

This study examines three possible approaches to improving the speed in generating wind-optimal routes for air traffic at the national or global level. They are: (a) using the resources of a supercomputer, (b) running the computations on multiple commercially available computers and (c) implementing those same algorithms into NASA's Future ATM Concepts Evaluation Tool (FACET) and compares those to a standard implementation run on a single CPU. Wind-optimal aircraft trajectories are computed using global air traffic schedules. The run time and wait time on the supercomputer for trajectory optimization using various numbers of CPUs ranging from 80 to 10,240 units are compared with the total computational time for running the same computation on a single desktop computer and on multiple commercially available computers for potential computational enhancement through parallel processing on the computer clusters. This study also re-implements the trajectory optimization algorithm for further reduction of computational time through algorithm modifications and integrates that with FACET to facilitate the use of the new features which calculate time-optimal routes between worldwide airport pairs in a wind field for use with existing FACET applications. The implementations of trajectory optimization algorithms use MATLAB, Python, and Java programming languages. The performance evaluations are done by comparing their computational efficiencies and based on the potential application of optimized trajectories. The paper shows that in the absence of special privileges on a supercomputer, a cluster of commercially available computers provides a feasible approach for national and global air traffic system studies.