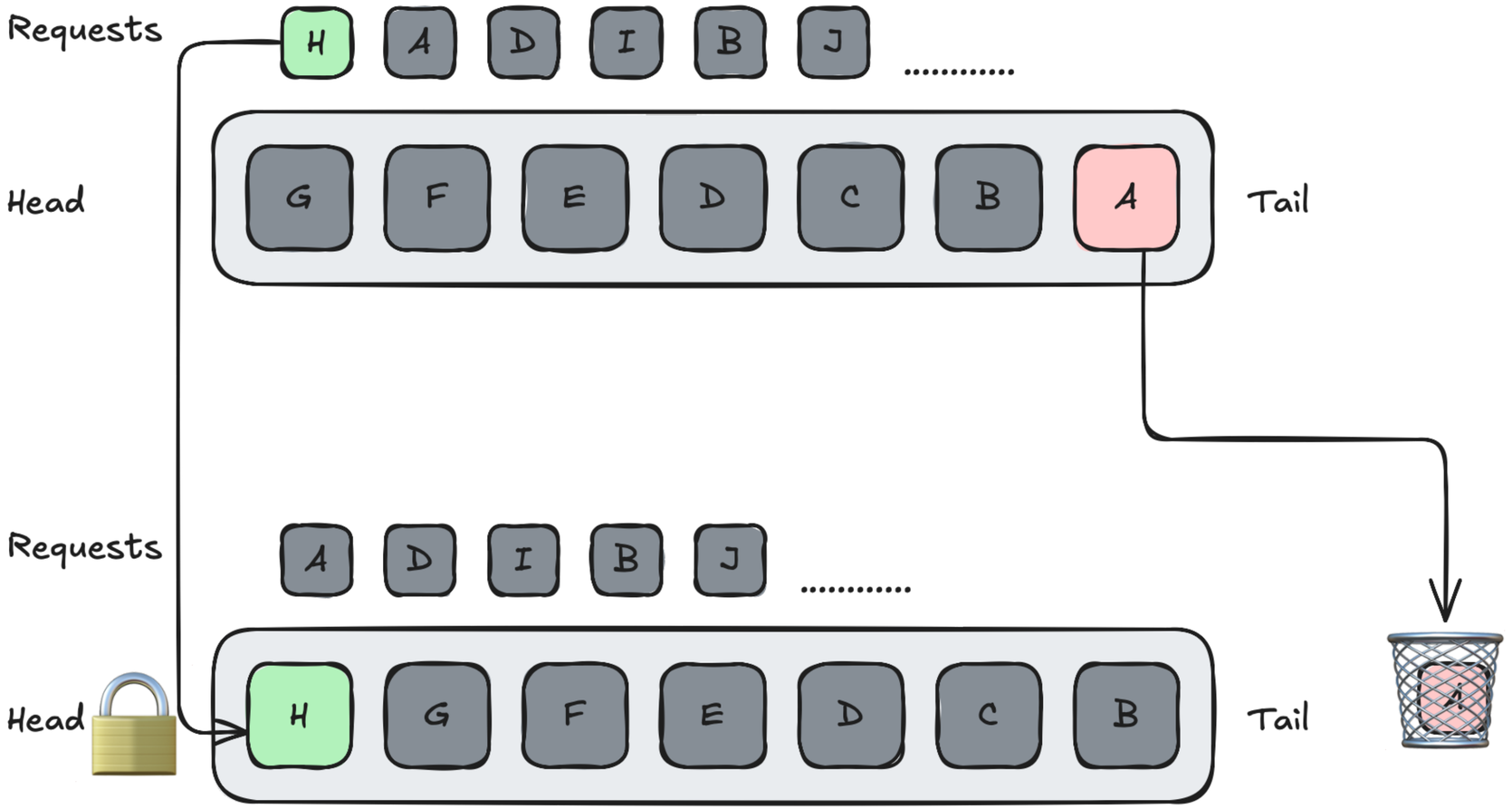
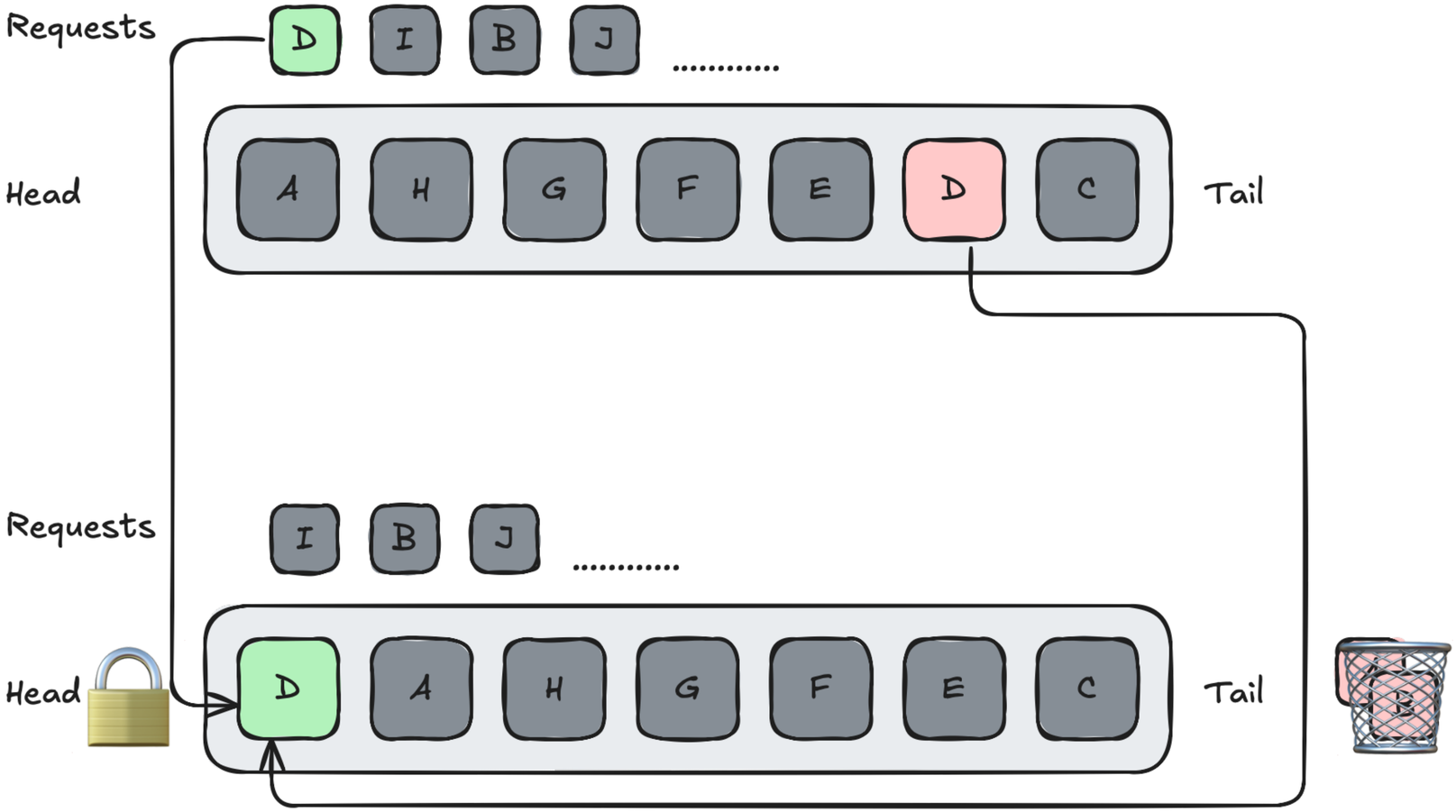
SIEVE

An Eviction Algorithm Simpler than LRU for ~~Web~~ Caches

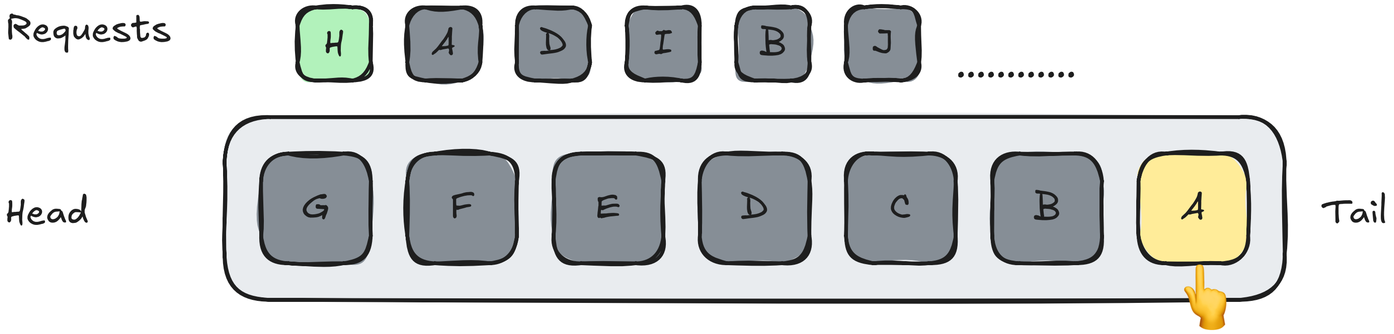
Ondřej Surý, ISC; RIPE 90 Lisbon

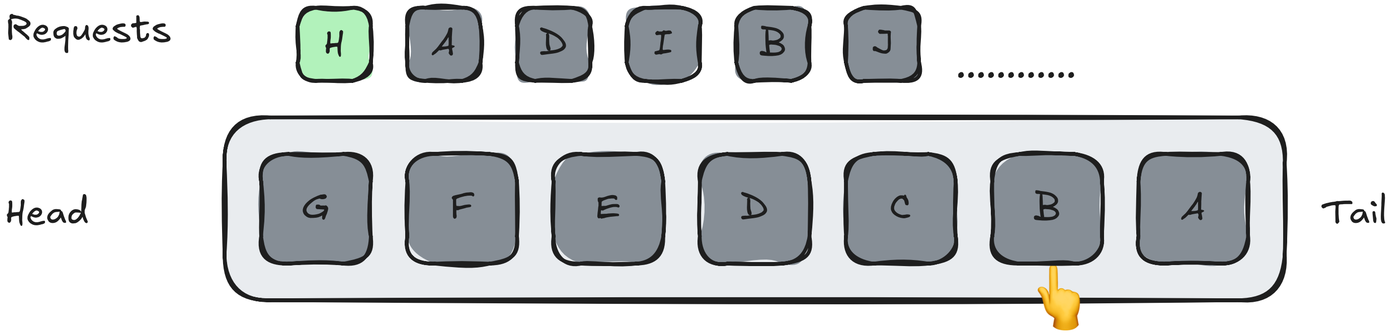


LRU – Cache Miss

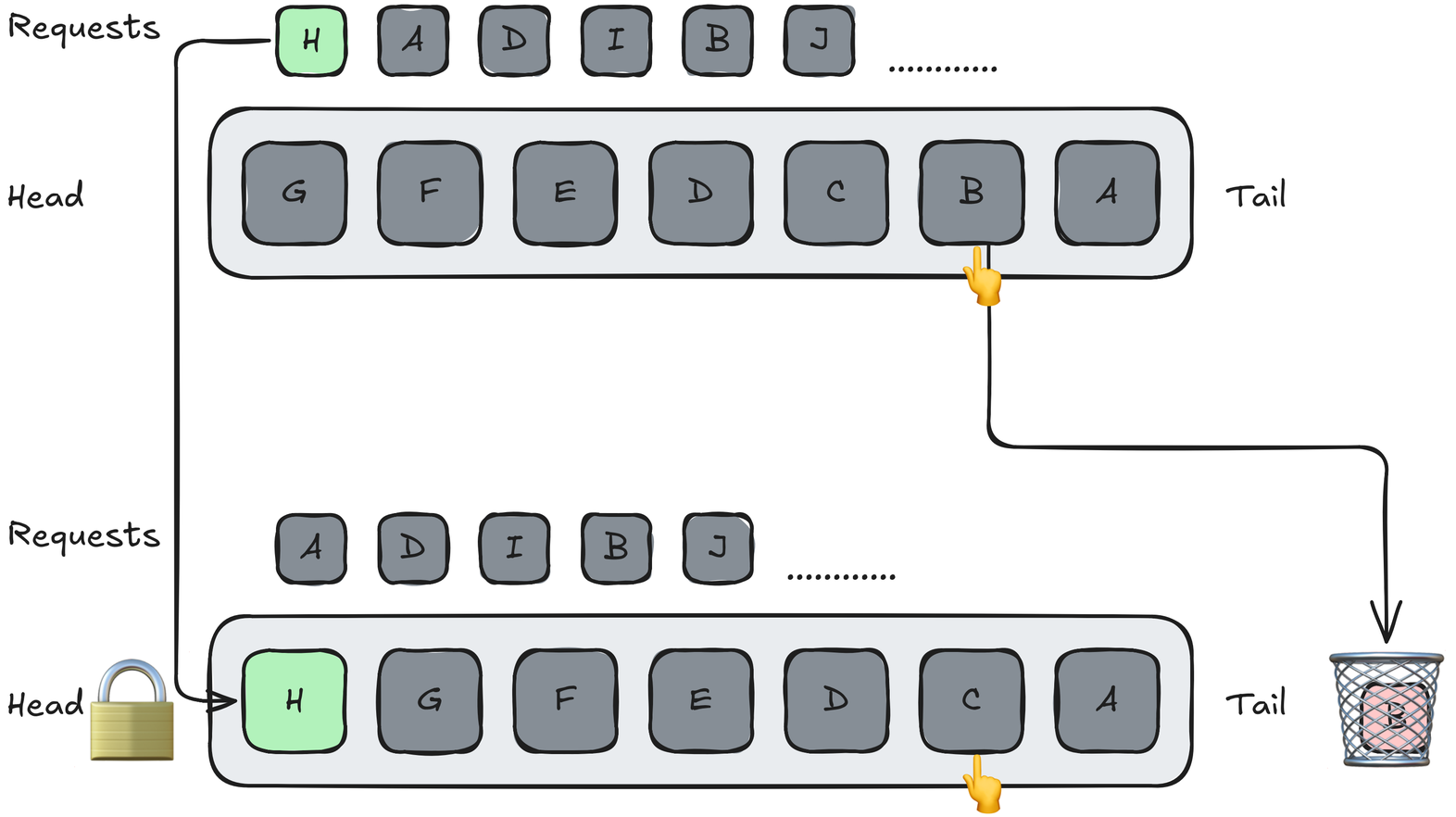


LRU – Cache Hit

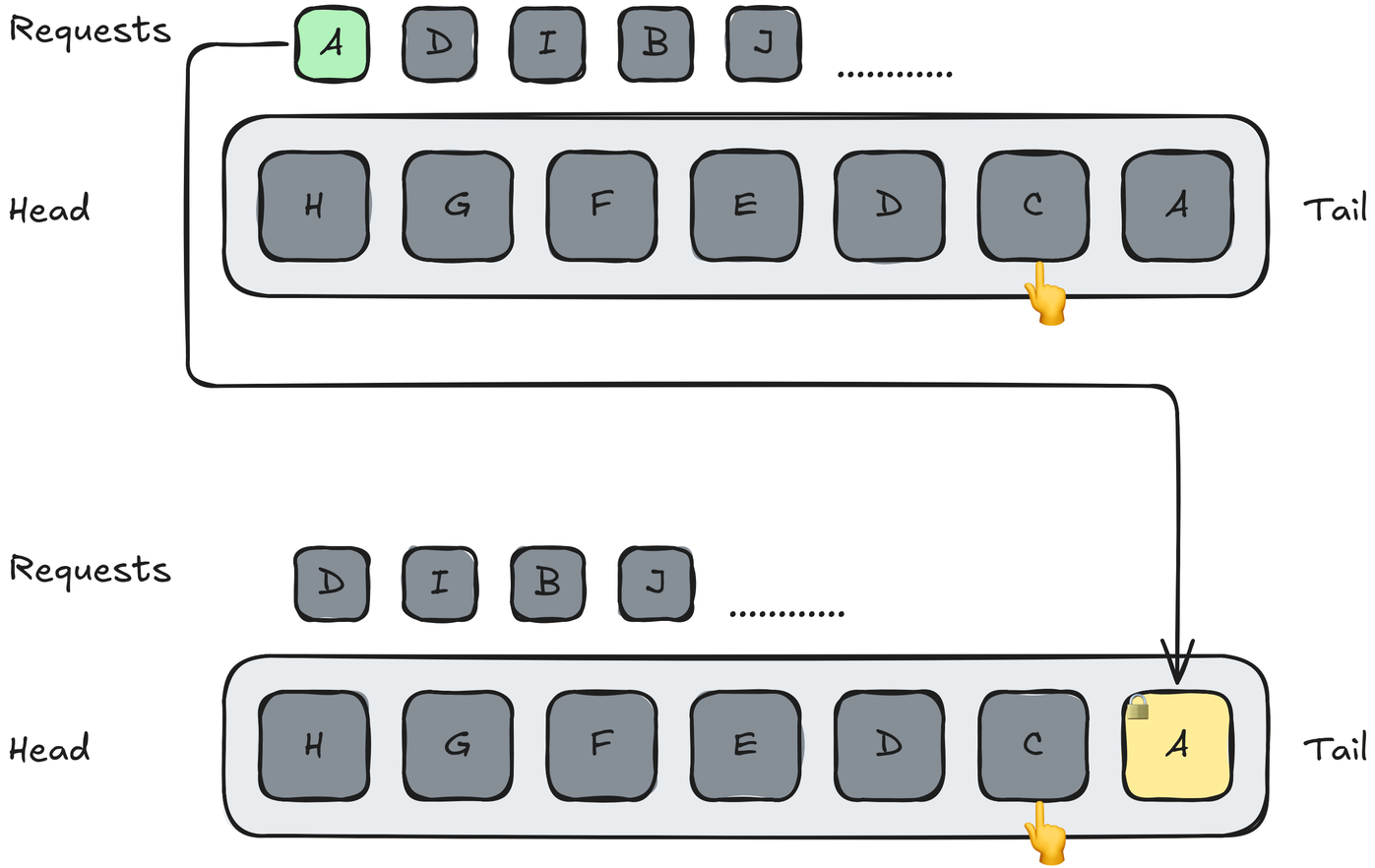




SIEVE – Cache Miss 1/2



SIEVE – Cache Miss 2/2



SIEVE – Cache Hit

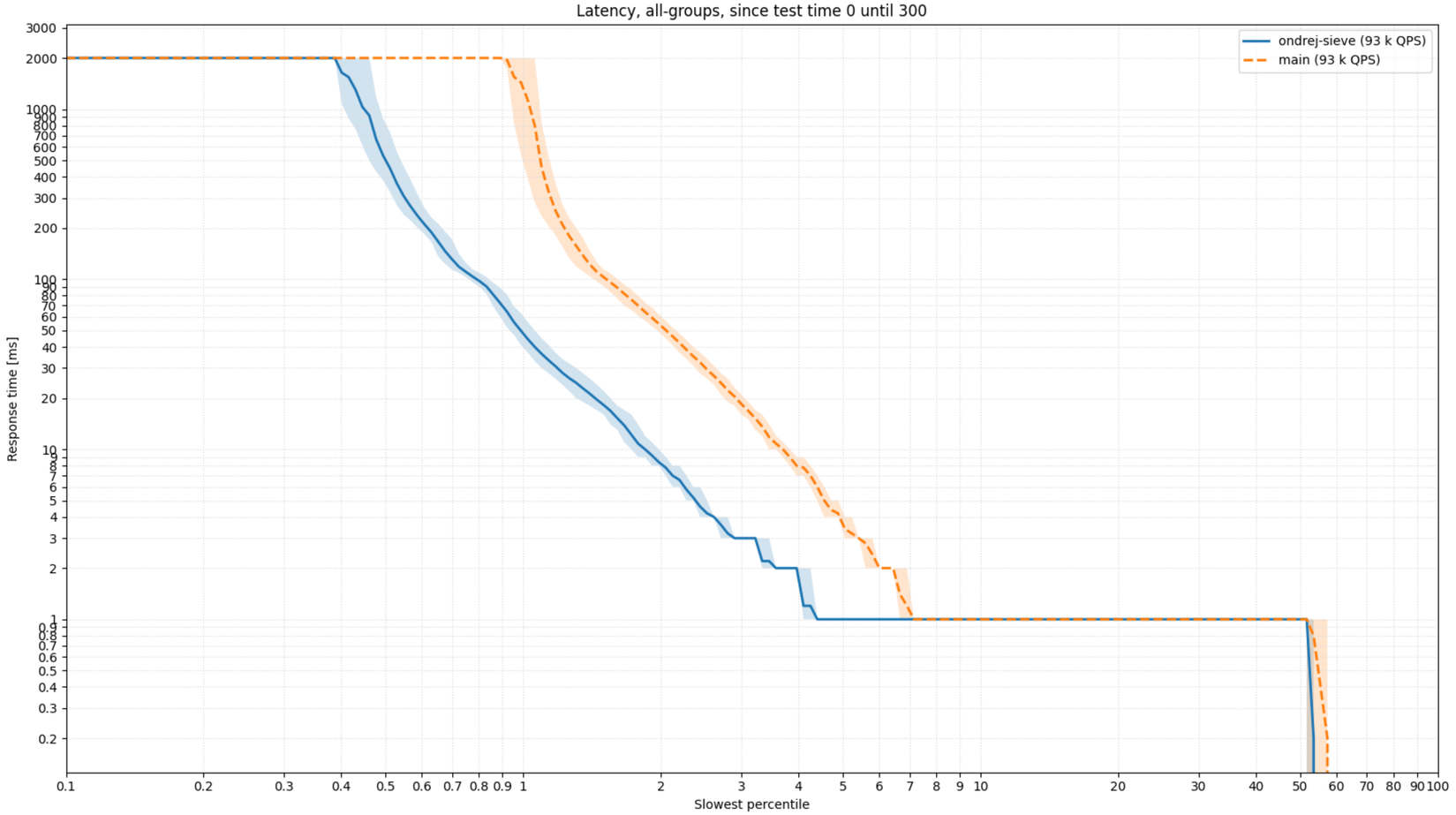
Lazy promotion and quick demotion

- LAZY PROMOTION
  - Only promote the cached objects at the eviction time
- QUICK DEMOTION
  - Remove most objects quickly after insertion

SIEVE IN BIND 9

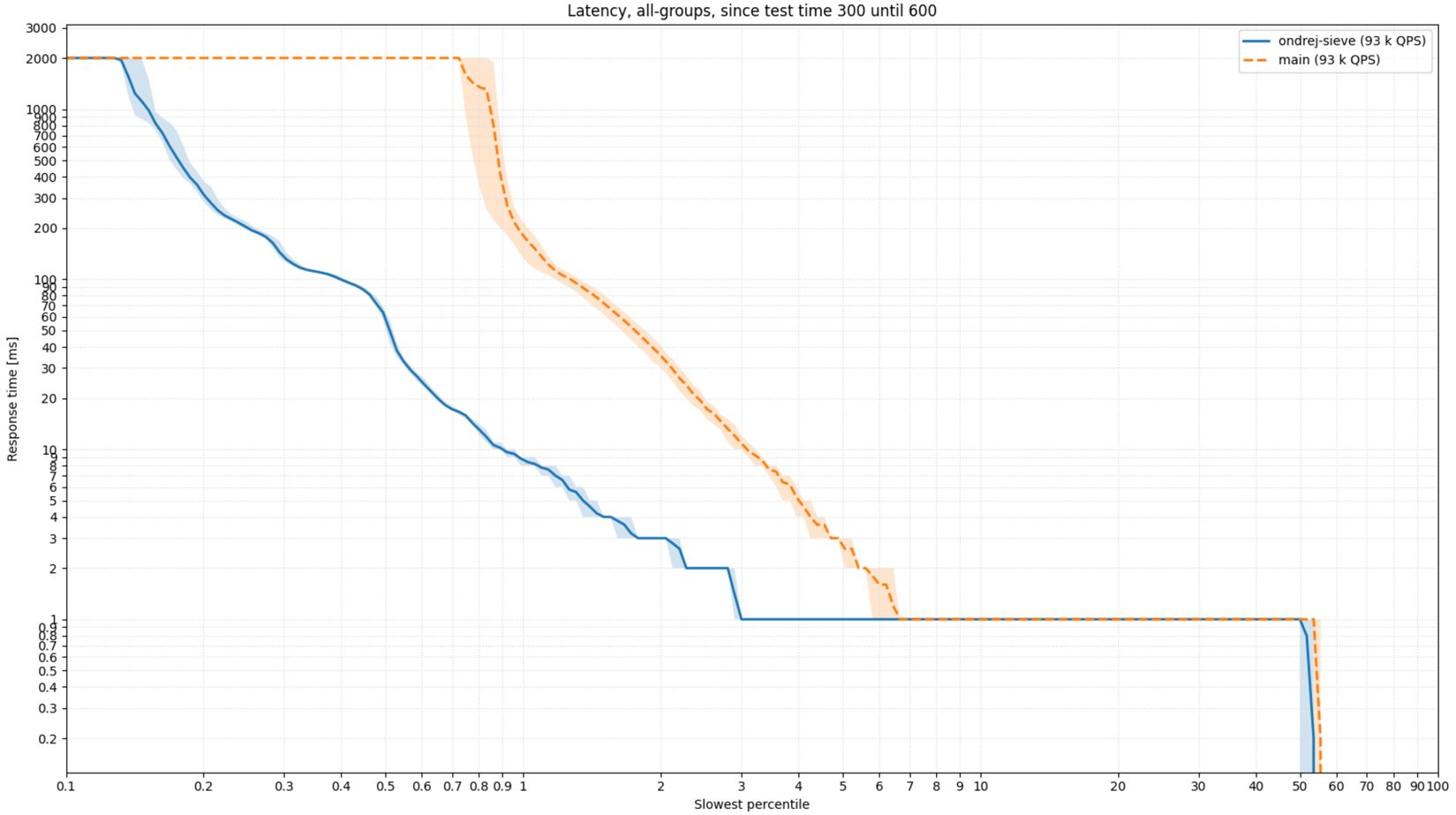
- Implementation in BIND 9.21+ (development version)
- The SIEVE implementation is simpler than the LRU implementation

```
$ git diff --stat origin/main
 lib/dns/include/dns/rdataslab.h |  10 +--
 lib/dns/qpcache.c               | 512 ++++++++++++++++++++
+-------------------------------------------------------
-------------------------------------------------------
--------
 lib/isc/Makefile.am             |   1 +
 lib/isc/include/isc/sieve.h     |  62 ++++++++++++++++++
 4 files changed, 144 insertions(+), 441 deletions(-)
```



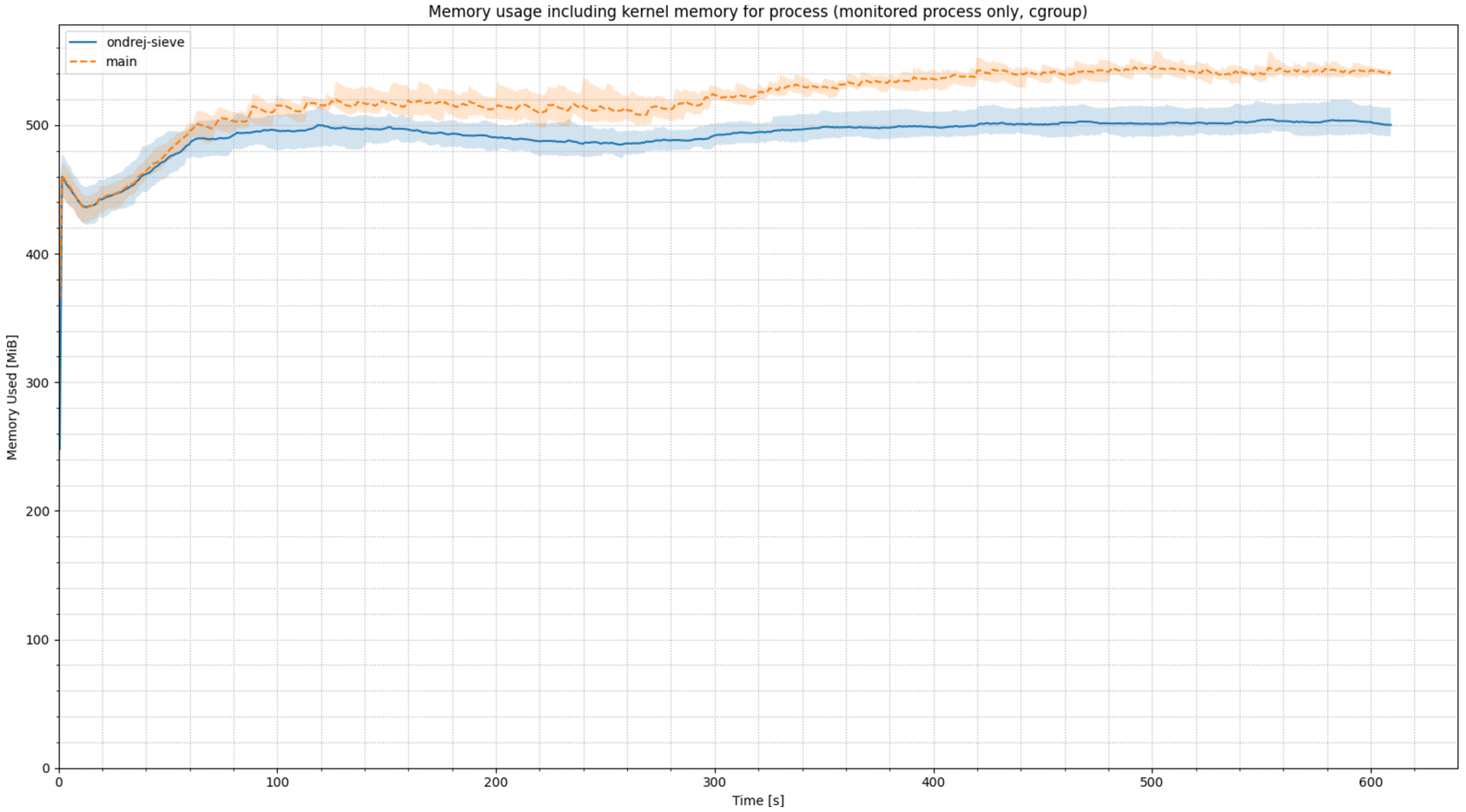
BIND 9 (128MB CACHE)

Latency, Cold-Cache



BIND 9 (128MB CACHE)

Latency, Hot-Cache

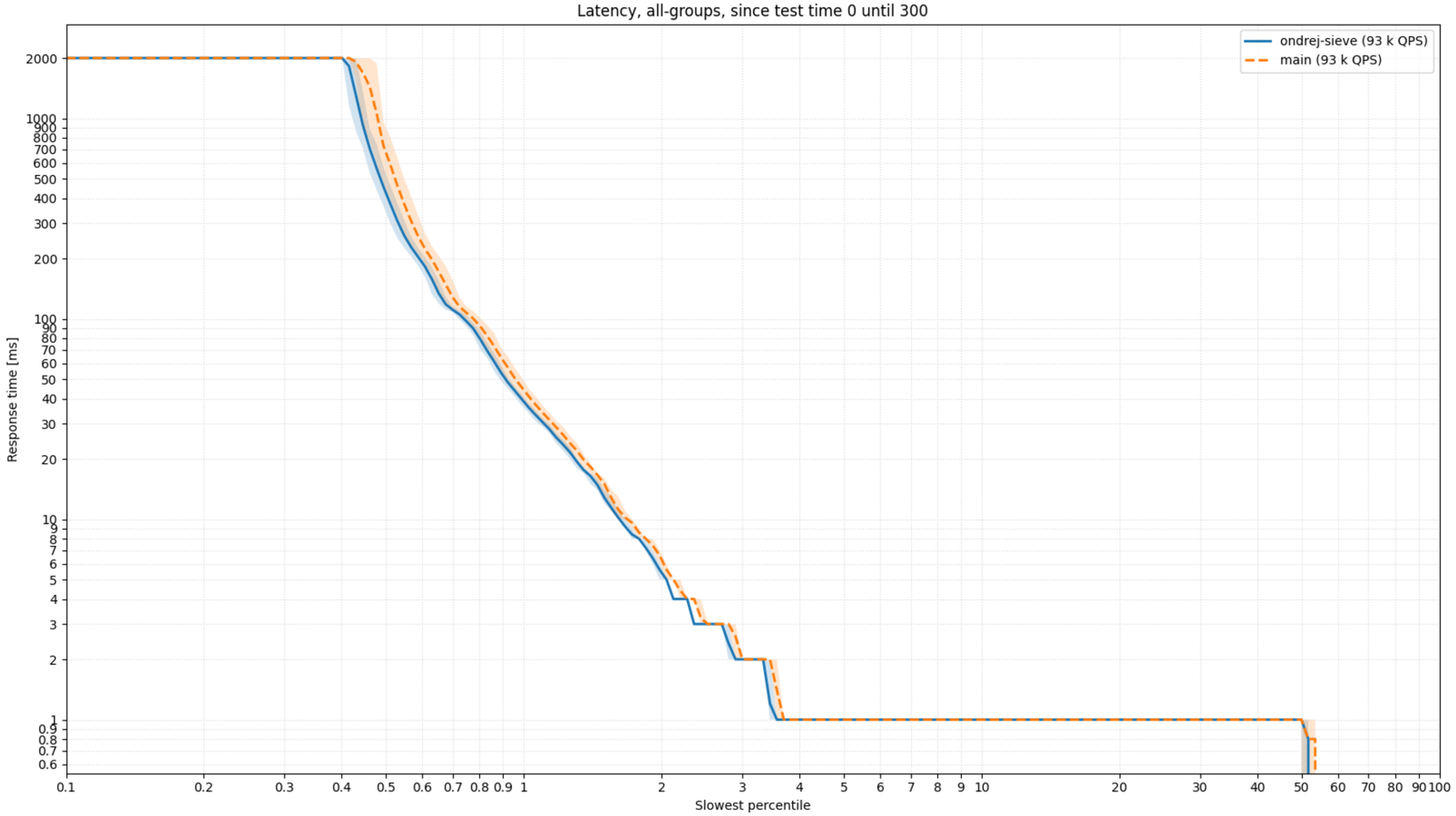


BIND 9 (128MB CACHE)

Memory

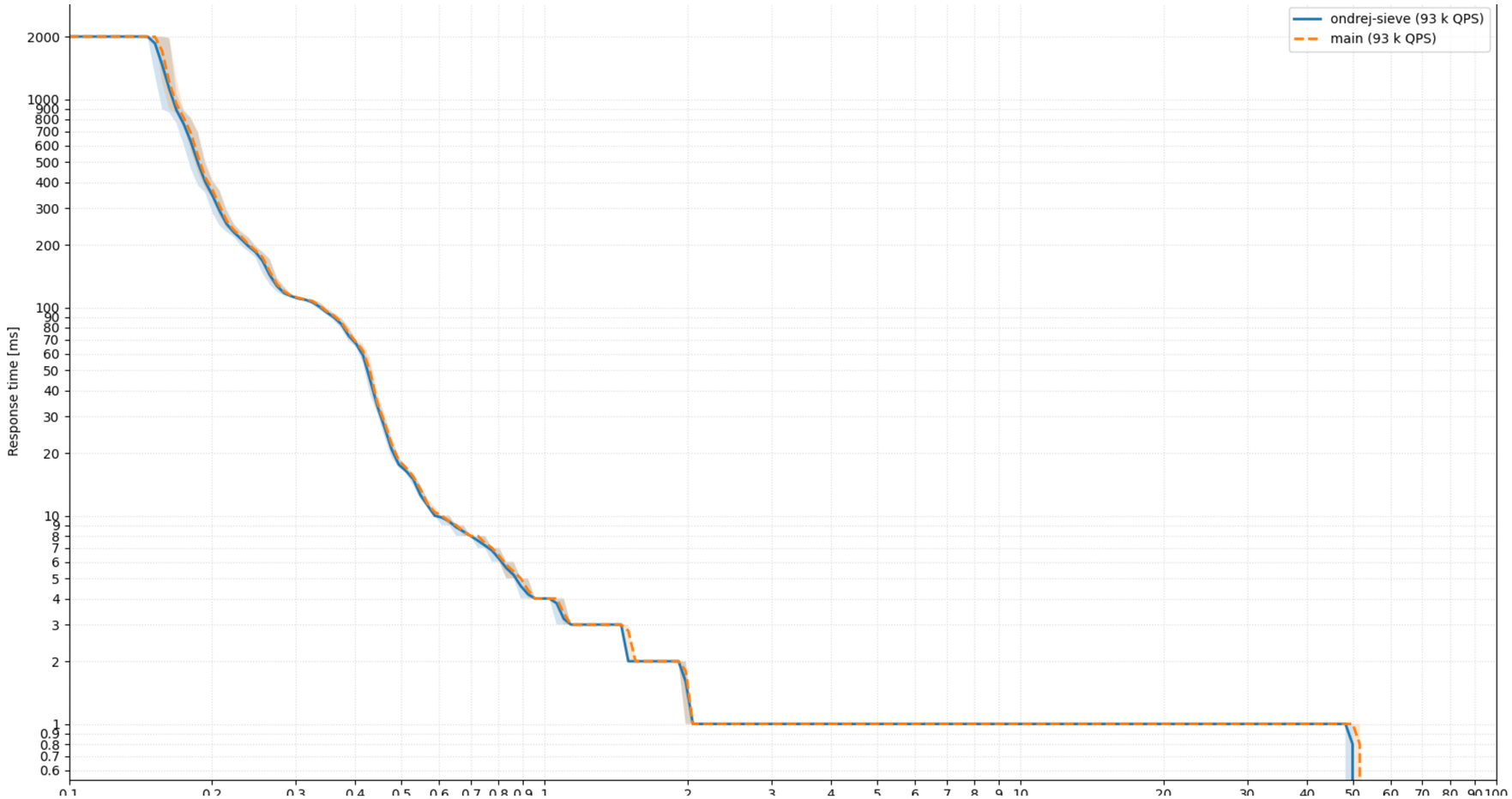
BIND 9 (128MB CACHE)

CPU



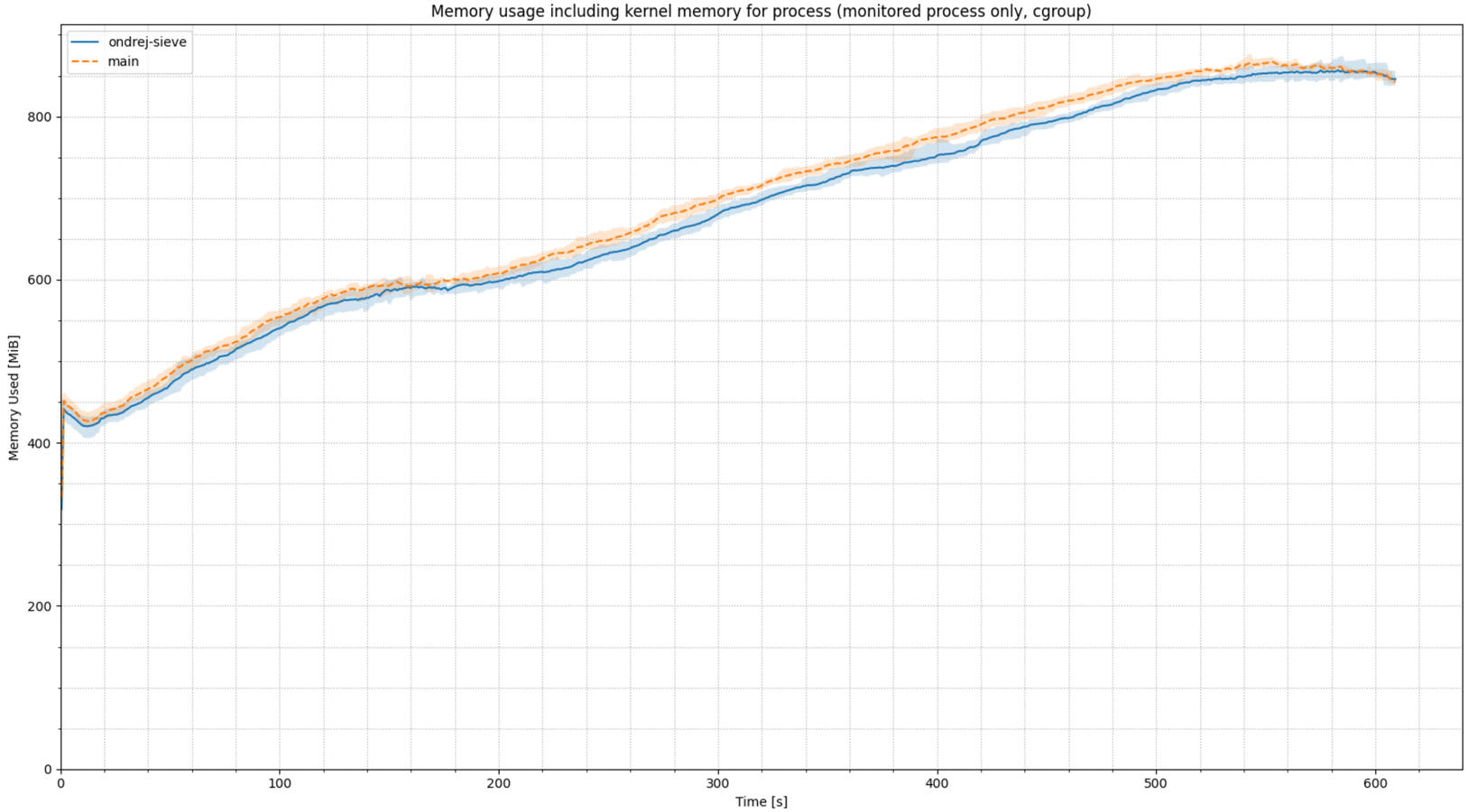
BIND 9 (30GB CACHE)

Latency, Cold-Cache



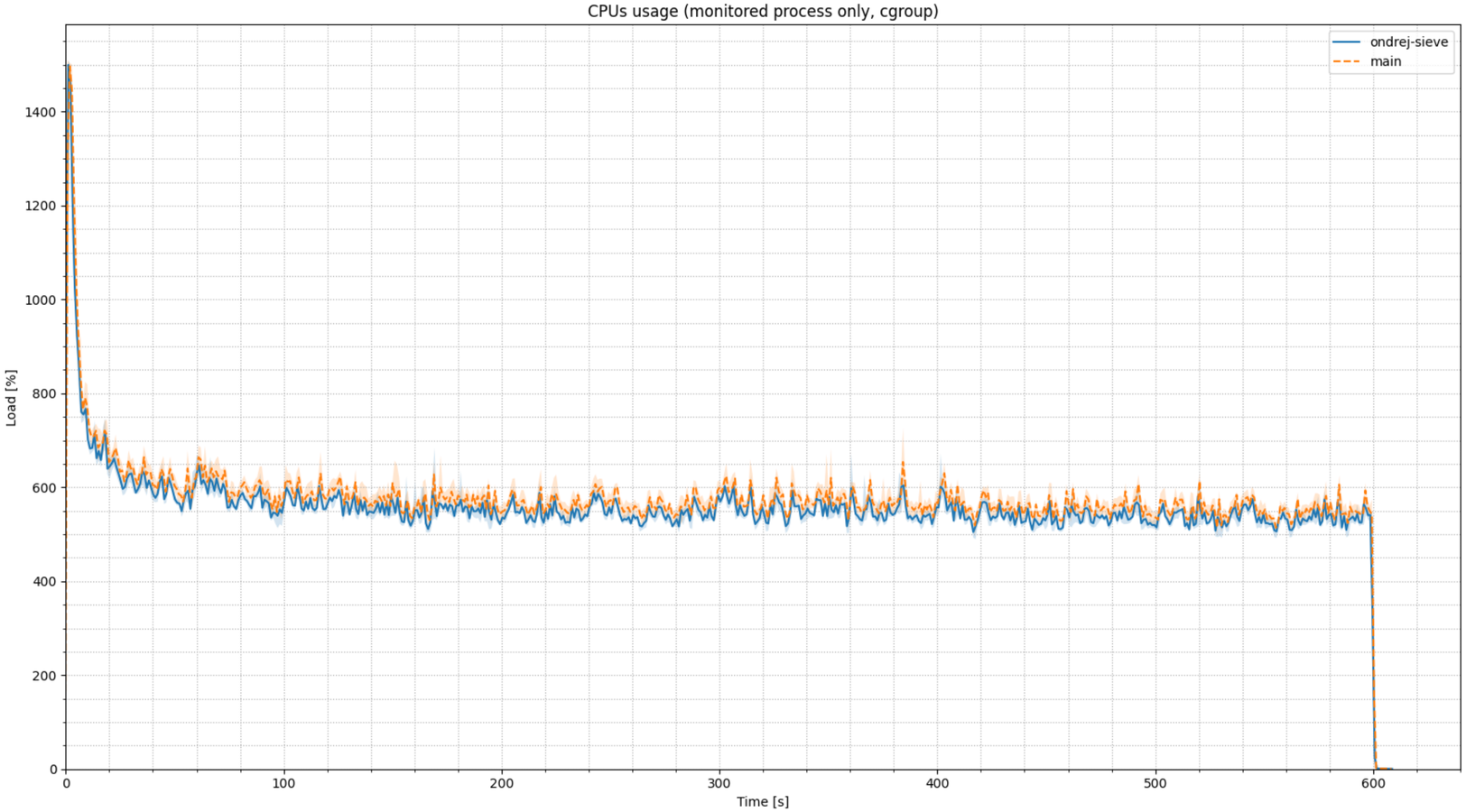
BIND 9 (30GB CACHE)

Latency, Hot-Cache



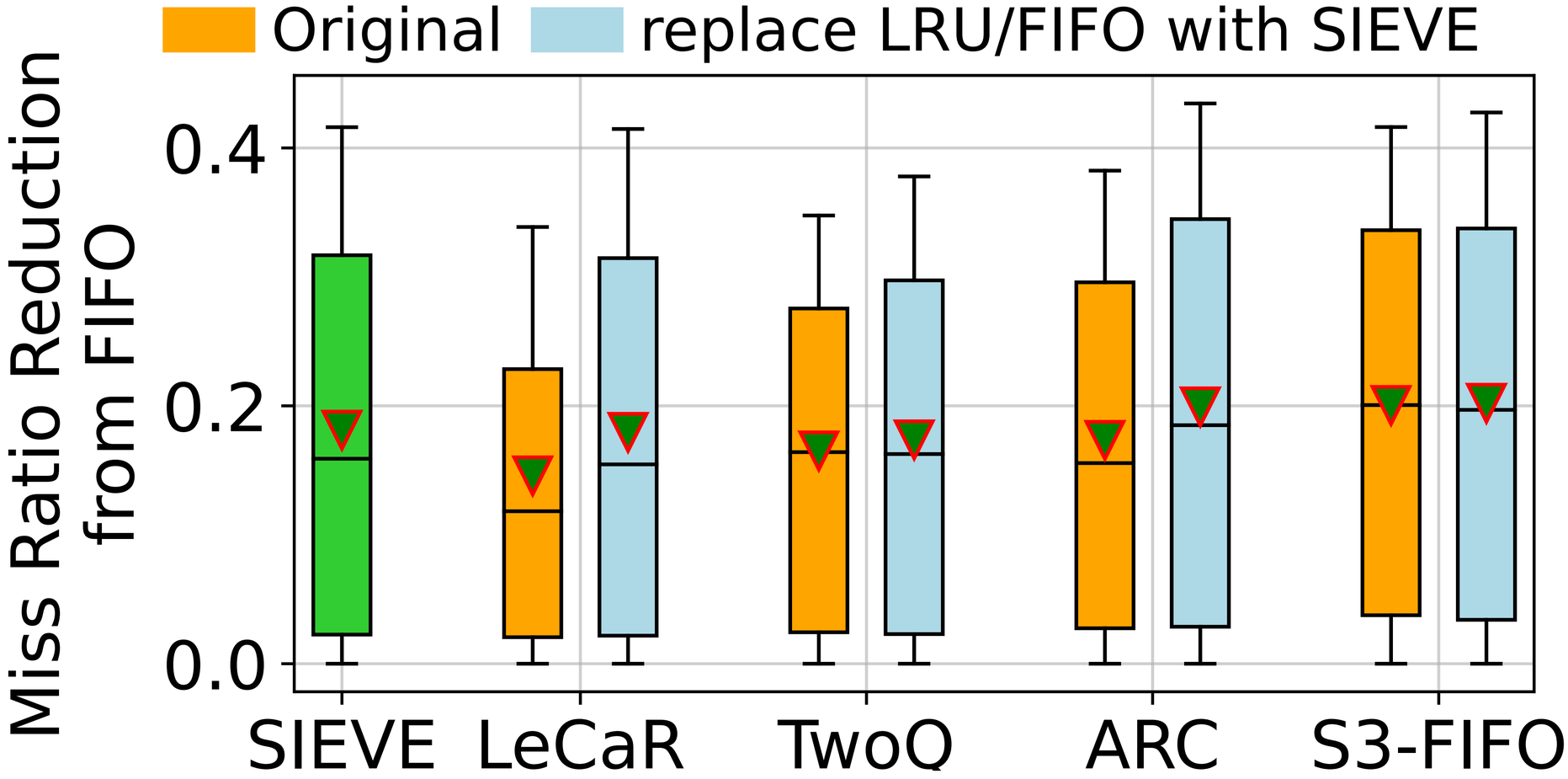
BIND 9 (30GB CACHE)

Memory



BIND 9 (30GB CACHE)

Memory



SIEVE is BEYOND AN EVICTION ALGORITHM

It can be plugged into more advanced algorithms

SIEVE IS NOT SCAN RESISTANT

- Scanned items get intermingled with popular items
- Future research:
  - Use a small counter instead of just a flag
  - Use a shadow cache that keeps track of recently evicted items

Questions?

REFERENCES

- https://sievecache.com/
- https://junchengyang.com/publication/nsdi24-SIEVE.pdf
- https://cachemon.github.io/SIEVE-website/blog/2023/12/17/sieve-is-simpler-than-lru/
- https://isc-projects.gitlab-pages.isc.org/-/bind9-shotgun-ci/-/jobs/5392303/artifacts/index.html (30 GB cache)
- https://isc-projects.gitlab-pages.isc.org/-/bind9-shotgun-ci/-/jobs/5392288/artifacts/index.html (128 MB cache)