OpenPowerNet

Release Notes Version 1.3.2

Institut für Bahntechnik GmbH
Branch Office Dresden

Document No. OPN/RN/1.3.2

l:\opn\10_documents\20_program_documentation\30_release_notes\rn_opn_01.03.02.doc

Author	Review	Release
_____ Date Martin Jacob	_____ Date Harald Scheiner	_____ Date Dr. Jörg von Lingen

1   Introduction

1.1   Overview

The purpose of this document is to describe the changes and the status of OpenPowerNet version 1.3.2. 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 1.3.2 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
GUI	Graphical User Interface
ODBC	Open Database Connectivity
PSC	Power Supply Calculation

2   List of files on DVD delivery

```
OPN_InstallationInstruction_1.3.2.pdf
OPN_ReleaseNotes_1.3.2.pdf
OPN_UserManual_1.3.1.pdf
OpenPowerNet\my.ini
OpenPowerNet\createUser.bat
OpenPowerNet\OpenPowerNet-1.3.2.zip
OpenTrack\OpenTrack.V_1.6.5.2011-06-28.zip
ThirdPartyPrograms\HASPUserSetup.exe
ThirdPartyPrograms\jre-6u14-windows-i586.exe
ThirdPartyPrograms\MCRInstaller_R2009a_win32.exe
ThirdPartyPrograms\MCRInstaller_R2009a_win64.exe
ThirdPartyPrograms\mysql-connector-odbc-3.51.27-win32.msi
ThirdPartyPrograms\mysql-connector-odbc-5.1.5-win32.msi
ThirdPartyPrograms\mysql-connector-odbc-5.1.5-winx64.msi
ThirdPartyPrograms\mysql-essential-5.0.67-win32.msi
ThirdPartyPrograms\mysql-essential-5.0.67-winx64.msi
ThirdPartyPrograms\mysql-gui-tools-5.0-r14-win32.msi
ThirdPartyPrograms\odbcad32 (x86).lnk
ThirdPartyPrograms\odbcad32.lnk
```

```
ThirdPartyPrograms\vcredist_x64.exe
ThirdPartyPrograms\vcredist_x86.exe
update\artifacts.xml
update\content.xml
update\index.html
update\site.xml
update\features\de.bahntechnik.dd.opn.bin_1.3.0.v_201003311200.jar
update\features\de.bahntechnik.dd.opn.bin_1.3.1.v_201005170000.jar
update\features\de.bahntechnik.dd.opn.bin_1.3.2.v_201106291500.jar
update\features\de.bahntechnik.dd.opn.psc.prj.ui_0.3.0.v_201003311200.jar
update\features\de.bahntechnik.dd.opn.psc.prj.ui_0.3.1.v_201005170000.jar
update\features\de.bahntechnik.dd.opn.psc.prj.ui_0.3.2.v_201106291500.jar
update\features\de.bahntechnik.dd.opn.ui_0.3.0.v_201003311200.jar
update\features\de.bahntechnik.dd.opn.ui_0.3.1.v_201005170000.jar
update\features\de.bahntechnik.dd.opn.ui_0.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.ana.help_0.3.0.v_201003311200.jar
update\plugins\de.bahntechnik.dd.opn.ana.help_0.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.ana_0.3.0.v_201003311200.jar
update\plugins\de.bahntechnik.dd.opn.ana_0.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.bin.help_1.3.0.a1_201002110900.jar
update\plugins\de.bahntechnik.dd.opn.bin.help_1.3.1.v_201005170000.jar
update\plugins\de.bahntechnik.dd.opn.bin.help_1.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.bin_1.3.0.v_201003311200.jar
update\plugins\de.bahntechnik.dd.opn.bin_1.3.1.v_201005170000.jar
update\plugins\de.bahntechnik.dd.opn.bin_1.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.diagram_0.3.0.v_201003311200.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.diagram_0.3.1.v_201005170000.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.diagram_0.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.edit_0.3.0.v_201003311200.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.edit_0.3.1.v_201005170000.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.edit_0.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.editor_0.3.0.v_201003311200.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.editor_0.3.1.v_201005170000.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.editor_0.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.help_0.3.0.v_201003311200.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.help_0.3.1.v_201005170000.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui.help_0.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui_0.3.0.v_201003311200.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui_0.3.1.v_201005170000.jar
update\plugins\de.bahntechnik.dd.opn.psc.prj.ui_0.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.ui.help_0.3.0.v_201003311200.jar
update\plugins\de.bahntechnik.dd.opn.ui.help_0.3.1.v_201005170000.jar
update\plugins\de.bahntechnik.dd.opn.ui.help_0.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.ui_0.3.0.v_201003311200.jar
update\plugins\de.bahntechnik.dd.opn.ui_0.3.1.v_201005170000.jar
update\plugins\de.bahntechnik.dd.opn.ui_0.3.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.opn.util_0.1.1.v_201001110000.jar
update\plugins\de.bahntechnik.dd.opn.util_0.1.2.v_201106291500.jar
update\plugins\de.bahntechnik.dd.util_1.0.3.v_200908261600.jar
update\plugins\de.bahntechnik.dd.util_1.0.4.v_201102241500.jar
update\web\site.css
update\web\site.xsl
```

3   Main functionality

OpenPowerNet version 1.3.2 has the following main functionality:

- Calculation of AC, 2AC and DC power supply system,
- Calculation of magnetic coupling of conductors is done internally,
- Calculation of tractive effort used by OpenTrack and analysis,
- Calculation of braking effort for analysis,
- Evaluation of tractive and braking current limitation,
- Calculation of electrical engines with single or multiple propulsion systems,
- Division of power consumption for multiple Train Operating Companies,
- Evaluation of station energy storage for stabilisation of line voltage and energy saving,
- Evaluation of engine energy storage,
- Consideration of coasting behaviour of the courses,
- Calculation of short circuit currents,
- Quick evaluation of network structure using constant current engine model,
- Visualisation of results using analysis of data with prepared Excel-Files and
- Visualisation of results using the automated analysis of the Analysis Tool.

The latest changes since version 1.3.1 are as follows:

- **General:**
- Updated software protection to Sentinel HASP 5.0, please update to the latest runtimes!
- Record messages to database in case any data is recorded to the database. These messages are available by Excel file Messages.xlsx from GUI.
- Use fixed voltage for engine recovery if sufficient power is available (U_source), otherwise use the old implementation (I_source). New attribute "recoveryMode" with values "I_source" and "U_source" added to element "Propulsion" in Project-File. Apart from the pantograph voltage for the case that no energy can be recovered, the simulation results for both recovery modes are the same but the simulation time may be shorter for U_Source and not recoverable rectifiers. It is advised to use U_Source for DC and not recoverable rectifier and otherwise I_Source.
- Change Error checking of the actual time step order from termination of the simulation to just displaying the error message and using the actual time step instead for calculation. The disorder of requests has a rare occurrence but should not terminate the simulation to improve the robustness.
- Message for power off changed from type WARNING to INFO.
- Message for failed iteration changed from type WARNING to ERROR.
- Record engine data, currents and voltages also in case of failed iteration.
- The failed ATM-PSC iteration is selective for each network. This improves the simulation robustness because the networks with stable iteration are not marked as failed. This is useful if projects contain more than one network.
- Added the ability to simulate distributed engines and respect the different positions of the engines in the electrical network. This is useful for very long trains. Minimum OpenTrack version to use this feature is 1.6.5 (2011-05-24). The train configuration is

done in OpenTrack "Trains-Edit" panel using an additional parameter positions in the engines and trailers table.

- Multiple bugs fixed in this version.

- **Excel Analysis:**
  - Excel analysis uses now ODBC connection without database schema name. This enables the Excel-files to display the results from multiple databases. The DSN (Data Source Name) "pscresults" will display the results from the schema selected in the ODBCData Source Administrator (see document Installation Instruction).
  - Added the following Excel-Files to analysis menu:
    - Message.xlsx to display the recorded messages from the database.
    - EngineStorage2.xlsx to compare two engine energy storages.
    - Course.xlsx to analyse courses combining the results of all engines contained in one course.
    - Course2.xslx to compare two courses.
    - PowerSupplyStorage.xlsx to analyse the new station energy storage.
    - PowerSupplyStorage2.xlsx to compare two new station energy storages.
    - Impedance.xlsx to calculate the impedance between one substation and one engine. Only one engine should run in the simulation otherwise the calculation will be incorrect as the impedance is calculated using the voltage difference between the substation busbar and the pantograph and the pantograph current.
    - ShortCircuitFeeder.xlsx to analyse the short circuit currents by substation feeder.
    - ShortCircuit2Feeders.xlsx to analyse the short circuit currents of two feeders in one substation.

- **Analysis Tool:**
  - Added possibility to save/load selections to/from file.
  - Tool now uses presets for creation of Excel charts. Using a customised XML file, which may be defined in setup dialogue, many chart settings and description strings can be modified by the user. A template can be found beside the XML schema (Alanaysis.xsd) in defaultPresets.xml. The schema path is available via the GUI.
  - Added possibility to define decimalSeparator and thousandsSeparator for Excel in preset. The user will be prompted to adjust this per-user global Excel setting manually.
  - Several GUI improvements and bugfixes.
  - Show only database connection in selection that allows reading XML file. MyODBC Connector 3.51 can not be used for automatic analysis.
  - Set time scope from project file as default instead of time recorded to database.
  - Station names with first character "!" in OpenTrack will not be added to line charts.
  - Create charts for power output and input TRLPC at power supply and sum of power supplies.
  - Consider new engine energy storage in energy calculation.
  - Set chart type as default footer in output files.

- Improved automatic chart axis scaling. Minimum and maximum values may also be defined in presets. Axis scale is caught at 0 if not defined.
- Fixed charts for lines: Axis scale was set to minimum and maximum of all tracks instead of selected tracks.
- Fixed axis units for several charts.
- Chart Substations/UI_PS: Draw |I_OCS|, |I_Rails| and |I_NF| only for ThreeWindingTrafo, for other power supplies only |I_OCS|.
- Cleaned up charts for rectifier.
- Cleaned up substation name in selection window.
- Create vehicle and energy overviews in subdirectories.
- Add leading zero to filename for chart and substation numbers.
- Append timestamp to information file instead of overwriting it.
- Write time scope to information file.
- Write messages to information file.
- Display the number of warnings and errors after creation of output files.
- Bugfix: Station and vehicle names could be translated to numbers while parsing them from XML file.
- Fixed bug in calculation of TRLPC which would lead to performance issues for simulations with more than 7200 timesteps.
- Magnetic field tool renamed to "OpenPowerNet Inline Measurement" as it is now possible to analyse conductor currents between 2 slices.
- Magnetic field: Added possibility to generate output for mean values of magnetic flux density. These mean values are calculated out of the images for each simulation time step at each raster point.
- Magnetic field: A factor can be used e.g. to show mean values for a whole day out of a simulation with duration of 1 h.
- Magnetic field: Use presets for output creation.
- Magnetic field: Default output format is DIN A4 landscape.
- Magnetic field: Image output is created in PDF file which results in better image quality and scalability.
- Magnetic field tool: Default designation is now simulation comment.

- **GUI:**
  - Open the analysis Excel files as write protected to keep the prepared files and avoid unmeant changes.
  - Use color coding for console messages.
    - ERROR: red
    - WARNING: blue
    - INFO: black
  - PSC Viewer indicates now the recording of voltages and currents. Nodes with recorded voltage are light gray and others white. Wires with recorded currents are solid and others dashed.

- PSC Viewer is able to generate the switch states according to a specific simulation time step. The normal state and the actual state will be visible as icon, as tooltip and in the properties view.

- **ATM:**
  - Added minimum speed for recovery braking to engine propulsion system in Project-File.
  - Give warning in case different maximum recovery voltage per power supply system is configured.
  - Improved stability of engine current limitation.
  - Improved and faster calculation while using engine energy recovery by new algorithm.
  - The engine energy storage losses calculation fixed. Now the percentage of the load efficiency is based on 1h, e.g. 90% efficiency means any time step 10% of the actual load divided by 1h is the actual loss (loadLoss_W =: load_Ws/3600s*10%)

- **PSC**
  - Removed special DC version of PSC as the optimisation is now included in the normal builds.
  - Create network matrix in sparse format to use less system memory. This matrix is now saved as .dat-file.
  - The condition number of the matrix is now tested and an error occurs in case the matrix is ill conditioned. To solve the problem avoid very small and very big resistances in the network model.
  - Now it is possible to set a fixed voltage between two nodes, e.g. 0V for a short circuit. New attribute constantVoltage_V instead of shortCircuitEngine.
  - Force the same voltage of rails at engine position in case both rails are modelled. The voltage is forced by adding a fixed voltage of 0V between them.
  - Removed option evenlyDistributedTractionReturnCurrent. Now the rails are always electrically connected at engine position. In case this is not wanted it is recommended to model one rail as type ReturnFeeder.
  - Added new energy storage with the ability to model energy saving and voltage stabilisation behaviour.
  - Display warning in case equivalent radius is smaller than 1 mm.
  - Improved performance for matrix calculation, e.g. time reduced to 5% only for a 8500 nodes network.

4   Known restrictions

OpenPowerNet is tested with OpenTrack version 1.6.5 (2011-06-28) 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.

The Engine-File uses the RailML rollingstock schema version 1.03 with OpenPowerNet specific extensions and is therefore not 100% compatible with the mentioned version 1.03.

5   Version of corresponding documentation

The following table lists the version of the documents related to OpenPowerNet 1.3.2.

Document	Version
Installation Instruction	1.3.2
User Manual	1.3.1

6 Known issues

The following table contains all known but unsolved bugs.

ID	Summary	Status
371	When using larger time steps other than 1s, 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: Use always 1s simulation time steps. 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.
453	An additional load in a substation will lead to a wrong evaluation of subnets used PSC internally. Workaround: Add an additional load as a connector between two line side conductors and not inside the substation.	Open
458	The information of split, merged and connected courses is not available in OpenPowerNet. Therefore the engine energy storage of an engine will be reset to the initial values even if the new course is connected with the previous course and the two courses represent the same physical train.	Open