Fugaku Commercial Software
Simcenter STAR-CCM+
User's Guide

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1. Preface

Purpose of this document

This document describes how to use Simcenter STAR-CCM+, which is maintained by the RIKEN Center for Computational Science (R-CCS) on the supercomputer "Fugaku".

- For general information on how to use Fugaku, please refer to the manuals in the Fugaku Portal
- Please refer to the Simcenter STAR-CCM+ manual for general Simcenter STAR-CCM+ usage

Prerequisite

The user shall have executed procedures such as the conclusion of a license agreement for Simcenter STAR-CCM+ in accordance with the "Flow to Start Using" and shall have received a notice of completion for the software usage environment.

When using commercial software installed on Fugaku, R-CCS and cooperating organizations cooperate with software vendors to manage software licenses (operation checks) and conduct investigations when inquiring about software operation. Therefore, license information and inquiries may be shared among R-CCS, cooperating organizations, and software vendors. Please understand this in advance.

2. Executing Simcenter STAR-CCM+ Mesher

The following is an example of a job script for executing Mesher. Please modify it as appropriate for your work environment. Refer to the description below for the red parts. This job is submitted to the pre-post environment.

Table 1 Mesher Sample Script (Using License Manager)

```
#!/bin/bash
#SBATCH -p mem2
#SBATCH -n 56
#SBATCH -t 24:00:00
#SBATCH --mem 1500G

module use /vol0004/apps/isv/STAR-CCM+/modulefiles
module load STAR-CCM+_MESHER

# sim file info ==================
STARCASE=HypersonicSphere_start.sim

# Licnese File Info ( Specify only when using the License Server )======================
export CDLMD_LICENSE_FILE=[Port number]@[IP address for license server]

CASE="${STARCASE%.sim}"
LOGFILE=$CASE.mesh.log

# STAR-CCM+ TEMP DIR ========
export TMPDIR=[TEMPORARY_DIRECTORY_PATH]

# Run simulation ================
date > $LOGFILE
echo "TMPDIR               : $TMPDIR"        >> $LOGFILE
echo "SIM FILE NAME    : $STARCASE"     >> $LOGFILE
echo "CASE NAME          : $CASE"          >> $LOGFILE
starccm+ ¥
  -locale en ¥
  -rsh ssh ¥
  -power ¥
  -mpi intel ¥
  -on `hostname`:$SLURM_NTASKS ¥
  -batch mesh ¥
  $STARCASE >> $LOGFILE
date >> $LOGFILE
```

Table 2 Mesher Sample Script (Using PoD)

```
#!/bin/bash
#SBATCH -p mem2
#SBATCH -n 56
#SBATCH -t 24:00:00
#SBATCH --mem 1500G

module use /vol0004/apps/isv/STAR-CCM+/modulefiles
module load STAR-CCM+_MESHER

# sim file info ==================
STARCASE=HypersonicSphere_start.sim

# PoD Info ( Specify only when using PoD  )==================
PODKEY="[License code]"
POD="-podkey $PODKEY -licpath 1999@flex.cd-adapco.com"
export -n CDLMD_LICENSE_FILE

CASE="${STARCASE%.sim}"
LOGFILE=$CASE.mesh.log

# STAR-CCM+ TEMP DIR ========
export TMPDIR=[TEMPORARY_DIRECTORY_PATH]

# Run simulation ================
date > $LOGFILE
echo "TMPDIR              : $TMPDIR"       >> $LOGFILE
echo "SIM FILE NAME    : $STARCASE"    >> $LOGFILE
echo "CASE NAME          : $CASE"          >> $LOGFILE
starccm+ ¥
  -locale en ¥
  -rsh ssh ¥
  -power ¥
  $POD
  -mpi intel ¥
  -on `hostname`:$SLURM_NTASKS ¥
  -batch mesh ¥
  $STARCASE >> $LOGFILE
date >> $LOGFILE
```

2.1. Settings for Simcenter STAR-CCM+ Mesher

- module command

  Used to set environment variables.

- module use

  Specifies where modulefile is stored. Do not change.

- module load *modulefile*

  Sets environment variables defined in *modulefile*.

```
module load STAR-CCM+_MESHER
```

  is specified, the latest version installed on Fugaku is used.

  Important: Environment variables set by the module load command may include runtime parameters. When specifying runtime parameters, be sure to specify them after the module load command.

  To use a specific version, change the *modulefile*.

```
Example: Using 2302.0001 version
  module load STAR-CCM+_MESHER/2302.0001
```

  - module avail

    Displays a list of available *modulefiles*.

```
  module use /vol0004/apps/isv/STAR-CCM+/modulefiles
  module avail STAR-CCM+_MESHER
```

  - module show *modulefile*

    Displays what is set by the module command.

```
Example: Show what is set when STAR-CCM+_MESHER is specified
  module use /vol0004/apps/isv/STAR-CCM+/modulefiles
  module show STAR-CCM+_MESHER
```

- CDLMD_LICENSE_FILE

  Specify the IP address and port number of the license server. Set the IP address and port number you received from the Fugaku Support in the format "port-number@IP-address".

- PODKEY

  Specifies the license key to use with the PoD.

- TMPDIR

  Specifies the temporary directory path. Specify the data area, not the login directory.

3. Executing Simcenter STAR-CCM+ Solver

The following is an example of a job script for executing Solver. Please modify it as appropriate for your work environment. Refer to the description below for the red parts. This job is submitted to the computation node.

Table 3 Solver Sample Script (Using License Manager)

```
#!/bin/bash
#PJM -L "node=1"
#PJM --mpi "max-proc-per-node=48"
#PJM -L "elapse=00:40:00"
#PJM -L "rscgrp=small"
#PJM -L "freq=2200,eco_state=2"
#PJM --llio cn-cache-size=1024Mi
#PJM --llio perf
#PJM --llio "stripe-count=24"
#PJM --sparam "wait-time=unlimited"
#PJM -L "exepjrsh=1"
#PJM -g <groupname>
#PJM -x PJM_LLIO_GFSCACHE=/vol0004
#PJM -S

module use /vol0004/apps/isv/STAR-CCM+/modulefiles
module load STAR-CCM+

# sim file info ================
STARCASE=Wing.sim

# Licnese File Info ( Specify only when using the License Server )=====================
export CDLMD_LICENSE_FILE=[Port number]@[IP address for license server]



<< continue >>
```

```
# STAR-CCM+ TEMP DIR ========
export TMPDIR=[TEMPORARY_DIRECTORY_PATH]

# Batch run setting ==============
BATCHRUN="run"

# Case Path Settings ============
CASE="${STARCASE%.sim}"
CASELOG=$CASE.${PJM_JOBID}.log
echo "" > $CASELOG
# Get host list =================
LOCAL_WORK_DIR=`pwd`
HOSTLIST=$LOCAL_WORK_DIR/host.list
HOSTNAMELIST=$LOCAL_WORK_DIR/hostname.list
pjshowip | awk '{print $1""}' > $HOSTLIST
NP=`wc -l $HOSTLIST | awk '{print $1}' `
# Directory info ================
echo "----" >> $CASELOG
echo "Original HOME : " $HOME >>$CASELOG
echo "TMPDIR : " $TMPDIR >>$CASELOG
echo "WORK_DIR : " $LOCAL_WORK_DIR >>$CASELOG
echo "OPENMPI_DIR : " $OPENMPI_DIR >>$CASELOG
echo "" >>$CASELOG
echo CCM_START: `date` >>$CASELOG
echo "Number of Nodes : ${PJM_NODE}" >>$CASELOG
echo "Number of Procs : $NP" >>$CASELOG
echo "Max Elapse Limit : ${PJM_ELAPSE_LIMIT} sec" >>$CASELOG

starccm+ ¥
 -batch "run" ¥
 -pio ¥
 -np $NP ¥
 -noconnect ¥
 -mpi fujitsu ¥
 -power ¥
 $POD
 $STARCASE >> $CASELOG
echo CCM_END: `date` >>$CASELOG
echo "==== FINISHED ALL PROCESSES">>$CASELOG
```

Table 4　Solver Sample Script (Using PoD)

```
#!/bin/bash
#PJM -L "node=1"
#PJM --mpi "max-proc-per-node=48"
#PJM -L "elapse=00:40:00"
#PJM -L "rscgrp=small"
#PJM -L "freq=2200,eco_state=2"
#PJM --llio cn-cache-size=1024Mi
#PJM --llio perf
#PJM --llio "stripe-count=24"
#PJM --sparam "wait-time=unlimited"
#PJM -L "exepjrsh=1"
#PJM -g <groupname>
#PJM -x PJM_LLIO_GFSCACHE=/vol0004
#PJM -S

module use /vol0004/apps/isv/STAR-CCM+/modulefiles
module load STAR-CCM+

# sim file info ==================
STARCASE=Wing.sim



# PoD Info ( Specify only when using PoD  )==================
PODKEY="[License code]"
POD="-podkey $PODKEY -licpath 1999@flex.cd-adapco.com"
export -n CDLMD_LICENSE_FILE

# STAR-CCM+ TEMP DIR ========
export TMPDIR=[TEMPORARY_DIRECTORY_PATH]

# Batch run setting =============
BATCHRUN="run"

# Case Path Settings ============
CASE="${STARCASE%.sim}"
CASELOG=$CASE.${PJM_JOBID}.log
echo "" > $CASELOG
# Get host list =================
LOCAL_WORK_DIR=`pwd`
HOSTLIST=$LOCAL_WORK_DIR/host.list
HOSTNAMELIST=$LOCAL_WORK_DIR/hostname.list
pjshowip | awk '{print $1""}' > $HOSTLIST
```

<< continue >>

```
  NP=`wc -l $HOSTLIST | awk '{print $1}' `
  # Directory info ================
  echo "----" >> $CASELOG
  echo "Original HOME : " $HOME >>$CASELOG
  echo "TMPDIR : " $TMPDIR >>$CASELOG
  echo "WORK_DIR : " $LOCAL_WORK_DIR >>$CASELOG
  echo "OPENMPI_DIR : " $OPENMPI_DIR >>$CASELOG
  echo "" >>$CASELOG
  echo CCM_START: `date` >>$CASELOG
  echo "Number of Nodes : ${PJM_NODE}" >>$CASELOG
  echo "Number of Procs : $NP" >>$CASELOG
  echo "Max Elapse Limit : ${PJM_ELAPSE_LIMIT} sec" >>$CASELOG

  starccm+ ¥
   -batch "run" ¥
   -pio ¥
   -np $NP ¥
   -noconnect ¥
   -mpi fujitsu ¥
   -power ¥
   $POD
   $STARCASE >> $CASELOG
  echo CCM_END: `date` >>$CASELOG
echo "==== FINISHED ALL PROCESSES">>$CASELOG
```

3.1. Settings for Simcenter STAR-CCM+ Solver

- #PJM -L "freq=2200,eco_state=2"

  This option specifies the execution mode of Fugaku. In the example above, the boost eco mode is specified. Whether or not the execution mode setting has an effect on execution performance, and how large the effect is, depends on the input data. Please select the mode which makes acceptable performance degradation and as large power reduction as possible. For more detail, please refer to:

  https://www.fugaku.r-ccs.riken.jp/en/operation/20220701_01

- #PJM -x PJM_LLIO_GFSCACHE=/vol0004

  When submitting jobs, be sure to specify /vol0004 in the environment variable PJM_LLIO_GFSCACHE.

- module command

  Used to set environment variables.

- module use

  Specifies where *modulefile* is stored. Do not change.

- module load *modulefile*

  Sets environment variables defined in *modulefile*.

```
module load STAR-CCM+
```

  is specified, the latest version installed on Fugaku is used.

  Important: Environment variables set by the module load command may include runtime parameters. When specifying runtime parameters, be sure to specify them after the module load command.

  To use a specific version, change the *modulefile*.

```
Example: Using 2302.0001 version
  module load STAR-CCM+/2302.0001
```

  - module avail

    Displays a list of available *modulefiles*.

```
module use /vol0004/apps/isv/STAR-CCM+/modulefiles
module avail STAR-CCM+
```

  - module show *modulefile*

    Displays what is set by the module command.

```
Example: Show what is set when STAR-CCM+ is specified
  module use /vol0004/apps/isv/STAR-CCM+/modulefiles
  module show STAR-CCM+
```

  address and port number you received from the Fugaku Support in the format "port-number@IP-address".

- PODKEY

  Specifies the license key to use with the PoD.

- TMPDIR

  Specifies the temporary directory path. Specify the data area, not the login directory.

4. Change in the environment of Simcenter STAR-CCM+

When environmental changes are made to Simcenter STAR-CCM+, the details and

date of the changes will be posted on the Fugaku Portal. Please check the details of the changes and take action if necessary. The following is a list of expected changes, their impact on users, and how to deal with them.

- **Simcenter STAR-CCM+ Version Upgrade**

  If you use the latest version specified with STAR-CCM+ or STAR-CCM+_MESHER in module load, the software version executed after the change date will be changed to the newly latest version. If you want to keep using the currently using version, add the product version to the module load specification.

- **Simcenter STAR-CCM+ specific version removal**

  If the version to be deleted is specified in module load, the software will not be available after the change date. Please change the module load settings to switch to another available version.

5. Support

Please contact the Fugaku support (https://fugaku.zendesk.com/hc/en-us/requests/new) for Fugaku-specific content. For general information about Simcenter STAR-CCM+, please contact your licensee.