT/bin

Table 2-2 File-Related Environment Variables **(continued)**

Variable	Default Value
FUSIONVUE_LIBS_DIR	$FUSIONVUE_ROOT/libs
FUSIONVUE_MODULE_DIR	$FUSIONVUE_ROOT/modules
FUSIONVUE_DATA_DIR	$FUSIONVUE_ROOT/config/data
FUSIONVUE_DISPLAY_DIR	$FUSIONVUE_ROOT/config/display
FUSIONVUE_DISPLAY_FILE	1x_800x600.conf
FUSIONVUE_GFXCONF_DIR	$FUSIONVUE_ROOT/config/gfxconf
FUSIONVUE_GFXCONF_FILE	gfx_30Hz.conf
FUSIONVUE_FRAME_DIR	$FUSIONVUE_ROOT/config/frame
FUSIONVUE_FRAME_FILE	$FUSIONVUE_ROOT/config/frame.conf
FUSIONVUE_MENU_DIR	$FUSIONVUE_ROOT/config/menu
FUSIONVUE_MENU_FILE	$FUSIONVUE_ROOT/config/menu.conf
FUSIONVUE_BUTTON_DIR	$FUSIONVUE_ROOT/config/button
FUSIONVUE_BUTTON_FILE	$FUSIONVUE_ROOT/config/button.conf
FUSIONVUE_TEMPLATE_DIR	$FUSIONVUE_ROOT/config/template
FUSIONVUE_KEYBOARD_CONFIG_FILE	${FUSIONVUE_ROOT}/config/keyboard.conf
FUSIONVUE_ASSET_DIR	/usr/share/sgi/vue/fusionvue

An environment variable preceded by a $ character is interpreted by the Linux shell to be the value of the environment variable itself. Thus, according to the preceding table, `$FUSIONVUE_BIN_DIR` is equivalent to `/opt/sgi/vue/fusionvue/bin`.

Figure 2-1 illustrates the default directory structure after a normal FusionVUE installation. Directories are shown in purple, files are orange, and filesystem mount points are green. Environment variables related to directory paths or filenames are shown in light tan and all begin with the `$FUSIONVUE_` prefix.

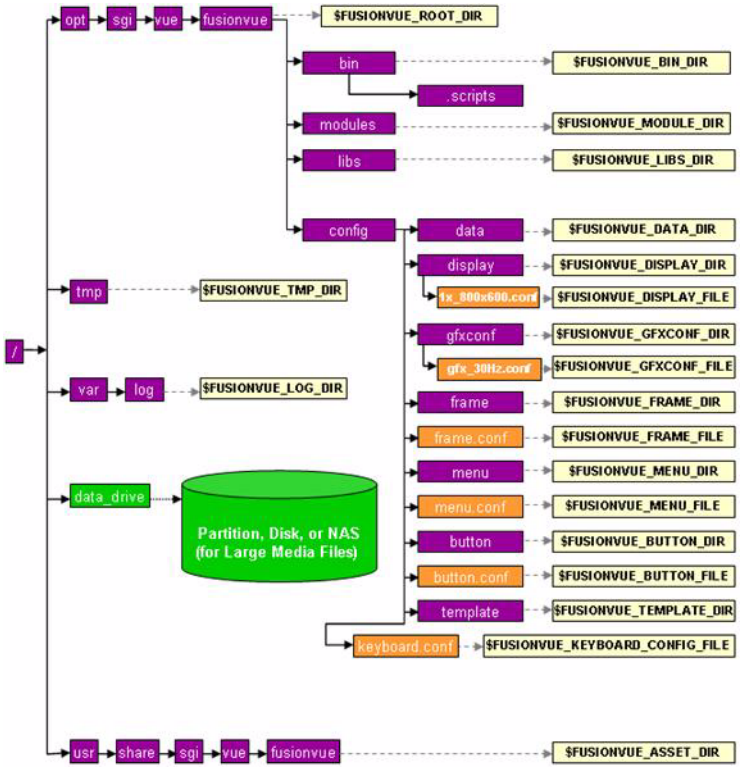


Figure 2-1 FusionVUE Directory Structure

Using Environment Variables to Customize Your Environment

The FusionVUE server configuration may be customized by modifying environment variables from their default values. There are two ways of accomplishing this:

- Individually set certain environment variables in a Linux shell and then manually launch FusionVUE from that shell. See “Alternate Startup Sequence” in Chapter 3.
- Create a wrapper launch script, such as `myFusionVUE`, to set the appropriate environment variables before calling the `fusionvue-RUN` launch script. See the next bullet.
- Create a custom launcher which sets the appropriate environment variables before calling the `fusionvue-RUN` launch script. SGI provides a base `fusionvue` Python script.

Environment variables must be set to valid values or point to legitimate files and directories. Otherwise, FusionVUE may fail to start. Exercise caution and, should problems occur, check Chapter 7, “Troubleshooting.”

Setting Environment Variables Individually

Individual environment variables may be set within a Linux shell terminal using one of the following commands depending on which type of interactive shell you are using:

Example for `csh` or `tcsh` shells:

```
setenv FUSIONVUE_ROOT /opt/sgi/vue/fusionvue
```

Example for `sh` or `bash` shells:

```
export FUSIONVUE_ROOT=/opt/sgi/vue/fusionvue
```

For a list of FusionVUE environment variables that are currently set, use the following commands:

```
printenv | grep FUSIONVUE
```

List of Environment Variables

Table 2-3 describes each FusionVUE environment variable and its purpose. These variables are listed in groups that are related to each other. Certain environment variables have dependencies on others for correct FusionVUE operation. These dependencies are noted in the descriptions of the variables.

Table 2-3 FusionVUE Environment Variables

Variable	Default Value/Type	Description
File-Related		Unless explicitly defined otherwise, many of these environment variables are specified in relation to `$FUSIONVUE_ROOT`.
`FUSIONVUE_ROOT`	`/opt/sgi/vue/fusionvue` Directory, absolute path	Directory containing FusionVUE server software.
`FUSIONVUE_TMP_DIR`	`/var/tmp` Directory, absolute path	A writeable directory for temporary files created during a FusionVUE session. An alternate location would be `$HOME/.fusionvue/tmp`.

`FUSIONVUE_LOG_DIR`	/`var/log`
	Directory, absolute path
		A writeable directory for log files created during a FusionVUE session. The following files are created:
		`fusionvue-VNC.log`
		`fusionvue-SM.log`
		`fusionvue-VE.log`
		Log files are overwritten every time `fusionvue-RUN` is called. An alternate location would be `$HOME/.fusionvue/log`.

Table 2-3 FusionVUE Environment Variables **(continued)**

Variable	Default Value/Type	Description
FUSIONVUE_BIN_DIR	$FUSIONVUE_ROOT/bin Directory, absolute path	Directory containing FusionVUE server startup and shutdown programs, which you can execute to launch a FusionVUE server environment (See Chapter 3, "Launching the FusionVUE Environment."). Contains the following command scripts: fusionvue fusionvue-RUN fusionvue-SHUTDOWN
FUSIONVUE_LIBS_DIR	$FUSIONVUE_ROOT/libs Directory, absolute path	Directory containing requisite libraries.
FUSIONVUE_MODULE_DIR	$FUSIONVUE_ROOT/modules Directory, absolute path	Directory containing FusionVUE server executable components. Do not directly launch these executables.
FUSIONVUE_DATA_DIR	$FUSIONVUE_ROOT/config/data Directory, absolute path	Directory containing various data files used by FusionVUE server software. Noteworthy is the image file nullViewerTex.rgb, which appears in all newly created viewer portals that are not yet connected to a pixel stream.
FUSIONVUE_ASSET_DIR	/usr/share/sgi/vue/fusionvue Directory, absolute path	Points to the initial directory used by the Media File Selection GUI. The default path points to a collection of sample test files included with every standard FusionVUE installation.

Table 2-3 FusionVUE Environment Variables **(continued)**

Variable	Default Value/Type	Description
VUESpace config/UI		
FUSIONVUE_DISPLAY_DIR	$FUSIONVUE_ROOT/config/display Directory, absolute path	Directory containing sample display configuration files: 1x_800x600.conf 1x_1280x1024.conf 1x_1280x1024_twinview.conf 1x_1920x1080.conf 1x_1920x1200.conf
FUSIONVUE_DISPLAY_FILE	1x_800x600.conf File, relative path from $FUSIONVUE_DISPLAY_DIR	The Display Configuration File is used in conjunction with a properly configured /etc/X11/xorg.conf file to define the VUESpace output resolution and field of view. See the *SGI FusionVUE Installation and Configuration Guide* for configuration details.
FUSIONVUE_GFXCONF_DIR	$FUSIONVUE_ROOT/config/gfxconf Directory, absolute path	Directory containing sample VUESpace Graphics Engine configuration files.
FUSIONVUE_GFXCONF_FILE	gfx_30Hz.conf File, relative path from $FUSIONVUE_GFXCONF_DIR	The VUESpace Graphics Configuration File defines various attributes of the VUESpace. Most notable is the frame rate at which it runs. Use the file with the desired frame rate that matches the predominant frequency of input streams.
FUSIONVUE_FRAME_DIR	$FUSIONVUE_ROOT/config/frame Directory, absolute path	Directory containing various viewer portal border types.
FUSIONVUE_FRAME_FILE	$FUSIONVUE_ROOT/config/frame.conf File, absolute path	Configuration file used to define viewer portal frame behavior.

Table 2-3 FusionVUE Environment Variables **(continued)**

Variable	Default Value/Type	Description
FUSIONVUE_MENU_DIR	$FUSIONVUE_ROOT/config/menu Directory, absolute path	Directory containing menuing system components.
FUSIONVUE_MENU_FILE	$FUSIONVUE_ROOT/config/menu.conf File, absolute path	Defines menuing system behavior.
FUSIONVUE_BUTTON_DIR	$FUSIONVUE_ROOT/config/button Directory, absolute path	Directory containing script and image files used by the $FUSIONVUE_BUTTON_FILE.
FUSIONVUE_BUTTON_FILE	$FUSIONVUE_ROOT/config/button.conf File, absolute path	Defines the layout and function of the Extended Menu buttons. Default functionality described in Table 6-2 on page 65. See the *SGI FusionVUE Installation and Configuration Guide* for more details.
FUSIONVUE_TEMPLATE_DIR	$FUSIONVUE_ROOT/config/template Directory, absolute path	Directory containing template definition files. See the *SGI FusionVUE Installation and Configuration Guide* for more details on template definitions.
FUSIONVUE_KEYBOARD_CONFIG_FILE	$FUSIONVUE_ROOT/config/keyboard.conf File, absolute path	Points to the file which defines hot keys and their actions. The default functionality is described in *Appendix A, "Keyboard Controls"*. See the *SGI FusionVUE Installation and Configuration Guide* for more details.
Miscellaneous		
PFNFYLEVEL	2 Integer	Specifies the verbosity of the OpenGL Performer error messages. Range is from 1 (quiet) to 4 (very verbose).

Launching the FusionVUE Environment

The FusionVUE environment is a collection of software components that work together to accomplish the fusion process as shown in Figure 3-1. Pixel streams are transformed by stream modules and written into shared memory, where they are read by the VUESpace Graphics Engine and fused into a 3D virtual VUESpace display. Stream modules are created and destroyed by the Stream Manager at the request the VUESpace Graphics Engine in response to user interaction with the VUESpace menus (for example, Stream Requestor, Viewer Portal Menu, etc.).

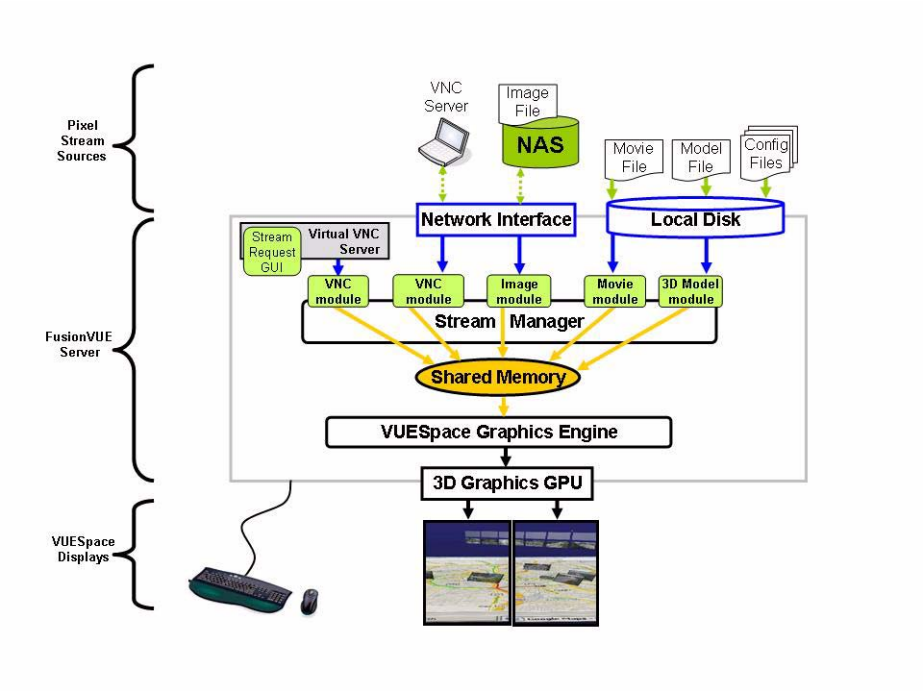


Figure 3-1 The FusionVUE Environment

At a minimum, the startup procedure involves launching the Stream Manager, VUESpace Graphics Engine (VE), and a virtual VNC server that plays host to the Stream Request interface.

This chapter describes the following:

Note: You must have a valid license to launch FusionVUE. Failures to launch for any reason (such as a missing license) will be noted by error messages in the console output and a popup error dialog.

Automatic Startup

For convenience, all necessary components may be started automatically with default values by executing the following program:

```
/opt/sgi/vue/fusionvue/bin/fusionvue
```

The `fusionvue` program will respond by displaying a small dialog box, as shown in Figure 3-2. Select the preferred FusionVUE resolution and click the **Start** button to launch the FusionVUE environment.

Figure 3-2 The FusionVUE Launcher

This method does not honor any previously set `FUSIONVUE_DISPLAY_FILE` and `FUSIONVUE_GFXCONF_FILE` environment variables. Instead, the FusionVUE Launcher will generate display configuration files.

If you require a custom configuration other than what the predefined options allow, then use the alternate startup sequence described in next section or create a modified version of the FusionVUE Launcher script.

Alternate Startup Sequence

To start a FusionVUE environment without using the FusionVUE Launcher, use the following steps:

1. Set any appropriate environment variable values (See Chapter 2, “Getting Started.”).
2. Clean up after any previous FusionVUE session (if necessary).
3. Start FusionVUE.

Step 1: Settting Environment Variables

For a default FusionVUE installation, place the directory containing launch scripts in your `PATH` environment variable. This allows the execution of startup and shutdown scripts from any location on the system.

For `csh` or `tcsh` shells:

```
setenv FUSIONVUE_ROOT /opt/sgi/vue/fusionvue
setenv FUSIONVUE_BIN_DIR FUSIONVUE_ROOT/bin
setenv PATH ${PATH}:${FUSIONVUE_BIN_DIR}
```

For `sh` or `bash` shells:

```
export FUSIONVUE_ROOT=/opt/sgi/vue/fusionvue
export FUSIONVUE_BIN_DIR=FUSIONVUE_ROOT/bin
export PATH = ${PATH}:${ FUSIONVUE_BIN_DIR }
```

Step 2: Cleaning Up from a Previous FusionVUE Session

It is important to free any shared resources left from a previous FusionVUE session before launching a new FusionVUE environment. Normally, this is handled by the `fusionvue-SHUTDOWN` script, which is used to terminate a FusionVUE session. However, it is good practice to run the shutdown script just before launching a new session. The FusionVUE Launcher program does this automatically.

Step 3: Starting FusionVUE

Start the FusionVUE environment using the following command:

```
/opt/sgi/vue/fusionvue/bin/fusionvue-RUN
```

This will start the appropriate software components and will send some console (log) output to the shell from which it is run, but most messages will be sent to the logs located under `$FUSIONVUE_LOG_DIR`. The following logs will be written:

```
fusionvue-SM.log
fusionvue-VE.log
fusionvue-VNC.log
```

Shutdown

To terminate the FusionVUE Enviroment, use the `ALT-TAB` sequence to display the FusionVUE Launcher, shown in Figure 3-2, and click the **STOP** button to terminate all FusionVUE processes and free resources.

Alternatively, you can execute the shutdown command from a shell:

```
fusionvue-SHUTDOWN
```

If the VUESpace completely covers the display, you will first need to use the `ALT-TAB` key combination to access a shell in which to issue the `fusionvue-SHUTDOWN` command or just connect to the system from a remote shell to issue the shutdown command.

Viewer Portals and Pixel Streams

Chapter 3 describes how you start FusionVUE. After launching, it creates a VUESpace, as shown in Figure 4-1.

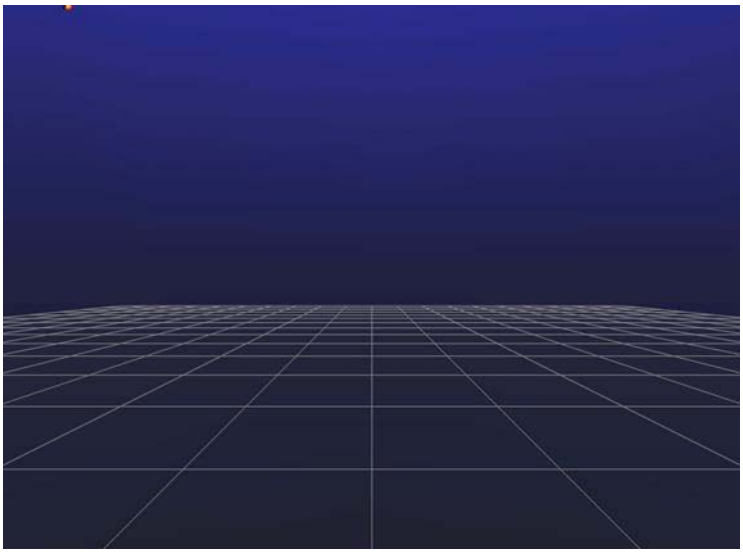


Figure 4-1 VUESpace at Startup

This chapter describes how you populate the VUESpace with *viewer portals* (subsequently, referred to only as *viewers*) and, in turn, how to populate the viewers with pixel streams. In addition, this chapter describes how you maniuplate these entities in the VUESpace.

The following topics appear in this chapter:

Keyboard and Mouse Conventions

You will probably use the keyboard and the mouse extensively for the interactive control of the VUESpace. In addition to the special conventions cited in the front matter of this book, this chapter and subsequent chapters use the terminology and notations listed in Table 4-1 for keyboard and mouse entries.

Note: Keyboard and mouse entries within VUESpace are context-sensitive. Depending on the location of the mouse cursor, the entries have different meanings. Execute keyboard entries when the mouse cursor is in the background, not over a viewer or a *template*, a grouping of viewers (See Chapter 5, "Templates.").

Table 4-1 Conventions for Keyboard and Mouse Actions

Term/Notation	Description
left-click	Press and release the left mouse button.
right-click	Press and release the right mouse button.
left-hold	Press and hold the left mouse button.
right-hold	Press and hold the right mouse button.
release	Release the mouse button you have been holding.
x key	Denotes a key on the keyboard. The entries are case-sensitive.

Creating a Viewer

Figure 4-2 VUESpace with a Viewer

A viewer is a VUESpace portal (3D window view) to which you can attach a pixel stream.This section describes two ways to create a viewer:

- Use the VUESpace Menu.
- Use a keyboard entry.

Using the VUESpace Menu

The VUESpace Menu has a button that creates a viewer. To access the VUESpace Menu, right-hold the mouse in the VUESpace. The VUESpace Menu appears, as shown in Figure 4-3.

If you release the right button, the menu disappears.

Figure 4-3 VUESpace Menu

Table 4-2 describes the three buttons in the VUESpace Menu.

Table 4-2 VUESpace Menu Buttons

Button	Description
	Creates a viewer.
T	Display a list of template choices.
E	Toggles on/off the Extended Menu.

To activate the create-viewer button (uppermost button), drag the mouse cursor over the create-viewer button and release.

Using a Keyboard Entry

To create a viewer from the keyboard, enter the v key. If VUESpace already contains other viewers, the mouse cursor must be in the background.

Controlling a Viewer

This section describes how you can move and otherwise manipulate a viewer in the 3D VUESpace.

Viewer Frame

Besides its obvious structural and cosmetic contributions, the viewer frame provides other features. It can house menu buttons/icons that allow you to populate and otherwise manipulate the viewer and its content. In addition, portions of the frame itself coupled with the context-sensitive mouse cursor provide a mechanism for manipulating the viewer in the VUESpace.

The VUESpace is highly configurable, including the viewer frame. Figure 4-2 shows the default configuration for a viewer frame. Your site may have configured some of the menu buttons/icons differently, but their functions do not change, regardless of placement.

Viewer Control Menu

The top-left portion of the viewer frame contains the Viewer Control Menu with its two buttons, as shown in Figure 4-4.

Figure 4-4 Viewer Control Menu

The leftmost menu button is for the Viewer Menu (a snowflake menu) and the second, for the Stream Menu. The Stream Menu is described later in this chapter.

To access the Viewer Menu, right-hold the the snowflake button. Figure 4-5 shows the Viewer Menu.

Figure 4-5 Viewer Menu

Table 4-3 describes the six buttons in the Viewer Menu.

Table 4-3 Viewer Menu Buttons

Button	Action
	Opens the Stream Requestor dialog screen to attach a pixel stream to this viewer.
	Changes the frame decoration. Each time you select the button, it will cycle to the next frame decoration.
	Attaches/Detaches the viewer to/from a template. (For more information about templates, see Chapter 5, “Templates.”)
	Toggles the window decoration on or off. When off, only the viewer control menus are available.

Table 4-3 Viewer Menu Buttons **(continued)**

Button	Action
	Deletes the viewer. Detaches any active pixel streams first. Terminates the pixel stream if it is not used by another viewer.
	Detaches the active pixel stream from the viewer. Terminates the pixel stream if it is not used by another viewer.

Panning, Zooming, and Rotating the Viewer

Figure 4-6 shows the Pan, Zoom, and Rotate buttons on the viewer frame. These buttons along with other areas of the viewer frame allow you to pan, zoom, and rotate the viewer.

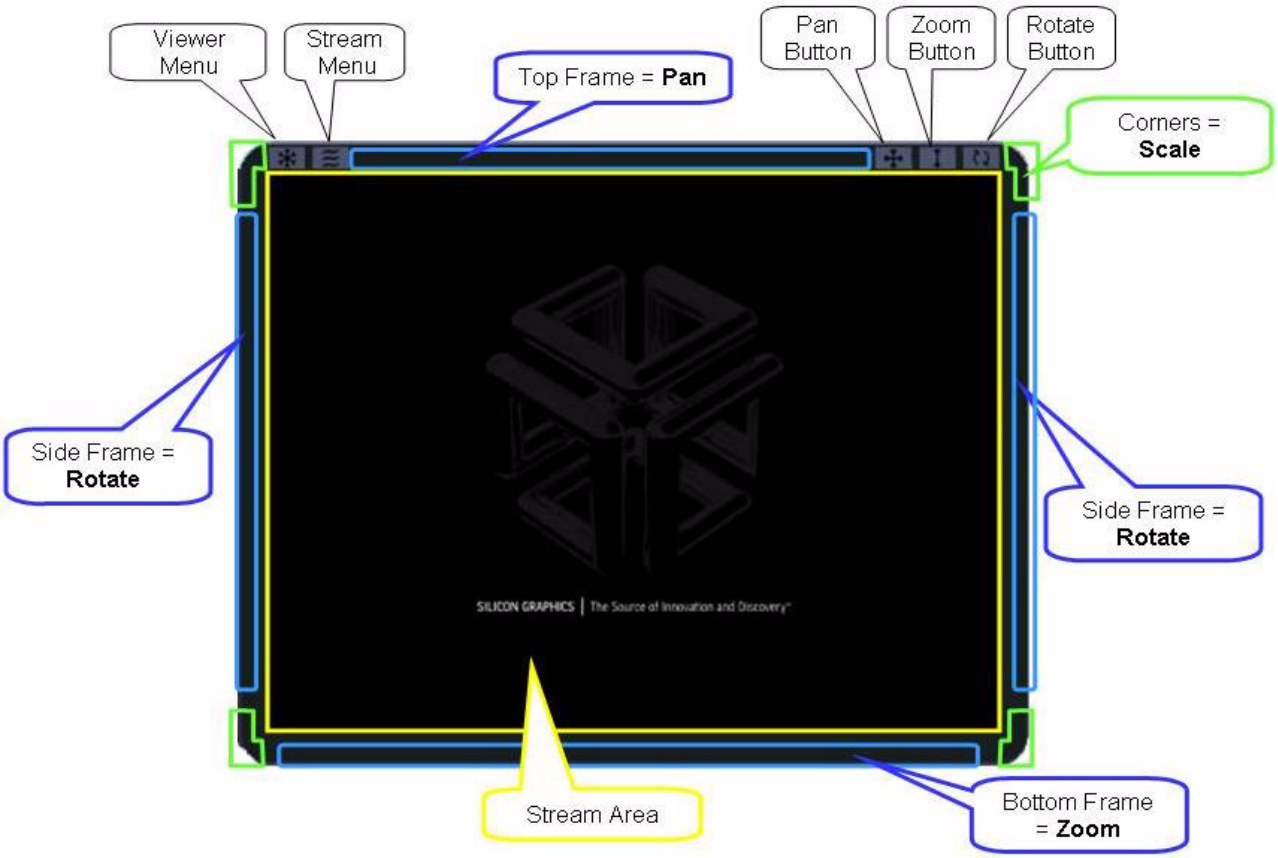


Figure 4-6 Viewer Anatomy

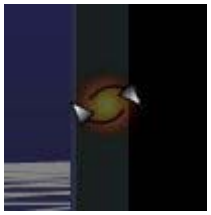
The mode of the mouse cursor changes as you move it across the viewer frame. This allows you to manipulate the viewer in different ways, depending on the location of the cursor.

Table 4-4 describes panning, zooming, rotating, and the related context-specific cursor modes.

Table 4-4 Context-Specific Cursor Modes

Cursor Location	Cursor Appearance	Cursor Mode	Description
		pan	When the cursor is in pan mode, left-hold allows you to select the viewer and move it in the VUESpace in a plane parallel to the display screen. A left-right motion of the cursor moves the viewer left-right relative to the display screen. An up/down motion of cursor moves the viewer up/down relative to the display screen.
top of frame		pan	See the preceding description.
		zoom	When the mouse cursor is in zoom mode, left-hold allows you to move the viewer perpendicular to the display screen (near, far). Moving the mouse down moves the viewer towards you and vice versa.

Table 4-4 Context-Specific Cursor Modes **(continued)**

Cursor Location	Cursor Appearance	Cursor Mode	Description
bottom of frame		zoom	See the preceding description.
corner of frame		zoom	See the preceding description.
		rotate	When the mouse cursor is over the rotate icon or the left or right side of the frame, left-hold rotates the viewer about its center point as you move the mouse on the screen.
side of frame		rotate	See the preceding description.

Attaching Pixel Streams

There are three general steps to attach a pixel stream to a viewer:

1. Select the Viewer Menu.
2. Select the attach-pixel-stream button.
3. Select the pixel stream type.

This section describes these steps and, additionally, shows examples of the following:

- Attaching an image
- Attaching a movie
- Controlling a movie
- Attaching a 3D model
- Attaching a VNC server
- Manipulating a 3D model in VUESpace

Selecting the Viewer Menu

Figure 4-7 Viewer Menu

To select the Viewer Menu, place the cursor over the snowflake menu button on the viewer frame and left-hold, as shown in Figure 4-7.

Selecting the Attach-Pixel-Stream Button

To select the attach-pixel-stream button, move the cursor over the icon shown in Figure 4-8 and release the mouse button.

Figure 4-8 Attach-Pixel-Stream Button

FusionVUE then displays the Stream Requestor screen, as shown in Figure 4-9.

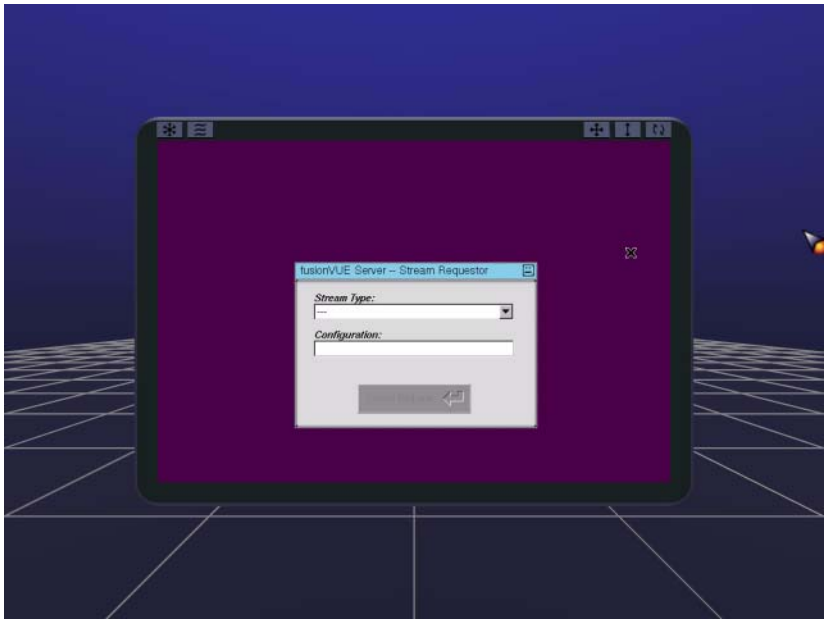


Figure 4-9 Stream Requestor Screen

Selecting the Pixel Stream Type

To select the desired stream type, do the following:

1. Scroll the entries from the **Stream Type** field shown in Figure 4-10 and select the desired stream type.

   The stream types are described in Table 4-5.

2. Left-click the **Submit Request** button.

   FusionVUE then displays a dialog screen based on your stream type selection.

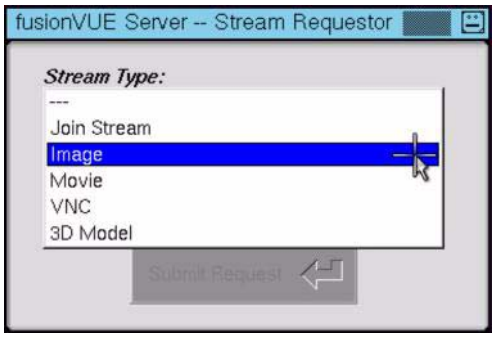


Figure 4-10 **Stream Type** Scroll Field

Table 4-5 Stream Types

Stream Type	Description
`Join Stream`	Duplicates a stream which is already running in a viewer.
`Image`	Selects an image file from a browser.
`Movie`	Selects a movie file from a browser.
`VNC`	Enables connection to a remote VNC server.
`3D Model`	Imports a 3D model into the VUESpace.

Attaching an Image

If you selected `Image` for your stream type, the Image Selector dialog screen appears, as shown in Figure 4-11.

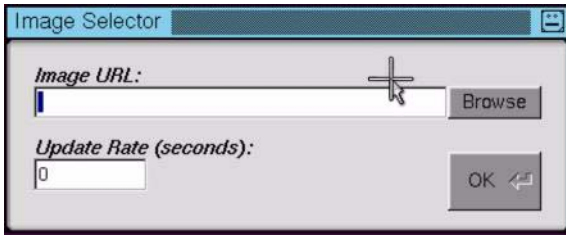


Figure 4-11 Image Selector Screen

Press the **Browse** button to get a file browser window, as illustrated in Figure 4-12.

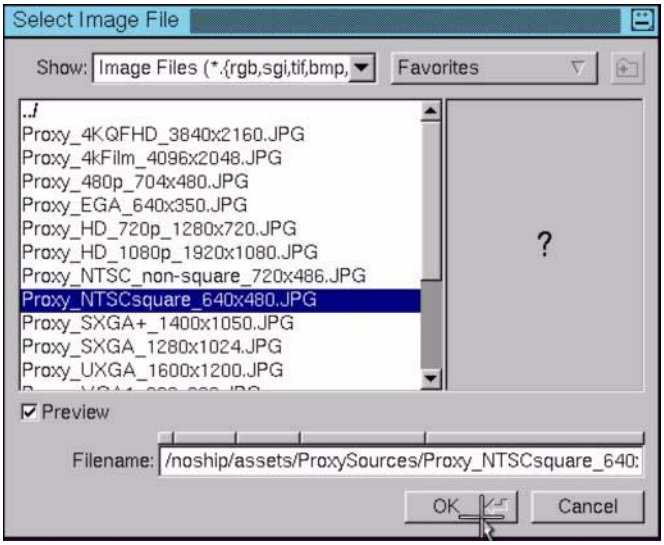


Figure 4-12 Image File Browser Screen

Navigate to the desired directory and select the desired image file. Press the **OK** button and you return to the Image Selector screen (now populated), as shown in Figure 4-13.

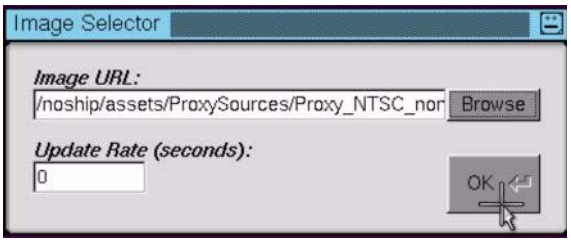


Figure 4-13 Populated Image Selector Screen

Press **OK** button from the Image Selector screen to return to the Stream Requestor screen (now populated), as shown in Figure 4-14.

Figure 4-14 Populated Stream Requestor Screen

Press the **Submit Request** button from Stream Requestor screen to display the image in the viewer. Figure 4-15 is an example.

Figure 4-15 Sample Image Pixel File in Viewer

Attaching a Movie

If you selected `Movie` for your stream type, the Select Movie File dialog screen appears, as shown in Figure 4-16.

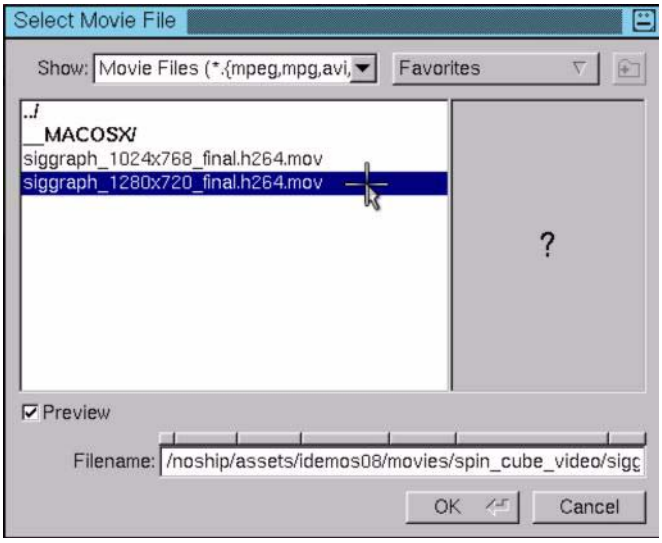


Figure 4-16 Movie File Selector Screen

Navigate to the desired directory and select the desired movie file.

Press **OK** button from the Select Movie File screen to return to the Stream Requestor screen (now populated).

Press the **Submit Request** button from Stream Requestor screen to display the movie in the viewer. Figure 4-17 is an example.

Figure 4-17 H.264.mov Movie Playing in Viewer

Controlling a Movie

You can control a movie using the Stream Menu. Left-hold the Stream Menu button to display the menu, as shown in Figure 4-18.

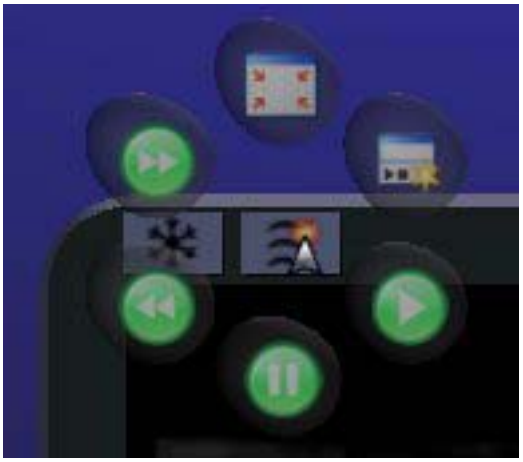


Figure 4-18 Stream Menu

Table 4-6 describes the functions of the buttons in the menu.

Table 4-6 Movie Control Buttons

Button	Action
	Toggles on/off the viewer decoration.
	Fast-forward movie.
	Rewind movie.

Table 4-6 Movie Control Buttons **(continued)**

Button	Action
	Pause the movie.
	Play the movie.
	Not currently used.

To use a specific control, drag the cursor over the associated button.

Attaching a 3D Model

If you selected `3D Model` for your stream type, the Select Model File dialog screen appears, as shown in Figure 4-19.

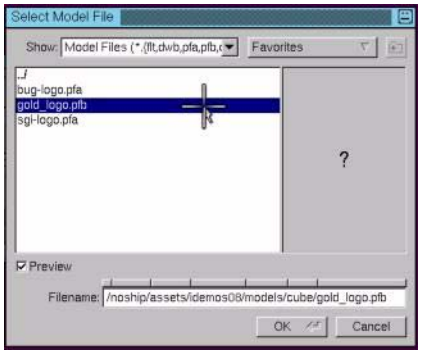


Figure 4-19 Model File Selector Screen

Navigate to the desired directory and select the desired model file.

Press **OK** button from the Select Model File screen to return to the Stream Requestor screen (now populated), as shown in Figure 4-20.

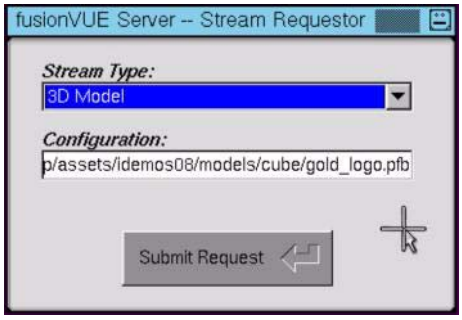


Figure 4-20 Populated Stream Requestor Screen – 3D Model File

Press the **Submit Request** button from Stream Requestor screen to display the model in the viewer. Figure 4-21 is an example.

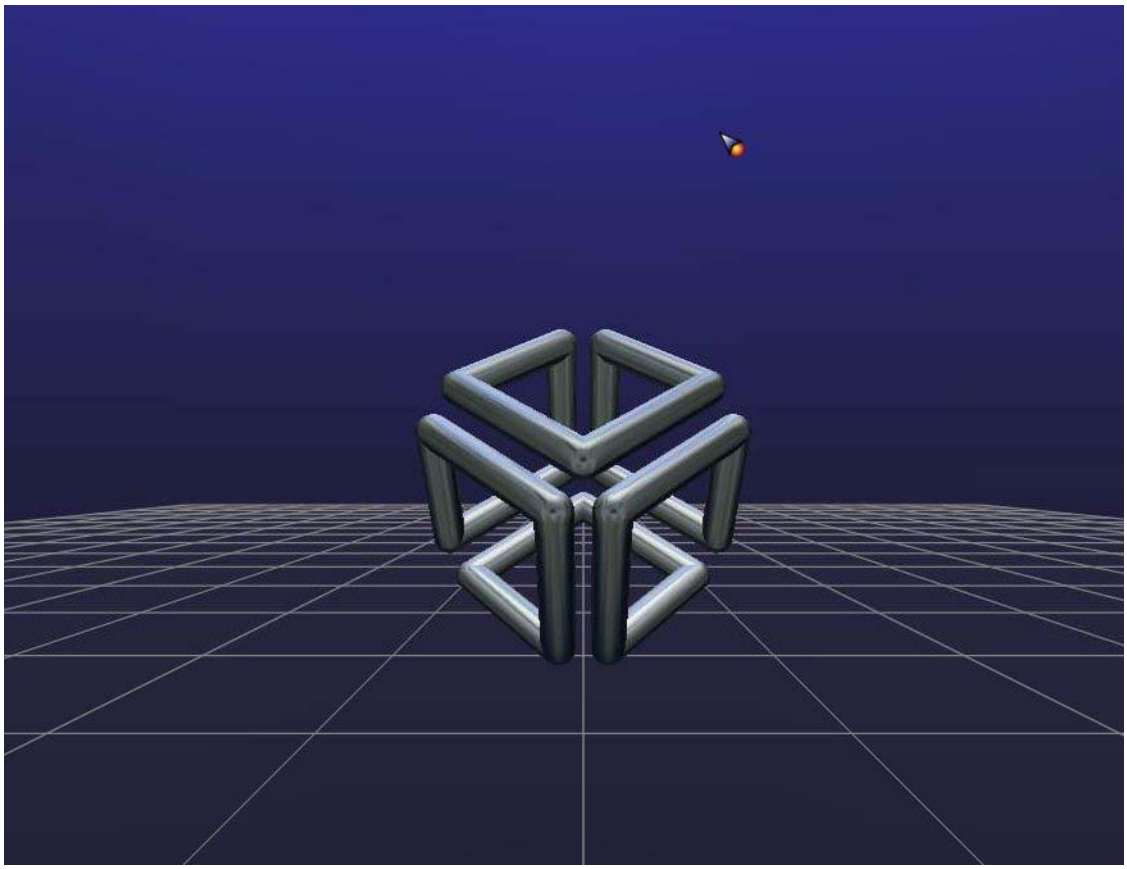


Figure 4-21 3D Model File in Viewer

Attaching a VNC Server

If you selected `VNC` for your stream type, the VNC Computer Selector dialog screen appears, as shown in Figure 4-22.

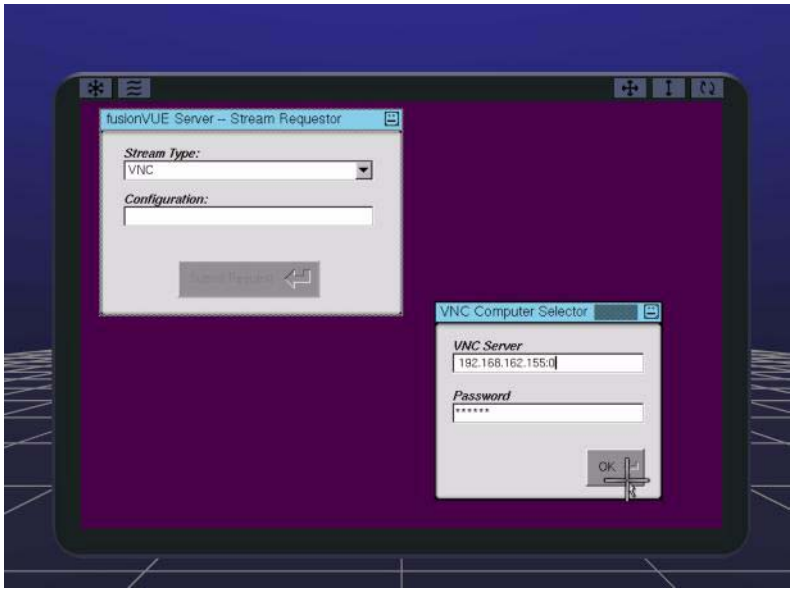


Figure 4-22 VNC Computer Selector Screen

The following steps describe how you complete the attachment.

1. Use the following format to specify the value for the **VNC Server** field:

   hostname:*display*

   The value *hostname* is the resolvable name or IP address for the host computer with the desired VNC server. The value *display* is the desired display number (which defaults to `0` if nothing is explicitly specified).

   Examples:

   ```
   192.168.162.155
   192.168.162.155:0
   localhost:11
   myhost.test.sgi.com
   ```

In the preceding examples, the `localhost:11` value specifies a VNC server running on the FusionVUE server.

2. In the **Password** field, enter the password used to connect to the VNC server.
3. Press the **OK** button.

   Figure 4-23 shows the resulting Stream Requestor screen now populated.

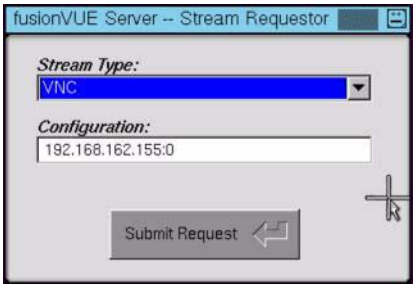


Figure 4-23 Populated Stream Requestor Screen – VNC Stream

4. Press the **Submit Request** button to initiate the stream attachment.

   Figure 4-24 illustrates a VNC stream attached to a viewer.

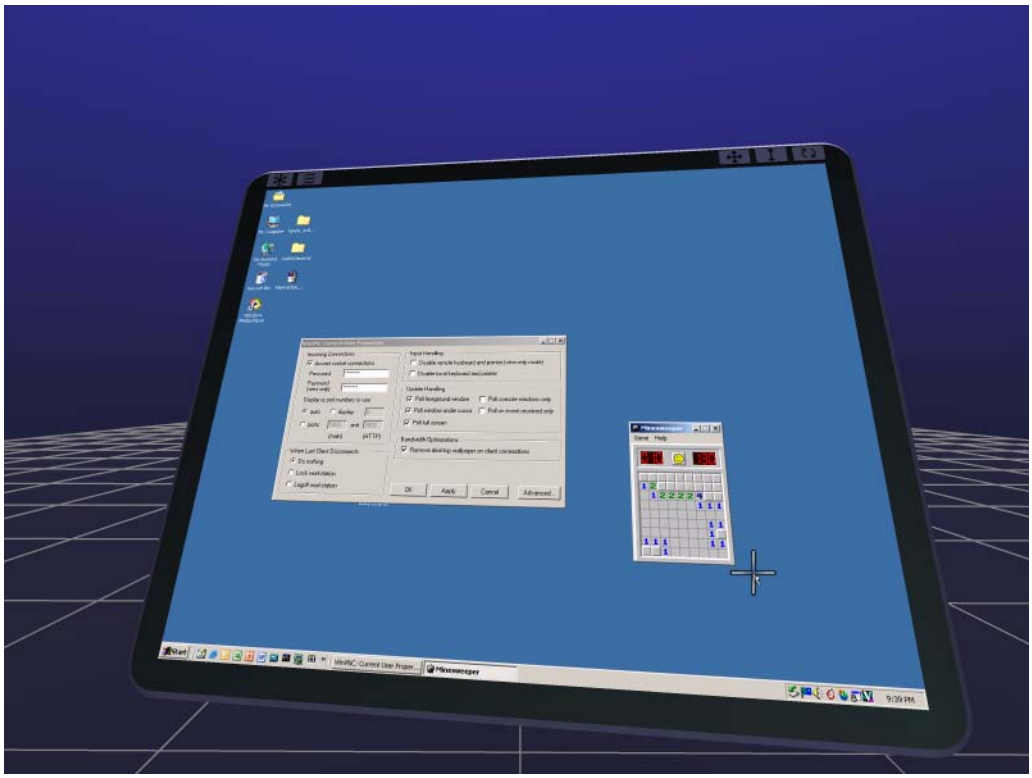


Figure 4-24 VNC Stream in Viewer

Manipulating a 3D Model in VUESpace

Right-holding when the cursor is over the 3D model displays a control menu, as shown in Figure 4-25.

Figure 4-25 Entity Manipulation Menu

Table 4-7 describes the functions of the icons in the menu.

Table 4-7 Entity Manipulation Icons

Icon	Action
	Rotates the model.
	Focuses the model by moving it front and center. Acts like a toggle: repeating the selection returns the model back to its original location.
	Orbits your eye point around the model.
	Scales the model larger or smaller without changing its position.

Table 4-7 Entity Manipulation Icons **(continued)**

Icon	Action
	Zooms the model toward and away from your eye point.
	Pans the model side to side and up and down relative to your eye point.

To use a specific control, drag the cursor over the associated icon.

Templates

Templates are FusionVUE containers designed to group multiple viewers in fixed spatial relationships to each other. Templates consist of a piece of geometry called a template handle and one or more docking ports or docks, to which viewers may be attached (and detached).

This chapter describes how you manage templates:

Templates Supplied by SGI

Figure 5-1 shows four of the templates supplied by SGI.

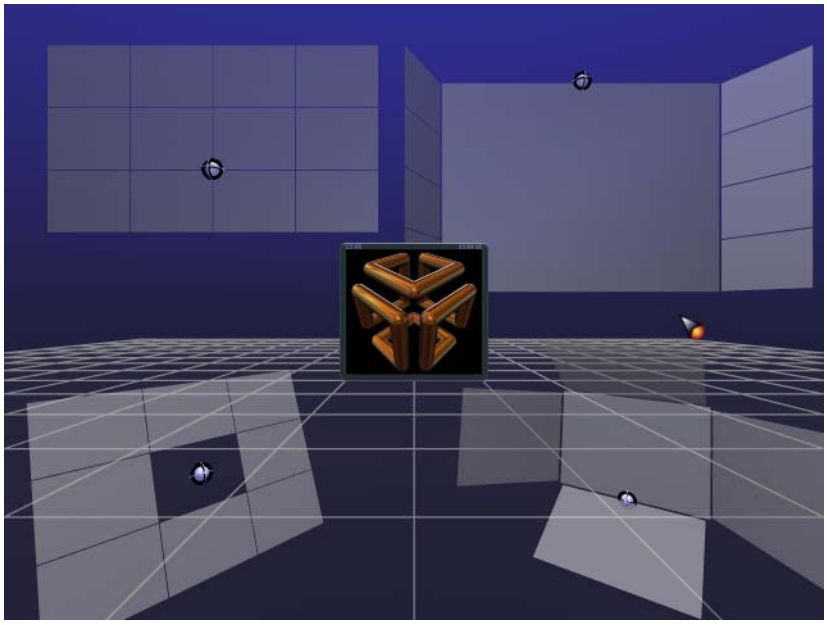


Figure 5-1 Four Templates Supplied by SGI

The templates at your disposal are determined during system configuration. See the *SGI FusionVUE Installation and Configuration Guide*.

Loading a Template

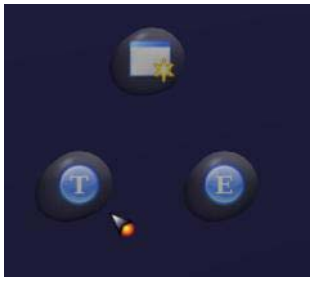


Figure 5-2 VUESpace Menu

To load a template, do the following:

1. Right-hold the mouse button in VUESpace.

   The system displays the VUESpace Menu, as shown in Figure 5-2.

2. With the right mouse button still depressed, glide over the **T** button.

   The system then displays the **1**, **2**, and **3** buttons.

3. With the right mouse button still depressed, glide over desired selection and release the right mouse button.

   The system then displays the desired template in VUESpace.

Manipulating a Template

Templates may be manipulated by left-holding over the template handle (template manipulator shown if Figure 5-3). The manipulation options are the same as those for viewer entities. See "Controlling a Viewer" in Chapter 4.

Figure 5-3 illustrates the various template manipulation options.

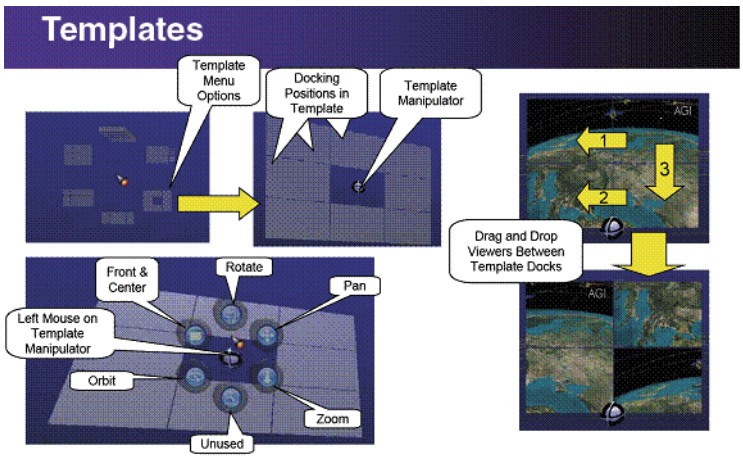


Figure 5-3 Template Anatomy

Populating a Template

Figure 5-4 Viewer Menu

To populate a template, do the following:

1. Left-hold over the Viewer Control Menu (snowflake menu) on the desired viewer.

   This displays the Viewer Menu, as shown in Figure 5-4.

2. Glide the cursor over the plug item and then onto one of the template docking ports (transparently shaded) before releasing the mouse button.

   The viewer docks. While docked, the viewer frame is automatically hidden, though the Viewer Menu and stream buttons are still accessible. See Figure 5-5 and Figure 5-6.

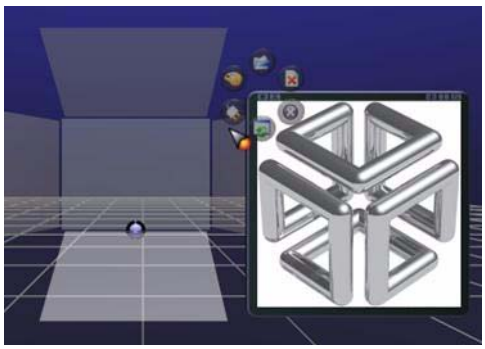


Figure 5-5 Template Before Viewer Docking

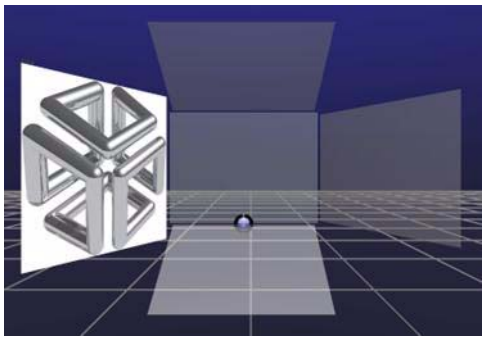


Figure 5-6 Template After Viewer Docking

To undock a viewer from a template, simply repeat the preceding steps but rather than releasing the mouse button inside a template dock, release the left mouse button over an empty region of the VUESpace. The viewer will detach and return to the position it held prior to docking and its frame will be visible again.

Note that you can move a viewer from one dock to another. Just release the left mouse button on another dock. If the target dock is presently occupied, the current occupant will swap places with the viewer being docked. See the sequence shown in Figure 5-7 and Figure 5-8.

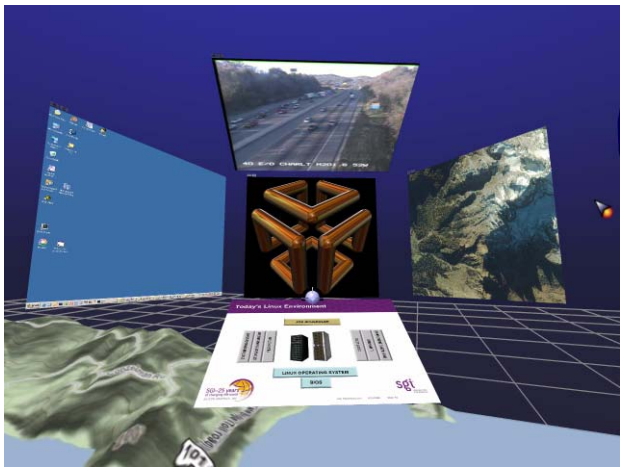


Figure 5-7 Template Before Viewer Swap

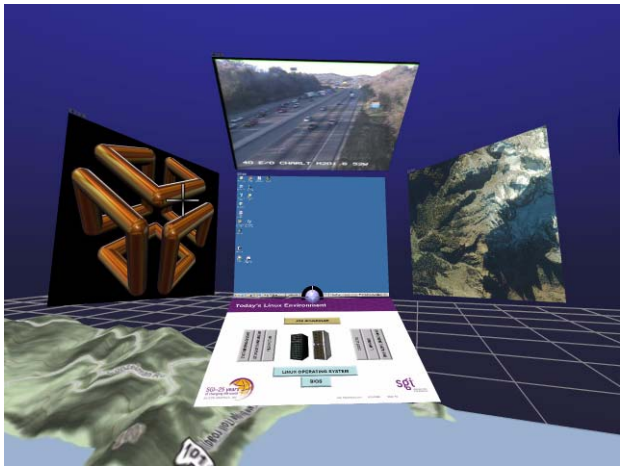


Figure 5-8 Template After Viewer Swap

Navigation

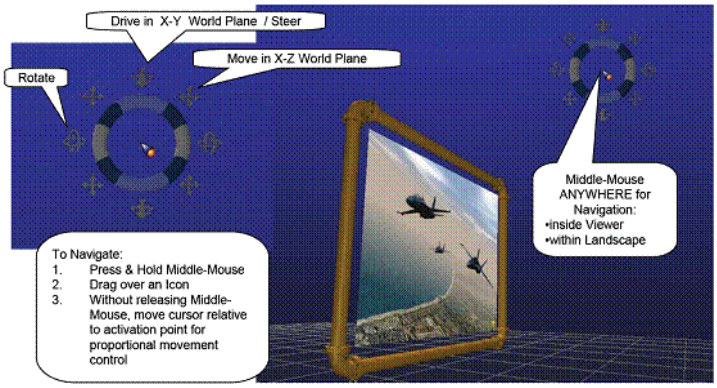


Figure 6-1 VUESpace Navigation Overview

The VUESpace is a 3D environment where you can customly arrange the various entities and then navigate about them. Using the following topics, this chapter describes how you navigate about VUESpace:

- "The VUESpace Coordinate System" on page 60
- "VUESpace Navigation Menu" on page 62
- "Orbiting around an Entity in the VUESpace" on page 63
- "Inching along the X or Y Axis" on page 64

Notes:

- This chapter describes how you nagivate about VUESpace using the mouse. For information about keyboard navigation, see Appendix A, "Keyboard Controls".
- In this chapter, consider yourself the camera, the virtual observer.

The VUESpace Coordinate System

VUESpace uses a right-handed coordinate system, as illustrated Figure 6-2.

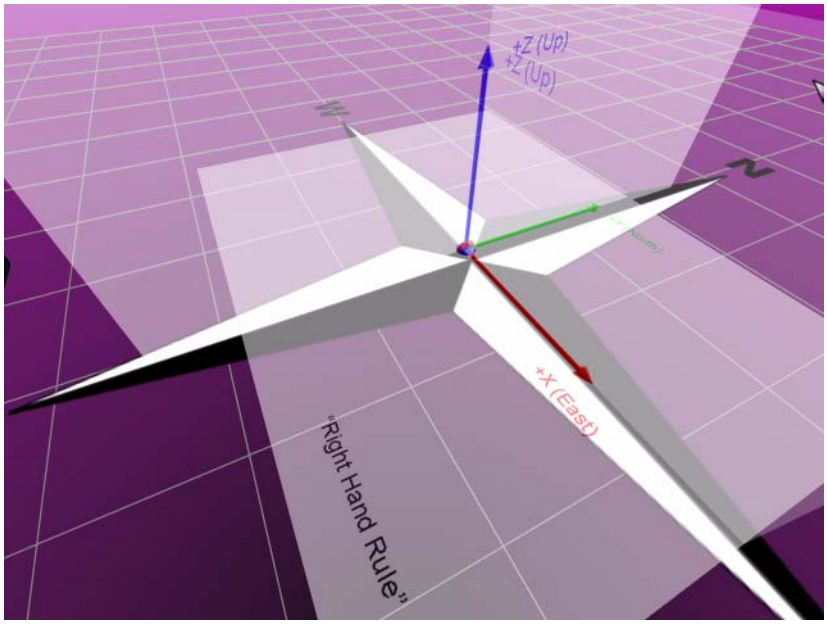


Figure 6-2 VUESpace Coordinate System

If you look down on the grid plane, the +X axis (red) points east, +Y axis (green) points north, and the +Z axis (blue) points up.

Positive rotation angles for heading, pitch, and roll are also shown in Figure 6-3. In a right-handed system, the heading angle is a rotation around the Z (blue) axis, the pitch angle is a rotation about the X axis (red), and the roll angle is a rotation about the Y (green) axis.

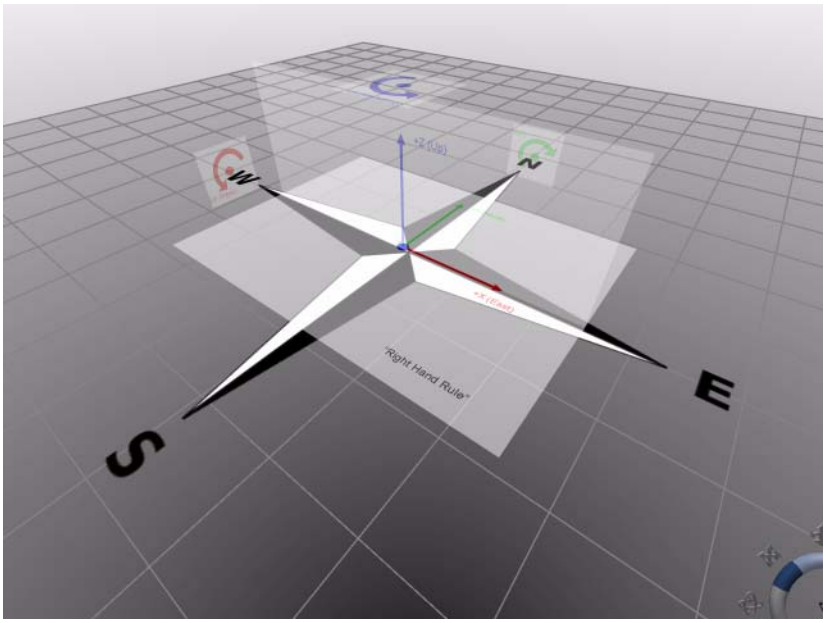


Figure 6-3 Heading, Pitch, and Roll

As shown in Figure 6-4, viewer portal positioning follows the same rules as camera positioning within the VUESpace.

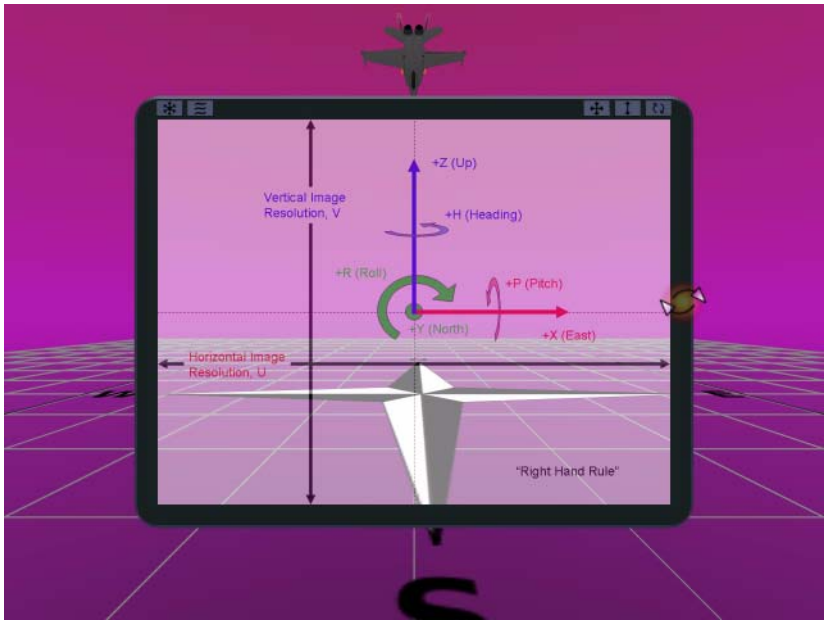


Figure 6-4 Camera and Viewer Portal Positioning

VUESpace Navigation Menu

The VUESpace Navigation Menu, shown in Figure 6-5, is the primary tool for navigation. You access the menu by holding down the middle mouse button and gliding the cursor over one of the eight icons on the navigation ring.

Figure 6-5 Navigation Menu

Table 6-1 describes the actions associated with each of the icons.

Table 6-1 Navigation Menu Icons

Icon	Mode/Action
	Walk mode. Forward/Backward mouse movement moves the virtual observer forward/backward along the current heading. Left/Right mouse movement steers the observer's heading left/right. In walk mode, the observer remains at the starting altitude (z value) above the grid plane.
	Pan mode. Forward/Backward mouse movement moves the observer up or down in the Z direction. Left/Right mouse movement causes the virtual observer to move laterally in the plane of the screen (that is, perpendicular to the observer's heading). NOTE: The observer cannot navigate below the grid plane.
	Rotate mode. Forward/Backward mouse movement causes the observer's gaze to pitch forward/backward. Left/Right mouse movement changes the observer's heading angle.

The VUESpace Navigation Menu is the one menu that is not context-sensitive. It is always accessible by holding down the middle mouse button.

Orbiting around an Entity in the VUESpace

Figure 6-6 The Orbit Icon

You enter orbit mode by activating the orbit icon, shown in Figure 6-6. You can do this in following two ways:

- Place the cursor over the geometry of a viewer frame or a 3D model and right-hold.
- Place the cursor over a template handle and left-hold.

Inching along the X or Y Axis

You can use the Extended Menu to make minor adjustments in position along the X and Y axes. To access the Extended Menu, do the following:

1. Right-hold in an empty region of VUESpace.

   FusionVUE then displays the VUESpace Menu.

2. Glide the cursor over the **E** button and, without releasing the mouse button, glide the cursor over the **1** button.

   FusionVUE then displays the Extended Menu along the left side of the screen, as shown in Figure 6-7.

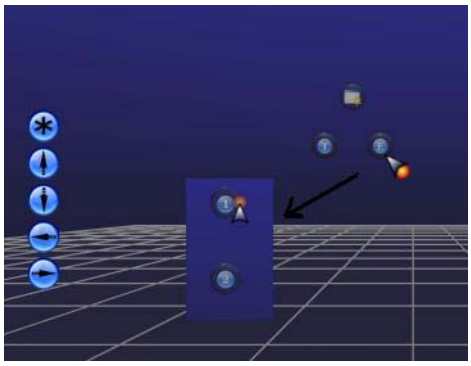


Figure 6-7 Extended Menu

Table 6-2 describes the icons in the Extended Menu.

Table 6-2 Extended Menu Icons

Icon	Action
	Create a new viewer.
	Incrementally step in +Y direction (north).
	Incrementally step in -Y direction (south).
	Incrementally step in -X direction (west).
	Incrementally step in +X direction (east).

Troubleshooting

This chapter describes troubleshooting steps for various problems that may arise. If you encounter a problem not listed here or the suggested solution does not work, please call SGI Customer Support at 1-800-800-4744.

The various problems are categorized in the following manner:

General Troubleshooting Issues/Techniques

To aid in troubleshooting, a great deal of output is generated by the various components of the FusionVUE server. All are valuable aids for diagnosing many types of problems. The log and temporary files are valid only for the current session as they are overwritten at the start of each new session. You must copy them prior to the start of the next session if you want to preserve them. A new session begins when the **Start** button is pressed or when the `fusionvue-RUN` program is executed.

Three standard log files are created along with console output generated by the various system components:

```
$FUSIONVUE_LOG_DIR/fusionvue-SM.log
$FUSIONVUE_LOG_DIR/fusionvue-VE.log
$FUSIONVUE_LOG_DIR/fusionvue-VNC.log
```

Some of the problems listed in this chapter will leave tell-tale signs in one of these logs. So, it is important to understand and monitor the various logs.

The following topics and problems are described in this section:

Output Formats

The VUESpace Graphics Engine log (`fusionvue–VE.log`) and the Stream Manager log (`fusionvue–SM.log`) have the general structure shown below:

process-ID seconds_from_the_epoch : *event_message*

Some lines or event messages may be preceeded by one of the following two-letter codes:

(II)	Information
(WW)	Warning
(EE)	Error
(!!)	Iimportant notice
PF	OpenGL Performer Toolkit notification. Controlled by the `PFNFYLEVEL` environment variable in range [1-4].

Not all log entries will adhere to this standard form especially when multi-line output is required but the sequential record of execution will still be valid.

The `fusionvue–VNC.log` is written by the `vncserver` and `Xvnc` processes and adheres to its own standard.

Console output generally has the following form:

<=*ProgramName*=> *EventMessage*

The *ProgramName* field is the name of the program or script that issued the *EventMessage*.

Monitoring the Logs

A useful technique for monitoring the output of FusionVUE logs in real time is to open shells for each log and then enter the following command:

`tail –f` *log_file_name*

The option *log_file_name* is one of the following:

```
$FUSIONVUE_LOG_DIR/fusionvue-SM.log
$FUSIONVUE_LOG_DIR/fusionvue-VE.log
$FUSIONVUE_LOG_DIR/fusionvue-VNC.log
```

Cannot Find Log Files

Log files are located in the directory specified by environment variable `FUSIONVUE_LOG_DIR`. By default, the location is `/var/log` but, to be certain, look for the following line in the console output from `fusionvue-RUN`:

```
<=fV-RUN=>FUSIONVUE_LOG_DIR not set. Setting FUSIONVUE_LOG_DIR to
/var/log
```

It may look like the following if it has been customized:

```
<=fV-RUN=> * FUSIONVUE_LOG_DIR previously set. Using
/root/.fusionvue/log
```

If `fusionvue` or `fusionvue-RUN` cannot write to `/var/log`, the startup program writes to `/tmp` instead of failing to start.

Cannot Find Temporary Files

Temporary files are located in the directory specified by environment variable `FUSIONVUE_TMP_DIR`. By default, the location is `/var/tmp` but, to be certain, look for the following line in the console output from `fusionvue-RUN`:

```
<=fV-RUN=>FUSIONVUE_TMP_DIR not set. Setting FUSIONVUE_TMP_DIR to
/var/tmp
```

It may look like the following if it has been customized:

```
<=fV-RUN=> * FUSIONVUE_TMP_DIR previously set. Using
/root/.fusionvue/tmp
```

Startup or Shutdown Problems

The following problems are described in this section:

FusionVUE Fails to Start Correctly

Startup typically takes a few seconds after executing `fusionvue-RUN` or after pressing **START** on the FusionVUE Launcher. During this time, a continuous stream of console output indicates the startup procedure is functioning normally. If console output stops before reaching the following message or if the VUESpace fails to appear within five seconds after receiving this message, look in the `fusionvue-VE.log` for what went wrong.:

```
<=fV-RUN=>4. Starting FusionVUE VUESpace
```

FusionVUE may fail to start the VUESpace for the following reasons:

- "Missing or Invalid FusionVUE License" on page 72
- "Invalid FUSIONVUE_* Environment Variables" on page 72

```
FUSIONVUE_ROOT
FUSIONVUE_BIN_DIR
FUSIONVUE_MODULES_DIR
FUSIONVUE_DATA_DIR
FUSIONVUE_TEMPLATE_DIR
```

FusionVUE may start incorrectly (ie a VUESpace appears but is incorrectly sized or missing features) if one of the following environment variables are invalid:

```
FUSIONVUE_DISPLAY_DIR
FUSIONVUE_DISPLAY_FILE
FUSIONVUE_GFXCONF_DIR
FUSIONVUE_GFXCONF_FILE
FUSIONVUE_BUTTON_FILE
```

For details, see section "Invalid FUSIONVUE_* Environment Variables" on page 72.

Missing or Invalid FusionVUE License

If you see a `FusionVUE license not valid` message either in a popup window or in the `fusionvue-VE.log` file, do the following:

1. Check for a valid FusionVUE license.

   Check the string in the `/etc/lk/keys` license file or enter the following command:

   ```
   lk_verify -A
   ```

2. If it has expired, contact SGI.
3. If the license has not expired, ensure that the license was installed properly.

   See Chapter 4 in the *SGI FusionVUE Installation and Configuration Guide*.

Invalid FUSIONVUE_* Environment Variables

FusionVUE will start with defaults if there are no environment variables set. However, FusionVUE will fail to start correctly or may not start at all if certain of the `FUSIONVUE_ *` environment variables are not set correctly. The likelihood of incorrect startup is diminished when launching using the `fusionvue` command since this program ensures the correct specification of environment variables and uses default configuration files, for the most part.

First, `fusionvue-RUN` will echo all the environment variables it detects during startup whether they were previously set (indicated by an *) or default values. You might spot an incorrect path or filename in that output.

Next, check the log files for clues. The following error messages in the `fusionvue-VE.log` file indicate an incorrectly set environment variable with the actual error underlined in boldface type:

Symptom	Failure to start VUESpace
Error Message	`/usr/tiptoe/bin/.scripts/run_vuespace_engine: Command not found.`
Cause	`FUSIONVUE_ROOT` `FUSIONVUE_BIN_DIR`
Symptom	Failure to start VUESpace
Error Message	`/opt/sgi/vue/fusionvue/modulesy/gfx_engine: Command not found.`
Cause	`FUSIONVUE_MODULES_DIR`
Symptom	Failure to start VUESpace
Error Message	`(EE) Unable to open image file: /root/.fusionvue/myconfig/displays/font.rgb`
Cause	`FUSIONVUE_DATA_DIR`
Symptom	Failure to start VUESpace
Error Message	`PF Fatal(2): (EE) GFX: Could not open menu directory './TEMPLATES'.`
Cause	`FUSIONVUE_TEMPLATE_DIR`
Symptom	VUESpace starts but with default size of 800x600 instead of requested size.
Error Message	`PF Warning(2): (EE) GFX: Cannot open config file '/root/.fusionvue/myconfig/gfxconfs/gfx_30Hz.conf'. Using default settings.`
Cause	`FUSIONVUE_GFXCONF_DIR,` `FUSIONVUE_GFXCONF_FILE`
Symptom	VUESpace starts but with default size of 800x600 instead of requested size.
Error Message	`PF Warning(2): (II) GFX: No config file specified. Using default settings.`
Cause	`FUSIONVUE_DISPLAY_DIR` `FUSIONVUE_DISPLAY_FILE`
Symptom	VUESpace starts fine but Extended Menu is not available.
Error Message	`(II) Could not open Button list file 'missing'.`
Cause	`FUSIONVUE_BUTTON_FILE`

For details about valid environment variables, see “Using Environment Variables to Customize Your Environment” in Chapter 2.

FusionVUE Terminated Unexpectedly

If the VUESpace suddenly crashes or disappears, then it will be necessary to do a shutdown and a restart. Do the following:

1. Check the `fusionvue-VE.log` and `fusionvue-SM.log` files to possibly discern the cause of the crash.
2. Correct the problem if possible.
3. If FusionVUE was launched using the FusionVUE Launcher, press the **Reset** button (or **Stop** followed by **Start** button).
4. Otherwise, run the `fusionvue-SHUTDOWN` program.
5. After the shutdown completes, rerun the `fusionvue-RUN` program.

Navigation Problems

Stuck. Cannot Access Navigation or Viewer Menus

FusionVUE popup menus are actually selectable 3D objects in the VUESpace placed a short distance in front of the observer's current position. It is possible to navigate too close to a viewer's stream area (or to bring the viewer too close to your eye point) such that the popup menus are occluded by viewer geometry and the viewer frames are outside the visible boundary of your display screen. This results in *navigational entrapment* with no means of escape because of one of the following:

- Access to the middle mouse Navigation Menu is blocked.
- The viewer frames are not accessible to reposition the viewer.
- The VUESpace background is not sufficiently visible to place the cursor and activate keyboard shortcuts.

There are several escape options:

- Reposition your eye point.
  1. Open a shell on the FusionVUE server and enter this command:

     ```
     telnet localhost 6262
     ```

  2. At the telnet prompt, issue the following command as many times as necessary until you can break out of the entrapment.

     ```
     CAMERA|INCREMENT|C_INDEX:0|XYZ:0,-100,0
     ```

     This will nudge your eye point along the negative Y axis by -100 units.

  Note:

  If your VUESpace occupies the full screen on your only connected display, you may not have access to the desktop to launch a shell. Consult your window manager documentation or try one of the following techniques:

  - `ALT-TAB` to an existing shell
  - `ALT-F1` to access the window manager menu
  - `CTRL-ALT-F1` to access a Linux terminal text login prompt
  - `CTRL-ALT-F7` to return to the graphic display
  - Log in remotely from a network-connected terminal.

- Restart the FusionVUE session.

  All work will be lost. See the shutdown and startup procedures in Chapter 3, “Launching the FusionVUE Environment.”

Viewer Manipulation Problems

The following problems are described in this section:

Cannot Access the Desired Pan/Rotate/Zoom Button or Frame

Sometimes a viewer is largely off-screen and you want to move it back toward the center without changing your eye point to access the viewer’s pan button or frame segment. In this case, it is best to place the cursor over any visible part of the frame and hold down the right mouse button to access the Entity Manipulation Menu (see Figure 4-25 and Table 4-7) and select the desired manipulation function.

Difficulty Accessing Menus on Distant Viewers

Sometimes a viewer is too far away to easily select a manipulation function from the normal menu choices. Either navigate toward the distant viewer or move the cursor over the viewer until you see it change to indicate you are over a portion of the viewer frame. Then access the Entity Manipulation Menu (see Figure 4-25 and Table 4-7) by holding down the right mouse button. You can then more easily select the desired manipulation option.

Cannot Precisely Position Viewer(s)

The interactive manipulation controls do not provide for accurate placement of entities in 3D space. For more specific placement, use the technique for opening a telnet session to the VUESpace described in "Stuck. Cannot Access Navigation or Viewer Menus" on page 75 and enter a command similar to the following:

`VIEWER|MODIFY|V_INDEX:`*n*`|XYZ:0,1000,2000|HPR:90,0,0|DURATION:1.0`

n	An integer index identifying the viewer
`0,1000,2000`	The XYZ position of the viewer center (in VUESpace units)
`90,0,0`	The heading, pitch, and roll angles of the viewer (in degrees)
`1.0`	The `DURATION` in seconds to make the move. Use `0` for instantaneous.

Refer to the figures in "The VUESpace Coordinate System" in Chapter 6 for coordinate system information.

Note: When a stream is attached to a viewer, by default, the viewer is scaled so that its longest dimension equates to 1000 units (width or height).

VUESpace Problems

The following problems are described in this section:

Two Cursors at Startup

Immediately following startup, there are two cursors shown. This is a design feature. One is the standard X11 cursor. The second is the VUESpace *virtual cursor*. The standard X11 cursor will disappear when inside the VUESpace as soon as the first viewer is added.

When the virtual cursor appears to be chasing the X11 cursor, the system is in standard X11 cursor mode. This mode allows the X11 cursor to escape from the VUESpace boundaries and interact normally with the Linux desktop window manager. The virtual cursor remains detached in the VUESpace at the departure point of the X11 cursor.

When the X11 cursor appears to jitter in the center of the display screen while the virtual cursor moves freely, the system is in virtual cursor mode, which only occurs if there are custom-defined multichannel VUESpaces. This mode allows seamless mouse control across multiple channels but prevents the X11 cursor from leaving the VUESpace.

Poor Graphics Performance, Sluggish Interactivity

If graphics performance becomes increasingly sluggish to allow reasonable interactivity, it could be an indication of several problems:

- Too many high-resolution dynamic pixel streams visible inside the VUESpace (movies or VNC streams).

  There is a fixed amount of pixel bandwidth into the VUESpace. Several ways to reduce this are as follows:

  – Navigate your eye point closer to a high-priority viewer to isolate it from other less-critical viewers.

  – Occluding less-critical viewers, zoom the critical viewer closer to your eye point.

  - Temporarily pause movies. Models, images, and paused movies do not continuously consume pixel bandwidth.
  - Close unnecessary streams or move them fully or partially off-screen.

- Too much demand for resources from other applications running on the FusionVUE server.

  If this were the case, then taking steps to reduce pixel bandwidth will have little positive effect.

- Incorrect graphics drivers

  Confirm that the 3D graphics driver (an NVIDIA driver) is installed and active. The following commands determine whether the `nvidia` kernel module is loaded:

  ```
  lsmod | grep nvidia
  ```

  See the *SGI FusionVUE Installation and Configuration Guide* for information about accelerated graphics drivers.

- Insufficient hardware resources

  See the *SGI FusionVUE Installation and Configuration Guide* for information about minimum and recommended hardware requirements.

VUESpace Keyboard Shortcuts Do Not Work

Verify that the virtual cursor is over the empty VUESpace background and not inside a viewer. For a description of the virtual cursor, see section "Two Cursors at Startup" on page 78.

General Stream Problems

The following problems are described in this section:

Stream Requestor Dialog Does Not Appear in Viewer

New viewers without streams attached display the default SGI logo image, as shown in Figure 7-1.

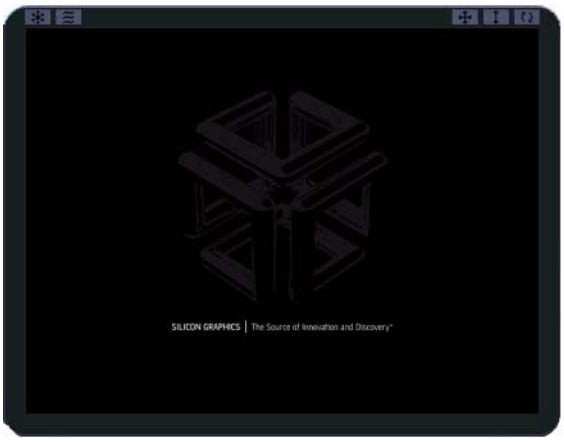


Figure 7-1 SGI Logo in New Viewer

When the stream request option is selected, the viewer's background color changes and the Stream Requestor screen should appear in the viewer, as shown in Figure 7-2.

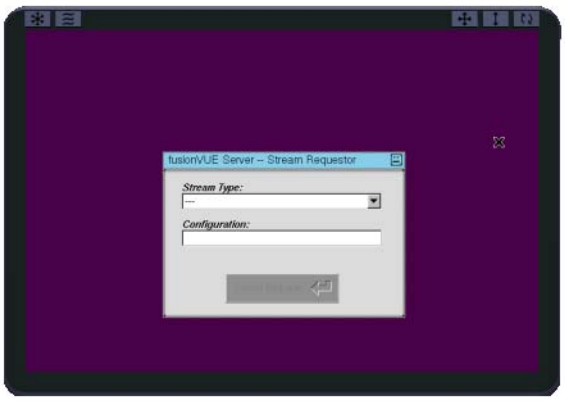


Figure 7-2 Stream Requestor Screen in Viewer

If one or more of the following symptoms occur, then the local restricted VNC server is probably not running correctly:

- Viewer background does not change to purple color.
- Stream Requestor screen fails to open in the viewer as shown in Figure 7-2.
- Stream Requestor screen opens in a separate window on the Linux window manager.

Check the `fusionvue-VNC.log` file for errors. Its file path is the following:

`$FUSIONVUE_LOG_DIR/fusionvue-VNC.log.`

It is possible that a prior abnormal shutdown left some resources open and prevented proper startup of the restricted VNC server. Take the folowing steps:

1. To close those resources, execute the following :

   `$FUSIONVUE_BIN_DIR/.scripts/stop_vncserver`

   By default, this path expands to the following:

```
/opt/sgi/vue/fusionvue/bin/.scripts/stop_vncserver
```

Check the console output from `fusionvue-RUN` for the correct value of `FUSIONVUE_BIN_DIR` if different from the default shown here.

2. Check to see if an `Xvnc` process for display `:99` is still using the `–rfbport 5999` needed by this VNC server.

   ```
   ps -C Xvnc -o pid= -o args | grep 5999
   ```

3. If so, kill the process, as follows:

   ```
   kill -9 PID
   ```

   The value *PID* is the first number in the output from the `ps` command.

4. Restart FusionVUE normally.

   See Chapter 3, “Launching the FusionVUE Environment.”.

Note: By default, the local restricted VNC server is only accessible to requests from the local host and is assigned the display number `:99` .

Stream Fails to Attach

There are several reasons why streams of various types fail to attach to a viewer:

- Invalid **Configuration** entry in the Stream Requestor dialog.
- Invalid file format for the `Image`, `Movie`, and `3D Model` stream types
- Invalid host name, IP address, or VNC password for the `VNC` stream type
- Stream resolution too large for FusionVUE

  See the following sections:

  - “Image Stream Problems” on page 83
  - “Movie Stream Problems” on page 86
  - “Model Stream Problems” on page 88
  - “VNC Stream Problems” on page 89

Check both log files `fusionvue-VE.log` and the `fusionvue-SM.log` for clues.

Some Media Files Do Not Appear in the File Selection Browser

For stream types `Image`, `Movie`, and `3D Model`, the File Selection Browser filters out filenames that do not match the list of common extensions associated with supported formats. To view all files without filtering by extensions, select the **All Files (*)** option in the **Show** box.

Important Notes:

- A file extension is only a label. The actual format of the file (not its extension) determines whether it will render properly.
- Some files may be supported even though they have extensions that do not match the pre-defined filter strings. This is particularly true of image files, for which many more formats are valid than appear in the supported file extension list, documented in Appendix B, “Supported Media Formats”.
- Not all files are supported just because their extension matches one of the pre-defined filter strings. This is particularly true of movie files which have multiple encoding types associated with the same extension. Not all encodings are supported.

Image Stream Problems

The following problems are described in this section:

Image File Fails to Load

If your image file fails to load, do the following:

1. Ensure that the image file is one of the supported formats.

   See Appendix B, “Supported Media Formats”.

   The following major image types (extensions) are listed by the file selection browser:

   ```
   .bmp
   .gif
   .jpg
   .pdf
   .png
   .rgb
   .sgi
   .tif
   ```

2. Ensure that the image filename is correct.
3. Ensure that the image size is within the FusionVUE limits:

   Maximum area of an image 5242880 square pixels

   Maximum horizontal width 4096 pixels

   Maximum vertical height 3072 pixels

   The following are valid maximum image resolutions:

   ```
   2048x2560
   3072x1706
   4096x1280
   ```

   See “Maximum Image Resolution” in Chapter 1.

Image Size Is Too Big for FusionVUE

It is possible to display larger images within FusionVUE by first opening the image in an image-roaming application (such as ImageMagick `display`) rendered into a `vncserver` display and then ingesting the VNC display into FusionVUE. The following steps show how this is done.

1. Launch a virtual VNC server of desired resolution from a Linux shell, as shown in the following example:

   ```
   vncserver -geometry 4096x3072 :112
   ```

   If you have never opened a VNC server on this host, you will be prompted for a password.

2. Open a FusionVUE viewer and attach to this VNC stream by specifying `:112` and *your-vnc-password* for the **VNC Server** and **Password** values, respectively, on the VNC Computer Selector screen.

3. From the shell, open the desired large image in the virtual VNC display, as follows:

   ```
   display –display :112 image_file_name
   ```

   You should see the image in a roamable window inside the FusionVUE viewer. You can roam the image using the arrow keys or the little locator map.

4. When you are done, you may wish to remove the VNC server using this command:

   ```
   vncserver –kill :112
   ```

Transparent Region of Image Occludes Distant Viewers

Except for 3D models, FusionVUE supports the dynamic setting of a transparency or alpha value for an entire viewer.

While some support is included for transparent PNG or GIF images with embedded alpha values scattered throughout an image, there are limitations to this.

Need to Change the Default Image for New Viewers

By default, newly created viewers display the `nullViewerTex.rgb` image until a stream is attached. This image is a 1024x1024 `.sgi` format (`.rgb`) texture displaying the SGI logo. Its file path is the following:

```
$FUSIONVUE_DATA_DIR/nullViewerTex.rgb
```

By default, this path expands to the following:

`/opt/sgi/vue/fusionvue/config/data/nullViewerTex.rgb`

This image can be customized using any of the supported image formats but must be of the same size (1024x1024) and the same name (including the `.rgb` extension regardless of its actual format).

Movie Stream Problems

The following problems are described in this section:

Movie File Fails to Load

If your movie file fails to load, do the following:

1. Ensure that the movie container file is one of the supported formats.

   See Appendix B, "Supported Media Formats".

2. Ensure that the movie filename is correct.
3. Ensure that `.VOB` files are not encrypted.
4. Ensure that the movie size is within the FusionVUE limits.

   Most movies should be under the 1920x1080 resolution to avoid reduced performance from consuming too much pixel bandwidth.

Movie Playback is Distorted

Ensure that the codec is supported. See Appendix B, “Supported Media Formats”. Even for supported codecs, there can be instances where certain encoding parameters are not properly decoded.

Movie Playback Is Slow or Choppy

Movies consume more pixel bandwidth than comparable images (of the same resolution), which load only one frame. In general, movie resolutions are lower than many image resolutions. Hence, this is not a severe problem. A higher-performance CPU and GPU may be required.

Movie frames must be continually updated in the VUESpace; this consumes pixel bandwidth. As the total number of simultaneously playing movies increases, the pixel bandwidth also increases. This results in an overall decrease in the update rate of the entire VUESpace. Consequently, the movie may be streaming off disk at full frame rate but not all frames will be visible if the overall VUESpace frame rate is slower than that of the movie.

No Audio during Movie Playback

Audio playback is currently not supported for movies.

Movie Stream Fast Forward / Rewind Buttons Do Not Work

The pause, stop, and play functions work on most supported formats but rewind and fast forward are dependent on the encoding parameters chosen.

Model Stream Problems

The following problems are described in this section:

3D Model File Fails to Load

If your model file fails to load, ensure that the 3D file format is one of the supported formats. See Appendix B, "Supported Media Formats"

FusionVUE uses the OpenGL Performer toolkit and, consequently, has a degree of 3D model support for a number of file formats but the following are the best file formats to use:

`.pfa`	OpenGL Performer ASCII
`.pfb`	OpenGL Performer binary
`.obj`	Wavefront Technologies data format version 14
`.flt`	MultiGen OpenFlight data format

3D Model Loads without Textures

FusionVUE only allows loading of 3D models contained in a single file. Some 3D models use separate files for geometry, materials, and textures. Hence, certain models may not properly render textures and materials in FusionVUE.

One workaround is to merge geometry, materials, and textures into a single file as with OpenGL Performer `.pfa` or `.pfb` files. For information regarding file converters and free modeling software to help massage models for optimal display inside FusionVUE, see Appendix B, "Supported Media Formats".

VNC Stream Problems

The following problems are described in this section:

Cannot Access VNC Server on Remote Host

If you cannot access a VNC server on a remote host, do the following:

1. Ensure that the remote VNC server is running and is set to accept connections from external systems.
2. Ensure that you are using the correct password for the remote VNC server.

   For VNC servers on Windows, use TightVNC version 1.3.9 or later. For configuration details, see Appendix C, "VNC Server Configuration on Windows".

VNC Stream Resolution is Too High

Though VNC streams allow a larger memory footprint than images, VNC streams still have limits:

Maximum area of an image	12,582,912 square pixels
Maximum horizontal width	6144 pixels
Maximum vertical height	3072 pixels

You can acheive optimal performance when each dimension is a multiple of 128.

The following are valid maximum VNC desktop resolutions:

```
6144x2048
4864x2560
4096x3072
```

Note that these very large resolutions could kill performance by adding a huge pixel bandwidth overhead if the applications running on the VNC server are dynamic in nature. However, there are practical uses for such high-resolution VNC streams.

Extremely high-resolution images may be rendered using the ImageMagick `display` command into a high-resolution local virtual VNC server. This would give a high-resolution image and an image-roam capability. See section "Image Size Is Too Big for FusionVUE" on page 85.

VNC Display Only Partially Updates

If your VNC display only partially updates, do the following:

1. Ensure that the remote VNC server is either TightVNC or TurboVNC.

   Some VNC servers are incompatible with the FusionVUE VNC viewer module and may leave visual artifacts.

2. Ensure that the remote VNC server is properly configured.

   For configuration details, see Appendix C, "VNC Server Configuration on Windows".

Middle Mouse Events Do Not Reach VNC Server

FusionVUE reserves the middle mouse button globally for the VUESpace Navigation Menu even when the cursor is over a VNC viewer.

There is a workaround if you absolutely must pass middle mouse events through to your VNC streams. It requires creating an alternate `keyboard.conf` file.

VNC Viewer Is Too Small to Read Text

If the text in your VNC viewer is too small, navigate closer to the viewer or bring the viewer closer to your eye point using the focus option on the viewer's right mouse menu.

Frame Rate Too Slow to Effectively Interact with VNC Display

VNC performance is impacted by several variables both on the remote server side and on the FusionVUE VNC client side of the connection.

Server-Side Variables

- CPU speed of the host on which the VNC server software is running

  The CPU speed affects how long it takes to encode the remote display.

- Resolution of the remote display being VNC-served

  Is it serving out the full screen or just a subset?

- Type of application running on the VNC server

  Production-quality 2D applications are encoded more efficiently than highly dynamic 3D animation applications, where the entire screen tends to continuously change. This requires the VNC server to encode more pixels and, consequently, lowers the frame rate.

Client-Side Variables

- Capabilities of graphics accelerated hardware
- Current pixel bandwidth into the VUESpace

  The bandwidth is affected by the number, resolution, and arrangement of open streams in the VUESpace.

- Frequency with which a VNC display changes

  Pixel bandwidth is only consumed when a change in display is detected.

The best solution for increasing interactivity within a VNC viewer is to temporarily bring the desired viewer closer to your eye point using the focus option on the viewer's right mouse menu. This causes it to fill most of the VUESpace display and will temporarily reduce the pixel bandwidth to other streams behind it. More bandwidth will then be available for the VNC viewer of interest.

Avoiding excessively high resolutions and non-essential animation of remote VNC displays will help as well though this may not always be an option.

Keyboard Controls

There are a number of operations that can be executed using direct keystrokes to FusionVUE. The keyboard commands described in Table A-1 can only be used when the FusionVUE mouse cursor is not over a viewer or a template.

Table A-1 Keyboard Controls

Keystroke	Action
Camera Movement Controls	
right arrow	Move +X 100 units.
left arrow	Move -X 100 units.
q	Move +Z 100 units.
a	Move -Z 100 units.
up arrow	Move +Y 100 units.
down arrow	Move -Y 100 units.
Home	Move +Z 100 units.
End	Move -Z 100 units.
f	Adjust heading -5 degrees.
s	Adjust heading +5 degrees.
e	Adjust pitch +5 degrees.
c	Adjust pitch -5 degrees.
r	Roll +5 degrees about Y.
w	Roll -5 degrees about Y.
d	Reset orientation to 0,0,0.

Table A-1 Keyboard Controls **(continued)**

Keystroke	Action
Button List Controls	
F11	Turn on button list.
F12	Turn off button list.
Camera Presets	
F1	Moves camera to XYZ (0.0,-11000.0,600.0) with HPR (0.0,0.0,0.0). (low/straight view)
F2	Moves camera to XYZ (0.0,-12500.0,5000.0) with HPR (0.0,-28.0,0.0). (mid-range view)
F3	Moves camera to XYZ (0.0,0.0,12500.0) with HPR (0.0,-90.0,0.0). (high-eye view)
Miscellaneous	
v	Creates a new viewer.
Esc	Exits FusionVUE. A formal shutdown is still required. See “Shutdown” in Chapter 3.

Supported Media Formats

This appendix lists the supported media formats for the following types of media:

- Image
- Movie file
- 3D model

In addition, it lists tools for format conversions.

Images

FusionVUE supports most image file formats including file having the following extensions/formats:

```
.bmp
.gif
.jpg
.pdf
.png
.rgb
.sgi
.tif
```

To find the full list, see this webpage:

`http://www.imagemagick.org/script/formats.php`

Movie Files

FusionVUE currently supports the movie formats shown in Table B-1..

Table B-1 Supported Movie Formats

File Extension	File Format	Codec
`.mpg`, `.mpeg`	MPEG-1/MPEG-2	ES/PS/PES
`.VOB`	MPEG-2	MPEG2-part2
`.avi`	AVI	multiple
`.mov`, `.qt`	Quicktime	MPEG-4/H.264
`.3gp`	3GP	MPEG-4/H.264

3D Models

FusionVUE supports the 3D model formats shown in Table B-2:

Table B-2 3D Model Formats

Extension	Description
`.flt`	MultiGen OpenFlight format provided by MultiGen
`.obj`	Wavefront Technologies data format (version 14)
`.pfa`	OpenGL Performer ASCII format
`.pfb`	OpenGL Performer binary format

Format Conversion Tools

Of the numerous format converters available, PolyTrans from Okino Computer Graphics, Inc. is a very powerful commercial conversion tool to get multiple formats into `.obj` or `.flt` format.

The following are free modeling tools that output `.obj` files:

Blender	http://www.blender.org/
Wings 3D	http://www.wings3d.org/

VNC Server Configuration on Windows

This appendix describes the configuration of a TightVNC server on a Windows system for use with FusionVUE. The following steps outline the process.

1. Install TightVNC 1.3.9 or later on your Windows system.
2. Ensure that the TightVNC server is running by checking for the System Tray icon, as shown in Figure C-1.

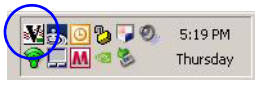


Figure C-1 VNC Server – System Tray Icon

3. Access the VNC server **Properties** via right mouse menu on this icon, as shown in Figure C-2.

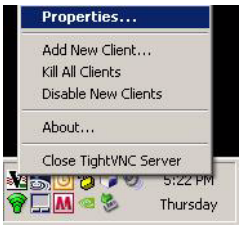


Figure C-2 VNC Server – Properties

4. On the **Server** tab shown in Figure C-3, enter a password you will remember:

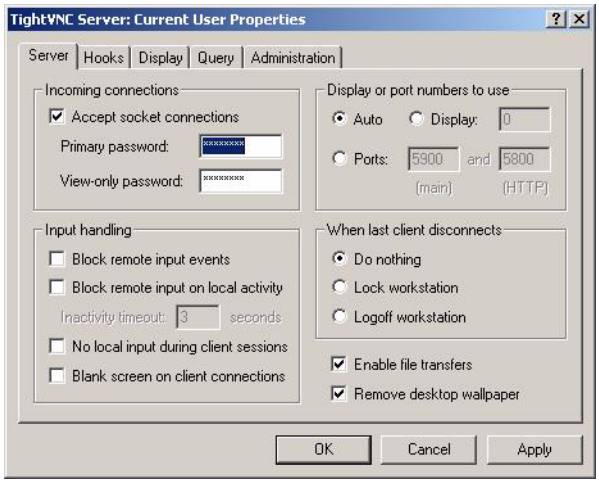


Figure C-3 VNC Server – Properties Server Tab

5. On the **Hooks** tab shown in Figure C-4, select **Poll full screen**:

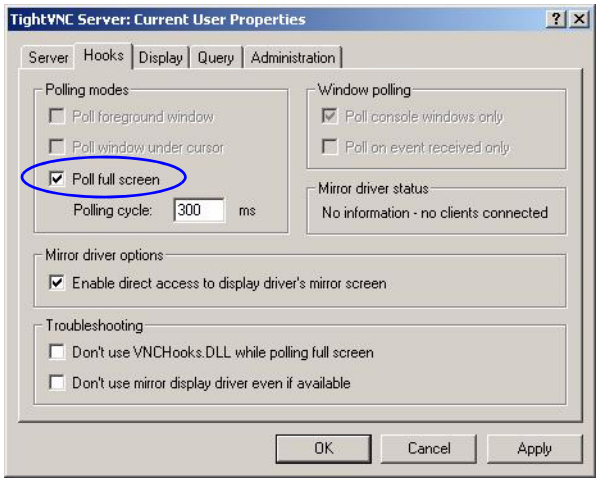


Figure C-4 VNC Server – Properties Hooks Tab

3. On the **Display** tab shown in Figure C-5, select which part of the display you wish to serve out.

If you select **Full desktop**, make sure the dimensions fall within the maximum 4096x3072 for all screens comprising the desktop.

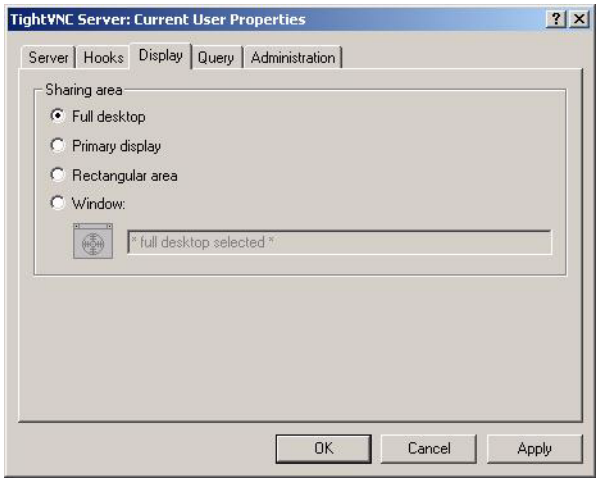


Figure C-5 VNC Server – Properties Display Tab

Your Windows system should now be accessible to FusionVUE if you use the correct password to access it.

Glossary

FusionVUE environment

The collection of engines, managers, modules, and processes which comprise a functional, operating FusionVUE server. The FusionVUE environment does not exist until it is started by some means and accessible to external users or systems. The FusionVUE environment must be started by means of a launcher application (`fusionvue`, f`usionvue-RUN`, etc.) and, for practical purposes, exists when the VUESpace appears.

FusionVUE

Product name referring to all components comprising the solution, which includes FusionVUE software and FusionVUE hardware.

FusionVUE server

The term used to describe the physical workstation and the core FusionVUE software that runs on it. Currently, a Linux workstation that typically includes graphics cards (GPUs), network interfaces, and limited internal shared storage for assets.

FusionVUE Standard

Software product needed to turn a properly configured Linux workstation into a standard FusionVUE server capable of ingesting pixel streams from files and network sources.

FusionVUE core, FusionVUE server core, FusionVUE server software

Only the software that runs on the FusionVUE server platform (currently a Linux workstation). The principal components are the Stream Manager, Stream Modules, and VUESpace Graphics Engine.

FusionVUE display channel, display channel

A viewport which is defined by horizontal and vertical size (in pixels) and field of view (in degrees). A display channel may span two channels of a single GPU if configured for `TWINVIEW` mode. See the *SGI FusionVUE Installation and Configuration Guide*.

FusionVUE source, pixel source, stream source

A remote device that generates pixels which are transmitted via network and/or video cables into

the FusionVUE server. Typically, refers to remote network-attached computers running VNC server software.

VUESpace Graphics Engine, VUESpace Engine, Graphics Engine

The software engine that generates a separate virtual 3D environment across one or more display channels. This is the engine that receives control protocol inputs via network and locally-attached mouse/keyboard inputs from the FusionVUE user.

VUESpace, 3D VUESpace

The 3D virtual environment which is generated and maintained by the VUESpace Graphics Engine. It is a coordinate system in which to hang VUESpace entities.The VUESpace may span multiple FusionVUE display channels from multiple GPUs in the same FusionVUE server. There could be multiple VUESpaces (future release) on a single FusionVUE server. FusionVUE uses the XYZ coordinate system (X=east/west, Y=north/south, Z=up/down).

Virtual Network Computing (VNC)

Software that allows a desktop to be displayed and controlled remotely.

Virtual Network Computing (VNC) module

Module for ingesting streams from remote VNC servers. Provides keyboard/mouse feedback control to the remote source.

background

Any portion of the VUESpace display not occupied by a viewer portal frame or stream area. The background is defined by a top, middle, and bottom color.

camera

The virtual eye point of the observer within the VUESpace. Inherits the field of view of the FusionVUE display channel. The camera has XYZ position attributes and HPR attitude attributes. The camera can be interactively modified via the Navigation Menu.

display channel

See **FusionVUE display channel**.

entities

See **VUESpace entities**.

grid

The cross-hatched region on the XY plane at z=0 elevation.

image module

Module for ingesting image files supported by the open source ImageMagick display component.

model module

Module for ingesting 3D model files supported by OpenGL Performer 3.3.0.

movie module

Module for ingesting movie model files supported by the open source mplayer application.

object

Refers to a 3D model.

pixel stream

See **stream**.

snowflake menu

A generic FusionVUE menuing mechanism which presents up to six buttons in a circle around the cursor click point. The contents of the menu are dependent on the region clicked. Nested menus are supported to allow access to more than six items from one menu.

stream, media stream, pixel stream

A 2D raster of pixels that can change frame-by-frame that is delivered through a viewer portal for visual fusion within the 3D VUESpace. Each active stream has its own instance of a type-specific stream module. A stream may be attached to one or more viewer portals. Supported streams are images, movies, and remote desktops over the network (using VNC).

stream modules, modules

Independent software applications that capture pixel streams from disk files, network packets, or video capture cards and renders a sequence of images to the Fusion server's shared memory. Also, handles control feedback from user input to affect the stream source.

template

A grouping mechanism which provides docking ports for viewer portals in pre-defined arrangements. Templates may be moved about the VUESpace.

template geometry, template model

A 3D model which is anchored to the template and serves as the template menu button. Default is a gizmo sphere. Right-click this object to raise the Entity Manipulation Menu.

viewer portal frame, viewer frame

The frame geometry surrounding the viewer portal. Composed of 9 distinct elements that act like menu buttons; that is, they initiate actions upon a left-mouse click:

Top (pan)
Bottom (zoom, dolly)
Left (tilt)
Right (tilt)
Four corners (resize)
Back (pan)

viewer portal, viewer

A window within the VUESpace with a pixel stream attached to it. You can move the viewer within the VUESpace using the keyboard/mouse. Viewer portals have spatial attributes (a location and orientation as well as other properties), menu buttons, and display attributes (which are used to affect the appearance of streams in the VUESpace). Viewer portals are analagous to 2D windows in a 2D desktop window manager.

virtual cursor, cursor

A current-position pointer, a focal point indicator. The standard X11 cursor will disappear when inside the VUESpace as soon as the first viewer appears. In contrast to the standard X11 cursor, the virtual cursor spans seamlessly across multiple FusionVUE display channels. The cursor may change depending on its context.