

SMART CITIES: BRINGING INTELLIGENCE TO INFRASTRUCTURE

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COMCAST
BUSINESS

INTRODUCTION

Imagine a city in which roads send commuters alerts when there's heavy traffic, street lights monitor the environment for weather changes or park sprinklers turn on automatically according to moisture levels in the soil.

These are some of the possibilities with smart cities, a concept of urban design that integrates information and communication technology with the internet of things (IoT) to create a network that manages a city's infrastructure. Office buildings, hospitals, water supply networks, schools, waste management, law enforcement and more can be connected to enable more efficient services and, ultimately, better quality of life for its citizens.

Through the connected networks, city officials can monitor activity within the city limits, and monitor, interact with and control all types of things on the network, from the heating system in an office building to a trash can on a street corner. The networks also can

interact with citizens of the city to automatically alert them of traffic hazards such as roadwork or police/fire activity or potentially dangerous weather such as tornadoes or impending blizzards—all without human interaction.

Research firm Gartner predicts that by 2020, half of all the smart city objectives will include climate change, resilience and sustainability key performance indicators (KPIs)¹, point-

ing to a growing awareness of—and desire by cities to address—climate change. Gartner noted companies implementing an integrated business management system (BMS) for lighting and heating and cooling can reduce energy consumption by 50 percent.²

Statistics such as that are driving an increasingly attractive market. Persistence Market Research forecasts the smart cities market will increase to more than \$1 trillion in 2019 from \$622 billion today and reach \$3.48 trillion by the end of 2026.³ In North America alone, the market will see a compound annual growth rate of 14.5 percent between 2016 and 2026 to reach \$750 billion.⁴ Smart security will lead the charge, Persistence believes, to reach as much as \$780 billion worldwide in 2026.⁵

Much of the promise of smart cities is reliant on a robust network that powers and supports the many sensors and devices that collect and process information. Municipalities looking to become smart cities tomorrow are upgrading and updating their infrastructures today, as an increasing number of devices connect to the network and collect data. Wired and wireless networks, broadband and other emerging technologies such as LoRa (low-range) together will power the networks of tomorrow for smart cities.



**SMART CITIES MARKET
WILL INCREASE TO MORE
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SMART CITY EXAMPLES

Smart cities are being developed worldwide, all with the intention of addressing issues ranging from traffic abatement to climate control. In the United States, municipalities are adopting technologies to make their cities smarter.

Philadelphia recently kicked off an initiative that utilizes low-power wide area network (LP-WAN) technology from Comcast Business to connect devices and locations citywide. Sensors installed on dumpsters, water meters, traffic lights, transit systems and other things help the city better understand and react to events as nominal as traffic congestion on the onramp to I-95 or as critical as a broken water main flooding downtown.

The underlying Comcast Business technology is called machineQ and connects to the sensors via long-range (LoRa) technologies. The sensors collect specific data from the devices they're installed on, and sends the data over machineQ to be analyzed. The result is a quicker reaction time and streamlined operations, with the added benefit of historical

data to spot trends such as how quickly certain dumpsters become full, for example.

In Detroit, Project Green Light was launched as a partnership with the local business community to create safer neighborhoods. Under the initiative, participating businesses installed high-definition video cameras inside and outside their locations, which are monitored at the City of Detroit's Real Time Crime Center. Since its launch, businesses participating in Project Green Light have seen a reduction in violent crime ranging from 20 percent to almost 40 percent, and the city has experienced a 40 percent reduction in carjackings.⁶

Other smart city initiatives deal with the more mundane yet annoying aspects of urban life. Boston, for

example, is enabling citizens to report potholes and other road hazards via a mobile app called Street Bump. Users simply hit a button in the app to record their trip, and the app collects road condition data while they drive. That data is collected and aggregated to provide the city with real-time information "to fix short-term problems and plan long-term investments," according to the website.⁷

Other cities are joining the smart cities fray, as well, spurred in part by funding from the U.S. government. In 2016 the U.S. Department of Transportation announced it was investing \$165 million in smart city solutions, as part of the White House's Smart Cities Initiative under then-president Obama. Pittsburgh, Pennsylvania, was tapped to receive nearly \$11 million to deploy smart traffic signal technology, among other technologies, while Denver, Colorado, was selected to receive approximately \$6 million to help to alleviate commuter traffic congestion via connected vehicles.⁸

TECHNOLOGIES ENABLING SMART CITIES



The idea of a smart city is quite simple: integrate information and communication technologies with IoT to create a network that manages a city's infrastructure. Making that happen, however, isn't so simple; executing a smart city requires multiple technologies, from sensors and kiosks to broadband and wireless networks. The amount of data collected from the myriad devices is staggering, requiring not only applications that can manage and parse the data into actionable intelligence but also a strong yet flexible network to handle the bandwidth requirements of all the components that make up a smart city.

At the heart of any smart city is IoT, or the network of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors and network connectivity that enable these objects to collect and exchange data. Without IoT, smart cities simply would not exist, as IoT drives the data, which is then processed and managed via big data analytics.

Powering IoT is a networking infrastructure that includes wired and wireless, broadband, 5G, radio and other technologies. Together these form the backbone of a smart city, connecting all the components into one wide area network.

Sitting atop the networks are multiple devices that generate data through sensors or are designed to collect information for processing by big data systems. Sensors embedded in

roads or parking garages can send alerts about heavy traffic or unoccupied parking spaces, which helps reduce congestion and pollution. Connected garbage cans send alerts when they reach capacity, so city workers spend time emptying only the bins that need attention, which frees them to do other tasks.

Even streetlamps are important elements in a smart city infrastructure, as many of them are connected through their LED lights to monitor and measure the power. Many cities have used that connectivity to create a low-power WAN network, over which video cameras, gunshot sensors or other devices could be connected. Streetlamps are becoming so important that Gartner predicts that by 2020, 10 percent of smart cities will use their streetlamps as the primary conduit for a smart city WAN.⁹

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CHALLENGES TO SMART CITIES

As promising as smart cities are as an enabler for more efficient operations and overall better quality of life for citizens, they are not without their challenges. Security, connectivity and infrastructure, to name a few, have stymied efforts of some cities and slowed the progress of others.

Of all the issues that have the potential to thwart smart city efforts, security stands out as a major factor. Smart cities rely on connected devices, but as with every other network, each device on the network is a potential breach point. And the more devices connected to the network, the more points for a cybercriminal to breach the network and cripple critical services such as traffic control or water supply systems.

Gartner predicts that in 2017, 8.4 billion connected things will be in use worldwide, up 31 percent from 2016, and will reach 20.4 billion by 2020.¹⁰ It's a safe bet not all of those connected things will be secured properly, a fact that already has been proven: In Dallas, Texas, hackers broke into the city's emergency alert system and set off 156 emergency sirens, upsetting residents and overwhelming 911 operators with calls.¹¹

Protecting the integrity of the infrastructure is critical for all networks, and especially so for the networks that power smart cities. It is imperative all elements connected to the network, from data-collecting sensors to the data centers powering the analytics and even the mobile devices running over free city-wide Wi-Fi, are secured from potential hacks and other cyber-threats that can threaten to disrupt or even take down smart city networks.

Equally as important in ensuring municipalities realize the benefits smart cities technology bring is connectivity. The intelligence in smart cities comes from the data collected from connected devices and processed by the myriad technologies that make up a smart city infrastructure. Without connectivity, data cannot be collected, devices cannot interact, and cities won't see the efficiency, safety or cost savings that smart technology can provide.



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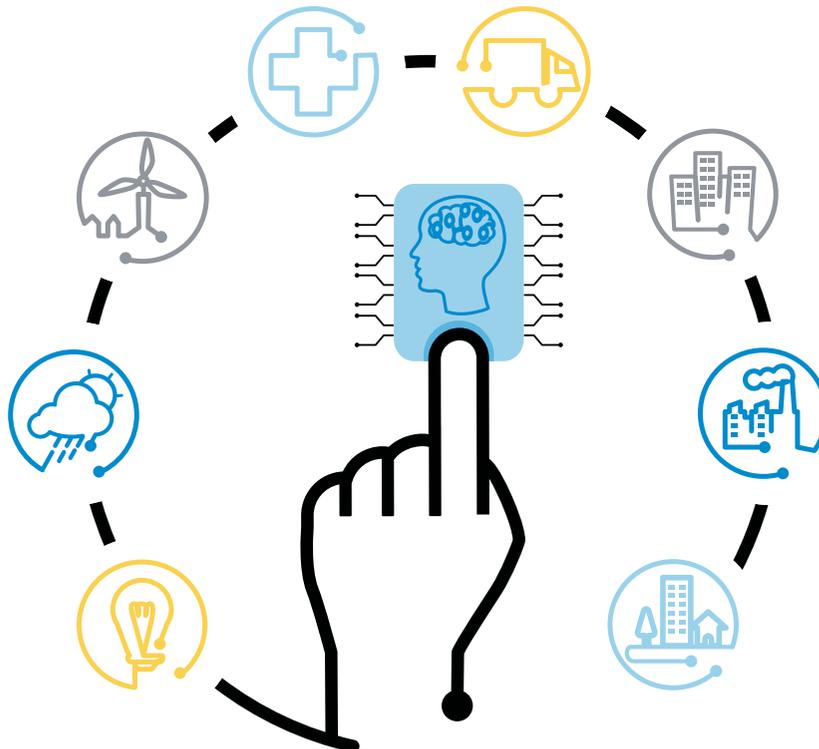
CHALLENGES TO SMART CITIES

To ensure the connectivity to power a smart city, a strong and resilient network is required so each technology and device on the network can operate at its peak efficiency. Likewise, effective management of the network, from regulating bandwidth for network devices to ensuring every technology is online and

operating, is also a critical component. But, should a part or all of a network go offline due to a security breach or network failure, built-in redundancy can help keep critical services and systems running.

MUNICIPALITIES MUST PLAN FOR UPGRADES OR BUILDING NEW INFRASTRUCTURE WITH AN EYE TOWARD ADDING INTELLIGENCE

Even with the right network operating at peak efficiency, smart cities also must have an infrastructure that can support it. Aging and outdated buildings, crumbling roads, inefficient transportation systems and other infrastructure components simply cannot handle the technology requirements of a smart city. Therefore, municipalities must plan for upgrades or building new infrastructure with an eye toward adding intelligence, such as repaving roads to include traffic sensors or installing LED lighting in streetlamps to create a low-power WAN, for example.



CASE STUDY: PROJECT GREEN LIGHT

One of the more successful smart cities initiatives is occurring in the city of Detroit, Michigan, a city long plagued by high crime rates. The city began a partnership with Comcast Business in 2016 to equip eight local gas stations with video surveillance cameras to reduce criminal activity and increase public safety in the area.

Project Green Light, as the initiative is called, was designed to make crime-fighting a proactive activity through real-time monitoring of high-crime locations. Its aim is threefold: to improve neighborhood safety, better enable the Detroit Police Department to fight crime, and promote the growth of local businesses.



DETROIT POLICE DEPARTMENT
PROJECT GREEN LIGHT

**BUSINESSES
PARTICIPATING IN
PROJECT GREEN
LIGHT HAVE SEEN
A REDUCTION IN
VIOLENT CRIME
RANGING FROM 20
PERCENT TO ALMOST
40 PERCENT**

At the start of the initiative, eight gas stations were outfitted with real-time camera connections with the city's Real-Time Crime Center at police headquarters, enabling police officers to monitor the activity in and around the area. The stations installed and are maintaining high-definition indoor and outdoor cameras, and upgraded to high-speed network connections capable of handling video streams. The stations also upgraded lighting in and around the buildings and other parts of their property, as well as other upgrades.

The results have been impressive: Since its launch, businesses participating in Project Green Light have seen a reduction in violent crime ranging from 20 percent to almost 40 percent, and the city has experienced a 40 percent reduction in carjackings. Other businesses, including almost a dozen McDonald's restaurants, have since signed on to take part in the program.¹²

Project Green Light is powered by Comcast Business SmartOffice, a video surveillance solution designed to improve efficiency for small and medium-sized businesses (SMBs) through advanced monitoring. "Without the complete video technology system Comcast provides, Project Green Light would not be the success it is today," said Detroit Mayor Mike Duggan in a statement. "Because business owners know they can get everything they need from one provider to meet the requirements of the program, enrollment is growing at a rapid pace, and we are seeing improvement across the city."

CONCLUSION

Smart cities hold the promise of more efficiency, increased public safety, reduced energy use and, ultimately, better quality of life for its citizens. The integration of information and communication technology with the internet of things (IoT) creates a network that enables management of a city's infrastructure, helping streamline the cost of services while simultaneously improving the types of services offered to citizens.

The benefits of smart cities are many, but there are challenges as well. Security, connectivity and infrastructure are three major elements in a smart city that, if not managed correctly, can thwart a city's smart initiatives.

The potential for smart cities is real, and municipalities worldwide are already reaping the benefits of a smart city design. To ensure optimal performance and, ultimately, the success of any smart city initiative, the right technology elements running on a robust and resilient network are critical. Wired and wireless networks, broadband, LoRa and other technologies together will power the networks of tomorrow for smart cities.

1 "Gartner Predicts that by 2020, Half of Smart City Objectives Will Include Climate Change, Resilience and Sustainability KPIs," news release, Gartner, Nov. 8, 2016 <http://www.gartner.com/newsroom/id/3507317>

2 Ibid

3 "Global Smart Cities Market to Reach US\$ 3.482 Trillion by 2026, APEJ to Outpace North America," news release, Persistence Market Research, Jan. 4, 2017 <http://www.prnewswire.com/news-releases/global-smart-cities-market-to-reach-us-3482-trillion-by-2026-apej-to-outpace-north-america-609626355.html>

4 Ibid

5 Ibid

6 "Mayor, Chief join community in celebrating success of Project Green Light at opening of 100th participating business," news release, City of Detroit, Feb. 2, 2017 <http://www.detroitmi.gov/News/ArticleID/1186/Project-Green-Light-Celebrates-Opening-of-100th-Location-Growth-Rate-Tripled-Since-Partnerships-with-DTE-and-Comcast>

7 "About Street Bump," Street Bump website <http://www.street-bump.org/about>

8 "Secretary Foxx Participates in White House Frontiers Conference, Announces Nearly \$65 Million in Advanced Technology Transportation Grants," news release, U.S. Department of Transportation, Oct. 13, 2016 https://www.transportation.gov/Briefing-Room/Advanced-Technology-Transportation-Projects?utm_source=Triggermail&utm_medium=email&utm_campaign=Post%20Blast%20%28bii-iot%29-%20Nissan%20CEO%20discuss%20the%20future%20of%20automobiles%20%E2%80%94%20US%20Department%20of%20Transportation%20makes%20big%20investment%20in%20smart%20cities%20%E2%80%94%20Amazon%20unveils%20Echo%20Spatial%20Perception&utm_term=Bill%20List%20IoT%20ALL

9 Kasey Panetta, "Smart Cities Look to the Future," blog post, Gartner March 27, 2017, <http://www.gartner.com/smarterwithgartner/smart-cities-look-to-the-future/>

10 "Gartner Says 8.4 Billion Connected "Things" Will Be in Use in 2017, Up 31 Percent From 2016," news release, Gartner, Feb. 7,

2017 <http://www.gartner.com/newsroom/id/3598917>

11 Eli Rosenberg and Maya Salam, "Hacking Attack Woke Up Dallas With Emergency Sirens, Officials Say," news article, New York Times, April 8, 2017 <https://www.nytimes.com/2017/04/08/us/dallas-emergency-sirens-hacking.html>

12 Joe Guillen, "Detroit's crime-fighting Project Green Light expands," news article, Detroit Free Press, May 23, 2016 <http://www.freep.com/story/news/2016/05/23/detroit-expands-video-camera-based-anti-crime-program/84803842/>