WIBORNE, INC.

www.wiborne.com January 20, 2008

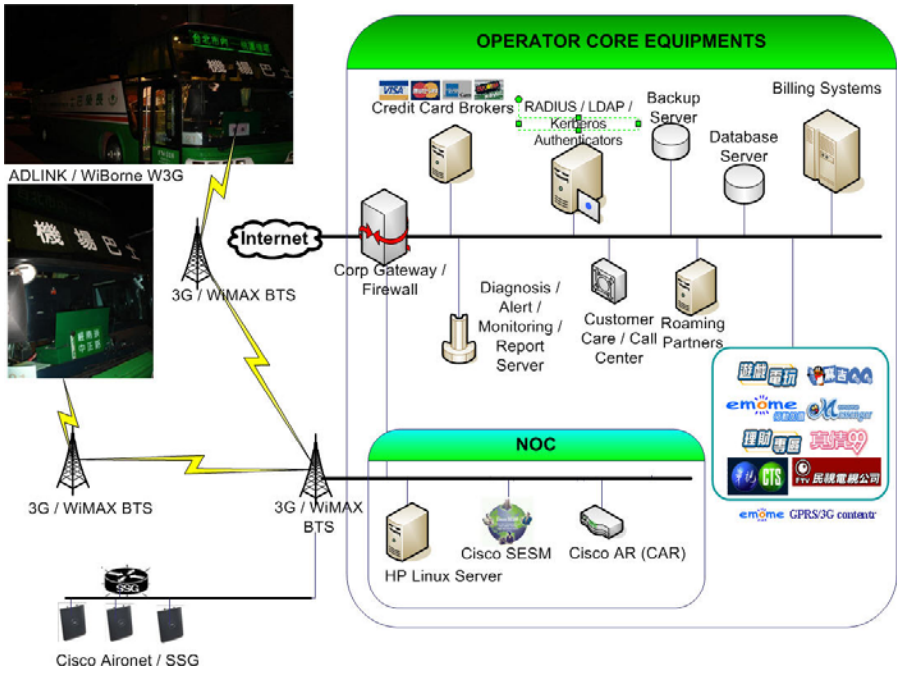
Wireless Broadband Roaming with 3G / WiMAX Routers

WiBorne Inc. awards 2nd phase contract from ADLINK Technology Inc. to co-develop a 3G/WiFi/WiMAX router based on ADLINK's leading edge of hardware technology for carriers and industries, along with extension of WiBorne's W3G Wireless Access Controllers,W3G-1000. This equipment is planned to be on production mode to offer mobile internet services during period of 2007/Q1 for 3G as the 1st phase, and the 2nd phase for 3G+WiMAX as part of Mobile-Taiwan (M-Taiwan) WiMAX projects with joint development with local operator, Far EasTone Telecommunications Co., Ltd.

WiBorne plans to offer above requirement with W3G-1000, carrier for enterprise mobility of 3G/WiFi/WiMAX routers. The W3G-1000 is a rugged edge server and wireless gateway, designed for use in harsh mobile and mobile environments. The W3G-1000 enables the seamless extension of mission critical information management resources to public safety/first responder vehicles and response sites through the convergence of next generation LAN and multi-WAN technologies including Ethernet, 802.11/WiFi, 3rd generation (3G) cellular networks (UMTS, GPRS, W-CDMA, HSDPA, HSUPA), and WiMAX 802.16e backward compatible with Alcatel, Motorola.

WiMAX / 3G Coverage with Roaming Agreement for Wireless Users

The reality of networks today consists of a combination of different access & core network technologies from ISP. The vision for the future is to be always connected seamlessly = anytime, anywhere. This is not achieved using a single technology, but using different networks stitched together in order to form a network of networks, where users can roam seamlessly and securely across different infrastructures always utilizing the best resources available. Combined with 802.11, 3G, WiMAX multi-WAN, built-in IPSec / VPN, policy routing, multiple vendors RADIUS attributes, WiBorne's W3G-1000 offers Wireless ISP (WISP) roaming agreement deployment that benefit two or more WISP to create a roaming agreement that allows customers from one WISP to connect to the Internet through the Wi-Fi hotspots owned and operated by the other WISP or WISPs.



WiMAX 802.16e base station and mobile client devices

Mobility WiFi with 3G/WiMAX Deployment

The ***Mobile-Taiwan*** Mobility Initiative: We plan offer wireless approaches that unwire services for Warehousing, Public Security, Transportation & Traffic Information Services, Digital Content & Entertainment, Video Phones, and Law Enforcement & Emergencies. First field deployment is done with Evergreen buses serviced on freeway between Taipei city and international airport. On a shuttle bus service provided by Evergreen International Storage and Transport Corp. Far EasTone' WiMAX-enabled real-time information on flight schedules is perfect for those who are on their way to the airport to catch a flight.

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SUCCESS STORY: *Remote Video Surveillance over 3G for Security Monitoring, Johannesburg, South Africa*

With the lack of fixed line infrastructure in many countries and even in rural areas of South Africa (SA), the evolution of cellular communication was the logical alternative. Cell phones are today the most used communication instrument, more SA organizations have been migrating towards low bit-rate video surveillance products that have turned remote and centralized video surveillance across the corporate wide area network (WAN) into an affordable and practical reality, by using 3G or even WiMAX for mobile data communication.

Brigit Fire of SA, www.brigit.co.nz, singularly focuses at the security and safety disciplines required for commercial and industrial systems. The product range offered by Brigit varies to suit specific needs of digital CCTV and peripheral equipment providing the client with a single system integrator ensuring equipment compatibility and solutions achieved.

The president of Brigit, Deon van Zyl, introduces such state-of-the art mobile video CCTV monitoring solutions really do take the security industry into its next phase. Brigit's customers can access remote CCTV video monitoring over cell phone (GPRS or 3G), ADSL, 802.11, or any other IP-based WAN link. Clients can accurately verify images and data immediately, ensuring that they don't waste time responding to false alarms - which account for over 90% of alarms.

Brigit introduces such solutions to SA companies because they offer significant cost and productivity benefits: "CCTV surveillance video was typically run on a separate network or over ISDN in the past, as it tends to interfere with normal data traffic by causing data and transaction loss". Brigit installed such solutions on Tanzania from 4Q 2007 and expected for 400 remote sites of deployment by using WiBorne's W3G-200U Wireless / 3G USB router which offers "***AlwaysOn***" for seamless and uninterrupted security monitoring.

Benefits associated with Brigit's remote monitoring include alarm verification, improved productivity, improved security management as well as improved management of armed response services. By allowing management to access remote sites on alarm, CCTV becomes a proactive response tool instead of a post event investigative solution.

Brigit / WiBorne solutions are simple and affordable. For example, for a control room in Johannesburg to watch over video feeds from Sandton, Durban, Pretoria, and Cape Town. The value proposition of centralized, off-site monitoring includes saving on control room staff and better facilities management.

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December 08, 2007

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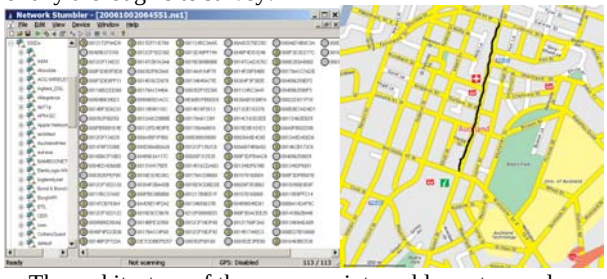
Design & Implementation WiFi Mesh for Queen Street, Auckland, New Zealand

Queen Street is the major commercial thoroughfare of the Auckland CBD in Auckland City, New Zealand's main population centre. It rises from Queens Wharf on the Auckland waterfront, adjacent to the Britomart Transport Centre and the Downtown Ferry Terminal, and extends uphill for almost 3 KM in a mostly straight south-southwesterly direction towards the Karangahape Road ridge, and the residential suburbs in the interior of the Auckland isthmus.

WiBorne of NZ office proposed the WiFi hotspot service on lower Queen Street for range of 1.5 KM on Sept. 2006. **Challenge** for such deployment is:

- Maximum concurrent users is 1000
- Wireless clients can be online with existing wireless cards from laptop or wifi phones
- APs must resize inside buildings while utilize outdoor antennas
- Intermediate APs would repeat each other without wired internet.
- Heavy interference zone with the most restricted city regulation in New Zealand

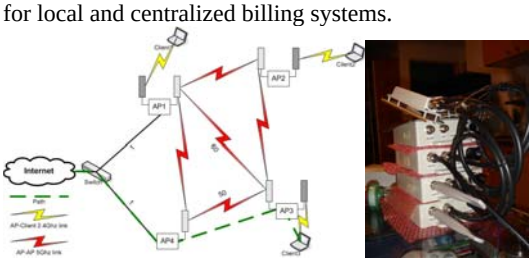
We can see 113 APs with 9 minutes of driving on the road for site survey, which indicate highly interference zone from this street. We then guide to understand the following components of any thorough site survey:



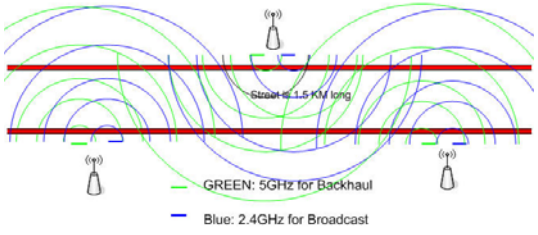
- The architecture of the access points, cable routes, and electrical needs

- The proper site survey technique and usage of appropriate utilities
- The structural and installation obstacles, including building construction, transmission coverage area, building contents, present cable configuration, area regulations, and building codes
- The documentation that outlines the necessary parts and equipment, and diagrams exhibiting the proper placement of the equipment

A design with WiBorne's Mesh node WAP-500 which has dual radios, one 2.4GHz is for broadcast while the 2nd 5GHz runs backhaul from satellite internet (VSAT), and HSG-200 for local and centralized billing systems.



A Directional Wireless Mesh Network: We consider a typical single-channel, single-interface WMN deployment with omni-directional antennas in which mesh routers are placed behind window of department stores, and are interconnected via 802.11a links. The practical directional antennas used in directional mesh are non-steerable and they always point to the direction toward which they were manually placed during the network deployment.



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Designed & Implemented on Sept. 2006.

Written on August 25, 2007

WIBORNE, INC.

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SUCCESS STORY: *Field Test of WiBorne Radios in Gandhinagar Districts, Gujarat, India*

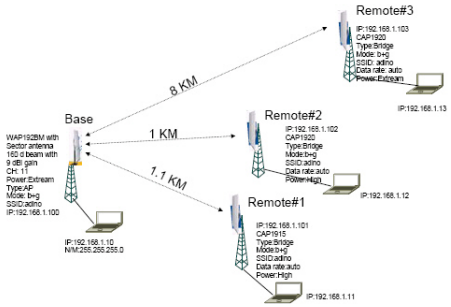
Gandhinagar is the capital of Gujarat State, India. It is one of the three planned cities of India. Located on the banks of the River Sabarmati, the city is the administrative centre of Gandhinagar District. The weather is hot through the months of March to June when the maximum temperature stays in the range of 36 °C and 42 °C, and the climate is extremely dry. The southwest monsoon brings a humid climate during summer.

Adino Telecom (www.adinotelecom.com) is headquartered in Mumbai with well equipped regional offices in India. It established itself as a system Integrator providing the entire range of Broadband Wireless Solutions with strategic alliances and tie-ups with other major international and Indian companies. Adino has an installed base of more than 2,000 broadband wireless links all over India for Telcos/ISPs, corporations, and government departments

Adino Telecom started deployment of Broadband Wireless Networks in Gujarat State Wide Area Network (GSWAN) from middle of the year 2003. Prior to this Adino Telecom had carried out extensive field trials and demonstrations of Broadband Wireless technology to India government keeping in: *data transmission, Voice over IP, video conferencing, long-range wireless deployment with large number of remotes in a point to multipoint deployment (P2MP) while offers usable throughput and availability.*

WiBorne started to team up with Adino for certain domestic projects since 2006 and have done several demonstration sites. A field test in Gandhinagar does successful links along with e-government functions such as VoIP (SIP phone with option of WMM as Quality of Service), video conference, bandwidth, and stable link by using WiBorne's base ration radio (WAP) and CPEs (CAP), was done on May 2007.

The test scenario is for P2MP with variety of applications for communication



Test result:
The short range that is less than 2 kilometers (KM), shows 18.5Mbps of throughput while successful VoIP phone call connection was in progress. FTP session then run with VoIP call shows 15 Mbps of throughput from iperf test software. The longer range with all 3 remotes run FTP and VoIP calls, shows up to 9.5Mbps of throughput from longer remote while 14Mbps for shorter remotes.

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July 15, 2007

WiBorne, Inc.

www.wiborne.com

SUCCESS STORY: *WiFi School Campus, Selangor D.E., Malaysia*

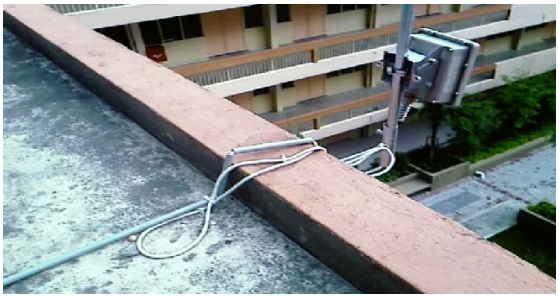
HinHua School (HHS), http://www.hinhua.edu.my, is an independent educational institution founded in 1947. Its main objective is to provide an excellent all round education within a happy and supportive community for pupils who have completed their studies in the Malaysia, English, and Chinese Primary. It offers excellent academic facilities and achievements with broad choice for further studies, and has traditionally been a trendsetter for many Campus-wide initiatives.

HHS students are highly mobile, moving between the facility, library, classroom and home. To make the best use of their time at each location, these students need an innovative set of tools. PROLiNK of Singapore (Fida International), www.prolink2u.com, envisioned an affordable, flexible and easy to maintain mobile technology solution that would not only improve communication between mobile groups of students and faculty, but also serve as a learning tool to facilitate better education.

E-Classes Anywhere Extends Existing Technology for HHS and Students

According to PROLiNK, the decision to deliver a mobile solution was practical. “HHS has well-equipped science laboratories, computer centre, multi-media classrooms and technology workshop. Most of HHS students are familiar with using the computer devices, interacting with content on a mobile screen, and populating forms with data. Rather than introduce a new technology, we were able to leverage their existing mobile devices and transform them into a powerful learning tool.”

Today, HHS students access and interact with E-Classes applications on their mobile devices through synchronization with their desktop computer, or wirelessly through 802.11 connections. Wireless connections are set up around high raise campus building on teaching floors, the library and class areas. HHS students are also using their handheld devices to log case notes on homework, check class schedules, and study animated anatomy illustrations. This improves transcription errors that were caused by incorrect manual entry and eliminate the costs associated with some full-time data entry positions.



PROLiNK/FIDA and WiBorne team up to develop WiFi deployment worldwide, and partner for modem telecommunications technology.

Contact:

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April 2, 2007

WIBORNE, INC.

www.wiborne.com

Long-Range 3G / WiFi / Pre-WiMAX Routers

FOR IMMEDIATE RELEASE

WiBorne Inc. awards contract to ADLINK Technology Inc. (www.adlinktech.com) to co-develop a 3G/WiFi/WiMAX router based on ADLINK's leading edge of hardware technology for carriers and industries, along with extension of WiBorne's HSG Wireless Access Controllers. This equipment is planned to be on production mode to offer internet services during period of 2007/Q1 for 3G, and tentative 2007/Q3 for 3G+WiMAX.

WiBorne plans to offer above requirement with HSG-200M, carrier for enterprise mobility of 3G/WiFi/WiMAX router. The HSG-200M is a rugged edge server and wireless gateway, designed for use in harsh mobile and mobile environments. The HSG-200M by ADLINK-WiBorne enables the seamless extension of mission critical information management resources to public safety/first responder vehicles and response sites through the convergence of next generation LAN and multi-WAN technologies including Ethernet, 802.11/WiFi, 3rd generation (3G) cellular networks (UMTS, GPRS, W-CDMA, HSDPA), with WiMAX backward compatible.

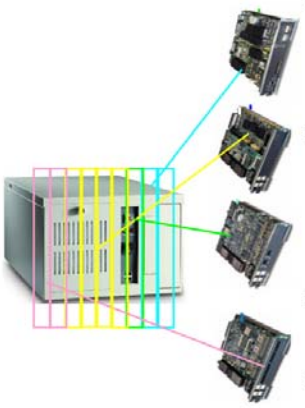
Applications

Intended for use in challenging multi-user, multi-device, multi-application, and/or multi-network environments such as command vehicles, cruisers, other public safety and first responder vehicles or temporary command posts, the HSG-200M Gateway serves as a communications gateway and integration hub for other peripheral devices (printers, scanners, cameras, specialized diagnostics equipment etc.). Enabling even more functional and reliable mobile applications deployment, the HSG-200M also serves as a complete remote applications platform with compute server, open Unix BSD for the deployment of specialized software applications (such as records management), and hardened storage for caching, hosting and automatic, bi-directional synchronization of large data stores. This managed distributed network storage (content) presents data to authorized users at speeds many orders of magnitude faster than any of today's broadband wireless networks and minimizes the user impact on the network during peak usage events.

Authorized users are simply, effectively and transparently provided access to standard communication and collaboration applications via virtual private networks (VPNs) while on the move. Standards based Mobile IP and IPSec are supported as VPNs for secure end-to-end networking applications. No additional client software or hardware installation is required. Authorized users simply turn on their WiFi-equipped laptops or PDAs and connect to the Mobile Gateway using their proprietary VPN clients or standards based 802.11i secure wireless networking technology. Billing systems support credit card, pre-paid card, or external RADIUS accounting servers.

Flexibility of our 3G Router – Multi-WAN / Multiplexing (Bonding) / Trunk

Mobile Wireless Center: Various access systems - 3G cellular, new radio interfaces, satellite link, WLAN, short range radio, wired access, and later WiMAX, are connected seamlessly via one core network for mobile environment. By combining a base station, radio network controller and core network router into one system, HSG-200M helps mobile operators extend the value of their 3G network investments by plugging radios modules that cover service quickly and lower cost.



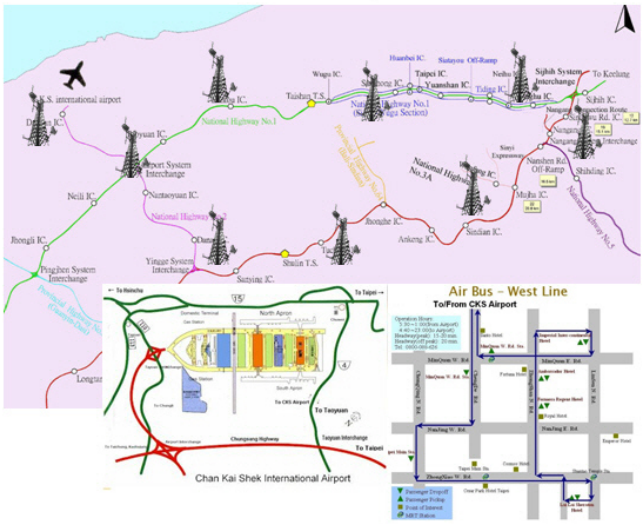
- **802.11b/g Wireless AP**
  - Power range up to 400mW
  - Range from 100 meter to 10KM
  - WEP/WPA/WPA2
- **3G Modules**
  - Option GlobeTrotter 3G Quad (Vodafone Connect 3G)
  - HUAWEI Mobile Connect E618 / E612
  - Belkin / GoHubs / e-Tek /Novate / Nokia / Sony
  - …
- **WiMAX Backward Compatible**
  - 802.16e 2007/Q3
- **Base Station Grade of Hotspot Functions**
  - Refer to HSG-200

Deployment

As part of Taiwan's aggressive plan to drive economic growth through nationwide access to broadband services, mobile communications is being promoted as a key element in transforming the country into one of the most e-nations in Asia by 2008.

This project is for part of M-Taiwan (Mobile Taiwan) Mobility Initiative that plan to offer wireless service on buses commuted between Taipei City and CKS International Airport.

- 3G Bases on Taipei Downtown and Freeway



Leveraging standards based networking technology to provide a dramatically more effective approach to new mobile broadband networking, the HSG-200M is the right answer for organizations requiring security, reliability, and cost effectiveness.

Contact us for an adaptive, cost effective and Reliable 3G Router capability study.

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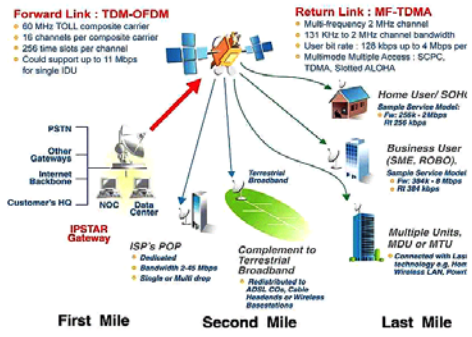
January 10, 2007

Success story: *WIRELESS EXTENSION FOR SATELLITE BROADBAND SERVICES*

In recent years, with the development of wireless Internet technologies that are often less expensive to deploy than more traditional fiber optic or cable wireline networks, a variety of institutions from coffee shops to non-profit organizations to universities and municipalities have deployed wireless Internet networks to serve their customers or residents. Satellite broadband providers offer broadband Internet service targeted primarily to the estimated large quantity of homes and small businesses that do not have access to other broadband Internet options.

Internet Connection for Rural Areas of NZ

WirelessNation (www.wirelessnation.co.nz) delivers high speed Internet services with satellite broadband and latest wireless technologies. Such Satellite Internet service is provided through the same small dishes used to deliver video services, such as DirecTV and Dish Network. Users send and receive information to the Internet via a satellite dish to a receiver on a satellite in space. The satellite retransmits the signal to and from the network operation center that is connected to the Internet. A major advantage of satellite broadband is its ability to deliver service to any location with a clear view of the sky. Disadvantages for Satellite broadband is that it costs more for such dish/receiver and installation



WirelessNation powers Satellite Broadband from IPStar

The initial part of connecting rural people is to connect the community and unite it as a whole. The purpose of people-to-people connectivity is to facilitate the transfer of information across a tribe and to provide information readily to every home. By connecting at a small-scale and then working up to a larger scale connection will be easier to be handled and organized. The central idea of local-to-local connection is by having a base-station that will be connected by outdoor wireless Client Point Equipments (CPE) to a router in each home. Each person in the home will then be able to connect to the router through a voice over Internet protocol (VoIP) phone, or even connects to CPE devices with WiFi phone.

Hybrid Architecture

Infortek Limited (www.infortek.co.nz) and WiBorne, Inc., come out very cost effective solutions to offer such base station, CPE, and small controller, with single satellite dish / receiver as a mobile hotspot that serve small group of households. This dramatically reduces cost of installation and equipments for satellite broadband services. Radio solutions are flexible and scalable and avoid the high costs and delays associated with wire deployment. Wireless is also a natural solution for adding nomadic services. Our systems combined with Wireless Local Area Networks (WLAN), and to some extent 2G/3G networks, can provide real broadband connectivity in rural and developing areas. We use hybrid architecture that produces right combination of a satellite system and broadband terrestrial technologies (wireless, mostly). It seems to be the most efficient and affordable way to provide broadband communications to remote regions.

Billing Strategies

We offer three types of billing options. **Simple** is for small networks controlled by thin access controller for Internet Café with a VSAT connection. **Local** is an independent hotspot operation that provides local AAA as WiBorne's HSG-250 Hotspot Controller for 250 to thousands of users. **Centralized** is for multi-site networks that managed by RADIUS servers or HSG-1000. We also implemented Aradial RADIUS and other open source RADIUS servers as centralized managements too.

WirelessNation Ltd. www.wirelessnation.co.nz

Infortek Limited, www.infortek.co.nz

WiBorne, Inc. www.wiborne.com

December 15, 2006

Success story: *WIRELESS VIDEO SURVEILLANCE FOR MOVING RAIL VEHICLES*

Metropolitan transportation departments around the world have a pressing need to bring applications familiar in fixed networks to moving vehicles, such as metros, trains and buses. One example is video camera (CCTV) for surveillance, which is an essential factor for today's public transit security. Traditional wireless data communications systems do not provide the reliability and performance to support applications such as full motion video in moving vehicles. The importance of these applications is growing rapidly, and the WiBorne solutions are vital ingredients for today's ground transportation, urban rapid transit, metro, subway, and bus systems.

Toll Rail (www.tollrail.co.nz) is New Zealand's leading transport operator and multimodal freight transport and distribution company. The company provides a cost-efficient linehaul service for the movement of bulk commodities or containerized freight. They also offer an integrated national network of rail, road, and sea freight transportation, along with world class distribution and logistics management services, and inter-island and urban passenger services.

Toll Rail in conjunction with Infortek (www.infortek.co.nz) and WiBorne (www.wiborne.com), is the first rail line in the country to successfully complete a "proof of concept" for wireless broadband access technology that provides continuous high-speed Intranet access along a rail line at high travel speeds. Other rail lines have provided wireless Internet access based on slower communication technologies.

Railway lines are often isolated from infrastructure, such as when traveling through long tunnels, by using different technologies, we can use each system to hold on to the signal as long as possible and deliver the best possible connection. Toll Rail has installed WiFi hotspots in each carriage and antenna on each train roof, with a local area network running along the length of the train. The service will be tested on the North-South Mainline route. Such remote management and surveillance includes a number of functions, making it possible to monitor the operation of the service on its fleet.

Wireless Train Network - The Infortek-WiBorne developed **Wireless Train Network (WTN) / Wireless Vehicle Network (WVN)** systems that support multiple applications such as video camera for security, VoIP, telemetry, automation & remote control of vehicles and data communications for monitoring and updating of information throughout the transport network. For example, full transmission of live video and security surveillance information from the moving train to a central server can be easily accomplished via the Infortek-WiBorne system. Our WTN/WVN is the backbone of intranet on train, hooking up all vehicles together; in each vehicle, WiFi access points (AP) are deployed to cover the whole area, allowing end users to access this WLAN via mobile devices, such as portable computer, PDA, mobile IP phone, etc.

Each carriage has 4 cameras and one DVR that expect high throughput of streaming data and 10 more carriages aim to one carriage that acts as base station. Once train approaches to railway station it then start to sending video to **Railway Information System** (**RIS**) by using wireless AP along railroad with **Train-Ground Internetworking** (**TGI**) and **Broadband Railway Digital Network** (**BRDN**). All carriages are interchangeable along with any base carriage as part of infrastructure of **BRDN** along the railway track. Thus whole system must be designed to be very flexible with rapid mobility to support interconnection scheme between vehicles of a train. Programmable **SNMP** MIBS is implemented to support such flexible **WTN**.

Our **WTN / WVN** infrastructure technologies show very promising technology that offer internet on moving vehicles and trains. It can serve internet quickly either from 3G (UMTS, GPRS), Satellite, WiFi, and WiMAX stations.

Travelers aboard with Toll Rail New Zealand will now have more than scenery and solitaire to keep them occupied as Canada's national passenger rail service has introduced WiFi access aboard its trains. All that is needed to access the network is a WiFi enabled device such as a laptop or PDA.

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November 20, 2006

WiFi Tag Asset Tracking for Chinese Coal Mine Jiaozuo, Henan, China

WiBorne starts contact with coal mine school, www.hpu.edu.cn (HPU) along with it's associated Mining Technology Research Corporation www.hpuz.com (HPUZ) since summer of 2006. It's located in Jiaozuo, Henan, China's second largest coal producing province. Both WiBorne and Head of this research corporation for initial partnership agreement that WiBorne would deliver WiFi RFID tags and an advanced location tracking and communications solution for underground mines. These would bundle with HPU's anti-explosion WiFi telecommunication equipments designed for coal or metal mines safety. Using wireless networking technology for underground environments and the industry's leading WiFi based Active RFID system; this solution enhances overall miner health and safety without adding unnecessary networking or personal equipments.

China comprises more than 280,000 mining enterprises, of which 80,000 are state-owned, while rest are small, privately owned, and less well-policed ventures. Mine safety has been a major issue in the Chinese mining industry, with more than 6,000 miners killed in mining-related accidents in China last year. The estimated 12 million people were employed as Chinese miners in 2005, and 7 million of these were coal miners. China announces it would close 5,290 coal mines in a safety crackdown following a series of inspections during 2005

HPU leads coal mining research since 1909 and is one of major mining schools that has influence with Chinese mines for safety regulation. WiBorne demonstrated WiFi telecommunication and 802.11 RFID asset tracking and real-time location systems during first visit to HPU this summer, both parties started to work on hardware design for 802.11 tags that is suitable for coal miners.

Gas exploded underground at a coal mine would cause gas blasts and explosion is the major reason that kill miners. HPU developed anti-explosion equipments for all WiFi telecommunication. WiBorne resources wireless boards for tags and related products, along with LOC-1000 tracking system shown on Chinese High-Tech Fair (www.chtf.com) hold Oct. 2006

Dr. Jeff Ouyang and his staff on www.chtf.com

Contact:

WiBorne, Inc. www.wiborne.com

Henan Polytechnic University www.hpu.edu.cn
HPU Technology Corp. www.hpuz.com

October 13, 2006

SUCCESS STORY: *WiFi Waikato Home and Garden Show Hamilton, New Zealand*

The 22nd **Waikato Home and Garden Show** in the heart of Hamilton, www.thehomeshow.co.nz, is one of Australasia's premier events, this is New Zealand's world class showcase of innovation in building, renovating, landscaping and interior design.

Infortek (www.infortek.co.nz) and Wireless Nation (www.nationwireless.co.nz) together powered up Wireless Service by using WiBorne's Indoor / Outdoor APs and HSG Access Controller. It is a WiFi Revolution in NZ that guests can order mechanism on the exhibition via Wireless Nation's ***Point of Sales*** that offer wireless laptops for immediate applications of business.

The Point of Sales which broadcast such services from Wireless Nation, are streaming MORE FM Waikato 24/7 using IPStar's Satellite Internet via WiBorne's Mobile hotspot equipments. As indicated by Tom Linn, owner of Wireless Nation: *"Please visit www.cruzz.co.nz to try out. Radio Works Waikato is pretty impressed with it."*
Such service also introduced immediate customers to Bank of New Zealand (BNZ) that utilized Wireless Nation's wifi service, "*BNZ has been signing up several customers using our wireless network at Waikato Home and Garden Show.*", Tom said.

Infortek and Wireless Nation will provide businesses and communities with their own Wireless ISP (WISP) networks in partnership with established ICT companies around the globe:
• Real time video conferencing and boardroom
• Voice-over internet telephone services: call any phone anywhere on the planet, for no extra charges, from home phones, mobiles and PDAs.
• HDTV and radio; virtual DVD movies
• System monitoring
• Mobile uplinks for remote locations, special events, trade shows
• WiFi Citywide Deployments

Infortek also teams up with WiBorne for several on going challenge projects in NZ such as surveillance for moving train, Wellington railway yard, warehouse, and WiFi citywide for Hamilton.

Infortek Limited **Wireless Nation**
www.infortek.co.nz **www.wirelessnation.co.nz**

WiBorne, Inc.
www.wiborne.com

October 09, 2006

Success Story: *WiFi Dominion Golf Club, San Antonio, Texas*

The Dominion Country Club's world-class golf course, www.the-dominion.com, has been carefully sculptured to complement the graceful contours of the San Antonio, Texas, while providing an exciting challenge. It's located in the peaceful wooded Texas Hill Country just 20 minutes from the heart of San Antonio. The Club offers the very finest facilities, service and amenities.

The 54,000 square foot clubhouse comes with Courtyards, hand carved Cantera stone columns and arched floor-to-ceiling windows, enhance the old world charm, created by the Renaissance architecture. It has seven separate dining areas for delightful variety of dining experiences.




Dominion currently has very old computer systems served during past 18 years. Dominion was faced with the challenge of creating a central, shared system when it connected other course. It required network that would transmit program and data files, enabling staff to instantly update members' account information, regardless of which course they were playing. To maintain the pristine natural environment and give seamless service to its customers, digging into the ground to lay wire was not desirable. Dominion needed to reconsider its options.

Dominion required connectivity solution to increase operational communications without impacting the 18-hole course's pristine natural environment. Dmarc Netcom, www.dmarc.us, designed and set up a wireless network by using WiBorne's supplied advanced wireless Ethernet radios to link all remote courses / buildings together, giving staff at each location the ability to provide seamless service, while serves visitors with ***Point of Sales*** (7 – F&B / 2 – Golf / 1 Tennis) such that visitors have updated information along golf trail while using wireless to pass information back to central management.


In a business where the condition of the land dictates success, ripping up the course for network maintenance or upgrading is not feasible. Dmarc-WiBorne wireless solutions mean upgrading can be done easily, without delaying or halting daily operations and activities. Such solutions have also helped the course increase its operational efficiency. With access to Internet and e-mail, staff has increased communications and ability to provide customers with timely and accurate service. The network also gives the business operation the ability for point after sale inventory, tee time booking services, and easy access to customer accounts.

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September 24, 2006

Story: Long-Range Active RFID system for Underground Mine, FMC Corp, Wyoming

Abstract

With the forecast worldwide capital investment in municipal wireless broadband networks will reach $400 million in 2007 (by Yankee Group), we would need to consider additional benefits from building boom Wi-Fi and WiMAX networks. WiBorne has designed and developed Wi-Fi Citywide projects worldwide during past years, and are realising the benefits of Wi-Fi based location services and innovative Wi-Fi network planning and optimisation tools for Public Wireless LAN (P-WLAN). While deploying long range wireless projects, we feel that asset tracking for large scale wireless deployment is demanded and an improvement of existing active Radio Frequency Identification (RFID) technology is required.

The majority of our applications will be designed for large organizations because Wi-Fi and RFID have already been deployed in the enterprise. Applications will eventually be developed with these technologies to target the consumer space. However, due to such large coverage areas, wireless MAN will require some mechanism to further refine location to provide effective services.

We address the discussion of problems and solutions for such deployment, along with success case study for recently demonstration of WiFi and RFID tracking for a mine in Wyoming, USA.

1. Introduction

The emerging local and wide area networking technologies, WiFi and WiMAX, have opened up exciting new modes of communication. Wifi was and still will be used in LAN environments for the foreseeable future. WiMAX was designed to provide (MAN) Metropolitan Area Access, to homes and businesses. The popularity of wireless 802.11 networks over the past few years has grown significantly and provides an excellent opportunity to include real-time location system (RTLS) based services in indoor and outdoor environments where GPS fails or cost issues. With the wireless networks in place, a user with a laptop or PDA and an 802.11 network card needs no further hardware.

Other similar positioning tool, such as a GPS device, through triangulation of multiple signals received and determination of propagation (how long it took the signal to go from the satellite to the GPS device), is able to accurately determine a users location to within few meters. The problem with GPS is that the device must have a clear line of sight between itself and the satellite. This means the technology is unusable in heavily forested areas, urban environments with tall buildings, underground such as mining, and indoor environments. Similarly, ultra-sonic based, infrared / optical-based, cellular-based, magnetic-tracking, has different level of strength and weakness for variety of applications.

The use of Radio Frequency Identification (RFID) technology is expanding rapidly in commercial. Active RFID uses an internal power source (battery) within the tag to continuously power the tag and its RF communication circuitry. Many resources within the RFID research and development community have been focused on hardware and firmware components, including active and passive RFID tags, tag readers, embedded software, error reduction, and stored in electronic databases, while applications of such RFID tags are limited with sensing of indoor or small coverage areas. Yet fewer resources have been focused on exploiting the applications of RFID are viable and cost effective for wireless MAN or large coverage areas.

There has been a great deal of research done on similar topic with limited range of wireless broadcasting. Therefore the aim of this paper is to improve existing techniques in location determination for services of long range wireless internet service provider (WISPer). The intent is also to demonstrate how one can access and utilize the data necessary for location determination as performed on existing 802.11 WiFi/WiMAX network that have vast implications in the area of context-aware and pervasive computing.

During deployment of long range WiFi, WiBorne encountered challenges of wide-scale of outdoor tracking techniques for application of horse tracking, children spotter, underground mine, and vehicle tracking. These are usually with range of 20 kilometres to hundreds of kilometres, with both indoor / outdoor environment, or uncovered by GPS systems. Newer technology is needed for active RFID to support such wireless MAN.

2. Related Work

Here we discuss existing RFID systems, along with applications of RFID onto mining industry for rescue, access control, equipments.

2.1 Active 802.11 RFID Systems

There have couple of research and commercial software that supports location tracking for 802.11 wireless tags. Most of are limited with few hundred meters of range. For example, MoteTrack[1], PlaceLab[2], RADAR[3], MagicMap, Ekahau, WhereNet, and Aeroscout. Followings show comparison of these systems:

Usually above location system is an active RFID system that includes Wi-Fi asset tags and all the software necessary to easily track assets over a wireless LAN which is a range of few hundreds meters at most, such as indoor or smaller outdoor community area.

The nearest neighbor search technique for RTLS is to take sample of radio signals and correlate them to known physical locations during when signal is unreachable. Once these samples were taken and stored, all recorded samples was performed with a linear search in real time and the closest signals match was determined to be the user's location.

The triangulation technique can offer additional gains in accuracy were made by averaging the three closest locations found during the search; what is referred to as triangulation. Means of determining location via formulating radio propagation models were discussed, but proved to be less accurate.

The probabilistic technique been applied for RTLS, is to find location that is based upon which location in the stored radio map which has the maximum probability given the received signal strength vector. Usually implementation of such wireless location determination must be done one step at a time even though the superiority of probabilistic approaches.

In the work of [4], the feasibility of building a wide-area 802.11 WiFi based positioning system is evaluated. It does not require line-of-sight (LoS). Their experiments show estimation a user's position with a median positioning error of 13–40 meters. As indicated by these authors, moving Wi-Fi location out of controlled indoor environments into this metropolitan-scale area is not as simple as just moving the algorithms outside. The calibration differences demand a careful examination of the performance of positioning techniques in this new environment.

2.2 Wireless Mine-Rescue Systems

In wake of recent mining tragedies, some technology companies have suggested extension of wireless real-time location technology using WiFi networks to pinpoint miners trapped underground -- a solution that could save lives in the near future.

Mining is a perfect example of an industry with a strong need for real- time location. Mine equipments such as vehicles, containers, drills and other pieces of valuable mobile ore production equipment are constantly moving through large underground areas. Because the equipment does not necessarily follow a pre- defined track and is spread throughout the mine, it is difficult to locate particular assets that are needed in real-time. By attaching RFID tags to equipment, miners can use the mine's existing wireless access points to determine their location instantly and with high accuracy. The joint solution offers instant tracking of personnel, equipment and other assets for improved safety and efficiency.
Condition in mines to consider deployment of RFID system, such as telecommunication cables, water, sewage, oil, gas, surface irrespective of soil conditions in terms of the presence of metal, water, concrete, also battery-life hours that powers the miners' lamps and RFID tags. Other consideration such as poor signal penetration, high implementation costs and, in the case of systems that used battery-powered tags, the inability to control the tag's RF signal.

Mining companies will also be able to use the same infrastructure in the future for other location-based applications such as supplies and energy management. The use of existing access points as readers enabled the system to be installed quickly and at a low total cost of ownership. Mine's information from drills and trucks, such as their positions and the weight of their loads, is relayed via wireless base stations to a computer in a control room above ground. With Wi-Fi networks, fewer miners have to face the risks of working underground, and those who do have a more durable link to the outside.

A summary can be found from [5] that constitute a brief review of mine communications concepts and technologies, based on information that has been previously published by NIOSH, the former U. S. Bureau of Mines and other sources, including information from manufacturers.

Figure 1. Minor's Tracking Tag

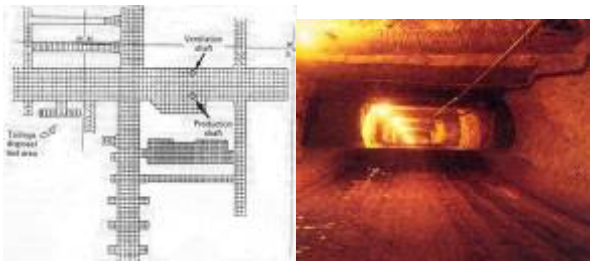


Figure 2. Mine Tunnels

Through joint development of Exavera Technologies (www.exavera.com) [6], Dmarc Netcom Inc. (www.dmarc.us), and WiBorne, Inc. (www.wiborne.com), we have piloted demonstration for long range RFID tracking with a trona mine of FMC Corp. at Green River, Wyoming. We has integrated dual band of real-time location systems, 802.11 2.4GHz and UHF 915MHz, into a 5 miles of tunnel for broadcast of wireless and tracking of moving vehicles. Objective of our truly long range (1 mile) active RFID tag, with is installed into minors' cap lamps or battery packs, providing Wi-Fi based location tracking. With this in place, the location of workers, as well as valuable mobile equipment, can be continually tracked and viewed in real-time from any web browser, to ensure safety and to improve operations.

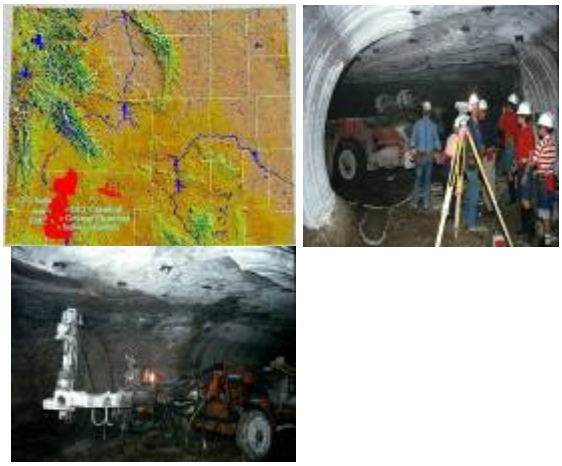


Figure 3. FMC's Trona Mine in Green River, Wyoming

3. Methodology

Research and experience has shown that communication systems may not work equally well in every mine. Each mine requires a customized solution that caters to the individual requirements of the mine environment and avoids interference with other mine monitoring and control systems. Since communication systems may not cover the entire underground working area of the mine, the area of coverage is an important planning aspect. Also, all underground mine communication systems require MSHA (www.msha.gov) approval (30 CFR 23) [7].

We have concluded design of that such mine communication systems must be: look at a big picture, combine different technologies, incorporate mine layout, and perform risk assessment.

To deploy wireless for mines, we consider it's an indoor GPS system that as many uses underground, keeping track of explosives, trucks, compressors, drills and above all, the well-being and safety of miners.

Each mine requires a customized solution that caters to the individual requirements of the mine environment and avoids interference with other mine monitoring and control systems. Since communication systems may not cover the entire underground working area of the mine, the area of coverage is an important planning aspect.

Communication systems components such as Leaky Feeders or wire connections may break from a roof fall or during an explosion. They also may get destroyed in a fire or may stop functioning due to power failure. Designing systems for redundancy can maintain operability after such events.

Certain mines such as coal mines, are a particularly unique environment for radio signals. Radio systems require a clear path or open air for signal propagation. Stopping or roof falls halt or impede conventional signal propagation. It is also believed that ionized air as a result of a mine fire can be a problem.

With the increase of WiFi networks in mines for data and voice lines, the proliferation in WiFi networks

has created a standard wireless infrastructure in which products like our wireless tracker device can operate.

Ideally, a miner's battery powered WiFi tag has a call button which a miner pushes letting the tag alarm by sending the precise location to a remote server outside of the mine.

Then using wireless computers, outside staff are able to access location information on internal Web pages by pointing their Web browsers to an intranet page. Movement and location of each tagged miner, vehicle, or equipment is tracked in a database and shown on a visual map. The last known locations of a miner will be mapped, in the event the wireless network has collapsed. As long as the WiFi network extended with the coverage of depth or length of the area underground, then the tracking device would be able to stay connected with the RTLS server.

We have developed a hybrid frequencies system by utilized both 915MHz and 2.4 GHz. UHF such as 915MHz works in a metal-heavy environments, or partial Non-LoS. Standard 2.4 GHz is for longer range of wireless deployment with LAN network based on WiFi technology. Miners can utilize such 2.4 GHz for data / voice communication too.

Figure 4. Real Time Location Tracking for Moving Vehicle

The safety system in the mining industry should evolve with the technology that is being made available. WiFi technology is evolving and products like WiBorne's hybrid systems are becoming cost effective.

4. Results, analysis and discussions

Our system demonstrates significantly contribute to safety on mines through measures like tagging of lamps, gas meters and rescue packs. Not only does this ensure that each miner has the correct equipment with him, but also that the equipment is functional and within calibration limits. This provides a portable database that travels with the product and can interface to any existing mining management system providing the ideal tool for quality control and selective mining.

The upside to the system is that even if disrupted it still provides the last known location of personnel and equipment but conversely, the system is subject to damage from fire and explosion, which could compromise the ability to track, or send messages on a data line.

The only downside could be employees not wanting to be tracked. Therefore an efficient system would need to be place when employees aren't tracked during downtime like lunch.

A recent discussion from West Virginia's mine emergency response center, can be found from [8]. The objective of such discussion was to collect expert opinion on the challenges and opportunities to better inform the discussion regarding implementation. A roundtable meeting was hold at the same time to convene a roundtable of 40 mining experts2 with a collective experience of 946 years

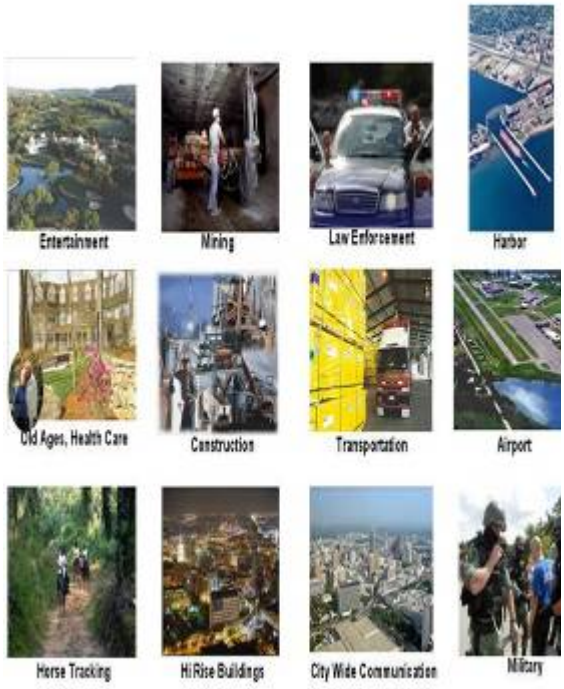
5. Conclusions

The major advantages that we offer to such project, is to have true long-range of RFID readers which also act as wireless access points for communication. This dramatically reduces cost of installation and maintain. Our how power RFID tag and RTLS system ensure ubiquitous computing with accuracy yet battery-life saving.

There has limitation that most of systems would encounter. We had concerns about keeping the network operating after an explosion or collapse.

WiBorne's asset location tracking system, LOC-1000, is web based and can be applied for standard 802.11 wireless broadcast with frequencies of long range 802.11. For example, facilities such on below figure such as Asset Tracking, Automated Parking, Access Controls, Hospitals, Airport, Harbor, Communities, Commercial Facilities, Animals, Horse Riding, Mining, and Transit Stations. It applies to any 802.11 applications such as Data Logging, Surveillance, Emergency, Proprietary Tracking, Field

Force Automation, Law Enforcement, Tracking Fleets, Couriers, and Construction.



Acknowledgement

The authors would like to thanks recommendation and lead of deployment from Kendall Wells of Dmarc Netcom for long-range WiFi techniques. Opportunity to work on FMC's Trona mine is given by Exavera Technologies, along with deployment of 915MHz active RFID equipments available from Exavera. A special thanks goes to all FMC miners who team up with us to succeed such demonstration on the 22nd of March, 2006

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Story: WiFi Bandera County, Texas

Pleasant Hill, Missouri is a city in Cass County, in the Kansas City metro area. It is "*The Old Town*" since 1824 when Pleasant Hill saw the arrival of the first settlers to the area and all of Cass County. Pleasant Hill has many old buildings now being restored to their original look.

Main Street Technologies, Inc., a Wireless ISP provider located on Independence, Missouri, *Old Town Square*, is supplying wireless broadband services from range of 2 miles to 40 miles.

Due to dense business district and historical buildings, so and many tall trees that over 20 meters, Brian Yolder and Ron Wells, founders of Main Street Technologies (www.mstreettech.com), clamed that they would apply *"dual bands"* technology to overcome such *Non Line-of-Sight* issues that occur for their short range deployment.

Street View from Main Street Technologies

Main Street Technologies will provide access to 10,000 area customers who presently have no free local calls and no high speed.

Main Street Technologies teams up with Dmarc Netcom, Inc, and WiBorne, Inc., that supplies long range wireless technology and software / hardware equipments for their intelligent data/voice/emergency/security wireless network and billing systems.

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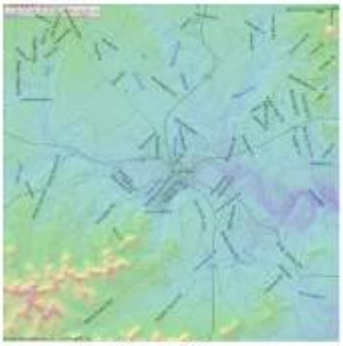
February 24, 2006

Story: WiFi Bandera County, Texas

Bandera County, Texas, *The Cowboy Capital of the World*, is serving county rural access broadband service, wireless internet, and VOIP services deployed by Dmarc Netcom, Inc. (www.dmarc.us). Dmarc is a WISP available in Helotes, Texas.



Bandera, Texas

Kendall Wells, owner of Dmarc Netcom, started this service since August, 2004. With 20 years experience in the communication and computer technologies, Kendall serves as communications technology integrators that design, develop, install, configure, and maintain communications infrastructure and systems. Dmarc is on an expansion planned for WiFi San Antonio, Texas by Q3 2006.

Base Station for Bandera Site

Due to lack of long distance DSL / cable services around such rural areas, Dmarc expects that wireless service is the most convenient to deploy internet, VoIP, and video services in such area. Dmarc offers a number of service plans within this Bandera HotZone.

View from tower of Base Station

Wireless Internet mounted on the top roof

Wireless Services from Dmarc

For home service, Dmarc uses integrated third party customer premise equipment (CPE) devices to bring the broadband signal to houses.

Bandera CPE for Home Users

As of today, there have more than 70 of CPE are installed with these services. Dmarc can provide home users connection speeds comparable to cable or DSL, without the costly and time consuming installation associated with those technologies.

CPE devices aimed to Base Station

To deploy Bandera site, Dmarc applied specification of WiBorne's Bandera Series Base Station, antenna model OA-24, large scale of Access Point WAP-250, and Hotspot gateway HSG-1000 that support 1000 concurrent users.

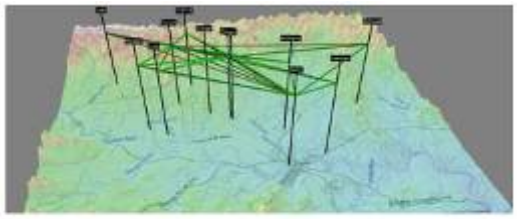
OA-24 Antenna

WAP250 Access Point

HSG-1000 Hotspot Gateway

Antenna OA-24 has great rejection of interference for most of WLAN systems, with 360 degrees direction for point-to-multi-points that is suitable for coverage of Bandera County. With WAP-250 as Access Point applies to this large public wireless access network without numerous smaller APs to construct wireless network. This reduces construction fees for such public areas. WAP-250 acts as a wireless broadcast without additional functions, while rest of operation functions are assigned to HSG-1000 Hotspot Gateway which performs authentication, authority, accounting, bandwidth control (QoS), IPSec VPN from gateway to individual clients, and management for all associated AP.

Based on the 802.11 standard (Wi-Fi) for backhaul and client access, the Bandera network requires no proprietary radio frequency (RF) equipment for access devices. The Wi-Fi network delivers true broadband speeds to users accessing the network with a standard 802.11b client device. Additionally, mobile users such as Bandera Policy Department (BPD), and Fire Engine Department, have the ability to freely roam VPN wireless throughout the coverage area while the Bandera WiFi Series seamlessly and transparently perform node-to-node handoffs, ensuring the client continually has the most optimal path available back to the wired WiBorne HSG-1000 Gateway. No manual re-association of the client is required.



Link Budget for Part of CPE Nodes

Authentication, Security from HSG-1000

For security WiBorne has utilized a multi-layered approach, allowing them to operate a WiFi network that is even more secure than wired networks while running IPSec VPN mode. The features built into the 802.11 standard such as 64/128 bit WEP encryption act as early deterrents to hacking by casual users. Subscribers must sign in and be authenticated by local Kerberos, or external Domain Server, RADIUS, or LDAP in order to have access to the WiBorne network. During the registration and login process, all HTTP traffic is secured over SSL. WiBorne also supports public IP for home users and full VPN compatibility. Based on the login information, the WiBorne HSG-1000 enforces the network policies established by Dmarc, seamlessly providing the appropriate levels of service for which the subscriber has paid.

Internet Services on the 62" Big Screen TV

Dmarc also offer wireless VoIP service for Bandera site by installing internet telephony via wireless. Simply plug a phone adapter onto client's CPE router and home users can dial up to outside by using wireless internet service.

IP Camera for Security Surveillance

Dmarc offers wireless webcam service for Bandera Site. Such system is perfect for security surveillance, business, education, and home monitoring. Bandera clients wonder how their business, school, website or family ever got along without it. Dmarc's webcam program is configured to monitor remotely and live website broadcasting. It can also automatically send an e-mail alert if its built-in motion alarm or another connected device, such as a smoke detector, is triggered.

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October 27, 2005

Story: Applying AWG-1000 to Large & Semi-Mobile Training/Teaching Environment

About

A large military tactical training facility that hosts short term training sessions (several to several dozen hours) for low to medium level officers. Due to the dynamic and mobile nature of the premise, the training sessions are based on wireless equipments.

Issues and Requirements

Dynamically reconfigure, to meet the exercise premises. The exercise/training scenarios are dynamic and unpredictable, requiring the supporting wireless setup to be equally adaptive.

Groups of participants use a number of wireless devices (PCs, handheld, etc.) on a rapidly roaming basis, both indoor and outdoor, in an area of several acres.

The participants are there for anywhere from one to many sessions, in different times and roles. Due to the transient nature of the participants, user management has to be simplified, else it would be a tremendous workload for the system administration. Automated setting up of user accounts and full integration with existing authentication mechanism of the training facility is a must.

Assignments and groupings can change even within the same session.

Heavy database access.

Security is mandatory due to the site's military nature.

What *AWG-1000* Did

The implementation of *AWG-1000* (military version) at this site has completely met and exceeded the requirements:

Comprehensive and automated user management functions fully support this site's need for quickly and easily changing user setup. The adaptive user management afforded by *AWG-1000* allows on-the-fly reconfiguration of the exercise scenarios.

The robust seamless roaming capability of *AWG-1000* allows rapid movements of the participants without interruption to the applications sessions.

Through *AWG-1000*'s tight integration with the Microsoft Domains in existence at the facility, users can easily logon and access the training sessions.

With security being *AWG-1000*'s staple, all security requirements, including the FIPS (Federal Information Processing Standards) 140-2 are met.

Experiences and Lessons Learned

The best market is the one that requires something different from the rest of the customers. Also, the knowledge of the SI can be a very good source of ideas that can trigger the customers' imagination. In this case, there are many functional capabilities that never imagined by the customer site, but were suggested by the SI.

In other words, *AWG-1000*'s capability actually expanded the function scope of the training, and it's the SI's role to

make the customers see these possibilities.

Also, the nature of this training site is no different from that of modern non-military applications; whatever used here also apply to universities, vocational training sites, and even sports practices. The market for wireless application in training is simply tremendous.

Story: AWG-1000 for College Campus

About

The Networking Laboratory of California State University, Northridge (CSUN) is heavily endowed with wireless equipment, not only for student usage and graduate research, but also for serving the daily administration usage for a number of departments and graduate programs. With the ever increasing user pool and the load on the wireless resources, the laboratory was seeking ways to both manage the user accounts and optimize the use of resources.

Issues and Requirements

Although security is not as much a concern as for the military and enterprise users, the ability to handle the ever changing user accounts and its associated load requirements (sometimes every session of a class requires a different set of accounts and firewall rules) in an automated way, as well as the ability to manage and distribute the wireless resources to the student and non-student users in an equitable way, are what CSUN was looking for in a wireless gateway.

What *AWG-1000* Did

As part of the collaboration program with CSUN, Loopcomm went into joint requirements definition and system development with the Networking Laboratory. With customization, the CSUN version of AWG-1000 provided pseudo load balancing, when combined with the ability to precisely manage quality of service (QoS), a brilliant solution was created that paved the way for future versions of *AWG-1000* as a wireless gateway.

In other words, we have in hand a wireless gateway that is almost a "wireless switch." Although some of the functions are proprietary and specific developments to address the needs of this collaboration program, similar technologies and solutions can and will be added to the main versions of *AWG-1000* as this product progresses.

The resulting smart wireless gateway is currently serving the needs of users from many departments and programs, with their fluid user account pools that are typical of a class-driven campus environment fully addressed and managed.

Experiences and Lessons Learned

College campuses probably present the biggest challenges to a wireless gateway, it is a scenario in which the users (especially students) and their privileges are constantly changing – in this sense it's almost similar to the case of hotspots, however, different from hotspots, a certain degree of control and management still needs to be maintained for campuses. A set of functions has been implemented in *AWG-1000* to address this particular market, and should prove to be valuable in differentiating *AWG-1000* from the competitors.