NOAA Testbed and Proving Grounds
Annual Meeting Summary
April 7th & 8th, 2020a
This meeting was entirely virtual with all attendees participating remotely.

Meeting Planning Group: Peter Stone (TBPG Chair, NOS), Virginia Dentler (NOS), Emily Niebuhr (ATB, NWS), Hendrik Tolman (NWS), Andrea Ray (HMT, OAR), Satya Kalluri (NESDIS)
Meeting Objectives:

- To build upon the discussions at the 2019 meeting and chart a path to address the issues raised
- To hear from and interact with NOAA senior leadership and decision makers on technical topics pertinent to the Testbeds and Proving Grounds
- To identify potential alternatives for future testbed and proving ground transitions to operations, applications, or commercialization

Agenda

Day 1 Focus: Understanding NOAA's Priorities for Environmental Predictions from NOAA Decision Makers

Keynote Speaker – **Dr. Neil Jacobs** R&D & transitions to operations with in NOAA's environmental prediction system

Key points:

- EPIC: community involvement in a global modeling program - following in the successful footsteps of WRF - but this time using UFS
- EPIC first needs to build out software and architecture
- Look to the public and NOAA labs to provide innovations- need to get process and infrastructure up and running - if people come to us with innovations now we have no way to build them into the system
- UFS is on GitHub- this is a huge success
- Dr. Jacobs has compiled UFS on his MacBook :)
- The reason why no one has contributed to GFS in the past- is that it was hard coded to NOAA's machine- you could not develop without access and login to NOAA's machine.
- What was not realistic 5 years ago is reality now- how quickly cloud servers are adapting and competing so price will come down
- UFS on GitHub- next thing is DA - need access to obs.
- Cloud is offering to host all obs for free- obs input and model output. Both University and industry want access to data. No one wants to pay egress since people are getting away from running on their own machine. Instead they are buying time on the cloud where data is hosted. We are bringing business to them and increasing their revenue. Great for NOAA- need as much free storage as we can get.

- Top priority is data assimilation such as Jedi program, and 4D VAR. How we assimilate, how much and how quickly will determine how much we pull ahead in the modeling world
- Second to this is the physics - how many ensembles, how to perturb members]
- Looking forward is probabilistic and moving away from deterministic
- Anomaly correlation for global models is what he uses for verification- but not many people at 500 mb - need some more real world metrics that account for uncertainty and representativeness error
- Future is having a solid coupled two way model with ocean- maybe even with a coupled space
- ACCARS is so helpful for DA, but could be taking a % skill hit in model verification score
- On decent of radiosonde- winds are actually more accurate on way down according to ECMWF
- Use AI to replicate what radiative transfer model can produce - NESDIS
- There are a lot of interesting ways to plot and show graphics so that people can understand and make sense out of them
- We can have the best forecast on the planet, but if we can't give info in a useful way its useful
- Funding –Can't just have everyone's idea funded to a C+ level - just want a few with A+ but not every idea can get funded
- Problem - competing for publications and grants makes sharing of information much slower
- Brought this up to NOAA Science advisory board - how to incentivize sharing early on - (i.e. wait for it to be accepted but not in press)

Unified Forecast System Update - Hendrik Tolman (NWS/STI)

Key points:

1. The UFS is a comprehensive, community-developed earth modeling system, designed as both a research tool and as the basis for NOAA's operational forecasts
2. Governance: Planning and Evidence-based decision-making support improving research and operations transitions and community engagement
3. UFS is a paradigm shift that will enable NOAA to simplify the NCEP Production Suite, to accelerate use of leading research and to produce more accurate forecasts for the US and its partners
4. Modular, community-based systems architecture for the coupled model infrastructure - Coupling(ESMF, NUOPC, JEDI, CCPP Framework(atmospheric Physics, METplus
5. Release strategy - incremental releases as new capabilities mature - initial release is medium range FV3
6. Graduate student testing (GST) student can easily get code, run code etc - different GST for different tests - i.e. S2S
7. https://github.com/ESCOMP
8. UFS app version 1 already available

NOAA NWS Planning and Policy Priorities Dr. Dorothy Koch - STI-Modeling

Key points:

- NWS STI-Modeling Program objective: Support the development of improvements to NOAA's operational forecast systems
- NWS STI Modeling Programs: NGGPS, CAM, air quality forecasting, Hurricane Forecast Improvement Program
- Unification: reduce diversity of model code versions among forecast applications to focus effort on fewer modeling systems
- R2O: Strengthen collaboration between research and operations in modeling so that research is targeting operational requirements
- UFS Medium Range Weather App release at https://github.com/ufs-community/ufs-mrweather-app
- Unification roadmap is clear but not easy: Testbeds could help with the hard work of testing and downselecting
- http://www.weather.gov/sti/stimodeling
- https://ufscommunity.org

NOAA/NESDIS Planning and Policy Priorities - Steve Volz

Key points:

- NESDIS- Provide a truly integrated digital understanding of our earth environment that can evolve quickly to meet changing user expectations by leveraging our own capabilities and partnerships
- GOES: continuous real time obs supporting warnings and watches
- LEO: better precipitation forecasts, wave height predictions, ocean currents
- Space Weather: monitoring coronal mass ejections
- Strategic focus: 1) advance obs leadership in geo and extended orbits
- 2) evolve LEO architecture 3) develop agile scalable ground capabilities
- Provide consistent ongoing enterprise-wide user engagement to ensure timely response
- Deliver integrated program development
- Focus: provide better and more useable products to users: from fire hose to sprinkler
- Workflow harmony
- Anatomy for a successful Initiative: 1) strategic alignment at many levels, sustained support through development, close connection to end users throughout development

End of Day 1

Day 2 Focus: Interactions between NOAA Organizations and Testbeds and Proving Grounds

LOTMC - Readiness levels - Dr. Gary Matlock DAA/OAR

Key points:

- How is transition in NOAA achieved? Through Readiness levels!

- Not all research is transitioned (RL 9). But for things that we think can be transitioned have tried to develop a more structured way.
- 2005 there was a NOAA administrative order to guide a structure for transitions. This is where Readiness Levels originated
- Challenge: Identification of what exactly it is that is being researched and put into use.
- RL - are not a gotcha tool - to learn and improve on what we do and how we do it.
- 6 Project type things to transition at NOAA
    1) Assessments 2)Tools 3)Products 4)Systems 5) Processes 6) Services

- Confusion - to tackle this - have a forum for people to raise issues they are facing and get a broader discussion on resolution of the issues - NOAA Readiness levels workshop - improve NOAA RL and transition understanding, like what each RL means and how to assign an RL . Currently issues in RL are raised within line offices and not more broadly discussed
- RL system is to inform us about the progress of something. Usually are fed in the top- but sometimes the O2R - may need some adjustment
- Was not meant to have to follow the exact pathway.
- RL serve multiple functions in evaluating transition
- Not to be obstacles - but should help us to move things through transition process.

Moving to community Modeling in the National Weather Service - Brian Gross (NWS/NCEP/EMC)

Key points:

- Why does it take so long to transition model upgrades into operations: We run too many modeling suites.
- Pros & Cons of a unified approach:
    - Pros:
        - All NPS applications will be grouped into fewer applications using UFS
        - Number of modeling systems dramatically redacted
        - Model development will be streamlined
        - Implementation schedules easier to manage
        - Better utilization of WCOSS and SPA resources
    - Cons:
        - Some existing products and delivery timelines will change (some will be substituted and some will retire
        - Downstream dependencies (non-WCOSS applications) need to adopt to new products / timelines
        - Individual implementation becomes big and complex
        - Difficult to implement upgrades (non-linear impacts for coupled components)
- Provided several great overview slides on timelines (not going in detail here for brevity)
- Community Based Development:

- UFS Portal launched in April 2019, UFS Medium-range weather application March 11 2020
- Repository plan emphasizes github
- MoA with NCAR and NOAA OAR MOA focuses on synergist development and use of infrastructures
- Use cycles of physics development and ongoing coupled system development to define and improve the R2O process (Use MRW GFS release to increase community engagement

Managing Transition Plans for R2O Projects - Tabitha Huntemann * NWS Office of science and technology integration)

Key points:

- Per NAO 216-105-B transition plans must be coordinated among the PI, OAR and NWS
- Transition Plan coordination process:
    - 1) PI notified that their proposal was selected
    - 2) Receiving office and NWS POC identified
    - 3) PI kickoff and training
    - 4) PI and POC draft transition plan
    - 5) Transition Plan Review Meeting
    - 6) Transition Plan cleared by WPO and ready for signatures
    - 7) Guiding transition
    - ** a completed and signed transition plan does not guarantee the project will actually be transitioned into operations
    - R&D Transition plans are required for all NOAA-funded RL5+ projects per NOAA policy (NAO 216-105B)
    - Example plans: http://nrc.noaa.gov/NOAARDPolicies/ExampleTransitionPlans.aspx

Priorities of the NWS Office OSTI - Stephan Smith

Key points:

- Focus on 2-5 year planning
- Applications of cloud to STI mission
- Moving to cloud represents a disruption in NWS development and operations culture- requires new skill sets for supporting workforce to be acquired via hiring and retraining
- But move to cloud is not free and implies a partial and gradual shift in funding from hard iron to annual compute costs (budget planning must explicitly include cloud compute costs) helps to handle low FISMA products - but also need to address products made by academia that operations might need
- Establishing a NWS Cloud Control Board to help with governance

NOAA Technology Partnerships Offices - Derek Parks and Kevin Garret

Key points:

- NOAA relies on grants contracts and other collaborations to meet science mission
- Can include gadgets, devices sensors, software, processes design methods creative works
- A lot of work in govt is in public domain by nature- what you do for govt is for public benefit
- Document, white paper, photo as federal employee- it is assigned to public domain- software as well
- Grantee-Developed - i.e. from a University- their rights go to their main institution(Bayh-Dole Act) grantee has first right to ownership; in exchange the govt has a nonexclusive paid license to practice invention. Allows universities and contractors to elect title and file patents on any invention on
- Public good vs licensing - how do we balance income, collaboration and mission requirements?
- Scrutinize your contracts & grants- there should be an intellectual property clause in all contracts - ask your AGO rep or CTO to verify

End of Day 2 and Meeting