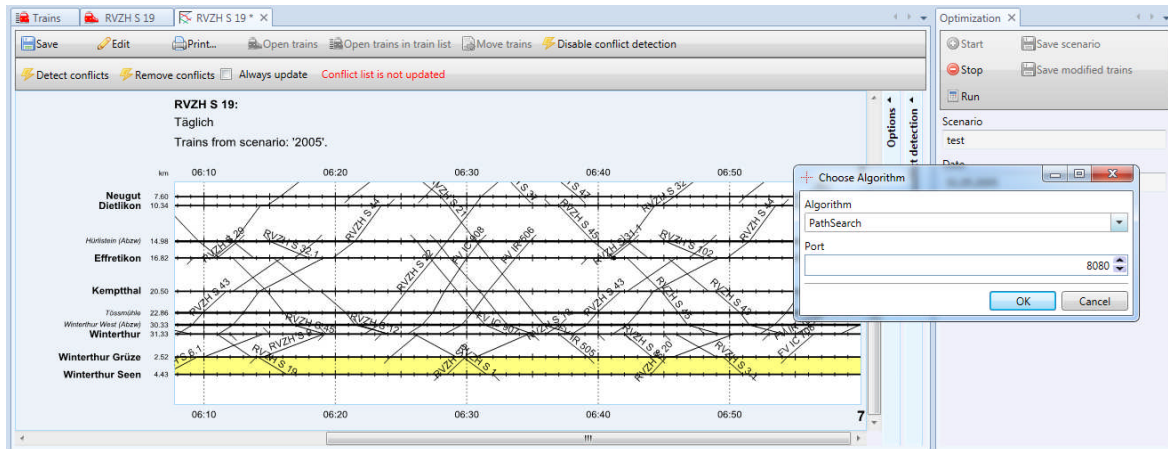


# Viriato: Algorithm Platform

## Interface for Optimisation Algorithms



The Algorithm Platform serves as a communication system between Viriato and external algorithms, acquiring timetable and infrastructure data from Viriato, providing them to optimisation algorithms and allowing results of algorithms to be written back to Viriato. Using this platform trains planned by external algorithms can be managed, validated and analysed with the full functionality of Viriato.

The Viriato Algorithm Platform allows collaboration between infrastructure managers or train operators on the one side and algorithmic researchers on the other via an easy-to-understand and use interface. The Algorithm Platform puts productivity for algorithmic research at the forefront and allows the actors in railway operations to involve multiple professional researchers in their projects to solve algorithmic questions.

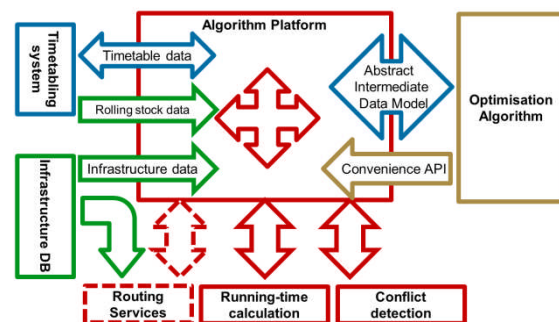
Researchers do not need to understand complicated application-specific data models. The full Viriato visualisation capabilities can be used to display and analyse their results. Infrastructure managers and train operators can test algorithms developed by external researchers on their own realistic data sets, or share their data with researchers.

### Data Types for Algorithmic Purposes

The Algorithm Platform enables algorithmic researchers to access train and infrastructure data from Viriato in a straightforward, consistent way. The data types provided offer an appropriate level of abstraction tailored to algorithmic use cases. No data is exported that is not meaningful for algorithmic purposes, such as colours or other display attributes. The values delivered by the interface, including running-time durations and planned departure and arrival times are normalised so that tedious handling of special cases is avoided.

### Data Acquisition and Provision

The Algorithm Platform manages data acquisition from Viriato and potentially other third party systems and provides these to external algorithms. Algorithmic experts can focus on the development of their method and do not need to invest time in implementing database queries to retrieve data. Instead they communicate through the easy-to-use methods defined by the interface of Algorithm Platform.

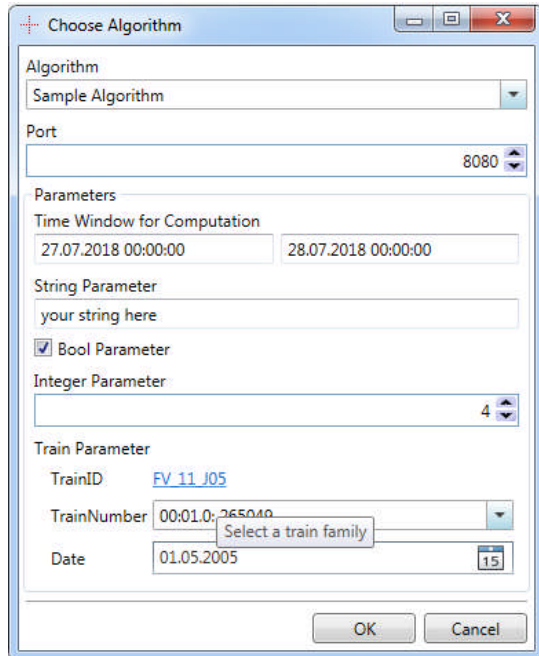


### Relevant Data and Performance

The Viriato Algorithm Platform provides methods for filtering data out-of-the-box. An algorithm developer can request only the data that is relevant to them. They are able to choose the subset of relevant network nodes and the time window for which they want to retrieve train data. This gives an efficient workflow as there is no need to export all data, which can lead to performance bottlenecks.

## User-defined Input Parameter Masks

Via a configuration file it is possible for algorithms to request additional parameters from the user. In addition to the definition of a time window, strings, boolean values, integers, and the selection of specific trains can be passed from Viriato to an algorithm.



Therefore, researchers do not need to develop their own GUI for retrieving input data from users, and all data necessary to start an algorithmic computation can be passed to the algorithm.

## Results

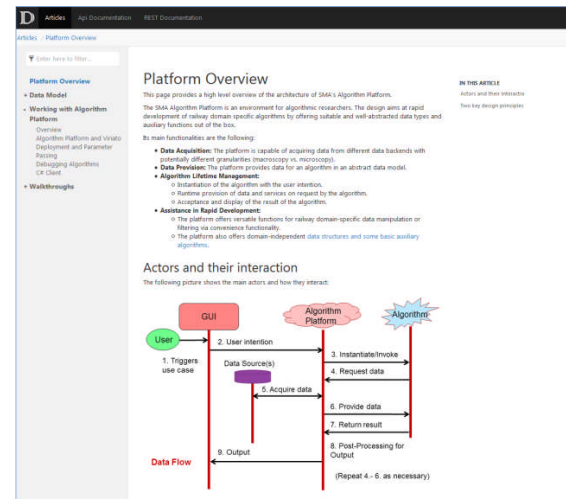
Results from an external algorithm can be easily written back via the interface of Algorithm Platform and saved in Viriato timetable scenarios.

All Viriato timetabling features can be used to visualise and analyse the quality of the results.

## Documentation and Language Interoperability

The Viriato Algorithm Platform comes with detailed documentation explaining the basic concepts as well as a complete description of the REST-API from which data can be retrieved. In addition, the documentation contains code examples, which are elucidated step-by-step in walkthroughs.

As the REST technology is interoperable, an arbitrary programming language can be used by researchers for implementing algorithms and to work with the Algorithm Platform. For C# there exists an easy-to-use native API offering type-safety.



Features	
<b>Areas of application</b>	Train operators & Infrastructure Managers Researchers, Students
<b>Data model</b>	Data model using terms from train operational domain tailored to algorithmic needs Configuration-based sets of parameters Programming language independent communication via REST interface
<b>Outputs</b>	Saving modified data in Viriato train scenarios Save modified trains only or all trains in a Viriato timetable scenario
<b>Prerequisites</b>	Viriato and Algorithm Platform add-on module licence
<b>Technology</b>	REST, .NET Framework, MS Windows, 64-Bit support, any arbitrary programming language capable of retrieving data from and sending data to REST interfaces
<b>Databases</b>	Oracle, MS-SQL, MS-Access