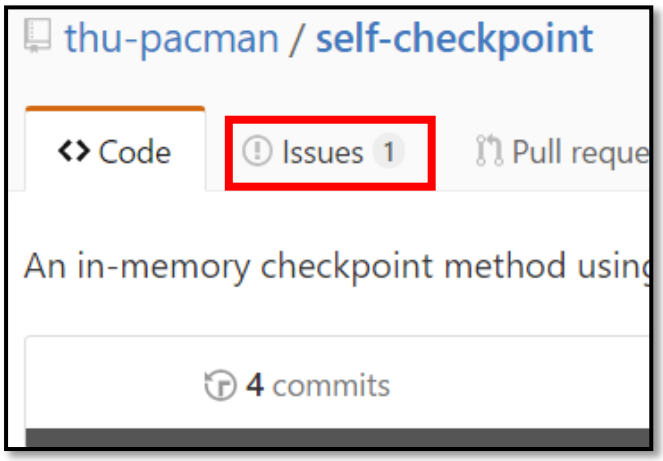
Run SKT-HPL on *gorgon* cluster

This document is for a fast evaluation of SKT-HPL. Environment has been prepared and there is no need to install or compile anything. Just follow this guide. If you have any question, you can create an issue on GitHub then we will try to answer it. https://github.com/thu-pacman/self-checkpoint



Firstly, login to our gateway

```
ssh aereviewer@166.111.68.163 -p 2222
PASSWORD: aereviewer
```

Then login to gorgon cluster

```
ssh gorgon0
PASSWORD: aereviewer
```

Please notice that there are several reviewers, and one should try not to interrupt others' job. Use the command `w` to check who has login.

```
aereviewer@gorgon0:~ $ w
 19:51:45 up  4:56,  3 users,  load average: 0.48, 0.51, 0.50
USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
txc      pts/0    172.23.100.17    15:01    2:43m  2.38s  0.01s sshd:
txc      pts/2    172.23.100.17    16:11   39:05   0.33s  0.03s ssh ae
aereview pts/1    172.23.0.1       18:42    1.00s  0.21s  0.00s tmux
```

Enter the directory of workspace

```
aereviewer@gorgon0:~ $ ls
HPL.dat  intel  self-checkpoint
aereviewer@gorgon0:~ $ cd self-checkpoint/skt-hpl/bin/scripts/
aereviewer@gorgon0:~/self-checkpoint/skt-hpl/bin/scripts $ ls
check.sh  clean.sh  clr.sh  hpl-daemon.sh  HPL.dat  README.txt  sparelist  worklist
aereviewer@gorgon0:~/self-checkpoint/skt-hpl/bin/scripts $
```

Run SKT-HPL, just type `./hpl-daemon.sh`

```
aereviewer@gorgon0:~/self-checkpoint/skt-hpl/bin/scripts $ ./hpl-daemon.sh
No xhpl running, going to (re)start
================================================================================
HPLinpack 2.2  --  High-Performance Linpack benchmark  --   February 24, 2016
Written by A. Petitet and R. Clint Whaley,  Innovative Computing Laboratory, UTK
Modified by Piotr Luszczek, Innovative Computing Laboratory, UTK
Modified by Julien Langou, University of Colorado Denver
================================================================================

An explanation of the input/output parameters follows:
T/V    : Wall time / encoded variant.
N      : The order of the coefficient matrix A.
NB     : The partitioning blocking factor.
P      : The number of process rows.
Q      : The number of process columns.
Time   : Time in seconds to solve the linear system.
Gflops : Rate of execution for solving the linear system.
```

Then we need to inject a node failure during computing. To do so, follow next steps (see the figure below):

1. Login to gorgon1, use ssh gorgon1
2. Kill all xhpl processes on gorgon1. This should be done while printing 'Column=xxxxxxx Fraction=xx% Gflops=xxxxx'.
3. Clean the memory (i.e. delete the in-memory checkpoint) on gorgon1

```
Column=000006784 Fraction= 4.5% Gflops=5.825e+02
Column=000006912 Fraction= 4.6% Gflops=5.834e+02
Column=000007040 Fraction= 4.6% Gflops=5.842e+02
Column=000007168 Fraction= 4.7% Gflops=5.849e+02
Column=000007296 Fraction= 4.8% Gflops=5.934e+02
srun: error: gorgon1: tasks 0-15: Terminated

aereviewer@gorgon0:~/self-checkpoint/skt-hpl/bin/scripts $ ssh gorgon1
Last login: Wed Dec  7 19:00:58 2016 from gorgon0
aereviewer@gorgon1:~ $ cd self-checkpoint/skt-hpl/bin/scripts/
aereviewer@gorgon1:~/self-checkpoint/skt-hpl/bin/scripts $ killall xhpl
aereviewer@gorgon1:~/self-checkpoint/skt-hpl/bin/scripts $ ./clr.sh
aereviewer@gorgon1:~/self-checkpoint/skt-hpl/bin/scripts $
```

After killing xhpl processes, it will take a while for SLURM to cancel the job. To skip the waiting, type twice Ctrl+C to cancel the job. Then hpl-daemon.sh should try to restart SKT-HPL.

```
Column=000007040 Fraction= 4.6% Gflops=5.842e+02
Column=000007168 Fraction= 4.7% Gflops=5.849e+02
Column=000007296 Fraction= 4.8% Gflops=5.934e+02
srun: error: gorgon1: tasks 0-15: Terminated
^Csrun: interrupt (one more within 1 sec to abort)
srun: tasks 16-127: running
srun: tasks 0-15: exited abnormally
^Csrun: sending Ctrl-C to job 8657.0
srun: Job step aborted: Waiting up to 32 seconds for job step to finish.
MPI FAILED Wed Dec 7 19:02:08 CST 2016
No xhpl running, going to (re)start
================================================================================
HPLinpack 2.2  --  High-Performance Linpack benchmark  --   February 24, 2016
Written by A. Petitet and R. Clint Whaley,  Innovative Computing Laboratory, UTK
```

SKT-HPL should restart and continue to compute.

```
- The matrix A is randomly generated for each test.
- The following scaled residual check will be computed:
      ||Ax-b||_oo / ( eps * ( || x ||_oo * || A ||_oo + || b ||_oo ) * N )
- The relative machine precision (eps) is taken to be              2.220446e-16
- Computational tests pass if scaled residuals are less than                16.0

SET RPN to 16
SET T Size to 8
allocate space for vprt
reuse matrix from checkpoint
Acnt = 205082336, Scnt = 25635292, A->ld = 9472, A->nq = 18945
PREPARING WORK COSTS     0.00 seconds
ITVL = 30
THIS RECOVERY COSTS     0.00 (load-data),    18.46 (rebuild-snapshot), Total 18.46 sec
Column=000003968 Fraction= 2.6% Gflops=9.618e+03
Column=000004096 Fraction= 2.7% Gflops=9.126e+03
Column=000004224 Fraction= 2.8% Gflops=8.729e+03
Column=000004352 Fraction= 2.9% Gflops=5.193e+03
```

For a failure during checkpoint updating, repeat the steps above. And processes should be killed after it prints out ‘partially overwrite chkpt data’.

```
Column=000007552 Fraction= 5.0% Gflops=1.318e+03
Column=000007680 Fraction= 5.1% Gflops=1.296e+03
partially overwrite chkpt data
srun: error: gorgon1: tasks 0-15: Terminated

aereviewer@gorgon0:~/self-checkpoint/skt-hpl/bin/scripts $ ssh gorgon1
Last login: Wed Dec  7 19:07:18 2016 from gorgon1
aereviewer@gorgon1:~ $ cd self-checkpoint/skt-hpl/bin/scripts/
aereviewer@gorgon1:~/self-checkpoint/skt-hpl/bin/scripts $ killall xhpl
```

At last, we need to wait for completion. If it takes too much time, a smaller problem size can be used. Modify the N value in skt-hpl/bin/scripts/HPL.dat. Some example values are 18944, 37888, 75776.

```
--------------------------------------------------------------------------------
||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)=        0.0013669 ...... PASSED
================================================================================

Finished      1 tests with the following results:
              1 tests completed and passed residual checks,
              0 tests completed and failed residual checks,
              0 tests skipped because of illegal input values.
--------------------------------------------------------------------------------

End of Tests.
================================================================================
```