System-wide Modeling Capabilities Scope and Elements
How big is our sand-box?

- Scope
  - "System-wide" is equivalent to runway-to-runway operations (US) or to gate-to-gate operations (European)
  - System operations as opposed to economic, financial or the political side of ATM system.
  - High-fidelity system-wide modeling capabilities that capture propagation of a problem throughout the system.
  - Future operations modeling based on future system (System-wide) reactions.

- The scope of this TIM and subsequent document includes the following elements:

  - Time Horizon
    - To evaluate system dynamics during a day of operations
    - To assess system capabilities assuming the infrastructure and ideas we have or could implement today. Complex changes in infrastructure will likely require significant changes in modeling capabilities, and will need to be initially investigated using higher level/lower fidelity system-wide models.
  - Flights
    - 4D flight trajectories
    - Aircraft performance characteristics
    - Equipage issues
    - Performance based operations
    - Flight schedule and future demand modeling as an input. We are not investigating a future demand modeling capability.
  - Airports
    - Arrival and departure traffic management
    - Airport surface/ground movements
    - Gate Operations
  - Terminal areas
    - Approach and departure trajectories
    - Approach and departure traffic management
    - Corner fixes/important waypoints
    - Terminal Capacity
  - Airspace
    - Regions and domains: ground capability/separations standards and procedures, en-route vs. oceanic, user-preferred routes vs. flex/fixed tracks, etc.
    - Traffic Flow Management (TFM)

        - Dynamic airspace configurations (does not include the logic behind it only the ability to look at different and dynamic sectorization schemes)
- Environment
    - Infrastructure (impact on operations)
    - Weather
    - Special Use Airspace and Temporary Flight Restrictions
    - Aeronautical information, including LOA, etc.
    - Mixed equipage issues (or performance based operations)
        - Different equipage (technology vs. equipage)
        - Equipped and non-equipped aircraft
    - Current and future operations and procedures
    - Noise and emissions (mostly as a limitation; for instance, a cap on the available resources)
    - Transition to NextGen
- Decision Making
    - Air-carriers/AOC's (as applicable to flight efficiency and recovery, but not planning or scheduling)
    - ANSP's
    - Other ATC related positions (TFM, MSP, etc.) (ATM related)
    - Pilots
    - Information exchange (data requirements, etc.)
    - Inter-operability issues (performance of different tools that work on the same issue; data availability: accuracy, timelines, etc.)
- Human Involvement
    - Task-load: what exactly is done
    - Workload: can it be done
    - Pilot vs. controller: roles and responsibilities, integration issues, resolving the off-nominal conditions, failure mode, etc.
    - Automation vs. human: roles and responsibilities, integration issues, resolving the off-nominal conditions, failure mode, etc.
- Performance assessment
    - Metrics
    - Measures
    - Connectivity to Flight Plan and similar docs
- Other issues
    - Interoperability between models
        - Is there a model that does it all, or
        - Do inputs/outputs of various models assure ability to sequentially run a scenario through several models in order to get the whole picture
    - Is it possible to model some real-world challenges faced by the ANSP's that impact the ability to achieve the same success as achieved within a simulation

- Differences in behavior between different air-carriers; for instance, some are willing to fly closer to a bad weather cell then the others
- Unforeseen effects of initiatives in the real-world; for instance, limitation of the ground delay programs by focusing only on the large airports (Chicago vs. Midway)