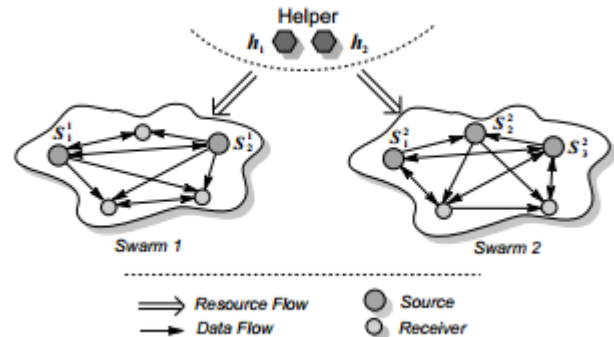


Optimal Bandwidth Sharing in Multi-Swarm Multi-Party P2P Video Conferencing Systems

Chao Liang, Miao Zhao, and Yong Liu
Networking, IEEE/ACM Transactions on (Volume:19 , Issue: 6)

Multi-swarm multi-party P2P conferencing

- Helpers: Helping relaying the resource
- Swarms:
 - Sources: Peers who generate video streams
 - Receivers: Peers who watch the streams



Distribution tree within conferencing swarm

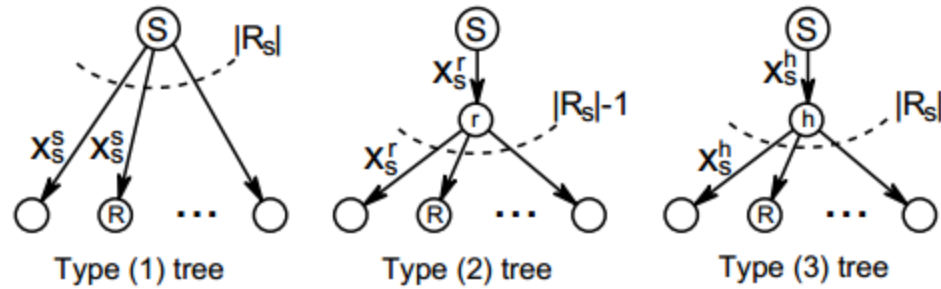
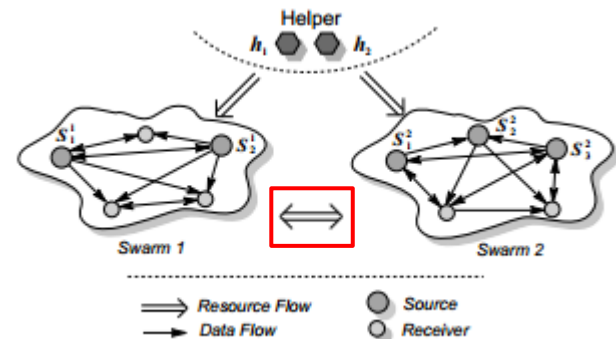


Fig. 2. Different Types of Distribution Trees.

Problem and solution

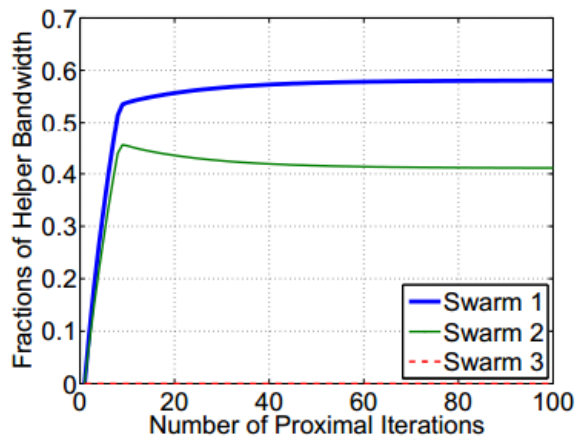
- Problem: Peers in the conferencing swarm do not have enough bandwidth to support video stream from sources.
- Solution: Cross-swarm bandwidth sharing
 - Independent swarms
 - Cooperative swarms



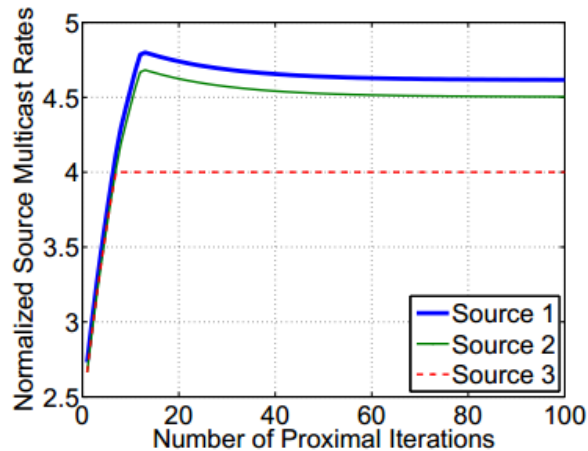
Cross-swarm bandwidth sharing: Independent swarm

- Proximal approximation algorithm
 - Source multicast rate adjustment
 - Helper bandwidth allocation
 - Swarm coordinator:
 - Communicate with helpers
 - Maintain the Lagrangian multiplier
- Marginal utility driven algorithm
 - Intra-swarm source rate adaptation
 - Inter-swarm helper bandwidth allocation

Cross-swarm bandwidth sharing: Independent swarm(cont.)



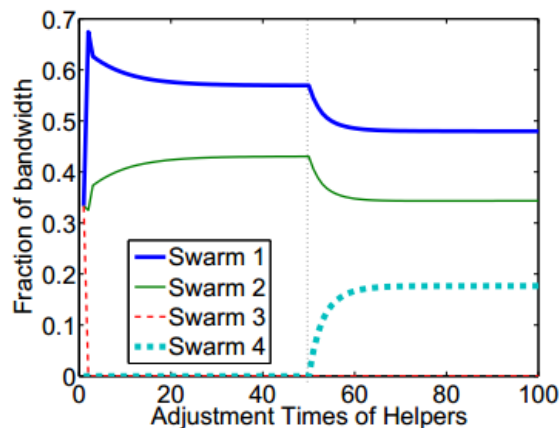
(a) Fractions of Helper Bandwidth



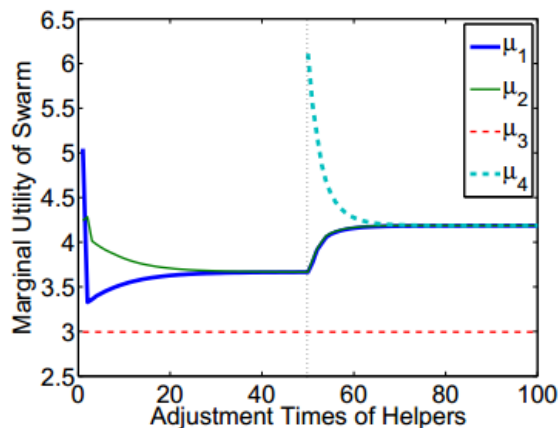
(b) Source Rate Evolution

Fig. 5. System evolution with proximal approximation based algorithm.

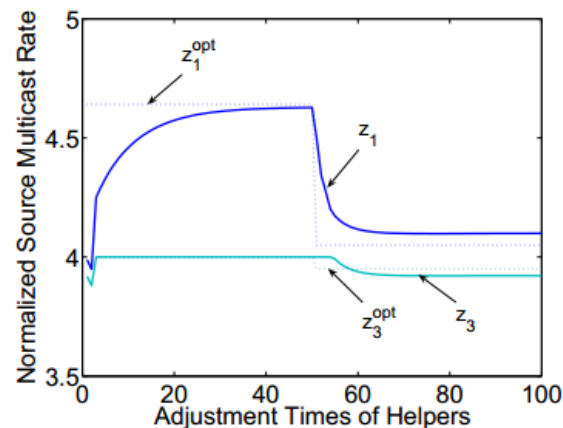
Cross-swarm bandwidth sharing: Independent swarm(cont.)



(a) Bandwidth fraction of helpers



(b) Marginal utility of swarm

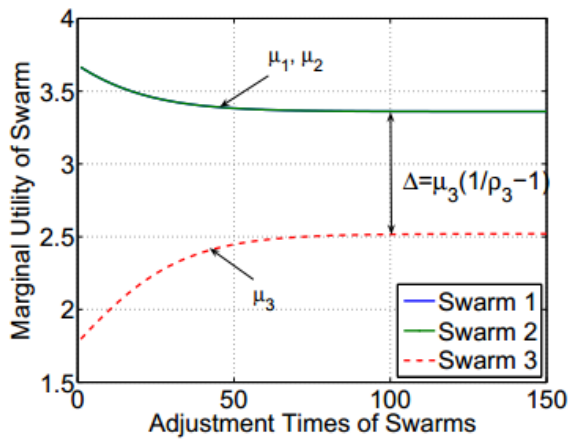


(c) Source multicast rate

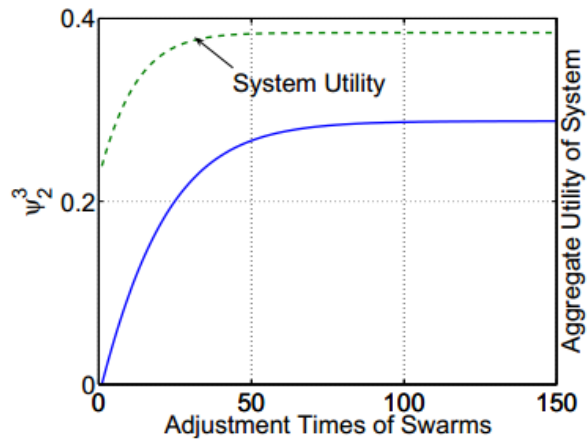
Fig. 7. Simulation results of marginal utility based algorithm. There are three conferencing swarms at the beginning and swarm 4 joins the system in the middle.

Cross-swarm bandwidth sharing: cooperative swarm

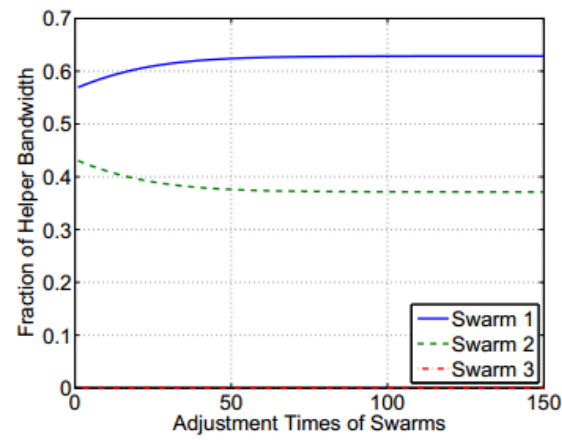
- Marginal utility driven algorithm
 - Swarm sharing adjustment



(a) Marginal utility of swarm



(b) Bandwidth fraction of swarm



(c) Bandwidth fraction of helpers

Fig. 8. System evolution in cooperative conferencing systems. Swarm 3 shares its bandwidth resources with other swarms.