Introduction & Problem Setup

- Popularity of mobile video streaming increases.
- Wireless network resources are expensive and scarce.
- Video multicast uses network resources more efficiently.
- Video file is usually split into blocks (each consisting of many packets).
- The base station (BS) has to finish multicasting one block to all users, before it can multicast the next block.
- Aim: multicast the packets of a block to all users as quickly as possible. (note: we assume rateless coding of the packets of a block)
- Per-slot opportunistic scheduling based on maximizing instantaneous rate is no longer the optimal solution.
- The optimal solution should take into account both channel and receiver state (number of packets received so far).

Objective

Minimizing the completion time (time for all users to receive all the packets in a block) by choosing the modulation and coding scheme (MCS) based on the channel and receiver state.

Existing Algorithm (Broadcast & Greedy(Max-Sum Rate)) VS Optimal Algorithm (Dynamic Programming (DynProg))

Broadcast & Greedy algorithms
- Channel state dependent but receiver state independent algorithms
- Greedy transmits at high rate to maximize instantaneous throughput when one user is a lot better than the other.
- Broadcast always transmit at low rate so that all user successfully receive data with high probability.

Optimal algorithm (DynProg)
- Channel & receiver state dependent algorithm
- Tradeoff between throughput and estimated completion time

Weighted-Completion Time (Weighted-CT)

Estimated Completion Time

Results

Scenario: N=2 users and C=2 channel states

Conclusions

- Broadcast performs well in highly heterogeneous scenarios but not in homogeneous scenarios when the channel variation is high.
- Greedy opportunisticly transmits at high rate, thus performs well in homogeneous scenarios but not in heterogeneous scenarios when there exists a bad user.
- Weighted-CT performs close to optimal in both homogeneous and heterogeneous scenarios by taking into account receiver and channel state; it outperforms both Broadcast and Greedy algorithms.

References

1. Gek Hong Sim, Balaji Rengarajan, Joerg Widmer, Institute IMDEA Networks, University Carlos III