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Cloud computing has evolved from a promising approach to the service provisioning to the reference model for all new data centres to build. Additionally, an increasing number of companies are choosing to migrate their business in the cloud "ecosystem" adopting the solutions developed by the biggest public Cloud Service Providers (CSPs). Nevertheless, these providers adopt a particular interface to manage their services and use proprietary technologies generating a lock-in for the users who cannot easily migrate to other providers. In order to compete, many smaller CSPs rely on common technologies available for the creation of their cloud.

To better support user activities and provide enough resources to their users, a possible solution for small providers is the federation. In this work, we present different federation models, showing their strengths and weakness together with our considerations. Beside the highlighted existing federation we show the design of a new implementations we are implementing at INFN. The goal of our implementation is to maximise the scalability and flexibility of small and/or hybrid clouds by the introduction of a federation manager. This new component will support a seamless resources renting on the base of acceptance of federation agreements among operators. The challenge is to overcome all the problems raising trying to merge small clouds with heterogeneous administrative domains and technologies, although the initial prototype will limit its scope to a more homogeneous scenario.

According with our model cloud federation life cycle comprises of two distinct moments: join/exit and the resources access. The former is related to the activities performed by a CSP to create or destroy the environment needed by the federation members to communicate each others. The latter is related to the discovery, negotiation and usage of federated resources. To join a federation the CSP has to follow several steps aimed at defining and signing an agreement with the federation.

The federation defines the technical aspects in order to access remote resources and maintains a list of CSPs providing resources with both qualitative and quantitative information. Nevertheless, in order to access member resources a new negotiation is requested between the two members with the supervision of the federation manager.
After a new agreement between both is signed a cloud can start deploying services on
the other, upon user requests.

Finally, we will discuss how the implementation of this model inside research
institutes could help in the field of High Energy Physics with explicit reference at
LHC experiments, digital humanities, life sciences and others.

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