

Chapter 45

Cloud Computing for Global Software Development: Opportunities and Challenges

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ABSTRACT

The cloud computing paradigm offers an innovative and promising vision concerning Information and Communications Technology. Actually, it provides the possibility of improving IT systems management and is changing the way in which hardware and software are designed and purchased. This paper introduces challenges in Global Software Development (GSD) and application of cloud computing platforms as a solution to some problems. Even though cloud computing provides compelling benefits and cost-effective options for GSD, new risks and difficulties must be taken into account. Thus, the paper presents a study about the risk issues involved in cloud computing. It highlights the different types of risks and how their existence can affect GSD. It also proposes a new risk management process model. The risk model employs new processes for risk analysis and assessment. Its aim is to analyse cloud risks quantitatively and, consequently, prioritise them according to their impact on different GSD objectives.

1. INTRODUCTION

Nowadays, modern software development is carried out globally. New development teams consist of developers who are geographically distributed across the world, working together on one project. Boundaries between countries in modern software development are disappearing, and the software development process is becoming globally oriented, multidisciplinary and cross-cultural (Sommerville, 2011). This new

approach is called Global Software Development (GSD). GSD's popularity amongst IT businesses is growing rapidly because of potential economical benefits. GSD facilitates business growth and makes products appear faster on the market (Khazaei & Misi, 2010). Furthermore, GSD presents opportunities for companies to use resources in other geographical regions. Even so, despite all the potential benefits GSD creates, there are some serious challenges. Challenges commonly referred to are heterogeneous platforms, distributed web

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services, multiple enterprises geographically dispersed all over the world, unified coordination problems, communicational problems, linguistic distance and time distance (Gurdev et al., 2011).

Recently, the software engineering community has come to a realisation that with the growing complexity of global software systems and the problems that they are trying to solve, cloud computing is an important instrument that determines the accomplishment of GSD projects (Arshad et al., 2010).

There are many definitions of cloud computing, but in general it refers to both software and hardware resources that are delivered over the internet (Aljawarneh, 2011). By using these services, software development in the cloud can be a cheaper, more efficient and more flexible way of producing new software than by traditional methods. Developers can use the cloud services and pay only for the time they actually use resources. Another advantage is that developers can access the cloud from any location in the world. So cloud computing can assist GSD and make some challenges less noticeable (Bhisikar, 2011). On the other hand, using cloud computing brings new risks and difficulties and, as result, there are both new risks to be determined and old risks to be re-evaluated (Alford, 2009). For these reasons, it is absolutely necessary to introduce risk management processes into the whole cloud computing domain. Generally, treatment of risks in cloud environments must be performed at service, data and infrastructure layers.

This paper presents a cloud computing paradigm and its components as a solution to defined GSD problems. Additionally, it presents a study about the risk issues involved in cloud computing and how their existence can affect GSD. It also attempts to contribute to the inclusion of risk management into the cloud computing paradigm by proposing a new risk model that not only minimises the risks of not achieving the objectives of GSD but also identifies and exploits opportunities.

The rest of the paper is organised as follows. Section 2 provides an overview of cloud computing. Advantages and challenges of cloud computing for GSD analyzed in Section 3. The risks involved in cloud computing are described in Section 4. The proposed risk model is described in Section 5. Evaluation of the proposed risk model is discussed in Section 6. Section 7 presents the limitations of the research. Related work is described in Section 8, followed by the conclusion and a discussion of future work in Section 9.

2. BACKGROUND

Cloud computing is not a technology revolution, but rather a process and business evolution in terms of how we use those technologies that enable cloud computing as it exists today (Xiong & Perros, 2009). Cloud computing is based on the idea of renting out servers, storage, networks, software technologies, tools and applications as utilities or services over the internet as and when required in contrast to owning them permanently (Alford, 2009). Before analysing the impact of cloud computing for GSD it will be useful to define the general service types and deployment models for cloud computing.

Depending on what resources are shared and delivered to customers, there are three types of cloud computing. In cloud computing terminology, when hardware such as processors, storage and networks are delivered as a service it is called infrastructure as a service (IaaS). Examples of IaaS are Amazon's Elastic Cloud (EC2) and Simple Storage Service (S3). When programming platforms and tools like Java, Python, .Net, MySQL and APIs are delivered as a service it is called platform as a service (PaaS). When applications are delivered as a service it is called software as a service (SaaS) (Lefèvre & Orgerie, 2010).

Depending on the amount of self governance or control on resources by the renter, there are mainly

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