# TUTORIAL: Petri Net Modelling and Analysis with WoPeD

This tutorial will provide you the necessary steps to perform modelling and analysis with the tool WoPeD. The underlying theory can be found in Chapter 6 of the book "Conformance Checking – Relating Processes and Models".

Getting WoPeD

WoPeD is a tool for the modelling and analysis of process models as Petri nets. It can be obtained from the following link. Follow the installation instructions provided in the webpage of the tool.

Petri Net Modelling with WoPeD

You can create the Petri net corresponding to the running example used in the book. The tool contains an online help to guide you in the modelling process. The final net in WoPeD should like like the following image:
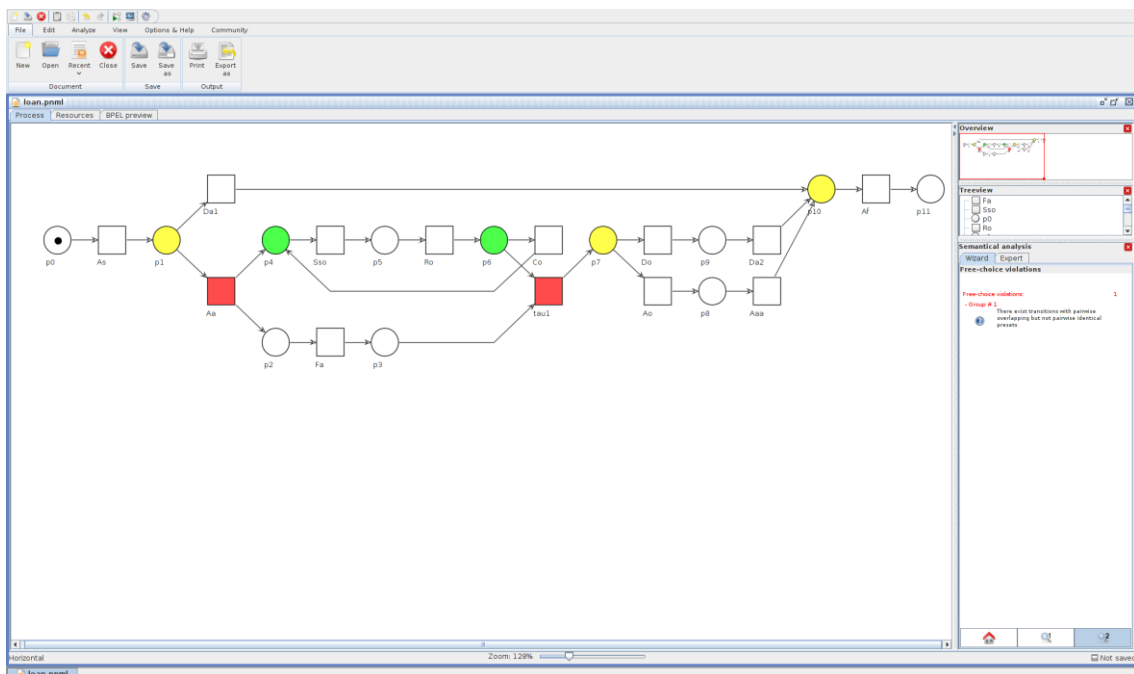

Token-Replay in WoPeD

WoPeD has the capability of playing the token game to replay a trace on top of the Petri net. For this, you need to go to the Analyze tab and select "Tokengame". You will be taken to a executable window where you can click on the enabled transitions that you want to fire in the current marking of the net. The following image shows an intermediate marking, the one when replaying the trace *As, Aa, Sso, Ro.*
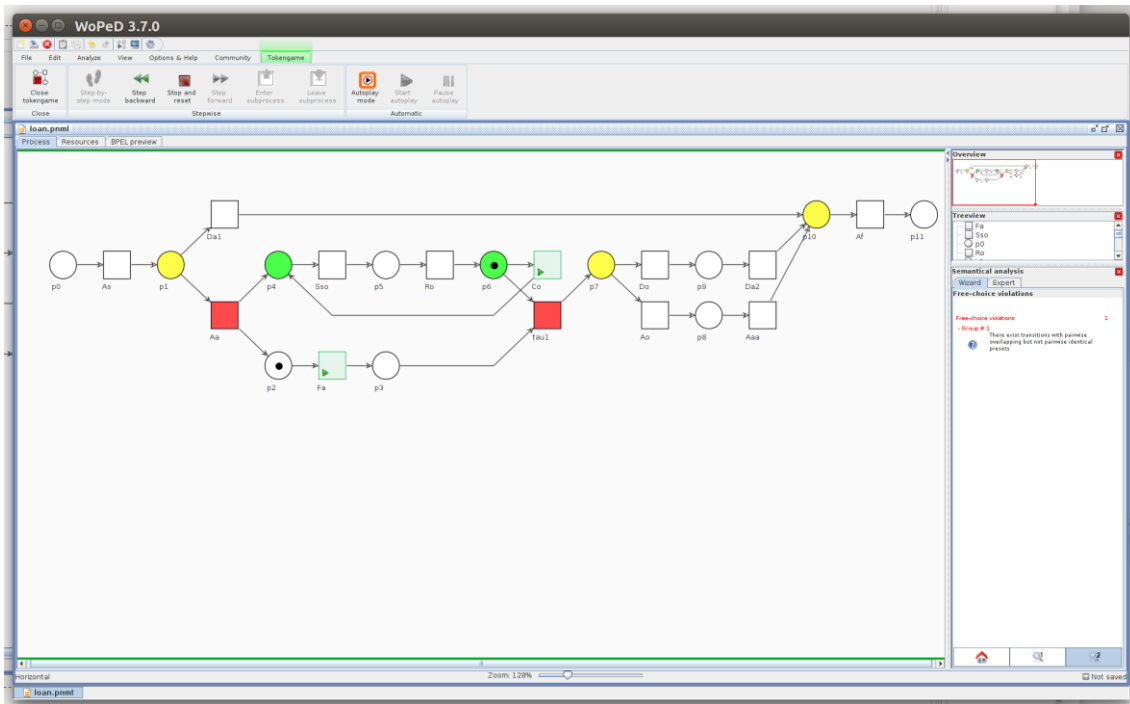
Notice that you have also an "Autoplay mode", to see different executable sequences of the Petri net. For that, you need to use the button "Start autoplay" so that the current marking is the starting point to the replay until the final marking is reached. Once you are in the final marking, you can get back to the initial marking by clicking in the button "Stop and reset".

Petri Net Analysis in WoPeD

Now close the Tokengame mode by clicking in the button "Close tokengame". Then you are back to the Analyze section. Now click on the "Semantical Analysis" button; a new information in the windows placed at the bottom right part will appear:
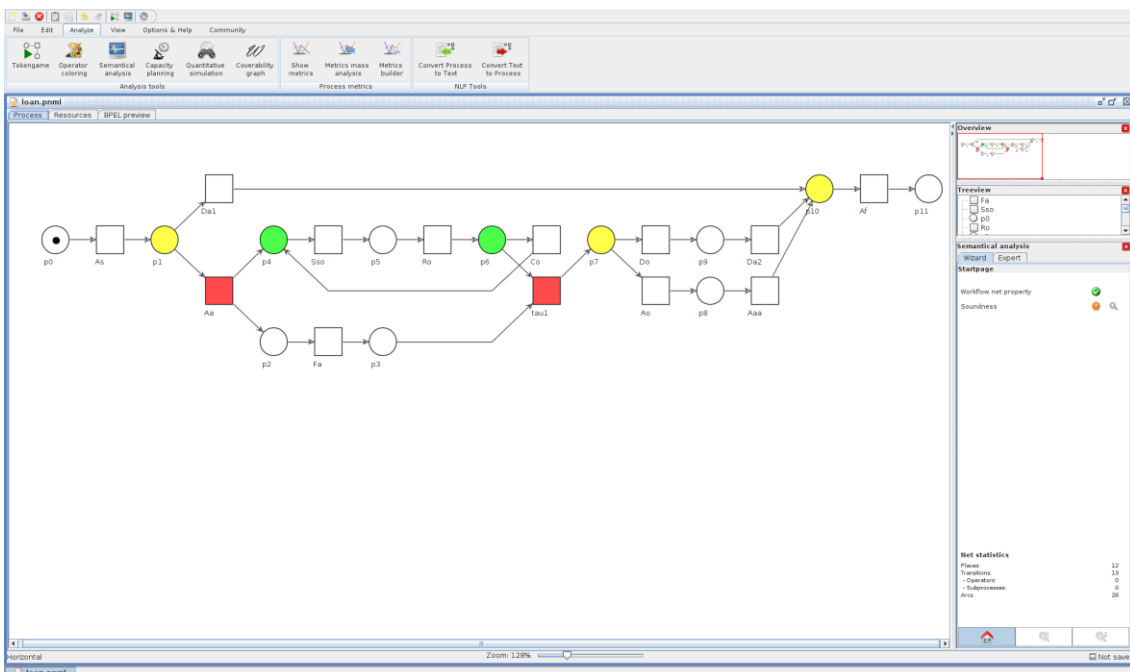
Where it shows that the Petri net is workflow, and satisfies most of the properties related to soundness. You can click in the "Expert" tab to see a more detailed information:
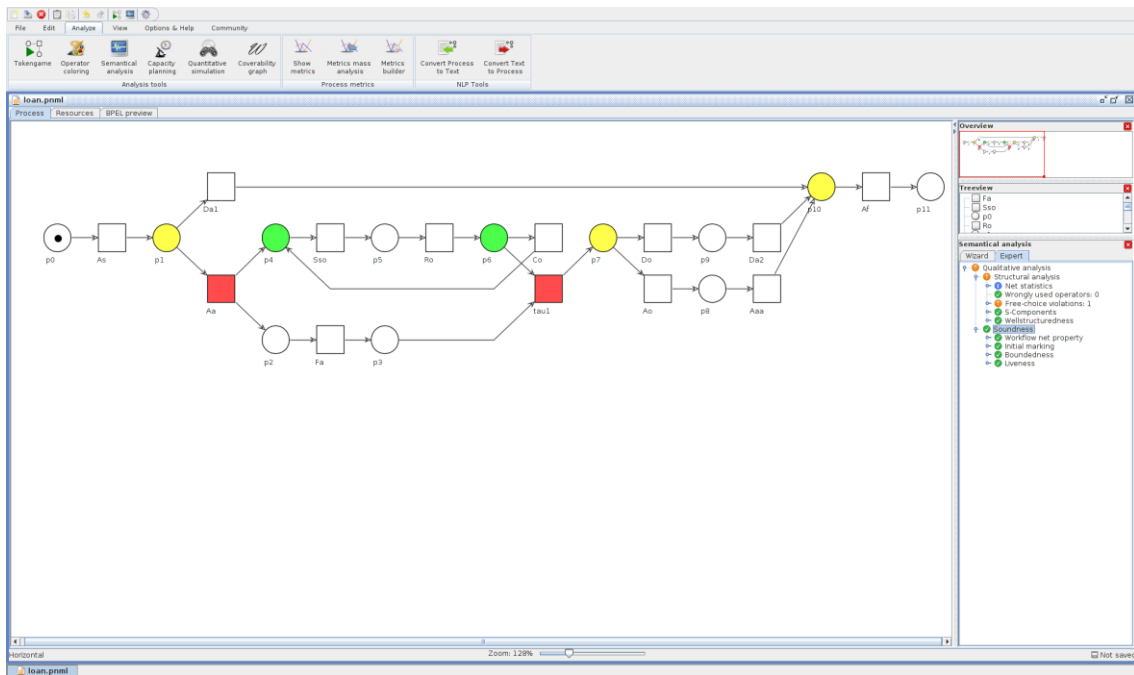
Where you can see the structural analysis of the Petri net (e.g., reporting that the Petri net is well-structured), and the soundness analysis including boundedness and liveness properties.

State Space Analysis with WoPeD

WoPeD incorporates the capability of analysing the state space of a Petri net. For that, you should click on the "Coverability Graph" button under the Analysis tab. The coverability graph is an abstraction of the state space of a Petri net, such that it can represent infinite state spaces (that arise when the Petri net is not bounded). For our example, since the Petri net is bounded, the coverability graph coincides (up to isomorphism) with the reachability graph shown in Figure 6.6 of the book. For displaying it, we have adjusted the display settings (in the new tab "Coverability Graph", the button "Settings"), selecting "Token visualization" as the representation of the markings, and "colored" color scheme. The resulting reachability graph is shown below:
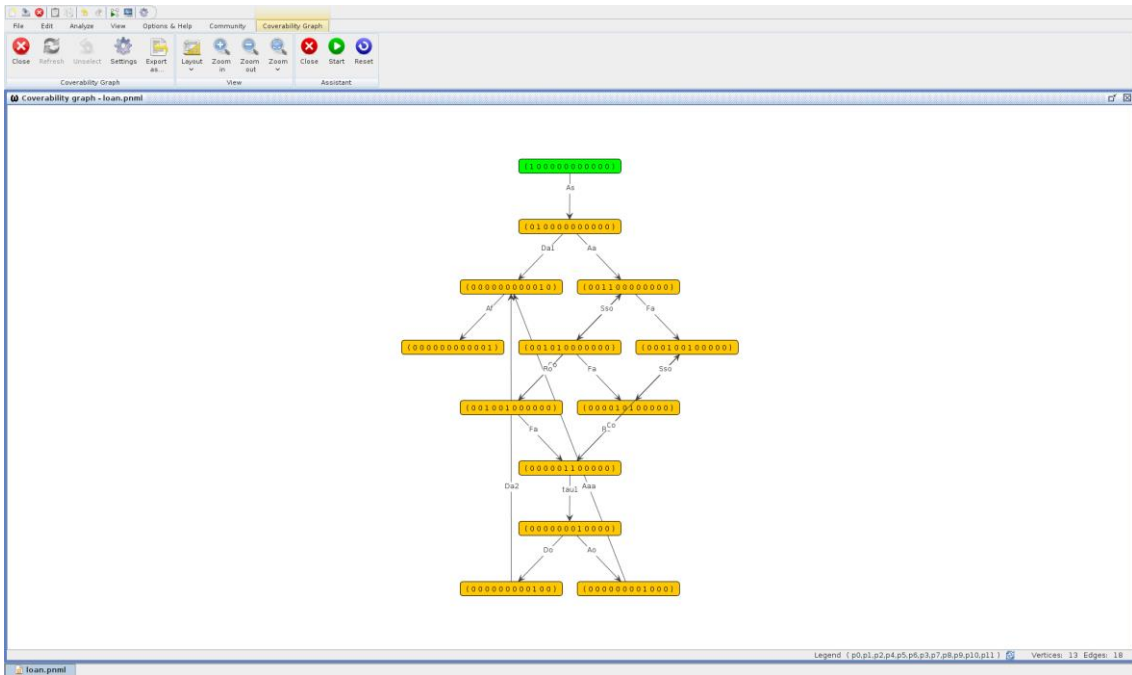
Further Analysis in WoPeD

There exist more features to explore in the WoPeD platform, including "Capacity planning", "Quantitative Simulation" and different types of metrics. Recently the ability to generate a Petri net from a textual description and back is also included (current version 3.7.0). We strongly reccommend to explore this tool so that the Petri net modelling and analysis can be done easily!