

Chapter 8

Smart Grid: A Study on Communication Technologies, Security, and Privacy

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ABSTRACT

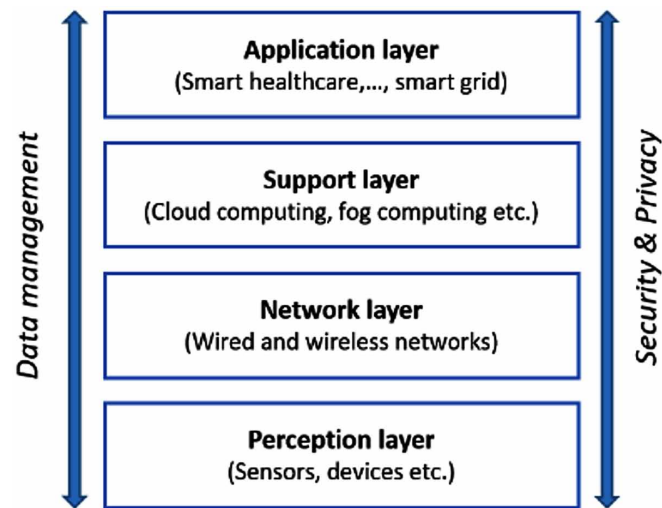
Smart grid is a new emerging trend as it is more efficient because of its computation process and energy utilization. It provides many benefits due to the communication between the service company and users. Smart grid includes smart metering, which is used to collect the data from the appliances, devices, sensors, etc. and transfer the data to the network, and the data is analyzed for energy consumption. The transmission and distribution of energy; the smart grid architecture; communication technologies like LAN, HAN, and NAN; and security and privacy challenges are discussed in this chapter.

INTRODUCTION

Smart City is created by the integration of new technologies. Smart city concept is a new article because it is formed by combining innovative technologies. Such as in recent years government has been taking lot of initiatives to make the cities into smart cities, with the support of information and internet, to attain linkage of intelligence, self sensing and adaptation etc. Smart cities are preferred because of its advantages like environment protection, security for public and new life style it offers to the inhabitants. People around the world have started sensing the importance of smart city. Humans are connected with the smart objects like smart phones, gadgets etc. Moreover all the objects in this world are connected to one another each other for monitoring, control and automation. The life style of people has improved because of the new innovations and technology. In smart cities, the heterogeneous elements are combined together to form an IoT. Microcontrollers, transceiver and protocols that stack for communication are equipped together in IoT. It will manages and optimizes the services like transport, electricity, structural

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Figure 1. IoT Based Architecture for Smart Grid



health monitoring, waste management, noise monitoring, traffic congestion, energy consumption, smart parking, smart lightening etc.. The above mentioned management makes the city into smart city. The smart Grid will overcome all the problems that occur in the power Grid like insecurity, damage in the transmission power line, physical and cyber-attack etc. (Anastasia Mavridou & Mauricio Papa, 2012). An IoT based architecture in figure 1, which has four layers. They are Network layer, Application layer, Support layer and Perception layer. The bottom layer is the perception layer; it has sensors and WSN etc. The main purpose of this layer is to collect data from the end devices (things in the real world) and transmit it to the upper layer (network layer). The root layer in IoT architecture is network layer, which is connected with the servers, devices and smart things, and it transfers the data from the perception layer to the higher layer. It builds upon mainly on internet, Communication Networks and WSN which is called as basic networks. The next higher layer is Support layer, it functions along with higher layer called application layer. It has the computing techniques like cloud computing, edge computing fog computing etc. The top most layers are the application layer, which serves the end users based on their demand (Lei Cui, Gang Xie, Youyang Qu, Longxiang Gao & Yunyun Yang, 2018).

Smart grid is one of the applications of smart city that makes a way to change the city smart. When a traditional power grid is replaced by smart grids, it reduces energy utilization, and unwanted costs. Smart meters are used by the consumers to share about their utilization of the energy to the providers. Since, multiple smart meters are linked with each other and it is computerized, it gets vulnerable to several attacks. The large scale data generated by the grid is stored in the cloud. By using Anomaly detection techniques the anomalies can be detected from the data that is stored in the cloud. It is also supports forensic investigation. This technique is applied to all the IoT components to detect the compromised devices (Zubair A. Baig et al., 2017).

Electricity is the necessary thing in daily life. Without electricity water services and other basic amenities will be a problem. Electricity helps to maintain the quality of life and productivity. The fundamental grid operations are not changed since 1930, the general infrastructures are same but some of the technologies have changed because of new inventions. The significant issue is fusing the renewable

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