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# WoPeD - A “Proof-of-Concept” Platform for Experimental BPM Research Projects

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**Abstract.** WoPeD (**W**orkflow **P**etrimet **D**esigner) is an open-source, Java-based software product supporting the creation, simulation and analysis of business process models. Over the years, WoPeD has become a widely-used tool in the academic sector, primarily known and used for teaching purposes. To some extent WoPeD is also playing a second role by serving as an experimental software platform for implementing and validating research ideas from various BPM fields. This demo gives an overview over the features which have been added to WoPeD following this “proof-of-concept” research approach.<sup>1</sup>

**Keywords:** Petri net tool, open-source, teaching and e-learning tool, experimental research implementation platform.

## 1 Introduction

WoPeD has been extended continuously resulting in the current release 3.6.0 from June 2017. WoPeD covers a variety of BPM aspects. Firstly, it provides a graphical editor for workflow nets and enterprise resources. Secondly, it supports model-based simulation, analysis, verification and property visualization by providing built-in algorithms for soundness, coverability graph construction, quantitative simulation and more. Thirdly, it allows the transformation from and to other common process model formats like BPMN or EPCs via AProMoRe repositories [1]. WoPeD has proved to be an easy-to-use software tool allowing students and practitioners hands-on experience and fast acquisition of fundamental concepts of Petri nets in general and BPM in particular. In the past, WoPeD has served researchers in the BPM community as a software platform for the implementation of innovative project ideas. The remainder of this paper gives an overview over example projects. Some of them have been successfully completed and presented on past BPM conferences (section 2, [3]). Other projects refer to recently improved features (section 3) or brand new extensions (sections 4 and 5).

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## 2 Operator Syntax Coloring and Process Metrics

In cooperation with researchers from TU Eindhoven, an operator coloring function has been added to the WoPeD editor following the principle of syntax highlighting of programming languages. The corresponding sets of opening (“split”) and closing (“join”) operators are highlighted in the same color - also interactively during editing of the model. The research hypothesis stated that operator coloring will lead to a better understanding of control flow and has a positive impact on the error rate of the resulting process model. The evidence was derived from a field study with a test user group making use of this new function. The results were published in [9].

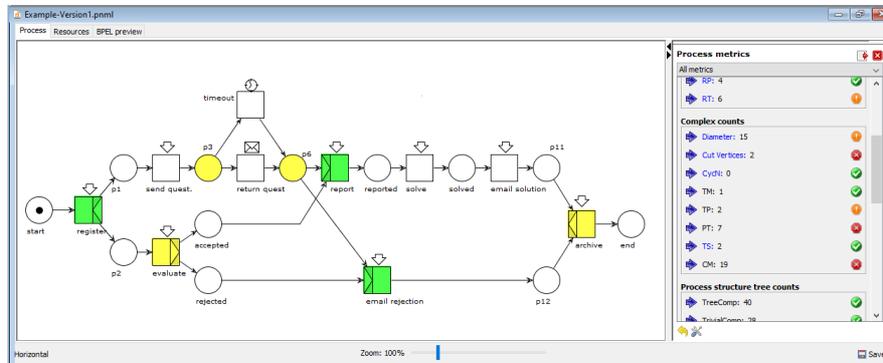


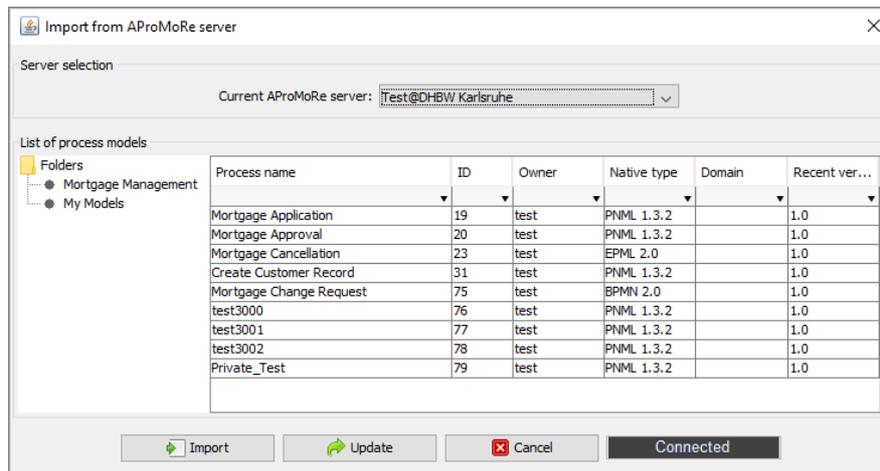
Fig. 1. Operator coloring and process metrics sidebar

In a second project with researchers from WU Vienna, a component was developed and embedded into the WoPeD editor to compute, visualize and rate process metric values. A large set of predefined metrics, like simple counts (e.g. number of tasks), analytical counts (e.g. graph diameter) or relational properties (e.g. degree of structuredness) are computed by built-in algorithms (making use of the BPStruct library developed at HPI Potsdam [2]) and displayed in an editor sidebar. Additionally, new metric algorithms can be created via an interactive formula editor. The implemented functions were used to validate the hypothesis that certain metric values allow the prediction of certain error types in process models. The results were published in [6]. Figure 1 shows an example WoPeD session with enabled operator coloring and the computation of all predefined process metrics opened in the sidebar.

## 3 Redesigned AProMoRe Interface

AProMoRe is an open source software maintained at QUT Brisbane [1]. It provides a server-based process model repository and a set of conversion algorithms

that allow model interchange between the most common process modeling languages like BPMN, EPML and YAWL.



**Fig. 2.** AProMoRe settings and import dialog

There is a recently improved interface in WoPeD for importing and exporting process models from and to AProMoRe servers in any supported modeling language. This allows applying WoPeD’s built-in analysis, simulation and visualization functions also to models created in non-Petrinet-based languages. Figure 2 shows the redesigned AProMoRe import dialog. WoPeD is an associated partner of the AProMoRe project. There is an ongoing collaboration between developers from both tools with the goal to further improve the bidirectional conversion between AProMoRe’s “Canonical Process Format” (CPF) and PNML, the common Petri net file format used by WoPeD.

## 4 Interactive Coverability Graph Construction

In cooperation with University of Innsbruck, a wizard has been included into WoPeD which guides the user step by step through the construction of the minimal coverability graph of the modeled process. This feature extends the educational usage of WoPeD as a learning tool for Petri nets. The wizard uses the Monotone Pruning Algorithm introduced in [8], which is based on the well-known Karp&Miller Algorithm [5]. The Monotone Pruning Algorithm applies sophisticated optimization during the graph construction, which significantly reduces the computing power required. In addition, the algorithm computes the unique minimal coverability graph, which can be used for further analysis. Figure 3 shows a screenshot of the construction of the coverability graph of the

demonstration model taken from [5] where the node highlighted in blue has just been analyzed in this step.

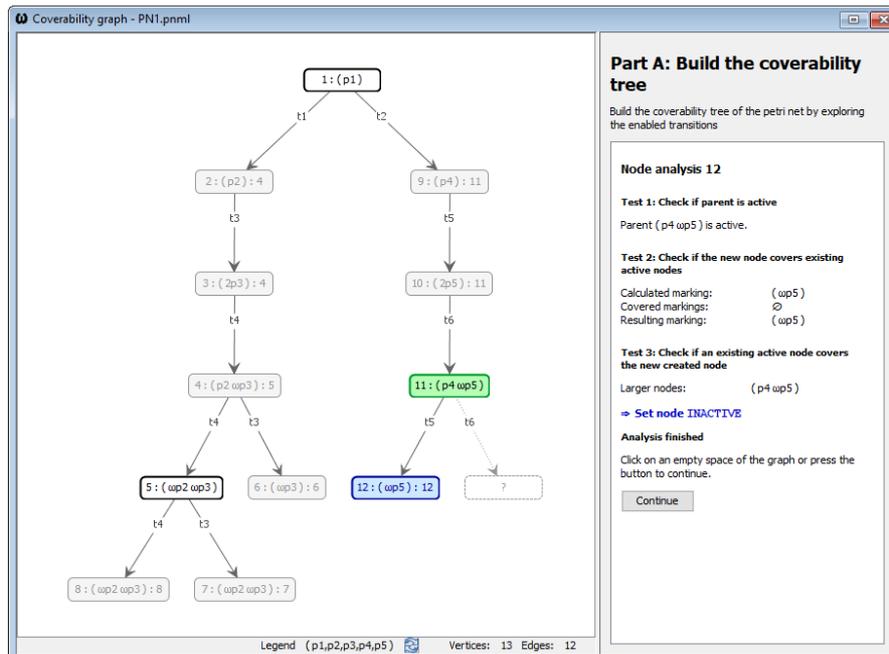


Fig. 3. Process2Text sidebar

## 5 Process2Text and Text2Process Interface

Another cooperation project was performed recently with VU Amsterdam, resulting in the development of a WoPeD interface to a webservice delivering a textual representation of the model shown in the WoPeD editor (“Process2Text”).

The underlying techniques from linguistics and graph decomposition allow the synthesis of accurate natural language text like from process handbooks [7]. Figure 4 shows a screenshot of WoPeD with a “Process2Text sidebar” containing the generated text. The highlighted text regions represent hyperlinks to the associated elements in the process graph. A new feature currently under advanced development (expected to be published soon) allows the construction of a process model from a given natural language description (“Text2Process”). The implementation makes use of the ideas and algorithms published in [4].

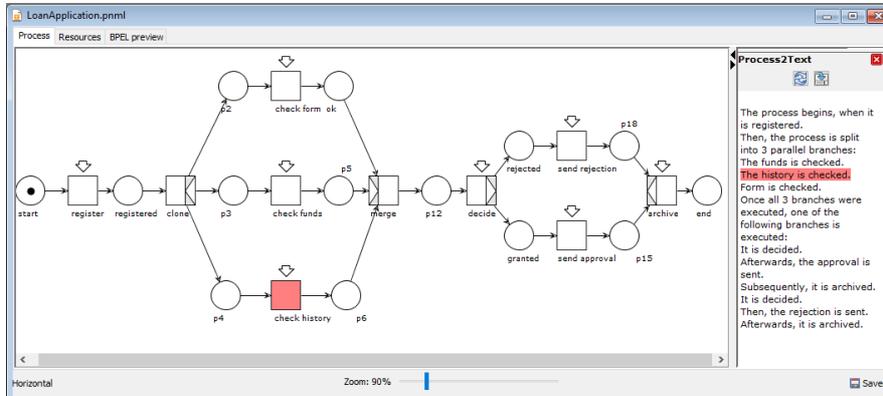


Fig. 4. Process2Text sidebar

## 6 Conclusion and further readings

WoPeD can be downloaded via its homepage [10] or directly from Sourceforge. The code is open source and is published under the LGPL license. A screencast of the features described in this demo session paper can be found at [11].

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