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SAGE DESIGNS, INC.
SCADA & Security Products

SCADA

Victorville Water District
Building Reliable SCADA Communications in a Challenging Environment

ORGANIZATION
Victorville Water District

LOCATION
Victorville, California
United States

INDUSTRY
Municipal Water District

CHALLENGE
Reliable wireless communications in high-interference environment with frequent power outages

SOLUTION
Firetide Wireless Mesh Network

MORE INFORMATION
www.firetide.com
www.sagedesignsinc.com

Victorville Water District, established in 1931, has had several SCADA monitoring systems over the years, from simple tone system employing telephone lines for communication to the present SCADAPack 357's now being deployed using Firetide radios. The system consists of over 60 sites including wells, booster pump stations, 70 Mg of storage tanks and 4 treatment plants. With the ample storage, we are able to do a majority of our pumping from midnight to 6 a.m. which saves over $500,000/year in energy costs, more than paying for the Telemetry Department budget.

In 1995, I came to the District and was quickly charged with the job of upgrading the aging Aquitrol system with Wonderware HMI software and MDS 2300 Radios. As I evaluated the existing system, it became clear that the system was extremely slow and cumbersome. It had a single repeater site located on top of a mountain some 7 miles away from the main office which was needed to reach some of the stations located in some difficult to reach sites within the District's 54 square mile area. This system used a 1200 baud Bell 202 modem serial com-munications system that, on a good day, took 5 to 10 minutes to contact each of the District's 40 sites. Another problem was that the Repeater site was located on a site occupied by no less that 50 other repeaters, TV stations and telephone communications systems, all adding up to a major communications nightmare.

The first time I looked at the existing repeater, I noticed that there was a 40db attenuator attached to the 5 watt radio and was told that was due to the extreme amount of noise on the site. The first order of business was to remove the attenuator and install a cavity filter to remove the unwanted noise and restore the system to full capacity. We later increased the baud rate to 9600 by replacing the Aquitrol PLCs and their Bell 202 modems with the SCADA-Pack Micro16s, which reduced the system poll time down to 3 minutes. Then, we replaced the Wonderware system with Lookout HMI and decreased the polling time to less than 2 minutes, even with an additional 10 new sites in the system. With the replacement of the MDS 2300's with iNET 900 Spread Spectrum radios, we were able to increase Baud rate to 256k, and by replacing the SCADAPack Micro16s with SCADAPack 32s were able to move the entire system to an IP-based system.

Problems started to mount for this system, as the single site for the repeater was plagued with power outages and interferences from neighboring sites and access problems in bad weather. We also started having problems with IP addresses. In some cases, we had as many as 5 IP addresses at a site: the radio, RTU, VFD, power monitors and local site computers. We also found out that our centralized control system was prone to failure if the main HMI con-trol were to go down or if the repeater was disabled. In our case, a lot of the well sites were not able to communicate directly with the tank sites in order to know when to operate.

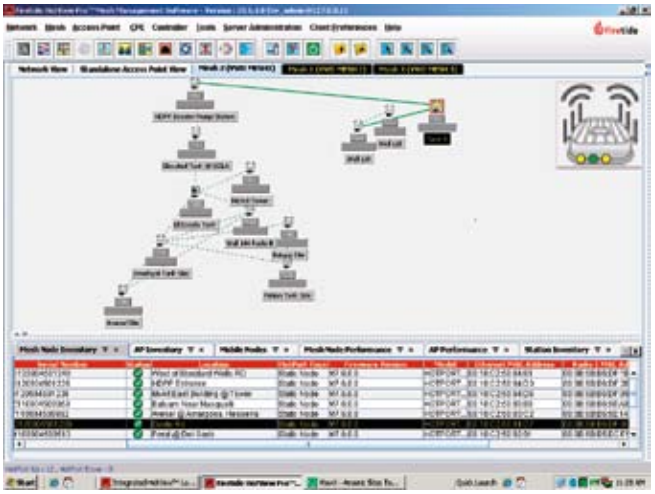
Power Outages, RF Interference Drive Need for Better Communications Solution

We started looking for a better solution to the single site repeater system, and an end to the dependency of the single mountain site. Several options came to mind: a multi-repeater system using several of the Districts 6 tank storage sites; a peer-to-peer store-and- forward system utilizing report-by-exception; and a new system we had been hearing about utilizing what was called a Mesh topology system.

Mesh Topology Best Approach

We started to see that the Mesh system looked like the best solution for the District, and prepared a list of minimum requirements for the system. We had reviewed several manufacturers' products for the system and wanted to come up with a solution that would not only meet our needs, but would be easy to maintain. The District origi-nally used outside consultants for the integration and maintenance of the system, but since 1999 had moved those responsibilities to District personnel. We had been successful in re-programming the HMI from Wonderware to Lookout and then to ClearSCADA in 2005. With background in UHF and VHF radios, District personnel installed and maintained the iNET 900 radios at all the sites. As the economy turned down and funding dropped, it became clear that the cost of the system would need to be such that replacement could be done as the funding was available. So, it was a logical move to make sure the new system could be installed by the District.

Our first hurdle was to come up with a minimum list of require-ments and submit them to several vendors for bids. These included minimum throughput, ease of installation, maintenance require-ments and technical assistance. We looked at the overall District and decided that the minimum throughput should be determined by the vendor who would be in the best position to give us an idea of what to expect. It was also suggested that the minimum throughput be 1.5 Mbps. Installation needed to be addressed and a certain exper-tise was required, so training of District personnel was added to the requirements. We stipulated that the vendor provide a minimum warranty period, technical support for the term of the installation period plus one year, and ongoing product and technical support. We had also wanted a system that would be self-healing, able to re-route if a single or multiple systems were disabled, allowing us to decentralize our system and have the wells run autonomously if the central control were disabled.



Firetide HotViewPro Network Management screen.

Sage Designs Recommends Firetide Mesh

Several vendors were contacted, including Firetide through Sage Designs. Firetide's bid was accepted due to the low cost and ability to provide the equipment and training needed for District personnel to install the system. Firetide also agreed to help us with the site analysis and design of the system and technical support. During the design phase, we provided them with a list of sites including Lat-Long and elevation from the District's recent GIS survey infor-mation, and Firetide then provided site analysis based information including antenna height requirements and suggested radios and antennas.

In 2009, the project was given approval by the City for implemen-tation, and in 2010 the first of the Firetide radios were installed. Although the system is only 25% complete as of this printing, we feel that it is a success. The backbone system has been com-pleted and we have throughput exceeding 7 Mbps, with some sites seeing speeds of 200+Mbps. With the entire system using only 3 IP addresses for the communications, we have reduced our IP addresses by 40%. We have grown to 79 sites and have found the system performs well.

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