ANALYSIS OF ADMISSION CONTROL IN P2P-BASED MEDIA DELIVERY NETWORK BASED ON POMDP

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Abstract. *In this paper, we study admission control problems of P2P-based Media Delivery Network (P2P-based MDN). We propose a specific partially observable Markov Decision Process (POMDP) model for P2P-based MDN. Based on this model, the observation-based randomized policy for admission control is provided, which optimizes system's performance by applying policy-gradient algorithm. Observation-based policy can enhance the real-time performance of the system, and policy optimization can improve the accuracy of controller's judgments based on partial information. Novel source selection policy and bandwidth allocation policy are designed to reduce service delay and provide high-quality service. A numerical example is provided to illustrate the effectiveness of our methods.*
Keywords: P2P-based MDN, POMDP, Observation-based randomized policy, Admission control

1. **Introduction.** Streaming media services pose stricter demand on the Quality of Service (QoS) comparing with other types of Internet services. Before the birth of P2P-based architecture, much work has been done to provide QoS assurance of media delivery systems. Various techniques, such as admission control, congestion control and load balance, have been applied to improve QoS. Admission control is an important issue worthy of discussing. A good admission control policy can reduce the degree of the system's congestion and lighten the workload of the central server. The development of admission control just follows the evolution of network architectures.

Admission control policies on the traditional service framework with one single server can be simply divided into two types: deterministic algorithm and statistical algorithm. Deterministic algorithm guarantees the resource consumed by all the connections in the system less than or equal to the capacity of the system [1,2]; statistical algorithm uses the distributions of the system's parameters to compute the overflow probability of the system [3-6]. Admission control in distributed systems can be divided into two kinds: centralized control [7] and distributed control [8,9]. In this paper, considering the special architecture of P2P-based MDN, we adopt both statistical algorithm and distributed control among Peer Nodes (PNs).

Another function of proxy servers in distributed system is to store the heads of media contents to reduce the service delay by transmitting data to clients in advance. This technique is called prefix caching, which has been widely used in streaming media distribution services [10-12]. Prefix caching has a potential problem as mentioned in [8]. If a proxy server accepts a client's request and transmits data, the effort may be worthless when the media server is heavily loaded and has to finally deny the request. However, this problem is not addressed in [8].