Research Paper   **Agricultural Science**

Prospects of Cloud Computing in Agriculture in India

Prof. Bhavesh D. Patel	Assistant Professor, ASPEE Agribusiness Management Institute, Navsari Agricultural University, Navsari
Dr. Rahul G. Thakkar	Assistant Professor, ASPEE Agribusiness Management Institute, Navsari Agricultural University, Navsari
Dr. Bankim L. Radadiya	Director IT, Navsari Agricultural University, Navsari

ABSTRACT   In recent years, new ICT technologies are being implemented in every sector of India. The principal source of income & livelihood is the agriculture. To reach out the various farmers and serving their variety of information needs like Weather Forecasting, Agri Input supply, Agro Advise services, location specific agriculture marketing information, and many information needs of the Indian farmers can be reached out with the help of ICTs. For greater adoption of ICT in the agriculture sector it requires integrated ICT from the finger tips of the farmers. Cloud computing applications in the agriculture can provide the all the required the various information service needs by using the Cloud Computing Applications.

KEYWORDS : Cloud Computing, ICT

Introduction

Agriculture in India contributes 13 % of the Indian GDP and 62 % of population directly and indirectly depends upon the Agriculture in India. Presently growth in the India Agriculture Growth is 4. If farmers' Information requirement can be fulfilled in right time in a right manner can spurt the agriculture growth in the coming Years. It is possible with the help of ICT's in the agriculture sector. Government of India has initiated many ICT initiatives in Agriculture sector in India but the due to the lack of the literacy among the farmers it has not reaped the best results in the recent times. But Cloud Computing can provide the necessary impedance in the ICT implementation in the agriculture sector in India which can reap better results than the Past.

Presently there is no Agriculture specific cloud exists in India. Presently the well known cloud computing initiatives in India   by are

➢ Meghdooth: Open Source Cloud Stack

➢ Scientific Cloud Computing: Scientific Cloud Stack, IaaS, StaaS, PaaS

➢ E-Sikshak: C-DAC's E-Learning on Cloud

➢ MANTRA: MAchiNe Assisted TRAnslation System over CLOUD

The Cloud computing can speed up the ICT adoption among the framers with the more simplified usage of services from the Computer in a integrated manner as it will provide the all the information.

Introduction to Cloud Computing Technology

Cloud computing is a computing paradigm, where a large pool of systems are connected in private or public networks, to provide dynamically scalable infrastructure for application, data and file storage. With the advent of this technology, the cost of computation, application hosting, content storage and delivery is reduced significantly.

Cloud Computing Models

Cloud Providers offer services that can be grouped into three categories.

1. Software as a Service (SaaS):

Software as a Service Software as a Service (SaaS) is the model in which an application is hosted as a service to customers who access it via the Internet. When the software is hosted off-site, the customer doesn't have to maintain it or support it. On the other hand, it is out of the customer's hands when the hosting service decides to change it.

2. Platform as a Service (PaaS):

Platform as a Service (PaaS) is another application delivery model. PaaS supplies all the resources required to build applications and services completely from the Internet, without having to download or install software. PaaS services include application design, development, testing, deployment, and hosting. Other services include team collaboration, web service integration, database integration, security, scalability, storage, state management, and versioning.

3. Hardware as a Service :

Hardware as a Service (HaaS) is the next form of service available in cloud computing. Where SaaS and PaaS are providing applications to customers, HaaS doesn't. It simply offers the hardware so that your organization can put whatever they want onto it. Rather than purchase servers, software, racks, and having to pay for the datacenter space for them, the service provider rents those resources. HaaS allows you to "rent" such resources as Server space, Network equipment, Memory, CPU cycles, Storage space.

Types of Cloud Architecture
Public Clouds

A public cloud is basically the internet. Service providers use the internet to make resources, such as applications (also known as Software-as-a-service) and storage, available to the general public, or on a 'public cloud. Examples of public clouds include IBM's Blue Cloud, Sun Cloud, Google App Engine and Windows Azure Services Platform.

Private Clouds

Private clouds are data center architectures owned by a single company that provides flexibility, scalability, provisioning, and automation and monitoring. The goal of a private cloud is not sell "as-a-service" offerings to external customers but instead to gain the benefits of cloud architecture without giving up the control of maintaining your own data center.

Hybrid Clouds

By using a Hybrid approach, companies can maintain control of an internally managed private cloud while relying on the public cloud as needed. For instance during peak periods individual applications, or portions of applications can be migrated to the Public Cloud.

Cloud Computing Applications in Agriculture

Cloud computing is having upward trend up the global market covering almost all the prime sectors; there is nothing much done in agricultural sector. Only some countries like China, Japan, some parts of Africa, USA etc. have started implementing cloud computing in agro sector in recent past, but it is still in dormant state. It can be considered a new shift in developing countries. The optimal benefit and effect of cloud computing may be achieved if all the stakeholders can implement it and can be brought under a centralized control.

Proposed Cloud Computing Applications in Agriculture Development in India

The farmers or the people who have certain information about pests or diseases or any useful information are unable to share and propagate with other people who require it. If the proper knowledge sharing mechanism is at place then most of the above stated challenges can be solved.

The cloud can offer a centralized knowledge bank which can be used to store all the agriculture related information. This information bank will be available to the farmers and other users from agriculture sector at anyplace and at anytime at a very reasonable cost.

Another cloud computing application can be the database for the crop related the information which can be used for storing information about the production, Input cost,, pest & disease information.

Cloud Computing application can be ask the expert database which will provide solutions to common problems that farmers frequently face. Farmers can also post their problems seeking for solutions from the experts. It will also have an extensive set of frequently asked questions (FAQs) and their answers to make the response reach the farmers faster.

Following are some of the possible database solutions which can be offered as a service by Cloud service providers to the farmers.

➢ Store and maintain a database for the information generated in daily farming activities:

➢ Weather forecasting and related information

➢ Database for crop specific all the information with different parameters

➢ Database for market related information like Price, Season, market surplus ect.

➢ Database for production related data

➢ Database for various agricultural tools related information

Cloud computing will change the way that farming community obtain agricultural information. At present, people used to store and use their own data and related applied software, but in the era of cloud computing, the users need not to know where their own data is, they only need to put forward their needs to cloud computing and the cloud will meet all the propose requirements for the farmers. Using the Various services farmers does not need advanced computers knowledge, a famer trained to use basic computer work he will be able to use the Agriculture Cloud Service.

Advantages of Agriculture Cloud System in Agriculture in India

• **Data Management**
The Data is better managed with the help of I.T professional who are specialized in the Data Management and Data Warehousing Task.

• **Cost Reduction**
As hardware & Everything is out sourced to the specialized professionals rather than in house capacity building leading toward resulting more focus on Core Agriculture related activities.

• **Fast Scalability**
The information requirement can be scaled up fast and easily.

• **Better Communication Farmers & Researchers**
The Communication between researcher & the farmer can be minimized as they share same Cloud, ultimately resulting better user required research ripping better results for the Agriculture sector.

• **Wider Reach due to the Low Cost**
As cost gets down many users can adopt the I.T solutions resulting a unified approach for Software Services. Like APMC can use APMC Management software across the State.

• **Information Fusion**
Involvement of Farmers, Researchers, Traders, Agri Input Dealers, Banks, Agri Marketers, Organized Retailers, State Agriculture Universities, Extension Department Sharing a common platform sharing knowledge & requirements with each other can result a Picture in a more Co-ordinate manner. The Information coming from the different stake holder if properly combined can present the Information Fusion & benefiting all the Stake holders of the Cloud.

Disadvantages of Cloud Computing in Agriculture

• **Conflicting Laws :**
One of the main concerns of cloud computing is the conflict in different country laws because some servers are located in the other countries in different countries with different laws.

• **Security & Privacy:**
Another concern is the security and privacy. The nation may not be willing to hand over sensitive data to a third party.

• **High Bandwidth Requirement:**
The current national internet speed of India is 100 Mbps, which is just sufficient to cater the basic needs of India only, for entire India more than 1200Mbps speed is needed. For optimally use the cloud services in India needs much higher bandwidth than the current capacity.

• **Capacity Management:**
Capacity Management can be challenge for the Cloud Service providers as End Users have ability to deploy self service portals.

Conclusion

The Cloud computing is a game changing phase of IT that is not only impacting the way computing services are and will be delivered but also the way in which users will use IT. The Cloud promises several benifits but the challenges too need to be considered when planning for Cloud adoption in agricultural sector. The Cloud Computing is a new phenomenon if properly used with the some cautions it can pave the way for Faster ICT Adoption among the Agriculture Sector in India. Due to its low cost & Easy Use of the Cloud services can result the wider Agriculture specific ICT solution with the Unified approach. If it is widely adopted then it can connect all the agriculture sector stake holders with single cloud with bridging the gap between the Agriculture Researchers & Farmers. Farmers can get the Information Fusion of the all the stake holders of the Agriculture Cloud resulting farmers are getting what they actually want in form of Information on a right timely manner.

REFERENCES

Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility R Buyya et al. / Future Generation Computer Systems 25 (2009) 599_616. | | [2] Cloud Security Alliance. Security best practices for cloud computing, 2010b http://www.cloudsecurityalliance.org [Accessed: October 2014]. | | [3] Duan Yan-e ,"Design of Intelligent Agriculture Management Information System Based on IOT",IEEE,4 ,.Fourth International conference on Intelligent Computation Technology and Automation,2011 | | [4] Shikhar Kr. Sarma, Kh. Robindro Singh & Abhijeet Singh,"An Expert System for diagnosis of diseases in Rice Plant", International Journal of Artificial Intelligence, Volume(1): Issue(1) ,pp 26-31 | | [5] Introduction to Cloud Computing architecture, White Paper,1st Edition, June 2009,sun microsystems ,[Online][Available], http://eresearch.wiki .otego .ac.nz /images/7/75/Cloudcomputing.pdf | | [6] K.Venkataramana, M.Padmavathama, "Agent Based approach for Authentication in Cloud", IRACST International Journal of Computer Science and Information Technology & Security", Vol. 2, No.3, June 2012 | | [7] Dr. G Sahoo,* Dr. Shabana Mehfuz** and Rashmi Rai " Applications of Cloud Computing for Agriculture Sector " Technical trends www.csi-india.org | | [8] Anthony T. Velte, Toby J. Velte, Ph.D. Robert Elsenpeter "Cloud Computing: A Practical Approach " | | [9] http://www.asigra.com/blog/cloud-types-private-public-and-hybrid (accessed on October 2014) | | [10] Jayade, K. G. , Gaikwad, C. J "Cloud Computing for Agricultural Information Management in India " | International Association of Scientific Innovation and Research (IASIR). |