

TMD's Numerical Weather Prediction System

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Abstract

In year 2017, Thai Meteorological Department deploy the Weather and Research Forecasting model instead the Unified Model which operated more than 20 year. These model had applied for short range, medium range, long range and specific research. The model and related libraries are often update of various improved to better accuracy and performance. The Graphic User Interface had designed for setting up, processing and testing new model before puts to operation. The interface are effective to protected parameters and options of each operational case on specified computing.

1 Introduction

The National Weather Services (NWS) had improved the numerical weather prediction system of new technology to served the required of the national not only weather forecast, climate seasonal outlook, water management, early warning, risk management and environment. The Thai Meteorological Department (TMD) had upgrade the NWP system with the new technology of high performance computing for replaced the old model to community model which easier than the old one. The new NWP system is more effective in operation and modification and is in house development with new challenge for our young generation to perform for the best services of the country. Disruptive not only technology and modeling, the required and need of the users is importance for the services and improvement.

2 Graphic User Interface

Rapid advantage of technology and atmospheric science, the WRF model and required libraries and often update, its take a time to testing before adopt to operational. The Graphic User Interface (GUI) had developed for reconfiguration and operational the numerical weather prediction system. The GUI are base on native python script s for configure and installed related libraries packages and WRF model to fit on the computing environment on both local and/or remote machine. The GUI composed of python script with interface to Tcl/Tk in this called "wrf_apps.py". It's GUI of single executable command called "wrf_apps" which compiled by "pyinstaller" packages. The executable Command Line Interface (CLI) of each step of WRF model processes from state of ingest initial data, geogrid, ungrib, metgrid, real, wrf and etc., until to end of process are provided. The command line for configure and installed as shown in figure 1 and figure 2 respectively, configuration on the local machine by the command,

```
HOST=localhost BUILD=True ~/pybin/wrf_apps
```

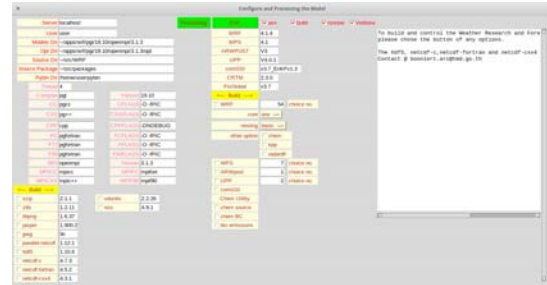


Figure 1. Configure and Compile the WRF Model.

and processing the WRF model with,

```
HOST=localhost ~/pybin/wrf_apps
```



Figure 2. Processing the WRF model.

3 Operation System

The new platform of TMD numerical weather prediction system composed of Graphic User Interface, Forecasting Model, High Performance Computing and Mobile Application.

3.1 Forecasting Model

The Weather and Research Forecasting (WRF) model very useful not only on Nation Weather Services, the Thai Meteorological Department (TMD) had applied to predicted short term and long term weather and climate for the whole country with the initial data from National Center for Environmental Prediction (NCEP). There are 3 domain for operational and 2 domain for climate model as shown in the figure 3 and 4 respectively. The high resolution of 3-nested domain of 18, 6 and 2 km resolution for 10-day, 3-day and 3-day forecast respectively with cycle run four time per day at 00, 06, 12 and 18UTC. The global 54 km with nested 18 km resolution for 397-day simulation with cycle run at 00UTC.

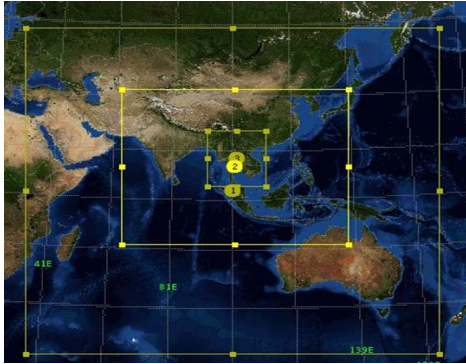


Figure 3. Short and Medium Range Forecast Domain.

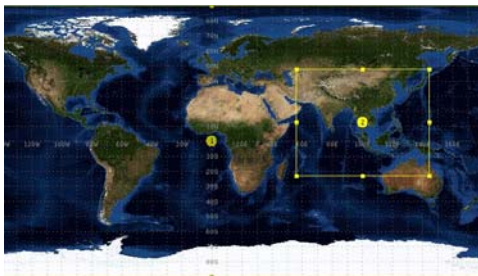


Figure 4. Long Range Forecast Domain.

3.2 High Performance Computing

The HPC performance is 228 Teraflops as shown in figure 5, HPE Apollo 2000 series, Proliant XL170r Gen 9, total 172 nodes with 32 core and 128 gigabyte memory per node. The high-speed storage is 3 petabytes. The interconnection is Intel Omni-Path of 100 Gb/s speed.



Figure 5. TMD High Performance Computing.

3.3 Mobile Application

The post-processing NWP results had puts on the “TMD Smart Sim” application for the users to access.

TMD Smart Sim (mobile app)



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Figure 6. TMD Smart Sim

3.4 Forecasting Results

The model results puts on the TMD website after processing completed. The followed are some of the results.

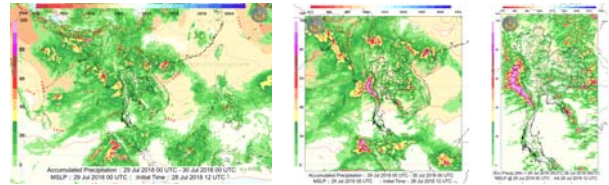


Figure 7. Short and Medium Range Forecast (<http://www.nwp.tmd.go.th>)

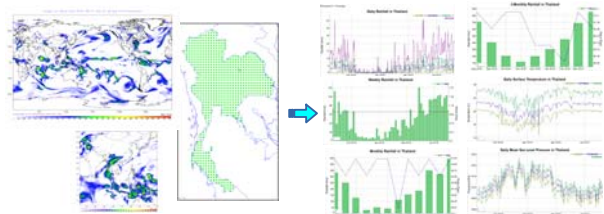


Figure 8. Experiment Long Forecast (<http://weather.tmd.go.th/seasonal>)

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References

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<http://www2.mmm.ucar.edu/wrf/users/>.