

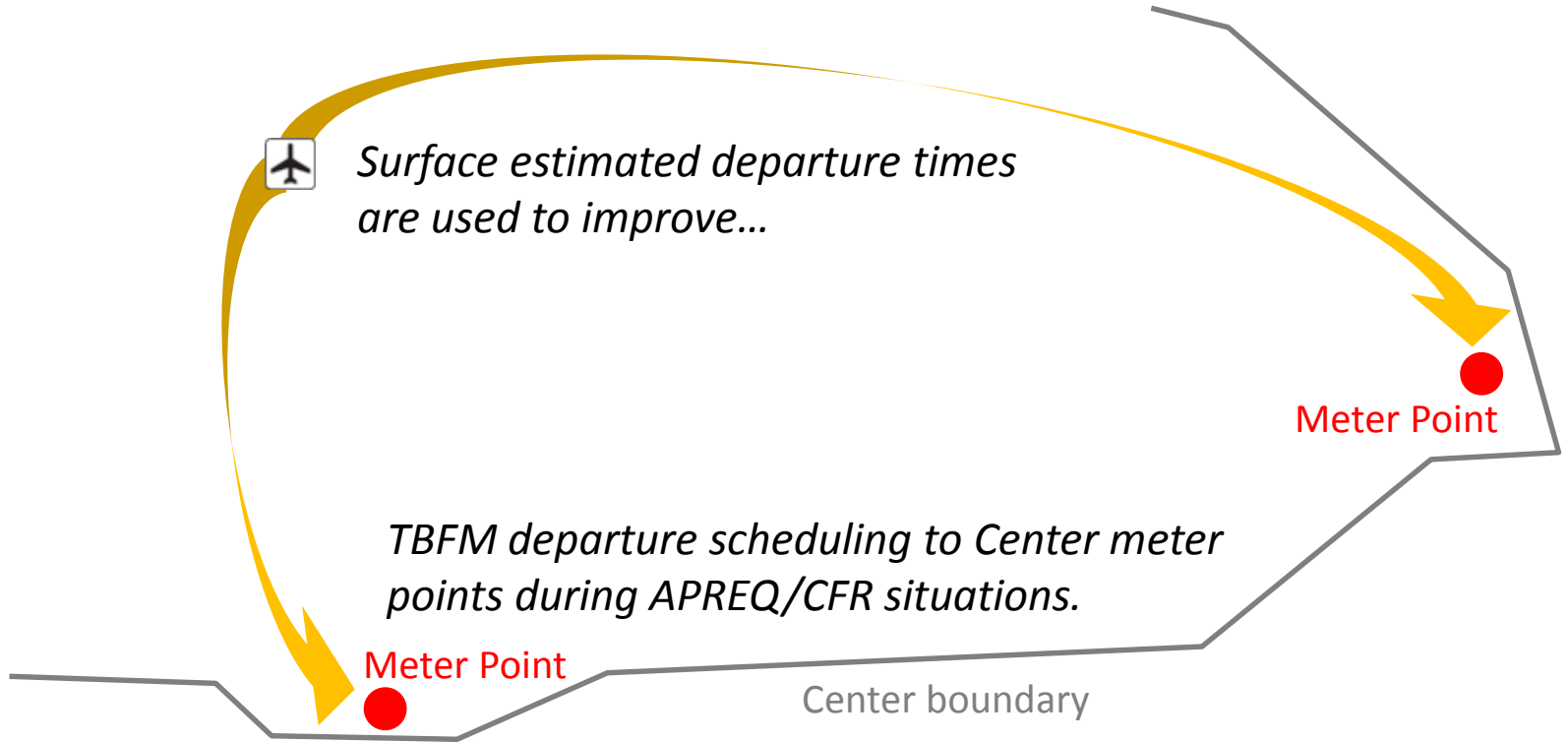
Departure Approval Request Compliance Effects on Overhead Stream Insertion

Todd Callantine

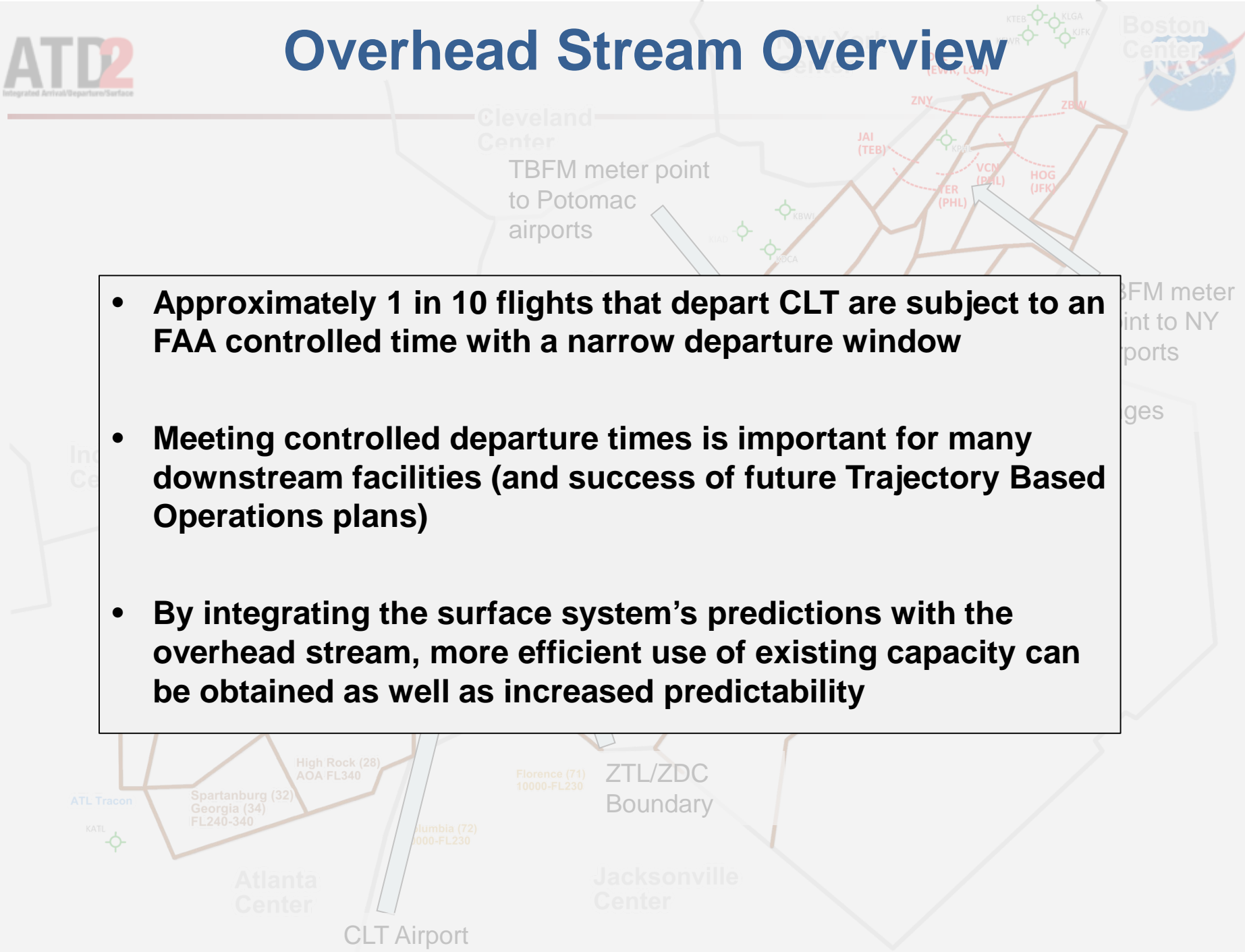
Jeremy Coupe

Bob Staudenmeier

5 September 2019

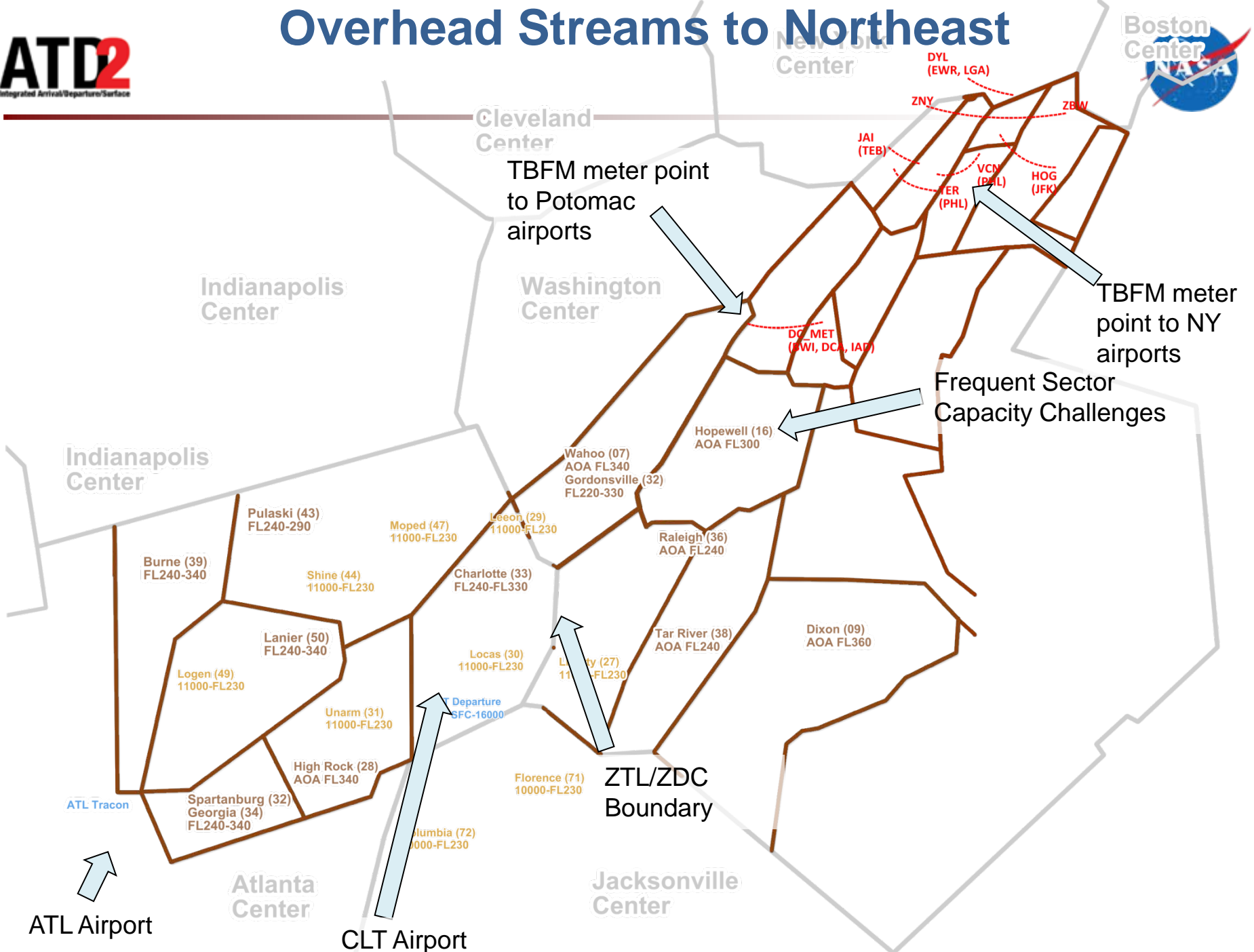


Overhead Stream Overview



- **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 Streams to Northeast



TBFM meter point to Potomac airports

TBFM meter point to NY airports

Frequent Sector Capacity Challenges

ZTL/ZDC Boundary

ATL Airport

CLT Airport

Indianapolis Center

Washington Center

Indianapolis Center

Atlanta Center

Jacksonville Center

Cleveland Center

New York Center

Burne (39)
FL240-340

Pulaski (43)
FL240-290

Shine (44)
11000-FL230

Moped (47)
11000-FL230

Leeon (29)
11000-FL230

Charlotte (33)
FL240-FL330

Logen (49)
11000-FL230

Lanier (50)
FL240-340

Unarm (31)
11000-FL230

High Rock (28)
AOA FL340

Spartanburg (32)
Georgia (34)
FL240-340

Columbia (72)
10000-FL230

Florence (71)
10000-FL230

Lilly (27)
11000-FL230

Tar River (38)
AOA FL240

Dixon (09)
AOA FL360

Raleigh (36)
AOA FL240

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

Hopewell (16)
AOA FL300

DC MET
(MWI, DC, IAD)

JAI
(TEB)

DYL
(EWR, LGA)

TER
(PHL)

VCN
(PHL)

HOG
(JFK)

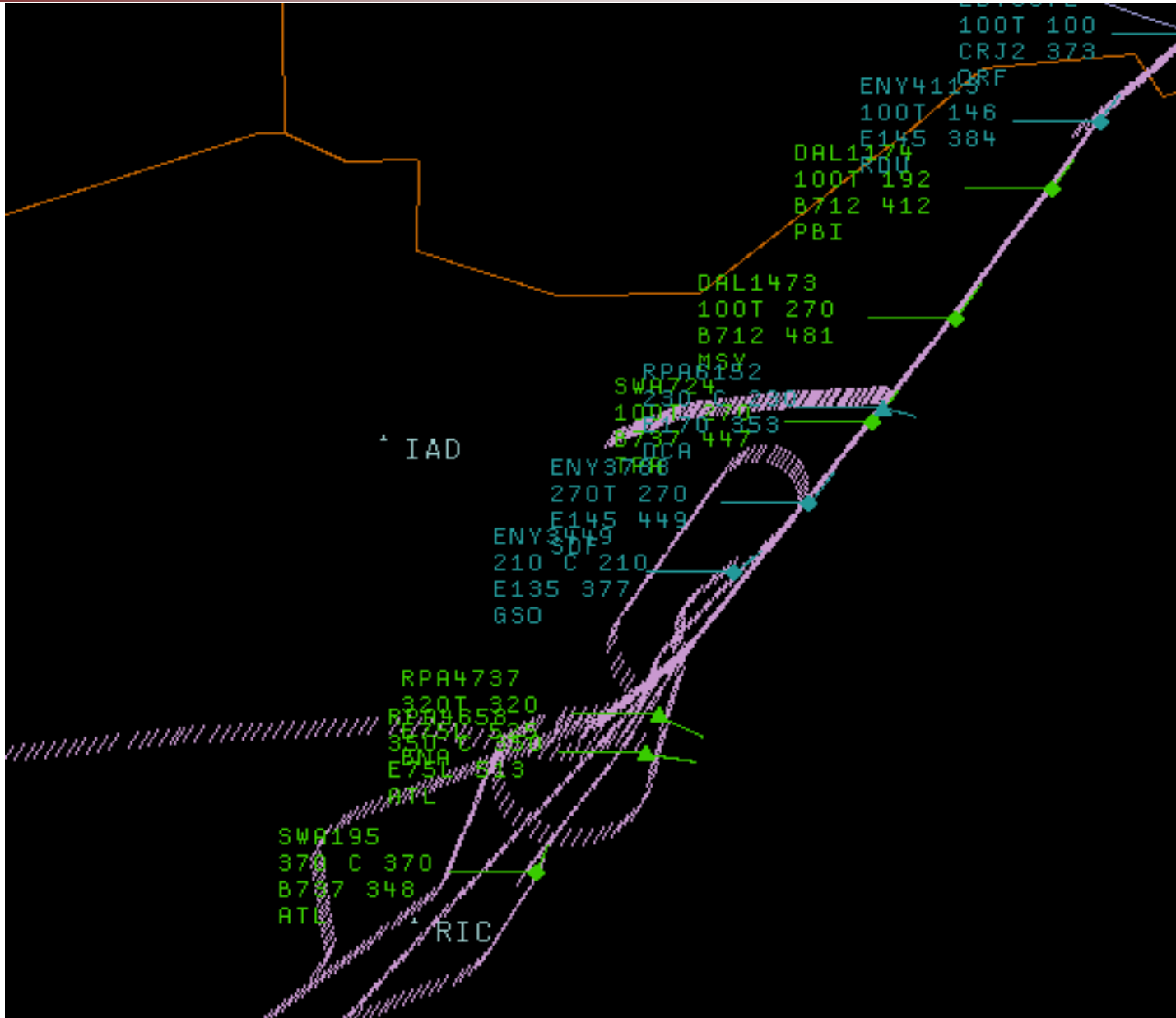
ZNY

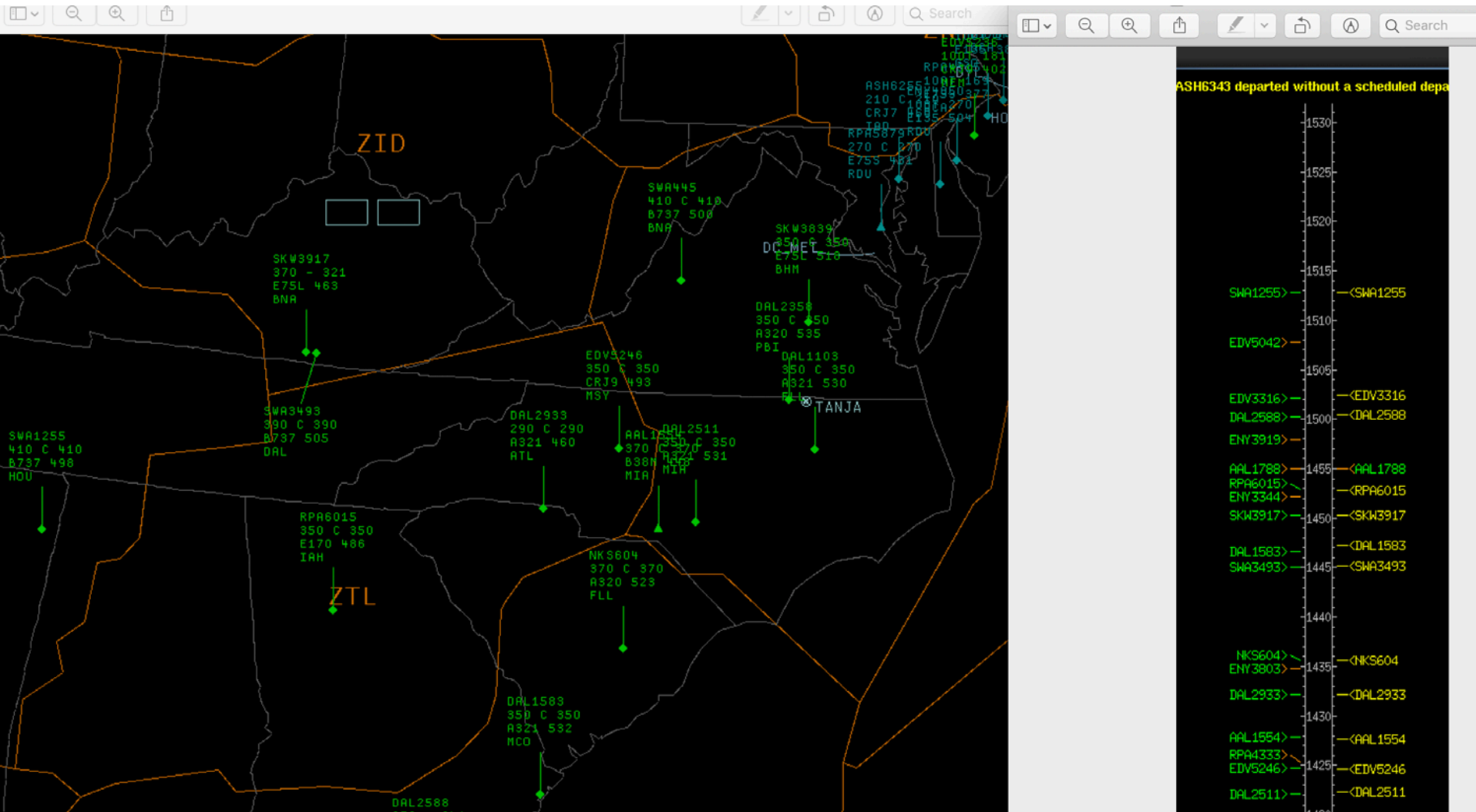
ZBW

ATL Tracon

Departure
SFC-16000

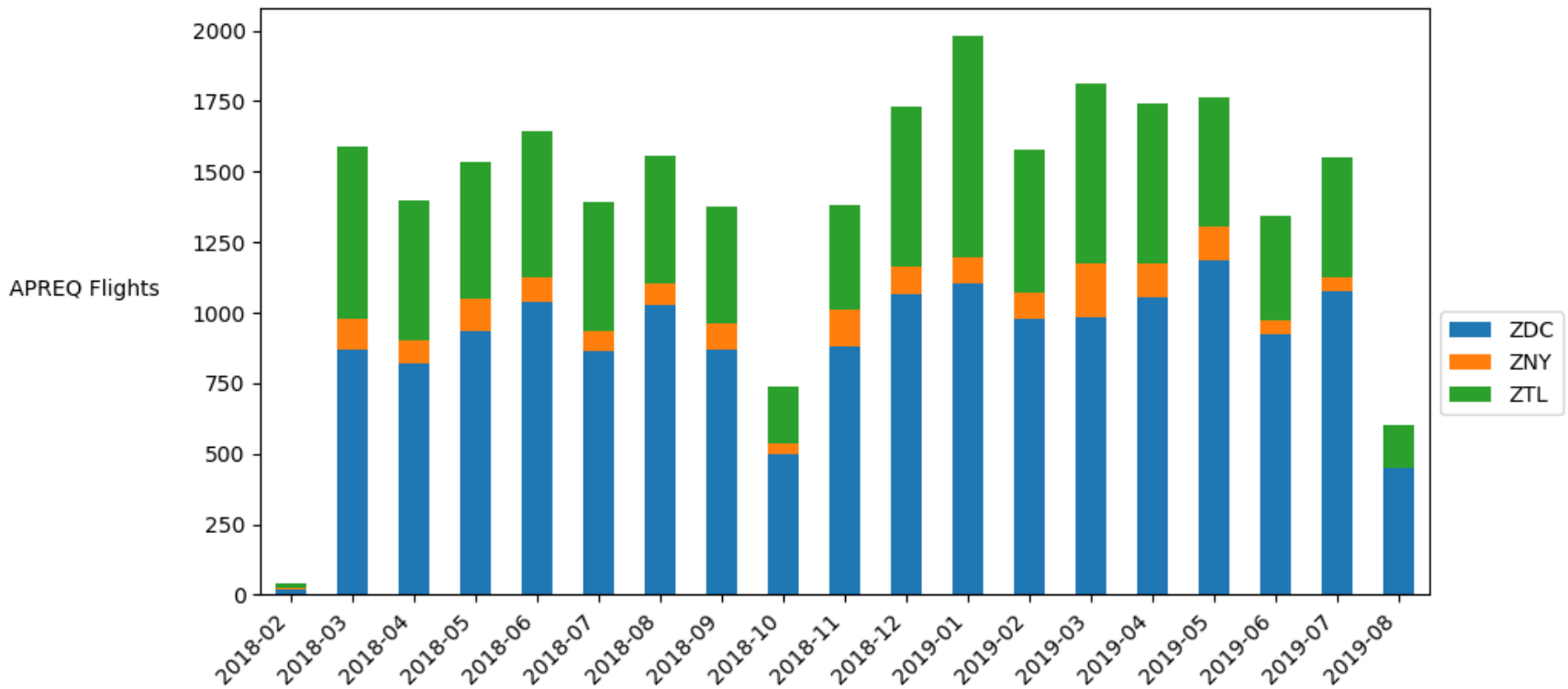
Vectoring to Merge Flows



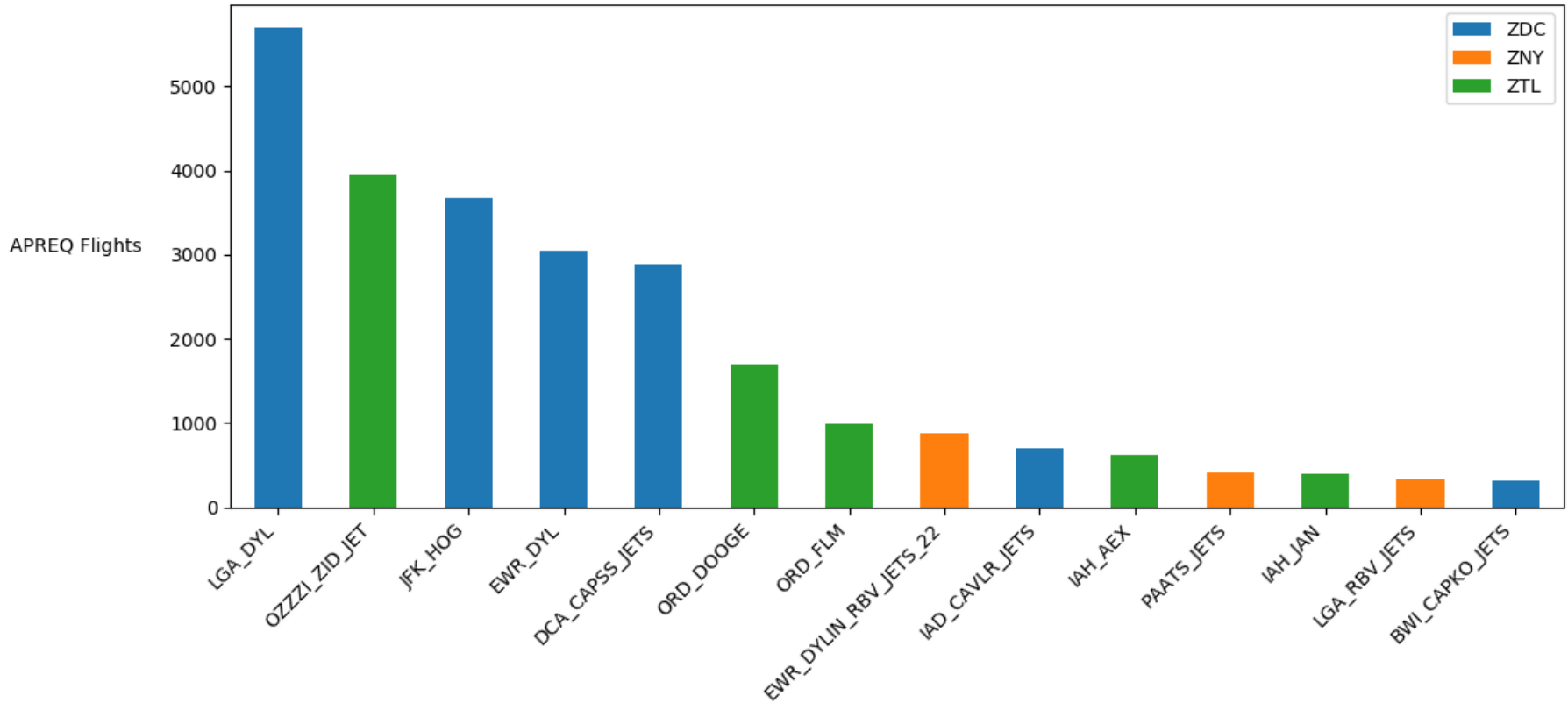


- TBFM schedule data merged with flight_summary data
 - CLT APREQs with TBFM schedule data and departure_runway_actual_time

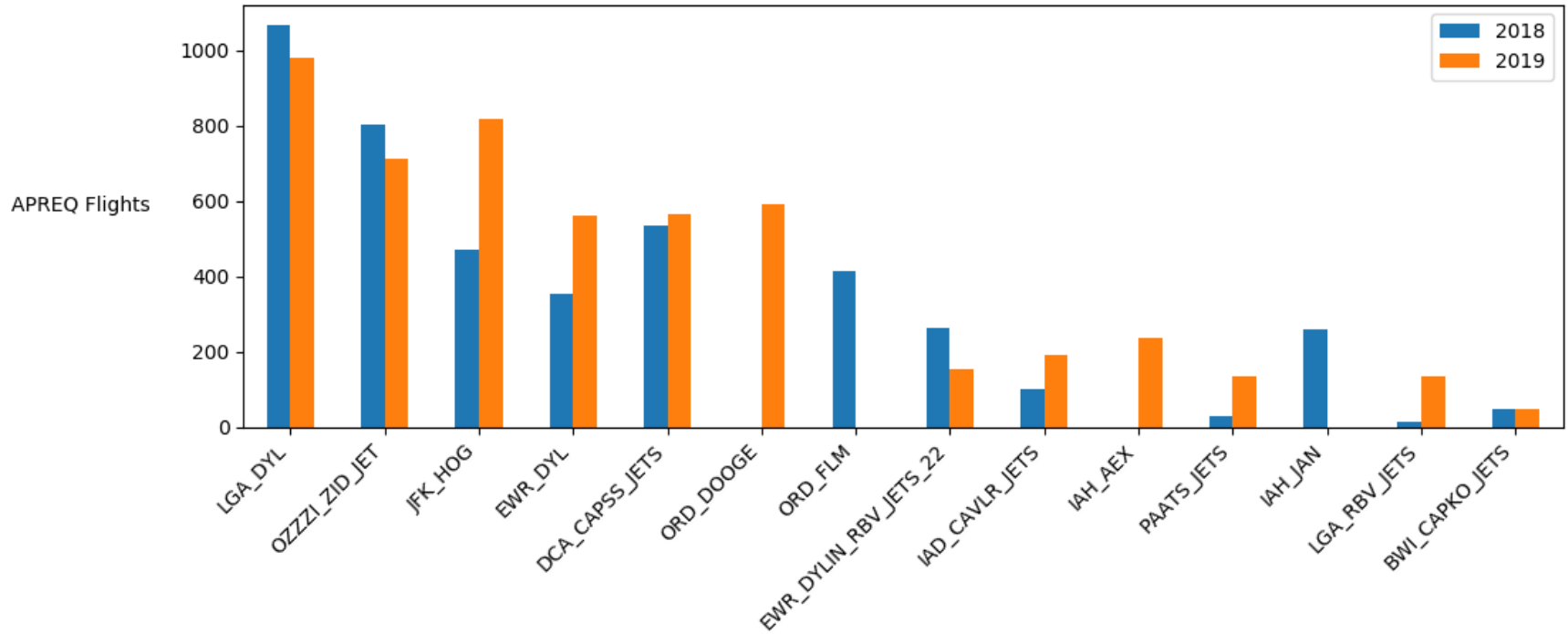
26,752 Flights



Most utilized:

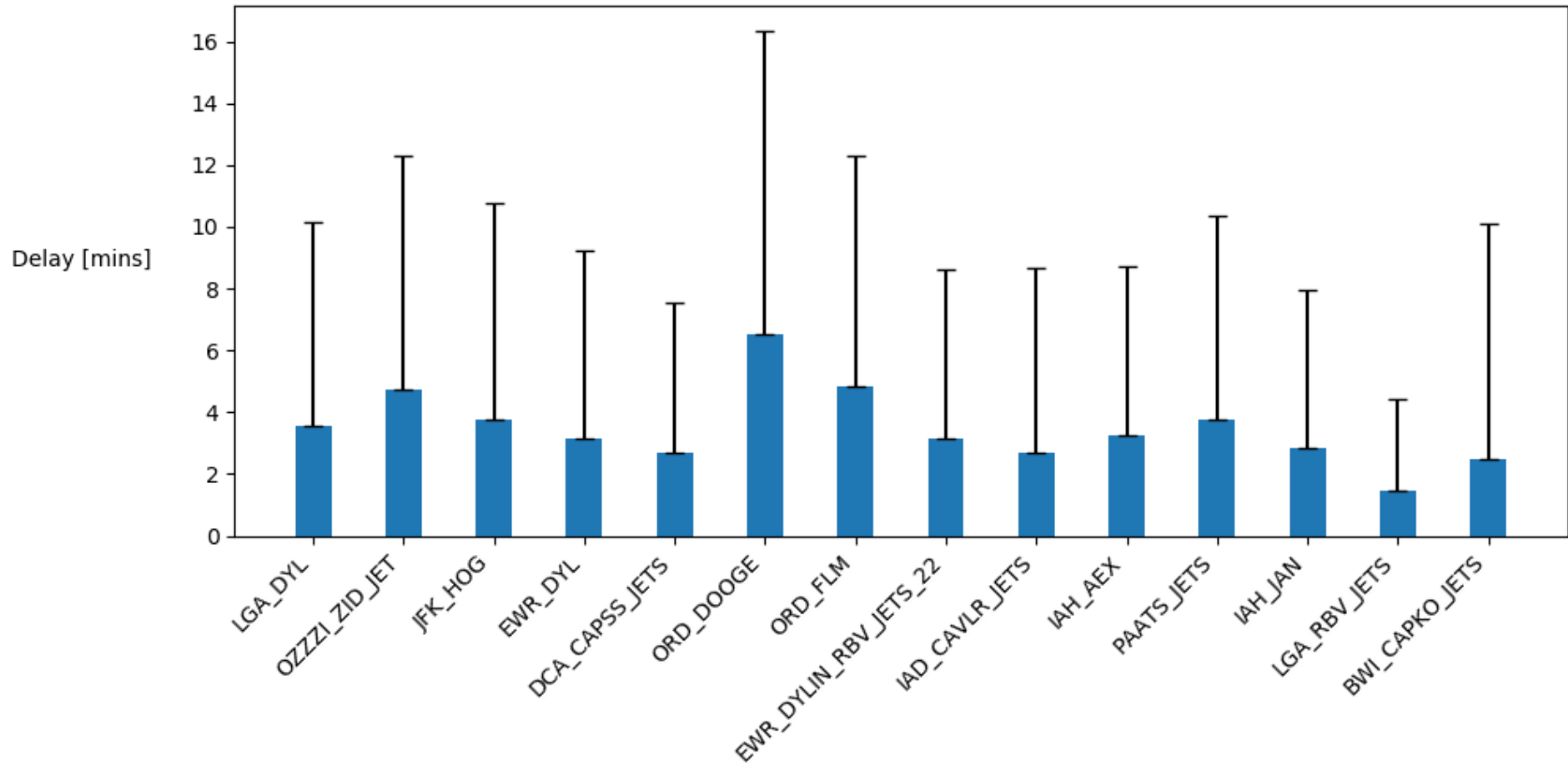


Year-over-year stream-class utilization changes:



CLT Apreqs: Mar-May 2018 vs. Mar-May 2019

Average delay by stream class for CLT Apreqs:



Error bars: 1 std. dev.



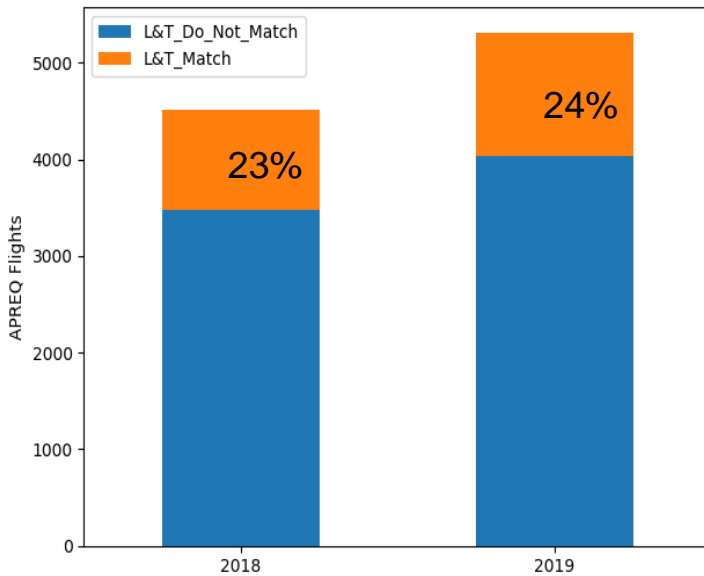
- Lead & Trail Match

Lead and trail upon departure scheduling match lead and trail upon schedule-point crossing

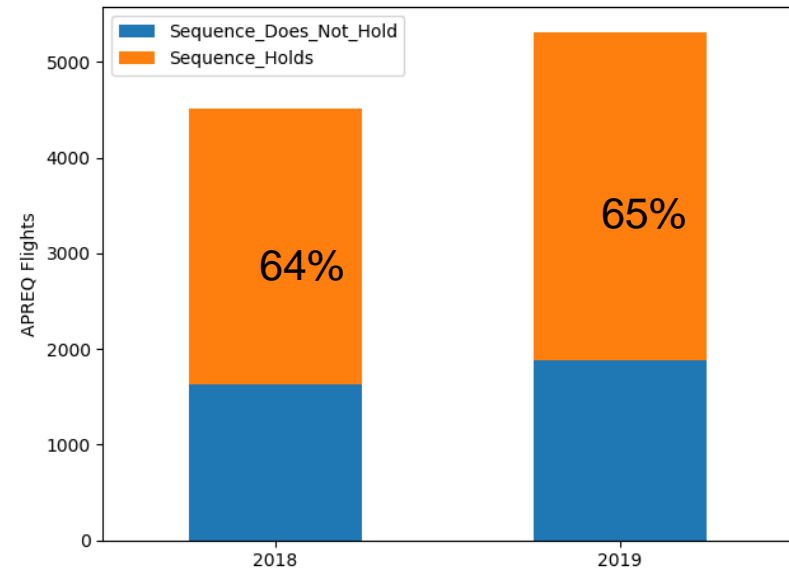
- Sequence Holds

Upon schedule-point crossing, lead at departure scheduling is still ahead and trail at departure scheduling is still behind (other aircraft may have merged)

Lead & Trail Match

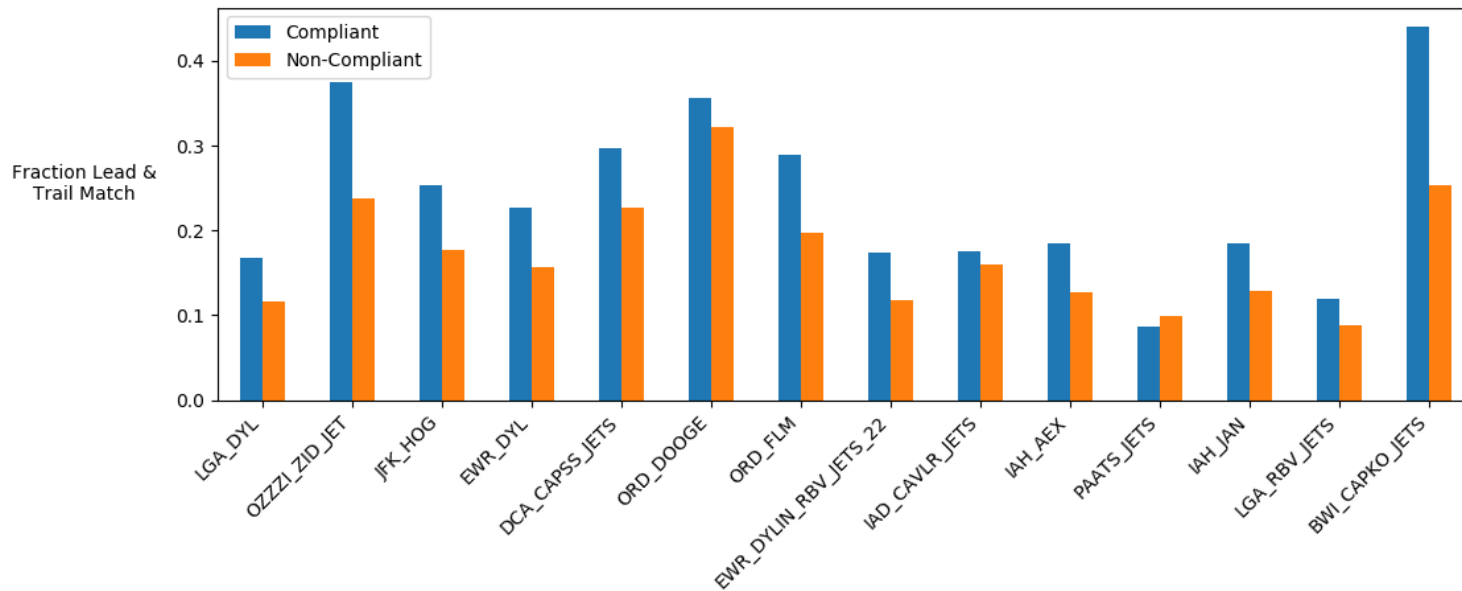
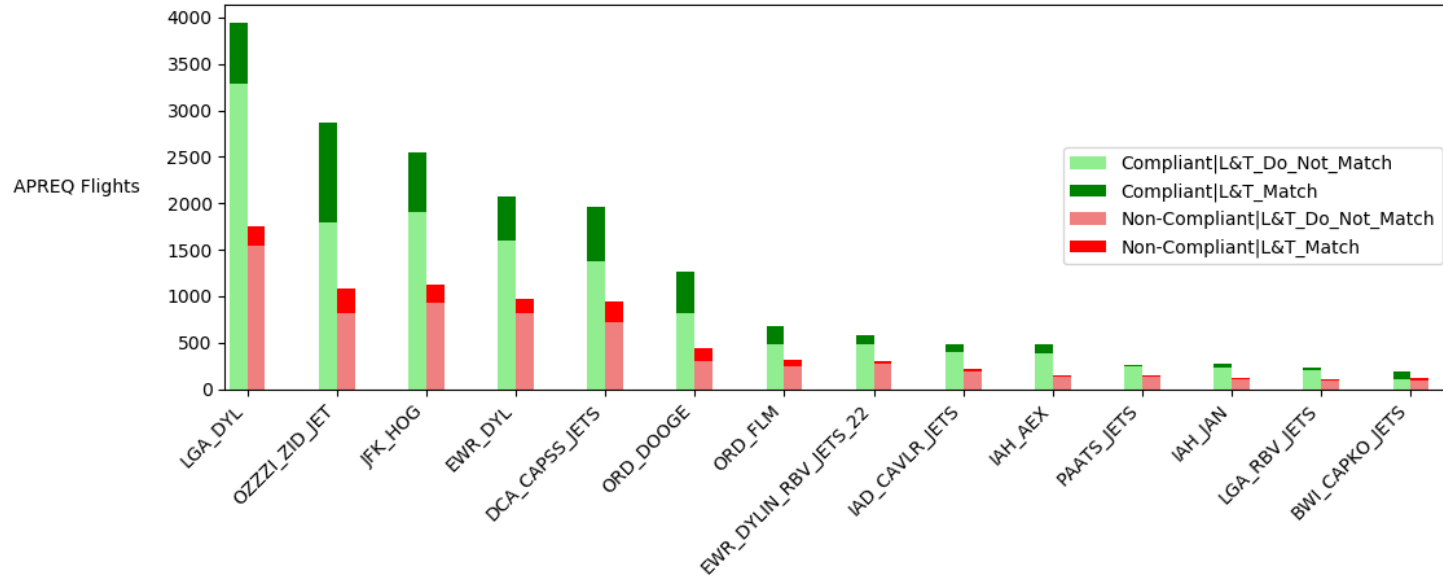


Sequence Holds

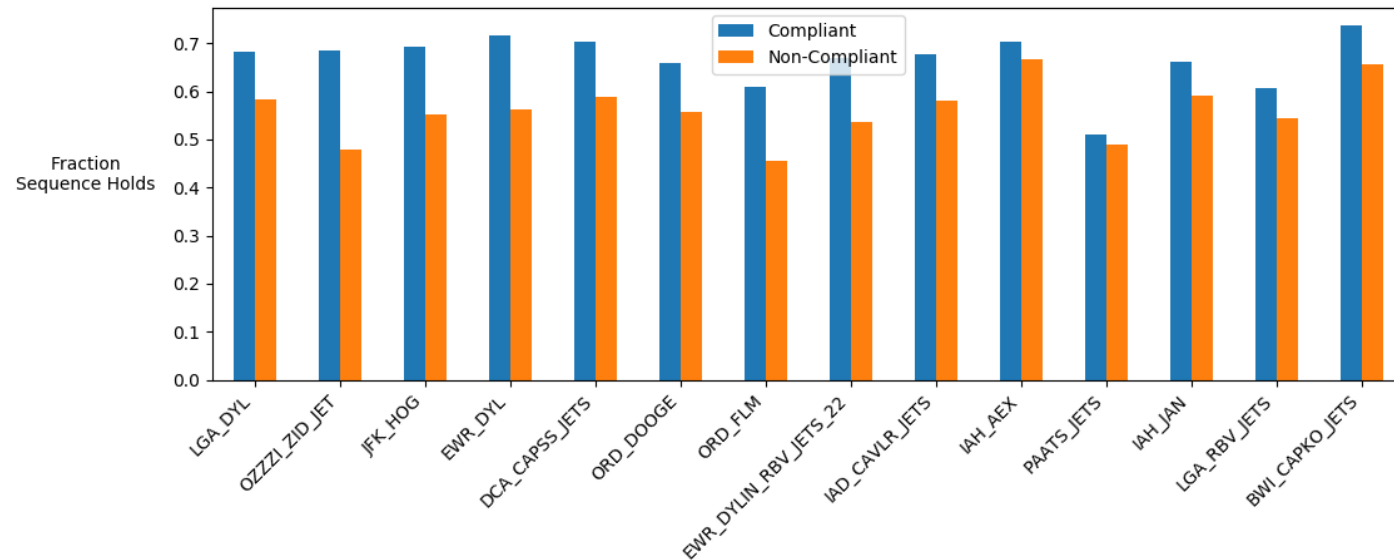
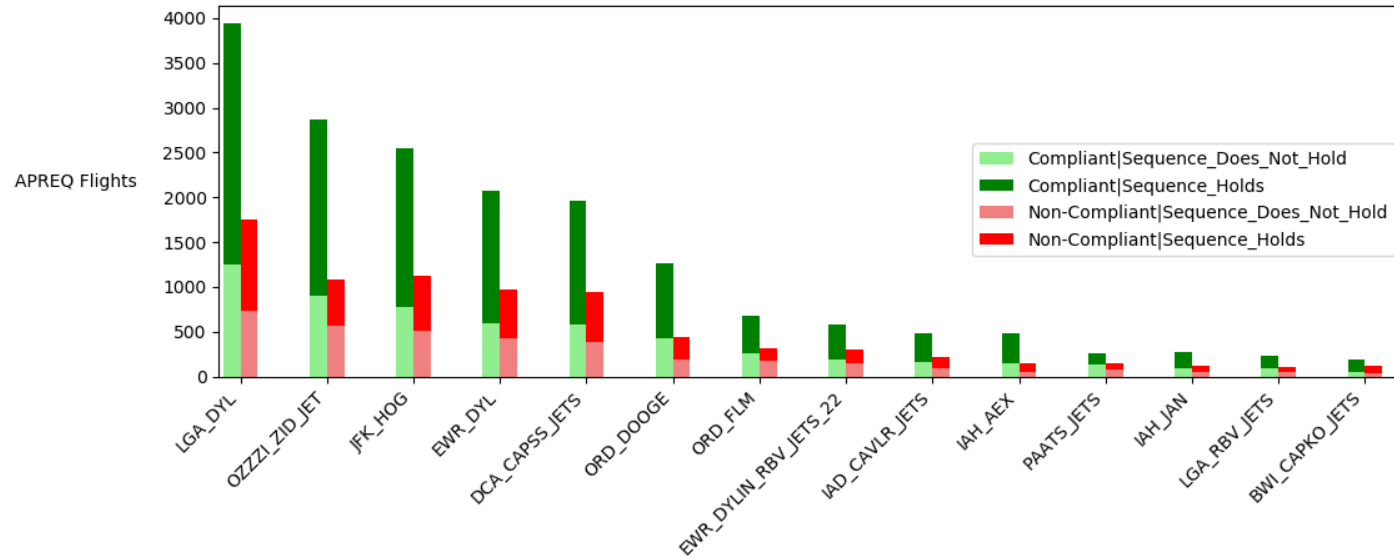


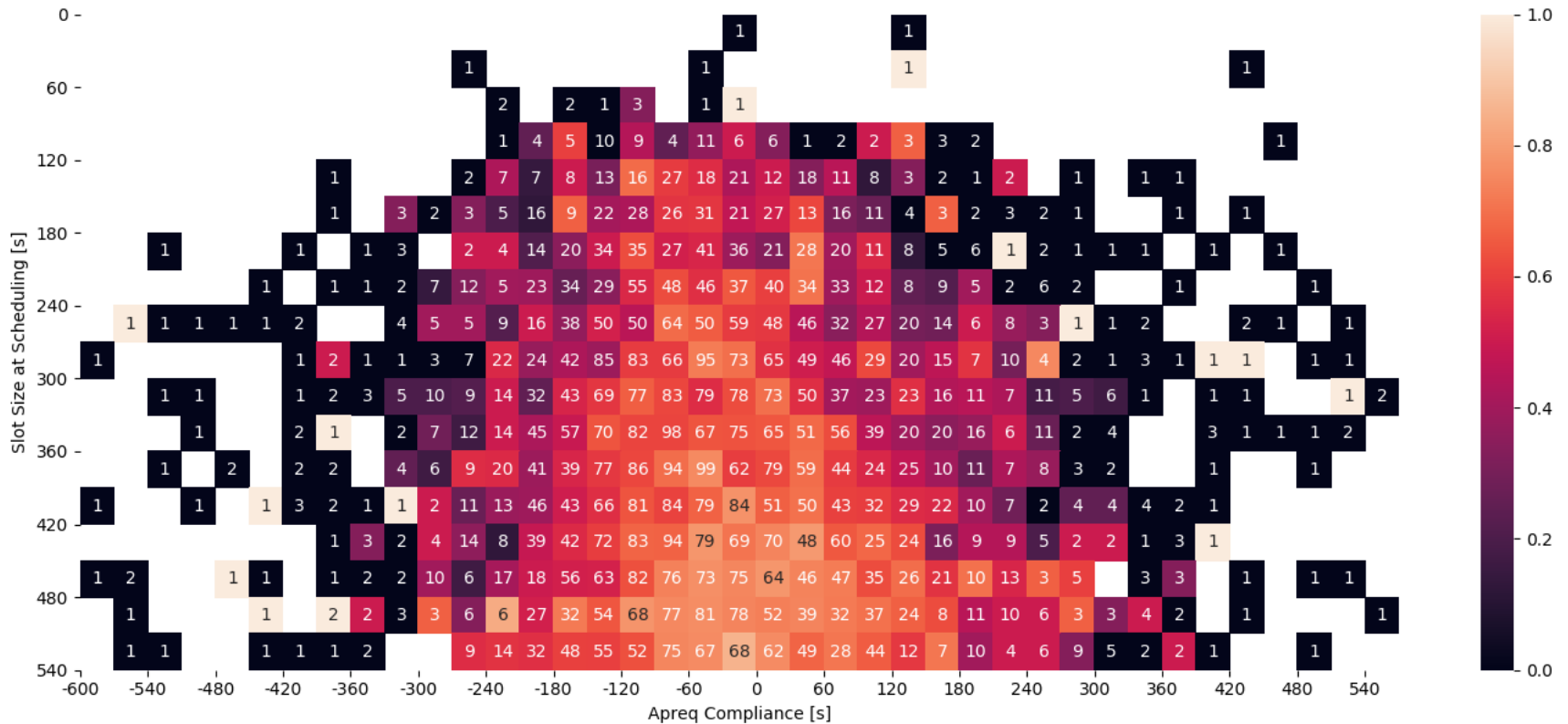
CLT Apreqs: Mar-May 2018 vs. Mar-May 2019

'Lead & Trail Match' by Stream Class

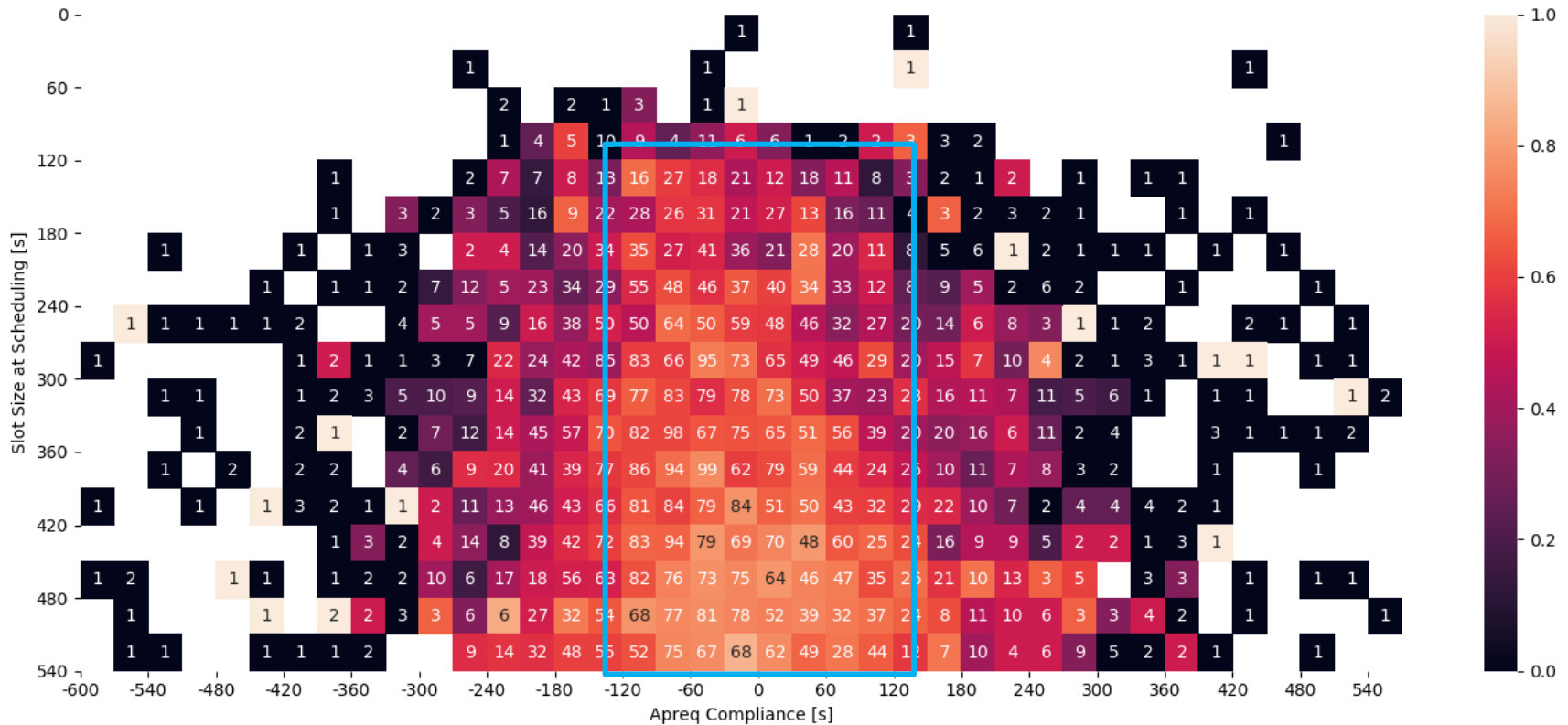


'Sequence Holds' by Stream Class





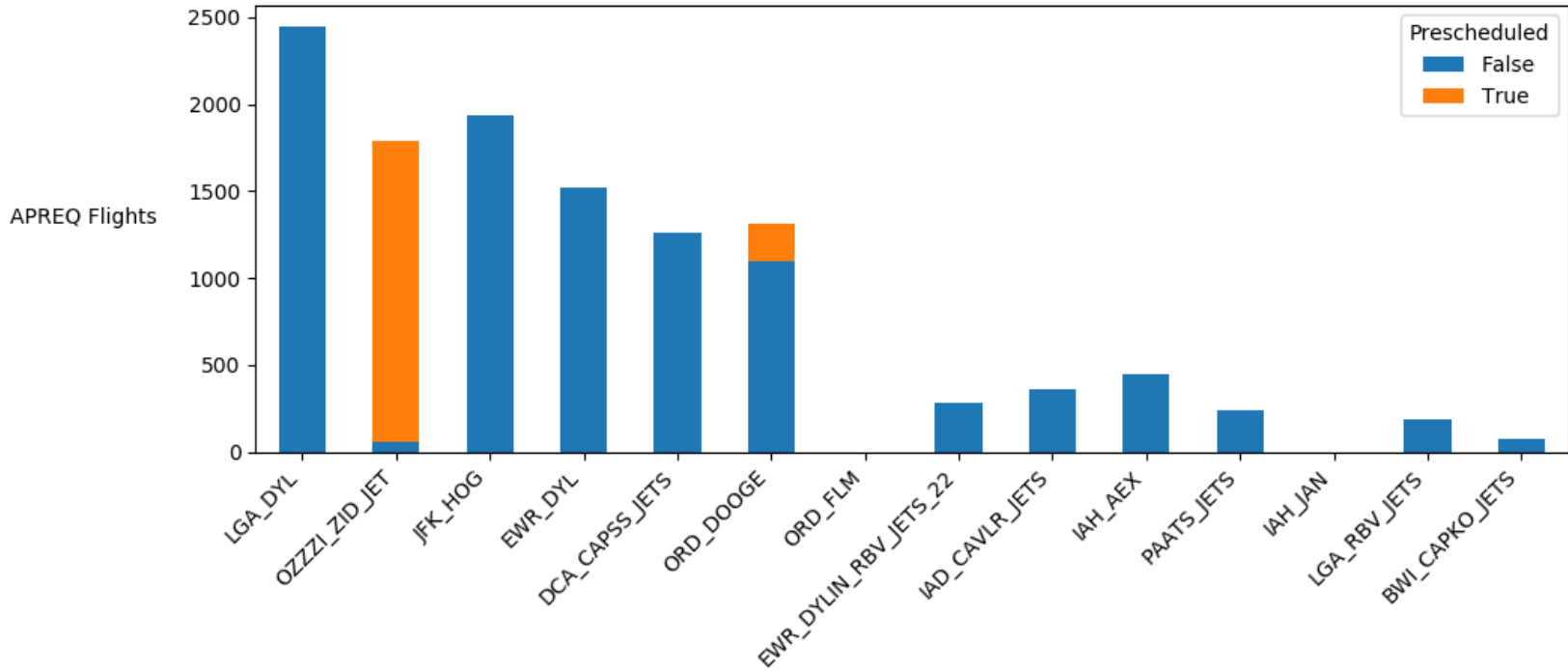
- Top stream classes
- Colors show fraction for which sequence holds
- Numbers show sample size (23,735 CLT Apreqs)



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- Colors show fraction for which sequence holds
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Stream classes with prescheduling:

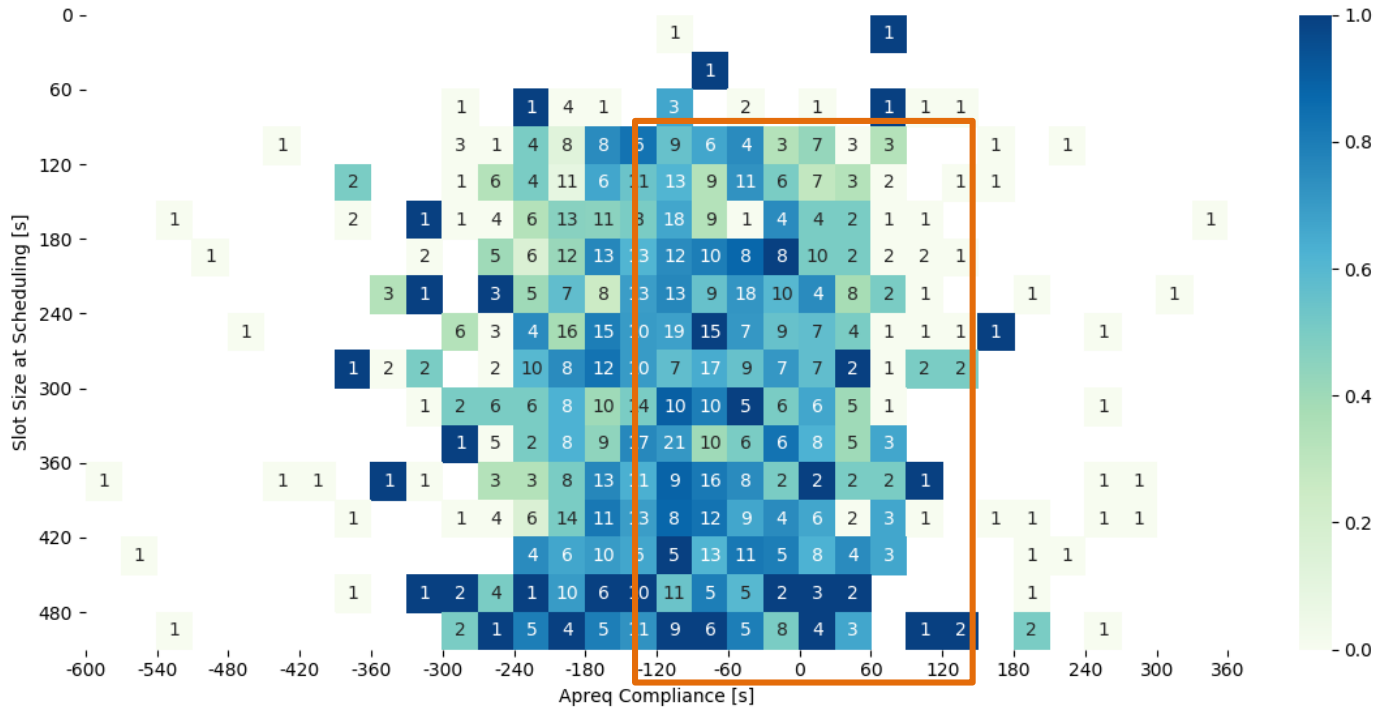


2019 CLT Apreqs

	Compliance	Lead & Trail Match	Sequence Holds
Prescheduled	75%	34%	63%
Not Prescheduled	69%	22%	63%

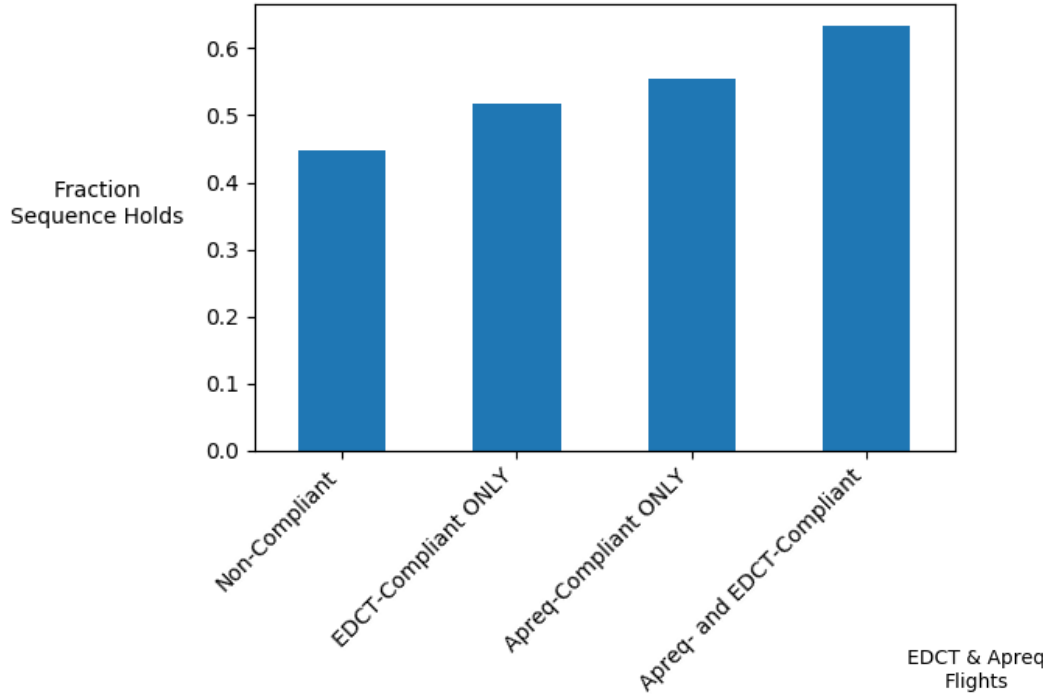
- 2,428 *prescheduled* CLT Apreq flights

- Prescheduled flights



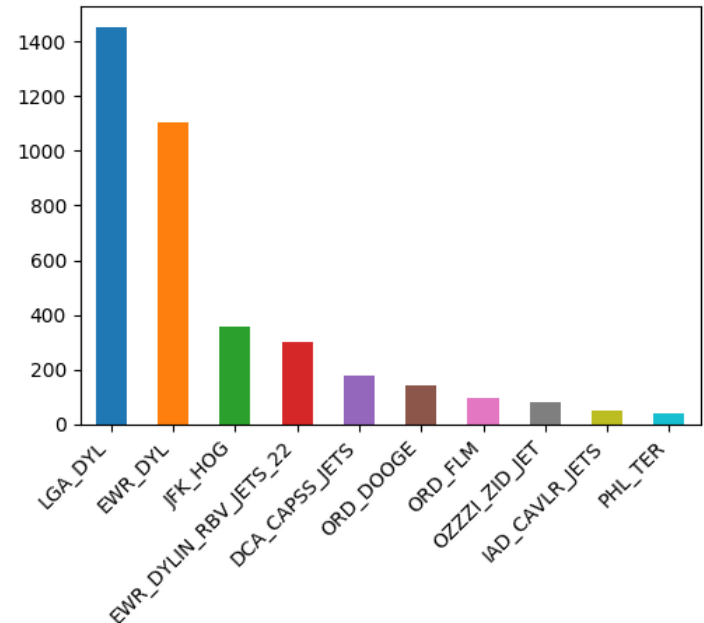
- Colors show fraction of sequence-hold's
- Numbers show sample size (2,297 *prescheduled* CLT Apreqs)

'Sequence Holds' by Apreq and EDCT Compliance



- 4,061CLT Apreq flights with EDCTs

EDCT Stream Classes





- Stream-class specific analysis combines TBFM and surface data
- Areq compliance consistently improves stream insertion
 - Variation with slot size
 - Variation with stream class and specific flow characteristics
- ‘Sequence Holds’ insensitive to prescheduling (also insensitive to airport configuration)