Increase of long-term success ratio using novel splitting methods in Interdimensional SpeedyMurmurs

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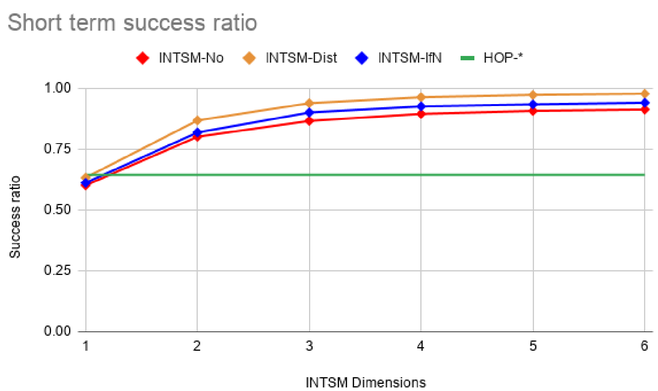
1 Background

- Popular cryptocurrencies lack scalability (low transaction throughput).
- Payment channel networks (PCN's) try to increase scalability.
- PCN's have frequent payment failures.
- Interdimensional SpeedyMurmurs (INTSM)[1] increases the success ratio by allowing intermediaries in the PCN to split transactions.
- INTSM combined with several splitting methods achieved a big increase of success ratio in the short term.

2 Research Questions

How do the current splitting methods fare in the long term?

How can novel splitting methods increase the long term success ratio?



3 Method

- Simulate protocol with old and novel splitting methods.
- Using a snapshot of a real-world used PCN (Lightning) as data.
- Transactions and channel capacities modeled with exponential distributions.
- Network balance changes remain on the network for every subsequent transaction.

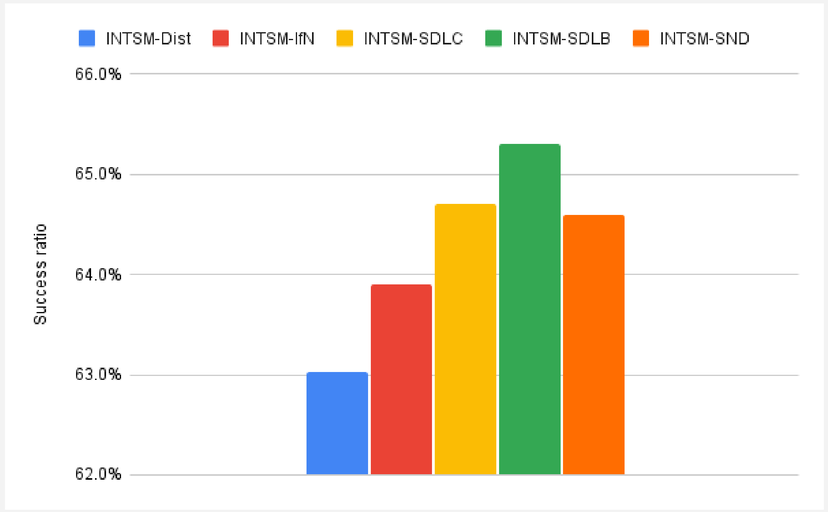
4 Current Splitting Methods

1. INTSM-IfN: Splits the transaction only when necessary.
2. INTSM-Dist: Splits the transaction over the nodes closest to the receiver.
3. INTSM-No: Does not split.
4. Hop-Dist: Less flexible hop distance.

5 Novel Splitting Methods

- **Split Distance Look-Ahead Capacity (SDLC):**
  Dist often has ties. **SDLC** improves upon Dist by splitting ties by preferring channels with a higher total outgoing capacity.
- **Split Distance Look-Ahead Balance (SDLB):**
  Dist often has ties. **SDLC** improves upon Dist by splitting ties by preferring channels with a higher total outgoing balance.
- **Split If Necessary Distance (SND):**
  Iterates over all possible subsets of size *k* where *k* is the minimal amount of splits needed to perform the transaction. Selects the subset with closest additive distance receiver.

6 Results



- **SDLC:** In combination with HOP initially an increase of 6% but eventually converged back to normal. With INTSM a consistent 0.8% increase was achieved.
- **SDLB:** With HOP a large increase of 11.6% was maintained. With INTSM an increase of 1.8%.
- **SND:** No change with HOP, with INTSM and increase of 0.7%

7 Conclusions

- The new splitting methods show a slight increase over the previous methods with **SDLB** performing best overall.

R References

[1] L Eckey, S Faust, K Hostáková, S Roos: Splitting Payments Locally While Routing Interdimensionally .

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