

Chapter 62

Cloud Computing for Rural ICT Implementations: Methods, Models, and Architectures

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ABSTRACT

Half of the world's population live in rural areas and majority of them are in developing countries. The rural population face many challenges in their life compared to their urban counterparts. Some of these challenges include high unemployment rate, limited employment opportunities in their areas, high brain drain to more developed cities, lack of access to education and healthcare facilities. Information and communication technology has been identified as the enabling technology that can be used to overcome the present day problems. There are several ICT projects implemented across the world with the objective of helping these rural masses. But many of these projects face sustainability challenges due to lack of resources. In this chapter, the author takes an in depth look at how cloud computing can be leveraged successfully to address the sustainability problem of current rural ICT implementation.

INTRODUCTION

Cloud computing is one of the newest computing paradigms helping the people use computers and allied technologies more effectively (Shawish & Salama, 2014). Cloud computing has transformed the way how people access, use and pay for computing resources (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009; Chang, Walters, & Wills, 2013a). Prior to the arrival of cloud computing, the computing resources including especially hardware was either purchased outright or leased on fixed charges. It has been observed that the utilization or productivity of these resources was very low as most of these resources were just idling most of the time. On the contrary, cloud computing improves the resource utilization by making them available only when needed and releasing them to other users and applications when not in use

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(Kiruthika & Khaddaj, 2013). Also the cloud systems can be accessed using a variety of client hardware including desktop computers, laptop (portable) computers, tablet PCs, personal digital assistants, iPads and smart phones (Dihal, Bouwman, de Reuver, Warnier, & Carlsson, 2013). Due to the advantages of cloud computing over traditional computing schemes, it can be successfully employed where traditional computing paradigms struggle or sometimes totally fail to deliver their services.

Traditionally, rural population living in far away from urban centers face several challenges in their life compared to their urban counterparts (Mtega & Malekani, 2009). Also majority of the rural population live in developing countries aggravating the issues further (Usman, Dutta, Habeeb, & Jean, 2013). The rural population suffer from poverty, high unemployment, lack of access to proper infrastructure and social services etc., (Mechanic & Tanner, 2007). In some areas, the poverty is so widespread that the majority of the population live on less than USD 1 a day below the absolute poverty level set by the World Bank (Ahmed, Hill, Smith, Wiesmann, & Frankenberger, 2007). Hence the rural population living in developing countries is considered the most vulnerable out of all the world population. In order to help these people overcome the current deficiencies, they need to be sufficiently empowered with new opportunities, skills and technologies (Sianipar, Yudoko, Adhiutama, & Dowaki, 2013).

The effective empowerment of rural youth is only possible by introducing them to the effective use of Information and Communication Technologies (ICT) (Alibaygi, Karamidehkordi, & Pouya, 2012). This is due to the fact that the ICT has been considered to be the enabling technology that could effectively bridge the gap between the rural and urban population (Songan, Hamid, Yeo, Gnaniah, & Zen, 2008). ICT empowers the rural population by providing them with new skills and opening up new opportunities that were hitherto confined to the people living in urban areas. The main advantage of ICT is the effective elimination of physical distance between people living across a wide geographic separation (Bargh & McKenna, 2004). Now people living in rural areas can participate in many activities and benefit from them without leaving their places of birth. This would effectively reduce one of the main problems challenging the sustainability of the rural communities. That is youth migration to urban areas looking for better employment and other opportunities. Youth migration affect the sustainability of rural communities by depriving the community of one of the most vital segment of the population (Ango, Ibrahim, Yakubu, & Alhaji, 2014; Ajaero & Onokala, 2013). When the youth migrate to the urban areas, the rural areas are left with an aging and underage population to look after their traditional livelihood, farming and other family endeavors. This would adversely affect the output of the farming activities and the family income unless the loss income is sufficiently compensated by the inward remittances of the migrants.

Governments and nongovernmental social activists have already identified the crucial role to be played by ICT in empowering the rural masses (Nag, 2011). Hence they have implemented several rural ICT projects with the objective of improving the quality of life of rural people. These projects have met with various successes and failures (Best & Kumar, 2008; Musiyandaka, Ranga, & Kiwa, 2013). One of the main issues identified for the failure of many rural ICT implementation is lack of financing and trained human resources for continuous maintenance of the projects.

In this chapter, the author takes a critical look at how cloud computing can be leveraged to mitigate the problems faced by traditional rural ICT implementations. The main focus of the chapter will be on the shortcomings of traditional ICT implementations and how the cloud based projects could successfully overcome these shortcomings. Finally the chapter presents the cloud computing based rural ICT architectures that could harness the maximum advantage from the implementations.

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