Chapter 20
Vertical Integration Between Providers With Possible Cloud Migration

Aleksandra Kostic-Ljubisavljevic
University of Belgrade, Serbia

Branka Mikavica
University of Belgrade, Serbia

ABSTRACT

All vertically integrated participants in content provisioning process are influenced by bandwidth requirements. Provisioning of self-owned resources that satisfy peak bandwidth demand leads to network underutilization and it is cost ineffective. Under-provisioning leads to rejection of customers' requests. Vertically integrated providers need to consider cloud migration in order to minimize costs and improve quality of service and quality of experience of their customers. Cloud providers maintain large-scale data centers to offer storage and computational resources in the form of virtual machines instances. They offer different pricing plans: reservation, on-demand, and spot pricing. For obtaining optimal integration charging strategy, revenue sharing, cost sharing, wholesale price is applied frequently. The vertically integrated content provider's incentives for cloud migration can induce significant complexity in integration contracts, and consequently improvements in costs and requests' rejection rate.

INTRODUCTION

The continuous growth of Internet traffic is significantly pushed by emerging high bandwidth demanding contents. All participants in content provisioning process including content providers, service providers, Content Delivery Networks (CDN) and customers are influenced by bandwidth requirements. Appropriate bandwidth demand estimation and consequently, network dimensioning are of great importance for addressing resource investment. However, peak bandwidth demand varies during the day. Provisioning of self-owned resources that satisfy peak bandwidth demand leads to network underutilization in the periods of low or normal traffic load. Hence, over-provisioning is cost ineffective. On the other hand,

under-provisioning of network resources leads to rejection of customers' requests for service provisioning. Considering all aforementioned, vertically integrated providers in content provisioning process need to consider cloud migration in order to minimize costs and improve Quality of Service (QoS) and hence Quality of Experience (QoE) of their customers. Cloud providers maintain large-scale data centres to offer storage and computational resources in the form of Virtual Machines instances at a relatively low cost. Depending on the characteristics, cloud instances are available at different prices. In general, cloud providers offer three different pricing plans, such as reservation, on-demand and spot pricing. With the aim of obtaining optimal integration charging strategy, concepts like Revenue Sharing, Cost Sharing, Wholesale Price etc. are applied frequently. Involvement of cloud providers into content provisioning process introduces additional complexity for choosing appropriate interconnection contract. The vertically integrated content provider's incentives for cloud migration can induce significant changes in integration contracts, and consequently in costs and requests' rejection rate.

In this chapter different methods of vertical integration charging among providers are analyzed and compared. With the aim of QoS and QoE improvement, providers can perform cloud migration. In that manner, cloud resources utilization concepts like reservation, on demand, and potential application of spot-pricing are going to be analyzed.

BACKGROUND

In order to provide content to the customers, vertical integration between providers is necessary. Term vertical integration refers to interconnection, i.e. physical and logical connecting, among providers operating at different network's levels. For instance, long-distance operator and local operator can be vertically integrated. Intrinsically, interconnection enables customers connected to one network to communicate with customers of the same or different network. It is a set of legal rules, technical and operational arrangements which providers use to connect their equipment, networks and services. Vertical integration is economical, efficient and it enables achievement of economies of scale (Dai & Tang, 2009). Often applied contracts are Revenue Sharing, Cost Sharing and Wholesale Price. Instead of explicitly defined interconnection tariffs, operators often apply Revenue Sharing, which establishes fixed revenue share among providers. This type of contract is characterized with operational simplicity, and it can rebalance providers' returns when retail prices are distorted for any reason. Some of the greatest challenges that providers are dealing with are increasing profitability of the offered services, assuring higher charges for improved services and obtaining a fair share of the increased revenues. A fair Revenue Sharing contract based on the weighed proportional fairness criterion is proposed by He & Warland, (2006). They also show that non-cooperative strategies between providers may lead to unfair distribution of profit and may even discourage future upgrades to the network. Modelling of non-cooperative interaction between service providers and content provider as a Stackelberg game is performed by Wu, Kim, Hande, Chiang & Tsang (2011). These authors propose Revenue Sharing contract between service providers that jointly provide network connectivity between content provider and customers. They introduce profit division factor into the contract with the aim of social profit's maximization. Revenue Sharing contract between content provider and two service providers under network neutrality debate is observed by Coucheney, Maille, & Tuffin (2014). In this model, service providers enable direct connectivity to a fixed proportion of the content and compete in terms of price for customers. Relations between service providers are established using Revenue Sharing contract in order to maximize customers' welfare.

Related Content

Statistically Enhanced Multi-Dimensional Trust Computing Mechanism for Cloud Computing
Mohamed Firdhous, Suhaidi Hassanand Osman Ghazali (2013). *International Journal of Mobile Computing and Multimedia Communications (pp. 1-17).*
www.irma-international.org/article/statistically-enhanced-multi-dimensional-trust/78382

An Infrastructural Perspective on U-Commerce
S. Keegan, C. Byrne, P. O'Hareand G. O'Hare (2007). *Encyclopedia of Mobile Computing and Commerce (pp. 310-316).*
www.irma-international.org/chapter/infrastructural-perspective-commerce/17094

SWOT Analysis of M-Commerce
Ramandeep Kaurand Harmeet Malhotra (2018). *Mobile Commerce: Concepts, Methodologies, Tools, and Applications (pp. 1261-1280).*
www.irma-international.org/chapter/swot-analysis-of-m-commerce/183339

Mobile Clinical Learning Tools Using Networked Personal Digital Assistants (PDAs)
Bernard Mark Garrett (2009). *Mobile Computing: Concepts, Methodologies, Tools, and Applications (pp. 1256-1260).*
www.irma-international.org/chapter/mobile-clinical-learning-tools-using/26586

Epsilon-Greedy-Based MQTT QoS Mode Selection and Power Control Algorithm for Power Distribution IoT
Xinhong You, Pengping Zhang, Minglin Liu, Lingqi Linand Shuai Li (2023). *International Journal of Mobile Computing and Multimedia Communications (pp. 1-18).*
www.irma-international.org/article/epsilon-greedy-based-mqtt-qos-mode-selection-and-power-control-algorithm-for-power-distribution-iot/306976