

5G and Smart Cities

Unlocking Tomorrow's
Potential



Introduction

Smart cities use technology to gather and analyze data from many sources to improve all aspects of city life. Data collection and transmission are foundational for smart city projects, and 5G's speed and capacity enable smart-city advancements at a remarkable pace.

This is because 5G's capabilities leap over 4G. Using 5G in smart cities enables the prolific use of sensors—on streetlights, inside pipes, buses, trains, etc.—to transmit and capture vast volumes of data. All these connected devices can collect and transmit data to the cloud (or to one another) simultaneously, which requires high speed and low latency.

Faster transmission speeds also enable use cases that were previously impossible outside a controlled setting like a factory floor.

With 5G, multiple technologies like cloud computing, edge computing, AI, big data analytics and IoT devices can finally transform smart cities from innovative ideas to remarkable reality.



Harnessing the Power of 5G in Smart Cities

The potential of 5G in urban areas is immense. It can completely transform cities and the experience of city living for residents. 5G in smart cities can revolutionize many aspects of daily life by helping city managers make more insightful decisions and streamline aspects ranging from public transportation to communication.

The sheer volume of data that 5G can handle makes many data-intensive use cases attainable. These include applications requiring unstructured data like video images for analysis and any function requiring massive data transmission from millions of IoT devices all over the city.

Unstructured data is different from data that fits neatly into a spreadsheet. It includes videos, sound, images, sensor data and more. This data requires a high level of processing, like AI and ML,

to derive insights and teams can only collect it with the robust communication pipeline that 5G provides. This capability was not possible before 5G.

Access to all this data does not mean it's easy to manage. According to IDC, unstructured data accounts for 90% of all enterprise data and grows three times faster than structured data.

The situation is just as bad in cities, where departments and bureaus often use disparate systems, and some information has yet to be digitized. Yet the ability to collect and mine this data for insights is necessary for a city to evolve.

Fortunately, 5G delivers the bandwidth to transmit these more extensive data sets, and AI and ML have the horsepower to analyze them. This unstructured data holds the secret to making cities smart.





The Importance of 5G

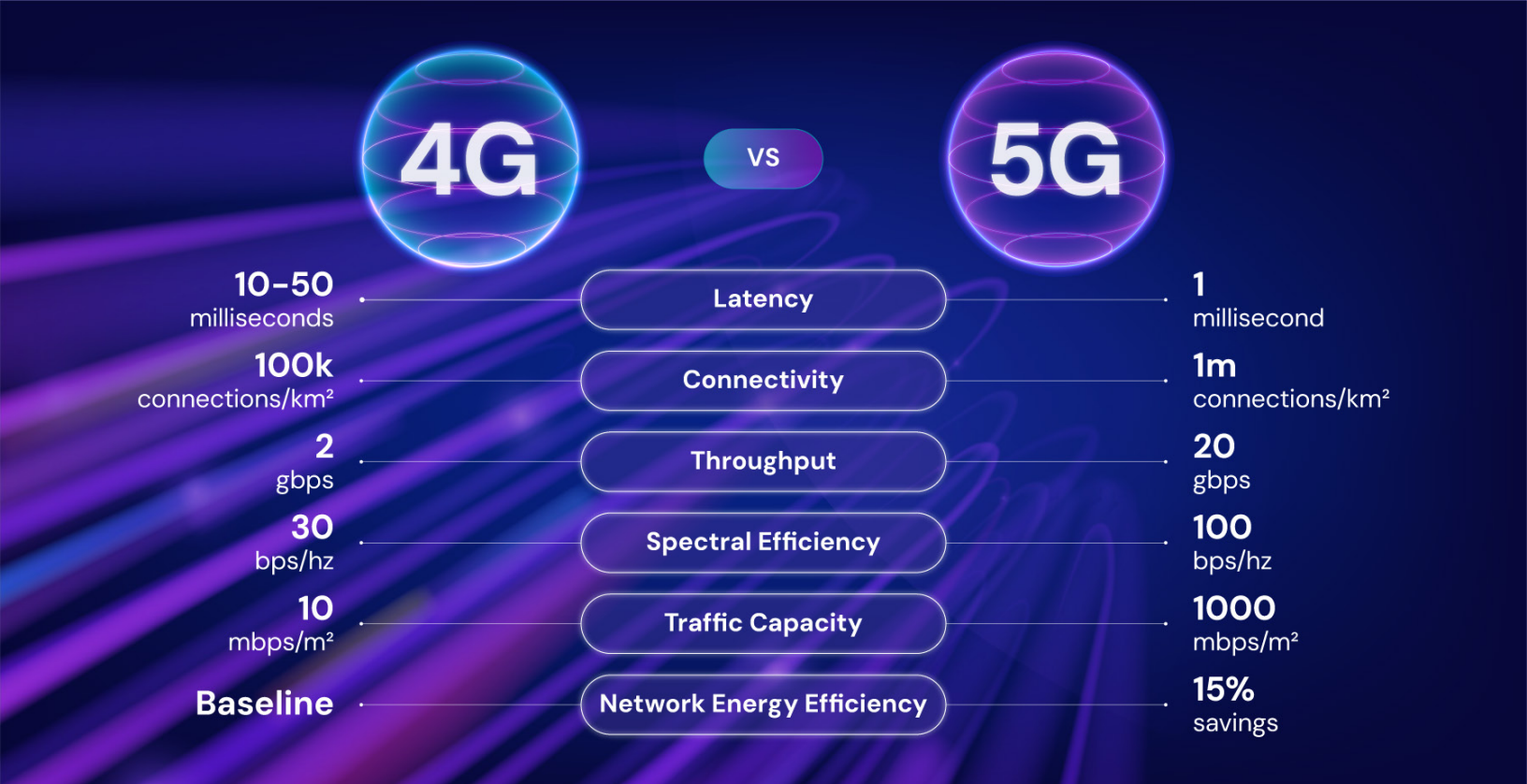
For years, low latency has impeded “smart everything.” 5G removes this barrier with 10–20 times faster speeds than previous wireless tech. And the vast number of connected devices makes building thousands of IoT-supported applications possible.

IoT use in smart cities is growing rapidly, making 5G even more critical. The global IoT market value was \$293.2 billion in 2023 and will likely be worth \$621.6 billion by 2030.

5G unleashed a wave of advanced capabilities that will transform everything from communications and transportation to healthcare and education. It has also impacted many aspects of our personal lives. The reason: 5G provides stable and reliable connectivity.

The extended capacity will transform communications, allow people to work from anywhere worldwide, improve productivity and enable data-driven insights for better decision-making.

5G has removed many obstacles to smart city capabilities. To illustrate its transformative power, the potential financial benefits could add \$12.3 trillion to the global GDP and 22 million jobs by 2030.



Key Benefits of 5G for Smart Cities

As referenced above, 5G is one of the main reasons for the explosive growth of IoT use in smart cities. IoT devices and connectivity are not new. What changed with 5G is the sheer power it brings to the table. For example, 4G supports approximately 2000 devices in a .38-mile area, while 5G can support up to one million in the same geographic space.

The increased connectivity allows the use of millions of devices in previously unimaginable locations, such as sewer pipes, streetlights and vehicles.

Another 5G improvement over 4G is reduced latency. 4G offered speeds from 60 - 98 milliseconds (ms). 5G offers speeds of less than 5 ms. The difference is extraordinary. The reduced latency means data can be collected in real-time, making a

host of time-sensitive applications now possible for smart cities – including vehicle-to-infrastructure for smart mobility solutions.

In addition, it allows network slicing with added data security for a more connected world. Network slicing permits multiple applications on the same network, even with different security requirements. This feature allows public and private applications to run on the same municipal network but on other “slices,” making these networks the most cost-effective.

For example, a professional stadium can leverage 5G and network slicing to handle ticketing and merchandise sales on a private slice and in-stadium pedestrian navigation on a public slice, all part of the same network.

Case Studies and Best Practices for 5G-Enabled Smart Cities



5G is opening a world of possibilities for smart city innovation. Below are three examples of 5G-enabled smart city programs. While there's a whole list of smart cities, and many initiatives are underway globally, these examples highlight two important things. First, each team used 5G to overcome a derivative obstacle instead of returning to older solutions. Second, smart city teams are embracing more unstructured data for better insights. The second point is important because unstructured data is now the fastest-growing type.

5G Smart City Cases

SAN DIEGO, CALIFORNIA, converted traditional street lights to LED to save emissions and money. However, they learned that LED bulbs degrade gradually over time, similar to the life of batteries in computers and cell phones. San Diego set up a wireless network (supported by 5G) to collect information from each street light. Now, they can monitor bulb strength and know when maintenance is needed, and the connected system allows the city to control the streetlights remotely. Changing to LEDs saves the city \$2.2 million a year, but the practical implications of managing those LED bulbs wouldn't be possible without 5G networks are saving time and money now and will continue to do so in the future.



The **GREATER MANCHESTER, ENGLAND**, area aims to achieve intelligent transportation. The team installed 5G smart junctions that use 5G communications and AI to optimize traffic signals by collecting video images. The images feed into an AI model to detect speed, path, travel time, number of vehicles at lights, and transport information on bikes and pedestrians. This information is helping the city plan more efficient transport in and around the city. The team learned that using 5G networks future-proofed the system because there was no need to continue running cables. 5G-enabled WiFi networks are saving time and money now and will continue to do so in the future.



CHINA MOBILE added communication infrastructure to extend coverage to more citizens. However, they quickly learned that tower inspection and maintenance would be risky and costly. The tall communication towers make inspections time-consuming and dangerous. Using the same connectivity for the infrastructure equipment, China Mobile deployed a drone system to examine the communication towers using a 5G network to transmit the data for review and analysis. Now, drones can inspect a tower in 15 minutes compared to two hours.



Best Practices for 5G Infrastructure for Smart Cities

Before cities embark on 5G smart city innovation, a 5G infrastructure must be in place. As with any technology project, success requires following best practices. In the case of 5G and associated technologies, the two biggest challenges will be securing the skills needed and staying agile, as the technology landscape is changing rapidly.

Start with these best practices:

- ① Identify the business case or areas to improve, like transportation, energy efficiency and public safety.
- ② Determine technology and data requirements for each business case and plan to remove data silos.
- ③ Design an infrastructure plan to support the use cases and ensure it is scalable for future uses.
- ④ Identify the required skills and the existing skills gap and plan how to acquire the new skills needed.
- ⑤ Plan for data privacy throughout the collection, transmission and analysis stages, and include a monitoring program for ongoing governance.
- ⑥ Build out 5G capability, install IoT devices and sensors, and begin collecting data.
- ⑦ Involve citizens in getting buy-in for data collection and project ideas that may not occur to city management.
- ⑧ Work with experienced systems integrators and build technology partnerships.

Choosing the Right Partner for Smart City Transformation

When embarking on a smart city endeavor, it is essential to have an experienced 5G and AI solution provider who can help with design and rollout.

5G in smart cities improves city life using connected IoT devices, data storage, cloud access, edge computing, AI and ML, and smart automation. In other words, smart cities require many different technologies, the experience to connect them and the knowledge to leverage the data. These abilities require a partner with demonstrated experience in various data integrations and analytics, including telecom AI solutions, and the vision to manifest what was previously impossible.

A partner's utility comes from value-added services and support during deployment that ensure smooth operations.

The right partner knows how to use AI for real impact and help maximize ROI in 5G and smart city investments.



Smart Cities and the Future of Digital Transformation

Until the rollout of 5G, smart cities were a heavy lift. 5G changes the dynamics of city management. Instead of the existing pattern of reacting, the prolific connectivity, data and analytics will allow governments to be proactive and make value-added decisions based on real-time data.

Additionally, many cities have aging systems and infrastructure. 5G can

rejuvenate city services by replacing their systems with 5G-enabled WiFi networks and the cloud, which is less expensive and more efficient.

Emerging trends in smart cities will undoubtedly require 5G connectivity and support for IoT. The increased speed and capacity of 5G will make even the most ambitious smart city projects possible.

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