Guide to the **pbdPROF** Package

Gaurav Sehrawat[1], Wei-Chen Chen[2], Drew Schmidt[3], Pragneshkumar Patel[3], and George Ostrouchov[2,3]

[1]Jaypee Institute of Information Technology
Uttar Pradesh, India

[2]Computer Science and Mathematics Division,
Oak Ridge National Laboratory,
Oak Ridge, TN, USA

[3]Remote Data Analysis and Visualization Center
University of Tennessee,
Knoxville, TN, USA

July 10, 2013

Contents

This publication was typeset using LATEX.

Acknowledgement

Warning: The findings and conclusions in this article have not been formally disseminated by the U.S. Department of Energy and should not be construed to represent any determination or policy of University, Agency, and National Laboratory.

This document is written to explain the main functions of **pbdPROF** (Sehrawat *et al.*, 2013), version 0.1-0. Every effort will be made to ensure future versions are consistent with these instructions, but features in later versions may not be explained in this document.

Information about the functionality of this package, and any changes in future versions can be found on website: "Programming with Big Data in R" at http://r-pbd.org/.

1   Introduction

The main features of **pbdPROF** are:

1. ...

1.1   System Requirements

pbdPROF requires an MPI installation and an MPI-using package, such as **pbdMPI** (Chen *et al.*, 2012a) or **Rmpi** (Yu, 2010). For information regarding how to install MPI or **pbdMPI**, please see the **pbdMPI** vignette (Chen *et al.*, 2012b) or the pbdR website http://r-pbd.org/.

2   Installation

2.1   fpmpi

WCC: Need fpmpi reference.

Using internal **fpmpi** library, via

<div align="center">Shell Command</div>

```
R CMD INSTALL pbdPROF_0.1-0.tar.gz
```

By default, this compiles `src/fpmpi/*`, generates a static library `libfpmpi.a`, and installs the library to `pbdPROF/lib/`. No shared library is generated or needed, so the directory `pbdPROF/libs/` is empty (no need to build `pbdPROF.so`.) The linking argument is saved in `Makeconf` and installed to `pbdPROF/etc/` for further linking such as **pbdMPI** is reinstalled with `--enable-pbdPROF`.

Linking with external **fpmpi** library, via

<div align="center">Shell Command</div>

```
R CMD INSTALL pbdPROF_0.1-0.tar.gz \
  --configure-args="--with-fpmpi='-L/path_to_fpmpi/lib -lfpmpi'"
```

This only provides the linking arguments `-L/path_to_fpmpi/lib -lfpmpi` which is saved in `Makeconf` and installed to `pbdPROF/etc/` for further linking such as **pbdMPI** is reinstalled with `--enable-pbdPROF`.

Reinstall **pbdMPI**, **pbdSLAP**, and **pbdNCDF4**, via

<div align="center">Shell Command</div>

```
R CMD INSTALL pbdMPI_1.0-0.tar.gz --configure-args="--enable-pbdPROF'"
R CMD INSTALL pbdSLAP_0.1-6.tar.gz
R CMD INSTALL pbdNCDF4_0.1-1.tar.gz
```

Note that the `pbdMPI/R/get_conf.r` and `pbdMPI/R/get_lib.r` are used in `pbdMPI/configure.ac` or `pbdMPI/configure` to determine an appropriate linking flag `PROF_LDFLAGS` based on preset flags in `pbdPROF/etc/Makeconf`.

If the internal library is used in **pbdPROF**, then the path to the `pbdPROF/lib/libfpmpi.a` is set in the flag `PKG_LIBS` of `pbdMPI/src/Makevars.in`. If the external library is used in **pbdPROF**, then the linking arguments `-L/path_to_fpmpi/lib -lfpmpi` is set in the flag `PKG_LIBS` of `pbdMPI/src/Makevars.in`. Therefore, the **pbdMPI** can be intercepted by the **fpmpi** library when MPI function calls are evoked.

WCC: I am not sure I need to reinstall **pbdSLAP** or **pbdNCDF4**. I suspect only **pbdMPI** is good enough, but how **fpmpi** instrument or intecept the MPI calls???

Reinstall for **pbdMPI** has no doubt to me. However, for 100% sure, we need to run a simple example twice based on **pbdBASE** demo to see if the outputs are the same for both of reinstall **pbdSLAP** (with `PROF_LDFLAGS`) and no reinstall **pbdSLAP** (without `PROF_LDFLAGS`).

2.2   mpiP

2.3   Test Script

Below we provide sample scripts to test that the installation of **pbdPROF** was successful. For **pbdMPI**, use:

<div align="center">Test script for pbdMPI</div>

```
library(pbdMPI)
init()

set.seed(comm.rank())
x <- allreduce(rnorm(100))

finalize()
```

and for **Rmpi**, use:

<div align="center">Test script for pbdMPI</div>

```
library(Rmpi)

# ...
```

3   FAQ

4   References

Chen WC, Ostrouchov G, Schmidt D, Patel P, Yu H (2012a). "pbdMPI: Programming with Big Data – Interface to MPI." R Package, URL http://cran.r-project.org/package=pbdMPI.

Chen WC, Ostrouchov G, Schmidt D, Patel P, Yu H (2012b). *A Quick Guide for the pbdMPI package.* R Vignette, URL http://cran.r-project.org/package=pbdMPI.

Sehrawat G, Chen W-C Schmidt D, Patel P, Ostrouchov G (2013). "pbdPROF: Programming with Big Data – MPI Profiling Tools." R Package, URL http://cran.r-project.org/package=pbdPROF.

Yu H (2010). "Rmpi: Interface (Wrapper) to MPI (Message-Passing Interface))." R Package (v:0.5-9), URL http://cran.r-project.org/package=Rmpi.