

Chapter 46

Characterizing PaaS Solutions Enabling Cloud Federations

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ABSTRACT

Cloud Computing has opened new ways of flexible resource provisions for businesses migrating IT applications and data to the cloud to respond to new demands from customers. Recently, many businesses plan to take advantage of the flexible resource provision. Cloud Federations envisage a distributed, heterogeneous environment consisting of various cloud infrastructures by aggregating different IaaS provider capabilities coming from both the commercial and academic area. Recent solutions hide the diversity of multiple clouds and form a unified federation on top of them. Many approaches follow recent trends in cloud application development, and offer federation capabilities at the platform level, thus creating Platform-as-a-Service solutions. In this chapter the authors investigate capabilities of PaaS solutions and present a classification of these tools: what levels of developer experience they offer, what types of APIs, developer tools they support and what web GUIs they provide. Developer experience is measured by creating and executing sample applications with these PaaS tools.

INTRODUCTION

Cloud computing providers offer services according to several models which can be categorized as follows: (i) Infrastructure as a Service (IaaS) – this is the most basic cloud-service model, where infrastructure providers manage and offer computers (physical or virtual) and other resources, such as a hypervisor that runs virtual machines. IaaS clouds often contain additional resources such as a virtual machine disk-image marketplace with pre-installed images, raw block storage and other file or object storage, load balancing, IP addresses and VLANs. Providers supply these resources on-demand from their large pools of computers installed in their datacenters; (ii) Platform as a Service (PaaS) – these providers deliver a computing platform, including an operating system, programming language execution

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environment, database and web server. Developers can develop and run their software applications on the cloud platform without the cost and/or complexity of buying and managing their own server farms to match application demand. (iii) Software as a Service (SaaS) –such providers install and operate application software in the cloud and cloud users access the software from cloud clients. Cloud users do not manage the infrastructure nor the platform on which their application runs. Load balancers distribute the workload over the set of allocated virtual machines. The load balancing is transparent to the end user, who only sees one entry point to the application. This model has the potential to reduce IT operational costs by outsourcing maintenance of hardware and software to a provider, enabling the reallocation of IT operation costs to other goals.

According to a recent study, the Dzone Guide to cloud development (Dzone, 2015), over half of the companies use cloud computing in their development (53%), testing and quality assurance (44%), production and deployment work (52%), and these percentages are going up around 10% in surveys from the past years. Lot of the survey respondents replied that they are “planning to perform” testing, development and deployment in the cloud. This shows that cloud is growing ever more important in our world. From the over 600 IT professionals who responded to the survey, 50% see hybrid cloud as their ideal platform, and private cloud is second with 29%. When asked about hosting types, respondents preferred third party (56%) over on premise (41%) hosting. A good representation of the market could be seen by the data gathered in the survey. Respondents of the survey are most likely to deploy web applications (73%) and enterprise applications (54%) in the cloud. They are most likely to use Paas and IaaS types of service. It is interesting to note that Storage-as-a-Service and Database-as-a-Service have risen, and this relates to the impact of Big Data technologies in cloud environments.

Cloud computing is already a part of our everyday life, and there is so much data produced by humans and their machines. As the technology evolves, new kind of innovative use cases can be invented. These new capabilities are the motivation for developing even better cloud infrastructures (Rajkumar Buyyaa, 2009), (Michael Armbrust, 2009).

There are some concepts which create an additional abstraction layer above infrastructure cloud providers, such as (David Cunha, PaaS Manager: A Platform-as-a-Service Aggregation, 2014). Some of these offer standard APIs (David Cunha, A Platform-as-a-Service API Aggregator, 2013), while others try to avoid vendor lock in situations (Kolb S., 2014; Sellami M., 2013). These approaches are important in creating a standard for cloud platforms, but it is hard to integrate innovative ideas and their implementations.

Some of the most critical parts in cloud computing in general are security issues. The cloud technology is relatively new, and it has to gain the trust of its users (Yanpei Chen, 2010). The nature of it makes it hard, as in many cases the users does not know where or how their data is stored. The cloud is used by many users at the same time and it is the responsibility of the provider to make sure that the applications can not affect each other without permission (Luis Roderio-Merinoa, 2012).

The aim of this chapter is to present an overview of the state-of-the-art Platform-as-a-Service solutions that are used to develop applications over cloud federations. The authors investigated and provided an overview of the capabilities of the most advanced tools, both PaaS software stacks and PaaS providers: what levels of developer experience they offer, how they follow recent trends in cloud application development, what types of APIs they provide, what kind of developer tools they support and what web GUIs they provide. Primary sources for this investigation were public documentation of the relevant tools, research publications and trial or demo versions where applicable. Developer experience has been measured by creating and executing sample applications with some of these PaaS tools.

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