Missive: Fast Application Launch from an Untrusted Buffer Cache

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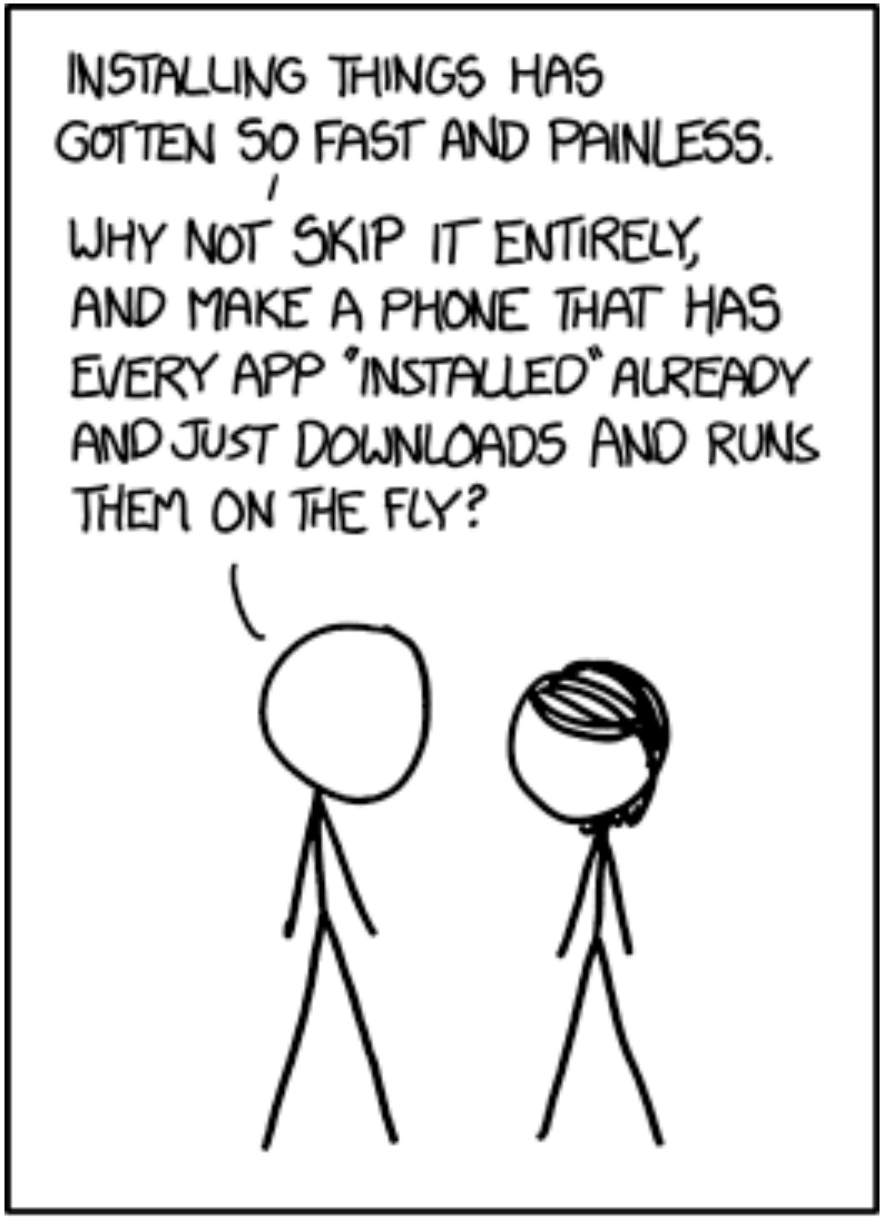
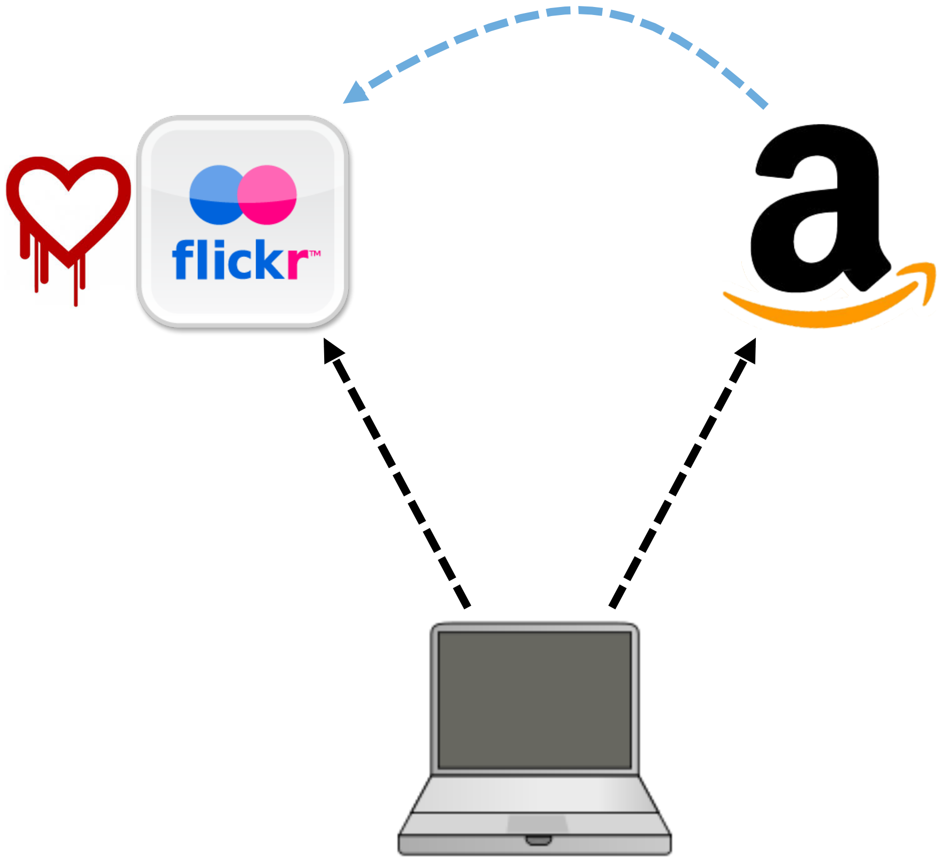

INSTALLING THINGS HAS GOTTEN SO FAST AND PAINLESS.
WHY NOT SKIP IT ENTIRELY, AND MAKE A PHONE THAT HAS EVERY APP "INSTALLED" ALREADY AND JUST DOWNLOADS AND RUNS THEM ON THE FLY?

I FELT PRETTY CLEVER UNTIL I REALIZED I'D INVENTED WEBPAGES.

http://xkcd.com/1367/

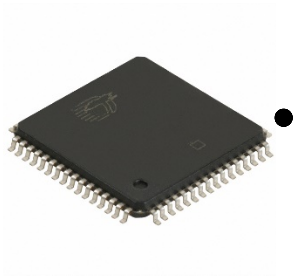
Autonomy leads to painlessness



Client installations are not autonomous

Embassies: autonomy on the client

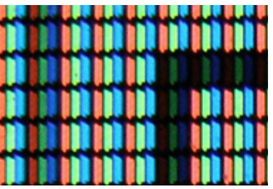
Minimality leads to autonomy



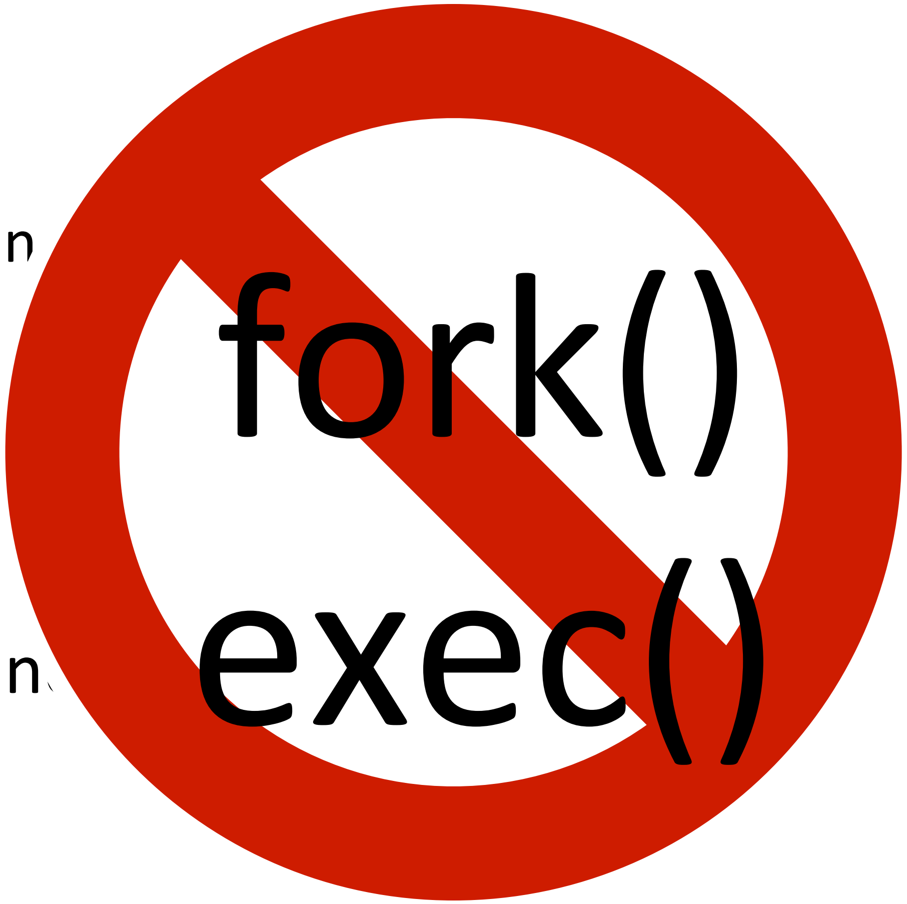
- picoprocess:
  - memory allocation in
    and scheduling

- all communications

- crypto primitives (ran

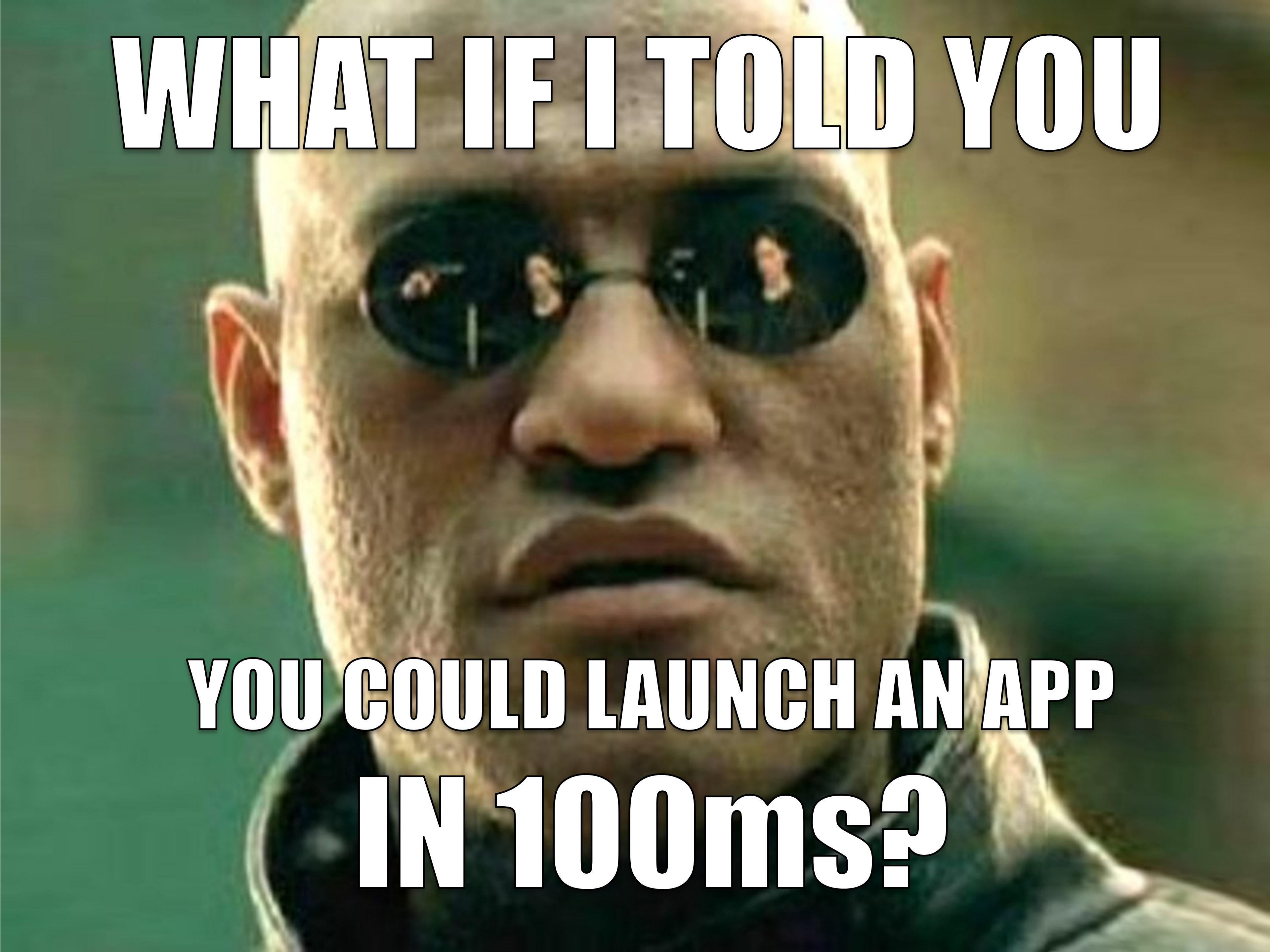


- UI is pixel blitting



Consequences of minimality

- Apps are big.
  - browser
  - rendering libraries
  - OS, filesystem
- No shared, trusted buffer cache


WHAT IF I TOLD YOU
YOU COULD LAUNCH AN APP
IN 100ms?

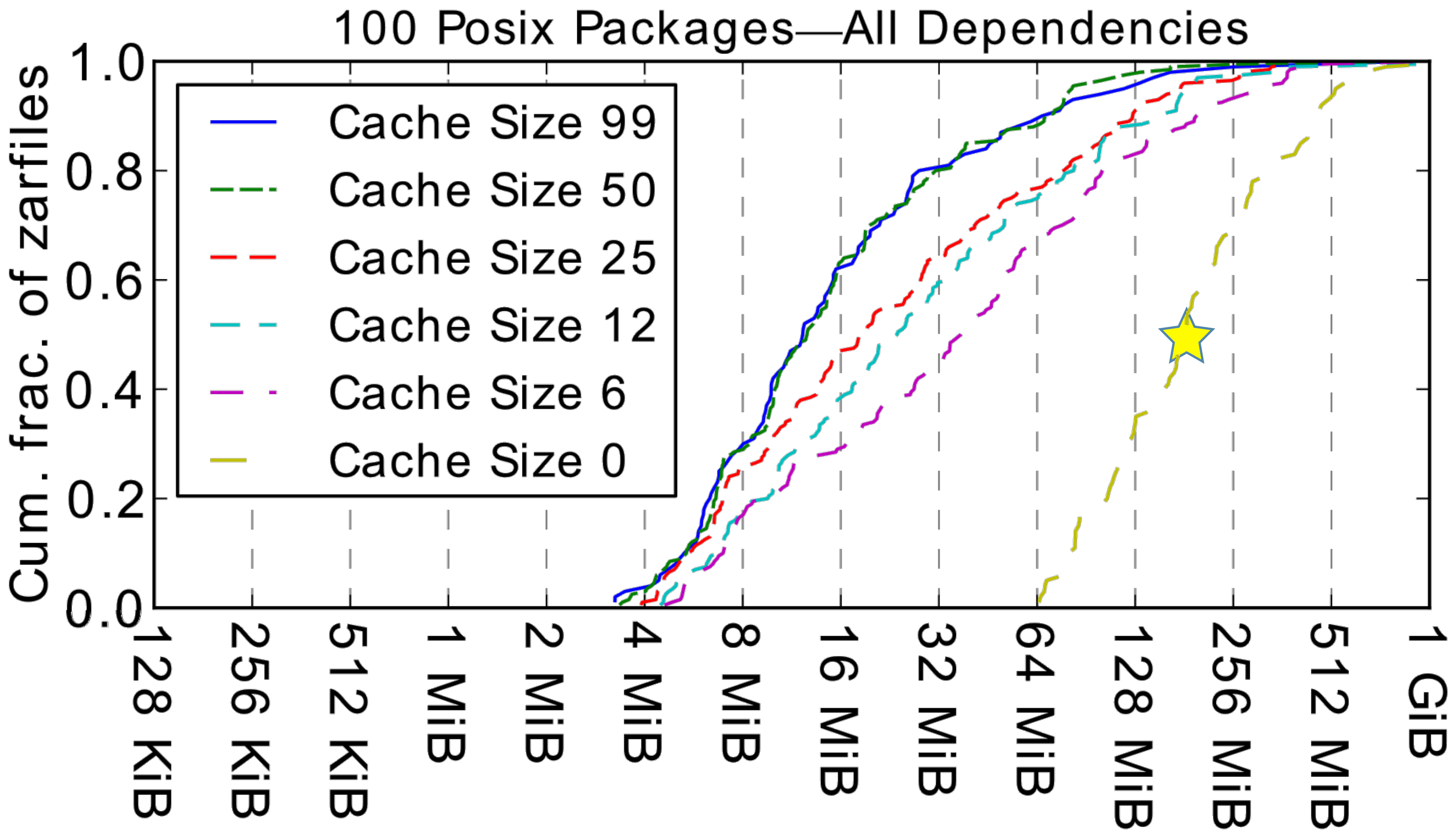
Why will it work?

- Commonality is available
- We can exploit it
    - to reduce network costs
    - to minimize local startup latency
- Proof of concept: cost is around ~100ms

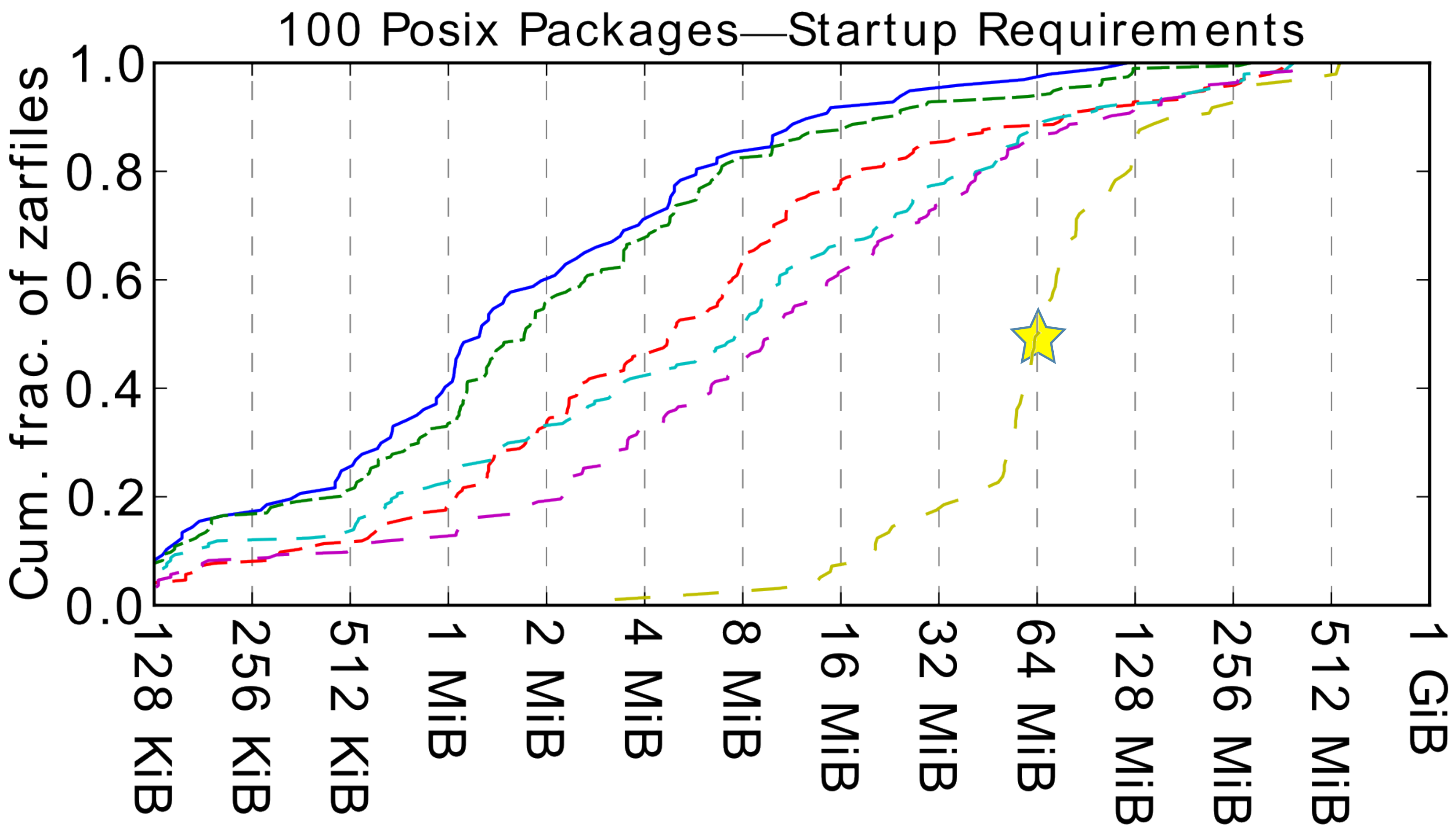
100MiB apps have commonality

- Servers *could* run anything…
  but a few programs serve each function
    - OpenSSL, PolarSSL, Windows SSL
    - postfix, qmail, exim
- Embassies clients *could* run anything…
    - 100 “best-of” interactive desktop apps

100MiB apps have commonality



100MiB apps have commonality



Fast app launch

- Exploiting commonality to save network bandwidth
- Exploiting local commonality at low latency

App launch in Embassies

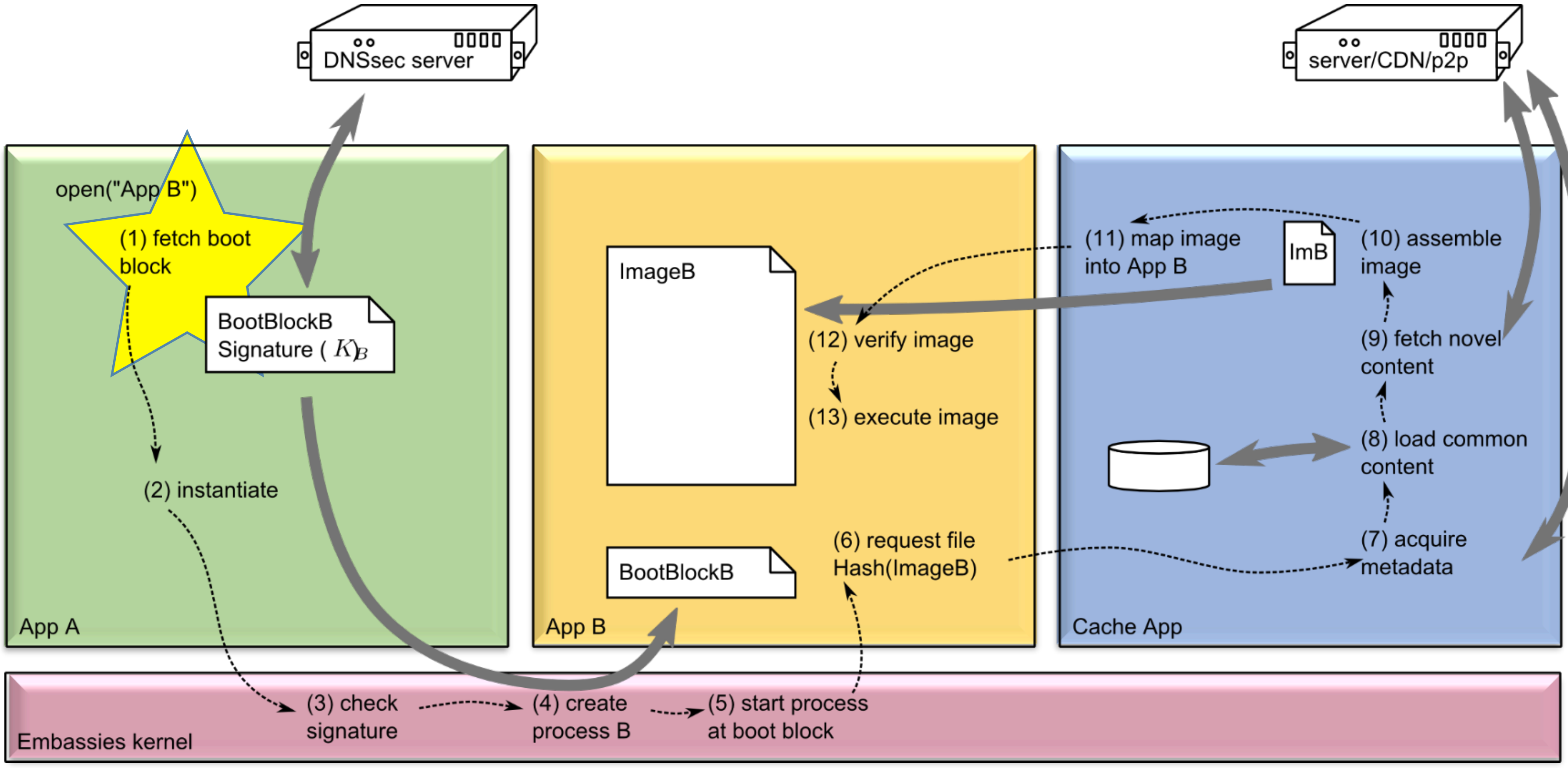
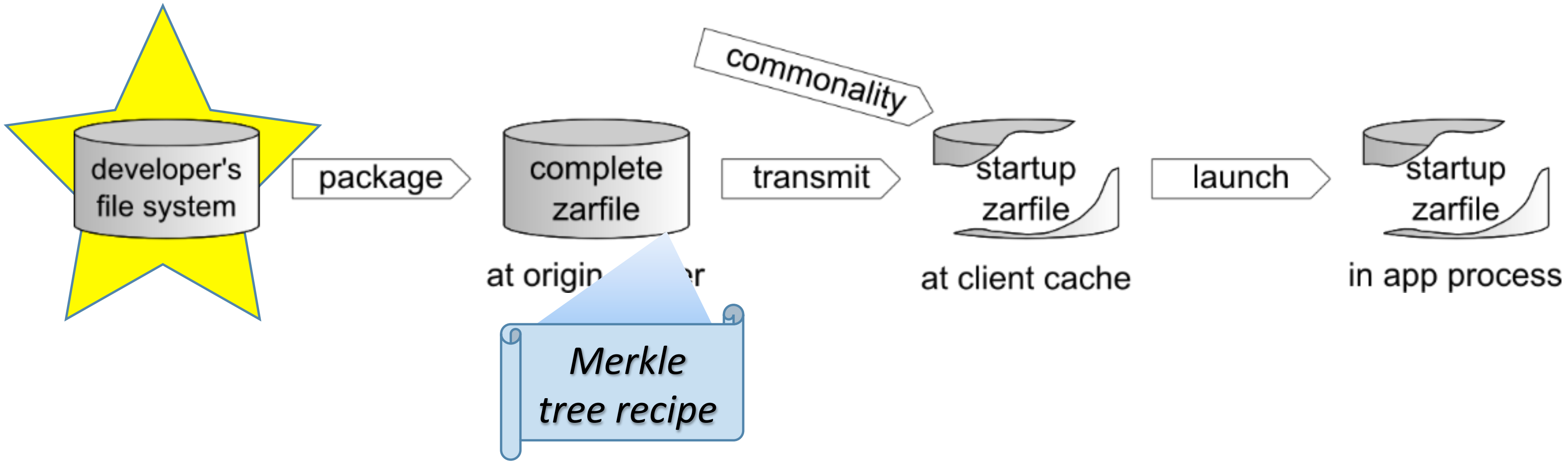
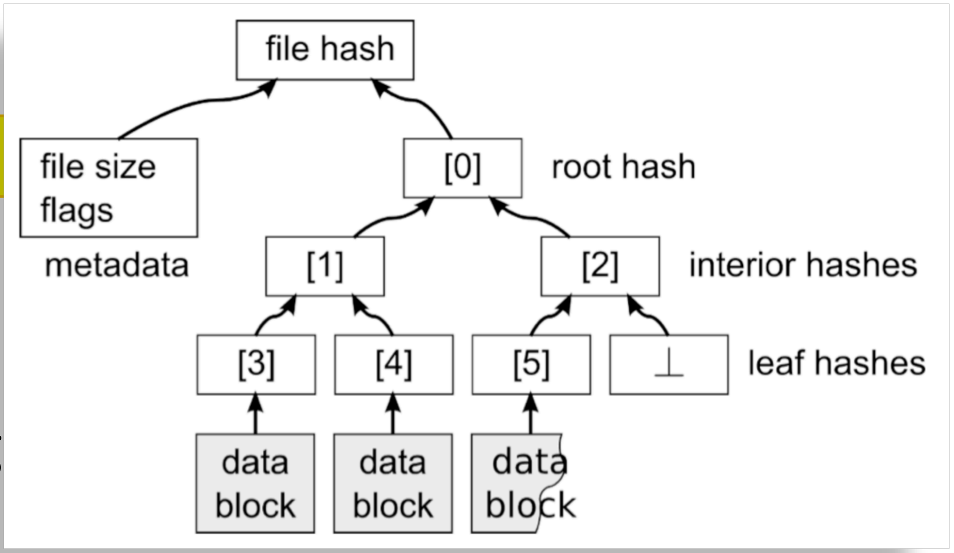


Image provenance

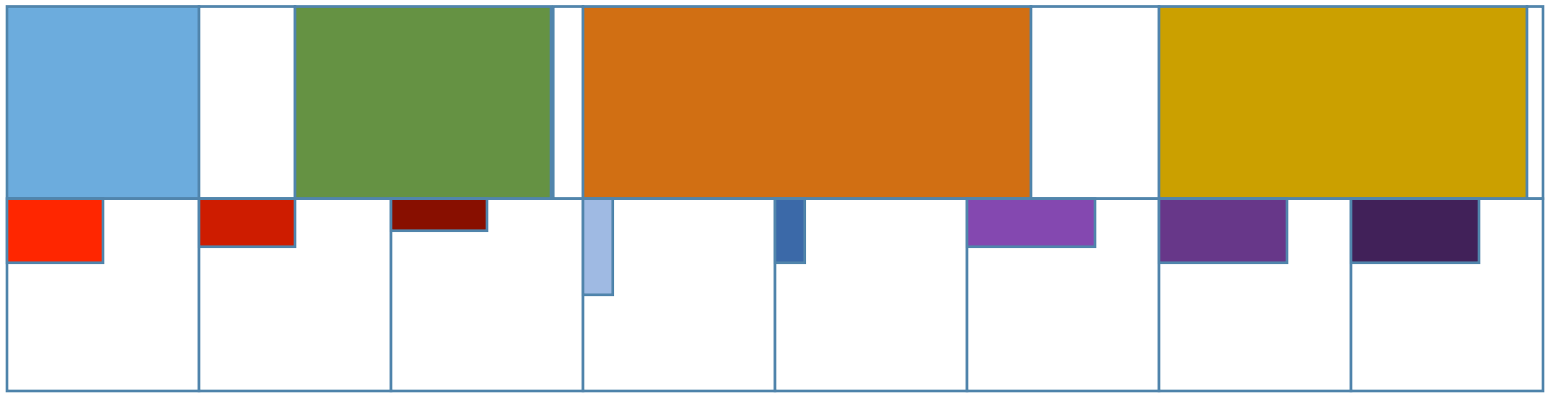


Zarfile structure

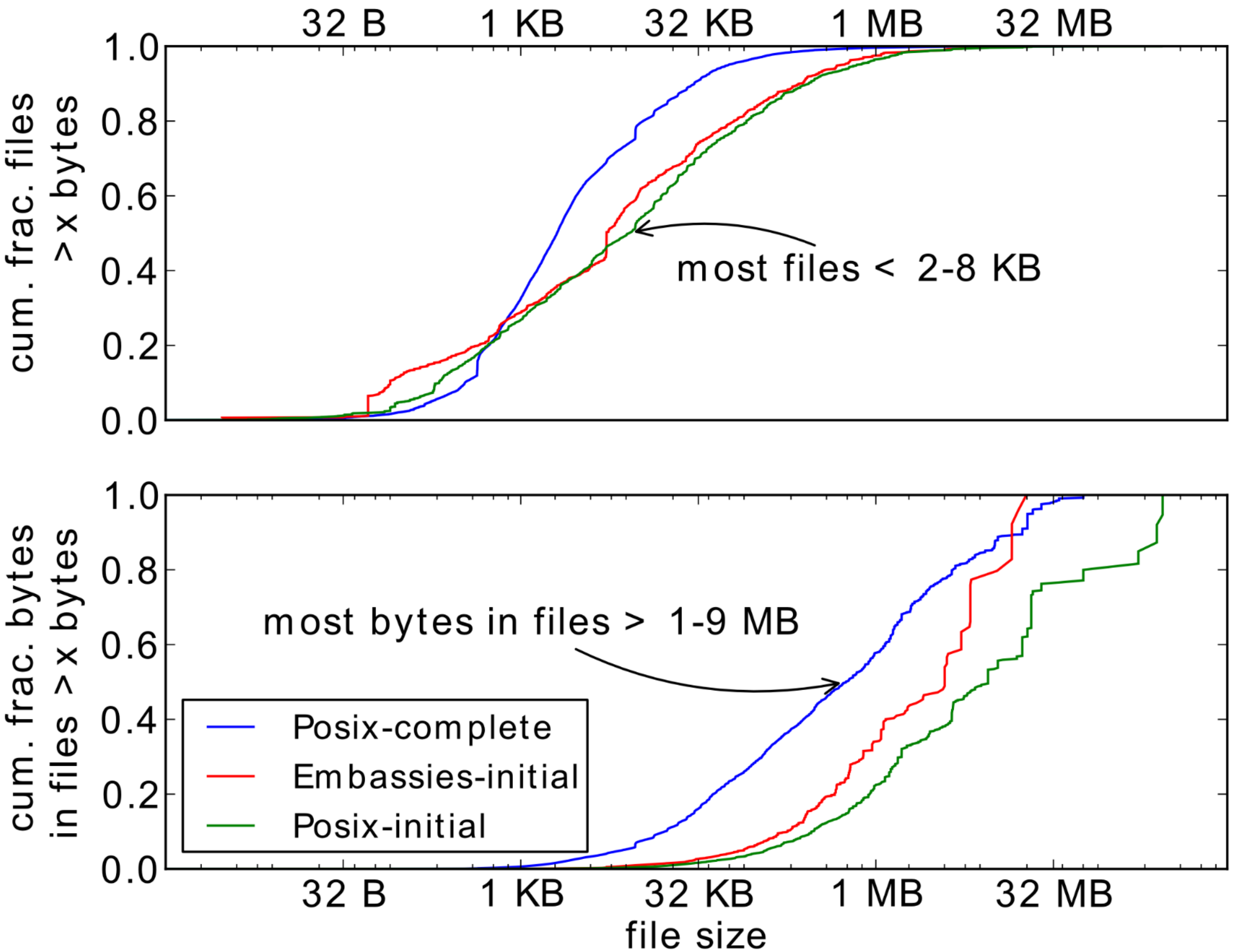
- Blocks vs. strings
- Block size
    - Small blocks: big recipes
    - Big blocks: extra padding
- Small-file packing
- Merkle tree degree
- File placement with consistent hashing



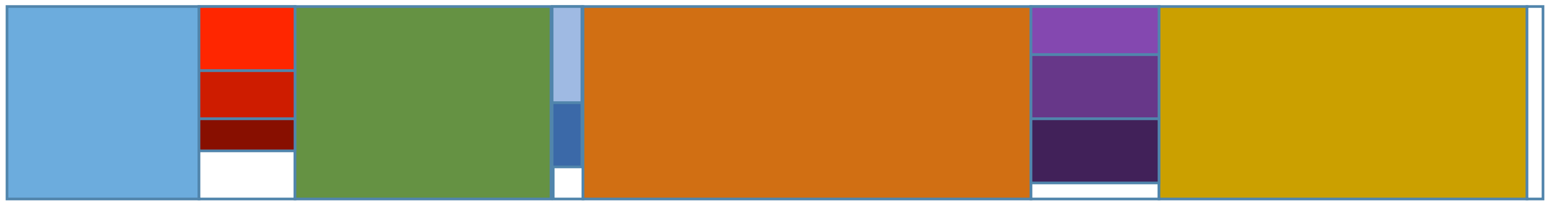
Small file packing



Small file packing



Small file packing



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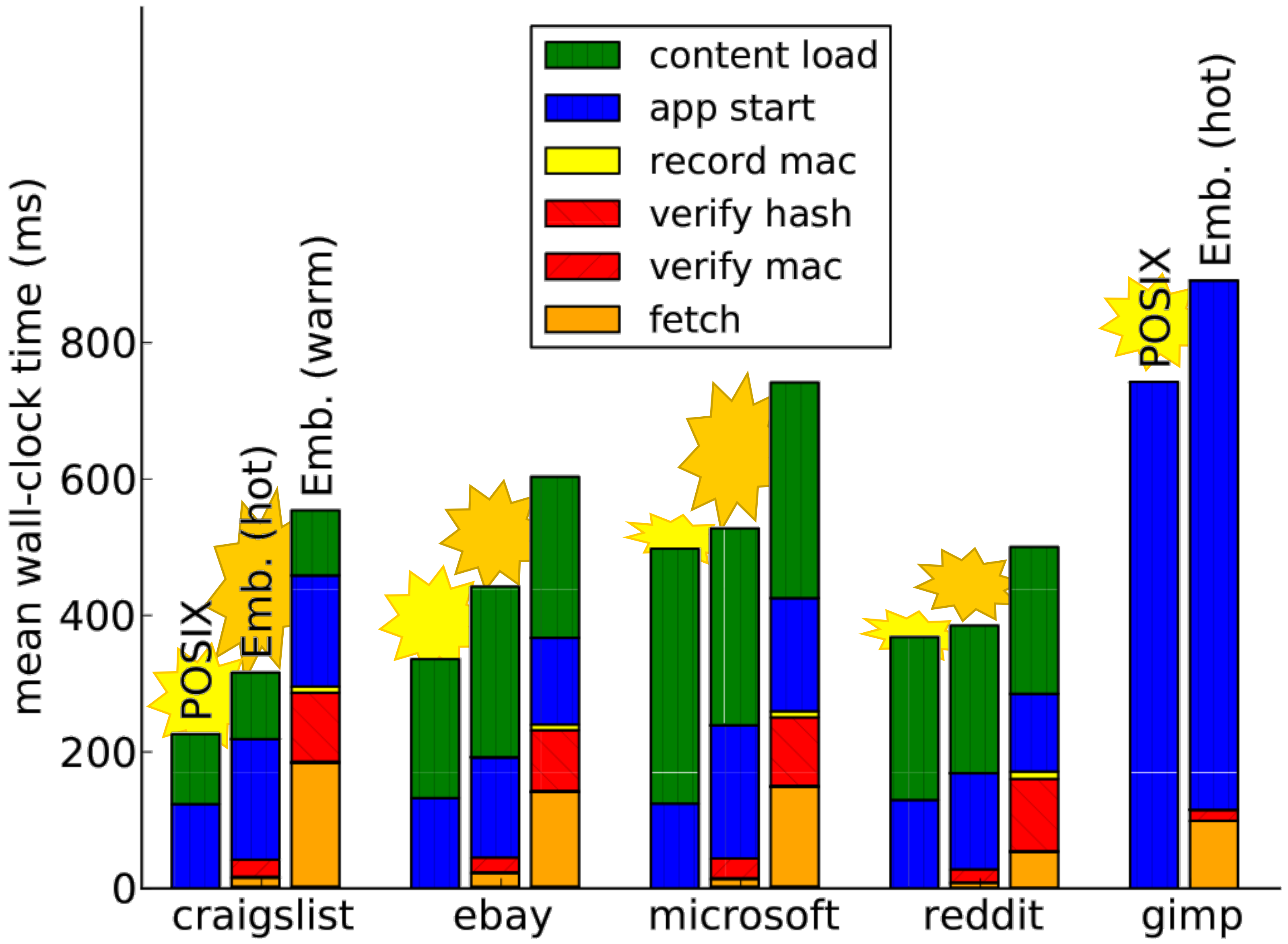
Fast verification

- SHA-1: 390ms   (100MiB)
- VMAC: 29ms
    - depends on a secret
    - how can boot block have a secret?

Launch times



Summary

- Client apps exhibit commonality
- Untrusted cache costs ~100ms
- We really can deliver 100MB apps