iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 **Issue:** V **Month of publication:** May 2016

DOI:

www.ijraset.com

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Volume 4 Issue V, May 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Cloud Computing For Rural India

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Abstract— Majority of Indian population lives in the villages and hence the future of India lies in the development of rural India. Cloud Computing is the revolution in computing domain where the cloud resources are made available whenever needed and they are charged on pay-as-you-go basis. Cloud Computing allows software applications, processing and data storage to deliver as a utility. Benefits of cloud computing like reduced capital costs and improved accessibility for the user can plays a key role in the development of rural India. The facts like widespread use of advanced smartphones by rural people and the increasing number of rural Internet users are making the way simple to implement cloud. This paper discusses how the cloud computing technology can be used for the overall development of rural India enabling better decision making, online activities and improved livelihood of rural population.
Keywords— cloud computing, village, service, education, agriculture

I. INTRODUCTION

Cloud computing is a model for empowering helpful, on-demand network access to a shared pool of computing resources (for example networks, servers, storage, applications and services) that can be quickly acquired and released with minimum interaction and management by service provider. Cloud Computing allows to deliver storage, processing and applications as an utility. The cloud service providers can now provide all these services through internet. The cloud is a troublesome innovation, and numerous natives of rural India will benefit by speedier, less expensive and reliable applications on the cloud. Utilized in the right way, the cloud can offer the government some assistance with delivering new administration models which thusly will drive development and diminish costs. Be that as it may, for this to happen, it is vital for key partners to get instructed, teach the administration pioneers in the second stage, and after that distinguish the cloud system for the rural population. On the off chance that this happens in the right heading, the cloud will develop into merchandise pushing down costs of administrations.

Most of the population of India lives in its villages and smaller cities. Obviously the future of India lies in villages. About 69 per cent of India's total population and 86 per cent of the rural population gets less than Rs. 100 as their daily earning. According to the Census of India 2011, out of 121 Crore of population 83.3 Crore people are spending their lives in rural India [2]. This figure is 68.84 % of total population of India. Such a huge number of people have great potential to make India a superpower. But the biggest obstacle for this is the lack of infrastructure and thus technical knowledge among the people in rural India. But the fact that India is the fastest growing Internet country spreads the ray of hope for better India. The opportunity is that there are more mobile phones than Radio in Rural India (100million subscriber base).

The number of internet users could cross 550 million in 2018, according to the 2015 report 'india@digital.bharat' by the Boston Consulting Group (BCG) and Internet and Mobile Marketing Association of India (IAMAI) [3]. In June 2014, there were 60 million Rural Internet users. This number could increase to 280 million in 2018 [3]. With such a widespread use of Internet in rural areas and introduction of cloud computing technologies, the overall development of rural India can be achieved with a little cost.

Rural population has been overlooked for more than 60 years and the cloud will convey the change that is required to connect the gap between country India and urban India and will enhance the economy of rural India. The government of India through BSNL (Bharat Sanchar Nigam Ltd) is giving broadband network up to the Taluka level which makes information availability a reality for rural India. This will enable rural population to use the cloud without any hassle.

II. ADVANTAGES OF CLOUD COMPUTING FOR RURAL INDIA

Cloud can be advanced as "Gandhi Engineering", the term utilized by New York Times as a part of an article on the Tata Nano and it defines Gandhi Engineering as "a mantra that combines irreverence toward established ways with a scarcity mentality that spurns superfluities" [4]. The cloud computing is a wonder of Gandhi engineering and includes low cost; high operational proficiency; being elastic and scalable.

There are many advantages of using cloud computing, out of which following advantages seems more suitable for rural India development:

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Low setup cost makes cloud computing particularly appealing for rural India.

Ease of administration. No need of software licenses, cooling and power supply to run the servers or obtaining extra hardware.

Scalability makes rapid rural infiltration a reality; without much of a stretch the quantity of clients can be added irrespective of the location.

Acceptability from any device from any location. The user could access the cloud through personal computer, someone else's computer, mobile phone, or even a touch pad powered by solar energy.

The widespread wired network of BSNL could provide the broadband Internet connectivity.

The benefits of bringing the cloud to rural India:

The expenses on education, e-governance, health and other government services will be highly get reduced.

The gap between rich urban and poor rural India will be bridged to give equal opportunities to all citizens of India.

The cloud will enable the illiterate people to participate in the governance and data revolution. The cloud will enable them to use the web in the native language of their choice.

III. APPLICATIONS OF CLOUD COMPUTING IN RURAL INDIA

The cloud will permit data innovation to be mixed to the littlest villa of India and make access to data accessible to the poorest of the poor to give them a superior life by engaging them with information determined through the net book or cellular telephone associated with the cloud. The following cloud services can be made available to the people at an affordable low cost:

Government schemes for citizens

Weather Forecasting

Banking & e-wallet

Telemedicine

Share Trading

KYC

Agricultural data

Online Portals for citizens

E-learning

Real Time communication

Many such services can be provided as a cloud service. But in this paper only few major and important services are described.

A. Education

The education system in India primarily focusing on learning from books, giving written examinations and evaluating a student on the basis of grades or marks obtained. Students don't have any option but to study only the things given in curriculum. The open learning system lies far away. Information Technology specially Cloud can be used as key change maker in this situation. Nowadays the availability of Internet and its users are growing exponentially in India. Here lies the opportunity to bring the change in the Indian education.

Cloud Computing will enable to bring useful educational software, videos and files to the doorstep of schools without paying for any license for software.

B. Agriculture

Cloud Computing is being globally used in almost all major areas. But a little work has been done for use of cloud in agriculture

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sector of rural India. Here is the description of how cloud can be effectively utilised to enhance the agricultural sectors.

1) Online Communication: Cloud Computing will enable the farmers to establish an online communication with the agricultural experts. Even the farmers then will not be needed to go and take the training; they can attend the agricultural trainings from their village itself. This communication can be a global one, in the sense that the farmers can consult global agro experts. Also the farmers can be made aware of new agricultural concepts online.

2) Central Crop Database: The government can keep a central database of all the farmers with the collected data like information of farmer, the cultivated land and the respective crop etc. This will help the government in monitoring how much land is actually cultivated and what kind of agricultural material is going to come in market. The single point access to all this data will also speedup the decision making process of government.

3) Central Information Of Demand And Supply: On the other hand the government can provide the information about current demand and supply of agricultural products from different parts of India. This enables the farmers to decide the selection of next crop. The detail study of statistics of demand and supply will result in more accurate decision of next crop selection, which eventually results in more profit to the farmers.

4) Information About Soil: The information about nature of soil from different parts of the country can be provided to enhance the decision making of crop selection. The past behaviour of soil can be provided along with the predicted future behaviour.

5) Crop Growth Information: The growth of the crops from different parts of the country can be centrally monitored by capturing the crop growth statistics regularly. This will help the government take preventive actions in case a region is suffering from poor growth of the crops due some reason.

C. Medical and Health

Medical care services in rural India are lagging far behind the rest of the world. One of the reasons behind this is the unavailability of enough doctors in rural areas. Majority of the doctors in rural area don't have state of the art medical facilities like diagnostic laboratories, costly medical equipment and sometimes the expertise required diagnosing a disease. Considering the economy of the villages and the earning of doctors in villages, it is not possible for an individual or group of doctors to set up all these facilities in rural areas. The main reason lies in lack of funding and maintenance of instruments. It is a serious concern since most of the population lives in rural areas. Conventional ways to maintain the records of patients are not effective and may consume a lot of valuable time of a doctor. It may also affect the decision making to diagnose a problem. Another important issue is lack of proper communication among patients and doctor(s). Therefore intelligent and ubiquitous techniques should be used to handle healthcare data to make the treatment and diagnosis more effective.

The introduction of telemedicine has increased the efficiency of healthcare services through better handling of the patient's records. It provides equal access to the healthcare services to all the parts of society. Telemedicine enables the people in rural areas to generate the data of about their health. The data collected by telemedicine equipment can then be sent to data centers located in hospitals in urban areas, which can then be accessed by expert doctors. But the main issue with telemedicine is that it follows the client/server architecture. Over the time large amount of health related data would get accumulated in data server. Then the costs incurred in maintaining the collected data and the cost of administering and maintaining the data servers will be much more.

Cloud Computing can address these issues more efficiently. It can fill the gap between healthcare services of rural and urban areas. It is the perfect tool to bring the healthcare services to the doorstep of rural villages. Cloud Computing along with commonly used smartphones would make it more affordable.

D. Aadhaar

Aadhaar is a widely accepted identity verification scheme throughout the country for accessing the services like banking, education, driving license, government schemes passport and so on. A central information management system based on cloud can be developed for identity authentication of a citizen.

The authentication using Aadhaar card in collaboration with cloud based information management will guarantee transparent food delivery to the villager through Public Distribution System. The government authorities can monitor the availability of food grains in warehouses and their regular distribution to the genuine beneficiary. As every individual is having a unique UID number the non-existing, fake and duplicate beneficiaries can easily be eliminated which results in effectiveness of the scheme and cost saving.

IV. CHALLENGES AND OPPORTUNITIES IN IMPLEMENTATION

Though Cloud Computing is the advanced tool to tackle the challenges in rural development, it still has to address enormous

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challenges in implementing cloud in rural areas. Few of the key challenges are highlighted here.

Establishing a strong network of computing devices with internet access in rural areas.

Having internet access is not enough for the efficient use of cloud in rural India. It needs high bandwidth internet access; provide which is another challenge in itself.

English is still not a very well-known language in rural India. Instead the villagers may prefer their local languages. But India is a country with high diversity in local languages.

The illiteracy of rural people may restrict them to use the cloud services at their own on their smartphones.

Private cloud service providers may feel insecure to invest because of social and cultural obstacles.

Irrespective of the challenges highlighted above, cloud for rural India still provides lot many opportunities from different perspective.

The government can enhance the widely connected network of BSNL which has already reached in rural areas in last decade.

The number of institutes providing graduate education in computer science has significantly increased in rural and semi-urban areas in last couple of years. These IT graduates can work under Business Process Outsourcing (BPO) sector by which employment can be given at local level without migrating to cities.

Marketing strategies in rural India could be more refined by monitoring the behaviour and preferences of people in rural India through cloud usage statistics. This will help manufacturers to reach to more customers with precise prediction of possible buyer.

V. CONCLUSIONS

Cloud Computing paradigm can be used as an efficient tool for promoting the development of rural India. The services and schemes provided by the government will become more reachable than before. It not only provides the overall development of rural people but also provides huge opportunities from business point of view. The strategic move of adoption of cloud will make Information Technology easier and cheaper to use and widely open to access by mass population. Cloud Computing could help in bridging digital the gap between rural and urban India.

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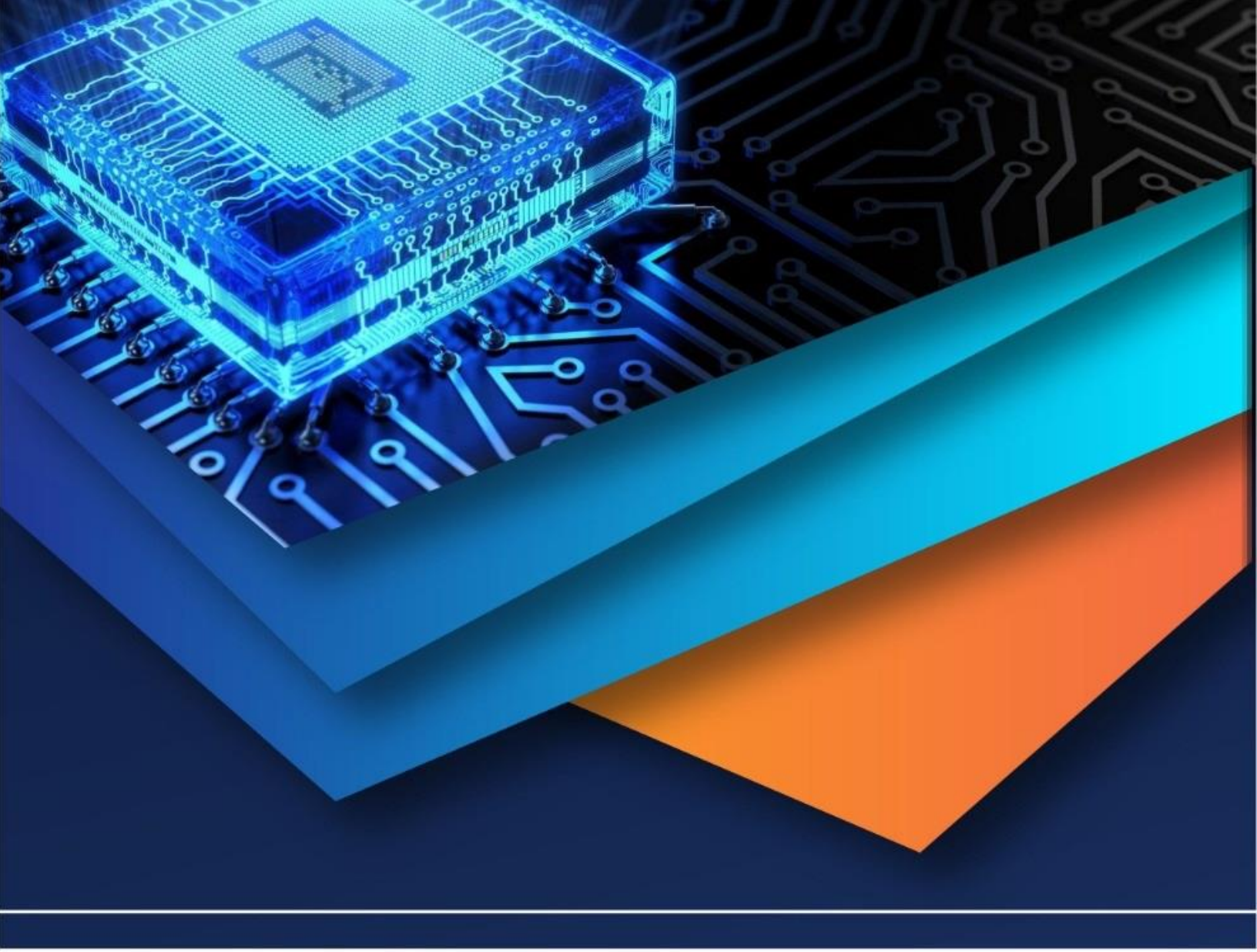

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