Update on Ara

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ETH Zürich

Energy Efficiency

- **Scaling**
  - #Lanes
  - Data width
  - Data type

`fmatmul, 128x128x128`

Lanes	Efficiency (GOPS/W)
2	30.09
4	34.33
8	?

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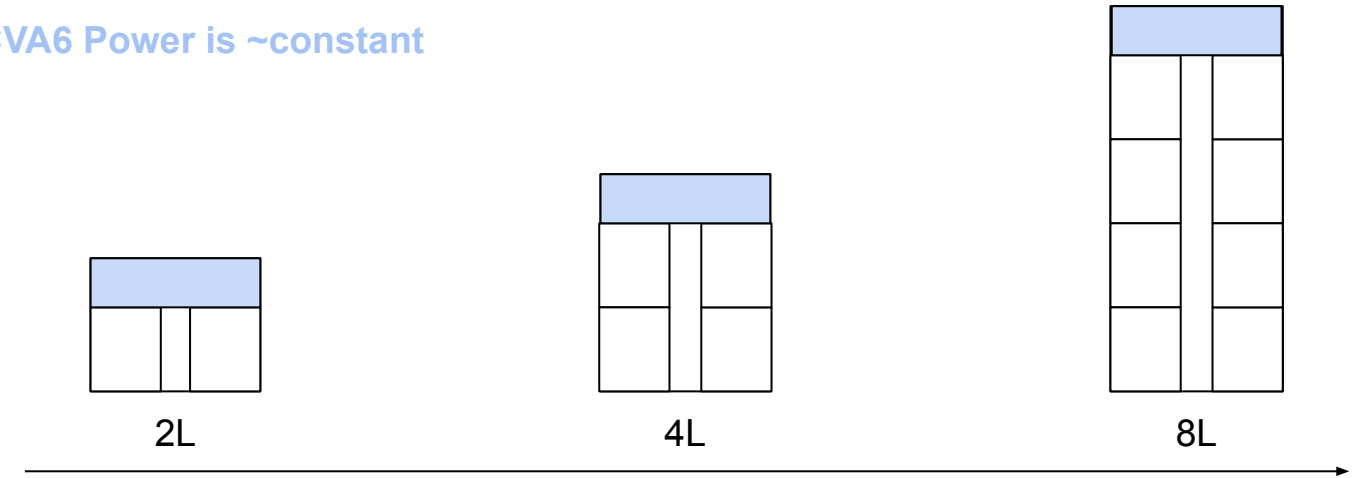
CVA6 Power is ~constant



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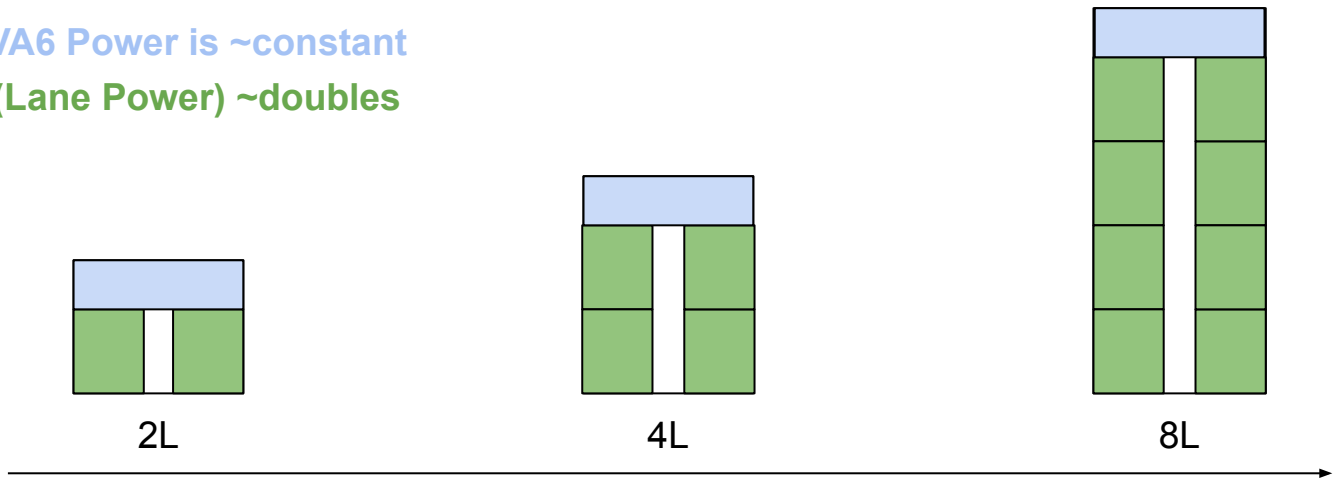

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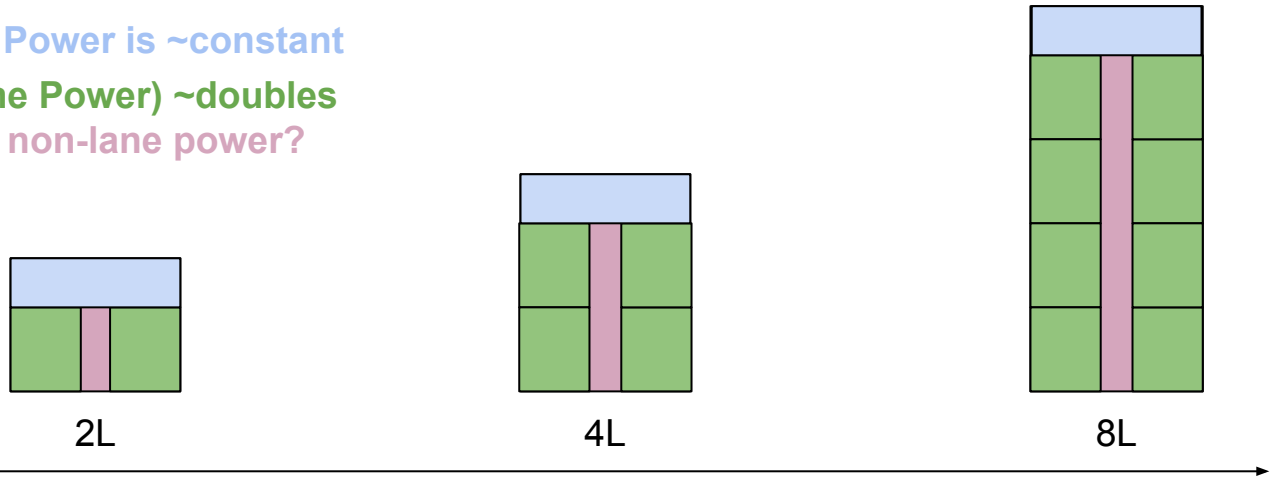
Ara non-lane power?



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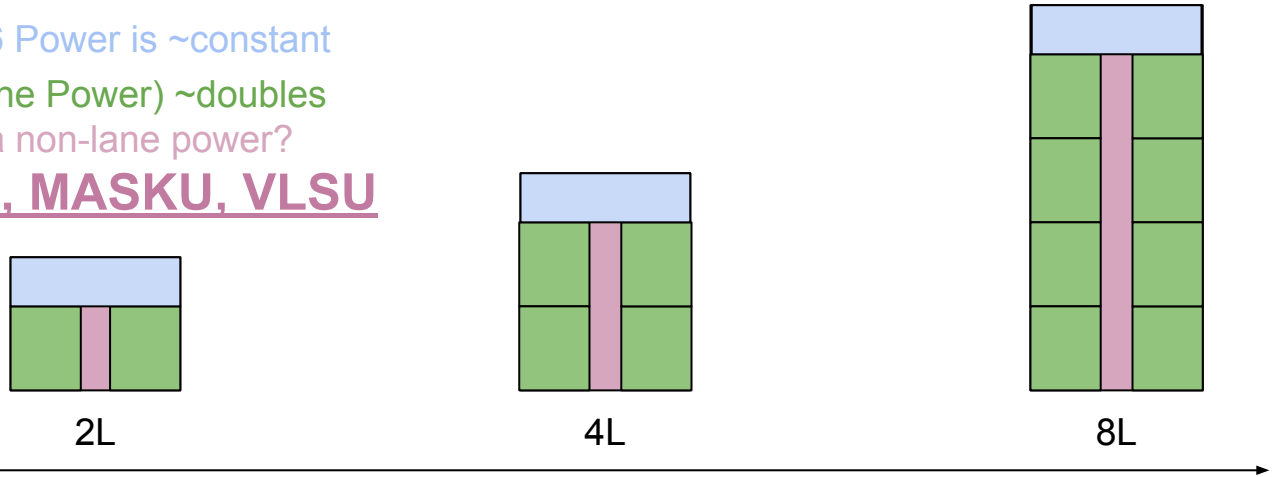
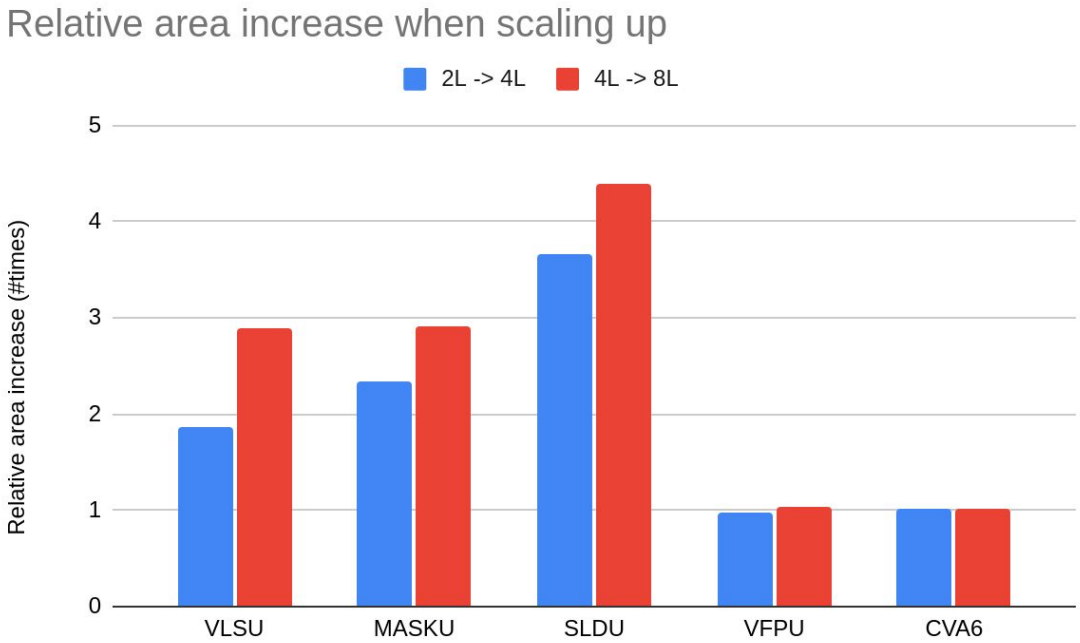
SLDU, MASKU, VLSU



How do Ara's units scale in AREA?



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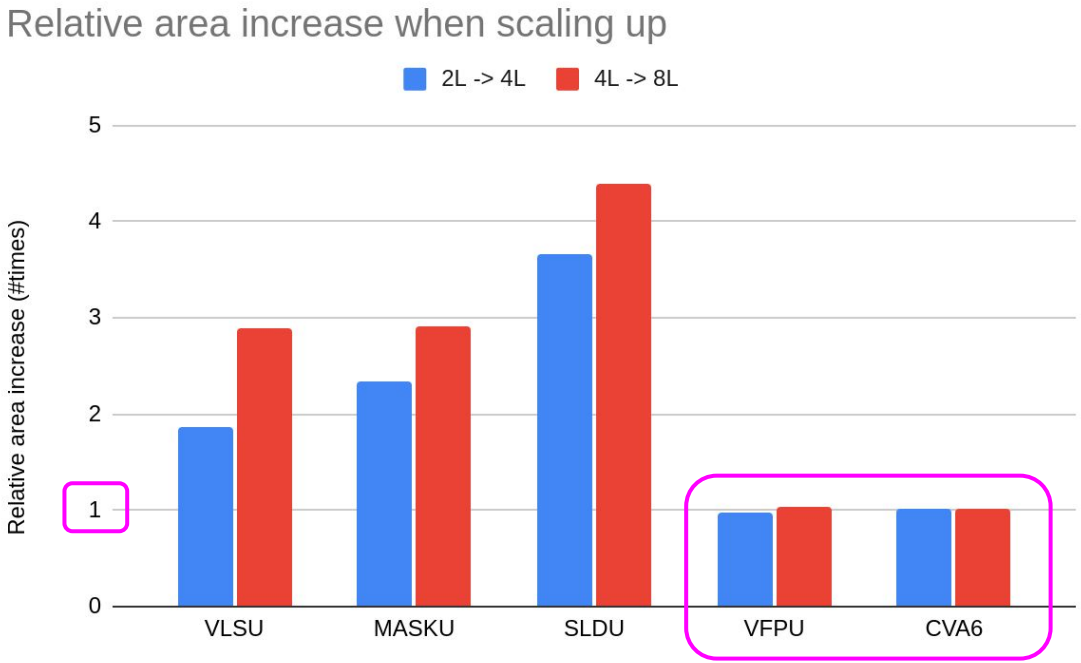

Same Area, as expected

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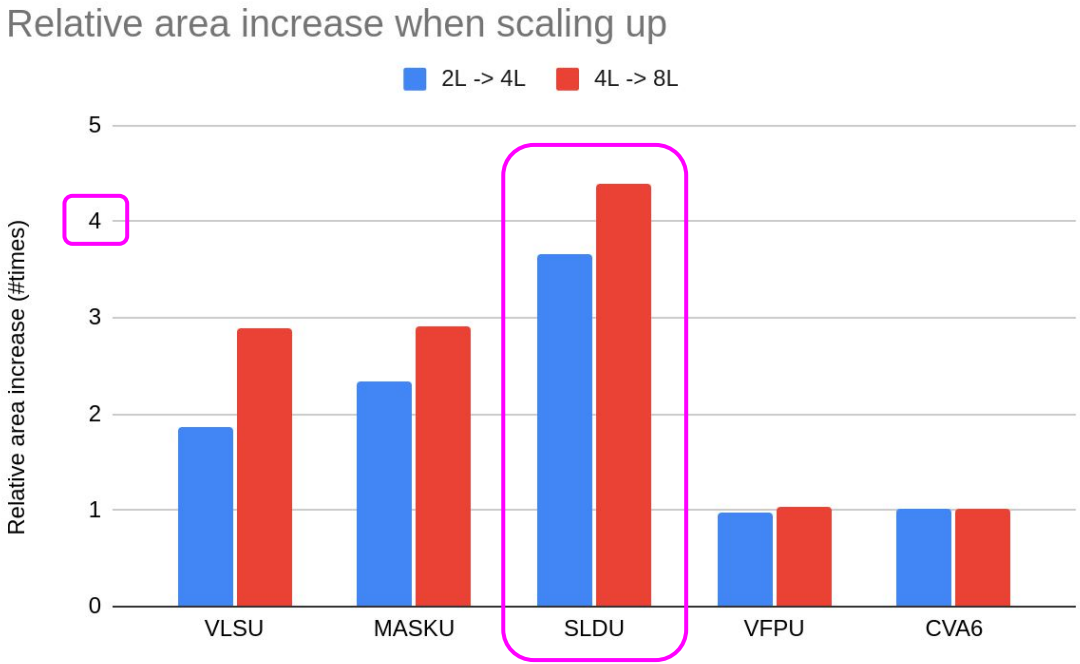

Largest growth $O(L^2)$

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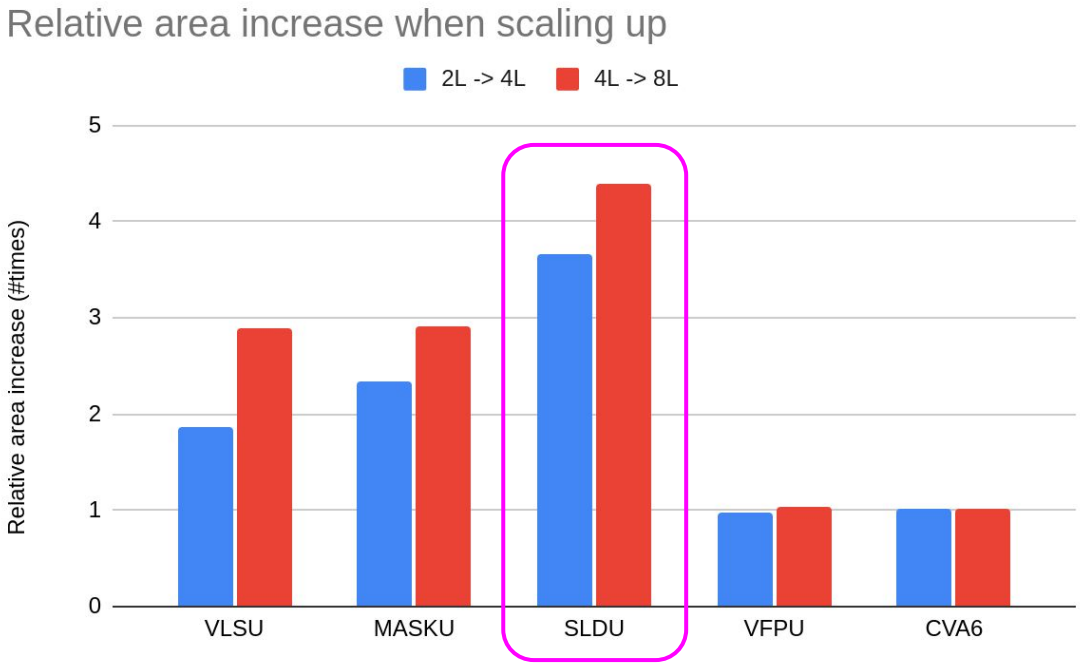
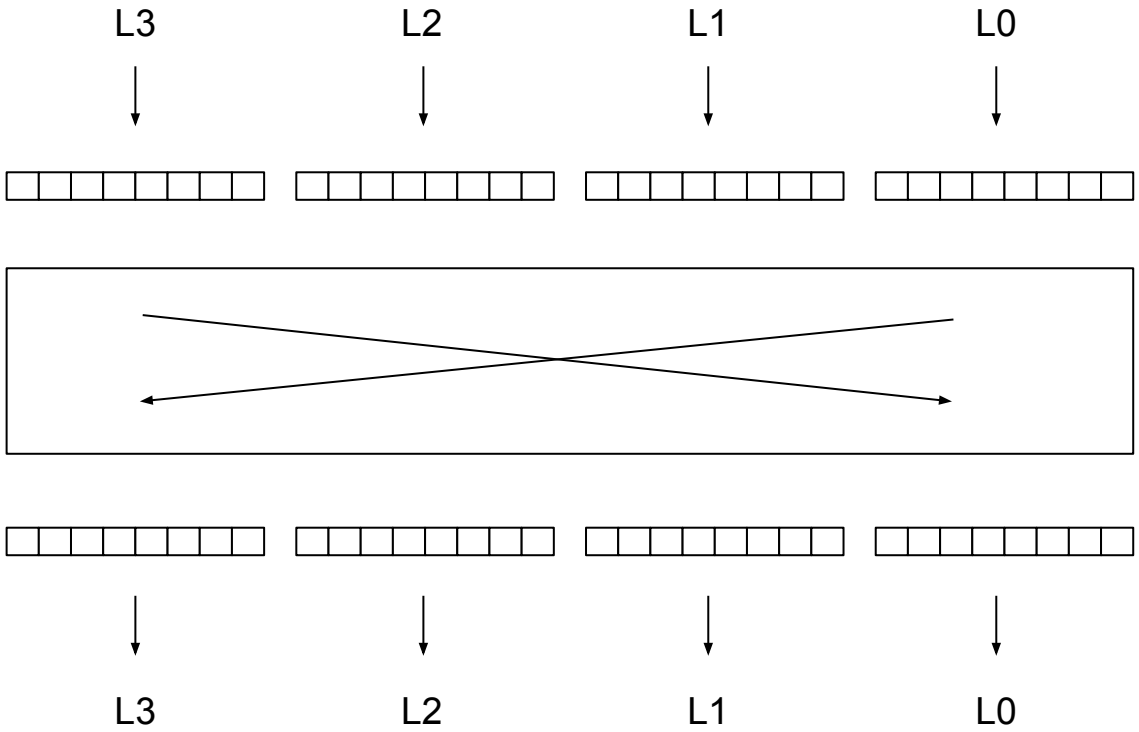


SLDU is also the largest unit
8L: SLDU area == 1.7x VLSU area

SLDU - Connections



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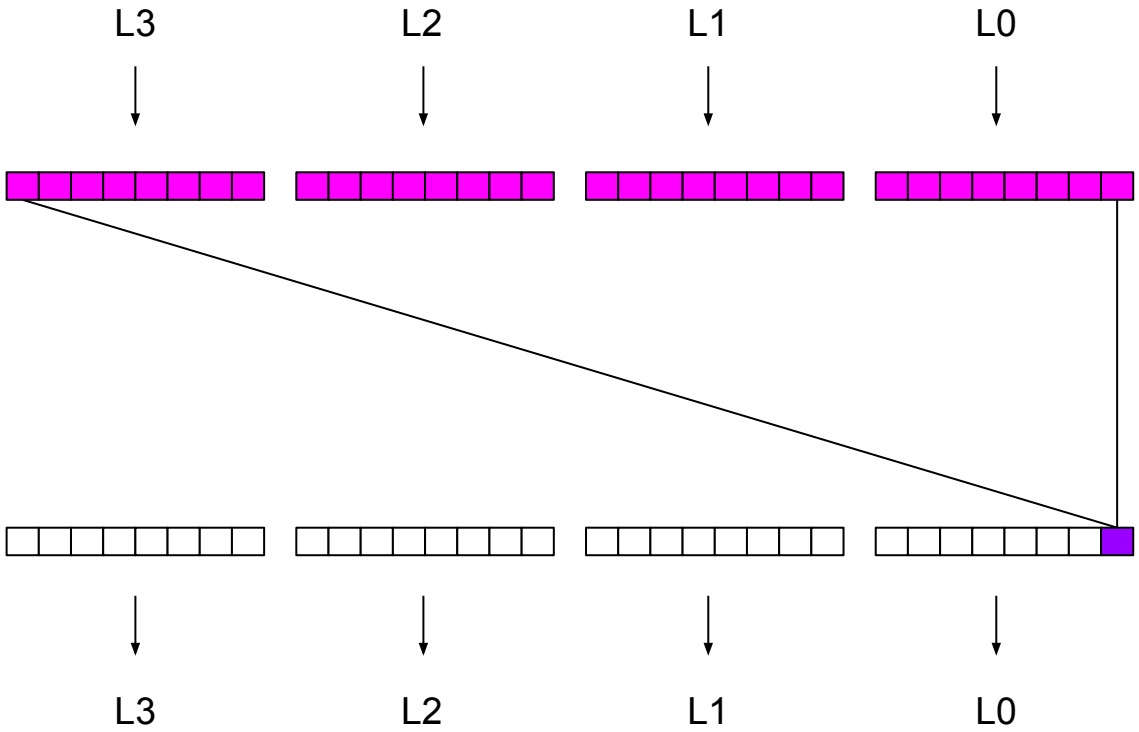

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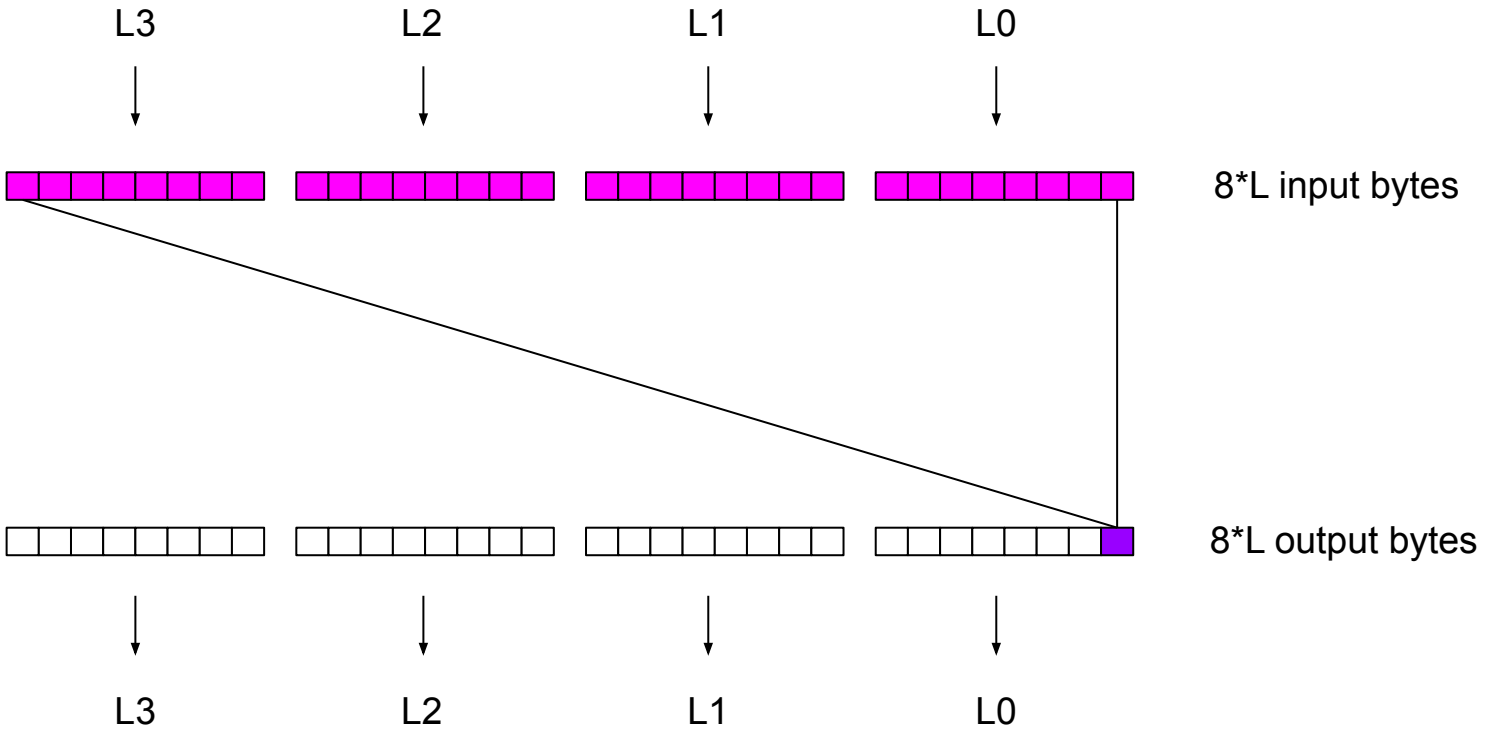

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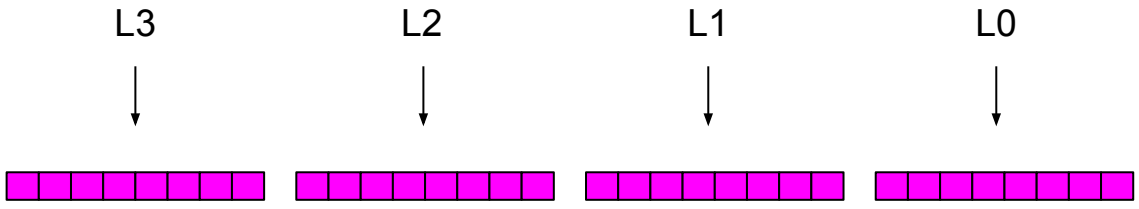
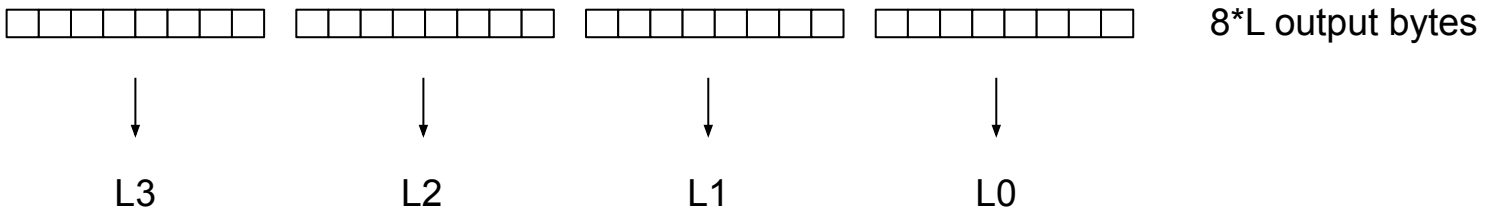


All-to-All to support **arbitrary slides** with **8-bit elements** (and **re-encoding**)



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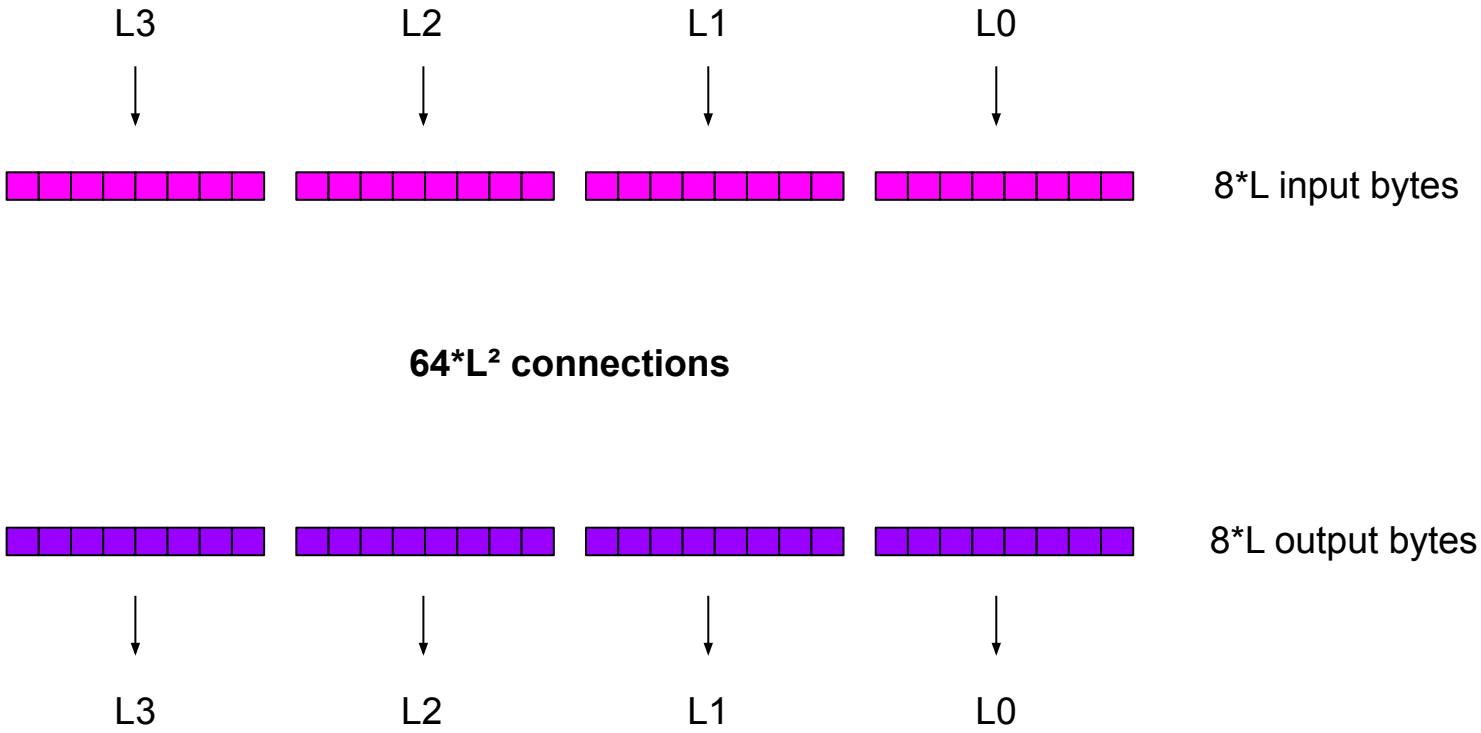

SLDU - A New Hope

- How to **simplify** the **SLDU?**
  - Only **slides** by **1?**
  - Only **slides** by **powers of 2?**
  - **Time Multiplex slides** and **encoding?**

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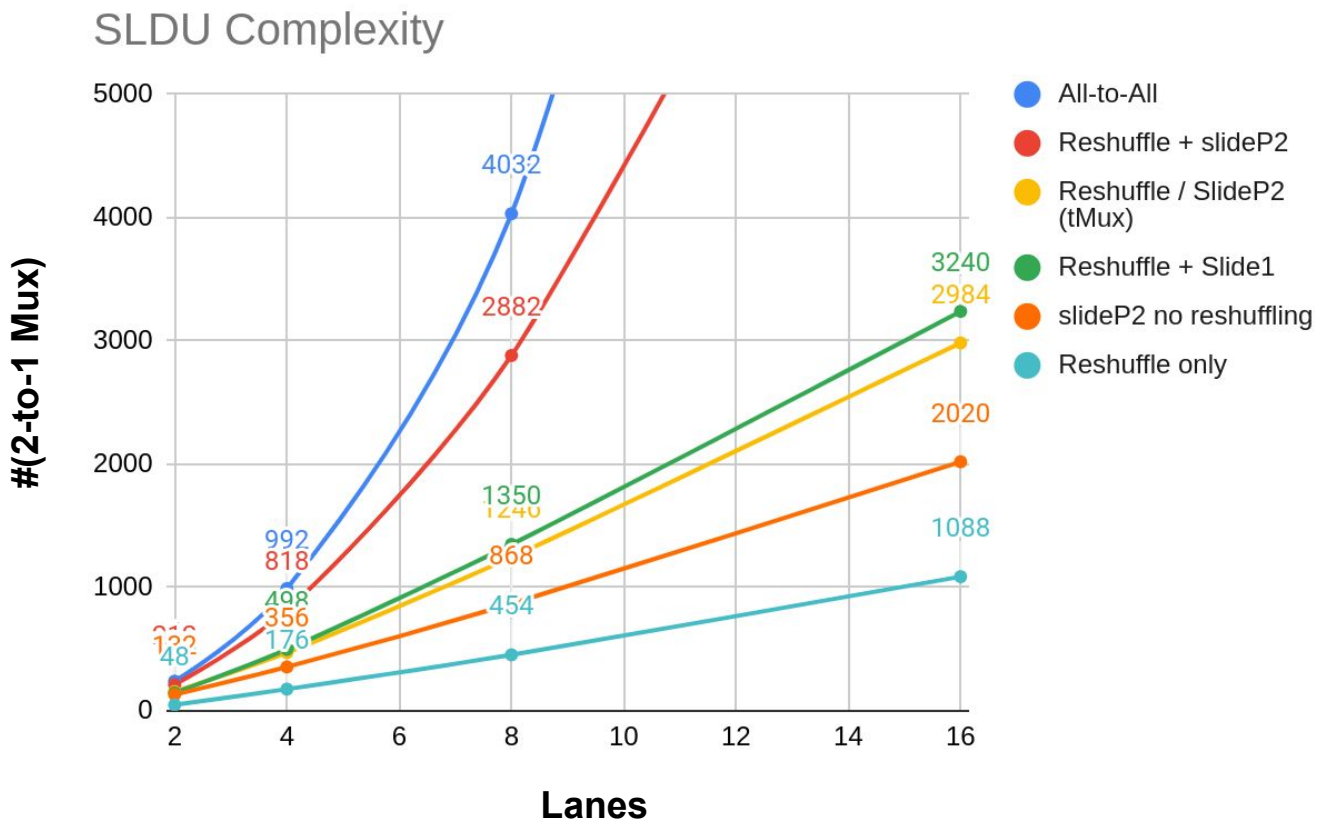

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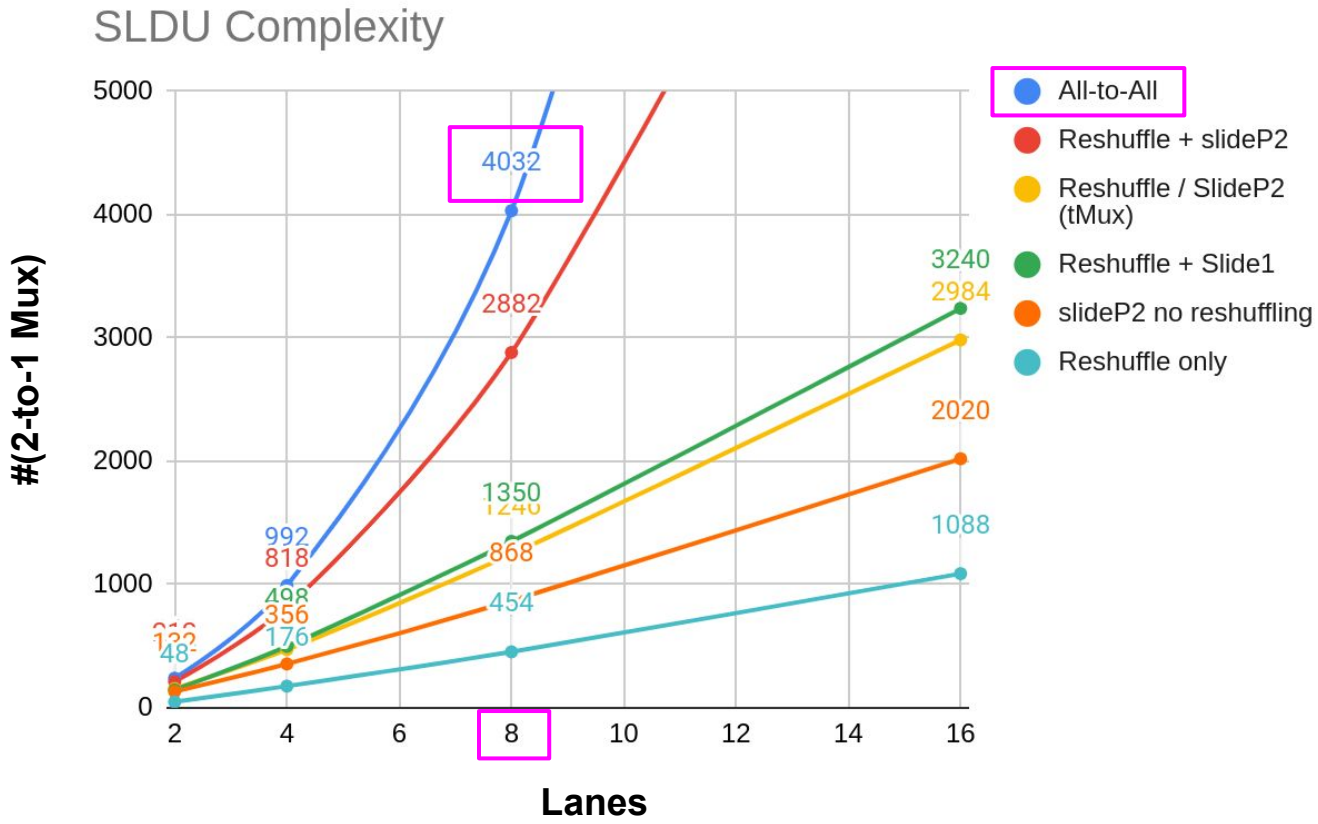

Original SLDU

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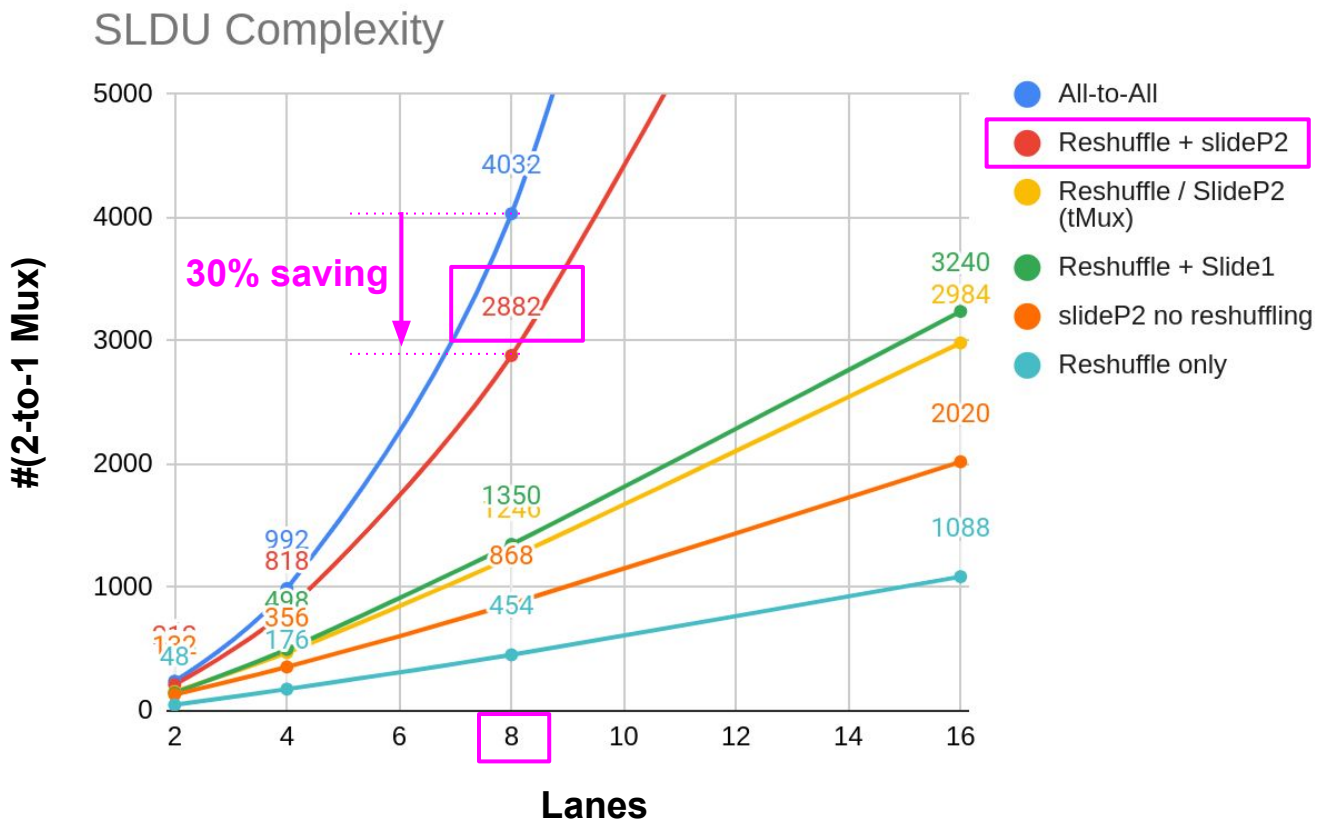

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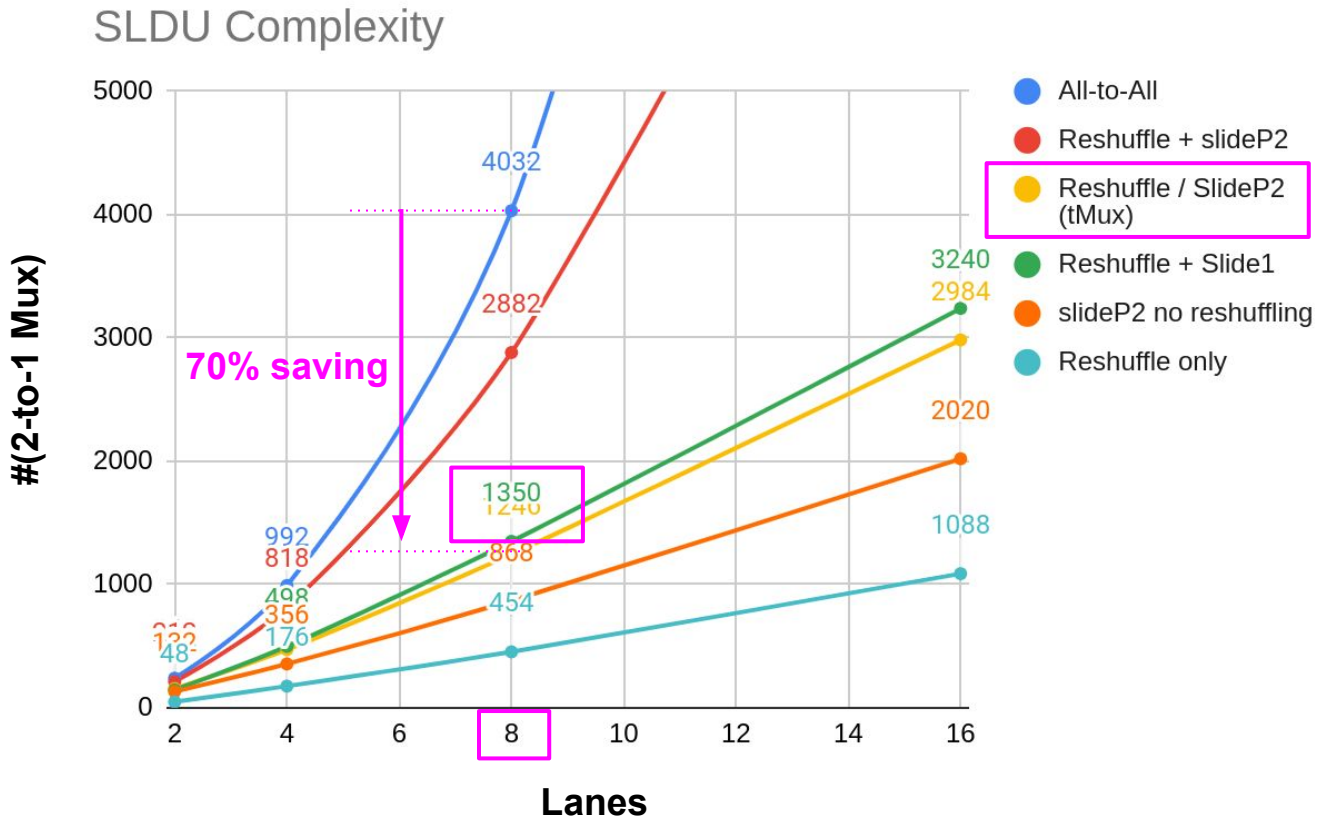

SLDU - A New Datapath

- Time-multiplex p2 slides and re-encoding
- Some difficulties to support undisturbed policy
- In parallel:
  - Energy efficiency of 4L and 8L without SLDU