REDUCE

Installation Guide

for Unix Systems

Winfried Neun
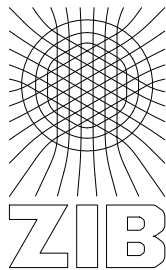
REDUCE Installation

Guide

for Unix Systems

Version 3.8

by

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Abstract

This document describes operating procedures for the installation of REDUCE on UNIX systems.

Contents

1   Introduction

This document describes the Installation of REDUCE version 3.8 for Unix systems, including workstations and mainframe computers. Most of the operations needed to install REDUCE are in common for all Unix systems, therefore it is sufficient in most cases to follow these guidelines. Special instructions for some platforms are included.

This notation and the examples given in this document are based on **csh**. If `csh` is not your favourite shell, please change the commands used in the examples accordingly.

REDUCE is based on Standard Lisp, and this version requires the availability of Portable Standard Lisp (PSL), version 4.2 or later. The PSL files necessary to run REDUCE are included on the system tape. This is not however a complete PSL system and in particular does not include PSL sources. A complete PSL, if needed, is available separately from the Konrad-Zuse-Zentrum by contacting:

<div align="center">

Konrad-Zuse-Zentrum für Informationstechnik Berlin
- attn Winfried Neun -
Takustrasse 7
D-14195 Berlin-Dahlem
Federal Republic of Germany
Telephone: (+49) 30 84185 196
Electronic Mail: neun@zib.de
Facsimile: (+49) 30 84185 269.

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2   Installation Material

The installation material for REDUCE 3.8 is distributed via ftp transfer. A CD–ROM is send on request as well, if large ftp transfers are a problem. The documentation for REDUCE is contained in the ftp files and especially the installation guide (this document) can be found on the webpages at http://www.zib.de/Symbolik/reduce. The data consists of a small file **install.csh** and a large file **reduce.tgz**.

3   Installation Steps

The REDUCE distribution material contains the platform specific REDUCE and PSL files together with some general information and third party software. In order to install the software, please put the two files mentioned above in a directory of your file system and make sure that install.csh is executable, or mount the CD–ROM. Please 'cd' to the directory or drive. Please choose the **reduce root directory** such that there are about 80 MBytes available in this filesystem. The REDUCE file tree will be allocated there.

```
cd <cd-rom mount point or directory>
./install.csh <reduce root directory>
```

This will unpack several subdirectories into the REDUCE root directory and adapt some scripts (reduce, and XR, etc.) to this location in the file tree. In these scripts the MACHINE environment variable is set which is needed for the `mkreduce.psl` script. The correct setting of the MACHINE variable can be read off here for maintenance purposes (see below). The installation is usually complete now, but ...

On some systems the install.csh scripts appears nonexecutable. In this case a little extra effort is needed:

```
cd <cd-rom mount point>
cp install.csh /tmp
chmod +x /tmp/install.csh
/tmp/install.csh <reduce root directory>
```

You can unmount the CD now or archive the installation files.

4   Some extras

The next few sections contain special information for users of some operating systems which are not relevant otherwise.

4.1   Additional Installation Step for IBM RS/6000

The installation of REDUCE for IBM/RS 6000 requires super user privilege.
Please make sure that you are able to 'su' to super user mode.

For the next step, please change to super user mode (su command) and run the program `./install.csh` in the `./lisp/psl/ibmrs/psl/syscall` directory. Please add the cd command and the invocation of `./installsysc` to your boot files,e.g. `/etc/rc.local`.

The script `./install` compiles and installs the system call. This is necessary for the first installation and after upgrades of the Aix version. The script `./installsysc` installs the precompiled system call. This is needed at Aix boot time. If the system call is not installed, the start of reduce fails, complaining about a missing external reference **mycflush**. In this case please install the syscall by starting `./installsysc` from within the directory `./lisp/psl/ibmrs/psl/syscall`.

> cd lisp/psl/ibmrs/psl/syscall
> su
> ./install
> ./installsysc
> exit

```
The installation of an additional system call is mandatory.  Otherwise RE-
DUCE is not able to run on your system.  The sources of the program in-
stallsysc can be found in the psl/syscall directory as well and can be
checked there.
```

Technically speaking, an interface for PSL is needed which allows it to flush the instruction and the data caches of the RS/6000 processor. Such system call is not generally available in AIX.

4.2   If the binaries do not run under Linux or FreeBSD

There may be problems with some dialects of Linux were the file `bpsl` is not executable in the form which is on the CD–ROM. In this case, please recompile it by the following steps:

```
cd kernel
./asm
./cclnk
```

This produces a new file bpsl (on your system) which should be (hopefully) o.k. and can be started with:

```
./bpsl -td 12000000
```

If this is sucessful (your will get a sort of file-not-found error by starting the program), please move it to the proper place:

```
cd $reduce
setenv MACHINE linux
setenv lisp psl
cp kernel/bpsl lisp/psl/linux/psl
util/mkreduce.psl
```

which should finally fix the problem.

4.3 Special Steps which may be required on SGI/IRIS

The PSL-based REDUCE system appears to very sensible to changes of the SGI/Iris operating system, causing several 'unexplainable' errors after a system upgrade. Therefore, when the Irix system is upgraded, please produce a new image by:

```
cd $reduce
setenv MACHINE iris
setenv lisp psl
util/mkreduce.psl
```

If your site runs different levels of IRIX simultaneously, you need an extra image for each version.

4.4 Choosing 32 or 64 bit mode of operation

On some systems, e.g. the Ultrasparc/Solaris or the Mips 10000/Irix there is an alternative to use either a 32 bit version of the software or a 64 bit version. The relevelant system names are iris64 or solaris64 whereas iris and solaris are the 32 bit system names. By changing the environment variable MACHINE in the script reduce in the root directory you may change the default from 32 to 64 bit.

5 Testing REDUCE

To test the installation you can type:

```
cd $reduce
./reduce
```

REDUCE will respond with a banner line and then prompt for the first line of input:

```
REDUCE 3.8, 15-Apr-2004 ...
1:
```

A simple (but not primitive) test is performed by the following input :

```
factorize 4712;
```

REDUCE will respond with the list of prime factors of 4712, namely

```
{{2,3},{19,1},{31,1}}
```

To end the first session, please type :

```
bye;
```

The Standard Test which tests a lot more features of REDUCE can be run by starting

```
$reduce/util/tstpckge alg
```

which produces a log file as $reduce/log/reduce.log. The test should not take longer than 20 seconds.

6 Testing the Gnuplot interface

If the basic test has been successful, one can test the functionality of the REDUCE Gnuplot Interface. If you start REDUCE as described in the previous chapter and type

```
plot sin x;
```

a plot of the sine function should be visible. If the environment variable DISPLAY is set it should appear on the display or in DUMB terminal mode otherwise.

7 The Redfront Interface

The directory redfront contains a REDUCE frontend which supports the GNU readline functionality plus color input/output. Redfront ist started automatically by the scipts reduce or redcue.psl if it is available and if the stdin channel is a tty. This interface has been updated to its present form by T. Sturm and A. Dolzmann at the University of Passau. The sources of redfront can be found in the directory as well.

8 The TeXmacs Interface

"GNU TeXmacs is a free scientific text editor, which was both inspired by TeX and GNU Emacs. " It is developed by a group spearheaded by Joris v.d. Hoeven (U Paris) and is available through the website www.texmacs.org. There all the information about Texmacs is available, e.g., how to start a REDUCE session in TeXmacs.

The Texmacs REDUCE interface has been written and promoted by Andrej Grozin from Novosibirsk University. Recently, it has been improved at the University of Passau.

If you install Texmacs, please make sure that the script reduce is contained in the PATH. Second, please change the last line of the file

<texmacs dir>/plugins/reduce/bin/tm_reduce

such that is reads **exec reduce** instead of **exec reduce | reduce_filter** as it comes with the Texmacs distribution. The binary part of the Texmacs interface is loaded if REDUCE is started by Texmacs. There is no need to included this in the .reducerc file.

9 Installing XR graphical user interface

The following paragraph does not (yet) apply for Cray and Convex systems. With this release of REDUCE comes a recently developed Graphical User Interface called **xr**, which runs on most UNIX workstations equipped with X11 release 4 or higher. This interface is not part of the normal REDUCE distribution, but nevertheless please complain about errors. The functionality of xr and its installation is decribed in a separate document by Chris Cannam which comes with the distribution tape. In most cases, you simply have to copy the file

```
$reduce/xr/src/XR
```

to the directory

```
/usr/lib/X11/app-defaults
```

to install the software. If all these tests have been sucessful so far and if you are using an X workstation or terminal, you may wish to try

```
$reduce/xr/bin/xr
```

or alternatively, `$reduce/Xr`.

10 Installing Access to REDUCE for users

After successfully testing REDUCE, please install an easy access to REDUCE for the users of your system. Two basic steps are required for the user access:

Setting the variable reduce: The environment variable **reduce** must be set such that it is pointing to the RE-DUCE root directory. If this is not done properly, load modules can't be found.

Including the executable reduce in the path: The easiest way is to update the script $reduce/util/reduce and to put it (or a link) into a directory which is in the user's standard path. In most cases the script ist updated automatically and put into the REDUCE home directory as $reduce/reduce and $reduce/Xr, resp.

11 Contents of the REDUCE Filetree

The REDUCE file tree contains the following directories and files:

reduce.img and/or reduce This file (or these files) are the REDUCE binary. Recent implementations of RE-DUCE are organized as `image model`, where the binary information is not stored as a Unix executable (e.g. as a.out, COFF or ELF file), but as file which contains the LISP memory cells and which is read in at startup time. This normally prints a message like:

```
Loading image file: /silo/cons/reduce37/reduce.img
```

before the REDUCE banner is printed. In the case of an image model PSL implementation, **reduce** is a shell script (csh or sh) which starts the image loader. It will set the environment variable **$reduce** to the root of the REDUCE file tree, too.

redfront This directory contains files necessary to use the REDUCE interface to the GNU readline library. This is (in a simplified view) something like REDUCE with the cursor keys available. Instead of using the command reduce it may be more convenient to invoke `$reduce/redfront`

Details can be found in the REDUCE User's Guide.

packages The complete set of REDUCE sources and documentation. The suffixes are `.red, .sl, .tex, .tst and .rlg` for RLISP files and Standard LISP files resp.

lisp This directory contains the binary files of the underlying PSL system. The suffix `.b` indicates a PSL load module. The directory ../red contains the load modules which belong to REDUCE rather than to PSL. From these modules the Algebraic Operation Mode is built on top of the LISP system.

doc Documentation of REDUCE, suffixes `.tex` or `.doc`. It may be useful to print copies of the REDUCE User's Guide. Please refer to the chapter **Printing Documents**.

docextra Ready-to-print versions of the documentation. Includes the REDUCE Manual, User's Guide and Installation Guide together with documentation of the packages.

util Various Utility files which are described in detail in the chapter **Maintaining REDUCE**.

wutil   Some system dependent binary files, e.g. Gnuplot.

log   Depository for log files produced by running the tests in the packages directories.

xr   The ZIB X interface to REDUCE. This is decribed in a separate manual by Chris Cannam.

help   These are (binary) files which are used by the help system. Most files are in Gnu info file format.

izic   Contains files which contain the graphics system IZIC together with the interface interface for Izic and some more documents. (IZIC is developed by Robert Fournier, Norbert Kajler and Bernard Mourrain (INRIA, Sophia-Antipolis), the REDUCE interface by Kerry Gaskell, ZIB. For more information please refer to documents contained in the subdirectories doc or doc-files. IZIC is not available for some versions of REDUCE on UNIX machines.

12   Working with Minimal Disk Space

Many of the REDUCE system files are not necessary for running REDUCE. In situations where disk space is at a premium, the following files may be deleted from disk:

   – all files in the sub-directories doc, packages, util and log.

After rebuilding or copying the files ../psl/bpsl and reduce, you should run the program `wutil/sparsify` with the relevant filename as parameter. This will drastically reduce the amount of disk space used.

Although the sub-directories doc and packages are not necessary, it is advisable to leave at least the REDUCE manual, system operating instructions, the documents for the user packages on line for users.

13   Printing Documents

The distributed documents are in the directory $reduce/doc and $reduce/docextra. The directory doc contains LATEX files which need processing before they can be printed. Plain text files may be printed using standard UNIX utilities. They are paginated and formatted with standard ASCII control characters. A maximum of sixty print lines per page are assumed. The left margin offset must be supplied by the user. The usage of the LATEX files is of course preferable, since the print quality is much higher. The ASCII files are used mostly by the help system.

The directory docextra contains ready to print documentation files. The REDUCE manual and users guides can be found there as well. Most of the files are formatted in Adobe's Acrobat (pdf) format. For printing one needs to use the Acrobat Reader software which can be fetched from `www.adobe.com`.

Almost all of the REDUCE documents are contained in the `docs` directory on the CD–ROM or can be found on the WWW pages in: `www.reduce-algebra.com`.

14   Patches for REDUCE

The REDUCE system is equipped with a mechanism for correcting bugs *in situ*. The basis for such corrections is the file `packages/support/patches.red`. It contains individual patches for the REDUCE core modules and for REDUCE packages. Its header contains the actual date of the file and gives information about the repaired bugs. A version of this file is delivered with all REDUCE disk sets, including Personal REDUCE. The installed binary includes the contents of this file in compiled form. The most recent version of the file `patches.red` can

be obtained from the Web at `http://www.reduce-algebra.com/support/patches` To install a new version on your system please perform the following steps:

- **professional or personal REDUCE**:
    1. copy `patches.red` to the directory `packages/support`,
    2. run the script `util/remake`.
       This script compiles the patches file and builds a new binary.

The Web server mentioned above contains other items that might be useful for your REDUCE installation.

15 REDUCE Network Library, REDUCE Electronic Forum

Recent information about REDUCE can be obtained via the World Wide Web, at the URL

http://www.reduce-algebra.com

For distribution of REDUCE news and for discussing REDUCE topics of general interest there is an electronic mail forum. Every user of REDUCE is invited to participate. To register for this forum, or for further information, please send email to `reduce-forum@rand.org`.

16 Rebuilding REDUCE FASL Files

Because of its organization into independently compilable modules, the current REDUCE system is fairly easy to maintain. If any source updates are necessary, they can be incorporated into the appropriate files using a convenient editor. Once any of the system source files have been updated, it is necessary to rebuild (compile) the equivalent fast loading modules in order to utilize the changes.

To rebuild any of the REDUCE fasl files, connect to the directory REDUCE homedirectory and call the script:

        util/mkpckge xxx

where xxx is the appropriate package name, e.g. rend to rebuild
$reduce/lisp/psl/$MACHINE/red/rend.b from $reduce/packages/support/rend.red.

If any of the fasl files used in building the REDUCE system packages are changed (alg, arith, entry, mathpr, module, poly, prolog, rend, and rlisp), the reduce binary image will need to be rebuilt with the script:

        util/mkreduce.psl

A separate utility script $reduce/util/build is available for completely rebuilding all of the REDUCE fasl files. This should normally never be required. It is only included in case the system becomes so corrupted that it is no longer possible to rebuild even single modules with the mkfasl procedure.

17 Maintaining REDUCE

The `util` directory includes a number of scripts that are useful for the ongoing maintenance of REDUCE. Most of these are only of interest to the system maintainer, although some (such as `mkslfile` and `test`) may be of interest to the general user. Several of these scripts have been described earlier in this guide. However, for completeness, they are all described in this section. The scripts are as follows:

build.psl This is used to rebuild the complete REDUCE fast-loading (fasl) file system from scratch. It first uses the script `dbuild` to build a version of REDUCE suitable for compiling all packages, and then uses the script `xbuild` to create the actual fasl files.

checkall   This can be used to check the logs generated by `testall` with the "exemplary" versions found in the packages as .rlg file. It produces a `diff` of each log referenced in `testall`.

dbuild   This is used by `build` (q.v.) to build a version of REDUCE suitable for compiling all packages.

mkpckge   This creates the fasl files which belong to a package. It is used in the form `mkpckge <package-name>`.

mkreduce.psl   This has been mentioned earlier. It creates the REDUCE executable from PSL sources and RE-DUCE fasl files. Important: This script requires that the MACHINE variable is set properly. For the MACHINE variable, please refer to the `reduce` script in the root directory.

mkslfile   This has also been mentioned earlier. It generates a Lisp equivalent of REDUCE or RLISP source files.

reduce   This is a prototypical script that can be installed, say, in /usr/local/bin, to set the environment variable `reduce`, and call the REDUCE executable.

reduce-names   This file is normally used as an argument to `source` to set up symbolic names for the REDUCE sub-directories. It must be modified to conform to local file conventions.

sparsify   Has been moved to the `wutil` directory, because it is a binary program. This utility is used to remove "dead" space from various PSL binary files that grow in size when copied. In addition to the executable, the source (`sparsify.c`) and a UNIX "man" page (`sparsify.l`) are included.

tstpckge   This can be used to run one of the test files from the packages directory. `tstpckge <package>` will run a test file, <package>.tst, that does not require the explicit loading of a package.

testall   This script runs all the tests contained in the packages directory, using the `tstpckge` script on each one. The complete test suite takes around 1 hour to run.

remake   This is used to update the system. If new patches are to be incorporated, the patches file will be compiled an a new image will be produced.

18   Program Registration

There are two ways to register your copy of REDUCE : Either use an online-registration facility at: `www.reduce-algebra.com` or use the appended form.

Please fill out the accompanying registration form and send to:

<div align="center">

Dr. Anthony C. Hearn
RAND
1700 Main Street
Santa Monica, CA 90407-2138
Telephone (310) 393-0411
Facsimile (310) 393-4818
Email: reduce@rand.org

</div>

This should be done so that you can be advised direct of any changes which are made to the system. Furthermore, the copyright statement on the REDUCE documents requires such registration as a requirement for their local distribution. The test time requested on the registration form is the time printed by the final call of `showtime` in the output from the test described in the section "Testing REDUCE".

Alternatively, the **Registration form in email form** can be found in the REDUCE/doc directory as **register.txt** . You can fill out this form and send it to `reduce@rand.org` by email.

19   Inquiries and Reporting of Errors

We would appreciate hearing about other bugs you encounter or questions you may have regarding the assembly or the operation of the system. Suspected errors should be accompanied by the relevant job output and a copy of the input source. Corrections for documented problems or other improvements to the system are also welcomed.

REDUCE 3.8 Registration Form

After installing REDUCE, please fill out this form and send to:

Anthony C. Hearn
RAND
1700 Main Street
P.O. Box 2138
Santa Monica CA 90407-2138 U.S.A.
Electronic Mail: reduce@rand.org

This should be done so that you can be advised of any changes made to the system. Furthermore, returning the registration form is a requirement for local reproduction of the REDUCE documentation.

Date: _____

Contact Person: _____

Organization: _____

Address: _____

_____

_____

Telephone: _____

Network Address: _____
(Indicate network: Internet, BITNET, EARN, UUCP, etc)

REDUCE Supplier: **Konrad-Zuse-Zentrum Berlin**

Computer Description:

Vendor: _____ Model: _____ Operating System: _____

Please indicate the test time as printed by the final call of `showtime` in the output from the test described in the section "Testing REDUCE" of the REDUCE Installation Guide.
Also give the memory size used (real or virtual) if known (called Region below), and the total amount of (real) memory available on the machine, if you know.

Time: _____ Region: _____ Machine Memory: _____

Please also write on the back of this form any comments you may have about the installation procedure, and system documentation and performance.

If you would like to be listed in a published registry of REDUCE system holders, please check here ☐ .