Chapter 25
Data Access Control in the Cloud Computing Environment for Bioinformatics

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ABSTRACT

Bioinformatics is a branch of science that applies computational science in the biological world. In bioinformatics, large sizes of biological data (genome) are processed in the cloud computing platform. Due to the advantages of cloud computing, such as reduced cost scalability, high performance, unlimited storage and many more, the applications of cloud computing in bioinformatics are increasing exponentially. However, cloud computing has some disadvantages like security, privacy, transferability, etc. Among all these problems, access control is a critical issue in the cloud computing environment. The main objective of this paper is to present many access control models along with their advantages and disadvantages. Moreover, some of the popular cloud-based bioinformatics applications are also introduced for the benefit of researchers.

1. INTRODUCTION

Cloud computing facilitates fast and efficient parallel processing of terabyte-scale data in the virtual environment (Huthand & Chebula, 2011). In cloud computing, there are three entities (stakeholders) namely Data Owner (DO), Cloud Service Provider (CSP) and user. The DOs share their own data or file on the cloud server. The CSP provides the cloud services for both DO and user. The users access data or file from the cloud server (Namasudra et al., 2014; Zhang et al., 2010; Namasudra & Roy, 2017a). The users cannot access data randomly by their wishes. Each CSP has its own access policy or right. So, when the users want to access any data or file from the cloud server, they must satisfy the access right to access the requested data from the cloud environment.

There are mainly four types of cloud deployment models:

1. Private cloud
2. Public cloud
3. Community cloud
4. Hybrid cloud

A private cloud infrastructure is solely operated by a single organization. It can be managed by an organization or by a third party. In a public cloud, the CSP provides the resources, such as network, server, etc. to the users. Anyone can join in the public cloud. In a community cloud infrastructure, a cloud environment is shared by a community/several communities. All these communities must have a common goal. Hybrid cloud is the combination of public, private and community cloud. It is managed by a central administrator.

Cloud services can be provided in three ways, namely Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). Figure 1 shows the simple scenario of a cloud environment.

Figure 1. Simple scenario of a cloud environment
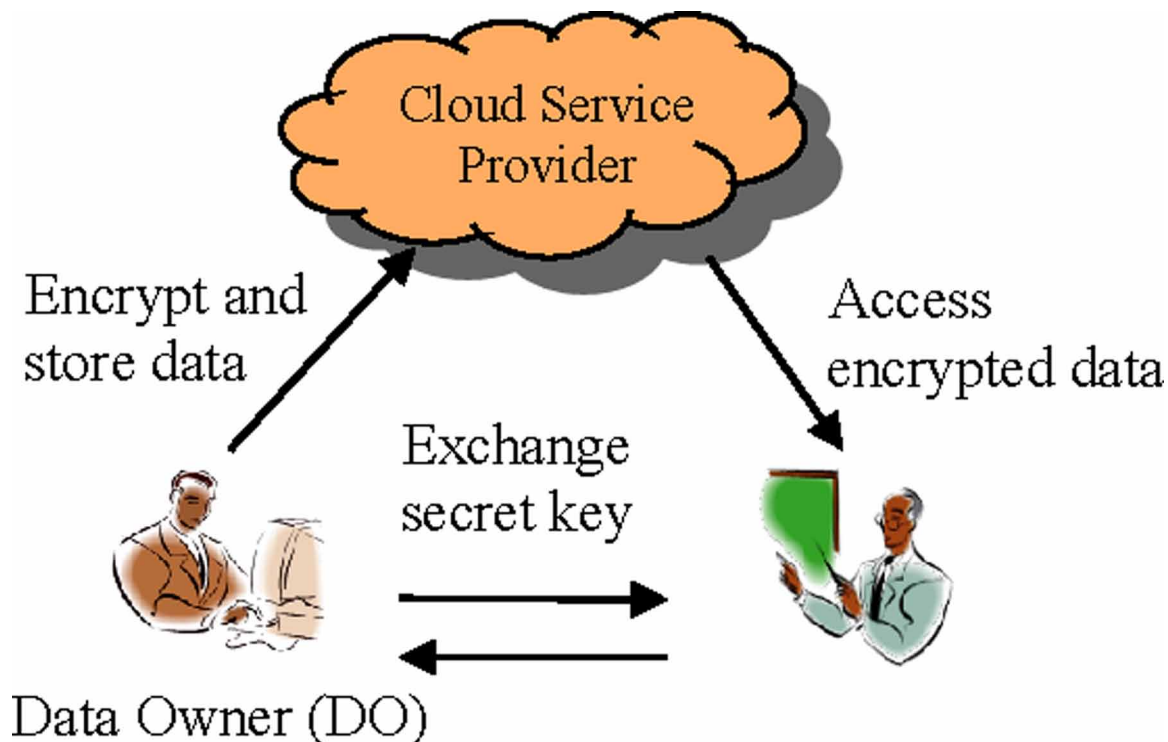
In a cloud environment, when the CSP receives a data access request from a user, it must provide public key of the DO to the user to get the secret key and other necessary credentials. So, if the CSP takes much time to search the DO, the user must wait to get the details. Thus, in result, the data accessing

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