Container User Guide V2

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Upgradation:

1. **Continuous Data Assimilation (CDA) module is attached to Forecast module.**
2. **RAP Prepossessing is included.**

Hardware and Software Requirements:

1. CPU architecture shall be aarch64, RAM shall be larger than 16GB, storage shall be larger than **65GB**.
2. Container is built using Docker version 20.10.8.
3. Operating system is not strictly restricted, but Linux is preferred.

How to Run the Container:

This container is tested using AWS EC2 c6g.8large instance (32 virtual CPU, 64GB RAM), Entire execution cost (excluding data uploading and downloading) is approximately $8.00 for a single run. A running example is listed below:

1. Launch an AWS EC2 instance via any user-preferred interface. Instances such as **c6g.4xlarge, c6g.8xlarge, c6g.12xlarge, c6g.16xlarge, c6gd.4xlarge, c6gd.8xlarge, c6gd.12xlarge, c6gd.16xlarge** are suggested, users shall evaluate the financial cost against computational efficiency by him(her)self before launching any instances. For the operating system, ubuntu 20.04 is used in this case.

2. Install the Docker Engine. There are plenty tutorials online, please choose one based on your own preference. Official version is listed here:
    https://docs.docker.com/engine/install/ubuntu/

3. Downloading container to launched instances using the url:
    http://cas.hamptonu.edu/~qi.zhang/Container/devops_armv8_ec2c6g_CDA.tar.gz

4. Loading container to Docker Engine:
    # docker load --input devops_armv8_ec2c6g_CDA.tar.gz

5. Prepare PHSnABI data. User shall contact PHSnABI data providers for the access location of its hdf5 format data. The name format of PHSnABI data used by this is "**PHSnABI_YYYY_MM_DD_JJJ_tHHmmSS_rtv_With*Polar.h5**". Currently, user can access the PHSnABI data using the url:
    http://cas.hamptonu.edu/~adinorscia/ABInPHS_Files/output/

6. Before executing the container, all PHSnABI data shall be put together in the same directory, **for example, in order to run the forecast initialized at 00Z Oct. 07th. 2021, four PHSnABI data acquired around (1) 00Z Oct. 07th. 2021, (2) 01Z Oct. 07th. 2021, (3) 02Z Oct. 07th. 2021, and (4) 03Z Oct. 07th. 2021 should be moved to running directory**. User has to make sure that Docker engine has the read and write authorization of the running directory.

7. Running Forecast. Once procedure 1-6 are finished, user could generating the forecast results using the command listed below:
    # docker run --name Devops --shm-size 60G -v /tmp/TestTest/:/root/Test --rm --user root -it arm64v8/ubuntu:20.04 bash /Run.sh -s ${start_date} -d ${lead_time}
For example, if user wants to run a 18-hours lead-time forecast initialized at 00Z Oct. 07th. 2021, the ${start_date} shall be 2021100700, the ${lead_time} shall be 18.

Output:

The netcdf format forecast output files (wrfout_d01_yyyy-mm-dd_hh:00:00) can be found in the directory /tmp/TestTest. In the Analysis Directory, user can find the output (typical WRF output file) from CDA analysis cycle. The diagnostic wind, which is assimilated in the forecast cycle comes from this file.