



NOAA

Nov. 10, 2020

The Future of NOAA's Satellite Observing and Data Information Systems

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Director, Office of Systems Architecture and Advanced Planning (OSAAP)

NOAA National Environmental Satellite, Data, and Information Service





Our Agenda Today

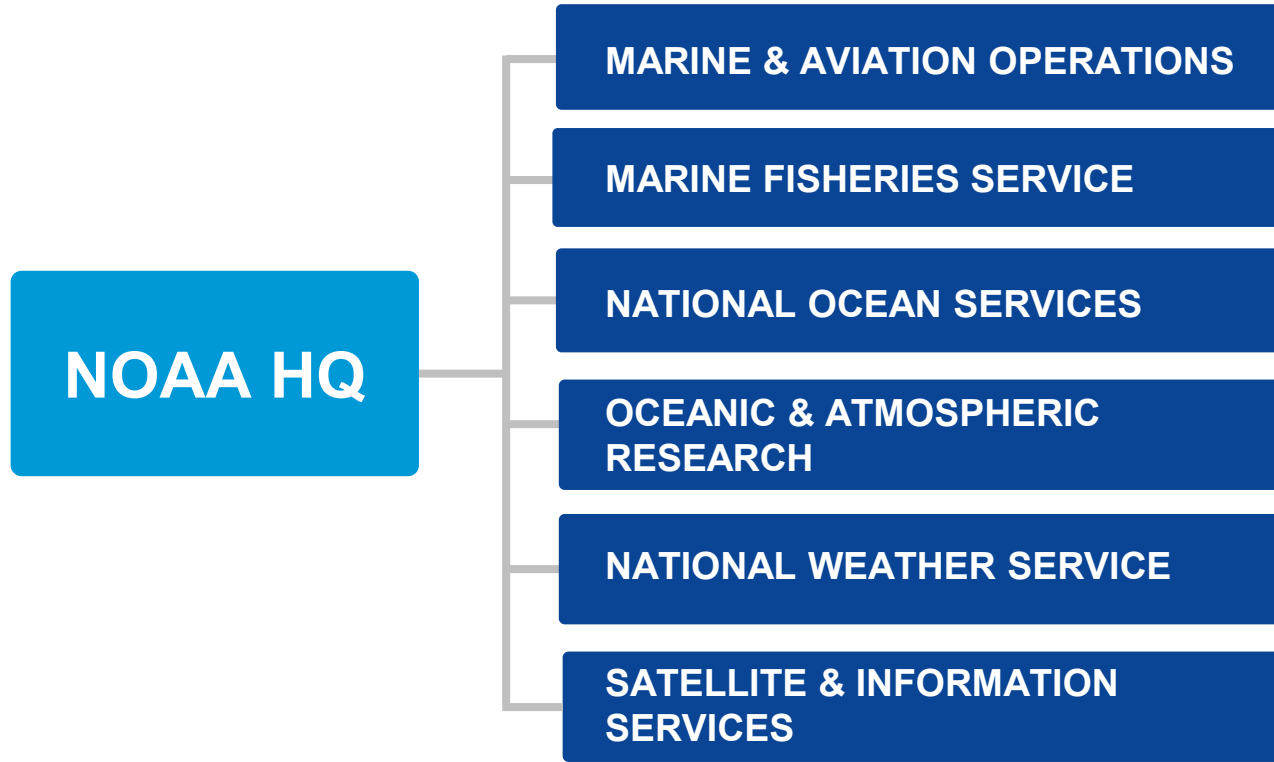
Mission and Responsibilities for NESDIS Office of Strategic Architecture and Advanced Planning (OSAAP)

Why the Mission Matters: Our Changing Planet

Next Generation of NOAA's Earth Observation Architecture: Where we're going and how we're getting there

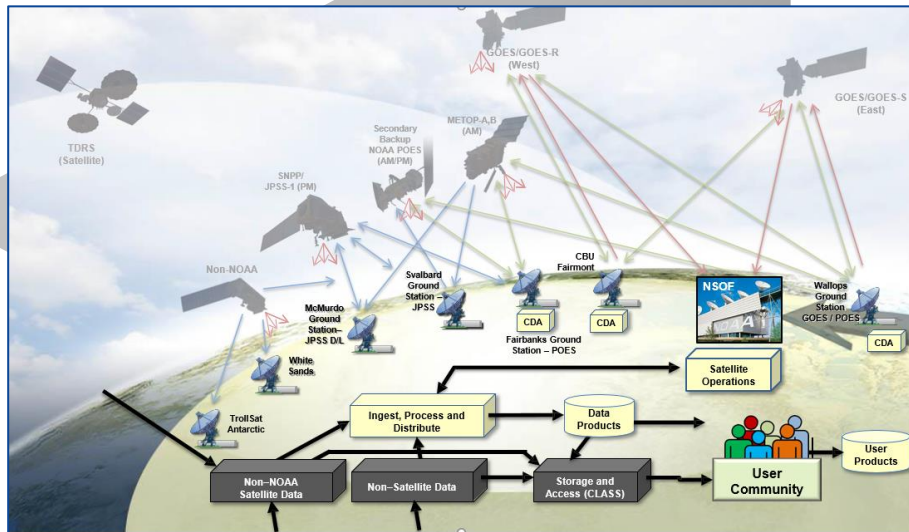


NESDIS in the NOAA Line Office Lineup





NESDIS: From Space to Ground

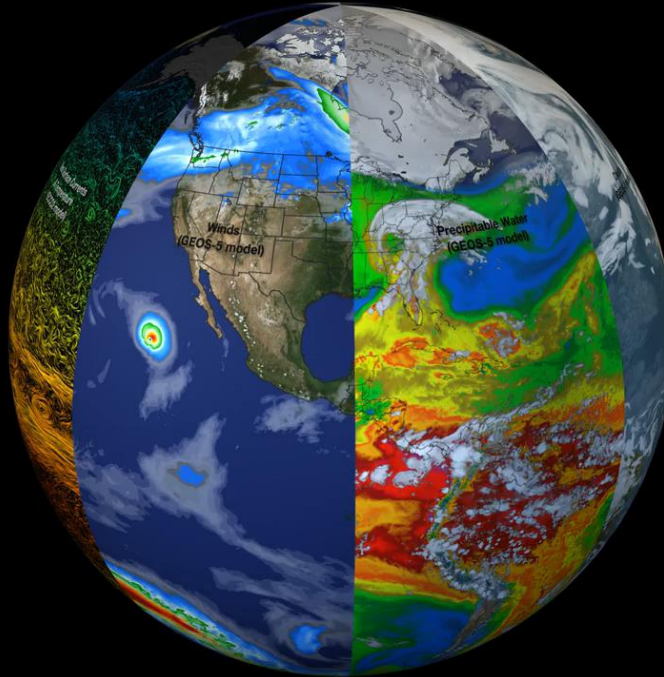


The National Environmental Satellite, Data, and Information Service (NESDIS) provides secure and timely access to global environmental data and information from satellites and other sources to promote and protect the Nation's security, environment, economy, and quality of life.

OSAAP oversees the ongoing development of ground and space architecture.



An Integrated, Digital Understanding of Earth's Complex Environmental Systems





OSAAP Responsibilities

STRATEGY



Architecture

Governs the enterprise architecture to achieve strategic goals and objectives

Planning & Implementation

Stewardship of NESDIS-wide strategic planning & implementation

CONSISTENCY



Policy

Maintains policies and processes for program management and system engineering

Decision Support

Enables informed decision making by ensuring compliance with top level requirements

PRIORITIZATION



Requirements

Manages NESDIS top-level requirements

Risk

Leads enterprise risk management to ensure NESDIS is addressing risks and opportunities

COMMUNICATION



Liaison

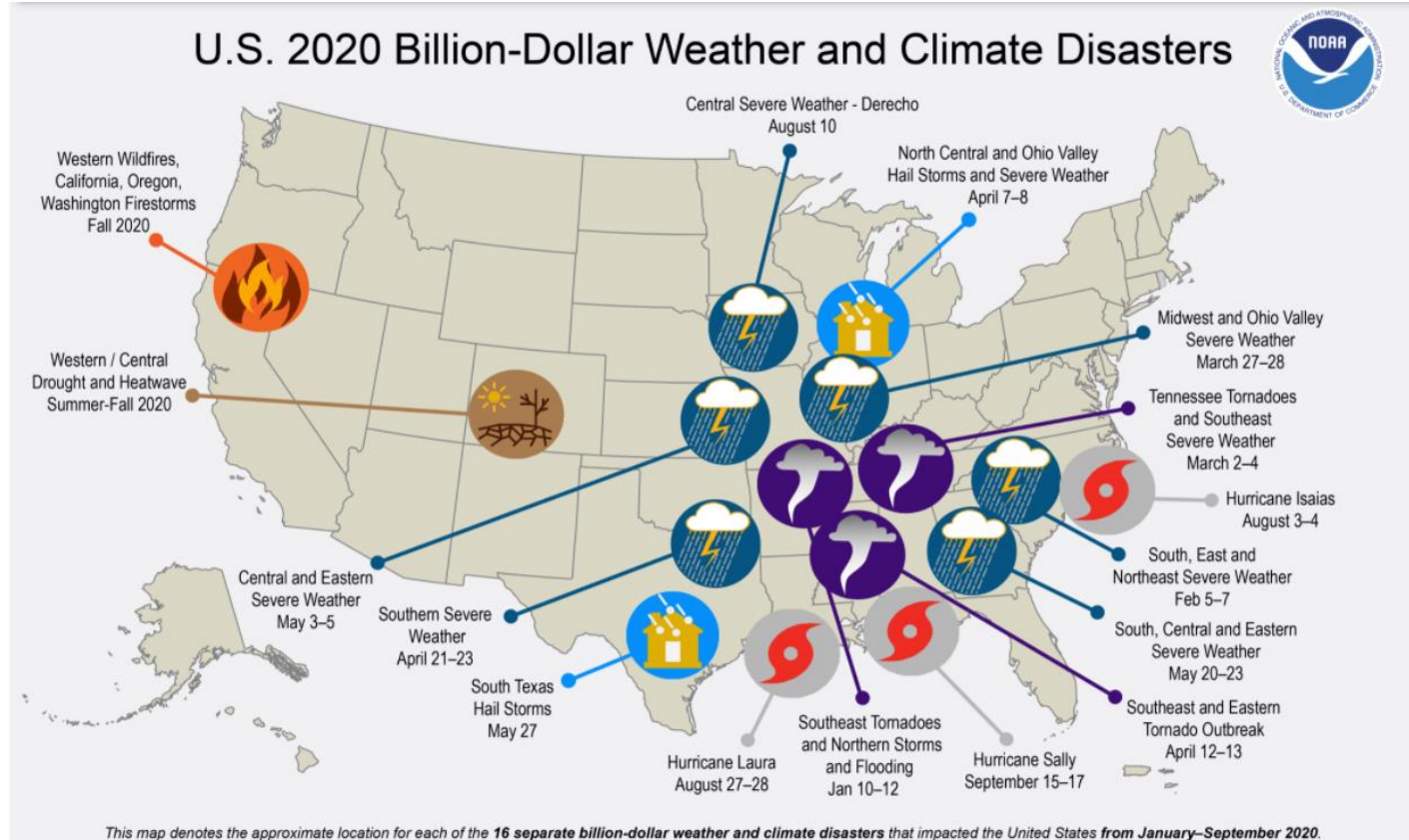
Technical liaison for communication of the enterprise architecture to outside entities

Validation

Ensures delivered products and services meet NOAA customer performance needs

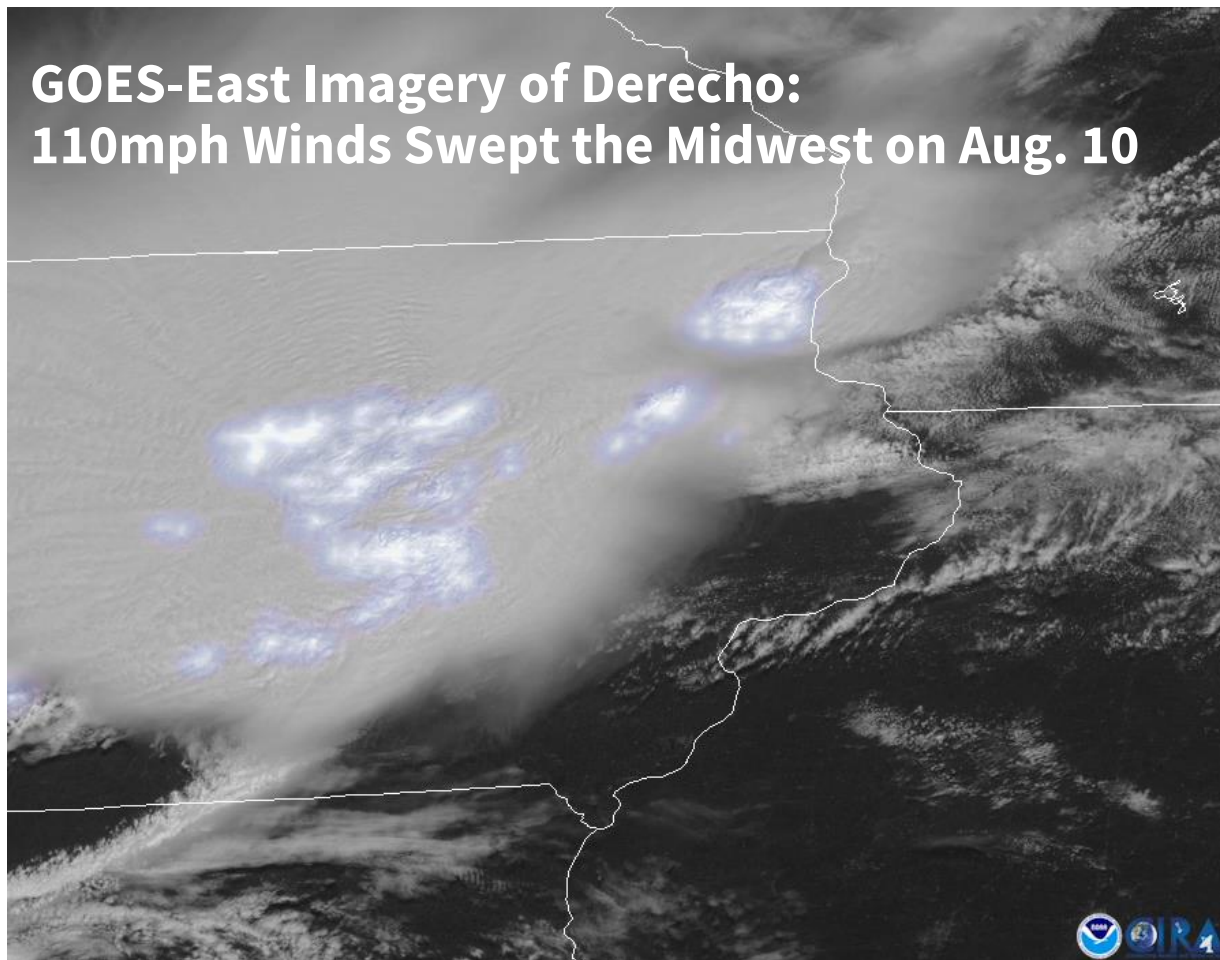


Why It Matters Now More Than Ever



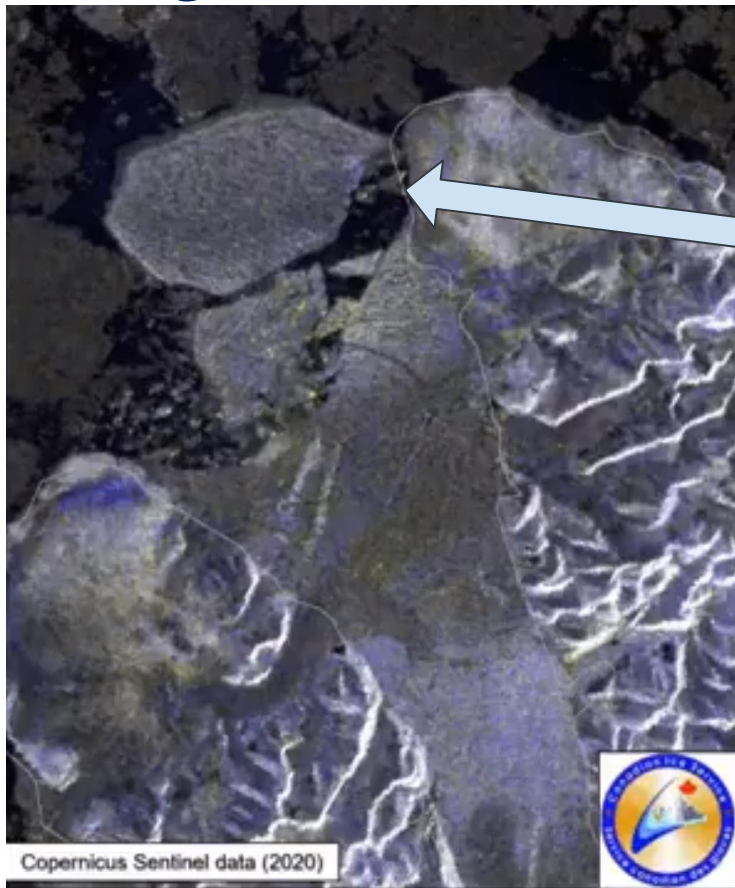


GOES-East Imagery of Derecho: 110mph Winds Swept the Midwest on Aug. 10





Melting Ice Caps: Milne Ice Shelf Collapse Aug. 4



Canada's largest intact ice shelf lost more than 30 square miles -- an area larger than the island of Manhattan.

<https://twitter.com/i/status/1293617433614442497>





Speed and Ferocity: Hurricane Laura Grows from Cat 1 to Cat 4 in less than 18 hours!

1800 UTC AUG 27

1200 UTC AUG 27

0600 UTC AUG 27

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1800 UTC AUG 26

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0600 UTC AUG 26

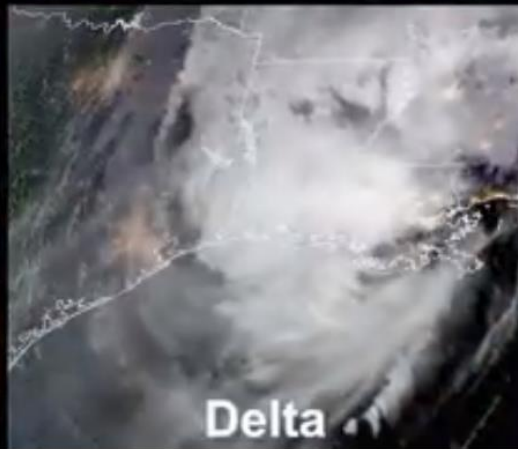
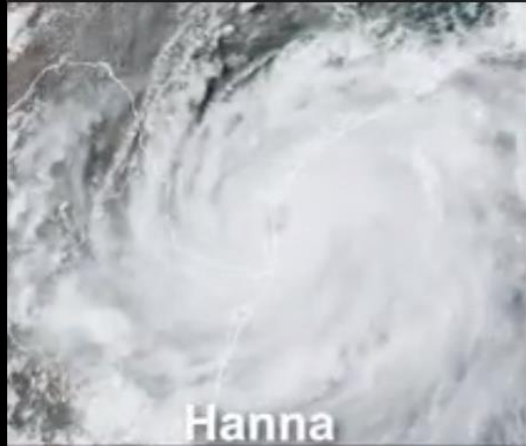
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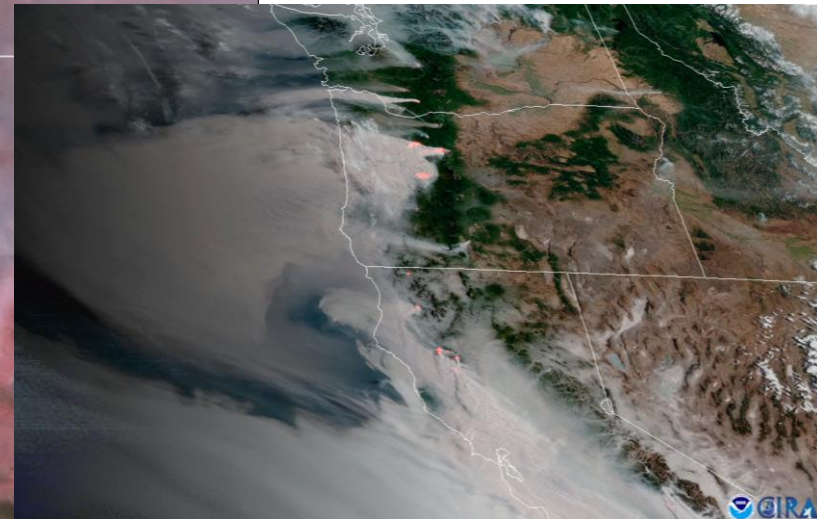
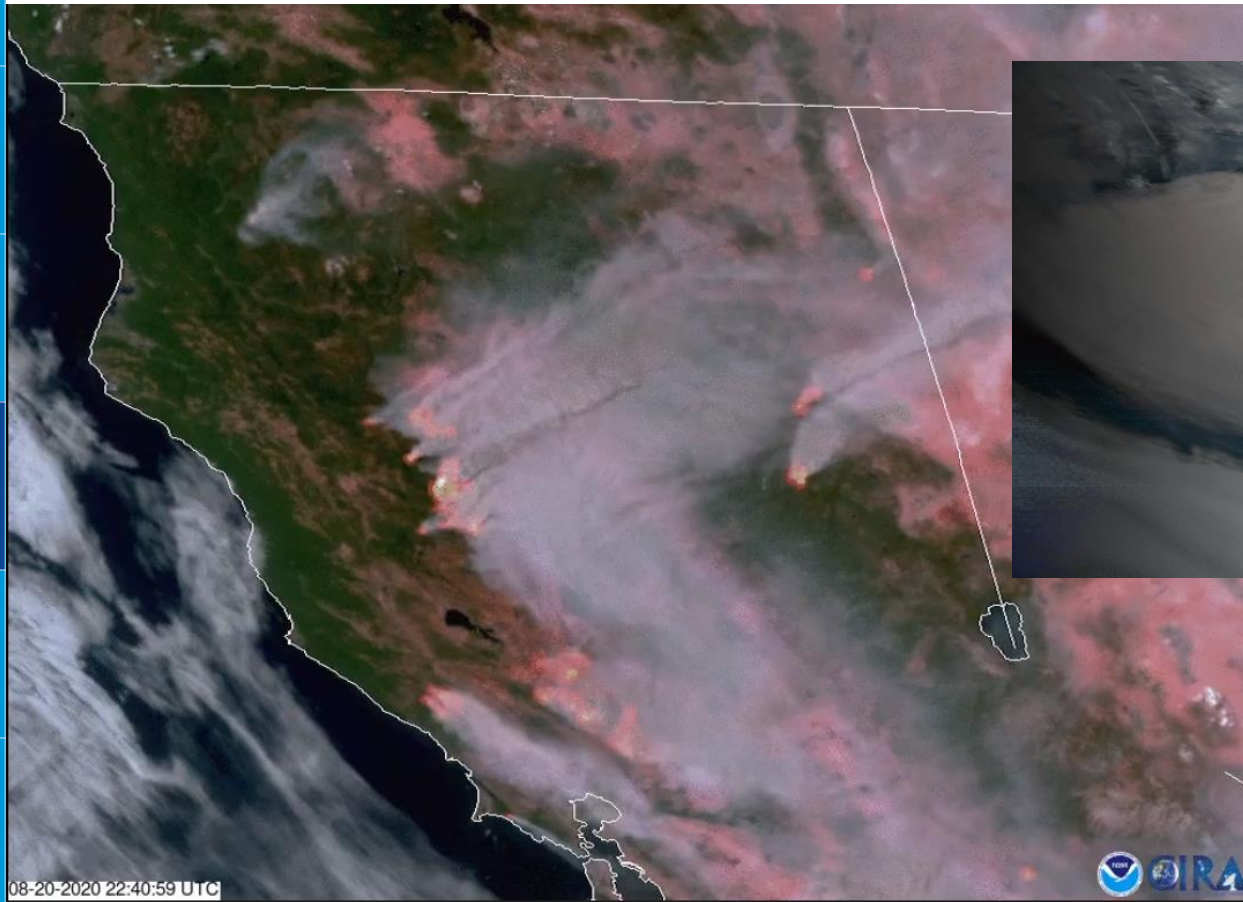


GOES-East Shows 6 Named Atlantic storms





Western Wildfires: Multiple West Coast Fires, Aug. 20





Today's Space Architecture

Today's space-based observation architecture is highly capable – but not adaptable.

Large, capable satellites require:

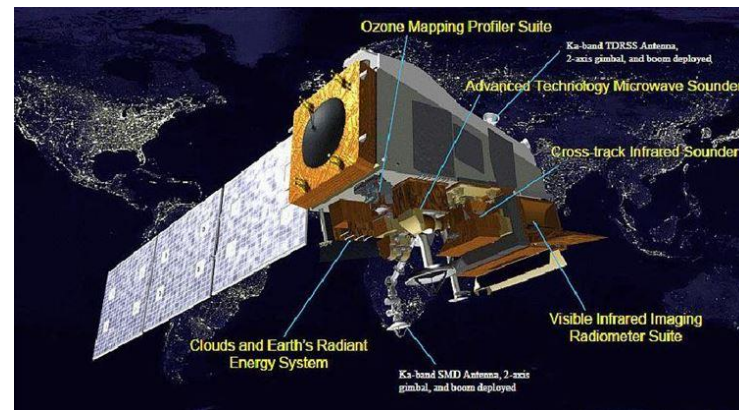
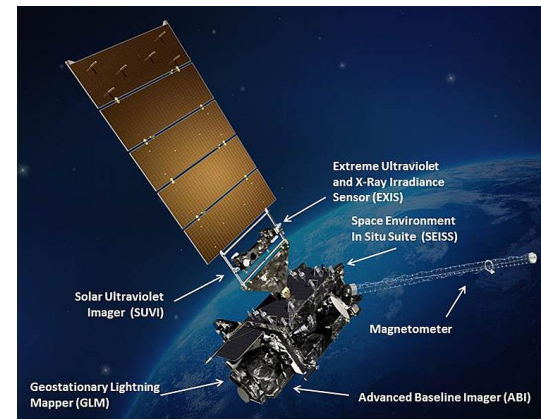
- Very low risk for each satellite
- 10+ years in development

Very low risk requires:

- Locked up funds
- High cost for top end of assurance scale

Long development requires:

- Inability to exploit tech advances





Four Pillars Support Next-Gen Earth Observations

Integrated, Adaptable, and Affordable: Orbits, Instruments & Systems

LEO

Miniaturized instruments on small, affordable, and proliferated satellites and partner data improving forecasts through better and additional data. Better precipitation forecasts, wave height predictions, ocean currents, and more.

GEO

Continuous real-time observations supporting warnings and watches of severe weather and hour-by-hour changes. High-inclination orbits to observe northern latitude & polar regions.

Space Weather

Reliably monitoring coronal mass ejections from L1, GEO, and LEO can protect the nation's valuable, vulnerable infrastructure. New capabilities at L5 and high earth orbit can provide additional insight and improve forecasts.

Common Ground Services

Secure ingest of data in different formats from different partners requires a flexible, scalable platform. Common Services approach integrates cloud, AI, and machine-learning capabilities to verify, calibrate, and fuse data into new and better products and services.

From NSOSA to Now, and What Comes Next: Examining Capabilities in LEO, GEO-XO



2018:

NSOSA Analysis
Completed, Reference
Architecture Identified



2019-2020:

Broad Agency
Announcements,
Industry Concept Study
Cycles for GEO-XO and
LEO Capabilities,
Missions & Instruments



2020's:

Ongoing Industry Concept
Study Cycles, Ongoing
Joint Ventures, NGES
Underway, Demonstration
Flights Begin



2026-2029:

Next-Gen Ground
Architecture
Identified,
SounderSat1 & 2
Launches*



~2030:

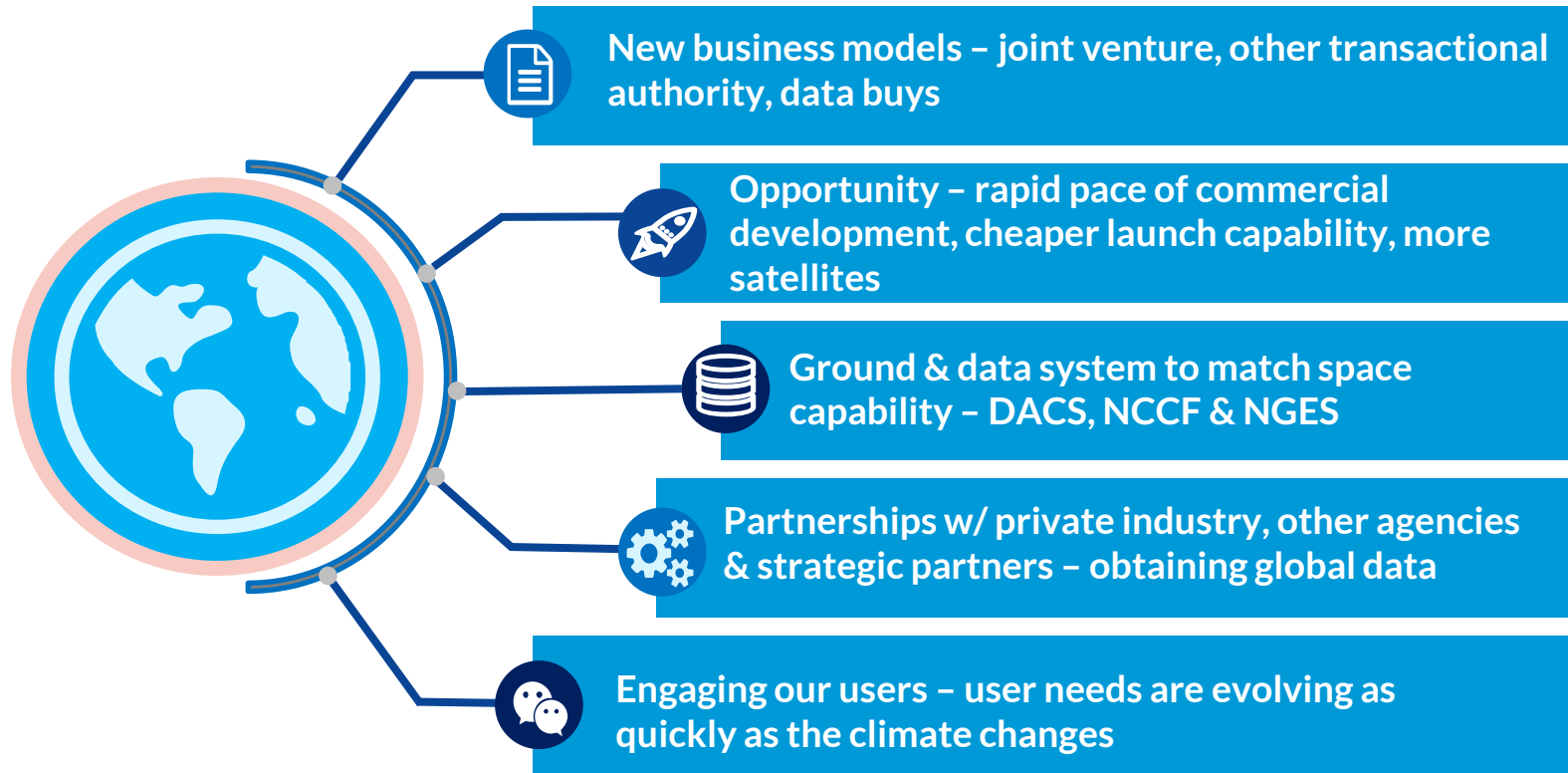
Transition Underway
to Next-Gen Ground,
GEO-XO1 Launch*

**Notional launch dates, dependent on out-year funding*





NOAA'S Next-Gen Observation & Data Information Systems: How We Get There





GEO-XO Industry Concept Analyses

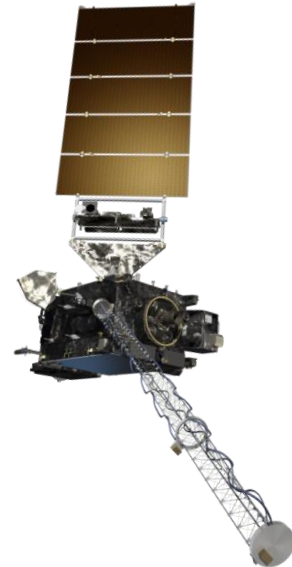
FY20 funds being used to partner with industry for options to **replenish GOES-R Series data by 2030:**

Instruments

- Regional, real-time weather imagery
- Space weather data
- High latitude observations – highly elliptical orbits (Tundra) for Arctic observations
- Hyperspectral sounding

Implementation solutions

- Standard satellite bus
- Small satellites for space weather instruments
- Hosting services
- Commercial data



2020: Complete pre-Phase A studies
2021: Phase A start



SounderSat Industry Concept Analyses

Priorities in LEO:

- SounderSats providing critical sounding data
- Small to medium instruments observing 3D winds, ocean surface vector winds, precipitation data, and low light imagery.



Industry awards to explore design and capability options:

- Sounding instruments (microwave, infrared, radio occultation)
- New acquisition and observing system concepts:
 - Commercial services
 - Multi-orbit coverage
 - Common satellite bus for flexibility in instruments flown
 - Rapid launch cadence
 - Demonstration missions
 - Risk tolerance and observing system risk management

2020: Initial pre-Phase A studies

2021: Complete pre-Phase A and begin focused industry designs and collaborations

Mid-2020s: Demonstration Flights



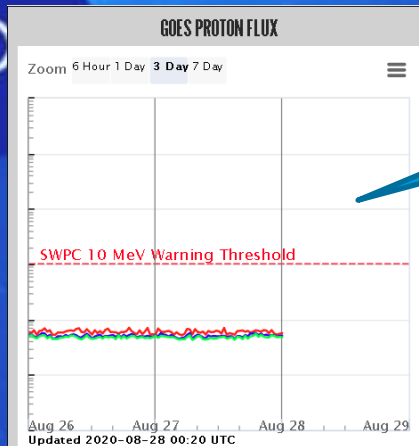
New Capabilities: Space Weather Observations



Increasingly critical to our nation's information-based economy.



Solar winds bomb our planetary system with subatomic particles, electrified plasma and other forms of powerful energy.



Geomagnetic storms threaten:

- >2,000 space borne satellites
- Energy transmission systems
- Telecommunications
- Financial services
- GPS, maritime & flight navigation networks

Currently, GOES-16 and DSCOVR are primary sources for Space Weather observations

Continuity of Space Weather Observations:

- Space Weather Follow On to L-1
- Partnerships to obtain L-5 data
- Capabilities on GOES-T & GOES-U

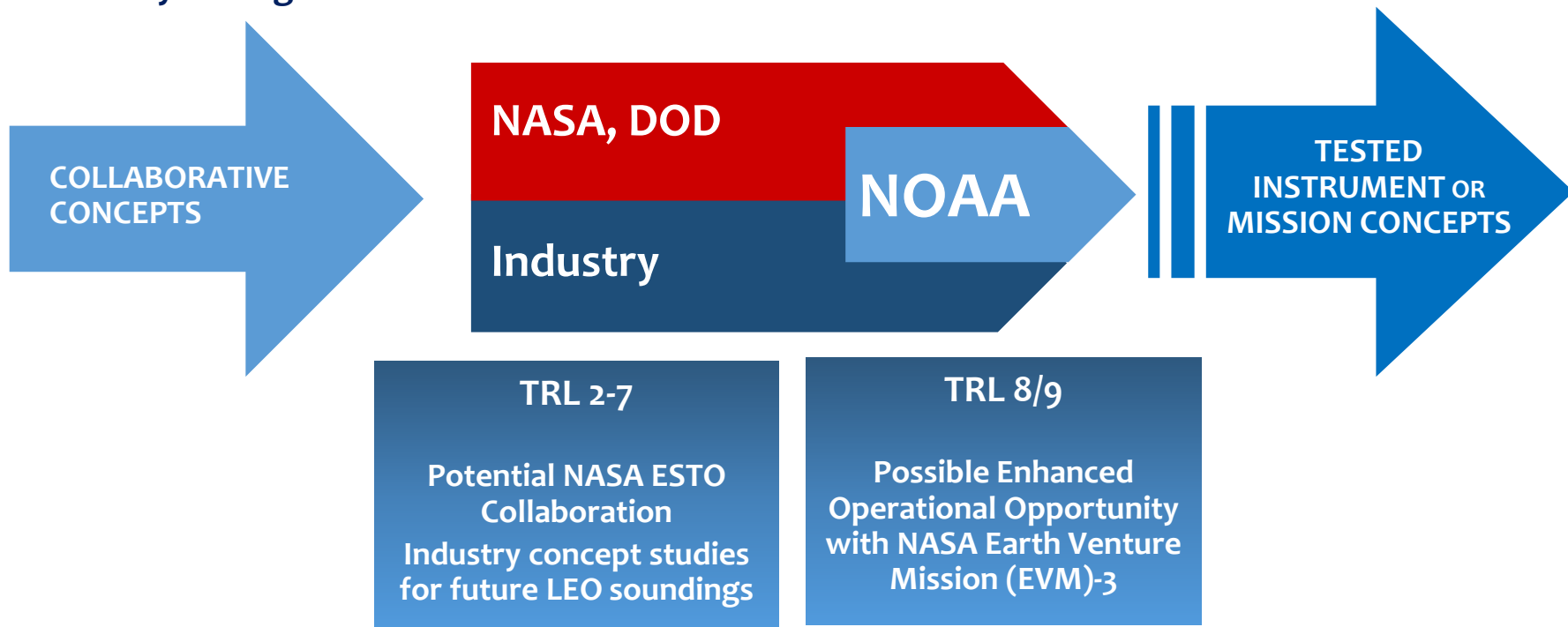




Developing Capabilities Through Joint Venture



NOAA develops new technology and capabilities with NASA, DOD and industry through Joint Venture.





Commercial Weather Data Pilot & Purchase



Radio Occultation Data to Date:

- **Commercial Weather Data Pilot Round 2 Completed Spring 2020:** Demonstrated readiness of commercial sector to provide RO data operationally
- **Commercial Weather Data Purchase:** RFP released in August for purchase of commercially-provided RO data for operational use



Upcoming work:

- **Continuing Commercial Weather Data Pilots:** FY21 budget request includes funds to investigate additional commercial capabilities beyond RO
- **Looking at responses to recent RFI to inform upcoming pilots**

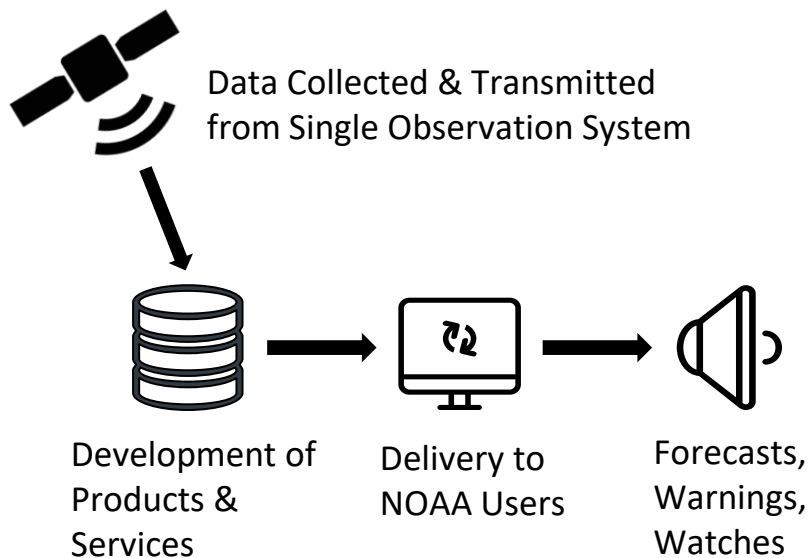




A New Paradigm in Data Science and Information Services

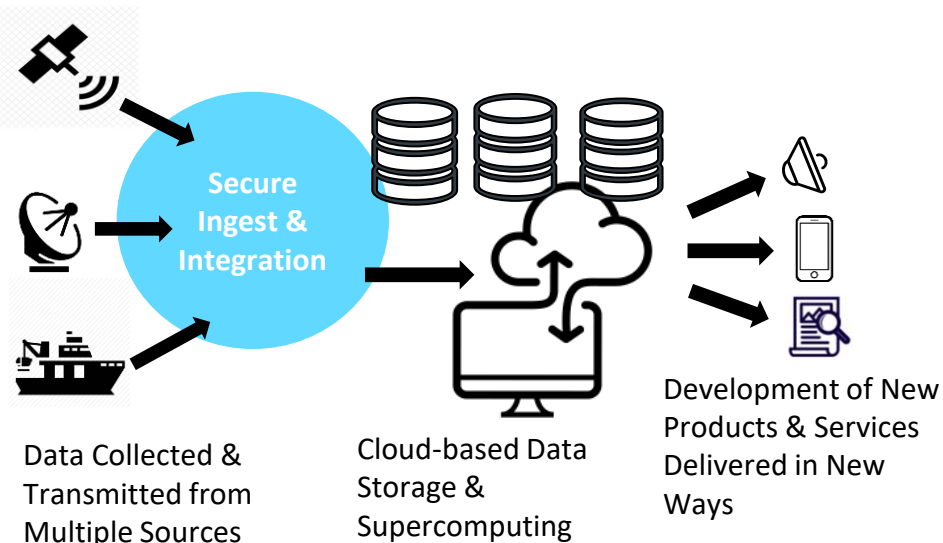
TODAY'S GROUND SERVICE

- Single system data services
- Limited computing power



TOMORROW'S GROUND SERVICE

- Secure ingest for all data types
- Powered by AI, data science
- Super-computing capability through cloud transition & beyond





Matching Tomorrow's Enterprise Ground Services to our Next Gen Flight Systems



Strategic Architecture Analysis to Shape NOAA's Common Ground for 2030+

**Satellite
Operations**

Space-Ground Communications
Mission Operations

**Science
Operations**

Algorithm Operations
Environmental Information
Operations

**Data
Operations**

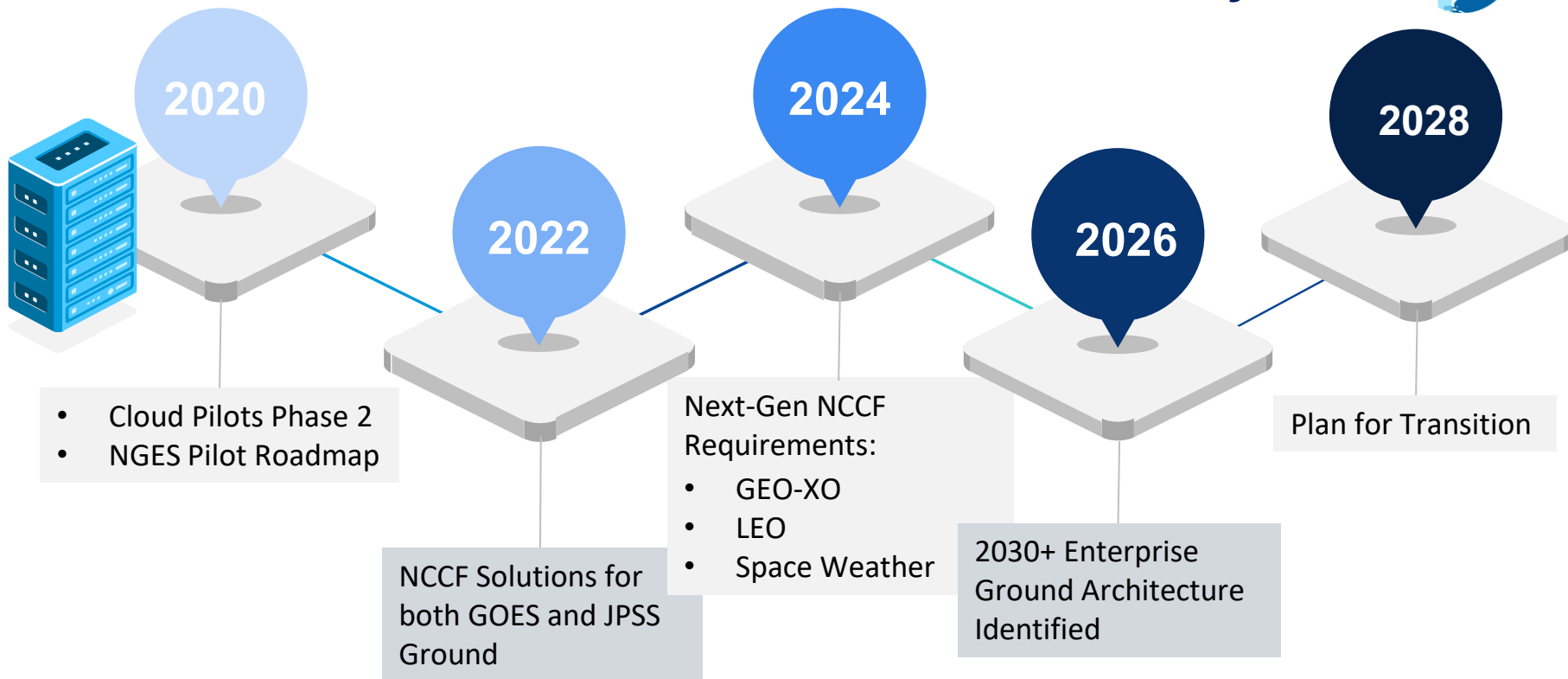
Production Operations
Data Delivery

Study to be Completed by Summer 2021





How We Get There: Next-Gen Data & Information Systems





User Engagement Shapes our Program



User Needs

**USG Agreements,
Policies, Laws**

**NESDIS Level
Requirements**

NESDIS Strategic Objectives

NESDIS Projects/Programs

Implementing NOAA's mission of Science, Service, and Stewardship

- NESDIS Level Requirements are developed from User Needs
- NESDIS Program/Project requirements are derived from the NESDIS Level Requirements, guided by the NESDIS Strategic Objectives





Achieving Our Next-Generation Earth Observation & Data Architecture



Acquiring space-based satellite observing

- Delivery for 2030-2050
- Joint Venture with NASA and DOD to mature tech
- Concept studies & “fly-before-buy” with GEO and LEO BAAs
- Space Weather Observations

Leveraging commercial and international partnerships

- First data buy of operational Radio Occultation data
- Working with aerospace on instruments, spacecraft & missions

Adaption of emerging tech

- Advances in data analytics, move to cloud-based data infrastructure
- Incorporating AI into weather forecasts & other data products





Acknowledgements

OSAAP wishes to acknowledge the strategic expertise and subject matter expertise of our partners in NESDIS, NOAA, and outside NOAA.

We rely on the program leadership and our working groups of users to determine those capabilities we must design and acquire, both for today's world and for the world to come.

Questions? Please email: noaa.tpio.soe@noaa.gov

