Air Traffic Management-eXploration Testbed for Urban Air Mobility Research and Development

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Testbed Vision

• Testbed is a distributed air traffic simulation capability to **accelerate** the introduction of technologies in the National Airspace System.

• Its core purpose is to enable **realistic simulations** of proposed air traffic concepts with real systems and data.

• It enables our ATM **community**, consisting of government, industry and academia, to **share** and **leverage** each other’s data and tools.
Outline

• Testbed Goal
• Testbed Features
• Architecture Design
• Progress
• What’s Next?
• Take Away
Testbed Goal

• Accelerate National Airspace System Transformation
  – Simulation
  – What-if Analysis

• Create Best Design (NRA 2014-2015)
  – Architecture Design
  – Cost and Benefit Assessment

• Overcome Challenges
  – Data Sharing
  – Scenario Generation
Testbed Features

- Community Pooled Resources (e.g., Data)
- Defined Workflow
  - Automated Scenario Generation
  - Simulation Asset Configuration
  - Simulation Execution
- Defined Interfaces
- Standardized System and Data Connectivity
Architecture Design

- Researchers
- Developers
- Vendors
- Cloud Service Providers

**Application Layer**
- Operator Center Functions
- Other ATM Functions

**Framework Layer**

**Platform Layer**
- Communication Middleware

**Infrastructure Layer**
- Network Interconnect

Layers:
- **Application Aware**
- **Application Agnostic**
Architecture Design

Researchers

Developers

Vendors

Cloud Service Providers

Application Layer

Framework Layer

Platform Layer

Communication Middleware

Operator Center Functions

Other ATM Functions

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Infrastructure Layer

Application Aware

Application Agnostic
Collaboration

• NASA Provides
  – Web Access for Simulation Setup
  – Adapter Example
  – ATM simulators & systems
  – ATM Data: e.g., System Wide Information Management
  – Application Programming Interface

• Required for Partnering with NASA
  – Space Act Agreement
  – Interconnection Security Agreement
Partner Provides

Application and Framework

- Application/Model that Is Shareable/Reusable
- How to Apply/Use your Model in Testbed
- Data if Not Available in Testbed (e.g., adaptation data needed by the model)
- Domain Expertise (e.g., to determine appropriateness or correctness)
- Test or Conduct the Simulation
Concept of Operations

1. User
   →  Web Browser

2. Web Server
   →  Authentication

3. Authorization

4. Application Server
   →  Simulations

5. Simulations
Simulation Design User Interface
Library User Interface
What’s Next?
Testbed Architecture

UAS Traffic Management Lab

Other Labs

Visualization

Communication Middleware

Support Services

Tools

Data

Conflicts Detection

ATM Functional Services

ATC Lab

Cloud

Component
• Testbed is a community resource for accelerating ATM concept and technology development where **partners** can collaborate and leverage each other’s data and tools

• Targeted to be transitioned to community in 2020
1. Shadow Mode Assessment using Realistic Technologies for the National Airspace System (SMART NAS) Test Bed Development, AIAA Aviation, Dallas, TX, 22-26 June 2015


3. Automated Scenario Generation for Human-in-the-Loop Simulations, AIAA Aviation, Atlanta, GA, 25-29 June 2018
Questions?
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