Setting Up a pbdR Environment

Installing MPI, R, and pbdR

Version 1.0

Prepared by the pbdR Core Team:

Drew Schmidt
Remote Data Analysis and Visualization Center,
University of Tennessee, Knoxville

Wei-Chen Chen
Computer Science and Mathematics Division,
Oak Ridge National Laboratory

Pragneskumar Patel
Remote Data Analysis and Visualization Center,
University of Tennessee, Knoxville

George Ostrouchov
Computer Science and Mathematics Division,
Oak Ridge National Laboratory

This publication was typeset using LaTeX.

Contents

1 Quick Introduction

In this guide, we will detail the necessary steps for how to set up a pbdR environment. What follows in the remaining sections is a very lengthy list of installation instructions; however, most users should find the process fairly straight-forward, and may not need (or want) all of the details we will provide unless something goes wrong. In any case, the short version for setting up a pbdR environment is to:

1. install R (and Rtools for Windows); see http://cran.r-project.org/
2. install an MPI library; http://www.open-mpi.org/, or http://www.mpich.org/ for Windows
3. install the pbdR packages; see http://r-pbd.org/

Items 1 and 2 are interchangeable, and so if you already have R (and additionally Rtools for Windows) and/or an MPI library installed, then merely skip this/these step(s); there is no need to reinstall anything.

1.1 Installing R

This should be fairly painless. R has binary packages for every operating system you have heard of (and some you haven't), and the install should go fine. Of course, since R is open source, you are free to compile it yourself, should have have reason or need to do so. You can find both the source as well as binaries at the R project's main site: http://cran.r-project.org/.

Additionally, you may wish to customize your R build by compiling from source. For example, you may wish to link R with a high performance linear algebra library, such as MKL. See the *R Installation and Administration Manual* at http://cran.r-project.org/doc/manuals/R-admin.html for full details.

1.2 Installing MPI

For Linux and Mac users, we recommend installing OpenMPI, which is available from http://www.open-mpi.org/ in both binary and source formats. Windows users should install MPICH2, available from http://www.mpich.org/ .

1.3 Installing pbdR Packages

All released pbdR packages are available from http://cran.r-project.org/ which is the Comprehensive R Archive Network (CRAN). This is similar to the CPAN for perl or CTAN for LaTeX, although with many improvements and benefits over its competitors.

It is also possible to link pbdR with high performance linear algebra libraries, such as MKL. Figure 1

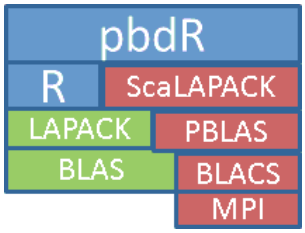

Figure 1: pbdR Relationships to Libraries

offers some insight into the package organization. See the pbdSLAP vignette for more details.

2 Windows

Officially, the pbdR team does not support gaming consoles. However, it is possible to install pbdR packages on Windows.

The instructions and screenshots for this document are for version 2.15.1 of R, but later versions should be very similar, if not identical.

2.1 R

1. Download R: http://cran.r-project.org/bin/windows/base/
2. Open the saved file from 1 above to begin the installation. At the first setup screen, click 'Next' to continue.
3. When prompted with the license, click 'Next' to continue.
4. When prompted for the location to install R, we strongly encourage you to use the default. When you have made your decision, click 'Next'.
5. When prompted with the components to install, you should select a 'User installation'. Then click 'Next'.
6. When prompted with the option to alter the startup options, we suggest selecting `No (accept defaults)`. When you have made your decision, click 'Next'.
7. When prompted with the start menu folder options, make your choice and then click 'Next'.
8. When prompted with the additional tasks options, we suggest making sure that `Save version number in registry` and `Associate R with .RData files` are both **checked**. When you have made your decisions, click 'Next'.
9. To complete the R installation, select 'Finish'.

2.2 Rtools

1. Download Rtools: http://cran.r-project.org/bin/windows/base/
2. Open the saved file from 1 above to begin the installation. At the first setup screen, click 'Next' to continue.
3. When prompted with the license, click 'Next' to continue.
4. When prompted for the location to install R, we strongly encourage you to use the default. When you have made your decision, click 'Next'.
5. When prompted with the components to install, you should select a 'User installation'. Then click 'Next'.
6. When prompted with the option to alter the startup options, we suggest selecting `No (accept defaults)`. When you have made your decision, click 'Next'.
7. When prompted with the start menu folder options, make your choice and then click 'Next'.
8. To complete the Rtools installation, select 'Finish'.

3 Linux and FreeBSD

Before starting, make sure you have

3.1 Installing R

If your distribution is Debian-derived, including Debian, Ubuntu, and Mint:

Installing OpenMPI on Debian Linux

```
apt-get install r-base-dev
```

If your distribution is "Redhat-ish", including Fedora and CentOS:

Installing OpenMPI on Fedora Linux

```
yum install R-devel
```

If your distribution is OpenSUSE:

Installing OpenMPI on OpenSUSE Linux

```
zypper install R-patched-devel
```

If you are using FreeBSD:

Installing OpenMPI on FreeBSD

```
cd /usr/ports/math/R && make install clean
```

3.2 Installing MPI

For these systems, we recommend using OpenMPI. To install OpenMPI

If your distribution is Debian-derived, including Debian, Ubuntu, and Mint:

Installing OpenMPI on Debian Linux

```
apt-get install openmpi-bin libopenmpi-dev
```

If your distribution is "Redhat-ish", including Fedora and CentOS:

Installing OpenMPI on Fedora Linux

```
yum install openmpi openmpi-devel
```

If your distribution is OpenSUSE:

Installing OpenMPI on OpenSUSE Linux

```
zypper install openmpi-devel lam-devel
```

If you are using FreeBSD:

Installing OpenMPI on FreeBSD

```
cd /usr/ports/net/openmpi && make install clean
```

You can test the installation of OpenMPI via the command:

Shell Command

```
mpiexec -np 2 hostname
```

3.3 Installing pbdR

Installing pbdR should be fairly straight forward.

4 Installation Problems

During the course of installation, you may run into unrecoverable issues. The pbdR team does not support MPI libraries or R core, so if you have problems during that portion of the installation phase, we probably can not directly help you. However, there are still many great resources at your disposal, maintained by those individual projects.

4.1 R and MPI

If you have problems installing or customizing R, see the *R Installation and Administration Manual* at http://cran.r-project.org/doc/manuals/R-admin.html for help.

If you are having trouble installing an MPI library, you should see that library's official documentation. For OpenMPI, see http://www.open-mpi.org/community/help/ and for MPICH, see http://www.mpich.org/documentation/guides/ .

For the remainder, we will be addressing installation issues with pbdR packages.

4.2 pbdR

5 Running pbdR Scripts

This information is covered in *much* more detail in the pbdDEMO vignette, and should not be considered a substitute. However, there are two key points one needs to understand in order to use pbdR tools. Namely,

- pbdR codes are written in Single Program/Multiple Data style
- pbdR codes are executed in batch

For full details, see the pbdDEMO package vignette.

Below is a simple pbdR script. This will help you know if things are installed properly or not. To understand what the script is doing, or to learn how to do much more substantial things, you should see the pbdDEMO package vignette.

```
1 library(pbdMPI, quiet = TRUE)
2 init()
3
4 x <- comm.rank()
5
6 comm.print(x, all.rank = TRUE)
```

```
7
8 finalize()
```

To run the script, you must do so in batch (i.e., non-interactively). On Linux, you should execute the command:

```
mpirun -np 2 Rscript my_script.r
```

On Windows, you should execute the command:

```
mpiexec.exe -np 2 Rscript my_script.r
```