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Structured Access Control Mechanism for Mesh-based P2P Live Streaming Systems

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Abstract : Peer-to-Peer (P2P) live streaming systems still suffer a challenge when thousands of new peers want to join into the system in a short time, called flash crowd, and most of new peers suffer long start-up delay. Recent studies have proposed a slot-based user access control mechanism, which periodically determines a certain number of new peers to enter the system, and a user batch join mechanism, which divides new peers into several tree structures with fixed tree size. However, the slot-based user access control mechanism is difficult for accurately determining the optimal time slot length, and the user batch join mechanism is hard for determining the optimal tree size. In this paper, we propose a structured access control (SAC) mechanism, which constructs new peers to a multi-layer mesh structure. The SAC mechanism constructs new peer connections layer by layer to replace periodical access control, and determines the number of peers in each layer according to the system's remaining upload bandwidth and average video rate. Furthermore, we propose an analytical model to represent the behavior of the system growth if the system can utilize the upload bandwidth efficiently. The analytical result has shown the similar trend in system growth as the SAC mechanism. Additionally, the extensive simulation is conducted to show the SAC mechanism outperforms two previously proposed methods in terms of system growth and start-up delay.

Keywords : peer-to-peer, live video streaming system, flash crowd, start-up delay, access control
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