CHAPTER

TWO

INSTALLATION, LICENSING, AND CONFIGURATION

This chapter provides detailed instructions for installing ***FLOW-3D***, configuring software licensing, and setting up the remote solving features. If you have any trouble during the installation, please contact our support department at support@flow3d.com or by calling (505) 982-0088 and we will be happy to assist you.

2.1 Pre-installation

2.1.1 Supported operating systems

There are certain operating systems on which ***FLOW-3D*** and FlowSight are tested. While it may be possible to install and run both of these programs on other operating systems, Flow Science supports and provides installation assistance for only the following **64 bit** operating systems:

- Microsoft **Windows 7** and greater
- Microsoft **Windows Server 2008** and greater
- **SUSE Enterprise Linux 11 Service Pack 2** and greater
- **Red Hat Enterprise Linux 6** and greater

Note: 32 bit operating systems are no longer supported.

2.1.2 Hardware requirements and recommendations

- **Processor**: An x86-64 compatible CPU is required. Multiple processor cores are recommended. **Intel Core i7** and **Intel Xeon** CPUs are preferred.
- **Memory**: The software requires a minimum of 2GB RAM per processor core. Note that the amount of RAM required is highly problem dependent. For simulations with large domains, or with complex geometry requiring fine resolution, significantly more RAM than the required minimum will be necessary. Memory speed has a small effect on simulation time and typically 1333 or 1600 MHz memory is adequate.
- **Graphics**: The FlowSight postprocessor works best with a workstation card.
- **nVidia Quadro K series** cards or **AMD FirePro W series** cards are highly recommended. nVidia's **GTX series** 660 and above have shown decent performance on desktop and notebook machines.
- ***FLOW-3D*** for **Windows** requires at least 1GB of free disk space. On **Linux** operating systems, at least 1.2GB of free disk space is necessary. Additional space is required for simulation results, which can be upwards of 100GB depending on the simulation.

2.1.3 Licensing requirements

Please ensure that you have a valid ***FLOW-3D*** license file or the name or IP address of your ***FLOW-3D*** license server before beginning the installation. If you do not have a license file or a license server please contact your sales associate or licenses@flow3d.com and provide the following information:

- The host name of the machine that will run the license server software
- Either the FlexID (if using a hardware dongle; the FlexID is printed on the side of the dongle) or the MAC address of the machine

If the MAC address is not known:

- On **Windows** operating systems, the host name and MAC address can be found by opening the command prompt and entering **ipconfig /all**. When multiple ethernet cards are present, multiple MAC addresses may be listed in the output. The connected ethernet device or the first in the series is preferable.
- On Linux operating systems, typing **/sbin/ifconfig** in a terminal window will provide the MAC address, under the heading "HWAddr." The host name can be found by entering the **hostname** command in a terminal window. When multiple ethernet cards are present, multiple MAC addresses may be listed in the output. eth0 is usually best, but if you are unsure which MAC address to use, please send a text file or attach a screen capture with the output of the command, and the License Administrator will determine the best option.

Once the host name and MAC address or FLEXID have been received, the License Administrator at Flow Science will send the license file (`flow3d.lic`) as an email attachment. It is an ASCII text file with encryption codes that allow it to be used only on the computer for which it was generated. Check the license file to be sure that it contains the host name and HOSTID that matches the license server.

2.2 General Licensing Information

2.2.1 Licensing Software

FLOW-3D uses the licensing package FlexNet Publisher, by Flexera Software. FlexNet enables ***FLOW-3D*** licenses to be shared across a network. More information about FlexNet and its tools can be found below under the *FlexNet License Administration Tools* section. A FlexNet License Administration Guide is available in the *utilities* subdirectory of the ***FLOW-3D*** installation.

FlexNet License Administration Tools

Flexera Software provides utilities for users or local license administrators to manage FlexNet licensing activities. The FlexNet End User Manual is available in the "utilities" subdirectory of the ***FLOW-3D*** installation. This manual is available in both PDF and HTML formats. For Windows computers, the program **lmtools.exe** is provided with all installations. With **LMTOOLS**, users can start, stop and configure FlexNet license servers, get system information, get server information, and more. For more information, please see Chapter 12 of FlexNet End User Manual.

On **Windows** computers, the license manager daemon `lmgrd` will restart automatically whenever the computer is rebooted. On Linux computers, however, the license manager must be started each time the computer is rebooted. To have the license manager start automatically on Linux requires editing the appropriate boot script and inserting the appropriate startup commands. See Section 6.2 of the FlexNet End User Manual for more information. A summary of commonly used administration tools on Linux is included here. Full descriptions of these and other available utilities can be found in Chapter 12 of the FlexNet manual.

- **lmdiag** – diagnoses license checkout problems Useful debugging command: `lmutil lmdiag -n -c "full_license_file_path"`
- **lmdown** – gracefully shuts down all license daemons on the license server node.

- **lmgrd** – the main daemon program for FlexNet
- **lmhostid** – reports the HOSTID of a system
- **lmreread** – causes the license daemon to reread the license file and start any new vendor daemons
- **lmstat** – helps monitor the status of all network licensing activities Useful debugging command: `lmutil lmstat -a -c "full_license_file_path"`
- **lmver** – reports the FlexNet version of a library or binary file

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Note: Using "kill –9" to to shut down the license server on Linux computers is not recommended. Instead, use either "lmdown" or use the "kill" command without the "-9" parameter.

2.2.2 Licensing Terminology

- **Definition of Client and License Server**: Any computer running ***FLOW-3D*** is referred to as a "client." The computer on which the FlexNet license server is installed will be referred to as the "license server." The client and server may be (and often are) the same machine.
- **Software Package and Software Distribution**: The terms "software package" and "software distribution" will be used to refer to the directory structure containing all of the data files and executables needed to run ***FLOW-3D*** on a particular computer.
- **License Files and Servers**: A valid license file from Flow Science is required to use ***FLOW-3D***. This license file will be sent as an email attachment from Flow Science's License Administrator at licenses@flow3d.com. This license file must be saved in the licenses directory of the ***FLOW-3D*** installation on the machine that will act as the license server. More detail about this is given in the *Windows Installation* and *Linux Installation* sections below.

  As discussed in *Floating vs. Node-Locked Licenses*, ***FLOW-3D*** can be used on multiple computers, but one computer must be selected to be the license server. If the computer chosen to be the license server will not actually be used to run ***FLOW-3D***, then only the FlexNet license server needs to be installed on that machine. Also, if the FlexNet license server will be installed on a Windows computer, a licensing dongle that attaches to the USB port of the computer will be provided by Flow Science. This key is enclosed in the ***FLOW-3D*** package.

Tokens

The total number of ***FLOW-3D*** solver processes that can be run concurrently is determined by the number of "tokens" contained in the license file. The number of tokens available depends on how many were purchased. The license server checks tokens out to client computers on the network, and then checks them back in when the application has completed. In this process, tokens are counted by the license server and when all of the tokens purchased have been checked out, no more tokens can be checked out until a token which is in use has been checked in.

There are several different types of solver tokens. The most important distinction is between "serial" solver tokens and "parallel" solver tokens. Flow Science offers multi-processor versions of ***FLOW-3D*** for both shared-memory (SMP) and distributed-memory (cluster) environments. A shared memory parallel solver token (shown in the license file as `hydr3dp`) enables ***FLOW-3D*** simulations using more than one processor on a multiprocessor computer. For the distributed-memory version, ***FLOW-3D***/MP, a `hydr3d` or `hydr3dp` instance token is required as well as `hydr3dmpi` rank tokens. For example, to run a simulation on 16 processors using ***FLOW-3D***/MP, the license file must have a `hydr3d` token and 15 `hydr3dmpi` tokens.

Unless tokens were purchased for one of the multi-processor versions, the license file will contain one or more serial solver tokens `hydr3d`. These serial solver tokens can be used on computers running any supported operating system. There are essentially an unlimited number of tokens available to run ***FLOW-3D***'s auxiliary programs such as the preprocessor, the postprocessor, and the various visualization options.

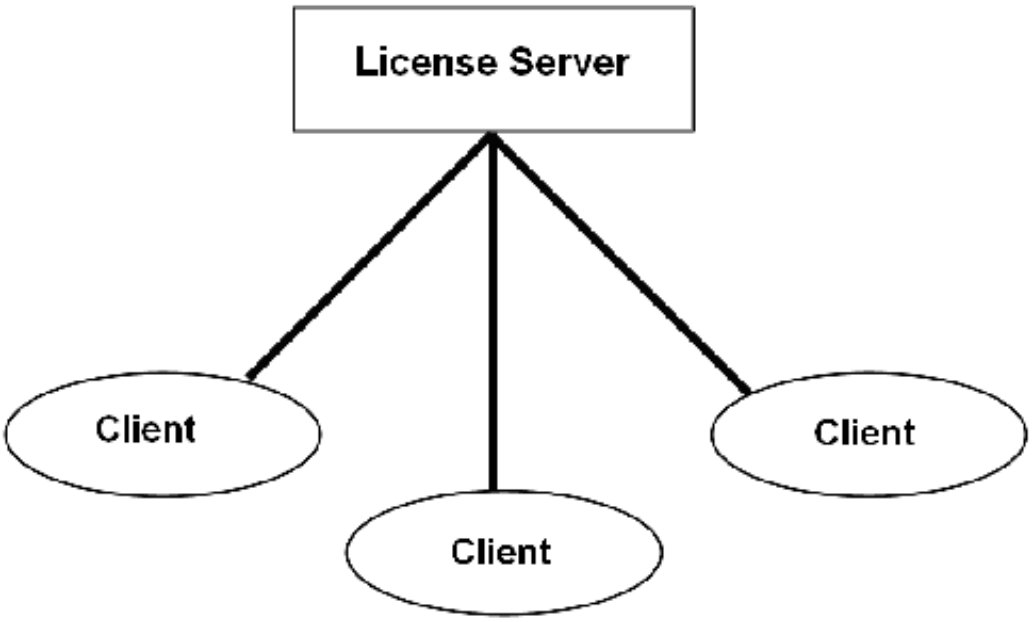
Floating vs. Node-Locked Licenses

There are two general types of licenses used to enable ***FLOW-3D***: "floating" and "node-locked." A floating license is the most common type of license and is available to any computer on the network. Flow Science can also provide a node-locked license. Node-locked licenses can only be used on the designated computer.

Both floating and node-locked licensing schemes require that one computer be designated as the license server.

- **Floating Licenses**: To use floating licenses, it is important that both the network and the computer intended for use as the license server are reliable. The TCP/IP protocol must be loaded and functional, and all intended clients must be able to access the license server. Floating licenses may also be accessed through a VPN tunnel. The computer that is acting as the license server may be any computer on the network, and does not need to have ***FLOW-3D*** installed. The license server may be a Windows or a Linux computer. Users may load ***FLOW-3D*** on any client running a supported Linux or Windows computer on the network. A hardware key is not needed on a client computer unless it uses a node-locked license.

  To employ a floating license on a single computer, ***FLOW-3D*** should be installed with the client/server option. The license server and the clients may reside on the same local area network, over a WAN, or across VPN. ***FLOW-3D*** must be installed locally on each client. An example of a floating license configuration is shown below.



- **Node-Locked Licenses**: Users may choose to have their solver tokens locked to a particular computer so that only that computer can run the solver.

Both floating and node-locked licensing schemes have their advantages and disadvantages. A floating license is advised if several people are sharing a license, or it may be necessary to run ***FLOW-3D*** on a different computer if a particular computer is busy. With a floating license, a problem can be set up on one computer while using another to run the ***FLOW-3D*** solver on a second problem. If other machines or problems are using all available tokens, the solver will not run until a token becomes available. The main advantage of a node-locked license is the ability to ensure that token(s) are always available to a specific machine and not available to others on the network.

Note: All licenses are floating licenses unless specifically requested as node-locked.

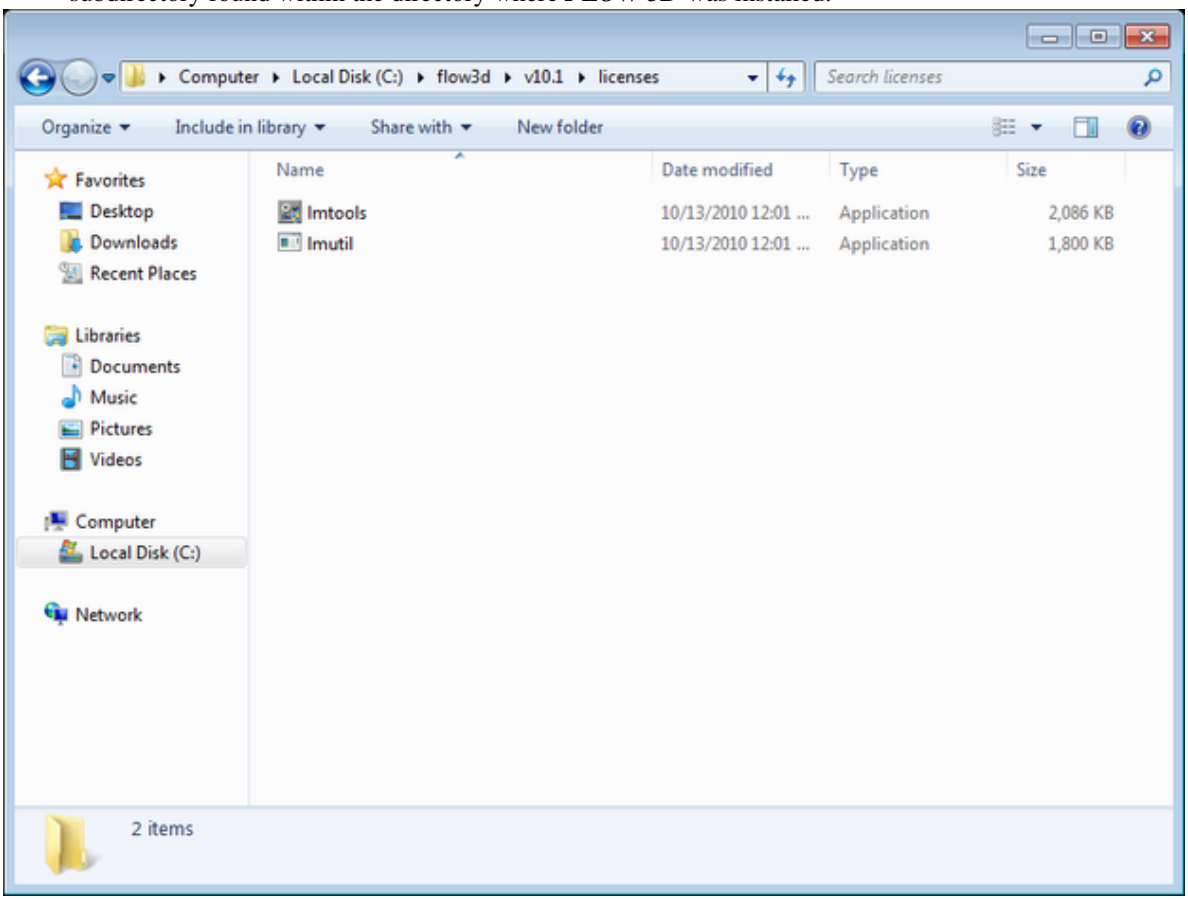
2.2.3 Moving License Servers

When a floating license is locked to a fixed host ID, such as an Ethernet address or host ID, it is recommended that users choose a server which is likely to be used for the duration of the license. Changing license servers can be done once a year without incurring a re-licensing fee. Re-licensing fees are not necessary (maximum one change per year) when users use a USB or parallel port hardware key (dongle) as their host ID. To move the dongle (and hence license server) to a different computer, the user may change the first line in the license file to reflect the computer name change. For example, if the license server was previously running on a server named Celsius and will be moved to Kelvin, the first line in the license file would be changed from `SERVER Celsius FLEXID= "your ID"` to `SERVER Kelvin FLEXID= "your ID"`.

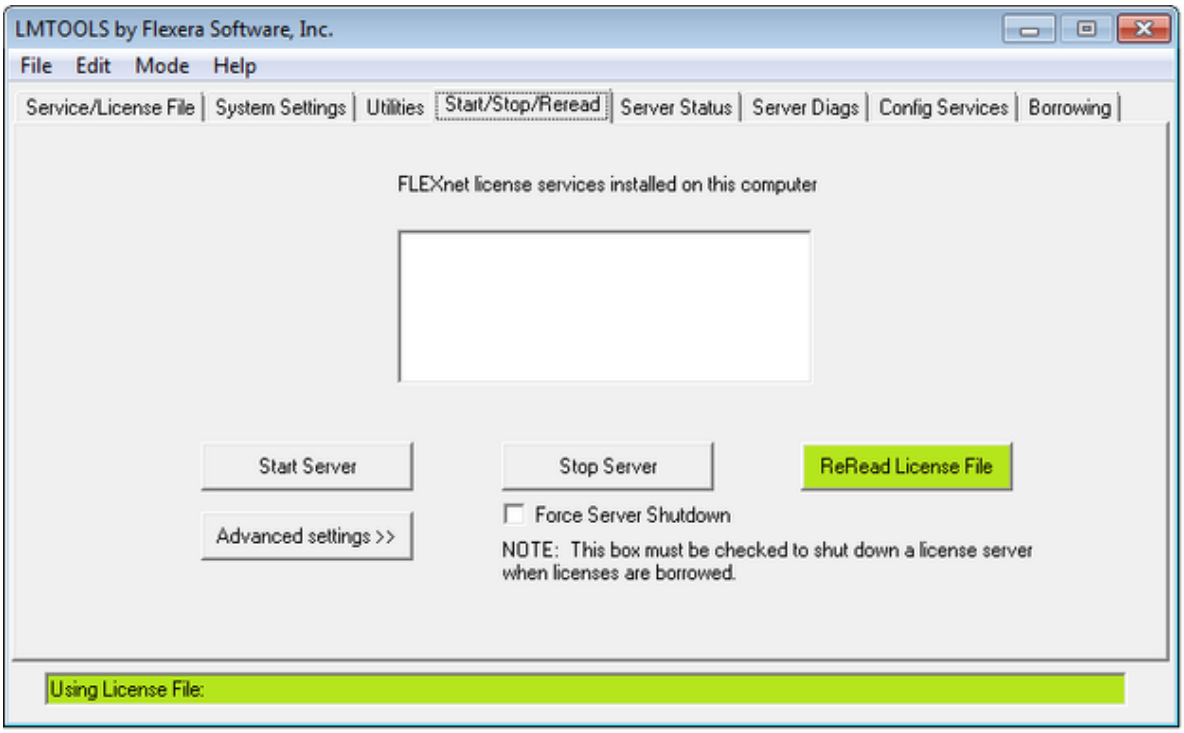
2.2.4 Installing a New/Replacement License File

Windows

1. When a new or replacement `flow3d.lic` is received from the License Administrator, place it into the **licenses** subdirectory found within the directory where ***FLOW-3D*** was installed.

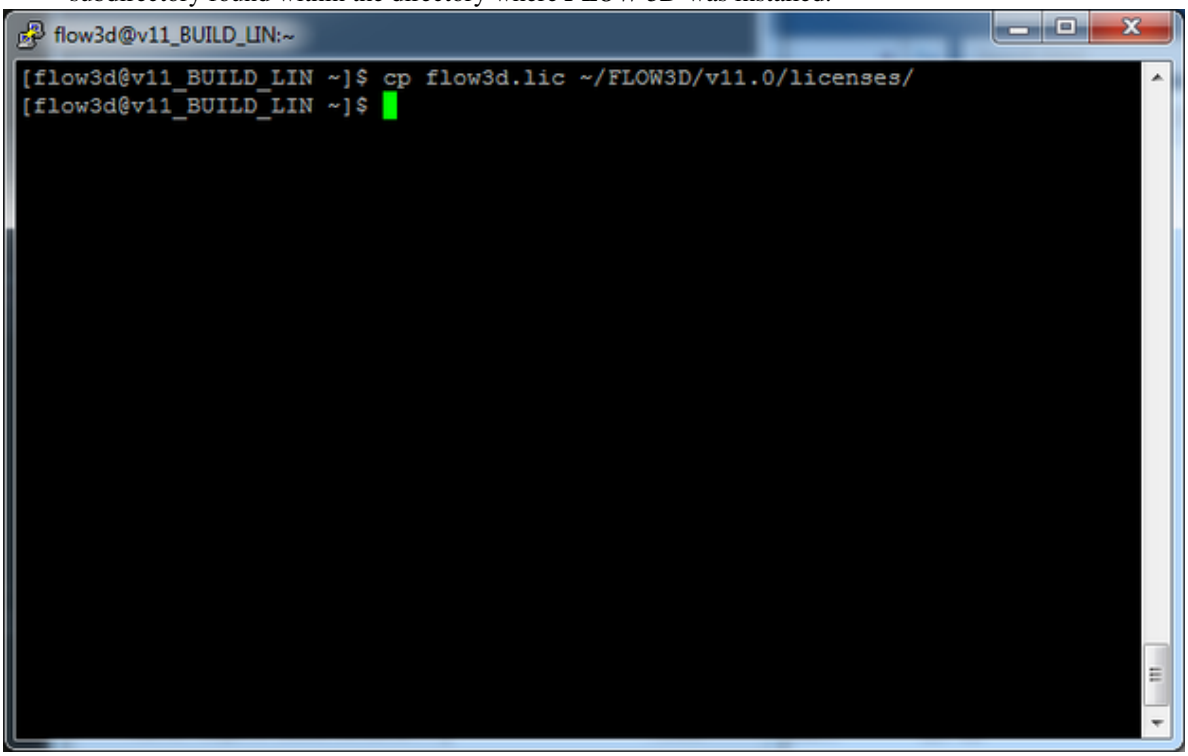


2. Start the **LMTOOLS** utility, from either this directory, the shortcut on the desktop, or the icon in the *Start Menu*. Click the *Start/Stop/Reread* tab. Verify that the license file is in the correct location by checking the directory shown (highlighted in the figure below). If correct, click the *ReRead License File* button (also highlighted).



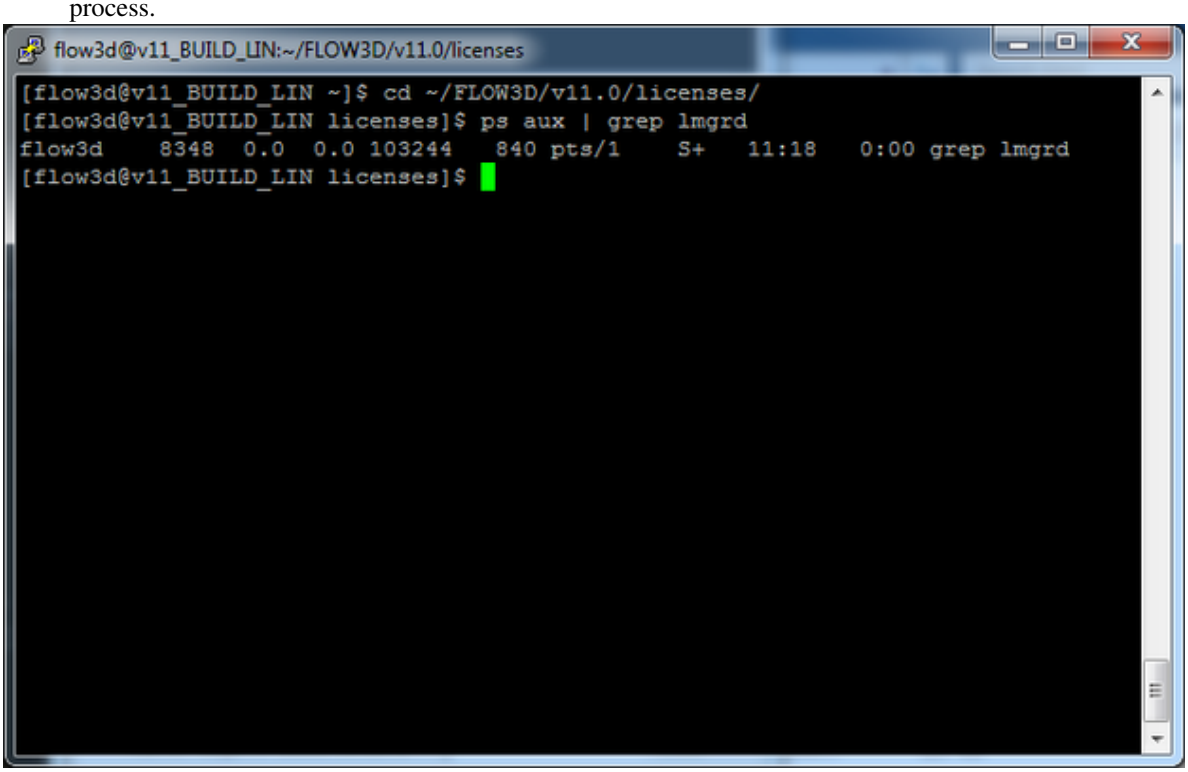
Linux

1. When a new or replacement `flow3d.lic` is received from the License Administrator, place it into the **licenses** subdirectory found within the directory where ***FLOW-3D*** was installed.

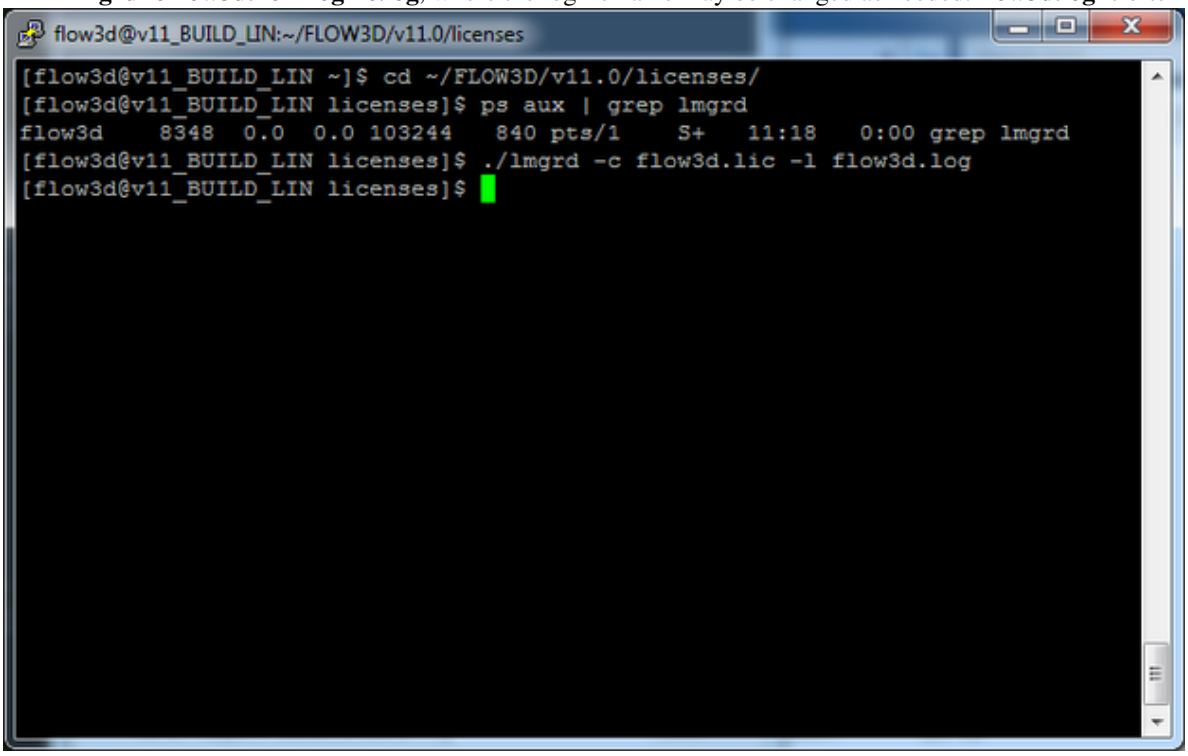


2. Check whether the license server is running using **ps aux | grep lmgrd**. This will provide the PID of any running

license servers. They can be killed using **kill (PID)**. It is not recommended to use **kill -9** on a running lmgrd process.



3. It is recommended to run the license server as a user, not as root. The command to start the new lmgrd process is **lmgrd -c flow3d.lic -l logfile.log**, where the logfile name may be changed as needed. **flow3d.log** is often used.



2.2.5 Troubleshooting License Problems

Windows

This guide provides a series of steps that can be used to diagnose and resolve licensing issues with ***FLOW-3D***. Feel free to contact our support staff at support@flow3d.com or at (505) 982-0088 if you have trouble at any point.

1. Close any open instances of ***FLOW-3D*** and close *RunnerServer.exe* (an application running in the task tray). After closing ***FLOW-3D***, confirm that there are no instances of *flow3d.exe*, *hydr3d.exe*, *RunnerServer.exe*, *guiobs.exe*, or *flscon.exe* running by looking at the processes tab of the task manager. If there are, terminate the process.
2. Verify that the correct install option was chosen.
   (a) **Client**: You intend to run ***FLOW-3D*** on this computer but will install the license server on another computer.
   (b) **Server / Client**: You intend to run both ***FLOW-3D*** and the license server on this computer.
   (c) **Server**: You are only installing the license server on this computer.

   If the *Server or Server/Client* installation was not selected for the machine running the license server you will need to run the *Server* installation on this computer. You can check if the necessary software was installed by looking for the files *F3DTKNUX.exe* and *lmgrd.exe* in the licenses folder of the installation directory on the server machine. If they are in this folder then the server software was installed.
3. Verify that the license file (*flow3d.lic*) is in the correct location. It should be in the licenses subfolder of the installation directory on the server machine (e.g. `C:\flow3d\v11.0\licenses`).
4. Make sure you are using the correct license file for your server machine. You will need to open the license file (*flow3d.lic*) in a text editor on the server machine.
   (a) Make sure the server machine computer name (or IP address) matches what is in the license file. This parameter may be edited in the license file to match the computer.
      i. The first line of the license file will read `SERVER <name> ...`
      ii. The computer name, `<name>`, can be found from *My Computer* → *Properties*. Alternatively, the IP address can be found by opening a command prompt and typing `ipconfig -all`. The IP address looks like: `xx.x.x.xxx`.
   (b) If you were sent a USB dongle:
      i. Verify that the dongle is plugged into the server machine and that the red light on the dongle is lit.
      ii. Make sure that the dongle matches the license file
         A. Compare the flexID marked on the dongle with the one at the top of the license file (open in a text editor). The first line of the license file should look like: `SERVER <name> FLEXID=<flexID> <port>` , where `<flexID>` is a string of numbers and characters and cannot be modified.The dongle flexID must match what is specified in the license file.
         B. This can also be checked by opening LMTOOLS, located in the licenses folder of the install directory, and viewing the FLEXID box on the system settings tab.
   (c) If your license is locked to an Ethernet (MAC) address:
      i. Make sure the server network card physical address matches what is specified in the license file. The value in the license file cannot be changed.
         A. The first line of the license file will read `SERVER <name> <physical address> <port>`

B. The server network card physical address, <physical address>, can be found by opening a command prompt and typing ipconfig -all. The server network card physical address looks like: xx-xx-xx-xx-xx-xx

5. Check that the necessary environment variables are set on the client machines.
   (a) Right-click on the ***FLOW-3D*** icon and choose *Edit*.
   (b) Verify that the following variables have the correct values. Note that the values below are based on the default install location.
      i. F3D_HOME = C:\flow3d\v11.0 (the ***FLOW-3D*** installation directory)
      ii. PATH = C:\flow3d\v11.0\local
      iii. F3DTKNUX_LICENSE_FILE = @xx.x.x.xxx (this should point to the server IP address preceded by the @ symbol)
6. Verify that the firewall on the server machine has exceptions for the license daemons.
   (a) Go to *Start* → *Control Panel* → *Windows Firewall*.
   (b) Click *Allow a program or feature through Windows Firewall*.
   (c) Verify that *FLOW-3D_v11_license_daemon* and *FLOW-3D_v11_vendor_daemon* are in the list and checked for the appropriate networks. If not, choose *Allow another program...* and browse to the licenses folder of the installation directory and add exceptions for *lmgrd.exe* and *F3DTKNUX.exe.*
7. Now restart the license server and reread the license file on the server machine.
   (a) Open a command prompt and change to the licenses folder in the install directory (e.g. cd c:\flow3d\v11.0\licenses)
   (b) Type lmutil lmdown -c flow3d.lic to shut down any running license daemons
   (c) Type lmgrd -c flow3d.lic -l flow3d.log to restart the server. You may be notified that the firewall is blocking the license daemons. If this is the case, allow exceptions for *F3DTKNUX.exe* and *lmgrd.exe*
   (d) Perform a status check by typing lmutil lmstat -c flow3d.lic. This will display the server status. It should now report:

```
[Detecting lmgrd processes...]
License server status: <port>@<name>
License file(s) on <name>: @<IPaddress>
License file(s) on <name>: <licensepath>: <name>: license server UP (MASTER) v11.9
Vendor daemon status (on <name>): F3DTKNUX: UP v11.9
```

   Where <port> is the port number being used by the server, <name> is the name of the computer running the server (as it appears on the network), <IPaddress> is the IP address of the server, and <licensepath> is the full directory location of the license file (*flow3d.lic*). Note that running multiple license servers on the same machine may result in conflicts in port usage. If there is a conflict, change (or add) the port number, <port>, in the license file and repeat step 6. The default port number is 27000.
8. You should now be able to launch and run ***FLOW-3D***.

Linux

This guide provides a series of steps that can be used to diagnose and resolve licensing issues with ***FLOW-3D***. Feel free to contact our support staff at support@flow3d.com or at (505) 982-0088 if you have trouble at any point.

1. Close any open instances of ***FLOW-3D*** and close *RunnerServer.exe*. It is. worth verifying that there are no instances of *flow3d.exe*, *RunnerServer.exe*, *hydr3d.exe*, *guiobs.exe*, or *flscon.exe* running by typing `ps -A | grep flow3d`, `ps -A | grep hydr3d`, etc. If something is running it can be stopped using the kill command.
2. Verify that the correct install option was chosen.
   (a) **Client**: You intend to run ***FLOW-3D*** on this computer but will install the license server on another computer.
   (b) **Server / Client**: You intend to run both ***FLOW-3D*** and the license server on this computer.
   (c) **Server**: You are only installing the license server on this computer.

   If the *Server* or *Server/Client* installation was not run on the machine running the license server you will need to run the Server installation on this computer. You can check if the server software was installed by looking in the licenses folder of the installation directory on the server machine for the files *F3DTKNUX.exe* and *lmgrd.exe*. If they are in this folder then the server software was installed.
3. Verify that the license file (*flow3d.lic*) is in the correct location. It should be in the licenses subfolder of the installation directory on the server machine (e.g. `/home/flow3d/v11.0/licenses`).
4. Make sure you are using the correct license file for your server machine. You will need to open the license file (*flow3d.lic*) in a text editor (or using more) on the server machine.
   (a) Make sure the server machine computer name (or IP address) matches what is in the license file. This parameter may be edited in the license file to match the computer.
      i. The first line of the license file will read `SERVER <name> ...`
      ii. The IP address, `<name>`, can be found by entering `/sbin/ifconfig` in to a terminal. The eth0 section will contain the information. The IP address is called inet addr and looks like: `xx.x.x.xxx`
   (b) If you were sent a USB dongle (RHEL only):
      i. Verify that the dongle is plugged into the server machine and the red light on the dongle is lit.
      ii. Make sure that the dongle matches the license file
         A. The first line of the license file should look like: `SERVER <name> FLEXID=<flexID> <port>` , where `<flexID>` is a string of numbers and characters.
         B. The flexID is marked on the dongle and at the top of the license file (open in a text editor). The dongle flexID must match what is specified in the license file and the value in the license file cannot be modified.
         C. This can also be checked by opening LMTOOLS, located in the licenses folder of the install directory, and viewing the FLEXID box on the system settings tab
   (c) If your license is locked to an Ethernet (MAC) address:
      i. Make sure the server network card physical address matches what is specified in the license file. The value in the license file cannot be changed.
         A. The first line of the license file will read `SERVER <name> <physical address> <port>`.
         B. The server network card physical address, `<physical address>`, can be found by entering `/sbin/ifconfig` into a terminal. The eth0 section will contain the information. The server network card physical address is called HWaddr and looks like: `xx-xx-xx-xx-xx-xx`
5. Check that the necessary environment variables are set on the client machines. The easiest way to do this is to run one of the included shell or c-shell files.

(a) Open a terminal and change to the local directory in the install directory (e.g. `cd /home/flow3d/v11.0/local`)

(b) Type `more flow3dvars.sh` (or `more flow3dvars.csh`) and verify that the environment variables are correct. The variables and example definitions are shown below. If the definitions are incorrect they can be fixed using a text editor like vi.

i. `export F3D_HOME = /home/flow3d/v11.0`: This should point to the ***FLOW-3D*** installation directory.

ii. `export F3D_VERSION=double`: Sets the default solver type to double-precision.

iii. `export PATH=$F3D_HOME/local:$PATH`: Tells the file system where to find the ***FLOW-3D*** executable

iv. `ulimit -s unlimited`: This unlimits the stack size. Not doing this is a common cause of segmentation faults.

v. `export F3D_HELP=/usr/bin/firefox` (default browser for help files)

vi. `export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$F3D_HOME/gui/lib`

vii. `export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$F3D_HOME/gui/lib/qt`

viii. `export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$F3D_HOME/gui/lib/ifort`

ix. `export F3DTKNUX_LICENSE_FILE = @xx.xx.xx.xxx`: This variable is used on client machines and should point to the server name or IP address.

(c) Type `source flow3dvars.sh` (or `source flow3dvars.csh`) to set the variables defined in the shell (or c-shell). This command will need to be called every time a new terminal is opened to launch ***FLOW-3D***. Alternatively, this command can be added to the .bashrc file to make this an automatic process.

6. Now restart the license server and reread the license file on the server machine

(a) Open a terminal and change to the licenses directory in the install directory (e.g. `cd /home/flow3d/v11.0/licenses`)

(b) Type `./lmdown -c flow3d.lic` to shut down the running license daemons

(c) Type `./lmgrd -c flow3d.lic -l flow3d.log &` to restart the server

i. The `&` is to run the daemons in the background

ii. You may need to allow firewall exceptions for *F3DTKNUX.exe* and *lmgrd.exe*

(d) Type `./lmreread -c flow3d.lic` to reread the license file

(e) Perform a status check by typing `./lmstat -c flow3d.lic`. This will display the server status. It should now report:

```
[Detecting lmgrd processes...]
License server status: <port>@<name>
License file(s) on <name>: @<IPaddress>
License file(s) on <name>: <licensepath>: <name>: license server UP (MASTER) v11.9
Vendor daemon status (on <name>): F3DTKNUX: UP v11.9
```

Where `<port>` is the port number being used by the server, `<name>` is the name of the computer running the server (as it appears on the network), `<IPaddress>` is the IP address of the server, and `<licensepath>` is the full directory location of the license file (*flow3d.lic*).

(f) Note that running multiple license servers on the same machine may result in conflicts in port usage. If there is a conflict, change (or add) the port number, `<port>`, in the license file and repeat step 6. The default port number is 27000.

7. You should now be able to launch and run ***FLOW-3D***.

2.3 Installation Procedure

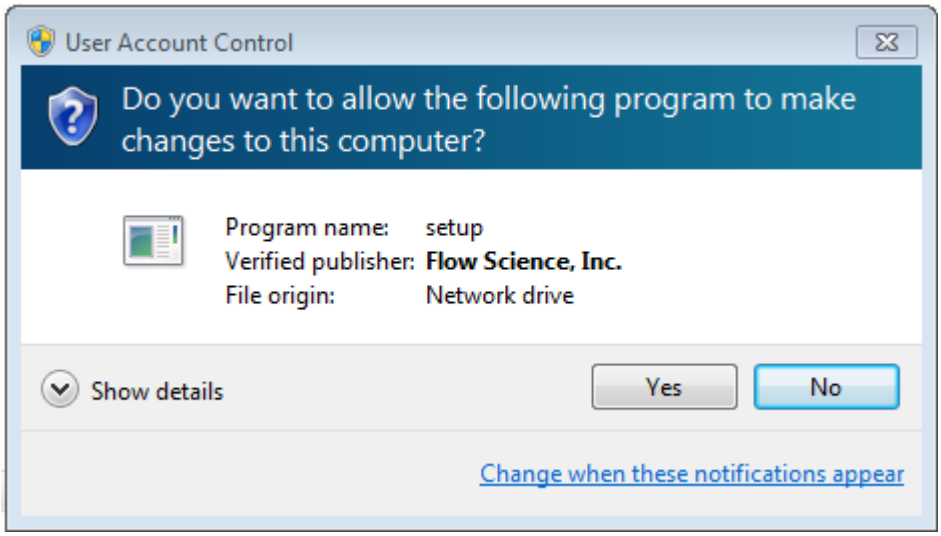
2.3.1 Windows Installation

Note:

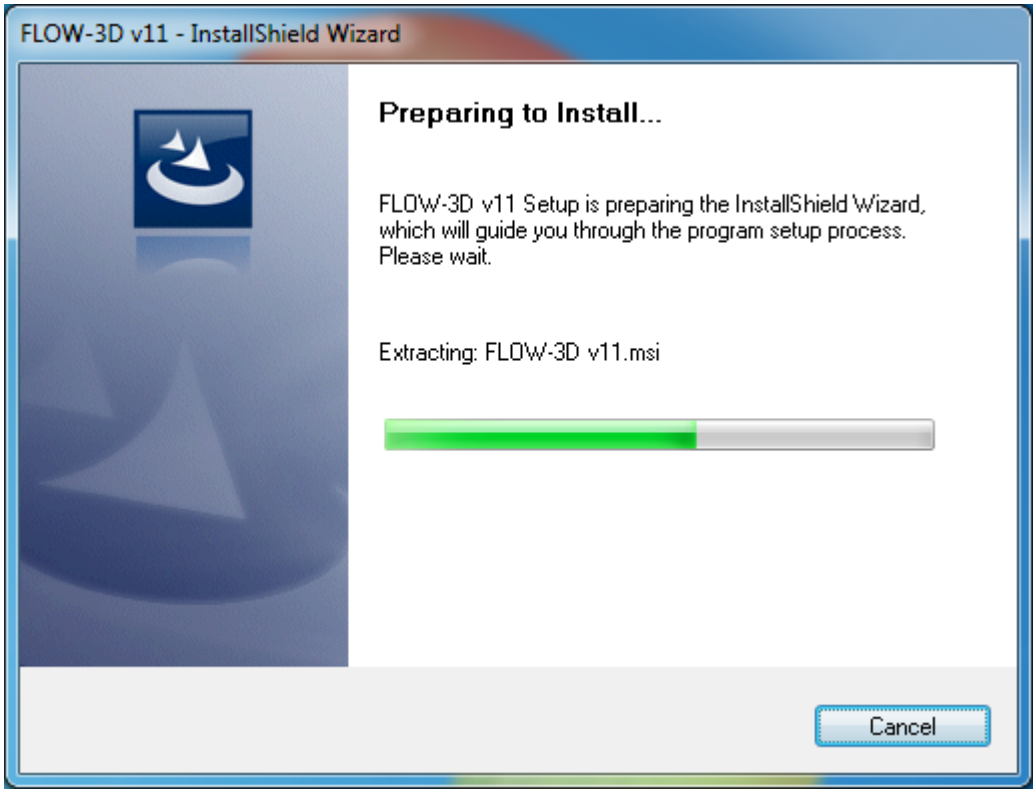
- Administrator privileges are necessary to install ***FLOW-3D*** on **Windows**. Before installing, please close all other running programs.
- If installing on a machine that has ***FLOW-3D*** version 10.1 installed, please close any running copies of **RunnerServer.exe**. This can be done by right-clicking the green "running person" icon in the system tray and choosing *Quit* or by using the Windows Task Manager and stopping any RunnerServer.exe processes shown in the *Processes* tab. It may be necessary to click the *Show Processes from All Users* button. The RunnerServer process may be chosen and the *End Process* button can then be clicked to close the program.
- If installing on the **Windows 8** operating system, please consult the *Special Considerations for Windows 8*.

The installation can be started by double clicking the downloaded **flow3d.exe** file.

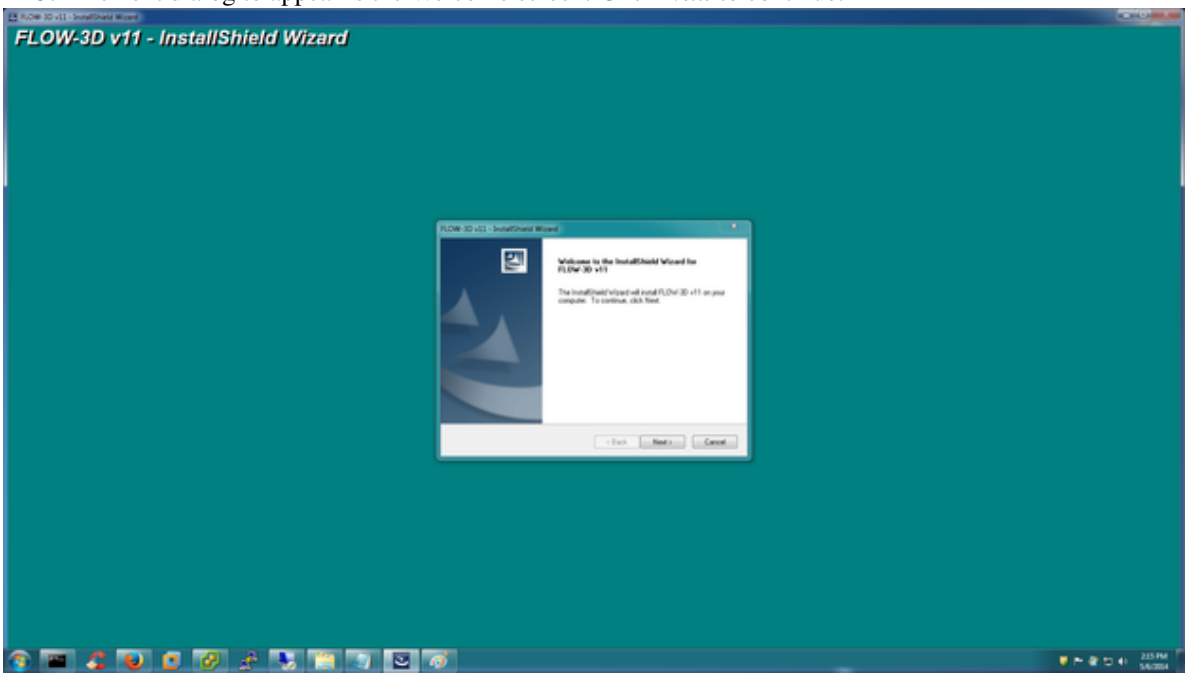
1. On **Windows** operating systems, a User Account Control dialog, similar to the one below, will appear. The "Verified publisher" entry should confirm that the executable has been digitally signed by Flow Science, Inc.



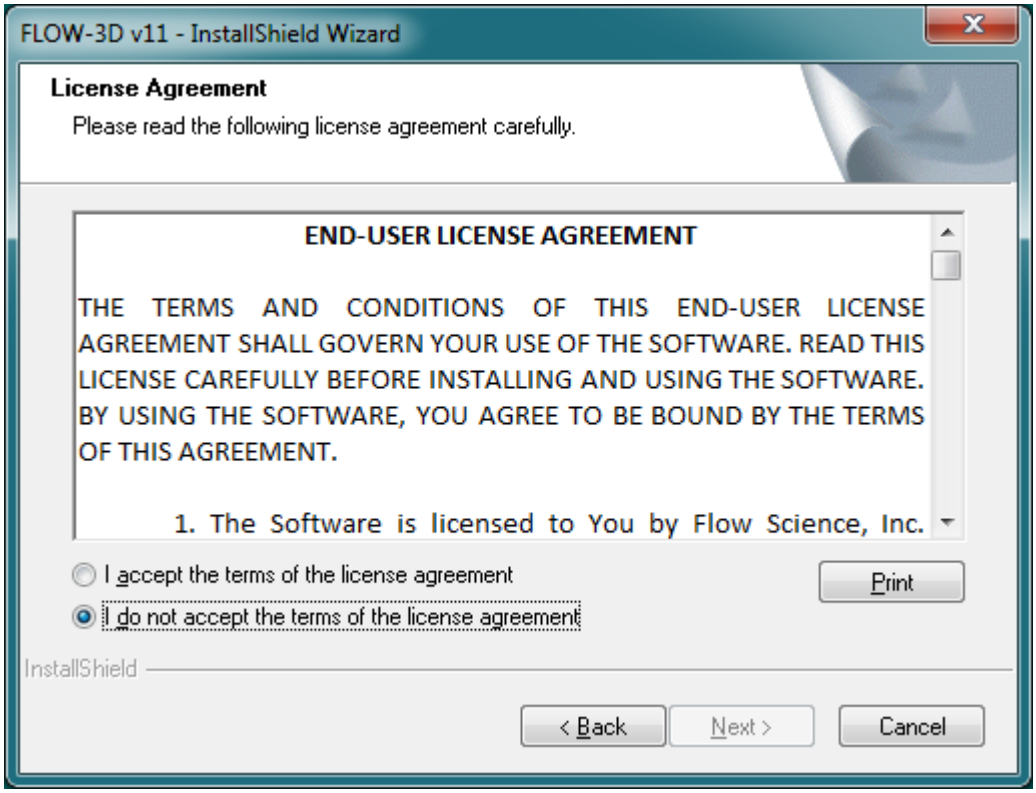
2. Next, the Preparing to Install dialog will be displayed. It requires no user input and will disappear after several seconds.



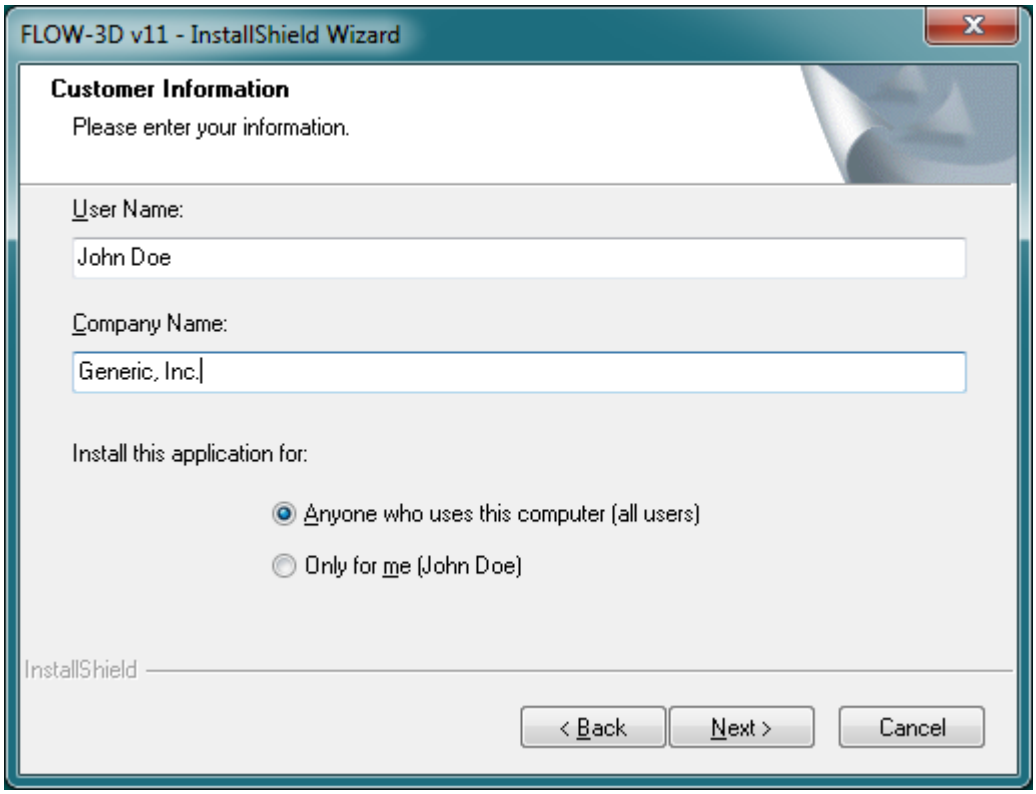
3. The next dialog to appear is the Welcome screen. Click *Next* to continue.



4. The next dialog is the ***FLOW-3D*** end user license agreement. Please read it carefully. If all the terms are acceptable, click the *Next* button to signify agreement and move to the next dialog.

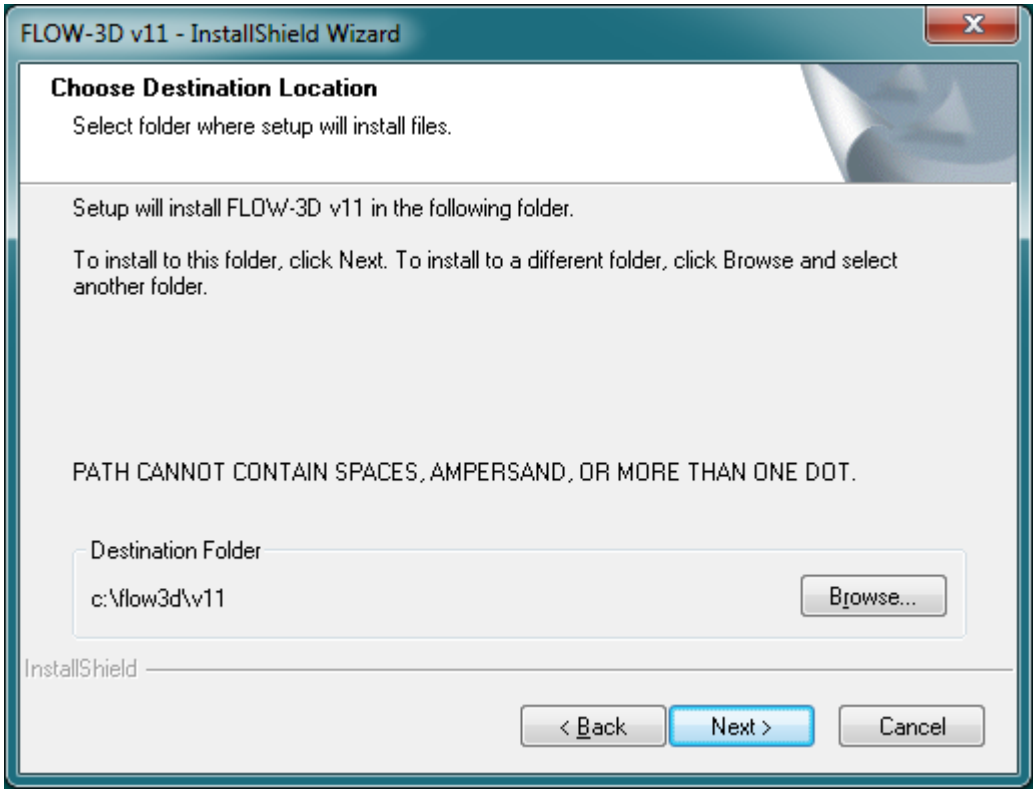


5. This dialog collects user information. Enter user and company names and click *Next* to move forward.

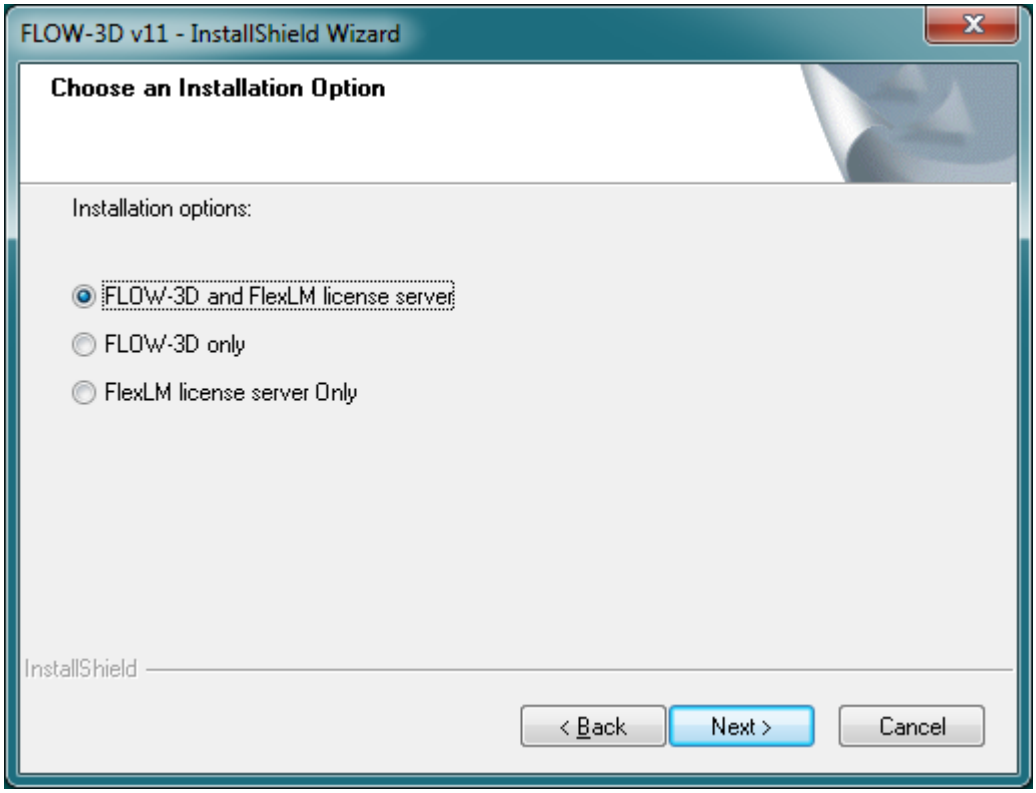


6. Now the install location can be chosen. The default directory can be used, or ***FLOW-3D*** can be installed to a specific directory. Once the location is chosen, click *Next*. When installing to a different location, it is important

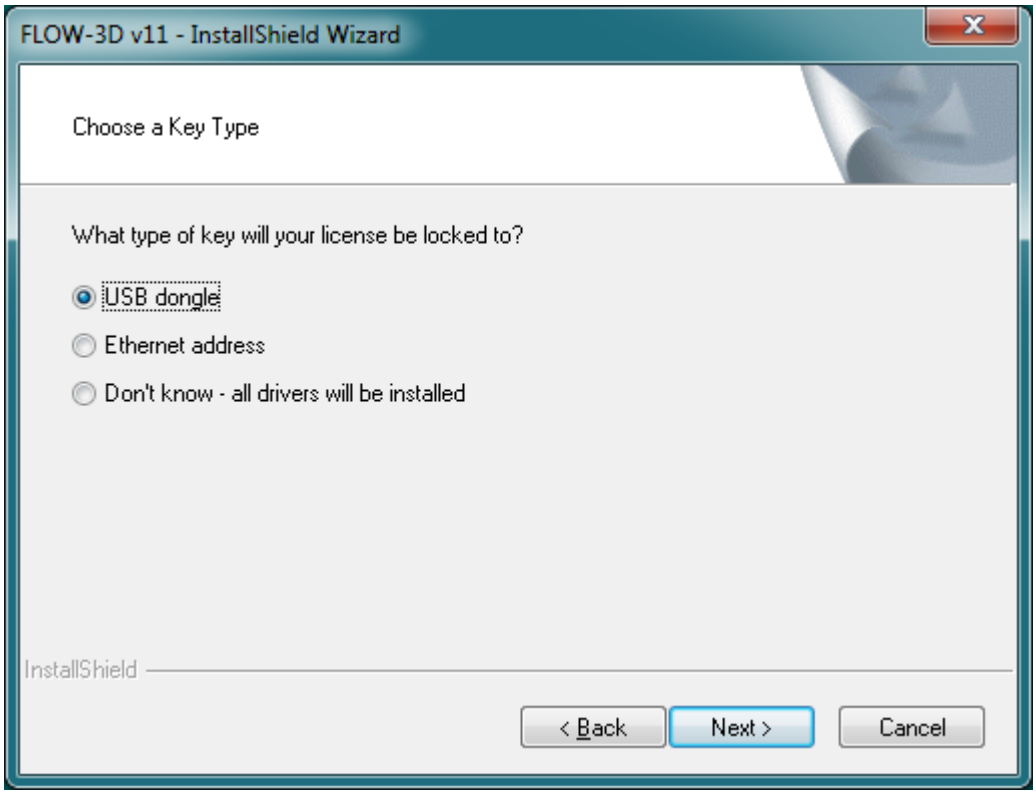
that the directory name not contain spaces, ampersand characters, or multiple dots.



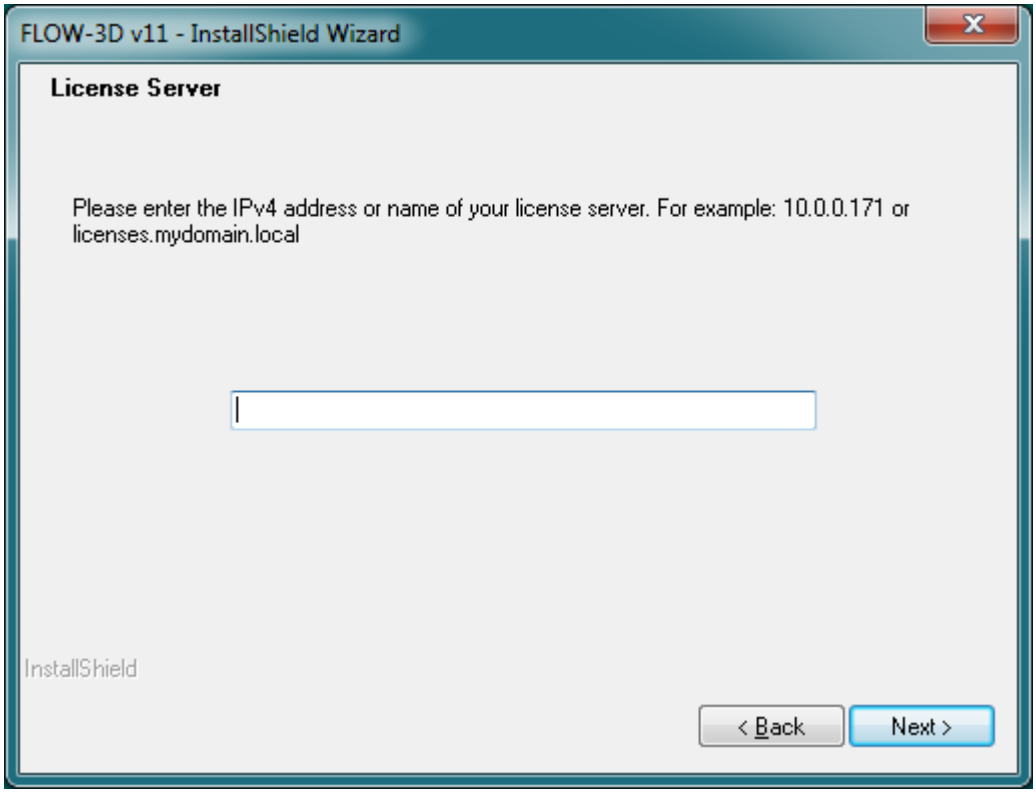
7. The installation options are shown. Choose *FLOW-3D and FlexLM license server* if this computer should contain both the ***FLOW-3D*** software and the license server software. Choose *FLOW-3D only* if the license server software i running on a different computer on the network. *FlexLM license server only* installs only the license server components; the GUI and Solver will not be installed. A *FLOW-3D only* install would then be required for machines that will connect to this license server. If the machine is intended to act as a remote server with the new Remote Solving feature, an Installation Option that includes ***FLOW-3D*** should be chosen.



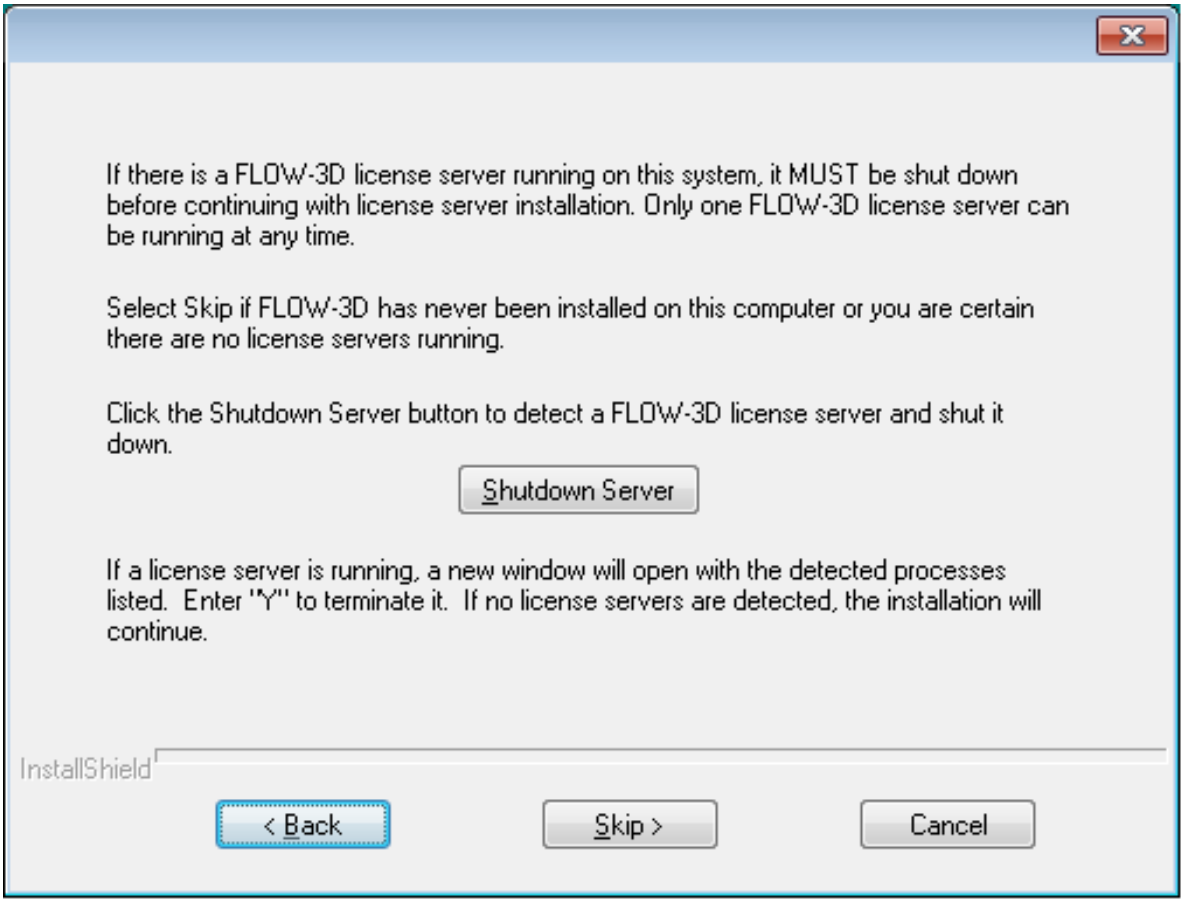
8. If the *FLOW-3D and FlexLM license server* or *FlexLM license server only* installation option was chosen in the previous step, this dialog will appear. This choice determines the appropriate drivers. The *USB dongle* or *Don't know* options will install special drivers for the FlexLM USB key.



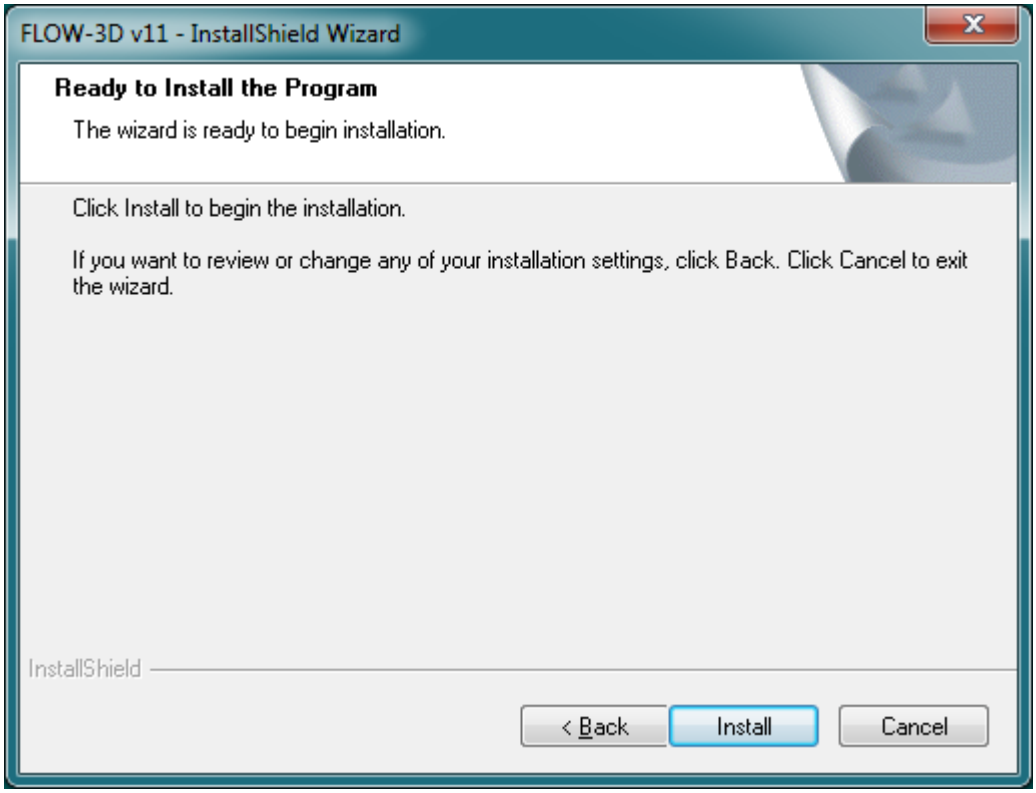
9. If the *FLOW-3D only* installation option was chosen, this dialog will be shown instead. It allows an IPv4 address or a server name to be specified for the license server. If unknown, the IP address can be found by opening the command prompt and entering **ipconfig /all** on the license server machine. The name can be determined by opening a command prompt or terminal window and issuing the command **hostname**. When using a hostname, the server should respond to **ping** requests. The name required may differ based on the network. For example, a machine may respond to **ping host.company.com** but not to **ping host**. If this is the case, the full name must be used. If the hostname entered is not reachable, the client will not be able to check out a license.



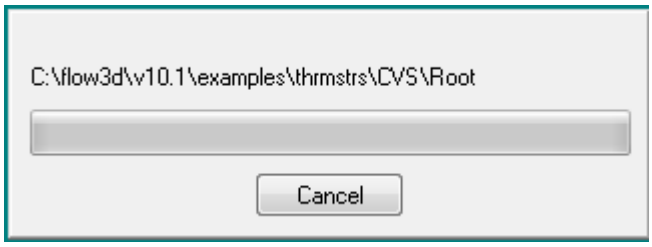
10. If a license server is being installed, ***FLOW-3D*** will ask to temporarily shut down any existing license servers. This allows the ***FLOW-3D*** license as well as **FlexLM** licenses from other vendors to be served. This can only be skipped safely when no other software that uses **FlexLM** licensing is installed, including older versions of ***FLOW-3D***.



11. ***FLOW-3D*** is now ready to install.



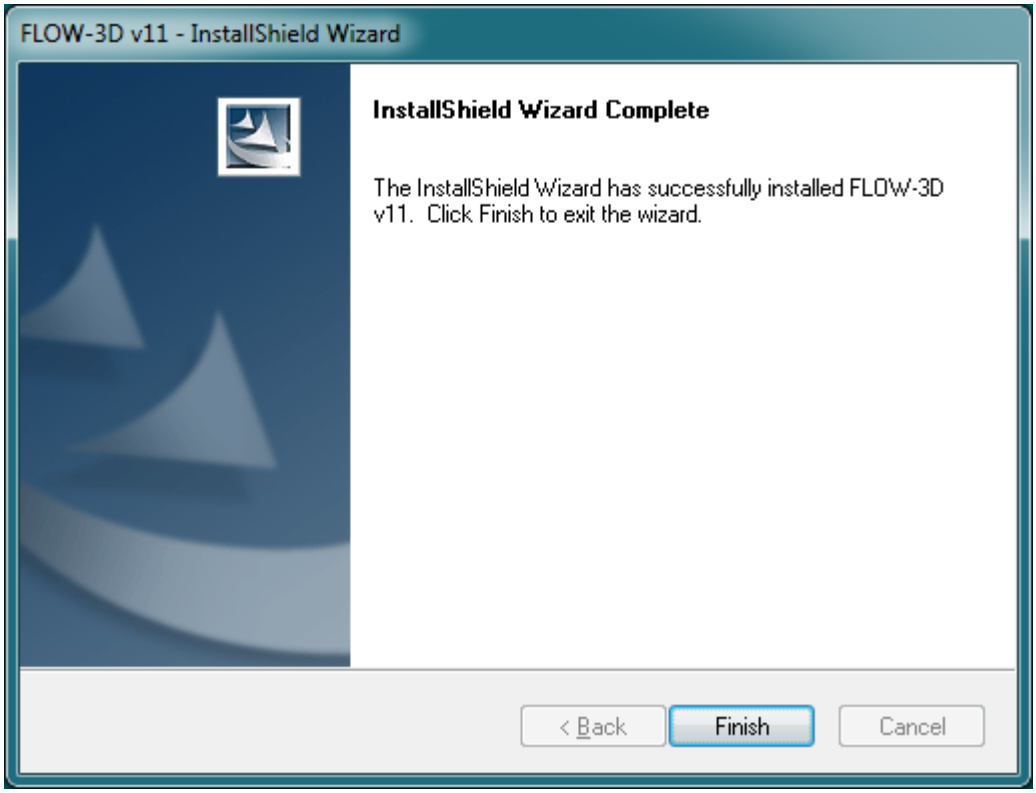
12. The ***FLOW-3D*** installer will copy the necessary files.



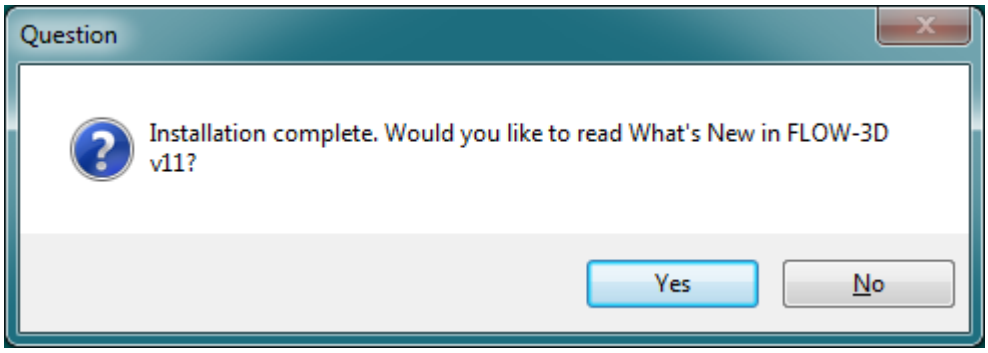
13. Next, the installer will create firewall exceptions to allow communication to remote license servers and for the new remote solving capability.

14. Finally, the Microsoft Visual C++ redistributables will be installed.

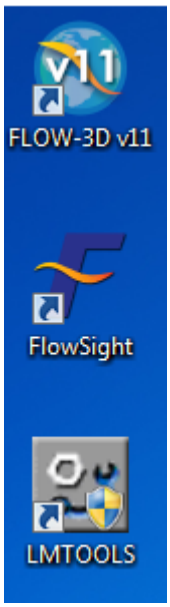
15. The installation is now complete.



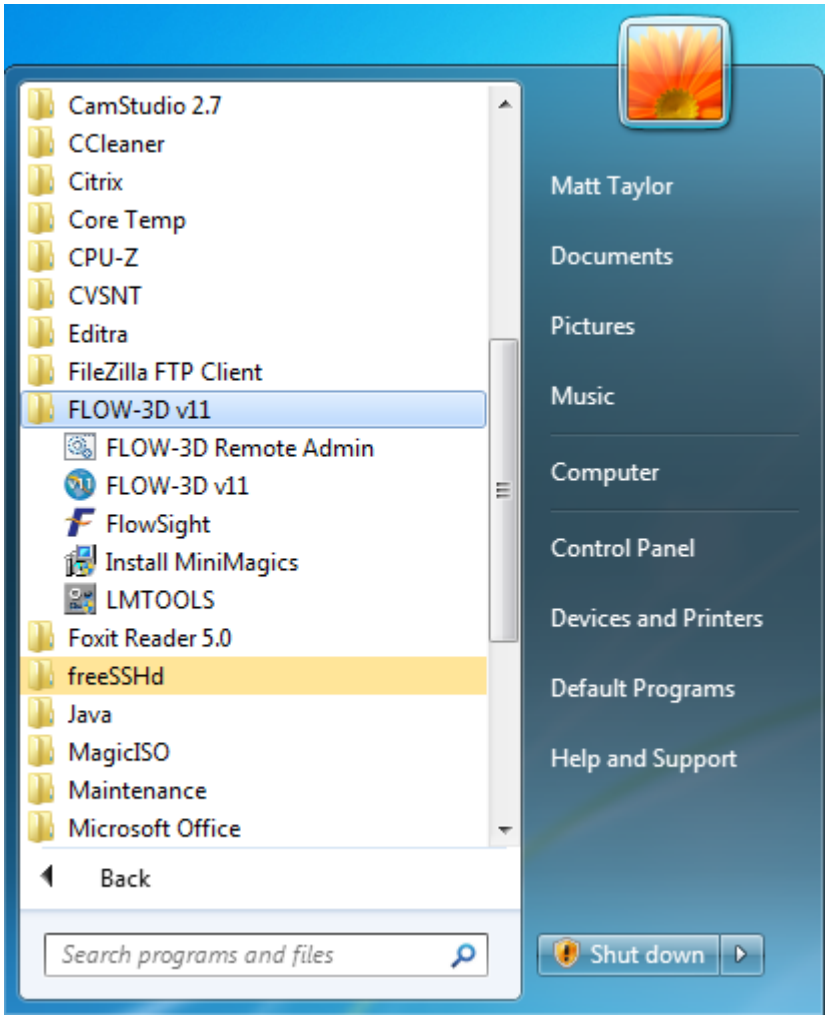
16. After installation, an opportunity is presented to learn about new features.



17. The ***FLOW-3D***, FlowSight, and **LMTOOLS** icons will now appear on the desktop. LMTOOLS allows for interaction and configuration of local or remote license servers.



18. Also, there will be a new *Program Group* in the **Windows** *Start Menu*.



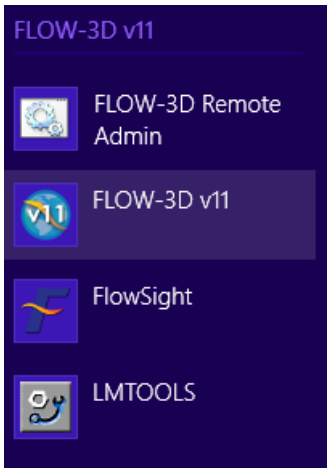
Special Considerations for Windows 8

Flow Science highly recommends updating **Windows 8** to **version 8.1 Update 1** (or the newest version available) before installing ***FLOW-3D***.

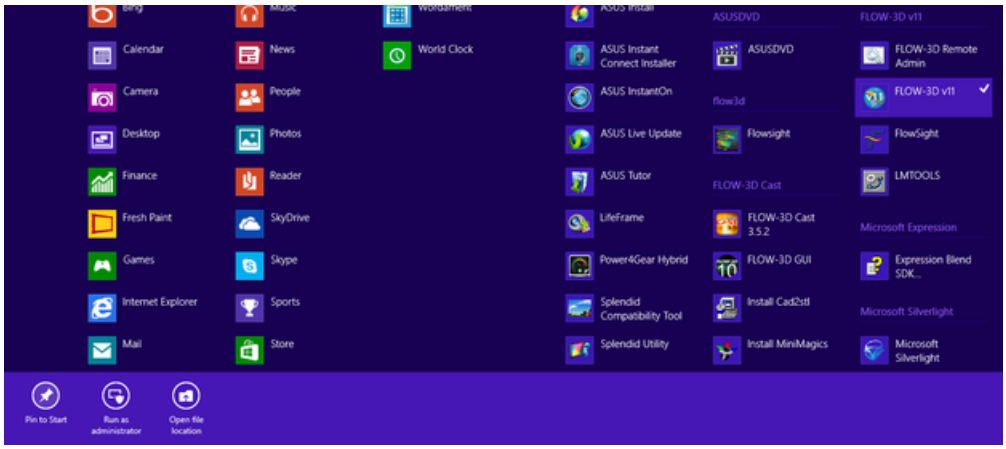
- On all versions of the **Windows 8** operating system, including those which have been updated, the following considerations apply:
  - Secure boot must be disabled for the **Sentinel HASP USB drivers** to install. Please see http://technet.microsoft.com/en-us/library/dn481258.aspx for the procedure.
  - The "Creating Firewall Exceptions" dialog is not shown. However, the firewall exceptions are created.
- When the **Windows 8** operating system has not been updated, the desktop icons are not created by the installer automatically.
  - One potential solution is to install a third-party Start Menu replacement, such as **Classic Shell** or **Start8**. If a Start Menu replacement is installed prior to installing ***FLOW-3D***, the icons will be created correctly.
  - Another option is to use the Modern interface *All Apps* view. This can be done by right-clicking the Start Screen, then clicking *All Apps* at the lower right.

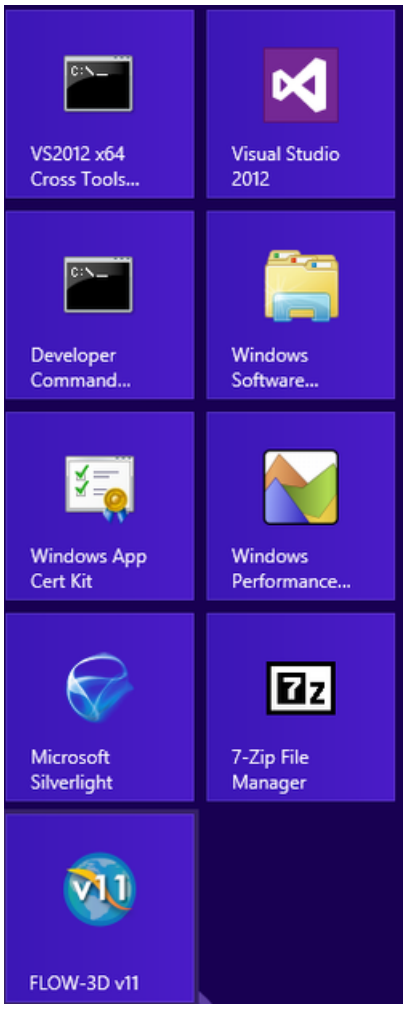
    There will be a Program Group for ***FLOW-3D***.

    Right-click one of the icons and choose *Pin to Start* at the lower left to place the icon on the main Start Screen.



The icon should now appear on the main Start Screen and can be used to launch the program.



2.3.2 Linux Installation

FLOW-3D for Linux is distributed as a gzip-compressed tar archive, often called a tarball. The installation files can be extracted from `flow3d.tar.gz` in a terminal window, using the command **tar -xzvf flow3d.tar.gz**. The tarball can

be unpacked into any directory on the filesystem using the -C flag. For example, to extract the tarball to /home/user, use **tar -xzvf flow3d.tar.gz -C /home/user**

Once in the directory where the installation files exist, or to which they have been unpacked, the script `install` can be run. A preceding dotslash may be necessary depending on whether the current directory is on the system PATH (i.e., **./install**). By default, this file is executable. ***FLOW-3D*** is only supported on Red Hat Enterprise Linux 6 or newer and SUSE Linux Enterprise 11 SP2 or newer. It may be possible to install on other distributions, but due to potential library and package differences, Flow Science does not provide technical assistance on these distributions.

Note:

- SUSE Linux 11 must be at Service Pack 2 or greater
- For SUSE Linux *Client/Server* or *Server* installations, the **lsb-base** package is required. If it is not found, the installation script will output a reminder.
- The FlowSight visualization software requires libstdc++.so.5. These can be installed as follows:
  - RHEL: 'yum install compat-libstdc++-33'
  - SUSE: 'zypper install libstdc++33'

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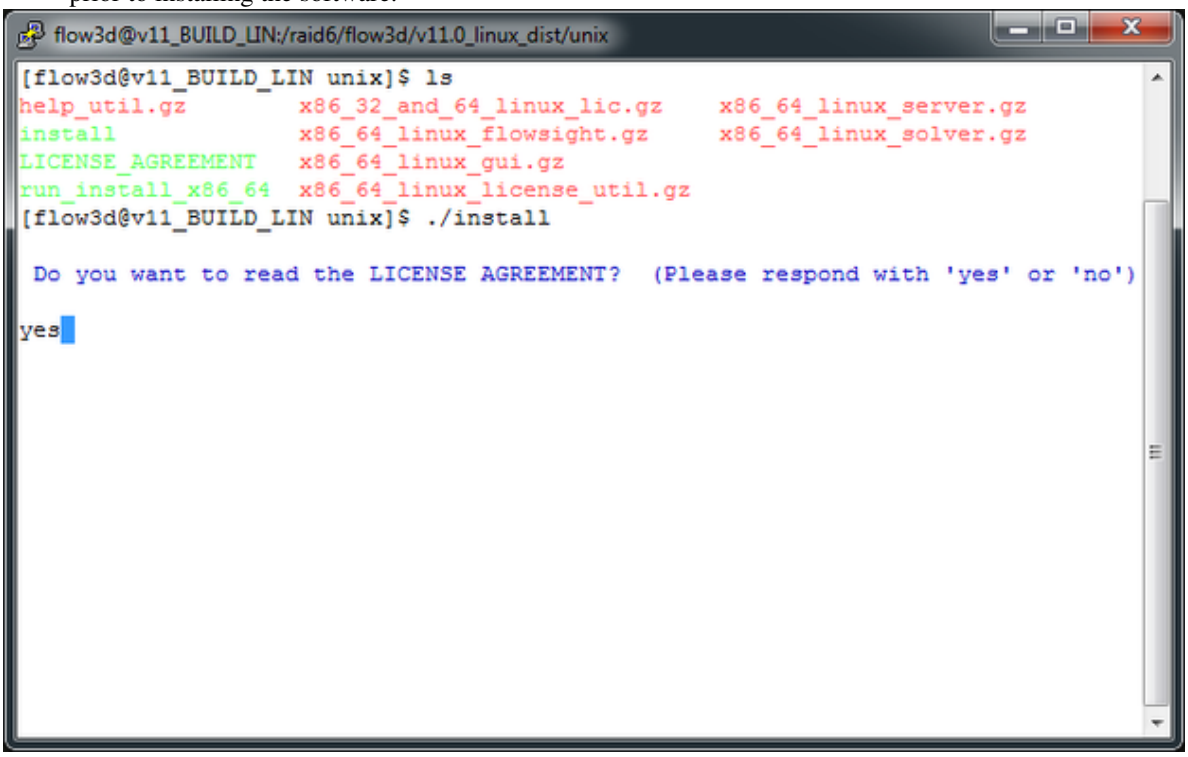
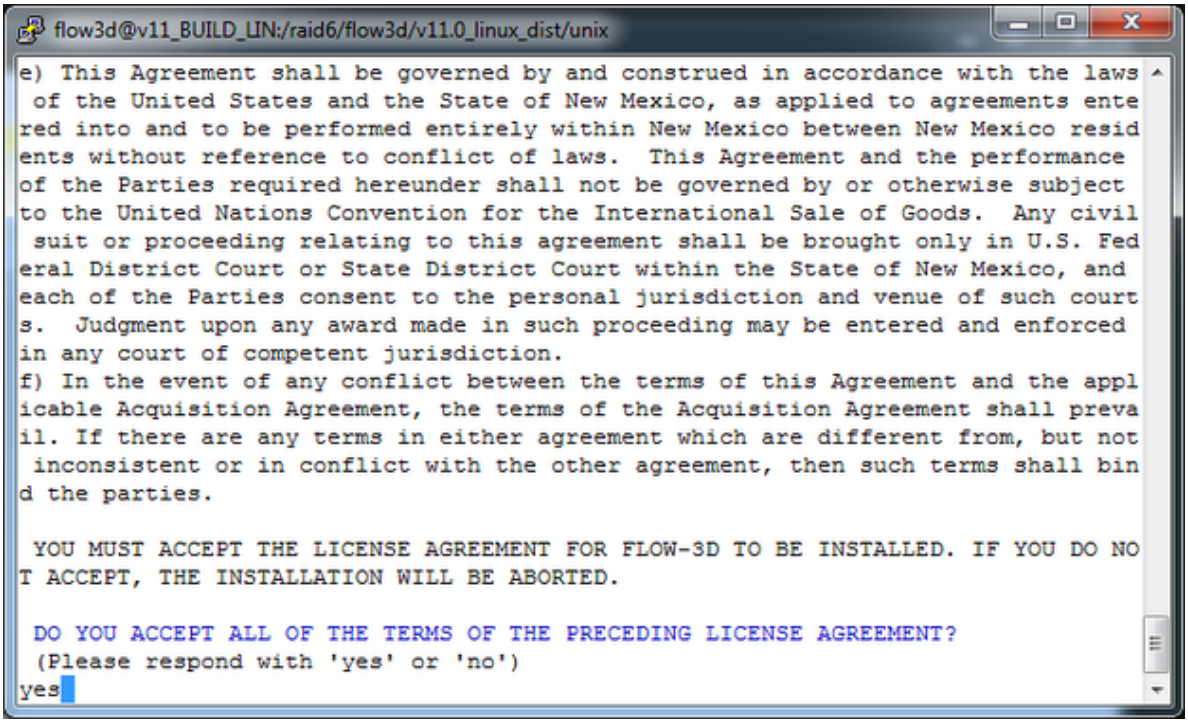
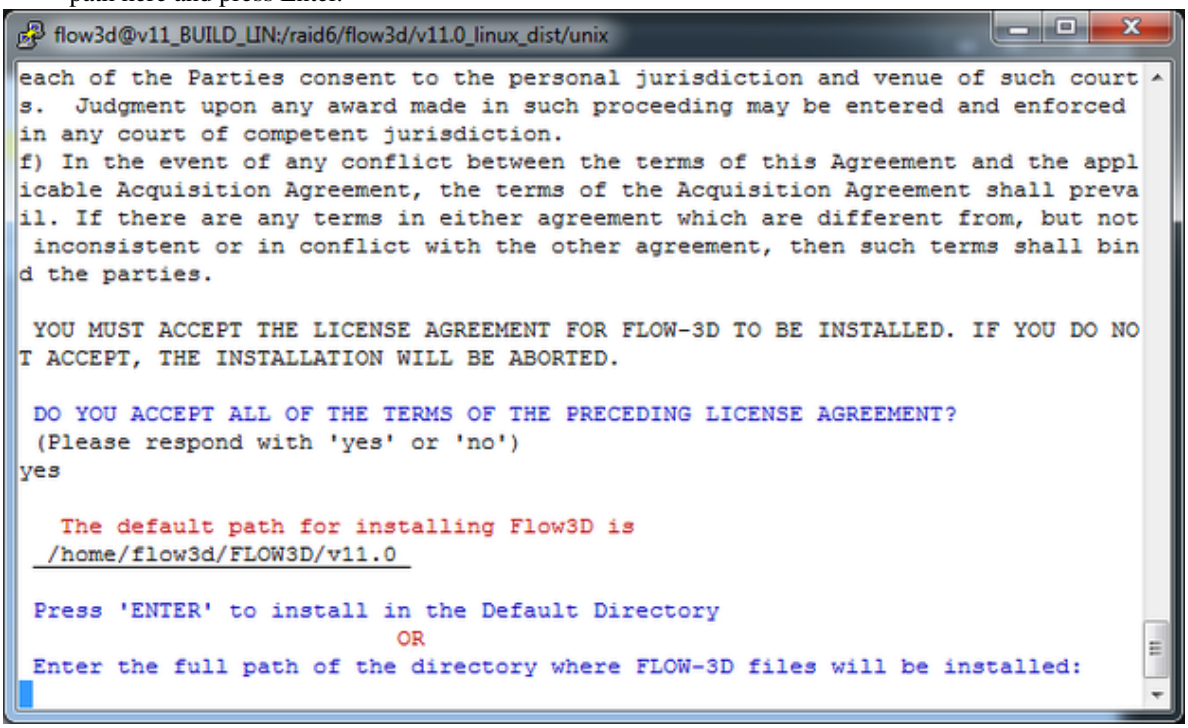
1. Execute the install script in the directory where the tarball was unpacked. The license agreement can be read prior to installing the software.



2. If all the terms are acceptable, typing **y** or **yes** and pressing Enter will continue the installation.

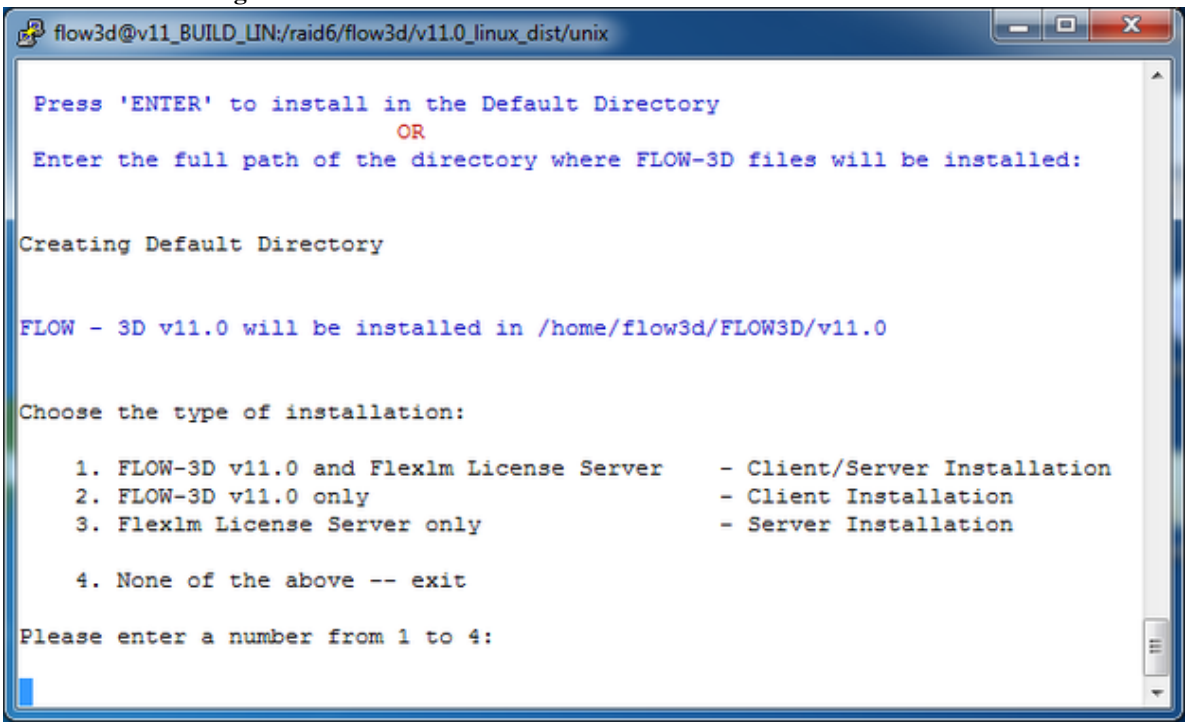


3. ***FLOW-3D*** can be installed to a directory of your choosing. The default is **/home/(current_user)/FLOW3D/v11.0**. Press Enter to use this. To change the default, enter the *full* path here and press Enter.

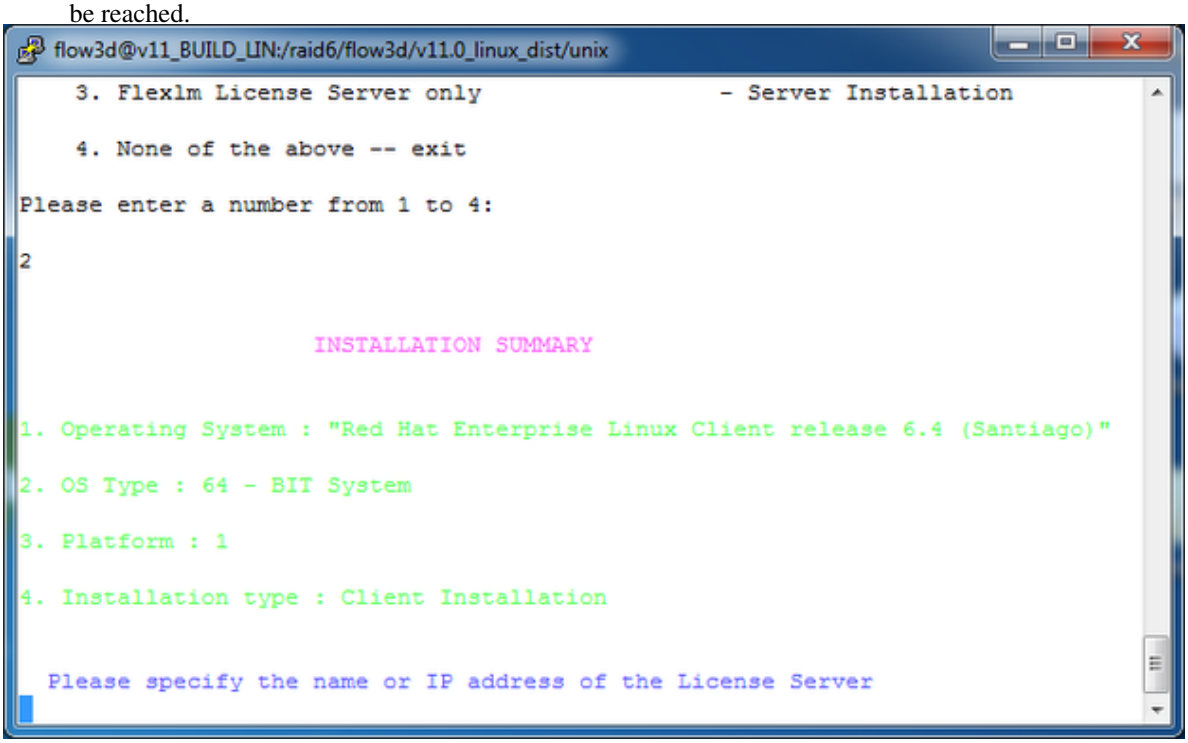


4. After the directory has been determined, an installation type may be chosen. . The *FLOW-3D v11.0 and Flexlm License Server* option is used if this machine should contain both ***FLOW-3D*** and the license server software. *FLOW-3D v11.0 only* is used if this is a client machine that will connect to a remote license server. Finally, *Flexlm License Server only* is used when this machine will only run the license server software; the GUI and Solver will not be installed. A *FLOW-3D Only* install would then be required for machines that will connect to

this license server. If the machine is intended to act as a remote server with the new Remote Solving feature, an installation type that includes ***FLOW-3D*** should be chosen. **Note that SUSE Linux machines cannot use the Remote Solving feature.**

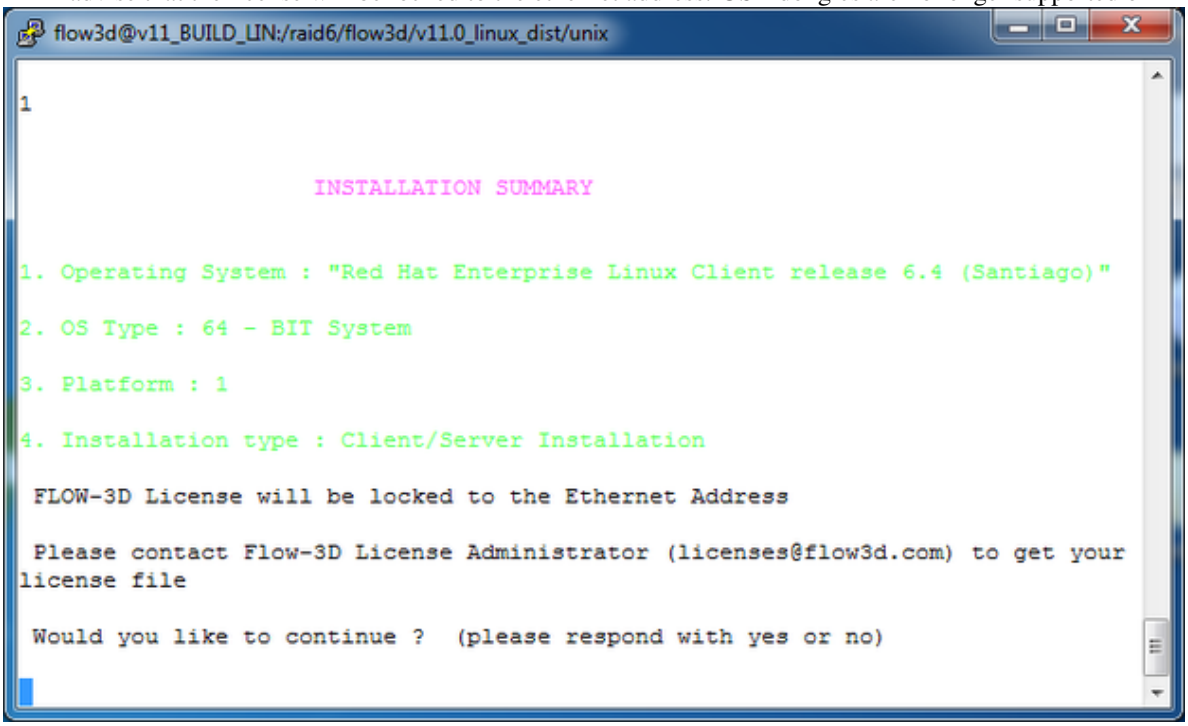


5. If the *FLOW-3D v11.0 only* option is chosen, the script will display an installation summary, and request the name or IPv4 address of the license server. This server machine must be accessible by the client. Unless networking is configured otherwise, **ping hostname** or **ping (ip_address)** will verify whether the machine can be reached.

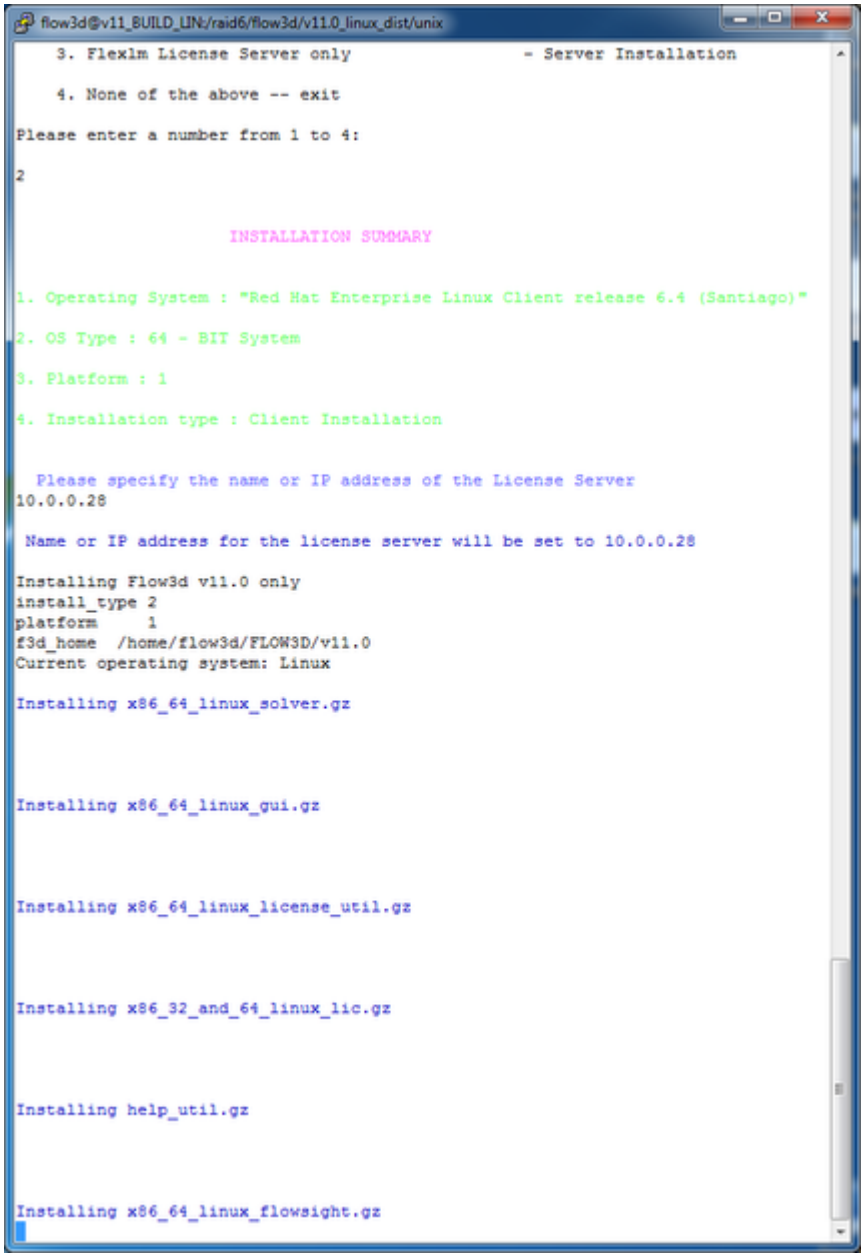


6. If an Installation Type that includes FlexLM is chosen, the script will display the installation summary and

advise that the license will be locked to the ethernet address. USB dongles are no longer supported on Linux.

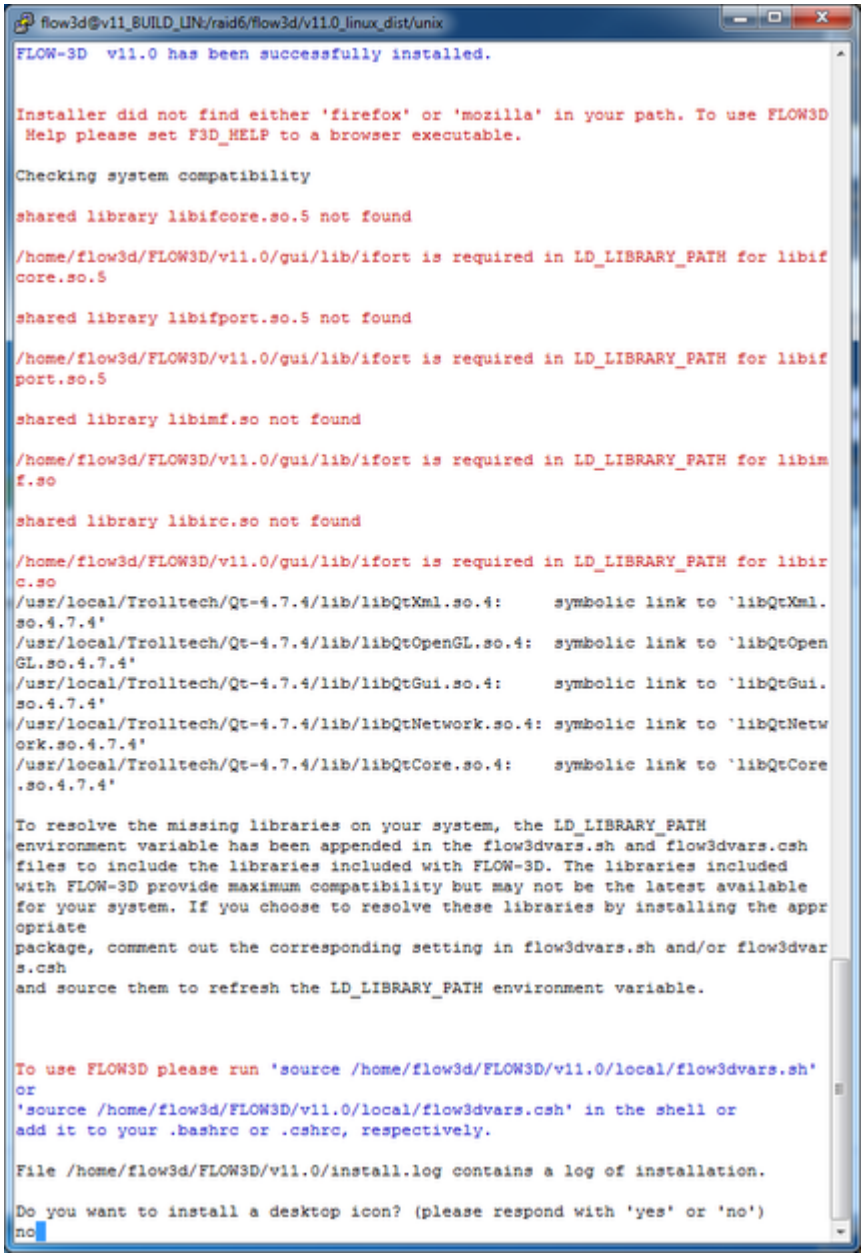


7. The installation will now unpack the tarballs that are needed for the selected Installation Type.

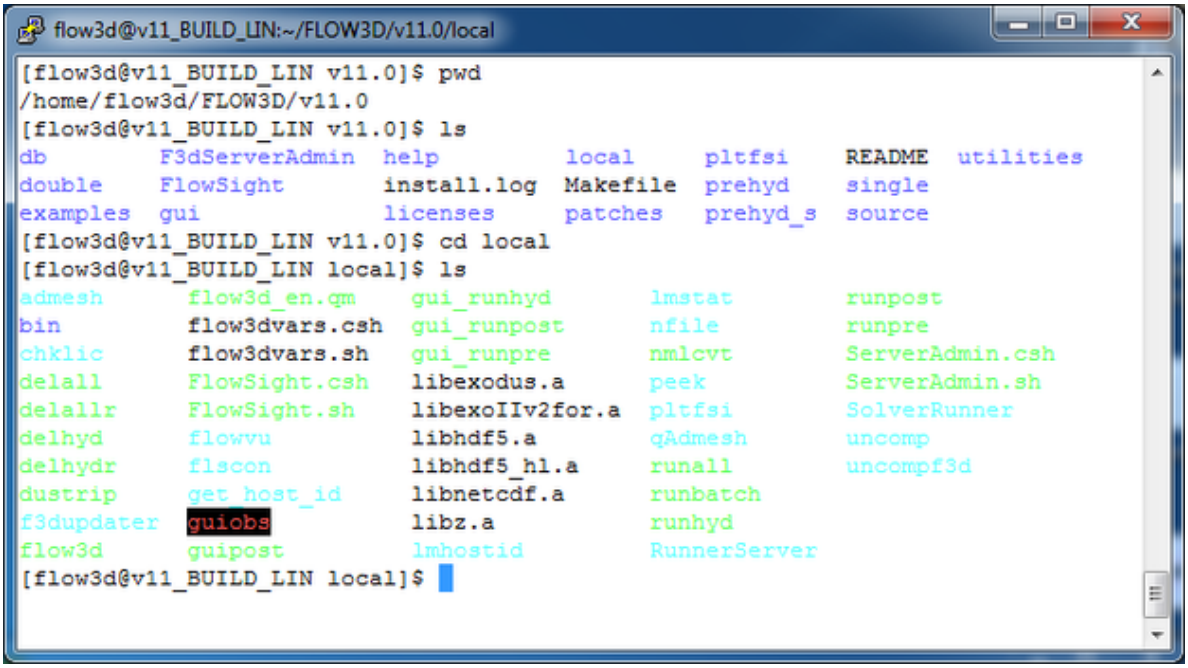


8. As a final step, the install script checks the system for the libraries needed to run ***FLOW-3D***. Two shell scripts for launching ***FLOW-3D***, **flow3dvars.sh** and **flow3dvars.csh**, are written into the *local* directory of the installation path. Another pair of scripts is included in the *local* directory to launch FlowSight. These scripts set up the environment and launch the executable. They are named **FlowSight.sh** and **FlowSight.csh**. Another option is to allow the install script to create desktop icons to run ***FLOW-3D*** and FlowSight. These icons set up the environment and run the software. They are only created for the **GNOME** desktop environment which is the default for Red Hat and SUSE Linux. *If other desktop environments are used, the icons will not be created.*

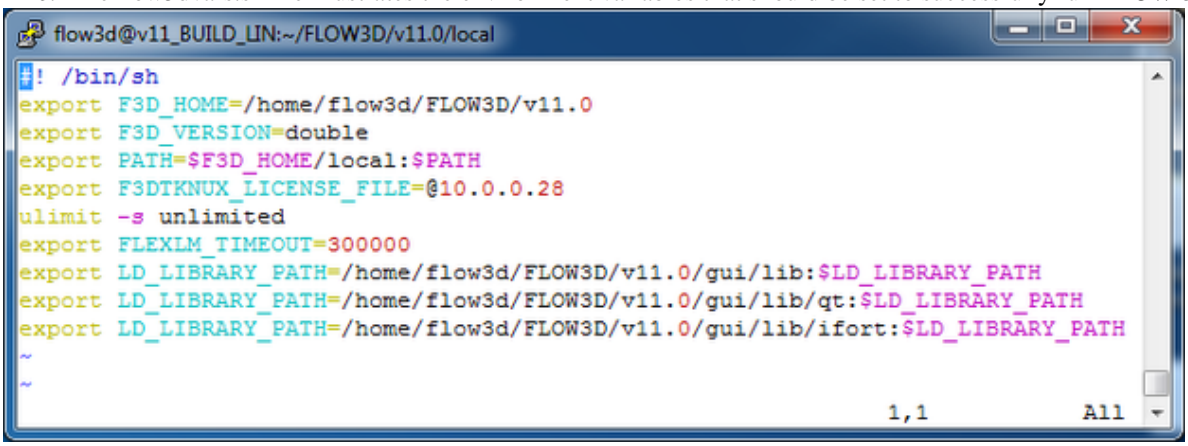
   Necessary libraries are included with the distribution in the $F3D_HOME/gui/lib directory. The LD_LIBRARY_PATH environment variable is set in the **flow3dvars** scripts so any libraries not found on the system will be accessible. The install script also gives the **source** command that can be used on your system to set up an environment to run ***FLOW-3D***. The command may be added to the user's **.bashrc** or **.cshrc** file, if desired. ***FLOW-3D*** can then be run from a terminal prompt using the command **flow3d&** or **flow3d**.



9. After installation, the installation directory will contain a directory structure similar to the one shown. A log of the installation, named **install.log** will be at the top level, and the scripts created by the installer will be in the **local** directory.



10. The flow3dvars.sh file illustrates the environment variables that should be set to successfully run ***FLOW-3D***.



2.4 Remote Solving Setup

A new feature in ***FLOW-3D*** v11.0 is the ability to connect remote machines (called remote servers) to a primary workstation (referred to as the client) and submit simulations from the primary workstation to run on these remote computers. In addition to running remote simulations, these remote computers retain their ability to run ***FLOW-3D*** as a client. The following sections will discuss how to set up *Remote Servers* and *Clients*.

2.4.1 Terminology and Requirements

The remote solving setup uses several programs on multiple machines, so it helps to define what each program is and the terminology that will be used beforehand. A list of the programs and terms is given below:

- **Server**: The remote machine where the simulation will be run.
- **Client**: The local machine where the setup is done. Simulations can also be run on this machine.

- **F3dServerAdmin**: This is a configuration program that is run on the server to configure **RunnerServer** for remote solving.
- **RunnerServer**: This program interfaces between the ***FLOW-3D*** user interface and **SolverRunner**. An instance of this runs on both the client (for running local simulations) and the server (for running remote simulations).
- **SolverRunner**: This program interfaces between **RunnerServer** and the solver, **hydr3d**.

Additionally, there are two main requirements for the remote solving feature:

1. All of the clients and servers must have either a working client installation or client/server installation of ***FLOW-3D*** before the remote setup can begin (see *Installation Procedure* for more information on installing ***FLOW-3D***).
2. **SolverRunner**, **RunnerServer**, and ***FLOW-3D*** all communicate using sockets, so certain ports will need to be opened in the firewall.

2.4.2 Remote Servers

1. Run **F3dServerAdmin** on the server machine: **F3dServerAdmin** is an executable that configures and controls the **RunnerServer** for use as a remote server. It is accessed differently depending on the OS:
   - *Windows*: Use the **FLOW-3D Remote Admin** icon in the ***FLOW-3D*** v11.0 Program Group in the Windows Start Menu. This is a shortcut to a batch file in the *local* folder of the ***FLOW-3D*** installation directory (e.g., `c:\flow3d\v11\local\ServerAdmin.bat`)
   - *Linux*: Run the script `ServerAdmin.sh` (or `ServerAdmin.csh`) located in the *local* folder of the ***FLOW-3D*** installation directory (e.g., `home/usr/FLOW3D/v11.0/local/ServerAdmin.sh`)

   Note: **The remote server administration software is not supported on SUSE Linux**. **F3dServerAdmin** will not be installed on SUSE machines.

   ---

2. *File→Server Configuration*: configure the settings for **RunnerServer**.
   - *Server Name*: The *Server Name* field provides a way for the server administrator to name the server for tracking purposes.
   - *IP address*: The IP address specified here is the IP address of the server machine. This field will automatically be populated with possible entries; select the one that is appropriate for your network.
   - *Server Port Number*: This is the port through which ***FLOW-3D*** on the client will communicate with **RunnerServer** on the remote machine. *This port must be accessible through the firewall*.
   - *SolverRunner Minimum / Maximum Port Number*: Each time **RunnerServer** receives a job to run, it will spawn a new instance of **SolverRunner** to run the solver. Each instance of **SolverRunner** communicates simulation status information with the ***FLOW-3D*** user interface using a different port, so these fields specify the range of ports that may be used for communication between ***FLOW-3D*** and each **SolverRunner**. *This range of ports must be open for communication through the firewall*. The number of open ports is recommended to be equal to or greater than the number of solver tokens that are available.
3. *File→Solver Registration*: Configure what solvers are available. When a simulation is submitted to run on the remote server, it will automatically select the newest compatible installation to run the simulation. It should also be noted that only ***FLOW-3D*** v11.0 and newer solvers are supported.
   - *Add*: Add a ***FLOW-3D*** installation to the available solver list.
     - *Installation Directory*: The directory where ***FLOW-3D*** is installed on the server machine.
     - *Release Number*: The version number associated with the solver in the *double* folder of the ***FLOW-3D*** installation directory. This is automatically populated and not editable.

  - *Solver versions*: A list of the available solvers in the directory specified above. These are automatically populated and not editable.
- *Edit*: Edit the selected solver entry.
- *Delete*: Remove the selected set of solvers from the list.

4. *File→User Registration*: Configure user authentication settings.
   - *Add*: Adds a new user to the authenticated user list.
     - *Full Name*: The name of the user (for the administrator's tracking purposes)
     - *User ID*: This is the username that will be used to authenticate the user when a client attempts to connect to the server.
     - *Password*: The password associated with the user ID for authentication
     - *Confirm Password*: Re-enter the password to avoid typographical errors
     - *Email Address*: The email address of the user. The administrator can send setup information to this address.
     - *Phone Number*: The phone number of the user (for the administrator's tracking purposes)
     - *Home Directory*: The directory on the server where the user's files are to be written before being transferred to the client.
   - *Edit*: Edits the selected user's account settings.
   - *Delete*: Deletes the selected user's account.
   - *Email*: Provided for the administrator to send an email to one or more of the registered clients for disk management, maintenance issues, etc. When the administrator adds a new user during the remote server setup, the software automatically generates an email message with the user ID, password, IP address and server port number to the user. The administrator is given the chance to modify the message if desired and then send it. The same also occurs if any of those fields are modified when the Edit button is selected where the email message specifically references the change.
5. *File→Start Server*: Starts **RunnerServer**, allowing client machines to connect and submit jobs. When the server is running, this automatically changes to *Stop Server*. The server can also be activated and deactivated by toggling the icon of a running person.

Once **RunnerServer** is configured and running on the server, clients may begin submitting jobs to the server. When a job completes, the results files are compressed, encrypted, and copied back to the client machine where they are decrypted and uncompressed. The results files are not deleted from the server, so the administrator will need to do periodic cleanup of the file system to manage the available disk space. This can be done by selecting one or more simulations in the main list and clicking the *Delete Selected Jobs* button.

If necessary, the server administrator can also kill running jobs by selecting one or more simulations and choosing the *Kill Selected Job* button. If the administrator kills a running job from the server, the simulation is aborted and **the results files are not saved**. This is intended as a **last resort** option for stopping a running simulation; terminating from the client is preferred as the results will be saved and transferred to the client.

Note: Any changes made to the server settings in **F3dServerAdmin** do not take effect until **RunnerServer** is restarted.

2.4.3 Clients

Once the remote server setup is complete (see *Remote Servers*), client machines can be configured to use this server for remote solving. When adding a new remote server on a client machine, the relevant setup information is entered

in the *Preference→Remote Server Registration* dialog:

- *Server name*: the name of the server machine
- *IP address*: the IP address of the server machine
- *Port Number*: the port on the server machine through which **RunnerServer** communicates with external programs.
- *User ID*: the user ID (for authentication purposes)
- *Password*: the password associated with the user ID (for authentication purposes)

Existing remote servers can be edited or deleted using the respective buttons. After registration, the available remote servers will be listed in the queue and in the menu when submitting jobs to preprocess or run. As with any program running on a network, there are some potential issues that may occur:

- If a remote server disconnects it may be reconnected by right-clicking on the disconnected remote server in the queue (shown in red) and choosing *Try reconnecting to remote server*.
- If the file upload fails when submitting a job, a simulation in the queue can be removed by right-clicking on the simulation and choosing *Remove from queue*.
- If the results file fails to transmit (e.g., due to a connectivity problem) the results file must be manually retrieved from the server.

2.5 License Agreement and Copyright

2.5.1 *FLOW-3D End User License Agreement*

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Portions of HDF5 were developed with support from the Lawrence Berkeley National Laboratory (LBNL) and the United States Department of Energy under Prime Contract No. DE-AC02-05CH11231.

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Published by: Woodhead Publishing Ltd

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