

Fluent 6.x and 12.x – Execution Guidelines for running applications in aggregated environment using ScaleMP’s vSMP Foundation

Overview

Fluent is a multi-process application that uses MPI for inter-process communication. HP-MPI has been set as the default MPI for the Fluent application. In addition Fluent supports MPICH2 as well.

While it is possible to run Fluent on the aggregation platform with any MPI implementation, using MPICH2 tuned for vSMP Foundation may yield a performance improvement of 5-15%.

Since there are some differences in the way versions 6.x and 12.x are launched, please see the relevant section below.

Running Fluent 6.x with HP-MPI

HP-MPI has a built-in mechanism for assigning MPI processes to specific CPUs. Process placement is controlled by environment variables named **MPI_BIND_MAP** and **MPIRUN_OPTIONS**. When these variables are not set, process placement will not be performed.

Environment variables – HP-MPI

If you are running Fluent with HPMPI, you should set the following environment variables prior to running Fluent to yield the optimal performance:

```
export MPI_BIND_MAP=0,1,2,3,4,5,6,7 (For example)

export MPIRUN_OPTIONS="-cpu_bind=map_cpu,v"

export HPMP_FRAGSIZE=131072

export MPI_SHMEMCNTL=16,24000000,4000000
```

MPI_BIND_MAP specifies a list of CPUs to which MPI ranks will be bound. You should replace the list above with a list of integers, zero to #cpus-1.

For more information on HP-MPI CPU affinity settings, refer to the HP-MPI user's guide available from ["http://docs.hp.com/en/B6060-96022/B6060-96022.pdf"](http://docs.hp.com/en/B6060-96022/B6060-96022.pdf).

Sample script for HP-MPI

```
export PATH=/opt/Fluent.Inc/bin:$PATH

export MPI_BIND_MAP=0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15

export MPIRUN_OPTIONS="-cpu_bind=map_cpu,v"

export HPMP_FRAGSIZE=131072

export MPI_SHMEMCNTL=16,24000000,4000000

#Launches the sedan_4m benchmark with 16 processes

fluentbench.pl sedan_4m -t16 -mpi=hp
```

Running Fluent 6.x with MPICH2 tuned for vSMP

Fluent is provided with support for MPICH2 (as well as other MPI implementations). In order to configure Fluent to work with MPICH2 tuned for vSMP Foundation, perform the following:

- Rename 'fluent6.3.26/multiport/mpi/lnamd64/mpich2' to 'fluent6.3.26/multiport/mpi/lnamd64/mpich2.orig'
- Extract the modification tar file to the Fluent installation folder: **tar xzf fluent6-vsmp-patch.tgz -C /opt/Fluent.Inc**

NOTE: The tar file **expects version 6.3.26 (it creates files under the fluent6.3.26 folder)**. If a different fluent 6.x version is used, the tar file will need to be repackaged with the name of this other version.

- Selecting the use of mpich2 in Fluent by setting '-mpi=mpich2' in the command line for Fluent

Environment variables – MPICH2

```
export VSMP_PLACEMENT=PACKED
export VSMP_MEM_PIN=YES
```

Sample script for MPICH2 tuned for vSMP

```
export PATH=/opt/Fluent.Inc/bin:$PATH

export VSMP_PLACEMENT=PACKED

export VSMP_MEM_PIN=YES

#Launches the sedan_4m benchmark with 16 processes

fluentbench.pl sedan_4m -t16 -mpi=mpich2
```

Running Fluent 12.x with HP-MPI

HP-MPI has a built-in mechanism for assigning MPI processes to specific CPUs. Process placement is controlled by environment variables named **MPI_BIND_MAP** and **MPIRUN_OPTIONS**. When these variables are not set, process placement will not be performed.

Environment variables – HP-MPI

If you are running Fluent with HP-MPI, you should set the following environment variables prior to running Fluent to yield the optimal performance:

```
export MPI_BIND_MAP=0,1,2,3,4,5,6,7 (For example)

export MPIRUN_OPTIONS="-cpu_bind=map_cpu,v"

export HPMP_FRAGSIZE=131072

export MPI_SHMEMCNTL=16,24000000,4000000
```

MPI_BIND_MAP specifies a list of CPUs to which MPI ranks will be bound. You should replace the list above with a list of integers, zero to #cpus-1.

For more information on HP-MPI CPU affinity settings, refer to the HP-MPI user's guide available from ["http://docs.hp.com/en/B6060-96022/B6060-96022.pdf"](http://docs.hp.com/en/B6060-96022/B6060-96022.pdf).

Sample script for HP-MPI

```
export PATH=/opt/ansys_inc/v120/fluent/bin:$PATH

export MPI_BIND_MAP=0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15

export MPIRUN_OPTIONS="-cpu_bind=map_cpu,v"

export HPMP_FRAGSIZE=131072

export MPI_SHMEMCNTL=16,24000000,4000000

#Launches the sedan_4m benchmark with 16 processes

fluentbench.pl sedan_4m -t16 -mpi=hp
```

Running Fluent 12.x with MPICH2 tuned for vSMP

Fluent 12.x comes with several MPI implementations, but MPICH2 isn't one of them any more. However, Fluent does provide a framework for support additional MPI implementation. In order to configure Fluent to work with MPICH2 tuned for vSMP Foundation, perform the following:

- Extract the modification tar file to the Fluent installation folder:
tar xzf fluent12-vsmp-patch.tgz -C /opt/ansys_inc/v120/fluent
NOTE: The tar file expects version 12.0.16 (it creates files under the fluent12.0.16 folder). If a different fluent 12.x version is used, the tar file will need to be repackaged with the name of this other version.
- Selecting the use of mpich2 in Fluent by setting '-mpi=mpich2' in the command line for Fluent

Environment variables – MPICH2

```
export VSMP_PLACEMENT=PACKED
export VSMP_MEM_PIN=YES
```

Sample script for MPICH2 tuned for vSMP

```
export PATH=/opt/ansys_inc/v120/fluent/bin:$PATH

export VSMP_PLACEMENT=PACKED

export VSMP_MEM_PIN=YES

#Launches the sedan_4m benchmark with 16 processes

fluentbench.pl sedan_4m -t16 -mpi=mpich2
```