Thin client and cloud computing in healthcare industry

Sharma S.U\textsuperscript{a} and Y.B. Gandole\textsuperscript{b}

\textsuperscript{a}Department of Electronics, DCPE, HVPM, Amravati-444 601, India

\textsuperscript{b}Adarsha Science J.B.Arts and Birla Commerce, Mahavidyalaya, Dhamangaon Railway-444 709, India

Corresponding author: \textsuperscript{a}sumitapande@yahoo.com; \textsuperscript{b}ygandole@indiatimes.com

Abstract

The Thin Client Solutions for healthcare offers organizations a reliable, more secure way to manage patient records and other critical medical information. Thin client implementations can provide secure, centralized access to healthcare data, helping reduce medical and billing errors. Centralized access can also improve clinical workflow, helping medical staff get quick, reliable access to accurate information for an improved patient experience. Today, as cloud computing becomes a more mainstream technology, physician practices and healthcare organizations are evaluating whether this platform holds the answer for a less expensive, more secure alternative to traditional computing networks. To better understand the possibility of this computing power, it is important to examine the cultural impact and the challenges of deploying EHR (Electronic Health Records) and other vital medical and clinical information on a cloud computing platform against the benefits.

Keywords: thin client, cloud computing, healthcare

Introduction

The use of computers and Information Technology has become a mandatory element in the Healthcare industry. The Information Technology plays a very important and vital role in all areas of Medical Science and healthcare, from Data Storage and Management to patient diagnosis or treatment. Everything as we know today in medical field might not have been possible without the valuable contribution of computers. Computers are also very extensively used in hospital administrative activities like patients’ history management, accounting and billing, patient and doctor’s appointments, hospital inventory management, and many more. Computers can store and manage very vast volumes of medical journals, various documents and files, research papers and reference books on a central Data Repository System. This information stored is more easily and quickly accessible in an electronic formats. Furthermore, the Thin Clients are greatly making their presence in the IT scenario. More and more organizations are migrating to Thin Client technology. Thin clients are cheaper than PCs, and take less time and money to maintain, according to Meraz Nasir, Manager of Infrastructure at Interfaith. Even more important, they deliver rock-solid reliability and speed. They help ensure our staff always have what they need to fulfil our mission of delivering excellent patient care, while freeing up financial resources for further investment in serving patients. In addition, HIPAA regulations about privacy of patient data are stringent, and thin clients help us to comply and prove compliance. With thin clients, Interfaith can roll out any changes to security policies everywhere at once, in a comprehensive, traceable way.
Use of thin client in health care: case studies

Wyse is the leading thin client providers to the healthcare industry, with more installations than any other provider at the 'Most Wired Hospitals' for 2009 according to Hospitals and Health Networks. Wyse can be found at the Orlando Orange County Convention Center in Booth 1301. Companies are finding that Wyse software and hardware solutions can handle the rigors and dynamic demands of working in hospital and clinical environments. Through the use of Wyse management, virtualization, and cloud software, in concert with thin clients and cloud PC clients, healthcare organizations are able to safeguard shared workstations from security risks while streamlining access to information. Wyse cloud and desktop virtualization solutions also automate key procedures and enhance collaboration between healthcare professionals, which ultimately contributes to improving overall patient care. The School of Dentistry (ULSD), University of Louisville enjoys a rich heritage in dental education and a reputation for clinical excellence that reaches back over a hundred years. To keep in synch with best practices in the industry, ULSD eliminated paper-based record-keeping several years ago and implemented chair-side access to electronic medical records (EMRs). ULSD's first concern was reliability of chair-side devices. Its clinics handle more than 1,00,000 patient visits each year. We couldn't afford to have PC maintenance issues take chairs out of commission, so we chose Wyse Thin OS-based thin clients along with Citrix HDX technology for their reliability, longer refresh cycles, and ability to store images digitally, explains Christopher Morgan, Director of Dental Informatics at ULSD. We didn't need to bring in PCs at all. Instead, this implementation put us on the cutting edge of technology: we became one of the first dental organizations to take radiographic images with digital sensors and upload those images using thin clients.

Seattle Children's Hospital in Seattle, WA has approximately 4,500 employees supporting 2,92,000 annual patient visits. The hospital is consistently ranked among the nation's best children's hospitals by U.S. News and World Report magazine. It's also the primary teaching, clinical, and research site for the Department of Pediatrics, School of Medicine at the University of Washington. The IT team at Seattle Children's recently undertook the task of improving patient care by improving the system responsiveness. We wanted the technology to be so fast, pervasive, and intuitive for our staff that it was almost invisible to our patients, explains Jake Hughes, Senior Enterprise Architect at Seattle Children's. As soon as we identified VDI as our approach, we knew we wanted Citrix and Wyse as our partners. The partnership between the companies and the integration of their technologies made us confident that they would work together to help us get the solution we wanted.

Seattle Children's is deploying a centralized virtual desktop infrastructure (VDI) leveraging Citrix Xen Desktop and Xen App in concert with approximately 3,000 Wyse Xenith next-generation thin-client devices. The implementation has accelerated connecting to systems from several minutes to five seconds, saving staff time and improving patient interactions. It’s anticipated to virtually eliminate desktop technical issues, enhance patient service and save $1.2 million of IT staff time. Financially, the implementation is anticipated to achieve a threefold increase in desktop performance while avoiding $6 million in PC replacement over 5 years; and cutting energy costs by $1 million over that same period. Spectra thin clients are being used at various healthcare facilities which
include nursing stations, laboratories, general practitioners and business offices. Spectra thin client advantages over PCs include lock down of the user’s environment, preventing the introduction of un-authorized software and viruses. In addition, Spectra thin client appliances are less expensive to purchase and administer than PCs because centralizing the management of software on the server means that IT staff do not have to go in to the field to perform upgrades.

Concentra, a subsidiary of Humana inc., is a national health care company with facilities in 40 states. It concluded several years ago that centralized, server-based applications would best serve its needs, and that the best way to provide access to those applications was through thin clients. Now it is standardizing on HP t 5740 thin clients and HP 4320 t mobile thin clients based on their value, reliability, and the minimal support they require. We periodically challenge all our old assumptions and re-evaluate the technology, say John de Lorimier, chief marketing and sales officer for Concentra. We look at different vendors, their systems, and try to ensure we’re on the best technology to meet our needs. When it comes to the technology we put into users' hands, that technology is HP.

HP thin clients provide myriad benefits to healthcare organizations. HP thin client solutions can help empower an IT staff by allowing IT to deliver best-in-class support and provide high availability to data. Their very small footprint can support a wide variety of user needs. They are compact and quiet, making them suitable for installation in exam rooms and even at the bedside. The absence of fans in HP thin clients means they can be installed in a hospital setting without increasing the risk of spreading airborne infectious disease or dust. This makes them suitable for installation in a hospital, allowing IT to standardize on a single platform for both purchasing and management efficiencies. The systems have no fan or any other moving parts that generate heat, thus they have a longer lifecycle alongside lower maintenance and cooling costs. According to Forrester, 3 thin clients last an average of seven years compared to three to four years for a typical PC. In addition, they draw between six and 20 watts per hour compared to 150 to 350 watts for a typical desktop PC.

Thin-client technology like Citrix MetaFrame and Windows Terminal Services has become popular in the health care industry. A key benefit of this technology is optimal remote connectivity performance, which is particularly important in environments with limited communications bandwidth. In this model, servers execute applications while the client PCs merely display information and execute functions. Citrix access not only includes connectivity to the MEDITECH applications, but also access to other applications (such as Microsoft Office products). All applications need to be tested and loaded for compatibility. A feature termed centralized management is provided where the software is updated on a server automatically for user sessions without the need for user intervention. Many benefits can result from centralized management, including improved efficiency and cost savings. Some of the advantages of Citrix’s 'thin-client' technology include improved remote access performance, secure connectivity through the Internet, centralized software management.

Applications of thin client in health care

1. A web-based mobile medical monitoring system

A hospital-wide mobile medical monitoring system is a new concept in healthcare. Telemetry devices are attached to patients to acquire, store and process continuous data
about their state of health. Medical staff may examine real-time graphical information and make comparisons with historical data. Parameters may be set to cause an automatic alert to portable devices held by appropriate staff if a patient requires urgent observation. The system uses the services provided by Internet and intranet to allow remote supervision and consultation. A hardware/software prototype has been constructed to demonstrate real-time data acquisition, wireless transmission/reception and connection to the World Wide Web. The real-time, supervisory and remote-teaching aspects of the software system are being designed and are in the process of implementation.

2. Context-aware mobile agents for decision-making support in healthcare emergency applications

As the mobile computing paradigm proliferates rapidly into the medical field alongside the existing legacy systems, it is important to realize the changes in the landscape of the computing devices it brings. Unlike stationary desktop oriented machines like PC’s, mobile devices such as phones, PDA’s, tablets are constrained by their shape, size and weight. Due to their limited size, these devices tend to be extremely resource constrained in terms of their processing power, available memory, battery capacity and screen size among others. Traditional applications however, are not designed to cater to such issues. In order to achieve an acceptable level of performance, application which target such ‘thin clients’ need not only be able to conserve resources but should also be lightweight enough. The aim this prototype is to be able to support real-time ‘intelligent’ deployment of ambulances based on the latest available hospital resource information. It is envisaged that the application will primarily run on a terminal onboard the ambulance. It is assumed that due to the nature of such an environment the on-board computer is either a PDA, carried by the paramedic or a dashboard mounted computer, which is similar in capability and resources to a PDA.

3. Sharing health-care records over the Internet

A novel approach to sharing electronic health-care (EHR) records that leverages the Internet and the World Wide Web developed as part of two European Commission-funded projects, Synapses and SynEx. The approach provides an integrated view of patient data from heterogeneous, distributed information systems and presents it to users electronically. Synapses and SynEx illustrate a generic approach in applying Internet technologies for viewing shared records, integrated with existing health computing environments. Prototypes have been validated in a variety of clinical domains and health-care settings.

4. A Cloud Computing Solution for Patient’s Data Collection in Health Care Institutions

Existing processes for patients’ vital data collection require a great deal of labor work to collect, input and analyze the information. These processes are usually slow and error-prone, introducing a latency that prevents real-time data accessibility. This scenario restrains the clinical diagnostics and monitoring capabilities. The solution proposes to automate this process by using sensors attached to existing medical equipments that are interconnected to exchange service. The proposal is based on the concepts of utility computing and wireless sensor networks. The information becomes available in the cloud from where it can be processed by expert systems and/or distributed to medical staff. The proof-of-concept design applies commodity computing integrated to legacy medical devices, ensuring cost-effectiveness and simple integration.
5. Mobile healthcare information management utilizing Cloud Computing and Android OS

Cloud Computing provides functionality for managing information data in a distributed, ubiquitous and pervasive manner supporting several platforms, systems and applications. This work presents the implementation of a mobile system that enables electronic healthcare data storage, update and retrieval using Cloud Computing. The mobile application is developed using Google's Android operating system and provides management of patient health records and medical images (supporting DICOM format and JPEG2000 coding). The developed system has been evaluated using the Amazon's S3 cloud service.

Advantages of Thin Clients in Health Care Industry

Simplified technology, reduced costs, improved return on investment, patient care etc. are some of the objectives within any healthcare organization. With constant infrastructure refresh and pressure to find cost-effective methods to replace aging PCs in an ever growing environment, implementing thin client desktop technology and remote management, provides one consistent solution with a single interface for managing, installing, updating and securing software in the healthcare enterprise. Further advantages can be as listed as:

- Reduce technology burden on healthcare staff provide uniform access to healthcare and general applications
- Enhance patient privacy and control security
- Distribute data and application access easily
- Reduce overall operation cost of desktop support and management

Future scope

The Thin Client market is viewed positively and the projected growth is high and growing quickly with the benefits and advantages being evident. The target markets are being clearly defined and addressed on a daily basis by Thin Client suppliers and their offerings. With endorsement of thin client market by Microsoft, IBM, Citrix, Sun, Wyse Technology, Intergraph Computer systems, National Semiconductor, and other big name players, Thin Client Technology will continue to grow and be a significant part of corporate desktop computing and the healthcare industry. The cloud computing is truly a state of the art technology for many business organizations. Because of the technology's ease of adoption, significantly lower maintenance costs, and greater workflow efficiency, the cloud computing will gain widespread popularity going forward.

Conclusion

Thin client or server-based, computing is among the fastest growing sectors of IT today. It is cost effective and easy to manage providing lower ownership costs than PC-based solutions. Thin clients conform to the trend of centralizing IT assets while providing on-demand access to data and applications via a device that fits each user’s job function.

References

http://www.spectraindia.com/page.php
http://www.wyse.com/solutions/healthcare/