CLOUD COMPUTING AND AGRICULTURE

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Abstract- Cloud computing refers to the delivery of computing resources over the Internet (network of remote servers). Instead of keeping data on your own hard drive (local server or personal computer). Cloud computing is a newly introduced concept and most of the developing nations are not readily willing to accept and implement it. Therefore, it needs a mass awareness among the stakeholders 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 agriculture, businesses, industries, and entire economies, but substantial challenges stand in the way.
Cloud computing will change the way that people use to obtain agricultural information. The cloud computing infrastructure in the future will become an essential basis for farmer's lives. Many countries like South Africa, Japan, Bhutan and USA has migrated to cloud based application in agriculture sectors.

Keywords- ICT, Cloud Computing, Agriculture, Farmers.

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Introduction

In recent years, new ICT technologies are being implemented in every sector basically focused on the agricultural sector within which new application domain is of Cloud Computing. It allows users to make use of services such as real-time computation, data access, and storage without the need to know the physical location and configuration of the system that delivers the services.
Developing nations based on agriculture can improve the economic condition by using ICT applications in agricultural sectors. One of the possible way by which this can be achieved is the successful implementation of the new ICT tool like

Cloud Computing:
Cloud Computing: Storing and securing huge amounts of data that is accessible only by authorized users, having ability to use applications on the Internet that store and protect data while providing a service. Used in Web services to integrate photos, maps, and GPS information to create a mashup in customer Web browsers.

Agriculture and Cloud Computing
Types of clouds:
o   Public Cloud
  ▪   Public clouds are term common cloud. Public clouds are owned and operated by cloud provider. In this, resources provided by a cloud provider are used by different organizations through public Internet on a Pay As You Go (PAYG) model.
For Example:
The Infosys Company provide the public cloud services that is only used by the external people. So, this people can access their application & software & also store the data on PYAG model.
o   Private Cloud
  ▪   Private clouds are built exclusively for a single enterprise. Cloud infrastructure is owned and maintained by an organization. They aim to address concerns on data security and offer greater control, which is typically lacking in a public cloud.

For Example:
BMC Software Company in Pune uses private cloud. They only focus on work done on time or not, not on working hours. So, employees of BMC Company do their work by sitting at home & the entire work stores it on private cloud. And this data can be access by project manager at any time anywhere. An external person does not access it, so it is secure then public.
o   Hybrid Cloud
  ▪   The National Institute of Standards and Technology (NIST) defines hybrid cloud as "a combination of public and private cloud." They can help to provide on-demand, externally provisioned scale. Mainly the hybrid cloud is used to manage unexpected workload. Hybrid clouds introduce the complexity of how to distribute applications across both a public and private cloud.

Characteristics of Cloud Computing:
o   Everything As a service
  ▪   Define standard interfaces and protocols to allow developers to utilize information tools and functions as services that users can access without knowledge of their internal workings.
o   Availability of broadband
  ▪   Today users routinely download music and short video clips. However, full-length movies at high quality are still download faster and easier.
o   Warehouse-size data centres
  ▪   Another driver of cloud computing is an evolution from small, distributed, data-oriented computing centres to more cost-effective, very large scale commercial cloud services.
o   Energy efficiency
  ▪   In some data centres, only 30 percent of the electric power is used by the IT equipment, with the remaining 70 per cent going to cooling, backup, etc.
  ▪   The last few years has seen rapid learning in warehouse-size data centres on the design of cooling systems environment and backup with the result that power utility efficiency is improving.

Cloud Computing Benefits
o Reduced Cost :
  ▪ The billing model is pay as per usage; the infrastructure is not purchased thus lowering maintenance. Initial expense and recurring expenses are much lower than traditional computing.
o Increased Storage :
  ▪ Today, storage & maintenance of large volumes of data is a reality. Sudden workload are also managed effectively & efficiently by the using cloud computing.
o Minimize infrastructure risk :
  ▪ Cloud computing minimizes the infrastructure risk by enabling "surge computing", where an enterprise datacentre able to handle workload and resources can be better matched to immediate needs, and at lower cost.
o Increased pace of innovation:
  ▪ This allows small companies to compete more effectively with traditional organizations whose enterprise datacentres can be longer. Increased competition helps to increase the pace of innovation. The entire industry serves to benefit from the increased pace of innovation that cloud computing promotes.
o Flexibility:
  ▪ This is an extremely important benefit. Enterprises having to adapt more rapidly, to changing business conditions and speed to deliver. Cloud computing getting applications to market very quickly, for deployment.

Cloud Computing Challenges
o Data Protection :
  ▪ Enterprises need an assurance of business data security from vendors. They fear losing data to competition of consumers. In the existing models, firewalls across data centres (owned by enterprises) protect sensitive information. In the cloud model, Service providers are responsible for maintaining data security and enterprises would have to rely on them.
o Data Recovery and Availability:
  ▪ Appropriate clustering and Fail over
  ▪ Data Replication
  ▪ System monitoring (Transactions monitoring, logs monitoring and others)
  ▪ Maintenance
  ▪ Disaster recovery
  ▪ Capacity and performance management
o Management Capabilities:
  ▪ Because of multiple cloud providers, the management of platform and infrastructure is still not developed very much. For example, Features like "Auto-scaling" are a crucial requirement for many enterprises. There is huge potential to improve on the load balancing features provided today.
o Regulatory and Compliance Restrictions :
  ▪ In some of the European countries, Government regulations do not allow customer's personal information and other information to be physically located outside the state or country.
  ▪ In order to meet such requirements, cloud providers need to setup a data centre or a storage within the country with regulations. Having such an infrastructure may not always be feasible and is a big challenge for cloud providers.

Relationship between Cloud Computing and Agricultural Development
Now a day's cloud computing is a newly adopted concept & it is rarely used in agriculture sector. But it can be possible to implement it in agriculture sector. The applications of cloud computing technology in agriculture can solve the problem of:

  ▪ Agricultural Modernization: Modernization of agriculture includes three aspects:

a. Widely use modern agriculture production equipment, agricultural machinery.
b. Use modern agricultural planting and breeding technology.
c. Use modern forms of production and management methods.

  ▪ Agricultural Informatization: Import cloud computing technologies into agricultural industry, establish information network services platform, the level of Agricultural Informatization will be a qualitative upgrading.
  ▪ Efficient use of agricultural resources: Management of agricultural production leads to low utilization of agricultural resources. However, cloud computing can integrate production facilities, technical equipment, information services and other resources effectively; this form of paid services like as easy to buy.
  ▪ Promote the circulation of agricultural products: Agricultural producers facing a difficulty, is the problem of sales of agricultural products. Cloud computing will establish a bridge of communication between farmers and consumers; it is not only beneficial to the farmers to produce marketable products but also realization of the value-added of the agricultural products.

Cloud Computing Applications in Agriculture
o 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.
  ▪ 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.
o 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.
o 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.
o Tracking and monitoring of the agricultural products quality
  ▪ In the cloud computing platform, the animal husbandry 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.

Current Challenges in Indian Agriculture
o Poor knowledge about the weather forecast, pests and diseases.
o Poor ICT infrastructure and ICT illiteracy.
o Non availability of timely and relevant content.
o Lack of awareness among farmers about the benefits of ICT in agriculture.
o Particular non availability of agricultural information kiosks/ knowledge centres at the grass root level.

Role of Cloud Computing In Solving These Challenges
o 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.
o 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.

o   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.

o   They can also provide the systematic information collection like Supply chain management, Market forecasting and Business decision-making information.

Cloud Computing in Agriculture: Global Landscape

o   In South Africa, Farmers use a cloud-based trading system that disseminates information about planting schedules, crop status, harvesting times, and market prices through mobile phones.

o   In Japan, Fujitsu, a leading company in Cloud Services, provide a SaaS-based solution for agricultural production management, which is designed to support management in both agriculture and food related industries. These services allow farmers to visualize the entire production process, while enabling management leading to revenue growth through utilizing comprehensive data.

o   In USA, The United States Department of Agriculture (USDA) has moved its e-mail and productivity applications to the cloud in order to consolidate disparate messaging environments onto a single, unified platform, which will reduce costs, boost workforce productivity and improve communications and collaboration across the agency.

Discussion

Cloud computing will change the way that people use to obtain agricultural information. The cloud computing infrastructure in the future will become an essential basis for people's lives. At present, people used to store and use their own data and related applied software, but in the era of cloud computing, the users only need to have one computer which can access internet, one browser and they can enjoy the endless fun that brought by cloud computing and they never need to worry about the virus of software, latest version of software, etc.

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 China will be more and more used by enterprise.

Conclusion

Cloud computing offers benefits for organizations and individuals. There are also privacy and security concerns. If you are considering a cloud service, you should think about how your personal information, and that of your customers, can best be protected. Carefully review the terms of service or contracts, and challenge the provider to meet your needs.

Cloud computing is a newly introduced concept and most of the developing nations are not readily willing to accept and implement it. Therefore, it needs a mass awareness among the stakeholders 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 businesses, industries, and entire economies, but substantial challenges stand in the way. Defining an action for industry in order to accelerate cloud adoption and generate benefits for all. "Cloud Computing may multiply the benefits of the Internet by a factor of 10 but we may also face 10 times the challenges."

Conflict of Interest: None declared

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