Overview

This document covers the details of the benchmark applications associated with workstreams 4, 5 and 6 (see section C.3.4.1 and other RFP sections for definitions related to the concept of “workstreams”).

A Microsoft Excel spreadsheet has been supplied for reporting initial results. Report all performance measures using only the benchmark supplied parallel infrastructure. Report only actual measurements in the original table. Copy the table to report performance values obtained using alternate technologies; clearly mark projected values and provide details as to how the projection was derived.

Benchmark Components

Components for Workstreams 4, 5 and 6

Summary:

Only the benchmark code for workstream 5 (GSF) is available at this time.

The following is the application of the fundamental build/run design as outlined in the head benchmark instruction document to the content of workstreams 4, 5 and 6:

0) Build the libraries described below.

1) Download bench.base.tgz. Unpack the benchmark build directory bench using gunzip and tar –xvf.

2)

NOTE: Default size of real must be 64; default size of integer may be either 32 or 64.

3) Change directory to the target benchmark bench/<model>/exec

4) Edit the make for local directory structure, compiler options, etc.

5) Make the executable; record the time make required to compile and link the executable in the spreadsheet provided.

6) Owing to their size, the benchmark run directories will be provided by tape. Offerors will supply a set of DLT format tapes to receive a copy of the benchmark run directories. Details for this process are pending and will be announced shortly.

The benchmark run directories associated with workstreams 4, 5 and 6 are:

a) WRF-NMM_4.5KM.tar (required - not available with first release)
b) GFS.tgz (required)
c) GSI_T254.tgz (required - not available with first release)

Unpack the benchmark model run directory using gunzip and tar –xvf.

7) Change to the run directory. Set the BASE variable in the x.126.54 script for local conditions.

8) Follow the directions below to run the executable

10) Report the time taken to run rounded to the nearest second.

11) Report per process memory used.

12) Check results against verification files provided.

Model output files often have the same name regardless of PE count. Care must be taken not to accidentally overwrite output you wish to keep between consecutive model runs.

Note: The RFP benchmark will require a reproducibility test across PE count for some setting of the compiler, preferably that used for the performance benchmark itself. It is theoretically possible that high levels of compiler optimization might destroy reproducibility across PE count. To date, we have not seen this to be the case. Any mechanism causing loss of the capability to reproduce must be explained in detail. Use of such compiler optimizations will be weighed against the performance gain.

Specific Instructions:

See http://www.emc.ncep.noaa.gov/gmb/moorthi/gam.html for more details.

The GFS contains the following subdirectories
1. I.C - Initial Conditions (benchmark run directory in gfs.tgz)
2. FIX - Fixed data (benchmark run directory in gfs.tgz)
3. gfs - source code (benchmark src directory in bench.base.tgz)
4. results - results directory with subdirectory sig12664 and the standard out contained in file "out" (ascii output in benchmark src directory; full set including binary files in benchmark run directory).

To build the gfs executable you will first need to build the
w3 and bacio libraries.

starting from bench/gfs/gfs directory
cd libs/w3.subs
make -f Makefile.w3 ! builds libw3_d.a in libs

cd libs/bacio.subs
make -f Makefile.bacio ! builds libbacio_4.a in libs

cd ../.. ! back to gfs directory

To build the GFS executable, f126.64.x, execute the script
ini.126.126.64.port.

The run script is gfs/PORT/x.126.64 located in gfs.tgz. The BASE variable must be set to the appropriate local directory.

Results are in the directory results/sig12664 with standard out in the file "out".

The following are the list of input data files required for execution.

.....
Initial condition (time dependent):

```
% ls -lt $BASE/PORT/I.C/t126.64
-rw-r--r--   1 wx23ys   g01       25103400 Aug 25 16:29 sig.12664
-rw-r--r--   1 wx23ys   g01        7588460 Aug 25 16:29 sfc.12664
```

.....
Vertically dependent fix fields:

```
ls -lt $BASE/PORT/FIX/fix.k64
-rw-r--r--   1 wx23ys   staff       106796 Feb 11 14:36 co2l64
-rw-r--r--   1 wx23ys   staff         1638 Feb 11 14:36 global_hyblev.l64.txt
-rw-r--r--   1 wx23ys   staff          572 Feb 11 14:36 global_siglevel.l64.txt
```

.....
Horizontally dependent fix fields:

```
% ls -lt $BASE/PORT/FIX/gg.384.190
-rwxr-xr-x   1 wx23ys   g01         146004 Aug 25 16:38 orography
-rwxr-xr-x   1 wx23ys   g01        4085768 Aug 25 16:37 mtnvar14_126
```

.....
Completely independent fixed fields:

```
% ls -lt $BASE/PORT/FIX/fix

-rw-r--r--   1 wx23ys   staff       253171 Feb 11 14:38 aeropac3a.m05
-rw-r--r--   1 wx23ys   staff       253171 Feb 11 14:38 aeropac3a.m06
-rw-r--r--   1 wx23ys   staff       253171 Feb 11 14:38 aeropac3a.m07
-rw-r--r--   1 wx23ys   staff       253171 Feb 11 14:38 aeropac3a.m08
-rw-r--r--   1 wx23ys   staff       253171 Feb 11 14:38 aeropac3a.m09
-rw-r--r--   1 wx23ys   staff       253171 Feb 11 14:38 aeropac3a.m10
-rw-r--r--   1 wx23ys   staff       253171 Feb 11 14:38 aeropac3a.m11
-rw-r--r--   1 wx23ys   staff       253171 Feb 11 14:38 aeropac3a.m12
-rwxr-xr-x   1 wx23ys   staff       119520 Feb 11 14:38 o3loss
-rwxr-xr-x   1 wx23ys   staff       119520 Feb 11 14:38 o3prod
```

```
-rwxr-xr-x   1 wx23ys   staff      146772 Feb 11 14:38 tbthe
-rwxr-xr-x   1 wx23ys   staff      206020 Feb 11 14:38 tune1
-rw-r--r--   1 wx23ys   staff      253171 Feb 11 14:38 aeropac3a.m01
-rw-r--r--   1 wx23ys   staff      253171 Feb 11 14:38 aeropac3a.m02
-rw-r--r--   1 wx23ys   staff      253171 Feb 11 14:38 aeropac3a.m03
-rw-r--r--   1 wx23ys   staff      253171 Feb 11 14:38 aeropac3a.m04
```

additional fixed fields are in :
$BASE/PORT/FIX/fix.phys

```
-rwxr-xr-x   1 wx23ys   staff      880656 Apr 07 12:37 global_soilmcpc.1x1.grb
-rwxr-xr-x   1 wx23ys   staff       32484 Apr 07 12:37 seaice_newland.grb
-rwxr-xr-x   1 wx23ys   staff       56784 Apr 07 12:37 global_soiltype.1x1.grb
-rwxr-xr-x   1 wx23ys   staff       64884 Apr 07 12:37 global_vegtype.1x1.grb
-rwxr-xr-x   1 wx23ys   staff     1394712 Apr 07 12:37 global_albedo4.1x1.grb
-rwxr-xr-x   1 wx23ys   staff       99288 Apr 07 12:37 global_iceclim.2x2.grb
-rwxr-xr-x   1 wx23ys   staff       20094 Apr 07 12:37 global_tg3clim.2.6x1.5.grb
-rwxr-xr-x   1 wx23ys   staff      487008 Apr 07 12:37 global_vegfrac.1x1.grb
-rwxr-xr-x   1 wx23ys   staff      681408 Apr 07 12:37 global_zorclim.1x1.grb
-rwxr-xr-x   1 wx23ys   staff        8274 Apr 07 12:37 global_glacier.2x2.grb
-rwxr-xr-x   1 wx23ys   staff        8274 Apr 07 12:37 global_maxice.2x2.grb
-rwxr-xr-x   1 wx23ys   staff      438768 Apr 07 12:37 global_snoclim.1.875.grb
-rwxr-xr-x   1 wx23ys   staff      222144 Apr 07 12:37 global_sstclim.2x2.grb
```