

# ptv vision

PTV Vision Public Transport: Solutions for Public Transport



# Understanding Public Transportation

Developing sustainable solutions – public transportation offers the potential for safe and efficient transportation. Achieving this potential requires planning from all three levels – strategic, service and operations.

Public transport timetables strike a balance between market demand and technological capabilities. They are complex products, developed through planning models. However, the most perfectly planned timetable, if it does not address operational considerations, will cause delays and interruptions in service – and won't be worth the effort to develop them. The only way to avoid these problems and the related costs is to incorporate operational traffic data and constraints into the planning models.

This feedback allows experience from operations to be taken into account in the planning process.

Beyond operations, the planning process should be sensitive to the fact that demand and operational quality influence one another. This process must be supported by passenger count data and survey data.

Modern IT solutions for public transportation need to support the integrated planning approach.

## **Our mission**

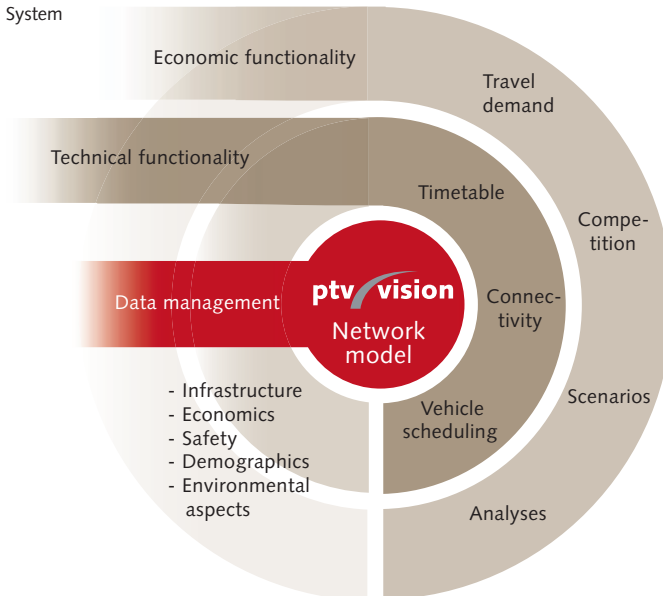
PTV is committed to sustainable mobility. "Sustainability" means, ensuring transport remains economically and ecologically viable in the years to come. Worldwide, public transport will play a major role to achieve sustainable transportation. PTV AG, being strongly committed to this mission, has developed PTV Vision Public Transport.

## **Our service**

PTV Vision is the world's only integrated software suite that can analyse passenger demand and operations and incorporate intermodal aspects of ridership analysis, planning, impact analysis and monitoring, quality control and capacity analysis.



Structure of an Integrated Planning System



## Identifying Potentials – Improving Service Quality

Public transport projects aim to achieve three types of goals:

### Economic goals

- ▶ Investing budgeted funds efficiently
- ▶ Reducing costs
- ▶ Increasing revenues
- ▶ Entering new markets

### Technical goals

- ▶ Improving service quality and operational performance
- ▶ Enhancing customer information systems
- ▶ Monitoring and analysing quality performance

### Political goals

- ▶ Documenting decision-making processes
- ▶ Supporting public outreach
- ▶ Improving transparency
- ▶ Making regions more attractive
- ▶ Encouraging modal shifts
- ▶ Protecting the environment
- ▶ Finding sustainable solutions

### Our customers

PTV Vision supports governments, operating companies, transport federations, regional agencies and consultancies in the domain of public transport.

### PTV Vision Public Transportation Analysis

PTV Vision Public Transportation supports our customers at planning, analysis, data integration, information management and providing sustainable solutions for public transportation. PTV Vision Public Transportation provides value in four distinct stages:

#### Basic planning and analysis

- ▶ Demand, supply, competition
- ▶ Accessibility, connectivity, service quality
- ▶ Scenario, sensitivity and impact analysis
- ▶ Capacity and utilisation, line and network performance

#### Integration of network, operations and ridership data

- ▶ Data acquisition, aggregation, validation, supply
- ▶ Data integration
- ▶ Comprehensive presentation and visualisation

#### Monitoring of implementation and impacts

- ▶ Actual/target comparisons for quality monitoring
- ▶ Benchmarking
- ▶ Quality assessment
- ▶ Visualisation
- ▶ Public outreach

#### Conclusions and policy development

- ▶ Quality management
- ▶ Modifications to infrastructure, service, prices
- ▶ Protecting the value of investments
- ▶ Resource planning
- ▶ Improving planning models
- ▶ Interpolation / extrapolation based on modelling, evaluating alternatives

# Integrating Data – Leveraging GIS Functionality

PTV Vision is a versatile impact model for simulating and evaluating complex scenarios for decision-makers. The data models meet all the requirements for service planning and operations planning; and it is compatible with passenger information systems, automated passenger count systems and automated vehicle location systems.

**The model covers:**

- ▶ Stops and stations with stop areas and stop points, assigned tariff zones
- ▶ Links in each transport system with lengths and run and dwell times
- ▶ Line routes with stops, stop points and other alignment points
- ▶ Calendar and service days
- ▶ Tariff zones and ticket types
- ▶ Traffic analysis zones with network connectors
- ▶ Analysis districts, which can be based on cities, towns, counties

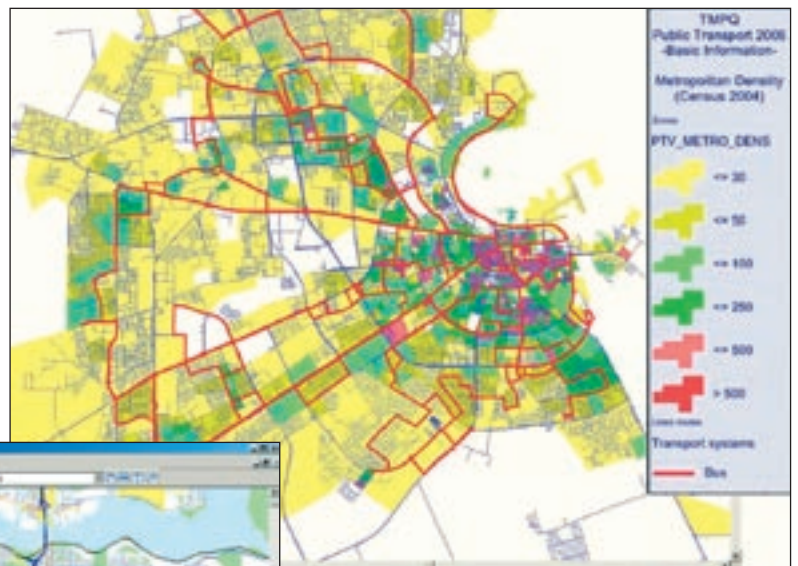
PTV Vision utilises a GIS compatible digital map with railways, roads and additional information. However, the underlying data model contains much more than network elements. It also includes multiple spatial units and points for identifying locations in the network and capturing relevant information such as the locations of work places, schools, public institutions and shopping centres. The data model can be

scaled and adapted to various applications, while specific requirements can be met by defining fully customisable attributes as needed. PTV Vision offers many features of a geographic information system (GIS):

- ▶ Pasting, moving and deleting objects on the map with consistency check
- ▶ Easy toggling between graphs and tables
- ▶ Combining objects for various purposes, such as determining the number of residents or work places in areas served by public transport stops or corridors.

PTV Vision also features standardised interfaces for exchanging data with existing GIS.

Digital Network Model for TransLink, Vancouver, Canada



Bus Network Overlaid over a Population Density Map in Doha, Qatar

# Managing Data Consistently – Planning Comprehensively

PTV Vision offers a wide range of features for network and service planning. Its core functionality includes designing, analysing and rendering timetables. This allows you to describe and evaluate your service.

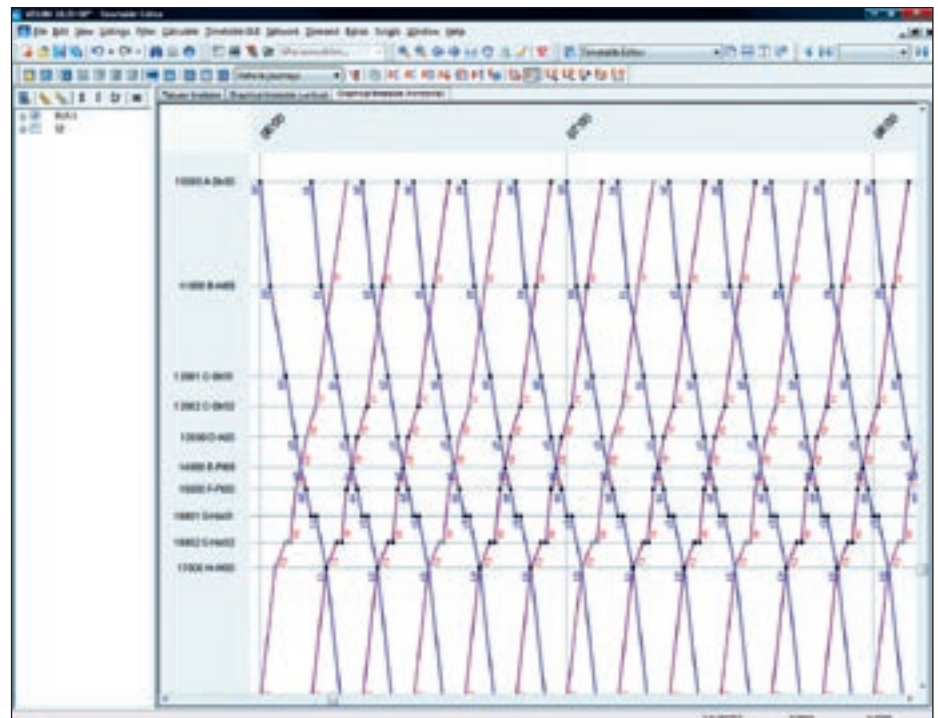
Transport stops and links provide the basic topographical data for interactive service planning. Line routes can be designed or modified easily and effortlessly with a few mouse-clicks on a couple of alignment points. Since all line routes are represented on a digital map and thoroughly checked for errors, the data remain always consistent.

You can visualise timetables in graphics or tables using a wide array of options – either for simple, average day types or broken down by calendar day for each individual trip.

Vehicle types and multiple units are user-definable including cost function and capacity. Multiple units can be assigned to lines, to individual trips or even to segments of a trip to simulate coupling/decoupling of trains.

A line blocking routine allows you to estimate how many vehicles would be required in each scenario. The resulting blocks can be analysed and visualised in tables or graphics.

For added support in timetables development, you can easily generate run time profiles. Run and dwell times and lengths can be automatically derived from the network

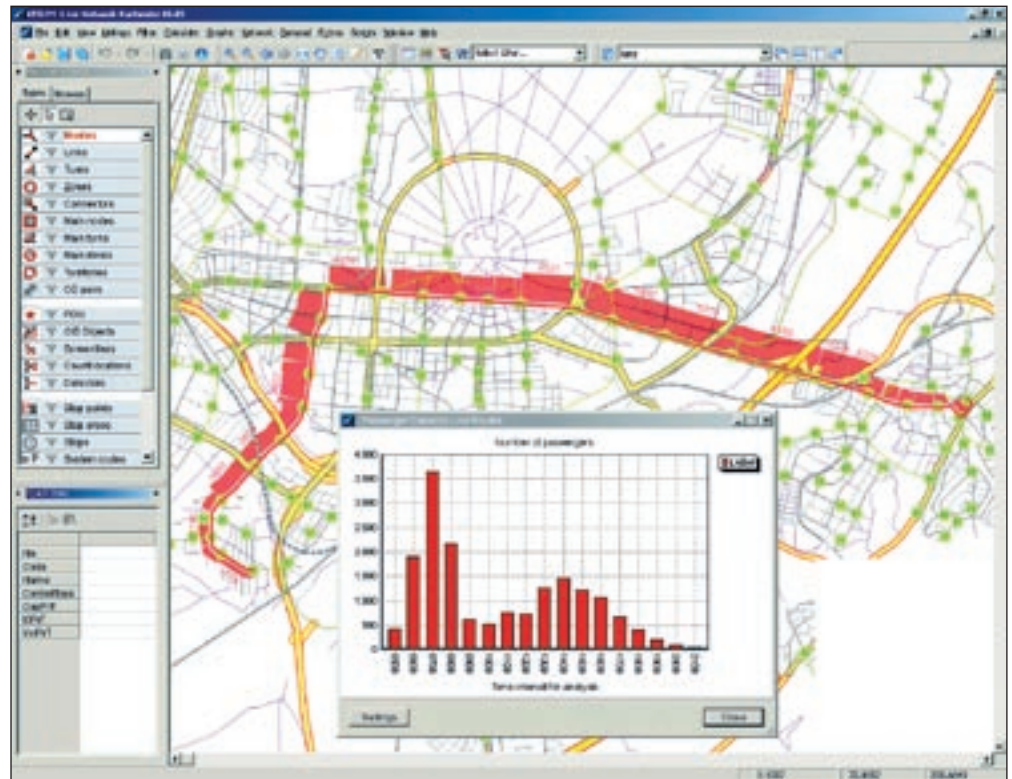


Line Timetable as a  
Time Space Diagram

structure or edited manually. The system also offers numerous layout options for presentations and powerful features for editing timetables in tabular and graphical form (in a time space diagram).

A special network-related graphic helps you to present and edit arrival and transfer times at transfer hubs.

VISUM Model for Karlsruhe:  
Time distribution of passenger  
boardings for a selected line  
route segment



## Linking Supply and Demand – Optimising Capacity

What sets PTV Vision apart is the integration of ridership models with operations and network analysis.

Ridership data can be incorporated from the following sources:

- ▶ Manual or automatic boarding counts
- ▶ Passenger surveys which collect the origins and destinations of passenger trips and/or the itineraries
- ▶ Electronic ticketing systems
- ▶ Travel demand models that use land use data, behavioural assumptions and transport supply properties

With PTV Vision, you can present, analyse and edit demand information ranging from purely quantitative data to origin-destination matrices, broken down by time (type of day, time interval, etc.) or demand stratum (trip purpose, ticket type, passenger demographics, etc.).

Traffic assignment is the main tool used to link supply and demand. It simulates passenger behaviour in order to calculate the routes taken by passengers in the network.

PTV Vision offers several distinct state-of-the-art methods of simulation:

- ▶ System-based assignment for identifying desired lines
- ▶ Headway-based assignment for impact analyses in planning scenarios without detailed timetables
- ▶ Timetable-based assignment for plans and analyses with complex link and connection situations

Just import timetable and network data into VISUM, and you can immediately perform in-depth analyses on service frequencies for stops, links, lines, zones or relationships – broken down by time and distance. You can even determine and

visualise the accessibility of central points such as public institutions, companies and schools.

Supply and demand are presented together so you can perform sophisticated analyses and presentations in tabular and graphical form. Besides conventional presentations of passenger volume and utilisation by stop, link, line and trip, there are also flow bundles that represent the number of passengers on selected routes between origins and destinations. These passenger flows provide a powerful tool for estimating the impacts of line route changes due to construction or road closures.

# Getting Results with PTV Vision – And its Time-Dynamic Analysis

Governments, operating companies and transit agencies have to address technical, economic and political questions. PTV Vision offers to measure impacts in all areas and allows developing solutions that are efficient and sustainable at the same time.

The combination of GIS and network/service planning functions provides users with a wide range of application areas:

- ▶ Transit agencies can use it to develop master plans and issue calls for competitive bidding of transit services
- ▶ Operating companies can use it to plan lines and networks in detail based on navigation networks
- ▶ Transport federations can use it to visualise their entire network on one map, run coordinated analysis of intermodal operations and feed the complete picture into the passenger information systems.

Cost and revenue estimates play a key role in these efforts. Cost rates are assigned to stops, links, vehicle types and operators so each line's costs can be calculated and presented in detail. With PTV Vision, you can estimate revenues and thus contribution margins for each line and zone. Passenger volumes on individual lines can be assigned value-based on revenue rates in the tariff model. The program visualises line performance and line costing results

as well as the network performance for individual operators, branches, lines, line bundles or zones.

The PTV Vision-based count data management system helps you to harness the full power of your automated passenger counting (APC) system and to evaluate and to visualise APC data in many different ways.

The impact analysis is dynamic with respect to a particular day or service time. If you wish, you can view a particular day in its entirety, or broken down by hour

group in PTV Vision. Likewise, you can model an entire year in the calendar or use various types of days.

Another way of dynamically presenting data is in vehicle and pedestrian simulations and interactions.

With VISSIM, a PTV Vision module, and VISSIM Pedestrian, you can simulate and analyse traffic flows within the public transport infrastructure in order to develop effective solutions – such as buslanes, traffic signal priority or appropriately sized pedestrian facilities.

Traffic planners can run multiple whatif scenarios and perform exhaustive sensitivity analyses with PTV Vision.

Bus lane simulation in Abu Dhabi using VISSIM





# Using PTV Vision as a Data Warehouse – Making Rock-Solid Decisions

In addition to its powerful planning features, PTV Vision is also an excellent platform for consolidating and integrating data from a variety of sources.

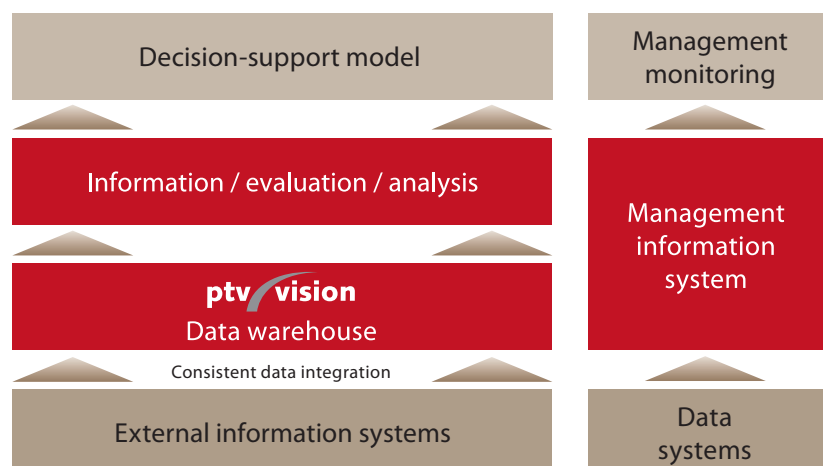
The PTV Vision data model has a wide multi-layered, flexible structure. PTV Vision is an open system that supports modern data standards (ODBC, XML, SVG and others) and is compatible to all kinds of programming languages, third-party software and data models of private and public transportation. Automated interfaces exist to software such as HAFAS and MicroBus.

Thus, the transit data warehouse in PTV Vision can incorporate data from scheduling systems, geographic information systems (GIS), stop and vehicle data bases, automated passenger count systems (APC), other ridership surveys, and automated vehicle location systems (AVL). After all, what makes a data model valuable is not the individual data records, but rather its ability to interlink records and thus add value. The final solution is an up-to-date and intermodal transit data warehouse.

PTV Vision allows you to use the same information structure to analyse existing data and forecasts. That way, scenarios can be compared and the differences visualised and as a result, PTV Vision can contribute significantly to decision making.

The PTV Vision data model and interface concept provide a powerful platform for integrating otherwise isolated data records. Integration in a data warehouse offers countless benefits and extra value in terms of referential analyses, presentations and evaluations. It also gives you a wide range of tools in order to address technical, economic and political issues.

Data management with PTV Vision



# Benefiting from Personal Support – Running Customised Applications

PTV Vision is utilised by a wide variety of people: from relative novices, who use it only occasionally to experienced power users. Given the constant growth in functionality, PTV offers different levels of service to make sure that the solution responds to the individual needs and background of each customer.

## Data Viewer – focus on visualisation

Sometimes, companies need simple, lowcost access to selected data or results from a specific use case - especially for inexperienced users. Data Viewer formats this information in tabular and graphical form so users can present and print out the data in PTV Vision using a simple toolbar. Users can easily activate functions such as moving or zooming in on a map section.

## Traffic Studio – the customised solution

Traffic Studio helps to structure complex in-house processes and establish effective workflows.

With this personalised blend of software, necessary data and application expertise, you will always use PTV Vision efficiently, regardless of your own level of experience. Traffic Studio's functionality can include data selection, evaluations, presentations and planning.

## Scripting – customise-it-yourself

Power users can program their own PTV Vision workflows in VBS, VBA, Python or other standard programming languages in order to handle recurring processes reliably and effectively, or to integrate external processes right into PTV Vision workflows.

You can use this feature yourself or have PTV develop scripts for you as an added service.

## System analysis and model design

We will analyse your requirements and objectives and develop customised solutions with hardware, software, data and industry expertise.

## Turn-key solutions

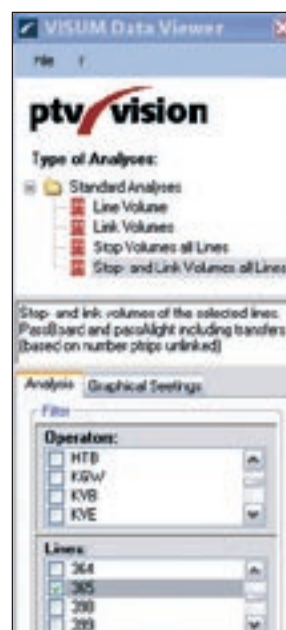
In addition to providing the software itself, PTV also performs consulting services of building, updating and technology transfer of public transportation planning

models customised for your specific needs. With this approach, PTV will help you be ready for your first application.

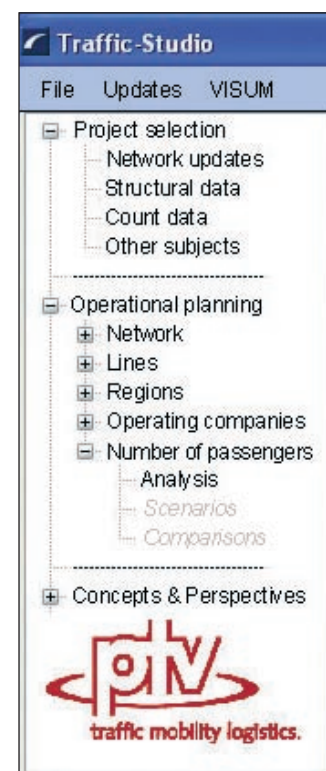
## Long-term use

We maintain a long-term relationship with our users, – with an assisting and supporting role – to make the individual applications more efficient over time. Successes are shared through our online community and through active User Group Meetings globally (including North America, Germany, China, Middle East).

PTV Vision Data Viewer



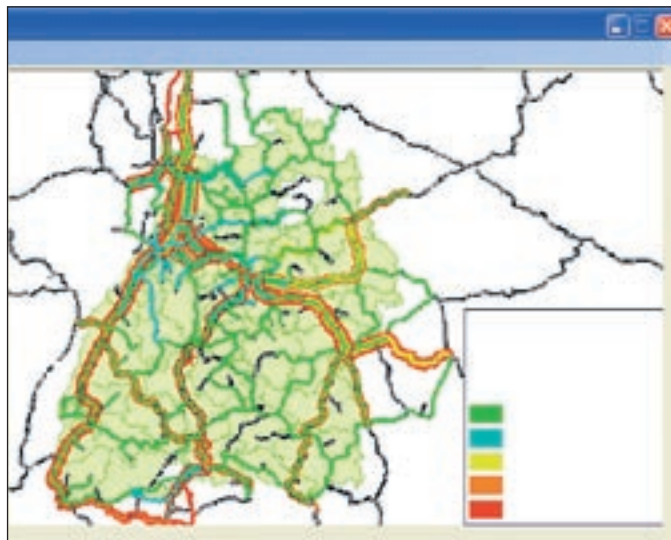
Traffic Studio



## PTV Vision Public Transportation – Success Stories

### NVBW / Management Studio

NVBW plans and manages all local rail transport in the State of Baden-Württemberg, Germany. Its responsibilities include preparing competitive bidding, issuing calls for bids, and marketing and monitoring local rail service throughout the State. NVBW utilises a special toolkit to handle all these responsibilities effectively and efficiently. Known as NVBW Management Studio, it was developed based on PTV Vision Public Transport and Traffic Studio. Its main modules include an NVBW traffic model that maps supply and demand as well as a customised user interface that contains all central workflows.



NVBW Transport Model in PTV Vision Management Studio

The transportation model is designed as a PTV Vision data warehouse and supplied with data from various sources (including timetable, passenger count and link network data). NVBW Management Studio calls directly specific PTV Vision procedures and functions, integrates and consolidates third-party data, and analyses and evaluates the data in the data warehouse. Various measures can be developed, presented and their impacts analysed from a traffic and technical perspective. This is an excellent way to answer technical planning questions, address economic and environmental issues and prepare for traffic policy decisions.



### ÖBB / Supernova

ÖBB Personenverkehr AG is Austria's largest provider of rail- and bus-based mobility services. Each year, it transports 200 million passengers by rail and 247 million by bus.

ÖBB developed the largest transportation model in use in Austria with PTV Vision: Supernova. It contains all the trains, regional buses, and urban transport services in Austria, as well as selected trains in neighbouring countries. Supernova was designed to optimise transport service based on demand studies of public and

private passenger transport. Essentially, Supernova is a supply evaluation tool that allows ÖBB to compare and assess timetable scenarios and infrastructure projects.

In local transport, it is used to develop and map rail transport plans for Austria's States; in long-distance transport, it models transalpine routes or operating plans for Vienna's new central train station starting in 2012.

Traffic relationships are calculated to resolve intermodal questions. Internal controlling is supported by calculating coefficients for revenue sharing of intermodal passenger trips. This integrated transport model provides the framework needed to develop, evaluate and present scenarios for decision-makers of various levels.

SkyTrain – an Automated Light Rail Transportation System in Vancouver, Canada



## PTV Vision Public Transportation – Success Stories

### TransLink's Regional Transit Model, Vancouver/ Canada

Metro Vancouver in western Canada is home to 2.2 million people who took 175 million trips on public transport systems in 2007. Market shares for public transportation have been increasing significantly over the last several years.

TransLink is a cross-regional authority responsible for planning and marketing public passenger transport, developing the fare system and coordinating, integrating various operating companies and more. Its multimodal public passenger transport system includes several bus systems, commuter rail, ferries and its backbone, the SkyTrain, a 49 km long automated rapid transit system that carries over 230,000 passengers per day. Three additional rapid transit lines are either in construction or in planning to open over the next few years.

TransLink in consultation with PTV developed a VISUM transportation model for the region's entire transit system and explored many different scenarios: Different line routings and train assignment (2008). Service and operating options for various scenarios of future rail operations (2011, 2014, 2021). Fleet strategies and long-term fleet requirements for SkyTrain Bus network and service adjustments and timetable modifications.

Multiple performance measures covering the passenger and the operator's impact are computed and compared across all the scenarios. The demand model was calibrated based on count data and OD matrices, while results from the new automated passenger counting system were used extensively in the calibration and validation process. The transport model covers 24-hours of an average operating day and supplies all statistics and performance measures down to 30-minute intervals within the day. The operating model was calibrated using operational statistics (train kilometers per line, number of blocks, vehicle assignment time).

After two successful pilot applications of the model, the model is now widely accepted and contributes to all transit capital investment projects in the Region as TransLink's official transit operations planning tool.

### Dubai – Bus Master Plan

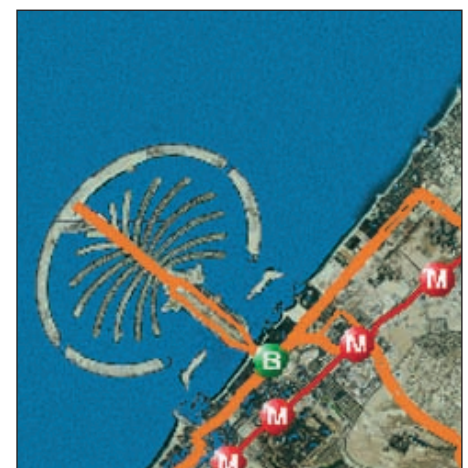
Dubai is one of the fastest-growing cities on the planet. It is currently home to 1.4 million people; this number is expected to reach 2.3 million by 2010, and 5.2 million by 2020. This rapid growth will have an enormous impact on traffic volumes. In 2008, public transport accounts for less than 5% of total local transport. The current bus network of 70 lines is serviced by around 500 vehicles. This is set to change: new metro lines and a restructuring of the bus system are expected to raise the transit share to 26% of all motorised trips by 2010.

The Roads & Transport Authority (RTA) of the Emirate of Dubai hired PTV to analyse and forecast supply and demand up to 2020 as part of its bus master planning process. The project included the following phases:

- ▶ Analysing the existing bus system
- ▶ Developing a manual for planning and quality guidelines
- ▶ Developing and assessing bus networks with multiple time horizons

PTV Vision was used for all these activities. Based on the demand forecasts, RTA and PTV developed line networks that effectively connect local feeder networks with express buses and the metro system. Bus rapid transit programs were analysed using a VISSIM-generated traffic simulation.

Metro and Express Bus Network, Dubai (Section)



# PTV Vision – for Better Public Transportation

## Focus on public transportation

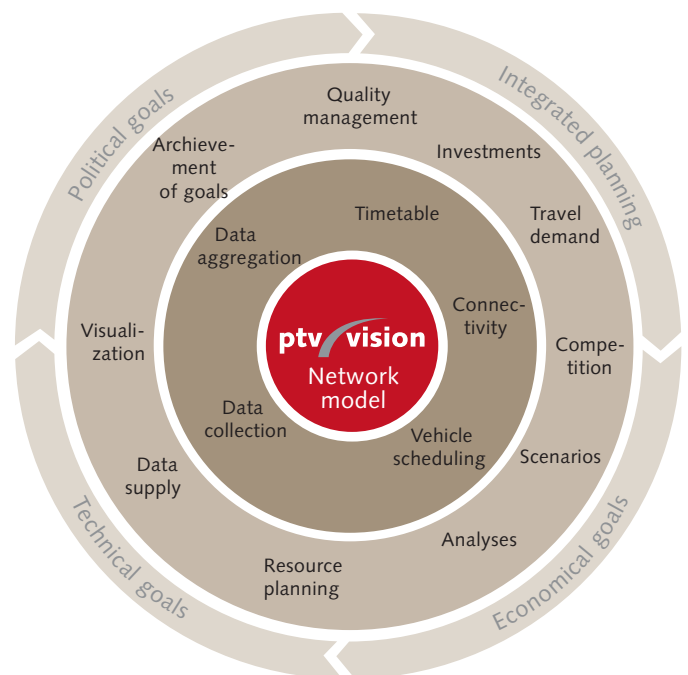
Today's transit must be attractive to existing as well as to potential passengers. Expectations are high for both service quality and cost efficiency. These are challenging times for decisions makers. Around the globe, PTV Vision has assisted to better decisions making. PTV Vision offers a complete and integrated picture of the complex interrelationships between operations, service quality and passenger demand.

## Target group

- ▶ Governments
- ▶ Transit agencies
- ▶ Transit federations
- ▶ Operating companies
- ▶ Consulting firms

## Possible applications

- ▶ Answers to strategic questions
- ▶ Solutions for operational decisions
- ▶ Integrating supply and demand data
- ▶ Designing and planning of transit route networks
- ▶ Time-dynamic simulation of individual projects or corridors
- ▶ Cost benefit evaluations
- ▶ Monitoring of route performance and costing/revenue analysis
- ▶ Planning and evaluation of line bundles



## Key advantages

### Economic:

- ▶ Allocate resources effectively
- ▶ Find opportunities for cost-reduction and optimisation
- ▶ Identify new business and revenue opportunities

### Technical:

- ▶ Integrate many different sources (timetable, count, network, demand data) in a single data model
- ▶ Boost quality of service
- ▶ Enhance customer information
- ▶ Analyse connectivity and service quality of transport systems and subsystems

Integration of Planning, Operations Analysis and Implementation

For more information and the latest news about our products and services, visit us on the Internet at: [www.ptv-vision.de](http://www.ptv-vision.de)

### Political:

- ▶ Thoroughly research options prior to making decisions
- ▶ Support your public outreach
- ▶ Establish a common ground where government and operating companies can work together