Virtual Learning and Curriculum Delivery in A Post Covid Era: A Proposal of Easylearn Virtual Learning Architecture (VLA)

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Abstract- Virtual Learning had become a norm after the COVID-19 outbreak. Many school have seen the potentials of teaching through this technology while retaining the quality of classroom teaching and this same time reaching many students at their comfort zone. However, there exist the challenge of getting a virtual learning platform that will adequately meet the needs of the school at a cheaper subscription. The diversity in the needs of school made it necessary for schools to look at the possibility of developing a platform that best suits their needs. Also owning to the fact that there exist but a few virtual learning platforms that can be adapted to meet the needs of schools. To this end, this research introduces a Virtual Learning Architecture code named "EASYLEARN" that is highly scalable and runs on intranet, internet and cloud network, thereby making it available to all users regardless of location or time. This architecture was developed using CISCO Packet Tracer and is designed to deliver seamless teaching and learning between instructor and large number of students connecting concurrently.

Indexed Terms- Virtual Learning, Architecture, COVID-19, Cloud Network, Internet.

I. INTRODUCTION

COVID 19 emergency affected virtually all aspect of Nigeria's economy. Amidst the worst hit is the educational sector. Owning from the fast rate of reproduction of the virus, the government were left with no choice than to declare a lockdown in all sectors of the economy which includes education. With this lockdown, the conventional way of teaching and learning is no longer applicable. This opened up research for alternative means of curriculum delivery for all tiers of schools within the nation(Aina & Opeyemi, 2020). Research shows that virtual learning is the only alternative to the conventional classroom learning the nation is accustomed to. Owning to the fact that virtual learning is not common placed in Nigeria's higher institutions, the pandemic opened up the development of different virtual learning architectures. These virtual learning platforms have changed the perception of teaching during this time so much that institutions across the nation had seen the potentials of delivery curriculum effectively without borders of classes or limitations to the number of students that could be thought at a time(Ravi, R; Parthasarathy, M; Ananthasayanam, 2009).

As the pandemic is gradually ending and normalise returning to the educational sector in Nigeria, many institutions are looking for ways of delivering the curriculum in order to achieve collaborative teaching without gathering large number of students in a class as stated by (Obasa et al., 2011). Similarly, virtual learning had allowed robustness of distance learning for many institutions across the nation, thereby bringing learning to the comfort zones of the working-class students.

However, the existence of few architectures (Alharbi & Jemmali, 2017)for virtual learning had giving room to the development of this architectures in order to build a robust learning platform that will demand little or no data cost and accessibility for all learners within Nigeria by considering the internet connectivity issues in some areas within the nation.

II. LITERATURE REVIEW

Robust teaching/learning, distance learning and most recently pandemic are some of the reasons for virtual learning or e-leaning architectures or platforms. According to (Aina & Opeyemi, 2020) the COVID19 pandemic period is a typical time when the

conventional learning method had failed and therefore the need virtual learning method that ensures social distancing and restrictions to gathering. (Fakeeh, 2017) developed a virtual class room model that uses Bio inspired Algorithms based on four conditions; human to machine, machine to human, human to human and machine to machine. Similarly, (Obasa et al., 2011) developed an integrated virtual classroom system that uses multiple-tiers application that comprises of Client-Tier (CT) and Web-Tier (WT) and the Enterprise Information System-Tiers (EIS). In the architecture, the CT application gives a Graphical User Interface to the end user. This is achieved using any web browser of choice. The WT holds data models of the business data, presents it to the client through

the HTML/PHP pages, accepts and analyses the user input, then passes the user's request to the EIS for processing and forward response back to the client. All the architectures discussed are internet dependent and there usage could not be adequate where internet facility is not available or weak. Furthermore, there exist in literature few virtual leaning architectures that provides inclusive and collaborative learning, hence there is need for development of more inclusive ones that relies less on internet for its functionality.

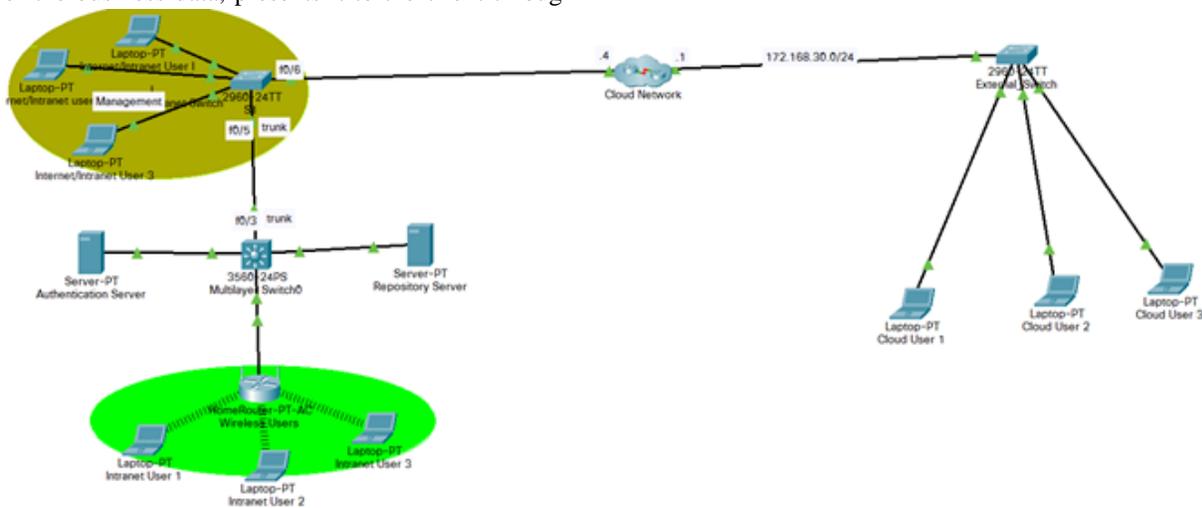## III. EASYLEARN VIRTUAL LEARNING ARCHITECTURE (VLA)

Fig 1: EASYLEARN VLA. (Configured Using Cisco Packet Tracer 8.0.1.0064)

The VLA architecture shown in fig: 1 above is Cloud, intranet and internet based. The intranet and internet provide connectivity for on-campus access of the learning materials and teaching at no data cost while the cloud provides access for off-campus connectivity and prevailing rate of Internet Service Provider (ISP). The institution's gateway serves as the entrance and exist point for cloud network users. The components of the architecture are:

IV. THE INTRANET/INTERNET COMPONENTS

This part of the architecture is divided into these distinct parts namely;

i. Management: This comprises of a 2900 series switch, used as a plug and play device and connection to end devices connected to it via wires (Twisted pair cables) in a Local Area Network (LAN) setting.

ii. The Multilayer Switch: The switch provides routing functions to the servers connected to it and switching functions to and fro the Wireless Routers and the switch in the Management setup.

iii. The Servers: The architecture uses two servers namely; the authentication server and the repository server.

a. The Authentication Server is used to authenticate all users; lecturers and students connecting via the internet or intranet.

b. The Repository Server is used to warehouse learning materials (video and text) and to initiate

live lectures that students can connect to. For the flow of learning materials lectures upload to the repository server while students download form the server.

iv. Wireless Routers: The router provides wireless access for on-campus users through the route service provided by the Multilayer switch.

V. THE CLOUD NETWORK

i. The Cloud Network: This is a virtual network that remote users can connect with using cloud applications and software in order to get into the institution's VPN for authentication and download of repository materials.

ii. Off-Campus Users: This refers to students outside the institution campus that are connecting via the cloud network in order to access learning materials.

VI. WORKING OPERATION OF THE ESAYLEARN VLA

The VLA operation is as shown in fig: 2 below. The network radio provides the needed campus wide connectivity and it's configured into the switch. The switch is Virtual Private Network (VPN) and it serves as filter for all traffic passing through the institution's gateway via the internet. In addition, it serves as connection for the authentication and repository servers.

In order to achieve user authentication within the intranet and internet-based users the authentication server which is a database of all eligible user within the institution (Lecturers and Students is used. The authentication server will run an appropriate database software as desired. The objective of the repository server is to serve as the warehouse of all learning materials (video or/and text). It also serves as the path for live lecture delivery with appropriate audio/visual equipment connected. The repository server is where lecturers will upload learning materials and students will download learning materials. Within the architecture, there will not be a through pass to the repository server without the intending user passing through the authentication server at first. The repository server will run appropriate software for

document archiving and all software needed for practical at each school of departmental level.

The servers are linked wirelessly to classroom routers. These routers are placed in classrooms where students can sit to receive live lectures via there end devices (laptops, smart phones) by connecting through the routers to the appropriate servers.

For users outside the institution, the cloud network configured with appropriate wireless routers and cloud applications are used for connection by off-campus users. However, before these set of users can have access to learning materials, they need to pass through the institution's gateway which is a verified Uniform Resource Locator (url) of the institution and other firewall devices that will be added to fortify the network from attacks. The gateway takes the user to the VPN switch from where the users follow the process of an on-campus user.
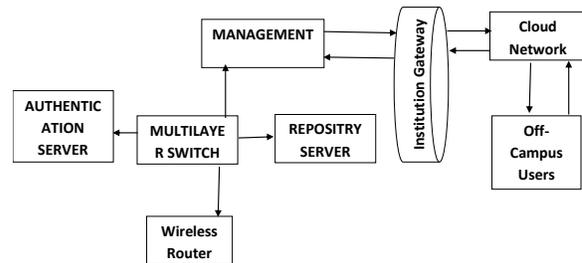
Fig 2: Block Diagram of EASY VLA

CONCLUSION

The architecture is expected to provide any avenue for quality curriculum delivery while observing all the conditions set out in the post COVID-19 guideline. More traffic is expected within the intranet base connection as this will operate at no data cost to lectures and students, hence, the architecture is made scale able, that is, equipment in the architecture can be increased to accommodate more traffic without affecting the overall performance of the architecture. The architecture demands less data cost from off-campus users as the only cost to be bared will be the cost of getting into the VPN via the gateway. This is expected because all activities once the user is within the VPN is at no data cost since the user will be working on the intranet from that point onwards. In summary, this architecture provides zero and less data

cost compared to other existing architecture while providing an environment for quality collaborative learning during live lectures and restrictions to large gathering of students. The architecture also guarantees adequate curriculum delivery as all learning materials will be made available at all times.

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