BATS: Achieving the Capacity of Networks with Packet Loss

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Abstract: Network coding can significantly improve the transmission rate of communication networks with packet loss compared with routing. However, using network coding usually incurs higher computational and storage costs in the network devices and terminals. For example, some network coding schemes require the computational and/or storage capabilities of an intermediate network node to increase linearly with the number of packets for transmission, making them difficult to be implemented in a router-like device that has only constant computational and storage capabilities.

In this talk, we introduce BATS code, which enables a digital fountain approach to resolve the above issue. BATS code is a coding scheme that consists of an outer code and an inner code. The outer code is a matrix generation of a fountain code. It works with the inner code which comprises random linear coding at the intermediate network nodes. BATS codes preserve such desirable properties of fountain codes as ratelessness and low encoding/decoding complexity. The computational and storage capabilities of the intermediate network nodes required for applying BATS codes are independent of the number of packets for transmission. It has been verified theoretically for certain special cases and demonstrated numerically for general cases that BATS codes can achieve rates very close to optimality.