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
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

SMART NAS Test Bed

Lab Segment

Model/Comp

DB

ARC DW

Existing / Ext Sims

4

5

Operational System + Personnel

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

Other

Airlines

Airports

ANSP

Operation

Simulation

Simulation

Comp

MCE Segment

DB
Arrival/Departure TBO Use Case
Integrated UTM Use Case

UTM

Sacramento Int’l

McClellan Airfield

Downtown Sacramento

Sacramento Mather

Sacramento ExecuEve

Univ of North Dakota

Florida NextGen Testbed

NASA ARC FFC Lab

NASA ARC AOL Lab

FAA NIEC Lab

NASA ARC and LaRC UAS/Aircraft Simulators

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