European Commission

mOSAIC

mOSAIC aimed to develop an open-source platform that enables application developers to select Cloud services according to their application needs. Cloud-application developers and maintainers are able to postpone their decision on the procurement of Cloud services from design time until run-time, while end-user applications are able to find best-fitting Cloud services to their actual needs and efficiently outsource computations and storage.

AT A GLANCE

Project title

Open-Source API and Platform for Multiple Clouds

Project coordinator

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Partners

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Terradue SRL (IT)
AITIA International Informatics Inc. (HU)
Tecnalia Research & Innovation (SP)
XLAB (SI)
University of Ljubljana (SI)
Technical University of Brno (CZ)

Duration

September 2010 – March 2013

Total cost/EC contribution

3 705 784 € / 2 915 785 €

Programme

FP7-ICT-Call 5

Website

www.mosaic-cloud.eu

Scope and objectives

mOSAIC project was motivated by low availability of programming models for Cloud applications, tools for easy deploy-ment of applications in multiple Clouds, and user-driven service level agreements, as well as platform dependability and non-portability of Cloud applications due to different APIs for different types of Cloud services. mOSAIC aimed to: (a) design a language- and platform-agnostic application programming interface for using multi-Cloud resources; (b) build an open-source and portable platform for using Cloud services based on the proposed API; (c) design a generic agent skeleton for representing various stakeholders, e.g. Cloud vendors and their resources, Cloud users of various types, and collection of modules that can be used to adapt agent skeleton to support needed functionalities; (d) design user-centric service level agreements, a Cloud ontology and mechanisms for resources brokerage based on multi-agent technologies and semantic data processing; (e) build proof-of-concept applications.

Achievements and results

mOSAIC offers a solution to the vendor lock-in problem that affects the IT companies and customers as they are dependent of the Cloud service providers since the Cloud applications are not usually portable from one Cloud to another. The final results of the consortium efforts are reflected *in a set of new concepts and software prototypes*. The main targeted users are the application developer, for whom mOSAIC is offering a new degree of freedom:

the decision of which Cloud service to be used is postponed from the design phase to the deployment phase. The results that are distinguishing mOSAIC from other solutions for multiple Clouds are the followings:

- A new level of abstractions of the Cloud resources that allows not only an uniform access to multiple Clouds, but also to decouple from the inherited style of programming of the accessed services; the conceptual API is implemented currently in Java, Python and Erlang;
- Targeting the application developer, an entire set of tools was built for an easy design of the Cloud applications. Eclipse plug-ins, workbenchs, templates, and various front-ends, like web interfaces are able to assist the developer. In particular the Semantic Engine assists in discovering the facilities offered by mOSAIC and various Cloud providers; its strength is increased by the service discovery mechanisms and semantic extractors as well as a comprehensive Cloud ontology and the mechanism for building domain specific ontologies. Another software prototype is the Personal Testbed Cluster that allows the development, testing and debugging of the codes on own desktop, and then, with the help of the other tools, to experience a seamless deployment in multiple Clouds;
- As being a complex task, the selection of the Cloud service to be consumed as semi-automated in mOSAIC by a unique Cloud agency, a multi-agent systems capable to broker the resources and to establish the service-level-agreements with the selected Cloud(s) according to the needs of the applications; six Cloud commercial Cloud providers and six open-source and deployable infrastructure(-as-a-)services are currently connected;
- An open-source and deployable Platform-as-a-Service that is able to manage the selected resources, as well as the application components; particular features are related to the full control of the life-cycle of the application individual components, not encountered elsewhere.
- A set of innovative applications relying upon infrastructure and software services from multiple Clouds.

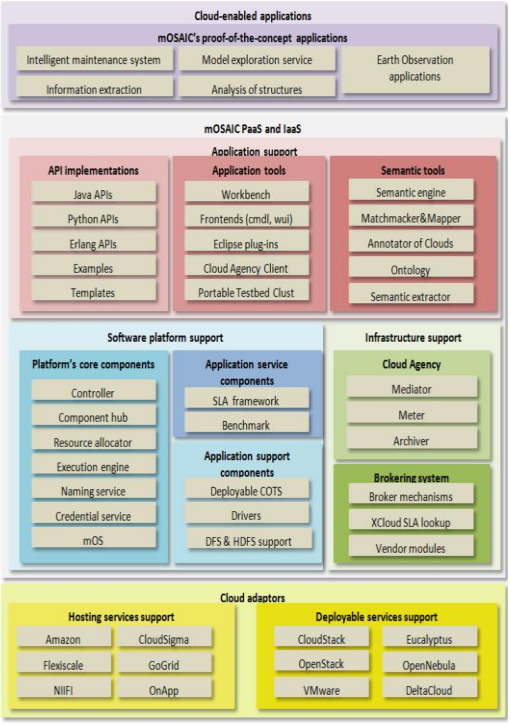
Open-source codes are available at:
http://bitbucket.org/mosaic

Use cases

The proof-of-concept applications are:

1.An Earth observation application where infrastructure services are procured for processing satellite products in emergency situations;

2. An intelligence maintenance system allowing maintenance of devices from different industrial scenarios through early diagnosis of faults in critical components and real-time monitoring of key variables;



3.A model exploration service, an online service to run agent-based simulations, requiring scalability;

4.A cloudified version of a legacy application for the information extraction from scientific papers;

5.A cloudified version of an engineering application for analysis of structures under static loading intending to be accessible on the Internet without the need for special licenses or environment.

Benefits for business

The main reason of using mOSAIC solutions is its vendor-agnosticity. The application developper and owner can select at run-time the Cloud services to be consumed. A side effect is the possibility to migrate applications from one Cloud provider to another. Therefore mOSAIC can be seen as a solution for portability of applications consuming Cloud infrastructure services. Other reasons for using mOSAIC are more technical:

1.Ability to ensure the elasticity at component level (usually done to a lower level of granularity, at virtual machines level).

2.Integration in one set of solutions of application development tools with deployment and control tools, as well as with Cloud brokering mechanisms.

3.Open-source that allows extensions as needed for special applications, embedding of other technologies.

4.Deploy-ability that allows to use on-premises resources in development phase and to build Private or Hybrid Cloud applications.