Institut für Bahntechnik GmbH

OpenPowerNet

Release Notes Version 1.16.0

Institut für Bahntechnik GmbH
Branch Office Dresden

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1 Introduction

1.1 Overview

The purpose of this document is to describe the changes and the status of OpenPowerNet version 1.16.0. The document contains:

- List of delivered files on DVD,
- Description of the main functionality,
- Any restrictions known,
- List of corresponding documentation and
- Known issues.

1.2 Configuration

See document Installation Instruction version 1.16.0 for required third-party software versions.

1.3 Acronyms and abbreviations

The following abbreviations are used within this document.

Abbreviation	Description
2AC	2 Phase AC
AC	Alternating Current
ATM	Advance Train Module
DC	Direct Current
DVD	Digital Versatile Disk
EFE	Engine File Editor
GUI	Graphical User Interface
NMMV	Network Model Microscopic Viewer
OCS	Overhead Catenary System
ODBC	Open Database Connectivity
OPN	OpenPowerNet
OT	OpenTrack
PDF	Portable Document Format
PSC	Power Supply Calculation
SoC	State of Charge
VLD	Voltage Limiting Device
XML	Extensible Markup Language

2 List of files on DVD delivery

```
OpenTrack/ (all installation files)
openpowernet_app_01.16.00.msi
openpowernet_system_components_01.16.00.exe
OPN_InstallationInstruction_1.16.0.pdf
OPN_ModellingCheckList_1.16.0.pdf
OPN_ReleaseNotes_1.16.0.pdf
OPN_UserManual_1.16.0.pdf
```

3 Main functionality

OpenPowerNet version 1.16.0 has the following main functionality:

- Calculation of AC, 2AC and DC power supply system,
- Calculation of magnetic coupling of conductors is done internally,
- Possible electrical network configurations include, but are not limited to:
  - Highspeed railway,
  - Freight railway,
  - Metro systems with OCS or 3rd/4th rail,
  - Monorail systems,
  - Tram networks,
  - Trolleybus networks,
  - Battery buses with charging station.
- AC / 2AC power supply models:
  - Transformer,
  - Static Frequency Converter (SFC),
  - Auto transformer,
  - Booster transformer,
- DC power supply models:
  - Rectifier/Inverter,
  - Stationary energy storage for stabilisation of line voltage and energy saving,
  - Voltage limiting device model to limit the touch voltage,
- Calculation of tractive effort with retroactive effect to the railway operation simulator OpenTrack,
- Consideration of regenerative braking,
- Consideration of tractive and braking current limitation,
- Consideration of power factor at vehicle pantograph,
- Calculation of electrical engines with single or multiple propulsion systems,
- Division of power consumption for multiple train operating companies,
- Evaluation of engine energy storage charging from regenerative braking and/or catenary,
- Evaluation of catenary-free operation,
- Consideration of coasting behaviour of the courses,
- Consideration of changing train mass at station stops,
- Calculation of short circuit currents,
- Quick evaluation of network structure using constant current engine model,
- Visualisation of results using prepared Excel-Files and
- Visualisation of results using the automated analysis of the Analysis Tool generating Excel and PDF files for:
  - Minimum pantograph voltage,
  - Maximum touch voltage,
  - Maximum leakage current,
  - Substation:

        - Feeder current versus time and as TRLPC[1],
        - Busbar voltage versus time,
        - Power (P,Q,S) versus time and as TRLPC for input, output and total (per substation and total of all substations of a network),
        - Power factor versus time,
    - Magnetic Field as flux density (B-field) and field strength (H-field),
    - Conductor and connector current versus time and as TRLPC[1],
    - Voltage versus time and as TRLPC[1],
    - Energy overview,
    - Vehicle specific charts,
    - Vehicle specific overview
- Visualisation of scenario results comparison using the Analysis Tool.

[1] The **T**ime-**R**ated **L**oad **P**eriods **C**urve (TRLPC) shows the maximum or minimum of a set of varying window-size averages where the window time duration is defined by the x-axis value.

4 Changes

4.1 Version 1.16.0 vs. 1.15.2

4.1.1 New Features

- OPN-13983: Implement Compare Analyses Prototype
  - It is now possible to create Analysis output for multiple scenarios to compare them. To create that output, a new "Comparison Selection File" (.csel) has to be created using the dedicated editor.
  - Note: The prototype can create output for Lines U_Panto chart only. More output possibilities will be added in future releases.

4.1.2 Improvements & Changed Behaviour

4.1.2.1 Calculation

- OPN-15841: Improve simulation performance by using a new solver
- OPN-15983: Implement matrix caching
  - PSC now uses a bigger portion of system RAM to cache matrix objects. This significantly improves simulation performance for most models.
  - The maximum amount of RAM to use for calculation, that is configured on the "Server" preference page, may be between 1 GB and 3/4 of the system RAM. The default value is 1/8 of system RAM.
- OPN-16032: Use initial SoC on failed turnaround connection with engine energy storage
  - If a turnaround connection for courses with engine energy story fails and warning message APS-W-011 (early start) is displayed, the followup course will now use the initial SoC as defined in the project file instead of 0 Ws.

4.1.2.2 Analysis & Selection Editor

- OPN-15317: Improve selection of infrastructure items
  - Allow deselection of all infrastructure marker items on Lines and Vehicles page again.
  - Rename column "Infra" to "Infra Marker" on Lines and Vehicles page.
  - Rename "Feeder of SS with ES" to "Feeder of SS with WES" in "Infra Marker" selection on Lines page.
- OPN-15935: Remove separate time selection for magnetic field images
- OPN-15979: Immediately show invalid selections
- OPN-16018: Show validation error if no Y axis is selected
- OPN-16020: Improve scaling for y axis with mixed units
- OPN-15570: Change y-axis title for vehicle effort

4.1.2.3 Automation Config

- OPN-15123: Support OPNCORE message ignore setting
- OPN-16109: Hide debug log file

4.1.2.4 Usability & Setup

- OPN-15462: Show OpenPowerNet version in window title
- OPN-15688: Improve default workspace options
- OPN-10629: Implement new database connection setup method
    - Database connections are configured in a new section in OPN preferences now. This replaces the usage of ODBC Data Sources.
    - Existing ODBC Data Sources may be kept to enable usage of previous OPN versions.
    - ODBC Data Source "pscresults" is still needed to load data into the "Prepared Excel Files". The button for starting Windows ODBC Administrator was moved to the corresponding menu in the GUI.
    - Existing project files need to be updated by the user to match the project-file schema: Attributes odbcDsn, databaseSchema, dbUser and dbPasswd are deprecated respectively ignored and will be removed in future version 01.17.00.
    - Scenarios that were orchestrated with a previous version of OPN need to be reorchestrated, which makes it necessary to run finished scenarios again. Therefore the user should consider to finish current investigations before upgrading to the new version. Alternatively a migration of the model files in the scenario and accepting the changes is also possible but only recommended if remake is not possible.
- OPN-16008: Upgrade MariaDB database server version to 11.4
    - MariaDB database server now uses port 9050.
    - The Installer allows side by side installation of System Components 1.16 with prior versions to maintain support for older OPN versions on the same machine.
- OPN-16015: Improve installation of Sentinel LDK Runtimes
    - Thales Sentinel Runtime will now be installed as a prerequisite to reduce possible collision with other software that relies on it. Uninstall is not executed with System Components anymore.
- OPN-16064: Improve dropping database
    - Remove delete triggers from database schema as they are not needed anymore.

4.1.3 Bugfixes

- OPN-14793: ANA Fix rare issue where a valid selection could cause an unhandled error during analysis
- OPN-14918: EFE Fix display of non-existing propulsion in engine model
- OPN-15376: SimS Fix out of memory error with large files in scenarios directory
- OPN-15526: GUI Fix possible exception on closing preferences
- OPN-15728: ATM Extend range of f(v) tables to mitigate error LIB-E-011 from rounding issue
- OPN-15797: SEL Fix editor behaviour when the file is changed outside OPN
- OPN-15933: ANA Fix missing user feedback for skipped references in inline voltage charts
- OPN-15984: OPNCORE Fix engine consuming current limit exceeded in rare cases
- OPN-15996: CSEL/EFE/SIMS Fix editor behaviour when the file is changed externally
- OPN-16000: ANA Fix issue where missing data was not handled properly
- OPN-16014: GUI Make Ctrl+V text field behaviour consistent
- OPN-16019: ANA Fix calculation of mean values for signals with time gaps
    - Vehicle overviews:
        - Values in overview tables are correctly skipped now depending on time gaps and selected time bases.
        - Minimum values could be 0.0 instead of being skipped.
        - Minimum average values could be too small.
        - Percentil values could be too small.
        - Values for total P_ES_max in overview for all courses could be too small when mixing engines with and without energy storage.
        - Values for non-existing model elements like storages could be 0.0 instead of being skipped.
    - Substations:
        - Values for sum of feeder currents in overview tables are correctly skipped now depending on time gaps and selected time bases.
        - TRLPC output for sum of feeder currents did not consider time gaps.
- OPN-16025: SEL Fix "Save All" button
- OPN-16053: ANA Fix VLD count missing for timestep length not 1s
- OPN-16079: INST Fix import of most recent workspace during app installation
- OPN-16081: OPNCORE Fix crash on exceptions and SOAP memory leak
    - Fix possible OPNCORE crash on model errors like engine efficiency value too big. The error message will be displayed correctly now.
    - Fix possible memory leak connected to SOAP communication between OT and OPN.
- OPN-16082: ANA Fix abort for selection with one timestep
    - Fix creation of some Analysis output would fail for selections with only one timestep. However, some chart series may not be displayed if they consist of only that one timestep. This problem will be fixed in a later release.
- OPN-16115: SIMS Fix scenarios are damaged by adding reference to typedefs in original project file

4.1.4 OpenTrack

- The OpenTrack version tested with OpenPowerNet is 1.10.7 (2024-12-20).

5 Known restrictions

OpenPowerNet 1.16.0 is tested with OpenTrack version 1.10.7 (2024-12-20) and should only be used with this version.

OpenPowerNet is a single user application. It is not tested to use the same database for multiple users at the same time.

6 Version of corresponding documentation

The following table lists the version of the documents related to OpenPowerNet 1.16.0.

Document	Version
Installation Instruction	1.16.0
User Manual	1.16.0

7 Known issues

The following table contains all known but unsolved issues.

ID	Summary	Status
371	When using larger time steps other than 1s or 0.5s, OpenTrack sends the requests not for all courses in the same time raster but OpenPowerNet is designed to calculate always in the same time raster. Workaround 1: Always use 1s or 0.5s simulation time steps, which is recommended for best performance and accuracy anyways. Workaround 2: Set all times within OpenTrack in the raster according to the selected simulation time step, e.g. for 3s time step only time hh:mm:00, hh:mm:03, hh:mm:06 ….. The simulation will be terminated by OpenPowerNet in case of OpenTrack requests outside of the time raster.	Can’t be solved.
n/a	Due to a limitation of the Excel VB interface, sheet names must not use international character sets. Therefore all sheet names will be created in English.	Can’t be solved.
n/a	Warning message PRE-W-506 might be displayed on localised systems. This happens due to a limitation of the Excel VB interface, if the printer can not be set correctly. Technical background: As Excel sets the page size of new sheets according to the current printer, a printer with proper setup has to be selected before creating output. This is normally achieved using "Microsoft XPS" printer. If it fails, the user has to take care, that the system default printer is configured as desired. The warning message may be ignored in this case.	Can’t be solved.
n/a	Vehicles, charts for all courses with multiple time windows: As data is written to the sheet sorted by engine first and timestep second, the chart series in a subchart can not be limited as easy as if sorted by timestep and therefore will contain time data from other subcharts. The axis scaling will be set correctly though.	Can’t be solved.
OPN-13883	While merging with attribute mergeNetwork=”false” the model parsing might fail with error message INT-E-353 as the network is still evaluated and checking references to master network.	Open

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