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An Analysis of the Effects of Network Implementation Choices on Healthcare Applications

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Abstract

This paper presents an analysis of the role of the networking choices on health care applications. The variation in the implementation of networks that evolved to Medical Grade Networks are explored for five different medical network applications in terms of the network parameters, performance and success results of these health care applications. The analysis covers basic components such as network design, Cisco IPS 4260 sensor, firewalls, PACS, and Cisco catalyst switch. The discussion about the functions of the components individually and the integration of components is also included. This comparison specifies the features of these five health care applications and helps in deciding the best fit to a heath care facility. This paper contributes to help investors in elevating needs such as network scalability, security management, and day to day services and advantages.

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1. Introduction

In recent years, the network technology in the health sector has changed drastically. It has helped doctors and care takers to observe their patients' health conditions continuously by monitoring the statistics from every corner of the hospital with remote access to offer excellent care and protective experience to the patients at the finest and lower prices.

The number of patients at each healthcare facility is increasing out of proportion to the health professionals. When it comes to major medical institutions that provide services at large scales and their business runs around the globe, the challenge of meeting customer needs becomes harder to meet. Network technology presents a solved puzzle and encourages investment in technology and in developing IT infrastructure in health sector to overcome operational limitations. In addition to solving the existing concerns, a broad platform of solutions for their future developments is also envisioned to enable the best health service provisions. Technology from leading networking vendors such as Cisco is the backbone of many networking infrastructures at medical institutions and hospitals.

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Cisco Medical Graded Network technology provides a foundation that enable reliable and secure data communication with transparency among health care communities while providing a framework to meet their specific requirements. This framework allows integration and interoperability at each functional area and optimizes interaction between healthcare participants, applications, components and hardware. This technology is empowered with characteristics such as communication needs of the patients, administrators, clinicians, patient privacy and data security with health care regulatory requirements, uniqueness of health centers with bandwidth and integration capabilities, any time anywhere information capture access through wireless or wired networks and the ability to stay connected to the patients by monitoring them at the lowest and the finest cost [1,2].
In this paper various real time applications are analyzed and compared based on the challenges, network design, features, implementation and performance. This comparison helps in understanding the capabilities such as security, interoperability, productivity and flexibility to choose a user friendly network application in health sector with the ability of the integration of the future technologies to get rid of the existing challenges and to achieve 90 plus percentage of accuracy and availability.
Rest of the paper is organized as described in the following paragraph. Section 2 explains the networking needs, operational challenges, and available options in the marketplace. Section 3 covers the role of networking choices on performance. Section 4 presents recommendations and technologies for better future vision. Section 5 concludes this paper.

2. Networking Needs, Operational Challenges and Available Options:

Providing medical services to millions of people appropriately is a major concern. Delay-time, disrupts, and life affecting treatments are some of the added concerns for health sectors around the globe as described in [3,4].
For example, after initial step by Hospital Israelita Albert Einstein to integrate voice, data and wireless services to overcome business challenges such as productivity of clinical staff, patient care and working together with leading networking minorities to achieve the strategic policy goals, they introduced Cisco Medical Grade Network which brought drastic changes in smart analysis, smart net and high tech operations in the management of services. In addition to this network they allowed to sustain IT in telephony network which provides security, productivity, flexibility for patients, clinical staff, administrators, partners and even external partners [5].
The addition of Cisco catalyst switches, virtual private network, Cisco Intrusion Prevention System (IPS) 4260 sensor, implementation of firewalls and PACS system resulted in improved performance. Picture Archiving and Communication System (PACS) system allows to combine all data devices to a single centralized device which gave flexibility to view every image from anywhere in a hospital. Remote access is provided by using virtual private network and Cisco IPS 4260 is used as sensor for intrusion preventions. The most important element is the security that is made achievable by implementing firewalls in the network.

2.1. Network Stages and Views

A medical network consists of four stages which were known as campus environment, data center, WAN edge and ambulatory care [1,4]. A number of checks known as red flag rules or conditions such as protected, resilient, interactive and responsive must be satisfied. The patients' information should be secured confidentially under the notion of being protected. Patients must be able to interact with their care takers as a result of interactivity. Increase in patients or any outsiders doesn't matter for the quality of service due to the elasticity of the technology as for any changes in a network, the network should respond quickly to the changing demands that may range from regular security requirements to latest mobile and clinical devices to be eligible for being graded as a responsive network.
A campus view of the networks consists of three different layers: access layer, distribution layer and core layer [1]. Now considering access layer, it provides intelligent demarcation between computing devices and network infrastructure. It also provides security and multiple services by using key elements such as policy trust boundary and QoS. In the same layer it uses RFID tags and location based services to allow health providers to locate staff, patients and also to monitor environmental temperature in refrigerator by biomedical teams.
Distribution layer acts as the control boundary between the access layer and the core layer of a network system. This provides layer 3 switching for connectivity to core and layer 3 or 2 connectivity to the access layer which protects

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