PTV Visum 2020 Release Notes

PTV **GROUP**

the mind of movement

Last modified: 2020-01-27

2020.01-05   [150554]

2020-01-24

⊕ New Features and Changes

Data Model

⊕ New relation from location to activity: A new relation from locations to the activity executions at the respective location was inserted. **(20743)**

I/O Installation

⊕ More service pack notifications: After deploying a service pack that is newer than the installed service pack, a notification is now displayed more often than before. Regardless of this, recent service pack notifications are still permanently displayed on the start page. **(19826)**

I/O Interfaces

⊕ Better identification of stop points in the Public Transport import: When importing public transport supply from Visum, the default label is now used instead of the stop point code in error messages that refer to stop points that are not allocated in the target network, so that the name is output in the case of an empty code. **(20836)**

⊕ Only active network objects when exporting to VisionWeb: When exporting a network to VisionWeb, the set of exported network objects of a type can now be restricted to the active network objects. **(20438)**

⊕ SQLite databases as export target: The network, lists, and views of the Matrix Editor can now be exported to SQLite databases as an alternative to MS Access. Via COM the export is done by the new methods SaveSQLiteDatabase or SaveSQLiteDatabaseUsingLayout on the IIO object. **(20262)**

Other Procedures

⊕ Emission calculation according to HBEFA 4.1: The emission calculation can now be carried out according to HBEFA 4.1 in the October 2019 variant. According to the HBEFA 4.1 systematics, the number of subsegments has been revised, additional pollutants and new static traffic situations are available, and the Level of Service is classified in 5 levels. **(20536 ❗)**

PuT Line Blocking

⊕ Performance improvements with vehicle interchange: Line blocking with vehicle interchange has been accelerated in various constellations, especially when vehicle journey sections marked as optional reinforcements are planned. **(20740 ❗)**

Scenario Management

⊕ Scenario attributes available as auto texts in the print frame: The number, name, and description of the currently loaded scenario can now be inserted as auto texts in the print frame. **(13530)**

✓ Fixed Bugs

Demand Procedures

✓ Calculate demand from path sequences with matrix time series: If a time series of matrices is specified for the target demand segment, the procedure 'Calculate demand from path sequences' cannot be executed properly. A message now indicates this case. **(20655)**

Dialogs

✓ Crash when opening the parameters for stop area skim matrix: No more crash when opening the parameters dialog of the procedure 'Calculate stop area skim matrix' in the timetable-based variant. **(20834)**

- ☑ Missing attributes below search results in attribute selection: When searching in the attribute selection dialog, elements below a search result were filtered again in some constellations. As a result, sometimes only those attributes whose name also contained the search string were displayed next to a relation whose name contained the search word. This error has been fixed. **(19920)**

Graphics

- ☑ Crash when combining route course and lane allocation: Crashes no longer occur when drawing the network if both the lane allocation and the route course layers are activated in the graphic parameters. **(20870)**

I/O Interfaces

- ☑ *L lines in HAFAS import: The import of HAFAS data failed under certain conditions if the line name specified in an *L line in the timetable file did not consist of 8 characters. This error has been fixed. **(20518)**
- ☑ Crash when exporting to MaaS Modeller: No more crashes when exporting a network without a specified co-ordinate system to PTV MaaS Modeller. Export is not possible in this case, and the attempt is now aborted with an error message. **(20879)**
- ☑ Import VDV452 too slow: Due to the content extension by the specific dwell times per vehicle journey section (ID 20626), the VDV452 import was considerably slowed down. This has been fixed. **(20909)**
- ☑ Maas Modeller export crashes when service area is not extended: A crash no longer occurs when exporting to PTV MaaS Modeller if the service area has no height or width, e.g. because it comprises only one node or only nodes of exactly the same height or width. **(20802)**
- ☑ OSM import sometimes freezes: The OpenStreetMap import sometimes froze after reading the temporary network file. This bug has been fixed. **(20818)**
- ☑ Statistics tables in the export to VisionWeb: If one of the three statistical network objects Network statistics, PuT assignment statistics, or Emissions (HBEFA) was selected for export to VisionWeb, the export failed. This error has been fixed. **(20759)**

Installation

- ☑ Display name set incorrectly by update: Up to now, the display name in the list of installed programs was set incorrectly by updates. This incorrect display name was displayed under 'Uninstall programs', for example. This error has been fixed. **(20856)**

Main Window

- ☑ Indication of no longer visible messages in the message window: If the message window was only opened after the execution of a process (e.g. procedure or import) that produced so many messages that not all messages were displayed anymore, then the indication of the other, no longer visible messages was missing. This error has been corrected. In addition, the option to open the message file directly to display the messages that are no longer visible has been added to this indication. **(20489)**
- ☑ Wrong online help if start page not available: If PTV Visum could not reach the start page, an incorrect URL was used when calling the online help. This error has been corrected. **(20945)**

Network Editor

- ☑ Several copyright notices for static Bing maps backgrounds: Under certain circumstances, the copyright notices for static Bing Maps backgrounds were displayed multiple times. This error has been fixed. **(20838)**

PrT Assignment

- ☑ Extended route import freezes: The 'Extended route import' procedure got into an infinite loop if dynamic results were imported and there were already time intervals and user-defined attributes with these time intervals as subattributes in the target network. This bug has been fixed. **(20749)**
- ☑ No shortest paths in the Equilibrium assignment Bi-conjugate Frank-Wolfe: In the 'Equilibrium assignment Bi-conjugate Frank-Wolfe', objects temporarily overloaded during assignment could lead to a situation where no (or a wrong) path was found for an origin-destination pair. Depending on the situation, this could lead to the termination of the procedure or to slightly different results. This error has been fixed. **(20871 ⛔)**

PuT Assignment

- ☑ Crash when calculating PuT skim matrices in headway-based assignment: No more crash when calculating PuT skim matrices in the headway-based variant with several cores. **(20847)**
- ☑ Inconsistent skim matrices in timetable-based assignment with iterations: In timetable-based assignments with iterations (e.g. Sharing or capacity-restricted), the skim matrices were previously based on the unsmoothed volumes of the last iteration and were therefore not consistent with the assignment result. This error has been corrected. **(20885)**

- ✅ Unauthorized error message for DRT with one search iteration: If the use of DRT (Demand Responsive Transport) was planned for a timetable-based assignment with only one demand segment to be assigned and only one iteration with path search was required, the assignment terminated with an unauthorized error message. This error has been fixed. **(20761)**
- ✅ Units for time-related skim matrices: In the general procedure settings, for public transport skim matrices you can specify whether time-related values are stored in seconds or minutes. For matrices that exist per transport system (e.g. In-vehicle time), this setting did not work until now. This error has been corrected. **(20872)**

PuT Line Blocking

- ✅ Block check too slow: The block check was unnecessarily slow for extensive blocks and has been accelerated. **(20826)**
- ✅ Considerable memory consumption for recurring actions: In line blocking with recurring actions (e-mobility), an unnecessarily large amount of memory was used, especially in networks with weekly or annual calendars. This error has been fixed. **(20929)**
- ✅ Minimum duration of charging processes did not work: In PuT Line Blocking with user-defined recurring activities ('e-mobility'), the procedure parameter 'Minimum duration of user-defined activities' did not work correctly. As a result, line blocks with limit faults were rated too well and were therefore sometimes output as a result. This error has been corrected. **(20591 ❗)**
- ✅ Possible infinite loop in line blocking procedure: In the line blocking procedure (all variants), an infinite loop could occur in the step 'Calculate line blocks from best solution...'. This error has been corrected. **(20881)**

Visum Files

- ✅ Empty values for user-defined attributes with time interval subattribute in network files: If values for a user-defined attribute with a time interval subattribute were read in from a network file, where the first value read in was an empty value, the value of this user-defined attribute was set to the default value instead of the empty value. This applied to all objects up to the first one for which a non-empty value was specified for the attribute. This error has been fixed. **(20837)**
- ✅ Version files with static backgrounds not readable: Version files whose graphic parameters contained static Bing Maps backgrounds could not be read again. This error has been fixed. **(20831)**

❗ Breaking Changes

Other Procedures

- ❗ Emission calculation according to HBEFA 4.1: The emission calculation can now be carried out according to HBEFA 4.1 in the October 2019 variant. According to the HBEFA 4.1 systematics, the number of subsegments has been revised, additional pollutants and new static traffic situations are available, and the Level of Service is classified in 5 levels. Execution of the calculation in a version file prepared for PTV Visum 18 and earlier (with HBEFA 3.3) is only possible after updating the fleet composition and adjusting the procedure parameters. Naturally, different procedure results will then be obtained. **(20536 ⊕)**

PrT Assignment

- ❗ No shortest paths in the Equilibrium assignment Bi-conjugate Frank-Wolfe: In the 'Equilibrium assignment Bi-conjugate Frank-Wolfe', objects temporarily overloaded during assignment could lead to a situation where no (or a wrong) path was found for an origin-destination pair. Depending on the situation, this could lead to the termination of the procedure or to slightly different results. This error has been fixed. This can lead to changed assignment results even in networks in which the assignment was not terminated. **(20871 ✅)**

PuT Line Blocking

- ❗ Minimum duration of charging processes did not work: In PuT Line Blocking with user-defined recurring activities ('e-mobility'), the procedure parameter 'Minimum duration of user-defined activities' did not work correctly. As a result, line blocks with limit faults were rated too well and were therefore sometimes output as a result. This error has been corrected. As a result, the results of PuT Line Blocking with recurring activities (with and without vehicle interchange) change. **(20591 ✅)**
- ❗ Performance improvements with vehicle interchange: Line blocking with vehicle interchange has been accelerated in various constellations, especially when vehicle journey sections marked as optional reinforcements are planned. As a result, the results of line blocking with vehicle interchange and without vehicle interchange but with recurring services, change. **(20740 ⊕)**

⊕ New Features and Changes

I/O Interfaces

⊕ Acceleration of the VDV452 import: The VDV452 import has been accelerated especially for large amounts of data. **(20742)**

⊕ Separator for railML and Hafas import: Since commas in line names are not forbidden but nevertheless very problematic (see ID 20255), the default value for the separator between the name components in the Hafas and railML import has been changed to '-'. In addition, forbidden semicolons in line names are no longer replaced by commas, but also by hyphens. This second measure also changes the result of the import when using existing PuT import project files (*.puti), if the data used for names contains semicolons. **(20780)**

⊕ Vehicle journey-specific stop times in VDV452 import: For VDV452 imports, the vehicle journey-specific stop times are now also transferred from the REC_FRT_HZT file. As a result, several different time profiles may be created for each travel time group in order to take these individual stop times into account. **(20626)**

⊘ Fixed Bugs

COM-API, Procedure Sequence

⊘ PrT assignment quality lists always empty in procedure sequence: If one of the PrT assignment quality lists was opened and read out via COM in a procedure step 'Run script' within the procedure sequence, its content was always empty. This error has been corrected. **(20715)**

Data Model

⊘ Negative values when converting a percentage time series to a matrix time series: When converting a percentage demand time series to a matrix time series, cells with negative values were lost. This bug has been fixed. **(20667)**

Dialogs

⊘ Crash when inserting skim procedure settings: No more crashes when inserting multiple values into the public transport skims table within the general procedure settings. **(20764)**

⊘ Editing the line allocation for fare systems: In the dialog 'Edit PuT fares' the allocated lines of a fare system could not be edited if another separator than the comma was selected in the network settings for concatenated attributes or if a lot of lines were allocated. This bug has been fixed. Commas that occur in line names remain problematic. In this case, a separator must be selected in the network for concatenated attributes, which does not occur in any line name. **(20255)**

⊘ Incorrect value range check for VD functions: In the dialog for the parameters of the VD functions, the permissible value ranges were not checked correctly. This error has been fixed. **(20638)**

Formulas

⊘ Subattribute replacement in formulas: In formula attributes with subattributes, other attributes with the same subattribute can be used in the defining formula without specifying a specific subattribute value. In this case, the same value is used as for the formula attribute itself. However, this did not work if the unspecified subattribute occurred elsewhere, for example, as a second subattribute. This error has been corrected. **(20733)**

Graphical Procedures

⊘ Crash when closing a link after public transport shortest path search: A crash no longer occurs when closing a link for PuT-Walk transport systems if a public transport shortest path search was previously calculated. **(20584)**

Graphics

⊘ 'Text sizing factor screen' affects print: The 'Text sizing factor screen' in the graphic parameters of the network editor also took effect in the print preview and in print. This bug has been fixed. **(20402)**

I/O Interfaces

⊘ Missing values of user-defined attributes when importing intersection data: When importing intersection data, values of user-defined attributes were not transferred if the matching user-defined attributes already existed in the target network before the import. This error has been fixed. **(20511)**

⊘ No empty line name during railML import: Previously, empty line names could occur during railML import, but these are forbidden in the data model. This error has been fixed by assigning a generated line name (uniform throughout the import process) instead of an empty line name. **(20612)**

- ✅ OSM import of zipped OSM files: Importing zipped files with the OpenStreetMap import took unnecessarily long. This bug has been fixed. **(20737)**
- ✅ Suppressing further messages in import of PuT supply from Visum: When importing a PuT supply from Visum, it was not possible to suppress further warnings in the case of warnings for non-importable lines. This bug has been fixed. **(19848)**
- ✅ railML-import fails in certain constellations: If a 'train' element in the railML data consists of several 'trainPart' elements of which one has more than one time values, but all except one are of type 'pass', then the section described by the following 'trainPart' element was also not imported. This bug has been fixed. **(19596)**

Junction Editor

- ✅ Crash in turn volumes view: No more crashes when switching to the turn volumes view in the Junction Editor. **(20762)**

Lists

- ✅ Unstable sequence of selected objects: If several objects are selected consecutively in a list, the sequence of these objects in the global marking is unstable, i.e. cannot be reproduced. If the renumbering of objects is then called on such a marking, the sequence of the renumbered objects is also unstable. This error has been corrected. **(20741)**

Network Editor

- ✅ Special functions for line routes did not work in line mode: When using the 'Edit: Lines' mode, the four special functions from the context menu, which refer to line routes, did not work. This bug has been fixed. **(20700)**

Other Procedures

- ✅ Crash of tour planning without zones: The 'Tour planning' procedure no longer crashes if there are trip requests but no zones. **(20707)**
- ✅ Noise calculation in accordance with RLS-90: The noise calculation in accordance with RLS-90 was based on the average daily traffic volume instead of an hourly one. This error has been fixed. **(20636 🔴)**

PrT Assignment

- ✅ LUCE always successful: The error status of the equilibrium assignment LUCE was not output, that is, it was flagged as 'successful' regardless of the result of the procedure, even if the user terminated the procedure. This error has been corrected. **(20784)**
- ✅ TRIBUT assignment freezes: The PrT assignment in the variants 'TRIBUT-Equilibrium assignment' and 'TRIBUT-Equilibrium_Lohse' did not finish when executed. This bug has been fixed. **(20774)**

PuT Assignment

- ✅ Crash when using TSys-based paths after network change: Accessing the paths of a transport system-based assignment (e.g. by path list or evaluation of the OD pair filter) no longer leads to a crash if the network is changed after the assignment. **(20222)**
- ✅ No skims and statistics for iterative assignment with iterations with path search only: If 0 is set for the parameter 'Maximum number of iterations without a new path search' during the execution of an iterative timetable-based assignment (i.e. with DRT, Sharing or capacity restriction), the values of the zone and network statistics as well as all skim matrices were missing. This error has been fixed. **(20755)**

PuT Line Blocking

- ✅ Vehicle interchange does not consider average capacity overload correctly: If volumes were taken into account in PuT line blocking with vehicle interchange and the average capacity overload was used as a criterion, this had too little effect. This error has been corrected. The calculation based on peak capacity overload was not affected. **(20725)**
- ✅ Vehicle interchange uses too large vehicles: In line blocking with vehicle interchange, larger (and thus more expensive) vehicles than necessary tended to be included in the optimization target when using the balance between volume and capacity. This error has been fixed. **(20738 🔴)**

PuT Passenger Survey

- ✅ Attribute allocations to target attributes that do not exist in the network: If a procedure parameters file contained a 'Read survey data' procedure and attribute allocations to user-defined attributes of public transport paths that did not exist in the network, the allocation was not displayed on the 'Attributes' tab of the procedure parameters dialog. However, clicking the 'Create user-defined attributes' button did not allocate any new target attributes either for the source attributes concerned. This error has been fixed. **(20648)**

Timetable Editor

- ✅ Overflow of the vehicle journey number in case of repeated Copy&Paste: When copying vehicle journeys to the clipboard and then pasting them into another network, the vehicle journey numbers could quickly overflow if several vehicle journeys were transferred to the same target network. The same happened when copying and pasting a section of a line route if the vehicle journeys were also transferred during pasting. This bug has been fixed. **(20665)**

Visum Files

- ✅ Version files with static backgrounds not readable: Version files whose graphic parameters contained static Bing Maps backgrounds could not be read again. This error has been fixed. **(20791)**

⚠ Breaking Changes

Other Procedures

- ⚠ Noise calculation in accordance with RLS-90: The noise calculation in accordance with RLS-90 was based on the average daily traffic volume instead of an hourly one. This error has been fixed. Noise calculation results change accordingly. **(20636 ✅)**

PuT Line Blocking

- ⚠ Vehicle interchange uses too large vehicles: In line blocking with vehicle interchange, larger (and thus more expensive) vehicles than necessary tended to be included in the optimization target when using the balance between volume and capacity. This error has been fixed. As a result, the results of line blocking with vehicle interchange and line blocking without vehicle interchange but with recurring actions (e-mobility) change. **(20738 ✅)**

2020.01-03 [148684]

⊕ New Features and Changes

Data Model

- ⊕ Relations in the demand model: Between the network objects of demand modelling (demand model, activities, activity pairs / chains, demand strata, etc.), the previously missing relations in the data model were added. **(19383)**

Graphics

- ⊕ Bars and object restriction: If on the one hand the restricted object selection ('Draw only the N objects with...') is effective for links or connectors and on the other hand the option 'Draw bars only on active links / connectors' for bars, the bars will now only be drawn on those links or connectors that are among the N best active objects. Thus the selection of the objects with bars and the selection of the objects are consistent. **(19011)**
- ⊕ Retain formatting of bar labels: If the scaling attribute was changed for a bar (or the weighting attribute for line or path bars), the settings for the formatting of the labels were previously changed to the defaults of the new attribute. These settings are now retained if the settings match the type of the new attribute. In particular, it is now possible to create two bars with identical formatting settings by setting the formatting once, duplicating the bar, and then selecting the desired scaling attribute for the second bar. **(19778)**

I/O Interfaces

- ⊕ 'Only active' when exporting to Vision Web: The export of public transport trajectories to Vision Web can now be restricted to active vehicle journeys and their shares on active links. **(20427)**
- ⊕ Empty PUDO schemes and service areas in MaaS Modeller export: The export to PTV MaaS Modeller is aborted with a warning if there is no POI with a node or zone allocation in the selected POI category. Such a POI category would describe an empty PUDO scheme or service area, and the exported data could not be used in PTV MaaS Modeller. **(20689)**

Other Procedures

- ⊕ Charging processes (e-mobility) in tour planning: In the 'Tour planning' procedure, additional restrictions for the range of the vehicles and possible charging areas in the network can be taken into account. **(20693)**
- ⊕ Display of credits for tour planning: The status of available credits for tour planning to be calculated in PTV MaaS Modeller can be viewed in the MaaS Modeller license dialog. If there are not enough credits available for tour planning, a clear error message is now issued when executing the procedure. **(20178)**

PrT Assignment

- ⊕ Convergence in assignment with ICA: In the assignment statistics list for assignment with ICA, all attributes are now calculated regardless of the option selected for convergence - Classical or WebTAG-compliant. **(20723 ⊘)**
- ⊕ Extended convergence criteria and statistics in static assignments: In the static assignment procedures Equilibrium assignment, Equilibrium assignment LUCE, Equilibrium assignment Bi-conjugate Frank-Wolfe and Equilibrium_Lohse both extended convergence statistics and extended convergence criteria are available. This can be used to check which links and turns show larger deviations of the volume and/or the impedance between the iterations, and a minimum share of converged links and turns can be used as an additional convergence criterion. **(17226)**

PuT Line Blocking

- ⊕ Rounding the duration of empty trips: If the arrival and departure times of the relevant vehicle journey items are whole minutes or useful factors of them (e.g. half, quarter, tenth of a minute), the durations of empty trips are now rounded up to multiples of this factor. The reachable next departures do not change, and extremely short waiting activities are avoided. If system routes are used for empty trips, their run times can also be rounded as an option. **(20592 ⊘)**

PuT Operating Indicators

- ⊕ Territory-based evaluation also for vehicle journey sections: Within the framework of the 'PuT Operating Indicators' procedure, you can now calculate territory-based indicators for vehicle journey items. The results are output in the new list 'Territory PuT detail-vehicle journey items'. **(18623)**

✓ Fixed Bugs

Data Model

- ✓ Empty strings as key: For objects whose key is a character string (e.g. transport system, line), empty strings could be entered for this key. This was only prevented in some dialogs, but was possible in lists or via COM. This bug has been fixed. **(20241)**

Dialogs

- ✓ Crash on attribute selection for attribute with time interval set subattribute: No crash anymore when selecting a user-defined attribute with a time interval set as subattribute as target attribute in the Multi-edit dialog for any network object. **(20709)**
- ✓ Empty strings in the dialog 'Edit vehicle journey(s)': If the 'Edit vehicle journey(s)' dialog is opened for several vehicle journeys, it should display an asterisk for each attribute for which the vehicle journeys have different values. However, this did not work if one of the attribute values involved was empty. If the dialog was left in this situation via 'OK', the displayed value was taken over unintentionally for the vehicle journeys which previously had the empty value. This bug has been fixed. **(20657)**

Graphics

- ✓ Color of the line bars changed when the decimal places were changed: When increasing the decimal places of a bar using the 'Edit bar' dialog, the graphic parameters of the first class of classified graphic parameters were also adopted for the uniform display, which could change colors and other settings. This bug has been fixed. **(20446)**
- ✓ Distance between bars in turn volume display: If the option 'Draw bars only on selected turns' is selected for the bars of a turn volume display, the option 'Distance between bars' did not affect the bars, i.e. the bars were drawn without a distance to the turn edge. This bug has been fixed. **(20400)**
- ✓ Network does not draw if the file type is incorrect in the pfd file: If a file was specified in the configuration file AKTDRV.CFG for graphic parameters that did not contain a graphic parameters file and PTV Visum was started by double-clicking on a version file, the network was not drawn at all, i.e. the network window remained empty. This bug has been fixed. **(20000)**
- ✓ No locations in the legend: Locations could not be selected as objects in the legend. This bug has been fixed. **(20560)**
- ✓ Text blocks of turn volumes in graphic parameters file: The information which text blocks are stored was no longer correctly written to or read from the graphic parameters for turn volumes at main turns. This error has been corrected. Turn volumes at turns were not affected. **(19853)**

Graphics 3-D

- ✅ Incorrect progress display for prism display of POI categories: When recalculating a 3-D network view, which showed prisms for the POIs of a certain category, the number of all POIs was displayed as objects to be processed and not the number of POIs of the category. This bug has been fixed. **(18156)**
- ✅ Marking network objects through dashboard actions: It was no longer possible to mark network objects or define the visible information signs using storyboard actions. This bug has been fixed. **(20611)**

I/O Interfaces

- ✅ Crash in case of invalid matrix reference in Maas Modeller export: A crash no longer occurs when exporting to PTV MaaS Modeller if the demand of a demand segment is described by a time series of matrices and one of the matrix time series items has an empty or invalid matrix reference. **(20688)**
- ✅ Filter on active main nodes in intersection data import: In the import for intersection data, the allocation of node legs to the cordon links of a main node in the target network was not correctly created if the import should only be done for active main nodes and passive main nodes existed in the target network. This bug has been fixed. **(20386)**
- ✅ HAFAS data in version 5.40 with 9-digit stop numbers: HAFAS data written in the format specified by version 5.40 but with 9-digit stop numbers could not be read. This bug has been fixed. **(20629)**
- ✅ Link type of blocked reverse links during shapefile import: During a directed import of links from a shapefile, the links not specified in the data, hence the blocked links, have been assigned to the same link type. This bug has been fixed, i.e. the blocked opposite links are now assigned to link type 0. **(20180)**
- ✅ Missing attributes in parameter file for export to VisionWeb: If a parameter file is read in for the export to VisionWeb in which attributes shall be exported that do not exist in the current network, the export failed so far. This error has been fixed. **(20640)**
- ✅ Parameters dialog for railML import forgot settings: If you activated the option 'Import all vehicle journey sections as 'daily'' on the 'Calendar' tab of the parameters dialog for railML import and then switched to another tab and back again, the setting was lost. This bug has been fixed. **(20664)**

Lists

- ✅ Display of time-varying attributes with subattributes: Values of time-varying attributes with subattributes could not be displayed or changed in lists. This bug has been fixed. **(18390)**

Miscellaneous

- ✅ Occasional crash when terminating Visum: A cause of occasional, non-reproducible crashes when exiting PTV Visum has been fixed. **(20671)**

Network Editor

- ✅ Default values for (main) turns: If only the type is to be set with the Multi-edit special function Set default values for (main) turns, no changes are made to the network at all. This error has been corrected. **(20694)**
- ✅ Deleting intermediate link points on nodes: If a link has an intermediate point exactly on the From- or To-node, it could not be deleted or moved in the network editor. This bug has been fixed. **(20210)**

Other Procedures

- ✅ Crash of tour planning in case of trip requests without zones: No more crash when executing tour planning if there are trip requests without a To- or From-zone. **(20646)**
- ✅ Project directory after tour planning execution: After executing the 'Tour planning' procedure using the local installation of the MaaS Modeller, previously set relative paths for project directories led to a different location in the file system than before. This bug has been fixed. **(20620)**

PrT Assignment

- ✅ Unstable results in list 'PrT assignment quality data' for Equilibrium_Lohse and TRIBUT Equilibrium_Lohse procedures: When using the Equilibrium_Lohse procedure or the TRIBUT-Equilibrium_Lohse procedure, the values for the hypothetical shortest path impedance (and derived values) shown in the 'PrT assignment quality data' list were not stable, i.e. they could show minor differences with unchanged input data. This error has been fixed. **(20699)**

Procedure Sequence

- ✅ Questions and suppressed warnings: If warnings on the user interface were suppressed in the procedure sequence (or in comparable contexts, such as subnetwork generator or railML import) by the corresponding option, all questions with the same priority were not displayed, but the default answer was assumed. However, these questions were not listed in the message window. This bug has been fixed. **(20690)**

PuT Assignment

- ✅ Timetable-based assignment slow if only routes are saved: If only routes were saved as volumes and there were no analysis time intervals in the network, the timetable-based assignment took considerably longer than in earlier program versions. This bug has been fixed. **(20695)**

PuT Line Blocking

- ✅ Incorrect layover times in discharging function: During the evaluation of the discharging function for recurring actions ('e-mobility'), layover times were not evaluated correctly. As a result, line blocks may have been calculated, which do not meet the conditions for recurring actions, i.e. which show a limit fault if discharging at layover was modeled. This error has been corrected. **(20337)**
- ✅ Wrong costs in case of forced chainings: If two or more vehicle journey sections were connected by forced chainings, the costs for the operation of these vehicle journeys were wrongly calculated with regard to both duration and distance. Furthermore, the theoretical minimum number of required vehicles was not output correctly. Both errors have been fixed. **(20601 🛑)**

PuT Operating Indicators

- ✅ Time reference for indicators of vehicle journey items: In the case of the Service kilometers, Section service kilometers, Service time, Section service time, Seat kilometers, Seat hours, Total capacity kilometers, Total capacity hours indicators per analysis time interval at the vehicle journey item, the values of all links up to the next vehicle journey item were previously assigned to the time interval in which the vehicle journey item itself lies, instead of, as is usual, to each time interval the values of the links whose From-nodes were traversed in this time interval. This error has been fixed. **(20142)**

Scenario Management

- ✅ Display error in case of very long scenario indicators: If very long scenario indicators were used, display errors could occur in the scenario table. This error has been corrected. **(20375)**
- ✅ Execution of scripts not possible: When calculating scenarios as part of scenario management, it was not possible to execute scripts or add-ins in the procedure sequence. This error has been fixed. **(20724)**

Scenario Management, Visum Files

- ✅ Matrix data when renumbering (main) zones: If zones, main zones, or stop areas are renumbered in a network with matrices in such a way that their order is retained and this action is saved as a model transfer file, the matrix values of the affected zones are lost when this file is used. The same applies to a modification in scenario management. This error has been corrected. **(20625)**

Subnetwork Generator

- ✅ Generating a subnetwork not possible with certain dynamic data: The cutting of a subnetwork with dynamic results for PrT was only possible if the network was calculated with simulation-based dynamic assignment (SBA). If there were other dynamic results, e.g. from a route import, the cutting of a subnetwork failed so far. This error has been corrected by continuing to cut the subnetwork like in the static case, i.e. without a temporal resolution of the demand. **(20614)**
- ✅ If a user-defined formula attribute existed in the network whose formula refered to POI categories, creating subnetworks of this network failed. This bug has been fixed. **(20604)**

Timetable Editor

- ✅ Crash when editing several vehicle journeys: If the 'Edit vehicle journey(s)' dialog was opened for several vehicle journeys whose start and end time profile items differed, a crash could occur when assigning a new line, direction, or line route. This bug has been fixed. **(20406)**
- ✅ Rounding of attribute values when copying to clipboard: When copying vehicle journeys or marked sections of a line route to the clipboard, the attribute values of the vehicle journeys or the line route items and time profile items as well as of dependent objects that were also copied were rounded so far. When pasting this data, this either led to incorrect data or to queries regarding references to other network objects with attribute values that did not quite match. This bug has been fixed. **(20682)**

Visum Files

- ✅ Reading a global layout with reserved characters in filter condition: If a character reserved in XML occured in a filter condition (e.g. '<' or '>' for conditions to the public transport directions), a global layout file with such conditions could not be read in entirely. This error has been fixed. **(20525)**
- ✅ Reading old version files with operating periods: When importing a version file written with Visum 18 or earlier and when creating a new time interval set, a misleading warning occurred if the network contained operating periods. This bug has been fixed. **(20637)**

❗ Breaking Changes

PrT Assignment

- ❗ Convergence in assignment with ICA: In the assignment statistics list for assignment with ICA, all attributes are now calculated regardless of the option selected for convergence - Classical or WebTAG-compliant. The basis on which the convergence-relevant shares are calculated has changed, so that assignment results change. **(20723 ➕)**

PuT Line Blocking

- ❗ Rounding the duration of empty trips: If the arrival and departure times of the relevant vehicle journey items are whole minutes or useful factors of them (e.g. half, quarter, tenth of a minute), the durations of empty trips are now rounded up to multiples of this factor. The reachable next departures do not change, and extremely short waiting activities are avoided. If system routes are used for empty trips, their run times can also be rounded as an option. The formed line blocks thus differ in both variants of the procedure. **(20592 ➕)**
- ❗ Wrong costs in case of forced chainings: If two or more vehicle journey sections were connected by forced chainings, the costs for the operation of these vehicle journeys were wrongly calculated with regard to both duration and distance. Furthermore, the theoretical minimum number of required vehicles was not output correctly. Both errors have been fixed. This leads to different results of the line blocking procedure, not only in networks with forced chainings. **(20601 ✅)**

2020.01-02 [147727]

2019-10-15

➕ New Features and Changes

Subnetwork Generator

- ➕ Handling of DRT path legs: When generating a subnetwork, public transport path legs covered by DRT transport systems are now taken into account, i.e. their demand enters or exits the network at the point where the (imaginary) shortest path in the PrT network enters or exits the subnetwork area. **(20500)**

✅ Fixed Bugs

COM-API

- ✅ Crash at ILink.InMainTurns or ILink.OutMainTurns: No more crash when calling one of the methods InMainTurns or OutMainTurns to output the inbound or outbound main turns of a link if the From- or To-node of the link is not assigned to a main node. **(20607)**
- ✅ ILink.InTurns and OutTurns as well as InMainTurns and OutMainTurns: Until now, the methods ILink.InTurns and ILink.OutTurns returned the wrong result set, i.e. InTurns returned the outbound turns and OutTurns the inbound turns. In the same way, ILink.InMainTurns and OutMainTurns were mixed-up. This bug has been fixed. **(20564 ❗)**

Network Editor

- ✅ Locations are not re-projected: When changing the co-ordinate system of a network, the co-ordinates of locations were not converted. This error has been fixed. **(20609)**

PrT Assignment

- ✅ Procedure parameters not correct after switching the assignment procedure: If the procedure variant was switched to 'TRIBUT-Equilibrium assignment' or 'TRIBUT-Equilibrium_Lohse' in a PrT assignment procedure step and assignment was then started without first opening the parameter dialog for this procedure, assignment could not be executed. This error has been corrected. **(20522)**

PuT Line Blocking

- Interruptions of depot stays due to very short loading: In line blocking with recurring actions and depots, unwanted interruptions of the depot stay could occur due to very short loading activities. This effect occurred particularly when the arrival and departure times of the vehicle journey sections were not all full minute values. This error has been fixed. **(20351)**

Transfers Display of Regular Services

- Switching the interface language: If the language of the user interface was switched when the display of regular services was open, the input fields for From-time, To-time, basic cycle and tolerance were cleared. This bug has been fixed. **(19016)**

⊘ Breaking Changes

COM-API

- ⊘ ILink.InTurns and OutTurns as well as InMainTurns and OutMainTurns: Until now, the methods ILink.InTurns and ILink.OutTurns returned the wrong result set, i.e. InTurns returned the outbound turns and OutTurns the inbound turns. In the same way, ILink.InMainTurns and OutMainTurns were mixed-up. This bug has been fixed. Scripts that have relied on this error must therefore be adapted to the corrected output. **(20564 ⊘)**

2020.01-01 [147561]

⊕ New Features and Changes

Dialogs

- ⊕ Filter for time intervals in attribute selection: In the attribute selection dialog, the filter for restricting the displayed subattribute values for time-dependent attributes has been extended so that it is now also possible to filter for a specified time period. In this case, the subattributes are provided for each time interval that overlaps with the specified period, regardless of the time interval set to which the respective time interval belongs. The belonging to different time interval sets is visible in the attribute tree itself. **(20479)**

Miscellaneous

- ⊕ Presetting for time interval filter in user preferences: Until now, there was an option in the user preferences to set the attribute filter for attributes with a time reference to 'analysis period only' in the attribute selection dialog. In order to also have access to time interval sets, the meaning has been changed to 'Hide analysis horizon', i.e. if this option is activated, the subattribute values for the analysis period and - if available in the network - for time intervals are now visible. **(20478)**

Network Comparisons

- ⊕ Partial changes of node geometries in model transfer files: Previously, node geometries in model transfer files were always completely replaced when one of the involved links was deleted, i.e. the complete node geometry was listed in '!' tables. This meant that different changes to the same node geometry could not be combined in successively imported model transfer files. This error has been fixed. **(20586 ⊘)**

PrT Assignment

- ⊕ Parallelization of network volume: The calculation of network volumes within the framework of all PrT assignment procedures was parallelized. This means that the strongly parallelized procedure variants in particular scale better with the number of cores used. **(20579)**

⊘ Fixed Bugs

Add-Ins

- ⊘ Error messages of the add-in 'FareZone -> POI' not displayed in the message window: Error messages issued during the execution of the add-in 'FareZone -> POI' were no longer displayed in the message window. This bug has been fixed. **(20517)**

COM-API

- ✅ Crash when terminating Visum: When terminating a Visum instance started via COM, a non-deterministic crash could occur if certain views in PTV Visum were open, e.g. a schematic line diagram. This bug has been fixed. **(20448)**

Data Model

- ✅ Access to legs very slowly in large networks: In large networks, access to the legs of nodes and main nodes was unnecessarily slow. As a result, operations such as deleting nodes or main nodes lasted too long, possibly triggered indirectly by importing network or model transfer files. This error has been fixed. **(20502)**
- ✅ Changing the start day of the calendar period leads to error messages: If the start day of the calendar period is changed and time interval sets exist in the network, unauthorized messages occurred for overlapping time intervals within the time interval set. This error has been corrected. **(20575)**
- ✅ Update of the attribute tCur_PrTSys at connectors: The value of the attribute tCur_PrTSys at connectors depends on the setting of the calculation method for connector shares of different attributes of the zones, the general procedure parameters as well as the demand itself. Previously, the values were not updated when changes were made to the relevant data. This error has been fixed. The values are still not updated when changing the demand description (selection of the relevant matrices) or the values of the matrices themselves. In PrT assignment, however, updated values are always used for calculation, so that non-updated values are only displayed in lists. **(20425)**

I/O Interfaces

- ✅ Floating-point numbers in railML export XML-compliant: Until now, the decimal separator specified in the user preferences of PTV Visum was used for floating-point numbers in railML export. In XML, however, only the point is allowed as decimal separator. The output is now in XML correct format, regardless of the user setting. **(20163)**
- ✅ Invalid link orientations after GTFS import: After executing a GTFS import, the From- and To-node orientations of some links were 'invalid'. This error has been fixed. **(20589)**

Lists

- ✅ Reference object for lists for static ABM objects: In the lists for the static objects activity locations, households and persons of an ABM demand model, the location filter did not adapt when the location selected as the reference object was changed. This error has been corrected. **(20567)**

Network Comparisons

- ✅ Exchange of main node cordon links via model transfer file: If a model transfer file contains both the removal of cordon links of a main node and the insertion of other links at the same main node, this network change could not be restored correctly in certain constellations when applying the model transfer file. This bug has been fixed. **(20554)**
- ✅ Major flows and node geometries in model transfer files: Certain changes to node geometries and major flows could not be applied when using a model transfer file. This error has been fixed. **(20587)**
- ✅ Merging or separating node legs via a model transfer file: If a model transfer file contains the merging of two links to a node leg or the splitting of a node leg consisting of two opposite one-way streets, this network change could not be performed correctly when applying the model transfer file. This bug has been fixed. **(20553)**

Other Procedures

- ✅ Matrix disaggregation in the procedure sequence: If the 'Matrix disaggregation' procedure was performed in a procedure sequence and it was not the first procedure in the procedure sequence, the output matrix could contain incorrect values. This bug has been fixed. **(20594)**

PuT Assignment

- ✅ Crash at timetable-based assignment with passenger trip chains: No more crashes when executing timetable-based assignment with PTV Visum 2020 if there are passenger trip chains in the network. **(20557)**

PuT Line Blocking

- ✅ Crash during temporal shifting of line block items: No more crash when shifting empty trips or user-defined line block items in the line block display. **(20595)**
- ✅ Crash in case of empty trips between bound vehicle journey sections at the end of a block: If there is a forced chaining where the arriving vehicle journey section ends at a different stop point than the departing vehicle journey section begins, a crash occurred during line blocking if the arriving vehicle journey section was served by the last line block item of a formed block. Otherwise the empty trip item was assigned to a wrong calendar day. Both bugs have been fixed. **(20266)**

- Transfer layover to depot not possible: In the line block display, it was not possible to transfer a layover to the depot if the display level at which the action was executed comprised more than one calendar day. This error has been fixed. **(20334)**

Scenario Management

- Copying and pasting a line route in scenario management: If part of the course of a line route was copied to the clipboard while editing a modification of a scenario management project, it could not be pasted into another line route afterwards. This bug has been fixed. **(20569)**

Visum Files

- Endless loop when reading version files: When importing version files that contained main nodes, a situation could occur in which PTV Visum no longer responded and could only be terminated by the operating system (e.g. via task manager). This bug has been fixed. **(20563)**
- Messages in the context 'Read network' not in message window: Messages that were output in the context of reading a network file were no longer listed in the message window. This bug has been fixed. **(20565)**

Visum Files, Scenario Management

- Signal coordination groups cannot be changed via model transfer file: Attributes of signal coordination groups could not be changed by applying a model transfer file. This bug has been fixed. **(20507)**

⊘ Breaking Changes

Network Comparisons

- Partial changes of node geometries in model transfer files: Previously, node geometries in model transfer files were always completely replaced when one of the involved links was deleted, i.e. the complete node geometry was listed in '!' tables. This meant that different changes to the same node geometry could not be combined in successively imported model transfer files. This error has been fixed. If newly created model transfer files are imported into earlier Visum versions (up to PTV Visum 2020.01-00), the changes to the node geometries contained therein can no longer be applied in some cases. **(20586 ⊕)**

2020.01-00 [147146]   2019-09-27

⊕ New Features and Changes

Scenario Management

- Default folder for temporary files: The default folder for temporary files, which are created during the distributed calculation of scenarios or procedure steps in the procedure sequence (e.g. before the files are transferred to the compute node), was moved from the user directory to the temporary directory of the system (%TMP%). This means that when temporary files are deleted using the standard Windows procedure, these files are also deleted. **(19041)**

ANM

- Export of routes and matrices with rounded demand: When exporting to ANM, the demand can now optionally be rounded. The method used ('Bucket Round') keeps the total demand as constant as possible. In addition to the volumes on the routes, the values of the exported matrices are also consistently rounded. If SBA is used for assignment and rounding to entire vehicles, the simulation paths in particular are retained. **(17406)**

Add-Ins

- StreetLight Data: The company StreetLight Data from San Francisco offers OD data for any user-defined zone layers on its website. The add-in enables the retrieval of this data from PTV Visum. It sends the zone layer from the currently loaded version to StreetLight Data and imports the returned OD data as matrices. **(18784)**

COM-API

- Besides the continued support for legacy Python 2.7, PTV Visum now brings a Python 3.7 compatible environment. Scripts and Add-Ins started from within Visum can now be written in the Python 3.7 dialect. The Python version to be used can be selected for each script individually, with Python 3.7. beeing the default for new procedures. For procedures in existing version files, Python 2.7 is used in order to avoid errors in the model runs. Custom script written in the Python 2.x dialect need to adapted to work in a Python 3.7. environment. The Python libraries installed with PTV Visum are now also provided in recent Python 3.7.x compatible versions. They can be used in external scripts through a venv Python environment. **(19633)**

- Better messages if the script component fails to start: If the script component cannot be started, e.g. because of a non-existent, unsuitable or incomplete Python installation, the message now provides more information about possible causes. **(9372)**

- Deleting all LongTermChoices: The new method 'IPerson.RemoveAllLongTermChoices()' allows to delete all long-term choices of all persons in the container. **(20350)**

- Handling of target attributes during railML import: If there are attributes in the .puti file that do not exist in the target network during railML import, these can optionally be created as user-defined attributes (UDA). When executed via COM, they are always read in as UDAs. **(17922)**

- IAnalysisTimes no longer exists: The COM object IAnalysisTimes was removed during the conversion of the time interval sets (18222). It is now replaced by the ITimeIntervalSet objects. To establish compatibility, the access function IFunctions.AnalysisTimes still exists, but it returns the ICalendarPeriod, whose interface looks like the previous IAnalysisTimes. However, this access will be removed in the next major version. **(20083 ⛔)**

- Irrelevant classes removed from COM-Reference. The COM-reference listed some classes which are not reachable through API functions. These irrelevant entries have been removed. **(20225)**

- New method ITableAttrSelection::RemoveColumn: The new method RemoveColumn at the ITableAttrSelection object allows to remove attributes of a table from the selection. If an attribute has subattributes and these are not specified in the parameter of the method, all subattribute values of this attribute are removed from the selection. **(19002)**

- New method for evaluating formulas on many objects. All network object collections (e.g. ILinks) provide a new method 'GetMultiByFormula()' which evaluates a formula expression for all active objects of the collection. The results are returned as an array similar to 'GetMultiAttValues'. Attribute values remain unchanged. The formula must evaluate to a numeric value, string expressions are not yet supported. **(20121)**

- New variant for filtered network object containers: In addition to the 'FilteredBy' property, COM container objects such as ILinks, INodes, etc. now also have a GetFilteredSet method. Both accesses deliver a container object of the same type, but they differ in terms of filter evaluation and performance: FilteredBy evaluates the formula specified as the filter condition at the time when the objects in the container are accessed. However, the container created with GetFilteredSet contains only those objects that make the filter condition true at the time of the call. This variant is significantly faster, especially in nested cases. **(20250)**

- Paper size and orientation when printing: When printing using the IGraphic::PrintNetEditor2D method, the paper size and orientation of the print page can now be specified as optional parameters. **(18073 ⛔)**

- Read and write access to transfer walk times for stop areas: The new property IStop.StopAreaTransferWalkTime allows read or write access to stop area transfer times at the stop. **(17559)**

- Remove discontinued methods: The following discontinued methods have been removed from the COM-API: ITimeProfile.Couple, ITimeProfile.Uncouple, IStop.InitSpecialTransferTimes and at the INetReadRouteSearchTSys object the methods DontRead, InsertOrOpenLink, SearchShortestPath, UseExistingLineRouteCourses, DeleteOldLineRoutes and IgnoreItemsWithUnknownNetworkReferences. In the case of the INetReadRouteSearchTSys object, line route completion options are controlled by attributes accessible through the AttValue property. **(17930)**

- Setting values of a matrix using a formula: With the new method IMatrix.setValuesToResultOfFormula the values of a matrix can be determined via a matrix-valued formula. There is no context in this formula, and the dimension must match the dimension of the matrix in Visum represented by the IMatrix object. **(17326)**

- Switch of the working directory when executing scripts: Previously, when executing a script, the working directory of PTV Visum was switched to the folder in which the script code could be found. Depending on the settings of the project directories, this also affected the subsequent loading of files. This switch no longer takes place, i.e. the set project directories remain untouched in any case. **(19437 ⛔)**

- Visum now registers a virtual Python environment named 'PTV Visum 2020' suited for the venv tool. This facilitates to reference the Python libraries installed with Visum in external scripts or in development tools (IDEs). The SysPath module so far provided for this purpose is still available, but in most cases it is no longer nescessary to include this with the custom script code. Many modern Python-IDEs provide integrated support for virtual environments and allow to select the environment registered by Visum for script development and execution. **(20134)**

- Writing a list using a layout file: Using the new method IIO.SaveAttributeFile, an attribute file can be written using a specified layout file without first having to create the appropriate list COM object. The type of the list to be exported is taken from the layout file. **(17822)**

- venv compatibility: The subfolder 'Python37Modules' in the exe directory of the installation has been converted to a venv-compatible virtual environment. **(19953)**

Data Model

- ⊕ Demand segment set at the demand stratum: At the demand stratum, the demand segments, in which the demand of this stratum enters, can now be modelled in a new attribute. This information is currently not used in the program, but will be used in the future to create a procedure sequence for a demand model. **(19046)**
- ⊕ Internal memory limit for matrices: The internal memory for managing matrix data has been limited. This means that after initializing or deleting matrices, memory space is returned to the operating system earlier and does not remain reserved, and procedures with very high memory requirements are more likely to run through. **(19684)**
- ⊕ Line Block Items: The attribute 'StartDayIndex' does not refer to the start of the calendar, but to the start of the line blocking period. Therefore, it has been renamed 'RelativeStartDayIndex'. The Attribute that refers to the start of the calendar is called 'AbsoluteStartDayIndex'. Similarly, 'EndDayIndex' becomes 'RelativeEndDayIndex'. **(20122)**
- ⊕ New network setting for handling of length information in PT: When activating this option, length information of line and system routes are automatically adjusted to the link attribute 'Length'. **(18620)**
- ⊕ New relation from link to vehicle journey items: The new relation from link refers to all vehicle journey items passing over the link. **(19796)**
- ⊕ New relation from node to stop: A new relation from node to stop has been added. The relation from the node refers to stops whose stop points are either located on the node or whose stop areas are connected to the node. **(18805)**
- ⊕ New relation: The relations between path sets and network have been added. **(20216)**
- ⊕ New relations between nodes and zones: There are new relations between nodes and zones showing containing zones and contained nodes, respectively. **(18799)**
- ⊕ Normalization and harmonization of surfaces: The network setting for number of decimal places for coordinates is no longer used when normalizing and harmonizing surfaces. To achieve desired effects when harmonizing sufaces the parameter can be set in the dialog when reading data. **(10140)**
- ⊕ Relation of PuT paths to all path legs including walk legs: The previous relation from PuT paths to their PuT path legs only lists path legs with transport, i.e. no path legs covered with PuT-Walk transport systems. For this purpose a new relation 'PuT path legs including walk legs' was created, which lists all PuT path legs. The previous relation has been renamed to 'PuT path legs excluding walk legs' for clarification (with the short name remaining for PTV Visum 18). **(19919)**
- ⊕ Relation of vehicle journey item to all serving vehicle journey sections: In addition to the existing relation of vehicle journey items to vehicle journey sections, which lists the vehicle journey sections operating on the following stop-stop section, there is now an additional relation, which lists all vehicle journey sections serving the stop itself, i.e. also those ending there. **(19577)**
- ⊕ Relations from network to demand objects: The relations from network to demand objects have been added. **(20323)**
- ⊕ UDA with user-defined time intervals: User-defined attributes can be created with any time intervals. To do this, the subattribute must be selected from the existing time interval sets. **(19937)**
- ⊕ User-defined attributes for signal coordination groups: Signal coordination groups can now also have user-defined attributes (data and formulas). **(16938)**
- ⊕ User-defined time interval sets: It is possible to define multiple time interval sets. The time intervals within one set may vary in duration, but cannot overlap. The time interval sets are network objects and are no longer available in the General procedure settings. Only one time interval set can be used for analysis time intervals. **(18222 ⚠)**
- ⊕ Changed default value for empty values of user-defined attributes: the default value for the property 'Allow empty values' was changed to 'false'. Thus, new user-defined attributes don't allow empty values if the setting remains unchaged. **(10302 ⚠)**
- ⊕ More zone types: The attribute 'Type no' of zones now accepts values up to 100 instead of only 9 before. This allows use more combinations of zone types for defining demand time series. **(19017)**
- ⊕ Preservation of chainings when changing calendars: When switching between calendar types e.g. from yearly to 'no calendar' during imports of railML data, all vehicle journey chainings got lost. This was changed and chainings are now preserved where possible. **(20148)**

Demand Procedures

- ⊕ Coupling across demand strata in EVA demand models: Until now, EVA demand models carry out origin- and destination-bound binding for each demand strata separately. Now, the binding can be coupled among all demand strata of an activity pair. **(18305)**
- ⊕ Create procedure sequence: When creating a procedure sequence from the demand model dialog (Tab: Basis) the allocation of demand strata to demand segment sets is considered. **(19047)**
- ⊕ Creating tours with the tour-based model: When executing the procedure 'Tour-based model - Combined trip distribution / mode choice', it is now possible to optionally output path sequences, which result from random dicing of the zone transfers according to the transfer probabilities calculated in the tour-based model and thus represent the result of the distribution and mode choice in an exemplary manner. **(17408)**
- ⊕ Gaps from the Nested Demand model in protocol file: The Gap calculated by the procedure 'Nested Demand Gap Caculation' is now reported in the protocol file. Thereby, the progression of Gap values in iterative procedure sequences can be observed. **(20377)**

- Generation of path sequence activities when issueing path sequences in the tour-based model: If the generation of path sequences is activated in the 'Tour-based model - Combined trip distribution / mode choice' procedure, any missing path sequence activities are created automatically. These then refer to the respective activity in the demand model. **(19516)**
- Incremental model form: The constraint type 'doubly-constrained' is now also available in the incremental model form. **(19394)**
- Less run time and memory consumption of 'Nested Demand': The run time and memory consumption of the 'Nested Demand' procedure was reduced, especially in the case of 'doubly-constrained'. **(20233)**
- Microscopic demand modelling (ABM): The new ABM modul stands for activity-based model and allows building a microscopic demand model based on individual decisions of individual persons. The implementation comprises the data structures (persons, activity executions, tours, ...) and visualisation tools. The model core including the decision models is scripted by the user. An example of such a script is part of the release. **(19656)**
- Tour-based distribution/mode choice no longer executable in case of contradictory information on path sequences: The 'Tour-based model - Combined trip distribution / mode choice' procedure now explicitly terminates with an error if the generation of path sequences is required but no valid path sequence set is selected. In addition, the parameter dialog has been improved in details. **(19515)**

Dialogs

- Allocation of stops to fare zones: The allocation of stops to fare zones can additionally be done using the Search-Dialog. **(18624)**
- Demand model dialog with list grids: In the demand model dialog some tabs, e.g. demand strata, are changed to list grids, i.e. typical functionality like group column is available. **(19223)**
- Different structure of 'large' attribute selection dialog: In the 'large' attribute selection dialog, which allows not only the selection but also the formatting of columns, the attribute selection and the formatting options are no longer arranged one below the other, but next to each other. **(7406)**
- Improvements to the 'Alias' dialog: In the 'Alias' dialog, the inputs already defined by the call context are now only displayed as labels. In addition, the first control that requires an input gets the focus after opening the dialog. **(17694)**
- In many places of the user interface, long lists for selecting objects (e.g. lines, line routes,...) have been replaced by a new interactive search control. **(19136)**
- Line Route Editor: Selected line route elements in the line route editor can be copied and pasted into another line route. This also works between version files. If several travel time profiles are available in the source or destination, the user can match those. **(18529)**
- Move and duplicate filter conditions: Filter conditions can be duplicated as block. The entire block is then inserted under the selected filter conditions. Additionally, new buttons in the dialog allow to move filter conditions up or down. **(18606)**
- Name suggestion for 'Copy line': When copying a line, the previous name of the line is now offered as default (which of course has to be changed), analogous to line routes. **(18137)**
- Network check: The model diolog for the network check has been changed to a tool window. Therefore, network checks can be executed while this tool window can be open. **(19177)**
- Optimum table width by double-clicking on the separator in the line route editor: In the line route editor, the position of the separator can be adjusted to the current width of the left table with a double-click. **(17566)**
- Search in graphic parameter dialog for line bars: In the graphic parameter dialog for line bars, on the dialog page 'Fill', you can now search in the (possibly very long) list of network objects. To do this, open the search dialog by clicking a new button and then search for the appropriate network object based on any attribute value. **(18793)**
- Vehicle units and combinations: The dialog for editing vehicles and vehicle combinations has been modernized. **(19667)**

Filters

- Move and duplicate filter conditions: Filter conditions can be duplicated as block. The entire block is then inserted under the selected filter conditions. Additionally, new buttons in the dialog allow to move filter conditions up or down. **(18606)**

Foreign Formats

- Handling of target attributes during railML import: If there are attributes in the .puti file that do not exist in the target network during railML import, these can optionally be created as user-defined attributes (UDA). When executed via COM, they are always read in as UDAs. **(17922)**

Formulas

- Acceleration for matrix variables: The formula function matrix sum has been accelerated for the use of matrix variables (e.g. M for matrix). **(20437)**

- ⊕ Control variable of a TableLookup via matrices in formulas: If a TableLookup statement whose control variable is a matrix was used in a formula, this control variable could not be used in a part of the expression to be evaluated for the control variable that expected a matrix, such as in the formula 'TableLookup(MATRIX M, M[NO]=[NO], MATRIXSUM(M))'. This bug has been fixed. **(19387)**
- ⊕ Editing formulas in lists: Formulas of attributes or matrices can easily be edited via the button '...' which opens the formula editor. **(19545)**
- ⊕ Help in subdialogs of the formula dialog: The subdialogs accessible from the formula dialog, e.g. for inserting operators, operands and functions, now offer a context-sensitive help that can be opened by pressing the F1 function key. **(19608)**
- ⊕ In formula attributes, new functions now also allow the use of terms that access matrices via aggregate functions, for example the total sum of a matrix. Conversely, scalar-valued terms can also be used in formula matrices, which in turn are derived from matrices via aggregate functions. **(12544)**
- ⊕ Naming of functions in the formula dialog: In the dialog 'Insert function', which can be reached from the formula dialog, the names of the available functions have been improved. **(19028)**
- ⊕ Output of control variables in ForEach: If a loop is used in the 'Combination of matrices and vectors' procedure using the 'ForEach' instruction, in the dialog, the system now displays which matrices would be changed when the current formula was executed and which would be newly created. When the procedure is actually executed, the changed and newly created matrices are logged (in the message window and log file). **(19212)**

Formulas, Demand Procedures

- ⊕ Acceleration of the evaluation of matrix formulas: The evaluation of matrix formulas was accelerated, especially for large networks. This also has a positive effect on the duration of the 'Tour-based model - Combined trip distribution / mode choice' procedure. **(17602)**

Graphical Procedures

- ⊕ DRT in flow bundle and skims: In the PuT flow bundle, conditions for nodes and links can now also be set for PrT transport systems in order to be able to distinguish the volume of DRT (MaaS) systems from line and walk transport systems. Furthermore, the new skims 'DRT distance' and 'DRT time' can be calculated as skim matrices. **(18028)**
- ⊕ Dynamic shortest path search for SBA: The interactive PrT shortest path search has been enhanced for SBA, i.e. a dynamic search is possible by specifying a departure time. **(18413)**

Graphics

- ⊕ Charts with classified colors: Up to now it was only possible to define the size of a pie chart or a column chart by an attribute value. Now the color of each chart element can additionally be classified by an attribute value. For example, a pie chart scaled by the number of passengers alighting and coloured by the average risk of delay. **(18299)**
- ⊕ Connect bar polygons: Connecting link bars often led to misrepresentations at junctions with multiple legs or unusual geometries. The methods for calculating bar polygons has been improved. The option 'Connect bar polygons' has been removed. The link bars are now always connected. **(12784)**
- ⊕ Opening files after graphical export: After a graphical export (screenshot, SVG export) the resulting file is opened immediately. **(18926)**
- ⊕ The default value of the 3D graphics interface has been changed from OpenGL 3.0 to DirectX 11. **(18987)**
- ⊕ Units in tables: Units can optionally be displayed for tables that contain attribute values with units. **(19057)**

I/O Interfaces

- ⊕ Acceleration of database export: Export to a database has been significantly accelerated. This acceleration depends on the database and the ODBC driver supporting the new procedure. This is at least the case for MS SQL Server with the latest driver. If the requirements are not fulfilled, the previous, slower variant is used. **(18526)**
- ⊕ Aggregating optional with GTFS: When importing a General Transit Feed (GTFS), aggregating the resulting line routes is now optional. **(19096)**
- ⊕ Aggregation of line routes accelerated: The aggregation of line routes has been accelerated for many constellations. This applies both to the special function in the network editor and especially to aggregation in the context of the GTFS import. **(19097)**
- ⊕ Attributes from operationalTrains in railML import: Attributes from operationalTrain can be imported and allocated to attributes of vehicle journeys. **(19013)**
- ⊕ Code of the stop point in railML export: The code of the stop point is additionally used to create the OCP-ID. **(18808)**
- ⊕ Intersection data import: External intersection data can be imported into an existing Visum model. Precondition is that the data are available in a specified format consisting of several .csv files that enables mapping of geometry data and adding information about signalization. **(19640)**

- Link stop points traversed multiple times when updating PuT supply: When importing a PuT supply from Visum, undirected link stops were traversed multiple times at the beginning or end of line routes, where the line route initially leads in the wrong direction to the end of the link and turns there. This is now avoided by an improved routing at both ends of a line route. **(18934)**
- Not uniquely assigned ocp at the beginning or end of a trainPart in railML import: If a trainPart element starts or ends at an ocp that is not or not uniquely allocated to a stop point in the Visum network, this trainPart could not be read in during railML import. This case is now handled by using the nearest ocp for ambiguously assigned ocp. If an ocp is not located in the target network at all, the trainPart (and thus the resulting vehicle journey) is shortened to the next allocated ocp with a stop. A trainPart is therefore only completely omitted in very rare cases, e.g. if there is not any clearly allocated ocp in the route course. **(18326)**
- OSM import: The progress bar shows the actual status as well as the steps of the import. **(16544)**
- PuT Supply from Visum: When using the import of PuT supply from Visum intermediate points can be omitted if these points prevent matching to the target network. **(18660)**
- Sequence of name components for railML and HAFAS import: In the parameter dialogs of the railML and HAFAS dialogs, the sequence of the name components in the naming rules for vehicle journeys, lines, destination coaches, etc. can now be changed subsequently without having to deselect and re-select the components in the correct sequence. **(18605)**
- Special codings of couplings in railML import: The railML import reads data in which the same 'trainPart' is used in two 'commercial trains'. **(18809)**
- Standards-compliant GTFS export: The GTFS export now always delivers a fully standards-compliant file. **(16529)**
- Parameters in SATURN input files: The SATURN import now accepts parameters spanning multiple lines in the SATURN data file **(20510)**

IO Interfaces

- Warnings for skipped data in VDV452-Import: The VDV452 import skips records with unmatching Base version number. When rows are skipped, this is now reported in the messages in order to indicate possible inconsistencies in the source data. **(20271)**

Installation

- Diagnostics program: Diagnostics for PTV Visum has been integrated in the Setup. **(15973)**
- Russian manual: The installation now also contains a manual in Russian, but it refers to an older version (PTV Visum 15). **(19354)**
- Safety and importers in demo version: In the demo version, you can now also use the Safety module and various importers, e.g. for OpenStreetMap. **(16207)**
- The Silent-Installation does now also install the the Python packages automatically. **(19393)**
- Update Python Engine: The Python installation distributed with PTV Visum has been updated to version 2.7.15. This also includes the package management system pip. **(18424)**

Junction Editor

- Save / open layout: The junction editor layout can now be saved and read explicitly via a menu entry. **(13232)**
- Vissim previewer updated: The Vissim version used for the node preview has been updated to PTV Vissim 11.00-03. **(19442)**
- Vissim-Preview: The Vissim-Previewer is using PTV Vissim 11. **(18800)**
- Vissim-Preview: The Vissim-Previewer is using PTV Vissim 2020. **(20295)**

Line blocking

- Runtime improvement: The run time of the line blocking procedure has been improved, specifically when recurring activities are considered **(20392 ⛔)**

Lists

- 'Irrelevant' marker in the demand model: In lists for the network objects of the demand model (demand models, demand strata, person groups, activities, activity pairs, sectors and delivery concepts), attributes are now marked as irrelevant if they are not included in the calculation in the demand model used because of its type or because of other properties (e.g. O-D type of the demand stratum, etc.). **(19015)**
- Attributes list improved: The usability of the Attributes list has been improved in some respects. **(19053)**
- Column filter in attribute list: The column filter on the column 'ObjTypeName' has been improved in the 'Attributes' list. In particular, only those entries can be selected that are displayed in the list according to the set global filter (i.e. 'All attributes', 'Only network object types' or 'Only user-defined'). **(19124)**

- ⊕ Copy column as user-defined attribute: It is now possible to copy the contents of a column in a list to a user-defined attribute using an entry in the shortcut menu of the header of a column. In detail, this means that a user-defined attribute of the appropriate type is created for the same network object, the values of the selected column are copied there, and the new attribute is displayed as a column in the list. **(16813)**
- ⊕ Drag & drop for list layouts: If layouts of lists (.lla files) are moved to the Visum GUI using drag & drop, the list is automatically opened with the corresponding list layout. **(18572)**
- ⊕ Editing formulas in lists: Formulas of attributes or matrices can easily be edited via the button '...' which opens the formula editor. **(19545)**
- ⊕ Improved usability for color schemes: The usability of the settings for color schemes in lists has been improved. In particular, the dialog for the operation 'Specify color scheme for all columns...' is already initialized with the existing classification if the columns already have a uniform classification. **(17179)**
- ⊕ List PuT transfer objects: The list PuT transfer objects contains an additional filter condition for 'Operators'. **(19747)**
- ⊕ Loading of the list 'Passengers transfer stops / time profiles' faster: The build-up of the list 'Passengers transfer stops / time profiles' was accelerated. **(18950)**
- ⊕ Local filters for columns: In lists, the contents can be filtered according to attribute values in individual columns. This local filter is independent of the global filter for the network object and only works in the list, possibly in addition to other filters in the same list, for example 'Only active objects'. **(18015)**
- ⊕ Marking of ABM objects: Markings are now synchronized between different related objects of the ABM data model. For example, marking of a person will also mark the related schedules in lists when synchronization is activated. **(20056)**
- ⊕ Restrict lists of ABM objects by reference objects: The rows displayed in listings for ABM objects can now be restricted by a selection of related reference objects (locations or persons). **(20031)**
- ⊕ Settings for connecting journeys: The network settings for connecting journeys can be accessed and edited from the list Connecting journeys. **(18571)**

Lists, Matrix Editor, Procedure Sequence

- ⊕ Horizontal scrolling with direct movement: Previously, when scrolling vertically in longer lists, the view was moved directly so that new rows were added to the visible area, whereas when scrolling horizontally, the view was not updated until the mouse was released. This behavior has now been changed so that the visible area is immediately adjusted in both directions. This makes it easier, for example, to find the desired column in a list with many columns. This new behavior works in all list-like views, for example in the procedure sequence window and in the matrix editor. **(20139)**

Main Window

- ⊕ Default aggregation functions in Quick view: In the Quick view, the 'Compare' aggregation function has always been used by default for editable attributes, even if other aggregation functions were more useful from a content perspective. Now the aggregation functions 'Compare', 'Distinct', and 'Histogram' are offered depending on the specific attribute. With these aggregation functions, it remains visible if several attribute values are involved when several objects are selected. **(19376)**
- ⊕ Hot key F7: The shortcut F7 can be used to trigger the aggregation of territorries. **(17455)**
- ⊕ Project directories on the start page: Project directory files from the history of recently opened files are now also displayed on the start page. **(18406)**
- ⊕ Repairing individual messages: Added the ability to repair individual messages for the network check function 'Find line and system routes with zigzags'. **(20315)**

Matrix Editor

- ⊕ More stable calculation for matrix and row sums: The calculation of matrix and row sums in the Matrix Editor has been improved. Only interactive editing in the Matrix Editor can cause small inaccuracies. **(20436 🛑)**

Matrix Estimation

- ⊕ Dynamic matrix estimation for PT: The procedure for dynamic matrix estimation has been extended for public transport. Matrices of demand segments assigned using the timetable-based assignment can be corrected. **(19106)**
- ⊕ Preview of the shares even with a classified matrix: In the parameters dialog of the 'Demand matrix correction' procedure, the shares of the individual classes are now displayed in the table on the 'Distribution' dialog page, even if they were not entered directly, but result from the corresponding classification of the existing or selected matrix. **(19525)**
- ⊕ Progress dialog for large flow matrices: Since flow matrices can become very large, especially in dynamic matrix estimation, and the generation takes correspondingly long, a progress dialog is displayed in this case which also allows aborting. **(20421)**

Miscellaneous

⊕ Default option for antialiasing: The option for antialiasing in the user preferences is by default enabled. This results in an improved display in the 3D view. **(20069)**

⊕ The languages offered for the user interface are no longer controlled through the license. All available languages can be selected, independent of the license. The completeness of the translations cannot be guaranteed for all languages; thus, some elements might appear in the fallback language u'–'; usually English.
Online help, manuals etc. are still provided in a subset of the supported languages. **(20137)**

Network Comparisons

⊕ Load paths: There is a new option 'Load paths' when creating a version comparison. Loading paths allows to evaluate volumes in the comparison network if in the loaded version a filter on network volumes is applied. **(16091)**

⊕ Update of version comparison: If for the version comparison a version in the background is loaded and this version has been changed, the target network can be updated to account for these changes. The information is displayed in a message bar. **(19018)**

⊕ Warning for version comparison with OD pair filter: If an OD pair filter with the option 'Filter network volumes' is active in the currently loaded network, the filtered volumes of a comparison network are always 0 in the version comparison, because the paths of a comparison network are never loaded. In this case, warnings are now issued when you create a version comparison indicating this fact. **(19664)**

Network Editor

⊕ Aggregation of line routes accelerated: The aggregation of line routes has been accelerated for many constellations. This applies both to the special function in the network editor and especially to aggregation in the context of the GTFS import. **(19097)**

⊕ Changing background maps: Showing and hiding different background maps is now also possible directly via the toolbar of the network editor. **(18831)**

⊕ Conversion of percentage time series to matrix time series: A new function in the 'Demand data' dialog, page 'Demand time series', can be used to convert a demand time series based on a standard time series into a matrix time series. This is particularly necessary as preparation before generating a subnetwork with a dynamic assignment result (SBA or timetable-based). **(18789)**

⊕ Display of direction. The display of the direction of lines and line routes, respectively, has been improved. **(18141)**

⊕ Display of path sequence items: The network editor has been modified to display (and in particular label) selected path sequence items with the same origin and destination zone graphically. **(19209)**

⊕ Edit polygons without normalizing: When editing polygons (surfaces and faces of polygonal network objects such as zones, territories, POIs), the normalization of the surface data model is no longer carried out for each change, but only if the change has resulted in a new overlap of edges. This makes processing in networks with complex polygons much smoother. **(18806)**

⊕ Finding routing errors of line and system routes: The checking of line and system routes on links traversed several times has been enhanced. The result now distinguishes zigzag routings, which are usually the result of digitalization errors, from links that have been traversed several times, but not immediately one after the other, as they can also occur in reality with loops in the route course. Repair functions are available for zigzag routings, especially for the case where the served stops can be maintained in their order ('trivial zigzag routing'). **(17457)**

⊕ Internet map requests no longer block: In certain cases, unanswered requests to the server of an Internet map service could freeze Visum. This is now avoided by completely decoupling the requests, i.e. you do not see the Internet map as long as the server does not answer, but you can continue working in Visum. **(13620)**

⊕ Length and duration of inserted system routes: When manually inserting a system route, its duration and length are now set to the totaled run times or lengths of the links traversed (instead of to the value 0 as before). **(18736)**

⊕ SSL/TLS encryption for WMS services for background maps: SSL/TLS encryption is now supported when integrating WMS services for displaying background maps. **(19504)**

⊕ Special functions: Up to now, special functions in the network editor could only be executed for one object, all active objects, and all objects. In addition, it is now possible to execute special functions for all special functions also on manually set selections. **(10538)**

⊕ Switching between Edit and Insert mode: If you press the 'Insert' key repeatedly, the network editor toggles between the Edit and the Insert mode. **(18014)**

⊕ a new function allows to shorten active line routes to the maximum extent of the corresponding vehicle journeys. Unused line route items at the beginning and end of the line routes are removed. **(18619)**

- Projection for background maps: The option to adjust the netzwork projection to the background map projection is no longer provided when the background maps are activated in order to reduce clicks. The adjustment can now quickly be triggered by a new button in the graphics parameters. Using a projection matching the background map will slightly speedup the loading of the background tiles, but at the cost of using different coordinates for the network objects. **(16569)**

Other Procedures

- 'Combination of matrices and vectors' with a lot of matrices: The 'Combination of matrices and vectors' procedure was accelerated in networks with a large number of matrices. **(18940)**
- DRT in flow bundle and skims: In the PuT flow bundle, conditions for nodes and links can now also be set for PrT transport systems in order to be able to distinguish the volume of DRT (MaaS) systems from line and walk transport systems. Furthermore, the new skims 'DRT distance' and 'DRT time' can be calculated as skim matrices. **(18028)**
- Improved support for combining matrices and vectors: The parameters dialog of the procedure 'Combination of matrices and vectors' provides the user with better assistance. In particular, there is now a direct reference to the online help with additional examples and explanations as well as a preview of the matrices that will probably be changed or created during the execution of the procedure step. **(19340)**
- Minimization of fleet size in tour planning (MaaS): If the 'Use dispatcher' option is used in the 'Tour planning' (MaaS) procedure, a new parameter can be used to explicitly control the consideration between the most complete possible service of the trip requests on the one hand and the smallest possible number of vehicles used on the other. **(19436)**
- More network object types in the 'Edit attribute' procedure: The 'Edit attribute' procedure can now also be used for the following network object types: Activities, activity chains, activity pairs, operators, sectors, ticket types, operating periods, vehicle units, vehicle combinations, vacation days, delivery concepts, matrices, modes, demand models, demand strata, demand segments, main lines, person groups, structural properties, fare systems, fare zones, block items, block item types, transport systems, valid days, path sequence activities, path sequence sets. **(19342)**
- Selection of the procedure variant for MaaS tour planning: In the dialog of the 'Tour planning' (MaaS) procedure, you can now switch between the 'Use xTour' and 'Use dispatcher' options for the actual optimization. **(18889)**
- Signal offset optimization: A new version of the solution method has been added for the 'Signal offset optimization' procedure. This may change the results of the procedure. **(18869 ⚠)**
- Speed up of matrix operations: Matrix operations have been accelerated. This concerns in particular the procedures matrix aggregation and disaggregation and affects networks with many zones. **(20173)**
- Tenant selection for PTV MaaS Modeller: If a PTV MaaS Modeller user belongs to several tenants, the tenant to be used for the calculation run started from the Visum procedure sequence can now be selected in the Visum MaaS Modeller license dialog. **(18475)**
- The progress of the cloud-based MaaS-Tourplanning using the Dispatcher algorithm is now reported. **(19972)**
- Tour planning (DRT / MaaS): The 'Tour planning' procedure now uses the dispatcher algorithm by default. **(20070)**
- Tour planning without skim matrices for PrT-DSeg: The 'Tour planning' procedure can now also be executed without skim matrices of the journey time and journey distance being available for the PrT demand segment selected for the vehicle fleet if the dispatcher algorithm is used. Export to PTV MaaS Modeller is also possible in this case. **(19928)**
- Tour planning: The execution of Tour planning is optionally possible on the local computer. To use it, you must be logged in to the MaaSModeller and have a credit balance. A credit will be deducted if you use it. The cloud-based calculation is still possible. **(20251)**
- Calculation of emissions with HBEFA temporarily disabled: In the course of updating to the new version HBEFA 4.1 which was released in September 2019, the calculation of emissions is temporarily completely disabled - even for older versions of HBEFA. PTV Visum 2020 will exclusively support HBEFA 4.1 for the calculation of emissions. Due to the various changes in HBEFA, existing procedure parameters and model data need to be adjusted and results will differ from previous versions. The functionality will be enabled again in an early ServicePack expected for autumn 2019. **(20531 ⚠)**

PrT Assignment

- Acceleration Frank-Wolfe in large networks: The PrT equilibrium assignment Bi-conjugate Frank-Wolfe was accelerated especially in networks with a lot of zones. **(20257)**
- Base load in SBA: A base load can be optionally taken into account in SBA. The base load can vary within the assignment time interval and requires the allocation of a transport system with meaningful SBA parameters for the effective vehicle length and reaction time defined. **(15540)**
- Customizable Contraction Hierarchies (CHH): The shortest path search has been speed up using the technique called CHH for the PrT assignment methods Incremental, Equilibrium, BFW, Lohse, SBA, Stochastic and dynamic stochastic. **(18681)**
- Effect of SC daily schedules in SBA: In simulation-based dynamic assignment (SBA), daily schedules of signal controls in the assignment time interval are taken into account. More precisely: For a signal control of the type Vissig, a daily schedule can be selected via an attribute, which then takes effect. For RBC controls, a daily schedule coded in it always takes effect if it exists, otherwise the set signal program takes effect continuously. **(16497 ⚠)**

- Evaluation of VD functions: The evaluation of VD functions that depend on more than one single attribute has been accelerated. **(19716)**
- Export from SBA for visualization: During simulation-based dynamic assignment (SBA), vehicle trajectories can be exported for external visualization. **(18777)**
- Extended factors for reaction times in SBA: With the help of the Boolean link attribute 'SBA is reaction time factor transport system dependent' the factors for the SBA reaction time can be defined depending on the combination of the transport systems of a vehicle and the vehicle in front. This way, the driving behaviour of autonomous vehicles can be mapped in SBA. **(19489)**
- ICA calculation for Two-way stops: The type of site, i.e. 2-lanes, 4-lanes, or 6-lanes, is now determined by the major flow approach with the larger number of through lanes. For example, if that approach has two through lanes, the site is treated as 4-lane-site, even if the other major flow approach is an outbound one-way street. **(20390 ⛔)**
- SBA Number of paths: The SBA assignment parameters contain a new parameter that defines the minimum volume of a path. Using the default value the number of paths can be reduced considerably but the parameter also has an influence on convergence. **(20089)**
- Skim matrix calculation for impedance in the stochastic assignment: It is possible to calcutate a skim matrix for the total impedance with in the stochastic assignment. This skim matrix contains components of the impedance defined over the entire path. **(17670 ⛔)**
- Speed up of path-based assignments with MPA: The aggregation of path trees has been multithreaded which speeds up assignments with MPA. **(13669)**
- Speed-up: The evaluation of volume-delay functions has been accelerated. The shortest path search within the classical equlibrium and the incrmenatal assignment, respectively, has been multithreaded. **(16995 ⛔)**
- Temporary closures in SBA: Temporary closures of a link that are modeled using a temporary value of the transport system set attribute are now taken into account in simulation-based dynamic assignment (SBA). **(19004 ⛔)**
- User-defined volume-delay functions (VDF): The creation of user-defined VDF has been simplified and allowes further attributes to be considered. **(20312)**

Procedure Sequence

- Default folder for temporary files: The default folder for temporary files, which are created during the distributed calculation of scenarios or procedure steps in the procedure sequence (e.g. before the files are transferred to the compute node), was moved from the user directory to the temporary directory of the system (%TMP%). This means that when temporary files are deleted using the standard Windows procedure, these files are also deleted. **(19041)**
- Display and deleting of groups: By selecting the grouping element in the process dialog, the associated process steps are highlighted. The row of the grouping element differs from the subordinate procedural steps in all columns. The simultaneous deletion of groups and procedures has been made possible. **(12770)**
- Use of variables: To make the use of variables more transparent, the result message of the procedure in which the variable has been used and the output to the message window have been improved. **(18840)**
- Executing the entire procedure sequence on a compute node: Within the framework of distributed computing, it is now possible to execute the entire procedure sequence of a version file on a compute node, in particular also outside scenario management. **(13038)**

PuT Assignment

- Acceleration for PuT walk links: The management of PuT walk links has been accelerated. **(18670)**
- Acceleration of the Branch&Bound search: The timetable-based assignment in the Branch&Bound search variant was slightly accelerated. The extent of acceleration depends on the nature of the individual network. **(17442)**
- Demand Responsive Transit DRT: In order to evaluate the feeder function of ride-sharing systems (first & last mile concepts), the timetable-based assignment brings together the modes of conventional public transport and ride-sharing systems. Within an assignment, the transfer process is depicted, and the temporal and spatial consistency is considered. The results are intermodal connections including the passenger volume. **(20380)**
- Distributed computing of the PuT assignment: The timetable-based assignment can be distributed to several computation nodes. The results must be merged in a subsequent procedure. **(17435)**
- Faster headway-based assignment: The headway-based assignment has been slightly accelerated. **(14956)**
- Holding areas in tour planning: In the 'Tour planning' procedure, selected nodes can now be used as preferred holding areas for MaaS vehicles. If this option is activated, these holding areas are frequented by the vehicles in phases of inactivity. **(19888)**
- Round volumes: Rounding of volumes within a capacity restricted PT assignment, i.e. also when vehicle sharing systems are considered, is suppressed because it has a negative effect on convergence. In the last iteration the volumes of the connection are rounded. **(19399 ⛔)**
- Rounding of demand and passenger volumes: Rounding of demand and passenger volumes have been improved for the PuT assignment. It can be rounded using decimal places or multiple of a pre-defined number. **(18432 ⛔)**
- Skim impedance Log Sum: For the timetable-based assignment the skim matrix "Impedance Log Sum" can be computed. This option is available only if the choice model is "Logit". **(13682)**

- The volumes of PuT pathes can now be reported per time interval. The demand from the demand time series intervals is allocated to the respective analysis time intervals. The behaviour is controlled through the option 'Save path volumes per time intervals' in the general procedure settings. Due to the memory consumption, by default volumes are not stored per time interval. **(20168)**

PuT Line Blocking

- Active line block version: The option to set one line block version active has been removed. The line block version can be defined directly in the procedure 'PuT operating indicators'. **(2605)**
- Layover in depot as block item type: Previously, individual block item types of the category 'Layover' could be flagged as taking place in the depot using an attribute. Other cost rates then apply in line blocking. This attribute 'In depot' no longer exists. Instead, there is a separate system-defined block item type 'Layover in depot', which marks a block item as a layover in the depot. **(20297 ⊘)**
- Line blocking for battery- electric vehicles: Recurring activities are part of the line blocking procedure in order to determine the number of vehicles and the operating costs after conversion to e-vehicles. Both the temporal function of the charging process and the energy consumption definition is editable and stored within the data model. The capacity of the vehicle combinations as well as the configurations of the charging infrastructure is part of the network model. A genetic algorithm that iteratively solves graph flow problems and evaluates them by means of a parameterizable cost function generates an optimal vehicle scheduling. The state of charge of the individual vehicles is calculated for each line block element and can thus be visualized in the line block editor. **(19611)**
- Running the line blocking procedure does no longer affect the layout and selection in the line block selection toolwindow. **(20154)**

PuT Operating Indicators

- Active elements of the list 'Territory PuT detail': Setting the status 'active' does not only depend on the filter settings of the Territory. Rather, both the filter of the Territory and the respective reference object (e.g., main- / line) are now evaluated. Non-filtering reference objects (e.g. operators, TSys) are always active. The filtering of the active elements is still enabled via the filter icon in the Territory PuT detail list. **(18796)**
- Calculation for lines without main line assignment: The indicators for lines without assigned main lines are combined for their dimension. The results are as well retained when the version file is saved. **(19925)**
- Distinction according to operator in PuT Operating Indicators: The operator is available as an additional dimension in the public transport operating indicators. **(18810)**
- Empty rows in list Territory-PuT detail: The list for detailed PuT operating indicators for territories can now optionally also contain empty rows for elements which are defined, but don't occur in the data - e.g. for transport systems which are not used by any line. **(18607)**
- Indicators on vehicle journey level: Additional indicators are now also displayed for time intervals at the network object vehicle journey. This includes indicators for transport supply and transport performance. The updated list of indicators can be found in the document 'IndicatorAvailability.xls'. **(18011)**
- Intersection of links and territories in version file: The result of the intersection of links and territories, which is calculated and also used within the framework of the PuT operating indicators, is now saved in the version file. A later repetition of the calculation with unchanged geometry of the links and territories is therefore faster. **(20016)**
- Renamed attributes: The attributes 'Seat capacity PuT' and 'Total capacity PuT' have been renamed 'Seats PuT' and 'Total seats PuT' respectively. **(18981)**
- Spatial PuT analysis: The length-proportional division into line route elements can optionally be deselected. This assign each element the complete value. The distribution rules for the vehicle journey sections remain unaffected. **(18626)**
- Vehicle Journey items: For the vehicle journey items the indicators seat- kilometer, seat mileage and seat- hour are available. The indicators for the total capacity are available in the same way. **(19670)**
- Warning for very long passenger trip chains: Before the 'PuT Operating Indicators' procedure is executed, a warning is now issued if there are passenger trip chains in the network whose stay time is longer than one hour. The stay time of passenger trip chains is estimated as service time, so that unintentional long passenger trip chains, e.g. as they occurred during GTFS import with the Add-In (up to Visum 17), can have a large influence on this. **(19359)**

Scenario Management

- Format of data base: The data base format has been converted to SQLite. The data base of projects, that are started in older Versions of PTV Visum, are automatically converted. **(19535)**
- Global layouts for scenarios: Global layouts can now also be managed in a scenario management project. You can assign a global layout to a scenario that is used when the scenario is opened. You can also explicitly apply a global layout to another scenario to obtain a view suitable for displaying certain results, for example. **(17729)**
- Grouping: Like in other lists, columns in the grid of the scenario management project can be grouped. **(18838)**
- Long Indicators: Indicators in scenario management projects are no longer restricted to 1024 characters but can be up to 1MB. Although indicators of this length may not be displayed completely in the scenario table, it is still possible to copy the value from the cell. **(19547)**

- Netzwork UDA: User-defined attributes (UDA) defined for network can be accessed directly when selecting attributes for scenario indicators. **(19257)**
- Scenario indicators: The calculated scenario indicators are additionally saved in a text file in the folder of the corresponding scenario. **(19517)**
- User-defined attribute (UDA): User-defined attributes have been introduced for objects of the scenario management project, namely for scenarios, modifications and procedure parameter sets. **(16334)**

Schematic Line Diagram

- Arrange center labels using the toolbar: The action 'Arrange centered labels' is now also accessible via the toolbar of the schematic line diagram. **(18601)**
- Graphic parameters dialog for inner classification of edge courses resizable: The graphic parameters dialog for editing the inner classification of a double classification of edge courses is now resizable. **(17962)**

Subnetwork Generator

- Adopt time-varying attributes: When cutting a subnetwork, the definitions and values of time-varying attributes are now also transferred to the subnetwork. **(19571)**
- Dynamic subnetworks: Subnetworks can be generated from network with dynamic assignments. For the allocation of demand to a time interval the entry time (and exit time, respectively) is considered. Pre-condition is the use of matrix time series. **(10825)**

Timetable Editor

- Comparison of run and dwell times also for opposite direction: In the dialog 'Comparison of run and dwell times', time profiles and system routes in the opposite direction are now also taken into account. Furthermore, this dialog has been modernized so that, for example, copy & paste and simultaneous input into several cells of the table are possible. **(18621)**
- Edit vehicle journey: While changing the line route of a vehicle journey PTV Visum now suggest the most suitable time profile and direction. **(18429)**
- Improved initial sorting in tabular timetable: When opening the tabular timetable, an improved sorting according to the stop sequence item with the most vehicle journeys is now produced. This sorting requires more time for a large number of vehicle journeys, but the process can be canceled in the progress dialog. In this case the vehicle journeys are sorted as before according to the departure time (without consideration of the departure point). **(18807)**
- It is now possible to merge line routes with different number of time profiles. If one of the line routes to be merged has more than one time profile, a dialog is shown which allows to map the time profiles of the two line routes or to trigger the computation of new time profiles from the network run times. **(14009)**

Visum Files

- Attribute files with extended header: When saving attribute files it is possible to optionally save extended attribute descriptions and a line with long names of attributes. This option can also be accessed via COM. **(18811)**
- Column charts in the global layout: The settings for open column charts in the network editor are now also saved in the global layout file. **(18894)**
- Default project directory on version file folder: The default project directory for almost all file types is now the respective folder of the currently loaded version file. In other words, after opening a version file in the program, Visum behaves as if the version file had been opened by double-clicking in the Explorer. In particular, the version file and the other files used in it can be shared if relative paths are used in the version file by copying the whole folder. **(19035)**
- Desire line in the global layout: The settings of the desire line are now saved in the global layout. **(18893)**
- File extension for PrT skim matrices: The file extension for PrT skim matrices written in csv format has been changed from 'CSV' (in upper case) to the common extension 'csv' (in lower case). **(19370)**
- Flow bundle definition in global layout: Global layout files now also contain the flow bundle definition. **(18891)**
- Graphic tools parameters in global layout: The global layout file now also contains the parameters for the graphic tools shortest path search, isochrones, and turn volumes. **(14126)**
- Open Visum xml files: Opening xml files via Drag & Drop is also possible, if these are not procedure parameters. User settings and script menu files will be applied immediately. For further files, the message, that they cannot be opened from the main window appears. **(10391)**
- Text-based file exports in English: Until now, all text-based Visum files (i.e. network file, attribute file, demand file, model transfer file, interval file and multi-line survey data) were written in the language set for the user interface if it was German, English, French, Italian, or Polish. Now it is always possible to export in English, regardless of the languages available in the license. A user setting can be used to switch between English-language and localized export. **(18849 ⛔)**
- Read/write version files with assignment results faster: The reading and writing of version files with assignment results has been accelerated. **(18920)**

⚠ Breaking Changes

COM-API

- ⚠ Changed default value for empty values of user-defined attributes: the default value for the property 'Allow empty values' was changed to 'false'. Thus, new user-defined attributes don't allow empty values if the setting remains unchaged. This affects scripts which create user-defined attributes through COM. When the function AddUserDefinedAttributes is called in a script without passing a value for the optional parameter 'CanBeEmpty' the behaviour will change. **(10302)**
- ⚠ IAnalysisTimes no longer exists: The COM object IAnalysisTimes was removed during the conversion of the time interval sets (18222). It is now replaced by the ITimeIntervalSet objects. To establish compatibility, the access function IFunctions.AnalysisTimes still exists, but it returns the ICalendarPeriod, whose interface looks like the previous IAnalysisTimes. However, this access will be removed in the next major version. **(20083 ⊕)**
- ⚠ Module pytables leads to crashes: The current version 3.3.0 of pytables (directory name tables) delivered with PTV Visum leads to non-deterministic crashes depending on data and computer. To avoid this, the version was updated to version 3.4.4. Due to incompatible changes in this version, scripts that use numpy must also be adapted. **(20118)**
- ⚠ Paper size and orientation when printing: When printing using the IGraphic::PrintNetEditor2D method, the paper size and orientation of the print page can now be specified as optional parameters. Because of the additional parameters, applications that integrate the COM API via Early Binding must be rebound. **(18073 ⊕)**
- ⚠ SetObjects of a PrT path list changes column selection: If an IPrTPathList or IPrTPathLinkList object was implicitly switched from assignment paths to user-defined PrT paths by calling the SetObjects method and a PrT path set specified instead of a demand segment, the list then had the default attribute selection for user-defined PrT paths, even if it had no attributes previously. This error has been fixed. **(20103)**
- ⚠ Shapefile export truncates file name: If the file name specified in the IIO.ExportShapefile function contained a point, it was truncated at the first point during export. This bug has been fixed. This may change the resulting file names, even with existing scripts. **(20196)**
- ⚠ Switch of the working directory when executing scripts: Previously, when executing a script, the working directory of PTV Visum was switched to the folder in which the script code could be found. Depending on the settings of the project directories, this also affected the subsequent loading of files. This switch no longer takes place, i.e. the set project directories remain untouched in any case. However, scripts that have relied on the switch of the working directory must be adapted to the new behavior. **(19437 ⊕)**

Calculation

- ⚠ Two-way stops: Results are different, when there is a major flow with non-zero grade. **(20367 ✓)**

Data Model

- ⚠ Consideration of switched off SC: If a signal control was switched off according to its properties, (main) nodes using this signal control were partly treated as signalized nodes anyway - especially in the ICA calculation. This error has been corrected. This changes the results of the ICA calculation and all assignments, as far as they use node impedances according to ICA, in particular the assignment with ICA. **(18854)**
- ⚠ Default transport systems for main turns from underlying network: Previously, the default transport system set for a newly inserted main turn was the cut set of the transport system sets of the incoming and outgoing link, as for turns. Now, those transport systems are removed from this cut set for which there is no path between these two links in the underlying nodes-links-turns network. As a result, certain turns may be closed by main nodes, and PrT assignment results change accordingly. **(19322)**
- ⚠ Line network length at main lines: The attribute 'Line network length (directed/undirected)' showed the sum of the corresponding attributes of the lines of the main line instead of the total length of all links of the main line, so that links used by different lines entered the attribute several times. This error has been corrected. **(18827)**
- ⚠ Line network length at transport system and operator: At the network objects transport system and operator, the attribute 'Line network length (directed/undirected)' displayed the sum of the corresponding attributes of the lines with a suitable transport system or operator instead of the total length of all links travelled by these lines, so that links travelled by different lines entered the total several times. This error has been corrected. **(18861)**
- ⚠ User-defined time interval sets: It is possible to define multiple time interval sets. The time intervals within one set may vary in duration, but cannot overlap. The time interval sets are network objects and are no longer available in the General procedure settings. Only one time interval set can be used for analysis time intervals. **(18222 ⊕)**

Demand Procedures

- ⚠ Invalid values in the output matrices of the tour-based model: If the procedure 'Tour-based model - combined distribution/mode choice' was executed, invalid values (NaN, 'not a number', and similar) could occur in the output matrices if rubber banding was used for calculation. This bug has been fixed. Due to a changed execution order, there may be minor numerical deviations in the output matrices. **(20347 ✓)**

⚠ Numerical difficulties in Nested Demand: In the 'Nested Demand' procedure, overflow/underflow problems could occur when calculating the log sums if all impedances were very large or very small. This error was corrected. This also results in more accurate results. In particular, there are small numerical deviations in the calculation results. **(18968)**

Formulas

⚠ TableLookup without suitable object: The function TableLookup returned the value of the expression specified as the third parameter even if there was no network object that satisfied the condition (formulated in the second argument) as long as the expression did not access attribute values of the network object that satisfied the conditions. This error has been fixed, i.e. if there is no network object that meets the condition, TableLookup now always returns an empty value. This may change the results of calculation steps defined by formulas. **(17879)**

Installation

⚠ Spelling mistake in the user settings: The previous user setting 'ActicityProtocolLevel' is renamed to 'ActivityProtocolLevel'. The corresponding entry in the registry will be renamed accordingly compared to PTV Visum 18. **(19521)**

Matrix Editor

⚠ More stable calculation for matrix and row sums: The calculation of matrix and row sums in the Matrix Editor has been improved. Only interactive editing in the Matrix Editor can cause small inaccuracies. This can change the values of matrix and row sums. **(20436 ⊕)**

Other Procedures

⚠ Signal offset optimization: A new version of the solution method has been added for the 'Signal offset optimization' procedure. This may change the results of the procedure. **(18869 ⊕)**

⚠ Calculation of emissions with HBEFA temporarily disabled: In the course of updating to the new version HBEFA 4.1 which was released in September 2019, the calculation of emissions is temporarily completely disabled - even for older versions of HBEFA. PTV Visum 2020 will exclusively support HBEFA 4.1 for the calculation of emissions. Due to the various changes in HBEFA, existing procedure parameters and model data need to be adjusted and results will differ from previous versions. The functionality will be enabled again in an early ServicePack expected for autumn 2019. **(20531 ⊕)**

PrT Assignment

⚠ Assignment with ICA with Bi-conjugate Frank-Wolfe as internal assignment incorrect: In the ICA assignment, when using the Bi-conjugate Frank-Wolfe assignment as internal assignment, the ICA calculation was not calculated based on the correct data from the assignment. As a result, the assignment with ICA may not have converged. This error has been fixed. This changes the results of the assignment with ICA when Frank-Wolfe is used as internal assignment. **(19872)**

⚠ Calculation error in fast variant of the blocking back model: The blocking back model provided incorrect results if the option 'Exploit capacities evenly (faster)" was active and only turn capacities, but no link capacities were taken into account. This error has been fixed. This combination is used in particular in assignments with ICA, the results of which change as a result. **(18183)**

⚠ Calculation error when optimizing the proportionality in LUCE: With the PrT assignment procedure 'LUCE', a calculation error could occur when the option 'Optimization of the proportionality of route volumes at meshes' was activated, so that no real numerical value was output as volume. As a result, the ICA calculation could not be carried out correctly. This bug has been fixed. This potentially changes all assignment results calculated with LUCE and proportionalization switched on. **(18904)**

⚠ Congestion starts for no reason in case of blocking-back calculation: If the calculation of congestion according to the blocking-back model was activated, congestion could occur in the network without reason if transport systems with passenger car units other than 1 were involved. This error has been fixed. This changes the assignment results of PrT assignments with the blocking-back model switched on as well as the results of assignment with ICA. **(20090)**

⚠ Effect of SC daily schedules in SBA: In simulation-based dynamic assignment (SBA), daily schedules of signal controls in the assignment time interval are taken into account. More precisely: For a signal control of the type Vissig, a daily schedule can be selected via an attribute, which then takes effect. For RBC controls, a daily schedule coded in it always takes effect if it exists, otherwise the set signal program takes effect continuously. If there are RBC controls with daily schedules in the network, the assignment result changes when SBA is used. **(16497 ⊕)**

⚠ Extension of roundabouts within SBA: For roundabouts where the leg attribute 'Number of conflicting lanes' had different values, the number of lanes within the roundabout was not generated correctly. This error has been fixed. The number of lanes within the internally expanded roundabout is the maximum of the number of conflicting lanes (leg attribute) and the number of lanes of the incoming link. The number of conflict lanes (leg attribute) are mapped as the number of lane turns of the nodes of the SBA internally expanded roundabout. **(19825)**

⚠ **Factor before tCur in the impedance function can cancel closure:** If a coefficient smaller than 1 is specified in the impedance definition for the travel time in the loaded network tCur, closed links (e.g. with an empty transport system set) in the assignment variants (classic) 'Equilibrium assignment', 'Equilibrium assignment LUCE', or 'Equilibrium assignment Bi-conjugate Frank-Wolfe' could still be used under certain circumstances, but in practice only with extremely small pre-factors. This error has been fixed. The assignment results of the three procedure variants mentioned can therefore change in the affected networks. **(19873)**

⚠ **ICA calculation for Two-way stops:** The type of site, i.e. 2-lanes, 4-lanes, or 6-lanes, is now determined by the major flow approach with the larger number of through lanes. Node impedances calculated using ICA method and thus the assignment with ICA differ, if the approaches of the major flow have a different number of inbound through lanes. **(20390 ⊕)**

⚠ **ICA calculation for capacity or saturation flow rate 0:** A capacity or saturation flow rate of 0 was not handled correctly in the ICA calculation. This error has been fixed. This changes the results of the assignment with ICA. **(18890)**

⚠ **ICA calculation in assignments:** When calculating an assignment, impedances at nodes are determined using the node impedance calculation according to ICA. If an error occured during the calculation of the node impedances, the assignment itself was not canceled until now. This error has been corrected. As a result, assignment might be aborted in more cases. **(18850)**

⚠ **SBA assignment with balancing time intervals of different lengths:** If the balancing time intervals in a simulation-based dynamic assignment (SBA) had different durations, the calculation of the travel times and thus of the gap reached as well as the balancing between alternative paths were faulty. This has also impaired convergence behaviour. This error has been fixed. **(19823)**

⚠ **Skim matrix calculation for impedance in the stochastic assignment:** It is possible to calcutate a skim matrix for the total impedance with in the stochastic assignment. This skim matrix contains components of the impedance defined over the entire path. The results of the stochastic assignment can change if the impedance component for the entire path results in an empty value. **(17670 ⊕)**

⚠ **Speed-up:** The evaluation of volume-delay functions has been accelerated. The shortest path search within the classical equlibrium and the incrmenatal assignment, respectively, has been multithreaded. These modifications result in changes of the assignment results for the methods BFW, classical equilibrium, and the incremental assignment. **(16995 ⊕)**

⚠ **Temporary closures in SBA:** Temporary closures of a link that are modeled using a temporary value of the transport system set attribute are now taken into account in simulation-based dynamic assignment (SBA). Naturally, this changes the assignment result if there are temporary closures in the network. **(19004 ⊕)**

⚠ **Turning on red in SBA:** In the simulation-based dynamic assignment (SBA), turns where turn on red is permitted were handled incorrectly: Vehicles could only drive in case of a green light, but then the set gaps took effect, so that the capacity was even lower than without turning on red. This error has been fixed, i.e. the set gaps now take effect in case of a red light, and vehicles can move unhindered when the light is green. This changes the assignment results of the simulation-based dynamic assignment (SBA). **(18817)**

⚠ **Turns with capacity 0 in assignment with ICA and LUCE:** In the Equilibrium assignment LUCE turns with a capacity of 0 were previously always considered closed. However, this criterion does not necessarily apply to ICA assignment. As a result, if LUCE assignment was used as a subordinate assignment in ICA assignment, turns with a capacity of 0 were never used. This error has been fixed. This changes the results of LUCE assignment and ICA assignment with LUCE as subordinate assignment. **(19849)**

⚠ **User-defined VD functions for nodes and turns dependent on the transport system:** So far, user-defined VDF could depend on the transport system, in principle. However, nodes and turns for which the impedance was calculated by such a VDF were always blocked, i.e. no transport system was permitted on those objects. From now on, transport system dependent user-defined VDF are only allowed for links, user-defined VDF for nodes and turns must be the same for all transport systems, i.e. independent from the transport system. **(19615)**

⚠ **User-defined ideal flow rate for node impedance according to ICU:** The user-defined ideal flow rate was not taken into account when calculating node impedances for signalized nodes according to ICU for left turns. This error has been fixed. This may change the assignment results. **(19202)**

⚠ **VD function 'Akcelik2' at length 0:** The VD function 'Akcelic2' returned tCur = 0 at length 0. In particular, the travel time in the loaded network tCur may have been lower than the travel time t0 in the unloaded network for each turn. This error was corrected by issuing tCur = t0 at length 0. This changes the results of all PrT assignments when using this VD function. **(18820)**

⚠ **Wait time from blocking back in assignment with ICA:** In assignments with ICA, the wait time resulting from congestion on links with a constant VD function was ignored. This bug has been fixed. This changes the results of the assignment with ICA in networks with blocking back and constant VD functions. **(19867)**

⚠ **Warmstart in the equilibrium assignment:** When using the option 'Use current assignment results as initial solution' inconsistencies in the results could occur. This error has been fixed. This changes the assignment results using this option. **(19776)**

⚠ **ICA, signalized nodes:** When a leg has more than one right turn or more than one left turn, and the lane turns to different target legs originate from different lanes, these lanes are no longer put in the same lane group. Instead, there is a lane group for each target approach. **(20318 ✓)**

PuT Assignment

⚠ Preselection in the iterative variants of the timetable-based assignment: If a second search is carried out in a capacity-restricted timetable-based assignment or in a timetable-based assignment with Sharing transport systems and if there are two equivalent connections for an OD pair from the first search, but none at all from the second search, many paths are unjustifiably omitted in the preselection of the second search. This error has been fixed. As a result, the result of the timetable-based assignment changes significantly in affected cases. **(20317 ✅)**

⚠ Round volumes: Rounding of volumes within a capacity restricted PT assignment, i.e. also when vehicle sharing systems are considered, is suppressed because it has a negative effect on convergence. In the last iteration the volumes of the connection are rounded. This changes the assignment results as well as the skim matrices. **(19399 ⊕)**

⚠ Rounding of demand and passenger volumes: Rounding of demand and passenger volumes have been improved for the PuT assignment. It can be rounded using decimal places or multiple of a pre-defined number. Results of the assignment and related analyses like skim calculations, flow bundle change. **(18432 ⊕)**

PuT Line Blocking

⚠ Considering depot capacities: Depot capacities were incorrectly taken into account during line blocking. This error has been fixed. This can lead to different results in the blocks as soon as capacities in depots should be taken into account. **(19984)**

⚠ Layover in depot as block item type: Previously, individual block item types of the category 'Layover' could be flagged as taking place in the depot using an attribute. Other cost rates then apply in line blocking. This attribute 'In depot' no longer exists. Instead, there is a separate system-defined block item type 'Layover in depot', which marks a block item as a layover in the depot. The introduction of the new system-defined block item type increases the numbers of user-defined block item types by one when importing version files from PTV Visum 18 and earlier. This also affects attributes with subattribute block item type number, so that the corresponding values can now be found under the number increased by one. **(20297 ⊕)**

PuT Operational Indicators

⚠ Line network length at territory: For each transport system, the links traversed by several lines of the transport system were counted several times for territories in the attribute 'Line network length (directed/undirected)'. Moreover, in the undirected variant, the entire link was used for the reverse direction instead of only the respective share in the territory. These errors have been corrected, which changes the corresponding indicators. **(18860)**

Visum Files

⚠ Text-based file exports in English: Until now, all text-based Visum files (i.e. network file, attribute file, demand file, model transfer file, interval file and multi-line survey data) were written in the language set for the user interface if it was German, English, French, Italian, or Polish. Now it is always possible to export in English, regardless of the languages available in the license. A user setting can be used to switch between English-language and localized export. The default value of this user setting is the English export, so that the program behavior changes unless the user setting is explicitly switched. **(18849 ⊕)**

Line blocking

⚠ Runtime improvement: The run time of the line blocking procedure has been improved, specifically when recurring activities are considered. This may result in different - but equivalent - results in all variants of the line blocking procedure. **(20392 ⊕)**