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DIGITAL INFORMATION PLATFORM (DIP)
Request for Information (RFI) Informational Session
April 14, 2021

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Ground Rules

- Please **turn off your mic and camera** (for bandwidth issue)
- There will be a Q&A session at the end
 - You may post questions in the chat box while presenting
- There will be no break
- **This session will be recorded**
 - Slides and recording will be posted on DIP home page after the event



Purpose of Sessions

- This session is to go over elements of the Digital Information Platform **Request for Information** (Notice ID: NARC21DIP-RFI)
- Question and Answer will follow the presentation



Agenda

- DIP Vision and Motivation
- Example Use Cases
- Collaboration Approach
- Demonstration Progression
- Information Requested
- Question & Answer
- RFI Submission Instructions and Timeline



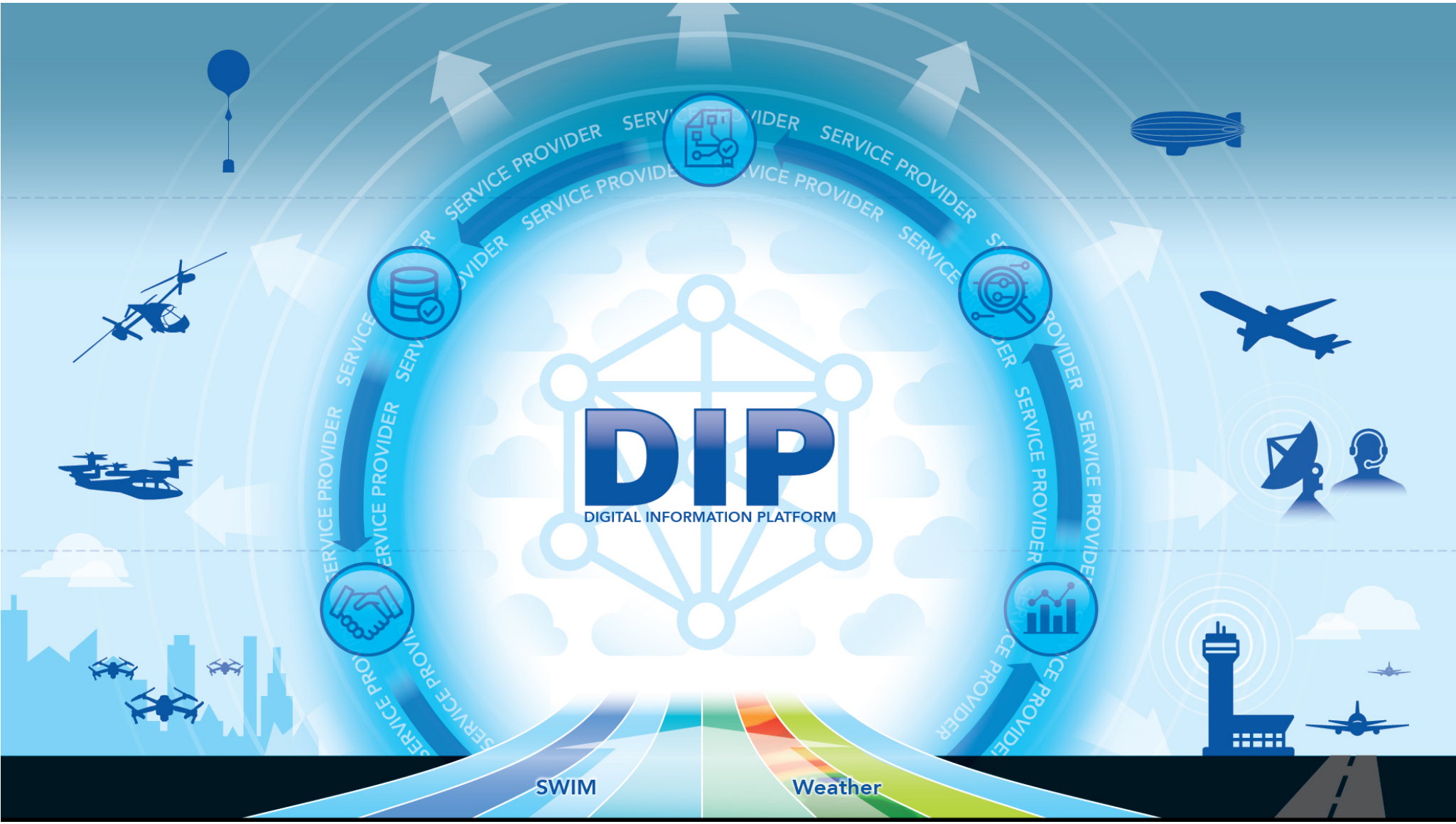
Digital Information Platform (DIP) Vision & Motivation

Sub-Project Background



DIP Vision

Accelerate transformation of the NAS through the development of a *foundation* for advanced, *data-driven, digital services* from *traditional operations and new entrants* to promote *cohesive decision making*





Motivation

- Current day ATM system is segmented by domain, operator groups and solution provider groups
 - A challenge for those who seek holistic (system wide) solutions
 - Very few understand all of the data producing systems and their artifacts
- Aviation community is trending towards wider range of operations types
 - New types of aircraft, and/or at a higher level of operational density
 - Complexity that requires higher levels of synchronization
- Traditional ATM system was built in an era when rapid technologies were not available or common
 - Changing the large and complex system-of-systems in the NAS is an overwhelmingly complex integration challenge in which very few innovators can contribute
 - Technology advances—in cloud-based infrastructures and artificial intelligence, for example—that are converging to further streamline access and conduct airspace operations in a more collaborative, integrated, and seamless way.



Formulation Input

From Sep-Nov 2019, NASA collected substantial formulative input from airline operators, airport operators, NBAA, FAA and vendor groups.

- Create an **architecture that allows high reuse of solutions** and serves as a building block for advanced capabilities
- Align NAS data assets to **leverage the explosion in data science technologies** to create an oasis of innovation (i.e. – create clean datasets for training)
- Establish an **environment to rapidly innovate** toward wholesale upgrades to NAS efficiency and safety
- Change the solution evaluation paradigm from large-scale field-based testing requirements to **smaller footprint cloud-based demonstrations**
- Pave the way for a **commercialization methodology for digital services** to be more quickly obtained from the cloud via trusted sources
- Evolve the use of cloud-based computing within the aviation system while increasing the ability to **rapidly collaborate across aviation development teams**



High Interest Data Assets



Transfer key data from ATC's and Operators into support tools

Important information from ATC and Operators is emerging in digital form such as the System Wide Information Management (SWIM) system.

Additional effort is required to fully extract and utilize this information for greater benefit to the aviation community.

- Specific examples of high interest digital assets (from community interviews)
 - Provide a capability that integrates key flight information from multiple sources for an accurate and reliable nation-wide stream of data in the cloud
 - Create objective measures of data quality that are shared with the community
 - Reduce data access rights limitations that prevent broader community innovation

Digital assets are the building blocks of future game-changing services

Image Credit: "Profile of bearded man with symbol neurons in brain," Lia Kolytina, <https://www.shutterstock.com/image-photo/profile-bearded-man-symbol-neurons-brain-622200797>, Royalty-free stock photo, purchased.



High Interest Services*

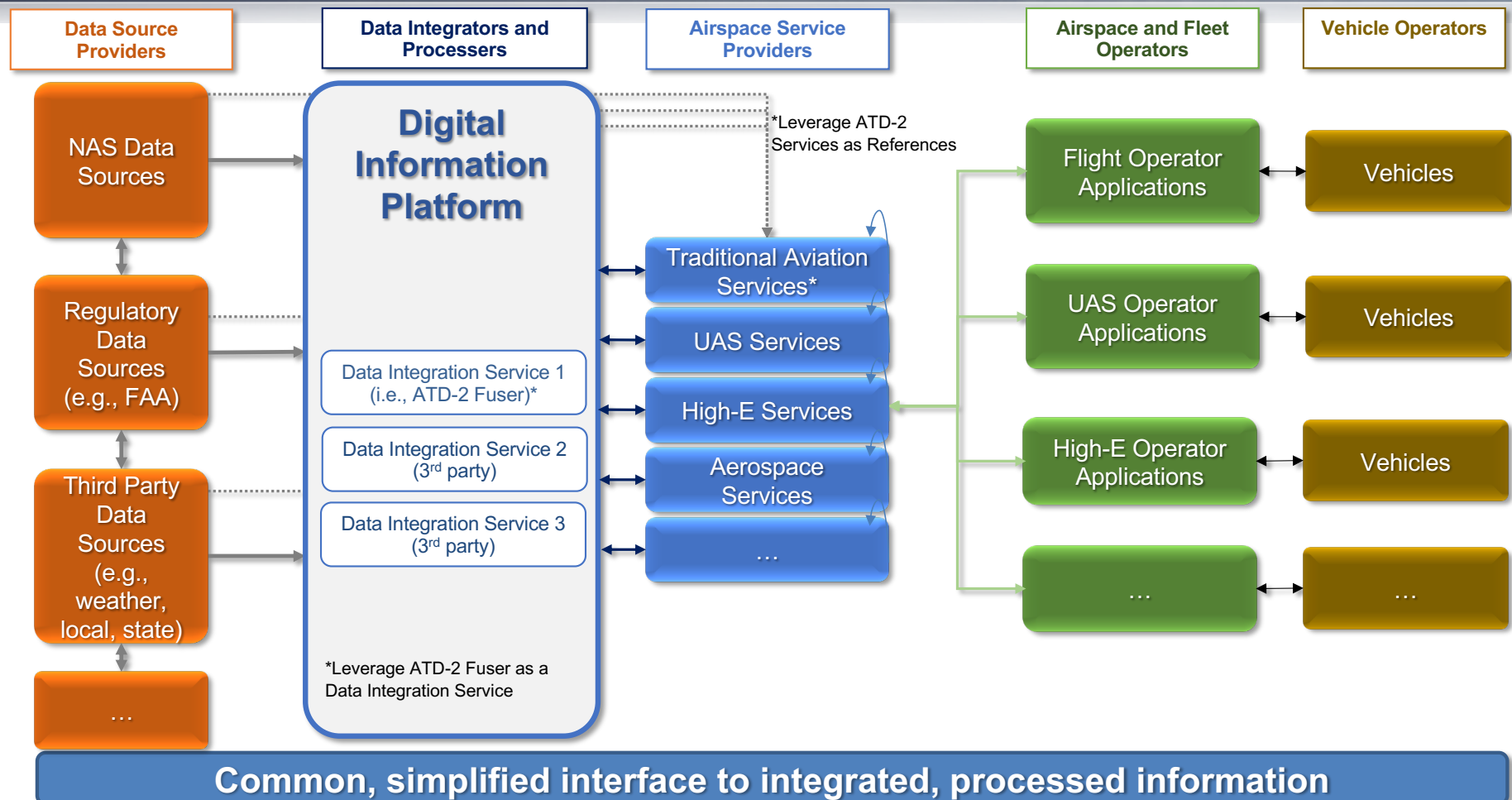
*listed services are subject to change based on stakeholder input

- From Sep-Nov 2019, identified highly-reusable services that can be leveraged as building blocks for more advanced capabilities for both traditional and new entrants:
 - **Digitize the re-routing process** (Trajectory Option Set) to make better use of existing capacity
 - Provide a multi-system, multi-domain view of **impacts to their flights from gate-to-gate**
 - Create services **that promote system-wide safety** related to new entrants
 - Provide services to help **reduce impact of space launch** (current day problem)
 - Create **disruption management services**. Faster recovery to nominal operations
 - NAS-wide **wind miles prediction** service
- Opportunities to apply Machine Learning and develop core data sets

Continue Partnership Input to prioritize services to enable for innovation



Notional Digital Information Platform





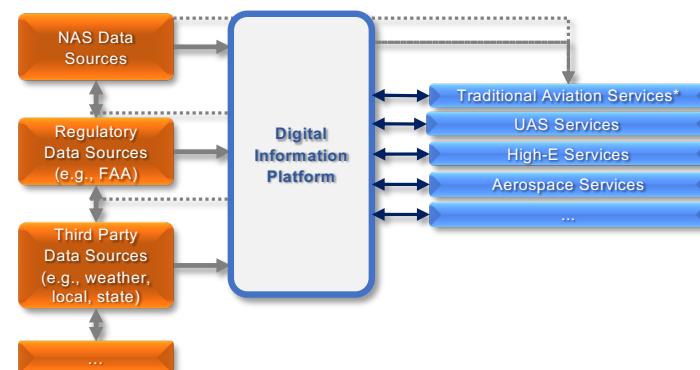
Leveraging Previous NASA ATD-2 Work

- Collaboration with SWIFT and CDM led NASA and Industry to realize that the SWIM-based services NASA used to build the ATD-2 system have value above and beyond their use in the ATD-2 Field Demo
- **Fuser**
 - Ingests voluminous air traffic data from disparate sources and intelligently organizes it to deliver the **right data, at the right time**
- **Fuser-to-Cloud Connection**
 - Connects NAS-wide Fuser to Consumers via Cloud
- **Re-Route Digitization Service**
 - Digital rerouting of departure flights that accounts for real-time demand/capacity imbalances and incorporates flight operator preferences via Trajectory Option Sets (TOSs)
 - Multiple flight operators from multiple airports used the system to intelligently identify and execute reroutes in coordination with FAA traffic managers
 - Builds on Reusable Services: Airport Configuration Prediction, Arr/Dep Runway Prediction, Taxi Time Prediction (OUT & IN), ON time prediction



Benefits of Digital Information Platform

- Increase the use of NAS Information powered by Advanced Technology
 - Integrated and fused data from FAA, airlines and other sources
 - Common, simplified API to access the fused information
- Improve operational flexibility with the development of user-informed airspace management services
 - Ecosystem of NAS-wide available digital services open to all, using high quality information from DIP
- Leverage Third Party Services and continue progress towards a service-oriented architecture
 - Establish new partnerships with solution providers with the goal of industry building the technologies
- Enable more and new types of operations by creating a scalable and resilient airspace system





DIP Technical Goals



- **Discoverable Data & Services** – easy to understand and find information and services
 - (e.g., get a full picture of a flight using DIP services without relying heavily on deep subject matter expertise to handle complex, real-time SWIM data)
- **Scalable Integration** – able to connect variety of data sources and data-driven services, including
 - Fused data services for real-time decisioning and collaboration
 - Post-operations analysis and understanding
- **AI/ML & other Advanced services**
 - Able to create machine learning or artificial intelligence models and data pipelines, for innovative ways to plan and understand operations (e.g., runway arrival prediction model)
 - Standardize data API to be more data-science friendly
- **Adaptability/Configurability** – ability to adapt and configure DIP services for
 - Re-using and connecting one or more services to align with a specific operator's needs (e.g., integration with specific operator scheduling or planning systems)
 - Learning and adapting one or more advanced AI/ML services (e.g., customizing models for specific region)
- **Trust** – trust the data services, with secure access for producers and consumers of services

Improve the access and usability of NAS data services for operator decision support tools and for collaborative decision making among all NAS users



Programmatic Objectives



- **Stakeholder-Informed Platform:** Create stakeholder-informed requirements for a digital data platform to improve the deployment and access of services
- **Validated Reference Implementation:** Develop an MVP reference implementation of DIP to validate stakeholder-informed requirements
- **Data Needs for Services:** Evaluate a variety of services to identify data needs for the DIP architecture
- **Demos with Partner Collaboration:** Coordinate demonstration with stakeholders of reference technologies, new service(s) and DIP framework
- **Recommend Processes:** Share best practices for sharing data and data handling among stakeholders in the DIP community

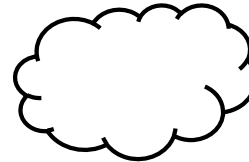
Use a collaborative approach with the community to define, develop and demonstrate the benefits of a Digital Information Platform and promote concept adoption



Example Use Cases



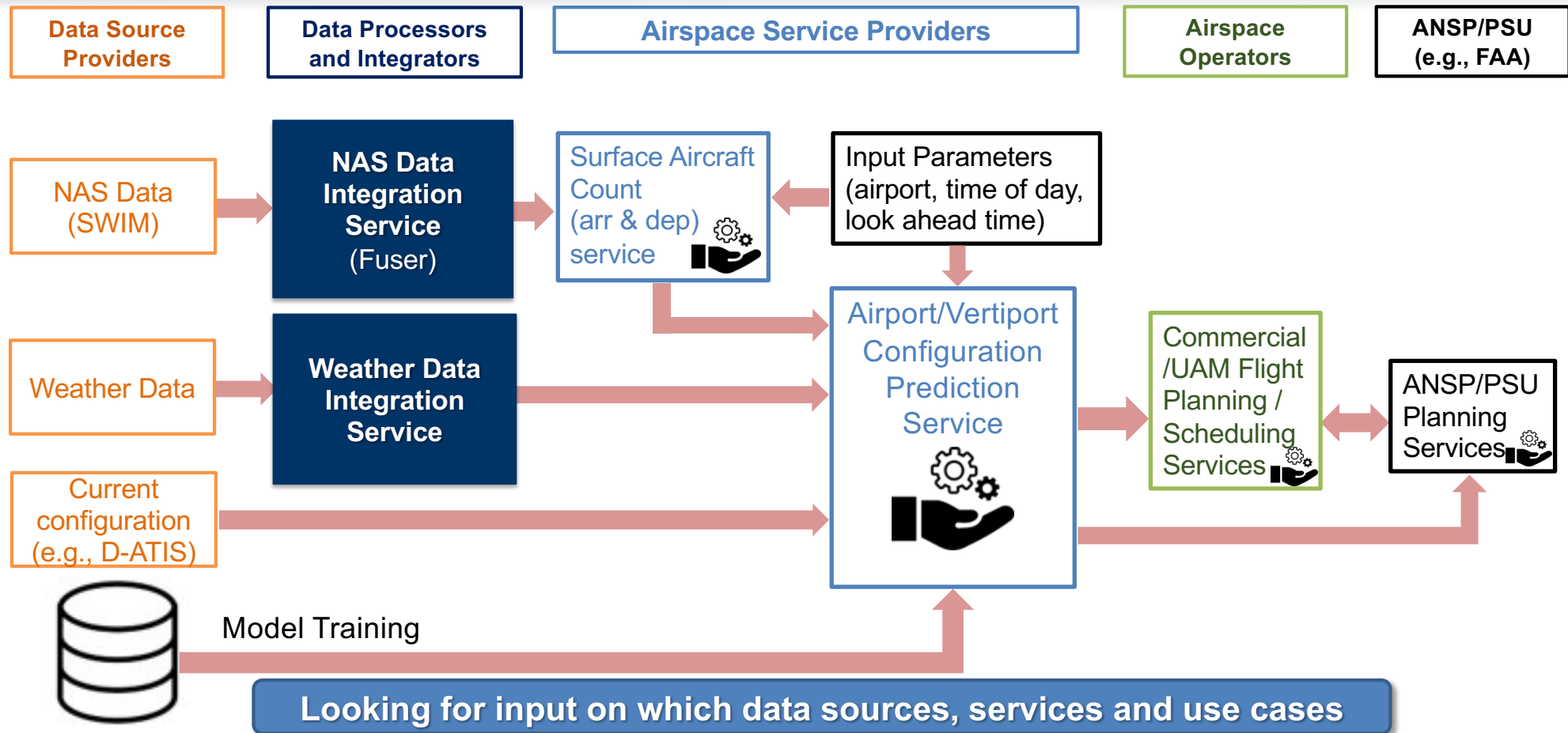
Description of Actors



	DATA PROVIDERS	DATA INTEGRATION	PLATFORM HOST	SERVICE PROVIDERS	OPERATORS
Examples	• FAA and Govt Orgs • Flight Operators • Space Telemetry • City, Regional Authorities	• Companies/Orgs with Data analytics, ML, AI, etc.	• Public or private cloud providers	• Industry Vendors • Operators – services sector	• Airlines, Flight Operators, Airport Operators, FAA • New Entrants: PAAV, UAM • UAS and sUAS • Travel Apps
Role	• Primary Source of Data	• Offer Data Integration Services, for different types of data	• Cloud infrastructure or platform services provider • Expertise in cloud operations and hosting services	• End user of Fuser • Developer of Service • End user of other services	• End User of Service
Interest	• Make valuable data available	• One stop shop for best and standardized information	• Use cloud and devops expertise to host DIP • Note: NASA will host reference implementations and facilitate demos	• Use best data available to deliver high quality services • One stop shop for high quality information	• Initial beneficiary of new digital services • One stop shop for high quality services

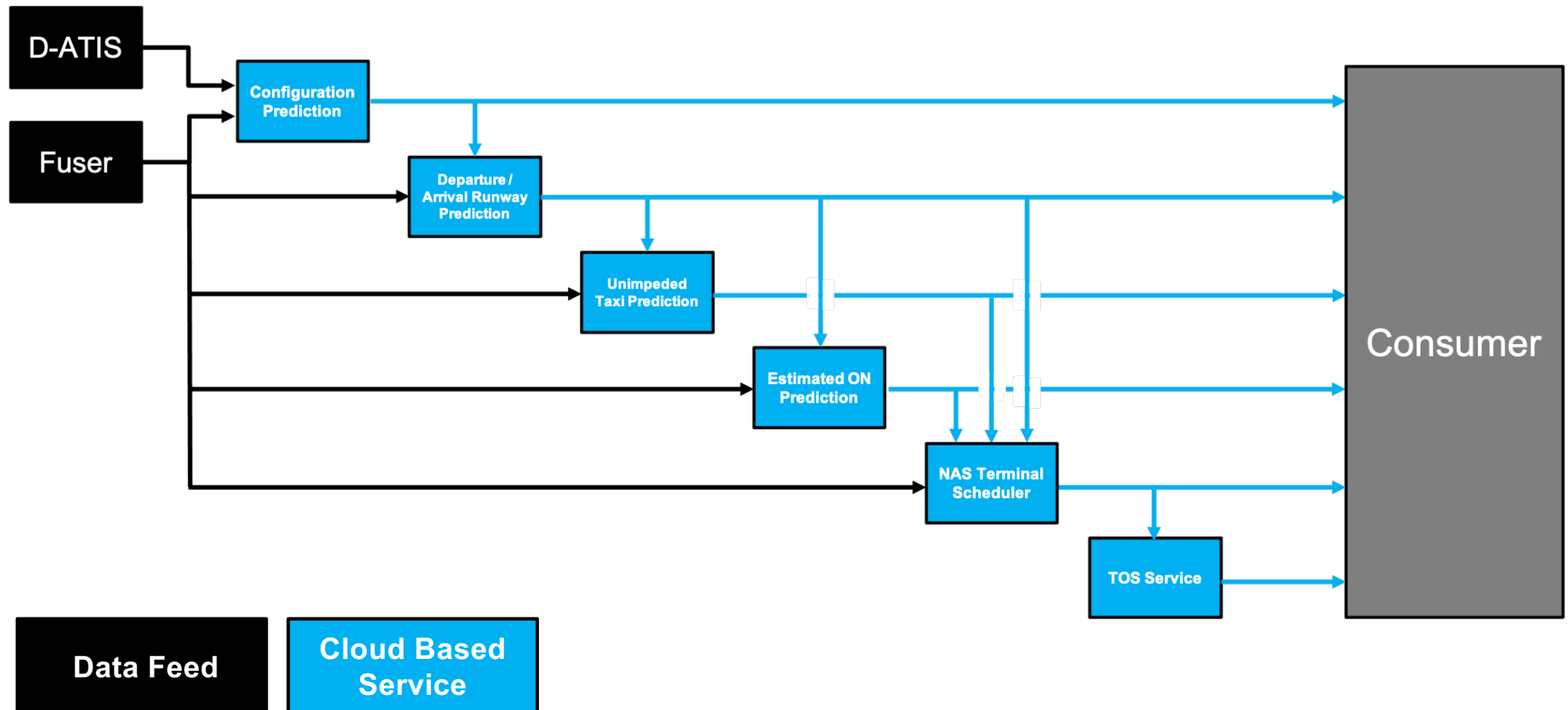


Use Case: Airport/Vertiport Configuration Prediction





Reference Implementation Example





Collaboration Approach



Who Should Participate

DATA SOURCE PROVIDERS

FAA Sources/SWIM
Airline
Airport
Vehicle
Weather



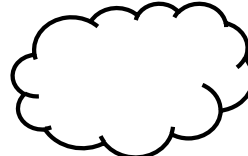
DATA INTEGRATORS

Industry
Academia



PLATFORM HOST

Public Cloud
Private Cloud



SERVICE PROVIDERS

Service Developers
Industry
Academia



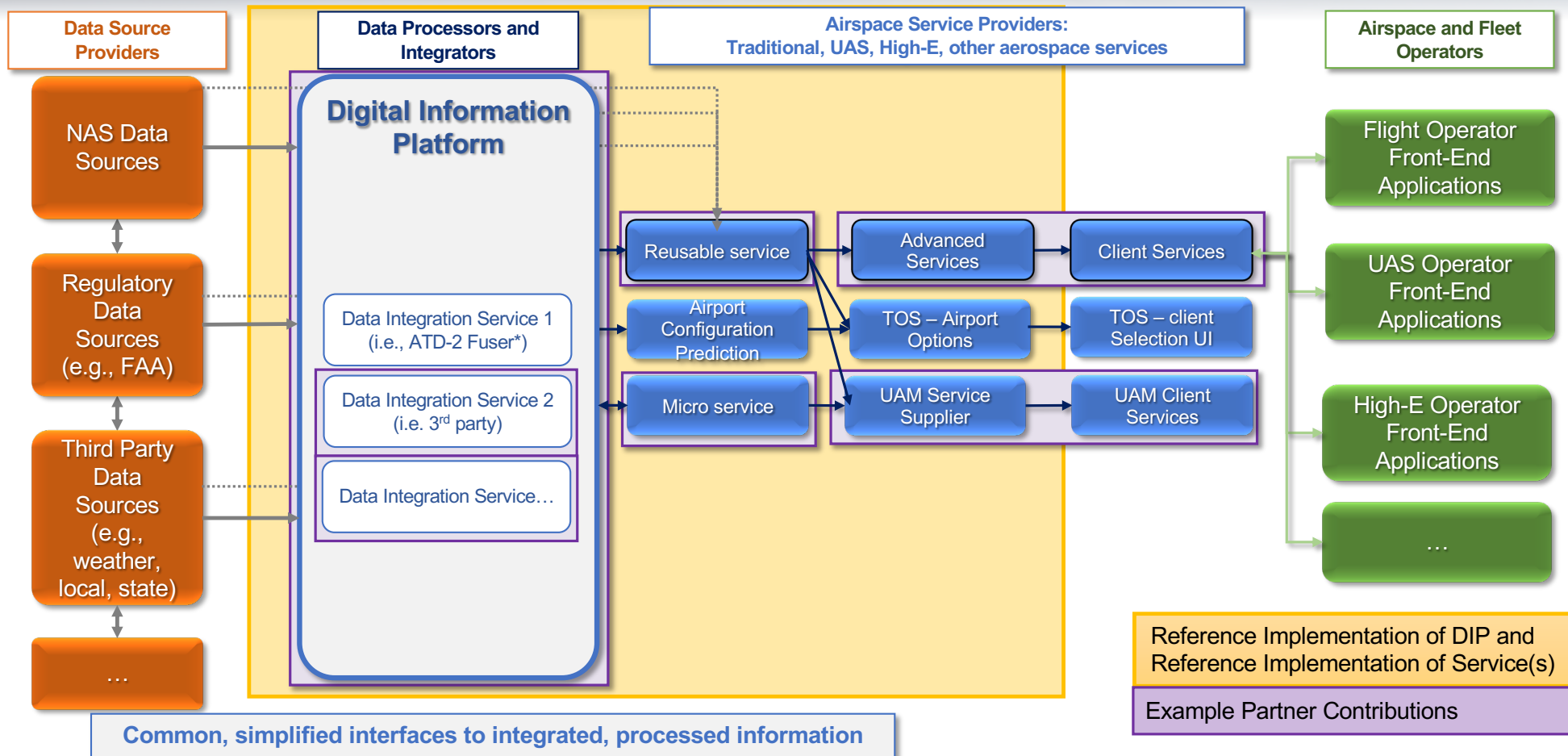
AIRSPACE/FLEET OPERATORS

Service Consumers
Airlines
Airports
UAS Ops
AAM Ops
Space Ops
FAA
Research Orgs





DIP Notional Ecosystem





Benefits of Participating

- **Define and Contribute**
 - Be an Industry Contributor to drive the data services architecture
- **Develop and Showcase**
 - Develop capabilities early and Participate in demonstrations
 - Be a Data Champion for your organization
- **Spur Efficiency and Growth**
 - Collaborate with NASA to drive standardization of new data and new services

Have a VOICE in DIP design and be EARLY to adopt



NASA's Role

- NASA has a congressionally mandated charter to help keep the U.S. #1 in the world in Aeronautics
 - includes both industry and government agencies
- NASA has contributed to the aviation system for many years
 - TBFM (TMA, part of CTAS suite)
 - ATDs (ATD-1 TSAS, ATD-2 IADS, ATD-3 NASCENT)
 - Hundreds of research contributions
- NASA's leadership on Unmanned Airspace System Traffic Management (UTM) unveiled **design patterns and partnership collaboration** that it believes are **necessary for rapid technology adoption** in commercial aviation



Example Contributions by Interested Parties

- Provide and share current (or future) operational needs and pain points to current system
- Provide data and define data elements upon which services can be built
- Define and provide APIs to access and retrieve data
- Apply model/logic to transform and integrate data into airspace management services
- Provide data and cloud infrastructure value-added services for DIP Collaborative Demo implementation
- Provide advanced big data, machine learning, artificial intelligence solutions
- Develop and test requirements to standardize API between DIP and connected services
- Develop and validate metrics to evaluate DIP performance
- Define reporting and performance requirements for data information and services to characterize against expectations
- Provide and share current (or future) regulatory needs
- Test and validate components of DIP including interfaces, services, data inputs and outputs

Ideas of how Interested Parties can contribute towards Collab Demos



Example NASA Contributions

- Access to subject-matter experts (SMEs) and researchers involved with the development and evaluation of DIP concepts, technologies, and procedures
- Access to SMEs with relevant operational and testing expertise in Air Traffic Management
- Access to relevant DIP software components, supported by appropriate software usage and licensing agreements (to be determined) for reference use
- Access to relevant test environments for fast-time and real-time airspace simulation and demonstration platforms
- Access to relevant data from DIP research and development evaluations
- Access to necessary air traffic operations data through shared APIs or repositories
- Access to relevant third-party government (local/state/federal) data that may be needed for shared data services
- Facilitation of data/information sharing agreements among/between partners to make data services viable

NASA support available to ensure successful collaboration



Demonstrations Progression



Goals of Collaborative Demonstrations

- Demonstrate to stakeholders the quantifiable benefits of a digital information platform with data-driven services built upon it
- Assist industry in adopting DIP concept for operational use
- Scope, technical focus, progression, desired outcomes and products will be refined based on responses to RFI and follow-up discussions
- Nominally targeting one major event per year in 2022-2024



Overview of Proposed DIP Demos

Capstone Collaborative Demo (2024)

Demonstrate an end-to-end DIP system continually running in shadow mode to an operator facility

CCD

Collaborative Demos (2023-2024)

- Integrate additional data and services for reuse or decision support
- Demonstrate connectivity with an operator facility in a series of limited-duration dry run tests

CD

Infrastructure Build-Up (2022)

Demonstrate connectivity across an end-to-end DIP system with access to NASA reference implementation services

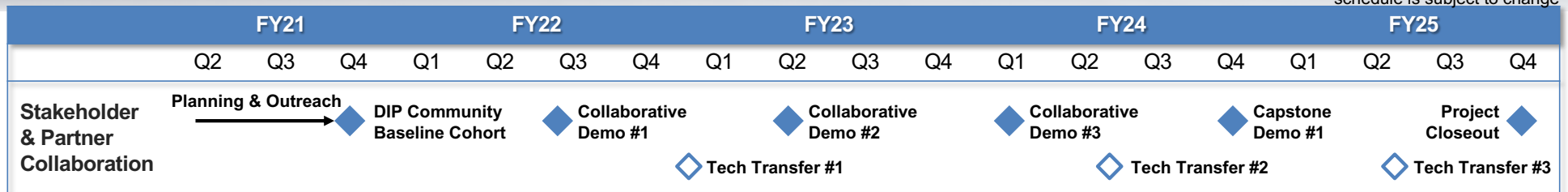
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DIP Milestones*



*schedule is subject to change



Demo #1: Build up and Partner Integration Demo:

Demonstrate ecosystem of NASA reusable micro services in the cloud to support more advanced or decision support services for traditional operations.

- Deploy Fuser in the Cloud
- Release reusable services: ATD-2 complex services broken up for “reuse” for other decision support services to leverage (e.g., TOS-based re-routing)
- Evaluation/Self-scoring of ML services

Partnership

- Connectivity testing to DIP and reusable services
- Partners observe and feedback to concept

Demo #2-3: Collaborative Demo:

Demonstrate ecosystem is scalable for conventional and can be leveraged by new entrants

- Add new reusable services (NASA & 3rd party)
- Add new 3rd party data sources to support reusable services
- Reference implementation of decision support service (e.g., TOS@NEC)

Partnership

- 3rd party of reusable services and data
- 3rd party compete ML models in the cloud
- Operators connect and leverage services
- Other NASA project services.(i.e., SWS)

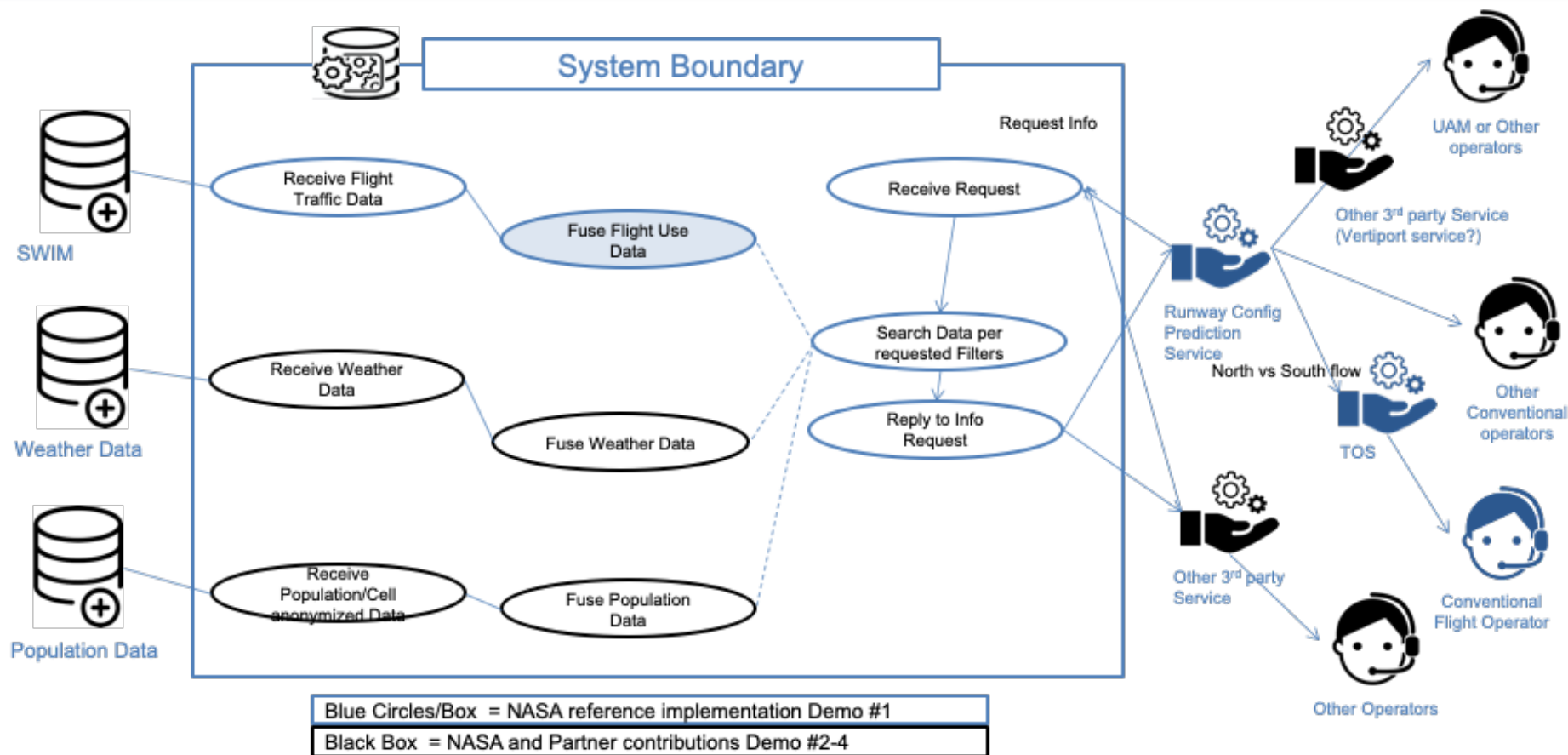
Capstone Demo #1: Demonstrate system of system benefits when using common information and reusable services

Partnership

- Ensure DIP information reaches operator’s decision support services
- Showcase successful adoption of concept and technologies



Demo Progression for Services as Building Blocks





Information Requested



Summary of Information Requested

- **Parties Contact Information**
 - Point of Contact, Email, Address, Phone
 - Other organizations part of the interested team for collaboration
- **Concept Input**
 - Needs, Challenges and Pain Points
 - Operational Concept Input
 - Highly desired Data Assets and Services
 - Concept Adoption Feedback
- **Collaboration Interest**
 - Collaboration Approach Feedback
 - Proposed Partner Contributions
 - Feasibility of Contribution
 - Prior or existing NASA collaborations
 - Technology Transfer requirements



DIP Concept Input

- What **challenges or issues** do you face integrating data and services into operations?
- Are there any **specific features or capabilities** that DIP could provide to address these challenges?
- What expectations are there in the **operational view** to integrate and operate under the DIP framework?
- What should be considered for DIP to integrate into your **operational environment**?
- Are there any scenarios or use cases that would be of high interest to test in a virtual or operational environment?

Seeking input to identify needs and gather stakeholder requirements



Data Needs

- Describe the data that would be beneficial to integrate and how that data will be consumed.
 - Are there data feeds that could be utilized differently than applied today?
 - Are there missing data feeds that you feel would be beneficial for a data information platform to incorporate?
 - Are there specific concerns you have regarding existing data feeds (e.g., accuracy, timeliness, volume)?
- What methods are desired to request and receive the data?
- If applicable, does your organization share or intend to share data that could be ingested into DIP, either real-time or historic? Any limitations to sharing the data with other partners?
- If applicable, do you have security protection process in place to properly secure any non-public data being shared through DIP?

Seeking input to identify requirements for data needing integration and mediation



Services Needs

- Which services should be developed that are high value and can be reused as building blocks for more advanced services? Consider services that are of high value to traditional and emerging fleet operators to build more advanced or data science services.
- If applicable, does your organization offer or intend to offer services that could benefit from integrating with DIP? If so, provide a description.
 - If applicable, do you have security protection process in place to properly secure any non-public data being shared through DIP?
- If applicable, does your organization offer or intend to offer services that could benefit from integrating with DIP? If so, provide a description.

Seeking input to identify requirements for high-value, reusable services



DIP Adoption Feedback

- Identify requirements or limitations to the technical approach of implementing DIP and services such that it is supported by the community.
- What obstacles would your specific organization face in order to participate in the collaboration?
- What are your business priorities when deciding to invest in the development of DIP components and its adoption?
- What additional information do you need from NASA and/or others in the community to make a collaboration or investment decision on DIP and integrated services?

Seeking input to path to successful adoption and technology transfer



Collaboration Interest

- DIP Collaboration Approach:
 - Feedback on overall DIP approach to the engagement model with the community
- Proposed Contributions:
 - Specific partner contributions, anticipated level of effort, timeframe, capabilities, technologies, and other resources
- Proposed Role/s in DIP:
 - Self-identification of respondent's envisioned contributor role based on the notional DIP ecosystem diagram
- Proposed NASA Contributions:
 - Specific expertise and support needed from NASA.
- Feasibility of a Collaboration:
 - Type of agreement with NASA desired by the organization, and why
 - Any considerations, circumstances, or issues that would need to be addressed in an agreement
- Prior and/or Existing Collaborations with NASA (if any):
 - Description of past and present partnerships with NASA, including type of agreement and connections to/from NASA networks (if any).

Seeking input to articulate potential partnership profile



Q&A



RFI Submission Instructions and Timeline



What to Submit

- Response should address each of the questions in Concept Input and Collaboration Interest
- Format: Microsoft Word, PowerPoint, or PDF format
- Files should be
 - No greater than 25MB
 - Recommended max 18 pages
- All responses to this RFI shall be submitted to the URL:
 - <https://nari.arc.nasa.gov/atmx-dip-rfi>



Upcoming Dates and Times



Key Dates	What to Expect	Timeframe
RFI Published	This Request for Information is made available publicly to solicit response from community	March 22, 2021
DIP RFI Information Session	DIP concept and platform overview. Review RFI and Q&A before responses deadline	April 14, 2021
RFI Responses DUE	Community submission of RFI responses	May 14, 2021
Next Steps for Collaboration Brief Out	Share how we are using the RFI information Share next steps for collaboration opportunities	July 2021

- RFI is published:
 - <https://beta.sam.gov/opp/72937e9b69834a708b216cbb3540699e/view>
- All responses to this RFI shall be submitted to the URL:
 - <https://nari.arc.nasa.gov/atmx-dip-rfi>
- All other inquiries shall be directed to the E-mail:
 - ARC-DIP-EXT@mail.nasa.gov
- Contracting Office Address:
 - NASA/Ames Research Center, JA:M/S 241-1
 - Moffett Field, California 94035-1000



Thank you for joining!