PORTABILITY ISSUES IN CLOUD ENVIRONMENTS

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ABSTRACT

Cloud computing has recently attracted a lot of attention and has emerged in prominence because of its perceived and potential benefits. Some of the benefits often cited include benefits of scale, easy and fast deployment, pay-as-you-go model, and less in-house IT staff and costs. Despite the benefits of cloud computing, there still remain major challenges and risks to adopting cloud-based solutions. Security, performance/reliability, availability, interoperability, and portability are major concerns for top IT executives and roadblocks to migration to cloud computing [1][2]

Organizations that use cloud services must have a contingency plan that addresses the possibility of a move from one cloud service provider to another. Organizations face major portability challenges when they have to change their cloud service provider, either because the cloud service provider is out of business or due to the company's dissatisfaction with the providers' service or due to some other reason. Portability challenges differ with different types of cloud services.

Cloud portability is defined as portability of applications (and services) and its associated data in Infrastructure as a Service (IaaS) and Portability as a Service (PaaS) and portability of data in Software as a Service (SaaS). IaaS includes Hardware as a Service (HaaS), Database as a Service (DaaS), and Communications as a Service (CaaS). Cloud portability could be across different cloud computing environments, such as between CaaS and HaaS or between SaaS and PaaS, and so on. It could be from one cloud service provider's public or private cloud to another cloud provider's public or private cloud. It could also be from an internal data center to a cloud service provider or vice versa. Cloud interoperability is defined as application-level interoperability where applications running in different clouds are able to share data and information using a common set of interfaces.

Challenges and issues due to lack of portability and interoperability in cloud results in the customer being locked into a single cloud provider. The challenges due to cloud portability vary depending on the strategy and choice used by an organization for their IT computing needs.

Portability of applications means that the applications work in the exact manner in the target cloud as they did in the source cloud. Migrating applications between clouds involves making sure that policies that ensure the availability, security, speed, and reliability of applications are also transferred from the source cloud to the target cloud. These policies include policies for load balancing, security, acceleration, optimization, storage, network, and access.

In this paper, we will discuss portability and interoperability challenges in the cloud computing environment. Some of the challenges that arise when applications need to be moved include conflicts that are created when operating system and hypervisor versions in the target cloud do not match those in the source cloud, differences in performance metrics used by the original and the new cloud provider, differences in resources used by the original and new cloud provider such as network addressing, firewalls, directory services, identity services, naming services, etc., differences in security policies, and

lack of common cloud APIs. Before migrating applications, applications need to be virtualized. If applications are legacy applications, virtualization is more of an issue.

To address these issues, many standards have been proposed and adopted. We will investigate various standards that have been proposed by industry groups/forums as well as those that are vendor initiatives. Some of these standards are still in draft versions whereas others have already been adopted. We will discuss these standards as they pertain to portability, interoperability, security, governance, and compliance.

Many efforts are being made to develop open and proprietary APIs. Open API efforts done by Open Cloud Computing Interface Working Group, Sun's Open Cloud API, VMware's DMTF-submitted vCloud API. Proprietary APIs include Amazon EC2 API, Rackspace API, GoGrid's API. DMTF's Open Virtualization Format (OVF) is being developed to help with portability and interoperability issues.

We will discuss several vendor initiatives including initiatives by Google and RightScale. Google has teamed up with VMware to offer cloud portability solutions that allows enterprise developers to develop and deploy web applications across multiple environments and devices. Google also supports data portability and has started the Data Liberation Front whose main objective is to make it easier for users to move their data in and out of Google products using the existing open standards (and not creating any new ones).

Other vendor initiatives include RightScale's product offerings. RightScale is a transparent platform designed to work across multiple clouds where the cloud customer has the flexibility to choose the cloud vendor, to move their data store, and design the architecture and components using their own software library, RightScale's solution library or components developed by cloud infrastructure providers.

We will present best practices that cloud customers should follow to minimize the effects of portability challenges. We will conclude the paper by providing recommendations and directions for future research in this important area of cloud computing.

REFERENCES

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