Altair Engineering Inc.

Altair Grid Engine Documentation

RStudio AGE Launcher plugin User's Guide

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Contents

1 Authentication with RStudio Workbench

1.1 Sign in to RStudio Workbench

The user can sign in to RStudio Workbench service by using the credentials as shown in Figure 1. If RStudio Workbench is configured to use the local Linux accounts for authentication, the same system credential is used for sign in to the RStudio service. If there is an issue with the sign in, refer to the official documentation in the RStudio Workbench administrator's guide for the authentication configuration.

1.2 Sign out from RStudio Workbench

The user can get access to the dashboard after successfully signing in. This is the central place to manage user and session information. The user can close the active web session by clicking the **Sign Out** button as shown in Figure 2.

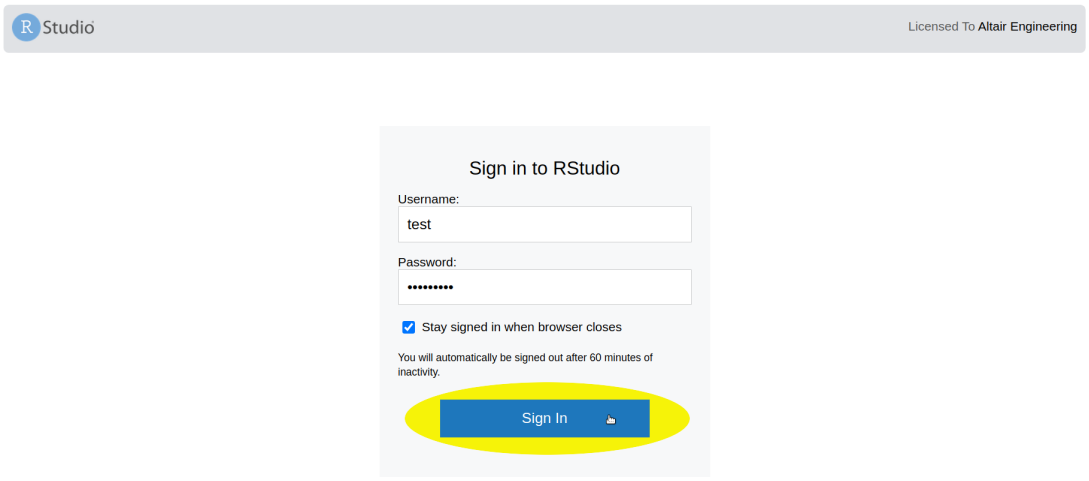

Figure 1: Sign in to the RStudio Workbench by clicking the **Sign In** button as highlighted in the yellow ellipse marker

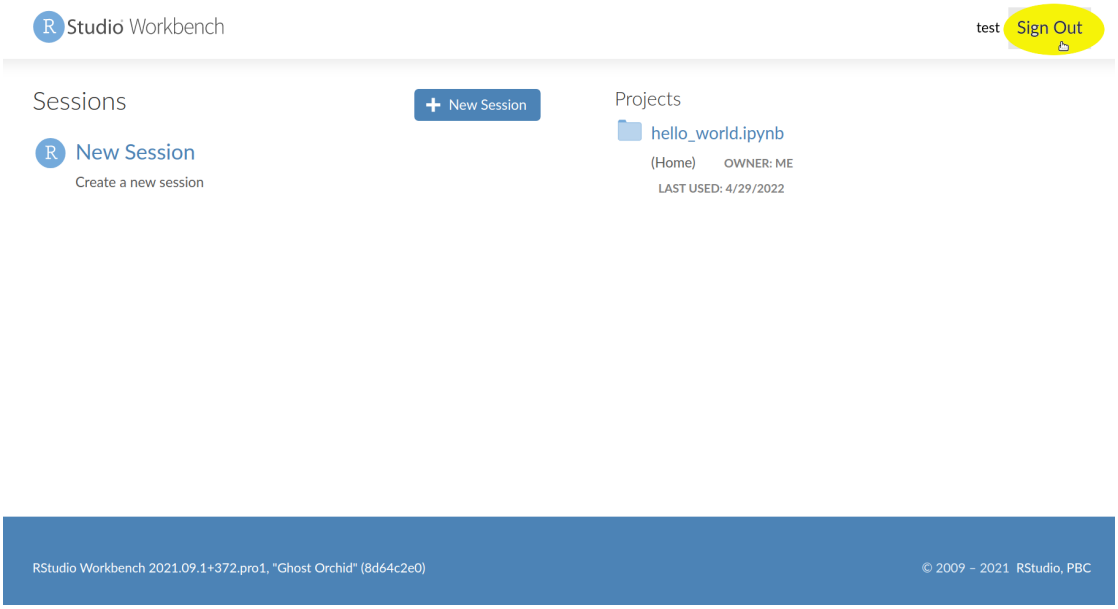

Figure 2: Sign out from the RStudio Workbench by clicking the **Sign Out** button as highlighted in the yellow ellipse marker

2 Basic RStudio session

2.1 Create a basic RStudio Session

A new session can be created by clicking the button as shown in Figure 3. This will pop up a window to fill in the requirments of the compute node for running the RStudio session upon it. If RStudio Workbench is configured with multiple clusters and different editors, the user can select based on their preferences. If the RStudio workbench is configured with the AGE (Altair Grid Engine) cluster, the session request window looks like the Figure 4. The user can request the number of cores and the amount of memory as a basic session to run the RStudio session upon the available nodes in AGE cluster. If the session is successfully submitted and the resource is allocated to the session by the AGE cluster, the session state is in **IDLE** as shown in Figure 5. The user can find more information about the other options in the session window in later chapters of **Resource selection request for AGE cluster** and **Different editors supported in RStudio Workbench with AGE**.

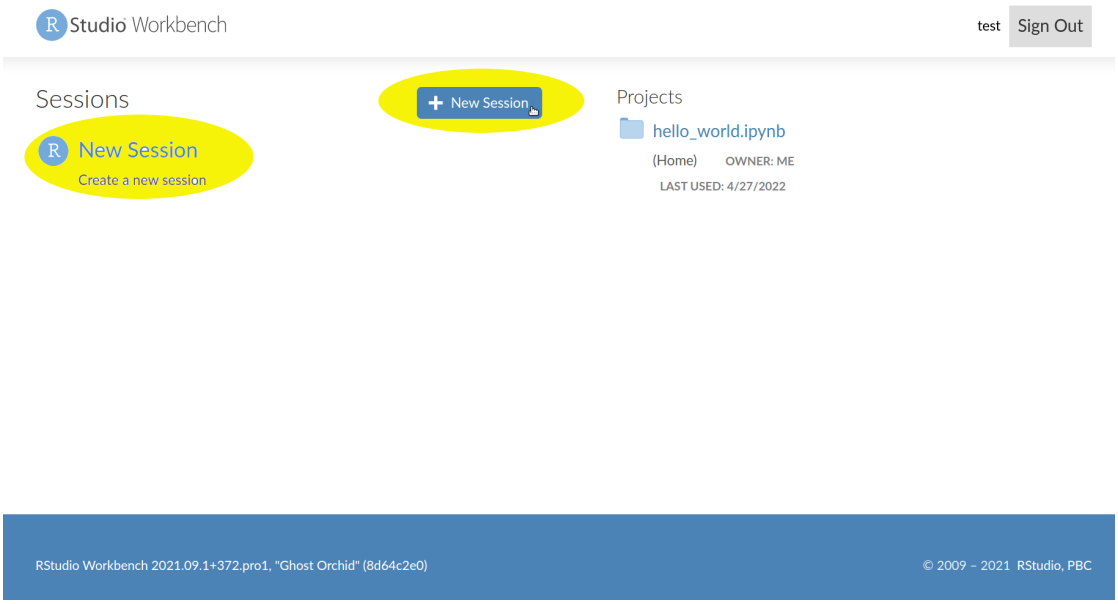

Figure 3: Create new session by clicking the **New Session** button as highlighted in the yellow ellipse marker

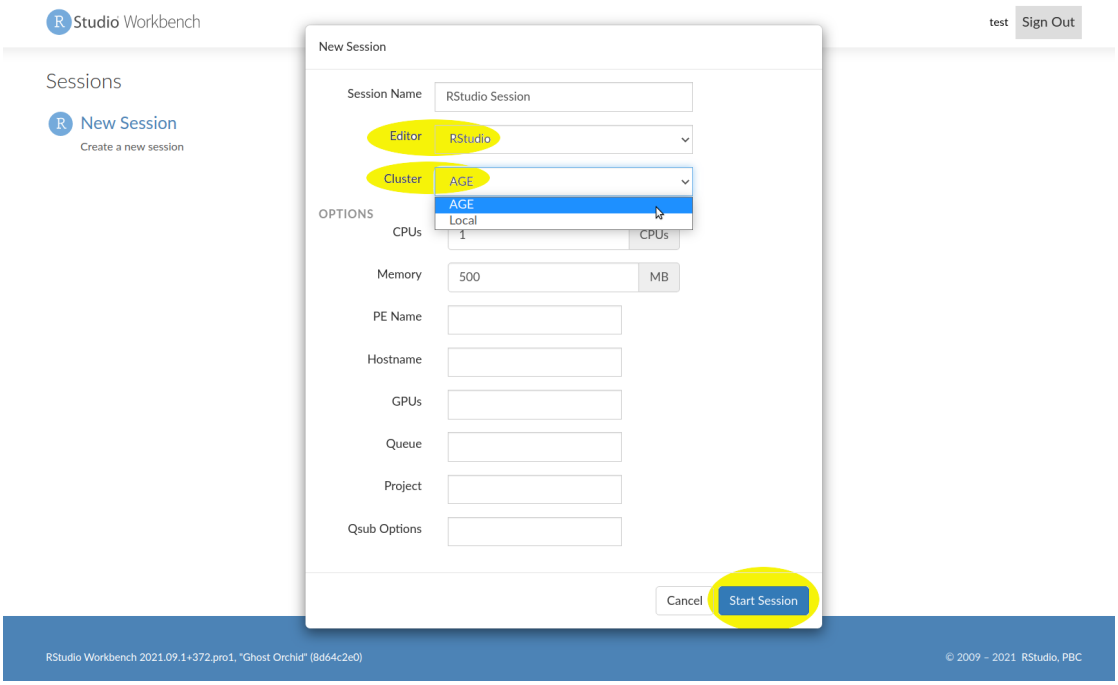

Figure 4: The new session window with the AGE cluster and the session is created by clicking the **Start Session** button as highlighted in the yellow ellipse marker

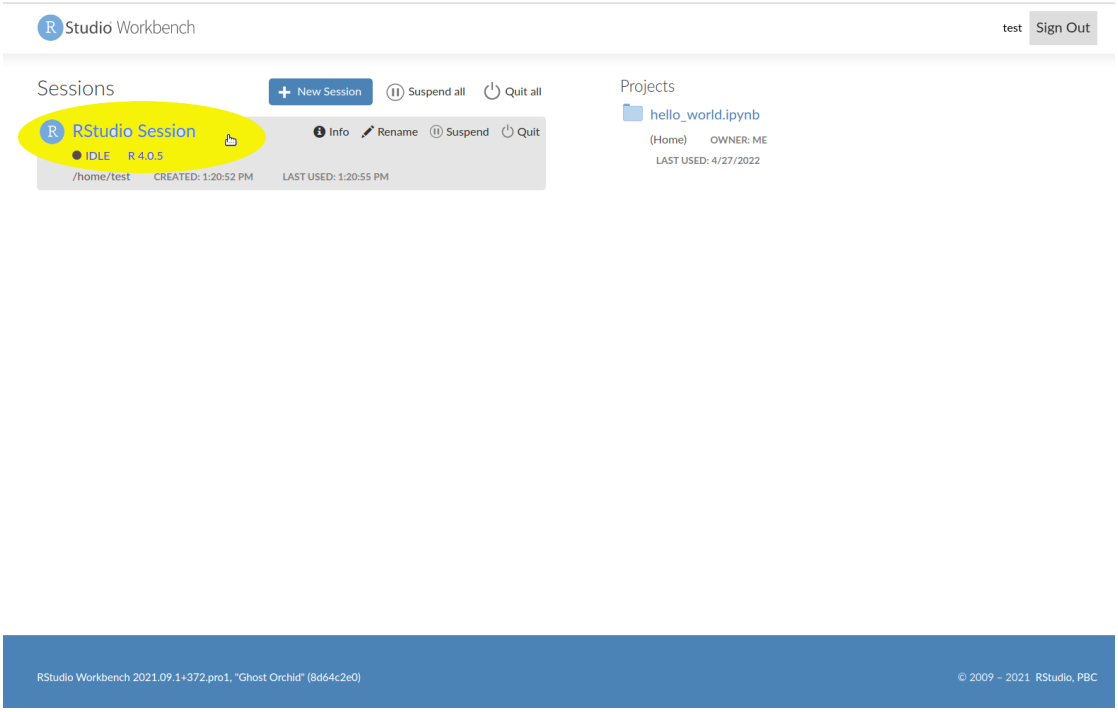

Figure 5: The RStudio session is in the state of **IDLE** as highlighted in the yellow ellipse marker

2.2 Information about the submitted RStudio session

The user can find information about the submitted session in the AGE cluster and RStudio Workbench. The jobs are submitted in the AGE cluster with the prefix of **RStudio-**, so with that the user can distinguish their job from the RStudio jobs by following the prefix. To avoid conflict with the plugin functionality, the user should avoid using the **RStudio-** prefix with normal jobs. The user can get information about the RStudio session by clicking the **Info** button as shown in Figure 6 and the button **Details** as shown in Figure 7. Session information is provided about AGE (CLUSTER, STATUS, SUBMITTED TIME, WORKING DIR, LIMITS, QUEUES and OUTPUT) and RStudio session (EXECUTABLES, ARGUMENTS and TAGS) respectively, as shown in Figure 8.

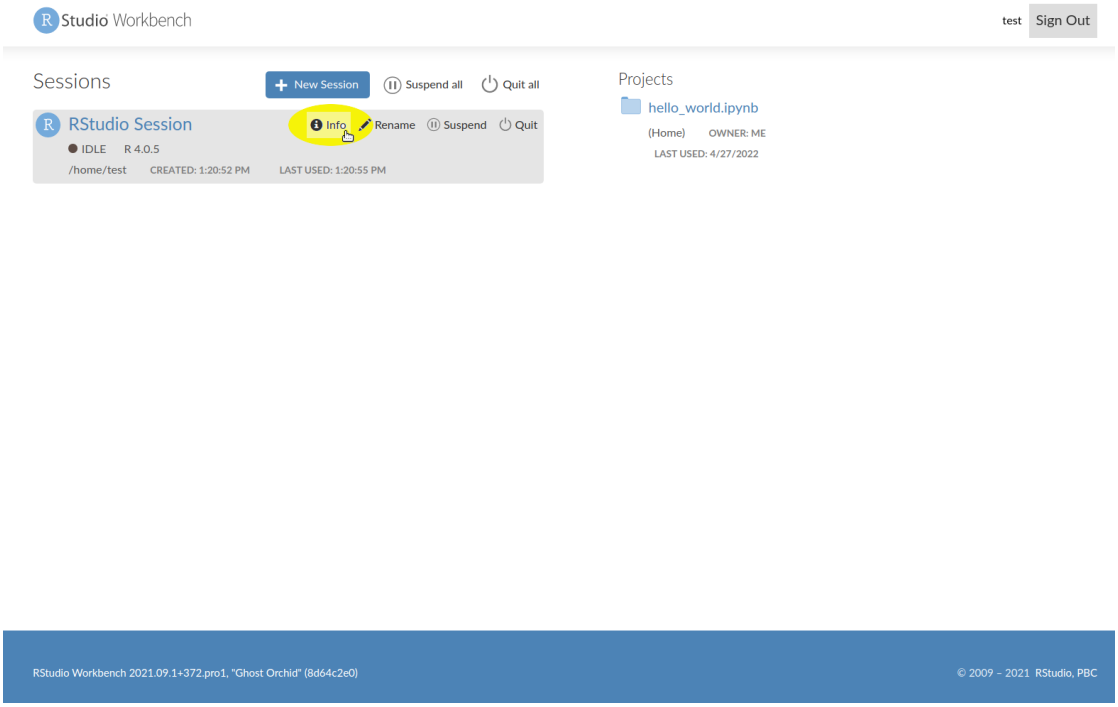

Figure 6: Get the details of session by clicking the **Info** button as highlighted in the yellow ellipse marker

Information about a job submitted in the AGE cluster can be collected via the qstat command. Session details are available in the **context** attribute of qstat -j <job_id>; these allow the user to match the AGE job with the RStudio session tags. The amount of memory allocated in AGE cluster is based on the number of CPUs. For example, if the user requested 2 CPUs and 800 Mb Memory, the AGE cluster allocates 800 Mb Memory per CPU as detailed below in the output of command - **qstat -j 3000000003**.

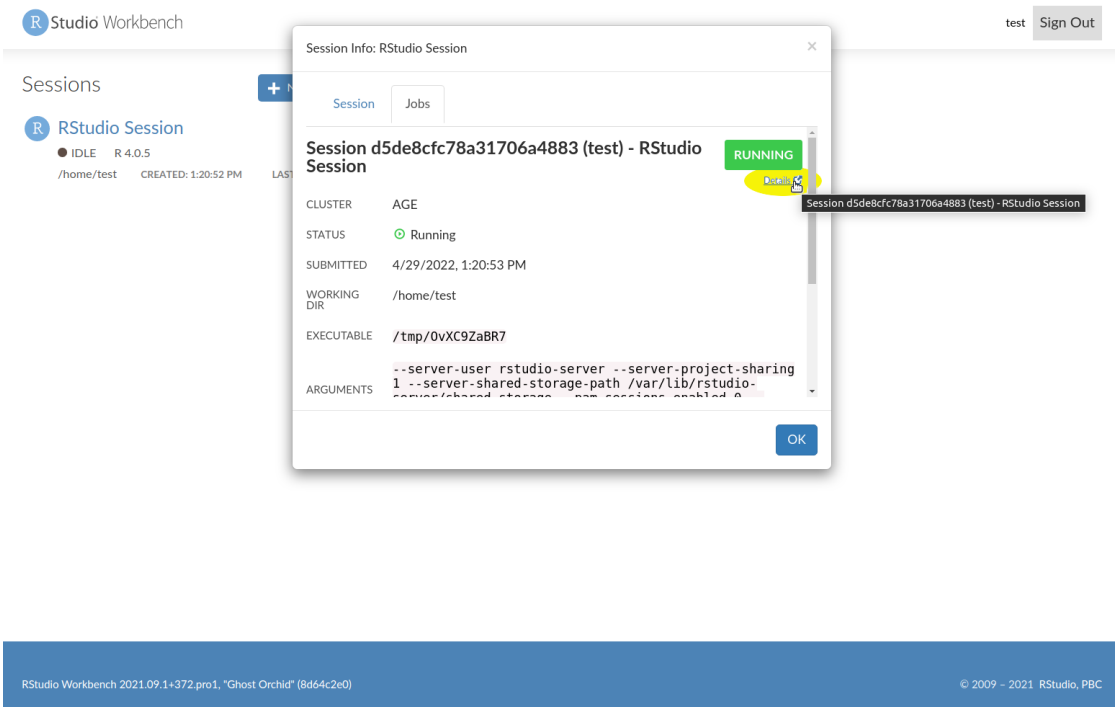

Figure 7: Get the more details of session by clicking the **Details** button as highlighted in the yellow ellipse marker

Figure 8: The details of session related to AGE cluster is highlighted in the yellow ellipse marker

qstat output from AGE:

```
# export SGE_LONG_JOB_NAMES=-1

# qstat -u test -f
queuename                      qtype resv/used/tot. np_load  arch          states
---------------------------------------------------------------------------------
test_q@node-1-centos8          BIP   0/0/28         0.01     lx-amd64
---------------------------------------------------------------------------------
test_q@node-2-centos8          BIP   0/2/28         0.01     lx-amd64
3000000003 0.55500 RStudio-RStudio-Session test         r     05/02/2022 12:31:40
---------------------------------------------------------------------------------
test_q@node-3-centos8          BIP   0/0/28         0.01     lx-amd64

# qstat -j 3000000003
==============================================================
job_number:                 3000000003
exec_file:                  job_scripts/3000000003
submission_time:            05/02/2022 12:31:39.797
owner:                      test
uid:                        1000
group:                      testg
gid:                        2000
supplementary group:        testg
sge_o_workdir:              /home/test
sge_o_host:                 node-1-centos8
account:                    sge
cwd:                        /home/test
hard_resource_list:         m_mem_free=800M
job_name:                   RStudio-RStudio-Session
script_file:                /tmp/5SHPArd184
parallel environment:       test_pe range: 2
department:                 defaultdepartment
context:                    rstudio_tags=157eeac2|d5de8cfc78a31|
                              d5de8cfc78a31157eeac2|rstudio-r-session|
                              rstudio-r-session-id:d5de8cfc78a31157eeac2|
                              rstudio-r-session-name:RStudio Session
submit_cmd:                 /nfs/install/gridengine/bin/lx-amd64/qsub -wd
                              /home/test -l m_mem_free=800M -pe test_pe 2 -ac
                              rstudio_tags='157eeac2|d5de8cfc78a31|
                              d5de8cfc78a31157eeac2| rstudio-r-session|
                              rstudio-r-session-id:d5de8cfc78a31157eeac2|
                              rstudio-r-session-name:RStudio Session'
                              -N RStudio-RStudio-Session /tmp/5SHPArd184
category_id:                2
start_time            1:    05/02/2022 12:31:40.001
job_state             1:    r
exec_host_list        1:    node-2-centos8:2
granted_req.          1,0:  m_mem_free=800.000M
```

```
granted_req.          1,1:  m_mem_free=800.000M
usage                 1:    wallclock=00:07:38, cpu=00:00:02, mem=1.77797 GBs,
                              io=0.00912 GB, iow=0.370 s, ioops=5547,
                              vmem=1.139G, maxvmem=1.139G
```

2.3 Different Session States

If the session is submitted and not executing any program in the session, it will be in the **IDLE** state. If the session is waiting for the resource allocation, it will be in the **PENDING** state. If the session is executing a code, it will be in the **EXECUTING** state. If the session is not successfully submitted in the AGE cluster or is killed by the user, it will be removed by changing the state to **KILLED**. If the session is idle for more than the waiting period, the session is automatically suspended and the resource is released, and it will be in the **SUSPENDED** state.

2.4 Navigating the RStudio Editor

2.4.1 Execute the code in the RStudio Editor

The RStudio session is accessible by clicking the corresponding session as shown in Figure 9 and the program is loaded by opening the file from the home directory of the user. The program can be executed by selecting the line and clicking the **Run** button as shown in Figure 10. The RStudio editor has direct access to an SSH terminal, so the source code can be accessed and built directly in the shell commands as shown in Figure 11.

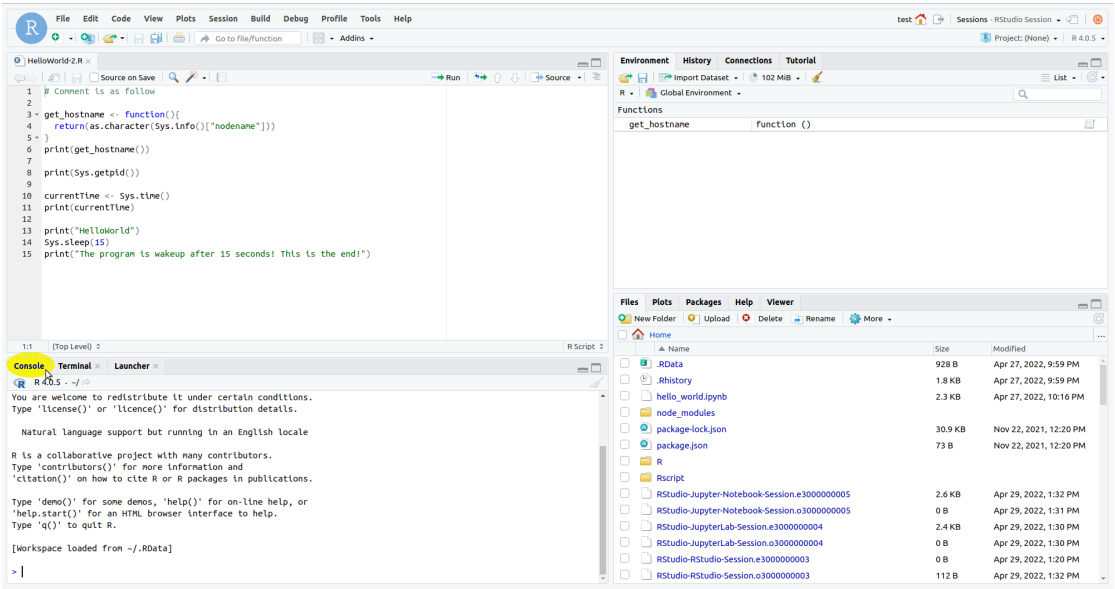

Figure 9: RStudio editor with console. The programs output (stdout and stderr) is displayed in the console while running the program

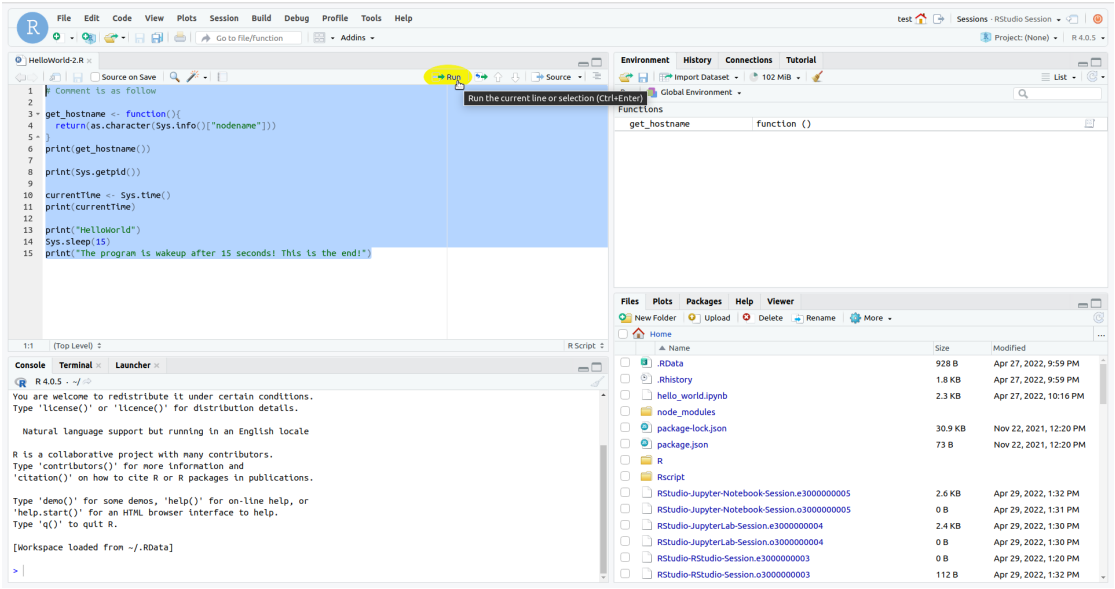

Figure 10: Execute the source code in the RStudio editor and the output is written to the console for each line of the program

2.4.2 Submit the launcher job

The launcher job can be submitted to run the job in the background by clicking the **Launcher** tab as shown in Figure 12 and the job submission window is displayed as shown in Figure 13. The status of submitted launcher job details are available as shown in Figure 14 and the user can access the specific outcome of the job by clicking it as shown in Figure 15.

2.4.3 Miscellaneous Functionalities in RStudio Editor

The session details can be accessed inside the editor by clicking the session details as shown in Figure 16. The session can be closed by clicking the quit button as shown in Figure 17. The user can go to their home page by clicking the home button as shown in Figure 18. These are all the main feature, which is related to the plugin. The user can find more details about other features in RStudio Editor by referring the official documentation in the RStudio Workbench user guide.

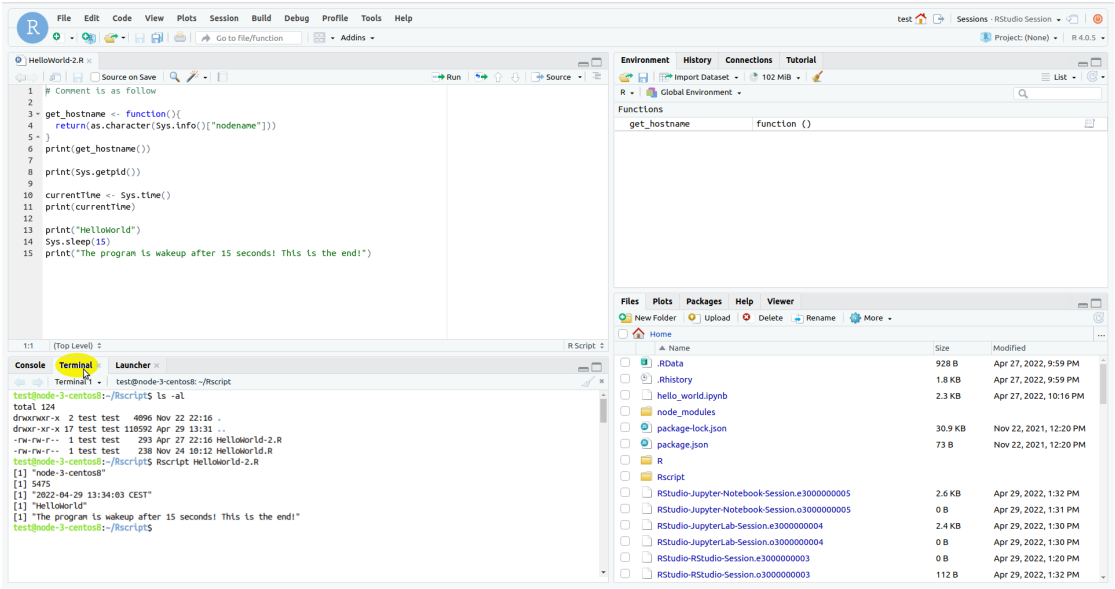

Figure 11: Terminal to access Shell and execute the commands directly in it

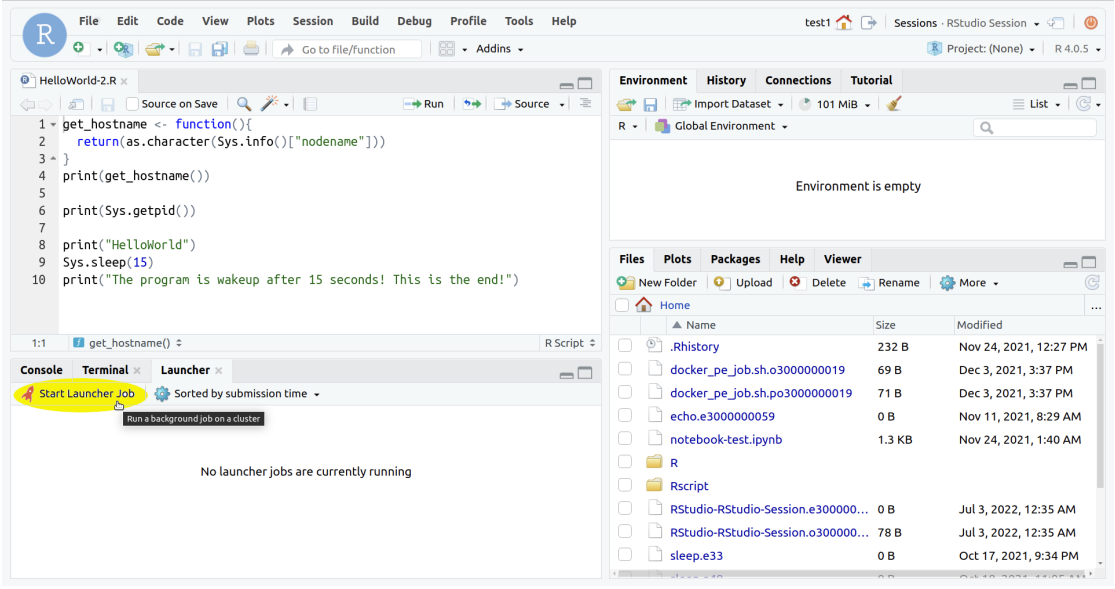

Figure 12: Start the Launcher job in the background

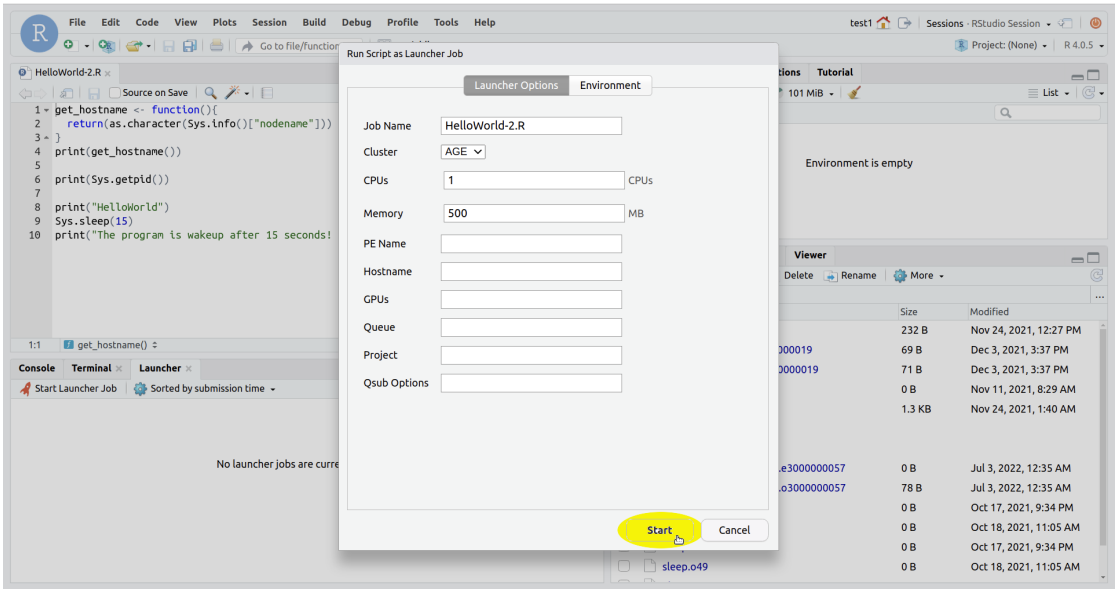

Figure 13: The job submission window for Launcher job

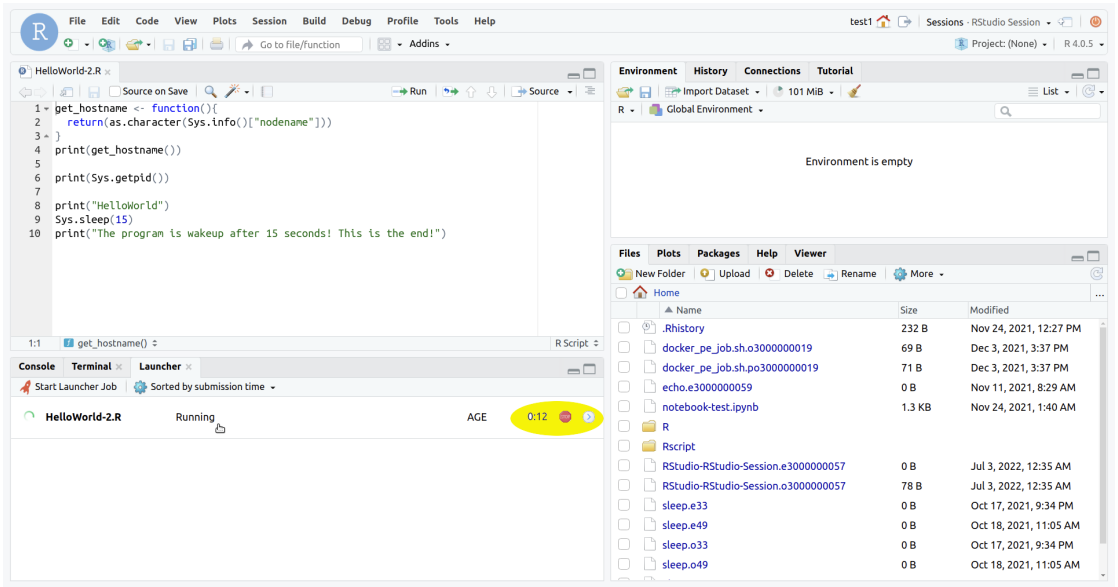

Figure 14: The status of submitted Launcher job

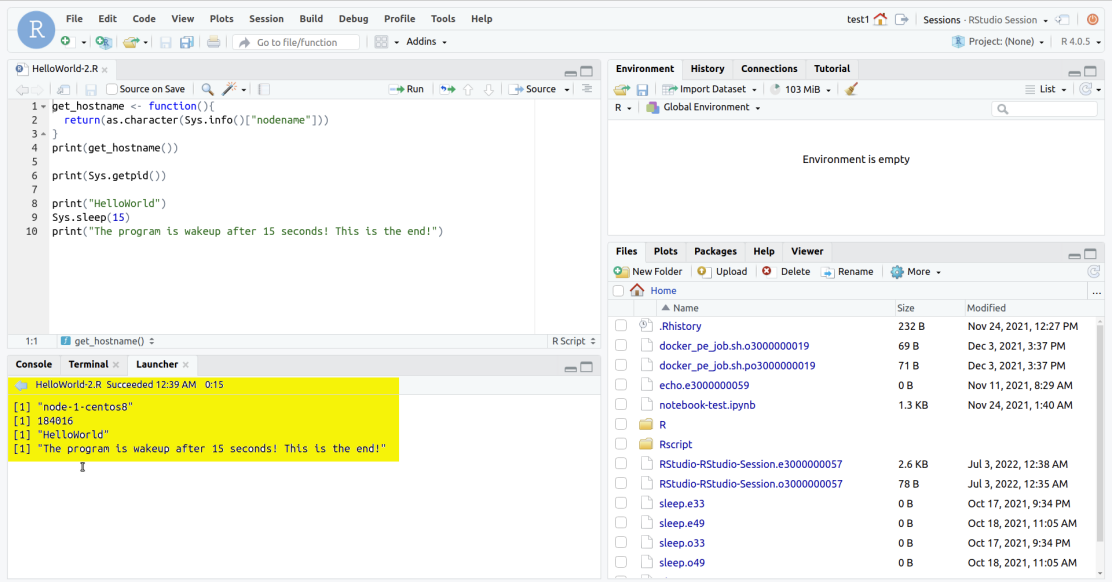

Figure 15: The outcome of submitted Launcher job

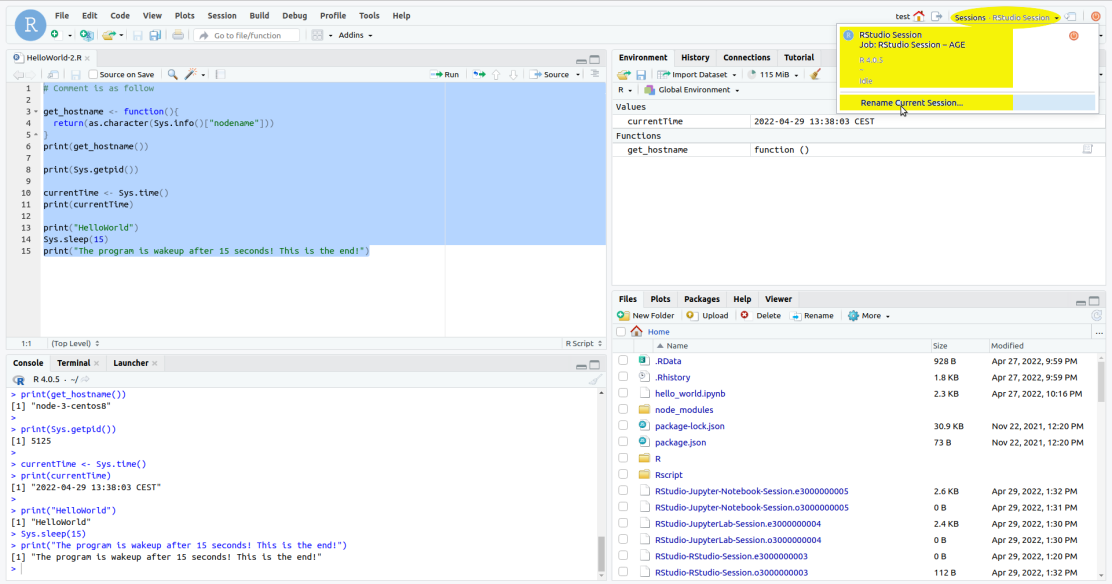

Figure 16: RStudio session name change and access to session details inside the editor as highlighted in the yellow ellipse marker

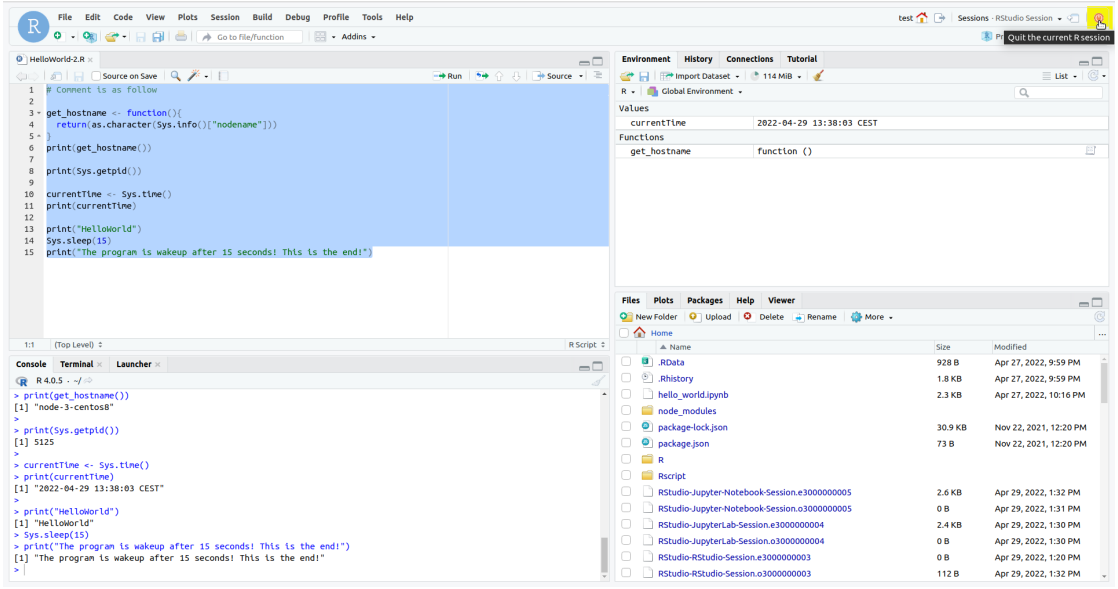

Figure 17: Quit the session in the RStudio Editor as highlighted in the yellow marker

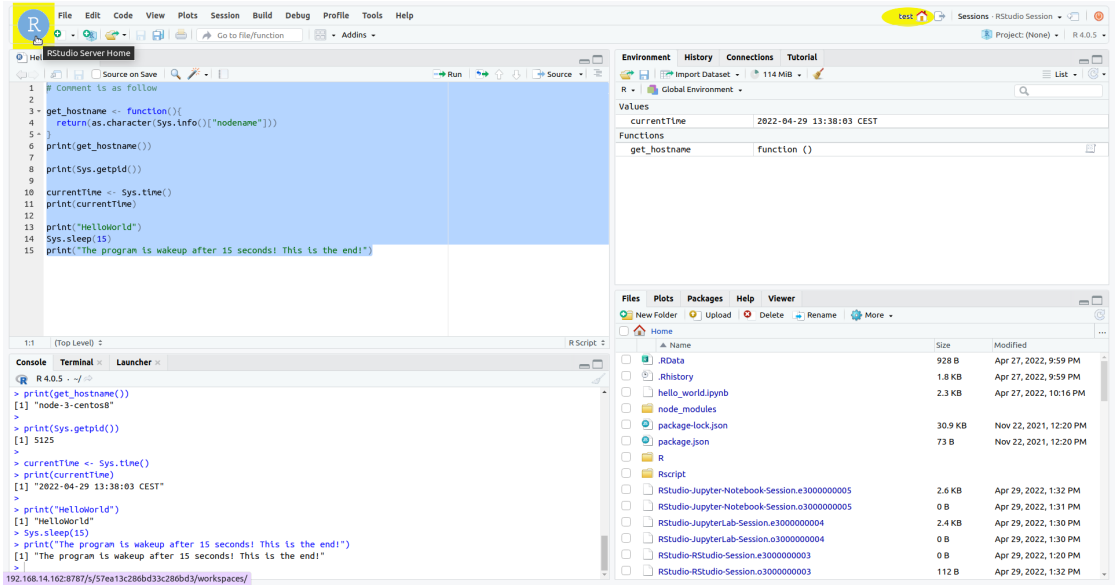

Figure 18: Access the home page of the user from the RStudio Editor as highlighted in the yellow ellipse marker

3 Resource Selection Request for AGE Cluster

3.1 GPU request

If the AGE cluster is configured with GPU complexes, the session will be created with the GPU request as shown in the Figure 19 and the corresponding qstat output as follows:

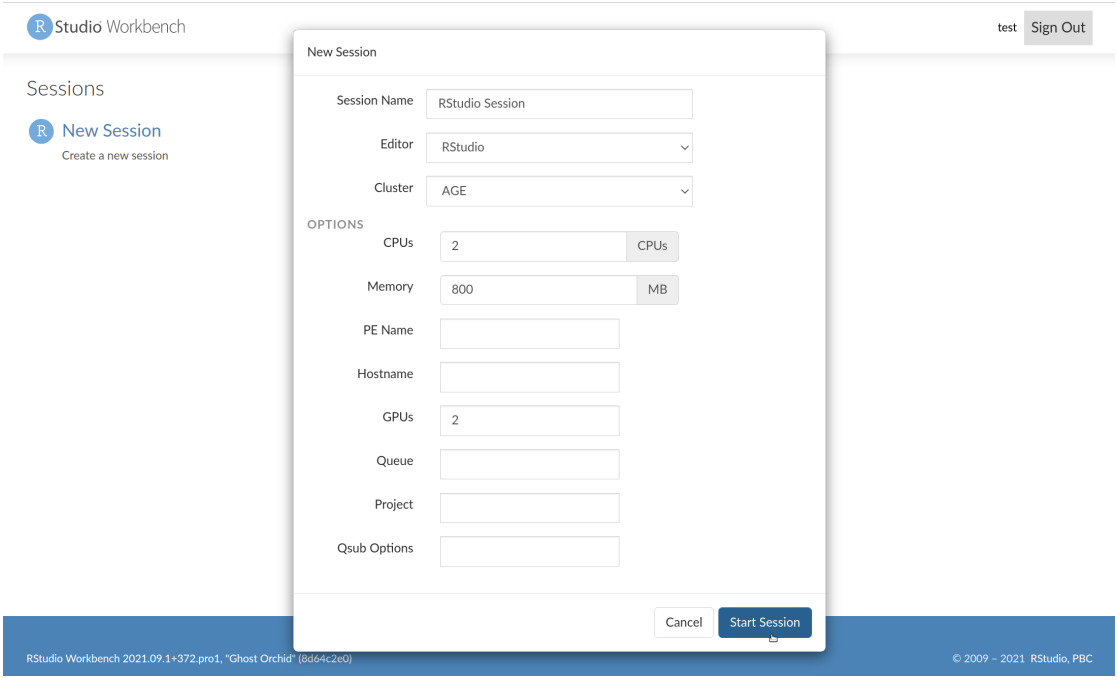

Figure 19: Submit the RStudio Session with AGE (Specific GPU request)

qstat output from AGE:

```
# qstat -u test -f
queuename                      qtype resv/used/tot. np_load  arch          states
---------------------------------------------------------------------------------
test_q@node-1-centos8          BIP   0/0/28         0.04     lx-amd64
---------------------------------------------------------------------------------
test_q@node-2-centos8          BIP   0/0/28         0.00     lx-amd64
---------------------------------------------------------------------------------
test_q@node-3-centos8          BIP   0/2/28         0.00     lx-amd64
3000000006 0.55500 RStudio-RStudio-Session test         r     05/02/2022 16:18:46

# qstat -j 3000000006
==============================================================
job_number:                 3000000006
exec_file:                  job_scripts/3000000006
submission_time:            05/02/2022 16:18:45.595
```

```
owner:                      test
uid:                        1000
group:                      testg
gid:                        2000
supplementary group:        testg
sge_o_home:                 /home/test
sge_o_log_name:             test
sge_o_path:                 /sbin:/bin:/usr/sbin:/usr/bin
sge_o_shell:                /bin/bash
sge_o_workdir:              /home/test
sge_o_host:                 node-1-centos8
account:                    sge
cwd:                        /home/test
hard_resource_list:         gpu_test=2,m_mem_free=800M
job_name:                   RStudio-RStudio-Session
parallel environment:       test_pe range: 2
start_time            1:    05/02/2022 16:18:46.001
job_state             1:    r
exec_host_list        1:    node-3-centos8:2
granted_req.          1,0:  gpu_test=2, m_mem_free=800.000M
granted_req.          1,1:  gpu_test=2, m_mem_free=800.000M
resource_map          1,0:  gpu_test=node-3-centos8=(0 1)
resource_map          1,1:  gpu_test=node-3-centos8=(2 3)
```

3.2 Specific host request

If the user wants to run the session on the specified node, the specified node is requested in the session as shown in Figure 20 and the corresponding qstat output as follows:

qstat output from AGE:

```
# qstat -u test -f
queuename                      qtype resv/used/tot. np_load  arch          states
---------------------------------------------------------------------------------
test_q@node-1-centos8          BIP   0/2/28         0.03     lx-amd64
3000000007 0.55500 RStudio-RStudio-Session test         r     05/02/2022 16:47:40
---------------------------------------------------------------------------------
test_q@node-2-centos8          BIP   0/0/28         0.00     lx-amd64
---------------------------------------------------------------------------------
test_q@node-3-centos8          BIP   0/0/28         0.01     lx-amd64

# qstat -j 3000000007
==============================================================
job_number:                 3000000007
exec_file:                  job_scripts/3000000007
submission_time:            05/02/2022 16:47:39.189
owner:                      test
uid:                        1000
group:                      testg
```

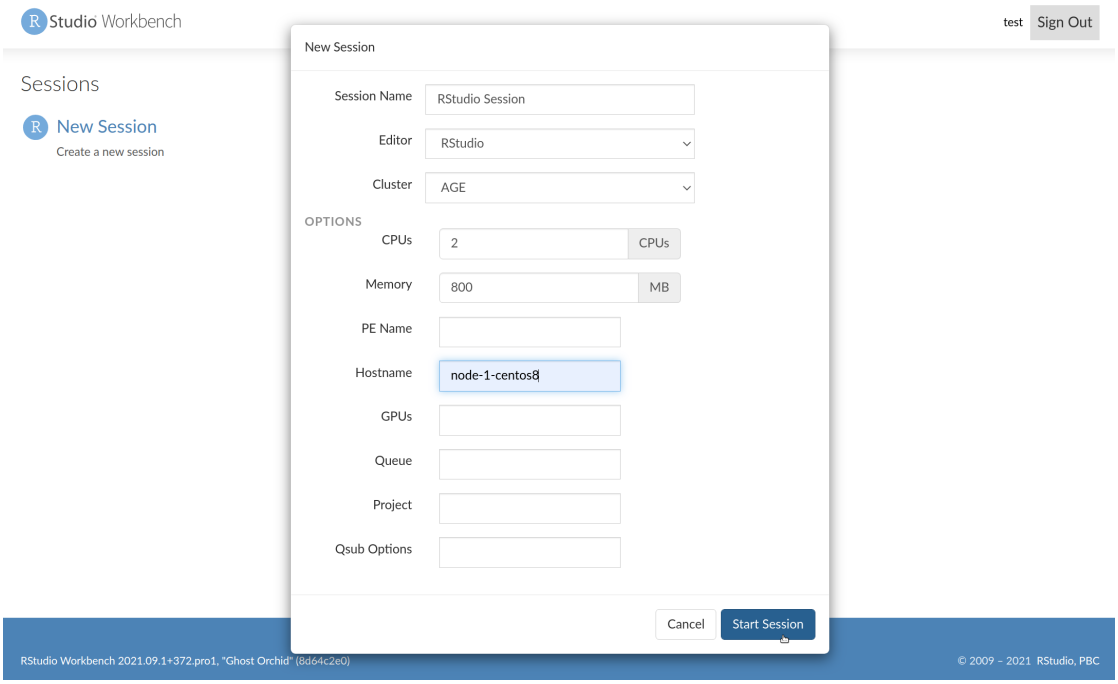

Figure 20: Submit the RStudio Session with AGE (Specific host request)

```
gid:                          2000
supplementary group:          testg
sge_o_home:                   /home/test
sge_o_host:                   node-1-centos8
cwd:                          /home/test
hard_resource_list:           hostname=node-1-centos8,m_mem_free=800M
job_name:                     RStudio-RStudio-Session
parallel environment:         test_pe range: 2
context:                      rstudio_tags=45480bfd|d5de8cfc78a31|
                              d5de8cfc78a3145480bfd|rstudio-r-session|
                              rstudio-r-session-id:d5de8cfc78a3145480bfd|
                              rstudio-r-session-name:RStudio Session
submit_cmd:                   /nfs/install/gridengine_ts_master/bin/lx-amd64/qsub
                              -wd /home/test -l m_mem_free=800M -l h=node-1-centos8
                              -pe test_pe 2 -ac rstudio_tags='45480bfd|
                              d5de8cfc78a31|d5de8cfc78a3145480bfd|
                              rstudio-r-session|rstudio-r-session-id:
                              d5de8cfc78a3145480bfd|
                              rstudio-r-session-name:RStudio Session'
                              -N RStudio-RStudio-Session /tmp/goeICpDHHu
start_time            1:      05/02/2022 16:47:40.002
job_state             1:      r
exec_host_list        1:      node-1-centos8:2
granted_req.          1,0:    m_mem_free=800.000M
```

```
granted_req.          1,1:  m_mem_free=800.000M
```

3.3 Specific queue and Parallel Environment (PE) request

If the user wants to run the session upon the specified queue, the specified queue is requested in the session as shown in Figure 21 and the corresponding qstat output as follows:

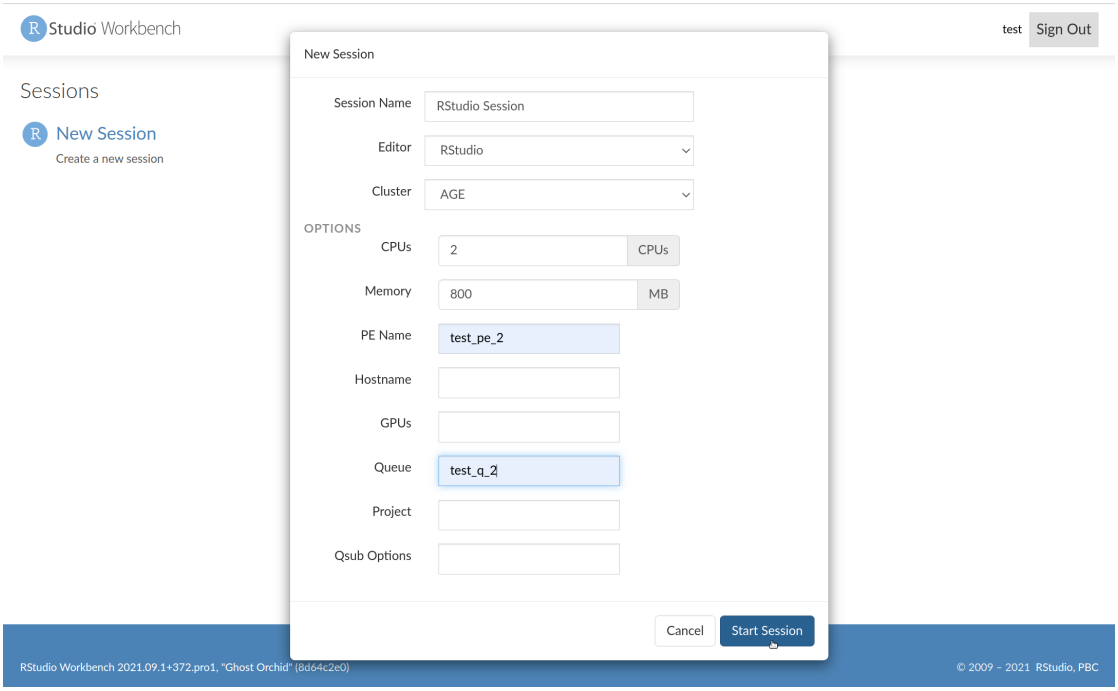

Figure 21: Submit the RStudio Session with AGE (Specific queue and Parallel Environment request)

qstat output from AGE:

```
# qstat -u test -f
queuename                      qtype resv/used/tot. np_load  arch          states
---------------------------------------------------------------------------------
test_q@node-1-centos8          BIP   0/0/28         0.04     lx-amd64
---------------------------------------------------------------------------------
test_q@node-2-centos8          BIP   0/0/28         0.01     lx-amd64
---------------------------------------------------------------------------------
test_q@node-3-centos8          BIP   0/0/28         0.00     lx-amd64
---------------------------------------------------------------------------------
test_q_2@node-1-centos8        BIP   0/0/28         0.04     lx-amd64
---------------------------------------------------------------------------------
test_q_2@node-2-centos8        BIP   0/2/28         0.01     lx-amd64
3000000012 0.55500 RStudio-RStudio-Session test         r     05/02/2022 16:57:56
---------------------------------------------------------------------------------
```

```
test_q_2@node-3-centos8        BIP   0/0/28         0.00     lx-amd64

# qstat -j 3000000012
==============================================================
job_number:                 3000000012
exec_file:                  job_scripts/3000000012
submission_time:            05/02/2022 16:57:55.496
owner:                      test
uid:                        1000
group:                      testg
gid:                        2000
supplementary group:        testg
sge_o_home:                 /home/test
sge_o_host:                 node-1-centos8
account:                    sge
cwd:                        /home/test
hard_resource_list:         m_mem_free=800M
hard_queue_list:            test_q_2
job_name:                   RStudio-RStudio-Session
script_file:                /tmp/15bhvXEoN8
parallel environment:       test_pe_2 range: 2
context:                    rstudio_tags=a46dcba5|d5de8cfc78a31|
                            d5de8cfc78a31a46dcba5|rstudio-r-session|
                            rstudio-r-session-id:d5de8cfc78a31a46dcba5|
                            rstudio-r-session-name:RStudio Session
submit_cmd:                 /nfs/install/gridengine_ts_master/bin/lx-amd64/qsub
                            -wd /home/test -l m_mem_free=800M -q test_q_2
                            -pe test_pe_2 2 -ac rstudio_tags='a46dcba5|
                            d5de8cfc78a31|d5de8cfc78a31a46dcba5|
                            rstudio-r-session|rstudio-r-session-id:
                            d5de8cfc78a31a46dcba5|rstudio-r-session-name:
                            RStudio Session'
                            -N RStudio-RStudio-Session /tmp/15bhvXEoN8
category_id:                10
start_time            1:    05/02/2022 16:57:56.002
job_state             1:    r
exec_host_list        1:    node-2-centos8:2
granted_req.          1,0:  m_mem_free=800.000M
granted_req.          1,1:  m_mem_free=800.000M
```

3.4 Specific project request

If the user wants to run the session upon the specified project, the specified project is requested in the session as shown in Figure 22 and the corresponding qstat output as follows:

qstat output from AGE:

```
# qstat -u test -f
queuename                      qtype resv/used/tot. np_load  arch          states
```

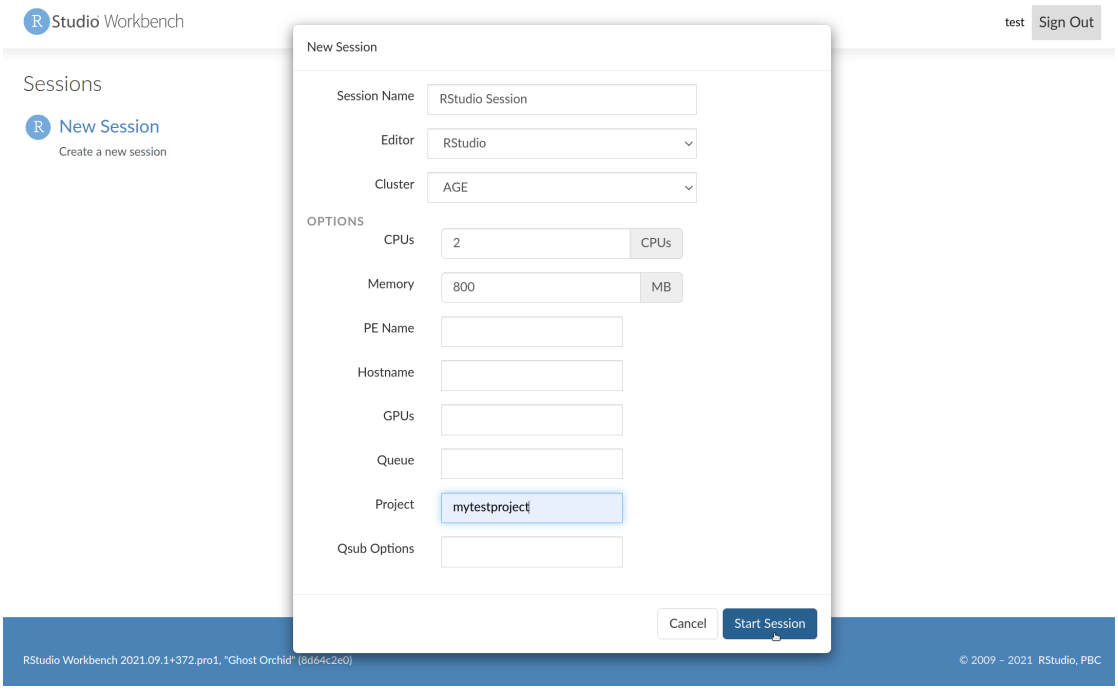

Figure 22: Submit the RStudio Session with AGE (Specific project request)

```
---------------------------------------------------------------------------------
test_q@node-1-centos8          BIP   0/0/28         0.04     lx-amd64
---------------------------------------------------------------------------------
test_q@node-2-centos8          BIP   0/0/28         0.01     lx-amd64
---------------------------------------------------------------------------------
test_q@node-3-centos8          BIP   0/2/28         0.02     lx-amd64
3000000013 0.55500 RStudio-RStudio-Session test         r     05/02/2022 17:04:23

# qstat -j 3000000013
==============================================================
job_number:                 3000000013
exec_file:                  job_scripts/3000000013
submission_time:            05/02/2022 17:04:22.036
owner:                      test
uid:                        1000
group:                      testg
gid:                        2000
supplementary group:        testg
sge_o_home:                 /home/test
sge_o_log_name:             test
sge_o_path:                 /sbin:/bin:/usr/sbin:/usr/bin
cwd:                        /home/test
hard_resource_list:         m_mem_free=800M
job_name:                   RStudio-RStudio-Session
```

```
script_file:                /tmp/hKfTLfnPCL
parallel environment:       test_pe range: 2
project:                    mytestproject
department:                 defaultdepartment
start_time            1:    05/02/2022 17:04:23.002
job_state             1:    r
exec_host_list        1:    node-3-centos8:2
granted_req.          1,0:  m_mem_free=800.000M
granted_req.          1,1:  m_mem_free=800.000M
usage                 1:    wallclock=00:00:13, cpu=00:00:00,
                            mem=0.41796 GBs, io=0.00912 GB, iow=0.090 s,
                            ioops=2044, vmem=1.077G, maxvmem=1.077G
```

3.5 Custom Qsub options

This **Qsub Options** textbox allows the user to submit jobs based on their customized needs without restricting them to the predefined menu options. If the user wants to use the complicated resource selection rule, the user can request the details in the session as shown in Figure 23 and the corresponding qstat output as follows:

Note
Array jobs are not supported with the current version of the plugin, so the **Qsub Options** do not support the "-t" option.

qstat output from AGE:

```
# qstat -u test -f
queuename                      qtype resv/used/tot. np_load  arch          states
---------------------------------------------------------------------------------
test_q@node-1-centos8          BIP   0/0/28         0.04     lx-amd64
---------------------------------------------------------------------------------
test_q@node-2-centos8          BIP   0/2/28         0.01     lx-amd64
3000000014 0.55500 RStudio-RStudio-Session test         r     05/02/2022 17:09:38
---------------------------------------------------------------------------------
test_q@node-3-centos8          BIP   0/0/28         0.01     lx-amd64
---------------------------------------------------------------------------------
test_q_2@node-1-centos8        BIP   0/0/28         0.04     lx-amd64
---------------------------------------------------------------------------------
test_q_2@node-2-centos8        BIP   0/0/28         0.01     lx-amd64
---------------------------------------------------------------------------------
test_q_2@node-3-centos8        BIP   0/0/28         0.01     lx-amd64

# qstat -j 3000000014
==============================================================
job_number:                 3000000014
jclass:                     NONE
exec_file:                  job_scripts/3000000014
```

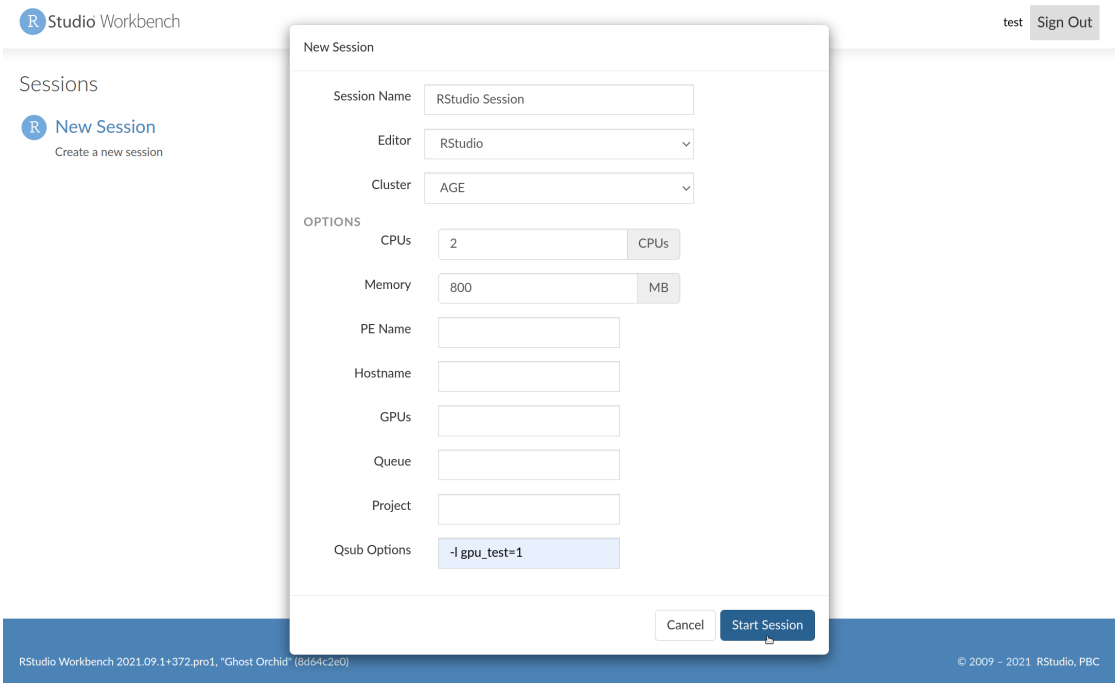

Figure 23: Submit the RStudio Session with AGE (Miscellaneous QSUB options)

```
submission_time:            05/02/2022 17:09:37.898
owner:                      test
uid:                        1000
group:                      testg
gid:                        2000
supplementary group:        testg
sge_o_home:                 /home/test
sge_o_log_name:             test
sge_o_path:                 /sbin:/bin:/usr/sbin:/usr/bin
sge_o_shell:                /bin/bash
sge_o_workdir:              /home/test
sge_o_host:                 node-1-centos8
account:                    sge
cwd:                        /home/test
hard_resource_list:         gpu_test=1,m_mem_free=800M
mail_list:                  test@node-1-centos8
notify:                     FALSE
job_name:                   RStudio-RStudio-Session
priority:                   0
jobshare:                   0
env_list:
script_file:                /tmp/V61NQtbBuH
parallel environment:       test_pe range: 2
department:                 defaultdepartment
```

```
submit_cmd:                 /nfs/install/gridengine_ts_master/bin/lx-amd64/qsub
                            -wd /home/test -l m_mem_free=800M -l gpu_test=1
                            -pe test_pe 2 -ac rstudio_tags='2456acea|
                            d5de8cfc78a31|d5de8cfc78a312456acea|
                            rstudio-r-session|rstudio-r-session-id:
                            d5de8cfc78a312456acea|
                            rstudio-r-session-name:RStudio Session'
                            -N RStudio-RStudio-Session /tmp/V61NQtbBuH
category_id:                12
request_dispatch_info:      FALSE
start_time            1:    05/02/2022 17:09:38.001
job_state             1:    r
exec_host_list        1:    node-2-centos8:2
granted_req.          1,0:  gpu_test=1, m_mem_free=800.000M
granted_req.          1,1:  gpu_test=1, m_mem_free=800.000M
resource_map          1,0:  gpu_test=node-2-centos8=(0)
resource_map          1,1:  gpu_test=node-2-centos8=(1)
```

4 Different editors supported in RStudio Workbench with AGE

If RStudio Workbench is configured with different types of editors, it will be used with the AGE cluster without any restriction. If multiple sessions are requested with different types of editors, the dashboard appears as in Figure 24.

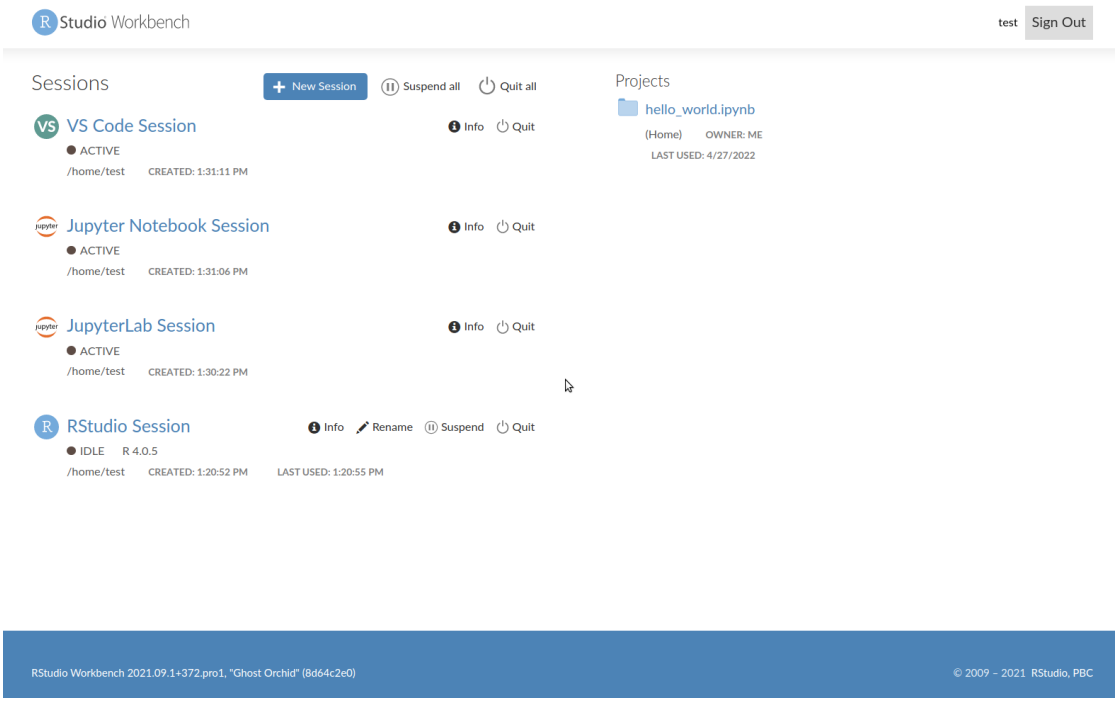

Figure 24: The dashobaord with multiple session and different editor

4.1 Jupyter Lab session

If a Jupyter Lab session is successfully submitted, it can be accessed as shown in Figure 25 to run the specified code. The user can find more details about other features in Jupyter Lab Editor by referring to the official documentation for Jupyter Lab.

4.2 Jupyter Notebook session

If a Jupyter Notebook session is successfully submitted, it can be accessed as shown in Figure 26 to run the specified code. The user can find more details about other features in Jupyter Notebook Editor by referring to the official documentation for Jupyter Notebook.

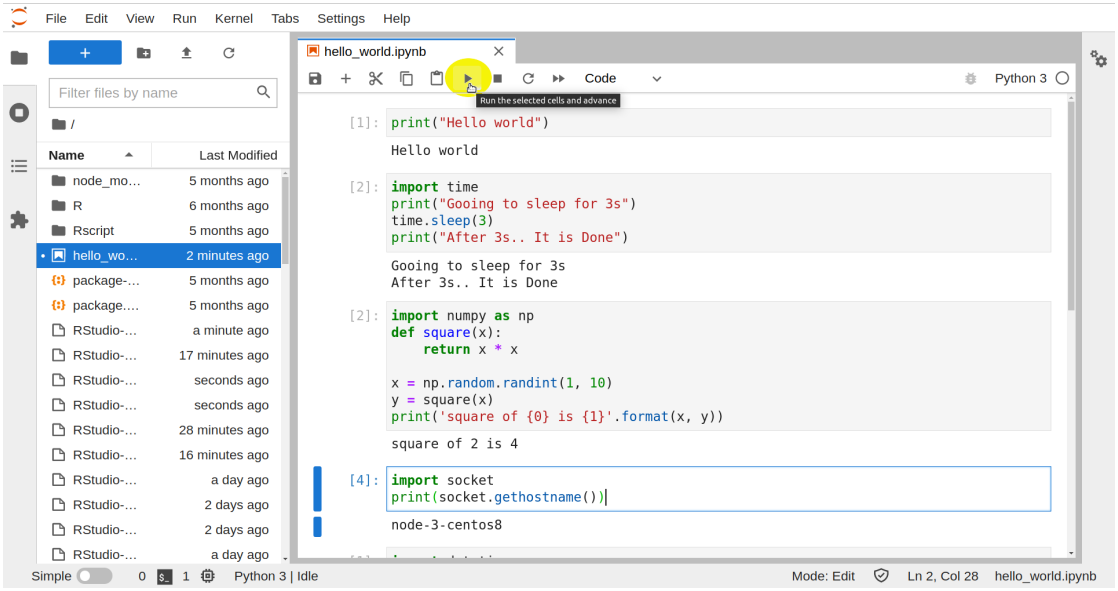

Figure 25: Execute the code in Jupyter Lab editor inside the RStudio Workbench server

4.3 Microsoft Visual Studio Code session

If a Microsoft Visual Studio Code session is successfully submitted, it can be accessed as shown in Figure 27 to run the specified code or access the terminal. The user can find more details about other features in Microsoft Visual Studio Code Editor by referring to the official documentation for Microsoft Visual Studio Code.

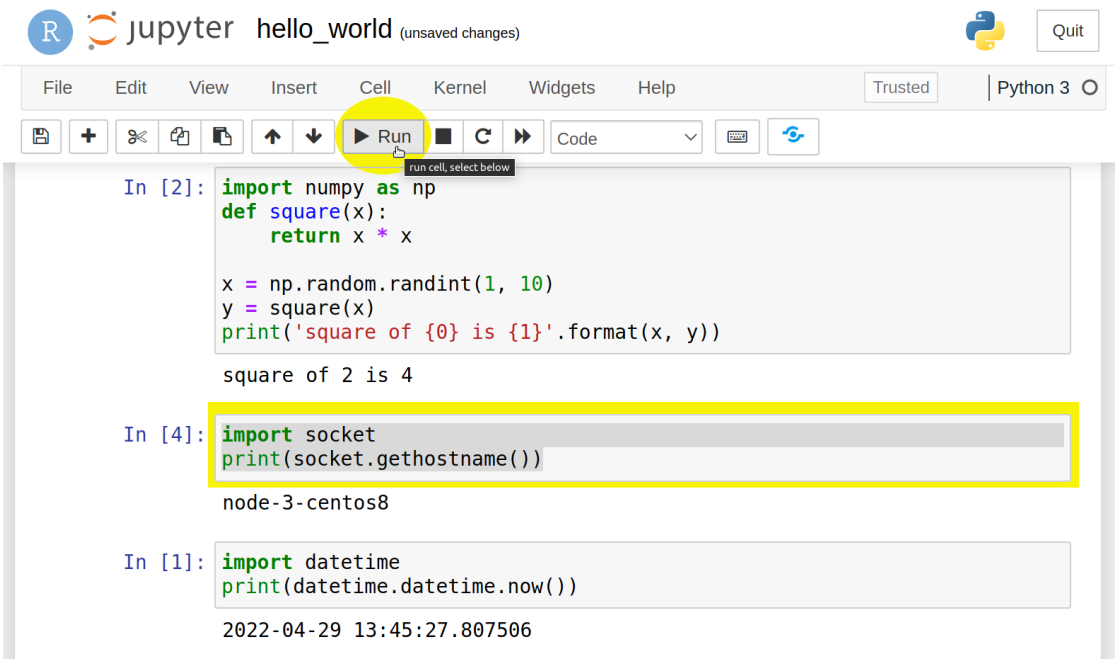

Figure 26: Execute the code in Jupyter Notebook editor inside the RStudio Workbench server

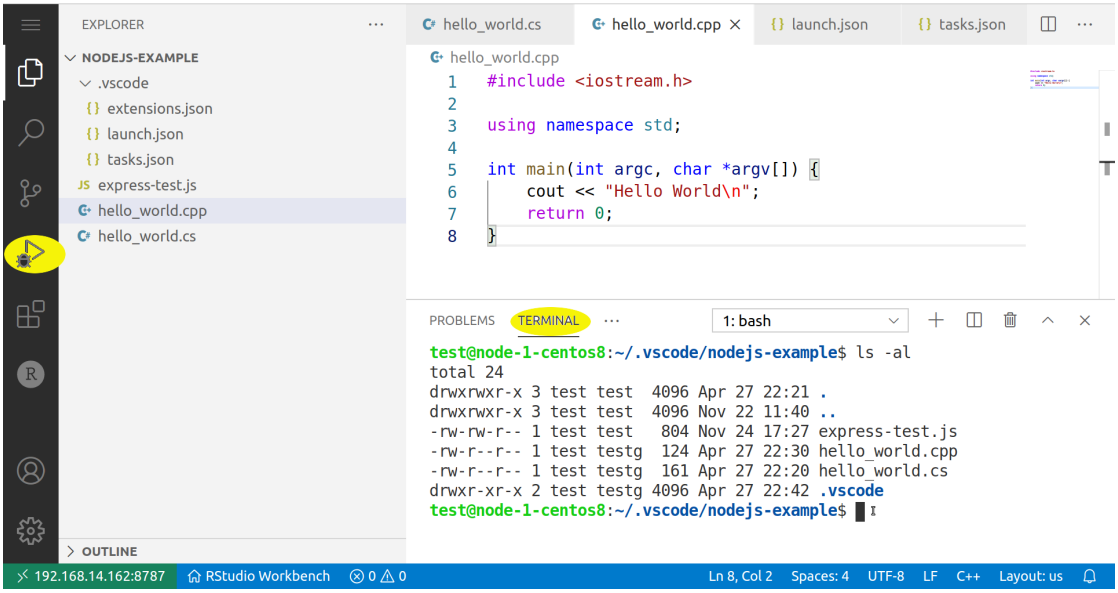

Figure 27: Execute the code in Microsoft Visual Studio Code editor inside the RStudio Workbench server

5 Limitations

Note
Jupyter Notebook, Jupyter Lab and Microsoft Visual Studio Code have the **ACTIVE, PENDING, KILLED** state only. The **ACTIVE** state is similar to **IDLE** in the RStudio Editor. If the source code is run inside the editor, the state cannot be changed into **EXECUTING** and it shows only the availability of the sessions for those editors.

Note
Jupyter Notebook, Jupyter Lab and Microsoft Visual Studio Code do not have the the menu options to change the session name and suspend the session after it is created.

Note
The user should not submit their own jobs with the prefix of **RStudio-** as a job name to avoid any conflict with the plugin-generated jobs.

Note
Array jobs are not supported with the current version of the plugin, so the session request menu does not support the "-t" option in **Qsub Options**.

Note
If the session is allocated to multiple nodes, it cannot run the editor in multiple nodes.