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Suboptimal network coding subgraph algorithms for 5G minimum-cost multicast networks

Key words: Network coding subgraph, Minimum power cost, 5G, Separation architecture

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Motivations

1. Multicasts play an important role in mobile games, live casts, and webcasts, which apply considerable pressure on 5G networks.

2. The coexistence is not within the scope of classical multicast technologies and optimal solutions of a minimum-cost networking problem are unacceptable for large scale networks considering their computational complexity and convergence.

Main idea

Utilizing the flexible routing configuration under the separation architecture of control and data planes in 5G, We re-configure the links in the network to extend the Steiner tree multicast. We proposed the critical 1-cut path eliminating (C1CPE) algorithm to find the minimum-cost solution for the coexistence of two multicast trees with the same throughput, and the extend selective closest terminal first (E-SCTF) algorithm when the two multicast trees share the same source and destinations.

Methods

1. Analyse the power cost for different throughput in wireless channel to get quantificational guidance for routing choice and existing connection reuse.
2. For one multicast session with doubled throughput, the E-SCTF algorithm extends the method of Ramanathan (1996) to alter the cut-set value of the topology from 1 to 2. The algorithm chooses the least cost one among the shortest paths for the remaining destinations.
3. For two-multicast session with overlapping links, the C1CPE algorithm aims to eliminate the critical 1-edge cut (Wang and Shroff, 2010) to create a decodable topology.

Major result

Our methods cost less power in the corresponding simulations.

one multicast

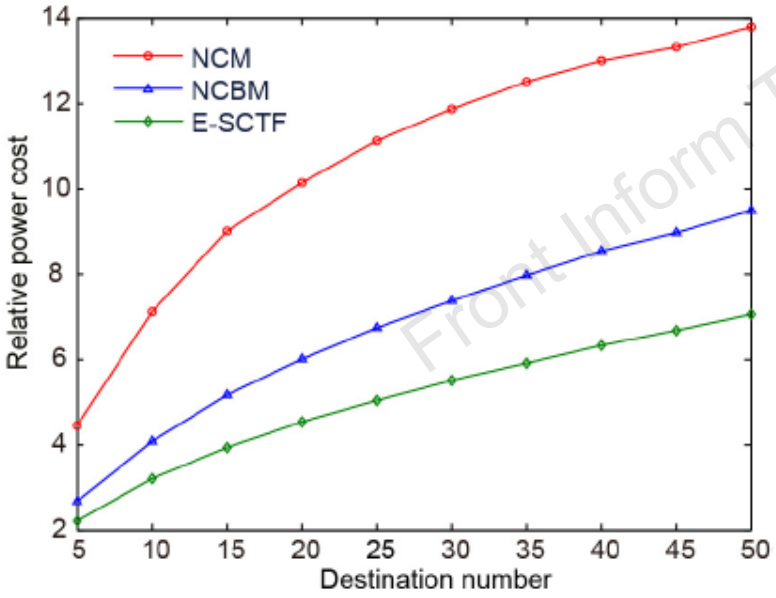

Fig. 4 Relative power cost for different destination numbers

two multicasts

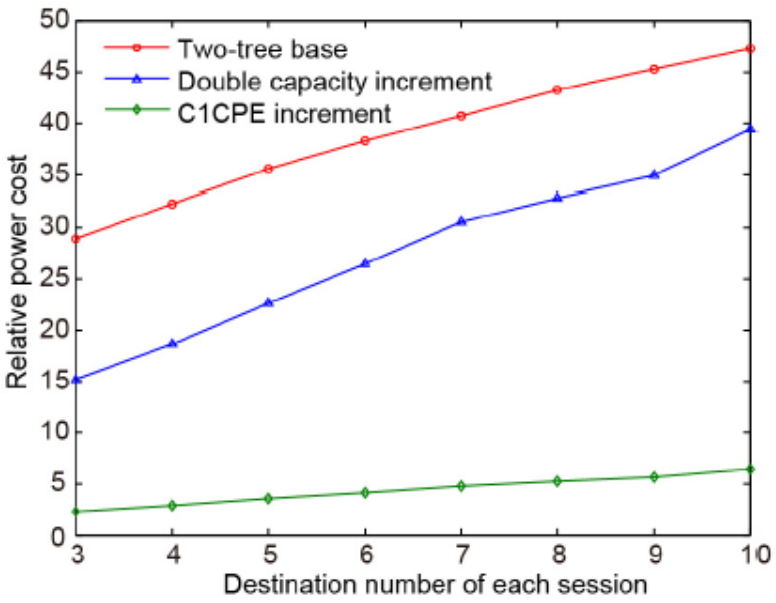

Fig. 7 Relative power cost for different destination numbers of each session

Conclusions

1. We solved the generalized routing problem for the coexistence of two multicasts with the same throughput in the C1CPE algorithm and the special case in the E-SCTF algorithm when the two multicasts shared the same source and destinations.

2. The algorithms were opposite to the logically centralized controller in a 5G separation architecture with the minimum-cost target effectively reducing the waste of the resource.