

Dynamic Orchestrator

BigDataStack Software Component developed by NEC

The Dynamic Orchestrator triggers the redeployment of applications during runtime to ensure they comply with their Service Level Objectives (SLOs). For this task it is being used a Reinforced Learning-based approach which can operate efficiently, with a light overhead for the overall system.

Input

- System and application metrics,
- SLOs specification and metric, -
Deployment configurations

Output

- Redeployment changes to be performed (if any)

Initial TRL

TRL 1

Final TRL

TRL 7

End Users

The Dynamic Orchestrator can be used by all developers that utilize BigDataStack

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Key Features and Benefits

The Dynamic Orchestrator triggers redeployment mechanisms during runtime in order to adapt applications and services to the changing context and ensure they comply with their requirements. - Features: flexible, learns on its own, fast reaction - Benefits: ensures applications keep up with their requirements in changing environments

Essential Information for Users

The Dynamic Orchestrator is implemented in a logic, based on machine learning. Because of this, it needs time to learn about its environment (application/service and deployment environment) in order to learn how to behave correctly, i.e. the behaviour when the application has just started might not be optimal for a short period of time.

Standards involved in the development of the component

The development of the Dynamic Orchestrator is aligned with the latest recommendations from the BDVA and AIOTI (<https://aioti.eu/>)

Implementation in BigDataStack Use Cases

The Dynamic Orchestrator is related to all three use cases to be implemented within BigDataStack, in the Insurance, Shipping and Retail industries. In the Connected Consumer use-case, in which a varying load of inputs needs to be processed by the BigDataStack application, it is necessary to monitor that Service Level Objectives (SLOs) are met during runtime, and if not, trigger the corresponding deployment changes to improve the application's performance.

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How can the BigDataStack component contribute to Standardization foundations or initiatives?

The results of Dynamic Orchestrator will innovate data-driven infrastructure management, which is closely related to IoT and Big Data solutions. As such contributing to: - Data Management, - Data Processing Architectures, - Data Analytics, - Data Visualization, - User Interaction activities within BigData PPP, - Evolution of BDVAs Strategic Research and Innovation Agenda, - Evolution for data management in IoT, - Contributing to AIOTI standardization strategies, - Its implementation in FogFlow to orchestrate data flows from edge nodes to data centers, using and complementing NGSI 9 & 10 specifications (fogflow.readthedocs.io/en/latest/)

Differentiators from competitors in the market

- Dynamic Orchestrator component uses more system metrics and SLOs metrics, to decide when to change the current deployment,
- Higher abstraction for developers, making it easier to ensure SLOs and application requirements,
- The redeployment action spectrum includes more actions than just scaling in or out, which makes this component more flexible.