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STANDARDIZATION IN CLOUD COMPUTING

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ABSTRACT

Much attention has been given to data sharing services utilizing a cloud computing environment. Cloud computing is a computing technology to provide IT resources (e.g., software, storage, and server) with internet technology. Everybody talks about it but with little know-ledge of the implications. Cloud computing has become very useful because of its cost effectiveness, high availa-bility, anywhere access, and infinitely scalable. There are a lot of vendors including Microsoft, IBM, Amazon, and Google providing cloud services. A currently recurring issue in the context of commercial cloud is "vendor lock in": As most commercial tools were developed independently from one another with a particular focus on solving the respective company's customers' prob-lems first, there is little (technical) convergence between the available products. This is also due to the typical development cycle of clouds which typically start as in-house, internal solutions (private clouds) which are then extended to provide (a subset of) capabilities to potential customers (public clouds). There are no standards as such in the cloud computing discipline. Each vendor has his own standards, which are not compatible with others. This results in vendor lock-in and it has become very difficult for the customer to change the Cloud vendor whenever needed. This situation is similar to the DBMS before ODBC. We need a technique similar to ODBC in cloud computing, so that the client can mi-grate among cloud vendors without redesigning and recompiling massive systems and also without convert-ing the data. This paper discusses the need for such standard and proposes a conceptual standard for the cloud computing discipline.

***Keywords*: Cloud, Interoperability, Vendor Lock-in, Java Database Connectivity, mixins.**

I. INTRODUCTION

Cloud computing is sharing of resources on a larger scale which is cost effective and location independent. Resources on the cloud can be set up by the vendor, and can be used by the client. It facilitates sharing necessary software and tools on-demand for various IT Industries. Amazon is the first company to look into the growing importance of Cloud computing very seriously and then followed by Google & IBM. Some of the other companies which make use of Cloud are Salesforce.com, Zoho, Rackspace, and Microsoft [1].

Benefits of Cloud computing are enormous. The most important one is that the customers don't need to buy the resource from a third party vendor, instead they can use the resource and pay for it as a service. Thus, it helps the customer to save money and time. Cloud is not only for Multinational companies but it's also being used by individuals, Small and medium enterprises.

The architecture of the Cloud Computing involves multiple cloud components interacting with each other about the various data they are holding on too, thus helping the user to get to the required data on a faster rate. When it comes to Cloud it's more focused upon the front-end and the back-end. The front-end is the user who requires the data, whereas the back-end is the numerous data storage device, such as, server which makes the Cloud [2,3].

IBM had differentiated Cloud into three types according to the usage. They are Private Cloud, Public Cloud and Hybrid Cloud. The Private Cloud is owned by a single organization and Public clouds are shared on a larger scale. Private cloud provides better control and more flexibility. Hybrid cloud is a combination of Private Cloud and Public Cloud which is used by most of the industries.

The advantages of cloud computing may be very appealing but nothing is perfect. In reality, the cloud has a lot of pros and cons [4] as depicted in Fig. 1.

So cloud computing also has its requirements to meet the needs of the increasing demand. These are generally seen as drawbacks rather than requirements by the users.

There is a wealth of chatter and hype around the cloud right now, especially as more startups continue to go public. Separating the hype and fleeting trends from the reality is often becoming difficult.

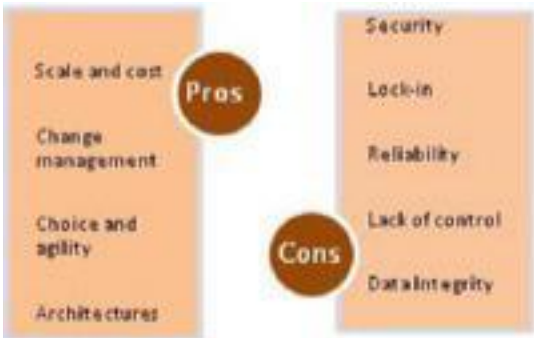

Fig. 1 Cloud Computing Pros and Cons

Fig. 2 Key requirements [2]

The forth coming years may increase the use of Cloud if the Key requirements are met as given in Fig. 2 and the important aspects to adapt Cloud for many applications is possible if the below mentioned aspects [5] are considered.

1. Applications must be available on the cloud.
2. Increased growth in the market for cloud.
3. Promotion of hybrid cloud.
4. .Increased development for the cloud.
5. More innovation must be realized with the cloud.

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In brief, the cloud systems are classified [6] and is as depicted in Fig. 3.

A Context

Standards are a feature of all information and communication technology markets, including cloud computing. Standards make the world go round. They embody a consensus about how to do something based on accumulated experience, as well as signaling how things should be done going forward. Standards are important in cloud computing for a variety of reasons. Standards for interoperability of data Moreover, application portability can ensure an open competitive market in cloud computing because customers are not locked-in to cloud providers and can easily transfer data or applications between cloud providers. Standards for cloud security and for data protection in the cloud can reassure cloud customers that using the cloud is safe for them, their data and businesses. Standards in these area build trust in cloud computing. Many alternative approaches to the present standardization initiatives and middleware based solutions for achieving cloud application portability and interoperability have been suggested [7,8,9]. Finally, standards concerning cloud metrics and service levels enable customers to evaluate and compare cloud providers, leading to more trust in cloud computing and more competition. The standards most frequently discussed in relation to cloud standards in the EU are outlined and its importance to cloud computing providers or customers is explained in two approaches.

II. META CLOUD APPROACH

To some extent, the meta-cloud can be realized based on a combination of existing tools and concepts. Figure 4 depicts the meta-cloud's main components. These components are categorized based on whether they're important mainly for cloud software engineers during development time or whether they perform tasks during runtime.

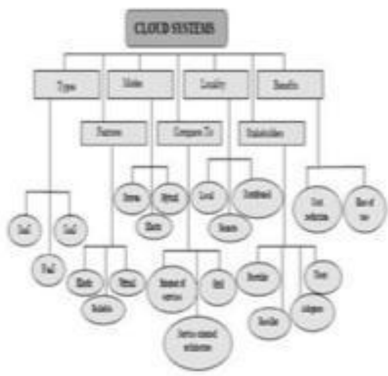

Fig. 3 Cloud Systems

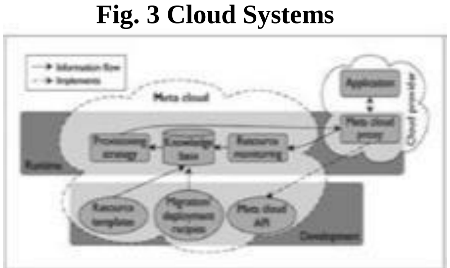

Fig. 4 Meta cloud Architecture

Meta cloud is a model framework that is aimed to provide both integrity modeling and assurance. Hence, the data is stored and sent to a cloud to maintain integrity and non-repudiation throughout its use. This model combines the use of techniques similar to file integrity monitoring and log monitoring to access the state of a disaster recovery instance.

Java Database Connectivity (JDBC) is an application program interface (API) specification for connecting programs written in Java to the data in popular databases. Similarly meta-cloud is also an API, which provides a unified programming interface to abstract from the differences among Cloud Service provider implementations. For customers using this API, their application is freed from being hard-wired to a specific cloud service offering. The meta-cloud can help mitigate vendor lock-in and promises transparent use of cloud computing services.

Most of the basic technologies necessary to realize the meta-cloud already exist, yet lack integration.

Meta-cloud could solve the vendor lock-in problems that current public and hybrid cloud users face. Meta cloud uses resource templates to define concrete features that the application requires from the Cloud.

Another standard that is discussed in this paper is Open Cloud Computing Interface.

III. OPEN CLOUD COMPUTING INTERFACE

The Open Cloud Computing Interface (OCCI) comprises a set of open community-lead specifications delivered through the Open Grid Forum. OCCI is a 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 integration, portability, interoperability and innovation while still offering a high degree of extensibility. Although it focuses on providing interoperable infrastructures, OCCI can be adopted into many cloud-related setups. The current release of the Open Cloud Computing Interface is suitable to serve many other models in addition to IaaS, including PaaS and SaaS [10].

Architecture. OCCI is a boundary API that uses HTTP and the REST architectural style. It creates a standardized API for all kinds of service offerings and delivers an interoperable interface for many different service.

Because OCCI lives on the boundary, service consumers must be able to discover what service providers offer. So, the working group designed the specification with three main goals:

- **Discoverability.** Service consumers can query the service provider to find out what capabilities are available. The information is self-describing and complete. If the service consumer is a broker, it can request that multiple service providers describe what's offered and then choose from among them.
- **Extensibility.** Because cloud computing spans a broad set of offerings, from infrastructure to software as a service (IaaS to SaaS), the OCCI specification must be extensible. Currently, it specifies one extension for the IaaS domain,but the working group can add others, as can providers themselves.
- **Modularity.** Because of its extensibility, OCCI must be modular. Indeed, even the OCCI specification itself is split into three documents: the first describes the core model, which serves as the foundation; the second describes an extension to this model for the IaaS domain; and the third describes a simple text-based

HTTP RESTful rendering. Each document can be used individually, ignored, or replaced as the situation requires.

How OCCI Uses the Web. The OCCI HTTP specification 6 details how the core model and its extensions can be transported over the wire. When implemented and deployed, OCCI uses many of today's available HTTP features. It builds on the Resource Oriented Architecture (ROA) paradigm and uses REST to handle client and service interactions. Additionally, it defines some simple ways to filter and query the service provider.

Each entity (that is, resources and links) is exposed through URIs. Service consumers can use the normal set of HTTP verbs (POST, PUT, GET, and DELETE) to manage these resources, and can alter resource instances by updating their representation.

The OCCI working group is currently investigating asynchronous behaviors associated with service offerings. This is useful for features such as notifying service consumers when monitoring is being used, and providing a constant stream of up-to-date information. A monitoring and agreement negotiation extension for OCCI is also under development so that service providers can offer service-level agreements (SLAs) to their customers.

Impact and Implications. OCCI is clearly defined, royalty free, and lets anyone implement the service. Numerous OCCI implementations - many of them open source - are available, including Eucalyptus Open Nebula, Open Stack, and libvirt. Other OCCI-related software is also available to the community. Various deployments hosting live systems use OCCI.

OCCI represents a collective effort to create one of the first standards in the cloud space. OCCI's extensibility features offered through its core model, extensions, and mixins can be added to other kinds of interfaces and in general be useful for other Internet standards. Thus, we believe the future is bright for broadly interoperable cloud computing.

IV. CONCLUSION

Clouds offer the opportunity to build data observatories with data, software and expertise together to solve problems such as those associated with economic modeling, climate change, terrorism, healthcare and epidemics, etc. Clouds could assist greatly in the e-government agenda by providing information in one place to the citizen, together with software to manipulate the data. It has been claimed and indeed demonstrated that Cloud computing is a green option.

As it is seen, a proliferation of standards is not necessarily symptomatic of a problem for the cloud industry, being instead more a reflection of the variety and complex nature of the technologies that comprise the cloud ecosystem. Standards serve a multitude of different purposes, whether solving a technical problem; enabling interoperability; facilitating competition, or as a means of generating a trusted environment. The standards-making process will also generally differ between technical, informational and evaluative standards. The institutional structure within which technical standards are developed varies considerably from official to private, and formal to ad hoc arrangements; reflecting the diverse nature of the industry. Technically, we need standards for storage, security, retrieval, inter operability of data in cloud as well as migration of application sources and running systems is also needed to avoid vendor lock-in.

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