Chapter 4
Blockchain-Enabled Decentralization Service for Automated Parking Systems

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ABSTRACT

Due to recent development in technology and smart devices in people's lives, their lives are becoming easier and safer. One of popular examples in todays is parking (i.e., people find free parking space without moving a long distance or consuming more time or fuel over the road network). Today many automated companies are designing vehicles, but we are still unable to get automatic parking system in an area. Finding free parking slot/space has a probability of revealing user's privacy (i.e., either by service provider to third party/attacker or submitted information [user personal information] can be hacked by an attacker [via performing attacks like Man in Middle, Denial of Service, etc.]). Hence, privacy is a main issue in parking. Providing sufficient privacy in parking to vehicle users is a primary concern of this chapter. For that, this chapter used the blockchain technology to avoid privacy issues (raised in parking searching). Blockchain technology makes reservation of parking slot transparent, decentralized, and secure (privacy-preserved).

1. INTRODUCTION

In the modern world, the growth of the industry is rapidly increasing by increase in the number of vehicles on the streets, which raises the parking related issues. In day to day life parking vehicles is becoming a hectic problem. In big cities any place if you want travel first thing, we do is searching for parking lot. If no parking lot is free at our place, we need to search for other parking lot in other location, evenwe cannot park our vehicles road side because government collects fine from us for parking vehicle at road side which is illegal. (parkres, 2018) With the increase of population there is increase in

DOI: 10.4018/978-1-7998-3295-9.ch004

vehicles (for daily needs) on the road than ever before in human history. The more vehicles, more risk to control traffic on the streets. Most of the times people spend more time to find parking lot then doing the main work for which they came out for. Parking lot has become a rare place to find in metropolises, town centers, shopping areas, Imax, railwaystations, busstations, hospitals and sometimes airports also. Getting parking lot at these locations is a luck.In case of emergency hospital visits, people often end up parking in the no-parking zonethe patient still has to suffer more. Ultimately,it causes additional parking problems and adds other patients and ambulances to the traffic woes around hospital. In Current generation the automated vehicles are coming up with new features and many automated companies are competing each other to introduce advanced automated vehicles in the market. Smart driver aid systems play a main role as the automotive industry becomes more automated due to this competition. Smart vehicles are increasing but the parking lot are not sufficient. It is not possible for network companies, because parking providers do not collaborate with the companies, to provide updated data on parking lots over the internet.

A Smart parking system was developed in the creation of traffic management systems to decrease the cost of employing car drivers and optimize the use of resources for owners of parking lots.(Lu et al., 2009) VANET (Vehicular Adhoc Network) is a technology developed to ensure safe and efficient drivingexperience and traffic management. VANET may include wireless sensor networks, vehicle-to-vehicle(V2V) and vehicle-to-infrastructure(V2I) communication. In the existing smart parking system still, it has few major technical issues such as privacy, security and trust. The most promising use cases for blockchain is intersection of blockchain and IoT. Blockchain integrated into IoT can improve the development of IoT application environment. The privacy risks of IoT are increasing day-to-day by the lack of fundamental security concepts in many IoT applications. Blockchain anonymity is well-suited for most IoT applications in which the user's identification must remain confidential.(Zinon et al.,2019) Blockchain with IoT have many benefits. 1.**Trust**: It removes trusted third party and all data correctness and data immutability are done by participants. In IoT applications it is complex task to build trust among various entities while data processing. 2.**Security:** Blockchain uses various security mechanisms like hashing algorithms to secure transaction data. 3. **Transaction:**blockchain by its distributed nature it offers, IoT to process billions of transactions between smart devices by blockchain. 4. **Decentralization:** Blockchain provides decentralized authority, i.e., no centralized system. When IoT applications do nottrust centralized system, it goes for blockchain. Blockchain is a distributed public ledger, it allows users to have secure transactions which are broadcasted into a network and once verified are linked with previous blocks expanding the networks capacity. Blockchain uses peer-to-peer network. Using cryptography, it secures all the transaction. So that no one can temper the data. As, there is a distributed ledger it doesn't require any centralized authority (trusted third party).Before transactions are performed between varies parties, they have to accept the agreement, it is provided by trusted third party. Smart contract is aMemorandum of understanding (MOU) between different parties. In blockchain smart contract plays a vital role. They are saved on a public distributed ledger which cannot be tampered or hacked. Based on smart contract only transactions are implemented. All the transactions are automatically sent on to distributed public ledger without any trusted third party or an intermediator.

Related Work

There are some existing algorithms to improve the smart parking system. Few of the algorithms will be reviewed in this section. (Siemens, 2012)SiPark intelligent parking system was proposed. Which includes