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# INTERNET OF THINGS: SMART CITIES

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**Abstract:** The Internet of Things (IoT) is the inter networking of physical devices, vehicles, buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data. The IoT allows objects to be sensed or controlled remotedly across existing network infrastructure, creating opportunities for more direct integration of physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit . IoT Technology can be found in many industries like Health Care, Energy and Transportation , Building management smart cities, smart energy, agriculture. It involved from the union of wireless technology ,the internet and micro electro mechanical systems. Smart cities is another powerful application of IoT generating curiosity among world's population. Smart surveillance, automated transportation, smarter energy management systems, water distribution, urban security and environmental monitoring all are examples internet of things applications for smart cities. IoT will solve major problems faced by the people living in cities like Pollution , Traffic Congestion and shortage of energy supplies etc. Products like cellular communication enabled Smart Belly trash will send alerts to municipal services when a bin needs to be emptied. By installing sensors and using web applications, citizens can find free available parking slots across the city. Also, the sensors can detect meter tampering issues, general malfunctions and any installation issues in the electricity system. In this paper, the focusing point will be the impact of smart cities on Internet of Things.

## INTRODUCTION:

Internet of Things (IoT) is a recent communication pattern that envisions a near future, in which the objects of everyday life will be equipped with microcontrollers, transceivers for digital communication, and suitable protocol stacks that will make them able to communicate with one another and with the users, becoming an integral part of the Internet . The IoT concept, hence, aims at making the Internet even more immersive and pervasive. By enabling easy access and interaction with a wide variety of devices such as, for instance, home appliances, surveillance cameras, monitoring sensors, actuators, displays, vehicles, and so on, the IoT will foster the development of a number of applications that make use of the potentially enormous amount and variety of data generated by such objects to provide new services to citizens, companies, and

public administrations.The Internet of Things is about installing sensors for everything, and connecting them to the internet through specific protocols for information exchange and communications, in order to achieve intelligent recognition, location, tracking, monitoring and management. Only then a Smart City can be formed by integrating all these intelligent features at its advanced stage of IOT development.

**SMART CITIES**

Smart cities are no longer the wave of the future. They are here now and growing quickly as the Internet of Things (IoT) expands and impacts municipal services around the globe.

While there are many definitions of a smart city, in general, a smart city utilizes IoT sensors, actuators and technology to connect components across the city, and it impacts every layer of a city, from underneath the streets, to the air that citizens are breathing. Data from all segments is analyzed, and patterns are derived from the collected data .A City will embrace new technologies, focussing on smart- enablement, resilience and collaborative innovation, to create a city that is competitive, open, interconnected and intelligent.

SCOPE:

In order to achieve these goals, Smart Cities rely on state-of-the-art information technology like fiber optic networks, sensors and connected devices, open data analytics, internet of things etc. Smart city's strategies are smart buildings, smart energy grids, smart water management, smart mobility smart traffic management. It is widely assumed that the digital infrastructure of modern cities offers a unique opportunity to facilitate entrepreneurship, creativity and innovation. Smart City's initiative mainly depends on four dimensions a) technology innovation; b) open data and transparency; c) collaboration and engagement; d) efficiency and resource management.

Smart City is the product of accelerated development of the new generation information technology and knowledge-based economy, based on the network combination of the Internet, telecommunications network, broadcast network, wireless broadband network and other sensors networks where Internet of Things technology (IoT) as its core. The main features of a smart city include a high degree of information technology integration and a comprehensive application of information resources. The essential components of urban development for a smart city should include smart technology, smart industry, smart services, smart management and smart life.

**SMART CITIES INVOLVES**

- Natural resources / energy (smart grids, public lighting, renewable energies, waste management, food and agriculture)
- Transport and mobility (city logistics, people mobility)
- Smart buildings (facility management, services, housing quality)
- Smart living (entertainment, hospitality, pollution control, public safety, healthcare, welfare and social innovation, culture, public spaces)
- Smart working in the smart city
- Sustainable Districts
- Business-led Urban Development
- Developing social and relational capital in Smart Cities
- The socio-technical challenges of the Smart City

- Attracting and developing high-tech and creative industries.

## Features of smart cities:

- Smart Parking
- Structural health
- Smartphone Detection
- Traffic management
- Smart Lighting
- Waste Management
- Smart Roads
- Smart City architecture and infrastructure
- Smart City technology
- Smart home
- Networks and communications

**TRAFFIC MANAGEMENT**

**CITY SECURITY ISSUES**

The modern, expanding cities of the world face many challenges. The increased population among other issues leads to a more stressed traffic and less secure public spaces. Cities that think of their present and future and seek to solve their security challenges can call themselves smart cities

**CITY SURVEILLANCE**

Another important pillar of the solution is city surveillance. As the high-resolution cameras can provide quality images of all public spaces in a city, operators can prevent criminal or suspicious activity so people can live in more safe environments.

**TRAFFIC VIOLATION MANAGEMENT**

The Safe and Smart City solution is able to maintain security in everyday traffic by precisely detecting and recording traffic violations. The effectively captured violation footage and additional information prove to be irrefutable evidences for local authorities.

The Safe and Smart city surveillance solution provides an answer for urban security issues. The solution was designed to help cities to achieve a sustainable, liveable environment through smarter urban traffic and safety management.

**FACILITIES TO BE PROVIDED**

- Wide dynamic range 20 MP cameras to monitor intersections
- Integrated IR flash for night operation mode
- Fully automatic operation, only the evaluation process is performed by operators
- Safe policeman feature
- Real time monitoring of all areas

There are key technologies that make a smart city work.

**1. Smart energy**

Both residential and commercial buildings in smart cities are more efficient, using less energy, and the energy used is analyzed and data collected. Smart grids are part of the development of a smart city, and smart streetlights are an easy entry point for many cities.

"Lighting is ubiquitous—it's everywhere that people work, travel, shop, dine, and relax. Digital communications and energy-efficient LED lighting are revolutionizing urban lighting infrastructures already in place, transforming them into information pathways with the capacity to collect and share data and offer new insights that enable, and really drive, the smart city. Overall energy usage is also part of a smart city. "Many may have experienced this already with the installation of smart meters at their homes. But with the rise of home solar power systems and electric vehicles, hardware and software technology will allow for the potential of better grid management, optimization of power production through different sources and

distributed energy production. Furthermore, buildings that monitor their energy usage actively and report this data to utilities can reduce their costs. "Smart grid solutions play an important role in the development of smart cities. From prepaid energy applications to advanced metering infrastructure, there are several solutions to enhance energy services.

**2. Smart transportation**

A smart city supports multi-modal transportation, smart traffic lights and smart parking.

"One of the key areas that we have seen a lot of activity on has to do with mobility. Anything around transportation, traffic monitoring, parking.These are areas where cities are seeing a very fast return on investment. It not only helps to reduce the cost of monitoring parking and making sure that they are collecting fines, it's also reducing congestion."

By making parking smarter, people spend less time looking for parking spots and circling city blocks. Smart traffic lights have cameras that monitor traffic flow so that it's reflected in the traffic signals.

Even city buses are becoming connected, so that people have real time information on when a bus will arrive at a bus stop. In Australia, traffic lights are prioritized based on the bus schedules so that traffic flows more freely during rush hours

it's using sensors to collect data about the movement of people, all forms of vehicles and bikes. A smart city is one that greatly reduces vehicle traffic and allows people and goods to be moved easily through various means. Intelligent traffic systems are an example of this and the achievement of autonomous vehicle transportation would be a prime example of success for a smart city, as this could reduce vehicle related deaths. All these efforts would reduce pollution as well as time stuck in traffic, resulting in a healthier population."

**3. Smart data**

The massive amounts of data collected by a smart city must be analyzed quickly in order to make it useful. Open data portals are one option that some cities have chosen in order to publish city data online, so that anyone can access it and use predictive analytics to assess future patterns.

"The pervasiveness of technology and the expansion of open data policies is about to unleash an economic growth engine for urban innovation that we have never seen. We are moving from analyzing data that exists within city hall, to generating new data from sensors that are deployed all across cities for use by multiple departments and people for multiple uses.Even the data collected by streetlights can be used to benefit citizens.

**4. Smart infrastructure**

Cities will be able to plan better with a smart city's ability to analyze large amounts of data. This will allow for pro-active maintenance and better planning for future demand. Being able to test for lead content in water in real time when the data shows a problem is emerging could prevent public health issues.Having a smart infrastructure means that a city can move forward with other technologies and use the data collected to make meaningful changes in future city plans.

**5. Smart mobility**

"Mobility refers to both the technology and the data which travels across the technology. The ability to seamlessly move in and out of many different municipal and private systems is essential if we are to realize the promise of smart cities. Building the smart city will never be a project that is "finished."

Technology needs to be interoperable and perform to expectations regardless of who made it or when it was made. Data also needs to be unconstrained as it moves between systems, with all due attention to intellectual property, security and privacy concerns.

**6. Smart IoT devices**

And finally, one of the key components that ties everything together in a smart city is IoT devices.

"Whether we like it or not, sensors and actuators in our cities are here to stay.Sensors are essential in a smart city."A wide range of reporting devices such as sensors, visibility devices and other end points that create the data that makes a smart city work."

" In a smart city, information will increasingly be obtained directly from purposefully deployed sensors or indirectly from sensors deployed for another purpose but which gather and share useful information. With this information, freely exchanged, complex city systems can be managed in real-time and, with sufficient integration, to minimize unintended consequences. As dependence on sensors grows, so too will the need that they be reliable and that the systems to which they are connected will be able to tolerate the inevitable failures."

Beacons are another part of IoT, and one of the problems with a smart city is the vast amount of information. Too much information can be overwhelming. Information received at a time when one is unable to take advantage of it is essentially noise.

"As cities move from millions to billions and then trillions of devices transmitting usable and potentially unusable information, bandwidth efficiency and capacity could be challenged. Short range notification that a user-selected need can be fulfilled nearby, whether it is the location of a subway station or a service, provides convenience without tying up some of the bandwidth of the carrier data networks.

Quite simply, smart cities use Internet of Things (IoT) devices such as connected sensors, lights, and meters to collect and analyze data. The cities then use this data to improve infrastructure, public utilities and services, and more..

Automatic traffic applications

- Speeding detection
- Stop line violation detection
- Red light violation detection
- Bus lane violation detection
- Wrong-way violation detection
- Parking violation detection
- Traffic counting

**RED LIGHT VIOLATION DETECTION**

- Automatic VCA detection of red light violations
- Automatic management of the workflow - from violation detection to creating a violation report
- Recognition of the license plates of the violating vehicles
- Interfacing to government databases to identify the violator
- Police interface
- Universal interface for connection to traffic light controllers
- 24/7 operation
- Providing irrefutable visual evidence

**TRAFFIC COUNTING**

- Image-based automatic vehicle counting
- Virtual loops
- Accurate, reliable operation
- Maintenance and installation is easy
- Monitoring traffic load in each lane
- 24/7 operation

- Direct connection to traffic light system

**SPEEDING VIOLATION DETECTION**

Logipix engineers developed a VCA and radar-based application that automatically detects speeding violations. The Logipix cameras, the VCA and the radar module efficiently complete each other, providing an irrefutable visual evidence. The high accuracy, automatic VCA is based on the images of the 20 MP Logipix ONE cameras. The Logipix monopulse, multi-lane radar works together with the Video Content Analysis built in the Network Video Recorder. The radar provides telegrams that contain the coordinates and the speed of up to seven vehicles

- 20 MP Logipix cameras
- Network Video Recorder with integrated VCA
- Multi-lane radar for velocity measurement
- Synchronized IR Laser Flash with multiple power illumination mode to recognize both reflective and non-reflective license plates even at night

- Automatic License Plate Recognition
- Interface for external vehicle database and customer-managed list
- Easy-to-use Violation Management Client software to maximize the daily number of processed violations

**ONE-WAY VIOLATION DETECTION**

- Automatic VCA detection of any vehicle that violates the one-way traffic rule
- Automatic management of the workflow - from violation detection to creating a violation report
- Machine recognition of license plates of the violating vehicles
- Interfacing to government databases to identify the violator
- Police interface
- Privacy mask
- Automatic download of the relevant images
- 24/7 operation, sharp and detailed license plates at night as well
- Providing irrefutable visual evidence.

**BUS LANE VIOLATION DETECTION**

- Automatic VCA detection of any vehicle that violates the bus lane traffic rule
- Automatic management of the workflow - from violation detection to creating a violation report
- Machine recognition of license plates of the violating vehicles
- Interfacing to government databases to identify the violator
- Police interface
- Machine recognition of plate numbers of the violating vehicles
- Privacy masks
- Automatic download of the relevant images
- 24/7 operation, sharp and detailed license plates at night as well
- Providing irrefutable visual evidence

The Logipix Video Content Analysis measures the presence of the vehicles within the designated traffic lane and detects all bus lane traffic violations. The algorithm is able to tell the authorized buses apart from regular vehicles. An integrated ANPR recognizes the license plates. More optional interfaces help identifying the vehicles and provide relevant owner data. Leading edge Logipix 20 MP security cameras record exceptionally high-resolution images of these violating vehicles and their license plates to provide an irrefutable visual evidence for the local authority.

**TRUCK PARKING**

, real-time parking space information could notably ease the everyday life of truck

drivers during their way. LOGIPIX cameras continuously monitor the whole truck parking and provide high-quality images on which the analysis is based. No matter if it's day or night the system operates accurately. It summarizes the visual information of multiple camera images and counts the available parking spaces based on them. It connects to a specific interface, the current occupancy statuses of the actual and next parking lots are visualized on LED display boards.

## CONCLUSION

Making a city "smart" is emerging as a strategy to mitigate the problems generated by the urban population growth and rapid urbanization.To close the gap in the literature about smart cities and in response to the increasing use of the concept, this paper proposes a framework to understand the concept of smart cities. Based on the exploration of a wide and extensive array of literature from various disciplinary areas we identify eight critical factors of smart city initiatives: management and organization, technology, governance, policy context, people and communities, economy, built infrastructure, and natural environment. These factors form the basis of an integrative framework that can be used to examine how local governments are envisioning smart city initiatives. The framework suggests directions and agendas for smart city research and outlines practical implications for government professionals

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