Implementation of Wireless Networks

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Every city wants to manage its streets, freeways, and highways more effectively. **Current economic, political, and environmental factors are motivating North American governments to undergo a phase of restructuring. It appears this stage of re-organization applies to every level of government.** Constraints on time and budget weigh in heavily on each city as they choose how to best utilize existing infrastructure while maintaining an acceptable level of service. So how do you reduce the disruption of traffic in a major metropolitan centre with limited time, funds, and space? It is a daunting challenge, one that requires innovative thinking and extensive planning. However, the introduction of wireless mesh networks and broadband wireless technologies has armed traffic engineers with fresh approaches to overcome the conventional obstacles.

WHAT IS A MESH NETWORK?

Mesh networking is a particular way of routing between nodes; it allows for continuous connections and reconfiguration around broken or blocked paths by "hopping" from node each other is known as a fully connected network. Mesh networks differ from other networks in that the component parts can all connect to each other via multiple hops. One of the most important characteristics of these kinds of networks is the fact that Mesh networks are self-healing: the network can still operate even when a node breaks down or a connection goes down. As a result, a very reliable network is formed.

POTENTIAL BENEFITS

Wireless mesh networks and broadband wireless technologies have recently become attractive to municipal governments due to their cost effectiveness, ease of installation, and rapid deployment. They allow municipalities to do more with less by using their current static infrastructure and extending it to a flexible, connected environment. Intelligent Transportation System (ITS) designers now recognize the evolution of wireless technology into an extremely secure, reliable and flexible form of communication. It is highly effective for rugged data transmission applications and has performed consistently without compromising throughput. Wireless broadband solutions are ideal for long distance bridging, high performance point-to-multipoint links, and mesh networking. These systems can be used in an array of applications, such as video surveillance, controller interconnect, broadband Internet access, voice-over-IP (VoIP), public and municipal Wi-Fi access, or any wireless networks for video, voice and data. It is this inherent ability to remain stable in harsh conditions that has put radio, and, more specifically Spread Spectrum radios at the forefront of the wireless data communications for the modern Traffic Industry.

REAL WORLD APPLICATION

The Missouri Department of Transportation (MoDOT) sought to manage traffic signals and coordinate traffic flows in St. Louis County during the massive Route 100 widening

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project by integrating cutting-edge wireless broadband communications technology to their pre-existing fiber optic system. St. Louis County has an approximate population of a million people. It is part of the St. Louis Metropolitan Area which includes the independent City of St. Louis and its suburbs in St. Louis County, as well as the surrounding counties in both Missouri and Illinois combined it accounts for a total population of nearly 3 million people. MoDOT District 6 manages all major freeways leaving downtown St. Louis. MoDOT was seeking a redundant, scalable 4.9 GHz wireless ITS mesh network. A wireless system was sought to provide coverage along Route 100 (Manchester Ave, Choteau aver) west from the Missouri River (spanning over 20 square miles). The project was comprised of over 100 sites divided into numerous smaller MESH systems. Each 10-15 radio system connects directly to the existing fiber network or utilizes a wireless backhaul bridge to connect to the fiber optic infrastructure.

FIELD TESTED

In the case of St. Louis County, there were two phases to this project. Phase I of the project involved the implementation of a Wireless MESH network at over 40 intersections. Each intersection has several types of information that must to be transmitted through the MESH networks to the TMC (Traffic Management CentER). For example, many of the intersections have Autoscope detection cameras, Eagle traffic controllers, and CCTV cameras installed. The data collected from those devices is collected and sent to the TMC via wireless modems (ENCOM's 5200 series), then bridged to the existing Fiber-Optic system using a communication link (ENCOM's COMMPAK BB 49 INT), in the 4.9 GHz band. It should be noted the 4.9 GHz band has been allocated in the United States and Canada for broadband use specifically for public safety use. One of the greatest benefits to working within the 4.9 GHz frequency is that it is license-free; therefore once the equipment is installed there are no ongoing costs to the municipalities to transfer their data. At present, the wireless broadband system implemented now provides 7-10 Mbps at each location on the system. Latency is less than 40ms and all video images are stable and reliable. The second phase of the project has also been completed There are now currently over 100 MESH network nodes in operation with expansion plans to encompass over 200 sites.

LONG TERM GAIN

Overall, in these times of economic uncertainty municipalities naturally progress towards solid and steadfast investments. In the end, it all comes down to results. Wireless broadband has proven itself as a reliable and efficient mean of communication for large scale projects, such as the St. Louis County, MO. Route 100 widening project. The bar has been raised; advancements in Broadband MESH network technology, its cost effectiveness, ease of installation and rapid deployment support the growing momentum of this media in the transportation industry.

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