Perspectives on STAR-Aligned Cooperative Institutes

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STAR Priorities

- New satellite products / algorithms and transition to operations
  - Mission support: prototype data, ATBDs, testing, documentation, and approval (e.g. GOES-R AWG, SPSRB, ADEB)
  - New / improved capabilities: nowcasting / nearcasting, data assimilation
- Instrument design and characterization
  - New instruments: hyperspectral sounder for GOES-R, geostationary microwave (long-term)
  - Characterization: calibration / validation, performance analysis, National Calibration Center

STAR Priorities

- Climate data and services
  - Calibration: re-calibration, stable sites
  - Climate analysis: Trends and their causes
  - Climate services: coordination with National Climate Service planning

STAR Challenges

- Increased numbers of research and international satellites and sensors; more sophisticated applications (this is a good challenge)
- Declining real budgets, Declining federal staff
- Staff succession & next generation skills
- Max'ed out facilities, space, power (NWCPC)
- Access to high performance and super-computing resources
- Long-term Science Maintenance
- Supporting International

STAR Initiatives

Leveraging Core Capabilities into Multi-Mission Satellite Services

- Establishment of a Satellite Operational Algorithms Readiness (SOAR) program leveraging GOES-R AWG experience.
- Establishment of an NESDIS led National (satellite) Calibration Center, leveraging STAR sensor calibration / validation experience, leadership of the WMO GSICS program, and collaborative relationships with NASA and NIST.
- Continued build-out of the STAR Collaborative Computing Environment, incorporating new high performance computing capabilities serving STAR and affiliated Cooperative Institutes and other external research collaborations
- Development of a community Satellite Algorithm, Application, Instrument and Validation Test Bed, jointly with NESDIS / STAR affiliated Cooperative Institutes, with links to other NOAA/ USWRP R2O Testbeds.
- Visualization Lab

National Calibration Center Proposed Components

NESDIS/STAR

Executive Review Board

Science Steering Committee

NATIONAL CALIBRATION CENTER

Director (NOAA)

Agency Associate Directors (NASA, NIST, NOAA, others)

Scientific & Support Staff

Agency Technical Liaisons

International
-WMO/GSICS
-CEOS/GEO

Service-based projects for all satellite applications

Collaborative R&D, R2O, R2O2R - Participating agencies/labs/ universities

Operational support (NOAA)

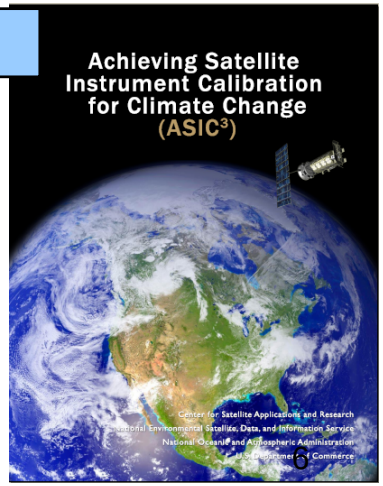
Acquisition Programs

NWP centers, data centers & JCSDA

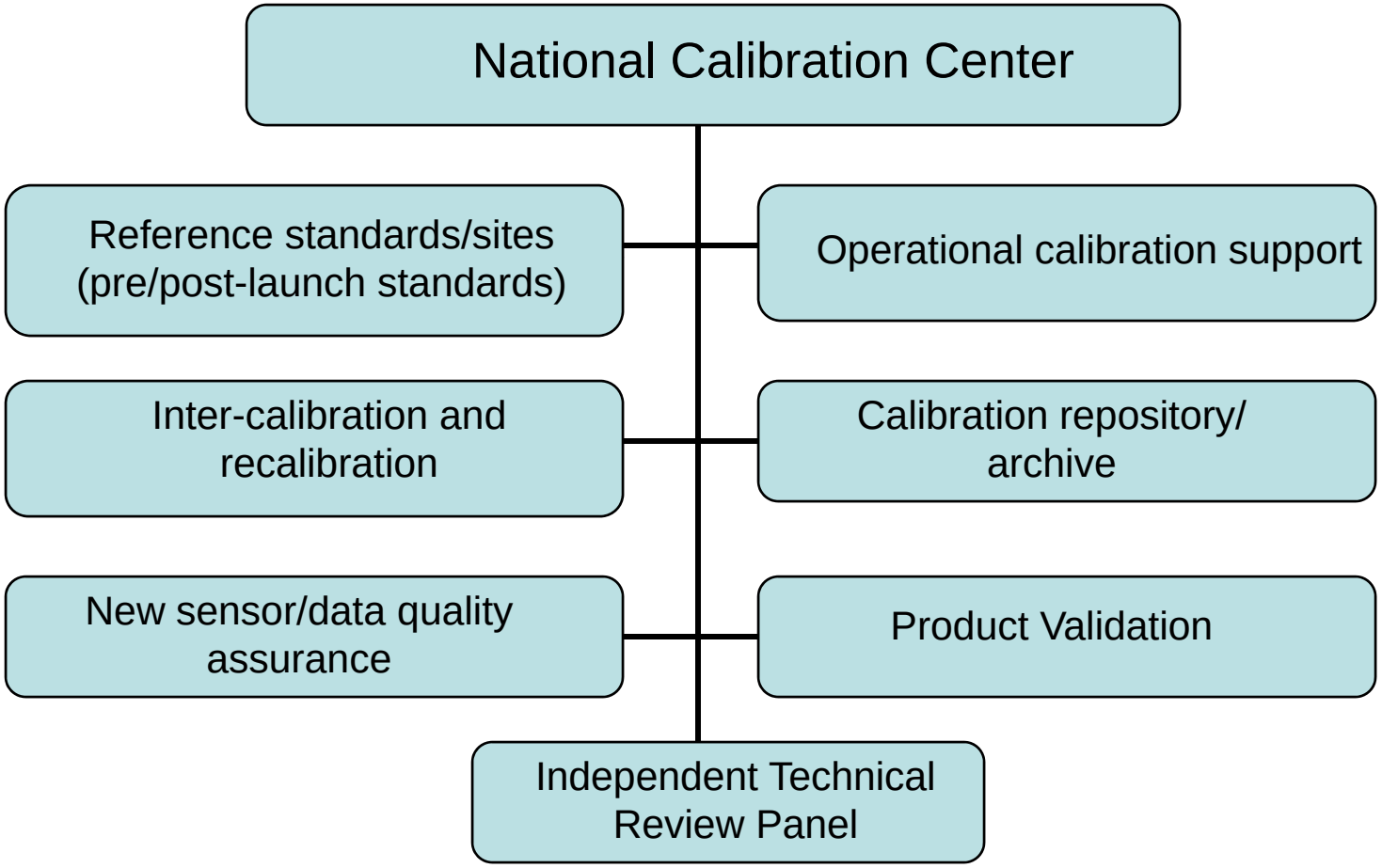
User community:

NWP centers, operational & acquisition programs, data centers, climate science community, GEOSS, CEOS, general data users, and others.

Calibrated SDRs are fundamental building blocks for all satellite products, including radiances for data assimilation in NWP, reanalysis, and FCDRs.



NCC Technical Functions



Satellite Operational Algorithm Readiness Program (SOAR)

- Currently, each new satellite program employs different algorithm development processes, pre and post-launch instrument validation, different approaches to user engagement and training, different requirements formulation, software development, documentation and scheduling practices.

- Consolidation in-house using proven repeatable processes across all major satellite programs will result in improved, cost, schedule, and technical performance reliability; improved efficiency and greater consistency through professionally executed, repeatable CMMI processes;

- SOAR is rooted in lessons learned from GOES-R Algorithm Working Group (AWG).
  - » *CMMI level 3 repeatable processes*
  - » *Performance monitoring using EVM and IMS*
  - » *Integration of algorithms and product demo systems*
  - » *Prelaunch instrument cal/val through GOES-R CWG*
  - » *Post launch validation*
  - » *R&D for new applications*
  - » *User readiness and user community interaction*

Collaborative Environment

- Build-out of the STAR Collaborative Computing Environment, incorporating high performance computing access serving STAR, affiliated Cooperative Institutes and other research collaborations
- Provides operating systems & platforms, data storage and access, tools, utilities and scientific application and libraries most needed by scientists involved in research, development and testing for new satellite algorithms and applications.
  - *Online Storage overcomes limitations of CLASS and other Archives in meeting needs of researchers for seamless access to large time and space contiguous satellite data sets.*
  - *High performance computing capability will enable STAR and its External Partners in Cooperative Institutes to be competitive in computationally intensive work involving advanced satellite data assimilation techniques, multi-model methods and ensembles, satellite data model impact studies and to support extensive re-processing and inter-calibration of historical satellite data*
  - *Super-computing access is necessary due to limited access to existing NOAA supercomputing resources (cycles) in which research needs compete for operational resources*
  - *Make these capabilities available through STAR Collaborative (Computing) Environment not only to STAR scientists, but also to all Cooperative Institutes and other external research partners.*
  - *Satellite Algorithm Testbed is an instantiation and subset of capabilities and functionality within CE*

Other of Potential Interest

- Environmental Modeling Enterprise Strategic Plan
- Integrated Water Forecasting Program
- Space Weather Operations Transition
- Renewable Energy (Wind, Solar)
- NPOESS Restructuring (Organization, Payload and Schedule)
- Operationalization of NPP (opportunities?)
- GOES-R Ground Segment awarded without protest
- GOES-R Space Segment re-protested
- R_2O Transition Scientists (NASA to NOAA)
- New NOAA Administration → Next Generation Strategic Plan
- STAR External Review in November

- New SOCD Division Head – Paul DiGiacomo
- New Chief of Staff – Mike Goldberg

I. Scientific Quality, Productivity & External Engagement

HOW GOOD ARE WE? WHO SAYS SO?

Activities that involve or support ***PREDICTION***
Activities that involve or support ***MONITORING***
Activities that involve or support ***CLIMATE***

II. Organization, Management & Resources

ARE WE RESOURCED AND ORGANIZED TO SUCCEED? GROW? LEAD?
ARE WE VISIONARY ENOUGH? ARE WE REALISTIC ENOUGH?
HOW DO WE HAVE THE RIGHT BUSINESS MODEL?

III. Leveraging Core Capabilities

WHERE ARE OUR OPPORTUNITIES FOR GROWTH AND RELEVANCE?
WHAT IS OUR POTENTIAL FOR GROWTH?

IV. Service to NOAA, Society and Community (Alignment)

HOW VALUABLE ARE WE?
HOW RELEVANT ARE WE?

Observation & Opinions

- Much of the expertise and capabilities required for NOAA and NESDIS long term Success and Leadership resides external to NOAA; Partnerships are essential.
- Given the increasing numbers of research and operational satellites world-wide in the coming decade, and given the challenges of the NOAA environmental mission, CI engagement should be high priority.
- Much of the intellectual capability and creative value of our university partners is untapped or is accruing to other agencies.
  - *Core funding is minimal and restricted to administration*
  - *Technical funding tied too close to satellite acquisitions and operational objectives*
  - *CI's need to be more than staff augmentation*
- NOAA's Cooperative Institutes are intended as strategic research partners, and partners in strategic research
- Properly valued and engaged, cooperative Institutes are important to NOAA Growth & Leadership
  - *CI's are key to development of NOAA's next generation workforce*
  - *CI's are keys to Innovation*
- Think of CI contributions in terms of Investments, not Milestones

Obligations

- It is NOAA's responsibility to invite and enable the CI community to share in both development of, and access to facilities, support and services focused on NOAA missions and goals.
- It is NOAA's responsibility to fund CI's at a level that enables them to succeed within their own institutional environments
  - *Allow CIs to perform & maximize their value in the scientific areas for which each was selected.*
  - *Enable CI's to make long term plans for development of the CI and sustain a relevant research and training agenda over a time frame that matches the time scale of a graduate student's career – a driving issue for universities.*
- In order realize true potential of Cooperative Institutes to plan for and sustain NOAA related strategic research, we will recommend base funding for research as well as administration

Layers of Support

- **A** – Core Administration Funding
- **R** - Core Research Funding
  - Strategically relevant research
  - Leverage Curriculum into NOAA Workforce Development
  - Facilitate Exchange & Partnership with NOAA and CI community
- **R2(R2O)** - Competitive Research Funding
  - e.g. Satellite Algorithm TestBed (development, testing, validation)
  - Other new
- **R2O** – Competitive Research to Operations Funding
  - Mission Support / Satellite Acquisition & Process Driven (SPSRB)
  - G/PSDI, GIMPAP, GOES-R[3],

Innovation (Leads)

- NOAA view is operational. Research supports achievable and useable results, and minimizes risks that might compromise delivery of products and services.
- NOAA can not afford to be at the bleeding edge in terms of investments in undeveloped technologies and techniques that are as likely to fail as to succeed.
- NOAA must be positioned to partner in the work of other organizations with mandates for high risk advanced concepts, some of which may guide NOAA strategic directions and investments.
- Establish a Cooperative Institute Advanced Concepts to support long term strategic research on new technologies, system architectures, and new technology-enabled concepts of operation focused on NOAA technical leadership in the post-NPOESS, post-GOES-R, and new GEOSS era.
- Stimulate innovative development of next generation satellite systems concepts and enabling technologies with relevance to NOAA with 15 to 30 year time horizon.
- **Who would be interested in this?**

Discussion

- Everybody wants to be a CI; How many CIs are too many?
- Do Cooperative Institutes have sufficient access or resources to engage NOAA as full partners?
- Is NESDIS positioned for Leadership?
- What would represent a “real” commitment to your institution from NOAA?
- If you had 1M / year core research/programmatic funding, what would you do with it?

BACKUP SLIDES

Partnership is an Attitude

STAR fosters community approaches, and invites and enables the external community, to share in both the development and use of models, facilities, support and services

What distinguishes the STAR – affiliated Cooperative Institutes is emphasis on maximizing uses of satellite data and information to support societal decision support requirements.

The NOAA Environmental Modeling Enterprise will be proactive in building new relationships with Academic Institutions and Consortia, which provide access to advanced theoretical and state of the art research, methods, technologies, and access to graduating students trained in emerging areas important to NOAA workforce development strategies.

NOAA will be proactive in building Federal Inter-Agency partnerships, especially leveraging common interests and complementary assets in modeling, observations and science,

NOAA will be proactive in building State and Local Government partnerships. State and communities are often as stakeholders and end consumers of NOAA information. Development of new applications, domains, and decision processes will most often derive from emergency and operation needs of state and local governments.

NOAA will be proactive in building partnerships with Industrial, Commercial and other Private Sector, serving industries and industry consortia as consumers of NOAA model output and decision support.

NOAA will be proactive in building International Governmental Partnerships through MOU's and MOA's, leveraging common interests, joint investments, and complementary assets in modeling, observations and science , and a common focus on Global environmental and societal applications.

Finally, NOAA will be proactive in learning learn how to Partner with itself to achieve a common vision - that is the Essence of EME.

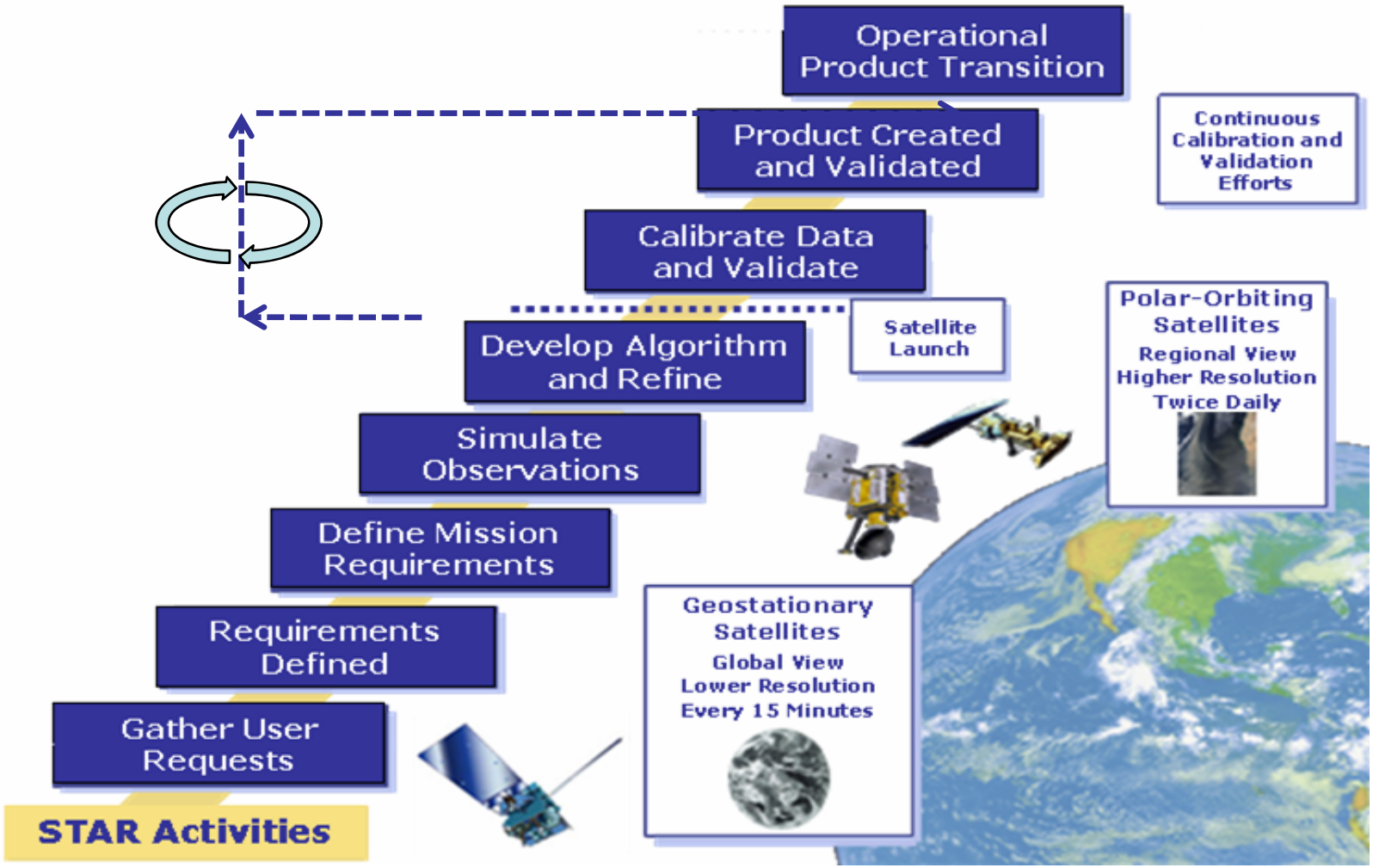
Workforce

- *A central strategy calls for NOAA to assume a proactive "Operations to Research to Applications" stance with respect to the university community by actively communicating its future requirements, and then challenging and also incentivizing the community to respond.*
- *NOAA strategic workforce and succession planning. In order to align NOAA research with societal benefits needs, NOAA will require collaborative and interdisciplinary perspectives in its next generation scientific / technical workforce.*
- *NOAA should more Proactively foster needed next-generation scientific skills and perspectives by promoting NOAA-inspired and motivated educational experiences in universities.*
- *Partner with & seed universities to create special emphases or tracks within existing curricula programs that instill interdisciplinary understanding and collaboration skills that enable career paths in which scientific and technical capabilities are more readily directed toward societal decision and benefits.*
- *Promote faculty sabbaticals and IPAs to NOAA.*

We Make Satellite Data Valuable & Useful

- What NESDIS Does – Makes Satellite data valuable and useful
  - OSD makes big plans and buys stuff ($$$)
  - OSO gets satellite data ($$)
  - ORA makes satellite data valuable and useful ($)
  - OSDPD makes satellite data accessible and useable ($)
- STAR where NESDIS mission exists in microcosm

STAR involvement through a Satellite Mission



NESDIS Priorities

- Global Earth Observations
  - Applying data for societal benefit
  - Data exchange and archive
- GOES
  - GOES-O Launch (no earlier than June 26)
  - GOES-R hyperspectral sensor
  - New projects and applications
- NPOESS
  - Calibration
  - Sensor validation
  - NASA EOS applications transition to NPOESS

NESDIS Priorities

- Research to Operations Transition
  - NASA to NOAA
  - Global Precipitation Mission (GPM)
  - Meteorological and weather applications
  - High-impact weather
  - Data assimilation for GEO data
  - Improved operational models
  - Climate Measurements
  - Scatterometry
  - GPS Radio Occultation
- Joint Center for Satellite Data Assimilation
- NOAA Climate Services
  - Climate sensors and data records

NESDIS Priorities

- International Partnerships
  - Committee on Earth Observation Satellites
  - Group on Earth Observations
  - JAXA (Japan), ISRO (India), CMA (China)

Leveraging Core Capabilities

CORE CAPACITIES

-Calibration / Validation
-Algorithm Development
-Collaborative Environment
-Blended Products / Applications
-Satellite Data Assimilation

INITIATIVES

-National Calibration Center (NCC)
-Satellite Operational Algorithm Readiness (SOAR)
-Computing, Data Access & Analysis Services
-Satellite Algorithm Testbed
-Joint Center for Satellite Data Assimilation