Chapter 14
The Role of Edge/Fog Computing Security in IoT and Industry 4.0 Infrastructures:
Edge/Fog-Based Security in Internet of Things

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ABSTRACT

The development of information and communication technologies (ICT) has led to many innovative technologies. The integration of technologies such as the internet of things (IoT), cloud computing, and machine learning concepts have given rise to Industry 4.0. Fog and edge computing have stepped in to fill the areas where cloud computing is inadequate to ensure these systems work quickly and efficiently. The number of connected devices has brought about cybersecurity issues. This study reviewed the current literature regarding edge/fog-based cybersecurity in IoT to display the current state.

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INTRODUCTION

In an era of rapid growth in science and technology and aggressive competition, an innovative capability is associated with an advance in knowledge and the welfare of many in the population (West & Altink, 1996). Innovative capability is crucial because innovation plays essential roles in emerging technologies or new information and communication technologies (ICT). Firstly, new ideas are required to develop innovative products or technologies. The increasing use of new and innovative ICT such as mobile computing, social media, Web 2.0 networking, cloud computing, Internet of Things (IoT), and virtual collaborative environments have enabled a voluminous exchange of data, information and intellectual property (Mejias & Balthazard, 2014).

It has been forecasted that the number of devices connected over the internet will be around 50 billion by the end of this decade. By the end of 2020, the massive increase in the number of connected smart things, known as IoT, is estimated to be about six times the world's population (Boakye-Boateng et al., 2019). Alongside mobile devices, the digitalization of home devices (refrigerators, fans), smart city applications (connected cars, smart traffic lights, smart grids, smart wear utilities, etc.) and operational technologies (factory machines) across the globe are the main factors for this increase (Boakye-Boateng et al., 2019). These connected devices lead to the problem of vast masses of data being processed and applications with low latency expectancy. The huge scale adoption of IoT, and big data creation has led businesses and industries to find new methods for data processing, storage and communications. For example, cloud computing enables IT outsourcing capability with value-added services for customers (Diro, Chilamkurti & Nam, 2018).

Cloud computing architecture means uploading data through the Internet and realizing CPU and storage operations in data centers. Benefiting from the processing power of datacenters sounds good but the high latency due to Internet connection can be seen as a disadvantage. Lately, a new computing paradigm is to extend traditional data centers for the cloud to the edge of the network to decrease transmission and processing-response delays (Tsaur & Yeh, 2019). In order to decrease delays, the most straightforward approach could be handling data operations such as processing tasks, analytics, and knowledge generation closer to the data source. This is called edge computing.

Cloud computing has provided on-demand access to computing, storage infrastructure, and services for corporates and individuals at a reduced cost. The communicated IoT devices continually generated and transmitted different types of data in different amount. However, the current cloud models are not proposed to deal with the type of data generated by IoT devices, so they must consider some issues such as latency, bandwidth utilization, and throughput (Viejo & Sánchez, 2019).

This study reviews the cybersecurity issues faced within IoT with fog/edge computing. The rest of the paper is structured as follows: the next section explains the Edge and Fog Computing concepts along with their place regarding cybersecurity and IoT devices. The subsequent section presents the reviewing method of the study. The 'Findings' section reveals the results of the review based on the variables selected in the method section. Finally, the conclusion and limitations of the study are given.