A Tool for Assisted Business Process Redesign

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Abstract
This document describes how the assisted business process redesign (ABPR) tool can be used to find redesign options as improvements in a process. For this purpose, this document explains how the tool can be used, how an existing process model can be loaded, how improvement options can be selected and used and how they can be evaluated by means of simulation.

1. Getting started with the tool

This section describes how the ABPR tool is set up for testing. The tool is modeler application for assisted business process redesign of BPMN process diagrams that has been designed, developed and evaluated in Fehrer et al. [1].

1.1. Setup and installation

Depending on your Windows plattform (32 bit vs. 64 bit), either download camunda-modeler-5.0.0-abpr-win-x64.zip or camunda-modeler-5.0.0-abpr-win-ia32.zip from https://github.com/dtdi/assisted-bpr-modeler/releases/latest and extract the .zip file. In the extracted folder, you will find the `Camunda Modeler.exe` file that you can execute. Since the ABPR tool is an extension of the Camunda Modeler[1], you can use the tool also to edit .bpmn, .dmn or .form files (see Figure 1). The file extension for working with ABPR process diagrams is .simubpmn, for simulatable BPMN (simuBPMN).

1.2. Import and file conversion

The file extension for working with ABPR process diagrams is .simubpmn. A regular .bpmn file can by opened with the ABPR tool, after changing the file extension to .simubpmn. When importing a process diagram, that has never been opened with the ABPR tool, the tool will

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[1]https://github.com/camunda/camunda-modeler

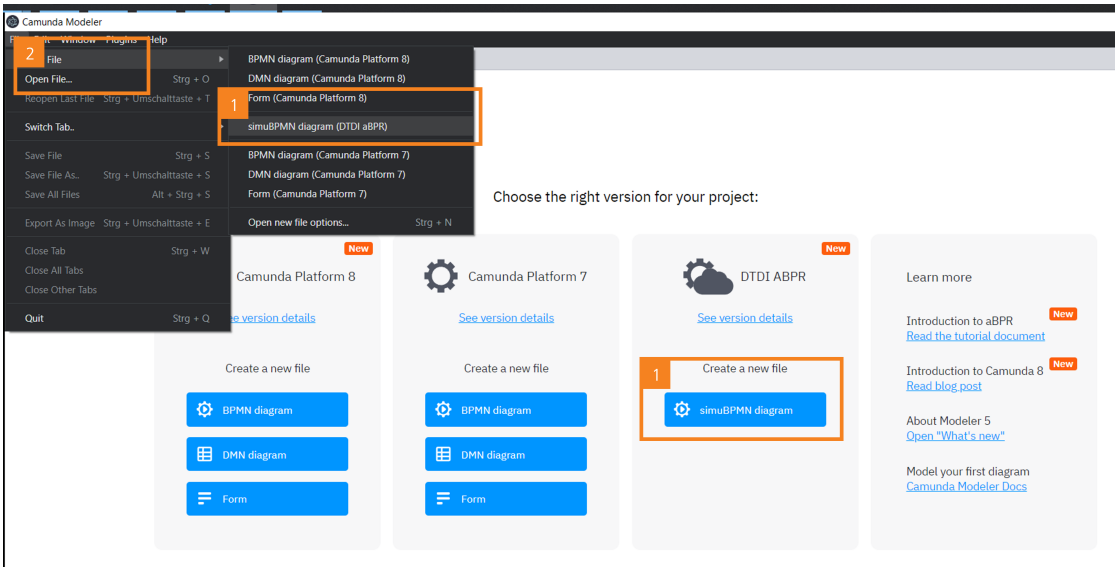

Figure 1: Create an empty file (1) or open an existing .simubpmn file (2)

automatically add default simulation configuration for an easy start. The default values for the simulation can be found in Section 1.2.

Element	**Property**	**Value**
Simulation Configuration	Random Seed	random integer
	Start Date Time	start of the current week
	End Date Time	-
Simulation Definition	Timezone Offset	+01:00
	Resource Assignment Order	simulationTime
Timetables	DEFAULT	Mon-Fri (09:00-17:00)
Resources	Id	defaultResource
	Quantity	1
	Cost	20
	Timetable	DEFAULT
Event Arrival Rate	Time Unit	Minutes
	Distribution	normal (20, 5)
Task	Duration	normal (20, 5)
	Setup Duration	-
	Resources	-

Table 1
Default simulation configuration for process models imported from business process modeling notation (BPMN) diagrams.

1.3. Diagram modeling

The set of shapes available in the process modeler is restricted to a set of shapes that the tool can process and simulate. These include `activites/tasks`, `collaboration` diagrams with one `pool` but multiple `lanes`, `gateways` (parallel & exclusive), and `events` (start, end, intermediate, boundary). The shapes can be added to the diagram by dragging them from the left-sided palette menu or from the left palette menu, or by appending shapes to another shape by using the context pad.

The properties panel on the right side as well as the overflow menus on each of the elements (indicated by the pen symbol) can be used to model further properties. The properties model is updated any time a new shape is selected.

Overall properties (simulation configuration, resources, and timetables) can be edited within the properties panel by selecting the outermost shape (collaboration diagram or process).

The properties panel and the redesign panel (see Section 1.6) can be collapsed and resized using drag handlers that appear when hovering over the outer edges of the corresponding panel. The blue hover line relates to the properties panel whereas the green hover line relates to the redesign panel, as can be seen in Figure 2.

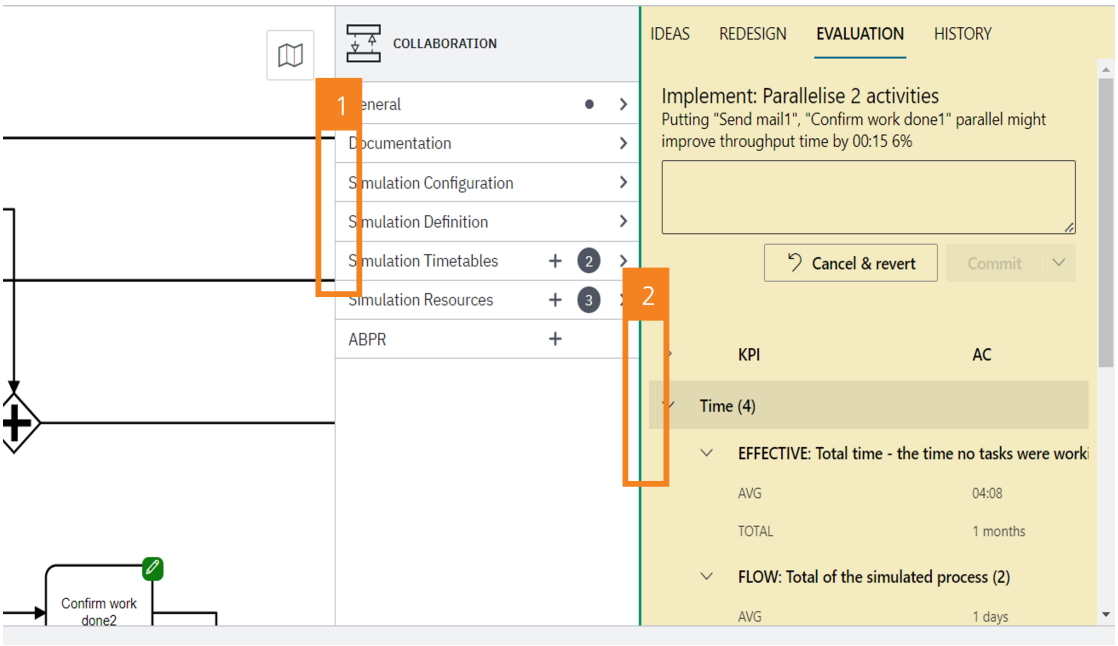

Figure 2: Both panels, (1) the properties panel, and the (2)redesign panel can be controlled via a drag handler.

1.4. Linting and model validation

simuBPMN files must be valid before being executed by the simulation engine. You will not be able to run a simulation, until there are no errors shown in the linting tab. By opening the

linting tab on the bottom left ("Errors"), all modeling problems are listed. Clicking any entry will select the causing shape in the diagram and the properties panel.

1.5. Simulating process models

simuBPMN diagrams are simulated with the *Scylla* package [2] that is embedded in the tool. Since *Scylla* relies on Java, make sure to add the folder to your Java executable to your PATH variable (Executing `java -version` in your command prompt demonstrates a functioning Java installation, see Figure 3).

When executing simulation experiments, Scylla generate temporary files. These files are stored in sub-directory `sim/` at your diagram's storage location. When creating a new diagram and performing a simulation without storing the file first, the `sim/` folder is created your TEMP directory. For the purpose of demonstration, a timeout of 20 seconds was coded into the simulator. All ongoing simulation experiments are aborted, when the user manually triggers a new simulation.

The simulation results become visible in the tab EVALUATION in the redesign panel. When comparing two process models, the measures will be visualized side-by-side, also indicating relative and absolute deviations.

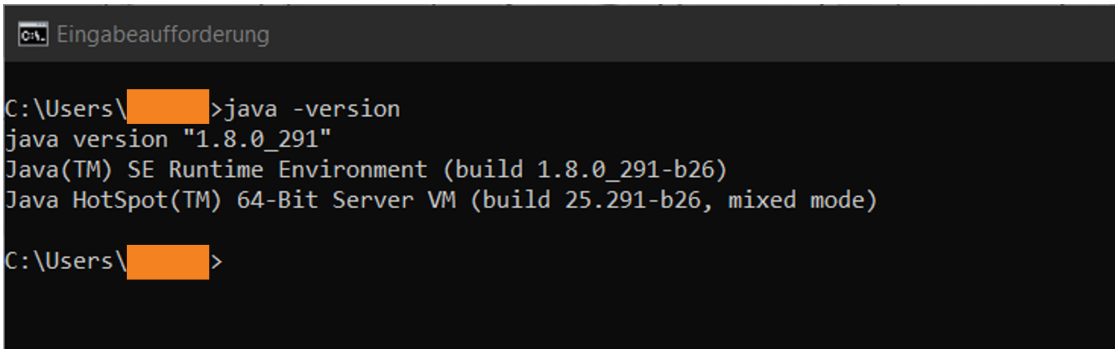

Figure 3: A check to make sure Java is installed and accessible in your command prompt.

1.6. Working with recommendations

After selecting a redesign objective in the redesign panel's IDEA tab, a list of recommendations is generated. Note, that the list of recommendations continues to grow after initially selecting a performance objective, since some recommendation providers execute simulation experiments in the background to assess the estimated value of the recommendation.

Scrolling

2. The example process

For a demonstration, we redesign an artificial service request process [3] that has been designed within the prototype from scratch. The process diagram can be found as

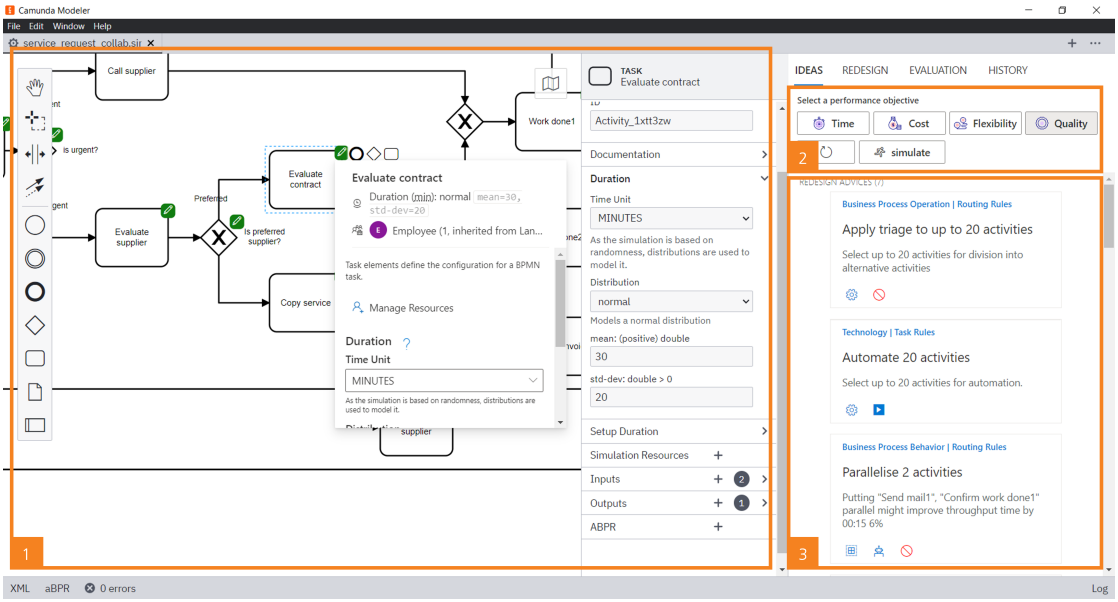

Figure 4: Software prototype - general overview with graphical user interface (GUI) elements (1) diagram editor, (2) performance objective selection, and (3) list of recommendations.

`service_requests.simubpmn` in the tool folder. Figure 5 shows the process model, and Table 2 details simulation and data dependency properties.

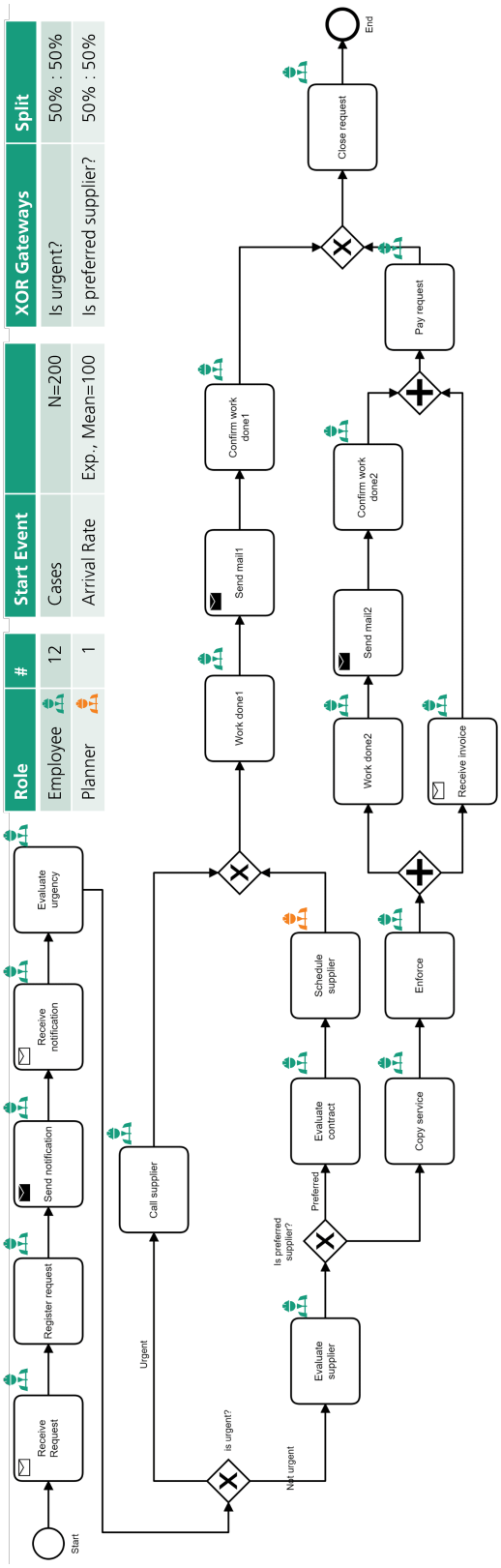

Figure 5: Service request process model.

Table 2
Simulation configuration for the service request process model.

Activity	Processing time (in minutes)			Resource	In	Out
	Distribution	Mean	Variance			
Receive request	Normal	10	1	Employee		request, custinfo
Register request	Normal	10	1	Employee	request, custinfo	custfile, notif
Send notification	Normal	5	0.5	Employee	custinfo, notif	overview
Receive notification	Normal	5	0.5	Employee	custinfo, overview	approv
Evaluate urgency	Uniform[20;60]	40	133.33	Employee	notif, approv	urgent, slist
Call supplier	Normal	10	5	Employee	approv, urgent, slist	ext
Evaluate supplier	Uniform[20;60]	40	133.33	Employee	approv, slist	pref
Copy service	Normal	5	1	Employee	approv, urgent	job, porder
Evaluate contract	Normal	30	20	Employee	approv, pref	contract
Enforce	Normal	30	50	Employee	approv, job, porder	worder, invoice
Schedule supplier	Normal	30	20	Planner	approv, pref	order, sched
Work done2	Normal	40	60	Employee	job, worder	rep2
Receive invoice	Normal	50	50	Employee	invoice	payreq
Send mail2	Uniform[40;80]	60	133.33		approv, custfile, rep2	mail2
Work done1	Normal	20	20	Employee	approv	rep1
Confirm work done2	Normal	30	1	Employee	job, approv	conf2
Send mail1	Uniform[40;80]	60	133.33		rep1	mail1
Pay request	Normal	20	20	Employee	con2, payreq	receipt
Confirm work done1	Normal	50	1	Employee	approv	conf1
Close request	Normal	10	1	Employee	custfile, approv	history

3. Using the tool

We seek to improve the overall throughput time. Upon starting the application, time is already selected as the performance objective (see box 2 in Figure 4). Automatically, a simulation experiment for the base scenario is executed and recommendations are generated. The user can click on the tab EVALUATION to examine the simulation results. As some recommendations build on simulation experiments themselves, the list of recommendations in the tab IDEAS is progressively enlarged within a few seconds. As we seek to improve on the time dimension, the top recommendations of type AL4 suggest parallelizing two activities. A click on the "find in model" button (the dashed grid) on the recommendation card reveals the two activities "Send mail1" and "Confirm work done1". The simulation suggests that parallelizing these two activities will decrease throughput time by 6 %. Since the process model incorporates data dependencies and no dependencies are modeled between these two activities, we can apply this redesign. Automatically, the process model is remodeled, and the tab is activated where all model changes are listed.

A click on COMMIT will reveal the EVALUATION tab. Analyzing the results and considering the domain knowledge, we can conclude that the redesign is a valid way to improve the process. Therefore, we finalize the redesign and enter a commit message into the corresponding field, to describe our change. After completion, we end up in the IDEAS tab, where again, recommendations are generated under consideration of the changed process model.

Another recommendation suggests identifying activities where the triage pattern may be applied. We seek to apply the triage pattern in a way that automates cases that match certain conditions. That is, a human specialist may focus only on complicated cases. A click on the recommendation card reveals a wizard, that lists all activities. We select the "register request" activity as a candidate for the triage pattern. A text box is revealed, that captures the split criteria for the cases. The IDEAS tab now presents a specific recommendation that suggests applying the triage pattern to the previously selected activity. Selecting the recommendation "Apply triage to register request" therefore reveals wizard that supports remodeling the process. From own judgment, we expect 80 % of the cases to be submitted in a form that can be handled via automation in a short duration and reduced cost. The remaining 20 % remain with the standard resource and duration configuration. Closing the wizard reveals the re-modeled process and a click on COMMIT executes the simulation experiment. The simulation reveals, that, as expected, the throughput time decreases. At the same time, the cost will be reduced, as certain cases are handled by an automation resource. The redesign can be considered useful and confirmed with a click on FINALIZE. Finally, the redesigned process model can be exported as a .simubpmn file for later use.

4. Send debug & usage information

Optionally, and completely voluntarily, you can provide usage information and error information while using the tool. Under Help > Privacy Preferences feel free to check "Enable Error Reports" and "Enable Usage Statistics". With any of these options, none of your personal information or stored data will be submitted.

References

[1] T. Fehrer, D. A. Fischer, S. J. Leemans, M. Röglinger, M. T. Wynn, An assisted approach to business process redesign 156 (2022) 113749. doi:10.1016/j.dss.2022.113749.

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