


Chapter 8

Safeguarding Urban Intelligence: Redefining IoT Networks With Privacy in Mind

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ABSTRACT

The growing reliance on Internet of Things (IoT) technologies in smart cities brings significant data privacy and security challenges. This paper presents a privacy-preserving IoT network model designed to protect sensitive information while retaining functionality and performance. The model utilizes edge computing, lightweight encryption, pseudonymization, and role-based access control alongside blockchain for enhanced trust and transparency. Experimental results demonstrate that this approach efficiently safeguards data without compromising service quality. This study aims to enable the responsible and sustainable implementation of smart city innovations while preserving citizen dignity, consent, and control over their own data.

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1. INTRODUCTION

The Internet of Things (IoT) links everything on Earth. Things are just things that have a unique identifier. Everything may be connected to the Internet from any location and at any time. The technology allows for the provision of higher-level services than before, and for extracting useful information from the data. By allowing infrastructures like electric and hybrid smart cars to interconnect, driving quality, safety, and fuel efficiency can all be greatly improved. Smart city models are designed to improve the quality of people's residential lives, evaluate environmental dangers, strategic planning, and the use of more energy by intelligently collecting and processing data using smart devices. Usage of clever technology-based solutions for the problems, and the introduction of smart city concepts, are taken into consideration. The wide range of distinct methodologies, settings, application areas, and technology solutions that have been documented in the literature for the management and implementation of smart cities is indicative of this complexity.

Implementing and integrating IoT technology is primarily intended to enable smart cities to develop, offering new features and capabilities while drastically lowering the requirement for human interaction. To reduce operating expenses and improve the sustainability of the city, it is imperative that redundant solutions for data input, storage, and analysis not be implemented. Three main issues caused by the vast number of devices are heterogeneity, protecting the privacy of generated data, as well as offering high-level services. Large amounts of data are created and shared by the proliferation of IoT devices in smart cities. The difficulty of privacy preservation, which guarantees that the sensitive data gathered by IoT devices is securely shielded from unauthorized access, arises from heterogeneity, since IoT devices are produced with varied capabilities and standards. Because it offers top-notch services without jeopardising user privacy, service quality is also an issue. Strong frameworks that can handle privacy issues and the varied nature of IoT devices must be developed to meet these problems (Gheisari et al., 2023).

IoT serves as a global network that connects all physical objects that have a unique identifier, enabling global communication between devices. Universal access allows things to connect and communicate anytime and anywhere via the Internet. This service facilitates higher-level services by analyzing and extracting valuable information from the data it generates. For example, smart vehicles integrating electric and hybrid smart cars with IoT infrastructure can improve their driving quality, road safety, and fuel efficiency. Smart cities rely on intelligent data collection through IoT-enabled devices to improve the quality of life for citizens, monitor environmental risks, enable strategic traffic planning, and optimize energy usage. These problems are solved in urban areas. The smart city frameworks use IoT-based technologies to address everyday urban challenges effectively. Semantic reasoning helps identify

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