Smart Cities and the Networks that Make Them Possible

Technology advances in wireless networks and sensor technology create the perfect opportunity to take interconnectedness to the next level, especially in dense urban areas. The result is a drive toward a “smart city” concept.
The smart city goal is simple: a better quality of life for its residents and visitors through improved efficiency, better access to information, and enhanced communication between city officials and the community.

Sensors integrated with real-time monitoring systems collect, process, and analyze data from devices and people, all with the objective of more efficiently dealing with the myriad aspects of city life.

**Communication is Key**

As the Smart Cities Council points out, it is ubiquitous broadband communication that is a prerequisite for a smart city. The telecommunications infrastructure – primarily wireless, with a fiber-optic backbone – is as critical to the success of a smart city as is its streets and water lines. The smart city does not have to build, own, and operate the infrastructure itself, but it must at least establish an environment in which the private sector is encouraged to develop the extensive network that is needed.

A smart city infrastructure needs to function as a unified and completely interoperable network. This network must have the capacity to handle all the communications – the “direct” communications involving individual devices such as smartphones and computers and the “indirect” communications among sensors and switches. It must be able to cope with spikes in demand connected with special events in order to deliver a high quality of service at all times, without fail.

**But what makes a city smart? It is the integration of three things, all intended to securely manage a city’s assets and improve service:**

- Networks that enable the Internet of Things
- Environmental sensors
- Information technology that works in concert with the sensor data.

**Benefits for All**

This communications infrastructure plays a critical role in promoting livability, workability, and sustainability in the smart city. The Smart Cities Council points to benefits such as these:

- **Reducing congestion.** Sensor data combined with communications can improve traffic flow by changing the timing of traffic lights based on real-time conditions.
- **Improving services.** Governments can deliver personalized alerts and applications directly to residents’ smartphones and keep citizens better informed about all aspects of urban life, from street repairs to water line improvements to transportation system schedules. Apps can allow citizens to easily report repair or maintenance issues or other problems that need to be brought to city officials’ attention.
- **Enhancing mobility.** Apps and streamlined access to information can make it easier for citizens to choose public transportation as an option, reducing the amount of automobile traffic on the streets.
- **Reducing the digital divide.** The smart city communications infrastructure enables access for many residents who might not have been able to obtain it otherwise. This opens opportunities to them and levels the playing field for the disadvantaged.
- **Better business environment.** Cities with superior telecommunications have an edge in attracting business investment. A city’s appeal depends on its ability to offer the services that support growth. It also enables telecommuting, providing an option for workers that helps reduce the amount of automobile traffic on the streets.
- **Maximizing existing assets.** When equipment such as transformers, pumps, power plants, and power lines can be remotely monitored, it can be pushed to greater capacity without fear of overload. This monitoring also enables repairs to be made before the equipment fails, extending its life.
- **Reducing resource use.** Monitoring energy, water, and other systems via the communications infrastructure enables utilities and governments to maximize their efficiency, limit waste, and reduce overall consumption.
Who Builds the Infrastructure?
The communications infrastructure will typically be built out by a non-governmental service provider, or as happens in many cases, in a public-private collaboration. Whatever the circumstances, a city needs to provide leadership, develop effective incentives, and encourage policies that help to ensure that residents, businesses, and visitors have the access they need.

The Smart Cities Council strongly recommends that the urban network be ubiquitous and multi-purpose. Single-purpose networks, such as those set up by each city department, or which are not interoperable with other networks, will not only limit communications capabilities, but end up costing the city more both in terms of investment and ongoing maintenance and management.

An open network, one that adheres to industry standards, allows equipment from many manufacturers to be used, not restricting the city to one company’s products.

Kansas City's Smart Zone

If Kansas City isn’t the smartest city in America, it’s at least in the top ten – thanks to a truly innovative “smart zone” it has created along a new streetcar line that has helped revitalize the downtown area.

This zone leverages a robust Wi-Fi network, strategically placed interactive informational kiosks, and the most advanced sensors and data analytics to streamline traffic, adjust street lights to real-time needs, and generally make the immediate area a cool place to live and to visit.

Bob Bennett is Kansas City’s Chief Innovation Officer, and his mission is to find new and better solutions to the city’s problems and issues. Often, but not always, those solutions involve technology.

Bennett coordinated the smart city infrastructure to integrate fully with streetcar construction so that both projects could rollout together in the spring of 2016. Now he’s applying those lessons learned to other basic services provided by the city.

How it Got Started

A bit of background: In 2012, Kansas City produced a forward-looking plan that was the genesis of the Smart City initiative. Then, when construction of the streetcar line began in 2013, it offered an opportunity to create a truly smart zone. To do that, the city formed a public-private collaboration with a total of 14 technology vendors, including Sprint and Cisco.

“The initial vision was to make the Kansas City streetcar the most technologically advanced streetcar line on earth,” Bennett says. “It was seen as a differentiation opportunity for us. Then we started talking about how to expand beyond the streetcar and into a true smart city effort. For that, data is the most important aspect and connectivity is the enabler.”

The 2.2-mile streetcar line is designed to incorporate four distinct districts in the downtown area into a single community. In many ways it is both a response to increased business and residential activity in the area and a driver of that activity.

Since voters approved the streetcar project, Kansas City has seen almost two billion dollars of retail, commercial, and residential development in the immediate area, including a new convention center hotel. It is a hot area for younger people to live and work, with a thriving startup community taking hold.

“We have a full 51-block Wi-Fi array, and in many ways that is the most critical element,” Bennett says. “As cool as the sensors and capabilities, without the Wi-Fi backbone to connect it all, that wouldn’t be happening.”
The Essence of Smart
What makes the zone so smart is the network, with Wi-Fi that not only covers the immediate streetcar line area but extends outward, providing connectivity beyond the needs of passengers.

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Half of the Wi-Fi bandwidth is reserved for Sprint customers, 40 percent is available to any resident or visitor to the streetcar line area, and 10 percent is for transmitting all the sensor data.

The smart zone has made a distinctive addition,” Bennett says. “The ability to connect via Wi-Fi, share where you are with friends, and post to social media has been a real enhancement factor.”

It has apparently also helped boost streetcar usage far beyond initial expectations.

“We originally hoped to see 2,000 to 2,500 riders per day on the streetcar line, but we are actually seeing 6,000,” Bennett says, adding that the first-year goal of a million riders was actually achieved in the first seven months.

Kiosks are a Hit
Twenty-five interactive kiosks, provided by Cisco and connected by the Sprint network, are a key element of the smart zone. They can be used to access information about transportation options, local restaurants and businesses, and special events. Bennett says that information about when the next streetcar is arriving at a particular stop is the top reason people use the kiosks, with information about restaurants the second highest. Since Kansas City can generate revenue from restaurants who want to advertise in order to provide that information, the kiosks have become moneymakers.

The streetcars have helped reduce automobile traffic, but so has an adaptive signal program that is part of the Smart City project. Special sensors keep a close eye on traffic on Main Street and intersecting streets, and the data is analyzed instantly to minimize idling times at red lights. In one stretch of Main Street, this has helped decrease travel time by more than half a minute.

Kansas City is also deploying a smart streetlight test project in the downtown area. Sensors detect how much pedestrian traffic is in the area, and reduce the wattage of the LED lights by as much as 25 percent when the light isn’t needed. It’s too early to gauge how much that is reducing lighting costs, but the city is confident that as it broadens the project to more lights, the savings will add up.

Next Steps
Kansas City plans to eventually expand the Smart City elements across the entire city, first addressing some technologically underserved areas beyond downtown, and later expanding the streetcar line and its tech foundation.

Smart technology will be used to improve street lights, traffic signals, and even sewer pipes. The data gathered by smart sensors will drive decision making by city leaders in ways that improve the quality of life for residents.

“We know we are in many ways a testbed city, with a truly innovative public-private collaboration that may be a model for future cities,” Bennett says. “We know we will make mistakes, but we will make ourselves better by overcoming those obstacles. I really do think that we can become the smartest city on earth in five years, making our government more efficient and learning things that will help all cities.”

How Sprint Makes Kansas City Smart
A chance meeting at an industry trade show in 2014 between representatives of the city of Kansas City and Sprint snowballed into Sprint’s participation in the city’s streetcar smart zone.
The meeting led to an informal smart city discussion, which ultimately led to an extremely successful collaboration with the city. Convenient, too, because Kansas City is where Sprint is based, so the project is, essentially, in Sprint’s back yard.

Construction on the streetcar line had already started, but Sprint and Kansas City formalized the collaboration in 2015, making Sprint one of 14 technology vendors to collaborate with the city.

“Sprint has been a great service provider,” says Bob Bennett, Chief Innovation Officer for the city of Kansas City. “It has changed the paradigm of how a service provider interacts with the community – not as a wireless company but as a connectivity provider that is deploying a utility for the public good.”

Flooding the Zone
The Wi-Fi network that Sprint provides permeates the area via more than 300 wireless access points, provided by Cisco, that offer coverage for several blocks on either side of the 2.2-mile streetcar line.

Network capacity is divided three ways: Half the capacity is for Sprint customers, 40 percent is for general public usage, and 10 percent is for all the Internet of Things needs, such as interactive information kiosks and sensor data from street lights, traffic signals, and other connected devices.

Before Sprint flipped the switch on the network, there were some tense moments. Typically, to launch a network like this involves weeks and months of network optimization and testing. Sprint didn’t have that luxury, because Kansas City needed the network live in March 2016 to provide coverage for tens of thousands of visitors in town for the first segment of the NCAA March Madness basketball tournament.

“We felt confident that we had done it right, but we were used to doing so much testing beforehand. It was a nerve-wracking moment,” said Tony Singer, Manager of Network Planning and Business Development. “But it went really well, and interestingly, within minutes we could see users immediately signing on. Usage really grew over the next several days, even without us marketing it.”

Sprint hasn’t looked back since. The network has performed tremendously, and Sprint is leveraging what it is learning from this network as it talks with other municipalities about the potential for smart city projects and initiatives. Some of those may incorporate Wi-Fi networks, while others may rely on wireless LTE, 5G, and beyond. The possibilities are almost endless.

Sprint’s contribution is a carrier-grade Wi-Fi network that was designed from the start with so much capacity that it can easily accommodate long-term growth in demand. Previously, the neighborhood’s Wi-Fi capabilities were limited to intermittent hot spots and coffee shops. Now the network is like a blanket, covering several square miles in the heart of Kansas City.

“To learn more about how Sprint Business can help your city become a Smart City, visit: sprint.com/IoT or call: 877-280-5604.