Mimblewimble: Private, Massively-Prunable Blockchains

Andrew Poelstra

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October 8, 2016

History

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- I am not Lord Voldemort.

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- Mimblewimble transactions are inherently scriptless.

Mimblewimble Transactions

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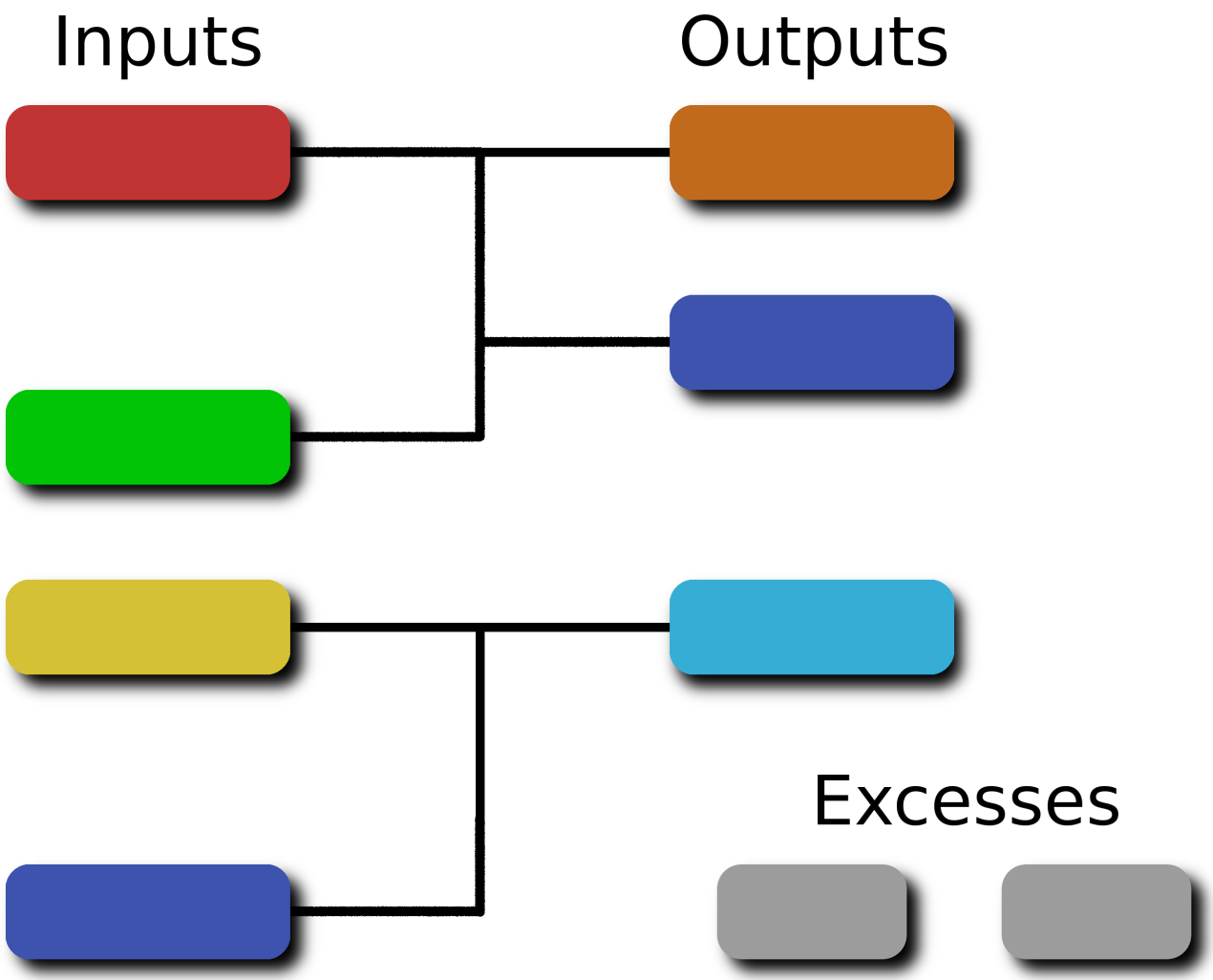
- Excess: difference between outputs and inputs (group element), plus signature (for authentication and to prove non-infaltion)

Mimblewimble Transactions



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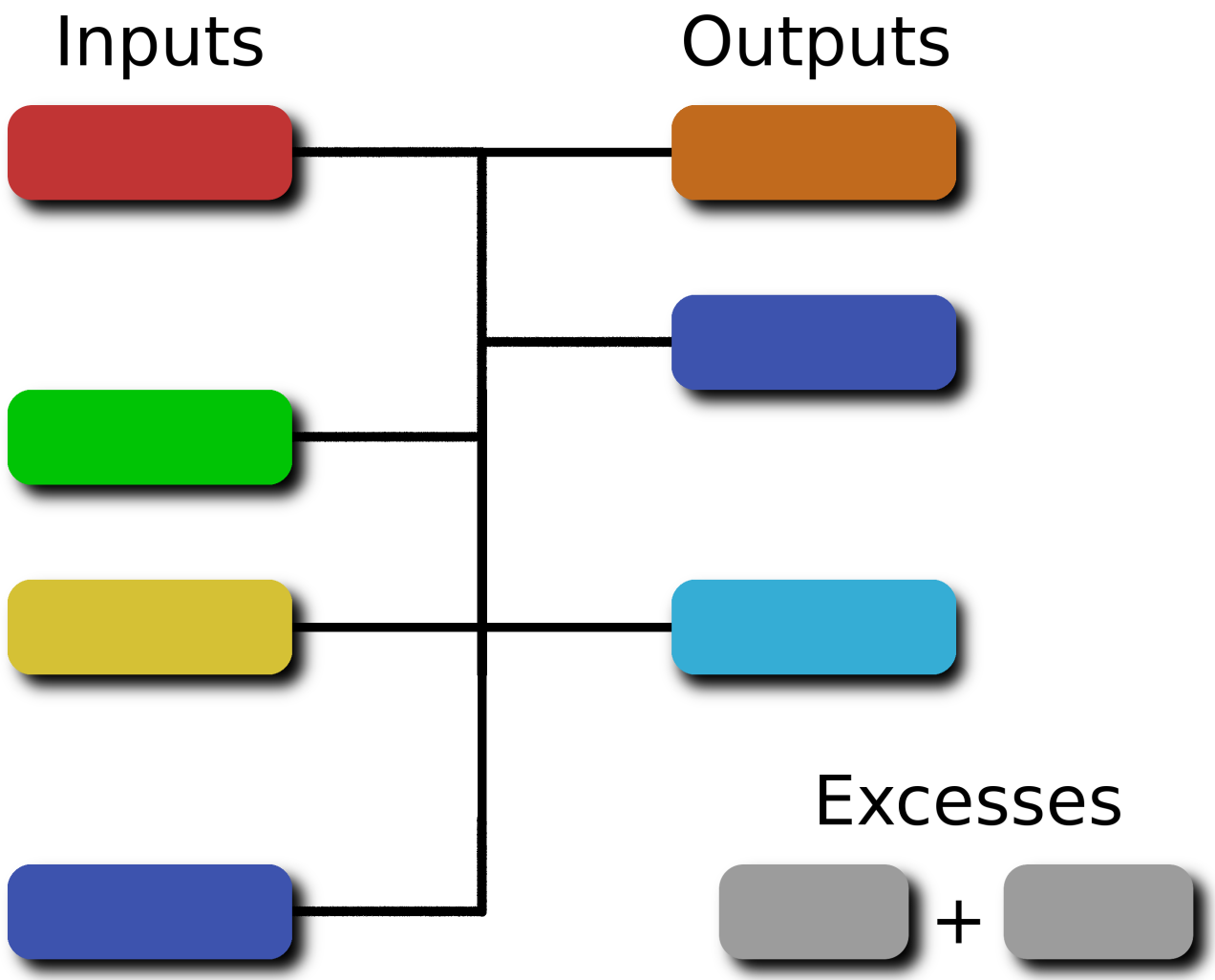

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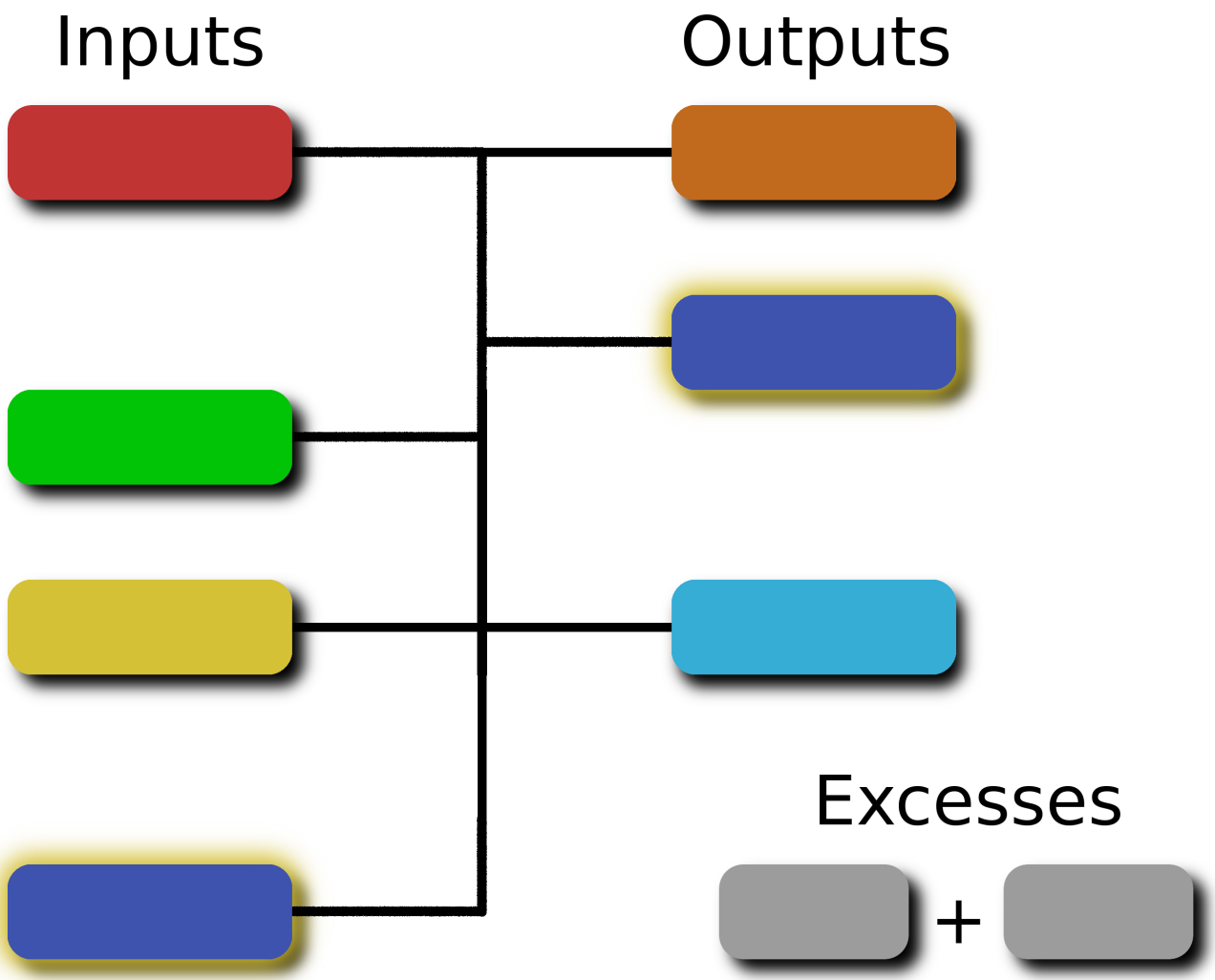

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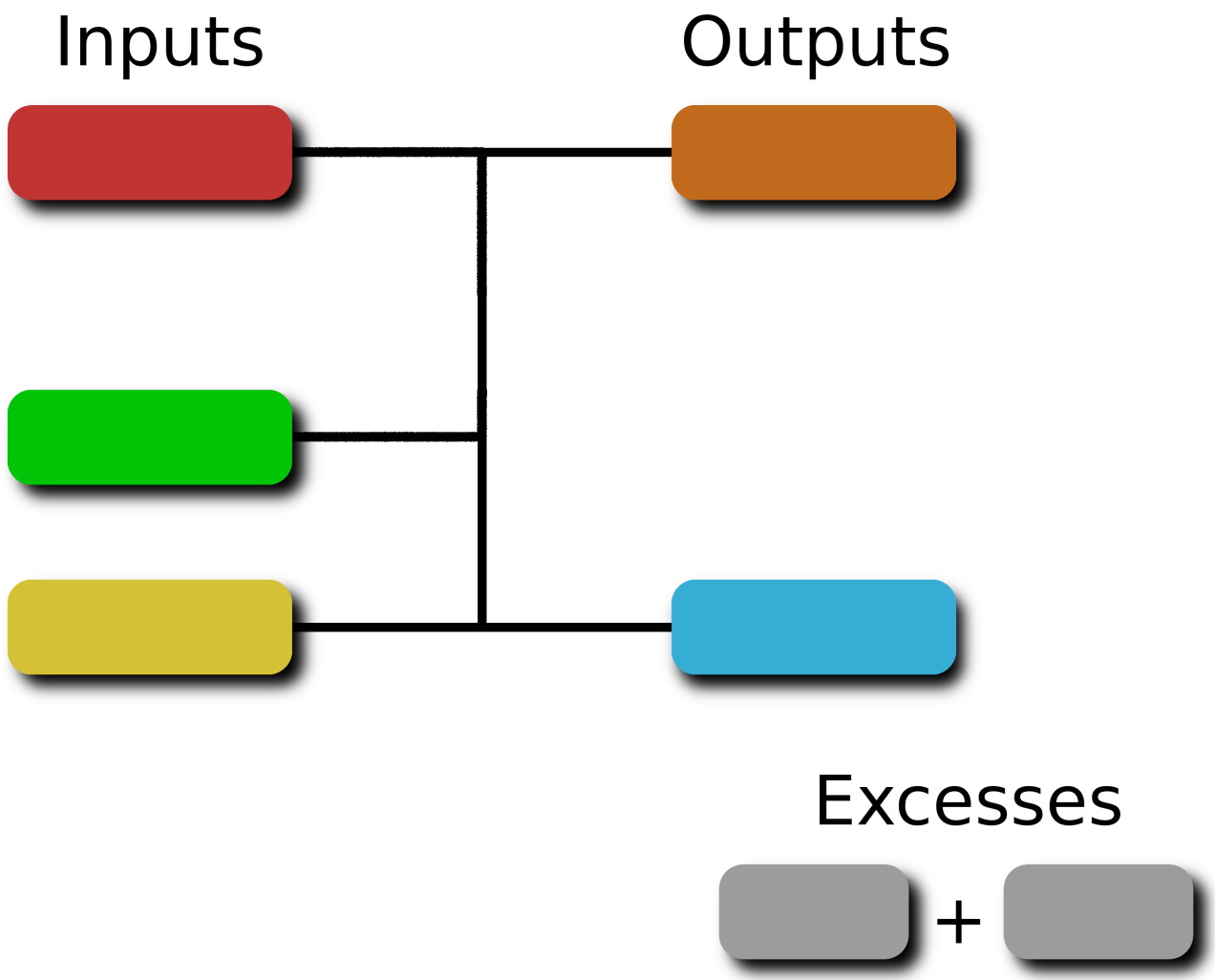

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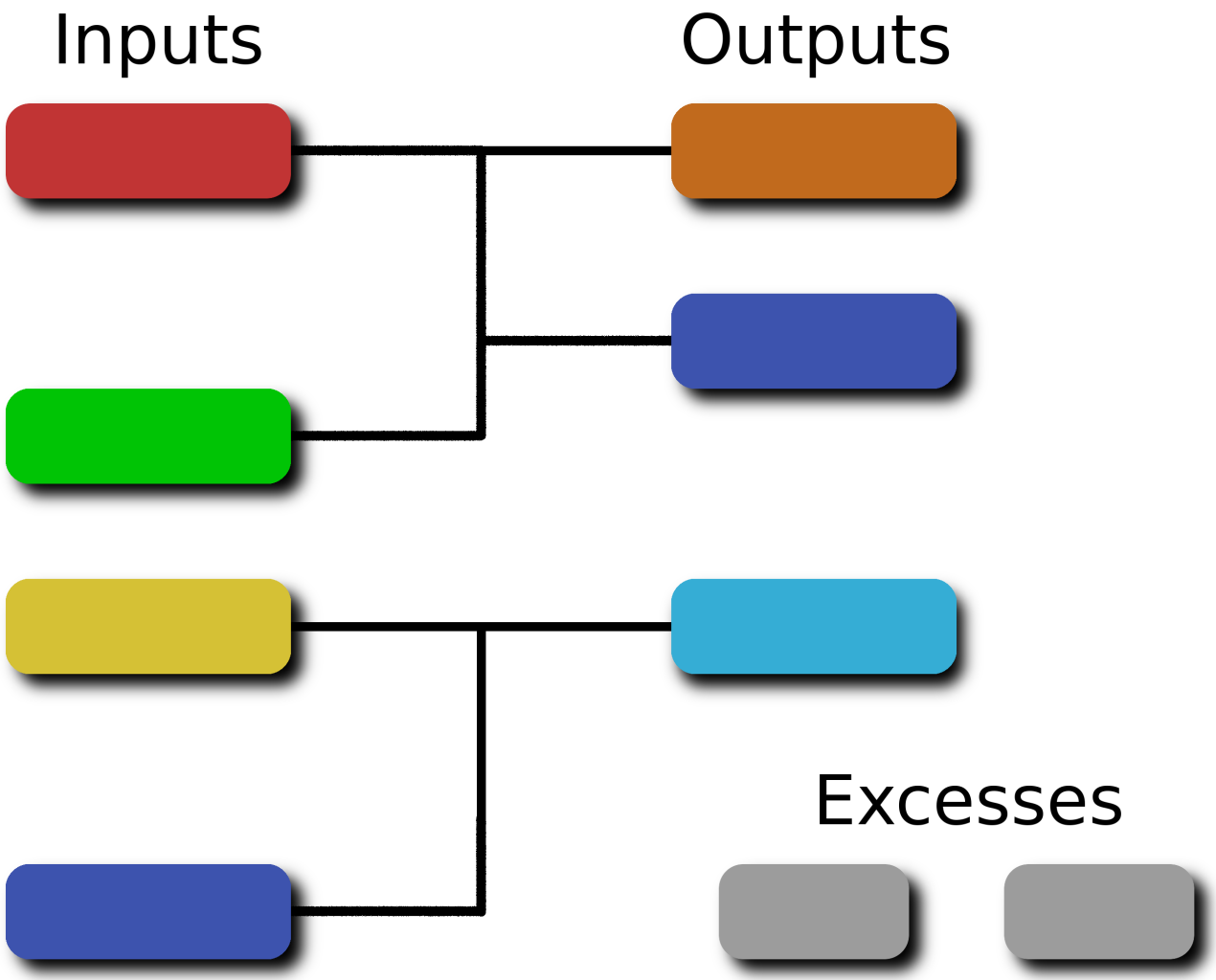

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- A list of excess value(s) and signature(s)

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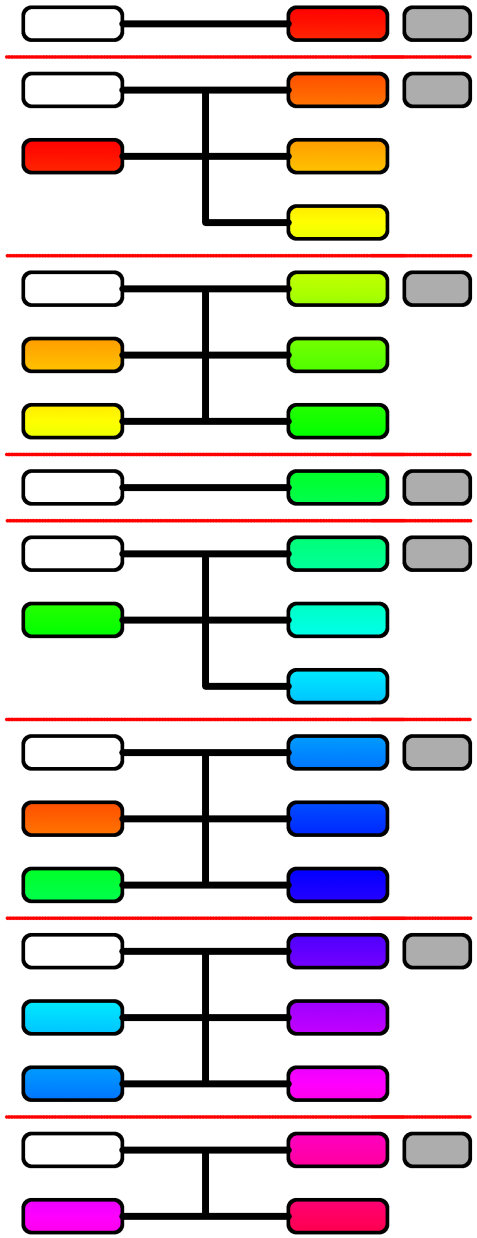

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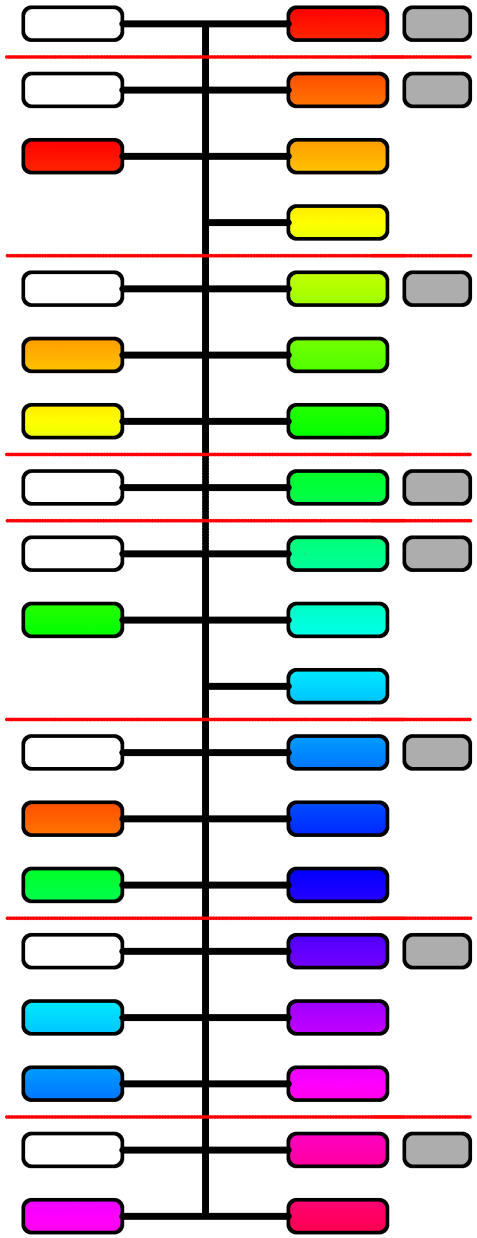

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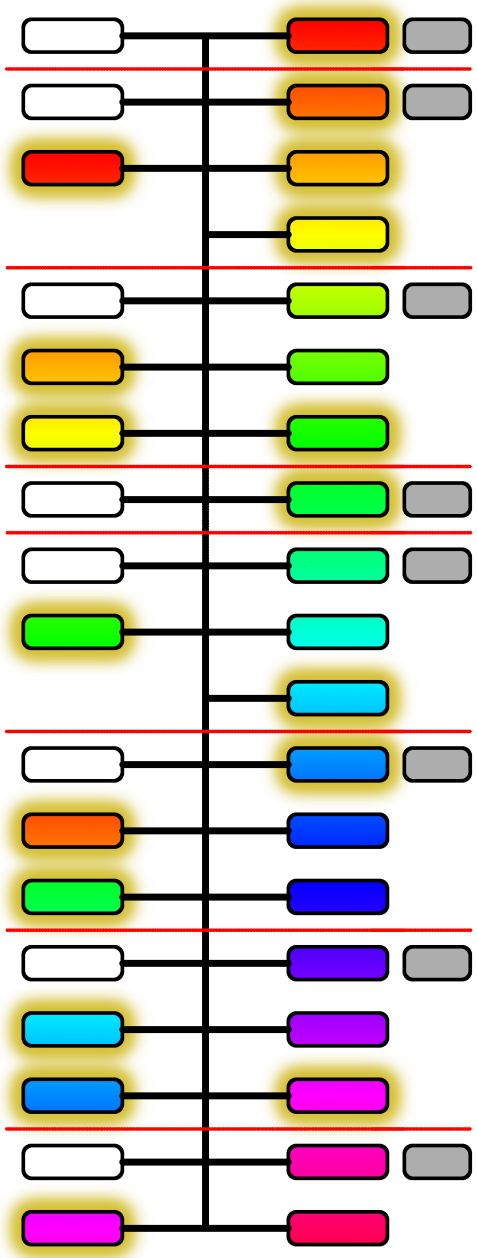

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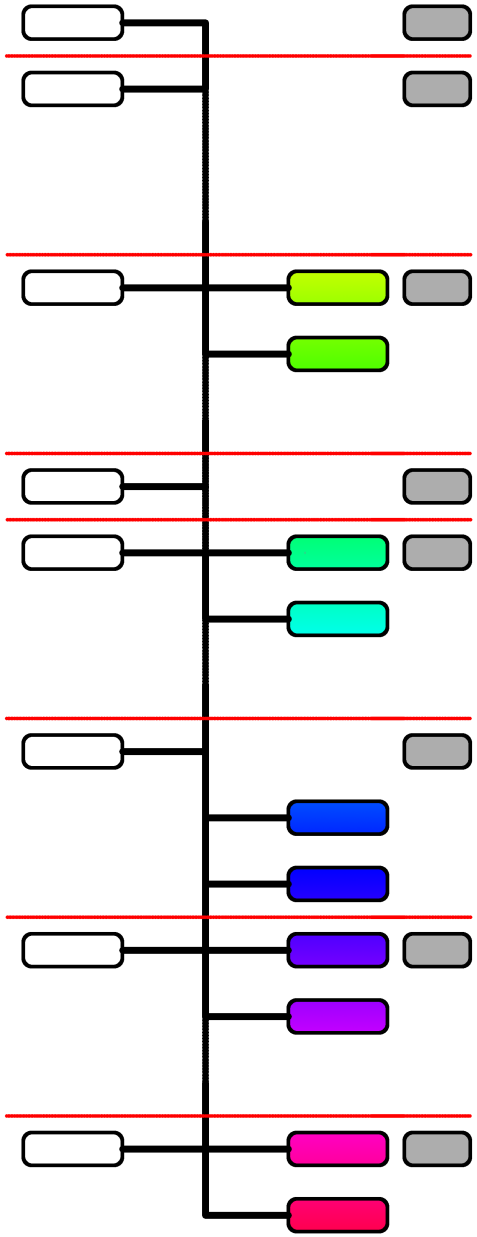

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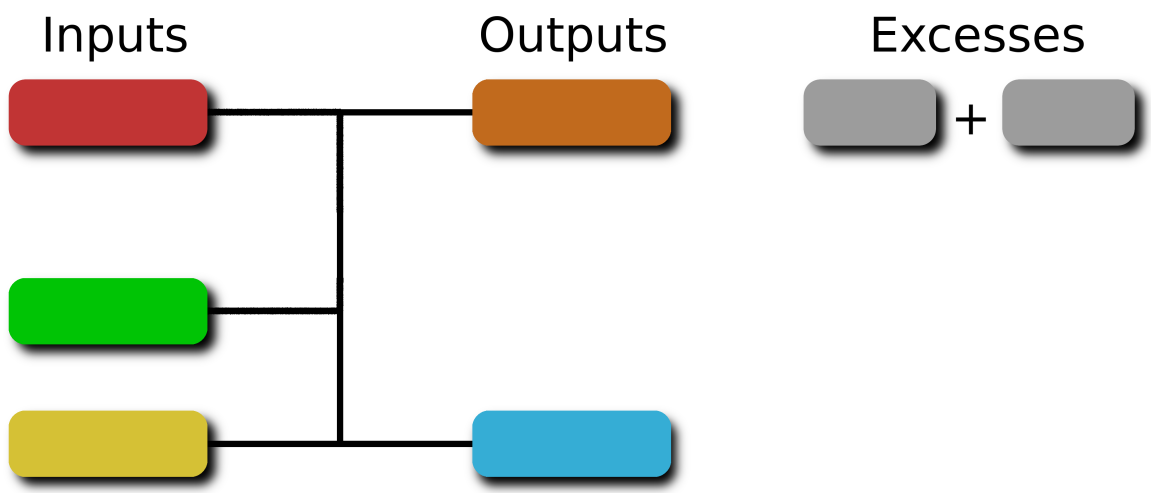

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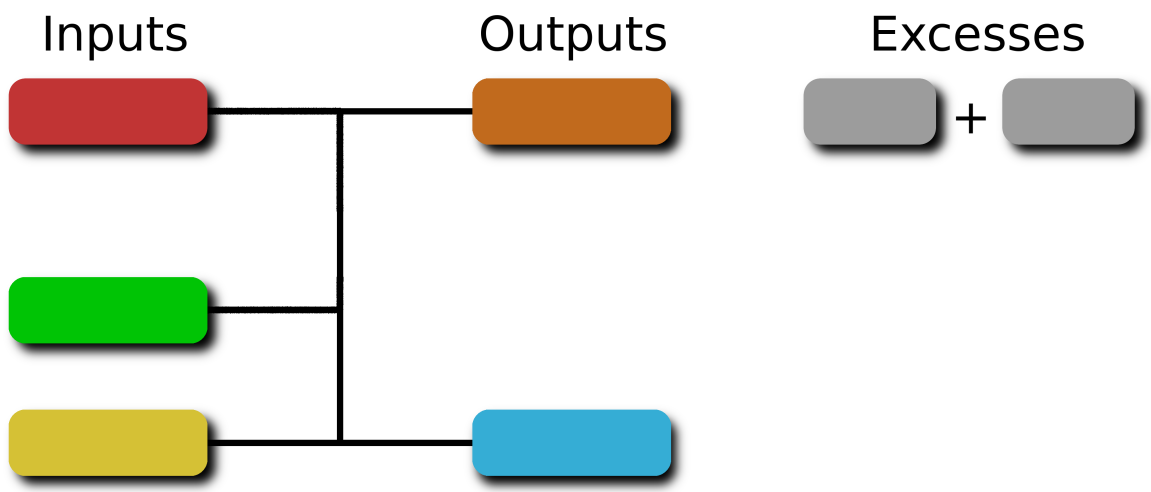

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- Block headers
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- Rangeproofs for the above (witness data)
- Full blocks near the tip should be kept to handle reorgs
- In Bitcoin there are 150 million transactions and 40 million unsigned transaction outputs: 21.6Gb of historic data, 2Gb of UTXOs and 100Gb of UTXO rangeproofs.

Sinking Signatures

Open problem 2 from the Voldemort paper: can we aggregate excess signatures?

- Difficult to do without also making them negatable in later blocks. (If you can add you can subtract.)

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- Now only one excess and (multi-)signature per block.
- In Bitcoin there are 450000 blocks: so 22Mb of historic data (but 450k pairings to verify), 2Gb of UTXO and 100Gb of rangeproofs.

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- It is possible to compress a chain of blockheaders to logarithmic size while still having a proof that takes the same expected work as the original [Back et. al. 2014; Kiayias, Lamprou, Stouka 2016].

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- This is a *sinking signature*, which can be made log-sized. [Poelstra, Kulkarni 2016]
- Simulations show a 500000-block chain can likely be compressed to 300 blocks. We now have *1Mb* of historic data (20 seconds on one core to verify), 2Gb of UTXO and 100Gb of rangeproofs.

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- Mimblewimble verifiers should demand a month or two of non-compact blocks on top of a compact chain. This proves a month or two of work, but a forger expects to do as much work as the entire chain. So no "incentive cliff" and verifiers can also be assured that their chain was no accident.

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- Sidechain?

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- Quantum resistance

Thank You

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