

We consider the problem of transforming any weakly connected overlay network into a topology of logarithmic degree and diameter.

The overlay network is modeled as a directed graph, in which messages are sent in synchronous rounds, and new edges can be established by sending node identifiers.

However, every node can only send and receive (at most) a polylogarithmic number of bits in each round, which makes the naive approach of introducing all neighbors to each other until the network forms a clique infeasible.

We present a randomized algorithm that takes time $O(\log n)$, w.h.p, which is asymptotically optimal. At the heart of our algorithm lies an observation of the behaviour of short random walks combined with recent result about the conductance of graph powers.