Himeno Best Practices for Intel® Cluster Ready

1. Introduction:

The following best practices document is provided as courtesy of the HPC Advisory Council.

2. Application Description:

The Himeno benchmark was developed by Dr. Ryutaro Himeno, Director of the Advanced Center for Computing and Communication of RIKEN in Japan, to evaluate performance of incompressible fluid analysis code. This benchmark takes in measurements to precede major loops in solving the Poisson's equation solution using the Jacobi iteration method. The current "himenoBMTxp" source code is aimed to decrease the calculation time difference between computers due to the differences of the systems' performances. The Himeno Benchmark is made available under the LGPL2.0 or later.

3. Version Information:

Download Himeno at:

http://accc.riken.jp/HPC_e/himenobmt_e/download2_e.html

4. Prerequisites:

The instructions from this best practice have been tested with the following configuration:

4.1 Hardware:

The instructions from this best practice have been tested with the following configuration:

- Dell PowerEdge M610 14-node cluster
- Intel Xeon X5670 CPUs @ 2.93 MHz
- Memory: 24GB per node @ 1333MHz
- Mellanox ConnectX-2 QDR InfiniBand Adapters
- Mellanox QDR InfiniBand Switch

4.2 Software:

- Intel® Cluster Ready running CentOS 5 Update 4
- Application: Himeno
- Compilers: Intel compilers, GNU compilers 4.4.0 and 4.1.2
- MPI: Intel MPI 4 U1, Open MPI 1.5, Platform MPI 8.0.1
- Miscellaneous: NetCDF 4.1.1

- Benchmark workloads: L 512x256x256, XL 1024x512x512

5. Building Himeno

Extracting Himeno

The Himeno benchmark is compressed in a LZH file format. To extract the files in the LZH file, you will need to use the LHA tool for Linux. The tool can be downloaded from:

http://www.infor.kanazawa-it.ac.jp/~ishii/lhaunix/linux/lha117.tar.gz

Then unzip the LZH file that you download.

```
% path_to_lha117/lha xw=f77_xp_mpi f77_xp_mpi.lzh
```

The following 3 files will be extracted:

himenoBMTxpr.f

param.h

paramset.sh

Building HIMENO

Run "paramset.sh" to generate the dataset "param.h". The example below is for generating XL grid size dataset of 1024x512x512 for 12 processes. The product of the 3 numbers (each for an I, J, and K dimensions) has to equal the number of processes in mpirun.

```
% ./paramset.sh XL 2 2 3
```

Use mpif77 or mpiifort (for Intel MPI and Intel compilers) to compile:

```
% mpif77 <flags> himenoBMTxpr.f -o himenoBMTxpr
```

Then run the executable:

```
% mpirun -np 12 ./himenoBMTxpr
```

6. Running HIMENO

After you finished compiling HIMENO, that you verify the Himeno.exe executable is generated in run/Himeno.exe, there are a few steps you will need before running the application.

Running with Intel MPI

```
% mpdboot -r ssh -f ~/mpd.hosts.ib.14 -n 14

% mpiexec -np 168 -IB ./himenoBMTxpr

 %mpdallexit
```

Running with Open MPI

```
%mpirun -np 168 -mca btl self,sm,openib –hostfile /
home/demo/hostfile-ompi.14 -mca mpi_paffinity_
alone 1 ./himenoBMTxpr
```

Running with Platform MPI

```
% mpirun -np 168 -IBV -cpu_bind -prot -hostfile ~/
hostfile-ib14 ./himenoBMTxpr
```


350 Oakmead Pkwy, Sunnyvale, CA 94085
Tel: 408-970-3400 • Fax: 408-970-3403
www.hpcadvisorycouncil.com