SMART NAS Test Bed

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SMART-NAS Test Bed Overview
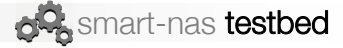
smart-nas **testbed**

- Problem and SMART NAS Test Bed role

- Metric and Benefits

- Objectives

- Test Bed

- Use-Case Driven
  - Trajectory-Based Operations
  - UAS Integration

- Status

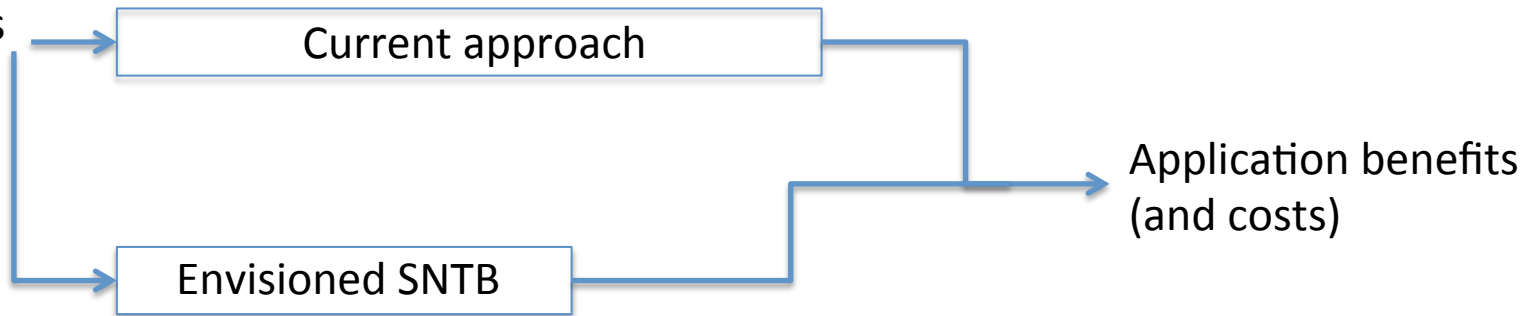# Problem

Pro-longed concept and technology development

- lack of archived/historical data access/sharing
- absence of scenario generation capability
- pro-longed "socialization" of C&T by stakeholders

SNTB Role

Trajectory Based Operation Concepts & Technologies

Current approach

Envisioned SNTB

Application benefits (and costs)

Time from concept to deployment and beyond

Metric

- ## Concepts & Technologies measures:
  - Efficiency
    - Delay/cost reduction
    - Increased throughput
    - On time/predictability/stability, flexible schedule/on demand
  - Maintain or enhance safety and environmental impact
  - Maintain or reduce workload
  - Equity
  - Adherence

Accelerated delivery of benefits of Concepts & Technologies

Benefits

- **Higher Complexity and Broader Scope**
  - Integrate across ATM domains and beyond physical labs
  - Evaluate more diverse operations

- **Higher Fidelity**
  - Standardize simulation infrastructure across work-groups
  - Use live, virtual, and high-fidelity constructive assets

- **Easier Access to Real-time Simulations**
  - Automate human-intensive preparation and post-processing
 - Leverage advances in software assurance and big data

Objectives

Enable high-fidelity human-in-the-loop and automation-in-the-loop simulations and tests that are either impractical or impossible today but are needed to:

- Validate concepts using multiple operational domains (gate-to-gate TBO)

- Investigate concepts related to revolutionary operations (UAS integration)

- Provide a high-fidelity test environment for real-time system-wide safety assurance (RSSA) capabilities
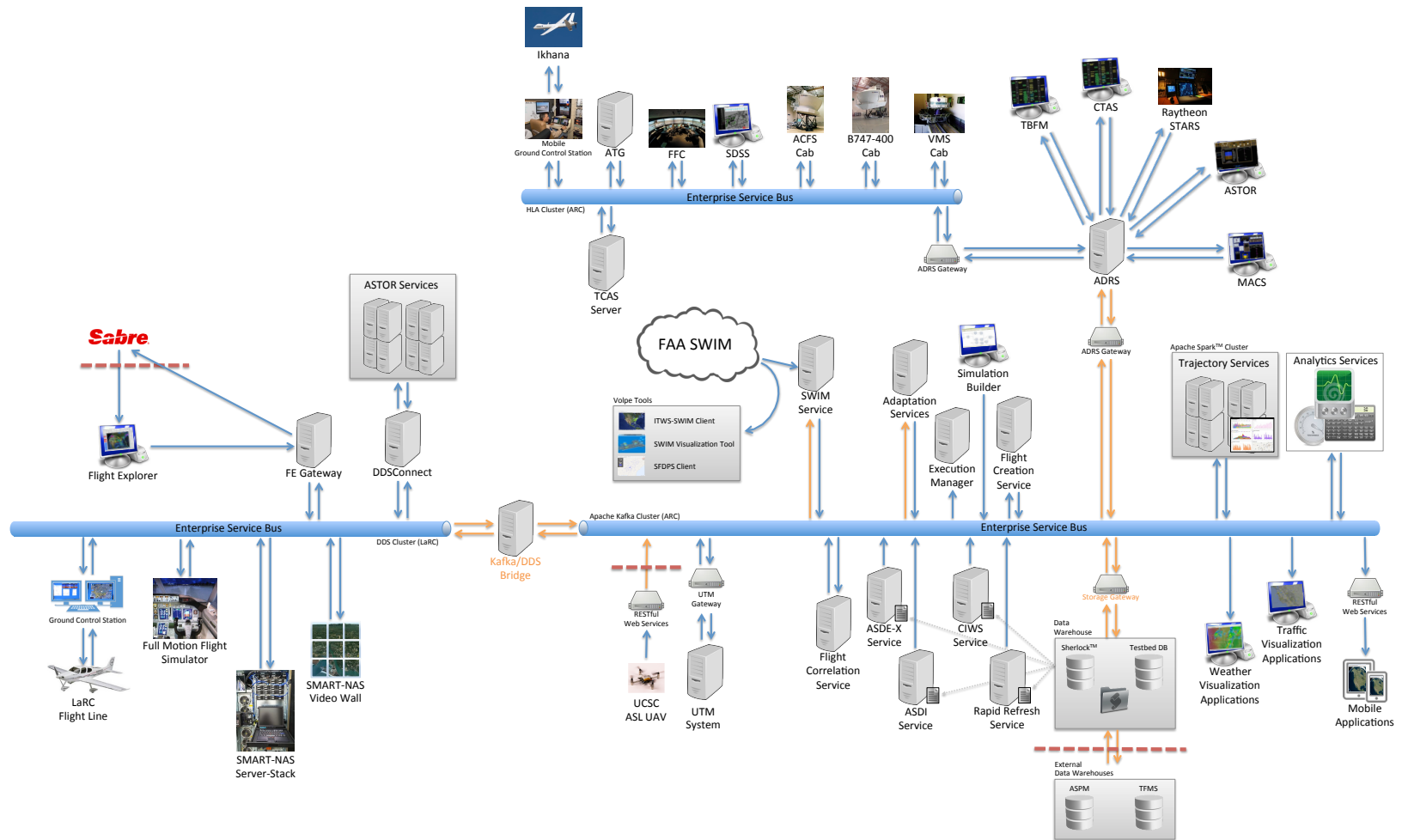
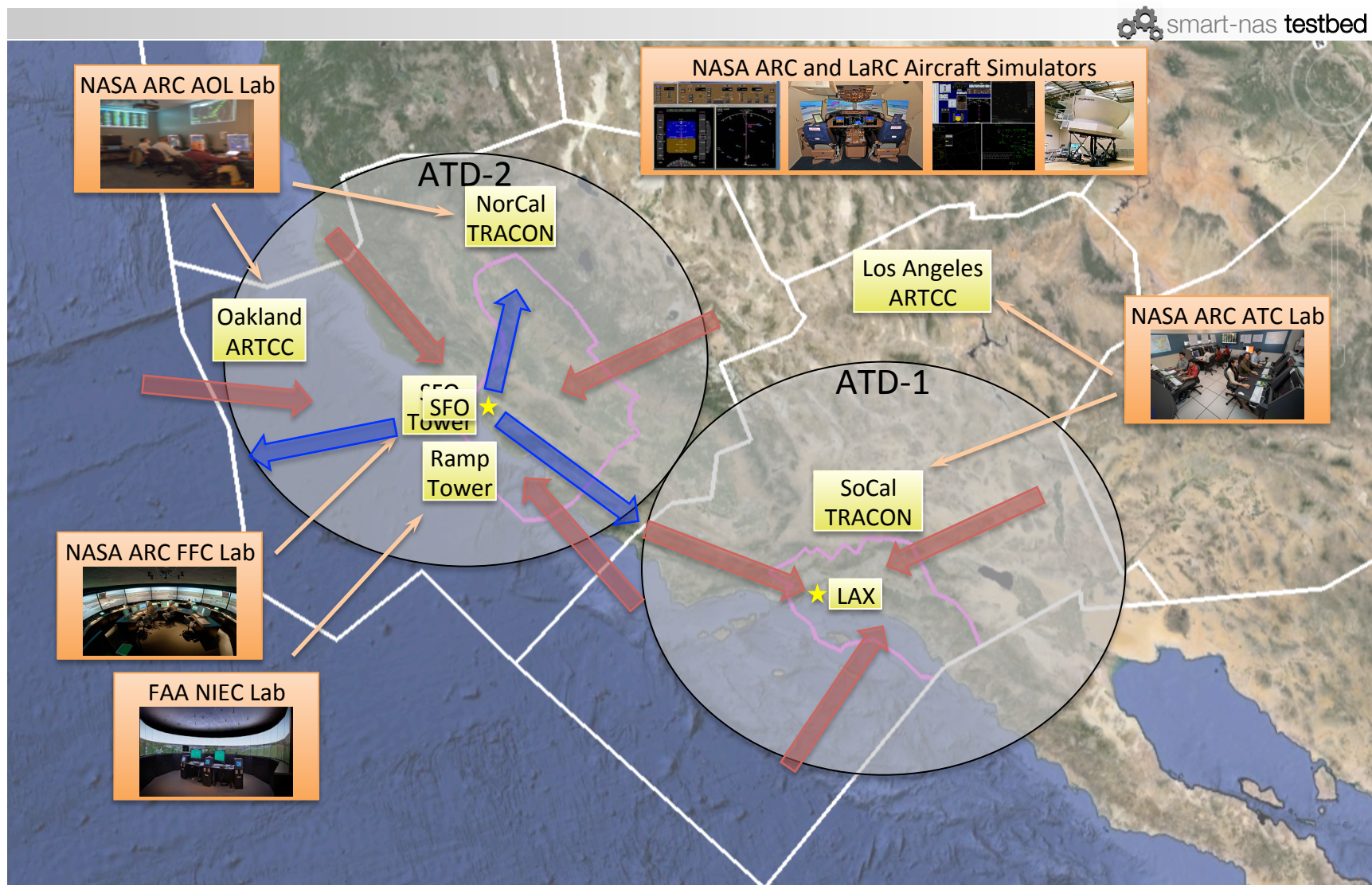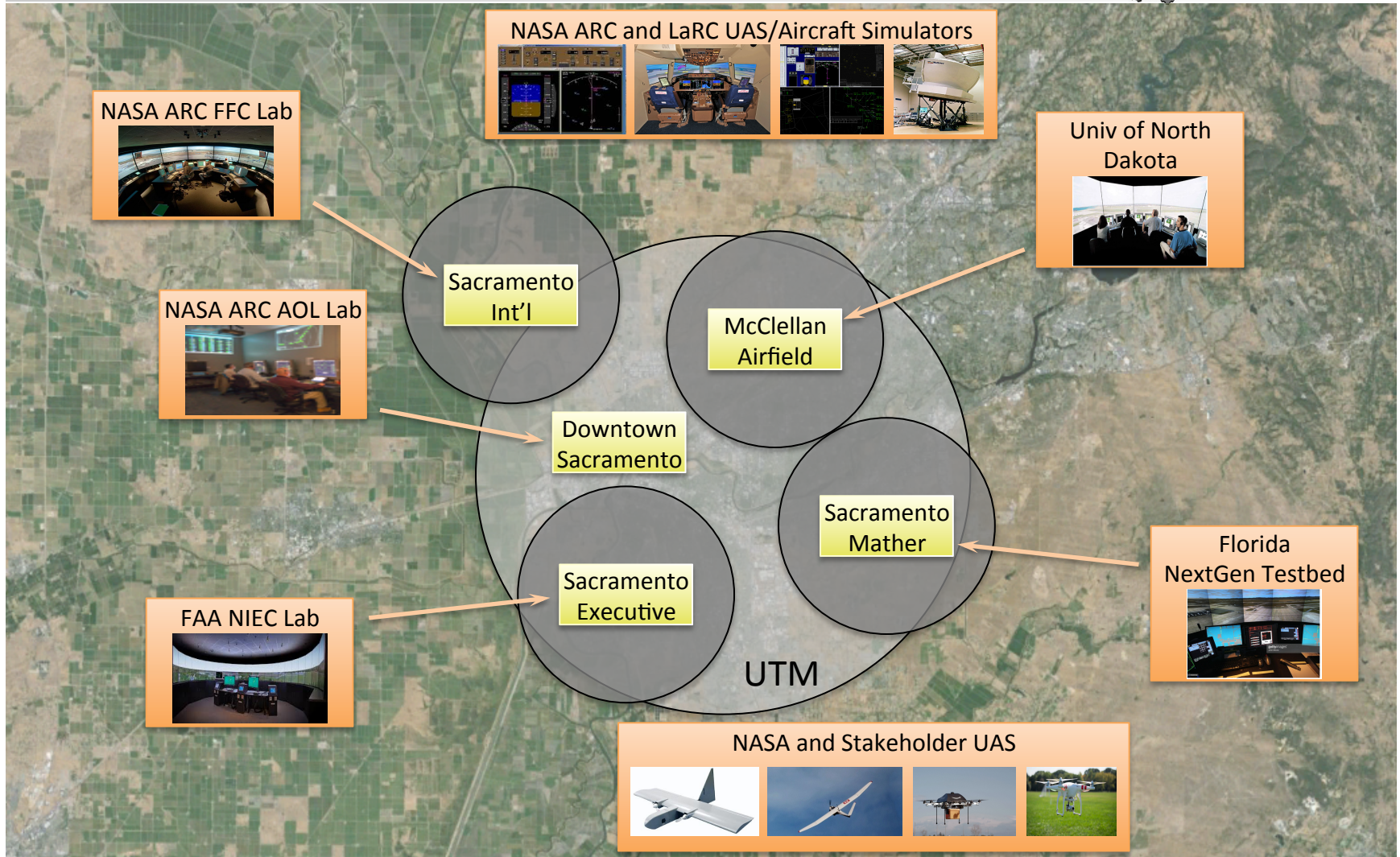# SMART NAS Test Bed and Context
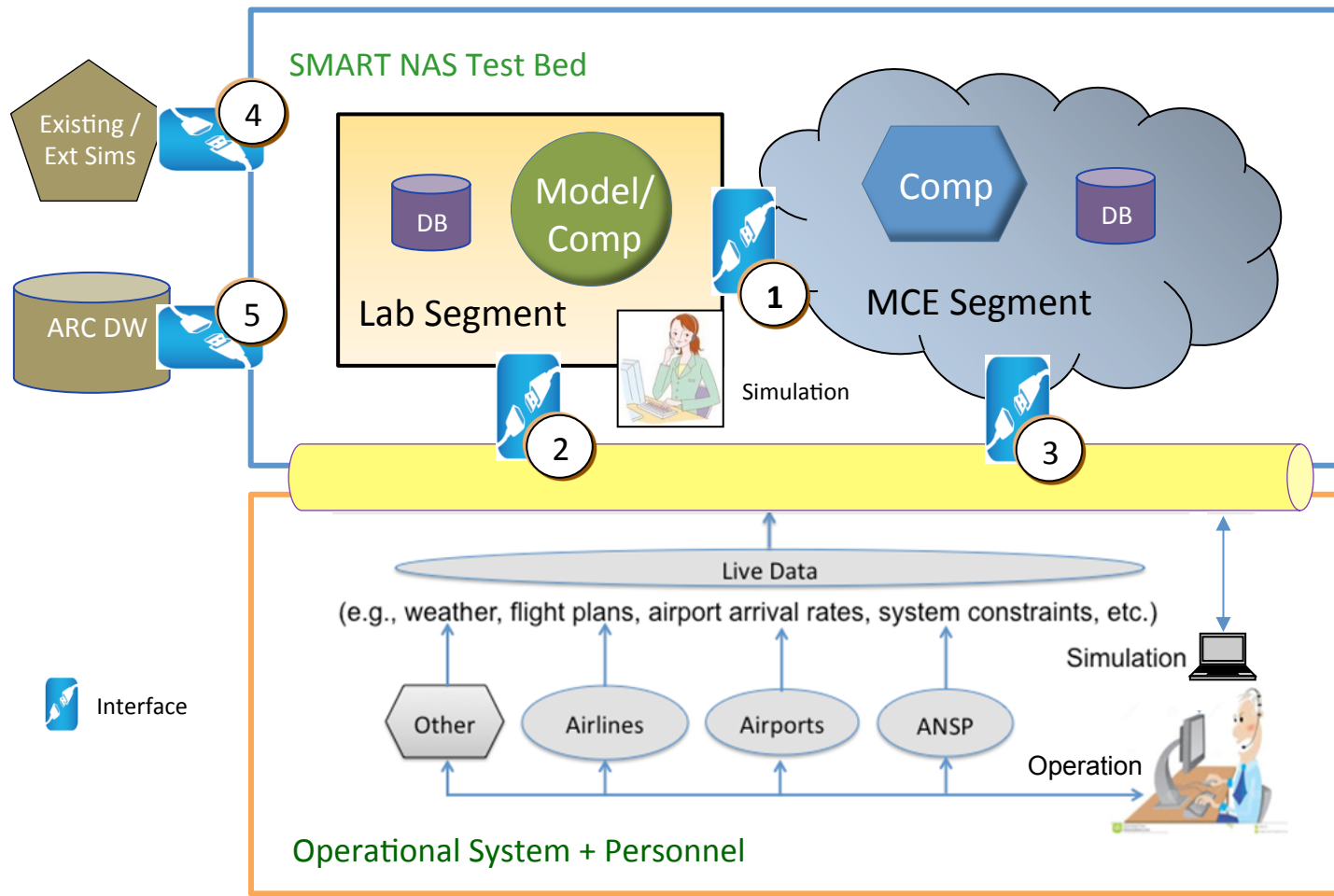
SNTB Year #1 Architecture

Arrival/Departure TBO Use Case

Integrated UTM Use Case

Status

- ## Finished 2-Year Testbed Architecture NRAs
  - Defined enterprise service bus architecture for distributed high-fidelity simulations
  - Cost/benefit assessments showed positive benefits for both research activities and deployment of new ATM systems

- ## Developed Proof-of-Concept Testbed Software
  - Focused on traffic, weather, and airspace data integration
  - Investigated several software assurance, cloud-computing, big data, and real-time analytics technologies relevant to implementation

- ## Implementing Full-scale Testbed Software
  - Realistic scenario design and validation for gate-to-gate TBO simulations
 - Scalable and distributed data provider for real-time data analytics
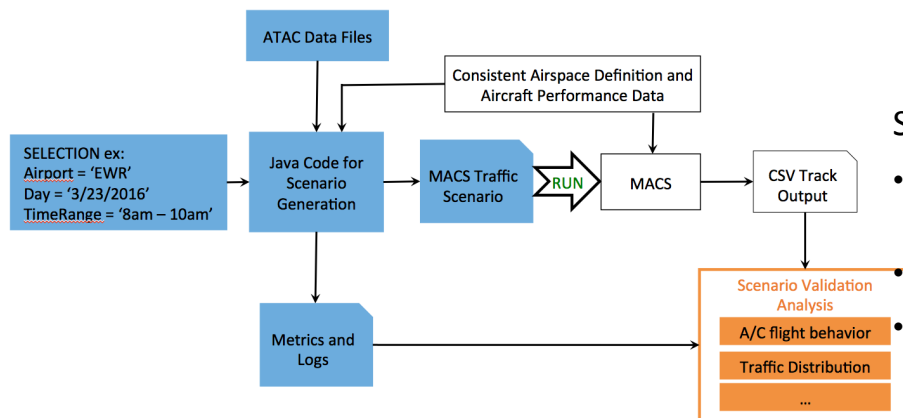
SMART NAS Test Bed Highlight
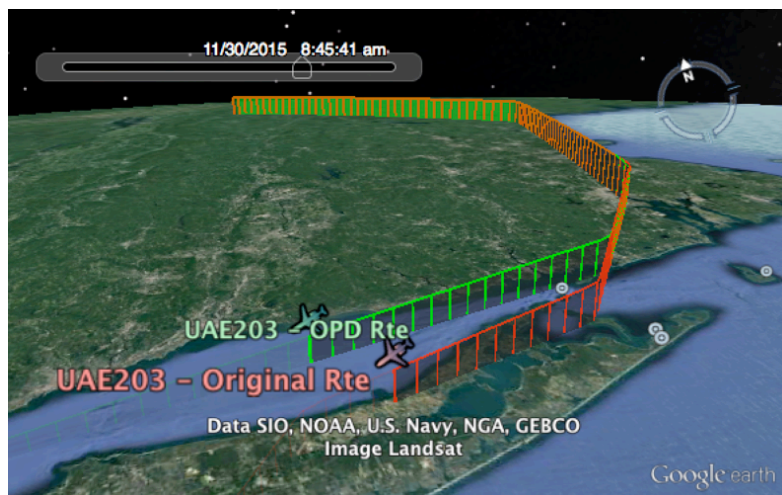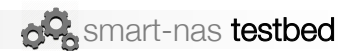
Early exploration enabling metroplex-type simulation of NY-area airports. As part of NY TBO project and working with PANYNJ

- In July 2016, NY metroplex with combined arrival, departure, and surface operations was simulated using early SNTB execution and connection framework for distributed simulation

- Preliminary SNTB enabled metroplex scenario simulation
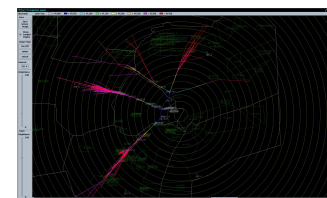
Scenario Validation (Use Case #2)

- Initial auto-generation of MACS scenario input file from data in database (minutes to generate)

- Manually verify on MACS and keep statistics

- Next: automating the verification step

Demo

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