Overview of the NOAA Satellite Observing Systems Architecture (NSOSA)

NOAA

Satellite and Information Service

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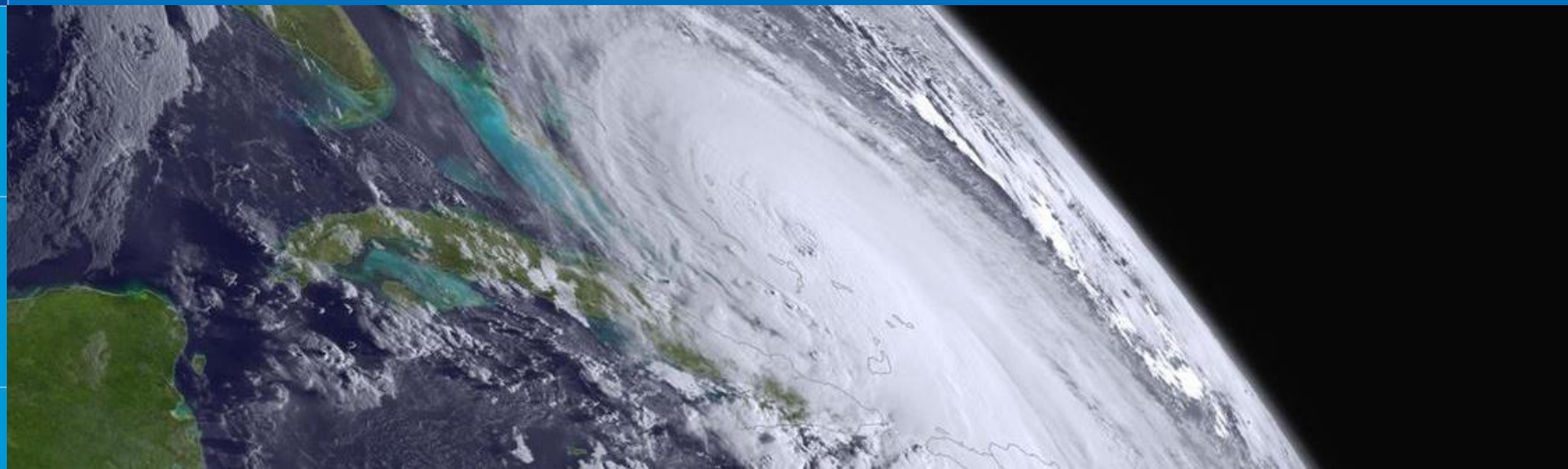
Dr. Karen St. Germain

Director, Office of Systems Architecture and Advanced Planning

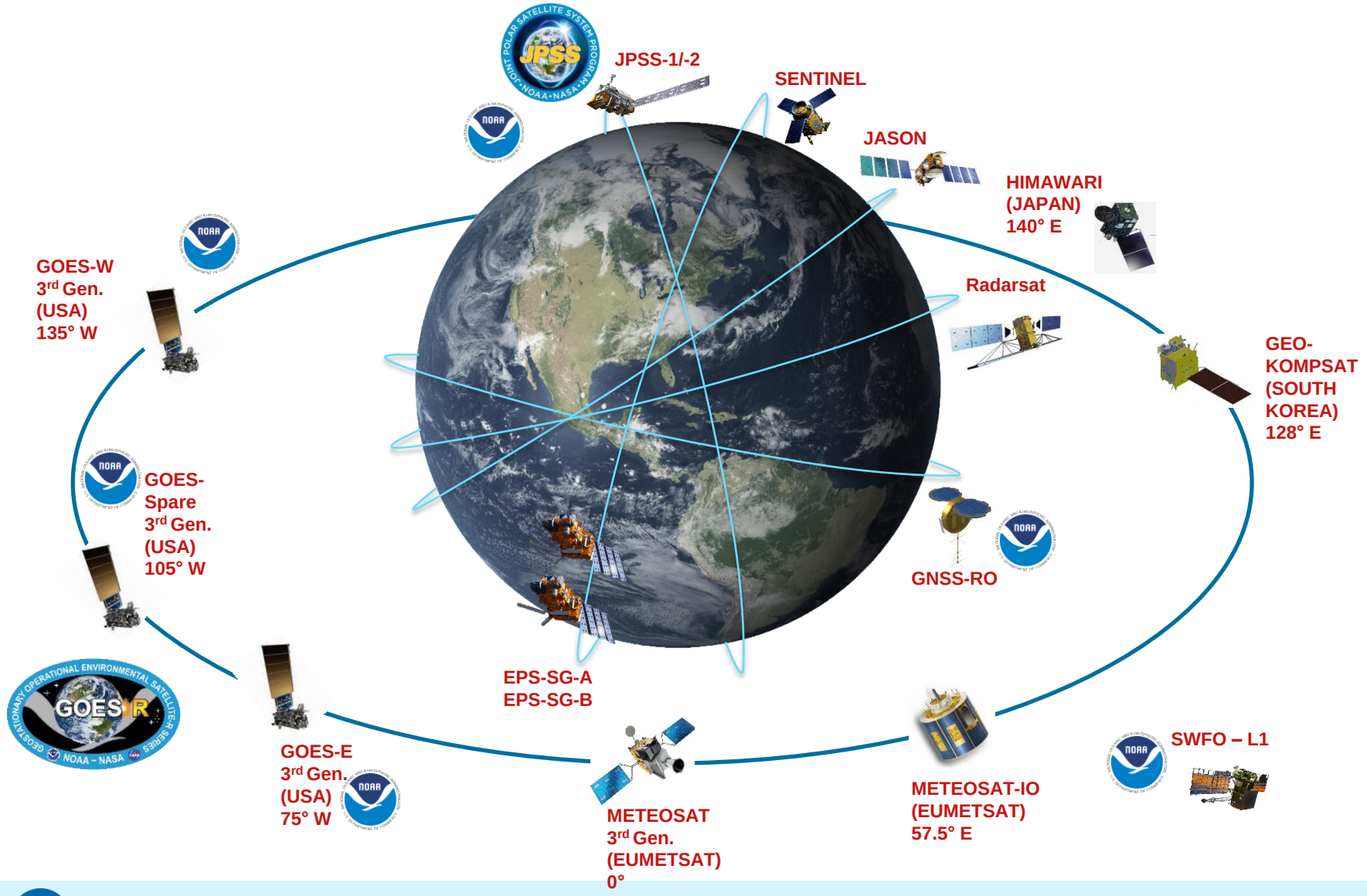
NSOSA Community Day



Why Observing Capabilities Matter

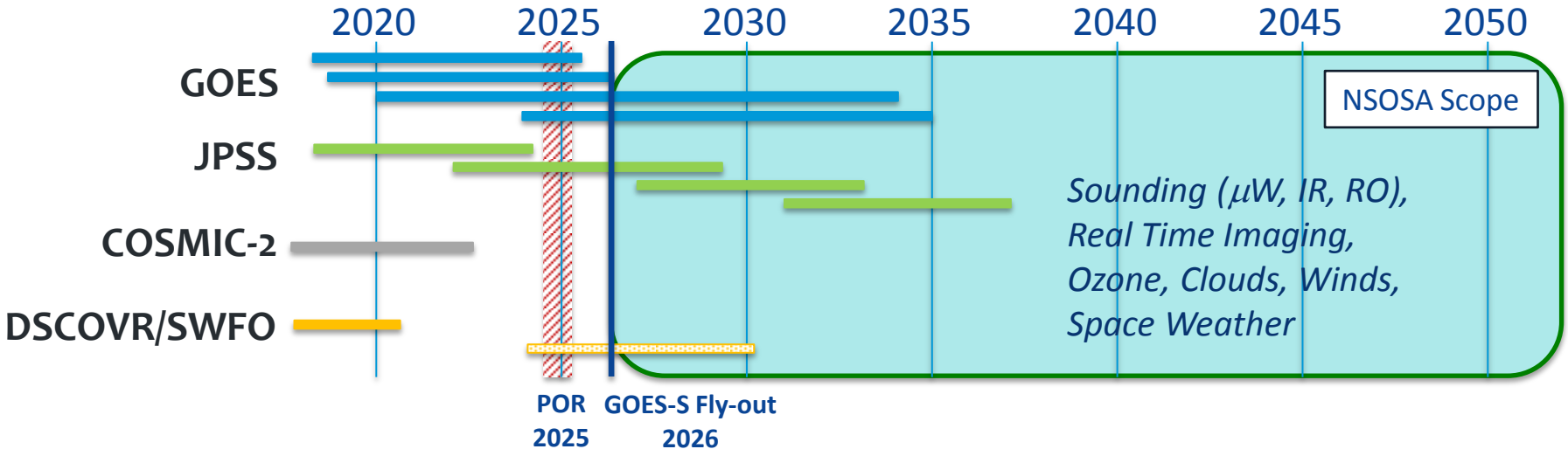
- *NESDIS helps to keep our **public safe** and our **economy strong***
- *NESDIS' 24x7 satellite data and products:*
  - Reduce extreme weather impacts through enhanced prediction capabilities, and by providing actionable and timely weather data
  - Improve space weather readiness to lessen vulnerability of power suppliers, telecommunications banking and transportations systems
  - Feed model predictions to maximize agricultural returns, savings for the energy sector and efficiency in the transportation industry

Today's Generation of Observational Capability



Planning for the Future

- Evolving to a more mission-effective, integrated, adaptable, and affordable portfolio while responding to changing technology, emerging partnerships and evolving observation requirements
- ***Why start now?***
  - 10-15+ year development timeline for space assets
  - Current constellation (GOES-R/S/T/U and JPSS-1/2/3/4) fly-outs 2026-2035
- ***The NOAA Satellite Observing Systems Architecture (NSOSA) study*** is examining NOAA's future space segment architecture decisions



Future partner contributions assumed, including Sentinel, Himawari, Radarsat, MTG

NSOSA Study – Informing Future Investments

- *The NSOSA study is a pre-decisional analytic process to inform NOAA's future space segment architecture decisions*
  - Which observation functions should be allocated to which orbits?
  - Should we retain the legacy architecture or seek major change?
  - Which observation functions should be improved?
- *End-user requirements driven by NOAA operational needs*
- *Leveraging commercial, public and academia for innovative solutions*

NASA GSFC, JPL, and KSC

Aerospace

JHU APL

MIT-LL

NOAA NESDIS, NWS, NOS, NMFS, and OAR

UCAR

NSOSA Study – Strategic Objectives

Availability of Core Capabilities
Ensures the highest availability for mission critical observations and services

Availability of All Capabilities
Ensures moderate availability for broader scope of NOAA observations and services

Compatibility with Fixed Budgets
Favors architectures that are compatible with stable top-line funding

Develop and Maintain International Partnerships
Encourages exploitation of available partner data to meet mission needs

Programmatic Flexibility and Adaptability
Favors architectures that can be responsive to change

Low Risk at Constellation Level
Allows tolerance for risk associated with new business models and new technology while maintaining reliability

NSOSA Study – Observational Objectives

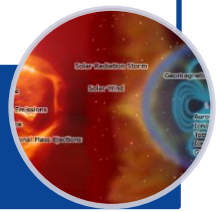
- Value model was driven by 38 observation requirements that encompass NOAA's operational needs for the 2030-2050 epoch

Terrestrial/Ocean Objectives

- 3-D Winds
- Real Time (RT) regional weather imagery
- Global GNSS-RO soundings
- Global RT imagery
- Global Near RT microwave (MW) soundings
- Global Near RT infrared (IR) soundings
- Global ocean surface vector winds
- Non-RT global weather imagery
- Global ocean color/phytoplankton composition
- Microwave imagery
- Lightning
- Radar-based global precipitation rates
- Regional MW soundings
- Regional IR soundings
- Global sea surface height
- Global chemical concentration
- Ozone
- Outgoing Long Wave Radiation (NASA Mission)
- Incoming solar radiation (NASA Mission)

Space Weather Objectives

- Coronograph imagery: Off Sun-Earth line
- Coronograph imagery: Sun-Earth line
- Photospheric magnetogram imagery: Off Sun-Earth line
- Heliospheric images
- Auroral imaging
- Thermospheric O/N2 ratio (height integrated)
- Upper thermospheric density
- Ionospheric electron density profiles
- Ionospheric Drift Velocity
- Interplanetary Solar wind: Off Sun-Earth line
- Photospheric magnetogram imagery: Sun-Earth line
- Solar X-ray irradiance
- Solar EUV imaging
- Solar EUV irradiance
- Interplanetary Solar wind: Sun-Earth line
- Interplanetary energetic particles
- Geospace energetic Particles
- Geomagnetic field
- Interplanetary magnetic field



NSOSA Study Informs Decision Making

NOAA User Prioritized Requirements

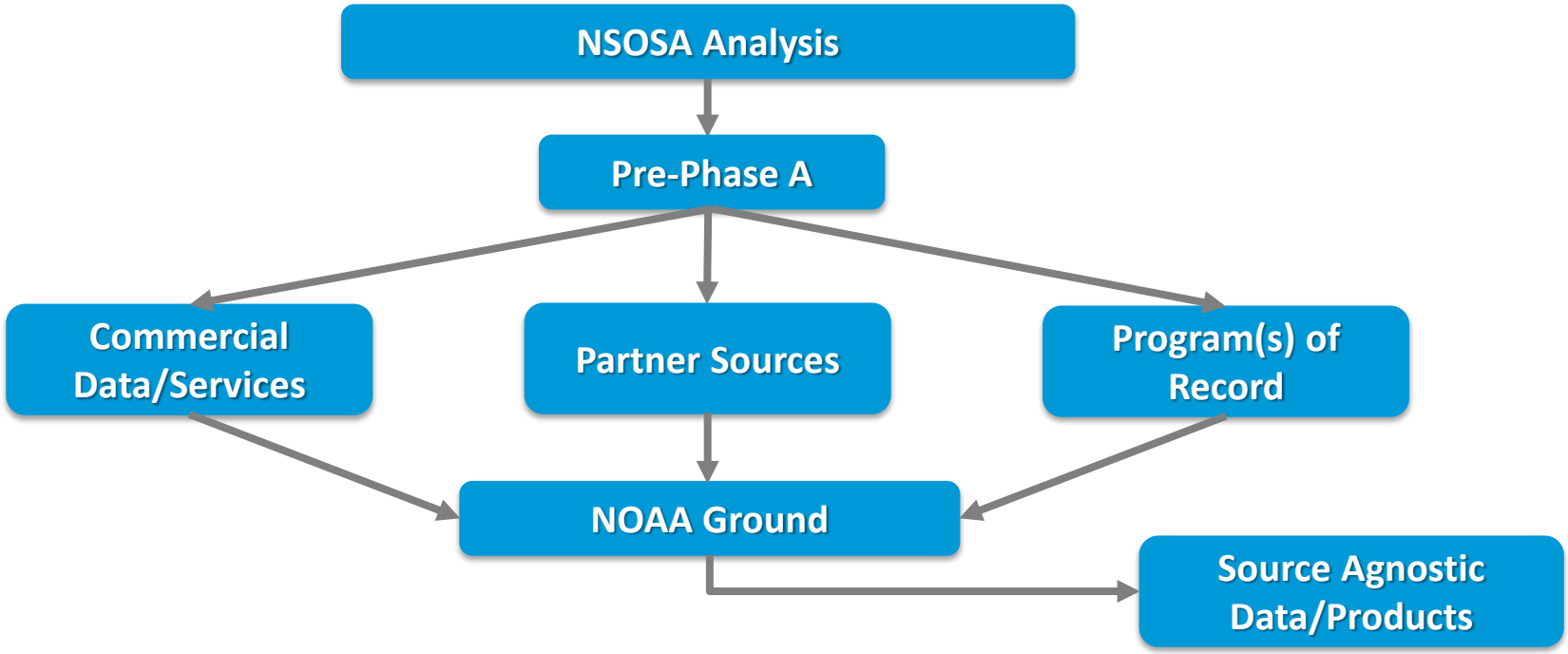
Strategic Priorities

National Weather Service
National Marine Fisheries Service
National Ocean Service
Office of Oceanic and Atmospheric Research

Operational Considerations (NOAA/DoD/ Partners)

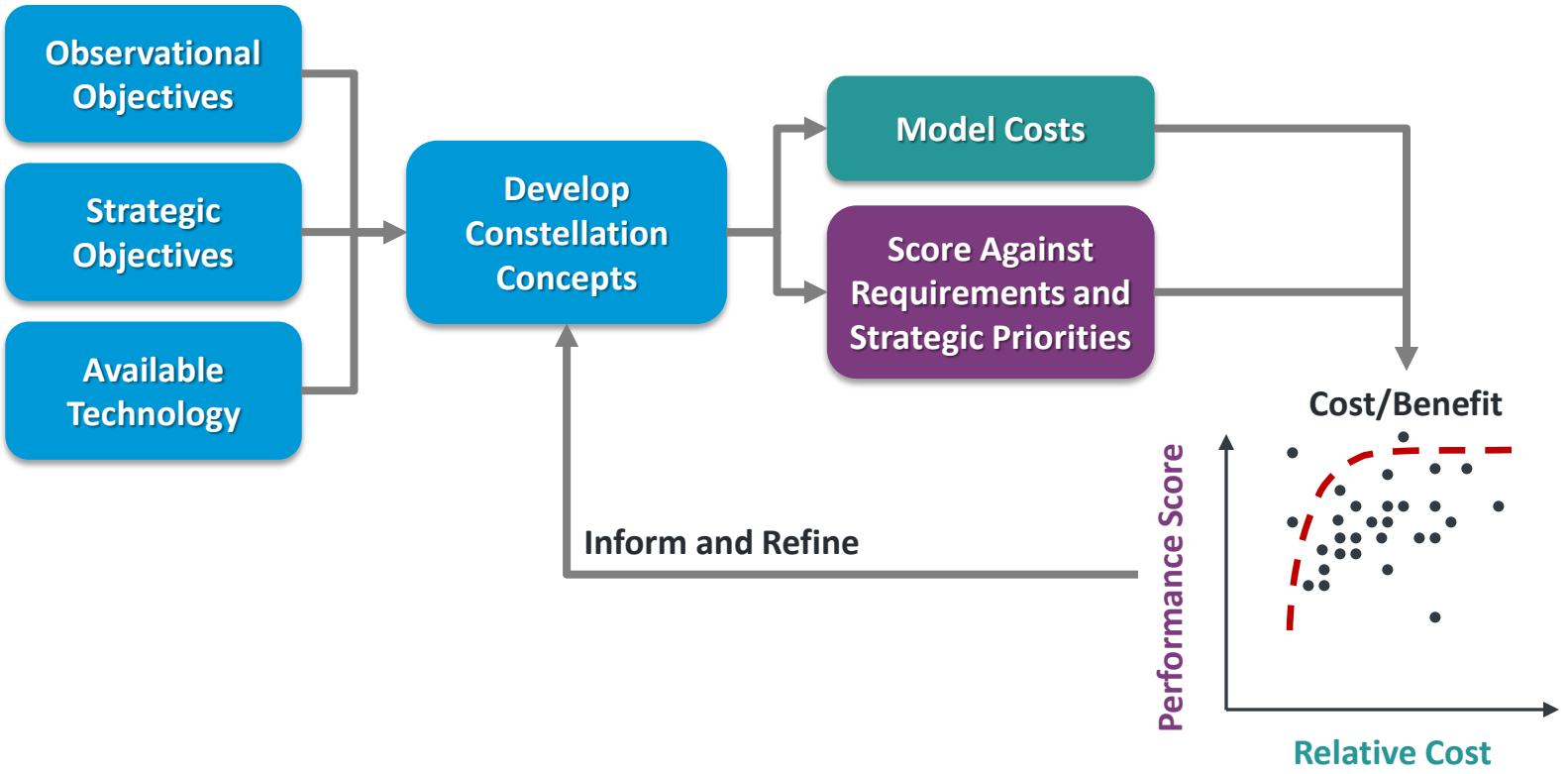
Policies & Standards

Technology Opportunities

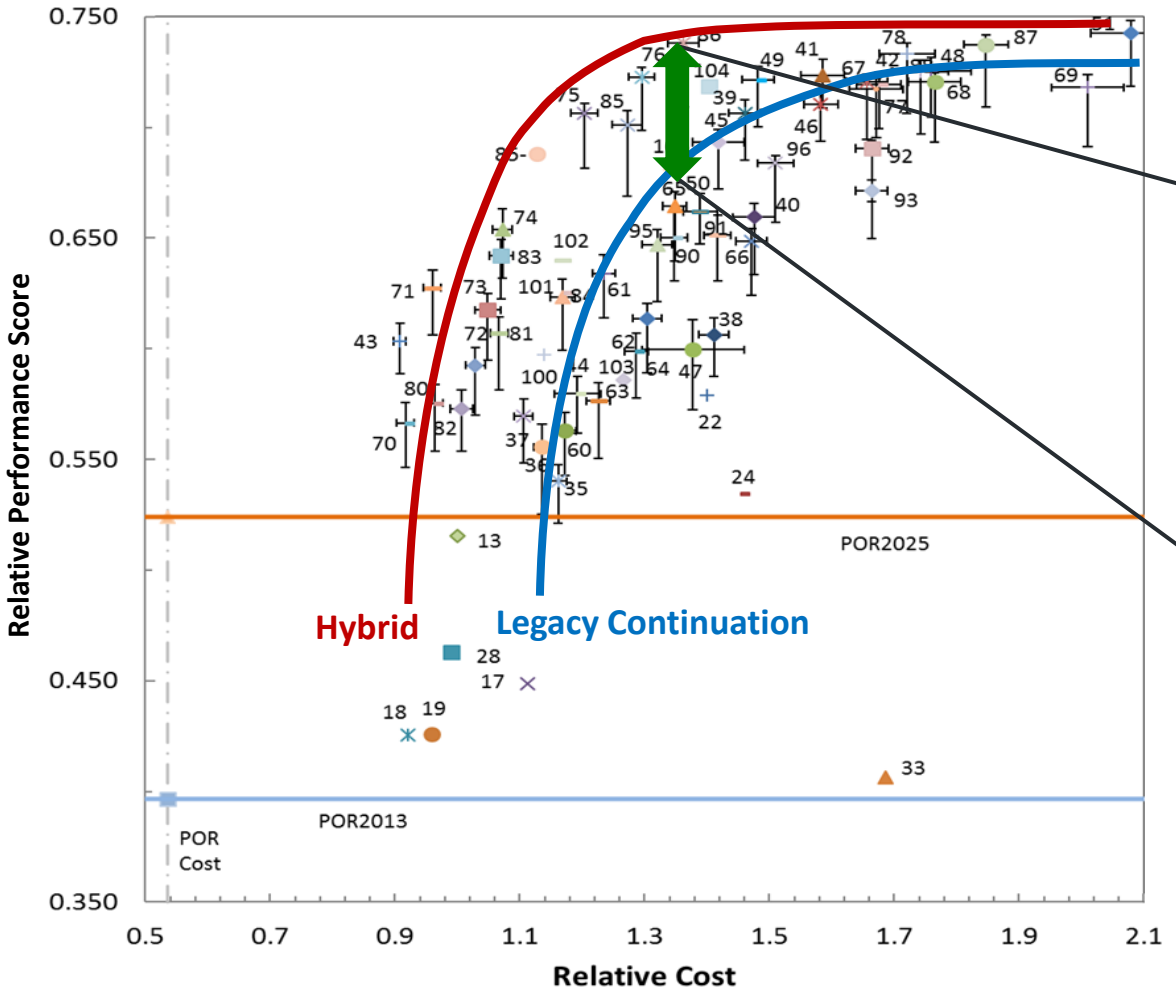


NSOSA Study Architecture Analysis

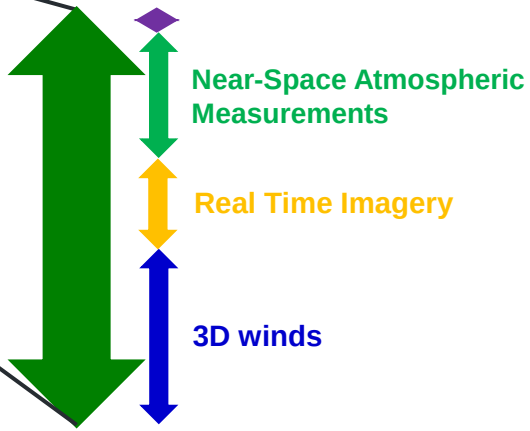
- Considers future observing capabilities, partner observations, user requirements, instrument technologies, and commercial interests
- Provides discriminating choices and opportunities about the next generation, and establishes a robust analytic capability to evaluate and iterate opportunities



Evidence-Based Decision Making Tool



The value difference between constellations 65 and 86 provides an example of additional capabilities possible at the same cost

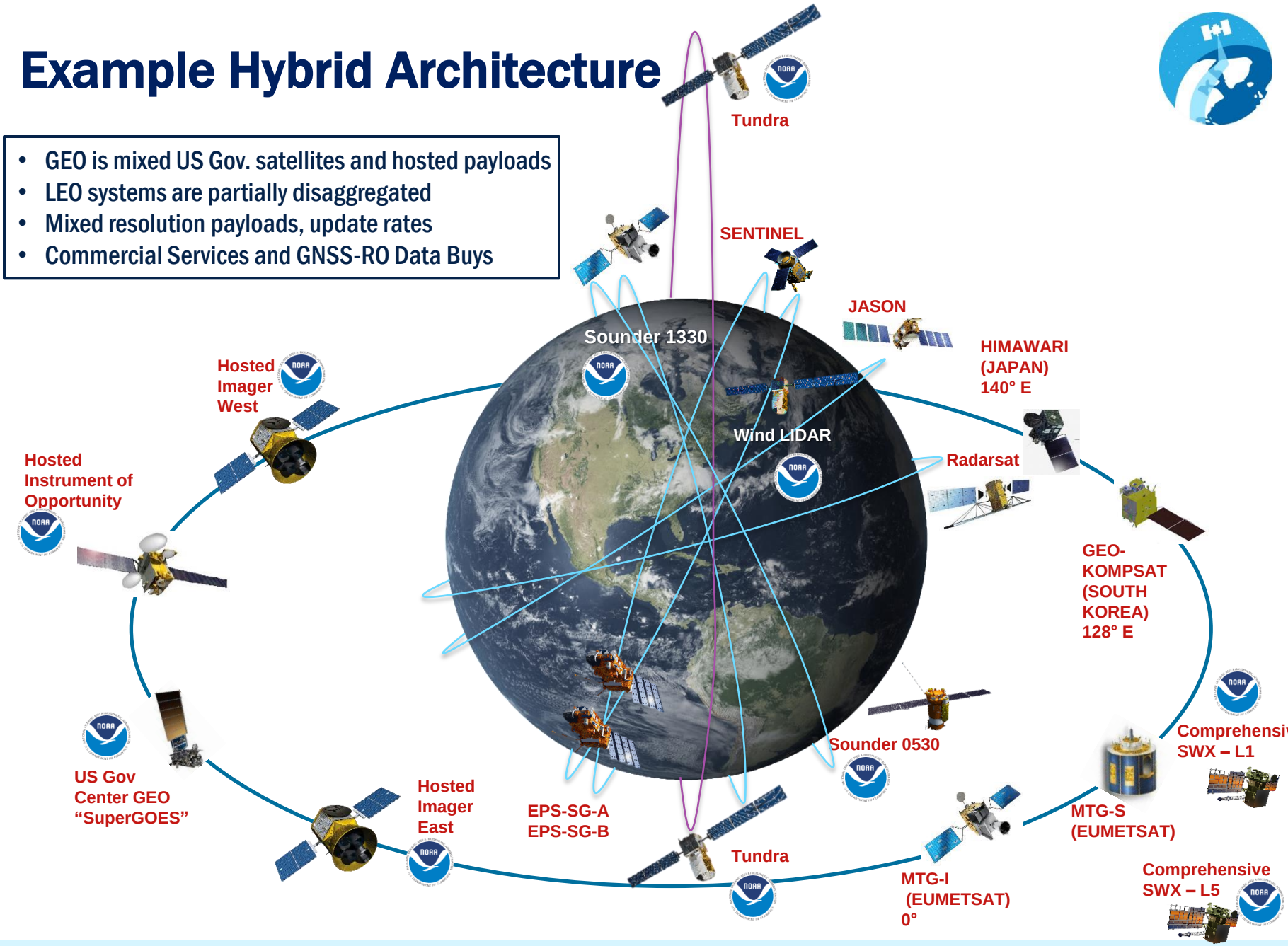


60 Series – "Legacy Continuation"
(Comprehensive US Govt satellites)

80 Series – "Hybrid"
(Mix of disaggregated US Govt satellites and hosted payloads and services)

Example Hybrid Architecture

- GEO is mixed US Gov. satellites and hosted payloads
- LEO systems are partially disaggregated
- Mixed resolution payloads, update rates
- Commercial Services and GNSS-RO Data Buys



Hybrid Architecture Opportunities

- *Different mix of observations with higher mission impact than strict legacy*
  - Quality and quantity of soundings (IR, MW, and GNSS-RO)
  - Enhanced imagery and high-latitude coverage
  - Operational space weather measurements
  - New types of data needed by models
- *More agility*
  - Adjust to changing technology, needs, and opportunities
  - Increased use of and reliance on partner contributed observations
  - Disaggregate and balance risk
- *New business models*
  - Hosting of instruments
  - Data purchase
  - Ride shares
  - Instruments of opportunity

EXAMPLES OF HIGH VALUE TRADES AND DEMOS

- Transition to hosting payloads
- Legacy vs new measurements
- Space weather collected differently
- Cross-grade imagers
- New NOAA LEO orbits (0530, crossing)
- Secure ingest of external data

Ongoing Community Engagement

- ***Public comment on NSOSA Study draft report***
  - NOAA is seeking comments via the Federal Register
  - Community Day to discuss the study and answer questions
- ***Commercial Observations RFI***
  - Will support CWDP Round 3 and other NOAA observation requirements
  - Released May 21, 2018; open for 60 days
- ***JPSS-2 Rideshare RFI***
  - Capabilities demonstrations that could rideshare with JPSS-2
- ***RFIs for other NSOSA-favored capabilities***
  - To include weather and space weather instruments and payload hosting services under various partnership models

NSOSA Feedback Solicited

- Did NOAA consider a sufficiently broad range of alternatives?
- Are the opportunities that the analysis identified as deserving of consideration consistent with your knowledge of the state of the space enterprise?
- Are there outcomes or options that you recommend for further analysis?
- What suggestions do you have on how NOAA can better engage with industry, including approaches for developing innovative capabilities, new partnership opportunities and business models that may inform NOAA's path forward?
- What suggestions do you have on how we can engage with the academic and research community and other stakeholders to ensure NOAA makes the best use of the outputs of this study?