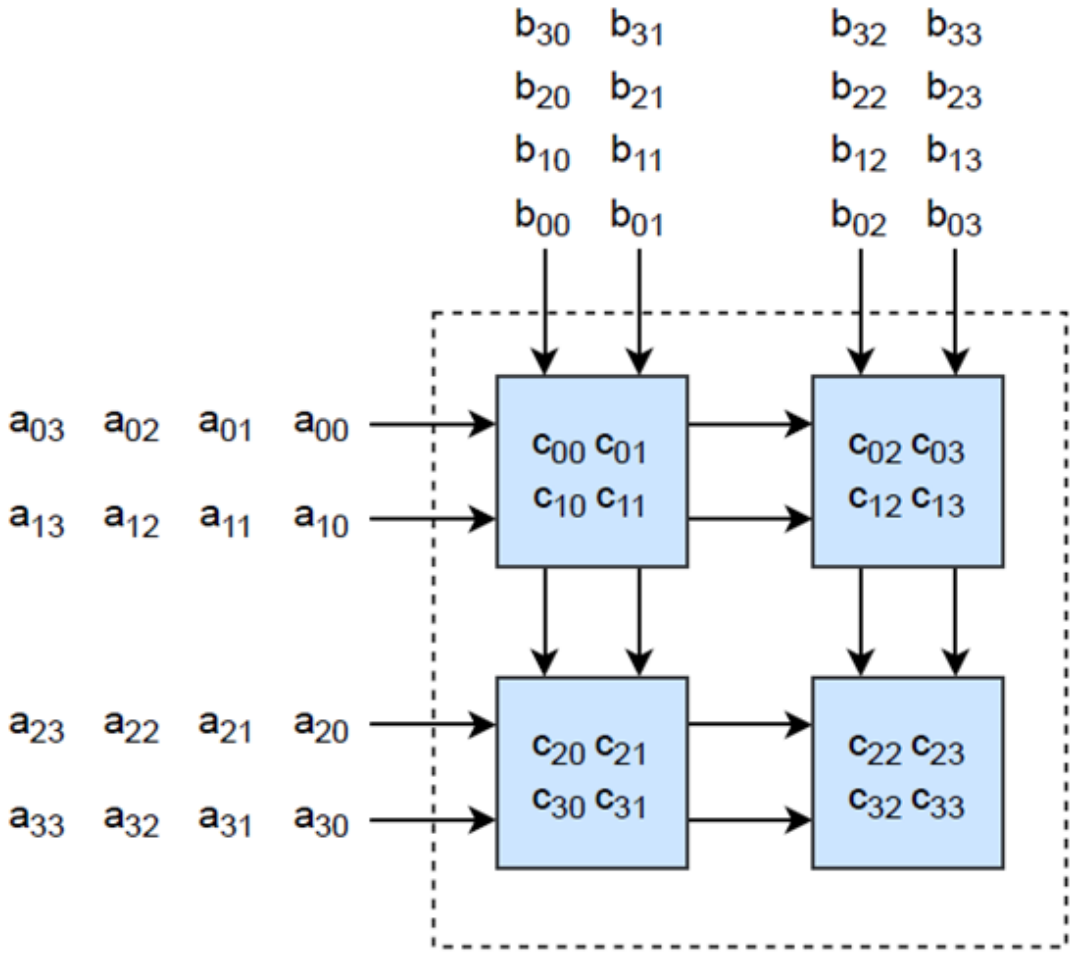
ETH zürich

MemPool meets Systolic

Samuel Riedel
Matheus Cavalcante
Prof. Luca Benini

Systolic Runtime is Merged

- We merged the first part of the systolic runtime
  - https://github.com/pulp-platform/mempool/pull/34
- Contains the runtime and systolic matrix multiplication
- We are now also adding the 2D convolution



Next step: ISA Extension

- Reduce the complex pop and push functions to a single instructions
- Keep the benefits of queues in the TCDM

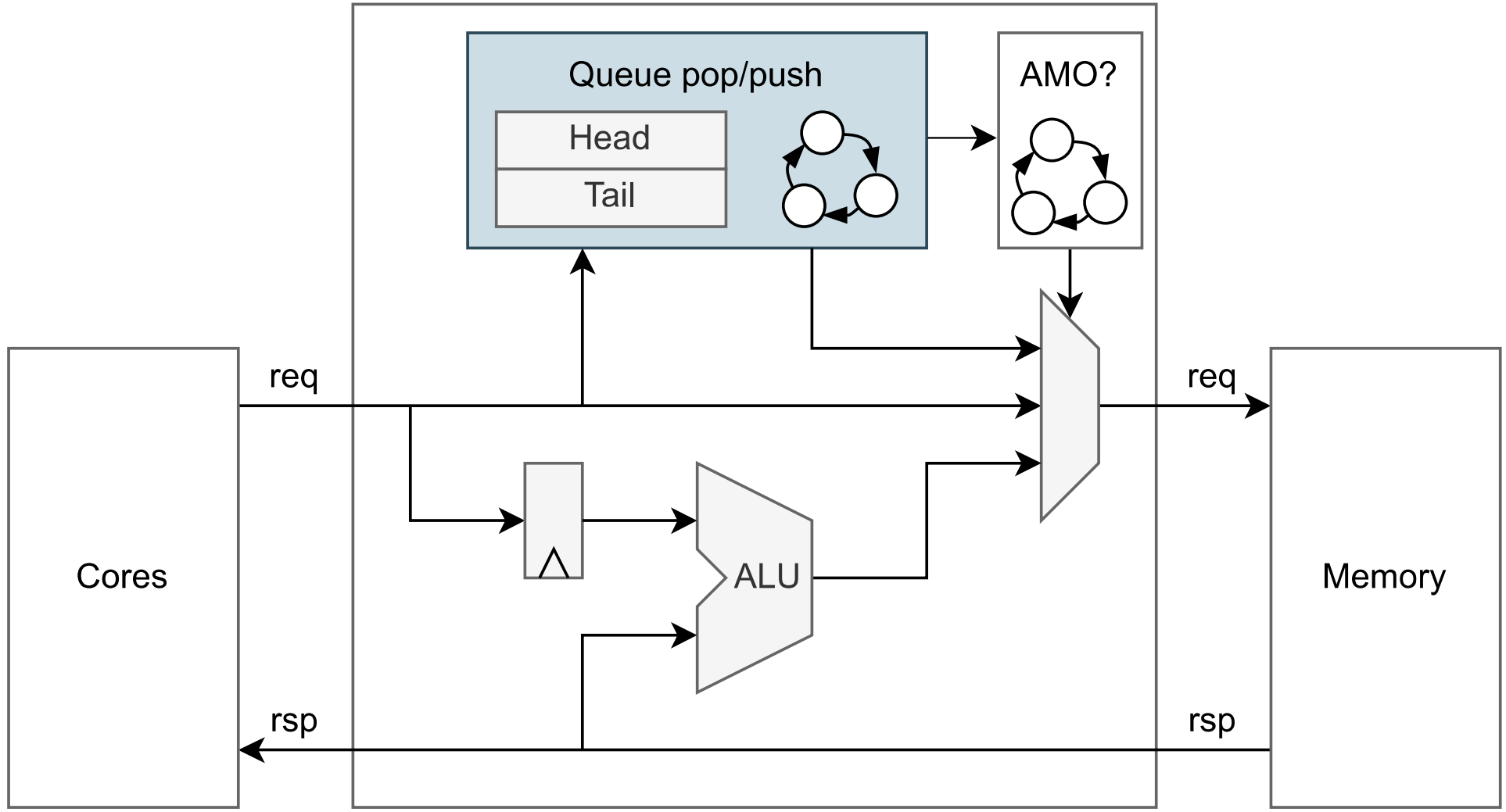
- Similar implementation as atomics
- Extension in Snitch and memory controller
  - Needs checking and cleanup

Eliminate tens of instructions

```
// Baseline
c = 0;
for (i=0; i<N; i++) {
  a = queue_pop(qa_in);
  b = queue_pop(qb_in);
  c += a * b;
  queue_push(a, qa_out);
  queue_push(b, qb_out);
}
```

```
// +queue pop/push extension
c = 0;
for (i=0; i<N; i++) {
  a = __builtin_pop(qa_in);
  b = __builtin_pop(qb_in);
  c += a * b;
  __builtin_push(a, qa_out);
  __builtin_push(b, qb_out);
}
```

Queue pop and push in memory controller



Open-Source Computer Architecture Research Submission

- We are submitting a poster to OSCAR
  - Abstract deadline is today
  - Workshop is on: June 11, 2022
- Current state of MmS

Journal Paper Update

- Writing is progressing
  - We started the internal review process
- What is missing?
  - DMA
  - Final backend
  - Evaluation
- Working on DMA this week
- Starting the benchmarks next week