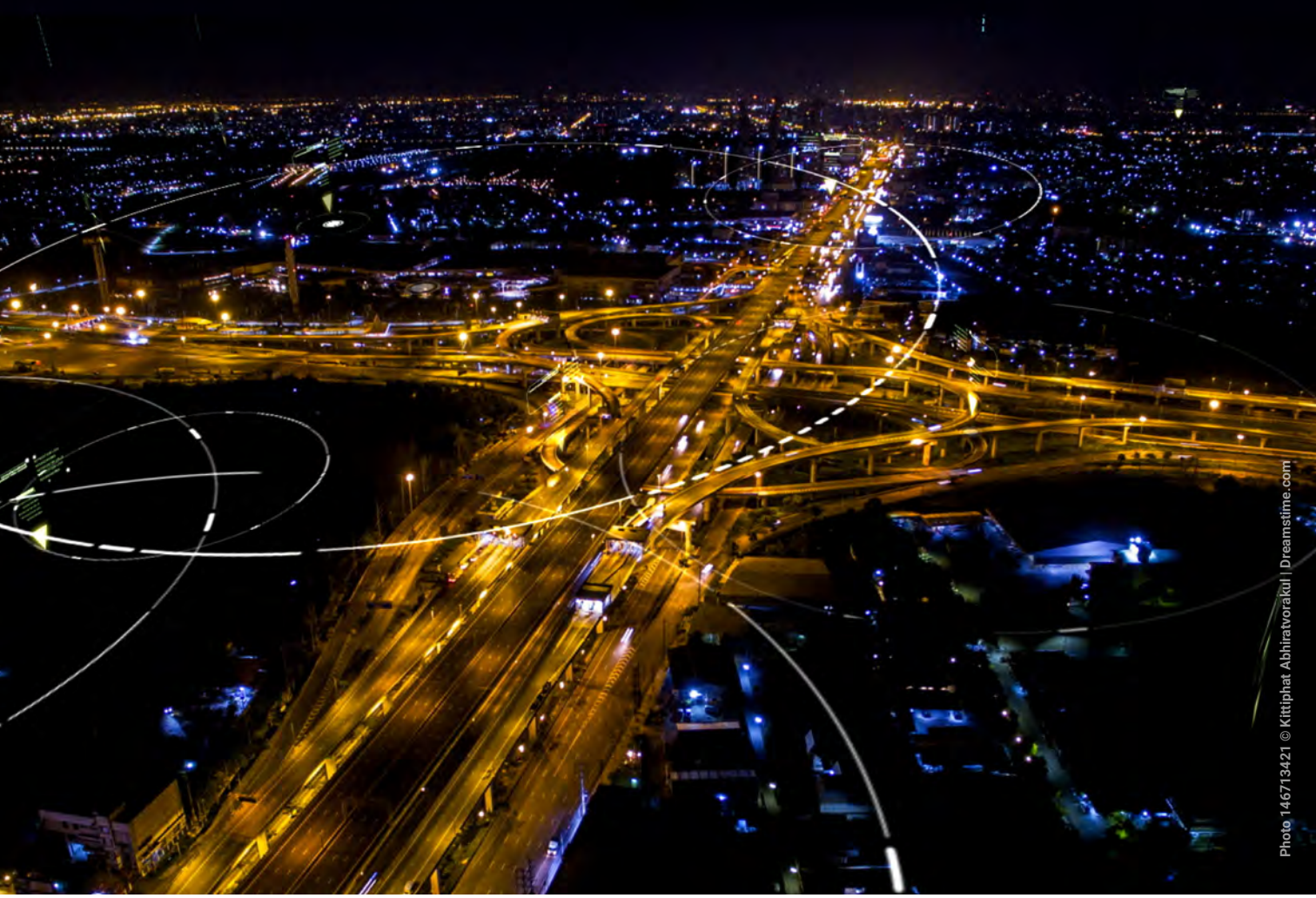
Smart streetlights: The gateway to intelligence-led city management



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The data-driven city

Cities are becoming increasingly data-driven – that is, using data to inform decisions and policies to tackle their biggest challenges, from congestion and pollution to public safety and staff shortages.

This data-driven approach is crucial to deliver results faster, demonstrate an evidence-based approach to residents, make the most effective use of funds, and track progress.

In 2021, The Monitor Institute by Deloitte and What Works Cities surveyed 44 cities about their use of data. They reported outcomes including improved emergency response times (60 percent) increased neighborhood safety (49 percent), and reduced waste and emissions, or improved air or water quality (37 percent).

Four in five reported using data to deliver city services more efficiently, effectively and/or equitably and a similar amount said they use data to make better budget decisions. Three in five use data to repurpose dollars or defund ineffective programs and half to award city contracts or shift procurement dollars.

Many cities are also beginning to use or preparing to deploy artificial intelligence (AI) to improve insights and efficiencies further.

There are still challenges to becoming data-driven, though. These include skills shortages, a fragmented approach across departments, budget limitations, and more.

A step-by-step approach can offer cities a manageable and scalable way forward.

A place to start

Streetlights are an increasingly popular platform to facilitate this: their ubiquity and built-in power and the latest advances in technology mean cities can move quickly and overcome traditional deployment hurdles.

"Cities are examining the role data and AI play in building a better city. Sometimes the plans become too big and complicated to implement due to issues like access to power. We see benefits in building on existing assets like the streetlight where our technology resides and obtains its power," said Greg Steininger, a product and smart city specialist at technology company Ubicquia.

"Adding intelligence to existing streetlights opens many opportunities for cities that are willing to work across departments to maximize budgets."

A foundation of intelligent streetlighting saves energy, costs and resources, while providing a platform for data-driven city-wide benefits. Deploying sensors and cameras for traffic management, public safety and more via existing infrastructure also makes sense from an aesthetic standpoint as cities strive to ensure public spaces don't become cluttered.

According to technology intelligence firm ABI Research,

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Greg Steininger
Ubicquia

global investments in multifunctional smart streetlights or 'smart poles' and 'smart corridor' road technologies will grow from US$10.8 billion in 2022 to more than US$132 billion in 2030. More than 10.8 million smart poles are expected to have been installed by 2030.

"They represent a cost-efficient, scalable and modular framework for deploying the whole spectrum of smart urban infrastructure," the analyst firm said.

Streetlights as a backbone

A growing number of examples show how cities are using streetlights as a platform for wider innovation, starting with their most pressing needs.

Smart asset management

Many cities begin their smart lighting journey with LED conversions to save energy and costs. It makes sense to add intelligent controls at the same time since combined, these typically result in a 60 to 80 percent reduction in total energy usage compared to high pressure sodium lights, along with a corresponding reduction in carbon emissions. This translates to cost savings too, when public lighting can account for up to 40 percent of a municipality's electricity bill.

"Adding intelligence to existing streetlights opens many opportunities for cities that are willing to work across departments to maximize budgets."

Greg Steininger, Ubicquia

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Smart nodes bring additional benefits, including the opportunity for dimming and scheduling, instant alerts of streetlight failures and predictive maintenance. With proactive prompts and cloud visualization, staff no longer need to carry out routine inspections, and complaints about light outages from the public can be much reduced.

Good maintenance is also critical for residents' quality of life, as public lighting plays an important role in making pedestrians feel safer and in deterring crime and improving road safety.

Ultimately, real-time and historical data from smart lighting nodes can help cities be more efficient.

Abir Fakhreddine, Senior Product Manager at Ubicquia, explained: "This data can cut back on maintenance and truck rolls because you're able to identify and predict outages, you're able to identify day burns and inefficient lighting fixtures, and by doing so you can be more strategic with your truck rolls, which saves you about $200 an hour."

She added: "Cities can save on maintenance costs using data that's reported by the nodes. Being able to observe the health of your luminaires, fixtures and transformers also really helps in reducing energy consumption."

One smart streetlight, many uses

Streetlights can support:

- Smart asset management for on-time and predictive maintenance
- Public Wi-Fi deployments
- Video with AI analytics for public safety and traffic management
- Air quality and noise sensors
- And more

San Jose sees the benefits of smart lighting

The City of San Jose, CA owns and operates around 500 buildings and facilities, covering roughly 8.5 million square feet.

"We were looking for a way to engage with some of the emerging technologies to manage and control our lights and to try features that help to defer or reduce some of our maintenance costs," said John Wildemuth, Electrical Senior in the Facilities Management Division of San Jose's Department of Public Works.

Following a Request for Proposals (RFP), San Jose is in the process of deploying around 10,000 smart nodes from Ubicquia on its exterior light fixtures at venues such as fire stations, libraries and community centers. The city is realizing benefits already.

"We've seen work orders for lights out significantly reduced," said Wildemuth. "We used to rely on city staff and citizens to turn in work orders for lights that were not working. Now, we get immediate notifications, and we can respond in days versus weeks or months."

The system also sends an alert if the power is cut, which is helping the city tackle the ongoing challenge of copper wire theft. In addition, predictive analytics help staff to get ahead of fixture failures.

"We are reducing the amount of truck rolls and maintenance costs. When a maintenance person is required, they can go out with the parts they need and avoid multiple truck rolls," said Wildemuth.

Further, with the smart nodes in place, the city no longer has to send staff out to manually adjust the lights for daylight saving time because they are automatically updated.

Another benefit is that the project has created an opportunity to better catalog lighting assets.

For many cities, documentation on lighting assets is very out of date, yet they receive regular requests from leaders and council members to provide the latest information and statistics.

John Wildemuth
City of San Jose

Wildemuth explained: "When we deploy a node, we catalog everything: the type of pole, the fixture, etc. and we try to be as detailed as we can so that down the road when we get any questions, we can just query it in the database. That is really a gamechanger for municipalities."

With the underlying infrastructure in place, further experimentation is possible.

"We wanted a future-looking product," said Wildemuth. "And we were looking for something that rolled everything up into one platform."

The city now has the capability to deploy AI cameras for anonymized people-counting or air quality sensors all on the same infrastructure platform.

People-counting is being piloted at two community centers and a handful of air quality sensors are being trialed at city-owned buildings.

The city is also considering bike and pedestrian-counting applications in parks and trails.

Wildemuth said: "One of the things I like about this emerging technology is that we don't always know what we're going to use it for in the future. Use cases continue to pop up through creative thinking and partnering with other departments."

Safer cities

Public safety is a major priority for US cities at the moment as many saw a rise in violent crime and property crime in the wake of the pandemic. As they strive to ensure safety and reassure residents, municipalities are also grappling with policing shortages and a struggle to attract and retain officers.

Many are using technology such as cameras, license plate recognition systems and sensors to drive efficiencies.

As well as providing on-demand video evidence of crime, the latest cameras with AI analytics can help officials get ahead of public safety issues. Police can gain better awareness of a situation before they attend a crime scene and systems can be configured to detect unusual activity. This can help to deter crime in parks after dark, for instance, as well as enhancing protection in schools and secluded areas like parking lots.

"Smart streetlights have significant public safety benefits."

Presentation from San Diego Police Department.

Public safety 'force multiplier' in San Diego

San Diego Police Department is proposing to install cameras and automatic license plate readers on an initial 500 smart streetlights.

Captain Jeffrey Jordon told local media recently that the plan comes as the department faces low staffing levels and struggles to fill vacancies.

"We look at technology as one way of being a force multiplier. We can't be everywhere at once," he said.

San Diego's program has faced some challenges, with 3,200 smart streetlights deactivated in September 2020 until rules were agreed governing their use. With a new surveillance technology ordinance and privacy advisory board in place, the police department is engaging with the public on the proposal to use the system strategically to detect, deter and prosecute crime.

In a presentation, the police department said: "Smart streetlights have significant public safety benefits."

Between August 2018 and September 2020, evidence from smart streetlights was used in the investigation of over 400 crimes, including homicides, fatal collisions, and serious assaults. The police say this helped increase conviction rates, reduce investigation costs, and cut gun violence.

The department is also looking to automatic license plate recognition technology to provide "objective, real-time and investigative leads." It expects such a system to increase clearance rates and act as a deterrent.

A growing trend is also the establishment of real-time crime centers, where law enforcement agencies bring together tools such as networked cameras, body-worn cameras, automated license plate readers, gunshot detection, and data analytics. The hubs are staffed 24/7 by officers and analysts to advance "intelligence-led" policing strategies, including getting ahead of problems, spotting trends, and responding faster.

Cities with real-time crime centers include Cleveland, New Orleans, Detroit, and Sacramento.

"The key is being able to move quickly. We can roll out to an intersection and put up a couple of UbiHubs and a camera system within hours."

Ron Ivie, President, Telcon Services, LLC

Ontario's real-time crime center

Ontario in California is upgrading its streetlighting infrastructure as part of a five-year program to close the digital divide, including rolling out wireless services along the existing and planned fiber optic system.

The city recently deployed 12,500 Ubicquia UbiCells for smart lighting analytics and energy savings. Upgrading some of these to the new UbiHub product from Ubicquia will enable the city to offer low-cost Wi-Fi as a service as well as deploying cameras for public safety.

"We plan to leverage the UbiHub features by using the integrated and an external camera in our real-time crime center platform," said Ron Ivie, President, Telcon Services, LLC, a connectivity systems integrator that is working with the city.

New pan-tilt-zoom (PTZ) cameras will be added in strategic areas to complement the city's existing network. They will also provide pedestrian and car counting to support planning decisions on issues like congestion and road safety.

"The goal is to be able to be more proactive," said Ivie. "Rather than putting a camera up on every intersection, we're taking a strategic approach, combining video analytics, license plate readers and other technologies into the UbiHub interface so that we minimize the aesthetic footprint and have the backhaul."

"But the key is being able to move quickly," Ivie added. "We can roll out to an intersection and put up a couple of UbiHubs and a camera system within hours, where traditional systems take much longer, especially if fiber isn't available."

Ontario is also setting up an oversight committee and policy on how the data is gathered, stored and managed. Officials are collaborating with other cities and pulling together best practices.

"Public safety is not just the video," said Ivie. "17,000 lights were upgraded to LED. We're getting more visible light at night, reducing dark areas and we're making sure that lights are repaired quicker. The lighting itself is also a benefit."

Road safety: Informed investments

According to The National Highway Traffic Safety Administration, an estimated 31,785 people died in traffic crashes in the US in the first nine months of 2022. This is only a slight decrease on the previous year and while fatalities overall declined, deaths among cyclists and pedestrians continued to rise.

Many communities are making Vision Zero pledges to eliminate traffic deaths and severe injuries. This requires making evidence-based interventions that deliver results.

Technology such as sensors, cameras and AI analytics can play an important role. These systems can be configured to automatically count and classify vehicles, bikes and pedestrians to inform road usage decisions and highlight high-traffic areas. In addition, cities can monitor road conditions, lane usage, traffic patterns and flow, to guide actions.

They can also receive alerts on issues such as wrong-way driving, near-misses and other anomalies in order to address any immediate danger and act on the insights, such as by adjusting a bike lane, turning lane or traffic signal.

"It allows them to take those analytics and create useful information around it," said Steininger. "We're seeing a lot more cities take a data-driven approach to Vision Zero."

Data-driven decisions

As part of its goal of eliminating traffic deaths by 2040, the City of Albuquerque has committed to using data "to make decisions, prioritize funding, and evaluate traffic safety projects to ensure that Vision Zero initiatives are equitable and transparent". This includes using crash data, demographic data, traffic counts, pedestrian and bicyclist counts, and speed data, input from road users, and land use data.

As part of a broader smart city transformation, the City of West Hollywood in California is piloting the use of its streetlight luminaires as hubs for smart city sensors and services.

The smart nodes from Ubicquia have sensors configured to count vehicular and pedestrian traffic, detect noise levels, monitor parking demand and measure environmental quality.

"We have deployed the UbiHub on streetlights in West Hollywood to benefit from the smart city traffic and curb management capabilities the platform provides," said Jackie Rocco, Deputy City Manager for West Hollywood. "Intelligent data on traffic, bicycle, and pedestrian management supports public safety measures and our future planning development needs for our residents and visitors."

Succeeding with smart streetlight upgrades

Smart streetlight upgrades bring a wide range of benefits to cities and offer a platform for wider, data-driven innovation. They are also complex projects that touch many departments. Pioneering examples highlight best practices for success.

As well as offering better aesthetics and reduced visual clutter, an integrated approach makes better sense financially because the major cost of the unit and installation is only incurred once. Cities can tackle multiple use cases with one deployment and one management system.

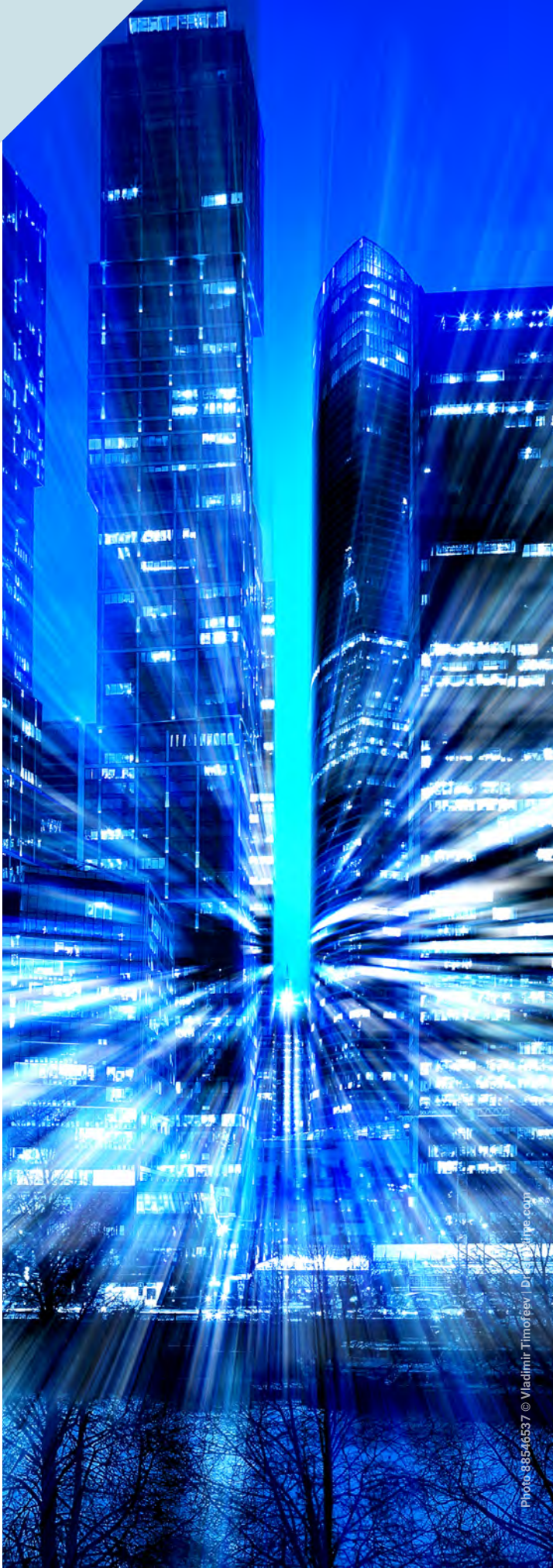
According to Northeast Group, integrated solutions can halve the total costs compared to a piecemeal approach to smart city sensor deployments.

"It's really about the power of the portfolio," said Steininger.

This requires collaboration across departments, which is a growing trend in leading cities.

In Ontario, CA, for instance, a broadband division was formed for the management of external infrastructure such as fiber, towers and streetlights.

Steininger cites examples such as the City of Dallas which created an integrated group with representation from across the city, including



traffic, public works, city management, the Chief Information Officer, and legal to bring together plans such as lighting controls, Wi-Fi enablement to address the digital divide, traffic monitoring capabilities and air quality management.

"They were able to map those initiatives and use cases to specific technologies and then access and see all the analytics around those devices in a user-friendly, visual format which was very powerful for them."

A collaborative approach also helps cities maximize funding across multiple budgets – particularly in light of the significant federal funding that is available through programs such as the American Rescue Plan Act (ARPA), the Infrastructure, Investment and Jobs Act (IIJA), and the Inflation Reduction Act (IRA), as well as other grants in areas such as public safety.

The $1.2 trillion IIJA includes $550 billion in new spending for roads and bridges, climate resilience and environment, broadband, road safety, and more. Cities can use this as a starting point for investment in a multifunctional platform such as smart streetlights.

"Cities are getting very creative on how they're going after some of these infrastructure funds and that's enabling them to do pieces of this and create synergies," said Steininger.

Bob Bennett
Chair of the Cities Today Institute

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Governance policies around use, privacy and transparency are also important to build public trust. Cities such as Oakland, San Diego and Portland have created examples that other cities can follow.

According to Bob Bennett, Chair of the Cities Today Institute, a peer-to-peer events and research network for city leaders: "Streetlights are a highly adaptive tool that cities can afford right now. The transition to LED lighting and the ability to create a future-proofed infrastructure using what they already have in place makes sense for a lot of communities."

About Ubicquia

Ubicquia offers municipalities, utilities, and communication service providers cost-effective and scalable platforms for deploying smart city, connectivity, and smart grid solutions.

The Ubicquia® suite of streetlight-mounted smart city and connectivity platforms include UbiCell®, which enables smart streetlight control; UbiMetroTM, a streetlight small cell that accelerates 4G and 5G network deployments; and UbiHub®, which delivers high speed wireless internet access and street level video and audio intelligence.

Ubicquia's smart grid platforms include UbiGridTM DTM+, a platform to monitor a utility's distribution transformers and network in real-time; and UbiSmartT AQM+, a sensor that monitors a city's air quality index, noise levels and environmental data.

Ubicquia's solutions install in minutes to help communities become smarter, safer, and more connected.

To learn more visit www.ubicquia.com