ADMINISTERING LICENSES

CHAPTER TEN

Introduction

This chapter provides instructions for administering AVS 5.5 licenses with the Flexible License Manager (FLEXlm).

AVS 5.5 NOTE: No significant licensing changes have been made for AVS 5.5 except that the AVS Animator and BTF renderer modules no longer require a special license. Existing AVS 5.4 licenses will continue to work without new licenses or changes in the license daemons used to support licensing.

This chapter discusses:

- About licensing
- How licensing works
- Installation issues
- Licensing configurations
- License administration tools
- What can go wrong

About licensing

You must have a license from Advanced Visual Systems in order to run AVS 5.5 which is a licensed product of Advanced Visual Systems Inc. Access to AVS is controlled by the Flexible License Manager (FLEXlm) network-wide floating licensing system provided by Globetrotter Software. The FLEXlm system, which is supplied with the AVS 5.5 product, consists of licensing software, several utility programs that support the licensing mechanism, and associated documentation.

When correctly installed and functioning, the licensing mechanism is largely transparent to the AVS end user. However, licensing does require some installation procedures (as described in Chapter 2, *Installation*, "Step 6: Install the AVS license"), and may require some additional installation and administrative tasks, depending upon the particulars of your installation.

How licensing requirements vary

The installation and administration of licensing varies from site to site. These differences depend primarily on two issues:

- whether other software products on your network are also using the FLEXlm licensing system, and
- the kind of license you are using: node-locked, floating, or some combination.

Multiple FLEXlm software vendors

A relatively complex licensing scenario arises when more than one software product is using the FLEXlm licensing system to administer licenses in a networked environment. On Sun networks, for example, use of the SunSoft compiler(s) is controlled by FLEXlm.

If you are using AVS 5.5 on a system where other products are using FLEXlm, you need to install and maintain AVS licensing carefully so that it won't conflict with other FLEXlm users. More information on this situation can be found below in *Multiple vendors using FLEXlm*.

Using node-locked versus floating licenses

There are two kinds of licenses available for Advanced Visual Systems products: node-locked (or fixed) licenses and floating licenses.

A node-locked license is tied to a specific host system. Up to *n* simultaneous users can run the AVS product, where *n* is the number of licenses purchased. The product can execute only on a single host workstation. This kind of license is appropriate either to a timesharing model (one powerful central system with many X terminals connected to it), or to a single independent user with his or her own workstation.

In contrast, a floating license allows any workstation in a network to execute the product, up to *n* simultaneous users, where *n* is the number of licenses purchased. Floating licenses are appropriate on a network with many users, each with his or her own workstation, each of whom wants to run AVS locally. Rather than buying a license for each workstation, a floating license provides a "pool" of licenses that users share.

For the most part, license installation and administration is identical for both types of licenses. Both require that a specific system (or specific group of systems) be established as the license server, because licensing is administered in a client/server model; that is, a license *daemon* running on the server system handles all license requests from other systems in the network. The license daemon must run continuously on the server system, and workstations that are running AVS must be able to communicate with the server.

The license.dat files for node-locked and floating licenses are only slightly different. In a node-locked license.dat file, the machine id of the node machine appears at the end of the **FEATURE** line. In most cases, the node and license server will be the same machine.

License administration options and tools

The FLEXlm licensing system provides a great deal of flexibility in regulating access to AVS. The license administrator on your system can use a variety of tools and procedures to customize your licensing setup. Specifically, you can:

- customize the license.dat file to control access to and use of AVS (see "license.dat control options" below)
- monitor and administer licensing use and behavior by using the various license administration tools provided by Advanced Visual Systems and FLEXlm (see "License administration tools" below).

One particularly useful tool that AVS provides is a licensing diagnostic utility called *licdiag*. This utility, which is installed in the *$AVS_PATH/bin* directory, is a shell script that examines your license file and licensing configuration, troubleshoots licensing problems, helps you to start and stop license daemons, and makes various recommendations depending on your platform. Many of the procedures described here and in *Installation*, "Step 6: Install the AVS license", can be taken care of more easily by using the *licdiag* utility. For a complete description of *licdiag*, see below.

Documentation for FLEXlm

Manpages, message files, and other documentation for the FLEXlm licensing system is installed in the *$AVS_PATH/license* directory when you install AVS 5.5.

How licensing works

The FLEXlm licensing mechanism works on the client/server model. The server process is the FLEXlm license manager daemon, named *lmgrd*; the AVS kernel process is the client. A file named *license.dat* contains the information that the *lmgrd* daemon uses to determine whether you are a licensed user of AVS and, so, have permission to start up the AVS kernel process.

When you first type the command "avs" to start the AVS kernel you start a client process named avs. This process looks for the *license.dat* file. When it finds this file, the avs process contacts the license manager daemon, *lmgrd*, which is continuously running on a server system somewhere in your network. The *lmgrd* daemon then references the *license.dat* file to locate and contact the *avs_lmd* vendor daemon. *lmgrd* passes the license request to *avs_lmd*, the process which actually dispenses AVS licenses.

The *avs_lmd* process determines if a license is available. If so, then *avs_lmd* notifies *lmgrd*, which then returns permission to execute, and the avs process starts up. If no licenses are available or if, for any reason, this licensing sequence fails (if, for example, the *lmgrd* license daemon cannot be found), avs will not start up.

When you exit from avs - whether normally or abnormally with Ctrl-C - the license is "checked back in", thereby available for use by another avs process.

The license.dat file

The administration of AVS licenses depends on the contents of your *license.dat* file. All of the processes - *avs, lmgrd,* and avs_lmd - *read the information in license.dat* to locate and verify all steps in the licensing procedure. The information contained in *license.dat* is slightly different for each kind of license, but its use as the central "database" for assigning licenses is the same.

You obtain your license.dat file from Advanced Visual Systems when you purchase a license for AVS 5.5.

The lmgrd license daemon

In the client/server model used to administer AVS licenses, the *lmgrd* license daemon is the master server process that handles all licensing requests. One *lmgrd* process runs continuously on a host server system in your network; all licensing requests (that is, all attempts to start an avs process) are passed to the *lmgrd* license daemon.

In a case where multiple software vendors on your network are using FLEXlm for license administration, *lmgrd* handles all license requests (not just those from avs). See "Multiple vendors using FLEXlm" for details on how to handle this case.

The executable file for the *lmgrd* license daemon is installed during the AVS 5.5 installation process. By default, it is installed in the *$AVS_PATH/license* directory. It is your responsibility to arrange for *lmgrd* start-up on the system you have chosen as your server system.

The avs_lmd vendor daemon

The *avs_lmd* vendor daemon is the process that actually dispenses AVS licenses. The *lmgrd* license daemon serves as a "clearing house" for all licensing requests; it, in turn, passes those requests along to the *avs_lmd* daemon. The *lmgrd* daemon starts up the *avs_lmd* vendor daemon (and all other vendor daemons) when it initializes.

The executable file for the *avs_lmd* vendor daemon is installed during the AVS 5.5 installation process. By default, it is installed in the *$AVS_PATH/license*.

The licensing sequence

The following represents a typical series of license transactions for establishing and dispensing an AVS license.

1. A user in the network types the avs command to start AVS.

2. The *avs* process looks for the *license.dat* file. It locates the file either in its default location, */usr/local/flexlm/licenses/license.dat*, or at the location defined by the **LM_LICENSE_FILE** environment variable, if that variable has been set.

3. In the *license.dat* file, the *avs* process finds the information necessary to locate the *lmgrd* license daemon within your network. This is the information that appears on the **SERVER** line in the *license.dat* file. avs passes the request for a license to the *lmgrd* daemon.

4. When the *lmgrd* daemon receives the license request, it reads the *license.dat* file to locate the *avs_lmd* vendor daemon. *lmgrd* uses the information that appears on the **DAEMON** line in the *license.dat* file to locate the *avs_lmd* vendor daemon, which is the process that keeps track of AVS licenses.

5. The *avs_lmd* daemon determines whether a license can be granted. *avs_lmd* keeps a tally of licenses in use compared to the total number of available licenses. If a license is available, *avs_lmd* returns authorization back to the *lmgrd* daemon which then gives authorization to the original requestor.

6. With the license granted, the avs process starts up the AVS product.

7. Throughout the running AVS session, avs makes periodic checks to make sure the *lmgrd* daemon is still running. If it loses contact with *lmgrd* (if, for example, the host server has crashed) a warning is issued and, after 15 minutes of no *lmgrd* response, the avs process terminates.

8. When the avs process exits, either normally or abnormally through Ctrl-C or a crash, the license is checked back in to the *lmgrd* and *avs_lmd* daemons so that it is available to the next AVS user.

How the license.dat file is used

All of the information necessary to administer AVS licenses is contained in the *license.dat* file that you obtain from Advanced Visual Systems when you purchase an AVS license. By default, the *license.dat* file is expected to be located in */usr/local/flexlm/licenses/license.dat*. See "If you move files" if you want to move or rename this file.

An example license.dat file

A license.dat file has the following format:

```
SERVER <hostname> <host machineid> <TCP socket>
DAEMON avs_lmd <pathname>/avs_lmd [options file]
FEATURE <FEATURE> <vendor daemon> <vers> <date> <#>
         <code> <"vendor_string"> [node machineid]
```

There may be many more lines in this file if FLEXlm is being used to administer other software products, or if you have obtained several different licenses for different Advanced Visual Systems products or versions.

SERVER: This line contains the information that the avs process uses to locate and contact the *lmgrd* license manager daemon that is running in your network. It defines which network host runs the *lmgrd* license daemon, both by name and by unique machine id. The information on this line includes:

- <hostname> is the name of the system where the *lmgrd* license daemon is running. This is usually just the local hostname (e.g., ccn), but if your network name service is not correctly configured you may need to specify the full Internet hostname (ccn.uc.edu).

- <host machineid> is the machine id of the system where the *lmgrd* license daemon is running. You will have supplied this machine id to Advanced Visual Systems when you purchased your licenses.

- <TCP socket> is the TCP/IP socket number that the avs process uses to connect to the license server. This number may be absent if the socket is already defined in the /etc/services file.

Note: If you are using redundant licensing daemons, there will be multiple **SERVER** lines in the *license.dat* file. See "Creating license daemon redundancy".

DAEMON: This line contains the information that the *lmgrd* license daemon reads in order to locate the *avs_lmd* vendor daemon.

- *avs_lmd* is the name of the Advanced Visual Systems vendor daemon.

- *<pathname>/avs_lmd* is the fully-qualified pathname to the *avs_lmd* executable file. By default, the *avs_lmd* executable is installed in the *$AVS_PATH/license* directory. You will need to edit the pathname on the **DAEMON** line if it is incorrect, or if you have moved the *avs_lmd* executable to another location.

- [options file] is the fully-qualified pathname to an options file - if you are using one - which contains FLEXlm local control options that fine-tune licensing for your installation. See "license.dat control options" for a description of these files.

FEATURE: These lines contain the information that the avs process and the *avs_lmd* vendor daemon use to administer licenses. The information on **FEATURE** lines define specific aspects of the licensed feature that are subject to license control; this information is used internally by both the avs process and the *avs_lmd* vendor daemon. Much of the information on this line is encrypted; do not attempt to modify this line or licensing will not work properly.

The information on a **FEATURE** line includes:

- <FEATURE> is the name of the feature being licensed. The feature name for AVS 5.5 is AVS.

- <vendor daemon> is the name of the vendor daemon associated with the licensed feature; all Advanced Visual Systems products use the *avs_lmd* vendor daemon.

- <vers> is the version number of the licensed feature. The version number for this release is 5.000 which permits you to execute AVS 5.5 and earlier AVS 5 releases.

- <date> is the expiration date of the license; 1-jan-00 means there is no expiration date.

- <#> is the number of licenses that have been purchased for the feature.

- <code> is an alphanumeric string containing encrypted licensing information.

- <"vendor_string"> is not currently used for AVS 5 products.

Note: You can find out the licensed components as specified in the vendor string by using the *licdiag* utility. See "licdiag" section below.

- [node machineid] appears only for node-locked licenses and is the machine id of the system where the feature executes. If the host server and execution node are the same (as is usually the case), this is the same machine id that appears on the **SERVER** line.

There is one **FEATURE** line for each licensed product that you have purchased. When you upgrade an AVS 5.5 license, you should remove the **FEATURE** lines associated with earlier releases.

Changing the license.dat file

The *lmgrd* license and *avs_lmd* vendor daemons read the *license.dat* file once, when they initialize. If modifications are made to the file on the fly, then you must either restart the *lmgrd*license daemon, or force it to re-read the file, either with the *lmreread* command or option #5 of the *licdiag* utility. For information about both of these utilities, see "License administration tools."

license.dat control options

The FLEXlm licensing system allows you to customize local use of licenses, arranging for things like reserved licenses and software timeouts. To make these customizations, you create an options file, then add the fully-qualified pathname of the options file to the **DAEMON** line in your license.dat file. The *avs_lmd* vendor daemon, which is responsible for dispensing AVS licenses, uses the information in your options file to determine whether a license should be granted to the requestor. If you create an options file named */usr/local/local.options*, you would modify the *license.dat* **DAEMON** line like this:

```
DAEMON avs_lmd /usr/avs/license/avs_lmd /usr/local/local.options
```

The daemon options file is a text file containing a series of keyword-based instructions. This file has the following format (where keywords are in uppercase and command options are indicated here with the use of <> angle brackets):

```
RESERVE <number> <feature> {USER | HOST | DISPLAY | GROUP} <name>
INCLUDE <feature> {USER | HOST | DISPLAY | GROUP} <name>
EXCLUDE <feature> {USER | HOST | DISPLAY | GROUP} <name>
GROUP   <name> <list_of_users>
TIMEOUT <feature> <timeout_in_seconds>
NOLOG   {IN | OUT | DENIED | QUEUED}
REPORTLOG <file>
```

You can include comment lines in this file by putting the sharp character (#) as the first character in the line. The following keywords are supported:

```
RESERVE <number> <feature> <OPTION> <name>
```

Ensures that AVS or one of its licensed features is always available to the specified user, host computer system, specific displays, or group of users. This keyword requires a number (count of licenses to be reserved), the name of the feature being reserved (for example, AVS), the option to which this reservation applies (USER, HOST, DISPLAY, or GROUP), and the name associated with that option (username, hostname, display name, or group name). For example,

```
RESERVE         1       AVS             USER    pat
```

reserves one license for the AVS feature for the user named "pat".

```
GROUP <name> <list_of_users>
```

Specifies a group of users for use in other commands in the options file. For example,

```
GROUP           all_of_us               tom dick harry
INCLUDE <feature> <OPTION> <name>
```

Specifies a list of users, hosts, displays, or groups of users who are allowed access to AVS or one of its licensed features. This keyword requires a feature name, the option to which inclusion applies (user, host, display, or group of users), and the name associated with that option (username, hostname, display name, or group name). For example,

```
INCLUDE         AVS/Animator            GROUP   all_of_us
```

specifies that all users in the group named "all_of_us" can use the AVS/Animator feature.

```
EXCLUDE <feature> <OPTION> <name>
```

Specifies a list of users, hosts, displays, or groups of users who are prohibited access to AVS or one of its licensed features. This keyword requires a feature name, the option to which exclusion applies (user, host, display, or group of users), and the name associated with that option (username, hostname, display name, or group name). For example,

```
EXCLUDE         AVS             USER    unabomber
```

specifies that the user named "unabomber" is prohibited from using the AVS feature.

```
TIMEOUT <feature> <timeout_in_seconds>
```

Allows idle licenses to be returned, after a specified time, to the free pool, for use by another user. This keyword requires the feature name and a timeout interval, in seconds. For example,

```
TIMEOUT         AVS             600
```

```
REPORTLOG <filename>
```

Specifies that an *avs_lmd* logfile be written that is suitable for use by the Enhanced User Tools report writer. If you prepend the filename with the + sign, the file is opened for append (rather than overwritten).

```
NOLOG <OPTION>
```

Causes messages of the specified type to be filtered out of the *avs_lmd* daemon’s log output. Message types that can be filtered out are IN, OUT, DENIED, and QUEUED messages.

Installation issues

There are a number of different situations that may affect how you install and administer FLEXlm licensing on your system. This section describes these issues.

Where files get installed

With the exception of the *license.dat* file, the various components of the FLEXlm licensing system are installed when you install AVS 5.5. All of these files are located in $AVS_PATH/license.

The default location for the *license.dat* file is the */usr/local/flexlm/licenses* directory of the licensing server.

If you move files

You can move most of the licensing components to other directories on your system, but if you do so you may have to make the following adjustments:

- If you move or rename the *license.dat* file, you must set the **LM_LICENSE_FILE** environment variable to point to it; for example,

  ```
  setenv LM_LICENSE_FILE /u2/avs/license/license.dat
  ```

  or:

  ```
  setenv LM_LICENSE_FILE /usr/local/flexlm/licenses/avslic.dat
  ```

  Be sure to notify everyone who will be using AVS to set this variable in their environment.

- If you move *avs_lmd*, you must modify its pathname on the **DAEMON** line in the *license.dat* file to reflect its new location.

- If you move the *lmgrd* binary to run on a system other than the host system (as specified on the **SERVER** line in the license.dat file), you must obtain a new *license.dat* file from Advanced Visual Systems. The machine id for the host server is encrypted in the *license.dat* file and cannot be modified.

Starting the lmgrd license daemon

Since the *lmgrd* license daemon needs to be running continually on the host server system, the easiest way to arrange this is to add the *lmgrd* start-up command line to your system's boot file. The simplest command to start the *lmgrd* license daemon is:

```
lmgrd &
```

You may need or want to use the fully-qualified pathname to the *lmgrd* binary file; for example:

```
/u2/avs/license/lmgrd &
```

Option #1 of the *licdiag* utility can also be used to start or restart the *lmgrd* daemon. See the "licdiag" section below, for information about this utility.

The *lmgrd* command line has a number of options available (see the *lmgrd* manpage for a complete list). The following example illustrates those options which Advanced Visual Systems recommends:

```
lmgrd -c <license_file_path> -t <connect-timeout> > license.log &
```

where:

```
-c <license_file_path>
```

The fully-qualified name of the license file. By default, *lmgrd* looks for a file named *license.dat* either in the */usr/local/flexlm/licenses* directory or in the directory specified by the **LM_LICENSE_FILE** variable, if it is set. If you have renamed or moved the file, you can use the -c option to specify its new name or location. The -c option supersedes the location specified by **LM_LICENSE_FILE**.

```
-t <connect_timeout>
```

The timeout, in seconds, for "connect" calls to other daemons if you are operating redundant license daemons on multiple servers (see below, "Creating license daemon redundancy").

```
license.log
```

Since the *lmgrd* license daemon generates transaction messages, you will probably want to redirect the output away from stdout and into a log file. Redirecting to */dev/null* effectively eliminates the log file. A list of log messages and their meanings is available in the *$AVS_PATH/license/logmessages* file.

Adding lmgrd start-up to your boot file

You can add your *lmgrd* start-up command to your host system boot file so that the license daemon will automatically be started when the system is booted. The following lists and notes the boot files for the platforms supported by AVS. Option #7 of the *licdiag* utility provides help on starting the *lmgrd* daemon at boot time. See the section on "licdiag".

Compaq Tru64 UNIX: */sbin/init.d* startup file

HP 9000/7xx: */etc/rc* startup file. (This applies to HP-UX 9.05 only; no comparable option is currently available for HP-UX 10.10.)

IBM RS/6000: */etc/rc* startup file

SGI: The */etc/rc2.d* directory contains links to specific feature startup scripts. The scripts themselves can be anywhere, including the */etc* directory.

SunOS 5.x: */etc/init.d* startup file

Note: If you are concerned with security, you can place an "su username <" at the beginning of your *lmgrd* start-up line. Without this restriction, any ordinary user can perform the *lmgrd* start-up manually. It is usually desirable to leave this option open so that users can restart the license daemon without administrator intervention.

Creating license daemon redundancy

If the *lmgrd* license daemon is not accessible to the AVS process, the program cannot run. By running redundant license daemons on multiple host servers, you can create a situation in which work can continue if one of the *lmgrd* daemons fails. You must specifically arrange for the use of redundant license daemons when you arrange to obtain your *license.dat* file from Advanced Visual Systems. If you wish to add redundancy at a later time, you will have to contact Advanced Visual Systems to obtain a new *license.dat* file.

You can create redundancy by running an odd number of *lmgrd* daemons on different hosts. As long as a majority of the daemons are active, then if AVS can contact two of the three (or three of the five), AVS will be satisfied that it has reestablished contact with a suitable license daemon and will continue to execute. See "Redundant license servers" for a description and diagram of this kind of licensing configuration.

Multiple vendors using FLEXlm

In the case where multiple software vendors install FLEXlm-based products at a single end-user site, the potential arises for license file location conflicts. If you are running AVS on a system or network where other products are using FLEXlm, there are several ways to handle it. You can use an existing lmgrd license daemon to control AVS licenses. Or, you can make the AVS licensing mechanism independent by running a separate license daemon on a different host server.

Using the correct FLEXlm version

You must be using FLEXlm version 5.12 or later in order to use AVS 5.4 and above. If a vendor is already using FLEXlm on your system and it is an earlier version, install version 5.12 (which is provided with AVS 5.4 and 5.5) and restart the licensing daemons.

This is also true if you are already using FLEXlm to license earlier products or versions from Advanced Visual Systems. These earlier releases use earlier versions of FLEXlm that are incompatible with AVS 5.4 and 5.5. They will continue to work with FLEXlm 5.12.

You can use option #4 of the *licdiag* utility to find out what version of FLEXlm is currently running.

Using a single licensing file

You can combine the *license.dat* files of all software products using FLEXlm and have one *lmgrd* license daemon administer all licenses for all products. To do this, you must be sure to specify the machine id of the licensing server that is already in use when you obtain your license from Advanced Visual Systems.

Append the **DAEMON** and **FEATURE** lines of your AVS license.dat file to the existing *license.dat* file on your system. The combined license file can be located in the default location *(/usr/local/flexlm/licenses/license.dat),* or you can put it in another location and set the **LM_LICENSE_FILE** variable to point to it.

Using one lmgrd daemon and multiple license files

If you want to use a single license daemon but keep the license files of the various products separate, you can use the **LM_LICENSE_FILE** variable to point to multiple license files. Since you are using a single license daemon, be sure to specify the machine id of the licensing server that is already in use when you obtain your license from Advanced Visual Systems.

For example, you may already have a product that is using a *license.dat* file that is in the default */usr/local/flexlm/licenses* directory. You might rename your AVS license.dat file to *avslic.dat* and copy it to the *$XP_PATH/license* directory. By then setting the **LM_LICENSE_FILE** variable to point to both files, the *lmgrd* daemon will be able to find the individual licensing information for each product. When setting **LM_LICENSE_FILE** to include multiple filenames, use a colon to separate the pathnames (must be all one line):

```
setenv LM_LICENSE_FILE /usr/local/flexlm/licenses/license.dat:
       /u2/avs/license/avslic.dat
```

Using multiple license daemons

You can create a separate *license.dat* file and run a different *lmgrd* license daemon to handle AVS licensing independently of other products being licensed by the FLEXlm licensing system. Each *different lmgrd* daemon must run on a separate host server. You can then either set **LM_LICENSE_FILE** to point to all of the possible license files, or start each *lmgrd* daemon using the -c option specifying the location of the license file to be read.

Socket numbers in a multi-vendor environment

In your *license.dat* file, the TCP socket number that appears on the **SERVER** line is usually set to 1700. However, there may be other programs on your network that already use number 1700, in which case you will receive "socket already in use" errors. If that is the case, change the TCP number on the **SERVER** line to an unused TCP socket number. (You can use option #1 of *licdiag* to check the availability of the socket.)

Licensing configurations

The two different kinds of licenses that are available for AVS 5.5 - node-locked licenses and floating licenses - reflect the two basic licensing configurations. Other configurations, such as combining node-locked and floating licenses or running redundant licensing servers, are also possible.

Basic node-locked license configuration

Node-locked, or fixed, licenses reflect a configuration in which AVS is installed and executes on a single, designated host system; AVS users access the host from the main console or via rlogin from other workstations and run AVS on the host machine. In most node-locked configurations, the execution node and the licensing server is the same machine, although this is not always the case.

In the following figure, AVS is installed and executes on the machine, hostA. hostA also serves as the host server for the licensing daemons, *lmgrd* and *avs_lmd.* Up to *n* users can log in to hostA and run AVS there (*n* reflects the number of licenses purchased). *The license.dat* file resides on hostA.

The *license.dat* file for such a configuration would look something like this:

```
SERVER hostA <machineidA> 1700
DAEMON avs_lmd /usr/avs/license/avs_lmd
FEATURE AVS avs_lmd 5.000 1-jan-00 <n> FB4FB43AFD04E643099C "" <machineidA>
```

Basic floating license configuration

Floating licenses use one central host server to administer licenses for users who are running AVS locally on their own, networked workstations.

In the following figure, hostA is the host license server where the *lmgrd* license daemon runs continually. Requests for licenses come in to the *lmgrd* daemon from client systems; when a license is granted AVS runs locally on the client workstations (client host 1, client host 2, and so forth). The *license.dat* file resides on hostA. (Note that any host in the configuration could actually be used as the license server.)

For this floating license configuration, the *license.dat* file might look something like this:

```
SERVER hostA <machineidA> 1700
DAEMON avs_lmd /usr/avs/license/avs_lmd
FEATURE AVS avs_lmd 5.000 1-jan-00 <n> FB4FB43AFD04E643099C ""
```

Redundant license servers

There may be situations when you want to set up redundant licensing so that if one *lmgrd* license server fails, licensing will continue to be administered by an alternate server. In that case, you can create redundancy by running an odd number of *lmgrd* daemons on different license servers. This would be reflected by multiple **SERVER** lines in your *license.dat* file, an identical copy of which resides on each server. An *lmgrd* license daemon would run on each machine.

As long as a majority of the daemons are active, then if AVS can contact two of the three (or three of the five), AVS will be satisfied that it has reestablished contact with a suitable license daemon and will continue to execute.

You must specifically arrange for the use of redundant license daemons when you arrange to obtain your *license.dat* file from Advanced Visual Systems. If you wish to add redundancy at a later time, you will have to contact Advanced Visual Systems to obtain a new *license.dat* file.

In the following figure, three license servers are being used. The license daemons communicate and a majority constitutes a quorum that will permit AVS access.

The *license.dat* file for this configuration might look something like:

```
SERVER hostA <machineidA> 1700
SERVER hostB <machineidB> 1700
SERVER hostC <machineidC> 1700
DAEMON avs_lmd /usr/avs/license/avs_lmd
FEATURE AVS avs_lmd 5.000 1-jan-00 <n> FB4FB43AFD04E643099C ""
```

Mixed floating and node-locked licenses

It is perfectly possible to have both node-locked and floating licenses within one configuration. As long as the node-locked **FEATURE** line precedes the floating **FEATURE** line in the *license.dat* file, when the AVS process starts on a node-locked workstation, it will try to use the node-locked license first (and run AVS locally). Otherwise, it will issue a request to the *lmgrd* license daemon for a floating license.

License administration tools

Advanced Visual Systems provides a number of licensing utilities to facilitate the installation and administration of licensing. This section describes these utilities, which include:

- *licdiag* - a shell script that helps with various licensing administration and diagnostic tasks.
- *lmstat* - to monitor the status of network licensing activities
- *lmdown* - to gracefully shut down the licensing and vendor daemons
- *lmlist* - to list current users of licensed features
- *lmremove* - to remove a single user's license of a specified feature
- *lmreread* - to have the *lmgrd* license daemon re-read the license file
- *lmhostid* - to report the machine id of the system

licdiag

The *licdiag* utility is installed in the *$AVS_PATH/license* directory. It is a shell script which provides a convenient way to perform many license administration tasks and to diagnose problems. *licdiag* examines your license file and license setup, troubleshoots the most common licensing problems, helps you to start and stop the daemons, and makes various recommendations depending on the platform.

When you start *licdiag,* the script first determines your host's type. It then checks the validity of your AVS path and looks for a valid license file, analyzing it for syntax errors and consistency. It tells you if the license file exists, if it is readable, and whether it has any valid **FEATURE** AVS lines; checks for **SERVER** lines for limited floating licenses; and identifies evaluation licenses.

licdiag then prompts you with an eleven-item menu that provide the following options:

1. Start or restart the daemons.

    - The license file must contain exactly one **DAEMON** *avs_lmd* line.
    - The license file must contain at least one **SERVER** line.
    - The machine's id must be listed in one of the **SERVER** lines.
    - No other *lmgrd* or *avs_lmd* processes should be running; they are killed before proceeding.
    - All lock files are removed.
    - Ensure that the TCP/IP port number specified in the **SERVER** line is not being used by another application.
    - After starting the daemons, scan the log file for error messages.

2. Stop the daemons.

    - Run *lmdown* to gracefully shut down *lmgrd* and *avs_lmd.*
    - Check the process id of *lmgrd* and *avs_lmd* to ensure they are shut down.

3. Get status.

    - Execute *lmstat* to determine whether any daemons are running.
    - Verify the ability to write and lock files in */tmp.*

4. Show *lmgrd* version.

    - Run *lmgrd* -version to determine which version of *lmgrd* is running.

5. Reread license file.

    - Run *lmreread*.

6. Check networking.

    - Makes recommendations on network troubleshooting.

7. Help on starting at bootup.

    - Makes recommendations depending on the platform and operating system revision level.

8. Show license file.

    - Displays the contents of the *license.dat* file being used.

9. Show machine's id.

    - Displays the machine id as it must appear in the *license.dat* file (for node-locked licenses) and the string to be used for obtaining licenses from Advanced Visual Systems Inc.

10. Show the current log file.

    - Displays the contents of the *lmgrd* logfile.

11. Quit

lmstat

The *lmstat* utility is installed in the *$AVS_PATH/license* directory. *lmstat* lets you monitor the status of all FLEXlm network licensing activities instantly, and displays the following:

- which daemons are running
- users of individual features
- users of features served by a specific **DAEMON**

The *lmstat* syntax is as follows:

```
lmstat         [-a] [-S DAEMON] [-f feature_name] [-s server_name]
               [-t value] [-c license_file]
               [-A] [-l regular_expression]

-a                      Display everything
-S DAEMON               List all users of DAEMONs features
-f feature_name         List users of feature_name
-s server_name          Display status of node named server_name
-t value                Set lmstat timeout to value
-c license_file         Use the license file named license_file
-A                      List all active licenses
-l regular_expression   List users of matching license(s)
```

lmdown

The *lmdown* utility is installed in the *$AVS_PATH/license* directory. *lmdown* allows for the graceful shutdown of all license daemons (both *lmgrd* and all vendor daemons) on all nodes. To use *lmdown,* type "lmdown" with the correct license file in either */usr/local/flexlm/licenses/license.dat,* or the license file pathname in the environment variable **LM_LICENSE_FILE**. Alternatively, *lmdown* permits the "-c license_file_path" argument to specify the license file location. The *lmdown* utility can be executed only by the root user. The local administrator should protect the execution of *lmdown,* since shutting down the servers causes the loss of licenses.

lmlist

The *lmlist* utility is installed in the *$AVS_PATH/license* directory. *lmlist* lists the users of any individual feature, in much the same way as "lmstat -f". To use *lmlist,* type "lmlist <feature_name>"; for example,

```
lmlist AVS
```

lists current users of AVS. A list of users of the selected feature is displayed.

lmremove

The *lmremove* utility is installed in the *$AVS_PATH/license* directory. *lmremove* lets you remove a single user's license for a specified feature. For example, this could be required in the case where the licensed user was running the software on a node that subsequently crashed. This situation sometimes causes the license to remain unusable. The *lmremove* utility allows the license to return to the pool of available licenses.

lmremove's syntax is as follows:

```
lmremove [-c file]   feature user host [display]
```

The *lmremove* utility removes all instances of the user on the node host (on display display, if specified) from the use of the feature. If the optional "-c file" is specified, the indicated file is used as the license file. The administrator should protect the execution of *lmremove* since removing a user's license can be disruptive.

lmreread

The *lmreread* utility is installed in the *$AVS_PATH/license* directory. *lmreread* causes the *lmgrd* license daemon to reread the license file and start any new vendor daemons that have been added to the file. In addition, all pre-existing daemons are signaled to reread the license file for changes in feature licensing information. The usage is as follows:

```
lmreread [-c license_file]
```

Note: If the "-c" option is used, the license file specified is read by *lmreread*, NOT by *lmgrd; lmgrd* rereads the file it read originally. Also, you cannot use *lmreread* to change server node names or port numbers. Vendor daemons will reread their license files but will not reread their option files.

lmhostid

The *lmhostid* utility is installed in the *$AVS_PATH/license* directory. *lmhostid* reports what FLEXlm thinks is the machine id of the system on which it is executed.

What can go wrong

The following sections describe some of the more common licensing-related problems that can occur.

Connection to the license daemon has been lost

AVS periodically contacts the *lmgrd* license daemon while it is running. If AVS loses contact with the license daemon - either because the daemon has died or because the system on which the daemon was running has crashed or become inaccessible - a yellow-bordered warning window that displays the following message pops up on your screen:

```
The connection to the license daemon has been lost.
You have 15 minutes to save your work or
restart the license daemon before your session ends.
```

If this occurs, you should save your work and then restart the license daemon.

In the terminal emulator window from which you started AVS , this message appears and periodically repeats:

```
Attempting reconnection to license server for AVS
```

If the license daemon does not restart, the warning message is repeated when 5 minutes remain. At the end of 15 minutes, the AVS session exits. You will need to restart the *lmgrd* license daemon in order to restart AVS (see "Starting the lmgrd license daemon:).

Problems starting AVS

When you start AVS, a number of messages may be written to the terminal emulator window from which you started it. These messages are fairly self-explanatory.

Note: You can use the *licdiag* utility to diagnose a variety of problems with licensing. It may provide additional information beyond what is reported in the error message. For more information, see "licdiag" section above.

cannot connect to license server
AVS cannot make a network connection to the designated license server. Check the **SERVER** line in your license file and make sure that machine can be accessed through the network, at the specified port. It is also possible that that server is no longer running or that network traffic is slow.

cannot connect to a license server
The **DAEMON** name specified in your *license.dat* **FEATURE** line does not match the vendor daemon name.

cannot find license file
The license file cannot be opened. The license mechanism first uses your **LM_LICENSE_FILE** environment variable, if present. Next it looks for */usr/local/flexlm/licenses/license.dat*. If you are using a license server (for floating licenses), you should have a copy of your server's license file on this machine or at least be able to access it.

cannot find SERVER hostname in network database
The hostname specified in the **SERVER** line is not listed in */etc/hosts* or is unknown to this system; check the spelling, and

make sure that hostnames in **SERVER** lines are not longer than 10 characters; if they are, alias them and define the alias in */etc/hosts* or */etc/resolv.conf*, as necessary. For example, hostname *foo.bar.com* should be aliased to *foo*, then *foo* should be defined in */etc/hosts* as follows:

```
IP-address foo foo.bar.com
```

It also possible that the **SERVER** name requires a full DNS name.

cannot read license file

The license file cannot be read; check the path and directory/file permissions; all directories to the license file should be world-readable, as well as the license file itself.

clock difference too large between client and server

The system clock difference between the client (where *avs* is to be used) and the server (where *lmgrd* is running) is too large; maximum allowed time difference between these two machines is 27 minutes.

encryption code in license file is inconsistent

The encryption code for the requested **FEATURE** is inconsistent, i.e. it does not match the rest of the data in the license file, such as the **SERVER** line information, number of licenses, expiration date, etc. Please make sure you are using the license file as given to you by AVS Inc.

feature checkin failure detected at license server

This is somewhat serious and should be brought to the attention of the administrator. When it occurs, it is usually because the host on which the application was running has crashed. A license token may be temporarily "lost" from the pool.

feature has expired

Today's date is after the expiration date in the license file. This may occur for demonstration, evaluation, or beta copies of software.

feature not yet available

The requested **FEATURE** is not enabled yet; the date on the machine is set prior to the feature's start date.

invalid host

The hostid/hostname shown in the **SERVER** line does not match this machine's hostid/hostname; please check the spelling of the hostname, the hostid and make sure that this hostname is listed in */etc/hosts*; also check your domain: the hostname may have to be typed with its full DNS name.

license server does not support this feature

lmgrd does not support the requested **FEATURE;** either the feature has expired, or is no longer supported, or is not supported yet. Make sure that *lmgrd* version 5.12 or higher is currently being used; the *lmgrd* provided with the AVS software is version 5.12.

licensed number of users already reached

There were *n* licenses purchased for this AVS feature, and yours is the *n+1* request. This may also appear as "request for more licenses than this feature supports".

no such feature exists

The requested feature (e.g. AVS, AVS-Animator) was not found in the license file. You are probably using the wrong license file.

user/host not on INCLUDE list for feature

The local administrator has established local access lists for the feature. Contact your administrator.