

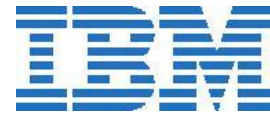


Session # 4716

IBM Cloud in a US Federal Agency: How Bluemix Helps NASA Innovate

Dr. Peter Kostiuk – President, Robust Analytics, Inc. | peter.kostiuk@robust-analytics.com

Randall S. Ho – Consulting Solution Architect, IBM SW Services for Federal | rsho@us.ibm.com





Agenda

1. Overview of Air Traffic Management (ATM) research domain
2. How Robust Analytics helps NASA innovate
3. An example of how Bluemix speeds Robust Analytics research for NASA
4. Three top lessons learned
5. Questions



Overview of ATM

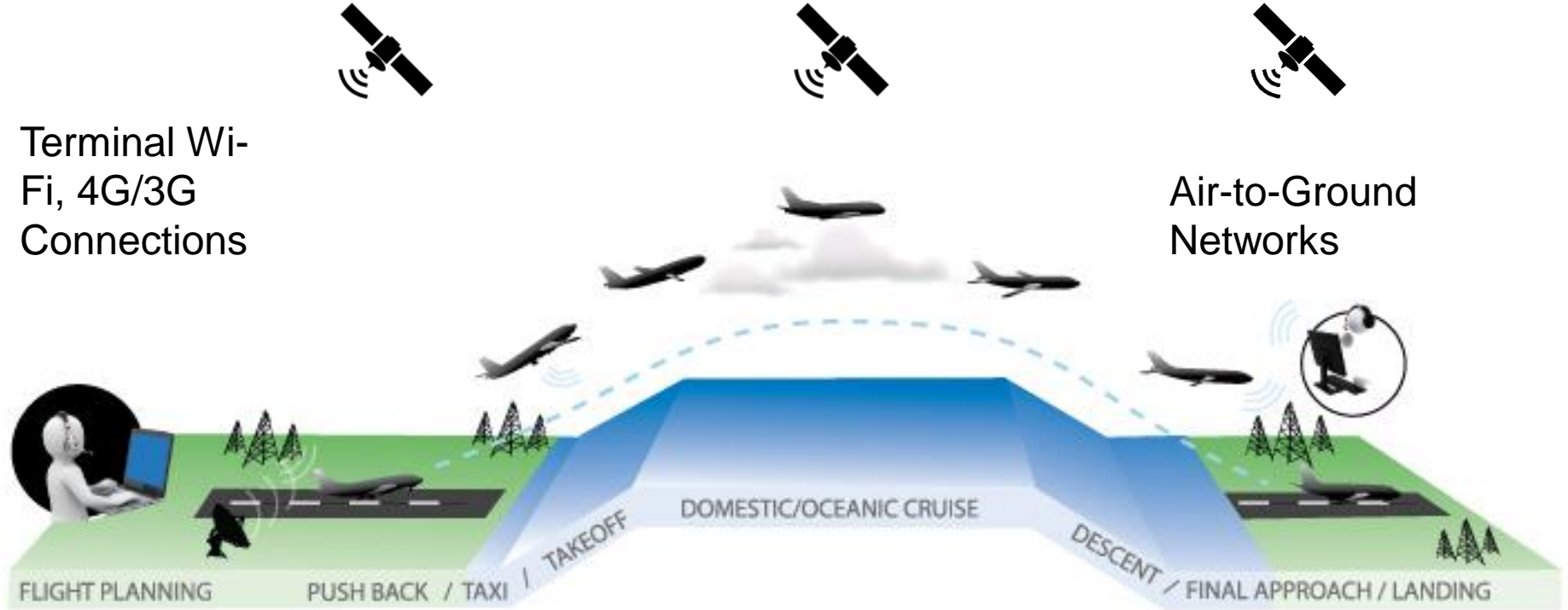
Key Characteristics of Air Traffic Management

1. Responsibility shared among:
 - Government and industry
 - Pilots, controllers, and dispatchers
2. Require high levels of safety and reliability
 - Diverse information with varying fidelity and timeliness
 - Frequently at the mercy of weather
3. Mixture of advanced technology and legacy systems
4. Expected influx of new vehicles with greater automation
 - And, of course, unmanned aircraft systems (UAS)



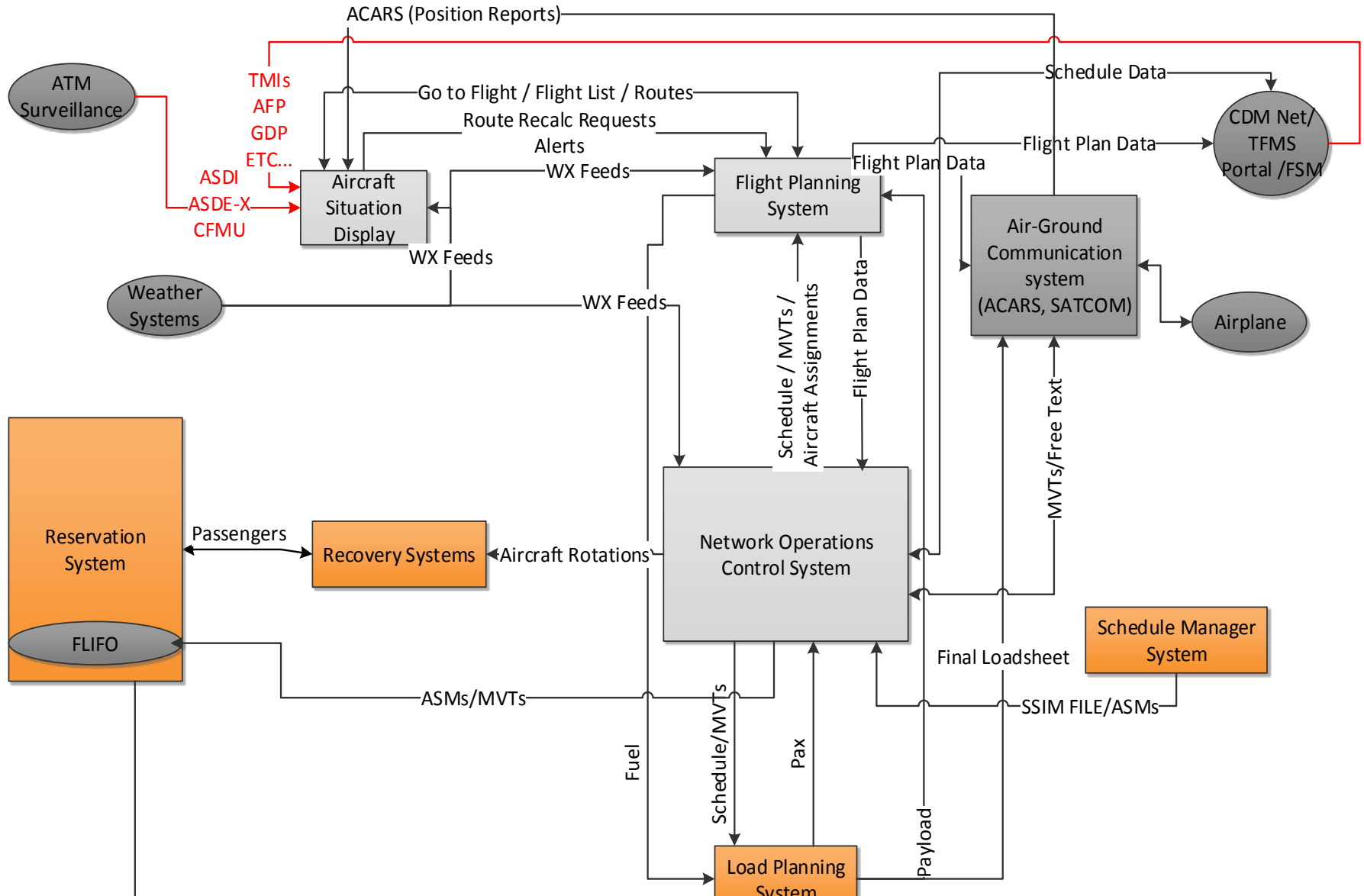
Phases of Flight and Communications

Ku and Ka Band Satellite Communications





Airline Operations





NASA Aeronautics Strategic Research Thrusts

- 1. Safe, Efficient Growth in Global Operations**
- 2. Innovation in Commercial Supersonic Aircraft**
- 3. Ultra-Efficient Commercial Transports**
- 4. Transition to Low-Carbon Propulsion**
- 5. Real-Time System-Wide Safety Assurance**
- 6. Assured Autonomy for Aviation Transformation**

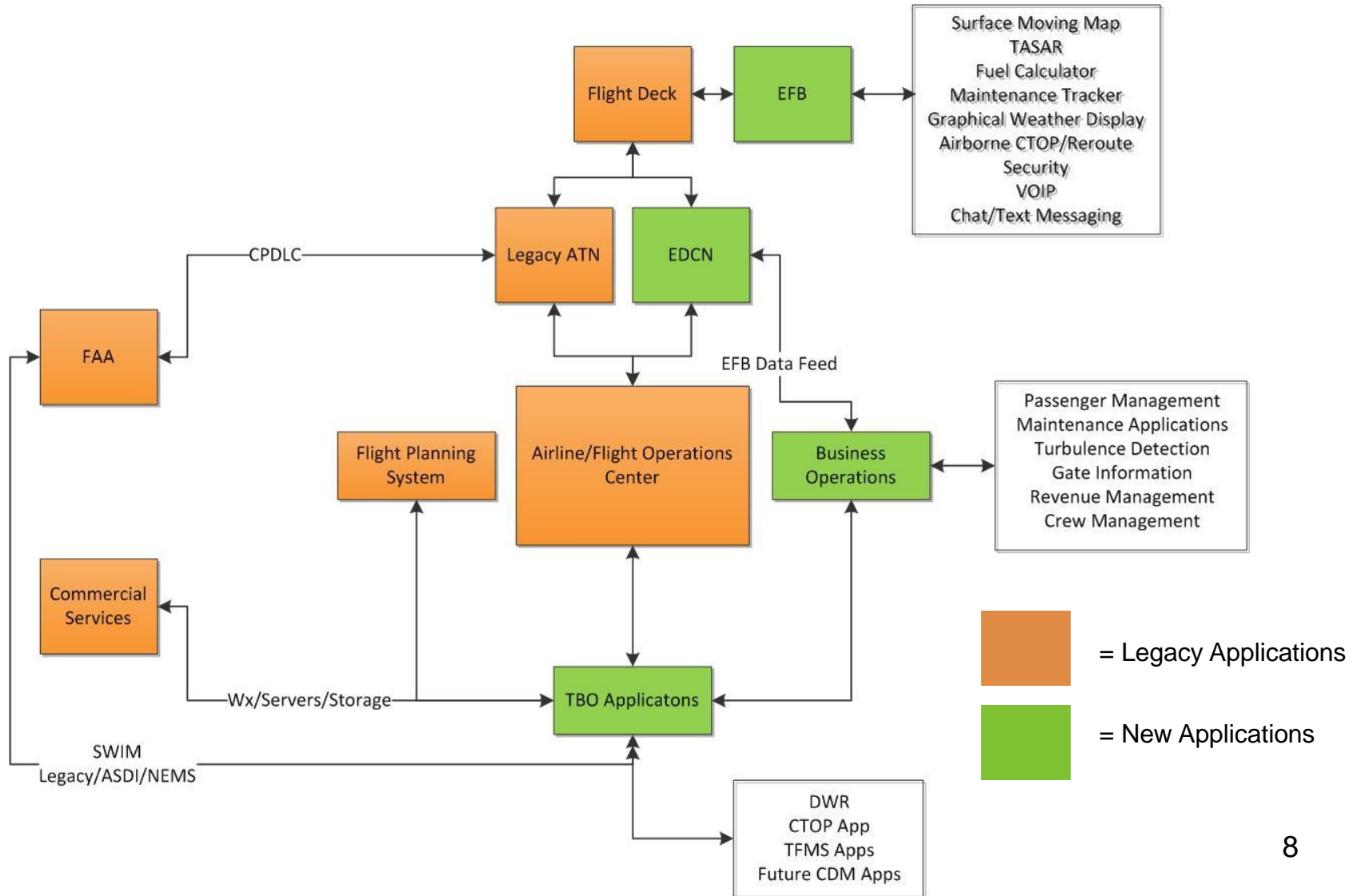


Active ATM Research Areas

1. Trajectory Based Operations (TBO)
 - 1) Gate-to-gate flight planning and management
 - 2) Increased automation and negotiation between operators and FAA
2. Real-time System-wide Safety Assurance
3. Airspace Technology Demonstrations
 - 1) Optimized descents
 - 2) Integrated arrivals and departures
 - 3) Traffic flow management
4. UAS Traffic Management System
 - 1) Small vehicles
 - 2) Operating at low altitude



Active Research Topics





How Robust Analytics Helps NASA Innovate

Develop – Demonstrate – Deploy Air Traffic Management Solutions

- **Develop** air traffic management technologies,
- **Demonstrate** their value through modeling, simulation, and operational tests; and
- **Deploy** technology solutions for airlines and the FAA to improve the efficiency and safety of flight operations

Develop – Demonstrate – Deploy



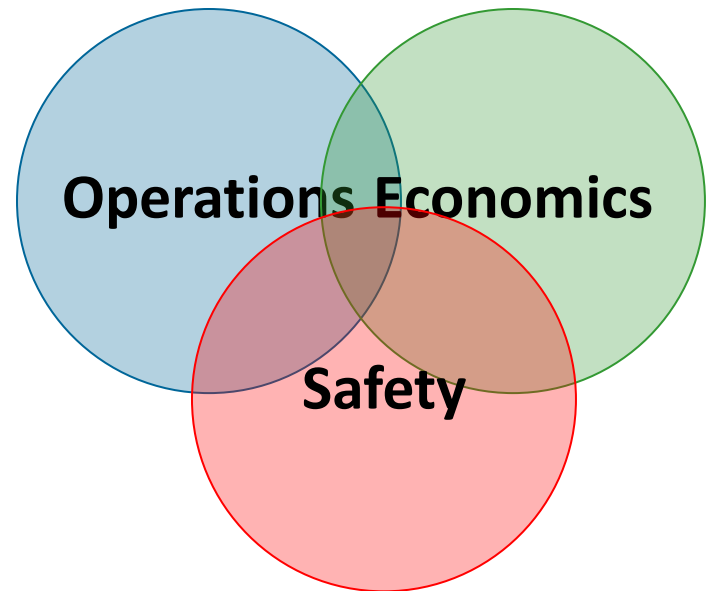
How Robust Analytics Helps NASA Innovate

- Identify promising ideas early in the research process
 - Conduct initial operational, economic, and safety impact analyses
 - Assist managers develop the research portfolio
- Develop prototypes for concepts proposed by NASA and awarded through full and open competition
 - NASA Research Announcement (NRA) process and other procurements
- Propose new ideas through the Small Business Innovation Research (SBIR) annual solicitation
- Develop new ideas with company internal research funds



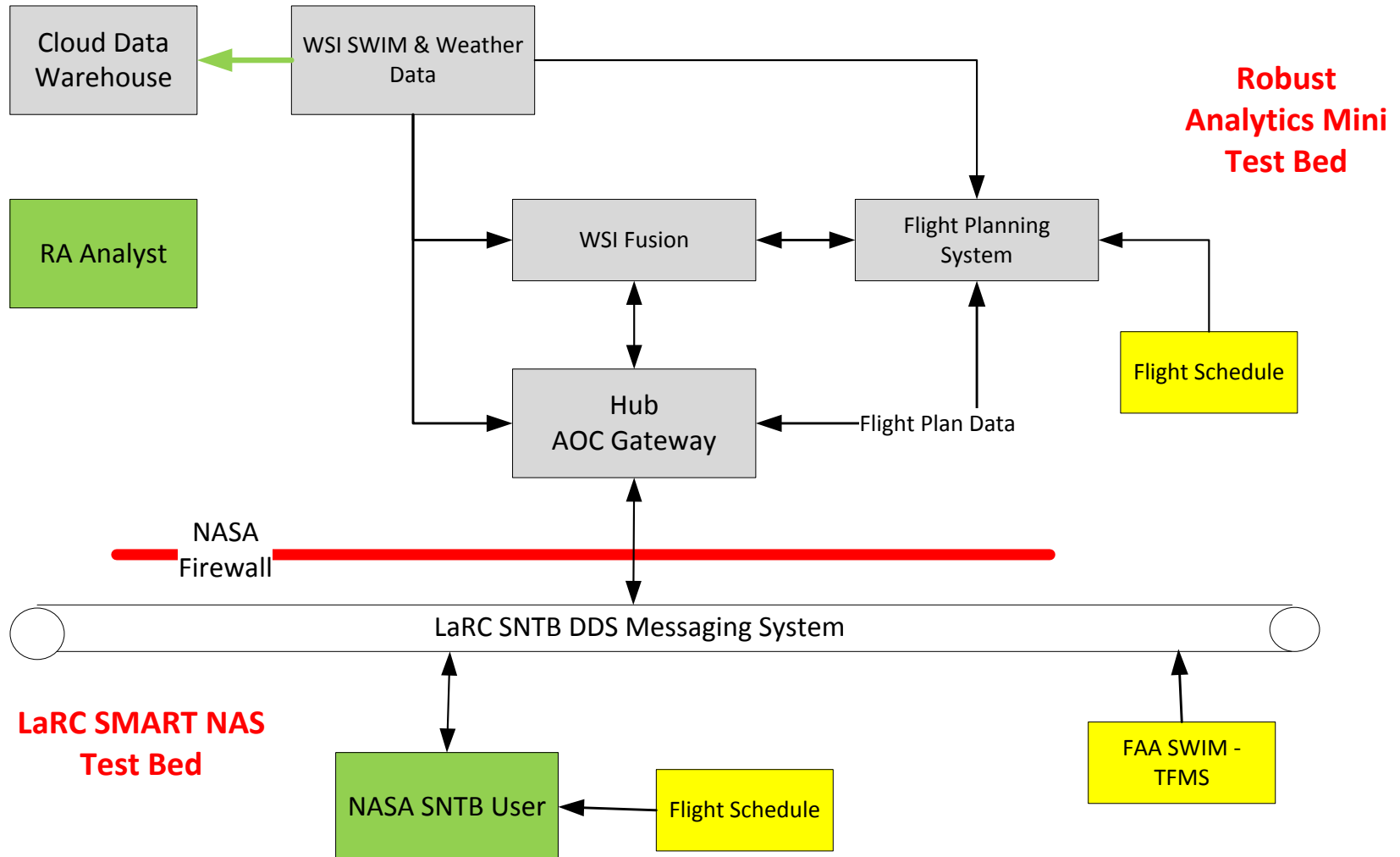
Multiple Hurdles to Deployment

1. **Operational Impact:** does the proposed concept increase capacity or reduce flight time?
2. **Economic Impact:** will the airline operating cost change and will revenue increase?
3. **Safety Impact:** will risk increase or decrease?





Development Environment for ATM Research





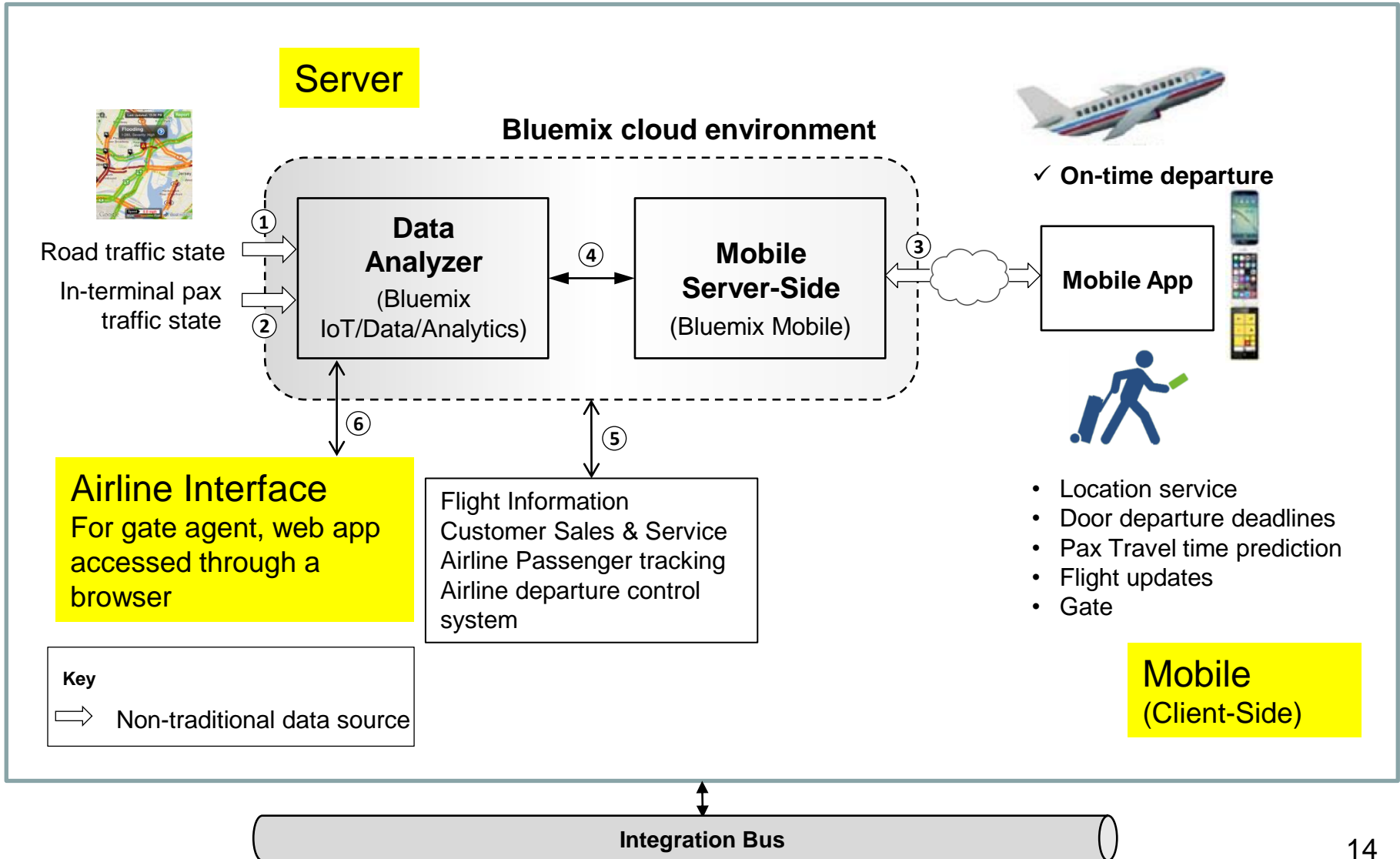
Capabilities to Accelerate Research and Development

- Rapid prototyping to explore new concepts and algorithms
- Fast-time modeling and simulation to mature concepts and estimate benefits
- Real-time and shadow mode testing and demonstration
- Integration with NASA laboratories through the SMART NAS Test Bed

End-to-end process requires access to lots of data (traffic, flight plans, weather, navigation), flexible processing capabilities, analytical services, and scalable architectures



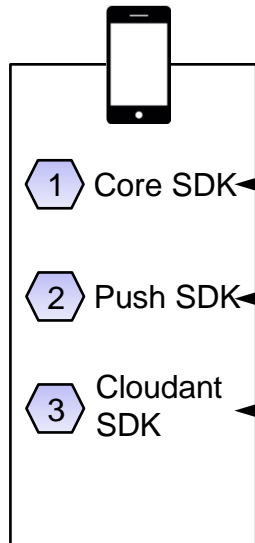
How Bluemix Speeds Robust Analytics Research for NASA: An Example



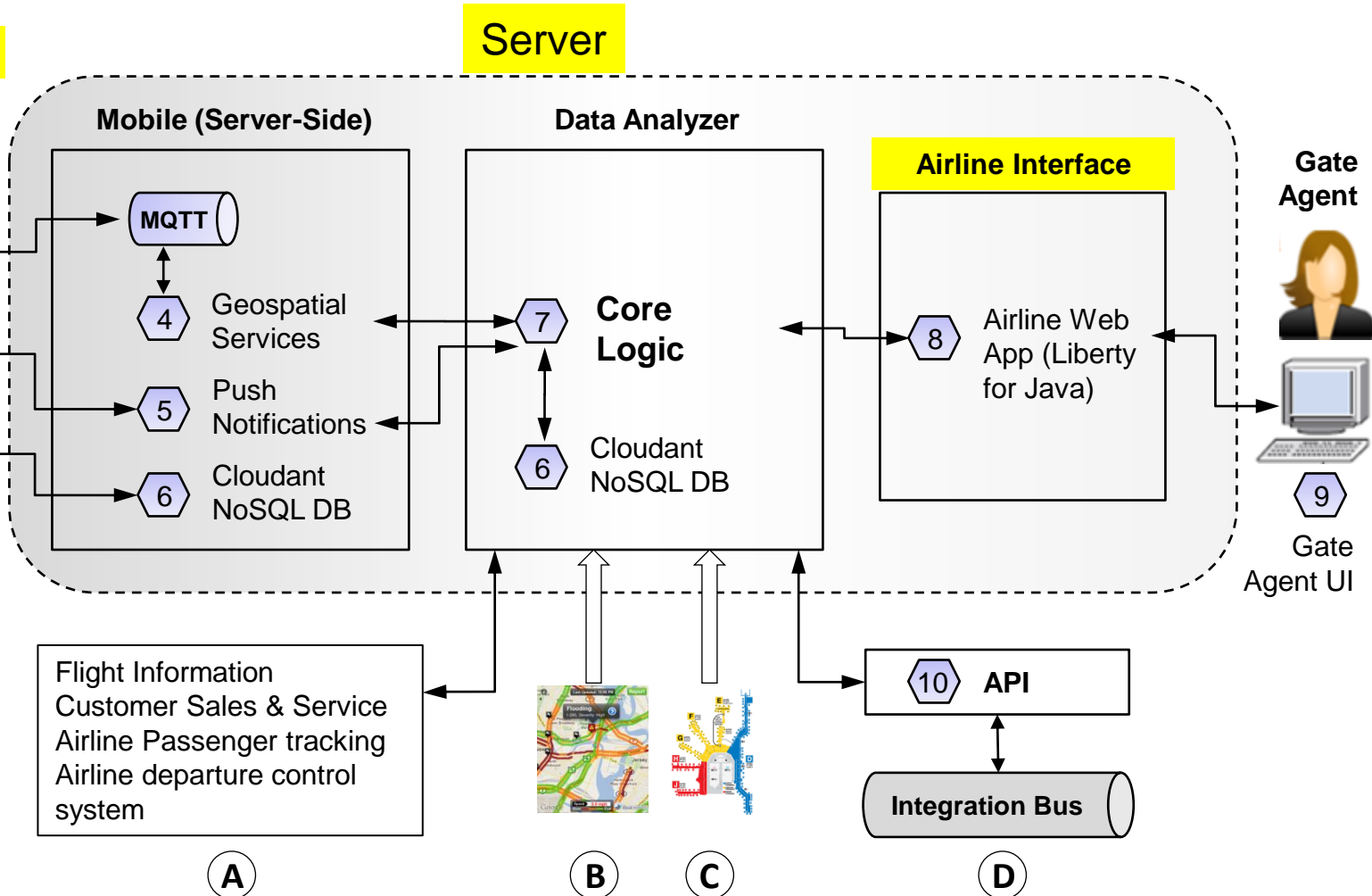


How Bluemix Speeds Robust Analytics Research for NASA: An Example (Cont.)

Mobile (Client-Side)

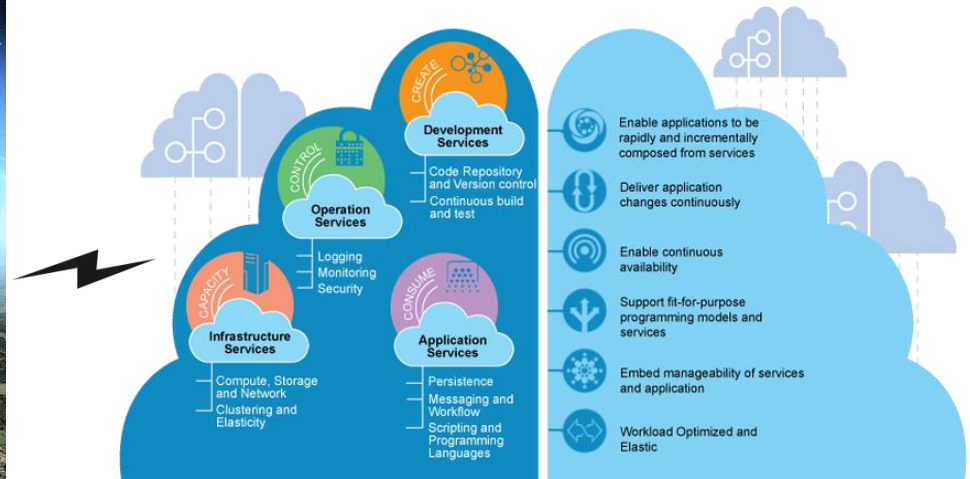


Server



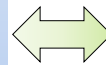


Other Bluemix Capabilities for Aviation Research



Aviation Research Areas:

- Real-Time System-Wide Safety Assurance
- Trajectory-Based Operations
- Airspace Technology Demos
- UAS Integration into NAS



Bluemix Services:

- Weather (TWC/WSI data and API)
- Spark Streaming
- Watson Speech2Text/Text2Speech
- Watson Tonal Analysis
- Watson Machine Learning



Challenges

- **Integration with Peer Cloud and On-Prem Applications**
 - Interoperation
 - Latency
 - Security
- **Federal Cloud Security Assurance: FedRAMP**
 - Production environments require initial certification and ongoing monitoring for FedRAMP compliance
 - Rapid advances and open source vs. demand for security assurance





Top Three Lessons Learned

- **Lesson 1: What worked**

- Use Bluemix for rapid prototyping
- Find best alternatives fast



- **Lesson 2: What worked**

- Leverage Architecture Center & Catalog for pattern reuse



- **Lesson 3: What did not work**

- Proprietary technologies need extra justification to win NASA research awards
- NASA researchers tend to favor open technologies





Questions?



