Free and Open Source Software (FOSS) of Cloud Application in Libraries: An Overview

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Abstract: Cloud computing is Internet-based computing, whereby shared resource, software, and information are provided to computers and other devices on demand, like the electricity grid. Cloud computing technologies promises new opportunities and service offerings for the library and information service practices. The real value of cloud computing is that it makes our library related software and data available transparently and everywhere including in latest available smart phone devices. FOSS is developed to meet the lowest risk choice for software systems today. All FOSS licenses specify that the software is available to use, modify, and distribute at no cost. The FOSS-Cloud is the most advanced Open Source Cloud. For a country like India these technologies have a great role in reducing the digital divide up to a good extent. The growing need for digital libraries to manage large amounts of data requires storage infrastructure that libraries can deploy quickly and economically. This paper introduces FOSS-Cloud applications in libraries which are going to be the most promising technology in the next few years.

Keywords: Cloud Computing, Free and Open source Software (FOSS), I.T., Virtual Library, Open source, Digital Library

1. Introduction

Anyone connected to the Internet is probably using some type of cloud computing on a regular basis. Whether they are using Face book, Google's Drive, Gmail, or uploading photos on Flicker they are engaged in cloud computing. Within few year Cloud computing became a technology solution for many issues like hardware failure, software installs, upgrades and compatibility issues. It allows them to avoid locally hosting multiple servers and equipment. Influence of IT shook the very foundation of the libraries. In this digital era people don't want to come to library physically instead they prefer to get services virtually. So libraries need to cope with the changing needs and to serve people with information in a global cloud ecosystem.

2. What is Cloud Computing?

Cloud computing is a kind of computing technology which facilitates in sharing the resources and services over the internet rather than having these services and resources on local servers/ nodes or personal devices [1].
Cloud computing can be defined as 'simply the sharing and use of applications and resources of a network environment to get work done without concern about ownership and management of the network's resources and applications' [2].
There are four different models of cloud computing applications are there: infrastructure, platform, applications and services. Many cloud services actually incorporate two or more of these models. For example, Google docs provide infrastructure as well as applications.

Type	What It is?	Examples
Infrastructure	Buying space / time on external servers	Amazon A3
Platform	An existing software platform to build your own applications on	own applications on
Applications	Software applications accessed with a Web browser	Google Docs
Services	Ready to use services accessed with a Web browser	ADP

Table 1: Models of Cloud Computing

3. Free and Open source Cloud Computing

Developed on the concept of "free software" by Richard Stallman, FOSS (Free Open Source Software) is the standard for operating systems to user applications, for individuals to large enterprises. In free and open source software the source text is available freely and the user has the right to modify it and several users can exchange improved versions among themselves. Moreover, open source world supports open standards. All FOSS licenses specify that the software is available to use, modify, and distribute at no cost. FOSS is developed to meet the lowest risk choice for software systems today. The FOSS-Cloud is the most advanced Open Source Cloud[4].

Various free and open source soft wares of cloud applications are available and many of these are fruitfully used in libraries for a wide variety of applications. Some of the potential free and open source soft wares of cloud applications are given in table 2 and comparison of these soft wares are given thereafter.

Type	Software
IaaS (Infrastructure as a Service)	Cloud Stack
	Eucalyptus
	Nimbus
	Open Nebula
	Open Stack
Management Software	Delta cloud
SaaS(Software as a Service	Alfresco
	Collabtive
	Nuxeo
	VTiger

Table 2
FOSS of cloud application

No.	Software	Features	Developer(s)	Written in	Operating system	Type	License
1	Cloud Stack	IaaS	Apache Software Foundation		Cross-platform, GNU/Linux Windows,	Cloud computing	Apache License 2
2	Eucalyptus	IaaS	Eucalyptus Systems, Inc.	Java, C	Java, C	Private and hybrid cloud computing	GPLv3
3	Nimbus	IaaS	Kate Keahey, Tim Freeman, et al.	Java, Python	Linux	Cloud computing	Apache License version 2
4	Open Nebula	IaaS	OpenNebula Community	C++, C, Ruby, Java, Shell script, lex, yacc	Linux	Cloud computing	Apache License version 2
5	Open Stack	IaaS	Rackspace Hosting and NASA	Python	Cross-platform	Cloud computing	Apache License version 2
6	Delta cloud	Management Software	Apache Software Foundation / Red Hat	Ruby	Linux, Windows	Library	Apache Software License
7	Alfresco	SaaS	Alfresco Software, Inc.	Java, JSP and JavaScript	Cross-platform	Enterprise content management	Enterprise Edition is proprietary; Community Edition is LGPL v3
8	Collabtive	SaaS	Philipp Kiszka, Eva Kiszka	PHP5, JavaScript	Cross-platform	Project management software	GPL
11	Nuxeo	SaaS(Software as a Service)	Nuxeo	Java, Python	Cross-platform	Enterprise content management	LGPL
10	VTiger	SaaS	vtiger	PHP	Cross-platform	Customer Relationship	MPL 1.0

					Management	

Table 3

Comparison of FOSS of cloud application

Free and Open source Cloud Computing software

1. **Cloud Stack [4]**

CloudStack is open source software designed to deploy and manage large networks of virtual machines, as a highly available, highly scalable Infrastructure as a Service (IaaS) cloud computing platform. CloudStack is used by a number of service providers to offer public cloud services, and by many companies to provide an on-premises (private) cloud offering, or as part of a hybrid cloud solution.

Features

- ➢ Rich Management User Interface. It is a fully AJAX based solution compatible with most of the latest internet browsers and can also be easily integrated with your existing portal.
- ➢ On Demand Virtual Data center Hosting
- ➢ Secure Single Sign On. Aggregate and integrate your existing applications with our management user interface via our secure single sign-on for a better user experience.
- ➢ Network As a Service. Admin can compose network offerings with different network behaviors.

2. **Eucalyptus[5]**

Eucalyptus is a free and open-source computer software for building Amazon Web Services (AWS)-compatible private and hybrid cloud computing environments. Eucalyptus is the acronym for Elastic Utility Computing Architecture for Linking Your Programs To Useful Systems. Eucalyptus empowers organizations to create self-service, elastic clouds inside their datacenter using existing IT infrastructure. It also enables a seamless path to hybrid cloud to deliver services both on-premises and through the AWS public cloud for greater business agility.

Features
- ➢ Amazon Machine Image (AMI) Compatible Utilizes a virtual machine image format compatible with AWS's Amazon Machine Image (AMI) format and allows you to create, store, or easily import existing AMIs.
- ➢ Identity and Access Management (IAM). Provides account, user, and group management compatible with AWS Identity and Access Management (IAM). Eucalyptus supports instance roles enabling cloud administrators to avoid the security risk of shared credentials and grant applications permission to resource by delegating access.
- ➢ Expanded SDK Support. Includes enhancements that expand the set of SDKs with demonstrated support.

3. **Nimbus[6]**

Nimbus Infrastructure is an open source EC2/S3-compatible Infrastructure-as-a-Service implementation specifically targeting features of interest to the scientific community such as support for proxy credentials, batch schedulers, best-effort allocations and others.

Features

- ➤ Storage Cloud Service. Cumulus is storage cloud service that is compatible with the S3 REST API. It can be used against many existing clients (boto, s3cmd, jets3t, etc) to provide data storage and transfer services.
- ➤ Compatibility with Amazons Network Protocols. EC2 based clients written for EC2 can be used with Nimbus installations. Both SOAP API and the REST API have been implemented in Nimbus.
- ➤ Easy to Use Cloud Client. The workspace cloud client allows authorized clients to access many Workspace Service features in a user friendly way. It is designed to get users up and running in a matter of minutes, even from laptops, NATs, etc. cloud-client is the easiest way to use both a storage cloud and IaaS. Even the uninitiated finds this fully integrated tool easy to use.
- ➤ Multiple protocol support / Compartmentalized dependencies

4. **Open Nebula[7]**

OpenNebula is a cloud computing toolkit for managing heterogeneous distributed data center infrastructures. The OpenNebula toolkit manages a data center's virtual infrastructure to build private, public and hybrid implementations of infrastructure as a service.

Features

- ➤ Powerful and Innovative: Most advanced and innovative enterprise-class functionality for the management of virtualized data centers to build private and hybrid clouds
- ➤ Infrastructure Agnostic: Fully platform independent with broad support for commodity and enterprise-grade hypervisor, storage and networking resources, allowing to leverage existing IT infrastructure, protecting your investments, and avoiding vendor lock-in
- ➤ Adaptable, Extensible and Integrable: Open, adaptable and extensible architecture, interfaces and components to build your customized cloud service and make cloud operations conform to existing polcies
- ➤ Interoperable: Cloud interoperability and portability providing cloud consumers with choice across standards and most popular cloud interfaces

5. **Open Stack[8]**

OpenStack is a cloud operating system that controls large pools of compute, storage, and networking resources throughout a datacenter, all managed through a dashboard that gives administrators control while empowering their users to provision resources through a web interface. Founded by Rackspace Hosting and NASA, OpenStack has grown to be

a global software community of developers collaborating on a standard and massively scalable open source cloud operating
system.
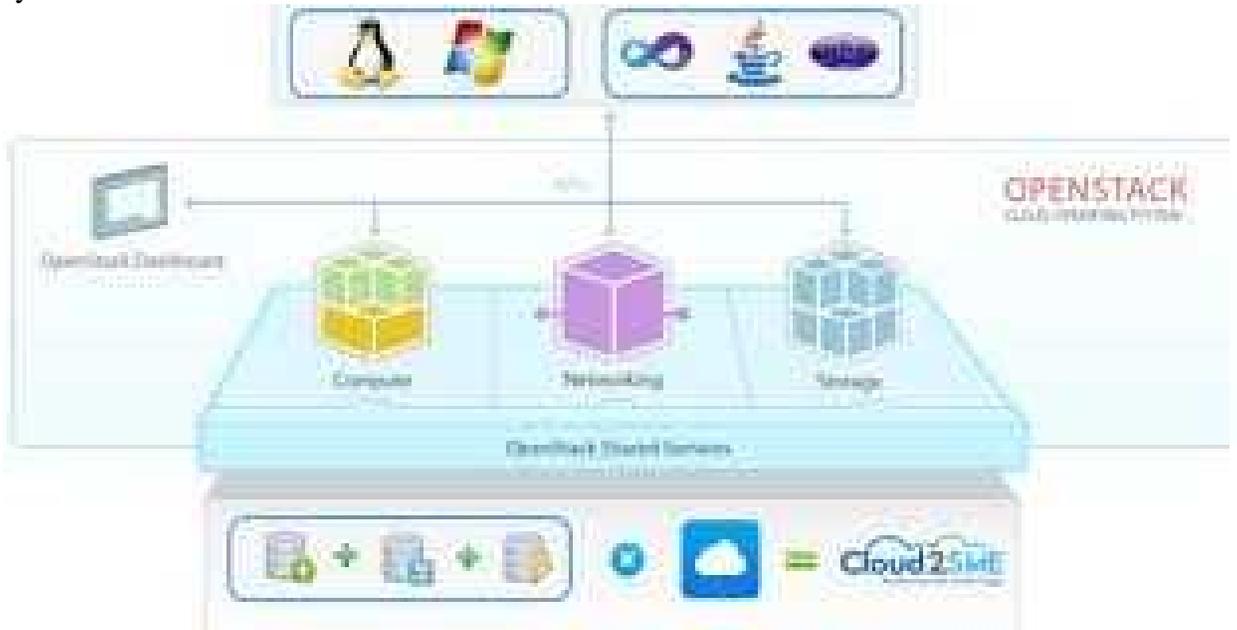
Corporations, service providers, VARS, SMBs, researchers, and global data centers looking to deploy large-scale cloud deployments for private or public clouds leveraging the support and resulting technology of a global open source community.

6. Delta cloud[9]

Deltacloud is an application programming interface (API) developed by Red Hat and the Apache Software Foundation that abstracts differences between cloud computing implementations.
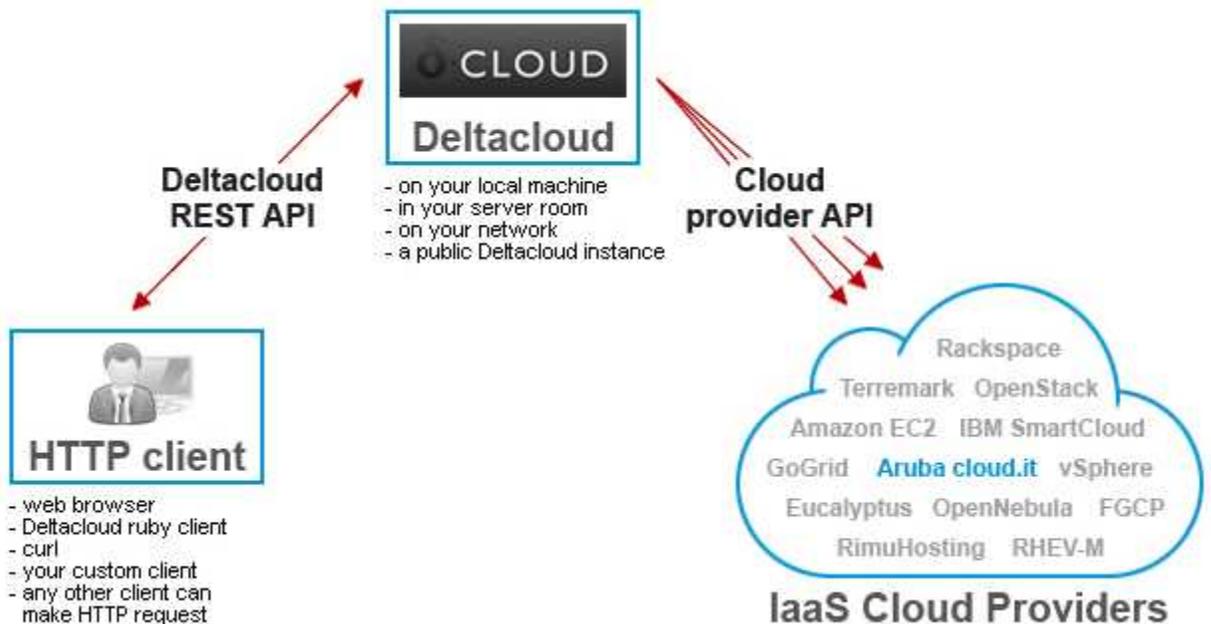
7. Alfresco[10]

Alfresco in the cloud is fully managed Software as a Service (SaaS) enterprise content management solution that allows users to securely access their corporate documents and files on any device, from any location.

Features

➢   Extranet Collaboration. Alfresco in the cloud provides a secure extranet to enable you to collaborate with a range of business partners to keep projects on track and get work done.

➢   Mobile Support. Mobile Support. Content locked behind the firewall is not always easy to access while working outside the office. VPN issues and complexity can frustrate end users that just need to access their documents and files. Alfresco in the cloud can be used as a simple but secure solution to allow mobile access.

➢   Synchronization. Firewall locked, on-premise solutions drive the use of unsanctioned 'file sharing and sync' tools (the 'Dropbox Problem') leading to content chaos. Alfresco in the cloud provides a way to sync content from on-premise to the cloud in a controlled way.

8. Collabtive[11]

Collabtive is web-based project management software. The project was started in November 2007. It is open source software and provides an alternative to proprietary tools like Basecamp. Collabtive is written in PHP and JavaScript.

Features

➢ Core functionality. Unlimited projects, milestones, tasklists, and tasks, Unlimited members with user profiles, Role-based permission management, Messaging, File management, Timetracking

➢ Reporting and notifications, Timetracker reports, activity logs and messages in PDF format, Export user profiles as vCard, RSS feeds for messages and tasks, Synchronization of calendars via iCal task export, Excel files from activity logs and timetracker reports, E-mail notifications

➢ Search, Data encryption, Fully themeable, Available in more than 35 languages, Full UTF8 support

9. Nuxeo[12]

Nuxeo Cloud provides the Nuxeo Platform as a Service - a seamless development, testing and production environment with nuxeo.io management services. From proof of concept to deployment, it has never been easier to build and scale Document Management, Digital Asset Management, and Case Management applications.

Features

- ➢ No Upgrade Stress. As part of the Nuxeo Cloud service offering, Nuxeo commits to upgrading and maintaining all of the underlying infrastructure.
- ➢ Reliable and secure. Nuxeo Cloud provides a range of different mechanisms to secure the application. it also provides an extremely reliable environment where replacement instances can rapidly be deployed by the engineers.

10. VTiger[13]

Vtiger CRM refers to both cloud and open source versions of the CRM application offered by the company Vtiger. It offers reporting, a customer portal and an Outlook plugin in its free edition, whereas those functions are in paid versions of the other CRM applications.

Sales automation (customizable product entries, inventory management, quotations, billing, and trouble ticketing)

Features

- ➢ Customer support & service functions, including a customer self-service portal
- ➢ Marketing automation (lead generation, campaign support, knowledge bases)
- ➢ Inventory Management
- ➢ Analysis and reporting
- ➢ Tag cloud functionality
- ➢ RSS feed subscription

4. Cloud Computing Applications in Libraries

Cloud computing is one of the most popular virtual technology for libraries to deliver the services in an effective manner. The library community can apply the concept of cloud computing to amplify the power of cooperation and to build a significant, unified presence on the Web. This approach to computing can help libraries save time and money while simplifying workflows.

A brief list of potential areas of improvement could include Goldner (2010)[14]:

- Most library computer systems are built on pre-Web technology
- Systems distributed across the Net using pre-Web technology are harder and more costly to integrate
- Libraries store and maintain much of the same data hundreds and thousands of times
- With library data scatter across distributed systems the library's Web presence is weakened
- With libraries running independent systems collaboration between libraries is made difficult and expensive
- Information seekers work in common Web environments and distributed system make it difficult to get the library into their workflow
- Many systems are only used 10% of their capacity.

- Combining systems into a cloud environment reduces the carbon footprints, making libraries greener

5. Conclusion

The real value of cloud computing is that it makes our library related software and data available transparently and everywhere including in latest available smart phone devices. FOSS is developed to meet the lowest risk choice for software systems today. All FOSS licenses specify that the software is available to use, modify, and distribute at no cost. The FOSS-Cloud is the most advanced Open Source Cloud. For a country like India these technologies have a great role in reducing the digital divide up to a good extent. The growing need for digital libraries to manage large amounts of data requires storage infrastructure that libraries can deploy quickly and economically.

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