PTV GROUP

System requirements

PTV Route Optimiser ST 2023.1

Document information

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Contents

1   Introduction

The following system recommendation for use of PTV Route Optimiser is based on the current status of this document and applies to version 2023.1.

The hardware and system software requirements for the computer required are set out below. As the requirements may vary according to the size of the installation and intensity of use, PTV Group has defined three installation categories and has established individual hardware and system software requirements for each of them. An explanation of the installation categories can be found in the next chapter, as well as a list of other factors within the installation category that may lead to a specific variation in the hardware requirements.

Your point of contact at PTV will tell you to which installation category you have been assigned and whether the factors described affect you.

- Chapters 2 to 4 describe the hardware and system software requirements for the three installation categories.
- Chapter 5 describes requirements which are applicable only if you are using certain modules.
- Chapter 6 provides a description of which hardware can be virtualised in which installation category.
- Additional demands on the network, operating mode, and licences are set out in Chapters 7 to 9.
- Chapter 10 describes requirements which are applicable only if you are using the telematic functionality.
- Chapter 11 describes remote maintenance to data exchange.

1.1 Forms of installation

PTV distinguishes between three forms of installation:

- Single location installation
- Medium installation
- Large installation

In the case of the single location installation, all the required PTV components are installed onto one computer, normally a user workstation.

A medium installation is characterised by:

- Maximum of four users making intensive use of PTV Route Optimiser
- Installation into the LAN

A large installation is characterised by:

- At least five users making intensive use of PTV Route Optimiser
- Installation either into the LAN or via users linked by DSL
- Various scalability options
- Server and infrastructure in the back-end as well as the appropriate customer technical know-how

1.2 Important Factors

The hardware and system software requirements for the installation categories can be influenced by the following factors:

- Method of distance calculation
- Data volumes
- Planning dynamics

1.2.1 Method of distance calculation

The distance calculation between two geo-locations can be carried out in three ways:

- Reference matrix
  Here, the distances are pre-calculated based on reference points and with minimum loading of the memory and CPU.
- Dima (= distance matrix) plus search graph (on the PTV Route Optimiser client)
  With this method, all distances between each pair of geo-locations are calculated dynamically on start-up or updating. Calculations are not performed directly on the basic map grid, but on a pre-generated, highly compressed search graph. This dramatically speeds up the calculation. The loading of the search graph and associated calculation of the distance matrix is distinctly quicker and puts less load on the CPU. However, more memory is required
  Furthermore, the search graph must be calculated individually in a separate step.

➡ PTV xDima Server (= Dima plus search graph as central server component)
Unlike the previous alternative, this calculation is carried out on a central server for all clients. This alternative is used within the framework of larger PTV Route Optimiser installations. The search graphs are already preloaded so that the calculation can be carried out with even more efficiency and better performance.

Note: At present, a maximum of two search graphs per installation can be used while the PTV xDima Server is being used.

The following system requirements assume a maximum of four search graphs per installation. If you would like to use more than four search graphs, discuss the hardware requirements with your PTV GROUP consultant.

1.2.2 Data volumes

The more data that are imported, processed, planned and exported, the more complex the individual steps become and, under certain circumstances, the greater the demands are on the hardware itself.

The requirements listed in the following chapters are based on the following data volumes:

➡ 1000 orders per day

➡ 300 tours per day

If the data volumes exceed these limits, talk to your PTV GROUP consultant again about your hardware and system structure requirements.

1.2.3 Planning dynamics

As new orders need to be integrated more frequently into existing plans, or as existing orders which have already been imported are changed by updates, greater demands are placed on the import process. Similarly, the demands on planning are increased, especially on performance during the updating of the planning data.

2   Single location installations

2.1 Description

The following diagram shows the structure of a PTV Route Optimiser single workstation installation:

2.2 PC Workstation

Property	Requirement
Processor	Current AMD/Intel processor with at least 4 cores
Main memory	At least 32 GB, including at least 10 GB for the PTV Route Optimiser environment (application, database, xServer), 10 GB for the PTV Route Optimiser environment when using search graphs
Operating System	Microsoft Windows® 10 Pro, 64 bit, with current patches Microsoft Windows® 11 Pro, 64 bit, with current patches
Hard drive	At least 60 GB of free memory space, SSD (solid state drive) hard drives are recommended
System software	.Net Framework 4.8 (Installed with the installation of PTV Route Optimiser) Local MS SQL server 2017, 2019 or 2022, 64 bit, Express or Standard edition A current Oracle Java version 8 or Amazon Corretto Version 8 (JDK-Version)

	Note: To be provided by customer before installation of PTV Route Optimiser
Screen	2 monitors recommended
Data security	Regular database backup (daily/nightly), also see Chapter "Operating requirements"

3   Medium installation

3.1 Description

The following diagram shows the structure of an average PTV Route Optimiser installation:

3.2 PC Workstation
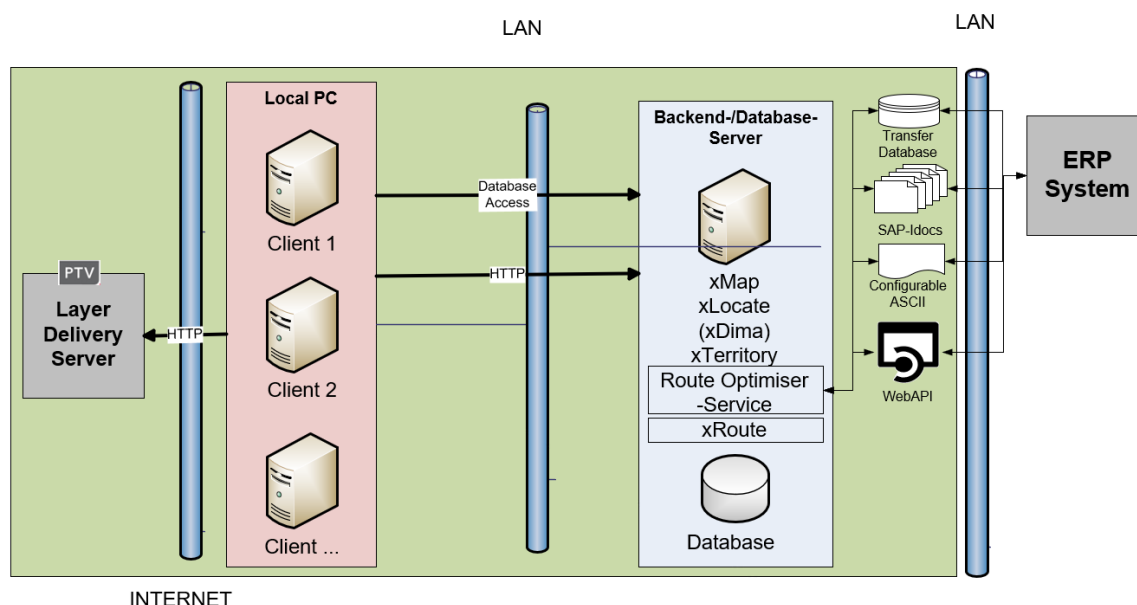
Property	Requirement
Processor	Current AMD/Intel processor with at least 4 cores
Main memory	At least 32 GB 6 GB available for PTV Route Optimiser
Operating System	Microsoft Windows® 10 Pro, 64 bit, with current patches Microsoft Windows® 11 Pro, 64 bit, with current patches
Hard drive	At least 50 GB of free memory space At least 10 GB free disc space when using central PTV xDima Server
System software	.Net Framework 4.8 (Installed with the installation of PTV Route Optimiser)
Screen	2 monitors recommended
Data security	Also see Chapter "Operating requirements"

3.3 Backend-/Datenbank-Server

Note: PTV Group assumes that the back-end/database server will be used exclusively by PTV Route Optimiser and that the servers and the clients will be run in the same domain.

Property	Requirement
Processor	Current AMD/Intel server processor with at least 4 cores At least 6 cores when using PTV xDima Server
Main memory	Minimum 24 GB
Operating System	Windows® 2016 Server, 64 bit, at least Standard Edition Windows® 2019 Server, 64 Bit, at least Standard Edition Windows® 2022 Server, 64 Bit, at least Standard Edition
Hard drive	At least 30 GB of free memory space At least 60 GB free disc space when using central PTV xDima Server Fast server hard drives, RAID recommended Maximum 1 year's data in the system
System software	MS SQL-Server 2016, 2017, 2019 or 2022, 64 Bit, at least Standard Edition Including Reporting Services (must be provided by the customer prior to PTV Route Optimiser ST installation) You can find Microsoft's hardware and software requirements here: MS SQL Server 2016 and 2017: http://msdn.microsoft.com/de-de/library/ms143506.aspx MS SQL Server 2019: https://docs.microsoft.com/de-de/sql/sql-server/install/hardware-and-software-requirements-for-installing-sql-server-ver15?view=sql-server-ver15 MS SQL Server 2022: https://learn.microsoft.com/de-de/sql/sql-server/install/hardware-and-software-requirements-for-installing-sql-server-2022?view=sql-server-ver16 .Net Framework 4.8 (Installed with the installation of PTV Route Optimiser) A current Oracle Java version 8 or Amazon Corretto Version 8 (JDK-Version)

	Note: To be provided by customer before installation of PTV Route Optimiser.
Data security	Regular database backup (daily/nightly)
	Also see Chapter "Operating requirements"

4   Full installation

4.1 Description

The following diagram shows the structure of a large PTV Route Optimiser installation:
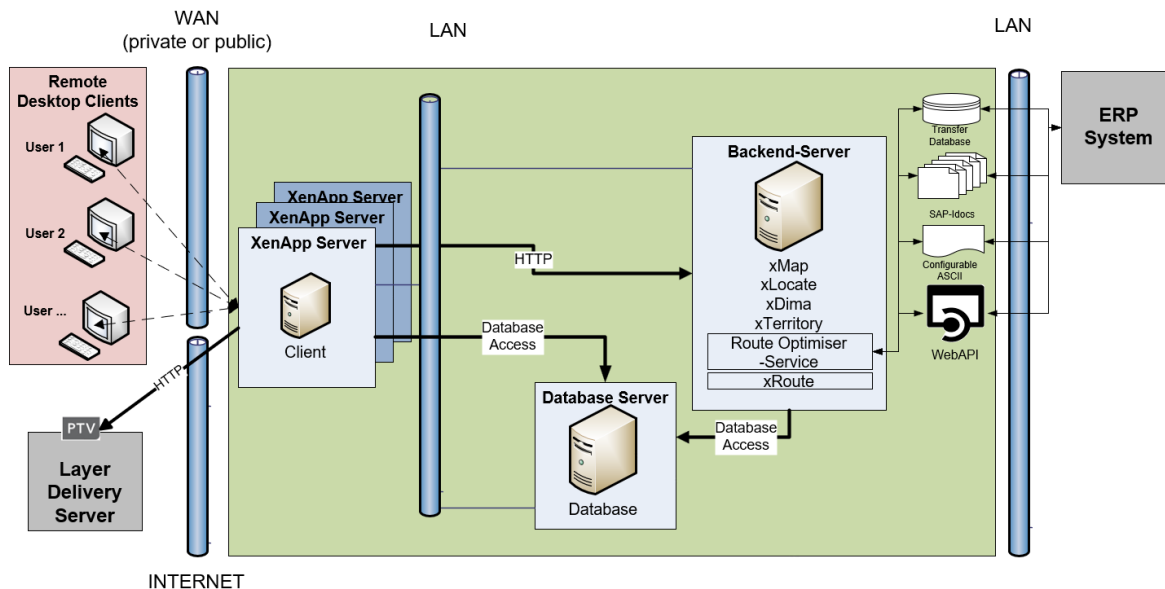
4.2 Remote Desktop Client

The requirements of the Remoting software are essential for the Remote Desktop client. In addition the following requirements from PTV Group:

�د PTV Group requires the use of the RDP protocol (version 8 at least) while using a Windows® with Remote Desktop Services.

�د PTV Group requires the use of a compatible and preferably up-to-date Citrix Workspace app or Citrix online plug-in when using Citrix XenApp.

�د The Remote Desktop Client should support the H.264-Codec. Only with the H.264-Codec a good performance for the processing of the video signal through the Remote Desktop Client is possible.

4.3 Remote Desktop Session-Host

Property	Requirement
Processor	Current AMD/Intel server processor, Multi Socket Server recommended (enables extension by an additional processor if required) (~1 core per 1-2 user(s))[1]
Main memory requirement per user session	3-4 GB depending on use of PTV Route Optimiser
Operating system / Remoting software	Windows® 2016, 2019 or 2022 with Remote Desktop Services, 64 bit, with option of Citrix XenApp 7.11 or newer, 64 bit
	Note: PTV recommends the use of Citrix XenApp to optimise performance and bandwidth for map-intensive applications, and Windows® language packs if PTV Route Optimiser needs to be used in multiple languages.
Hard drive	At least 15 GB of free disc space
	Rapid RAID server hard drives and RAID hardware controllers are recommended
System software	.Net Framework 4.8 (Installed with the installation of PTV Route Optimiser)
Number of users	Up to 16 planned users per Session Host if the required hardware is provided. PTV Group recommends a loading test during the introduction phase.
Data line	Also see Chapter „Required cable bandwidth between Remote Desktop Client and Session Host"
	Note: The performance of the import process can be significantly improved if the import process is installed and run on the database server as a service.
Data security	Complete server backup following updates and configuration changes

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[1] Applies to average and time-allocated use of the system. With very intensive use, in particular for long-running planning processes, PTV Group recommends that the requirements are increased to 1 physical Core per user.

4.4 Database Server

It is assumed that the database server will be used exclusively by PTV.

Property	Requirement
Processor	Current AMD/Intel server processor with at least 4 cores
Main memory	At least 32 GB
Operating System	Windows® 2016 Server, 64 bit, at least Standard Edition Windows® 2019 Server, 64 Bit, at least Standard Edition Windows® 2022 Server, 64 Bit, at least Standard Edition
Hard drive	At least 50 GB of free disc space Rapid RAID server hard drives and RAID hardware controllers are recommended Maximum 1 year's data in the system
Database software	MS SQL-Server 2016, 2017, 2019 or 2022, 64 Bit, at least Standard Edition Including Reporting Services (must be provided by the customer prior to PTV Route Optimiser installation) You can find Microsoft's hardware and software requirements here: MS SQL Server 2016 and 2017: http://msdn.microsoft.com/de-de/library/ms143506.aspx MS SQL-Server 2019: https://docs.microsoft.com/de-de/sql/sql-server/install/hardware-and-software-requirements-for-installing-sql-server-ver15?view=sql-server-ver15 MS SQL-Server 2022: https://learn.microsoft.com/de-de/sql/sql-server/install/hardware-and-software-requirements-for-installing-sql-server-2022?view=sql-server-ver16
Data security	Regular database backup (daily/nightly) Complete server backup following updates and configuration changes Also see Chapter "Operating requirements"

4.5 Backend Server

It is assumed that the remote desktop session host and the backend server will run in the same domain.

Property	Requirement
Processor	Current AMD/Intel server processor with at least 6 cores
Main memory	Minimum 24 GB
Operating System	Windows® 2016 Server, 64 bit, at least Standard Edition Windows® 2019 Server, 64 bit, at least Standard Edition Windows® 2022 Server, 64 bit, at least Standard Edition
Hard drive	At least 60 GB of free disc space
System software	.Net Framework 4.8 (Installed with the installation of PTV Route Optimiser) A current Oracle Java version 8 <u>or</u> Amazon Corretto Version 8 (JDK-Version) (To be provided by customer before installation of PTV Route Optimiser)
Data security	Complete server backup following updates and configuration changes Also see Chapter "Operating requirements"

Note: The performance of the import process can be significantly improved if the import process is installed and run on the database server as a service.

4.6 Required cable bandwidth between Remote Desktop Client and Session Host

Tests at PTV Group have shown that the necessary bandwidth is dependent on the following factors:

- Map configuration
- Size of the map window and screen resolution
- Intensity and how the map is used
- Planning dynamics

During the tests it was possible to achieve an acceptable level of usability with appropriate configuration and handling limitations, even with a low bandwidth.

PTV recommends the following bandwidths (guaranteed bandwidth per user):

- At least 2 MBit/s bei Citrix XenApp, up to 4 MBit/s depending on the planning intensity.

➤ At least 2 Mbit/s bei Windows® with Remote Desktop Services, up to 8 MBit/s depending on planning intensity.

The differences between Citrix XenApp and Windows® with Remote Desktop Services can be replicated and are consistent for all versions.

Example: At least 3 MBit/s will be necessary for the Citrix XenApp with dual screen use of standard monitors where the card uses one monitor.


Hint: The general rule is always that, when using a Remoting-Software solution in the WAN, the cable bandwidth is subject to fluctuations and the quality of the cabling also depends on the provider. In any case, when a Remoting-Software in WAN is in use, the usability on the client site must be tested thoroughly by the customer and the users and PTV Group must come to an agreement on the test results.

Reference environment

A reference environment was installed and intensive tests carried out in order to measure the effect of bandwidth.

➤ The Windows® 2012 with Remote Desktop Services, Citrix XenApp 7.6 and for comparison the no more supported Citrix XenApp 6.5 systems released for PTV Route Optimiser were tested on the same hardware.

➤ The bandwidth of the connection was varied (1,024 kbit, 2,048 kbit, 4,096 kbit, 8,192 kbit).

➤ For every Remoting-Software system and bandwidth combination, a number of different operations was run on the map and their running times measured (please see the test outputs).

Result of the tests: PTV Group recommends using Citrix XenApp 7.6 or newer on connections with low bandwidth.

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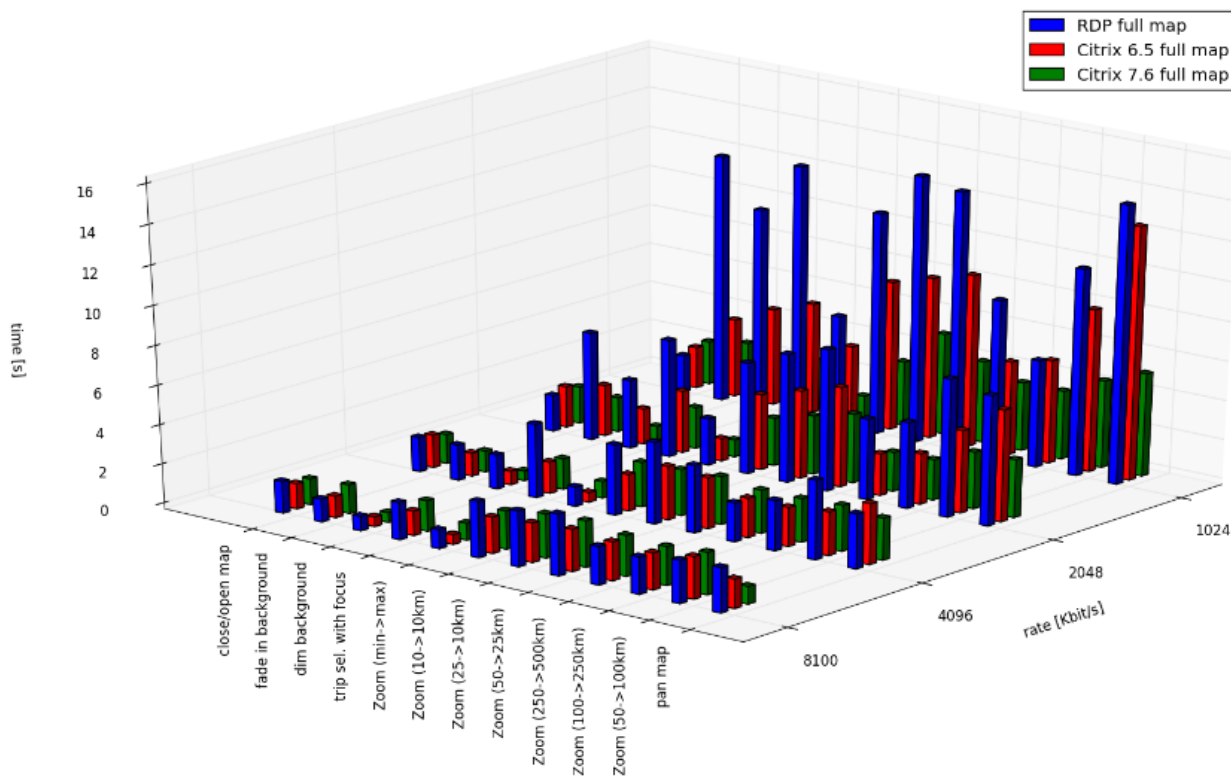
5   Modules

5.1 TripDisplay Module

The TripDisplay module (subject to charge) enables a detailed display of your routes and orders in a browser without a PTV Route Optimiser client. The TripDisplay module is run as an LAN web service.

Note: Access via the internet is not supported.

Additional hardware and system software requirements are listed below.

5.1.1 Client

PC Workstation
The TripDisplay module is supported by the browser versions listed below.

Note: We cannot guarantee that PTV Route Optimiser will run on newer browsers which we have not tested at the time of release.

Likewise, we cannot guarantee that our module is fully compatible with older browser versions which are not shown in the list.

- Microsoft
  - Edge
- Firefox
  - Version 109
- Google Chrome
  - Version 109

Note: Using the TripDisplay module with Remoting-Software and published applications may make it necessary to publish an additional application of the TripDisplay module parallel to PTV Route Optimiser. This is required if the browser on the work station PC or Remote Desktop client has no direct access to the TripDisplay web service on the back end server.

Remote Desktop Client

No changes

5.1.2 Remote Desktop Session Host

The TripDisplay module is supported by the browser versions listed below.

Note: We cannot guarantee that PTV Route Optimiser will run on newer browsers which we have not tested at the time of release.

Likewise, we cannot guarantee that our module is fully compatible with older browser versions which are not shown in the list.

- Microsoft
  - Edge
- Firefox
  - Version 109
- Google Chrome
  - Version 109

Note: Using the TripDisplay module with Remoting-Software and published applications may make it necessary to publish an additional application of the TripDisplay module parallel to PTV Route Optimiser. This is required if the browser on the work station PC or Remote Desktop clients has no direct access to the TripDisplay web service on the back end server.

5.1.3 Database Server

No changes

5.1.4 Back-End Server

No changes to system requirements regarding hardware.

The Internet Information Services (IIS) must also be installed. The TripDisplay module is supported by the following versions of IIS:

- 10.0

5.2 Module Notification

With the module notification, the planned arrival times of the trip stopps can be announced to the customers via SMS and email. The module costs an extra license fee.

Hint: An access to the internet is required.

5.3 Module PTV Drive&Arrive

With a link to the module PTV Drive&Arrive, the monitoring of the ETA times at the trip stopps can be activated. In addition with the module notification, the automatic notification service of the customers via SMS and email can be used. The module costs an extra license fee.

Hint: An access to the website of PTV Drive&Arrive via internet is required.

5.4 Modul PTV Driver App

The PTV Driver App is an complementary tool for calculating the time of arrival in road freight traffic. The app is used as a simple telematics end device for customers of the cloud service PTV Drive&Arrive. Based on the positions and status messages of your shipment sent by the app, PTV Route Optimiser can recalculate the trips with the actual data received.

In addition, PTV Drive&Arrive calculates in PTV Route Optimiser the exact expected arrival time of your shipment and automatically informs all registered participants.

Note: Access to the website of PTV Drive&Arrive via Internet, the notification service module and the enabled telematics interface of PTV Route Optimiser are required.

The PTV Driver App can be downloaded free of charge for Android from version 4.0 in the Google Playstore or for iOS in the AppStore.

https://play.google.com/store/apps/details?id=co.infinum.ptv.etamonitor&hl=de

https://itunes.apple.com/de/app/ptv-driver-app/id946450489?mt=8

5.5   Modul PTV Axylog

With a connection to the PTV Axylog module, which requires a licence, you can send the trips to PTV Axylog for monitoring the execution.

Note: Access to the PTV Axylog website with your own PTV Axylog account via the Internet is required.

5.6 General overview

The diagram of the system architecture of PTV Route Optimiser with all modules is based on chapter 4 „Full installation".
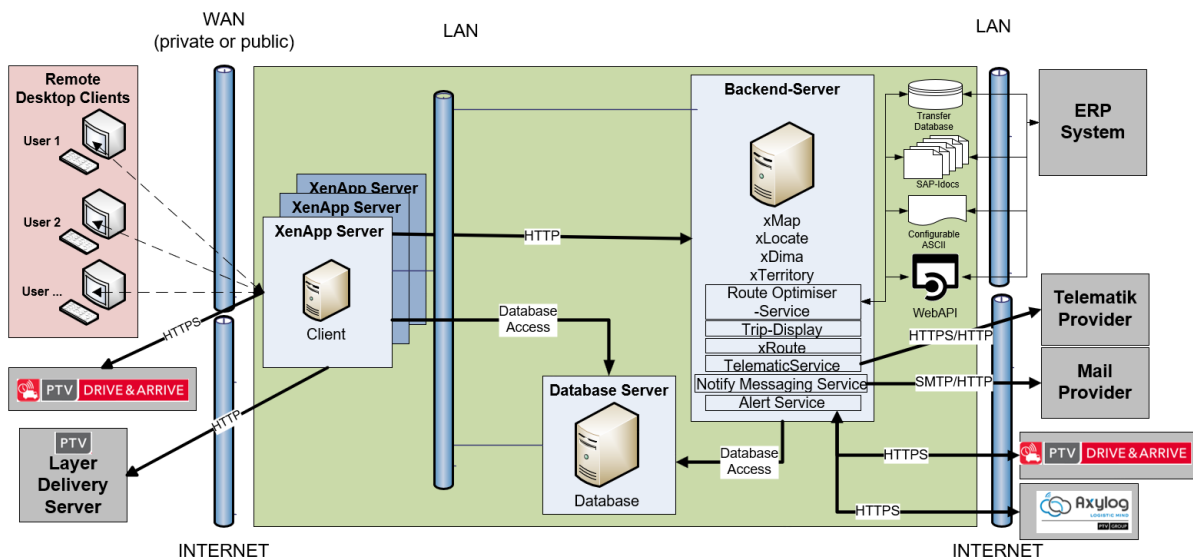
6   Virtualisation

The hardware resources listed here can also be operated in virtualised form. Whether virtualisation of the hardware resources is advisable or not depends on the available know-how and the existing infrastructure.

For virtualisation, the hardware recommendations also apply to the virtual machines. The following should be taken into account for the physical resources which are to be provided:

➡ PC workstations
PC workstations can be operated in virtualised form via LAN. For continuous use, PTV recommends installation onto a Remote Desktop Session-Host or PC workstation.

   ➡ <u>Processor:</u> One real core per workstation VM must be guaranteed

   ➡ <u>RAM:</u> All the required memory capacity must be guaranteed (no "over commitment")

   ➡ <u>Hard drive</u> No special requirements

   ➡

➡ Back-End Server

   ➡ <u>Processor:</u> At least two real cores must be guaranteed

   ➡ <u>RAM:</u> All the required memory capacity must be guaranteed (no "over commitment")

   ➡ <u>Hard drive</u> No special requirements

➡ Remote Desktop Session-Host

   ➡ <u>Graphics:</u> Since graphics performance cannot be provided in virtual form or only with excessive effort, graphics performance on a virtual Remote Desktop Session-Host compared to a physical Remote Desktop Session-Host can be worse. The CPU has to take over the graphic functions, but is only partially designed to do so. That can have an effect on the performance in PTV Route Optimiser, for example in the card representation area.

The manufacturer's requirements must be taken into account for the database and the Remote Desktop Session-Host. In general, the processor and main memory resources required for PTV Route Optimiser must be guaranteed for virtualisation. PTV Group recommends a high preformat (FibreChannel-) connection to a fast SAN (storage area network).

7   Network requirements

The network must fulfil the following requirements:

- TCP/IP protocol
- At least 1 GBit

Note: The performance of the PTV software systems can be largely influenced by factors that cannot be influenced by PTV, such as the LAN, WAN, the quality of the hardware components used and other installed software (e.g. anti-virus software). Performance must therefore be tested as part of the normal test routine.

8   Licences and installation

Licences for operating systems must be obtained by the customer. The customer is responsible for installing the operating system onto the computers which are to be used.

Apart from single-user installations, the licences for the database system must be obtained by the customer. Apart from single-user installations, the installation and configuration of the database system on the server must be carried out by the customer.

Note: PTV provides the separate document „SQL_Server_licensing_PRO_ST_en" for calculating the license costs when using the MS SQL Server Standard Edition.

The licences for an operation with Remoting Software must be obtained by the customer. The installation and configuration of the Remote Desktop Session Host is done by the customer.

8.1 Installation of operating system updates

Ensure that the operating system is updated and that pending updates are installed.

After installing operating system updates, ensure that any necessary restarts of the computers concerned are made.

Errors that occur due to non-compliance with the above rules are not supported by PTV Group.

9   Operating requirements

In order to guarantee trouble-free operation of the database used, it is necessary to implement a regular maintenance plan for updating the database statistics, for the reorganisation of index fields and for backing up the database. The PTV Group delivers the freely available [SQL Server Maintenance Solution](#) from Ola Hallengren with the installation. The scripts are available with the PTV Route Optimiser setup. You will find further information in the document "Installation Instructions DB Server".

In addition, PTV Group recommends that old data should be deleted from the database at regular intervals, e.g. with the PTV Route Optimiser **data reduction functionality**. The actions required must be carried out by the customer.

If the customer is unable or unwilling to take on these maintenance tasks himself, PTV Group recommends engaging an external service provider.

The customer is responsible for backing up and archiving the hard drives of the computers that are used. In particular, this should take place following software updates and configuration changes.

10   Telematics provider

A connection to the telematics providers Webfleet and Trimble is currently integrated into the telematics module of PTV Route Optimiser. Access data to the provider interfaces and parts of the user interface on the terminals can be configured from within PTV Route Optimiser. Additional telematics providers can be connected to PTV Route Optimiser via the TelematicService, see as an example the connection to Teletrac Navman. With a connection to PTV Axylog, the "QR Delivery" App from PTV Axylog can also be used.

Hint: internet access is required for connecting the interfaces of the telematics providers.

10.1 Webfleet

10.1.1   Permitted devices

You should use up-to-date devices from Webfleet that support the Webfleet interface and the required status handling. In these cases, contact Webfleet support in advance.

10.1.2   Configuration

In order to use the Webfleet interface, you will need a Webfleet Account with adimistrator rights on which the **Webfleet-Connect** interface has been enabled. This option can be found in user settings under the **Extended** button. You should also activate full access to **jobs, fields,** and **general settings**.

Note: If these settings are changed, it can take several hours before the interface becomes available again.

Note: In most cases, Webfleet Support will also need to activate the Webfleet Connect interface for the customer. In this case, please contact Webfleet Support.

Note: The administrator rights for the Webfleet account are required in order to be able to set the options for order progress in Webfleet from PTV Route Optimiser.

10.2 Trimble

10.2.1   Permitted devices

The following types of device are approved for use with PTV Route Optimiser:

- Trimble CarCube

10.2.2   Configuration

You will need Trimble customer access in order to use the Trimble Telematics interface. You will need to configure terminals and settings via the Trimble Website: https://fleetworks.trimbletl.com/fleet/

10.3 Teletrac Navman

To use the Teletrac Navman module at the customer, you need the PTV Telematics Service module, see chapter 10.6.

10.3.1   Allowed devices

Note: Please contact Teletrac Navman directly to inquire about suitable device types.

10.3.2   Configuration

To use the Teletrac Navman telematics interface, you need a customer access from Teletrac Navman. The interface is configured in cooperation with Teletrac Navman and PTV.

10.4 Radaro

To use the Radaro module at the customer, you need the PTV Telematics Service module, see Chapter 10.6.

10.4.1   Allowed devices

Note: Please contact Radaro directly to inquire about compatible device types.

10.4.2   Configuration

The import and export path for file exchange is configured in PTV Telematics Service.

10.5 Spedion

To use the Spedion module at the customer, you need the PTV Telematics Service module, see Chapter 10.6.

10.5.1   Allowed devices

Note: Please contact Spedion directly to inquire about compatible Smartphones.

10.5.2   Configuration

To use the Spedion telematics interface, you need a customer access from Spedion. The configuration of the interface is done in cooperation with Spedion and PTV.

10.6 Telematics Service

Other telematics providers can be linked to PTV Route Optimiser with the Telematics Service module.

Further information can be found in the document " Telematics Service PRO_ST_<Version>".

11   Remote maintenance software and data exchange

The use of remote maintenance software via VPN over a DSL line is required for maintenance and online support. Currently, VPN is considered to be the most secure and reliable connection for subscribers and their data exchange. The use of passwords, public keys and/or digital certification ensures the authentication of VPN end-users.

Alternatively, authenticated dial-up via web-based portals (e.g. Secure Access SSL VPN portal) to the authorised servers and computers can be used for remote maintenance.

Connection by **Windows Remote Desktop** is preferred, but only limited data exchange is possible. An alternative method of data exchange must be established.

Customer access to a PTV FTP server is recommended for data exchange.

An individual image can create for each customer. This means that the customer's environment is accessed independently of PTV's own network.

Note: If no remote maintenance access exists for the customer, then the handling of queries or problems is either not possible at all, or only possible with delays and considerable outlay on both sides.

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