CLOUD COMPUTING AND AGRICULTURE DEVELOPMENT IN INDIA

1 P.ANITHA, 2 Dr.T.CHAKRAVARTHY
Research Scholar, Research Advisor,
Dept of computer science,
Avvm Sri Pushpam College(Autonomous),
Poondi, Thanjavur(dt),
TamilNadu.

ABSTRACT :

Cloud computing technology in agricultural areas has greater change in the overall development of India. An effective implementation of cloud computing is encouraging in agricultural sector. Cloud Computing is emerging today as a commercial infrastructure that eliminates the need for maintaining expensive computing hardware, software, Information technology, staff, infrastructure, recourses and their maintenance. Cloud computing is a network-based environment that focuses on sharing computations, Cloud computing networks access to a shared pool of configurable networks, servers, storage, service, applications and other important Computing resources[1]. Cloud computing technology very helpful for all-agricultural related data bank (Soil-related, weather, Research, Crop, Farmers, Agriculture marketing, fertilizers and pesticide information) in the cloud. The future development of agriculture depends how the new technologies such as cloud computing are adopted with a focus on farmer needs. The use of this technologies should help a farmer in terms of accessibility. Cloud computing in agriculture provides an enabling environment for development and services with a flexible environment. In this paper, discuss about the computing models, characteristics, deployment model, cloud service model, cloud benefits and challenge of cloud computing in agriculture field.

Keywords: *Cloud computing, Cloud model, Indian Agriculture, IaaS, Paas and SaaS* .

I.INTRODUCTION

With the continuous development of computer technology and network technology, various areas of the world have been undergoing enormous changes. The application of information technology will not only change the way of information interaction to shorten the distance of the world, but also conducive to social and economic development, improvement of production efficiency. The cloud computing technology, the resurgence of the climax of the national information construction, being seen as the third IT wave following the computer technology and Internet technology[2].

Currently, the countries in the world for the study of cloud computing technology is not very mature, Research in developed countries started earlier, and has made outstanding achievements in the basic framework, technical support, platform building. Now, cloud computing has been used and promoted in the field of medicine and medical, manufacturing, financial services, energy, communication and other key areas, which will play an important role for improving the efficient use of resources, information sharing and integration. In India, Cloud computing applications in agriculture are in the phase of theoretical research, and lack mature cases. This technology is great significant to improve management level in the weak field of agriculture information construction, the combination of agricultural information and modernization.

II.AGRICULTURE AND CLOUD COMPUTING CLOUD SERVICES

a)Infrastructure as a Service (IaaS):

Infrastructure as a Service, sometimes abbreviated as IaaS, contains the basic building blocks for cloud IT and typically provide access to networking features, computers (virtual or on dedicated hardware), and data storage space. Infrastructure as a Service provides you with the highest level of flexibility and management control over your IT resources and is most similar to existing IT resources that many IT departments and developers are familiar with today.

b)Platform as a Service (PaaS):

Platforms as a service remove the need for organizations to manage the underlying infrastructure (usually hardware and operating systems) and allow you to focus on the deployment and management of your applications. This helps you be more efficient as you don't need to worry about resource procurement, capacity planning, software maintenance, patching, or any of the other undifferentiated heavy lifting involved in running your application.

c)Software as a Service (SaaS):

Software as a Service provides you with a completed product that is run and managed by the service provider. In most cases, people referring to Software as a Service are referring to end-user applications. With a SaaS offering you do not have to think about how the service is maintained or how the underlying infrastructure is managed; you only need to think about how you will use that particular piece software.

A common example of a SaaS application is web-based email where you can send and receive email without having to manage feature additions to the email product or maintaining the servers and operating systems that the email program is running on.

TYPES OF CLOUDS

a)Public cloud

The cloud infrastructure applications, storage, and other resources are made available to the public for free or on pay-per-use model. It is owned by an organization selling cloud services. Example: Amazon, Google Apps, Windows Azure etc.

b)Private cloud

The cloud infrastructure is operated solely for a single organization. It may be owned, managed and operated by the organization or a third party, and may exist on-premises or off-premises.

c)Hybrid cloud

The cloud infrastructure is a composition of two or more clouds (private, community, or public) that re-main unique entities but are bound together by standardized or proprietary technology that enables data and application portability.
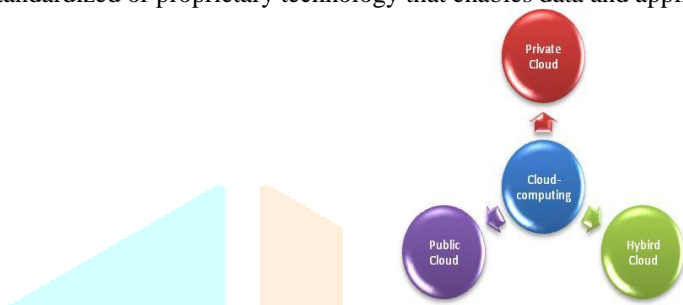

Figure1.1-model of cloud computing

III.CHARACTERISTICS OF CLOUD COMPUTING:

The special publication includes the five essential characteristics of cloud computing:

1. **On-demand self-service:** A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider[3].

2. **Broad network access:** Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., **mobile** phones, tablets, laptops and workstations).

3. **Resource pooling:** The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand[4]. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state or datacenter). Examples of resources include storage, processing, memory and network bandwidth.

4. **Rapid elasticity:** Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

5. **Measured service:** Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth and active user accounts). Resource usage can be monitored, controlled and reported, providing transparency for the provider and consumer.
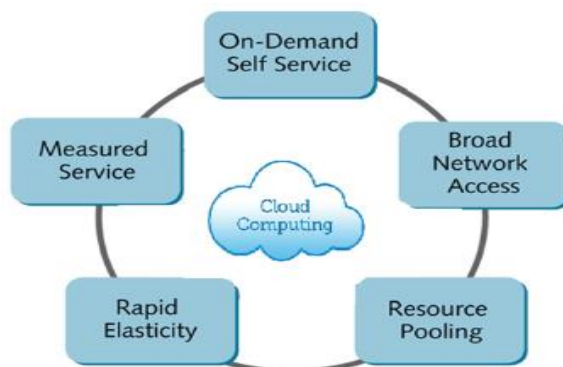

Figure1.2-cloud characteristics

IV.ROLE OF CLOUD COMPUTING IN AGRICULTURE FIELD:

➢ Agriculture information data bank (crop, weather, soil, growth progress, farmer data & expert consultation)
➢ Store all the agriculture related information in a centralized cloud, which will be available to all the users at anytime, anywhere
➢ Management of all data related to land,
➢ location, area; soil and land characteristics through centralized decision support systems
➢ High integration & sharing of agricultural information
➢ It can be eliminate the farmer's limitations of technical knowledge & resources Providing agricultural technology service & science
➢ Improvement of the agricultural products marketing
➢ Efficient use of agricultural resources
➢ Promote the circulation of agricultural product and service in wider level.

V.BENEFITS OF CLOUD COMPUTING IN AGRICULTURE:

▪ Data Readiness any time & any where
▪ Local and global communication
▪ Improve economic condition of the Nation
▪ Enhanced the GDP of the nation
▪ Ensure food security level
▪ Motivation of farmers and researchers
▪ Reduction of technical issue
▪ Rural-Urban movement
▪ Data availability at any time and at any location without delay
▪ Improve market price of Food, seeds, other product

VI.CHALLENGE OF CLOUD COMPUTING IN AGRICULTURE

Maintenance & Supervision by third party, So data security is less

▪ Indirect administrator accountability
▪ Farmer is unknown for cloud computing technology
▪ Less physical control
▪ Attraction to hackers
▪ Need on the network connectivity
▪ Requires a constant Internet connection
▪ It runs the risk of security
▪ Farmers training necessary for this technology
▪ Does not work well with low-speed connections
▪ Platform facility is not easily available for farmers

VII.CLOUD COMPUTING APPLICATIONS IN AGRICULTURE

High integration and sharing of agriculture information

Cloud computing offers a new management mechanism, which can integrate information resources in different regions and departments, build information sharing space and share infrastructure[5]. In the Agriculture Information Resources Cloud (AIRC) users are able to get agricultural information through a variety of terminal not just the computer, which promotes the information sharing significantly[6].

Real-time monitoring and guidance in agricultural production

Currently, cloud computing technology already achieves real-time visual monitoring of crop growth, not only able to quickly get the surface information but also be able to detect the water and fertilizer content in the soil[7].

Construction and improvement of the agricultural products supply chain

The cloud platform facilitates the information exchange and communication between farmers and agricultural enterprises, it has very important significance for constructing and improving agricultural products supply chain, ameliorating agricultural products sales, and increasing farmers' profits.

Tracking and monitoring of the agricultural products quality

In the cloud computing platform, the animal can take advantage of advanced computer imaging technology to evaluate-

1. The animal meat,
2. Select and cultivate varieties,
3. Establish the database and animal nutrition demand model, and meet a number of animal's nutritional needs indicators and allow the maximum production of livestock and poultry.

VIII. CURRENT CHALLDNGES IN INDIAN AGRICULTURE

- Poor knowledge about the weather forecast, pests and diseases.
- Poor ICT infrastructure and ICT illiteracy.
- Non availability of timely and relevant content.
- Lack of awareness among farmers about the benefits of ICT in agriculture.
- Particular non availability of agricultural information kiosks/ knowledge centre's at the grass root level.

IX.ROLE OF CLOUD COMPUTING IN SOLVING THESE CHALLENGES

Using the applications of cloud the farmers have nothing to worry about hardware and software investment and also the technical knowledge required to learn them [8]. The farmers will send the request for the specific cloud service using a user friendly device, and the cloud service provider will analyze and handle the request dynamically. And finally the results will be passed back to the client. They can get most up-to-date farming and propagation techniques, pest control knowledge, and can also track the whole process from production, distribution to consumption [9]. They can also provide the systematic information collection like Supply chain management, Market forecasting and Business decision-making information[10].

X.CONCLUSION

Cloud computing is a newly introduced concept and most of the developing nations are not to acquire it and have a well established information base for the nation. This will return to a well-connected world. Cloud computing has benefit to and entire economics, but substantial challenges stands in the way.

Cloud computing will support the farmers access to application services at any wherever using various terminals. They request their resources from the cloud not from a fixed physical entity. The applications are run in the cloud, the farmers don't need to know and worry the specific location of the application. They only need to a laptop or a cell phone and they can achieve what they want. In the next three years, cloud computing in India will be more and more used by enterprise. India will definitely benefit if the proposed model is implemented effectively in the agricultural sector. An effective implementation of this model will encourage other sectors also, which will lead to optimal benefit of shifting towards cloud . This will bridge the gap between technology, information and farmers of India. This will have positive and tremendous impact on other fields also that will lead the nation towards technological development. Therefore, promotion and awareness of Cloud computing technology and its use, implementation will bring out new zenith in economic development in India.

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