Project Grid-One
CSD, BITS-Pilani, India

Official Position Paper on *iCharak*

A Grid-enabled Collaborative Healthcare Architecture Initiative

1.1 Introduction to *iCharak* and Motivation behind it

Even though India does have a functional system in place for a very large set of public health care services, it is not efficient and easy to scale. Also, it does not necessarily support enough the semi-urban and rural population. These semi-urban and rural areas have actually lost out in enjoying most of the benefits of recent technological and scientific breakthroughs in the world of medicine and healthcare. As a consequence even though we do have a very large pool of qualified medical doctors, pharmacists and health management technology officials and they are quite capable in their respective domains, if they do not get the assistance of such a system their efforts may not yield the desirable results.

1.2 Approach Taken

We propose a novel solution to this problem using the Grid-One-based Infrastructure and technology that exploits pervasiveness. This solution can be implemented to help in the acquisition, validation and use of this information independent of any platform-specific considerations. This character of the Grid makes it a sort of medium to port with various types of devices and/or sub-grids. In nutshell major concern of this project is to present "How the Grid approach exactly maps to the specific domain of Health Care Support System" in specific to our "***iCharak***" and how the healthcare facilities can be adopted using the recent technologies of Medicine.

In this scenario we assume that even though most of the rural areas lacks specialist medical healthcare support but they do have some elementary amenities. Therefore, our technology can utilize required resources often available in metropolitan / urban areas by collecting data from semi-urban and rural areas and make use of Grid for

collaborative decision-making / diagnosis / processed etc. and thereby provide initial breakthrough to medical facilities in rural areas.

1.3 Design

The system can be structured into following units, based on respective locations of functions involved:

a. The Village Level Grid-Access Units (used by the trained Health worker)
b. Regional Level Grid-Member units (District Hospital / NGO)
c. Central-level Grid Management Unit (at BITS Pilani)

The Village Level Unit is expected to use a Mobile Device or a custom-designed workstation with Audio/Video capturing hardware (Video Resolution, Sound quality and format shall depend upon the need of the situation and availability of the hardware). The latter system, when needed, will have the ability to send the recorded data about the patient to Regional and Central Servers (in compressed format). This data is to be stored locally as well where appropriate storage maintenance is possible. (Note: Complete data recorded may be sent to the doctor as and when the doctor / specialist consultant as and when required). The devices at Unit Level may have regular or intermittent. These end-user units can go online as per the need and synchronize the data with Regional and Central Servers apart from receiving the doctor's feedback on the patient data sent earlier or even during a session of the live kind where so needed based on the criticality of the situation on hand.

The Regional Servers (connected to one-another preferably with high speed WAN links) are to be connected to the Central Grid. It needs to be always available so that the Village Units can synchronize the data with it.

The Central BITS Grid will analyze the work to be done by the Grid continuously and would have the responsibility to ensure balanced timely distribution of the work according to several parameters of operation including Hospital/Doctor availability. It is also expected to collate and send the data for analysis to machines / experts, collect the prescriptions / advice from specialists if any and send the entire processed data of

relevance to Regional Servers. (If a doctor / specialist does not respond within a fixed time interval, system shall be able to take care of it and send the job to another specialist.

1.3.1 Application-space partitioning of functionalities

- For the Village Units
- For the Independent Doctors and doctors at Regional Hospitals
- For the Regional Server Units
- And the application running over the Central Grid Unit at BITS Pilani

The application makes uses of the underlying IPv6-QoS-aware network and is transparent to the above layers. All data is sent over a secure channel.

1.4 Plan of Work

We have planned the research and development in a waythat could allow three groups of researchers to work in parallel on the following aspects of ***iCharak***.

- Design of the Rural Healthcare Support System involving all related aspects including:
    - Mobile infrastructure-based test-bed design and development
    - Integration planning and testing of Fixed-and-Mobile elements
    - Design of the Security Provisioning System
- IPv6-QoS-aware Grid supporting the services required by the System.
- Integrating the development done for Grid-one like Network layer QoS.

We have analyzed available grid middleware that can suit our purpose of multiple operating systems, provide IPv6 support, Flow label support for implementing Quality of Service architecture. As of now, no such support seems to exist and therefore, we have decided to extend / modify ALCHEMY architecture for our first experimental setup.

Work Done Previously on Flow Label control which can be applied to grid computing.

1.5 Status

Flow Label specification as exploitable by the grid computing is being implemented

1.6 References

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