Title: Epidemic Live Streaming: Optimal Performance Trade-Offs
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This paper uses diffusion function to analyze the performance trade-offs of push based peer/chunk selection schemes. The peer selection schemes contain random peer, random useful peer, and most deprived peer. The chunk selection schemes include latest blind chunk, latest useful chunk, and random useful chunk. The paper gives two performance metrics: diffusion rate and diffusion delay, which could be derived from diffusion function. There is a natural trade-off between rate and delay.

 First, the paper gives the general lower bound on diffusion delay, valid for any diffusion scheme. The proof of this lower bound uses the obvious view that the population of peers that have received any given chunk at most doubles every time unit. Then, according to the specific characters of random peer, latest blind chunk scheme and random peer, latest useful chunk scheme, the paper derives the more tight bounds for them respectively.

For random peer, latest blind chunk scheme and latest blind chunk, random useful peer scheme, the paper derives the recursive formulas through mean-field approximations for them. We then could get the solution of the diffusion function through the recursive formulas.

The above analysis is based on some assumptions. First, the paper assumes a complete overlay graph and a homogeneous upload capacity distribution. Second, the paper assumes peers have a perfect knowledge of the collections of chunks owned by their neighbors.