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Plan for a renewed PaaS Orchestration solution in the DataCloud Project at INFN

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In 2021, the National Institute for Nuclear Physics (INFN) launched the INFN Cloud orchestrator system to support Italy's largest research and academic distributed infrastructure. The INFN Cloud orchestration system is an open-source middleware designed to seamlessly federate heterogeneous computing environments, including public and private resource providers, container platforms, and more. It provides a customizable service portfolio, crafted to suit the distinct needs of specific communities. It supports standard Infrastructure as a Service (IaaS) options, advanced Platform as a Service (PaaS) configurations and useful Software as a Service (SaaS) solutions, such as Jupyter Hub, Kubernetes, Spark, and HTCondor clusters. Its primary function resides in orchestrating the deployment of virtual infrastructures, ranging from simple to intricate setup, providing users with convenient access and operational control.

At the heart of the federation middleware of the INFN Cloud platform lies the INDIGO PaaS Orchestrator system. This orchestration suite consists of a set of interconnected open-source micro-services. Among them, there is the orchestrator component that is a Java REST API enable to manage high-level deployment requests to federated cloud providers. Those micro-services play a crucial role in assisting the orchestrator by facilitating the selection of the optimal provider among all the providers available in the federated environments and managing the communication within the federated environment.

The most recent software upgrades can be intended as the first steps toward the definition of a new architecture based on message exchange between micro-services and exploiting Machine Learning for the optimal resource provider selection. In this context, a plan to replace the existing micro-services, exploiting newer and modern technologies, is under definition and will be adopted in the next period. In particular, the AI-ranker, devoted to the smart choice of the best provider, and the Federation-Registry, devoted to collect different information from the federated providers, will replace and evolve the in-use services providing undersized features.

Adopting a similar approach, new components will be implemented to introduce advanced features, like the adoption of open-source infrastructure as code tools aimed at extending the interaction to containerized platforms like Kubernetes. As an added value, among the renovation plans there is the adoption of the Kafka queue mechanism to manage the PaaS deployments and deliver the deployment details to the INDIGO PaaS Orchestrator micro-services.

Finally, with the continuous growth of the number and quality of micro-services, a reliable and automated procedure aimed at securing and simplifying the deployment procedure of the core services is under definition.

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