SipHash: a fast short-input PRF

D. J. Bernstein,
University of Illinois at Chicago &
Technische Universiteit Eindhoven

Joint work with:

Jean-Philippe Aumasson,
Kudelski Security (NAGRA)

https://131002.net/siphash/

Several motivations:

1. Optimize secret-key crypto for *short messages*.

2. Build a PRF/MAC that's secure, efficient, *simple*.

3. Application: authenticate Internet packets.

4. Application: defend against hash flooding.

5. Analyze security of other hash-flooding defenses. Followup work with Martin Boßlet pushes this much further.

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Store string s in list $\#i$
where $i = H(s) \bmod \ell$.

With n entries in table,
expect $\approx n/\ell$ entries
in each linked list.
Choose $\ell \approx n$:
expect very short linked lists,
so very fast list operations.

(What if n becomes too big?
Rehash: replace ℓ by 2ℓ.)

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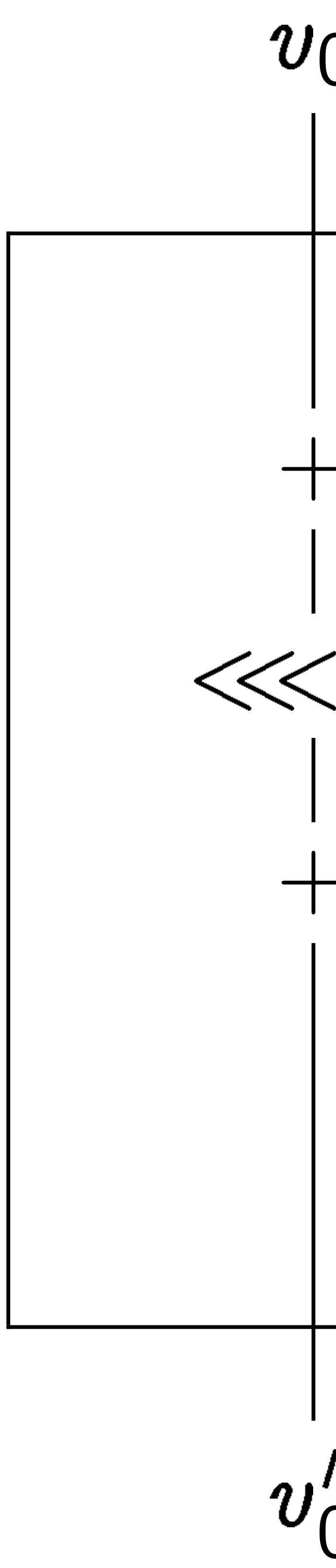

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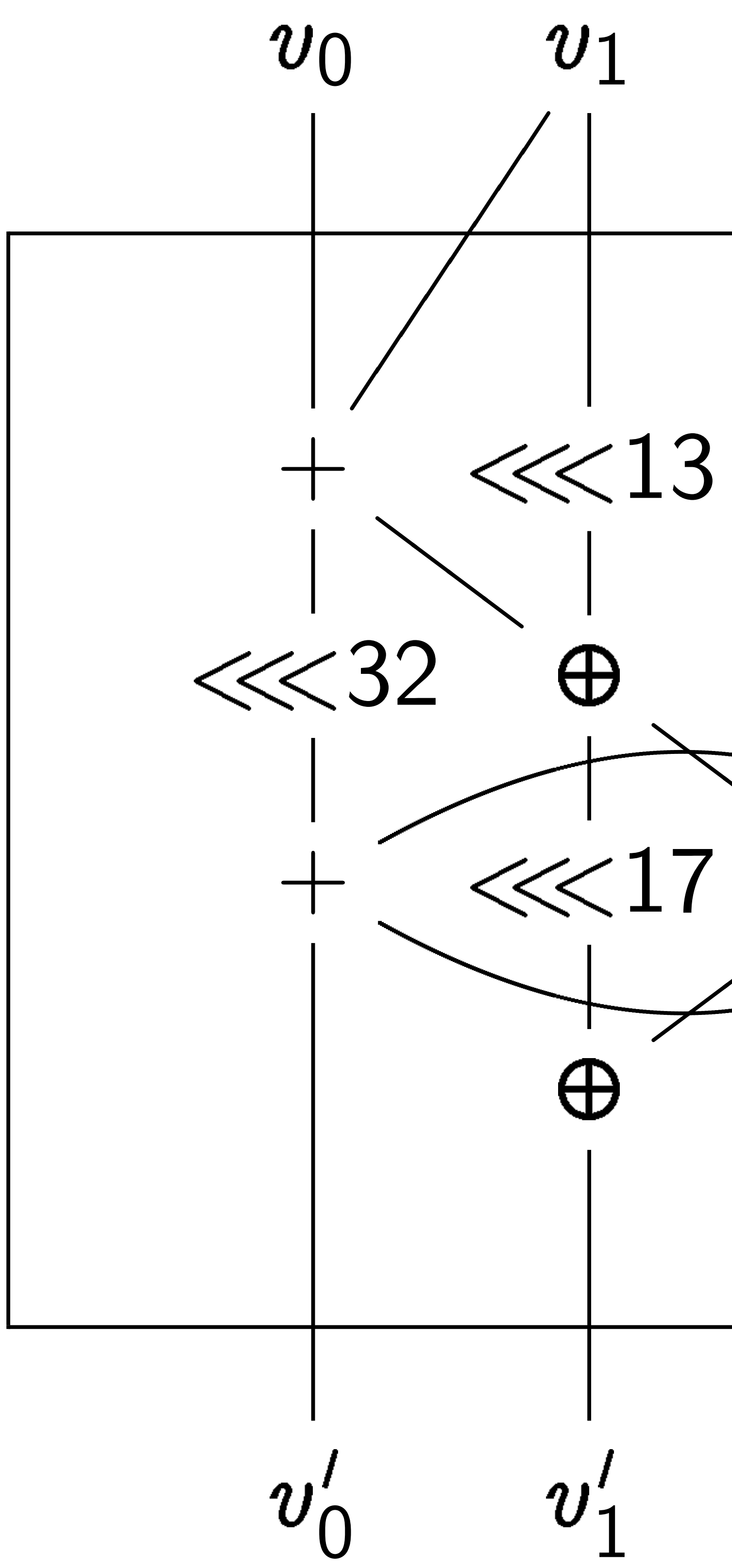

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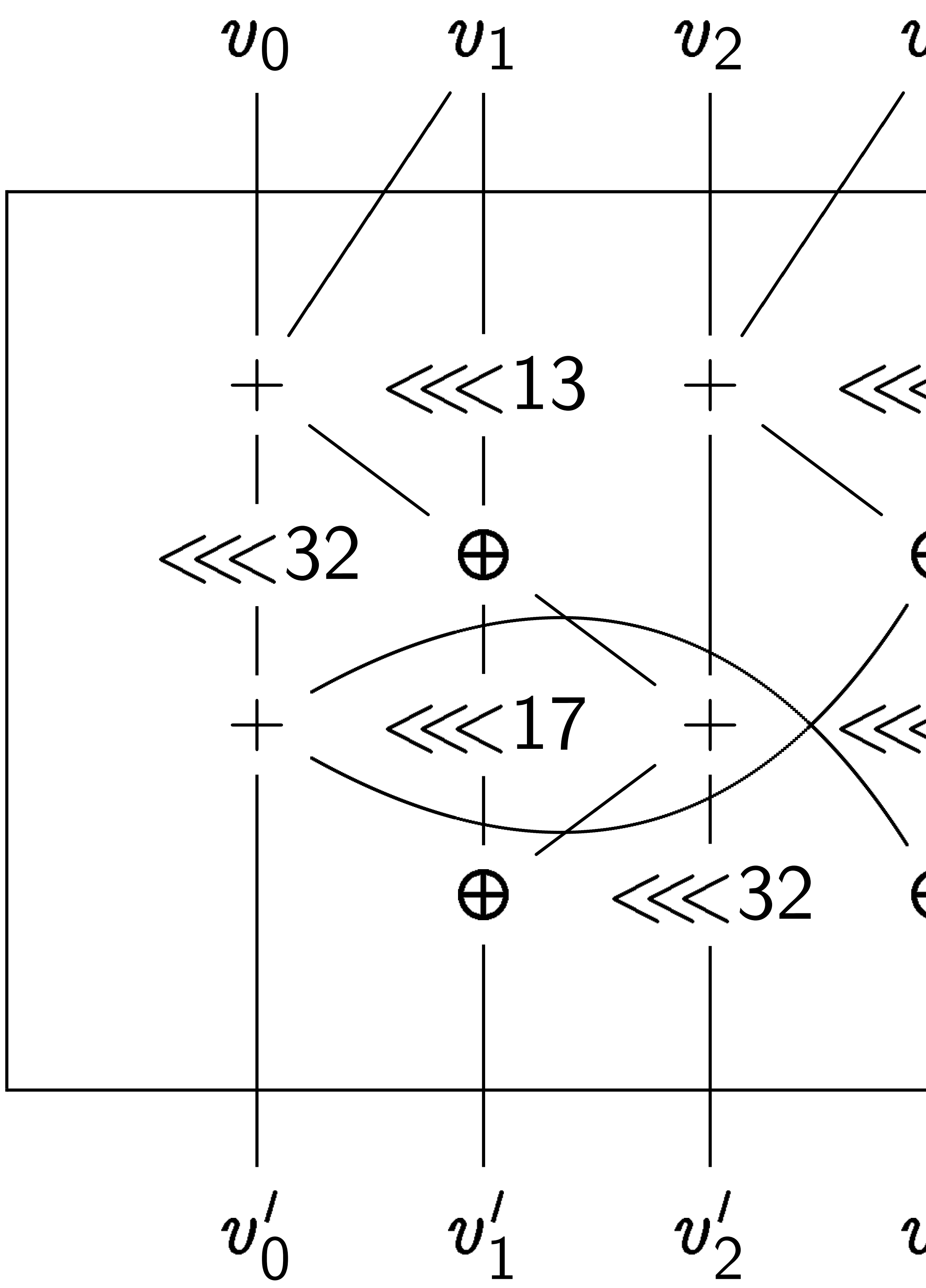

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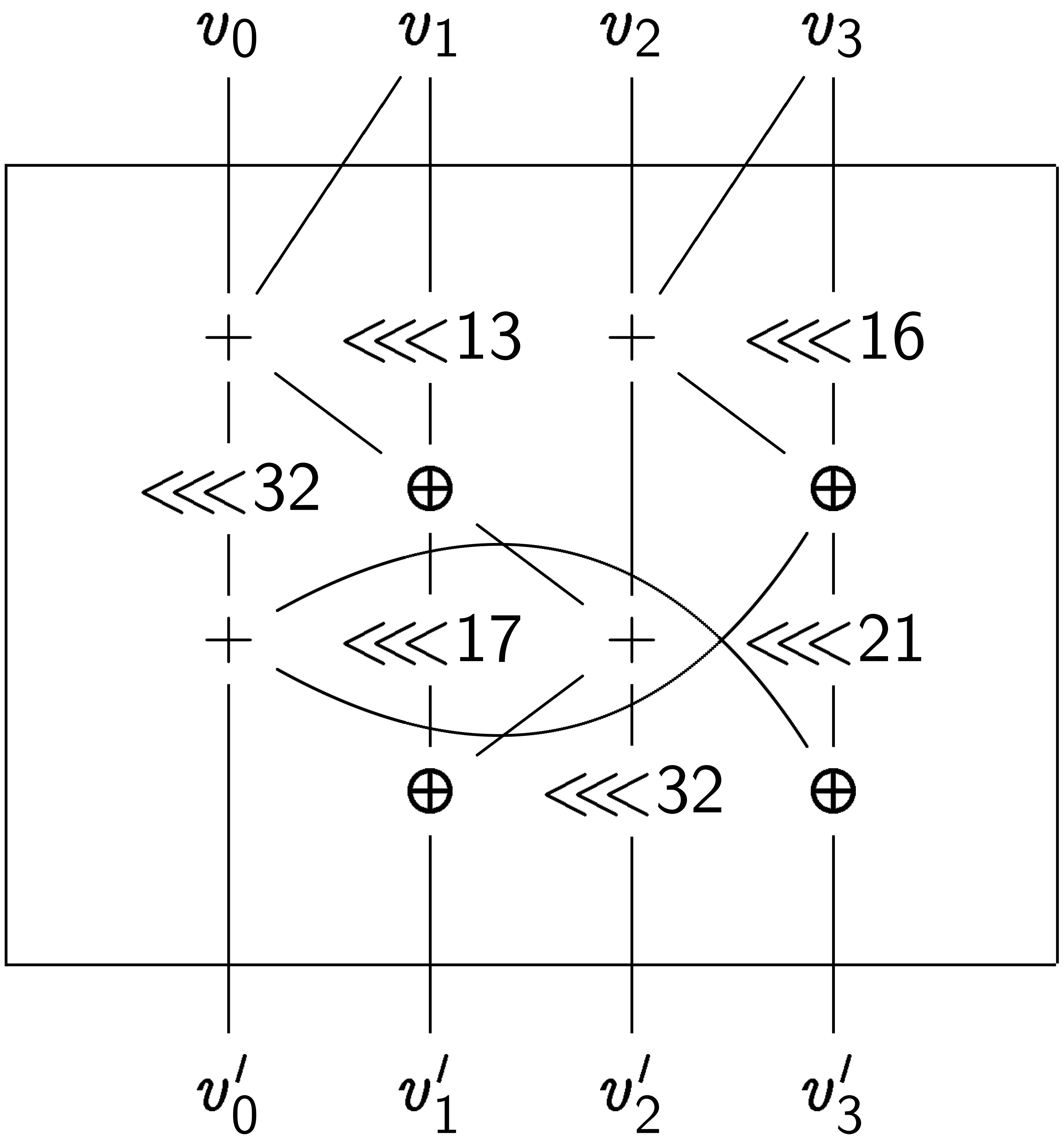

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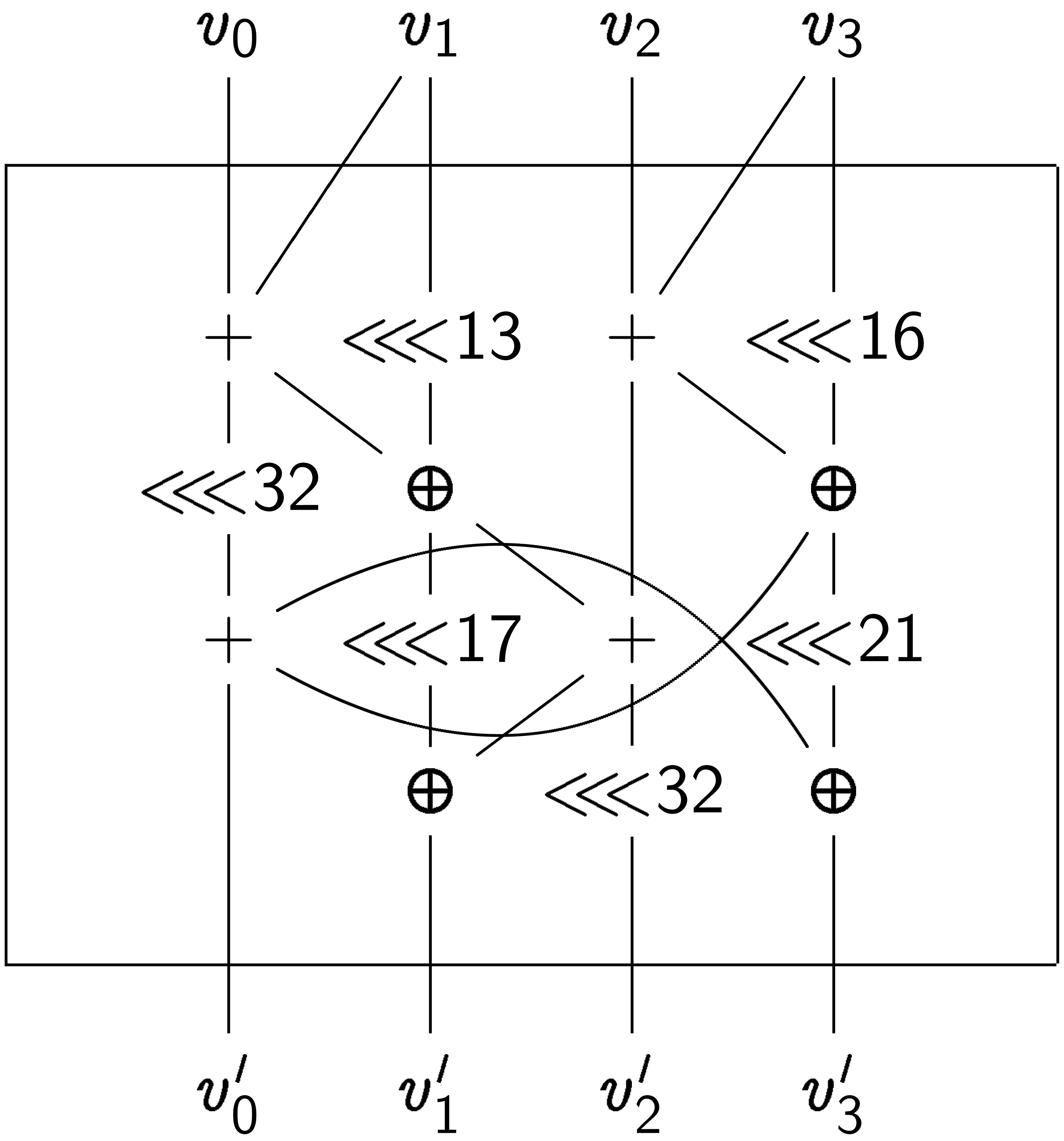

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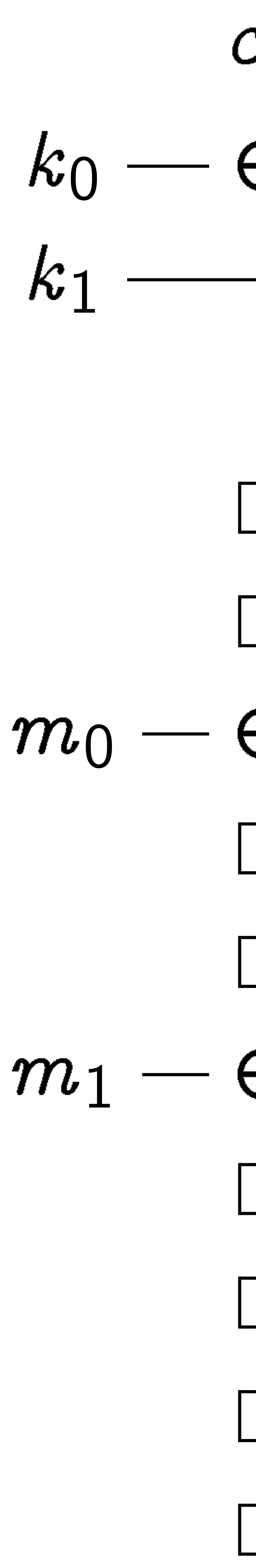

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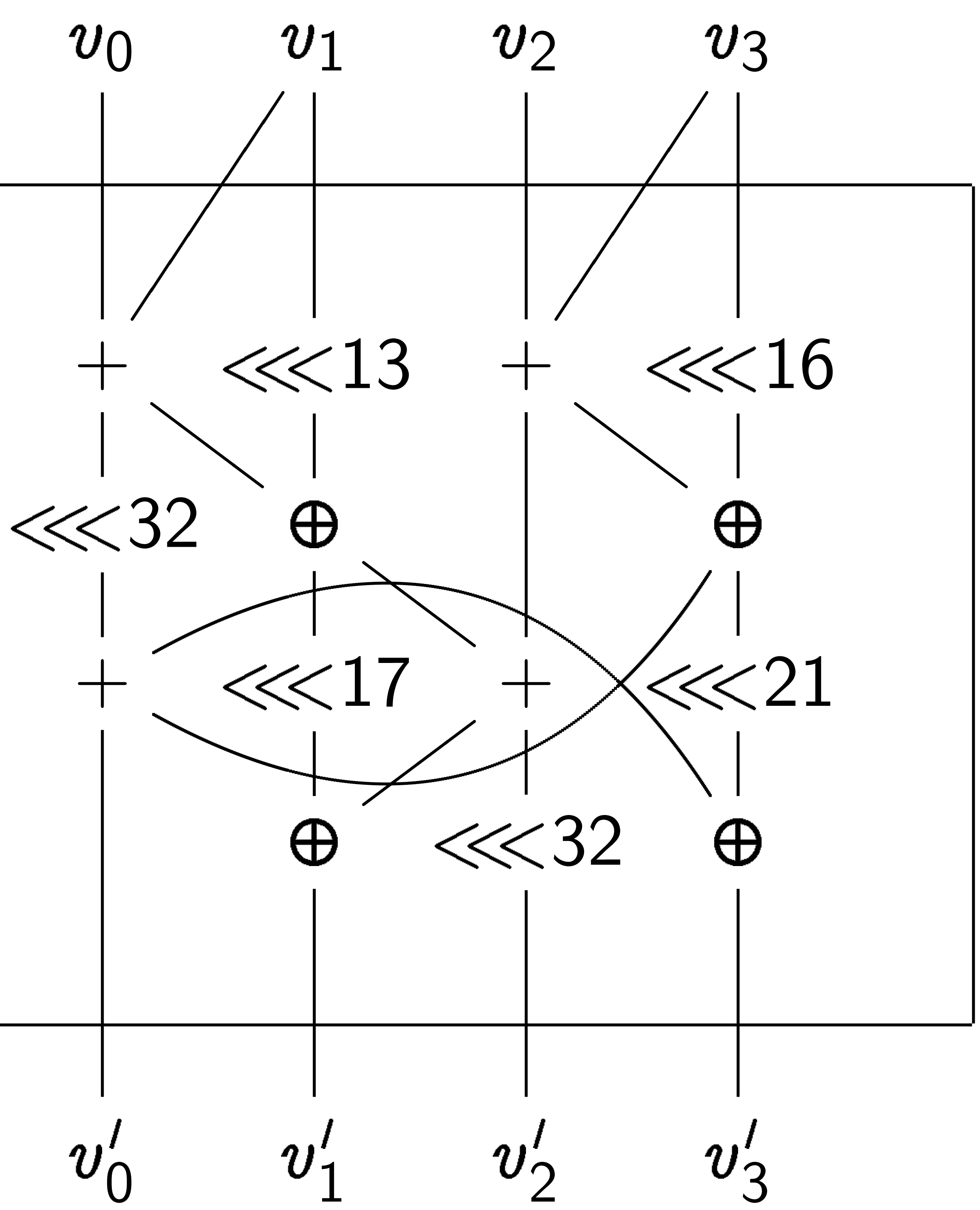
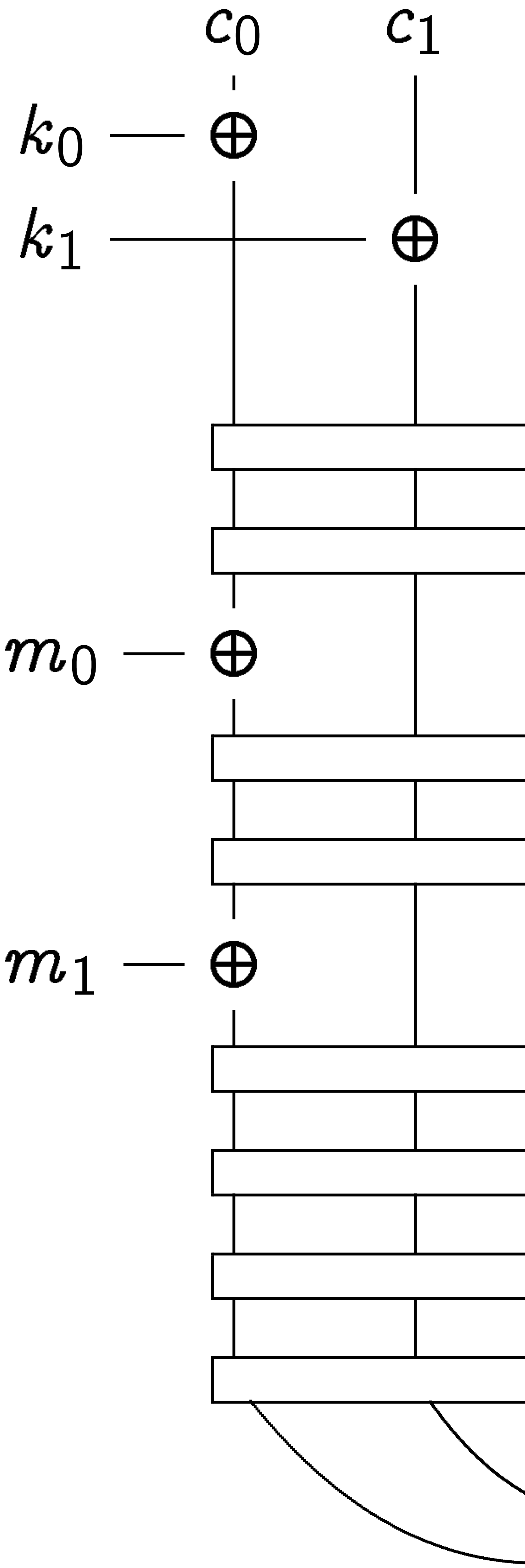


This is SipRound. Next page: SipHash-2-4 applied to 16 bytes.



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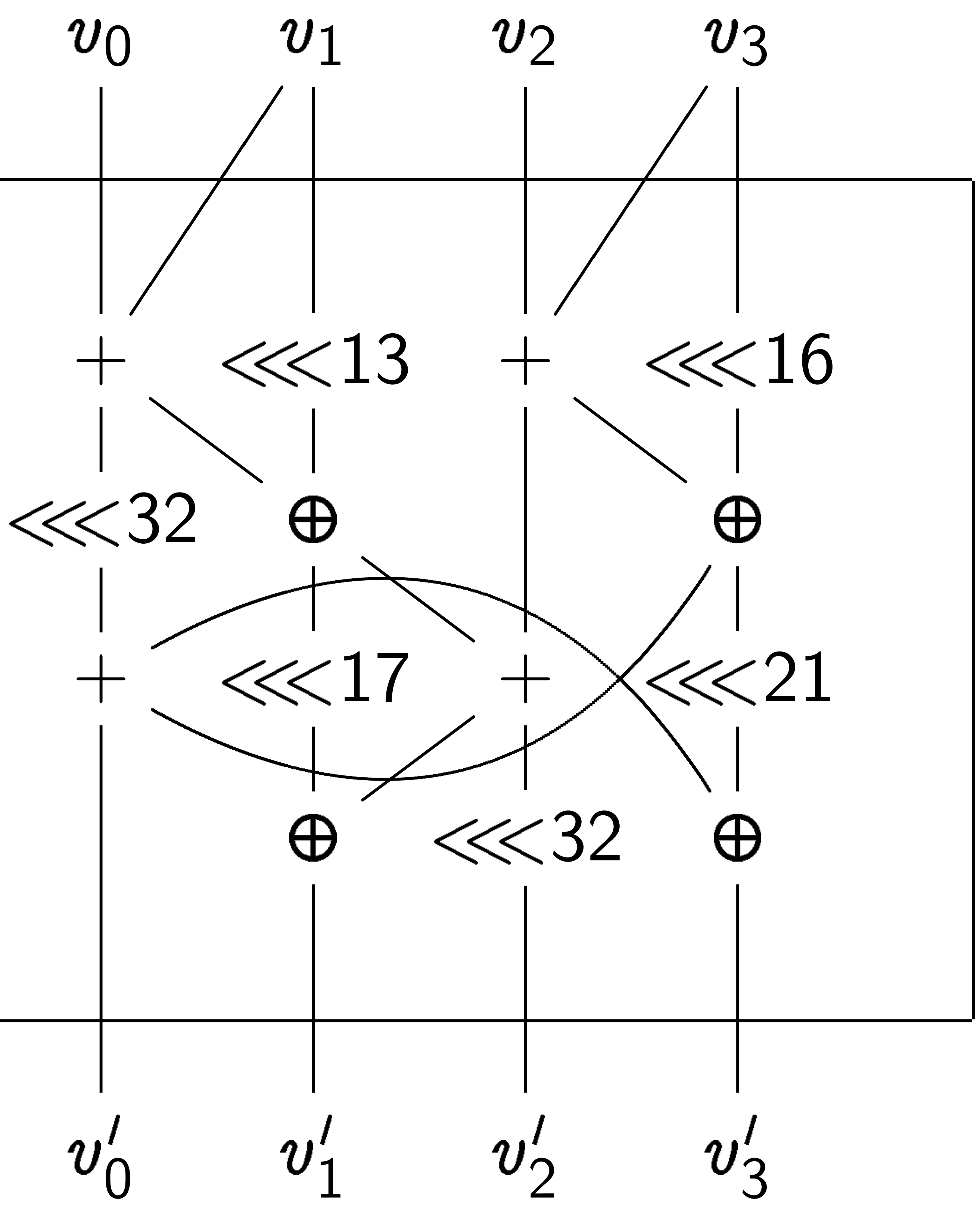
SipRound and SipHash



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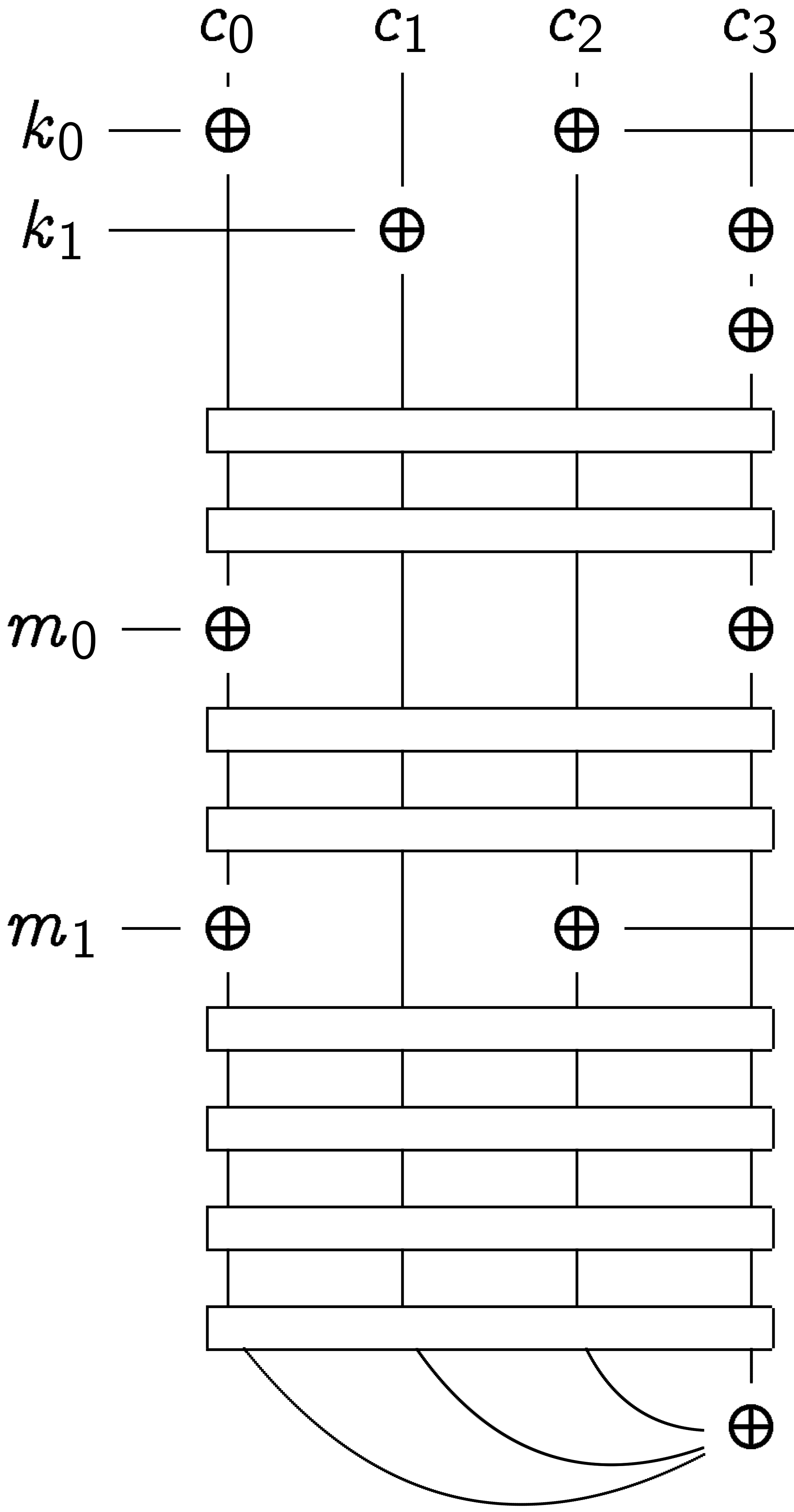
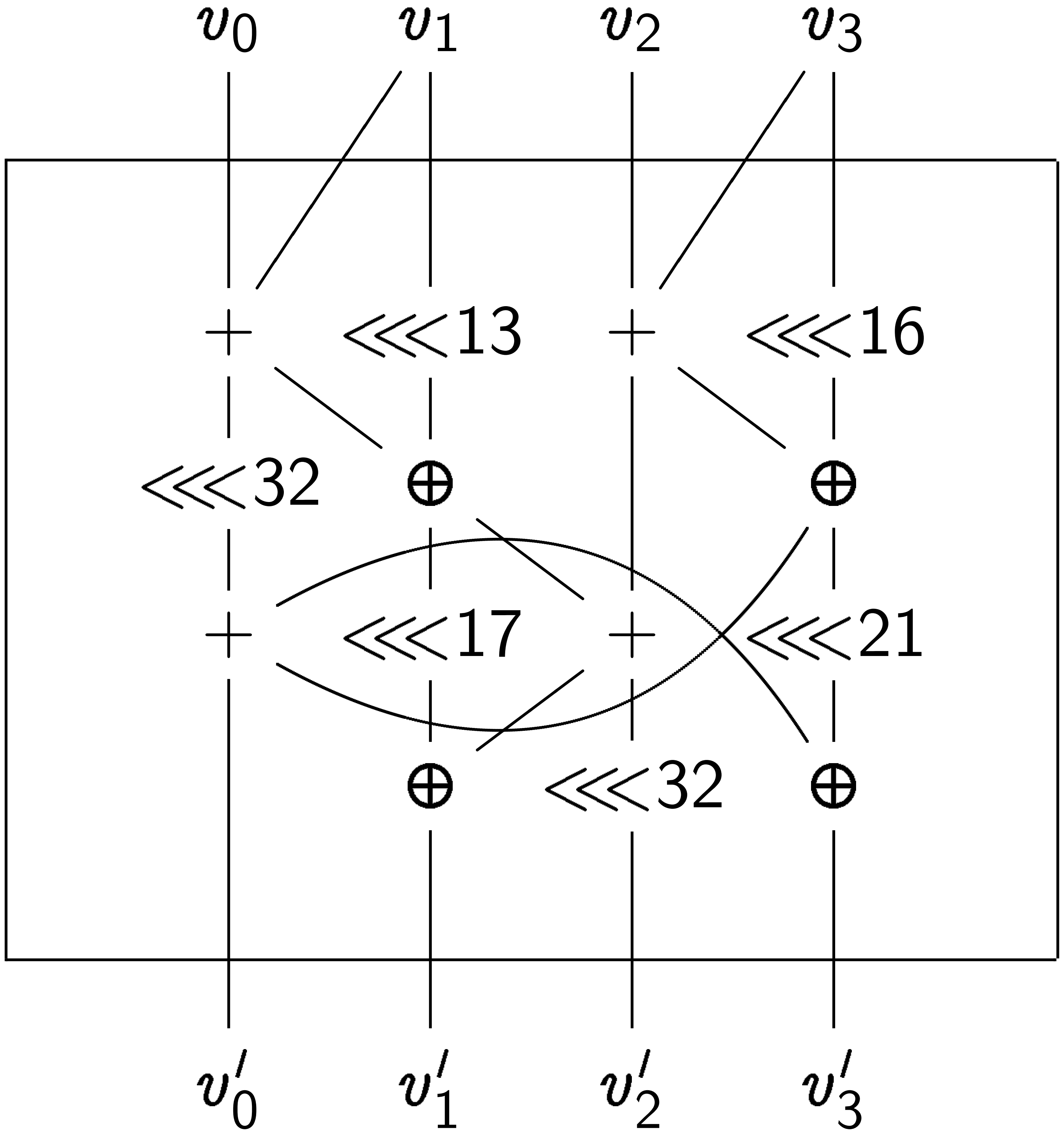


SipRound and SipHash



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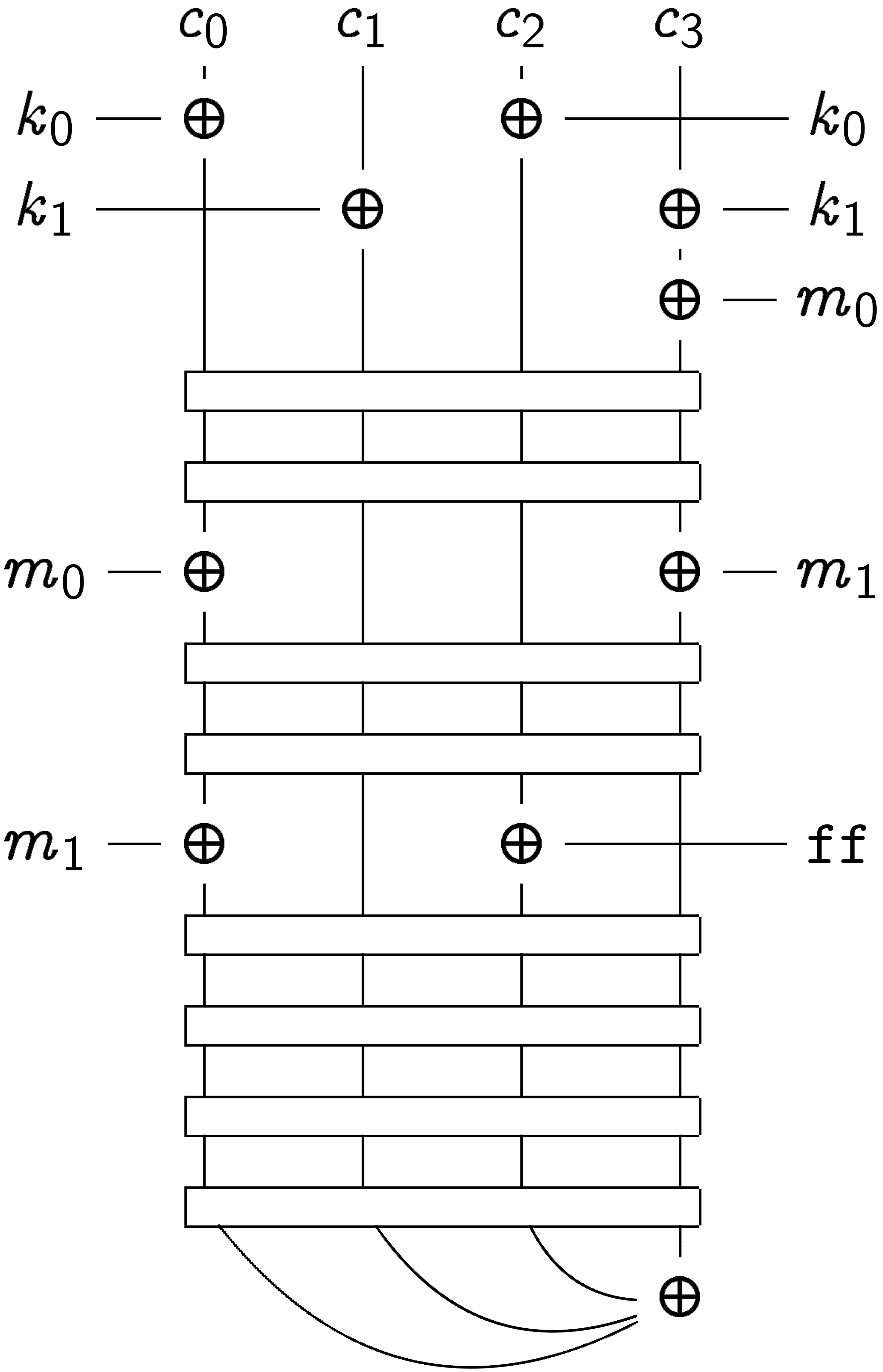

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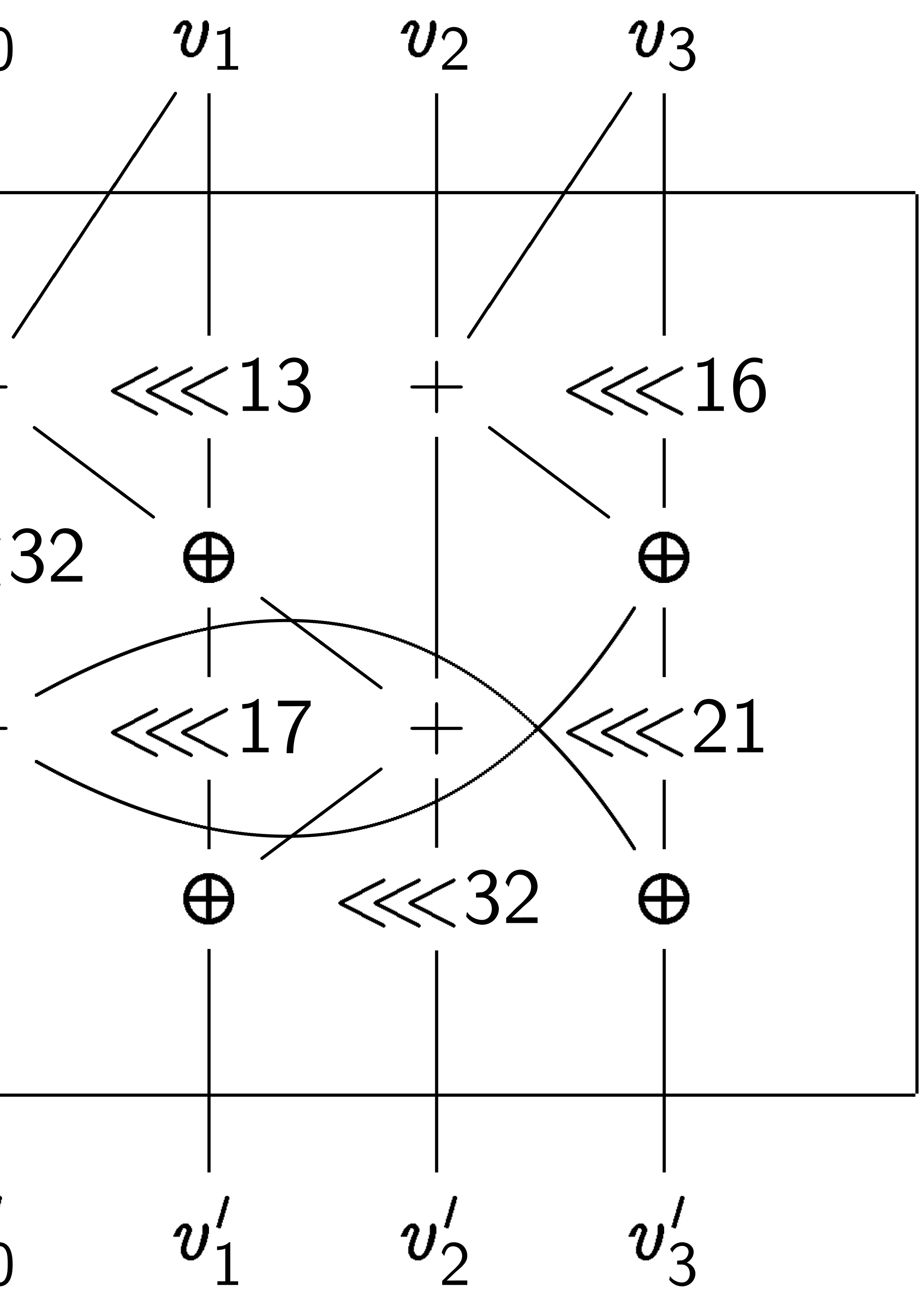
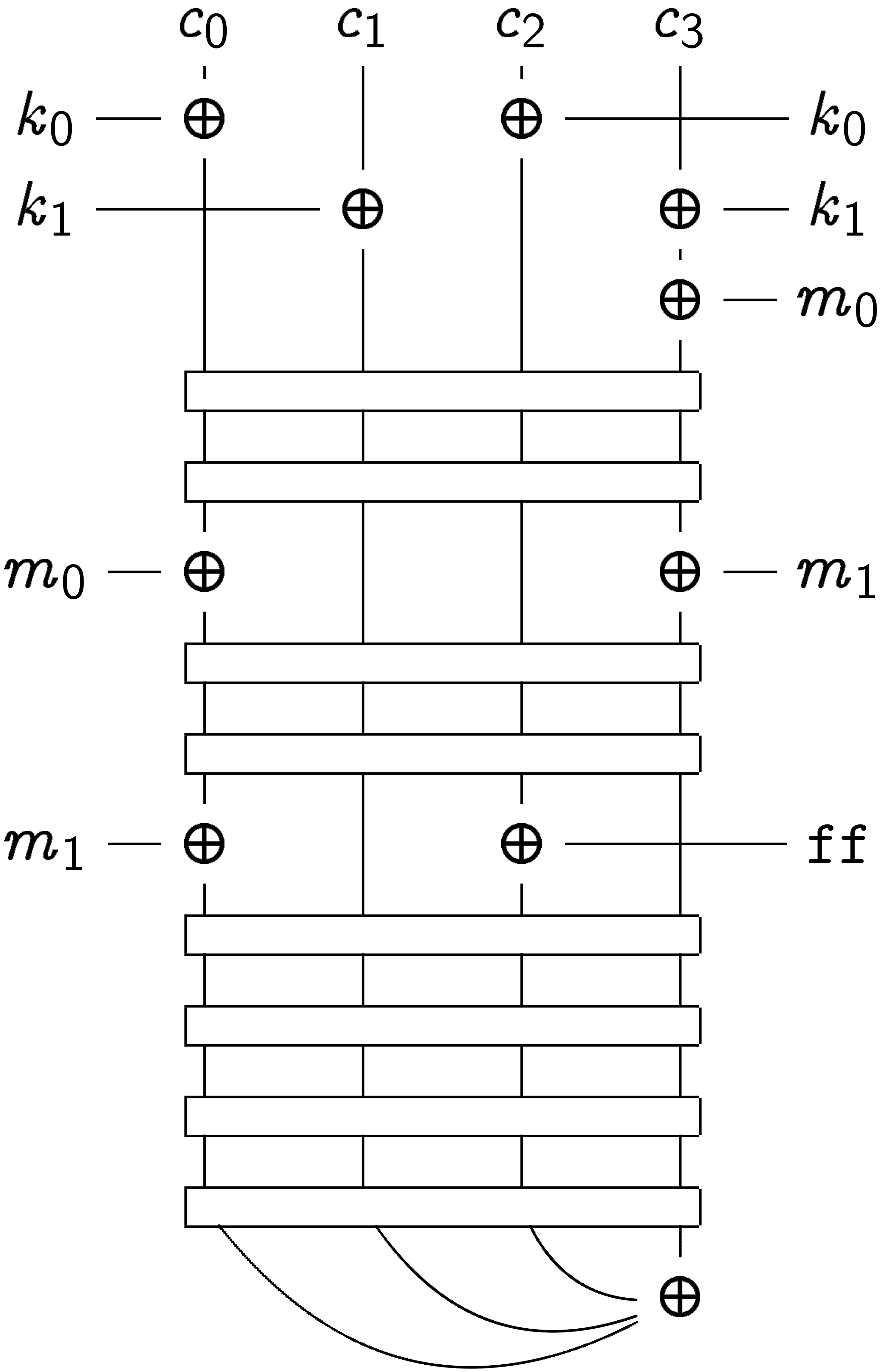


SipRound. Next page:

-2-4 applied to 16 bytes.



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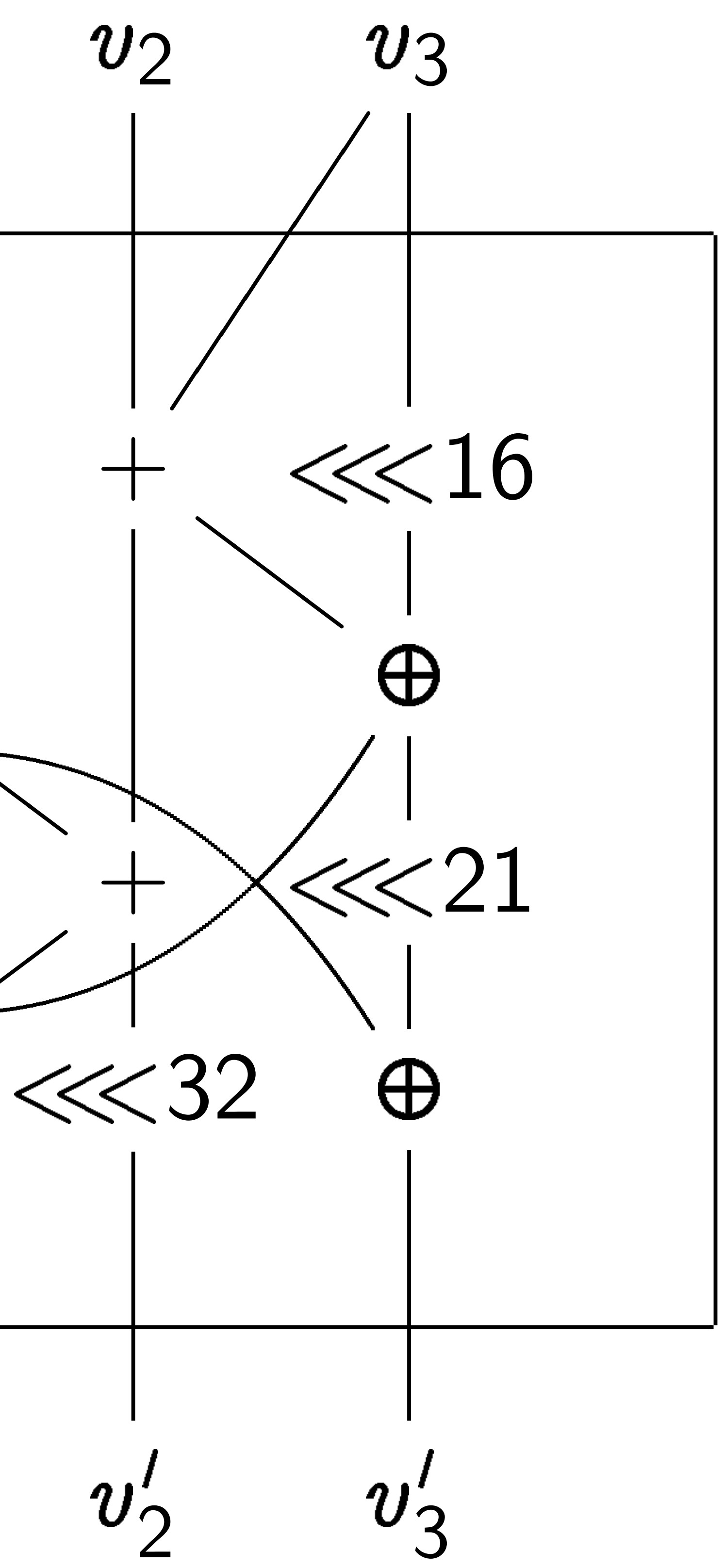

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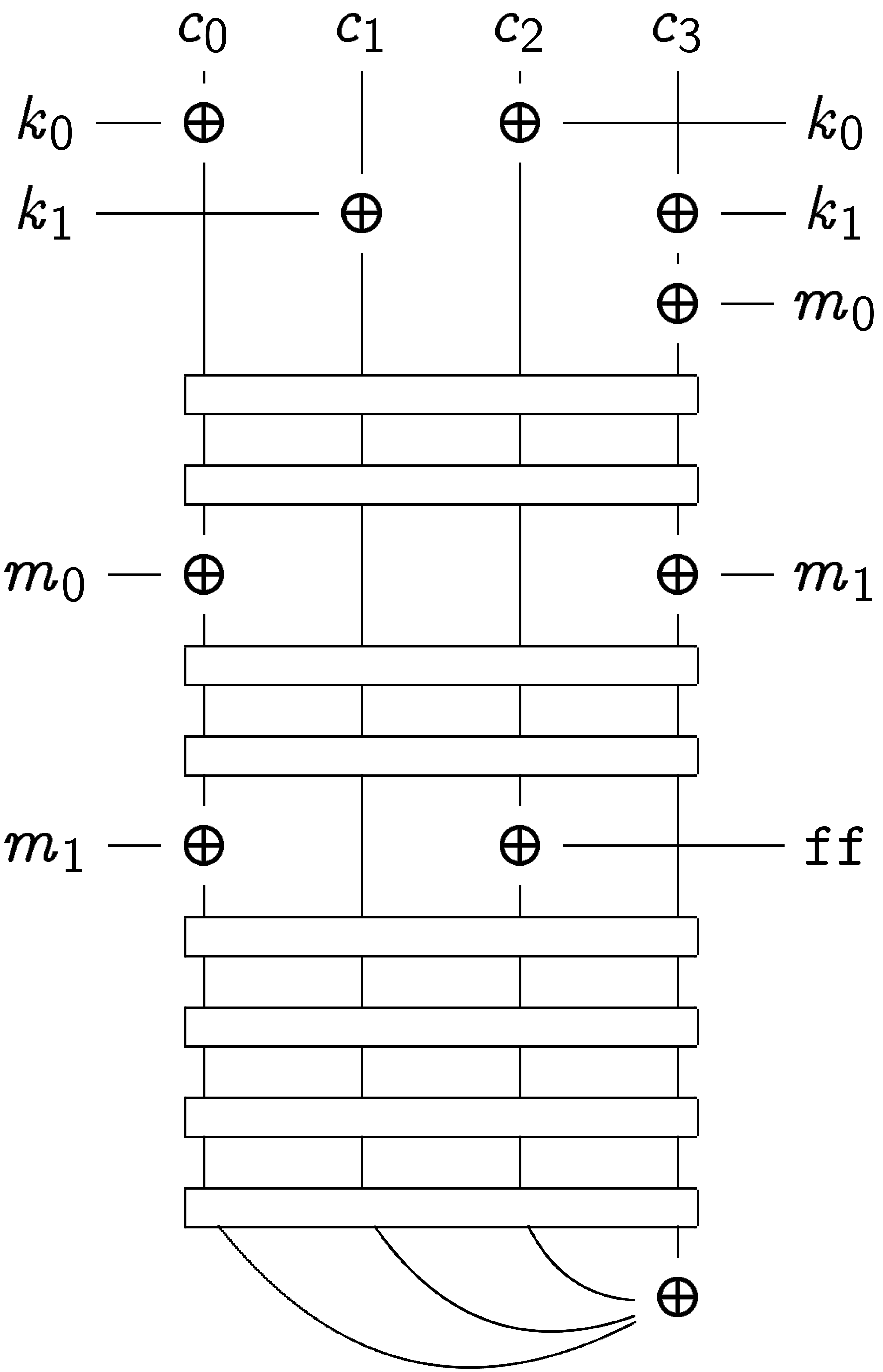

Much more in pap

- Specification: pa
- Discussion of fea
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- Preliminary cryp
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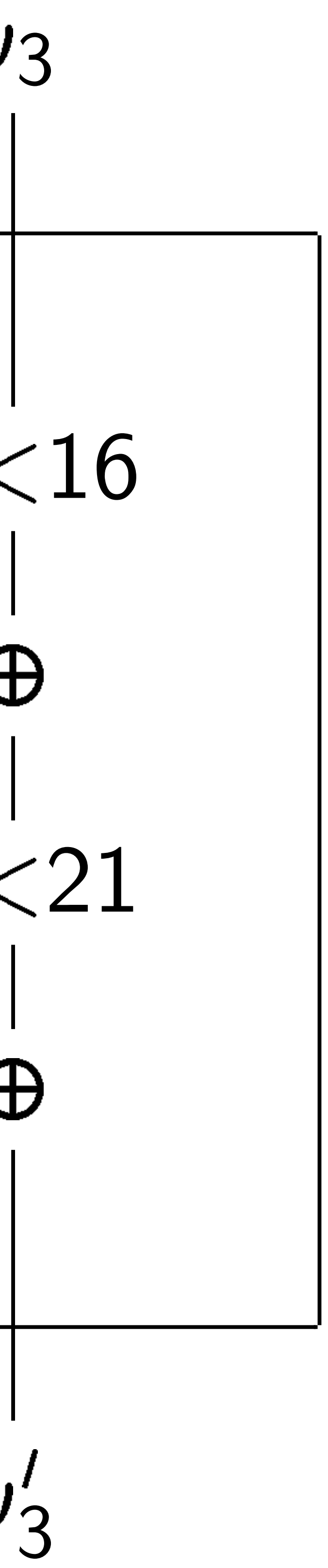
Positive SipHash r
third-party implem
now used for hash
Redis, Rust, Open



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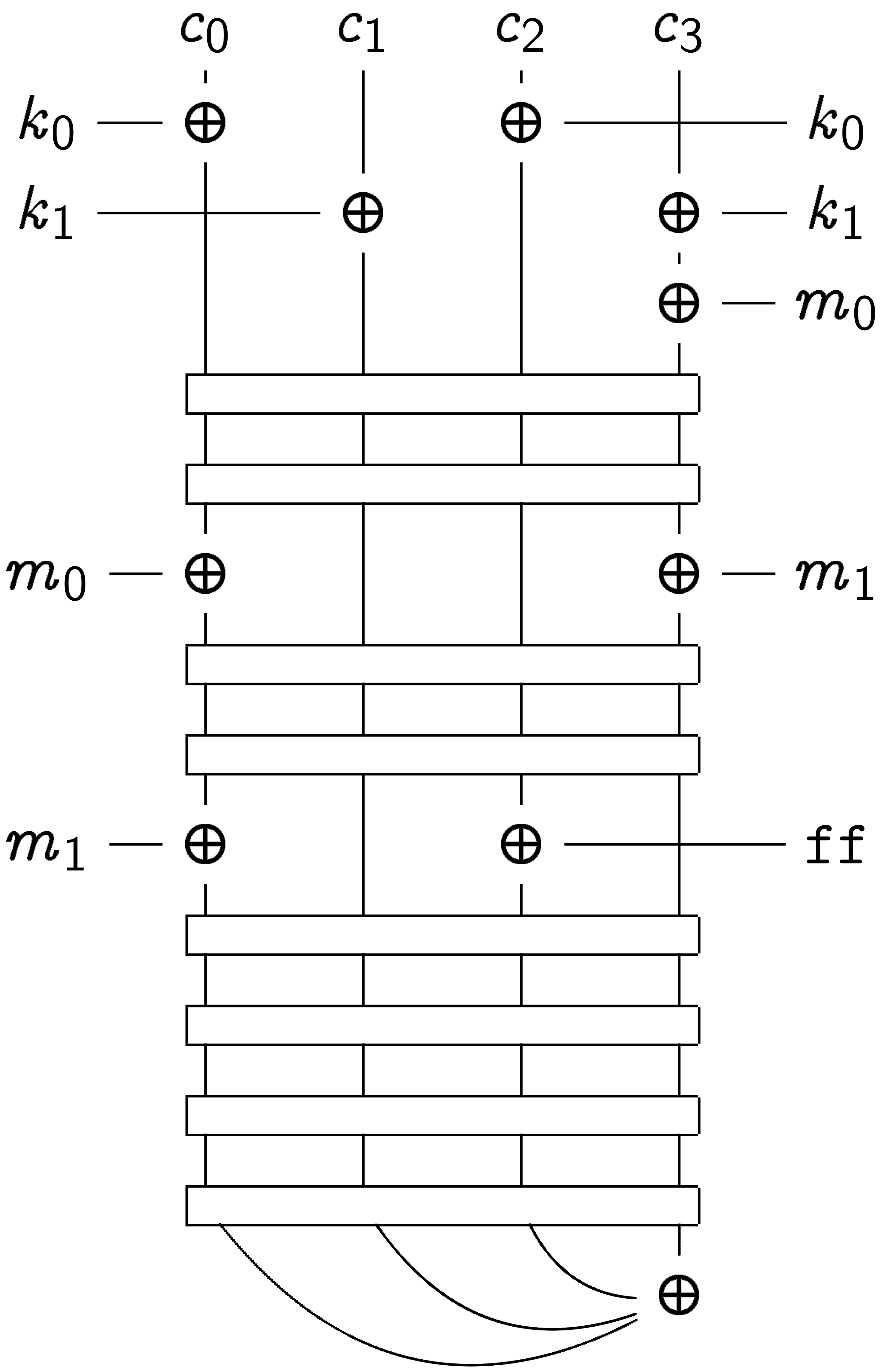

Much more in paper:

- Specification: padding etc
- Discussion of features.
- Statement of security goal
- Design rationale and credi
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Positive SipHash reception:
third-party implementations;
now used for hash tables in
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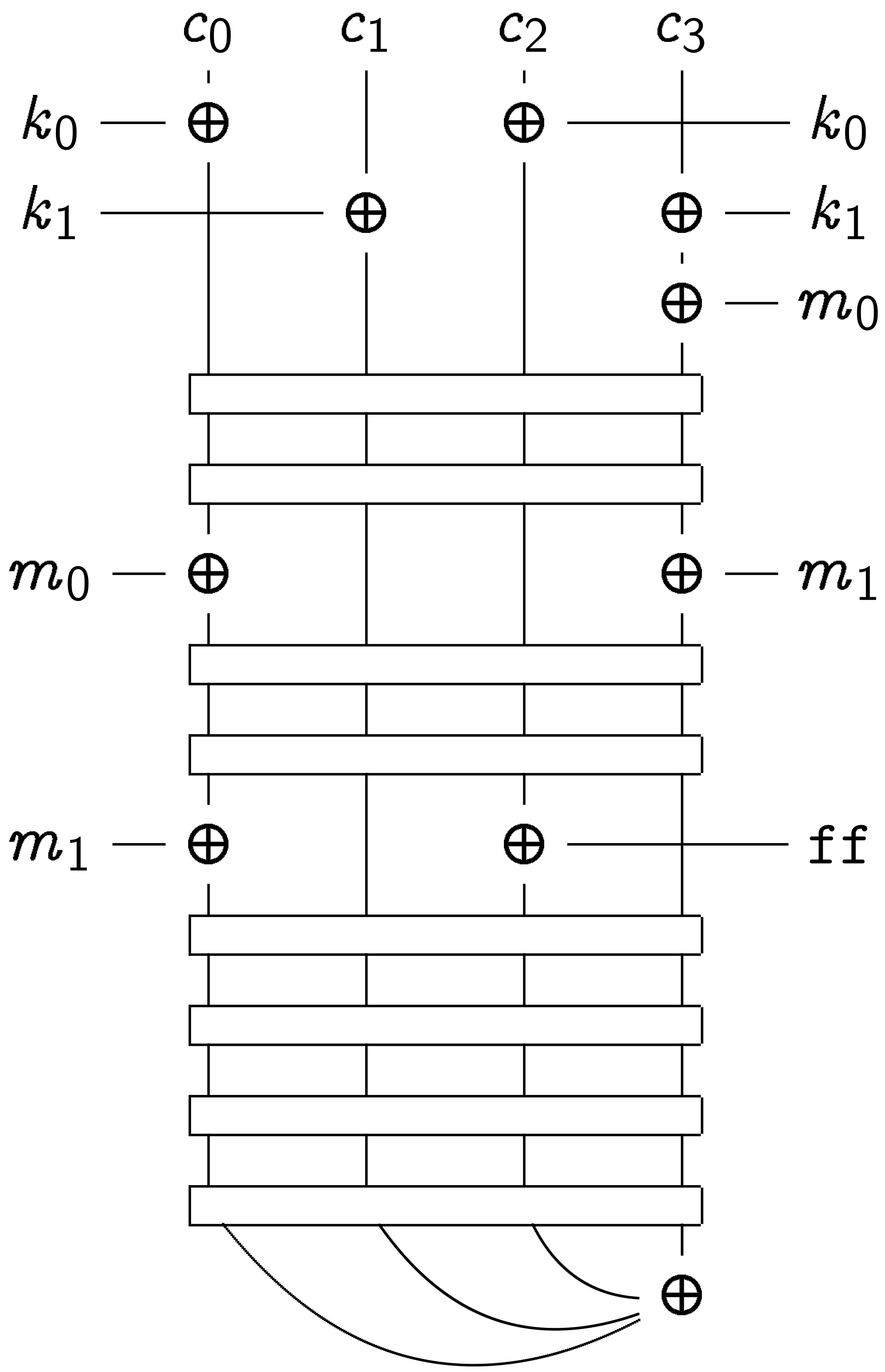

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Positive SipHash reception: many third-party implementations; now used for hash tables in Ruby, Redis, Rust, OpenDNS, Perl 5.