# Chapter 6
# 5G and Cloud Computing Synergy in Smart City Networks: A Review

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## ABSTRACT

*As urban populations continue to grow, the demand for efficient, interconnected, and sustainable smart city solutions becomes increasingly imperative. In this context, the convergence of 5G wireless technology and cloud computing presents a promising opportunity to transform urban environments into intelligent and interconnected ecosystems. This paper explores the synergy between 5G and cloud computing within the context of smart city networks, aiming to identify key research challenges,*

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*opportunities, and implications for future development. In this paper we examine the fundamental characteristics and capabilities of 5G technology, highlighting its ultra-fast data speeds, low latency, and massive device connectivity. We then delve into the foundational principles of cloud computing, emphasizing its scalability, flexibility, and on-demand resource provisioning. By integrating these two transformative technologies, we then look at the emerging cloud paradigms which utilize 5G and advances that result from them to solve the emerging challenges of smart city.*

## 1. INTRODUCTION

The integration of 5G technology and cloud computing has unlocked unprecedented potential for the development of smart city networks. As cities strive to become more connected, efficient, and sustainable, this synergy offers a robust foundation for innovation and transformation. 5G, the fifth-generation wireless technology, promises ultra-fast speeds, low latency, and massive connectivity, while cloud computing provides scalable, on-demand access to computing resources and data storage. Together, they form a dynamic duo driving the evolution of smart cities, enhancing various aspects of urban life such as transportation, healthcare, energy management, and public safety. We explore the synergies between 5G and cloud computing within smart city networks, highlighting their transformative impact and the opportunities they present for creating more intelligent, responsive, and resilient urban environments.

### 1.1 Smart City and why it is needed

The world is experiencing a rapid urbanization process, with the urbanization level increasing from 39% to 52% in the last 3 decades (Chen et al., 2014), with 60% of the population forecasted to live in an urbanized environment by 2030 (Petrolo et al., 2014). This has led to traditional models of city planning to come up short as the complexity and sizes of cities keeps increasing. Poor urban infrastructure - such as unreliable power systems, congested roads, poor public transport systems and inefficient allocation of public resources to list a few can reduce a cities' competitiveness and economic prospects, according to (Joshi et al., 2016). To be able to fully capitalize on the increasing population and urbanization, the concept of smart cities was proposed, which aims to utilize the advancements made in the field of Information Communication Technologies (ICTs) (Parida et al., 2024) through smart mobile devices and sensors to optimize the use of public assets, improve coordination & manageability, and enhanced Quality of Experience (QoE).