

# System-wide Modeling for NextGen

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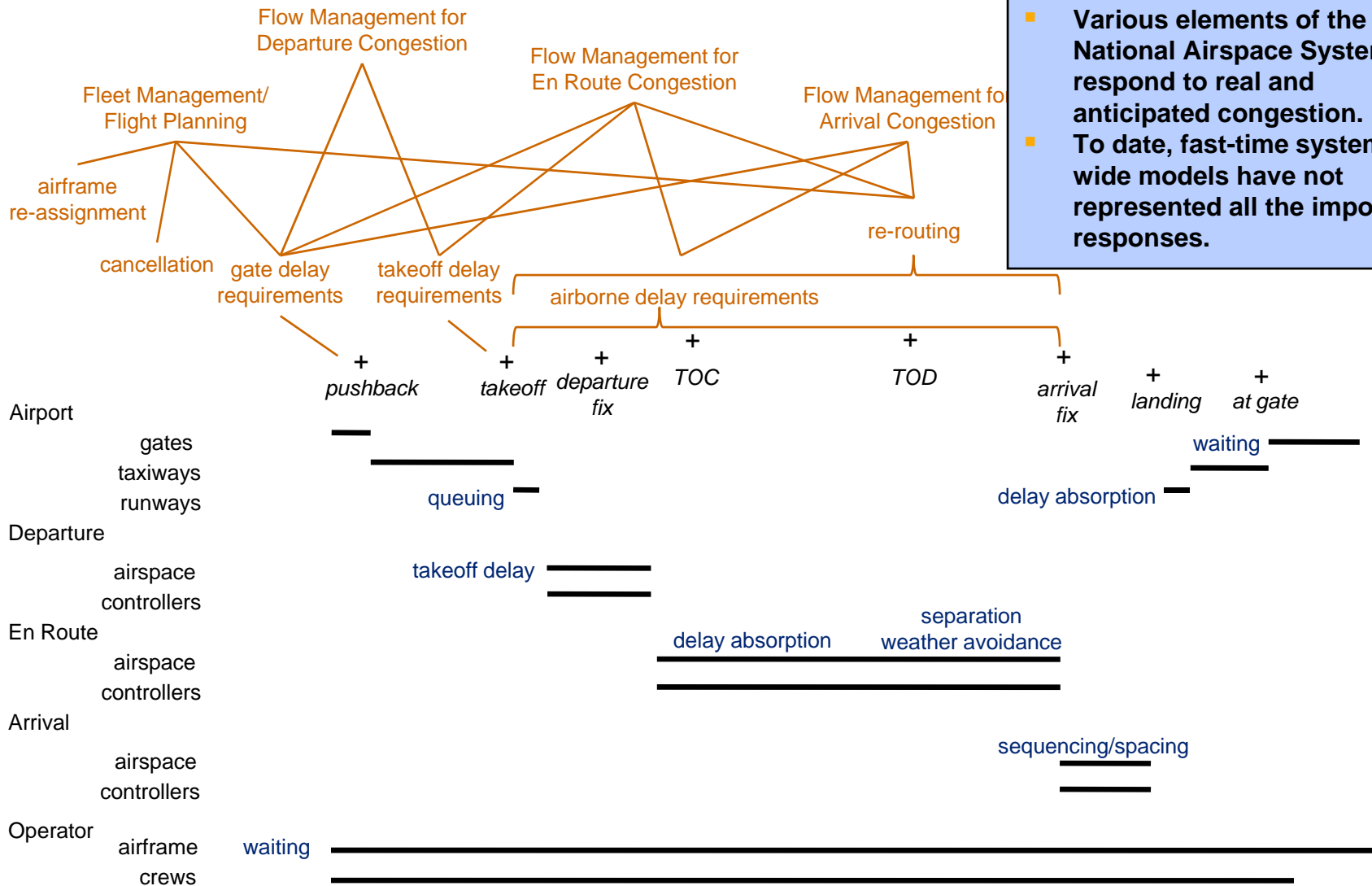


# Problem



- To improve the behavior of *systemwideModeler*, MITRE's fast-time simulation of the National Airspace System, and to improve its sensitivity to NextGen operational improvements.
- To facilitate analyses using *systemwideModeler* with improved pre- and post-processing tools, especially visualization.

# Background



- Various elements of the National Airspace System respond to real and anticipated congestion.
- To date, fast-time system-wide models have not represented all the important responses.

# Objective



- **To add a more complete and realistic set of congestion responses to *systemwideModeler* :**
  - **Tactical responses**
    - **Representation of terminal spacing and sequencing and en route separation and weather avoidance**
  - **Flow management responses**
    - **Distance- and time-based management of arrivals (FY09)**
    - **Smooth delays for en route sector congestion (FY09)**
    - **Surface management**
    - **Re-routing**
  - **Airspace user responses**
    - **Cancellations (FY09)**
    - **Airframe re-assignment (FY09).**

# Activities

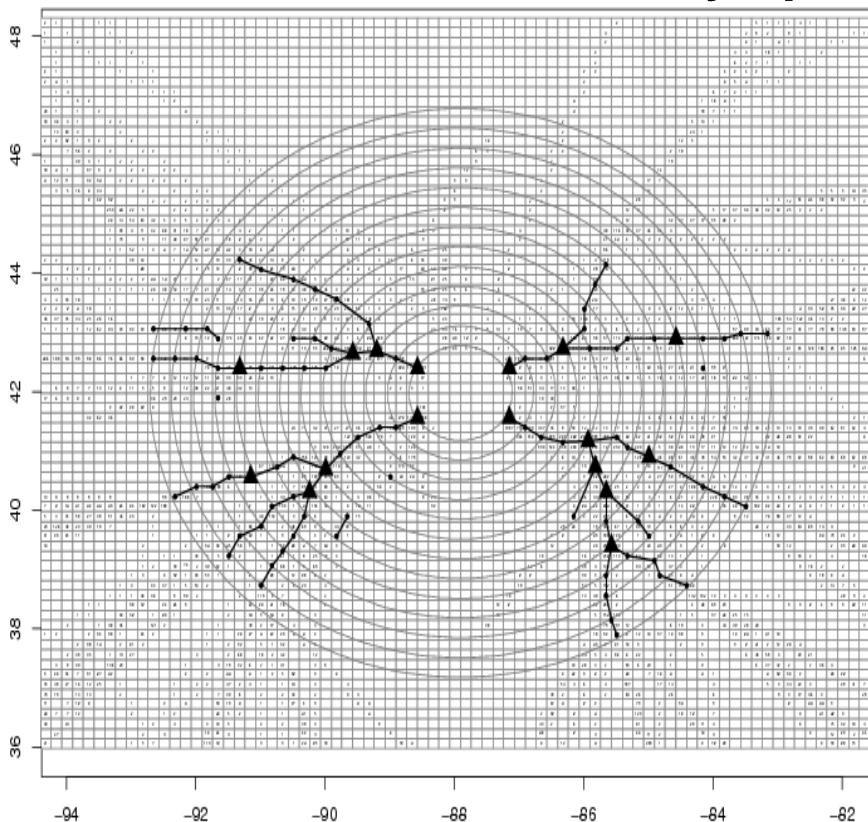


- **Modeling**
  - **Merging and Spacing**
  - **Departure fixes**
  - **Arrival Terminal Approach Control (TRACON) congestion and demand management**
  - **Strategic en route sector congestion and delay absorption**
  - **Airspace user fleet management.**
- **Software Development**
  - **Implementation of model enhancements**
  - **Refactoring and input validation mode.**
- **Visualization package development.**

# Highlight

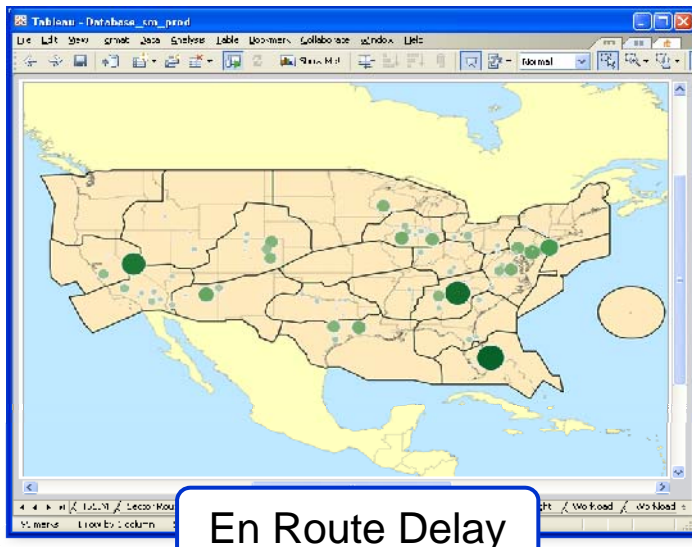
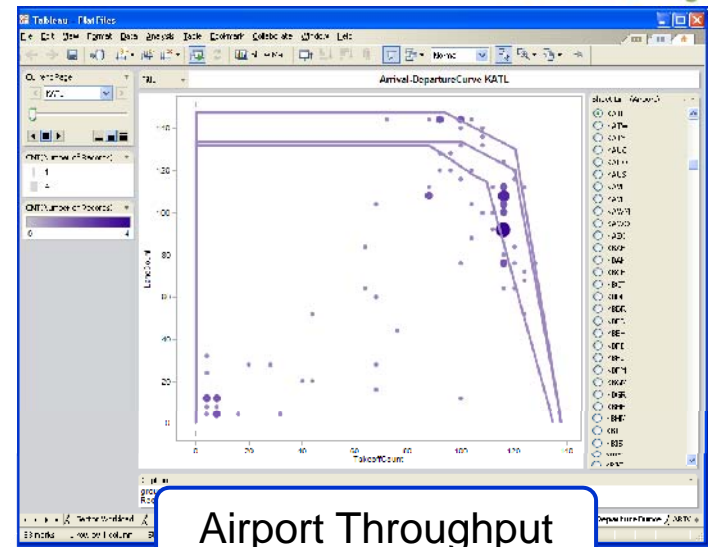
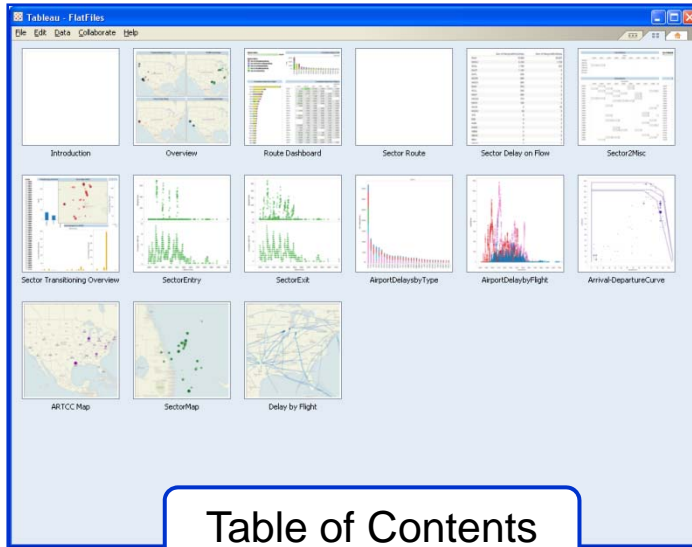
## ■ Merging and Spacing (Part 1)

- Delays arrivals to congested airports in en route airspace to realize a continually updated landing schedule



- Merge points identified from flight plans via cluster analysis in pre-processor
- Flights re-compute permitted landing times upon approaching each merge point
- Flights re-planned to smoothly absorb required delay
- Adds no overall delay and avoids unrealistically large delays near airport.

# Highlight



# Impacts



- **We are improving estimates of delay and identification of problems in the National Airspace System.**
- **Current *systemwide*Modeler-based analyses include:**
  - **NextGen influential factors analysis**
  - **Future Airspace Capacity and Efficiency Study (FACES)**
  - **Effect of en route controller workload improvements**
  - **Sensitivity of delays to equipage rates**
  - **Playbook with National Route System waypoints.**
- **Visualization automation**
  - **Reduces the time between scenario generation and understanding**
  - **Standardizes interpretation of complex model behavior.**

# Future Plans

