

## **External Software Modules for Traffic Flow Management Decision Support Tools**

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### **Abstract**

NASA, FAA and several of their leading industry partners have developed numerous software tools and applications which can be used for several air transportation problems, in particular for traffic flow management. Most of these tools are not open source, and the corresponding source code is in general not available to the public. Over the years, the development of these products has led their authors to create interfaces designed to meet their customers' needs. For numerous applications, the functionalities offered by these software products thus enable the user to perform most of the tasks required by their projects.

In the case of academic research, for which new applications, algorithms and methods are investigated, several functionalities required to implement and to test new concepts are sometimes not available to the users. For example, in the case of the well known numerical analysis software Matlab, the creation of numerous toolboxes enabled new sets of users to benefit from functionalities not required by the average customer of the core Matlab program. Several aviation software products follow the same trend: a main "official" version is developed, and sets of users create their own versions, which meet their specific needs. Sometimes, these modifications make it back to the core software and become part of it.

We will illustrate these trends with the case of the Future ATM Concepts Evaluation Tool (FACET), developed at NASA Ames, for which the source code is not available to the academic community. We will show how efficient interfacing between FACET and external software modules enables the academic community to use this tool for traffic flow management research and algorithm development. We will present new results obtained using an efficient interface between FACET and CPLEX, a leading combinatorial optimization software which we use for traffic flow management applications in the en route airspace. Examples using Aircraft Situation Display to Industry / Enhanced Traffic Management System (ASDI/ETMS) data will be shown.