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E-Marketplaces: A New Approach

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Abstract. This paper aims to present the Cloud-Marketplaces approach which is aiming to deliver a new paradigm to e-marketplace vendors in the Future of Internet. As the proposed Cloud-Marketplaces architecture is being experimented in real business scenario, the case study of Vortalway, an industrial-based research project conducted by a major international e-Marketplace, is presented.

Keywords: E-Marketplaces, Cloud Computing, SOA.

1. Introduction

Whilst business-to-business (B2B) electronic commerce has had considerably grow since the dot.com burst 10 years ago, existing electronic marketplaces platforms have somehow fall short of potential, not fulfilling buyers and sellers expections. After the euphoric phase of development (until 2001), since the mid-2000s several e-maketplaces demonstrated low success or failure (e.g. Chemdex, E-Chemicals, MetalSpectrum, Steelscreen, Expresso, etc.) [1]. It is acknowledged that existing e-commerce platforms do not provide an adequate foundation for B2B applications architecture, business processes, interoperability and the integration to back-end systems is usually very poor if done at all. Moreover, there is today a lack of interoperability between e-marketplaces, making cross-platform information flows and commercial transactions impossible [2]. If current e-marketplace platforms are characterised by low degrees of flexibility to adapt to new business demands, how can e-marketplaces thrive in an ever increasingly demanding digital B2B environment? Furthermore, Can Cloud Computing paradigm sustain a new way to develop e-marketplaces platforms and their businesses, particularly as some of their services are sometimes offered as Software as a Service (SaaS)?

This paper aims to present the Cloud-Marketplaces approach which is aiming to deliver a new paradigm to e-marketplace vendors in the Future of Internet. As the proposed Cloud-Marketplaces architecture is being experimented in real business scenario, the case study of Vortalway, an industrial-based research project conducted by a major international e-Marketplace, is presented.

2. Towards the Cloud-Marketplace

2.1. Cloud-Marketplace Architecture

The vision for the next generation of platforms for e-Marketpaces is the Cloud-Marketplace. Its architecture is grounded on the combination of Cloud Computing concept and Service-Oriented Computing (SOC), and decouples the traditional e-marketplaces into E-marketplaces and Community Services Clouds, as described in Figure 1.

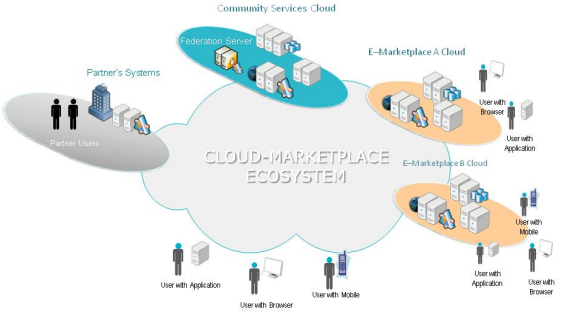

Fig. 1: Vision a Cloud-Marketplace Ecosystem

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Nonetheless, the approach is still relatively new and has not yet been widely adopted. IT departments are still wary of it because they don't control the cloud-computing platform. E-Marketplaces define the working environment for clients, and is where buyers and sellers can transact. Therefore it will be where users will configure and interact their procurement and transactional business environments and platform functions. From the e-marketplace service provider perspective, each client, remotely and through the Internet, can instantiate as many E-Marketplaces as they need, and each client is likely to have its own E-marketplace.

Since there is a need for disparate working environments for the procurement and transactional processes, according to companies' requirements, markets or business lines, the approach is to virtualize the E-marketplace [3]. This way, e-marketplaces service providers can make their business scalable according to the needs of the market. Then, Business Lines define the rules and procedures to a market, like National Public Administration Procurement. To create a specific market, rules and procedures are instantiated to create the object Market (e.g. Health or Energy and Utilities). Once the Market object exists, there is a need to characterise and customize it with a Skin for direct interfacing with the user.

2.2. Community Services Cloud

The Community Services Cloud manages the back-end of the services made available on the E-Marketplaces. It sets the rules, profiling, authentication, security, generic and specific functionality, in a federated environment managed in a service-oriented basis. It also shall be responsible to guarantee interoperability between the various E-Marketplaces, being a connecting hub, along with sustaining interoperability with external e-marketplaces [2]. The envisaged architecture is also conceived to support integration with other cloud-based applications, which can occur in two different approaches [4].

Firstly, on a *Service Consumer* approach, part (or all) of the applications of the E-marketplace are provided in an embedded way to other cloud-based applications and systems (e.g. other e-commerce applications). In this approach, the platform can also incorporate in an embedded way other cloud-based applications from other software vendors or suppliers. Secondly, on a *Service Provider* approach, with clients having the ability to design customer specific services, which are not on the scope of the services provided by the E-marketplace. An important concept in the envisaged Cloud-Marketplace platform is how communication flows occur between the Community Services Cloud and the E-marketplaces. Figure 2 depicts the typical Request For Information (RFI) information flow and Figure 3 depicts the Tender information flow of the company.

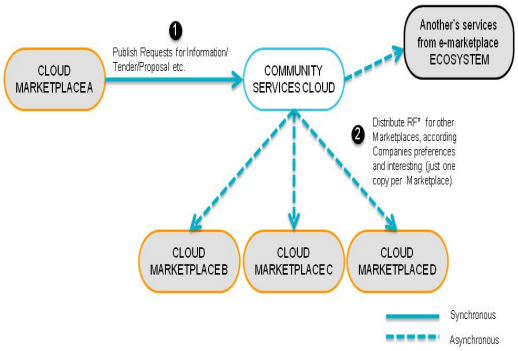

Fig. 2: Information Flows in RFI

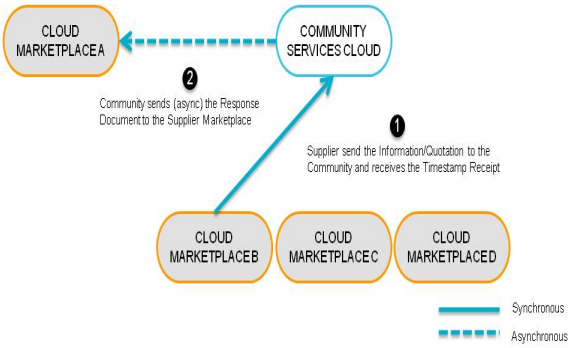

Fig. 3: Information Flows in Tender

2.3. Functional Architecture

The functional architecture considers four layers for enabling the operation of the Cloud-Marketplace. The lowest level layer – the Computing Platform Layer – provides the computing functionality of the platform and therefore all services are computing related. In the second layer - Software Platform Layer – are all services related with the platform resources processing. The third layer - Platforms Interfaces Layer – delivers services to access the previous two layers. In the fourth and upper layer - Client Applications Layer – are all applications available to users, like for example Sourcing, Auctions, Contract Management, Orders, etc.. It is through the interaction with the applications at this layer that users develop their electronic

procurement/transactions activities. All services available to users are deployed at this level, being the services Web Applications or Web Services.

An important feature of this architecture is the complete decoupling between the computing and resource processing layers and the applications layer. This enables true Software as a Service (SaaS) model to the e-marketplaces platforms and the deployment of a *Hybrid Cloud*. Mostly services triggered by users and some processing services are part of the *Public Cloud* and all remaining processing, interface and computing services are part of the *Private Cloud*. Hence, the Cloud-Marketplace platform can be divided considering that the Client Application Layer becomes the Front-End, and the Computing Platform Layer and the Software Platform Layer become the Back-End, while the communication between the Front-End and Back-End occurs through the interfaces available at the Platforms Interfaces Layer.

The Cloud-Marketplace architecture envisages to support interoperability with e-marketplaces located in other heterogeneous platforms and with other application systems available through the Web. The interoperability between platforms shall be considered to enable, across platforms, the flow of business opportunities between buyers and suppliers, and eventually electronic transactions. Interoperability shall be obtained in a seamless way to the user, which means that when a user authenticates in one platform it will have the opportunity to use all or part of the applications and information access of the other interoperable platforms without the need to re-authenticate [5].

The Cloud-Marketplace interoperability is also designed to enable the E-marketplace and Community Services Cloud to connect to external Web Services or Web Applications available in the Web, which may provide added functionality to the Client Applications Layer. For example, a client may want to use a specific Market Intelligence application from another software vendor, and that is available through Web Services. The Community Services Cloud will develop the connecting mechanisms to embed the application in the services made available to the client through its E-marketplace. Conversely, the Community Services Cloud may also make available to other vendors' e-marketplaces platforms specific applications that are located in the Client Applications Layer [6][7].

A challenging dimension of the Cloud-Marketplace concept is the creation of a Virtual Storefront, aggregating data from buyers and suppliers e-Catalogues, considering not only data from the companies' E-marketplaces, but also considering the possibility of collecting data from e-Catalogues outside the Community Services Cloud, accessed through Web Semantic crawlers.

3. Case Study: The Vortalway Cloud-Marketplace

One of the first Cloud-Marketplace available in the market has been developed and implemented by Vortalway, an industrial pilot project that has been conducted by Vortal, a Portuguese leading e-marketplace company and third largest e-marketplace in Europe. Vortal has currently over 25,000 companies connected to its platform, covering the markets of Public eTendering, Construction, Health, Energy & Utilities, Industry and Office & Supplies, mainly in Portugal, but entering now in Spain and UK geographical markets. In 2010, 3.7 billion Euros worth of transactions were carried out on its platforms.

In the Front-End, Vortalway delivers both as Web Applications and Web Services, traditional and advanced i) e-Sourcing services (Savings Management, Sourcing, e-Auctions, Supplier Info Management, Contract Management, etc.); ii) e-Commerce services (Market Intelligence, Leads Management, Sales Management, Offers and Promotions, Sales Contract Management, etc.); and iii) e-Procurement services (Orders, Invoice, Payments, etc.). Vortalway was designed grounded on a three-tier architecture, where the Front-End (Public Cloud) consists of the Presentation Tier (user interaction), and the Back-End (Private Cloud) has the Business Logic Tier (resources processing) and the Data Tier (computing services).

Vortalway has two types of web applications available: Public E-Marketplace Services, that manage the E marketplace itself and its functions, and an application that virtualizes each E-marketplace.

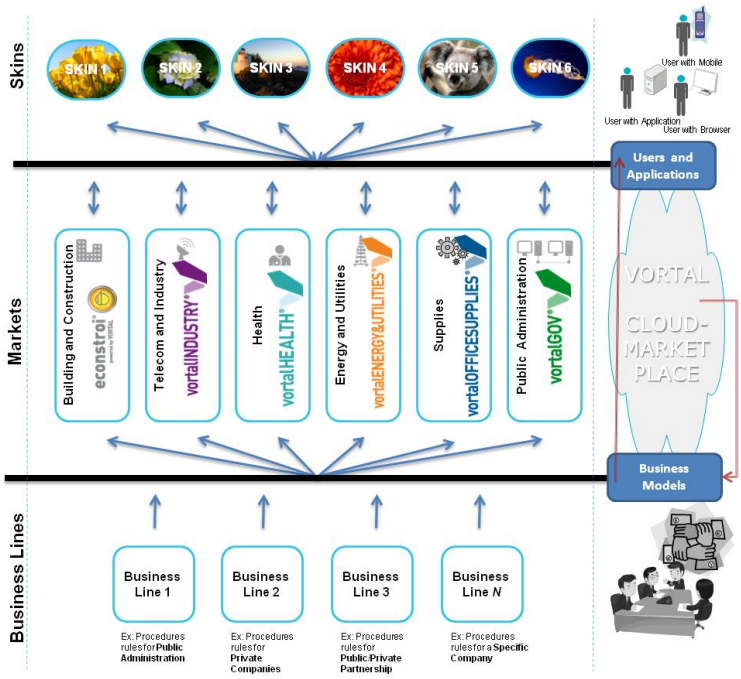

Fig. 4: Cloud-Marketplace Configuration Framework

This configuration framework considers that each market is created as a Business Line, implemented as a *Swim Lane* between the Business Line and the Skin, that interfaces directly with the user. Web services have also the same types as Web applications, and all are also implemented using Windows Server AppFabric technology. Web Services are the most important access point for the application to use the functionalities provided by the Vortalway platform. Web services provide a common, platform-independent medium for functionalities (exposed as web services) to be discovered, aggregated and orchestrated across vendors, systems, and organizational boundaries without having to expose the detail logics behind the functionalities.

Overall operation scenario of Vortalway involves a number of clouds. Vortalway itself consists of a private cloud and a public cloud, and overall platform has the ability to interact with independent third party clouds. Each cloud makes use of standard service consumption gateway and service provider interface for consuming and providing service respectively. The standard interfaces are the points through which cloud service consumers access and monitor their contracted services. The interface covers SLA negotiation, service access, service monitoring, and billing. This interface is also the interface through which a cloud service developer interacts with a cloud service provider to create a service template that is added to the service catalog, that in the case of Vortalway the service interface is Web Service. Vortalway basically handles the case of SaaS which is easily achieved by using the standard interfaces just explained above. Note that IaaS and PaaS can also be handled similarly by adding more connection points. For instance if IaaS is to be implemented then add the connection points at the data layer and expose the accessible interface as web service.

Even though basic interoperability between services provided by clouds is achieved by making use of Web Services, as explained, inter-cloud interoperability is one of the emerging fields of research. The development of standards for inter cloud interoperability has just started and the important ones being initiated by IEEE on ‘ P2301 - Guide for Cloud Portability and Interoperability Profiles (CPIP)’ and ‘P2302 - Standard for Intercloud Interoperability and Federation (SIIF)’.

The Open Cloud Computing Interface (OCCI) is a RESTful Protocol and API for all kinds of management tasks. OCCI was originally initiated to create a remote management API for IaaS model-based services, allowing for the development of interoperable tools for common tasks including deployment, autonomic scaling and monitoring. It has since evolved into a flexible API with a strong focus on interoperability while still offering a high degree of extensibility. The current release of the Open Cloud Computing Interface is suitable to serve many other models in addition to IaaS, including e.g. PaaS and SaaS.

4. Conclusions

The proposed Cloud-Marketplaces approach aims to deliver a new paradigm to e-marketplace vendors. The envisaged Cloud-Marketplaces architecture is being experimented in real business scenario by Vortalway, an industrial-based research project conducted by a major international e-Marketplace. The project, that is in its roll-out phase, has delivered e-sourcing, e-commerce and e-procurement full functionality to Vortal's electronic platform, offering which is envisaged as being strategic considering their business options to move to other countries in Europe, and to covering disparate vertical markets like public administration, construction, health, etc.

Nevertheless, the implementation of the Cloud-Marketplaces paradigm, besides the engineering and technological issues, poses interesting challenges regarding business models. The new possibilities brought by the new architecture do also require such new business models that move away from traditional fee or transaction-based revenue mechanisms, which is also currently being researched.

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