Agricultural Development In IRAN Base On Cloud Computing Theory

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Abstract

Cloud computing technology has brought great opportunities to the development of IRAN's agriculture; however it is also facing unprecedented challenges. According to the advantages of cloud computing, based on the status quo of Iran's agricultural development, the paper first discussed the impacts of cloud computing for IRAN's agricultural development; and analysed the field and the prospects of its possible applications in agriculture; then presented the application and promotion of cloud computing technology is a long-term system works, not only need to build the data centre, integrate resources, enhance service capabilities, and also need to make information security .

1. Introduction

With increasing development of IT and communications and growth of data size in the network, together with the emergence of new applications and computing needs, the necessity of computational capacity is growing exponentially day-by-day. In shofar as nowadays-computational capacity is considered as one of the main source (together with water, electricity, fuel and telephone) [1]. This necessity will attract the attention more than before with presenting new considerations such as providing the energy of data canters and their influence on the environment and also global instruction about the constant development. Cloud Computing is a new approach which brings the information computing and storage from PC's into giant data centre. It presents application programs and informational needs as service via Internet [2]. On the other hand, one can take advantages of third person facility to do his computational requirements. One of the main motivations in developing the cloud computing is enhancing server's efficiency, decreasing the cost of computations and storage, fast and unlimited growth of computing and storage capacity and also increasing the reliability [3].

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. Major world-class IT companies, such as Microsoft, HP, Google, IBM, Oracle, and so on, have deeply realized the huge market potential and business opportunities in the field of "cloud computing", and all have been engaging in these studies [4]. 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 [5].

In Iran, Cloud computing applications in agriculture is in the phase of theoretical research, and lack mature cases [6]. Therefore, this technology is great significant to improve management level in the weak field of agriculture information construction, the combination of agricultural information and modernization [7].

2. Cloud Computing Technology

During the recent years, many scholars had focused on cloud computing as the latest development in the field of Information Technology. Cloud computing is commonly described as the usage of computing resources provided as services over network [8]. Different definitions and domains have been attributed to cloud computing. It provides various services for users in spite of not having relevant information

over the technology structures. Therefore, it actually can be called "service on the cloud" [9].

An all over the world well-accepted institution in the Information Technology field is national institute of standards and technology (NIST), which defined the cloud computing. NIST used five important features, four cloud deployment models and three cloud services models to describe the cloud computing architecture [10]. Figure 1 shows the overall architecture of cloud computing.

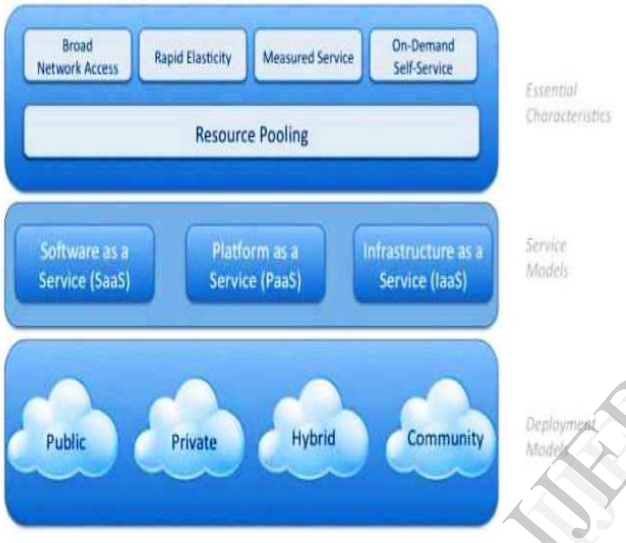

Fig 1: Cloud Computing Architecture

As figure five important characteristics are identified by the NIST to make a distinction between cloud computing from other computing models, which could be categorized as common and essential characteristics. These characteristics are categorized as follow: On Demand Self-Service, Broad Network Access, Resource Pooling, Rapid Elasticity and Measured Service [9].

Cloud computing is a general term for anything that involves delivering hosted services over the Internet. These services as mentioned in figure 1 are broadly divided into three categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS). The name cloud computing was inspired by the cloud symbol that's often used to represent the Internet in flowcharts and diagrams [11].

SaaS delivers all traditional application purposes, but access to certain applications is achieved over Internet. In the cloud, PaaS is the service layer middle factor that provides software and services for users without downloading or installations. Platform as a Service, offers an infrastructure with a high level combination to use and test the cloud applications [12]. IaaS is the part of the architecture to offer the infrastructure, which is essential for SaaS and PaaS. IaaS uses operating and applications systems to create resources such as network, storage and servers more accessible, which provides basic infrastructure on-demand services [13].

Various deployment models are proposed based on the cloud computing environments availability and the intended access methods. Access permission or limitation is depends on the type of information, business processes and organization characteristics. More limited environment is required in some organizations to certify that the only accurately authorized users can use deployed cloud services of certain resources. In this section, a number of clouds computing deployment models are discussed that comprise of public cloud, private cloud, hybrid cloud and community cloud [14].

3. The relationship between Cloud computing and agricultural development

Although IRAN has achieved fruitful results in crop cultivation, animal and plant breeding, agricultural production is still decentralized operation, low level information technology, coupled with farmers limitations constraints, the speed of agricultural modernization resulting is slow [15]. Therefore, it is often the obvious contradiction between supply and demand in agricultural products; it not only hurt the enthusiasm of farmers engaged in agricultural production, reducing farmers' income, but also hindered the rapid socio-economic development. The applications of cloud computing technology in agriculture can solve the bottleneck problem of agricultural modernization and agricultural information, and can also break agricultural producers' limitations in knowledge or technology, reduce duplication, improve

utilization of existing resources to make up for dispersed, small-scale, regional differences agricultural production and the strong dependence on the natural climate vulnerability of agricultural production [16].

Cloud computing applications in agriculture makes agricultural producers do not need too much hardware and software investment, do not need to master advanced knowledge of computer and network technology; they can enjoy a more professional and more comprehensive services. The client just need to send the request to the cloud, then resources dispatch center will analysis and handle dynamically, and finally the corresponding processing results will be passed back to the client [7].

4. Cloud computing applications in agriculture

In the 'Agriculture Information Resources Cloud (AIRC)', the agricultural sector and farmers can be real-time access to a full range of agricultural information that satisfies users extremely, and greatly reduces operating costs while substantially increase the efficiency of information haring.

Currently, cloud computing technology already achieves real-time visual monitoring of crop growth, not only able to quickly get the surface information, such as leaf area, leaf perimeter, stem diameter, stem height, etc., but also be able to detect the water and fertilizer content in the soil. Meanwhile, the crops information received from the cloud platform intelligent processing can automatically trigger corresponding improvement measures [17].

As an important supporting technology of digital agriculture, cloud computing technology offers advanced information technology services, and realizes digitizing and visualizing expression, controlling, design and management of all the agriculture involving objects and the whole process. Agricultural extension, education and scientific research achieve trinity in the cloud-computing environment [7].

Tracking and monitoring of agricultural products quality and safety can be fully realized in the cloud-computing platform. The cloud computing technology has been integrated into the scientific research, raw materials access, production and processing, storage and transportation, marketing, quality traceability and information services, inspection and quarantine, supervision and administration, etc. [18].

The cloud platform facilitates the information exchange and communication between farmers and agricultural enterprises; it has very important significance for constructing and improving agriculture product supply chain [19].

Figure 2 show the overview of the affect of cloud computing applications is agriculture industry.

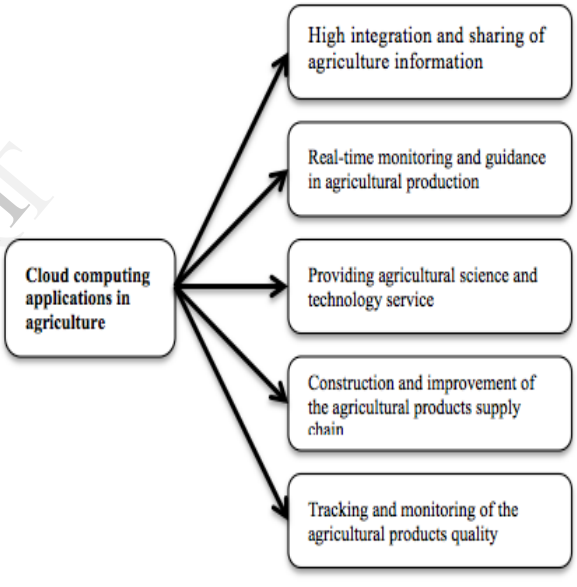

Fig 2: Cloud computing applications in agriculture

Cloud computing technology improves many industry in different way and help organization the gain the benefit from adoption of cloud computing [20]. As mentioned in figure 2, cloud computing application cause agriculture industry gain many benefit by adoption of cloud computing.

5. Implementation of cloud computing technology in agriculture

Promotion and application of cloud computing technology is an inevitable choice to achieve the modernization and informatization of agriculture, is also an inevitable trend in the Internet technology popularization. But cloud computing application is still in its infancy stage and lacks references of success cases, therefore needs long-term exploration and step-by-step implementation. Meanwhile, it is more needed to raise awareness of the abundant agricultural producers and all-level government departments to improve their own qualities and enhance management capabilities for safeguarding the smooth implementation of cloud computing technology [21].

In order to operate and implement of the agricultural cloud computing technology better, first we must determine what constitutes the cloud computing data center and how to achieve the functions. The underlying of cloud computing data center is constituted by a large number of servers connected through the network and various types of controllers. Load balancing and computing virtualization are used for balancing the computing power of underlying server, and then dynamically deploy computing resources to agriculture-related personnel. Storage virtualization and cloud distributed file system are used to provide cross-server file storage service, automatically migrating information from the full server to get high utilization of storage resources [22].

Agricultural service application, the required functions include basic authentication and billing functions that can be shared with other fields such as GPS data processing and mapping systems. Other functions that should be shared with other fields are too numerous to mention, but include image/speech processing and data mining. These functions can probably be used not only in agriculture but also in any business where work needs to be done on the spot, such as medicine/nursing and maintenance work. Some examples are shown in Figure 3 [7].

At present, in the verification trials we are using a system with a vertically integrated structure, but from the beginning of the prototype development we have focused on the fact that it is possible to develop horizontally at the platform-as-a-service (PaaS) layer and below. In the future, in parallel with holding specific discussions for the construction of optimal platforms in a crosscutting internal fashion, we also intend to ensure greater exposure of Fujitsu's elemental technologies that have remained buried until now [7].

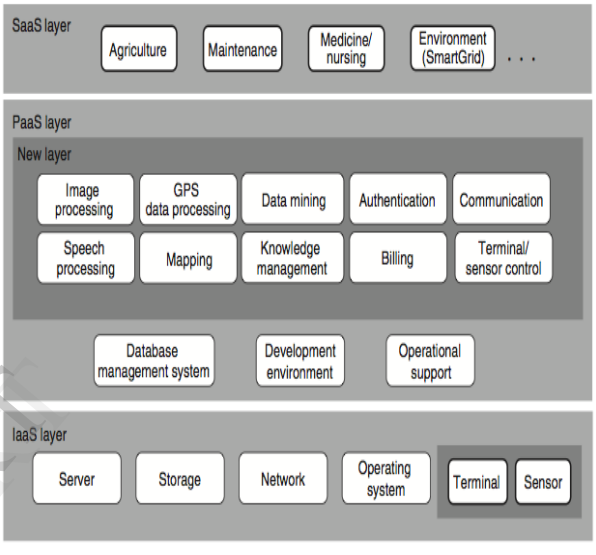

Fig 3: Proposed layer structure for Cloud services

6. Conclusions

Agriculture traditionally maintained by families and villages where the passing on and sharing of knowledge is regarded as very important. The accumulation and sharing of knowledge has resulted in better overall efficiency and productivity**.** Cloud computing technology attracts more and more attentions of countries and enterprises with its powerful advantages and market potential, the feasibility and applicability of whose application are also exploring in various industries. This technology will bring greater opportunities to the agricultural development in Iran, and also be the inevitable choice to achieve modernization and informatization in agriculture. However, all-level governments should be fully aware that its implementation will be a long exploring process, especially in the weak infrastructure and information construction

agriculture area, where the application difficulties are hard to imagine. Therefore, government departments and institutions should pay full attention to the implementation of this technology, raise awareness, and especially provide strong support in platform construction, resource integration and service capabilities. We believe that with the supporting of modern information technology and network technology, Iran's agriculture is bound to usher in a rapid and healthy development period.

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