

# Zencrack

**Installation And Execution Manual**

Version 7.8



# Zencrack 7.8 - Installation And Execution

## Issue 7.8

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Zentech document no.: **i009/doc/780e**

Revision status		Approval			
Iss./Rev.	Date	Originator	Checked	Zentech	Client
7.8, 0	04/07/2012	CMT	AH	RC	

<b>Status details for Issue 7.8 Revision 0</b>			
<b>Status legend: * = change, N = new, D = deletion</b>			
<b>Pages</b>	<b>Status</b>	<b>Rev. no.</b>	<b>Comments</b>
<b>1-31</b>	<b>N</b>	<b>0</b>	<b>Original version of document</b>

**Software – versions are identified by version number and build date**

Version	Build date	Description
7.8-1	28 June 2012	Program release

**Version Status for this manual:**

This version of the manual is to be used with Zencrack program version 7.8-1, 28 June 2012. The program version and build date are shown in the banner at the start of every Zencrack output file (i.e. the .rep file). All pages are at “Issue 7.8, Revision 0”.

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## 1. Introduction

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This document describes installation, set-up and execution of Zencrack version 7.8-1 for Windows x86 and Linux x86 platforms. This includes the Zencrack product and the RLM license server (which is required for network licensing). If sub-releases are made, the sub-version will change to 2, 3 etc. (e.g. 7.8-2, 7.8-3) and the instructions in this document should be read with 7.8-1 replaced by the appropriate sub-version number.

A 32bit version of Zencrack 7.8 operates on x86 machines running Windows XP or later. A 64bit version is available for x86 machines running 64bit versions of Windows such as Windows XP x64 Edition or later. A 64bit version of Zencrack is also available for x86 machines running Linux.

Documentation uses Adobe Acrobat format pdf files (version 5) and requires a suitable reader. A reader can be downloaded from <http://www.adobe.com/products/acrobat/readstep.html>.

Up-to-date information on compatibility of different versions of the interfaced finite element codes is maintained on the Zencrack section of the Zentech website:

<http://www.zentech.co.uk/zencrack.htm>

If Zencrack user subroutines are to be used then an appropriate version of the Intel Fortran compiler must be installed. Up-to-date information on compatibility of compiler versions can also be found on the above website.

### 1.1 License types

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Zencrack can be licensed using a nodelocked license file or using a token-based license server (i.e. network licensing) system. Both systems are based on the Reprise License Manager (RLM v8) [Ref. 1].

For a nodelocked system the software (either Zencrack Standard or Zencrack Professional) can only be executed on the machines(s) specified in the license file. The nodelocked method does not require installation of a license server – only the placement of the supplied license file into the license sub-folder of the Zencrack installation.

For network licensing, a license server must be installed on a specified machine. The license file declares this machine as the license server and contains information about the licensed products. All files required for the license manager are supplied by Zentech – there is no requirement to download files from the Reprise website. The Zencrack product is then installed on one or more client machines (one of which could be the server machine). When a Zencrack job is executed on a client machine a request is made to the server to check out the required number of tokens for the job. This manual covers the basics of installing, starting and using the RLM license server. Additional information can be found in the RLM End User Manual supplied as part of the license server installation and the Zencrack documentation.

### 1.2 Hardware requirements

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The approximate disk space requirements for Zencrack installations are:

- |                                  |      |
|----------------------------------|------|
| • 32bit x86 Windows              | 71Mb |
| • 64bit x86 Windows              | 75Mb |
| • 64bit x86 Linux                | 71Mb |
| • License server (all platforms) | 2Mb  |
| • Documentation                  | 30Mb |

Memory requirements are governed by the requirements of the finite element analysis rather than by Zencrack so provided there is sufficient memory to run the finite element analyses of typical user models there should not be any memory issues for Zencrack.

The Zencrack analysis program is purely an “analysis engine” so there are no special graphical hardware requirements. Input and output to the program is via ASCII text files.

The Zencrack plug-ins for Abaqus/CAE and Abaqus/Viewer have no special hardware requirements beyond any requirements for running /CAE or /Viewer.

THE RLM license server and client installations are available for Windows x86-32 or x86-64 machines or Linux x86-64 machines.

### 1.3 Software requirements

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Zencrack is supplied as an executable, object files and ancillary support files. In the event that a Zencrack user subroutine option is required it is necessary to compile the routines and link with the supplied object files to create a new executable. This can be achieved using the -u command line option (see section 5.2) and requires an Intel Fortran compiler. Updated information about compatibility with Intel Fortran versions is available at:

[http://www.zentech.co.uk/zencrack\\_support\\_fortran.htm](http://www.zentech.co.uk/zencrack_support_fortran.htm)

If user subroutines are not used, there is no requirement to have an Intel Fortran compiler installed.

Each installation of Zencrack contains a readme.txt file in its top-level directory that provides details of the operating system and compiler used to create that version of the software. If you have an earlier compiler version, you may need to upgrade to at least the compiler version used to create Zencrack, or have the necessary run-time files in place.

Zencrack is interfaced to Abaqus/Standard and Ansys/APDL and the user license permits use with one or both of these programs. The finite element program must be executed on the same machine as Zencrack unless the remote finite element execution option is activated. This capability is available if Zencrack is installed on a Windows PC with the finite element analysis required on a remote Linux or Unix machine.

For users with a license server arrangement all necessary files for the server installation are supplied in a separate installation file, i.e. one installation file for client product installation and one for license server installation.



## 2. Installation - Zencrack Product

This section describes installation of the Zencrack product. This is applicable for nodelocked licenses and for client installations when using a network license server.

### 2.1 Windows

The Zencrack product is supplied as two files:

Zencrack\_7-8-1\_Windows\_x86-nn.exe  
 setup program containing the program files  
 (nn is 32 or 64 for 32bit or 64bit versions of Windows)

Zencrack\_7-8-1\_Windows\_x86-doc.exe  
 setup program containing the documentation files

If Windows UAC (User Account Control) is running on the installation machine, there may be additional system messages generated when installing from these files.

The default program installation location is c:\Zencrack\7.8-1 but this may be changed if required. The user installing the program must have sufficient privilege to create files in the chosen location.

As part of the program installation, a setup program is run to configure the installation. During this process two files are created in the Windows “system32” directory. This requires that the logged-in user have privilege to create files in this system area. During this configuration process the choice is made regarding location of finite element code(s), the Fortran environment and the licensing type.

The documentation can be installed before or after installation of the program. It is recommended that the documentation be installed into a sub-directory of the main Zencrack folder. For this reason the default documentation location is c:\Zencrack\7.8-1\_document.

It is not recommended to run analyses or create any other files within the Zencrack installation directories.

#### 2.1.1 To install the program files (Windows)

1. Log in as an administrator or any user with sufficient privilege to meet the requirements stated above regarding creation of files in the Windows “system32” directory.
2. Run the Zencrack\_7-8-1\_Windows\_x86-nn.exe setup program to install Zencrack (the default home directory c:\Zencrack\7.8-1 is used throughout the remainder of these instructions).
3. The following directory structure is created under the home directory:
 

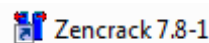
bin	Zencrack executable, object and library files (Intel Fortran)
crack	Crack-block files Tolerance file tol.dat
demos	Example input files – see the readme.txt file in this directory
fe_abaqus	Files related to the Abaqus interface (including /CAE plug-in files).
fe_ansys	Files related to the Ansys interface
license	Nodelocked license file should be placed here <sup>1</sup>
machine_id	Utility to extract details required to license Zencrack
tools	Setup files and location of file runzcr78.bat after completion of setup Setup executable is setupzcr_32.exe for 32bit installations Setup executable is setupzcr_64.exe for 64bit installations
utils	Utility programs: 3dmesh : crack profile generator process : creates a .csv data file for specified node(s) on a crack front

<sup>1</sup> The nodelocked license file is supplied separately from the program installation files. See section 7.

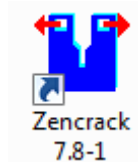
rainflow : rainflow cycle counting  
 tanh : creates tabular growth data from tanh growth equation data  
 T4eRexec: used for remote f.e. execution  
 T4eSSH : used for remote f.e. execution  
 examples directory for utility programs

readme.txt Installation information  
 versions.txt Version information

4. If the “Zencrack configuration” phase of the setup was successfully run, this step can be skipped, otherwise open the c:\Zencrack\7.8-1 tools directory and run the program setupzcr\_32.exe (or setupzcr\_64.exe) located in this directory by double clicking on the file. It requests information on the location of Abaqus and Ansys and also details of the Fortran environment (if any) and license type. It then configures the Zencrack files accordingly.
6. For nodelocked licenses put a copy of your license file (see section 7) into the license directory.
7. To make a desktop shortcut for Zencrack:  
 Right click on the Zencrack shortcut file in the c:\Zencrack\7.8-1\tools directory and drag it onto your desktop. This shortcut is the file called “Zencrack 7.8” (not the icon file “Zencrack781.ico”). Depending upon the view setting for the folder, the file looks like this (for Windows Vista):



Details or List



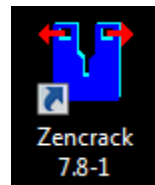
Icons



Tiles

Select “Copy here” or “Create shortcut here”.

The desktop shortcut including the Zencrack icon should look like this after completion:



If the shortcut does not display with this icon, a re-boot may be necessary.

8. Some items in the runzcr78.bat script can be manually modified after completion of installation. These items are described in section 4.

Note: the program detailed in step 4 above must be run at least once, either during the setup process or directly as described in step 4.

## 2.1.2 To un-install Zencrack (Windows)

The installation process does not create an entry in the list of installed programs, nor does it create any entry in the start menu. Un-installation is therefore a process of removal of the installed files:

1. Log in as an administrator.
2. Delete files under the installation directory, e.g. c:\Zencrack\7.8-1 in the above example, making sure to first backup any analysis files that may have been located there. It is not recommended to run analyses or create any other files within the Zencrack installation directories.
3. Delete two system directory files:  
 %SystemRoot%\system32\zencrack781.ico  
 %SystemRoot%\system32\zcrpath781.bat

4. Delete any desktop shortcuts that were created.

### 2.1.3 To install the documentation files (Windows)

It is recommended that the documentation be installed into a sub-directory of the main Zencrack folder. The documentation is in Adobe Acrobat version 5 format and requires a suitable reader.

1. Double click on Zencrack\_7-8-1\_Windows\_x86-doc.exe to start the installation process. Specify a home directory for the installation. The documentation does not have to be installed in the same location as the program files. The default is:  
c:\Zencrack\7.8-1\_document  
(this default name is used throughout the remainder of these instructions). When all files are unzipped select “ok” then “close”.
2. To make a desktop shortcut for the Zencrack documentation:  
Right click on zencrack78\_documentation.pdf file in the c:\Zencrack\7.8-1\_document directory.  
Drag it onto your desktop.  
Select “Create shortcut here”.

### 2.1.4 To un-install the documentation files (Windows)

1. Delete the documentation installation directory.  
i.e. c:\Zencrack\7.8-1\_document in the above example.
2. Delete any desktop shortcuts that were created.

### 2.1.5 Remote execution of the finite element code

A capability exists to allow remote execution of the finite element code on a Linux or Unix machine when Zencrack is installed on a Windows machine. This differs from the normal arrangement in which Zencrack and the finite element code are executed on the same machine. Please see section 8 for more information. The standard installation procedure described in the previous sections must be followed before configuration of remote execution of the finite element code is possible.

## 2.2 Linux

---

The Zencrack product is supplied as two files:

Zencrack\_7-8-1\_Linux\_x86-64.exe  
setup program containing the program files

Zencrack\_7-8-1\_Linux\_x86-doc.exe  
setup program containing the documentation files

The default program installation location is /home/Zencrack/7.8-1 where /home is the home directory for the user installing the program. This may be changed if required. The user installing the program must have sufficient privilege to create files in the chosen location.

After installing the program files the script file “runzcr78” in the sub-directory “tools” must be edited to specify certain information (see section 4).

The documentation can be installed before or after installation of the program. It is recommended that the documentation be installed into a sub-directory “document” of the main Zencrack installation.

It is not recommended to run analyses or create any other files within the Zencrack installation directories.

## 2.2.1 To install the program files (Linux)

1. Log in as any user with sufficient privilege to meet the requirements stated above.
2. Run the Zencrack\_7-8-1\_Linux\_x86-64.exe setup program to install Zencrack (the default home directory /home/Zencrack/7.8-1 is used throughout the remainder of these instructions).
5. The following directory structure is created under the home directory:
 

bin	Zencrack executable, object and library files (Intel Fortran)
crack	Crack-block files
	Finite element keyword status files
	Tolerance file tol.dat
demos	Example input files – see the readme.txt file in this directory
fe_abaqus	Files related to the Abaqus interface (including /CAE plug-in files).
fe_ansys	Files related to the Ansys interface.
license	Nodelocked license file should be placed here <sup>2</sup>
machine_id	Utility to extract details required to license Zencrack
tools	Location of file runzcr78
utils	Utility programs:
	3dmesh : crack profile generator
	process : creates a .csv data file for specified node(s) on a crack front
	rainflow : rainflow cycle counting
	tanh : creates tabular growth data from tanh growth equation data
	T4eRexec: used for remote f.e. execution
	T4eSSH : used for remote f.e. execution
	examples directory for utility programs
versions.txt	Version information
6. Edit the script file /home/Zencrack/7.8-1/tools/runzcr78.  
Set the value of the symbol ZENDIR. Depending upon the required finite element interfaces set values for the symbols ZCRABAQUS and ZCRABAQUSVER and/or ZCRANSYS and ZCRANSYSVER (see section 4 for additional information). Set the value of ZENCRACK\_LICENSE to indicate the license type. For license server installations set the value of ZENCRACK\_RLM\_SERVER to define the location of the license server machine on the network. Some other optional items in the runzcr78 script can also be set. These items are described in section 4.
7. For nodelocked licenses put a copy of your license file (see section 7) into the license directory.
8. Define a command to allow users to execute the ZENCRACK shell script, e.g. create a soft link in a directory in all users' paths or add the /home/Zencrack/7.8-1/tools directory to paths of individual users.

## 2.2.2 To un-install Zencrack (Linux)

1. Delete files under the installation directory, i.e. /home/Zencrack/7.8-1 in the above example, making sure to first backup any analysis files that may have been located there. It is not recommended to run analyses or create any other files within the Zencrack installation directories.

## 2.2.3 To install the documentation files (Linux)

It is recommended that the documentation be installed into a sub-directory of the main Zencrack folder. The documentation is in Adobe Acrobat version 5 format and requires a suitable reader.

1. Double click on Zencrack\_7-8-1\_Linux\_x86-doc.exe to start the installation process. Specify a home directory for the installation. The documentation does not have to be installed in the same location as the program files. The default is:  
/home/Zencrack/7.8-1\_document

<sup>2</sup> The nodelocked license file is supplied separately from the program installation files. See section 7.

#### **2.2.4 To un-install the documentation files (Linux)**

1. Delete the documentation installation directory.  
i.e. /home/Zencrack/7.8-1\_document in the above example.

### 3. Installation - License Server

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The RLM license server is available for Windows x86 and Linux x86-64 machines. The client (i.e. Zencrack product) installations may be on any Windows x86-32 or x86-64, or Linux x86-64 machines with network access to the server.

The extraction and installation of the license server files is described below. For further information on configuring the license server and monitoring license usage, refer to section 7.3 and the RLM End User Manual.

The RLM End User Manual contains information that is oriented towards the person who installs and administers RLM. In general, as a Zencrack end-user, you should not need to refer to this manual. The RLM End User Manual is supplied as part of the Zencrack documentation and with the RLM install files. Note that:

- Some topics in the RLM End User Manual are not relevant to the licensing of Zencrack.
- The RLM version used by Zencrack 7.8 is v8, though the supplied RLM End User Manual also covers RLM v9.

#### 3.1 Windows

---

The RLM files are supplied in one setup file, Zencrack\_RLMv8\_Windows\_x86-nn.exe (where nn is 32 or 64 for 32bit or 64bit versions of Windows). The file contains:

- The generic license server rlm.exe.
- The Zentech International license server zentechint.exe.
- The RLM command line utilities rlmutil.exe.
- The RLM End-User Manual, RLM\_Enduser.html.
- The license request program, machine\_id.exe (see section 7.1).

If Windows UAC (User Account Control) is running on the installation machine, there may be additional system messages generated when installing from these files.

The license file is provided separately and can be placed in any location. However, the configuration is simpler if the license file is located in the same folder as the installed server binaries.

To install the license server

1. Log in as an administrator.
2. Run the setup program to extract the files into your chosen location on the server. The files are extracted into a sub-folder rlm in the chosen location.  
If the machine is also to contain a client installation, it is recommended that the server location is outside the folder of a specific Zencrack version e.g. c:\Zencrack would be appropriate but c:\Zencrack\7.8-1 would not.
3. Place the supplied server license file in the same rlm sub-folder as the extracted files.
4. After placing the license file in the rlm sub-folder, refer to section 7.3.2 for information on starting the license server.

#### 3.2 Linux

---

The RLM files are supplied in one setup file, Zencrack\_RLMv8\_Linux\_x86-64.exe. The file contains:

- The generic license server rlm.
- The Zentech International license server zentechint.
- The RLM command line utilities rlmutil.

- The RLM End-User Manual, RLM\_Enduser.html.
- The license request program, machine\_id.exe (see section 7.1).

The license file is provided separately and can be placed in any location. However, the configuration is simpler if the license file is located in the same folder as the installed server binaries.

To install the license server

1. Run the setup program to extract the files into your chosen location on the server. The files are extracted into an rlm sub-folder in the chosen location.  
If the machine is also to contain a client installation, it is recommended that the server location is outside the folder of a specific Zencrack version e.g. /home/Zencrack would be appropriate but /home/Zencrack/7.8-1 would not.
2. Place the supplied server license file in the same rlm sub- folder as the extracted files.
3. After placing the license file in the rlm sub-folder, refer to section 7.3.2 for information on starting the license server.

Note that the programs rlm, rlmutil and machine\_id.exe should be run from within a terminal window.

## 4. Setup Of Zencrack Product After Installation

Zencrack requires that several symbols be set up prior to executing the program. Other optional settings can also be made as part of the program setup. The required and optional settings are defined in the `.\tools\runzcr78.bat` file for Windows and the `./tools/runzcr78` script file for Linux. Additional notes on all items described in the following sections are contained in the `runzcr78.bat` file and the `runzcr78` script file.

On Windows installations the execution of the setup program described in section 2.1.1 includes configuration of the items listed in section 4.1.1.

Note that re-running the `setupzcr_nn.exe` program for Windows installations will create a new `runzcr78.bat` file. Existing settings will either be retained or modified, depending upon the choices made when the setup program re-runs. A backup of any existing `runzcr78.bat` file is made before a new file is created.

### 4.1 Environment variables

#### 4.1.1 Required items

On Windows machines the required symbols are already defined in the batch file `.\tools\runzcr78.bat` after running the setup program. After the setup program is completed, the only change that is likely to be required is the specification of the number of processors to be used for finite element analyses submitted by Zencrack (see `OPTIONS_ABAQUS` and `OPTIONS_ANSYS` in section 4.1.2). However, the symbols may be manually modified at any time by editing the `runzcr78.bat` file.

For Linux installations the script file `./tools/runzcr78` must be edited manually after installing the program. The `ZENDIR` symbol must be defined. The symbols that should be set for execution of the finite element analysis depend upon the required finite element interfaces.

Options with spaces in their values should have the spaces replaced by a `#` character, e.g.:

```
ZCRANSYS="C:\Program#Files\ANSYS#Inc\v140\ansys\bin\winx64\ansys140.exe"
```

The symbol that require definitions (depending upon the licensed finite element interfaces) are:

<code>ZENDIR</code>	the Zencrack top level directory
<code>ZCRABAQUS</code>	the full location of the file <code>abqxxx.exe</code> provided as part of the Abaqus program installation and used to run Abaqus, where <code>xxx</code> refers to a version number, e.g. <code>610ef1</code> , <code>6111</code> , <code>6121</code> etc.
<code>ZCRABAQUSVER</code>	the Abaqus version which may optionally include the sub-version, e.g. <code>6.12-1</code> .
<code>ZCRANSYS</code>	the full location of the file <code>ansys.exe</code> provided as part of the Ansys program installation and used to run Ansys. To use a non-default Ansys product, ensure that “ <code>-p productname</code> ” is included in the definition of <code>OPTIONS_ANSYS</code> (see below).
<code>ZCRANSYSVER</code>	the Ansys version must include the sub-version and any service pack number, e.g. <code>11.0SP1</code> , <code>14.0</code> .
<code>ZENCRACK_LICENSE</code>	the type of licensing being used, either <code>NETWORK</code> or <code>NODELOCKED</code> .
<code>ZENCRACK_RLM_SERVER</code>	the location of the RLM license server specified in the form <a href="#">port@IPaddress</a> if network licensing is being used. The port number is stated in the license file on the license server. The IP address is the LAN address of the server machine. This variable does not need to be set when using a nodelocked license.



If a new version of Abaqus or Ansys is installed on the system, the relevant symbols ZCRABAQUS, ZCRABAQUSVER, ZCRANSYS and ZCRANSYSVER must be updated in the runzcr78.bat file or the runzcr78 script file.

To have Zencrack available with multiple versions of a finite element code, a copy of the runzcr78.bat file or runzcr78 script file should be made. For example, runzcr78.bat could be configured for Abaqus 6.12-1 and runzcr78\_abaqus69.bat could be configured for Abaqus 6.9-1. When a job is executed, the runzcr78 or runzcr78\_abaqus69 command is used depending upon which version of Abaqus is required for that particular Zencrack job.

#### 4.1.2 Optional items

Several additional items may be defined. Options with spaces in their values should have the spaces replaced by a # character, e.g.:

```
OPTIONS_ABAQUS=interactive#cpus=2
```

The symbols that are optional are:

**DEFAULTOUT** defines the default string applied to the input zcr filename to generate the output filenames when the OUTPUT parameter is omitted from the \*FILES keyword. The default is "r". For example:  
 if `DEFAULTOUT = _crack`  
 and the zcr file is `example.zcr`  
 then the output files are `example_crack.*` (e.g. `example_crack.rep`)

**FETYPE** defines the default type of finite element analysis. Value "input" is set at installation meaning "use the f.e. analysis type defined on the OPTIONS keyword of the .zcr file". The other allowed value is "check". This setting is overridden for individual jobs by the "-f" command line option. The default value in the script file should not be changed – use the command line option for individual jobs instead.

**OPTIONS\_ABAQUS** defines command line options for running Abaqus. This must contain "interactive". Other Abaqus command line options may be added. For example the CPUS option can be added to specify how many CPUs are used by Abaqus jobs submitted by Zencrack, e.g.:  
`OPTIONS_ABAQUS=interactive#cpus=4`

**OPTIONS\_ANSYS** defines command line options for running Ansys. This may include, for example, the number of processors used to run Ansys jobs or a specific Ansys licensed product, e.g.: `OPTIONS_ANSYS=-np#4#-p#prf`.

**OVERWRITE** defines whether or not previous output files are overwritten by default. Value "no" is set at installation, i.e. if a job identifies that previous output files exist it will abort without overwriting the existing files. This can be changed to "yes". This setting is overridden for individual jobs by the "-o" command line option.

**FORTRANstring** defines command line options for the compiler when a Zencrack user subroutine is required. For Windows this string defines only the compile options. In normal use this should not be modified.

**FORTRANlink** defines command line link options for the compiler when a Zencrack user subroutine is required. This option is only relevant for Windows. In normal use this should not be modified.

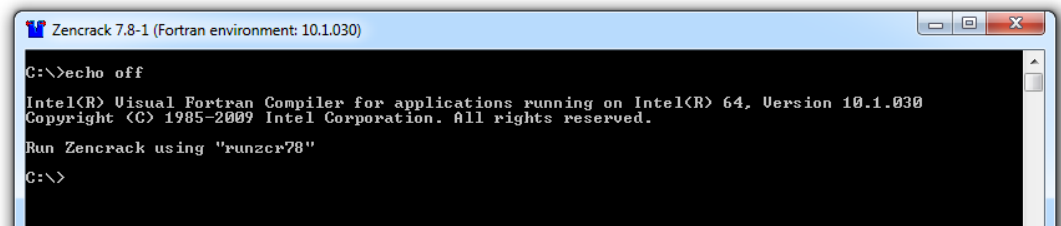
EXEC	defines the default Zencrack executable. This may be modified if a non-standard executable is to be used as the default. This setting is overridden for individual jobs by the “-e” command line option.
ZCROBJ	defines the location of the Zencrack object file used during linking when a Zencrack user subroutine is required. This setting should not need to be changed.
ZCRLIB	defines the location of the Zencrack library file used during linking when a Zencrack user subroutine is required. This setting should not need to be changed.
CNVANSYS	defines the default type of Ansys uncracked mesh file. The default is “automatic” for automatic determination of the type as normal or solid model. The other allowed values are “normal” or “solidmodel”. This setting is overridden for individual jobs by the “-a” command line option. It is recommended that the value “automatic” be used.
ZENCRACK_WAIT	the time in minutes that a job should wait for license tokens to become available if the tokens are in use by another job. The default is 30 minutes. During the waiting period the availability of tokens is checked every ten seconds. If this variable is not defined the wait time will be set to zero. This variable does not need to be defined for nodelocked licenses.

## 4.2 Using Zencrack user subroutines

A Zencrack user subroutine is included in an analysis by using the “-u” command line option as described in section [5.2](#).

Zencrack on Windows is configured for use with user subroutines as follows:

- When the setupzcr\_nn program is executed after installation it requests details of the required Fortran environment. Upon completion of the setup a file zcrpath781.bat is created in the %SystemRoot%\system32 folder. This file contains an initialisation for Fortran. This should not need to be modified by the user.
- When the Zencrack shortcut is used to start a Zencrack command prompt session, the zcrpath781.bat file is used to configure the command prompt window. The title bar of the command prompt window includes details of the Fortran environment and the initialisation of the Fortran compiler is reported in the window, e.g.:



```

Zencrack 7.8-1 (Fortran environment: 10.1.030)
C:\>echo off
Intel(R) Visual Fortran Compiler for applications running on Intel(R) 64, Version 10.1.030
Copyright (C) 1985-2009 Intel Corporation. All rights reserved.
Run Zencrack using "runzcr78"
C:\>

```

Zencrack on Linux is configured for use with user subroutines as follows:

- The runzcr78 script contains a variable called FORTRANstring which is set to the default string to execute for the target system, e.g. ifort
- If you use a non-standard command line name to execute your Fortran compiler, you should change this variable.
- When a job is executed that requires a Zencrack user subroutine, the Fortran environment must be configured in the terminal window from which the job is executed in addition to defining the variable FORTRANstring, e.g. for Linux with Intel Fortran 10.1.025:

```
source /opt/intel/fce/10.1.025/bin/ifortvars.sh
runzcr78 -j myjob -u myusersub.f
```

If a Zencrack user subroutine is used and the compilation and linking process is successful, the newly created executable is saved in the job folder. On both Windows and Linux the file is `zcr78_user.exe`. This executable can be used for subsequent jobs via the `-e` command line option. On Linux the specification of the executable in a local folder requires a `./` before the executable name e.g.:

```
runzcr78 -j myjob_new -e zcr78.exe           Windows
runzcr78 -j myjob_new -e ./zcr78.exe        Linux
```

### 4.3 Configuring the plug-ins for Abaqus/CAE

The Abaqus/CAE plug-ins are available on all platforms on which Zencrack is supported. They require Abaqus version 6.8 or later. The plug-ins will report an error if they are executed within an earlier version of Abaqus. Abaqus extended functionality (EF) releases are supported but compatibility with pre-release (PF) versions is not guaranteed.

Due to a change in the Python version between Abaqus 6.9 and 6.10 there are two sets of files provided with each installation – one for Abaqus 6.8/6.9 and one for Abaqus 6.10 or later. (In these version descriptions, 6.x also includes 6.x-EF). The availability of a Zencrack license for the plug-ins is checked when Abaqus/CAE or Abaqus/Viewer is started. If no license is available an error will be generated and Abaqus/CAE or Abaqus/Viewer will load without the plug-ins.

The plug-in files are installed with the Zencrack product and need to be moved into the Abaqus environment. The Zencrack installation contains a folder `fe_abaqus` with a sub-folder `zencrackplugins_6-8_6-9` for Abaqus 6.8/6.9 and `zencrackplugins_6-10` for Abaqus 6.10 or later. There are a number of options available for configuring Abaqus plug-ins so each user should consult their Abaqus administrator and/or the section “The Plug-in toolset” of the Abaqus/CAE User’s Manual. Note that some relevant sub-sections of this part of the Abaqus/CAE manual are available in the HTML version of the Abaqus documentation but not the PDF version.

When Abaqus/CAE starts it searches for plug-in files in a number of locations. The two suggested possible locations for the Zencrack plug-ins are:

- `abaqus_dir\abaqus_plugins`, where `abaqus_dir` is the Abaqus parent directory. Simply copy the entire `zencrackplugins_xx` folder into the `abaqus_dir\abaqus_plugins` folder.
- `plugin_dir`, where `plugin_dir` is a directory specified in the Abaqus environment file by the environment variable `plugin_central_dir`. Using this method you can store plug-ins in a central location that can be accessed by all users at your site if the directory to which `plugin_central_dir` refers is mounted on a file system that all users can access. Alternatively if the only additional Abaqus plug-ins that you are using are the Zencrack plug-ins you can set this variable to point to the `zencrackplugins` folder in the Zencrack installation, e.g.:

```
plugin_central_dir = "c:\\Zencrack\\7.8\\fe_abaqus\\zencrackplugins_6-10"
```

The plug-ins must also be aware of the Zencrack license settings. The file `zencrack_plugin.ini` in the `zencrackplugins` folder must be configured to reference either the directory containing the license file for nodelocked licenses, or the license server port and hostid for license manager licencing.

The `zencrack_plugin.ini` file may contain comment lines starting with a `#` character. Currently, only a “SETTINGS” section is configured with a required entry to identify the license. An optional entry, relevant to Linux machines, forces the crack-block names into a given case. For example:

```
#####
# About zencrack_plugin.ini #
#####
#
```

```

# This file controls aspects of the Zencrack Abaqus plug-in's behavior.
# It must be named 'zencrack_plugin.ini' and located in the plugin folder.
#
# Whitespace and anything after a # is ignored.
#
# Directives are specified as directive = value
#
# In the [SETTINGS] section:
# LICENCE
# Zencrack license server (eg: 2764@192.168.1.5) or the directory containing
# the nodelocked license file (eg: c:\Zencrack\x.x-x\license)
# CBCASE
# Force case of crack-block names on input & output (lower or upper)
#
[SETTINGS]
LICENCE = 2764@192.168.1.5
CBCASE = lower

```

Once configured the plug-in is available from the Abaqus plug-ins menu and appears as an additional tab named 'Zencrack' as shown in [Figure 4-1](#). For more information on the plug-in refer to the Plug-in for Abaqus/CAE Manual.

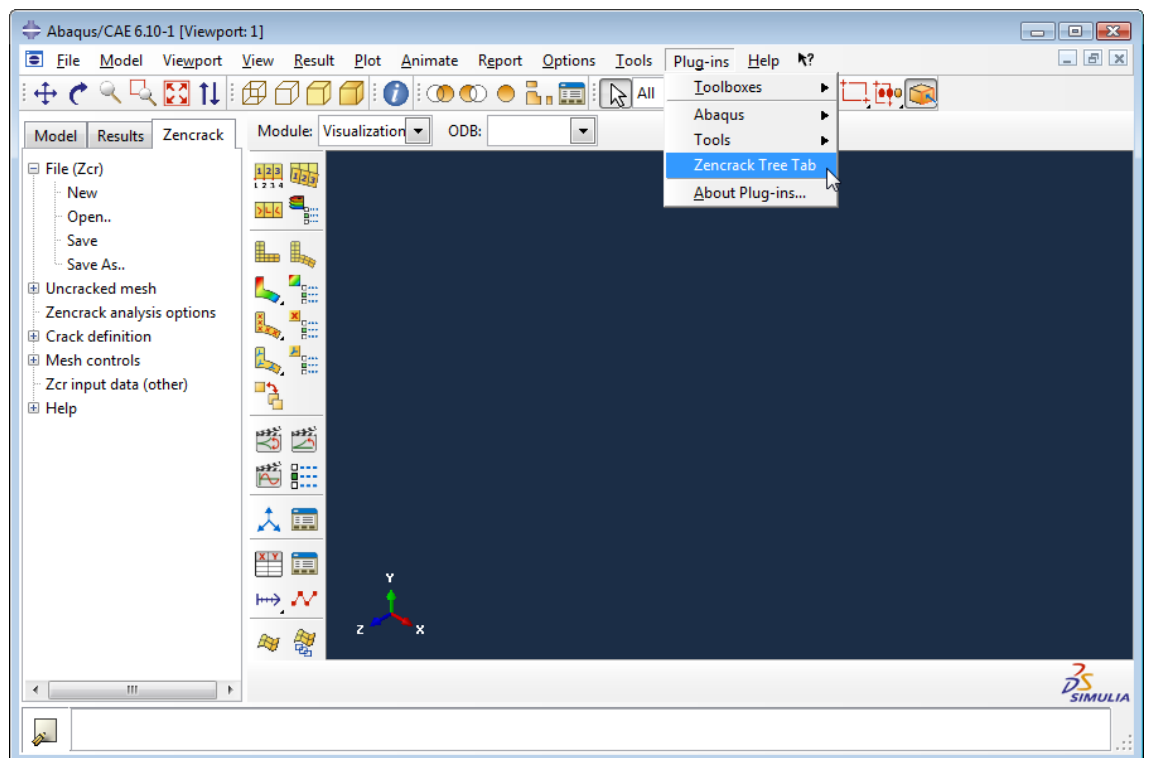


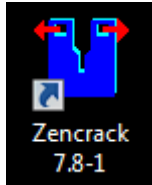
Figure 4-1 – Plug-in access in Abaqus/Viewer

## 5. Running Zencrack

Zencrack is executed using the `runzcr78` script located in the tools directory of the Zencrack installation. This section describes the execution options in detail.

### 5.1 Command prompt setup in Windows

Zencrack is executed from a command prompt session. A “Zencrack” shortcut icon is included in the `.\tools` directory. This can be copied to the desktop as described in section 2.1.1. The shortcut icon looks like this:



Double clicking on the “Zencrack” shortcut icon starts a command prompt session that is set up to execute Zencrack. The session is created with a PATH that includes the Zencrack `.\tools` directory. The session is also set up for Fortran if it is installed, e.g.:

 A screenshot of a Windows command prompt window. The title bar reads "Zencrack 7.8-1 (Fortran environment: 10.1.030)". The command prompt shows the following text:
 

```
C:\>echo off
Intel(R) Visual Fortran Compiler for applications running on Intel(R) 64, Version 10.1.030
Copyright (C) 1985-2009 Intel Corporation. All rights reserved.
Run Zencrack using "runzcr78"
C:\>
```

### 5.2 Execution using “runzcr78”

The program is run using the `runzcr78.bat` batch file (`runzcr78` script file) located in the tools directory of the Zencrack installation. This file must be executed from the directory containing the `.zcr` input file. Attempting to run the executable directly generates an error.

There are seven command line options for the script that can be used in combination and five “stand-alone” options:

The following options can be used in combination with one another:

- j job                    job is the Zencrack job name (without `.zcr` extension)
- u user                    user is the name of a Zencrack user subroutine, including the file extension. If the `-u` option is used the `-e` option is ignored. If the compile and link is successful this option creates and saves a new executable called `zcr78_user.exe` in the local directory. This can subsequently be referenced using the `-e` option.
- e exe                    exe is the Zencrack executable to be used - when specified on the command line the pathname for this executable should not contain spaces
- fe fecmdline            fecmdline is a list of arguments to be passed to the command line for each f.e. analysis that is submitted. This should be enclosed by double quotes.
- o overwrite            overwrite is yes to automatically overwrite old output files or no to stop if previous output files exist
- a cnvansys            cnvansys defines the type of Ansys uncracked model and may be “normal” for a standard uncracked mesh or “solidmodel” for an uncracked mesh that contains Ansys solid model options
- f fetype                fetype is “input” to use the f.e. analysis type from the `.zcr` file or “check” to force a datacheck/sizing type of analysis without having to modify the `.zcr` file

The following options should be used on their own:

help	to get information on run-time options and defaults
3dmesh	to run utility 3dmesh
process	to run utility process
rainflow filename	to run utility rainflow with an input file called filename
tanh filename	to run utility tanh with an input file called filename

A number of screen messages are generated when the runzcr78 file is executed. These show some of the options that are set for the job. For example, for the job a01a described in section 4 executed with a network license the following is seen under Windows (with similar for Linux):

```
C:\Zencrack\7.8-1\demos\abaqus\verify>runzcr78 -j a01a

C:\Zencrack\7.8-1\demos\abaqus\verify>echo off

ZENCRACK 7.8-1
-----

Job      = Job name (.zcr file) : a01a
User     = Zencrack subroutine  :
Exe      = Zencrack executable  : c:\zencrack\7.8-1\bin\zcr78.exe
Overwrite= Overwrite old output : no

Zencrack job a01a started
29/05/2012
12:39

Using RLM network licensing method.
1 token is required.
Successfully acquired 1 token from 2764@192.168.1.5.
Starting mesh generation
*** Zencrack job completed without any errors
*** There are input warnings - check the .rep file
Zencrack job a01a completed
29/05/2012
12:39
```

## 5.3 Examples

---

runzcr78 -j example  
Run job example.

runzcr78 -j submod -fe "globalmod=global"  
Run job submod using global model results file global.

runzcr78 -j myanalysis -u user\_dadn.f  
Run job myanalysis using Zencrack user subroutine user\_dadn.f.

runzcr78 3dmesh  
Run utility program 3dmesh

runzcr78 process  
Run utility program process

## 6. Verifying An Installation

Once the program is ready for execution, the supplied examples in the <fe interface>\verify sub-directory of the demos program directory can be executed to verify the installation. These examples are based on the ex01 files described in section 2 of the Examples Manual. It is recommended that all example files are copied to a new location before being executed, thus ensuring that a virgin copy of the files is retained in the Zencrack directory. The following is suggested after copying the files to a new location:

- Run a mesh generation example to confirm that Zencrack is running:

Windows users should start a Zencrack command prompt window by double-clicking the “Zencrack” shortcut icon.

Change to the directory containing the example files (e.g. <user location of installed files>\demos\<fe interface>\verify).

Run job:

- a01a for Abaqus users `runzcr78 -j a01a`
- n01a for Ansys users `runzcr78 -j n01a`

To confirm that the analysis completes successfully, check the a01ar.rep or n01ar.rep output file. The banner at the top of the file should correctly identify the customer and license details from the license file. At the end of the output file there should be a message:

```
New mesh created.
***ANALYSIS COMPLETE***
```

The cracked mesh should be created as a01ar.inp or n01ar.ans.

Sample output is contained in the demos\<fe interface>\verify\output directory for comparison purposes.

- Run an initial crack analysis to confirm that the f.e. interface is set up correctly:

Run:

- a01c for Abaqus users `runzcr78 -j a01c`
- n01c for Ansys users `runzcr78 -j n1c`

To confirm that the analysis completes successfully, check the a01cr.rep or n01cr.rep output file. The banner at the top of the file should correctly identify the customer and license details from the license file. At the end of the output file there should be a message:

```
Analysis of initial crack only.
***ANALYSIS COMPLETE***
```

Sample output is contained in the demos\<fe interface>\verify\output directory for comparison purposes.

## 7. Nodelocked and License Server (Network) Licensing

Zencrack is licensed using the Reprise License Manager (RLM) with either a nodelocked license file or a network license server system. The following sections describe these options.

### 7.1 Information required to generate a license file

The Zencrack installation contains a sub-directory called “machine\_id” containing an executable that can be used to collect and report the information required before a license file can be issued. (This machine\_id executable is also included with the installation of the RLM license server files). The machine\_id program must be run on either:

- for a nodelocked license, the machine on which Zencrack is to be run
- or,
- for network licensing, the machine (server) on which the license manager will run

The program requests identification of the organisation to be licensed, contact details, which finite element interfaces are required and what licensing method is to be used. Upon completion a file called zencrack.txt is generated which should be sent to Zentech for creation of the license file. The file should not be edited so, if corrections are necessary, the machine\_id program should be re-executed.

Note - a Zencrack Professional license also permits Zencrack Standard jobs to be run.

### 7.2 Nodelocked license file

A nodelocked license allows Zencrack to be executed only on the machines(s) specified in the license file and allows only one Zencrack run at a time. This file must be located in the “license” sub-directory of the Zencrack installation and may be given any name as long as it has a .lic extension.

This method requires the setting ZENCRACK\_LICENSE=NODELOCKED in the runzcr78 file. A sample license file (for a license with Abaqus and Ansys interfaces) is shown below, note that the last ‘License’ line allows Zencrack Professional to be run - without this only Zencrack Standard is licensed.

```
### main zencrack 7.8
LICENSE zentechint zencrack 7.8 31-jul-2012 single hostid=b8bc6fca46e0
start=01-may-2012 issuer=UK\\\Commercial customer="Zentech
International Ltd" contract="590b Finchley Road\London\NW11 7RX"
_ck=f792c36e39 sig="60P0453H6PEM03QES48JAJKRPNAX4RMD5QR072GCT6HNT
U91XA0NX3DNC5291F5W4A15S28"
### main zcrabaqusgui 7.8
LICENSE zentechint zcrabaqusgui 7.8 31-jul-2012 uncounted
hostid=b8bc6fca46e0 start=01-may-2012 _ck=b791c30d2d sig="60PE451KSW
5NN7Y1EG6WJYANNK397FET0PHJA4G22M09NBQ53X9WNKW5MW03VJ1HRC8S2HGUCH0G"
### enabling zcrAbaqus 7.8
LICENSE zentechint zcrabaqus 7.8 31-jul-2012 single
hostid=b8bc6fca46e0 start=01-may-2012 _ck=7292c391d4 sig="60PG453TR0
4MCFXACXBP5DKPJBPVVBGDUIJ5Y5VT062M0ACGR2QP2936VS1SW125HC6J03Y2QWP380"
### enabling zcrAnsys 7.8
LICENSE zentechint zcransys 7.8 31-jul-2012 single hostid=b8bc6fca46e0
start=01-may-2012 _ck=2392c33afa sig="60P0453GTNRXXM4P66TAD0DGW2JCO
6APPAD4W022HQX4SMGEAEFNBGHDOJN2BTRVCU31SKYG"
### enabling zencrackprof 7.8
LICENSE zentechint zencrackprof 7.8 31-jul-2012 single
hostid=b8bc6fca46e0 start=01-may-2012 _ck=ae92c32932 sig="60PG4583PE
ESB1G0YD35B5DD0S51SC7QKT4JFWT708A6WYV8H66EGCY6N5DKWBFBVF0FWJNJ6JVG"
```

### 7.3 Network License server

A network license requires the Reprise License Manager (RLM) system to be running on a network server. Under this method of licensing the Zencrack product is installed on one or more client



machines on the same network as the server (or on the server itself). The necessary license server files are supplied by Zentech – there is no requirement for end users to download files directly from the Reprise website. Installation of the license server files is described in section 3. This section describes the configuration and use of the license server.

The license file supplied for use with the license server is valid to run only on the specified server machine and is configured with a number of “tokens” and a list of licensed finite element interfaces. When a Zencrack job is executed on a client machine, a request is made to the server to check out the required number of tokens for the job:

- Zencrack Standard analysis requires 1 token
- Zencrack Professional analysis requires 3 tokens

In addition the finite element interface for the job is checked against the licensed finite element interfaces. If the interface is allowed and sufficient tokens are available the job executes. If tokens have been taken by another job that is still executing the job waits and re-checks for available tokens every 10 seconds. If, after a user specified time, the tokens are still unavailable the job exits.

This method requires the setting `ZENCRACK_LICENSE=NETWORK` in the `runzcr78` file. A sample license file (for a license with Abaqus and Ansys interfaces) is shown below, note that the first ‘HOST’ line specifies the server machine hosting the licenses.

```
HOST COMPUTERNAME b8bc6fca46e0 2764
ISV zentechint
### main zencrack 7.8
LICENSE zentechint zencrack 7.8 31-dec-2012 12 start=26-apr-2012
  issuer="U.K.\01252 376388\Commercial" customer="Zentech
  International Limited" contract="590B Finchley Road\London\NW11
  7RX" replace _ck=d90817f80b sig="60PG4480JT66930959JRAJW7NWNQC4QDQM
  W5RSYM08A0KPK3VDHCS7MVJTDQYT147NKY106P8RW0"
### main zcrabaqusgui 7.8
LICENSE zentechint zcrabaqusgui 7.8 31-dec-2012 99 start=26-apr-2012
  replace _ck=9917d714da sig="60PG4521Y17ESAYNETGMMYAWDET53UCD6FTX8582
  2M0AF8M9T1P9DTEKD1V356UH8UB6WJBW5GFG"
### enabling zcrAbaqus 7.8
LICENSE zentechint zcrabaqus 7.8 31-dec-2012 1 start=26-apr-2012
  replace _ck=54d69270d5 sig="60PG451B304SHTBETQHWQXD7R2N4PHM4CNAERDR2
  2M0A2T1WYU612QAQRK4RE5WUCE4KR5GP3DK0"
### enabling zcrAnsys 7.8
LICENSE zentechint zcransys 7.8 31-dec-2012 1 start=26-apr-2012
  replace _ck=05d643c700 sig="60P045173F0W7PE57RSP54MBUWMMWYNV6DWXJ9UG2
  2H3VS6XC985D902L9FNB5U4SXS42WSTG0G"
```

### 7.3.1 Configuring the license server

Five files are supplied for the license server machine:

- The generic license server, `rlm` on Linux, `rlm.exe` on Windows.
- The Zentech International license server, `zentechint` on Linux, `zentechint.exe` on Windows.
- The RLM utilities, `rlmutil` on Linux, `rlmutil.exe` on Windows.
- The license file, with extension `.lic`, that describes the user rights to the Zencrack product.
- The RLM End-User Manual, `RLM_Enduser.html`.

The supplied files are installed as described in section 3. It is recommended that the license file be installed in the same folder as the RLM license server files.

### 7.3.2 Starting the RLM server

It is recommended that RLM is configured as a service on Windows and to start at bootup on Linux machines.

If this is not done the license server can simply be started by executing the `rlm` command in the license server folder (provided that the license file is in the same folder):

```
rlm > output_file
```

### 7.3.2.1 Running the RLM server as a service on Windows

Installing RLM as a service is done in a command window. Once installed as a service, it remains installed until it is explicitly deleted as a service. Installing RLM as a service does not start RLM; services are started via the Windows Services control panel, and at boot time. RLM is installed using the RLM program itself, with special arguments:

```
rlm -install_service -dlog [+]logfile [-service_name sname] <rlm runtime args>
```

where logfile is the pathname for the server debug log. This parameter is required. If preceded by the '+' character, the logfile will be appended, rather than created.  
sname is an optional name for the installed service. If not specified, sname defaults to "rlm". If sname contains embedded whitespace, it must be enclosed in double quotes.

<rlm runtime args> are any other command line arguments to be passed to rlm when it is started.

Example:

```
rlm -install_service -service_name rlm-zencrack -dlog  
c:\Zencrack\rlm_v8\server.log -c c:\Zencrack\rlm_v8\yourlicense.lic
```

This installs RLM as a service under the name "rlm-zencrack". When started via the Services control panel or at boot time, RLM will be passed the "-c c:\Zencrack\rlm\_v8\yourlicense.lic" arguments, and it will write debug log information to the file c:\Zencrack\rlm\_v8\rlm-zencrack.log.

To start the service after installing it:

Start > Control Panel > Administrative tools > Services  
Locate rlm-zencrack. Right click > Properties > Start  
The service should now start.  
Click OK or Cancel to leave the Properties screen.

The server status can be checked from the command line using:

```
rlmutil rlmstat
```

Alternatively the browser-based utility described in section [7.3.3](#) may be used to monitor the license server.

If it is required to remove the service it is necessary to first stop the service via Control Panel > Administrative tools > Service. Then from the command line:

```
rlm -delete_service -service_name rlm-zencrack
```

### 7.3.2.2 Starting the RLM server at system boot time on Linux systems

On most Unix and Linux systems, system services are started at boot time, usually via startup scripts located in /etc/rc.<something>. For further information and a sample script that defines the necessary RLM variables please refer to the RLM End-User Manual.

### 7.3.3 Browser-based license administration

The RLM server contains an embedded Web Server that can be used to perform most administration of the RLM server itself. The web server allows you to retrieve server and license status, cause the servers to re-read the license files, switch debug or report log files, move the current report log file to a new name, or shut down the license servers. Using this web-based interface, you can administer the license servers from any platform, and you do not need to install the RLM utilities - you only need a web browser.

The web server is started automatically on port 5054 when rlm is started. To use the web server, simply point your browser to: `http://ServerHostName:5054` (or use the server network IP address, e.g. `http://192.168.3.4:5054`) and select the operation you would like to perform. You will be prompted for any required information. Typical status screens are shown in [Figure 7-1](#) and [Figure 7-2](#). Note: the previous version of RLM web server used for Zencrack 7.6 used port 9000 by default.

For further information please refer to the RLM End-User Manual.

The screenshot shows the 'Reprise License Server Administration' web interface. The browser address bar indicates the URL `http://192.168.3.3:5054/home.asp`. The page title is 'Reprise License Server Administration' with a copyright notice for 2006-2010. The main content area displays the status for 'rlm' on 'zen\_dell\_03 (port 2764)'. It includes a table for RLM software and command versions, a table for rlm statistics, and a table for ISV Servers.

RLM software version	v8.0 (build:0)
RLM comm version	v1.1
debug log file	C:\Zencrack\rlm_v8\server.log
license files	C:\Zencrack\rlm_v8\zencrack_zen_dell_03.lic

rlm Statistics	Since Start	Since Midnight	Recent
Start time	05/29 14:36:42	05/29 14:36:43	05/29 14:36:43
Messages	0 (0/sec)	0 (0/sec)	0 (0/sec)
Connections	0 (0/sec)	0 (0/sec)	0 (0/sec)

Name	port	Running	Restarts	Server Status	License Usage	Debug Log	REREAD	OPTIONS	TRANSFER	SHUTDOWN
zentechint	49678	Yes	0	zentechint	zentechint	zentechint	zentechint	zentechint	zentechint	zentechint

Figure 7-1 – Typical license status screen after selecting “Status” from the left side menu

The screenshot shows the 'Reprise License Server Administration' web interface. The main content area displays the 'ISV zentechint status on zen\_dell\_03 (port 49678)'. Below this, there are two tables: 'zentechint Statistics' and 'License pool status'.

**zentechint software version**

zentechint software version	v8.0 (build-6)
zentechint comm version	v1.1
debug log file	C:\Zencrack\rlm_v8\zentechint.dlog
report log file	._n/a_.

**zentechint Statistics**

zentechint Statistics	Since Start	Since Midnight	Recent
Start Time	05/29 14:36:43	05/29 14:36:44	05/29 14:36:44
Messages	2 (0/sec)	2 (0/sec)	2 (0/sec)
Connections	1 (0/sec)	1 (0/sec)	1 (0/sec)
Checkouts	0 (0/sec)	0 (0/sec)	0 (0/sec)
Denials	0 (0/sec)	0 (0/sec)	0 (0/sec)
License Removals	0 (0/sec)	0 (0/sec)	0 (0/sec)

**License pool status**

Product	Pool	Ver	Expires	count	soft lim	inuse	res	timeout	share	transactions	Show License Usage
zencrack	1	7.8	31-dec-2012	12	12	0	0	0	None	0	<a href="#">usage...</a>
zorabaqusgui	2	7.8	31-dec-2012	99	99	0	0	0	None	0	<a href="#">usage...</a>
zorabaqus	3	7.8	31-dec-2012	1	1	0	0	0	None	0	<a href="#">usage...</a>
zoransys	4	7.8	31-dec-2012	1	1	0	0	0	None	0	<a href="#">usage...</a>

The interface also includes a left-hand navigation pane with options like 'Status', 'Shutdown', 'Reread/Restart Servers', 'Switch Reportlog', 'New Reportlog', 'Switch Debuglog', 'Manage Windows Service', 'Activate License', 'Diagnostics', 'RLM Manual...', 'System Info', and 'About...'. A 'Refresh' button is located below the license pool status table.

**Figure 7-2 – Typical server license status after selecting “zentechint” from the Server Status of the main status screen**

### 7.3.4 Installing an updated RLM license file

If it is required to install a new license file, the file should first be placed in the same folder as the existing license file. The browser-based license administration facility described in section 7.3.3 can then be used to re-read the license file:

- Select “Reread/Restart Servers” from the left pane.
- Set the ISV box to “all” or “zentechint” and select REREAD LICENSES.

### 7.3.5 Contents of the RLM license file

The server license file contains information that configures the license server and describes all the licenses granted from Zentech International to the end-user. License files have 3 types of lines: HOST, ISV and LICENSE.

The HOST line specifies the license server machine (by ethernet address) and includes the port through which clients can access the license server.

The ISV line specifies that the license server information is for ISV “zentechint”

The LICENSE lines describe license grants from Zentech International to the end-user. All license files (except evaluation licenses) contain a license grant for product “zencrack”. This specifies the total number of license tokens available, the license expiry date and includes details about the customer (e.g. company name, address, etc). Other parameters (e.g. a license start date) may also be included. One or more additional license lines are present depending upon the licensed finite element interfaces. A sample license file is shown in section 3.

### 7.3.6 Configuring a client machine

The Zencrack program is installed on the client machine following the procedure in section 2.

Zencrack is executed using a runzcr78.bat batch file on Windows and a runzcr78 script file on Linux as described in section 5.2. Three variables are defined in these files for use with the license server:

#### ZENCRACK\_LICENSE

This variable is set to NETWORK to indicate that a network license server should be used.

#### ZENCRACK\_RLM\_SERVER

This variable specifies the license server machine using the syntax port@Ipaddress. The port number is contained in the license file installed on the license server. The IP address is the LAN address of the license server machine. For example:

Windows      set ZENCRACK\_RLM\_SERVER=2764@192.168.1.10

Linux          ZENCRACK\_RLM\_SERVER=2764@192.168.1.10

#### ZENCRACK\_WAIT

This variable defines the number of minutes that a job should wait for license tokens to become available if they are in use by another job. The availability of tokens is checked every 10 seconds while the job is waiting.

Windows      set ZENCRACK\_WAIT=30

Linux          ZENCRACK\_WAIT=30

This option is not the same as a strict queue option available with license managers. If several jobs are in a “wait” state at the same time the first job to continue execution is the first one to check for license tokens when they become available rather than the first job that reached a wait condition.

Note - the RLM end user environment variable for queuing (RLM\_Queue) must not be set as this option is not supported within Zencrack. Setting this option with the previous RLM version (v4) causes an indefinite queuing of a Zencrack license check out.

## 8. Remote Execution Of The Finite Element Analysis

This section describes the configuration and use of the “remote f.e.” capability in Zencrack. This capability allows users with Zencrack on a Windows platform to execute the finite element part of a Zencrack job on a Linux or Unix machine on the same network.

The “remote f.e.” capability in Zencrack uses the following procedures:

- FTP to copy files from the local to the remote machine.
- An Rexec or SSH command to run a script on the remote machine. The script runs the finite element program on the remote machine.
- FTP to copy files from the remote to the local machine.

The capability utilises the plink.exe [Ref. 2], T4eRexec.exe or T4eSSH.exe executables [Ref. 3] to establish the remote connection. T4eRexec is a utility that is similar to the Windows REXEC command except that it allows a password as input. To run commands on a Rexec compatible operating system, such as Linux, the Rexec daemon has to be running on the target system. Note that passwords are transmitted in clear text. A more secure option is the plink or T4eSSH utility. These are secure implementations of the SSH protocol to allow access to a UNIX/Linux operating system. The plink.exe, T4eRexec.exe and T4eSSH.exe files are supplied with Zencrack in the utils folder of the Zencrack installation and should not be moved from that folder. In addition, the full PuTTY.zip file, of which plink.exe is a part, is also included.

The three utilities plink, T4eRexec and T4eSSH are provided for convenience – only one needs to be selected and used when configuring the remote f.e. capability.

Note that passwords for access to the remote machine are set up in clear text in the runzcr78.bat file.

It is necessary to ensure that any firewalls allow the necessary communication between the local and remote machines. On the local machine plink.exe, T4eRexec.exe or T4eSSH.exe and the FTP daemon must be able to communicate with the remote machine. The Rexec protocol must be enabled on the target machine if using T4eRexec. The FTP daemon must also be running on the remote machine. Please consult your system documentation for information on these processes.

### 8.1 Configuration

Zencrack should be installed on the target Windows machine and the setup program run in the usual way (see section 2.1). If there is to be a local f.e. capability in addition to the remote f.e. capability, it is suggested that the installation is verified before commencing with the remote f.e. configuration.

Zencrack is executed via the runzcr78.bat file in the program tools folder. This file must be edited (e.g. using Notepad) to configure the remote f.e. execution. The file contains the following section:

```
rem #####
rem Items for remote f.e. execution
rem #####
rem
rem These options define variables required to run the f.e. analysis on a
rem remote
rem computer. REMOTEFE can be modified on the command line by the -r option.
rem
rem
rem set REMOTEFE=no
rem
rem set ZCRABQUSremote=
rem set ZCRABQUSVERremote=
rem set ZCRANSYSremote=
rem set ZCRANSYSVERremote=
rem set LOGINUTIL=
```

```

set LOGINNAME=
set LOGINPWD=
set LOGINPATH=
set LOGINIP=
set LOGINSHELL=
set LOGINSCRIPT=
set LOGINEXTRA=

```

Some of these items must be set and others may be left blank, depending upon the f.e. interface and options required for the chosen remote execution utility. The items are described below.

REMOTEFE	<p>This item defines the default status for f.e. execution. If it is set to “no”, then by default all f.e. jobs will be executed on the local machine. If it is set to “yes”, then by default all f.e. jobs will be executed on the remote machine.</p> <p>This option can be overridden for an individual Zencrack analysis by using the <code>-r</code> command line option, which has values yes or no. For example, if REMOTEFE is set to “no” but it is required to run a specific job with remote f.e. execution, the command line would be:</p> <pre>runzcr78 -j jobname -r yes</pre>
ZCRABAQUSremote	<p>This is analogous to variable ZCRABAQUS for local execution. It defines the location of the Abaqus executable on the remote machine.</p> <p>This can be left blank if Abaqus is not available on the remote machine or if Abaqus is not a licensed interface for the Zencrack installation.</p>
ZCRABAQUSVERremote	<p>This is analogous to variable ZCRABAQUSVER used for local execution. It defines the Abaqus version on the remote machine. It may optionally include the sub-version, e.g.:</p> <pre>ZCRABAQUSVERremote=6.10-1</pre> <p>This can be left blank if Abaqus is not available on the remote machine or if Abaqus is not a licensed interface for the Zencrack installation.</p>
ZCRANSYSremote	<p>This is analogous to variable ZCRANSYS used for local execution. It defines the location of the Ansys executable on the remote machine.</p> <p>This can be left blank if Ansys is not available on the remote machine or if Ansys is not a licensed interface for the Zencrack installation.</p>
ZCRANSYSVERremote	<p>This is analogous to variable ZCRANSYSVER used for local execution. It defines the Ansys version on the remote machine. It should include the sub-version and service pack if there is one, e.g.:</p> <pre>ZCRANSYSVERremote=13.0</pre> <p>This can be left blank if Ansys is not available on the remote machine or if Ansys is not a licensed interface for the Zencrack installation.</p>
LOGINUTIL	<p>The utility for remote execution of commands. This must be set to one of <code>plink</code>, <code>t4erexec</code> or <code>t4essh</code>.</p>
LOGINNAME	<p>This is the user name that is used to log into the remote machine.</p>
LOGINPWD	<p>This is the password for user name LOGINNAME on the remote machine.</p>
LOGINPATH	<p>This is the path on the remote machine into which all analysis files will be placed. The remote f.e. analysis will be executed in this directory. This item should include the trailing <code>/</code> on the path definition. The path can be a full path</p>

LOGINIP	or a relative path in which case it is relative to the home directory for user LOGINNAME.
LOGINSHELL	This is the network IP address of the remote machine. By default (if this item is blank) Zencrack uses the ksh shell when executing the script file that runs the finite element analysis on the remote machine. An alternative script, e.g. bash, can be set using this variable.
LOGINSRIPT	This item defines the name of a script located in the LOGINPATH folder that should be run before execution of the finite element analysis. This is optional and should be left blank if no script is to be executed.
LOGINEXTRA	This item defines any additional command line options that should be used with the chosen plink, T4eRexec or T4eSSH utility.

Notes for T4eRexec or T4eSSH:

- A timeout should be defined by including “-a 9999” in LOGINEXTRA. This defines a timeout period of 9999 seconds during which a remote session command remains active if there is no response from the remote machine. See section 8.2 for more information regarding the timeout period.
- In some cases the “-A password” option may need to be included when the T4eSSH utility is being used. (This “-A password” option contains the word password rather than any user or system password). This option defines the authentication method.

Notes for plink:

- The first time that the utility is used on the local machine, the user may be prompted to save a key for the remote machine in the PuTTY cache. Replying yes to this prompt should ensure the prompt does not appear again.

A special case exists to allow the full command line for plink, T4eRexec or T4eSSH to be specified using LOGINEXTRA. If the value of LOGINEXTRA starts with “fullcommandline” then the remainder of the string is used as the full command line string for plink, T4eRexec or T4eSSH. The values of LOGINNAME and LOGINPWD are ignored for execution of commands on the remote machine (but are still used for ftp file transfers). The full command line option should generally not be required and is provided mainly for troubleshooting purposes. The full list of command line options for the utilities is available by typing plink, T4eRexec or T4eSSH at a Zencrack command prompt.

A sample configuration for remote execution of Abaqus and Ansys using T4eSSH may be:

```
set ZCRABAQUSremote=/abaqus/6.11-1/exec/abq6111.exe
set ZCRABAQUSVERremote=6.11-1
set ZCRANSYSremote=/ansys_inc/v140/ansys/bin/ansys140
set ZCRANSYSVERremote=14.0
set LOGINUTIL=t4essh
set LOGINNAME=myusername
set LOGINPWD=mypassword
set LOGINPATH=/usr/test_remote/
set LOGINIP=192.168.1.15
set LOGINSHELL=bash
set LOGINSRIPT=
```



```
set LOGINEXTRA=-a 9999 -A password
```

A sample configuration for remote execution of Abaqus and Ansys using plink may be:

```
set ZCRABAQUSremote=/abaqus/6.11-1/exec/abq6111.exe
set ZCRABAQUSVERremote=6.11-1
set ZCRANSYSremote=/ansys_inc/v140/ansys/bin/ansys140
set ZCRANSYSVERremote=14.0
set LOGINUTIL=plink
set LOGINNAME=myusername
set LOGINPWD=mypassword
set LOGINPATH=/usr/test_remote/
set LOGINIP=192.168.1.15
set LOGINSHELL=bash
set LOGINSCRIPT=
set LOGINEXTRA=
```

## 8.2 Remote command timeout period

The timeout issue described in this section relates to the T4eRexec and T4eSSH utilities. There is no such timeout period for the plink utility.

When a command is executed on the remote machine using T4eRexec or T4eSSH, the local machine has a timeout period in which it expects some response from the remote machine. If there is no response within the timeout period the execution will stop and the following error is reported to the screen:

```
ERROR: Timeout while waiting for data
```

The LOGINEXTRA option should include parameter “-a 9999” to set the timeout period to the maximum allowed value of 9999 seconds.

During the solution phase of the finite element analysis on the remote machine there is a period of no response. If the solution phase exceeds the timeout setting then the command will time out and the Zencrack analysis will fail. The timeout period therefore sets an upper limit on the elapsed duration of a phase of the finite element analysis. For Abaqus, for example, the pre.exe and standard.exe phases are separate and each may run for an elapsed time of up to the defined timeout period.

For Abaqus analyses which exceed 9999 seconds elapsed runtime but which have increments less than 9999 seconds, a solution to prevent the timeout is to include a simple Abaqus urdfil subroutine which writes to the screen upon completion of every increment:

```
subroutine urdfil(lstop,lovrrwt,kstep,kinc,dtime,time)
  include 'aba_param.inc'
  character*8 crray(513),nset
  dimension array(513),jrray(nprecd,513),time(2)
  equivalence (array(1),jrray(1,1))
  equivalence (crray(1),jrray(1,1))
  write(*,10) kstep,kinc,time(2)
10 format('Processing .fil file: step ',i4,' increment ',i4,
&        ' : total time ',1pe14.8)
  return
end
```

At least one request for data to be written to the .fil file should be made in the uncracked mesh (i.e. \*NODE FILE or \*EL FILE with FREQ=1 in step 1). The subroutine is referenced via the Zencrack USER keyword in the .zcr input file.

---

### 8.3 Zencrack input file

---

One Zencrack keyword is relevant to remote f.e. execution: REMOTE TRANSFER. By default, all necessary files are transferred to and from the local machine. This keyword can be used to specify transfer of additional files.

The SAVE keyword operates in the normal way on files that are present on the local machine. So, for example, if SAVE, ODB=YES is specified, the remote ODB files are transferred to the local machine after each f.e. analysis and are then renamed and saved locally on the machine.

For remote f.e. analyses there are also issues related to case sensitivity in filenames. Care should be taken when specifying filenames in the input file.

In addition, other system / f.e. related issues may arise. For example, Abaqus user subroutines require an extension of .for on Windows and .f on Unix and Linux.

---

### 8.4 Execution of a Zencrack job with remote F.E. analysis

---

If the REMOTEFE variable described in section 8.1 is set to “yes”, then all jobs are automatically sent for remote f.e. execution. No additional options are required. In this configuration a local f.e. analysis can be forced for an individual Zencrack job by using the “-r no” option, e.g.:

```
runzcr78 -j jobname -r no
```

If the REMOTEFE variable described in section 8.1 is set to “no”, then all jobs are automatically sent for local f.e. execution. In this configuration a remote f.e. analysis can be forced for an individual Zencrack job by using the “-r yes” option, e.g.:

```
runzcr78 -j jobname -r yes
```

---

## 9. References

---

- Ref. 1 Reprise License Manage v8 from Reprise Software, Inc., <http://www.reprisesoftware.com>.
- Ref. 2 PuTTY utility from <http://www.chiark.greenend.org.uk/~sgtatham/putty>.
- Ref. 3 Utilities from Tools4ever, <http://www.tools4ever.com>.

# Zencrack

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Version 7.8

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