

Development and Validation of an Automated Simulation Capability in Support of Integrated Demand Management

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Antony D. Evans

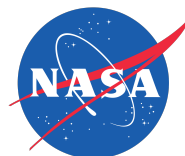
Crown Consulting Inc., NASA Ames Research Center

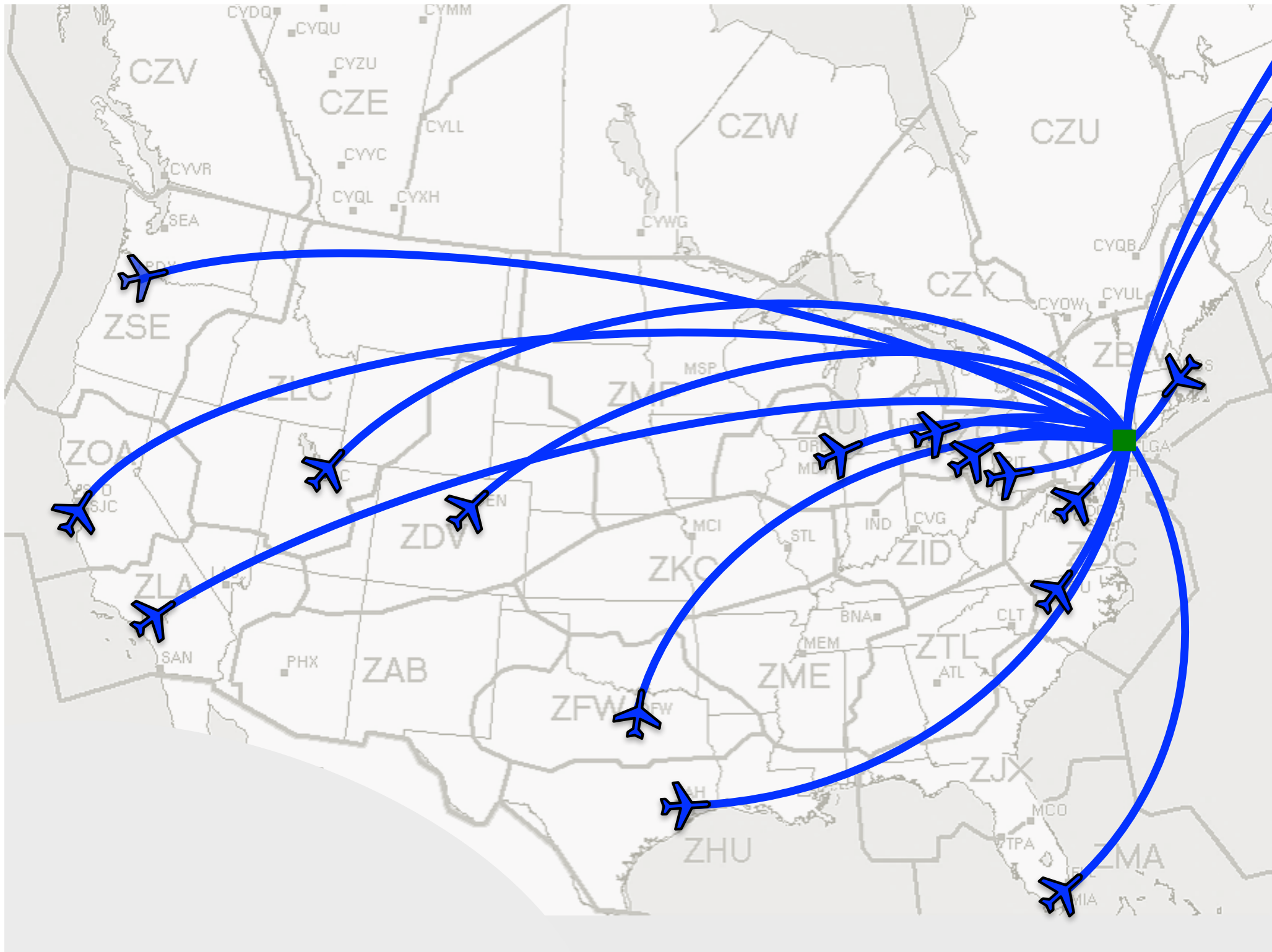
Jinhua Li

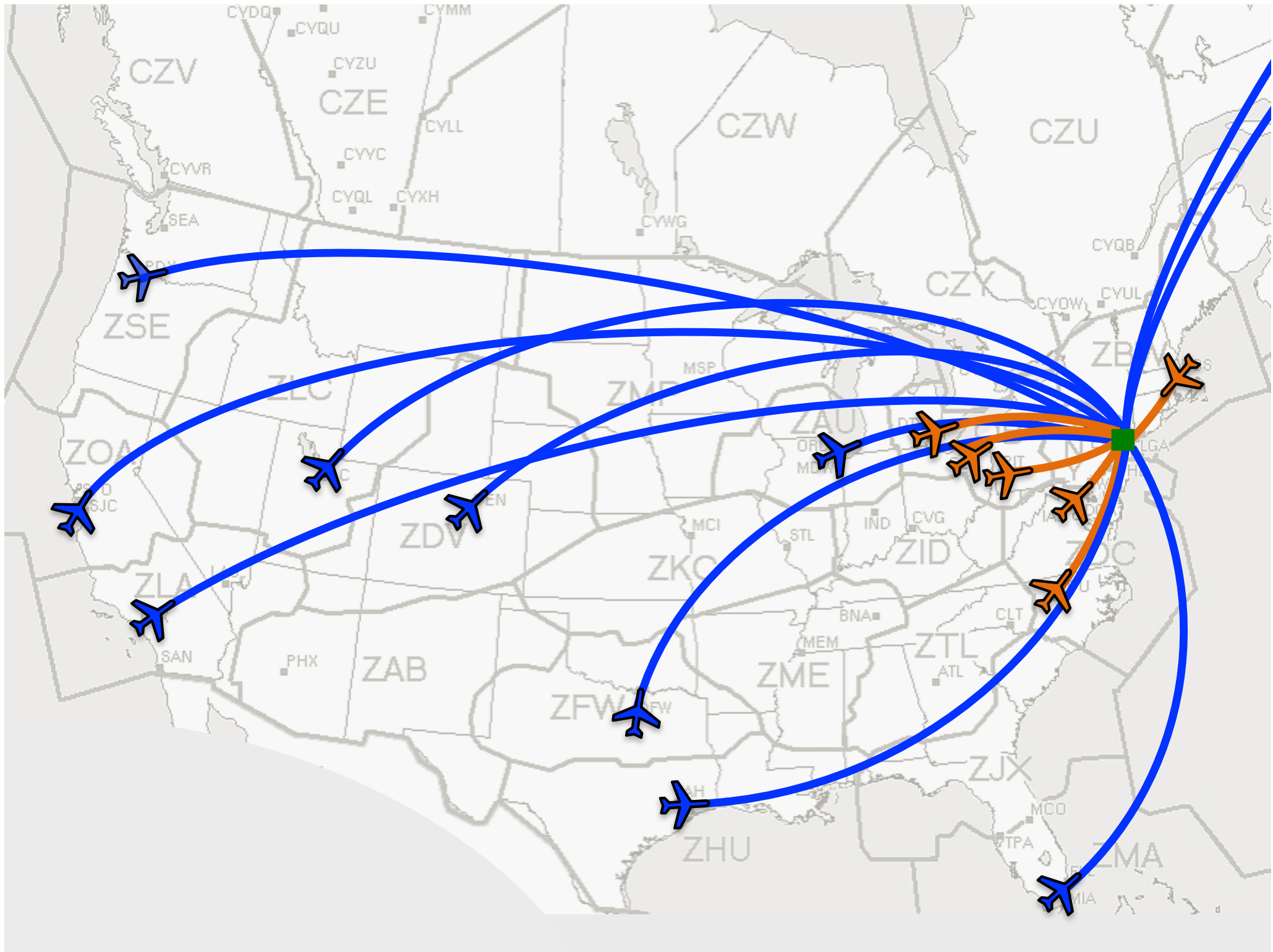
Universities Space Research Association, NASA Ames Research Center

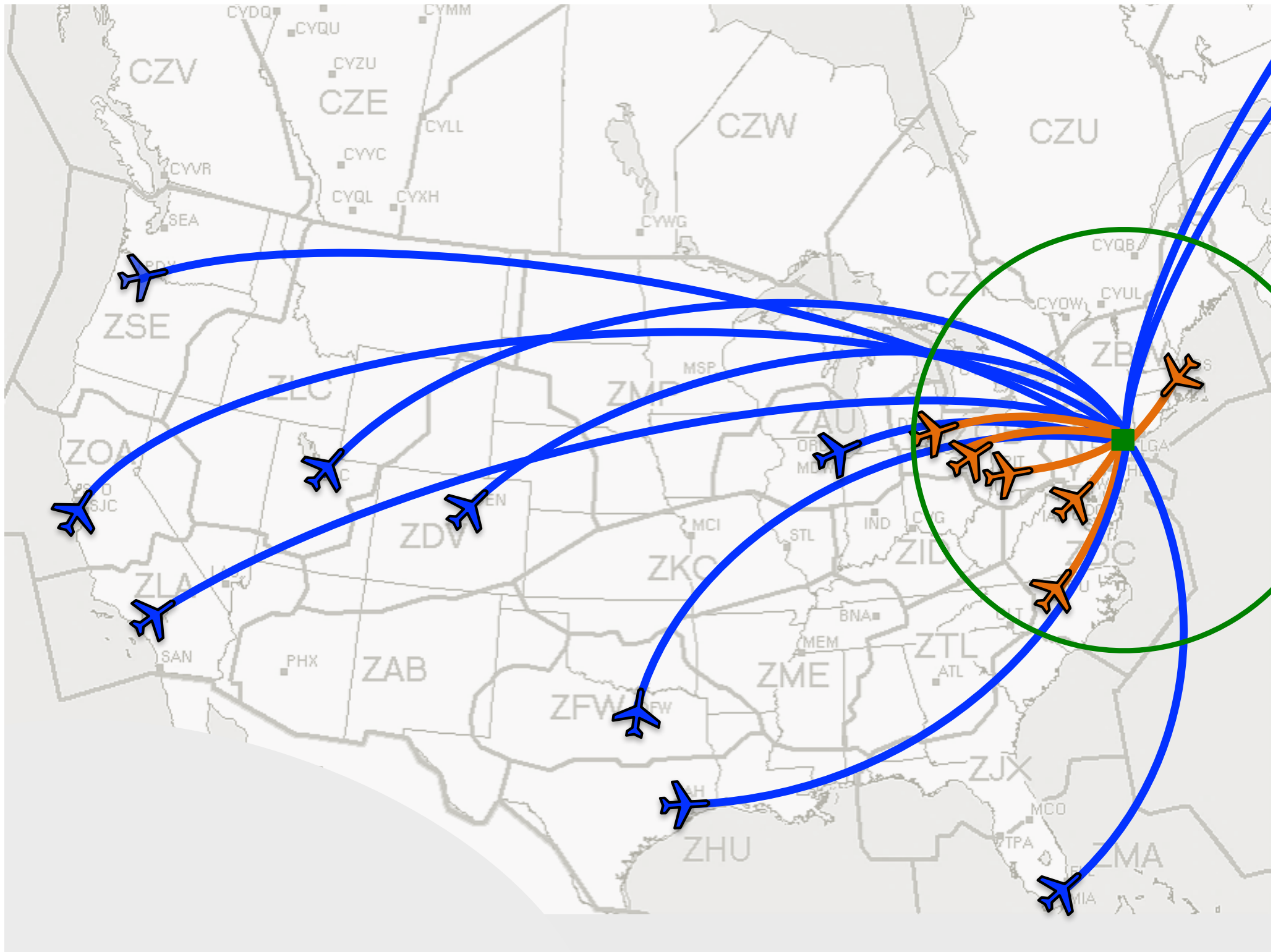
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Strategic Planning

Tactical Planning

Human-in-the-loop (HITL) simulations

- Study integration of strategic and tactical planning tools
 - Strategic:
 - Pre-departure ground delay
 - ⇒ Adjusts demand to roughly meet airport arrival constraint
 - Tactical:
 - Airborne delay near arrival airport
 - Pre-departure ground delay for short-haul flights
 - ⇒ Delivers demand to actual arrival rate constraint
- Subject matter expert participants:
 - Air traffic controllers
 - Traffic flow managers

Challenges of HITL simulations

- **Expensive**
 - Subject matter expert participants
 - Simulation support staff
- **Time consuming**

Minimum of 5 hours to capture long-haul flights pre-departure
- **Limitations**
 - Number of simulations executed
 - Number of airspace sectors that can be populated with traffic
 - Traffic volume

Motivation

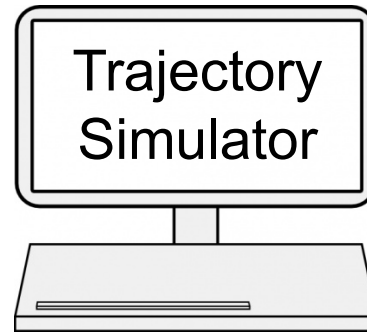
- Evaluate over larger variation in parameters
- Simulate larger, more realistic traffic scenarios
- Augment HITL with automated background traffic

Objectives

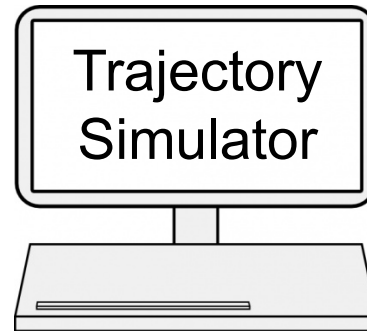
- Automate HITL simulation
- Emulate HITL simulation results
- Maintain high fidelity trajectory simulation
- Incorporate updates to strategic planning tool

- Simulation structure
 - HITL simulation
 - HITL participant actions
 - Automated simulation capability
- Initial validation
- Conclusions and future work

Simulation structure



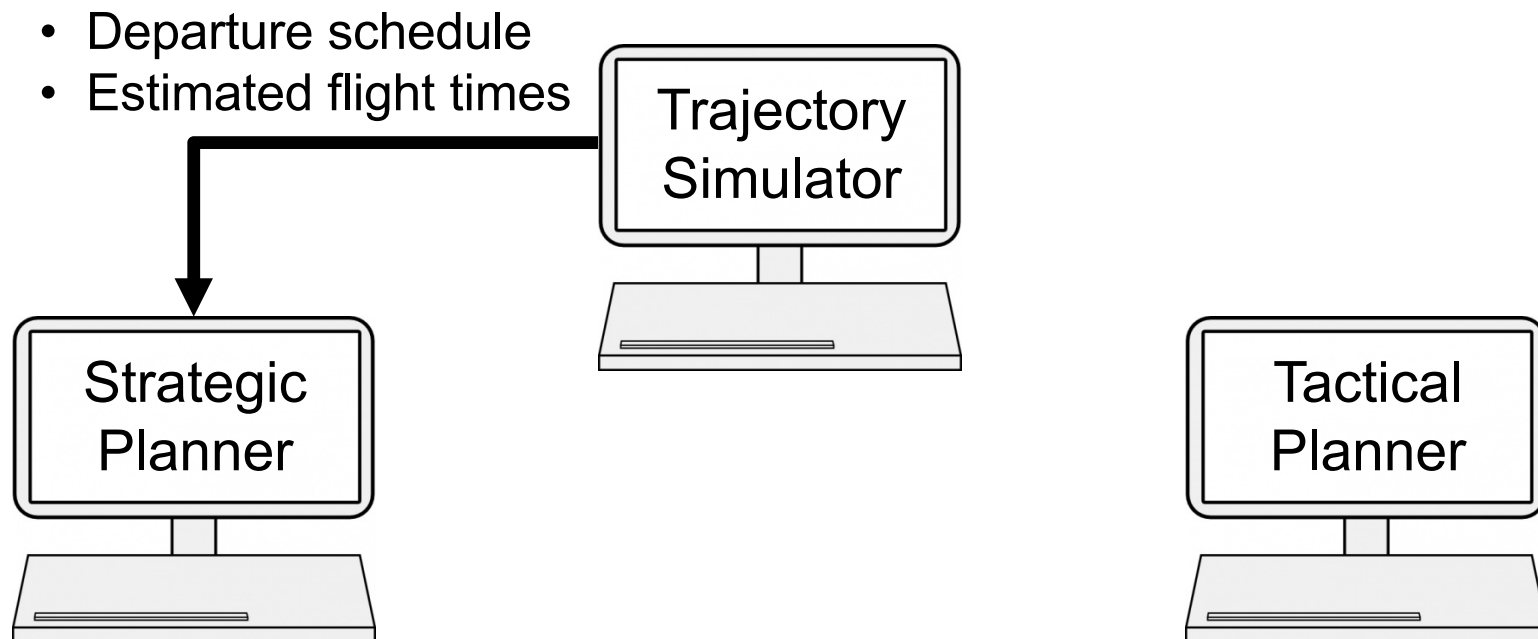
Simulation structure



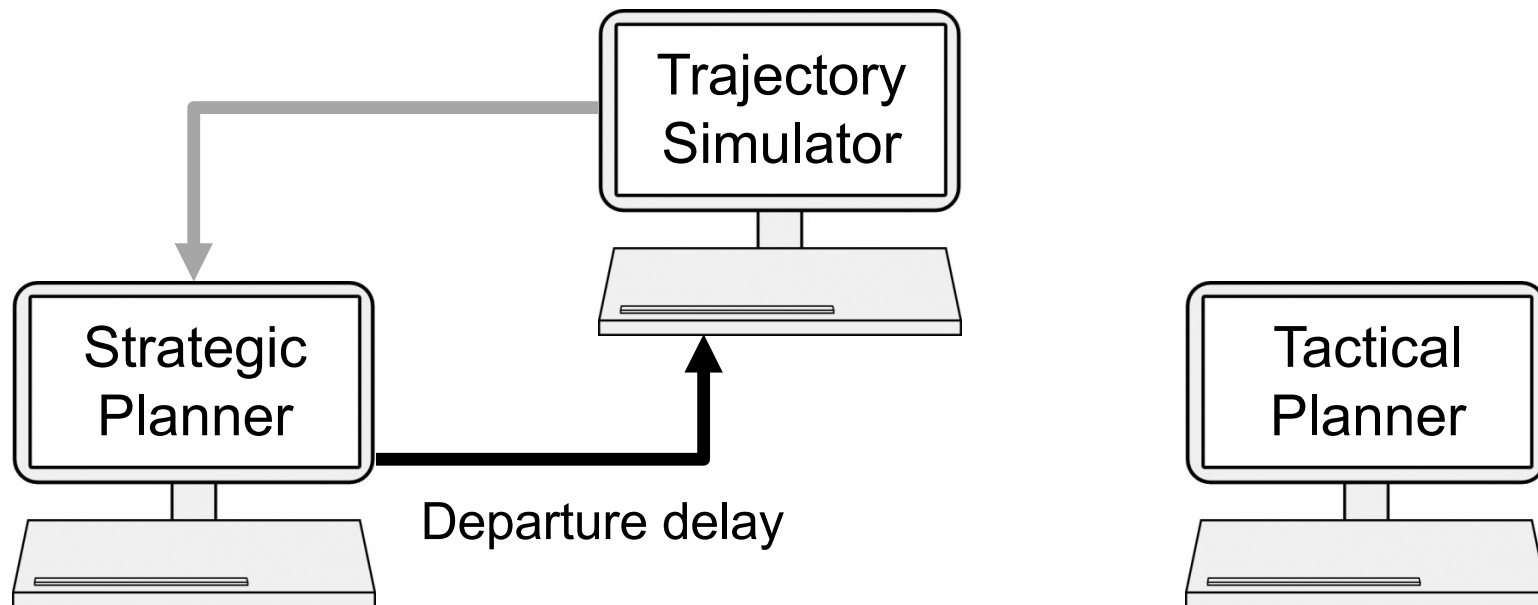
Simulation structure



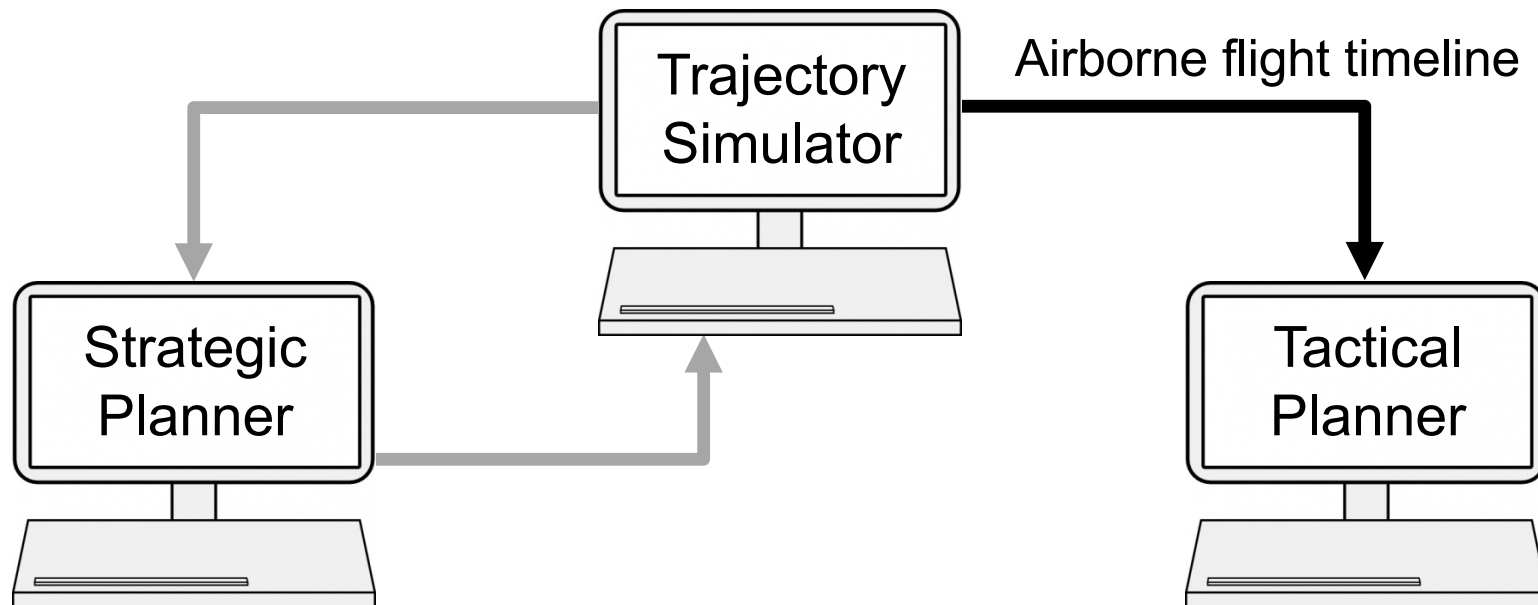
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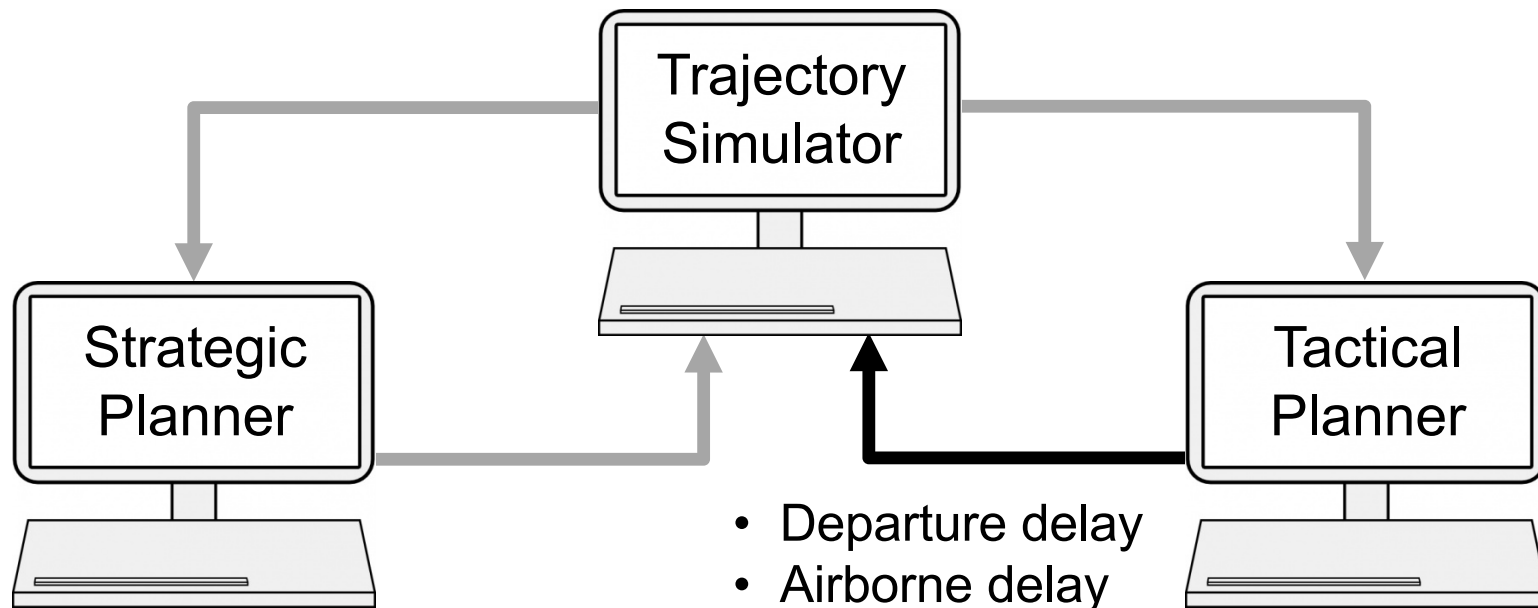
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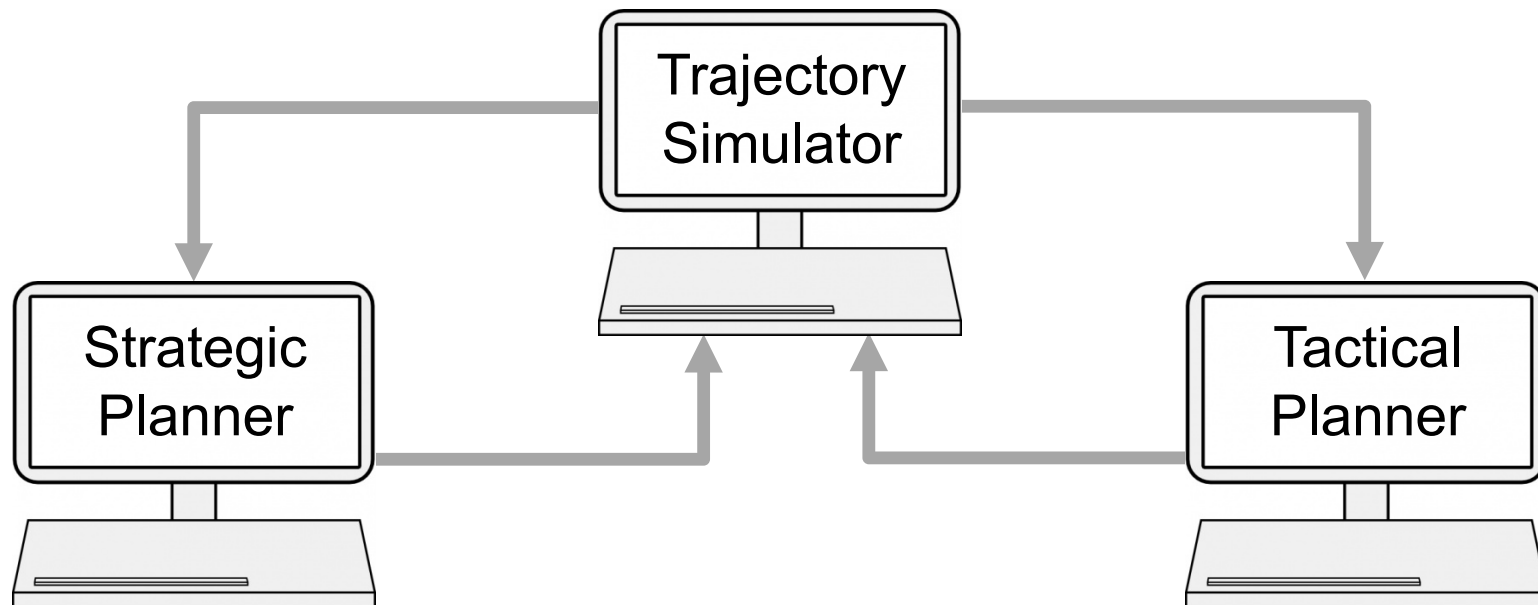
Simulation structure



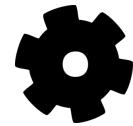
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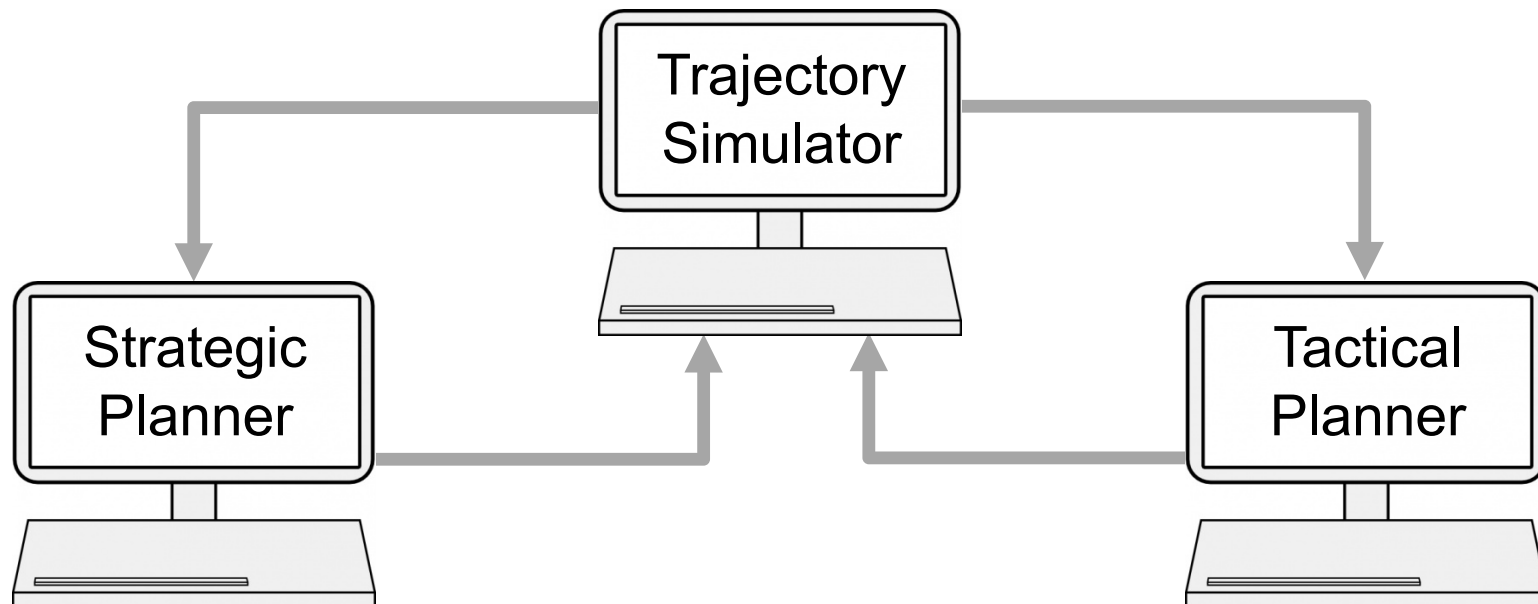
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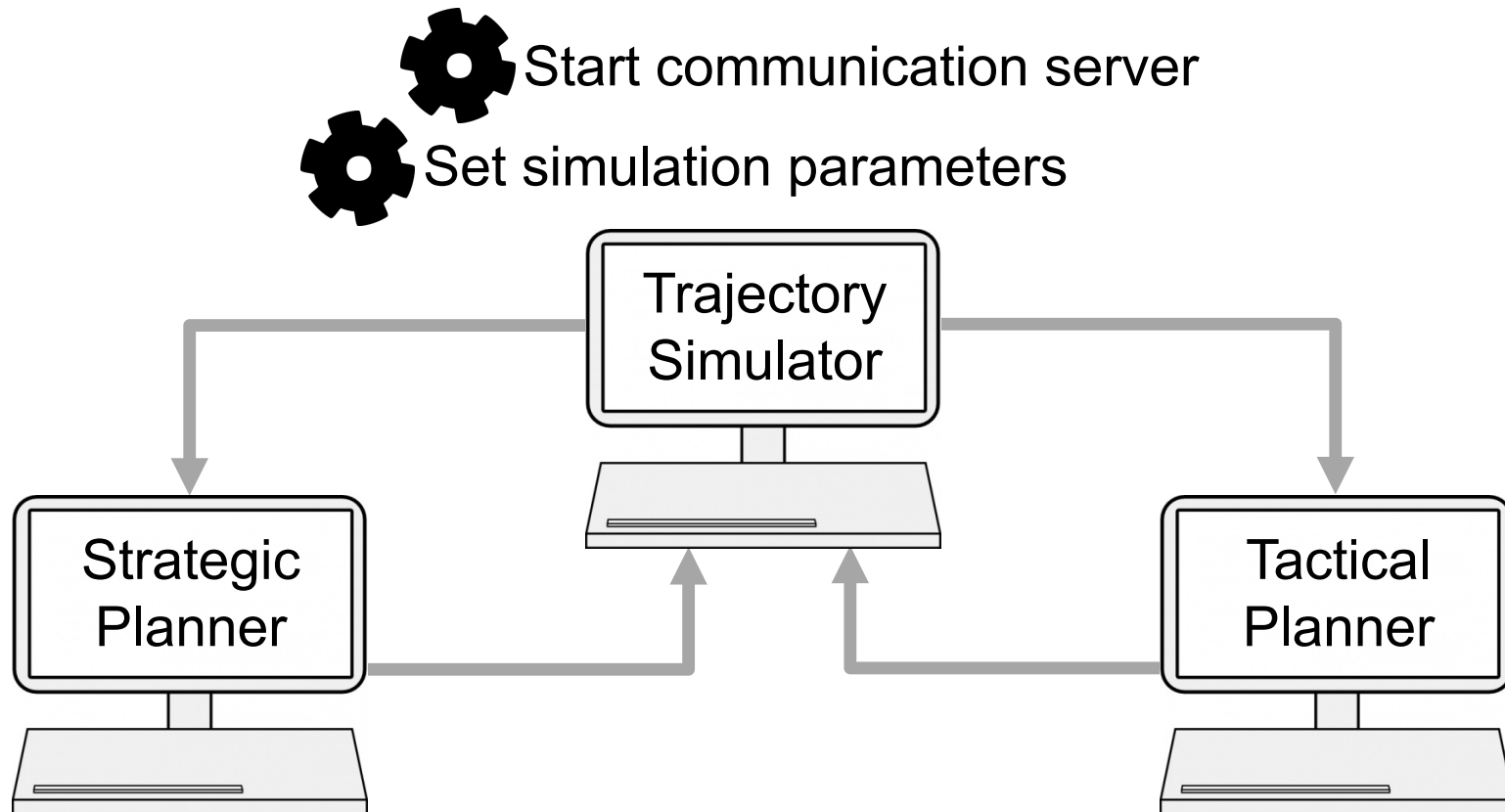
Simulation structure



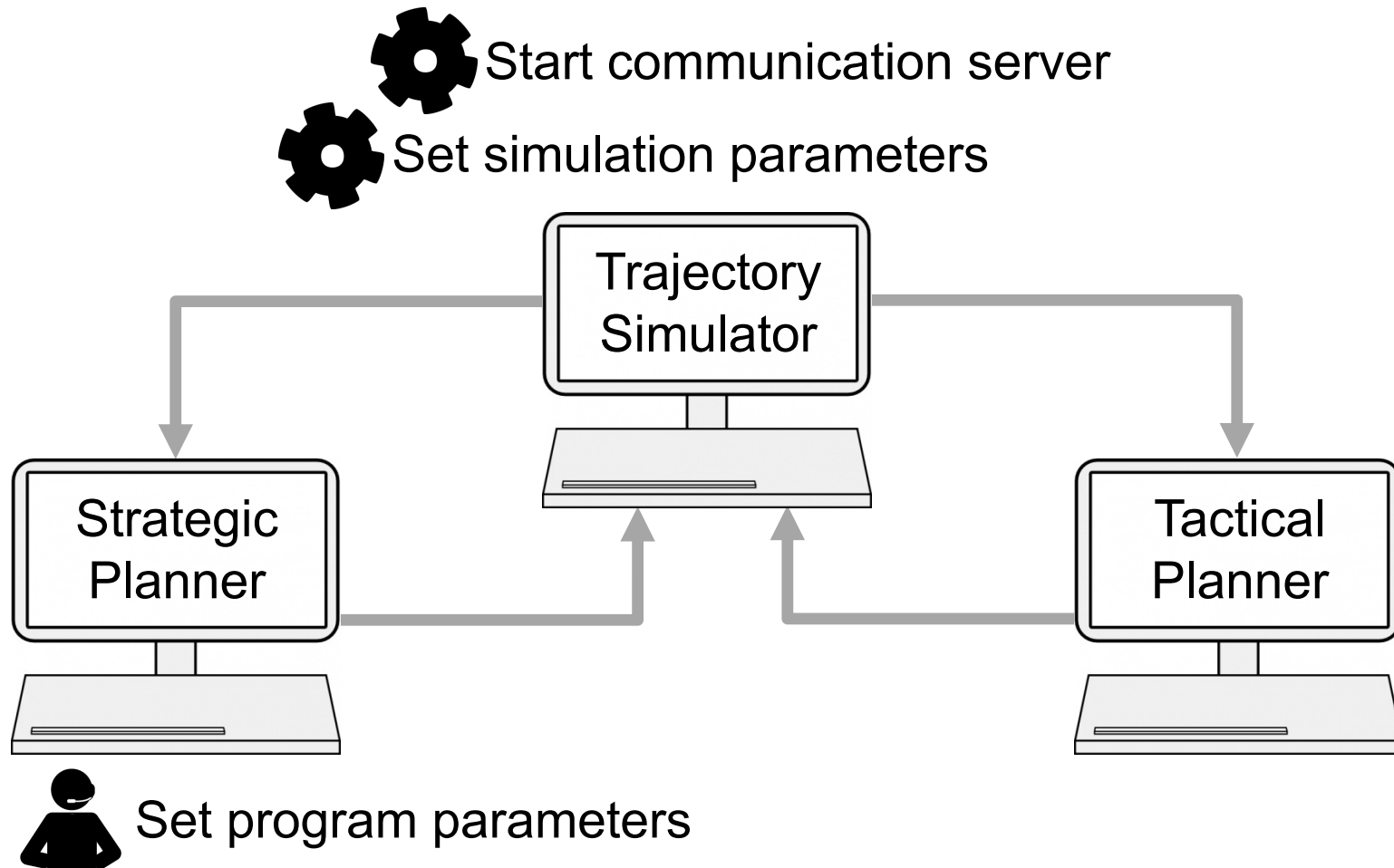
Start communication server



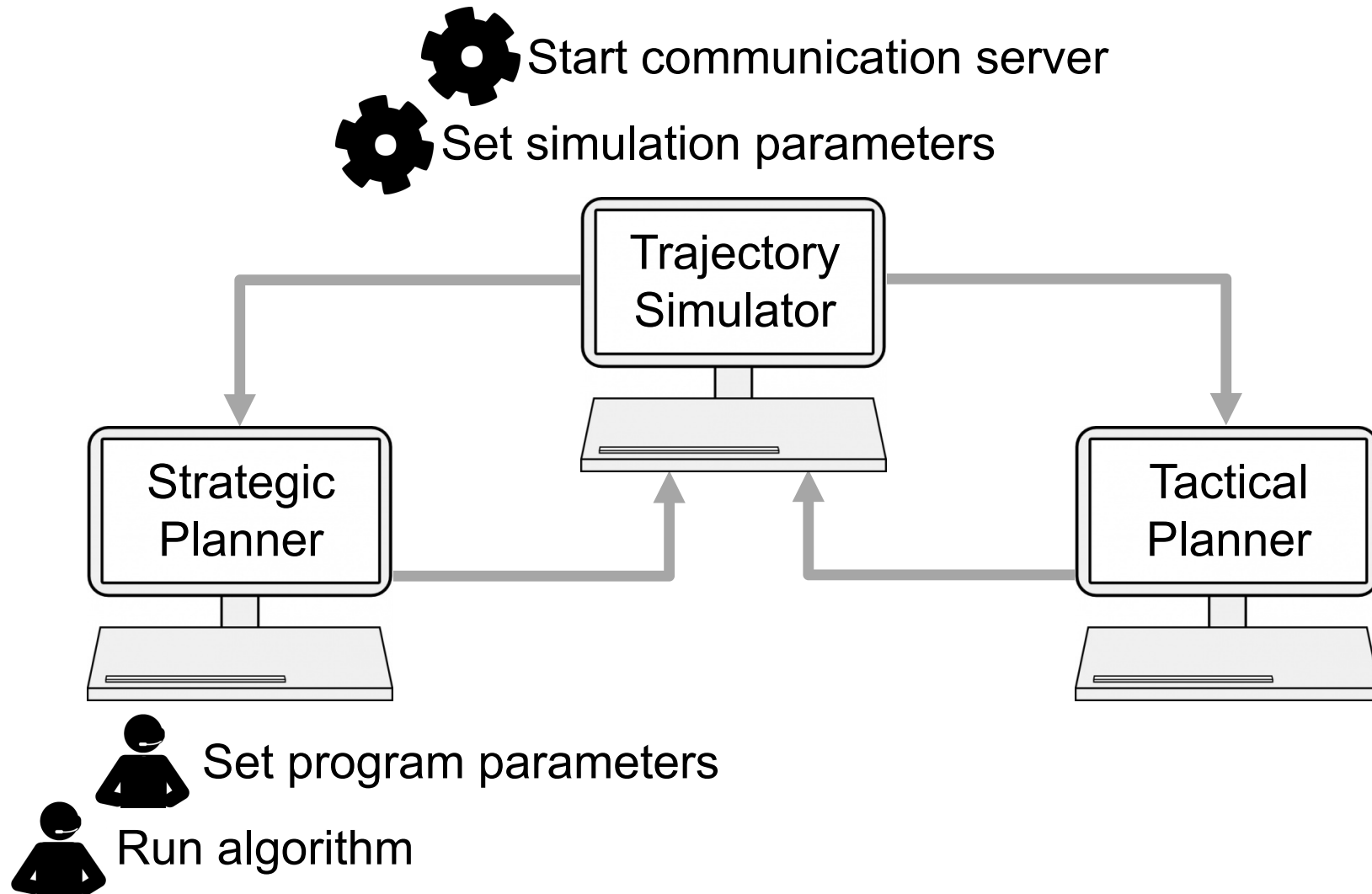
Simulation structure



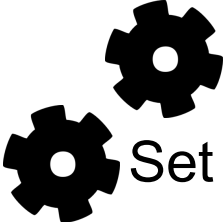
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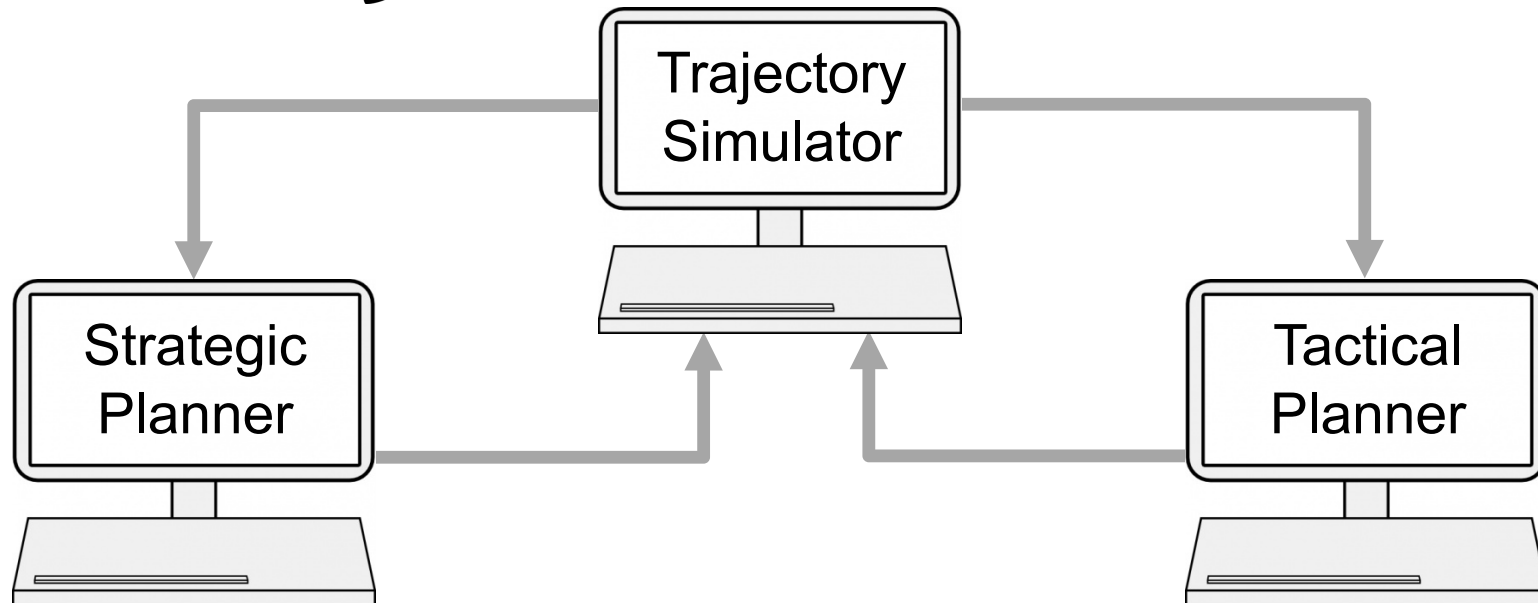





Simulation structure



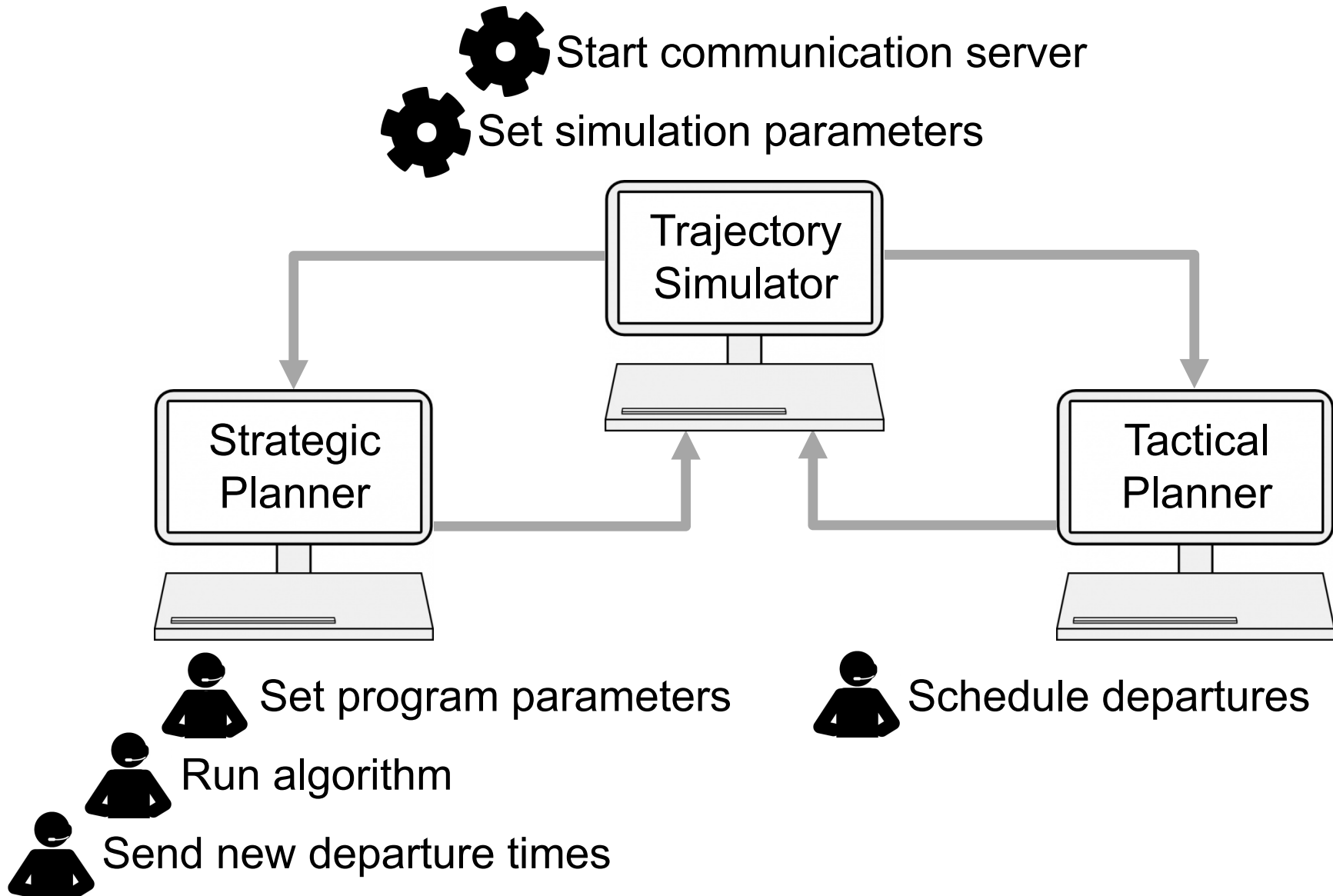
Simulation structure

 Start communication server
Set simulation parameters

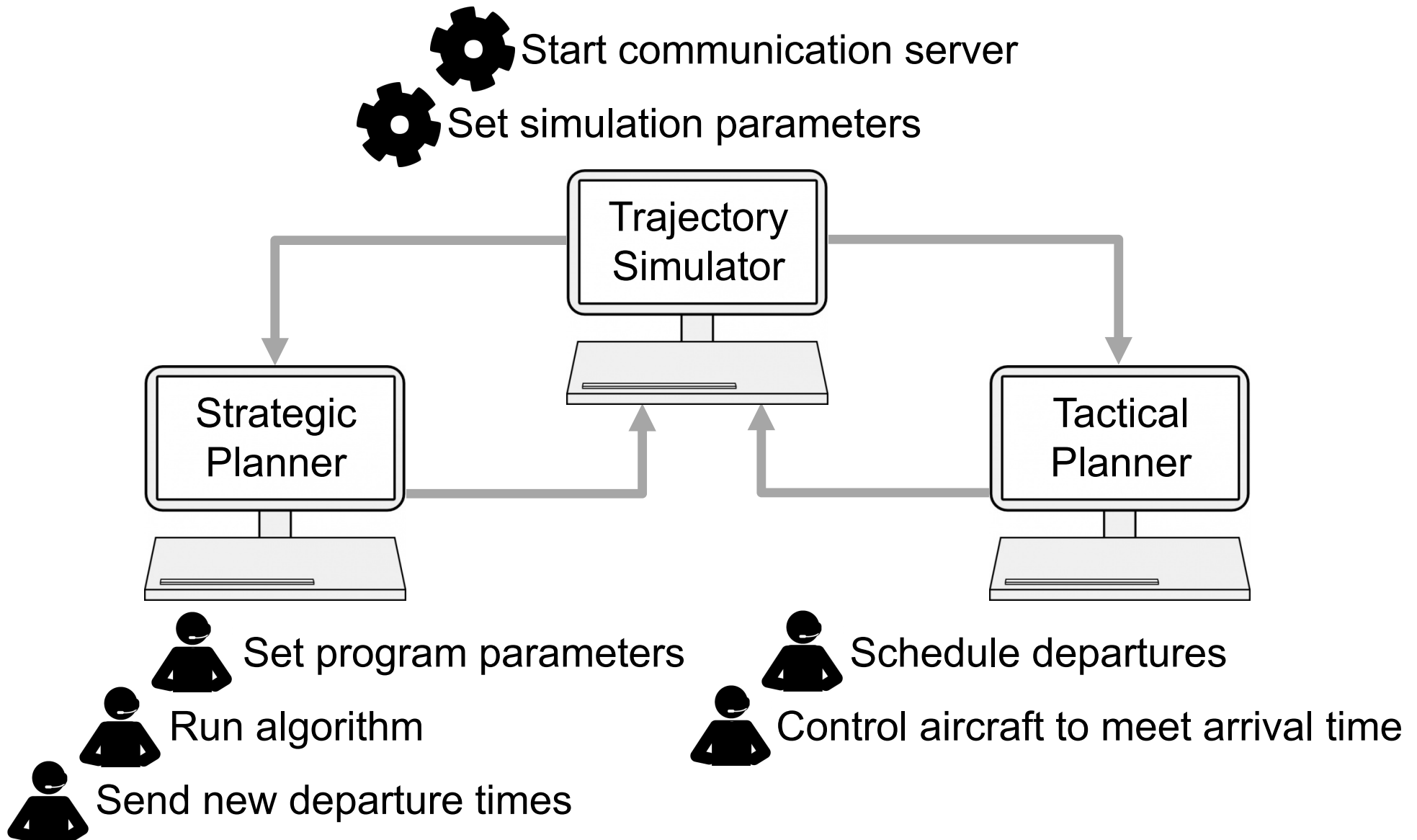


 Set program parameters
 Run algorithm
 Send new departure times



Simulation structure

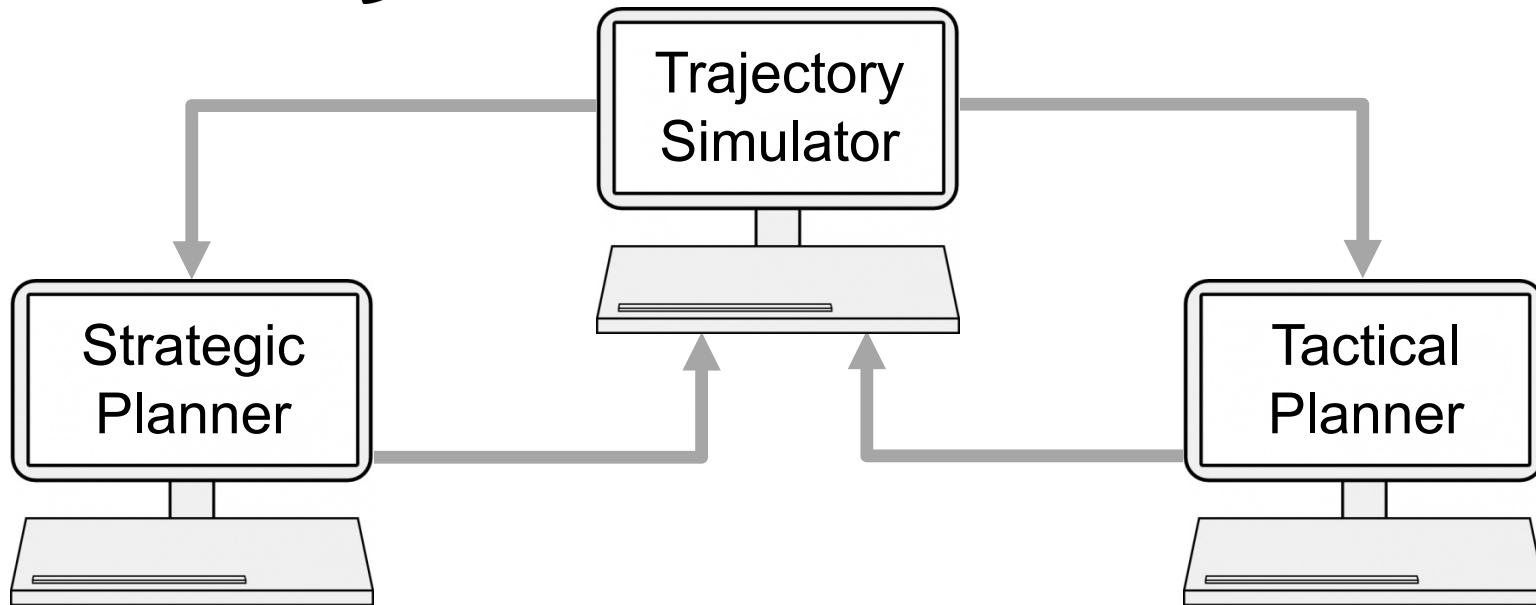







Simulation structure



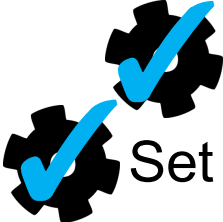

Simulation structure

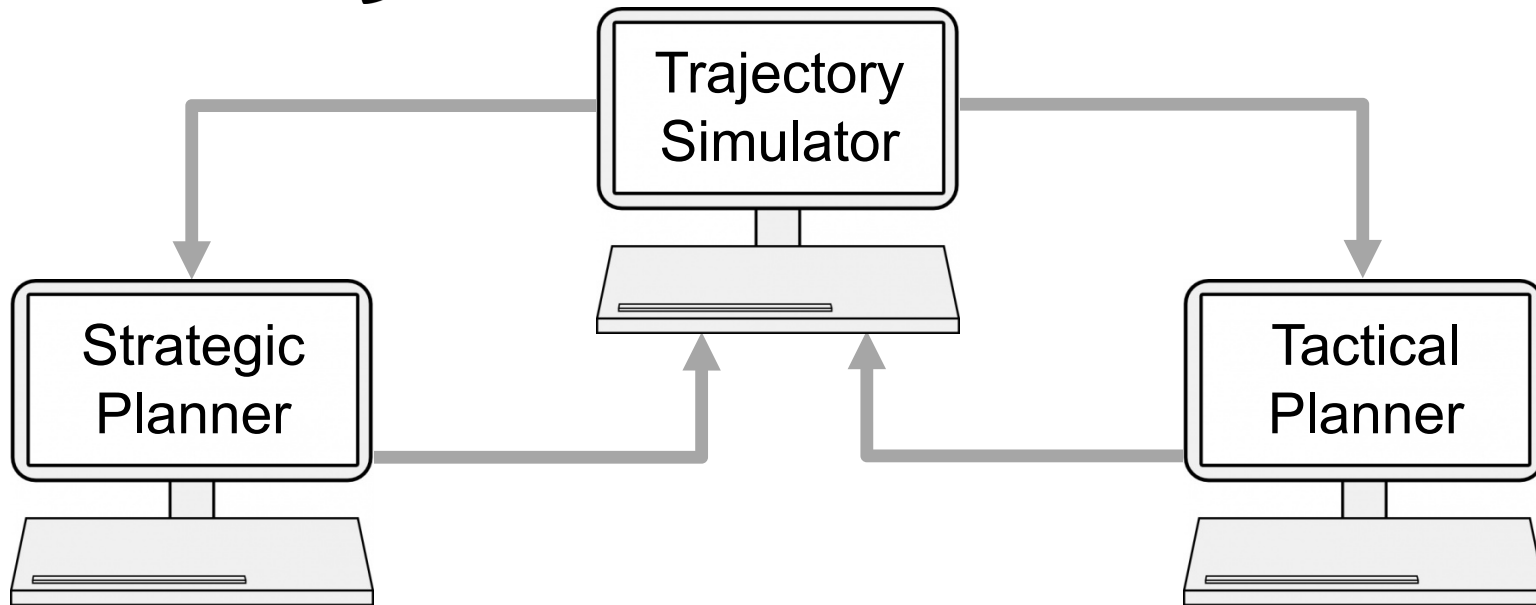
-  Start communication server
-  Set simulation parameters








-  Set program parameters
-  Run algorithm
-  Send new departure times
-  Schedule departures
-  Control aircraft to meet arrival time

Simulation structure

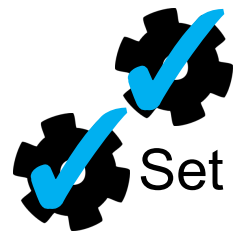
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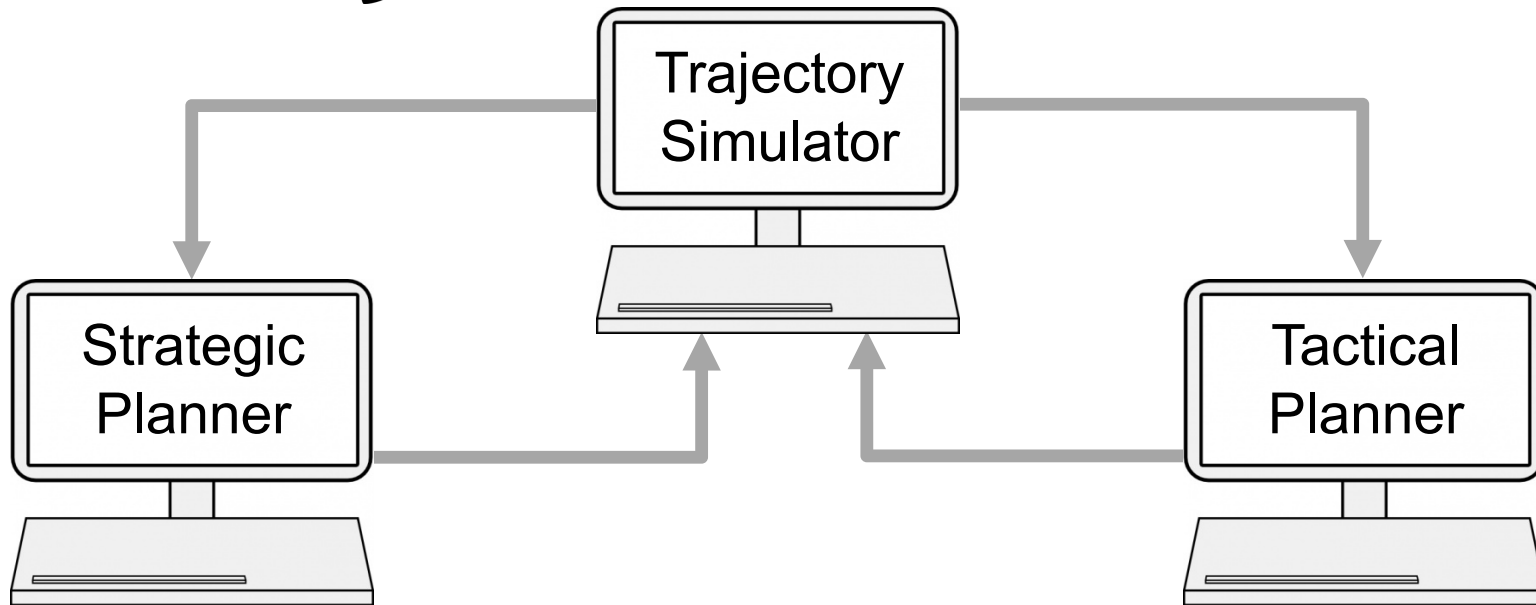





-  Set program parameters
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-  Send new departure times



-  Schedule departures
-  Control aircraft to meet arrival time

Simulation structure

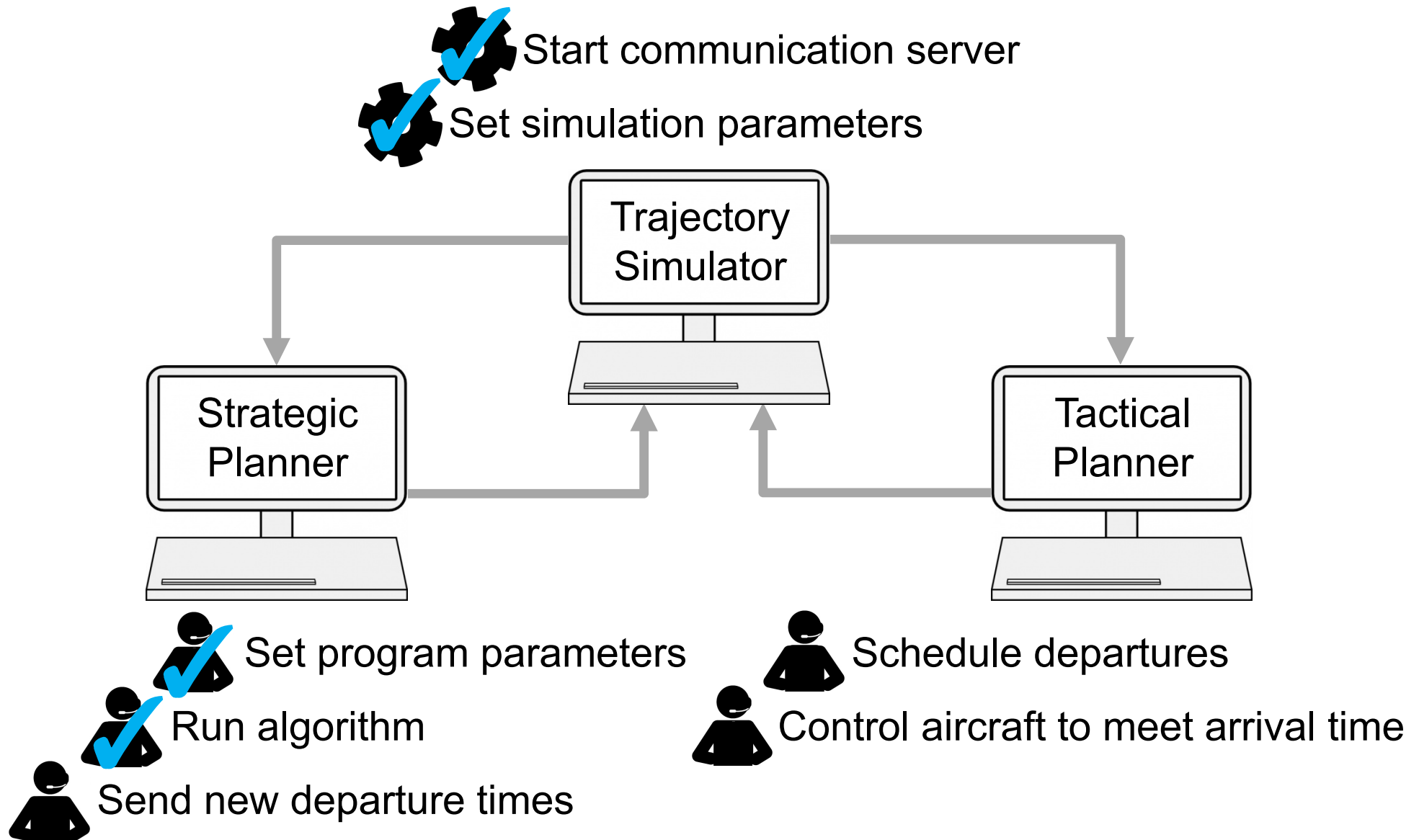
 Start communication server
Set simulation parameters



 Set program parameters
 Run algorithm
 Send new departure times

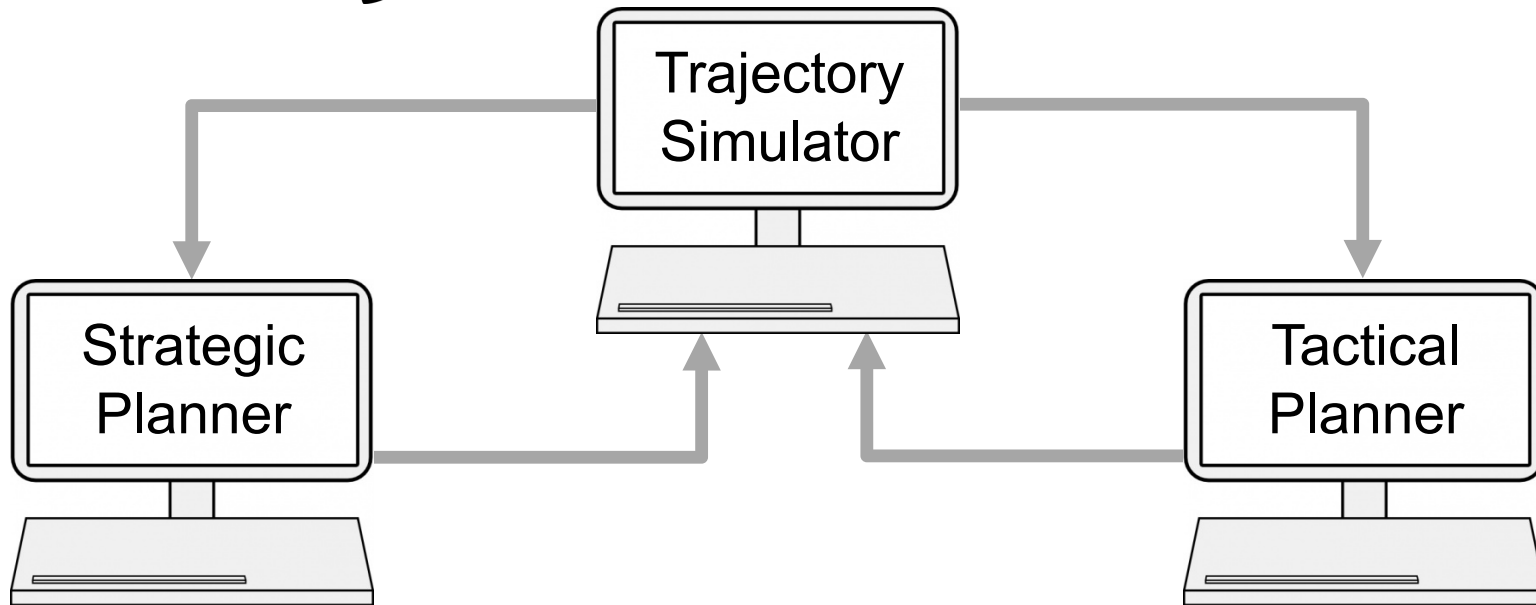
 Schedule departures
 Control aircraft to meet arrival time

Simulation structure



Simulation structure

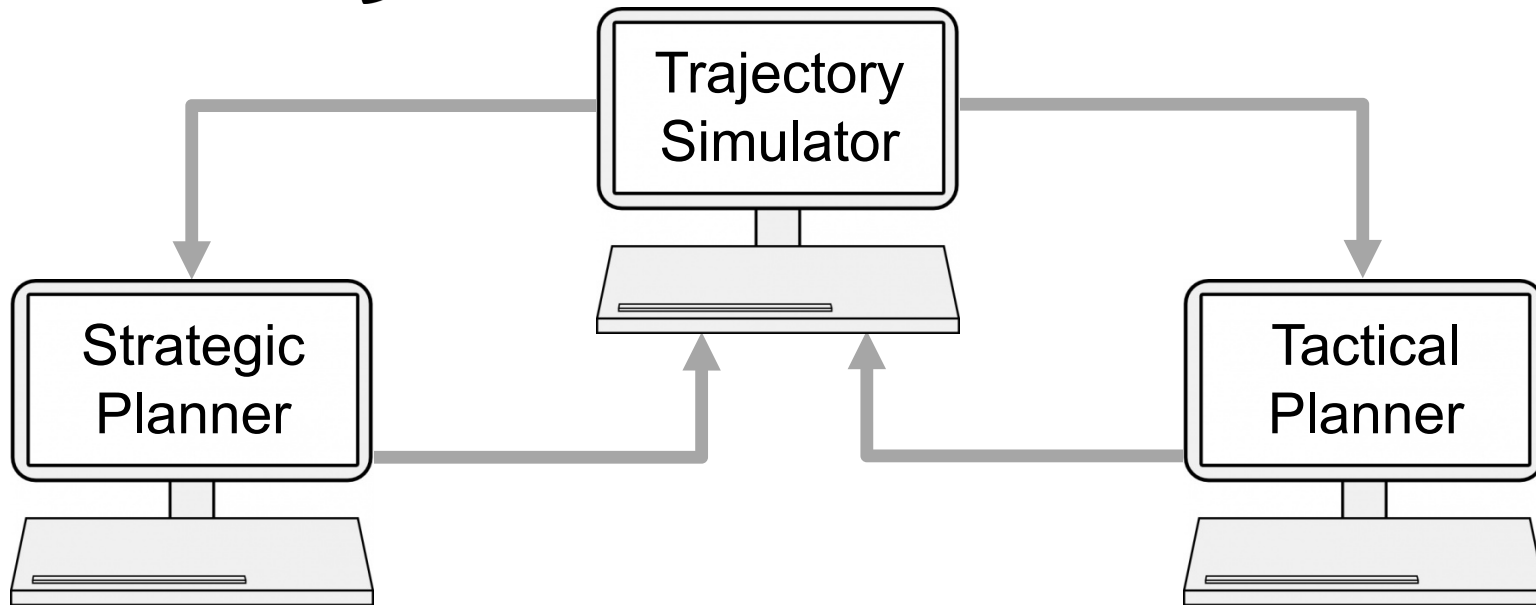
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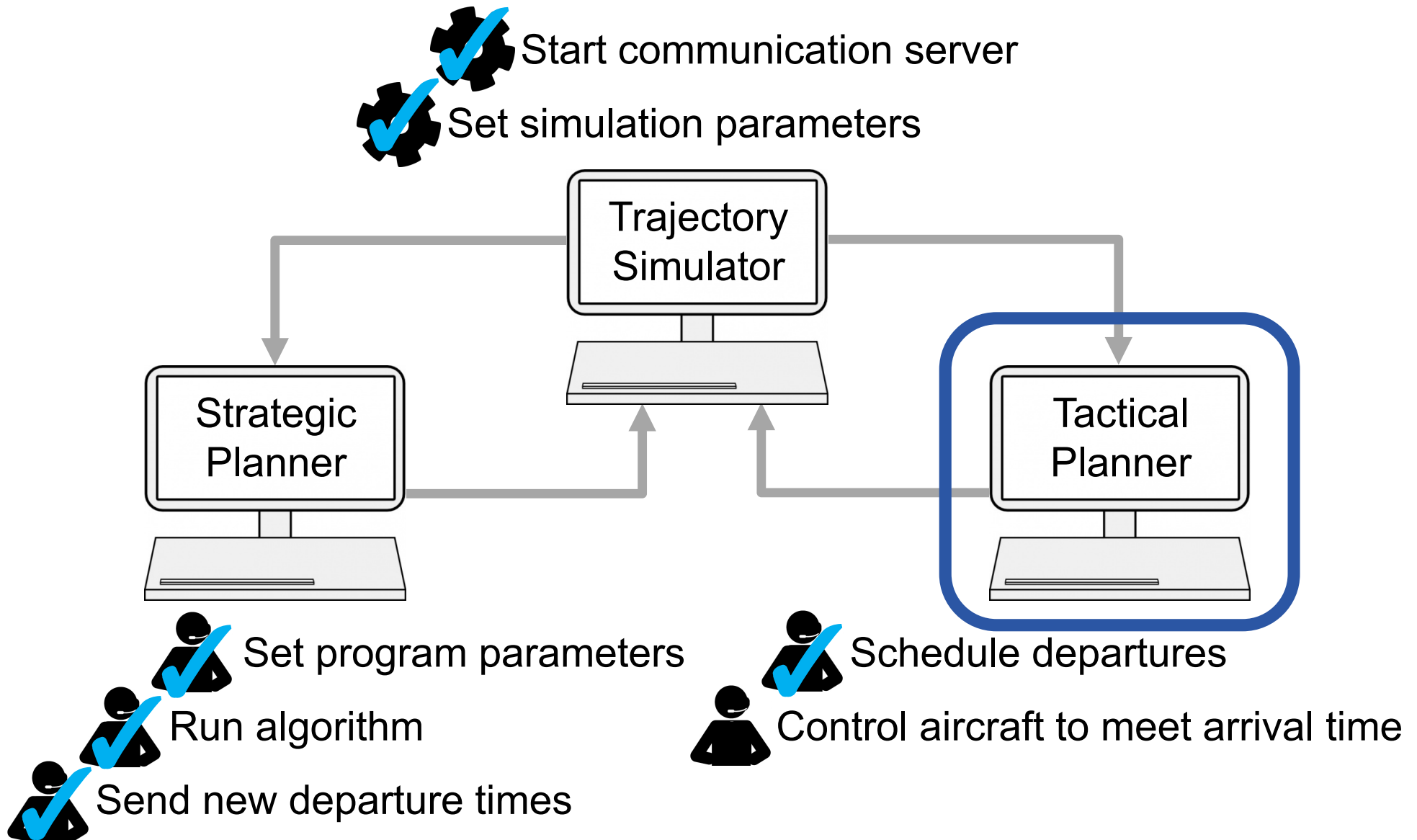
Simulation structure

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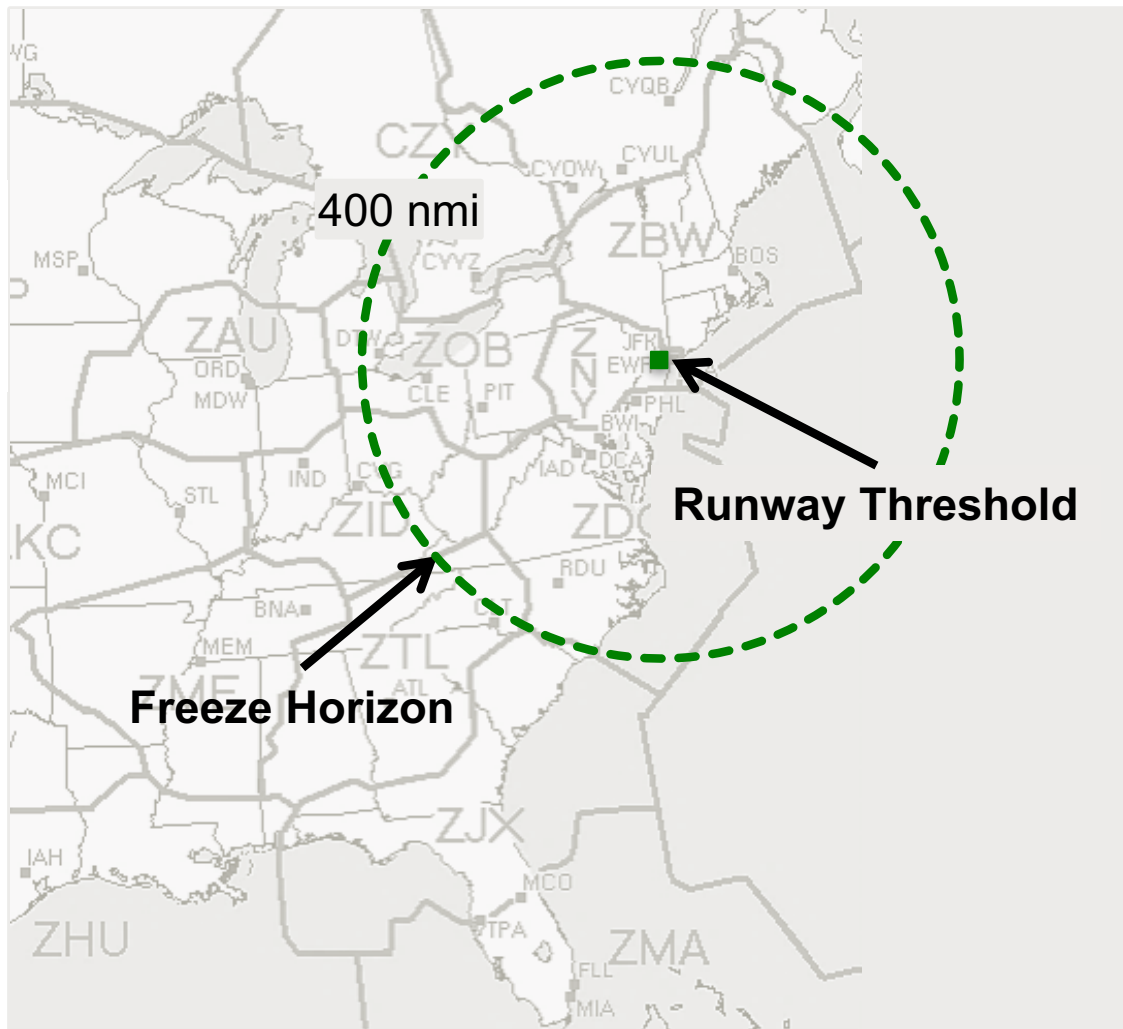
Simulation structure



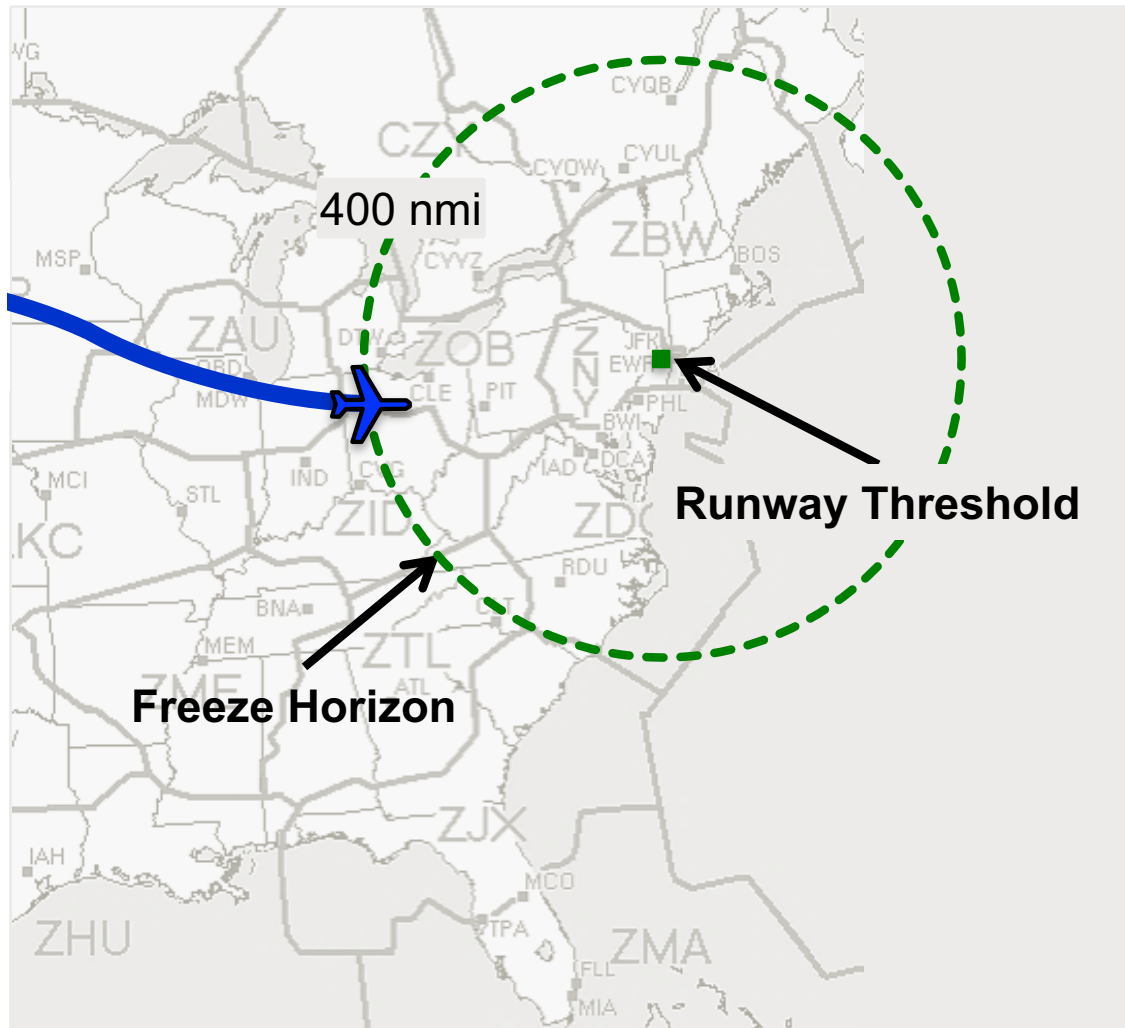
Tactical planner emulator

- Scheduler developed in house at NASA
 - Can run in fast-time
 - Code easily accessible for modification
- Adapted for Newark Liberty International Airport
- Modified to schedule internal departures automatically

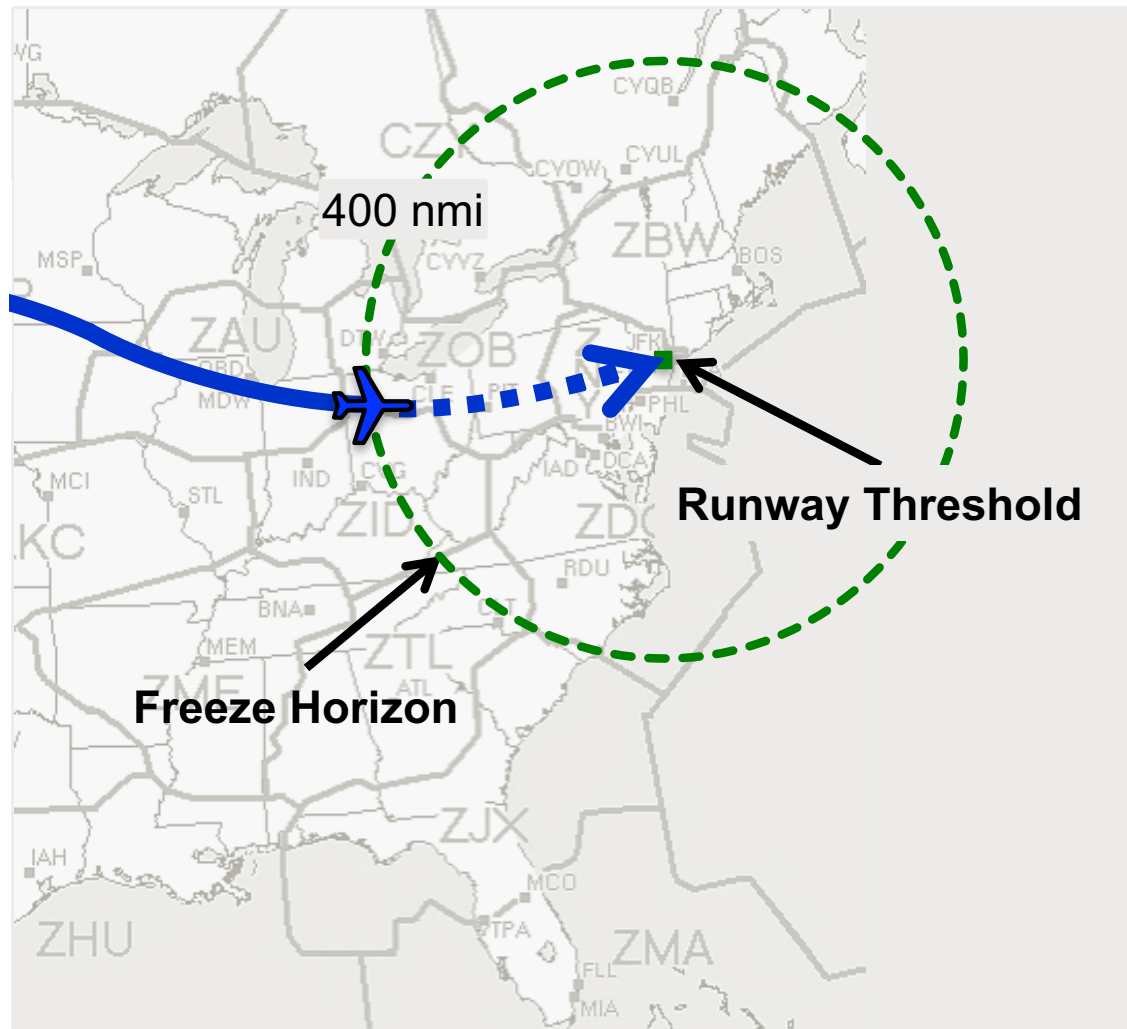
Tactical planning



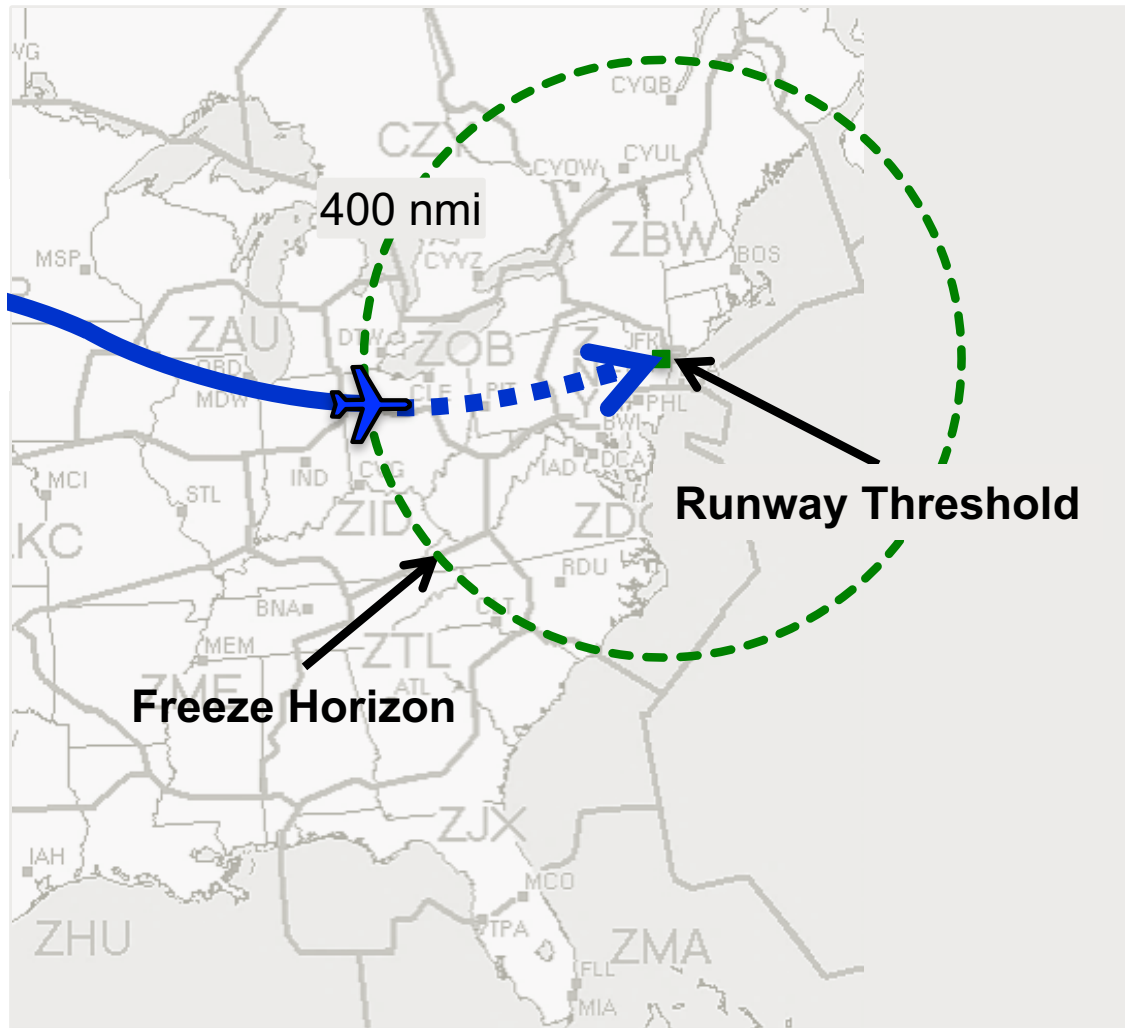
Tactical planning



Tactical planning



Tactical planning

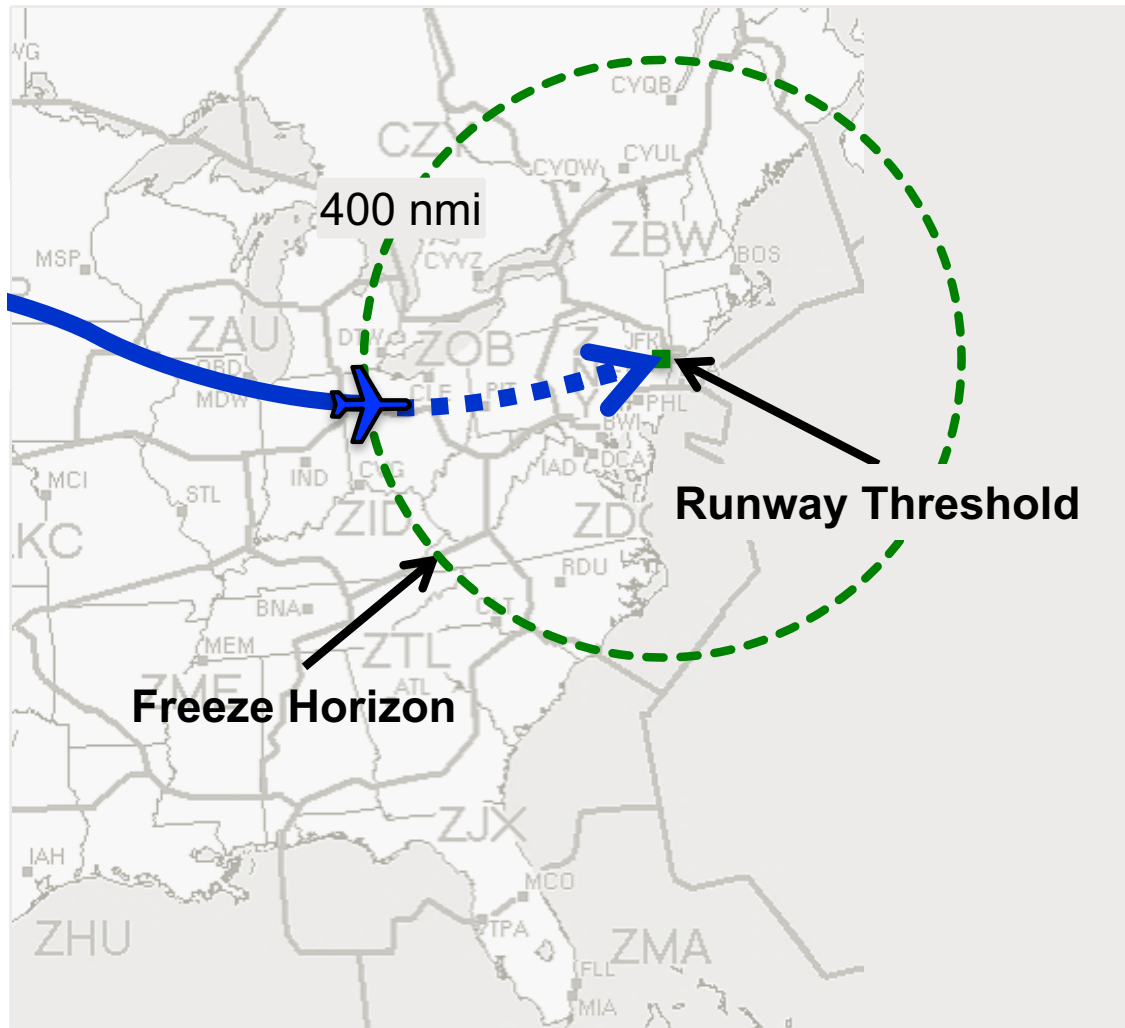


Expected
Time

Scheduled
Time

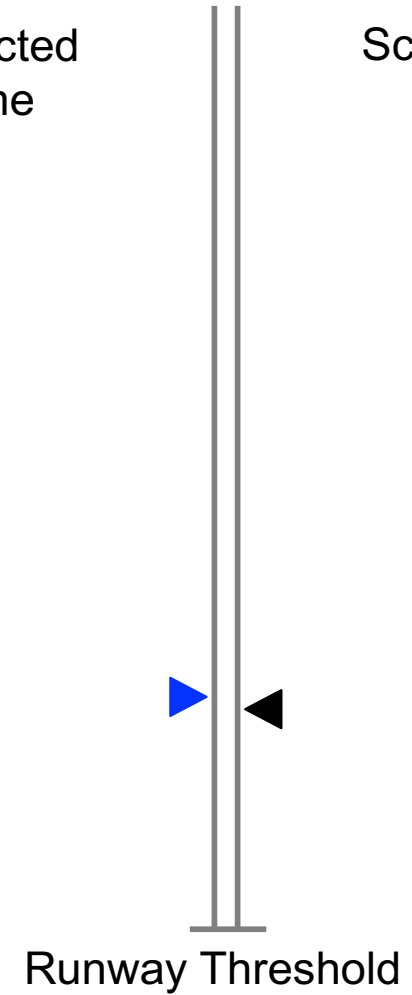
Runway Threshold

Tactical planning

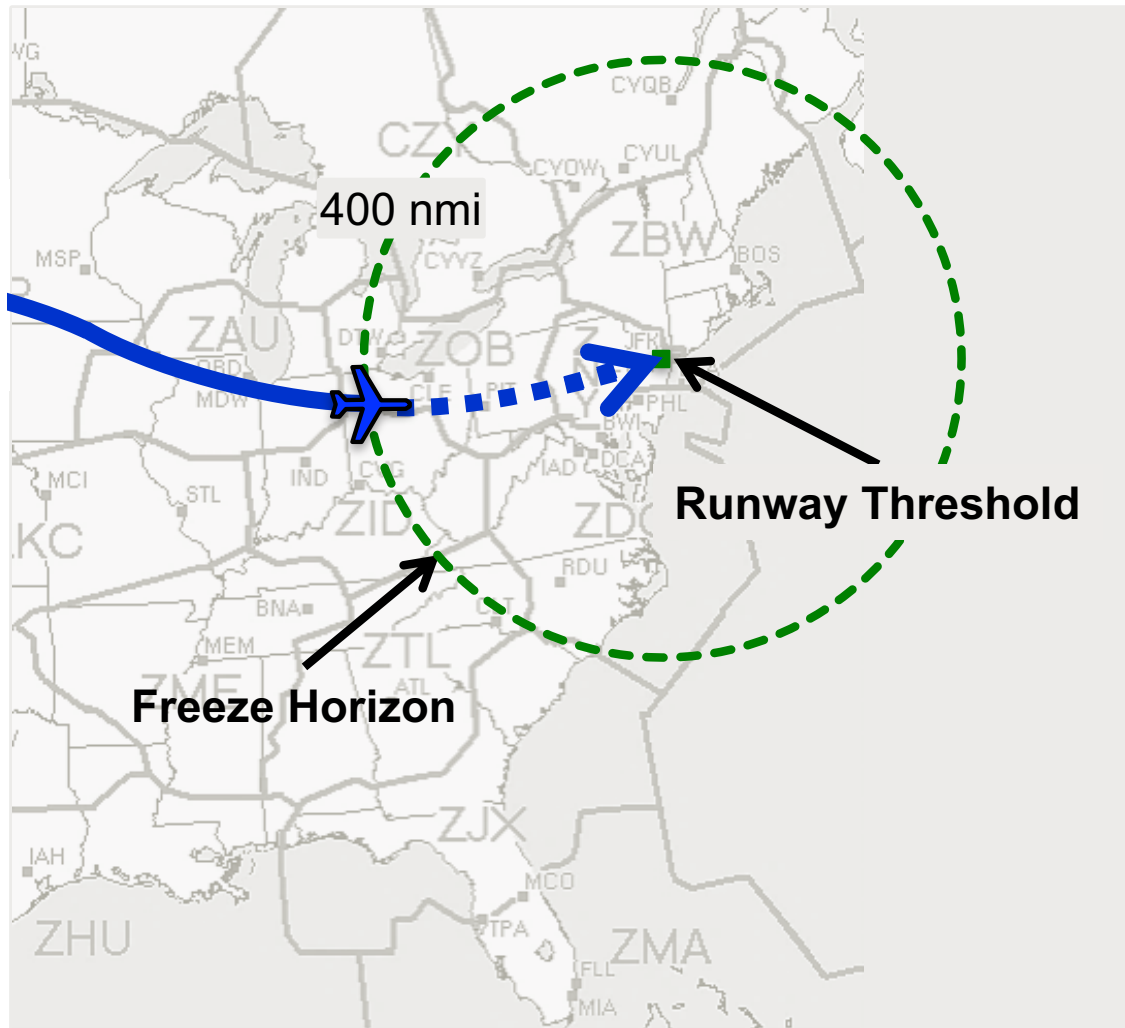


Expected
Time

Scheduled
Time

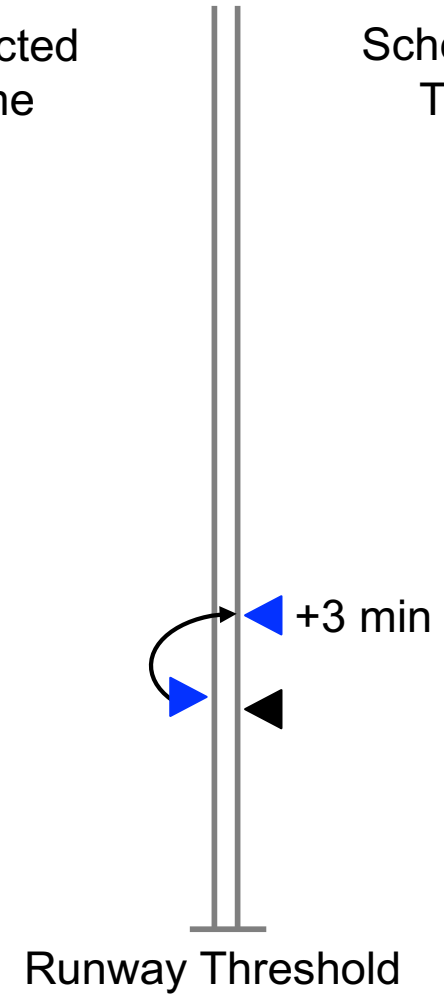


Tactical planning

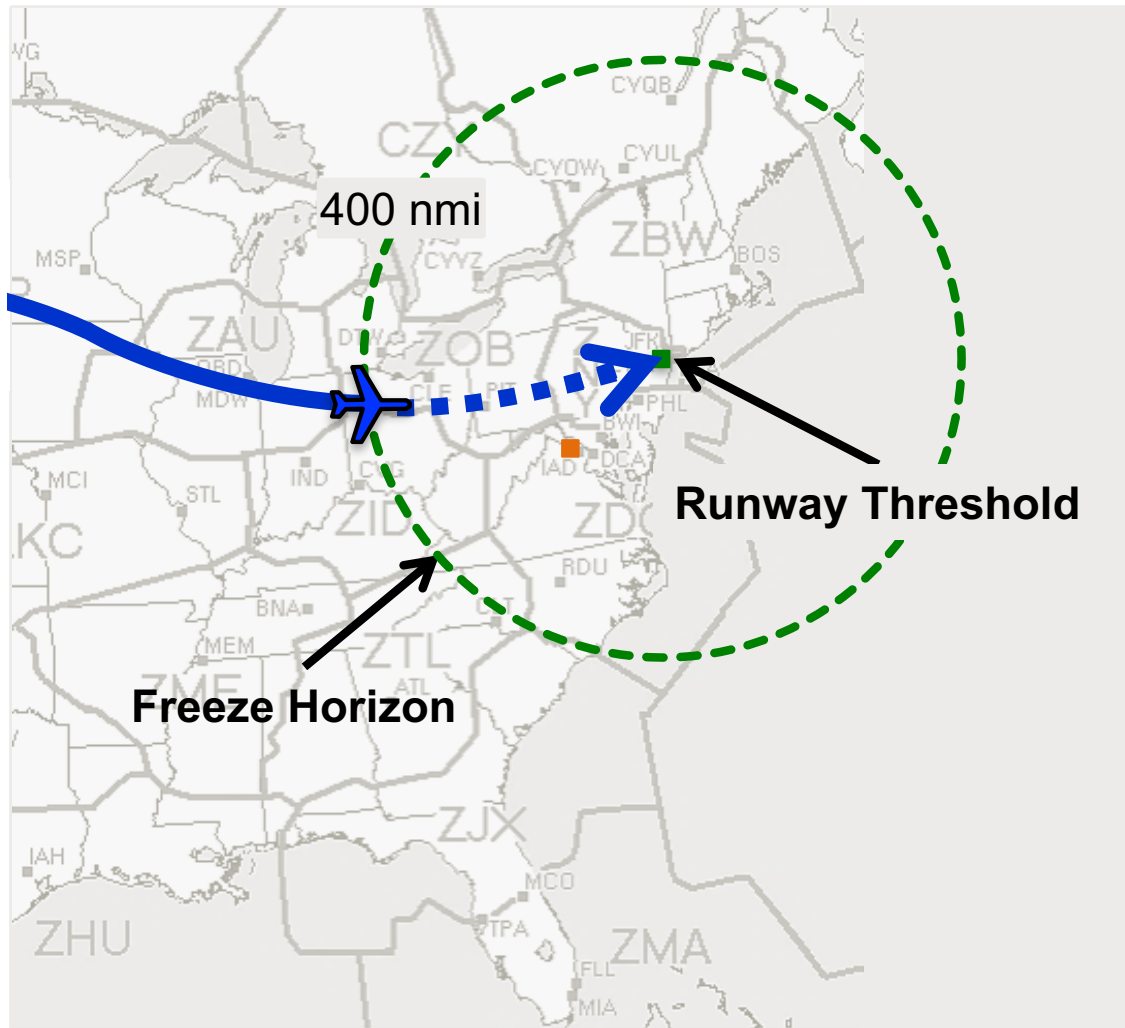


Expected Time

Scheduled Time

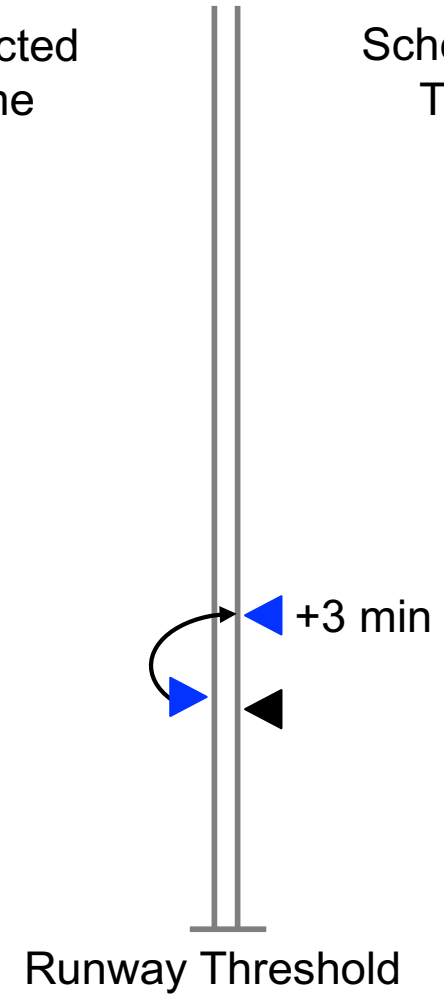


Tactical planning



Expected Time

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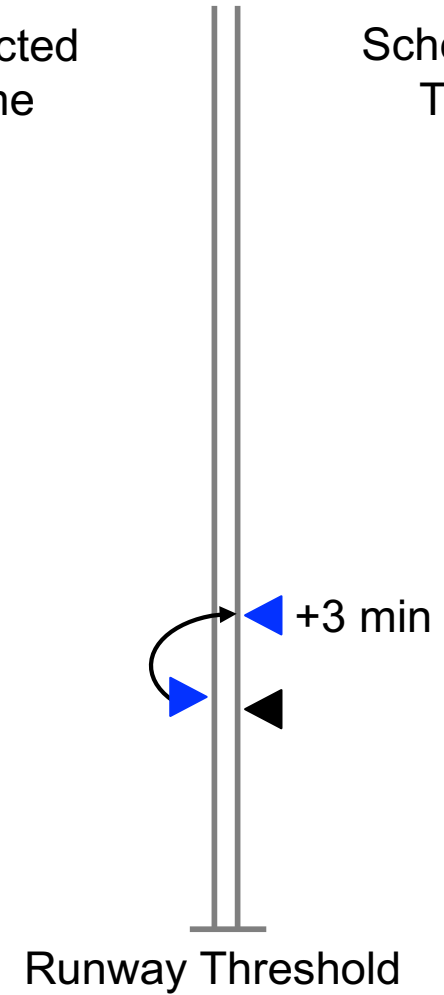


Tactical planning



Expected Time

Scheduled Time

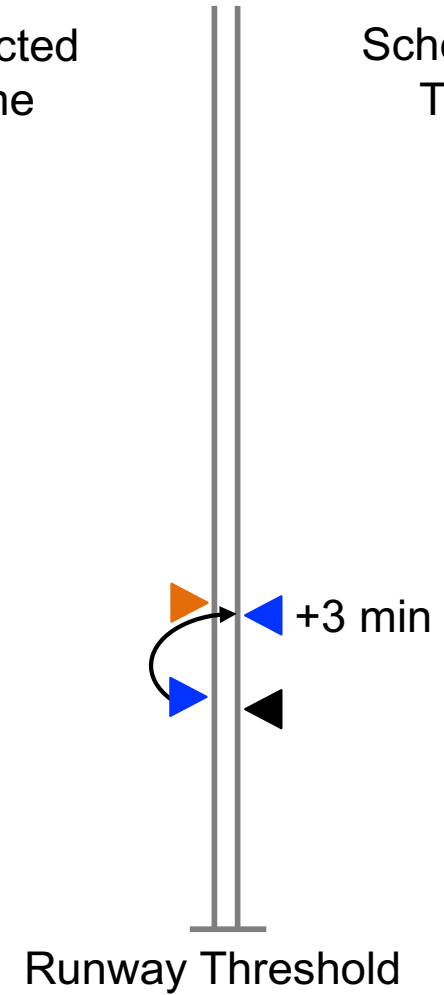


Tactical planning

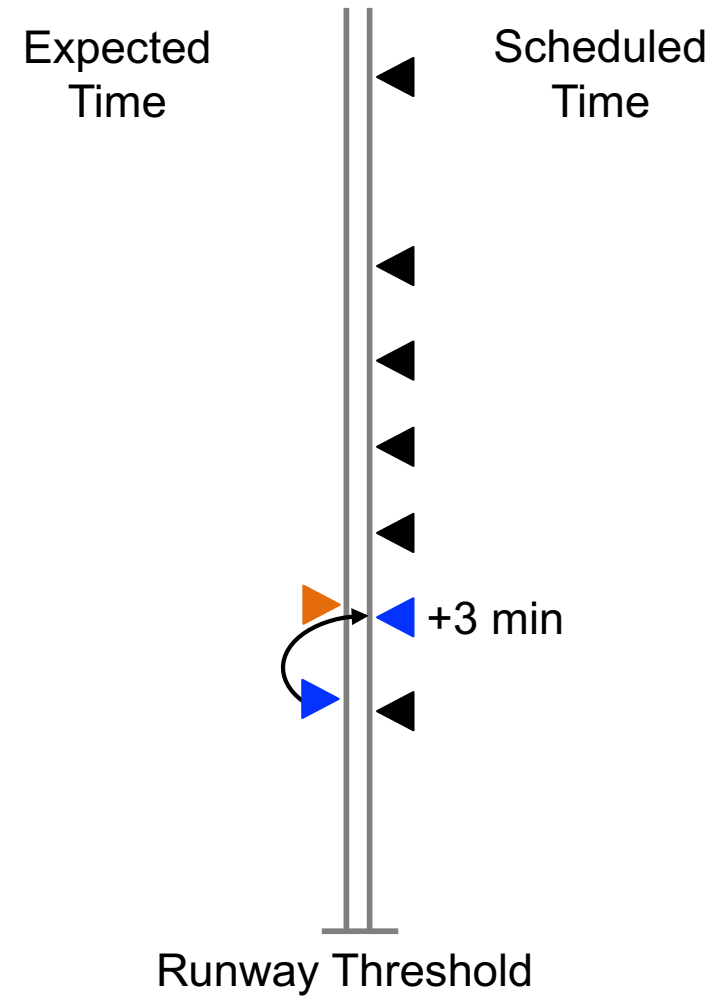


Expected Time

Scheduled Time



Tactical planning



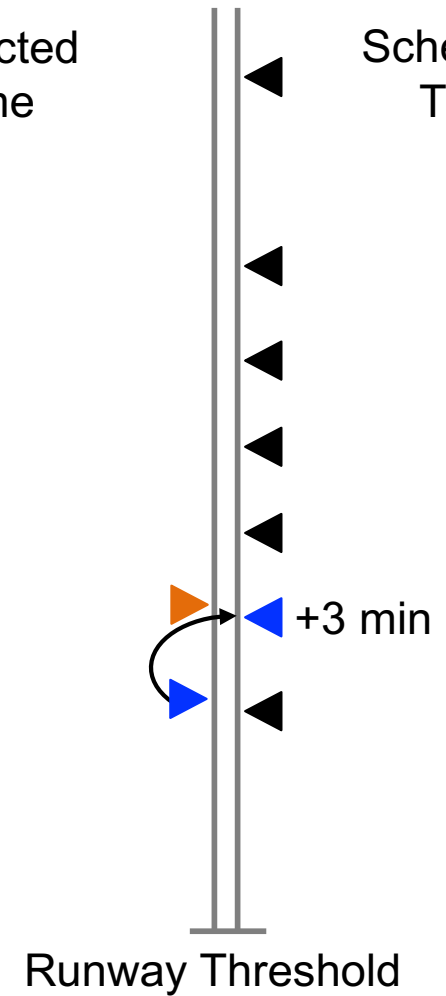
Tactical planning



Priority to airborne flights

Expected Time

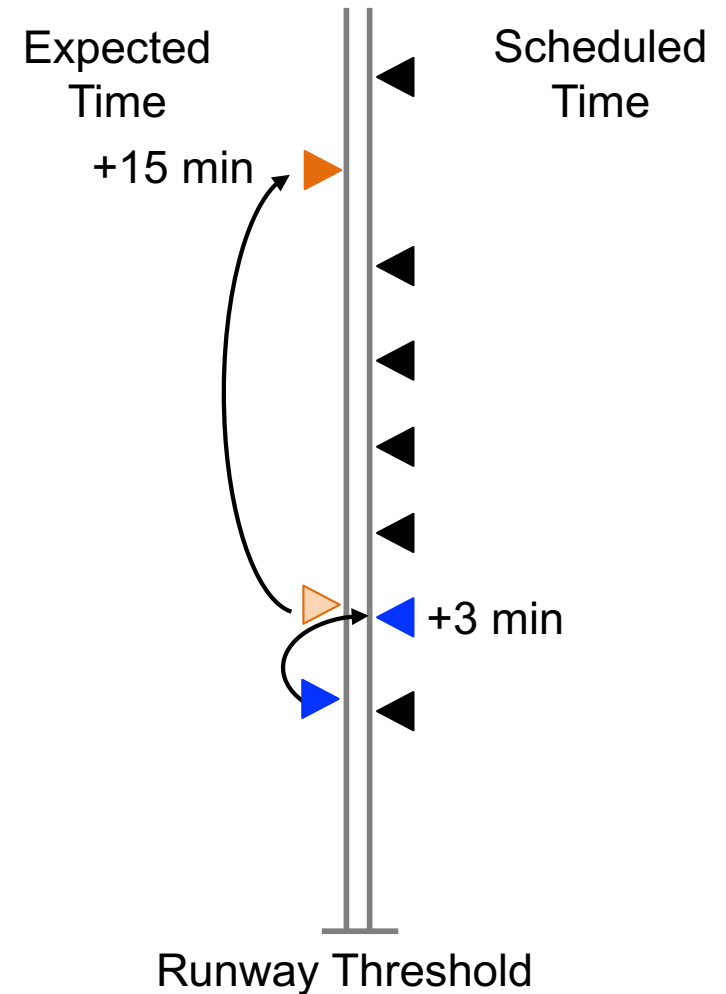
Scheduled Time



Tactical planning



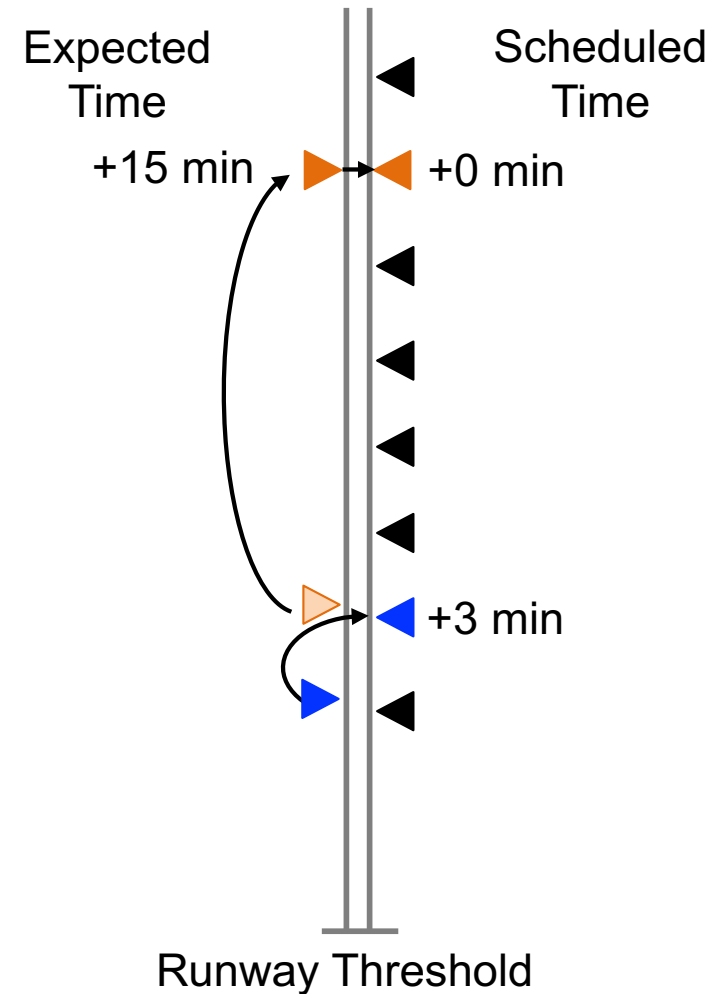
Priority to airborne flights



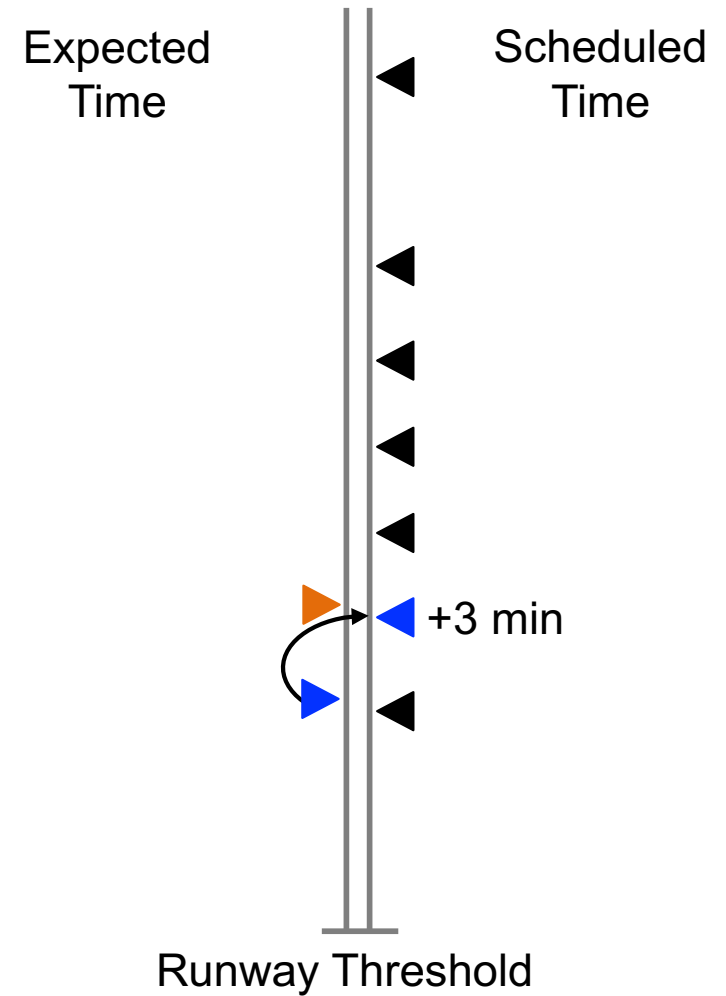
Tactical planning



Priority to airborne flights



Tactical planning



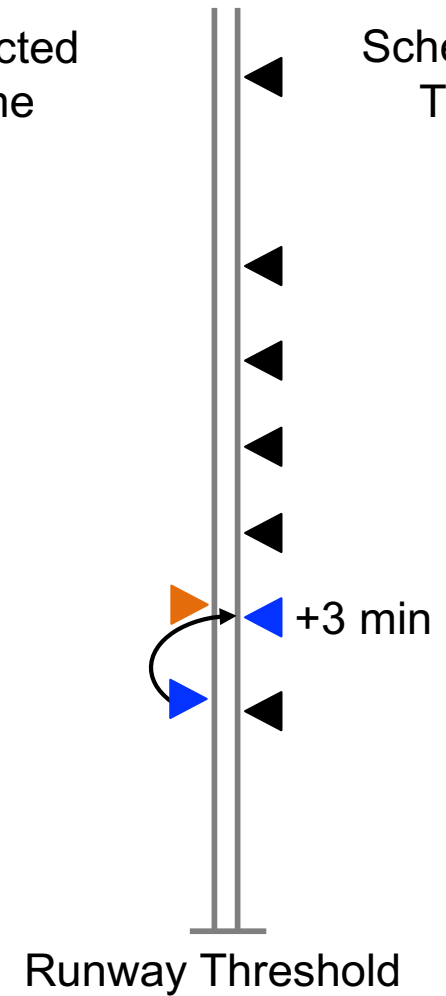
Tactical planning



Priority to internal departures

Expected Time

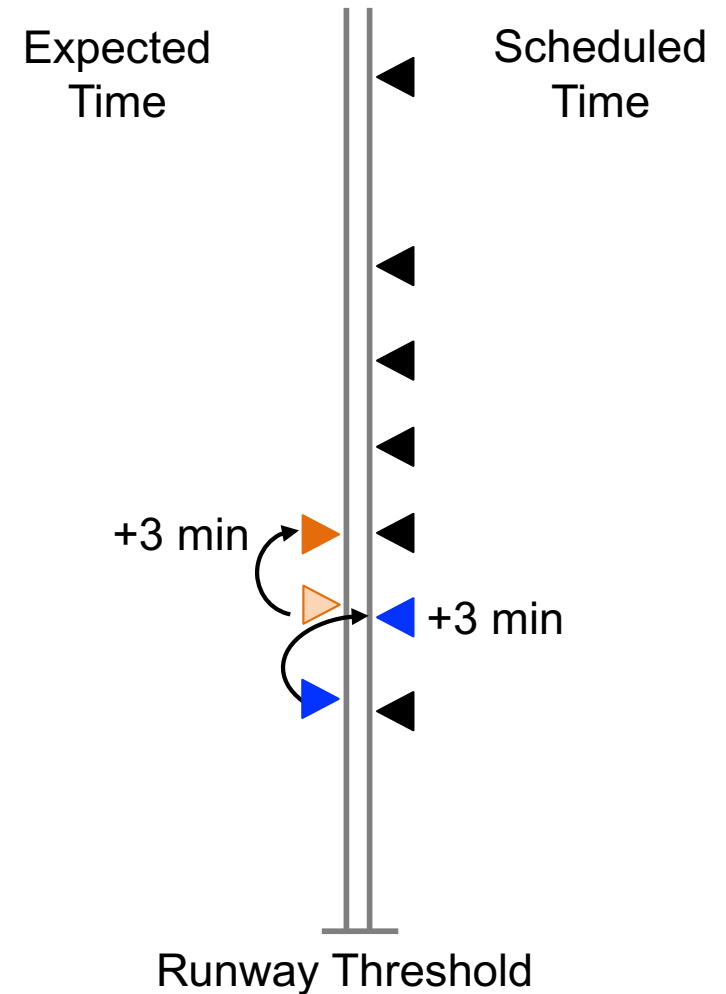
Scheduled Time



Tactical planning



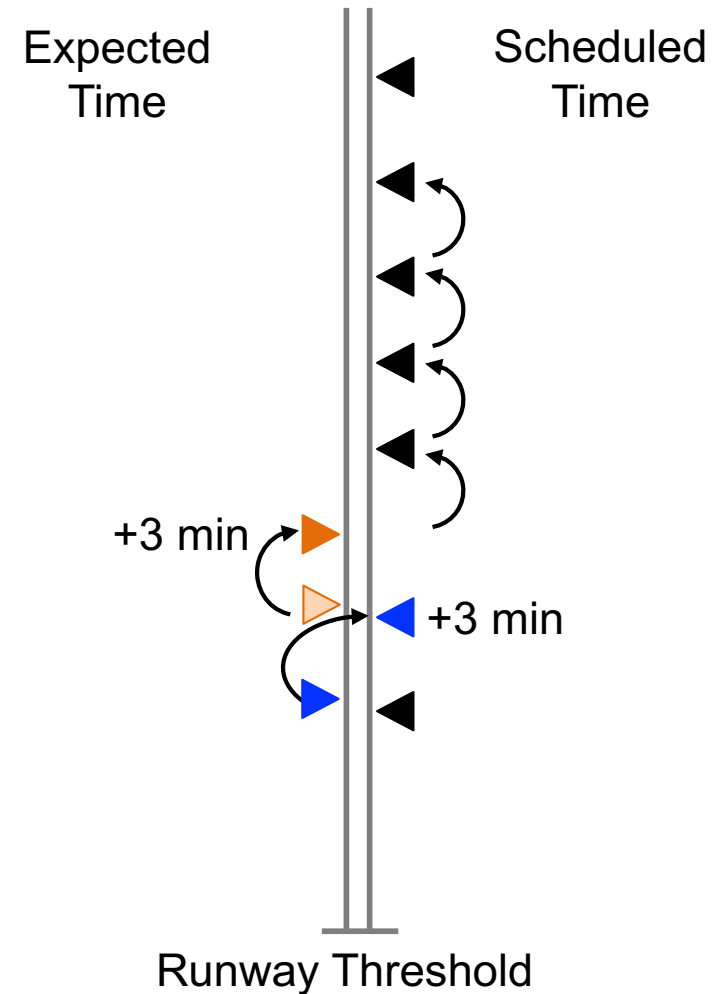
Priority to internal departures



Tactical planning



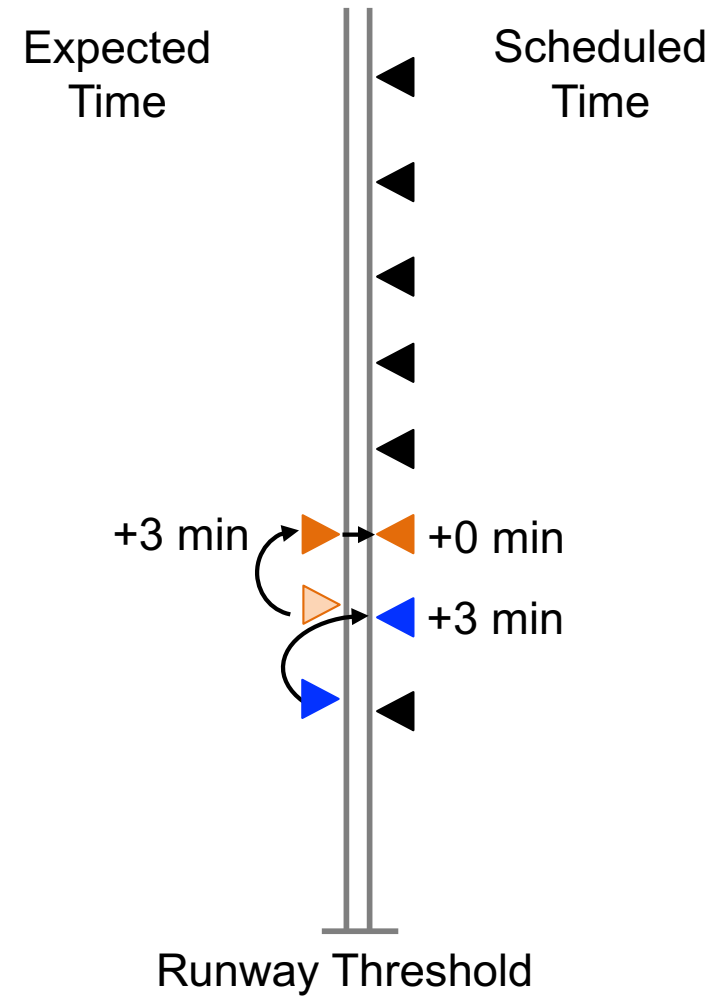
Priority to internal departures



Tactical planning



Priority to internal departures



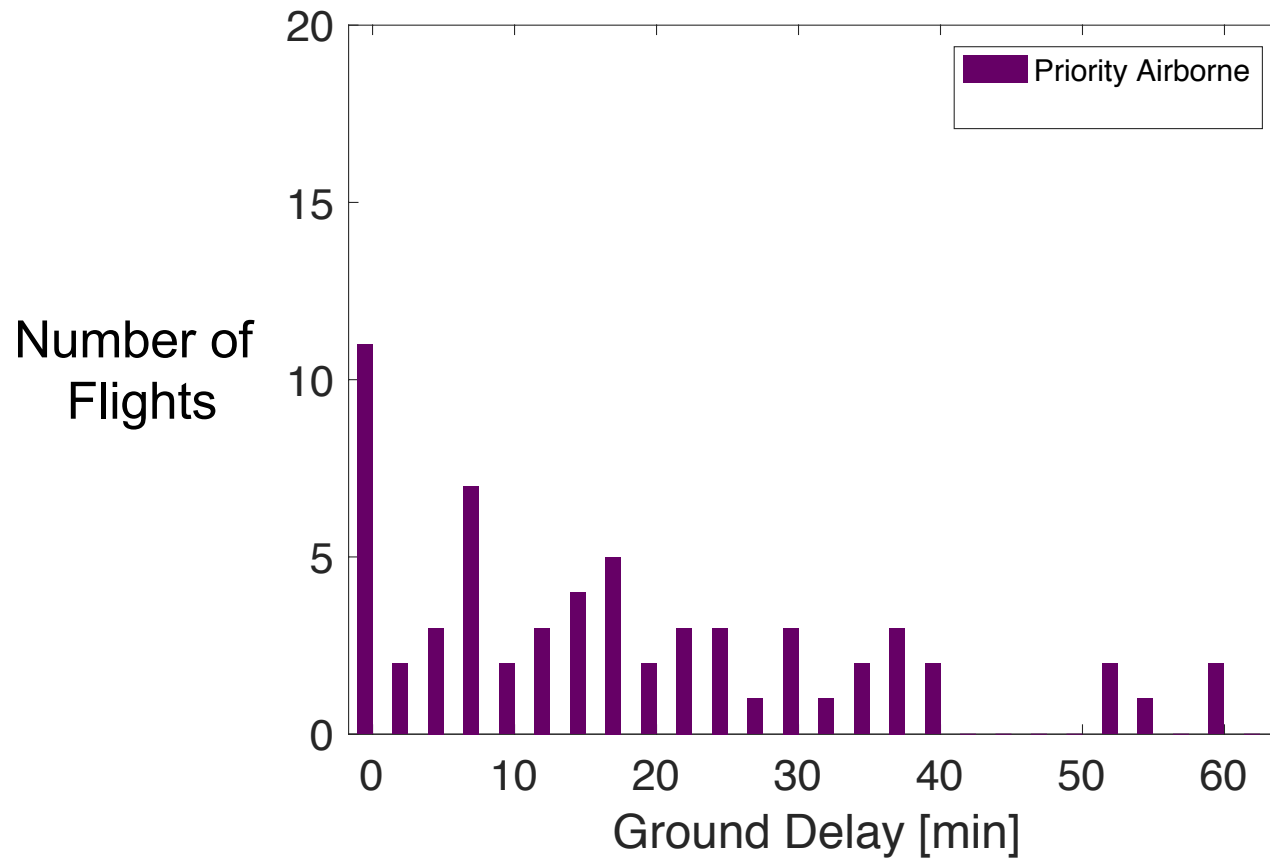
Experimental setup

- Duration of 5 hours
- 253 flights
 - 98 airborne at simulation start
 - 91 external departures
 - 64 internal departures
- Flights depart with some error
- Tactical scheduling paradigms
 - Priority given to airborne flights
 - Priority given to internal departures

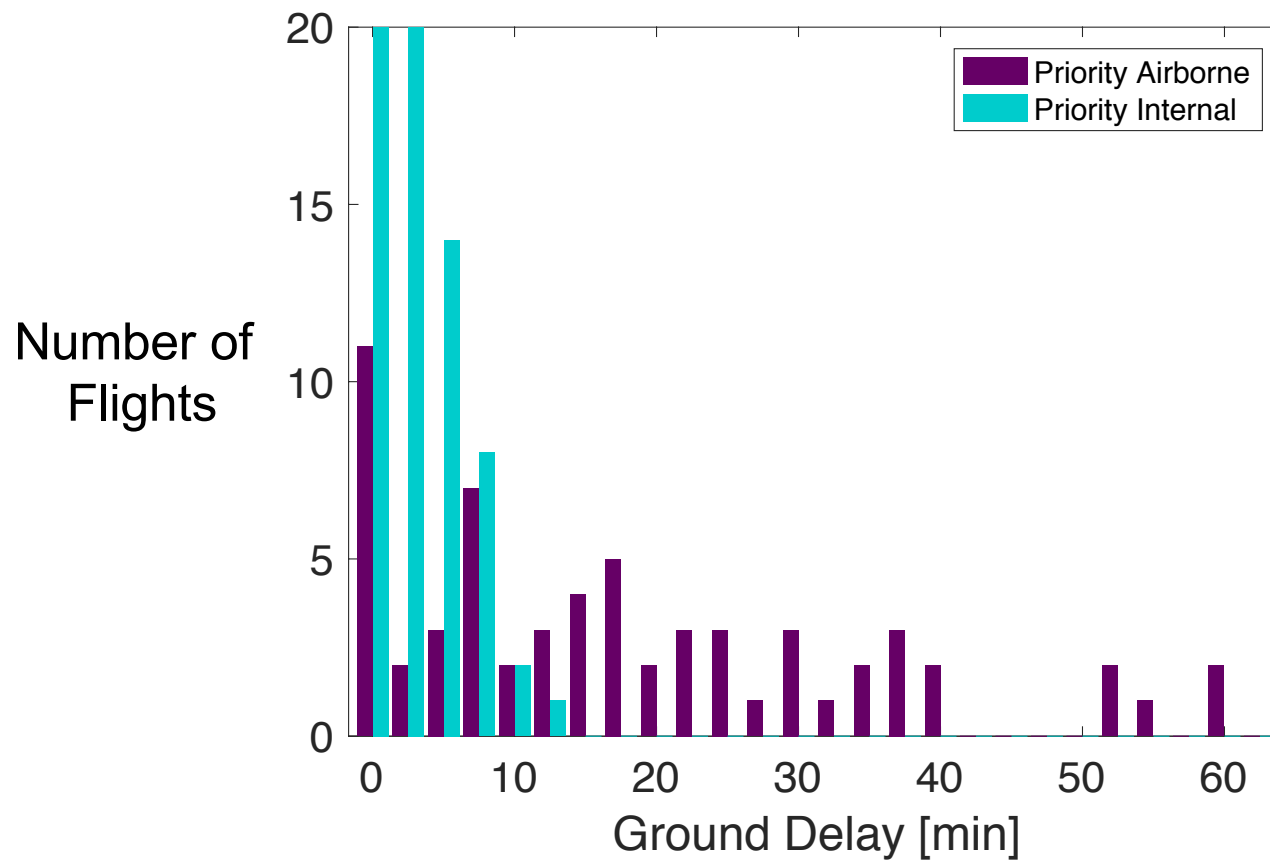
Expected results

- Generate results *qualitatively* similar HITL
- HITL simulations have shown:
 - Priority given to airborne flights
 - ⇒ Relatively high ground delay for internal departures
 - Priority given to internal departures
 - ⇒ Significant reduction in ground delay for internal departures
 - ⇒ Required airborne delay is manageable

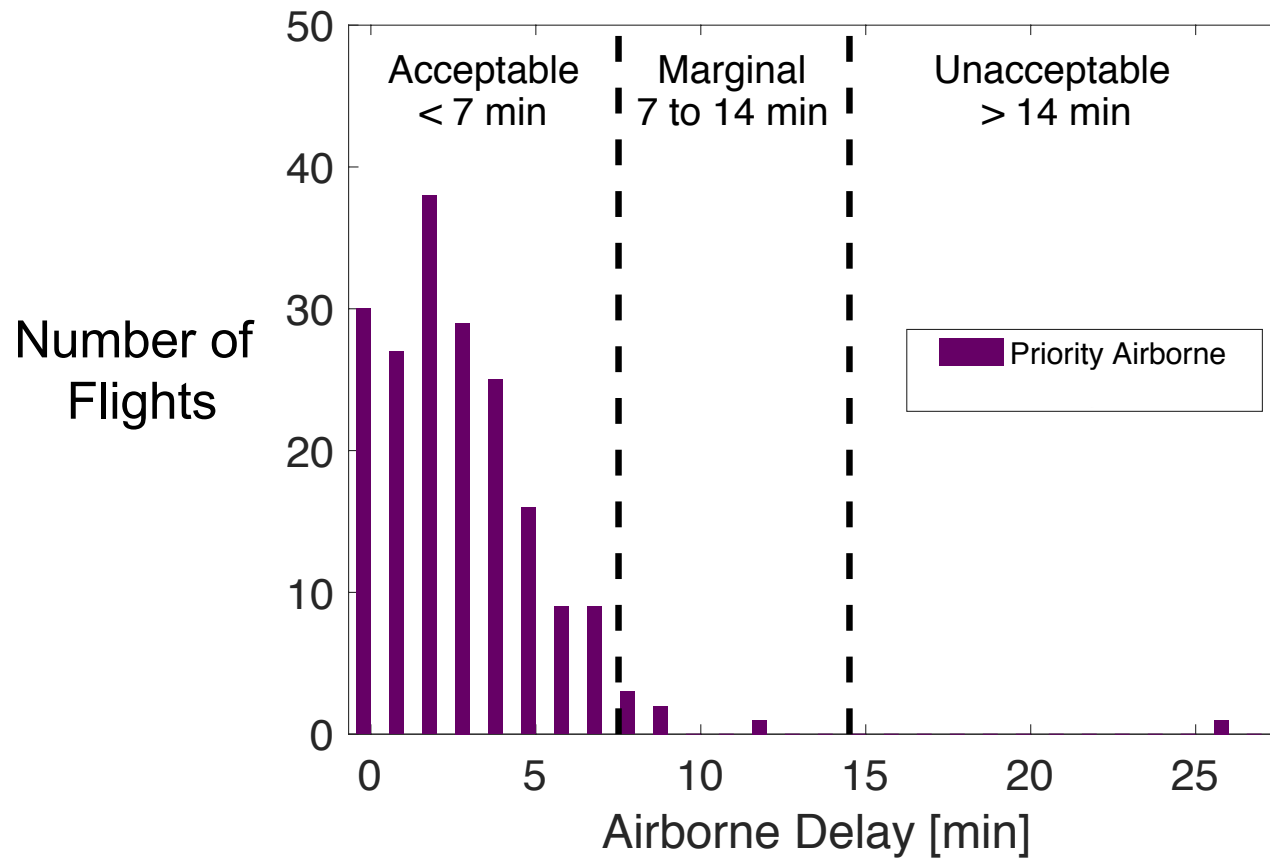
Internal departure ground delay



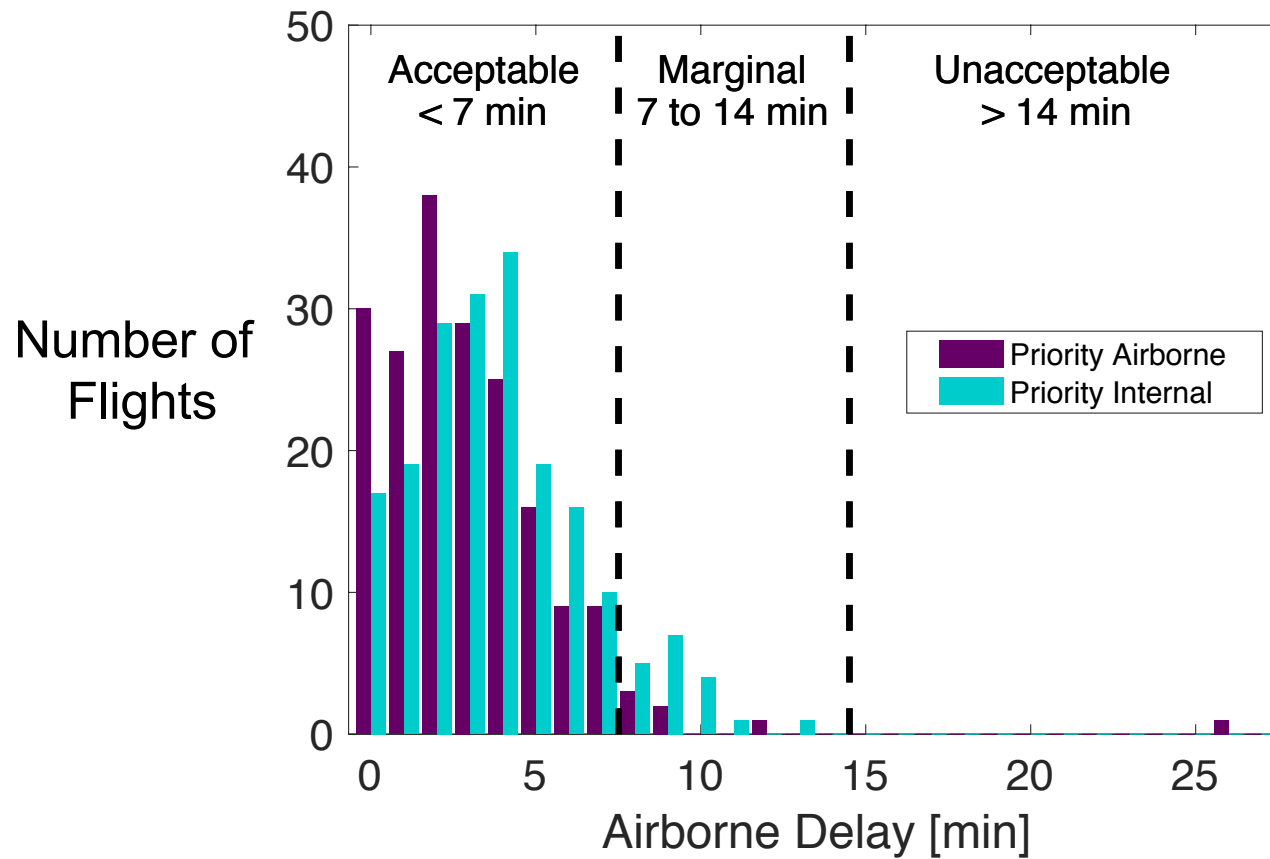
Internal departure ground delay



Airborne delay



Airborne delay



Comparison to HITL simulation

Tactical Scheduling Paradigm	Simulation	Tactical Airborne Delay		
		Acceptable (<7 min)	Marginal (7-14 min)	Unacceptable (>14 min)
Priority Internals	HITL	82 %	17 %	1 %
	Automated	87 %	13 %	0 %
Priority Airborne	HITL			
	Automated	94 %	5 %	1 %

Comparison to week-long HITL

	HITL	Automated	Automated fast-time (5x)
Subject matter experts	320 hours	0 hours	0 hours
Simulation technician	32 hours	1 hour	1 hour
Number of simulations	4	20	104
Active Simulation Time	20 hours	100 hours	104 hours

Automated simulation capability

- Automate HITL simulation
- Emulate HITL simulation results
- Maintain high fidelity trajectory simulation
- Incorporate updates to strategic planning tool

Automated simulation capability

- Automate HITL simulation
- Emulate HITL simulation results
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Benefits

- Evaluate over larger variation in parameters
- Simulate larger, more realistic traffic scenarios
- Augment HITL by automated background traffic

Development

- Add other New York airports:
 - LaGuardia Airport (LGA)
 - John F. Kennedy International Airport (JFK)
- Augment HITL simulations with more traffic
- Enable fast-time simulation (up to 5x real-time)

Research

- Parameter studies
- Uncertainty in departure and flight time



Backup



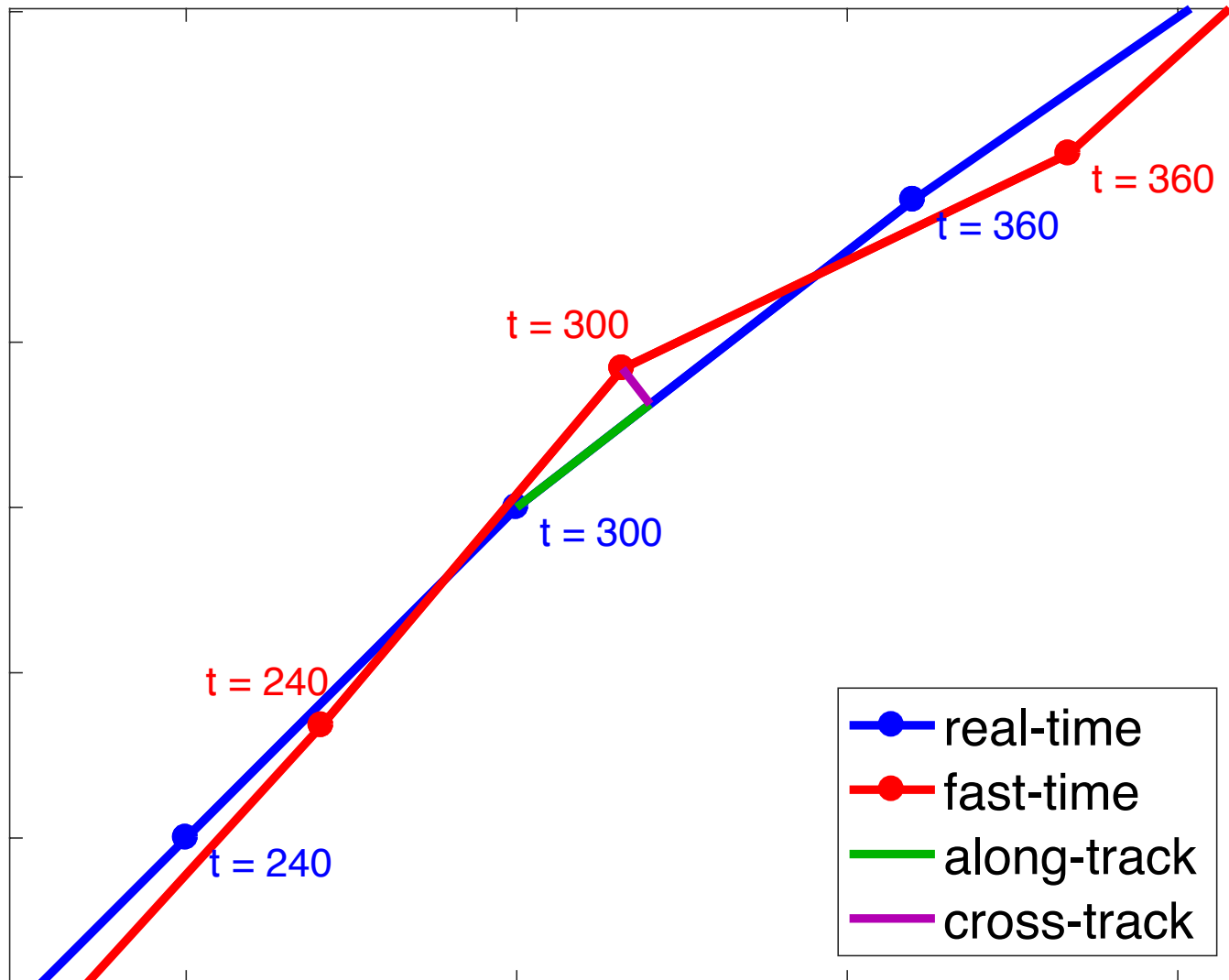
Fast Time MACS



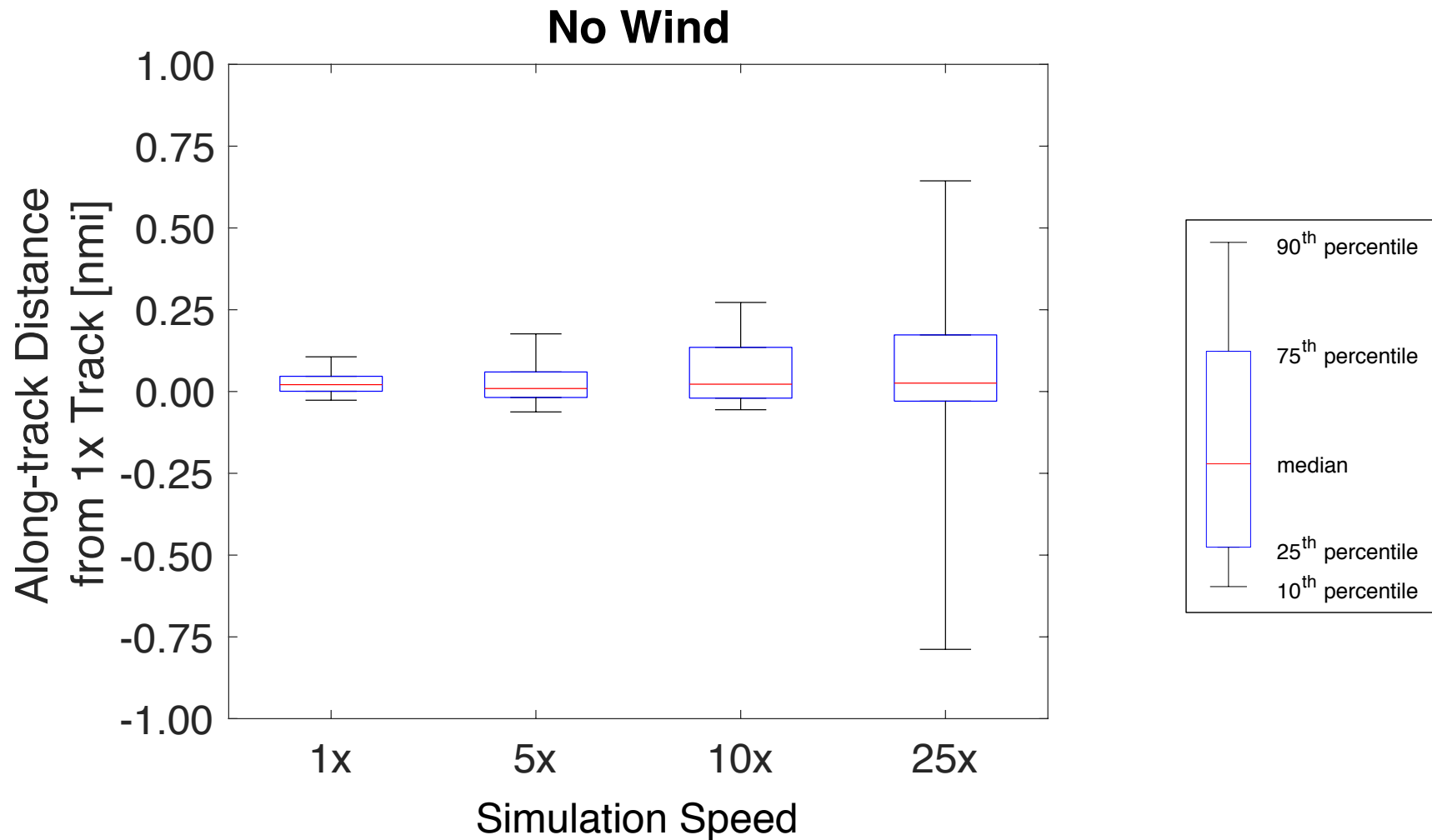
Fast time MACS

- Flights analyzed: 196
- FlightState data output from MACS
- Trajectory information every 12 seconds
- Resampled in 1 minute intervals
(for 1x reference sim and 1x, 5x, 10x, 25x sim)

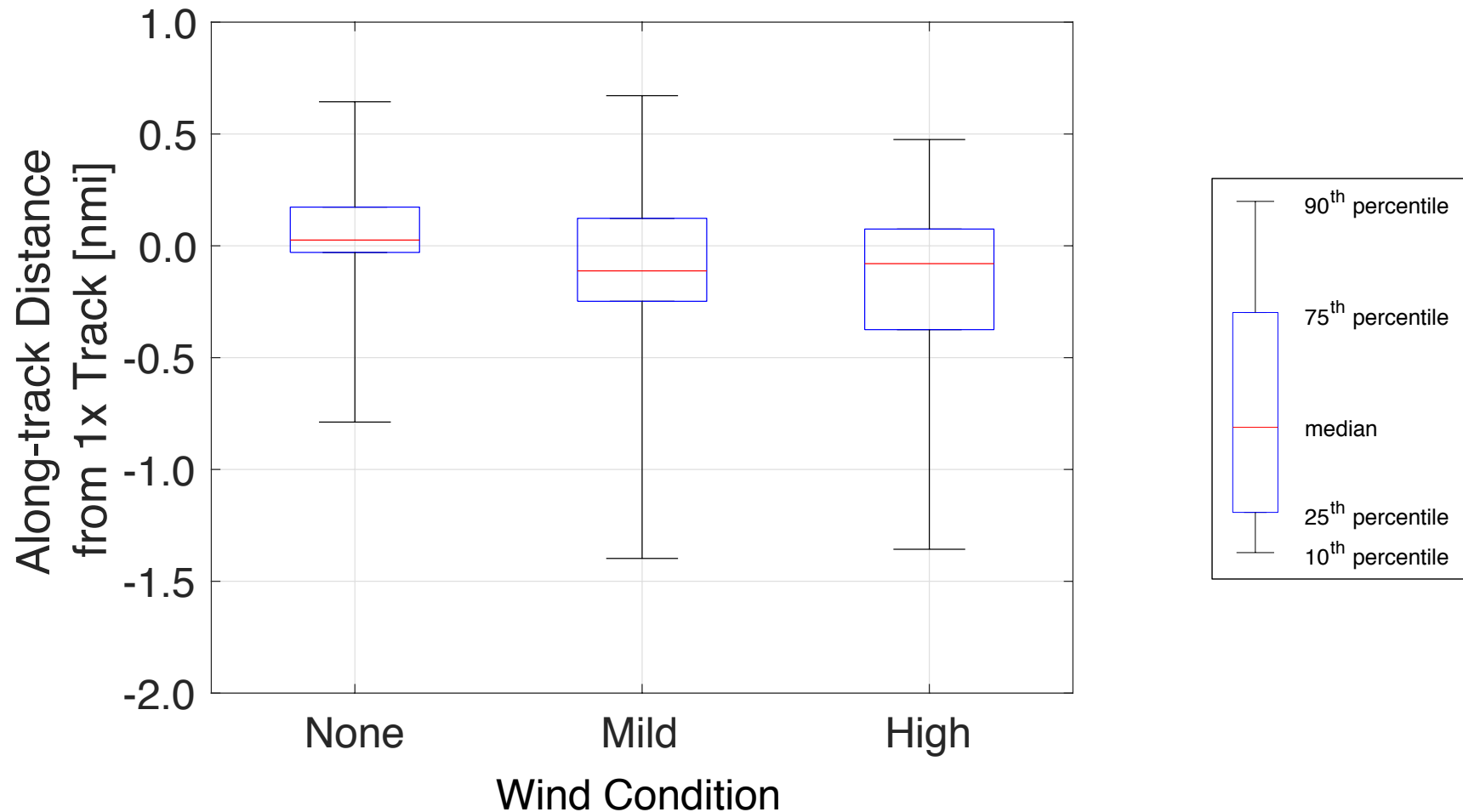
Distance measure



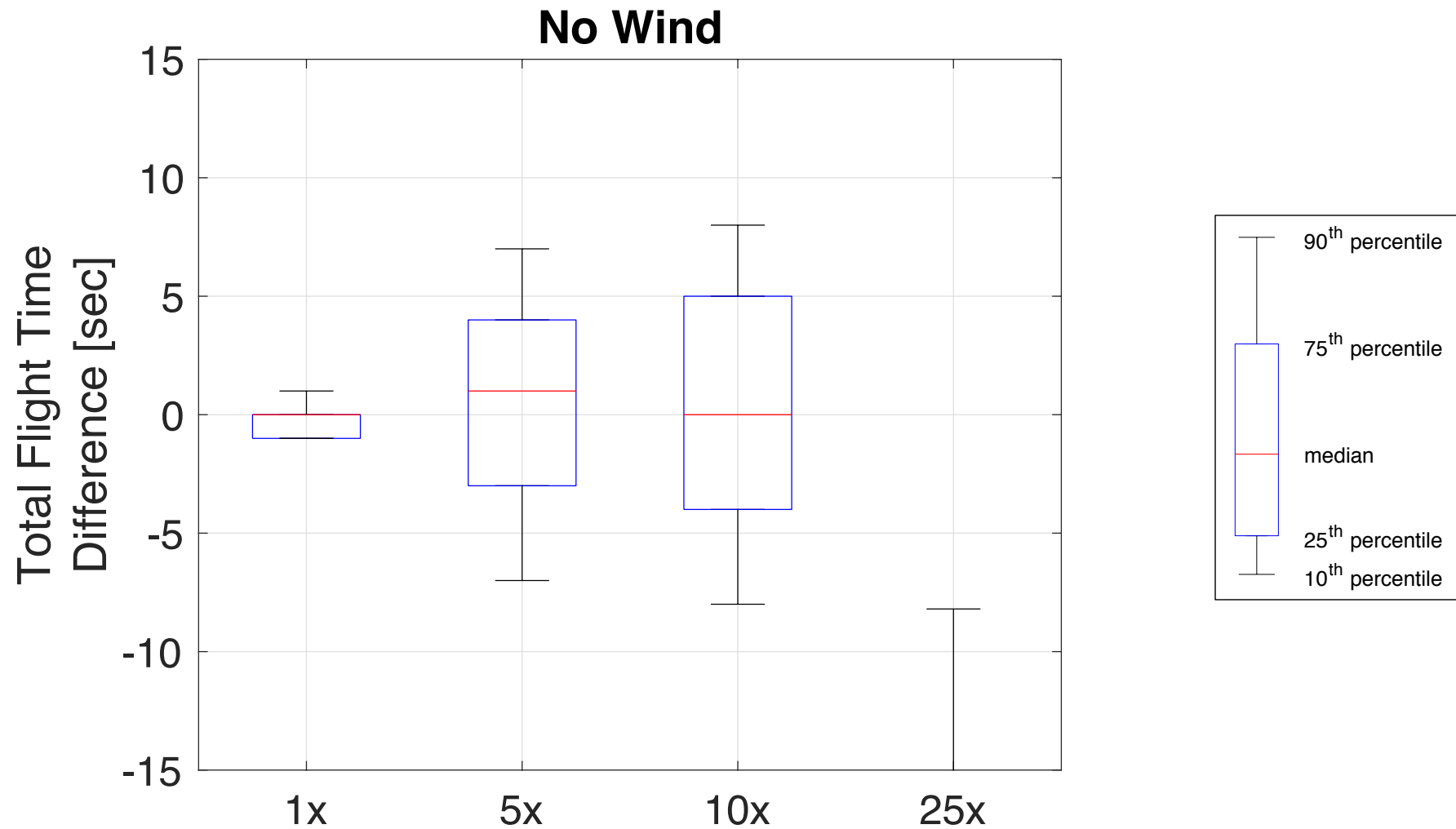
Along-track distance



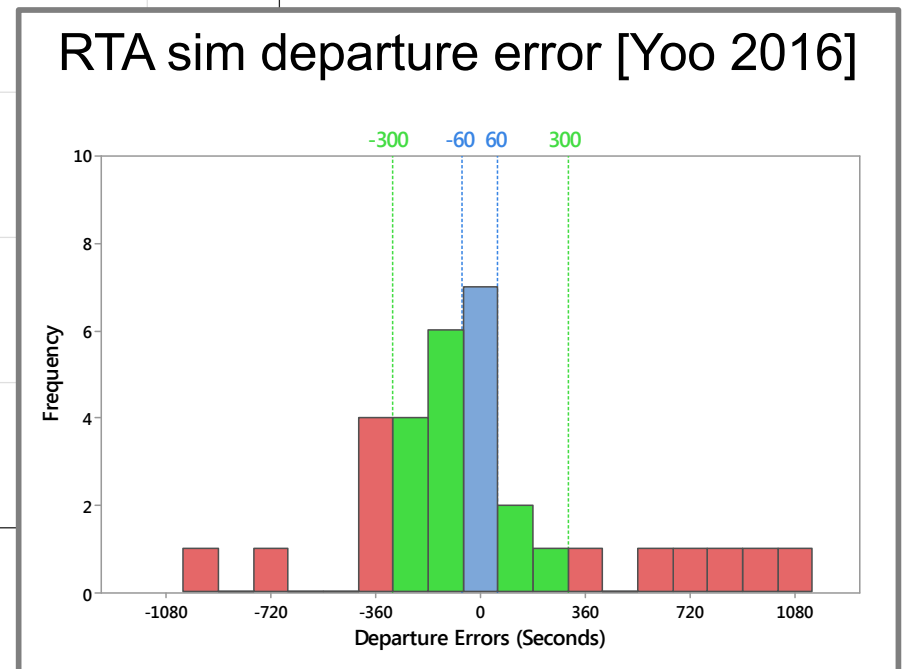
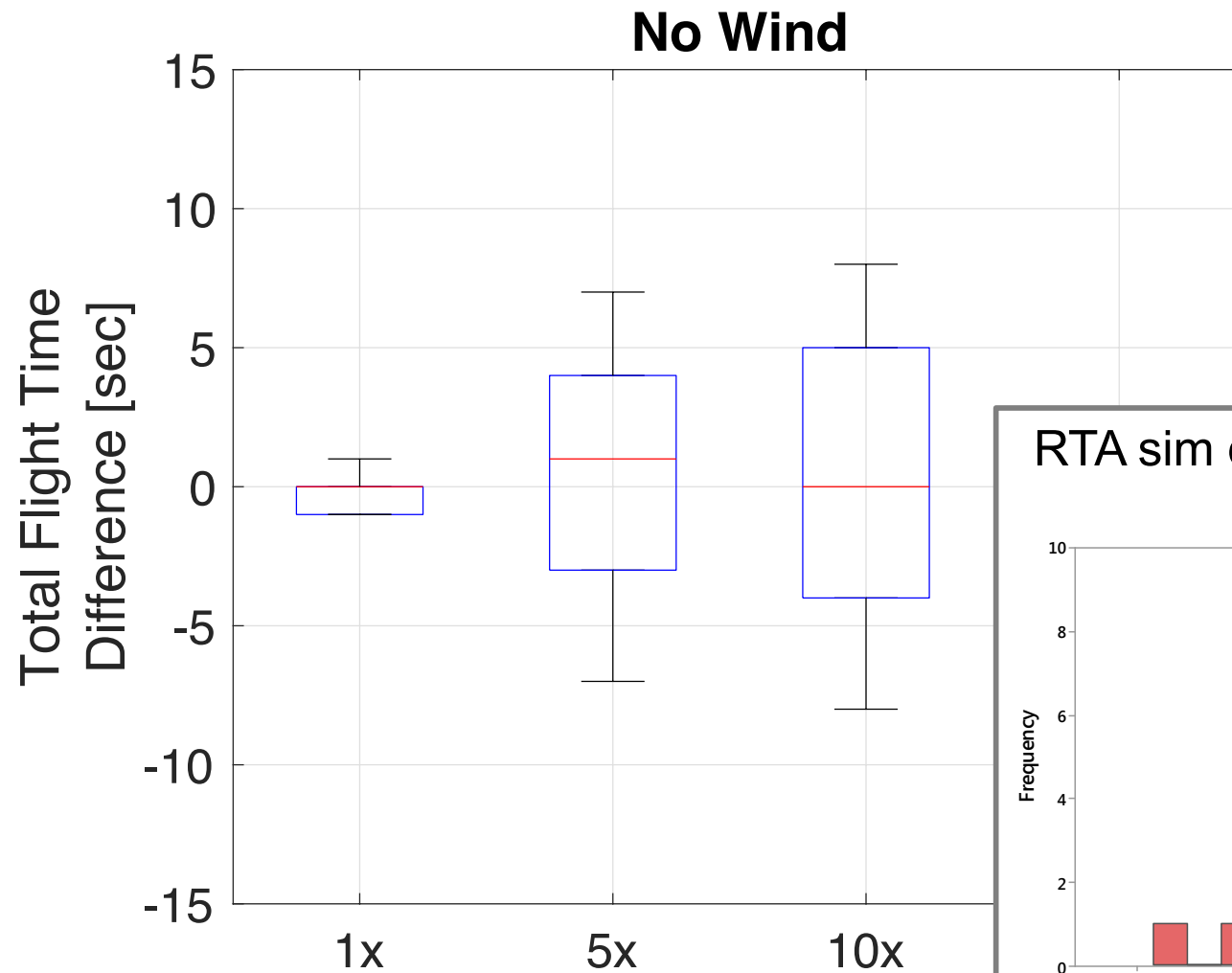
With wind, 25x: along-track distance



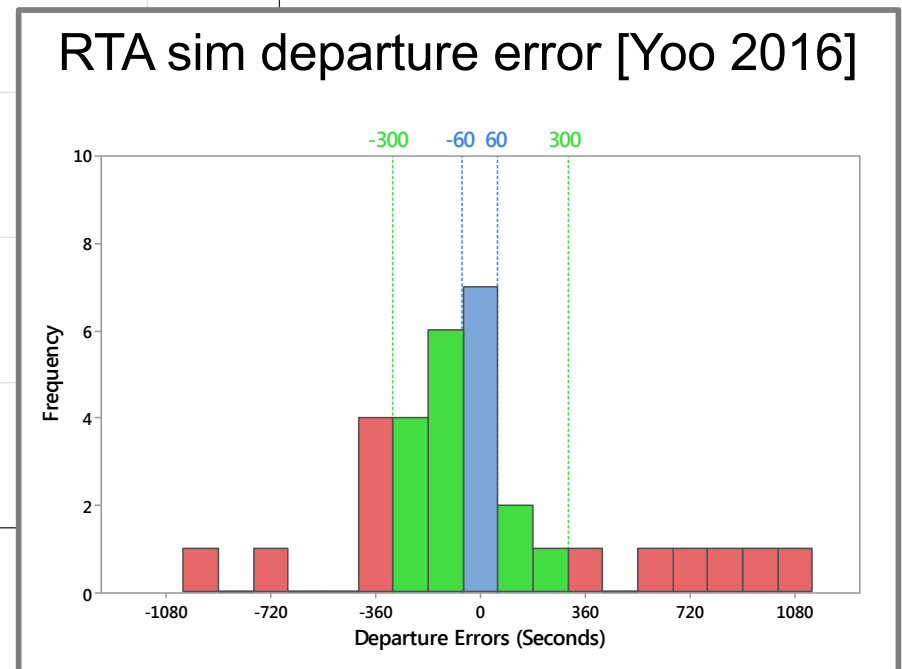
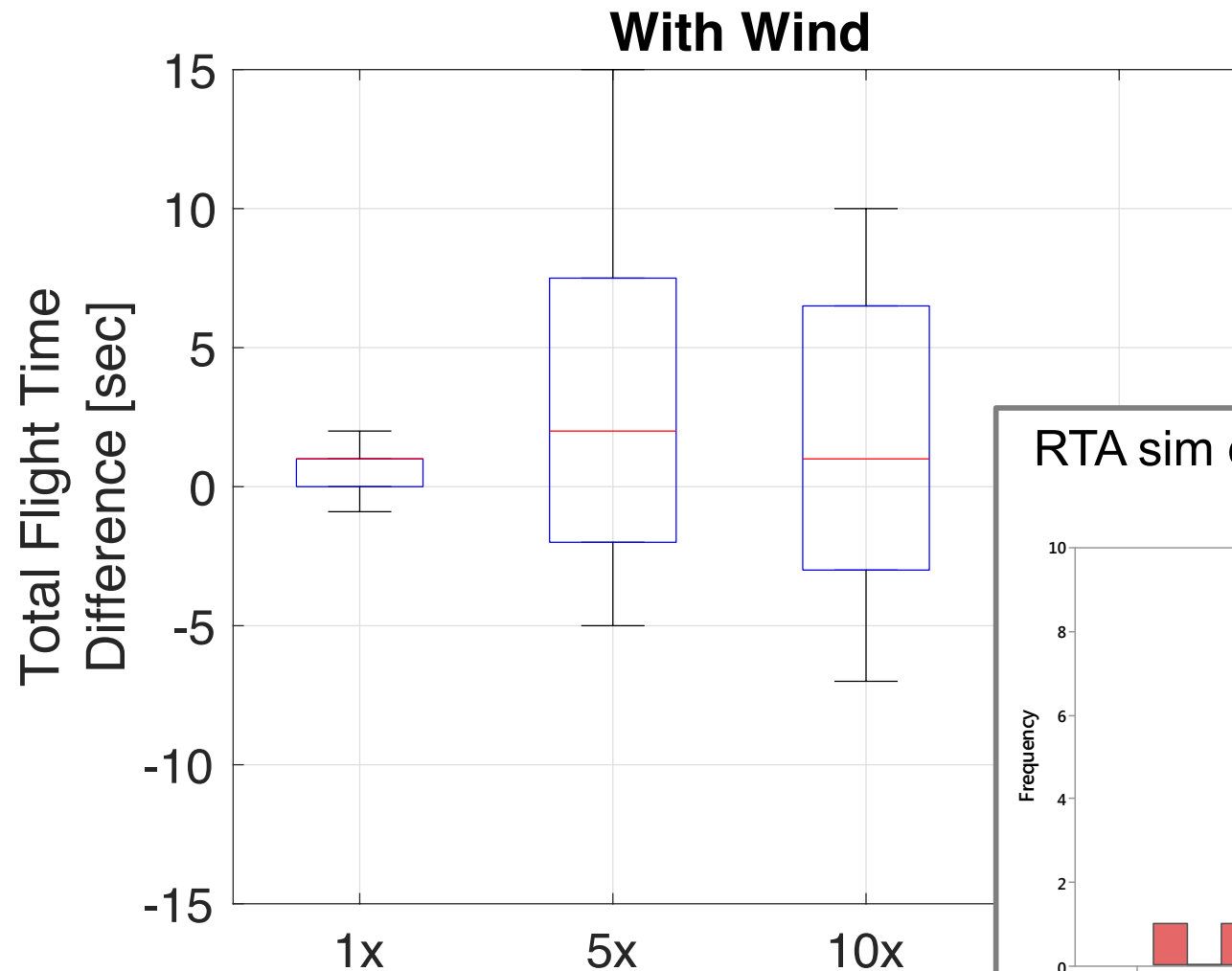
Flight time difference



Flight time difference



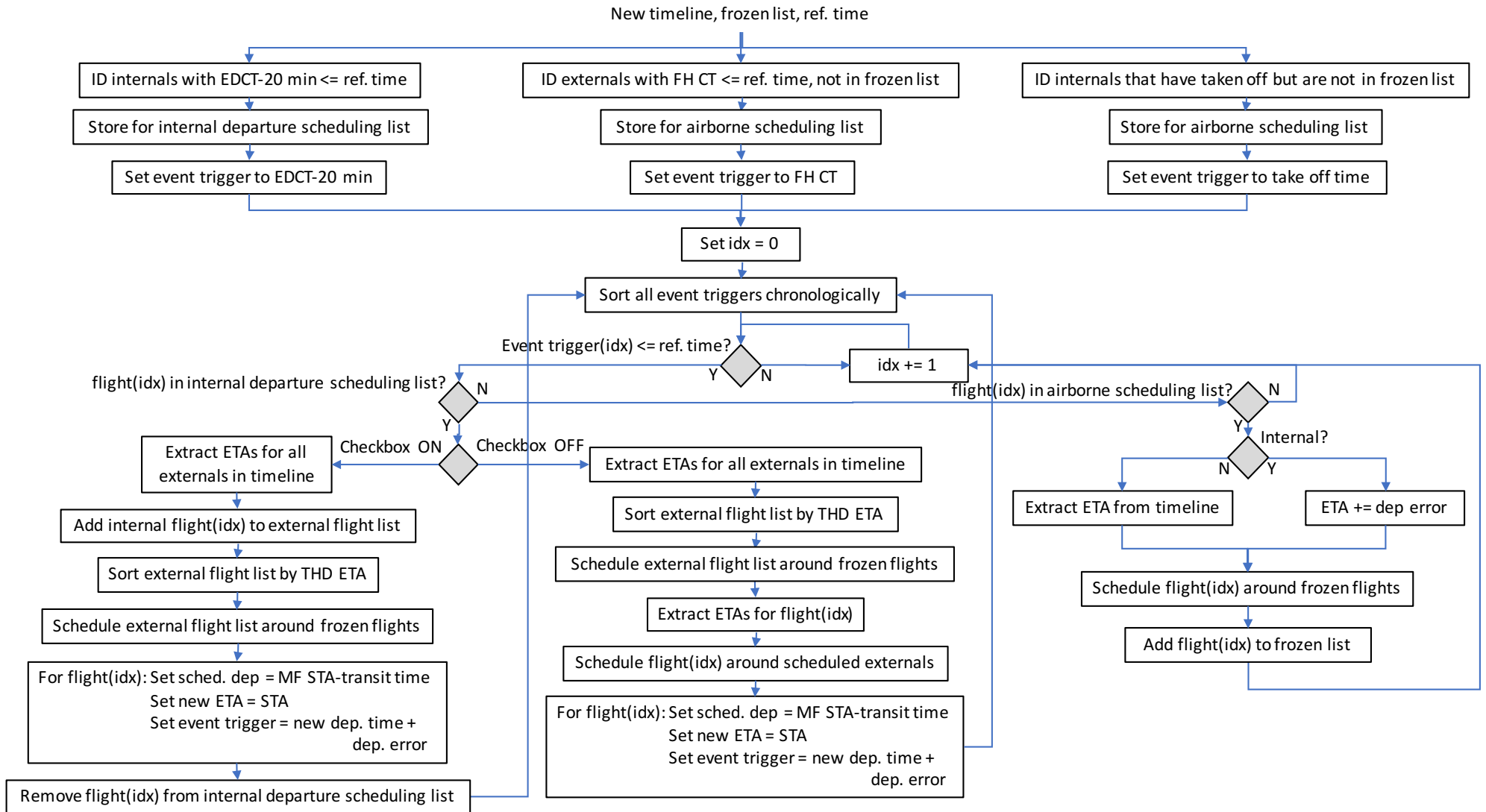
Flight time difference



TBFM Emulator



Scheduling internal departures



TBFM Emulator

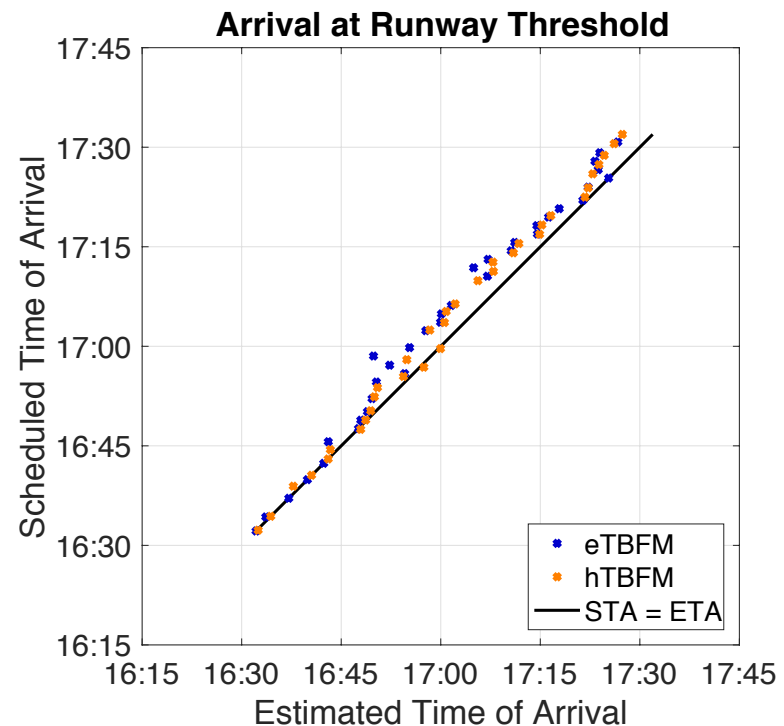
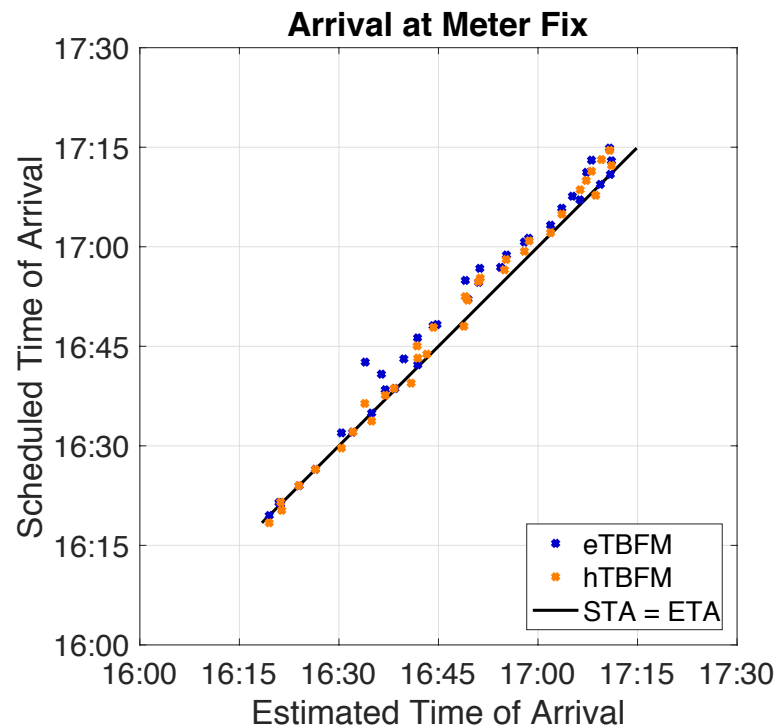
- Scheduler from Optimized Route Capability (ORC)
 - Fast-time
 - Code easily accessible for modification
- Adapted for EWR
- Modified to schedule internal departures automatically
 - Check box ON/OFF
- Integrated with Automated Simulation Capability / MACS

TBFM Emulator Capabilities

Capability	rTBFM	eTBFM
Fast-time		✓
EWR adaptation	✓	✓
Schedule flights at Meter Fix	✓	✓
Schedule flights at Runway Threshold	✓	✓
Schedule flights at Final Approach Fix	✓	Planned
Model wind effects inside TRACON	✓	Planned
Model wind effects upstream of TRACON	✓	✓
Automated scheduling of internal departures (Check Box ON/OFF)		✓
Extended metering	✓	Planned
Coupled scheduling	✓	
Integrated with Automated Simulation Capability / MACS		✓
Interface directly with SMART-NAS Testbed		Planned

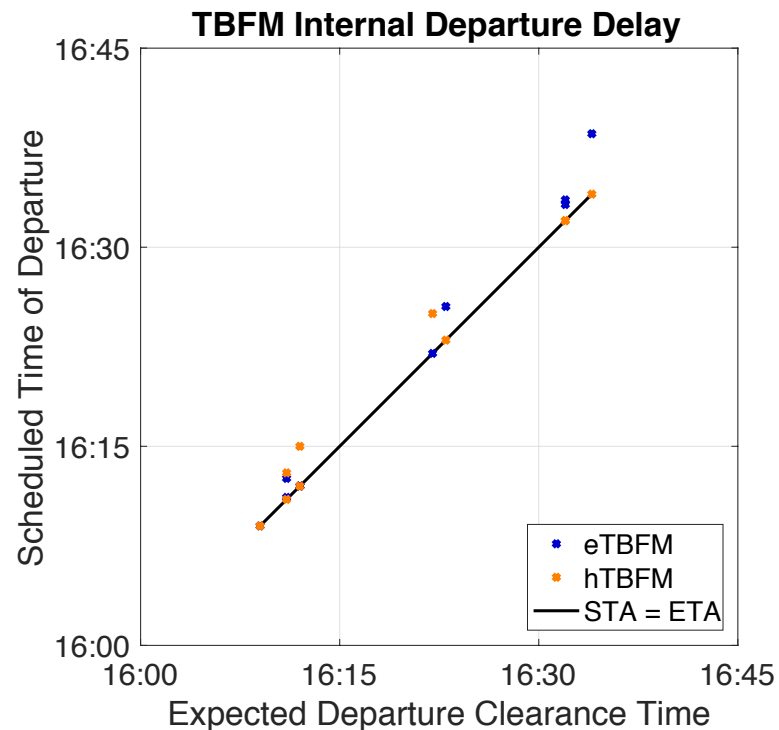
Initial validation: ORC scheduler

	Meter Fix		Threshold	
	[Seconds]			
Avg. hTBFM metering delay (standard deviation)	80	(104)	136	(106)
Avg. eTBFM emulator metering delay (standard deviation)	143	(131)	180	(135)
Avg. ETA Error: hTBFM-eTBFM (standard deviation)	19	(75)	52	(77)
Avg. STA Error: hTBFM-eTBFM (standard deviation)	-43	(104)	7	(100)



Initial validation: TBFM emulator

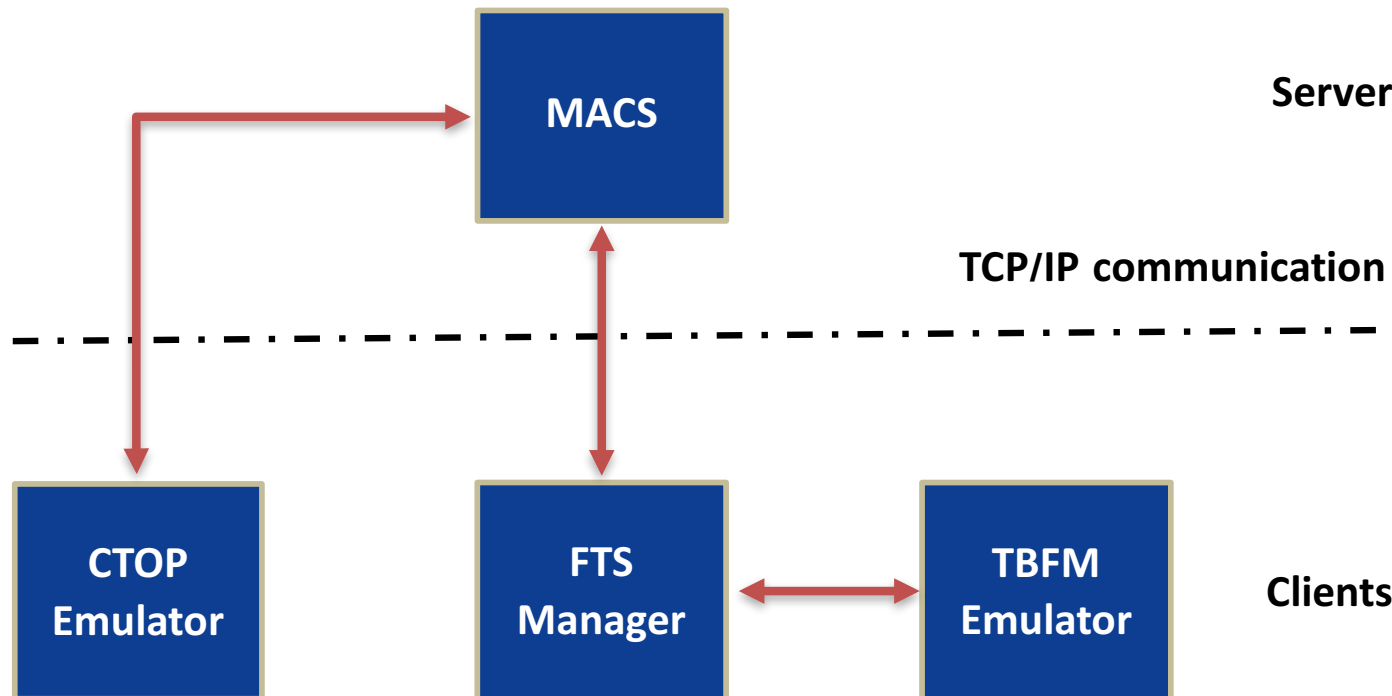
	[Seconds]	
Avg. rTBFM internal departure scheduling delay	66	(72)
Avg. eTBFM internal departure scheduling delay	70	(90)
Avg. scheduled departure time error (rTBFM-eTBFM)	-4	(129)



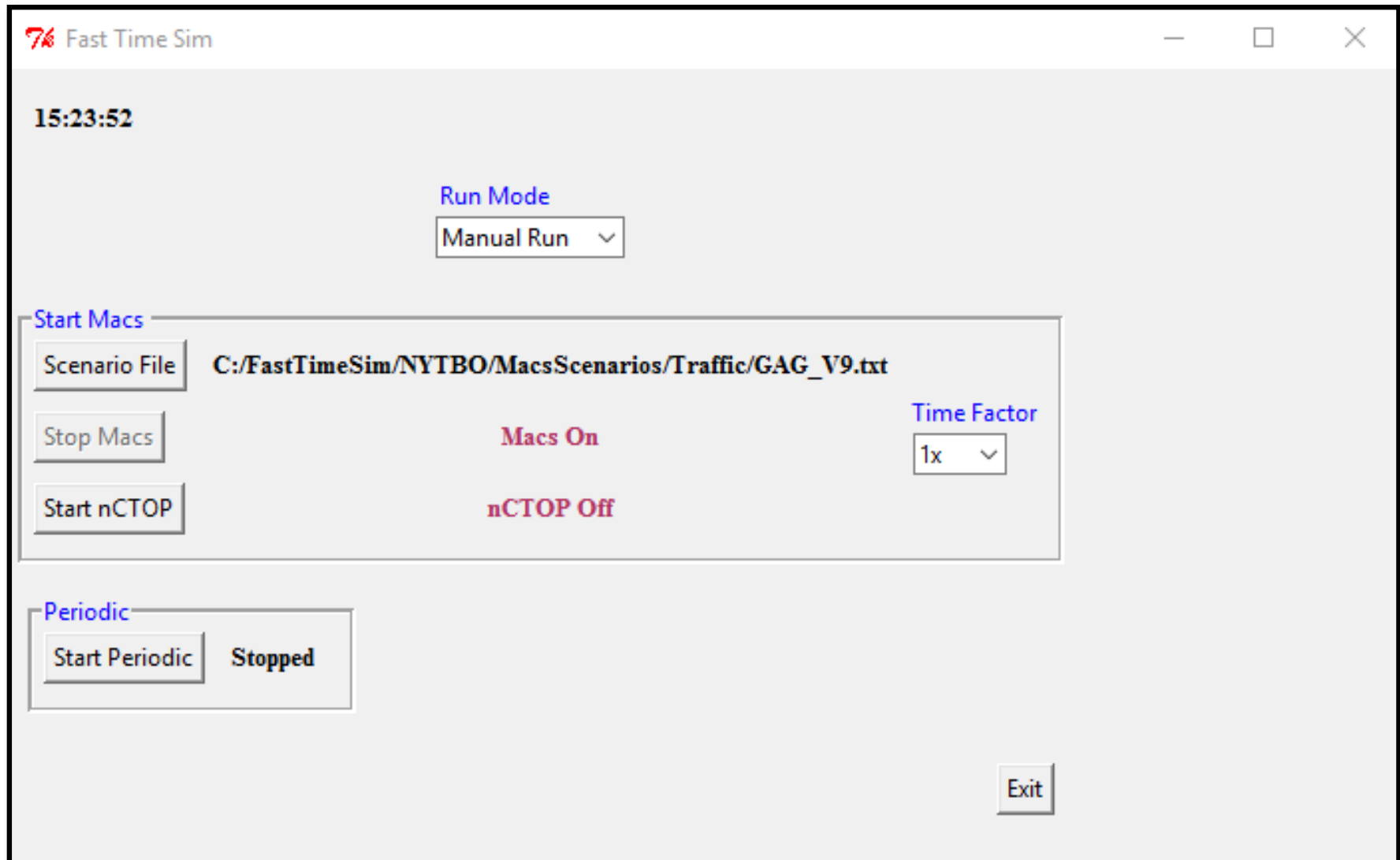
Simulation Manager



Simulation manager



Communication GUI



Demo



Create and run batch process

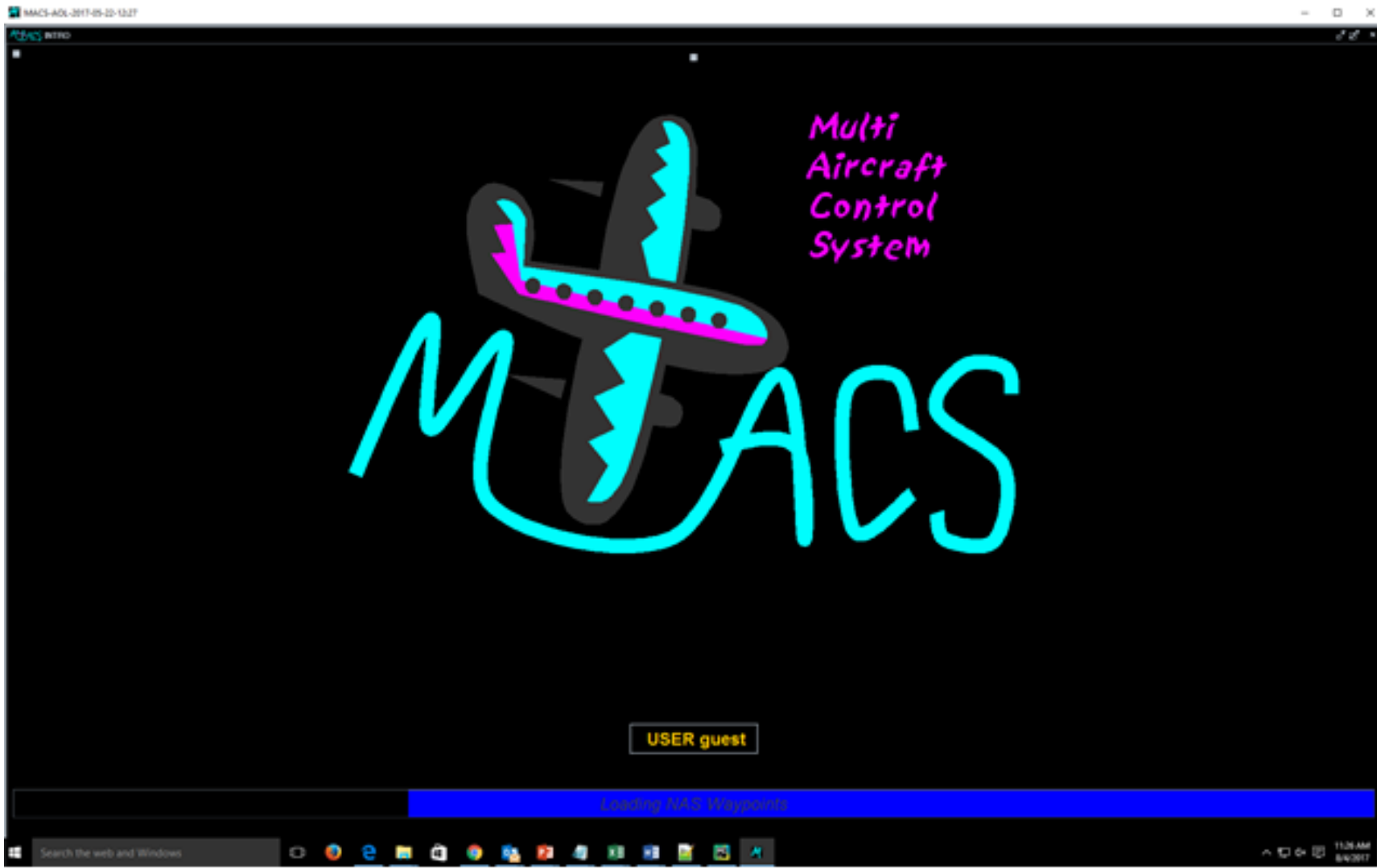
- Create batch file `FTS_bat.txt`

```
#RunName      Scenario      TimeFactor      RunMinutes      startnCTOPseconds
proc1 C:/fts-tbfm/input_files/EWR/Scenario/GAG_v9.txt 1x 30 10
proc2 C:/fts-tbfm/input_files/EWR/Scenario/MACS_20170421_1hr_traffic_NOdeperr.txt 1x 30 10
```

- Python command

```
Python FTS_Macs-batch.py FTS_bat.txt
```

Launch MACS

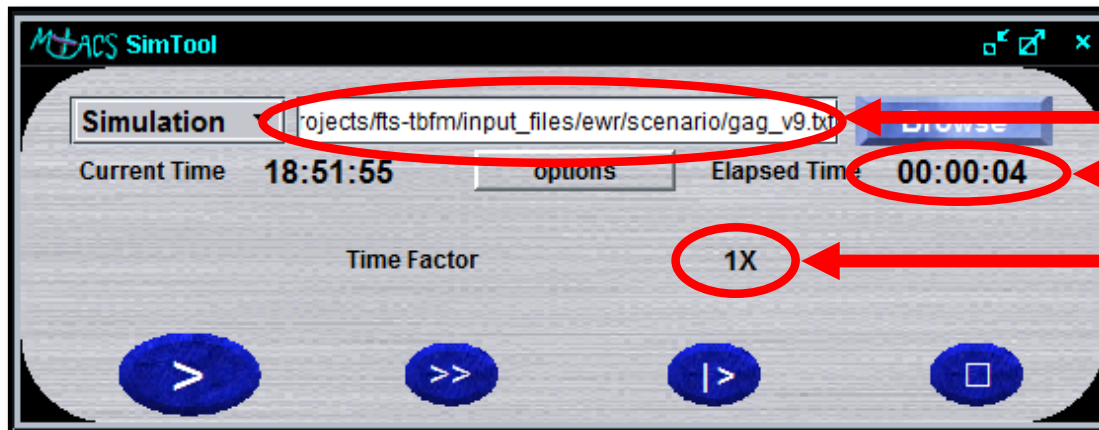


Enable external communication

The screenshot shows the MACS External Communications window for a server at IP 143.232.130.242 on port 7850. The window title is "MACS External Communications [Server (/143.232.130.242:7850)]". The "Server Status" is "Registered Open", which is circled in green and pointed to by a red arrow. The window contains a log of network messages, including a successful data loop start at 11:27:17 AM. At the bottom, there is a dropdown menu showing "/143.232.130.242:52884" and a "who" button. An unchecked checkbox labeled "Automatically start the server when MACS starts" is also visible.

Communication window
Server Status: Registered Open

Start simulation



Scenario file name

Simulation time

Simulation time factor
(simulation speed)

Launch nCTOP

59

Waiting for MACS traffic to settle...

[Click here if you are not redirected...](#)

Calculate new departure times

MACS-AOL-2017-05-22-12:27 NYTBO 22|31 Developer-Lite: guest Pilot-Config: view(Enabled) ATC-Sector: ZDC_12(Enabled) ADRS: offline 195 flights

18:28:18

AC MULTI DSR STARS ATM VIEW ADMIN **ERAM**

SimTool nCTOP v1.30.n (Full control) [Open Connected] [/143.232.130.242:52890] (Sending Actual...)

Model: CTOP-ALL TOS

Parameters
Name: CTOP002 NASA1 Start: 07 1700 End: 07 2159 Purge Program

Rank 1 Change Automatic Revision (AR):
 Look-Ahead: 3 hrs Offset: 1 hr Refresh Interval: 30 min.
 AR Start: End: Smoothing Factor: 45 min.

Total Flights: -----
 On Off

FEA/FCAs: Draw Add/Remove
Exemptions: Apply Exemption
Exempt all flights departing within 30 minutes.
Pop-Up Delay Limit (minutes): 180 Default

FCA Parameters
View: F472S Model Time: -- -- --
Time: 1815 1830 1845 1900 1915 1930 1945 2000 2015 2030
Demand: 0 2 4 5 6 2 3 1 4 4
Capacity: 5 5 5 5 5 5 5 5 5 5
AR_Above: AR_Below:
Fill: Capacity With: From: 1815 Through: 1815 Fill Fill All Reset
FEA/FCA: Start: End: Ceiling: 600 Floor: 0 Edit...

Bar Chart
F472S Hours Visible: 5 15 30 60 Capacity AR Merge flows
Demand
Time
ALL
 Active
 Inactive
 Routed Out
 NC Demand

Flight List
F472S (52)

#	FCA	ACID	ETA	BETD	CTD	G...	A...	BETA	STA	Current RTE	ORIG
01	F472S...	JBU416	04/2015	04/1926	04/1926	0	0	04/2017	04/2015	KMCO/.OPMAY..ILM..FA...	KMCO
02	F472S...	UAL237	04/1846	04/1844	04/1844	0	0	04/1846	04/1846	KMYR./.FAK.PHLB03..KEWR	KMYR
03	F472S...	ASQ4152	04/1951	04/1942	04/1942	0	0	04/1952	04/1951	KGSP./.SPA..GENOD..GS...	KGSP
04	F472S...	ASQ4394	04/2219	04/2140	04/2140	0	0	04/2221	04/2219	KJAX./.CAE.J51..FAK..PH...	KJAX
05	F472S...	UAL1238	04/2151	04/2044	04/2044	0	0	04/2152	04/2154	KRSW./.PAILS..FAK..PHL...	KRSW
06	F472S...	JBU428	04/1921	04/1832	04/1832	0	0	04/1923	04/1921	KMCO/.OPMAY..ILM..FA...	KMCO

Filter: From: Through: Customize Columns... Advanced Sort... Rebase Avg: 44 (165 nZ) Median: 0.0 Mode: 0 (38) Range: 754 (0-754)
 Show Current Route Show Assigned Route Flight Search Flight Info Flight History
Send Actual send STAs Model TOS Algorithm Send Actual Reset Cancel note

ASSIGN SWAP RESET F472S F300W

1872507064;VRD166
809~150187393752
0000;UAL1289~150
501877541101;UAL
AAL5633~15018789
9814225;FDX3022~
~1501880540380;U
UAL575~150188201
3100000;ASQ4956
1280~150188430000
252110;ASQ4301~1
1501875986976;BA
LH654~1501879065
;ASQ4191~150188
4887176;ASQ4747

Run simulation

The screenshot displays the MACS (Mission Aerial Control System) interface. At the top, a status bar shows system information: MACS-AOL-2017-05-22-12:27, NYTBO 22|31, Developer-Lite: guest, Pilot-Config: view(Enabled), ATC-Sector: ZDC_12(Enabled), ADRS: offline, and 195 flights. The main interface is divided into three primary windows:

- Traffic display screen:** A large map window titled "MACS ERAM_VIEW -- Configuration: Center" showing a detailed traffic display. It features a toolbar at the top left with the number "1829 12" and a "TOOLBAR" label. The map displays numerous aircraft icons with callouts containing flight numbers (e.g., UAL 1632, UAL 1743, FDX 3022, UAL 526, UAL 1496, UAL 1061, UAL 157, ASQ 439, UAL 1618) and altitudes. A red text label "Traffic display screen" is overlaid on the map. A context menu is visible at the bottom right of the map with options: "ACCEPT", "TOGGLE ALL TIMELINES", and "TL".
- Communication window:** A window titled "MACS External Communications [Server (/143.232.130.242:7850)]". It shows server IP: 143.232.130.242 and Port: 7850. A "Stop" button is present, and the "Server Status" is "Registered Open". A log entry reads: "11:28:58 AM RESPONSE,705279,START,180-F472S-F406W-F360N-F40WHOLE,Successful (MACS Periodic Loop already running)". A dropdown menu shows "/143.232.130.242:52884" and a "who" button. A checkbox "Automatically start the server when MACS starts" is present. A red text label "Communication window" is overlaid on the window.
- Simulation setup window:** A window titled "MACS SimTool" with a "Simulation" dropdown menu. The selected scenario is "objects/fts-tbfm/input_files/ewr/scenario/gag_v9.bt". It displays "Current Time 18:29:12" and "Elapsed Time 00:01:59". A "Time Factor" of "1X" is shown. Navigation buttons include a play button (>), a fast forward button (>>), a stop button (|), and a refresh button (⌂). A red text label "Simulation setup window" is overlaid on the window.

The bottom of the screen shows the Windows taskbar with the search bar and various application icons. The system tray on the right indicates the time "11:29 AM" and the date "8/4/2017".

Monitor simulation status

```
Run FTS-Macs-batch
waypoint SSC345020 specified more than once:
  previous SSC345020,,34.2502777778,-80.6663888889,0.0,0.0,0.0,729.133177634,305.922805499,790.711043082,0.397262877815,0.0,0.0,0.0,original,None
  new SSC345020,,34.2502777778,-80.6663888889,0.0,0.0,0.0,729.133177634,305.922805499,790.711043082,0.397262877815,0.0,0.0,0.0,original,None
waypoint ZORBO specified more than once:
  previous ZORBO,,41.6572222222,-79.2075,0.0,0.0,0.0,730.322076911,763.42859306,1056.50061653,0.807557883635,0.0,0.0,0.0,original,None
  new ZORBO,,41.6572222222,-79.2075,0.0,0.0,0.0,730.322076911,763.42859306,1056.50061653,0.807557883635,0.0,0.0,0.0,original,None
waypoint # specified more than once:
  previous #,,0.0,0.0,0.0,0.0,0.0,7443.20256093,347.794210912,7451.32371973,0.046692457896,0.0,0.0,0.0,original,None
  new #,,0.0,0.0,0.0,0.0,0.0,7443.20256093,347.794210912,7451.32371973,0.046692457896,0.0,0.0,0.0,original,None
MF_MIT
{}
start: 2017-08-04 11:51:17
proc1 C:/Users/jli10/PycharmProjects/fts-tbfm/input_files/EWR/Scenario/GAG_
C:/Users/jli10/PycharmProjects/fts-tbfm/input_files/EWR/Scenario/GAG_v9.txt
proc2 C:/Users/jli10/PycharmProjects/fts-tbfm/input_files/EWR/Scenario/MACS
C:/Users/jli10/PycharmProjects/fts-tbfm/input_files/EWR/Scenario/MACS_20170

proc1 - C:/Users/jli10/PycharmProjects/fts-tbfm/input_files/EWR/Scenario/
'C:/FastTimeSim/NYTBO/macs.bat' is not recognized as an internal or extern
operable program or batch file.
Received a flight data.....
Received a flight data.....
Processing the flight data....

The flight data is processed....

08-04-2017_11-52-02.17
Received a flight data.....
Processing the flight data....

stop
Re-schedule internal departure ASQ4672...
Re-schedule internal departure RPA3142...
The flight data is processed....

Received a flight data.....
Received a flight data.....
Processing the flight data....

The flight data is processed....
```

08-04-2017_11-52-02.17

Received a flight data.....

Processing the flight data....

stop

Re-schedule internal departure ASQ4672...

Re-schedule internal departure RPA3142...

The flight data is processed....

Received a flight data.....

Received a flight data.....

Processing the flight data....

The flight data is processed....

Batch process terminated

```
fts-tbfmt - [C:\Users\j1110\PycharmProjects\fts-tbfmt] - ...FTS_batch.txt - PyCharm Community Edition 2017.1.3
File Edit View Navigate Code Refactor Run Tools VCS Window Help
fts-tbfmt | FTS_batch.txt | FTS-Macs-batch.py | FTSClass.py | ORC_TBFMScheduling.py | process_TBFMTxAndIntx_v2.py | GAG_V9.txt
Project
fts-tbfmt C:\Users\j1110\PycharmProjects\fts-tbfmt
input_files
output_files
schedule
TBFMTSettings
config.py
FTS-Macs-batch.py
FTS_batch.txt
FTSClass.py
ORC_TBFMTParameters.py
ORC_TBFMScheduling.py
process_TBFMTxAndIntx_v2.py
Run
FTS-Macs-batch
()
start: 2017-08-04 11:59:24
proc1 C:/Users/j1110/PycharmProjects/fts-tbfmt/input_files/EWR/Scenario/GAG_v9.txt 1x 5 10
C:/Users/j1110/PycharmProjects/fts-tbfmt/input_files/EWR/Scenario/GAG_v9.txt 1x 5 10
proc1 - C:/Users/j1110/PycharmProjects/fts-tbfmt/input_files/EWR/Scenario/GAG_v9.txt 1x 5 10
Received a flight data.....
Processing the flight data....
The flight data is processed....
08-04-2017 12-00-09.06
Received a flight data.....
Processing the flight data....
stop
Re-schedule internal departure S04672...
Re-schedule internal departure RPAS142...
The flight data is processed....
Received a flight data.....
Processing the flight data....
The flight data is processed....
Received a flight data.....
Processing the flight data....
Re-schedule internal departure DAL1340...
The flight data is processed....
Received a flight data.....
Processing the flight data....
The flight data is processed....
Waiting for finishing the last data.2017-08-04 12:05:01.056000
```

Received a flight data.....
Processing the flight data....

The flight data is processed....

Waiting for finishing the last data.2017-08-04 12:05:01.056000

STARS ATM VIEW ADMIN ERAM

fts-tbfmt/input_files/ewr/s/Scenario/gag_v9.txt Browse

05 options Elapsed Time 00:00:00

Time Factor 1X

>> > <

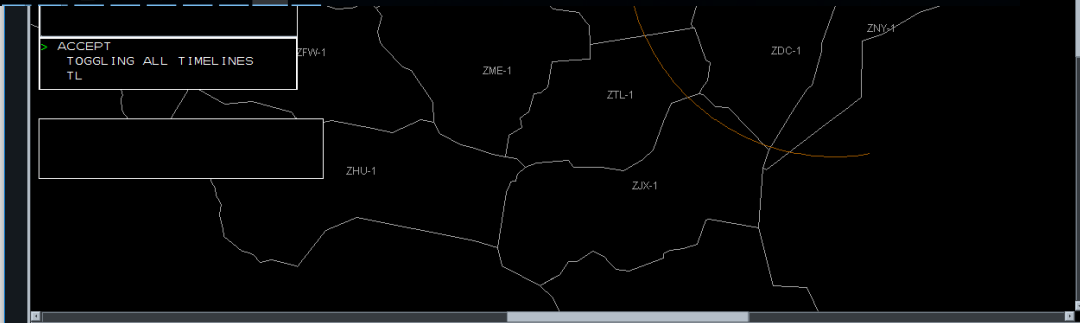
MACS External Communications [Server (/143.232.130.242:7850)]

Server IP: 143.232.130.242 Port: 7850

Stop Server Status: Registered Open

143.232.130.242:53043 who

Automatically start the server when MACS starts



Log data

Name	Date modified	Type	Size
RUNLOG	8/4/2017 12:06 PM	Text Document	220 KB
flightSchedule_mytest_2017-08-04_12-06...	8/4/2017 12:06 PM	Microsoft Excel C...	1 KB
nodeSchedule_mytest_2017-08-04_12-06...	8/4/2017 12:06 PM	Microsoft Excel C...	1 KB
FTS_proc1_2017-08-04_11-59-25	8/4/2017 11:59 AM	Text Document	0 KB
FTS_proc1_flightData_2017-08-04_11-59-25	8/4/2017 11:59 AM	Text Document	0 KB
FTS_proc1_raw_2017-08-04_11-59-25	8/4/2017 11:59 AM	Text Document	0 KB
FTS_proc1_special_2017-08-04_11-59-25	8/4/2017 11:59 AM	Text Document	0 KB
FTS_proc1_flightData_2017-08-04_11-51-18	8/4/2017 11:53 AM	Text Document	330 KB
FTS_proc1_raw_2017-08-04_11-51-18	8/4/2017 11:53 AM	Text Document	261 KB
FTS_proc1_special_2017-08-04_11-51-18	8/4/2017 11:53 AM	Text Document	549 KB
FTS_proc1_2017-08-04_11-51-18	8/4/2017 11:51 AM	Text Document	0 KB
FTS_proc1_flightData_2017-08-04_11-50-06	8/4/2017 11:51 AM	Text Document	326 KB
FTS_proc1_raw_2017-08-04_11-50-06	8/4/2017 11:51 AM	Text Document	341 KB
FTS_proc1_special_2017-08-04_11-50-06	8/4/2017 11:51 AM	Text Document	548 KB
FTS_proc1_2017-08-04_11-50-06	8/4/2017 11:50 AM	Text Document	0 KB
FTS_proc1_2017-08-04_11-33-12	8/4/2017 11:33 AM	Text Document	0 KB
FTS_proc1_flightData_2017-08-04_11-33-12	8/4/2017 11:33 AM	Text Document	0 KB
FTS_proc1_raw_2017-08-04_11-33-12	8/4/2017 11:33 AM	Text Document	0 KB
FTS_proc1_special_2017-08-04_11-33-12	8/4/2017 11:33 AM	Text Document	0 KB
FTS_proc1_flightData_2017-08-04_11-26-41	8/4/2017 11:29 AM	Text Document	496 KB
FTS_proc1_raw_2017-08-04_11-26-41	8/4/2017 11:29 AM	Text Document	349 KB
FTS_proc1_special_2017-08-04_11-26-41	8/4/2017 11:29 AM	Text Document	332 KB
FTS_proc1_2017-08-04_11-26-41	8/4/2017 11:26 AM	Text Document	0 KB
FTS_proc1_2017-08-04_11-26-33	8/4/2017 11:26 AM	Text Document	0 KB
FTS_proc1_flightData_2017-08-04_11-26-33	8/4/2017 11:26 AM	Text Document	0 KB
FTS_proc1_raw_2017-08-04_11-26-33	8/4/2017 11:26 AM	Text Document	0 KB
FTS_proc1_special_2017-08-04_11-26-33	8/4/2017 11:26 AM	Text Document	0 KB
FTS_proc1_2017-08-04_11-26-17	8/4/2017 11:26 AM	Text Document	0 KB
FTS_proc1_flightData_2017-08-04_11-26-17	8/4/2017 11:26 AM	Text Document	0 KB
FTS_proc1_raw_2017-08-04_11-26-17	8/4/2017 11:26 AM	Text Document	0 KB
FTS_proc1_special_2017-08-04_11-26-17	8/4/2017 11:26 AM	Text Document	0 KB
flightSchedule_mytest_2017-08-04_11-23...	8/4/2017 11:23 AM	Microsoft Excel C...	1 KB
FTS_proc1_2017-08-02_11-04-07	8/4/2017 11:23 AM	Text Document	2 KB
FTS_proc1_flightData_2017-08-02_11-04-07	8/4/2017 11:23 AM	Text Document	1,184 KB
FTS_proc1_raw_2017-08-02_11-04-07	8/4/2017 11:23 AM	Text Document	709 KB
FTS_proc1_special_2017-08-02_11-04-07	8/4/2017 11:23 AM	Text Document	2,104 KB
nodeSchedule_mytest_2017-08-04_11-23...	8/4/2017 11:23 AM	Microsoft Excel C...	1 KB
FTS_proc1_flightData_2017-08-02_10-57-17	8/4/2017 11:23 AM	Text Document	163 KB
FTS_proc1_raw_2017-08-02_10-57-17	8/4/2017 11:23 AM	Text Document	173 KB
FTS_proc1_special_2017-08-02_10-57-17	8/4/2017 11:23 AM	Text Document	268 KB
FTS_proc1_2017-08-04_10-37-07	8/4/2017 11:09 AM	Text Document	3 KB
FTS_proc1_flightData_2017-08-04_10-37-07	8/4/2017 11:09 AM	Text Document	2,037 KB
FTS_proc1_raw_2017-08-04_10-37-07	8/4/2017 11:09 AM	Text Document	1,158 KB
FTS_proc1_special_2017-08-04_10-37-07	8/4/2017 11:09 AM	Text Document	3,908 KB
flightSchedule_mytest_2017-08-04_11-08...	8/4/2017 11:08 AM	Microsoft Excel C...	3 KB
nodeSchedule_mytest_2017-08-04_11-08...	8/4/2017 11:08 AM	Microsoft Excel C...	2 KB
FTS_proc1_flightData_2017-08-04_10-34-52	8/4/2017 10:36 AM	Text Document	163 KB
FTS_proc1_raw_2017-08-04_10-34-52	8/4/2017 10:36 AM	Text Document	173 KB
FTS_proc1_special_2017-08-04_10-34-52	8/4/2017 10:36 AM	Text Document	268 KB

Name
RUNLOG
flightSchedule_mytest_2017-08-04_12-06...
nodeSchedule_mytest_2017-08-04_12-06...
FTS_proc1_2017-08-04_11-59-25
FTS_proc1_flightData_2017-08-04_11-59-25
FTS_proc1_raw_2017-08-04_11-59-25
FTS_proc1_special_2017-08-04_11-59-25

Sample output

nodeSchedule_mytest_2017-08-04_20-55-20

Home Insert Page Layout Formulas Data Review View

Calibri (Body) 12

General

nodeid

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	nodeid	nodeType	flightId	STA	ETA	delayPassback	NomSpeed	isInternal	eventTrigger	FH_CT	EDCT	depError	TBFMSchedDep	SchedDelay	reqT
2	EWR22L	RWY	UAL1116	1501892541	1501892541	0.00999999	140								
3	EWR22L	RWY	DAL1348	1501892732	1501892732	0.00999999	140	TRUE	1501888587		1501888587	-121	1501888587	0	
4	EWR22L	RWY	JBU6	1501892948	1501892948	0.00999999	140	FALSE	1501888355	1501888355					
5	EWR22L	RWY	BAW943	1501893134	1501893091	42.13638115	140	FALSE	1501889285	1501889285					
6	EWR22L	RWY	SKV7007	1501893278	1501893095	182.1363811	140	TRUE	1501889751		1501889751	95	1501889751	0	
7	EWR22L	RWY	JBU328	1501893531	1501893531	0.00999999	140	FALSE	1501888867	1501888867					
8	EWR22L	RWY	ASQ4672	1501893641	1501893551	89.45000005	140	TRUE	1501887764		1501887764	102	1501887764	0	
9	EWR22L	RWY	RPA3142	1501893733	1501893608	125.4344084	140	TRUE	1501888368		1501888368	-10	1501888368	0	
10	EWR22L	RWY	ASQ4276	1501893826	1501893802	23.71285701	140	TRUE	1501889556		1501889341	52	1501889556	215	
11	EWR22L	RWY	TCF3792	1501894011	1501894003	8.17869401	140	TRUE	1501890505		1501890505	50	1501890505	0	
12	EWR22L	RWY	UCA4775	1501894104	1501893925	179.1628571	140	TRUE	1501891238		1501890854	66	1501891238	384	
13	EWR22L	RWY	VIR1F	1501894204	1501894204	0.00999999	140	FALSE	1501890322	1501890322					
14	EWR22L	RWY	SWA45	1501894415	1501894415	0.00999999	140	FALSE	1501889574	1501889574					
15	EWR22L	RWY	AAL5177	1501894508	1501894244	264.2242858	140	TRUE	1501891891		1501891834	200	1501891891	57	
16	EWR22L	RWY	UAL1618	1501894778	1501894778	0.00999999	140	FALSE	1501890146	1501890146					
17	EWR22L	RWY	UAL994	1501894871	1501894797	74	140	TRUE	1501891105		1501891100	-14	1501891105	5	
18	EWR22L	RWY	ASQ4326	1501895058	1501895058	0.00999999	140	TRUE	1501889997		1501889957	170	1501889997	40	
19	EWR22L	RWY	UAL1419	1501895167	1501895089	77.92000008	140	FALSE	1501890411	1501890411					
20	EWR22L	RWY	AAL2379	1501895334	1501895334	0.00999999	140	FALSE	1501888575	1501888575					
21	EWR22L	RWY	VRD166	1501895451	1501895451	0.00999999	140	FALSE	1501889033	1501889033					
22	EWR22L	RWY	BAW187	1501895544	1501895123	420.1519728	140	FALSE	1501891161	1501891161					
23	EWR22L	RWY	ASQ5830	1501895688	1501895437	251.01	140	TRUE	1501892777		1501892302	-47	1501892777	475	
24	EWR22L	RWY	JBU2579	1501895780	1501895598	182.5814285	140	TRUE	1501893102		1501892579	-30	1501893102	523	
25	EWR22L	RWY	DLH26	1501895910	1501895910	0.00999999	140	FALSE	1501892057	1501892057					
26	EWR22L	RWY	UAL1636	1501896095	1501896095	0.00999999	140	FALSE	1501891247	1501891247					
27	EWR22L	RWY	UCA5884	1501896307	1501896307	0.00999999	140	TRUE	1501893976		1501893563	179	1501893976	413	

nodeSchedule_mytest_2017-08-04_...

Select destination and press ENTER or choose Paste

150%