

Chapter 11

QoS in the Mobile Cloud Computing Environment

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ABSTRACT

Mobile Cloud Computing (MCC) integrates cloud computing into the mobile environment and overcomes obstacles related to performance (e.g., bandwidth, throughput) and environment (e.g., heterogeneity, scalability, and availability). Quality of Service (QoS), such as end-to-end delay, packet loss ratio, etc., is vital for MCC applications. In this chapter, several important approaches for performance evaluation in MCC are introduced. These approaches, such as Markov Processes, Scheduling, and Game Theory, are the most popular methodologies in current research about performance evaluation in MCC. QoS is special in MCC compared to other environments. Important QoS problems with details in MCC and corresponding designs and solutions are explained. This chapter covers the most important research problems and current status related to performance evaluation and QoS in MCC.

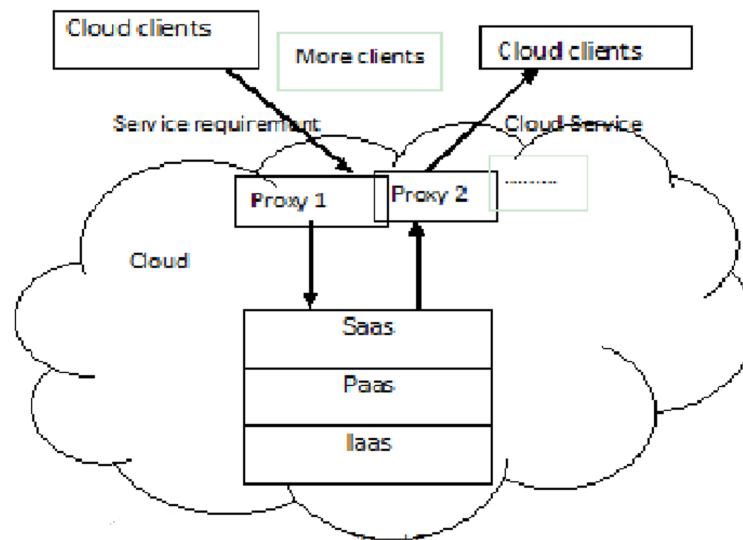
1. INTRODUCTION

Cloud computing is considered as the next generation's computing infrastructure. Cloud computing provides services such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS),

Software as a Service (SaaS). Cloud providers, such as Google, Amazon, and Microsoft, are providing more and more applications, including mobile applications. Cloud computing is a large scale economic and business computing paradigm. The cloud computing system provides various QoS guaranteed services such as hardware, infrastructure, platform, software and storage to

DOI: 10.4018/978-1-4666-4781-7.ch011

Figure 1. Cloud service model



different Internet applications and users. Cloud computing includes resources of computing and storage. It includes infrastructure layer, platform layer, and application layer (Figure 1).

Mobile Computing is a form of human-computer interaction. Mobile computing is based on a collection of three major concepts: hardware, software and communication. Hardware is mobile devices, such as smartphone and laptop, or their mobile components. Software of mobile computing is the numerous mobile applications, such as the mobile browser, and games. The communication issue includes the infrastructure of mobile networks, protocols and data delivery.

The features of mobile computing include:

- **Mobility:** Mobile nodes can establish connections with others or with fixed nodes through a Mobile Support Station (MSS) as they are moving.
- **Diversity of Network Conditions:** Networks used by mobile nodes are not unique; such networks can be a wired network with high-bandwidth, or a wireless Wide Area Network (WWAN) with low-bandwidth.

- **Frequent Disconnection and Consistency:** Mobile nodes will not always keep the connection, but disconnect and are consistent with the wireless network passively or actively.
- **Low Reliability:** A mobile computing system needs to be considered from networks, database platforms, and applications development to address the security issue.

MCC is an integration of cloud computing into mobile network. From MCC Forum, MCC is defined as:

MCC at its simplest refers to an infrastructure where both the data storage and the data processing happen outside of the mobile device. Mobile cloud applications move the computing power and data storage away from mobile phones and into the cloud, bringing applications and mobile computing to not just smartphone users but a much broader range of mobile subscribers.

Because mobile applications can be quickly released and minimally managed, MCC brings new types of services and facilities. Mobile ap-

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