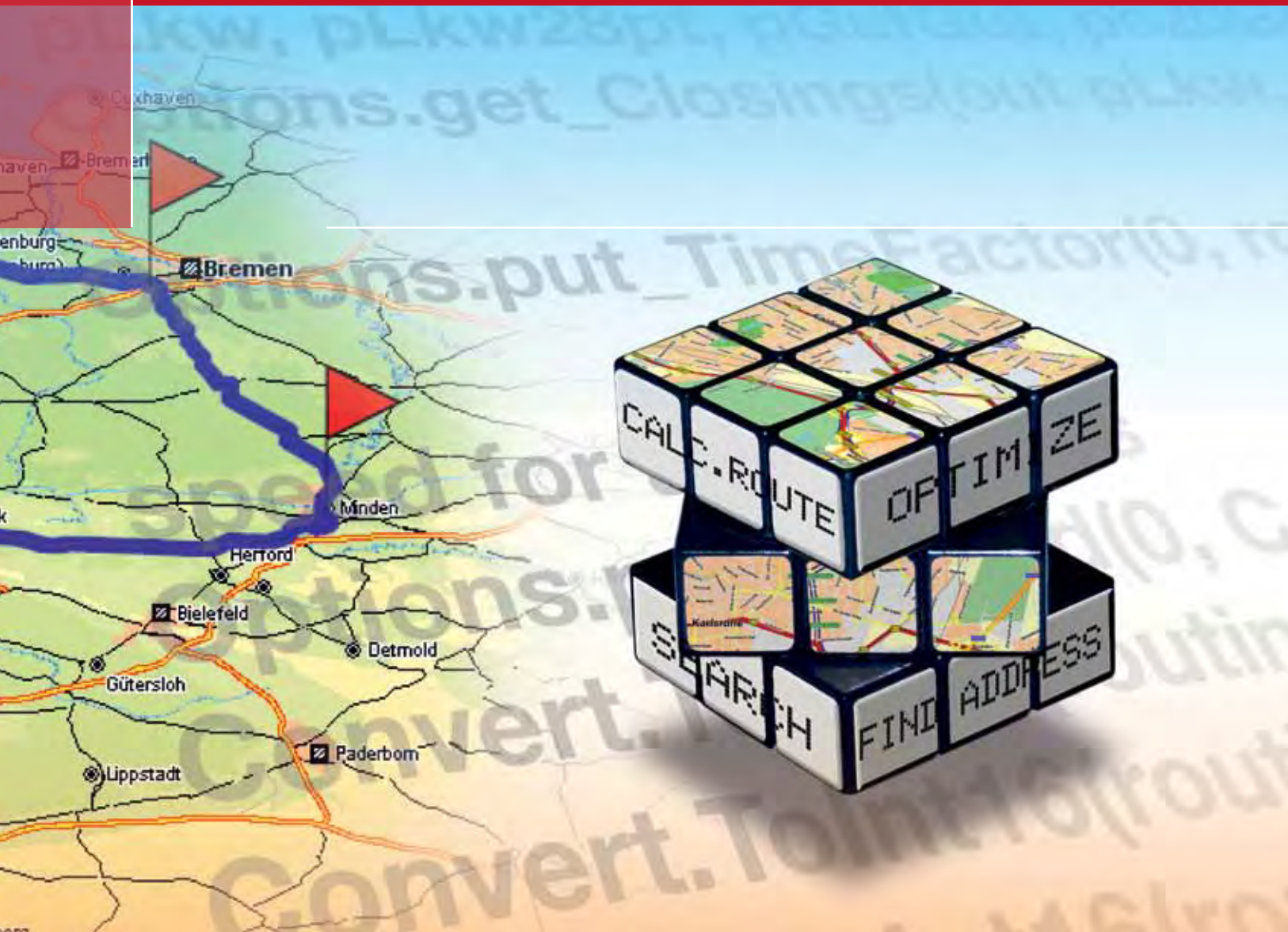


# PTV Developer Components

Geographical and logistics functions for your software



# Integrate geographical and logistics functions

With PTV Developer Components, you can integrate individual geographical and logistics functions into your software or system environment:

- ▶ Digital mapping
- ▶ Address geocoding
- ▶ Route calculation
- ▶ Toll calculation
- ▶ Distance matrices
- ▶ Sequence optimisation
- ▶ Trip planning and optimisation

Our components are used to build new functions or make existing functions more powerful. Our customers and partners include:

- ▶ Software developers
- ▶ System integrators
- ▶ IT consulting firms
- ▶ In-house IT departments

## About PTV AG

PTV AG develops the market's premier software for digital geography, transport planning and traffic planning. Headquartered in Karlsruhe, Germany, it employs 700 people worldwide. It invests continuously in research and development to maintain its 30-year track record of success.

PTV's software is the product of extensive real-life experience, including countless consulting projects in transport planning or sales force optimisation.

PTV Developer Components distil all of PTV's know-how and expertise into high-quality products.

## Your benefits

# 10 reasons to choose PTV Developer Components

### Staying ahead with new functions

Integrate digital maps, address geocoding, route calculation or logistic optimisation procedures from PTV in your application and get ahead of your competition. Save on extensive developing costs and profit from our know-how and many years of experience.

### Experience with transport and sales force planning

For thirty years, PTV's core competency has been trip planning for transport and sales forces. This can be seen by the functions of the PTV components:

- Precise toll calculations
- Specialist truck routing with truck attributes
- Emissions calculations
- Distance matrices
- Route calculation with driving times and rest periods
- Trip planning based on time and capacity restrictions
- Trip planning based on exact road distance or travel time

### Top-quality map data

We work closely with the leading suppliers of map data. With PTV components, you know you'll always have the latest, most detailed map material available. It can even be supplemented on request with other data, such as truck attributes, toll data, geomarketing attributes and dynamic traffic flow data.

### Modularity

Only as much application as necessary! PTV components are modular by design: each component handles one function. That frees you up to only choose the components you really need. Then, if you need more functions later on, you simply license the corresponding component.

### Straightforward integration

All components have standard interfaces (XML/SOAP or COM). That lets them easily integrate with other systems and applications. They support the main programming languages. They also integrate completely – your current software interface does not change. Extensive documentation and code samples guide you through your first steps.

### Protect your investment

Long-term customer and business partner relationships are important. That's why PTV components are based on standard technologies that promote and protect our software's continued evolution. PTV components are also scalable and cluster-capable (PTV xServers). Top performance is assured – no matter how much your systems may grow. Clear road maps for our technologies give you reliable guidelines for future development.

### Extensive support

We provide integration assistance as well as skilled, personal support throughout your entire contract.

### Customised settings

You want your maps to look different? Do you want to prioritise motorways more when calculating routes? Do you want to set the error tolerance for address geocoding yourself? Do you want to weight customer status more heavily when sequencing customer calls? These and other settings can be individually customised.

### Edit road networks yourself

The road network in our digital maps is highly detailed and up-to-date. However, many customers have to make their own changes to the network on a day-to-day basis. With RoadEditor, you can block or open roads and road segments or close or open them for trucks. That way, you decide which roads are included in route calculations.

### SaaS / SOA

Software as a Service (SaaS), deployed on the basis of a service-oriented architecture (SOA), is gaining popularity in the market. PTV components (PTV xServers) are perfectly suited for SOA integration: they are individual modules, based on standard technology, fully scalable, and outfitted with standard interfaces (XML/SOAP).



Adding value to your software

# Overview of functions

With PTV Developer Components, you can integrate geographical and logistics functions into your software or system environment. You can pick and choose the functions you need for your specific use case. No more and no less – thanks to the modular design.

### Route and toll calculation

Routing between two or more stopping-off points. Fastest or shortest route. Calculating distance, travel time, toll costs, travel costs throughout Europe. Truck routing that utilises truck attributes (e.g. weight or height restrictions, truck blocks) as well as driving times and rest periods. Modify route calculations by blocking or releasing individual road segments.

### Tracking and tracing

Display of vehicle positions on the map in real-time. Reconstructing a completed route using recorded GPS points.

### Geocoding

Address geocoding down to the exact house number. Rapid geocoding of large address databases (batch geocoding). Identifying the mailing address for a geo-coordinate (reverse geocoding).

### Blocking and releasing road segments

Block and release individual roads for routing purposes (RoadEditor): block/release for certain vehicle classes (e.g. truck) or vehicle profiles (overhead clearance, weight, etc.). Prefer/avoid certain types of roads. Impose time limits on blocks/releases.

### Distance matrices

High-performance distance matrices between many different locations / stopping-off points. Basis for rapid trip planning and optimisation.

### Trip planning

Trip planning for transportation logistics and sales forces on the basis of exact road distance or travel times. Clustering customers/orders. Sequence optimisation. Taking restrictions into account such as customer time limits, depot opening hours, driving times, rest periods and vehicle capacities. Generating precombined trip plans.

### Radius search

Radius search / search for next based on direct distance, travel time or road distance. Corridor search (POI search along a route. Example: "Which customers are located near the planned route?").

### Digital maps

Displaying location-specific information such as sites, customer addresses, sales territories or routes on the map. Up-to-date worldwide map data (right down to the house numbers in many countries). Map's look and feel can easily be customised as desired (colours, icons, level of detail, etc.). Fast zooming and panning with the map.

### Route and toll calculation Tracking and tracing

### Geocoding

### Blocking and releasing road segments



### Distance matrices

### Trip planning

### Radius search

# Application scenarios

Many software firms and IT integrators use PTV Developer Components to build new features or add to existing ones. Companies with their own IT infrastructure also integrate finished PTV components, eliminating the costs of in-house development. Thanks to the components' modular design, our customers only use the functions they really need. Below, we describe typical application scenarios in which PTV Developer Components are used to implement certain functions.

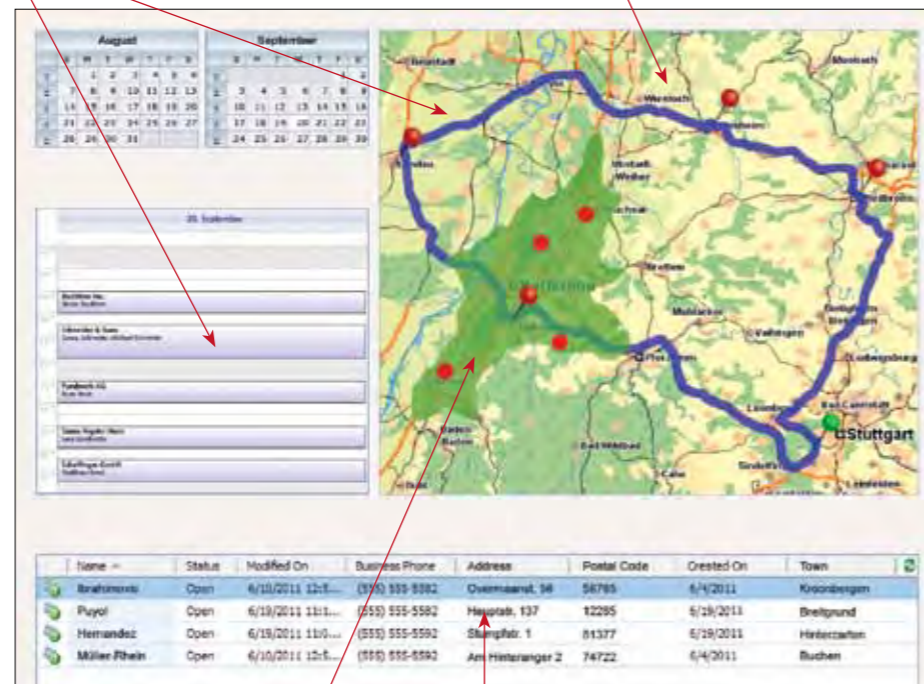
**Scenario 1:**  
Integration with a CRM/ERP system for planning sales calls

**Trip planning:**

The trip planning function produces optimised weekly and daily plans. It efficiently assigns the week's customer calls to day trips and organises them into the optimum sequence. Pre-set restrictions such as time limits, visiting rhythms, visit durations or fixed appointments are taken into account. The trip is optimised based on exact travel times or road distances.

**Route calculation:**

The route, distances and travel times are calculated and displayed on the map.



**Radius / corridor search:**

A time window suddenly becomes available in the calendar. The radius search identifies customers who can be reached within a certain road distance or travel time. The corridor search finds customers along the originally planned route.

**Geocoding:**

Customer addresses are geocoded, validated and displayed on the map.

**Scenario 2:**  
Integration with transport, logistics and freight forwarding software

**Trip planning:**

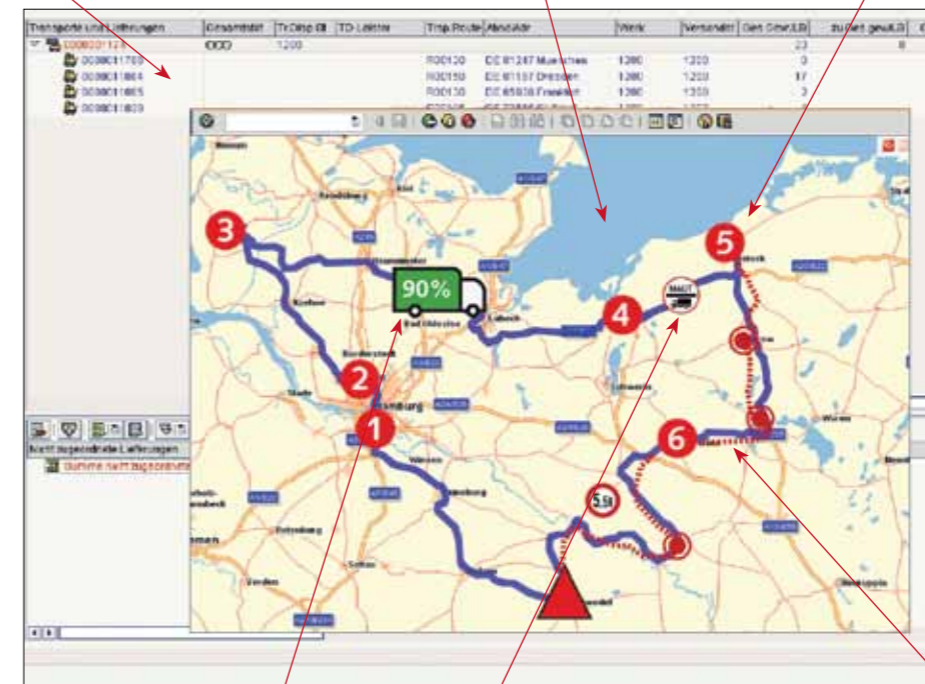
The trip planning function efficiently assigns orders to vehicles in the fleet and arranges them in an optimised sequence. Vehicle capacities, time limits and break rules are taken into account. The trip planning is based on exact road distances or travel times. The result: an efficient utilisation of your vehicle fleet.

**Digital maps:**

Maps say more than a thousand data records. In this scenario, the map application opens in a separate window and presents information in a user-friendly visualisation instead of the usual table.

**Geocoding:**

Geocoded customer addresses are displayed on the map. More information about the customer and shipment can be retrieved from the map with a click of the mouse.



**Tracking and tracking:**

Identifying and displaying a vehicle's position on a map in real time. Reconstructing a completed route using recorded GPS points.

**(Truck) route and toll calculation:**

The component calculates distances, travel times, travel costs and toll costs in addition to the actual route. Truck routing utilises truck attributes (e.g. height or weight restrictions) as well as driving times and rest periods.

**Tracking Premium:**

Subsequent matching of received GPS coordinates using the underlying street map. For exact traces and target/actual comparison.

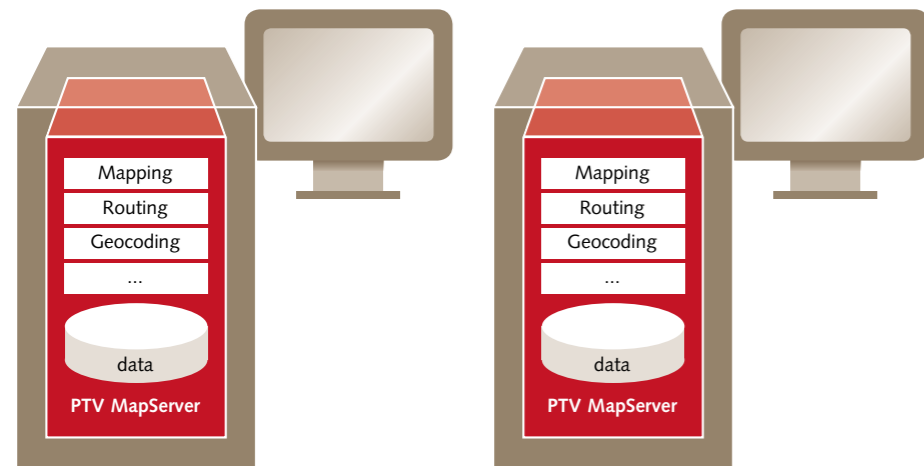
Select your components

# An overview of the PTV Developer Components

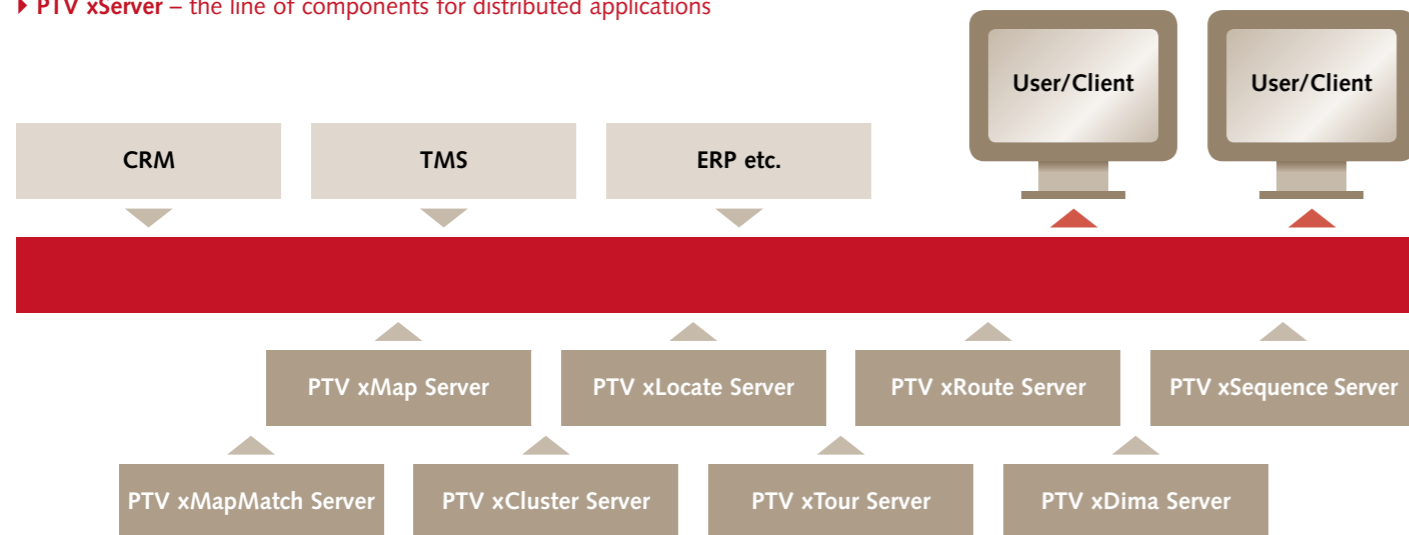
The "PTV Developer Components" include two products or product families.

Describe your application and what features you need, and we'll put together the ideal components for you.

► PTV MapServer – the component for desktop software in Windows



► PTV xServer – the line of components for distributed applications



	PTV MapServer	PTV xServer
Application architecture	Desktop software / local applications	Client-server architecture / distributed applications
Interfaces	COM	XML / SOAP
Operating system	Windows	Windows, Linux
Geocoding	Yes	Yes
Digital mapping	Yes	Yes
Route, distance and travel time calculation	Yes	Yes
Truck routing	Yes	Yes
Toll calculation	Yes	Yes
Blocking and releasing individual roads (RoadEditor)	Yes	Yes
Radius search	Yes	Yes
Sequencing	Yes	Yes
Time windows used in calculations	Yes	Yes
Distance matrices	Yes	Yes
Tracking Premium	No	Yes
Transport orders used in calculations	No	Yes
Automatic trip planning for entire fleet or sales force	No	Yes
Includes map data	Yes	Yes
Modularity	Separate DLLs	One xServer per function

Only as much application as necessary

## The PTV Developer Components in detail

### PTV MapServer

#### PTV MapServer

PTV MapServer provides extensive mapping and routing functionality as well as user-friendly logistics optimisation. For integration with desktop software solutions in Windows.

### PTV xServer

#### PTV xLocate Server

converts mailing addresses into geo-coordinates – from single addresses to entire address databases. It can even work in the other direction and find mailing addresses for geocoordinates (such as GPS position data).

#### PTV xMap Server

displays information such as customer addresses, locations, routes, vehicle positions or sales territories.

#### PTV xRoute Server

calculates routes, determines road distances and travel times, and computes toll costs. Vehicle profiles and routing behaviours can be configured as needed. Truck routing takes truck attributes, driving times and rest periods into account.

#### PTV xSequence Server

identifies the ideal sequence for stopping-off points in a particular trip. The calculations are based in part on vehicle capacity, time restrictions, and legal guidelines on driving times and rest periods.

#### PTV xCluster Server

handles a basic function of trip planning: grouping all the orders or customer calls into “clusters.” A cluster typically contains all the customer calls for one day trip.

#### PTV xDima Server

calculates the distances and travelling times between many locations (so-called *Distance matrices* or distance tables) and makes them available for use in other applications.

#### PTV xTour Server

creates efficient trip plans for transportation logistics and sales forces. It considers customer time limits, depot opening hours, driving time, rest periods and vehicle capacities.

#### PTV xMapMatch Server

validates and corrects a string of received GPS coordinates (tracks) using the underlying street map. This refined data is the ideal basis of performance and compliance measurement.

### PTV xTOUR SERVER – FACTSHEET

## PTV xTour Server

### Depot-related trip planning

*The PTV xTour Server creates transportation logistics and sales customer time limits, depot opening hours, driving time, rest periods and vehicle capacities.*

#### Plan trips efficiently

With the PTV xTour Server, trip plans can be created or existing trip plans can be optimised. PTV xTour Server efficiently assigns transport orders to vehicles in your fleet and optimizes the order sequence. All the plans are “depot-related.” That means trips start at a depot and end at a depot – although not necessarily the same one. Either direct distance, route or driving time can be selected as basis for planning.

#### Time restrictions

PTV xTour Server takes the following time limits into account when planning trips:

- Depot opening hours
- Availability / return time
- Only available for certain days

Read more in the fact sheets:

#### PTV MapServer

Mapping and routing for desktop software

#### PTV xServer

Geographical and logistics functions for distributed environments:

- ▶ PTV xLocate Server: address geocoding and radius search
- ▶ PTV xMap Server: map display
- ▶ PTV xMapMatch Server: Tracking Premium
- ▶ PTV xRoute Server: route, distance and toll calculation
- ▶ PTV xDima Server: distance matrices
- ▶ PTV xCluster Server: clustering orders and customer calls
- ▶ PTV xSequence Server: sequence optimisation
- ▶ PTV xTour Server: trip planning and optimisation

Traffic Software  
▶ Logistics Software  
Transport Consulting

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Digital mapping  
Address geocoding  
Route calculation  
Toll calculation  
Distance matrices  
Sequence optimisation  
Trip planning and optimisation

Integrate geographical or logistics functions into your software or system environment.  
Contact us! We will be happy to advise you.



# PTV MapServer

## Mapping & Routing for Desktop Software

*PTV MapServer provides extensive mapping and routing functionality as well as user-friendly logistics optimisation. For integration with desktop software solutions in Windows.*



### Technology and integration

PTV MapServer can be used anywhere you need to simply and seamlessly integrate digital maps, address geocoding and validation, routing, toll and emission calculation. Extensive code samples included in the package. PTV MapServer is intended to be run with local desktop software in Windows.

It supports the following database formats for integrating your own addresses: Oracle, SQL, Access. The COM interfaces give you ready access to all the functions using standard programming languages. No special hardware is required. 1GB RAM is recommended. Up to 500 MB hard drive space is needed per country map. PTV MapServer supports Windows 2000, 2003, XP and Vista (32-bit).

### Mapping

- Interactive map display
- Zoom and pan around maps quickly
- Print and export maps (BMP, WMF, GIF, JPG, EMF)
- Display individual lines, dots, areas (such as routes, locations, sales territories)
- Show customer addresses, sites, etc. with freely selectable logos
- All objects can be selected with a mouse-click
- Map look and feel is fully customizable
- GIS layers: display and edit your own geometries
- GeoGrid Viewer: this add-on module can integrate grid maps using the EADS format (generally third-party digital map material)

### Routing

- Calculate the route, road distance, travel time and travel costs
- Unlimited number of stop-off points
- Fastest / shortest routes available
- Create customized vehicle profiles (not just truck and slow car, but also bicycle, pedestrian, etc.)
- Generate route lists
- Route list available in 10 languages (English, German, French, Spanish, Dutch, Italian, Portuguese, Swedish, Danish, Norwegian)
- Integrate and leverage traffic information (requires additional data)
- Utilize certain ferries
- Soft via routing: The route goes by the city specified as a via point, not through it (e.g. from Munich to Berlin "via Regensburg" instead of Nuremberg)

### Truck routing

- Consider 'truck attributes' when calculating truck routes: information on height, weight, hazardous goods and other restrictions
- Give preference to motorways and trunk roads; avoid most residential areas
- Take driving times and rest periods into account
- Our maps are permanently extended. For detailed information concerning the map coverage please contact our sales department

### Dynamic routing

Varying driving speeds on identical road sections at different day times can be taken into consideration. E.g. low speed from 8:00 to 9:30 every weekday and maximum speed during the night.

### Logistics optimization

- Take breaks and stay times into account
- Take specified starting or arrival times into account
- Optimize the sequence of stop-off points if there are more than three on the route

### Toll calculation

- Calculate toll costs for many European countries (see image)
- Avoid toll roads
- Calculate various tolls by date for all concerned countries
- Consider future toll costs by mixing various toll scenarios

### Emission calculation

- Visualize your CO<sub>2</sub>-emissions with the inclination based HBEFA 3.1 emission calculation
- Basis for verifiable compensation solutions and improvement of carbon footprint

### Geocoding

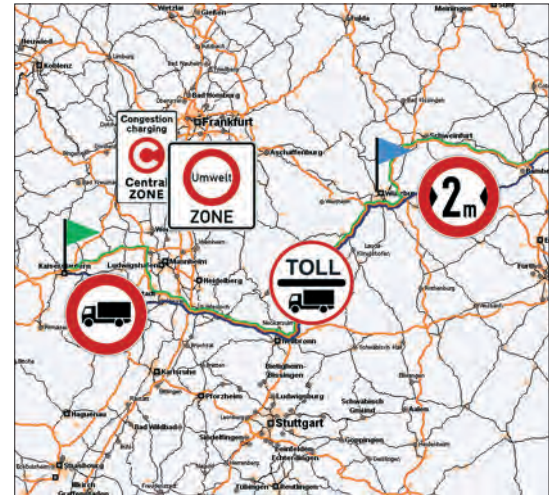
- Address geocoding (converting a mailing address to a geocoordinate)
- Select your preferred error tolerance for address entries: accept identical sounding (phonetic) or similar addresses (fuzzy)
- Advanced filtering of additional house number information
- Reverse geocoding: determine the address for a particular geocoordinate (e.g. GPS position)
- Validate addresses

### Radius search

- Radius search / search for next based on direct distance, travel time or road distance
- Corridor search: search the surrounding area along a route (e.g.: "Which customers can a driver visit on a trip from Frankfurt to Munich if he detours up to 20 km from the direct route?")

### Tracking and tracing

- Locate vehicles and dynamic objects in real time
- Display their current position on a map
- Reconstruct a completed route based on recorded GPS points ("road matching")



### Address management

- Import and manage your own addresses
- PTV MapServer uses these addresses to generate an address layer in Microsoft Access, SQL Server or an Oracle database
- Addresses can be displayed on the map and utilised in routing and radius searches

### RoadEditor

RoadEditor lets you make changes directly to the road network by blocking or releasing individual segments of the road. PTV MapServer takes these blocks or releases into account when calculating routes. The average speed of these segments can be adapted.

# PTV xLocate Server

## Address geocoding

*PTV xLocate Server converts mailing addresses into geocoordinates – from single addresses to entire address databases. It can even work in the other direction and find mailing addresses for geocoordinates (such as GPS position data).*



### Functions

PTV xLocate Server provides the following functions:

- Geocoding: Georeferencing of address data (e.g. customer addresses, depots, warehouses, POIs) for further use in information and planning systems.
- Batch mode for rapidly geocoding large address databases
- Reverse geocoding: PTV xLocate Server identifies the address for a particular geocoordinate
- Validating individual addresses or entire databases
- POI radius search / search for next (based on direct distance)
- Individually configuring the error tolerance for address entries

### Technology

When geocoding, PTV xLocate Server checks the specified address against a reference database. Parameters determine the degree of error tolerance for address entries:

- Binary: exact match required
- Phonetic: includes identical-sounding addresses (entering "Kalsrue" produces Karlsruhe)
- Fuzzy: includes similar addresses

In reverse geocoding, PTV xLocate Server identifies the mailing address for a particular geocoordinate from the reference database. It supports several coordinate formats, including Geodecimal and GeoMinSec.

PTV xLocate Server integrates with other applications over standardised web service interfaces (XML, WSDL, SOAP).

It is scalable and actively supports multi-processor systems.

**Data basis**

PTV xLocate Server uses PTV's standard maps. PTV offers a wide range of regularly updated maps. For decades, PTV has been working closely with NAVTEQ, Tele Atlas and AND - all leading suppliers of map data.

**Hardware requirements**

- At least 1 GB RAM (1 GB RAM recommended for each CPU in use)
- Pentium 4 (1 GHz) or better
- Hard drive space: depends on map in use. Example - Europe map: 10 GB

**Operating system**

PTV xLocate Server runs on the following platforms:

- Windows 2000, XP, 2003
- SuSE Linux 8.2, 9.x, 10.x, Red Hat Enterprise Linux 4

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**PTV xLocate Server at a glance:**

- ▶ Geocode addresses and address databases
  - ▶ Validate addresses
  - ▶ Identify the mailing address for actual position coordinates
  - ▶ Perform radius searches based on direct distance
  - ▶ Integrate the component easily using standardised interfaces (XML/SOAP)
-

# PTV xMap Server

## Display of digital maps

*The PTV xMap Server displays information such as customer addresses, locations, routes, vehicle positions or sales territories on digital maps.*



### Functions

- Display digital maps
- Zoom and pan around maps quickly
- Display customer addresses, surfaces, lines, routes etc. on the map
- Display vehicle positions and mobile objects in real-time
- Integrate your own data (for example customer addresses or depot locations)
- Individual map design (look & feel):  
Free choice of colour, line width, font size, icons etc.

### Technology and integration

PTV xMap Server provides map sections as graphics file for use in other applications. The formats GIF, JPG, BMP, PNG are supported.

Integration with other systems is performed over standardised web service interfaces (XML, SOAP). The PTV xMap Server is scalable and actively supports multi-processor systems.

### Data basis

PTV xMap Server comes with PTV's standard maps. PTV provides many maps for various regions or individual countries, which are regularly updated. For decades, PTV has been working closely with NAVTEQ, Tele Atlas and AND – all leading suppliers of map data.

### Integrate your own data and addresses

Your own customer addresses, locations or POIs can be easily included in the PTV xMap Server database, making them available for map display.

**Individual map design**

The appearance of the map can be customised: Individual map elements (streets, towns, woodlands, water etc.) can be changed by selecting colours, line types and font types, for example to match your corporate design. In addition, points can be displayed using individual graphics – for example the company locations can be displayed using a logo.

**Hardware requirements**

- At least 1 GB RAM (1 GB RAM recommended for each CPU in use)
- Pentium 4 (1 GHz) or better
- Hard drive space: depends on map in use. Example – Europe map: 10 GB

**Operating system**

The PTV xMap Server runs on the following platforms:

- Windows 2000, XP, 2003
- SuSE Linux 8.2, 9.x, 10.x, Red Hat Enterprise Linux 4

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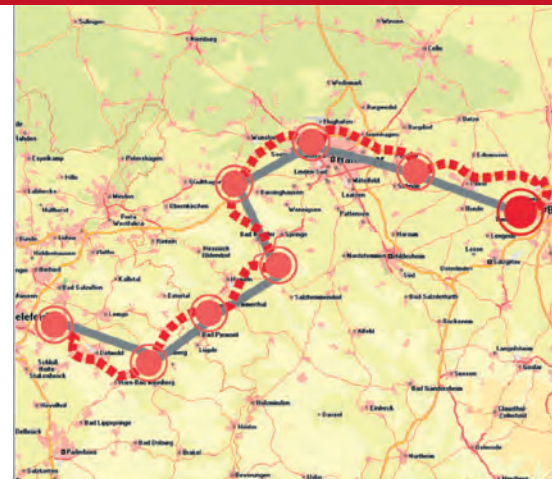
**PTV xMap Server at a glance:**

- ▶ Display locations, routes, customer addresses, vehicle positions etc. on digital maps
  - ▶ Up-to-date detailed map data in top quality
  - ▶ Interactive map control using quick zooming and moving functions
  - ▶ User-friendly transfer of your own addresses or address databases
  - ▶ Appearance of map can be customised (look & feel)
  - ▶ Integrate the component easily using standardised interfaces (XML/SOAP)
-

# PTV xMapMatch Server

## Tracking Premium

The PTV xMapMatch Server validates and corrects a string of received GPS coordinates (tracks) using the underlying street map. This refined data can be processed with other applications, for example with the PTV xRoute Server. When interacting like this, the PTV xMapMatch Server forms the basis of performance and compliance measurement.



### Functions

- Correction of inaccurate GPS signals (tracks)
- Inclusion of map data (tunnels, bans, etc.)
- Two modes with many options:  
Local: Map comparison of each individual GPS point without considering previous positions  
Global: Comparison while considering historical data
- Plausibility check (History / Crawler)
- Recognition of standstill
- Dense (second intervals) and sparse signals (minute intervals) processable

### Technology

The PTV xMapMatch Server verifies external position details (normally GPS tracks) and cleans up GPS inaccuracies. The actually driven routes are returned in a format relevant to the digital map. This data is the basis for a number of transport-related variance analyses in a data warehouse context in **combination** with PTV xRoute Server and PTV xMap Server:

- Detailed check of toll calculations and subcontractor invoicing
- Later calculation of actually caused emissions
- Analysis of routes taken and driver behaviour (fuel consumption, speeding, break times etc.)

PTV xMapMatch Server also enables evaluation of the extent to which the actually driven transport movements differ from the original planning (e.g. with PTV xRoute or PTV xTour Server). It forms an important element in „pay-as-you-drive“ scenarios (toll, insurance, taxes) and can – with a sufficient amount of input data - form the basis of speed line graphs. With the PTV xMapMatch Server it is also possible to process the driven routes which will be exchanged between the users of navigation communities.

**Integration**

Integration with other systems is performed over standardised web service interfaces (XML, SOAP). PTV xMap-Match Server is scalable and actively supports multi-processor systems.

**Data basis**

PTV xMapMatch Server uses PTV's standard maps. PTV offers a wide range of regularly updated maps. For decades, PTV has worked closely with NAVTEQ, Tele Atlas and AND - all leading suppliers of map data.

**Hardware requirements**

- At least 1 GB RAM (for each CPU used)
- Pentium 4 (1 GHz) or higher
- Hard drive space: depends on map in use. Example - Europe map: 10 GB.

**Operating System**

The PTV xMapMatch Server runs on the following platforms:

- Windows 2000
- Windows 2003
- Windows XP
- Windows Vista (Administrator rights)
- Windows 7
- Windows Server 2008 R2
- Linux

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**PTV xMapMatch Server at a glance:**

- ▶ Examination and correction of raw GPS data
  - ▶ Unique referencing of tracks on the digital map
  - ▶ Basis for transport data warehouse applications, transport compliance measurement and „pay-as-you-drive“ scenarios
  - ▶ Basis for gaining traffic data from mobile units (Floating Car Data) and community applications concerning navigation
  - ▶ Easy integration of the component using standardised interfaces (XML/SOAP)
-

# PTV xRoute Server

## Route, distance and toll calculation

*PTV xRoute Server calculates routes, determines road distances and travel times, and computes toll costs. Vehicle profiles and routing behaviours can be configured as needed. Truck routing takes truck attributes, driving times and rest periods into account.*



### Functions

- Calculate routes between two or more points
- Calculate road distances and travel times
- Calculate shortest or fastest route
- Customise vehicle profiles (speed, dimensions, vehicle class, weight, etc.)
- Calculate exact toll costs
- Configure settings to avoid tolls
- Truck routing: apply truck attributes (e.g. height or weight restrictions, truck or hazardous goods blocks), prefer motorways and trunk roads, avoid residential areas, etc.
- Take driving times and rest periods into account
- Avoid certain road classes, low-emission zones, toll roads on request
- Soft via routing: routes are modified by selecting a „soft via point“.

Example: the green alternative route in the image where Nuremberg was set as the “soft via point“. The soft via route passes through the Nuremberg motorway, not the city proper.

- Emissions calculations
- Pedestrian and bicycle routing
- Corridor search: search for next along a route (e.g.: “Which customers can a driver visit on a trip from Frankfurt to Munich if he detours up to 20 km from the direct route?“)
- Isochrone calculations: calculate availability zones based on driving distance or travel time (ex.: “What area can be reached from company headquarters within 30 minutes travel time / 20 km road distance?“)
- Take traffic information into consideration (requires additional data)

### Technology and integration

PTV xRoute Server calculates a route defined by waypoints and routing parameters and shares it with other applications. It calculates road distances and determines travel times and costs based on the vehicle profile. The route is issued as a route list and visualised on a digital map. PTV xRoute Server integrates with other systems over standardised web service interfaces (XML, SOAP).

It is scalable and actively supports multi-processor systems.

### Data basis

PTV xRoute Server comes with PTV's standard maps. PTV has many standard maps that are always kept updated. For decades, PTV has been working closely with NAVTEQ, Tele Atlas and AND – all leading suppliers of map data.

### RoadEditor: block and release roads

RoadEditor lets you make changes directly to the road network by blocking or re-releasing individual segments of the road. These changes can also be restricted to individual vehicle classes such as trucks. PTV xRoute Server takes these blocks or releases into account when calculating routes.

### Toll calculation

PTV xRoute Server needs current toll data in order to calculate the toll costs. It currently supports exact toll calculations for Germany, France, Liechtenstein, Austria, Portugal, Switzerland, Czech Republic, and many special toll-paying sections in Europe. Lump-sum toll calculations are available for Greece, Italy, Croatia, Macedonia, Slovenia, Spain, Turkey (see image).

### Truck routing

• PTV xRoute Server calculates truck routes using 'truck attributes': information on height, weight, hazardous goods and other restrictions. Truck attributes are available for the following countries: BeNeLux, Denmark, Germany, Norway, Austria, Sweden, Switzerland (see image).

- Give preference to motorways and trunk roads; avoid most residential areas
- Take driving times and rest periods into account

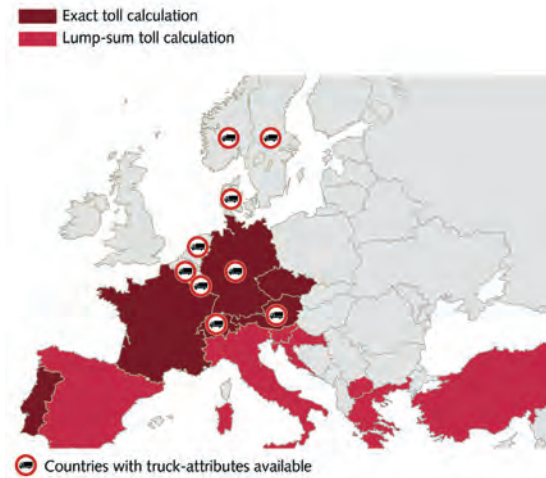
### Hardware requirements

- At least 1 GB RAM (1 GB RAM recommended for each CPU in use)
- Pentium 4 (1 GHz) or better
- Hard drive space: depends on map in use. Example – Europe map: 10 GB

### Operating system

PTV xRoute Server runs on the following platforms:

- Windows 2000, XP, 2003
- SuSE Linux 8.2, 9.x, 10.x, Red Hat Enterprise Linux 4




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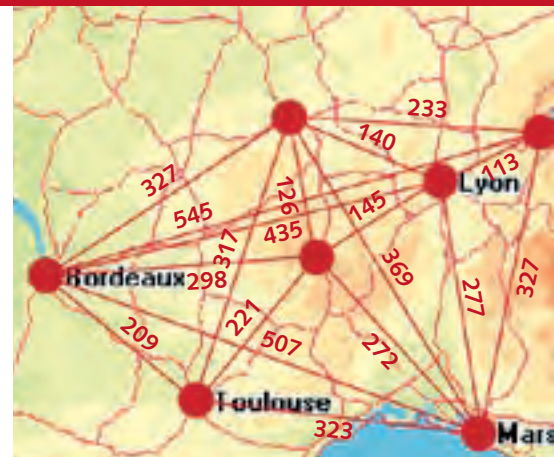
### PTV xRoute Server at a glance:

- ▶ Calculate routes between two or more points
  - ▶ Calculate toll costs
  - ▶ Calculate route length, travel time and costs
  - ▶ Truck routing is based on truck attributes, driving times and rest periods
  - ▶ Individually customisable vehicle profiles (speed, weight, vehicle class, etc.)
  - ▶ Integrate the component easily using standardised interfaces (XML/SOAP)
-

# PTV xDima Server

## Distance matrices

*The PTV xDima Server calculates the distances and travelling times between many locations (so-called Distance matrices or distance tables) and makes them available for use in other applications.*



### Calculation of distance matrices

The PTV xDima Server receives geocoordinates from locations and calculates routes and travelling times between all locations. The result is a distance matrix, which contains the distances and travelling times between all locations. Vehicle profiles and other routing parameters can be set in the calculation:

- Vehicle type (PKW or LKW)
- Route/time preferences – you decide whether the fastest or the shortest route should be calculated and to what extent
- Preference or avoidance of eight road classes is possible (e.g. toll roads, motorways, residential areas)
- Speed for eight road classes

### Management of distance matrices

The PTV xDima Server manages the calculated distance matrix and makes it available for other applications (for example trip planning or location planning systems). They are then provided with the precalculated distances and travelling times much quicker than if a new calculation had to be made for each request. Intelligent management mechanisms ensure increased performance. The PTV xDima Server can export distance matrices so that they can be directly used by other systems. In the same way, previously calculated distance matrices can be imported and managed.

**Integration**

PTV xRoute Server integrates with other systems over standardised web service interfaces (XML, SOAP).

It is scalable and actively supports multi-processor systems.

**Data basis**

The PTV xDima Server is provided with PTV standard maps and accesses their road network data. PTV offers a wide range of regularly updated maps. For decades, PTV has been working closely with NAVTEQ, Tele Atlas and AND – all leading suppliers of map data.

**Hardware requirements**

- At least 1 GB RAM (1 GB RAM recommended for each CPU in use)
- Pentium 4 (1 GHz) or better
- Hard drive space: depends on map in use. Example - Europe map: 10 GB

**Operating system**

PTV xSequence Server runs on the following Windows platforms:

- Windows 2000
  - Windows XP
  - Windows 2003
- (Linux support under development)

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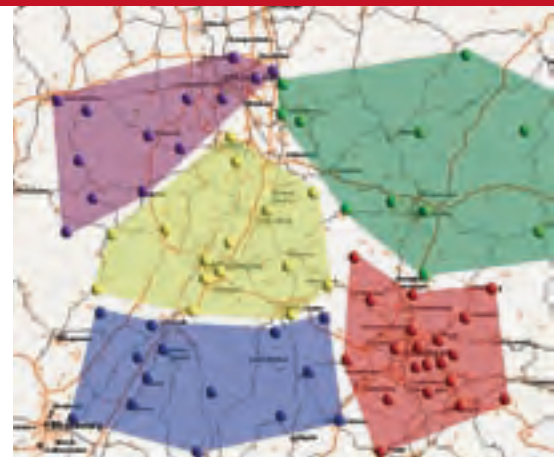
The PTV xDima Server at a glance:

- ▶ Calculate and manage distance matrices / distance tables
  - ▶ With road distance or travel time
  - ▶ Customisable vehicle profiles
  - ▶ High performance
  - ▶ Integrate the component easily using standardised interfaces (XML/SOAP)
-

# PTV xCluster Server

## Clustering orders / customer calls

*PTV xCluster Server handles a basic function of trip planning: grouping all the orders or customer calls into "clusters". A cluster typically contains all the customer calls for one day trip.*



### Functionality

Trip planning often begins by grouping all the orders or customer calls into clusters, especially for recurring orders or calls. This approach is particularly common when planning trips for sales forces. Take a two-week plan, for example. It consists of ten day trips (two weeks with five business days each). PTV xCluster Server will split up all the customer calls scheduled for these two weeks into ten clusters – one cluster per day trip.

PTV xCluster Server considers visiting patterns during the week (e.g. Monday and Thursday) and visiting frequencies across several weeks (e.g. every 14 days). The clusters are set up so that each call is assigned to one, and only one, cluster. That means if customers are visited twice a week, they will be assigned to four different clusters in our example. Once the clusters are generated, the ideal sequence of stop-off points can be determined (PTV xSequence Server).

### Goal: compact, balanced clusters

PTV xCluster Server creates clusters that fulfil two goals:

- Geographically compact clusters: orders or customer calls are grouped into the most geographically compact clusters possible, which produces shorter trips. That means that customers located near one another are assigned to the same cluster wherever possible. The calculations are based on road distances or travel times.
- Well-balanced clusters: the clusters should be roughly equivalent to one another in terms of pre-defined factors (e.g. number of calls, revenue potential, call duration).

**Integration**

PTV xRoute Server integrates with other systems over standardised web service interfaces (XML, SOAP). It is scalable and actively supports multi-processor systems.

**Hardware requirements**

- At least 1 GB RAM (1 GB RAM recommended for each CPU in use)
- Pentium 4 (1 GHz) or better

**Operating system**

PTV xTour Server runs on the following

Windows platforms:

- Windows 2000
- Windows XP
- Windows 2003

(Linux support under development)

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**PTV xCluster Server at a glance:**

- ▶ Cluster (regularly occurring) orders or customer calls
  - ▶ On the basis of distance or driving times
  - ▶ Compact clusters for short trips
  - ▶ Integrate the component easily using standardised interfaces (XML/SOAP)
-

# PTV xSequence Server

## Sequence optimisation

*PTV xSequence Server identifies the ideal sequence for stopping-off points in a particular trip. The calculations are based in part on vehicle capacity, time restrictions, and legal guidelines on driving times and rest periods.*



### Functions

PTV xSequence Server solves the kind of sequencing problems typically encountered in sales force and transport planning.

- Shortest / fastest trip: the stopping-off points are completed in a specially optimised sequence that minimises the overall driving distance or travel time (travelling salesman problem).
- Maximum number of stop-off points: The PTV xSequence Server selects orders or customer appointments and optimises the sequence of calls, so that as many stop-offs as possible can be made. The maximum trip length or duration is specified in this scenario (orienteeing problem).
- Maximum revenues: this version of the orienteeing problem plays an important role in sales force planning. All stopping-off points are assigned a particular

revenue level. PTV xSequence Server selects the stopping-off points and optimises their sequence in order to maximise revenues from the trip.

- Minimal financial penalties: the same method can be used to sequence service calls by technicians in order to minimise financial penalties due to delays in after-sales service.

PTV xSequence Server can be used to plan a new trip and to validate existing trips. Planning and optimisation are performed on the basis of exact routes or driving times.

### Applied restrictions

PTV xSequence Server optimises trip sequences based on the following restrictions:

- Time restrictions: required driving times and rest periods, customer opening hours, specified visit hours, no overnight stays
- Vehicle capacities / loading capacities
- Transport times / expiry times (product's maximum residence time on the vehicle)

**Settings**

The following settings can be configured in PTV xSequence Server:

- Vehicle type (e.g. car, truck)
- Speed per road class
- Heavier weighting for either travel time or road distance (results in faster or shorter trips)

**Data basis**

PTV xSequence Server uses PTV's standard maps. PTV offers a wide range of regularly updated maps. For decades, PTV has been working closely with NAVTEQ, Tele Atlas and AND – all leading suppliers of map data.

**Hardware requirements**

- At least 1 GB RAM (1 GB RAM recommended for each CPU in use)
- Pentium 4 (1 GHz) or better
- Hard drive space: depends on map in use. Example – Europe map: 10 GB

**Operating system**

PTV xSequence Server runs on the following Windows platforms:

- Windows 2000
  - Windows 2003
  - Windows XP
  - Windows Vista
- (Linux support under development)

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**PTV xSequence Server at a glance:**

- ▶ **Optimise trip sequence**
  - ▶ **Optimisation goals: shortest trip, fastest trip, highest number of stopping-off points**
  - ▶ **Travelling salesman and orienteering problems**
  - ▶ **Take vehicle capacities and time limitations into account**
  - ▶ **Integrate the component easily using standardised interfaces (XML/SOAP)**
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# PTV xTour Server

## Depot-related trip planning

*The PTV xTour Server creates efficient trip plans for transportation logistics and sales forces. It considers customer time limits, depot opening hours, driving time, rest periods and vehicle capacities.*



### Plan trips efficiently

With the PTV xTour Server, trip plans can be created or existing trip plans can be optimised. PTV xTour Server efficiently assigns transport orders to vehicles in your fleet and optimizes the order sequence. All the plans are „depot-related“. That means trips start at a depot and end at a depot - although not necessary the same one. Either direct distance, route or driving time can be selected as basis for planning.

### Time restrictions

PTV xTour Server takes the following time limits into account when planning trips:

- Depot opening hours
- Availability / return time: goods are only available at the depot after a certain time or have to be delivered to the depot by a certain time.

- Customer opening hours
- Fixed pick-up / delivery times
- Maximum time between pick-up and delivery

### Vehicle parameters

PTV xTour Server takes the following parameters into account when planning trips:

- Vehicle capacity: freely select the loading capacity unit (cubic meter, liter, etc.)
- Configurable vehicle parameters: up to 255 properties can be assigned to a vehicle (e.g. Refrigeration available yes/no) and used during planning. The transport order needs to be assigned an equivalent criterion (e.g. Refrigeration needed yes/no).

- Speed profile: PTV xTour Server assumes that all vehicles generally travel at the same speed. However, you can specially configure the travel time calculations for individual vehicles.
- Loading and unloading time: this parameter adds to a fixed component another variable component that rises as the amount of cargo increases.

### Driving times and rest periods throughout Europe

PTV xTour Server factors in driving times and rest periods for professional cargo and passenger transport within the European Community. They can be supplemented with the following rules:

- Vehicle loading and unloading times can be classified as breaks
- Balances (breaks and working hours) can be carried forward from one trip to another
- A regular break can be split up into several short ones

### Multi-depot planning

PTV xTour Server supports multi-depot planning in which orders are assigned to the best possible depot. Assignments are made based on travel time or road distance.

### Integration

PTV xRoute Server integrates with other systems over standardised web service interfaces (XML, SOAP). It is scalable and actively supports multi-processor systems.

### Hardware requirements

- At least 1 GB RAM (1 GB RAM recommended for each CPU in use)
- Pentium 4 (1 GHz) or better

### Operating system

PTV xTour Server runs on the following Windows platforms:

- Windows 2000
  - Windows XP
  - Windows 2003
- (Linux support under development)

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#### The PTV xTour Server at a glance:

- ▶ Trip planning and optimisation
  - ▶ On the basis of road distance or travel time
  - ▶ Efficient utilisation of vehicle fleet or sales force
  - ▶ Take time limits and vehicle capacities into account
  - ▶ Take driving times and rest periods into account
  - ▶ Integrate the component easily using standardised interfaces (XML/SOAP)
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