
Network coding: A transportation vs. computation model

Network coding enhances the operation of networks to go far beyond traditional routing, or store-and-forward, approaches. After a suitable representation of source signals the notion of coding is associated with a mechanism to provide protection against losses in the network; coding is also employed at the link level to protect against random errors or erasures on individual links. Traditionally, the network's main task is to transport, /unmodified, / information from source nodes to sink nodes. Network coding, breaks with this viewpoint in several essential ways. Information is treated as a virtual, abstract entities that can be operated upon, rather than as objects to be transported unchanged. In fact, it allows network nodes to combine data streams from different incoming links into arbitrarily formed mixtures. This mixing of data streams radically changes the way information is transmitted. Rather than transporting bits, an intended receiver is provided with enough evidence to infer the intended information. Naturally, any piece of evidence can be replaced with any other piece of evidence so that the loss of particular packets or information is not nearly as problematic as in the transportation model.

The consequences of this paradigm shift for the operation of networks would justify and motivate substantial work.

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