

# Optimization model for large-scale air traffic flow management

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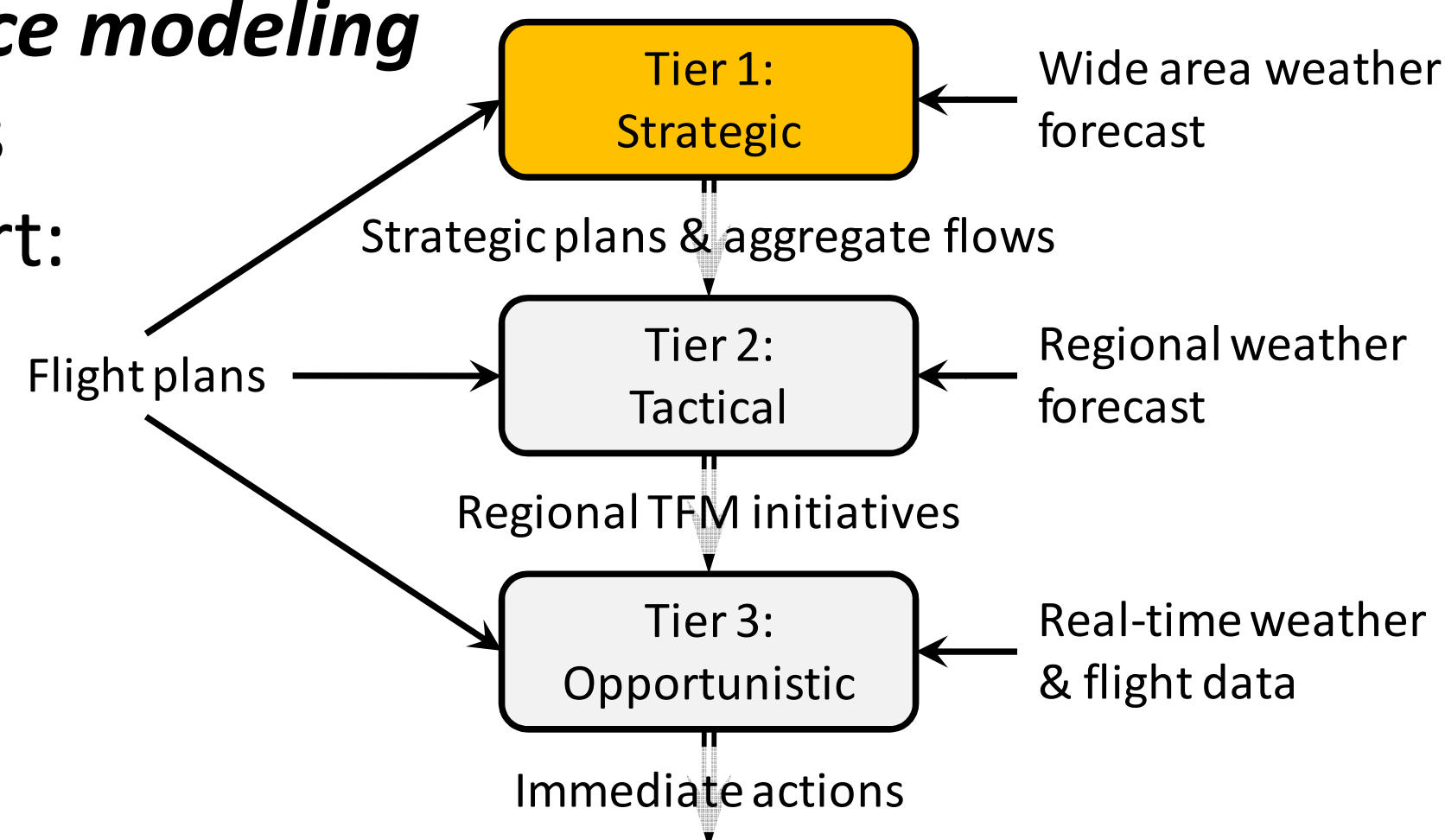
## Motivation

Large scale air traffic flow management model needed for:

- Strategic planning
- Congestion prediction
- Traffic management coordination
- Dynamic airspace configuration

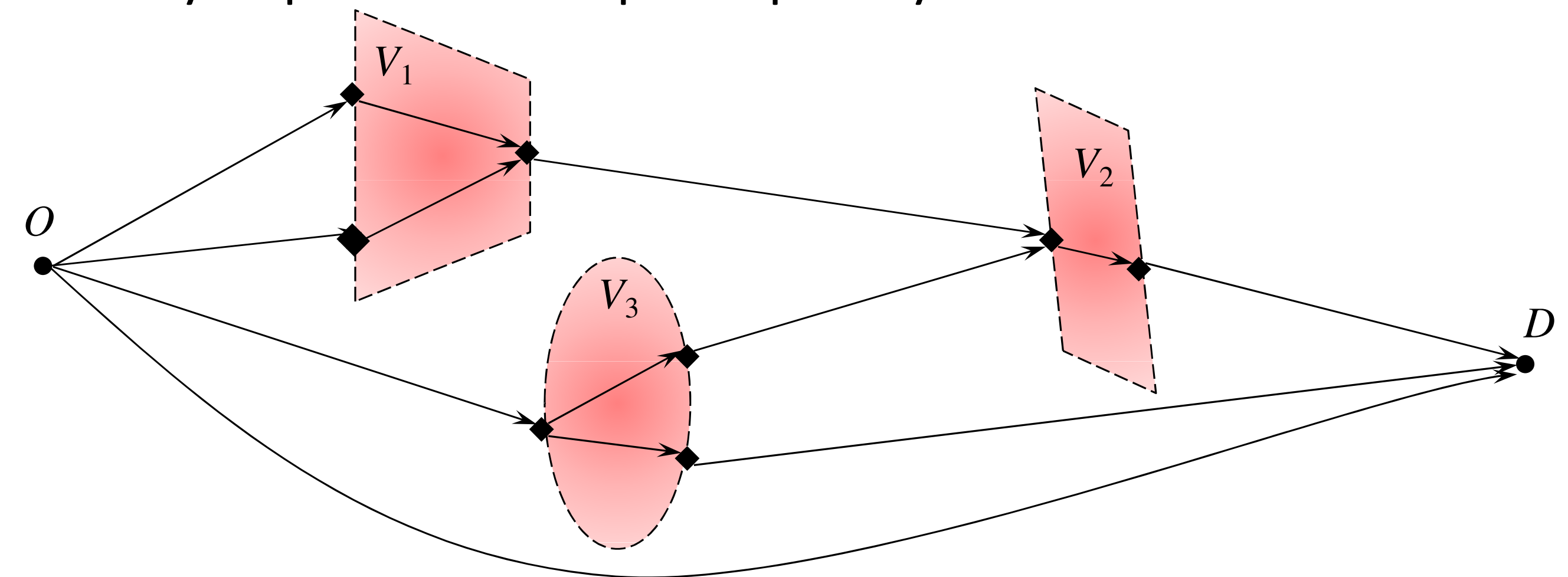
## Hierarchy of airspace modeling

This model provides highest level in effort:



## Reducing complexity

- Model does not rely on the current center & sector paradigm
- Considers a simplified network of routes and specific capacitated elements, including:
  - Weather systems
  - Busy airports or multiple airport systems



## Structure

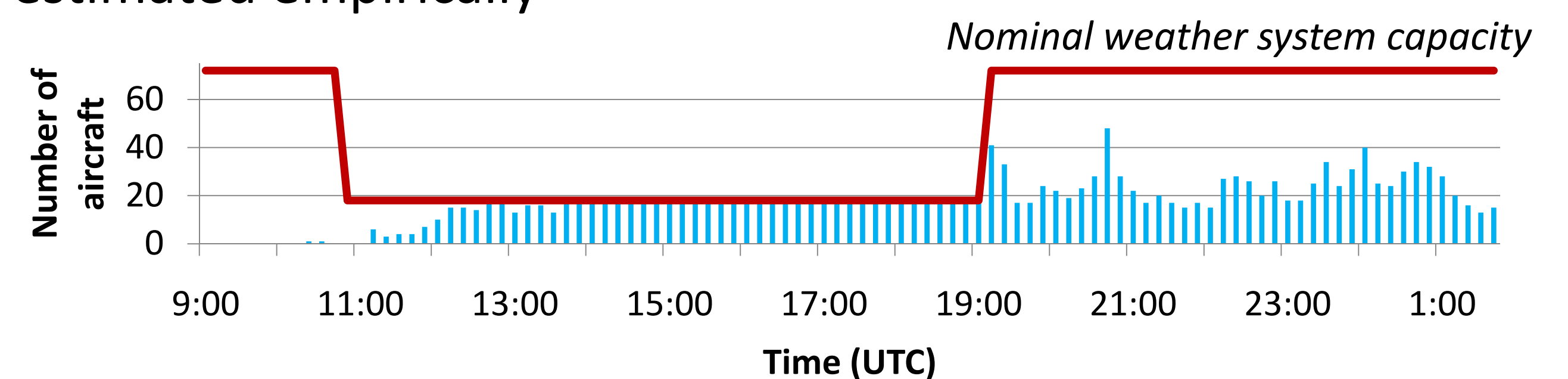
Large scale integer program minimizes a weighted sum of ground and airborne delays, considering:

- Airport and airspace capacity constraints
- Network forcing constraints
- Aircraft connectivity constraints

Based on earlier work by Bertsimas, Lulli, and Odoni

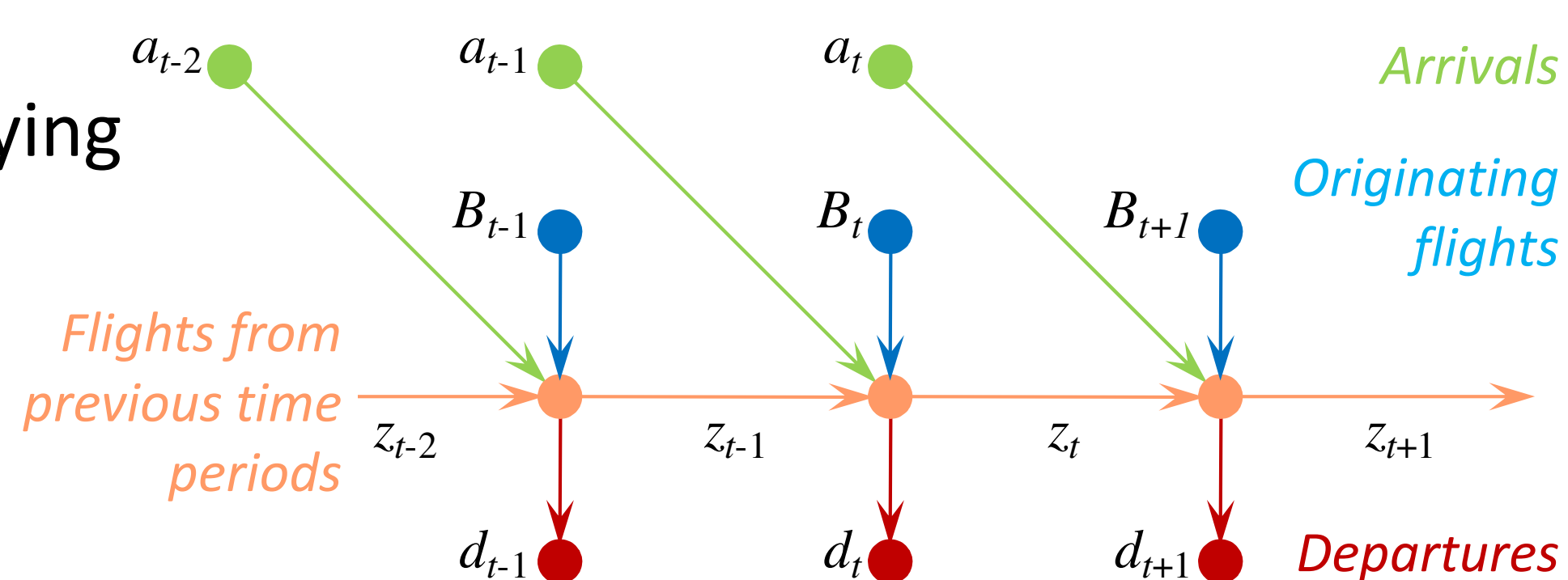
## Case study

- Scenario constructed with real weather systems and schedule
- Airport capacities reflect nominal values
- Weather system duration drawn from forecast data, capacity estimated empirically



## Delay propagation

- Captured by applying a flow model of individual aircraft into and out of large airports



## Continuing work

- Develop automated system for identifying disruptions and network structure surrounding them
- Create more sophisticated case study
- Reduce model complexity