Framework Design of E Health care system for Cloud-Based EHR Service in Uttarakhand

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Abstract: The objective of this paper is to provide a practical orientation to support information technology (IT) and healthcare industry by considering the implications of cloud computing as per the domain of Uttarakhand. The paper includes guidance and strategies required to assess and compare cloud computing offerings in health care areas from various cloud providers. Paper proposed an EHR development model with the help of VPN and Cloud computing.

KEYWORDS: Cloud Computing, EHR (Electronic Health Record), Virtual Private network (VPN), SWAN (State Wide area Network).

I. INTRODUCTION
After making a survey in most of the hospital sites in Uttarakhand, we came to know that almost all the super specialists’ hospitals have adopted a hospital information system i.e. [HIS]. But issue with these systems is that, these systems are installed and functional, standalone at each hospital site which leads to high maintenance costs. Also, one more disadvantage is that, these hospitals are maintaining the EHR [Electronic Health Record] of the patients reporting there hospitals but at the same due to the non-sharing of patients electronic health records the effectiveness of EHR can’t be acknowledged.

So, in this research paper author has tried to propose an EHR sharing model through cloud computing for government hospitals in Uttarakhand. However, after implementing the proposed model, the population could get positive results as clinical decision support system could be established with the help of electronic health record.

II. ABOUT UTTARAKHAND
Uttarakhand is located at the foothills of the Himalayan mountain ranges; it is basically a hilly State, having international boundaries with China (Tibet) in the north and Nepal in the east. Implementation of EHealth services through cloud computing provides the simpler and operative way of keeping patient facts. This also helps in development of Electronic Health Record. Development of cloud server by using existing SWAN [1] architecture allows us to provide better EHealth services in deprived areas of Uttarakhand [2, 3, and 4]. In December 2002, Uttarakhand became the first state to formulate an integrated Health and Population Policy, which delivered policy guidelines to initiate health reforms in the state. The overall mission of the policy includes efforts to improve the health status and quality of life of the population; alleviate inequalities in access to healthcare; address leading and emerging health concerns; and, eventually, stabilize population growth [1].

III. CLOUD COMPUTING
Cloud computing [5, 6] is one of the promising information technology based concept which provides a low costs of EHR [5] based systems in Uttarakhand. This concept can be introduced to get efficient and quality based health information system. Cloud computing is the use of computing resources like hardware and software over the internet. The entire cloud computing infrastructure has been divided under three parts as follows:
SaaS [Software as a Service]
Basic software services required for running the HIS by connecting hospitals is come under this category. It allows software application to be executed and information to be stored. Through SaaS data/information is kept in servers at an off-site location, where users can access the technology through the Internet based applications. Moreover, this deployment model could be used for various IT based health services, which includes electronic health records (EHRs), Clinical decision support system, and health information exchange (HIEs) system.

PaaS [Platform as a Service]
All the tools like operating system, development tools and runtime tools required for developing an application are come under this head. The low cost and ease of use of PaaS-enabled health application allows government hospitals in Uttarakhand to drastically improve the quality of health care services they are capable to provide, often on a reasonable budget. Also, the hospitals have been able to restrain data redundancies and errors by PaaS based applications, while improving efficiency and class of patient care. The application also helps users/hospitals to capture immense amounts of valuable undocumented information/data

IaaS [Infrastructure as a Service]
Based on the concept of virtualization. It offers a less-cost solution which provides scalability with security and flexibility by pre-defined service level agreements. It also provides built-in data backup and security.

IV. BENEFITS OF CLOUD BASED SYSTEM
So, finally we could say that, Cloud computing provides the key technology solutions for the healthcare services in Uttarakhand. Some major solutions based on the cloud based models are as follows:

• Cloud applications enable on-demand access to computing and data storage facilities which are not present in conventional IT environments.

• Applications on cloud environment supports big data concept for electronic health records (EHR). It (cloud apps.) also allows facility for radiology images and genomic data offloading which reduces some burden of managing data from hospital.

• Sharing of EHR/EMR by doctors in various geographical locations around the Uttarakhand may help in reducing the treatment time for patients.

• Easy tracking of information could be done by using this service model.

V. PROPOSED CLOUD MODEL
In the fig 1 below, the framework has been shown in reference to the EHR [Electronic Health Record] building system in remote areas of Uttarakhand

Fig 1: Proposed Model of EHR Building (Img src: google.com)
NETWORKING/CONNECTIVITY FACILITY UPTO BLOCK LEVELS IN UTTARAKHAND [7]; WE COULD CONNECT THE PHC’S/CHC/DISTRICT HOSPITALS AT BLOCK LEVEL THROUGH THIS NETWORK BY USING VARIOUS MODES OF COMMUNICATION. IN MIDDLE STAGE THE SWAN IS CONNECTED WITH HEAD QUARTER OF STATE HEALTH. A VPN [VIRTUAL PRIVATE NETWORK] IS ESTABLISHED AT HEAD QUARTER LEVEL. THIS VPN IS DEVELOPED BY THE EXPERTS FOR HEALTH STATE HEAD QUARTER WHICH COMPLIES OF THE FOLLOWING.

A VPN [8] is a technology which spreads a private network through a public network. Under this scheme users can directly send/receive data across the network through point to point connection facility. In the proposed model the VPN connects the health cloud developed at head quarter level and also, connects the SWAN (State Wide area Network) at other end. Virtual private network is one of the effective way of building a private network. Using of SWAN instead of regular internet is one constraint in the present model. The accessing of VPN could be managed by using username and password facility, which could be made available to all the users at block/taluka level.

ROLE OF CLOUD HAS ALSO BEEN DISCUSSED IN THE PROPOSED MODEL. AS CLOUD CAN BE USED FOR STORING THE DATA I.E. PATIENT’S RECORDS. THE CLOUD IS CONNECTED TO THE CONTROLLING OFFICE, PRESENTLY PROPOSED AT DEHRADUN, WHICH CONNECTS ALL THE HOSPITALS THROUGH SWAN (STATE WIDE AREA NETWORK) INFRASTRUCTURE AND VPN [9] FACILITY AVAILABLE AT CONTROLLING OFFICE. THE CLOUD IS USED FOR STORING THE PATIENT’S RECORDS IN FORM OF AN EHR THROUGH DISTRICT OR TALUKA LEVEL.

VII. BENEFITS OF THE PROPOSED MODEL


VII. CONCLUSION

4. THE OBJECTIVE OF THE PRESENT PAPER IS TO INTRODUCE THE APPROACHES FOR CONNECTING PHC’S/BLOCK LEVEL HOSPITALS BY USING CLOUD BASED APPLICATIONS. USING OF VARIOUS TECHNOLOGIES LIKE CLOUD SERVER AND VPN FOR CONNECTING DEPENDS UPON THE EHR BASED APPLICATIONS AND FACILITIES WE NEED TO IMPLEMENT. IN FURTHER RESEARCH WE CAN ENHANCE THE EXISTING RESEARCH BY DISCUSSING THE ISSUES RELATED WITH CLOUD TECHNOLOGY AND APPLICATIONS IN IMPLEMENTING eHEALTH.
REFERENCES

[1] Joshi M et al. (2013), Service Delivery Model in health Services through Swan in Uttarakhand, Vol 3(10), IJARCSSE.


