

Next Generation Detection

the Smart Cities series: part 2



Smart devices are multiplying. Every day, new technology helps our communities perform daily functions more efficiently, detect potential dangers, and streamline vital city services. Smart phones remotely communicate with thermostats in our living room. The GPS in our car helps us safely arrive at our destination by triangulating a moving signal. These networked devices, transmitting and receiving scores of data behind the scenes, constitute the ever-expanding Internet of Things (IoT).

Try to imagine the quantity of data that this creates. According to experts, determining the quantity of data that currently exists in the universe is nearly impossible because the volume is growing so fast. “Some say that about 90% of all the data in the world today has been created in the past few years,” states a 2014 BBC News article on Big Data. “According to computer giant IBM, 2.5 exabytes—that’s 2.5 billion gigabytes (GB)—of data was generated every day in 2012. That’s big by anyone’s standards.”

Although our virtual airways are cluttered, this data-boom has provided valuable insight into day-to-day activities that wasn’t previously accessible. Within a cityscape alone, smart technology has reinvented efficiency. Our cell phones, cars, watches, televisions, and refrigerators are all “smart.” Even electric meters, when combined with weather patterns can be used to assist power utilities in forecasting usage demands to keep power grids efficient. Smart products are improving our lives in new ways every day.

In parking, smart technology provides new opportunities in the management, enforcement, and collection of our cities’ programs. At the center of this innovation, the vehicle detection sensor can provide cities with the following: occupancy information to develop

SENSOR BENEFITS

Provide occupancy data

Data can shape parking policy regarding rates, zero-out capability, time limits, etc.

Makes an efficient and streamlined parking program, resulting in increased revenue and citizen satisfaction.

better parking policies; provide enhanced customer convenience via apps and in-car navigation; and optimize operations of a valuable city asset. When paired with a Smart Parking meter, the City can unlock deeper layers of intelligence while alleviating the chaotic aftermath of the big data-boom.

METER EMPOWERMENT

As discussed in “The Smart Meter and the Rise of the Smart City, Part I” of this article series, smart devices are more efficient when empowered to make decisions locally. As a common example of local decision-making power, a computer contains operating instructions based on installed firmware. When a user clicks the mouse, the computer understands the instruction to select an item. However, it would be cumbersome, cost-prohibitive, and inefficient to outfit every smart object with a fully-operating computer. History has reflected this transition. As everyday objects grew smarter, computing technology grew smaller to outfit smart devices with the minimal capabilities to perform their required functions.

However, if local devices contain bare-bones functionality, data must be transmitted to a governing authority to “decide” how that device should proceed. In the example of a parking management solution, local devices might include a parking meter and a sensor. Both of these devices need to communicate with a central repository—sometimes referred to as a data management system—to determine what action must be taken. In the cloud model, data is sent to and gathered in the central repository. The data is analyzed, and a decision is made and sent back to the meter.

For example, a car leaves a parking spot with time left on the meter—what should the meter

Cloud based systems lead to inefficient meters and battery drain. IPS meters allows devices to make decisions without communicating to the cloud, increases data efficiency and improves battery life.



“SMART TECHNOLOGY PROVIDES NEW OPPORTUNITIES”

do? The sensor transmits the data “car has vacated the parking spot” to the central repository. The repository decides that the meter should reset to zero time. The instructions “reset to zero” are then transmitted to the meter. In this scenario, the central repository—the cloud—acts as the system’s brains.

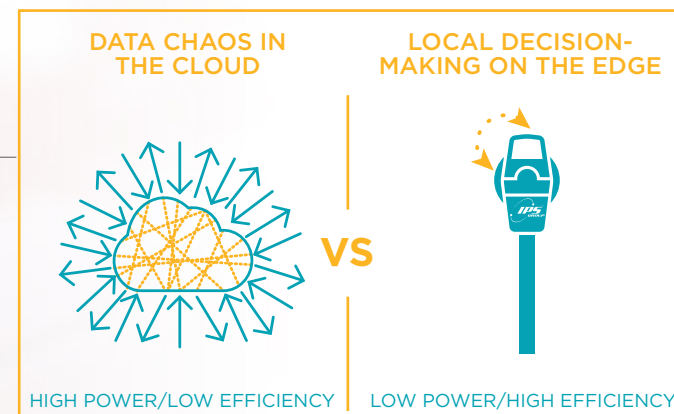
However, this model contributes to data-chaos while requiring additional power at the meter to continually transmit and receive data, equating to a high-power, low-efficiency system. IPS Group, Inc., a leading developer of Smart City technology and the inventor of the single-space Smart Meter has deviated from the traditional parking meter IoT model by developing a product that communicates directly with the vehicle detection sensor, enabling local decision-making capability at the meter.

A BRIEF HISTORY

Like all technological developments, wireless networks, specifically vehicle

detection sensor networks, suffered from trial and error. Similar to wired networks, the information path in a wireless network was first developed as one single route back to a central data point. Any hindrance to that path resulted in network failure. To solve this issue, mesh networks—networks that synchronized all sensors, or nodes, into one wireless backbone—were developed in the mid-2000s. First generation vehicle detection sensors utilized this technology, requiring wired receivers every four to six blocks to read the sensor network’s transmissions and send them to the central repository.

The problem with the mesh network model is its similarity to the cloud computing model. In a mesh network, the local node is typically unable to communicate directly with the parking meter and must request instructions from the central repository at every sensor event. In terms of data flow, the sensor detects a vehicle in the parking space and transmits that information to the mesh network receiver, which transmits that information to the central repository. The sensor’s central repository then notifies the parking meter’s central repository (which might be a different management system entirely), which then finally notifies the parking meter. If such a data transmission occurs every time a vehicle comes or goes, an unnecessary amount of data is generated, time is wasted, power is consumed, and many possible points of communication breakdown are introduced.



“ THE FUTURE OF PARKING LIES IN SOLUTIONS—DEVELOPING INTEGRATED SMART DEVICES THAT, WHEN UNITED, SEAMLESSLY MANAGE THE PARKING ENVIRONMENT IN THE MOST EFFICIENT WAY POSSIBLE. ”

Additionally, the proprietary mesh network model is often cost prohibitive to install and maintain.

We now know that, for a smart device to be truly efficient, we must eliminate potential room for error, remove wasteful data, and save critical time and power. This is only accomplished by imbuing the parking meter with a basic level of intelligence and developing a symbiotic communication flow between products.

LESSONS LEARNED

The vehicle detection sensor's short history has taught us one key lesson: the sensor, parking meter, and data management system must comprise an optimized micro-unit, connected via two-way communication channels. In this scenario, the parking meter has the necessary tools to make local decisions, operate with the longest battery life, and perform with impeccable accuracy. Each pair—meter and sensor—must work symbiotically, together, as parts of a whole. Within this streamlined system, each segment is refined to create the most power and energy-efficient solution possible.

When looking back at first generation sensors through the lens of today, it's easy to realize that sensors proved troublesome because they were thrown into a piecemeal system, not because sensors are innately unreliable. When tested alone (or in a lab), sensors commonly demonstrate up to 99.9% accuracy, proving that sensor unreliability is more often due to the environment in which they operate, not the sensors themselves. In addition to weather conditions, the less-than-fully-reliable manner in which people park, bikes, pedestrians, and other adjacent vehicles affect the detection algorithm.

IPS GROUP SENSOR OPTIONS



No sensor system is perfect. In order to implement any imperfect system, City policy has to accept the fact that perfection, while preferred, is not practical. To better streamline sensor testing, ensure accuracy, and push the boundaries of success, IPS Group has developed sensor accuracy testing software never before seen in the industry.



Stephanie Simmons is Director of Marketing at IPS Group, Inc. and specializes in business-to-business marketing, brand consulting, and design.

SMARTER, SMALLER, INTEGRATED

IPS Group has increased their product suite to include the first ever single-space dome mount sensor, as well as pole mount and in-ground options that communicates directly with the IPS Smart Meter. In this latest innovation, the company wanted to ensure sensor accuracy claims were precise. So a sensor accuracy methodology and software system was innovated in 2015. Results have shown the IPS Group dome-mount sensors are testing at 99% accuracy in most tested applications.

In addition to the dome-mount sensor, the company also provides a pole mount and in ground sensor option. This direct communication enables local decision-making power (“decisions on the edge”) with the capability to reset the IPS Smart Meter, prevent piggybacking, enable more complex variable rate structures, and manage enforcement more efficiently. Because of their pre-integrated design, IPS Smart Meters and sensors are cost effective, increasing the likelihood of their mass adoption. Only once mass adoption begins to take place will we have the data needed to enable the truly Smart Cities of the future.

SMARTER PARKING for SMART CITIES.™

IPS Group, Inc. is headquartered in San Diego, CA (USA), with offices in Canada and Europe (ipsgroup.com). IPS is a design, engineering, and manufacturing company focused on low-power wireless telecommunications, payment processing systems, and parking technologies and has been delivering Smart City technology solutions for over 20 years. The company offers a fully integrated smart product suite comprised of single-space meters, multi-space pay stations, pay station upgrade kits, vehicle detection sensors, smart cash collection systems, and SaaS management software with advanced data analytics. IPS is delivering the Internet of Things (IoT) and Intelligent Parking Systems to transportation and parking operations all over the world. Contact IPS at info@ipsgroupinc.com, or call 858.404.0607.