NESDIS Common Cloud Framework: A Scalable, Agile and Enterprise Cloud Solution

Cloud Computing and Big Data Technologies for Ground Systems Working Group
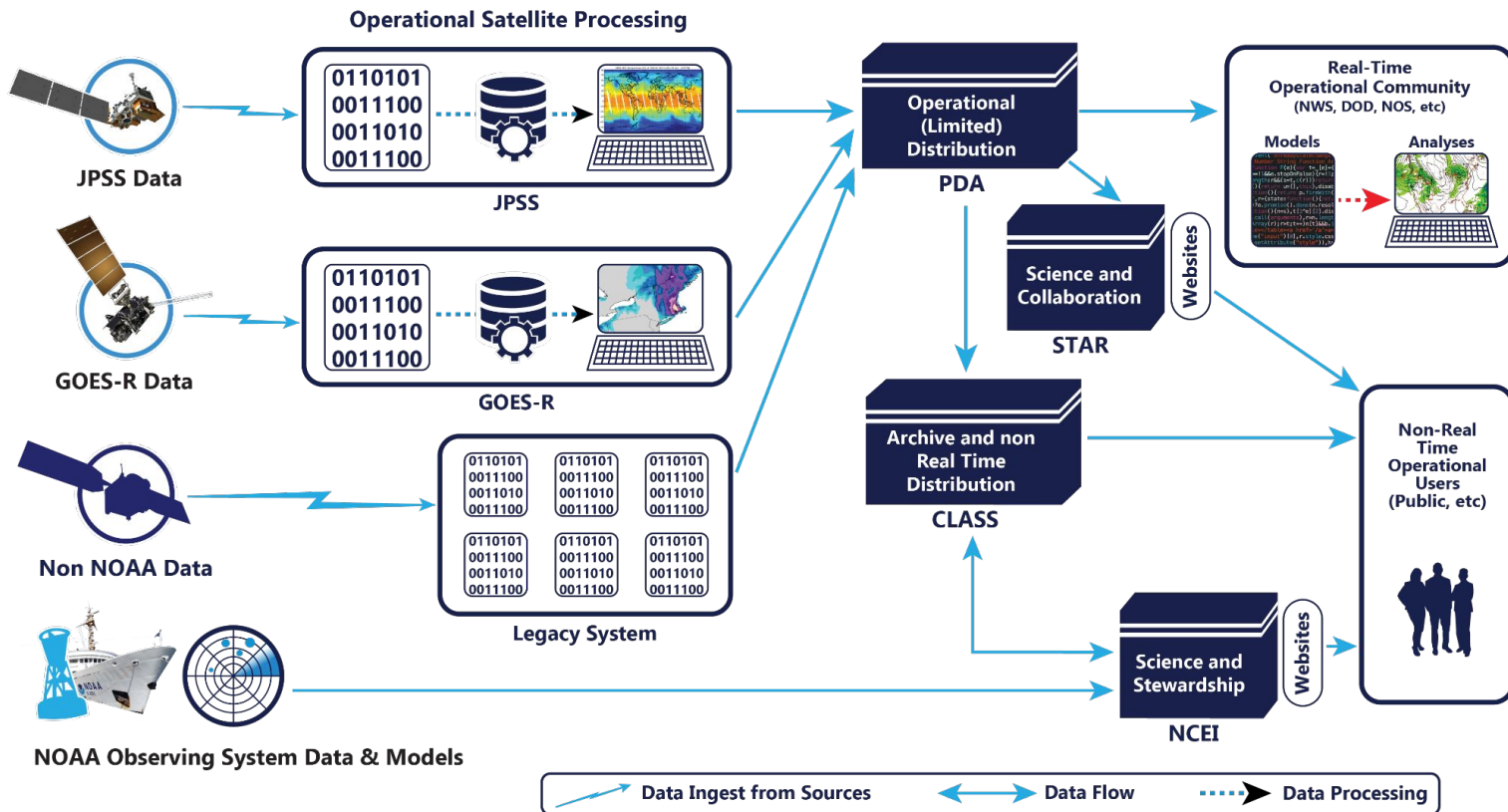
Kathryn Shontz, Director (Acting) OSGS

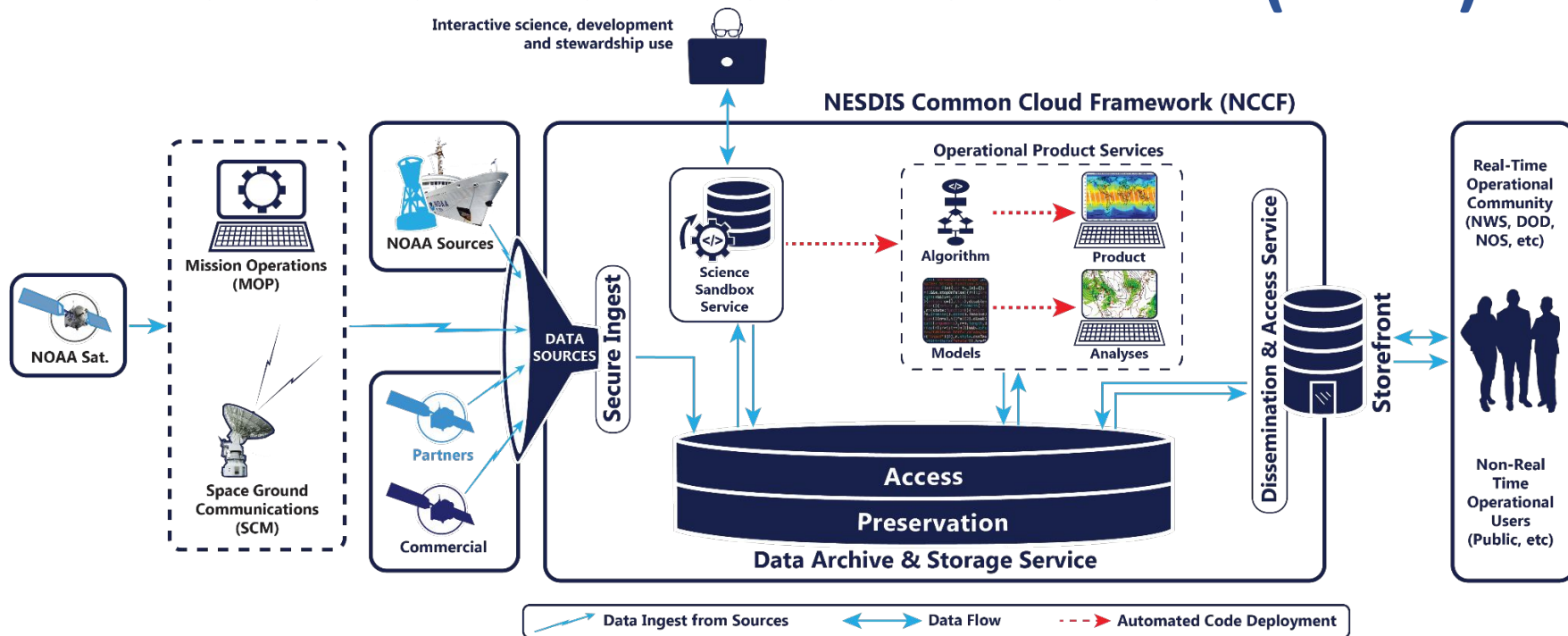National Environmental Satellite, Data, and Information Service

February 27th, 2023

Agenda

- NESIS Common Cloud Framework (NCCF) Overview

- NCCF Roadmap

- Data and Security

- Services

- Summary

NESDIS Ground Enterprise: Legacy

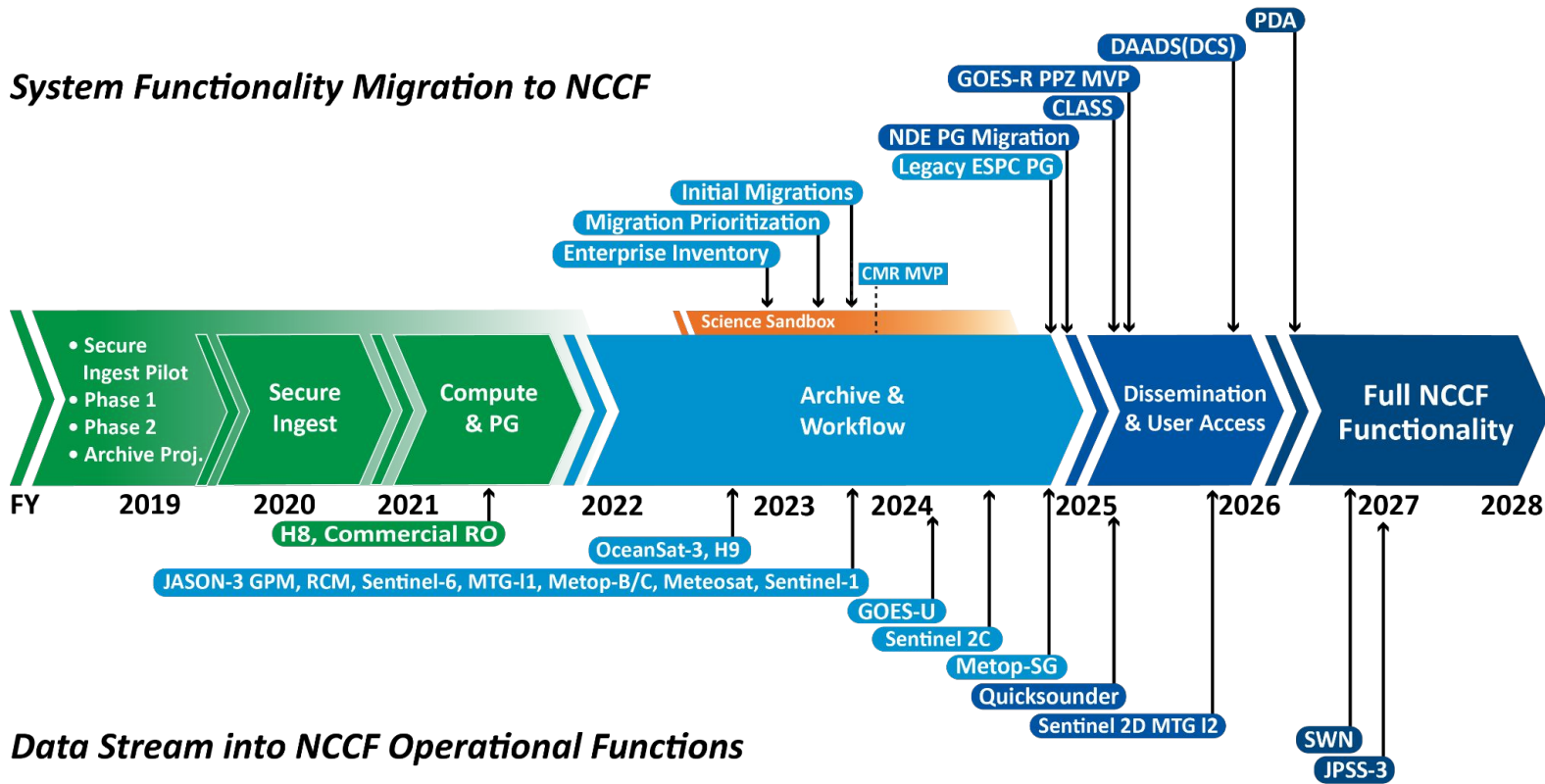# NESDIS Common Cloud Framework (NCCF)

NCCF is an operational enterprise framework in the Amazon Web Services (AWS) commercial cloud, with a data-centric architecture that is envisioned to provide full ground capability in the cloud with innovative use of new antenna and missions operations tools and technologies.

NCCF Roadmap Diagram

Security & Data in NCCF

- NCCF is a 24x7 **operational framework** meeting NESDIS high availability and low latency requirements today
  - FISMA High System with an ATO that employs FedRAMP moderate AWS commercial services available with controls tailored to high
  - Deployment results in improved Continuity of Operations (COOP) resiliency
- NCCF is a data-centric architecture, built with the goal of bringing people to the data for use and development
  - Sandbox service enables anyone with approval to come in and work alongside the data
- NCCF Operational Production Service is a High Performance Computing (HPC) architecture that is scalable to meet organizational needs - it processes NESDIS' algorithms but was built with modeling in mind

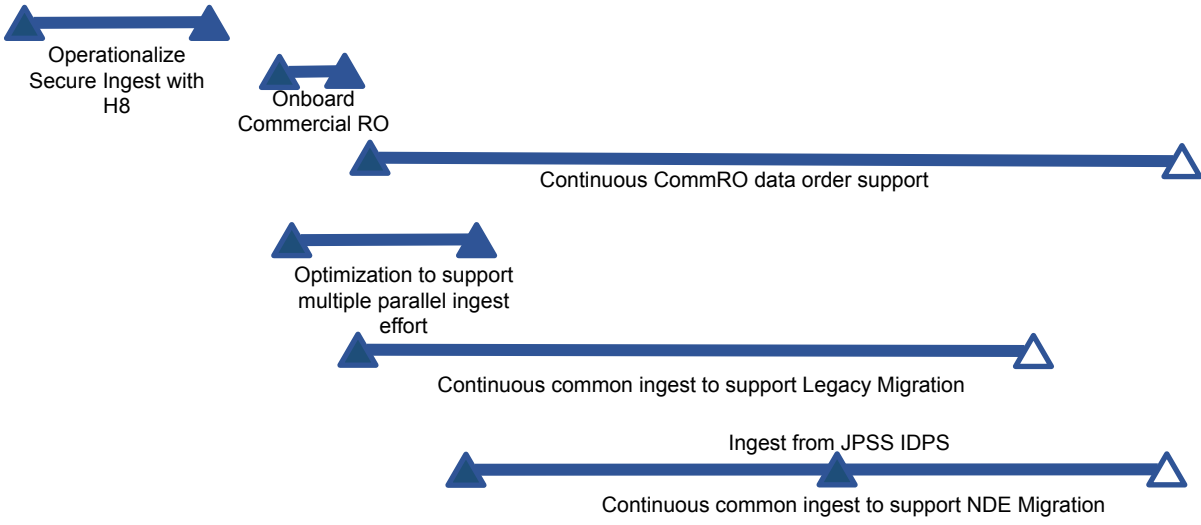# Current NCCF Framework
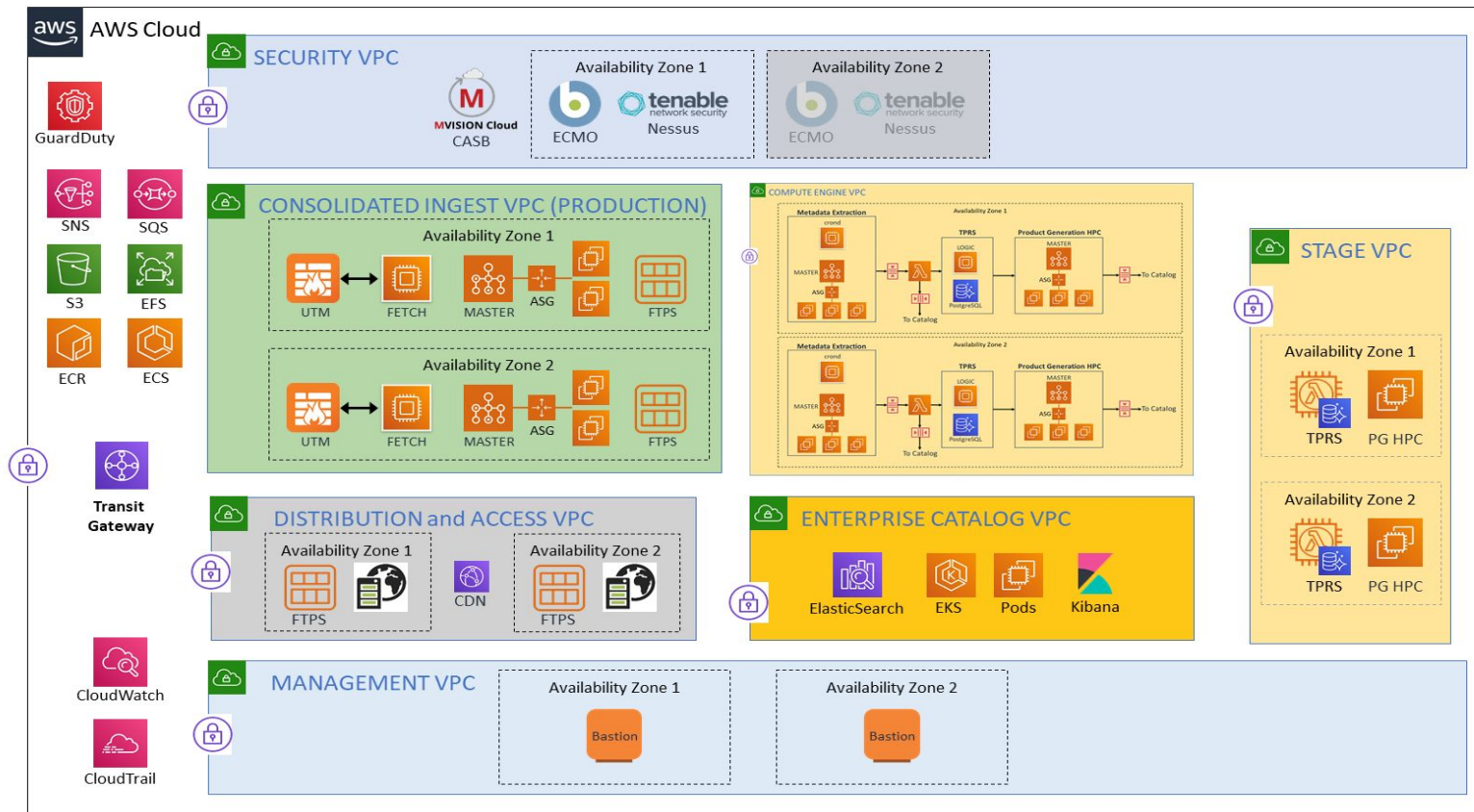
NCCF Secure Ingest Service

PI1	PI2	PI3	PI4	PI5	PI6	PI7	PI8	PI9	PI10	PI11	PI12	PI13	PI14	PI15	PI16	PI17	PI18	PI19	PI20	PI21	PI22	PI23	PI24	PI25

2020	2021	2022	2023	2024	2025	2026

SIG-P → **Operational Expansion for NOAA and non-NOAA ingest** → **Optimization, Expansion and Evolution**

Operationalize Secure Ingest with H8

Onboard Commercial RO

Continuous CommRO data order support

Optimization to support multiple parallel ingest effort

Continuous common ingest to support Legacy Migration

Ingest from JPSS IDPS

Continuous common ingest to support NDE Migration

Key Accomplishments & Insights:

- Piloted Secure Ingest in 18 months
- Operationalized Secure Ingest Q2 FY20
- Onboard Commercial Radio Occultation (RO) in 30 days
- Completed 50+ data product ingest to date
- Enterprise Dashboard / Performance Metrics
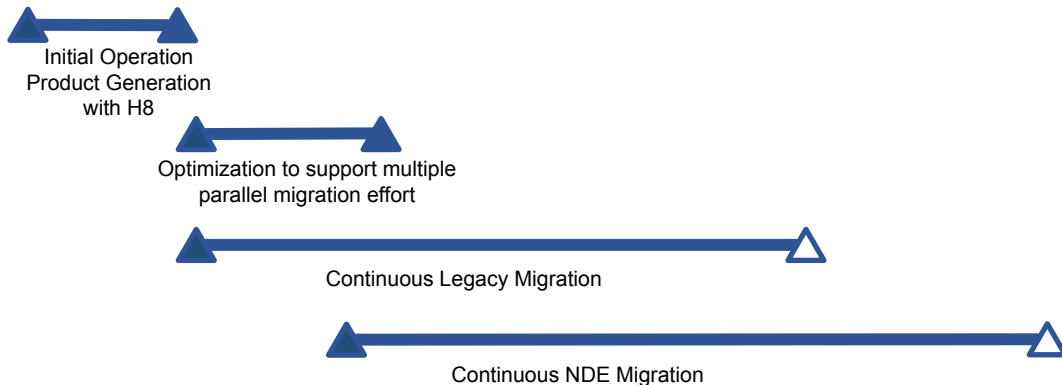- Expect to ingest 200+ data products from 10+ sources by 2023

Pilot completed, secure ingest operationalized, optimized and rapid onboarding

NCCF Compute (Product Generation) Service

PI2	PI3	PI4	PI5	PI6	PI7	PI8	PI9	PI10	PI11	PI12	PI13	PI14	PI15	PI16	PI17	PI18	PI19	PI20	PI21	PI22	PI23	PI24	PI25	PI26	PI27	PI28	PI29
2021				2022				2023				2024				2025				2026				2027			

IOC → Optimization for Parallel Migration → ESPC Operational Migration → Optimization, Expansion and Evolution

Initial Operation Product Generation with H8

Optimization to support multiple parallel migration effort

Continuous Legacy Migration

Continuous NDE Migration

Robust and scalable operational compute service underpinned by an HPC architecture

Key Accomplishments & Insights:

- High Performance Computing (HPC) architecture backbone of all processing
- Capability fully developed and demonstrated in 12 months
- Operations in Q3 FY21 for geostationary Himawari-8 data products
- Migrating algorithm production workflows
  - 6 operational algorithms generating 45 products
  - 22 algorithms integrating into production, generating 194 products
- Plans to deploy Continuous Improvement/ Continuous Delivery (CI/CD) pipeline in FY24

NCCF Archive Service

PI2	PI3	PI4	PI5	PI6	PI7	PI8	PI9	PI10	PI11	PI12	PI13	PI14	PI15	PI16	PI17	PI18	PI19	PI20	PI21	PI22	PI23	PI24	PI25	PI26	PI27	PI28	PI29

2021	2022	2023	2024	2025	2026	2027

IOC

Enterprise Archive Capability

Sustainment of Archive / Access Enterprise Functionality

NCCF Archive IOC

NCCF Enterprise, Archive, and Stewardship Development

NCCF Enterprise Archive, and Stewardship and Iterative Optimization Releases

Connection/Development of Functionality of Existing Archive Systems

Migration of Legacy Data Streams from Existing Archive Systems

Key Accomplishments & Insights

- Transition from pilot to NCCF in progress
- NCAP - Piloted archive capability in NCCF within 12 months
- Initial Operational Capability for archive 09/22 with integration with Secure Ingest

Archive service will aggregate all NESDIS data in a common, accessible location, enabling innovation like Artificial Intelligence
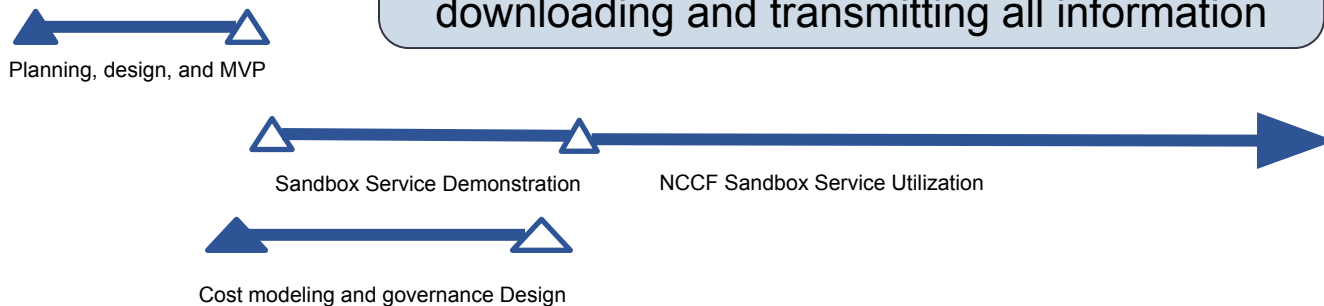
NCCF Sandbox Service

PI2	PI3	PI4	PI5	PI6	PI7	PI8	PI9	PI10	PI11	PI12	PI13	PI14	PI15	PI16	PI17	PI18	PI19	PI20	PI21	PI22	PI23	PI24	PI25	PI26	PI27	PI28	PI29

2021	2022	2023	2024	2025	2026	2027

Design → **Demonstrate** → **Utilize Sandbox Services as an initial capability** → **Sustainment Sandbox Capability**

Key Accomplishments & Insights:

- Three science teams identified from STAR and NCEI for the demonstration
- Demonstration will provide the usage patterns and help with cost modeling and governance for sandbox utilization

The Sandbox Service will bring developers, scientists and users to the data versus downloading and transmitting all information

Planning, design, and MVP

Sandbox Service Demonstration

NCCF Sandbox Service Utilization

Cost modeling and governance Design

NCCF Dissemination and Public Access Service

| PI2 | PI3 | PI4 | PI5 | PI6 | PI7 | PI8 | PI9 | PI10 | PI11 | PI12 | PI13 | PI14 | PI15 | PI16 | PI17 | PI18 | PI19 | PI20 | PI21 | PI22 | PI23 | PI24 | PI25 | PI26 | PI27 | PI28 | PI29 |

| 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |

- IOC for Access
- Distribution IOC with Fire Storefront
- Enterprise Dissemination and PDA Migration
- Sustainment of Access and Dissemination Capability

Flat Rate Egress Contract in place

NCCF Public Access IOC

Key Accomplishments & Insights:
- Flat rate cloud egress contract in place as of Q4 FY22
- Transition from public access pilot to NCCF in progress
- Completed Dissemination pilot in 6 months with login.gov integration
- Initial Operational Capability for public access Q4 FY22
- IOC for Distribution with Fire Weather Storefront in Q3 2023

Dissemination Pilot

Dissemination IOC

NCCF Enterprise Public Access and, Dissemination development and PDA migration

NCCF Enterprise Public Access, Dissemination and Iterative Optimization Releases

Creating one authoritative portal to all NOAA real-time and archived data assets, tailored to user experience

Summary

- NCCF is flexible, scalable, highly available and secure suite of cloud services to provide environmental data and science operations functionality to serve NOAA goals
  - Centralized data will enable development in the cloud across all stakeholders, promoting innovation while decreasing networking costs
  - NCCF is supports on-demand and HPC processing
  - Supports future AI initiatives on the compute and data management
- NCCF is an operational system
  - Demonstrated ability to meet latency, availability and reliability requirements
  - ATO met FISMA high requirements
  - Fault tolerant approach meets COOP disaster recovery needs
  - Data-centric architecture promotes scientific collaboration and innovation