

Decision-making process for decentralized multi-hop payments

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The problem in decision-making in a person-to-person chain is that a single link in the chain can break it. Primarily, a link in a chain can block decisions (by not agreeing on and forwarding it). In person-to-person payments, a blocked decision results in credit being locked indefinitely as the payment cannot proceed (it simply gets stuck). It is possible to prevent attacks that block decisions by punishing the attacker. As organizing such a punishment is itself a decision that can get blocked, the payment has to be done in such a way that the decision to start the penalty is itself enforced by a penalty, and the decision to end the penalty (and the payment) is also itself enforced with a penalty. Logically, the decision to start the payment (and the penalty) has to affect the outgoing balance (and thus start from the buyer) and the decision to finish the payment (and the penalty) has to affect the incoming balance (and thus start from the seller). When finishing the payment, there is a gradual decrease in how much can be claimed, and when starting the payment, there is a gradual decrease in how much can be cancelled (along with fees added on top of the payment that are paid out in proportion to how long the payment was stuck). With this penalty system, the buyer will request an agreement to start the payment. Depending on if everyone agrees, the buyer will either cancel the attempt, or go through with it. For either outcome, each intermediary and the seller is incentivized (by the penalty) to conform to it. The decision to go through with the payment requires two steps. First, the buyer has to inform each intermediary that they decided to do the payment (i.e., that they revoke their right to decide to cancel the payment). Then, the payment has to be finished from the seller and backwards, so that the penalty can enforce it (i.e., the penalty when finishing the payment has to affect the incoming balance, by reducing it relative to how much had been finalized already at the outgoing balance).

