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A Wireless VPN for a Textile Group Using Wireless Access Points

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ABSTRACT

A Virtual Private Network for National Group of Industries, Faisalabad was developed by using the latest techniques of wireless Access Points using 802.11a standards. The study was designed to facilitate the management as well as the MIS department for the ease in their work. The key benefits of the present study indicated that that VPN are: centralized database, voice over IP, video conferencing and fastest data transfer.

Key Words: Wireless; VPN; Wireless Access Points

INTRODUCTION

A Virtual Private Network for National Group of Industries, Faisalabad is purely a kind of WAN (Beaulieu, 2001). The main purpose of this project was to facilitate the management and the related officials for the ease of their work. This network consists of four different locations / offices which are combined through using the WAN techniques. National Group of Industries is a well known group in Faisalabad's Industry.

There are different kinds of wireless networks, including satellite, cellular, fixed wireless access, and wireless LANs (Stallings, 2002). In this project main emphasis is on fixed wireless access through towers and radio bridges. There are different types of towers and antennas along with radio bridges e.g. Flare Stack, Self Supporting, Welded Guy Towers and Die Cast, Vagi, Echo Series and Omni Directional Antennas (Unger, 2003). In this particular project Omni Directional antennas and Welded Guy Towers are used. Different kind of topologies and techniques are there for WAN development but the technique used for the completion of this project is VINE technology. (VIP 110-24 Operator's Manual)

MATERIALS AND METHODS

Basic technique used for data collection and initial analysis was SDLC. During which the initial information and requirement by the NGI were collected and then some surveys were planned to find out the best solutions among the WAN solutions. From the findings of these surveys it was decided to ground one tower at each location on which VIP 110-24, were planted along with an antenna, *which is th*e building block of the Wi-Lan Technologies Inc. proprietary "VINE" Network topology. During the surveys and initial analysis following virtual diagram was designed for the completion of the project which is now the actual diagram and plan of the project.

On each side one Welded Guy type tower is installed on which Omni Directional Antennas along with Wi-Lan's *VIP 110-24* are installed at following heights (Table I).

Table I. Heights of antennas

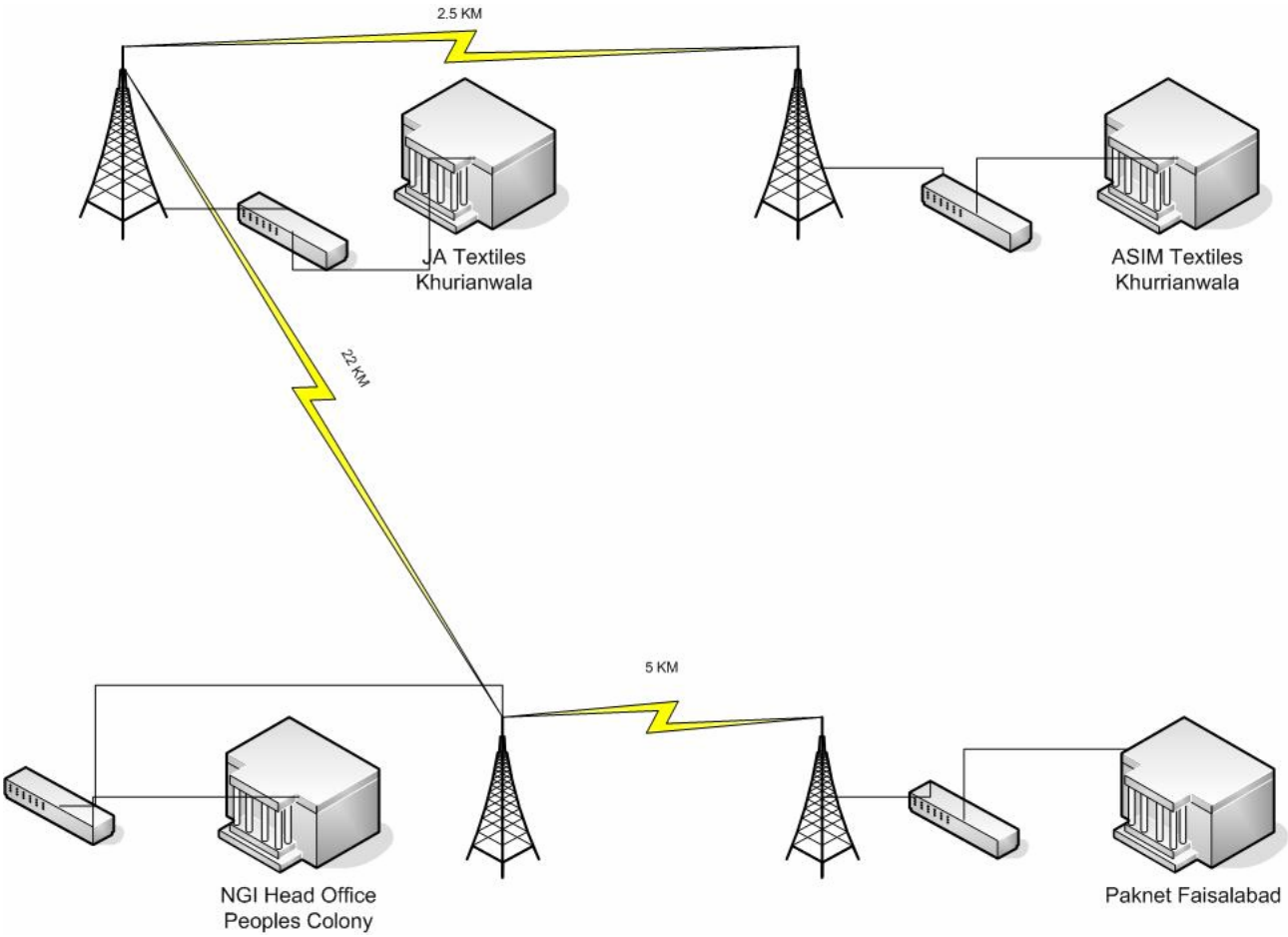
Sr.No.	Site	Height
1	Paknet Office to NGI Head Office	95 feet
2	NGI Head Office – Paknet Office	95 feet
3	NGI Head Office to JA Textiles	75 feet
4	JA Textiles to NGI Head Office	75 feet
5	JA Textiles to Asim Textiles	75 feet
6	Asim Textiles to JA Textiles	75 feet

The *VIP 110-24* is used to interconnect Ethernet LAN's (Local Area Networks) and WAN's (Wide Area networks) across large distances, creating a virtual single network. This unique network topology can also be used to provide broadband internet access by a Service Provider or to interconnect multiple nodes in a private network.

The VINE technology allows a complete wireless network to start with as little as two radios, and gradually grows, a node at a time, into a very large and complex wireless network. New nodes can be added at any time with the sole requirement that they must have line of sight connectivity to another node already on the VINE. The new node, once attached, becomes a potential attaching point for other nodes.

The radio includes a 10/100-Base T Ethernet port for connection to the Local Area Network (LAN). Each radio operates in a self-learning bridge mode. Any Ethernet station connected to the local LAN can see all other stations connected to any of the other LANs at the remote sites. No special configuration of the user stations is necessary, as each of them believes that there is just one Ethernet.

Fig. 1. Virtual Diagram of the VPN



The *VIP 110-24* is a Spread Spectrum radio operating in the "Industrial Scientific and Medical"(ISM) band from 2.400GHz to 2.4835 GHz. Spread Spectrum technology allows operation without a license with an output power of up to 23 dBm at speeds up to 11 Mbps (mega-bits per second).With exception of the indoor power inserter, all of the *VIP 110-24* electronics are included in a watertight outdoor unit enclosure. A single CAT 5 cable carries the Ethernet data and DC power to *VIP 110-24.*

Operation. The VINE network topology is a tree. The different node types in the tree are: "root", "repeater", and "leaf".

The *VIP 110-24* is equipped with two antenna ports. Antenna port A is assigned for communications with that node's "parent". With exception of the root, each node in the VINE has one and only one parent node**.** The antenna connected to port A is typically a high gain directional antenna pointing at this parent node. The root node is the only radio without a parent node , therefore antenna must be connected at Port B of the root node and port A of this radio remain not connected with any antenna.

Antenna port B is assigned for communications with the node's "children". This antenna must provide coverage to all of the node's children. Depending on the geographic location of those children the antenna connected to port B could be an omni, sector, or directional antenna. Leaf nodes do not have children, so no antenna is connected to port B. Each *VIP 110-24* in a VINE network operates in a half duplex mode, i.e., it may either transmit or receive at any given time. Transmissions consist of variable length packets. "Outbound" packets flow "*downstream*" or *away from the root (from parent to child).* "Inbound" packets flow "*upstream*" or *towards the root (from children to parent*).

Configuration Technique For Vip110-24

At root:(port b)

1. Run econ.exe or telnet the VIP if u know the pre-configured IP addresss.A window will be opened with radio numbers at the most left side of screen.
2. Enter your radio number i.e. (1,2,3,....). NOTE: If there are only two radios, in point to point link, then there will only be two radios displayed. Enter no.1 for your radio. If link is not established then only your radio will appear.
3. A prompt will be flashed like prompt>

4. Follow the command node type=root and then press enter node name=site1
5. node location=site name like NGI Head, JA Tex. etc.
6. Rf-from-child ch=channel no.

Like 5, 15,25,35 these are four non-overlapping channels .You can select one of these as your best option. Range is (1-35) but keep a sufficient difference in channels to void any co-channel interference. This is also called inbound channel at root

7. Rf-nnp1 ch=channel no.

Keep as same as in above step. This is also called outbound Channel at root. If you keep step8 and step9 same then it means that you are using same channel for inbound and outbound If you select another channel for step9 then it means that you are using different channel for outbound at root and this channel should be entered at leaf for rf-from-parent

8. Rf-nnp1 pwr=power in dbm The maximum value is 23dbm
9. **Save**

At leaf: (port a)

Repeat step 1 to 4.

1. Node type=leaf
2. Node name=site2
3. Node location=site name
4. Rf-from-parent ch=channel no.
5. Rf-from-parent pwr=power in dbm
6. Rf-from-parent sp=speed in Mbps The values acceptable are 1,2,5.5 and 11Mbps
7. Save

When configuration has been made. To check the link status after having configured the radios, the following commands are used.

Prompt>sh

This will show you the link parameters like RSSI, channels and power etc.

The following command will display the current configuration of your radio

Prompt>discon

RESULTS AND DISCUSSION

The old system was completely manual. In this system the data was saved in the form of files which had its own drawbacks. The centralized database has replaced this file system in the recent years. Deshpande (1997) stated advantages of popular database systems as; Query, language, simplicity, physical implementation, security and recovery. McFadden (1998) stated following objectives in attempting in a database design; economical, accurate, timely, flexible, robust, efficient, secure, maintainable, portable. Krumm (1997) stated that for a successfully, designed and maintained database we have the following; identify which part of the world's data is of interest to us, identify what specific objects in that part of world's data are of interest to us and identify a relationship between the object.

Now the problem was to share this centralized database among different locations like the head office in Faisalabad and the two Mill sides which are situated in Khurrianwala, 35 KM away from Faisalabad. For this purpose different latest techniques were in consideration and wireless WANs was one of them. Unger (2003) stated that it is not only possible to connect two fairly distanced locations but also relatively cheap by using the Wireless WAN techniques. He further discussed the different techniques and topologies along with the hardware provisions. Stallings (2002) stated that Wireless technology has become the most exciting area in telecommunications and networking. The rapid growth of mobile telephone use, various satellite services, and now the wireless Internet are generating tremendous changes in telecommunications and networking.

Davis (2004) stated that Wi-Fi is the technology that allows you to connect anywhere, anytime.

These latest techniques are being in use by different banks in Pakistan like UBP, HBL, MCB, ABL etc and organizations like PSO. But the difference of current study and above mentioned studies is merely the WAN Topology (VINE).

The flaws of manual and file system have been removed by this system. The new system is time efficient.

The manual system was lacking the centralized database, data security and accuracy because of the splitting database (previously the database was not centralized and located at different places) which had many chances of error generation, dual data entries due to which a lot of problems occurred in accounts. The new system has enhanced security and accuracy.

There is also provision of video and audio conferencing between different nodes / stations which will further enhance the communication.

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