Designing a Remotely Accessible Computer Networking Technology Lab

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EXTENDED ABSTRACT

The purpose of this project was to design and develop remotely accessible computer networking lab that allows 24/7 access to laboratory equipment housed in the Networking Engineering Technology lab within the Department of Technology at Elizabeth City State University. The accessibility to current networking lab, equipped with the state-of-the-art industrial grade networking devices, is limited to classroom hours. While progressing through the computer networking program students were met with a number of problems when trying to access the lab beyond classroom hours, when projects exceed the capabilities of the devices at hand, and when device life spans were severely shortened by improper upkeep. The project design team solved these problems by implementing remote laboratory around NETLAB, an online solution that encompasses virtualization, remote access, and lab device maintenance. The remote laboratory consists of a VMWARE server, the NETLAB network appliance, APC power management devices, and numerous routers and switches. Our current implementation houses one routing pod that has three interconnected routers and four virtual PCs, and a switching pod that has one router, two switches, and three interconnected virtual PCs. Each of these pods can be accessed from anywhere in the world via a Internet-enabled browser interface, be powered ON when in use, and OFF when unused, and gives instructors many teaching tools to enhance their capability to deliver fully online computer networking program.

Implementation

To implement this solution each student took a specific portion of the multifaceted project (virtualization, device configuration, cabling, testing) and worked through a schedule aimed to conclude in four weeks. The virtualization and configuration of the network appliance and other networking devices were tackled first. The VMWARE server hosts seven cloned virtual machines connected to the routers and switches for network analysis and testing. The network appliance acted as the Internet's gateway into the lab and the networking devices therein. Networking technology concepts such as application access security, IP addressing scheme, device communication, and virtual local area networking (VLAN) configuration were applied in successfully implementing the project. Each feature from virtual PC access to lab reservation/scheduling and remote device shutoff was thoroughly tested.

In summary, the remote networking lab will allow for hosting real lab equipment, real software applications and curriculum on the Internet for blended distance learning, instructor led training, student team and individual student equipment access. Resources can be scheduled, automated, and accessed remotely, allowing Academies to maximize their investment in equipment and software.