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**ONLINE RESOURCE SCHEDULING UNDER CONCAVE PRICING FOR**

**CLOUD COMPUTING**

**ABSTRACT**

With the booming cloud computing industry, computational resources are readily and elastically available to the customers. In order to attract customers with various demands, most Infrastructure-as-a-service (IaaS) cloud service providers offer several pricing strategies such as pay as you go, pay less per unit when you use more (so called volume discount), and pay even less when you reserve. The diverse pricing schemes among different IaaS service providers or even in the same provider form a complex economic landscape that nurtures the market of cloud brokers. By strategically scheduling multiple customers' resource requests, a cloud broker can fully take advantage of the discounts offered by cloud service providers. In this paper, we focus on how a broker can help a group of customers to fully utilize the volume discount pricing strategy offered by cloud service providers through cost-efficient online resource scheduling. We present a randomized online stack-centric scheduling algorithm (ROSA) and theoretically prove the lower bound of its competitive ratio. Three special cases of the offline concave cost scheduling problem and the corresponding optimal algorithms are introduced. Our simulation shows that ROSA achieves a competitive ratio close to the theoretical lower bound under the special cases. Trace-driven simulation using Google cluster data demonstrates that ROSA is superior to the conventional online scheduling algorithms in terms of cost saving.