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

2. Application Description:
Adaptive Mesh Refinement (AMR) is actually a collection of three applications for solving a wide variety of problems that benefit from grids with adaptive, inhomogeneous spatial resolution. AMR is the product of the Center for Computational Sciences and Engineering at Lawrence Berkeley National Laboratory. This particular benchmark makes use of the HyperClaw application for solving a gas dynamic problem. It is written primarily in C++.

3. Version Information:
Version of this date is used: 2009 May 11.

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

4.1 Hardware:
- Dell PowerEdge M610 38-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 RHEL 5.5
- Application: AMR
- Compilers: Intel compilers, GNU compilers
- MPI: Intel MPI 4, MVAPICH2 1.5.1p1, Open MPI 1.5.1, Platform MPI 8.0.1
- Benchmark workload: Standard

5. Building AMR
Changes for GNU 4.1.2 Compilers

app/amr/HCAII/GNUmakefile

PROFILE = TRUE
Changes for MPI: Platform MPI
App/amr/mk/Make.defs
  CXX := mpiCC
  FC := mpif77
  fC := mpif77
Make.mpi
  ifdef MPI_HOME
      MPI_HOME=/opt/platform_mpi
  endif
  ifndef $(WHICHLINUX), JACQUARD)
      ifndef $(WHICHLINUX), COLUMBIA)
          BL_MPI_LIBS += -lmpi
      endif
  endif
  ifndef $(WHICHLINUX), GENERICLINIX)
      LIBRARY_LOCATIONS += $(MPI_HOME)/lib
      INCLUDE_LOCATIONS += $(MPI_HOME)/include
  endif
Changes for MPI: Open MPI
App/amr/mk/Make.defs
  CXX := mpicxx
  FC := mpif77
  fC := mpif77
Make.mpi
  ifdef MPI_HOME
      MPI_HOME=/usr/mpi/gcc/openmpi-1.4.2/
  endif
  ifndef $(WHICHLINUX), JACQUARD)
      ifndef $(WHICHLINUX), COLUMBIA)
          #BL_MPI_LIBS += -lmpich
          BL_MPI_LIBS += -lmpi
      endif
  endif
  ifndef $(WHICHLINUX), GENERICLINIX)
      LIBRARY_LOCATIONS += $(MPI_HOME)/lib
      INCLUDE_LOCATIONS += $(MPI_HOME)/include
  endif

6. Running AMR
Setting up the dataset
  % dataset=standard
  % cd ${HPCMP_DIR}/ded/amr/$dataset
  % mkdir test
  % cp ${HPCMP_DIR}/ded/amr/standard/inp/inputs test
  % cp ${HPCMP_DIR}/ded/amr/standard/inp/probin test
  % DATA=${HPCMP_DIR}/ded/amr/standard/inp/inputs

For executable compiled using Intel compilers:
  % EXE=hc3d.Linux.Intel.Intel.MPI.ex

For executable compiled using GNU compilers:
  % EXE=hc3d.Linux.GNU.GNU.MPI.ex

Running with Intel MPI and MVAPICH2
  % mpdboot -r ssh -f ~/mpd.hosts -n 38
  % mpiexec -np 456 -IB $EXE $DATA
  % mdallexit

Running with Open MPI
  %mpirun -np 456 -mca btl self,sm,openib -hostfile ~/hostfile -mca mpi_paffinity_alone 1 $EXE $DATA

Running with Platform MPI
  % mpirun -np 456 -IBV -cpu_bind -prot -hostfile ~/hostfile $EXE $DATA