A COMPARATIVE STUDY ON MANUAL AND AUTOMATED SYSTEM FOR WIRELESS NETWORKS

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ABSTRACT

VNR Vignana Jyothi Institute of Engineering and Technology- have an existing network of outdated equipment purchased on an as-needed basis with limited planning and support. A portion of the outdated equipment was reaching end-of-life (EOL). The network was unmanaged & a lot of its equipment was outdated and underperforming, however, the college's rapid growth and subsequent increase in network traffic, was creating a demand for more network applications and updated hardware. Before deploying a wireless network, it needed to update its network to boost bandwidth capacity and resiliency and tighten security controls. In addition to supporting its communications and applications. The college's vision was to build a facility that provided the students, faculty and staff with the most up-to-date IP network that would enable secure delivery of data over Wired as well as Wireless Network.
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1. INTRODUCTION

VNR College had an outdated core network built on switches of various different technologies & not all Networking Devices were from the same Vendor, so the bottom-line was to standardize on a Single-Vendor-Solution. Deploying a wireless LAN (WLAN) to give students, faculty and staff Internet access from various locations, after careful consideration, the College looked at Wireless Network equipment from Siemens Enterprise Networks. In addition to a wireless network, VNR College wanted to revamp the existing Wired Network Infrastructure by placing priority on reliability, performance, cost-2 efficiency, vendor support, and the ability to help the college meet all of its application goals, including the digital library system, Power over Ethernet (PoE), Gigabit to desktop & Centralized control over the network. Based on preliminary work, the College estimated they would need 40+ Ethernet Switches, 80+ wireless access points, a high-end router & a Unified Threat Management system, and wanted the selected WLAN vendor to perform a full site survey to determine the exact number and correct placement of these Network Devices.

1.1 The Solution After reviewing several responses, Vignana Jyothi selected Siemens, as a System-Integrator, for Wired/Wireless Network deployment
- Siemens HiPath Wireless LAN Controller & HiPath Wireless Access Points
- Extreme Networks Managed L2/L3 PoE Ethernet Switches & NMS Software & Enterasys Router.
- SonicWall Network Security Appliance & Proxy-Server Software Licenses.
- ADC Krone Fiber backbone & CAT6 passive components for inter-connectivity between different buildings as well as end-users respectively.
- Point-to-point wireless bridging between new management hostel & the college campus.

1.2 Top Benefits An IPv6-ready network with high-speed Internet Access, Gigabit at desk &

optional 10G uplink – to build a solid Future-Proof network infrastructure)[Davies,j.U IPv6]

- Network Management Software for Centralized configuration, management & control over both network devices as well as users.

- Effective security that protects against unauthorized use of the network by deliver real-time network protection without compromising network performance.

- Flexible management of user groups on both Wired as well as Wireless Network.

- New Services like DHCP, Proxy Service being installed in New Server.

Centralized Network: The issue arises here was the form of connectivity in between College campus & the Hostel, as Fiber-laying was not a feasible solution in this case. The College determined it wanted to deploy an 802.11 a/b/g Wireless LAN to service the entire campus. The Wireless Network should meet the needs of today's technology-savvy students by providing a wireless computing environment & capable enough to handle Futuristic Voice-over-Wireless (VoWLAN) or other Application integration. sources are available at different geographical locations close to loads, therefore, the latest trend is to have distributed or dispersed power system. Examples of such systems are wind-diesel, wind-diesel-micro-hydro-system with or without multiplicity of generation to meet the load demand. These systems are known as hybrid power systems. To have automatic reactive load voltage control SVC device have been considered. The multi-layer feed-forward ANN toolbox of MATLAB 6.5 with the error back-propagation training method is employed.

2. READY FOR THE FUTURE-WIRED NETWORK

The Network is designed with hierarchical 3-tier architecture (core, distribution and access switches) with core switch located in the central server and the backbone connectivity is through separate Single mode OFC which will be connected to PG block and MBA block on Gigabit connectivity. All other floors have high speed Distribution & Access switch with Gigabit uplinks to the core. Each of the Summit switches at VNR College offers dual stacking interfaces to provide high-speed 40 Gbps stacking bandwidth.

2.1 Switches The equipment environment for the LAN consists of:

- Summit X450a-24t (Layer – 3)&Summit X450e-24t (PoE Layer – 3)

- Summit X350-24t

- EPICenter 6.0 Network Management Software , (Layer – 2)

❖ **Summit X450a-24t (Advanced Layer-3 Ethernet Switch)**

Summit X450a is based on the revolutionary ExtremeXOS operating system from Extreme Networks®. Extreme XOS is a highly resilient, modular operating system that provides continuous uptime, manageability and operational efficiency. Summit X450a switch offers the same high-performance, non-blocking hardware technology used on Extreme Networks Black Diamond® 8800 series Chassis, in the Extreme Networks' tradition of simplifying network deployments through the use of common hardware and software throughout the network. Summit X450e (Power Over Ethernet) supports hardware-based routing for both IPv4 and IPv6 to help provide investment protection by allowing the rollout of IPv6 in your network now or in the future.

❖ **Summit X350-24t/48t (Layer-2 Ethernet Switch)**
Summit X350 series 24- or 48-port 10/100/1000 Gigabit Ethernet stand-alone switches deliver outstanding performance in a simple Enterprise edge solution with the revolutionary modular operating system, ExtremeXOS®.Summit X350 series switches are based on the revolutionary ExtremeXOS® core-class operating system from Extreme Networks®. ExtremeXOS is a highly resilient, modular operating system that helps provide continuous uptime, manageability and operational efficiency. The highly flexible Summit X450a, X350 switch provides high-density Gigabit Ethernet ports plus a slot for an XGM2 dual 10 gigabit option module in a compact 1RU format, supporting intelligent Layer 2 switching with Layer 2 – Layer 4 traffic classification and QoS on every port for high productivity)[IW EXOS 2006]

2.2 EPI Center EPICenter® 6.0 (Network Management Software)

EPICenter management suite from Extreme Networks is a scalable full-featured network management tool that simplifies configuration, troubleshooting and status monitoring of IP-based networks. Offering a comprehensive set of network management applications providing the ability to configure, monitor, troubleshoot and manage the network and its elements, EPICenter delivers on both the basic requirements of network management while adding valuable and intuitive features that help save time by streamlining common tasks.

EPICenter Features EPICenter version 6.0 is a future-proof management platform capable of establishing and maintaining networks that are undergoing rapid change due to convergence. EPICenter establishes a new benchmark for accommodating convergence applications by offering intuitive user interfaces and by reducing the complexity of managing converged networking environments. EPICenter offers an open architecture, to accommodate a multi-vendor, service-rich environment that enables voice-class availability, and the enforcement of robust security policies)[SNM EPICENTER Q 2007].See fig.1.

3   IPV6

The imminent successor to the current IPv4 addressing scheme and protocol, Internet Protocol version 6 (IPv6) clears the way for a new network environment. This environment is characterized by rampant growth and the need to accommodate new convergence applications such as Voice-over-IP (VoIP), mobile telephony, Peer-to-Peer networking, IP video distribution and government security and defense systems[Miller, M. *Implementing IPv6]*. Extreme Networks® has addressed these concerns with a product architecture and Operating System (OS) that are built from the ground up for IPv6. Extreme Networks recognizes that supporting IPv6 is only the first step to a sound implementation.

3.1 Following are some of the advantage of IPv6 over IPv4

1)Larger Address Space: address filed in IPv6 is 128 bits long while the address filed of IPv4 is only 32 bits in length. IPv6 offers very large, i.e.296 address space as compared to IPv4. 2) Better header format: the header of IPv6 has been designed in a way to speed-up the routing process. In header of IPv6 options are separated from the base header. Options are inserted into base header only when required by the upper-layer data. 3) Provision for extension: IPv6 has been designed in a way that a protocol can be extended easily to meet the requirements of emerging technologies or new applications

4) Resource Allocation support in IPv6: IPv6 provides a mechanism called Flow Label for resource allocation. Flow label enables source to send request for the special handling of a packet)[TCP/IP Guide]: .. 5) Security Features: to ensure confidentiality and packet's integrity encryption and authentication options are included in IPv6

3.2 Research of IPv4 & IPv6 The Internet Protocol version 4 or IPv4 is the most widely used network layer protocol on the Internet. IPv4 offered 32-bit (4 byte) address space of 232 that was equivalent to about 4,294,967,296 unique addresses on the network. The IPv4 protocol is described in IETF RFC 791 (September 1981). Internet Protocol version 6 or IPv6 is the successor to the IPv4. It offers an address space of 2128 or approximately 5x1028 unique addresses to be used over the Internet. The IPv6 protocol is described in the IETF RFC 2460 [IPv6 2006]. 1.Independence from network processes and network architecture of the host 2.Universal connectivity throughout the network 3.Standardized application protocols 4.End-to-end acknowledgements

There are four principal topologies used in LANs: bus topology, ring topology, star topology,tree topology These topologies can also be mixed. For example, a bus-star network consists of a high-bandwidth bus, called the *backbone,* which connects a collections of slower-bandwidth star segments. **3.2 Transporting IPv6 multicast** :As IPv6 multicast is almost not available in production networks for the moment, the M6Bone is a tunnel network with edge equipments supporting IPv6 multicast[Huitema , C.IPv6] . The tunnels can be: IPv6 multicast over IPv6 unicast IPv6 multicast over IPv4 unicast IPv6 multicast over GRE.

4   WIRELESS ACCESS

With the new campus-wide Wireless Network, VNR College students and faculty now have secure Internet access from wherever they are on campus. They can access networked university resources from Auditorium halls, and they can access digital library from their laptop. The equipment environment for the Wireless Network consists of:

4.1 HiPath Wireless Controller C 2400 Campus

The HiPath Wireless Controller is a high-performance platform that provides centralized intelligence for the HiPath Wireless LAN (WLAN) solution. As a result, the need for on-site installation and maintenance of remote access points is greatly reduced and network manager's benefit from enhanced centralized control. This makes it easy to implement sophisticated Open Mobile Enterprise Solutions across the WLAN. The Controller is a full-functioning router that aggregates all access points into what appears to the rest of the network as individual, centrally managed, IP subnets, which means that there is never a need to configure Access Points individually. As a result, network management is greatly simplified, eliminating the need to ever physically visit the remote access points. Further, the Controller operates at wire line speed for maximum throughput.

4.2 HiPath Wireless Access Point AP 2620

HiPath Wireless family of Access Points are enterprise-class dual radio 802.11a/b/g capable, providing coverage anywhere that wireless LAN (WLAN) service is required. Unique Plug-and-Play technology dramatically simplifies deployment of the network. The distribution of responsibilities between the AP and Controller is optimized by using a "Fit AP" model that balances high performance, security and manageability. Unlike ―Fat APs which require all functions to be performed at the access point (adding cost by needlessly duplicating processing and functionality) instead of centralizing at the controller, and unlike ―Thin APs which delegate almost all functionality to the controller (impacting performance by creating processing bottlenecks and adding unnecessary traffic and network transactions), Fit AP solutions deliver **exceptional performance** while remaining **easy to manage**. See Fig.2. and Fig.3.

FIT APs perform time sensitive tasks such as encryption, and communicate directly with each other for radio management and load balancing. The controller automatically detects and configures new access points for complete plug and play functionality. Power over Ethernet is provided to make deployment even simpler. All APs associated with a controller are individually monitored and managed from a central console. When needed, each AP can be separately configured, enabled, or disabled. APs can be managed through the Controller via SNMP, which provides alarms, traps

and reporting statistics suitable for HP Open View or other SNMP network managers. APs also provide consolidated reports for performance management, security logging, and usage data. HiPath Fault Management is also supported.

4.3 Centralized Layer 3 Wireless Network is better option:

Centralized layer-3 architecture provides benefits of Centralized Management, high Availability, Scalability and Secure Seamless Mobility. Wireless Portfolio: Unique Value Proposition, Highly HiPath Manageable Controller-Based Architecture, Highly Flexible and scalable, Centralized Management,Plug'n Play Configuration, Automated RF Management. Flexible Layer 3 Wireless Deployment , Extend to Branch Office Solutions , Secure Tunneling and user Segments , Seamless Mobile Roaming , Optimized Voice over Wireless Support, Low Latency Fast Roaming (<40ms) ,High Calls per AP Capacity (15-25 / AP) , Optipoint WL2professional 802.11b / g support.
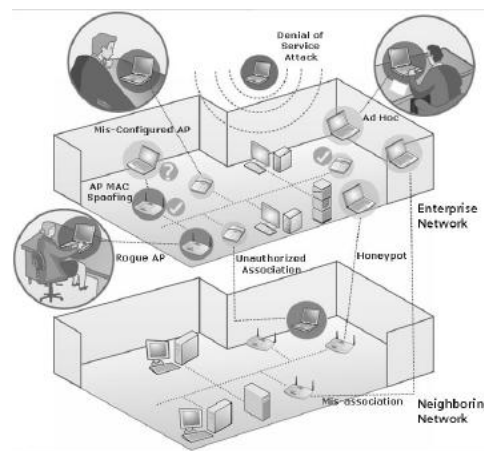
4.4 Wireless Security

Fig 4.

Siemens has architected its Wireless portfolio for enterprise-grade security, with a strong standards-based approach to data confidentiality and authentication, as well as a unique, powerful intrusion detection and prevention implementation. By implementing the 802.11i standard, Siemens has addressed the security issues pertaining to data confidentiality and authentication. Beyond this, Siemens has also taken measures to make it easy to integrate with existing wired LAN security mechanisms like RADIUS authentication or IPSec VPNs. While data confidentiality and authentication are addressed through industry standards, no equivalent exists for wireless intrusion detection and prevention. Siemens HiPath

Wireless Portfolio can provide today the best of Wireless Infrastructure, Mobility Solutions, Voice Applications and Wireless Security Solutions.

4.4.1 SonicWall Network Security Appliance

The SonicWALL Network Security Appliance is a next-generation Unified Threat Management platform, utilizing a breakthrough multi-core hardware design with 2 cores and 6 Gigabit Ethernet interfaces to deliver real-time network protection without compromising performance. SonicWall delivers complete Internet security to educational institutions for creating not just a secure network, but also a safe academic environment. In the Multiple User-Single Machine situation faced by educational institutions and libraries where multiple students and faculty access the Internet over shared machines, SonicWall has the solution that can pinpoint the user who has accessed unauthorized porn, dating, hacking sites, carried out illegal P2P file sharing, gaming, gambling, extensive non-academic chatting, downloaded virus-carrying files, or received excessive, non-academic spam.

Fig.5.

SonicWall Network Security Appliance**:** 1)Deep Packet Inspection & Multi-Threat Protection 2)Patented Reassembly-free Deep Packet Inspection (RFDPI) technology 3)Fully integrated deep packet inspection firewall, including gateway anti-virus, anti- spyware, intrusion prevention, and application firewall for perimeter and internal protection 4)SSL VPN and IPSec VPN clients for secure remote access 5)Application Firewall feature-set for Application inspection and control 6)Automated and Dynamic Security Updates 7)Business application prioritization & QoS 8)Integrated Network Security Policy and Management.

4.4.2 Enterasys XRS 3250 Router The **XSR 3000 Series Security Router** delivers simple and powerful enterprise WAN networking by combining comprehensive IP routing features; a broad range of WAN interfaces; and a rich suite of security functions, including site-to-site and remote access Virtual Private Networking and policy-managed, stateful-inspection firewall—in a single device. Unlike typical WAN routers, the XSR Security Router provides best-of-breed security and maintains wire-speed WAN performance when features are enabled.

4.4.3 IBM Rack Mountable Server with different Services (Proxy, DHCP, FTP,Antivirus etc.)

4.4.4 Wireless Bridging A **wireless bridge** is a hardware component used to connect two or more network segments (LANs or parts of a LAN) which are physically and logically (by protocol) separated. The New Hostel is connected to the College's network via dedicated wireless links. Main link as well as a redundant link, both is configured on 5 GHz bandwidth, while this is robust and often more Cost-effective solution than T1 lines. **The Benefits: Flexibility + Simplicity = Lower TCO** wireless networking solutions deliver more than just data connectivity without wires. With the HiPath portfolio companies can use the benefits of a truly mobile communications solution.

❖ Converged voice and data networks providing Data Connectivity, offering productivity with a lower cost of ownership compared to proprietary wireless Network solutions Wireless LAN architecture designed from the ground up for flexibility, scalability, and manageability and enhanced user services.

❖ Integrated vertical solutions providing always on access to corporate data and supports true user mobility across the enterprise through seamless roaming.

❖ HiPath Wireless' virtualization capabilities enable the creation of separate subnets for students, faculty, and staff. To ensure that all users can benefit from the connectivity, but only gain access to areas of the network appropriate to their role.

❖ With the Extreme Networks Summit switches in place, the College has a solution that delivers a non-blocking switch fabric and architecture, all at wire-speed. The applications

will perform as expected, regardless of network and server load.

5   CONCLUSIONS

Improved Performance + Reliability = Higher Quality Education With the knowledge and expertise of Siemens Enterprise Communications Network , VNR College is confident and ready for future network growth, including the future expansion of the college by planning, state-of-the-art building, all of which will accommodate the expected growth of the college.

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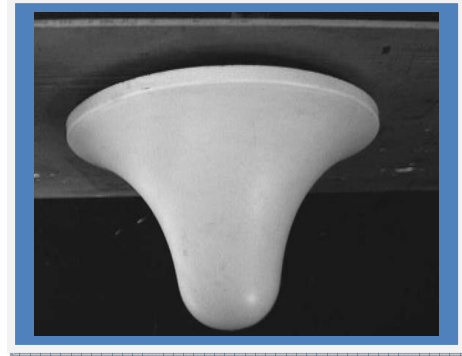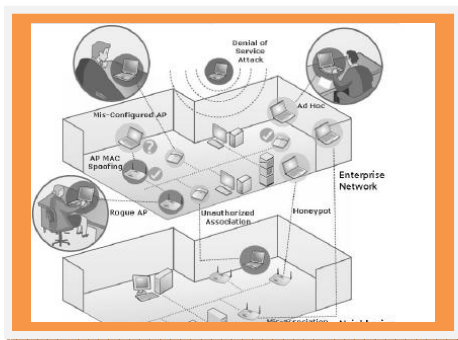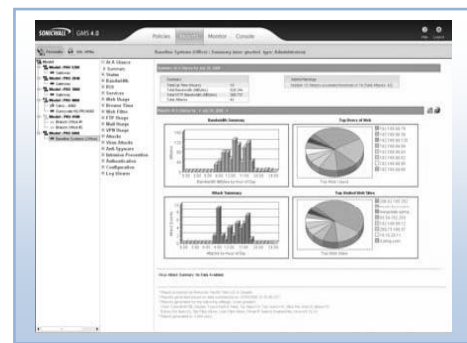
FIGURE 2
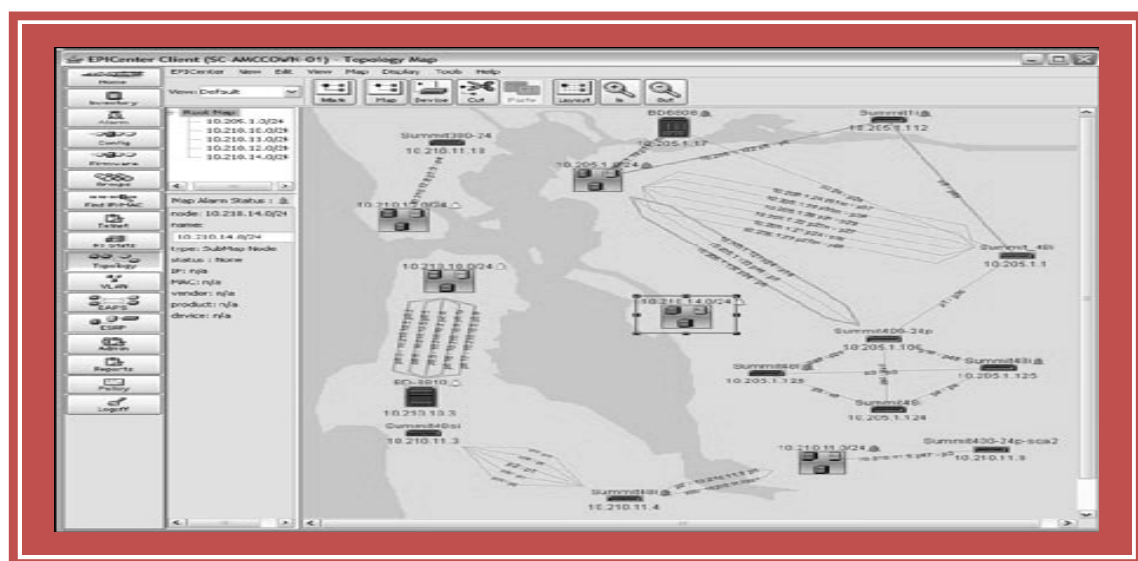

FIGURE 3

FIGURE 4

FIGURE 5

FIGURE 1