



Opportunities for Mobile Applications in the 3T Environment Mobile Applications for the Surface

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Initiatives and Factors Driving Surface and Departure Management Improvements



Surface and departure research



FAA investments in new surface automation



Transition to time-based management in the NAS



Improved data sharing and connectivity, including mobile tech

Uncertainty Makes Departure Management Challenging

A large commercial airplane is parked on a tarmac at sunset. The sun is low on the horizon, creating a warm orange and yellow glow. The airplane's wings and engines are prominent, and the sky is filled with soft, colorful clouds. The overall scene is serene yet suggests the busy nature of airport operations.

- Maintenance issues
- Connecting flights/passengers
- Crew status
- Passenger loading
- Baggage/cargo loading
- Fueling
- And more...

Flight operators are often the best source of information regarding the status of their flights

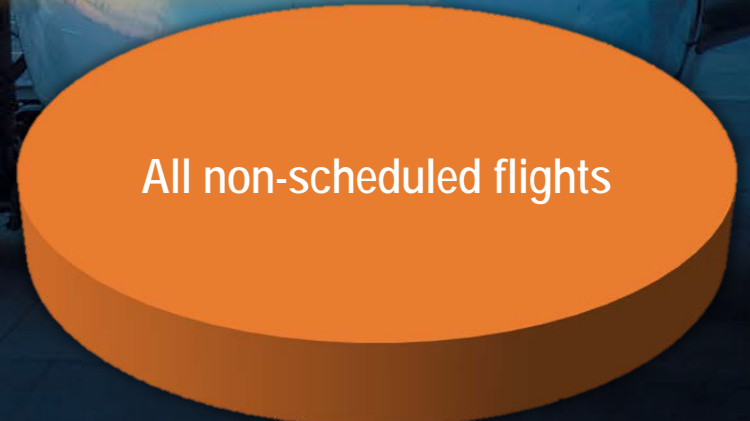
Another Source of Uncertainty



Charlotte

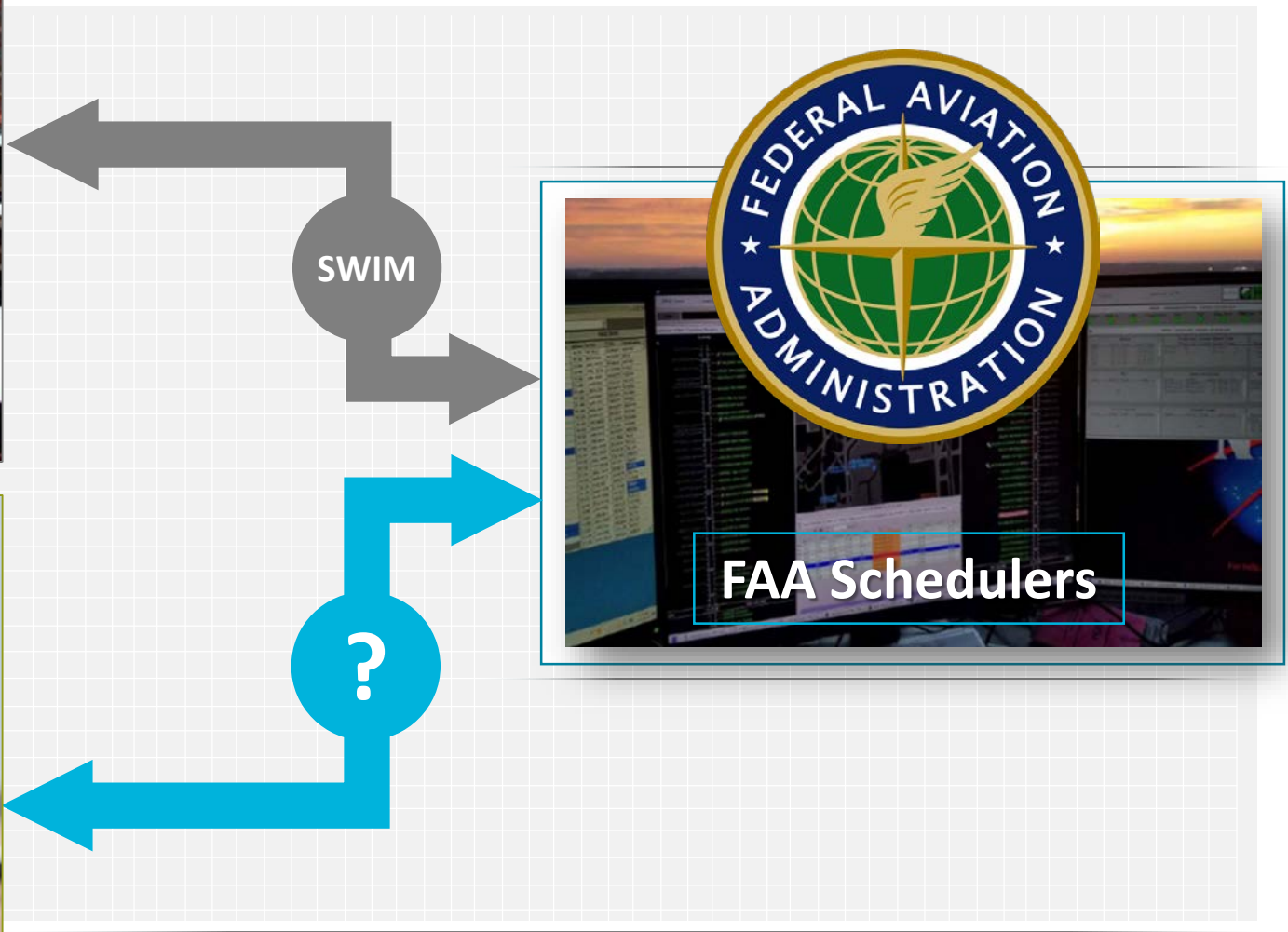


Las Vegas, Dallas Love



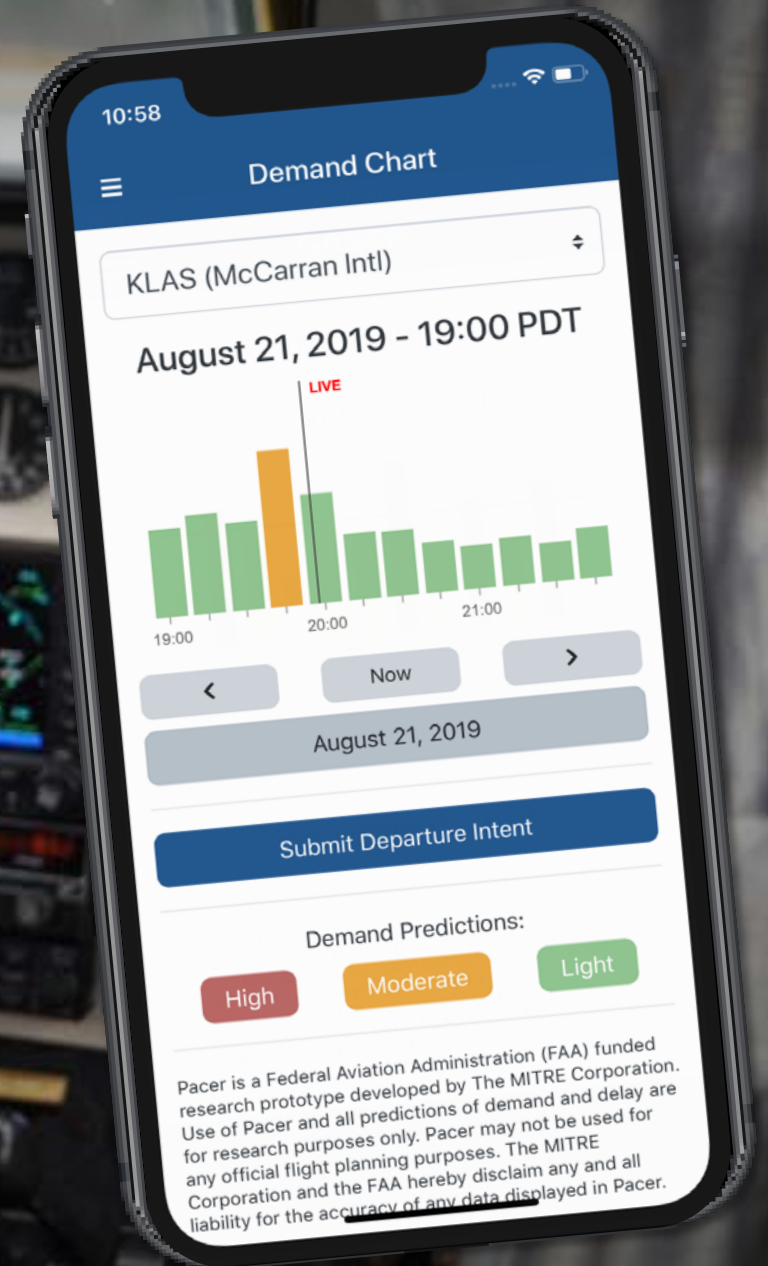
Teterboro

How Will GA/BA Operators Exchange Departure Readiness Data?



Can Mobile Technologies Be Leveraged?

MITRE has been investigating the use of mobile technology to provide this capability in collaboration with the FAA, NBAA, and NASA.



Understanding the User Environment and Operations

Earliest Off Block Time (EOBT)

A low-angle, front-facing view of an airplane's cockpit. The image shows the top of the fuselage, the wings, and the cockpit windows. The sky is bright blue with scattered white clouds. The text is overlaid on the image.

A time submitted by GA/BA flight operators or pilots via a mobile app, to indicate when they will be ready to taxi. This means, engines running, at appropriate spot on the ramp, ready to contact Ground Control for taxi.

Departure Planning Flow for GA/BA Operators



Flight Plan ETD
1445Z

Expected Passenger
Arrival Time: 1500Z

Ready to taxi
1510Z
EOBT

Observation: Producing EOBT estimates is not part of the pilot's current flight planning or pre-flight procedures.

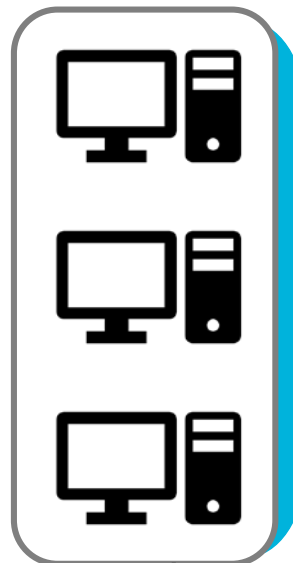
The Idea

for Departure Readiness Information Exchange for GA/BA

When do you expect to be ready to taxi?

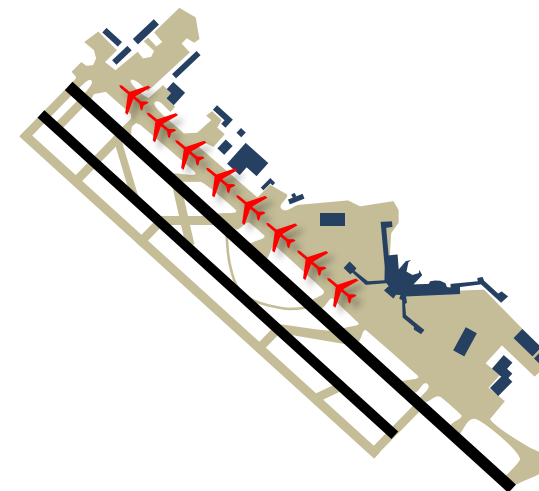


FAA Scheduling Functions



Mobile Application Service Provider

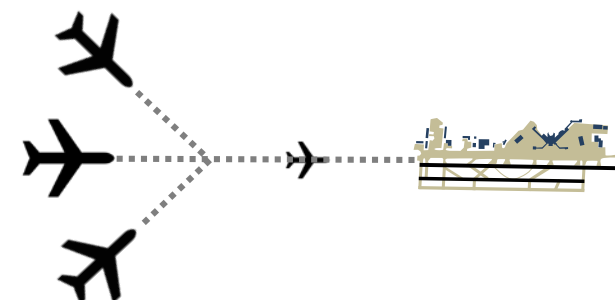
Surface demand



Airspace demand



Arrival demand



In Collaboration with...






NBAA
NATIONAL BUSINESS AVIATION ASSOCIATION



Research Overview

Current Research

MITRE is using mobile technology to enable the submission of departure readiness information, specifically EOBTs, by General Aviation (GA) and Business Aviation (BA) pilots at three airports:

			
Readiness submission timeframe	Tactical		Strategic/Early intent
Managed resource	Airport Surface	Terminal Departure Fixes	Airport Surface
Info available to pilot	Surface/schedule data: runway, TTOT, delays	Airport surface demand	

**In collaboration with NASA as part of ATD-2*

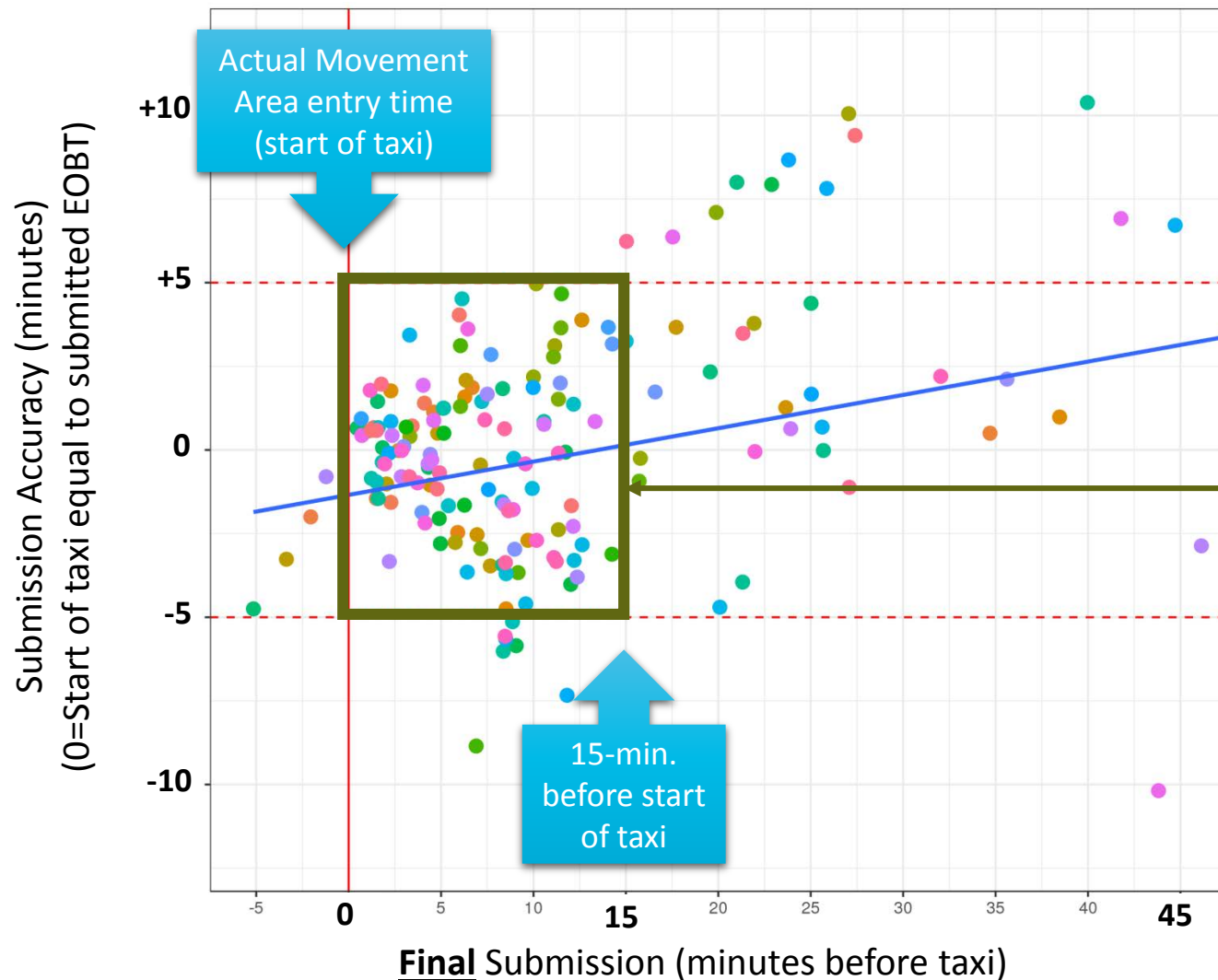
Research Activities

- **Exploring methods for collecting readiness data from GA pilots and the impact of it on the surface scheduler**
 - Pilots use SMS texting and progressive web app to submit EOBTs
- **Pilots receive data, such as estimated takeoff time and expected runway, after readiness submission**
 - Feedback from participants: returned data helps with planning, can program expected runway in FMS before taxi, and passengers can coordinate pickup times at destination using estimated takeoff time
- **Applying lessons learned across research efforts to mature and advance the concepts**



Lesson Learned: Departure Readiness Submission Accuracy

CLT BA Pilots

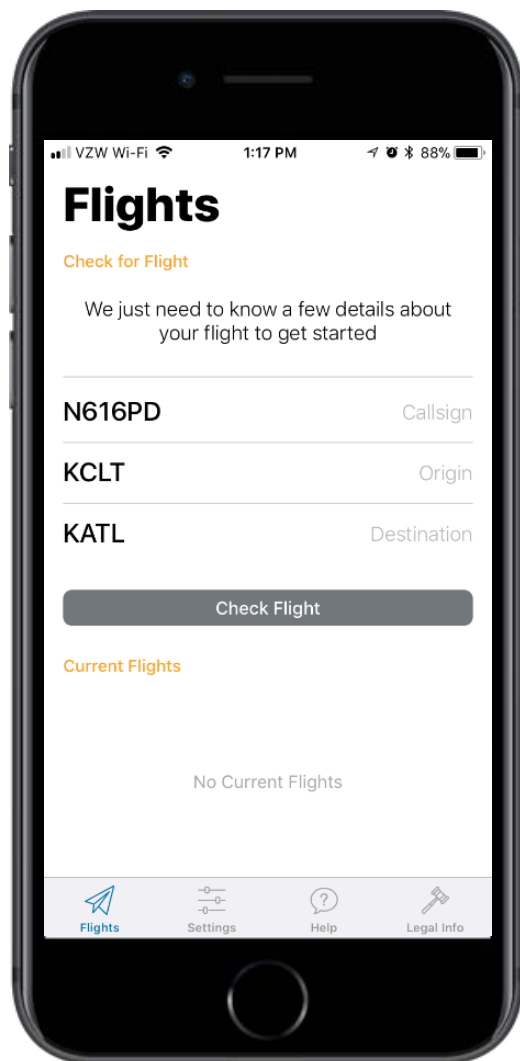


- When pilots submitted their EOBT estimate within 45 minutes of their actual Movement Area entry time, the accuracy of their estimate was within ± 10 min.
- When pilots submitted their EOBT estimate within 15 minutes of their actual Movement Area entry time, the accuracy of their estimate was within ± 5 min.

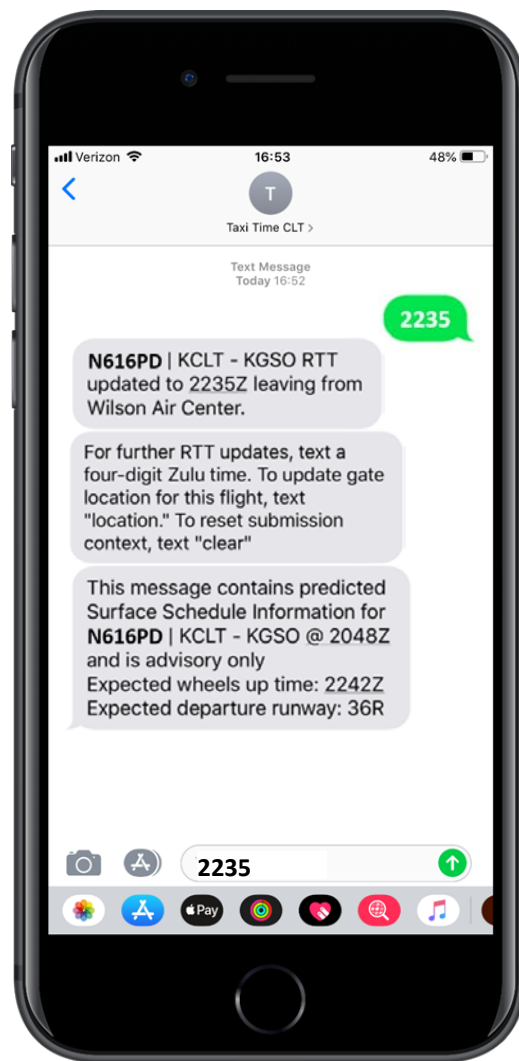
Observation: GA/BA pilots can provide departure readiness times that are consistent with the accuracy of airline provided data and deemed acceptable for departure scheduling.

Technical Considerations

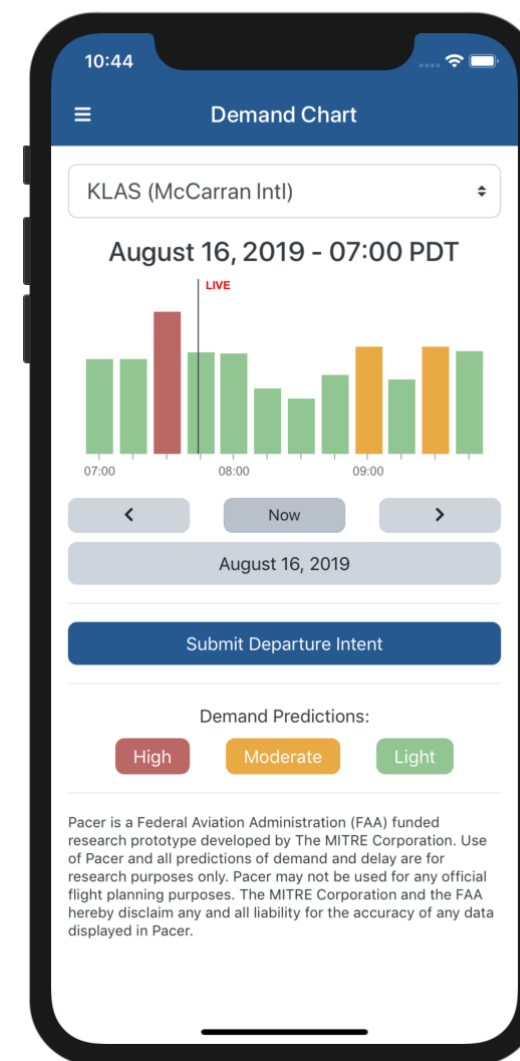
MITRE Prototype User Interfaces



Native apps



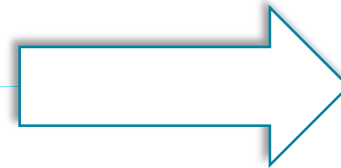
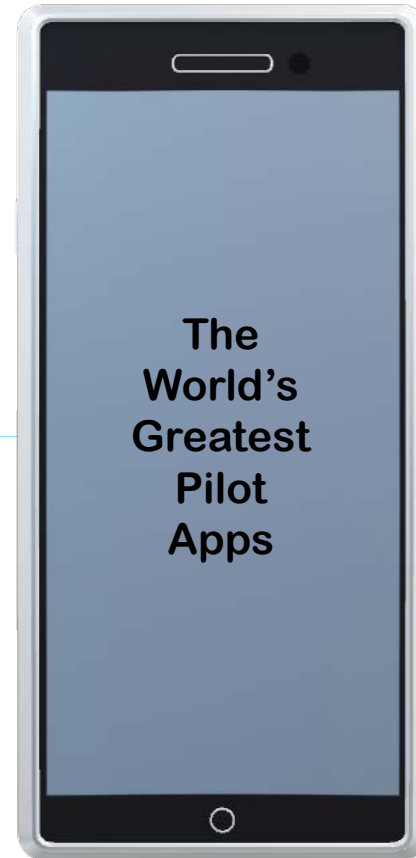
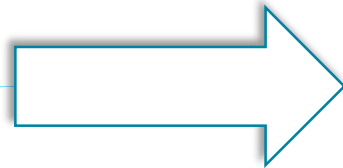
SMS/texting



Progressive web app

Integration into Service Provider Applications

**Ability to submit
readiness data**

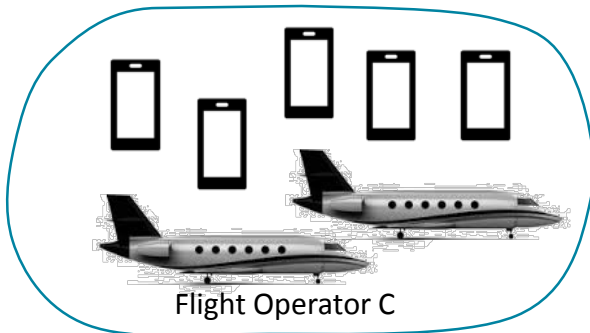
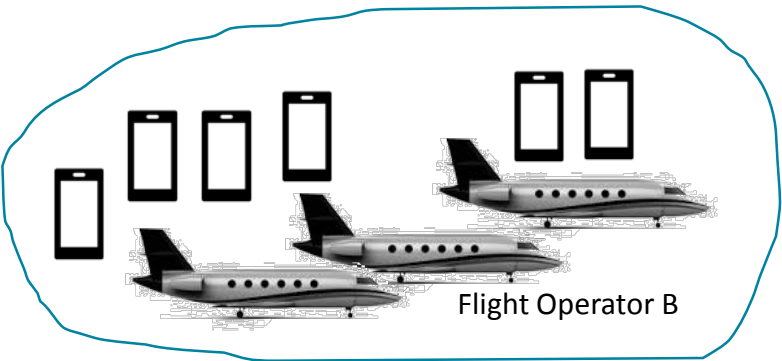
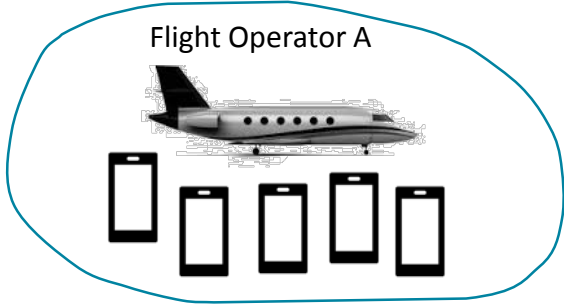


Ability to receive data

Airport demand
TMATs for surface metering
Expected runway
Delay info



MITRE Prototype Texting Capability ATD-2 Phase 2 (KCLT)



Pilot/dispatcher phone numbers associated with callsigns

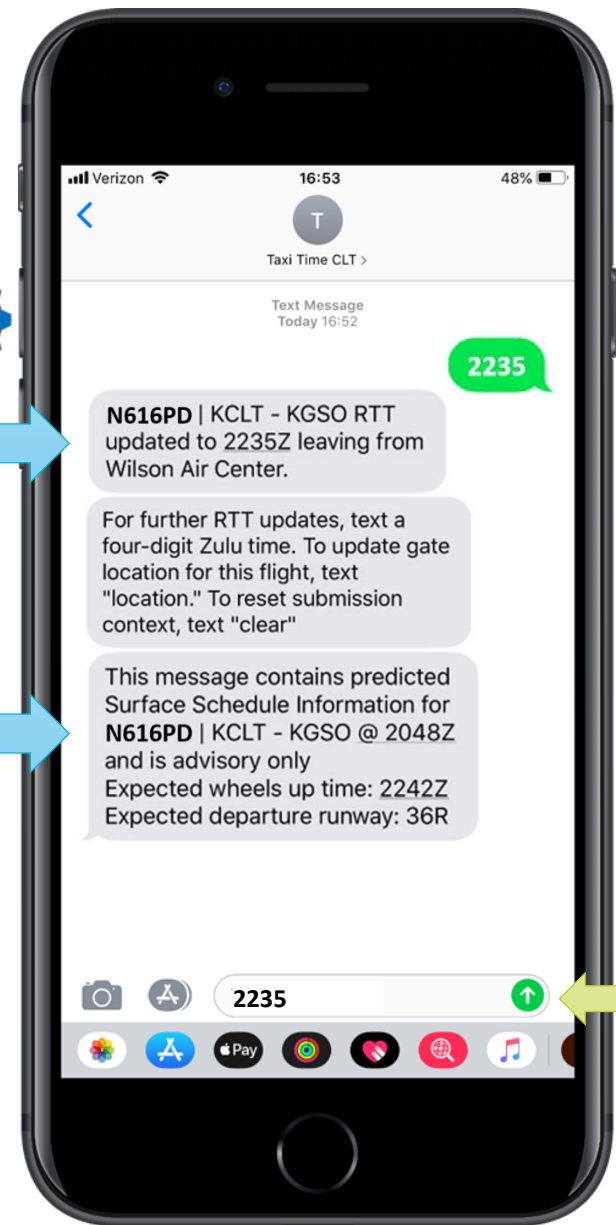
2 System searches for matching callsign within a window of time around the submitted EOBT.

3 System acknowledges EOBT, parking location, and associated flight

Pilot is prompted if there are multiple matches

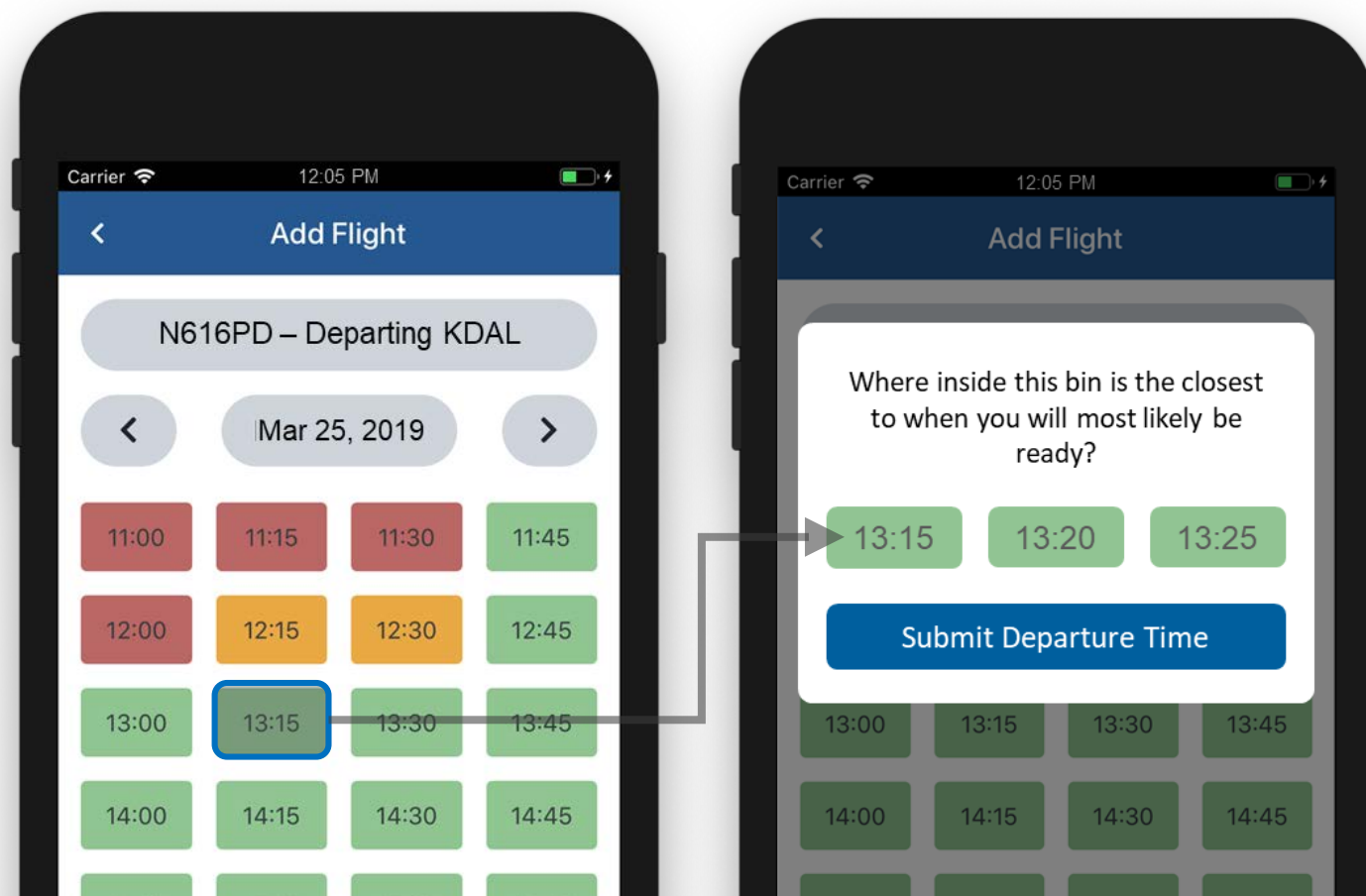
4 System returns flight-specific information to the pilot via TTP.

Observation: There are several approaches (e.g., mobile app or texting) to using mobile technologies to provide easy and intuitive ways to submit EOBT information.

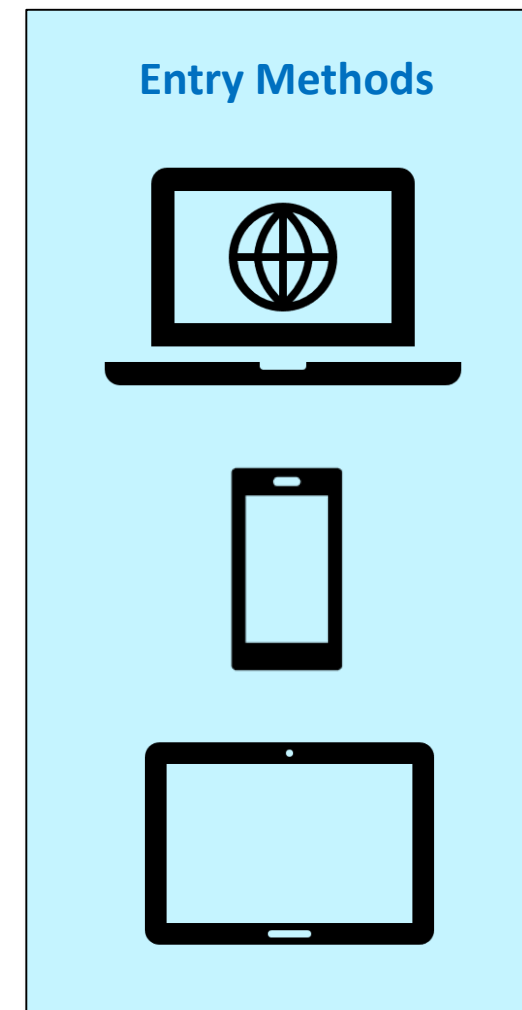


1 Pilot submits EOBT

Pacer Progressive Web App (KDAL & KLAS)

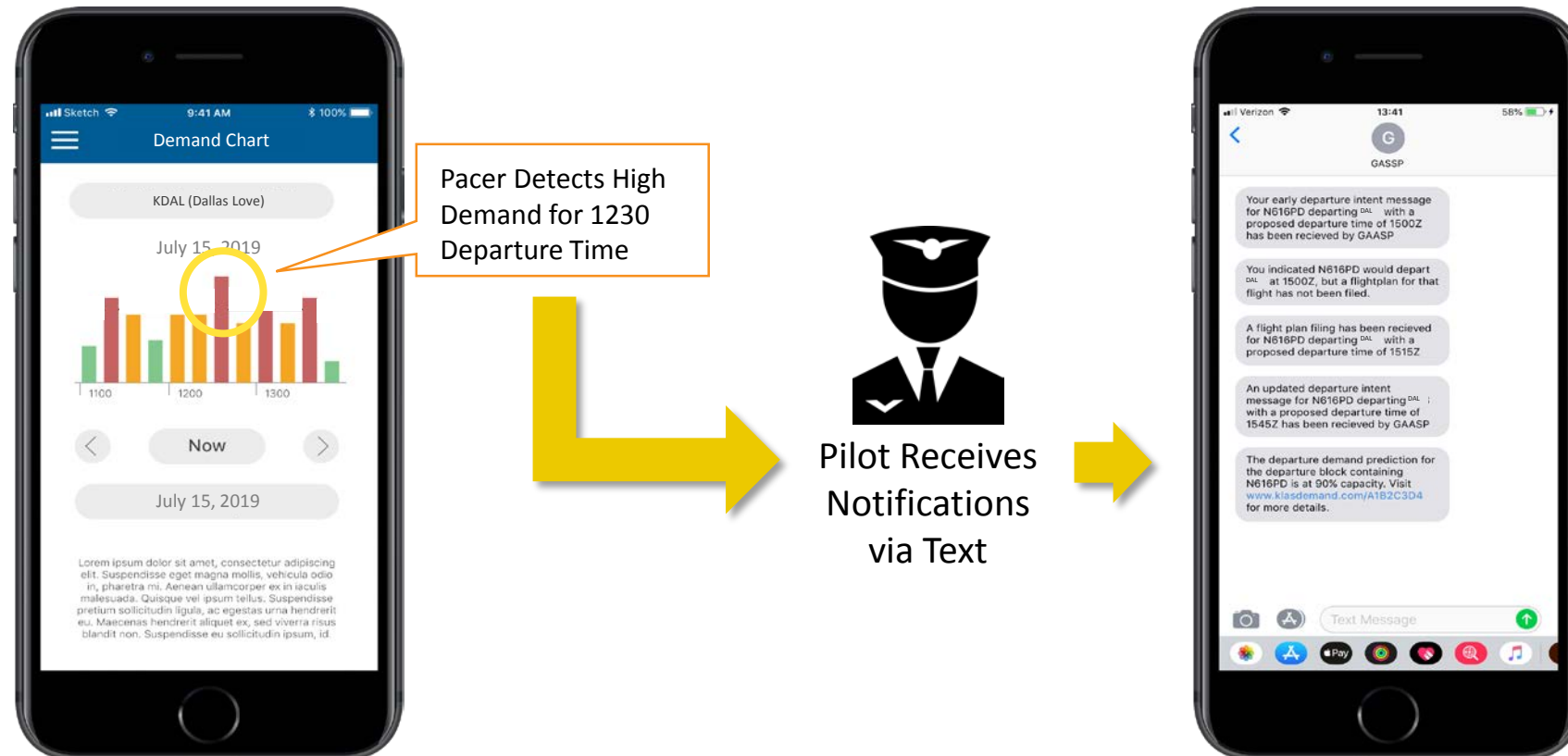


Important: colors indicate relationship between AIRPORT departure capacity and demand. It is not a reflection of departure fix demand.

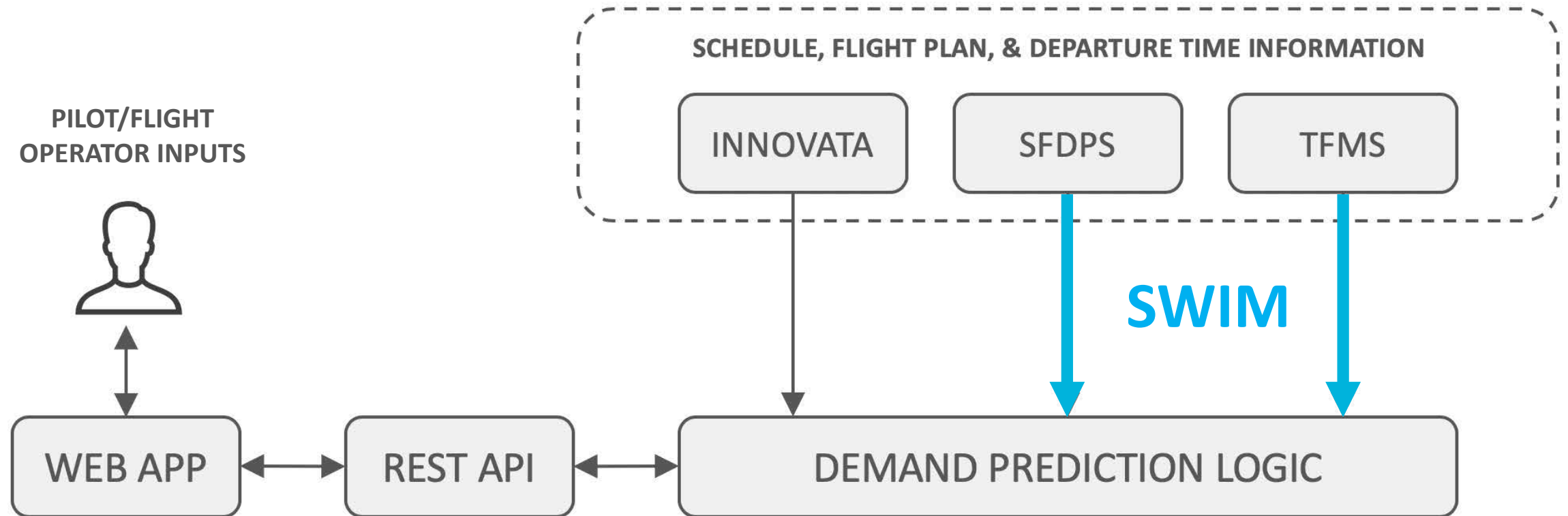


Receiving Notifications with Pacer

- The mobile application will automatically notify users via text messages regarding certain conditions



Building the Demand Picture in Pacer



Flight Matching

- **To limit duplicate flights in demand predictions, flight matching is performed between the various data sources using a number of data elements including:**
 - Callsign / Registration Number
 - Origin and Destination Airports
 - Time entries (e.g. scheduled time, ETD, Pacer times)
 - Logical time periods for updated times
- **It can be complicated to determine if the data is for an existing flight or a new flight**
 - Example: An aircraft that goes out and back to the same location multiple times in one day

Access and Identity Management

- **To use Pacer a user must complete the registration process**
- **Requests made to the Pacer REST API must be made by an authenticated user**
- **The Pacer REST API limits access and visibility of data based on a user's role within the Pacer web application**
- **Examples of user roles in Pacer include:**
 - Pilot
 - Fix Based Operator
 - Fleet Operator
 - Airport/Facility Administrator

2020 and Beyond: Exchanging Data

Roles of Mobile Application Service Providers

With Examples

- 1. Develop and deploy a GA data exchange capability**
 - Seamlessly integrate capability into apps used by pilot
 - Make it part of pilot's normal pre-departure workflow
- 2. Incentivize GA flight operator participation**
 - Through earlier awareness of expected departure delay and relevant TMIs
- 3. Collect, validate, and provide data to the FAA**
 - Ensure that data provided by GA operators is reasonable for the flight
- 4. Harmonize disparate operational environments**
 - Help translate nomenclature of GA operators into Collaborative Decision Making (CDM) terminology and vice versa
- 5. Establish and enforce policies**
 - Making customers aware of CDM Data Quality Code of Conduct

Using a Mobile Device to Exchange Departure Readiness Information

Future State

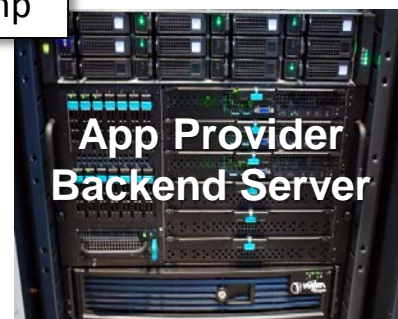
- 1** Pilot transmits readiness time to app provider backend server



Ready-to-taxi Time: 1925Z
Parking Location: West Ramp

Expected departure runway: 36R
Expected taxi time: 1933Z
Expected wheels up time: 1945Z
No expected traffic mgmt delays

- 2** App provider server forwards EOBT and parking location to FAA

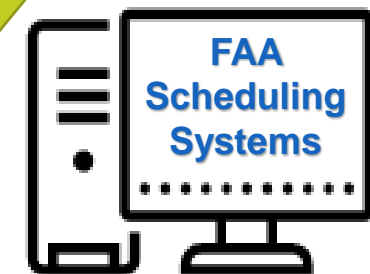


SWIM



- 5** FAA publishes schedule related information such as expected runway, TMAP, TTOT, and TMIs

- 3** Data is received by appropriate FAA scheduling systems



- 4** Controllers use information from TFDM, TFMS, and TBFM

- 6** App provider forwards data to pilot

NASA currently publishes TFDM Terminal Publication (TTP) data on the SWIM research and development network.

Benefits of Exchanging Departure Readiness Data

- Gives ATC a better view of surface demand and allows them to make more informed decisions
- Provides the flight operator more visibility into ATC scheduling and planning
- Allows better scheduling of resources, both on the surface and airborne
- Enables FAA to share relevant departure information with pilots, such as expected takeoff time, expected departure queue wait time, and TMIs
- Reduces the need for uncertainty buffers in scheduling
- Facilitates better departure planning for flight operators
- Enables greater predictability for the flight operators

Questions & Discussion

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