



Airspace Technology Demonstration 2 (ATD-2)

Understand and Process ATC Restrictions in the National Airspace System: Part 2

September 5, 2019

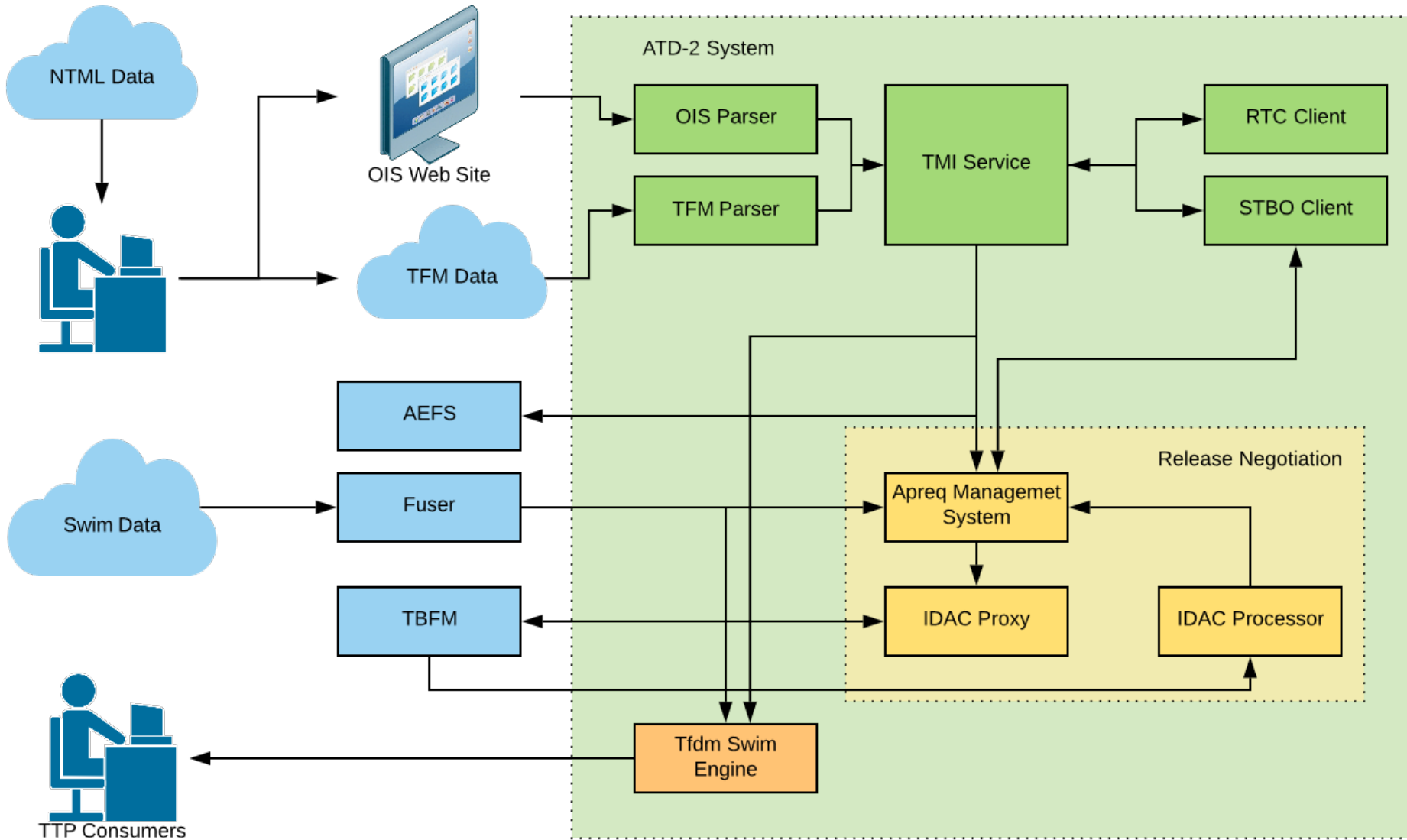
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Reduce verbal communication and streamline restriction compliance in the NAS by:

1. Automatically detecting Traffic Management Initiatives (TMIs)
2. Providing situational awareness of TMIs
3. Providing tools to manage TMIs within the ATD-2 system
4. Interfacing with existing FAA systems to improve the speed and accuracy of controlling TMI affected flights
5. Distributing flight and TMI data via TFDM Terminal Publication (TTP) SWIM feed.





TMI	OIS	TFM Flow	NTML
Airport Information	NO	YES	YES
Airspace Flow Programs	NO	YES	YES
Ground Delay Programs	NO	YES	YES
Ground Stops	NO	YES	YES
Miles/Minutes in Trail	YES	YES	YES
Altitude Restrictions	YES	YES	YES
APREQs	YES	NO	YES
Advisories	NO	YES	YES
Closures (Fixes, etc.)	YES	YES	YES
FADT	NO	YES	NO
RAPT	NO	YES	NO
CTOP	NO	YES	NO
DICE	NO	YES	NO
REROUTEs	NO	YES	NO
TMI FLIGHT LIST	NO	YES	NO



- Restriction column in OIS table is free text
 - Typos in keywords
 - Keywords out of expected order (e.g. start/end time values before APREQ/MIT keyword when they are expected after)
 - Precision matters!

Example: STOP CLT to CLT via NORTH JOJJO 1834-1930 WX:TSTMS ZTL:CLT

- NORTH was interpreted as the closure with JOJJO marked as an inclusion constraint
- Resulted in all fixes in the NORTH departure gate being closed
- TMI was intended to only close JOJJO



- Not all restriction types are available from OIS
- Not all airports/centers publish data to OIS
- OIS page does not display future restrictions
- Restriction only show after they have started
- Lag time between when a restriction goes into affect and when it shows on the OIS page (9 min. average lag)
- Occasional OIS page down time results in missing restrictions
- Unexpected changes to page URL, format, or permissions could result in a loss of data

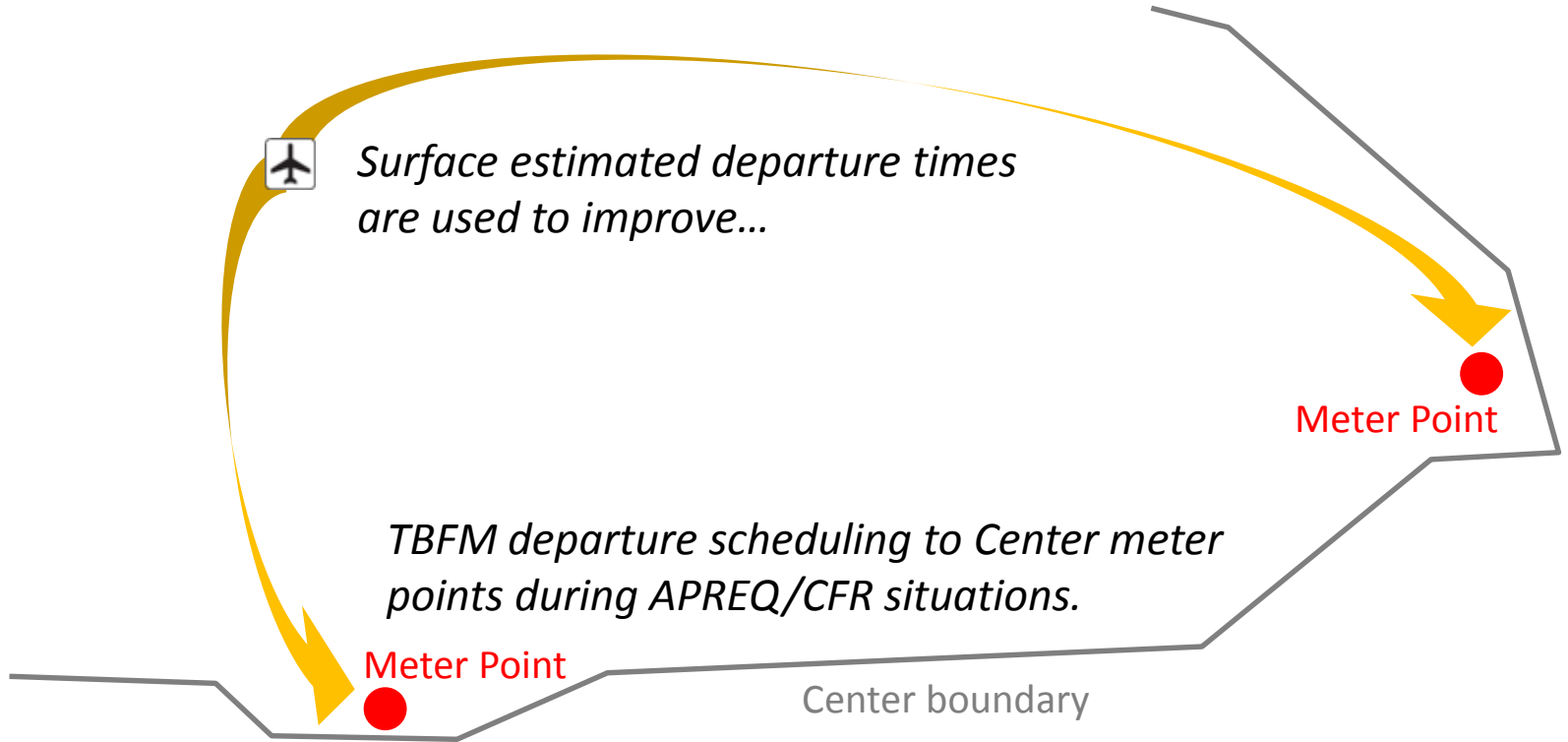


- APREQs are not currently observed in TFM Flow.
- Manual entry of the restrictions can result in typos that cause difficulties in parsing or dropped data.
- If TMIs are not entered into NTML, they may not end up in TFM Flow. FDIO, phone, or internal systems may be used to distribute TMI information.
- If ATC makes a free text log entry rather than using NTML's restriction panel the automated publishing of the restriction data may not happen.
- Ground Stop advisories are usually generated automatically when a Ground Stop is entered into FSM. However, some stops are initiated verbally with a free-text advisory manually created. These stops will not follow the same format as the automated Ground Stop advisories.
- Requires a well defined and consistent process of generating the TFM messages
- Value added qualifier and remarks fields contain center specific formatting
- Refresh messages are difficult to decipher and match

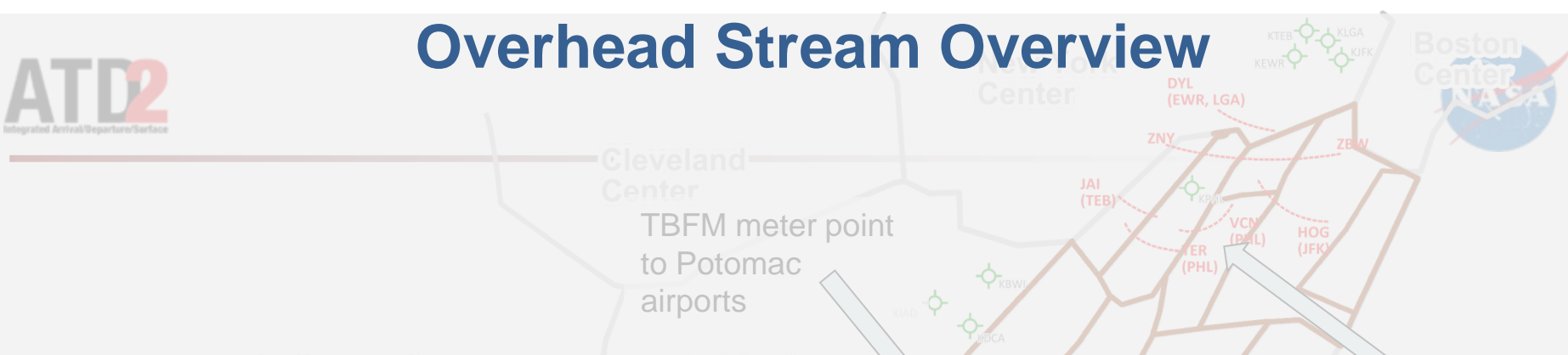


- Authoritative TMI repository across all ATD-2 components
- Processes, stores, de-conflict, and distribute TMI's
- Automatically recognizes and tags flights constrained by an active or future TMI event.
- Support persistent TMI's spanning multiple days (e.g. taxiway closures)
- Handles the following TMI data:

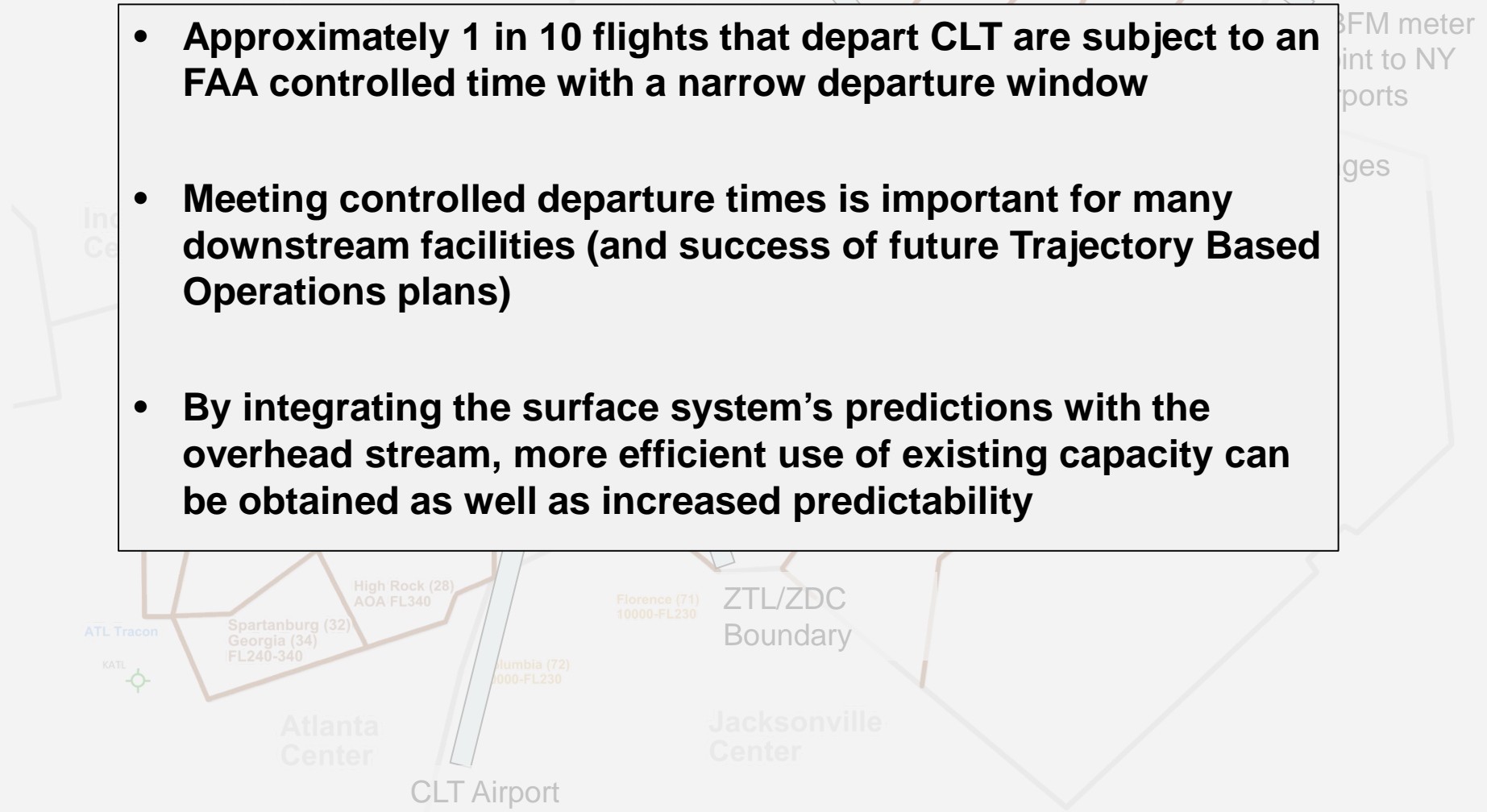
TMI Type	Possible Sources
Runway Utilization	User, Model
APREQs	User, TFM, OIS
Surface Metering Programs	Scheduler
Departure Fix Closures	User, TFM, OIS
Departure Gate Closures	User, TFM, OIS
Ground Delay Programs	TFM
Ground Stops	User, TFM
MITs	User, TFM, OIS
Ramp Closures	User
Runway Closures	User
Scheduled Metering Modes	User
Taxiway Closures	User



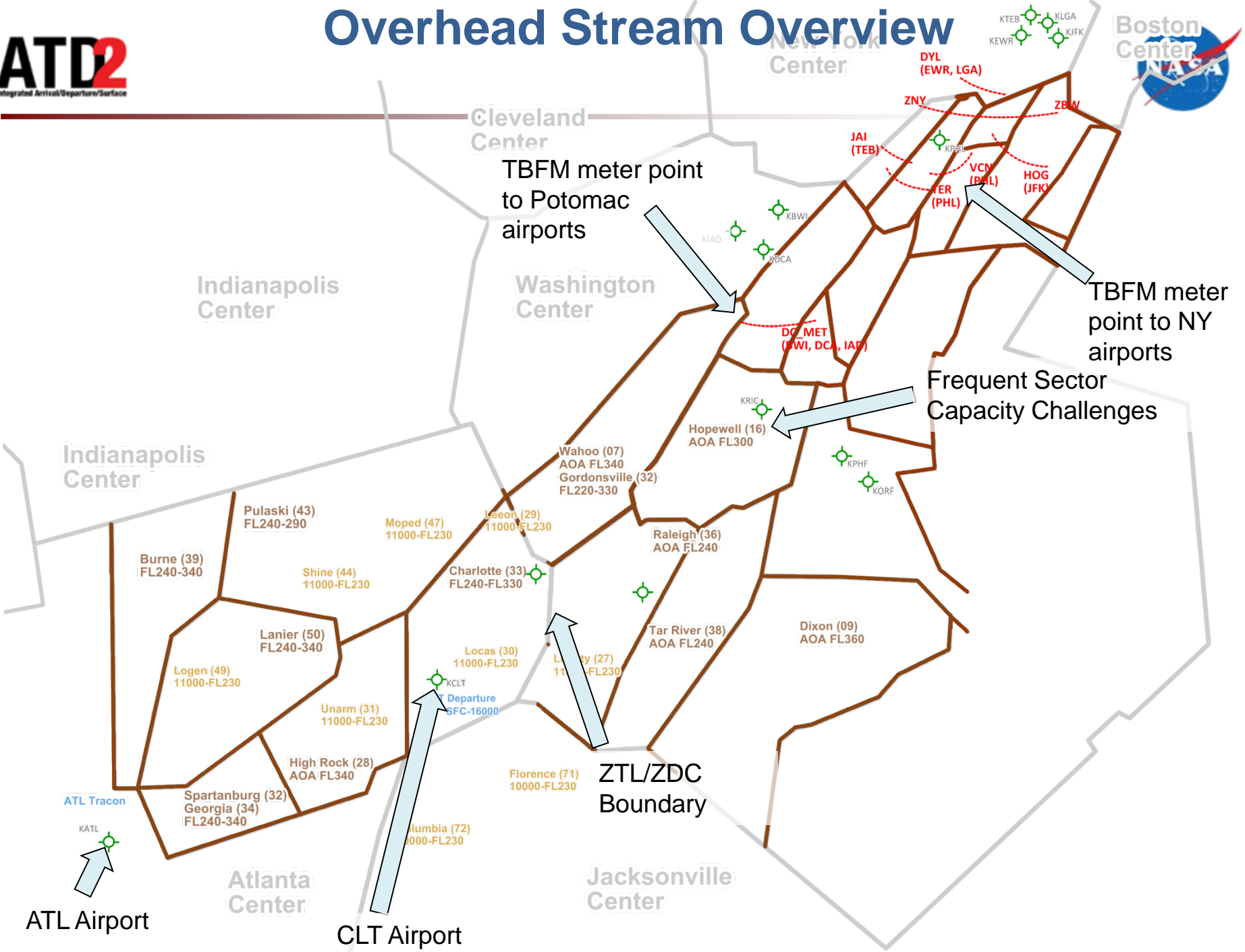
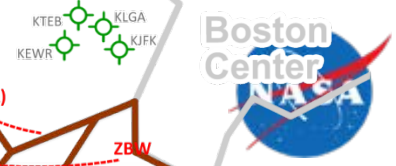
Overhead Stream Overview



- **Approximately 1 in 10 flights that depart CLT are subject to an FAA controlled time with a narrow departure window**
- **Meeting controlled departure times is important for many downstream facilities (and success of future Trajectory Based Operations plans)**
- **By integrating the surface system's predictions with the overhead stream, more efficient use of existing capacity can be obtained as well as increased predictability**



Overhead Stream Overview



Cleveland Center

TBFM meter point to Potomac airports

Indianapolis Center

Washington Center

TBFM meter point to NY airports

Frequent Sector Capacity Challenges

Indianapolis Center

Wahoo (07) AOA FL340
Gordonsville (32) FL220-330

Burne (39) FL240-340

Pulaski (43) FL240-290

Moped (47) 11000-FL230

Leeon (29) 11000-FL230

Raleigh (36) AOA FL240

Shine (44) 11000-FL230

Charlotte (33) FL240-FL330

Tar River (38) AOA FL240

Lanier (50) FL240-340

Unarm (31) 11000-FL230

Locas (30) 11000-FL230

Lilly (27) 11000-FL230

Dixon (09) AOA FL360

Logen (49) 11000-FL230

High Rock (28) AOA FL340

Florence (71) 10000-FL230

ZTL/ZDC Boundary

Spartanburg (32) Georgia (34) FL240-340

Columbia (72) 10000-FL230

ATL Tracon

ATL Airport

Atlanta Center

CLT Airport

Jacksonville Center

New York Center

DYL (EWR, LGA)

JAI (TEB)

ZNY

ZBW

KIAD

KBWI

KOCA

KPHL

VCM (PHL)

HOG (JFK)

DC MET (BWI, DCA, IAD)

KRIC

Hopewell (16) AOA FL300

KPHF

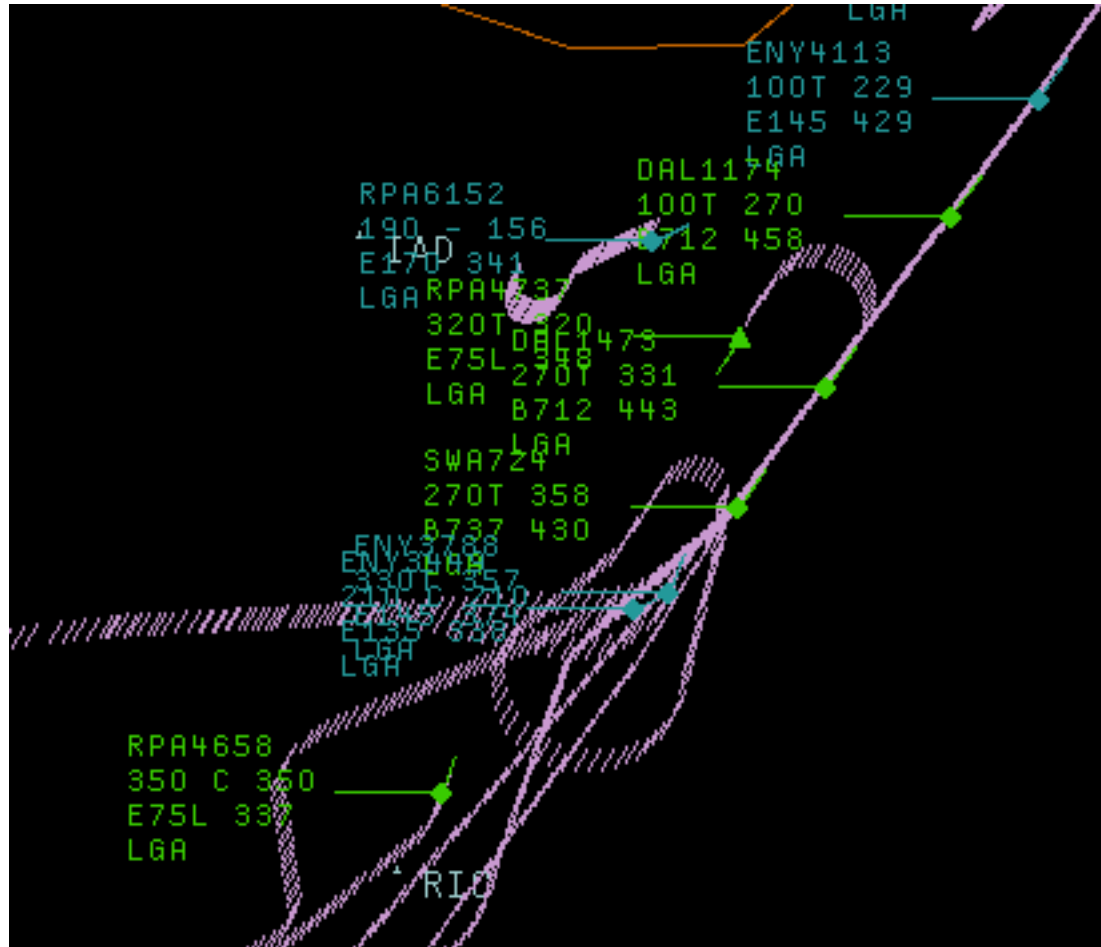
KORF

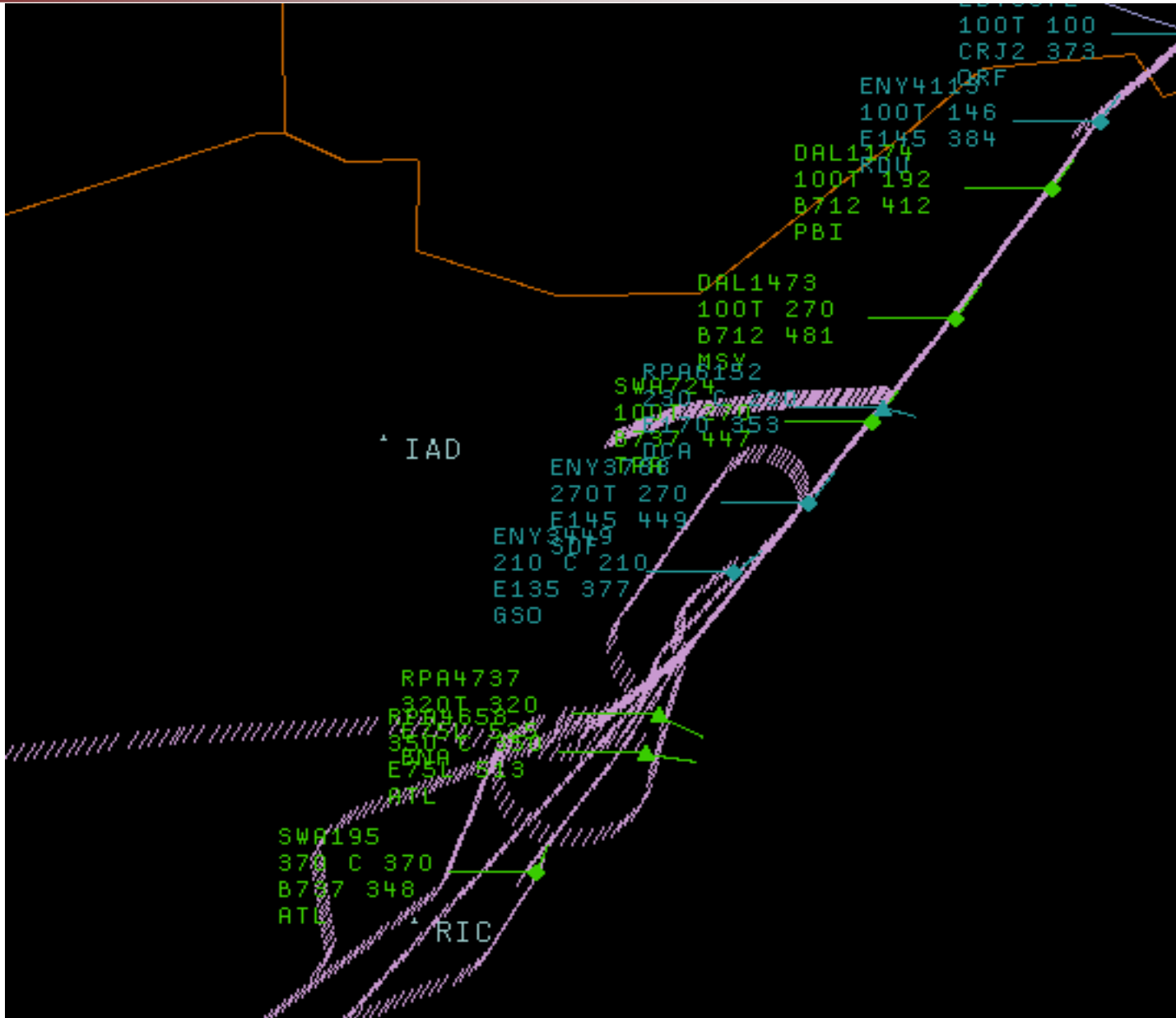
KATL

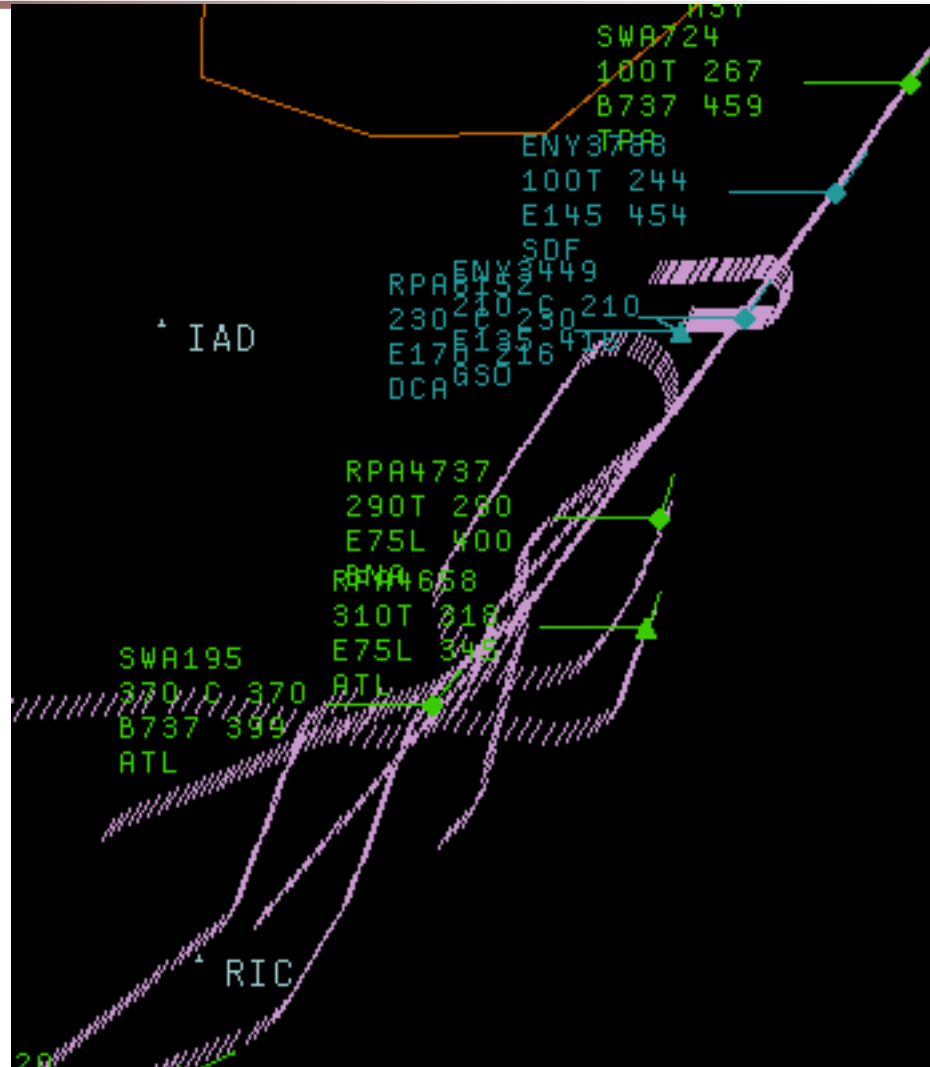
KCLT

Departure SFC-16000

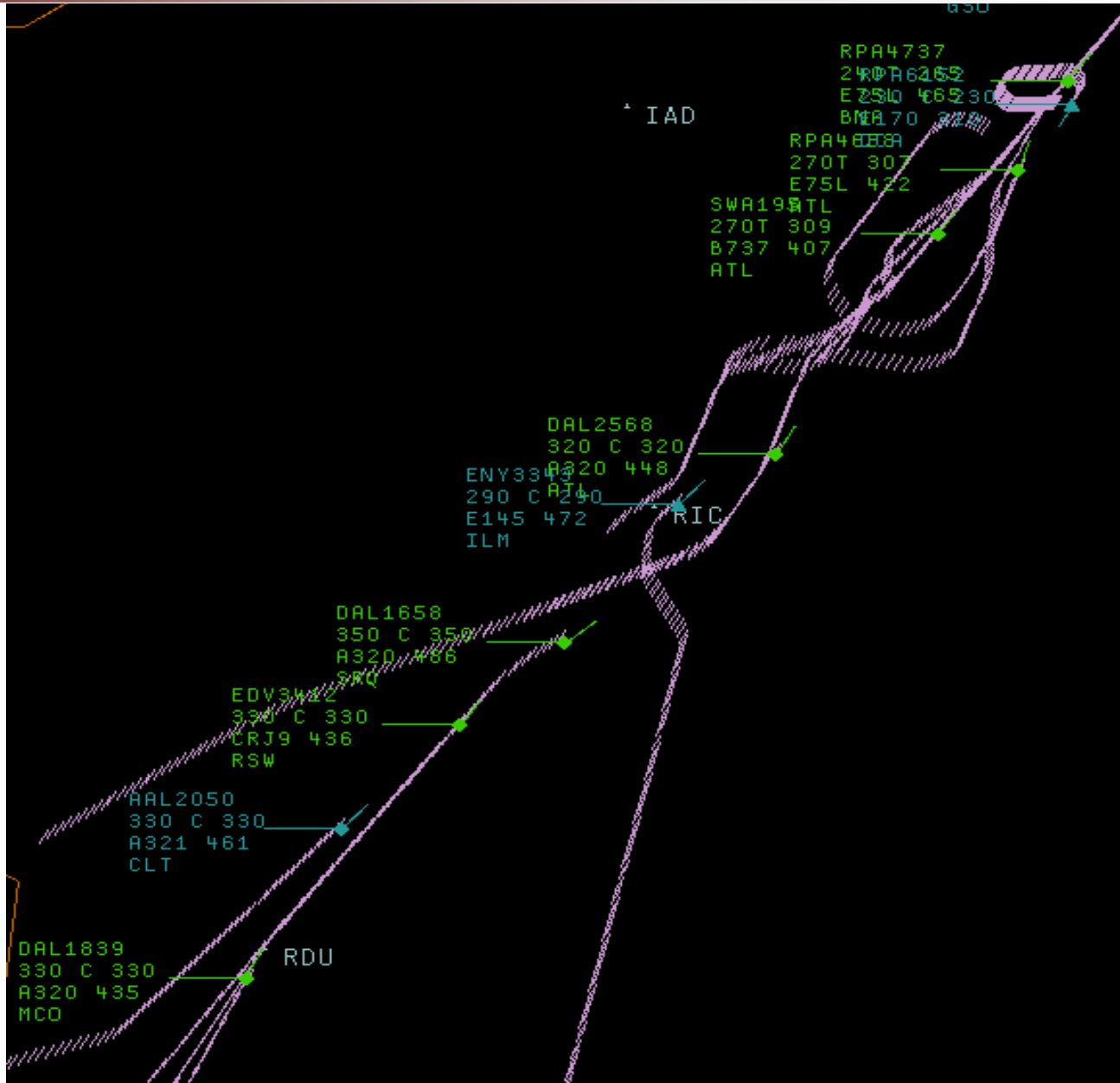




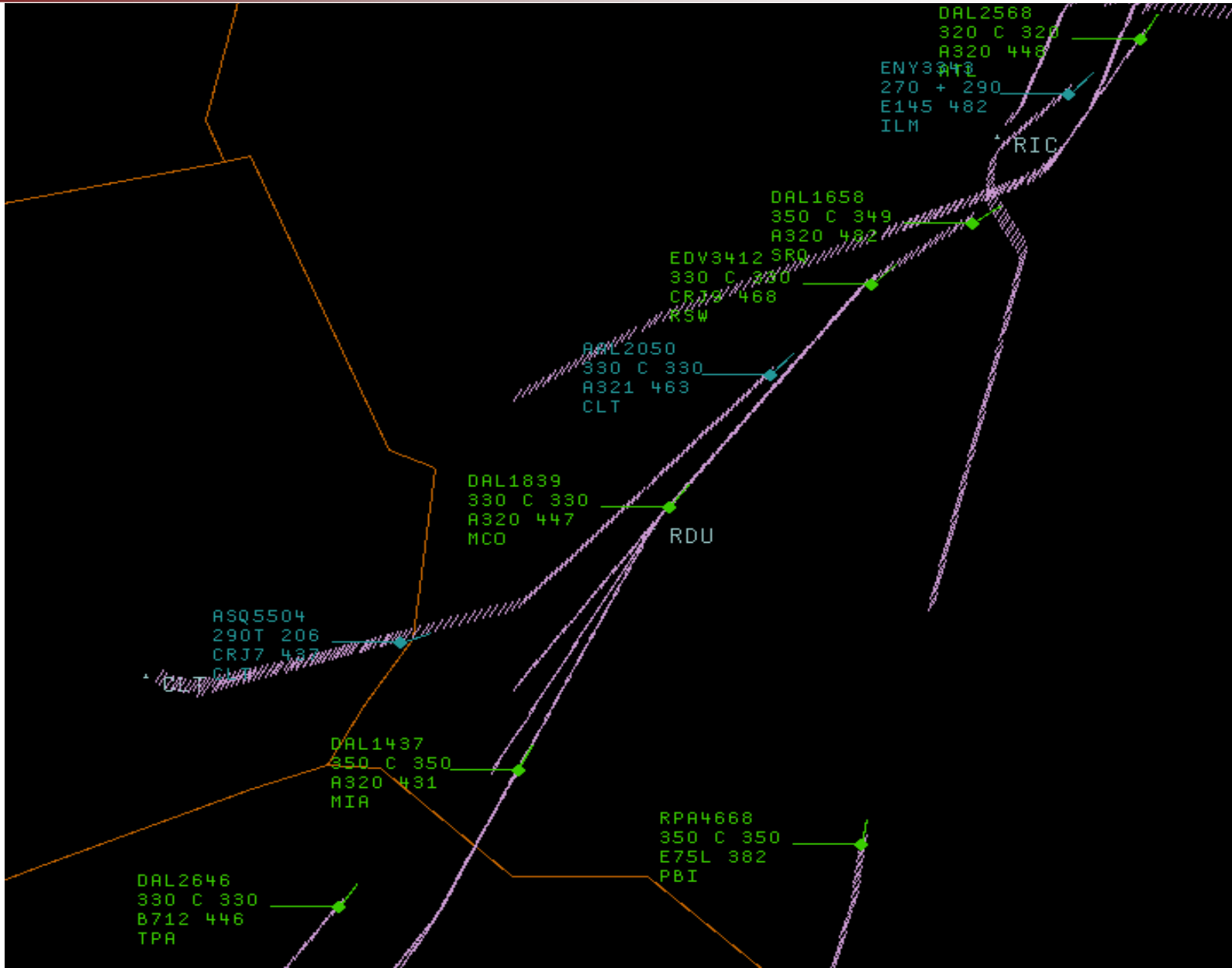


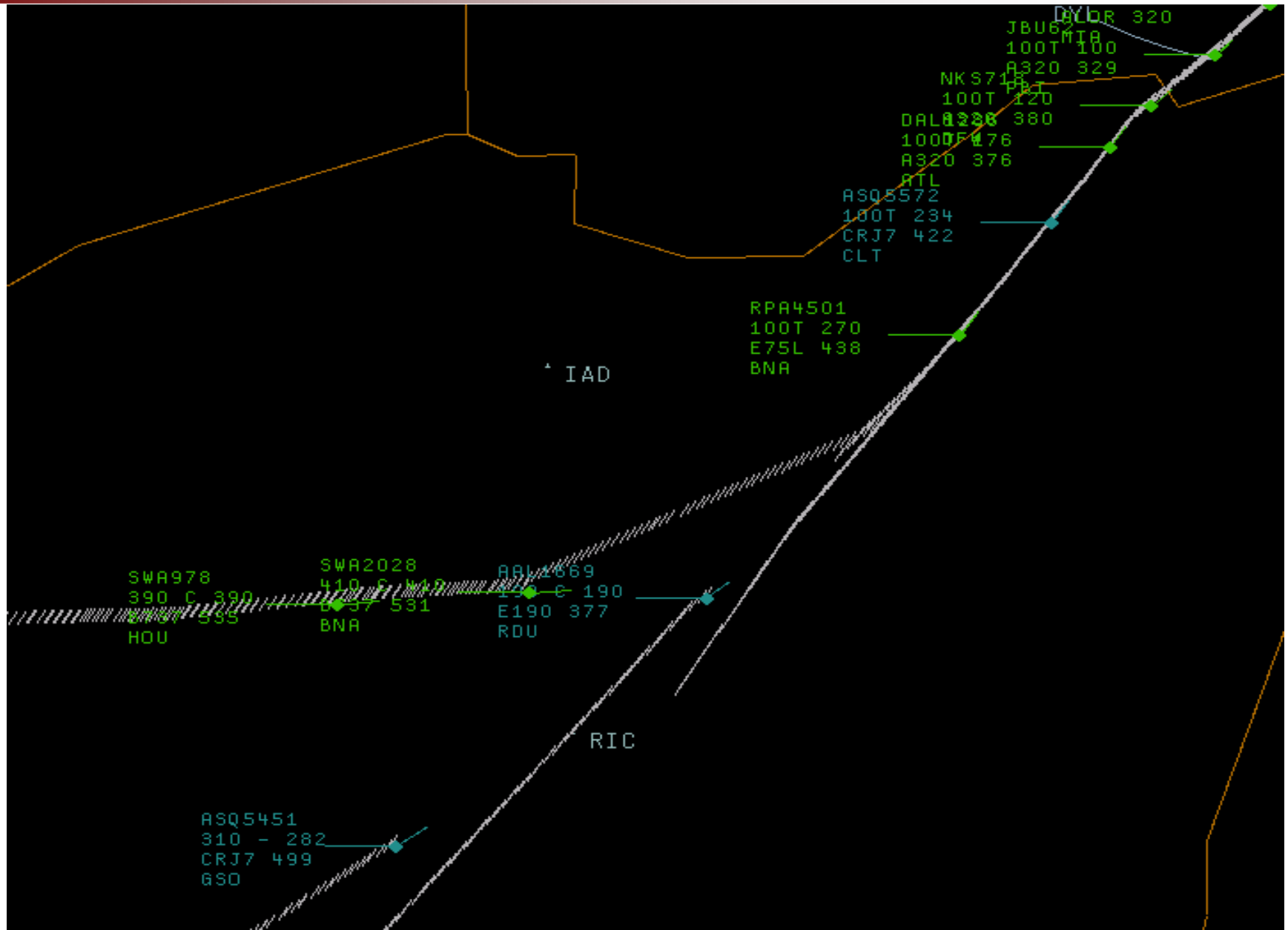


Consequences of Bad Releases RDU departure delayed 46 minutes



Came Out of Hold Before Next Flow Arrived



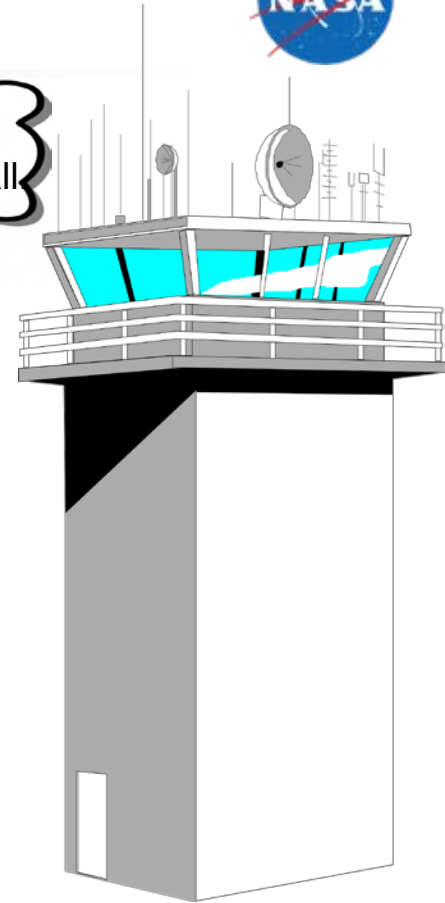
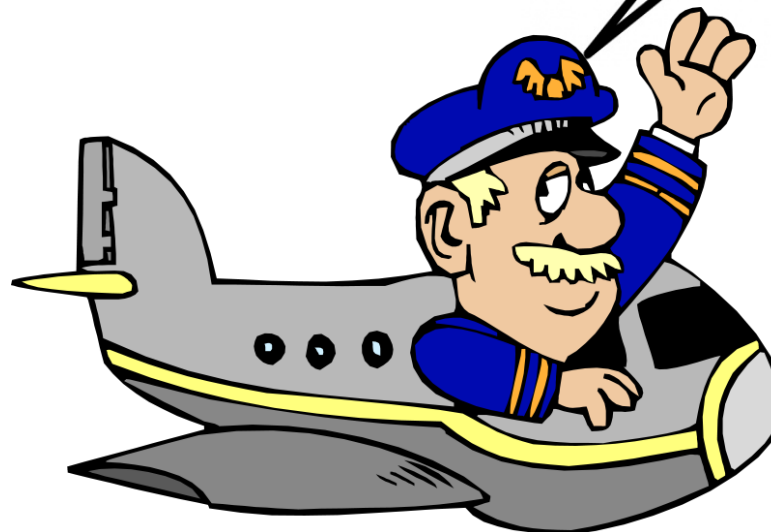


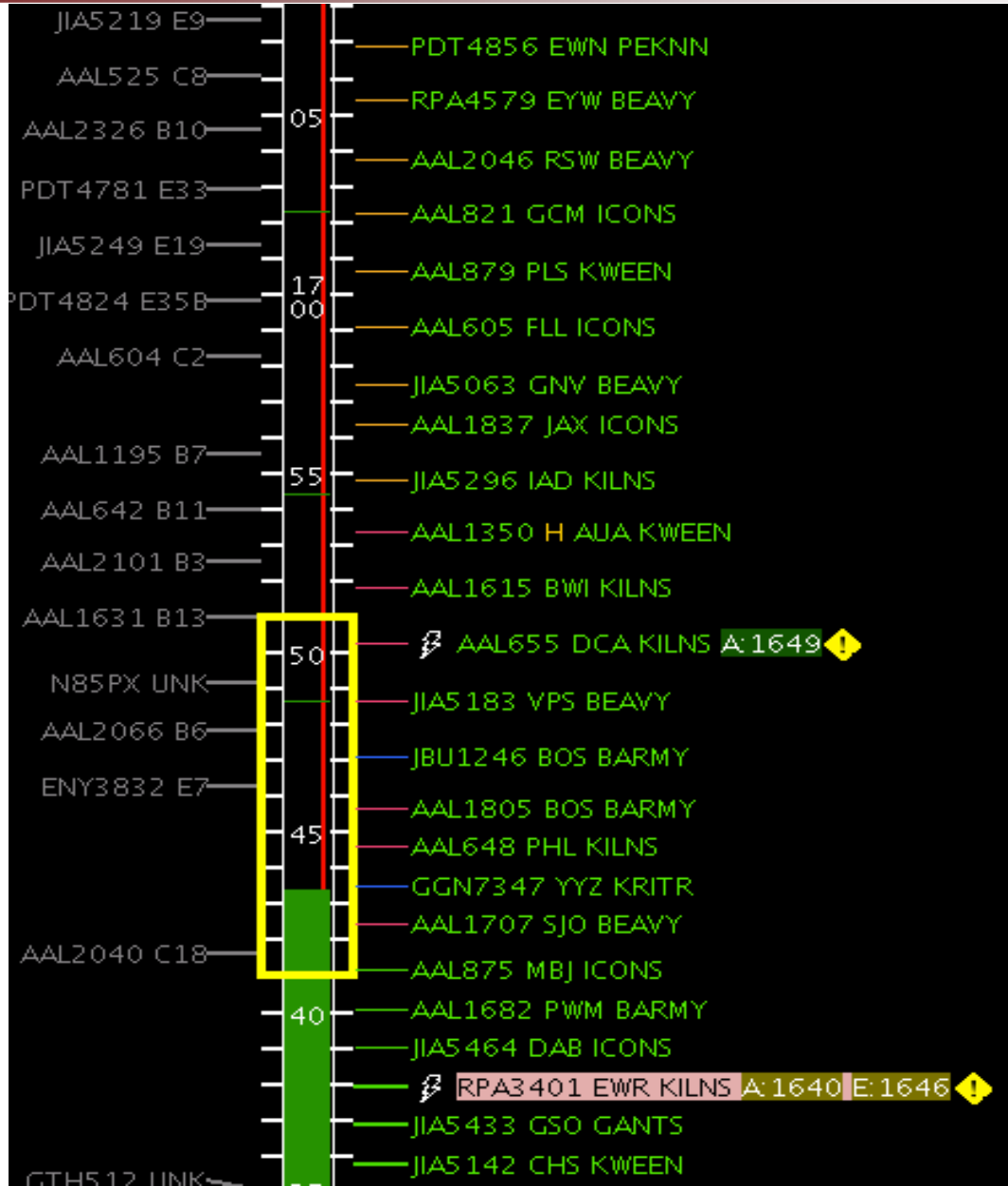


- Provides visibility into availability of overhead slots
- Reduces workload requesting release times by supporting Manual, Semi Automatic, and Automatic release modes
- Prevents errors by automatically detecting scheduled release times through SWIM and direct connections with IDAC

Hold on, got to make a phone call

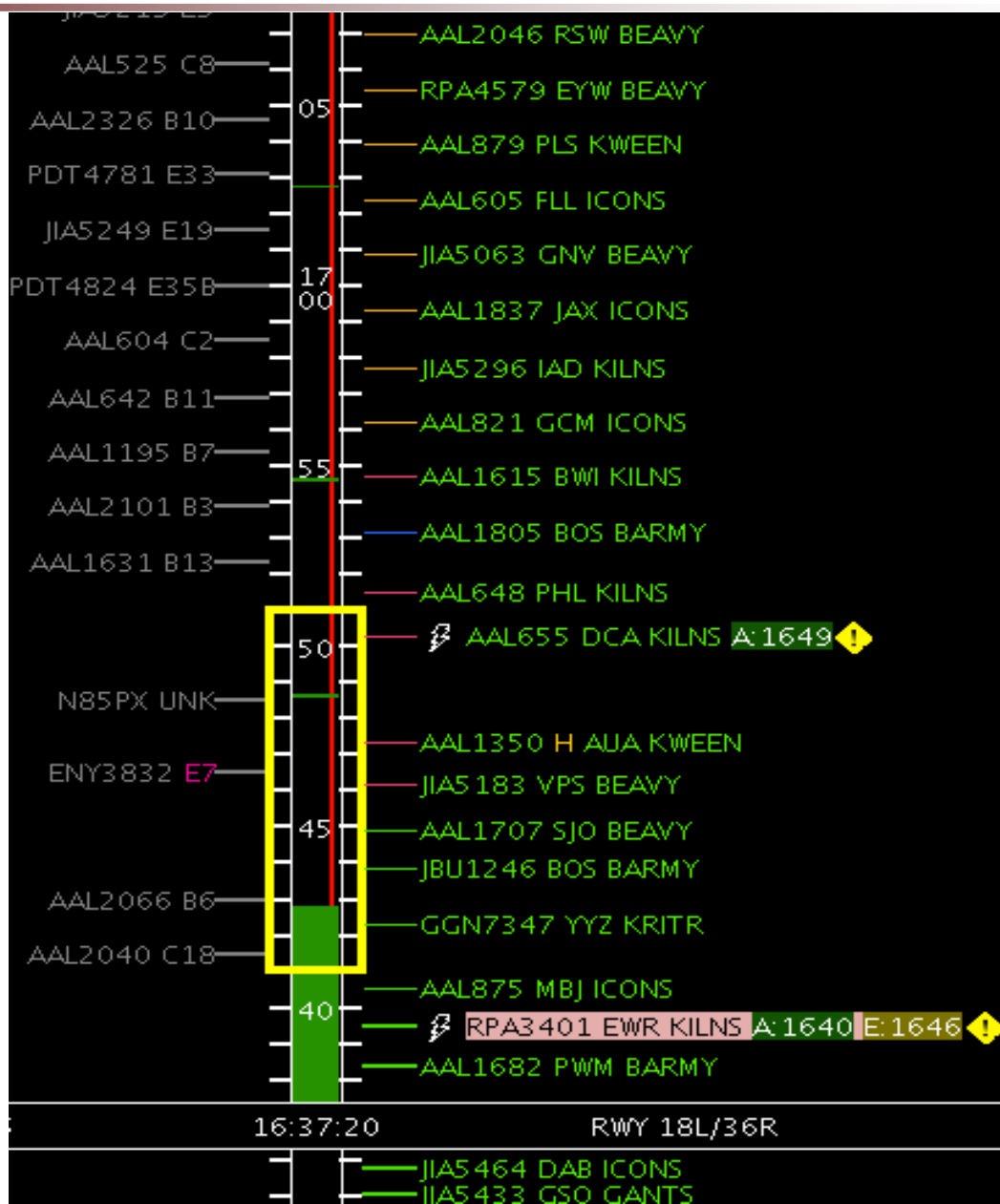
Can I depart?

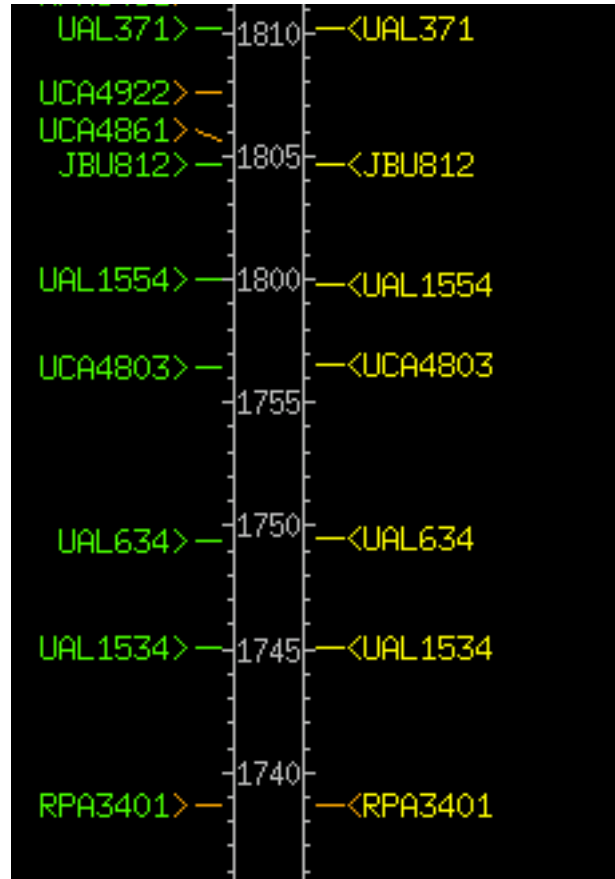




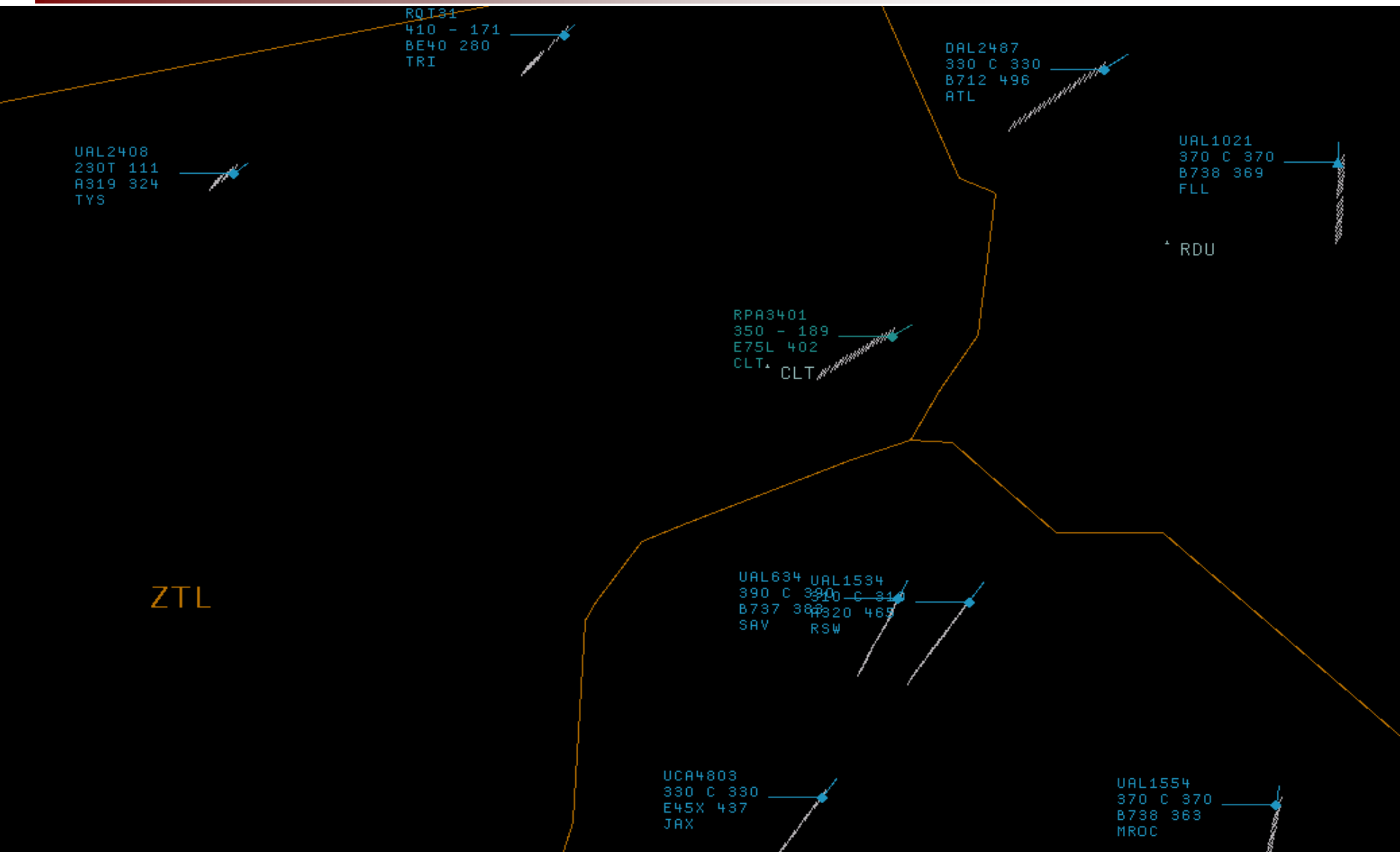


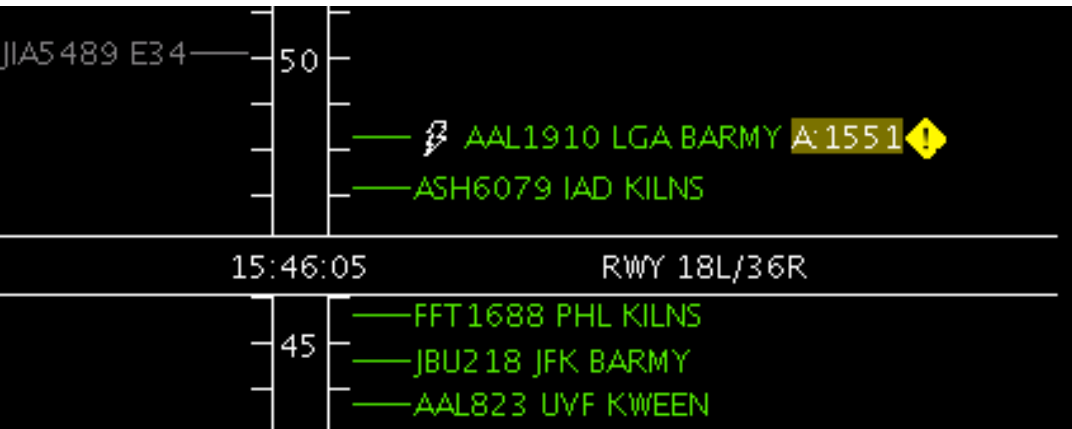
On Time Departure













	AAL1910 LGA BARMY A:1551
	ASH6079 IAD KILNS
15:46:55	RWY 18L/36R
	FFT1688 PHL KILNS



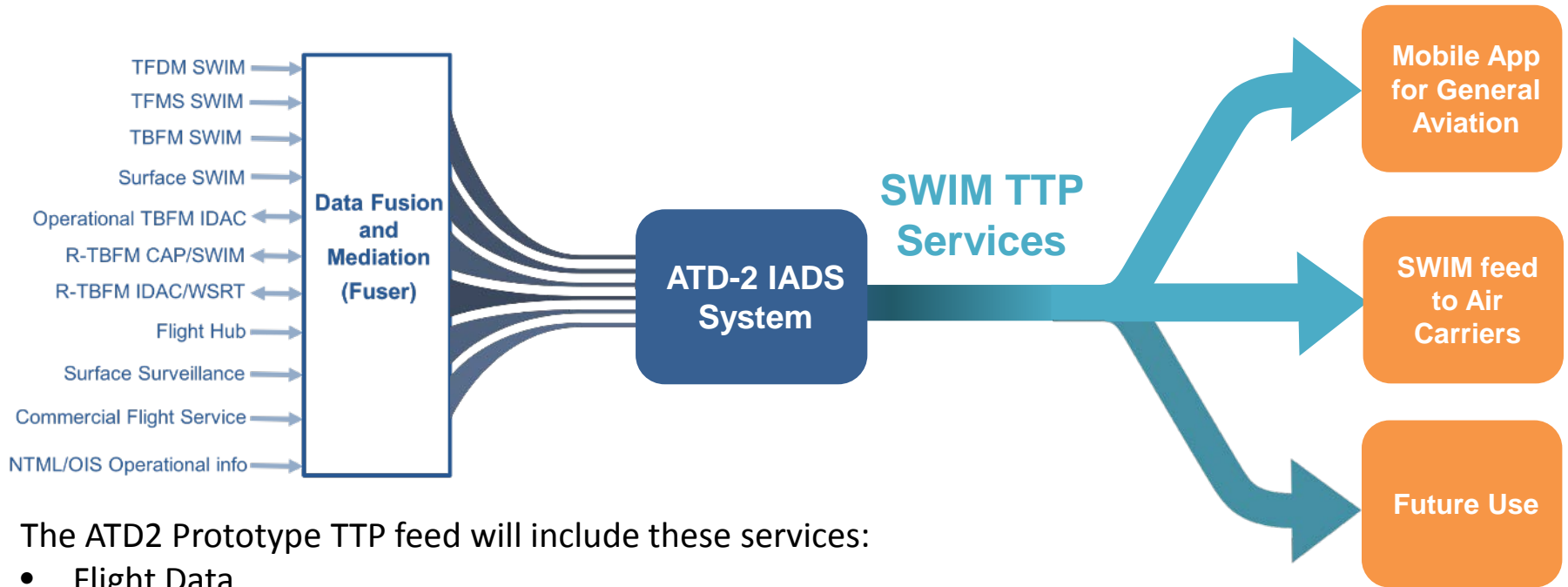


- With ZDC (East runway) 68% (1316 APREQ's to ZDC)
 - +/- 1 minute 87%
 - -1 minute 78%
-
- With ZTL (Center runway) 71% (842 APREQ's to ZTL)
 - +/- 1 minute 85%
 - -1 minute 79%

27% of Flights in Auto Mode. Of those flights 74% were compliant

NASA and the FAA are collaborating to provide a prototype TFDM Terminal Publication (TTP) feed via SWIM R&D network as part of the ATD-2 Field Demonstration

Applications that Leverage the TTP Prototype Feed



The ATD2 Prototype TTP feed will include these services:

- Flight Data
- Airport Information
- Traffic Management Restrictions
- Flight Delay
- Surface Metering Program
- Operational Metrics

TTP is now available on SWIM R&D for CLT. You are welcome to onboard now!



- TTP documentation: <https://nsrr.faa.gov/services/nasa-ttp/documents>
- Flight Data
 - TMI Identifiers
 - Release times
- Airport Information
 - Current runway utilization
 - Resource closures: runway, ramp, and taxiway
- Traffic Management Restrictions
 - APREQ's
 - Miles In Trail
- Surface Metering Program



- Only supports: MIT and APREQ
- All TMRs in the system are published in sync message every 15 minutes
- Any time a TMR is updated, an update message is published for that restriction including all fields (not just those updated)

APREQ Data	Miles/Minutes In Trail Data
<ul style="list-style-type: none"> • Timestamp (Creation Time) • Original Producer (Source) • TMR Action (Add, Update, Remove) • Unique ID • Restricted Resource • Start Time • End Time 	<ul style="list-style-type: none"> • Timestamp (Creation Time) • Original Producer (Source) • TMR Action (Add, Update, Remove) • Unique ID • Restricted Resource • Start Time • End Time • Miles/Minutes In Trail Spacing

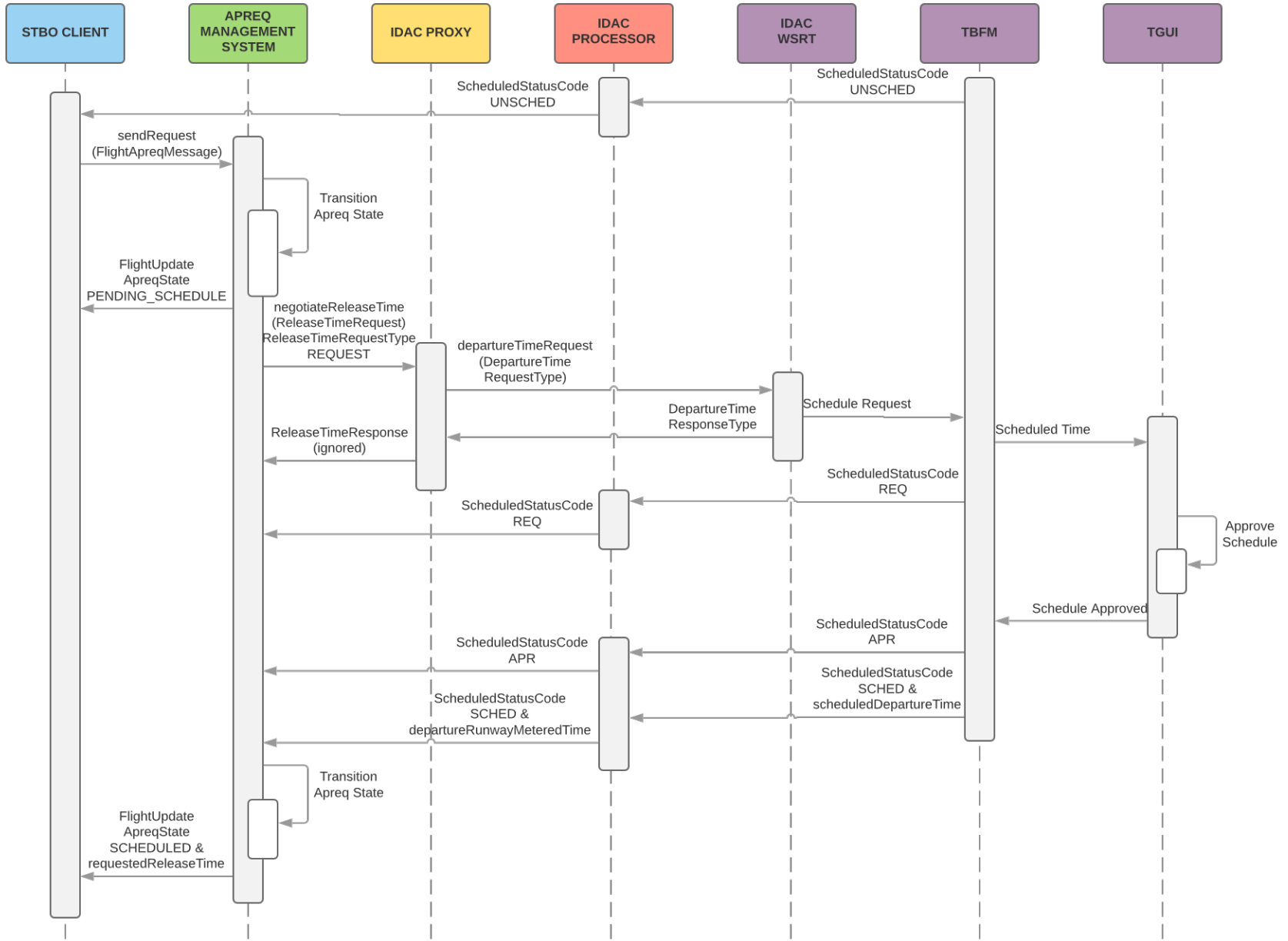


- Backup



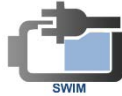
- Triggers
 - TMI's are added, updated, or removed
 - Flights are added, updated, or removed from the system
- Flight Criteria
 - A flights undelayed targeted take off time (UTOT) or best available runway time is between the start/end time of the TMI
 - Chose to use UTOT since it is not changed by scheduling logic
 - This prevents possibility of flight times repeatedly changing over the threshold for inclusion and thrashing between inclusion and exclusion from the TMI
 - Matches TMI resource
 - Uses destination resource specified in APREQ, Ground Stop, or MIT
 - Uses departure fix specified in Fix Closures or MIT
 - Uses runway/taxiway/jet route or any other resource specified by the TMI
 - TMI Constraints
 - If TMI constraints are defined, a flight will be included or excluded if matching the defined set of constraints

Release Negotiation Flow



ATC to Operator

- Real-time traffic management initiatives
- Airport configuration coordination
- Runway intent information



Ramp Tool Colors and Symbology



Arrivals are green



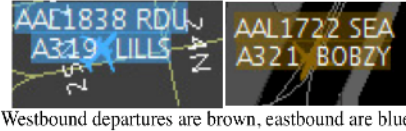
After pushback, engine symbol indicates spool up state



757 aircraft has blue and white border



Sector ownership



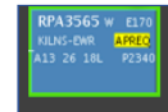
Westbound departures are brown, eastbound are blue



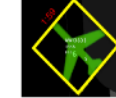
Hollow icon (if no surveillance)



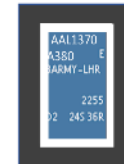
Heavy aircraft has orange and white border



Priority flight has green border

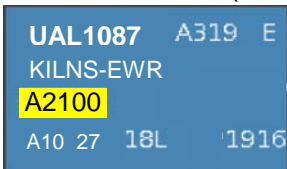


A flight assigned to the hardstand has yellow border

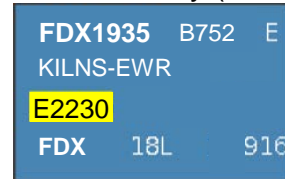


Super type aircraft has thick white border

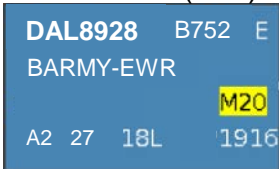
Call for release (APREQ)



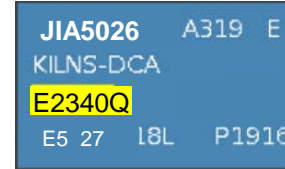
Ground delay (EDCT)



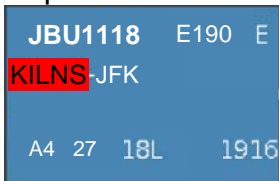
Miles in trail (MIT)



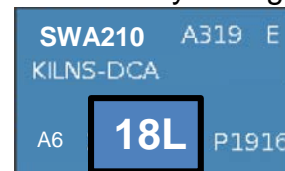
APREQ + EDCT



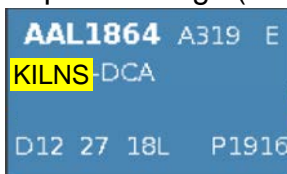
Dep Fix closure



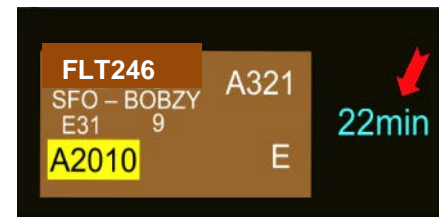
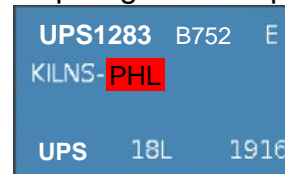
ATC runway change



Dep Fix change (CDR)

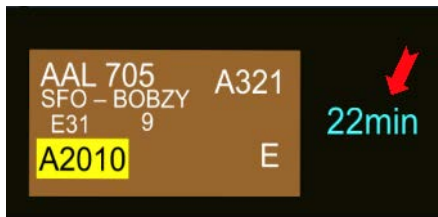


Airport ground stop




- How long can I **hold at the gate** and still make my APREQ or EDCT time?

- Target Movement Area Entry Times (TMATs) are important both for surface metering and to make overhead stream slot reservation



- How long can I **hold at the gate** and still make my APREQ or EDCT time?

Airline and Airport Operators will gain access to these data elements through TTP SWIM 

- “TargetedOffBlockTime”
- “TargetMovementAreaEntryTime”



```
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- FIXM Format <https://www.fixm.aero/>



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- Show Airspace and STBO from INT 10 and 12