Cloud Based Business Processes Orchestration

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Abstract

As the value concept of the cloud is evolving from a cost-saving mechanism into a growth instrument, more and more organizations are turning to the cloud in an attempt to redesign their core business processes. The opportunity for process innovation is vast, and it will take the disciplined approach of BPM, with the computing understanding and accessibility of the cloud, to make the most of what lies ahead. With the popularity of cloud computing, Platform-as-a Service (PaaS) becomes one of the core technical enablers of enterprises to change the delivery of services to both customers and internal organizations. An application in an enterprise needs to take into account various specific requirements for hosting in private and hybrid cloud, with unique requirements on rapid development, simplicity for deployment and management, integration with existing solution and compliance to industry standards.

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1. Introduction

Today, every business interacts direct or indirect with the cloud.

The cloud introduced new business models and change the way we organize, develop and offer our services. It literary is the answer of many problems regarding distribution, security and costs. However, it also raise many other questions and challenges.

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With the large adapted architectural design, the Service Oriented Architecture brought a revolution among business models. Thus, service oriented business models started to appear and a new shift was made towards a better align between businesses and IT.

The apparition of the cloud - which according to Peter Fingar, brings nothing new to the table only a new set of delivery models - is the answer the newest economically challenges raised by globalization, distribution and cost effective resource scaling.

As expected, the cloud was also modeled from a service-oriented approach. Thus, we have:

- **IaaS** – Infrastructure as a Service – is a delivery model where a company / organization outsources infrastructure equipment used to support operations, such as storage, hardware, servers and network components. The provider is responsible in hosting, running and maintain all the infrastructure’s components.
- **PaaS** – Platform as a Service – is a delivery model, which offers beside the infrastructure (the computing platform) also the required software (the solution stack) to run it, like operating systems, database software, etc. This delivery model allows end users to rent, on demand, virtualized servers and any associated services. Based on it, the consumer controls how the software is deployed and configured.
- **SaaS** – Service as a Service – is a delivery model where software with related and associated data are centrally hosted in a cloud environment by either independent software vendors or application providers. This model, best follower of the service-oriented paradigm, gained a lot of popularity and become a common delivery model for businesses and enjoys all the features given by the IaaS and Paas delivery models.

2. **Business Process Management as a Service (BPMaaS)**

By adopting this new delivery model, enterprises differentiate themselves from a consumer cloud computing, enjoying benefits like:

- Quick start, without too much IT hassle, focusing on the right business value.
• Flexible subscription plan – pay as you go
• Collaboration in modeling the business processes
• Cloud service orchestration
• Scalability
• Portability
• Reliability
• Security
• Cost benefits by removing, as stated, the IT hassle, and by adjusting the required IT resources.
• Elasticity
• Process governance

It is already known that with business processes businesses can easily orchestrate software services by easily choreograph them using their exposed API’s or other direct communication channels and protocols. In the current paper, we focus on a cloud based infrastructure (the IaaS) orchestration using business processes and Chef recipes.

3. BPM in infrastructure orchestration

The IaaS is the basic cloud-service delivery model. We can consider the first delivery model that defined the “cloud”. It offers physical or virtual computers plus other computing resources (storage, memory, processors, communication channels, etc).

At a small-medium company level, the out-of-the-box offered IaaS features and pricing is in most cases good enough from an economically point of view as maintenance costs are reduced to minimum. For enterprises, on the other hand, even if the common features are good enough and the IaaS pricing is being reduced every year, as hardware is becoming cheap, the real problem is their maintenance and organization.

Due to globalization and economically challenges, highly (geographically) distributed complex systems are created to answer the increasing demand. Nowadays, the cloud is the first step in building such geographically distributed system with a new challenge to the table: scalability.

The quick and viable answer to scalability is by adopting two approaches:

1. Vertically – by adding more resources on a given node (server). Regarding the costs, this can be considered a fast and cheap way to solve the problem. This increasing can be done until a limit – the machine limitation (you can add maximum X number of processors or you can add X number of GB of RAM on a single machine). This approach is given only to one node more power, which makes sense if and only if the node’s served region has a higher demand than the rest.

2. Horizontally – by adding more nodes (servers). Maybe it is not that cost effective than the first, but by using this approach the application distribution covers a wider region, thus customers will be more happy which will convert to more income. On the long run, it is more cost effecting as conversion is higher.

In our opinion, we consider that these two approaches are good if the demand is constant in time. There are enterprises for which these scalability approaches once done they remain unchanged even if there are demand fluctuations. There are cases when servers are removed due to a dramatic reduced in service consumption otherwise they are left running.

We here propose and describe a model in orchestrating the infrastructure scalability by adding and removing nodes based on business cycle, seasonal or region demand at lower costs.

Beside the basic IaaS, cloud vendors offers also the platform (PaaS) including operating systems, specialized software and a series of tools for monitoring, authentication and authorization, etc. For our model to be effective, we take advantage mostly of the offered cloud monitoring.

Thus, we created a tool, which collects monitoring data about:

1. number of requests per second
2. the device used to make the request (mobile, desktop, others)
3. the geographically region from where the request was made
The created tool is also connected to other systems that provide data regarding the number of sales, requests and the conversion rate. By combining the two data sources the tool uses time series in order to forecast future trends in consuming the offered services and required resources.

Based on the created trends, we propose the next business process – Figure 2 – which is used to orchestrate the resource utilization by adding or removing nodes at need. With the proposed business process, the costs are reduced by:

- using fully automated scripts to adjust the number of nodes
- minimizing the human intervention in nodes & software configuration
- minimizing the number of nodes and their running number of hours

The proposed business process is just an orchestrator but his power is given by the utilization of Chef [7], which is an automation platform that transforms the infrastructure into code. By leveraging the power of Chef, we can easily automate and manage large-scale infrastructures.

Thus, in case of augmenting the number of a given resource, based on the forecasted trends and pre-defined business rules the process detects the needed resource and based on the defined cookbook, it pulls its recipe, serve it to Chef, which automatically creates / builds it. The advantage of using Chef recipes is that there is no need to configure the new resource as all the instructions are already found within the receipt.

![Figure 2. Business Process for infrastructure orchestration](image)

In either cases, adding or removing a resource, Chef uses a pre-defined recipe to make the necessary adjustments and configurations to introduce / eliminate the resource from the infrastructure.
4. Conclusions

The cloud brings nothing new to the table, only predefined delivery models such as IaaS, PaaS and SaaS and others. Proving to be successful and cost effective, enterprises are taking the delivery models to the next level by adopting business processes management as a service delivery model.

Based on experience of orchestrating software services using business processes, we present in this paper a business process through the use of which the cloud infrastructure – the IaaS – it is orchestrated. The proposed business process use a custom developed tool that uses cloud based monitoring data, sales volume, temporal number of requests, conversion rates in order to forecast future usage trends. Based on those trends, predefined business rules and with the help of Chef recipes, the proposed business process easily adds and configure required resources or removes existing ones. The proposed process is a good cost effective strategy for enterprises to control their IT resources.

References

Biren Gandhi, Business Process as a Service (BPaaS) delivered from the cloud, http://thoughtsoncloud.com/2011/12/business-process-as-a-service-bpaas-delivered-from-the-cloud/
Bruce McCracken, Business Process as a Service – The Next Wave of BPO Delivery, http://outsourcing-center.com/2011-02-business-process-as-a-service-the-next-wave-of-bpo-delivery-article-42948.html
Marcia Kaufman, Fern Halper, and Dan Kirsch, What Is Business Process as a Service (BPaaS) in Cloud Computing?, Hybrid Cloud For Dummies, 2012;
Peter Whibley, BPTrends, http://www.bptrends.com/bpt/wp-content/publicationfiles/10-01-2013-ART-Process%20on%20Demand-Whibley.pdf
Chef - http://www.getchef.com/chef/