SWIM Users Forum #15

June 8, 2017

Washington, DC

Hosted by the SWIM Program Office

Federal Aviation Administration

Today's Agenda

- **STDDS Update**
- **SFDPS Update**
- **CAT10 Briefing**
- **Next Users Forum – New Dates**
- **Voice of the User: Aviation Hackathon**
- **Q&A**

Got questions during the forum?

- **Type your questions into GoTo Webinar**
  - Names will not be announced
- **Where can you find a copy of today's slides?**
  - See the "Handouts" section in GoTo to download today's slides
  - Slides will be posted in the SWIM Users Forum page.
- **For questions after today:**
  - Contact us at swim@faa.gov

STDDS Update

STDDS R3.3 Contents

- **SMES:**
  - Only new messages added; only received if subscription changed
  - Non-Movement Area (NMA) data publication derived from MLAT and ADS-B CAT10 data published by ASSC/ASDE-X
  - ASSC/ASDE-X Safety Alerts publication
- **APDS:**
  - Add airport identifier to payload of messages
  - Downsample RVRDataUpdate messages
- **TAIS:**
  - Add latitude/longitude to track points
  - Filter out flights about FL180 to reduce bandwidth
- **URN Namespace and Header Property**
  - e.g., *us:gov:dot:faa:atm:terminal:entities:smes:v3-0*
  - *Version = 3.0*

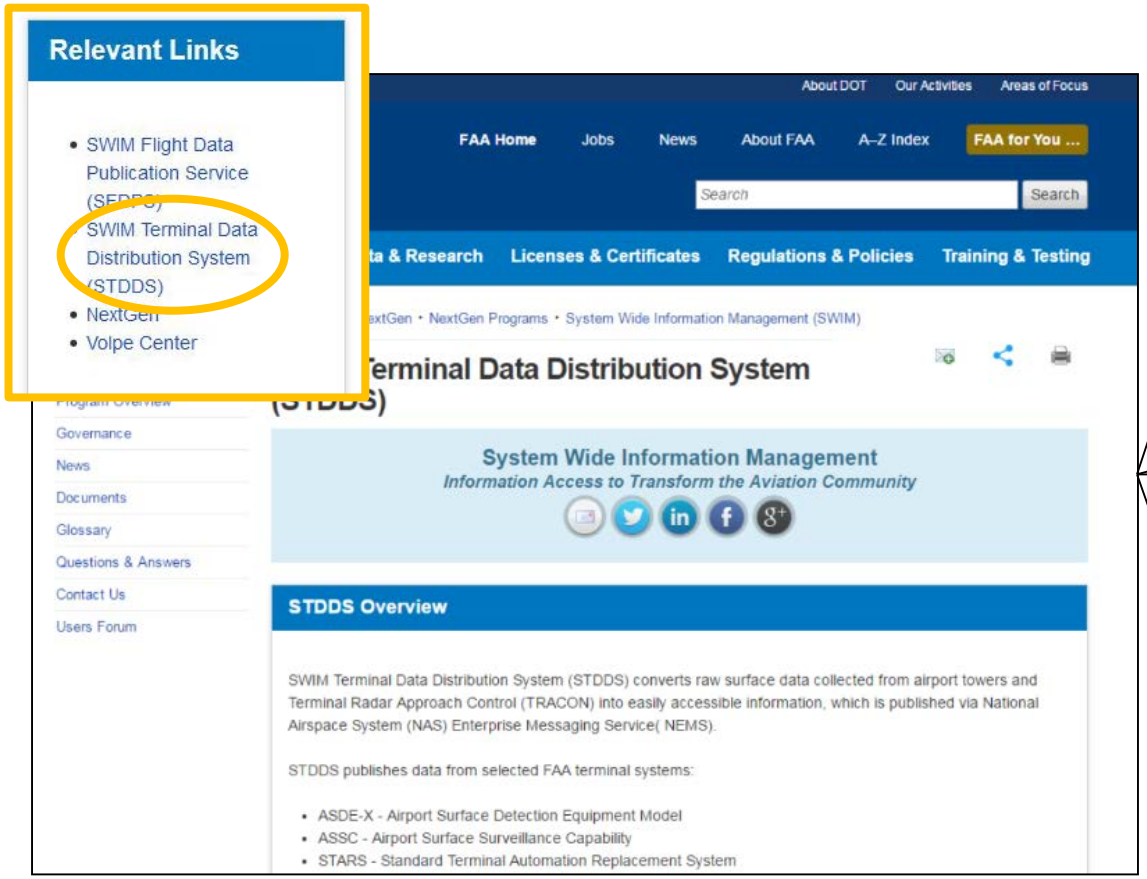
Interfaces must be updated to R3.3 or messages may be dropped or fail!

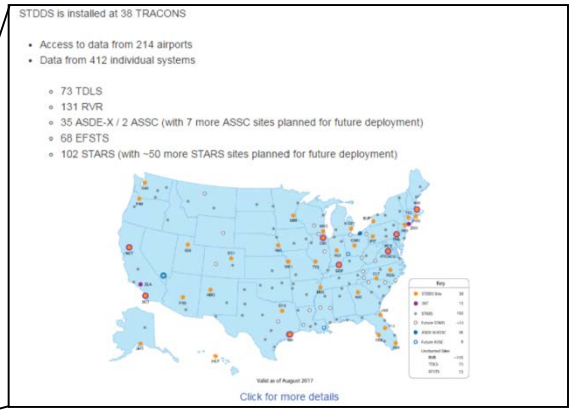
STDDS R3.3 Schedule

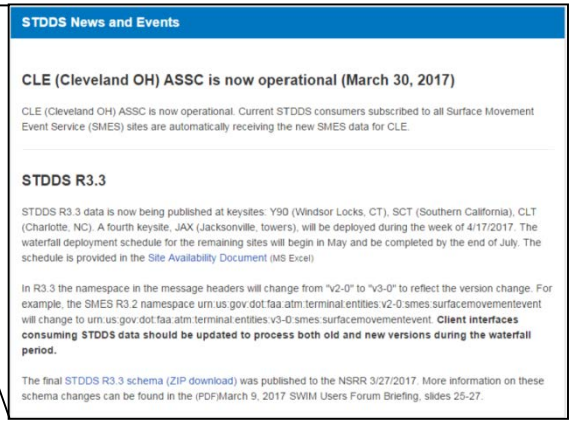
- **Complete (19)**
  - JAX, Y90, CLT, SCT, NCT, MIA, HCF, A90, D21, M98, TPA, PCT, PVD, S56, BUF, R90, IND, D10, SDF
- **Upcoming Deployments (19)**
  - MCI, I90, ABQ, A80, T75, P50, D01, S46, CMH, A11, N90, RDU, PIT, MKE, PHL, P80, M03, F11, C90
- **16 R3.3 STARS sites**
  - Complete (7): BTR, MOB, BGR, DLH, SUX, LEX, MLI
  - Upcoming (9): FAY, PSC, MWH, GGG, CAE, MGM, CHS, ABI, AGS
- **See site availability file on NSRR**

STDDS Webpage

STDDS webpage has been deployed as a link from the SWIM webpage. Page includes STDDS news and information.







ASDE-X and CAT10 Data

Federal Aviation Administration

Agenda

- ASDE-X Cat10 data overview
- Site specific analysis of Cat10 data
  - CLT
  - LAX
  - SAN
  - SNA
- Correlating Cat10 and Cat11 ASDE-X data

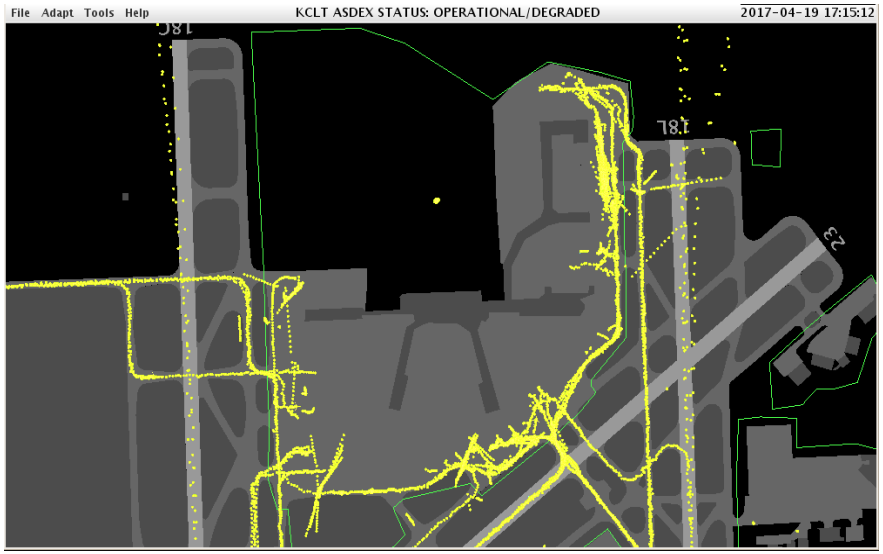
ASDE-X Cat10 data overview

- Raw surveillance data of the airport surface
  - This is the data that goes into the ASDE-X system before it is fused together to generate the Cat11 position reports users receive now.
  - Accuracy of the positon report varies depending on the location of the target on the surface, primarily due to signal interference from the terminal buildings.
- Two new messages sent (msgType=):
  - AD – ADSB position report (less frequent ~4K/hr at LAX)
  - ML – Multilateration (MLAT) position report (~32K/hr at LAX)
- Data is geographically filtered to include just the non-movement area

Analysis of Cat10 data at CLT

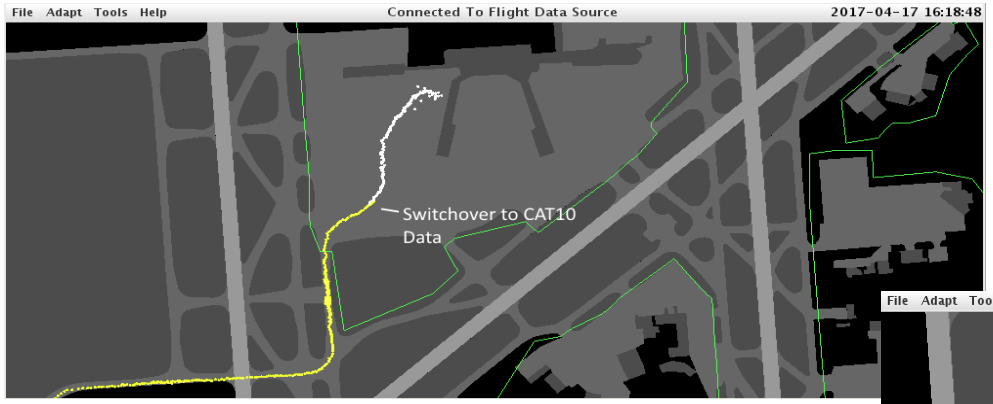
- Cat11 data is smoothed by ASDE-X as shown by the nice neat trails
- Cat10 data is not as smooth
  - Cat10 coverage varies by airport
  - Cat10 coverage can vary at different locations at one airport
  - Cat10 positions exhibit more positional noise on stationary targets
- Overall, Cat10 data provided good coverage of the ramp (non-movement) areas at CLT

Cat11Position Reports



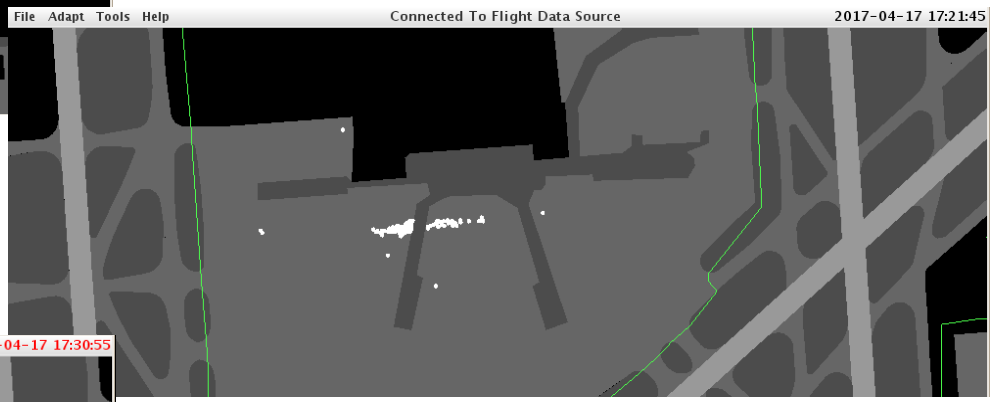
Cat10 Position Reports

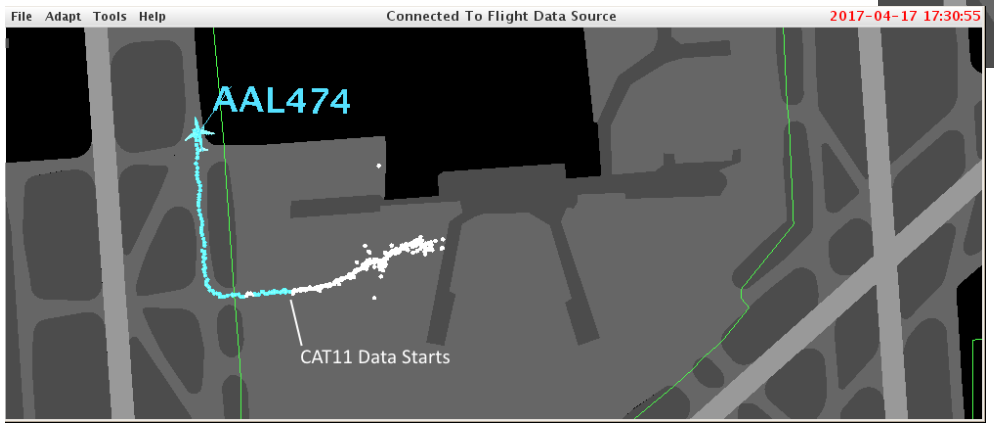
A good case at CLT



Cat11 and Cat10 reports on AAL474 arriving

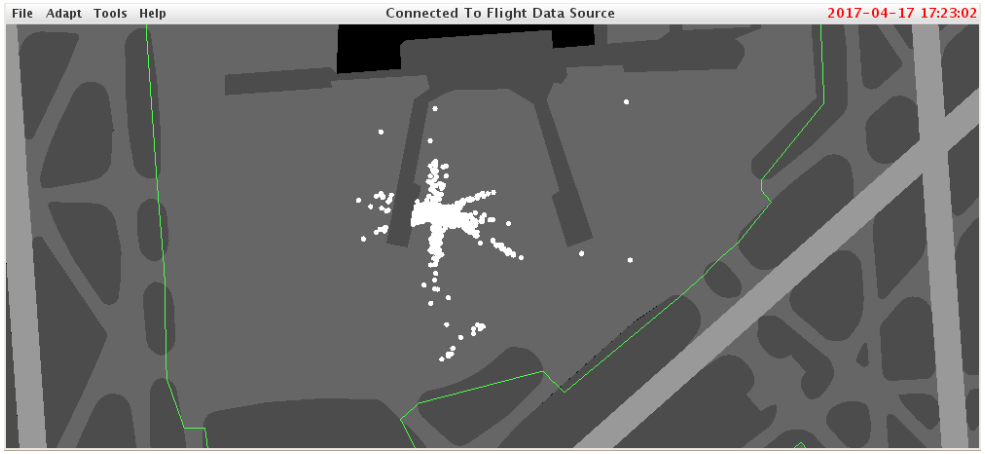
Cat10 reports while parked at the gate



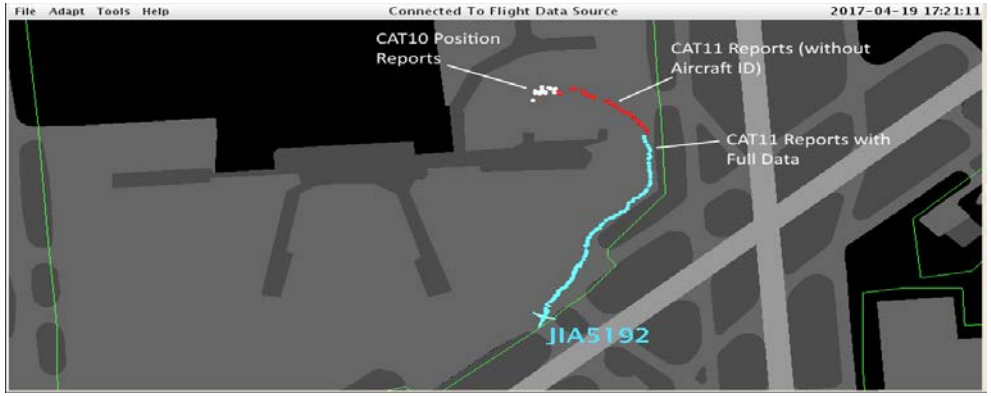


Cat10 and Cat11 data after pushback

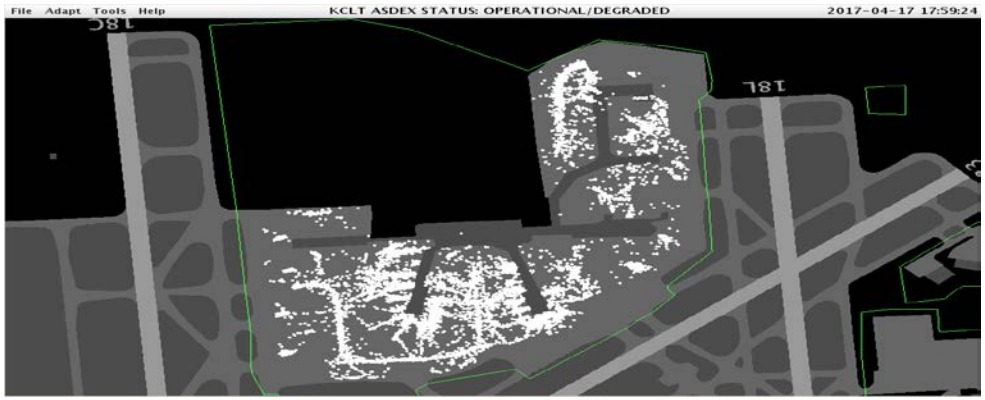
Other cases at CLT



Some flights exhibited quite a lot of drift while parked at the gate



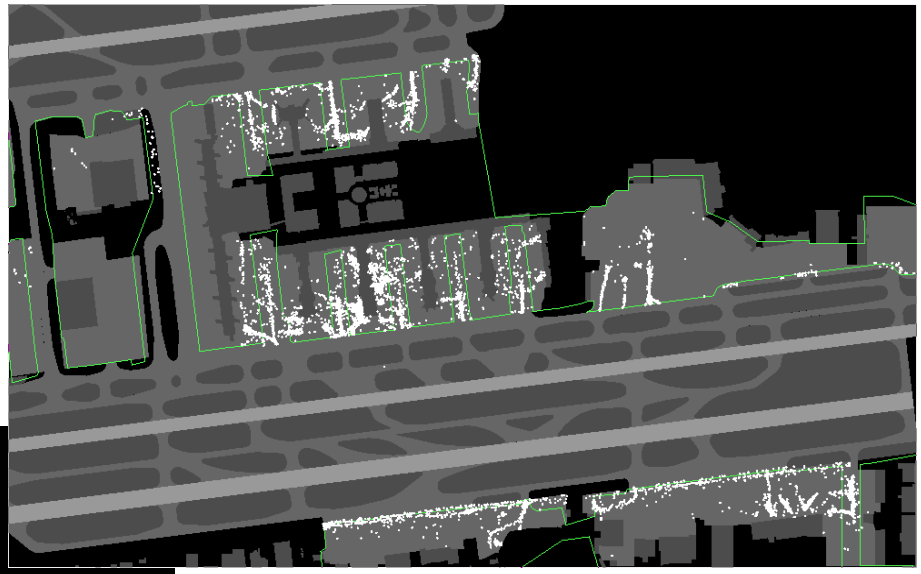
The Terminal E area didn't have coverage to the gates.



The aggregated position plot shows which portions of the terminal/ramp area have good coverage to the gates

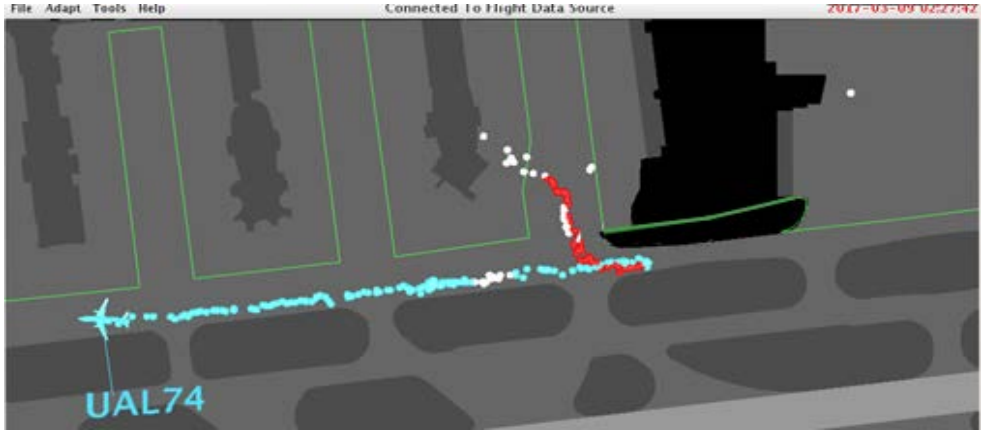
Analysis of Cat10 data at LAX

LAX generally didn't have full coverage to gates further into the terminal areas

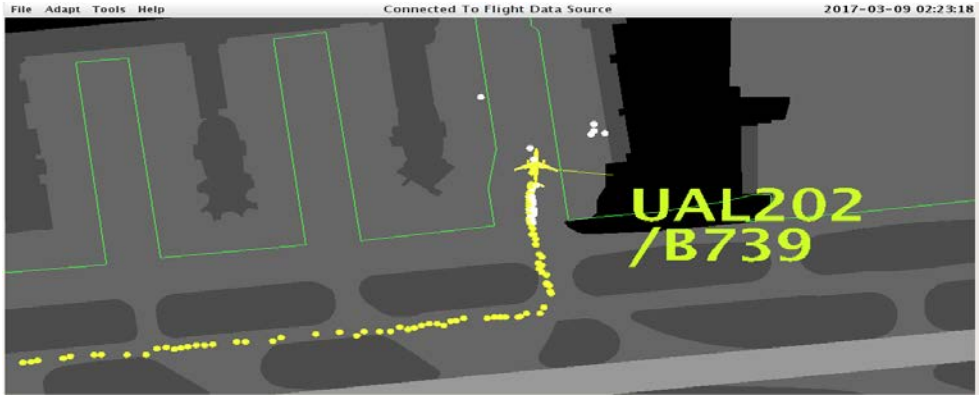


Some Ramp/Terminal areas had better coverage than others

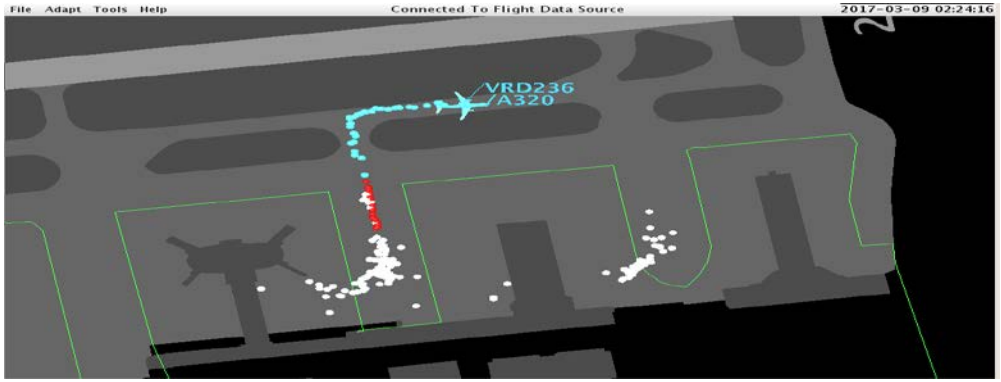
Various cases at LAX



UAL74 had good Cat10 positions while departing from the end of Terminal 7



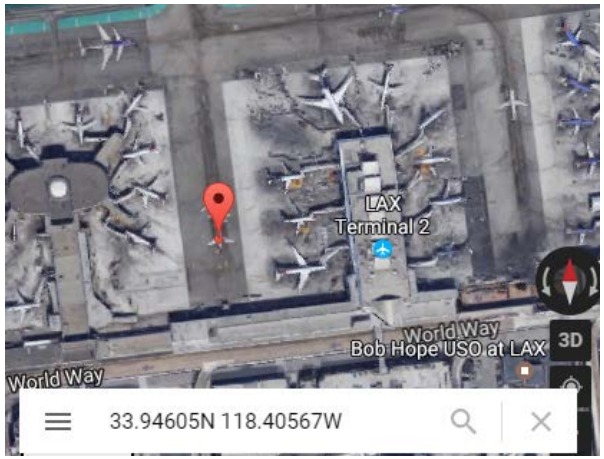
But UAL202 wasn't tracked to the gate in the same area.



Sometimes there seemed to be some errors in the locations (or confusion with another target? See next slide for example data.)

Example Data at LAX

```
<mlatReport full="false">
  <report>
    <basicReport>
      <time>2017-03-09T02:18:56.000Z</time>
      <track>2949</track>
      <position>
        <x>-171</x>
        <y>228</y><
        <lat>33.94605</lat>
        <lon>-118.40567</lon>
      </position>
    </basicReport>
    <acAddress>A411DF</acAddress>
  </report>
</mlatReport>
```




```
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      <track>2949</track>
      <position>
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        <y>296</y>
        <lat>33.94666</lat>
        <lon>-118.40277</lon>
      </position>
    </basicReport>
    <acAddress>A411DF</acAddress>
  </report>
</mlatReport>
```
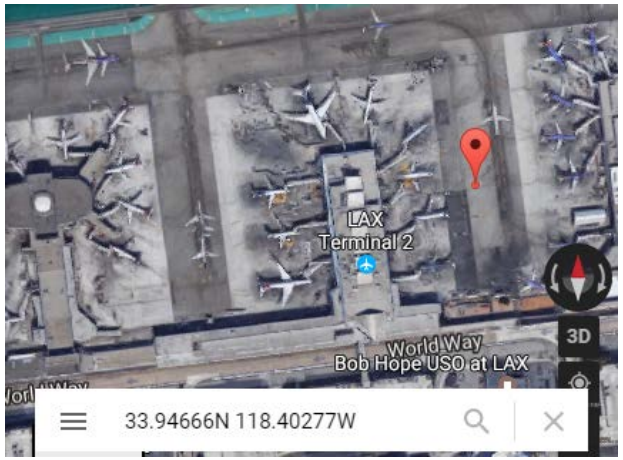
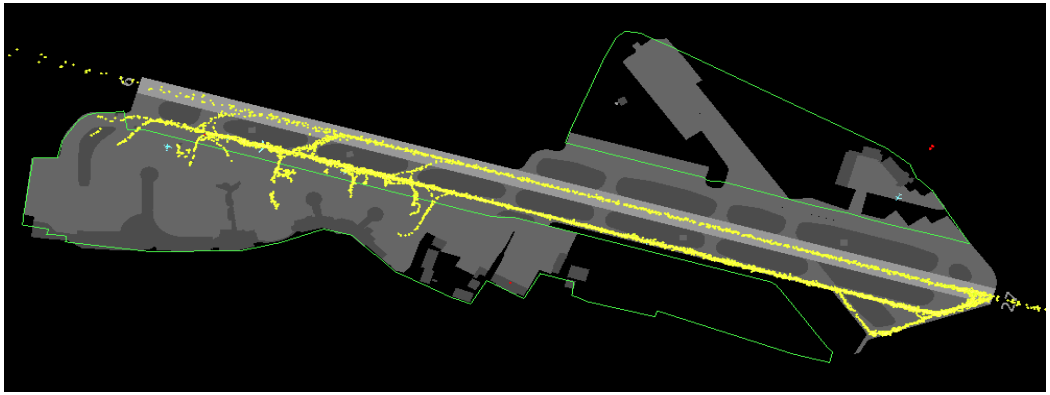
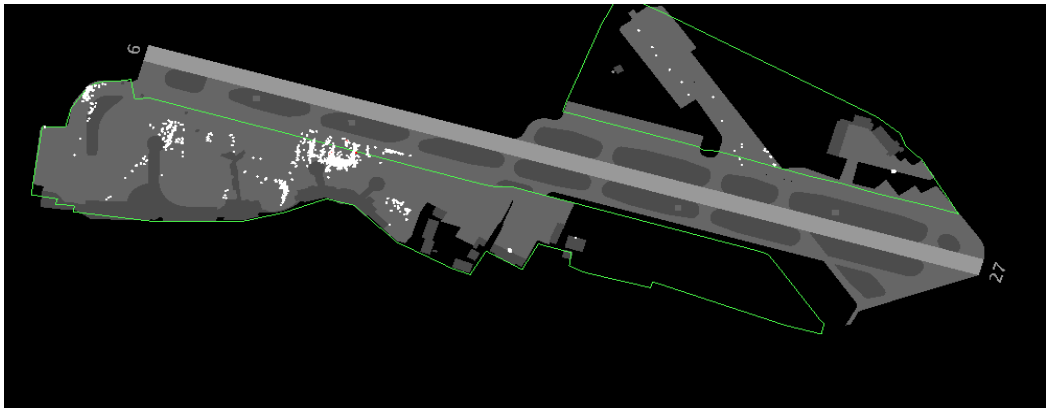



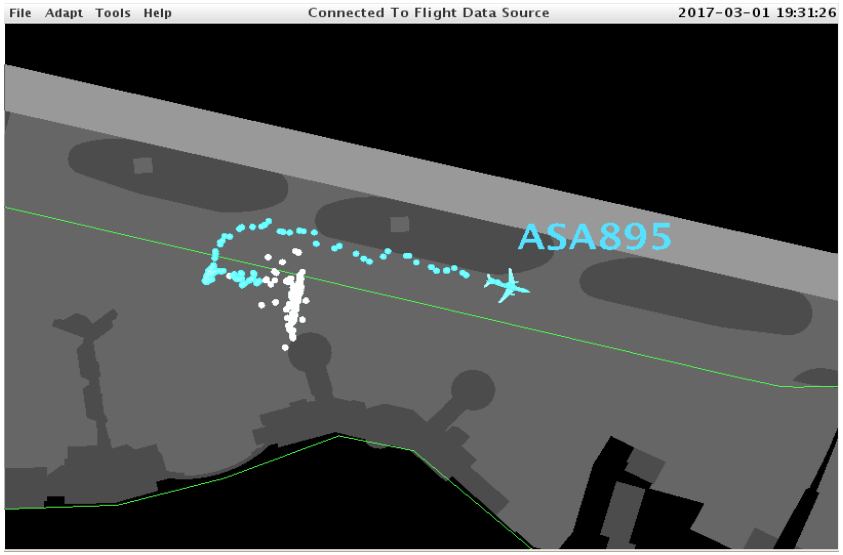
Analysis of Cat10 data at SAN

Cat10 data coverage at SAN was not very good.
There were many flights that didn't receive any Cat10 reports at all.

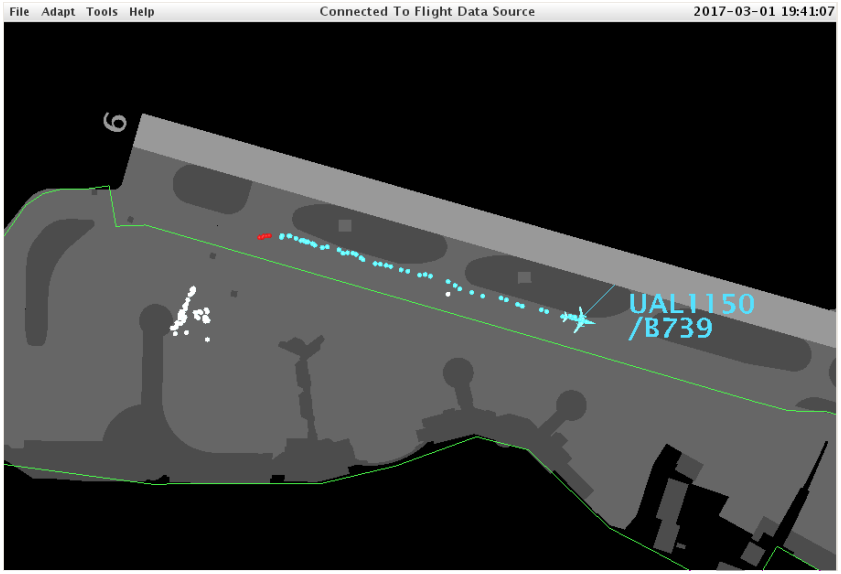




SAN Example Flights



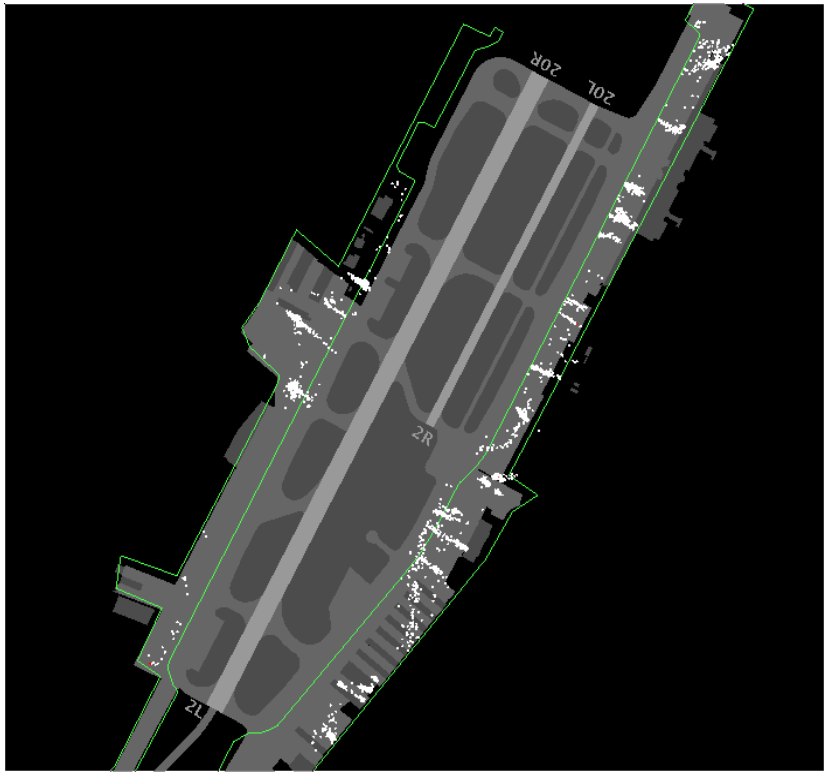
ASA895 looks like a good case, but the Cat10 positions jumped around enough that it was difficult to determine where the aircraft likely was before the Cat11 data started up.



UAL1150 had Cat10 positions reported near the gate, but then there was a 6 minute gap in data before Cat11 data started with the aircraft out in the taxiway.

Analysis of Cat10 data at SNA

SNA had good Cat10 data coverage, although the relatively small size of the ramp areas may limit the value of the data.



Some examples from KSNA

AAL1168 was tracked from the gate out, although there were a few Cat10 positions that looked to be errors.

UAL2012 was also tracked well, although some drift while the aircraft was likely parked muddied the picture a bit. If a subscriber knew when an aircraft was parked, it could easily ignore the less accurate data.

Correlating Cat10 and Cat11 ASDE-X data

- **Correlation of Cat10 data can be difficult (even with previously received Cat10 data)**

- **Cat10 data doesn't provide the Aircraft ID, but it does provide some fields for correlation:**
  Track Number (provided on each update, but can change anytime there is a gap in the data – is not related to a target's Cat11 track number).
  acAddress (not provided each update, but does correlate with Cat11 data)
  mode3ACode

- **For this study, we correlated Cat10 data by:**
  - **If an acAddress value is provided, match to any Cat10 or Cat11 record having the same acAddress (and update the Cat10 track number if needed).**
  - **If an acAddress value was not included in the message, match to a record having the same Cat10 track number.**

SFDPS Update

Federal Aviation Administration

Upcoming Releases

- **SFDPS 1.3.0**
  - Provides batched track data and is currently available in operations
- **SFDPS Release 1.3.1**
  - Contains fixes for several issues with data, many of which have been brought to our attention by consumers
    - Release Notes will be posted to the NSRR
  - Will become operational end of 2017/early 2018
    - Exact dates will be provided at a later date
  - No changes to interface (no WSDL/schema changes)
- **SFDPS Release 1.4.0 (mid-2018)**
  - Will support FIXM 4.0
  - Both FIXM 3.0 and FIXM 4.0 will be supported during a six month or one year transition period, allowing FIXM 3.0 consumers to migrate to FIXM 4.0 at their own pace

In other news

- **Reconstitution and Web Services**
  - To use reconstitution or ad-hoc queries:
    - Work with your FAA project lead to get qualified in FNTB to use web services
- **12 second track updates**
  - If you would like to receive 12 second track updates and you currently consume data via NEMS, please talk to your FAA project lead to transition to Solace

Update to Future Users Forums

Federal Aviation Administration

Users Forums are going Bi-monthly

- **Next Users Forum:** August 10, 2017, 2:30pm – 4:00pm EST
  - October 12
  - December 14
- Forums will continue to meet on the 2nd Thursday of the month
- Bring your questions, bring your topic ideas

Voice of the User:
Aviation Hackathon 2017 Summary and Results

Federal Aviation Administration

Presented to: SWIM Users Forum

By: Booz Allen Hamilton

Date: June 8, 2017

@AVIATIONHACK
#AVIATIONHACKATHON

Agenda

Hackathon Overview

Aviation Hackathon Event Details

Results and Themes

Q/A

What is a Hackathon?

hack·a·thon - an event, typically lasting several days, in which a large number of people meet to engage in collaborative problem solving.

- "Hackathon" has become a trendy word in today's business vernacular.
  The word "hackathon" comes from both "hack" and "marathon." If you think of a "hack" as a creative solution and "marathon" as a continuous, often competitive event, you're at the heart of what a hackathon is about
- Hackathons enable creative problem solving through an innovative and often competitive structure that engages stakeholders to come up with unconventional solutions to pressing challenges
- Hackathons can be used to develop new processes, products, ways of thinking, or ways of engaging stakeholders and partners, with benefits ranging from solving tough problems to broader cultural and organizational improvements
- While hackathon structures can vary widely, all share the same organizing principles—collaboration, crowdsourcing, competition, and creative problem solving. They can last hours, days, or even weeks, bringing people together to ideate, test and accelerate new ideas in a low-risk environment
- Hackathons can focus on a defined problem or challenge you're trying to solve, or they can be exploratory.

Hackathon Models

EXPLORATORY - Co-creation of questions that could be analyzed with the stakeholders

Participation: Invitation only, selected SMEs
Challenge: Nothing pre-defined, review data and brainstorm
Data: Public or proprietary/sensitive, cleansed in advance
Tools: Can pre-define or leave open

OPEN - What we traditionally think of, full participation and open to all solutions

Participation: Open to Public
Challenge: Broad Concept or Narrow Target defined
Data: Publically available
Tools: Bring your own

CAPABILITY FOCUSED – Use similar data or question with multiple teams using unique

Participation: Invitation only. Data scientists required, Pre-defined teams.
Challenge: Similar question or data set shared with all teams
Data: Proprietary/sensitive, cleansed in advance
Tools: Pre-define the tools for each capability group

INTERNAL – Focus around a specific stakeholder group

Participation: Pre-defined teams and stakeholder groups
Challenge: Narrowly defined
Data: Publically available and/or Proprietary/Sensitive
Tools: Bring your own

Aviation Hackathon

OBJECTIVE

Bring together a data analytics community from academia, industry and government to explore new use cases for aviation data. The diversity of the community is paramount for innovation and encourage broad perspectives

This event:

- Created great networking opportunities
- Created potential partnerships among participating organizations
- Identified new analytics models for mobility applications and transportation
- Raised awareness about the transportation market
- Provided training to participants (Data Science and Business Development basics)

AUDIENCE

- Data scientists, IT strategists, Process Improvement specialists, Data Analysts
- Benefits for the Audience – Improve coding skills; receive mentorship for technical skills; networking

BENEFITS FOR FAA

- Promote innovation within government
- Increased understanding of what SWIM data is available for use
- Justification to continue funding SWIM
- Good public relations

Summary of available aviation data sets

FAA SWIM Data

Available SWIM data feeds include:

Flight Plans & Track Data via SFDPS –
e.g. Flight plan, track and position data.
Terminal Data via STDDS –
e.g. Terminal / approach flight data.
Surface Data via STDDS –
e.g. Surface movement, ground radar, and RVR data.
Flow Management Data via TFMData Service -
e.g. Flight data, reroutes, advisories and flow constraints
TBFM Data via TBFM SWIM Service **–**
e.g. Aircraft information and metering information
Weather Data via ITWS SWIM Service**–**
e.g. Precipitation, gust fronts, storm motion, microburst, tornados

Additional SWIM services planned to be added
e.g. Aeronautical Common Services and Aviation Safety Reporting Data

Publicly Available Aviation Data

Aeronautical Information via National Flight Data Center

Safety Data via ASIAS (Public Site)

DOT Bureau of Transportation Statistics (BTS) data

- **Airline Ticket Samples**: 10% sample of Airline origins and destinations
- **Airline Traffic Data**: Monthly air carrier traffic information
- **On-Time Arrival Data**: Data from major carriers for domestic flights. Includes departures and arrival delays, origin and destination airports.
- **Air Carrier Financial Reports**: Monthly reported fuel costs, Annual Inventory of Airframe and Aircraft Engines, operating balance sheet statements.

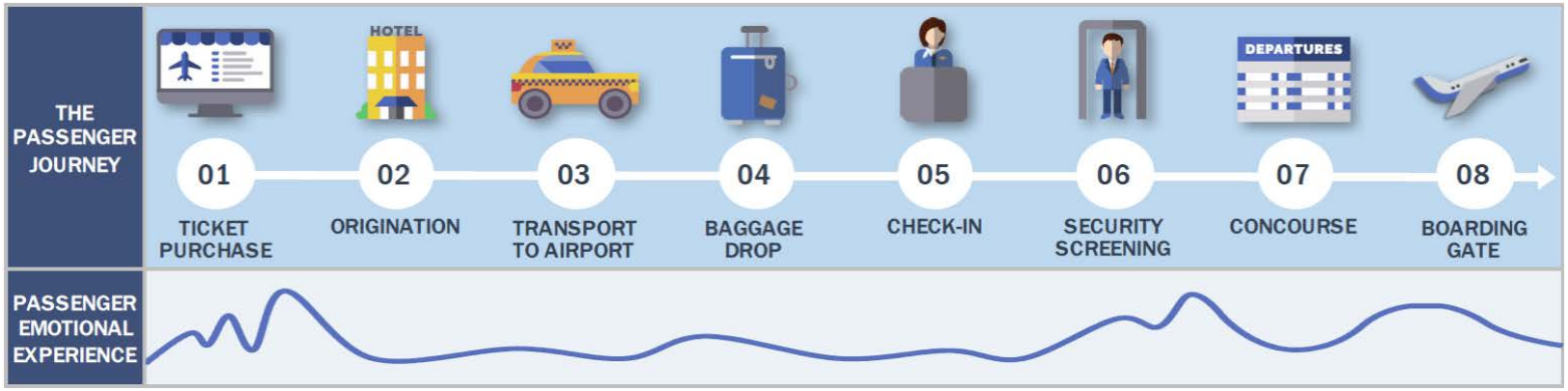
Social Media Data – Public sentiment data based on flights

(Additional publicly available data can be incorporated as needed)

Competition Format

EXPLORE / ANALYZE / IDEATE / INNOVATE

- Use cases to improve the traveler experience
- Consider other publicly available data
- Consider impact to traveler and industry



- Presentation templates were provided to participants
- Scoring criteria with definitions provided to participants

Teams and Mentors

TEAMS

- Typical teams were three to six people, with a mix of aviation experts, data scientists, developers and business/industry experts.
- 15 teams registered (later coalesced to 7 teams)
- Participants came from UMD, GWU, JMU, GMU, Apogee, ATA, CNN and Booz Allen

MENTORS

- Business and Industry applications
- Technology / Tools / approach
- SWIM data mentors

General Themes for Use Cases

SOCIAL MEDIA

- Social media is a great source to extract social sentiment on aviation events.
- Airlines and Airports can correlate SWIM data with social sentiment data to determine appropriate incentives for varying situations
- There are other potential business applications such as meal specials during delays, or tracking how social sentiment improves or worsens based on certain incentives

AIRLINE OPERATIONS

- Teams explored ideas on how Airlines can adjust operations based on historical trends on passenger and other airline behaviors.
- Airport terminal layouts were considered for additional needed information to design optimum connecting flights or placement of entities providing passenger incentives

SMART AIRPORTS

- SWIM data by itself, or correlated with other data can be accessible in varying ways, e.g. interactive touch screens, airport specific mobile apps and websites, and large screen displays.

UAS RELATED APPLICATIONS WERE DISCUSSED BUT NOT PURSUED.

Past Booz Allen Hackathon Highlights

COUNTERTERRORISM HACKATHON

- Participant teams explored new ways of predicting terror attacks, utilizing 50+ public, open source datasets and APIs to answer questions like:
  - What are radical new ways of predicting terror attacks?
  - How do you find a potential terrorist in massive amounts of data

https://twitter.com/hashtag/hackterror

VETERANS AFFAIRS BRAINTRUST HACKATHON

- Participant teams worked together to create brain health innovations for Veterans experiencing mild traumatic brain injury (mTBI) and post traumatic stress disorder (PTSD)

https://3blmedia.com/News/Booz-Allen-Hamilton-Joins-VABrainTrust-Hackathon-Veterans and http://bit.ly/1U8ZmOW

ML BASEBALL ANALYTICS HACKATHON

- Participants worked to develop innovative data science and visualization solutions using unique datasets provided alongside other publically available data
- The hackathon brought together creative minds in a competitive environment and led to novel solutions to some of the baseball industry's toughest questions

TRANSPORTATION HACKATHON

- The advent of smart cities and connected vehicles (CV) brings need to integrate multiple technological solutions in a secure fashion to manage the city's assets
- Participant teams measured future connectedness, livability and transportation prospects in Boston communities using multi-variable analysis and predictive techniques to identify opportunities for connected vehicle effectiveness and identify the best locations for new businesses

https://smbah.shinyapps.io/BostonCity/

Past Booz Allen Hackathon Highlights

HACK THE SKY FOR SWARM DRONE CONTROL SYSTEMS

- The U.S. Navy currently faces two converging, unprecedented revolutions: the emergence of autonomous machines and cyber manipulation of those smart machines. Participants focused on three challenges:
  - Future of Autonomy Design Thinking Workshop focused on swarm security optimization, command and control theory, and human machine interface
  - Rapid User Experience (RUX) Challenge with Topcoder focused on designing visual concepts for three user types (commander, marine operator, and swarm engineer) and how they interact to control the swarm drones' visual display dashboards on a desktop, tablet, and mobile device
  - HACKtheSKY Hackathon with teams tackling three unique challenge prompts outlining critical weaknesses in the Navy's world-record-setting swarm drones

http://bit.ly/2gDaItk

US COAST GUARD DATATHON EVENT

- Participant teams focused on three challenges
  - used GIS network analytics to optimize the itinerary of inspectors to improve their efficiency when traveling to each inspection point
  - applied proximity analysis and geofencing capabilities to pollution data to identify vessels that may be associated with hazardous pollution incidents, and
  - analyzed Search and Rescue (SAR) cases by district (e.g., types of incidents/assets, location, average distance, average response time) and where SAR cases occur in each District (e.g., trend analysis, cluster analysis)

Questions?