A. PRACTICAL DEMO INFORMATION

A. Testing the Tool

The reviewers can access both to the on-line and desktop based versions of the tool from https://simqri.cetic.be. Here is a quick summary of the installation procedure:

- for the web-based edition, click on the "Open web-based tool" button. A recent web-browser is recommended.
- for the desktop-based edition, the simplest way is to download a ready to use environment including all the required plug-ins. An update site can also be used from an already installed Eclipse or Obeo Designer.

B. Tool Demo Settings and Related Requirements for the Workshop

The tool demonstration will be run on a laptop connected to the video projection system available in the workshop room. For the web-based version, an Internet connection is required for running it from the above URL. However a local server can be used as backup if no Internet connection is available.

C. Interest for the audience and the presenters

We believe the audience will be interested in

- the query-based approach for efficiently measuring the level of satisfaction of key domain requirements.
- the proposed scenarios either for the contribution to make them easier to implement or their innovative aspect
- having a try at the tool demonstrators, both on-line and desktop
- our comparison and feedback on developing web-based and Eclipse-based user interface for model-based tool

The presenters are interested in

- collecting feedback on their current prototype tools
- possibly identifying new scenarios and further extensions
- make some concrete contacts for application in research and industry use cases

B. MORE DETAILED SCENARIOS

B.1 Supply Chain Risk Management

In this section, we describe in details the process of analysing the first scenario by using the web-based interface.

After modelling a factory, the analyst can then move to the risk identification tab of the interface. The tool includes a wizard helping the user to express risk using our query language as shown in Figure 5. It starts from the main risk categories, then guides the user into specifying how to measure risks at system level and then at component level.

The next tab is devoted to running the simulator on the model together with the queries to collect all required risk information. The simulator can either be run in "one shot mode" (for checking the model behaviour) or "Monte Carlo Mode" (for a full analysis).

Different tools are available for trace analysis. The first tool enables to explore a single trace using a time slider as shown in Figure 6. The granularity of time is arbitrary and selected by the model designer.
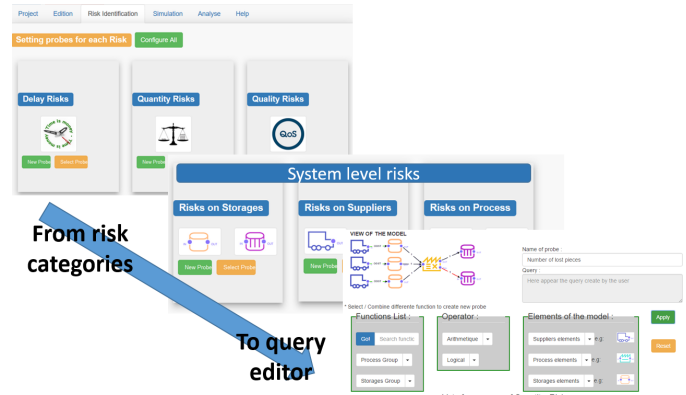

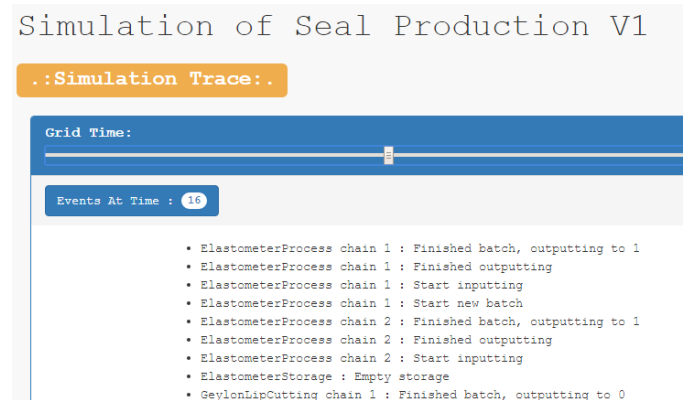
Fig. 5. Encoding a query for a quantity risk

Fig. 6. Trace analysis tool

Focusing on this specific time, it is possible to zoom on any specific element or any query. Figure 7 shows the state of the final storage for $ProducedGoods$ at time 11.

In Monte Carlo mode, the risk analyst can check some key statistical indicators of the model elements and queries, such as minimum, maximum, mean and standard deviation (Figure 8). The full distribution of the simulation data is available to the client for more complex analysis.

Figure 9 shows the risk management dashboard at the top-level for our case study. It displays a pie chart representing the relative importance of the three main risks (quality, quantity and delay) estimated at the system level. The probability distribution of those three risk factors are displayed in the bottom part. A diagram on the left part also displays the evolution over time of specific queries (by default the total risk). Two curves are drawn: one displaying the expected value (mean) of the indicator and the other displaying the Value at Risk (VaR). It is then possible to zoom in specific risk categories and explore how specific processes, storage or suppliers behaves with respect to a specific risk.

Controlling the risks requires tuning the model in order to minimise the estimated costs induced by risks. However, changing a parameter in the model might have multiple and possibly conflicting effects. The tool supports a simple way to change the values of some parameters to find out their optimal
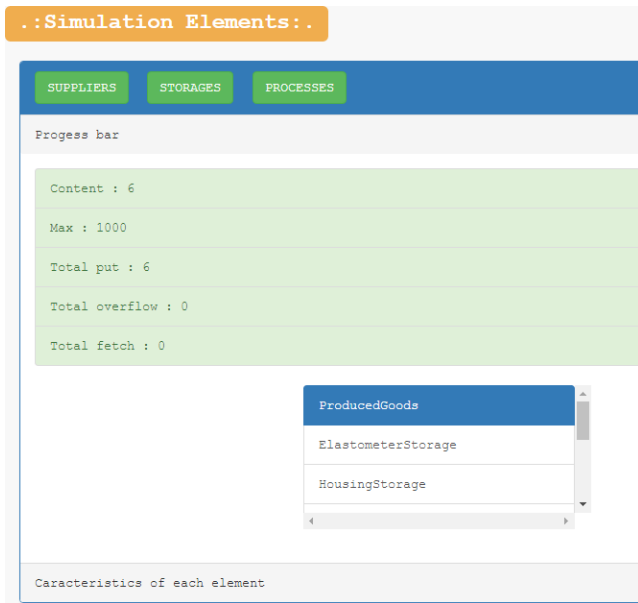
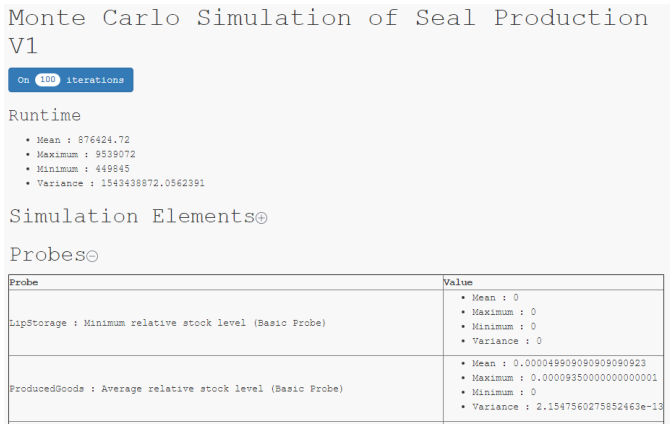Fig. 7. Element detail at a specific time of a trace

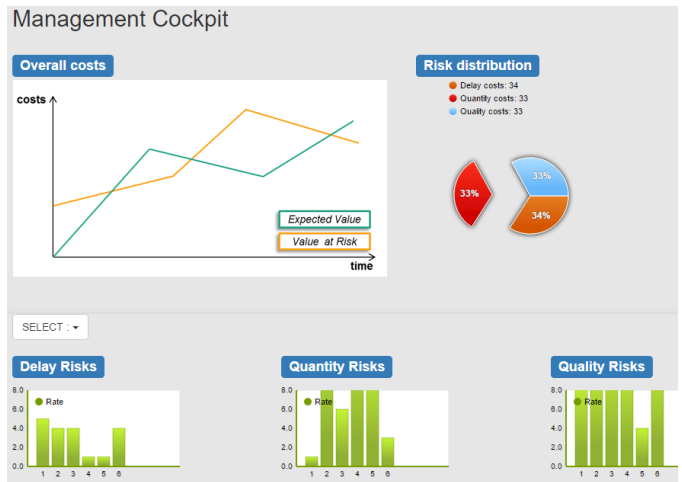Fig. 8. Overview of statistical data on queries and elements

Fig. 9. Top-level dashboard of the risk analysis

simulation takes a few seconds with about 10 percent overhead for the set of about 20 measured probes.
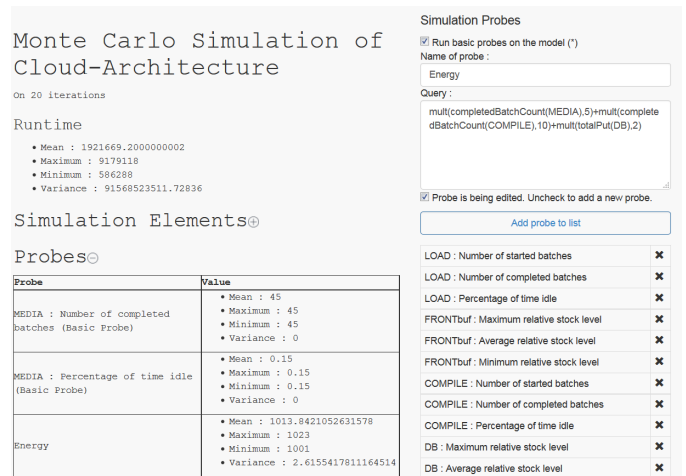

Fig. 10. Monte Carlo simulation run with energy probe

values, given that other parameters remain constants. The risk analyst can then perform a tuning-simulation-analysis process on the model in order to find out the best alternative to control the risk as shown in Table I.

TABLE I
OPTIMISATION OF THE ORDERING THRESHOLD

Ordering Threshold Size	Process Idle Time
0 (wait empty)	70%
10	34%
20	5%
30	0.01%
40	0%

B.2 Green Cloud Design

Based on the model described earlier, Figure 10 shows the simulation results gathered using Monte Carlo with some variability in the delays between incoming requests. The

In this model, it is also possible to simulate and compare different design alternatives, either based on distinct models or using parameters available as variability points. For example, a load balancing component can have some threshold to trigger new client or to perform request aggregation. Table II shows the impact of a buffer size to optimize energy. Its optimal value is about 30 requests.

TABLE II
BUFFER SIZE ANALYSIS TO MINIMIZE ENERGY CONSUMPTION

Buffer size	CPU Load	Network Traffic	Energy Cost
0	30%	1000	67
10	64%	100	19
20	95%	50	11.6
30	99%	33	11.1
40	100%	25	11