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According to the International Telecommunication Union, a smart city is an innovative city that uses information and communication technology (ICT) and other means to improve the quality of life and efficiency of urban operation and services while meeting the economic, social and environmental needs of the present and future generations. The definition outlines that highly advanced ICT infrastructure, which comprises devices connected through telecom networks, forms the foundation of a typical smart city. This is because these connected devices generate data, which is subsequently leveraged for decision-making and for creating services and applications. Further, ICT infrastructure plays a vital role in developing user-friendly programming platforms that are a prerequisite for automating smart cities and improving their serviceability.

Owing to these benefits, there is a surge in the adoption of ICT solutions in smart cities. Globally, a mix of communications and networking technologies including wired networks, wireless networks, satellite networks, transmission protocols, machine-to-machine (M2M) communication and internet of things (IoT) is being used to provide the requisite infrastructure for smart cities. In addition, these cities are deploying public Wi-Fi services, big data analytics, and cloud computing technologies, which are set to become the backbone of next-generation smart cities.

tele.net takes a look at the key drivers for ICT adoption in smart cities and the global adoption scenario...

ICT adoption scenario

The key driver for adopting ICT solutions in smart cities is the need to set up a seamless and interconnected ecosystem for users, devices and systems. ICT infrastructure comprising optical fibre cable (OFC), public Wi-Fi hotspots and kiosks, devices and chipsets, data centres and central command centres, and internet protocol (IP)-based surveillance systems play an important role in the setting up of this ecosystem.

Within a smart city, OFC forms the backbone for ensuring high speed internet access and facilitates the installation of sensors, which are essential for the development of intelligent solutions. In addition to wired broadband networks, public Wi-Fi solutions also play a vital role in smart city implementation. According to industry experts, public Wi-Fi is the most widely deployed use case of ICT in smart cities. This is because a single Wi-Fi network becomes a viable option for supporting multiple applications like IP videos as well as private and secure networks of municipalities. Further, Wi-Fi access points help in providing low-cost and secure connectivity for IoT applications such as weather and noise sensors, smart buildings, and water and waste management.

Moreover, embedded systems and a host of devices such as smartphones, sensors, radio frequency identification tags, chipsets and actuators are being installed along with the physical infrastructure set-up to ensure real-time data management, alerts and information processing for city administration. Collectively, these devices help in managing city transportation systems, predict the arrival of trains and buses, manage parking space availability, identify areas where waste disposal pickups are needed, and measure energy consumption and emissions. This collective embedded intelligence keeps city planners abreast with the key developments by enabling new ways of city transport management, traffic control and environmental pollution monitoring. Further, data centres help store data on the cloud, while central command centres help in monitoring all applications and integrating them. This ensures that a single interface is used to access the entire city-level information. Meanwhile, big data analytics and IP-based surveillance systems are also playing a crucial role in smart cities. Analytics is being used extensively on the data gathered through various smart applications to gain insights and help in taking smart decisions for the betterment of the city and citizens. Besides, city surveillance systems are being used to leverage information from video surveillance cameras and combine it with social media and citizen reports, thereby enhancing safety.

Recognising these benefits, smart city planners across the world have been leveraging ICT to make their cities “smarter”. In New York, sensors are being used to boost public safety. Further, 10,000 old-fashioned payphones have been converted into structures providing gigabit internet access to residents and superfast Wi-Fi services to others. In Chicago, smart solutions are being used for controlling the rodent population by using predictive analytics to determine which trash dumpsters are most likely to be full and attract more rats. In San Francisco, an application allowing smartphone users to find available parking spots throughout the city is being used. In Barcelona, smart bus stops are connected to the city’s fibre network. They display real-time bus timetables, tourist information and digital advertising, offer USB sockets for charging mobile devices such as smartphones and tablets, and act as free Wi-Fi hotspots. This allows people to access the internet through their mobile devices while waiting for a bus. Meanwhile, Beijing has an urban and interurban traffic control system that comprises an enforcement system, and supervision and monitoring system for traffic flow detection. Further, the Tianjin smart city has a

geographic information system installed in its smart grid, while Guiyang's smart grid collects and analyses real-time operational data across a distribution network covering around 4 million people.

Global growth scenario

As key smart cities across the world are stepping up their investments in ICT, the global smart city market for ICT is expected to be valued at $774.8 billion by 2021. As per industry reports, the global smart city ICT infrastructure market is expected to grow at a compound annual growth rate (CAGR) of 17.7 per cent between 2017 and 2021. Amongst all regions in the world, North America is expected to dominate the market with regard to smart city technologies. Therefore, ICT investment in smart cities in North America is likely to increase from $118.5 billion in 2016 to $244.5 billion in 2021. These investments will be driven by technology ubiquity and advanced investments in cities such as New York, Los Angeles and Chicago in the US and Toronto, Vancouver and Calgary in Canada. Besides, the market in Latin America is also expected to witness strong growth.

Apart from the US, Europe and the Asia-Pacific (APAC) region are also expected to gain momentum as regional and local governments strive to increase ICT adoption in the smart cities in these regions. As per industry reports, the ICT market for smart cities in Europe is likely to grow at a CAGR of 24.3 per cent between 2017 and 2021, while the market in the APAC region is expected to grow at a CAGR of 14.7 per cent during the same period. This growth will be driven by the increasing number of smart city initiatives taken by emerging economies and aggressive investments in this space. Some of the countries that are likely to take smart city initiatives in the APAC region are China, India, Singapore, Australia and Taiwan.

Challenges and outlook

Although ICT is witnessing significant traction in the smart city space, there are certain challenges that hamper its smooth adoption. A major challenge is that legacy infrastructure such as electricity grids or transport systems tend to have a longer lifespan as compared to ICT systems and software applications. Cities are often locked into these legacy systems with well-established contractual, commercial and legal structures that deter innovation and adoption of new technologies. To this end, infrastructure networks need to be flexible to support changes both in peak demand and in the implementation of new systems.

Another challenge is that cities often lack a standard data collection, analysis and management framework from where data collated from multiple sources can be accessed. To this end, the implementation of a comprehensive data management framework, which can be monitored and governed by an appropriate body within the city's municipal organisation, would ensure cost savings in processing, storage and database management. Further, cities need to adopt operating systems that grant a certain degree of standardisation for data collection, storage, display and reporting across city systems.

These challenges notwithstanding, the adoption of ICT in smart cities is going to increase at an unprecedented rate in the future. This would open up a plethora of opportunities for ICT companies. However, unlocking the opportunities presented by the new smart city ecosystem would require the combined efforts of ICT companies, telecom operators, governments and businesses.

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