Strategic Implementation Plan (SIP) for a Community-based Unified Forecast System

System Architecture Working Group

Presented by

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Coordination Meeting for the Unified Forecast System

Strategic Implementation Plan (SIP) Annual Update

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System Architecture WG
Membership

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- Tom Auligne (JCSDA)
- V. Balaji (Princeton University)
- Rusty Benson (NOAA GFDL)
- Ligia Bernardet (NOAA ESRL)
- Arun Chawla (NOAA NCEP)
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- Gerhard Theurich (ESMF/NRL)
- Sam Trahan (NOAA NCEP)
- Mariana Vertenstein (NCAR)
- Jun Wang (NOAA NCEP)

- *Co-Chair ***

System Architecture WG
Project Milestone Accomplishments

- **SIP project accomplishments to date:**

  - Provided coupling infrastructure and user support for UFS coupled apps and FV3GFS

  - Released ESMF (v7.1.0r) with capabilities needed for FV3GFS release, both in March 2018

  - Validated the Community Mediator for Earth Prediction Systems (CMEPS) in the CESM and released the result in a user-friendly workflow in June 2018, UFS integration with CMEPS in progress

  - Promoted communication and collaboration between the research community (NCAR, GFDL, GSD, …) and NCEP on coupled apps, for example through sharing MOM6 and CICE5 ESMF/NUOPC component “caps”

- **SIP project challenges:**

  - Ensuring compatible and efficient operation of the various parts of UFS, including component interface, physics interface, and DA interface

  - Establishing the graduate student test as a key metric and organizing principle

System Architecture WG Graduate Student Test - Detail

- *GST Activities* – How well can first-year or advanced graduate students reach various milestones?
  - *Get code*. Easily distinguish between versions of code (capabilities, readiness, limitations);easily identify which code to get and which options are available
  - *Run code*. Easily execute workflow (script) for given experimental setup. Understand and access setups with active and passive (data) components and cold-start or DA-cycling runs. Easily access and run code on systems available to the public.
  - *Change code for research experimentation*. Either parameterizations, components (models), or coupling strategies.
  - *Test code*. Access standard unit/system tests and functional tests. Easily obtain test data sets.
  - *Evaluate code*. Easily obtain and use standard diagnostics of general behavior and individual processes. Easily interact with output data for post-analysis.
- *Metrics*:
  - Time to solution
  - Number of contacts needed
  - Qualitative ease-of-attainment
- *Transition* - Develop a clear pathway for transition from research to operations, accounting for evolving nature of public release and operational codes. Requires input from the Steering Committee.
- *Training needed* - Course or mini-curriculum, possibly online, on using codes and workflows associated with ESMF/NUOPC/CIME/CMEPS suite.

CMEPS Coupled Prototypes

- CMEPS: community (shared NCAR, NOAA) coupler based on NEMS mediator
  - CESM CMEPS milestone delivered 6/2018
  - UFS CMEPS milestone scheduled 9/2018

Hierarchical Model Development (HMD)

Turn off feedbacks

Test simplified configs

- Available through a github "umbrella" repository
- Supported by established community workflow (CIME)
- Data components available
- Data inputs included in workflow
- Verification included in workflow

Graduate Student Test (GST)

Easy to get code

Easy to port and run code

Change configuration

Verify correct operation

System Architecture WG Team Coordination and Dependencies

Successes

- Global Model Suites and Marine – provided coupling framework and support for coupled systems including FV3GFS-MOM6-CICE5, FV3GFS-wave
- Aerosols and Atm Comp WG – provided coupling framework and support for FV3GFS-Chem system, working on FV3GFS-CMAQ (air quality)
- Infrastructure (Repo) WG – coordinated on proposed repository strategy
- Dynamics and Nesting WG – provided coupling framework and support for atm - space weather application, coordinated on Hurricane Supplemental planning for nested systems

Open Issues:

- Land and Physics WGs – coordination on a flexible implementation strategy for land surface (inline or component)
- DA WG – coordination on design strategies for efficient implementation and coupled DA
- Infrastructure (Workflow/Data) WG – just getting started, critical for ease of use and satisfying the graduate student test
- UFS-SC, Infrastructure WG, others – R2O transition