If both peers in each “link” in a multihop payment deposits the amount to be sent (i.e., the peer receiving also locks an equal amount same as the peer sending), they have a strong incentive to cooperate (on the “abort step” specifically). This makes it possible to make decisions by majority vote (a form of “proof-of-stake” actually). This only works where the payment chain has oversight such that they can know exactly all nodes involved, and this is only the case with 4 nodes or less. With 4 nodes, the “central pair”, BC in ABCD, have full oversight.

The symmetric deposit requires both peers in a pair sign it, and to abort requires both peers sign it. The first and last pair (AB and CD) can then “upgrade” their pending state, by 3 of 4 signatures. The upgraded state, overrules an abort at the “pair pending” state (which required 2 of 2 signatures). The middle pair (BC) cannot participate in this “majority vote pending state” because they would then risk more capital than A and D (twice as much), so BC use the pair-pending only (2 of 2 to abort).

Now, B and C have control of the situation, but A and B and C and D all have the same “deposit” and therefore risk. The situation is in symmetry, game theoretically.

Then, the commit proof (which is valid on-chain, and note there is no timeouts here in any way) includes the pending proof for all pairs (the upgraded proof for AB and CD, and the basic proof for BC). It then requires 3 of 4 signatures, and is enforceable on-chain by any pair’s payment channel.