Guided Navigation for PTV Navigator

Userguide

Contents

Version and Document Info

Document info

The software references for this version of the document is PTV Navigator 11 and above (Android).

Some descriptions might therefore not be applicable for older versions of our Android app or for our Windows software.

Please check the release notes of higher app-versions for any updates / new features that are not yet documented here.

Karlsruhe, March 2020

1. Introduction: what is Guided Navigation?

1.1 What is Guided Navigation?

Guided Navigation is a technology for route calculation within PTV Navigator.

The standard route calculation in PTV Navigator is a "blackbox" to most users, i.e. you are not able to predict/plan the navigation result in advance.

In contrast, Guided Navigation aims to offer predictable results that correspond with a pre-planned route. In order to get this result, you initially focus on the preparation: You plan a route and identify relevant waypoints from this route. These waypoints, extracted into a special "bcr-file", can then be loaded by PTV Navigator and will influence the standard route calculation to such an extent, that the route you planned will also be calculated.

Please have a look at http://ptv.to/guidednavigation for a short video explaining the goal of Guided Navigation.

1.2 Glossary

Let´s first introduce some terms that are part of the "Guided Navigation universe" and that you should know about:

BCR	*.bcr is the file format of the input data to use Guided Navigation.
Guided BCR/ Guided Tour	A Guided BCR is a *.bcr-file with specific waypoints that will trigger a route calculation based on Guided Navigation. If the Guided BCR has no waypoints, it´s just a regular tour (see below).
Segment	A segment is a tiny part of the road network – each route you see consists of several segments and each segment comes with some specific details about the road it represents. Segments are relevant for Guided Navigation because we aim to match each waypoint to a segment of the map.
Stop	A stop is a destination that the driver has to reach. Your tour can have an unlimited number of stops.
Tour	When speaking of tours in this document, we´re referring to bcr-files without waypoints for Guided Navigation.
Waypoint	Every line in a guided BCR that starts with point*= repretens one waypoint. Without waypoints, there´s no Guided Navigation.
Via-Point / Soft Via Point	PTV Navigator does not use via-points in the same way that for example Map&Guide Internet does:

During navigation, though, we do not offer via-points (=points that you should get close to without having to actually reach them).

Any intermediate points that you use for planning, but not as actual stops, will not be represented as as station but merely become a waypoint in the bcr-file.

Please note that therefore (although the bcr-format allows for a section [SOFT VIAPOINTS]), PTV Navigator will ignore any information that´s offered there.

1.3 Example – Standard Tour vs. Guided Tour

Here is a quick example of a standard tour and a Guided Route.

Route without Guided Navigation

Route influenced by Guided Navigation

```
[COORDINATES]
STATION1=937109,6270033
STATION2=922589,6261738

[DESCRIPTION]
STATION1=Bei D 76131 Karlsruhe /
STATION2=Bei D 76287 Rheinstette
```

Standard BCR (No Guided Navigation)

```
[COORDINATES]
STATION1=937109,6270033
STATION2=922589,6261738

[DESCRIPTION]
STATION1=Bei D 76131 Karlsruhe / Oststadt,
STATION2=Bei D 76287 Rheinstetten / Mörsch

[Station2Segmentcenters]
Point1=937001,6269979,239
Point10=933377,6273495,346
Point11=931143,6275329,315
Point12=930263,6275880,192
Point13=929816,6274361,192
Point14=929491,6272874,195
Point15=929073,6271246,191
Point16=928659,6270222,288
Point17=928065,6270534,161
Point18=927156,6269608,241
Point19=927384,6268478,119
Point2=936330,6269587,234
Point20=927690,6267115,186
Point21=926933,6265960,219
Point22=925865,6264659,220
Point23=924828,6263385,219
Point24=924008,6262387,219
Point25=923905,6262262,219
```

vs. Guided BCR

2. Format description

2.1 The BCR-File

Let´s sum up some basic details of the the bcr-format:

- *The *.bcr-format is recognized by PTV Navigator as a tour.*
- *It can have one or several stops.*
- *Waypoints for Guided Navigation are optional, not mandatory, within the bcr-file.*
- *You have to load a Guided BCR including waypoints if you want to achieve a Guided Navigation.*

Mercator Format

Please note that any coordinate used in the bcr-file needs to be in Mercator format.

You will find some documentation on this format online: https://en.wikipedia.org/wiki/Mercator_projection

If you need help converting your coordinates to Mercator, please have a look at the code for the conversion that we provide with this documentation.

2.2 File-Header

The bcr-file has several blocks, some are mandatory (marked below with an *), some optional, some may be visible in the file but not ignored by PTV Navigator.

Client // optional block

This block contains various infos that planning systems such as Map&Guide may use but that are not relevant for Navigation.

If you want to offer any additional info or configuration in this section, please use:

Parameter	*Description*
ROUTENAME	This is the name of the Route as you will see it in the app. Example: **Routename= My New Route**
REROUTEATTRACTIONFACTOR	See detailed description below Example: **ReRouteAttractionFactor=80**
VEHICLEPROFILE	Use this to define which profile is to be used for this tour. Example: **Vehicleprofile=myProfile**

FORGETWEAKLORRYRESTRICTIONS	Set this value to 1 to ignore weak lorry restrictions. Hard restrictions are still avoided! This setting overrides global settings of the Navigator for the specific BCR-file. This variable is optional. If this section is not used, the presetted setting of the Navigator will be used. (**weak lorry restrictions**: regular truck restictions, weight, dangerous goods, explosives, waterendangering, trailer. **hard restrictions**: Height, width, length, axleweight) FORGETWEAKLORRYRESTRICTIONS =1 (minimum version > 1200256 needed)

Coordinates* // mandatory block

This block holds the coordinates of each station.

Don´t forget: this has to be in Mercator Format.

Description* // mandatory block

This block allows you to give a description of each station.

This description usually (when automatically generated) shows the addresses of each station. You could also display individual hints like “drop parcel here” in this section.

2.3 File Body

The file body is the part where you add the waypoints for Guided Navigation.

2.3.1 Station2Segmentcenter, Station3Segmentcenter, Station4Segmentcenter…

This block is to be used for the points towards each station: so for example Station5Segmentcenter shall include all waypoints to get from station 4 to station 5.

For each of those blocks, the list of points shall start with “Point1”, so please do not enumerate all points but re-start the count with each block.

2.3.2 Routelistinfo

This block is optional and will only appear in files that have been created in Map&Guide Internet. None of the info included in this block will be used or is relevant for the route calculation.

2.4 Additional elements: Visited & Skipped

For each station in the BCR-file you may set a status (skipped or visited).

Normally Station1 should be set on 1 as being visited if used with guided navigation, else the starting station has to be visited before the guided navigation begins.

2.5 Encoding

Please make sure to follow these encoding and format instructions

- File encoding needs to be UTF-8
- Include a line-break after each point and each

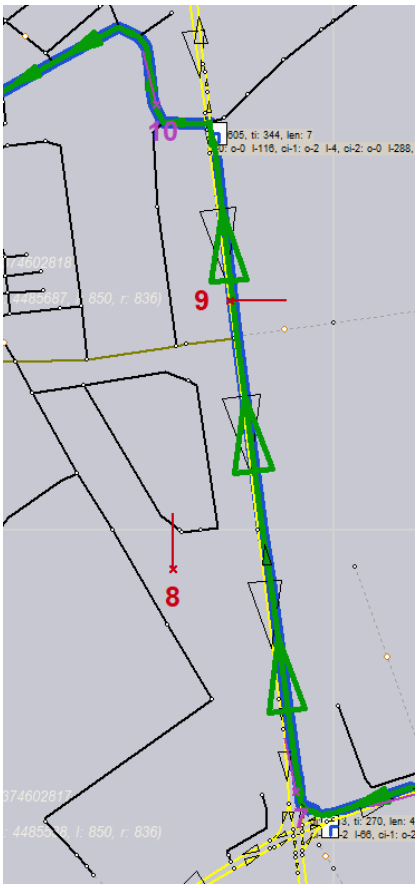
3. Quality of Waypoints / RouteSegemts

The quality of your Guided Navigation result depends on just one thing: the input data you give PTV Navigator.

Relevant for good quality results are:

- Amount of waypoints/density
- Placement of waypoints
-

When using PTV´s own BCR-converter, we make sure that the ideal waypoints are being used. If you were to create the Guided BCR on your own, we can help you with some basic explanation of how to create waypoints in the best possible way.



Example for good and bad quality of RouteSegments (visualization via our testtool TileRouting, see details below)

<u>7 and 10</u>

These are good waypoints, which you can see from the colour: they will be used and they will influence the route calculation.

<u>8 and 9</u>

These are bad waypoints that will not influence the route calculation:

8 – this waypoint is not close enough to any road and can therefore not be matched to a segment of the map.

9 – while this waypoint is close enough to an actual segment of the map, the direction of this waypoint is wrong (=does not match the underlying road network), therefore this waypoint will also be ignored.

4. Process

4.1 First: Create the BCR file

You can create a Guided Navigation file using these PTV products:

- PTV xServer2/xRoute2: probably the easiest way. The regular routing method calculateRoute offers a parameter resultFields which enables you to request a complete BCR
- PTV xServer / MapServer

  We offer a free tool "BCRConverter" that will convert the xRoute result into bcr format. You may download this tool here:
- PTV Map&Guide Internet

  Map&Guide Internet allows you to create the Guided BCR directly in your browser. As a bonus, this approach lets you send the file directly to the device (without setting up additional infrastructure)

You may of course also create a bcr-file without any PTV components involved in the creation. If you do this, though, you are likely not to get the same quality we expect of a Guided BCR.

4.2 Next: Transfer the Guided BCR to the device

Please note that transferring the guided BCR to a mobile device is not a specific feature of Guided Navigation. As we are not able to support every possible connection between your dispatching and your mobile solution, we kindly ask you to transfer the guided BCR to the mobile device in a way that´s ideal for you.

Android

Under Android, we expect to find the Guided BCR in our app´s directory (package name can vary based on the version you have) in the directory /files/bcr/

You can either push the file to the device using your existing infrastructure/connection with the device or you can load the file directly from a specific URL.

Windows

On Windows-Enviroments, you need to send the file to the device and place it in the directory "bcr" inside PTV Navigator´s Program Data directory. Once the file is there, you are able to load it via the application´s user interface (from the "tour" dialog) or using the Remote Interface.

4.3 And finally: Start the Guided Navigation

To activate Guided Navigation, all you need to do is load a "Guided BCR", i.e. a bcr-file with Guided Navigation waypoints, into PTV Navigator.

You can do this….

- …by opening a bcr attached to an e-mail
- …by loading the bcr via the API / Remote Interface
  - Either directly from the device

    - Or from any URL in the web
- …by loading the bcr-file via intent
- …by sending your Guided BCR from PTV´s Map&Guide Internet or PTV RouteOptimiser ST directly to your device

Once the Guided BCR is loaded, the waypoints within the file will influence the route calculation.

You do not need a special license, nor do you have to pay additional fees to use Guided Navigation.

5. Usefull workflows

5.1 Trace planned routes

5.2 Regular tours, for example for busses or waste management

Guided Navigation comes in handy when you want to send new drivers on regular tours, where the driver always should follow a very specific

5.3 Secure tours

….

5.4 Offroad

Each waypoint within a Guided BCR is either onroad (default) or offroad.

Onroad waypoints are matched to a road segment and increase the attraction to this road segment.

Offroad waypoins are part of a polygon that has no link to the underlying mapdata whatsoever. Several offroad waypoints will result in a grey trace visible in the map. This trace is nothing but a polygon drawn onto the map – the driver will not receive any navigation instruction when in offroad mode.

You are able to mix offroad and onroad waypoints whenever needed, even between two stations.

Please be aware of these ..

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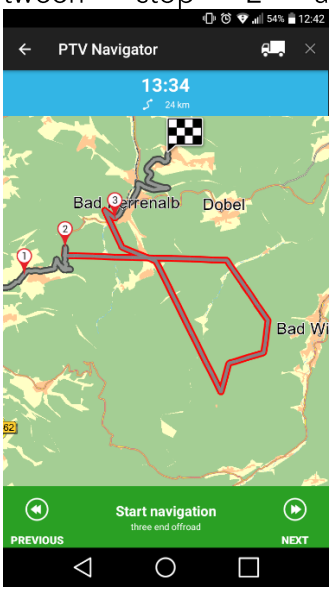
There are two relevant advantages to offroad segments

Onroad waypoints are used for navigation, whereas the goal of an offroad waypoint is merely to draw something on the map. You can use offroad waypoints to “fake” a

Guided Route with Offroad Elements : the section between stop 2 and 3 is fully offroad



Offroad sections are tagged with a 1 behind the heading in the Station2Segmentcenters section.

[Station2Segmentcenters]

Point1=936961,6270547,90

Point2=936970,6270451,174

Point3=937129,6270271,166, **1**

Point4=937170,6270165,154, **1**

5.5 System Limits

As every system has it´s limits, we´d like to point out some assumptions or misunderstandings. As Magnetic Via Points help the routing algorithms by preferring road, they can not guide on route with loops, for the algorithm will take the abbreviation in the loop if possible and not follow the original route. You can fix it with inserting stations in the loop.

5.6 General Do´s and Don'ts

DO

- Use "intermediate" stops or short offroad segments. Intermediate stops can be very helpful

DON´T

- Use the same segment of the road for the way to a certain spot and back – this is not supported by our format.
- Create “gigantic” tours – you may want to send a driver on a trip through Europe.

6. Testing your Guided Navigation

PTV offers you a free test tool, “Tilerouting”, that will allow you to visualize the guided navigation file you created. Our goal is to allow you to see the results you created and to check if these correspond with what you planned.

We would kindly like to ask you to first use this tool and check your input data before sending your support request, as we have often found the reason for unexpected results to be insufficient input data.

As Tilerouting is an internal PTV-tool, it may seem a bit complicated at first. Nevertheless, all you will need this for is to load the file and see if the waypoints within your file can be matched to the road network.

7. Enhanced Configuration Options

For your individual usecase, several configuration settings may be interesting

7.1 Set a certain Vehicle Profile

While you may have planned your route using a truck profile, you cannot be sure what profile the driver has currently activated. If you don´t want to check this first, you can simply pre-define the profile to be used in the BCR-file.

7.2 Drive over most truck restrictions

Please try if Forced Guided Navigation helps you when you´re using a truck profile but the calculated route does not match your planned route. Often, this is due to "minor" truck restrictions that keep us from calculating the route you intented.

If you find such examples, you may set as described above.

FORGETWEAKLORRYRESTRICTIONS =1

You can also set this globally in the app preferecences to ignore all "low-priority-truck-restrictions" such as general restrictions or weight restrictions. This setting will NOT guide you through height or width restrictions.

7.3 Define the "stickiness" of the route

When the driver deviates from the planned route, you are able to define how strongly you want the driver to stick to the initial route and with that how much you want us to lead the driver back to the initially planned Guided Route.

You may set this parameter via the bcr-file (so that it only applies to the current tour) or via the vehicle profile (so that it always applies for a certain vehicle).

7.4 Prohibit to change the vehicle profile

There are two options to keep a driver from messing with the vehicle profiles:

1. Stop him from editing the current profilt
2. Stop hm from selecting a new profile.

8. Frequently asked questions

8.1 What has changed with this new version of the BCR converter?

We have updated the bcr-converter to help you transfer less data to the mobile device. Basically, the file size before was rather big for long routes, so now we have improved our algorithm to extract less waypoints and with that we were able to lower the filesize significantly.

You may of course still use the old converter, but we´d suggest you switch to this new version.

8.2 How many stations can a Guided Navigation File hold?

There is no limit to the amount of stations (or waypoints) a Guided Navigation File can hold. You should, though, expect a slower performance when loading huge amounts of data, which is why we would suggest that you try and limit the amount of stations to one that coresponds with a reasonable time of service for the driver.

8.3 What file size does a Guided Navigation file have?

This depends on various elements such as the amount of waypoints and/or the length of the route. Based on the current BCR converter, you can start with this assumption:

30 kb of file size for every 1.000 waypoints.

8.4 Are there additional costs for Guided Navigation?

No, Guided Navigation is a free feature for every customer of PTV Navigator.

Also, you don´t need to “activate” Guided Navigation, this technology will be used whenever you load a Guided BCR.

8.5 Where can I get support?

If you need help creating a Guided BCR, please contact your sales representative.

If you wonder why the routing result is not as you planned it:

- Please first check your input data with Tilerouting.
- If the input data looks fine, please make sure your configuration options are correct

If you´ve done all the above things and still don´t get the desired result, please contact our support team via e-mail or our Helpdesk Portal. Please add a screenshot of your planned route, the bcr-file you send, the result PTV Navigator gives you, an export of your app-preferences. Don´t forget to let us know what version of the map you´re testing with.

8.6 Does Guided Navigation ignore truck restrictions?

No. Guided Navigation helps influence the route calculation, but one of the elements that still matter is the truck attributes. So if you plan a route through a tunnel that is lower than your vehicle, we will not follow this planned route and instead route around this “obstacle”.

There are other situations, though, where ignoring the restrictions might be less of a problem: for example when the dispatcher knows that some restrictions no longer apply or when the company is allowed to drive through areas because of certain permits. For these cases, we offer "Forced Guided Navigation".

8.7 What happens when a route is planned though an area that is not in the map yet?

You can expect the same behaviour as when you use "bad" waypoints: the waypoints will simply be ignored.

8.8 What does "ReRouteAttractionFactor" do?

You should be aware that Guided Navigation is relevant in two situations that are not necessarily linked:

1. When initially calculating the route

   When you calculate the route, PTV Navigator loads all waypoints and strongly prefers a route that leads via these waypoints. Depending on the number and quality of waypoints in your Guided BCR, this can lead to good or bad results. Your only option to influence this initial routing result is by using good quality waypoints that you usually only get when using the PTV products and tools.

2. When deviating from the route

   When you deviate from the route, PTV Navigator has to re-calculate the route. In this situation, we can choose between two options: forget all waypoints or stick to them whatever it takes. Neither option is ideal, depending on your situation, which is why we give you an individual configuration option: the ReRouteAttractionFactor.

   This parameter is only relevant in ReRouting-situation, it has no effect on the initial route calculation.

   You can set this factor in the app or add it directly to your bcr-file.

   Here are some values you can set:

- 100 – set this and all waypoints are forgotten once a ReRoute is being calculated
- 70 – set this for a medium result: don´t forget all waypoints but also don´t stick to them at any cost.
- 40 – please set this if you want to ReRoute the driver to the initial route as much as possible.

  We suggest you do not use any value lower than 40, as this could lead to "backwards detours", i.e. the driver being sent back to some waypoints that he may have "skipped" due to a detour he made.

8.9 Why is my result different than the planned route?

Guided Navigation aims to bring you a result that is closes to you planned route. There is no guarantee for a 100% identical route as was planned due to external reasons.

If your route is different, you might want to look out for:

- Truck restrictions

  Please check the area that you wanted to drive through: is there a truck restriction in the map. If so, please try Forced Guided Navigation

- Map provider and version

  Please check for relevant differences in the “planning” and “navigation” maps, like roads that have recently been built.

- Borders

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the mind of movement

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