
WRF – Application Execution Guidelines for vSMP Foundation Aggregated Virtual Machine

Overview

WRF is a Weather Research Forecast model supporting both real and idealized data set simulations. It is composed of several data initialization programs, numerical integration (computation) program and a one-way nesting program. It supports multiple execution models namely, dmpar (MPI), smpar (OpenMP), dm+sm etc. as well as several compilers and platforms. This document explains how to build and run the dmpar (MPI) version of WRF application with **Intel compilers** and **MPICH2** tuned for vSMP foundation. WRF requires **netCDF** library from UCAR. It is available on UCAR website [2].

Building MPI version of WRF

Environment variables

It is imperative to set the path to required components by WRF before any of the test cases is built. Below is the sample script which sets up the correct environment before WRF is configured:

```
.....  
#!/bin/sh  
  
# Source intel compiler variables  
. /opt/intel/Compiler/11.1/069/bin/intel64/iccvars_intel64.sh  
. /opt/intel/Compiler/11.1/069/bin/intel64/fortvars_intel64.sh  
  
# Path to netcdf  
export NETCDF=/opt/3rdpartylibs/netcdf/  
  
# Path to MPICH2 tuned for vSMP foundation  
export PATH=/opt/ScaleMP/mpich2/1.0.8/bin:$PATH  
.....
```

WRF comes with a default configure script which sets up variety of environment variables and compiler options. It is also recommended to cleanse any previous build before configuring.

./clean -a

./configure

Configuration throws out several option and this document assumes that 'dmpar' option with Intel Compiler followed by basic nesting is selected. The rest of the configuration should go smoothly assuming the correct setup as described till now.

Once WRF is configured successfully, it generates a conifgure.wrf file reflecting all the settings. To compile a particular test case, use the compile script provided in WRF package.

```
./compile em_b_wave > build.log 2>&1
```

Running WRF on vSMP Foundation System

Two programs are generated after compilation. The ideal.exe initializes the simulation data while wrf.exe is the actual numerical integration program. Both of them are parallel executables and use MPI. Below is the sample run script.

Sample run script for WRF

```
.....  
#!/bin/sh  
  
export PATH=/opt/ScaleMP/mpich2/1.0.8/bin:$PATH  
export VSMP_PLACEMENT=PACKED  
export VSMP_VERBOSE=YES  
ulimit -s unlimited  
  
./ideal.exe > init.log  
  
# Number of MPI ranks to run  
np=16  
  
/usr/bin/time mpirun -np $np ./wrf.exe > mpi_output_${np}.txt 2>&1  
.....
```

After the run, there are two types of files generated. The reference files generated by ideal.exe (*.error) and output files generated by wrf.exe (*.out). Check the rsl.out files for success messages at end. One can also use tools such as 'diff' to compare error files and output files to further verify the simulation.

References:

- [1] http://www.mmm.ucar.edu/wrf/users/docs/user_guide_V3/contents.html
- [2] <http://www.unidata.ucar.edu/downloads/netcdf/index.jsp>