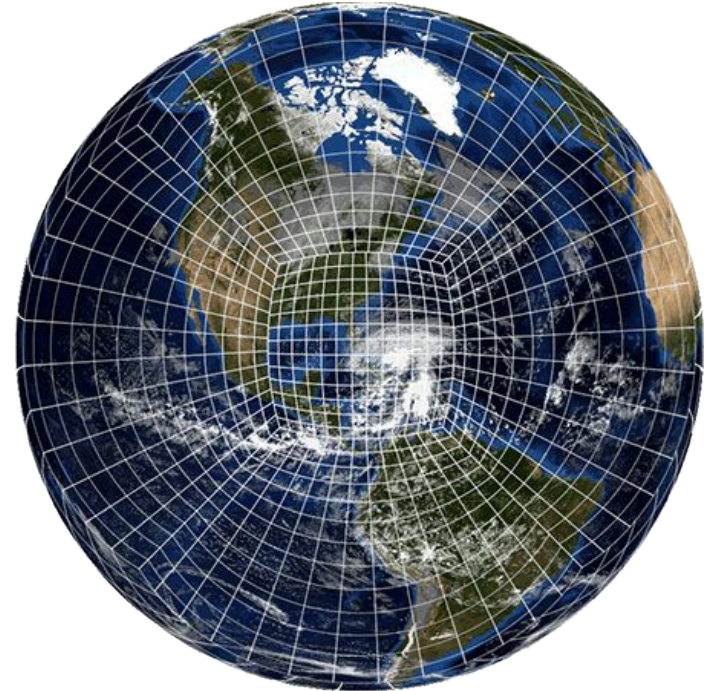




NOAA's Unified Forecast System

Strategic Implementation Plan (SIP)



Coordination Meeting for UFS SIP Annual Update

Dorothy Koch
May 14, 2019



Exciting and Dynamic Times!



UFS:

- Works toward unified forecast, from hours to weeks
- Reduces the number of model versions, thereby focusing development and research
- Strengthens the collaboration among NOAA Labs and with community partners
- Establishes underpinning infrastructure, across Institutions and from R2O

NWS-OSTI and OAR-OWAQ are coordinating programs and projects to achieve these goals



STI Modeling Highlights



FY19 achievements:

- FV3 implementation imminent
- CMAQ AQM implementation
- Code releases:
 - FV3 CAM
 - CCPP
 - WW3
- UFS Web-Portal is live!
- UFS Technical Oversight Board Meeting, May 9, 2019
- NCAR-NOAA MOA signed



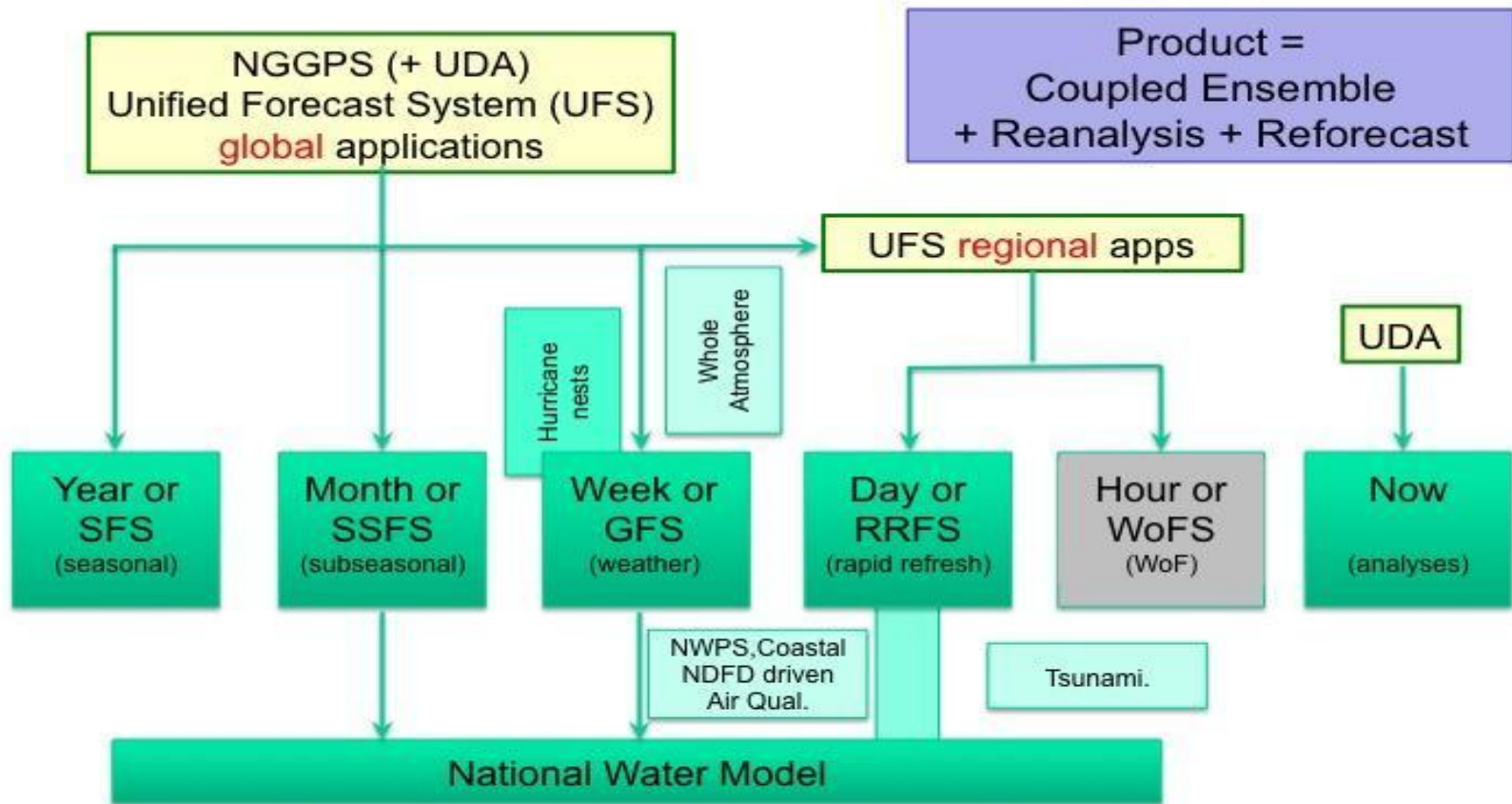
Modeling New Directions



- Increasing alignment of STI-modeling program elements (AQ, Hurricanes, Coastal-Act, “weeks 3-4”, NGGPS)
- Increased focus on S2S prediction in coupled system
- Increased focus on computation - assessing needs, retire codes, and building new capabilities in performance
- Other compute-related advances: DA and ML
- Increased interest in CAM for severe weather, fires; Computational performance advances important!
- Planning to coordinate infrastructure (repositories, workflow, V&V, etc) across Labs and from R2O; EPIC goal
- Land: land-DA, coastal impacts, water model, fire
- FV3GFS release to community with initial support (GMTB)
- FY20 coordinated management of OSTI and OWAQ
- Personnel - new hires, new opportunity



Unified Forecast System NWS Operational Applications



UDA: Unified Data assimilation
SFS: Seasonal Forecast System
SSFS: Subseasonal Forecast System

GFS: Weather Forecast System
RRFS: Rapid Refresh Forecast System
WoFS; Warn on Forecast System

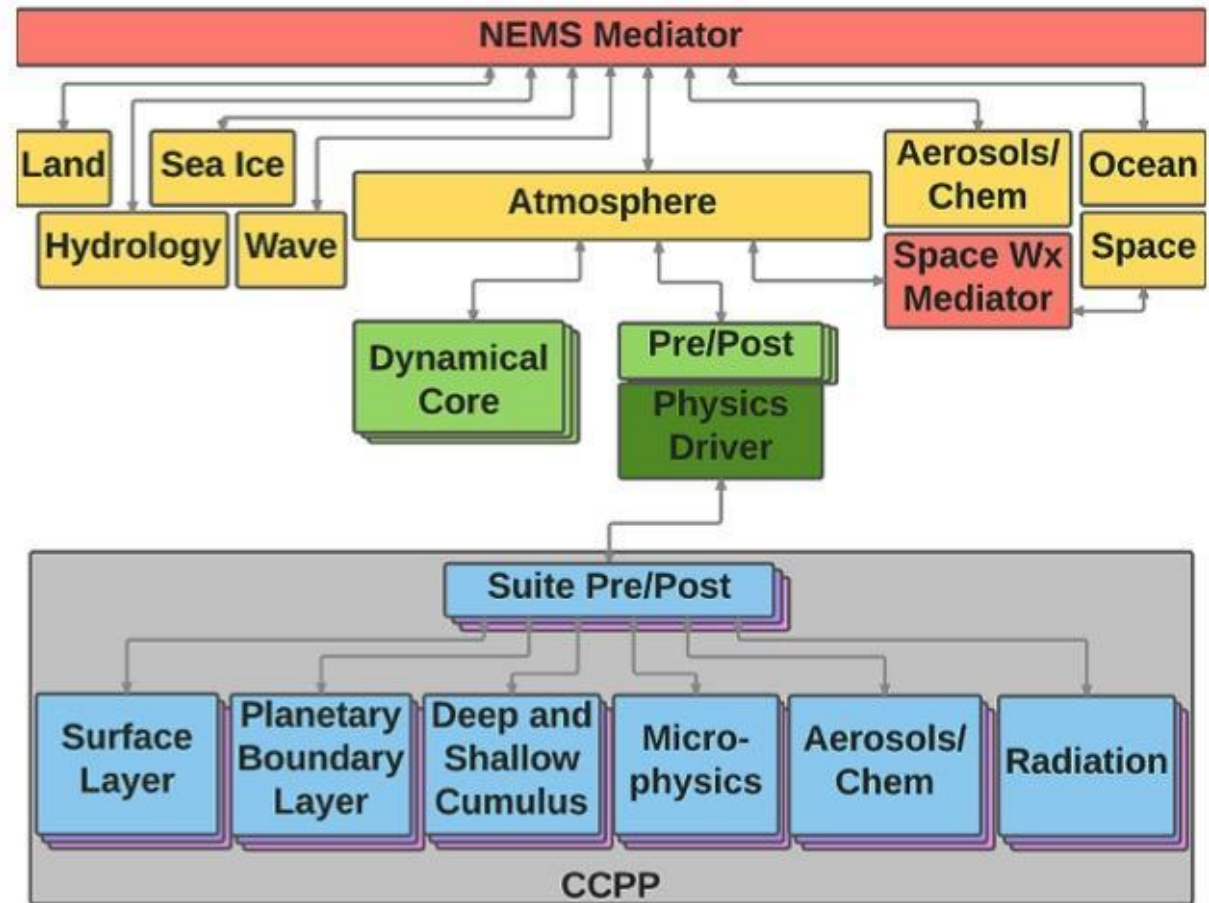


Unified Forecast System for Operational Earth System Prediction (2018)



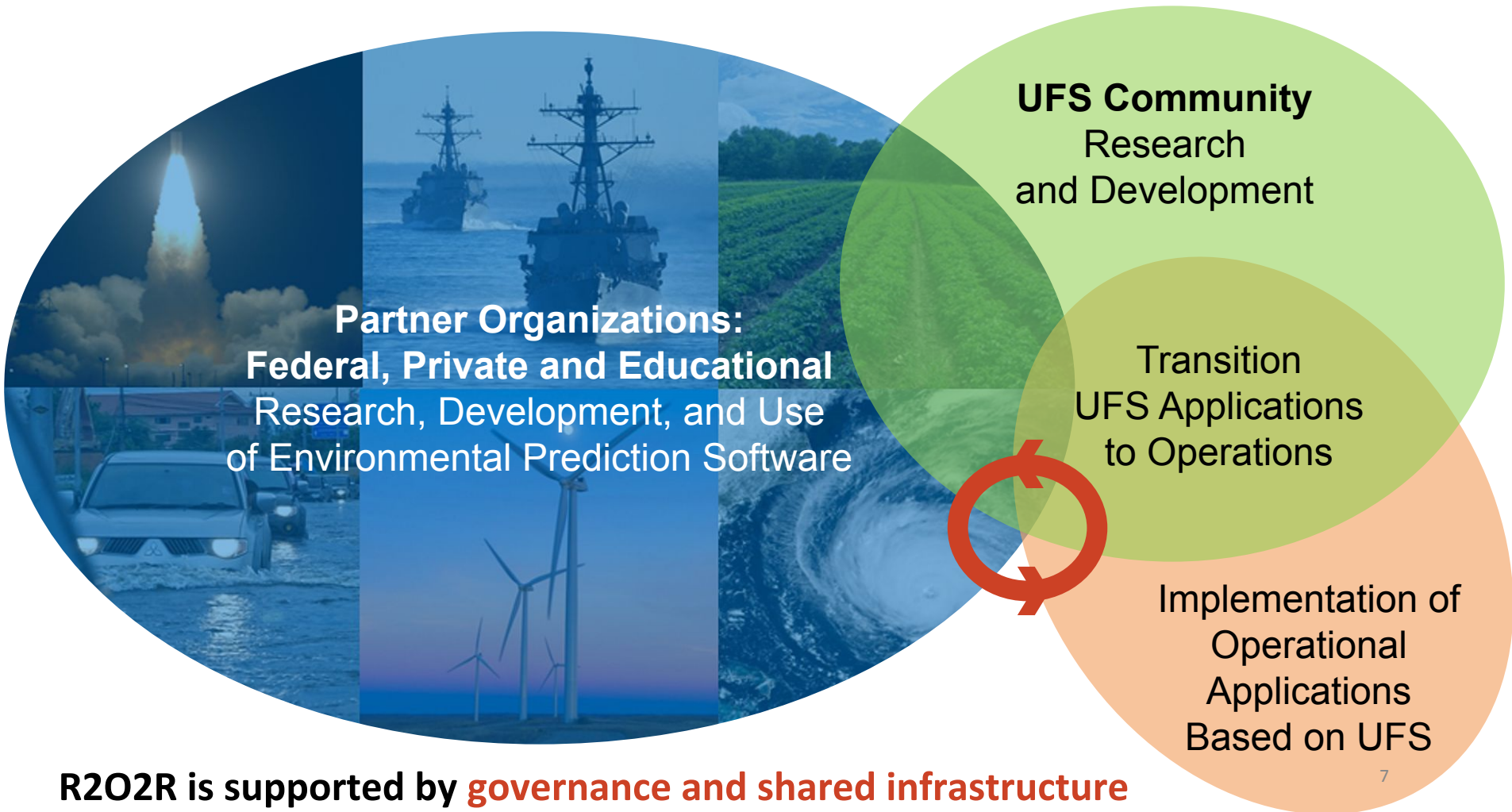
ESMF/NUOPC/NEMS architecture enables unified global and regional coupled modeling and DA

Consistent with broader community (CESM) and US National ESPC



Community-Based Development

The Unified Forecast System (UFS) is a comprehensive, **community-based** Earth modeling system, designed as both a research tool and as the basis for NOAA's operational forecasts.



R2O2R is supported by **governance and shared infrastructure**

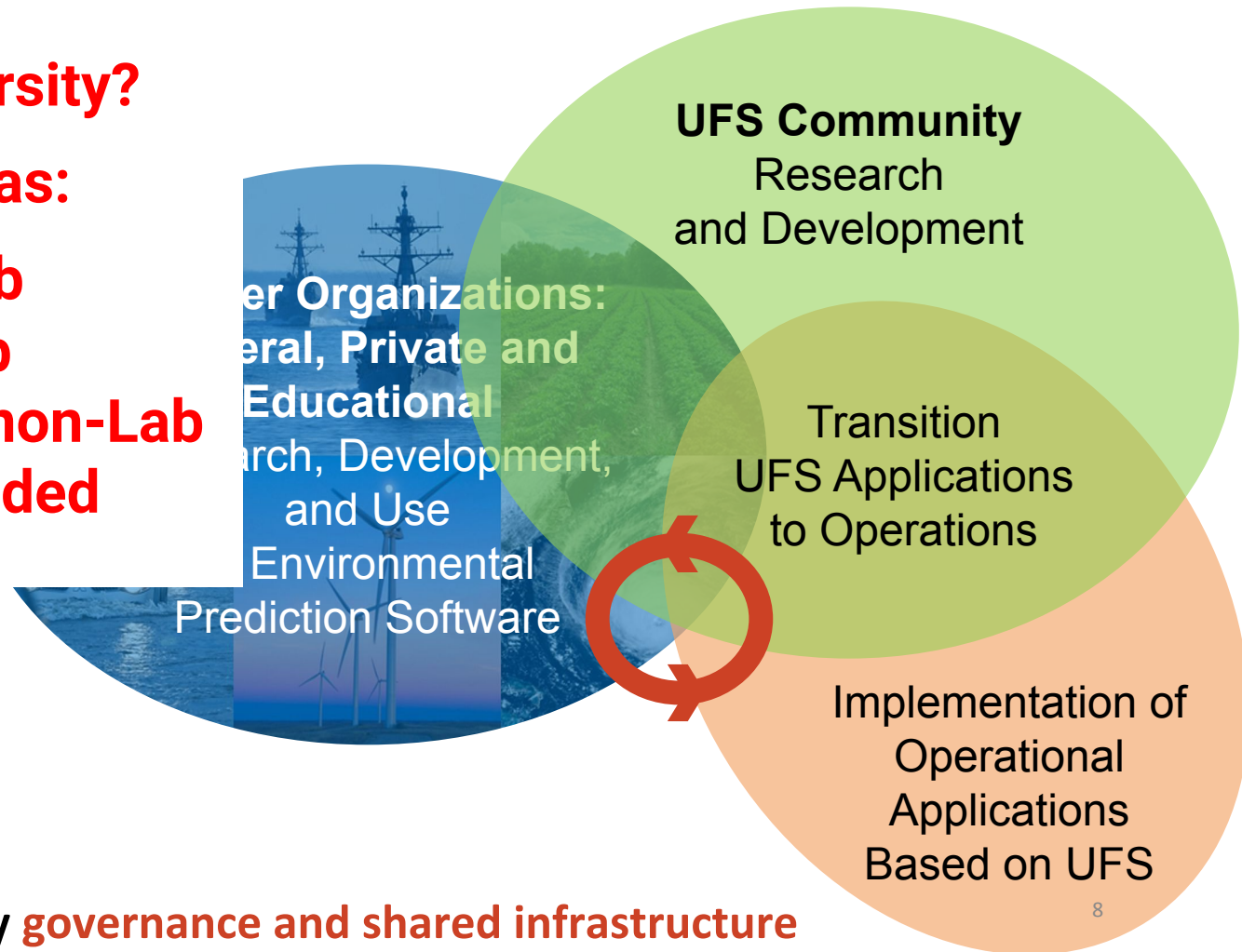
Community-Based Development

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UFS scientist diversity?

UFS participation as:

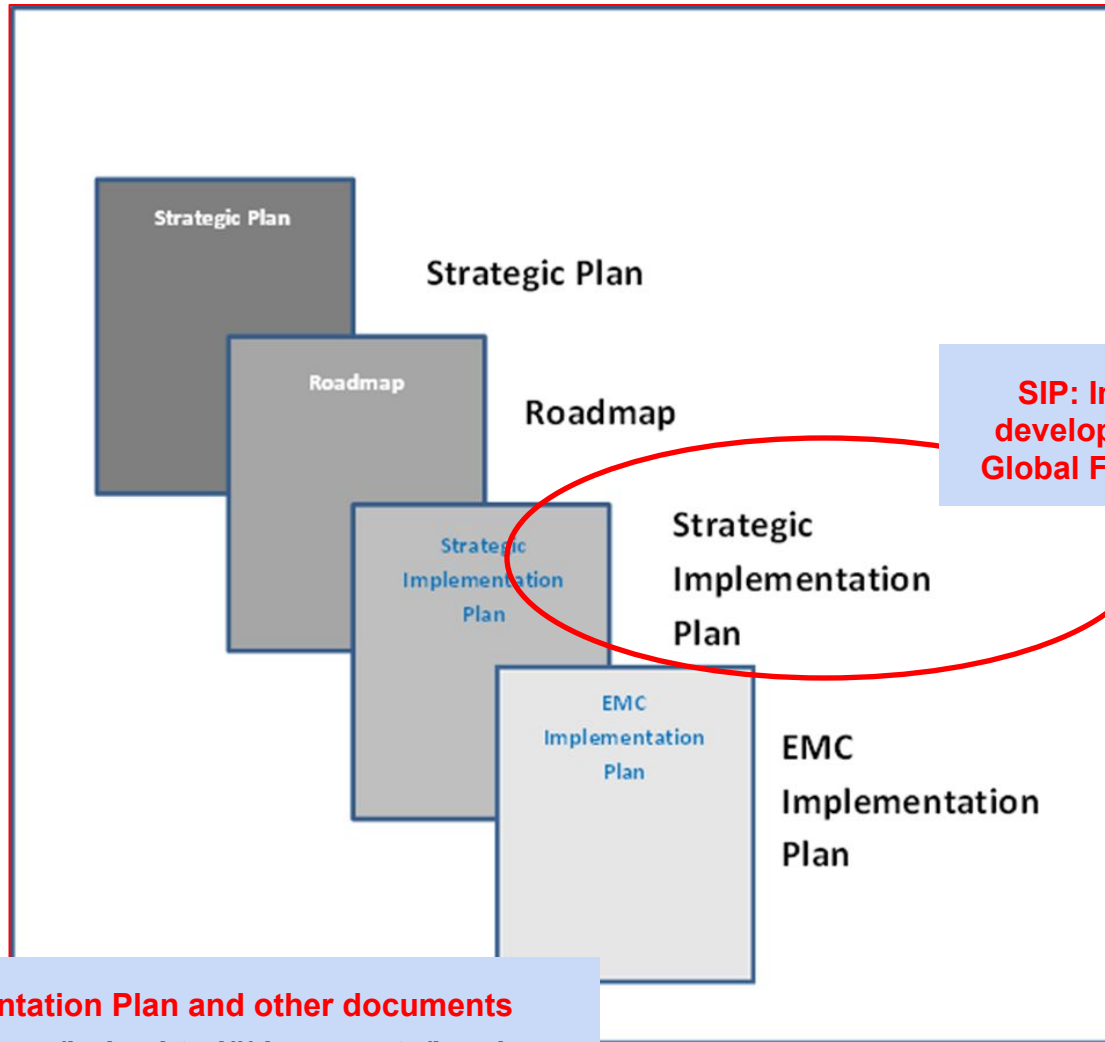
1. NOAA NWS Lab
2. NOAA OAR Lab
3. NOAA funded non-Lab
4. Non-NOAA funded



R2O2R is supported by **governance and shared infrastructure**



NOAA – UFS Planning Documents Hierarchy



Strategic Implementation Plan and other documents

<https://ufsccommunity.org/index.html#/documents/keydocs>

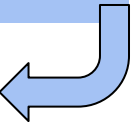


SIP Approach shift, for Unified Modeling Planning



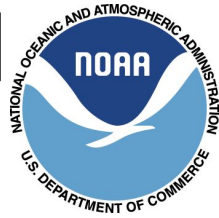
- **Old approach:** The SIP contains the 1-3 year plan for NGGPS-driven implementation activities with near-term strategic actions carried out by set of Working Groups (WG's)
- **New approach:**
 - Establish 2-3 “Application Teams (AT's)” (UFS model configurations) e.g.:
 - Global Weather (Medium term)
 - Subseasonal to seasonal (Long term)
 - Convection Allowing Model (Short term)
 - Identify the deficiencies and goals for each
 - Determine Research and Development needed
 - Design SIP tasks and WG structure optimal to achieve Research, Development, Implementation
 - WG's are subsidiary to AT's

**Wednesday
afternoon breakouts!**





SIP Approach shift, for Unified Modeling Planning



- Strategic Implementation Plan:
 - Expand to include not only 1-3 year implementation goals - ***now also 1-3 year research goals*** for the 4-6 year implementation.
 - ...Noting that Research needs to be open to innovation and not as prescriptive as the current SIP. So the format is TBD.
- The new SIP document will improve alignment and coordination of OSTI/NWS and OWAQ/OAR



UFS governance



- UFS governance evolves, some shifts:
- TOB: “review” SIP, determine Steering Committee (SC) membership, monitor UFS progress
- Steering Committee
 - Executive Committee (of 4-5) to handle minor issues, define WG structure and leadership, resolve WG problems, set SC meeting agenda
 - SC will receive regular reports from WG’s and Application Teams, establish cross-group tiger-teams for short-term efforts as needed



UFS governance



- Application Teams and Working Groups
 - these should shift over time as needed by the UFS
 - WG activities should consist of funded work - selected SIP projects, other funded projects, organize into sub-groups
 - Add WG element: computational performance
 - More thoughts on the WG's before Wednesday afternoon break-out session



SIP Annual Planning Cycle



UFS Strategic Implementation Plan - a rolling 3-year plan, started in FY18 and updated annually

- 2017: First SIP for FY18-20
- Nov 2018: First annual update for FY19 – 21
- **This week: Second update FY20 – 22, kick-off**
 - June-July: SC-EC update WG's, determine process for SIP revisions
 - Aug - Sep: WG's meet to develop SIP tasks
 - Oct 2019: Updated SIP completed and reviewed
 - Nov 2019: SIP (FY20-22) published



Current SIP Working Groups



- **Communications and Outreach**
 - Messaging strategy; community support
- **Convection-Allowing Models (CAM)**
 - Steps toward CAM ensembles, Warn on Forecast; test/evaluate with community
- **System Architecture**
 - NEMS evolution; coupling projects; community approach
- **Infrastructure**
 - CM & documentation; code repository; workflow
- **Marine**
 - Marine models; NOS coastal/bay models
- **Verification & Validation (V&V)**
 - V&V of ops forecasts vs. R&D testing/evaluate; unified/standard tools and data formats
- **Dynamics and Nesting**
 - FV3 transition on global wx/S2S/climate; moving nests for hurricanes
- **Model Physics**
 - Common Comm. Physics Package (CCPP); stochastic, scale-aware physics
- **Data Assimilation**
 - DA Science Strategy, FV3 integ. between NOAA, NASA; Joint Effort for DA Integ. (JEDI); coupled DA
- **Ensembles**
 - Strategy across scales; model uncertainty
- **Post-Processing**
 - Comm. PP infrastructure; std formats/tools
- **Aerosols and Atmos Composition**
- **Land Surface Models and Hydrology**



How STI and OWAQ Use SIP



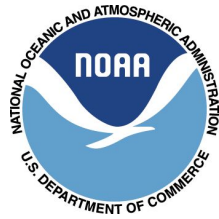
- Establish Funding Priorities
- Make Funding Determinations
- Used for (Hurricane) Supplemental Planning; EPIC
 - Begin with SIP Modeling Research and Development Activities
 - Accelerate as appropriate!
 - Augment as appropriate!



Meeting Objectives



- To hear updates on the status of current SIP Working Group activities & special topical reports
- To establish priority research and development for UFS Applications (Wednesday breakouts)
- To work through processes and workflows for GFSv16, Community support for GFSv15, and to unify toward FV3-based-SAR (Thursday breakouts)
- Facilitate discussion and coordination among SIP Working Groups and consider updates needed to draft the FY20-FY22 SIP document



Questions?

STI Modeling Program Website:

<http://www.weather.gov/sti/stimodeling>

Information NGGPS:

http://www.weather.gov/sti/stimodeling_nggps

UFS Portal:

<https://ufscommunity.org>

Strategic Implementation Plan and other documents

<https://ufscommunity.org/index.html#/documents/keydocs>

Information on Grants:

<http://www.weather.gov/sti/stigrants>



Back-Up



Operational model implementation plans/schedule



- List of possible implementations in FY20 (after current moratorium):
 - Q2FY20:
 - GLWU
 - GWM
 - NWPS
 - AQM
 - Q3FY20:
 - RAP/HRRR
 - RTMA/URMA
 - HWRF/HMON
 - Q4FY20:
 - GEFSv12/GWEM/NGAC;
 - HREFV3
- Completion of development work for possible implementations in Q1/Q2FY21 (before next moratorium)
 - Q4FY20:
 - RTOFS DA
 - GFSv16



NGGPS Goals and Objectives¹



- Design/Develop/Implement NGGPS global atmospheric prediction model
 - Non-hydrostatic scalable dynamics
- Improve data assimilation and physics
- Position NWS for next generation high performance computing
- Engage community in model/components development
- Reduce implementation time
- Increase effectiveness of product distribution
 - Post-processing, assessments, and display

World's Best Global Forecast Guidance

¹From NWS Budget Initiative proposal to OMB