A Dashboard for System Trustworthiness: usability evaluation and improvements

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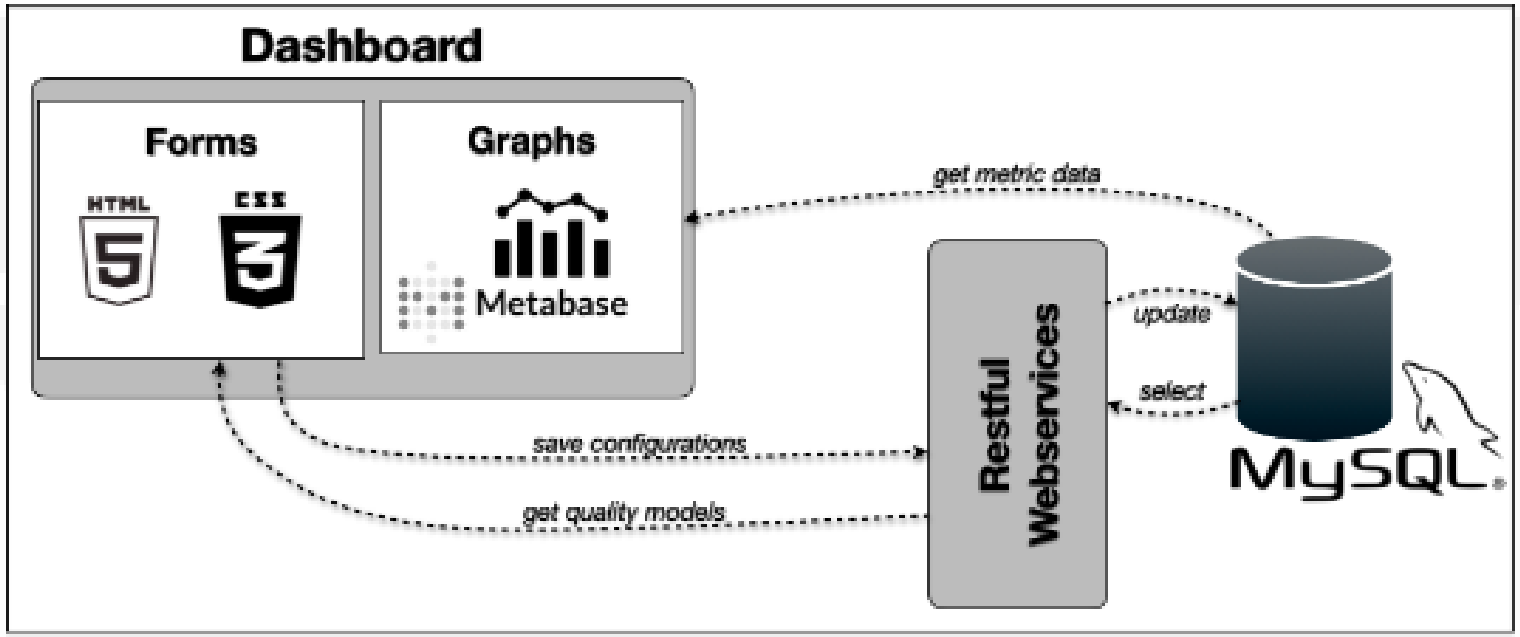
Motivation

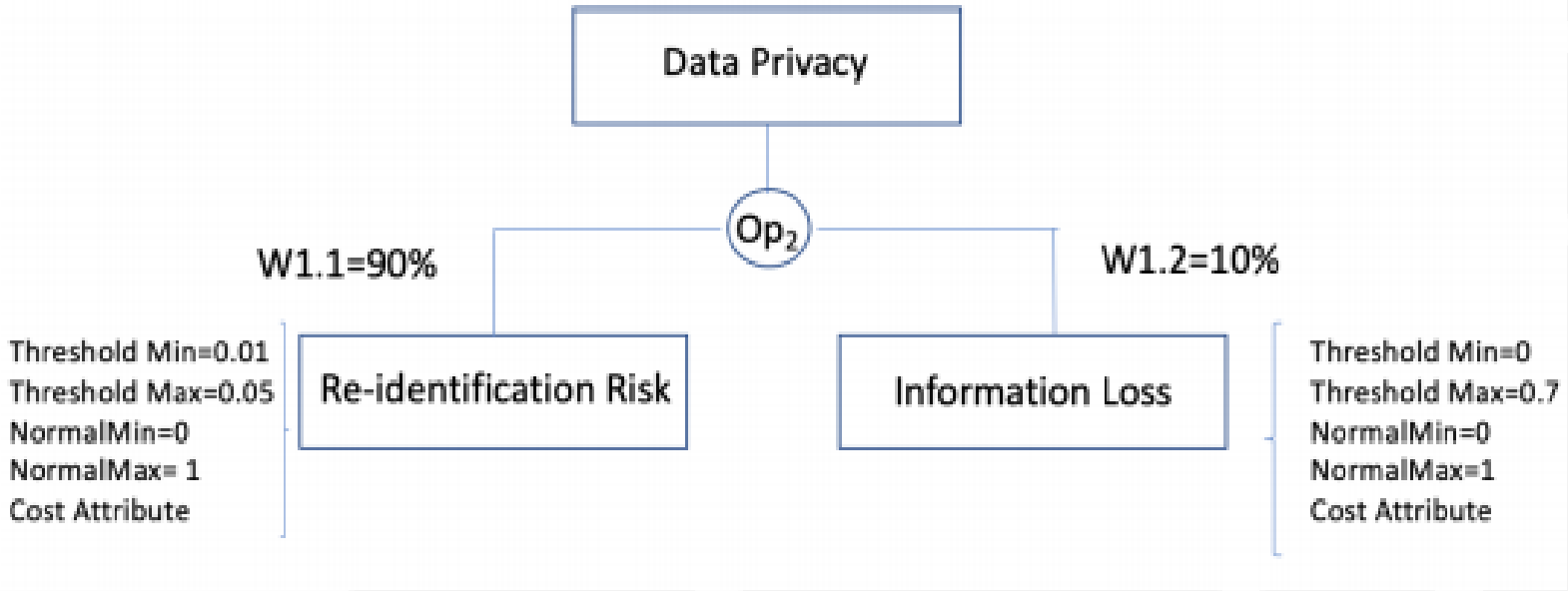
- **Dashboard** is a tool used for information management and business intelligence. Data dashboards organize, store, and display important information from multiple data sources into one easy-to-access place.



Importance of Dashboards

- Large volumes of information are generated by several devices connected to the internet.
- Companies and even governmental organizations are interested in holding these data.
- Data mining has received a lot of attention.
- As the dashboard is a data visualization tool, it must provide easy use and understanding of information semantics.

Quality Models



- This dashboard was developed to show information provided by a specific solution. The dashboard is based on Quality models.
- Data privacy is one of the properties used in this work to make up a trustworthiness system.

The Dashboard for Trustworthiness Assessment

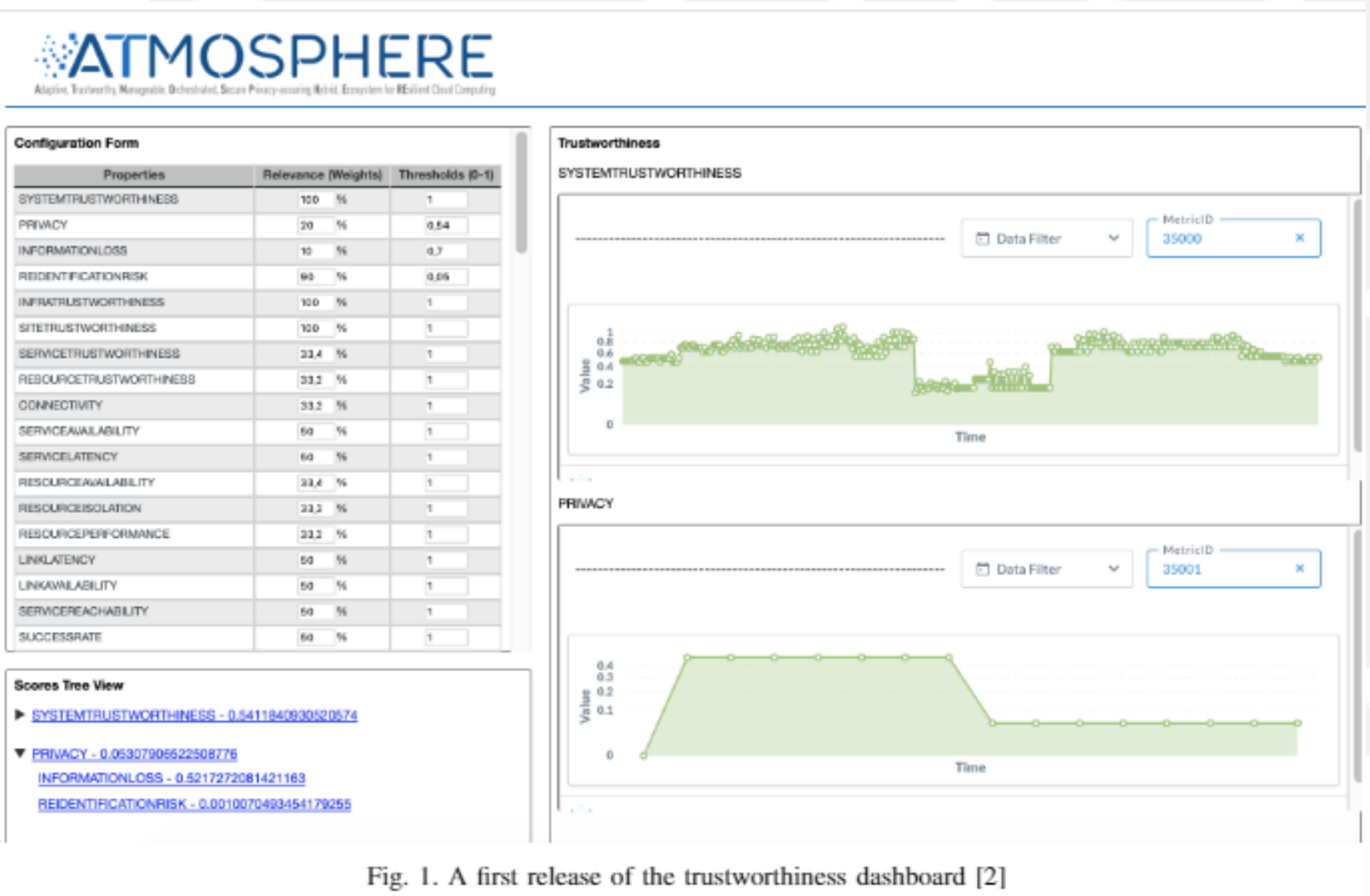


Fig. 1. A first release of the trustworthiness dashboard [2]

- We developed a dashboard to present the scores of trustworthiness properties for applications deployed in a cloud environment.
- TDMS is a component of the ATMOSPHERE project similar to a database service in cloud systems. It deals with mechanisms for data storage.

Usability Evaluation

- In order to evaluate and improve the trustworthiness dashboard, we performed two sprints of evaluation.
- In the first sprint, a preliminary (pilot) test was performed with 3 specialists on system security and data privacy.
- In the second sprint, 22 IT specialists, including professionals involved in the ATMOSPHERE project, evaluated the dashboard interface.

Discussions and Improvements

TABLE I. Assessment Results (four-point questions)

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
The dashboard interface is friendly (for example, colors, easy viewing)	16%	60%	16%	8%
The volume of data displayed is adequate (i.e., the dashboard does not have excessive information)	16%	44%	36%	4%

TABLE II. Assessment Results (five-point questions)

Statement	Very Easy	Easy	Medium	Difficult	Very Difficult
Navigation through the dashboard was ...	20%	28%	28%	24%	0%
The use of the configuration form for setting the parameters was ...	20%	32%	20%	24%	4%
The navigation in the tree structure to view the scores of the attributes was ...	20%	32%	16%	24%	8%
The symbols used in the tree structure made the hierarchy of attributes.... to use	20%	12%	32%	16%	20%
The results presented in the form of charts based on the history of the scores let the understanding ...	12%	44%	12%	20%	12%

TABLE III. Assessment Results (user testing two-point questions)

Question	Yes	No
Would you use the dashboard again?	68%	32%
Did you have any problem when using the dashboard?	44%	56%
Do you suggest any change to improve the dashboard?	64%	36%

TABLE IV. Assessment Results (user testing essay comments)

Category	Comments (%)
Understanding	37%
Volume of Data	37%
Navigation	44%
Charts	26%

Table I - Shows the questionnaire statements with a rating on a four-point scale.

Table II - Shows the statements with a rating on a five-point scale, also from the questionnaire.

Table III - Presents the results from the two-point scale.

Table IV - Summarizes the problems and suggestions pointed by the evaluators through essay questions.

Usability Improvements for the Dashboard

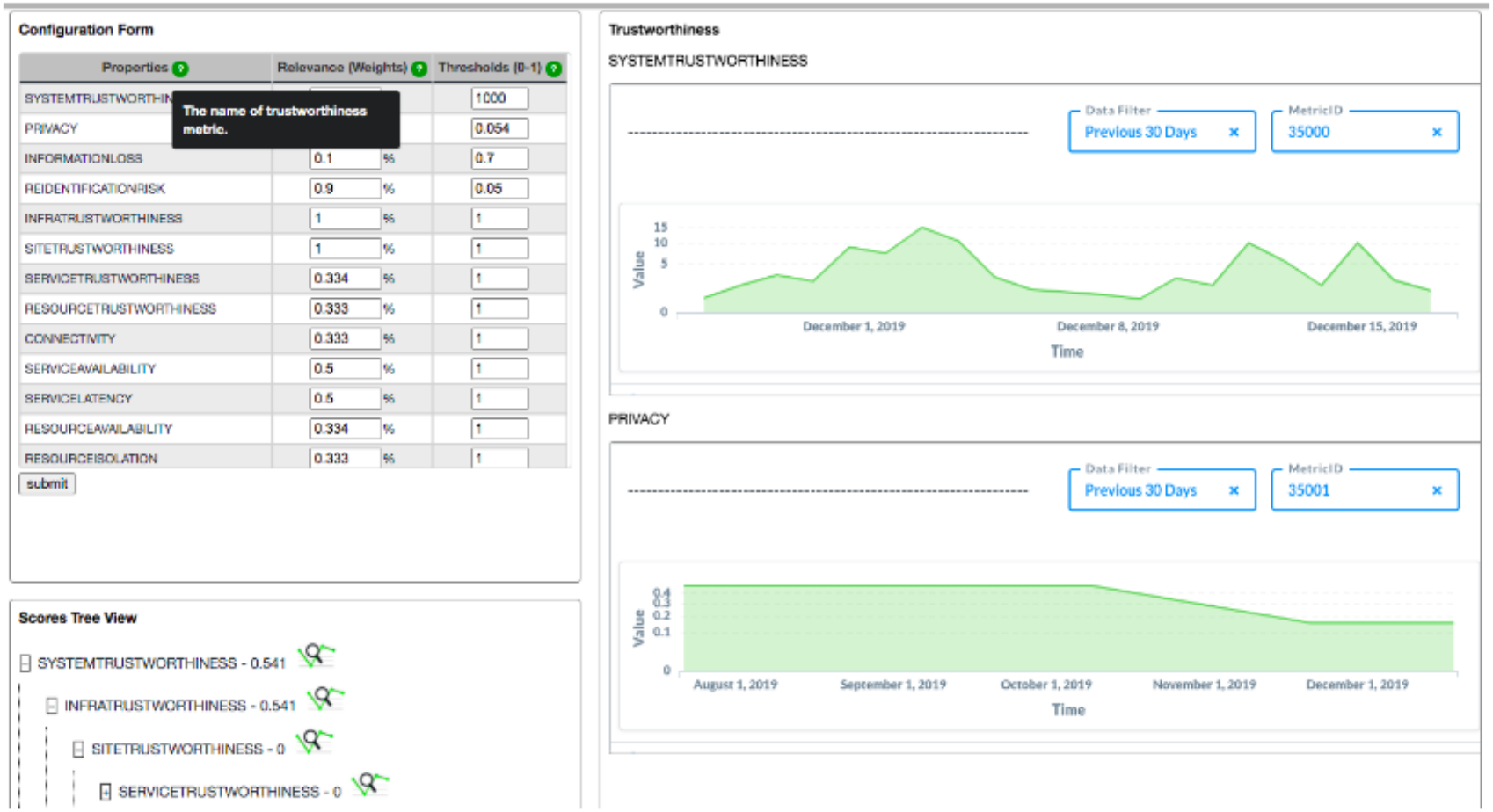


Fig. 4. Improved dashboard based on the usability evaluation

- We provided the dashboard improvements

Usability Improvements for the Dashboard

TABLE V. Example of query optimization for chart visualization improvement

Before	After (optimized)
SELECT ‘MetricData‘.‘metricId‘ AS ‘metricId‘, ‘MetricData‘.‘valueTime‘ AS ‘valueTime‘, ‘MetricData‘.‘value‘ AS ‘value‘ FROM ‘MetricData‘ WHERE ‘metricId‘ IS NOT NULL AND {{filter}} LIMIT 2000	SELECT distinct ‘MetricData‘.‘metricId‘ AS ‘metricId‘, CAST(‘MetricData‘.‘valueTime‘ as date) AS ‘valueTime‘, AVG(cast(‘MetricData‘.‘value‘ as decimal(10, 2))) AS ‘value‘ FROM ‘MetricData‘ WHERE ‘metricId‘ IS NOT NULL AND {{filter}} GROUP BY ‘valueTime‘, ‘metricId‘ LIMIT 2000

- We also optimized some queries to better group information.

Impacts on ATMOSPHERE Project

- The use of the dashboard with adequate usability.
- Previously, the validation was performed by scripts and analysis of log files.
- Accelerating the validation and integration of components.

Conclusions

This work presented a usability evaluation of a dashboard by applying:

- Questionnaires
- Usability tests

Future Work

- As future work we intend to identify and apply different usability evaluation techniques together with usability testing to identify specific usability issues and room for improvement.

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Thank you! **Questions?**

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