Testing WRF-PHDF5 at NCSA Teragrid machine

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1. MPI Fortran compiler

mpif90 compiler
(under /usr/local/mpich/1.2.5..10/gm-2.0.5_Linux-2.4.19-SMP-ia64/smp/intel64/ssh/bin/mpif90 at NCSA TG)

1) A sample program
CAN NOT compile a sample program(provided by Albert Cheng) with "USE MPI" module.

The compiling result is as follows:

```
Compilation
program MPIOEXAMPLE
efc: error: Fatal error in /opt/intel/compiler70/ia64/bin/f90com, terminated by segmentation violation
compilation aborted for Sample_mpio.f90 (code 1)
```

The sample program is as follows:

```
PROGRAM MPIOEXAMPLE

    USE MPI

    IMPLICIT NONE

    CHARACTER(LEN=80), PARAMETER :: filename = "/tmp/filef.h5" ! File name
    INTEGER     ::  ierror  ! Error flag
    INTEGER     ::  fh      ! File handle
    INTEGER     ::  amode   ! File access mode

    call MPI_INIT(ierror)
    amode = MPI_MODE_RDWR + MPI_MODE_CREATE + MPI_MODE_DELETE_ON_CLOSE
    call MPI_FILE_OPEN(MPI_COMM_WORLD, filename, amode, MPI_INFO_NULL, fh, ierror)
    print *, "Trying to create ", filename
    if ( ierror .eq. MPI_SUCCESS ) then
      print *, "MPI_FILE_OPEN succeeded"
      call MPI_FILE_CLOSE(fh, ierror)
    else
      print *, "MPI_FILE_OPEN failed"
    endif

    call MPI_FINALIZE(ierror);
    END PROGRAM
```

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2) Can compile and run the sample program when we replace <USE MPI> with <'include mpif.h'> and put mpif.h under the current working directory. That's not supposed to be.

2. Parallel HDF5

Parallel HDF5 fortran failed because of "mpif.h" cannot be found. This is exactly what the sample program showed. After I manually changed the configure file; I can build parallel HDF5 fortran and run a fortran example, it indeed gives the correct output.

3. Parallel WRF-HDF5 IO module

With some small modifications of the WRF-PHDF5 codes; I got the WRF-PHDF5 IO module compile.

Note: The mpif90 compiler has a strict type-checking restriction to the arguments of fortran subroutine. Size_t and integer cannot exchangeable; it must be one way or the other. So I have to make them consistent.

4. Parallel WRF running under GPFS

With the help of Albert Cheng, I used the "interactive batch" mode to run my job and generate the output under /gpfs/ with 4 processes and 32 processes; it generates the output within the reasonable time. I checked the output between 4 and 32 processes; they are identical (only several data are different with the least significant bit because of the model computation round error). I also manually check the result from parallel HDF5-WRF and the result from Sequential HDF5-WRF. From the part I checked, they are identical.

5. Summary

Parallel HDF5-WRF can run and generate correct output at NCSA teragrid machine under GPFS. However, mpif90 compiler cannot compile the fortran code with "USE MPI" module and the user must copy mpif.h to their own directory make fortran users inconvenient.

Acknowledgment
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