A Guide to Enable RStudio Server on IBM Power System

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1. Introduction

RStudio server is an integrated development environment for R, which provides console and tools for online code editing and execution, plotting, debugging and workspace management. To enable RStudio on Power9 system, we need to build it from source code with proper configuration. Below is the guide to build and run RStudio server on Power.

2. Instructions to build and install optimized R

Optimized R is built with IBM ESSL (replace BLAS) and gives much better performance for those requiring scientific computing. To build it, use the following script to configure and build your R. First, download the latest R version from CRAN site.

```
#!/bin/bash
# Build with static option
PREFIX=/gpfs/gpfs_4mb/rchen/Power9/NGS-App/Miami/RStudio/R-3.6.1
GUI_OPTS="${GUI_OPTS} --with-x --with-cairo"
GUI_OPTS="${GUI_OPTS} --with-tk-config='$TK_CONFIG'"
GUI_OPTS="${GUI_OPTS} --with-tcl-config='$TCL_CONFIG'"
BLAS_OPTS=”-lessl”
MISC_OPTS='LIBnn=lib'

# Need to do this odd-looking "echo ... | xargs ./configure" thing so any
# quoted spaces in environment variables (e.g., $BLAS_OPTS on OS X) are
# properly passed to configure. Without it, "./configure $FOO" risks breaking
# up $FOO into multiple strings/options, even with IFS set.
echo ${GUI_OPTS} ${BLAS_OPTS} ${MISC_OPTS} |
    xargs ./configure --prefix="${PREFIX}" \
    --with-pic \
    --enable-R-profiling \
    --enable-memory-profiling \
    --enable-shared \
    --enable-BLAS-shlib \
    --enable-R-shlib \
    --disable-java \
    --with-readline \
    --with-ICU \
    --enable-static \
    --disable-shared \
    --with-libpng \
    --with-jpeglib \
    --with-libtiff \
    --disable-prebuilt-html \
    --with-recommended-packages=no  \
    2>&1 | tee configure.log

make -j${BB_MAKE_JOBS} 2>&1 | tee build.log
make install
```

If you are running into any error during configuration, please make sure your system has all the prerequisites installed. All the prerequisite packages must have ${package}-devel.ppc64le installed as well.

3. Building RStudio server

The latest version of RStudio source code is download from its GitHub site. Below are instructions to build on Power9.

a) download

git clone https://github.com/rstudio/rstudio.git

b) the following system packages are required

```
cmake v3.14+, pandoc, pam-devel, gnome-dictionary-devel
```

c) installing boost 1.71.0

Download the latest version of Boost 1.71.0 and build with the following steps:

```
     sh bootstrap.sh --with-toolset=gcc \
        --prefix=$HOME/Boost_p95a29
     ./b2 link=static
     ./b2 install
```

d) installing dependencies

```
     [rchen@p95a29]$ cd dependencies/common
     [rchen@p95a29]$ ./install-dictionaries
     [rchen@p95a29]$ ./update-mathjax.sh
     [rchen@p95a29]$ ./install-pandoc
     [rchen@p95a29]$ ./install-packages
     [rchen@p95a29]$  cd pandoc/2.3.1
     [rchen@p95a29]$  cp /usr/bin/pandoc .
     [rchen@p95a29]$  cp /usr/bin/ pandoc-citeproc .
```

e) build and install

```
     export PATH=$HOME/RStudio/R-3.6.1/bin:$PATH

     BOOST_ROOT=$HOME/Boost_p95a29            \
         cmake .. -DRSTUDIO_TARGET=Server     \
            -DCMAKE_BUILD_TYPE=Release        \
            -DRSTUDIO_BOOST_SIGNALS_VERSION=2 \
            -DCMAKE_INSTALL_PREFIX=$HOME/RStudio/rstudio
     make
     make install
```

note: using system's GCC to build is recommended for both R and RStudio. If using /opt/at12.0, you will need to modify the source code and script to build it, additional options to configure is needed.

```
     -DOPENSSL_CRYPTO_LIBRARY:FILEPATH=/opt/at12.0/lib64/libcrypto.so \
     -Dpkgcfg_lib__OPENSSL_crypto:FILEPATH=/opt/at12.0/lib64/libcrypto.so \
```

4. Configuring RStudio server

a) create /etc/rstudio

```
     [root@p95a29 rstudio]# cat rserver.conf
     www-port=8787
     www-address=p95a29.pbm.ihost.com

     # set which r from config
     rsession-ld-library-path=/gpfs/gpfs_4mb/rchen/Power9/NGS-
     App/Miami/Boost_p95a29/lib
     rsession-which-r=/gpfs/gpfs_4mb/rchen/Power9/NGS-App/Miami/RStudio/R-
     3.6.1/bin/R
     auth-required-user-group=rstudio-server
```

```
# don't daemonize so we can easily abort
server-daemonize=1
# set the data dir to be a user friendly place
server-data-dir=/tmp/rstudio-server
# don't validate that web authenticated users exist on the system
auth-validate-users=0
# always authenticate users (defaults to no-auth if not root)
auth-none=0
# use dev config for rsession
rsession-config-file=/etc/rstudio/rsession.conf

[root@p95a29 rstudio]# cat rsession.conf
session-timeout-minutes=30

[root@p95a29 rstudio]# systemctl daemon-reload
```

b) configure rstudio server start/stop service

```
cp $RStudio_Home/rstudio/extra/systemd/ rstudio-server.service
/usr/lib/systemd/system/rstudio-server.service
cd /etc/systemd/system/multi-user.target.wants
ln -fs  /usr/lib/systemd/system/rstudio-server.service
```

c) setup system LD_LIBRARY_PATH (adding rstudio-server.conf)

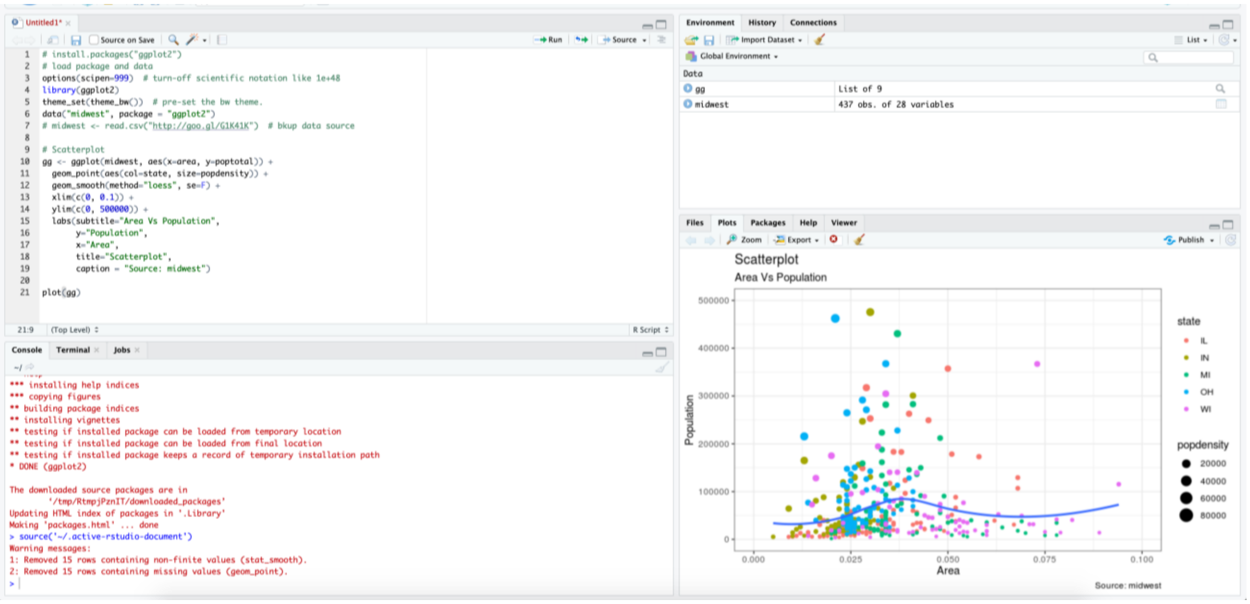
```
[root@p95a29]# cd /etc/ld.so.conf.d
[root@p95a29]# cat rstudio-server.conf
/gpfs/gpfs_4mb/rchen/Power9/NGS-App/Miami/Boost_p95a29/lib
[root@p95a29]# ldconfig
```

5. Manage RStudio server

```
[root@p95a29 rstudio]# systemctl start rstudio-server.service
```

OR

```
[root@p95a29 rstudio]# service restudio-server start|stop}status
```



```
# install.packages("ggplot2")
# load package and data
options(scipen=999)  # turn-off scientific notation like 1e+48
library(ggplot2)
theme_set(theme_bw())  # pre-set the bw theme.
data("midwest", package = "ggplot2")
# midwest <- read.csv("http://goo.gl/G1K41K")  # bkup data source

# Scatterplot
gg <- ggplot(midwest, aes(x=area, y=poptotal)) +
  geom_point(aes(col=state, size=popdensity)) +
  geom_smooth(method="loess", se=F) +
  xlim(c(0, 0.1)) +
  ylim(c(0, 500000)) +
  labs(subtitle="Area Vs Population",
       y="Population",
       x="Area",
       title="Scatterplot",
       caption = "Source: midwest")

plot(gg)
```

```
*** installing help indices
*** copying figures
** building package indices
** installing vignettes
** testing if installed package can be loaded from temporary location
** testing if installed package can be loaded from final location
** testing if installed package keeps a record of temporary installation path
* DONE (ggplot2)

The downloaded source packages are in
        '/tmp/RtmpjPznIT/downloaded_packages'
Updating HTML index of packages in '.Library'
Making 'packages.html' ... done
> source('~/.active-rstudio-document')
Warning messages:
1: Removed 15 rows containing non-finite values (stat_smooth).
2: Removed 15 rows containing missing values (geom_point).
> 
```

```
Data
gg          List of 9
midwest     437 obs. of 28 variables
```