P.O.Box 8718, Beijing 100080, China	Journal of Software, Feb. 2007,18(2):391-399
E-mail: jos@iscas.ac.cn	ISSN 1000-9825, CODEN RUXUEW, CN 11-2560/TP
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基于P2P网络的大规模视频直播系统

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Received 2005-10-13; Accepted 2006-02-23

Abstract
A P2P (peer-to-peer) network based large-scale live video streaming system called Gridmedia is presented in this paper. In this system, a gossip-based protocol is adopted to construct an unstructured application layer overlay. Each peer independently selects its own neighbors and uses a push-pull streaming method to fetch data from neighbors. Compared with the pure pull method of DONet, push-pull method greatly diminishes the accumulated latency observed at end users and efficiently reduces the control overhead of streaming system, both of which are evaluated by the experiments on PlanetLab. A prototype system of Gridmedia has been developed to broadcast the Spring Festival Gala Evening in 2005 over global Internet with 300Kbps video stream and attracted more than 500 000 users all over the world with the peak concurrent online users of 15 239 during the event.

Luo JG, Zhang M, Zhao L, Yang SQ. A large-scale live video streaming system based on P2P networks. *Journal of Software*, 2006,18(2):391-399.
DOI: 10.1360/jos180391
http://www.jos.org.cn/1000-9825/18/391.htm

摘要
介绍了一种基于P2P(peer-to-peer)网络的大规模视频直播系统Gridmedia.该系统采用Gossip协议构建无结构的应用层覆盖网络,每个节点可以独立地选择自己的伙伴节点.在覆盖网络上,每个节点通过一种推拉结合的流传输策略从邻居节点获取数据.与DONet中的纯拉策略相比,推拉结合策略大幅度减小了终端用户观看视频的延迟,并有效降低了直播系统的控制开销.PlanetLab上的大量实验充分表明了该策略的有效性.Gridmedia的原型系统通过300Kbps的视频码流对2005年春节联欢晚会进行了全球互联网直播.晚会期间,全球范围内有超过500 000人次通过系统观看了直播,最高在线人数达到了15 239人,充分验证了系统的性能.

基金项目: Supported by the National Natural Science Foundation of China under Grant No.60432030 (国家自然科学基金); the National Grand Fundamental Research 973 Program of China under Grant No.2006CB303103 (国家重点基础研究发展规划(973)); the National High-Tech Research and Development Plan of China under Grant No.2006AA01Z321 (国家高技术研究发展计划(863))

References:

[1] Wang YW, Zhang ZL, Du DHC, Su DL. A network conscious approach to end-to-end video delivery over wide area networks using proxy servers. In: Guerin R, ed. Proc. of the IEEE INFOCOM. San Francisco: IEEE Press, 1998. 660-667.

[2] Vakali A, Pallis G. Content delivery networks: Status and trends. IEEE Internet Computing, 2003,7(6):68-74.

[3] Chu YH, Rao SG, Zhang H. A case for end system multicast. In: Brandwajn A, ed. Proc. of the ACM SIGMETRICS. Santa Clara: ACM Press, 2000. 1-12.

[4] Zhang B, Jamin S, Zhang L. Host multicast: A framework for delivering multicast to end users. In: Kermani P, ed. Proc. of the IEEE INFOCOM. New York: IEEE Press, 2002. 1366-1375.

[5] Banerjee S, Bhattacharjee B, Kommareddy C. Scalable application layer multicast. In: Steenkiste P, ed. Proc. of the SIGCOMM. Pittsburgh: ACM Press, 2002. 205-217.

[6] Tran DA, Hua KA, Do T. ZIGZAG: An efficient peer-to-peer scheme for media streaming. In: Bauer F, ed. Proc. of the IEEE INFOCOM. San Francisco: IEEE Press, 2003. 1283-1292.

[7] Rejaie R, Stafford S. A framework for architecting peer-to-peer receiver-driven overlays. In: Padmanabhan V, ed. Proc. of the ACM NOSSDAV. Kinsale: ACM Press, 2004. 42-47.

[8] Zhang XY, Liu JC, Li B, Yum TSP. CoolStreaming/DONet: A data-driven overlay network for live media streaming. In: Znati T, ed. Proc. of the IEEE INFOCOM. Miami: IEEE Press, 2005. 2102-2111.

[9] PlanetLab. http://www.planet-lab.org/

[10] Padmanabhan VN, Sripanidkulchai K. The case for cooperative networking. In: Kaashoek F, ed. Proc. of the IPTPS. LNCS 2429, Heidelberg: Springer-Verlag, 2002. 178-190.

[11] Castro M, Druschel P, Kermarrec AM, Nandi A, Rowstron A, Singh A. SplitStream: High-Bandwidth content distribution in a cooperative environment. In: Castro M, ed. Proc. of the IPTPS. LNCS 2735, Heidelberg: Springer-Verlag, 2003. 292-303.

[12] Goyal VK. Multiple description coding: Compression meets the network. IEEE Signal Processing Magazine, 2001,18(5):74-93.

[13] BitTorrent. http://www.bittorrent.com/