



ZENCRACK

Installation and Execution Manual for Zencrack 7.5

Issue 7.5

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Installation and Execution Manual for Zencrack 7.5

Issue 7.5

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Zentech is continually improving the program and welcomes suggestions and comments. Any error encountered in the program or documentation should be reported as soon as possible.

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1. Introduction

This document describes installation, set-up and execution of Zencrack version 7.5 for Windows x86, Linux x86 and Unix platforms.

A 32bit version of Zencrack 7.5 operates on x86 machines running Windows 2000 and XP. A 64bit version is available for x86 machines running 64bit versions of Windows such as Windows XP x64 Edition. A 64bit version of Zencrack is also available for x86 machines running Linux. A list of supported Unix platforms is maintained on the Zencrack support pages accessible from:

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

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>.

1.1 Hardware requirements

The approximate disk space requirements for Zencrack program files documentation are:

- 32bit x86 Windows version 55Mb
- 64bit x86 Windows version 35Mb
- 64bit x86 Linux 40Mb

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 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.

1.2 Software requirements

Zencrack is supplied as an executable and object files with 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 [3.2](#)) and requires a Fortran compiler.

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, Ansys/Classic, Finas and MSC.Marc and the user license permits use with one or a combination 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.

2. Installation Files

2.1 Windows

Zencrack is supplied as two self-extracting zip files:

- zcr75.exe containing the program files
- zcr75doc.exe containing the documentation files

The program files can be installed in any location. The default is c:\zencrack75. The user installing the program must have sufficient privilege to create files in the chosen location.

After installing the program files a setup program must be 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 setup process the choice is made regarding the Fortran environment and Zencrack binaries (see section [2.1.1](#)).

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

2.1.1 Fortran compiler for 32bit Zencrack installations

Two sets of binaries are included in the "bin" folder with the 32bit version of Zencrack 7.5:

- binaries created using Compaq Fortran 6.1a
- binaries created using Intel Fortran 9.0

Both versions are supplied in order that users can choose how to configure their installation depending upon the compiler requirements of their finite element code(s) and their anticipated use of user subroutines.

Zencrack is executed from a command line in a specially configured command prompt window. Part of the configuration of this window includes setting up the correct Fortran environment for using user subroutines. This environment choice should be made depending upon your finite element code and your use of user subroutines with that code. For example, user subroutines with Abaqus 6.5-1 require a Compaq Fortran compiler whereas Abaqus 6.6-1 onwards requires an Intel Fortran compiler.

The setup program provides the following options for choice of Fortran environment at the Zencrack command prompt

```
Please specify the Fortran environment required
at the Zencrack command prompt:
  0 - No compiler installed
  1 - Compaq Fortran 6.x
  2 - Intel Fortran 8.x
  3 - Intel Fortran 9.x
  4 - Intel Fortran 10.x
0, 1, 2, 3 or 4 ?
```

The choice made here determines whether you will be able to run your f.e. code with user subroutines. Zencrack will configure the installation to use the Zencrack Compaq Fortran binaries if the choice made is “1”. Otherwise the installation is configured to use the Zencrack Intel Fortran binaries.

If you are in any doubt about the choice of environment and binary versions, please contact us for advice.

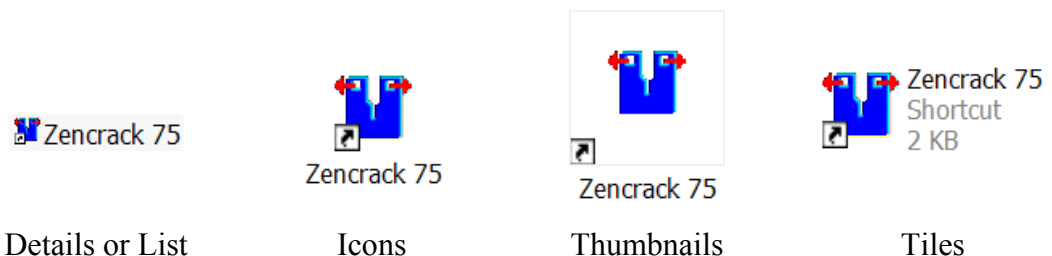
2.1.2 To install the program files (Windows)

1. Log in as an administrator or any user with sufficient privilege to meet the requirements stated above.
2. Double click on zcr75.exe to unzip the files. Specify a home directory for the installation - the default is:
c:\zencrack75
(this default name is used throughout the remainder of these instructions). When all files are unzipped select “ok” then “close”.
3. The following directory structure is created under the home directory:

bin	Zencrack executable, object and library files (Intel Fortran)
bin\compaq	Zencrack executable, object and library files (Compaq Fortran)
	This is only for the 32bit installation
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:
	user subroutines zcr-jint.for and zcr-ctint.for
fe_marc	Files related to the MSC.Marc interface:

	user subroutine impd_marc.for
license	License file customer.lic should be placed here ¹
machine_id	Utility to extract machine ethernet address required to license Zencrack
tools	Setup files and location of file runzcr75.bat after completion of setup Setup executable is setupzcr75_32.exe for 32bit installations Setup executable is setupzcr75_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 rainflow : rainflow cycle counting tanh : creates tabular growth data from tanh growth equation data
readme.txt	Installation information
versions.txt	Version information

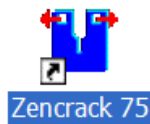
- Open the c:\zencrack75\tools directory.
- Run the program setupzcr75.exe located in this directory by double clicking on the file. THIS STEP IS ESSENTIAL. THIS PROGRAM REQUESTS INFORMATION ON THE LOCATION OF ABAQUS, ANSYS, FINAS AND MSC.Marc. IT ALSO REQUESTS INFORMATION ON THE FORTRAN ENVIRONMENT AND THEN CONFIGURES THE ZENCRACK FILES ACCORDINGLY.
- Put a copy of your customer.lic license file (see section 5) into the license directory.
- To make a desktop shortcut for Zencrack:
Right click on the Zencrack shortcut file in the c:\zencrack75\tools directory and drag it onto your desktop. This is the file called “Zencrack 75” (not the icon file “Zencrack75.ico”). Depending upon the view setting for the folder, the file looks like this (for Windows XP):



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

¹ The license file is supplied separately from the program installation files. See section 5.

The 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.

9. Some items in the runzcr75.bat script can be manually modified after completion of installation. These items are described in section [2.3](#).

2.1.3 To un-install Zencrack (Windows)

1. Log in as an administrator.
2. Delete files under the installation directory, e.g. c:\zencrack75 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\zencrack75.ico
%SystemRoot%\system32\zcrpath75.bat
4. Delete any desktop shortcuts that were created.

2.1.4 To install the documentation files (Windows)

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

1. Double click on zcr75doc.exe to unzip the files. 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:\zencrack75\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 one of the .pdf files in the c:\zencrack75\document directory.
Drag it onto your desktop.
Select “Create shortcut here”.

2.1.5 To un-install the documentation files (Windows)

1. Delete files under the documentation installation directory.
e.g. c:\zencrack75\document in the above example.
2. Delete any desktop shortcuts that were created.

2.1.6 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 setup in which Zencrack and the finite element code are executed on the same machine. Please consult Zentech International Limited for full details of this procedure.

2.2 Linux & Unix

Zencrack is supplied as two self-extracting gzip files:

- `zcr75.tar.gz` containing the program files
- `zcr75doc.tar.gz` containing the documentation files

The program files can be installed in any location. The user installing the program must have sufficient privilege to create files in the chosen location.

After installing the program files the script file “runzcr75” in the sub-directory “tools” must be edited to specify certain file locations (see section [2.3](#)).

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

2.2.1 To install the program files (Linux & Unix)

1. Log in as any user with sufficient privilege to meet the requirements stated above.
2. Create a home directory for the Zencrack installation e.g.
`/usr/zencrack75`
3. Place the `zcr75.tar.gz` file in this home directory and de-compress the file:
`gzip -d zcr75.tar.gz`
4. Extract the Zencrack files from the tar file:
`tar xvf zcr75.tar`
5. The following directory structure is created under the home directory:

<code>bin</code>	Zencrack executable, object and library files
<code>crack</code>	Crack-block files
	Finite element keyword status files
	Tolerance file <code>tol.dat</code>
<code>demos</code>	Example input files – see the <code>readme.txt</code> file in this directory
<code>fe_abaqus</code>	Files related to the Abaqus interface: user subroutines <code>zcr-jint.f</code> and <code>zcr-ctint.f</code>
<code>fe_marc</code>	Files related to the MSC.Marc interface: user subroutine <code>impd_marc.f</code>

license	License file customer.lic should be placed here ²
machine_id	Utility to extract the id required to license Zencrack
tools	Script file runzcr75
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
versions.txt	Version information

5. Edit the script file `./tools/runzcr75`.
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` and/or `ZCRMARC` and `ZCRMARCEXE` (see section 2.3 for additional information). Some other items in the `runzcr75` script can be manually modified. These items are described in section 2.3.
6. Put a copy of your `customer.lic` license file (see section 5) into the license directory.
7. 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 `./tools` directory to paths of individual users.

2.2.2 To un-install Zencrack (Linux & Unix)

1. Delete files under the installation directory, e.g. `/usr/zencrack75` 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 & Unix)

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

1. Create a home directory for the documentation e.g. `/usr/zencrack75/document`. The documentation does not have to be installed in the same location as the program files.
2. Place the `zcr75doc.tar.gz` file in this home directory and de-compress the file:

² The license file is supplied separately from the program installation files. See section 5.

```
gzip -d zcr75doc.tar.gz
```

3. Extract the Zencrack files from the tar file:

```
tar xvf zcr75doc.tar
```

2.2.4 To un-install the documentation files (Linux & Unix)

1. Delete files under the documentation installation directory.

e.g. /usr/zencrack75/document in the above example.

2.3 Manual setup 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\runzcr75.bat` file for Windows and the `./tools/runzcr75` script file for Linux & Unix. Additional notes on all items below are contained in the `runzcr75.bat` file and the `runzcr75` script file.

Note that re-running the `setupzcr75.exe` program for Windows installations will create a new `runzcr75.bat` file. Any manual changes will be lost. If you make manual changes, you should create a backup copy of the file before re-running the setup program.

2.3.1 Required items

On Windows machines the required symbols are defined in the batch file `.\tools\runzcr75.bat` after running the setup program. After the setup program is completed, no further changes to the file should be required. However, the symbols may be manually modified at any time by editing the `runzcr75.bat` file.

For Linux & Unix installations the script file `./tools/runzcr75` 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.

<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. 671.
<code>ZCRABAQUSVER</code>	the Abaqus version which may optionally include the sub-version e.g. 6.7-1.
<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 “-p productname” is included in the definition of <code>ZCRANSYS</code> , where <code>productname</code> is identified in the Ansys documentation.
<code>ZCRANSYSVER</code>	the Ansys version must include the sub-version and any service pack number e.g. 10.0, 11.0SP1.

ZCRFINAS	the full location of the Finas executable file ufinas.exe provided as part of the Finas program installation. (Windows only).
ZCRMARC	the full location of the file run_marc.bat provided as part of the MSC.Marc program installation and used to run MSC.Marc. For Linux and Unix installations MSC.Marc must be executed with “-b no -v no” options to ensure that Zencrack submits the job correctly and waits for the job to complete. These options should be added to the definition of ZCRMARC with # used to represent the spaces e.g.: ZCRMARC=/msc/marc2005r3/tools/run_marc#-b#no#-v#no
ZCRMARCEXE	the full location of the MSC.Marc executable that includes the impd subroutine supplied with Zencrack (see section 2.5). This should include the full path and file name but not the .exe file extension if there is one.

If a new version of Abaqus, Ansys, Finas or MSC.Marc is installed on the system the relevant symbols ZCRABAQUS, ZCRABAQUSVER, ZCRANSYS, ZCRANSYSVER, ZCRFINAS (Windows only), ZCRMARC and ZCRMARCEXE must be updated in the runzcr75.bat file or the runzcr75 script file.

2.3.2 Optional items

The following may also be defined although in most cases this will not be necessary:

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
containing          *FILES, UNCRACKED=mymesh.inp
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.

- ABQMODE** defines options for running Abaqus. This must contain “interactive”. Other Abaqus command line options may be added e.g. the CPU option can be added to specify how many CPUs are used by Abaqus jobs submitted by Zencrack.
- 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.
- FORTRAN** defines whether the Windows version of Zencrack is using Compaq or Intel binaries. This is subsequently used to define the command line options for the compiler, FORTRANSTRING, and defaults for the Zencrack executable, object and library file locations, ZCREXEDEFAULT, ZCROBJDEFAULT and ZCRLIBDEFAULT. This is only relevant for 32bit Windows installations where the values may be set to “compaq” or “intel”. For 64bit Windows installations the value should always be “intel”.
- FORTRANSTRING** Command line options for the compiler when a Zencrack user subroutine is required.
- 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. For Windows this setting is based on the value of the FORTRAN option.
- 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. For Windows this setting is based on the value of the FORTRAN option.

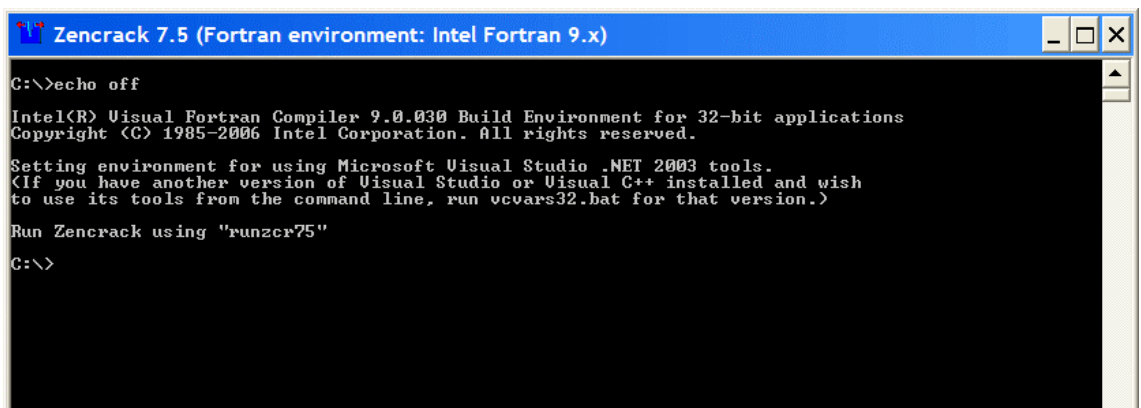
CNVANSYS defines the default type of Ansys uncracked mesh file. The default is “normal”. The other allowed value is “solidmodel”. This setting is overridden for individual jobs by the “-a” command line option.

2.4 Using Zencrack user subroutines

A Zencrack user subroutine is included in an analysis by using the “-u” command line option as described in section 3.2.

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

- When the setupzcr75 program is executed after installation it requests details of the required Fortran environment. Upon completion of the setup program, a file zcrpath75.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 zcrpath75.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 7.5 (Fortran environment: Intel Fortran 9.x)
C:\>echo off
Intel(R) Visual Fortran Compiler 9.0.030 Build Environment for 32-bit applications
Copyright (C) 1985-2006 Intel Corporation. All rights reserved.

Setting environment for using Microsoft Visual Studio .NET 2003 tools.
<If you have another version of Visual Studio or Visual C++ installed and wish
to use its tools from the command line, run vcvars32.bat for that version.>

Run Zencrack using "runzcr75"
C:\>
```

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

- The runzcr75 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 90 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 9.1.043:

```
source /opt/intel/fce/9.1.043/bin/ifortvars.sh
runzcr75 -j myjob -u myusersub.f
```

2.5 Creating an executable for MSC.Marc

The MSC.Marc interface requires that a supplied MSC.Marc subroutine be used to pass data between Zencrack and MSC.Marc. In order to use this subroutine it is necessary to create a special MSC.Marc executable and then reference that executable using the ZCRMARCEXE symbol in the runzcr75 file. It is suggested that once created the Marc executable should be located in the fe_marc folder of the Zencrack installation. The **EXE** keyword in the Zencrack input file can be used to override the value of ZCRMARCEXE for individual jobs.

The supplied MSC.Marc user subroutine is in the “fe_marc” directory after installation of Zencrack. This subroutine supplied with Zencrack 7.5 is set up to be used with MSC.Marc 2003 or 2005.

The subroutine is used to create and save a Marc executable as follows:

```
run_marc -j dummy -u impd_zencrack -sa yes
```

where dummy.dat is a dummy Marc input file. To use the “run_marc” script from the command line requires that the system path be correctly configured for Marc.

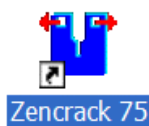
The command as shown here creates a Marc executable impd_zencrack.exe that incorporates the user subroutine.

3. Running Zencrack

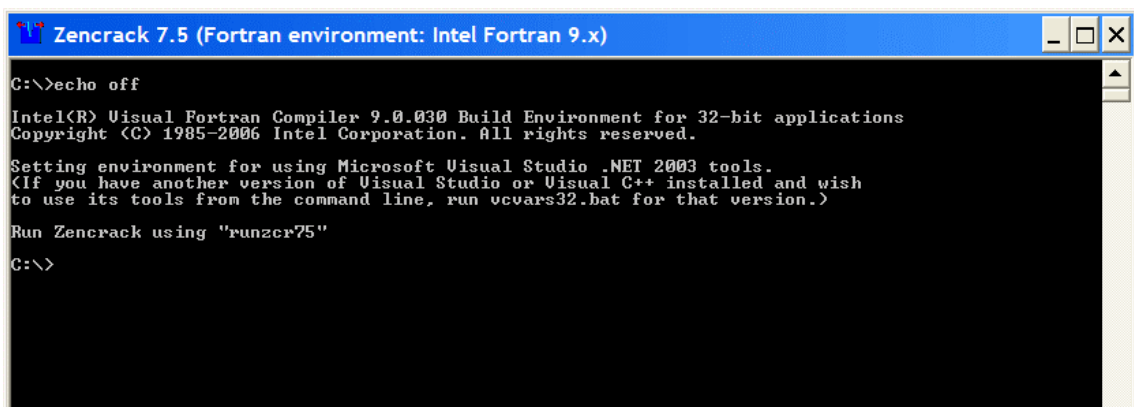
Zencrack is executed using the `runzcr75` script located in the `tools` directory of the Zencrack installation. This section describes the execution options in detail.

3.1 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 [2.1.2](#). 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.:



```
C:\>echo off
Intel(R) Visual Fortran Compiler 9.0.030 Build Environment for 32-bit applications
Copyright (C) 1985-2006 Intel Corporation. All rights reserved.

Setting environment for using Microsoft Visual Studio .NET 2003 tools.
<If you have another version of Visual Studio or Visual C++ installed and wish
to use its tools from the command line, run vcvars32.bat for that version.>

Run Zencrack using "runzcr75"
C:\>
```

3.2 Execution using “runzcr75”

The program is run using the `runzcr75.bat` batch file (`runzcr75` 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 this option is used the -e option is ignored. If the compile and link is successful this option creates and saves a new executable called zcr75_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
- g gmodel gmodel is the globalmodel filename for an Abaqus analysis (default: nul - no global model)
- 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 runzcr75 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 the following is seen under Windows (with similar for Linux & Unix):

```
C:\zencrack75\demos\abaqus\verify>runzcr75 -j a01a
C:\zencrack75\demos\abaqus\verify>echo off

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-----

Job      = Job name (.zcr file) : a01a
User    = ZENCRACK subroutine  :
Exe     = ZENCRACK executable  : c:\zencrack75\bin\zcr75.exe
Gmodel  = ABAQUS global model  : nul
```

```
Overwrite= Overwrite old output : no
FEtype    = F.E. analysis type   : input
CNVansys  = Ansys model type     : normal
remoteFE  = Remote fe execution  : no
Default output stem          : r
```

```
ZENCRACK job a01a started
28/06/2007
09:45
```

```
Starting mesh generation
*** Zencrack job completed without any errors
*** There are input warnings - check the .rep file
ZENCRACK job a01a completed
28/06/2007
09:45
```

3.3 Examples

`runzcr75 -j example`

Run job example.

`runzcr75 -j submod -g globalmod`

Run job submod using global model results file globalmod.

`runzcr75 -j myanalysis -u user_dadn.for`

Run job myanalysis using Zencrack user subroutine user_dadn.for.

`runzcr75 -j mysolid -a solidmodel`

Run Ansys job mysolid that contains solid model options.

`runzcr75 3dmesh`

Run utility program 3dmesh

- f01c for Finas users runzcr75 -j flc
- m01c for MSC.Marc users runzcr75 -j m01c
- To confirm that the analysis completes successfully, check the a01cr.rep, n01cr.rep, f01cr.rep or m01cr.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.

5. License File

Zencrack is licensed on a node-locked basis. The Zencrack installation contains a sub-directory called “machine_id” that contains an executable that can be used to report the machine identification number required before a license file can be issued.

A valid customer license file is required to allow execution of Zencrack. This file must be located in the “license” sub-directory of the Zencrack installation. The filename must be customer.lic and the contents of the file must be exactly as sent by Zentech.

To obtain a valid license file please contact Zentech: support@zentech.co.uk.

A sample license file is shown below. Note that a carriage return should be included after the password for the computer code.

```
Licensed to:
Zentech International Limited
103 Mytchett Road
Camberley
Surrey GU16 6ES
U.K.
+44 1252 376388
+44 1252 376389
License type:
Commercial v7.5
Valid dates:
01-06-2007:31-05-2008
Password:
LBWLPHGFFJFJFQ
QPA81XQ256AEK70
ZL265UT602M1433
LG124SFV40QO156
AP308BX550ZJ919
124753678515912
Computers:
PC:MYPCNAME:00-C1-F0-23-A2-DF:BU407W2613E3712
Computer code:
AEXBPKGMLVXSXEZX
```

6. QA Procedures

Zentech have installed a quality system following the guidelines of ISO 9001 and ISO 9000-3. The quality system is applied to Zencrack development and customer support. Quality procedures are implemented to control, for example, configuration management, program and technical documentation, release activities, software fault reports and program enhancements.

Prior to release, a set of QA benchmarks are performed to verify the Zencrack program. The tests comprise of over 1850 analyses. Utility programs are used to perform regression tests against the previously verified version of Zencrack. The programs report differences in results and a percentage verification error margin can be specified so that results falling outside of this margin produce error reports.

Users are invited to report software faults using the Software Fault Report Form QA13 (which is included with the program documentation). Further information on requesting support is contained in section 2.10 of the User Manual.

A reference is assigned to each fault report to allow follow up bug fix progress. We offer hotline, telefax and e-mail support for users with a Zencrack maintenance contract. Users may be asked to provide supportive information and possibly to re-run failed analyses with debug options set. The information on how to set the debug options for particular routines in the code will be given by a Zentech support engineer. This is considered to be necessary since voluminous output could be created without support guidance.

Zentech has an open policy of informing the customer of known existing bugs and bug fixes incorporated into a new Zencrack release. If a work-around is available, it will be stated. Support information, including the current bug list and workarounds is available via the Zencrack page on Zentech's web site:

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