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

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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.)

Fig. 5. System evolution with proximal approximation based algorithm.
Cross-swarm bandwidth sharing: Independent swarm (cont.)

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

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