In Favour of Posting

THE CHINESE UNIVERSITY OF HONG KONG
Institute of Network Coding
and
Department of Information Engineering
Seminar

Towards Low-Delay Multi-Party Conferencing

By

Prof. Minghua Chen (陳名華教授)
The Chinese University of Hong Kong

Date : 10 August 2011 (Wednesday)
Time : 11:00 am -12:00 pm
Venue : Room 833, Ho Sin Hang Engineering Building
The Chinese University of Hong Kong

Abstract

With the availability of front-facing cameras in high-end smartphone devices, laptops, and HDTVs, multi-party video conferencing, which involves more than two participants in a live conferencing session, has attracted a significant amount of interest from the industry. Skype, for example, has recently launched a monthly-paid service supporting multi-party video conferencing in its latest version. Google+, a recently launched social network service, also involves an exciting multi-party conferencing component named Google hangout.

In this talk, we first give an overview to the existing industrial and academic solutions to multi-party conferencing. We present a formulation to the problem, of which the existing solutions can be understood as algorithms solving special cases. We then revisit the problem of multi-party conferencing and rethink the design space beyond those explored in existing solutions. The emphasis on maximizing session rate subject to low end-to-end delay constraints between any two parties in the conference is a must, and makes the problem uniquely challenging. To this end, we present Celerity, a multi-party conferencing solution specifically designed to achieve our objectives. It is entirely Peer-to-Peer (P2P), and as such eliminating the cost of maintaining centrally administered servers. It is designed to deliver video with low end-to-end delays, at quality levels commensurate with available network resources over arbitrary network topologies where bottlenecks can be anywhere in the network. This is in contrast to commonly assumed P2P scenarios where bandwidth bottlenecks reside only at the edge of the network. The highlight in our design is a distributed and adaptive rate control protocol, that can discover and adapt to arbitrary topologies and network conditions quickly, converging to efficient link rate allocations allowed by the underlying network. In accordance with adaptive link rate control, source video encoding rates are also dynamically controlled to optimize video quality in arbitrary and unpredictable network conditions. We apply network coding to allow flexible and opportunistic local loss recovery, without incurring additional retransmission delay which deteriorates conferencing experience.

We have implemented Celerity in a prototype system, and demonstrate its superior performance over existing industrial and academic solutions, including Skype, in a local experimental testbed and over the Internet.

We believe it is critical to exploit network coding to further improve the performance of such delay-sensitive systems. To this end, I will discuss some open problems which we are currently investigating.

This is a joint work with Xiangwen Chen from The Chinese University of Hong Kong, Baochun Li from The University of Toronto, Yao Zhao from Alcatel-Lucent, Yunnan Wu from Facebook, and Jin Li from Microsoft Research.

Biography

Minghua Chen received his B.Eng. and M.S. degrees from the Department of Electronics Engineering at Tsinghua University in 1999 and 2001, respectively. He received his Ph.D. degree from the Department of Electrical Engineering and Computer Sciences at University of California at Berkeley in 2006. He spent one year visiting Microsoft Research Redmond as a Postdoc Researcher. He joined the Department of Information Engineering, the Chinese University of Hong Kong, in 2007, where he currently is an Assistant Professor. He received the Eli Jury award from UC Berkeley in 2007, the ICME Best Paper Award in 2009, and the IEEE Transactions on Multimedia Prize Paper Award in 2009. His recent research interests include optimizing energy consumption in data centers, designing efficient and secure smart-grids, delivering multimedia content subject to delay constraint with network coding, synthesizing distributed algorithms for combinatorial network optimization, p2p and wireless networking, and secure network communications.

****ALL ARE WELCOME ****

Host: Professor Raymond W.H. Yeung (Tel: 2609-8375, Email: whyeung@ie.cuhk.edu.hk)
Enquiries: Information Engineering Dept., CUHK (Tel.: 2609-8388)

S:\2011\sem2311_INC_Minghua Chen_WHY_100811