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Bright Lights, Smart City

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Connecting people, places and things, smart city infrastructure and the IoT to secure an inclusive, sustainable and resilient future

Frost & Sullivan predicts that in two years smart cities will become a $1.5 trillion global market. The business consulting and market research firm identifies eight key factors that characterize smart cities, including smart governance, smart energy, smart building, smart mobility, smart infrastructure, smart technology, smart healthcare and smart citizen.

According to the National League of Cities, 66 percent of U.S. cities surveyed report that they are investing in smart city technology, and 25 percent of those without any smart city systems are exploring future implementations.

Of those cities that have invested in smart city technology, the top applications include:

- Smart meters for utilities
- Intelligent traffic signals
- e-Governance applications
- Wi-Fi kiosks
- Radio Frequency Identification (RFID) sensors in pavement for monitoring road damage and traffic flow

And the core rationale for smart city development? Major cities around the world are experiencing a massive increase in new inhabitants each year. According to a report by the International Organization for Migration, every week, three million more people move to metropolitan areas. The United Nations predicts that by 2050, the world's urban population is likely to double and reach 68 percent, up from its present day composition of 55 percent, and adding another 2.5 billion people to its present day level of 4.2 billion.

Today, the most urbanized regions on the planet include North America, with 82 percent of its population living in metro areas in 2018. As the world continues to urbanize, sustainable development depends increasingly on meeting the needs of growing urban populations, including housing, transportation, energy systems and other infrastructure, as well as basic services like education and healthcare.

Enter the smart city

The Eden Strategy Institute, a Singapore-based sustainability consulting firm, recently unveiled its rankings of the Top 50 Smart Cities globally, of which 12 were based in the U.S. Not surprisingly, large metropolises were on the list, including Chicago, Los Angeles, New York City, and San Francisco. But so were Kansas City, Missouri, Columbus, Ohio, and LaGrange, Georgia, with a population of approximately 30,000 people.

But what is it that makes a smart city "smart," and what infrastructure is needed to make these cities a reality? Let's explore.

What is a Smart City, Anyway?

Not surprisingly, the definition of a smart city depends on whom one asks. There are relatively broad but engineering-based definitions, such as that of the British Standards Institute (BSI), which defines a smart city as, "The effective integration of physical, digital and human systems in the built environment to deliver sustainable, prosperous and inclusive future for its citizens."

There are data-driven definitions from the likes of IBM, which defines a smart city as, "One that makes optimal use of all the interconnected information available today to better understand and control its operations and optimize the use of limited resources."

There are more technical but somewhat circular definitions, such as that from Technopedia: "A smart city is a designation given to a city that incorporates Information and Communication Technologies (ICT) to enhance the quality and performance of urban services such as energy, transportation and utilities in order to reduce resource consumption, wastage and overall costs. The overarching aim of a smart city is to enhance the quality of living for its citizens through smart technology."

And then there is this, courtesy of the Smart Cities Mission, an initiative of the Ministry of Housing and Urban Affairs of the Government of India:

"In the imagination of any city dweller in India, the picture of a smart city contains a wish list of infrastructure and services that describes his or her level of aspiration. To provide for the aspirations and needs of the citizens, urban planners ideally aim at developing the entire urban ecosystem, which is represented by the four pillars of comprehensive development: institutional, physical, social and economic infrastructure. This can be a long-term goal and cities can work towards developing such comprehensive infrastructure incrementally, adding on layers of smartness."

This last definition, while relatively soft, hits upon several notable themes and attributes of smart city infrastructure. **To wit: imagination, aspiration, ecosystem, incremental and layers.**

There's no doubt that smart cities *will* defy our imaginations, and they are certainly aspirational in the best sense of the word. But they will also require an ecosystem that will develop in increments and rely upon layers of technology, some existing and some emerging, to fully become the transformational habitats for our growing urban populations.

Understanding the Layered Ecosystem of Smart City Development

The key technology underlying all smart city initiatives is the Internet of Things (IoT). The IoT is a network of physical, connected devices that enable these 'things' to connect and exchange data. This connectivity, in turn, creates opportunities to converge the physical and the digital realms via data analytics to improve efficiency, drive economic benefits and improve the quality of life of urban dwellers.

Smart cities, by their very nature, generate enormous amounts of data, some of it static, but much of it high velocity, high volume and extremely heterogeneous in its sources. In other words, Big Data. The real-time data gathered in smart cities derives in large quantity from connected devices and sensors, in addition to streaming video and audio, log files, networks, web, transactional applications and social media.

Turning this continuous flow of data into actionable information will require both existing and next-generation technologies. Cloud computing provides a strong enabling platform for smart cities because it provides the necessary scale, storage and processing power, as well as the ability to integrate all the disparate data sources in order to effectively manage this information.

Edge Computing

While cloud computing is already an established part of smart city solutions, an emerging trend is the augmentation of cloud computing with edge computing. Edge computing is a distributed, open IT architecture that features decentralized processing power, enabling mobile computing and IoT technologies. In edge computing, data is processed by the device itself or by a local computer or server located in an edge data center or colocation facility.

Driven by a need to overcome cloud overhead in latency and bandwidth, and the demand for more local processing, edge computing is poised to enable billions of new IoT end-points, and real-time, localized Artificial Intelligence (AI) and Machine Learning (ML) applications for autonomous systems. Edge computing allows smart applications and devices to respond to data almost instantaneously—as it's being created and eliminating lag time—which is critical for technologies such as self-driving cars.

Next-Generation Wireless

Along with edge computing and small cell technology, the advent of next-generation 5G wireless networking will be integral to meeting the needs of smart cities, which

require gigabit-per-second throughputs to relay massive amounts of data among connected devices and systems in near-real time. Compared to current 4G LTE networks, 5G provides very high data rates, extremely low latency, an increase in base station capacity and significant improvement in quality of service (QoS).

In the U.S., one global networking provider has just launched 5G initiatives in support of smart city developments in Houston, Indianapolis, Los Angeles, and Sacramento. Given their ability to provide enhanced connectivity and their experience managing complex networks while mitigating cybersecurity threats, network operators and telecom providers are uniquely positioned to serve the technological requirements of smart cities. Telcos, in turn, must colocate network infrastructure in highly connected data centers located within the city limits to ensure fast, secure and resilient connectivity at all times.

Colocation at the Edge

As smart cities grow in number and complexity, placing increasingly high demands on centralized cloud data centers, many industry experts believe that colocation facilities, especially those located in or within close proximity to major metro areas, will become their foundation. In seeking colocation, smart city architects and service providers will need to prioritize scalable storage for the exponential increase in data and the computing power needed for advanced analytics. Many edge devices and smart systems lack adequate computing power to accomplish this on their own. And moving data back and forth to the cloud presents challenges of latency, bandwidth and security that are a non-starter for self-driving cars and robotics, applications in which decisions have to be made with lightning speed.

Hence, as smart city planners future-proof for tomorrow's requirements, it's essential that data

centers are located as close as possible to the edge of the network to ensure low latency so that smart systems and applications can function optimally. But beyond storage, compute and connectivity, colocating at the edge in Tier III facilities will also provide technical infrastructure with the necessary flexibility and security as well as an abundant, reliable power supply and cooling resources. Smart cities, the embodiment of the Internet of Everything (IoE), which Cisco defines “the intelligent connection of people, process, data and things,” require a high-availability, reliable and sustainable data center that can deliver continuous uptime.

The Tier III Data Center Solution Supporting the Smart City of Los Angeles

The City of Los Angeles in the process of teaming up with several major carriers to help realize the ambition of making LA one of the smartest cities in America through improvements in traffic control, public safety, air quality and digital infrastructure. To achieve this, the city is exploring public-private partnerships for the deployment of a variety of smart cities solutions ranging from digital kiosks and smart streetlights to structural monitoring. In addition, multiple enterprises are working on a host of IoT applications, including autonomous vehicles.

As the second-largest city in the United States with a population of more than four million people, the need for ample colocation space has never been more of a priority as Los Angeles strives to become a leader in smart city development. While the city has approximately 2.6 million square feet of custom-built data center space, much, but not all of it, is already at capacity.

Colocation data centers located in the heart of LA are needed to provide:

- Scalable capacity for future growth
- Resilient infrastructure to securely house critical data
- Low latency interconnectivity at the edge of the network

West 7 Center can serve the requirements of smart city IoT network and application environments, as well as their end users. The 348,000 square foot facility is the ideal place to house mission-critical equipment, establish vital cross-connects and ensure data analysis occurs close to an end-user population and edge devices, helping make Los Angeles’ dream of being a smart city a reality.