PTV GROUP
the mind of movement

PTV VISUM - MODULES

Interfaces

Public transport interface package

Timetable data from timetable information systems (HAFAS interface)	Via the HAFAS import interface, you can import network and timetable data from the HAFAS system (company HaCon). With HAFAS data you can both build up new network and update existing networks. Setting up a network with HAFAS data consists of two steps: ➡ Setup of the network data and infrastructure (coordinates, links, stops, operators etc.) ➡ Setup of the timetable (lines, line routes, run times, etc.)
railML® import	The interface enables the import of railML® files into PTV Visum. railML®-standard is directed towards railway organizations and includes aspects such as timetable, infrastructure, rolling stock, control and safety technology etc. The import to PTV Visum focuses on timetable data. Timetable data and basic information on vehicle usage are imported into an existing PuT network by matching the corresponding elements (stops etc.) through their IDs.
railML® export	The railML® export generates a xml file in line with railML®-standard version 2.1. The file contains network and time table data as well as information about the rolling stock, i.e. only the schemata *infrastructure*, *rollingstock*, and *timetable* are written.
VDV 452 import	VDV 452 is common ASCII data format for the description of public transport data. It supports, for example, the exchange of data between operational and planning divisions of public transport operators. The VDV 452 import enables the import of network and time table data into PTV Visum. Furthermore, information about fare zones and operations calendar can be taken into account. Additionally, line blocks (incl. depots, empty trips and their system routes and vehicle units) can be imported.
VDV 452 export	Corresponding to the VDV 452 import, the VDV 452 export generates the relevant files in VDV 452 format from the network, timetable and line block data maintained in Visum in order to exchange them with external systems.

Other interfaces

Timetable data from other information systems	This module provides an interface between Microbus, an IVU product, and PTV Visum. Microbus is a software package for detailed planning of public transport operations, such as timetables, operation schedules and driver rosters. The interface allows users to import timetable and vehicle scheduling data from Microbus to Visum. Here, they can then analyse and assess the scenario in terms of travel

	demand and profitability, for example. It is also possible to transfer timetable data from Visum to Microbus in order to add further details.
Business Analysis Export (SVG)	This module allows you to export the current network view as a graphic file in SVG format (Scalable Vector Graphics). The resulting files are suited for sharing model results on web pages or for further processing in external tools. The *.svg format is ideal as a graphics exchange format and offers numerous advantages compared to other graphics formats: scalability without loss in quality, rotatable and infinite zoom, embedded information on objects, interactive access to objects, manipulation through script, animation. Graphic files in the *.svg format can be imported into PTV Visum again as background images.
MS SQL interface	MS SQL interface enables the export of PTV Visum object data into a Microsoft SQL server database or import data from the database into PTV Visum.

Modules

PrT Assignment

SBA

The simulation-based assignment (SBA) is a dynamic assignment method in which temporal changes of supply and demand is taken into account. The method is particularly suitable for operational applications where oversaturation and queueing to adjacent roads is present over large parts of the network at different times and in different places. An essential feature of this assignment method is the use of a simulation for the network loading process, i.e. impedances in the network are updated considering individual vehicles moving through the network. Delays at junctions are calculated based on the junction control and the detailed node geometry.

Junction modeling package

ICA: node impedance calculation

In PTV Visum, detailed evaluation of junction performance is enabled by the module Intersection Capacity Analysis (ICA) which includes procedures of the US Highway Capacity Manual (HCM) to calculate junction performance indicators.
The ICA module includes a complex junction model that reflects best practice in traffic engineering analysis. ICA takes interdependencies between turning volumes at a junction into account, and therefore provides more realistic results of junction capacity and delay analysis. The module supports ICA calculations with respect to HCM 2000 and HCM 2010. The results of the calculation are provided in an automatically created report which lists the detailed calculation results for each node. An additional overview of the most important parameters of all nodes in the network facilitates analysis.

Junction editor

It allows you to model all junction details in a single view, from the node and turn attributes to the complete junction.
Different views show the different aspects of the junction:

- Nodes: shows the basic node attributes and the major flow
- Links: shows the attributes of all approach links of a node, e.g. the number of lanes or their geographic orientation
- Turns: shows the macroscopic attributes of all turns
- Geometry: the node model for node geometry, including lanes and lane turns
- Signal times: shows the signal times for signal group-based and stage-based signal controls

The Nodes, Links and Turns views are standard views in PTV Visum and replace the former dialogues "Edit node" and "Edit turn". The Geometry and Signal times views are only available with the Junction editor add-on.

Traffic engineering package

Vissig

Manage and process several signal programs for a fixed-time signal control. Vissig's enables you to quickly and easily access each element. It can be used to design controls that can be saved to an external file (*.sig format). They can be imported from PTV Visum into PTV Vissim or vice versa at any time.
The graphical editor integrated into Vissig enables easy editing or modifying the controls. Changed signal time plans or interstages are only few mouse clicks away. Other compelling Vissig features provided in PTV Visum and PTV Vissim are:

- Management of several intergreen matrices and signal programs
- Editing of interstages and signal time plans
- Green time optimisation
- Operation of different daily signal programs

Signal control-offset time-optimization (SCCO)

In addition to the optimization of the green time and cycle time for individual signal controllers (SC), PTV Visum also provides a way of coordinating several SCs by adjusting the offset times.
More specifically, the optimization of the SC-offset times serves to coordinate the given signal time programs of adjacent signalized junctions in such a way that the total waiting time for all vehicles is kept to a minimum. The coordination for signal controlled nodes along a corridor is aimed to allow vehicles to pass through green on all SCs on this route section (progressive signal system). In order to perform the offset time optimization, it is necessary to model the nodes in detail including their signal control and to provide the result of an assignment which represents the traffic conditions in the network.

Matrix estimation

Demand matrix correction

The demand matrix correction module allows enhancing PuT and PrT trip matrices using current count data and reference values. The new matrix data is calculated by an iterative method based on routes computed from individual OD pairs. This is for the following cases:

- A demand matrix based on empirical survey data is outdated. Goal is to update it without having to conduct a new (origin-destination) survey. The update shall be based on census data only.
- Goal is to calibrate a matrix generated from the transport network model using count volume data.
- Goal is to improve a matrix generated from incomplete or unreliable data using current and more complete/reliable count volume data.
- A survey contains the trip distance distribution, but the model does not reflect the data at the level of accuracy required.

There are two methods available to solve this problem for PuT and for PrT: TFlowFuzzy and Least Squares. The update affects the demand matrix and refers to total volumes. You can combine the following typical count and survey data:

- Link volumes
- Origin/destination travel demand per zone
- Volumes of turns at nodes or main turns at main nodes (as long as they are defined)
- Volume screenlines
- PuTpassenger trips
- Boarding/alighting passengers at stop areas
- Skim data distribution, e.g. trip distance distribution

The methods differ in the way count data are described. In TFlowFuzzy a possible range for count data is entered whereas in the Least Squares method weights are defined. Therefore the method Least Squares always produces a result.

Demand modeling (Visem or EVA)

Visem demand calculation

This model is based on the concatenation of activities that create a "mobility program". The population is divided into "behaviour groups" for typical trip chains (e.g. employees with a car, pupils ...). Calculations performed with Visem also consider socio-demographic and transportation policy issues.
Visem calculates three logical work units: trip generation, trip distribution and mode choice. These logical units are interlocked. Trip distribution and mode choice are calculated simultaneously, with a single method. For all three work units, the calculations are based on the behaviour-homogenous groups and activity chains.

EVA demand calculation method

This method provides an alternative approach for three stages (trip generation, trip distribution and mode choice) of the conventional 4-stage traffic planning model. Developed by Prof. Lohse (Dresden University of Technology), this new model is characterized by a variety of features:

- Method of balancing the differences between origin and destination traffic: If trip generation and trip distribution are calculated independently, i.e. one after the other and above all separately for each activity pair as in the standard 4-stage model, differences frequently occur between the origin and destination traffic of the zones. The EVA model links generation and distribution by an explicit constraints step to make up for the differences.
- Simultaneous calculation of destination choice and mode choice: In the EVA model, trip distribution and mode choice are performed simultaneously, i.e. by applying a one-stage discrete choice model to three-dimensional utility matrices indexed according to origin zone, destination zone and mode.

Tour based freight modeling

Tour based freight modeling

This module allows the modelling of tour-patterns of different economic sectors, for example agriculture, construction, and healthcare, and different vehicle types (delivery concepts) such as lorries, vans and cars. The demand model consists of two procedures: generation and distribution; followed by the calculation of tours and subsequent trip matrices.
The first procedure is trip generation and distribution which is similar to the corresponding calculations of the standard 4-step-model, but with some extensions for modelling interrelations between the sectors. The model does not cover a mode choice step, as the segmentation into vehicle types is an input. The output from this procedure are matrices of 'orders' or 'jobs' between origin-destination pairs.
The second procedure is where special characteristics of commercial traffic are introduced into the model. This procedure groups 'orders' or 'jobs' of the same purpose into single vehicle tours in an aggregated, macroscopic manner. Thus, the procedure transforms the order-based distribution matrices generated by the first procedure into vehicle tours which are then converted in to trip matrices for assignment. The internal assessment of the tours is driven by the Savings algorithm, which is widely used for tour optimization in the logistics industry.

Emission calculation package

Environment module calculation of noise emissions RLS ´90

The PTV Visum add-on module Environment calculates environmental impacts such as noise and pollutants caused by motorised private transport. Results are presented in graphs and tables. The following models are available for calculating environmental impacts:

- Calculation of noise emission levels according to 'RLS-90'
- Calculation of air pollution emissions in accordance with emission factors of the Swiss Federal Office for the Environment (FOEN)

Environment module pollution calculation HBEFA

Prediction of road emissions and fuel consumption is becoming increasingly important for evaluation of environmental policies and infrastructural developments. Since Feb. 2010, the new HBEFA (Handbook emission factors for road transport) is available. Meet the ever more stringent legislation for traffic in cities using this module for your planning.

Toll modelling

TRIBUT

The TRIBUT module contains a special PrT assignment method that accounts for road toll. "Conventional" approaches use a constant value of time to calculate road toll. Basically costs (toll fees) are then converted into time and standard mono-criteria assignment methods can be directly applied. Unlike the conventional approach, TRIBUT applies a random time value. Therefore, TRIBUT calculates the route search and choice based on two separate sets of criteria: time and costs (bi-criteria). During the last few years, this method has been applied to evaluate privately funded toll motorways in France. In contrast to the conventional approach, it is characterised by a more realistic price elasticity concerning the use of toll roads.

PTV Visum Safety

Safety

The Safety module adds a road safety dimension to your traffic model. Using the module, you will be able to import and analyse accident data. One of its functions is filtering data and providing a clear overview of this on the transport network. Thanks to the Heatmap, accident black spots are available at a glance and are displayed in line with the criteria you have chosen to set. Black spots can be generated and stored manually or automatically for subsequent analysis. With the reporting function, you receive detailed information about each and every accident. Group evaluation enables you to identify similarities between accidents and draw conclusions for traffic planning purposes.

Timetable management package

Graphical timetable editor

The graphical timetable editor complements the tabular one since its display options provide an optimum overview of the current planning status and trip-related information:

- Display and editing of all or selected timetable trips in time-distance or distance-time diagrams
- Display of one or several lines, selection of stops for display, control of order of stops
- Trip-differentiated display according to certain attributes (e.g. day, line, vehicle type, operator, etc.)
- Intelligent combination of tabular and graphical display for selection, insertion, editing and deleting of trips
- Visualisation of additional service trip details, e.g. number of passengers per route section per trip (based on assignments), automatic passenger count results or the deviations between actual and scheduled departure times
- In the time-distance diagram you can also show the assignment of individual trips to blocks
- The blocks can be displayed in bar diagrams (Gantt charts) for interactive editing

Calendar

Using the Calendar module, you can show and edit a weekly or an annual timetable in PTV Visum. Thereby the service days are shown. It is also possible to show a specific service on weekdays or to define special regulations for holidays. Additionally, when importing data from timetable and service programs, you can transfer complete timetables.

- Weekly calendar: You can describe the travel demand and PuT services for each day of the week, determine the weekday schedule for each line or enter a projection for each day.
- Annual timetable: In the network model, you are able to specify a period (e.g. "daily" or "Sat. 5/18/10") for the service days.

Sharing

Vehicle Sharing

This module introduces Vehicle Sharing Systems (e.g. Car- or bike sharing) in a macroscopic transport model. It enables to answer questions about planning, dimensioning and usage of vehicle sharing systems.
This module is an extension of the time table- based assignment and as such it consider path legs and transfers between sharing systems and classic Public Transport supply. Three types of sharing systems can be distinguished and be depicted by this model:

- Station-bound systems
  a) With free choice of return system (one- way system)
  b) Exclusive return at renting station (round trip)
- Free floating systems

The procedure results are available as PuT path legs. Therefore, the variety of public transport evaluations of PTV Visum can be used.

Onboard survey

Passenger onboard survey and e-ticketing data

Passenger surveys usually do not include the passengers' complete trip within the PuT network - especially when they transfer several times or who walk from one stop to another to transfer. In general the following data is gathered when boarding the vehicle :

- Boarding stop on the survey line
- Alighting stop on the survey line,
- Initial boarding stop of the trip,
- Final stop of the trip and
- other trip details (e.g. type of ticket, purpose of the journey)

The module is used to check and complement trip-based passenger information. It is primarily based on computer-aided modelling of the survey-relevant PuT supply and on parameters for reconstructing incomplete or correcting wrong trip data.
From route information and by means of so-called direct assignment, a PTV Visum version file is created. It allows you to perform all common procedures, e.g. route evaluation according to the number of traversed zones, the generation of demand matrices and visualisation of passenger volumes per links, stops, and lines.

Line costing and revenue calculation

Line costing and revenue calculation

This module enables to analyzing the efficiency and cost recovery level of a PuT system, its service units and service lines. The results can be separated by operators and service areas. The costs are calculated based on vehicle deployment, the use of stops and routes as well as on general, operator-specific attributes and the respective rates.

Detailed line blocking

Detailed line blocking *(requires line costing & revenue calculation as well as graphical timetable editor)*

The detailed line blocking module extends the basic line blocking functionality provided by the Line Costing module.

- Vehicle deployment can be further optimised by allowing to choose from a set of suitable vehicle combinations.
- Forced chainings can be modelled as previous or successive relations.
- Secondary criteria can be used for a systematic selection among equally good solutions.

You can assign a number of possible vehicle types to a trip. During the optimisation procedure the vehicle type is chosen that allows for a minimum deployment of vehicles. For vehicle selection, the software can also consider passenger volumes calculated during assignment or based on survey data as well as the vehicle's capacity to ensure demand-optimised vehicle deployment.
Note:The modules Graphical timetable editor and Line Costing are required for line blocking and represent the basis for use of the detailed line blocking module.

Schematic line diagram

Schematic line diagram

The Schematic Line Diagram (also known as Timetable-network-graph) is used for visualizing a Public Transport network and time-table in a schematic display known from network maps provided by many Public Transport organizations. This kind of display supports the planning of Public Transport supply by providing a quick overview on connections and line routes. Extensive graphics parameters, bars and labeling options allow presenting the most important aspects like service frequencies, departure times, service type, operators or model results like capacities, volumes or transfer flows in an informative and intuitive way. The initial positioning of the stops and routing of edges is supported by automated positioning algorithms, but can be adapted manually. The smart data model allows transferring a layout to other variants of a network or time-table, thus minimizing the effort for maintaining the diagram. The possibility to export the graphic to SVG allows passing it to other departments post-processing for customer information

Distributed computing

Distributed Computing	This module allows to distribute the calculation of selected procedures or scenarios of a Visum project across several computation nodes. Thereby, the procedures or scenarios are evaluated simultaneously making the results be quicker available for analysis and evaluation. The computation nodes must be connected over the network and require matching, licensed versions of Visum to be installed, which are bundled into a license group. The distributed computation on these nodes is controlled from the project view opened in one of the Visum installation. All input data and results are transferred to/from the computation nodes automatically. It is possible to limit the availability for distributed computing of individual computation nodes to specific time windows in order to reserve their resources for other purposes.

PTV Visum Engine

PTV Visum Engine	To fully leverage the potential of distributed computing, PTV offers a new license scheme at reduced costs for exclusive usage as computation nodes in distributed computing. Therefore, such licenses can only be used in conjunction with a full Visum license with the add-on module "Distributed computing".