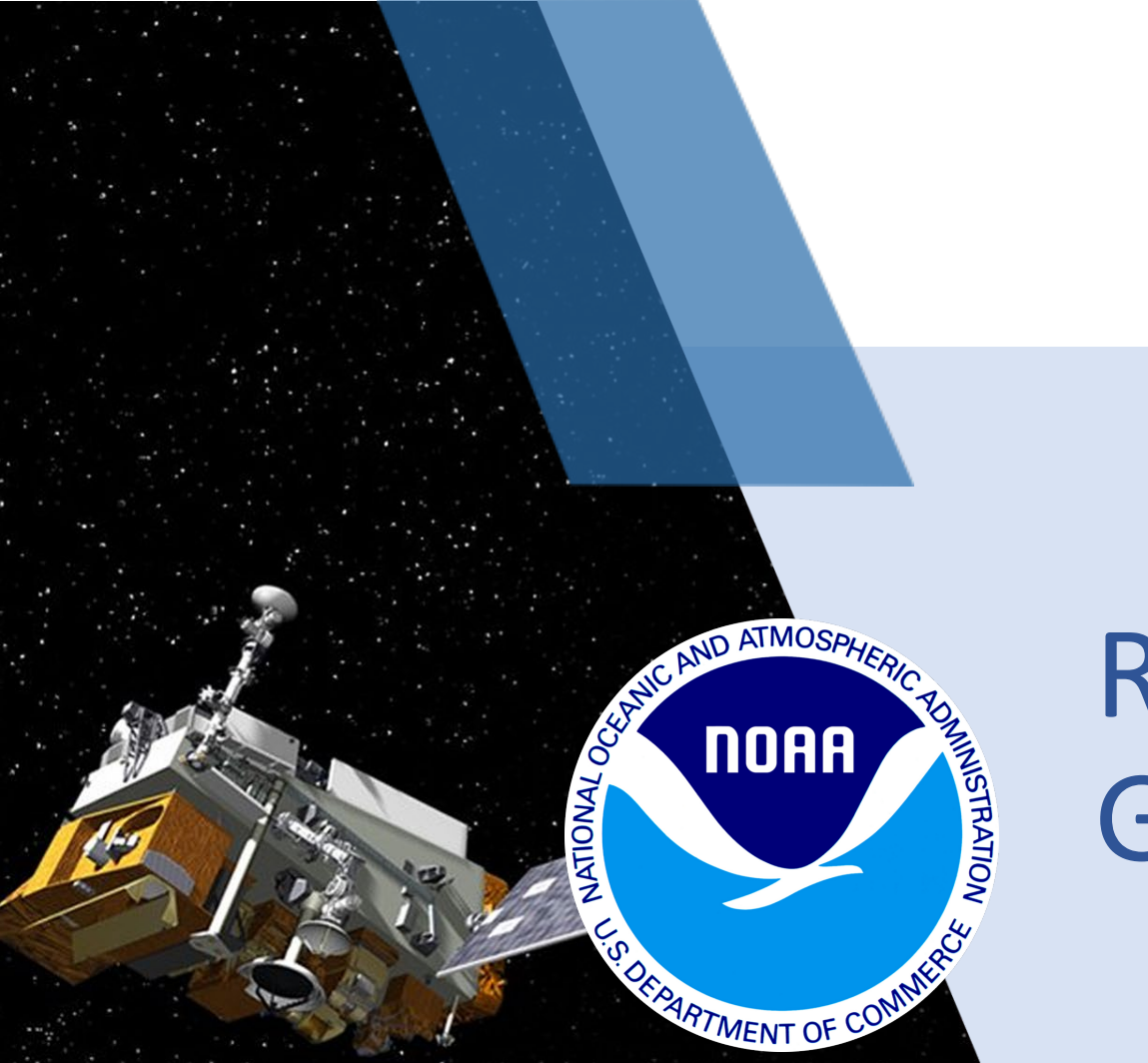


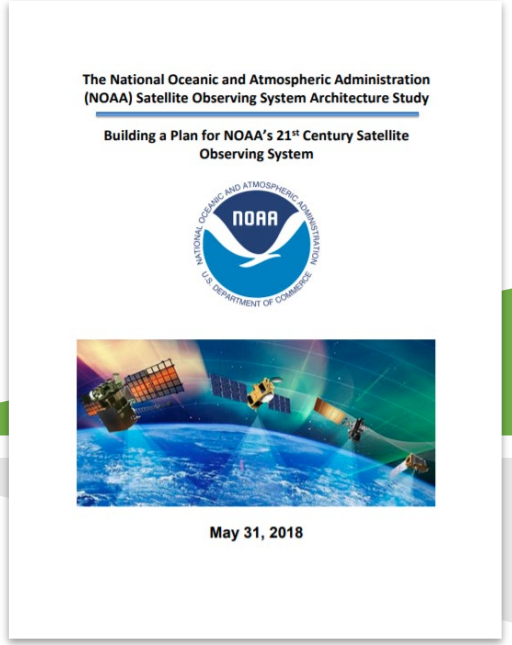
National Environmental Satellite, Data, and Information Service

February 28th, 2023

Results from the NESDIS Ground Enterprise Study

M.F. Bonadonna[1], F. W. Gallagher III[1], S. R. Marley[2],
NOAA/NESDIS/OSAAP[1],
The Aerospace Corporation[2]

Matching NOAA's Next-Gen Space Capability with Next-Gen Data Science & Ground Capability


The National Oceanic and Atmospheric Administration (NOAA) Satellite Observing System Architecture Study

Building a Plan for NOAA's 21st Century Satellite Observing System

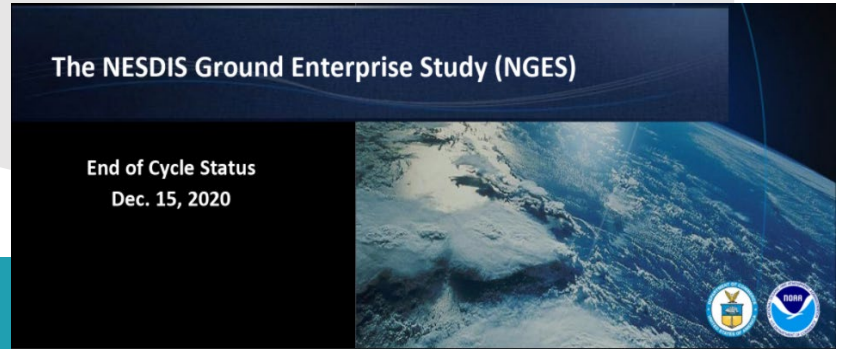
May 31, 2018

DISAGGREGATED & HYBRID CONSTELLATIONS

- MORE SATELLITES, INSTRUMENTS & DATA
- COMMERCIAL BUYS
- INTERNATIONAL PARTNERSHIPS
- OTHER FEDERAL AGENCY PROVIDERS

"BROADER APERTURE" TO ABSORB ALL FORMS OF DATA

- SECURE INGEST & DATA INTEGRATION
- QUANTUM-COMPUTING, MACHINE-LEARNING
- CLOUD-BASED ACCESS, ARCHIVING & INFORMATICS
- USER-CENTRIC DATA DELIVERY



NGES Integral to NESDIS Strategic Objectives

1. **Advance terrestrial observational leadership in geostationary and extended orbits**

2. **Advance space weather observational leadership in all applicable orbits to meet mission needs.**

3. **Evolve LEO architecture to enterprise system of systems that exploits and deploys new observational capabilities**

4. **Develop agile, scalable ground capability to improve efficiency of service deliverables and ingest of data from all sources**

5. **Provide consistent ongoing enterprise-wide user engagement to ensure timely response to user needs**

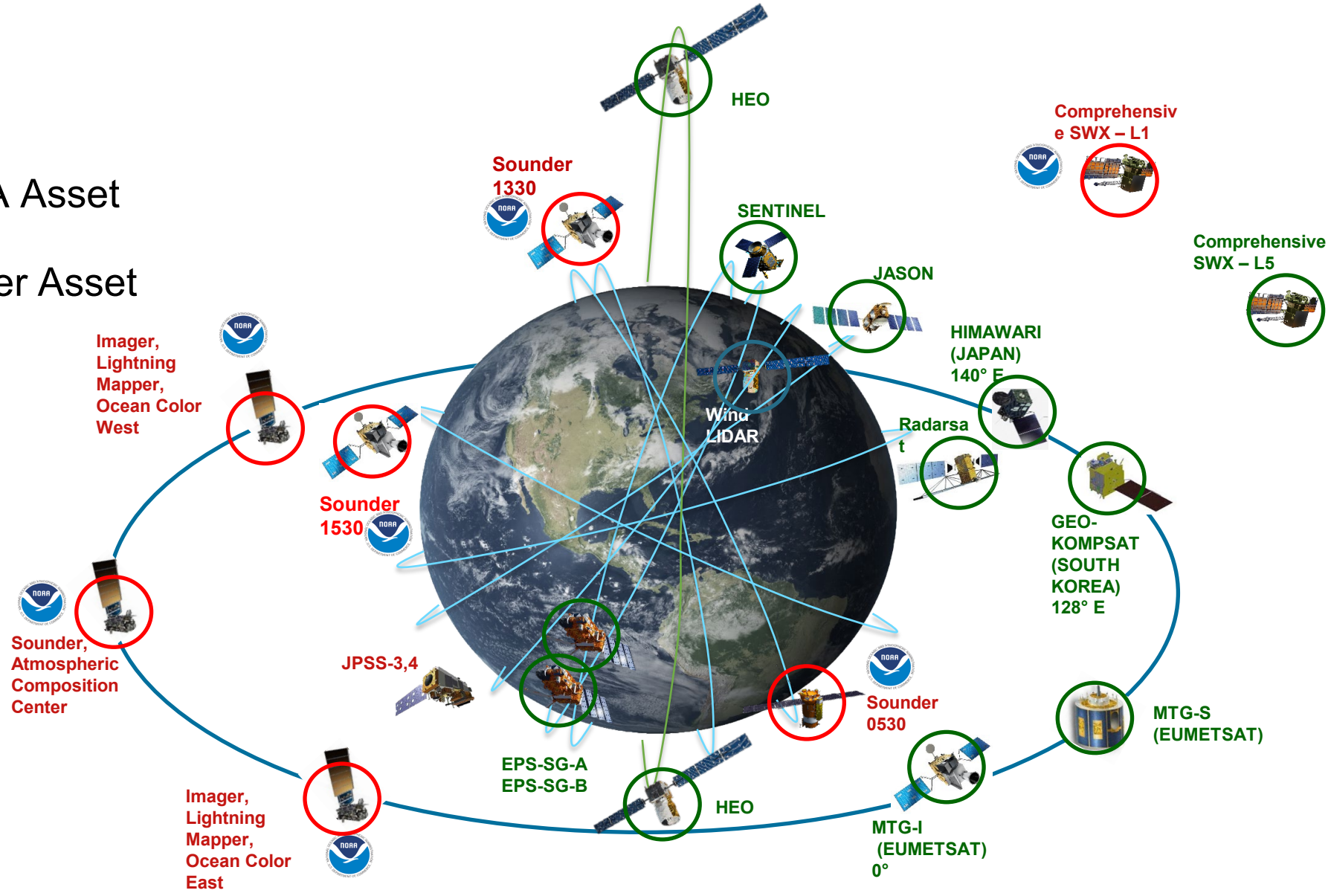
6. **Deliver the best value integrated suite of products and services responsive to user needs**

NGES provides the basis for Ground Enterprise Capability Portfolio Management

Potential NOAA Future: 2030–2050

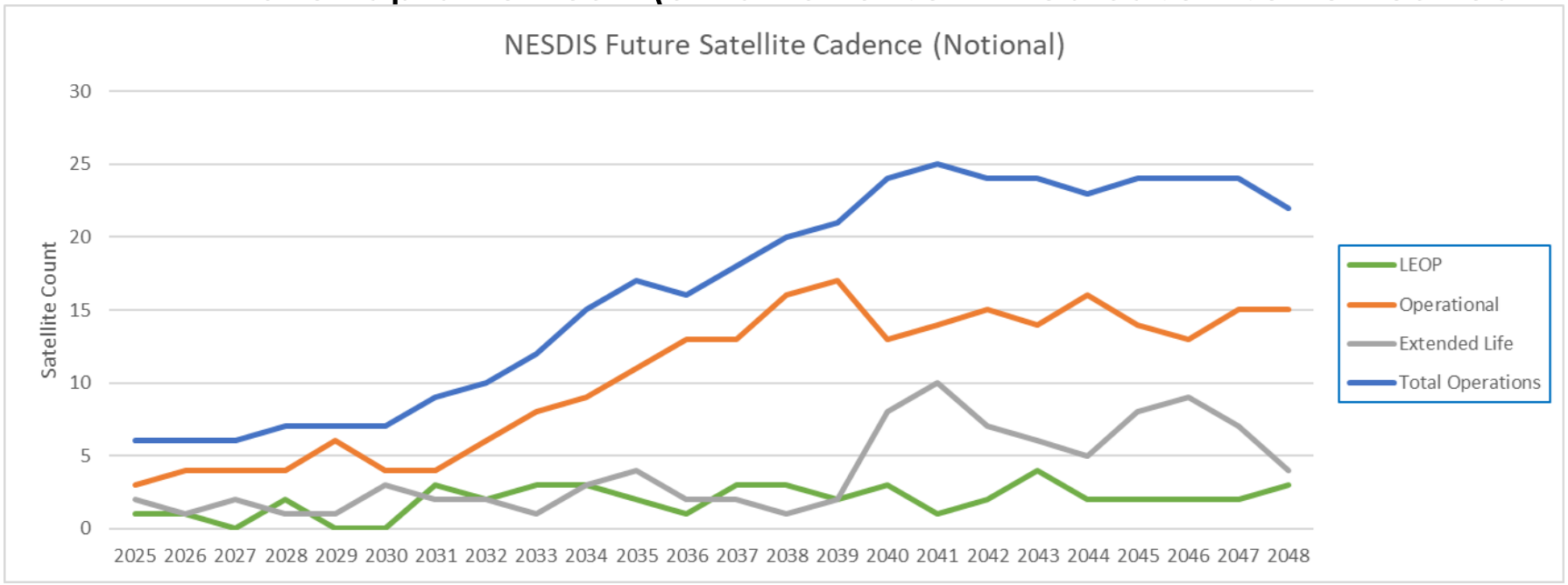
New NOAA Asset

New Partner Asset



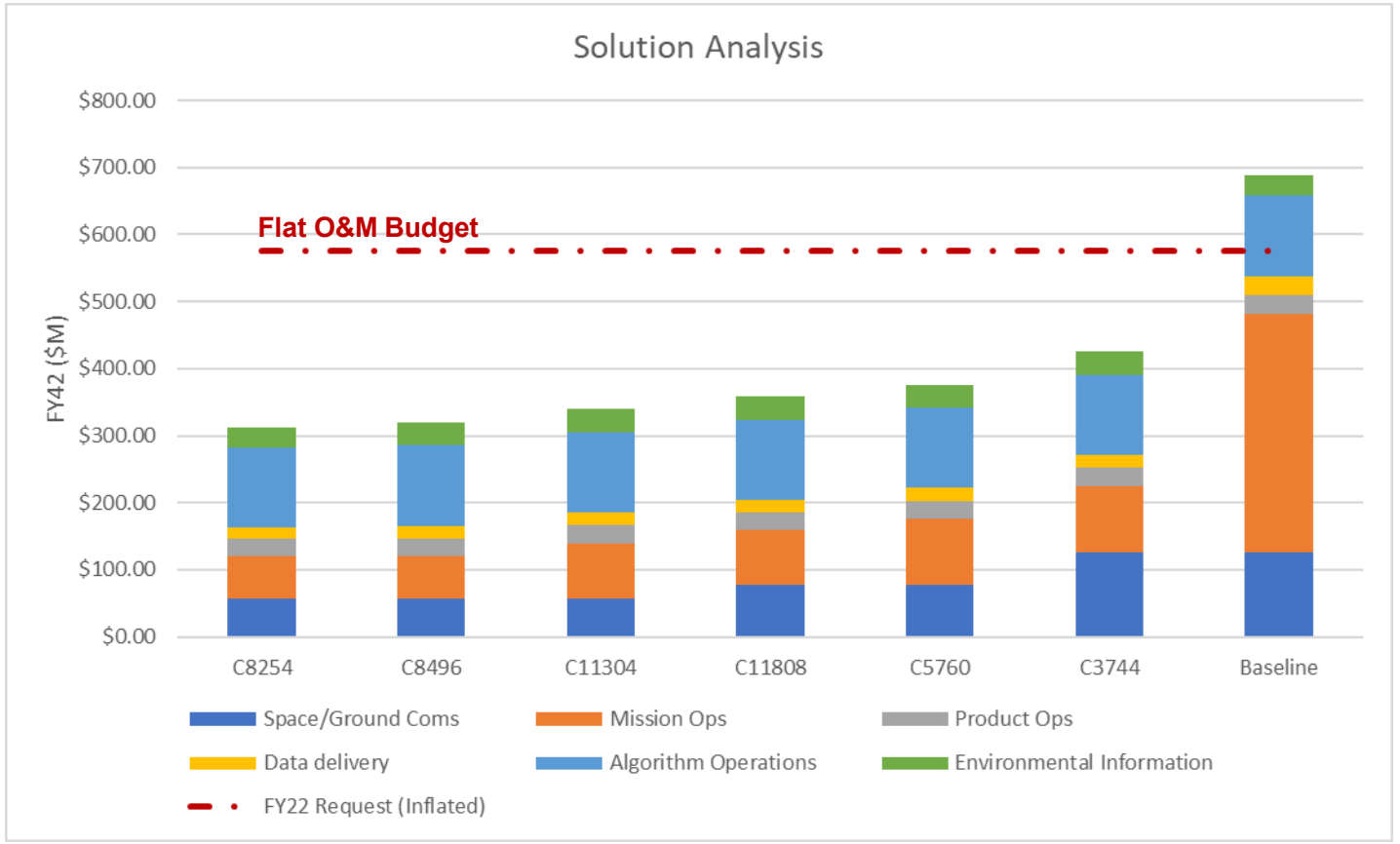
Evolving Observing Needs

- Escalation in supported missions driven by:
  - Disaggregation (multiple satellites to carry the observation suite)
  - More rapid refresh (small shorter-lived satellite refreshed more often)



  - >3x increase in operational satellites
  - >2x of pre/post operational satellites

Sustainability Impact



Mission Cadence in 2035-2050 era will drive costs to exceed current spending levels

- O&M increases from 17% to 21% of Budget

Most alternatives considered can reduce O&M costs to below current spending

- O&M ranges from 9% - 13% of budget
- Significant cost avoidance over Baseline

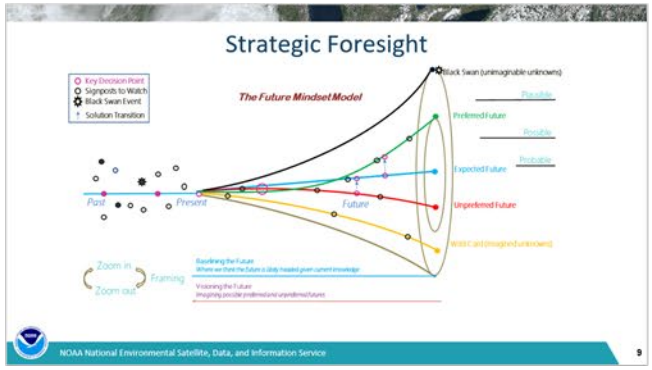
Non-budgetary cost estimates in FY42 $'s and are for comparison purposes only

Dimensions of Change

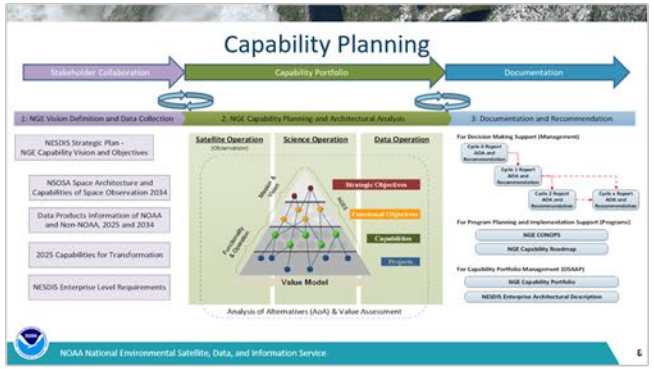
- Evolution of the NESDIS Ground Enterprise is not only about the use of technology, but also about how that technology is used to provision NESDIS business services

Dimension	Asset Location	Asset Ownership	Operational Control	Capability Provisioning Model	Acquisition Model	Operational Mode
Current Approach	NOAA Facility	NOAA Owned	NOAA Operated	Mission-Centric	Systems	Data Driven (Push)
Radical Alternative	Non-NOAA Facility	3rd Party	Outsourced Operations	Enterprise	Services	User Driven (Pull)
Enterprise Architecture Impact	Transfer of Capital Investment Responsibility	Transfer of Sustainment Responsibility	Transfer of Operations Responsibility	Transfer of Development Responsibility	Reallocation of Budget (PAC to ORF)	Realignment of Operational Priorities

Integrating Strategic & Tactical Perspectives

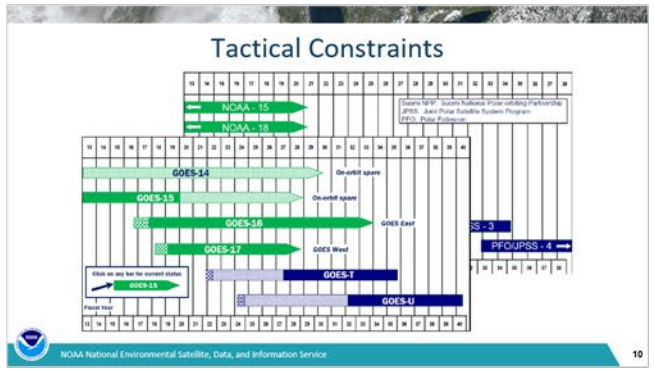


Strategic Foresight



Capability Planning

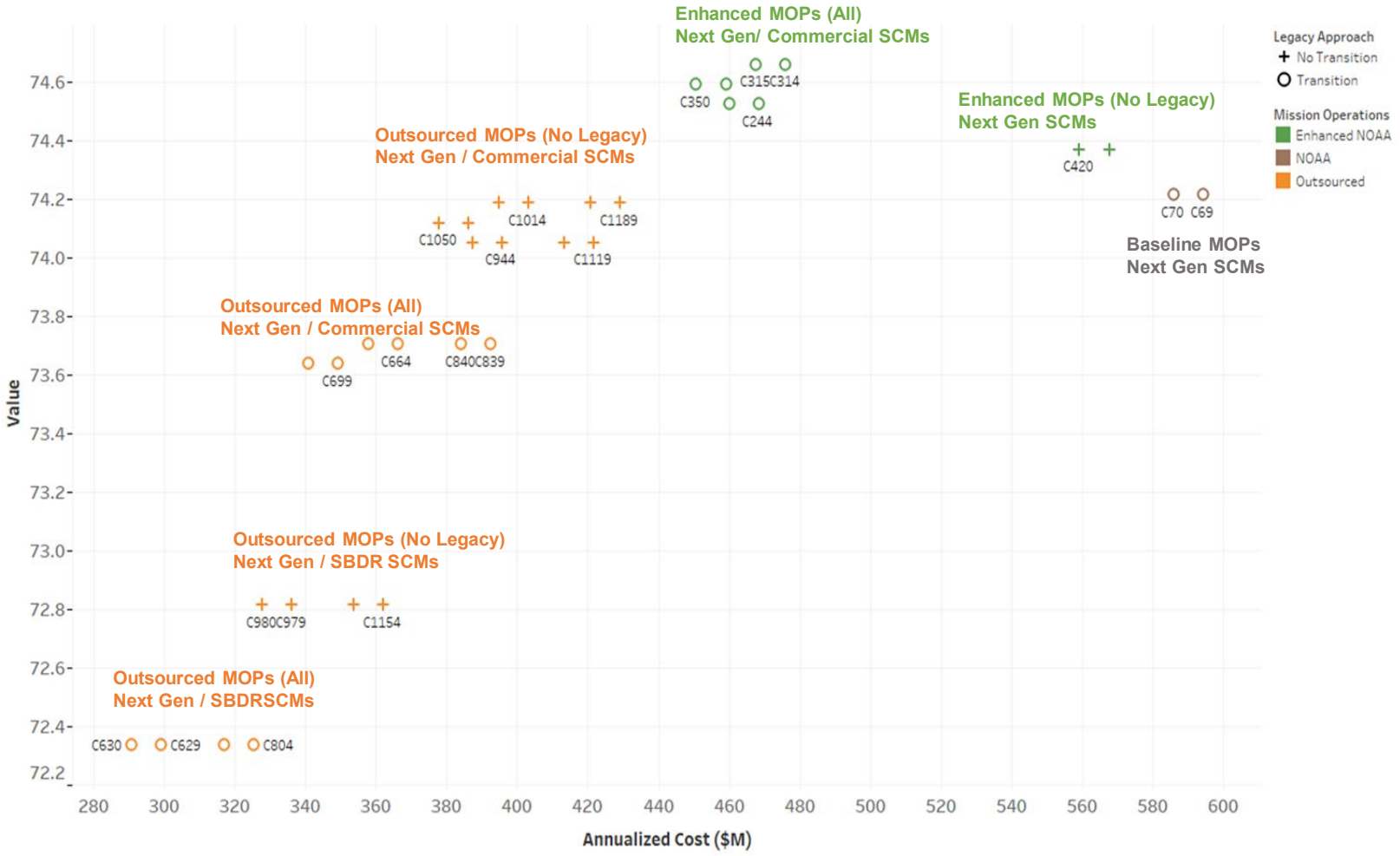
Strategic Roadmap



Tactical Constraints

Tactical Planning

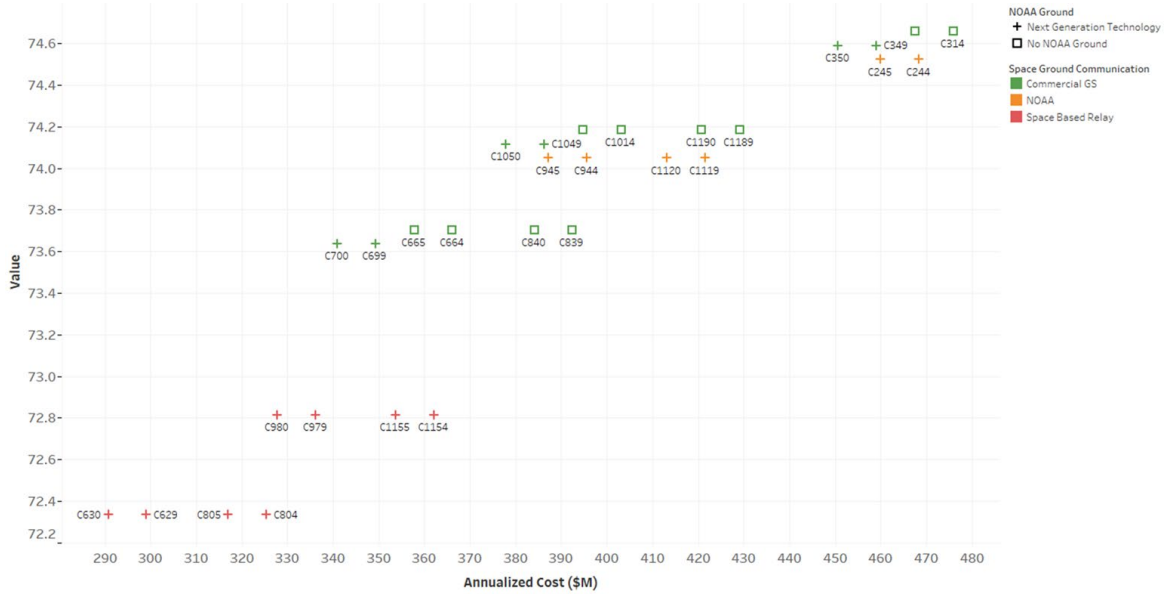
Mission Operations



- Mission Ops Value is driven by approach to legacy missions
- Current NOAA Ops is more Costly than Enhanced Operations
- Outsourcing is less costly than Enhanced
- Outsourcing has lower value than Enhanced

Non-budgetary cost estimates in FY42 $'s and are for comparison purposes only

Space-Ground Communications



Objective	C245 NOAA	C280 Space Based Relay	C350 Commercial GS
Workload Scalability	63.47	60.67	74.67
Work Verifiability	80.00	80.00	74.40
System/Service Availability	81.07	78.27	78.27
Service Adaptability	63.47	63.47	71.87
Response	92.27	86.67	81.07
Recovery	91.20	85.60	82.80
Recoverability	81.07	72.67	81.07
Owner Verifiability	86.67	78.27	78.27
Degraded Operations	81.07	75.47	78.27
Affordable Expandability	69.07	66.27	74.67
	80.27	69.07	80.27

Combo Name / Space Ground Communication

Value: 50.00 – 80.00

- NOAA benefits are high for Commercial Ground Stations
- NESDIS Satellites communicate with both partner ground station services and via commercial services
- We have a Commercial Services IPT coordinating a variety of demos, RFIs, and planning to pilot projects
- Efforts across NESDIS already underway

Non-budgetary cost estimates in FY42 $'s and are for comparison purposes only

Other Key Findings

Product Operations

- Demand Driven production augments data driven production by providing both the flexibility while maintaining operational assurance

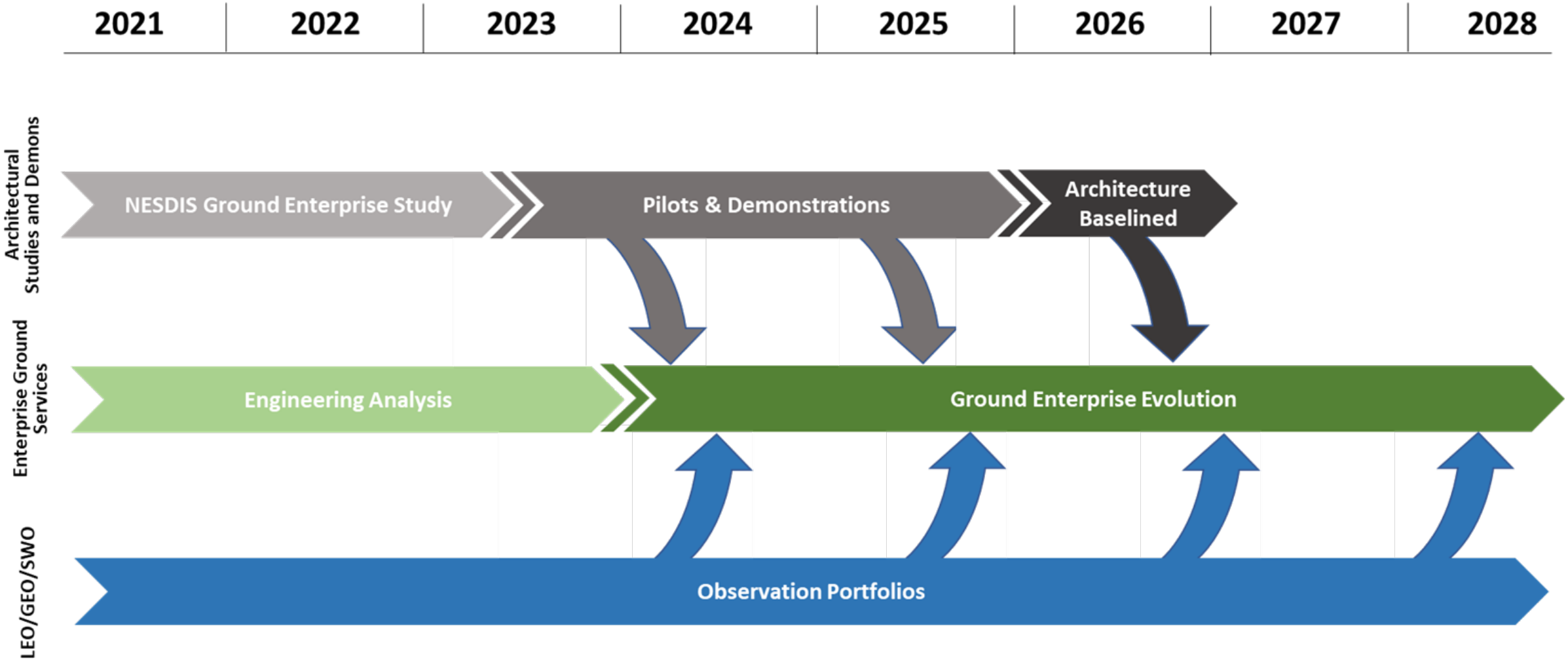
Data Delivery

- Tactical - Leverage Commercial Sat. Com. delivery of High Availability Products for Severe Weather / COOP operations
- Strategic - Migrate downstream processing (stakeholders) to cloud services

Algorithm Operations & Development

- Collaborative Science - Shared development infrastructure that removes technical barriers for access to data and resources for research activities and facilitates agile promotion to operations

NESDIS Ground Enterprise Strategy



Conclusion

- Current NESDIS operational services are not future proofed
  - Operational costs are projected to become a larger fraction of the NESDIS budget
  - NESDIS will need to change its business practices going forward in order to achieve affordable adaptability and resilience

- Emerging technologies and business practices offers a path forward
  - Cloud-based solutions reduces hardware footprint through reduced redundancy
  - New technologies improve asset utilization through multi-mission use
  - Buying commercial services reduces up front investment and ongoing sustainment costs while providing operational scalability