athena

Wisdom to guide mobility transformations at U.S. ports

Airport Traffic Management and Planning Frameworks

High-performance computing and high-fidelity traffic simulation can help guide airport traffic management decisions and understand operating bottlenecks.

Challenge

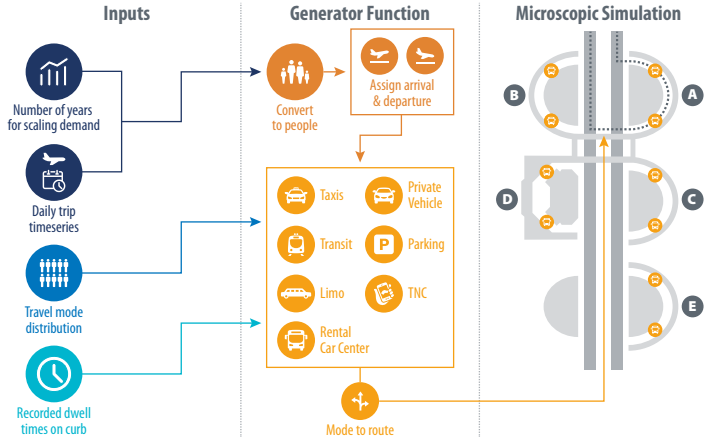
Emerging mobility technologies are changing the transportation system landscape. This is especially evident at airports like Dallas Fort Worth International (DFW) Airport. Without careful analysis, these changes could lead to inefficient and costly operations.

Our Approach

The Athena research team developed a modeling framework that integrates travel mode encoding, demand projection, and micro-simulation to enable airports to develop, simulate, and evaluate traffic management policies and measure their impacts.

We used the framework to analyze several traffic scenarios and policies for DFW Airport:

- Baseline scenario, which represents DFW Airport traffic patterns as observed in 2018 and projected to 2045
- COVID-19 scenario, which models the impact of the COVID-19 pandemic
- Transit network company (TNC) electrification policy
- TNC queuing policy, a policy that increases transit ridership
- Bus-only policy, which considers only the use of buses inside DFW
- Autonomous vehicle (AV) policy, which investigates the impact of AV adoption on airport operations.



The framework makes use of demand forecasting and high-fidelity simulation to enable evaluation of different policies and emerging technologies as they impact congestion in the DFW Airport road network. Figure by Christopher Schwing, NREL

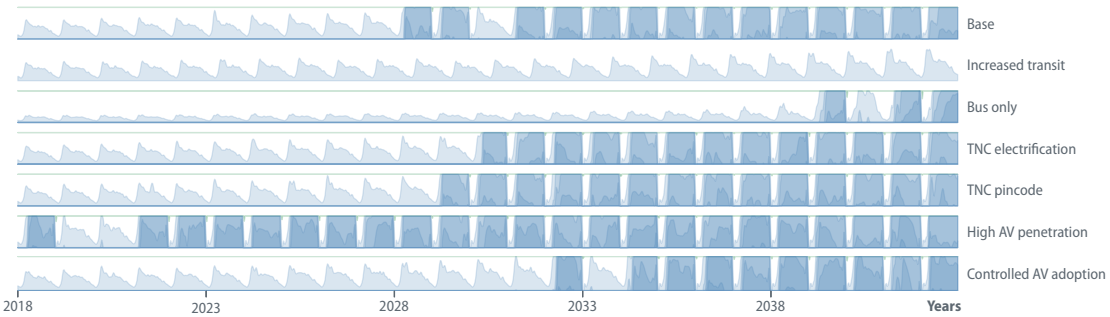
Results

The simulation demonstrated that increasing DFW Airport transit ridership was most effective in postponing the need for airport capacity expansion. Encouraging shared mobility with the bus-only policy produces the most savings in congestion delays, fuel consumption, and emissions. Uncontrolled AV adoption incurred the greatest increase in fuel consumption, delays, and emissions, and would potentially require immediate airport capacity extension.

Impact

Without policy intervention or investment in additional infrastructure capacity, these results predict that current operations would face significant congestion on high-demand days starting as early as 2028. Utilizing this framework, DFW Airport can evaluate low-cost policy changes alongside infrastructure investments and consider long-term tradeoffs to maintain efficient operations while reducing emissions and delays.

For more information, visit **athena-mobility.org** or contact **athena.mobility@nrel.gov**.



By encouraging moderate usage of public transit (5%–15% of trips), DFW Airport could save nearly 200 thousand tons of CO_2 from entering the atmosphere and significantly delay major impacts from congestion in the central terminal area. Figure by Monte Lunacek, NREL

Juliette Ugirumurera, Joseph Severino, Karen Ficenec, Yanbo Ge, Junghoon Chae, Lindy Williams, Qichao Wang, Monte Lunacek and Caleb Phillips. "A Modeling Framework for Designing and Evaluating Traffic Management Policies at Dallas Fort Worth International Airport." August 1, 2020. In Submission.

Photos by Dennis Schroeder, NREL.

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