



# *VisualDOC*

## **INSTALLATION GUIDE**

**VERSION 7.0**

December 2011

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# 1 General Installation

## 1.1 Introduction

This document provides a detailed description for installing and running all VisualDOC and DOT software components provided by Vanderplaats Research and Development, Inc. (VR&D). It is not required to read the entire document. However, it is recommended to carefully read this section before installing any software components. The remaining sections are optional and self-contained.

The VisualDOC CD-ROM from VR&D contains a number of general purpose optimization software components, as summarized in the table below. Most users will install and use only VisualDOC itself. VisualDOC is VR&D's general-purpose design, optimization, and process integration software.

Software Component	Description
VisualDOC	General-purpose Design and Optimization Software
VisualDOC C++ API	VisualDOC Application Programming Interface
DOT	Gradient-based Optimization Library
BIGDOT	Large Scale Gradient-based Optimization Library
FLEXlm License Server	FLEXlm License Server Tools

The VisualDOC C++ API is an application programming interface that allows users to embed the VisualDOC technology (all the included design components) inside their own software. DOT and BIGDOT are optimization libraries (licensed separately) for gradient-based optimization that users can embed into their own software. The DOT and BIGDOT libraries provide only a subset of the VisualDOC C++ API functionality, specifically targeted to gradient-based optimization. BIGDOT is targeted to large scale optimization problems with large number of design variables.

The FLEXlm license server provides VR&D customers with a floating or node-locked license capability, allowing users to setup a single license server machine that serves licenses to client machines connected by a local area network. The products and number of simultaneous licenses that are served depend on the license purchased from VR&D. A license server running on one platform can serve licenses to clients running on other supported platforms.

## 1.2 Supported Platforms

All VisualDOC software components are supported on the following platforms.

- Windows XP/Vista/7 (32 and 64 bit)
- Linux 64 bit (kernel version 2.6 and higher)

Please feel free to contact VR&D if any VisualDOC software component(s) are needed for a different platform.

---

## 1.3 Installing the Software

Installing the software is generally straightforward. By default all the included modules (VisualDOC, DOT, BIGDOT, and VisualDOC API) along with associated documentation and example problems are installed. The installer GUI is identical on all platforms.

---

### 1.3.1 Installation on Windows (XP/Vista/7) Platform

Installing from CD: The installation wizard should automatically start when the CD is inserted in the CD-ROM drive (if autoplay is enabled). If it does not start automatically, double click on the file with name *VisualDOC-7.0-Setup.exe* located in the main CD-ROM directory. Follow the instructions on the screen to complete the installation of VisualDOC.

Installing from the downloaded file *VisualDOC-7.0-Setup.exe*: Double click on the file *VisualDOC-7.0-Setup.exe* to start the installation. Follow the instructions on the screen to complete the installation.

---

### 1.3.2 Installation on Unix/Linux Platform

Installing from CD: Open the main CD-ROM folder in a file browser and double-click the file *VisualDOC-7.0-<platform>-Install* to start the installation. The phrase *<platform>* denotes the platform specific installer for VisualDOC. For example, on Linux 64 bit, this phrase is “*Linux-x86\_64*”. If double-clicking the installer does not start the installation process, then open a terminal window, change to the directory that contains the file *VisualDOC-7.0-<platform>-Install* and type the following two commands.

```
chmod 755 VisualDOC-7.0-<platform>-Install
./VisualDOC-7.0-<platform>-Install
```

The first command changes the permission of the installer file to enable its execution. The second command launches the installer.

Note: Depending upon the options that were used by your operating system to mount your CD ROM, you may or may not be able to change the permissions of the installer file. In such a case, a simple workaround is to copy the installer file to some temporary directory, change its permission to enable execution, and launch the installer. Once the installer is launched, follow the instructions on the screen to complete the installation.

Installing from downloaded file *VisualDOC-7.0-<platform>-Install*: The instructions are identical to that of installing from the CD ROM.

---

## Installing Selected Components

The installer GUI provides the option to install only the selected components. If the user wishes to customize/choose the components they wish to install, the user must choose the “**Custom**” option in the wizard as shown in [Figure 1-1](#). Clicking the next button then shows the list of components to choose from. The installation wizard with the list of components is shown in [Figure 1-2](#).

The installation CD-ROM also contains setup files for just the FlexLM installer. If the user only intends to install a license server (e.g. installing the license server on a one machine and the software on a different machine), then the appropriate installer can be launched. Further information about installing and configuring licenses is discussed later in this manual.

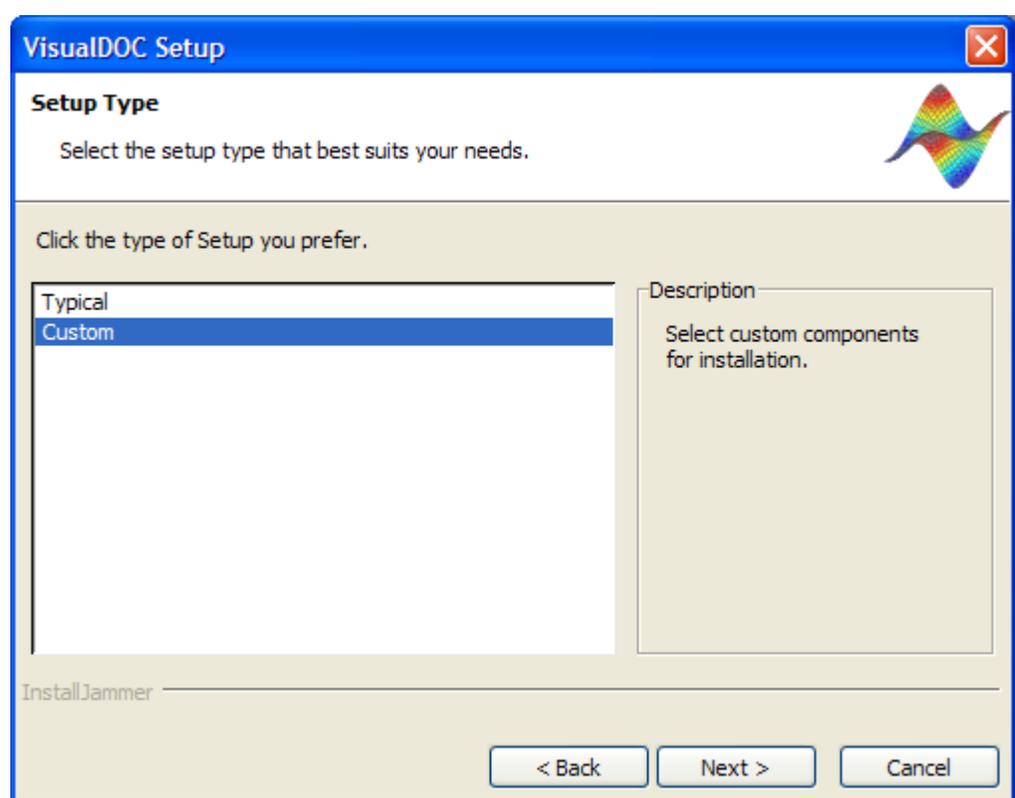


Figure 1-1 Install custom components

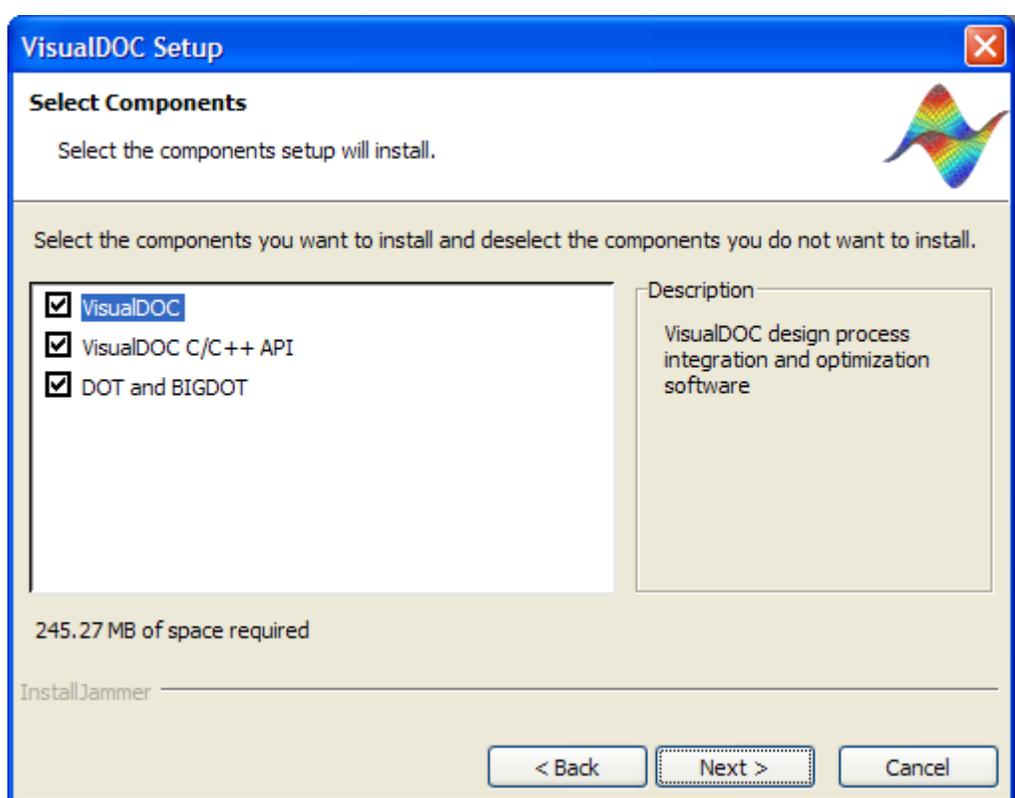


Figure 1-2 List of components

## 1.4 Additional Required Software

A valid Java Runtime Environment (JRE) is required to run VisualDOC. None of the other software components (DOT, BIGDOT, and VisualDOC API) require JRE. VisualDOC requires at least JRE 1.5.0, but it is highly recommended to use the latest available version. It is also recommended to use the JRE from Sun/Oracle since VisualDOC is developed and tested using Java Development Kit (JDK) from this vendor. The latest available version of JRE at the time this document was created is summarized below on a per platform basis. Java Virtual Machine (JVM) is also often used to refer to JRE.

Operating System	JRE Version
Windows 32 and 64 bit	Java 6 update 29
Linux 64 bit	Java 6 update 29

Only the JRE and not the JDK is required to run VisualDOC. The JRE can be downloaded, free of charge, for different platforms from the following website:

<http://java.com/en/download/manual.jsp>.

## 1.5 Obtaining a VR&D License File

All VisualDOC software components require a license to run. Without a valid license, some software components might not run or revert to demo mode which will result in limitations with regard to the problems that can be solved. To evaluate a full version of any software component, contact VR&D for a free evaluation license.

The first step in licensing VisualDOC, DOT/BIGDOT, and VisualDOC API is to request an authorization file from Vanderplaats Research & Development, Inc. The easiest way to request an authorization file is by using the VisualDOC Graphical User Interface (GUI). After the installation is finished, a license request must be completed and e-mailed to VR&D or your distributor. When VisualDOC is launched for the first time and if it does not find a valid license, it will pop up a license request dialog as shown in **Figure 1-3**. If it is already licensed or running in demo mode, the license request GUI can be launched from Help menu → License Request menu item. Please fill in the requisite information, then click on the “Save As...” button to save the license request file. Once the license request file is generated, email it to [license@vrand.com](mailto:license@vrand.com) or to your distributor to request a license.

If you face any problems or have any questions please contact Vanderplaats Research & Development, Inc. at:

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**Web Site: [www.vrand.com](http://www.vrand.com)**

**Email: [visualdoc.support@vrand.com](mailto:visualdoc.support@vrand.com)**

**41700 Gardenbrook Rd. Suite 115**

**Novi, MI 48375**

**Tel:+1-248-596-1611**

**Fax:+1-248-596-1911**

VisualDOC 7.0 License Request

Fill out the following information and save it to a file.  
Email the saved file to VR&D or your distributor.

**Client Information**

Organization:

Contact Person:

Email:

Phone:

Fax:

Address:

**License Type**

Commercial

Academic

Evaluation

**Network**

Node-Locked

Floating

**System Information**

Hostname: janus

LMHostid: 001731b7086d

Operating System: Windows XP

Architecture: x86

Date: Sep 22, 2011

**Products**

VisualDOC

DOT

BIGDOT

Save As... Close Clear

**Figure 1-3 VisualDOC License Request Dialog**

When the license request dialog is launched from the Start menu on Windows (or its equivalent on Linux), then the generic VR&D License Request dialog pops up and is shown in [Figure 1-4](#).

If only the FLEXlm license server is installed, the *lmutil* program can be used to obtain a **lmhostid**. The **lmhostid** can be e-mailed to VR&D with a description of the request.

Although several options for requesting a VR&D license file are provided, the first option of using the VisualDOC *request* program is preferred and should always be used if VisualDOC is installed.

---

## Note for Windows

VisualDOC requires administrative privileges (the user must be the Administrator or belong to the Administrator group) to install. If the user is not an administrator, the installer will quit with the error message saying that you need administrative privileges to install VisualDOC.

---

## Note for Linux

Any user can install VisualDOC at any location for which the user has write permission. Please note that shortcuts on the Desktop and in the Start Menu are created only for the user installing the software. Also, depending upon which Desktop Environment (DE) is used, the shortcuts may or may not have the appropriate icons. The behavior of the shortcuts is DE dependent.

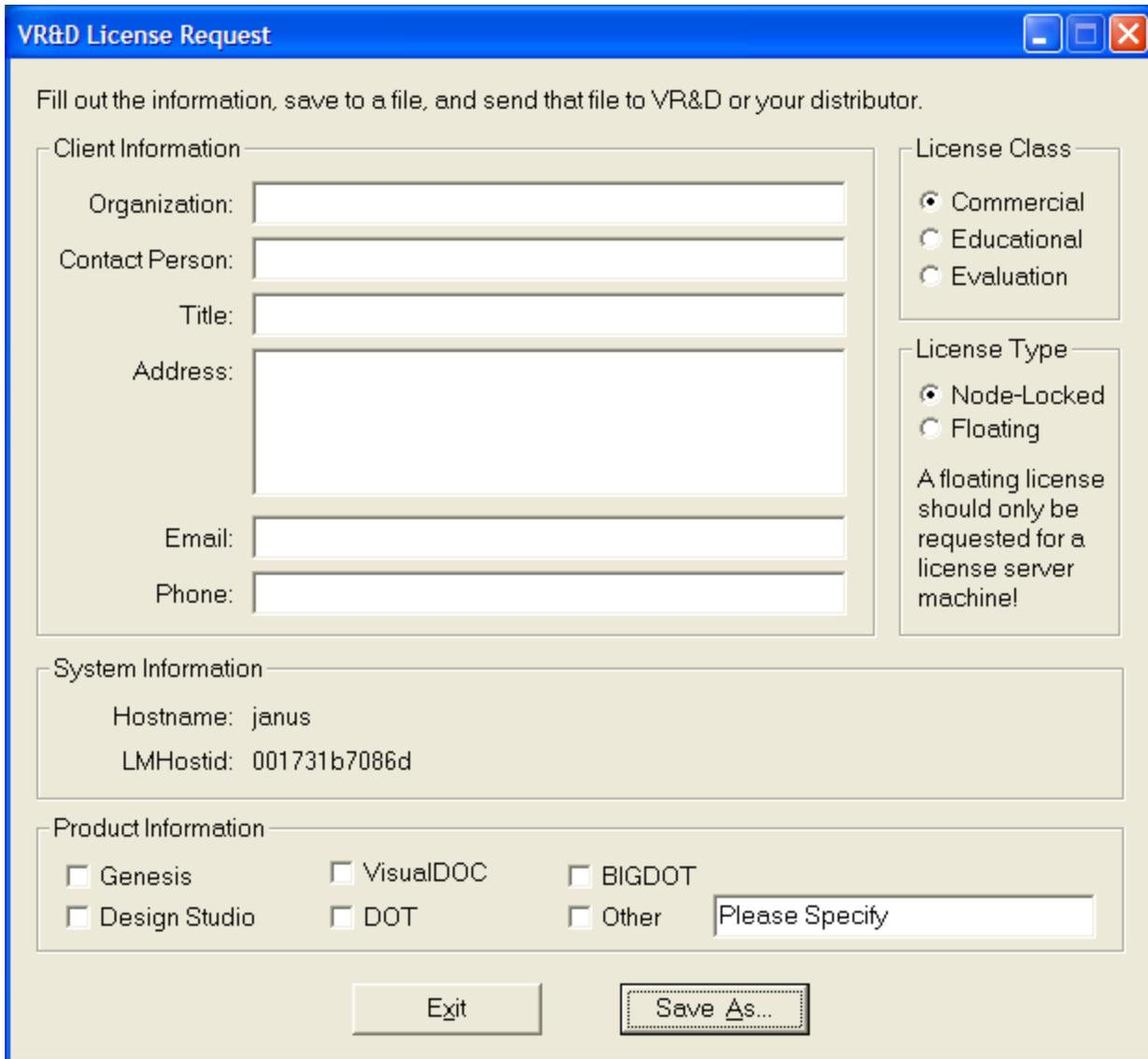


Figure 1-4 VR&D License Request Dialog

## 2 VisualDOC

### 2.1 Introduction

VisualDOC is VR&D's general-purpose design, optimization, and process integration software and is generally used to wrap design modules such as optimization around existing analysis programs or model complex design processes as a flowchart.

VisualDOC comes with detailed documentation which is provided in the form of *PDF* files in the `<install_dir>/vrand/vdoc7.0/docs` directory.

The following user manuals are provided with VisualDOC.

File	Description
WhatsNew.pdf	New Features in this Release
InstallationGuide.pdf	This Document
UsersManual.pdf	VisualDOC User's Manual
GettingStartedExamples.pdf	VisualDOC Getting Started Manual
AdvancedExamples.pdf	VisualDOC Advanced Examples Manual
TheoryManual.pdf	Theory Manual on Algorithms included in VisualDOC
CPP_API.pdf	API Manual for Accessing VisualDOC design algorithms from inside a Program

## 2.2 Using VisualDOC in Batch mode

VisualDOC can run in batch mode from a command line. The batch mode can be used to run a task from a database. The name of the executable varies based on the platform. The name of the executable/script for different platforms is as follows:

Platform	Name of the Executable/Script
Windows 32 bit	VisualDOCBatch32.exe
Windows 64 bit	VisualDOCBatch64.exe
Linux 64 bit	VisualDOCBatch

If you just run the batch-mode executable/script from the command line without any arguments, it will print the following message that contains a description of different command line arguments.

```
VisualDOC 7.0
```

```
Copyright 2011 Vanderplaats Research & Development, Inc.
```

```
Usage: VisualDOCBatch -d databaseName -t taskId -v verbosityLevel
```

```
databaseName --> Name of the database file (if database file contains spaces, then use double quotes)
```

```
taskId --> Id of the task to load
```

```
verbosityLevel:
```

```
0 --> No output
```

```
1 --> Minimal output
```

```
2 --> Verbose output
```

```
3 --> Debug output
```

The output message shown above is self-explanatory. For example, to run the task with id **3** contained in the database file **example.vdbx** in **verbose** mode, execute the following command.

```
VisualDOCBatch -d example.vdbx -t 3 -v 2
```

---

### 3 VisualDOC C++ Application Programming Interface (API)

For a description of how to compile, link, run, and distribute your examples that use API, refer to the API Manual (file with name *CPP\_API.pdf*). The API manual contains all the instructions for Windows 32 and 64 bit, and Linux 64 bit.

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## 4 DOT and BIGDOT Libraries

The process to compile, link, and distribute your example that uses DOT/BIGDOT is identical to that of VisualDOC API. For compiling and linking instructions, please refer to the VisualDOC API manual (file with name *CPP\_API.pdf*). For instructions on how to use DOT and BIGDOT methods, refer to their respective manuals. The following description is provided as a quick reference.

---

### 4.1 Introduction

The DOT and BIGDOT optimization libraries are similar to the VisualDOC C++ API in that it allows users to embed optimization directly within their own analysis program. However, DOT and BIGDOT provide only a subset of the VisualDOC C++ API functionality and are specifically targeted to gradient-based optimization. BIGDOT is specifically targeted to large scale optimization problems with large numbers of design variables. The DOT and BIGDOT libraries do not perform discrete optimization, multi-objective optimization, response surface approximate optimization, or design of experiments.

DOT and BIGDOT are bundled in a single library that is installed in the `<install_dir>/vrand/dot6.0/$ARCH` directory (where *\$ARCH* is one of Linux64, Win32, or Win64) and are licensed separately from VisualDOC. The installation only includes double precision static and shared libraries, and example problems. The supplied example problems include both DOT and BIGDOT examples and illustrate how to call DOT and BIGDOT from both FORTRAN and C.

Detailed DOT (*DOT.pdf*), and BIGDOT (*BIGDOT.pdf*) user manuals are provided in the `<install_dir>/vrand/dot6.0/docs` directory.

---

### 4.2 Using DOT and BIGDOT on Linux 64 bit

Before using the DOT/BIGDOT library it is necessary to set an environment variable that would allow the resulting executable to find the DOT or BIGDOT license file. For a typical installation in the `<install_dir>` directory, this variable should be set as follows for *cs*h shell environments

```
setenv VRAND_AUT <install_dir>/vrand/licenses
```

and as follows for **bash** shell environments

```
export VRAND_AUT=<install_dir>/vrand/licenses
```

In the above examples, `<install_dir>/vrand/licenses` is the full path to the directory that contains the VR&D license file.

On UNIX machines, the DOT/BIGDOT library is supplied as both a static and a shared library as follows.

File	Description
libdot.a	Double precision DOT and BIGDOT static library
libDOT.so	Double precision DOT and BIGDOT shared library

To use the DOT/BIGDOT library, simply invoke the FORTRAN compiler. For example; to use the static library on a Linux workstation one would typically use the following command

```
gfortran -o <outname> <example.f> -L<install_dir>/vrand/dot6.0/Linux64 -ldot
```

where *<outname>* is the name of the resulting executable, *<example.f>* is the name of the source file that calls DOT and *-ldot* is the name of DOT object library.

When using the DOT libraries on a Linux machine, it may be necessary to include the directory containing the DOT libraries in the shared library path.

```
export
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:<install_dir>/vrand/dot6.0/Linux64
```

## 4.3 Using DOT and BIGDOT on Windows

On Windows machines, the DOT/BIGDOT library is supplied as both static and dynamically linked libraries as follows.

File	Description
DOT.lib	Double precision DOT and BIGDOT static library
DOT.dll	Double precision DOT and BIGDOT shared library
DOT_DLL.lib	DOT link library for the DLL

These libraries are present in the *<install\_dir>/vrand/dot6.0/Win32* and *<install\_dir>/vrand/dot6.0/Win64* directory for 32 and 64 bit respectively.

Before using DOT or BIGDOT it is necessary to set the VRAND\_AUT environment variable to point to the VR&D license file. For a typical installation this variable should be set to point to *<install\_dir>/vrand/licenses*.

When linking against a static library, simply include that library as the input library. When linking against a dynamically linked library, include the corresponding link library as the input library.

When using the DOT/BIGDOT dynamically linked library, remember that the dynamically linked library will be invoked only at runtime and is not required when linking the program. The resulting executable must be able to resolve the DOT/BIGDOT dynamically linked library at runtime. To ensure that the DOT/BIGDOT dynamically linked library is resolved, modify the *PATH* environment variable to include the directory where the dynamically linked library is located. The DOT/BIGDOT DLL is installed in the *<install\_dir>/vrand/dot6.0/Win32* and *<install\_dir>/vrand/dot6.0/Win64* directory for 32 and 64 bit respectively.

Please note that all VR&D dynamically linked libraries are created as multi-threaded DLL's and the corresponding project files should be set up accordingly.

## 5 FLEXlm License Server

### 5.1 Introduction

VR&D makes use of FLEXlm Version 10.8.0.1 to provide our customers with a node-locked or floating network license capability. The FLEXlm license server provides VR&D customers with the ability to setup a single license server machine that serves licenses to client machines connected by a local area network. The products and number of simultaneous licenses that are served depend on the floating licenses purchased from VR&D.

The FLEXlm license server is available on all supported platforms. A license server running on one platform can serve licenses to clients running on any other supported platform.

The FLEXlm license server gets installed as part of VisualDOC installation. The FLEXlm license server will be installed into the `<install_dir>/vrand/flexlm` directory with sub-directories for documentation and platform specific programs. The platform specific programs are saved in the `$ARCH` sub-directory, where `$ARCH` depends on the machine architecture as follows: `Linux_x64` or `WIN32`. This platform specific directory contains all executable files required to set up and run the FLEXlm license server for the particular architecture. These files are discussed in more detail in Sections below.

**Note:** Additional FLEXlm documentation regarding the setup and use of the FLEXlm license server is provided in the `vrand/flexlm/htmlman` directory.

### 5.2 Starting the FLEXlm License Server on UNIX

After installing the FLEXlm license server on any of the supported UNIX machines, the `vrand/flexlm/$ARCH` directory will contain the following files:

Filename	Description
VRAND	VR&D FLEXlm vendor daemon
lmgrd	FLEXlm license server
lmutil	FLEXlm utilities

The `lmgrd` FLEXlm license server uses the `VRAND` vendor daemon to serve licenses for all VR&D products. The `lmutil` program provides the user with a set of utility programs for controlling the license server.

The user can use these programs directly, but VR&D provides a set of wrapper functions to aid the use of FLEXlm for VR&D products. These wrapper functions are provided in the form of shell scripts in the `vrand/flexlm` directory and will work on any of the supported UNIX platforms. These wrapper functions are summarized below:

Filename	Description
lmgrd	VR&D wrapper for the FLEXlm license server

lmutil

VR&amp;D wrapper for the FLEXlm utilities functions

To start the license server the user would typically execute the *vrand/flexlm/lmgrd* VR&D wrapper for the FLEXlm license server as follows

```
lmgrd [-c <license file>] [-l <log file>]
```

where [-c <license file>] and [-l <log file>] are optional arguments that point to the appropriate VR&D license file and corresponding server log file. If no [-c <license file>] option is provided, *lmgrd* will try to use the default VR&D license file in the *vrand/licenses* directory. If no [-l <log file>] option is provided, *lmgrd* will use *vrand/flexlm/lmgrd\_ \$HOSTNAME.log* as the default log file.

To control the license server, the *lmutil* wrapper is provided. The *lmutil* options are obtained by simply typing

```
lmutil
```

at the command line. The options are summarized in the listing below:

lmutil - Copyright (c) 1989-2006 Macrovision Europe Ltd. and/or Macrovision Corporation. All Rights Reserved.

usage: lmutil lmborrow -status

```
lmutil lmborrow -clear
```

```
lmutil lmborrow {all|vendor} dd-mmm-yyyy:[time]
```

```
lmutil lmborrow -return [-c licfile] [-d display_name] [-fqdn] feature
```

```
lmutil lmdiag [-c licfile] [-n]
```

```
lmutil lmdown [-c licfile] [-q] [-all] [-vendor name] [-force] [-help]
```

```
lmutil lmhostid [-ether|-internet|-user|-n]-string
```

```
-display|-hostname|-hostdomain|-vsn|-flexid|-long|-utf8]
```

```
lmutil lminstall [-i infile] [-o outfile]
```

```
[-overfmt {2, 3, 4, 5, 5.1, 6, 7.1, 8}]
```

```
[-odecimal] [-maxlen n]
```

```
lmutil lmnewlog [-c licfile] vendor new-file, or
```

```
lmutil lmnewlog [-c licfile] feature new-file
```

```
lmutil lmpath -status
```

```
lmutil lmpath -override {all | vendor } path
```

```
lmutil lmpath -add {all | vendor } path
```

```
lmutil lmremove [-c licfile] feature user host display
```

```
lmutil lmremove [-c licfile] -h feature host port handle
```

```
lmutil lmread [-c licfile] [-vendor name] [-all]
```

```
lmutil lmswitchr [-c licfile] vendor new-file, or
```

```
lmutil lmswitchr [-c licfile] feature new-file
```

```
lmutil lmstat [-c licfile] [lmstat-args]
lmutil lmswitch [-c licfile] vendor new-file, or
lmutil lmswitch [-c licfile] feature new-file
lmutil lmver flexlm_binary
lmutil -help (prints this message)
lmutil utility_name -help (display detailed usage information)
```

The VR&D wrapper for *lmutil* will automatically set the license file to the default VR&D license file in the *vrand/licenses* directory if no *-c licfile* option is provided. To use a specific utility, either specify the utility name and options to *lmutil*, for example

```
lmutil lmhostid
```

or copy the *lmutil* file to the name of the utility and execute the resulting file with the options for that utility, for example:

```
cp lmutil lmhostid
lmhostid
```

Links to a number of the most often used *lmutil* utilities are provided in the *vrand/bin* and *vrand/flexlm* directories.

### 5.3 Starting the FLEXlm License Server on Windows

After installing the FLEXlm license server on a Windows XP, Vista, or 7 machine, the *vrand/flexlm/win32* directory will contain the following files:

Filename	Description
VRAND.exe	VR&D FLEXlm vendor daemon
lmgrd.exe	FLEXlm license server
lmutil.exe	FLEXlm utilities
lmtools.exe	FLEXlm utilities with GUI

Similar to the UNIX installation, the *lmgrd.exe* FLEXlm license server uses the *VRAND.exe* vendor daemon to serve licenses for VR&D products, while the *lmutil.exe* program provides the user with a set of utility programs for controlling the license server. See Section 5.2 for a detailed description of using *lmutil.exe*.

Unlike the UNIX installation, no wrapper programs are provided for the license server and utility programs on Windows platforms. Instead, VR&D provides the *lmtools.exe* program, which provides an easy to use graphical user interface to all the FLEXlm utilities. For Windows platforms, it is recommended to use the *lmtools.exe* program rather than the *lmutil.exe* program.

**Note:** To avoid problems with starting the FLEXlm license server, install it in a directory without space characters in the path name.

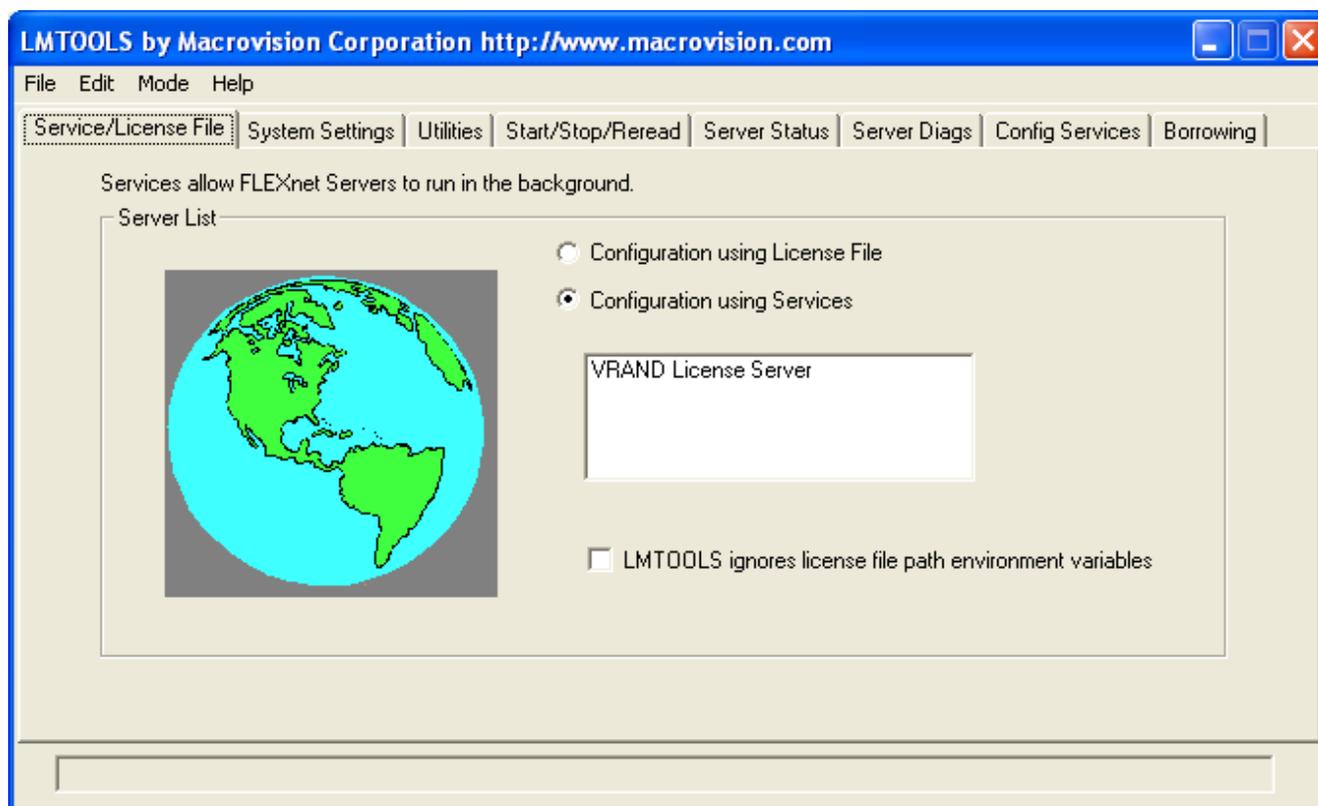
To start the license server on Windows platforms, make use of the *lmtools.exe* program. This will require several steps as outlined below:

## Start the *lmtools.exe* program

To start *lmtools.exe*, simply double click on the *lmtools.exe* file in the *vrand/flexlm/win32* directory. This should open the *lmtools.exe* program as shown in [Figure 5-5](#).

## Install the license server as a service

Before starting the license server, it must be installed as a Windows NT service. The first step is to select the **Configuration using Services** option in [Figure 5-5](#).



**Figure 5-5 LMTTOOLS startup screen**

Next select the **Configure Services** tab to obtain the window shown in [Figure 5-6](#). The **Configure Services** tab will only appear after selecting the **Configuration using Services** option.

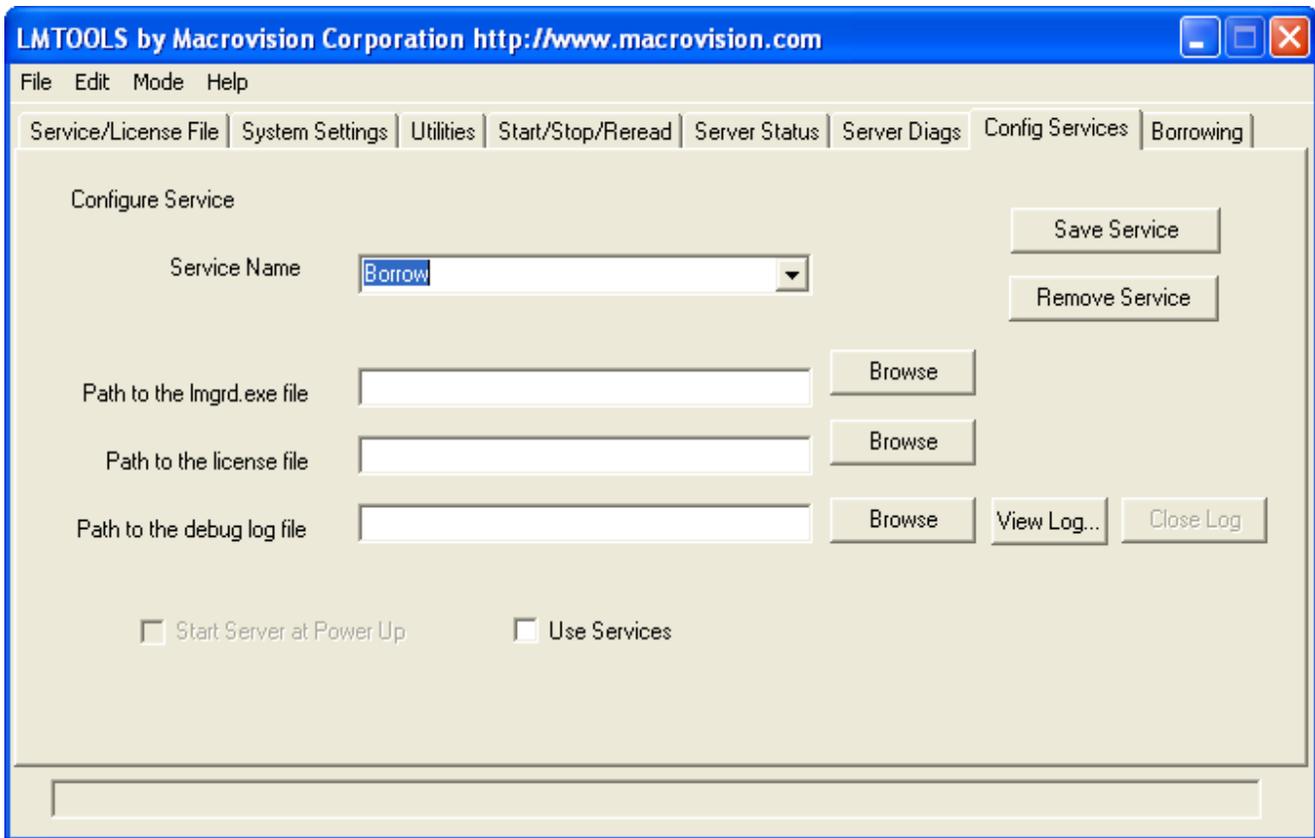


Figure 5-6 LMTTOOLS service configuration screen

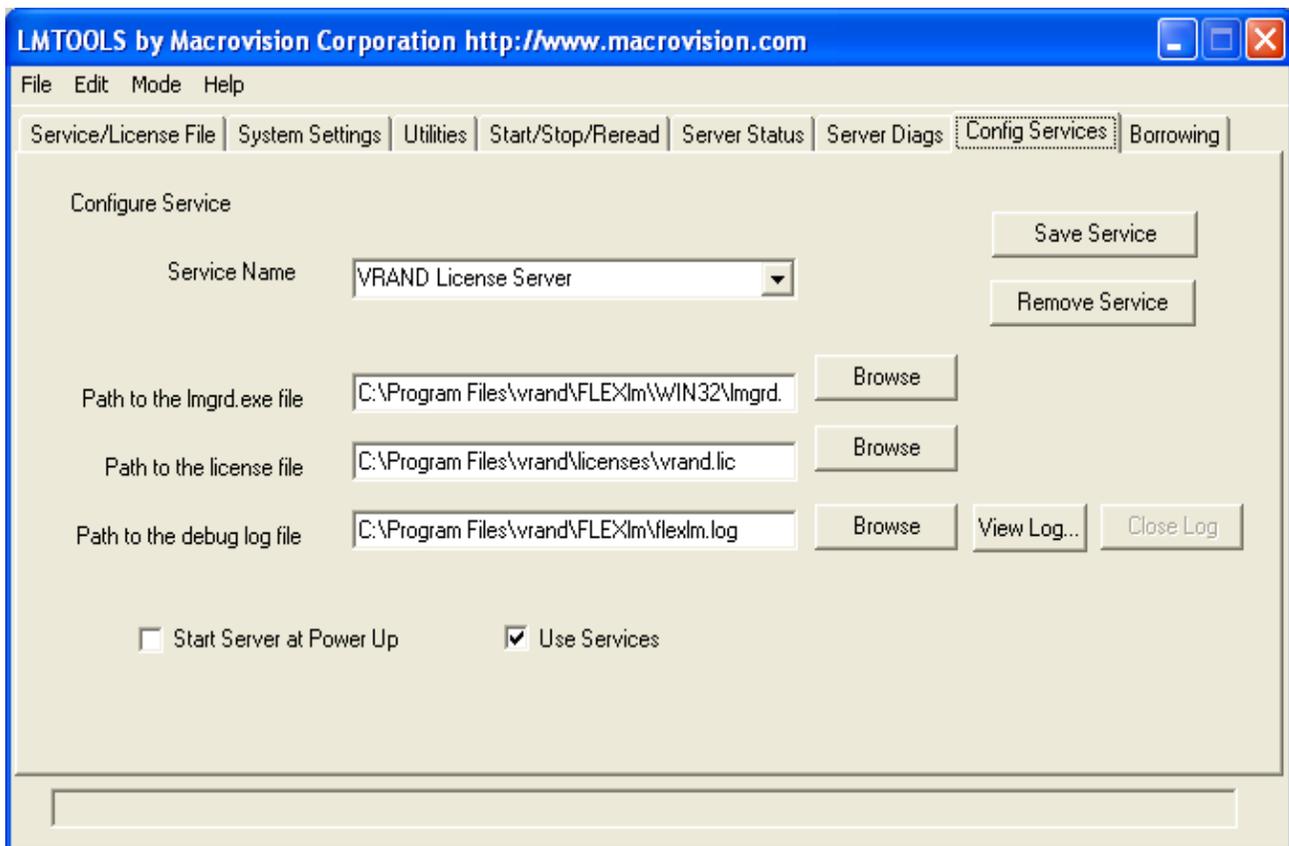


Figure 5-7 Updated LMTTOOLS service configuration screen

Enter the license service name, **VRAND License Server**, in the **Service Name** text field and browse for the appropriate **lmgrd.exe**, the VR&D license file and the log file paths. For a typical installation, the **Configure Service** windows should appear as shown in **Figure 5-7**.

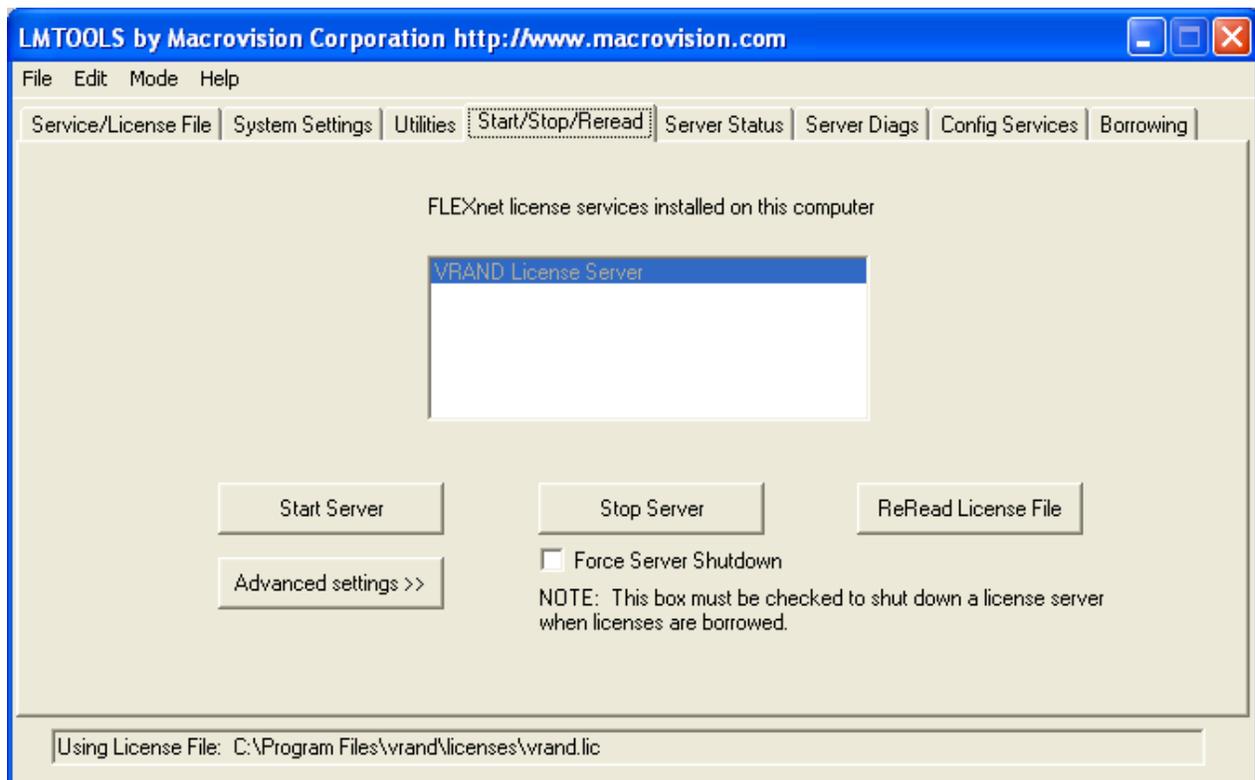
Make sure to select the **Start Server at Power Up** and **Use Services** options as shown in **Figure 5-7**. These two options will make sure the server is installed as a Windows NT service that will automatically start each time the machine is restarted. Finally, select the **Save Service** button to install the service.

## Start the license server

The license server is now installed as a Windows NT service and all that remains is to start the server. Select the **Start/Stop/Reread** tab to obtain the window shown in **Figure 5-8**.

To start the license server, select the **Start Server** button.

The license server should now be started and the *lmttools.exe* software can be used to maintain the server. For example, *lmttools.exe* can check the status of the server, start and stop the server, force the server to re-read a new license file, etc.



**Figure 5-8 LMTTOOLS server control screen**

---

## 6 Appendix A: Mounting the CD-ROM Drive on Supported UNIX Systems

On all UNIX platforms, it may be necessary to mount the CD-ROM drive before installing the VisualDOC software from the CD-ROM. Mounting the CD-ROM drive on any of the supported UNIX platforms is discussed below. After the CD-ROM drive is mounted, the installation is started by issuing the following command

```
/cdrom/VisualDOC-7.0-<platform>-Install
```

---

### Linux 64 Bit

The system should automatically mount the CD-ROM. If the system did not mount the CD-ROM automatically, mount the CD-ROM using the following commands:

```
mkdir /cdrom
mount -t iso9660 /dev/cdrom /cdrom
```

---

## 7 Appendix B: Setting/Editing Environment Variable on Windows Computers

The procedure for setting/editing environment variables is slightly different for the various Windows configurations. Each Windows configuration is considered separately for the case of adding the <install\_dir>\vrand\vdock7.0\Win32 directory to the PATH environment variable.

On Windows XP/Vista/7 computers, environment variables are added/modified by selecting the **Performance & Maintenance** option from the **Control Panel**. Next select the **System** options which will open the **System Properties** dialog box, where the **Advanced** tab should be selected. Finally, select the **Environment Variables** button on the **Advanced** tab. To edit the PATH environment variable, highlight the variable and select the **Edit** button. If the PATH environment variable is edited from the **User Variables** list, it will be modified only for the current user. If the PATH environment variable is edited from the **System Variables** list, it will be modified for all users.

After selecting the appropriate **Edit** button, a dialog box will appear for editing the PATH environment variable. Simply add the <install\_dir>\vrand\vdock7.0\Win32 directory to the existing value of the *PATH* environment variable. Note that multiple directories are separated by a semi-colon character “;”. To add a new environment variable, select the appropriate **New** instead of the **Edit** button.