Departure Approval Request Compliance Effects on Overhead Stream Insertion

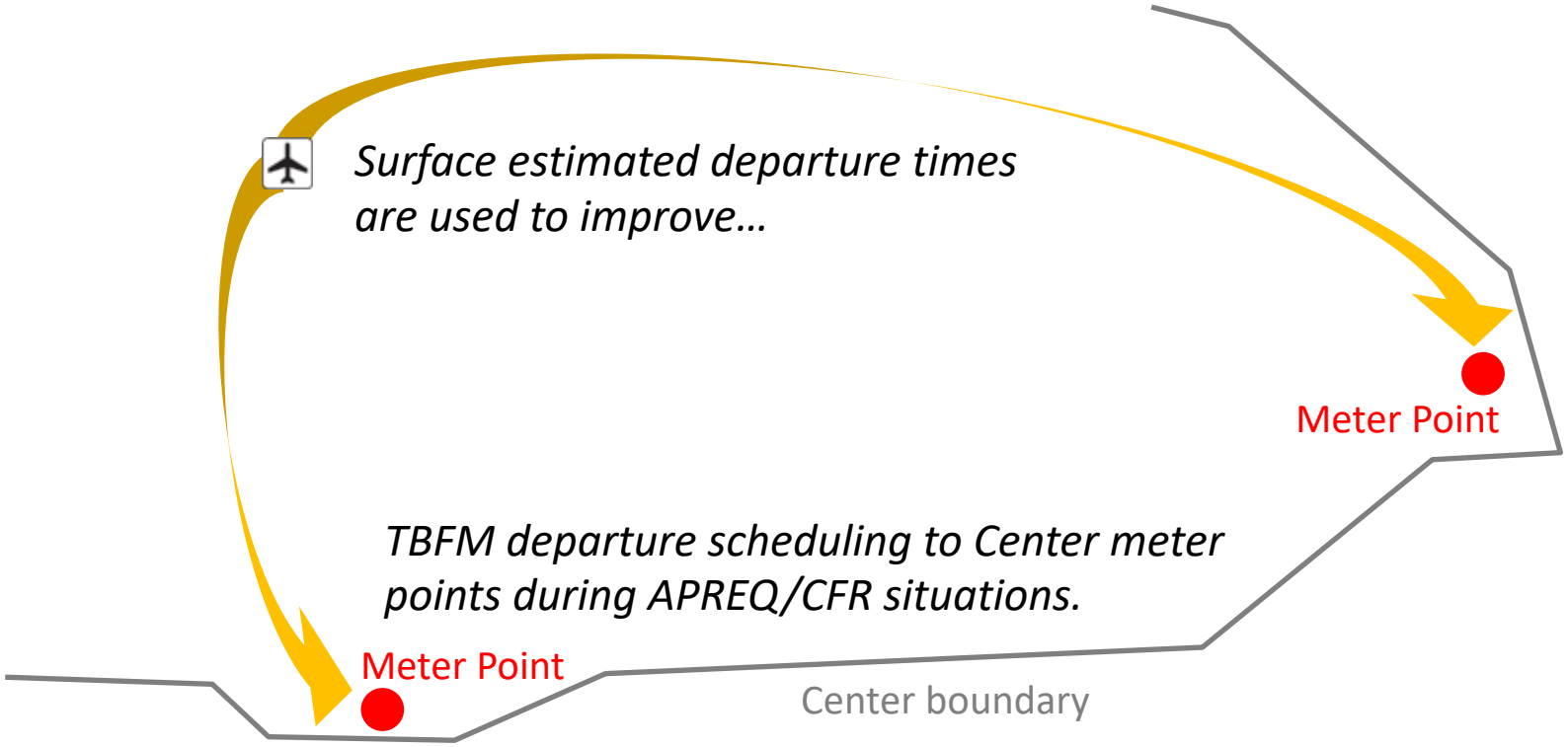
Todd Callantine

Jeremy Coupe

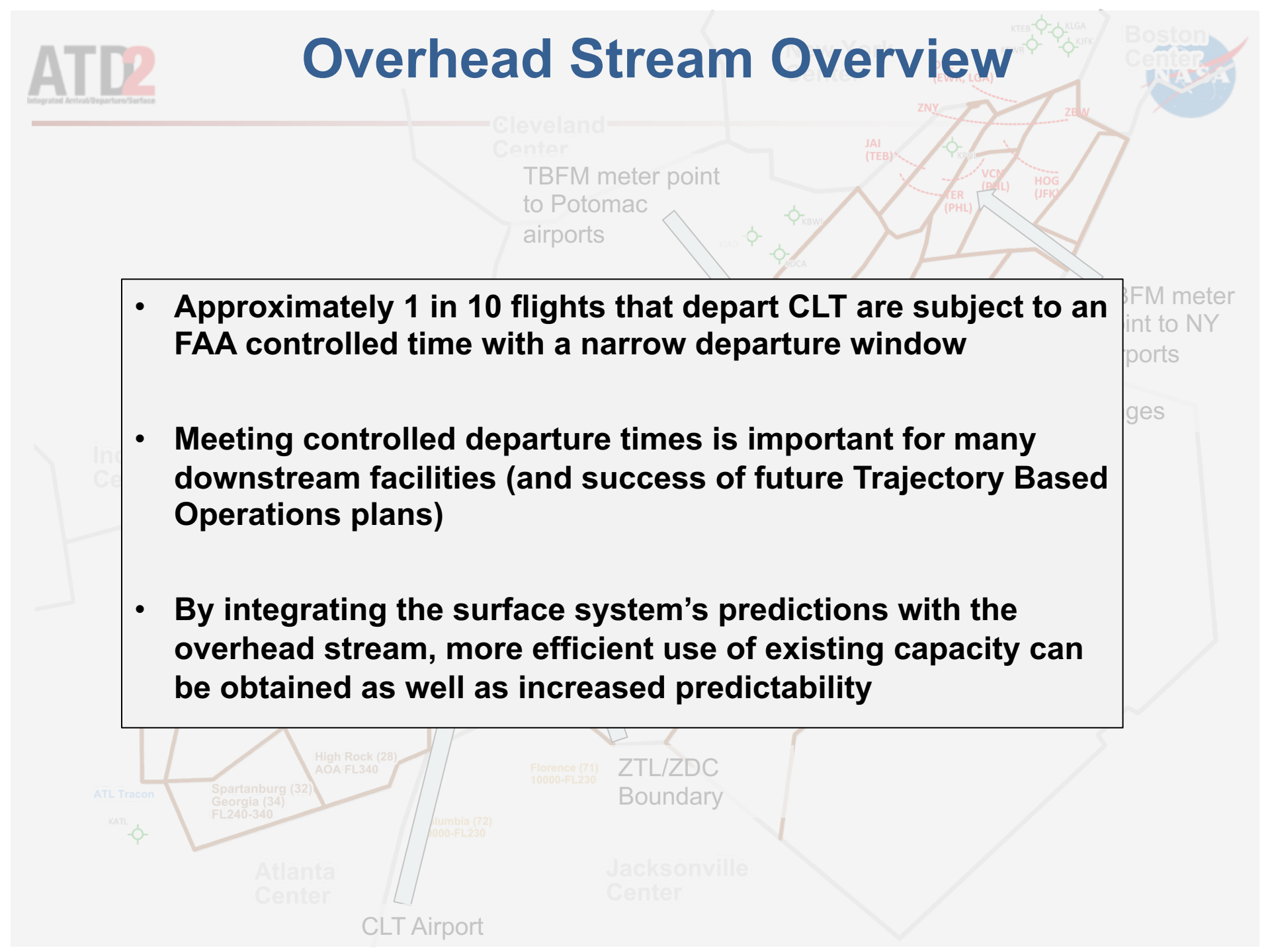
Bob Staudenmeier

5 September 2019

ATD-2 and Stream Insertion

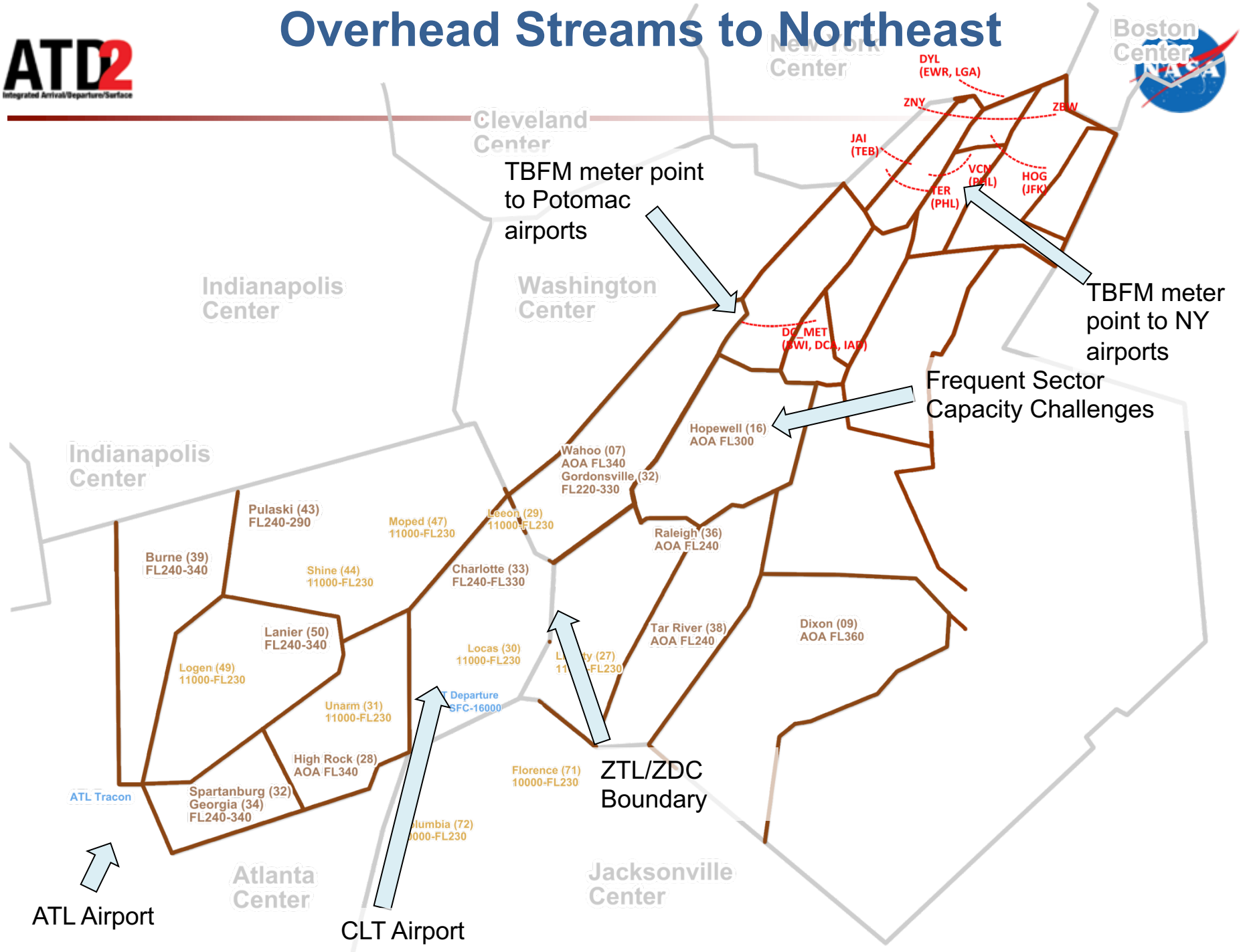


Overhead Stream Overview

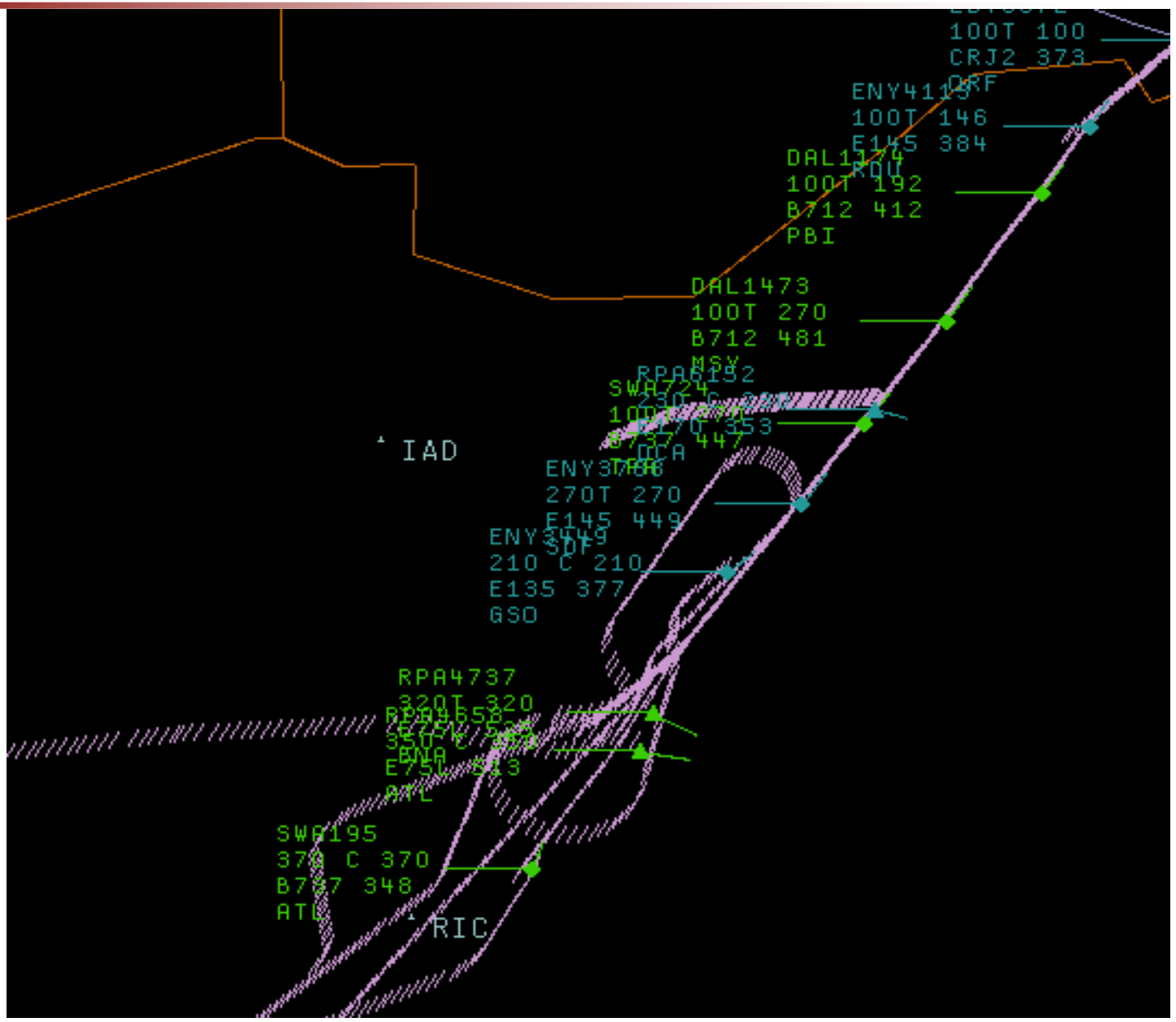


- **Approximately 1 in 10 flights that depart CLT are subject to an FAA controlled time with a narrow departure window**
- **Meeting controlled departure times is important for many downstream facilities (and success of future Trajectory Based Operations plans)**
- **By integrating the surface system's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

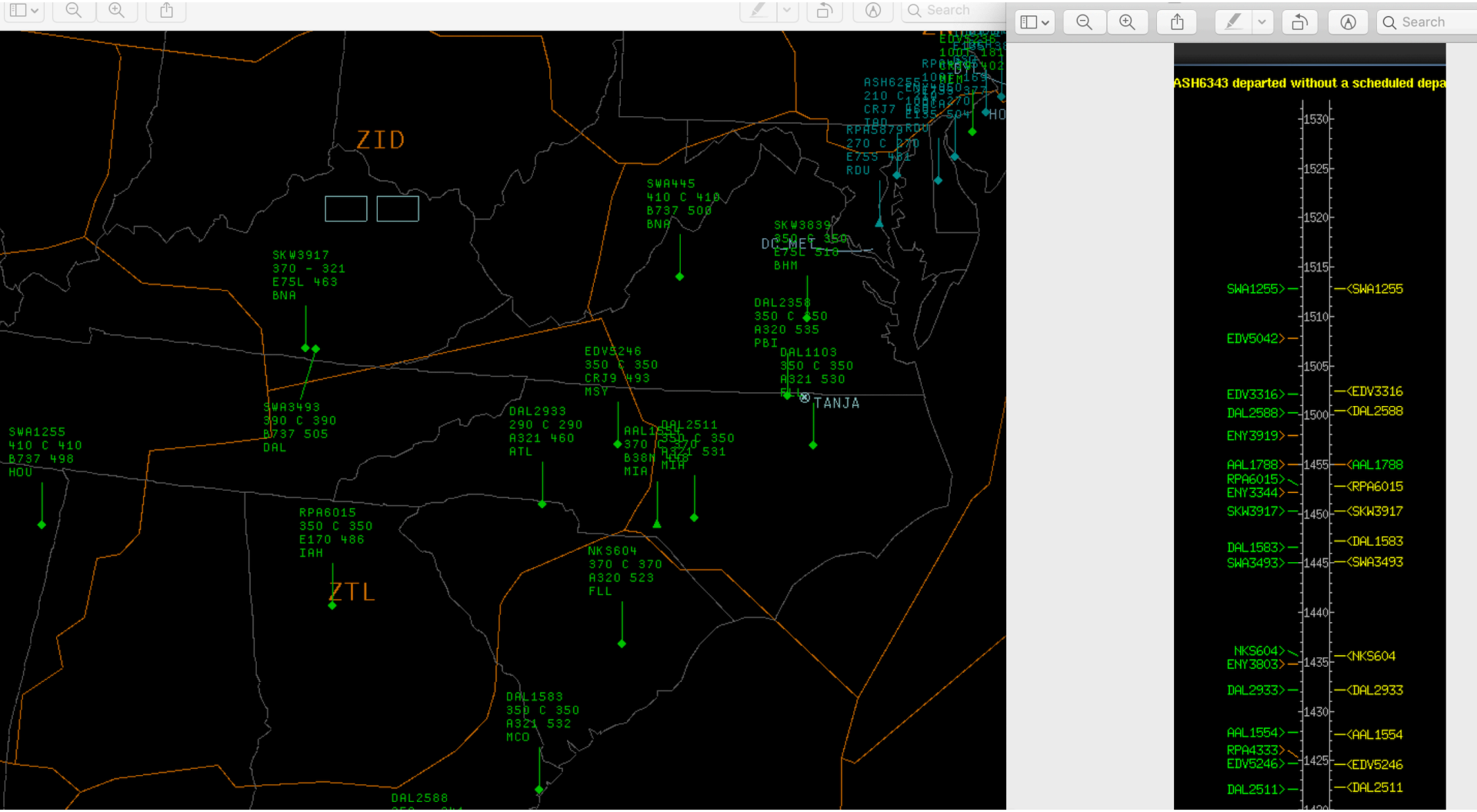
Overhead Streams to Northeast



Vectoring to Merge Flows



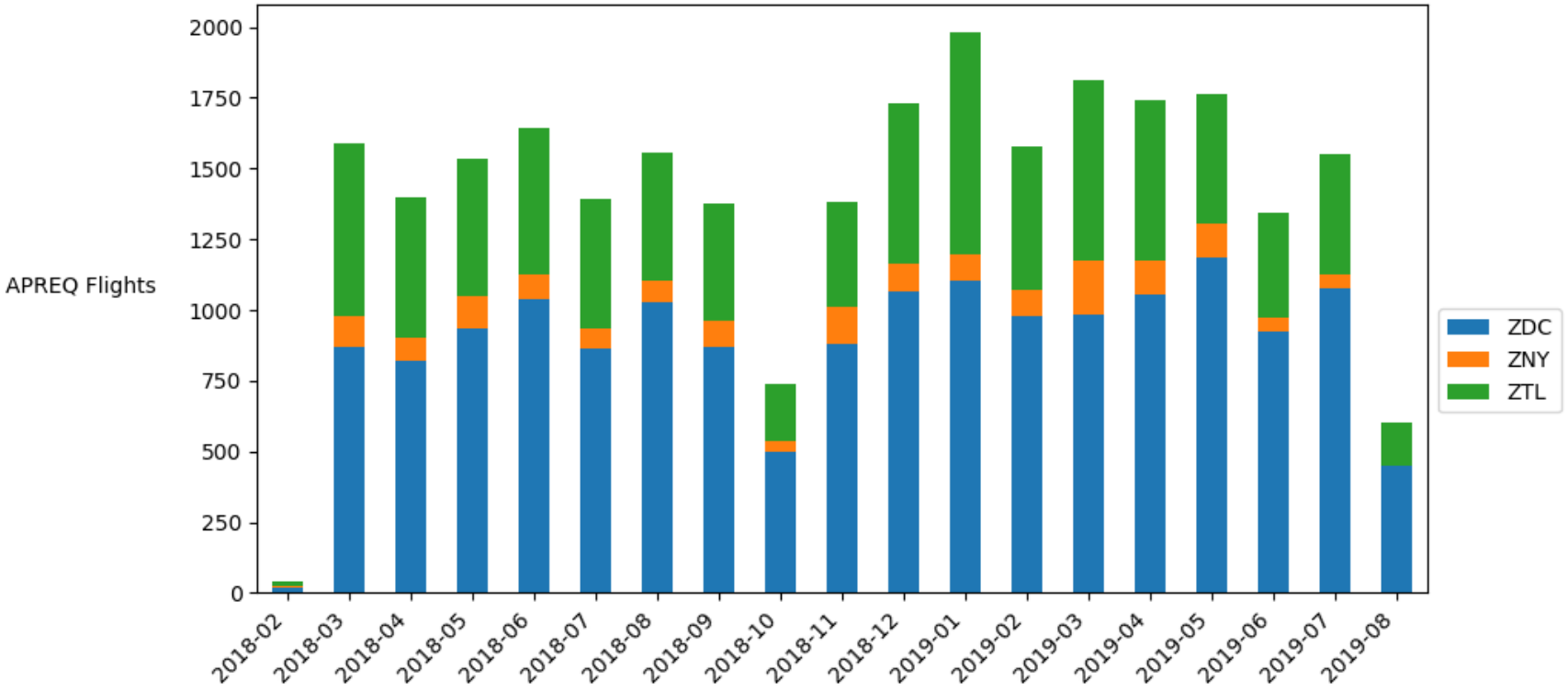
Smooth Stream Insertion



Stream Insertion Analysis

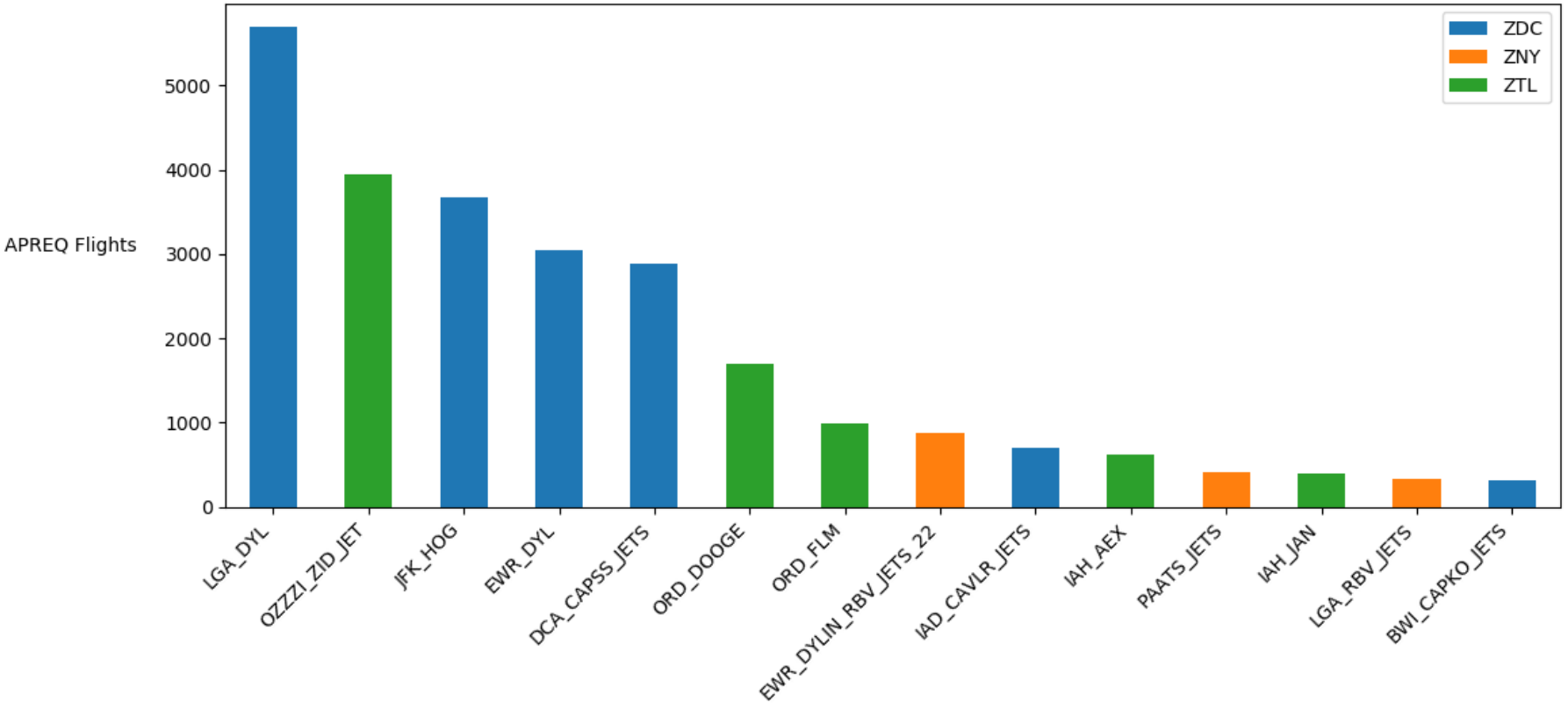
- TBFM schedule data merged with flight_summary data
  - CLT APREQs with TBFM schedule data and departure_runway_actual_time

26,752 Flights



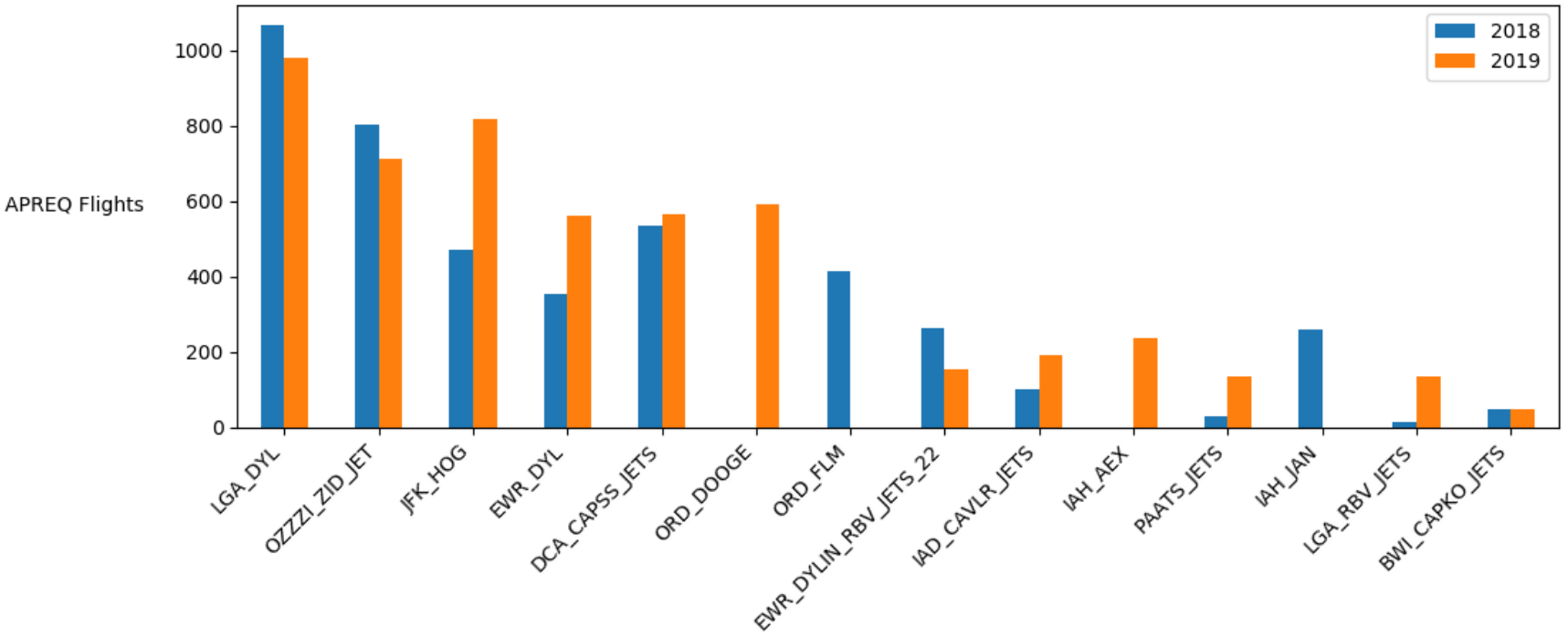
Stream Classes

Most utilized:



Stream Classes

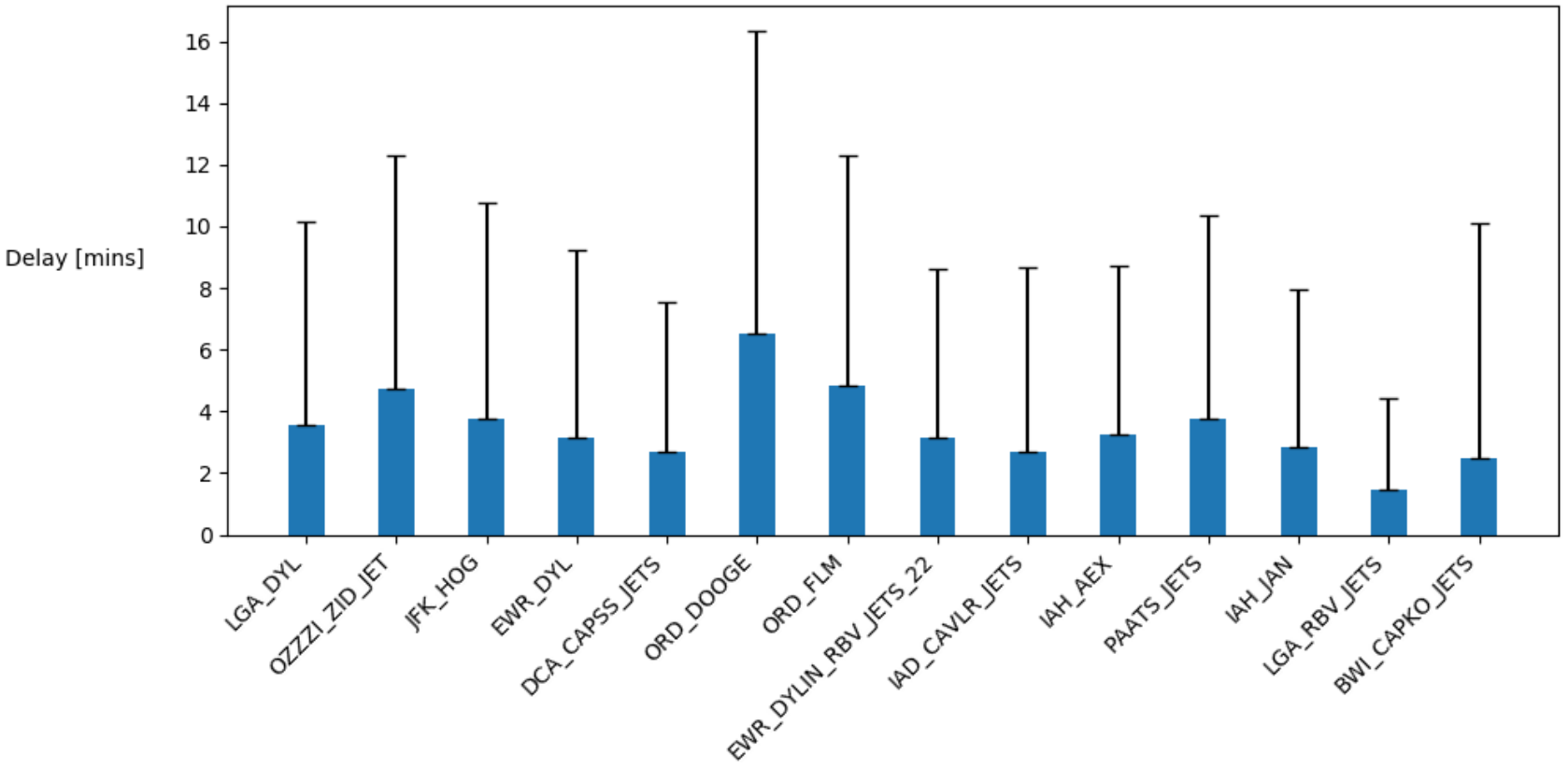
Year-over-year stream-class utilization changes:



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

Delays by Stream Class

Average delay by stream class for CLT Apreqs:



Error bars: 1 std. dev.

Stream-Insertion Metrics

- Lead & Trail Match

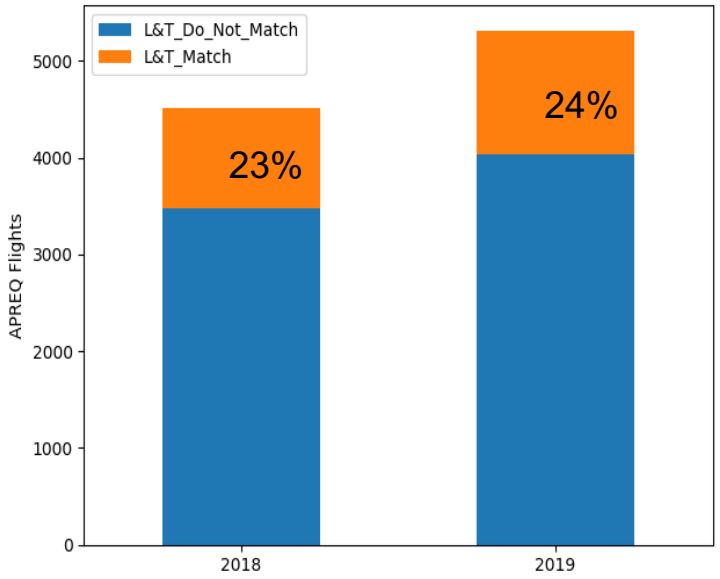
  Lead and trail upon departure scheduling match lead and trail upon schedule-point crossing

- Sequence Holds

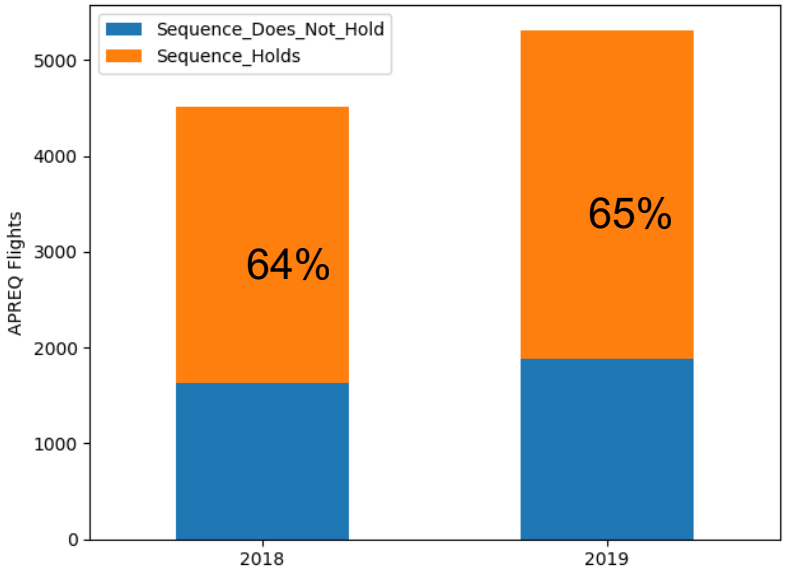
  Upon schedule-point crossing, lead at departure scheduling is still ahead and trail at departure scheduling is still behind (other aircraft may have merged)

2018 vs. 2019 Comparison

Lead & Trail Match

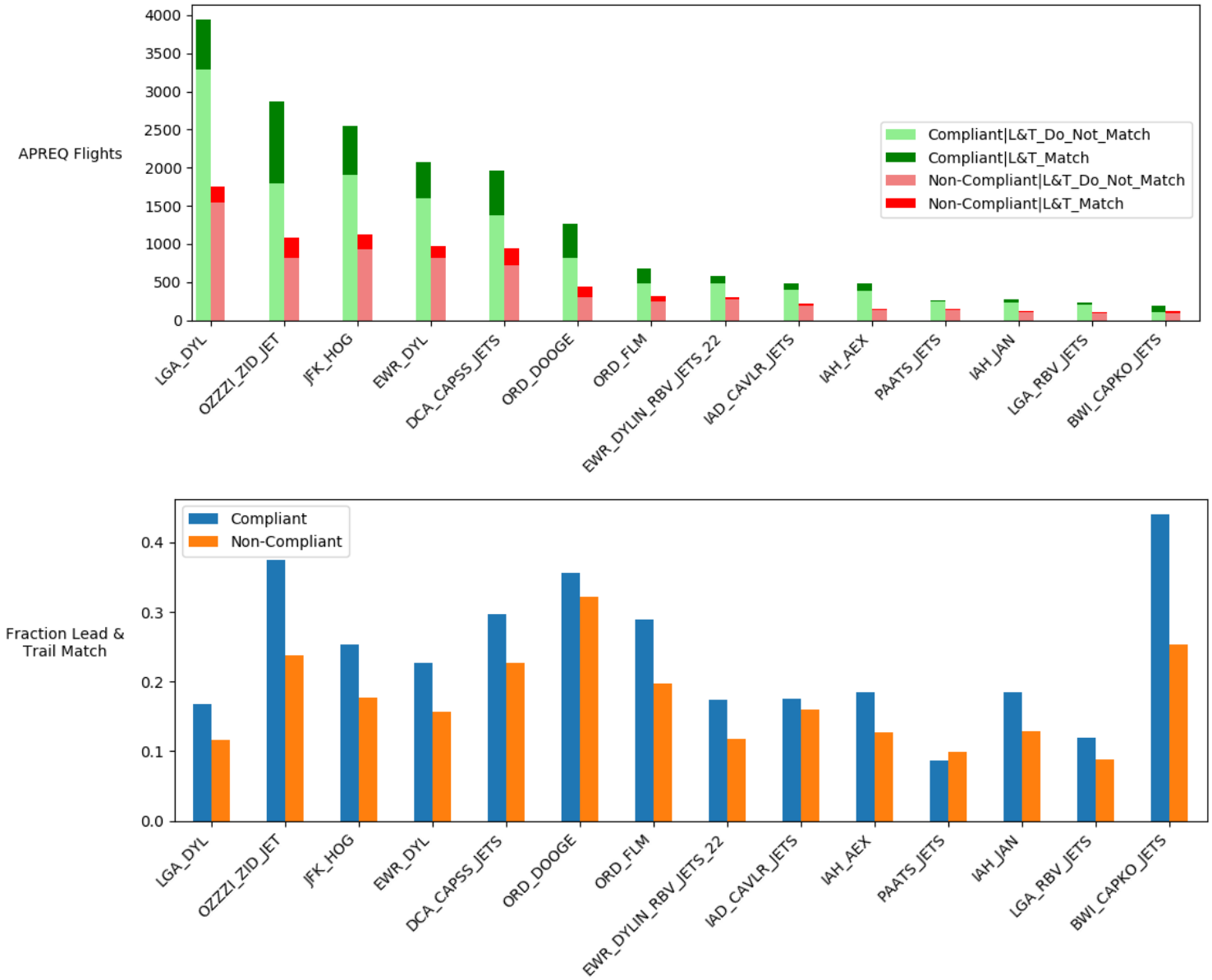


Sequence Holds

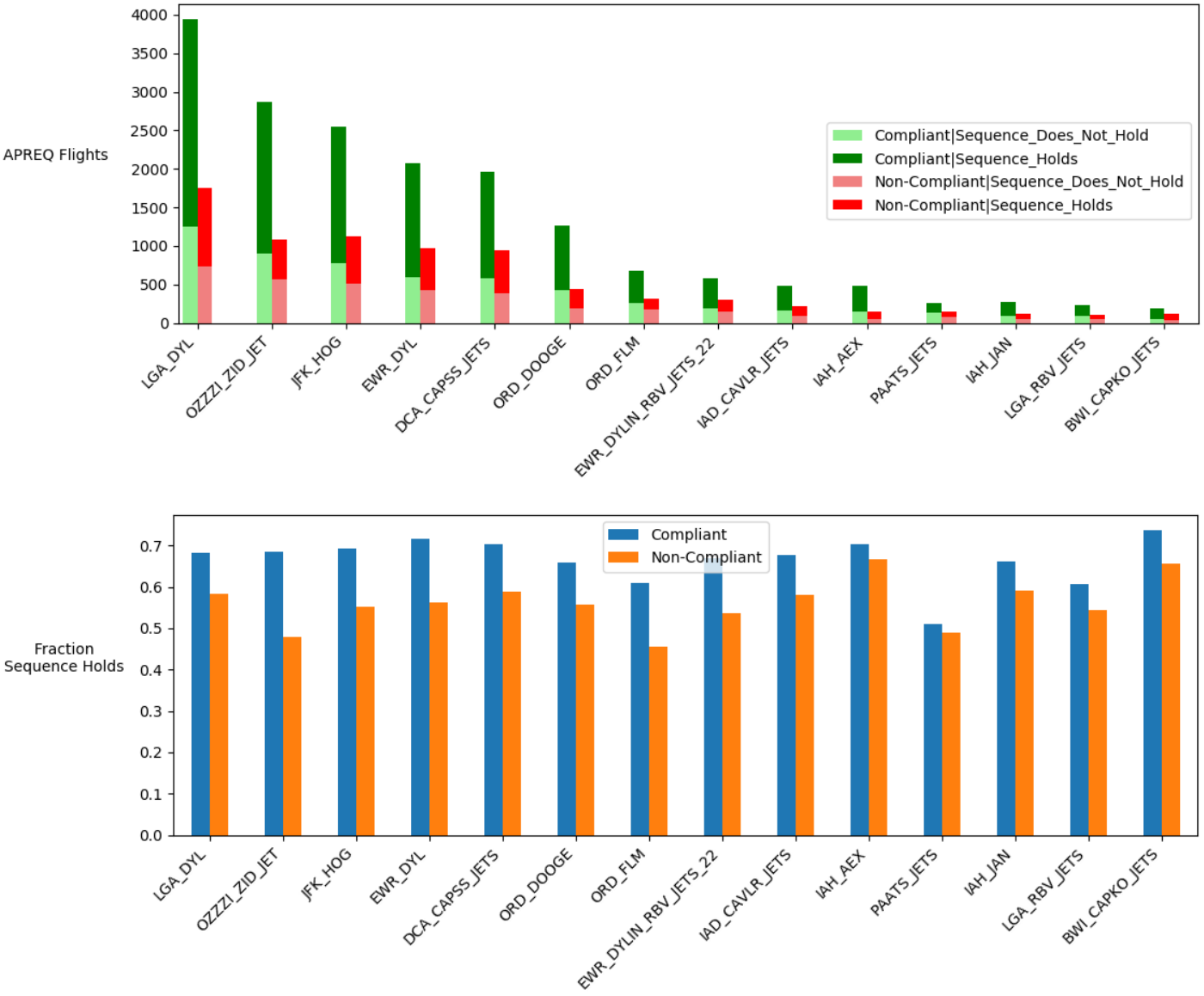


CLT Apreqs: Mar-May 2018 vs. Mar-May 2019

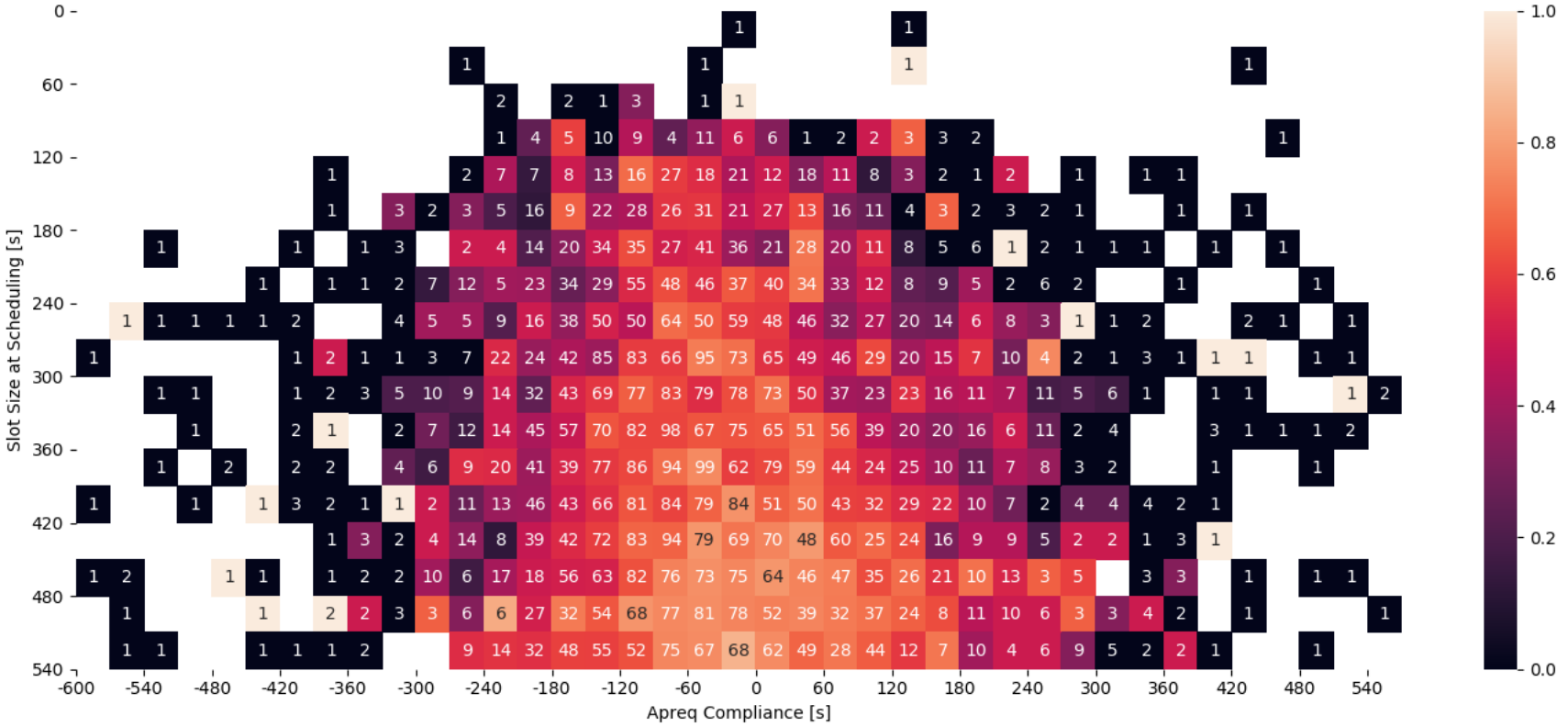
‘Lead & Trail Match’ by Stream Class



‘Sequence Holds’ by Stream Class

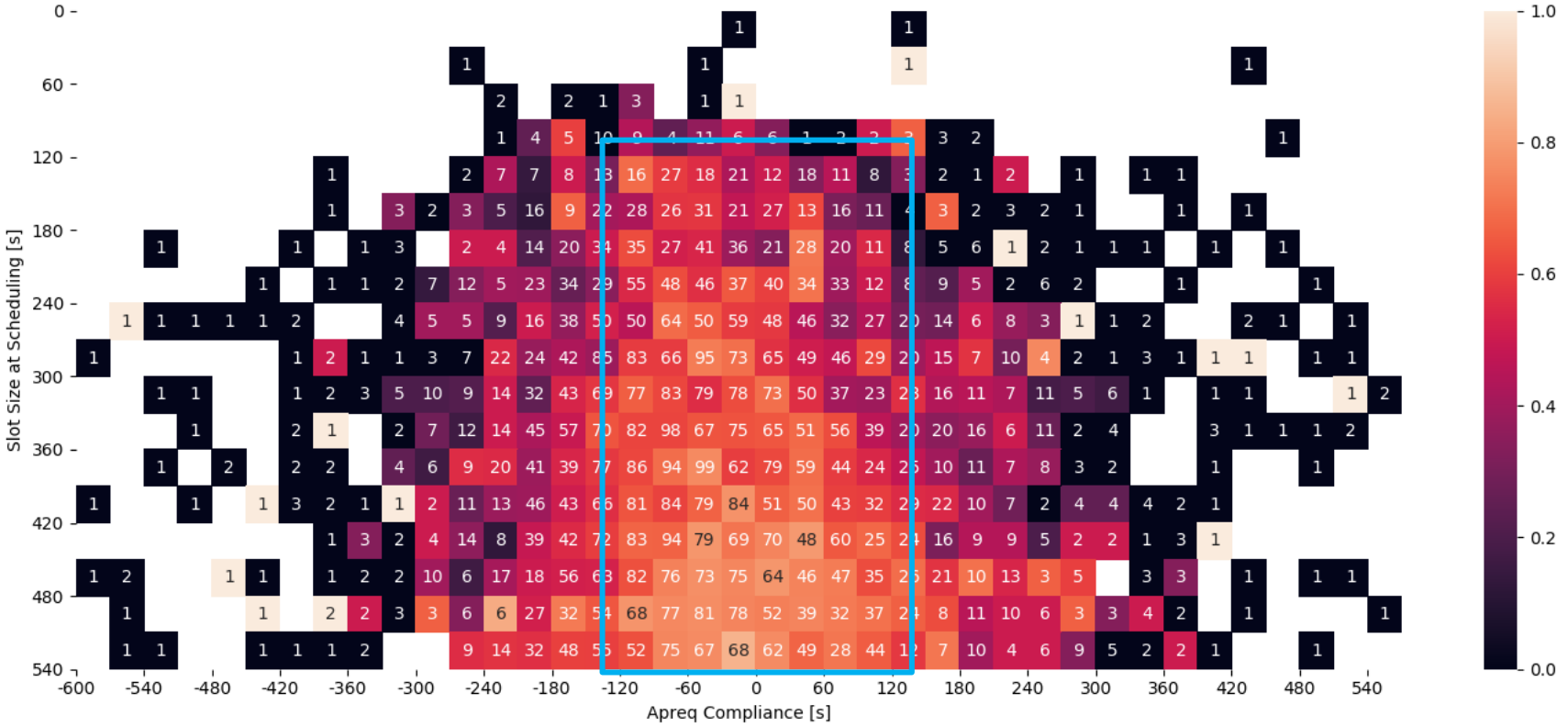


‘Sequence Holds’ by Slot Size & Compliance



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

‘Sequence Holds’ by Slot Size & Compliance



- Top stream classes
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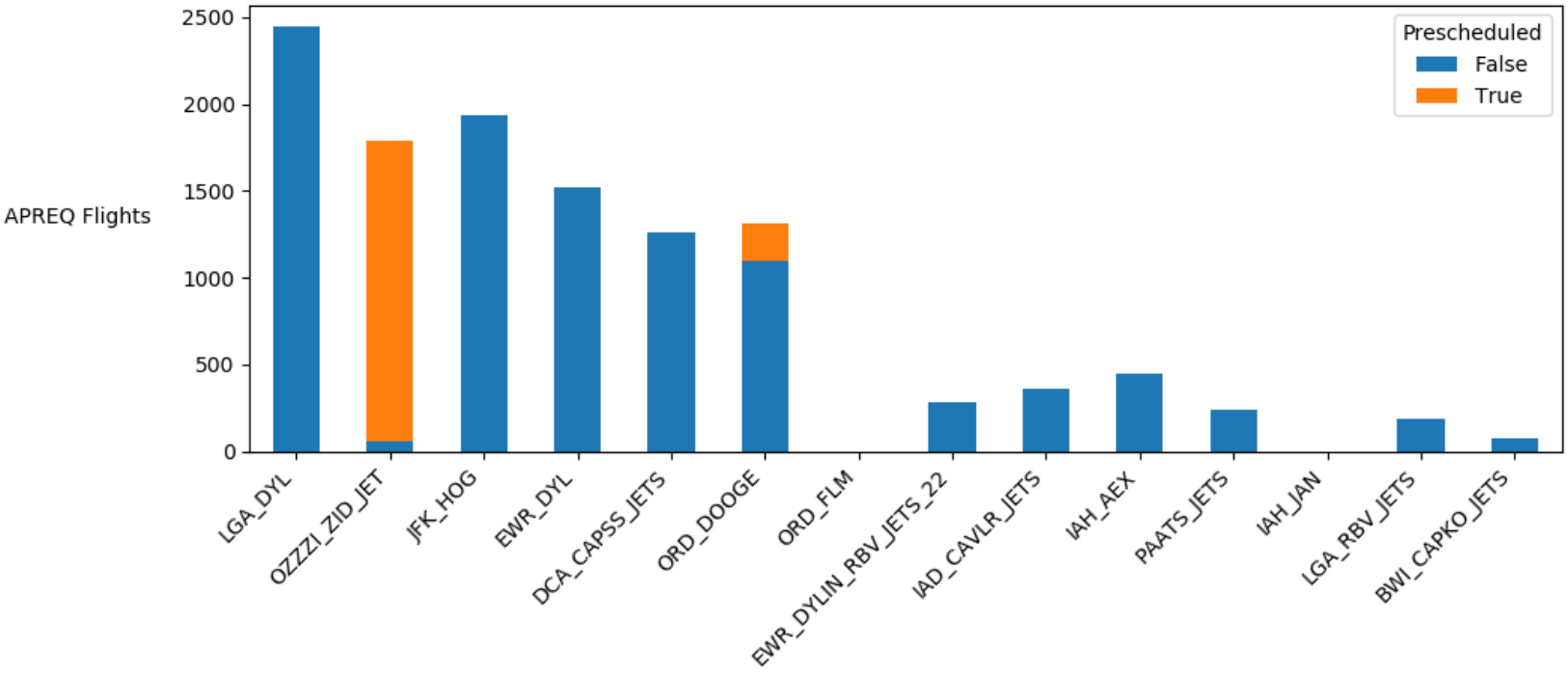
Prescheduled Apreqs by Stream Class

Stream classes with prescheduling:



2019 CLT Apreqs

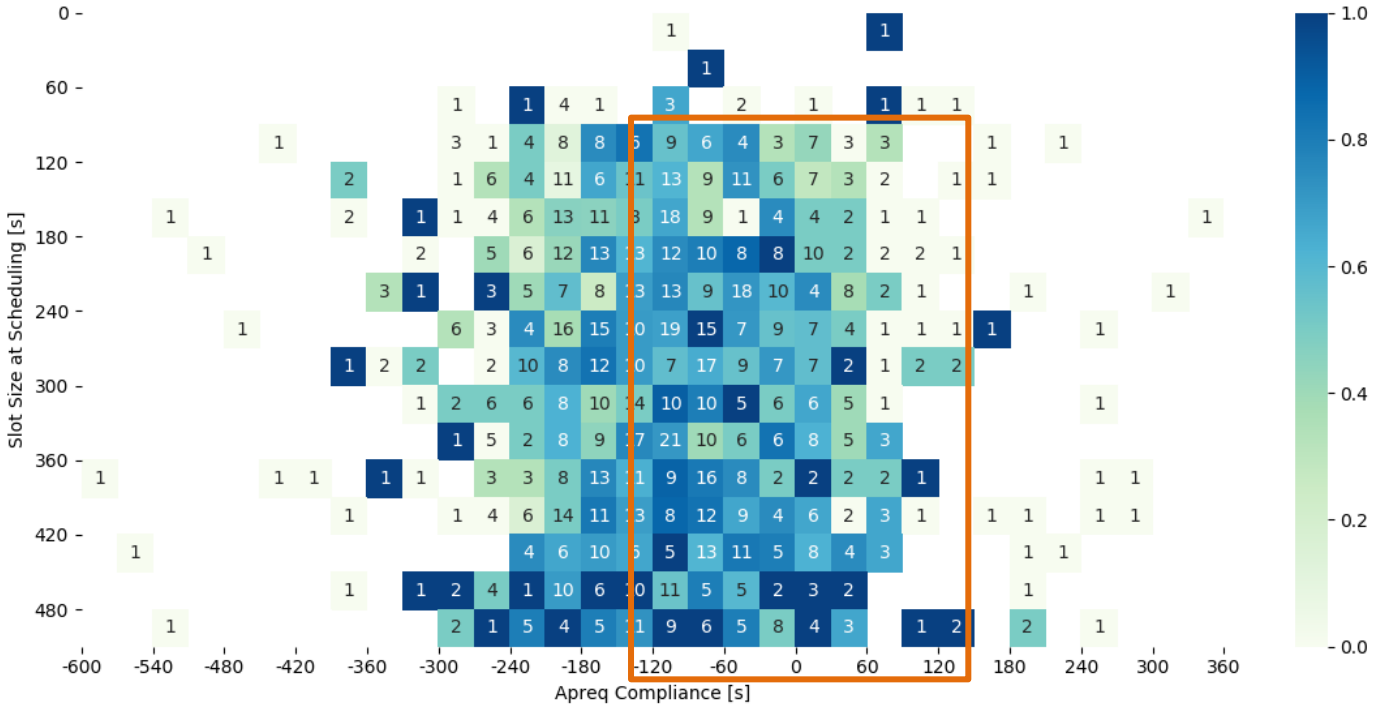
Apreq Prescheduling

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

- 2,428 *prescheduled* CLT Apreq flights

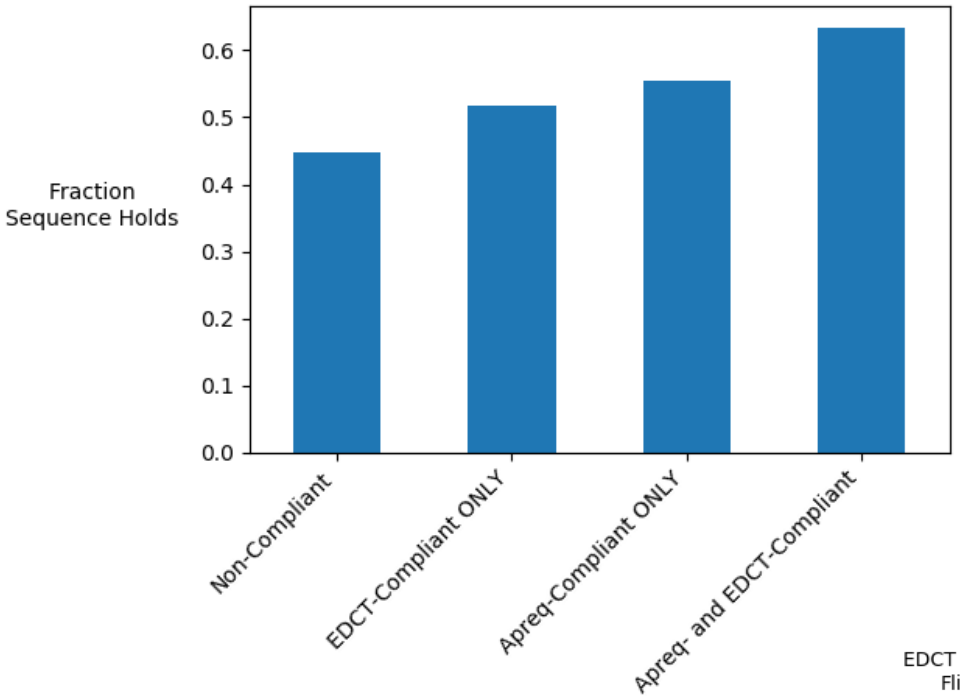
‘Sequence Holds’ by Slot Size & Compliance

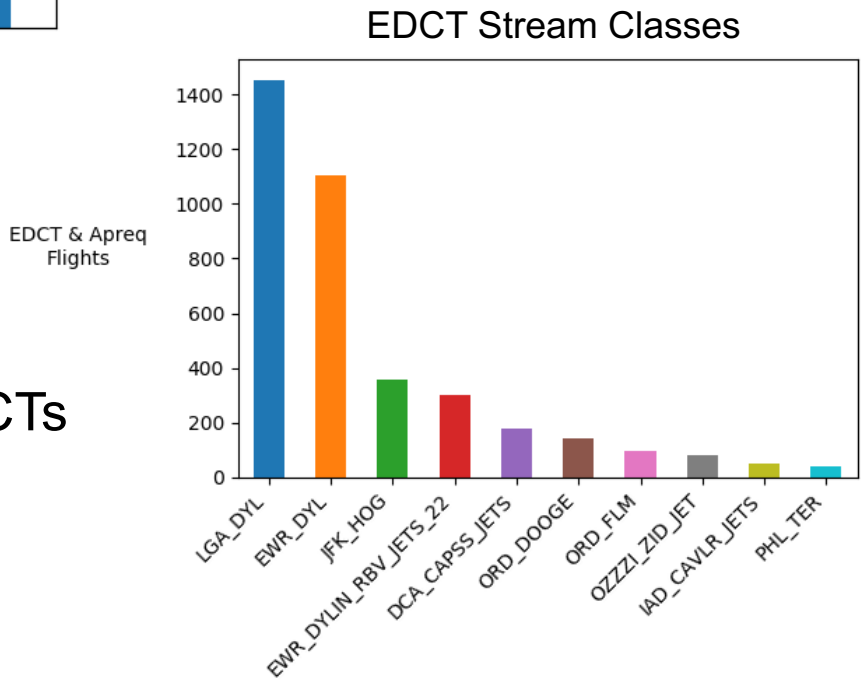
- Prescheduled flights



- 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

Summary

- Stream-class specific analysis combines TBFM and surface data
- Apreq 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)