Installation and Operations Guide
Documentation Feedback

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Please include the following information with your feedback:

- Document name
- Release/Version number
- Chapter/Section name
- Topic title (for Online Help)
- Brief description of the content (for example, incomplete/incorrect information, grammatical errors, information that requires clarification or more details and so on).
- Your suggestions for correcting/improving documentation

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**Note:** The above mentioned e-mail address is only for providing documentation specific feedback. If you have any technical problems, issues, or queries, please contact Technical Support.
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About This Guide

This Guide is *Marc Installation and Operations Guide*. It contains information about installing and running Marc, Mentat and its components. The other Marc documents are as follows:

<table>
<thead>
<tr>
<th>TITLE</th>
<th>VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory and User Information</td>
<td>Volume A</td>
</tr>
<tr>
<td>Element Library</td>
<td>Volume B</td>
</tr>
<tr>
<td>Program Input</td>
<td>Volume C</td>
</tr>
<tr>
<td>User Subroutines and Special Routines</td>
<td>Volume D</td>
</tr>
<tr>
<td>Demonstration Problems</td>
<td>Volume E</td>
</tr>
<tr>
<td>Release Guide</td>
<td></td>
</tr>
</tbody>
</table>

You will find references to these documents throughout this guide.

Purpose of This Guide

This guide explains the procedure for installing Marc and Mentat. It also describes how to install the associated documentation. This purpose of this guide is to:

- Help you install the licensing server on Windows and Linux platforms.
- Help you install Marc and Mentat on Windows and Linux platforms.
- Identify and ensure that the installation is successful.
- Provide you with basic troubleshooting.
- Provide you information about files, directories, and their location in the installed folders.
- Inform you about using Marc and Mentat on parallel networks.
## Contents of This Guide

The principal categories of information are found under the following titles:

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>SECTION 1: MICROSOFT WINDOWS</strong></td>
<td></td>
</tr>
<tr>
<td>Chapter 1</td>
<td>Prerequisites for Marc and Mentat</td>
<td>Describes the prerequisites required for the installation and usage of the Marc and Mentat programs on Microsoft Windows platforms.</td>
</tr>
<tr>
<td>Chapter 2</td>
<td>Marc and Mentat Installation</td>
<td>Provides a detailed installation procedure of Marc and Mentat on Microsoft Windows platforms. The instructions provided in this chapter require a basic knowledge of the machine on which you are loading the Marc products. Also contains a section with details about the installation procedure and a section about the license management utility.</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Running and Using Marc and Mentat</td>
<td>Explains running and usage of the Marc and Mentat for Microsoft Windows platforms. Sections related to Mentat external programs and making changes to MPI settings are also discussed in this chapter.</td>
</tr>
<tr>
<td>Chapter 4</td>
<td>Marc Parallel Network</td>
<td>Provides the general description about the hardware and software requirements and definitions. Provides a step-by-step approach to installation of the network version. Provides miscellaneous information about executing a parallel job over a network and use of user subroutines.</td>
</tr>
<tr>
<td>Chapter 5</td>
<td>Windows Troubleshooting</td>
<td>This chapter contains information about troubleshooting general and problems.</td>
</tr>
<tr>
<td></td>
<td><strong>SECTION 2: LINUX</strong></td>
<td></td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Prerequisites for Marc and Mentat</td>
<td>Contains information regarding the necessary prerequisites (related to hardware and software) for installing and running Marc and Mentat. There is also a section which informs us about the supported platforms by this version.</td>
</tr>
<tr>
<td>Chapter 7</td>
<td>Marc and Mentat Installation</td>
<td>Detailed procedure about installing Marc and Mentat on Linux platforms is explained here.</td>
</tr>
<tr>
<td>Chapter 8</td>
<td>Running and Using Marc and Mentat</td>
<td>In this chapter running and using Marc and Mentat is described. Sections such as modifying MPI settings and Mentat interfaces are also discussed in this chapter.</td>
</tr>
<tr>
<td>Chapter 9</td>
<td>Marc Parallel Network</td>
<td>Provides the general description about the hardware and software requirements and definitions. Provides a step-by-step approach to installation of the network version. Provides miscellaneous information about executing a parallel job over a network and use of user subroutines.</td>
</tr>
</tbody>
</table>
The information in this manual is both descriptive and theoretical. You will find some techniques discussed in detail. You will also find specific instructions for operating the various options offered by Marc and Mentat.

## Typographical Conventions

The section provides a brief overview of the typographical conventions used in the document to help the user better follow the MSC Nastran documentation.

This section describes some syntax that will help you in understanding text in the various chapters and thus in facilitating your learning process. It contains stylistic conventions to denote user action, to emphasize particular aspects of Marc and Mentat to signal other differences within the text.

<table>
<thead>
<tr>
<th>Adobe Garamond Pro</th>
<th>Body and general text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courier New</td>
<td>- Represents command-line options of Marc and Mentat.</td>
</tr>
<tr>
<td></td>
<td>- Directory names and paths</td>
</tr>
<tr>
<td></td>
<td>- File names and Paths</td>
</tr>
<tr>
<td></td>
<td>- Linux terminal script</td>
</tr>
<tr>
<td>Example: lmreread -c &lt;parent&gt;/msc/MSC.Licensing/licenses/license.dat</td>
<td></td>
</tr>
</tbody>
</table>

| Bold Text          | |
|--------------------| - Highlights |
|                    | - Dialog box names |
|                    | - Buttons |
|                    | - Menus |
|                    | - User inputs |
|                    | - The commands/user inputs for all descriptions related to terminal commands. |
|                    | - Default values |
| Example: [root@vm-tmrhel73 MSC]#/msc/licensing_helium_linux64.bin |
| HelveticaNeueLT Pro Cn 57 | - Hyperlinks
   - Weblinks
   Example: *Appendix. A: Microsoft Windows: Marc Subdirectories and Installation*

| Italic Text                  | Represents references to books.
   Example: *Volume A: Theory and User Information*

| 20XX                        | Represents the latest version number. |
SECTION 1: MICROSOFT WINDOWS
1 Prerequisites for Marc and Mentat

- Installation Prerequisites 18
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The requirements of Marc and Mentat are as in the following table:

### Table 1-1  Requirements of Marc & Mentat

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>X86-64</td>
</tr>
<tr>
<td>Graphics Card</td>
<td>SVGA or better running in at least 16 bit (64k) color mode</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>Minimum:</td>
</tr>
<tr>
<td></td>
<td>950 MB Marc</td>
</tr>
<tr>
<td></td>
<td>800 MB Mentat</td>
</tr>
<tr>
<td></td>
<td>350 MB documentation</td>
</tr>
<tr>
<td>DVD Drive</td>
<td>Required for media based installation. Not required for electronic download installation.</td>
</tr>
<tr>
<td>Ethernet Card</td>
<td>An ethernet card is required. Also, Microsoft TCP/IP Service must be installed.</td>
</tr>
<tr>
<td>Mouse</td>
<td>Three button mouse is recommended</td>
</tr>
<tr>
<td>Memory</td>
<td>Minimum 8 GB</td>
</tr>
<tr>
<td></td>
<td>Recommended 16 GB</td>
</tr>
<tr>
<td>Fortran Compiler</td>
<td>A Fortran compiler is necessary if user subroutines are to be used. For other cases, no compiler is needed. The compiler needs to be compatible with the one used in the Marc build. For a list of supported compilers, refer to the <em>Marc and Mentat Release Guide</em>.</td>
</tr>
</tbody>
</table>

The instructions provided in this chapter require a basic knowledge of the machine on which you are loading the Marc products. No attempt is made to teach the use of Microsoft Windows commands.

This document contains a section containing details about the installation procedure, a section concerning the usage of the Marc and Mentat programs and a section about the license management utility. 

Troubleshooting related hints are provided in *Chapter 5: Windows Troubleshooting*. 

**Note:** If you encounter a problem during installation, please contact the customer support staff at the nearest MSC Software office.
## Installation Prerequisites

### Before installing the software

The product is available for download at the MSC Solutions Download Center available at https://mscsoftware.subscribenet.com

1. Select the product **Marc** and select the 20XX version on the next level.
2. Download the installer for your platform.
   - The FLEXlm security is installed separately.
3. Select the product **MSC Licensing FLEXlm** and the version 11.13 on the next level.
4. Download the installer for your platform.
5. Decide where you want the product to be installed and where to perform the installation.
   - Marc requires approximately 950 Mbytes of permanent disk storage capacity.
   - Mentat requires approximately 800 Mbytes of permanent disk storage capacity.
   - Documentation, stored in the separate documentation directories `doc` and `examples`, contains approximately 350 Mbytes of data.
   - It is preferred to first install security, then Marc and/or Mentat and finally the documentation.

### Password protection

The Marc and Mentat version you have received is protected against illegal usage by means of Flexera Software’s FLEXlm licensing software. You **cannot** run the program directly after you have installed the product from the installation media until you obtain a license file from MSC Software Corporation.

### Should I be Administrator?

You need not to be logged in as **Administrator**. However, you will need administrator privileges since the system registry will be updated. Also, check that you have read and write permissions to the installation directory.

### Fortran compiler

A Fortran compiler is necessary if you will use user subroutines. For other cases, no compiler is needed.

**Note:**

After you install the Fortran compiler, make sure that all users have their PATH and LIB environment variable include the path to the Fortran compiler. Otherwise using user subroutines will not work properly.

See **Chapter 5: Windows Troubleshooting** for important information regarding requirements for Intel Fortran compiler.
Supported Platforms

The supported Windows platforms are listed below:

<table>
<thead>
<tr>
<th>Type</th>
<th>OS</th>
<th>Hardware</th>
<th>Fortran Version</th>
<th>Default MPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows (64-bit)</td>
<td>Windows 7</td>
<td>Intel EM64T or AMD</td>
<td>Intel Fortran 17</td>
<td>Intel MPI 2018 Update 1</td>
</tr>
<tr>
<td></td>
<td>Windows 10</td>
<td>Opteron</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Windows 2016 Server</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 For user subroutines, Intel Fortran 17 and Microsoft Visual Studio 2017 are required.
2 MS-MPI is also supported.

Note: Installation of a Fortran compiler is only required if you need to run Marc with user subroutines.
Chapter 2: Marc and Mentat Installation

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- FLEXlm 11.13 VS Helium(11.16.3.0) License Manager 43
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- Configuring the Marc DCOM Server 48
**Installation Procedure**

The installation of Marc (Marc and Mentat) can be done in four steps as follows:

1. Install MSC licensing Helium (security)
2. Install Marc and Mentat
3. Install Marc and Mentat documentation
4. Set environment variables and verify installation

---

**Note:**

For old installation procedure, refer to Appendix A: Microsoft Windows: Marc Subdirectories and Installation

Ignore step 1 if the license manager is already installed.

---

**Install MSC Licensing Helium**

1. Download `msc_licensing_helium_windows64.exe` from MSC download center.
   - Default installation directory is `C:\Program Files\MSC.Software\MSC Licensing\Helium`
   - Obtain a license file from MSC Software. If a nodelocked license is to be used, then obtain FLEXlm hostid with
     - `C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools`
     - Select the **System Settings** tab and click on **Save HOSTID Info to a File**.
     - Copy the license file to the proper location. The standard location is: `C:\Program Files\MSC.Software\MSC Licensing\Helium\license.dat`

2. Run the executable file.
   - If your system already has the older version of the MSC Licensing Server then it will show the following message:
     - **11.13 License Server process currently running. Do you want to un-install 11.13 license server?**
   - Click **Yes** to continue.

   The **MSC Licensing Helium** window appears.
3. Click Next.

**Note:**
- The *MSC Licensing Helium User’s Guide* opens up automatically the moment you run `msc_licensing_helium_windows64.exe`. For detailed information, refer to the *MSC Licensing Helium User’s Guide*.
- For detailed and elaborated information specific to Marc and Mentat installation refer to Appendix. A: Microsoft Windows: Marc Subdirectories and Installation
The **Installer Requirements** window appears.

You need a valid MSC Software license, HostName and HostID to fulfil the requirements.

4. Click Next.
The Choose Destination Folders window appears. Specify paths for License Manager Executable Folder and License Manager Log File Folder.

5. Click **Browse** and specify the path for the folders as follows:
   - **License Manager Executable Folder**
     
     C:\Program Files\MSC.Software\MSC Licensing\Helium
   - **License Manager Log File Folder**
     
     C:\MSC.Software\MSC Licensing\Helium\LOG

6. Click **Next**.
The Select the License File window appears.

7. Click **Browse** and select your license.dat file.

   Review the license file details.

   • If one or more feature entries in the license file has expired, the following error message appears:

   One or more FEATURE entries have maintenance end dates that have expired. These licenses can be used only by MSC products that were released prior to the maintenance expiration date on the FEATURE entry.

   Click **OK** to continue

   • In case you face any problems related to the licensing, contact:

   msc_lic.support@mscsoftware.com or,

   MSC Software support center

8. Click **Next**.
The **Automatic Reporting of Usage Data** window usage appears.

9. Click **Next**.
The License Server Settings window appears.

10. Enter port number and hostname.
11. Click Next.
A window about the files are being copied will appear.

12. Click **Next**. The files are copied.

The **MSC Licensing - InstallShield** Wizard appears with a prompt as follows:

MSC Licensing Helium is installed successfully.
A window, **Installation Complete** appears.

![Installation Complete Window]

a. Check the boxes next to any of the options, if you want desktop icons.

**Note:** Important information related to **MSC_LICENSE_FILE** environment variable setting is displayed at the bottom of the window. Use this setting to create the environment variable.

13. Click **Finish**.

   The Licensing process is completed.
Install Marc and Mentat

1. Download the latest version from the MSC Software Download Centre.

2. Run the executable file.

3. The Setup Type window with language options appears.

   ![Setup Type Window]

   a. Select **English** as your language.

4. Click **Next**.

   The Welcome to Marc Install window appears.

   ![Welcome to Marc Install Window]
5. Click I Accept to consent.
   A window for customer information appears.

6. Enter User Name and Company Name.
   a. Select Anyone who uses this computer (all users) if you want to make it available for all users.
   b. Select Only for me if you want to make it available only for yourself.
Installation Procedure

Install Marc and Mentat

The Select Setup Type window appears.

7. Select Complete to Install Marc and Mentat.
   a. Select Solver if you want to install only Marc Solver.
   b. Select Modeler if you want to install only Mentat.
   c. Notice the default installation path.
   d. Click Browse to change the Destination Folder.

C:\Program Files\MSC.Software\Marc\2019.1.0

It is recommended that you leave the Destination Folder path as is.

8. Click Next.
The **Marc License Setup** window appears.

9. Click **Browse** and specify the location of the license manager, if you already a FLEXlm license server installed. For e.g. `27500@hostname`.

10. Click **Next**.
A window informing that the files are being copied appears.

11. Review the current settings and click Next.
The Marc installation starts and the Marc and Mentat 20XX window appears.

12. Click the Finish button to complete setup.

The installation is complete with a prompt as follows:
Now, install the documentation. The following section demonstrates the procedure of installing the documentation.

**Install Marc and Mentat Documentation**

To make optimal use of the documentation, it should be installed on a computer where Marc and Mentat are available. This way, documents can be accessed interactively from within Mentat, and Marc example problems can be run.

You can install the documentation either before or after installing Marc and Mentat. The documentation installer will check if there is a corresponding Marc and Mentat version installed, where the Marc and Mentat installer will check if there is a corresponding documentation version installed, so that they can be linked together.

The installer will prompt you to set the location where the documentation needs to be installed. This default location is: `C:\Program Files\MSC.Software\Marc_Documentation\2019.1.0`

You can now install the documentation to any other location. The `doc` and `examples` directories will be created in the directory specified by you. Follow the steps to install documentation:

1. Download the latest executable file from the download center.
2. Run the executable file.

### Notes:

- Ensure that the environment variable `MSC_LICENSE_FILE` is set properly to the full pathname of your valid license file. If it is not, the product will fail due to licensing.
- To run from the command prompt, `cd` to the `<parent>\mentat20XX` directory, and enter the command `bin\mentat` to start Mentat.
- Check the Mentat program by running one of the standard Marc demonstration examples as proof of a successful installation.
- Check if the user subroutines are working by running one of the standard user subroutine demo problems:
  ```
  cd C:\Program Files\MSC.Software\marc
cd 2019.1.0\marc2019.1.0\demo\tools\run_marc -j e2x4 -u u2x4
  ```
- If you have a **Fortran compiler**, run a user subroutine example using:
  ```
  run_marc -j e2x4 -user u2x4
  ```
  Marc should give a **Marc Exit number 3004**.
- If you plan on using the Marc Parallel Network feature, you need to setup MPI. This service is optionally installed on the system when you have installed Marc, however you need to install it on the remote machines. Refer **Chapter 4: Marc Parallel Network** for important information on installing and running jobs with the network version.
The Marc 20XX Documentation window appears.

3. Click Next.
   The Customer Information window appears.

4. Enter User Name and Company Name.
   a. Select **Anyone who uses this computer (all users)** if you want to make it available for all users.
   b. Select **Only for me** if you want to make it available only for yourself.
The **Choose Destination Location** window appears.

5. Retain the default path to `C:\Program Files\MSC.Software\Marc Documentation\2019.1.0`
6. Click **Next**.
A window informing that the files are being copied appears.

7. Review the current settings and click Next.
The installation process starts and can be seen in the window as follows:

An information message box is displayed:

8. Click OK.
9. Click Finish.

The documentation is now installed and linked to Marc and Mentat.

**Set Environment Variables and Verify Installation**

In this step, you will set the necessary environment variables and verify whether the installation is successful or not.

You will have to add the `MSC_LICENSE_FILE` environment variable on the license server and the client machines (if you have MSC Software installed on the client).

Follow the procedure to set the variable:

1. Right click on **My Computer >Properties**.
Control Panel Home window appears.

2. Choose the **Advanced system settings** option.

   The **System Properties** dialog appears.

3. Select the **Advanced** tab.
   
   a. Click **Environment Variables** button at the bottom.

   The **Environment Variables** dialog appears.
b. Click **New** in the **System Variables** section.
   The **New System Variable** dialog appears.

c. Enter **Variable Name** as MSC_LICENSE_FILE.
d. Enter **Variable Value** as 27500@license server name.

4. Click **OK** thrice to close all the dialog boxes and exit control panel.

The required environment variables are set. Try launching **Marc Mentat**.

**Notes:**
- If you face any problem in launching the application or any problems related to the licensing, contact [MSC Software support center](https://www.mscsoftware.com/support).
- The license server must be running in order to run Marc and Mentat.
- Previous versions of Marc and Mentat will run with the latest FLEXlm version, so it is safe to upgrade previous installations of FLEXlm.
FLEXlm 11.13 VS Helium(11.16.3.0) License Manager

This section contains information and directory paths according to Helium license manager. The changes in the default paths in comparison with FLEXlm 11.13 are as in the following table:

<table>
<thead>
<tr>
<th>11.13</th>
<th>Helium (11.16.3.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\msc</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\msc</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\lmtools</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\installs</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\installs</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\lmgrd</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmgrd</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\LOG</td>
<td>C:\MSC.Software\MSC Licensing\Helium\LOG</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\lmutil</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmutil</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\msclic.ini</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\msclic.ini</td>
</tr>
</tbody>
</table>
License file

1. Two lines of the file `license.dat` need to be modified
   - **SERVER** line which specifies the system hostname
   - **DAEMON** line which specifies the daemon name and the path to the daemon program

   The content is typically something like:
   ```
   SERVER this_host 0022192361f 1700
   DAEMON MSC /your_path/msc
   ```

2. Replace the string `this_host` with the hostname of the machine where the license server is running.

3. Replace the string `your_path` by the full path to the program `MSC`. If the default location is used for the security installation it should be

   ```
   DAEMON MSC "C:\Program Files\MSC.Software\MSC Licensing\Helium\MSC.exe"
   ```

4. Start the program
   ```
   C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools
   ```
   Select the **System Settings** tab and click on **Save HOSTID Info to a File**.

   The system identifier may also be found by running:
   ```
   lmutil lmhostid
   ```
   in the directory `C:\Program Files\MSC.Software\MSC Licensing\Helium`

hostid

- For a nodelocked license it is necessary to obtain a FLEXlm hostid for the machine running Marc and Mentat. This is done as follows:
  - Start the program
    ```
    C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools
    ```
  - Select the **System Settings** tab and click on **Save HOSTID Info to a File**.

  The system identifier may also be found by running:
  ```
  lmutil lmhostid
  ```
  in the directory `C:\Program Files\MSC.Software\MSC Licensing\Helium`

Specify license file

You will be prompted to specify the path to your license file. It will default to the current setting of `MSC_LICENSE_FILE`. If it is not set, then it will attempt to use the license file specified for FLEXlm License Manager version Helium(11.16.3). If you do not already have your license file, you may leave it blank. However you must set the `MSC_LICENSE_FILE` variable before attempting to run any of the Marc products.

**Note:** This is an important step. The installation will set the variable `MSC_LICENSE_FILE` to the setting that you enter. Failing to set it to a valid license file will result in a licensing failure and you will have to edit the environment variable setting by using the System applet in the Control Panel.
Managing FLEXlm

This section contains information about managing the license file and related tasks.

FLEXlm License File

When you receive your licenses from MSC Software, the license file, license.dat, should normally be placed in the C:\Program Files\MSC.Software\MSC Licensing\Helium directory. The file can be located elsewhere as long as the environment variable MSC_LICENSE_FILE points to it.

Two lines of the license file contains installation specific information:

- SERVER this_host 0022192361f 27500
Here **this_host** should be set to the hostname of the machine where the license server is running and **your_path** should be set to the full path to the msc program, by default located in C:\Program Files\MSC.Software\MSC Licensing\Helium.

### FLEXlm License Manager

When you install Marc or Mentat, the FLEXlm License Manager is installed in the MSC Licensing\Helium directory. Once lmgrd.exe is running, it will read the license file license.dat which is located in the MSC Licensing\Helium. The license file contains the Marc and Mentat license (and other MSC Software product licenses, if necessary). In addition, lmgrd.exe will also start the MSC Software vendor daemon MSC.exe. The path to MSC.exe is specified in the license file on the DAEMON line. These processes must be running on the license server for the MSC Software security system to obtain a license. The only exception to this is for a **zero count** license. If the number of licenses for a feature (the number following the expiration date) is 0, then neither lmgrd.exe or MSC.exe are used. The license manager is only used to keep track of licenses that are checked in/out.

Marc contacts these daemons at regular intervals. If no contact is made after a specified time period, Marc terminates execution.

**Note:** For the 20XX version, the FLEXlm License Manager must be at version 11.13 or higher.

You must start the FLEXlm License Manager before attempting to run Marc or Mentat on the system that is assigned the license. To start the license manager do the following:

1. Go to the **Start** menu and select **Programs** → **MSC Software** → **MSC.Licensing 11.16** → **lmtools**
2. Select the **Config Services** tab and verify that the settings are correct; i.e. the **License File** is set to the proper license file.
3. Then start the license manager from the **Start/Stop/Reread** tab by pressing the **Start Server** button.

### Environment Variables

The environment variable **MSC_LICENSE_FILE** is used to specify the license.dat file. This environment variable can be set using the System applet in the Control Panel, and is a semicolon separated list of file pathnames or hosts. The default setting will be C:\Program Files\MSC.Software\MSC Licensing\Helium\license.dat. When Marc executes, it checks the list of license files specified by this environment variable. You may have it point to a license server using the syntax port@host, as follows:

- **Variable:** MSC_LICENSE_FILE
- **Value:** 27500@myserver

If you have other products that use FLEXlm and they are required to be available when Marc is running (such as a Fortran compiler license), then you should modify the **MSC_LICENSE_FILE** setting to point to the proper license file for that product.

You may instead want to combine the licenses into one file.
The environment variable `MSC_AUTHQUE` is used to specify the number of minutes a program will wait for a license after it has been requested. If the license request cannot immediately be honored, the request will be queued and the variable defines how long it should wait in this queue. The variable must be set in your environment before Marc and Mentat are started. The default value is 5 minutes. It may be set as follows:

```
set MSC_AUTHQUE=20
```

**Client/Server Licensing**

The default installation assumes that the system in which Marc is installed will function as the license server. The term license server only refers to the fact that `lmgrd` and `MSC` will be running on that system, and will maintain the state of available licenses. Even if you have purchased a nodelocked license, the nodelocked system will function as the license server for that license. A nodelocked license can be distinguished from a floating license by the string `HOSTID=xxx` specified in the feature line.

**Configuring the Marc DCOM Server**

This section contains a procedure about configuring a DCOM Server.

**Specifying the Logon User**

The Marc DCOM Server allows you to run jobs on a remote Microsoft Windows machine without actually being logged into it. Unlike Marc Parallel, it will only run a single CPU job.

When you install Marc, the installation will initially setup the Marc DCOM Server. The server must be setup on both the client and the server machine. You must specify a login user for the Marc DCOM Server using `dcomcnfg` before attempting to run a job remotely.

To run `dcomcnfg` do the following:

1. Open up a console window and type `dcomcnfg` at the prompt.
2. Perform one of the following
   - Select Start menu and enter Run in the Search Window,
   - Select Windows logo key + r
3. Enter `dcomcnfg` and press OK. Component Services window (shown in Figure 2-1) appears.
4. Select Component Services in the Console Root panel.
5. In column right to the Console Root panel, select Computers → My Computer → DCOM Config
6. Scroll down to the Marc DCOM Server item.
7. Right click Marc DCOM Server item and select the Properties.
   The Marc DCOM Server Properties dialog will appear.

The Local Path depends on the destination folder chosen during the installation procedure.
The only property that needs adjusting is the Identity property.
8. Select the Identity tab. Dcomcnfg will then display the identity view as shown in Figure 2-2.
9. Select **This user** and specify a user that has access rights to this machine.
10. Select **Apply** and then **OK** to close the window.
11. Select **OK** in the main view.

The data files must be located in a shared directory. This is required so that the two machines can access the files. If the file is not located in a shared directory, Marc will issue an error message specifying that the file is not located in a shared directory.

To share a disk or a directory:
1. Select **My Computer** from the desktop and select the disk or browse to the directory.
2. Right click, and select **Sharing** to select the disk or the directory.
3. In the Sharing view, select the **Share this folder** button and enter a name for the share.

**Testing the installation**

You should first test the Marc DCOM Server on the server machine, and then test it on a client machine. First, copy a Marc data file to a shared directory. The file must be in a shared directory even if the job is to be run locally using the Marc DCOM Server. The data file `<parent>\marc2019.1.0\demo\e2x1.dat` will suffice. Run the job from any command prompt window using the `-pc` option:

```
<parent>\marc2019.1.0\tools\run_marc -pc <servername> -j e2x1
```

If it succeeds, then perform the same test on a client machine. If a failure occurs, refer to section **Troubleshooting 51**. Make sure the data file resides in a shared directory. When running the job, you may also use the UNC name in the path. If it is not specified, Marc will determine the UNC path and send it to the server.
Mentat Support

Running the job remotely may also be done within Mentat, however the menu is not displayed by default. You must first rebuild the menu file using:

```
cd <parent>\mentat2019.1.0
bin\mentat -compile menus\win64\main.msb -df DCOM
```

In the Jobs ➔ Run ➔ Advanced Job Submission menu, there now is a DCOM option (as shown in Figure 2-3). Select the DCOM option and in the adjacent text area specify the name of the remote machine.

![Figure 2-3 Advanced Job Submission Menu Displaying the DCOM Option](image)

Troubleshooting

In the case of an error, try some of the following suggestions:

- Check your user ID is valid on both the server and the client machines.
- Check the user ID has read and write access to the directory where the job is to be run.
- Check the directory that the data file resides in is a shared directory. For the Windows Server, you must specify the user permissions using one of the following methods:
  - Using the /GRANT option for the net share command
  - Clicking the Permissions button under the Sharing tab in the Explorer
- Run the run_marc script using the -it option to print out debugging information. This will print out exactly what is being sent to the server:

  ```
  <parent>\marc2019.1.0\tools\run_marc -pc <servername> -j e2x1 -it 0
  ```
- The path name displayed in the debug output should be displayed as a proper UNC name. If not, verify that the directory is shared.
3 Running and Using Marc and Mentat

- Running Marc 55
- Running Mentat 57
- Making Changes to the Marc Programs 60
- Mentat Interfaces 61
Running Marc

This section describes the Marc usage on Microsoft Windows based machines. The Marc programs are mainly controlled by a batch script program called *run_marc.bat*, which is stored in the `<parent>` subdirectory `marc2019.1.0\tools`.

The batch script will submit a job and must be executed in the directory where all relevant input and output files concerning the job are available. To use the batch script, each Marc job should have a unique name qualifier and all Marc output files connected to that job will use this same qualifier.

Marc input files should always be named `job_name.dat`, whereby the prefix `job_name` is the name qualifier which you are free to choose. The suffix `.dat` is obligatory.

To actually submit a Marc job from an MS-DOS Command Prompt window, the following command should be used. The single input line is split over multiple lines for clarity:

```
run_marc -jid job_name (required as minimum)

-rid restart file name
-pid post file name
-sid substructure file name
-prog name of a previously saved user executable
-user user subroutine name
-save save user executable
-back run in background
-vf view factor file name
-def defaults file name
-ndef number of domains
-nprocd number of domains
-nprocds number of domains in Single Input File mode
-nts number of threads for parallel matrix solver (same as -nthread_solver or -nt)
-nte number of threads for element assembly and stress recovery (same as -nthread_elem)
-nsolver number of matrix solver tasks
-mpi mpi version
-dir directory where job I/O takes place
-sdir directory where the scratch files are located
-host host file name; used for distributed execution in a network
-ci copy input files to remote machines in a network
-cr copy post files back from remote machines in a network
-ml memory limit in Megabytes
-gpuid GPU card ID or auto keyword
```

Table 3-1 describes the meaning of these input options and Table 3-2 gives examples.
Table 3-1  run_marc Input Options

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-jid (-j)</td>
<td>job_name</td>
<td>Input file (job) name identification.</td>
</tr>
<tr>
<td>-prog (-pr)</td>
<td>programe</td>
<td>Run saved executable programe.marc from a previous job (see -user and -save).</td>
</tr>
<tr>
<td>-user (-u)</td>
<td>user_name</td>
<td>User subroutine user_name.f is used to generate a new executable program called user_name.marc (see -save and -prog).</td>
</tr>
<tr>
<td>-save (-sa)</td>
<td>no</td>
<td>Do not save the new executable program user_name.marc.</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>Save the executable program user_name.marc for a future time (see -prog and -user).</td>
</tr>
<tr>
<td>-rid -(r)</td>
<td>restart_name</td>
<td>Identification of previous job that created RESTART file.</td>
</tr>
<tr>
<td>-pid (-pi)</td>
<td>post_name</td>
<td>Identification of previous job that created the post file.</td>
</tr>
<tr>
<td>-sid (-si)</td>
<td>substructure</td>
<td>Identify the job that contains the solution to the external nodes of the superelement.</td>
</tr>
<tr>
<td>-back (-b)</td>
<td>yes</td>
<td>Run Marc in the background.</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>Run Marc in the foreground.</td>
</tr>
<tr>
<td>-def (-de)</td>
<td>default_file</td>
<td>File name containing user defined default data.</td>
</tr>
<tr>
<td>-nprocd (-np)</td>
<td>number</td>
<td>Number of domains for parallel processing.</td>
</tr>
<tr>
<td>-nprocds (-nps)</td>
<td>number</td>
<td>Number of domains for parallel processing using a Single Input File.</td>
</tr>
<tr>
<td>-nts (-nthread)</td>
<td>number</td>
<td>Number of threads per parallel matrix solver (8, 9, and 11).</td>
</tr>
<tr>
<td>-nte</td>
<td>number</td>
<td>Number of threads used for parallel matrix assembly and stress recovery.</td>
</tr>
<tr>
<td>-nsolver</td>
<td>number</td>
<td>Number of processes to use for the MUMPS parallel matrix solver (solver 12).</td>
</tr>
<tr>
<td>-dir</td>
<td>directory_name</td>
<td>Pathname to directory where the job I/O should take place. Defaults to current directory.</td>
</tr>
<tr>
<td>-sdir</td>
<td>directory_name</td>
<td>Directory where scratch files are placed. Defaults to -dir.</td>
</tr>
<tr>
<td>-host (-ho)</td>
<td>hostfile</td>
<td>Specify the name of the host file for running over a network (default is execution on one machine only in which case this option is not needed).</td>
</tr>
<tr>
<td>-ci</td>
<td>yes</td>
<td>Copy input files automatically to remote hosts for a network run, if necessary.</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>-cr</td>
<td>yes</td>
<td>Copy post files automatically from remote hosts used for a network run, if necessary.</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>-vf</td>
<td>viewfactor_name</td>
<td>Name of file containing viewfactors for radiation from previous analysis or from Mentat using either the Monte Carlo or Hemicube method.</td>
</tr>
</tbody>
</table>
Running Mentat

This section describes the Mentat usage on Microsoft Windows machines. The Mentat program is started by a batch script called `mentat.bat` which is stored in the `<parent>\mentat2019.1.0\bin` directory. It may also be started by using the Marc Mentat 20XX menu item in the Start menu in the MSC.Software folder or by selecting the Marc Mentat 20XX icon that the Setup program created on your desktop.

You need not start the batch script from a specific directory.

The Mentat program creates the default files in your current working directory; i.e. where you are located at the time of starting the Mentat program (if run from the command line), or the Start in directory specified for the shortcut if started from the Marc Mentat 20XX icon.

---

Table 3-1 run_marc Input Options (continued)

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-mpi</td>
<td>intelmpi, msmpi</td>
<td>Select which version of mpi will be used for Domain Decomposition or the MUMPS solver. If not specified, the appropriate default shown below will be used:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Platform</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Windows 64</td>
</tr>
<tr>
<td>-ml</td>
<td>memlimit</td>
<td>Memory limit for deciding if the solver should go out-of-core. Specified in Mbyte. Defaults to the physical amount of memory on the machine.</td>
</tr>
<tr>
<td>-gpuid</td>
<td><a href="">id:id:id</a> or auto</td>
<td>GPU card number or auto for automatic selection by program. For parallel (DDM) jobs, multiple card IDs can be specified if available.</td>
</tr>
</tbody>
</table>

Table 3-2 Examples of Running Marc Jobs

<table>
<thead>
<tr>
<th>Examples of running Marc jobs</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>run_marc -jid e2x1</td>
<td>Runs the job e2x1, the input file e2x1.dat resides in the current working directory.</td>
</tr>
<tr>
<td>run_marc -jid e2x14 -user u2x14 -save yes</td>
<td>Runs the job e2x14, using the user subroutine u2x14.f and the input file e2x14.dat. An executable program named u2x14.dat will be saved after completion of the job.</td>
</tr>
<tr>
<td>run_marc -jid e2x14a -prog u2x14</td>
<td>Runs the job e2x14a using the executable produced by job e2x14.</td>
</tr>
<tr>
<td>run_marc -jid e3x2a</td>
<td>Runs the job e3x2a.</td>
</tr>
<tr>
<td>run_marc -jid e3x2b -rid e3x2a</td>
<td>Performs a restart job using the results of the previous job e3x2a.</td>
</tr>
<tr>
<td>run_marc -jid e2x1 -nprocd 2</td>
<td>Runs a two processor job on a single parallel machine.</td>
</tr>
<tr>
<td>run_marc -jid e2x1 -nprocd 2 -host hostfile</td>
<td>Runs a two processor job over a network. The hosts are specified in the file hostfile (refer to the Marc Parallel Network for runs on a network of machines.</td>
</tr>
</tbody>
</table>
The batch script `mentat.bat` contains a number of arguments which are passed on to the Mentat program. Table 3-3 gives the meaning of these input options. You are free to alter these commands to suit your preference.

### Table 3-3 Mentat Input Options

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-mode</td>
<td>preset1/preset2</td>
<td>This will launch the application in the selected preset mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For preset1, which is the default, the traditional theme, the traditional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mouse button scheme and complete picking will be active.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For preset2, the dark theme, the auto-dynamic mouse button scheme and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>partial picking will be active.</td>
</tr>
<tr>
<td>-ar</td>
<td>area ratio</td>
<td>This option sets the initial window size to the given fraction of the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>available space on the desktop.</td>
</tr>
<tr>
<td>-xr</td>
<td>horizontal ratio</td>
<td>This option sets the initial width of the window to the given fraction of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the available width on the desktop [default: 0.92]</td>
</tr>
<tr>
<td>-yr</td>
<td>vertical ratio</td>
<td>This option sets the initial height of the window to the given fraction of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the available height on the desktop [default: 0.92].</td>
</tr>
<tr>
<td>-aspr</td>
<td>aspect ratio</td>
<td>This option sets the aspect ratio (width over height) of the window</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[default: 1.6].</td>
</tr>
<tr>
<td>-maximize</td>
<td></td>
<td>Starts up Marc Mentat maximized.</td>
</tr>
<tr>
<td>-minimize</td>
<td></td>
<td>Starts up Marc Mentat minimized (iconified).</td>
</tr>
<tr>
<td>-bg</td>
<td></td>
<td>This option will run Mentat in the background.</td>
</tr>
<tr>
<td>-bp</td>
<td>DIR\bin</td>
<td>Directory path name where the external Mentat programs and shell scripts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>are located.</td>
</tr>
<tr>
<td>-compile</td>
<td>binary_menu_filename</td>
<td>This is used to compile ASCII menu files into a binary menu file. The</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-mf option would be used to specify the new binary file.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To recompile the default binary menu file <code>main.msb</code>, compile as:</td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>bin\mentat -compile menus\win64\main.msb</code></td>
</tr>
<tr>
<td>-dr</td>
<td>True/False</td>
<td>Enable/disable direct rendering. Enabling this option will make OpenGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bypass the underlying window system and render directly from hardware to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the screen, if this is supported by the system. The default is True.</td>
</tr>
<tr>
<td>-fn</td>
<td>font</td>
<td>Default font type.</td>
</tr>
</tbody>
</table>
### Table 3-3 Mentat Input Options (continued)

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-fngr</td>
<td>font</td>
<td>Font used by the graphics windows (overrides the font selected via the -fn option).</td>
</tr>
<tr>
<td>-fnme</td>
<td>font</td>
<td>Font used by the menus (overrides the font selected via the -fn option).</td>
</tr>
<tr>
<td>-gradient</td>
<td></td>
<td>This option switches on a gradient background when displaying the various windows (Model, Table, History Plot, etc.).</td>
</tr>
</tbody>
</table>
| -hd      | name filename | Define a document viewer with the given name for viewing a document that consists of a set of HTML files. The filename must be the name of an XML file that defines the contents of the document. A menu item to open the viewer can be created by adding an `<html_doc>` element that references the viewer (via the “name” attribute) to the appropriate `<menu>` in `menubar.xml`. The XML file must have the following contents:  
```xml  
<?xml version="1.0" encoding="UTF-8"?>  
<html_doc>  
  <proc_root env="DEMO_DIR"/>  
  <title_page href="index.html"/>  
  <contents>  
    <chapter href="file1.html"/>  
    <chapter href="file2.html"/>  
  </contents>  
</html_doc>  
```  
The “href” attributes of the `<title_page>` and `<chapter>` elements specify, respectively, the path to the HTML file of the title page and the HTML files of the chapters of the document. The file paths must be given relative to the directory in which the XML file is located.  
For example, the Mentat startup script defines the document viewer for the User's Guide as follows:  
```
-hd ug help\ug\ug.xml
```
and `menubar.xml` contains the following element to open the viewer:  
```xml  
<html_doc name="ug"  
   title="User's Guide"/>  
```  
| -help    |            | All of the options.                                                                                                                        |
| -hide-dialog |         | Hide the dialog window at startup.                                                                                                           |
| -hide_dynamic_menu |       | Hide the dynamic window at startup.                                                                                                          |
| -hide_main_menu |         | Hide the main window at startup.                                                                                                             |
| -hp      | DIR\help  | Directory path name where the help files are located.                                                                                      |
Making Changes to the Marc Programs

Modifying the MPI Setting: selecting MPI version

The MPI version used by default is defined in the table below. It also lists an alternative MPI version to use for the respective platform. The default MPI version to use can be set by creating a `run_marc_defaults` file (refer Mentat Interfaces 61) and enter:

```
MARC_MPI alternative_mpi
```

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-lf</code></td>
<td><code>filename</code></td>
<td>Specify the Mentat log file name.</td>
</tr>
<tr>
<td><code>-license_release</code></td>
<td><code>number</code></td>
<td>Enable Mentat to release its licenses if the program is inactive for the specified amount of time. The number is in minutes and must be greater than one.</td>
</tr>
<tr>
<td><code>-mf</code></td>
<td><code>main.ms</code></td>
<td>The name of the startup menu file.</td>
</tr>
<tr>
<td><code>-ml</code></td>
<td><code>DIR\material</code></td>
<td>Directory path name where the material files are located.</td>
</tr>
<tr>
<td><code>-mp</code></td>
<td><code>DIR\menus</code></td>
<td>Directory path name where the menu files are located.</td>
</tr>
<tr>
<td><code>-multiundo</code></td>
<td><code>off/on</code></td>
<td>This option enables the user to either set the one-level UNDO option (off), with data saved in memory, or the multi-level UNDO option (on), with data saved on disk [default: on].</td>
</tr>
<tr>
<td><code>-undo_levels</code></td>
<td><code>number</code></td>
<td>Number of UNDO levels when the multi-level UNDO option is active. The minimum is 1, the maximum is 50 [default: 10].</td>
</tr>
<tr>
<td><code>-nosolidmodeling</code></td>
<td></td>
<td>Utilize the Mentat_Parasolid_CAD which allows geometric models to be imported but does not allow solid geometry editing.</td>
</tr>
<tr>
<td><code>-path</code></td>
<td><code>directory_name</code></td>
<td>Provides a directory in which Mentat searches when opening an existing input file. Multiple directories can be specified as follows: <code>-path directory_1 -path directory_2</code> etc.</td>
</tr>
<tr>
<td><code>-pr</code></td>
<td><code>filename</code></td>
<td>Any additional set-up commands you wish to add. Store these in a procedure file containing the Mentat commands.</td>
</tr>
<tr>
<td><code>-ra</code></td>
<td></td>
<td>This reads all of the ASCII Menu files.</td>
</tr>
<tr>
<td><code>-rf</code></td>
<td><code>filename</code></td>
<td>Record the Mentat commands in the procedure file <code>filename</code>.</td>
</tr>
<tr>
<td><code>-szgr</code></td>
<td><code>width height</code></td>
<td>Set the size (width and height in pixels) of the graphics area.</td>
</tr>
<tr>
<td><code>-ti</code></td>
<td><code>title</code></td>
<td>Append <code>title</code> to the name of the window.</td>
</tr>
<tr>
<td><code>-unicode</code></td>
<td></td>
<td>Allow the use of unicode characters in load case titles, job titles, annotations and user-defined names of results file variables.</td>
</tr>
</tbody>
</table>
for setting a new default. Use the exact word as given in the Alternative MPI column. The MPI version can also be set with the command line option -mpi to run_marc. The command line option overrides the value set in run_marc_defaults.

<table>
<thead>
<tr>
<th>Platform</th>
<th>Default MPI</th>
<th>Alternative MPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 64</td>
<td>intelmpi</td>
<td>msmpi</td>
</tr>
</tbody>
</table>

**Setting defaults with the run_marc_defaults file**

A file called run_marc_defaults located in the user’s home directory (as given by the combined environment variables %HOMEDRIVE%\%HOMEPATH%) or the tools directory of the Marc installation can be used for setting program defaults. If both are present, then the setting in the user’s home directory will be used.

The following setting is currently available:

| MARC_MPI | as given in the table in this section |

This selects the MPI version to use.

**Mentat Interfaces**

This section contains information about the different interfaces available for different purposes in Mentat.

**Mentat External Programs**

Mentat supports a number of CAD interfaces: IGES, Patran, Ideas, VDAFS. These interfaces are programmed in external programs which are called from within Mentat. The interface programs are run from scripts stored in the <parent> subdirectory mentat2019.1.0\bin. These programs read the data files in their native format and translate the contents into a Mentat model file. This file is subsequently read by Mentat. The external programs are called from within Mentat by means of the FILE submenu.

**Jobs**

The subdirectory bin contains batch script files to start a Marc job using the following batch scripts:

`submit1.bat, submit2.bat, submit3.bat`

These batch scripts are called by means of the buttons in the job menu. You may alter these files to suit your environment.

**Plotter Interface**

Because of the many variations in plotting environments, we have created plotting interfaces in the form of batch scripts that operate from within Mentat. Currently, Mentat recognizes the following plotting formats:
- PostScript
- WinDump (translated into Windows bitmap (.BMP) format)

This section describes a template batch script for each of the formats mentioned above. They are located in the `mentat2019.1.0\bin` directory and are named as follows:

```
picolor1.bat, picolor2.bat, picolor3.bat
psgray1.bat, psgray2.bat, psgray3.bat
xdump1.bat, xdump2.bat, xdump3.bat
```

### PostScript

The PostScript function is activated by pressing the **Gray** or **Color Print** button from the UTILS menu on the POSTSCRIPT panel. The program captures the graphics portion of the screen into a file and sends this file to a PostScript printer using the `psgray` or `pscolor` batch scripts located in the `mentat2019.1.0\bin` directory. In the example listed below, the file is sent to the printer LPT1. This can be a printer attached locally, or located somewhere on the network. After the file is sent, it is removed from disk automatically.

```
print /D:LPT1: %1
del %1
```

The argument `%1` is the filename handed to the batch script by Mentat. If there is more than one printer on-line, the `pscolor2.bat` and `pscolor3.bat` batch scripts may be used to address these other printers.

You can use the `setup_printer` program to configure a network printer. Run `setup_printer` for more details.

### Edit

The `edit_window.bat` batch script is used to control the editor associated with the **EDIT** commands. It is possible to change the type of editor, for example, from notepad to emacs.

### System Shell

The `system_window.bat` batch script is used to control the type of window opened with the **SYSTEM SHELL** command.

### AVI Playback

The `avi_window.bat` batch script is used to control the program opened with the **PLAY AVI** command.

### MPEG Playback

The `mpeg_window.bat` batch script is used to control the program opened with the **PLAY MPEG** command.
Chapter 4: Marc Parallel Network

- Hardware and Software Requirements  65
- Installation Notes  68
- User Notes  69
Hardware and Software Requirements

The list of supported capabilities in parallel can be found in “Supported and Unsupported Features” in Chapter 12 of Marc Volume A, Theory and User Information.

The list of supported platforms can be found in “Introduction” in Chapter 1 of this guide.

To use Intel MPI, observe the following:

1. From the Command Prompt window, go into the directory
   
   C:\Program Files\MSC.Software\Marc\2019.1.0\marc2019.1.0\intelmpi\win64\bin\intelmpi\win64\bin

2. Type .\mpiexec.exe -register

   Note: When opening a Command Prompt window, always start the Command Prompt window by right clicking the icon and selecting Run as Administrator.

3. Enter your account (use a network account if you intend to run DMP jobs) and the password at the command prompt.

   account (domain\user) [\domain\<username>]:
   password:
   confirm password:

   The following message appears in the Command Prompt window.

   Password encrypted into the Registry will show in the Command Prompt window.

   Note: If you change your account and password, you will need to repeat this step.
4. Type:
\hydra_service -install

5. To run DMP (network parallel jobs) using Intel MPI, create a host file using the following format:

   host1 n1 workdir1
   host2 n2 workdir2
   host3 n3 workdir3

Use the directory name (UNC) as echoed by typing `net share` on your system for `workdir`.

For example:

   sv-x861 2
   sv-x862 2 \\sv-x862\test2

The DMP job will run using two processors on node `sv-x861` in the directory where the job is started and two processors on node `sv-x862` in the shared directory `test2`.

The `test1` and `test2` directories in nodes `sv-x861` and `sv-x862` as well as the `marc2019.1.0` directory in node `sv-x861` will need to be shared with a general permission to all users.

The default MPI is Intel MPI 2017.1 for Windows. The other MPI option for the 64-bit Windows platform is MS-MPI.

6. To use MS-MPI, install Microsoft MPI; the version is listed in the `include_win64.bat` file in the `marc tools` directory.

7. Turn off the Windows firewall in your cluster and share the `marc` directory with a general permission to all users.

Although no specific hardware requirements exist to run a job in parallel, it is preferable that for distributed parallel processing to have fast network connections between the machines. It is recommended that the network should have a speed of at least 100 MBit per second. If only two machines are to be used, a hub or a cross-over cable can be used to connect them. If more than two machines are to be used, a switch is preferable. TCP/IP is used for communications. Refer to the `include_win64.bat` file in the `tools` directory for requirements on O/S, compilers, etc. for more details regarding running on Microsoft Windows.
Definitions

The definition of some of the terms are as follows:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Root machine</td>
<td>The machine on which Marc job is started.</td>
</tr>
<tr>
<td>2</td>
<td>Remote Machine</td>
<td>Any machine other than the root machine which is part of a distributed Marc run on the network.</td>
</tr>
<tr>
<td>3</td>
<td>Shared installation</td>
<td>Marc is installed in a UNC shared directory on one machine only. The other machines can access the Marc executable since the directory is shared.</td>
</tr>
<tr>
<td>4</td>
<td>Distributed installation</td>
<td>Marc is installed on all machines. Each machine accesses its own Marc executable.</td>
</tr>
<tr>
<td>5</td>
<td>Distributed execution</td>
<td>Marc is run on multiple machines which are connected with a network. Each machine loads the Marc executable either from a shared or a local directory and then executes the executable.</td>
</tr>
<tr>
<td>6</td>
<td>Shared I/O</td>
<td>Marc reads and writes data in a UNC shared directory. Each Marc executable running on the network reads/writes to the same directory.</td>
</tr>
<tr>
<td>7</td>
<td>Distributed I/O</td>
<td>Marc reads and writes data in a directory located on each machine. Transfer of data files and post files between the root machine and remote machines is done automatically by Marc.</td>
</tr>
<tr>
<td>8</td>
<td>UNC</td>
<td>Uniform Naming Convention.</td>
</tr>
</tbody>
</table>

Network Configuration

Marc needs to be installed on the root machine where the installation directory is UNC shared (shared installation). Marc can also be installed on the remote machines which then use their own executable (distributed installation). For this case the same path name must be used on all machines. The root machine is the one on which the Marc job is started, typically from within Mentat. The remote machines can be located anywhere as long as they are connected to the network. The working directory on each machine can be a shared directory on any machine on the network (shared I/O) or it can be a local directory on the hard disk of each machine in the analysis (distributed I/O). The User Notes 69 describes how to specify what working directory to use.
Installation Notes

This part describes the specific steps needed to install and set up a network version of Marc. For general information on Marc installation, see Marc and Mentat Installation.

Steps 1–6: Must be performed as Administrator.

Step 1: Install Marc on the root machine.

Step 2: Make sure that the installation directory on the root machine is properly shared, so that the remote machines can access it. Assuming that Marc is installed under C:\Program Files\MSC.Software, share this directory by associating a UNC share name with it as follows. Use My Computer and locate the directory to be shared. Right click on the directory and choose Sharing, Choose Share As and give it a Share Name (this is the UNC name) and click OK.

Marc restricts the UNC name to have a maximum of 10 characters and the name of the shared directory to have a maximum of 30 characters. If necessary, a directory higher up in the path can be shared (for instance, C:\ instead of C:\Program Files\MSC.Software). It is sufficient that either C:\ or C:\Program Files\MSC.Software is shared.

Step 3: On the remote machines you can perform a full Marc installation or an installation of the Intel MPI Library Process Manager service only. In the latter case, the remote machine will be using the Marc installation of the root machine via the UNC share name.

The Process Manager service must be installed and running on all hosts involved a distributed job across the network. To install the Process Manager on a machine without a full Marc installation, copy the hydra_service.exe program from the intelmpi\win64\bin directory (on the root machine) to a local directory on the remote machine. Open a Command Prompt window on the remote machine, go into that directory and execute:

  .\hydra_service -install
Step 4: Create a Marc file with the shared naming information. From the Command Prompt, change directory to the tools directory in the Marc installation directory (here assumed to be `C:\Program Files\MSC.Software`).

```bash
c: cd \Program Files\MSC.Software\Marc\2019.1.0\marc2019.1.0\tools
ett share > marc.net
```

This file has to be recreated each time the shared name of the installation directory is changed. The file marc.net contains the connection between the path names on the root machine and the UNC names, and can be created only by the Administrator. If this file does not exist or contains outdated information, the remote machines will not be able to find the executable on the root machine.

Step 5: Test the Marc installation for single processor execution by typing from the root machine:

```bash
c: cd \Program Files\MSC.Software\Marc\2019.1.0\marc2019.1.0\test_ddm\exmpl2\exmpl2_1
run_marc -j cyl2
```

and Marc should exit in about three minutes if it is a successful run.

Step 6: Test the Marc installation for multi-processor, distributed execution. Assume the host name of the root machine is host1 and one of the remote machine is host2. Type from host1:

```bash
c: cd \Program Files\MSC.Software\Marc\2019.1.0\marc2019.1.0\test_ddm\exmpl2\exmpl2_2
```

and edit the file `hostfile` in this directory by replacing `workdir` with

```bash
c:\Program Files\MSC.Software\Marc\2019.1.0\marc2019.1.0\test_ddm\exmpl2\exmpl2_2
```

The host names and directory names should be replaced with the names on the current system. Finally, type:

```bash
run_marc -j cyl2 -nprocd 2 -host hostfile
```

and Marc should exit in about two minutes if it is a successful parallel run on host1 and host2 using one processor on each. If the job stalls or hangs at start-up time, exit it by typing `control-C` in the window in which is was started. See User Notes 69 in this chapter.

User Notes

This section assumes that the network version of Marc has been successfully installed on two machines that are to be used in a distributed analysis and that the appropriate Marc licenses are in order. Assume that host1 is the host name of the machine on which Mentat is running and from which the job is to be started (the root machine). The host name of the other machine (the remote machine) is host2.

How to Run a Network Job

First make sure that the two machines are properly connected. From host1, access host2 using Internet Explorer. If this is not possible, a network run will not be possible.
In order to perform an analysis over a network, you have to create a special file called the host file. This file defines which machines are to be used, how many processes are to run on each, what working directory should be used, and where the Marc executable can be found on each machine. The host file can be selected and edited in Mentat and the Marc job started as usual from within Mentat (see the following example). If Marc is run from the command line, it is done as for a normal run using an additional command line option.

For example:

```
run_marc -b no -jid test -nprocd 2 -host hostfile1
```

will run the two-processor job test.dat using the specification in the file hostfile1. No specific name or extension is used for the host file except that the name jobid.host (in this example test.host) must be avoided since it is used internally by Marc.

### Specification of the Host File

The host file has the following general format:

```
host1 n1
host2 n2 workdir2
host3 n3 workdir3
```

Each line must start at column 1 (no initial blanks). Blank lines and lines beginning with a # (number symbol) are ignored.

- The first entry is the host name of a machine to be used in the analysis. The root machine must be listed first and each machine must only occur once.
- The second entry specifies the number of processes to run on the machine specified in the first entry. The sum of the number of processes given in the host file must equal the number of domains used. In a five-domain job, it is required that \( n_1+n_2+n_3=5 \).
- The third entry specifies the working directory to use on this host. This is where the I/O for this host takes place. The Marc input files for this machine must be in this directory and the results files for this machine are created in this directory.

The different domains of the Marc job are associated with the different machines as follows. Suppose a five-domain job test is run using a host file defined as:

```
host1 2
host2 1 workdir2
host3 2 workdir3
```

with appropriate definitions of the third entry, see below. There will be six Marc input files associated with this job: test.dat, 1test.dat, …, 5test.dat. Domains 1 and 2 will be associated with host1, domain3 with host2 and domains 4 and 5 with host3.

**Note:** The current version does not support the IPV6 protocol.
**Shared I/O**

Suppose a job is to be run on host1 and host2. A shared directory on host1 is to be used for I/O. The UNC sharename for this directory is assumed to be dir7. The host file for a two-processor job would be:

```
host1 1
host2 1 \host1\dir7
```

To verify that the work directory is accessible, use **Internet Explorer** on host2 and browse to \host1->dir7. The directory seen should be the same one as the working directory on host1.

It is also possible to use only two entries for each host in the host file (host name and number of processes). This requires that the working directory is shared and that the sharing information is up to date in the file `tools\marc.net` in the Marc installation directory.

**Distributed I/O**

If you want to have the I/O to be local on host2, specify the host file as:

```
host1 1
host2 1 D:\users\dir5
```

The I/O on host2 will now take place in the directory `D:\users\dir5` on the hard disk of host2. For this case, the Marc input files are transferred to `D:\users\dir5` on host2 before the job is started, and the results files are transferred back after the analysis for postprocessing. This transfer of files is done by Marc automatically.

**Example**

The definitions for a network run with Mentat is demonstrated with a simple example. We assume the simplest case where both the working directory and installation directories are shared.

1. Enter the menu **Help → Run a Demo...**

   A **Run A Demo** dialog appears.

   ![Run A Demo dialog](image)

2. Select the example **Contact With DDM**.
3. After the process is completed, click **Close result file** button.

4. Select **Jobs** tab and check **Identify** to confirm your two domains as shown in the image as follows:

The complete model workflow can be seen in the **Model Navigator**.

5. Right click on **Indent** and select **Properties** from the drop down list.
The **Job Properties** dialog appears.

6. Click **Run**.
The **Run Job** dialog appears.

7. Click **Solver/Parallelization**.
The **Solver/Parallelization** dialog appears.

![Solver/Parallelization dialog](image)

Ensure the **Use DDM** option is selected. In this case three domains are used.

8. Select **Network** option from the submenu.

   An additional option to select the host file appears just below Network.

9. Click on the **Host File** and select the file called `hostfile` from the install directory and modify it to contain:

   ```
   host1 1
   host2 1  workdir installdir
   ```

10. Set the working directory according to the share names on the current system. The host file places one domain on hostname1 and one domain on hostname2.
11. Run Marc from within Mentat using the **Submit 1** button. When the analysis is complete, the following dialog box appears:

![Run Job Dialog Box](image1.png)

12. Check your results by clicking the **Open Post File (Results Menu)** button.

A plot of the Total Equivalent Plastic Strain in the final deformed configuration is shown as follows:

![Total Equivalent Plastic Strain Plot](image2.png)

Marc creates a post file associated with each domain as well as a root post file associated with the job id. For the previous model, `model1_job1.t16` and `2model1_job1.t16` are the processor files, while `model1_job1.t16` is the root file.
To post process the entire model, select `model1_job1.t16` as the post process file. If the model is very large, it may be convenient to view only a portion of the model by selecting any one of the processor post files, such as `2model1_job1.t16`. This file contains only data associated with domain 2 as selected in the Domain Decomposition menu. As specified in the host file, this file was created by host2.

**Shared vs. Distributed I/O**

For jobs with very large post or restart files, it is usually more efficient to use distributed I/O. With distributed I/O, the input files, and the post files are located on the host's local disks. Marc, by default, automatically transfers the input files and the post files to and from the remote host if needed. It is possible to suppress this transferring with two buttons in the Network settings in the JOBS menu in Mentat.

To run a job using distributed I/O, specify a local directory in the host file:

```
host1 2
host2 1 d:\workdir
```

**Jobs with User Subroutine**

User subroutines can be used as usual. If local directories are used on remote hosts (distributed I/O), then the working directory on the first host must be shared so the other hosts can find the executable.
Chapter 5: Windows Troubleshooting

- General 79
- Marc Parallel Network 82
General

This chapter contains information about troubleshooting general and problems according to FLEXlm version 11.13. The process for Helium(11.16.3.0) license manager is the same but the paths may vary. Use the paths in the following section to identify the difference between both the versions.

FLEXlm 11.13 VS Helium(11.16.3.0) License Manager

This section contains information and directory paths according to FLEXlm 11.13 license manager. The changes in the default paths for Helium license manager in comparison with FLEXlm 11.13 are as in the following table:

<table>
<thead>
<tr>
<th>11.13</th>
<th>Helium (11.16.3.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\msc</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\msc</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\lmtools</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\installs</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\installs</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\lmgrd</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmgrd</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\LOG</td>
<td>C:\MSC.Software\MSC Licensing\Helium\LOG</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\lmutil</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmutil</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\msclici.ini</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\msclici.ini</td>
</tr>
</tbody>
</table>
### Access is denied

**Cause**
No write permissions to the file or directories to which you are installing.

**User Action**
- Do the following:
  1. Open up an MS-DOS Command Prompt window.
  2. Run the `attrib` program to remove the read-only attributes (with the `-R` option).
- Use the File Manager’s Security menu to change ownership of files and directories and to change permissions on them.

### Error during move process

**Cause**
An application or a file open during the installation process that the installation is trying to overwrite.

**User Action**
Exit all applications and documents during installation and restart the installation.

### Security failed or Marc exit 67

**Cause**
1. The environment settings are not set properly.
2. You are attempting to run on a machine that according to the Marc password(s) you are not allowed to use
3. Your license period has expired

**User Information**
In this case you cannot access or read the `license.dat` file in the `C:\Program Files\MSC.Software\MSC Licensing\Helium` subdirectory.

Every Marc user should have read and write rights for the `<parent>` subdirectory11.13

**User Actions**
- Log out and log back in and try again.
- Check that the environment variable `MSC_LICENSE_FILE` is set to a valid license file.
- Install your passwords before security succeeds.
- Check that the FLEXlm license manager has been started from the FLEXlm Configuration Utility applet in the Start menu under MSC.Software → MSC.Licensing 11.16. This must be done AFTER you have saved your `license.dat` file in the `MSC.Software\MSC Licensing\Helium` directory. Test that it is working by pressing the Status button in the Control menu.
- Check time and date on your machine.
- Use the File Manager’s Security menu to change Ownership of files and directories, and to change Permissions on them.
License Manager does not start

Cause
1. Incorrect hostname on the SERVER line.
2. Incorrect path to the license daemon MSC.exe

User Actions
- Check that the hostname on the SERVER line is correct
- Check that the DAEMON line contains the correct path to the license daemon MSC.exe
- If you had an older version of the FLEXlm license manager installed, the new installation may replace it. If the Use NT Services button was previously checked, you should uncheck this button, start the license manager, and then select the Use NT Services button.

Link failed

Cause
1. No Fortran compiler or Fortran libraries
2. Your PATH or LIB environment variables settings do not point to the proper location for your Fortran compiler.

User Information
User subroutine causes compiler errors

User Actions
- Make Fortran compiler or Fortran libraries available
- Point your PATH or LIB environment variables settings to the proper location for your Fortran compiler.

Fortran files are not being compiled

Cause
The Fortran compiler is not in your search path, or the INCLUDE and LIB environment variables are not set.

User Information
The Intel Fortran compiler requires that the Microsoft .NET 2015 framework is installed and the LIB environment variable setting includes the required dependency libraries. Running the compilervars script mentioned below to make sure that the environment is correctly set up

User Actions
Verify that your settings are correct with the set command. Run the following scripts to set it up:

```
C:\Program Files (x86)\IntelSWTools\compilers_and_libraries_2017\windows\bin\compilervars intel64 vs2015\n```
(or substitute your installation directory)

User subroutines are not being called

Cause
For Fortran, the argument list for subroutines does not match exactly.

User Information
If the argument does not match exactly, your subroutine will not replace the existing subroutine in the Marc Library. The linker will continue to use the subroutine that is defined in the Marc Library, and since your routine will not be linked in, it will never be called.

User Actions
Make Fortran argument list match exactly.
Marc Parallel Network

This section contains information about troubleshooting specific to Marc parallel network.

General

If you face any problems in launching Marc Menatat, make sure that:

1. The user ID that was registered using the mpiexec.exe utility exists on the root machine and all remote machines (see General Information). Also check that the password you entered is the same on all machines.
   
   Note that if you change your login password, you must register it again using mpiexec.exe

2. The remote machines have permission to read from the Marc installation on the root machine via the UNC sharename. For shared I/O, the remote machines also must have permission to read from and write to the shared (working) directory on the root host.

3. Your Marc and Marc Parallel licenses are valid.

4. The host names are valid.

5. The Intel Process Manager service is installed and running on all hosts involved in the distributed job across the network. Select Start/Control Panel/Administrative Tools/Services and look for Intel MPI® Library Process Manager, Intel. Make sure that it is as Status:Started.

   The typical error message that appears if the Process Manager service is not running on or more hosts is:

   abort: Unable to connect to 'hostname:8676'
   sock error: generic socket failure, error stack:
   ...

   Refer to Step 3 of the installation instructions (Installation Notes) on how to install the Process Manager on machines without a full Marc installation.

Running a Parallel Job when Not Connected to the Network

If you disconnect your system from the network and want to run a parallel job on that system, you will have to install the Microsoft Loopback Adapter. Do the following:

1. Go to Control Panel -->Add/Remove Hardware.

2. Select the hardware task you want to perform:
   
   Add/Troubleshoot a device

3. Choose a Hardware Device:
   
   Add a new device

4. Do you want Microsoft Windows to search for your new hardware?
   
   No, I want to select the hardware from a list

5. Select the type of hardware you want to install:
   
   Network adapters

6. Select Network Adapter:
It will now install the loopback adapter. You will have to enable/disable the loopback adapter as you remove/connect your machine to the network.

**Running a Parallel job on a Windows System when not a member of a Domain**

If you are running a parallel job on a Windows system that is not a member of a domain, you will have to modify a registry entry.

Using `regedt32`, look for the following key:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Lsa
    "forceguest" : REG_DWORD : 00000001
```

If you find this key, change the REG_DWORD value to 0. The name may also appear as ForceGuest.

If you do not have this registry entry, your system will function properly.

**Running a Parallel Job on Windows**

The RPC protocol does not permit anonymous requests to the RPC Endpoint Mapper but requires client requests be authenticated using Windows XP SP2 or later. This will cause an *Access is Denied* error when you attempt to run a Marc Parallel job.

As a work around for this problem, do the following:

1. From a command prompt, run `gpedit.msc`.
2. Select **Computer Configuration**
   a. Expand **Administrative Templates**.
   b. Expand **System**.
   c. Click **Remote Procedure Call**.
   d. Double click **RPC Endpoint Mapper Client Authentication**.
   e. Change the value to **Enabled**.

You will also need to check the Data Execution Prevention settings.

1. Right click **My Computer**.
2. Go to **Properties**.
   a. Select the **Advanced** tab.
   b. Select the Performance **Settings** button.
c. Select the **Data Execution Prevention** tab.

d. Select the button for **Turn on DEP for essential Windows programs and services only**

**Required Privileges**

Running a parallel job either locally or over a network requires certain user privileges. If the privileges are not sufficient, MPI will print an error code of 1314.

You will need to check the following settings from the Control Panel:

1. Select **Administrative Tools**

2. Select **Local Security Policy**

3. Check the following items under **Local Policies → User RightsAssignment**.

   Windows
   
   - Adjust memory quotas for a process
   - Replace a process level token

You can add user names to these if needed by right clicking them and going to **Properties**.

<table>
<thead>
<tr>
<th><strong>Note:</strong></th>
<th>The setting on the domain controller will also need to provide access to these settings for each user name, if the users login through a domain controller.</th>
</tr>
</thead>
</table>
SECTION 2: LINUX
Prerequisites for Marc and Mentat

- Installation Prerequisites 89
- Supported Platforms 90
## Installation Prerequisites

This section contains information regarding the hardware and software which are required in order to complete the installation successfully.

### Before installing the software

The product is available for download at the MSC Solutions Download Center available at: [https://mscsoftware.subscribenet.com](https://mscsoftware.subscribenet.com)

1. Select the product **Marc** and select the 20XX version on the next level.
2. Download the installer for your platform.
3. The FLEXlm security is installed separately. Select the product **MSC Licensing** and the version Helium(11.16.3.0) on the next level.
4. Download the installer for your platform.
5. Decide where you want the product to be installed and where to perform the installation.
6. First install security. If you are installing both Marc and Mentat, then first install Marc and then install Mentat.

Marc requires approximately 1.1 GB of permanent disk storage capacity.

Mentat requires approximately 1.3 GB of permanent disk storage capacity. Documentation, stored in the separate documentation directories `doc` and `examples`, contains approximately 350 MB of data.

### Password protection

The Marc and Mentat version you have received is protected against illegal usage by means of Flexera Software’s FLEXlm licensing software. You cannot run the program directly after you have installed the product from the installation media until you obtain a license file from MSC Software Corporation.

### Multiple machines/NFS Fileserver

If you are installing Marc and/or Mentat on an NFS Fileserver, the install script needs to create directories in which to install Marc and/or Mentat; the default NFS export options do not allow this level of access by root. Two approaches are possible – do not install as root, or if you must install as root, modify your NFS export options to include `-root=list` (where list can include hostnames and netgroups).
You may need to be logged in as root if you want to create an optional link by which Marc and/or Mentat will be known system-wide under the name `marc20XX` and/or `mentat20XX`. This link will, by default, be placed in the directory `/usr/local/bin` to which you must have write permission. Logging in as root is one way of ensuring that you can create this link. Make sure that you have write permission to the installation directory before you start the installation script.

For NFS fileserver networks, read the previous paragraph.

<table>
<thead>
<tr>
<th>Should I be “root”?</th>
</tr>
</thead>
<tbody>
<tr>
<td>You may need to be logged in as root if you want to create an optional link by which Marc and/or Mentat will be known system-wide under the name <code>marc20XX</code> and/or <code>mentat20XX</code>. This link will, by default, be placed in the directory <code>/usr/local/bin</code> to which you must have write permission. Logging in as root is one way of ensuring that you can create this link. Make sure that you have write permission to the installation directory before you start the installation script.</td>
</tr>
<tr>
<td>For NFS fileserver networks, read the previous paragraph.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fortran compiler</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Fortran compiler is necessary if user subroutines are to be used. For other cases, no compiler is needed. The compiler needs to be compatible with the one used in the Marc build, see the Marc and Mentat Release Guide for a list of supported compilers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NVIDIA driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>An NVIDIA driver is necessary if the GPGPU capability is to be used. For other cases, no special driver is needed. The NVIDIA driver needs to be compatible with the one used in the Marc build; see Marc Volume A: Theory and User Information, Chapter 13 for the minimum driver version supported.</td>
</tr>
</tbody>
</table>

**Supported Platforms**

The supported Linux platforms are listed below. The installation of a Fortran compiler is only required if you would like to run Marc with user subroutines.

<table>
<thead>
<tr>
<th>Type</th>
<th>OS</th>
<th>Hardware</th>
<th>Fortran Version</th>
<th>Default MPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linux (64 bit)</td>
<td>Red Hat RHEL7.1</td>
<td>Intel EM64T or AMD Opteron</td>
<td>Intel Fortran 17</td>
<td>Intel MPI 2017.1</td>
</tr>
<tr>
<td></td>
<td>SUSE 11 SP4</td>
<td>Intel EM64T or AMD Opteron</td>
<td>Intel Fortran 17</td>
<td>Intel MPI 2017.1</td>
</tr>
</tbody>
</table>

1. Also runs on RHEL 7.3.
2. Also runs on SUSE 12 SP1 and RHEL 6.7.
3. For user subroutines, Intel Fortran 17 is required.
4. IBM Platform MPI (community edition) is also supported. In the documentation and the scripts, this is referred to as hpmipi.
Chapter 7: Marc and Mentat Installation

- Installation Procedure 93
- Installation Information 111
- Installation Summary 112
- Managing FLEXlm 114
Installation Procedure

The installation needs to be done in four steps:

1. Install MSC licensing Helium
2. Install Marc and Mentat
3. Install documentation
4. Verify installation

For old installation procedure, refer to Appendix. C: Linux: Marc/Mentat Files, Subdirectories and Installation

Install MSC Licensing Helium

1. Download the latest .bin file from the MSC Download Center.

2. Start the installation procedure by using the command as follows:

   [root@vm-tmrhel73 MSC]# ls
   license.dat  marc_20XX_linux_doc.tar.gz
   marc_20XX_linux64_rh7.1_7.3.tar.gz  msc_licensing_helium_linux64.bin
   [root@vm-tmrhel73 MSC]# ./msc_licensing_helium_linux64.bin

   The following prompt appears on the screen.

   ![Install MSC Licensing Helium]

   The commands/user inputs are marked in bold for all descriptions related to terminal commands in this document. Rest of the script is auto generated. For more details refer to Typographical Conventions in Preface.

3. Click Yes.

   The MSC Licensing Helium User’s Guide opens automatically.

   • For detailed installation about licensing, refer to the MSC Licensing Helium User’s Guide.
   • For quick installation continue with the following procedure
An MSC Licensing Helium Setup window appears.

4. Click Next

5. If your system already has the older version of the MSC Licensing Server, it will show the following message:

   11.13 License Server process currently running. Do you want to un-install 11.13 license server?

6. Click Yes to continue

   The Installer Requirements window appears.

7. Review the requirements and if all the requirements are fulfilled. Click Next.
The **Choose Destination Folders** window appears.

- Review and note the default locations for both the folders.
- Keep the default paths as is (strongly recommended).

8. Click **Next**
   A window to select license file appears.

9. Click **Browse**. An **Open** dialog appears.
   a. Select the required `license.dat` file.
b. Click **Open**

c. The following error message appears if one or more feature entries in the license file has expired:

   One or more FEATURE entries have maintenance end dates that have expired. These licenses can be used only by MSC products that were released prior to the maintenance expiration date on the FEATURE entry.

d. Click **OK** to continue.

10. Click **Next**.

   The **Details of the License File** window appears.

![Details of the License File window]

Note: Here, MSC One license is used to demonstrate the installation procedure. For more information about the license types, refer to the *MSC Licensing Helium User’s Guide*.

11. Click **Next**.
The **Automatic Reporting of Usage Data** appears.

![Automatic Reporting of Usage Data](image)

Please read the following comments on Automatic Reporting of Usage Data:

MSC Software collects general usage information in order to understand the needs of our customers. The details of the data collected are described in the MSC Licensing User Guide. MSC Software will only use this data for internal business reasons.

[ ] I agree to the automatic reporting of usage data.

Click "Back" to return to the previous screen.
Click "Next" to continue with the Setup Program.

1. Check the box against **I agree to the automatic reporting of usage data** (uncheck the box if you do not want automatic reporting).

12. Click Next.
The License Server Setting options appears.

![License Server Settings](image)

a. Open your license.dat file to verify your port number and hostname and enter values accordingly.
b. Click Browse and select the Options File path.
c. Against Access select Admin/Superuser or ANY according to your choice to control the access of license.
d. Check Start the server automatically.

13. Click Next.
The Start Copying Files window appears.

Review the settings for one final time.

14. Click Next.

15. An MSC Licensing Installation Program prompt appears.

16. Click OK.
17. Click Finish to complete the installation.

<table>
<thead>
<tr>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The installer creates a sample script that can be used to start the license server after a system reboot. This script and a README file with important details are written to a directory named startup_script under the installation directory you selected.</td>
</tr>
<tr>
<td>2. You can start your server (and create a log file) using the below command:</td>
</tr>
<tr>
<td>/msc/MSC.Software/MSC Licensing/Helium/lmgrd -c</td>
</tr>
<tr>
<td>/msc/MSC.Software/MSC Licensing/Helium/license.dat -l</td>
</tr>
<tr>
<td>/msc/MSC.Software/MSC Licensing/LOG/lmgrd.log</td>
</tr>
</tbody>
</table>

**Install Marc and Mentat**

This part will be further divided into two steps as follows:

1. Install Marc
2. Install Mentat

**Install Marc**

1. Download the file marc_20XX_linux64_rh7.1_7.3.tar.gz. Extract it using the commands as follows:
   ```
   [root@vm-tmrhel73 MSC]# tar -xvf marc_20XX_linux64_rh7.1_7.3.tar.gz
   install.exe
   products/
   products/gl27emt0.k10
   products/common1.gui
   products/al27emt0.k10
   products/list
   utils/
   utils/read_pdf
   utils/maintain_usage
   The file will be extracted.
   ```
2. Give execution rights to the extracted install.exe file and run the installation using the following commands:
   ```
   [root@vm-tmrhel73 MSC]# ls
   install.exe  marc_20XX_linux_doc.tar.gz  utils
   license.dat   msc_licensing_helium_linux64.bin
   marc_20XX_linux64_rh7.1_7.3.tar.gz  products
   [root@vm-tmrhel73 MSC]# chmod +x install.exe
   [root@vm-tmrhel73 MSC]# ./install.exe
   ```
The terminal asks for permission to start the Marc installation as follows:

```
This will install Marc 20XX on your computer. Continue? [y/N] y
```

3. Type **Y**, press **Enter**. The copyright information appears on the terminal screen as follows:

```
Software piracy is illegal and MSC Software Corporation and its affiliates reserve the right to take all legal steps to stop piracy of their products and pursue those who take part in those activities. As part of those anti-piracy efforts, the Software may contain security mechanisms intended to detect the installation or use of unauthorized copies of the Software, and collect and transmit data relating to such copies (including data relating to use of such copies, the machines on which such copies are accessed or used, and network and user configuration data), to MSC Software Corporation and/or its affiliates, and/or their agents, contractors, suppliers, successors and assigns. See MSC Software online privacy statement available at www.mscsoftware.com for more information. By entering "I Accept" below or otherwise installing or using the Software, you consent to such detection, collection and transmission, as well as to the use of such data, for the purposes of identifying unauthorized usage and protecting and enforcing intellectual property rights.

Enter "Cancel" to quit Setup.
Enter "I Accept" to consent and continue with the Setup program. [Cancel]

I Accept
```

4. Read the information and type **I Accept**.
The following information can be seen on the terminal screen:

```
root@vm-tmrhel73:~:/MSC
File Edit View Search Terminal Help

 contractors, suppliers, successors and assigns. See MSC Software online privacy statement available at www.mscsoftware.com for more information. By entering "I Accept" below or otherwise installing or using the Software, you consent to such
detection, collection and transmission, as well as to the use of such data, for
the purposes of identifying unauthorized usage and protecting and enforcing int
ellectual property rights.

Enter "Cancel" to quit Setup.
Enter "I Accept" to consent and continue with the Setup program. [Cancel]

I Accept

Welcome to the Marc installation script for Linux systems

Installation Directory
------------------------
Marc 20XX and Mentat 20XX will be installed in subdirectories
marc20XX and mentat20XX of the directory entered here.

Enter the directory to install the software
(/root/MSC)
: /root/MSC
```

5. Type `/root/MSC`, press Enter.

The Linux Installation script appears on the terminal screen as follows:

```
root@vm-tmrhel73:~:/MSC
File Edit View Search Terminal Help

Installation script for Linux systems
-----------------------------------

MSC Software Corporation

Main menu
--------

1) Install Marc
2) Install Mentat
0) Options
? ) Help information
q ) Exit from the installation script

Selection : 1
```
6. Type 1, press Enter.

Note: The installation of Marc should be done before installing Mentat. It will be done

The Marc 20XX Menu appears.

```
root@vm-tmrhel73:~/.MSC

File Edit View Search Terminal Help

MSC Software Corporation

Marc 20XX Menu
---------------------
L1) Install for Linux 64-bit RHEL 7.1/7.3       [-1.1 GB]
    ? ) Help information
    r ) Return to previous menu

Selection [L1] :L1

You have selected Linux 64-bit RHEL 7.1/7.3.
Is this correct? [Y/n] Y
```

7. Type L1, press Enter to admit the operating system version.
8. Type Y, press Enter to give final confirmation.
A prompt to create links to the startup scripts appears.

9. Type Y, press Enter to create links.

10. Type /usr/local/bin to specify the location to put the links for the startup scripts.

   The link is created and its name appears on the terminal screen.

   Supported MPI versions are IBM Platform MPI* and Intel MPI. The setting is stored in the file run_marc_defaults in the marc2019.1.0/tools directory. In the documentation and the scripts, this is labeled as hpmpi.

   The defaults can be changed by editing the file run_marc_defaults or by using the appropriate run_marc option.

11. Type R, press Enter (twice) to return to the main menu.
Install Mentat

In this part you will install Mentat using the same installer file.

**Note:** Mentat installation is in continuation with the last step of Marc installation.

The main menu can be seen on the terminal screen

```
1) Install Marc
2) Install Mentat
3) Options
4) Help information
5) Exit from the installation script

Selection : 2
```

1. Type 2, press Enter.

   The Mentat 20XX Menu appears.

```
11) Install for Linux 64-bit RHEL 7.1/7.3 (-1.3 GB)

? ) Help information
r ) Return to previous menu


You have selected Linux 64-bit RHEL 7.1/7.3.
Is this correct? [Y/n] Y
```
2. Type \texttt{l1}, press \texttt{Enter} to admit the operating system version.

3. Type \texttt{Y}, press \texttt{Enter} to give final confirmation.

4. Type \texttt{/root/MSC/marc2019.1.0} as pathname to the directory containing the solver. Press \texttt{Enter}.
   A prompt to create links to the startup scripts appears.

5. Type \texttt{Y}, press \texttt{Enter}.

6. Type \texttt{/usr/local/bin} to specify the location to put the links for the startup scripts.
The link is created and its name appears on the terminal screen.

7. Type R, press Enter (twice) to return to the main menu.

8. Type Q to exit the Marc and Mentat installation.

**Install Documentation**

This is the third step of the total installation. In this step you will install the Marc and Mentat documentation which will be accessible through Mentat.

1. Download the file marc_20XX_linux_doc.tar.gz. Use the following commands to extract the files and start the documentation installation.

   [root@vm-tmrhel73 MSC]# tar -xvf marc_20XX_linux_doc.tar.gz
   install_doc.exe
   products/
   products/common3.gui
   products/list
   products/common2.gui
   utils/
   utils/maintain_usage
   utils/read_pdf
   [root@vm-tmrhel73 MSC]# ls
1. Download the following files:

install                             marc_20XX_linux_doc.tar.gz
install_doc.exe                     mentat20XX
install.exe                         msc_licensing_helium_linux64.bin
license.dat                         products
marc20XX                            utils
marc_20XX_linux64_rh7.1_7.3.tar.gz

2. Give execution rights to the documentation installer (install_doc.exe) using the following command:

```
[root@vm-tmrhel73 MSC]# chmod +x install_doc.exe
[root@vm-tmrhel73 MSC]# ./install_doc.exe
```

Enter the directory path to install the documentation.

```
Installation Directory
---------------------
For a full installation with both Marc 2019 and Mentat 2019,
or an installation with Mentat 2019 only, please make sure that
these products have already been installed, and enter the same
installation directory here that was used to install these products.
The documentation files and example problems will be installed in the
subdirectories mentat2019/doc and mentat2019/examples
of the installation directory entered here.

For an installation with Marc 2019 only, please make sure that
Marc 2019 has already been installed, and enter the same installation
directory here that was used to install this product. The Marc 2019
Volumes A-E will be installed in the subdirectory marc2019/doc of the
installation directory entered here.

For an installation of the documentation files only, please enter the
directory to install the files. The Marc 2019 Volumes A-E
will be installed in the installation directory entered here.

Enter the directory to install the documentation

```
[root@vm-tmrhel73 ~/MSC]
: /root/MSC
```

3. Type /root/MSC, press Enter.
Main menu for documentation appears.

4. Type D, press Enter.

The documentation is installed. The location is displayed on the terminal screen.

**Verify Installation**

In this step you will verify that Marc and Mentat are functioning correctly. Also the documentation will be checked whether or not it is linked with Marc and Mentat.

1. Open terminal and enter the path to run Marc and Mentat as follows:

/root/MSC/mentat2019.1.0/bin/mentat
Ideally the application should start. It might fail for the security check as follows:

```
root@vm-tmrhel73:~

bash: Licensing/Helium/msclic.ini: No such file or directory
[root@vm-tmrhel73 ~]# /root/M
MSC/ Music/
[root@vm-tmrhel73 ~]# /root/MSC/mentat2019/bin/mentat
Unable to locate a license entry for 4104
The license server may be unavailable.
Verify that your license server is at FLEXlm version 11.13.1.3 or above
Security check failed!
Contact MSC Software Support.
```

If Marc and Mentat is unable to fetch the license, you will have to set some environment variables.

You can use the following command to set required variable in different shells:

- **In Bash:**
  
  ```bash
  MSC_LICENSE_FILE= 27500@hostname
  export MSC_LICENSE_FILE
  ```

- **In CSH:**
  
  ```bash
  setenv MSC_LICENSE_FILE 27500@hostname
  export MSC_LICENSE_FILE
  ```

**Notes:**
- This demonstrated procedure is done using VM ware installed on a windows machine. Here the license of a pre-installed Marc and Mentat package is fetched into Linux (VM ware). A vice versa process is also possible where a license from Linux can be fetched into windows.
- Various types of licenses are available for the users to suit their requirements. For details refer to the *MSC Licensing Helium User’s Guide*.
- An elaborated and detailed installation procedure is in Appendix. C: Linux: Marc/Mentat Files, Subdirectories and Installation
- In case you face any problems related to the licensing, contact:
  
  msc_lic.support@mscsoftware.com or,
  
  MSC Software support center
# Installation Information

## Options to the install.exe script

- The `install.exe` script will accept the following options:
  - `-a` Turns on automatic installation – installs both Marc and Mentat from the installation media. The `-i` option (described below) is required.
  - `-i <path>` Specifies the installation path (<parent> directory). This option is required when specifying the automatic installation option `-a`.
  - `-l <file>` Specifies a file for product listing
  - `-v` Turns on verbose mode.

- The **automatic** installation will install both Marc and Mentat. To perform an **automatic** installation, run the installation script as follows:
  ```
  ./install.exe -a -i <path>
  ```

## License file

- Two lines of the file `license.dat` need to be modified:
  - **SERVER** line which specifies the system hostname
  - **DAEMON** line which specifies the daemon name and the path to the daemon program

  The content is typically something like:
  ```
  SERVER this_host 0022192361f 1700
  DAEMON MSC /your_path/msc
  ```

  - The string `this_host` should be replaced by the hostname of the machine where the license server is running.
  - The string `your_path` should be replaced by the full path to the program `msc`. If the same location as in mentioned in this document is used for the security installation it should be:
    ```
    DAEMON MSC /msc/MSC.Software/MSC Licensing/Helium/MSC
    ```

## License server

- The FLEXlm license manager needs to be started on the license server before running Marc and Mentat.

  The license server is started with (assuming default installation location)
  ```
  /msc/MSC.Software/MSC Licensing/Helium/lmgrd -c
  /msc/MSC.Software/MSC Licensing/Helium/license.dat -l
  /msc/MSC.Software/MSC Licensing/Helium/lmgrd.log
  ```

## hostid

- For a nodelocked license it is necessary to obtain a FLEXlm hostid for the machine running Marc and Mentat. This is done by running the command:
  ```
  /msc/MSC.Software/MSC Licensing/Helium/lmhostid
  ```
# Installation Summary

In this section, installation summary is provided for a single license installation for Linux 64-bit. It is assumed that the licensing is already completed.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Command Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1: Download the product and start the install script</td>
<td><code>mkdir /tmp/marc</code> <code>cd /tmp/marc</code> <code>gunzip &lt;file&gt;.gz</code> <code>tar xvf &lt;file&gt;.tar</code> <code>./install.exe</code></td>
<td>Create a temporary directory and download the product file to that directory. Substitute the proper filename for <code>&lt;file&gt;</code>. Use <code>gunzip</code> to uncompress the file and extract the files using the <code>tar</code> command. Start the <code>install.exe</code> script which will be in the current directory. Confirm that Marc 20XX will be installed and enter “I Accept” if you accept the conditions echoed by the script.</td>
</tr>
<tr>
<td>Step 2: Install the files on your system</td>
<td>Welcome to the Marc installation script for Linux systems Enter a valid pathname to the directory to install the software (&lt;current directory&gt;).</td>
<td>Enter the path <code>/opt/marc</code> Marc Installation script for Linux systems MSC Software Corporation Main menu 1)Install Marc 2)Install Mentat o)Options ?)Help information q)Exit from the installation script Select option 1 Marc Installation The only options available will be those from the product file. MSC Software Corporation Marc 20XX Menu L1)Install for Linux 64-bit RHEL 7.1/7.3 (~1.1 GB) ?)Help information r)Return to previous menu</td>
</tr>
<tr>
<td>Steps</td>
<td>Command Information</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>---------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Select option L1 | Selection [L1]: L1 | You have selected Linux 64-bit RHEL 7.1/7.3  
| Make your choice. | Is this correct? [Y/n]: y | Installing Marc 20XX for Linux 64-bit RHEL 7.1/7.3  
| You may need to be root to create the links. | Installing the script files to /opt/marc/install | Installing from /tmp/marc/products/al27emt0.k10  
| You can use the default selection by just pressing the enter key. | Do you want to create links to the startup scripts [y/N]? n | The current default MARC_MPI is set to intelmpi  
| Do you want to change it to hpmpi [y/N]? n | You can always change the defaults by editing the run_marc_defaults file in the marc tools directory or use the appropriate run_marc options. | Hit return to continue |
| Mentat Installation | The only options available will be those from the product file. | MSC Software Corporation  
| The only options available will be those from the product file. | Mentor 20XX Menu | 11) Install for Linux 64-bit RHEL 7.1/7.3 (~1.3 GB)  
| | 11) Install for Linux 64-bit RHEL 7.1/7.3 (~1.3 GB) | ? ) Help information  
| | r ) Return to previous menu | Enter the path to the marc20XX directory.  
| Select option l1 | Enter the pathname to the directory containing the solver: [/opt/marc/marc20XX] | Enter the path to the marc20XX directory.  
| | You have selected Linux 64-bit RHEL 7.1/7.3 | You can use the default selection by just pressing the enter key.  
| | Is this correct? [Y/n]: y | Enter the path to the marc20XX directory.  
| | Installing Mentat 20XX for Linux 64-bit RHEL 7.1/7.3 | You can use the default selection by just pressing the enter key.  
| | Installing the script files to /opt/marc/install | Enter the path to the marc20XX directory.  
| | Installing from /tmp/marc/products/gl27emt0.k10 | Press return to continue  
| | Submit1 script adjusted | submit1 script adjusted  
| | Submit2 script adjusted | submit2 script adjusted  
| | Submit3 script adjusted | submit3 script adjusted |
FLEXlm is the network based licensing product from Flexera Software used in MSC products.

FLEXlm on-line documentation is available from Flexera, see the URL:
http://support.flexerasoftware.com/doc/

<table>
<thead>
<tr>
<th>Steps</th>
<th>Command Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 3:</td>
<td>Return to main menu</td>
<td>r)Return to previous menu</td>
</tr>
<tr>
<td>Step 4: Install Security</td>
<td></td>
<td>Run the installation executable for security. Install and run lmutil to obtain a hostid. Send this information to MSC Software and put the obtained license file in /msc/MSC.Software/MSC Licensing/Helium/license.dat</td>
</tr>
<tr>
<td>Step 5: Installing the documentation</td>
<td>mkdir</td>
<td>Enter the directory used to install Marc and Mentat: /opt/marc</td>
</tr>
<tr>
<td></td>
<td>/tmp/documentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cd /tmp/documentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>gunzip &lt;file&gt;.gz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tar xvf &lt;file&gt;.tar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>./install_doc.exe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enter the path</td>
<td></td>
</tr>
</tbody>
</table>

**Managing FLEXlm**

FLEXlm is the network based licensing product from Flexera Software used in MSC products.

FLEXlm on-line documentation is available from Flexera, see the URL:
http://support.flexerasoftware.com/doc/

**Note:** The above URL is not an MSC Software Corporation site, and MSC has no control over the site’s content. MSC cannot guarantee the accuracy of the information on this site and will not be liable for any misleading or incorrect information obtained from this site.

**FLEXlm License File**

The license file, license.dat, should normally be placed in the /msc/MSC.Software/MSC Licensing/Helium directory once you receive your licenses from MSC Software. Everyone should have read permission to the file. The file can be located elsewhere as long as the environment variable MSC_LICENSE_FILE points to it.

Two lines of the license file contains installation specific information:

SERVER this_host 0022192361f 27500
DAEMON MSC /your_path/msc
Here `this_host` should be set to the hostname of the machine where the license server is running. `your_path` should be set to the full path to the msc program, by default located in `/msc/MSC.Software/MSC Licensing/Helium/flexlm/<platform>`

where `<platform>` is the name of the platform of the license server.

**FLEXlm License Manager**

For the 20XX version, the FLEXlm License Manager must be at version 11.13 or higher.

The license manager must be running on the license server machine.

The license manager is started with (assuming default installation location)

```
/msc/MSC.Software/MSC Licensing/Helium/lmgrd -c
/msc/MSC.Software/MSC Licensing/Helium/license.dat
-l /msc/MSC.Software/MSC Licensing/Helium/lmgrd.log
```

**Environment Variables**

The environment variable `MSC_LICENSE_FILE` is used to specify the full path to the `license.dat` file, and is a colon separated list of file pathnames. An example setting of `MSC_LICENSE_FILE` is:

```
MSC_LICENSE_FILE=/msc/MSC.Software/MSC Licensing/Helium/license.dat:27500@license
```

The environment variable `MSC_AUTHQUE` is used to specify the number of minutes a program will wait for a license after it has been requested. If the license request cannot immediately be honored, the request will be queued and the variable defines how long it should wait in this queue. The variable must be set in your environment before Marc and Mentat are started. The default value is 5 minutes.

It may be set as follows in a Bourne shell:

```
MSC_AUTHQUE=20
export MSC_AUTHQUE
```

In a C shell, it may be set as:

```
setenv MSC_AUTHQUE 20
```

**Machine hostid**

For a nodelocked license it is necessary to obtain a FLEXlm hostid for the machine running Marc and Mentat. This is done by running the command

```
/msc/MSC.Software/MSC Licensing/Helium/lmutil lmhostid
```
Running and Using Marc and Mentat

- Running Marc  117
- Running Mentat  120
- Making Changes to the Marc Programs  123
- Mentat Interfaces  123
### Running Marc

This section describes the Marc usage on Linux based machines. The Marc programs are mainly controlled by a shell script called `run_marc` which is stored in the `marc20XX` subdirectory `tools`. If you have used the option to creating a link during the installation, this link is also known system wide as `marc20XX`. It is designed to handle practically all possible options.

The shell script will submit a job and must be executed in the directory where all relevant input and output files concerning the job are available. To use the shell script, each Marc job should have a unique name qualifier and all Marc output files connected to that job will use this same qualifier.

Marc input files should always be named `job_name.dat`, whereby the prefix `job_name` is the name qualifier which you are free to choose. The suffix `.dat` is obligatory.

To actually submit a Marc job, the following command should be used. The single input line is split over multiple lines for clarity:

```
run_marc -jid job name (required as minimum)
-rid restart file name
-pid post file name
-sid substructure file name
-prog name of a previously saved user executable
-user user subroutine name
-save save user executable
-back run in background
-ver verification flag
-vf view factor file name
-def defaults file name
-nprocd number of domains
-nprocds number of domains in Single Input File mode
-nts number of threads for parallel matrix solver (same as -nthread_solver or -nthread or -nt)
-nte number of threads for element assembly and stress recovery (same as -nthread_elem)
-nsolver number of matrix solver tasks
-mpi mpi version
-dir directory where job I/O takes place
-sdir directory where the scratch files are located
-host host file name; used for distributed execution in a network
-ci copy input files to remote machines in a network
-cr copy post files back from remote machines in a network
-ml memory limit in Megabytes
-gpuid GPU card ID or auto keyword
```
Table 8-1 describes the meaning of these input options and Table 8-2 gives examples. The default actions are shown in **bold** font.

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-jid (-j)</td>
<td>job_name</td>
<td>Input file (job) name identification.</td>
</tr>
<tr>
<td>-prog (-pr)</td>
<td>programe</td>
<td>Run saved executable programe.marc from a previous job (see -user and -save).</td>
</tr>
<tr>
<td>-user (-u)</td>
<td>user_name</td>
<td>User subroutine user_name.f is used to generate a new executable program called user_name.marc (see -save and -prog).</td>
</tr>
<tr>
<td>-save (-sa)</td>
<td>no</td>
<td>Do not save the new executable program user_name.marc.</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>Save the executable program user_name.marc for a future time (see -prog and -user).</td>
</tr>
<tr>
<td>-rid (-r)</td>
<td>restart_name</td>
<td>Identification of previous job that created RESTART file.</td>
</tr>
<tr>
<td>-pid (-pi)</td>
<td>post_name</td>
<td>Identification of previous job that created the post file.</td>
</tr>
<tr>
<td>-sid (-si)</td>
<td>substructure</td>
<td>Identify the job that contains the solution to the external nodes of the superelement.</td>
</tr>
<tr>
<td>-back (-b)</td>
<td>yes</td>
<td>Run Marc in the background.</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>Run Marc in the foreground.</td>
</tr>
<tr>
<td>-ver (-v)</td>
<td>yes</td>
<td>Ask for confirmation of these input options before starting the job.</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>Start the job immediately.</td>
</tr>
<tr>
<td>-def (-de)</td>
<td>default_file</td>
<td>File name containing user defined default data.</td>
</tr>
<tr>
<td>-nprocd (-np)</td>
<td>number</td>
<td>Number of domains for parallel processing.</td>
</tr>
<tr>
<td>-nprocds(-nps)</td>
<td>number</td>
<td>Number of domains for parallel processing using a Single Input File.</td>
</tr>
<tr>
<td>-nts (-nthread)</td>
<td>number</td>
<td>Number of threads per parallel matrix solver (8, 9, and 11).</td>
</tr>
<tr>
<td>-nte</td>
<td>number</td>
<td>Number of threads used for parallel matrix assembly and stress recovery.</td>
</tr>
<tr>
<td>-nsolver</td>
<td>number</td>
<td>Number of processes to use for the MUMPS parallel matrix solver (solver 12).</td>
</tr>
<tr>
<td>-dir</td>
<td>directory_name</td>
<td>Pathname to directory where the job I/O should take place.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Defaults to current directory.</td>
</tr>
<tr>
<td>-sdir</td>
<td>directory_name</td>
<td>Directory where scratch files are placed. Defaults to -dir.</td>
</tr>
<tr>
<td>-host (-ho)</td>
<td>hostfile</td>
<td>Specify the name of the host file for running over a network (default is execution on one machine only in which case this option is not needed).</td>
</tr>
<tr>
<td>-ci</td>
<td>yes</td>
<td>Copy input files automatically to remote hosts for a network run, if necessary.</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td></td>
</tr>
</tbody>
</table>
### Table 8-1  run_marc Input Options (continued)

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-cr</td>
<td>yes</td>
<td>Copy post files automatically from remote hosts used for a network run, if necessary.</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>-vf</td>
<td>viewfactor_name</td>
<td>Name of file containing viewfactors for radiation from previous analysis or from Mentat using either the Monte Carlo or Hemicube method.</td>
</tr>
<tr>
<td>-mpi</td>
<td>intelmpi</td>
<td>Select which version of mpi will be used for Domain Decomposition or the MUMPS solver. If not specified, the appropriate default shown below will be used:</td>
</tr>
<tr>
<td></td>
<td>hpmpi</td>
<td></td>
</tr>
<tr>
<td>-ml</td>
<td>memlimit</td>
<td>Memory limit for deciding if the solver should go out-of-core. Specified in Mbyte. Defaults to the physical amount of memory on the machine.</td>
</tr>
<tr>
<td>-gpuid</td>
<td><a href="">id:id:id</a> or auto</td>
<td>GPU card number or auto for automatic selection by program. For parallel (DDM) jobs, multiple card IDs can be specified if available.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Platform</th>
<th>Default MPI</th>
<th>Alternative MPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linux 64</td>
<td>intelmpi</td>
<td>hpmi</td>
</tr>
</tbody>
</table>

### Table 8-2  Examples of Running Marc Jobs

<table>
<thead>
<tr>
<th>Examples of running Marc jobs</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>run_marc -jid e2x1</td>
<td>Runs the job e2x1 in the background, the input file e2x1.dat resides in the current working directory.</td>
</tr>
<tr>
<td>run_marc -jid e2x14 -user u2x14 -save yes</td>
<td>Runs the job e2x14 in the background, using the user subroutine u2x14.f and the input file e2x14.dat. An executable program named u2x14.marc will be saved after completion of the job.</td>
</tr>
<tr>
<td>run_marc -jid e2x14a -prog u2x14</td>
<td>Runs the job e2x14a using the executable produced by job e2x14.</td>
</tr>
<tr>
<td>run_marc -jid e3x2a -ver no -back no</td>
<td>Runs the job e3x2a in the foreground. The job will run immediately without verifying interactively.</td>
</tr>
<tr>
<td>run_marc -jid e3x2b -rid e3x2a</td>
<td>Performs a restart job using the results of the previous job e3x2a.</td>
</tr>
<tr>
<td>run_marc -jid e2x1 -nprocd 2</td>
<td>Runs a two processor job on a single parallel machine.</td>
</tr>
<tr>
<td>run_marc -jid e2x1 -nprocd 2 -host hostfile</td>
<td>Runs a two-processor job over a network. The hosts are specified in the file hostfile (refer to the Marc Parallel Network for runs on a network of machines.</td>
</tr>
</tbody>
</table>
Running Mentat

This section describes the Mentat usage on Linux based machines. Mentat is started by a shell script called `mentat` which is stored in the `mentat2019.1.0/bin` directory. If you used the option to create a link during the installation, this link is known system wide as `mentat20XX`.

You do not need to start the shell script from a specific directory.

Mentat creates the default files in your current working directory; that is, where you are located at the time of starting Mentat.

The shell-script `mentat` contains a number of arguments which are passed on to Mentat. Table 8-3 gives the meaning of these input options (more details can be obtained using `-help` option). You are free to alter these commands to suit your preference.

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-mode</td>
<td>preset1/preset2</td>
<td>This will launch the application in the selected preset mode. For preset 1, which is the default, the traditional theme, the traditional mouse button scheme and complete picking will be active. For preset 2, the dark theme, the auto-dynamic mouse button scheme and partial picking will be active.</td>
</tr>
<tr>
<td>-ar</td>
<td>area ratio</td>
<td>This option sets the initial window size to the given fraction of the available space on the desktop.</td>
</tr>
<tr>
<td>-xr</td>
<td>horizontal ratio</td>
<td>This option sets the initial width of the window to the given fraction of the available width on the desktop [default: 0.92]</td>
</tr>
<tr>
<td>-yr</td>
<td>vertical ratio</td>
<td>This option sets the initial height of the window to the given fraction of the available height on the desktop [default: 0.92].</td>
</tr>
<tr>
<td>-aspr</td>
<td>aspect ratio</td>
<td>This option sets the aspect ratio (width over height) of the window [default: 1.6].</td>
</tr>
<tr>
<td>-maximize</td>
<td></td>
<td>Starts up Marc Mentat maximized.</td>
</tr>
<tr>
<td>-minimize</td>
<td></td>
<td>Starts up Marc Mentat minimized (iconified).</td>
</tr>
<tr>
<td>-bg</td>
<td></td>
<td>Will run Mentat in the background. Note that the DISPLAY environment variable must point to a valid display.</td>
</tr>
<tr>
<td>-bp</td>
<td>$(DIR)/bin/</td>
<td>Directory path name where the external Mentat programs and shell scripts are located.</td>
</tr>
<tr>
<td>-compile</td>
<td>binary_menu_filename</td>
<td>This is used to compile ASCII menu files into a binary menu file. The -mf option would be used to specify the new binary file. To recompile the default binary menu file <code>main.msb</code>, compile as: <code>bin\mentat -compile menus\win64\main.msb</code> Substitute for <code>&lt;plat&gt;</code> the platform name <code>linux64</code>.</td>
</tr>
</tbody>
</table>
-dr

Enable/disable direct rendering. Enabling this option will make OpenGL bypass the underlying window system and render directly from hardware to the screen, if this is supported by the system. The default is True.

-fn

font

Default font type.

-fngr

font

Font used by the graphics windows (overrules the font selected via the -fn option).

-fnme

font

Font used by the menus (overrules the font selected via the -fn option).

-gradient

Switches on a gradient background when displaying the various windows (Model, Table, History Plot, etc.).

-hd

name filename

Define a document viewer with the given name for viewing a document that consists of a set of HTML files. The filename must be the name of an XML file that defines the contents of the document. A menu item to open the viewer can be created by adding an <html_doc> element that references the viewer (via the “name” attribute) to the appropriate <menu> in menus/menubar.xml. The XML file must have the following contents:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<html_doc>
  <proc_root env="DEMO_DIR"/>
  <title_page href="index.html"/>
  <contents>
    <chapter href="file1.html"/>
    <chapter href="file2.html"/>
  </contents>
</html_doc>
```

The “href” attributes of the <title_page> and <chapter> elements specify, respectively, the path to the HTML file of the title page and the HTML files of the chapters of the document. The file paths must be given relative to the directory in which the XML file is located.

For example, the Mentat startup script defines the document viewer for the User’s Guide as follows:

```
-hd ug help/ug/ug.xml
```

and menubar.xml contains the following element to open the viewer:

```
<html_doc name="ug" title="User's Guide"/>
```

-help

Print a list of all of the options.

---

Table 8-3  Mentat Input Options  (continued)

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-dr</td>
<td>True/False</td>
<td>Enable/disable direct rendering. Enabling this option will make OpenGL bypass the underlying window system and render directly from hardware to the screen, if this is supported by the system. The default is True.</td>
</tr>
<tr>
<td>-fn</td>
<td>font</td>
<td>Default font type.</td>
</tr>
<tr>
<td>-fngr</td>
<td>font</td>
<td>Font used by the graphics windows (overrules the font selected via the -fn option).</td>
</tr>
<tr>
<td>-fnme</td>
<td>font</td>
<td>Font used by the menus (overrules the font selected via the -fn option).</td>
</tr>
<tr>
<td>-gradient</td>
<td></td>
<td>Switches on a gradient background when displaying the various windows (Model, Table, History Plot, etc.).</td>
</tr>
<tr>
<td>-hd</td>
<td>name filename</td>
<td>Define a document viewer with the given name for viewing a document that consists of a set of HTML files. The filename must be the name of an XML file that defines the contents of the document. A menu item to open the viewer can be created by adding an &lt;html_doc&gt; element that references the viewer (via the “name” attribute) to the appropriate &lt;menu&gt; in menus/menubar.xml. The XML file must have the following contents:</td>
</tr>
<tr>
<td>-help</td>
<td></td>
<td>Print a list of all of the options.</td>
</tr>
<tr>
<td><strong>Keyword</strong></td>
<td><strong>Option</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>-hide_dialog</td>
<td></td>
<td>Hide the dialog window at startup.</td>
</tr>
<tr>
<td>hide_dynamic_menu</td>
<td></td>
<td>Hide the dynamic window at startup.</td>
</tr>
<tr>
<td>-hide_main_menu</td>
<td></td>
<td>Hide the main window at startup.</td>
</tr>
<tr>
<td>hp</td>
<td>$(DIR)/help/</td>
<td>Directory path name where the help files are located.</td>
</tr>
<tr>
<td>If</td>
<td>filename</td>
<td>Specify the Mentat log file name.</td>
</tr>
<tr>
<td>license_release</td>
<td>number</td>
<td>Enable Mentat to release its licenses if the program is inactive for the specified amount of time. The number is in minutes and must be greater than one.</td>
</tr>
<tr>
<td>mf</td>
<td>main.ms</td>
<td>The name of the startup menu file.</td>
</tr>
<tr>
<td>ml</td>
<td>$(DIR)/material/</td>
<td>Directory path name where the material files are located.</td>
</tr>
<tr>
<td>mp</td>
<td>$(DIR)/menus/</td>
<td>Directory path name where the menu files are located.</td>
</tr>
<tr>
<td>multiundo</td>
<td>off/on</td>
<td>Enables the user to either set the one-level UNDO option (off), with data saved in memory, or the multi-level UNDO option (on), with data saved on disk [default: off].</td>
</tr>
<tr>
<td>undo_levels</td>
<td>number</td>
<td>Number of UNDO levels when the multi-level UNDO option is active. The minimum is 1, the maximum is 50 [default: 10].</td>
</tr>
<tr>
<td>nosolidmodeling</td>
<td></td>
<td>Utilize the Mentat_Parasolid_CAD which allows geometric models to be imported but does not allow solid geometry editing.</td>
</tr>
<tr>
<td>path</td>
<td>directory_name</td>
<td>Provides a directory in which Mentat searches when opening an existing input file. Multiple directories can be specified as follows: -path directory_1 -path directory_2 etc.</td>
</tr>
<tr>
<td>pr</td>
<td>filename</td>
<td>Any additional set-up commands you wish to add. Store these in a procedure file containing the Mentat commands.</td>
</tr>
<tr>
<td>ra</td>
<td></td>
<td>Reads all of the ASCII Menu files.</td>
</tr>
<tr>
<td>rf</td>
<td>filename</td>
<td>Record the Mentat commands in the procedure file filename.</td>
</tr>
<tr>
<td>szgr</td>
<td>width height</td>
<td>Set the size (width and height in pixels) of the graphics area.</td>
</tr>
<tr>
<td>ti</td>
<td>title</td>
<td>Append title to the name of the window.</td>
</tr>
<tr>
<td>unicode</td>
<td></td>
<td>Allows the use of unicode characters in load case titles, job titles, annotations and user-defined names of results file variables.</td>
</tr>
</tbody>
</table>
Making Changes to the Marc Programs

Modifying the MPI Setting
The MPI version used by default is defined in the table below. It also lists an alternative MPI version to use for the respective platform. The default MPI version to use can be set in the `run_marc_defaults` file (see next section). Enter a line

```plaintext
MARC_MPI alternative_mpi
```

for setting a new default. Use the exact word as given in the Alternative MPI column. The MPI version can also be set with the command line option `-mpi` to `run_marc`. The command line option overrides the value set in `run_marc_defaults`.

<table>
<thead>
<tr>
<th>Platform</th>
<th>Default MPI</th>
<th>Alternative MPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linux 64</td>
<td>intelmpi</td>
<td>hpmpi</td>
</tr>
</tbody>
</table>

Setting defaults with the `run_marc_defaults` file
A file called `run_marc_defaults` located in the user's home directory (as given by the environment variable HOME) or in the tools directory of the Marc installation can be used for setting program defaults. If both are present then the setting in the user's home directory will be used.

The following setting is currently available:

```plaintext
MARC_MPI as given in the above table
```

This selects the MPI version to use.

Mentat Interfaces

Mentat External Programs
Mentat supports a number of CAD interfaces: IGES, Patran, Ideas, VDAFS, etc. These interfaces are accessed using external programs called from within Mentat. The interface programs are stored in the `mentat2019.1.0` subdirectory `bin`. These programs read the data files in their native format and translate the contents into a Mentat model file. This file is subsequently read by Mentat. The external programs are called from within Mentat by means of the FILE submenu.

Jobs
The subdirectory `bin` contains shell script files to start a Marc FEM job using the following shell scripts:

```plaintext
submit1, submit2, submit3,
```

These shell scripts are called by means of the buttons in the JOBS menu.
You can alter these files to suit your environment; for example, set up one of the *submit* scripts so that it starts a Marc job on a different machine on your network.

**Plotter Interface**

Because of the many variations in plotting environments, we have created plotting interfaces in the form of shell scripts that operate from within Mentat. Currently, Mentat recognizes the following plotting formats:

- PostScript
- Xdump (translated in either PostScript or HPGL format)
This section describes a template shell script for each of the formats mentioned above. They are located in the bin directory and are named as follows:

- psgray1, psgray2, psgray3
- pscolor1, pscolor2, pscolor3
- xdump1, xdump2, xdump3

**PostScript**

The PostScript function is activated by pressing either the Gray or Color Print button from the UTILS menu on the POSTSCRIPT panel. The program captures the graphics portion of the screen into a file and sends this file to a PostScript printer using the psgray or pscolor shell scripts located in the bin directory. In the example listed below, the file is sent to a computer called ‘mars’ on the network. The lpr command with the -Psupt argument sends the file to a PostScript printer known to the spooler as supt. After the file is sent, it is removed from disk automatically.

```
#!/bin/csh
rsh mars lpr -Psupt < $1
rm -f $1
```

The argument $1 is the filename handed to the shell by Mentat. If there is more than one printer on-line, the psgray and pscolor shell scripts can be used to address these other printers.

**Xdump**

The xwd command, widely available on many platforms, dumps an image of an X window into a specially formatted dump file. This file can then be read by various other X utilities for redisplay, printing, editing, formatting, and archiving. Its complementary xpr command takes the window dump file as input and formats its output for a particular device, such as a PostScript or other color printer. Below is an example of a shell script that uses xwd, and, in conjunction with xpr, sends the information to printer pjetxl. See the man pages on your system for more details.

```
#!/bin/csh
xwd | xpr -device pjetxl -scale 2 | /etc/aprint -Abatphone2 -L25
```

**Edit**

The edit_window shell script is used to control the editor associated with the EDIT commands. It is possible to change the type of editor, for example, from vi to emacs or change the type of windowing environment.

**System Shell**

The system_window shell script is used to control the type of window opened with the system_shell command. It is possible to change the type of window.

**Parallel Render**

The marc_render shell script can be modified such that the photorealistic rendering is performed across multiple CPUs. The parameter nbands is used to specify the number of CPUs.
**MPEG Playback**

The `mpeg_window` shell script is used to control the program opened with the `play_mpeg` command.
Hardware and Software Requirements

This section provides the general description about the hardware and software requirements and definitions.

If your cluster requires a password to perform `ssh` or `rsh` between nodes, you may need to enter your password every time you run a parallel job. You can disable the password requirement in the use of `ssh` or `rsh`. Please consult your system administrator for password requirement in the use of `ssh` and `rsh`.

Although no specific hardware requirements exist for Marc to run in network mode, it is preferable to have fast network connections between the machines. It is recommended that the network should have a speed of at least 1 GBit per second. If only two machines are to be used, a hub or a cross-over cable can be used to connect them. If more than two machines are to be used, a switch is preferable. TCP/IP is used for communications.

The list of supported capabilities in parallel can be found in “Supported and Unsupported Features” in Chapter 12 of *Marc Volume A, Theory and User Information*.

The Supported platforms are listed in the section “Supported Platforms” in Chapter 6 of this guide.

Compatibility

All machines used in a network must use the same Marc version.

Definitions

The definitions of some of the terms are as follows:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Root machine</td>
<td>The machine on which Marc job is started.</td>
</tr>
<tr>
<td>2</td>
<td>Remote Machine</td>
<td>Any machine other than the root machine which is part of a distributed Marc run on the network.</td>
</tr>
<tr>
<td>3</td>
<td>Shared installation</td>
<td>Marc is installed in an NFS shared directory on one machine only. The other machines can access the Marc executable since the directory is shared.</td>
</tr>
<tr>
<td>4</td>
<td>Distributed installation</td>
<td>Marc is installed on all machines. Each machine accesses its own Marc executable.</td>
</tr>
</tbody>
</table>
Network Configuration

Marc only needs to be installed on the root machine where the installation directory is shared via NFS (shared installation). Please note that if HPMPI or Intel MPI is used the installation directory must be available with the same path for every machine. Marc can also be installed on the remote machines which then use their own executable (distributed installation), but the name of the path must be the same.

- The root machine is the one on which the Marc job is started, typically from within Mentat.
- The remote machines can be located anywhere as long as they are connected to the network.

The working directory on each machine can be a shared directory on any machine on the network (shared I/O) or it can be a local directory on the hard disk of each machine in the analysis (distributed I/O). The User Notes describes how to specify what working directory to use.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Distributed execution</td>
<td>Marc is run on multiple machines which are connected with a network. Each machine loads the Marc executable either from a shared or a local directory and then executes the executable.</td>
</tr>
<tr>
<td>6</td>
<td>Shared I/O</td>
<td>Marc reads and writes data in a NFS shared directory. Each Marc executable running on the network reads/writes to the same directory.</td>
</tr>
<tr>
<td>7</td>
<td>Distributed I/O</td>
<td>Marc reads and writes data in a directory located on each machine. The user must make the input available in each directory and collect the results files after the analysis.</td>
</tr>
<tr>
<td>8</td>
<td>NFS</td>
<td>Network File System.</td>
</tr>
</tbody>
</table>

Figure 9-1  Network Configuration
Installation Notes

This section describes the procedure required to install and set up a network version of Marc. For general information on Marc installation, see Marc and Mentat Installation.

Install Marc on the root machine. Marc only needs to be installed on the root machine. However, if Marc is to be used on the remote machines as well, it can also be installed there. There is nothing special that needs to be done related to the installation itself for the network version. For IBM MPI and Intel MPI the installation directory must be available with the same path on every machine, regardless of if the installation is local or if it uses a shared directory.

In order to run parallel jobs on machines connected over the network, it has to be set up properly. If any of the remote hosts does not have Marc installed, the installation directory on the root machine needs to be shared using NFS or some other mechanism so that the Marc version is available from the remote machines. Users need to be able to connect between the machines using `rlogin` or `ssh` without having to provide a password. It is possible to define if `rsh/rcp` or `ssh/rsh` or similar command is to be used. This is done by modifying the variables RCP and RSH in the include file for the platform used.

Assume that, there are two machines with hostnames host1 and host2 to be used in a parallel job over the network. Marc has been installed on host1 and the job is to be started from this machine. A hypothetical naming convention is used for shared directories where a directory name on any machine starts with `/nfs/hostname`, where `hostname` is the name of the machine on which the directory is located.

1. Test the installation for single processor execution.
2. Change directory to the `test_ddm` subdirectory of the Marc installation directory on host1.
3. Then do
   ```
   cd exmpl2/exmpl2_1
   marc -j cyl2 -b no -v no
   ```
   Marc should exit in about three minutes if it is a successful run. Here we assume that the command `marc` points to the current Marc version.
4. Test the Marc installation for multi-processor execution. Do the following:
   ```
   cd ..//exmpl2_2
   ```
5. Edit the file `hostfile` in this directory by replacing `workdir` with `/nfs/host1/marcinstall/test_ddm/examp2/exmpl2_2` and `installdir` with `/nfs/host1/marcinstall`.
6. For HPMPI and Intel MPI delete `installdir` (so only use three columns in the host file).
7. The host names and directory names should be replaced with the names on the current system.
8. Finally, type:
   ```
   marc -j cyl2 -b no -v no -nprocd 2 -host hostfile
   ```
   Marc should exit in about two minutes if it is a successful, parallel run on host1 and host2 using one processor on each.
**User Notes**

This section provides miscellaneous information about executing a parallel job over a network and use of user subroutines.

This section assumes that the network version of Marc has been successfully installed on at least one of two machines that are to be used in a distributed analysis and that the appropriate Marc licenses are in order. Assume that host1 is the host name of the machine on which Mentat is running and from which the job is to be started (the root machine). The host name of the other machine (the remote machine) is host2.

**Running a network job**

First, make sure that the two machines are properly connected. From host1, access host2 with

```
rlogin host2
```

or

```
ssh host2
```

If a password needs to be provided for the remote login, this has to be taken care of. If the `rlogin` or `ssh` is not possible without providing a password, a network run will not be possible. If you face any problems, refer to [Chapter 10: Linux Troubleshooting](#).

In order to perform an analysis over a network, you have to create a specific file called **host file**. This file defines which machines are to be used, how many processes are to run on each, what working directory should be used, and where the Marc executable can be found on each machine. The host file can be selected and edited in Mentat and the Marc job started as usual from within Mentat (see the example below). If Marc is run from the command line, it is done as for a serial run using an additional command line option. For example:

```
marc -v no-b no -jid test -nprocd 2 -host hostfile1
```

will run the two-processor job `test.dat` using the specification in the file `hostfile1`. No specific name or extension is used for the host file except that the name `jobid.host` (in this example `test.host`) must be avoided since it is used internally by Marc.

**Specification of the Host File**

The host file has the following general format:

```
host1 n1
host2 n2 workdir2 installdir2
host3 n3 workdir3 installdir3
```

- Each line must start at column 1 (no initial blanks). Blank lines and lines beginning with a # (number symbol) are ignored. The fourth column with `installdir` should not be used with HPMPI or Intel MPI.
- The first entry is the host name of a machine to be used in the analysis. The root machine must be listed first and each machine must only occur once.
The second entry specifies the number of processes to run on the machine specified in the first entry. The sum of the number of processes given in the host file must equal the number of domains used. In a five-domain job, it is required that \( n_1 + n_2 + n_3 = 5 \).

The third entry specifies the working directory to use on this host. This is where the I/O for this host takes place. The Marc input files for this machine must be in this directory and the results files for this machine are created in this directory.

The fourth entry specifies where the Marc installation directory that this host should use is located. This entry can be omitted if the name of the Marc installation directory is the same on all machines (which could be a shared directory on host1 with the same name from host2 and host3). This is a requirement for HPMPI and Intel MPI so this entry should here be omitted.

The directories in the third and fourth entries will be used from the respective host. To check the correctness of the host file specification, log in to the respective machine and list the directories as specified in the host file. For the host file given above, do:

```bash
ssh host2
ls workdir2
ls instaldir2
```

The second line should show the working directory to use on host2 and the third line the installation directory which will be used by host2.

The different domains of the Marc job are associated with the different machines as follows. Suppose a five-domain job `test` is run using a host file defined as

```plaintext
host1 2
host2 1 workdir2 installdir2
host3 2 workdir3 instaldir3
```

with appropriate definitions of the third and fourth entries.

There will be six Marc input files associated with this job: `test.dat`, `1test.dat`, ..., `5test.dat`. Domains 1 and 2 will be associated with host1, domain3 with host2 and domains 4 and 5 with host3.

Shared I/O

Suppose a job is to be run on host1 and host2. A shared directory on host1 is to be used for I/O and from host2 its name is `/nfs/host1/marc/workdir` (assuming a hypothetical naming convention for shared directories which starts with `/nfs/hostname`). The installation directory is assumed to have the same name on both machines. The host file for a two-processor job would simply be

```plaintext
host1 1
host2 1 /nfs/host1/marc/workdir
```

To verify the workdir given, do `rlogin host2 ; ls /nfs/host1/marc/workdir`. The directory seen should be the same one as the working directory on host1.

Distributed I/O

If you want to have the I/O to be local on host2, specify the host file as
The I/O on host2 will now take place in the directory `/usr/people/marcuser` on the hard disk of host2. For this case, the Marc input files are transferred to `/usr/people/marcuser` on host2 before the job is started, and the results files are transferred back after the analysis for postprocessing. This transfer of files is done by Marc automatically.

It is also possible to use only two entries in the host file. This requires that both the working directory and the installation directory have the same names on all machines.

**Example**

The definitions for a network run with Mentat is demonstrated with a simple example. We assume the simplest case where both the working directory and installation directories are shared.

1. Enter the menu **Help → Run a Demo**...

   A **Run A Demo** dialog appears.

   ![Run A Demo dialog](image)

2. Select the example **Contact With DDM**.

   ![Contact With DDM](image)

   **Note:** The input creation for the demo problem automatically starts as you select any of the problems. It continues till the results are seen. To stop/pause the automatic inputs creation, you need to click on the stop button. Once you stop the procedure use the Step button to see a step-by-step input creation.

3. After the process is completed, click **Close result file** button.
4. Select Jobs tab and check Identify to confirm your two domains as shown in the image as follows:

The complete model workflow can be seen in the Model Navigator.

5. Right click on Indent and select Properties from the drop down list.
The **Job Properties** dialog appears.

6. Click **Run**.
The Run Job dialog appears.

7. Click Solver/Parallelization button.
The **Solver/Parallelization** dialog appears.

![Solver/Parallelization dialog](image)

a. Ensure the **Use DDM** option is selected. In this case three domains are used.

b. Select Network option from the submenu.

   An additional option to select the host file appears just below Network.

c. Click on the **Host File** button and select the file called `hostfile` from the install directory and modify it to contain:

   ```
   host1 1
   host2 1  workdir installdir
   ```

d. Set the working directory according to the share names on the current system. The host file places one domain on hostname1 and one domain on hostname2.
8. Run Marc from within Mentat using the **Submit 1** button. Upon completion of the analysis, the **Run Job** dialog box appears:

![Run Job Dialog Box](image1)

9. Check your results by clicking the **Open Post File (Results Menu)** button.

A plot of the Total Equivalent Plastic Strain in the final deformed configuration is shown as follows:

![Plot of Total Equivalent Plastic Strain](image2)
Marc created a post file associated with each domain as well as a root post file associated with the job id. For the previous model, `model1_job1.t16` and `2model1_job1.t16` are the processor files, while `model1_job1.t16` is the root file.

If the model is very large, it can be convenient to view only a portion of the model by selecting any one of the processor post files, such as `2model1_job1.t16`. This file contains only data associated with domain 2 as selected in the domain decomposition menu. As described in the earlier steps, this file was created by host2.

**Shared vs. Distributed I/O**

For jobs with very large post or restart files, it is usually more efficient to use distributed I/O. With distributed I/O, the input files and the post files are located on the host’s local disks. Marc by default automatically transfers the input files and the post files to and from the remote host if needed. It is possible to suppress this transferring with two buttons in the Network settings in the JOBS menu in Mentat.

To run a job using distributed I/O, specify a local directory in the host file:

```plaintext
host1 2
host2 1 /usr/people/marcuser
```

**Jobs with User Subroutine**

User subroutines are fully supported in the network version.

The Fortran file with the subroutine is located in the working directory on the root machine. Marc automatically creates the executable and makes it available on all remote hosts. There is no need to modify the host file if it is correct for a job without a user subroutine.

If the working directory is shared for all remote hosts, the user subroutine is compiled on the root machine and the executable is available in the shared working directory.

If a remote host is using a local working directory, the executable will be automatically copied over to the remote machine using remote copy (`rcp` or `scp`). Marc automatically knows if a directory is shared or local.

**Troubleshooting**

If you face any problems in launching Marc Mentat, check the following:

1. The network connection between the hosts is working by using the command `ping host`.
2. A remote login using the command `rlogin` can be done between the hosts without providing a password. If not, contact your system administrator or check the man pages for `rlogin` and look for `.rhosts`.
3. The host names used in the hostfile are correct. It should be the same as the output from the command `hostname` on the respective host.
4. The working and installation directories on the host file are correct. Log onto the remote host, change directory to these directories to verify the host file content. The installation directory given should (among others) contain the executable in the bin directory.
5. The input files for each host are available in the respective working directory. An error message is printed out from Marc if they are not.

**Error messages:**

1. The error message `semget failed... at job start-up` means that the communication environment is not clean. This can be checked with the Linux command `ipcs`. If entries belonging to specific users except `root` show up, they may need to be removed. Run the script `tools/mpiclean` located in the Marc installation directory.

| Note: | This will kill all parallel jobs currently running under the current user. |
|       | Only entries belonging to the current user are deleted. |
Chapter 10: Linux Troubleshooting

10 Linux Troubleshooting
Cannot create

Cause
You have no write permission in the <parent> directory.

User Actions
Change with chmod

Security failed

Cause
The possible causes for this are:

■ Marc or Mentat was unable to obtain a license from the FLEXlm licensing software.
■ The FLEXlm license manager is not running. See Appendix C for information on how to run the license manager.
■ You are attempting to run on a machine that according to the license file you are not allowed to use.
■ Your license period has expired. Check the date on your machine.

For counted licenses, currently running too many Marc jobs.

User Information
In this case, Marc or Mentat will exit.

User Actions
■ If you have just modified the license.dat file, the lmgrd and MSC daemons may not have been restarted. Run the lmreread utility as follows:

```bash
lnreread -c <parent>/msc/MSC.Software/MSC Licensing/Helium/license.dat
```

■ If you get the FLEXlm error:

- Invalid (inconsistent) license key (-8,130:2) No such file or directory

  it may be implying that the hostid value specified on the SERVER line are inconsistent with the hostids. Check the values and restart the license manager.

■ If you get the following FLEXlm error when using a server license:

  Cannot connect to license server (-15,12:146)

  it means, the license manager (lmgrd) may not be running on the license server, or the USE_SERVER line in your client side license.dat file is incorrect. Also make sure that the TCP/IP port numbers used on the SERVER line are the same on both the client and the server.

■ If you get the FLEXlm error:

  No such feature exists (-5,147)

  and your license is limited to certain systems, you may be trying to run on a system that is not licensed for use. Check that the lmrhostid of the system you are trying to use and that on your marc20XX (FEATURE MARC) license is the same.
Link failed in Marc

Cause
- Your user subroutine causes compiler errors.
- You have no Fortran compiler.
- Fortran libraries not available.

User Actions
Check the variable `syslibs` in the file `include` in the `marc` installation subdirectory `tools`. It references special system libraries in `/usr/lib` which may not exist on your system.

Testing Marc installation failure

User Actions
If you are using `install.exe` to test Marc installation and the Test and maintain installation does not respond, remove `exec tcsh` from your `.cshrc` and restart installation testing.

Mentat cannot open display

Cause
- Mentat does not have X server access to your display device.
- You are using a terminal other than the default screen belonging to the machine, without setting the X-window output device.

User Actions
- Ensure Mentat has X server access to your display device. The following command allows Mentat to run on a remote screen:
  ```
xhost +
  ```
  This command must be issued while logged onto the computer that owns the remote screen.
- If you are using a terminal other than the default screen belonging to the machine, you may have to set the X-window output device:
  ```
  C-shell: setenv DISPLAY your_terminal_name:0.0
  Bourne shell: DISPLAY=your_terminal_name:0.0 export DISPLAY
  ```
Mentat runs, then aborts.

Cause The model you are working on becomes very large.

User Information Mentat requires a considerable amount of memory to store the model. Ensure that a minimum of 8 GB core memory is available in your machine.

User Actions
- Increase the core memory up to 8 GB
- If the multi-level UNDO option is off, you can save memory by switching UNDO off in the Tools → Program Settings... menu.

You are prompted for a password when running parallel jobs

User Information
- In Marc 20XX, on Linux the default MPI version is IntelMPI. This MPI version requires that the ssh command has been set up such that it does not prompt for a password. Here is a description on how to set this up.
- Make sure there is a directory called .ssh in the home directory (note that in this home directory only you must have write access):
  - cd $HOME
  - ls .ssh
- If it does not exist, create it:
  - mkdir .ssh
  - chmod 700 .ssh
  - cd .ssh
- Execute the command
  - ssh-keygen -t rsa -f id_rsa -P "
- It is -P followed by two single quotes. This will create two files: id_rsa and id_rsa.pub. Copy id_rsa into a file called identity:
  - cp id_rsa identity
- Append id_rsa.pub to a file called authorized_keys
  - cat id_rsa.pub >> authorized_keys
  - chmod 600 authorized_keys
- The directory $HOME/.ssh should now contain the four files id_rsa, id_rsa.pub, identity and authorized_keys (and possibly more files).
If all went well it should now be possible to do:

```
ssh thishost
```

- with `thishost` replaced by the hostname of the current machine, without getting a prompt for the password. After this it should be possible to run a parallel job without having to provide a password.

- In order to be able to connect to other Linux machines without being prompted for a password (for example for running parallel network jobs), use the following steps:

  Copy the file `id_rsa.pub` that was created above to the other machine. Make sure it has a directory `$HOME/.ssh`. Append the file `id_rsa.pub` to the files `$HOME/.ssh/authorized_keys` and `$HOME/.ssh/authorized_keys2` and give them the appropriate permission:

  ```
cat id_rsa.pub >> $HOME/.ssh/authorized_keys
  cat id_rsa.pub >> $HOME/.ssh/authorized_keys2
  chmod 600 $HOME/.ssh/authorized_keys $HOME/.ssh/authorized_keys2
  chmod 700 $HOME/.ssh
  ```

  The first time you login with `ssh` to the second system you will get a warning and asked if you want to continue. Type `yes` to accept and the remote host will be added to the file `$HOME/.ssh/known_hosts` and the next time you will not be prompted.
SECTION 3: APPENDICES
Appendix A: Microsoft Windows: Marc Subdirectories and Installation

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- Installation Procedure 151
## Marc Subdirectories

The Marc version you have received contains a full set of subdirectories listed below. You can save disk space by removing the example subsets that you do not need.

<table>
<thead>
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</tr>
<tr>
<td>AF_flowmat</td>
<td>material data for database</td>
</tr>
<tr>
<td>xdr_lib</td>
<td>machine dependent libraries</td>
</tr>
<tr>
<td>lib_shared</td>
<td>machine dependent libraries</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Extended set</th>
<th>Contents: only for use with user subroutines</th>
</tr>
</thead>
<tbody>
<tr>
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<td>binary libraries with the compiled Marc routines</td>
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<td>source routines for the post-file conversion programs pldump, pldump13 and pldump2000</td>
</tr>
<tr>
<td>intelmpi</td>
<td>MPI libraries for network parallel version</td>
</tr>
</tbody>
</table>
## FLEXlm 11.13 VS Helium (11.16.3.0) License Manager

This section contains information and directory paths according to Helium license manager. The changes in the default paths in comparison with FLEXlm 11.13 are as in the following table:

<table>
<thead>
<tr>
<th>11.13</th>
<th>Helium (11.16.3.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\msc</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\msc</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\lmtools</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\install s</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\install s</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\lmgrd</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmgrd</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\LOG</td>
<td>C:\MSC.Software\MSC Licensing\Helium\LOG</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\lmutil</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmutil</td>
</tr>
<tr>
<td>C:\MSC.Software\MSC.Licensing\11.13\msclic.ini</td>
<td>C:\Program Files\MSC.Software\MSC Licensing\Helium\msclic.ini</td>
</tr>
</tbody>
</table>
## Installation Procedure

![alt text](image-url)

<table>
<thead>
<tr>
<th>Steps</th>
<th>Command Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1: Security</strong></td>
<td>Download FLEXlm from the Solutions Download Center. Select the product <em>MSC Licensing FLEXlm</em>, version 11.13. Run the installation executable and follow the installation instructions.</td>
</tr>
<tr>
<td></td>
<td>Default installation directory is C:\MSC.Software\MSC.Licensing\11.13. Obtain a license file from MSC Software. If a nodelocked license is to be used, then obtain FLEXlm hostid with C:\MSC.Software\MSC.licensing\11.13\lmtools.</td>
</tr>
<tr>
<td></td>
<td>Select the <strong>System Settings</strong> tab and click on <strong>Save HOSTID Info to a File</strong>. Copy the license file to the proper location. The standard location is C:\MSC.Software\MSC.Licensing\11.13\licenses\license.dat.</td>
</tr>
<tr>
<td></td>
<td>Set the environment variable <strong>MSC_LICENSE_FILE</strong> to point to the license file. The license server must be running in order to run Marc and Mentat. Previous versions of Marc and Mentat will run with the latest FLEXlm version, so it is safe to upgrade previous installations of FLEXlm.</td>
</tr>
</tbody>
</table>
### Installation Procedure

#### Step 2: Install Marc and Mentat

Start the installation from the product media obtained from the Solutions Download Center.

**Choose Destination Location:**

*Destination Folder:*

```
C:\Program Files\MSC.Software\Marc\2019.1.0
```

The first screen will prompt you to set the location where you want the products installed. This path is the `<parent>` directory. It defaults to `C:\Program Files\MSC.Software\Marc\2019.1.0`

The directories `marc2019.1.0` and `mentat2019.1.0` will be created in the directory that you specify.

The default destination folder for Mentat is `C:\Program Files\MSC.Software\Marc\2019.1.0`

#### Setup type

You will then be presented with which product options to install.

- [ ] Complete
- [ ] Solver
- [ ] Modeler

Select the **Complete** option to install both Marc and Mentat.

Select the **Solver** option to only install Marc, or select the **Modeler** option to only install Mentat.

#### Program folder

Select Program Folder:

*Program Folder:*

```
MSC.Software
```

Select the folder that you wish to place the shortcut to the Mentat startup script.

The default program folder name is `MSC.Software`.

#### Specify license file

License:

```
C:\MSC.Software\MSC.Licensing\11.13\licenses\license.dat
```

When you perform the **Marc** installation, it will ask for the location of a valid Marc license file.

Specify the location of your license file.

- [ ] I would like to view the README file.

The last screen is the **Setup Complete** screen. It will present you with an option to view the readme.txt file.

Click on the **Finish** button to leave Setup. Then click on the **X** button in the lower left hand corner of the main installation menu window or press the escape button.
### Steps

#### Step 3:
**Start the License Manager**

- Start the FLEXlm license manager.
- You may also want to enable the license manager to run as a service and to start the server at power-up by enabling these options in the Config Services section.

Select **Start Programs → MSC.Software → MSC License 11.13 → FLEXlm Configuration Utility** to configure FLEXlm.

Select the **Config Services** tab and verify that the settings are correct; i.e., the **License File** is set correctly. Then start the license manager from the **Start/Stop/Reread** tab by pressing the **Start Server** button.

#### Step 4:
**checking**

- Run Mentat by either selecting the Mentat item in the program folder that you chose, or run it from the MS-DOS Command Prompt.

**First check that the variable MSC_LICENSE_FILE is set properly.** Use an MS-DOS Command Prompt window and type:

```bash
set msc_license_file
```

If it is not correct, change it using the System applet in the Control Panel.

- Then run the program using:

```bash
cd C:\Program Files\MSC.Software\marc 2019.1.0\mentat2019.1.0 bin\mentat
```

- Run a demo problem by selecting the menu buttons:

  **Help>Run A Demo>Thermal/Structural Contact**

Check the installation by running Mentat.

There are three methods to run Mentat:

1. Use the Mentat icon which is created on the desktop
2. The link in the MSC.Software\Marc 2019.1.0 program group
3. Run it from an MS-DOS Command Prompt window.

To run from the command prompt, do the following:

1. Go to the `<parent>\mentat2019.1.0` directory.
2. Enter the command `bin\mentat`.

You **must** first check that the environment variable MSC_LICENSE_FILE is set properly to the full pathname of your valid license file. If it is not, the product will fail due to licensing.

Check the Mentat program by running one of the standard Marc demonstration examples as proof of a successful installation. From the **Help** menu, select **Run A Demo...**, and then select the **Thermal/Structural Contact** demo. It will run for 50 increments.
### Installation Procedure

**Step 5:**

**for Network Version only**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Command Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To check that user subroutines are working by running one of the standard user subroutine demo problems:</td>
<td>If you have a <strong>Fortran compiler</strong>, run a user subroutine example using:</td>
</tr>
<tr>
<td></td>
<td>cd C:\Program Files\MSC.Software\marc \n cd 2019.1.0\marc2019.1.0\demo\tools\run_marc -j e2x4 -u u2x4</td>
<td>run_marc -j e2x4 -user u2x4 \n Marc should give a <strong>Marc Exit number 3004</strong>.</td>
</tr>
</tbody>
</table>

**Step 6:**

**Installing the documentation**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Command Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Start the installation from the product media obtained from the Solutions Download Center. Choose Destination Location:</td>
<td>To make optimal use of the documentation, it should be installed on a computer where Marc and Mentat are available. This way, documents can be accessed interactively from within Mentat, and Marc example problems can be run.</td>
</tr>
<tr>
<td></td>
<td>C:\Program Files\MSC.Software\Marc_Documentation\2019.1.0</td>
<td>You can install the documentation either before or after installing Marc and Mentat. The documentation installer will check if there is a corresponding Marc and Mentat version installed, where the Marc and Mentat installer will check if there is a corresponding documentation version installed, so that they can be linked together.</td>
</tr>
<tr>
<td></td>
<td>The installer will prompt you to set the location where the documentation needs to be installed. This defaults to:</td>
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</tr>
<tr>
<td></td>
<td>C:\Program Files\MSC.Software\Marc_Documentation\2019.1.0</td>
<td>C:\Program Files\MSC.Software\Marc_Documentation\2019.1.0</td>
</tr>
<tr>
<td></td>
<td>You can now install the documentation to any other location. The directories doc and examples will be created in the directory specified by you.</td>
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Mentat Files and Subdirectories

The Mentat version you have received contains a full set of subdirectories listed below.

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<th>Basic set:</th>
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<td>3-D mouse driver</td>
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<tr>
<td>bin</td>
<td>Shell scripts and programs for Mentat</td>
</tr>
<tr>
<td>ctkernel</td>
<td>CAD import libraries</td>
</tr>
<tr>
<td>help</td>
<td>Mentat online help files</td>
</tr>
<tr>
<td>lang</td>
<td>Localization dictionaries</td>
</tr>
<tr>
<td>materials</td>
<td>Mentat material files</td>
</tr>
<tr>
<td>materials_pre2010</td>
<td>Old Mentat material files</td>
</tr>
<tr>
<td>menus</td>
<td>Mentat menu files</td>
</tr>
<tr>
<td>parasolid</td>
<td>Parasolid schema files</td>
</tr>
<tr>
<td>python</td>
<td>Python installation</td>
</tr>
<tr>
<td>qt</td>
<td>Graphics plug-ins</td>
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<tr>
<td>scasystem</td>
<td>Components interface</td>
</tr>
<tr>
<td>shlib</td>
<td>Shared libraries</td>
</tr>
<tr>
<td>utilities</td>
<td>SIFT Python scripts</td>
</tr>
</tbody>
</table>
Linux: Marc/Mentat Files, Subdirectories and Installation

- Marc Files and Subdirectories 158
- Mentat Files and Subdirectories 159
- Installation Procedure 160
Marc Files and Subdirectories

The Marc version you have received contains a full set of subdirectories listed below. You can save disk space by removing the example subsets that you do not need.

Table C-1 Contents of the Marc installation

<table>
<thead>
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<tr>
<td>lib_shared</td>
<td>system dependent shared libraries.</td>
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<td>Shared libraries</td>
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<td>utilities</td>
<td>SIFT Python scripts</td>
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## Installation Procedure

Download the file marc_20XX_linux64_rh7.1_7.3.tar.gz.

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<th>Description</th>
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</thead>
<tbody>
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<td><strong>Step 1:</strong></td>
<td><strong>Security</strong></td>
<td>Download FLEXlm from the Solutions Download Center. Select the product <em>MSC Licensing</em>, version 11.13.</td>
</tr>
<tr>
<td></td>
<td>chmod +x msc_licensing_11.13_&lt;platform&gt;.bin</td>
<td>Run the installation executable. It may be necessary to give execution permission (chmod +x) to the downloaded file. Follow the installation instructions.</td>
</tr>
<tr>
<td></td>
<td>./msc_licensing_11.13_&lt;platform&gt;.bin</td>
<td>Default installation directory is /msc/MSC.Licensing/11.13.</td>
</tr>
<tr>
<td></td>
<td>For nodelocked license, run</td>
<td>Obtain a license file from MSC Software. If a nodelocked license is to be used, then obtain FLEXlm hostid with /msc/MSC.Licensing/11.13/bin/lmhostid</td>
</tr>
<tr>
<td></td>
<td>/msc/MSC.Licensing/11.13/bin/lmhostid</td>
<td>Copy the license file to the proper location. Standard location is /msc/MSC.Licensing/11.13/licenses/license.dat</td>
</tr>
<tr>
<td></td>
<td>cp license.dat</td>
<td>Set the environment variable MSC_LICENSE_FILE to point to the license file.</td>
</tr>
<tr>
<td></td>
<td>/msc/MSC.Licensing/11.13/licenses/license.dat</td>
<td>The license server must be running in order to run marc and Mentat.</td>
</tr>
<tr>
<td></td>
<td>For csh and similar: setenv MSC_LICENSE_FILE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>/msc/MSC.Licensing/11.13/licenses/license.dat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>For Bourne shell and similar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSC_LICENSE_FILE=/msc/MSC.Licensing/11.13/licenses/license.dat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>export MSC_LICENSE_FILE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Edit license.dat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Start the license server:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>/msc/MSC.Licensing/11.13/bin/lmgrd -c</td>
<td></td>
</tr>
<tr>
<td></td>
<td>/msc/MSC.Licensing/11.13/licenses/license.dat -l</td>
<td></td>
</tr>
<tr>
<td></td>
<td>/msc/MSC.Licensing/11.13/lmgrd.log</td>
<td></td>
</tr>
</tbody>
</table>
### Step 2:
**Download the product and start the install script**

<table>
<thead>
<tr>
<th>Command Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>mkdir /tmp/marc</td>
</tr>
<tr>
<td>cd /tmp/marc</td>
</tr>
<tr>
<td>Copy the file from Download Center to this directory</td>
</tr>
<tr>
<td>gunzip &lt;file&gt;.tar.gz</td>
</tr>
<tr>
<td>tar xvf &lt;file&gt;.tar</td>
</tr>
<tr>
<td>./install.exe</td>
</tr>
</tbody>
</table>

#### Description
Download the product from the Solutions Download Center and save the file to a temporary location. Marc and Mentat are available for Red Hat 7.1/7.3 and SUSE 11SP4/12SP1 (the SUSE version should be used when you want to run Marc 20XX on Red Hat 6.7). Please download the version compatible with your system. Unzip the file and extract the contents. Run the Marc installation script `install.exe` that is in the top-level directory.

In order to complete the installation, you need to confirm that you want to install Marc 20XX on your computer, and accept the installation conditions (by entering “I Accept”).

### Step 3:
**Extract the files from the installation media**

#### Main Menu

<table>
<thead>
<tr>
<th>Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ) Install Marc</td>
</tr>
<tr>
<td>2 ) Install Mentat</td>
</tr>
<tr>
<td>o ) Options</td>
</tr>
<tr>
<td>? ) Help information</td>
</tr>
<tr>
<td>q ) Exit from the installation script</td>
</tr>
</tbody>
</table>

#### Description
Select option 1 to install Marc. This will take you to the Marc submenu.

**Note:** Remember to install Marc before you install Mentat.
<table>
<thead>
<tr>
<th>Steps</th>
<th>Command Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select the platform</td>
<td>Marc 2019.1.0 GA Menu</td>
<td>Select the platform that you will be running Marc on. The script will show the platform for which you have downloaded the version and if this is compatible with your system, it is shown as a default value in brackets after the Selection prompt. Just press Return/Enter to use the default value, otherwise enter L1 to install the Red Hat 7.1/7.3 version and L2 to install the SUSE 11SP4/12SP1 / Red Hat 6.7 version. You will also be prompted whether you want to create a system wide link to the marc20XX run script.</td>
</tr>
<tr>
<td></td>
<td>L1) Install for Linux 64-bit RHEL 7.1/7.3 (-1.1 GB)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>? ) Help information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>r ) Return to previous menu</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The current default MARC_MPI is set to intelmpi</td>
<td>The script will ask about changing the default MPI from its current setting to another MPI if supported on the installed platform. Supported MPI versions are IBM Platform MPI* and Intel MPI. The setting is stored in the file run_marc_defaults in the marc2019.1.0/tools directory.</td>
</tr>
<tr>
<td></td>
<td>Do you want to change it to hpmpi [y/N]?</td>
<td>*In the documentation and the scripts, this is labeled as hpmpi.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>r )Return to the previous menu</td>
<td>Choose the Return to previous menu option to return to the main menu.</td>
</tr>
<tr>
<td>Steps</td>
<td>Command Information</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>---------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Mentat Installation</td>
<td>Select option 2 from the main menu to install Mentat.</td>
<td>Select the platform that you will be running Mentat on. The script will show the platform for which you have downloaded the version and if this is compatible with your system, it is shown as a default value in brackets after the Selection prompt. Just press Return/Enter to use the default value, otherwise enter l1 to install the Red Hat 7.1/7.3 version and l2 to install the SUSE 11SP4/12SP1 / Red Hat 6.7 version.</td>
</tr>
<tr>
<td>Mentat 2019.1.0 Menu</td>
<td>You will be prompted to supply the pathname to the directory where Marc is installed. If the script determines that Marc is already installed to the default location of &lt;parent&gt;/marc2019.1.0, then a default value for the path is displayed. Press Return/Enter to use the default value. If you do not have Marc at this site, you can ignore the prompt. You will also be prompted whether you want to create a system wide link in /usr/local/bin to the mentat2019.1.0 run script. You must be root to perform this.</td>
<td></td>
</tr>
<tr>
<td>l1) Install for Linux 64-bit RHEL 7.1/7.3 (~1.3 GB)</td>
<td>r)Return to the previous menu</td>
<td>Choose the Return to previous menu option to return to the main menu. Select q to exit the installation script.</td>
</tr>
<tr>
<td>3D Mouse</td>
<td>Mentat supports a 3-D Mouse (or Spaceball) device. If you want to use such a device with Mentat, please make sure that the right spacenav driver is installed on your system (see <a href="http://spacenav.sourceforge.net">http://spacenav.sourceforge.net</a>).</td>
<td></td>
</tr>
</tbody>
</table>

**Steps**

- **Mentat Installation**
  - **Mentat 2019.1.0 Menu**
  - **l1) Install for Linux 64-bit RHEL 7.1/7.3 (~1.3 GB)**

**Command Information**

- Select option 2 from the main menu to install Mentat.
- Select the platform that you will be running Mentat on. The script will show the platform for which you have downloaded the version and if this is compatible with your system, it is shown as a default value in brackets after the Selection prompt. Just press Return/Enter to use the default value, otherwise enter l1 to install the Red Hat 7.1/7.3 version and l2 to install the SUSE 11SP4/12SP1 / Red Hat 6.7 version.
- You will be prompted to supply the pathname to the directory where Marc is installed. If the script determines that Marc is already installed to the default location of <parent>/marc2019.1.0, then a default value for the path is displayed. Press Return/Enter to use the default value. If you do not have Marc at this site, you can ignore the prompt. You will also be prompted whether you want to create a system wide link in /usr/local/bin to the mentat2019.1.0 run script. You must be root to perform this.

**Description**

- r)Return to the previous menu
- Choose the Return to previous menu option to return to the main menu. Select q to exit the installation script.

**3D Mouse**

- Mentat supports a 3-D Mouse (or Spaceball) device. If you want to use such a device with Mentat, please make sure that the right spacenav driver is installed on your system (see http://spacenav.sourceforge.net).
### Installation Procedure

#### Step 4:
**Download the documentation and start the install script**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Command Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mkdir /tmp/documentation</td>
<td></td>
<td>Download the documentation file from the Solutions Download Center and save the file to a temporary location. Unzip the file and extract the contents. Run the documentation installation script <code>install_doc.exe</code> that is in the top-level directory.</td>
</tr>
<tr>
<td>cd /tmp/documentation</td>
<td></td>
<td>It is important to enter the same directory in which you want to install the documentation as the one in which Mentat has been installed. When doing so, it is possible to interactively access the various documentation files from within Mentat and to run a selected number of procedure files illustrating some analysis capabilities (see also Checking Mentat).</td>
</tr>
<tr>
<td>Copy the file from Download Center to this directory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gunzip &lt;file&gt;.tar.gz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tar xvf &lt;file&gt;.tar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>./install_doc.exe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Step 5:
**Checking Marc**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Command Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cd &lt;parent&gt;/marc2019.1.0/tools</td>
<td></td>
<td>If you installed Marc, Mentat and the documentation, you can check the Marc installation by following the instructions under Checking Marc from Mentat.</td>
</tr>
<tr>
<td>./maintain</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marc Tools Menu</strong></td>
<td></td>
<td>Change your directory to marc2019.1.0/tools and start the maintain script. This brings up a new menu. Select option 1, Test Marc installation. A new Test menu appears. You must choose either Serial or Parallel depending on the license you have.</td>
</tr>
<tr>
<td><strong>Test the Marc installation</strong></td>
<td></td>
<td>Run one of the standard Marc demonstration examples as proof of a successful installation by choosing option 1.1. If all goes well, one of the final messages on the screen should read: Marc 2019.1.0 Exit number 3004</td>
</tr>
<tr>
<td>1.1) Run a Marc job without user subroutine</td>
<td></td>
<td>If you have a Fortran compiler on your system, choose a second demonstration example, option 1.2. Here again, Marc should give the same exit message as shown above.</td>
</tr>
<tr>
<td>1.2) Run a Marc job with user subroutine</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Troubleshooting:

1. If you get an error message of `f90 not found` or `ifort not found` when running a job with a user subroutine and there is a Fortran compiler, its path needs to be appended to your path in the `.cshrc` or `.profile` file.

### Step 6:

**Checking Mentat**

- Change your current directory to be the `<parent>` directory in which you installed Mentat, and then cd to `mentat2019.1.0`.

- Enter the command `./bin/mentat` to start Mentat. From the Help menu, select Run A Demo..., and then select the Thermal/Structural Contact demo. It will run for 50 increments.

### Step 7:

**For Marc Parallel Network version only**

- Please follow the *Parallel Network Version for Linux Installation Instructions* (Chapter 9: Hardware and Software Requirements and Chapter 9: Installation Notes) on installing and running jobs with the network version.