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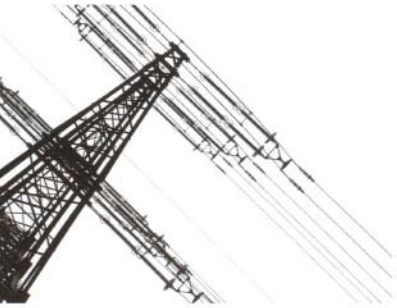

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Motorola Canopy®

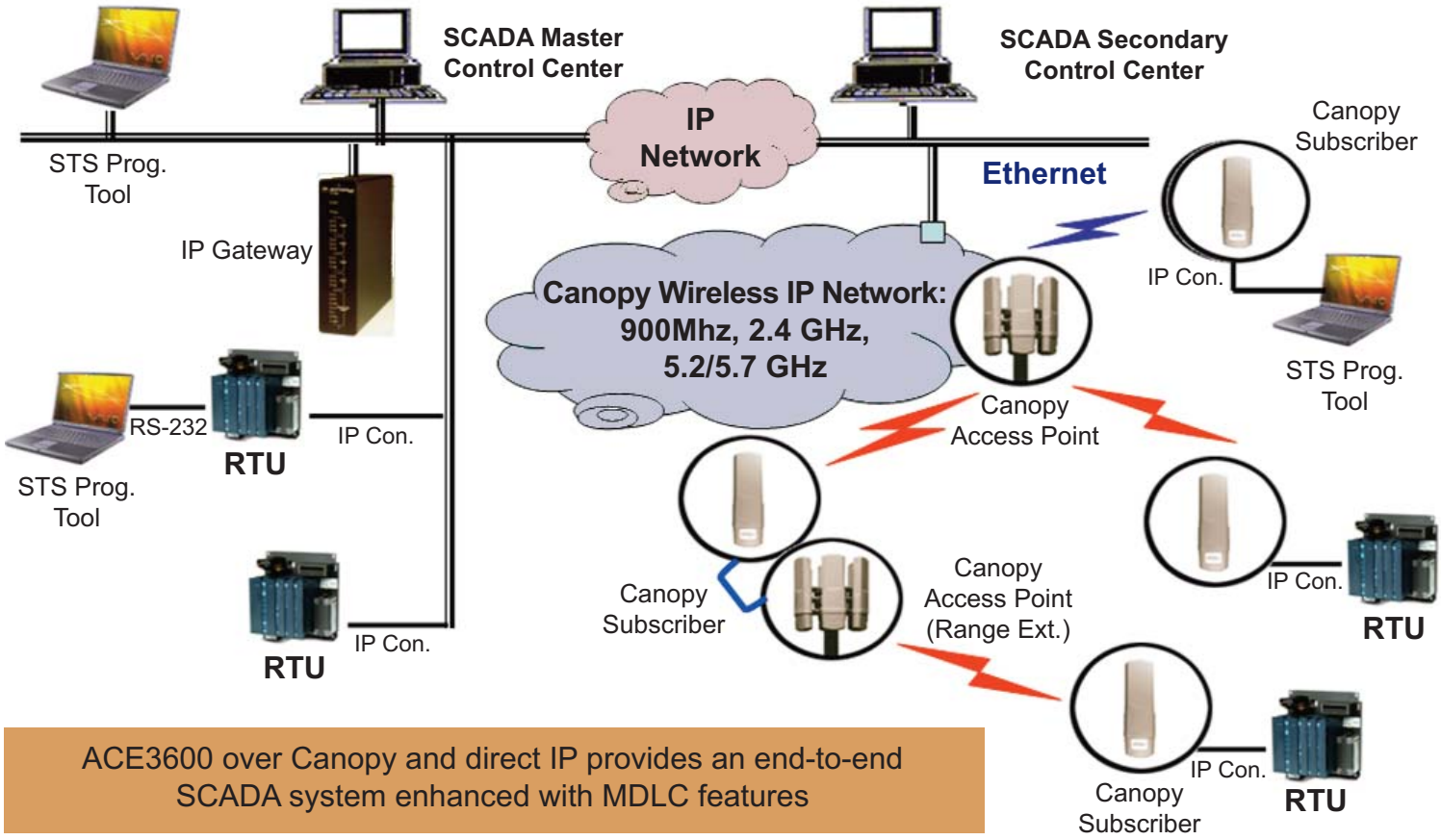
The Canopy® system is the ideal technology for developing, enhancing and extending advanced broadband networks and services, making delivery of high-demand technologies like Internet access, voice over IP, video services, security surveillance, and SCADA, both faster and less expensive.

How Canopy meets the Challenge

- License free Bands
  - Canopy works in the unlicensed UNII spectrum so there is no need for spectrum licensing
- Simple Installation
  - Canopy equipment is simple to install for those experienced in wireless communication systems
- Low Start-Up Cost
  - Canopy wireless modems are more affordable than any other wireless Internet suitable system for outdoor installations

Motorola Canopy®

Point to Multipoint
Wireless Data Solutions



ACE3600 over Canopy and direct IP provides an end-to-end SCADA system enhanced with MDLC features

Delivering Reliable, Cost-Effective High-Speed Connectivity to Multiple Locations

Wireless broadband over IP is quickly becoming the world's preferred technology for enterprises, municipalities, and service providers, delivering advanced and in-demand IP-based voice, video, data, and SCADA data applications. Motorola's Canopy Point-to-Multipoint wireless solutions are leading the way with successful deployments all around the globe.

Canopy solutions deliver scalable, interference-resistant, high-speed connectivity to multiple residential, business, institutional, and municipal locations. The platform combines exceptional reliability with robust performance, scalability, multiple layers of security, ease-of-use, accelerated deployment, and remarkable affordability.

It also integrates seamlessly with existing network systems and management tools, making it easier and more cost efficient to extend existing networks.

Maximizing the benefits by unlicensed wireless frequencies, Canopy solutions streamline the development, deployment, enhancement and extension of advanced IP-based wireless broadband networks. They excel at delivering ubiquitous high-speed connectivity and state-of-the-art services, and are currently helping to drive successful business models in more than 120 countries worldwide.

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SCADA Operating via Wireless IP Communications Networks

Dan Ehrenreich, Motorola Inc.

Overview

Supervisory Control And Data Acquisition (SCADA) solutions must provide reliable and timely communications, to a wide range of instrumentation, field sensors, and SCADA control centers. This means that messages sent from the control center to the Remote Terminal Unit (RTU), directly (point to point), or via one or more repeaters, or from RTUs to the control center, must be delivered on time and reliably. Furthermore, each message is to be confirmed for correct acceptance or information on rejection or failure must be returned to the sending entity.

When the utilized media is fiber optic or high quality private lines, the communication is close to ideal and unless there is a media malfunction the system operate seamlessly. However when any wireless media is used, the implementation requires more attention in order to achieve communication reliability.

The general perception among customers is that both RTUs and Programmable Logic Controllers (PLCs) may operate over a variety of wireless or physical media; however, many system engineers already reach the conclusion that their PLCs don't deliver identical networking, data security and data reliability as RTUs. As typical SCADA systems usually use just one vendor's RTU or PLC, often it may be difficult to perform true benchmarking.

To enable real time data flow, it has become of utmost importance to have connectivity across the SCADA system via broad bandwidth media. This white paper describes the various considerations and options available for IP based wireless communications such as: GPRS (General Packet Radio Service), APCO 25 digital and private Wi-Fi networks.

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Wireless IP Communications

The introduction of low-cost, reliable wireless communications has made many SCADA applications economically and technically practical. Now, the introduction of wireless IP communications technologies promises more function with similar cost, better reliability, and more technology and vendor choices. SCADA networks operating via wireless IP Networks may utilize IEC 60870-5-104, IEC 61850 or, MODBUS or DNP3 protocols over IP (TCP and/or UDP). While these protocols can offer many user benefits and provide an adequate solution for a majority of SCADA applications, potential security and reliability concerns should result in caution when considering wireless IP communications in critical applications. To evaluate the performance, costs, and benefits associated with wireless IP, it is important to examine the various wireless technologies. The following are available wireless SCADA systems:

Licensed Frequency Radio:

If a licensed channel is available, radio link is a low cost option to consider. It is easy to implement from a hardware perspective, making rapid deployment possible. They may include digital APCO 25 type radios utilizing VHF, UHF or 800 MHz licensed channels. Some systems utilize license-free spread spectrum communication, which may be suitable for non-critical monitoring applications. Using non-license channels for control might not be a preferred option.

Digital Cellular: GPRS:

Digital cellular communications, using GPRS technology, becomes a popular choice for wireless IP communications, producing higher data speeds and wider acceptability across the globe than other options. However most GPRS operators will agree that their network cannot gurantee highly reliable data communications needed for critical SCADA applications. Particularly, one must be aware of the following key features:

- Higher data communication rates. The utilized packet switching ensures spectrum efficiency because network resources are used only when data is actually transmitted.
- SCADA systems which perform Reporting by Event communication process utilize just light volume of data trough the network and this reduces the charges by the GPRS network operator. Consequently the GPRS operator might not consider SCADA RTUs as heavy users, and therefore they might not be excited talking about high reliability of their packet data communications.

Although GPRS technology offers a number of benefits as mentioned above, there are disadvantages which are applicable to SCADA systems. Stability can be an issuae during times when the network is overloaded.

Canopy Network:

Wireless broadband over IP is today the world's preferred technology for IP-based voice, video, data, and SCADA data applications. Motorola's Canopy Point-to-Multipoint wireless solutions are leading the way with successful deployments all around the globe. Canopy systems deliver scalable, interference-resistant, high-speed connectivity to multiple residential, business, institutional, and municipal locations. The platform combines exceptional reliability with robust performance, scalability, multiple layers of security, ease-of-use, accelerated deployment, and remarkable affordability. It also integrates seamlessly with existing network systems and management tools, making it easier and more cost efficient to extend existing networks.

Technology Benchmarking

There are many benefits to implementing wireless IP communication technologies for SCADA: these technologies can offer increased functionality and efficiency for a SCADA system. High tier wireless IP communications can also offer compliance with data security and reliability requirements. Besides the benefits of increased efficiency and functionality, wireless IP technology communications can also offer a reduction of the costs and overhead associated with infrastructure, installation, and coordination efforts. Wireless IP also allows greater accessibility to remote SCADA sites as well as increasing the functionality due to its hardware independence.

Wireless IP allows the utilization of non-proprietary communication hardware and lowers the network ownership cost while allowing multiple unrelated tasks to utilize the same physical communications channel. Furthermore, these technologies are faster when compared to traditional analog and RS-232 based serial communications. SCADA front-ends must be capable of significant latitude in configuration of communications timers.

Conclusion

Wireless IP-based communications using public networks offer many operating and cost benefits and are adequate for most SCADA applications. However, due to potential security and reliability concerns, caution should be used when considering its use in critical control applications. This technology integrates well with modern SCADA systems, the price is reasonable but it is required to manage the monthly account fees (typically by reducing the total amount of data transferred per month).

The communications performance is respectable but the average speed must be considered if large amounts of data will be transferred especially when the system is configured to perform cyclic polling. In private systems the channel security may be very good, but if the connection utilizes any public network infrastructure, a comprehensive security plan (i.e. VPN, firewalls, etc.) is a minimal requirement. The data throughput is consistent and adequate for most SCADA systems, however there is a lack of published information about data reliability specifically when referring to public networks (like GPRS) where the network may be often overloaded due to download of attractive events, on-line view of football games, news, etc.).

Some operators may be willing to offer static IP addressing and have a large variety of available pricing plans which need to be very seriously evaluated as usage costs can have extreme variations based on scanning strategies. Given a well-planned polling strategy, these costs can be competitive with traditional serial communications options.

The bottom line decision shall be: yes use Private wireless IP networks where available and consider using public IP networks only for non-critical data monitoring. Furthermore, refer to data reliability and data security considerations specifically as required for your system and verify this overall performance is adequate for that application.

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