RuM Tutorial

ICPM 2020 Tool-Demonstration

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Introduction

This tutorial gives a short overview of RuM, a desktop application for rule mining. The tutorial follows the same main steps as shown here.

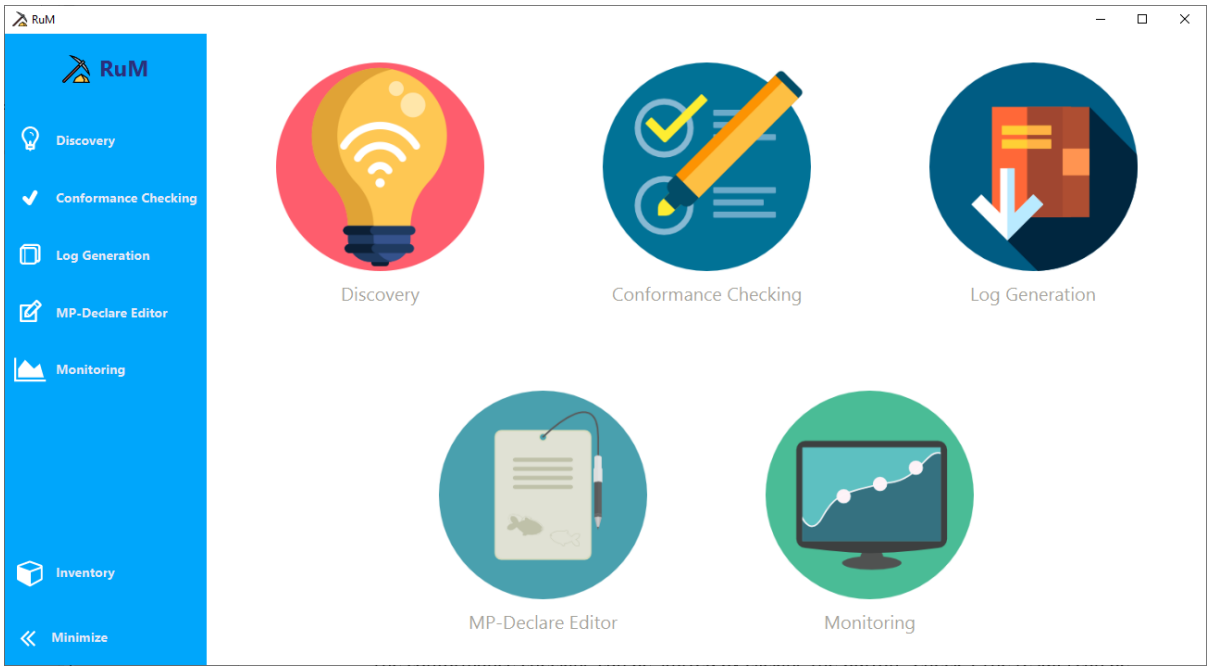
RuM is publicly available trough the web-page https://rulemining.org/ and requires Java 11 JDK to be installed. RuM is currently packaged as a single runnable jar file and does not require to be installed on the system.

The event log used in this tutorial can be found here.

Home Screen

After starting RuM, you see a home screen that provides access to all of the main sections of RuM, which are Discovery, Conformance Checking, Log Generation, MP-Declare Editor, and Monitoring. These sections can also be accessed via the navigation menu on the left. Additionally, the navigation menu provides access to the full inventory window and allows to open the home screen by clicking on RuM title. The navigation menu can also be minimized so that it takes up less space.

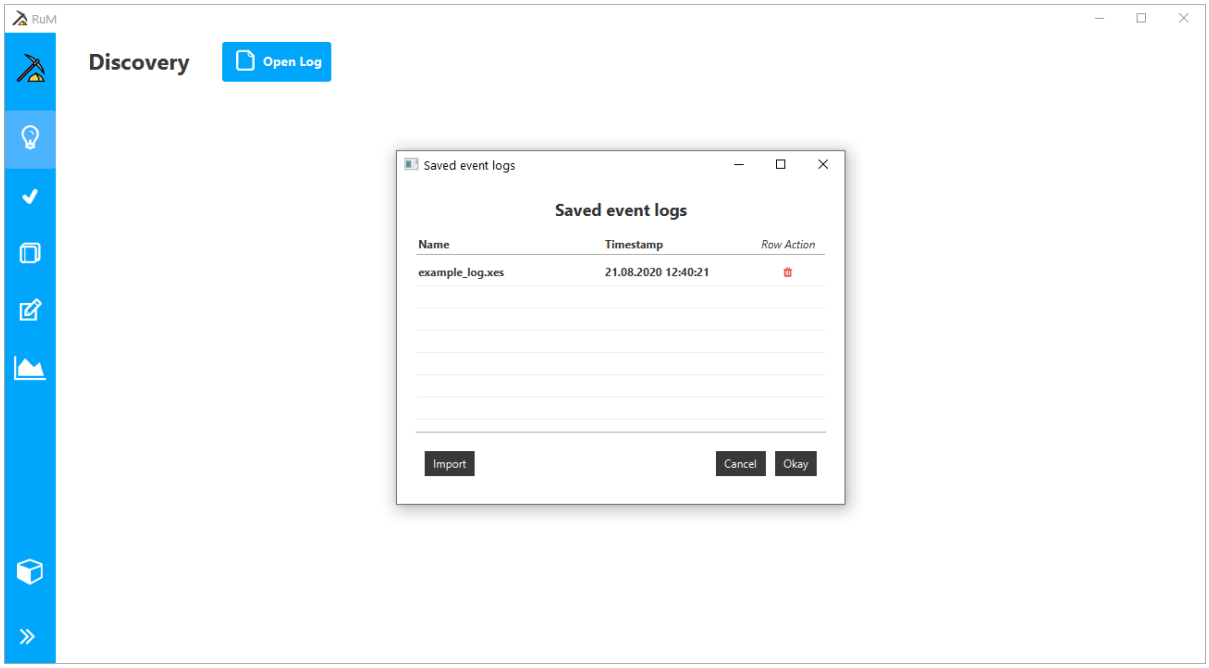
This tutorial covers all of the main sections of RuM starting with Discovery.



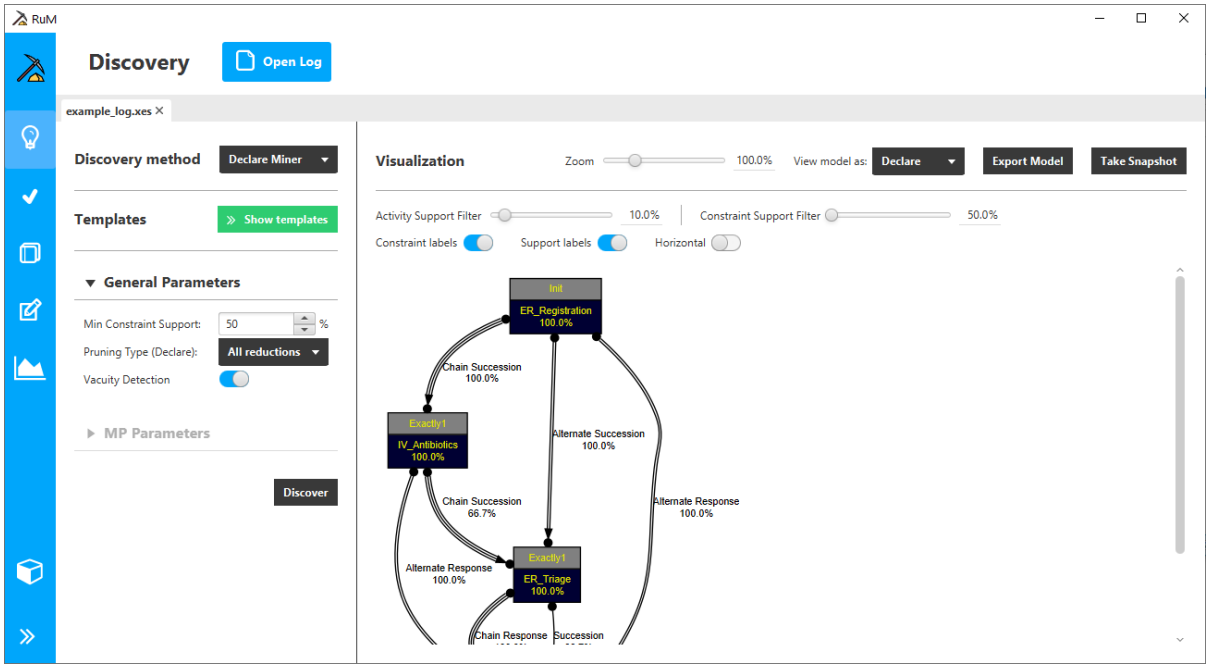
Process discovery

The Discovery section can be opened by clicking on the discovery button on the home screen or by using the navigation menu on the left.

In the discovery section we need to open an event log by clicking on the button "*Open Log*". This opens an inventory window which displays all of the event logs we have used thus far. An event log can be loaded from the file system using the button "*Import*" and then selecting the event log file. This adds the file to the inventory after which it can be opened by either double-clicking the row or by selecting the row and clicking "*Okay*".



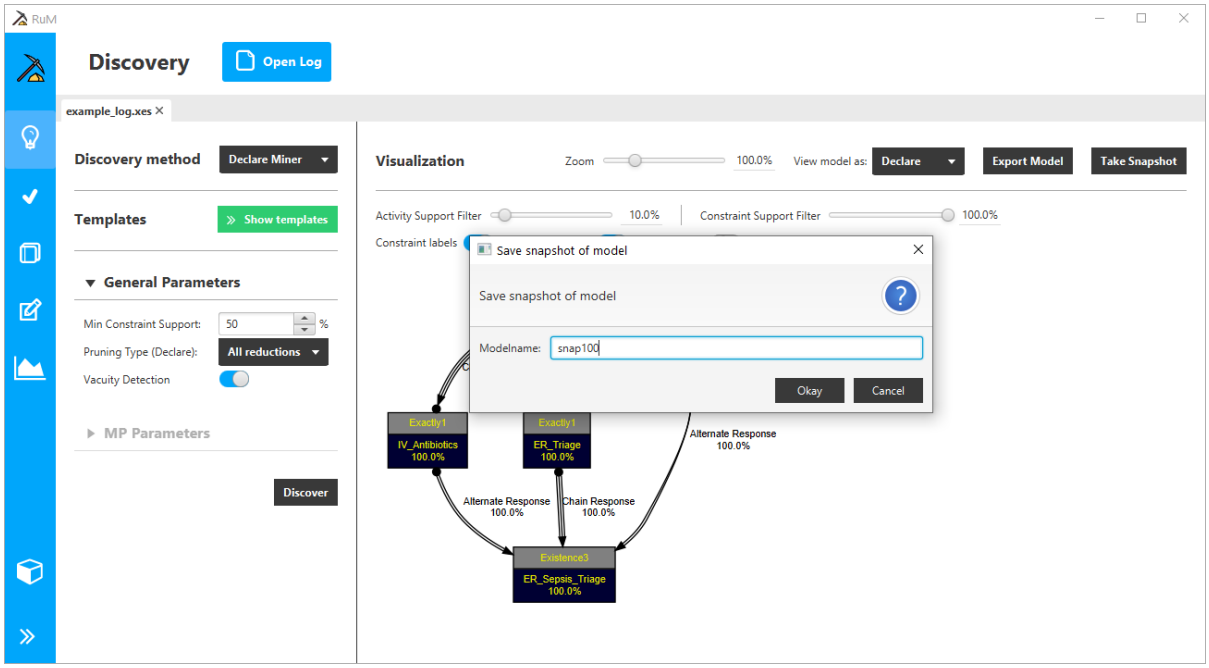
After opening an event log a process model will be automatically discovered using the default parameters. The parameters are shown in the left column and the resulting model is shown on the right. If the parameters in the left column are changed then the model must be rediscovered in order for the changes to take effect. In this case we will set "*Min Constraint Support*" to 50% and click "*Discover*" to rediscover the model.



It is possible to take snapshots of models (and also event logs) that can be easily used in other sections of the application. A snapshot is basically a temporary image of a file that can be used in RuM as if it is an actual file imported from the filesystem. To illustrate this, we will take two snapshots of the discovered model.

First, we click on the button "*Take Snapshot*", name the snapshot as "*snap50*" and then click "*Okay*". This adds a snapshot of the model we just discovered into the inventory. Next, we will use the

"*Constraint Support Filter*" to filter out all of the constraints that have less than 100% support *(changing the filters does not require rediscovering the model)*, click on the button "*Take Snapshot*", name the snapshot as "*snap100*" and then click "*Okay*".

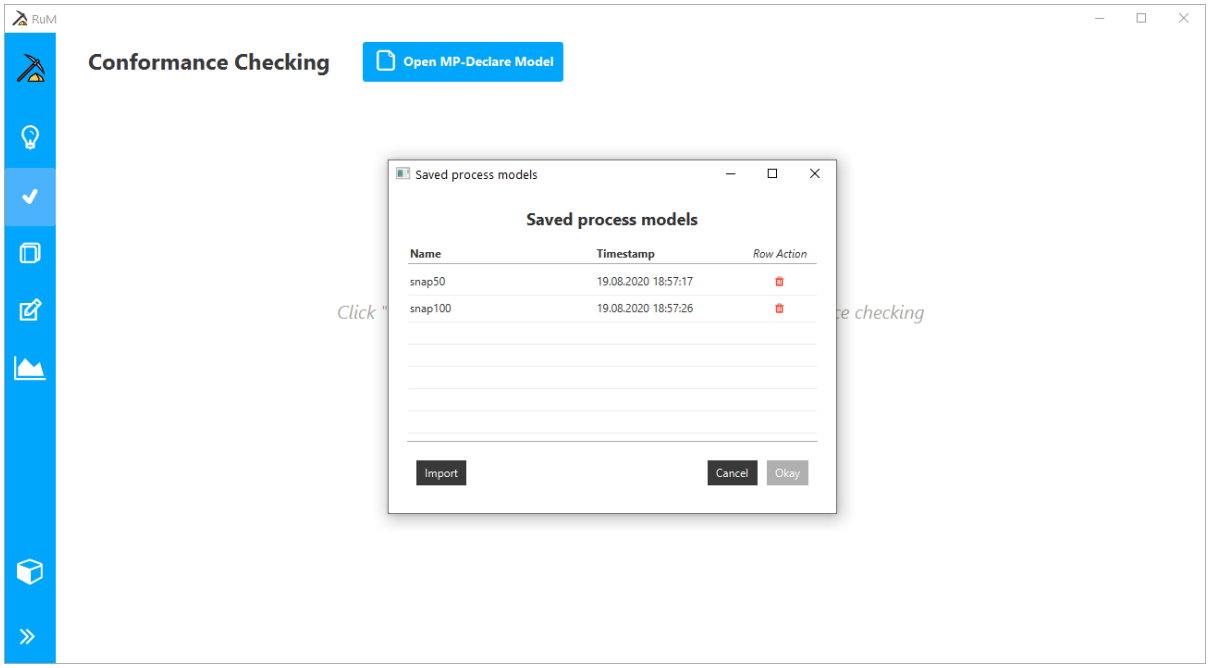


Now we have two independent versions of the same model in the inventory as snapshots. Next, we will use both of these snapshots for conformance checking.

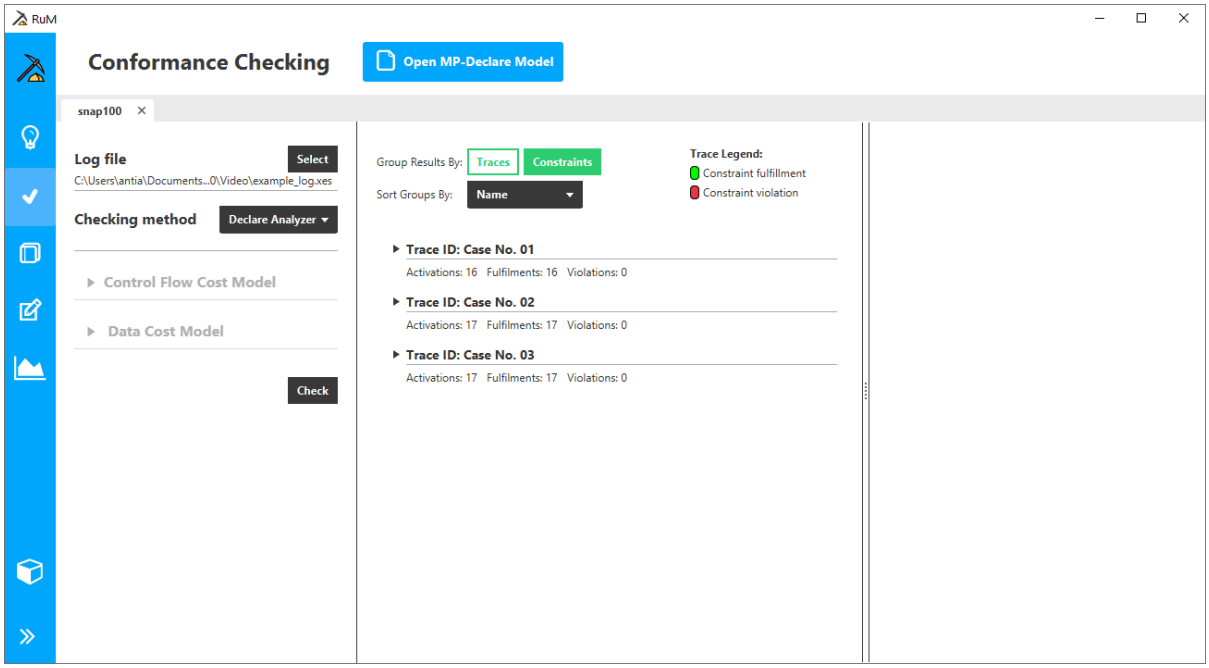
Conformance Checking

The Conformance Checking section can be opened by using the navigation menu on the left. If the menu is minimized, then the icons can still be used for navigation.

In the conformance checking section we need to open a model by clicking on the button "*Open MP-Declare Model*". Opening the model is similar to opening an event log. However, here we can notice that both of the snapshots we took previously are already present in the inventory.

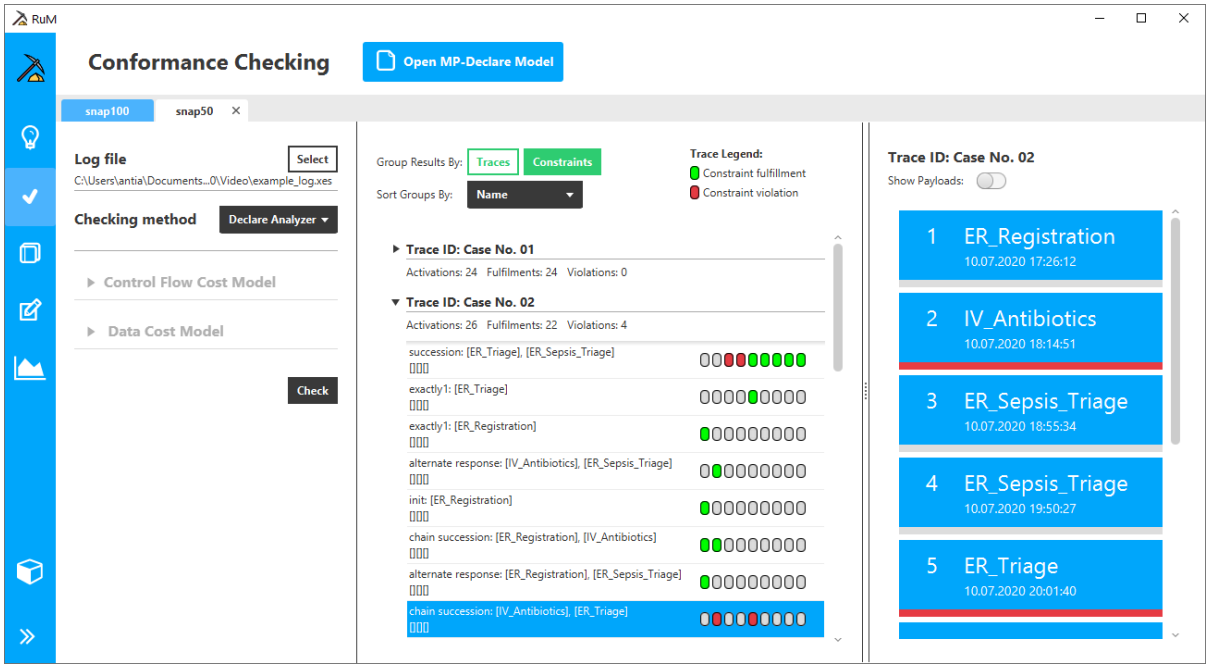


We will first open the snapshot "*sup100*" by either double-clicking the row or by selecting the row and clicking "*Okay*". Next, we will open the same event log that we used in the discovery section by clicking "*Select*" in the parameters column (parameter "*Log file*"). This opens an inventory window where we can select the previously used event log without importing it again. Finally, the conformance checking can be started by clicking "*Check*".



The results are displayed in two columns. The first column shows an overview of the results grouped by either traces or by constraints. The groups can be expanded to see detailed results about the group. If the results are grouped by trace, then the details of a group will show how the corresponding trace is affected by each constraint in the model. If the results are grouped by constraint, then the details of a group will show how this specific constraint affects each trace in the event log. It is also possible to see the entire trace on the left by clicking on a details row.

In this case we can see that there are no constraint violations. This is expected since all of the constraints in this snapshot had 100% support. However, when we run the same check using the snapshot "*sup50*" *(using the same steps as before)* then we would expect to see some violations.



After running the check using the "*sup50*" snapshot we can see that there are two constraints in this snapshot that cause violations in the second trace of the event log.

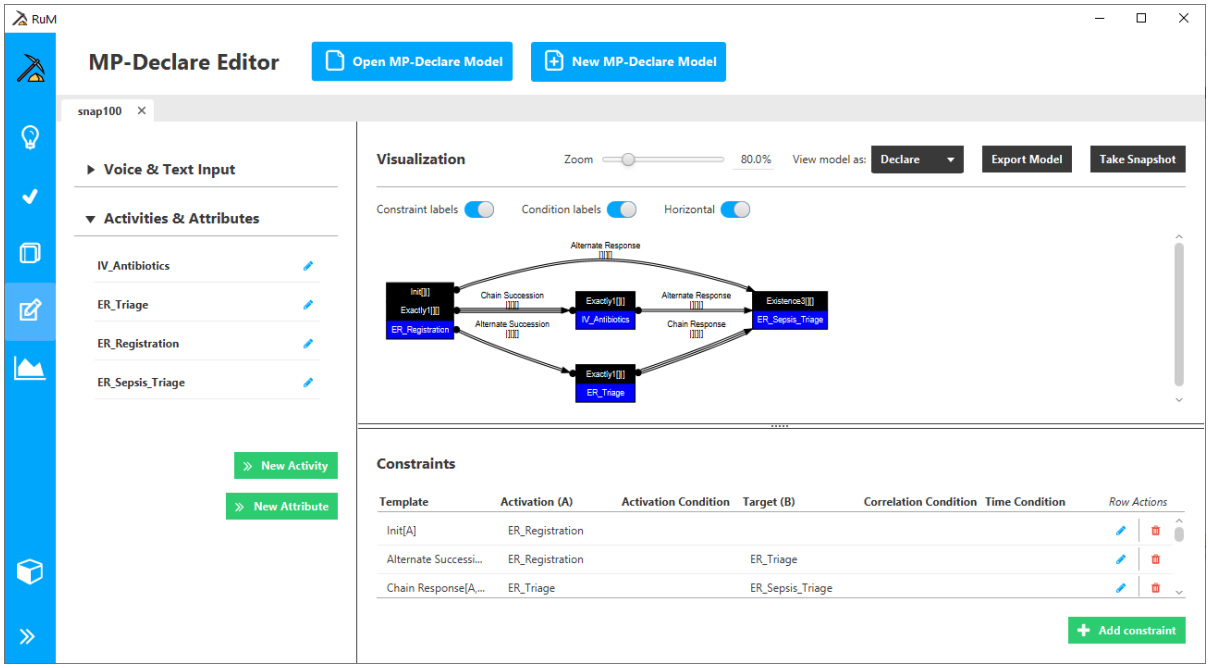
We can also notice that there are now two tabs in the conformance checking section. The first one contains the results for "*sup100*" snapshot and the second one contains the results for "*sup50*" snapshot. These tabs can be used independently from each other and it is possible to navigate between both freely.

Next, we will use the "*sup100*" snapshot to introduce the MP-Declare Editor.

MP-Declare Editor

The MP-Declare Editor can be opened by using the navigation menu on the left. If the menu is minimized, then the icons can still be used for navigation.

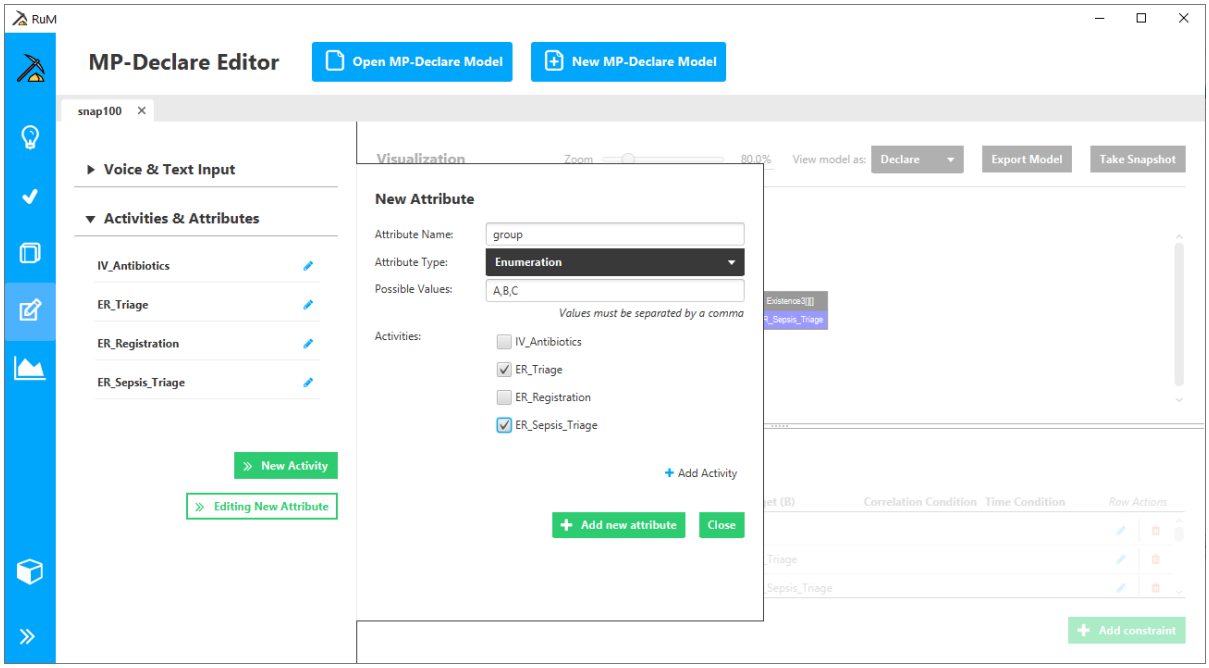
In the MP-Declare Editor we can either open an existing model by clicking on the button "*Open MP-Declare Model*" or we can create an entirely new model by clicking on the button "*New MP-Declare Model*". In this case we will open the "*sup100*" snapshot.



The MP-Declare Editor is divided into three areas. The column on the left allows to add and edit both activities and attributes in the model. The top right area shows a visual representation of the model which is updated on the fly as the model is being edited. The bottom right area allows to add and edit the constraints in the model. Note that the visualisation on the above figure is slightly changed compared to the default. The zoom level is set to 80% and a horizontal layout is used.

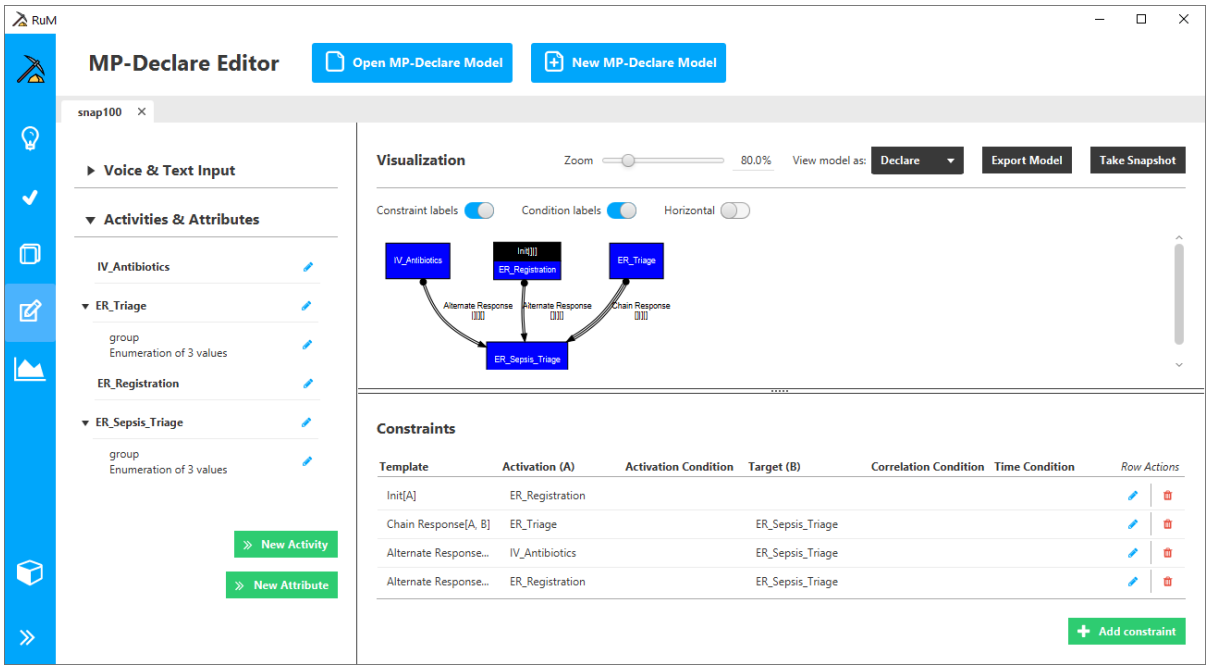
We will add a new attribute to the model, remove some constraints from the model and add an activation condition to one of the constraints.

A new attribute can be added by clicking on the button "*New Attribute*". This opens a slide-in panel that allows to enter the details of the attribute. We will name the attribute "*group*", select the type "*Enumeration*", and enter possible values "*A,B,C*". We will also select the activities "*ER_Triage*" and "*ER_Sepsis_Triage*".

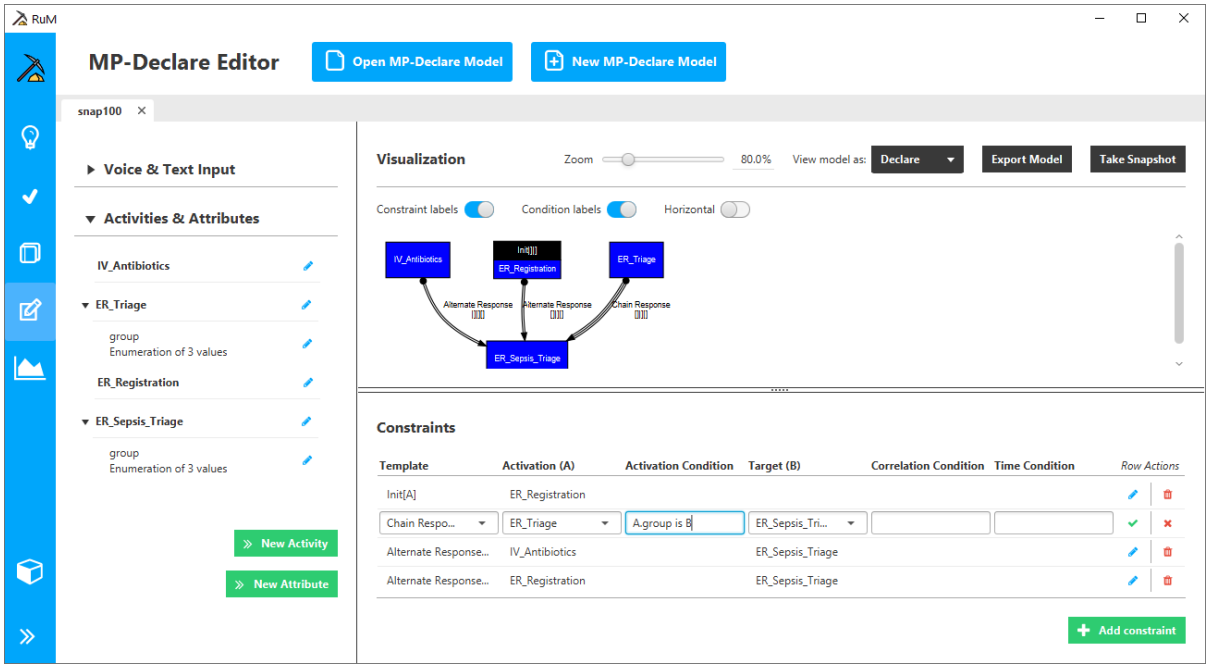


To finish adding the attribute we click on "*Add new attribute*" and then "*Close*".

We will remove all constraints except the ones where template is either "*Init*", "*Chain Response*" or "*Alternate Response*". This can be done in the constraints table by clicking on the trashcan icon at the end of the row that we wish to remove.



We will add an activation condition "*A.group is B*" to the constraint "*Chain Response [ER_Triage, ER_Sepsis_Triage]*". To add an activation condition to a constraint we need to start editing the row either by double-clicking on the row of by clicking the pencil icon at the end of the row. This changes the row to an editing state and allows us to make changes to the row.



We will save the row by clicking on the checkmark icon at the end of the row. And finally, we will take a snapshot of the modifications by clicking on "*Take Snapshot*", naming the snapshot "*supp100_modified*" and clicking "*Okay*".

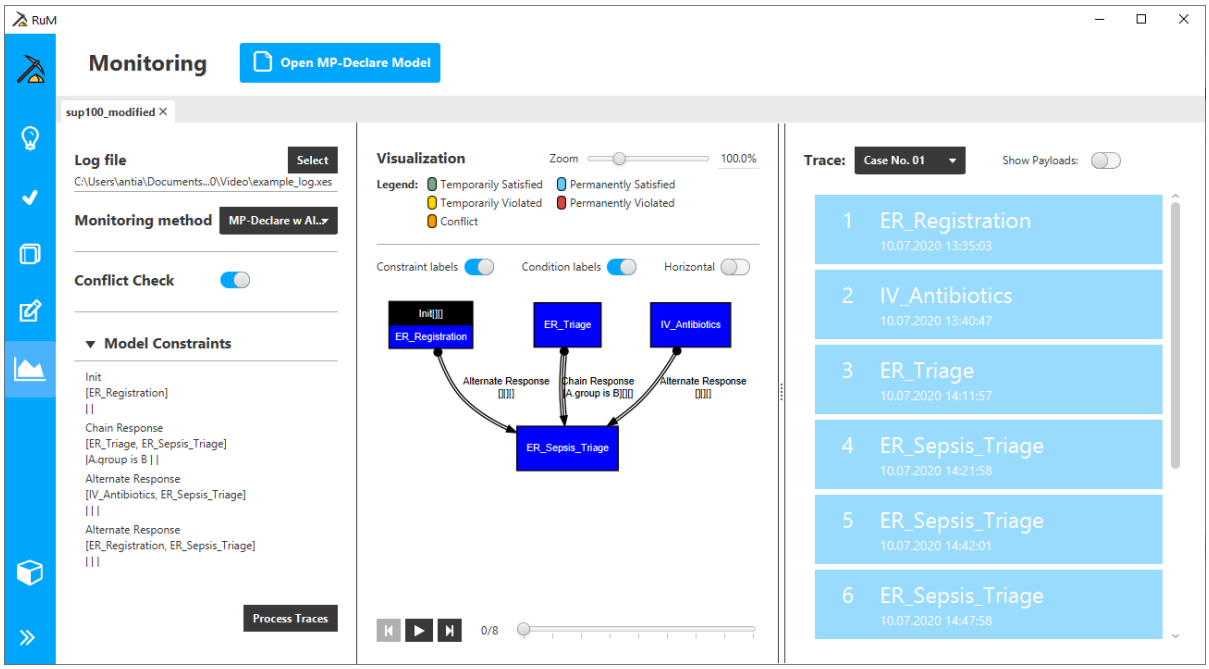
Next, we will use the "*sup100_modified*" snapshot to introduce the monitoring section.

Process Monitoring

The monitoring section can be opened by using the navigation menu on the left. If the menu is minimized, then the icons can still be used for navigation.

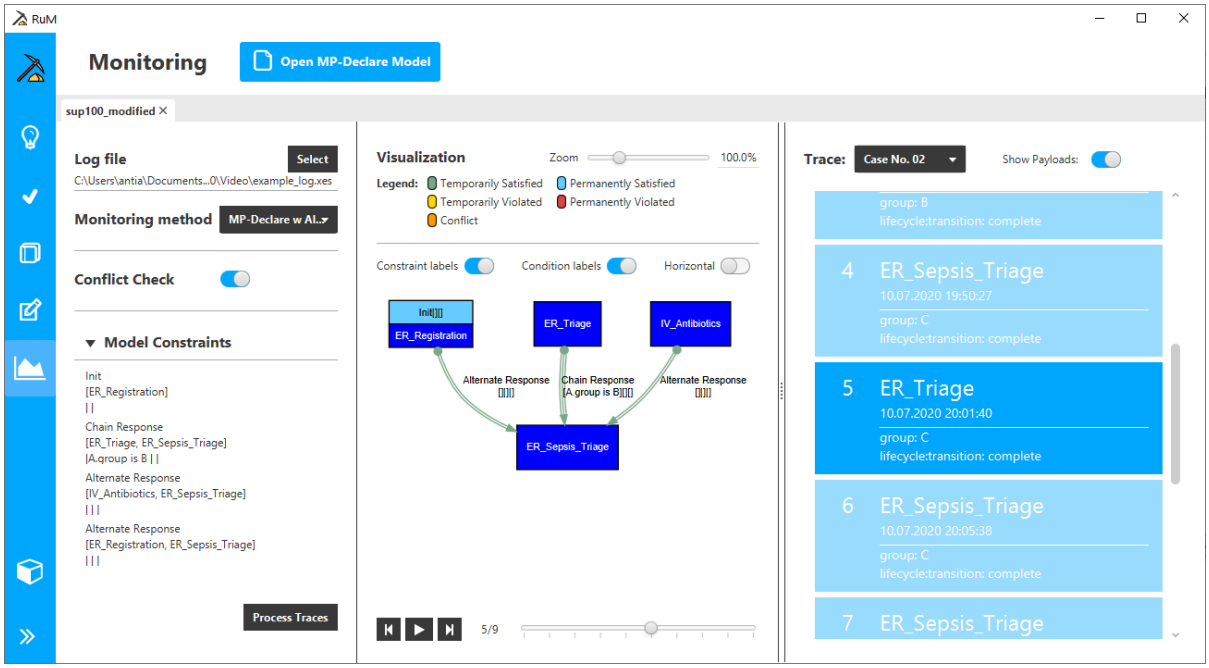
In the monitoring section we need to open a model by clicking on the button "*Open MP-Declare Model*". In this case we will open the "*sup100_modified*" snapshot. For monitoring we also need to open an event log by clicking "*Select*" in the parameter's column (parameter "*Log file*"). In this case we will use the same event log that we used in discovery and conformance checking sections.

After opening a model and selecting an event log we click on "*Process Traces*". This finds the state of each constraint in the model at every step of the event log.



The results are displayed in two columns. The first column shows the visual representation of the model and allows to both replay the selected trace on the model and to step trough the trace one event at a time. The constraints in the visualisation will be coloured based on the state at the currently selected event. The second column allows to select the trace that is displayed, to jump to a specific event in the trace and to see the payloads (attributes) of the events.

For example, when we select the second trace and click on the "*Show Payloads*" toggle then we can see that the event "*ER_Triage*" in the second trace does not cause a temporary violation of the constraint "*Chain Response [ER_Triage, ER_Sepsis_Triage]*". This is because of the activation condition that we added to the model, more specifically because the value of the attribute "*group*" of the event "*ER_Triage*" is "*C*" while the activation condition requires the value to be "*B*".

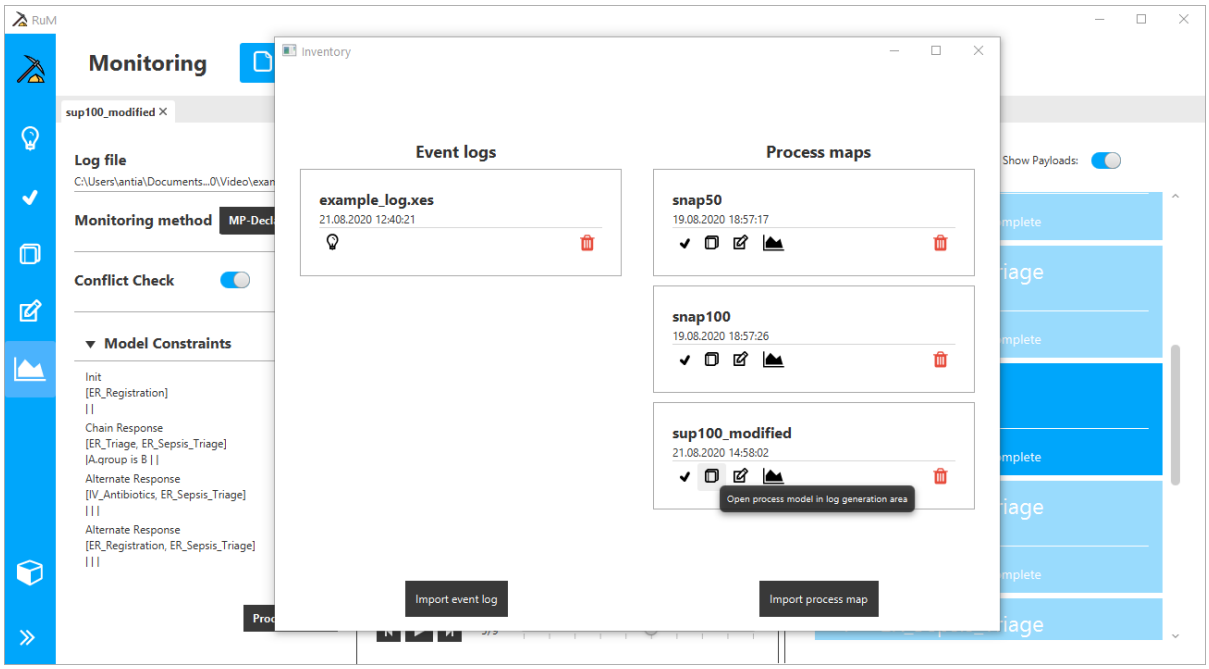


If we wish we could also let the trace play out as an animation by clicking the play button below the visualisation.

Next, we will use the "*sup100_modified*" snapshot to introduce the log generation section and also the full inventory window.

Full Inventory

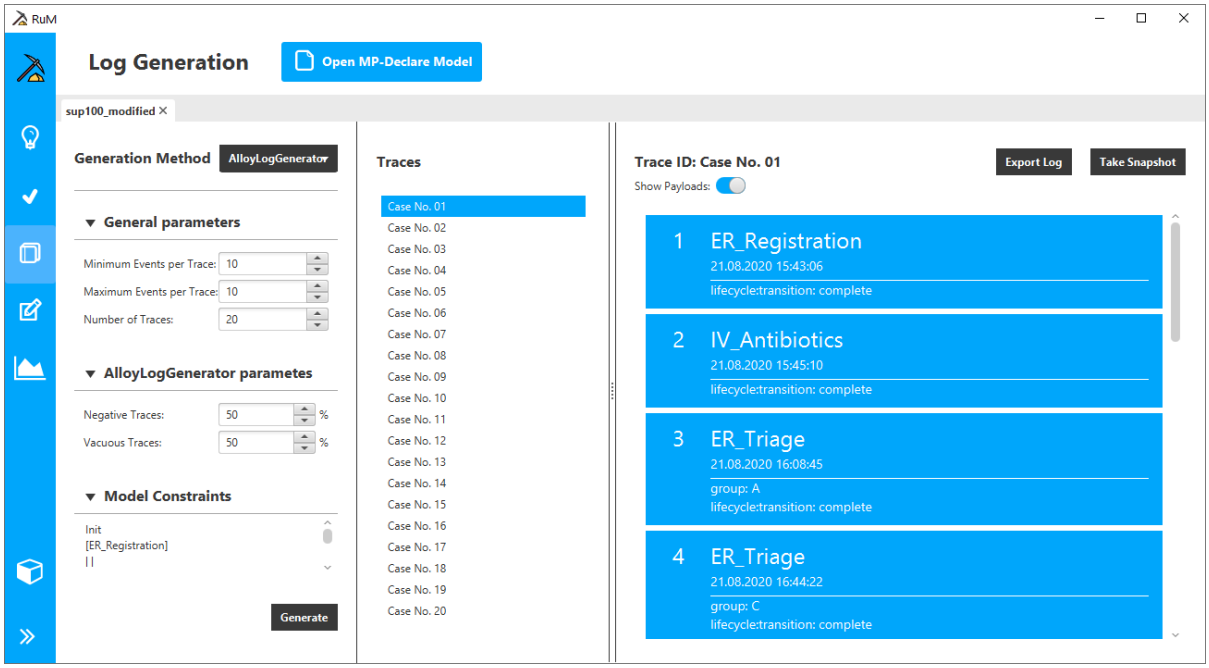
Up until this point in the tutorial we have started using every section by first opening the section and then opening the input file to be used in that section. However, it is also possible to use the full inventory window which can be opened from the navigation menu *(second icon from bottom)*.



This window shows all of the input files we have used thus far *(including the snapshots)*. From here we can click on the log generation icon of "*sup100_modified*" to open it in the log generation section directly.

Log Generation

After opening a model in the log generation section *(either through the inventory or by using the navigation menu and then opening the model snapshot)* we can click on "*Generate*" to generate an artificial event log based on the constraints in the model snapshot.



The generated log will be displayed in two columns. The first column shows the generated trace names and allows to select a trace to display. The second column shows the events in the selected trace. It is also possible to show the generated attributes by using the toggle "*Show Payloads*".

The generated model can be exported to the filesystem by clicking "*Export Log*" and it is also possible to take a snapshot by clicking "*Take Snapshot*".