

ABAQUS 6.14

INSTALLATION AND LICENSING GUIDE



3DEXPERIENCE

Abaqus

Installation and Licensing

Guide

Legal Notices

CAUTION: This documentation is intended for qualified users who will exercise sound engineering judgment and expertise in the use of the Abaqus Software. The Abaqus Software is inherently complex, and the examples and procedures in this documentation are not intended to be exhaustive or to apply to any particular situation. Users are cautioned to satisfy themselves as to the accuracy and results of their analyses.

Dassault Systèmes and its subsidiaries, including Dassault Systèmes Simulia Corp., shall not be responsible for the accuracy or usefulness of any analysis performed using the Abaqus Software or the procedures, examples, or explanations in this documentation. Dassault Systèmes and its subsidiaries shall not be responsible for the consequences of any errors or omissions that may appear in this documentation.

The Abaqus Software is available only under license from Dassault Systèmes or its subsidiary and may be used or reproduced only in accordance with the terms of such license. This documentation is subject to the terms and conditions of either the software license agreement signed by the parties, or, absent such an agreement, the then current software license agreement to which the documentation relates.

Abaqus software updates are designated by Version, Release, and, if applicable, Maintenance Delivery. Releases are software updates that include enhancements and new functionality. Maintenance Deliveries are software updates that address known issues but generally do not introduce enhancements or new functionality. Abaqus Extended Functionality Releases provide early access to a subset of the new functionality that will be introduced in the next numbered Release.

Consistent with the format used by other Dassault Systèmes brands for designating releases, Abaqus Software is designated by Version and Release as Abaqus 6.n (for example). Abaqus 6.n is not a new Version but is a new Release. Similarly, Abaqus 6.n-3 refers to Version 6, Release n, Maintenance Delivery 3. When the Abaqus Maintenance Delivery number is omitted in written communications, the reference is to be interpreted to mean the general release, which is referenced in the code as Abaqus 6.n-1. Extended Functionality Releases are designated by an EF suffix after the Release number.

This documentation and the software described in this documentation are subject to change without prior notice.

No part of this documentation may be reproduced or distributed in any form without prior written permission of Dassault Systèmes or its subsidiary.

The Abaqus Software is a product of Dassault Systèmes Simulia Corp., Providence, RI, USA.

© Dassault Systèmes, 2014

Abaqus, the 3DS logo, SIMULIA, CATIA, and Unified FEA are trademarks or registered trademarks of Dassault Systèmes or its subsidiaries in the United States and/or other countries.

Other company, product, and service names may be trademarks or service marks of their respective owners.

The Abaqus Software and its documentation includes processes under U.S. Patents 5,920,491, 6,044,210, and 6,697,770. Dassault Systèmes or its subsidiaries may also have other patents or pending patent applications, trademarks, copyrights, or other intellectual property rights covering Abaqus Software and/or its documentation. No license of such patents, trademarks, copyrights, or other intellectual property rights is provided or implied except as may be expressly provided in a written license agreement from Dassault Systèmes or its subsidiary.

Open Source Programs

Abaqus Software uses several open source or free programs (“OS” Programs) that are identified below. Each such program is distributed with Abaqus software in binary form and, except as permitted by the applicable license, without modification. Each such program is available online for free downloading and, if required by the applicable OS Program license, the source code will be made available by Dassault Systèmes Simulia Corp. (“SIMULIA”) upon request.

All of the OS Programs used in the Abaqus software that require a public citation are listed in the table below. Each of these OS Programs is available for use under a license that may be found by searching for the name of the OS Program in the table below. While users should consult the specific license applicable to each OS Program, generally these licenses provide permission for any person to obtain a copy of the OS Program without restriction, including without limiting the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the OS Program and to permit persons to whom the OS Program is furnished to do so. Some of the licenses for the OS Programs listed below impose additional restrictions on use or modification and require that source code be made available. Each license includes substantially the following conditions and in some cases additional or different terms:

The copyright notice associated with each OS Program (as listed in the program license) and the above permission notice (or other applicable restrictions indicated in each license) shall be included in all copies or substantial portions of such OS Program.

The warranty and Support Services provided by SIMULIA under the End User License Agreement apply to all such open source software and are provided by SIMULIA and not by the original licensor. The original licensor of the open source software provides such software on an “as is” basis and without any liability whatsoever to any licensee.

NO CONTRIBUTOR TO THE DEVELOPMENT OF ANY OS PROGRAM SHALL BE LIABLE TO ANY USER OF ANY OS PROGRAM FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES OR LOSS (INCLUDING BUT NOT LIMITED TO PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS, OR BUSINESS INTERRUPTION) AS A RESULT OF USING, MODIFYING, OR DISTRIBUTING THE OS PROGRAM OR ANY DERIVATIVE THEREOF EVEN IF ADVISED OF THE POSSIBILITY THEREOF, HOWEVER CAUSED AND ON ANY THEORY OF STRICT LIABILITY OR TORT.

Software Name	Release
asyncore-asyncchat	(none)
clBLAS	1.10
Cookie	(none)
ctypes	(none)
Exodus II	4.84
FOX Toolkit Library	1.0.31
FreeType	2.1.10
Info-ZIP Utilities UnZip	6.0
Info-ZIP Utilities Zip	3.0
Jakarta	2.07
libffi	(none)
Mesa	6.0.1
Metis	4.0.1
ML	5.0
Modelisar	1.0
Natural Order Sort	2004-10-10 mbp
NEMESIS	3.09
NetCDF	4.0.1

Software Name	Release
NumPy	1.6.2
OpenSSL	(none)
PBMPlus	8.3
Perl	5.005 (lnx86_64), 5.8.8 (WinX86_64)
PNG	1.0.3
profile, pstats	(none)
Pychecker	0.8.17
pyexpat	(none)
Python	2.7.3
Python for Windows Extensions	Build 217
_random	(none)
SCXML	Working Draft 16 December 2010
Socket	(none)
Tcl/Tk	8.5
TIFF	3.5.7
Trace	(none)
uu	(none)
Visualization ToolKit (VTK)	5.6.0
_wincon.c	5/8/2001
Xalan-C++	Version 1.10
Xerces C++	3.0.1
XML Expat Parser	1.95.4
xmlrpclib	(none)
Zlib	1.2.8

Asyncore – asynchat

Copyright 1996 by Sam Rushing

All rights reserved.

Permission to use, copy, modify, and distribute this software and its documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appear in all copies and that both that copyright notice and this permission notice appear in supporting documentation, and that the name of Sam Rushing not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission.

SAM RUSHING DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, IN NO EVENT SHALL SAM RUSHING BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

Cookie

Copyright 2000 by Timothy O'Malley

timo@alum.mit.edu

All rights reserved.

Permission to use, copy, modify, and distribute this software and its documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appear in all copies and that both that copyright notice and this permission notice appear in supporting documentation, and that the name of Timothy O'Malley not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission.

Timothy O'Malley DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, IN NO EVENT SHALL Timothy O'Malley BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

Ctypes

Copyright (c) 2000, 2001, 2002, 2003, 2004 Thomas Heller

All rights reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Exodus II - Version 4.84

Copyright (c) 2005 Sandia Corporation. Under the terms of Contract DE-AC04-94AL85000 with Sandia Corporation, the U.S. Government retains certain rights in this software.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of Sandia Corporation nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

FOX Toolkit Library - Version 1.0.31

Copyright © 1998 - 2003 by Jeroen van der Zijp

GNU LESSER GENERAL PUBLIC LICENSE

Version 2.1, February 1999

Copyright © 1991, 1999 Free Software Foundation, Inc.

59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users.

This license, the Lesser General Public License, applies to some specially designated software packages—typically libraries—of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

We protect your rights with a two-step method: (1) we copyright the library, and (2) we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the “Lesser” General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a “work based on the library” and a “work that uses the library”. The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

GNU LESSER GENERAL PUBLIC LICENSE

TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called “this License”). Each licensee is addressed as “you”.

A “library” means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The “Library”, below, refers to any such software library or work which has been distributed under these terms. A “work based on the Library” means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either

verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term “modification”.)

“Source code” for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library’s complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

- a. The modified work must itself be a software library.
- b. You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.
- c. You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.
- d. If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a “work that uses the Library”. Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a “work that uses the Library” with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a “work that uses the library”. The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

- a. Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)
- b. Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.
- c. Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.
- d. If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
- e. Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

- a. Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.
- b. Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

ADDENDUM TO LICENSE

March 2003

Copyright © 2002,2005 Jeroen van der Zijp.

Everyone is permitted to copy and distribute verbatim copies of this license addendum document, but changing it is not allowed.

FOX Toolkit Library License Addendum.

1. License. The FOX Toolkit Library ("The Library") is licensed under GNU Lesser General Public License as published by the Free Software Foundation, version 2.1 of the License, or (at your option) any later version.
2. Relinking Exemption. You may distribute a combined work using a statically linked, unmodified copy of the FOX Library under terms of your choice, without the relinking requirement stipulated under the GNU Lesser Public License, subject to the following conditions:
 - a. This static relinking exemption covers only the FOX Toolkit Library. Other libraries which the FOX Library may need are covered by their own respective licenses.

- b. Modification of the configure scripts, makefiles, or installation tools of the FOX Library to support a specific platform does not constitute creating a modified copy based on the FOX Library.
 - c. Programs or binaries statically linked with the FOX Library must be identified as such by including, in the Documentation or by other means (for example in the About Box or Online Help), the following statement:
“This software uses the FOX Toolkit Library (<http://www.fox-toolkit.org>).”
 - d. Subclassing from Objects or Widgets supplied by the Library involves no modifications to the source code of the Library itself, and does not constitute creating a modified copy based on the Library.
3. If you do not accept or are unable to meet the conditions under (2), you may continue to distribute the combined work under the original GNU Lesser General Public License.

END OF ADDENDUM

FreeType - Version 2.1.10

Copyright 1996-2002, 2006

by David Turner, Robert Wilhelm, and Werner Lemberg

Portions of this software are copyright © 2006 The FreeType Project (www.freetype.org).

All rights reserved.

Legal Terms

0. Definitions

Throughout this license, the terms ‘package’, ‘FreeType Project’, and ‘FreeType archive’ refer to the set of files originally distributed by the authors (David Turner, Robert Wilhelm, and Werner Lemberg) as the ‘FreeType Project’, be they named as alpha, beta or final release.

‘You’ refers to the licensee, or person using the project, where ‘using’ is a generic term including compiling the project’s source code as well as linking it to form a ‘program’ or ‘executable’. This program is referred to as ‘a program using the FreeType engine’.

This license applies to all files distributed in the original FreeType Project, including all source code, binaries and documentation, unless otherwise stated in the file in its original, unmodified form as distributed in the original archive. If you are unsure whether or not a particular file is covered by this license, you must contact us to verify this.

The FreeType Project is copyright (C) 1996-2000 by David Turner, Robert Wilhelm, and Werner Lemberg. All rights reserved except as specified below.

1. No Warranty

THE FREETYPE PROJECT IS PROVIDED ‘AS IS’ WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL ANY OF THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY DAMAGES CAUSED BY THE USE OR THE INABILITY TO USE, OF THE FREETYPE PROJECT.

2. Redistribution

This license grants a worldwide, royalty-free, perpetual and irrevocable right and license to use, execute, perform, compile, display, copy, create derivative works of, distribute and sublicense the FreeType Project (in both source and object code forms) and derivative works thereof for any purpose; and to authorize others to exercise some or all of the rights granted herein, subject to the following conditions:

- Redistribution of source code must retain this license file (‘FTL.TXT’) unaltered; any additions, deletions or changes to the original files must be clearly indicated in accompanying documentation. The copyright notices of the unaltered, original files must be preserved in all copies of source files.
- Redistribution in binary form must provide a disclaimer that states that the software is based in part of the work of the FreeType Team, in the distribution documentation. We also encourage you to put an URL to the FreeType web page in your documentation, though this isn’t mandatory.

These conditions apply to any software derived from or based on the FreeType Project, not just the unmodified files. If you use our work, you must acknowledge us. However, no fee need be paid to us.

3. Advertising

Neither the FreeType authors and contributors nor you shall use the name of the other for commercial, advertising, or promotional purposes without specific prior written permission.

We suggest, but do not require, that you use one or more of the following phrases to refer to this software in your documentation or advertising materials: 'FreeType Project', 'FreeType Engine', 'FreeType library', or 'FreeType Distribution'.

As you have not signed this license, you are not required to accept it. However, as the FreeType Project is copyrighted material, only this license, or another one contracted with the authors, grants you the right to use, distribute, and modify it. Therefore, by using, distributing, or modifying the FreeType Project, you indicate that you understand and accept all the terms of this license.

4. Contacts

There are two mailing lists related to FreeType:

- freetype@nongnu.org

Discusses general use and applications of FreeType, as well as future and wanted additions to the library and distribution. If you are looking for support, start in this list if you haven't found anything to help you in the documentation.

- freetype-devel@nongnu.org

Discusses bugs, as well as engine internals, design issues, specific licenses, porting, etc.

Our home page can be found at <http://www.freetype.org>

Info-ZIP Utilities UnZip - Version 6.0

This is version 2009-Jan-02 of the Info-ZIP license. The definitive version of this document should be available at <ftp://ftp.info-zip.org/pub/infozip/license.html> indefinitely and a copy at <http://www.info-zip.org/pub/infozip/license.html>.

Copyright (c) 1990-2009 Info-ZIP. All rights reserved.

For the purposes of this copyright and license, "Info-ZIP" is defined as the following set of individuals:

Mark Adler, John Bush, Karl Davis, Harald Denker, Jean-Michel Dubois, Jean-loup Gailly, Hunter Goatley, Ed Gordon, Ian Gorman, Chris Herborth, Dirk Haase, Greg Hartwig, Robert Heath, Jonathan Hudson, Paul Kienitz, David Kirschbaum, Johnny Lee, Onno van der Linden, Igor Mandrichenko, Steve P. Miller, Sergio Monesi, Keith Owens, George Petrov, Greg Roelofs, Kai Uwe Rommel, Steve Salisbury, Dave Smith, Steven M. Schweda, Christian Spieler, Cosmin Truta, Antoine Verheijen, Paul von Behren, Rich Wales, Mike White.

This software is provided "as is," without warranty of any kind, express or implied. In no event shall Info-ZIP or its contributors be held liable for any direct, indirect, incidental, special or consequential damages arising out of the use of or inability to use this software.

Permission is granted to anyone to use this software for any purpose, including commercial applications, and to alter it and redistribute it freely, subject to the above disclaimer and the following restrictions:

1. Redistributions of source code (in whole or in part) must retain the above copyright notice, definition, disclaimer, and this list of conditions.
2. Redistributions in binary form (compiled executables and libraries) must reproduce the above copyright notice, definition, disclaimer, and this list of conditions in documentation and/or other materials provided with the distribution. Additional documentation is not needed for executables where a command line license option provides these and a note regarding this option is in the executable's startup banner. The sole exception to this condition is redistribution of a standard UnZipSFX binary (including SFXWiz) as part of a self-extracting archive; that is permitted without inclusion of this license, as long as the normal SFX banner has not been removed from the binary or disabled.
3. Altered versions--including, but not limited to, ports to new operating systems, existing ports with new graphical interfaces, versions with modified or added functionality, and dynamic, shared, or static library versions not from Info-ZIP--must be plainly marked as such and must not be misrepresented as being the original source or, if binaries, compiled from the original source. Such altered versions also must not be misrepresented as being Info-ZIP releases--including, but not limited to, labeling of the altered versions with the names "Info-ZIP" (or any variation thereof, including, but not limited to, different capitalizations), "Pocket UnZip," "WiZ" or "MacZip" without the explicit permission of Info-ZIP. Such altered versions are further prohibited from misrepresentative use of the Zip-Bugs or Info-ZIP e-mail addresses or the Info-ZIP URL(s), such as to imply Info-ZIP will provide support for the altered versions.
4. Info-ZIP retains the right to use the names "Info-ZIP," "Zip," "UnZip," "UnZipSFX," "WiZ," "Pocket UnZip," "Pocket Zip," and "MacZip" for its own source and binary releases.

Info-ZIP Utilities Zip - Version 3.0

This is version 2009-Jan-02 of the Info-ZIP license. The definitive version of this document should be available at <ftp://ftp.info-zip.org/pub/infozip/license.html> indefinitely and a copy at <http://www.info-zip.org/pub/infozip/license.html>.

Copyright (c) 1990-2009 Info-ZIP. All rights reserved.

For the purposes of this copyright and license, "Info-ZIP" is defined as the following set of individuals:

Mark Adler, John Bush, Karl Davis, Harald Denker, Jean-Michel Dubois, Jean-loup Gailly, Hunter Goatley, Ed Gordon, Ian Gorman, Chris Herborth, Dirk Haase, Greg Hartwig, Robert Heath, Jonathan Hudson, Paul Kienitz, David Kirschbaum, Johnny Lee, Onno van der Linden, Igor Mandrichenko, Steve P. Miller, Sergio Monesi, Keith Owens, George Petrov, Greg Roelofs, Kai Uwe Rommel, Steve Salisbury, Dave Smith, Steven M. Schweda, Christian Spieler, Cosmin Truta, Antoine Verheijen, Paul von Behren, Rich Wales, Mike White.

This software is provided "as is," without warranty of any kind, express or implied. In no event shall Info-ZIP or its contributors be held liable for any direct, indirect, incidental, special or consequential damages arising out of the use of or inability to use this software.

Permission is granted to anyone to use this software for any purpose, including commercial applications, and to alter it and redistribute it freely, subject to the above disclaimer and the following restrictions:

1. Redistributions of source code (in whole or in part) must retain the above copyright notice, definition, disclaimer, and this list of conditions.
2. Redistributions in binary form (compiled executables and libraries) must reproduce the above copyright notice, definition, disclaimer, and this list of conditions in documentation and/or other materials provided with the distribution. Additional documentation is not needed for executables where a command line license option provides these and a note regarding this option is in the executable's startup banner. The sole exception to this condition is redistribution of a standard UnZipSFX binary (including SFXWiz) as part of a self-extracting archive; that is permitted without inclusion of this license, as long as the normal SFX banner has not been removed from the binary or disabled.
3. Altered versions—including, but not limited to, ports to new operating systems, existing ports with new graphical interfaces, versions with modified or added functionality, and dynamic, shared, or static library versions not from Info-ZIP—must be plainly marked as such and must not be misrepresented as being the original source or, if binaries, compiled from the original source. Such altered versions also must not be misrepresented as being Info-ZIP releases—including, but not limited to, labeling of the altered versions with the names "Info-ZIP" (or any variation thereof, including, but not limited to, different capitalizations), "Pocket UnZip," "WiZ" or "MacZip" without the explicit permission of Info-ZIP. Such altered versions are further prohibited from misrepresentative use of the Zip-Bugs or Info-ZIP e-mail addresses or the Info-ZIP URL(s), such as to imply Info-ZIP will provide support for the altered versions.
4. Info-ZIP retains the right to use the names "Info-ZIP," "Zip," "UnZip," "UnZipSFX," "WiZ," "Pocket UnZip," "Pocket Zip," and "MacZip" for its own source and binary releases.

Jakarta - Version 2.07

SCXML Working Draft 16 December 2010

Xalan-C++ - Version 1.10

Xerces C++ - Version 3.0.1

Jakarta is licensed under the Apache license:

SCXML is licensed under the Apache license:

Xalan-C++ 1.10 is licensed under the Apache license:

Xerces C++ 3.0.1 is licensed under the Apache license:

Apache License

Version 2.0, January 2004

1999 - 2005 The Apache Software Foundation

<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix)

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

“Contribution” shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, “submitted” means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as “Not a Contribution”.

“Contributor” shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. **Grant of Copyright License.** Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.
3. **Grant of Patent License.** Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.
4. **Redistribution.** You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:
 - a. You must give any other recipients of the Work or Derivative Works a copy of this License; and
 - b. You must cause any modified files to carry prominent notices stating that You changed the files; and
 - c. You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and
 - d. If the Work includes a “NOTICE” text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License. You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.
5. **Submission of Contributions.** Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.
6. **Trademarks.** This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.
7. **Disclaimer of Warranty.** Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an “AS IS” BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.
8. **Limitation of Liability.** In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.
9. **Accepting Warranty or Additional Liability.** While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to

indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets“[]” replaced with your own identifying information. (Don’t include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same “printed page” as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner] Licensed under the Apache License, Version 2.0 (the “License”); you may not use this file except in compliance with the License. You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an“AS IS”BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND , either express or implied. See the License for the specific language governing permissions and limitations under the License.

libffi license

Copyright (c) 1996-2003 Red Hat, Inc.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “Software”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Mesa - Version 6.0.1

Copyright (C) 1999-2007 Brian Paul All Rights Reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “Software”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL BRIAN PAUL BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Metis - Version 4.0.1

Copyright (c) 1998, Regents of the University of Minnesota

METIS is copyrighted by the regents of the University of Minnesota. This work was supported by IST/BMDO through Army Research Office contract DA/DAAH04-93-G-0080, and by Army High Performance Computing Research Center under the auspices of the Department of the Army, Army Research Laboratory cooperative agreement number DAAH04-95-2-0003//contract number DAAH04-95-C-0008, the content of which does not necessarily reflect the position or the policy of the government, and no official endorsement should be inferred. Access to computing facilities was provided by Minnesota Supercomputer Institute, Cray Research Inc, and by the Pittsburgh Supercomputing Center. Related papers are available via WWW atURL :

<http://www.cs.umn.edu/~metis> and:

“A Fast and Highly Quality Multilevel Scheme for Partitioning Irregular Graphs”. George Karypis and Vipin Kumar. SIAM Journal on Scientific Computing, Vol. 20, No. 1, pp. 359–392, 1999.”

ML - Version 5.0 (<http://trilinos.sandia.gov/download/trilinos-9.0.html> (<http://trilinos.sandia.gov/download/trilinos-9.0.html>))

GNU LESSER GENERAL PUBLIC LICENSE

Version 3, 29 June 2007

Copyright © 2007 Free Software Foundation, Inc. <http://fsf.org/> (<http://fsf.org/>)

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

This version of the GNU Lesser General Public License incorporates the terms and conditions of version 3 of the GNU General Public License, supplemented by the additional permissions listed below.

0. Additional Definitions

As used herein, “this License” refers to version 3 of the GNU Lesser General Public License, and the “GNU GPL” refers to version 3 of the GNU General Public License.

“The Library” refers to a covered work governed by this License, other than an Application or a Combined Work as defined below.

An “Application” is any work that makes use of an interface provided by the Library, but which is not otherwise based on the Library. Defining a subclass of a class defined by the Library is deemed a mode of using an interface provided by the Library.

A “Combined Work” is a work produced by combining or linking an Application with the Library. The particular version of the Library with which the Combined Work was made is also called the “Linked Version”

The “Minimal Corresponding Source” for a Combined Work means the Corresponding Source for the Combined Work, excluding any source code for portions of the Combined Work that, considered in isolation, are based on the Application, and not on the Linked Version.

The “Corresponding Application Code” for a Combined Work means the object code and/or source code for the Application, including any data and utility programs needed for reproducing the Combined Work from the Application, but excluding the System Libraries of the Combined Work.

1. Exception to Section 3 of the GNU GPL.

You may convey a covered work under sections 3 and 4 of this License without being bound by section 3 of the GNU GPL

2. Conveying Modified Versions.

If you modify a copy of the Library, and, in your modifications, a facility refers to a function or data to be supplied by an Application that uses the facility (other than as an argument passed when the facility is invoked), then you may convey a copy of the modified version:

- a. under this License, provided that you make a good faith effort to ensure that, in the event an Application does not supply the function or data, the facility still operates, and performs whatever part of its purpose remains meaningful, or
- b. under the GNU GPL, with none of the additional permissions of this License applicable to that copy.

3. Object Code Incorporating Material from Library Header Files.

The object code form of an Application may incorporate material from a header file that is part of the Library. You may convey such object code under terms of your choice, provided that, if the incorporated material is not limited to numerical parameters, data structure layouts and accessors, or small macros, inline functions and templates (ten or fewer lines in length), you do both of the following:

- a. Give prominent notice with each copy of the object code that the Library is used in it and that the Library and its use are covered by this License.
- b. Accompany the object code with a copy of the GNU GPL and this license document.

4. Combined Works.

You may convey a Combined Work under terms of your choice that, taken together, effectively do not restrict modification of the portions of the Library contained in the Combined Work and reverse engineering for debugging such modifications, if you also do each of the following:

- a. Give prominent notice with each copy of the Combined Work that the Library is used in it and that the Library and its use are covered by this License.
- b. Accompany the Combined Work with a copy of the GNU GPL and this license document.
- c. For a Combined Work that displays copyright notices during execution, include the copyright notice for the Library among these notices, as well as a reference directing the user to the copies of the GNU GPL and this license document.
- d. Do one of the following:
 0. Convey the Minimal Corresponding Source under the terms of this License, and the Corresponding Application Code in a form suitable for, and under terms that permit, the user to recombine or relink the Application with a modified version of the Linked Version to produce a modified Combined Work, in the manner specified by section 6 of the GNU GPL for conveying Corresponding Source.
 1. Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (a) uses at run time a copy of the Library already present on the user’s computer system, and (b) will operate properly with a modified version of the Library that is interface-compatible with the Linked Version.

- e. Provide Installation Information, but only if you would otherwise be required to provide such information under section 6 of the GNU GPL, and only to the extent that such information is necessary to install and execute a modified version of the Combined Work produced by recombining or relinking the Application with a modified version of the Linked Version. (If you use option 4d0, the Installation Information must accompany the Minimal Corresponding Source and Corresponding Application Code. If you use option 4d1, you must provide the Installation Information in the manner specified by section 6 of the GNU GPL for conveying Corresponding Source.)

5. *Combined Libraries.*

You may place library facilities that are a work based on the Library side by side in a single library together with other library facilities that are not Applications and are not covered by this License, and convey such a combined library under terms of your choice, if you do both of the following:

- a. Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities, conveyed under the terms of this License.
- b. Give prominent notice with the combined library that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

6. *Revised Versions of the GNU Lesser General Public License.*

The Free Software Foundation may publish revised and/or new versions of the GNU Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library as you received it specifies that a certain numbered version of the GNU Lesser General Public License "or any later version" applies to it, you have the option of following the terms and conditions either of that published version or of any later version published by the Free Software Foundation. If the Library as you received it does not specify a version number of the GNU Lesser General Public License, you may choose any version of the GNU Lesser General Public License ever published by the Free Software Foundation.

If the Library as you received it specifies that a proxy can decide whether future versions of the GNU Lesser General Public License shall apply, that proxy's public statement of acceptance of any version is permanent authorization for you to choose that version for the Library.

The GNU GPL license follows, solely for reference from the above:

GNU GENERAL PUBLIC LICENSE

Version 3, 29 June 2007

Copyright © 2007 Free Software Foundation, Inc. <http://fsf.org/>

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The GNU General Public License is a free, copyleft license for software and other kinds of works.

The licenses for most software and other practical works are designed to take away your freedom to share and change the works. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change all versions of a program—to make sure it remains free software for all its users. We, the Free Software Foundation, use the GNU General Public License for most of our software; it applies also to any other work released this way by its authors. You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for them if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs, and that you know you can do these things.

To protect your rights, we need to prevent others from denying you these rights or asking you to surrender the rights. Therefore, you have certain responsibilities if you distribute copies of the software, or if you modify it: responsibilities to respect the freedom of others.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must pass on to the recipients the same freedoms that you received. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

Developers that use the GNU GPL protect your rights with two steps: (1) assert copyright on the software, and (2) offer you this License giving you legal permission to copy, distribute and/or modify it.

For the developers' and authors' protection, the GPL clearly explains that there is no warranty for this free software. For both users' and authors' sake, the GPL requires that modified versions be marked as changed, so that their problems will not be attributed erroneously to authors of previous versions.

Some devices are designed to deny users access to install or run modified versions of the software inside them, although the manufacturer can do so. This is fundamentally incompatible with the aim of protecting users' freedom to change the software. The systematic pattern of such abuse occurs in the area of products for individuals to use, which is precisely where it is most unacceptable. Therefore, we have designed this version of the GPL to prohibit the practice for those products. If such problems arise substantially in other domains, we stand ready to extend this provision to those domains in future versions of the GPL, as needed to protect the freedom of users.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The precise terms and conditions for copying, distribution and modification follow.

TERMS AND CONDITIONS

0. *Definitions*

“This License” refers to version 3 of the GNU Lesser General Public License.

“Copyright” also means copyright-like laws that apply to other kinds of works, such as semiconductor masks.

“The Program” refers to any copyrightable work licensed under this License. Each licensee is addressed as “you”. “Licensees” and “recipients” may be individuals or organizations.

To “modify” a work means to copy from or adapt all or part of the work in a fashion requiring copyright permission, other than the making of an exact copy. The resulting work is called a “modified version” of the earlier work or a work “based on” the earlier work.

A “covered work” means either the unmodified Program or a work based on the Program..

To “propagate” a work means to do anything with it that, without permission, would make you directly or secondarily liable for infringement under applicable copyright law, except executing it on a computer or modifying a private copy. Propagation includes copying, distribution (with or without modification), making available to the public, and in some countries other activities as well.

To “convey” a work means any kind of propagation that enables other parties to make or receive copies. Mere interaction with a user through a computer network, with no transfer of a copy, is not conveying.

An interactive user interface displays “Appropriate Legal Notices” to the extent that it includes a convenient and prominently visible feature that (1) displays an appropriate copyright notice, and (2) tells the user that there is no warranty for the work (except to the extent that warranties are provided), that licensees may convey the work under this License, and how to view a copy of this License. If the interface presents a list of user commands or options, such as a menu, a prominent item in the list meets this criterion.

1. *Source Code.*

The “source code” for a work means the preferred form of the work for making modifications to it. “Object code” means any non-source form of a work.

A “Standard Interface” means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

The “System Libraries” of an executable work include anything, other than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A “Major Component”, in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

The “Corresponding Source” for a work in object code form means all the source code needed to generate, install, and (for an executable work) run the object code and to modify the work, including scripts to control those activities. However, it does not include the work’s System Libraries, or general-purpose tools or generally available free programs which are used unmodified in performing those activities but which are not part of the work. For example, Corresponding Source includes interface definition files associated with source files for the work, and the source code for shared libraries and dynamically linked subprograms that the work is specifically designed to require, such as by intimate data communication or control flow between those subprograms and other parts of the work.

The Corresponding Source need not include anything that users can regenerate automatically from other parts of the Corresponding Source.

The Corresponding Source for a work in source code form is that same work.

2. *Basic Permissions.*

All rights granted under this License are granted for the term of copyright on the Program, and are irrevocable provided the stated conditions are met. This License explicitly affirms your unlimited permission to run the unmodified Program. The output from running a covered work is covered by this License only if the output, given its content, constitutes a covered work. This License acknowledges your rights of fair use or other equivalent, as provided by copyright law.

You may make, run and propagate covered works that you do not convey, without conditions so long as your license otherwise remains in force. You may convey covered works to others for the sole purpose of having them make modifications exclusively for you, or provide you with facilities for running those works, provided that you comply with the terms of this License in conveying all material for which you do not control copyright. Those thus making or running the covered works for you must do so exclusively on your behalf, under your direction and control, on terms that prohibit them from making any copies of your copyrighted material outside their relationship with you.

Conveying under any other circumstances is permitted solely under the conditions stated below. Sublicensing is not allowed; section 10 makes it unnecessary.

3. *Protecting Users' Legal Rights From Anti-Circumvention Law.*

No covered work shall be deemed part of an effective technological measure under any applicable law fulfilling obligations under article 11 of the WIPO copyright treaty adopted on 20 December 1996, or similar laws prohibiting or restricting circumvention of such measures.

When you convey a covered work, you waive any legal power to forbid circumvention of technological measures to the extent such circumvention is effected by exercising rights under this License with respect to the covered work, and you disclaim any intention to limit operation or modification of the work as a means of enforcing, against the work's users, your or third parties' legal rights to forbid circumvention of technological measures.

4. *Conveying Verbatim Copies.*

You may convey verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice; keep intact all notices stating that this License and any non-permissive terms added in accord with section 7 apply to the code; keep intact all notices of the absence of any warranty; and give all recipients a copy of this License along with the Program.

You may charge any price or no price for each copy that you convey, and you may offer support or warranty protection for a fee.

5. *Conveying Modified Source Versions.*

You may convey a work based on the Program, or the modifications to produce it from the Program, in the form of source code under the terms of section 4, provided that you also meet all of these conditions:

- a. The work must carry prominent notices stating that you modified it, and giving a relevant date.
- b. The work must carry prominent notices stating that it is released under this License and any conditions added under section 7. This requirement modifies the requirement in section 4 to "keep intact all notices"
- c. You must license the entire work, as a whole, under this License to anyone who comes into possession of a copy. This License will therefore apply, along with any applicable section 7 additional terms, to the whole of the work, and all its parts, regardless of how they are packaged. This License gives no permission to license the work in any other way, but it does not invalidate such permission if you have separately received it.
- d. If the work has interactive user interfaces, each must display Appropriate Legal Notices; however, if the Program has interactive interfaces that do not display Appropriate Legal Notices, your work need not make them do so.

A compilation of a covered work with other separate and independent works, which are not by their nature extensions of the covered work, and which are not combined with it such as to form a larger program, in or on a volume of a storage or distribution medium, is called an "aggregate" if the compilation and its resulting copyright are not used to limit the access or legal rights of the compilation's users beyond what the individual works permit. Inclusion of a covered work in an aggregate does not cause this License to apply to the other parts of the aggregate.

6. *Conveying Non-Source Forms.*

You may convey a covered work in object code form under the terms of sections 4 and 5, provided that you also convey the machine-readable Corresponding Source under the terms of this License, in one of these ways:

- a. Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by the Corresponding Source fixed on a durable physical medium customarily used for software interchange.
- b. Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years and valid for as long as you offer spare parts or customer support for that product model, to give anyone who possesses the object code either (1) a copy of the Corresponding Source for all the software in the product that is covered by this License, on a durable physical medium customarily used for software interchange, for a price no more than your reasonable cost of physically performing this conveying of source, or (2) access to copy the Corresponding Source from a network server at no charge.
- c. Convey individual copies of the object code with a copy of the written offer to provide the Corresponding Source. This alternative is allowed only occasionally and noncommercially, and only if you received the object code with such an offer, in accord with subsection 6b.
- d. Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in the same way through the same place at no further charge. You need not require recipients to copy the Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party) that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.
- e. Convey the object code using peer-to-peer transmission, provided you inform other peers where the object code and Corresponding Source of the work are being offered to the general public at no charge under subsection 6d.

A separable portion of the object code, whose source code is excluded from the Corresponding Source as a System Library, need not be included in conveying the object code work.

A "User Product" is either (1) a "consumer product", which means any tangible personal property which is normally used for personal, family, or household purposes, or (2) anything designed or sold for incorporation into a dwelling. In determining whether a product is a consumer product, doubtful cases shall be resolved in favor of coverage. For a particular product received by a particular user, "normally used" refers to a typical or common use of that class of product, regardless of the status of the particular user or of the way in which the particular user actually uses, or expects

or is expected to use, the product. A product is a consumer product regardless of whether the product has substantial commercial, industrial or non-consumer uses, unless such uses represent the only significant mode of use of the product.

“Installation Information” for a User Product means any methods, procedures, authorization keys, or other information required to install and execute modified versions of a covered work in that User Product from a modified version of its Corresponding Source. The information must suffice to ensure that the continued functioning of the modified object code is in no case prevented or interfered with solely because modification has been made.

If you convey an object code work under this section in, or with, or specifically for use in, a User Product, and the conveying occurs as part of a transaction in which the right of possession and use of the User Product is transferred to the recipient in perpetuity or for a fixed term (regardless of how the transaction is characterized), the Corresponding Source conveyed under this section must be accompanied by the Installation Information. But this requirement does not apply if neither you nor any third party retains the ability to install modified object code on the User Product (for example, the work has been installed in ROM).

The requirement to provide Installation Information does not include a requirement to continue to provide support service, warranty, or updates for a work that has been modified or installed by the recipient, or for the User Product in which it has been modified or installed. Access to a network may be denied when the modification itself materially and adversely affects the operation of the network or violates the rules and protocols for communication across the network.

Corresponding Source conveyed, and Installation Information provided, in accord with this section must be in a format that is publicly documented (and with an implementation available to the public in source code form), and must require no special password or key for unpacking, reading or copying.

7. Additional Terms.

“Additional permissions” are terms that supplement the terms of this License by making exceptions from one or more of its conditions. Additional permissions that are applicable to the entire Program shall be treated as though they were included in this License, to the extent that they are valid under applicable law. If additional permissions apply only to part of the Program, that part may be used separately under those permissions, but the entire Program remains governed by this License without regard to the additional permissions.

When you convey a copy of a covered work, you may at your option remove any additional permissions from that copy, or from any part of it. (Additional permissions may be written to require their own removal in certain cases when you modify the work.) You may place additional permissions on material, added by you to a covered work, for which you have or can give appropriate copyright permission.

Notwithstanding any other provision of this License, for material you add to a covered work, you may (if authorized by the copyright holders of that material) supplement the terms of this License with terms:

- a. Disclaiming warranty or limiting liability differently from the terms of sections 15 and 16 of this License; or
- b. Requiring preservation of specified reasonable legal notices or author attributions in that material or in the Appropriate Legal Notices displayed by works containing it; or
- c. Prohibiting misrepresentation of the origin of that material, or requiring that modified versions of such material be marked in reasonable ways as different from the original version; or
- d. Limiting the use for publicity purposes of names of licensors or authors of the material; or
- e. Declining to grant rights under trademark law for use of some trade names, trademarks, or service marks; or
- f. Requiring indemnification of licensors and authors of that material by anyone who conveys the material (or modified versions of it) with contractual assumptions of liability to the recipient, for any liability that these contractual assumptions directly impose on those licensors and authors.

All other non-permissive additional terms are considered “further restrictions” within the meaning of section 10. If the Program as you received it, or any part of it, contains a notice stating that it is governed by this License along with a term that is a further restriction, you may remove that term. If a license document contains a further restriction but permits relicensing or conveying under this License, you may add to a covered work material governed by the terms of that license document, provided that the further restriction does not survive such relicensing or conveying.

If you add terms to a covered work in accord with this section, you must place, in the relevant source files, a statement of the additional terms that apply to those files, or a notice indicating where to find the applicable terms.

Additional terms, permissive or non-permissive, may be stated in the form of a separately written license, or stated as exceptions; the above requirements apply either way.

8. Termination.

You may not propagate or modify a covered work except as expressly provided under this License. Any attempt otherwise to propagate or modify it is void, and will automatically terminate your rights under this License (including any patent licenses granted under the third paragraph of section 11).

However, if you cease all violation of this License, then your license from a particular copyright holder is reinstated (a) provisionally, unless and until the copyright holder explicitly and finally terminates your license, and (b) permanently, if the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

Moreover, your license from a particular copyright holder is reinstated permanently if the copyright holder notifies you of the violation by some reasonable means, this is the first time you have received notice of violation of this License (for any work) from that copyright holder, and you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does not terminate the licenses of parties who have received copies or rights from you under this License. If your rights have been terminated and not permanently reinstated, you do not qualify to receive new licenses for the same material under section 10.

9. Acceptance Not Required for Having Copies.

You are not required to accept this License in order to receive or run a copy of the Program. Ancillary propagation of a covered work occurring solely as a consequence of using peer-to-peer transmission to receive a copy likewise does not require acceptance. However, nothing other than this License grants you permission to propagate or modify any covered work. These actions infringe copyright if you do not accept this License. Therefore, by modifying or propagating a covered work, you indicate your acceptance of this License to do so.

10. Automatic Licensing of Downstream Recipients.

Each time you convey a covered work, the recipient automatically receives a license from the original licensors, to run, modify and propagate that work, subject to this License. You are not responsible for enforcing compliance by third parties with this License.

An “entity transaction” is a transaction transferring control of an organization, or substantially all assets of one, or subdividing an organization, or merging organizations. If propagation of a covered work results from an entity transaction, each party to that transaction who receives a copy of the work also receives whatever licenses to the work the party’s predecessor in interest had or could give under the previous paragraph, plus a right to possession of the Corresponding Source of the work from the predecessor in interest, if the predecessor has it or can get it with reasonable efforts.

You may not impose any further restrictions on the exercise of the rights granted or affirmed under this License. For example, you may not impose a license fee, royalty, or other charge for exercise of rights granted under this License, and you may not initiate litigation (including a cross-claim or counterclaim in a lawsuit) alleging that any patent claim is infringed by making, using, selling, offering for sale, or importing the Program or any portion of it.

11. Patents.

A “contributor” is a copyright holder who authorizes use under this License of the Program or a work on which the Program is based. The work thus licensed is called the contributor’s “contributor version”

A contributor’s “essential patent claims” are all patent claims owned or controlled by the contributor, whether already acquired or hereafter acquired, that would be infringed by some manner, permitted by this License, of making, using, or selling its contributor version, but do not include claims that would be infringed only as a consequence of further modification of the contributor version. For purposes of this definition, “control” includes the right to grant patent sublicenses in a manner consistent with the requirements of this License.

Each contributor grants you a non-exclusive, worldwide, royalty-free patent license under the contributor’s essential patent claims, to make, use, sell, offer for sale, import and otherwise run, modify and propagate the contents of its contributor version.

In the following three paragraphs, a “patent license” is any express agreement or commitment, however denominated, not to enforce a patent (such as an express permission to practice a patent or covenant not to sue for patent infringement). To “grant” such a patent license to a party means to make such an agreement or commitment not to enforce a patent against the party.

If you convey a covered work, knowingly relying on a patent license, and the Corresponding Source of the work is not available for anyone to copy, free of charge and under the terms of this License, through a publicly available network server or other readily accessible means, then you must either (1) cause the Corresponding Source to be so available, or (2) arrange to deprive yourself of the benefit of the patent license for this particular work, or (3) arrange, in a manner consistent with the requirements of this License, to extend the patent license to downstream recipients. “Knowingly relying” means you have actual knowledge that, but for the patent license, your conveying the covered work in a country, or your recipient’s use of the covered work in a country, would infringe one or more identifiable patents in that country that you have reason to believe are valid.

If, pursuant to or in connection with a single transaction or arrangement, you convey, or propagate by procuring conveyance of, a covered work, and grant a patent license to some of the parties receiving the covered work authorizing them to use, propagate, modify or convey a specific copy of the covered work, then the patent license you grant is automatically extended to all recipients of the covered work and works based on it.

A patent license is “discriminatory” if it does not include within the scope of its coverage, prohibits the exercise of, or is conditioned on the non-exercise of one or more of the rights that are specifically granted under this License. You may not convey a covered work if you are a party to an arrangement with a third party that is in the business of distributing software, under which you make payment to the third party based on the extent of your activity of conveying the work, and under which the third party grants, to any of the parties who would receive the covered work from you, a discriminatory patent license (a) in connection with copies of the covered work conveyed by you (or copies made from those copies), or (b) primarily for and in connection with specific products or compilations that contain the covered work, unless you entered into that arrangement, or that patent license was granted, prior to 28 March 2007.

Nothing in this License shall be construed as excluding or limiting any implied license or other defenses to infringement that may otherwise be available to you under applicable patent law.

12. No Surrender of Others’ Freedom.

If conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot convey a covered work so as to satisfy simultaneously your obligations under this

License and any other pertinent obligations, then as a consequence you may not convey it at all. For example, if you agree to terms that obligate you to collect a royalty for further conveying from those to whom you convey the Program, the only way you could satisfy both those terms and this License would be to refrain entirely from conveying the Program.

13. *Use with the GNU Affero General Public License.*

Notwithstanding any other provision of this License, you have permission to link or combine any covered work with a work licensed under version 3 of the GNU Affero General Public License into a single combined work, and to convey the resulting work. The terms of this License will continue to apply to the part which is the covered work, but the special requirements of the GNU Affero General Public License, section 13, concerning interaction through a network will apply to the combination as such.

14. *Revised Versions of this License.*

The Free Software Foundation may publish revised and/or new versions of the GNU General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies that a certain numbered version of the GNU General Public License "or any later version" applies to it, you have the option of following the terms and conditions either of that numbered version or of any later version published by the Free Software Foundation.

If the Program does not specify a version number of the GNU General Public License, you may choose any version ever published by the Free Software Foundation. If the Program specifies that a proxy can decide which future versions of the GNU General Public License can be used, that proxy's public statement of acceptance of a version permanently authorizes you to choose that version for the Program.

Later license versions may give you additional or different permissions. However, no additional obligations are imposed on any author or copyright holder as a result of your choosing to follow a later version.

15. *Disclaimer of Warranty.*

THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. *Limitation of Liability.*

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MODIFIES AND/OR CONVEYS THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

17. *Interpretation of Sections 15 and 16.*

If the disclaimer of warranty and limitation of liability provided above cannot be given local legal effect according to their terms, reviewing courts shall apply local law that most closely approximates an absolute waiver of all civil liability in connection with the Program, unless a warranty or assumption of liability accompanies a copy of the Program in return for a fee.

END OF TERMS AND CONDITIONS

Modelisar - Version 1.0

Copyright © 2008-2010, MODELISAR consortium.

All rights reserved.

This file is licensed by the copyright holders under the BSD License (<http://www.opensource.org/licenses/bsd-license.html>):

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of the copyright holders nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER

CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Natural Order Sort - Version 2004-10-10 mbp

Copyright (C) 2000, 2004 by Martin Pool

This software is provided "as-is", without any express or implied warranty. In no event will the authors be held liable for any damages arising from the use of this software.

Permission is granted to anyone to use this software for any purpose, including commercial applications, and to alter it and redistribute it freely, subject to the following restrictions:

1. The origin of this software must not be misrepresented; you must not claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required.
2. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software.
3. This notice may not be removed or altered from any source distribution.

This license applies only to the C implementation. You are free to reimplement the idea from scratch in any language

NEMESIS - Version 3.09

Copyright (c) 2005 Sandia Corporation. Under the terms of Contract DE-AC04-94AL85000 with Sandia Corporation, the U.S. Government retains certain rights in this software.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of Sandia Corporation nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetCDF 4.0.1

Copyright 1993-2008 University Corporation for Atmospheric Research/Unidata.

Portions of this software were developed by the Unidata Program at the University Corporation for Atmospheric Research.

Access and use of this software shall impose the following obligations and understandings on the user. The user is granted the right, without any fee or cost, to use, copy, modify, alter, enhance and distribute this software, and any derivative works thereof, and its supporting documentation for any purpose whatsoever, provided that this entire notice appears in all copies of the software, derivative works and supporting documentation. Further, UCAR requests that the user credit UCAR/Unidata in any publications that result from the use of this software or in any product that includes this software, although this is not an obligation. The names UCAR and/or Unidata, however, may not be used in any advertising or publicity to endorse or promote any products or commercial entity unless specific written permission is obtained from UCAR/Unidata. The user also understands that UCAR/Unidata is not obligated to provide the user with any support, consulting, training or assistance of any kind with regard to the use, operation and performance of this software nor to provide the user with any updates, revisions, new versions or "bug fixes".

THIS SOFTWARE IS PROVIDED BY UCAR/UNIDATA "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL UCAR/UNIDATA BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE ACCESS, USE OR PERFORMANCE OF THIS SOFTWARE.

NumPy 1.6.2

Copyright (c) 2005-2013, NumPy Developers.

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of the NumPy Developers nor the names of any contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

OpenSSL

The OpenSSL toolkit stays under a dual license, i.e. both the conditions of the OpenSSL License and the original SSLeay license apply to the toolkit.

Copyright (c) 1998-2008 The OpenSSL Project. All rights reserved. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgment: "This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (<http://www.openssl.org/>)"
4. The names "OpenSSL Toolkit" and "OpenSSL Project" must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact openssl-core@openssl.org.
5. Products derived from this software may not be called "OpenSSL" nor may "OpenSSL" appear in their names without prior written permission of the OpenSSL Project.
6. Redistributions of any form whatsoever must retain the following acknowledgment:
 "This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>)"

THIS SOFTWARE IS PROVIDED BY THE OpenSSL PROJECT "AS IS" AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OpenSSL PROJECT OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

This product includes cryptographic software written by Eric Young (ey@cryptsoft.com). This product includes software written by Tim Hudson (tjh@cryptsoft.com).

Original SSLeay License

Copyright © 1995-1998 Eric Young (ey@cryptsoft.com)

All rights reserved.

This package is an SSL implementation written by Eric Young (ey@cryptsoft.com). The implementation was written so as to conform with Netscape's SSL.

This library is free for commercial and non-commercial use as long as the following conditions are adhered to. The following conditions apply to all code found in this distribution, be it the RC4, RSA, lhash, DES, etc., code; not just the SSL code. The SSL documentation included with this distribution is covered by the same copyright terms except that the holder is Tim Hudson (tjh@cryptsoft.com).

Copyright remains Eric Young's, and as such any Copyright notices in the code are not to be removed. If this package is used in a product, Eric Young should be given attribution as the author of the parts of the library used. This can be in the form of a textual message at program startup or in documentation (online or textual) provided with the package.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the copyright notice, this list of conditions and the following disclaimer.

2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgement:
"This product includes cryptographic software written by Eric Young (eay@cryptsoft.com)" The word 'cryptographic' can be left out if the routines from the library being used are not cryptographic related :-).
4. If you include any Windows specific code (or a derivative thereof) from the apps directory (application code) you must include an acknowledgement:
"This product includes software written by Tim Hudson (tjh@cryptsoft.com)"

THIS SOFTWARE IS PROVIDED BY ERIC YOUNG "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

The license and distribution terms for any publicly available version or derivative of this code cannot be changed. i.e. this code cannot simply be copied and put under another distribution license [including the GNU Public License.]

PBMPPlus - Version 8.3

Copyright 1998 - 2000 Jef Poskanzer et al.

Permission to use, copy, modify, and distribute this software and its documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appear in all copies and that both that copyright notice and this permission notice appear in supporting documentation. This software is provided "as is" without express or implied warranty.

Perl

Versions 5.005 (Ixx86_64), 5.8.8 (WinX86_64)

The Artistic License

Copyright © 2005 by the Open Source Initiative

Preamble

The intent of this document is to state the conditions under which a Package may be copied, such that the Copyright Holder maintains some semblance of artistic control over the development of the package, while giving the users of the package the right to use and distribute the Package in a more-or-less customary fashion, plus the right to make reasonable modifications.

Definitions

"Package" refers to the collection of files distributed by the Copyright Holder, and derivatives of that collection of files created through textual modification.

"Standard Version" refers to such a Package if it has not been modified, or has been modified in accordance with the wishes of the Copyright Holder as specified below.

"Copyright Holder" is whoever is named in the copyright or copyrights for the package.

"You" is you, if you're thinking about copying or distributing this Package.

"Reasonable copying fee" is whatever you can justify on the basis of media cost, duplication charges, time of people involved, and so on. (You will not be required to justify it to the Copyright Holder, but only to the computing community at large as a market that must bear the fee.)

"Freely Available" means that no fee is charged for the item itself, though there may be fees involved in handling the item. It also means that recipients of the item may redistribute it under the same conditions they received it.

1. You may make and give away verbatim copies of the source form of this Package without restriction, provided that you duplicate all of the original copyright notices and associated disclaimers.
2. You may apply bug fixes, portability fixes and other modifications derived from the Public Domain or from the Copyright Holder. A Package modified in such a way shall still be considered the Standard Version.
3. You may otherwise modify your copy of this Package in any way, provided that you insert a prominent notice in each changed file stating how and when you changed that file, and provided that you do at least ONE of the following:
 - a. place your modifications in the Public Domain or otherwise make them Freely Available, such as by posting said modifications to Usenet or an equivalent medium, or placing the modifications on a major archive site such as unnet.uu.net, or by allowing the Copyright Holder to include your modifications in the Standard Version of the Package.
 - b. use the modified Package only within your corporation or organization.

- c. rename any non-standard executables so the names do not conflict with standard executables, which must also be provided, and provide a separate manual page for each non-standard executable that clearly documents how it differs from the Standard Version.
 - d. make other distribution arrangements with the Copyright Holder.
4. You may distribute the programs of this Package in object code or executable form, provided that you do at least ONE of the following:
 - a. distribute a Standard Version of the executables and library files, together with instructions (in the guide page or equivalent) on where to get the Standard Version.
 - b. accompany the distribution with the machine-readable source of the Package with your modifications.
 - c. give non-standard executables non-standard names, and clearly document the differences in guide pages (or equivalent), together with instructions on where to get the Standard Version.
 - d. make other distribution arrangements with the Copyright Holder.
5. You may charge a reasonable copying fee for any distribution of this Package. You may charge any fee you choose for support of this Package. You may not charge a fee for this Package itself. However, you may distribute this Package in aggregate with other (possibly commercial) programs as part of a larger (possibly commercial) software distribution provided that you do not advertise this Package as a product of your own. You may embed this Package's interpreter within an executable of yours (by linking); this shall be construed as a mere form of aggregation, provided that the complete Standard Version of the interpreter is so embedded.
6. The scripts and library files supplied as input to or produced as output from the programs of this Package do not automatically fall under the copyright of this Package, but belong to whomever generated them, and may be sold commercially, and may be aggregated with this Package. If such scripts or library files are aggregated with this Package via the so-called "undump" or "unexec" methods of producing a binary executable image, then distribution of such an image shall neither be construed as a distribution of this Package nor shall it fall under the restrictions of Paragraphs 3 and 4, provided that you do not represent such an executable image as a Standard Version of this Package.
7. C subroutines (or comparably compiled subroutines in other languages) supplied by you and linked into this Package in order to emulate subroutines and variables of the language defined by this Package shall not be considered part of this Package, but are the equivalent of input as in Paragraph 6, provided these subroutines do not change the language in any way that would cause it to fail the regression tests for the language.
8. Aggregation of this Package with a commercial distribution is always permitted provided that the use of this Package is embedded; that is, when no overt attempt is made to make this Package's interfaces visible to the end user of the commercial distribution. Such use shall not be construed as a distribution of this Package.
9. The name of the Copyright Holder may not be used to endorse or promote products derived from this software without specific prior written permission.
10. THIS PACKAGE IS PROVIDED "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

PNG - Version 1.0.3

Copyright (c) 1998, 1999 Glenn Randers-Pehrson

For the purposes of this copyright and license, "Contributing Authors" is defined as the following set of individuals:

Tom Lane

Glenn Randers-Pehrson

Willem van Schaik

John Bowler

Kevin Bracey

Sam Bushell

Magnus Holmgren

Greg Roelofs

Tom Tanner

Andreas Dilger

Dave Martindale

Guy Eric Schalnat

Paul Schmidt

Tim Wegner

The PNG Reference Library is supplied “AS IS”. The Contributing Authors and Group 42, Inc. disclaim all warranties, expressed or implied, including, without limitation, the warranties of merchantability and of fitness for any purpose. The Contributing Authors and Group 42, Inc. assume no liability for direct, indirect, incidental, special, exemplary, or consequential damages, which may result from the use of the PNG. Reference Library, even if advised of the possibility of such damage.

Permission is hereby granted to use, copy, modify, and distribute this source code, or portions hereof, for any purpose, without fee, subject to the following restrictions:

1. The origin of this source code must not be misrepresented.
2. Altered versions must be plainly marked as such and must not be misrepresented as being the original source.
3. This Copyright notice may not be removed or altered from any source or altered source distribution.

The Contributing Authors and Group 42, Inc. specifically permit, without fee, and encourage the use of this source code as a component to supporting the PNG file format in commercial products. If you use this source code in a product, acknowledgment is not required but would be appreciated.

profile, pstats

Copyright 1994, by InfoSeek Corporation,

All rights reserved.

Written by James Roskind

Permission to use, copy, modify, and distribute this Python software and its associated documentation for any purpose (subject to the restriction in the following sentence) without fee is hereby granted, provided that the above copyright notice appears in all copies, and that both that copyright notice and this permission notice appear in supporting documentation, and that the name of InfoSeek not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission. This permission is explicitly restricted to the copying and modification of the software to remain in Python, compiled Python, or other languages (such as C) wherein the modified or derived code is exclusively imported into a Python module.

INFOSEEK CORPORATION DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL INFOSEEK CORPORATION BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

Pychecker - Version 0.8.17

Copyright (c) 2000-2001, MetaSlash Inc

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither name of MetaSlash Inc. nor the names of contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS AS IS AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

pyexpat

Copyright (c) 1998, 1999, 2000 Thai Open Source Software Center Ltd and Clark Cooper

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “Software.”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED “AS IS”, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL

THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Python - Version 2.7.3

Copyright (c) 2001-2012 Python Software Foundation;

All Rights Reserved

PSF LICENSE AGREEMENT FOR PYTHON 2.7.3

1. This LICENSE AGREEMENT is between the Python Software Foundation ("PSF"), and the Individual or Organization ("Licensee") accessing and otherwise using Python 2.7.3 software in source or binary form and its associated documentation.
2. Subject to the terms and conditions of this License Agreement, PSF hereby grants Licensee a nonexclusive, royalty-free, world-wide license to reproduce, analyze, test, perform and/or display publicly, prepare derivative works, distribute, and otherwise use Python 2.7.3 alone or in any derivative version, provided, however, that PSF's License Agreement and PSF's notice of copyright, i.e., "Copyright © 2001-2012 Python Software Foundation; All Rights Reserved" are retained in Python 2.7.3 alone or in any derivative version prepared by Licensee.
3. In the event Licensee prepares a derivative work that is based on or incorporates Python 2.7.3 or any part thereof, and wants to make the derivative work available to others as provided herein, then Licensee hereby agrees to include in any such work a brief summary of the changes made to Python 2.7.3.
4. PSF is making Python 2.7.3 available to Licensee on an "AS IS" basis. PSF MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED. BY WAY OF EXAMPLE, BUT NOT LIMITATION, PSF MAKES NO AND DISCLAIMS ANY REPRESENTATION OR WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OR THAT THE USE OF PYTHON 2.7.3 WILL NOT INFRINGE ANY THIRD PARTY RIGHTS.
5. PSF SHALL NOT BE LIABLE TO LICENSEE OR ANY OTHER USERS OF PYTHON 2.7.3 FOR ANY INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES OR LOSS AS A RESULT OF MODIFYING, DISTRIBUTING, OR OTHERWISE USING PYTHON 2.7.3, OR ANY DERIVATIVE THEREOF, EVEN IF ADVISED OF THE POSSIBILITY THEREOF.
6. This License Agreement will automatically terminate upon a material breach of its terms and conditions.
7. Nothing in this License Agreement shall be deemed to create any relationship of agency, partnership, or joint venture between PSF and Licensee. This License Agreement does not grant permission to use PSF trademarks or trade name in a trademark sense to endorse or promote products or services of Licensee, or any third party.
8. By copying, installing or otherwise using Python 2.7.3, Licensee agrees to be bound by the terms and conditions of this License Agreement.

Python for Windows Extensions

Build 217

The Python for Windows Extensions provide additional Python services for Abaqus users. This open source software is installed as a part of the Abaqus installation, but is executed only at the user's discretion. More information on The Python for Windows Extensions is available at <http://sourceforge.net/projects/pywin32/files/pywin32/Build%20217/> (<http://sourceforge.net/projects/pywin32/files/pywin32/Build%20217/>).

_random

Copyright (C) 1997 - 2002, Makoto Matsumoto and Takuji Nishimura,

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The names of its contributors may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Socket

Copyright (C) 1995, 1996, 1997, and 1998 WIDE Project.

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of the project nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE PROJECT AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE PROJECT OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Tcl/Tk - Version 8.5

This software is copyrighted by the Regents of the University of California, Sun Microsystems, Inc., Scriptics Corporation, and other parties. The following terms apply to all files associated with the software unless explicitly disclaimed in individual files.

The authors hereby grant permission to use, copy, modify, distribute, and license this software and its documentation for any purpose, provided that existing copyright notices are retained in all copies and that this notice is included verbatim in any distributions. No written agreement, license, or royalty fee is required for any of the authorized uses. Modifications to this software may be copyrighted by their authors and need not follow the licensing terms described here, provided that the new terms are clearly indicated on the first page of each file where they apply.

IN NO EVENT SHALL THE AUTHORS OR DISTRIBUTORS BE LIABLE TO ANY PARTY FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF THIS SOFTWARE, ITS DOCUMENTATION, OR ANY DERIVATIVES THEREOF, EVEN IF THE AUTHORS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

THE AUTHORS AND DISTRIBUTORS SPECIFICALLY DISCLAIM ANY WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT. THIS SOFTWARE IS PROVIDED ON AN "AS IS" BASIS, AND THE AUTHORS AND DISTRIBUTORS HAVE NO OBLIGATION TO PROVIDE MAINTENANCE, SUPPORT, UPDATES, ENHANCEMENTS, OR MODIFICATIONS.

TIFF - Version 3.5.7

Copyright (c) 1988-1997 Sam Leffler

Copyright (c) 1991-1997 Silicon Graphics, Inc.

Permission to use, copy, modify, distribute, and sell this software and its documentation for any purpose is hereby granted without fee, provided that (i) the above copyright notices and this permission notice appear in all copies of the software and related documentation, and (ii) the names of Sam Leffler and Silicon Graphics may not be used in any advertising or publicity relating to the software without the specific, prior written permission of Sam Leffler and Silicon Graphics.

THE SOFTWARE IS PROVIDED "AS-IS" AND WITHOUT WARRANTY OF ANY KIND, EXPRESS, IMPLIED OR OTHERWISE, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL SAM LEFFLER OR SILICON GRAPHICS BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES OF ANY KIND, OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER OR NOT ADVISED OF THE POSSIBILITY OF DAMAGE, AND ON ANY THEORY OF LIABILITY, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

Trace

Copyright 2000, Mojam Media, Inc., all rights reserved.

Author: Skip Montanaro

Copyright 1999, Bioreason, Inc., all rights reserved.

Author: Andrew Dalke

Copyright 1995-1997, Automatrix, Inc., all rights reserved.

Author: Skip Montanaro

Copyright 1991-1995, Stichting Mathematisch Centrum, all rights reserved.

Permission to use, copy, modify, and distribute this Python software and its associated documentation for any purpose without fee is hereby granted, provided that the above copyright notice appears in all copies, and that both that copyright notice and this permission notice appear in supporting documentation, and that the name of neither Automatrix, Bioreason or Mojam Media be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission.

uu

Copyright 1994 by Lance Ellinghouse

Cathedral City, California Republic, United States of America.

All Rights Reserved

Permission to use, copy, modify, and distribute this software and its documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appear in all copies and that both that copyright notice and this permission notice appear in supporting documentation, and that the name of Lance Ellinghouse not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission.

LANCE ELLINGHOUSE DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, IN NO EVENT SHALL LANCE ELLINGHOUSE CENTRUM BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

Visualization Toolkit (VTK) 5.6.0

VTK is an open-source toolkit licensed under the BSD license.

Copyright (c) 1993-2008 Ken Martin, Will Schroeder, Bill Lorensen

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither name of Ken Martin, Will Schroeder, or Bill Lorensen nor the names of any contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

_wincon.c

Copyright (c) 1999-2001 by Secret Labs AB

Copyright (c) 1999-2001 by Fredrik Lundh

By obtaining, using, and/or copying this software and/or its associated documentation, you agree that you have read, understood, and will comply with the following terms and conditions:

Permission to use, copy, modify, and distribute this software and its associated documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appears in all copies, and that both that copyright notice and this permission notice appear in supporting documentation, and that the name of Secret Labs AB or the author not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission.

SECRET LABS AB AND THE AUTHOR DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL SECRET LABS AB OR THE AUTHOR BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE

XML Expat Parser - Version 1.95.4

Copyright (c) 1998, 1999, 2000 Thai Open Source Software Center Ltd.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

xmlrpclib

Copyright © 1999-2002 by Secret Labs AB

Copyright © 1999-2002 by Fredrik Lundh

By obtaining, using, and/or copying this software and/or its associated documentation, you agree that you have read, understood, and will comply with the following terms and conditions:

Permission to use, copy, modify, and distribute this software and its associated documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appears in all copies, and that both that copyright notice and this permission notice appear in supporting documentation, and that the name of Secret Labs AB or the author not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission.

SECRET LABS AB AND THE AUTHOR DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL SECRET LABS AB OR THE AUTHOR BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

Zlib - Version 1.2.8

April 28th, 2013

Copyright (C) 1995-2013 Jean-loup Gailly and Mark Adler

This software is provided "as-is", without any express or implied warranty. In no event will the authors be held liable for any damages arising from the use of this software.

Permission is granted to anyone to use this software for any purpose, including commercial applications, and to alter it and redistribute it freely, subject to the following restrictions:

1. The origin of this software must not be misrepresented; you must not claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required.
2. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software.
3. This notice may not be removed or altered from any source distribution.

Commercial Programs

Abaqus Software uses several commercial programs. Each such program is distributed with Abaqus software in binary form and, except as permitted by the applicable license, without modification. Each commercial program included in a SIMULIA product has been obtained through a commercial license that permits redistribution of that program in one or more SIMULIA products. In some cases these licenses require that users be informed of copyrights and/or license citations. In those cases this information may be found below.

Software Name	Release
ACML (AMD Core Math Library)	5.2

ACML (AMD Core Math Library) Release 5.2

LICENSE AGREEMENT FOR AMD CORE MATH LIBRARY

IMPORTANT: This is a legal agreement (“Agreement”) between you, either as an individual or an entity, (the “User”) and Advanced Micro Devices, Inc. (“AMD”). By loading the software or any portion thereof (“Software”), and any related documentation (“Documentation”), User agrees to all of the terms of this Agreement. Additionally, User remains subject to the original terms and conditions of any other software license agreements entered into by User and a third party. User is responsible for ensuring that use of the Software provided by “AMD” is not in violation of any such agreement.

DO NOT LOAD THIS SOFTWARE UNTIL YOU HAVE CAREFULLY READ AND AGREED TO THE FOLLOWING TERMS AND CONDITIONS. LOADING OR OTHERWISE USING THE SOFTWARE OR DOCUMENTATION CONSTITUTES ACCEPTANCE OF THE TERMS AND CONDITIONS SET FORTH IN THIS AGREEMENT. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, IMMEDIATELY UNINSTALL AND STOP USING THIS SOFTWARE, DOCUMENTATION OR ANY PORTION THEREOF.

NOW THEREFORE, the parties hereto agree as follows:

1. Definitions

- a. “Software” shall mean the AMD Core Math Library, and does not include any third-party runtime libraries.
- b. “Documentation” shall mean all guides for the Software or Licensed Materials, and all other materials, regardless of media, that describe or relate to the design, use or operation of the Software or Licensed Materials.
- c. “Executable Code” shall mean all software in a machine-readable, binary or executable form. In no event shall Executable Code include source code.
- d. “Licensed Materials” shall mean any Executable Code as provided to User by AMD, any Documentation and any Updates.
- e. “Effective Date” shall mean a date upon which User uses the Software or Licensed Materials or accesses any Documentation.

2. License

- a. Subject to the terms of this Agreement, AMD hereby grants to User a limited, non-exclusive, non-transferable, royalty-free copyright license to use the Licensed Materials only for the purpose of executing and evaluating the performance of software. Other than the limited license granted in this Section 2.a., User shall have no other rights in the Licensed Materials or Software, whether express, implied, arising by estoppel or otherwise. If User desires to distribute any of the Licensed Materials or Software, User shall enter into a separate written agreement with AMD.
- b. Without limiting Section 2.a. above, User does NOT have the right:
 - i. to modify, adapt, translate, or create derivative works based upon the Licensed Materials or Software or any part thereof; or
 - ii. to modify, disassemble, reverse engineer, decompile, or otherwise reduce to source code or any human perceivable form any part of the Software, Licensed Materials or updates thereto that are not already source code; or
 - iii. to remove proprietary legends in the Software or Licensed Materials including, but not limited to, legends that protect AMD’s patent, trade secret, copyright and other proprietary rights in the Software or Licensed Materials.

3. Ownership and Copyright of Material. The Software and Licensed Materials are owned by AMD and its licensors and are protected by United States and international intellectual property laws and other international treaty provisions. Except as expressly provided herein, AMD does not grant any express or implied right to User under AMD patents, copyrights, trademarks, trade secrets or other proprietary rights.

4. Obligations of the Parties

- a. Licensed Materials and Software. User may use the Licensed Materials and Software only in accordance with the terms and conditions of this Agreement.

- b. Feedback. During the term of this Agreement, User may inform AMD of all errors, difficulties or other problems with the Licensed Materials or Software, collectively referred to as "feedback". AMD may use for any purpose whatsoever, any feedback User provides regarding the Licensed Materials or Software including, but not limited to, usability, bug reports and test reports.
- c. Issuance of Software or Licensed Materials. AMD shall not be obligated to make the Software or Licensed Materials publicly available, in whole or in part.
- d. Support. AMD may, in its sole discretion, provide to User updates to the Software, Licensed Materials and Documentation, and such updates will be covered under this Agreement. AMD is under no obligation to provide User with any updates, support, or maintenance of the Software, Licensed Materials or Documentation.

5. Disclaimer of Warranty and Indemnity. THE LICENSED MATERIALS, SOFTWARE, AND ANY OTHER MATERIALS PROVIDED PURSUANT TO THIS AGREEMENT ARE PROVIDED "AS IS," WITH ALL FAULTS, AND WITHOUT WARRANTY OF ANY KIND. FURTHERMORE, NO WARRANTIES, EXPRESS OR IMPLIED, ARE MADE WITH RESPECT TO THE LICENSED MATERIALS OR SOFTWARE INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ANY WARRANTIES THAT MAY ARISE FROM USAGE OF TRADE OR COURSE OF DEALING, AND ANY IMPLIED WARRANTIES OF TITLE OR NON-INFRINGEMENT.

IN NO EVENT SHALL AMD BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES, EXPENSES, LOST PROFITS, LOST SAVINGS, BUSINESS INTERRUPTION, LOST BUSINESS INFORMATION, OR ANY OTHER DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE SOFTWARE OR LICENSED MATERIALS, EVEN IF AMD HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND NOTWITHSTANDING THE FAILURE OF ESSENTIAL PURPOSE OF ANY REMEDY.

User acknowledges that its use of the Software or Licensed Materials without charge reflects this allocation of risk. Some states or jurisdictions do not allow the exclusion or limitation of incidental, consequential or special damages, or the exclusion of implied warranties, and therefore, the above limitations might not apply to User.

In addition to the disclaimer of warranties set forth above, it is understood that AMD makes no representations concerning the completeness, accuracy or operation of the Software or Licensed Materials.

Furthermore, User shall have the sole responsibility for adequate protection and backup of its data used in connection with the Software or Licensed Materials, and User shall not make any claim against AMD for lost data, re-run time, inaccurate input, work delays or lost profits resulting from the use of the Software or Licensed Materials.

USER AGREES TO DEFEND, INDEMNIFY AND HOLD HARMLESS AMD, ITS LICENSORS, ITS LICENSEES, AND ANY OF THEIR DIRECTORS, OFFICERS, EMPLOYEES, AFFILIATES OR AGENTS, FROM AND AGAINST ANY AND ALL LOSS, DAMAGE, LIABILITY AND OTHER EXPENSES (INCLUDING REASONABLE ATTORNEYS' FEES), RELATED TO OR RESULTING FROM (A) THE USE OF ANY SOFTWARE, LICENSED MATERIALS OR DERIVATIVE WORKS THEREOF OR ANY OTHER MATERIALS PROVIDED AS A RESULT OF THIS AGREEMENT OR (B) ANY SOFTWARE OR LICENSED MATERIALS CREATED OR DISTRIBUTED BY USER.

6. Limitation of Liability. If, notwithstanding the provisions of this Agreement, AMD shall at any time have any liability arising from or by virtue of this Agreement, whether due to AMD's gross negligence, AMD's breach of its obligations under this Agreement, or otherwise, User agrees that in no event will the total aggregate liability of AMD for any claims, losses, or damages exceed \$1,000, notwithstanding the failure of essential purpose of any remedy. This limitation of liability is complete and exclusive, shall apply even if AMD has been advised of the possibility of such potential claims, losses, or damages, and shall apply regardless of the success or effectiveness of any other remedies possessed by User, User's customers, or any third parties. This limitation of liability reflects an agreed upon allocation of risk between AMD and User in view of the nature of this transaction. AMD assumes no liability that may arise out of the use or possession of the Software or Licensed Materials.
7. Termination. This Agreement is effective until terminated. User may terminate this Agreement at any time by destroying all copies of the Software and providing written notice to AMD. AMD may terminate this Agreement upon ninety (90) days written notice. If User fails to comply with any of its obligations hereunder, AMD shall have the right, at any time, to terminate the Agreement, and within five (5) days after termination of the Agreement for any reason other than the Software or Licensed Materials being released as a standard AMD product, User will remove or certify in writing to the destruction of, the Licensed Materials from its computer systems and return to AMD the Software and Licensed Materials in the form provided by AMD. This Agreement shall terminate immediately with respect to any person or entity asserting or threatening to assert any intellectual property right against AMD.

8. General

- a. Entire Agreement. This Agreement constitutes the entire agreement between the parties and supersedes all prior agreements concerning the subject matter herein and may not be changed or terminated except by a written communication signed by the party against whom the same is sought to be enforced.
- b. Severability. If any of the provisions of this Agreement are invalid under any applicable statute or rule of law, such provisions or portions thereof are to that extent deemed to be omitted. The User's remedies in this Agreement are exclusive.

- c. Governing Law, Venue. This Agreement shall be governed by the laws of the State of California without regard to the conflicts of laws provisions of any state or jurisdiction. Each party hereto submits to the jurisdiction of the state and federal courts of Santa Clara County and the Northern District of California for the purposes of all legal proceedings arising out of or relating to this Agreement or the subject matter hereof. Each party waives any objection which it may have to contest such forum.
- d. Import/Export/Re-Export/Use/Release/Transfer Restrictions and Compliance with Applicable Laws. User is hereby provided notice, and agrees and acknowledges by signing this Agreement, that the Licensed Materials and Software as well as any accompanying information may be subject to restrictions on use, release, transfer, importation, exportation and/or re-exportation under the laws and regulations of the United States or other countries ("Applicable Laws"), which include, but are not limited to, U.S. export control laws such as the Export Administration Regulations and national security controls as defined thereunder, as well as State Department controls under the U.S. Munitions List. User further agrees that the Software, Licensed Materials, any source code, any accompanying media, material and information, and any product thereof, will not be used, released, transferred, imported, exported and/or re-exported in any manner prohibited under Applicable Laws, including U.S. export control laws regarding specifically designated persons, countries and nationals of countries subject to national security controls.
- e. Government Users. If User is a U.S. Government User, then the Software and Licensed Materials are provided with "RESTRICTED RIGHTS" as set forth in subparagraphs (c) (1) and (2) of the Commercial Computer Software-Restricted Rights clause at FAR 52.227-14 or subparagraph (c) (1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7013, as applicable.
- f. No waiver. The failure of AMD to enforce any rights granted hereunder or to take action against User in the event of any breach hereunder shall not be deemed a waiver by AMD as to subsequent enforcement of rights or subsequent actions in the event of future breaches.

Directly Licensed Third-Party Software

Included on the media with the Abaqus Programs and under license from third parties are certain third-party and open source programs that are not part of the Abaqus Programs and are NOT warranted or supported by SIMULIA:

Software Name	Release
IBM Platform MPI Community Edition	V9.1

IBM Platform MPI Community Edition, V9.1

LICENSE INFORMATION

The Programs listed below are licensed under the following terms and conditions in addition to those of the IBM International License Agreement for Non-Warranted Programs (IBM form number Z125-5589-05).

Program Name: IBM Platform MPI Community Edition, V9.1

Program Number: Community

Source Components and Sample Materials

The Program may include some components in source code form ("Source Components") and other materials identified as Sample Materials. Licensee may copy and modify Source Components and Sample Materials for internal use only provided such use is within the limits of the license rights under this Agreement, provided however that Licensee may not alter or delete any copyright information or notices contained in the Source Components or Sample Materials. IBM provides the Source Components and Sample Materials without obligation of support and "AS IS", WITH NO WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING THE WARRANTY OF TITLE, NON-INFRINGEMENT OR NON-INTERFERENCE AND THE IMPLIED WARRANTIES AND CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Program-unique Terms

Money Back Guarantee

The program is provided at no charge. As such Section 6 (Money Back Guarantee) of the license does not apply.

International License Agreement for Non-Warranted Programs (IBM form number Z125-5589-05)

Part 1 - General Terms

BY DOWNLOADING, INSTALLING, COPYING, ACCESSING, CLICKING ON AN "ACCEPT" BUTTON, OR OTHERWISE USING THE PROGRAM, LICENSEE AGREES TO THE TERMS OF THIS AGREEMENT. IF YOU ARE ACCEPTING THESE TERMS ON BEHALF OF LICENSEE, YOU REPRESENT AND WARRANT THAT YOU HAVE FULL AUTHORITY TO BIND LICENSEE TO THESE TERMS. IF YOU DO NOT AGREE TO THESE TERMS,

* DO NOT DOWNLOAD, INSTALL, COPY, ACCESS, CLICK ON AN "ACCEPT" BUTTON, OR USE THE PROGRAM; AND

* PROMPTLY RETURN THE UNUSED MEDIA AND DOCUMENTATION TO THE PARTY FROM WHOM IT WAS OBTAINED FOR A REFUND OF THE AMOUNT PAID. IF THE PROGRAM WAS DOWNLOADED, DESTROY ALL COPIES OF THE PROGRAM.

1. Definitions

"Authorized Use" - the specified level at which Licensee is authorized to execute or run the Program. That level may be measured by number of users, millions of service units ("MSUs"), Processor Value Units ("PVUs"), or other level of use specified by IBM.

"IBM" - International Business Machines Corporation or one of its subsidiaries.

"License Information" ("LI") - a document that provides information and any additional terms specific to a Program. The Program's LI is available at www.ibm.com/software/sla (www.ibm.com/software/sla). The LI can also be found in the Program's directory, by the use of a system command, or as a booklet included with the Program.

"Program" - the following, including the original and all whole or partial copies: 1) machine-readable instructions and data, 2) components, files, and modules, 3) audio-visual content (such as images, text, recordings, or pictures), and 4) related licensed materials (such as keys and documentation).

2. Agreement Structure

This Agreement includes Part 1 - General Terms, Part 2 - Country-unique Terms (if any) and the LI and is the complete agreement between Licensee and IBM regarding the use of the Program. It replaces any prior oral or written communications between Licensee and IBM concerning Licensee's use of the Program. The terms of Part 2 may replace or modify those of Part 1. To the extent of any conflict, the LI prevails over both Parts.

3. License Grant

The Program is owned by IBM or an IBM supplier, and is copyrighted and licensed, not sold.

IBM grants Licensee a nonexclusive license to 1) use the Program up to the Authorized Use specified in the invoice, 2) make and install copies to support such Authorized Use, and 3) make a backup copy, all provided that

- a. Licensee has lawfully obtained the Program and complies with the terms of this Agreement;
- b. the backup copy does not execute unless the backed-up Program cannot execute;
- c. Licensee reproduces all copyright notices and other legends of ownership on each copy, or partial copy, of the Program;
- d. Licensee ensures that anyone who uses the Program (accessed either locally or remotely) 1) does so only on Licensee's behalf and 2) complies with the terms of this Agreement;
- e. Licensee does not 1) use, copy, modify, or distribute the Program except as expressly permitted in this Agreement; 2) reverse assemble, reverse compile, otherwise translate, or reverse engineer the Program, except as expressly permitted by law without the possibility of contractual waiver; 3) use any of the Program's components, files, modules, audio-visual content, or related licensed materials separately from that Program; or 4) sublicense, rent, or lease the Program; and
- f. if Licensee obtains this Program as a Supporting Program, Licensee uses this Program only to support the Principal Program and subject to any limitations in the license to the Principal Program, or, if Licensee obtains this Program as a Principal Program, Licensee uses all Supporting Programs only to support this Program, and subject to any limitations in this Agreement. For purposes of this Item "f", a "Supporting Program" is a Program that is part of another IBM Program ("Principal Program") and identified as a Supporting Program in the Principal Program's LI. (To obtain a separate license to a Supporting Program without these restrictions, Licensee should contact the party from whom Licensee obtained the Supporting Program.)

This license applies to each copy of the Program that Licensee makes.

3.1 Trade-ups, Updates, Fixes, and Patches

3.1.1 Trade-ups

If the Program is replaced by a trade-up Program, the replaced Program's license is promptly terminated.

3.1.2 Updates, Fixes, and Patches

When Licensee receives an update, fix, or patch to a Program, Licensee accepts any additional or different terms that are applicable to such update, fix, or patch that are specified in its LI. If no additional or different terms are provided, then the update, fix, or patch is subject solely to this Agreement. If the Program is replaced by an update, Licensee agrees to promptly discontinue use of the replaced Program.

3.2 Fixed Term Licenses

If IBM licenses the Program for a fixed term, Licensee's license is terminated at the end of the fixed term, unless Licensee and IBM agree to renew it.

3.3 Term and Termination

This Agreement is effective until terminated.

IBM may terminate Licensee's license if Licensee fails to comply with the terms of this Agreement.

If the license is terminated for any reason by either party, Licensee agrees to promptly discontinue use of and destroy all of Licensee's copies of the Program. Any terms of this Agreement that by their nature extend beyond termination of this Agreement remain in effect until fulfilled, and apply to both parties' respective successors and assignees.

4. Charges

Charges, if any, are based on Authorized Use obtained, which is specified in the invoice. IBM does not give credits or refunds for charges already due or paid, except as specified elsewhere in this Agreement.

If Licensee wishes to increase its Authorized Use, Licensee must notify IBM or an authorized IBM reseller in advance and pay any applicable charges.

5. Taxes

If any authority imposes on the Program a duty, tax, levy, or fee, excluding those based on IBM's net income, then Licensee agrees to pay that amount, as specified in an invoice, or supply exemption documentation. Licensee is responsible for any personal property taxes for the Program from the date that Licensee obtains it. If any authority imposes a customs duty, tax, levy, or fee for the import into or the export, transfer, access, or use of the Program outside the country in which the original Licensee was granted the license, then Licensee agrees that it is responsible for, and will pay, any amount imposed.

6. Money-back Guarantee

If Licensee is dissatisfied with the Program for any reason and is the original Licensee, Licensee may terminate the license and obtain a refund of the amount Licensee paid, if any, for the Program, provided that Licensee returns the Program to the party from whom Licensee obtained it within 30 days of the invoice date. If the license is for a fixed term that is subject to renewal, then Licensee may obtain a refund only if the Program is returned within the first 30 days of the initial term. If Licensee downloaded the Program, Licensee should contact the party from whom Licensee obtained it for instructions on how to obtain the refund.

7. Program Transfer

Licensee may transfer the Program and all of Licensee's license rights and obligations to another party only if that party agrees to the terms of this Agreement. If the license is terminated for any reason by either party, Licensee is prohibited from transferring the Program to another party. Licensee may not transfer a portion of 1) the Program or 2) the Program's Authorized Use. When Licensee transfers the Program, Licensee must also transfer a hard copy of this Agreement, including the LI. Immediately after the transfer, Licensee's license terminates.

8. No Warranties

SUBJECT TO ANY STATUTORY WARRANTIES THAT CANNOT BE EXCLUDED, IBM MAKES NO WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, REGARDING THE PROGRAM OR SUPPORT, IF ANY, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, FITNESS FOR A PARTICULAR PURPOSE, AND TITLE, AND ANY WARRANTY OR CONDITION OF NON-INFRINGEMENT.

SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO LICENSEE. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE MINIMUM PERIOD REQUIRED BY LAW. NO WARRANTIES APPLY AFTER THAT PERIOD. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO LICENSEE. LICENSEE MAY HAVE OTHER RIGHTS THAT VARY FROM STATE TO STATE OR JURISDICTION TO JURISDICTION.

THE DISCLAIMERS AND EXCLUSIONS IN THIS SECTION 8 ALSO APPLY TO ANY OF IBM'S PROGRAM DEVELOPERS AND SUPPLIERS. MANUFACTURERS, SUPPLIERS, OR PUBLISHERS OF NON-IBM PROGRAMS MAY PROVIDE THEIR OWN WARRANTIES.

IBM DOES NOT PROVIDE SUPPORT OF ANY KIND, UNLESS IBM SPECIFIES OTHERWISE. IN SUCH EVENT, ANY SUPPORT PROVIDED BY IBM IS SUBJECT TO THE DISCLAIMERS AND EXCLUSIONS IN THIS SECTION 8.

9. Licensee Data and Databases

To assist Licensee in isolating the cause of a problem with the Program, IBM may request that Licensee 1) allow IBM to remotely access Licensee's system or 2) send Licensee information or system data to IBM. However, IBM is not obligated to provide such assistance unless IBM and Licensee enter a separate written agreement under which IBM agrees to provide to Licensee that type of support, which is beyond IBM's obligations in this Agreement. In any event, IBM uses information about errors and problems to improve its products and services, and assist with its provision of related support offerings. For these purposes, IBM may use IBM entities and subcontractors (including in one or more countries other than the one in which Licensee is located), and Licensee authorizes IBM to do so.

Licensee remains responsible for 1) any data and the content of any database Licensee makes available to IBM, 2) the selection and implementation of procedures and controls regarding access, security, encryption, use, and transmission of data (including any personally-identifiable data), and 3) backup and recovery of any database and any stored data. Licensee will not send or provide IBM access to any personally-identifiable information, whether in data or any other form, and will be responsible for reasonable costs and other amounts that IBM may incur relating to any such information mistakenly provided to IBM or the loss or disclosure of such information by IBM, including those arising out of any third party claims.

10. Limitation of Liability

The limitations and exclusions in this Section 10 (Limitation of Liability) apply to the full extent they are not prohibited by applicable law without the possibility of contractual waiver.

10.1 Items for Which IBM May Be Liable

Circumstances may arise where, because of a default on IBM's part or other liability, Licensee is entitled to recover damages from IBM. Regardless of the basis on which Licensee is entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), IBM's entire liability for all claims in the aggregate arising from or related to each Program or otherwise arising under this Agreement will not exceed the amount of any 1) damages for bodily injury (including death) and damage to real property and tangible personal property and 2) other actual direct damages up to the charges (if the Program is subject to fixed term charges, up to twelve months' charges) Licensee paid for the Program that is the subject of the claim.

This limit also applies to any of IBM's Program developers and suppliers. It is the maximum for which IBM and its Program developers and suppliers are collectively responsible.

10.2 Items for Which IBM Is Not Liable

UNDER NO CIRCUMSTANCES IS IBM, ITS PROGRAM DEVELOPERS OR SUPPLIERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY:

- a. LOSS OF, OR DAMAGE TO, DATA;
- b. SPECIAL, INCIDENTAL, EXEMPLARY, OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR
- c. LOST PROFITS, BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.

11. Compliance Verification

For purposes of this Section 11 (Compliance Verification), “ILAN Program Terms” means 1) this Agreement and applicable amendments and transaction documents provided by IBM, and 2) IBM software policies that may be found at the IBM Software Policy website (www.ibm.com/softwarepolicies), including but not limited to those policies concerning backup, sub-capacity pricing, and migration.

The rights and obligations set forth in this Section 11 remain in effect during the period the Program is licensed to Licensee, and for two years thereafter.

11.1 Verification Process

Licensee agrees to create, retain, and provide to IBM and its auditors accurate written records, system tool outputs, and other system information sufficient to provide auditable verification that Licensee’s use of all Programs is in compliance with the ILAN Program Terms, including, without limitation, all of IBM’s applicable licensing and pricing qualification terms. Licensee is responsible for 1) ensuring that it does not exceed its Authorized Use, and 2) remaining in compliance with ILAN Program Terms.

Upon reasonable notice, IBM may verify Licensee’s compliance with ILAN Program Terms at all sites and for all environments in which Licensee uses (for any purpose) Programs subject to ILAN Program Terms. Such verification will be conducted in a manner that minimizes disruption to Licensee’s business, and may be conducted on Licensee’s premises, during normal business hours. IBM may use an independent auditor to assist with such verification, provided IBM has a written confidentiality agreement in place with such auditor.

11.2 Resolution

IBM will notify Licensee in writing if any such verification indicates that Licensee has used any Program in excess of its Authorized Use or is otherwise not in compliance with the ILAN Program Terms. Licensee agrees to promptly pay directly to IBM the charges that IBM specifies in an invoice for 1) any such excess use, 2) support for such excess use for the lesser of the duration of such excess use or two years, and 3) any additional charges and other liabilities determined as a result of such verification.

12. Third Party Notices

The Program may include third party code that IBM, not the third party, licenses to Licensee under this Agreement. Notices, if any, for the third party code (“Third Party Notices”) are included for Licensee’s information only. These notices can be found in the Program’s NOTICES file(s). Information on how to obtain source code for certain third party code can be found in the Third Party Notices. If in the Third Party Notices IBM identifies third party code as “Modifiable Third Party Code,” IBM authorizes Licensee to 1) modify the Modifiable Third Party Code and 2) reverse engineer the Program modules that directly interface with the Modifiable Third Party Code provided that it is only for the purpose of debugging Licensee’s modifications to such third party code. IBM’s service and support obligations, if any, apply only to the unmodified Program.

13. General

- a. Nothing in this Agreement affects any statutory rights of consumers that cannot be waived or limited by contract.
- b. For Programs IBM provides to Licensee in tangible form, IBM fulfills its shipping and delivery obligations upon the delivery of such Programs to the IBM-designated carrier, unless otherwise agreed to in writing by Licensee and IBM.
- c. If any provision of this Agreement is held to be invalid or unenforceable, the remaining provisions of this Agreement remain in full force and effect.
- d. Licensee agrees to comply with all applicable export and import laws and regulations, including U.S. embargo and sanctions regulations and prohibitions on export for certain end uses or to certain users.
- e. Licensee authorizes International Business Machines Corporation and its subsidiaries (and their successors and assigns, contractors and IBM Business Partners) to store and use Licensee’s business contact information wherever they do business, in connection with IBM products and services, or in furtherance of IBM’s business relationship with Licensee.
- f. Each party will allow the other reasonable opportunity to comply before it claims that the other has not met its obligations under this Agreement. The parties will attempt in good faith to resolve all disputes, disagreements, or claims between the parties relating to this Agreement.
- g. Unless otherwise required by applicable law without the possibility of contractual waiver or limitation: 1) neither party will bring a legal action, regardless of form, for any claim arising out of or related to this Agreement more than two years after the cause of action arose; and 2) upon the expiration of such time limit, any such claim and all respective rights related to the claim lapse.
- h. Neither Licensee nor IBM is responsible for failure to fulfill any obligations due to causes beyond its control.
- i. No right or cause of action for any third party is created by this Agreement, nor is IBM responsible for any third party claims against Licensee, except as permitted in Subsection 10.1 (Items for Which IBM May Be Liable) above for bodily injury (including death) or damage to real or tangible personal property for which IBM is legally liable to that third party.
- j. In entering into this Agreement, neither party is relying on any representation not specified in this Agreement, including but not limited to any representation concerning: 1) the performance or function of the Program; 2) the experiences or recommendations of other parties; or 3) any results or savings that Licensee may achieve.
- k. IBM has signed agreements with certain organizations (called “IBM Business Partners”) to promote, market, and support certain Programs. IBM Business Partners remain independent and separate from IBM. IBM is not responsible for the actions or statements of IBM Business Partners or obligations they have to Licensee.

l. The license and intellectual property indemnification terms of Licensee's other agreements with IBM (such as the IBM Customer Agreement) do not apply to Program licenses granted under this Agreement.

m. Both parties agree that all information exchanged is nonconfidential. If either party requires the exchange of confidential information, it will be made under a signed confidentiality agreement.

14. Geographic Scope and Governing Law

14.1 Governing Law

Both parties agree to the application of the laws of the country in which Licensee obtained the Program license to govern, interpret, and enforce all of Licensee's and IBM's respective rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

The United Nations Convention on Contracts for the International Sale of Goods does not apply.

14.2 Jurisdiction

All rights, duties, and obligations are subject to the courts of the country in which Licensee obtained the Program license.

Part 2 - Country-unique Terms

For licenses granted in the countries specified below, the following terms replace or modify the referenced terms in Part 1. All terms in Part 1 that are not changed by these amendments remain unchanged and in effect. This Part 2 is organized as follows:

- * Multiple country amendments to Part 1, Section 14 (Governing Law and Jurisdiction);

- * Americas country amendments to other Agreement terms;

- * Asia Pacific country amendments to other Agreement terms; and

- * Europe, Middle East, and Africa country amendments to other Agreement terms.

Multiple country amendments to Part 1, Section 14 (Governing Law and Jurisdiction)

14.1 Governing Law

The phrase "the laws of the country in which Licensee obtained the Program license" in the first paragraph of 14.1 Governing Law is replaced by the following phrases in the countries below:

AMERICAS

(1) In Canada: the laws in the Province of Ontario;

(2) in Mexico: the federal laws of the Republic of Mexico;

(3) in the United States, Anguilla, Antigua/Barbuda, Aruba, British Virgin Islands, Cayman Islands, Dominica, Grenada, Guyana, Saint Kitts and Nevis, Saint Lucia, Saint Maarten, and Saint Vincent and the Grenadines: the laws of the State of New York, United States;

(4) in Venezuela: the laws of the Bolivarian Republic of Venezuela;

ASIA PACIFIC

(5) in Cambodia and Laos: the laws of the State of New York, United States;

(6) in Australia: the laws of the State or Territory in which the transaction is performed;

(7) in Hong Kong SAR and Macau SAR: the laws of Hong Kong Special Administrative Region ("SAR");

(8) in Taiwan: the laws of Taiwan;

EUROPE, MIDDLE EAST, AND AFRICA

(9) in Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Former Yugoslav Republic of Macedonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan: the laws of Austria;

(10) in Algeria, Andorra, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis and Futuna: the laws of France;

(11) in Estonia, Latvia, and Lithuania: the laws of Finland;

(12) in Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome and Principe, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe: the laws of England; and

(13) in South Africa, Namibia, Lesotho, and Swaziland: the laws of the Republic of South Africa.

14.2 Jurisdiction

The following paragraph pertains to jurisdiction and replaces Subsection 14.2 (Jurisdiction) as it applies for those countries identified below:

All rights, duties, and obligations are subject to the courts of the country in which Licensee obtained the Program license except that in the countries identified below all disputes arising out of or related to this Agreement, including summary proceedings, will be brought before and subject to the exclusive jurisdiction of the following courts of competent jurisdiction:

AMERICAS

- (1) In Argentina: the Ordinary Commercial Court of the city of Buenos Aires;
- (2) in Brazil: the court of Rio de Janeiro, RJ;
- (3) in Chile: the Civil Courts of Justice of Santiago;
- (4) in Ecuador: the civil judges of Quito for executory or summary proceedings (as applicable);
- (5) in Mexico: the courts located in Mexico City, Federal District;
- (6) in Peru: the judges and tribunals of the judicial district of Lima, Cercado;
- (7) in Uruguay: the courts of the city of Montevideo;
- (8) in Venezuela: the courts of the metropolitan area of the city of Caracas;

EUROPE, MIDDLE EAST, AND AFRICA

- (9) in Austria: the court of law in Vienna, Austria (Inner-City);
- (10) in Algeria, Andorra, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, France, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Monaco, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis and Futuna: the Commercial Court of Paris;
- (11) in Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome and Principe, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe: the English courts;
- (12) in South Africa, Namibia, Lesotho, and Swaziland: the High Court in Johannesburg;
- (13) in Greece: the competent court of Athens;
- (14) in Israel: the courts of Tel Aviv-Jaffa;
- (15) in Italy: the courts of Milan;
- (16) in Portugal: the courts of Lisbon;
- (17) in Spain: the courts of Madrid; and
- (18) in Turkey: the Istanbul Central Courts and Execution Directorates of Istanbul, the Republic of Turkey.

14.3 Arbitration

The following paragraph is added as a new Subsection 14.3 (Arbitration) as it applies for those countries identified below. The provisions of this Subsection 14.3 prevail over those of Subsection 14.2 (Jurisdiction) to the extent permitted by the applicable governing law and rules of procedure:

ASIA PACIFIC

- (1) In Cambodia, India, Laos, Philippines, and Vietnam:

Disputes arising out of or in connection with this Agreement will be finally settled by arbitration which will be held in Singapore in accordance with the Arbitration Rules of Singapore International Arbitration Center (“SIAC Rules”) then in effect. The arbitration award will be final and binding for the parties without appeal and will be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators will be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties will appoint a third arbitrator who will act as chairman of the proceedings. Vacancies in the post of chairman will be filled by the president of the SIAC. Other vacancies will be filled by the respective nominating party. Proceedings will continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator will be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings will be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Agreement prevails over any other language version.

- (2) In the People’s Republic of China:

In case no settlement can be reached, the disputes will be submitted to China International Economic and Trade Arbitration Commission for arbitration according to the then effective rules of the said Arbitration Commission. The arbitration will take place in Beijing and be conducted in Chinese. The

arbitration award will be final and binding on both parties. During the course of arbitration, this agreement will continue to be performed except for the part which the parties are disputing and which is undergoing arbitration.

(3) In Indonesia:

Each party will allow the other reasonable opportunity to comply before it claims that the other has not met its obligations under this Agreement. The parties will attempt in good faith to resolve all disputes, disagreements, or claims between the parties relating to this Agreement. Unless otherwise required by applicable law without the possibility of contractual waiver or limitation, i) neither party will bring a legal action, regardless of form, arising out of or related to this Agreement or any transaction under it more than two years after the cause of action arose; and ii) after such time limit, any legal action arising out of this Agreement or any transaction under it and all respective rights related to any such action lapse.

Disputes arising out of or in connection with this Agreement shall be finally settled by arbitration that shall be held in Jakarta, Indonesia in accordance with the rules of Board of the Indonesian National Board of Arbitration (Badan Arbitrase Nasional Indonesia or "BANI") then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the chairman of the BANI. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English and/or Indonesian language.

EUROPE, MIDDLE EAST, AND AFRICA

(4) In Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Former Yugoslav Republic of Macedonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan:

All disputes arising out of this Agreement or related to its violation, termination or nullity will be finally settled under the Rules of Arbitration and Conciliation of the International Arbitral Center of the Federal Economic Chamber in Vienna (Vienna Rules) by three arbitrators appointed in accordance with these rules. The arbitration will be held in Vienna, Austria, and the official language of the proceedings will be English. The decision of the arbitrators will be final and binding upon both parties. Therefore, pursuant to paragraph 598 (2) of the Austrian Code of Civil Procedure, the parties expressly waive the application of paragraph 595 (1) figure 7 of the Code. IBM may, however, institute proceedings in a competent court in the country of installation.

(5) In Estonia, Latvia, and Lithuania:

All disputes arising in connection with this Agreement will be finally settled in arbitration that will be held in Helsinki, Finland in accordance with the arbitration laws of Finland then in effect. Each party will appoint one arbitrator. The arbitrators will then jointly appoint the chairman. If arbitrators cannot agree on the chairman, then the Central Chamber of Commerce in Helsinki will appoint the chairman.

AMERICAS COUNTRY AMENDMENTS

CANADA

10.1 Items for Which IBM May Be Liable

The following replaces Item 1 in the first paragraph of this Subsection 10.1 (Items for Which IBM May Be Liable):

1) damages for bodily injury (including death) and physical harm to real property and tangible personal property caused by IBM's negligence; and

13. General

The following replaces Item 13.d:

d. Licensee agrees to comply with all applicable export and import laws and regulations, including those of that apply to goods of United States origin and that prohibit or limit export for certain uses or to certain users.

The following replaces Item 13.i:

i. No right or cause of action for any third party is created by this Agreement or any transaction under it, nor is IBM responsible for any third party claims against Licensee except as permitted by the Limitation of Liability section above for bodily injury (including death) or physical harm to real or tangible personal property caused by IBM's negligence for which IBM is legally liable to that third party.

The following is added as Item 13.n:

n. For purposes of this Item 13.n, "Personal Data" refers to information relating to an identified or identifiable individual made available by one of the parties, its personnel or any other individual to the other in connection with this Agreement. The following provisions apply in the event that one party makes Personal Data available to the other:

(1) General

(a) Each party is responsible for complying with any obligations applying to it under applicable Canadian data privacy laws and regulations ("Laws").

(b) Neither party will request Personal Data beyond what is necessary to fulfill the purpose(s) for which it is requested. The purpose(s) for requesting Personal Data must be reasonable. Each party will agree in advance as to the type of Personal Data that is required to be made available.

(2) Security Safeguards

- (a) Each party acknowledges that it is solely responsible for determining and communicating to the other the appropriate technological, physical and organizational security measures required to protect Personal Data.
- (b) Each party will ensure that Personal Data is protected in accordance with the security safeguards communicated and agreed to by the other.
- (c) Each party will ensure that any third party to whom Personal Data is transferred is bound by the applicable terms of this section.
- (d) Additional or different services required to comply with the Laws will be deemed a request for new services.

(3) Use

Each party agrees that Personal Data will only be used, accessed, managed, transferred, disclosed to third parties or otherwise processed to fulfill the purpose(s) for which it was made available.

(4) Access Requests

- (a) Each party agrees to reasonably cooperate with the other in connection with requests to access or amend Personal Data.
- (b) Each party agrees to reimburse the other for any reasonable charges incurred in providing each other assistance.
- (c) Each party agrees to amend Personal Data only upon receiving instructions to do so from the other party or its personnel.

(5) Retention

Each party will promptly return to the other or destroy all Personal Data that is no longer necessary to fulfill the purpose(s) for which it was made available, unless otherwise instructed by the other or its personnel or required by law.

(6) Public Bodies Who Are Subject to Public Sector Privacy Legislation

For Licensees who are public bodies subject to public sector privacy legislation, this Item 13.n applies only to Personal Data made available to Licensee in connection with this Agreement, and the obligations in this section apply only to Licensee, except that: 1) section (2)(a) applies only to IBM; 2) sections (1)(a) and (4)(a) apply to both parties; and 3) section (4)(b) and the last sentence in (1)(b) do not apply.

PERU

10. Limitation of Liability

The following is added to the end of this Section 10 (Limitation of Liability):

Except as expressly required by law without the possibility of contractual waiver, Licensee and IBM intend that the limitation of liability in this Limitation of Liability section applies to damages caused by all types of claims and causes of action. If any limitation on or exclusion from liability in this section is held by a court of competent jurisdiction to be unenforceable with respect to a particular claim or cause of action, the parties intend that it nonetheless apply to the maximum extent permitted by applicable law to all other claims and causes of action.

10.1 Items for Which IBM May Be Liable

The following is added to the end of this Subsection 10.1:

In accordance with Article 1328 of the Peruvian Civil Code, the limitations and exclusions specified in this section will not apply to damages caused by IBM's willful misconduct ("dolo") or gross negligence ("culpa inexcusable").

UNITED STATES OF AMERICA

5. Taxes

The following is added to the end of this Section 5 (Taxes):

For Programs delivered electronically in the United States for which Licensee claims a state sales and use tax exemption, Licensee agrees not to receive any tangible personal property (e.g., media and publications) associated with the electronic program.

Licensee agrees to be responsible for any sales and use tax liabilities that may arise as a result of Licensee's subsequent redistribution of Programs after delivery by IBM.

13. General

The following is added to Section 13 as Item 13.n:

- n. U.S. Government Users Restricted Rights - Use, duplication or disclosure is restricted by the GSA IT Schedule 70 Contract with the IBM Corporation.

The following is added to Item 13.f:

Each party waives any right to a jury trial in any proceeding arising out of or related to this Agreement.

ASIA PACIFIC COUNTRY AMENDMENTS

AUSTRALIA

5. Taxes

The following sentences replace the first two sentences of Section 5 (Taxes):

If any government or authority imposes a duty, tax (other than income tax), levy, or fee, on this Agreement or on the Program itself, that is not otherwise provided for in the amount payable, Licensee agrees to pay it when IBM invoices Licensee. If the rate of GST changes, IBM may adjust the charge or other amount payable to take into account that change from the date the change becomes effective.

8. No Warranties

The following is added to the first paragraph of Section 8 (No Warranties):

Although IBM specifies that there are no warranties, Licensee may have certain rights under the Competition and Consumer Act 2010 or other legislation and are only limited to the extent permitted by the applicable legislation.

10.1 Items for Which IBM May Be Liable

The following is added to Subsection 10.1 (Items for Which IBM Maybe Liable):

Where IBM is in breach of a condition or warranty implied by the Competition and Consumer Act 2010, IBM's liability is limited to the repair or replacement of the goods, or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily obtained for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

HONG KONG SAR, MACAU SAR, AND TAIWAN

As applies to licenses obtained in Taiwan and the special administrative regions, phrases throughout this Agreement containing the word "country" (for example, "the country in which the original Licensee was granted the license" and "the country in which Licensee obtained the Program license") are replaced with the following:

- (1) In Hong Kong SAR: "Hong Kong SAR"
- (2) In Macau SAR: "Macau SAR" except in the Governing Law clause (Section 14.1)
- (3) In Taiwan: "Taiwan".

INDIA

10.1 Items for Which IBM May Be Liable

The following replaces the terms of Items 1 and 2 of the first paragraph:

1) liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence; and 2) as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Agreement, IBM's liability will be limited to the charge paid by Licensee for the individual Program that is the subject of the claim.

13. General

The following replaces the terms of Item 13.g:

g. If no suit or other legal action is brought, within three years after the cause of action arose, in respect of any claim that either party may have against the other, the rights of the concerned party in respect of such claim will be forfeited and the other party will stand released from its obligations in respect of such claim.

INDONESIA

3.3 Term and Termination

The following is added to the last paragraph:

Both parties waive the provision of article 1266 of the Indonesian Civil Code, to the extent the article provision requires such court decree for the termination of an agreement creating mutual obligations.

JAPAN

13. General

The following is inserted as Item 13.n:

n. Any doubts concerning this Agreement will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

MALAYSIA

10.2 Items for Which IBM Is Not Liable

The word "SPECIAL" in Item 10.2b is deleted.

NEW ZEALAND

8. No Warranties

The following is added to the first paragraph of this Section 8 (No Warranties):

Although IBM specifies that there are no warranties, Licensee may have certain rights under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if Licensee requires the goods for the purposes of a business as defined in that Act.

10. Limitation of Liability

The following is added:

Where Programs are not obtained for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this Section are subject to the limitations in that Act.

PEOPLE'S REPUBLIC OF CHINA

4. Charges

The following is added:

All banking charges incurred in the People's Republic of China will be borne by Licensee and those incurred outside the People's Republic of China will be borne by IBM.

PHILIPPINES

10.2 Items for Which IBM Is Not Liable

The following replaces the terms of Item 10.2b:

b. special (including nominal and exemplary damages), moral, incidental, or indirect damages or for any economic consequential damages; or

SINGAPORE

10.2 Items for Which IBM Is Not Liable

The words "SPECIAL" and "ECONOMIC" are deleted from Item 10.2b.

13. General

The following replaces the terms of Item 13.i:

i. Subject to the rights provided to IBM's suppliers and Program developers as provided in Section 10 above (Limitation of Liability), a person who is not a party to this Agreement will have no right under the Contracts (Right of Third Parties) Act to enforce any of its terms.

TAIWAN

10.1 Items for Which IBM May Be Liable

The following sentences are deleted:

This limit also applies to any of IBM's subcontractors and Program developers. It is the maximum for which IBM and its subcontractors and Program developers are collectively responsible.

EUROPE, MIDDLE EAST, AFRICA (EMEA) COUNTRY AMENDMENTS

EUROPEAN UNION MEMBER STATES

8. No Warranties

The following is added to Section 8 (No Warranties):

In the European Union ("EU"), consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the provisions set out in this Section 8 (No Warranties).

EU MEMBER STATES AND THE COUNTRIES IDENTIFIED BELOW

Iceland, Liechtenstein, Norway, Switzerland, Turkey, and any other European country that has enacted local data privacy or protection legislation similar to the EU model.

13. General

The following replaces Item 13.e:

(1) Definitions - For the purposes of this Item 13.e, the following additional definitions apply:

(a) Business Contact Information - business-related contact information disclosed by Licensee to IBM, including names, job titles, business addresses, telephone numbers and email addresses of Licensee's employees and contractors. For Austria, Italy and Switzerland, Business Contact Information also includes information about Licensee and its contractors as legal entities (for example, Licensee's revenue data and other transactional information)

(b) Business Contact Personnel - Licensee employees and contractors to whom the Business Contact Information relates.

(c) Data Protection Authority - the authority established by the Data Protection and Electronic Communications Legislation in the applicable country or, for non-EU countries, the authority responsible for supervising the protection of personal data in that country, or (for any of the foregoing) any duly appointed successor entity thereto.

(d) Data Protection & Electronic Communications Legislation - (i) the applicable local legislation and regulations in force implementing the requirements of EU Directive 95/46/EC (on the protection of individuals with regard to the processing of personal data and on the free movement of such data) and of EU Directive 2002/58/EC (concerning the processing of personal data and the protection of privacy in the electronic communications sector); or (ii)

for non-EU countries, the legislation and/or regulations passed in the applicable country relating to the protection of personal data and the regulation of electronic communications involving personal data, including (for any of the foregoing) any statutory replacement or modification thereof.

(e) IBM Group - International Business Machines Corporation of Armonk, New York, USA, its subsidiaries, and their respective Business Partners and subcontractors.

(2) Licensee authorizes IBM:

(a) to process and use Business Contact Information within IBM Group in support of Licensee including the provision of support services, and for the purpose of furthering the business relationship between Licensee and IBM Group, including, without limitation, contacting Business Contact Personnel (by email or otherwise) and marketing IBM Group products and services (the "Specified Purpose"); and

(b) to disclose Business Contact Information to other members of IBM Group in pursuit of the Specified Purpose only.

(3) IBM agrees that all Business Contact Information will be processed in accordance with the Data Protection & Electronic Communications Legislation and will be used only for the Specified Purpose.

(4) To the extent required by the Data Protection & Electronic Communications Legislation, Licensee represents that (a) it has obtained (or will obtain) any consents from (and has issued (or will issue) any notices to) the Business Contact Personnel as are necessary in order to enable IBM Group to process and use the Business Contact Information for the Specified Purpose.

(5) Licensee authorizes IBM to transfer Business Contact Information outside the European Economic Area, provided that the transfer is made on contractual terms approved by the Data Protection Authority or the transfer is otherwise permitted under the Data Protection & Electronic Communications Legislation.

AUSTRIA

8. No Warranties

In Austria (and Germany) the following replaces Section 8 (No Warranties) in its entirety, including its title, if Licensee paid a charge to obtain the Program.

8. Warranties and Exclusions

The warranty period is twelve months from the date of delivery. The limitation period for consumers in action for breach of warranty is the statutory period as a minimum.

The warranty for an IBM Program covers the functionality of the Program for its normal use and the Program's conformity to its specifications.

IBM warrants that when the Program is used in the specified operating environment it will conform to its specifications. IBM does not warrant uninterrupted or error-free operation of the Program or that IBM will correct all Program defects. Licensee is responsible for the results obtained from the use of the Program.

The warranty applies only to the unmodified portion of the Program.

If the Program does not function as warranted during the warranty period and the problem cannot be resolved with information available, Licensee may return the Program to the party from whom Licensee acquired it and receive a refund of the amount Licensee paid. If Licensee down loaded the Program, Licensee may contact the party from whom Licensee acquired it to obtain the refund.

This is IBM's sole obligation to Licensee, except as otherwise required by applicable statutory law.

10. Limitation of Liability

The following is added:

The following limitations and exclusions of IBM's liability do not apply for damages caused by gross negligence or willful misconduct.

10.1 Items for Which IBM May Be Liable

The following replaces the first sentence in the first paragraph:

Circumstances may arise where, because of a default by IBM in the performance of its obligations under this Agreement or other liability, Licensee is entitled to recover damages from IBM.

In the second sentence of the first paragraph, delete entirely the parenthetical phrase:

"(including fundamental breach, negligence, misrepresentation, or other contract or tort claim)".

10.2 Items for Which IBM Is Not Liable

The following replaces Item 10.2b:

b. indirect damages or consequential damages; or

BELGIUM, FRANCE, ITALY, AND LUXEMBOURG

10. Limitation of Liability

The following replaces the terms of Section 10 (Limitation of Liability) in its entirety:

Except as otherwise provided by mandatory law:

10.1 Items for Which IBM May Be Liable

IBM's entire liability for all claims in the aggregate for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Agreement or due to any other cause related to this Agreement is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault) or of such cause, for a maximum amount equal to the charges (if the Program is subject to fixed term charges, up to twelve months' charges) Licensee paid for the Program that has caused the damages.

The above limitation will not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

10.2 Items for Which IBM Is Not Liable

UNDER NO CIRCUMSTANCES IS IBM OR ANY OF ITS PROGRAM DEVELOPERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL, EXEMPLARY OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; AND / OR 3) LOST PROFITS, BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES.

10.3 Suppliers and Program Developers

The limitation and exclusion of liability herein agreed applies not only to the activities performed by IBM but also to the activities performed by its suppliers and Program developers, and represents the maximum amount for which IBM as well as its suppliers and Program developers are collectively responsible.

GERMANY

8. No Warranties

This Section 8 (No Warranties) is amended as specified for AUSTRIA.

10. Limitation of Liability

The following replaces this Section 10 (Limitation of Liability) in its entirety:

- a. IBM will be liable without limit for 1) loss or damage caused by a breach of an express guarantee; 2) damages or losses resulting in bodily injury (including death); and 3) damages caused intentionally or by gross negligence.
- b. In the event of loss, damage and frustrated expenditures caused by slight negligence or in breach of essential contractual obligations, IBM will be liable, regardless of the basis on which Licensee is entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), per claim only up to the greater of 500,000 euro or the charges (if the Program is subject to fixed term charges, up to 12 months' charges) Licensee paid for the Program that caused the loss or damage. A number of defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one default.
- c. In the event of loss, damage and frustrated expenditures caused by slight negligence, IBM will not be liable for indirect or consequential damages, even if IBM was informed about the possibility of such loss or damage.
- d. In case of delay on IBM's part: 1) IBM will pay to Licensee an amount not exceeding the loss or damage caused by IBM's delay and 2) IBM will be liable only in respect of the resulting damages that Licensee suffers, subject to the provisions of Items a and b above.

13. General

The following replaces the provisions of 13.g:

- g. Any claims resulting from this Agreement are subject to a limitation period of three years, except as stated in Section 8 (No Warranties) of this Agreement.

The following replaces the provisions of 13.i:

- i. No right or cause of action for any third party is created by this Agreement, nor is IBM responsible for any third party claims against Licensee, except (to the extent permitted in Section 10 (Limitation of Liability)) for: i) bodily injury (including death); or ii) damage to real or tangible personal property for which (in either case) IBM is legally liable to that third party.

IRELAND

8. No Warranties

The following sentence is added to the second paragraph of this Section 8 (No Warranties):

Except as expressly provided in these terms and conditions, or Section 12 of the Sale of Goods Act 1893 as amended by the Sale of Goods and Supply of Services Act, 1980 (the "1980 Act"), all conditions or warranties (express or implied, statutory or otherwise) are hereby excluded including, without limitation, any warranties implied by the Sale of Goods Act 1893 as amended by the 1980 Act (including, for the avoidance of doubt, Section 39 of the 1980 Act).

IRELAND AND UNITED KINGDOM

2. Agreement Structure

The following sentence is added:

Nothing in this paragraph shall have the effect of excluding or limiting liability for fraud.

10.1 Items for Which IBM May Be Liable

The following replaces the first paragraph of the Subsection:

For the purposes of this section, a “Default” means any act, statement, omission or negligence on the part of IBM in connection with, or in relation to, the subject matter of an Agreement in respect of which IBM is legally liable to Licensee, whether in contract or in tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default.

Circumstances may arise where, because of a Default by IBM in the performance of its obligations under this Agreement or other liability, Licensee is entitled to recover damages from IBM. Regardless of the basis on which Licensee is entitled to claim damages from IBM and except as expressly required by law without the possibility of contractual waiver, IBM’s entire liability for any one Default will not exceed the amount of any direct damages, to the extent actually suffered by Licensee as an immediate and direct consequence of the Default, up to the greater of (1) 500,000 euro (or the equivalent in local currency) or (2) 125% of the charges (if the Program is subject to fixed term charges, up to 12 months’ charges) for the Program that is the subject of the claim. Notwithstanding the foregoing, the amount of any damages for bodily injury (including death) and damage to real property and tangible personal property for which IBM is legally liable is not subject to such limitation.

10.2 Items for Which IBM Is Not Liable

The following replaces Items 10.2b and 10.2c:

- b. special, incidental, exemplary, or indirect damages or consequential damages; or
- c. wasted management time or lost profits, business, revenue, goodwill, or anticipated savings.

Z125-5589-05 (07/2011)

Preface

This section lists various resources that are available for help with using Abaqus Unified FEA software.

Support

Both technical software support (for problems with creating a model or performing an analysis) and systems support (for installation, licensing, and hardware-related problems) for Abaqus are offered through a global network of support offices, as well as through our online support system. Regional contact information is accessible from **SIMULIA→Locations** at www.3ds.com/simulia. The online support system is accessible by selecting the **SUBMIT A REQUEST** link at www.3ds.com/support-training (<http://www.3ds.com/support-training/>).

Online support

Dassault Systèmes provides a knowledge base of questions and answers, solutions to questions that we have answered, and guidelines on how to use Abaqus, Engineering Process Composer, Isight, Tosca, fe-safe, and other SIMULIA products. The knowledge base is available from www.3ds.com/support-training (<http://www.3ds.com/support-training/>).

By using the online support system, you can also submit new requests for support. All support/service requests are tracked. If you contact us by means outside the system to discuss an existing support problem and you know the support request number, please mention it so that we can query the knowledge base to see what the latest action has been.

Training

All support offices offer regularly scheduled public training classes. The courses are offered in a traditional classroom form and via the Web. We also provide training seminars at customer sites. All training classes and seminars include workshops to provide as much practical experience with Abaqus as possible. For a schedule and descriptions of available classes, see the **Training Classes** link at www.3ds.com/simulia or call your support office.

Feedback

We welcome any suggestions for improvements to Abaqus software, the support program, or documentation. We will ensure that any enhancement requests you make are considered for future releases. If you wish to make a suggestion about the service or products, refer to www.3ds.com/simulia. Complaints should be made by contacting your support office or by visiting **SIMULIA→Quality Assurance** at www.3ds.com/simulia.

Contents

1. Overview

2. Installing Abaqus

Installation procedures	2.1
Abaqus documentation installation details	2.2
Abaqus FLEXnet licensing installation details	2.3
Abaqus product installation details	2.4
Uninstalling Abaqus products or licensing	2.5
Uninstalling Abaqus documentation	2.6

3. Abaqus licensing

FLEXnet network licensing	3.1
Updating an Abaqus FLEXnet license file	3.2
Upgrading a FLEXnet license server and administration tools	3.3
Redundant FLEXnet license server configurations	3.4
FLEXnet license server manager lmgrd	3.5
FLEXnet Licensing administration tools	3.6
Using the FLEXnet options file	3.7
Reporting FLEXnet license usage data	3.8
Using the ds1sstat utility for a Dassault Systèmes license server	3.9
Using the reporttool utility	3.10

4. Customizing the Abaqus environment

Using the Abaqus environment file	4.1
Defining analysis batch queues	4.2
Examples	4.3

5. Customizing Abaqus/CAE and Abaqus/Viewer

Customizing the user interface	5.1
Configuring printers	5.2
Tuning graphics cards	5.3

A. System requirements notes

System software	A.1
Disk space	A.2
Memory	A.3

CONTENTS

Compilers	A.4
MPI	A.5
B. Abaqus release directories and files	
The SIMULIA parent directory	B.1
The Abaqus parent directory	B.2
C. Configuring Abaqus documentation	
Using an existing non-Abaqus web server	C.1
Setting the documentation URL after installation	C.2
D. Accessing remote file systems for installation and execution	
Accessing the installation files from a remotely mounted DVD	D.1
Client installation for Windows	D.2
Running Abaqus remotely on Linux	D.3
Using a network ODB connector	D.4
E. Verification procedure	
F. Troubleshooting Abaqus FLEXnet licensing	
General questions	F.1
FLEXnet license server operation	F.2
Special situations	F.3
Other licensing questions and problems	F.4

1. Overview

This guide contains information about installing and customizing Abaqus 6.14. This guide is also accessible from the **Documentation** section of the **Support** page at www.3ds.com/simulia.

The installation of Abaqus involves the following tasks:

- Installing the Abaqus documentation.
- Installing the Abaqus license server.
- Installing Abaqus products.

For a description of the installation procedures, see Chapter 2, “Installing Abaqus.”

Network licensing and procedures to administer the license server are described in Chapter 3, “Abaqus licensing.”

The environment file provides options for customizing an Abaqus installation. Specifying the file system to be used to store scratch files is particularly important. For details on how to set local defaults and adjust the system configuration to run Abaqus jobs efficiently, see Chapter 4, “Customizing the Abaqus environment.”

For more information on customizing the Abaqus user interface, printer configuration, and graphic card tuning, see Chapter 5, “Customizing Abaqus/CAE and Abaqus/Viewer.”

Additional information is provided in the following appendices:

- Appendix A, “System requirements notes”
- Appendix B, “Abaqus release directories and files”
- Appendix C, “Configuring Abaqus documentation”
- Appendix D, “Accessing remote file systems for installation and execution”
- Appendix E, “Verification procedure”
- Appendix F, “Troubleshooting Abaqus FLEXnet licensing”

2. Installing Abaqus

This chapter describes the installation procedures for Abaqus documentation, licensing, and products, as well as the procedures to uninstall these components. A complete Abaqus installation requires two DVDs: one for documentation and one for licensing and products.

Before starting the Abaqus installer, you should confirm that your computer is compatible with this release. You can do this by using the system information utility available on the licensing and products DVD. The system information utility checks your computer and reports the software components it finds. Use the following commands to run the system utility:

Linux platforms

```
/dvd_dir/setup -sysinfo
```

where *dvd_dir* is the directory used when the DVD was mounted or where the installation files reside.

Windows platforms

Do one of the following:

- From the startup screen, select **Launch the Abaqus System Information Utility**.
- From the command line, type

```
dvd_drive:\setup.exe -sysinfo
```

where *dvd_drive* is the DVD-ROM drive.

Compare your system's configuration to the Abaqus system requirements described in the Program Directory. The Program Directory is additional documentation, similar to release notes, available at <http://media.3ds.com/support/progdir>. Choose SIMULIA Abaqus as the product **Line** and Abaqus 6.14 as the **Level**, then choose **Prerequisites** in the left-hand pane. A support contract and private login account are required for access (see https://iam.3ds.com/self_service/login/service/websupport/).

The disk space used for installation will be charged against the account of the owner of the Abaqus installation directory. Administrator privileges are required on Windows platforms for all installation activities.

A complete Abaqus installation consists of three procedures. **You should perform the installation procedures in the following order:**

1. Abaqus documentation.
2. Abaqus licensing. You can use either FLEXnet licensing or Dassault Systèmes licensing, depending on which type of license file you have.
3. Abaqus products.

Abaqus documentation should be installed on at least one computer on your network. Abaqus documentation should be installed before licensing and products because the product installation procedure uses the documentation URL to configure network access to the online documentation.

During the installation procedures, default values are supplied whenever possible; it is highly recommended that you use the defaults unless you have good reason to change them. The SIMULIA directory structure is designed to facilitate multiple releases of Abaqus. The Abaqus products, Abaqus licensing, and Abaqus documentation should be installed in the same SIMULIA parent directory to take full advantage of this directory structure. For an illustration of the directory structure, see Appendix B, “Abaqus release directories and files.”

You can install Abaqus on a mounted network drive and configure your users’ computers to run Abaqus as a client. For more information, see “Client installation for Windows,” Section D.2.

2.1 Installation procedures

This section summarizes the commands used to perform an Abaqus installation on a computer that has a locally mounted DVD. If you are installing Abaqus on a computer using a remotely mounted DVD, see “Accessing the installation files from a remotely mounted DVD,” Section D.1. Because Windows User Account Control (UAC) alters shared network mapped drives, you cannot install Abaqus when the DVD is mounted on a shared network drive. To work around this problem, either disable UAC or copy the installation DVD contents to the local hard drive and run the installer from there.

If you are performing an installation on a computer with previous releases of Abaqus installed on it, Abaqus 6.14 release is installed using the same directory structure as the previous installations (see Appendix B, “Abaqus release directories and files,” for details). If you are installing Abaqus for the first time, create a parent directory structure for Abaqus. The recommended path for this directory structure is **SIMULIA/Abaqus/**. Throughout this guide, the **SIMULIA** directory is referred to as *simulia_dir* in directory path listings; Abaqus documentation and licensing are installed in *simulia_dir*. The **SIMULIA/Abaqus/** directory is referred to as *abaqus_dir* in directory path listings; the Abaqus products are installed in *abaqus_dir*.

Insert the appropriate DVD in the drive. On Windows platforms a startup screen is provided from which you can launch the commands used to perform an Abaqus installation, the command to run the system information utility, and other installation-related tasks.

If the DVD does not mount automatically, issue the DVD mount command for the platform on which you are installing Abaqus.

2.1.1 Documentation installation

Online documentation for all Abaqus releases, including general and extended functionality releases, is provided in two formats: HTML and PDF. There are several options for installing the documentation and making it available to your Abaqus users:

- Install HTML and PDF on a server on your network, and use web server software to serve both formats to users (this is the most common choice).

- Install multiple copies of the PDF files on individual users' machines, where they can view it locally using a PDF viewer such as Adobe Acrobat Reader.
- Skip the documentation installer, and simply copy the PDF files from the DVD to any computers or disks.

You must have write permission in the directory where documentation is installed. Administrator privileges are required to run the installer on Windows platforms.

The commands and options used to install documentation are described below. For more details about the documentation installation options, see "Abaqus documentation installation details," Section 2.2.

To install Abaqus documentation:

1. From the SIMULIA parent directory, execute the following command or use the following option:

Linux platforms

```
/doc_dir/setup [-replay full_path_to_replay_file]
```

where *doc_dir* is the directory used when the Documentation DVD was mounted or where the documentation installation files reside.

Windows platforms

- From the startup screen, select **Install Abaqus Documentation**.
- From the command line, type

```
doc_drive:\setup.exe [-replay full_path_to_replay_file]
```

where *doc_drive* is the DVD-ROM drive that contains the Documentation DVD.

Command option

```
-replay full_path_to_replay_file
```

Use this option to perform additional identical documentation installations without having to reenter the same information for each installation. For more information, see "Repeating documentation installations on multiple computers," Section 2.2.2.

2. Follow the instructions in the dialog boxes that appear to complete the installation. Choose which formats of documentation to install:
 - **HTML and PDF**
 - **PDF only**
3. If you installed the **HTML and PDF** format and selected the "Abaqus web server" or "no web server" option, you are provided with a URL that points to your HTML documentation when the installer completes. This URL is also written to a log file in the following location:

```
simulia_dir/Documentation/installation_info/v6.14/info.log
```

If you selected the “existing non-Abaqus web server” option, a sample URL is written to the **info.log** file. To access the HTML documentation from the Abaqus products, you must provide a valid URL during each subsequent Abaqus product installation.

4. If you installed only the PDF documentation, the path to the **index.pdf** file is shown.

To copy the PDF documentation from the DVD (without running the installer)

1. Find the directory **pdf_docs/** on the documentation DVD. Copy the entire contents of this directory.
2. To view the documentation, open the file **index.pdf** in a PDF viewer or web browser.

You may copy the PDF documentation in accordance with the following terms:

- Use of this material is governed by your Abaqus software license agreement.
- Keep the documentation confidential and utilize your best efforts to prevent unauthorized disclosure or use of any Abaqus Program including the Abaqus documentation for such program.
- Treat all Abaqus Programs including the Abaqus documentation with the same degree of care that you treat like information of your own that you do not want publicly disclosed or the subject of unauthorized access or use.
- Do not make or permit to be made any more copies of any Abaqus Program including the Abaqus documentation than are authorized by your Abaqus software license agreement.

2.1.2 Dassault Systèmes license server installation

You can use either FLEXnet or Dassault Systèmes licensing with Abaqus, depending on which type of license file you have. The Abaqus product installer lets you choose which type of license server to install. For Dassault Systèmes licensing, the Abaqus installer will install the Dassault Systèmes license server (DSLS) software on any computer with a supported platform (operating system).

The DSLS software package includes the *Dassault Systèmes License Server Installation and Configuration Guide* (**DSLS.pdf**), which contains instructions for configuring the license server and administering licenses. Refer to this guide for all DSLS licensing operations. You can find the **DSLS.pdf** file on the Licensing & Products DVD in the following location:

/dvd_dir/DSLS/DSLS.pdf

To install the Dassault Systèmes license server, you must be an Administrator on Windows or root on UNIX/Linux. The Dassault Systèmes license server is supported only with Abaqus 6.12 and higher.

Dassault Systèmes license server version R2014x is required for Abaqus 6.14.

Virtual machines, such as VMware, are not supported. It is not possible to install or run the Dassault Systèmes license server on a virtual machine.

After installation, you can use the **dslsstat** utility to check the DSLS status; see “Using the **dslsstat** utility for a Dassault Systèmes license server,” Section 3.9.

A new license file allows you to run all maintenance deliveries of the current version as well as the next two major releases.

The Dassault Systèmes license server should be installed on only one computer unless you are using a redundant license server configuration. The server computers that you choose for documentation and licensing should be accessible by all computers on the network where you plan to run Abaqus and should be stable machines that are not frequently rebooted or shut down.

Automatic configuration is recommended for most users, particularly those whose primary responsibility is not computer system or network administration. You can allow the installer to install, configure, and start the Dassault Systèmes license server automatically.

Installing the Dassault Systèmes license server on UNIX/Linux

You can start the DSLS installer from within the Abaqus product installer or directly from the DVD:

- To use the Abaqus product installer, follow these steps:
 1. From the SIMULIA parent directory, execute the following command:


```
/dvd_dir/setup
```

where *dvd_dir* is the directory used when the Licensing & Products DVD was mounted or where the licensing installation files reside.
 2. In the **Installation type** panel, choose **Dassault Systèmes License Server (DSL)**.
 3. Follow the instructions in the dialog boxes that appear to complete the installation.
- To start the DSLS installer directly from the DVD, follow these steps:
 1. Set the **DISPLAY** environment variable for your computer.
 2. Change directory (**cd**) into one of the following OS/platform-specific directories:

```
/dvd_dir/DSL/AIX/
/dvd_dir/DSL/SUN/
/dvd_dir/DSL/RedHat/
/dvd_dir/DSL/Suse/
```

3. Execute the file **startInstLicServ**.
4. Follow the instructions in the dialog boxes that appear to complete the installation.

After the installation finishes, you must use the Dassault Systèmes License Administration Tool to enroll the Abaqus licenses on the Dassault Systèmes license server; see “Enrolling Product Licenses” in the *Dassault Systèmes License Server Installation and Configuration Guide*. You must enroll the licenses before continuing with the Abaqus product installation.

Installing the Dassault Systèmes license server on Windows

You can start the DSLS installer in any of the following ways on Windows:

- From the DVD startup screen, select **Install Dassault Systèmes License Server (DSL)**.

INSTALLING Abaqus

- In Windows Explorer, browse to the DVD and double-click the DSLS installer:

`dvd_drive:\DSLS\SetupDSLsmsi.exe`

- To start the DSLS installer from within the Abaqus product installer, follow these steps:
 1. From the startup screen, select **Install Abaqus Product and Licensing**, or execute the **setup.exe** file from the command line:

`dvd_drive:\setup.exe`

2. In the **Installation type** panel, choose **Dassault Systèmes License Server (DSLS)**.
3. Follow the instructions in the dialog boxes that appear to complete the installation.

After the installation finishes, you must use the Dassault Systèmes License Administration Tool to enroll the Abaqus licenses on the Dassault Systèmes license server; see “Enrolling Product Licenses” in the *Dassault Systèmes License Server Installation and Configuration Guide*. You must enroll the licenses before continuing with the Abaqus product installation.

2.1.3 FLEXnet Licensing installation

You must have an Abaqus 6.14 FLEXnet license file to set up an Abaqus FLEXnet license server. FLEXnet Abaqus 6.14 licensing uses FLEXnet Licensing Version 11.6.1. A license file allows you to run subsequent Abaqus 6.14 maintenance deliveries, previous releases dating back to Abaqus 6.2-7, and two future major releases. For example, a new license file for Abaqus 6.14-1 can be used to run all Abaqus 6.14 maintenance deliveries (Abaqus 6.14-2, Abaqus 6.14-3, etc.) and any earlier releases of Abaqus (Abaqus 6.13, Abaqus 6.12, etc.) still installed on your network. To request an Abaqus license file, contact your local sales office.

FLEXnet Abaqus licensing should be installed on only one computer unless you are using a redundant license server configuration. The server computers that you choose for documentation and licensing should be accessible by all computers on the network where you plan to run Abaqus and should be stable machines that are not frequently rebooted or shut down.

Before installing the Abaqus products, you must have a FLEXnet network license server that is compatible with Abaqus 6.14 installed and running on your network.

Select the licensing installation you want to perform from the following scenarios:

- Automatic configuration is recommended for most users, particularly those whose primary responsibility is not computer system or network administration. Allow the installer to install, configure, and start the Abaqus FLEXnet license server for you automatically. An existing license server using a version of FLEXnet Licensing prior to Version 11.6.1 is upgraded automatically during the installation procedure if it was previously installed and configured using the Abaqus licensing installation procedure. For redundant license servers the installation will install and configure the Abaqus license servers automatically, but you will have to manually start each server. Use this method for ease of maintenance so that future upgrades can be configured automatically.

- Manual configuration is required for combining FLEXnet license files with other vendors. At the beginning of the installation, select **Just install the licensing utilities**. You will need to configure and start the Abaqus FLEXnet license server manually. Use this method to allow the system administrator more control.

Abaqus 6.14 requires **lmgrd** Version 11.6.1 or higher. If you integrate your Abaqus license features with other products using a FLEXnet Licensing combined license file, ensure that your version of **lmgrd** meets this requirement. For more information, refer to the FLEXnet Licensing End User Guide Version 11.6, which is available from the **Licensing** section of the **Support** page at www.3ds.com/simulia.

The commands and options used to install the Abaqus FLEXnet license server and to stop and remove a license server are described below. For a more complete discussion of the FLEXnet licensing installation options, see “Abaqus FLEXnet licensing installation details,” Section 2.3. To replace an existing or expired FLEXnet license file, see “Updating an Abaqus FLEXnet license file,” Section 3.2; for details on installing a redundant license server, see “Redundant FLEXnet license server configurations,” Section 3.4.

To install Abaqus FLEXnet licensing:

1. From the SIMULIA parent directory, execute the following command or use the following option:

Linux platforms

`/dvd_dir/setup`

where *dvd_dir* is the directory used when the Licensing & Products DVD was mounted or where the licensing installation files reside.

Windows platforms

- From the startup screen, select **Install Abaqus Product and Licensing**.
- From the command line, type

`dvd_drive:\setup.exe`

where *dvd_drive* is the DVD-ROM drive that contains the Licensing & Products DVD.

2. In the **Installation type** panel, choose **SIMULIA FLEXnet License Server**.
3. If you have an existing Abaqus FLEXnet license server on this system, the installer attempts to stop the license server; if unable to do so, it provides the option to install only the licensing administration tools. If you install only the FLEXnet licensing administration tools, you must manually configure the license server. If the installer is unable to stop the existing license server and you want to complete a full automatic license server installation, you need to stop the existing server using the procedure described below.
4. Follow the instructions in the dialog boxes that appear to complete the licensing installation.

5. On Linux platforms, the Abaqus FLEXnet license server does not restart automatically after a system reboot by default. If you are installing a new FLEXnet license server, you must add the Abaqus licensing command to your system startup script if you wish to have the FLEXnet license server restart automatically. The command that was used to start the license server is written to

simulia_dir/License/installation_info/license_startup.txt

On Windows platforms, an automatically configured license server starts automatically upon reboot.

Stopping and removing an existing FLEXnet license server

If you have an existing FLEXnet license server from a previous release of Abaqus running on your system, you will need to remove it before installing the new license server. The licensing installer will attempt to remove the existing server automatically. If it is unable to do so, you should remove the existing server using one of the following procedures:

Linux platforms

1. Enter the command

```
simulia_dir/License/lmdown -c [port]@license_server_host  
-vendor ABAQUSLM
```

where *license_server_host* is the hostname of the FLEXnet license server. If the license server is using a port that is not between 27000 and 27009, you must specify the port number as well.

2. Verify that the server has been stopped by running the command

```
simulia_dir/License/lmstat -c [port]@license_server_host
```

Verify that no **ABAQUSLM** vendor daemons are reported. An error status message may appear if the Abaqus FLEXnet license server was successfully stopped and there are no other vendor daemons running on the specified host.

Windows platforms

In addition to terminating the FLEXnet license server, you must remove licensing as a Windows service.

1. From the **Start** menu, select **Programs→Abaqus release→Licensing**, where *release* refers to the Abaqus release, to display the **LMTOOLS** dialog box.
2. Verify **Configuration using Services** is enabled on the **Service/License File** tabbed page.
3. Select the **Start/Stop/Reread** tab, select the appropriate Abaqus 6.x license server, where 6.x refers to the Abaqus release, and click **Stop Server**.

4. Select the **Config Services** tab, select the appropriate Abaqus 6.x license server, and click **Remove Service**.
5. Select **File**→**Exit** to close the **LMTOOLS** dialog box.

2.1.4 Abaqus product installation

To install the Abaqus products, you must have a network license server that is compatible with Abaqus 6.14 installed and running on your network. It is also recommended that you perform the documentation installation before installing Abaqus products to obtain the URL for the HTML documentation (or the base installation directory for PDF files) and to enable access to the documentation from Abaqus. You will be asked to provide the following information relating to the documentation and licensing installations:

- The hostname of your license server(s) (REQUIRED).
- One of the following (depending on which formats of documentation were installed):
 - The URL for the Abaqus HTML documentation (optional, but recommended). If you did not install the Abaqus HTML documentation before the products or if you do not specify the URL, you must perform additional steps to enable access to the HTML documentation from the Abaqus products (see “Setting the documentation URL after installation,” Section C.2).
 - The path to the base installation directory (*simulia_dir*) under which the PDF documentation files are installed (if only the PDF was installed or if you prefer PDF over HTML). Entering this path when the installer prompts you will configure the **abaqus doc** command to open PDF rather than HTML documentation. See “Abaqus documentation,” Section 3.2.11 of the Abaqus Analysis User’s Guide, for more information.

The commands and options used to install the Abaqus products are described below. For a more complete discussion of the Abaqus product installation options, see “Abaqus product installation details,” Section 2.4.

To install the Abaqus products:

1. From the Abaqus parent directory, execute the following command or use the following option:

Linux platforms

```
/prod_dir/setup [-jre system|path_to_jre]
[-replay full_path_to_replay_file] [-sysinfo]
[-help]
```

where *prod_dir* is the directory used when the Licensing & Products DVD was mounted or where the product installation files reside.

Windows platforms

- From the startup screen, select **Install Abaqus Product and Licensing**.

- From the command line, type

```
prod_drive:\setup.exe [-replay full_path_to_replay_file]  
[-sysinfo] [-help]
```

where *prod_drive* is the DVD-ROM drive that contains the Licensing & Products DVD. You cannot use a Universal Naming Convention (UNC) path to run the command-line installer.

Command options

-jre *system|path_to_jre*

Specify the Java Runtime Environment (JRE) to use for installation. This option is not normally required as JREs for most supported platforms are included with the installation disk and used by default. Specify the value **system** to use the system JRE, if installed; or specify the full path to a user-defined JRE. To use a system JRE, the **java** command must be in your PATH environment variable and the JRE must be Version 1.5 or later.

-replay *full_path_to_replay_file*

Use this option to perform additional identical installations without having to reenter the same information for each installation. For more information, see “Repeating product installations on multiple computers,” Section 2.4.3.

-sysinfo

This option lists information about your system’s software and hardware resources. Abaqus is not installed if this option is used, and all other command options are ignored.

-help

Display **setup** options.

2. In the **Installation type** panel, choose Abaqus **Product**.
3. Follow the instructions in the dialog boxes that appear to complete the product installation.

2.2 Abaqus documentation installation details

The Abaqus online documentation is provided in two formats, HTML and PDF. Most installations share the HTML and PDF documentation from a single server. Both formats of the documentation can also be installed on as many computers as desired, for local access by individual users.

The commands and options used to install Abaqus documentation are listed in “Documentation installation,” Section 2.1.1.

Abaqus HTML documentation can be installed on platforms that are supported for Abaqus 6.14 and should generally be installed on only one computer on your network. The server machine that you

choose for the HTML and PDF documentation should be accessible by all computers where you plan to run Abaqus.

The disk space requirement for the Abaqus HTML plus PDF documentation is approximately 2.0 GB.


The Abaqus PDF documentation is not meant as a replacement for the HTML-format documentation. However, it has the following advantages:

- Requires less disk space.
- Convenient portable reference.
- Ability to print a range of pages, such as a section or chapter.
- Higher quality printed output than that available from the HTML documentation.
- Searchable alternative to the HTML documentation, particularly for situations where the HTML documentation is not searchable because it was installed with no web server.

Installing only the PDF documentation has the following disadvantages:

- The detailed, step-by-step instructions for using each of the Abaqus/CAE functions are available only in the HTML version of the Abaqus/CAE User's Guide and as context-sensitive help. They do not appear in the PDF version of the guide.
- The hyperlinks in context-sensitive help will not function if you have not installed the Abaqus HTML documentation.
- Some of the items under the **Help** menu in Abaqus/CAE and Abaqus/Viewer will connect only to the HTML help, not to the PDF documentation.

The Abaqus PDF collection contains all the books in the HTML collection. The PDF version of all guides except the Abaqus Scripting Reference Guide and the Abaqus GUI Toolkit Reference Guide

includes a  icon in the top left corner of each page that allows you to print a selected section without specifying a page range. More information about navigating and printing the Abaqus PDF documentation is available in Chapter 5, "Overview of the Abaqus PDF documentation," of Using Abaqus Online Documentation.

2.2.1 Configuration of documentation installation

When the Abaqus documentation installer runs, it determines the configuration of any existing Abaqus documentation:

- If you have the documentation from an older release installed (Abaqus 6.13, for example), the new Abaqus 6.14 documentation is installed in the same location as the older versions.

The Abaqus installer creates a new subdirectory named **v6.14** to hold the Abaqus 6.14 documentation; see Appendix B, "Abaqus release directories and files," for information on the directory structure. If you are using the Abaqus web server software, you are prompted to choose whether or not to serve all releases of the documentation simultaneously.

- If documentation from a previous release of Abaqus is not installed, you are prompted for the installation directory. This should be the same as your SIMULIA parent directory (referred to as *simulia_dir*). The default location is the current working directory on Linux platforms and **C:\SIMULIA** on Windows platforms. You should *not* install Abaqus documentation in a directory that indicates a specific Abaqus release number. The installation procedure creates a subdirectory named **Documentation** under the specified directory.

During an HTML (plus PDF) installation, you must select one of the following options:

- Install and start the Abaqus web server software (recommended option, to allow search functionality).
- Install the HTML (plus PDF) documentation and use an existing non-Abaqus web server. In this case you must configure your web server software manually to access the Abaqus HTML documentation (see “Configuring an existing non-Abaqus web server,” Section C.1.1).
- Install the HTML (plus PDF) documentation with no web server. In this case no search functionality is available in the HTML documentation. Select this option if you want to view the HTML documentation from your local system without executing an active web server.

With the exception of “no web server,” the installation option that you select applies to both the Abaqus 6.14 HTML documentation and, if it exists, any previous release of Abaqus documentation. If you select the “no web server” option for the Abaqus 6.14 installation, the Abaqus 6.14 HTML documentation has no web server and the documentation from previous releases is not affected.

Note: On Windows platforms the Abaqus web server software will start up automatically after a reboot. On Linux platforms the Abaqus web server is started by the installation procedure, but you should include the script to restart the web server (*simulia_dir/Documentation/installation_info/v6.14/startServer*) in the system startup file for the server host machine to have the Abaqus web server restart automatically after a system reboot. Contact your system administrator or platform vendor for information on the system startup file for your computer.

When the installation is complete, log files are written to the following directory:

simulia_dir/Documentation/installation_info/v6.14/

The log files are helpful for troubleshooting problems, and they should not be removed. For more information on accessing and using the Abaqus HTML documentation, see “Abaqus documentation,” Section 3.2.11 of the Abaqus Analysis User’s Guide, and the online book Using Abaqus Online Documentation.

2.2.2 Repeating documentation installations on multiple computers

When you install documentation, a file called **installer.properties** is created in the *simulia_dir/Documentation/installation_info/v6.14/* directory. This file, called the

replay file, contains information that was used during the documentation installation, such as the installation directory and web server configuration. The **-replay** command option is available to repeat a previous installation on identical platforms without reentering the same information for each installation. You can use this option to perform a silent installation (no graphical user interface is displayed). It performs an installation identical to the previous installation (same installation directory, same configuration, etc.) using information stored in the replay file.

The information that was entered for the first installation must be valid for subsequent installations that use the **-replay** option. All installation error checking is skipped when this option is used. You should make sure that the system meets the requirements as specified in Appendix A, “System requirements notes,” and that you have write permissions and sufficient disk space in the installation directory before performing the installation. To use the **-replay** option, do the following:

1. Install documentation on a computer using the graphical user interface (without the **-replay** option). You can install either option: HTML and PDF, or PDF-only.
2. Copy the file **installer.properties** (the replay file) to the other computers on which you want to install Abaqus documentation (must be the same platform) or to a mounted network drive.
3. Install the documentation on another computer using the **-replay** option as follows:

Linux platforms

```
/doc_dir/setup -replay full_path_to_replay_file
```

Windows platforms

```
doc_drive:\setup.exe -replay full_path_to_replay_file
```

The documentation is installed silently.

4. Review the installation log files for errors:
 - **html_InstallLog.log** and **info.log** (for an installation of HTML and PDF)
 - **pdf_InstallLog.log** (for a PDF-only installation)

These files are located in the following directory:

```
simulia_dir/Documentation/installation_info/v6.14/
```

This step is optional but recommended.

5. Repeat the documentation installation using the **-replay** option on each of the remaining computers.

2.3 Abaqus FLEXnet licensing installation details

Abaqus 6.14 uses FLEXnet Licensing Version 11.6.1. The licensing installation procedure can be used for the following scenarios:

- to install the FLEXnet Licensing administration tools and to configure and start the FLEXnet Abaqus 6.14 license server automatically; or
- to install only the FLEXnet Licensing administration tools.

An existing FLEXnet license server from a previous version of FLEXnet Licensing is upgraded automatically during the installation procedure if it was previously installed and configured using the Abaqus licensing installer. If the installer detects an existing license server on your machine from a version of FLEXnet Licensing higher than Version 11.6.1, you have the option of either overwriting the existing server or terminating the installation procedure. To update your FLEXnet license file without overwriting the existing license server, see the procedure in “Updating an Abaqus FLEXnet license file,” Section 3.2.

The commands and options used to install the Abaqus FLEXnet license server or to stop and remove an existing license server are listed in “FLEXnet Licensing installation,” Section 2.1.3.

For redundant license server configurations, you can install the license administration tools and configure the license server, but you will need to start the license servers manually (see “Redundant FLEXnet license server configurations,” Section 3.4). If you choose to install only the license administration tools, you must start the license server manually using the FLEXnet license server manager **lmgrd** (see “FLEXnet license server manager **lmgrd**,” Section 3.5).

If you are installing an Abaqus 6.14 FLEXnet license server, you must have an Abaqus 6.14 license file saved on the computer on which you are installing the license server. The FLEXnet license file is the file containing the Abaqus 6.14 license that was attached to the e-mail message sent by SIMULIA (identified by “Subject: LK: *site ID* Abaqus 6.14 License File,” where *site ID* is the customer number that was assigned to your site) or by your local office or representative.

Abaqus FLEXnet licensing needs to be installed on only one computer on your network unless you are using a redundant license server configuration. The disk space requirement for the licensing utilities ranges from 10–25 MB depending upon the platform. The computer that you choose for licensing should be accessible by all computers where you plan to run Abaqus and should be a stable machine that is not frequently rebooted or shut down. For additional information on licensing, see Chapter 3, “Abaqus licensing.”

When the installation procedure is executed, a browse function is provided for prompts where you are requested to specify a directory or file location. You will be prompted for the following information:

- The location of the FLEXnet license file. The installation procedure will save the license file in the *simulia_dir/License* directory using the default name **simulialm.lic**.
- The installation directory. Specify the SIMULIA parent directory (*simulia_dir*), which is the location where the licensing directory will be stored. The default location for the installation directory is the current working directory on Linux platforms and **C:\SIMULIA** on Windows platforms.

Note: On Windows platforms the FLEXnet license server is started by the installation procedure and will start up automatically upon reboot. On Linux platforms the license server is started by the installation procedure, but you should include the command to restart the license server in the system startup file for the license server host computer to have the Abaqus license server

restart automatically after a system reboot. The command to restart the license server is written to the `license_startup.csh` file in the `simulia_dir/License/installation_info` directory. Contact your system administrator or platform vendor for information on the system startup file for your computer.

Log files are written to the `simulia_dir/License/installation_info` directory when the installation is complete. The log files are helpful for troubleshooting problems, and they should not be removed.

After the Abaqus documentation is installed and the license server is installed and running, you should proceed to the Abaqus product installation on each computer that you will use to run the products. You need not install the Abaqus products on the license server host unless you will run Abaqus on that computer.

2.4 Abaqus product installation details

It is recommended that you install Abaqus documentation before you install the Abaqus products; if you do not, you must perform additional steps to provide access to the HTML documentation from Abaqus.

To install the Abaqus products, an Abaqus network license server that is compatible with Abaqus 6.14 must be installed and running; you must know the name of at least one active Abaqus license server to perform the product installation.

All Abaqus products and sample problems are installed as part of the Abaqus product installation. Some Abaqus environment settings are defined appropriately for the parameters defined in your Abaqus license. Verification of a subset of licensed products is performed automatically during the installation.

The commands and options used to install the Abaqus products are listed in “Abaqus product installation,” Section 2.1.4.

You must have write permission in the Abaqus parent directory to install the Abaqus products. On Windows platforms Abaqus shortcuts and required environment variables, including **PATH**, are added to the **All User** profile.

2.4.1 Visual C++ and MPI Libraries

When you select **Install Abaqus Product & Licensing** from the startup screen on Windows platforms, the Microsoft Visual C++ 2010, 2008, and 2005 runtime libraries are installed automatically along with Abaqus. These libraries are required to run Abaqus. The following libraries are installed:

- 64-bit 2010 libraries
- 64-bit and 32-bit 2008 SP1 libraries
- 64-bit and 32-bit 2005 SP1 libraries

Note that on Windows/x86-64, both the 32-bit and 64-bit versions of the 2005 and 2008 libraries are required and installed.

If necessary, you can install the Microsoft Visual C++ runtime libraries independently of the product installation, by selecting **Install Microsoft Visual C++ 2005 SP1, 2008 SP1, and 2010 SP1 Runtime Libraries** from the startup screen. Alternatively, you can execute the following installers on the Abaqus Licensing & Products DVD:

```
win86_64/2010_SP1_vccredist_x64.exe (64-bit libraries)
win86_64/2008_SP1_vccredist_x64.exe (64-bit libraries)
win86_64/2005_SP1_vccredist_x64.exe (64-bit libraries)
win86_64/2008_SP1_vccredist_x86.exe (32-bit libraries)
win86_64/2005_SP1_vccredist_x86.exe (32-bit libraries)
```

Message Passing Interface (MPI) components must be installed to 1) use MPI-based parallel job execution in Abaqus/Standard, 2) to use domain-level parallelization in Abaqus/Explicit, or 3) to run any job in Abaqus/CFD (regardless of the number of CPUs). If your Abaqus users will be running these types of simulations, you must have the required MPI components preinstalled or allow the Abaqus installer to install them for you:

- On Windows/x86-64, the Abaqus product installer automatically installs the Microsoft MPI 3.0 libraries, if necessary. If desired, you can install these libraries separately by selecting **Install Microsoft HPC MPI Redistributable Pack** from the startup screen. This option is not shown if the libraries are already installed on your computer. You can also launch the Microsoft MPI installer separately from the command line by executing the following file on the Abaqus Licensing & Products DVD:

```
win86_64/msmpi_3.0_x64.msi
```

(If you have 64-bit Windows HPC Server 2008, however, this is not needed because the MPI components are included with the operating system.)

- On Linux 64-bit (lnx86-64) operating systems, the Abaqus product installer installs the Platform Computing Message Passing Interface libraries (Platform MPI 9.1.3).

For more information on MPI and thread-based parallel processing modes, see “Parallel execution,” Section 3.5 of the Abaqus Analysis User’s Guide.

Any other third-party software that will be used in conjunction with the Abaqus products (compilers, operating system patches, etc.) should be installed before installing the Abaqus products.

2.4.2 Information to enter during product installation

When the installer runs, you will be prompted for the items below. When a file location or directory is requested, you can click **Choose** to browse for the path.

- The network license server host name. The installation procedure will attempt to determine this information automatically, but you have the option of changing the default choice. Make sure the appropriate license server host is entered. If a set of redundant servers should be used, enter the host

names of the redundant servers in the boxes provided in the dialog box (see “Redundant FLEXnet license server configurations,” Section 3.4, for details on installing redundant license servers). The installation will define settings in the Abaqus environment file according to information detected in the Abaqus license file on the server. If the license server contains an academic teaching license, Abaqus will be configured to use this license by default (see “License management parameters,” Section 4.1.6).

- The URL for the Abaqus HTML documentation or path to the base installation directory (*simulia_dir*) under which the PDF documentation files are installed (if only PDF was installed or if you prefer PDF over HTML). Entering this path when the installer prompts you will configure the **abaqus doc** command to open PDF rather than HTML documentation. See “Abaqus documentation,” Section 3.2.11 of the Abaqus Analysis User’s Guide, for more information.

If you did not install the Abaqus HTML documentation before the products or if you do not specify the URL, you must perform additional steps to provide access to the HTML documentation (see “Setting the documentation URL after installation,” Section C.2).

- The installation directory. Specify the Abaqus parent directory (referred to as *abaqus_dir*), which is the location where all installed Abaqus releases will be stored. The default location is the current working directory on Linux platforms and **C:\SIMULIA\Abaqus** on Windows platforms. You should *not* install Abaqus in a directory that indicates a specific Abaqus release number; the release-specific directory will be created by the installer. For example, all files needed to run Abaqus 6.14-1 will be installed in *abaqus_dir/6.14-1/*.
- The location of the Abaqus start-in directory (Windows platforms only). Specify the location where user files created during Abaqus interactive sessions are stored and the home directory for the Abaqus command window. The default location is **C:\temp**. (This can be changed by users later; see “Common customizations on Windows platforms,” Section 5.1.2.) Ensure that the start-in directory has write permission for all users.
- If the installation program detects a wide area network (WAN) license file, you will be prompted for information about the geographic location of your computer. This information is used to automatically set the **computer_location** environment file parameter and enable license usage logging for report generation. For more information, see “Reporting FLEXnet license usage data,” Section 3.8.

When the installation is complete, a record of the installation and a listing of the licensed products is written to a file called **Abaqus 6.14_release_InstallLog.log** in the *abaqus_dir/release/installation_info/* directory. This file is helpful for troubleshooting problems, and it should not be removed.

2.4.3 Repeating product installations on multiple computers

When you install the Abaqus products on a computer, the installation creates a file called **installer.properties** in the *abaqus_dir/release/installation_info/* directory. This file, called the replay file, contains information that was used during the product installation, such

as the installation directory, license server host, and documentation URL. The **-replay** command option is available to repeat a previous installation on identical platforms without reentering the same information for each installation. You can use this option to perform a silent installation (no graphical user interface is displayed). It performs an installation identical to the previous installation (same installation directory, same license server host, etc.) using the information stored in the replay file.

The information that was entered for the first installation must be valid for subsequent installations that use the **-replay** option. All installation error checking is skipped when this option is used. You should make sure that the system meets the requirements as specified in Appendix A, “System requirements notes,” and that you have write permissions and sufficient disk space in the installation directory before performing the installation. To use the **-replay** option, do the following:

1. Install the Abaqus products on a computer using the graphical user interface (without the **-replay** option).
2. Copy the file **installer.properties** (the replay file) to the other computers on which you want to install the Abaqus products (must be the same platform) or to a mounted network drive.
3. Install the Abaqus products on another computer using the **-replay** option as follows:

Linux platforms

```
/prod_dir/setup -replay full_path_to_replay_file
```

Windows platforms

```
prod_drive:\setup.exe -replay full_path_to_replay_file
```

The Abaqus products are installed silently, and pre-installation system checks and post-installation verification are bypassed.

4. Run the verification procedure manually to check the installation of the Abaqus products (see Appendix E, “Verification procedure”). This step is optional, but strongly recommended.
5. Repeat the product installation using the **-replay** option on each of the remaining computers.

2.4.4 Using Abaqus commands

The installation procedure creates a unique command for each release of Abaqus. This command is written in the **Commands** directory below the Abaqus parent directory (*abaqus_dir*). For example, the command to run Abaqus 6.14-1 is **abq6141**. The command to run subsequent maintenance releases of Abaqus 6.14 is **abq614n**, where *n* is the maintenance delivery.

The installation procedure also creates a link called **abaqus** to the command for the latest release of Abaqus installed. For a list of all Abaqus command line options, use the **help** command line option with the appropriate Abaqus execution command. For example, to see the command line options for Abaqus 6.14-1, type **abq6141 help**. For a detailed description of Abaqus command line options, see Chapter 3, “Job Execution,” of the Abaqus Analysis User’s Guide.

On Windows platforms the **Commands** directory path is added automatically to all users' paths during installation. On Linux platforms the **Commands** directory should be added to each user's path manually. Alternately, a link for each Abaqus release can be defined at the system level or for each user, pointing to the appropriate command in the **Commands** directory.

2.5 Uninstalling Abaqus products or licensing

This section describes how to remove Abaqus FLEXnet licensing or product releases from your computer.

For instructions on how to remove the Dassault Systèmes license server, see “Uninstalling the Dassault Systèmes License Server” in the *Dassault Systèmes License Server Installation and Configuration Guide (DSLS.pdf)*.

2.5.1 Linux platforms

The following procedures explain how to remove Abaqus product releases or FLEXnet licensing from Linux platforms.

To remove Abaqus FLEXnet licensing:

This procedure must be performed on the license server host, and you must be logged in as root or the owner of the license server.

1. Before you can remove the license server and license files, you must terminate the license server using the FLEXnet Licensing tool **lmdown** (see “lmdown,” Section 3.6.2).
2. Create a backup of any files you wish to keep, such as your Abaqus license file (typically named **abaquslm.lic** or **simuliaalm.lic**) and the FLEXnet Licensing server debug log file (typically named **simuliaalm.log**).
3. Remove the files using the following procedure:

```
cd simulia_dir
rm -rf License
```

4. Remove the license server restart command from the computer's system startup file. Contact your system administrator or platform vendor for information on the system startup file for your computer.

To remove the Abaqus products:

You can remove a release of Abaqus by deleting the release-specific directory and all subordinate files. Your user account must have permission to delete the Abaqus release-specific directory.

1. Type the command

```
cd abaqus_dir
```

where *abaqus_dir* is the Abaqus parent directory.

2. Change the permissions of the directories and files by entering the command

```
chmod -R 755 6.14-n
```

where *n* refers to the update you wish to delete.

3. Remove the release or maintenance delivery by typing the command

```
rm -rf 6.14-n
```

where *n* refers to the update you wish to delete.

4. Links to the uninstalled Abaqus release will no longer be valid. You can remove an invalid link from the **Commands** directory by typing the command

```
rm link
```

where *link* refers to an invalid link name.

Alternatively, you can remove the entire **Commands** directory from the Abaqus parent directory (*abaqus_dir*) by typing the command

```
rm -rf Commands
```

2.5.2 Windows platforms

You can use the Windows uninstall shortcuts provided, the **Add or Remove Programs** tool, or the Abaqus silent uninstaller batch files to remove Abaqus products or FLEXnet licensing. The silent uninstallers allow you to automate these tasks from another batch/script file. The silent uninstallers are available only on Windows platforms. You must have Windows Administrator privileges to uninstall Abaqus components.

Both the Windows uninstall shortcuts and the silent uninstaller batch files generate a log file that you can review. The log file indicates whether the uninstall was successful and if you should reboot/restart your computer. This information is shown in the last two lines of the log file. For example,

```
Uninstall Status: SUCCESS  
Restart Needed: YES_RECOMMENDED
```

The **Uninstall Status** line will indicate either **SUCCESS** or **INCOMPLETE**. The **Restart Needed** line will indicate either **YES_RECOMMENDED**, **YES_REQUIRED**, or **NO**.

The uninstallers may be unable to remove some files; for example, files that are open in another application. In addition, the uninstallers remove only directories and files that were written by the Abaqus installer. You may want to delete any remaining directories and files manually.

To remove Abaqus FLEXnet licensing:

FLEXnet licensing can be removed in any of the following ways:

- From the **Start** menu, select **Programs→SIMULIA FLEXnet Licensing→Uninstall SIMULIA FLEXnet Licensing**.

- From the **Start** menu, select **Settings→Control Panel→Add or Remove Programs**. Select Abaqus licensing, and click **Change or Remove Programs**.
- To use the FLEXnet licensing silent uninstaller, execute the following batch file from the command line or from another batch/script file:

```
simulia_dir\License\installation_info\uninstaller\
silent_license_uninstall.bat
```

The FLEXnet licensing uninstallers generate the following log file:

```
simulia_dir\License\installation_info\uninstall_log.log
```

You should create a backup of any files you wish to keep, such as your Abaqus license file (typically named **abaquslm.lic** or **simuliaalm.lic**) and the FLEXnet Licensing server debug log file (typically named **simuliaalm.log**).

To remove the Abaqus products:

Abaqus products can be removed in any of the following ways:

- From the **Start** menu, select **Programs→Abaqus release→Uninstall Abaqus release**, where *release* refers to the Abaqus release.
- From the **Start** menu, select **Settings→Control Panel→Add or Remove Programs**. Select Abaqus, and click **Change or Remove Programs**.
- To use the Abaqus product silent uninstaller, execute the following batch file from the command line or from another batch/script file:

```
simulia_dir\abaqus_dir\release\installation_info\uninstaller\
silent_product_uninstall.bat
```

The product uninstallers generate the following log file:

```
simulia_dir\abaqus_dir\release\installation_info\uninstall_log.log
```

The uninstallers remove the Abaqus shortcuts from all user profiles.

2.6 Uninstalling Abaqus documentation

This section describes how to remove Abaqus documentation from your computer.

2.6.1 Linux platforms

The following procedures explain how to remove Abaqus documentation from Linux platforms.

To remove an installation of HTML and PDF documentation:

The Abaqus HTML and PDF documentation can be removed safely by using one of the following procedures to stop the web server and delete all of the installed documentation releases or a release-

specific directory and all subordinate files. You must have administrator privileges to uninstall Abaqus components.

- To remove all installed releases of the Abaqus documentation:
 1. Set your current directory to the parent directory for the Abaqus documentation (*simulia_dir*).
 2. If you use the monitor process to serve the HTML documentation (i.e., the Abaqus web server) or use the monitor process to perform searches (i.e., an existing non-Abaqus web server), stop the monitor process using the command

```
Documentation/bin/monitor -k
```

3. Remove the documentation directory by typing the command

```
rm -rf Documentation
```

4. Remove the web server restart command from the computer's system startup file. Contact your system administrator or platform vendor for information on the system startup file for your computer.
 5. Additional steps may be necessary if you are using an existing non-Abaqus web server. For more information, consult the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base.
- To remove a specific release of the Abaqus documentation:

1. Set your current directory to the *simulia_dir/Documentation* directory.
2. If the release that you are removing uses the monitor process to serve the HTML documentation (i.e., the Abaqus web server) or uses the monitor process to perform searches (i.e., an existing non-Abaqus web server), stop the monitor process using the command

```
bin/monitor -k
```

3. Type the following commands

```
rm -rf installation_info/release  
rm -rf taxis/release  
rm -rf docs/release
```

where *release* refers to the release of the Abaqus documentation you wish to delete.

After you remove a release of the documentation, you can configure the web server to serve the remaining HTML collection using the following procedure:

1. Set your current directory to the *simulia_dir/Documentation* directory.

2. Verify that the release number of the release that you wish to serve is referenced in the `texis.cnf` file as follows:

```
Default Database = %INSTALLDIR%/texis/release
```

where *release* refers to the documentation release you wish to serve.

3. Run the command

```
installation_info/release/initializeExecutable
```

4. To start the web server to serve the remaining documentation collection, run the command

```
installation_info/release/startServer
```

To remove a PDF-only documentation installation:

1. Set your current directory to the parent directory for the Abaqus documentation (*simulia_dir*).
2. Remove the documentation directory by typing the command

```
rm -rf Documentation
```

2.6.2 Windows platforms

You can use the Windows uninstall shortcuts provided, the **Add or Remove Programs** tool, or the Abaqus silent uninstaller batch files to remove Abaqus documentation. The silent uninstallers allow you to automate these tasks from another batch/script file. The silent uninstallers are available only on Windows platforms. You must have Windows Administrator privileges to uninstall Abaqus components.

Both the Windows uninstall shortcuts and the silent uninstaller batch files generate a log file that you can review. The log file indicates whether the uninstall was successful and if you should reboot/restart your computer. This information is shown in the last two lines of the log file. For example,

```
Uninstall Status: SUCCESS
Restart Needed: YES_RECOMMENDED
```

The **Uninstall Status** line will indicate either **SUCCESS** or **INCOMPLETE**. The **Restart Needed** line will indicate either **YES_RECOMMENDED**, **YES_REQUIRED**, or **NO**.

The uninstallers may be unable to remove some files; for example, files that are open in another application. In addition, the uninstallers remove only directories and files that were written by the Abaqus installer. You may want to delete any remaining directories and files manually.

To remove an installation of HTML and PDF documentation:

The Abaqus HTML and PDF documentation can be removed in any of the following ways:

- From the **Start** menu, select **Programs→Abaqus release Documentation→Uninstall Documentation**, where *release* refers to the release of the Abaqus documentation you wish to delete.

- From the **Start** menu, select **Settings**→**Control Panel**→**Add or Remove Programs**. Select the Abaqus documentation, and click **Change or Remove Programs**.
- To use the Abaqus documentation silent uninstaller, execute the following batch file from the command line or from another batch/script file:

```
simulia_dir\Documentation\installation_info\release\  
html_uninstaller\silent_doc_uninstall.bat
```

The documentation uninstallers generate the following log file:

```
simulia_dir\Documentation\installation_info\release\  
uninstall_log.log
```

Other releases of the Abaqus documentation on your system are not affected by this procedure.

To remove a PDF-only documentation installation:

The Abaqus PDF documentation can be removed in any of the following ways:

- From the **Start** menu, select **Programs**→**Abaqus *release* PDF Documentation** →**Uninstall Documentation**, where *release* refers to the release of the documentation you wish to delete.
- From the **Start** menu, select **Settings**→**Control Panel**→**Add or Remove Programs**. Select the Abaqus documentation, and click **Change or Remove Programs**.
- To use the Abaqus documentation silent uninstaller, execute the following batch file from the command line or from another batch/script file:

```
simulia_dir\Documentation\installation_info\release\  
html_uninstaller\silent_doc_uninstall.bat
```

The documentation uninstallers generate the following log file:

```
simulia_dir\Documentation\installation_info\release\  
uninstall_log.log
```

Other releases of the Abaqus documentation on your system are not affected by this procedure.

3. Abaqus licensing

This chapter describes network licensing for Abaqus, including the following topics:

- Updating an Abaqus 6.14 FLEXnet license file.
- Upgrading a FLEXnet license server and tools.
- Redundant FLEXnet license server configurations.
- The FLEXnet license server manager, licensing administration tools, and options file.
- Using the **ds1sstat** and **reporttool** utilities for a Dassault Systèmes license server (DSLS).

3.1 FLEXnet network licensing

Abaqus 6.14 FLEXnet licensing is provided in a network licensing format. Network licensing allows a limited number of analysis jobs and interactive sessions to be run simultaneously on any supported computer connected over a network. Abaqus network licensing uses the FLEXnet network license manager from Flexera Software (formerly Acreesso Software) to control an Abaqus license server, which is a process running on a single computer (license server host) on a network. Abaqus products can run on any supported computer on the network, including the license server host, as long as the necessary tokens are available.

Note: A network card or on-board network chip is required for a computer to operate as a license server.

Multiple FLEXnet license servers can be selected to provide redundancy in case the license server or its host fails. For information on redundant license servers, see “Redundant FLEXnet license server configurations,” Section 3.4.

Any supported computer on the network can be used to run the FLEXnet license server as long as the computers that will run Abaqus can communicate with the license server. A computer running Windows can act as the license server host for a Linux network and vice versa.

Each Abaqus analysis or interactive session must contact the license server prior to beginning execution and periodically while Abaqus is running. Therefore, Abaqus must have uninterrupted communication with the license server throughout the analysis or interactive session. If the license server or the computer on which it runs fails, it should be restarted as quickly as possible to ensure minimal interruption of Abaqus jobs.

License activity is recorded in a log file, called the server log. Tools to manage licensing activities are described in “FLEXnet Licensing administration tools,” Section 3.6, and The FLEXnet Licensing End User Guide Version 11.6; the latter document is available for download from the **Licensing** section of the **Support** page at www.3ds.com/simulia.

Restrictions can be applied to tokens to control access to Abaqus. A number of tokens can be reserved for certain users, or access can be denied to specific users and computers. These restrictions are defined in the network license options file. See “Using the FLEXnet options file,” Section 3.7,

for more information. You can also customize the behavior of a license server through settings in the Abaqus environment file. See “License management parameters,” Section 4.1.6, for information on the environment file settings.

The FLEXnet license server continuously tracks which tokens on the network are “available” and which are “in use.” Prior to beginning an analysis or interactive session, the Abaqus job (client) requests tokens from the license server. If tokens are in the available pool, the license server transfers tokens from the available pool to the in-use pool, and the tokens remain in the in-use pool until the end of the analysis or interactive session.

If no tokens are available, an analysis job or interactive session can be placed in the license queue to wait for a token, depending on the settings of the **lmlicensequeueing** and **lminteractivequeueing** parameters; see “License management parameters,” Section 4.1.6. If no tokens are available and the **lmlicensequeueing** and **lminteractivequeueing** parameters are set to **OFF**, the analysis job or interactive session exits with an error message. At the normal completion of the analysis or interactive session, the Abaqus client notifies the license server and the server returns the tokens to the available pool. If the analysis or interactive session aborts, the tokens are returned immediately.

For help in resolving questions relating to FLEXnet licensing, see Appendix F, “Troubleshooting Abaqus FLEXnet licensing.”

3.2 Updating an Abaqus FLEXnet license file

You may need to update an Abaqus 6.14 FLEXnet license file; for example, when you obtain a new license file to replace an expired license file or to revise license features. You may also need to replace a license file from a previous release of Abaqus. For example, if you manually upgraded an existing license server to a version of FLEXnet Licensing higher than Version 11.6.1, you need to update the license file for Abaqus 6.14 without reinstalling and overwriting the existing licensing utilities.

You must have write permissions to update the license file. If your license file is independent of other products using FLEXnet Licensing, you can replace the current license file with the new one using two methods: restarting the license server or forcing the server to reread the license file.

To update an Abaqus FLEXnet license file and restart the license server:

1. Backup the current license file by saving it with a new name.
2. Copy the new license file to the same location as the original license file using the name of the original license file.
3. Run the FLEXnet Licensing tool **lmdown** (see “lmdown,” Section 3.6.2) to shut down the currently running Abaqus license server.
4. Restart the Abaqus license server. For Windows platforms use the method described in “Starting the FLEXnet server using **LMTOOLS**,” Section 3.6.9. For Linux platforms use the method described in “Abaqus FLEXnet licensing installation details,” Section 2.3.

To update and reread an Abaqus FLEXnet license file:

1. Backup the current license file by saving it with a new name.
2. Copy the new license file to the same location as the original license file using the name of the original license file.
3. Run the FLEXnet Licensing tool **lmreread** (see “lmreread,” Section 3.6.6) to force the license server to reread the new license file.

The license file that you update must maintain its file name and path name (location). If either the file name or path name change, you should uninstall licensing and then run the licensing installation procedure (see Chapter 2, “Installing Abaqus”). The default name of the Abaqus license file is **simuliaalm.lic**. You can determine the name of the Abaqus license file by running the command

```
simulia_dir/License/lmstat -c [port]@license_server_host
```

where *simulia_dir* refers to the SIMULIA parent directory and *license_server_host* is the hostname of the license server. If the license server is using a port that is not between 27000 and 27009, you must specify the port number as well.

If your Abaqus license features are integrated with other products using a combined FLEXnet license file, replace the Abaqus licensing information in the combined license file with the updated information. You must run the FLEXnet Licensing tool **lmreread** (see “lmreread,” Section 3.6.6) to force the license server to reread the new license file. For more information on combined license files, see The FLEXnet Licensing End User Guide Version 11.6, which is available for download from the **Licensing** section of the **Support** page at www.3ds.com/simulia.

3.3 Upgrading a FLEXnet license server and administration tools

Abaqus 6.14 licensing requires FLEXnet Licensing Version 11.6.1; the license server must be upgraded if it is an earlier version. You can use the FLEXnet Licensing tool **lmver** or **lmstat** (see “lmstat,” Section 3.6.7) to check the version number of the license server.

If you need to upgrade the license server, you should use the licensing installation procedure to upgrade the license server automatically. If you want to configure the license server manually, you can use the licensing installation procedure to install only the FLEXnet Licensing administration tools. For more information, see “FLEXnet Licensing installation,” Section 2.1.3.

If your Abaqus license file is integrated with FLEXnet license files for other products using a combined license file, you must ensure that the **lmgrd** version meets the FLEXnet version compatibility rules. For more information, see the FLEXnet Licensing End User Guide Version 11.6, which is available for download from the **Licensing** section of the **Support** page at www.3ds.com/simulia.

3.4 Redundant FLEXnet license server configurations

Abaqus FLEXnet licensing offers two forms of server redundancy to guard against license disruptions: redundant license server triads and license file lists. A redundant license server triad consists of three license servers that function as one using the same license key. A license file list consists of multiple independent license servers, each with its own license key; token requests will check each license server in the list until available tokens are found. For a detailed comparison of the two redundancy configurations, see “Comparing multiple license servers to three-server redundancy” in the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base. Configuration of license file lists is not covered in detail in this guide.

A redundant license server triad requires three computers. At least two license servers must be running for licenses to be granted. Network communications must be consistent and reliable among the three computers used in a redundant server triad. Redundant license server triads are considered to be an advanced use of FLEXnet Licensing. More detailed requirements for redundant license servers appear in the FLEXnet Licensing End User Guide Version 11.6, which is available for download from the **Licensing** section of the **Support** page at www.3ds.com/simulia.

You can install and configure a redundant FLEXnet license server triad using either an automatic or a manual process. The manual process is required if your servers use different port numbers; otherwise, the automatic installation is recommended. In both cases you will have to start the servers manually using the FLEXnet license server manager **lmgrd**. In their initial startup, the redundant license servers must be started simultaneously (within one minute of each other).

3.4.1 Installing a redundant FLEXnet license server triad automatically

Use the following procedure to automatically install and configure a redundant license server triad.

1. Copy the license file that you received to each of the three license server computers.
2. On one of the server computers, use the Abaqus licensing installation procedure to automatically install, configure, and start the Abaqus license server (see “FLEXnet Licensing installation,” Section 2.1.3).

Once the installation program detects a redundant license file, it will not be able to start the server. However, it will install and configure the license server automatically.

3. Follow the instructions that appear in the dialog boxes to complete the licensing installation. When prompted, enter the port number on which the servers will run. In addition, enter the hostnames or IP addresses of your servers next to the corresponding host ids.
4. Repeat Steps 2 and 3 for the remaining two server computers. The server information must be entered in the same order for each installation.

5. Start the servers using the procedure described in “Starting a redundant FLEXnet license server triad,” Section 3.4.3.

3.4.2 Installing a redundant FLEXnet license server triad manually

Use the following procedure to manually install and configure a redundant license server triad. This procedure is necessary if the three servers in your configuration use different ports.

1. On each of the three license server computers, use the Abaqus licensing installation procedure to install the Abaqus FLEXnet Licensing administration tools (see “FLEXnet Licensing installation,” Section 2.1.3).

The licensing tools are saved in the *simulia_dir*/**License** directory, where *simulia_dir* is the SIMULIA parent directory.

2. Copy the license file that you received to the licensing directory on one of the server machines. Rename this license file **simulialm.lic**.
3. Edit the **simulialm.lic** file, and replace the string **this_host** with the actual hostname of your computer. Verify that the hostname corresponds to the host id provided. Use *hostname.domain_name* if you have client machines that are not local to the server network.
4. Add the network port number to the **SERVER** line. It is recommended that you do not use a port number between 27000 and 27009.
5. Repeat this process for each **SERVER** line.
6. Append the following keywords to the first **SERVER** line:

```
PRIMARY_IS_MASTER HEARTBEAT_INTERVAL=60
```

For example:

```
SERVER bifrost.simulia.com 69084992 2501 \
    PRIMARY_IS_MASTER HEARTBEAT_INTERVAL=60
SERVER tank.simulia.com 69094954 2501
SERVER willow.simulia.com 69094344 2501
VENDOR ABAQUSLM
```

where each server is configured to use port number 2501 and the numbers beginning with 690 are the host ids provided in the **simulialm.lic** file for each server host. The port number must be assigned for each server, but the number need not be the same on every server.

Note: Each line in the license file must be 80 characters or less. You can use a backslash character (\) to indicate a line continuation; keywords that appear on the line after a backslash are considered part of the previous line in the license file.

7. Save the **simulialm.lic** file, and copy the file to the licensing directory on each of the other two server computers.

8. On Windows platforms, you must install licensing as a service on each license server using the procedure described in “Installing FLEXnet licensing as a Windows service,” Section 3.6.8.
9. Start the license servers using the procedure described in “Starting a redundant FLEXnet license server triad,” Section 3.4.3.

3.4.3 Starting a redundant FLEXnet license server triad

After installing and configuring the license servers on all three computers, you must use the following procedure to start each of the servers within one minute of each other.

Linux platforms

Start the Abaqus license server by executing the following command from the licensing directory:

```
./lmgrd -c simulia.lic -l +simulia.log
```

Windows platforms

You must be logged in as Administrator to start the server.

1. From the **Start** menu, select **Programs→Abaqus Licensing→Licensing utilities**.
2. Verify that **Configuration using Services** is enabled on the **Service/License File** tabbed page, and select the **Start/Stop/Reread** tab.
3. Click **Start Server**.

3.5 FLEXnet license server manager lmgrd

The FLEXnet license server manager **lmgrd** handles the initial contact with the client application programs, passing the connection on to the appropriate vendor daemon. It also starts and restarts the vendor daemons.

The **lmgrd** program is the main daemon program for FLEXnet Licensing. When you invoke **lmgrd**, the program looks for a license file that contains information about vendors and features. On Linux platforms it is recommended that you run **lmgrd** as a non-privileged user (not root).

See The FLEXnet Licensing End User Guide Version 11.6 for more information on FLEXnet Licensing. This guide is available for download from the **Licensing** section of the **Support** page at www.3ds.com/simulia.

Syntax and Options

```
lmgrd [-c license_file_list] [-l [+]debug_log_path] [-2 -p] [-local]
[-x lmdown] [-x lmremove] [-z] [-v] [-help]
```

-c license_file_list

Specifies the license files to use.

-l [**+**]*debug_log_path*

Writes debugging information to the file *debug_log_path*. This option uses the letter **l**, not the numeral 1. Prepending *debug_log_path* with the **+** character appends logging entries.

-2 -p

Restricts usage of **lmdown** (see “lmdown,” Section 3.6.2), **lmreread** (see “lmreread,” Section 3.6.6), and **lmremove** (see “lmremove,” Section 3.6.5) to a FLEXnet Licensing administrator who is by default root. If there is a Linux group called “lmadmin,” use is restricted to members of that group. If root is not a member of this group, root does not have permission to use any of the three tools listed above. If you use **-2 -p** when starting **lmgrd**, no user on Windows platforms can shut down the license server with **lmdown**.

-local

Restricts **lmdown** and **lmreread** to be run only from the same machine where **lmgrd** is running.

-x lmdown

Disables the **lmdown** command (no user can run **lmdown**). If **lmdown** is disabled, you need to stop **lmgrd** via **kill pid** (Linux platforms) or stop the **lmgrd** and vendor daemon processes through the Windows **Task Manager** or Windows service. On Linux platforms, verify that the **kill** command does not contain the **-9** option.

-x lmremove

Disables the **lmremove** command (no user can run **lmremove**).

-z

Runs in foreground. The default behavior is to run in the background. If **-l debug_log_path** is present, no windows are used. If no **-l** options are specified, separate windows are used for **lmgrd** and each vendor daemon.

-v

Prints **lmgrd** version number and copyright and exits (does not launch **lmgrd**).

-help

Displays usage information and exits.

3.6 FLEXnet Licensing administration tools

FLEXnet Licensing provides administration tools to help manage the network licensing activities. The Abaqus licensing installation procedure installs the license file and the Abaqus license server. The FLEXnet Licensing administration tools are installed in *simulia_dir/License*. If you have installed

Abaqus products on the license server, you can access the **License** directory using the **abacus** command. Running the command

```
abacus licensing
```

without additional arguments displays a command usage summary of all available FLEXnet Licensing administration tools. The FLEXnet Licensing End User Guide Version 11.6 contains detailed information on the syntax and options of the FLEXnet Licensing administration tools. You can download this guide from the **Licensing** section of the **Support** page at www.3ds.com/simulia.

On Windows platforms the licensing tools are also available using the FLEXnet Licensing toolchest **LMTTOOLS**. The **LMTTOOLS** toolchest can be accessed from the **Start** menu or by executing one of the following commands:

```
abacus licensing lmtools
```

or

```
simulia_dir/License/lmtools
```

The following sections describe the syntax and options of several commonly used FLEXnet Licensing administration tools and **LMTTOOLS** procedures:

- “lmdiag,” Section 3.6.1
- “lmdown,” Section 3.6.2
- “lmhostid,” Section 3.6.3
- “lmpath,” Section 3.6.4
- “lmremove,” Section 3.6.5
- “lmreread,” Section 3.6.6
- “lmstat,” Section 3.6.7
- “Installing FLEXnet licensing as a Windows service,” Section 3.6.8
- “Starting the FLEXnet server using **LMTTOOLS**,” Section 3.6.9

3.6.1 lmdiag

The **lmdiag** tool allows you to diagnose problems when you cannot check out a license.

Syntax and Options

```
lmdiag [-c license_file_list] [-n] [feature[:keyword=value]]
```

-c *license_file_list*

Diagnose the specified files.

-n

Run in non-interactive mode; **lmdiag** will not prompt for any input in this mode. In this mode extended connection diagnostics (see below) are not available.

feature

Diagnose this feature only.

keyword=value

If a license file contains multiple lines for a particular feature, you can select a particular line for **lmdiag** to report on.

For example,

lmdiag f1:HOSTID=12345678

attempts a checkout on the line with the hostid “12345678.” *keyword* can be one of the following:

- VERSION
- HOSTID
- EXPDATE
- KEY
- VENDOR_STRING
- ISSUER

If no *feature* is specified, **lmdiag** operates on all features in the license files in your list. **lmdiag** first prints information about the license, then attempts to check out each license. If the checkout succeeds, **lmdiag** indicates this. If the checkout fails, **lmdiag** gives you the reason for the failure. If the checkout fails because **lmdiag** cannot connect to the license server, you have the option of running “extended connection diagnostics.”

These extended diagnostics attempt to connect to each TCP/IP port on the license server machine and detect if the port number in the license file is incorrect. **lmdiag** indicates each TCP/IP port number that is listening. If it is an **lmgrd** process, **lmdiag** indicates this as well. If **lmdiag** finds the vendor daemon for the feature being tested, it indicates the correct port number for the license file to correct the problem.

See The FLEXnet Licensing End User Guide Version 11.6 for additional information. This guide is available for download from the **Licensing** section of the **Support** page at www.3ds.com/simulia.

To use LMTTOOLS (Windows platforms) to run **lmdiag**:

1. From the **Start** menu, select **Programs→Abaqus Licensing→Licensing utilities**.

2. Verify that **Configuration using Services** is enabled on the **Service/License File** tabbed page, and select the **Server Diags** tab.
3. Click **Perform Diagnostics**.

3.6.2 lmdown

The **lmdown** tool allows for the graceful shutdown of selected license daemons (both **lmgrd** and selected vendor daemons) on all machines.

Syntax and Options

lmdown -c license_file_list [-vendor vendor] [-q] [-all]

-c license_file_list

Use the specified license files. Specifying **-c license_file_list** is always recommended with **lmdown**.

-vendor vendor

Shut down only this vendor daemon. **lmgrd** continues running.

-q

Do not prompt or print a header. Otherwise, **lmdown** asks “Are you sure? [y/n]:.”

-all

If multiple servers are specified, automatically shut down all of them. **-q** is implied with **-all**.

You can protect the unauthorized execution of **lmdown** when you start up the license manager daemon **lmgrd**. Shutting down the servers causes users to lose their licenses. See the **-local**, **-2 -p**, and **-x** options in “FLEXnet license server manager lmgrd,” Section 3.5, for details about securing access to **lmdown**.

If **lmdown** encounters more than one server (for example, if **-c** specifies a directory with many ***.lic** files), a choice of license servers to shut down is presented.

Note: On UNIX platforms, do *not* use **kill -9** to shut down the license servers. On Windows platforms, if you must use the **Task Manager** to kill the FLEXnet Licensing service, be sure to end the **lmgrd** process first, then all the vendor daemon processes.

To stop and restart a single vendor daemon, use **lmdown -vendor vendor**, then use **lmreread -vendor vendor** to restart the vendor daemon (see “lmreread,” Section 3.6.6).

When shutting down a three-server redundant license server, there is a one-minute delay before the servers shut down. **lmdown** shuts down all three license servers of a set of redundant license servers. If you need to shut down one of a set of redundant license servers (not recommended because if either of the remaining machines becomes unavailable, the license server will stop

serving licenses), you must kill both the **lmgrd** and vendor daemon processes on that license server machine.

To use LMTTOOLS (Windows platforms) to run `lmdown`:

1. From the **Start** menu, select **Programs→Abaqus Licensing→Licensing utilities**.
2. Verify that **Configuration using Services** is enabled on the **Service/License File** tabbed page, and select the **Start/Stop/Reread** tab.
3. Click **Stop Server**.

3.6.3 **lmhostid**

The **lmhostid** tool returns the FLEXnet Licensing host id of the current platform.

Syntax and Options

lmhostid [-n]

-n

Only the host id is returned as a string, which is appropriate to use with **HOSTID=** in the license file. Header text is suppressed.

Example

The following is an example of **lmhostid** output:

```
lmutil - Copyright (c) 1989-2008 Acresto Software
The FLEXlm host ID of this machine is "69021c89"
```

To use LMTTOOLS (Windows platforms) to run `lmhostid`:

1. From the **Start** menu, select **Programs→Abaqus Licensing→Licensing utilities**.
2. Verify that **Configuration using Services** is enabled on the **Service/License File** tabbed page, and select the **System Settings** tab.
The host id is listed under **Ethernet Address**.

3.6.4 **lmpath**

The **lmpath** tool allows direct control over FLEXnet license path settings. It is most useful for checking current license path settings for diagnostic purposes.

Syntax and Options

lmpath {-add | -override} {vendor | all} *license_file_list*

-add

Prepends *license_file_list* to the current license file list or creates the license file list, if it does not exist, initializing it to *license_file_list*. Duplicates are discarded.

-override

Overrides the existing license file list with *license_file_list*. If *license_file_list* is the null string (""), the specified list is deleted.

- **lmpath -override all ""**
Deletes the value of **LM_LICENSE_FILE**.
- **lmpath -override vendor ""**
Deletes the value of **VENDOR_LICENSE_FILE**

vendor

A vendor daemon name. Affects the value of **VENDOR_LICENSE_FILE**.

all

Refers to all vendor daemons. Affects the value of **LM_LICENSE_FILE**.

license_file_list

A colon-separated list on Linux platforms or a semicolon-separated list on Windows platforms. If *license_file_list* is the null string (""), the specified entry is deleted.

Note: **lmpath** works by setting **\$HOME/.flexlmrc** on Linux platforms and the FLEXnet Licensing registry entry on Windows platforms.

To display the current license path settings, use the command

lmpath -status

The following information is displayed:

```
lmutil - Copyright (C) 1989-2008 Acresto Software
Known Vendors:
```

```
demo: ./counted.lic:./uncounted.lic
```

Other Vendors:

```
/usr/local/flexlm/licenses/license.lic
```

Where the path is set to a directory, all of the *.lic files are listed separately.

To use LMTTOOLS (Windows platforms) to run lmpath:

1. From the **Start** menu, select **Programs→Abaqus Licensing→Licensing utilities**.

2. Verify that **Configuration using Services** is enabled on the **Service/License File** tabbed page, and select the **Utilities** tab.
3. Click **List All Vendor Paths**.

3.6.5 lmremove

The **lmremove** tool allows you to remove a single user's license for a specified feature. If the application is active, it rechecks out the license shortly after it is freed by **lmremove**. If an Abaqus process terminates abnormally, it may not return license tokens to the license pool even though the tokens are no longer needed. In this situation **lmremove** can be used to return Abaqus/CAE and Abaqus/Viewer tokens to the license pool. The *user*, *user_host*, *display*, *server_host*, *port*, and *handle* information must be obtained from the output of **lmstat -a**. The **lmremove** tool should not be used to return Abaqus analysis job tokens to the license pool; see Appendix F, "Troubleshooting Abaqus FLEXnet licensing," for more information.

Note: The **lmremove** tool does not free licenses for use by other jobs. To temporarily free a license for use by another job, a running analysis job can be suspended using the Abaqus **suspend** utility (refer to "Job execution control," Section 3.2.39 of the Abaqus Analysis User's Guide, for details). A running analysis job can be terminated using the Abaqus **terminate** utility or the appropriate operating system utility to stop the executable for the analysis job. For an example of using the **lmremove** tool, see "lmstat," Section 3.6.7.

Syntax and Options

lmremove [-c *license_file_list*] *feature* *user* *user_host* *display*

or

lmremove [-c *license_file_list*] -h *feature* *server_host* *port* *handle*

-c *license_file_list*

Specifies the license files.

feature

Name of the feature checked out by the user.

user

Name of the user whose license you are removing, as reported by **lmstat -a**.

user_host

Name of the host the user is logged on to, as reported by **lmstat -a**.

display

Name of the display where the user is working, as reported by **lmstat -a**.

server_host

Name of the host on which the license server is running, as reported by **lmstat -a**.

port

TCP/IP port number where the license server is running, as reported by **lmstat -a**.

handle

License handle, as reported by **lmstat -a**.

The **lmremove** tool removes all instances of *user* on *user_host* and *display* from usage of *feature*. If the **-c license_file_list** option is specified, the indicated file is used as the license file. The **-h** variation uses *server_host*, *port*, and license *handle*, as reported by **lmstat -a**.

3.6.6 **lmreread**

The **lmreread** tool causes the license manager to reread the license file and start any new vendor daemons that have been added. In addition, all currently running vendor daemons are signaled to reread the license file and their end-user options files for changes in feature licensing information or option settings. If report logging is enabled, any report log data still in the vendor daemon's internal data buffer are flushed. **lmreread** recognizes changes to server machine host names but cannot be used to change server TCP/IP port numbers.

If the optional vendor daemon name is specified, only the named daemon rereads the license file and its end-user options file (in this case **lmgrd** does not reread the license file).

Syntax and Options

lmreread [**-c license_file_list**] [**-vendor vendor**] [**-all**]

-c license_file_list

Use the specified license files.

-vendor vendor

Only this vendor daemon rereads the license file. **lmgrd** restarts the vendor daemon if necessary.

-all

If more than one **lmgrd** is specified, instructs all **lmgrds** to reread.

You may want to protect the execution of **lmreread**. See the **-2 -p** and **-x** options in "FLEXnet license server manager lmgrd," Section 3.5, for details about securing access to **lmreread**.

To stop and restart a single vendor daemon, use **lmdown -vendor vendor**, then use **lmreread -vendor vendor**, which restarts the vendor daemon.

Note: If you use the `-c license_file_list` option, the license files specified are read by `lmreread`, not by `lmgrd`; `lmgrd` rereads the file it read originally.

To use LMTTOOLS (Windows platforms) to run `lmreread`:

1. From the **Start** menu, select **Programs→Abaqus Licensing→Licensing utilities**.
2. Verify that **Configuration using Services** is enabled on the **Service/License File** tabbed page, and select the **Start/Stop/Reread** tab.
3. Select **Abaqus 6.14 FLEXnet License Manager**, and click **ReRead License File**.

3.6.7 `lmstat`

The `lmstat` tool helps you monitor the status of all FLEXnet network licensing activities, including:

- Daemons that are running
- License files
- Users of individual features
- Users of features served by a specific vendor daemon

The `lmstat` tool prints information that it receives from the license server; therefore, it does not report on unserved licenses such as uncounted licenses. To report on an uncounted license, the license must be added to a served license file and the application must be directed to use the license server for that license file (via `@host`, `port@host`, or `USE_SERVER`). Queued users and licenses shared due to duplicate grouping are also not returned by `lmstat`.

Syntax and Options

```
lmstat [-a] [-c license_file_list] [-f [feature]] [-i [feature]] [-s [server]]
[-S [vendor]] [-t timeout_value]
```

-a

Displays all information.

-c *license_file_list*

Specifies the license files to use.

-f *[feature]*

Displays the users of *feature*. If *feature* is not specified, usage information for all features is displayed.

-i *[feature]*

Displays information from the **FEATURE/INCREMENT** line for the specified *feature* or for all features if *feature* is not specified.

-s [*server*]

Displays the status of all license files in **\$VENDOR_LICENSE_FILE** or **\$LM_LICENSE_FILE** on *server* or on all servers if *server* is not specified.

-S [*vendor*]

Lists all users of the specified vendor's features.

-t *timeout_value*

Sets the connection timeout to *timeout_value*. This limits the amount of time **lmstat** spends attempting to connect to *server*.

Note: The **lmstat -a** command is a potentially expensive command. With many active users, this command generates a lot of network activity.

The **lmremove** tool requires the output of the **lmstat -a** command, as shown in the example below.

Example

The output for the command

simulia_dir/License/lmstat -a

where *simulia_dir* is the SIMULIA parent directory, looks similar to the following:

```
License server status: 27000@firestar
    License file(s) on firestar: simulia_dir/License/simulialm.lic:
    firestar: license server UP (MASTER) v11.6
Vendor daemon status (on firestar):
    ABAQUSLM: UP v11.6
Feature usage info:
Users of cae: (Total of 4 licenses issued; Total of 1 license
in use)
    "cae" v61.2, vendor: ABAQUSLM
    floating license
    smith watt watt (v61.2) (firestar/27000 101),
start Tue 3/1 9:29
where
```

smith	<i>user</i>	User name
watt	<i>user_host</i>	Host where user is running
watt	<i>display</i>	Display where user is running
v61.2	<i>release</i>	Release of feature
firestar	<i>server_host</i>	Host where license server is running

27000	<i>port</i>	Port on <i>server_host</i> where license server is running
101	<i>handle</i>	License handle
start Tue 3/1 9:29	<i>checkout_time</i>	Time that this license was checked out

Note: The **lmremove** tool does not free licenses for use by other jobs (see “lmremove,” Section 3.6.5, for more information).

To use the **lmremove** tool to free the license for a job run by user **smith**, you would use the command

```
abacus licensing lmremove cae smith watt watt
```

where

cae	<i>feature</i>	Name of the feature checked out by the user
smith	<i>user</i>	Name of the user whose license you are removing, as reported by lmstat -a
watt	<i>user_host</i>	Name of the host the user is logged into, as reported by lmstat -a
watt	<i>display</i>	Name of the display where the user is working, as reported by lmstat -a

To use LMTOOLS (Windows platforms) to run **lmstat -a:**

1. From the **Start** menu, select **Programs→Abaqus Licensing→Licensing utilities**.
2. Verify that **Configuration using Services** is enabled on the **Service/License File** tabbed page, and select the **Server Status** tab.
3. Verify that **Display Everything** is enabled, and click **Perform Status Enquiry**.

3.6.8 Installing FLEXnet licensing as a Windows service

You must be logged in as Administrator to install licensing as a Windows service. You use the installation procedure to install the licensing administration tools. You must use the following procedure to install and start the service:

1. To access **LMTOOLS** from the **Start** menu, select **Programs→Abaqus Licensing→Licensing utilities**.
2. Verify that **Configuration using Services** is enabled on the **Service/License File** tabbed page, and select the **Config Services** tab.
3. In the **Service Name** text field, type **Abaqus 6.14 FLEXnet License Manager**.

4. Specify the paths to the **lmgrd.exe** file, the license file, and the debug log file, as shown in Figure 3–1.

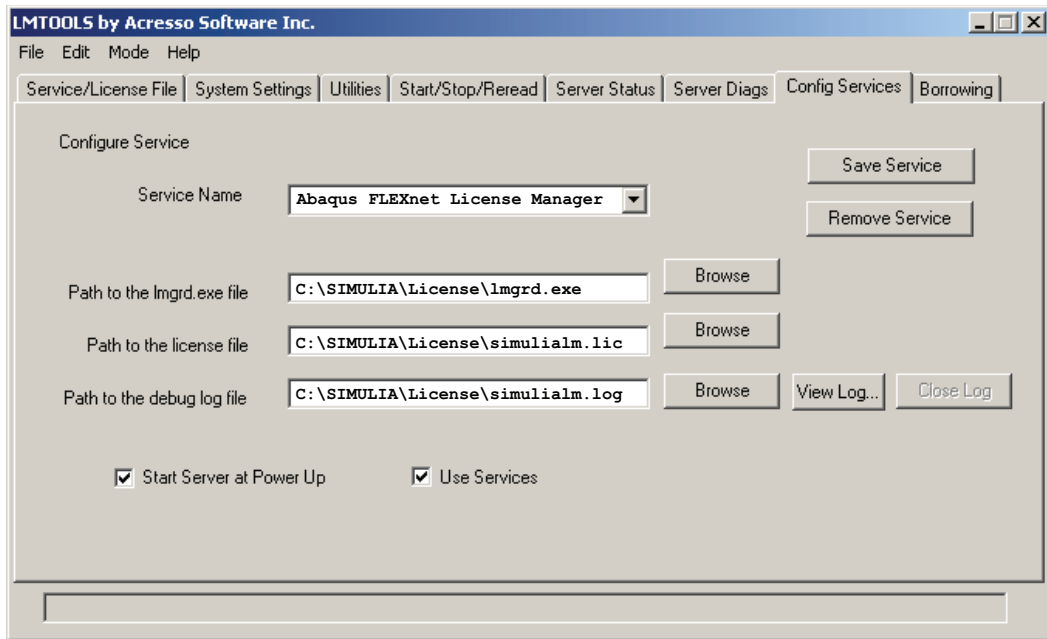


Figure 3–1 The **Config Services** tabbed page of **LMTOOLS**.

5. Toggle on **Use Services**.
Start Server at Power Up becomes available.
6. Toggle on **Start Server at Power Up**, and click **Save Service**.
7. Select the **Start/Stop/Reread** tab, and click **Start Server**.
8. From the main menu bar, select **File**→**Exit** to close the dialog box.

3.6.9 Starting the FLEXnet server using LMTOOLS

You must be logged in as Administrator to start the server.

1. To access **LMTOOLS** from the **Start** menu, select **Programs**→**Abaqus Licensing**→**Licensing utilities**.
2. Verify that **Configuration using Services** is enabled on the **Service/License File** tabbed page, and select the **Start/Stop/Reread** tab.

3. Click **Start Server**.
4. From the main menu bar, select **File**→**Exit** to close the dialog box.

3.7 Using the FLEXnet options file

The options file allows the license administrator to control various operating parameters of FLEXnet Licensing. Parameters, such as **EXCLUDE**, **INCLUDE**, **MAX**, and **RESERVE**, can be used to control Abaqus license usage. Usage can be controlled by user name, host name, display, IP address, or project. When specifying the features to control, you may specify features listed on a **FEATURE** line in the license file. Using a **PACKAGE** name in place of a **FEATURE** name applies the option to all of the components in the package. You should not specify individual **COMPONENTS** listed on the **PACKAGE** line, as it may lead to unexpected behavior. See Chapter 5 of the FLEXnet Licensing End User Guide Version 11.6 for detailed information on creating an options file. (This guide is available from the **Licensing** section of the **Support** page at www.3ds.com/simulia.)

The following is a sample options file:

```
INCLUDEALL INTERNET 192.168.0.*
RESERVE 5 abaqus USER robert
RESERVE 10 abaqus HOST demeter
MAX 5 abaqus USER jim
EXCLUDE abaqus USER khan
EXCLUDE viewer HOST guardian
```

In this options file:

- Connections are accepted only from machines with the IP addresses 192.168.0.*.
- Five tokens of feature **abaqus** are reserved for user *robert*.
- Ten tokens of feature **abaqus** are reserved for users on host *demeter*.
- The user *jim* is limited to five tokens of feature **abaqus** at a time.
- The user *khan* is excluded from accessing feature **abaqus**.
- The users on host *guardian* are excluded from accessing feature **viewer** (Abaqus/Viewer).

3.8 Reporting FLEXnet license usage data

This section describes methods for creating license usage reports. If your Abaqus FLEXnet license server is on a wide area network (WAN) and Abaqus users in different locations receive technical support and customer service from more than one regional SIMULIA office, you are required to submit license usage reports to SIMULIA. For more information about reporting requirements, see “License usage reporting for multi-territory accounts” in the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base.

The reporting tools are available to all Abaqus licensees. Two utilities are provided with Abaqus to generate license usage reports:

- The **usage** utility (described in “Manually creating FLEXnet license usage reports,” Section 3.8.1) can be used to manually generate license usage reports for a specified range of dates.
- The scheduled license reporting utility (**schLicRpt**, described in “Scheduling automated FLEXnet license usage reporting,” Section 3.8.2) can be used to set up automated license usage reports on a monthly or quarterly basis.

The license usage reporting utilities use information from the FLEXnet debug log file. You can ensure that this log is created by including the **-l** option when starting the license server using **lmgrd** (see “FLEXnet license server manager lmgrd,” Section 3.5). To subtotal reports according to user location, you must set the **computer_location** environment file parameter. More details about the environment file parameters can be found in “License management parameters,” Section 4.1.6.

3.8.1 Manually creating FLEXnet license usage reports

The **usage** utility allows you to generate CSV-formatted reports detailing the usage of Abaqus licenses. Two types of usage reports are generated: summary usage reports and daily usage reports. Summary usage reports provide usage information for each Abaqus license feature subtotaled by user location or individual user. Summary usage reports list the total number of licenses requested, number of licenses granted, number of licenses denied, and total hours of license usage within a specified period. Daily usage reports list the peak and average number of analysis and Abaqus/CAE license tokens checked out on each day within a specified period. Daily usage reports provide aggregate data for all users and locations.

The license usage reports calculate token usage to two significant figures. If the total hours of license usage (in a summary report) or the average number of tokens checked out (in a daily report) is less than 0.005, the usage report lists these values as zero.

If the FLEXnet debug log file (or log files) is located on a remote server, you must copy it to a directory that is accessible to the local computer before running the **usage** utility.

Syntax and Options

```
abaqus licensing usage {-summary report_file | -daily report_file} [-nouser]  
-log {debug_log_file | debug_log_directory} [-start start_date] [-end end_date]
```

-summary

Use this option to create a report summarizing usage of each license feature by user or location. The report is written to the path and file name specified by *report_file*.

-daily

Use this option to create a report providing peak and average daily usage of analysis and Abaqus/CAE license tokens. The report is written to the path and file name specified by *report_file*.

-nouser

This option suppresses usage data about individual users in a summary report. It reports aggregate data for the entire license server. If the **computer_location** environment file parameter is set, it also reports aggregate data for each location. This option has no effect when used in conjunction with the **-daily** option; daily reports do not include information about individual users or locations.

-log

Use this option to specify the path to the debug log file or to a directory that includes multiple debug log files; the utility reviews all log files located in the specified path for usage data within the specified reporting period.

-start

Use this option to specify the starting date and time for the reporting period. If the **-start** option is not specified, the reporting period begins with the oldest recorded item in the debug log files. The date and time must be entered in the following format:

dd-mmm-yyyy[_hh[:mm[:ss]]]

For example, **-start 01-jan-2008_09:00:00** indicates a starting time of 9:00 AM on January 1, 2008. Specifying a time is optional; the default start time is **00:00:00**. If the time is specified, the hour field (*hh*) must be entered in 24-hour format.

-end

Use this option to specify the ending date and time for the reporting period. If the **-end** option is not specified, the reporting period ends with the most recent recorded item in the debug log files. The date and time must be entered in the following format:

dd-mmm-yyyy[_hh[:mm[:ss]]]

For example, **-end 31-mar-2008_18:00:00** indicates an ending time of 6:00 PM on March 31, 2008. Specifying a time is optional; the default end time is **23:59:59**. If the time is specified, the hour field (*hh*) must be entered in 24-hour format.

3.8.2 Scheduling automated FLEXnet license usage reporting

Abaqus provides a utility that automatically generates both summary and daily FLEXnet license usage reports according to a monthly or quarterly schedule. The utility creates a script containing commands to generate the reports, then it installs a scheduled task (on Windows platforms) or a **crontab** entry (on Linux platforms) to execute the script on a monthly or quarterly basis. The debug log file can be located on a server that is remote from the computer on which automated license usage reporting is scheduled.

If desired, you can instruct the utility to automatically e-mail the reports to a specified address as soon as they are generated.

You should create a new directory dedicated to license usage reporting and run the scheduled license usage reporting utility from within this directory. The script for report generation (**usage_report.bat** or **usage_report.sh**), a utility configuration file (**schLicRpt.cfg**), and the generated reports are all saved to the directory in which you run the utility. Generated reports use the following file naming convention:

abaqus_usagen_siteID_date.csv

where *siteID* is the customer number that SIMULIA assigned to your site, and the *date* is written numerically in *yymmdd* format. The type of usage report is indicated by *n*: **1** indicates a summary usage report, and **2** indicates a daily usage report. For example, **abaqus_usage2_01ABCD_080515.csv** is the file name for a daily usage report created at site 01ABCD on May 15, 2008.

To run the utility, use the following command:

abaqus schLicRpt

The utility will prompt you for the required information, including the location of the debug log file, the frequency of report generation, and, if you choose to e-mail the reports, the fully qualified domain name of your SMTP server and the e-mail address to which reports are sent. If you run the utility again from the same directory, default settings will be provided during the configuration process based on the contents of the saved configuration file. You can, therefore, make minor modifications to the reporting configuration settings without reentering all of the required information.

You must have access to the **schTasks.exe** utility (on Windows) or **crontab** utility (on Linux) to run the scheduled license reporting utility. For best performance, it is recommended that you execute the utility on the Abaqus license server host computer, which is possible only if Abaqus products have been installed on this computer. The utility should be executed only on one computer within your site. Otherwise, you will generate duplicate usage reports and may degrade the performance of the license server when the reports are generated.

Use the following procedures to remove automatically generated reports from your system:

Linux platforms

To list current crontab entries, run the following command:

crontab -l

To edit the current crontab entries, run the following command:

crontab -e

To remove all of the current crontab entries, run the following command:

crontab -r

For more details on crontab, type **man crontab** from any prompt to view the crontab man page for your system.

Windows platforms

To list current scheduled tasks, run the following command:

```
schTasks /query
```

To remove the automated Abaqus license usage report, run the following command:

```
schTasks /delete /tn abaqus_usage_report
```

3.9 Using the **dslsstat** utility for a Dassault Systèmes license server

You can use the **dslsstat** utility to show basic status information about the Dassault Systèmes license server (DSLS); you can verify that the license server is running, is configured properly, and is serving the correct licenses. To see more detailed information about the license server, you can use the Dassault Systèmes License Administration Tool, which comes with the DSLS installation. See “Starting the License Administration Tool” in the *Dassault Systèmes License Server Installation and Configuration Guide (DSLS.pdf)*.

If you have installed Abaqus products on the network where the Dassault Systèmes license server resides, you can run the **dslsstat** utility using the **abaqus** command, as follows:

```
abaqus licensing dslsstat [-server machine:port] [-usage]
```

-server

Use this option to specify the name of the server machine and the port number on which the DSLS software is running; for example,

```
abaqus licensing dslsstat -server jupiter:4085
```

If you omit the **-server** option on the command line, **dslsstat** attempts to determine which Dassault Systèmes license servers to query in two ways:

- Use any Dassault Systèmes license servers that Abaqus has been configured to use (usually configured during installation).
- Look in the system default location for the **DSLicSrv.txt** license client configuration file that describes which license servers to use. The locations of this file are described in “File Locations, Settings and Registry Entries” in the *Dassault Systèmes License Server Installation and Configuration Guide*.

If no servers are found, an error message is issued.

-usage

Use this option to show license usage details for individual users in the output. See the example below.

The results are returned in the command/terminal window; for example,

```

Server:  jupiter:4085
  Name           : jupiter
  Port           : 4085
  Status         : Running
  Type           : Standalone
  Version        : 6.212.0
  OS Name        : Windows 2008
  OS Version     : 5.2
  OS Arch        : x86
  Computer Id    : TWK-4213101B783368E0

```

The information reported for each license server found includes:

- *Status*: **Running** or **Not Running**
- *Type*: **Standalone** or **Failover**

Information is also reported for each enrolled license feature found on the license servers; for example,

Licenses:							Server
Feature	Version	Model	Number	InUse	Expires		Name
QAE	11	Token	50	0	31-Dec-2013 19:59:00		jupiter
QAQ	11	ConcurrentUser	1	0	31-Dec-2013 19:59:00		jupiter
QEX	11	Token	50	0	31-Dec-2013 19:59:00		jupiter
QSD	11	Named User	50	0	31-Dec-2013 19:59:00		jupiter

The expiration date includes time in the local time zone.

If you include the **-usage** option, extra information is provided showing which users (login/username) are using particular license features; for example,

Licenses:							Server
Feature	Version	Model	Number	InUse	Expires		Name
QAE	11	Token	50	0	31-Dec-2013 19:59:00		jupiter
QAQ	11	ConcurrentUser	1	0	31-Dec-2013 19:59:00		jupiter
QEX	11	Token	50	0	31-Dec-2013 19:59:00		jupiter

jsmith on bigbird, granted on 18-Oct-2012 10:06:13
 tjones on kermit, granted on 18-Oct-2012 14:02:47

Each line of user information has the following format:

username on hostname, granted on date

For more information about the Abaqus licensing execution procedures, see “Licensing utilities,” Section 3.2.12 of the Abaqus Analysis User’s Guide.

3.10 Using the reporttool utility

You can use the **reporttool** utility to generate reports of Abaqus license usage history. The report tool reads data from the Dassault Systèmes license server log file or the FLEXnet debug log file and customizes the report according to your choices.

If you have installed Abaqus products on the network where the license server resides, you can run the **reporttool** utility using the **abaqus** command, as follows:

```
abaqus licensing reporttool -log logfile
-logtype {ds1s | flexnet}
[-start start_date] [-end end_date]
[-type {export | query}] -accessor accessors [-list_accessors]
[-filter filter] [-list_filters] [-sort sorter] [-list_sorters]
[-aggregator aggregators] [-list_aggregators] [-duration bucket_size]
[-output report_file] [-format output_format] [-list_formats]
[-custom customization_script] [-help]
```

For more information about the Abaqus licensing execution procedures, see “Licensing utilities,” Section 3.2.12 of the Abaqus Analysis User’s Guide.

In the context of this report tool, a license session is defined as a licensed job executing on an Abaqus product feature, which has a checkout time and a checkin time.

3.10.1 General options

The following command line options are available for the **reporttool** utility.

-log

Specify the path and file name of the log files to be read. The default location of a DSLS log file is **C:\ProgramData\DassaultSystemes\LicenseServer\LogFiles** on Windows or **/var/DassaultSystemes/LicenseServer/LogFiles/** on Linux. For FLEXnet, you must specify the debug log file. If the log file is located on a remote server, you must copy it to a directory that is accessible by your local computer. This option is required.

Multiple log files can be specified in two ways:

- Use the **-log** option multiple times: **-log first.log -log second.log**
- Give a comma-separated list of the file names: **-log first.log,second.log**

-logtype

Specify the type of license server being used with Abaqus: **ds1s** or **flexnet**. This option is required and is case-sensitive (must be lowercase).

-start

Specify the starting date and time for the reporting period. If the **-start** option is omitted, the reporting period begins with the oldest recorded item in the log files. The date and time must be specified in one of the following formats:

- ***dd-mmm-yyyy_hh:mm:ss***

For example, **-start 01-jan-2012_09:00:00** indicates a starting time of 9:00 AM on January 1, 2012. Specifying a time is required, including hours, minutes, and seconds. The hour field (*hh*) must be entered in 24-hour format.

- **-xhours** or **-xdays**

Use this format to pick a time or day in the past. For example, **-start -6hours** specifies a start time of six hours ago.

-end

Specify the ending date and time for the reporting period. If the **-end** option is not specified, the reporting period ends with the most recent recorded item in the log files. The date and time must be specified in one of the following formats:

- ***dd-mmm-yyyy_hh:mm:ss***

For example, **-end 31-mar-2012_18:00:00** indicates an ending time of 6:00 PM on March 31, 2012. Specifying a time is required, including hours, minutes, and seconds. The hour field (*hh*) must be entered in 24-hour format.

- **-xhours** or **-xdays**

Use this format to pick a time or day in the past. For example, **-end -3hours** specifies an ending time of three hours ago.

-type

Specify the type of report desired: **export** or **query**. If this option is omitted, the default is **export**. An export report provides the basic licensing session information, usually in tabular format or comma-separated values (CSV). The data can be optionally filtered or sorted. A query report lets you look at sessions in aggregate; you can operate on the raw data to calculate such things as maximum usage, peak usage, and averages. A query report divides the total time period into equal sized buckets. You choose the size of each time bucket with the **-duration** option. You can also use an export report to save the raw data to a CSV file, import it into an Excel spreadsheet, and perform custom calculations using your own tools.

-accessor

Comma-separated list of accessors to be read from the log data. Accessors are the fields or columns of the output report. For example: **-accessor username,checkout,duration**. This option is required.

-list_accessors

Use this option to obtain a list of the available report accessors. The basic accessors are as follows:

- **duration**—duration of the license session, in seconds
- **username**—username
- **checkout**—checkout date
- **feature**—Dassault Systèmes license feature (trigram); for example, QSD
- **quantity**—number of licenses requested
- **project**—custom project names or numbers recorded from the **lmp** project environment file parameter (see “License management parameters,” Section 4.1.6)
- **session**—the internal session object that represents the licensing job; this is useful only when using the **peak** aggregator or designing your own custom aggregators

-filter

Filter the report data. The required format for this option is **-filter accessor:value**. The report output is filtered to include only data records for which *accessor=value*. You can include multiple *accessor:value* pairs in a comma-separated list; for example,

```
-filter username:tsmith,hostname:zulu
```

This example would produce a report showing license checkouts only from the user **tsmith** on the computer **zulu**. To create other filters, use the **-custom** option with a Python program.

-list_filters

Use this option to obtain a list of the available filters. The one built-in filter takes the form **-filter accessor:value**. If you create any custom filters using the **-custom** option, they will appear in this list.

3.10.2 Export options

The following command line options are available for sorting the output of the **reporttool** utility.

-sort

Sort the report data chronologically, from oldest to newest. The required format for this option is **-sort date**.

-list_sorters

Use this option to obtain a list of the available sorters. The one built-in sorter is **date**. If you create any custom sorters using the **-custom** option, they will appear in this list.

3.10.3 Query options

The following command line options are available for query reports from the **reporttool** utility.

-aggregator

Comma-separated list of aggregator functions to be applied to the accessor values in each time bucket. For example: **-aggregator max,average**. This option is required if **-type query** is used.

-list_aggregators

Use this option to obtain a list of the available aggregator functions. The basic aggregators are as follows:

- **max**—maximum value of an accessor in each time bucket
- **min**—minimum value of an accessor in each time bucket
- **sum**—sum of all accessor values in each time bucket
- **average**—average value of accessor in each time bucket
- **len**—number of items in each time bucket
- **peak**—maximum number of licenses in use; must operate on the **session** accessor

Not all aggregators will work with all assessors. For example, you can successfully calculate the maximum duration of sessions, but attempting to find the average value of usernames is meaningless.

-duration

The size of each time bucket for query reports, in minutes, hours, days, weeks, or months. If this option is omitted, the default is 24 hours. Examples: **-duration 1hour**, **-duration 2days**

3.10.4 Output options

The following command line options are available for formatting the output of the **reporttool** utility.

-output

Specify the path and file name of the file to which the report will be written. If this option is omitted or **-output -** is used, the default is to write to standard output (showing the report in your command prompt or shell window).

-format

Specify the output format to use.

-list_formats

Use this option to obtain a list of the available output formats. The basic formats are as follows:

- **table**—a plain table with columns for each accessor and/or aggregator selected
- **csv**—comma-separated values
- **json**—JavaScript Object Notation (see <http://json.org>)

3.10.5 Advanced options

-custom

Specify a Python program file containing your custom definitions.

3.10.6 Examples

Several examples are shown below to demonstrate different ways to use the **reporttool** utility.

The following example generates a simple export type of report showing checkout date, username, product feature, and quantity.

```
abacus licensing reporttool -log today.log -logtype ds1s -type export
-accessor checkout,username,feature,quantity
```

Checkout Date	Username	Feature	Quantity
-----	-----	-----	-----
2012-Dec-10 03:05:16	bbaggins	QEX	50
2012-Dec-10 03:33:50	gandalf	QAE	1
2012-Dec-10 04:08:34	fbaggins	QAE	1
2012-Dec-10 06:27:18	gollum	QEX	50

The following example generates a query report that calculates the average number of license tokens used in each 1-hour time bucket.

```
abacus licensing reporttool -log today.log -logtype ds1s -type query
-accessor quantity -aggregator average -duration 1hour
```

Bucket	Average
-----	-----
2012-Sep-19 12:37:53	25
2012-Sep-19 13:37:53	19
2012-Sep-19 14:37:53	8
2012-Sep-19 15:37:53	18
2012-Sep-19 16:37:53	13
2012-Sep-19 17:37:53	34

The example below adds to the query report to calculate the total number of checkouts, the average checkout quantity, and the maximum checkout quantity for all sessions in **today.log**, grouped into 1-hour buckets.

```
abacus licensing reporttool -log today.log -logtype ds1s -type query
-accessor quantity,quantity,quantity -aggregator count,average,max -duration 1hour
```

Bucket	Number of items	Average	Maximum
-----	-----	-----	-----
2012-Sep-19 12:37:53	108	25	80
2012-Sep-19 13:37:53	98	19	80
2012-Sep-19 14:37:53	46	8	66
2012-Sep-19 15:37:53	114	18	50
2012-Sep-19 16:37:53	129	13	50
2012-Sep-19 17:37:53	74	34	66
2012-Sep-20 07:37:53	49	49	66
2012-Sep-20 08:37:53	11	52	66
2012-Sep-20 09:37:53	2	50	50

The example below adds one more column to the query report to show the maximum duration of the sessions in each bucket.

```
abacus licensing reporttool -log today.log -logtype ds1s -type query
-accessor quantity,quantity,quantity,duration -aggregator count,average,max,max
-duration 1hour
```

Bucket	Number of items	Average	Maximum	Maximum
-----	-----	-----	-----	-----
2012-Sep-19 12:37:53	108	25	80	1497
2012-Sep-19 13:37:53	98	19	80	1220
2012-Sep-19 14:37:53	46	8	66	77
2012-Sep-19 15:37:53	114	18	50	482
2012-Sep-19 16:37:53	129	13	50	449
2012-Sep-19 17:37:53	74	34	66	3552
2012-Sep-20 07:37:53	49	49	66	3272

4. Customizing the Abaqus environment

This chapter describes how to use environment file parameters to customize the Abaqus execution procedure, including how to define analysis batch queues. Example files are provided at the end of the chapter.

4.1 Using the Abaqus environment file

The Abaqus execution procedure (see Chapter 3, “Job Execution,” of the Abaqus Analysis User’s Guide) reads environment files to determine the various parameters that are used to run a job. The procedure searches three directories for the environment file, **abaqus_v6.env**, in the following order:

1. The **/SMA/site/** subdirectory of the Abaqus installation (see Appendix B, “Abaqus release directories and files”). An environment file must exist in this directory.

The settings in this file are ignored when a job is submitted to a remote queue. Instead, the settings in the **/SMA/site/** subdirectory on the remote computer are used.

2. The user’s home directory. This environment file is optional and will affect all jobs submitted from the user’s account.

On Windows platforms, for Abaqus to locate the environment file in the user’s home directory, the full path to the user’s home directory must be specified using the **HOME** environment variable or a combination of the **HOMEDRIVE** and **HOMEPath** environment variables.

3. The current working directory. This environment file is optional and will affect all jobs submitted from the current working directory.

If the same parameter is defined in more than one environment file or is defined more than once within an environment file, the last definition encountered will be used.

The environment file for Abaqus 6.14 uses Python syntax. See the Abaqus Scripting User’s Guide for more detailed information on Python syntax. The environment file for Abaqus 6.14 must be named **abaqus_v6.env**. Attempting to use a Version 5 format environment file will cause errors.

Environment file entries have the following syntax:

```
parameter=value
```

All parameters must have a value. The following syntactic rules also apply:

- All parameters are case sensitive.
- A string value must be enclosed in a pair of double or single quotes.
- Comments are preceded by a number sign (#). All characters following a number sign on a line are ignored. Number signs within a quoted string are part of the string, not the beginning of a comment.
- Blank lines are ignored.
- Lists must be enclosed in square brackets ([]). Individual items in the list are separated by commas. Entries take the form:

```
parameter=[value1, value2, value3]
```

- Tuples must be enclosed in parentheses (()). Individual items in the tuple are separated by commas. If the tuple is enclosed in parentheses and contains only one value, a comma has to follow the value. Entries take the form:

```
parameter=(value1, value2)
```

- Embedded single quotes do not require special handling if they are placed within a double-quoted string. For example, "**my value's**" is translated as **my value's**. The same holds true for double quotes embedded in a single-quoted string. Quotes of the same type as the enclosing quotes can be embedded if they are prefixed by the backslash (\) character. Strings in a list or a tuple must be enclosed in quotes.
- Triple-quoted (""") strings can span more than one line, and no special treatment of quotes within the string is necessary. Entries take the form:

```
parameter="""  
multi-line  
value  
"""
```

Examples of many of the environment file parameters are available in the **abaqus_v6.env** and **abaqusinc.env** environment files found in the **/SMA/site/** subdirectory of the Abaqus installation. Care should be taken when merging customized **abaqus_v6.env** settings from an earlier release into the current release. Settings from the earlier release may not be compatible with the new release. The available parameters are described in the following sections.

4.1.1 Memory and disk management parameters

Management of memory and disk resources for Abaqus/Standard and Abaqus/Explicit is discussed in detail in “Managing memory and disk use in Abaqus,” Section 3.4.1 of the Abaqus Analysis User’s Guide. The relevant parameters are listed here along with a single parameter, **abq_ker_memory**, that is used to manage memory in Abaqus/CAE and Abaqus/Viewer.

The available units for memory sizes are mb (megabytes) and gb (gigabytes). If the units are not specified, the size is assumed to be in megabytes.

abq_ker_memory

The maximum amount of memory that can be allocated by the Abaqus/CAE and Abaqus/Viewer kernel, specified in MB (megabytes). If the limit is exceeded, Abaqus/CAE displays an error message.

If the kernel memory size reaches the **abq_ker_memory** value or the virtual memory limit of the machine, the following message will be displayed: **Operation did not complete due to a memory allocation failure.**

For optimal performance, the memory limit should be set to a value less than the physical amount of memory on the machine. The minimum setting allowed is 256 MB.

scratch

Full path name of the directory to be used for scratch files. The default value on Linux is the value of the **\$TMPDIR** environment variable or **/tmp** if **\$TMPDIR** is not defined. On Windows the default value is the value of the **%TEMP%** environment variable or **\TEMP** if **%TEMP%** is not defined. During the analysis a subdirectory will be created under this directory to hold the analysis scratch files. The name of the subdirectory is constructed from the user's user name, the job ID, and the job's process number. The subdirectory and its contents are deleted upon completion of the analysis.

memory

Maximum amount of memory or maximum percentage of the physical memory that can be allocated during the input file preprocessing and during the Abaqus/Standard analysis phase. The default value is different on different platforms; for details, refer to the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base.

4.1.2 Parallelization parameters

Parallelization in Abaqus is discussed in detail in the following sections:

- “Parallel execution in Abaqus/Standard,” Section 3.5.2 of the Abaqus Analysis User's Guide
- “Parallel execution in Abaqus/Explicit,” Section 3.5.3 of the Abaqus Analysis User's Guide
- “Parallel execution in Abaqus/CFD,” Section 3.5.4 of the Abaqus Analysis User's Guide

The relevant parameters are listed here.

auto_convert

If this parameter is set equal to **ON** and an Abaqus/Explicit analysis is run in parallel with **parallel=domain**, the **convert=select**, **convert=state**, and **convert=odb** options will be run automatically at the end of the analysis if required. The default value is **ON**.

cpus

Number of processors to use during an analysis run if parallel processing is available. The default value for this parameter is 1.

domains

The number of parallel domains in Abaqus/Explicit. If the value is greater than 1, the domain decomposition will be performed regardless of the values of the **parallel** and **cpus** variables. However, if **parallel=DOMAIN**, the value of **cpus** must be evenly divisible into the value of **domains**. If this parameter is not set, the number of domains defaults to the number of processors used during the analysis run if **parallel=DOMAIN** or to 1 if **parallel=LOOP**.

gpus

Activate direct solver acceleration using GPGPU hardware in Abaqus/Standard. The value of this parameter should be the number of GPGPUs to use for an analysis. In an MPI-based parallel Abaqus/Standard analysis, this is the number of GPGPUs to use on each host.

max_cpus

Maximum number of processors allowed if parallel processing is available. If this parameter is not set, the number of processors allowed equals the number of available processors on the system.

mp_file_system

Type of file system available for an MPI-based parallel Abaqus analysis. The parameter must be set to a tuple; for example,

```
mp_file_system=(SHARED,LOCAL)
```

The first item in the tuple refers to the directory where the job was submitted, while the second refers to the job's scratch directory. If the file system hosting a directory is **LOCAL**, Abaqus will copy the required analysis files to the remote host machines and, at the end of the run, copy the output files back. In this case it must be possible to create the job's directory structure on all the hosts in **mp_host_list**. A **SHARED** file system means that the host machines share the same file system and file transfer is not necessary. With the recommended default (**DETECT, DETECT**) setting, Abaqus will determine the type of file system that exists. An MPI-based parallel Abaqus/Explicit analysis will use the scratch directory only if a user subroutine is used, whereas Abaqus/Standard normally writes large temporary files in this directory. Running on a local file system will generally improve the performance.

mp_host_list

List of host machine names to be used for an MPI-based parallel Abaqus analysis, including the number of processors to be used on each machine; for example,

```
mp_host_list=[['maple',1],['pine',1],['oak',2]]
```

indicates that, if the number of **cpus** specified for the analysis is 4, the analysis will use one processor on a machine called **maple**, one processor on a machine called **pine**, and two processors on a machine called **oak**. The total number of processors defined in the host list has to be greater than or equal to the number of **cpus** specified for the analysis. If the host list is not defined, Abaqus will run on the local system. When using a supported queuing system, this parameter does not need to be defined. If it is defined, it will get overridden by the queuing environment.

mp_mode

Set this variable equal to **MPI** to indicate that the MPI components are available on the system. Set **mp_mode=THREADS** to use the thread-based parallelization method. The default value is **MPI** where applicable.

mp_mpi_implementation

This variable determines the underlying MPI implementation to use. Generally, this variable does not need to be specified.

mp_mpirun_options

String of options that are passed to the MPI launcher for an MPI-based parallel Abaqus analysis. Generally this variable does not need to be specified.

mp_mpirun_path

A dictionary to define the full path to the MPI launcher for a given MPI implementation. For example, on Windows,

```
mp_mpirun_path={NATIVE: 'C:\\Program Files\\
Microsoft HPC Pack 2008 R2\\bin\\mpiexec.exe'}
```

mp_num_parallel_ftps

When performing parallel file staging using MPI-based parallelization, this parameter controls the number of simultaneous MPI file transfers. The first item controls the transfer of files to and from the temporary scratch directory. The second item controls the transfer of files to and from the analysis working directory. Setting either value to 1 disables the parallel file staging process. The use of file staging depends on the values specified in **mp_file_system**.

mp_rsh_command

Preferred command to open a remote shell on the machines specified by **mp_host_list**. Abaqus needs to open a remote shell to create and remove directories and files if the file system is not shared. The default value for this option is platform dependent; for example,

```
mp_rsh_command='ssh -n -l %U %H %C'
```

The following placemarkers are used:

%U Username.

%H The host where the remote shell is opened.

%C The command to be executed on the host.

Abaqus automatically uses secure copy (**scp**) to copy files to and from remote hosts if this parameter is set to use secure shell. By default, this parameter is ignored in favor of built-in MPI **rsh/scp** commands.

order_parallel

The default direct solver ordering mode in Abaqus/Standard if you do not specify the parallel ordering mode on the **abaqus** command line. If this parameter is set equal to **OFF**, the solver ordering will not be performed in parallel. If this parameter is set equal to **ON**, the solver ordering will be run in parallel. The default for parallel solver ordering is **ON**.

parallel

The default parallel equation solution method in Abaqus/Explicit if the user does not specify the parallel method on the **abaqus** command line. Possible values are **DOMAIN** or **LOOP**; the default value is **DOMAIN**.

standard_parallel

The default parallel execution mode in Abaqus/Standard if you do not specify the parallel mode on the **abaqus** command line. If this parameter is set equal to **ALL**, both the element operations and the solver will run in parallel. If this parameter is set equal to **SOLVER**, only the solver will run in parallel. The default parallel execution mode is **ALL**.

4.1.3 Job customization parameters

abq_cosimulation_lower_port

This variable specifies the lowest port number in the range of TCP/UDP port numbers available for co-simulation between two Abaqus analyses; it is valid only for Abaqus/CAE. The default value is 48000.

abq_cosimulation_upper_port

This variable specifies the highest port number in the range of TCP/UDP port numbers available for co-simulation between two Abaqus analyses; it is valid only for Abaqus/CAE. If this value is not specified, it is set to 1000 more than **abq_cosimulation_lower_port**.

auto_calculate

If this parameter is set to **ON**, the postprocessing calculator will be launched automatically at the end of an analysis if the execution procedure detects that output database postprocessing is necessary. If this parameter is set to **OFF**, the postprocessing calculator will not run at the end of an analysis even if the execution procedure detects that it is necessary to postprocess the output database file. The default value is **ON**.

average_by_section

This parameter is used only for an Abaqus/Standard analysis. If this parameter is set equal to **OFF**, the averaging regions for output written to the data (**.dat**) file and results (**.fil**) file are based on the structure of the elements. If this parameter is set equal to **ON**, the averaging regions also take into account underlying values of element properties and material constants. In problems with many section and/or material definitions the default value of **OFF** will, in general, give much better performance than the nondefault value of **ON**. See “Output to the data and results files,” Section 4.1.2 of the Abaqus Analysis User’s Guide, for further details on the averaging scheme.

cae_error_limit

This variable defines the maximum number of error messages that will be sent from an analysis job to Abaqus/CAE; it is valid only for Abaqus/CAE. The default value is 50.

cae_no_parts_input_file

This variable defines the format of the input file generated by Abaqus/CAE; it is valid only for Abaqus/CAE. If this variable is set to **ON**, Abaqus/CAE will generate an input file without parts and assemblies. The default value is **OFF**. For more information, see “Writing input files without parts and assemblies,” Section 9.10.4 of the Abaqus/CAE User’s Guide.

cae_warning_limit

This variable defines the maximum number of warning messages that will be sent from an analysis job to Abaqus/CAE; it is valid only for Abaqus/CAE. The default value is 200.

double_precision

The default precision version of Abaqus/Explicit to run if you do not specify the precision version on the **abaqus** command line. Possible values are **EXPLICIT** (only the Abaqus/Explicit analysis is run in double precision), **BOTH** (both the Abaqus/Explicit packager and analysis are run in double precision), **CONSTRAINT** (the constraint packager and constraint solver in Abaqus/Explicit are run in double precision, while the Abaqus/Explicit packager and analysis continue to run in single precision), or **OFF** (both the Abaqus/Explicit packager and analysis are run in single precision). The default is **OFF**.

max_history_requests

This parameter specifies the maximum number of history requests allowed in an Abaqus analysis. The default value is 10,000. History output in Abaqus is intended for relatively frequent output requests for small portions of a model and is displayed in X - Y plots in the Visualization module of Abaqus/CAE (Abaqus/Viewer). Requesting large amounts of history output will cause performance problems in both analysis and postprocessing of an Abaqus job. For vector- or tensor-valued output variables, each component is considered to be a single request. In the case of element variables, history output will be generated at each integration point. For example, requesting history output of the tensor variable **S** (stress) for a C3D10M element will generate 24 history output requests: (6 components) \times (4 integration points). When requesting history output of vector- and tensor-valued variables, it is recommended that individual components be selected where applicable. In cases where large amounts of history output are required, it is recommended that the data be written to the output database (**.odb**) as field output from which history data can be extracted using the Visualization module of Abaqus/CAE.

odb_output_by_default

If this parameter is set to **ON**, output database output will be generated automatically. If this parameter is set to **OFF**, output database request keywords must be placed in an input file to obtain output database output and to allow the analysis to be restarted. The default value is **ON**.

onCaeGraphicsStartup

Optional function to be executed before Abaqus/CAE or Abaqus/Viewer begins. This function allows the user to change the graphics options. See “Tuning graphics cards,” Section 5.3, for more information on this function. This function should not normally be changed.

onCaeStartup

Optional function to be executed before Abaqus/CAE begins. See “Customizing Abaqus/CAE startup,” Section 4.3.3, for examples of this function.

onDesignStartup

Optional function to be executed before Abaqus/Design begins.

onJobCompletion

Optional function to be executed after the Abaqus job completes. A function specified in the Abaqus environment file in the current directory will be executed first, followed by the function in the user’s home directory, and then the function in the Abaqus installation environment file. Multiple functions in the same environment file will result in only the last definition being used. See “Job variables,” Section 4.1.10, for a list of variables available to this function.

onJobStartup

Optional function to be executed before the Abaqus job begins. See “Job variables,” Section 4.1.10, for a list of variables available to this function.

onViewerStartup

Optional function to be executed before Abaqus/Viewer begins.

printed_output

By default, the values of all *PREPRINT parameters are NO and no results are printed to the data file. Set the **printed_output** parameter equal to **ON** to obtain the same preprint information in the data file as if

***PREPRINT, CONTACT=YES, ECHO=YES, HISTORY=YES, MODEL=YES**

were included in the input file. Setting **printed_output** equal to **ON** can also cause a large volume of tabular results to be printed to the data file (unless printed output control options are used to limit the output). If the input file is in terms of parts and assemblies, setting **printed_output** equal to **ON** will cause the part-assembly map to print out in the data file regardless of the settings on

the ***PREPRINT** option; this allows the user to associate the printed output with the part-assembly defined in the input file. The default value for this variable is **OFF**.

run_mode

Default run mode (**INTERACTIVE**, **BACKGROUND**, or **BATCH**) if the user does not specify the run mode on the **abaqus** command line when running the analysis products. The default value is **BACKGROUND**. This variable should not be set to **BATCH** unless batch queues are defined.

split_dat

If this variable is set to **ON**, the data file will be split into two pieces. The output from the user input processing will be put in a file with a **.pre** extension. The analysis output file will still have a **.dat** file extension. The default value is **OFF**.

unconnected_regions

If this variable is set to **ON**, Abaqus/Standard will create element and node sets in the output database for unconnected regions in the model during a **datacheck** analysis. Element and node sets created with this option are named **MESH COMPONENT N**, where *N* is the component number.

4.1.4 System customization parameters

admin

This parameter prevents unauthorized modification of environment file parameters. Set this parameter equal to a list of environment file parameters that cannot be changed in a lower-level **abaqus_v6.env** file. Unless otherwise noted, all system and job customization parameters can be locked out. Commands in the installation directory have the highest precedence, followed by commands in the user's home directory, and then commands in the current working directory. Thus, an Abaqus user cannot change environment file commands that were locked out by the Abaqus account manager.

ask_delete

If this parameter is set to **OFF**, the user will not be asked whether old job files of the same name should be deleted; the files will be deleted automatically. The default value is **ON**.

compile_cpp

C++ compile command. The command used at SIMULIA is included in the **abaqus_v6.env** file in the **/SMA/site/** subdirectory of the Abaqus installation. This command should not normally be changed. It may be either a string or a tuple of strings. If the command is a tuple of strings, each string must represent a single command line argument. The values of the placemaker are determined by the Abaqus execution procedure or by the command line options and cannot be

modified by the user. The values of the placemaker replace the placemaker in the **compile_cpp** string. The following placemaker is available:

%I Search directories for include files.

compile_fortran

FORTTRAN compile command. The command used at SIMULIA is included in the **abaqus_v6.env** file in the **/SMA/site/** subdirectory of the Abaqus installation. This command should not normally be changed. It may be either a string or a tuple of strings. If the command is a tuple of strings, each string must represent a single command line argument.

The compilation of FORTRAN files using Fortran 90 freeform specifications is not supported by default. The **abaqus_v6.env** file in the **/SMA/site/** subdirectory of the Abaqus installation includes comments that discuss the compile options.

file_format

Format of results file output (**ASCII** or **BINARY**). This parameter is valid only for Abaqus/Standard. The default value is **BINARY**.

link_exe

Command to link a postprocessing program. The command used at SIMULIA is included in the **abaqus_v6.env** file in the **/SMA/site/** subdirectory of the Abaqus installation. This command should not normally be changed. It can be either a string or a tuple of strings. If the command is a tuple of strings, each string must represent a single command line argument. The values of the placemarkers are determined by the Abaqus execution procedure or by the command line options and cannot be modified by the user. User-specified external libraries can be linked with the usual link commands. The following placemarkers are used in **link_exe**:

%J The job name (in this case the name of the executable to be created).

%F The name of the object file created from the user's source file.

%M The name of the internally created main object file.

%B The name of the shared library of utility functions.

%O The list of utility shared libraries for the output database application public interface.

%L The list of directories containing shared libraries (HP only).

link_sl

Command to link a shared library. The command used at SIMULIA is included in the **abaqus_v6.env** file in the **/SMA/site/** subdirectory of the Abaqus installation. This command, once its placemarkers have been exchanged, must be a valid command on the computer system where the shared library is linked. This command can be either a string or a tuple of strings. If the command is a tuple of strings, each string must represent a single command line argument. The values of the placemarkers are determined by the Abaqus execution procedure or by the command line options and cannot be modified by the user. The values of the placemarkers

replace the placemarkers in the **link_sl** string. User-specified external libraries can be linked with the usual link commands. The following placemarkers are available:

- %F** The name of the compiled object file.
- %U** The name of the shared library.
- %A** The name of the archive of compiled object files to be linked into the shared library.
- %B** The name of the shared library of utility functions.
- %E** The name of the file containing the names of the symbols to be exported from the shared library.
- %L** The list of directories containing shared libraries (HP only).

nodb_cache_limit

Maximum size of the cache in the temporary file directory. Abaqus/CAE uses this cache for local data storage when you use a network ODB connector to read from a remote output database. Set the **nodb_cache_limit** parameter to the number of megabytes to which the cache size will be limited. The minimum value of **nodb_cache_limit** is 500, indicating that the cache size is limited to 500 MB. If you set the maximum cache size to be greater than the available free space, Abaqus/CAE reduces it to a value that is equal to the available free space.

plugin_central_dir

Full pathname of the directory containing Abaqus/CAE plug-ins. In most cases this is a directory at a central location that is accessible to all users at your site. For more information, see Chapter 81, “The Plug-in toolset,” of the Abaqus/CAE User’s Guide.

usub_lib_dir

Full path name of the directory containing optional user-defined libraries of Abaqus/Standard and/or Abaqus/Explicit user subroutines. Valid user subroutine libraries are platform specific, but the file base names are the same for all platforms. The base names are **standardU**, **explicitU**, and **explicitU-D**. Use this variable to avoid the cost of recompiling and/or relinking frequently used user subroutines. The **abaqus make** utility is used to create the shared libraries for use with this variable (see “Making user-defined executables and subroutines,” Section 3.2.17 of the Abaqus Analysis User’s Guide). User libraries created by the **user** option of the Abaqus/Standard and Abaqus/Explicit execution procedure will supersede any user libraries in this directory.

verbose

If this parameter is in the environment file, the execution procedure will print more information on job submission. Possible values are **ON**, **OFF**, **1**, **2**, and **3**. Set the value to **ON** or **1** to print the commands used to run application executables and some performance data. Set the value to **2** to print licensing transaction information. Set the value to **3** to print operating system environment settings. The output associated with the **verbose** parameter is written to standard output. The default value is **OFF**.

The following system customization parameters are used during documentation installation and to specify a web browser to display the Abaqus HTML documentation and context-sensitive help in Abaqus/CAE.

WARNING: *If you customize browser behavior for Firefox or you use a web browser not supported by Abaqus, you may encounter restrictive behavior that prevents the display of the documentation collection window. For example, you may be prompted to select a profile under which to run when attempting to access the HTML documentation with a copy of the web browser already running.*

browser_path

Full path to the web browser executable on Linux platforms. The value of this parameter can be either a string or a list of strings. If a list of strings is specified, the first string must be the full path to the web browser executable and subsequent strings are arguments to customize the browser behavior. If any argument strings are included, at least one of them must contain **%s** for which the full uniform resource locator (URL) to the Abaqus HTML documentation will be substituted.

Abaqus automatically configures supported browsers to correctly display the HTML documentation. The configurations are different for each browser. This parameter can be used in conjunction with **browser_type** to clarify the browser being used. If **browser_path** is set equal to a string and **browser_type** is not set, the system checks the specified browser path for Firefox. If Abaqus does not detect Firefox, Abaqus assumes that an unsupported browser will be used and does not perform an automatic configuration. This parameter is ignored on Windows platforms.

browser_type

Web browser on Linux platforms. To correctly display the HTML documentation, Abaqus automatically configures the browser according to the specified browser type. The possible settings are **FIREFOX** and **CUSTOM_BROWSER**. If you set **browser_type=CUSTOM_BROWSER** to use a web browser other than Firefox, no support or automatic configuration is provided. For more information, see “Using a web browser not supported by Abaqus,” Section 4.3.4.

This parameter can be used in conjunction with **browser_path** to directly specify an executable command for the browser. If **browser_type** is set to Firefox and **browser_path** is not set, the system searches the system path for Firefox. If the specified browser is not found, an error is displayed. This parameter is ignored on Windows platforms.

doc_root

Full uniform resource locator (URL) or path to the Abaqus HTML or PDF documentation. This variable is set during product installation when you provide the documentation URL and should not normally be changed. The required format is one of the following.

- For HTML documentation with a web server:

`http://computername:port_number/v6.14/`

- For HTML documentation with no web server:

file:///simulia_dir/Documentation/docs/v6.14/index.html

- For PDF-only documentation, or if HTML and PDF were both installed but you prefer PDF, only the path to the installation base directory is required:

simulia_dir

Setting **doc_root** to this file path and setting **doc_root_type** to '**pdf**' will configure the **abaqus doc** command to open PDF rather than HTML documentation.

doc_root_type

The documentation formats specified by the **doc_root** parameter. Set to the string value '**html**' (the default) for an installation of HTML and PDF, or set to the string value '**pdf**' for PDF-only (or if PDF is preferred over HTML). These values must be lowercase.

doc_resource

Full path to the Adobe Acrobat Reader executable (**acroread**) on Linux platforms. The value of this parameter must be a string. Setting this parameter allows the **abaqus doc** command to open PDF rather than HTML documentation.

The following parameters disallow the execution of the corresponding modules prior to testing for license activation through the startup file. They can be used to provide “friendly” messages if an attempt is made to execute an analysis module for which your site does not have a license. Use these parameters in conjunction with the **admin** parameter to ensure uniformity across your site.

no_aqua

Block execution of Abaqus/Aqua if value is set to **ON**.

no_background

Block background execution of Abaqus analysis jobs if value is set to **ON**.

no_batch

Block batch queue execution of Abaqus analysis jobs if value is set to **ON**.

no_cae

Block execution of Abaqus/CAE if value is set to **ON**.

no_design

Block execution of Abaqus/Design if value is set to **ON**.

no_explicit

Block execution of Abaqus/Explicit if value is set to **ON**.

no_interactive

Block interactive execution of Abaqus analysis jobs if value is set to **ON**.

no_standard

Block execution of Abaqus/Standard if value is set to **ON**.

no_viewer

Block execution of Abaqus/Viewer if value is set to **ON**.

4.1.5 Executable parameters

The Abaqus executables for the licensed modules are placed automatically into the `/code/bin/` subdirectory of the Abaqus installation. Prefix parameters (***_prefix**) can be set to **"time"** on Linux systems to determine the execution time for a particular stage of an Abaqus run.

exe_prefix

Optional executable prefix for all Abaqus analysis executables. The default value is an empty string.

explicit_prefix

Optional executable prefix for Abaqus/Explicit. The value given for this prefix will override the value given for **exe_prefix**.

explicit_dp_prefix

Optional executable prefix for the double precision version of Abaqus/Explicit. The value given for this prefix will override the value given for **exe_prefix**.

package_prefix

Optional executable prefix for the Abaqus/Explicit PACKAGE program. The value given for this prefix will override the value given for **exe_prefix**.

pre_prefix

Optional executable prefix for the Abaqus analysis input file processor. The value given for this prefix will override the value given for **exe_prefix**.

standard_prefix

Optional executable prefix for the Abaqus/Standard program. The value given for this prefix will override the value given for **exe_prefix**.

4.1.6 License management parameters

License management customization parameters control the behavior of the Abaqus license server based on current network conditions and user needs. The Abaqus license server is installed with default parameters that should be suitable for most users. The following parameters are provided for customization:

abaquslm_license_file

This parameter provides the host name of the computer running the Abaqus FLEXnet license server and is set during the product installation. This parameter does not apply to DSLS license servers. If a single server is used, this parameter should be set to *port@license_server_host*, where *port* is the port number and *license_server_host* is the name of the computer running the server. If the port number is between 27000 and 27009, you do not need to include it. If redundant servers are used, the parameter should be set to a list of the names of the redundant server hosts and their ports. For example, if the host names for a set of three redundant servers are maple, pine, and oak, the following parameter definition is appropriate:

```
abaquslm_license_file="27000@maple:27000@pine:27000@oak"
```

Use a colon to separate the host names on Linux platforms, and use a semicolon to separate the host names on Windows platforms.

academic

This parameter indicates whether an academic Abaqus client should use research or teaching license tokens. Setting this parameter to **TEACHING** will force the Abaqus client to use only teaching license tokens. Setting this parameter to **RESEARCH** or removing the parameter will force Abaqus to use only research license tokens. This parameter is set automatically during the product installation: if the license server contains an Abaqus teaching license file, the installation sets the parameter to **TEACHING**; otherwise, the parameter is set to **RESEARCH**.

cae_timeout

The number of minutes that an Abaqus/CAE or Abaqus/Viewer session will remain idle due to no user activity before returning its token to the license server. The default value is 60 minutes.

computer_location

A string that indicates the location of the local client computer. This parameter allows you to subtotal license usage reports by location. The license usage reporting utility compiles and organizes data according to the **computer_location** name. The default value is an empty string. If you do not change this default, the license usage report will not distinguish between different locations in the report.

dsls_license_config

Path to the Dassault Systèmes license server (DSLS) configuration file (**DSLicSrv.txt**). This file determines which Dassault Systèmes license servers to use with Abaqus. For example,

- **Linux platforms:**

/opt/simulia/license/DSLicSrv.txt

- **Windows platforms:** (must use double backslashes)

C:\\SIMULIA\\License\\DSLicSrv.txt

For more information about the **DSLicSrv.txt** file, see “Configuring Clients” in the *Dassault Systèmes License Server Installation and Configuration Guide* (**DSLS.pdf**).

license_server_type

The type of license server software used by Abaqus clients. Possible values are **FLEXNET** (default) and **DSLS**. See “Dassault Systèmes license server installation,” Section 2.1.2, and “FLEXnet Licensing installation,” Section 2.1.3, for more information.

lmhanglimit

The number of minutes that an Abaqus client will wait in the license queue to obtain licenses if no licenses are currently available. The default value of 0 forces the job to remain in the license queue indefinitely unless it is killed by the user.

lminteractivequeuing

This parameter indicates whether an interactive Abaqus/CAE or Abaqus/Viewer session should queue for a license if one is not available. To allow Abaqus/CAE or Abaqus/Viewer sessions running interactively to queue for a license, set this parameter equal to **ON**. The default value is **OFF**. The **lmlicensequeuing** parameter is used for queuing sessions running without the graphical user interface.

lmlicensequeuing

This parameter indicates whether an Abaqus analysis job or an Abaqus/CAE or Abaqus/Viewer session using the **noGUI** option should queue for a license if one is not available. The default value is **ON**. If this parameter is set to **OFF**, jobs and Abaqus/CAE or Abaqus/Viewer sessions will terminate immediately if a license is not available. The **lminteractivequeuing** parameter is used for queuing sessions running interactively.

lmlog

This parameter indicates whether license usage data should be written to the FLEXnet debug log file. To use the Abaqus license usage reporting utility (see “Reporting FLEXnet license usage data,” Section 3.8), this parameter must be set to **ON**, which is the default value. To suppress license usage data in the debug log file, set this parameter equal to **OFF**.

lmpproject

This optional parameter can be used to record information about internal project names or numbers for your company. The **lmpproject** parameter can be set to any string value; for example, **lmpproject="turbomachinery-project-23"**. This parameter can be set in the environment file in each users' home directory and can be edited whenever necessary to change to a different project name.

The information about Abaqus license checkouts and associated project names is recorded on the license server and can be retrieved by obtaining historical reports using the accessor **project**. See "Using the **reporttool** utility," Section 3.10.

lmqueuesleep

The number of seconds that an Abaqus client will wait before checking the license queue to see if enough tokens are free. The default value is 30 seconds, which is the minimum allowed. Increasing this value will decrease network traffic when license queuing occurs.

lmsvrdownlimit

The number of minutes that an Abaqus client will attempt to connect to the license server if the license server is currently unavailable. The default value of 0 forces the job to attempt to connect indefinitely unless it is killed by the user.

4.1.7 Object-oriented batch queue parameter

The object-oriented interface for defining an analysis batch queue is easily customized and extended. An analysis batch queue is available from the Abaqus execution procedure command line once it has been instantiated and inserted into the dictionary of analysis queues. See "Defining analysis batch queues," Section 4.2, for more information.

queues

Dictionary of queue names and objects. Queue names and their corresponding object instances are inserted into the dictionary as key/value pairs. The special queue name **default** can be used to designate a default queue. The default queue is used when the **run_mode** is set to **BATCH** and the **queue** option is not specified on the command line. It is also used when the **queue** option is specified on the command line but the named queue is blank or does not exist in the **queues** dictionary.

4.1.8 String-based batch queue parameters

The string-based interface for defining an analysis batch queue allows access to a fixed number of options. The parameters below can be used to construct command strings to control the execution of an Abaqus analysis. The only requirement is the string must be a valid command on the computer system where it is executed. See "Defining a string-based analysis batch queue," Section 4.3.7, for an example.

after_prefix

Optional prefix to be output as part of the submit command when the **after** option is specified on the command line. The default value is an empty string.

queue_cmd

Default command to be used to submit a batch job when the **run_mode** is set to **BATCH**. This parameter, once its placemarkers have been exchanged, must be a valid command on the computer system where it is executed. The values of the placemarkers are defined by input specified on the command line of the Abaqus execution procedure or by environment file parameters. The values of the placemarkers replace the placemarkers in the **queue_cmd** string. The following placemarkers are available:

- %%** A percent (%) character.
- %A** The **after_prefix** string is substituted for **%A** when the **after** option is specified on the command line.
- %L** The log file name. This token will be replaced by *job-name.log*, where *job-name* is the value defined by the **job** command line option.
- %P** The **queue_prefix** string (see description below) is substituted for **%P** when the **queue** option is specified on the command line.
- %Q** The queue name from the **queue** command line option.
- %S** The command script file name. This token will be replaced by *job-name.com*, where *job-name* is the value defined by the **job** command line option.
- %T** The time from the **after** command line option.
- %J** The job name from the **job** command line option.
- %E** The token is substituted by the full path to the Python executable.
- %O** The full path to the output directory.

queue_name

List of names for batch commands, typically used for submitting jobs to queues other than the default (defined by **queue_cmd**). Then, elsewhere in the environment file, each of these command aliases must appear on the left side of the equal sign, with the desired command string on the right. This command string has the same format as the **queue_cmd** parameter. It can use the replaceable placemarkers in its construction as long as the final result is a valid system command.

queue_prefix

Optional prefix to be output as part of the submit command when a queue name is specified. The default value is an empty string.

4.1.9 Adams translation units parameters

The **abacus adams** translator refers to the environment file parameters in this section to specify default values for the units used in the modal neutral (**.mnf**) file it creates. For more information about valid units specifications in ADAMS/View, see “Units” in “Translating Abaqus data to MSC.ADAMS modal neutral files,” Section 3.2.36 of the Abaqus Analysis User’s Guide. These parameters provide the default values only; if you specify a units preference using one of the parameters in the **abacus adams** execution procedure, your selection overrides the default setting.

adams_units_family

The type of units system for the model. The possible values are **mmks**, **mks**, **cgs**, or **ips**, which correspond to the ADAMS/View options with the same names.

adams_length_units

The length units specified for the model in the modal neutral (**.mnf**) file.

adams_mass_units

The mass units for the model in the modal neutral (**.mnf**) file.

adams_time_units

The time units for the model in the modal neutral (**.mnf**) file.

adams_force_units

The force units for the model in the modal neutral (**.mnf**) file.

4.1.10 Job variables

The following variables can be used in an **onJobStartup** or **onJobCompletion** function:

id

The job identifier specified as the value of the **job** option on the command line.

savedir

The path name to the directory from which the job was submitted.

scrdir

The path name to the scratch directory.

analysisType

The type of analysis to be executed. Possible values are **EXPLICIT** and **STANDARD**.

In addition, for an MPI-based parallel job the following variables are available in an **onJobStartup** or **onJobCompletion** function:

host_list

List of host machine names that were used for the analysis, including the number of processors used on each machine. The format is identical to the **mp_host_list** environment variable (see “Parallelization parameters,” Section 4.1.2).

local_host

List of identifiers used to determine the host machine name from which the job was submitted (e.g., host name, IP address, aliases, etc.).

rsh_command

Command used to open a remote shell on the machines that were used during analysis. The format is identical to the **mp_rsh_command** environment variable (see “Parallelization parameters,” Section 4.1.2).

file_system

Tuple showing the type of file system used for the MPI-based parallel job. The first item in the tuple refers to the directory where the job was submitted, while the second refers to the job’s scratch directory. For MPI-based parallel Abaqus/Explicit analyses that do not use a user subroutine, the scratch directory will remain as **DETECT** unless it was set by the user.

cpus

Number of total processors used for the analysis summed across all host machines.

The following variables are available outside of the **onJobStartup** and **onJobCompletion** functions:

abaqus_version

A string that contains the Abaqus release.

analysisType

The type of analysis to be executed. Possible values are **EXPLICIT** and **STANDARD**.

applicationName

The name of the Abaqus execution procedure to be executed; e.g., **analysis**, **cae**, or **viewer**.

4.2 Defining analysis batch queues

Analysis batch queues are used to configure the way that Abaqus analysis jobs are run. They are particularly useful for integrating Abaqus with third-party batch queueing systems.

Two pieces of information are needed to run an Abaqus job: the syntax of the command used to execute the job and the job-specific information. The command used to execute the job is obtained from a queue definition in the Abaqus environment file. The job-specific information is obtained from the command line options and the analysis parameters defined in the Abaqus environment file. The command line options are described in Chapter 3, “Job Execution,” of the Abaqus Analysis User’s Guide.

The command syntax and the job-specific information are used to construct a command to run an Abaqus job in an analysis queue. An object-oriented interface and a string-based interface are available for defining the analysis batch queues. The object-oriented interface is preferred because it is easily customized and extended. This section discusses the object-oriented interface; see “String-based batch queue parameters,” Section 4.1.8, for information on the string-based interface.

A set of predefined (built-in) queue classes is available within an Abaqus environment file. These classes can be instantiated to create user-defined queue objects. See “Object-oriented batch queue parameter,” Section 4.1.7, for information on the **queues** environment file parameter. In addition to the predefined queue classes, users can create their own queue classes to customize the way analysis jobs are executed. The new queue classes can be derived from the predefined queue classes to minimize coding by the user. The **driverQueues** module must be imported to instantiate a predefined queue or to derive a custom queue class. The predefined classes are described in “Queue class,” Section 4.2.1, and “Predefined derived classes,” Section 4.2.2. In addition, examples that illustrate how to extend predefined classes and create custom queue classes are provided in “Using predefined derived classes,” Section 4.3.5, and “Deriving and using custom queue classes,” Section 4.3.6, respectively.

4.2.1 Queue class

The **Queue** class is an abstract base class. All other analysis batch queue classes are derived from it. The class has no explicit constructor or members. The following methods of the **Queue** class are common to all derived classes:

__repr__(...)

This method returns the class name as a string. The string is printed as a description for the queue when **abaqus information=environment** is executed. Derived classes should override this method to provide a useful description of the queue objects instantiated from them.

createScript(...)

This method creates a Python script named *job-name.com* in the current working directory. This script is used to run the analysis. This method is called by the analysis execution procedure prior to the **submit** method. If the *job-name.com* file cannot be written in the current working directory, a `FileCreationError` exception is raised. The following argument is required:

options A dictionary containing the analysis options.

getDriverName(...)

This method returns the name of the command used to invoke the Abaqus execution procedure.

getPython(...)

This method returns the absolute path to the Abaqus Python interpreter as a string.

getNumRequiredTokens(...)

This method returns the number of license tokens required for an analysis as an integer. The following argument is required:

options A dictionary containing the analysis options.

spawn(...)

This method executes a command in a new process, waits for it to complete, and returns an integer representing the exit status of the command. If the command cannot be executed, a `SpawnError` exception is raised. The following arguments are required:

cmd A valid command string to be executed in the new process. If analyses are submitted to this queue from Abaqus/CAE, the command must return the status immediately; otherwise, the ability to monitor the progress of the analysis jobs in Abaqus/CAE may fail. Examples of commands that return the status immediately are **qsub**, **bsub**, **at**, **batch**, etc.

env A dictionary of environment variables available to the process.

The following argument is optional:

verbose A Boolean specifying whether the command string is printed to **stdout**. The default value is OFF.

submit(...)

This abstract method must be implemented by a derived class. This method is called by the analysis execution procedure to submit the analysis to a queue. The **submit** method must return an integer; a value of 0 indicates success, and a nonzero value indicates failure. When this method is called, the analysis execution procedure supplies the following required arguments:

options A dictionary containing the analysis options.

env A dictionary of environment variables available to the process.

Most derived classes call the **spawn** method from this method and return its exit status.

4.2.2 Predefined derived classes

The following analysis batch queue classes are derived from the **Queue** base class:

AtQueue class

The **AtQueue** class executes an analysis using the Linux **at** command. This class overrides the following base class methods:

__repr__(...)

This method returns a string describing the class.

submit(...)

This method executes the Linux **at** command to run the *job-name.com* analysis script at the time specified on the command line **after** option. If the **after** option is not specified on the command line, a QueueError exception is raised.

BatchQueue class

The **BatchQueue** class executes an analysis using the Linux **batch** command. This class overrides the following base class methods:

__repr__(...)

This method returns a string describing the class.

submit(...)

This method executes the *job-name.com* analysis script under the Linux **batch** command.

HoldQueue class

The **HoldQueue** class creates a *job-name.com* file and exits. This class overrides the following base class methods:

__repr__(...)

This method is reimplemented to provide a useful description.

submit(...)

This method prints a message stating that the *job-name.com* script was not submitted and returns a value of 0.

LSFQueue class

The **LSFQueue** class submits an analysis to the LSF queue named when the object was instantiated. If a name was not specified, the analysis is submitted to the default LSF queue. The following constructor argument is optional:

name Name of a valid LSF queue.

This class overrides the following base class method:

submit(...)

This method invokes the LSF **bsub** command to submit the *job-name.com* analysis script to an LSF batch cluster and returns the exit status of the **bsub** command.

NQSQueue class

The **NQSQueue** class submits an analysis to the NQS queue named when the object was instantiated. If a name was not specified, the analysis is submitted to the default NQS queue. The following constructor argument is optional:

name Name of a valid NQS queue.

This class overrides the following base class method:

submit(...)

This method invokes the NQS **qsub** command to submit the *job-name.com* analysis script to an NQS system and returns the exit status of the **qsub** command.

PBSQueue class

Queues instantiated from the **PBSQueue** class will create a *job-name.pbs* script and run the command **qsub job-name.pbs**. The *job-name.inp* and *job-name.com* files will be copied to the execution host, where the *job-name.com* script will be executed. After job completion, all output files will be copied back to the submission host. The following constructor argument is optional:

name Name of a valid PBS queue.

This class overrides the following base class method:

submit(...)

This method invokes the PBS **qsub** command to submit the *job-name.pbs* script to a PBS system and returns the exit status of the **qsub** command.

4.3 Examples

The examples included in this section illustrate various uses of the Abaqus environment file.

4.3.1 Example environment file

An example Windows environment file is shown below. This file will work on Linux systems as well if you change the **scratch** directory setting appropriately. A sample environment file, **abaqusinc.env**, is included in the **/SMA/site/** subdirectory of the Abaqus installation to show the options used at SIMULIA.

```
scratch = "c:/temp"
if applicationName in ('analysis','datacheck','continue'):
    memory = "256 Mb"
```

```

def onCaeStartup():
    #Graphics preferences
    session.graphicsOptions.setValues(dragMode=AS_IS, displayLists=ON)
    # Print preferences
    session.printOptions.setValues(vpDecorations=OFF,
        vpBackground=OFF, rendition=COLOR,
        printCommand='lpr -S marley -P hp3')
    session.psOptions.setValues(date=OFF)
    # Job preferences
    def setJobPreferences(module, userData):
        session.Queue(name='long', hostName='server',
            queueName='large', directory='/tmp')
    addImportCallback('job', setJobPreferences)
    # Visualization preferences
    def setVisPreferences(module, userData):
        session.defaultOdbDisplay.contourOptions.setValues(
            renderStyle=SHADED, visibleEdges=EXTERIOR,
            contourStyle=CONTINUOUS)
    addImportCallback('visualization', setVisPreferences)

```

The default compile and link environment variables for your computer have also been inserted in your site environment file.

4.3.2 Notifying users when a job is completed

The following is an example of how environment file commands can be used to notify Linux system users when their job is finished. The notification method used depends on how the job was run and if the user is logged in. If the job was run interactively, the user will not be notified that the job has finished. If the user is still logged in when the job completes, a message will be output to the screen. If the user has logged out by the time the job completes, a message will be mailed to the user. The syntax of the **mail** command varies from system to system. Please consult your system documentation to determine the appropriate commands.

```

def onJobCompletion():
    import os, re

    userName = os.environ['USER']
    msg = 'Job %s has completed' % id

```

```
# Run "who" command, pipe the output, and read into a list
whopipe = os.popen('who', 'r')
output = whopipe.readlines()
whopipe.close()

# Find out if the user is logged in
loggedIn = 'no'
terminal = [ ]

for line in output:
    columns = re.split('[ ]+', line) # Split into blank separated columns
    name = columns[0] # User name is in the first column
    if name == userName:
        terminal.append(columns[1]) # Terminal at which user is logged in
        loggedIn = 'yes'

# Use "write" command if the user is logged in, use mail otherwise
if loggedIn == 'no':
    logFile = savedir + id + ".log"
    if os.path.exists(logFile):
        os.system('cat %s | Mail -s "%s" %s' % (logFile, msg, userName))
    else:
        os.system('Mail -s "%s" %s' % (msg, userName))
else:
    for termNum in terminal:
        os.system('echo "%s" | write %s %s' % (msg, userName, termNum))
```

4.3.3 Customizing Abaqus/CAE startup

The following example for the **onCaeStartup** parameter will establish viewport preferences and print options (including a print command), set up a remote execution queue for running Abaqus jobs, and set preferences for contour plots in the Visualization module:

```
def onCaeStartup():

    # Print preferences
    session.printOptions.setValues(vpDecorations=OFF,
        vpBackground=OFF, rendition=COLOR,
        printCommand='lpr -S server -P printer')
    session.psOptions.setValues(date=OFF, logo=OFF)
```

```

def initQueues(*args):
    session.Queue(name='long', hostName='server',
                  queueName='large', directory='/tmp')
addImportCallback('job', initQueues)

# Visualization preferences
def setVisPreferences(module, userData):
    import visualization
    session.defaultOdbDisplay.contourOptions.setValues(
        renderStyle=SHADED, visibleEdges=EXTERIOR,
        contourStyle=CONTINUOUS)
addImportCallback('visualization', setVisPreferences)

```

Indented text must be valid Python commands. For more queue examples, see Chapter 19, “The Job module,” of the Abaqus/CAE User’s Guide.

4.3.4 Using a web browser not supported by Abaqus

Abaqus provides support only for the Firefox web browser on Linux platforms; however, it does provide the ability to use a web browser not supported by Abaqus for viewing HTML documentation. Examples are shown for setting the **browser_type** and **browser_path** system customization parameters in this situation.

The first example illustrates the parameter settings to specify a web browser not supported by Abaqus:

```

browser_type = CUSTOM_BROWSER
browser_path = ['full_path_to_browser', 'argument1', 'argument2', etc.]

```

where the first string contains the full path to the web browser and subsequent strings are arguments to customize the browser behavior. Refer to the specific web browser documentation for valid arguments.

The second example illustrates the parameter settings to specify the Opera browser (not supported by Abaqus) as the web browser:

```

browser_type = CUSTOM_BROWSER
browser_path = ['/usr/local/bin/opera', '-newwindow' '%s']

```

where **/usr/local/bin/opera** is the full path to the browser and the argument **-newwindow** opens a new browser window using the full uniform resource locator (URL) to the Abaqus HTML documentation. Use the argument **-newpage** to open a new page.

The third example illustrates the parameter settings to specify the Konqueror browser (not supported by Abaqus) as the web browser:

```
browser_type = CUSTOM_BROWSER
browser_path = '/opt/kde3/bin/konqueror'
```

where `/opt/kde3/bin/konqueror` is the full path to the browser. By default, a new browser window opens using the URL to the Abaqus HTML documentation.

4.3.5 Using predefined derived classes

The following example illustrates the instantiation of some predefined derived classes and their insertion into the **queues** dictionary:

```
run_mode = BATCH
from driverQueues import *
queues['atq'] = AtQueue()
queues['batchq'] = BatchQueue()
queues['hold'] = HoldQueue()
```

To submit an analysis using one of the queues, specify the queue name as the value for the analysis execution procedure **queue** parameter.

4.3.6 Deriving and using custom queue classes

To derive a custom queue class, the **driverQueues** module must be imported and the class must inherit directly or indirectly from the **Queue** class. Derived queues must provide an implementation for the **submit** method. Derived class methods can raise exceptions as needed. The predefined **QueueError** exception is provided as a general-purpose exception.

The following examples illustrate the derivation and use of custom queue classes:

```
run_mode = BATCH
from driverQueues import *
#~~~~~
class NiceQueue(Queue):
    #~~~~~
    def __repr__(self):
        return 'Executes analysis using UNIX nice command.'
    #~~~~~
    def submit(self, options, env):
        job = options['job']
        after = options.get('after', '')
        verbose = options.get('verbose', 0)
        if options.get('after', ''):
```



```

        # a descriptive string must be supplied as data when
        # raising a QueueError exception
        #~~~~~
        raise QueueError, \
            "after" is not a valid argument for this queue.'
    # run nice under bourne shell to eliminate platform dependencies
    cmd = "/bin/sh -c 'nice %s python ./%s.com 1>./%s.log 2>&1 &'" \
        % (self.getDriverName(), job, job)
    return self.spawn(cmd, env, verbose)
#~~~~~
class LSF_ResvQueue(LSFQueue):
    # For integration with LSF. This queue class supports cpu, memory,
    # and license reservations.
    #~~~~~
    def __init__(self, name, memReserve=0, cpusReserve=0):
        LSFQueue.__init__(self, name)
        self.memReserve = memReserve
        self.cpusReserve = cpusReserve
    #~~~~~
    def __repr__(self):
        return 'Submits to LSF %s queue (run "bqueues -l %s" for description)' \
            % (self.name, self.name)
    #~~~~~
    def submit(self, options, env):
        job = options['job']
        verbose = options.get('verbose', 0)
        queue = self.name
        cpus = options.get('cpus', '1')
        if self.cpusReserve:
            cpus = self.cpusReserve
        resLst = [ ]
        # license reservation - For the following line to work, LSF
        # must be configured with a static or dynamic resource called
        # "abqtokens".
        #~~~~~
        resLst.append('abqtokens=%d' % self.getNumRequiredTokens(options))
        # memory reservation
        if self.memReserve:
            from math import ceil

```

```

        resLst.append('mem=%d' % int(ceil(self.memReserve/float(cpus))))
    resStr = ''
    if resLst:
        import string
        resStr = '-R rusage[%s]' % string.join(resLst, ':')
    bsub = 'bsub -q %s -J %s -n %s -o %s.log -N %s %s python %s.com' % \
        (queue, job, cpus, job, resStr, self.getDriverName(), job)
    return self.spawn(bsub, env, verbose)

# queue definitions
queues['default']      = NiceQueue()
queues['hold']          = HoldQueue()
queues['benchmark']    = LSF_ResvQueue(name='benchmark', cpusReserve=16)
queues['dedicated']    = LSF_ResvQueue(name='dedicated')
queues['a500M']         = LSF_ResvQueue(name='a500M', memReserve=500)
queues['a1500M']        = LSF_ResvQueue(name='a1500M', memReserve=1500)
queues['a3000M']        = LSF_ResvQueue(name='a3000M', memReserve=3000)
queues['a6000M']        = LSF_ResvQueue(name='a6000M', memReserve=6000)

```

4.3.7 Defining a string-based analysis batch queue

The following example illustrates the use of the environment file parameters for string-based analysis batch queue definition:

```

try:
    queue_name=list(queue_name)
except:
    queue_name = [ ]
queue_name=queue_name + ["aba_short", "aba_long", "hold "]
after_prefix="-a"
queue_prefix="-q"
queue_cmd="qsub -nr -me %P %Q %A %T -x -eo -o %L %S"
aba_short="qsub -nr -me -q short %A %T -x -eo -o %L %S"
aba_long="qsub -nr -me -q long %A %T -x -eo -o %L %S"
hold="printf 'Job %S not submitted\n' "

```

The **qsub** command used in this example is available only on certain computer systems. Other commands, such as **at** and **batch**, can be used to configure a queuing system on most Linux platforms. Please refer to your system documentation or contact your hardware vendor for information about queuing systems for your platform.

If the queue specified by the **queue** command line option matches one of the queue aliases in the **queue_name** parameter, that **queue** command is used in place of the default command **queue_cmd**. The following are legal command line options for the above example:

```
abacus job=qt queue=normal
abacus job=qt queue=aba_short after=10:00
abacus job=qt queue=hold
```

The first of these three command line options does not match a defined queue, so the **queue_cmd** string is used to submit the job to the **normal** queue. This queue must have been set up by the systems manager prior to submission of the job. The actual command used to send the job to the **normal** queue for execution on Linux platforms is

```
qsub -nr -me -q normal -x -eo -o qt.log qt.com
```

The value of **%A** is not output if **after=time** is not specified on the command line.

The second option uses the string defined by **aba_short**, which submits the job to the system predefined **short** queue. The command executed by the Linux platform is

```
qsub -nr -me -q short -a 10:00 -x -eo -o qt.log qt.com
```

The last command line option creates the file **qt.com**, which contains the Abaqus job commands, and saves it in the current directory. The message **Job qt.com not submitted** is then written to the terminal. The job is not submitted to any queue.

4.3.8 Locking out modifications to environment file parameters

In the example below, all Abaqus jobs will run in batch mode by default, and execution of Abaqus/Aqua jobs is not allowed. The inclusion of the **admin** parameter prevents modification of these settings in lower-level environment files. If this parameter is part of the environment file in the installation directory, the values of **run_mode** and **no_aqua** will override any corresponding values in a user's local directory or command line. Therefore, this example constrains all jobs submitted at your site to run in batch mode.

```
run_mode = BATCH
no_aqua = ON
admin = ['run_mode', 'no_aqua']
```

The **no_aqua** parameter would typically be used to provide a “friendly” message to users if Abaqus/Aqua is not licensed at your site.

5. Customizing Abaqus/CAE and Abaqus/Viewer

This chapter describes user interface customization, printer configuration, and graphics card tuning for Abaqus/CAE and Abaqus/Viewer.

Platform dependencies sometimes exist for Abaqus/CAE and Abaqus/Viewer. These dependencies can change between releases; therefore, they are listed on the **Support** page at www.3ds.com/simulia, where the latest information is published.

5.1 Customizing the user interface

To customize the Abaqus/CAE and Abaqus/Viewer user interface, you can specify general display properties on Windows platforms. Settings on other platforms, such as Linux, may also affect the appearance of the user interface and some of its functions. You can also record all of your actions in the Abaqus/CAE or Abaqus/Viewer user interface in a file named **abaqus.guiLog**.

5.1.1 Hardware acceleration (all platforms)

With some graphics devices Abaqus/CAE and Abaqus/Viewer may fail when hardware acceleration is turned on. It is possible to turn off hardware acceleration if completely necessary, although it is not recommended. Disabling hardware acceleration will severely degrade graphics performance in Abaqus/CAE and Abaqus/Viewer. You can disable hardware acceleration using one of the following methods:

Linux platforms

Start Abaqus/CAE or Abaqus/Viewer using the **-mesa** option:

```
abaqus cae -mesa
abaqus viewer -mesa
```

Windows platforms

There are two ways to disable hardware acceleration on Windows platforms:

- Add the parameter **abaqus_no_hardware_acceleration=ON** to the Abaqus environment file; or
- Create a system environment variable using the following command:

```
set ABAQUS_NO_HARDWARE_ACCELERATION=1
```

5.1.2 Common customizations on Windows platforms

The following procedures explain how to specify some commonly desired settings on Windows platforms:

To change the “start-in” location for any Abaqus shortcut:

1. Use **Windows Explorer** to go to the directory where the Abaqus shortcuts are located. The shortcuts contained in this directory affect all users on the computer and may require special permission to change.
2. Click mouse button 3 on the shortcut (**Abaqus CAE**, **Abaqus Command**, or **Abaqus Viewer**) for which you wish to change the start-in location, and select **Properties**; then click the **Shortcut** tab.
3. In the text box labeled **Start in:**, set the full path to the directory you wish to use as the default location for saving the files created by that Abaqus product.

To stop Abaqus/CAE and Abaqus/Viewer windows from being erased when a dialog box is moved:

Menu items may vary depending upon your Windows operating system. For Windows XP operating systems:

1. Select **Start→Settings→Control Panel**, and double-click **Display**.
2. From the **Display Properties** dialog box that appears, select **Appearance** and click **Effects**.
3. In the **Effects** dialog box, toggle off **Show window contents while dragging**.
4. Click **OK** to save your settings and to close the **Display Properties** dialog box.

To change the colors and fonts used in Abaqus/CAE and Abaqus/Viewer:

You can change the colors and fonts displayed in Abaqus/CAE and Abaqus/Viewer by applying a new color scheme to your session. Color schemes determine the colors and text settings that Windows uses to display each component in an application, such as its menus, dialog boxes, and title bar. For example, when the **Windows Standard** color scheme is selected, Windows displays white text in Tahoma font against a blue background in the title bar; and displays black text in Tahoma font on a white background in application menus.

You can also customize a color scheme by editing the color or text settings for any individual item in the color scheme. This customization enables you to change more specific settings, like increasing the text size in the title bar without changing the text size in other areas of the application.

Changes to the color and font settings affect all applications, not just Abaqus programs. Menu items may vary depending upon your Windows operating system. For Windows XP operating systems:

1. Select **Start→Settings→Control Panel**, and double-click **Display**.
2. From the **Display Properties** dialog box that appears, select **Appearance**.
3. Choose a preset **Color scheme** from the list.
4. If desired, choose a new **Font size** from the list.

Note: Some color schemes allow only one font size by default. To increase the font size for a particular item, edit the color scheme in the **Advanced Appearance** dialog box.

5. If desired, change the color or font settings for individual items in the selected color scheme:

a. Click **Advanced**.

The **Advanced Appearance** dialog box appears.

b. Select the **Item** for which you want to change color and font display.

The dialog box displays the current color and, if applicable, the font settings for the selected item. Windows excludes font settings for items that do not display text, like the active window border.

c. Choose a new item color from the **Color 1** list. For items like the active title bar that allow a gradient between two colors, you can also adjust the second color in the gradient by choosing a new color from the **Color 2** list.

d. Adjust the text settings for the selected item from the options at the bottom of the dialog box. You can choose a new **Font** from the list, click the **Size** arrows to increase or decrease text size, choose a new text **Color** from the list, and toggle the bold or italic formatting for the text in this item.

e. Repeat the previous two steps to change color and text display for other individual items in a color scheme.

f. Click **OK** to close the **Advanced Appearance** dialog box.

6. Click **OK** to save your settings and to close the **Display Properties** dialog box.

To change the default fonts used in Abaqus/CAE and Abaqus/Viewer:

By default, Windows renders text in the Abaqus/CAE and Abaqus/Viewer viewport windows by referring to the fonts available in your system fonts directory. You can override this default behavior and use other fonts for your session by adding the parameter **hks_font_path** to your Abaqus environment file. Set this parameter to multiple, comma-delimited values if you want to set up multiple font directories for your session.

To display Chinese characters in Abaqus/CAE and Abaqus/Viewer:

You can enable a localized Chinese version of Abaqus/CAE and Abaqus/Viewer. This localized version displays Chinese characters for text in menus, dialog boxes, the Model and Results Trees, and the message area; text in the viewport is not localized.

Menu items may vary depending upon your Windows operating system. For Windows XP operating systems:

1. Set the regional language settings for Windows to enable Chinese characters:

- a. Select **Start→Settings→Control Panel**, and double-click **Regional and Language Options**.

The **Regional and Language Options** dialog box appears.

- b. On the **Languages** tabbed page, ensure that the **Install files for East Asian languages** option is toggled on.

If the East Asian languages are not installed, you must have Administrator privileges to change this option.

- c. On the **Regional Options** tabbed page, select **Chinese (PRC)** in the **Standards and formats** section.

- d. Click **OK**.

2. Set the system environment variable **ABAQUS_USE_LOCALIZATION=1**.

- To set the variable for a single session, enter the following command in a command prompt:

```
set ABAQUS_USE_LOCALIZATION=1
```

You must run Abaqus/CAE or Abaqus/Viewer from the same command prompt.

- To set the variable permanently, save it in the Windows system properties. Environment variables can be saved using the **Advanced** tabbed page of the **System Properties** dialog box (select **Start→Settings→Control Panel**, and double-click **System**).

5.1.3 Linux settings that affect Abaqus/CAE and Abaqus/Viewer

Linux operating systems provide you with many options for customization. Because you can alter parts of the operating environment that are held constant on other platforms, your Linux settings may alter some basic interactions within Abaqus/CAE and Abaqus/Viewer. The exact settings available and the methods you use to change them vary according to the version of Linux that you have installed. Three possible settings and their effects are as follows:

Removal of window title bars

Your access to some dialog and toolbox functions may be limited if you have customized your system so that window title bars are not displayed. Without title bars, you may not be able to move a dialog box. Using the [Esc] key is the only means to close a dialog or toolbox that has no title bar or **Cancel** button.

Removal of window borders

Resizing a dialog box requires you to click and drag the border. If your Linux customizations include the removal of application window borders, you may not be able to resize dialog boxes in Abaqus/CAE and Abaqus/Viewer. Instead, use the scroll bars to access data that extend beyond the edges of a dialog box.

Displaying Japanese characters

If your locale setting is Japanese, Abaqus/CAE and Abaqus/Viewer can display Japanese text in the viewport. For example, text annotations and the state and title blocks are displayed in Japanese. To display the Japanese characters correctly, the Japanese TrueType fonts must be installed in the directory `/usr/lib/X11/fonts`.

5.1.4 Recording all user interface actions in a log file

You can record all of the actions you take in the Abaqus/CAE or Abaqus/Viewer user interface in a file named `abaqus.guiLog`. This setting can be toggled on for a single session, or you can select it as the default behavior.

Enabling user interface recording at runtime

Start Abaqus/CAE or Abaqus/Viewer using the `-guiRecord` option:

```
abaqus cae -guiRecord
abaqus viewer -guiRecord
```

Enabling user interface recording using `ABQ_CAE_GUIRECORD`

You can specify user interface recording by setting `ABQ_CAE_GUIRECORD` from a command line, in the Abaqus environment file, or—on Windows platforms—as a system environment variable.

- To set the variable for a single session, enter the following command in a command prompt:

```
set ABQ_CAE_GUIRECORD=1
```

You must run Abaqus/CAE or Abaqus/Viewer from the same command prompt.

- To enable user interface recording as the default behavior, add the parameter `ABQ_CAE_GUIRECORD=ON` to the Abaqus environment file; or on Windows platforms, save it in the Windows system properties. Environment variables can be saved using the **Advanced** tabbed page of the **System Properties** dialog box (select **Start**→**Settings**→**Control Panel**, and double-click **System**).

When user interface recording is the default behavior, you can still disable it from the command line by starting Abaqus/CAE or Abaqus/Viewer using the `-guiNoRecord` option:

```
abaqus cae -guiNoRecord
abaqus viewer -guiNoRecord
```

5.2 Configuring printers

Print commands are not normally needed for Windows platforms. Abaqus/CAE and Abaqus/Viewer automatically detect and list any installed Windows printers. If you encounter problems using the print

tool in Abaqus/CAE or Abaqus/Viewer, check the installed Windows printers on your machine and remove any printers that are no longer valid.

This section describes how Abaqus uses print commands. Print commands on Linux platforms should be identical to those used for other applications.

5.2.1 How Abaqus determines and uses the print command

When Abaqus/CAE or Abaqus/Viewer prints to a PostScript printer, it goes through the following steps:

Creating a temporary PostScript file

The temporary PostScript file contains all the PostScript code necessary to describe the page to be printed.

Retrieving the print command specified in the print dialog box

The command specified in the print dialog box can be any command that sends to the printer an unmodified copy of the file whose path is its last argument (some PostScript modifications such as the ones done by PostScript print managers are allowed).

To customize the default print command that is used by Abaqus/CAE or Abaqus/Viewer when it shows the print dialog box, add the following line to the **abaqus_v6.env** file in your home directory or in the site directory of the Abaqus release:

```
def onCaeStartup():
    session.printOptions.setValues(printCommand=
        'print_command_and_arguments_here')
```

Appending the name of the temporary file and invoking the resulting command

The name of the previously created temporary file is appended to the print command and the PostScript file is printed.

Deleting the temporary PostScript file

If the printer that you are using does not support print spooling, the temporary PostScript file may be deleted before the file is printed. To prevent the temporary PostScript files from being deleted, add the following line to the **abaqus_v6.env** file in your home directory or in the site directory of the Abaqus release:

```
def onCaeStartup():
    session.printOptions.setValues(deleteTemporaryFiles=False)
```

5.3 Tuning graphics cards

This section contains the information that you need to configure Abaqus/CAE and Abaqus/Viewer for a graphics adapter that is not yet qualified.

5.3.1 Why is tuning necessary?

SIMULIA tunes and qualifies a limited set of graphics adapters prior to each release. Tuning parameters for these graphics adapters are included in Abaqus. However, new graphics adapters and new drivers for existing graphics adapters become available between releases. Tuning may enable you to take advantage of these new adapters and drivers without waiting for a new release of Abaqus/CAE or Abaqus/Viewer.

Abaqus/CAE and Abaqus/Viewer use OpenGL for high-speed graphics rendering. While the OpenGL standard has strict conformance tests, some features are implementation dependent and require tuning to function correctly. Tuning a new graphics adapter or driver ensures that Abaqus/CAE and Abaqus/Viewer graphics are rendered correctly and that maximum rendering performance is obtained for each system.

You can find the latest information on qualified graphics adapters on the **Support** page at www.3ds.com/simulia. If you read the information on this page and follow the tuning procedures described in this section, you should be able to render Abaqus/CAE and Abaqus/Viewer graphics correctly and with maximum performance. If you continue to experience problems, you should contact your local technical support office for assistance.

5.3.2 How can I tune the parameters?

Abaqus/CAE and Abaqus/Viewer provide the following two methods for tuning graphics parameters:

- Select **View**→**Graphics Options** from the main menu bar. Abaqus displays the **Graphics Options** dialog box shown in Figure 5–1 from which you can select the desired settings. This approach allows you to select from only the most commonly used tuning parameters. The settings in the **Graphics Options** dialog box are described in Chapter 7, “Configuring graphics display options,” of the Abaqus/CAE User’s Guide.
- Use an Abaqus Scripting Interface command to select the desired settings. You can enter the command in the command line interface (CLI) and modify the values of the tuning parameters. This approach provides complete control of all the tuning parameters and is described in “Using the Abaqus Scripting Interface to tune the graphics parameters,” Section 5.3.3. This section also describes how you can use an Abaqus Scripting Interface command to obtain information about the graphics card that you are using.

Table 5–1 shows the tuning parameters that are available from Abaqus/CAE and Abaqus/Viewer. The table also shows the standard value of each parameter and whether you can use the **Graphics Options** dialog box to modify it. Certain parameters can be modified only before starting an Abaqus/CAE or Abaqus/Viewer session (see “Making your graphics configuration permanent,” Section 5.3.4, for details on modifying parameters on startup).

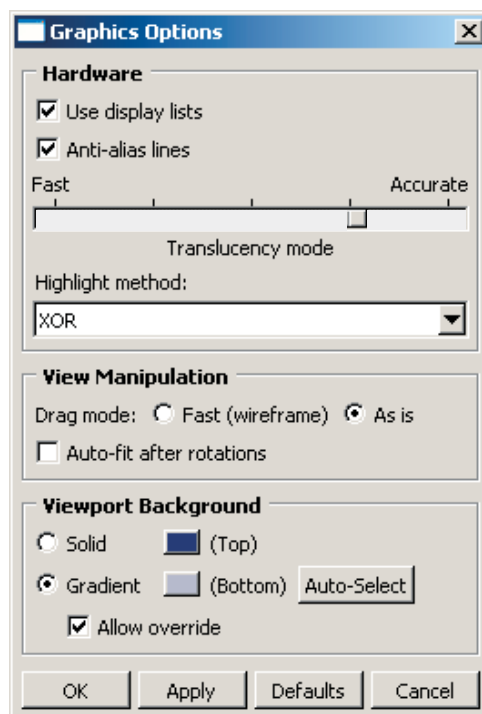


Figure 5-1 The **Graphics Options** dialog box.

Table 5-1 Tuning parameters.

Parameter	Standard value	Modify using Graphics Options dialog box	Modify only on startup
<i>displayLists</i>	On	Yes	No
<i>antiAlias</i>	On	Yes	No
<i>translucencyMode</i> ²	More accurate than fast	Yes	No
<i>highlightMethod</i> ³	Hardware	Yes	No
<i>highlightMethodHint</i>	Hardware	Yes	No
<i>dragMode</i>	As-is	Yes	No
<i>autoFitAfterRotate</i>	Off	Yes	No
<i>backgroundColor</i>	#333366	Yes	No

Parameter	Standard value	Modify using Graphics Options dialog box	Modify only on startup
<i>backgroundBottomColor</i>	#acacc1	Yes	No
<i>backgroundStyle</i>	Gradient	Yes	No
<i>backgroundOverride</i>	On	Yes	No
<i>doubleBuffering</i>	On	No	No
<i>polygonOffsetConstant</i>	0.0 to 100.0	No	No
<i>polygonOffsetSlope</i>	0.0 to 100.0	No	No
<i>printPolygonOffsetConstant</i>	0.0 to 100.0	No	No
<i>printPolygonOffsetSlope</i>	0.0 to 100.0	No	No
<i>textureMapping</i>	On	No	No
<i>printTextureMapping</i>	On	No	No
<i>vertexArrays</i>	On	No	No
<i>vertexArraysInDisplayLists</i>	On	No	No
<i>backfaceCulling</i>	On	No	No
<i>directRendering</i>	On	No	Yes
<i>accelerateOffScreen</i>	Off	No	Yes
<i>backingStore</i>	On	No	No
<i>hardwareAcceleration</i> ⁴	On	No	Yes
<i>hardwareOverlay</i>	None	No	Yes
<i>hardwareOverlayAvailable</i> ⁵	None	No	N/A
<i>shadersAvailable</i> ⁵	None	No	N/A
<i>viewManipDisplayListThreshold</i> ¹	40	No	No
<i>contourRangeTexturePrecision</i>	5.0×10^{-6}	No	No

¹The threshold is only used in the Visualization module of Abaqus/CAE (Abaqus/Viewer) when display lists are enabled.

²Translucency mode settings for rendering of translucent objects range from 1 (optimized for performance) to 5 (optimized for accuracy). The default value is 4.

³The highlight method is indirectly set by setting the *highlightMethodHint* parameter. Abaqus uses this value to determine an appropriate setting for *highlightMethod*.

⁴Hardware acceleration is applicable only to Windows platforms.

⁵You cannot directly set the *hardwareOverlayAvailable* parameter or the *shadersAvailable* parameter. Abaqus automatically sets these parameters by detecting the available hardware on your system.

5.3.3 Using the Abaqus Scripting Interface to tune the graphics parameters

You can enter Abaqus Scripting Interface commands in the command line interface to tune your graphics parameters and to find out information about the graphics adapter installed on your system. This section explains how to use the Abaqus Scripting Interface to modify the graphics options; the Abaqus Scripting Interface is described in detail in the Abaqus Scripting User's Guide.

In general, you should use the default values for most of the parameters. However, Abaqus provides the capability to modify parameters to fix the following specific problems:

- The *hardwareAcceleration* parameter controls a number of different graphics tuning parameters and generally should not be modified. Hardware acceleration options are discussed in “Hardware acceleration (all platforms),” Section 5.1.1.
- The *hardwareOverlay* parameter is controlled by the *hardwareOverlayAvailable* parameter. If your system supports hardware overlay planes, Abaqus/CAE and Abaqus/Viewer will use them by default. If your system supports hardware overlay planes but viewports display a solid color and will not display a model, you may need to manually set *hardwareOverlay*=OFF.
- The *contourRangeTexturePrecision* parameter sets the tolerance used when computing the appropriate scale for transforming result (contour) values to texture values. When set too low, the “out of range” colors may be shown incorrectly for values near the range limits.
- Some graphics adapters do not support the use of textures to generate contour plots properly. If you experience problems displaying contour plots (for example, all contours appear gray or the system aborts), you need to set *textureMapping*=OFF to emulate texture mapping in software. Similarly, if you experience problems printing contour plots, you need to set *printTextureMapping*=OFF.
- Some graphics adapters do not fully support the use of vertex arrays to process information about vertices. Some specific problems indicate that vertex arrays are not fully supported: when you drag the radius of a circle in the Sketcher, the circle is not visible; when you display an *X-Y* plot, the axis labels are not visible; and some facets in the shaded display of a mesh are missing. If you experience any of these problems, set *vertexArraysInDisplayLists*=OFF. If this does not resolve the problem, suppress the use of vertex arrays altogether by setting *vertexArrays*=OFF.
- The *backfaceCulling* parameter controls the display of facets that are determined to be facing away from the viewer. If the front sides of elements appear to be missing in the display or if the display is incomplete, set *backfaceCulling*=OFF.
- You can disable direct rendering (set *directRendering*=OFF) for Linux systems that do not behave correctly when accessing the graphics hardware directly.
- You can disable hardware-accelerated off-screen rendering (set *accelerateOffScreen*=OFF) when you want printed images to be rendered without OpenGL hardware acceleration or if you experience problems with the Probe functionality in the Visualization module of Abaqus/CAE (Abaqus/Viewer).

- You can disable the backing store (set *backingStore*=OFF) when you want to conserve memory. When *accelerateOffScreen*=ON, the memory for the backing store is allocated from memory on the graphics card. When OFF, the memory for backing store is allocated from system memory. The backing store is generated by rendering the viewport to an off-screen area. Subsequent viewport refreshes are performed more quickly by copying the off-screen area to the viewport window. Even when *backingStore*=ON, the backing store will not be created if the viewport can be redrawn sufficiently quickly.
- The *translucencyMode* parameter determines whether Abaqus/CAE optimizes the rendering of translucent objects for performance, accuracy, or for a level in between. Lower values provide better performance, while higher values provide greater accuracy.
- The *polygonOffsetConstant* and *polygonOffsetSlope* parameters, which affect onscreen display, require manual tuning for each graphics adapter. On Linux systems the *printPolygonOffsetConstant* and *printPolygonOffsetSlope* parameters can generally be set equal to the same values as the corresponding onscreen display parameters. On Windows systems the *printPolygonOffsetConstant* and *printPolygonOffsetSlope* parameters do not generally need to be adjusted.
- The *viewManipDisplayListThreshold* parameter can be lowered if there is an unacceptable delay when initiating view manipulation operations in the the Visualization module. Increasing this value may increase the delay for large models but should produce improved graphics performance during the view manipulation. If set high with a large model, the delay can be many seconds and in excessive cases may exceed system graphics memory and result in an empty display (no visible model) for the view manipulation.

You can tune the graphics parameters using the following Abaqus Scripting Interface objects:

- **GraphicsOptions:** The members of the GraphicsOptions object determine the current graphics settings. These settings can be modified during a session using the **setValues** method. The arguments to the **setValues** method are described in “setValues,” Section 17.9.1 of the Abaqus Scripting Reference Guide.

You can view the current settings of the graphics parameters by entering the following command in the command line interface:

```
print session.graphicsOptions
```

The following output is typical:

```
{'accelerateOffScreen': OFF,
 'antiAlias': ON,
 'autoFitAfterRotate': OFF,
 'backfaceCulling': ON,
 'backgroundBottomColor': '#acacc1',
 'backgroundColor': '#333366',
 'backgroundOverride': ON,
 'backgroundStyle': GRADIENT,
 'backingStore': ON,
```

```

'contourRangeTexturePrecision': 5.0e-06
'directRendering': ON,
'displayLists': ON,
'doubleBuffering': ON,
'dragMode': AS_IS,
'graphicsDriver': OPEN_GL,
'hardwareAcceleration': ON,
'hardwareOverlay': OFF,
'hardwareOverlayAvailable': False,
'highlightMethod': SOFTWARE_OVERLAY,
'highlightMethodHint': (HARDWARE_OVERLAY,
    SOFTWARE_OVERLAY, XOR, BLEND),
'polygonOffsetConstant': 2.0,
'polygonOffsetSlope': 0.75,
'printPolygonOffsetConstant': 1.0,
'printPolygonOffsetSlope': 0.75,
'printTextureMapping': ON,
'shadersAvailable': True,
'stencil': False,
'textureMapping': ON,
'translucencyMode': 3,
'vertexArrays': ON,
'vertexArraysInDisplayLists': ON,
'viewManipDisplayListThreshold': 40})

```

Note: Some of the parameters listed above have been deprecated. For information on accessing deprecated parameters, see “BackwardCompatibility object,” Section 53.4 of the Abaqus Scripting Reference Guide.

The following command uses the `setValues` method to modify some members of the `GraphicsOptions` object:

```

session.graphicsOptions.setValues(autoFitAfterRotate=ON,
    dragMode=AS_IS)

```

You can enter this command in the command line interface.

- **GraphicsInfo:** The members of the `GraphicsInfo` object provide information about the graphics adapter installed on your system. This information may be useful for determining how to tune the graphics adapter. The members are described in “GraphicsInfo object,” Section 17.8 of the Abaqus Scripting Reference Guide. The members are for reference only and cannot be modified.

You can view the graphics information by entering the following command in the command line interface:

```

print session.graphicsInfo

```


The following output is typical on Windows platforms:

```
({'glRenderer': 'Quadro FX 560/PCI/SSE2',
  'glVendor': 'NVIDIA Corporation',
  'glVersion': (2, 0, '.3'),
  'glxClientVendor': None,
  'glxClientVersion': (None, None, None),
  'glxServerVendor': None,
  'glxServerVersion': (5, 1, None)})
```

Tuning the `polygonOffsetConstant` and `polygonOffsetSlope` parameters

If display lists are enabled, you will not see the effect of tuning these parameters; therefore, you must toggle off **Use display lists** before attempting to tune your graphics adapter. Alternatively, you can enter the following command in the command line interface:

```
session.graphicsOptions.setValues(displayLists=OFF)
```

Setting drag mode to `AS_IS` is helpful for fine tuning the parameters. Rotating the view interactively will show you if minor adjustments are necessary.


```
session.graphicsOptions.setValues(dragMode=AS_IS)
```

It is recommended that you tune *polygonOffsetConstant* first, then tune *polygonOffsetSlope*. To tune these parameters, you should first display the part that is generated by the example script in “Creating a part,” Section 3.1 of the Abaqus Scripting User’s Guide. To retrieve the script, use the following command in a command prompt window (operating system shell):

```
abaqus fetch job=modelAExample
```

Select **File**→**Run Script** from the main menu bar, select the example script from the **Run Script** dialog box that appears, and click **OK**. The example script creates a new viewport; however, Abaqus should display only one viewport while you are trying to tune the graphics parameters. Select any old viewports and delete them by selecting **Viewport**→**Delete Current** from the main menu bar.

To tune the `polygonOffsetConstant` parameter:

1. From the **Views** toolbar, apply the bottom view .
2. In the command line interface, enter the following commands:

```
session.graphicsOptions.setValues(polygonOffsetSlope=0.0)
session.graphicsOptions.setValues(polygonOffsetConstant=0.0)
```

3. Display the bottom view again to refresh the display.
4. Examine the model for visible lines. If all lines are not visible, repeat Step 2, increasing the value of the polygon offset constant by a small increment; for example, `0.1`. The normal

range for this parameter is between 0.5 and 1.5, and two decimal places usually provide sufficient precision. You should attempt to find a value as small as possible that produces a correct display. Values that are too large may cause the lines to appear to float above the part. The following figures illustrate the lines that should be visible in your model.

Figure 5–2 illustrates the model with an incorrect value for *polygonOffsetConstant*; some lines are missing between the shaded areas.

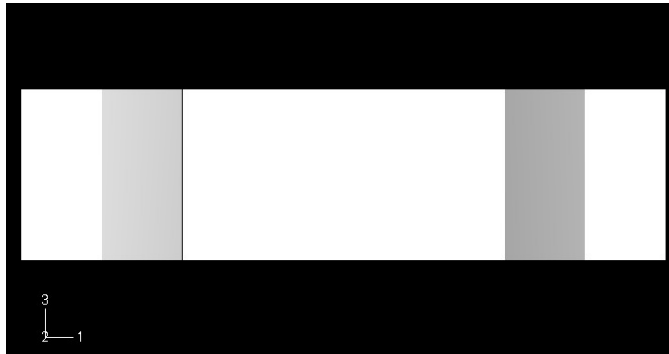


Figure 5–2 Incorrect value for *polygonOffsetConstant*.


Figure 5–3 illustrates the model with a correct value for *polygonOffsetConstant*; all the shaded areas are separated by lines.



Figure 5–3 Correct value for *polygonOffsetConstant*.

After you have derived a value for *polygonOffsetConstant*, you can tune *polygonOffsetSlope*.

To tune the `polygonOffsetSlope` parameter:

1. From the **Views** toolbar, apply the isometric view . This view shows edges at a 45° angle on at least one axis.
2. In the command line interface, enter the following command:

```
session.graphicsOptions.setValues (polygonOffsetSlope=1.0)
```

3. Examine the model for visible lines. If all lines are not visible, repeat Step 2, increasing the value of the polygon offset slope by a small increment; for example, **0.1** or **0.05**. The normal range for this parameter is between **1.0** and **2.0**, and two decimal places usually provide sufficient precision. If the *polygonOffsetConstant* value is too low, it may force the *polygonOffsetSlope* to be high. High values of *polygonOffsetSlope* may cause the edges of hidden polygons to show through where they meet visible polygons. In this case, raise the *polygonOffsetConstant* value to get an acceptable value for *polygonOffsetSlope*.

Figure 5–4 illustrates the model with an incorrect value for *polygonOffsetSlope*; some line segments are missing between the shaded areas, there is a line missing inside the hole, and some lines appear dashed when they should appear solid.

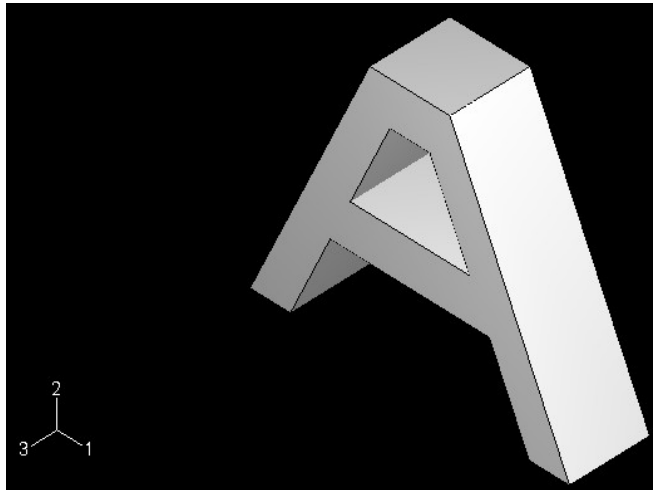


Figure 5–4 Incorrect value for *polygonOffsetSlope*.

Figure 5–5 illustrates the model with a correct value for *polygonOffsetSlope*; all the shaded areas are separated by solid lines.

Test the tuned values of *polygonOffsetConstant* and *polygonOffsetSlope* on several models to make sure the values are satisfactory. When you have finished tuning the graphics parameters, you should return your settings for display lists and drag mode to the original values.

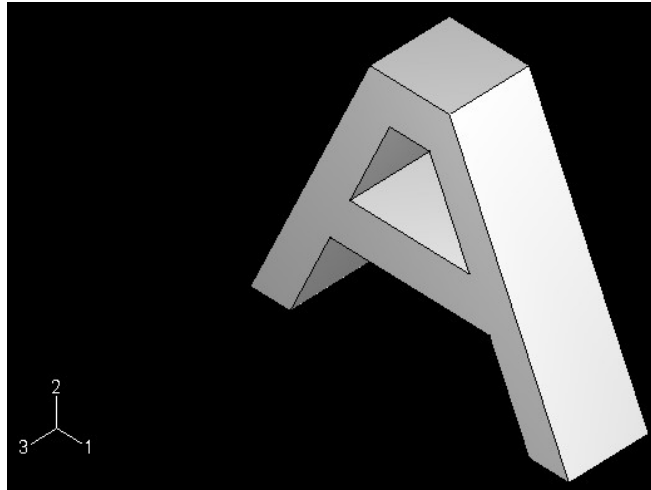


Figure 5–5 Correct value for *polygonOffsetSlope*.

When you are satisfied with the parameter settings, you should modify the environment file as described in “Making your graphics configuration permanent,” Section 5.3.4.

5.3.4 Making your graphics configuration permanent

Once you are satisfied with the values you have specified for the tuning parameters, you can make the changes permanent by including an **onCaeGraphicsStartup** function in your environment file (**abaqus_v6.env**). To avoid conflicts with other graphics settings, you should add the customized **onCaeGraphicsStartup** function only to the environment file in your home directory (see “Using the Abaqus environment file,” Section 4.1, for details on environment file location and execution).

The members of the **DefaultGraphicsOptions** object determine the default graphics settings that are enabled when you start a session and when you click **Defaults** in the **Graphics Options** dialog box. You can view the default graphics settings by entering the following command in the command line interface:

```
print session.defaultGraphicsOptions
```

You use the **setValues** method in the environment file (**abaqus_v6.env**) to modify the members of the **DefaultGraphicsOptions** object. To set your default graphics options in the environment file, you must use the **session.defaultGraphicsOptions** object instead of the **session.graphicsOptions** object that you modified from the command line interface. The following example environment file configures your Abaqus/CAE and Abaqus/Viewer graphics settings:

```
def onCaeGraphicsStartup():  
    session.defaultGraphicsOptions.setValues(  
        polygonOffsetConstant=1.0,  
        polygonOffsetSlope=1.2)
```


Appendix A: System requirements notes

A.1 System software

This appendix includes general information about the optional and required prerequisite system software for Abaqus. The definitive list of supported platforms and other system requirements is given in the Dassault Systèmes Program Directory.

The Program Directory is additional documentation, similar to release notes, available at <http://media.3ds.com/support/progdir>. Choose SIMULIA Abaqus as the product **Line** and Abaqus 6.14 as the **Level**, then choose **Prerequisites** in the left-hand pane. A support contract and private login account are required for access (see https://iam.3ds.com/self_service/login/service/websupport/).

Some Abaqus functionality requires additional software tools or components:

- A FORTRAN or C++ compiler is required for compiling user subroutines but is not required for running Abaqus without user subroutines.
- Message Passing Interface (MPI) components are required to use MPI-based parallel execution in Abaqus/Standard, to use domain-level parallelization in Abaqus/Explicit, or to run any job in Abaqus/CFD (regardless of the number of CPUs). See “Visual C++ and MPI Libraries,” Section 2.4.1, and check the Program Directory for supported MPI software and hardware interconnects.
- X-Windows is required on Linux platforms. The OpenGL shared library is required on the computer where Abaqus/CAE and Abaqus/Viewer are run.

A.2 Disk space

Estimates of disk space requirements are provided during the analysis input file processor stage of an Abaqus analysis. Swap space should typically be set to approximately three times the amount of physical memory installed on the computer.

Abaqus analyses can create large scratch files that are written to the directories specified by environment file parameters. These parameters can be changed from their defaults to point to file systems that are large enough to contain the scratch files. These variables are described in “Memory and disk management parameters,” Section 4.1.1.

A.3 Memory

If Abaqus is page faulting excessively, additional memory will reduce the page-fault rate, as well as the execution time. The requirements are highly job dependent. Abaqus will perform better if more memory is available; to run large problems, significantly more memory than the minimum is required.

A.4 Compilers

A FORTRAN or C++ compiler is required to compile and link user subroutines for Abaqus. SIMULIA cannot guarantee compatibility of Abaqus with user subroutines written in programming languages other than FORTRAN or C++. For more information, see “User subroutines and utilities,” Section 18.1 of the Abaqus Analysis User’s Guide.

User-written postprocessing programs created with the **abaqus make** utility in Abaqus 6.14 should be compiled using the compiler for the program language and linked using a C++ compiler. Therefore, both a FORTRAN and C++ compiler are required for user-written FORTRAN programs. User-written programs that were compiled and linked with the **abaqus make** utility in a previous release of Abaqus (before Abaqus 6.14) and processing only the results (**.fil**) file can still be used with an Abaqus 6.14 results file without any change. In these instances no C++ compiler is required.

A.5 MPI

Message Passing Interface (MPI) components must be installed to use MPI-based parallel execution in Abaqus/Standard, to use domain-level parallelization in Abaqus/Explicit, or to run any job in Abaqus/CFD (regardless of the number of CPUs). If your Abaqus users will be running these types of simulations, you must have the required MPI components preinstalled or allow the Abaqus installer to install them for you. MPI is a middleware scheme used to facilitate interprocessor communication. MPI-based parallelization is available for both computer clusters and shared memory architecture platforms. The necessary MPI software is included with Abaqus and is installed during the Abaqus product installation on most platforms; see “Visual C++ and MPI Libraries,” Section 2.4.1.

Appendix B: Abaqus release directories and files

The Abaqus directory structure is designed to facilitate multiple releases of Abaqus, as well as other SIMULIA products. The directory structure for Abaqus 6.12 (and later) is different from the structure used in Abaqus 6.11 (and earlier).

B.1 The SIMULIA parent directory

All files associated with Abaqus licensing and documentation installations are stored in the SIMULIA parent directory. It is recommended that Abaqus products are also installed within the SIMULIA parent directory. The suggested name for the SIMULIA parent directory is **SIMULIA**; throughout this guide, the SIMULIA parent directory is referred to as *simulia_dir* in path listings. The following directories will be created under *simulia_dir*, depending on which of the installation options are chosen:

License		Default directory for all the files associated with licensing (license file, server log file, and license options file).
	installation_info	Directory containing the FLEXnet license startup command and log files from the licensing installation procedure and Windows uninstaller (if used).
Documentation		Default directory for all files associated with documentation.
	installation_info	Directory containing the command to restart the web server and log files from the documentation installation procedure and Windows uninstaller (if used).
	docs	Directory containing release-specific book files for an HTML plus PDF documentation installation.
	pdf_docs	Directory containing release-specific book files for a PDF-only documentation installation.

An illustration of the SIMULIA parent directory structure is shown in Figure B-1.

B.2 The Abaqus parent directory

All files associated with an Abaqus product installation are stored in the Abaqus parent directory. It is recommended that the Abaqus parent directory be located within the SIMULIA parent directory, and the suggested path is **SIMULIA/Abaqus** (see Figure B-1). Throughout this guide, the Abaqus parent directory is referred to as *abaqus_dir*. The following directories will be created under *abaqus_dir*, depending on which of the installation options are chosen:

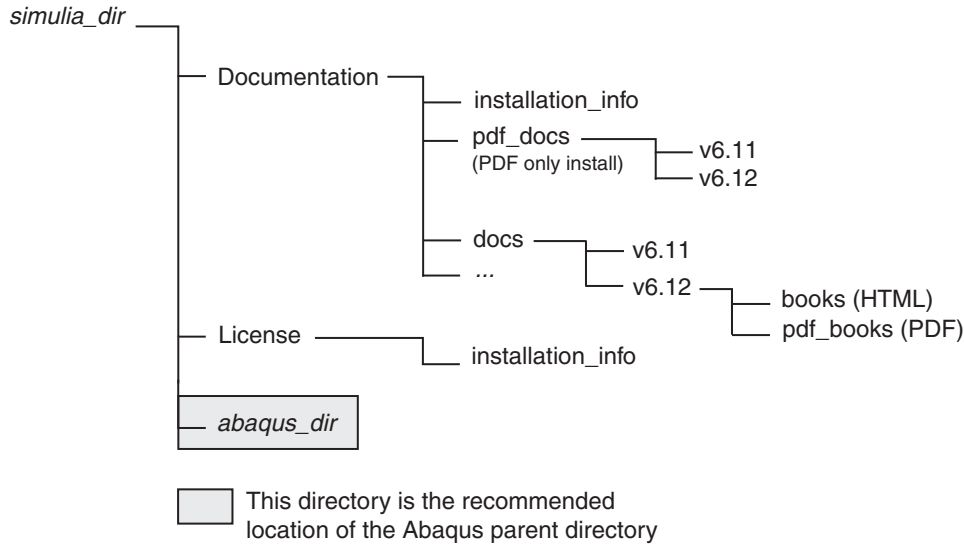


Figure B-1 The SIMULIA parent directory structure.

Commands	Directory containing links (Linux) to, or batch files (Windows) for, the driver commands for each release.
<i>release</i>	Release-specific parent directory for each installed release. For example, the default directory name for Abaqus 6.14-1 is 6.14-1 .
/api/cse	SIMULIA Co-Simulation Engine Application Programming Interface as well as documentation and examples.
/CAEresources	Configuration files.
/code	Abaqus executables and command procedures, third-party executables, and libraries. Also contains header files used for building postprocessing programs with the abaqus make utility.
/code/bin	The Abaqus executables and command procedures.

APPENDIX B: Abaqus RELEASE DIRECTORIES AND FILES

<code>/Help</code>	Files used for context-sensitive help in Abaqus/CAE.
<code>/installation_info</code>	Product installation and verification log files as well as the Windows uninstaller log file (if used).
<code>/samples</code>	Input files and directories associated with the installed products, including installation verification problems, timing test problems, files for the Introduction to Abaqus seminar, files for the Getting Started tutorial guides, files for application briefs, files used with the abaqus findkeyword utility, and files from the Example Problems, Benchmarks, and Verification Guides.
<code>/SMA</code>	Miscellaneous information and site-specific files.
<code>/SMA/site</code>	Site-specific files: the Abaqus environment file (abaqus_v6.env), a sample environment file (abaqusinc.env), include files (file_name.inc), a data file containing information used in the verification procedure (chksum.dat), and the platform computer tables.
<code>/tools</code>	Python interpreter.
<code>/code/python/lib/abaqus_plugins</code>	Example Python modules for Abaqus/CAE plug-ins.

An illustration of the Abaqus parent directory structure is shown in Figure B–2.

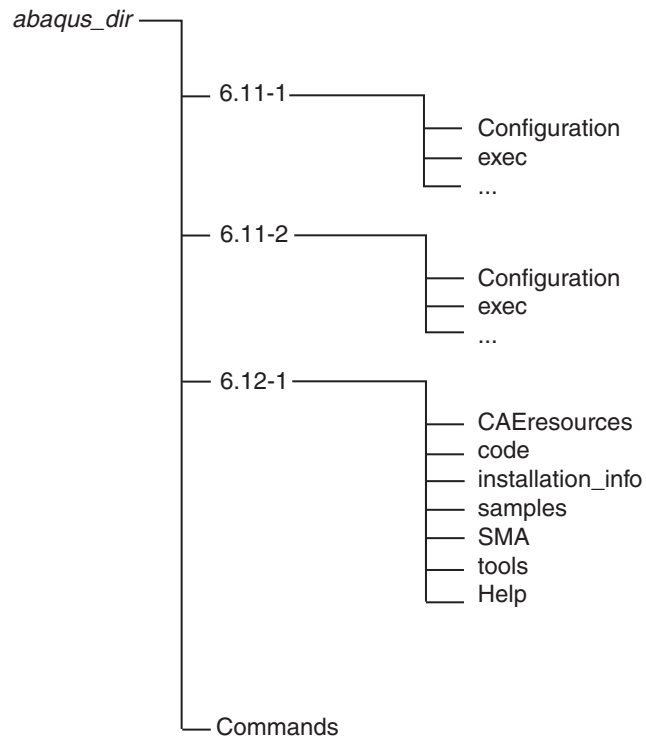


Figure B-2 The Abaqus parent directory structure.

Appendix C: Configuring Abaqus documentation

Abaqus HTML documentation is installed separately from the licensing and product installations and is viewed through a web browser. It is recommended that you install and start the Abaqus web server to serve the HTML (and PDF) files to your users' web browsers. You can install HTML documentation without a web server; however, in this case no search functionality is available. For information on the documentation installation options, see “Abaqus documentation installation details,” Section 2.2.

This appendix contains information related to configuring the web server and Abaqus HTML documentation. You must configure the Abaqus HTML documentation if you use an existing non-Abaqus web server during the HTML documentation installation procedure, if you install Abaqus products before installing Abaqus HTML documentation, or if you do not specify the URL for HTML documentation during the product installation.

For the latest information on supported web servers and configuring existing non-Abaqus web servers, see the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base.

Note: When you install the Abaqus HTML documentation, the PDF files are also installed. Both the HTML and PDF versions are available through a web browser, via a link from the HTML collection home page (`index.html`) to the PDF collection index file (`index.pdf`).

C.1 Using an existing non-Abaqus web server

When you install Abaqus documentation and you choose to use an existing non-Abaqus web server, you must configure your server manually to access the HTML (and PDF) documentation. If you want to access the HTML documentation from the **Start** menu (Windows platforms only), you must modify the `documentation.htm` file after you configure the server (see “Setting the documentation URL in the `documentation.htm` file,” Section C.1.2).

C.1.1 Configuring an existing non-Abaqus web server

You can configure an existing non-Abaqus web server to access the Abaqus HTML documentation using the following procedures. For the latest information about non-Abaqus web server configurations, see “How to install Abaqus HTML documentation using an existing web server” in the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base.

Linux platforms

1. Install the Abaqus HTML documentation in the SIMULIA parent directory (see “Installation procedures,” Section 2.1).

2. Create an alias in your web server's configuration file for the root directory of the HTML documentation. For example, on an Apache web server you must add

```
Alias /v6.14 "simulia_dir/Documentation/docs/v6.14"
```

where *simulia_dir* refers to the HTML documentation installation parent directory.

3. Create an alias in your web server's configuration file for the Taxis executable. For example, on an Apache web server you must add

```
ScriptAlias /taxis/ "simulia_dir/Documentation/scripts/taxis/"
```

4. Restart your web server to reread the web server's configuration file.
5. Access the Abaqus HTML documentation with the following URL:

```
http://computername:port_number/v6.14
```

where *computername* is the fully qualified domain name of your web server and *port_number* is the port number that your web server is running on (:*port_number* needs to be specified only if your web server is not running on the default port of 80).

Windows platforms

1. Install the Abaqus HTML documentation in the SIMULIA parent directory. The recommended location for the SIMULIA parent directory is **C:\SIMULIA**.
2. Create an alias in your web server's configuration file for the root directory of the HTML documentation. For example, on an Apache web server you must add

```
Alias /v6.14 "simulia_dir/Documentation/docs/v6.14"
```

where *simulia_dir* refers to the HTML documentation installation parent directory.

3. Create an alias in your web server's configuration file for the Taxis executable. For example, on an Apache web server you must add

```
ScriptAlias /taxis/ "simulia_dir/Documentation/scripts/  
taxis.exe/"
```

4. Restart your web server to reread the web server's configuration file.
5. Access the Abaqus HTML documentation with the following URL:

```
http://computername:port_number/v6.14
```

where *computername* is the fully qualified domain name of your web server and *port_number* is the port number that your web server is running on (:*port_number* needs to be specified only if your web server is not running on the default port of 80).

6. To access the Abaqus HTML documentation from the **Start** menu, see the instructions in "Setting the documentation URL in the **documentation.htm** file," Section C.1.2.

C.1.2 Setting the documentation URL in the `documentation.htm` file

After you configure an existing non-Abaqus web server on Windows platforms, you can modify the following file to access the Abaqus HTML documentation from the **Start** menu:

```
simulia_dir/Documentation/installation_info/v6.14/documentation.htm
```

where *simulia_dir* refers to the HTML documentation installation parent directory. The line in the `documentation.htm` file should have the following form:

```
<META HTTP-EQUIV="Refresh" CONTENT="0;
  URL=http://computername:port_number/v6.14">
```

where *computername* is the fully qualified domain name of your web server and *port_number* is the port number that your web server is running on (*:port_number* needs to be specified only if your web server is not running on the default port of 80). For example, a valid parameter definition is

```
<META HTTP-EQUIV="Refresh" CONTENT="0;
  URL=http://velouria.xyz.com:2080/v6.14">
```

C.2 Setting the documentation URL after installation

If you install Abaqus products before installing Abaqus HTML documentation or if you do not specify the URL for HTML documentation during the product installation, you must add the URL to the `abaqus_v6.env` and `url.js` files.

C.2.1 Setting the `doc_root` parameter in the `abaqus_v6.env` file

The documentation URL is required in the `abaqus_v6.env` file to provide access to the HTML documentation from Abaqus. The `abaqus_v6.env` file is located in the *abaqus_dir*/6.14-n/SMA/site/ directory, where *abaqus_dir* is the Abaqus parent directory and *n* refers to the Abaqus update. The required parameter definition is as follows:

- HTML and PDF documentation installation with web server

```
doc_root="http://computername:port_number/v6.14"
```

where *computername* is the fully qualified domain name of the web server and *port_number* is the port number used by the web server (if required). For example, a valid parameter definition is

```
doc_root="http://willow.xyz.com:2080/v6.14"
```

- HTML and PDF documentation installation with no web server

```
doc_root="file:///simulia_dir/Documentation/docs/
  v6.14/index.html"
```

where *simulia_dir* is the HTML documentation installation parent directory. For example, valid parameter definitions are

Linux platforms

```
doc_root="file:///usr/local/SIMULIA/Documentation/docs/
v6.14/index.html"
```

Windows platforms

```
doc_root="file:///d:/SIMULIA/Documentation/docs/
v6.14/index.html"
```

- PDF-only documentation installation (no web server). In this case you must set the values of two parameters as follows:

```
doc_root_type="pdf"
doc_root="simulia_dir"
```

where *simulia_dir* is the path to the installation base directory.

C.2.2 Setting the documentation URL in the `url.js` file

The documentation URL is required in the `url.js` file to enable links from help windows in Abaqus/CAE to associated topics in the Abaqus HTML documentation. The `url.js` file is located in the *abaqus_dir/6.14-n/Help/redirects* directory, where *abaqus_dir* is the Abaqus parent directory and *n* refers to the Abaqus update. The line in the `url.js` file should have the following form:

- HTML documentation installation with web server

```
var baseURL="http://computername:port_number/v6.14/books/";
```

where *computername* is the fully qualified domain name of the web server and *port_number* is the port number used by the web server (if required). For example, a valid definition is

```
var baseURL="http://willow.xyz.com:2080/v6.14/books/";
```

- HTML documentation installation with no web server

```
var baseURL="file:///simulia_dir/Documentation/docs/
v6.14/books/";
```

where *simulia_dir* is the HTML documentation installation parent directory. For example, valid definitions are

Linux platforms

```
var baseURL="file:///usr/local/SIMULIA/Documentation/docs/
v6.14/books/";
```


Windows platforms

```
var baseUrl="file:///d:/SIMULIA/Documentation/docs/  
v6.14/books/";
```


Appendix D: Accessing remote file systems for installation and execution

This appendix describes accessing remote file systems for Abaqus installation and execution.

D.1 Accessing the installation files from a remotely mounted DVD

This section describes the procedure to access the installation files from a remote DVD device. The DVD device must be properly mounted. If the device does not mount automatically, check the DVD mount command for the platform on which the device exists.

Once you have completed the following steps, you can use the installation procedures to install Abaqus:

Linux platforms

1. Locate the Abaqus products DVD.
2. Copy the following items from the top level of the DVD to a location that is accessible by the target computer:
 - The directory (and its entire contents) corresponding to the platform on which you are installing
 - The **common** directory (and its entire contents)
 - The **DSL** directory
 - The **setup** executable file

The UNIX utilities **cp** and **rcp** are convenient for copying these items. When copying files between different platforms (particularly between UNIX and Windows), special care may be needed to preserve the original file permissions and the file name case. In general, read and execute permissions on all files are sufficient for proper execution.

3. Create an Abaqus parent directory (**SIMULIA/Abaqus**) on the machine where you want to install Abaqus; see “Installation procedures,” Section 2.1, for details.
4. From the Abaqus parent directory, execute *prod_dir/setup* to launch the installation procedure, where *prod_dir* is the location of the copied installation files.

Windows platforms

You can install Abaqus from a remote DVD device if it has been defined as a share. Setting up the DVD device as a share must be performed by a user with Administrator privileges. To install Abaqus from a shared remote DVD, connect to that drive and perform the installation as if the drive were local (see “Installation procedures,” Section 2.1). Universal Naming Convention (UNC)

paths cannot be used to run the installer executable (**setup.exe**) but can be entered as the target installation directory during the installation. See “Information to enter during product installation,” Section 2.4.2.

D.2 Client installation for Windows

You can install Abaqus on a mounted network drive and configure your users’ computers to run Abaqus as a client. See “Client installation on Windows” in the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base.

You can use this technique to configure multiple computers to run Abaqus from a central server without installing Abaqus on each computer. The client computer must be able to access the directory containing the Abaqus installation on the network and the Abaqus license server.

D.3 Running Abaqus remotely on Linux

It is possible to run Abaqus on NFS-mounted file systems or to export the display from a remote computer; however, users may experience performance and reliability problems with these alternatives.

D.3.1 NFS-mounted file systems

There are several scenarios for running Abaqus on NFS-mounted file systems; the impact of using NFS-mounted file systems varies with the method of NFS use. The most common scenarios for running Abaqus on NFS-mounted file systems are as follows:

- Abaqus is installed on a remote file system. The CPU, save directory (see “Job variables,” Section 4.1.10), and scratch directory are local (on the computer where Abaqus will be run).
In this scenario Abaqus executables and shared libraries are loaded into local memory as they are needed across the network from the file system where Abaqus is installed. Processing and output occur locally. If there is sufficient local memory to prevent frequent paging of the code, network traffic will be relatively light. When local memory is insufficient to prevent paging, performance will suffer and reliability may be impacted.
- Abaqus is installed on a remote file system. The save directory and/or scratch directory is/are not local to the CPU where Abaqus is executed.
In this scenario program files and data used during execution are written across the network. Potentially large volumes of data will be transferred across the network, and performance may be impacted adversely. Abaqus performance may be extremely slow, and other users of the network may be affected because the network could become saturated. In addition, Abaqus does not trap file errors arising from NFS, so a failure in accessing NFS-mounted files, even temporary, will cause the Abaqus job to fail. The use of Abaqus in this configuration should be avoided whenever possible. If this configuration is required for an Abaqus/Standard job, the user should move the save directory to the NFS-mounted file system before moving the scratch directory.

D.3.2 Exporting the display

This configuration is relevant only for Abaqus/CAE and Abaqus/Viewer. In this configuration Abaqus is installed on a remote file system and the CPU, save directory, and scratch directory are located on the same remote computer, which is accessed through remote login. All processing occurs on the remote computer, and only output messages or graphics are exported to the local computer and display. This method is known to cause performance problems. Minor incompatibilities between OpenGL and GLX libraries can introduce significant graphics problems and, in some cases, can prohibit Abaqus/CAE or Abaqus/Viewer from running. The use of Abaqus in this configuration is not supported and should be avoided whenever possible.

D.4 Using a network ODB connector

Users can create a network ODB connector to access an output database on a remote computer (see “Accessing an output database on a remote computer,” Section 9.3 of the Abaqus/CAE User’s Guide). Abaqus/CAE or Abaqus/Viewer can start the server on the remote system and assign port numbers if the following are true:

- The user name on the remote host is the same as the user name on the local system.
- The remote shell command (**rsh**) or the secure shell command (**ssh**) is configured so that it does not prompt the user for a password.

Abaqus checks the security of the connection by passing a key back and forth between the server and the client. For information about how the key is generated, see the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base. If a file called **.abaqus_net_passwd** is present in the user’s home directory on the remote system, Abaqus uses the password in the file for authentication instead of the key generated by Abaqus. Abaqus checks that the user is the only account with permission to read and write to the password file. In addition, the user must update the file after 30 days, and the password must be at least eight characters long. These files are described in “Network output database file connector,” Section 3.2.24 of the Abaqus Analysis User’s Guide.

If users experience problems establishing communication or if the user names are different, they can start the network ODB server manually from the command line using the **abaqus networkDBConnector** execution procedure on the remote computer. Abaqus uses the password in **.abaqus_net_passwd** to authenticate the connection between the client and the server if the user starts the network ODB server manually. If **.abaqus_net_passwd** does not exist in the user’s directory on the remote system, the user cannot start the network ODB server from the command line.

You can disable network odb connectors by removing **dmbwtr** and **dmbwtrd** from the *abaqus_dir/release/code/bin/SMAExternal/dmbwtr/* directory, where *abaqus_dir* is the Abaqus parent directory, and *release* is the release of Abaqus you are using.

Appendix E: Verification procedure

The verification procedure checks the installation of all licensed Abaqus products and reports on the success or failure of verification for each product. The verification procedure runs automatically after the Abaqus installer has finished, but only a subset of the products are verified. The verification procedure can also be run as an Abaqus command option and from the **Start** menu on Windows platforms at any time following the installation.

The procedure runs verification problems for each licensed product and compares the results to reference values. The command line options are not affected by license type; that is, the verification procedure attempts to verify all products named in the command. Before the verification procedure is run, licensing requirements are checked for the selected product(s). If a teaching academic license is detected, the verification procedure that is run during installation checks only Abaqus/Standard, Abaqus/Explicit, and Abaqus/CAE.

Product verification is skipped if the product is not licensed. The command line option **-NoLicenseCheck** can be used to bypass these checks.

The verification problems for all Abaqus products are extracted automatically from the disk during the installation. When it runs, the verification procedure attempts to create a new directory called **verify** in the current working directory. During the Abaqus installation procedure, the **verify** directory is created in the release **installation_info** directory.

To run the verification procedure from the command line:

Run the procedure by typing the following command:

```
abaqus verify [-adams -all -ams -tosca -cae -catiaiv4 -catiaiv5
-cfd -contextHelp -cPerf -dcatiaiv5 -design -docUrl -exp -foundation
-help -install -ioPerf -log -make -moldflow -noGui
-NoLicenseCheck -parallel -param -parasolid -proe
-retainFiles -scripting -std -swi -user_exp -user_std
-verbose -viewer]
```

Common options

-all	Verify all licensed products. All other verification options except log and NoLicenseCheck are ignored.
-help	Print summary of verify usage.
-install	Verify only the main Abaqus products. Abaqus/Standard with user subroutines and Abaqus/Explicit with user subroutines will be tested only if your system has a Fortran compiler available.
-log	Direct all output to a file named verify.log in the current working directory.

APPENDIX E: VERIFICATION PROCEDURE

Product options

-ams	Verify Abaqus/AMS.
-tosca	Verify Tosca for Abaqus.
-cae	Verify Abaqus/CAE.
-cfd	Verify Abaqus/CFD.
-design	Verify Abaqus/Design.
-exp	Verify Abaqus/Explicit.
-foundation	Verify Abaqus/Foundation.
-param	Verify parametric studies in Abaqus.
-std	Verify Abaqus/Standard.
-user_exp	Verify Abaqus/Explicit with user subroutines.
-user_std	Verify Abaqus/Standard with user subroutines.
-viewer	Verify Abaqus/Viewer.

Translator options

-adams	Verify Abaqus Interface for MSC.ADAMS.
-catia v4	Verify Geometry Translator for CATIA V4.
-catia v5	Verify Geometry Translator for CATIA V5.
-dcatia v5	Verify Direct Geometry Import for CATIA V5 (Direct Geometry Import is a component of the CATIA V5 Associative Interface). Verifies geometry import capability in Abaqus/CAE; does not verify installation or functionality of the CATIA V5 Associative Interface plug-in.
-moldflow	Verify Abaqus Interface for Moldflow.
-parasolid	Verify Geometry Translator for Parasolid.
-proe	Verify Geometry Translator for Pro/ENGINEER (the Geometry Translator is a component of the Pro/ENGINEER Associative Interface). Verifies geometry import capability in Abaqus/CAE; does not verify installation or functionality of the Pro/ENGINEER Associative Interface plug-in.

-swi	Verify Geometry Translator for SolidWorks (the Geometry Translator is a component of the SolidWorks Associative Interface). Verifies geometry import capability in Abaqus/CAE; does not verify installation or functionality of the SolidWorks Associative Interface plug-in.
-------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Additional options

-contextHelp	Verify Abaqus/CAE context-sensitive help functions.
-cPerf	Verify Abaqus/CAE performance.
-docUrl	Verify Abaqus HTML documentation URL.
-ioPerf	Verify I/O performance.
-make	Verify the abaqus make utility.
-noGui	Verify the -noGUI option for Abaqus/CAE and Abaqus/Viewer.
-NoLicenseCheck	Requires -all , -install , or a list of product options. Run the verification procedure for the specified products but bypass all licensing checks. The procedure attempts to verify all selected products regardless of licensing.
-parallel	Verify Abaqus analysis jobs using parallelization.
-scripting	Verify the Abaqus scripting interface.
-retainFiles	Retain all verification files in the verify directory (by default, the files are deleted after a successful verification).
-verbose	Include additional details for debugging purposes.

If a product selected for verification is not licensed, an Abaqus warning is displayed for the selected product and the verification of other selected products continues.

To run the verification procedure on Windows platforms:

1. From the taskbar, click **Start**.
2. From the menu, select **Programs→Abaqus release→Abaqus Verification**, where *release* corresponds to the release you wish to verify.

This procedure attempts to verify all licensed products. Use the command line option to verify individual products.

Reviewing and resolving verification procedure failures

If the verification procedure finishes successfully, all files and the **verify** directory are removed (unless you use the **retainFiles** option). Error diagnostics for all products that fail verification remain in the **verify** directory. It is very important that you review these error messages.

APPENDIX E: VERIFICATION PROCEDURE

The following suggestions may help you to correct common installation errors that cause the verification procedure to fail:

- Make sure that the license file was installed properly. If there are problems with the license file, error messages will be written to standard output.
- Make sure that you have not tried to execute Abaqus products for which you are not licensed.
- Make sure that the operating system and compiler level are consistent with those specified for this release in the Program Directory. (See <http://media.3ds.com/support/progdir>. Choose SIMULIA Abaqus as the product **Line** and Abaqus 6.14 as the **Level**, then choose **Prerequisites** in the left-hand pane.)

If the error messages and these suggestions are insufficient to verify the installation, check for information about installation problems, resolutions, and verification in the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base.

If you are still unable to resolve the problem, contact your local office or representative for help. An overview of support options is available in the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base.

Appendix F: Troubleshooting Abaqus FLEXnet licensing

This appendix addresses questions about FLEXnet network licensing. For more information on troubleshooting FLEXnet licensing, you can refer to the resources in the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base.

F.1 General questions

This section addresses some general questions about Abaqus FLEXnet licensing.

F.1.1 Are there limits to network size for FLEXnet network licensing to work?

The size of a network is limited by the requirement that all computers running Abaqus must be able to connect directly and regularly with the FLEXnet license server. If communication with the server takes too long, the client will spend more time communicating with the server than it does processing. Failure to communicate regularly will result in clients losing tokens and waiting while they are reacquired. The most basic test of network communication is the **ping** command. If a client and server cannot ping each other by name and IP address, network licensing will not work between the two computers. (However, the fact that the **ping** command functions properly does not necessarily guarantee that network licensing will work.)

F.1.2 Must there be a name server running for FLEXnet network licensing to work?

Some form of host name resolution is required to set up network licensing. If there is no NIS or DNS name server functionality on your network, then host files must be manually configured on each machine. For more information, see “DNS name resolution” in the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base.

F.1.3 How can I tell if a FLEXnet license file is installed?

The license file for Abaqus is usually installed in a directory called *simulia_dir/License* and is typically named **simulia.lic**. The **License** directory can be placed anywhere, but it usually resides within the SIMULIA parent directory.

F.1.4 What is the FLEXnet license server log file, and where should it be stored?

The server log file records all the license requests for Abaqus jobs and sessions (clients). It is stored in the Abaqus **License** directory and can be given any name you like. Usually the file is called `simuliaalm.log`.

F.1.5 What is the FLEXnet license options file, and where should it be stored?

The options file allows the license administrator to control various operating parameters of FLEXnet Licensing, such as reserving a number of tokens for certain users, computers, or domains on a network or restricting access to Abaqus license tokens. Although it can be stored anywhere and can be given any name you like, the recommended location and name for the options file is `simulia_dir/License/SIMULIALM.opt`. If you do not want to restrict access to Abaqus license tokens, you do not need a license options file.

After creating or modifying a license options file, you must use the **lmreread** tool to reread the license file and implement the new options (see “lmreread,” Section 3.6.6). The options file is also read when the license server is started. Some changes to the options file will not take immediate effect unless the license server is restarted.

A sample options file is shown in “Using the FLEXnet options file,” Section 3.7, and instructions for creating an options file are included in Chapter 5 of the FLEXnet Licensing End User Guide Version 11.6, listed under **Licensing** on the **Support** page at www.3ds.com/simulia.

F.2 FLEXnet license server operation

This section addresses questions that relate to the operation of the FLEXnet license server. The answers to these questions usually involve running one of the FLEXnet administration tools.

F.2.1 How do I update the license file for our FLEXnet license server?

To update a FLEXnet license file, you should terminate your license server, replace the old license file with the new license file, and restart the license server. If necessary, you can also update the license file without stopping the license server so that there will be no interruption to Abaqus users. Both techniques are described in detail in “Updating an Abaqus FLEXnet license file,” Section 3.2.

F.2.2 How can I tell if the FLEXnet license server is running?

The easiest way to see if a license server is running is to execute the command

```
abaqus licensing lmstat
```

This command will list the license servers that are running for a general broadcast. To see if a license server is running on a specific computer, you can enter the command

```
abacus licensing lmstat -c [port]@license_server_host
```

where *license_server_host* is the hostname of the license server that you want to query. If the license server is using a port that is not between 27000 and 27009, you must specify the port number as well.

F.2.3 How can I restart the FLEXnet license server if it is not running?

You must login on the license server host to restart the server (on Windows platforms you must login as Administrator) and then run the **lmgrd** program (see “FLEXnet license server manager lmgrd,” Section 3.5). For an alternate method, see “Starting the FLEXnet server using **LMTOOLS**,” Section 3.6.9.

F.2.4 How can I terminate an Abaqus FLEXnet license server?

You use the FLEXnet Licensing administration tool **lmdown** to terminate an Abaqus license server. If you use **lmdown** to terminate a license server that is part of a redundant license server configuration, all three license servers in the redundant configuration will be terminated. If you do not want to terminate all three servers, you must use an operating system utility, such as the **ps** and **kill** commands (Linux platforms) or the Windows **Task Manager**, to terminate the license server. Do not use the **-9** option when using the **kill** command. For more information, see “lmdown,” Section 3.6.2.

F.2.5 What if the job or session loses contact with the FLEXnet license server before it completes?

The client enters a state of “suspended animation.” The client will attempt to reestablish contact with the license server until a user-defined expiration time is exceeded (the default is to continue checking perpetually until contact is reestablished). The minimum expiration time is 60 minutes. If the predefined expiration time has not been set, the client may be terminated by using the standard **kill** command (Linux platforms) for the process. On Windows platforms the client can be terminated by entering **<Ctrl>-C** in the DOS window where the client was started if the job was run in interactive mode; otherwise, use the **Task Manager**.

F.2.6 What happens to FLEXnet licenses if the client ends abnormally?

Tokens are normally returned immediately. If the tokens are not returned immediately, ensure that the job is not running and stop the executable for the analysis by using **abacus terminate** or the appropriate operating system utility, such as the **ps** and **kill** commands (Linux platforms) or the Windows **Task Manager**.

Do not use the **lmremove** tool to free license tokens used for analysis jobs, as it will not have the intended effect. You can use **lmremove** to free Abaqus/CAE or Abaqus/Viewer license tokens; you must first obtain token information using the **lmstat** tool (for an example, see “lmstat,” Section 3.6.7).

F.2.7 Can I see where my job is in the FLEXnet license queue?

No, only log file information is available. When an analysis job is in the license queue, information about the queue status is written to the log or status file for the job every 30 seconds. Abaqus/CAE and Abaqus/Viewer interactive sessions are not queued.

F.2.8 Can I see which users are using the Abaqus FLEXnet licenses?

The command `simulia_dir/License/lmstat -a`, where `simulia_dir` is the SIMULIA parent directory, will list users and the license features that they are using. For more information, see “lmstat,” Section 3.6.7.

F.2.9 Do I have to update the FLEXnet license server when I install a new release of Abaqus?

Yes, if the new release of Abaqus uses a later version of FLEXnet Licensing than your existing license server. Abaqus 6.14 uses FLEXnet Licensing Version 11.6.1. If you have a version of FLEXnet Licensing earlier than Version 11.6.1 installed on your system, you should use the licensing installer to automatically upgrade the license server. If you have an existing license server that uses a version of FLEXnet Licensing higher than Version 11.6.1, you should use the procedure described in “Updating an Abaqus FLEXnet license file,” Section 3.2, to update your license file without overwriting the existing license server. For more information, see “FLEXnet Licensing installation,” Section 2.1.3. If your Abaqus license file is integrated with FLEXnet license files for other products using a combined license file, you must ensure that the **lmgrd** version meets the FLEXnet version compatibility rules (listed in Appendix I of the FLEXnet Licensing End User Guide Version 11.6).

Starting with Abaqus 6.13, license keys will continue to work for two years of subsequent releases, so it may not be necessary to install new FLEXnet license keys with every new release.

You can check under **Licensing** on the **Support** page at www.3ds.com/simulia for the FLEXnet Licensing End User Guide.

F.3 Special situations

This section addresses questions concerning special operations that usually occur infrequently.

F.3.1 How do we add redundant servers if our network has a single FLEXnet license server?

You need to decide which other computers you wish to use as redundant license servers. The total number of redundant license servers is three, and reliable communication must be maintained at all times between the master server and at least one other backup server (shadow) for licensing to operate. The three server hosts must be on the same subnet.

1. Send the lmhostid for all three license server hosts to your local office or representative, and request a license file for redundant servers.
2. Install the redundant license file and start the Abaqus license server manually as described in “Redundant FLEXnet license server configurations,” Section 3.4.
3. For each installation of Abaqus, edit the Abaqus environment file (**abaqus_v6.env**) so that the line

```
abaquslm_license_file="[port]@license_server_host"
```

becomes

```
abaquslm_license_file="[port]@serverhost1:[port]@serverhost2:
[port]@serverhost3"
```

where *serverhost1*, *serverhost2*, and *serverhost3* are the names of the computers where the license servers are running (quotes are required). If a license server is using a port that is not between 27000 and 27009, you must include the port number with the server host name. Items in the list are colon-separated on Linux platforms and semicolon-separated on Windows platforms. Each entry must begin with an “@” symbol or a port number and an “@” symbol. Make sure that users make similar changes to any environment files in their home and local directories.

F.3.2 How can I tell if I am using a redundant FLEXnet server configuration?

View your Abaqus license file (**simuliaalm.lic**) located in the directory *simulia_dir/License*. If you are using a redundant server configuration, there will be three **SERVER** lines in the license file. The server names should be different for each line, although the port number may be the same for all three. For example:

```
SERVER bifrost.simulia.com 69084992 27003
SERVER tank.simulia.com 69094954 27003
SERVER willow.simulia.com 69094344 27003
VENDOR ABAQUSLM
```

F.3.3 What if I run the analysis job in a batch queue?

FLEXnet licenses are not checked out until the analysis actually begins, so tokens will not be held by a job in a batch queue. However, if a job executes in a batch queue and sufficient tokens are not available, the job will be placed in the license queue until the tokens are free, which will prevent the rest of the jobs in the queue from executing. To prevent wasted time in the batch queue, it is recommended that tokens be registered as a resource in third-party batch queueing systems. See the LSF example for token resource in “Deriving and using custom queue classes,” Section 4.3.6.

F.3.4 What is the difference between the license queue and a batch queue?

The batch queue controls how and when jobs are run on a certain computer (see “Defining analysis batch queues,” Section 4.2). The license queue is created by the license server when Abaqus jobs have requested more tokens than are currently available. A job will not request tokens until it reaches the front of the batch queue and begins execution.

F.3.5 If we have multiple, nonredundant network license servers, how do I connect to a specific server?

The situation with multiple, nonredundant license servers is significantly different from the one with redundant servers. With redundant servers one acts as the master and the others are backups (shadows) in case the master goes down. With multiple, nonredundant servers each one is independent of the others. To connect to a specific server, you must set the **abaquslm_license_file** parameter in a local Abaqus environment file (**abaqus_v6.env**) either in your home directory or in the current working directory. The proper format for the parameter definition is as follows:

```
abaquslm_license_file="[port]@license_server_host"
```

where *license_server_host* is the name of the computer on which the license server is running (the quotation marks should be included). If a license server is using a port that is not between 27000 and 27009, you must include the port number with the server host name. Multiple servers may be listed in the **abaquslm_license_file** parameter as follows:

```
abaquslm_license_file="[port]@server1:[port]@server2:  
[port]@server3:[port]@server_n"
```

Abaqus jobs will try to connect to the servers in the order that they are listed.

F.3.6 Are there any special requirements for using FLEXnet Licensing within a DHCP-configured network?

The hostname on the server line of the license file must be the computer name, not the IP address. The client must refer to the license server by hostname in the **abaquslm_license_file** parameter in an Abaqus environment file (**abaqus_v6.env**).

F.4 Other licensing questions and problems

If you are still experiencing problems with Abaqus FLEXnet network licensing and you have checked all the foregoing FAQs and searched the knowledge database of answers and solutions to questions that we have answered, please submit a request for systems support. Instructions for submitting this request are available through “Initial procedure for reporting system support related problems” in the Dassault Systèmes Knowledge Base at www.3ds.com/support/knowledge-base. If you do not have access to this document, contact your local support office to obtain a copy of the systems support request form.

About SIMULIA

Dassault Systèmes SIMULIA applications, including Abaqus, Isight, Tosca, and Simulation Lifecycle Management, enable users to leverage physics-based simulation and high-performance computing to explore real-world behavior of products, nature, and life. As an integral part of Dassault Systèmes' 3DEXPERIENCE platform, SIMULIA applications accelerate the process of making highly informed, mission-critical design and engineering decisions before committing to costly and time-consuming physical prototypes. www.3ds.com/simulia

Our 3DEXPERIENCE® Platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the 3DEXPERIENCE Company, provides business and people with virtual universes to imagine sustainable innovations. Its world-leading solutions transform the way products are designed, produced, and supported. Dassault Systèmes' collaborative solutions foster social innovation, expanding possibilities for the virtual world to improve the real world. The group brings value to over 170,000 customers of all sizes in all industries in more than 140 countries. For more information, visit www.3ds.com.

