

Harnessing telemedicine through video conferencing

Abstract

A survey was carried out about bandwidth subscriptions towards a better subscription that would allow ease of teleconsulting sessions for medical consultation in Plateau State University hospital. The result of various subscriptions with relevant information about ideal bandwidth subscriptions that would provide required internet service for this purpose was published with MedCrave by Datukun & Sellappan.¹ Based on interview results and analysis, some observations were made and recommendation for ISPs and bandwidth was made also. The results of this study showed that some of the ISPs' bandwidth provision was good and cost-effective. Plateau State University need to opt out of free services that could not deliver for a cost-effective service that can provide telemedicine sessions with ease beside improved learning and research. Hence, this paper presents a network model and corresponding video conferencing model that will integrate with the network for telemedicine practice. A MYSQL database was designed with indicated relationship for keeping track of information about teleconsulting, telemedicine, medical doctors and patience at the backend.

Keywords: telemedicine, teleconsulting, internet service, bandwidth subscription, improved learning and research, mysql database, entity relationship diagram

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Introduction

When a number of users become far higher than the available bandwidth in a network, transmission delay in traffic delivery becomes unavoidable.² These constitutes part of the technical factors that affects the reliability of internet service. However, reliable bandwidth subscription would enhance the performance of the network for impressive service delivery. Use of quality devices on the network is also a network performance milestone.³ Diagnosing a network that provides a week internet service would help in discovering loop holes and proffering a means of improving the network services.⁴ Characterizing a campus environment for proper view of what could serve as bottleneck or free connectivity would enhance the process of network diagnoses towards minimising any possible problems.⁵

Literature review

The world of telecommunications has changed dramatically as a result of the rapid expansion of the Internet.⁶ In 2009 alone, Nigerian banks achieved up to 30percent cost savings, Manufacturing Companies 25percent and Schools about 20percent cost saving on WAN recurrent costs through bandwidth optimization and management.⁷ This paper looked at the history of bandwidth subscriptions, comparing two Universities for dictating various subscriptions and their ISPs. What caused network bottleneck in a network is worth investigating the quality of subscribed bandwidth and ISP.⁸ Bandwidth and/or throughput contributes to the performance of a network, which enhances the functions in an academic environment.⁹ Optimum load for a given LAN link carrying voice, video and data is ideal of a University Campus traffic.¹⁰ A well designed network topology for a campus would guarantee a better utilization of internet bandwidths.¹¹ Simulating a network under different load conditions and extracted network performance statistic from real time network statistic for further analysis to show the effect of latency, jitter, packet drop, number of clients and limited bandwidth on the quality of service of applications running across the LAN could also be useful for improving the network performance.^{12,13} The quality of Internet service (QoS) is of key need in promoting the productivity of any organization, especially an academic environment.

People are often asked to go to meetings, attend and/or give lectures from a geographically distant site, away from their own institution and/or organisation.¹⁴ Distance, costs and the duration of the journey are frequently a source of discouragement to attend such meetings or even courses. Videoconferencing has emerged as a most successful solution. Crystalview HD is a versatile Unified Communication (UC) platform designed to support multiple Video and Voice over IP (VVoIP) applications within a single hardware unit that shares components such as the codec, Full HD Pan-Tilt-Zoom (PTZ) camera, Acoustic Echo Cancellation and high gain boardroom microphone.¹³

Methodology

A campus network model indicating the connecting points of Crystalview HD hardware will be designed for required use in the University. One of the connected hardware will be for telemedicine practices while others for e-learning and remote meetings. The network will be based on the layout of Plateau State University Bokkos. Afterward, a descriptive model of how each video conference system in the university is being connected to the conferencing server for relevant sessions. The Router connecting the internet, switches connecting the video conferencing systems will be enterprise-based to avoid failure while in session. The conferencing systems will be connected cable-based via cat 6 or higher version for stronger network connection. This will provide a clear conferencing session for telemedicine. A fix IP address will be configured for the video conferencing systems to avoid fluctuating connections at any point in time. The main hub (s) providing internet connection will be preferable were conferencing rooms are located to avoid possible attenuation of signals. The display should be able to display clear video of participating ends to the consulting ends. The camera will be preferably high definition at all ends of participation. A database that keeps track of the medical Doctors, patience, cases and consulting activities will be designed using dB designer. It will be imported into MYSQL database for implementation. This will integrate with the front-end for smooth interaction and referencing.

Campus network

The model in Figure 1 is the campus network model that depicts the existing campus of Plateau State University. Because the campus is still expanding, n...n+1 is a provision for extension as the campus grows. The Vice Chancellor’s office is within the administrative block and telemedical consultation may need the video conferencing for certain discussion and agreements. Every medical consultation and service session takes place in the university’s clinic or hospital. So, there may need to be two video conferencing rooms there. One will be consultation room which may involve the vice chancellor for necessary discussions. The other will be for the actual telemedical service.

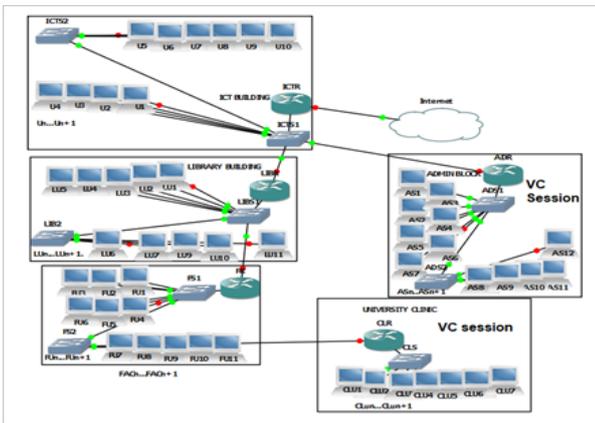


Figure 1 Campus network model.

Video conferencing connections

The model in Figure 2 shows how all the necessary participants for telemedicine sessions or pre-sessions are connected to Crystalview HD server. All the hardware has H.323, Crystalview, Clitehd and Skype integrated on it. Each of them requires internet connection to run because they are all hosted on a cloud server.

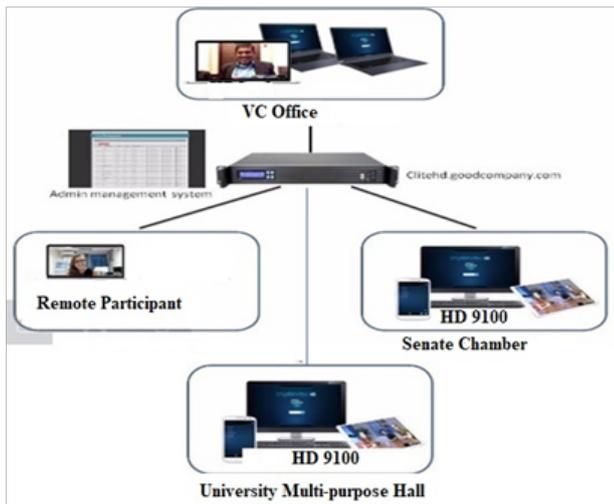


Figure 2 Video conferencing model.

Database design

A database is being designed for keeping tract of information about medical Doctors, patience, consulting activities and so on. This

will provide relevant interaction in the conferencing session. Records of consultants, patience and sessions will be kept tract of for reference purpose. The database can be upgraded as needs arises. Figure 3 gives the entity relationship diagram of the designed database.

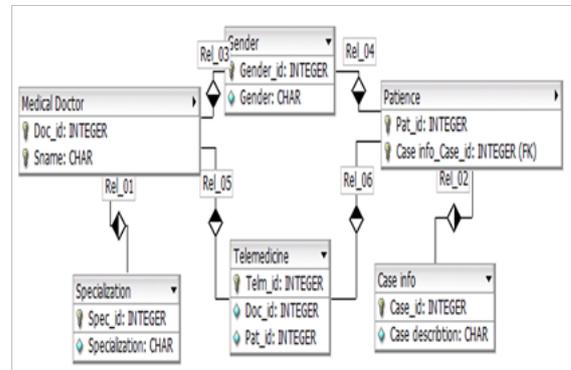


Figure 3 Entity relationship diagram.

Conclusion

Having designed a campus network model that incorporates video conferencing systems in the clinic and administrative block of plateau state university, a telemedicine could be practiced if the design is implement with the necessary recommendations. This will help the University to get remote expertise without extra cost of transportation and accommodation. Travelling risks could also be avoided. More so, other Universities or hospitals could also practice this with ease.

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None.

Conflict of interests

The author declares that there is no conflict of interest.

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