Chapter 17
Dew Computing: State of the Art, Opportunities, and Research Challenges

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ABSTRACT

Dew computing is an emerging paradigm that extends the edge computing concept by leveraging the resources available in the surrounding environment. This chapter presents a state-of-the-art review of dew computing, including its definition, characteristics, and architecture. The authors also discuss the opportunities and challenges of dew computing and provide a comprehensive survey of recent research efforts in this area. Specifically, they highlight the potential of dew computing to address the challenges of resource-constrained devices, increase data privacy and security, and improve network efficiency. However, several research challenges need to be addressed, including resource management, security, privacy, and interoperability. They discuss the future research directions and potential applications of dew computing in various domains, such as healthcare, smart cities, and the internet of things (IoT). In summary, dew computing has the potential to revolutionize the way we perceive and utilize computing resources and opens up a new research frontier for computer science and engineering.

1. INTRODUCTION

Dew computing is an emerging paradigm that extends the concept of edge computing, which is about processing data as close to the source as possible, by leveraging the resources available in the surrounding environment. Dew computing takes this a step further by utilizing the resources that are not directly connected to the internet, such as sensors, mobile devices, and other smart objects. These resources, which are often overlooked, can be used to create a distributed computing infrastructure that can be accessed and utilized by various applications and services. Note that the term “dew computing” was first introduced in 2015 by Dr. Hong Zhu, a professor at Oxford Brookes University, to describe a new com-

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puting paradigm that takes advantage of the resources available in the physical environment. The term "dew" is used to describe the phenomenon of water droplets that form on surfaces in the early morning when the temperature drops, which is similar to the concept of collecting resources from the surrounding environment. Dew computing has several characteristics that distinguish it from other computing paradigms. First, it is a distributed computing paradigm that utilizes resources from multiple sources, including sensors, mobile devices, and other smart objects. Second, it is a dynamic computing paradigm that can adapt to changing environments and resource availability. Third, it is a context-aware computing paradigm that considers the context in which the computing resources are available. In summary, dew computing has the potential to revolutionize the way we utilize computing resources and create a more efficient and sustainable computing infrastructure.

2. BACKGROUND OF CLOUD, FOG, EDGE, AND GRID COMPUTING

In this section, we will discuss background related to cloud, fog, edge, and grid computing as:

A. Cloud Computing

The supply of computing services, such as servers, storage, databases, networking, software, analytics, and intelligence, over the internet is known as cloud computing (i.e., the "cloud"). This eliminates the need for enterprises to purchase and maintain their own infrastructure by enabling access to and use of a variety of computer resources.

Three basic categories of cloud computing services are available as follows:

- Infrastructure as a Service (IaaS): It is a basic building blocks of computing infrastructure, including servers, storage, and networking, which organizations can use to build and run their own applications.
- Platform as a Service (PaaS): This enables businesses to create, test, and deploy applications without having to maintain the underlying infrastructure by providing a full-featured cloud development and deployment environment, including operating systems, programming languages, and tools.
- Software as a Service (SaaS): This gives users online access to programs and software, such as email, customer relationship management (CRM), and productivity tools.

Some benefits of cloud computing include increased scalability, flexibility, reliability, and cost-effectiveness. However, there are also potential drawbacks, such as security concerns and the need to rely on internet connectivity.

B. Fog Computing

Fog computing is a distributed computing concept that aims to provide services closer to end-users by using computing resources in edge devices such as routers, switches, and gateways. In this way, it reduces the latency and bandwidth requirements of cloud-based applications. Fog computing is particularly useful in scenarios where there is a large volume of data generated by IoT (Internet of Things) devices