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# Adaptive, Trustworthy, Manageable, Orchestrated, Secure, Privacy-assuring, Hybrid Ecosystem for REsilient Cloud Computing - ATMOSPHERE

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Trust is considered as a key challenge for applications dealing with data on cloud services, whichis built on the basis of guarantees, previous successful experiences, transparency and accountability. It is neither absolute nor constant. A service will have some degree of trust, which could be sufficient for its specific usage within a particular context. Trust is an attribute which is hard to build, but it is easy to be lost. It requires a priori certification and continuous verification and assurance. Evaluating trust involves many metrics (e.g., scalability, availability, performance, robustness, security, privacy assurance, dependability, etc.), but there is currently a lack of technologies and frameworks to build trust on cloud and Big Data applications, both from the self-evaluation and the dynamic adaptation perspectives.

To cover the above gap in this research area, we present the Adaptive, Trustworthy, Manageable, Orchestrated, Secure, Privacy-assuring, Hybrid Ecosystem for REsilient Cloud Computing (2017-2019) (hereinafter "ATMOSPHERE"), which is a 24-month Research and Innovation Action, funded by the European Commission under the H2020 Programme and the Secretary of Politics of Informatics (SEPIN) of the Brazilian Ministry of Science, Technology, Innovation and Communication (MCTIC). ATMOSPHERE aims at designing and developing a framework and a platform to implement trustworthy cloud services on a federated intercontinental hybrid resource pool.

To achieve cloud computing trust services, ATMOSPHERE focuses on providing four components:
- A dynamically reconfigurable federated infrastructure providing isolation, high-availability, Quality of Service and flexibility for hybrid resources, including virtual machines and containers.
- Trustworthy Distributed Data Management services that maximise privacy when accessing and processing sensitive data.
- Trustworthy Distributed Data Processing services to deploy adaptive applications for Data Analytics, providing high-level trustworthiness metrics for computing fairness and explainability properties.
- An trustworthiness evaluation and monitoring framework, to compute trustworthiness measures from the metrics provided by the different layers, and able to trigger adaptation measures when needed.

The different trustworthiness properties identified need to be considered at different layers:
- The federated cloud platform will provide isolation, stability and Quality of Service guarantees. The cloud platform will enable the dynamic reconfiguration of resource allocation to applications running on federated networks on an intercontinental shared pool.
- The Trustworthy Distributed Data Management services will provide privacy risk analysis of the processing of sensitive data by proprietary algorithms on enclaves, guaranteeing that neither the application developer sees the data nor the data owner sees the processing code.
- The Trustworthy Distributed Data Processing services will provide a Virtual Research Environment to compute the fairness (i.e. the bias towards ethically affected data such as sex, race, education, etc.) of the Data Analytics models, and the explainability of such models, maximising transparency.
- The Trustworthy evaluation and monitoring framework will provide quantitative scores of the trustworthiness of an application running on the ATMOSPHERE platform.

More information about ATMOSPHERE can be found in the website (https://www.atmosphere-eubrazil.eu/), in Twitter (@AtmosphereEUBR) and LinkedIn (https://www.linkedin.com/in/atmosphere/).

## Type of abstract

Presentation

## Summary

A key challenge for applications dealing with data on cloud services is trust. Trust is built from guarantees, previous successful experiences, transparency and accountability. Evaluating trust involves many metrics (scalability, availability, QoS, robustness, security, privacy assurance, dependability), but there is currently a

lack of technologies to build trust. ATMOSPHERE will develop an evaluation and monitoring framework to compute the trustworthiness on applications developed in the ATMOSPHERE platform, which is structured in three layers: A hybrid federated cloud platform, a Trustworthy Distributed Data Management layer and a Trustworthy Distributed Data Processing layer.

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