Change of ideas: How mesh networks create smarter cities

by Robert J. Schena, Chairman, CEO & Cofounder, Rajant Corporation

Reliable communication networks can make city services more intelligent, including water and power supply.

In 2002, Robert Schena co-founded Rajant Corporation, the pioneer of Kinetic Mesh Networks and a Finalist for PACT's Emerging Technology Company of the Year.

In 1999, Robert Schena co-founded Airclic, Inc., a wireless application and scanning company and raised $15 million from a group led by Goldman Sachs and Blue Capital Management. Motorola and Symbol Technologies forged a partnership to acquire Airclic and closed a $287 million financial round as well as the contribution of intellectual property in excess of $162 million. Also in 1999, Mr. Schena participated in the founding of World Wide Packets, a Gigabit Ethernet company.

In 1996, Mr. Schena successfully obtained for his company an FCC license to provide an Open Video System, becoming the first one to do so. In 2004, he was successful in changing U.S. telecommunications regulations, resulting in obtaining the first FCC license for broadband services delivered in the U.S. from a Canadian satellite.
In 1992, Schena founded FutureVision of America (FVA), forging a partnership with Bell Atlantic to commercially launch the first video dial tone and digital TV over television. FVA was successfully sold to Bell Atlantic.

Prior to founding FVA, Schena served as the CFO, Treasurer, Vice President of Finance and Vice President of Marketing for Harron Communications. Mr. Schena was appointed to the State of Pennsylvania's Ben Franklin Technology Board by Governor Ridge in 2001 and reappointed by Governor Rendell in 2004 and 2008. He serves on the Board of the Methodist Home for Children. In late 2010, Mr. Schena was named to Governor Corbett's Marcellus Shale Transition Team.

Mr. Schena earned a BA in Business Administration from Temple University and an MBA from the Wharton School of the University of Pennsylvania. He has lectured extensively on broadband communications to professional and corporate organizations.

As our technologies grow ever more advanced in a push to overcome new challenges and keep up with society's demands and high expectations, municipalities around the globe are morphing into fully connected, highly integrated entities known as smart cities.

A smart city aims to improve quality of life for its citizens by harnessing technology to connect infrastructures, resources and services, and make the municipality safer and more sustainable, livable, workable and competitive. A 2016 President's Council of Advisors on Science and Technology report states, "Information and communication technologies, the proliferation of sensors through the Internet of Things, and converging data standards are also combining to provide new possibilities for the physical management and the socioeconomic development of cities … Digital and mobile technologies are making the connections between service providers and users tighter, faster, more personal and more comprehensive."

To facilitate these connections, an important aspect of any smart city is its communication network, which should allow real-time monitoring of utilities, buildings and infrastructure as well as remote operations that automatically adjust for environmental factors. The Smart Cities Council states, "Super-fast, high-capacity broadband networks are considered essential to economic gowth, job creation and competitiveness." Without a mobile, scalable, reliable wireless network that allows real-time data transfer, many parts of a city may be running on outdated data or no data at all.

There are multiple ways that a reliable communication network can benefit a city and make it smarter. For example, deploying a wireless network to create integrated, more efficient power and water utilities can help cities become more resilient in the face of manmade and natural disasters and provide better services to its citizens – enhancing its overall livability.

Making power and water smarter

A city that owns and maintains its own water and electric utilities can find value in installing a communication platform that allows constant access to real-time data with no downtime.

A common challenge for power utilities is ensuring there is enough power on a grid to support the energy draw. Outages are almost always unplanned, and an outage-to-restoration process can involve several steps with long lead times, including multiple field visits to identify, locate and fix the problem. For example, an inspection crew would go track down the problem, then return to headquarters and report findings to a service crew, which would then go out to repair the issue.

Furthermore, the operations center may be unable to provide much assistance since it would be working off outdated information collected and compiled from multiple sources at different points in the process, so analyses would be limited. This communication breakdown drags out repair times, creating longer outages for residents.

A utility grid connected to a wireless network that never experiences downtime is a much smarter way to deal with outages. Vehicles are equipped with mesh or Wi-Fi-enabled laptops and handheld monitoring devices. The in-vehicle computing platform and vehicle network can be used to store field maps, detailed engineering diagrams or schematics, and best practices and procedures. Field technicians can connect through their devices, pull up the most current data, and send their own findings back to the operations center or other field technicians through the mesh while on site.

Everyone connected to the network can give and receive real-time information, enabling an end-to-end view of the detailed outage process and allowing timely analysis and decision-making. Dispatchers can take into account location and terrain-specific information, outage type, traffic times and closest available crew, optimizing dispatch decisions.

If a city does not have an intelligent water system – one that integrates water treatment systems with information and control systems using real-time data – response times will be slower, information may be inaccurate, and water quality and quantity may suffer.

Real-time data via a reliable communication network will make water utilities more intelligent. Smart water technology covering key elements of plants and distribution systems will provide the capability to more efficiently manage system infrastructure and extend resources. Installing real-time meters will make it easier for utilities and their customers to track and manage usage.

The integration of real-time data to make smarter short-term and long-term operating decisions will be particularly relevant for systems that deal with both drought and flood conditions. Smart water systems can incorporate features to adapt to changes in demand and supply patterns. Monitoring water supplies using analytics will allow a utility to track and anticipate challenging flow conditions.

In the case of low water flow, utilities could preemptively introduce alternate sources of supply. Greater accessibility to data can likewise facilitate collaborative planning on a regional scale between stakeholders to effectively plan and manage storm/flood conditions.

All of these applications would require other sensors and software, but the one thing they have in common is the need for a reliable wireless communication network.

Finding the Right Type of Network

One communication network that is helping to make cities smarter is Kinetic Mesh, which employs multiple radio frequencies and any-node-to-any-node capabilities to instantaneously route data via the best available traffic path and frequency. Each node serves as singular infrastructure, which enables all devices and the network itself to be mobile – meaning it can move around a city with no loss of connectivity.

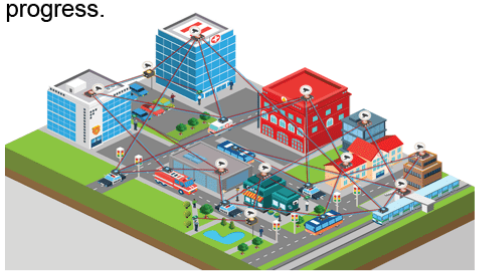
The network enables the nodes to manage interference and reduce network capacity constraints. Wireless nodes work in concert with networking software to deliver data via the fastest available path; routes are evaluated on a packet-by-packet basis, with no need for input from the network administrator. The nodes seamlessly integrate with each other as well as cellular data/LTE networks and third-party satellite.

If one path becomes unavailable for any reason – such as power loss – the network routes around it, eliminating any downtime. It is not uncommon for a node to have several hundred peer connections, giving it the ability to use any link at any time. Kinetic Mesh is highly scalable; the more nodes in a network, the better the performance.

Kinetic Mesh has been battle-tested in military, mining and disaster recovery operations and now can bring its capabilities to cities across the globe to allow transmission of real-time data for mission-critical services such as power and water supply. Despite the immense amounts of data now at our fingertips, we'll never be able to truly predict the future, but in a non-hierarchical communication network such as Kinetic Mesh, there is an exponentially higher chance that the vast majority of the network will still function in times of natural or manmade disaster, even if one or more links in the chain break.

Making Connections

A reliable communication network is an essential part of a fully integrated, truly connected smart city that is safe, sustainable, livable, competitive and resilient. The move toward smarter cities will help us meet current and future challenges head on and will in turn allow the development of new innovations and technologies, creating a continuous cycle of progress.



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