SMART NAS Test Bed

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SMART-NAS Test Bed Overview

- 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
• 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
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

SMART NAS Test Bed

Lab Segment

Model/Comp

DB

ARC DW

Existing / Ext Sims

Operational System + Personnel

Live Data
(e.g., weather, flight plans, airport arrival rates, system constraints, etc.)

Other
Airlines
Airports
ANSP

Simulation

Operation

Simulation

SMART NAS Test Bed

MCE Segment

Comp

DB

ExisEng / Ext Sims

4

5

1

2

3

Interface
Arrival/Departure TBO Use Case
Integrated UTM Use Case

UTM

- Sacramento Int'l
- McClellan Airfield
- Downtown Sacramento
- Sacramento Executive
- Sacramento Mather
- Florida NextGen Testbed
- NASA ARC FFC Lab
- NASA ARC AOL Lab
- FAA NIEC Lab
- NASA ARC and LaRC UAS/Aircraft Simulators
- Univ of North Dakota
- NASA and Stakeholder UAS
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
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