

ptv **vision**

VISSIM – State-of-the-Art Multi-Modal Simulation



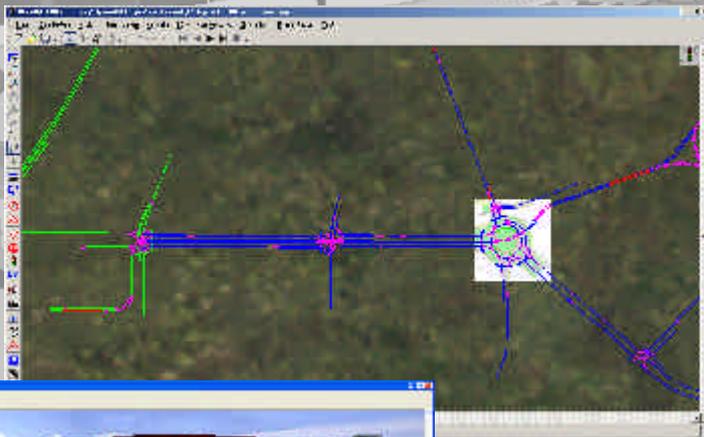
# VISSIM

## Microscopic Simulation

VISSIM is a microscopic simulation model and a component of the PTV Vision® suite. It is the most powerful tool available for simulating multi-modal traffic flows, including cars, trucks, buses, heavy rail, trams, LRT, bicyclists and pedestrians. Its flexible network structure provides the user with the confidence to know they can model any type of geometric configuration or unique operational/driver behavior encountered within the transportation system.

What are typical VISSIM applications? VISSIM is used for a host of traffic and transit (public transport) simulation needs. Common applications include:

- ▶ Freeway and arterial corridor studies
- ▶ Subarea planning studies
- ▶ Evacuation planning
- ▶ Freeway management strategy development
- ▶ Traffic calming schemes
- ▶ Light rail/bus rapid transit studies
- ▶ Transit signal priority evaluations
- ▶ Transit center/bus mall designs
- ▶ Railroad grade crossing analyses
- ▶ Toll plaza evaluations
- ▶ Environmental impact studies
- ▶ Intelligent Transportation Systems (ITS) assessments
- ▶ Current and future traffic management schemes
- ▶ Airport studies for landside and airside traffic



2D view of network structure



Detailed 3D view animation

# VISSIM Features - A Close Up View

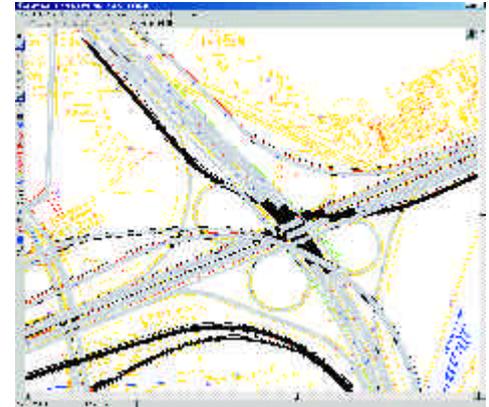
## What Makes VISSIM Special?

VISSIM is based on decades of intensive research at various academic institutions. Core algorithms are well documented. Open interfaces provide compatibility with external software. Its link-connector topology allows the highest versatility combined with vehicle movements in a detailed 1/10s resolution. Being on the market since 1992 VISSIM is setting the standard for simulation software; intensive research and a large user community worldwide guarantee VISSIM to be the leading edge software of its kind. Furthermore, the PTV Vision suite has been the first of its kind to integrate microscopic simulation with strategic transport planning/travel demand modeling.

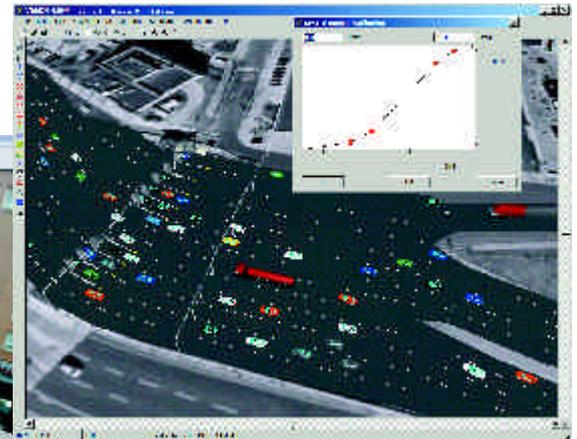
## Network

VISSIM has been used to analyze networks of all sizes ranging from individual intersections to entire metropolitan areas. Within these transportation networks, VISSIM is able to model all roadway functional classifications from freeways (motorways) to driveways. VISSIM's breadth of network applications also includes transit, bicycle and pedestrian facilities. Many common, as well as unique, geometric and operational conditions exist throughout the transportation system that VISSIM can simulate.

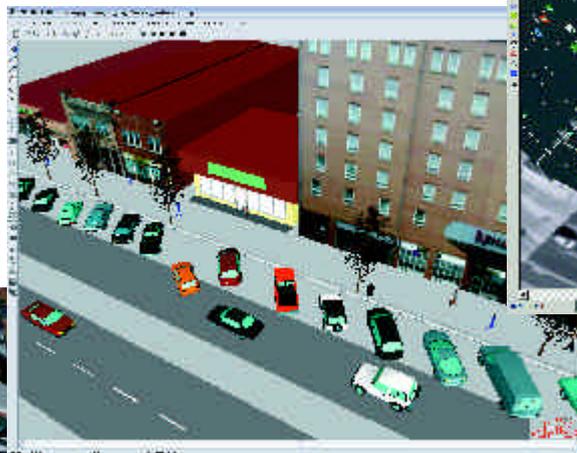
Some examples include:



*Complex freeway interchange, Concord, CA*



*Toll plaza, Camden, NJ*



*Diagonal parking, New York, NY*



*Multi-lane roundabout  
Edinburgh, UK*

- ▶ Multi-lane freeways, interchanges, roadway grades
- ▶ HOV (High Occupancy Vehicles) and HOT (High Occupancy Toll) lanes
- ▶ Merging and weaving areas
- ▶ Complex signalized and unsignalized intersections
- ▶ U-turns, exclusive lanes, mixed flow lanes
- ▶ 2-way left turn lanes
- ▶ Bike lanes
- ▶ Multi-modal lane sharing and passing (e.g., bikes and cars)
- ▶ Angle and parallel parking
- ▶ Roundabouts, continuous flow intersections
- ▶ Airport curbside drop-off areas
- ▶ Exclusive lanes, mixed-flow lanes, queue jumps, queue-bypass lanes
- ▶ Transit stops, terminals
- ▶ Center and side-running LRT alignments
- ▶ Pedestrian queuing
- ▶ Railroad lines

**Traffic Volumes**

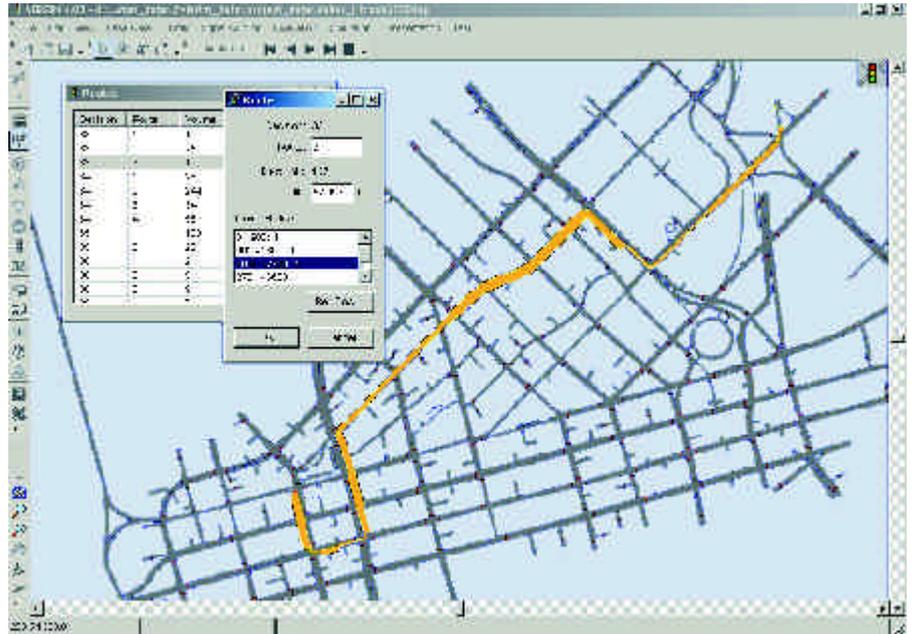
An unlimited number of vehicle types exist in VISSIM allowing the user to model a full range of multi-modal operations. These vehicle types include cars, trucks, vehicles equipped with route guidance systems, buses, heavy rail and light rail vehicles, bicyclists, wheelchairs, pedestrians and even aircraft.

VISSIM also offers the unprecedented ability to assign these vehicles to the network using one or a combination of three methods. The basic method assumes that traffic is stochastically distributed over Fixed Routes from user-definable start to end points. For coding intersection turning movement counts, these start and end points cover a single intersection, but they can also continue through multiple intersections (e.g., freeway interchange) or even the entire study area. Dynamic Routes allow traffic to be dynamically assigned to user-specified paths when specific events occur. One example of Dynamic Routes is the assignment of vehicles to a railroad underpass only when the railroad grade crossing is occupied on the more commonly traveled path.

Dynamic Traffic Assignment (DTA) allows VISSIM to assign traffic to the network using origin/destination matrices (time- and vehicle class-dependent) and travel cost stochastic assignment techniques. Origin/destination matrices can be generated using the integrated demand model of VISUM with its advanced matrix estimation and calibration functionality.

**Transit (Public Transport)**

VISSIM has long been the software of choice for transit related studies including bus rapid transit, light rail transit and multi-modal transit terminals. Besides being able to analyze the transit related network and signal control aspects listed in the previous sections, VISSIM models transit routes, various transit vehicle types, schedules, stops, stop types and dwell times.

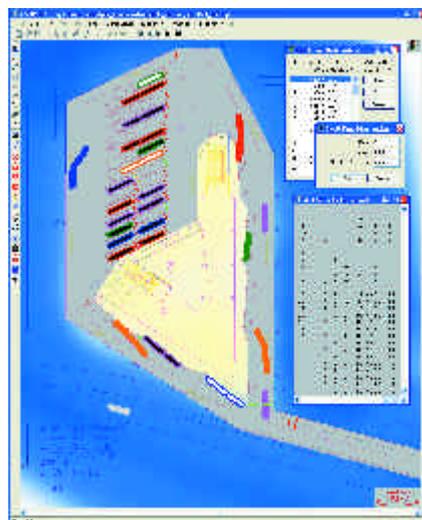


*Shortest Path Search in Dallas, TX*

The user has three choices for modeling dwell times in VISSIM. The first is a normal distribution where an average dwell time and standard deviation are specified. The second is an empirical curve where the user defines the probability of various dwell times. The last is a passenger flow model that computes the dwell time based on the number of passengers boarding and alighting at a particular stop.

**Analysis**

When, where and how data is reported in VISSIM is up to the user. Data can be reported for any time period and interval within that time period. Data can be reported for any point-location in the network, for an intersection, along any path and/or for the entire network. Data can be aggregated by mode or by vehicle class. It can also be reported for an individual vehicle. Numerous measures of effectiveness (MOEs) can be reported from VISSIM. Typical ones include delay, speed, density, travel time, stops and queues. The decision on which data to report and when, where and how the data is reported, is based on the needs of the project. For graphical representation of simulation output, VISSIM uses its PTV Vision suite's sister product VISUM. VISUM provides an extensive graphics library for effectively visualizing transportation modeling results.

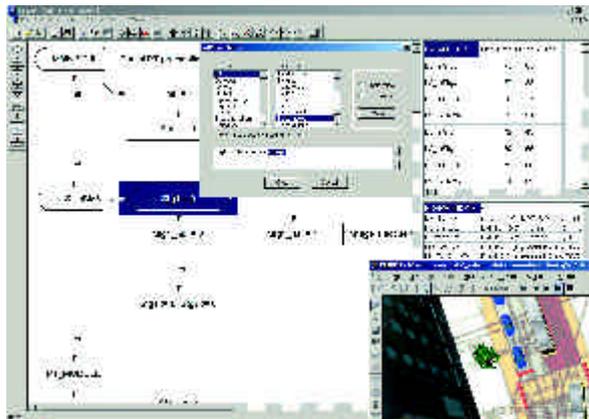


*Bus terminal (route/time dependent bay usage/dwell time distribution), Vancouver, BC*

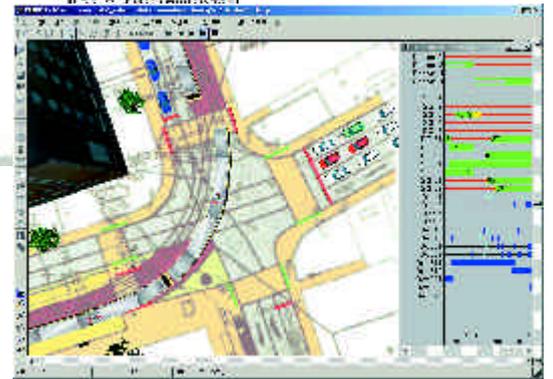
**Traffic Control**

VISSIM can model intersections that control traffic using yield signs, stop signs (all-way, 2-way stop control), signals, and any combination thereof. What sets VISSIM apart from other simulation software packages is its flexibility in modeling all forms of signal control. There are several ways to model signal control in VISSIM:

- ▶ Fixed-time / pre-timed signal plans
- ▶ Actuated (via a NEMA graphical user interface)
- ▶ User definable signal control logic through VISSIM's VAP macro language logic
- ▶ Interfaces to signal controller firmware (virtual controllers) such as Siemens NextPhase and Traffic Language, D4, VS-PLUS and Vialis
- ▶ Interfaces to adaptive algorithms such as Peek's Spot/Utopia, SCATS and SCOOT
- ▶ RS485 serial communication to external controllers
- ▶ Interfaces to the McCain CID II allowing users to connect signal controllers directly to VISSIM



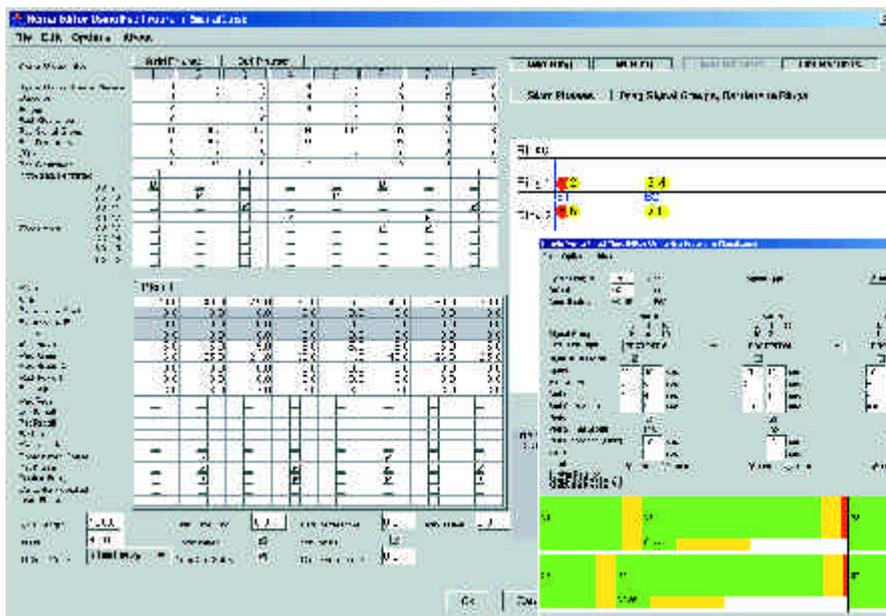
*VisVAP flow chart editor to define complex actuated control strategies*



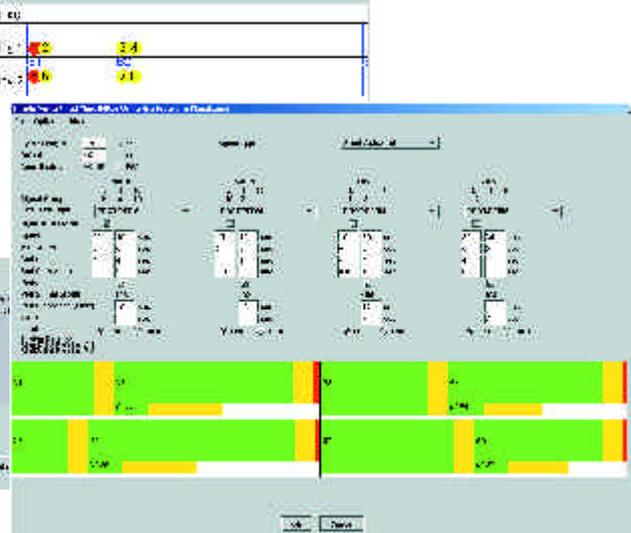
*Transit signal priority and dynamic signal settings*

The C-like traffic control macro language, VAP, is supplemented with a flow chart editor VisVAP for easy data entry, error checking and debugging. In addition, the NEMA GUI used to enter actuated signal timings in VISSIM also has custom menus to allow users to model bus and LRT priority and railroad preemption. Some examples of signal control and related ITS applications of VISSIM include:

- ▶ Ramp metering
- ▶ Adaptive signal control
- ▶ LRT and bus signal priority
- ▶ Railroad preemption
- ▶ Emergency vehicle preemption
- ▶ Dynamic speed control
- ▶ Lane control signals
- ▶ Dynamic lane assignment signals
- ▶ Changeable message signs



*NEMA controller interface (standard format)*



*NEMA controller interface (simple format)*

**Graphics**

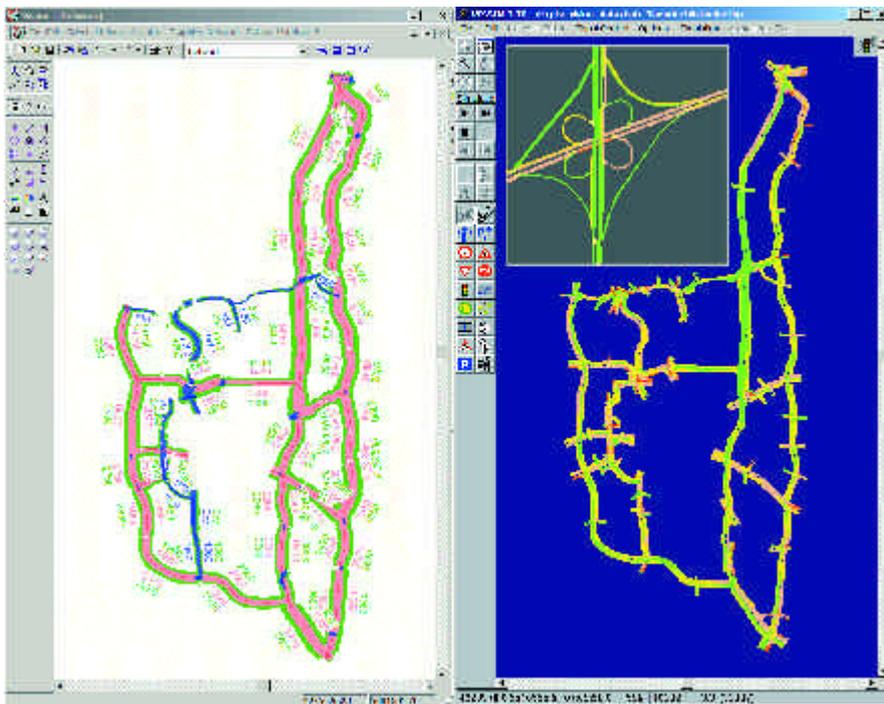
VISSIM features 4D animation. 4D refers to the combination of a 3D network and vehicles combined with the fourth dimension of time. This feature allows users to create realistic video clips in AVI format, an excellent tool for communicating a project's vision. VISSIM also offers users background mapping capabilities with aerial photographs and CAD drawings.



4D animation of Golden Gate Bridge, San Francisco, CA



4D animation of multi-modal transit terminal visualizing synchronized feeder bus schedule (including transfer walk), Munich, Germany



VISUM-SYNCHRO Interface

**Interfaces Increase Efficiency**

One of VISSIM's strengths is its ability to interface with a number of programs that are common to the transportation engineering and planning profession including:

- ▶ Signal optimization tools – Synchro™, TEAPAC\*
- ▶ Travel demand models - emme/2, TranPlan, etc.
- ▶ Geographic information systems (GIS) and navigation data - ArcGIS\* and NAVTEQ

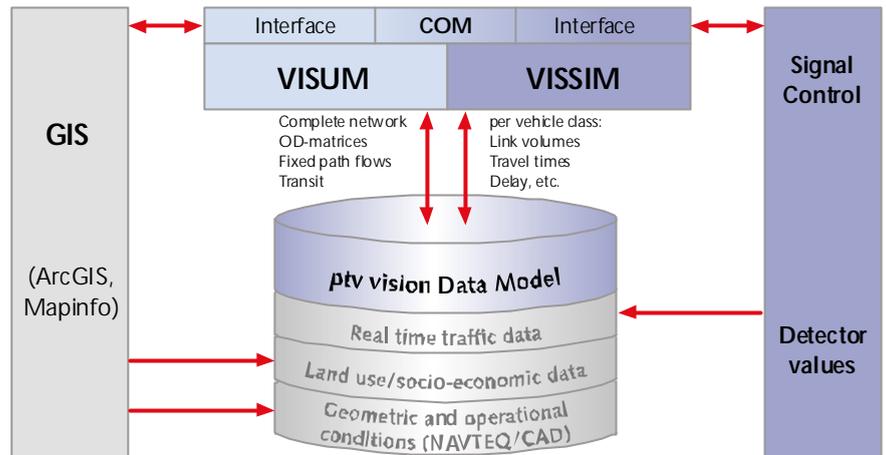
PTV pioneered the integration of simulation and travel demand software. This effort has led to the first truly integrated simulation software, VISSIM, and travel demand software, VISUM, on the market as explained in further detail below. Simply put, the benefit to the transportation community is efficiency.

\* Synchro™ is a registered trademark of the Trafficware Corporation  
TEAPAC is a product of Strong Concepts, ArcGIS is a product of ESRI

# PTV Vision – The Transportation Software Suite

For the past quarter century, PTV has been developing software tools to address the spectrum of needs within the transportation profession from traffic analysis to real-time traffic management. Our vision has been to seamlessly integrate these tools into a transportation software suite. This is a natural progression in the development of these tools since they share many of the same data elements (e.g., network geometry, volumes and traffic control devices). Our vision is a reality today! The transportation software suite, PTV Vision integrates these tools to increase efficiency in your work tasks and is scalable to grow with the needs of your organization.

VISSIM is a key component in PTV Vision as shown in the data flow diagram to the side. It allows for a detailed analysis of multi-modal traffic operations. In some instances, however, this level of detail may not be appropriate to answer the transportation question at hand. PTV Vision allows you to expand your analysis to a more macroscopic view with VISUM, VISSIM's complimentary travel demand model. Data sharing between VISSIM and VISUM is facilitated with the PTV Vision data model. This data-model provides access to numerous sources of data to expedite model building and thus answer transportation analysis questions more quickly.



PTV Vision - Data flow diagram

For example, PTV Vision provides the ability to:

- ▶ Share data elements between simulation and travel demand modeling to reduce manual data entry and the potential of errors.
- ▶ Incorporate real-time traffic data into the planning and analysis phases of a project.
- ▶ Monitor and manage the transportation system through PTV Vision. An abundant amount of data is collected by Traffic Management Centers as well as Transit AVL systems. PTV Vision allows this data to be presented in a way that decisions can be made.
- ▶ Share data across the internet among various transportation organizations. Depending on the level of access granted, these organizations can even query the transportation databases managed by PTV Vision.
- ▶ Access GIS data from sources like ArcGIS, Mapinfo and NAVTEQ to build and update/maintain model networks for a sub-area/corridor, metropolitan region, evacuation area or even for an entire country.
- ▶ Perform intersection level of service analyses based on Highway Capacity Manual or other commonly used capacity analysis methodologies.
- ▶ Share data with signal timing optimization programs and then import optimized timings back to ptv vision. From there, the timings can be uploaded to the field and/or used to evaluate scenarios.
- ▶ Interface with the suite through COM where users can write their own scripts to automate workflow tasks.

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## Application Development Platform

VISSIM 4 offers a COM interface allowing advanced users and researchers to program large applications using Visual Basic, Visual C++ or other applications macro languages (e.g., MS EXCEL). The COM interface provides access to the network topology, signal control, path flows, vehicle behavior and evaluation data. Typical applications of this powerful feature include automation of customized work flow processes, modification of simulation parameters during run time, and customized display options (e.g., side-by-side simulation of different scenarios). Important is that COM allows full flexibility and thus empowers the user to use his or her own creativity to the fullest extent.



## Hardware and Operating Environment

VISSIM, and the other components of the PTV Vision suite, operate in a Microsoft Windows® environment. Parallel Computing was recently introduced to distribute simulation on multiprocessor computers or across a Windows® network.

For current technical details please visit:

[www.ptv-vision.com](http://www.ptv-vision.com)

## Business Partnerships

PTV is partnering with many companies that develop software for the transportation markets. These partnerships extend PTV's products as well as those of our partners. It also builds on PTV's vision of a transportation analysis suite, PTV Vision. The suite concept is designed to efficiently answer questions at varying degrees of detail by seamlessly sharing data among commonly used software packages like

travel demand software, GIS, simulation and signal optimization and analysis programs.

PTV is an ESRI Business Partner. This partnership has led to software enhancements that share and maintain network consistency between ESRI GIS databases and PTV Vision. PTV has formed a partnership with NAVTEQ, the world leader in premium quality digital map data.

## PTV's Focus on the Users

For more than 15 years, the PTV Vision development team has been setting new standards that our clients value and our competitors aspire to. Today, PTV Vision is helping increase the productivity of transportation professionals and the value they provide to their communities in more than 70 countries. This level of success will only expand in the future as we

continue to focus on the needs of our clients. We draw on our experience as transportation planners, engineers and software developers to answer any and all questions asked by users. Our development team of more than 50 transportation professionals draws on several resources for ideas to enhance PTV Vision. We view our clients as a pivotal resource for ideas. These resources also

include knowledge gained through consulting projects; research conducted within PTV as well as inside and outside of our profession; and partnership with other software developers that share our values. Our industry leading products combined with our desire and motivation to continue setting new standards guarantees a sound investment for years to come.

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