

# Marc<sup>®</sup> and Mentat<sup>®</sup> 2020

# Installation and Operations Guide





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- 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 *Marc and Mentat Installation and Operations Guide* contains information about installing and running Marc, Mentat and its components. You will find references to following documents throughout this guide.

TITLE	VOLUME
Theory and User Information	Volume A
Element Library	Volume B
Program Input	Volume C
User Subroutines and Special Routines	Volume D
Demonstration Problems	Volume E
Release Guide	
Python: Tutorial and Reference Manual	

#### Marc Documentation

#### 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:

Chapter	Title	Description	
	SECTION 1: MICROSOFT WINDOWS		
Chapter 1	Prerequisites for Marc and Mentat	Describes the prerequisites required for the installation and usage of the Marc and Mentat programs on Microsoft Windows platforms.	
Chapter 2	Marc and Mentat Installation	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.	
Chapter 3	Running and Using Marc and Mentat	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.	
Chapter 4	Marc Parallel Network	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.	
Chapter 5	Windows Troubleshooting	This chapter contains information about troubleshooting general and problems.	
SECTION 2: LINUX			
Chapter 6	Prerequisites for Marc and Mentat	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.	
Chapter 7	Marc and Mentat Installation	Detailed procedure about installing Marc and Mentat on Linux platforms is explained here	
Chapter 8	Running and Using Marc and Mentat	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.	
Chapter 9	Marc Parallel Network	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.	

Chapter	Title	Description
Chapter 10	Linux Troubleshooting	This chapter contains information about troubleshooting general and problems.
	SECTION 3	APPENDICES
Appendix A	Microsoft Windows: Marc Subdirectories and Installation	Contains information regarding Marc subdirectories and the old installation procedure for windows platform
Appendix B	Microsoft Windows: Mentat Files and Subdirectories	Mentat files and subdirectories are mentioned in this file.
Appendix C	Linux: Marc/Mentat Files, Subdirectories and Installation	Marc/Mentat files, subdirectories and the old installation procedure for Linux platform are briefly described.

# **Typographical Conventions**

The section provides a brief overview of the typographical conventions used in the document to help the user better follow the *Marc and Mentat* 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.

Adobe Garamond Pro	Body and general text
Courier New	<ul> <li>Represents command-line options of Marc and Mentat.</li> </ul>
	<ul> <li>Directory names and paths</li> </ul>
	<ul> <li>File names and Paths</li> </ul>
	<ul> <li>Linux terminal script</li> </ul>
	Example: lmreread -c <parent>/msc/MSC.Licensing/licenses/license.dat</parent>
Bold Text	<ul> <li>Highlights</li> </ul>
	<ul> <li>Dialog box names</li> </ul>
	<ul> <li>Buttons</li> </ul>
	<ul> <li>Menus</li> </ul>
	<ul> <li>User inputs</li> </ul>
	<ul> <li>The commands/user inputs for all descriptions related to terminal commands.</li> </ul>
	<ul> <li>Default values</li> </ul>
	<pre>Example: [root@vm-tmrhel73 MSC] # ./msc_licensing_helium_linux64.bin</pre>
HelveticaNeueLT Pro Cn 57	<ul> <li>Hyperlinks</li> </ul>
	<ul> <li>Weblinks</li> </ul>
	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.

# Accessing Marc Manuals

This section describes how to access the Marc documentation outside of MSC Software. Marc documentation is available through PDF files. The PDF files can be obtained from the following sources:

- Marc documentation installer
- SimCompanion
- Combined documentation

The PDF documentation files are appropriate for viewing and printing with Adobe Acrobat Reader (version 5.0 or higher), which is available for most Windows and Linux systems. These files are identified by a .pdf suffix in their file names.

## Downloading the PDF Documentation Files

You can download the PDF documentation from SimCompanion (http://simcompanion.mscsoftware.com).

## Navigating the PDF Files

For the purpose of easier online document navigation, the PDF files contain hyperlinks in the table of contents and index. In addition, links to other guides, hyperlinks to all cross-references to chapters, sections, figures, tables, bibliography, and index entries have been applied.

# Printing the PDF Files

Adobe Acrobat PDF files are provided for printing all or part of the manuals. You can select the paper size to which you are printing in Adobe Acrobat Reader by doing the following:

- 1. Click File.
- 2. Select the Print .... option. The Print dialog box is displayed.
- 3. Select Page Setup....
- 4. Choose the required paper size in the Page Setup menu.

The PDF files are recommended when printing long sections since the printout will have a higher quality.

If the page is too large to fit on your paper size, you can reduce it by doing the following:

- 1. Select the File -> Print.
- 2. Under Page Scaling, choose the Shrink to Printable Area option.

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Modify PDF Portfolio	
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Save As Shift+Ctrl+S	Printer
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# **Training and Internet Resources**

Information about MSC's products, services and latest events is available on our website www.mscsoftware.com.

The information about MSC Seminars is available on the training link <a href="http://www.mscsoftware.com/msc-training">http://www.mscsoftware.com/msc-training</a>. You can also use this link to schedule the seminars.

If you are a new Marc user, we recommend the following courses:

#### MAR101 - Basic Nonlinear Analysis using Marc and Mentat

The purpose of this course is to introduce the new Marc user to both Marc and Mentat by lectures and hands on modeling of nonlinear problems.

#### **Pre-requisites:**

A basic knowledge of statics and strength of materials is highly recommended. Previous finite element analysis experience is recommended.

#### Topics:

- Introduction to Mentat
- Nonlinear Finite Element Analysis
- Resolving Convergence Problems
- Numerical Analysis of Nonlinear Problems

#### MAR102 - Advanced Nonlinear Analysis using Marc and Mentat

The purpose of this course is to enhance the current Marc user's understanding of modeling nonlinear problems. Lectures are supported by hands-on modeling of nonlinear problems.

#### Pre-requisites:

A basic knowledge of nonlinear simulations - Familiarity with Mentat 2011 - Completion of MAR101 (Basic Nonlinear Analysis using Marc and Mentat) or equivalent experience.

#### Topics:

- Material Nonlinearity
- Contact
- Adaptive Meshing
- User Subroutines in Marc
- Heat Transfer and Thermal Stresses
- Global Local (Structural Zooming) Analysis in Marc
- Restarts
- Performance
- Workshop Problems

#### MAR103 - Experimental Elastomer Analysis

The purpose of this course is to provide a fundamental understanding of how material testing and finite element analysis are combined to improve the design of rubber and elastomeric products.

#### Pre-requisites:

A basic knowledge of statics and strength of materials is highly recommended. Previous finite element analysis experience is recommended. And the knowledge of elastomeric materials.

#### Topics:

- Introduction
- Overview of Elastomer Testing and Analysis
- Uniaxial Tension/Compression Testing and Analysis
- Biaxial Tension/Compression Testing
- Pure Shear Testing
- Product Simulations with Specimen Data

#### MAR120 - Basic Nonlinear Analysis using Marc and Patran

MAR120 covers the use of Marc and Patran or AFEA (the interlocked combination of Patran and Marc) for the solution of complex engineering problems. Students who successfully complete this course will be able to: create finite element models representing nonlinear physical phenomena; select appropriate element types and mesh densities; understand the limitations of solving nonlinear FEA problems; select solution types for various nonlinear phenomena such as nonlinear

dynamics, metal forming, elastomers, and contact problems; select error tolerance parameters and properly use automatic time-stepping techniques; and understand the basis of large deformation, rotation, and strain finite element analysis. Patran provides a Marc Preference which directly supports most Marc features and indirectly supports all Marc features. MSC customers that have been using Advanced FEA (which is replaced by AFEA) for meeting their analysis needs will find this new Marc Preference to be the ideal environment to continue their work. They are especially encouraged to attend this course. All the class practice (16 exercises) is made using Patran and Marc rather than Marc and Mentat. Engineers who have attended the MAR101 and MAR102 will also benefit from attending this class if they intend to use the Patran Marc Preference.

#### Pre-requisites:

A basic knowledge of statics and strength of materials is highly recommended and previous finite element analysis experience is recommended.

#### MAR121 - Advanced Nonlinear Analysis using Marc and Patran

The purpose of this course is to enhance the current Marc user's understanding of modeling nonlinear problems. Lectures are supported by hands-on modeling of nonlinear problems.

#### Pre-requisites:

MAR120 - Basic Nonlinear Analysis using Marc and Patran

#### Topics:

- Expand knowledge from MAR120 (Basic Nonlinear Analysis using Marc and Patran) course
- Practical aspects of rubber simulation
- Creep
- Superplastic forming
- Composite failure techniques
- Advanced contact techniques
- Adaptive meshing
- User subroutines
- Global/Local modeling
- Heat transfer and thermal stress
- Coupled Thermal/Structural analysis
- Restarts
- Performance
- Workshop Problems

# **Technical Support**

If you encounter difficulties while using Marc, first please refer to the section(s) of the manual containing information on the commands you are trying to use or the type of problem you are trying to solve.

#### Visit SimCompanion

The product documentation is available in SimCompanion (http://simcompanion.mscsoftware.com). The SimCompanion gives you access to a wealth of resources for MSC Software products. You will find various information such as:

- Product documentations
- Knowledge base articles
- Product error lists (fixed and known issues for each release)
- SimAcademy webinars
- Product and support contact information

SimCompanion is a searchable database which allows you to find articles relevant to your inquiry. Valid MSC customer entitlement and login is required to access the database and documents. It is a single sign-on that gives you access to product documentation for complete list of products from MSC Software, allows you to manage your support cases, and participate in our discussion forums.

## Help Us Help You

Clients frequently call up the support engineers at MSC Software with enquiry regarding models that do not run correctly. Our technical support staff can help you much more efficiently and effectively if you are working with a small model, since debugging a small model is much easier, and the turnaround time to rerun a (hopefully) corrected test model is minutes rather than hours.

- For information on the latest events, products and services for all products, refer to the MSC Software corporate site (www.mscsoftware.com).
- For technical support phone numbers and contact information, please visit: http://www.mscsoftware.com/Contents/Services/Technical-Support/Contact-Technical-Support.aspx.

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# **SECTION 1: MICROSOFT WINDOWS**



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The requirements of Marc and Mentat are as in the following table:

	Table 1-1   Requirements of Marc & Mentat
Operating System	Windows 10, or Windows 2016 Server.
CPU	X86-64
Graphics Card	SVGA or better running in at least 16 bit (64k) color mode
Hard Drive	Minimum: <ul> <li>950 MB Marc</li> <li>800 MB Mentat</li> <li>350 MB documentation</li> </ul>
DVD Drive	Required for media based installation. Not required for electronic download installation.
Ethernet Card	An ethernet card is required. Also, Microsoft TCP/IP Service must be installed.
Mouse	Three button mouse is recommended
Memory	Minimum 8 GB Recommended 16 GB
Fortran Compiler	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 <i>Marc and Mentat Release Guide</i> .

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 product is available for download at the MSC Solutions Download Center available at
the software	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 FLEXIm security is installed separately.
	3. Select the product MSC Licensing and the version Helium 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 FLEXIm licensing software. You <i>cannot</i> 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 <i>Administrator</i> . 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: See Chapter 5: Windows Troubleshooting for important information regarding requirements for Intel Fortran compiler.

Computer Name	Your machine <b>must</b> have a computer name (host name). If no computer name is known, supply one by using the <b>Control Panel\Network</b> applet to set the <b>Computer Name</b> . You should also make sure the <b>Host Name</b> specified in the DNS tab of <b>Network\Protocols\TCP/IP Protocol</b> is the same as the "Computer Name".
Previous Versions	If you have previous versions of Marc and/or Mentat installed, you may want to adjust your PATH environment variable to remove the reference to the previous version.
NVIDIA driver	An NVIDIA driver is necessary if the GPGPU capability is to be used on Windows 64-bit machines. For other cases, no special driver is needed. The driver needs to be compatible with the one used in the Marc build; see <i>Marc Volume A: Theory and User Information</i> , Chapter 13 for the minimum driver version supported.

# Supported Platforms

The supported Windows platforms are listed below:

Туре	OS	Hardware	Fortran Version	Default MPI
Windows (64- bit)	Windows 10 Windows 2016 Server	Intel EM64T or AMD Opteron	Intel XE 19.04 <sup>1</sup>	Intel MPI 2019 Update 4 <sup>2</sup>
<ol> <li>For user subroutines, Intel Fortran XE 19.04 and Microsoft Visual Studio 2017 are required.</li> <li><sup>2</sup> Microsoft MPI program version 9.0 is also supported.</li> </ol>				

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

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- Configuring the Marc DCOM Server 54
- GPU Support on Windows 58

#### 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
- Dobtain a license file from MSC Software. If a nodelocked license is to be used, then obtain FLEXIm 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.

MSC Licensing Helium	
	Welcome to the MSC Licensing Installation Program
	It is strongly recommended that you exit all Windows programs before running this Setup program.
	Copyright (C) 20XX MSC Software Corporation and its licensors. All rights reserved.
	Warning: This computer program ("Software") is protected by intellectual property law including trade secret law, copyright law and international treaties. Reproduction or distribution in any manner requires written permission of MSC Software Corporation or its beneficiaries under the terms of a valid license. Unauthorized reproduction or distribution of this Software, or any portion of it, may result in severe civil and criminal penalties. Click "Cancel" to quit Setup. Click "Next" to consent and continue with the Setup program.
MSCX Software	<u>N</u> ext > Cancel

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.

MSC Licensing Helium		×
	Installer Requirements	
	Please have the following available before continuing with the installation	
	A valid MSC Software issued license file. The hostname and HostID of this machine are listed below.	
	HostName=	
	HostID=	
	A supported operating system. Supported operating systems are listed in the User Guide.	
MSCXSoftware	< <u>Back</u> <u>N</u> ext > Cancel	I

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

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

Choose Destination Folders
Please select the folders where Setup will install the files.
Select locations for both the License Manager executable files and the MSC usage Log Files. Both must be specified. It is recommended that the default settings are used.
License Manager Executable Folder
C:\Program Files\MSC.Software\MSC Licensing\Helium Browse
License Manager Log File Folder-
C:WSC.Software\MSC Licensing\Helium\LOG Browse
Please Note: The Log File Directory must have write permission by the account that installs and/or runs the MSC Licensing software.

- 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

The Select the License File window appears.

MSC Licensing Helium			22
	Select the	License File	
	Please select the MSC Software license	file.	
	Please Note: License files may requi MSC Licensing program. Please see e-mail with the license file.	re a minimum version of the the information provided in the	
	Select the License File		
	C:\Users\tmujawar\Desktop\license.dat	Browse	
	License File Details		
	License File Reference ID:		
	Product Type:	MSC One	
	License Type:	Lease	
	Usage Reporting Requirement:		
MSCX Software	< <u>B</u> ack	<u>N</u> ext >	Cancel

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 dare 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

 MSC Licensing Helium
 Image: Constraint of the state of the sta

The Automatic Reporting of Usage Data window usage appears.

MSC Licensing Helium	×
MSC Licensing Helium	
	License Server Settings
	Please define the desired license manager settings.
	Port:
	Hostname:
	Option File Path(Optional): Browse
	Select the privilege level for license manager access. (e.g.Server Start/Stop Functions)
	Access: Admin/Superuser O Any
	Start the server automatically
MSCX Software	< <u>B</u> ack <u>Next</u> > Cancel

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.

MSC Licensing Helium		x
Start Copying Files		
Review settings before copying	files.	
	Setup has enough information to start copying the program files. If you want to review or change any settings, click Back. If you are satisfied with the settings, click Next to begin copying files.	
	Current Settings:	
	Target Directory:C:\Program Files\MSC.Software\MSC Licensing\Helium Log Directory:C:\MSC.Software\MSC Licensing\Helium\LOG	
	Required space:67MB Available space:95054 MB	
	Installer Information: User Name: tmujawar Company Name: Undetermined	
	Install Application For:Anyone who uses this computer (all users)	
	Selected Features: -Enable Automated Usage Reporting	
	۲.	
MSCX Software	< Back Next > Cancel	

12. Click Next. The files are copied.

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

MSC Licensing Helium is installed succesfully.

A window, Installation Complete appears.

1 Inter 144	ta na shi ta ana nag ta ta an ngani ti na na ta na tina na ta 💻
	Installation Complete
	Thank you for installing the the MSC Licensing program. If the license server was set to start automatically, the status of the server will be displayed below.
	License File: C:\Program Files\MSC.Software\MSC Licensing\Helium\license.dat
	License Server: IND-TN Status:license server UP (MASTER) v11.13.1 Vendor Daemon: MSC: UP v11.13.1
	Check the boxes next to any desktop icons you would like to created
	MSC Licensing User Guide
	Flexera Intools Utility
	Please use the following setting for the MSC_LICENSE_FILE environment variable on the client's machines to access this license server.
	MSC_LICENSE_FILE=27 DIND-TA
	<u>Finish &gt;</u>

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.

Marc 20XX	X
Select the solute time that best with your yourds	
Select the setup type that best suits your needs.	
Please select the language	
© English	
<ul> <li>oabaliese</li> </ul>	
MSCX Software < Back Next >	Cancel

- a. Select **English** as your language.
- 4. Click Next.

The Welcome to Marc Install window appears.

Marc 20XX	x
	₩elcome to Marc Install
	It is strongly recommended that you exit all Windows programs before running this Setup program.
	Copyright (C) 20XX MSC Software Corporation and its licensors. All rights reserved.
	Warning: This computer program ("Software") is protected by intellectual property law including trade secret law, copyright law and international treaties. Reproduction or distribution in any manner requires written permission of MSC Software Corporation or its beneficiaries under the terms of a valid license. Unauthorized reproduction or distribution of this Software, or any portion of it, may result in severe civil and criminal penalties.
	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 these activities. As part of these antipiracy 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 selecting the "I Accept" button 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.
	Click "Cancel" to quit Setup and then close any programs you have running. Click "I Accept" to consent and continue with the Setup program.
MSC Software	[]Accept>] Cancel

5. Click I Accept to consent.

A window for customer information appears.

Marc 20XX		×
Customer Information Please enter your information.		
	User Name:	
	Company Name:	
	Undetermined	
	Install this application for: Anyone who uses this computer (all users) Only for me	
MSCX Software	< <u>B</u> ack <u>N</u> ext >	Cancel

- 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.

Marc 20XX			٢_)
Select Setup Type			
		Select type of setup you prefer	
	Complete	Installs Marc and Marc Mentat	
	Solver	Installs Marc	
	Modeler	Installs Marc Mentat	
	-Destination Folder		
	Cil Brogram Eilech	MSC Software March 20VV	
	C. (Frogram Files (		
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
MSCXSoftware		< <u>B</u> ack <u>N</u> ext> Cancel	

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\20XX.0.0

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

8. Click Next.

The Marc License Setup window appears.

Marc 20XX		x
Marc License Setup		
	If you already have a FLEXIm license server for Marc installed, specify the locatio manager using the License field below. If you're not sure what to do, just click N your System Administrator, and set it later.	on of the license ext, consult with
	Examples: 	
	License:	B <u>r</u> owse
MSCX Software	< <u>B</u> ack <u>N</u> ext >	Cancel

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

A window informing that the files are being copied appears.

Marc 20XX		×
Start Copying Files Review settings before copying file	rs.	
	Setup has enough information to start copying the program files. If you want to review or change any settings, dick Back. If you are satisfied with the settings, dick Next to begin copying files.	
	Current Settings:	
	Setup Type: Complete	
	Target Directory:	
	C:\Program Files\MSC.Software\Marc\20XX	
	Required space: 1889 MB Available space: 90957 MB	Е
	Installer Information: User Name: tmujawar Company Name: Undetermined	
	Install Application For: Anyone who uses this computer (all users)	Ŧ
	4	P
MSCX Software	< <u>B</u> ack <u>Next</u> > Cance	

11. Review the current settings and click Next.



The Marc installation starts and the Marc and Mentat 20XX window appears.

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

12. Click the Finish button to complete setup.

The installation is complete with a prompt as follows:



Notes:	<ul> <li>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.</li> <li>To run from the command prompt, cd to the <parent>\mentat20XX directory, and enter the command bin\mentat to start Mentat.</parent></li> <li>Check the Mentat program by running one of the standard Marc demonstration examples as proof of a successful installation.</li> </ul>
	<ul> <li>Check if the user subroutines are working by running one of the standard user subroutine demo problems:</li> </ul>
	cd C:\Program Files\MSC.Software\marc cd 20XX.0.0\marc20XX\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.
	<ul> <li>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.</li> </ul>

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\20XX.0.0

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.

The Marc 20XX Documentation window appears.



3. Click Next.

The Customer Information window appears.

Marc 20XX Documentation		×
Customer Information Please enter your information.	User Name: Company Name: Undetermined Install this application for: Anyone who uses this computer (all users)	
	Uniy for me	
MSCX Software	< <u>B</u> ack <u>N</u> ext > Cance	I

- 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 20XX.0.0
- 6. Click Next.

A window informing that the files are being copied appears.

Marc 20XX Documentation		×
Start Copying Files Review settings before copying fil	es.	
	Setup has enough information to start copying the program files. If you want to review or change any settings, dick Back. If you are satisfied with the settings, dick Next to begin copying files.	
	Setup Type: Complete Target Directory: C\Program Files\MSC.Software\Marc Documentation\20XX Required space: 361 MB Available space: 86004 MB Installer Information: User Name: tmujawar	
	Company Name: Undetermined Install Application For: Anyone who uses this computer (all users) ∢	
MSC Software	< Back Next > Cance	1

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.

System Properties
Computer Name Hardware Advanced System Protection Remote
You must be logged on as an Administrator to make most of these changes.
Performance
Visual effects, processor scheduling, memory usage, and virtual memory
Settings
User Profiles
Desktop settings related to your logon
Cettings
Jettings
Startup and Recovery
System startup, system failure, and debugging information
Settings
Environment Variables
OK Cancel Apply

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

The Environment Variables dialog appears.

Variable	Value
OneDrive	C:\Users\tmujawar\OneDrive - MSC Sof
OneDriveComm	C:\Users\tmujawar\OneDrive - MSC Sof
TEMP	%USERPROFILE%\AppData\Local\Temp
TMP	%USERPROFILE%\AppData\Local\Temp
	New Edit Delete
	New Edit Delete
vstem variables	New Edit Delete
ystem variables	New Edit Delete
ystem variables Variable	Value
ystem variables Variable ADAMS_RUN_P	Value C:\Program Files\MSC.Software\Adams\
ystem variables Variable ADAMS_RUN_P ComSpec	Value C:\Program Files\MSC.Software\Adams\ C:\Windows\system32\cmd.exe
variables Variable ADAMS_RUN_P ComSpec FP_NO_HOST_C	Value C:\Program Files\MSC.Software\Adams\ C:\Windows\system32\cmd.exe NO
vstem variables Variable ADAMS_RUN_P ComSpec FP_NO_HOST_C JAVA_HOME	Value C:\Program Files\MSC.Software\Adams\ C:\Windows\system32\cmd.exe NO C:\ProgramData\Adobe\CS5\jre
vstem variables Variable ADAMS_RUN_P ComSpec FP_NO_HOST_C JAVA_HOME	New     Edit     Delete       Value     C:\Program Files\MSC.Software\Adams\     C:\Windows\system32\cmd.exe       NO     C:\ProgramData\Adobe\CS5\tre

b. Click New in the System Variables section.

The New System Variable dialog appears.

New System Varial	ble
Variable name:	MSC_LICENSE_FILE
Variable value:	27500@license server name
	OK Cancel

- 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:	<ul> <li>If you face any problem in launching the application or any problems related to the licensing, contact MSC Software support center.</li> </ul>
	The license server must be running in order to run Marc and Mentat.
	<ul> <li>Previous versions of Marc and Mentat will run with the latest FLEXIm version, so it is safe to upgrade previous installations of FLEXIm.</li> </ul>

# FLEXIm 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 FLEXIm 11.13 are as in the following table:

11.13	Helium (11.16.3.0)
C:\MSC.Software\MSC.Licensing\11.13\msc	C:\Program Files\MSC.Software\MSC Licensing\Helium\msc
C:\MSC.Software\MSC.Licensing\11.13\lmtools	C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools
C:\MSC.Software\MSC.Licensing\11.13\install s	C:\Program Files\MSC.Software\MSC Licensing\Helium\installs
C:\MSC.Software\MSC.Licensing\11.13\lmgrd	C:\Program Files\MSC.Software\MSC Licensing\Helium\lmgrd
C:\MSC.Software\MSC.Licensing\11.13\LOG	C:\MSC.Software\MSC Licensing\Helium\LOG
C:\MSC.Software\MSC.Licensing\11.13\lmutil	C:\Program Files\MSC.Software\MSC Licensing\Helium\lmutil
C:\MSC.Software\MSC.Licensing $11.13$ \msclic. ini	C:\Program Files\MSC.Software\MSC Licensing\Helium\msclic.ini

Installation Information

License file	<ol> <li>Two lines of the file license.dat need to be modified</li> <li>SERVER line which specifies the system hostname</li> </ol>
	• 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 <b>this_host</b> with the hostname of the machine where the license server is running.
	3. Replace the string <b>your_path</b> by the full path to the program <b>MSC</b> . 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"
	<ol> <li>Start the program</li> <li>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools</li> <li>Select the System Settings tab and click on Save HOSTID Info to a File.</li> </ol>
	The system identifier may also be found by running:
	lmutil lmhostid
	in the directory C:\Program Files\MSC.Software\MSC Licensing\Helium
hostid	<ul> <li>For a nodelocked license it is necessary to obtain a FLEXIm hostid for the machine running Marc and Mentat. This is done as follows:</li> </ul>
	<ul> <li>Start the program</li> <li>C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools</li> </ul>
	• 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 FLEXIm License Manager version Helium(11.16.3). If you do not already have your license file, you may leave it blank. However you <u>must</u> set the MSC_LICENSE_FILE variable before attempting to run any of the <i>Marc</i> 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.

File types	<ul> <li>The installation will associate the file types.mfd, .mud, t16, .t19 and.proc to Mentat if they are not already associated. If they are, as it would be in the case that you have a previous Mentat installation, you will be asked if you wish to overwrite them.</li> <li>If you answer YES, then the files are set to the current version and the PATH environment variable is updated with the current version specified first.</li> <li>If you answer NO, then the files are not modified and the PATH environment variable is updated with the current version specified last.</li> </ul>				
Complete the	<ul> <li>Select the Finish button in Setup.</li> </ul>				
installation	<ul> <li>You may want to check the contents against the list supplied in Appendix A of this document. Should any subdirectory be missing, contact MSC Software customer support for further details.</li> </ul>				
Starting the License	You must start the FLEXIm License Manager before attempting to run Marc or Mentat on the system that is assigned the license.				
wanager	1. To start the license manager, use the <b>Start</b> menu and select:				
	$Programs \rightarrow MSC \text{ Software} \rightarrow MSC. Licensing 11.16 \rightarrow Imtools$				
	2. Select the <b>Config Services</b> tab and verify that the settings are correct; i.e. the <b>License File</b> is set to the proper license file.				
	3. Start the license manager from the <b>Start/Stop/Reread</b> tab by pressing the <b>Start Server</b> button.				
	Note: If you already had the MSC installed, you should not need to perform these steps.				
	You should specify the options <b>Use Services</b> and <b>Start Server at Power Up</b> under the <b>Config</b> <b>Services tab</b> . This will enable the license manager to start automatically at boot time.				

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

# Managing FLEXIm

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

# **FLEXIm 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

```
    DAEMON MSC /your path/msc
```

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

# FLEXIm License Manager

When you install Marc or Mentat, the FLEXIm 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 FLEXIm License Manager must be at version 11.13 or higher.
```

You must start the FLEXIm 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  $\rightarrow$  MSC Software  $\rightarrow$  MSC.Licensing 11.16  $\rightarrow$  Imtools
- 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 FLEXIm 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 dcomenfg before attempting to run a job remotely.

To run dcomenfg do the following:

- 1. Open up a console window and type dcomonfg 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.

Marc	Marc DCOM Server Properties				
Ger	neral Location Security	Endpoints Identity			
W	/hich user account do you	want to use to run this applica	tion?		
C	The interactive user.				
C	) The launching user.				
0	) This user.				
	User:	Usemame	Br	owse	
	Password:	•••••			
	Confirm password:	•••••			
The system account (services only).					
Learn more about setting these properties.					
		OK Cancel		Ар	ply

Figure 2-2 Dcomcnfg Displaying the Identity Properties of the Marc DCOM Server

- 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 sparent>\marc20XX\demo\e2x1.dat will suffice. Run the job from any command prompt window using the -pc option:

<parent>\marc20XX\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 57. 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>\mentat20XX
bin\mentat -compile menus\win64\main.msb -df DCOM

In the Jobs  $\rightarrow$  Run  $\rightarrow$  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.

📹 Adva	ance	d Job Subm	iissio	n			×
Name	job	1					
Туре	Stru	uctural					
Initial	Allo	cation	Ger	neral M	emory	25	Mb
🗖 Ou	t-Of-	Core Elemer	it Sto	orage			
🗖 Ou	t-Of-	Core Increm	enta	l Backu	р	Check	Sizes
		N	Marc	Input F	ile —		
Vers	ion	Default	-	Style	Table	-Driven	-
E E	xten	ded Precisior	1				
5	Scrat	tch Directory					
	OM	lloctromo					
(	-	nosuidille			-		_
		litte			Sa	ve Model	
					W	rite Input Fi	le
					E	dit Input Fil	е
	Sub	omit 1				Execute 1	
	Sub	omit 2				Execute 2	
	Sub	omit 3				Execute 3	
				ОК			

Figure 2-3

Advanced Job Submission Menu Displaying the DCOM Option

# 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>\marc20XX\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.

# **GPU Support on Windows**

#### Hardware and Software Requirements

The list of supported solver types with the GPU option can be found in *Marc Volume A: Theory and User Information* Chapter 11: Solution Procedures for Nonlinear Systems in Table 11-3 and Table 11-4.

An NVIDIA driver is necessary if the GPGPU capability is to be used. The driver needs to be compatible with the one used in the Marc build; see Marc Volume A: Theory and User Information, Chapter 12: GPU Support in for the minimum driver version supported.

The GPU capability in Marc is developed using CUDA toolkit 9.2 for NVIDIA Tesla cards with minimum supported compute capability 3.0. NIVDIA Quadro cards can also be used, even though; it is recommended to use Tesla cards that are dedicated for computing.

# **Deviceinfo Utility**

A stand-alone utility deviceinfo.bat is provided in the tools directory to check available GPU cards on the machine. This utility provides information about the GPU cards and the installed NVIDIA drivers toolkit version. Typical output from the deviceinfo utility is shown below:

```
** Marc GPGPU device diagnosis utility ** ]
Installed CUDA driver version is 9.20
Total 1 devices are detected on the machine
 Device id 0 : "Quadro M2200"
              Compute capability
                                                 : 5.2
              Number of Multiprocessors
              Number of Cores per Multiprocessor : 128
              Total Number of Cores
                                                 : 1024
              Total device memory (in MB)
                                                 : 4096
              TCC driver mode enabled
                                                 : No
 The minimum Compute capability required for Marc GPGPU feature is 3.0
 Below is the list of supported devices
     Device id 0
                                : "Quadro M2200"
     TCC driver mode enabled
                                : No
     Advise to user :
         TCC drive mode is not enabled on device id 0
         This does not allow parallel (DDM) jobs with INTEL-MPI.
         To use GPGPU device with DDM, enable TCC driver mode using NVSMI utility
         with Administrator credentials
         "C:\Program Files\NVIDIA Corporation\NVSMI\nvidia-smi.exe" -g 0 -dm 1
```

#### Mentat Support

Running the job with GPU may also be done from Mentat. The GPU menu is only displayed for supported solver types Multifrontal Sparse and Iterative Sparse. Note that solver multi-threading (which refers to CPU threads) is not supported when the GPU option is selected.

The GPU option in Mentat is shown in Figure 2-5. When the GPU option is chosen, there are two options available for GPU card selection:

- a. Automatic: At run-time, Marc determines the GPU cards that are available and assesses the optimal card to be used.
- b. User: The user can specify the GPU cards that need to be used for the job. The available device IDs can be determined by running the deviceinfo.bat utility.

Ma Solver/Parallelization ×				
Name <i>job</i> .	Name job1			
Type Stru	uctural			
	<ul> <li>Domain Decompositi</li> </ul>	on		
Use DD	м			
	Assembly And Recov	ery		
Multiple	e Threads			
	Matrix Solver			
Solution (	Symmetric O Nonsym	metric		
Туре	Iterative Sparse	•		
Iterative Options				
Precondit	Preconditioner			
Diago	Diagonal			
Scale	d Diagonal			
O Incom	O Incomplete Choleski			
Max # Iterations 1000				
Tolerance 0.0001				
Switch To Multifrontal Sparse When Not Converged				
Multiple Threads				
Use GP	U(s)			
GPU Selection Automatic 🔻				
	ОК			

Figure 2-5 GPU Option in Mentat

# Troubleshooting

#### Exit 63

Cause	The Marc version being used is not supported with the GPU version of the Multifrontal solver.
User Information	Non-GPU version of the Multi-frontal solver causes this error if used with the GPU option.
User Action	Contact MSC Software representative to obtain supported version.

#### Exit 64

Cause	Error occurs while attempting to use the GPU card specified by the user.
User Information	This error occurs while trying to use the GPU card specified by the user.
User Action	Use the deviceinfo utility to check for supported and available GPU cards on machine.

#### Exit 65

Cause	The Marc version being used is not supported with the GPU version of the Iterative solver.
User Information	Non-GPU version of the Iterative solver causes this error if used with the GPU option.
User Action	Contact MSC Software representative to obtain supported version.

# missing library "nvcuda.dll"

Cause	This error occurs when required NVIDIA drivers are not available while running Marc with the GPU option.
User Information	To use GPU feature in Marc, necessary NVIDIA drivers need to be installed on machine.
User Action	Use deviceinfo utility to check if supported drivers are installed on machine. If not, download the required drivers from NVIDIA.



# Running and Using Marc and Mentat

- Running Marc 63
- Running Mentat 65
- Making Changes to the Marc Programs 68
- Mentat Interfaces 69

# **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 cparent> subdirectory marc20XX\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
	-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 3-1 run_marc Input Options			
Keyword	Options	Description	
-jid (-j)	job_name	Input file ( job) name identification.	
-prog (-pr)	progname	Run saved executable progname.marc from a previous job (see -user and -save).	
-user (-u)	user_name	User subroutine user_name.f is used to generate a new executable program called user_name.marc (see -save and -prog).	
-save (-sa)	no	Do not save the new executable program user_name.marc.	
	yes	Save the executable program user_name.marc for a future time (see - prog and -user).	
-rid -(r)	restart_name	Identification of previous job that created RESTART file.	
-pid (-pi)	post_name	Identification of previous job that created the post file.	
-sid (-si)	substructure	Identify the job that contains the solution to the external nodes of the superelement.	
-back (-b)	yes	Run Marc in the background.	
	no	Run Marc in the foreground.	
-def (-de)	default_file	File name containing user defined default data.	
-nprocd (-np)	number	Number of domains for parallel processing.	
-nprocds (-nps)	number	Number of domains for parallel processing using a Single Input File.	
-nts (-nthread)	number	Number of threads per parallel matrix solver (8, 9, and 11).	
-nte	number	Number of threads used for parallel matrix assembly and stress recovery.	
-nsolver	number	Number of processes to use for the MUMPS parallel matrix solver (solver 12).	
-dir	directory_name	Pathname to directory where the job I/O should take place. Defaults to current directory.	
-sdir	directory_name	Directory where scratch files are placed. Defaults to -dir.	
-host (-ho)	hostfile	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).	
-ci	yes no	Copy input files automatically to remote hosts for a network run, if necessary.	
-cr	yes no	Copy post files automatically from remote hosts used for a network run, if necessary.	
-vf	viewfactor_name	Name of file containing viewfactors for radiation from previous analysis or from Mentat using either the Monte Carlo or Hemicube method.	

Keyword	Options	Description			
-mpi	intelmpi msmpi		Select which version of mpi will be used for Domain Decomposition or MUMPS solver. If not specified, the appropriate default shown below v be used:		ecomposition or the lt shown below will
			Platform	Default MPI	Alternative MPI
			Windows 64	intelmpi	msmpi
-ml	memlimit	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.			
-gpuid	<id:id:id> or auto</id:id:id>	GPU card number or auto for automatic selection by program. For parallel (DDM) jobs, multiple card IDs can be specified if available.			

Table 3	-1	ru
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Table 3-2

run\_marc Input Options (continued)

Examples of Bunning Marc Jobs

	Examples of Hamming Mare sobe
Examples of running Marc jobs	Description:
run_marc -jid e2x1	Runs the job $e2x1$ , the input file $e2x1$ . dat resides in the current working directory.
run_marc -jid e2x14 -user u2x14 -save yes	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.
run_marc -jid e2x14a -prog u2x14	Runs the job $e2x14a$ using the executable produced by job $e2x14$ .
run_marc -jid e3x2a	Runs the job e3x2a.
run_marc -jid e3x2b -rid e3x2a	Performs a restart job using the results of the previous job e3x2a.
run_marc -jid e2x1 -nprocd 2	Runs a two processor job on a single parallel machine.
run_marc -jid e2x1 -nprocd 2 -host hostfile	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.

# **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>\mentat20XX\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.

Note: Since Mentat is started by running a batch script, it is not possible to use a UNC path as the current working directory. It is recommended to map a UNC path to a drive letter, otherwise Mentat would use **%WINDIR%** (usually C:\Windows) as the current working directory.

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.

Keyword	Option	Description
-mode	preset1/preset2	This will launch the application in the selected preset mode.
		For preset1, which is the default, the traditional theme, the traditional mouse button scheme and complete picking will be active.
		For preset2, the dark theme, the auto-dynamic mouse button scheme and partial picking will be active.
-ar	area ratio	This option sets the initial window size to the given fraction of the available space on the desktop.
-xr	horizontal ratio	This option sets the initial width of the window to the given fraction of the available width on the desktop [default: 0.92]
-yr	vertical ratio	This option sets the initial height of the window to the given fraction of the available height on the desktop [default: 0.92].
-aspr	aspect ratio	This option sets the aspect ratio (width over height) of the window [default: 1.6].
-maximize		Starts up Marc Mentat maximized.
-minimize		Starts up Marc Mentat minimized (iconified).
-bg		This option will run Mentat in the background.
-bp	DIR\bin	Directory path name where the external Mentat programs and shell scripts are located.
-compile	binary_menu_filename	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 main.msb, compile as:
		bin\mentat -compile menus\win64\main.msb
-dr	True/False	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 <b>True</b> .
-fn	font	Default font type.

Table 3-3	Mentat Input Options
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Keyword	Option	Description
-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		This option switches on a gradient background when displaying the various windows (Model, Table, History Plot, etc.).
-hd	name filename	<pre>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 version="1.0" encoding="UTF-8"?> <html_doc> <proc_root env="DEMO_DIR"></proc_root> <title_page href="index.html"></title_page> <contents> <chapter href="file1.html"></chapter> <chapter href="file2.html"></chapter> </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 <br="" name="ug">title="User's Guide"/&gt;</html_doc></chapter></title_page></menu></html_doc></pre>
-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.

Table 3-3	Mentat Input Options	(continued)
	montal input optiono	(oonanaoa)

Keyword	Option	Description
-lf	filename	Specify the Mentat log file name.
-license_release	number	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.
-mf	main.ms	The name of the startup menu file.
-ml	DIR\material	Directory path name where the material files are located.
-mp	DIR\menus	Directory path name where the menu files are located.
-multiundo	off/on	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: <b>on</b> ].
-undo_levels	number	Number of UNDO levels when the multi-level UNDO option is active. The minimum is 1, the maximum is 50 [default: 10].
-nosolidmodeling		Utilize the Mentat_Parasolid_CAD which allows geometric models to be imported but does not allow solid geometry editing.
-path	directory_name	Provides a directory in which Mentat searches when opening an existing input file. Multiple directories can be specified as follows: <b>-path directory_1 -path directory_2</b> etc.
-pr	filename	Any additional set-up commands you wish to add. Store these in a procedure file containing the Mentat commands.
-ra		This reads all of the ASCII Menu files.
-rf	filename	Record the Mentat commands in the procedure file filename.
-szgr	width height	Set the size (width and height in pixels) of the graphics area.
-ti	title	Append title to the name of the window.
-unicode		Allow the use of unicode characters in load case titles, job titles, annotations and user-defined names of results file variables.

Table 3-3	Mentat Input Options	(continued)
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# 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 69) and enter:

MARC\_MPI alternative\_mpi

for setting a new default. Use the exact word as given in then Alterative MPI colum. 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.

Platform	Default MPI	Alternative MPI
Windows 64	intelmpi	msmpi

## 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 mentat20XX\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 mentat20XX\bin directory and are named as follows:

```
pscolor1.bat, pscolor2.bat, pscolor3.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 mentat20XX\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 pcolor3.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.


# 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 "Supported Platforms" 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\20XX.0.0\marc20XX\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 marc20XX 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 4-1 Definitions
Sr. No	Term	Definition
1	Root machine	The machine on which Marc job is started.
2	Remote Machine	Any machine other than the root machine which is part of a distributed Marc run on the network.
3	Shared installation	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.
4	Distributed installation	Marc is installed on all machines. Each machine accesses its own Marc executable.
5	Distributed execution	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.
6	Shared I/O	Marc reads and writes data in a UNC shared directory. Each Marc executable running on the network reads/writes to the same directory.
7	Distributed I/O	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.
8	UNC	Uniform Naming Convention.

# **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 77 describes how to specify what working directory to use.

#### root machine

#### remote machines



# **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).

```
c:
cd \Program Files\MSC.Software\Marc\20XX.0.0\marc20XX\tools
net 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:

```
c:
  cd \Program
Files\MSC.Software\Marc\20XX.0.0\marc20XX\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:

```
c:
  cd \Program
Files\MSC.Software\Marc\20XX.0.0\marc20XX\test ddm\exmpl2\exmpl2 2
```

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

c:\Program Files\MSC.Software\Marc\20XX.0.0\marc20XX\test\_ddm\exmpl2\exmpl2\_2

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

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 77 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. See User Notes 77 in this case. Note: The current version does not support the IPV6 protocol.

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 n1+n2+n3=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, ltest.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. The UNC sharename for this directory is assumed to be dir7. The host file for a two-processor job would be:

```
hostl 1
host2 1 \\hostl\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:

```
hostl 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  $\rightarrow$  Run a Demo...

A Run A Demo dialog appears.

📹 Run A Demo		X	Л	
Run D	emos —		1	
Rubber R	lezoning			
Superplastic F	orming (SP	F)		
SPF + Adapt	tive Meshin	g		
Axisymmet	tric To 3-D			
Thermal/Struc	tural Conta	act		
Contact				
Contact With DDM				
Control				
Menu Execute				
Start/Cont Stop				
Step Quit				
OK				

2. Select the example Contact With DDM.

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.

Name       indent         Type       Structural         Ilinear Elastic Analysis       Loadcases         Selected       Clear         loading       Structural         static       Up         unloading       Structural         static       Up         Initial Loads       Design         Analysis Options         Inertia Relief       Cyclic Symmetry         Job Results         Contact Control       Global-Local         Mesh Adaptivity       Steady State Rolling         Analysis Dimension       Active Cracks         Madel Sections       Material Data File         Deactivation       DMIG Out         Check       Input File Text         Title       Run	Job Properties							Σ	3
Type Structural  Structural  Linear Elastic Analysis Loadcases Selected Clear Loading Structural static Up Down Unloading Structural static Up Down Unloading Structural static Up Down Initial Loads Design Analysis Options Inertia Relief Cyclic Symmetry Job Results Contact Control Global-Local Job Parameters Mesh Adaptivity Steady State Rolling Analysis Dimension Active Cracks Map Temperature Plane Strain Crack Initiators Model Sections Material Data File Deactivation DMIG Out Check Input File Text Include File Title	Name in	dent							
Linear Elastic Analysis   Selected Clear   loading Structural   static Up   unloading Structural   static Up   Up Down   unloading Structural   static Up   Design Analysis Options   Inertia Relief Cyclic Symmetry   Job Parameters Mesults   Contact Control Global-Local   Job Parameters Analysis Dimension   Active Cracks I Map Temperature   Plane Strain •   Check Input File Text   Include File Run	Type St	tructural							
Loadcases         Selected       Clear         loading       Structural       static       Up       Down         unloading       Structural       static       Up       Down         Initial Loads       Design       Analysis Options         Inertia Relief       Cyclic Symmetry       Job Results         Contact Control       Global-Local       Job Parameters         Mesh Adaptvity       Steady State Rolling       Analysis Dimension         Active Cracks       I Map Temperature       Plane Strain       •         Crack Initiators       I Model Sections       Material Data File         Deactivation       DMIG Out       Check       Title         Run       Run       Run       Run	Linear Elastic Ana	ysis							
Selected       Clear         loading       Structural       static       Up       Down         unloading       Structural       static       Up       Down         Initial Loads       Design       Analysis Options         Inertia Relief       Cyclic Symmetry       Job Results         Contact Control       Global-Local       Job Parameters         Mesh Adaptivity       Steady State Rolling       Analysis Dimension         Active Cracks       I Map Temperature       Plane Strain       •         Crack Initiators       I Model Sections       Material Data File       Check         Input File Text       I Include File       Run       Run				- Loadcases					
Ioading       Structural       static       Up       Down         unloading       Structural       static       Up       Down         Initial Loads       Design       Analysis Options         Inertia Relief       Cyclic Symmetry       Job Results         Contact Control       Global-Local       Job Parameters         Mesh Adaptivity       Steady State Rolling       Analysis Dimension         Active Cracks       I Map Temperature       Plane Strain          Crack Initiators       I Model Sections       Material Data File         Deactivation       DMIG Out       Check          Title       Run	Selected Clear								
unloading       Structural       static       Up       Down         Initial Loads       Design       Analysis Options         Inertia Relief       Cyclic Symmetry       Job Results         Contact Control       Global-Local       Job Parameters         Mesh Adaptivity       Steady State Rolling       Analysis Dimension         Active Cracks       Map Temperature       Plane Strain         Crack Initiators       Model Sections       Material Data File         Deactivation       DMIG Out       Check         Title       Run       Run	loading		Structure	a/	static		Up [	Down	
Initial Loads Design Analysis Options Inertia Relief Cyclic Symmetry Job Results Contact Control Global-Local Job Parameters Mesh Adaptivity Steady State Rolling Analysis Dimension Active Cracks Map Temperature Plane Strain Crack Initiators Model Sections Material Data File Check Title Run	unloadin	g	Structura	a/	static		Up	Down	
Inertia Relief     Cyclic Symmetry     Job Results       Contact Control     Global-Local     Job Parameters       Mesh Adaptivity     Steady State Rolling     Analysis Dimension       Active Cracks     Map Temperature     Plane Strain     •       Crack Initiators     Model Sections     Material Data File       Deactivation     DMIG Out     Check       Input File Text     Include File     Run	□ Initial Loads		Desig	n		Analysi	s Option	S	
Contact Control     Global-Local     Job Parameters       Mesh Adaptivity     Steady State Rolling     Analysis Dimension       Active Cracks     Map Temperature     Plane Strain         Crack Initiators     Model Sections     Material Data File       Deactivation     DMIG Out     Check       Input File Text     Include File     Run	🔲 Inertia Relief		Cyclic Symmetry		Job Results				
Mesh Adaptivity     Steady State Rolling     Analysis Dimension       Active Cracks     Map Temperature     Plane Strain       Crack Initiators     Model Sections     Material Data File       Deactivation     DMIG Out     Check       Input File Text     Include File     Run	Contact Cont	rol	Global-Local		Job Pa	rameters	;		
Active Cracks     Map Temperature     Plane Strain       Crack Initiators     Model Sections     Material Data File       Deactivation     DMIG Out     Check       Input File Text     Include File     Run	Mesh Adaptiv	ity	Steady State Rolling		Analysis Dimension				
Crack Initiators     Model Sections     Material Data File       Deactivation     DMIG Out     Check       Input File Text     Include File     Run	Active Crad	s	Map Temperature		Plane Strain		•		
Deactivation DMIG Out Check Input File Text Include File Run	Crack Initiators	Model Sections Material D			l Data Fil	e			
Input File Text Include File Run	Deactivation		Out				Check		
Title Run	🔲 Input File Text	ude File				encer			
Dent	Title					Run			
R HCHI	Reset							OK	

6. Click Run.

The Run Job dialog appears.

📹 Run	🗃 Run Job 📃 🔀					
Name	indent					
Туре	Structural					
U	Jser Subroutine	e File				
S	olver/Paralleliz	ation				
Symme	etric Solution		DDM wit	h 3 Dom	ains	
Multifr	ontal Sparse S	olver	1 Assem	bly/Reci	over	y Thread
			No GPU(	's)		
Title	Style	Multi-Phy	/sics	-	S	ave Model
S	ubmit (1)	A	Advanced Job Submission			on
	Update	Moni	tor	Kill		
Status	;			Complete		
Curre	nt Increment (	Cyde)		70 (3)		
Singul	arity Ratio			0.94538		
Conve	ergence Ratio			16210	,	
Analys	sis Time			1		
Wall T	ime			8		
		To	tal		_	
Cycl	Cycles 368		Cut Backs		3	
Sepa	Separations 29			hes	0	
Exit N	Exit Number 3004			Exit Message		
Edit	Output Fi	le Log F	ile St	atus File	2	Any File
Open	Open Post File (Model Plot Results Menu)					
Re	eset					ОК

7. Click Solver/Parallelization.

The Solver/Parallelization dialog appears.



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							<u>&gt;</u>
lame	e indent							
уре	Stru	ctural						
U	ser S	ubroutine	e File					
S	olver/	Paralleliza	ation					
Symm	etric	Solution		DDM	1 wit	h 3 Do	oma	ins
Multif	ronta	l Sparse S	olver	1 As	seml	oly/Re	cove	ery Threa
				No (	SPU(	s)		
Title		Style	Table-D	riven		-	Sa	ave Model
Si	ubmit	: (1)	A	dvance	ed Jo	b Sub	mis	sion
	Upda	te	Mo	nitor	nitor Kill			kill
Status	5			Complete				
Curre	nt Ind	rement (	Cycle)	70 (3)				
Singu	larity	Ratio				1		
Conve	ergen	ce Ratio				10790	)	
Analy	sis Tiı	me				1		
Wall T	ime					4		
			Т	otal				
Cycle	es	3	68	Cut	Bac	ks	3	
Separations 29			9	Rer	nesh	ies	0	
Exit Number 3004				Exit Message				
Edit Output File Log				File	Sta	tus Fi	le	Any File
Open F	Post F	ile (Mode	el Plot Res	ults Me	enu)			

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:



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, lmodel1\_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 2as 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.



# General

This chapter contains information about troubleshooting general and problems according to FLEXIm version Helium. 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.

# FLEXIm 11.13 VS Helium(11.16.3.0) License Manager

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

11.13	Helium (11.16.3.0)
C:\MSC.Software\MSC.Licensing\11.13\msc	C:\Program Files\MSC.Software\MSC Licensing\Helium\msc
C:\MSC.Software\MSC.Licensing\11.13\lmtools	C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools
C:\MSC.Software\MSC.Licensing\11.13\installs	C:\Program Files\MSC.Software\MSC Licensing\Helium\installs
C:\MSC.Software\MSC.Licensing\11.13\lmgrd	C:\Program Files\MSC.Software\MSC Licensing\Helium\lmgrd
C:\MSC.Software\MSC.Licensing\11.13\LOG	C:\MSC.Software\MSC Licensing\Helium\LOG
C:\MSC.Software\MSC.Licensing\11.13\lmutil	C:\Program Files\MSC.Software\MSC Licensing\Helium\lmutil
C:\MSC.Software\MSC.Licensing\11.13\msclic.i ni	C:\Program Files\MSC.Software\MSC Licensing\Helium\msclic.ini

Access is denied						
Cause	No write permissions to the file or directories to which you are installing.					
User Action	Do the following:					
	Open up an MS-DOS Command Prompt window.					
	1. cd to the directory in which you are installing Marc					
	2. Run the <b>attrib</b> program to remove the read-only attributes (with the - <b>R</b> option).					
	<ul> <li>Use the File Manager's Security menu to change ownership of files and directories and to change permissions on them.</li> </ul>					
Error during move proc	ess					
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</parent>					
User Actions	<ul> <li>Log out and log back in and try again.</li> </ul>					
	Check that the environment variable MSC_LICENSE_FILE is set to a valid license file.					
	<ul> <li>Install your passwords before security succeeds.</li> </ul>					
	Check that the FLEXIm license manager has been started from the FLEXIm Configuration					
	Utility applet in the Start menu under MSC.Software $\rightarrow$ 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					
	<ul> <li>Check time and date on your machine.</li> </ul>					
	<ul> <li>Use the File Manager's Security menu to change Ownership of files and directories, and to change Permissions on them.</li> </ul>					

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				
	<ul> <li>If you had an older version of the FLEXIm 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</li> </ul>				
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	<ul> <li>Make Fortran compiler or Fortran libraries available</li> </ul>				
	<ul> <li>Point your PATH or LIB environment variables settings to the proper location for your Fortran compiler.</li> </ul>				

#### 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 2017 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_2019\windows\bin\ compilervars intel64 vs2017\ (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). 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<sup>®</sup> 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

- Select the type of hardware you want to install: Network adapters
- 6. Select Network Adapter:

```
Manufacturers:Microsoft
Network Adapter:Microsoft Loopback 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:

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.

Note: These settings are important to enable Microsoft Windows to run a parallel job. If they are not set properly, the error message Host is unreachable (5) or Access is Denied (5) will be issued.

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  $\rightarrow$  User Rights Assignment.

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.

Note: 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.

# **GPU Support on Windows**

# Hardware and Software Requirements

The list of supported solver types with the GPU option can be found in *Marc Volume A: Theory and User Information* Chapter 11: Solution Procedures for Nonlinear Systems in Table 11-3 and Table 11-4.

An NVIDIA driver is necessary if the GPGPU capability is to be used. The driver needs to be compatible with the one used in the Marc build; see Marc Volume A: Theory and User Information, Chapter 12: GPU Support in for the minimum driver version supported.

The GPU capability in Marc is developed using CUDA toolkit 9.2 for NVIDIA Tesla cards with minimum supported compute capability 3.0. NIVDIA Quadro cards can also be used, even though; it is recommended to use Tesla cards that are dedicated for computing.

# **Deviceinfo Utility**

A stand-alone utility deviceinfo.bat is provided in the tools directory to check available GPU cards on the machine. This utility provides information about the GPU cards and the installed NVIDIA drivers toolkit version. Typical output from the deviceinfo utility is shown below:



Figure 5-1 Deviceinfo.bat Output

# Mentat Support

Running the job with GPU may also be done from Mentat. The GPU menu is only displayed for supported solver types Multifrontal Sparse and Iterative Sparse. Note that solver multi-threading (which refers to CPU threads) is not supported when the GPU option is selected.

The GPU option in Mentat is shown in Figure 5-2. When the GPU option is chosen, there are two options available for GPU card selection:

- a. Automatic: At run-time, Marc determines the GPU cards that are available and assesses the optimal card to be used.
- b. User: The user can specify the GPU cards that need to be used for the job. The available device IDs can be determined by running the deviceinfo.bat utility.

Ma So	Ma Solver/Parallelization ×						
Name	job1						
Туре	Structu	ral					
		— Domain De	composit	ion			
Use	e DDM						
		Assembly A	nd Recov	very			
🗌 Mu	ltiple Th	reads					
		Matrix	Solver –				
Solutio	on 🔘 s	Symmetric 🔘	) Nonsym	metric			
Туре	Ite	rative Sparse	•	•			
		Iterative	e Options				
Preco	onditione	r					
	iagonal						
Os	caled Dia	igonal					
	complet	e Choleski					
Max	# Iterati	ons		1000			
Toler	ance			0.0001			
Switch To Multifrontal Sparse When Not Converged							
Multiple Threads							
Use GPU(s)							
GPU S	GPU Selection Automatic						
		C	ОК				

Figure 5-2 GPU Option in Mentat

# Troubleshooting

#### Exit 63

Cause	The Marc version being used is not supported with the GPU version of the Multifrontal solver.
User Information	Non-GPU version of the Multi-frontal solver causes this error if used with the GPU option.
User Action	Contact MSC Software representative to obtain supported version.

#### Exit 64

Cause	Error occurs while attempting to use the GPU card specified by the user.
User Information	This error occurs while trying to use the GPU card specified by user.
User Action	Use the deviceinfo utility to check for support-ed and available GPU cards on machine.

#### Exit 65

Cause	The Marc version being used is not supported with the GPU version of the Iterative solver.
User Information	Non-GPU version of the Iterative solver causes this error if used with the GPU option.
User Action	Contact MSC Software representative to obtain supported version.

## missing library "nvcuda.dll"?

Cause	This error occurs when required NVIDIA drivers are not available while running Marc with the GPU option.
User Information	To use GPU feature in Marc, necessary NVIDIA drivers need to be installed on machine.
User Action	Use deviceinfo utility to check if supported drivers are installed on machine. If not, download the required drivers from NVIDIA.

# **SECTION 2: LINUX**



- Installation Prerequisites 99
- Supported Platforms 100

# 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
	1. Select the product Marc and select the 20XX version on the next level.
	2. Download the installer for your platform.
	3. The FLEXIm 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 FLEXIm licensing software. You <i>cannot</i> 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 <i>you must install as root, modify your NFS export options to include ~ root=list</i> (where <i>list</i> can include hostnames and netgroups).

Should I be "root"?	<ul> <li>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 <i>marc20XX</i> and/or <i>mentat20XX</i>. 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.</li> <li>For NFS fileserver networks, read the previous paragraph.</li> </ul>
Fortran compiler	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 <i>Marc and Mentat Release Guide</i> for a list of supported compilers.
NVIDIA driver	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 <i>Marc Volume A: Theory and User Information</i> , Chapter 13 for the minimum driver version supported.

# 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.

Туре	OS	Hardware	Fortran Version	Default MPI	
Linux (64 bit)	Red Hat RHEL7.3/7.5 SUSE 12SP1/SP2	Intel EM64T or AMD Opteron Intel EM64T or AMD Opteron	Intel XE 19.04 <sup>1</sup> Intel XE 19.04 <sup>1</sup>	Intel MPI 2019 Update 4 Intel MPI 2019 Update 4	
<sup>1</sup> For user subroutines. Intel Fortran XE 19.04 is required.					

# 7 Marc and Mentat Installation

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# 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.

Note:	To demonstrate the installation procedure, /root/MSC/ this location is used as the installation directory for all three steps. You are advised to create a directory named MSC in your home/root directory. It is not mandatory to create this directory. You can create and install the application in any directory of your choice.
	The commands/user inputs are marked in <b>bold</b> 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.

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
This will install MSC Licensing Helium on your computer. Continue?
Yes No

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.

	MSC Licensing Helium Setup _ ×
5	Welcome to the InstallJammer Wizard for MSC Licensing Helium
	This will install MSC Licensing Helium version Helium on your computer.
4	Copyright (C) 20XX MSC Software Corporation and its licensors. All rights reserved.
2	Warning: This computer program("Software") is protected by intellectual property law including trade secret law, copyright law and international treaties. Reproduction or distribution in any manner requires written permission of MSC Software Corporation or its beneficiaries under the terms of a valid license. Unauthorized reproduction or distribution of this Software, or any portion of it, may result in civil and criminal penalties.
	Click "Cancel" to quit Setup. Click "Next" to consent and continue with the Setup program.
	Next > Cancel

- 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.

MSC Licensing Helium Setup						
Installer Requirements						
	Please have the following before continuing with the installation: - A valid MSC Software issues license file. The hostname and bedid of this machine are listed below.					
	nostid of this machine are listed below. Hostname = vm-tmrhel73.na.mscsoftware.com HostiD = 000c29d640fb					
<ul> <li>A supported operating system. Supported operating systems are listed in the User Guide.</li> </ul>						
	Click "Back" to return to the previous screen. Click "Next" to continue with the Setup Program.					
InstallJammer –						
	< Back Next >	Cancel				

7. Review the requirements and if all the requirements are fulfilled. Click Next.

The Choose Destination Folders window appears.

MSC Licensing Helium Setup -				
Choose Destination Folders				
Please select the folders where Setup will install the files. Select locations for both the License Manager executable files and the MSC usage Log F Both must be specified. It is recommended that the default settings are used.	Files.			
/msc/MSC.Software/MSC Licensing	Browse			
/msc/MSC.Software/MSC Licensing/LOG	Browse			
InstallJammer	Cancel			

- 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.

	MSC Licensing Helium Setup			_ ×
	Open			
Look in: MS( , license.dat , marc_2019_li , marc_2019_li , msc_licensing	C inux64_rh7.3_7.5.tar.gz inux_doc.tar.gz g_helium_linux64.bin	▼ ③ ④ ≝	mum version of the MSC Licensing in the e-mail with the license file. Browse	
File name: Files of type:	license.dat All Files (*.*)  ▼	Open Cancel		
			< Back Next >	Cancel

- 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 dare on the FEATURE entry.

- d. Click OK to continue.
- 10. Click Next.

The Details of the License File window appears.

	MSC Licensing Helium Setup	_ ×
Det	tails of the License File selected	A.
	License File Details	
	License File Reference ID:	
	Product Type:MSC One	
	License Type:Lease	
	Usage Reporting Requirement:	
Insta	IIJammer	
	< Back Next >	Cancel

- 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.

MSC Licensing Helium Setup	-	×
Automatic Reporting of Usage Data		1 N
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.		
< Back Next >	Cance	1

- a. 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.
|                                                     | MSC Licensing Helium Setup                                           | - ×    |
|-----------------------------------------------------|----------------------------------------------------------------------|--------|
| License Server Settings                             |                                                                      |        |
| Port:<br>Hostname:<br>Options Files path (Optional) | Browse                                                               |        |
| Select the privilege level for the<br>Access        | license manager access.(e.g. Server Start Stop)<br>○ Admin/Superuser |        |
| InstallJammer                                       | < Back Next >                                                        | Cancel |

The License Server Setting options appears.

- 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.

MSC Licensing Helium Setup										
Start Copying Files Review settings before copying files										
Setup has enough information to start copying the program files. If you want to review or change any settings, click Back. If you are satisfied with the settings, click Next to begin copying files.										
Target Directory: /msc/MSC.Software/MSC Licensing/Helium			-							
Log Directory: /msc/MSC.Software/MSC Licensing/LOG										
Setup Type: Complete										
Installation Type: Auto Reporting Enabled										
•			•							
InstallJammer										
	< Back Next >	Cance								

Review the settings for one final time.

- 14. Click Next.
- 15. An MSC Licensing Installation Program prompt appears.

MSC Licensing Installation Program
MSC Licensing Helium has been installed at /msc/MSC.Software/MSC Licensing/Helium on vm-tmrhel73.na.mscsoftware.com.
- Please find the necessary binaries in "/msc/MSC.Software/MSC Licensing/Helium" .
- Startup script has been created under "/msc/MSC.Software/MSC Licensing/Helium/startup_script" which can be used to start the Imgrd process after the reboot of the system. Please view the README "/msc/MSC.Software/MSC Licensing/Helium/startup_script/README" for more information.
- The license server has been started.
- See the MSC Licensing Helium Usage Guide for important information on managing the license server log file.
OK

16. Click OK.

17. Click Finish to complete the installation.

Notes:	<ol> <li>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.</li> <li>You can start your server (and create a log file) using the below command:</li> </ol>
	/msc/MSC.Software/MSC Licensing/Helium/lmgrd -c /msc/MSC.Software/MSC Licensing/Helium/license.dat -l /msc/MSC.Software/MSC Licensing/LOG/lmgrd.log

### 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
                                          msc licensing helium linux64.bin
   license.dat
   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:



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

root@vm-tmrhel73:~/MSC	×
File Edit View Search Terminal Help	
uction or distribution in any manner requires writt Corporation or its beneficiaries under the terms o ed reproduction or distribution of this Software, o lt in severe civil and criminal penalties.	en permission of MSC Software of a valid license. Unauthoriz or any portion of it, may resu
Software piracy is illegal and MSC Software Corpora ve the right to take all legal steps to stop piracy those who take part in these activities. As part o the Software may contain security mechanisms intend or use of unauthorized copies of the Software, and lating to such copies (including data relating to use on which such copies are accessed or used, and n data), to MSC Software Corporation and/or its affi contractors, suppliers, successors and assigns. See statement available at www.mscsoftware.com for more Accept" below or otherwise installing or using the detection, collection and transmission, as well as the purposes of identifying unauthorized usage and ellectual property rights.	Ation and its affiliates reser of their products and pursue of these anti-piracy efforts, ded to detect the installation d collect and transmit data re use of such copies, the machin network and user configuration liates, and/or their agents, a MSC Software online privacy information. By entering "I Software, you consent to such s to the use of such data, for d protecting and enforcing int
Enter "Cancel" to quit Setup. Enter "I Accept" to consent and continue with the S	Setup program. [Cancel]

4. Read the information and type I Accept.

The following information can be seen on the terminal screen:

				root@	vm-tn	nrhel73	8:~/MS	C				-		×
File	Edit View	Search	Terminal	Help										
cont stat Acce det the elle	ractors, s ement avai pt" below ection, co purposes ctual prop	upplier lable a or othe llectio of iden erty ri	s, succe t www.ms rwise ir n and tr tifying ghts.	essors scsoftwo nstallin ransmis unautho	and a are.c ng or sion, orize	assign com fo r usin , as w ed usa	s. See r more g the ell as ge and	e MSC e inf Soft s to d pro	Soft ormat ware, the u tecti	ware ion. you se of ng an	onlir By er conse such d ent	ne p nter ent n da forc	rivad ing to su ta, ing :	cy "I uch for int
Ente Ente	r "Cancel" r "I Accep	to qui t" to c	t Setup. onsent a	and con	tinue	e with	the S	Setup	prog	ram.	[Cano	cel]		
I Ac	cept													
	Welcome to	the Ma	rc insta	allatio	n scr	ript f	or Li	nux s	ystem	5				
	Installati	on Dire	ctory											
	Marc 20XX marc20XX a	and Men nd men	tat 20XX tat20XX (	will   of the g	be ir direc	nstall ctory	ed in enter	subd ed he	irect re.	ories				
	Enter the (/root/MSC : /root/MS	directo ) C	ry to ir	nstall	the s	softwa	re							

#### 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 o ) Options ? Help information Exit from the installation script q 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@v	m-tmrhel7	3:~/MSC			-	×
File	Edit	View	Search	Terminal	Help						
				MSC Sof	tware C	orporatio	on				
l	_1)	Insta	-= all for	Marc 202  Linux 64	KX Menu 	=-= EL 7.3/7.	=-= .5		(~1.1	GB)	
	?) r)	Help Retur	informa n to pr	ation revious m	enu						
		Select	ion [L1	l] :L1							
		You ha Is thi	ave sele s corre	ected Lin ect? [Y/n	ux 64-b: ] y	it RHEL7	.3/7.5				

- 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.

```
root@vm-tmrhel73:~/MSC
                                                                            ×
File Edit View Search Terminal Help
   L1) Install for Linux 64-bit RHEL 7.3/7.5
                                                                  (~1.1 GB)
    ? ) Help information
    r ) Return to previous menu
        Selection [L1] :
        You have selected Linux 64-bit RHEL 7.3/7.5
        Is this correct? [Y/n] y
 Installing Marc 20XX for Linux 64-bit RHEL 7.3/7.5
 Installing the script files to /root/MSC/install
 Installing from /root/MSC/products/al27emt0.k10
  Do you want to create links to the startup scripts [y/N] ? y
 Where to put the links for the startup scripts? [/usr/local/bin] /usr/local/bi
n
          Link name : /usr/local/bin/marc20XX
```

- 9. Type Y, press Enter to create links.
- 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.
- 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

			root@vm-tmrhel73:~/MSC	-		×			
File	Edit	View	Search Terminal Help						
	Installation script for Linux systems								
	MSC Software Corporation								
	Main menu =======								
	1 2								
	o ) Options ? ) Help information q ) Exit from the installation script								
			Selection : 2						

1. Type 2, press Enter.

The Mentat 20XX Menu appears.

	root@vm-tmrhel73:~/MSC	-		•	×
File Edi	t View Search Terminal Help				
	MSC Software Corporation				
	Mentat 20XX Menu 				
l1)	Install for Linux 64-bit RHEL7.3/7.5	(~1.3 (	GB)		
?) r)	Help information Return to previous menu				
	Selection [l1] : l1				
	You have selected Linux 64-bit RHEL7.3/7.5 Is this correct? [Y/n] y				

- 2. Type 11, press Enter to admit the operating system version.
- 3. Type Y, press Enter to give final confirmation.

```
root@vm-tmrhel73:~/MSC
                                                                           ×
File Edit View Search Terminal Help
        Help information
    ?)
    r ) Return to previous menu
        Selection [11] : 11
        You have selected Linux 64-bit RHEL7.3/7.5.
        Is this correct? [Y/n] y
 Installing Mentat 2019 for Linux 64-bit RHEL 7.3/7.5
 Installing the script files to /root/MSC/install
 Installing from /root/MSC/products/gl27emt0.k10
    Enter the pathname to the directory containing the solver :
    [/root/MSC/marc2019] /root/MSC/marc20XX
         submit1 script adjusted.
         submit2 script adjusted.
         submit3 script adjusted.
          encrypt_umt script adjusted.
  Do you want to create links to the startup scripts [y/N]?
  Where to put the links for the startup scripts? [/usr/local/bin] /usr/local/bi
n
```

- 4. Type /root/MSC/marc20XX as pathname to the directory containing the solver. Press Enter. A prompt to create links to the startup scripts appears.
- 5. Type Y, press Enter.
- 6. 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.

```
root@vm-tmrhel73:~/MSC
                                                                            File Edit View Search Terminal Help
        You have selected Linux 64-bit RHEL 7.3/7.5
        Is this correct? [Y/n] y
 Installing Mentat 20XX for Linux 64-bit RHEL 7.3/7.5
Installing the script files to /root/MSC/install
 Installing from /root/MSC/products/gl27emt0.k10
    Enter the pathname to the directory containing the solver :
    [/root/MSC/marc2OXX] /root/MSC/marc2OXX
          submit1 script adjusted.
          submit2 script adjusted.
          submit3 script adjusted.
         encrypt umt script adjusted.
  Do you want to create links to the startup scripts [y/N] ? y
 Where to put the links for the startup scripts? [/usr/local/bin] /usr/local/bi
n
           Link name : /usr/local/bin/mentat20XX
        hit return to continue.
```

- 7. Type **R**, press Enter (twice) to return to the main menu.
- 8. Type  $\mathbf{Q}$  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
install
```

install_doc.exe	mentat20XX
install.exe	<pre>msc_licensing_helium_linux64.bin</pre>
license.dat	products
marc20XX	utils
<pre>marc_20XX_linux64_rh7.3_7.5.tar.gz</pre>	

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

					root@vm-tmrhel73:~/MSC -		×
File	Edit	View	Search	Terminal	Help		
	Insta	allati	on Dire	ectory			
	For a or ar these insta The c subdi of th	a full inst prod allati docume recto ne ins	instal allatic ucts ha on dire ntatior ries ma tallati	llation work with Mave alreaded to the sectory here alreaded to the sectory here alreaded to the sector of the sector sec	with both Marc 20XX) and Mentat 20XX, Mentat 20XX only, please make sure that ady been installed, and enter the same are that was used to install these products and example problems will be installed in th C/doc and mentat20XX/examples tory entered here.	ie	
	For a Marc direc Volum insta	an ins 20XX tory nes A- allati	tallati has alı here th E will on dire	ion with ready bee nat was u be insta ectory er	Marc 20XX only, please make sure that en installed, and enter the same installatic used to install this product. The Marc 20XX willed in the subdirectory marc20XX/doc of th ntered here.	n 1e	
	For a direc will	an ins tory be in	tallati to ins† stalleo	ion of th tall the d in the	ne documentation files only, please enter th files. The Marc 20XX Volumes A-E installation directory entered here.	ie	
	Enter (/roo : /ro	the t/MSC ot/MS	directo ) C <b>ol</b>	ory to ir	stall the documentation		

3. Type /root/MSC, press Enter.

Main menu for documentation appears.

				гоо	:@vm-tmrh	el73:~/MSC			-		×
File	Edit	View S	Search	Terminal Help							
	Installation script for Linux systems										
	MSC Software Corporation										
	Main menu										
	d	) Ins	stall	)ocumentatio	าร						
	q	) Ex:	it fro	n the instal	lation sc	ript					
		Sel	lectio	n : d							

4. Type D, press Enter.

	root@vm-tmrhel73:~/MSC	-	×
File Edit Viev	v Search Terminal Help		
	Installation script for Linux systems		
	MSC Software Corporation		
	Main menu ======		
d )	Install Documentations		
q )	Exit from the installation script		
Installing (	Selection : d documentation in /root/MSC /mentat20XX/doc		
hit	return to continue.		

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/mentat20XX/bin/mentat

Ideally the application should start.It might fail for the security check as follows:

root@vm-tmrhel73:~	-	×
File Edit View Search Terminal Help		
<pre>bash: Licensing/Helium/msclic.ini: No such file or directory [root@vm-tmrhel73 ~]# /root/M MSC/ Music/ [root@vm-tmrhel73 ~]# /root/MSC/mentat20XX/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 Security check failed! Contact MSC Software Support.</pre>	above	

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:

MSC\_LICENSE\_FILE= 27500@hostname

```
export MSC_LICENSE_FILE
```

• In CSH:

setenv MSC\_LICENSE\_FILE 27500@hostname

```
export MSC_LICENSE_FILE
```

Notes:	<ul> <li>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.</li> </ul>
	<ul> <li>Various types of licenses are available for the users to suit their requirements. For details refer to the MSC Licensing Helium User's Guide.</li> </ul>
	<ul> <li>An elaborated and detailed installation procedure is in Appendix. C: Linux: Marc/Mentat Files, Subdirectories and Installation</li> </ul>
	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	The install.exe script will accept the following options:	
install.exe script	<ul> <li>-a Turns on automatic installation – installs both Marc and Mentat from the installation media. The -i option (described below) is required.</li> </ul>	
	<ul> <li>-i <path> Specifies the installation path (<parent> directory). This option is required when specifying the automatic installation option -a.</parent></path></li> </ul>	
	<ul> <li>-1 <file>Specifies a file for product listing</file></li> </ul>	
	• -v Turns on verbose mode.	
	<ul> <li>The automatic installation will install both Marc and Mentat. To perform an automatic installation, run the installation script as follows:</li> </ul>	
	./install.exe -a -i <path></path>	
License file	Two lines of the file license.dat need to be modified	
	• SERVER line which specifies the system hostname	
	• <b>DAEMON</b> 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	
	<ul> <li>The string this_host should be replaced by the hostname of the machine where the license server is running.</li> </ul>	
	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	<ul> <li>The FLEXIm license manager needs to be started on the license server before running Marc and Mentat.</li> </ul>	
	<ul> <li>The license server is started with (assuming default installation location)</li> </ul>	
	/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	<ul> <li>For a nodelocked license it is necessary to obtain a FLEXIm hostid for the machine running Marc and Mentat. This is done by running the command:</li> </ul>	
	/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.

Steps	Command Information	Description
Step 1: Download the product and start the install script	<pre>mkdir /tmp/marc cd /tmp/marc gunzip <file>.gz tar xvf <file>.tar ./install.exe</file></file></pre>	Create a temporary directory and download the product file to that directory. Substitute the proper filename for <file>. Use gunzip to uncompress the file and extract the files using the tar command. Start the install.exe 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.</file>
Step 2:		Welcome to the Marc installation script for Linux systems
Install the files on your system		Enter a valid pathname to the directory to install the software ( <current directory="">).</current>
	Enter the path	/opt/marc
		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	Selection: 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 7.3/7.5 (-1.1 GB) ? )Help information r )Return to previous menu

Select option L1       Selection [L1]: L1         You have selected Linux 64-bit RHEL 7.3/7.5	
You have selected Linux 64-bit RHEL 7.3/7.5	
T 1. N77/ 1	
Is this correct? [Y/n] y	
Make your choice.Installing Marc 20XX for Linux 64-bit RHEL7.3/7.5Installing the script files to /opt/marc/install	
Installing from /tmp/marc/products/al27emt0.k10	
You may need to be root to Do you want to create links to the startup create the links. Scripts [y/N]?	
You can use the default selection by just pressing the enter key. Hit return to continue	
Mentat Installation The only options available MSC Software Corporation	
will be those from the Mentat 20XX Menu	
product file. 11)Install for Linux 64-bit RHEL 7.3/7.5 (~1.3 GB)	
? )Help information	
r )Return to previous menu	
Select option 11 Selection [11]: 11	
You have selected Linux 64-bit RHEL 7.3/7.5	
Is this correct? [Y/n]: y	
Installing Mentat 20XX for Linux 64-bit RHEL 7.3/7.5 Installing the script files to /opt/marc/install	
Installing from /tmp/marc/products/gl27emt0.k10	
Enter the path to the marc20XX directory.Enter the pathname to the directory containing the solver:	ng
You can use the default [/opt/marc/marc20XX]	
selection by just pressing the Press return to continue	
submit1 script adjusted submit2 script adjusted submit3 script adjusted	
Make your choiceDo you want to create links to the startup scripts [y/N] ? n	
Press return to continue	

Steps	Command Information	Description
Step 3:	Return to main menu	r)Return to previous menu
Step 4:		Run the installation executable for security. Install and run
Install Security		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
Step 5:	mkdir	Enter the directory used to install Marc and Mentat:
Installing the	/tmp/documentation	/opt/marc
documentation	cd /tmp/documentation	
	gunzip <file>.gz</file>	
	tar xvf <file>.tar</file>	
	./install_doc.exe	
	Enter the path	

# Managing FLEXIm

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

FLEXIm 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.

# FLEXIm 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.

### FLEXIm License Manager

For the 20XX version, the FLEXIm 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
-1 /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 servername
```

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 FLEXIm hostid for the machine running Marc and Mentat. This is done by running the command

```
/msc/MSC.Software/MSC Licensing/Helium/lmutil lmhostid
```

# **GPU Support on Linux**

#### Hardware and Software Requirements

The list of supported solver types with the GPU option can be found in *Marc Volume A: Theory and User Information* Chapter 11: Solution Procedures for Nonlinear Systems in Table 11-3 and Table 11-4.

An NVIDIA driver is necessary if the GPGPU capability is to be used. The driver needs to be compatible with the one used in the Marc build; see Marc Volume A: Theory and User Information, Chapter 12: GPU Support in for the minimum driver version supported.

The GPU capability in Marc is developed using CUDA toolkit 9.2 for NVIDIA Tesla cards with minimum supported compute capability 3.0. NIVDIA Quadro cards can also be used, even though; it is recommended to use Tesla cards that are dedicated for computing.

# **Deviceinfo Utility**

A stand-alone utility deviceinfo is provided in the tools directory to check available GPU cards on the machine. This utility provides information about the GPU cards and the installed NVIDIA drivers toolkit version. Typical output from the deviceinfo utility is shown below:

```
sh-4.2$ deviceinfo
 ** Marc GPGPU device diagnosis utility ** ]
Installed CUDA driver version is 9.2
Total 2 devices are detected on the machine
  Device id 0 : "Tesla V100-PCIE-32GB"
              Compute capability
                                                  : 7.0
              Number of Multiprocessors
              Number of Cores per Multiprocessor : 64
              Total Number of Cores
                                                : 32480
              Total device memory (in MB)
 Device id 1 : "Tesla V100-PCIE-32GB"
              Compute capability
                                                  : 7.0
              Number of Multiprocessors
                                                  : 80
              Number of Cores per Multiprocessor : 64
              Total Number of Cores
              Total device memory (in MB)
                                                : 32480
 The minimum Compute capability required for Marc GPGPU feature is 3.0
 Below is the list of supported devices
      Device id 0
                                 : "Tesla V100-PCIE-32GB"
     Device id 1
                                 : "Tesla V100-PCIE-32GB"
sh-4.2$
```

Figure 7-1 Deviceinfo Output

### Mentat Support

Running the job with GPU may also be done from Mentat. The GPU menu is only displayed for supported solver types Multifrontal Sparse and Iterative Sparse. Note that solver multi-threading (which refers to CPU threads) is not supported when the GPU option is selected.

The GPU option in Mentat is shown in Figure 7-2. When the GPU option is chosen, there are two options available for GPU card selection:

- a. Automatic: At run-time, Marc determines the GPU cards that are available and assesses the optimal card to be used.
- b. User: The user can specify the GPU cards that need to be used for the job. The available device IDs can be determined by running the deviceinfo utility.

Ma Solver/Parallelization X		
Name job1		
Type S	tructural	
	Domain Decomposition	
Use D	)DM	
	Assembly And Recovery	
🗌 Multip	ple Threads	
	Matrix Solver	
Solution	Symmetric O Nonsymmetric	
Туре	Iterative Sparse 🔹	
	Iterative Options	
Precond	ditioner	
Diagonal		
Scaled Diagonal		
O Incomplete Choleski		
Max # Iterations 1000		
Tolerance 0.0001		
Switch To Multifrontal Sparse When Not Converged		
Multiple Threads		
Vse G	SPU(s)	
GPU Selection Automatic		
	ОК	

Figure 7-2 GPU Option in Mentat

# Troubleshooting

### Exit 63

Cause	The Marc version being used is not supported with the GPU version of the Multifrontal solver.
User Information	Non-GPU version of the Multi-frontal solver causes this error if used with the GPU option.
User Action	Contact MSC Software representative to obtain supported version.

### Exit 64

Cause	Error occurs while attempting to use the GPU card specified by the user.
User Information	This error occurs while trying to use the GPU card specified by the user.
User Action	Use the deviceinfo utility to check for supported and available GPU cards on machine.

#### Exit 65

Cause	The Marc version being used is not supported with the GPU version of the Iterative solver.
User Information	Non-GPU version of the Iterative solver causes this error if used with the GPU option.
User Action	Contact MSC Software representative to obtain supported version.

# missing shared object file "libcuda.so"

Cause	This error occurs when required NVIDIA drivers are not available while running Marc with the GPU option.
User Information	To use GPU feature in Marc, necessary NVIDIA drivers need to be installed on machine.
User Action	Use deviceinfo utility to check if supported drivers are installed on machine. If not, download the required drivers from NVIDIA.



# Running and Using Marc and Mentat

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

Keyword	Options	Description	
-cr	yes no	Copy post files automatically from remote hosts used if necessary.	for a network run,
-vf	viewfactor_name	Name of file containing viewfactors for radiation from from Mentat using either the Monte Carlo or Hemicu	previous analysis or be method.
-ml	memlimit	Memory limit for deciding if the solver should go out-o Mbyte. Defaults to the physical amount of memory or	of-core. Specified in n the machine.
-gpuid	<id:id:id> or auto</id:id:id>	GPU card number or auto for automatic selection by p (DDM) jobs, multiple card IDs can be specified if ava	rogram. For parallel ilable.

Table 8-2	Examples of Running Marc Jobs
Examples of running Marc jobs	Description:
run_marc -jid e2x1	Runs the job $e2x1$ in the background, the input file $e2x1$ .dat resides in the current working directory.
run_marc -jid e2x14 -user u2x14 -save yes	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.
run_marc -jid e2x14a -prog u2x14	Runs the job $e2x14a$ using the executable produced by job $e2x14$ .
run_marc -jid e3x2a -ver no -back no	Runs the job <i>e3x2a</i> in the foreground. The job will run immediately without verifying interactively.
run_marc -jid e3x2b -rid e3x2a	Performs a restart job using the results of the previous job $e3x2a$ .
run_marc -jid e2x1 -nprocd 2	Runs a two processor job on a single parallel machine.
run_marc -jid e2x1 -nprocd 2 -host hostfile	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.

#### Table 8-1 run\_marc Input Options (continued)

### **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 mentat20XX/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 8-3   Mentat Input Options			
Keyword	Option	Description	
-mode	preset1/preset2	This will launch the application in the selected preset mode.	
		For preset1, which is the default, the traditional theme, the traditional mouse button scheme and complete picking will be active.	
		For preset2, the dark theme, the auto-dynamic mouse button scheme and partial picking will be active.	
-ar	area ratio	This option sets the initial window size to the given fraction of the available space on the desktop.	
-xr	horizontal ratio	This option sets the initial width of the window to the given fraction of the available width on the desktop [default: 0.92]	
-yr	vertical ratio	This option sets the initial height of the window to the given fraction of the available height on the desktop [default: 0.92].	
-aspr	aspect ratio	This option sets the aspect ratio (width over height) of the window [default: 1.6].	
-maximize		Starts up Marc Mentat maximized.	
-minimize		Starts up Marc Mentat minimized (iconified).	
-bg		Will run Mentat in the background. Note that the DISPLAY environment variable must point to a valid display.	
-bp	\$(DIR)/bin/	Directory path name where the external Mentat programs and shell scripts are located.	
-compile	binary_menu_filename	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 main.msb, compile as:	
		bin\mentat -compile menus\win64\main.msb	
		Substitute for <plat> the platform name linux64.</plat>	
-dr	True/False	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 <b>True</b> .	
-fn	font	Default font type.	
-fngr	font	Font used by the graphics windows (overrules the font selected via the -fn option).	

	Table 8-3	Mentat Input Options (continued)
Keyword	Option	Description
-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	<pre>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:</menu></html_doc></pre>
-help		Print a list of all of the options.
-hide_dialog		Hide the dialog window at startup.
- hide_dynamic_men u		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.

ble 8-3 Mentat Input Options (continu	ued)	
---------------------------------------	------	--

Keyword	Option	Description
-lf	filename	Specify the Mentat log file name.
-license_release	number	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.
-mf	main.ms	The name of the startup menu file.
-ml	<pre>\$(DIR)/material/</pre>	Directory path name where the material files are located.
-mp	\$(DIR)/menus/	Directory path name where the menu files are located.
-multiundo	off/on	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].
-undo_levels	number	Number of UNDO levels when the multi-level UNDO option is active. The minimum is 1, the maximum is 50 [default: 10].
-nosolidmodeling		Utilize the Mentat_Parasolid_CAD which allows geometric models to be imported but does not allow solid geometry editing.
-path	directory_name	Provides a directory in which Mentat searches when opening an existing input file. Multiple directories can be specified as follows: - <i>path directory_1 -path directory_2</i> etc.
-pr	filename	Any additional set-up commands you wish to add. Store these in a procedure file containing the Mentat commands.
-ra		Reads all of the ASCII Menu files.
-rf	filename	Record the Mentat commands in the procedure file <i>filename</i> .
-szgr	width height	Set the size (width and height in pixels) of the graphics area.
-ti	title	Append <i>title</i> to the name of the window.
-unicode		Allows the use of unicode characters in load case titles, job titles, annotations and user-defined names of results file variables.

Table 8-3 Mentat Input Options (continued)

# 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

MARC\_MPI alternative\_mpi

for setting a new default. Use the exact word as given in the Alterative 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.

# 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 *mentat20XX* 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:

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</pre>
```

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 pjetx1. 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*.

Definitions

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.

Table 9-1

### Definitions

The definitions of some of the terms are as follows:

		Dominiono
Sr. No	Term	Definition
1	Root machine	The machine on which Marc job is started.
2	Remote Machine	Any machine other than the root machine which is part of a distributed Marc run on the network.
3	Shared installation	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.
4	Distributed installation	Marc is installed on all machines. Each machine accesses its own Marc executable.

		Deminiono
Sr. No	Term	Definition
5	Distributed execution	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.
6	Shared I/O	Marc reads and writes data in a NFS shared directory. Each Marc executable running on the network reads/writes to the same directory.
7	Distributed I/O	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.
8	NFS	Network File System.

Definitione

Tahla 0-1

# **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 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.

#### root machine

#### remote machines



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. 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 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.

Note: The current version does not support the IPV6 protocol.

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 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 n1+n2+n3=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 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:

```
ssh host2
ls workdir2
ls installdir2
```

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

host1 2 host2 1 workdir2 installdir2 host3 2 workdir3 installdir3

with appropriate definitions of the third and fourth entries

There will be six Marc input files associated with this job: test.dat, ltest.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

```
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

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

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  $\rightarrow$  Run a Demo...

A Run A Demo dialog appears.



2. Select the example Contact With DDM.

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.

	Fil	e Select	View	Tools	Win	dow	Help		li n
×	•	Geometry 8	Mesh	Tables	& Coo	rd. Sys	st. G	eometric Pr	roperti
in Menu		New Show Men Edit	Prop u	perties	Eler	nent Ty	/pes	User Dom Ident Tools	ains ify ▼
Щ			Jobs		Eler	nent Ty	/pes	User Dom	ains

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.

Job Properties							
Name indent							
Type Stru	ictural						
Linear Elastic Analysis							
Selected Clear							
loading		Structura	1/	static	static Up Dow		
unloading		Structura	1	static		Up D	own
Initial Loads		Desig	n		Analys	is Options	
Inertia Relief		Cvclic Symmetry		Job Results			
Contact Contro	1	Global-Local		Job Parameters			
Mesh Adaptivity	y .	Steady State Rolling		Analysis Dimension			
Active Cracks		Map Temperature		Plane Strain		-	
Crack Initiators		Model Sections		Material Data File		:	
Deactivation	Dut				Check		
Input File Text Title	Indu	ude File				Run	
Reset	Reset OK						

6. Click Run.

The Run Job dialog appears.

📹 Run Jol	b				×		
Name ind	Name indent						
Type St	ructural						
User	Subroutine	File					
Solve	er/Paralleliza	ation					
Symmetric	Solution		DDM v	with 3 Doma	ains		
Multifront	al Sparse So	lver	1 Asse	embly/Reco	very Thread		
			No GP	U(s)			
Title	Style	Multi-Phy	/sics	-	Save Model		
Subm	it (1)	A	dvanced Job Submission				
Upd	late	Moni	tor		Kill		
Status				Comple	Complete		
Current I	ncrement (C	Cyde)		70 (3)	70 (3)		
Singularit	y Ratio			0.9453	0.94538		
Converge	nce Ratio			16210	16210		
Analysis 1	Time			1			
Wall Time				8			
		To	tal		]		
Cycles	Cycles 368			Backs	3		
Separat	ions	29	Rem	leshes	0		
Exit Numb	ber	3004		Exit	Exit Message		
Edit	Edit Output File Log F			Status File	Any File		
Open Pos	t File (Mode	el Plot Resul	ts Menu	I)			
Reset	:				ОК		

7. Click Solver/Parallelization button.

The Solver/Parallelization dialog appears.



- 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:

lame	indent							
Type Structural								
u	lser Sub	routine	File					
S	olver/Pa	ralleliza	ition					
Symm	etric So	lution		DDN	4 wit	h 3 Do	oma	ins
Multif	rontal S	parse S	olver	1 As	semb	oly/Re	cov	ery Threa
				No	GPU(	5)		
Title	e	Style	Table-D	Driven		-	S	ave Model
S	ubmit (1	L)	A	dvano	ed Jo	b Sub	mis	sion
	Update		Мо	nitor		Kill		
Statu	<b>S</b> • • • • • •				Complete			
Curre	nt Incre	ment (	Cycle)			70 (3)	0	
Singu	larity Ra	atio				1		
Conv	ergence	Ratio				10790	)	
Analy	sis Time	•				1		
Wall 1	ime					4		
			T	otal —				
Cycl	es	3	68	Cu	t Bac	ks	3	
Separations 29 Remeshes 0								
Exit Number 3004					Exit Message			
Edit Output File Log File Status File Any File						Any File		
Doen I	Post File	(Mode	I Plot Res	ults M	enu)			
C								

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:



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, lmodel1\_job1.t16 and lmodel1\_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:

```
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.



#### Cannot create

Cause	You have no write permission in the <parent> directory.</parent>
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 FLEXIm licensing software.
- The FLEXIm 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.

In this case, Marc or Mentat will exit.

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

lmreread -c <parent>/msc/MSC.Software/MSC Licensing/Helium/license.dat

If you get the FLEXIm 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 FLEXIm 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 FLEXIm 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 **lmhostid** of the system you are trying to use and that on your marc20XX (FEATURE MARC) license is the same.

# User Information

User Actions

Link failed in Marc	
Cause	<ul> <li>Your user subroutine causes compiler errors.</li> </ul>
	<ul> <li>You have no Fortran compiler.</li> </ul>
	<ul> <li>Fortran libraries not available.</li> </ul>
User Actions	Check the variable syslibs in the file include_linux64 in the marc installation subdirectory tools. It references special system libraries in /usr/lib which may not exist on your system.
	jour system.

### Testing Marc installation failure

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

### Mentat cannot open display

Cause	<ul> <li>Mentat does not have X server access to your display device.</li> </ul>				
	<ul> <li>You are using a terminal other than the default screen belonging to the machine, without setting the X-window output device.</li> </ul>				
User Actions	<ul> <li>Ensure Mentat has X server access to your display device. The following command allows Mentat to run on a remote screen:</li> </ul>				
	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 upto 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**



- Marc Subdirectories 163
- Installation Procedure 165

### 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.

Basic set	Contents: required as minimum
bin	executable Marc programs
tools	batch scripts to run and maintain the Marc programs
AF_flowmat	material data for database
xdr_lib	machine dependent libraries
lib_shared	machine dependent libraries
Extended set	Contents: only for use with user subroutines
lib	binary libraries with the compiled Marc routines
common	insert files containing Marc common blocks
user	templates for all available Marc user subroutines
Examples	Contents: example files
Examples demo	Contents: example files input files and user subroutines for the <i>Marc Volume E: Demonstration Problems</i>
Examples demo demo_ddm	Contents: example files input files and user subroutines for the <i>Marc Volume E: Demonstration Problems</i> input files and user subroutines for the single parallel machine as well as the network parallel version of Marc
Examples demo demo_ddm demo_table	Contents: example files         input files and user subroutines for the Marc Volume E: Demonstration Problems         input files and user subroutines for the single parallel machine as well as the network parallel         version of Marc         input files and user subroutines for Marc Volume E: Demonstration Problems based upon Table         driven input format
Examples demo demo_ddm demo_table test_ddm	Contents: example files input files and user subroutines for the <i>Marc Volume E: Demonstration Problems</i> input files and user subroutines for the single parallel machine as well as the network parallel version of Marc input files and user subroutines for <i>Marc Volume E: Demonstration Problems</i> based upon Table driven input format one, two, and four processor test examples for installation testing of the single parallel machine as well as the network parallel version
Examples demo demo_ddm demo_table test_ddm Utilities	Contents: example files         input files and user subroutines for the Marc Volume E: Demonstration Problems         input files and user subroutines for the single parallel machine as well as the network parallel version of Marc         input files and user subroutines for Marc Volume E: Demonstration Problems based upon Table driven input format         one, two, and four processor test examples for installation testing of the single parallel machine as well as the network parallel version         Contents
Examples demo demo_ddm demo_table test_ddm <u>Utilities</u> pldump	Contents: example files         input files and user subroutines for the Marc Volume E: Demonstration Problems         input files and user subroutines for the single parallel machine as well as the network parallel version of Marc         input files and user subroutines for Marc Volume E: Demonstration Problems based upon Table driven input format         one, two, and four processor test examples for installation testing of the single parallel machine as well as the network parallel version         Contents         source routines for the post-file conversion programs pldump, pldump13 and pldump2000

### Table A-1 Contents of the Marc installation

# FLEXIm 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 FLEXIm 11.13 are as in the following table:

11.13	Helium (11.16.3.0)
C:\MSC.Software\MSC.Licensing\11.13\msc	C:\Program Files\MSC.Software\MSC Licensing\Helium\msc
C:\MSC.Software\MSC.Licensing\11.13\lmtools	C:\Program Files\MSC.Software\MSC Licensing\Helium\lmtools
C:\MSC.Software\MSC.Licensing\11.13\install s	C:\Program Files\MSC.Software\MSC Licensing\Helium\installs
C:\MSC.Software\MSC.Licensing\11.13\lmgrd	C:\Program Files\MSC.Software\MSC Licensing\Helium\lmgrd
C:\MSC.Software\MSC.Licensing\11.13\LOG	C:\MSC.Software\MSC Licensing\Helium\LOG
C:\MSC.Software\MSC.Licensing\11.13\lmutil	C:\Program Files\MSC.Software\MSC Licensing\Helium\lmutil
C:\MSC.Software\MSC.Licensing $11.13$ \msclic. ini	C:\Program Files\MSC.Software\MSC Licensing\Helium\msclic.ini

# Installation Procedure

Steps	Command Information	Description
Step 1: Security		Download FLEXIm from the Solutions Download Center. Select the product <i>MSC Licensing FLEXIm</i> , version Helium.
		Run the installation executable and follow the installation instructions.
		<b>Default installation directory is</b> C:\MSC.Software\MSC.Licensing\Helium
		Obtain a license file from MSC Software. If a nodelocked license is to be used, then obtain FLEXIm hostid with
		C:\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:\MSC.Software\MSC.Licensing\Helium\ licenses\license.dat
		Set the environment variable MSC_LICENSE_FILE 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 FLEXIm version, so it is safe to upgrade previous installations of FLEXIm.
Step 2: Install Marc	Start the installation from the product media obtained from the Solutions Download Center.	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</parent>
and Mentat	Destination Folder:	Files\MSC.Software\Marc\20XX.0.0
	C:\Program Files\MSC.Software\Marc\20XX.0.0	be created in the directory that you specify.
		The default destination folder for Mentat is C:\Program Files\MSC.Software\Marc\20XX.0.0

Steps	Command Information	Description
Setup type	You will then be presented with which product options to install. Complete Solver Modeler	Select the <b>Complete</b> option to install both Marc and Mentat. Select the <b>Solver</b> option to only install Marc, or select the <b>Modeler</b> option to only install Mentat.
Program folder	Select Program Folder: <i>Program Folder</i> : MSC.Software	Select the folder that you wish to place the shortcut to the Mentat startup script. The default program folder name is <b>MSC.Software</b> .
Specify license file	License: C:\MSC.Software\MSC.Licensing\Helium\ licenses\license.dat	When you perform the <b>Marc</b> 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 <b>Setup Complete</b> screen. It will present you with an option to view the readme.txt file. Click on the <b>Finish</b> 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.
Step 3: Start the License Manager	Start the FLEXIm 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 $\rightarrow$ MSC.Software $\rightarrow$ MSC License Helium $\rightarrow$ FLEXIm Configuration Utility to configure FLEXIm. 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.

Steps	Command Information	Description
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 Pompt window and type: set msc_license_file If it is not correct, change it using the System applet in the Control Panel. Then run the program using: cd C:\Program Files\MSC.Software\marc cd 20XX.0.0\mentat20XX bin\mentat Run a demo problem by selecting the menu buttons: Help>Run A Demo>Thermal/Structural Contact	<ul> <li>Check the installation by running Mentat.</li> <li>There are three methods to run Mentat: <ol> <li>Use the Mentat icon which is created on the desktop</li> <li>The link in the MSC.Software\Marc 20XX.0.0 program group</li> <li>Run it from an MS-DOS Command Prompt window.</li> </ol> </li> <li>To run from the command prompt, do the following: <ol> <li>Go to the <parent>\mentat20XX directory.</parent></li> <li>Enter the command bin\mentat.</li> </ol> </li> <li>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.</li> <li>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.</li> </ul>
	To check that user subroutines are working by running one of the standard user subroutine demo problems: cd C:\Program Files\MSC.Software\marc cd 20XX.0.0\marc20XX\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.
Step 5: for Network Version only		If you will be using the Marc Parallel Network feature, you need to setup MPI. This service is optionally installed on the system when you installed <b>Marc</b> , however you will need to install it on the remote machines. Follow the Marc Parallel Network for Microsoft Windows (Parts 1 and 2) for important information on installing and running jobs with the network version.

Steps	Command Information	Description
Step 6: Installing the documentati on	Start the installation from the product media obtained from the Solutions Download Center. Choose Destination Location: C:\Program Files\MSC.Software\ Marc_Documentation\20XX.0.0	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 defaults to: C:\Program Files\MSC.Software\Marc Documentation
		\20XX.0.0 You can now install the documentation to any other location. The directories doc and examples will be created in the directory specified by you.



Mentat Files and Subdirectories 170

# Mentat Files and Subdirectories

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

Basic set:	
3dx	3-D mouse driver
bin	Shell scripts and programs for Mentat
ctkernel	CAD import libraries
help	Mentat online help files
lang	Localization dictionaries
materials	Mentat material files
materials_pre2010	Old Mentat material files
menus	Mentat menu files
parasolid	Parasolid schema files
python	Python installation
qt	Graphics plug-ins
scasystem	Components interface
shlib	Shared libraries
utilities	SIFT Python scripts

### Table 2-1 Contents of the Mentat Directory

# C Linux: Marc/Mentat Files, Subdirectories and Installation

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- Installation Procedure 174

# Marc Files and Subdirectories

Table C-1

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.

Contents of the Marc installation

Basic set	Contents: required as minimum
bin	executable Marc programs
tools	shell scripts to run and maintain the Marc programs
AF_flowmat	material data for database
xdr_lib	machine dependent libraries
Extended set	Contents: only for use with user subroutines
common	insert files containing Marc common blocks
lib	binary libraries with the compiled Marc routines
lib_shared	system dependent shared libaries.
user	templates for all available Marc user subroutines
Examples	Contents: example files
Examples demo	Contents: example files input files and user subroutines for the <i>Marc Volume E: Demonstration Problems</i>
Examples demo demo_ddm	Contents: example files input files and user subroutines for the <i>Marc Volume E: Demonstration Problems</i> input files and user subroutines for the single parallel machine as well as the network parallel version of Marc
Examples demo demo_ddm demo_table	Contents: example files         input files and user subroutines for the Marc Volume E: Demonstration Problems         input files and user subroutines for the single parallel machine as well as the network parallel version of Marc         input files and user subroutines for the Marc Volume E: Demonstration Problems based upon Table driven input format.
Examples demo demo_ddm demo_table test_ddm	Contents: example files         input files and user subroutines for the Marc Volume E: Demonstration Problems         input files and user subroutines for the single parallel machine as well as the network parallel version of Marc         input files and user subroutines for the Marc Volume E: Demonstration Problems based upon Table driven input format.         one, two, and four processor test examples for installation testing of the single parallel machine as well as the network parallel version
Examples         demo         demo_ddm         demo_table         test_ddm         Utilities	Contents: example files input files and user subroutines for the <i>Marc Volume E: Demonstration Problems</i> input files and user subroutines for the single parallel machine as well as the network parallel version of Marc input files and user subroutines for the Marc Volume E: Demonstration Problems based upon Table driven input format. one, two, and four processor test examples for installation testing of the single parallel machine as well as the network parallel version Contents
Examples demo demo_ddm demo_table test_ddm Utilities pldump	Contents: example files         input files and user subroutines for the Marc Volume E: Demonstration Problems         input files and user subroutines for the single parallel machine as well as the network parallel version of Marc         input files and user subroutines for the Marc Volume E: Demonstration Problems based upon Table driven input format.         one, two, and four processor test examples for installation testing of the single parallel machine as well as the network parallel version         Contents         source routines for the post-file conversion programs pldump, pldump13 and pldump2000

### Mentat Files and Subdirectories

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

Table C-2	Contents of the Mentat directory unloaded from installation package
Basic set	
3dx	3D mouse driver
bin	Shell scripts and programs for Mentat
ctkernel	CAD import libraries
help	Mentat online help files
lang	Localization dictionaries
materials	Mentat material files
materials_pre2010	Old Mentat material files
menus	Mentat menu files
parasolid	Parasolid schema files
python	Python installation
qt	Graphics plug-ins
scasystem	Components interface
shlib	Shared libraries
utilities	SIFT Python scripts

# Installation Procedure

Download the file marc\_20XX\_linux64\_rh7.1\_7.3.tar.gz.

Steps	Command Information	Description
Step 1: Security	chmod +x msc_licensing_Helium_ <platform>.bin ./msc_licensing_Helium_<platform>.bin For nodelocked license, run /msc/MSC.Licensing/Helium/bin/lmhostid cp license.dat /msc/MSC.Licensing/Helium/licenses/license.dat For csh and similar: setenv MSC_LICENSE_FILE /msc/MSC.Licensing/Helium/licenses/license.dat For Bourne shell and similar MSC_LICENSE_FILE=/msc/MSC.Licensing/ Helium/licenses/license.dat</platform></platform>	Download FLEXIm from the Solutions Download Center. Select the product <i>MSC</i> <i>Licensing</i> , version Helium. Run the installation executable. It may be necessary to give execution permission (chmod +x) to the downloaded file. Follow the installation instructions. Default installation directory is /msc/MSC.Licensing/Helium Obtain a license file from MSC Software. If a nodelocked license is to be used, then obtain FLEXIm hostid with /msc/MSC.Licensing/Helium/bin/Imhosti d
	export MSC_LICENSE_FILE Edit license.dat to set SERVER and DAEMON (see chapter 3 below for details). Start the license server: /msc/MSC.Licensing/Helium/bin/lmgrd -c /msc/MSC.Licensing/Helium/licenses/license.dat -l /msc/MSC.Licensing/Helium/lmgrd.log	Copy the license file to the proper location. Standard location is /msc/MSC.Licensing/Helium/lice nses/ license.dat Set the environment variable MSC_LICENSE_FILE to point to the license file. The license server must be running in order to run marc and Mentat.

Steps	Command Information	Description
Step 2: Download the product and start the install script	mkdir /tmp/marc cd /tmp/marc Copy the file from Download Center to this directory gunzip <file>.tar.gz tar xvf <file>.tar ./install.exe</file></file>	Download the product from the Solutions Download Center and save the file to a temporary location. Marc and Mentat are available for Red Hat 7.3/7.5 and SUSE 12SP1/SP2. 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").
	Welcome to the Marc installation script for Linux systems Enter the directory to install the software ( <current directory="">)</current>	Enter the path for the directory in which you want to install the Marc product(s). The default selection will be your current directory. You must have write permission to this directory.
Step 3: Extract the files from the installation media	Main Menu 1 )Install Marc 2 )Install Mentat o)Options ? )Help information q )Exit from the installation script Selection: 1	Select option 1 to install Marc. This will take you to the Marc submenu. <b>Note:</b> Remember to install Marc before you install Mentat.

Steps	Command Information	Description
Select the platform	Marc 20XX Menu L1) Install for Linux 64-bit RHEL 7.3/7.5 (-1.1 GB)	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 7.3/7.5 version and L2 to install the SUSE 12SP1/SP2. You will also be prompted whether you want to create a system wide link to the <i>marc20XX</i> run script.
	? ) Help information r ) Return to previous menu	
	r)Return to the previous menu	Choose the Return to previous menu option to return to the main menu.
	Mentat Installation Mentat 20XX Menu 11) Install for Linux 64-bit RHEL 7.3/7.5 (-1.3 GB)	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 11 to install the Red Hat 7.3/7.5 version and 12 to install the SUSE 12SP1/SP2.

Steps	Command Information	Description
		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>/marc20XX, 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 <i>mentat20XX</i> run script. You must be root to perform this.</parent>
	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).	
Step 4: Download the documentation and start the install script	mkdir /tmp/documentation cd /tmp/documentation Copy the file from Download Center to this directory gunzip <file>.tar.gz tar xvf <file>.tar ./install_doc.exe</file></file>	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 install_doc.exe that is in the top- level directory. 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).

Steps	Command Information	Description
Step 5: Checking Marc	cd <parent>/marc20XX/tools ./maintain Marc Tools Menu 1)Test Marc installation Test the Marc installation 1.1)Run a Marc job without user subroutine</parent>	If you installed Marc, Mentat and the documentation, you can check the Marc installation by following the instructions under Checking Marc from Mentat. Change your directory to marc20XX/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. 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 20XX
		Exit number 3004
	1.2)Run a Marc job with user subroutine	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.
		Troubleshooting:
		<ol> <li>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.</li> </ol>
	0)Return to previous menu 0)Exit from the maintenance script	Repeatedly choose the Return/Exit option to leave the installation script. Choose option <b>0</b> to leave the maintenance script.

Steps	Command Information	Description
Step 6: Checking Mentat Checking Marc from Mentat	cd <parent>/mentat20XX ./bin/mentat Run a Demo problem by selecting the menu buttons: Help Run A Demo Thermal/Structural Contact</parent>	Next, change your current directory to be the <parent> directory in which you installed Mentat, and then cd to mentat20XX. 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.</parent>
Step 7: For Marc Parallel Network version only		Please follow the <i>Parallel Network Version</i> <i>for Linux Installation Instructions</i> (Chapter 9: Hardware and Software Requirements and Chapter 9: Installation Notes) on installing and running jobs with the network version.
