PMlibのインストールとテスト

- ゲスト無線LANの使用について（別資料）
- PMlibの入手方法
- テストシステムへのログイン
- PMlibのインストール
- 動作確認プログラムの実行

PMlibパッケージの入手方法

- PMlibパッケージの入手方法
  - 通常は下記公開リポジトリからDownload
  - http://avr-aics-riken.github.io/PMlib/
  - 本日は下記開発リポジトリからDownload

- PMlibに関する別ドキュメント
  - doc/ディレクトリ以下にある
    - html/index.html
      - 関数仕様の説明
      - doc/ディレクトリでdoxygenコマンドにより自動生成
    - How_to_use_PMlib.pdf　:クラスライブラリの説明書

PMlibのインストール　京コンピュータ(1)

- PMlibを利用するアプリケーションは計算ノードで実行される。
- PMlibのインストール作業はログインノードでも計算ノードでも可能。本日はログインノードでPMlibをインストール
- 公式リポジトリからパッケージをダウンロード
- Webブラウザで以下ページをアクセス
  - http://avr-aics-riken.github.io/PMlib/
- 右端のメニューからdownload tar.gzアイコンを選択
  - 自分のPCにパッケージがダウンロードされる
  - avr-aics-riken-PMlib-4.1.3-0-gced9279.tar.gz
- このファイルを京コンピュータログインノードへ転送する
- （本日京コンピュータ以外のシステムをリモート利用して実習参加の方は、各環境にあわせて以下読み替えて下さい）

PMlibのインストール　京コンピュータ(2)

- 京コンピュータの適当なディレクトリにパッケージを転送する

```
myPC$  ssh  ログイン名@k.aics.riken.jp ls -go
myPC$  ssh  ログイン名@k.aics.riken.jp mkdir –p pmlib/tar_balls
myPC$  scp  *PMlib*.tar.gz  ログイン名:pmlib/tar_balls
```

- 京コンピュータへログインし、パッケージを展開する

```
myPC$  ssh  ログイン名@k.aics.riken.jp

K$  cd pmlib/tar_balls
K$  tar –zxf  tar_balls/avr-aics-riken-PMlib-4.1.3-0-gced9279.tar.gz
K$  ln –s  tar_balls/avr-aics-riken-PMlib-4.1.3-0-gced9279  Pmlib
K$  ls –go
lrwxrwxrwx  1   28 2015-08-24 PMlib -> avr-aics-riken-PMlib-ced9279
drwxr-xr-x  9 4096 2015-08-24 avr-aics-riken-PMlib-ced9279
drwxr-xr-x  2 4096 2015-08-24 tar_balls
```

PMlibのインストール　京コンピュータ(3)

- ログインノード上で以下のコマンドで MPI版をmake する。

```
K$   cat  x.make-pmlib-K.sh
#! /bin/bash
INSTALL_DIR=${HOME}/pmlib/install_dir
SRC_DIR=${HOME}/pmlib/PMlib
BUILD_DIR=${SRC_DIR}/BUILD_DIR
cd $BUILD_DIR; if [ $? != 0 ] ; then echo '@@@ Directory error @@@'; exit; fi
# make distclean 2>&1 >/dev/null
CFLAGS="-std=c99 -Kopenmp,fast -Ntl_notrt"
FCFLAGS="-Cpp -Kopenmp,fast -Ntl_notrt"
CXXFLAGS="-Kopenmp,fast -Ntl_notrt "

../configure CXX=mpiFCCpx CC=mpifccpx FC=mpifrtpx \
   CXXFLAGS="${CXXFLAGS}" CFLAGS="${CFLAGS}" FCFLAGS="${FCFLAGS}" \
   --with-comp=FJ --host=sparc64-unknown-linux-gnu \
   --with-papi=yes --with-example=yes --prefix=${INSTALL_DIR}

make

K$  ./x.make-pmlib-K.sh
```

PMlibのインストール　京コンピュータ(4)

- configure/make のログ例

```
K$   ./x.make-pmlib-K.sh
+ ../configure CXX=mpiFCCpx CC=mpifccpx FC=mpifrtpx  … ----------------------------------------
Running PMlib Configure Script
----------------------------------------
checking for a BSD-compatible install... /usr/bin/install -c
checking whether build environment is sane... Yes
   …
------------------------------------------
Finished Running PMlib Configure Script
------------------------------------------
+ make
make  all-recursive
make[1]: ディレクトリ `/volume2/home/ra000004/a03155/pmlib/PMlib/BUILD_DIR' に入ります
   … (かなりメッセージが表示されますが、無害なものです）
make[1]: ディレクトリ `/volume2/home/ra000004/a03155/pmlib/PMlib/BUILD_DIR' から出ます

K$
```

PMlibのインストール　京コンピュータ(5)

- exampleプログラムがmakeされた事を確認する

```
K$  cd PMlib/BUILD_DIR/example
K$  ls -go test?/test?
-rwxr-xr-x 1 4451152 2015-08-25 12:39 test1/test1
-rwxr-xr-x 1 4451397 2015-08-25 12:39 test2/test2
-rwxr-xr-x 1 4456094 2015-08-25 12:39 test3/test3
-rwxr-xr-x 1 4454195 2015-08-25 12:39 test4/test4
K$  file test?/test?
test1/test1: ELF 64-bit MSB executable, SPARC V9, total store ordering, version 1
(SYSV), dynamically linked (uses shared libs), for GNU/Linux 2.6.12, not stripped
test2/test2: ELF 64-bit MSB executable, SPARC V9, total store ordering, version 1
(SYSV), dynamically linked (uses shared libs), for GNU/Linux 2.6.12, not stripped
test3/test3: ELF 64-bit MSB executable, SPARC V9, total store ordering, version 1
(SYSV), dynamically linked (uses shared libs), for GNU/Linux 2.6.12, not stripped
test4/test4: ELF 64-bit MSB executable, SPARC V9, total store ordering, version 1
(SYSV), dynamically linked (uses shared libs), for GNU/Linux 2.6.12, not stripped

K$
```

PMlib例題プログラムの実行　京コンピュータ(1)

- makeされたexampleプログラムを計算ノード上で対話的に実行してみる

```
K$  pjsub --interact --rsc-list "elapse=01:00:00" --rsc-list "node=1" --mpi "proc=2"
[INFO] PJM 0000 pjsub Job 2955440 submitted.
[INFO] PJM 0081 ....connected.
[INFO] PJM 0082 pjsub Interactive job 2955440 started.
Env_base: K-1.2.0-18

K$  pwd
${HOME}/pmlib/PMlib/BUILD_DIR/example

K$  /opt/FJSVXosPA/bin/xospastop
K$  mpiexec -np 2 ./test1/test1
```

PMlib例題プログラムの実行　京コンピュータ(2)

- exampleプログラムのバッチジョブ実行例

```
K$  cat x.run-test1.sh
#!/bin/bash
#PJM -N MYTEST1
#PJM --rsc-list "elapse=1:00:00"
#PJM --rsc-list "node=1"
#PJM --mpi "proc=2”
#PJM -j
#PJM -S
# stage io files
#PJM --stg-transfiles all
#PJM --mpi "use-rankdir"
#PJM --stgin-basedir "/home/ra000004/a03155/pmlib/PMlib/BUILD_DIR/example"
#PJM --stgin "rank=* test1/test1 %r:./test1”
source /work/system/Env_base
/opt/FJSVXosPA/bin/xospastop
export OMP_NUM_THREADS=2  NPROCS=2
mpiexec -n ${NPROCS} ./test1

K$  pjsub  x.run-test1.sh
```

example/test1の実行結果例

```
# PMlib Basic Report -------------------------------------------------

Timing Statistics Report from PMlib version 4.1.2
Linked PMlib supports: MPI, OpenMP, HWPC
Host name : v04-005
Date      : 2015/08/25 : 15:36:16
Mr. Bean
Parallel Mode:   Hybrid (2 processes x 2 threads)

Total execution time            = 2.248993e+00 [sec]
Total time of measured sections = 2.237422e+00 [sec]

Exclusive sections Statistics per process and per job.

Section         |    call  |        accumulated time[sec]           | [flop counts or byte counts ]
Label           |          |      avr   avr[%]      sdv   avr/call  |      avr       sdv   speed
----------------+----------+----------------------------------------+---------------------------
First location  :        3   1.344e+00  60.07  6.02e-03  4.480e-01    0.000e+00  0.00e+00   0.00 Mflop
Third location  :        1   4.468e-01  19.97  2.98e-04  4.468e-01    1.601e+10  0.00e+00  35.83 GB/se
Second location :        1   4.466e-01  19.96  3.99e-04  4.466e-01    4.000e+09  0.00e+00   8.96 Gflop
----------------+----------+----------------------------------------+---------------------------
Per Process flop sections    1.791e+00                                4.000e+09             2.23 Gflop
Per Process byte sections    4.468e-01                                1.601e+10            35.83 GB/se
----------------+----------+----------------------------------------+---------------------------
Job Total flop sections      1.791e+00                                8.000e+09             4.47 Gflop
Job Total byte sections      4.468e-01                                3.202e+10            71.66 GB/se
```

example/test1の実行結果例（続き）

```
# PMlib Process Report --- Elapsed time for individual MPI ranks ------

Label  First location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        3  1.348e+00   60.3  0.000e+00  4.494e-01  0.000e+00  0.000e+00 Flops
Rank     1 :        3  1.340e+00   59.9  8.512e-03  4.466e-01  0.000e+00  0.000e+00 Flops
Label  Second location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  4.469e-01   20.0  0.000e+00  4.469e-01  4.000e+09  8.950e+09 Flops
Rank     1 :        1  4.464e-01   20.0  5.641e-04  4.464e-01  4.000e+09  8.961e+09 Flops
Label  Third location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  4.470e-01   20.0  0.000e+00  4.470e-01  1.601e+10  3.581e+10 Bytes/sec
Rank     1 :        1  4.466e-01   20.0  4.210e-04  4.466e-01  1.601e+10  3.584e+10 Bytes/sec

# PMlib hardware performance counter (HWPC) Report ------------------------
     HWPC_CHOOSER environment variable was not given. So there will be no HWPC output.
```

example/test2の実行結果例

```
# # PMlib Basic Report ------------------------------------------------

Timing Statistics Report from PMlib version 4.1.2
Linked PMlib supports: MPI, OpenMP, HWPC
Host name : v04-005
Date      : 2015/08/25 : 16:17:09
Mr. Bean
Parallel Mode:   Hybrid (2 processes x 2 threads)

Total execution time            = 1.781796e+00 [sec]
Total time of measured sections = 1.774080e+00 [sec]

Exclusive sections Statistics per process and per job.

Section         |    call  |        accumulated time[sec]           | [flop counts or byte counts ]
Label           |          |      avr   avr[%]      sdv   avr/call  |      avr       sdv   speed
----------------+----------+----------------------------------------+---------------------------
First location  :        1   1.329e+00  74.93  6.96e-04  1.329e+00    0.000e+00  0.00e+00   0.00 Mflop
Second location :        1   4.448e-01  25.07  3.39e-04  4.448e-01    0.000e+00  0.00e+00   0.00 Mflop
----------------+----------+----------------------------------------+---------------------------
Per Process flop sections    1.774e+00                                0.000e+00             0.00 Mflop
----------------+----------+----------------------------------------+---------------------------
Job Total flop sections      1.774e+00                                0.000e+00             0.00 Mflop
```

example/test2の実行結果例（続き）

```
# PMlib Process Report --- Elapsed time for individual MPI ranks ------

Label  First location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  1.329e+00   74.9  9.842e-04  1.329e+00  0.000e+00  0.000e+00 Flops
Rank     1 :        1  1.330e+00   75.0  0.000e+00  1.330e+00  0.000e+00  0.000e+00 Flops
Label  Second location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  4.451e-01   25.1  0.000e+00  4.451e-01  0.000e+00  0.000e+00 Flops
Rank     1 :        1  4.446e-01   25.1  4.790e-04  4.446e-01  0.000e+00  0.000e+00 Flops

# PMlib hardware performance counter (HWPC) Report -------------------------
   HWPC_CHOOSER environment variable was not given. So there will be no HWPC output.
```

example/test3の実行結果例

```
# PMlib Basic Report -------------------------------------------------

Timing Statistics Report from PMlib version 4.1.2
Linked PMlib supports: MPI, OpenMP, HWPC
Host name : v04-005
Date      : 2015/08/25 : 16:20:55
Mr. Bean
Parallel Mode:   Hybrid (2 processes x 2 threads)

Total execution time            = 1.917597e+00 [sec]
Total time of measured sections = 1.959178e+00 [sec]

Exclusive sections Statistics per process and per job.

Section      |    call  |        accumulated time[sec]           | [flop counts or byte counts ]
Label        |          |      avr   avr[%]      sdv   avr/call  |      avr       sdv   speed
-------------+----------+----------------------------------------+---------------------------
First block  :        1   1.329e+00  67.85  4.00e-03  1.329e+00    0.000e+00  0.00e+00   0.00 Mflops
Second block :        1   6.298e-01  32.15  7.70e-02  6.298e-01    0.000e+00  0.00e+00   0.00 Mflops
-------------+----------+----------------------------------------+---------------------------
Per Process flop sections   1.959e+00                                0.000e+00             0.00 Mflops
-------------+----------+----------------------------------------+---------------------------
Job Total flop sections   1.959e+00                                  0.000e+00             0.00 Mflops
```

example/test3の実行結果例（続き）

```
# # PMlib Process Report --- Elapsed time for individual MPI ranks ------

Label  First block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  1.332e+00   68.0  0.000e+00  1.332e+00  0.000e+00  0.000e+00 Flops
Rank     1 :        1  1.327e+00   67.7  5.660e-03  1.327e+00  0.000e+00  0.000e+00 Flops
Label  Second block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  5.753e-01   29.4  1.089e-01  5.753e-01  0.000e+00  0.000e+00 Flops
Rank     1 :        1  6.842e-01   34.9  0.000e+00  6.842e-01  0.000e+00  0.000e+00 Flops

# PMlib hardware performance counter (HWPC) Report -------------------------
   HWPC_CHOOSER environment variable was not given. So there will be no HWPC output.

# PMlib Process Group [   77] Elapsed time for individual MPI ranks --------

Label  First block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  1.332e+00   68.0  0.000e+00  1.332e+00  0.000e+00  0.000e+00 Flops
Label  Second block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  5.753e-01   29.4  0.000e+00  5.753e-01  0.000e+00  0.000e+00 Flops

# PMlib Process Group [   77] hardware performance counter (HWPC) Report ---
   HWPC_CHOOSER environment variable was not given. So there will be no HWPC output.
```

example/test3の実行結果例

```
# # PMlib Process Report --- Elapsed time for individual MPI ranks ------

Label  First block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  1.332e+00   68.0  0.000e+00  1.332e+00  0.000e+00  0.000e+00 Flops
Rank     1 :        1  1.327e+00   67.7  5.660e-03  1.327e+00  0.000e+00  0.000e+00 Flops
Label  Second block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  5.753e-01   29.4  1.089e-01  5.753e-01  0.000e+00  0.000e+00 Flops
Rank     1 :        1  6.842e-01   34.9  0.000e+00  6.842e-01  0.000e+00  0.000e+00 Flops

# PMlib hardware performance counter (HWPC) Report -------------------------
   HWPC_CHOOSER environment variable was not given. So there will be no HWPC output.

# PMlib Process Group [   77] Elapsed time for individual MPI ranks --------

Label  First block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  1.332e+00   68.0  0.000e+00  1.332e+00  0.000e+00  0.000e+00 Flops
Label  Second block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  5.753e-01   29.4  0.000e+00  5.753e-01  0.000e+00  0.000e+00 Flops

# PMlib Process Group [   77] hardware performance counter (HWPC) Report ---
   HWPC_CHOOSER environment variable was not given. So there will be no HWPC output.
```

example/test3の実行結果例(8MPIの場合)

```
# PMlib Process Report --- Elapsed time for individual MPI ranks ------

Label  First block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  3.671e+00   60.3  2.049e-03  3.671e+00  0.000e+00  0.000e+00 Flops
Rank     1 :        1  3.672e+00   60.3  1.986e-03  3.672e+00  0.000e+00  0.000e+00 Flops
Rank     2 :        1  3.673e+00   60.3  8.080e-04  3.673e+00  0.000e+00  0.000e+00 Flops
Rank     3 :        1  3.674e+00   60.3  1.502e-05  3.674e+00  0.000e+00  0.000e+00 Flops
Rank     4 :        1  3.674e+00   60.3  0.000e+00  3.674e+00  0.000e+00  0.000e+00 Flops
Rank     5 :        1  3.673e+00   60.3  2.699e-04  3.673e+00  0.000e+00  0.000e+00 Flops
Rank     6 :        1  3.673e+00   60.3  7.451e-04  3.673e+00  0.000e+00  0.000e+00 Flops
Rank     7 :        1  3.673e+00   60.3  5.660e-04  3.673e+00  0.000e+00  0.000e+00 Flops
Label  Second block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  2.048e+00   33.6  7.445e-01  2.048e+00  0.000e+00  0.000e+00 Flops
Rank     1 :        1  2.048e+00   33.6  7.446e-01  2.048e+00  0.000e+00  0.000e+00 Flops
Rank     2 :        1  2.048e+00   33.6  7.445e-01  2.048e+00  0.000e+00  0.000e+00 Flops
Rank     3 :        1  2.048e+00   33.6  7.444e-01  2.048e+00  0.000e+00  0.000e+00 Flops
Rank     4 :        1  2.793e+00   45.8  1.788e-05  2.793e+00  0.000e+00  0.000e+00 Flops
Rank     5 :        1  2.793e+00   45.8  0.000e+00  2.793e+00  0.000e+00  0.000e+00 Flops
Rank     6 :        1  2.793e+00   45.8  4.792e-05  2.793e+00  0.000e+00  0.000e+00 Flops
Rank     7 :        1  2.793e+00   45.8  3.695e-05  2.793e+00  0.000e+00  0.000e+00 Flops

# PMlib Process Group [   77] Elapsed time for individual MPI ranks --------
Label  First block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  3.671e+00   60.3  2.034e-03  3.671e+00  0.000e+00  0.000e+00 Flops
Rank     1 :        1  3.672e+00   60.3  1.971e-03  3.672e+00  0.000e+00  0.000e+00 Flops
Rank     2 :        1  3.673e+00   60.3  7.930e-04  3.673e+00  0.000e+00  0.000e+00 Flops
Rank     3 :        1  3.674e+00   60.3  0.000e+00  3.674e+00  0.000e+00  0.000e+00 Flops
Label  Second block
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  2.048e+00   33.6  1.597e-05  2.048e+00  0.000e+00  0.000e+00 Flops
Rank     1 :        1  2.048e+00   33.6  1.390e-04  2.048e+00  0.000e+00  0.000e+00 Flops
Rank     2 :        1  2.048e+00   33.6  1.311e-05  2.048e+00  0.000e+00  0.000e+00 Flops
Rank     3 :        1  2.048e+00   33.6  0.000e+00  2.048e+00  0.000e+00  0.000e+00 Flops
```

example/test4の実行結果例

```
# PMlib Basic Report -------------------------------------------------

Timing Statistics Report from PMlib version 4.1.2
Linked PMlib supports: MPI, OpenMP, HWPC
Host name : v04-008
Date      : 2015/08/25 : 16:33:16
user
Parallel Mode:   Hybrid (2 processes x 2 threads)

Total execution time            = 1.666007e+01 [sec]
Total time of measured sections = 1.665253e+01 [sec]

Exclusive sections Statistics per process and per job.

Section   |    call  |        accumulated time[sec]           | [flop counts or byte counts ]
Label     |          |      avr   avr[%]      sdv   avr/call  |      avr       sdv   speed
----------+----------+---------------------------------------+---------------------------
2-submtxm :        3   1.665e+01  99.97  4.45e-03  5.549e+00    0.000e+00  0.00e+00   0.00 MB/sec
1-subinit :        1   5.305e-03   0.03  6.91e-06  5.305e-03    0.000e+00  0.00e+00   0.00 MB/sec
----------+----------+---------------------------------------+---------------------------
Per Process byte sections   1.665e+01                              0.000e+00             0.00 MB/sec
----------+----------+---------------------------------------+---------------------------
Job Total byte sections   1.665e+01                                 0.000e+00             0.00 MB/sec
```

example/test4の実行結果例（続き）

```
# PMlib Process Report --- Elapsed time for individual MPI ranks ------

Label  1-subinit
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  5.310e-03    0.0  0.000e+00  5.310e-03  0.000e+00  0.000e+00 Bytes/sec
Rank     1 :        1  5.300e-03    0.0  9.775e-06  5.300e-03  0.000e+00  0.000e+00 Bytes/sec
Label  2-submtxm
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        3  1.665e+01  100.0  0.000e+00  5.550e+00  0.000e+00  0.000e+00 Bytes/sec
Rank     1 :        3  1.664e+01   99.9  6.287e-03  5.548e+00  0.000e+00  0.000e+00 Bytes/sec

# PMlib hardware performance counter (HWPC) Report -------------------------
   HWPC_CHOOSER environment variable was not given. So there will be no HWPC output.
```

例題プログラムでHWPCを利用　京コンピュータ(1)

- ジョブスクリプト x.run−test1.shを編集（一行追加）

```
K$  cat x.run-test1.sh
#!/bin/bash
#PJM -N MYTEST1
#PJM --rsc-list "elapse=1:00:00"
#PJM --rsc-list "node=1"
#PJM --mpi "proc=2”
#PJM -j
#PJM -S
# stage io files
#PJM --stg-transfiles all
#PJM --mpi "use-rankdir"
#PJM --stgin-basedir "/home/ra000004/a03155/pmlib/PMlib/BUILD_DIR/example"
#PJM --stgin "rank=* test1/test1 %r:./test1”
source /work/system/Env_base
/opt/FJSVXosPA/bin/xospastop
export OMP_NUM_THREADS=2  NPROCS=2
export HWPC_CHOOSER=FLOPS
mpiexec -n ${NPROCS} ./test1

K$  pjsub  x.run-test1.sh
```

example/test1のHWPC利用結果例(1)

```
# PMlib Basic Report -------------------------------------------------

Timing Statistics Report from PMlib version 4.1.2
Linked PMlib supports: MPI, OpenMP, HWPC
Host name : e05-008
Date      : 2015/08/26 : 01:49:07
Mr. Bean
Parallel Mode:   Hybrid (2 processes x 2 threads)

Total execution time            = 2.240497e+00 [sec]
Total time of measured sections = 2.233066e+00 [sec]

Exclusive sections Statistics per process and per job.

Section         |    call  |        accumulated time[sec]           | [flop counts or byte counts ]
Label           |          |      avr   avr[%]      sdv   avr/call  |      avr       sdv   speed
----------------+----------+----------------------------------------+---------------------------
First location  :        3   1.339e+00  59.97  1.58e-03  4.464e-01    1.216e+10  4.24e+00   9.08 Gflop
Second location :        1   4.472e-01  20.03  4.22e-04  4.472e-01    4.033e+09  6.74e-07   9.02 Gflop
Third location  :        1   4.468e-01  20.01  6.49e-04  4.468e-01    4.033e+09  7.07e-01   9.03 Gflop
----------------+----------+----------------------------------------+---------------------------
Per Process flop sections    2.233e+00                                2.022e+10            9.06 Gflop
----------------+----------+----------------------------------------+---------------------------
Job Total flop sections      2.233e+00                                4.044e+10           18.11 Gflop
```

example/test1のHWPC利用結果例(1)

```
# PMlib Process Report --- Elapsed time for individual MPI ranks ------

Label  First location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        3  1.340e+00   60.0  0.000e+00  4.467e-01  1.216e+10  9.070e+09 Flops (HWPC)
Rank     1 :        3  1.338e+00   59.9  2.240e-03  4.460e-01  1.216e+10  9.086e+09 Flops (HWPC)
Label  Second location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  4.475e-01   20.0  0.000e+00  4.475e-01  4.033e+09  9.012e+09 Flops (HWPC)
Rank     1 :        1  4.469e-01   20.0  5.963e-04  4.469e-01  4.033e+09  9.024e+09 Flops (HWPC)
Label  Third location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  4.472e-01   20.0  0.000e+00  4.472e-01  4.033e+09  9.018e+09 Flops (HWPC)
Rank     1 :        1  4.463e-01   20.0  9.172e-04  4.463e-01  4.033e+09  9.036e+09 Flops (HWPC)

# PMlib hardware performance counter (HWPC) Report ------------------------
   HWPC_CHOOSER=FLOPS statistics were collected.
   The values of each process are the sum of threads.

Label   First location
Header  ID :     FP_OPS    [Flops]
Rank     0 :  1.216e+10  9.070e+09
Rank     1 :  1.216e+10  9.086e+09
Label   Second location
Header  ID :     FP_OPS    [Flops]
Rank     0 :  4.033e+09  9.012e+09
Rank     1 :  4.033e+09  9.024e+09
Label   Third location
```

例題プログラムでHWPCを利用　京コンピュータ(2)

- ジョブスクリプト x.run−test1.shを編集

```
K$  cat x.run-test1.sh
#!/bin/bash
#PJM -N MYTEST1
#PJM --rsc-list "elapse=1:00:00"
#PJM --rsc-list "node=1"
#PJM --mpi "proc=2”
#PJM -j
#PJM -S
# stage io files
#PJM --stg-transfiles all
#PJM --mpi "use-rankdir"
#PJM --stgin-basedir "/home/ra000004/a03155/pmlib/PMlib/BUILD_DIR/example"
#PJM --stgin "rank=* test1/test1 %r:./test1"
#source /work/system/Env_base
/opt/FJSVXosPA/bin/xospastop
export OMP_NUM_THREADS=2  NPROCS=2
export HWPC_CHOOSER=BANDWIDTH
mpiexec -n ${NPROCS} ./test1

K$  pjsub  x.run-test1.sh
```

example/test1のHWPC利用結果例(2)

```
# PMlib Basic Report -------------------------------------------------

Timing Statistics Report from PMlib version 4.1.2
Linked PMlib supports: MPI, OpenMP, HWPC
Host name : e05-008
Date      : 2015/08/26 : 02:02:09
Mr. Bean
Parallel Mode:   Hybrid (2 processes x 2 threads)

Total execution time            = 2.240130e+00 [sec]
Total time of measured sections = 2.232404e+00 [sec]

Exclusive sections Statistics per process and per job.

Section         |    call  |        accumulated time[sec]           | [flop counts or byte counts ]
Label           |          |      avr   avr[%]      sdv   avr/call  |      avr       sdv   speed
----------------+----------+----------------------------------------+---------------------------
First location  :        3   1.340e+00  60.02  1.90e-03  4.466e-01    2.072e+10  2.11e+09  15.46 GB/se
Third location  :        1   4.466e-01  20.00  6.90e-04  4.466e-01    6.885e+09  9.21e+08  15.42 GB/se
Second location :        1   4.459e-01  19.97  5.09e-04  4.459e-01    6.405e+09  1.03e+09  14.36 GB/se
----------------+----------+----------------------------------------+---------------------------
Per Process byte sections    2.232e+00                                3.401e+10            15.23 GB/se
----------------+----------+----------------------------------------+---------------------------
Job Total byte sections      2.232e+00                                6.802e+10            30.47 GB/se
```

example/test1のHWPC利用結果例(2)

```
# PMlib Process Report --- Elapsed time for individual MPI ranks ------

Label  First location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        3  1.341e+00   60.1  0.000e+00  4.471e-01  2.221e+10  1.656e+10 Bytes/s (HWPC)
Rank     1 :        3  1.339e+00   60.0  2.689e-03  4.462e-01  1.922e+10  1.436e+10 Bytes/s (HWPC)
Label  Second location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  4.463e-01   20.0  0.000e+00  4.463e-01  7.132e+09  1.598e+10 Bytes/s (HWPC)
Rank     1 :        1  4.455e-01   20.0  7.200e-04  4.455e-01  5.679e+09  1.275e+10 Bytes/s (HWPC)
Label  Third location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call   flop|msg    speed
Rank     0 :        1  4.470e-01   20.0  0.000e+00  4.470e-01  7.537e+09  1.686e+10 Bytes/s (HWPC)
Rank     1 :        1  4.461e-01   20.0  9.751e-04  4.461e-01  6.233e+09  1.397e+10 Bytes/s (HWPC)

# PMlib hardware performance counter (HWPC) Report ------------------------
   HWPC_CHOOSER=BANDWIDTH statistics were collected.
   The values of each process are the sum of threads.

Label   First location
Header  ID :     L2_TCM   L2_WB_DM   L2_WB_PF   [HW B/s]
Rank     0 :  1.732e+08  6.850e+02  3.898e+05  1.656e+10
Rank     1 :  1.500e+08  2.080e+02  1.527e+05  1.436e+10
Label   Second location
Header  ID :     L2_TCM   L2_WB_DM   L2_WB_PF   [HW B/s]
Rank     0 :  5.567e+07  2.800e+01  4.718e+04  1.598e+10
Rank     1 :  4.433e+07  2.700e+01  3.832e+04  1.275e+10
Label   Third location
```

例題プログラムでHWPCを利用　京コンピュータ(3)

- ジョブスクリプト x.run−test1.shを編集

```
K$  cat x.run-test1.sh
#!/bin/bash
#PJM -N MYTEST1
#PJM --rsc-list "elapse=1:00:00"
#PJM --rsc-list "node=1"
#PJM --mpi "proc=2”
#PJM -j
#PJM -S
# stage io files
#PJM --stg-transfiles all
#PJM --mpi "use-rankdir"
#PJM --stgin-basedir "/home/ra000004/a03155/pmlib/PMlib/BUILD_DIR/example"
#PJM --stgin "rank=* test1/test1 %r:./test1"
#source /work/system/Env_base
/opt/FJSVXosPA/bin/xospastop
export OMP_NUM_THREADS=2  NPROCS=2
export HWPC_CHOOSER=VECTOR
mpiexec -n ${NPROCS} ./test1

K$  pjsub  x.run-test1.sh
```

example/test1のHWPC利用結果例(3)

```
 PMlib Basic Report -------------------------------------------------

Timing Statistics Report from PMlib version 4.1.2
Linked PMlib supports: MPI, OpenMP, HWPC
Host name : g05-036
Date      : 2015/08/26 : 02:11:00
Mr. Bean
Parallel Mode:   Hybrid (2 processes x 2 threads)

Total execution time            = 2.241645e+00 [sec]
Total time of measured sections = 2.234203e+00 [sec]

Exclusive sections Statistics per process and per job.

Section         |    call  |        accumulated time[sec]
Label           |          |      avr   avr[%]      sdv   avr/call
----------------+----------+---------------------------------------
First location  :        3   1.341e+00  60.02  1.79e-03  4.470e-01
Third location  :        1   4.471e-01  20.01  5.45e-04  4.471e-01
Second location :        1   4.461e-01  19.97  3.57e-04  4.461e-01
----------------+----------+---------------------------------------
----------------+----------+---------------------------------------
```

example/test1のHWPC利用結果例(3)

```
# PMlib Process Report --- Elapsed time for individual MPI ranks ------

Label  First location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call
Rank     0 :        3  1.342e+00   60.1  0.000e+00  4.474e-01
Rank     1 :        3  1.340e+00   60.0  2.531e-03  4.466e-01
Label  Second location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call
Rank     0 :        1  4.464e-01   20.0  0.000e+00  4.464e-01
Rank     1 :        1  4.459e-01   20.0  5.050e-04  4.459e-01
Label  Third location
Header ID  :     call   time[s] time[%]  t_wait[s]  t[s]/call
Rank     0 :        1  4.475e-01   20.0  0.000e+00  4.475e-01
Rank     1 :        1  4.468e-01   20.0  7.710e-04  4.468e-01

# PMlib hardware performance counter (HWPC) Report ------------------------
   HWPC_CHOOSER=VECTOR statistics were collected.
   The values of each process are the sum of threads.

Label   First location
Header  ID :    VEC_INS    FMA_INS
Rank     0 :  4.761e+09  1.316e+09
Rank     1 :  4.761e+09  1.316e+09
Label   Second location
Header  ID :    VEC_INS    FMA_INS
Rank     0 :  1.581e+09  4.350e+08
Rank     1 :  1.581e+09  4.350e+08
Label   Third location
```

example/test1のHWPC利用結果例(others)

```
# PMlib hardware performance counter (HWPC) Report ------------------------
   HWPC_CHOOSER=CYCLE,INSTRUCTION statistics were collected.

Label   First location
Header  ID :    TOT_CYC    TOT_INS     LD_INS     SR_INS
Rank     0 :  5.363e+09  1.194e+10  6.007e+09  1.803e+07
Rank     1 :  5.355e+09  1.194e+10  6.007e+09  1.803e+07
Label   Second location

# PMlib hardware performance counter (HWPC) Report ------------------------
   HWPC_CHOOSER=CACHE statistics were collected.

Label   First location
Header  ID :     L1_TCM     L2_TCM
Rank     0 :  2.431e+08  1.668e+08
Rank     1 :  2.431e+08  1.490e+08
Label   Second location
```