simufact welding

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Simulating Manufacturing

MSC Software Company

PART OF
HEXAGON

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Table of Contents

8.0

1 **Installation guide**

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Before installing please read carefully the "`Release notes`" and "`What's new`". It contains additional information which is not documented in this booklet.

Please keep in mind that **administrative rights** are required for a successful installation!

Please keep in mind that Simufact Welding supports 64-bit operating systems only.

Before starting the installation make sure that you have a valid **license file** for the products you like to install. The recommended steps of the installation are:

1) get a valid license file

2) install the license server (see notes below)

3) install Simufact Welding (described in this manual)

Step 2) "Installation of the license server" is not needed if you have a 'trial license' or an 'uncounted demo license' as these licenses do not need a license server. But it is needed for all other license types like 'commercial license', 'test license', 'partner license', 'academic license', ...

For network licenses the installation of the license server software is only needed on the machine used as license server, this means on the machine with the host-ID specified in the license file. This machine may or may not be used to run Simufact Welding, too. For nodelocked licenses the license server software and Simufact Welding are installed on the same machine.

The required license server software is "MSC Licensing", a FLEXlm based licensing software. Please see the "`Release notes`" for the required version of MSC Licensing. Typically several version of Simufact Welding can be used with a constant version of MSC Licensing. Thus there may be no need to update an existing MSC Licensing.

MSC Licensing is not shipped with Simufact Welding. It is available as separate download in the MSC Solution Download Center (SDC) where you have downloaded Simufact Welding. MSC Licensing is not installed by the Simufact Welding installer but has to be installed separately. For this please follow the instructions shipped with MSC Licensing. It is recommended to activate "Edit the advanced properties" during the installation and to remember the port number and host name of the license server shown.

The installation of a license server is also not needed if you have the license server software "MSC Licensing" already running for other MSC products on the machine licensed for Simufact Welding. In this case the license files for the different products need to be combined, see the appendix at the end of this document.

For more information about configuring and managing your licenses please see the appendix at the end of this document.

1.1. Installation using Windows™

1.1.1. Attended installation

The Simufact Welding download package contains an easy-to-use installer: "Setup.exe". Double-click the executable to open a dialog that will guide you through the installation.

1.1.1.1. Choose the language

In the first step of the installation you can choose the language used during the installation. Select the language of your choice and click Next . Please note that this selection does not influence the language used in Simufact Welding. The language used in Simufact Welding can be chosen in the settings of Simufact Welding.
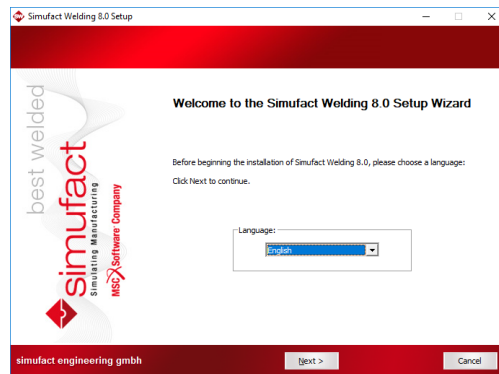
Figure 1.1. Choose the language

1.1.1.2. License agreement

To continue the setup, you must confirm the copyright notice by selecting OK . If you do not accept the agreement, click Cancel to quit the setup.
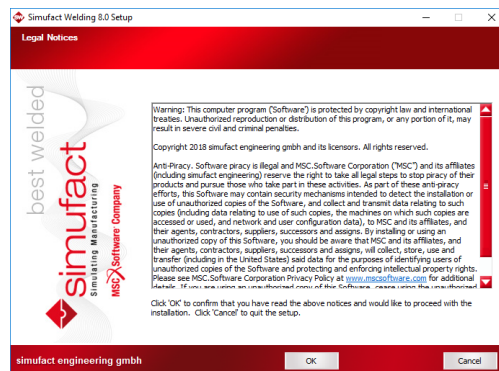
Figure 1.2. License agreement

1.1.1.3. Choose license location

The next action depends on the type of your license. You should have received a license file *before* running the setup or have a license server providing all necessary licenses. If you have a 'trail license' or an 'uncounted demo license' you need to specify the location of your license file you have received, for all other license types ('commercial license', 'test license', 'partner license', ...) you need to specify the location of you license server you should have set up. The location of the license is set in the system environment variable "MSC_LICENSE_FILE". On this page you can adapt the value of this variable.

• Set the location of the license file (for all 'demo licenses' or 'trial licenses')

Use the Browse... button to select the license file on your system.

The path and the name of the license part must not contain the special characters ";" and ":", otherwise the license will not be found.

• Set the location of the license server (for all other licences)

For all counted license type you have to set the right value to connect to your MSC FLEXlm license server. This is typically something like 'portnumber@hostname'. If you already have specified this with a previous setup you will see in the 'Current value' field previous entered data. If that is correct, you do not have to change anything. If you do not have an MSC FLEXlm license server running on your system please install the MSC licensing. This is a separate program, so a separate download and setup is necessary for the MSC licensing.

If the value is not set correctly, you won't be able to start any Simufact program. If you're not sure what to do, consult your System Administrator. You can set the value also after the installation in the advanced system settings on your Windows™ system.
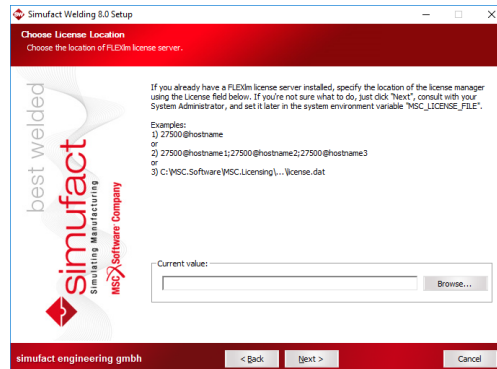
Figure 1.3. License location

1.1.1.4. Select target directory

Next you are asked to specify the location where you want to install the programs. If you have already installed an older version of Simufact Welding or other programs, then the destination folder is automatically set to the last installation directory. In this case, you should not change the folder to prevent conflicts.
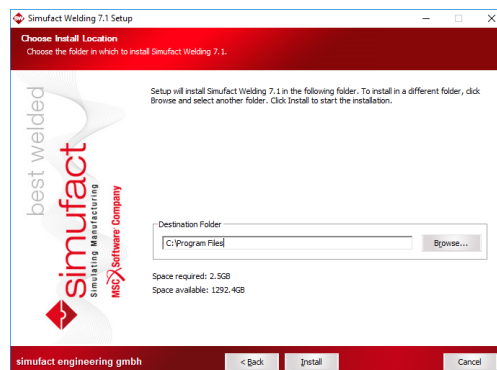
Figure 1.4. Installation location

You can select any folder on your computer. Spaces in the installation path are only supported if the optional additional 8.3 file names have been activated during the creation of the directory. If you see the following message, please select another installation directory.
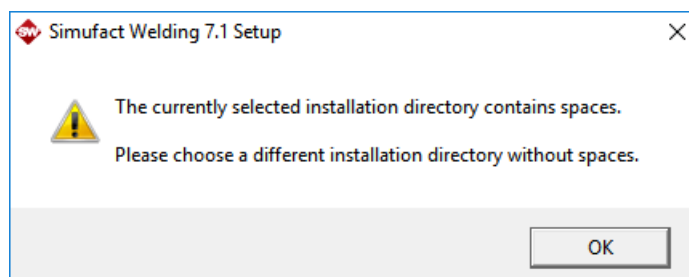
Figure 1.5. Spaces in installation path

1.1.1.5. Choose components

After this you will be asked which Simufact products you want to install.
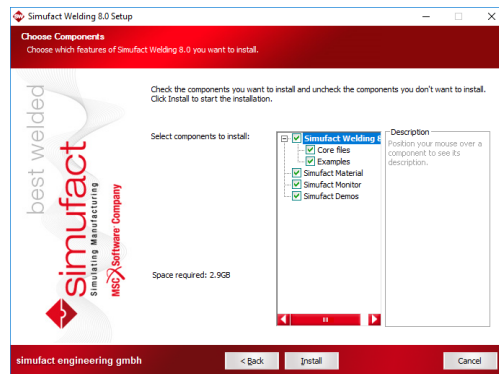
Figure 1.6. Choose components

By default, the following products are selected to be installed: Simufact Welding, Simufact Material, Simufact Utilities, and external Microsoft utilities.

The remaining items are necessary and should not be deselected.

Older versions of Simufact Material and Simufact Demos in the same installation path are updated during the installation procedure.

Removal of specific components is possible via the uninstall option in the windows control panel.

Simufact Welding can be used in parallel with previous versions. Please note that you cannot run different versions of the Simufact Demos and Simufact Material in parallel. Here we recommend using the latest version.

Additional programs or examples will not be installed if you deselect the corresponding option.

If you want to change something, you can go back to your previous selections by clicking Back. Otherwise start the installation by clicking Install. By clicking Cancel you can quit the installation.

1.1.1.6. Confirming the installation

The installation is fully automatic – the completion bar will inform you about the installation progress. The installation cannot be canceled anymore at this point.
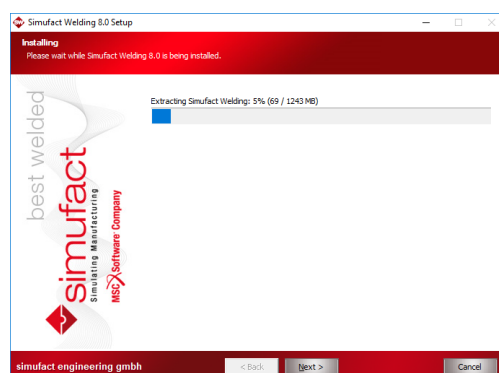
Figure 1.7. Installation progress

By default, the file extension `.swproj` is associated with Simufact Welding. At the end of the installation you will be informed accordingly by the setup program.

If there are insufficient access rights during the installation or if individual files are blocked by other programs, or if simulations are running, a message appears and the installation for the listed programs will be aborted. Please make sure that no simulations are running.

1.1.1.7. Complete setup

At the end of the installation you will be informed accordingly by the setup program. You only have to press Finish to end the setup.

The installation setup closes and you can use the installed Simufact products.
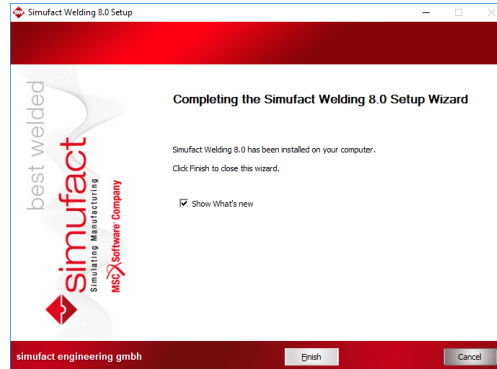
Figure 1.8. Installation finished

1.1.1.8. Show the What's new document

In case you haven't actively deselected the option **Show What's new**, the document „What's New" is shown after clicking Finish. It shows the fundamental program improvements. Enjoy reading!

1.1.2. Silent installation

In order to install the software without any user interaction, for example on multiple machines using a script, the setup supports a silent installation mode. To use the silent mode, please open a command line and type the name of the setup followed by "/S".

You must confirm the following copyright by adding /AcceptLicenseNotice=yes to install the software:

```
Warning: This computer program is protected by copyright law and international
treaties. Unauthorized reproduction or distribution of this program, or any
portion of it, may result in severe civil and criminal penalties. Copyright
2017 simufact engineering gmbh and its licensors. All rights reserved.
```

The following parameters are allowed:

Table 1.1. Allowed parameters

Accept license notice	/AcceptLicenseNotice=yes
To install Simufact Welding	/Welding=yes
To install Examples	/Examples=yes
To install Simufact Demos	/Demos=yes
To install Simufact Material	/Material=yes
To install Simufact Monitor	/Monitor=yes
Installation path (must be the last parameter)	/D=c:\some folder

If the installation path is not provided, C:\program files will be used by default. If the parameter for a program is not specified, it will not be installed. The system components and the Visual Studio™ Redistributable Packages will always be installed. Please note that the destination folder (for example C:\program files) must exist before the setup is started.

Examples:

• To install all programs to user dir:

```
setup.exe /S /AcceptLicenseNotice=yes /Welding=yes /Examples=yes /Demos=yes /
Material=yes /Monitor=yes /D=C:\Users\<username>\Program Files
```

• To only install Simufact Welding:

```
setup.exe /S /AcceptLicenseNotice=yes /Welding=yes
```

Normally the process setup.exe will return immediately if started from a script. You can circumvent that by starting it as follows:

```
start /WAIT setup.exe
```

with the options as given above.

A log file named setupSimufact.log will be created in your temporary directory (e.g. C:\Users \<username>\AppData-ta\Local\Temp) where the steps of the installation/uninstallation are recorded.

1.1.3. Uninstallation

You can use the Windows Control Panel to uninstall Simufact Welding. Alternatively you can use the generated uninstaller "Uninstall Simufact Welding 8.0.exe" located in the installation folder directly.

The uninstaller named supports a silent mode, too. For the silent mode start the uninstaller with the option "/S" using the command line. Please note that all programs installed before will be removed. There are no options to select certain programs.

Example:

```
"Uninstall Simufact Welding 8.0.exe" /S
```

1.2. Installation using Linux™

This documentation handles the basic tasks to install and configure simufact welding 8.0 on your Linux machine. Before you start you should read the following sections carefully.

The Infosheet `StartScripts_en.pdf` explains how customised scripts can be used to automatically couple the graphical user interface (GUI) running on Windows and the solver running on Linux.

After extracting the `simufact.welding.8.0_linux.tar.bz2` package, all the required software tools are already installed. So you only need to copy the `simufact/` folder to the final setup location:

```
cp -r simufact/ /target/directory
```

Maybe you want to extract the archive directly to the desired location:

```
tar xjvf simufact.welding.8.0_linux.tar.bz2 -C /target/directory
```

The next step will be configuring the license.

1.2.1. Licensing

Simufact welding uses the MSC FlexLM license tools. You get them from the MSC Software Solutions Download Center. Please look into the corresponding manuals for installation and configuration.

To run simufact welding the license server has to be accessible from the working machine and the environment variable `MSC_LICENSE_FILE` has to be set the following way:

```
MSC_LICENSE_FILE=27500@licserver # port@server
```

That's it! You should now be ready to use the simufact welding 8.0.

1.2.2. SFMARC run script

After a successful installation, you will find the solver executable in the following folder:

```
simufact/welding/8.0/solver/simufact/sfMarc/sf_tools/run_sfmarc
```

1.2.3. User subroutines

For creating user subroutines and integrating them to the SFMARC solver, you have to install the *IntelFortran* compiler in the version indicated in the Release Notes. For simufact welding to be able to find your installation of the compiler please edit the file

```
simufact/welding/8.0/solver/simufact/sfMarc/sf_tools/setintelcompiler_linux64
```

to match your system.

1.2.4. For administrators

1.2.4.1. Prerequisites and compatibility

For a complete install of Simufact.welding you need to have the following basic packages installed in your system:

• The shells /bin/sh, /bin/bash and /bin/ksh.

• GLIBC v2.12 or higher.

• Python in a version 2.x (not 3.x!).

The install scripts and the software itself were tested for being compatible to a variety of Linux distributions. You should be able to get simufact welding 8.0 up and running on the *x86-64* (sometimes called *amd64* or just *x64*) versions of

• Redhat Enterprise 7.1 and 7.3

• openSuSE 11.4 SP4 and 12 SP1

• CentOS 7.1 and 7.3

or later versions with a higher number.

> **Important**
>
> For process parallelization with *Domain Decomposition* in Marc 2018.0.0 the default MPI version requires that the ssh command has been set up such that it does not prompt for a password. See Appendix C how this is established.

1.2.4.2. Scheduling jobs on a remote server

simufact welding 8.0 for linux can be used with a scheduling engine. This functionality was developed and tested with the Sun Grid Engine (SGE) in mind but you should be able to get it running with other scheduling engines as well.

The basis of this functionality are three files. In order to enable scheduling on the server you have to edit these three files. The most common changes for SGE are already in these files albeit commented out. If you're using SGE you mostly just have to delete the "#" characters on the beginnings of the lines between "START SGE" and "END SGE". Please take care of the environment variable "MSC_LICENSE_FILE" in write_job and adjust them to match

your local settings. If you want to use a different scheduling engine you may have to adjust these sections to suit your needs. The files are as follows:

simufact/welding/8.0/solver/ simufact/sfTools/sfSchedul-ing/write_job	This small shell script writes the input file for the scheduling engine. This is the file needed to run the job on the scheduler and depends completely on the scheduling engine used. Please make sure to delete a file named RUNNING after you called the solver.
simufact/welding/8.0/solver/ simufact/sfTools/sfSchedul-ing/schedule_job	This shell script submits the job (using the jobfile written in write_job) to the scheduling engine. It will be entered in the queue. You may specify further options in this script to adjust the way new jobs are entered into the queue. Please make sure to create a file named RUNNING after you queued the job.
simufact/welding/8.0/solver/ simufact/sfMarc/sf_tools/ scheduled_job_started	This script is called right after the initialization of the FE solver has started. Depending on your scheduling engine you may need to supply the scheduler with additional options which are only available once the computation has started.

Additional information about these scripts can be found in the files themselves. To make it easier to understand how these files work together there is this sample runsf.bat file. The linebreaks are only inserted for this documentation and the paths have been shortened.

Another thing to pay attention to is licensing in combination with a scheduling engine. If you don't configure your scheduling engine to respect the number of available licenses it may schedule jobs for which not enough licenses are available. To circumvent these issues you may be able to configure the licenses as additional resources (comparable to computing slots or system load) which your scheduling engine manages. That way no jobs will be started if no more license are available.

1.2.4.3. Uninstall

simufact welding 8.0 is basically a self-contained package, i.e. all required files and executables are stored in the "simufact" folder created during installation.

So, for a complete uninstall you can safely remove the folder simufact/.

2   Installation and configuration of compilers

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Simufact Welding 8.0 supports user subroutines written in the FORTRAN programming language.

2.1. Requirements

To use user subroutines with Simufact Welding 8.0, additional programs are required.

For Windows™:

• Intel® Fortran Compiler Version 17.0.2.187

• Microsoft™ Visual Studio™ 2015

For Linux™:

• Intel® Fortran Compiler Version 17.0.2.187

Visual Studio™ on Windows™ provides linker support during the compilation of subroutines. The required compiler version is released by Intel® as **Intel Parallel Studio XE 2017 Update 2** as mentioned in Table 2.1.

Table 2.1. Compiler required for user subroutines in Simufact Welding 8.0

Intel Parallel Studio XE 2017	Intel® registration center activation date	Windows™ version / build	Linux™ version / build
Update 2	21-03-2018	**17.0.2.187** (20170213)	**17.0.2.187** (20170213)

The user can choose the compiler version from a drop-down menu from the Intel® compiler download web page.

2.2. Installation and configuration

On Windows™ platforms, it is recommended to first install Visual Studio™, followed by the Intel® Fortran compiler. This will help the Intel® compiler's installer script to detect the correct installation path of Visual Studio™, in case it is installed at a non-default location. After the installation of above listed program(s), user subroutines can be used to compile and run jobs in Simufact Welding 8.0. Multiple versions of the compiler and / or Visual Studio™ can be installed on the same machine. This might require manual changes to the Simufact compiler's script as described in Section 2.2.1.

For parallel (DDM) running of Simufact job with user subroutine, manually select the option **Cluster support for Intel®64** during compiler installation. By default, the option is unchecked and not installed.
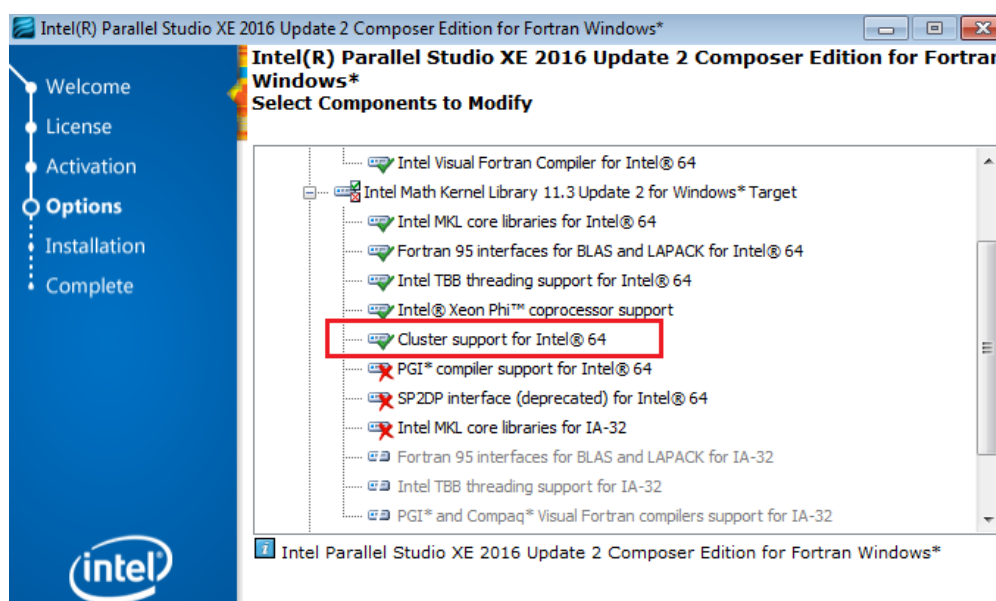

Figure 2.1. Cluster support for Intel®64 required for parallelization support

Some of the common compiler-related issues faced with running jobs with subroutines are discussed next.

2.2.1. Compiler not found

Intel® ifort Fortran compiler is installed however Simufact Welding 8.0 reports it as missing. Trying to run a job with a subroutine will output the following message in the job log file:

```
'ifort' is not recognized as an internal or external command, operable
 program or batch file.
```

Simufact uses its own script to set up the compiler environment for linking subroutines. Adding the compiler's path information to the system and / or user environment variables is not enough. You should check manually if the path mentioned in Simufact Welding 8.0 compiler's script is correct. Open in any text editor `setintelcompiler_win64.bat` located in Simufact installation directory at:

```
C:\Program Files\simufact\welding\8.0\sfMarc\sf_tools
```

The content of the file, for example, should be:

```
@echo off
set INTELPATH=c:\program files (x86)\intelSWTools
\compilers_and_libraries_2016.2.180\windows\bin\
if exist "%INTELPATH%compilervars.bat" call "%INTELPATH%compilervars.bat"
 intel64 vs2015
```

Check that the installation path of the compiler is the same as in the `setintelcompiler_win64.bat` script. If not, then change the path manually according to the actual installation path. The argument vs2015 loads the Visual Studio™ 2015 environment variables. The correctness of the script can be checked by opening a *cmd* command window and typing the command listed above followed by **ifort**. This should display the compiler version as shown below:

```
c:\Windows\System32>set INTELPATH=c:\program files (x86)\intelSWTools
\compilers_and_libraries_2016.2.180\windows\bin\

c:\Windows\System32>if exist "%INTELPATH%compilervars.bat" call "%INTELPATH
%compilervars.bat" intel64 vs2015
Intel(R) MPI Library 5.1 Update 3 for Windows* Target Build Environment for
 Intel(R) 64 applications
Copyright (C) 2007-2015 Intel Corporation. All rights reserved.

Copyright (C) 1985-2016 Intel Corporation. All rights reserved.
Intel(R) Compiler 16.0 Update 2 (package 180)

c:\Windows\System32>ifort
Intel(R) Visual Fortran Intel(R) 64 Compiler for applications running on
 Intel(R) 64, Version 17.0.2.187 Build 20170213
Copyright (C) 1985-2016 Intel Corporation.  All rights reserved.
```

In case of Linux™, a similar check should be done for the script `setintelcompiler_linux64`. The content of the script should be like:

```
# Setup script for the intel environment.
# You can declare the paths to your intel compilers in this file.

# Change the path to match your intel fortran compiler installation directory
ICPATH=/opt/intel/compilers_and_libraries_2016.2.181/linux
# Do NOT change anything below this line

if test -d $ICPATH ; then
```

```
  source $ICPATH/bin/compilervars.sh intel64
fi
```

2.2.2. Linker not found

If you get an output in the log file like:

```
'LINK' is not recognized as an internal or external command
```

This means that the linker could not be found after the executable was build. In some Visual Studio™ versions the path to the linker needs to be configured manually. Please also check if your Visual Studio™ version is supported by the script `compilervars.bat` (called by `setintelcompiler.bat`) and that the correct arguments are passed to it.

2.2.3. Link error: `unresolved externals`

Even if all the additional programs are installed, running a subroutine-based job might yield errors like:

```
mdsrc.lib(run_exe.obj) : error LNK2019: unresolved external symbol
 __intel_sse2_strcpy ...
```

```
sfclib.lib(sfjoining.obj) : error LNK2019: unresolved external symbol
 "__declspec(dlli ...
```

```
sfclib.lib(sfjoining.obj) : error LNK2019: unresolved external symbol
 "private: static ...
```

These errors are generally due to one of the following reasons:

• An older or newer version of the Intel® Fortran compiler is loaded by the Simufact compiler's script. Make sure that the correct compiler version is installed and the correct path is mentioned in the Simufact compiler's script as shown in Section 2.2.1.

• A wrong version of the Visual Studio™ environment is loaded by the Simufact compiler's script. Installing the correct version of Visual Studio™ will help to get rid of the error.

Other versions of Visual Studio™ may also be used provided all the run-time dependencies are met by installing proper **Redistributable Packages**. But this approach is not supported by Simufact.

8.0

3 Troubleshooting

A list of known issues of this version of Simufact Welding is given in the `Release Notes`. Please review this list as part of your troubleshooting activities.

3.1. Troubleshooting on Windows™

3.1.1. General hints

3.1.1.1. Firewall, ports and MPI

The firewall blocks some ports which are needed for some Simufact™ services. So if you do not want not deactivate the firewall completely, please make sure that the ports from 9985 and 9987 as well as the ports used for MSC Licensing are not blocked.

3.1.1.2. Antivirus software

Antivirus software sometimes can hinder some subprograms of Simufact™ to be installed, so it is strongly recommended to deactivate all antivirus software during the installation.

Antivirus software may slow down simulations considerably. Especially avoid that all files read and written on the local disk are scanned for viruses. The solvers and the GUI have a huge file I/O.

Some times antivirus software blocks files while they are checked. This may lead to random crashes of Simufact Welding, in particular of the solvers. If you experience such problems, deactivate your antivirus software.

3.1.1.3. Energy saving mode

Some calculations can sometimes take place over night. So if the energy saving mode is activated, the machine will go into standby mode after a certain time before the calculation has finished and thus the job is aborted. The suspend energy saving mode may not abort simulations as they will recover once the computer wakes up again. But for sure there will be no progress of the simulation during the suspend mode. The energy saving modes are triggered only be the user activity, not by the CPU activity. It is recommended to deactivate the energy saving mode completely on a machine used to run simulations.

3.1.1.4. Dell™ backup and recovery

Beside its high usage of CPU, the Dell backup stops some services (possibly the remote service or the license server) during the backup process, so it is recommended to deactivate this software.

Some versions of the Dell backup and recovery software conflict with Simufact applications causing these to crash, especially during "file open ..." dialogues. It is recommended to uninstall the Dell software in this case. See the `Release Notes` for more details.

3.1.1.5. Windows™ updates

It is recommended to disable automatic system updates, because the related reboot aborts all running Simufact simulations. In Windows 10 Pro™ you can use the Group Policy Editor for this:

1. Press Windows™ key + R to gain access to the Run dialog and type gpedit.msc.

2. Navigate to the following directory: Computer Configuration \ Administrative Templates \ Windows Components \ Windows Update.

3. Double-click on "Configure Automatic Updates" in the right hand panel.

4. Set the configuration to Enabled on the left-hand side and then choose "Notify for download and notify for install" from the drop-down list under the Options header.

3.1.1.6. INI files

INI files are created for Windows™ in `C:\Users\<username>\AppData\Local\Simufact`(`%localap-pdata%`), `C:\Users\<username>\AppData\Roaming\Simufact\` (`%appdata%`), and `C:\Program-Data\Simufact\` (`%programdata%`). They contain paths (e.g. for your company logo to be displayed in the results window), settings and other information. In case of problems with these settings, please check the contents of these INI files and - if necessary - edit them manually. If your setting files have been seriously corrupted for some reason, you can delete them or rename them to keep copies. If Simufact Welding is started without INI files, INI files with all default settings will be created.

If the Simufact Remote service is running as user SYSTEM, which is typically the case, INI files can be found in the subdirectories of `C:\Windows\System32\config\systemprofile\AppData` and of `C:\Windows\SysWOW64\config\systemprofile\AppData`.

The INI files are not deleted during un-installation and will not be reset during a re-installation of Simufact Welding. Thus, if you consider re-installing Simufact Welding to fix some issues, consider deleting the INI-files, too.

3.1.2. Problems with Shared Libraries (DLLs)

Simufact applications relay on Microsoft™ C++ and Intel™ Fortran Redistributable packages providing a wide range of DLLs. These redistributable packages are installed during the installation of Simufact Welding. If you experience problems that mention some DLL, it is likely that this installation has failed or that the redistributables have been overwritten by the later installation of a 3rd-party application.

Note: Not in all cases error messages mentioning DLL related problems may be displayed if internally subprograms, like the meshers, are called. You can call the subprograms as stand-alone programs to check on this. Or you just proceed with the hints given below if you suspect issues related to DLLs.

The Microsoft C++ Redistributables install into the system directories.

The Intel Fortran Redistributables install in a special path and are referenced by the environment variable PATH. PATH is defined using INTEL_DEV_REDIST. But if you execute `set` on the command prompt, INTEL_DEV_REDIST must not be contained in PATH literally, but must be expanded to its value. Some times a reboot helps to archive this.

The directory `3rd-party` of the Simufact Welding download contains the needed redistributables. If needed, you can reinstall them from there directly without re-installing Simufact Welding.

Some times 3rd-party applications install their DLLs in the system directories, but this DLLs conflict with DLLs Simufact Welding includes within its installation. As the system directories are checked first, errors can occur. In this case delete the DLLs from the system directories and place them in the installation of the 3rd-party application. One example for this is the `tbb.dll`.

3.1.3. Missing OpenGL support leads to display errors and crashes

As stated in the `Release Notes`, Simufact Welding needs a graphics adapter with 32-bit color depth and OpenGL 2.1 or higher compatibility. If this is not given, the following warning will be displayed during the start of the application:
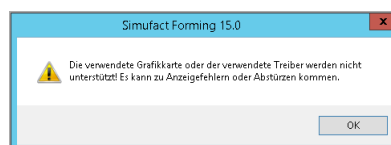

Figure 3.1. Warning because of unsupported graphics adapter

If you get this warning, you proceed at your own risk. Typical display errors are missing colors, missing captions, and blank windows. During post processing missing colors may lead to the impression of wrong results as the expected distribution is shown all in one color. Additionally Simufact Welding may crash reproducible or randomly at different occasions if an unsupported graphics adapter is used.

If your graphics adapter supports OpenGL 2.1 and you get this warning and issues, try whether updating the driver helps. Check whether you have several graphics adapters on your computer. Most modern computers have a "simple" graphics adapter integrated in the CPU or in the main board. Ensure that Simufact Welding does *not* use these adapters but uses your high performance graphics adapter. The management software of your graphics adapter may enable to bind `sfWelding.exe` to this adapter. Consider deactivating the additional graphics adapters completely in the BIOS of your computer.

Frequently the Windows Remote Desktop does *not* support OpenGL 2.1 correctly, even if the underlaying hardware and drivers do. This is a limitation of the Windows Remote Desktop, not of the Simufact application. If needed consider the usage of a more advanced 3rd-party Remote Desktop software that correctly supports the needed graphics features. An additional benefit of this is that the SpaceDevices from 3DConnextion™ are supported in some advanced 3rd-party Remote Desktop systems, while they are not in the Windows Remote Desktop.

3.1.4. The GUI does not appear after launching the program

- Make sure that the license feature to open the GUI on your machine is available and valid. You should get an error message with the possibility to review the licenses if no licenses are available for the GUI.

- Make sure that the target `"...\simufact\welding\8.0\bin\simufact.welding.exe"` of the shortcut to launch the program is correct.

- Open a command prompt, navigate to the installation directory and start `simufact.welding.exe` from within the command prompt. Watch for errors.

- Check in the Windows™ Taskmanager whether simufact.welding.exe is running. Note: The Windows™ pop-up messages indicating an application crash may be disabled on your system.

3.1.5. Initial meshing does not work

- Check the installation path and also the name of the geometry. They should not contain special characters such as @, ü, ø, etc. Try to mesh different geometries using different meshers, use some examples of the Demos & Examples of Simufact Welding.

- Initial meshing is done using a temporary directory in `%TEMP%\simufact.welding`. This should be on a local drive with a drive letter. Some times the user names, that get part or `%TEMP%` can cause problems. Consider to define an other location for `%TEMP%` by redefining this environment variable in the Windows™ system control under system.

- Check and redefine the setting `ScratchDirectory` in the `[Environment]` section of `C:\Users\<user-name>\AppData\Roaming\Simufact\simufact.welding_8.0\simufact.welding.ini`.

3.1.6. Simulation fails when the project is stored on a network drive

Simulation jobs with DDM may fail to run and exit immediately when the Simufact project is stored on a network drive. Parallel calculations using DDM require a local working directory for the solver. The usage of network drives or network paths is frequently not possible. Thus, to be able to use DDM, the Simufact project needs to be stored on a local hard drive (if neither Simufact Remote nor individual start scripts are used). Otherwise conflicts with the access rights to files will arise because of the control of the solvers by the MPI service causing an immediate abortion of the simulation. If your IT infrastructure or your IT policies do not allow this, you can configure the "local server"

of Simufact Remote with a local working directory on your local PC and start Simufact simulations stored on a network drive using "pseudo remote" to your own PC.

3.2. Log files

The software writes several log files that provide additional information that might be helpful in case of problems:

• **Simufact Welding GUI**: Keeps track of what the user does and what the program does internally.

• **License client**: keeps track of granted and denied licenses.

• **Result manager**: Keeps track of the result import from the `_Run_` directory into the result repository (directory `_Results_`).

• **Simufact Forming GUI memory dump**: If the GUI crashes, this file contains detailed information that might help our programmers to locate and fix the causes that led to the crash.

Generally the log files will clean up them self. Only a limited number or a limited size is stored. Normally no user interaction is needed to delete old log files.

3.2.1. Simufact Welding GUI

Path: `%localappdata%/Simufact/log`

Contents: Keeps track of what the user does and what the program does internally.

```
USE 1026 13:05:55.530463  1292 General      Check license
USE 1026 13:05:55.746518  1292 General      Open main window
USE 1026 13:05:58.052950  1292 General      Create new project
DET 1026 13:05:58.055965  1292 General      Units: mm, ton, C, s, deg., kN, MPa, J, kg/m3, rotation/min, mm/s, J, mm3
USE 1026 13:05:58.071084  1292 General      Show object catalog
USE 1026 13:05:58.072685  1292 General      Insert new process
USE 1026 13:06:01.504554  1292 Settings     Created process type in application module 'Cold forming' and with proces
WAR 1026 13:06:02.233372  1292 General      QFileInfo::absolutePath: Constructed with empty filename
USE 1026 13:06:02.238461  1292 General      Create new process preview for 'FormingFe3D'
DET 1026 13:06:02.239461  1292 General      Create frame 0x9bc0ef0
DET 1026 13:06:02.248467  1292 General      Create view 0x9b24840
USE 1026 13:06:02.258164  1292 General      Created new Qt view wrapper (FormingFe3D - Model view): (ID 4096)
WAR 1026 13:06:02.258664  1292 General      QLayout: Attempting to add QLayout "" to QGroupBox "", which already has
WAR 1026 13:06:02.261167  1292 General      QLayout: Attempting to add QLayout "" to vi::AnimationToolbar "animationT
PRO 1026 13:06:13.201246  1292 General      Create autoshape cube (xyz = 0.002 / 0.003 / 0.005, refine = yes, minimal
PRO 1026 13:06:13.201246  1292 General      Insert new item into object catalog: Cube
PRO 1026 13:06:15.298223  1292 General      Assign item in tree view: item Cube, parent Workpiece
PRO 1026 13:06:15.298724  1292 General      Process tree: rename Workpiece as Cube
USE 1026 13:06:54.586088  1292 General      Open the <Translate> dialog
DET 1026 13:07:02.835882  1292 General      New transformation matrix of Cube:
DET 1026 13:07:02.835882  1292 General                   1           0           0           0
DET 1026 13:07:02.835882  1292 General                   0           1           0           0
DET 1026 13:07:02.835882  1292 General                   0           0           1           0
DET 1026 13:07:02.835882  1292 General              0.0023           0           0           1
```

Figure 3.2. Simufact Welding GUI log file

Format:

• message type (USE = user, WAR = warning, PRO = progress, DET = details)

• date

• time (with microseconds)

• thread ID

• topic

• message

3.2.2. License client

The messages of the license client get part of the messages in the log- and out-files of the solver and of the meshers. The GUI does not log this.

Note: The MSC Licensing license server has its own log-file showing useful information and among this the granted licenses.

3.2.3. Result manager

Path: `<process directory>/_Log_/<process name>_ResultManager.log`

Contents: Keeps track of the result import from the `_Run_` directory into the result repository (directory `_Results_`).

```
Okt 26 16  12:02:42.578 [T DEBUG]  Solver @ increment 27, state: Running
Okt 26 16  12:02:42.579 [T INFO ]  Importing increment 25
Okt 26 16  12:02:42.581 [T DEBUG]  Moving 'C:/Users/christian/Desktop/01_Cold_2DFE/PROJECT/01_Cold_2DFE/Rigid
Okt 26 16  12:02:42.581 [T DEBUG]  Moving 'C:/Users/christian/Desktop/01_Cold_2DFE/PROJECT/01_Cold_2DFE/Rigid
Okt 26 16  12:02:42.582 [T DEBUG]  Moving 'C:/Users/christian/Desktop/01_Cold_2DFE/PROJECT/01_Cold_2DFE/Rigid
Okt 26 16  12:02:42.583 [T DEBUG]  Moving 'C:/Users/christian/Desktop/01_Cold_2DFE/PROJECT/01_Cold_2DFE/Rigid
Okt 26 16  12:02:42.584 [T INFO ]  Adding surface set to C:/Users/christian/Desktop/01_Cold_2DFE/PROJECT/01_C
Okt 26 16  12:02:42.589 [T DEBUG]  Took 5ms.
Okt 26 16  12:02:42.589 [T DEBUG]  Moving 'C:/Users/christian/Desktop/01_Cold_2DFE/PROJECT/01_Cold_2DFE/Rigid
Okt 26 16  12:02:42.590 [T DEBUG]  Moving 'C:/Users/christian/Desktop/01_Cold_2DFE/PROJECT/01_Cold_2DFE/Rigid
Okt 26 16  12:02:42.591 [T DEBUG]  Moving 'C:/Users/christian/Desktop/01_Cold_2DFE/PROJECT/01_Cold_2DFE/Rigid
Okt 26 16  12:02:42.592 [T DEBUG]  Moving 'C:/Users/christian/Desktop/01_Cold_2DFE/PROJECT/01_Cold_2DFE/Rigid
Okt 26 16  12:02:42.595 [- DEBUG]  Merge new increments
Okt 26 16  12:02:42.595 [- DEBUG]  Fetched increment 25
Okt 26 16  12:02:43.110 [T DEBUG]  Solver @ increment 38, state: Running
```

Figure 3.3. Result manager log file

3.2.4. Simufact Welding GUI memory dump

Path: `%appdata%/Simufact/MemoryDumps`

Contents: If the GUI crashes, this file contains detailed information provided by the operating system (error message, call stack etc.) that might help our programmers to locate and fix the causes that led to the crash.

3.3. Support

Although the simple and intuitive use of our software is one of our main focuses, the design of some complex processes requires additional training courses. Troubleshooting can also become difficult and time-consuming for unexperienced users. Generally it makes a lot of sense that the user solves these problems by himself in order to gain experience, but often a tight schedule does not allow this. For this reason Simufact offers an extensive support to our customers.

Please note that only the current version and the previous main version of the product in question can be supported.

3.3.1. Contacting the support

You get full support if your company or institution closed a support contract with Simufact. Otherwise we can only offer very limited or no support.

Since we value regional support without major language and time zone barriers, you receive the information required for contacting the Simufact support from your local vendor.

Please feel free to send the following inquiries to the support:

• problems with starting or executing Simufact products

• installation and configuration problems

• problems with the model setup

• problems with the simulation / calculation

• suggestions for software improvements or new functions

3.3.2. General information about your support request

In order to help us answer your requests, please provide us with the following information when calling or writing an e-mail:

- name of the user, name of the company or institution, location

- used products (Simufact Forming, Simufact.formingGP, Simufact Welding, Simufact Additive etc.) including the program versions

- operating system of workstation / server

- For problems with the installation or configuration we need the type of license (nodelocked or floating) and the planned usage (local, Simufact Remote, Start Scripts, Windows™ Remote Desktop, etc.).

3.3.3. Problem description

In order to reduce unnecessary delays, please make sure that your inquiry contains all relevant information:

- What kind of error occurs and in which situation? A detailed description about what happens and what was expected instead is very helpful to us.

- If you contact our support by e-mail, please add screenshots that demonstrate the problem.

- In case of a model-specific problem, please add the model without results. It is especially important to know at which simulation progress the error occurs. (See below for general information about sending models.)

- In case of aborted simulations the support needs the output files of the solver, which include the status file (*.sts), the log file (*.log), the standard-log file (*_std.log), and the out file (*.out). You can find these files in the _Run_ directory of your process, which can be opened with the shortcut Ctrl+E or by right-clicking the started process and then **Open process folder**.

- In case of installation or configuration problems: Do you install the program(s) for the first time or is it a re-installation? Do you have more installed Simufact products and do they work as expected, or did you uninstall them?

- In case of problems with stability, licenses or remote simulations: Did the problem occur since your first installation or only since you updated your system (e.g. new program version, new license, new antivirus program etc.)?

- Is the problem limited e.g. to a certain process, a certain model, a workstation, a user etc. or is it a global problem?

- Can you reproduce the problem or does it only occur sporadically or accidentally?

3.3.4. General information

How to send your models

Usually you should send your models without results, without redundant files and compressed into an archive file (zip, rar, 7zip).

- In order to send a Simufact Forming model, choose "File" → "Save as" → "without results" and select the process in question. Afterwards right-click in the object catalog window and select "remove unused". Now open the directory where the project is saved and compress the *.sfp file as well as the appropriate folder into an archive file.

  If your process transfers the results of a previous process stage, the corresponding result of that previous stage is also needed in the project. Choose "File" → "Save as" → "with results" and select the process in question as well as the previous stage. Delete the results of the process in question from your new project. Finally the redundant result steps of the previous stage have to be deleted using the result management: Right-click the result symbol 🏷 in the process tree and select "Properties". Mark all result steps except for the last step, and delete the marked steps with ❌.

- In order to send a Simufact Welding model, click on the small triangle next to the icon "create a new empty project" 📁▾ and choose "create project from current". Select the process in question and un-check the results. The object catalog will be automatically cleaned up in the new project and results from a previous stage will be added automatically if required.

- Even after deleting redundant data from the project it is possible that the size of the compressed model exceeds the mailbox limit. For these cases Simufact offers an FTP server with a secure location where you can put your model.

Contact your support for details. Please check in advance if you have sufficient permissions for a connection with an FTP server. Usually you can get this information from your IT department which can also grant permission.

Remote support / Remote maintenance

In principle we can offer remote support using a remote maintenance tool (e.g. TeamViewer™, WebEx™ etc.). Our support will check if this method can be helpful to solve your request. Please check in advance if you are allowed to use a connection via a remote maintenance tool like Teamviewer™ or if there are alternative tools available for this purpose in your company. Usually you will receive this information from your IT department.

Appendix A. MSC Licensing: Configuring and managing licenses

MSC Licensing, the FLEXlm based licensing software used for Simufact and MSC products, is shipped with its own documentation. A lot of additional information is available, too. This appendix is not indented to be a comprehensive information about MSC Licensing, only the most common tasks and situations when configuring and managing licenses are described and some more in depth topics are shortly mentioned. In case of deviations between this documentation and the MSC Licensing resp. FLEXlm documentation the later shall prevail.

The license system consists of a client, this is the Simufact application you want to run, and a server, that is the software service that provides the licences based on a license file. Additionally there are graphical and command line utilities for configuration and status information purposes.

A.1. Configuring the license client

The license client is configured only using the environment variable MSC_LICENSE_FILE. This variable tells the Simufact application where to look for the license. MSC_LICENSE_FILE is typically something like 'portnumber@hostname' pointing to a license server, which applies to nodelocked licenses, too. Only for uncounted demo licenses or similar exceptions MSC_LICENSE_FILE directly point to the license file. MSC_LICENSE_FILE may be a list with multiple entries separated by ";" (Windows) or ":" (Linux). These entries are queried in the order given.

Please note that MSC_LICENSE_FILE may be a system wide environment variable - recommended in most cases - or a user specific environment variable.

The value of MSC_LICENSE_FILE is displayed in the settings dialog of the Simufact application under Licenses and in all cases of a license failure. Further more it can be reviewed using the means provided by our operation system. Frequently using the command line is simple and fast for this: `set` shows a list of all environment variables, `echo %MSC_LICENSE_FILE%` (Windows) resp. `echo $MSC_LICENSE_FLIE` (Linux) display just this variable.

MSC_LICENSE_FILE can be set during the installation of your Simufact application (Windows only), but changing it afterwards is not supported within the Simufact applications or within MSC Licensing. Use the means provided by our operation system for this. On Windows this is typically in the system control panel under system \ advanced settings. Search the Windows help for "environment variable". On Linux use the initialisation files of your shell.

A.2. Firewall considerations

The license server of MSC Licensing uses two services: The FLEXlm main service called "lmgrd" and the vendor service called "MSC". Both use different ports. Thus if you have a firewall between license server and client, you need to open both ports. The port used by the main service is configured during the installation of MSC Licensing and is specified on the clients within the environment variable MSC_LICENSE_FILE. As default the port used by the vendor service is randomly chosen during startup. But it can be configured in the license file, which enables a constant firewall configuration.

To configure the port to be used by the vendor service, add `port=your_number` to the end of the `DAEMON` line in the top of the license file (see example blow) and restart the license server service either using the buttons provided in the graphically `MSC.Licensing Utility` (`LMTOOLS`) on the `Start/Stop/Reread` tab or using the means provided in the service control of your operating system.

The port to be used by the main service is given as last argument in the `SERVER` line in the top of the license file, thus it can be reviewed and changed there.

Resulting form this and other configurations there are differences between the license file as it is shipped to you and as it is used by the license server.

```
SERVER ING08 1813731e3d93 27500
DAEMON MSC C:\MSC.Software\MSC.Licensing\11.13\msc.exe port=27501
#
# MSC License Reference ID: WXYZ
#
# Simufact
#
FEATURE SF_FORM_GUI MSC 2018.0309 09-mar-2018 2 F92DAC800190 \
        VENDOR_STRING=PID:10653 ISSUED=11-mar-2017 ck=103 \
```

A.3. Updating the license file

After a renewal of your maintenance or lease period and on other occasions you will receive an updated license file. Please note that you will typically not receive a new license file once a new release of your Simufact applications has been published. To update the license file used by your license server, follow the following steps:

1. Locate the used license file in the installation directory of MSC Licensing - typically `license.dat` in `C:\MSC.Software\MSC.Licensing\11.13` - and create a backup copy of it.

2. Stop the license server service, either using the button provided in the graphically `MSC.Licensing Utility` (LMTOOLS) on the `Start/Stop/Reread` tab or using the means provided in the service control of your operating system.

3. Copy the received new license file `license.dat` into the installation directory of MSC Licensing replacing the old already existing file.

4. Manually edit the new `license.dat` as shown below. The automatic configurations done in the license file during the install of MSC Licensing have to be reproduced, potential manual configurations in the license file (for example for a firewall, see above) have to be reproduced, too.

5. Restart the license server service, either using the button provided in the graphically `MSC.Licensing Utility` (LMTOOLS) on the `Start/Stop/Reread` tab or using the means provided in the service control of your operating system.

The top of a license file as it is shipped typically looks like:

```
SERVER this_host 1813731e3d93 27500
DAEMON MSC /your_path/msc
#
# MSC License Reference ID: WXYZ
#
# Simufact
#
FEATURE SF_FORM_GUI MSC 2018.0309 09-mar-2018 2 F92DAC800190 \
        VENDOR_STRING=PID:10653 ISSUED=11-mar-2017 ck=103 \
```

If for example your license server machine has the IP-name `ING08`, you have chosen to use port 1700 for the main license service, you have installed in the default location and you have - which is

optionally - manually set a port for the vendor service, you have to edit the new license file to look like this:

```
SERVER ING08 1813731e3d93 1700
DAEMON MSC C:\MSC.Software\MSC.Licensing\11.13\msc.exe port=1701
#
# MSC License Reference ID: WXYZ
#
# Simufact
#
FEATURE SF_FORM_GUI MSC 2018.0309 09-mar-2018 2 F92DAC800190 \
        VENDOR_STRING=PID:10653 ISSUED=11-mar-2017 ck=103 \
```

Please note that the above modifications are an example which has to be adapted to your local settings. **It is recommend to review the old, working license file to check which adaptations are needed in the new license file.**

A.4. Combination with other MSC products

If you have licensed Simufact and other MSC products on the same license server, MSC Licensing is needed only once on this machine, actually it must only be used once on this machine. But you will receive separate license files for Simufact and other MSC products at separate times and from separate senders. You have to combine these license files for the usage by the license server.

The recommended method to do so is:

1. Install and configure MSC Licensing either for the Simufact application or for the MSC application in the normal way using only the corresponding license file. Test your installation.

2. Stop the license server service, either using the button provided in the graphically `MSC.Licensing Utility` (LMTOOLS) on the `Start/Stop/Reread` tab or using the means provided in the service control of your operating system.

3. Open the license file in the installation directory of MSC Licensing - typically `license.dat` in `C:\MSC.Software\MSC.Licensing\11.13` - with a text editor and copy all `FEATURE` lines of the 2nd license file into it. Additionally you may add some comment lines starting with # to separate the licenses for the different products. Please note that one `FEATURE` line typically consists of several lines of text. The \ at the end of a line of text indicate that the `FEATURE` line continuous in the next line of text. Please take care to copy all `FEATURE` lines complete and unchanged. Do not copy the `SERVER` and the `DAEMON` line of the 2nd license file.

4. Restart the license server service, either using the button provided in the graphically `MSC.Licensing Utility` (LMTOOLS) on the `Start/Stop/Reread` tab or using the means provided in the service control of your operating system.

Once you receive an updated license file for one of your Simufact or MSC products, repeat the steps above, but do not add `FEATURE` lines during copying but replace the existing `FEATURE` lines with the updates lines. Frequently 1st deleting all `FEATURE` lines of a product in the license file in the installation directory and then copying the new lines will be a good approach.

As an alternative advanced users may configure and maintain separate license files for different products. See the tech article KB8021145 in the MSC SimCompanion Knowledge Portal for details.

A.5. Combination with 3rd party products

MSC Licensing is based on the FLEXlm license management software of Flexera Software (www.flexerasoftware.com). FLEXlm is widely used of a lot of applications of different software

vendors. Typically no special care is needed when running applications of different vendors that use the FLEXlm license management system. Conflicts are rare. Nevertheless here some hints about this.

> Try to avoid the usage of the general FLEXlm environment variable LM_LICENSE_FILE. In rare conditions of license server and license client machines cross referencing each other for different applications this may result in conflicts including non-functionality. Use the vendor specific environment variables like MSC_LICENSE_FILE, HPQ_LICENSE_FILE or similar instead. If conflicts can not be solved with this, encapsulate the concerned license server and / or applications into their own environment.

If the same machine is used as license server for both, Simufact and MSC applications as well as for a 3rd party application that uses a FLEXlm based licensing system, we recommend to keep the installations separate and to run each vendors FLEXlm license server as a separate process on the same machine. The resources needed for this are very little. Keeping the installations separate simplifies the maintenance of the licenses and avoids conflicts, for example resulting from different required FLEXlm versions.

However, if desired, a common "lmgrd" main license service can be used. In this case the license files of all vendors would need to be combined including the required DAEMON and VENDOR lines as well as the other options that may be present. For more information, documentation and help for this option, please see the relevant FLEXlm resources. This is outside of the scope of the support of Simufact and MSC.

A.6. Restrictions

Within one license file each FEATURE can only be included once. Within one license file shipped to you all features will be of the same type (nodelocked or networking) and will have the same maintenance end date and the same expiry date. Furthermore a license file shipped to you may not include all your licensed features, but only the latest additions and changes. Thus, in case you purchase or lease additional Simufact products or modules during your maintenance or lease period, you will have to combine the new license file shipped to you and the already running licenses manually similar to the procedure explained in Section A.4 above.

In cases like a short term lease of additional simulation capacity or a test of the effectivity of for example more parallel options where the additional licenses expire before your regular license, you will probably receive a license file with FEATURE lines containing the sum of your licensed quantity, but expiring at the earliest date. In this case you first have to backup your used license file. Then you have to delete these features from your used license file and to add the new received FEATURE lines with the sum of your licensed quantity. After the expiry of the short term licenses you have to switch back to using your original backed-up license file.

Remember to stop and to start your license server service after each change of your license file.

A.7. Miscellaneous

- The license server service writes a log file, typically `C:\MSC.Software\MSC.Licensing\11.13\lmgrd.log`. This file does not only contain useful debugging information but shows `OUT:` and `IN:` messages of the license usage, too. This can be used to monitor the license usage.

  For more advanced usage reporting Flexera Software offers extra-cost tools directly to end-users. This is outside of the scope of the support of Simufact and MSC.

- Network licenses can be served by redundant license servers where one out of three may be offline. A special license file is needed for this. If needed, please ask your local Simufact sells representative about this. Please note: While new license queries will be very stable in this configuration, long running license occupancies (like solver runs) may still show some instability when a license server

goes offline. See the tech article KB8020361 in the MSC SimCompanion Knowledge Portal for details how to configure this set-up.

- MSC Licensing is shipped with the powerful command line debugging tool `lmutil`. Check `lmutil -help` for the available options. Some typical tasks are:

  `lmutil lmhostid` to get a list of valid host-IDs of the machine used. In rare circumstances this may deviate from the output of `getmac /v` or `ipconfig /all` (both on Windows) that are typically used when determining the host-ID before applying for a license.

  `lmutil lmcksum -c license.dat` to check the syntax and the checksum of the license file, which is useful if issues due to the transmission or the editing of the license file are suspected.

  `lmutil lmstat -a -c portnumber@hostname` to check the status of the license server and the vendor services including a list of license features that can be served. As the output may be bigger, you may want to redirect it to a file by adding `> status.txt` at the and of the command line.

  `lmutil lmdiag -c portnumber@hostname -n > diag.txt` to review diagnostic information about all license features served including whether they can be checked out and reasons why they can not be checked out. As the output is this command is typically quite large, it is recommended to redirect it to a file.

- MSC Licensing offers the a lot of advanced configurations. For example the access to network licenses can be restricted and controlled flexibly including reserving features for certain users. This is done using an additional option file. Please see the relevant FLEXlm resources. This is outside of the scope of the support of Simufact and MSC.

Appendix B. Basic commands of the editor `vim`

`visudo` will probably open /etc/sudoers in `vim`, a non-graphical text editor operated by key strokes. For your reference here a list of the very most basic key strokes needed to work with `vim`. See the man page and the on-line help of `vim` for much more.

```
arrow keys      navigate the cursor
i               chance to the insert mode before the current
 character
a               chance to the insert mode after the current
 character
ESC-key         chance back to the navigate mode

ZZ              save and exit
:q              exit with question about saving
:q!             exit without saving
:w              save

Ctrl + f        go down one screen
Ctrl + b        go up one screen
1G              go to the start of the file
G               go to the end of the file
$               go to the end of the line
0               go to the beginning of the line
ma              set the marking a
'a              go to the marking a
d'a             delete between the cursor and the marking a
x               delete the character below the cursor
dd              delete the current line
/xyz            search for xyz, consider capital and small letters
n               repeat last search
N               repeat last search upwards

:set [no]wrap   switch the line break on or off
```

Key strokes starting with `:` or `/` need to be followed a the `enter`-key.

Appendix C. Password-less login with `ssh`

In Marc 2018.0.0, 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 ''
  ```

  Please note that 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 localhost
```

without getting a prompt for the password. You could replace `localhost` by the hostname of the current machine.

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 su re 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.