dm-writeboost admin guide

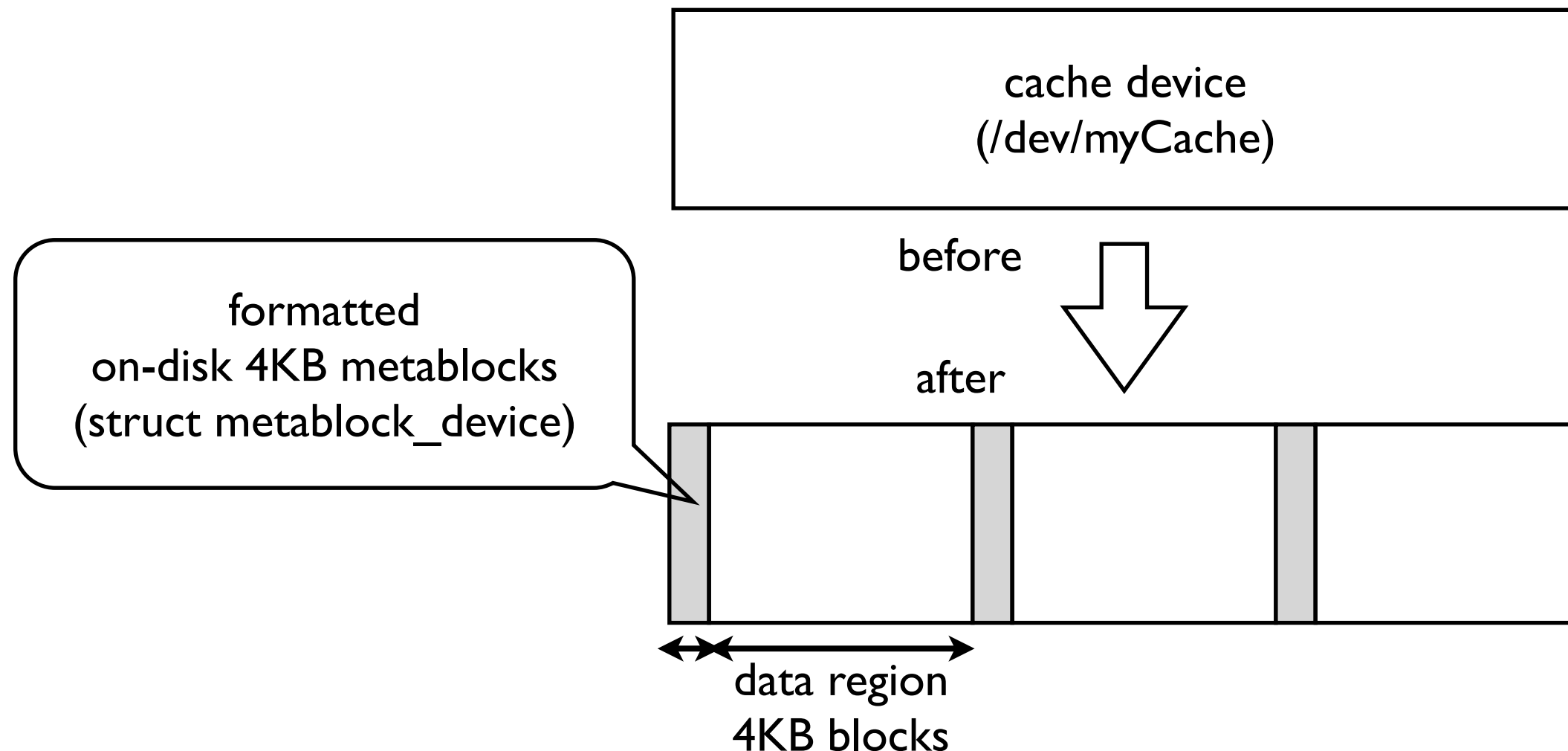Akira Hayakawa (@akiradeveloper)

Development is real fun!

Design

- Userland Tools in Python is a set of wrapper programs of the kernel interfaces (dmsetup create/remove/reload, dmsetup message).

- With the tools, using dm-writeboost becomes safer and thus easy.

- The userland Tools includes daemon program that is not essential but can increase the migration effectiveness by auto-modulation.

writeboost-format-cache

Format the on-disk metadata regions.

writeboost-format-cache /dev/myCache
--> dmsetup message writeboost-mgr 0
format_cache_device /dev/myCache

cache device
(/dev/myCache)

before

formatted
on-disk 4KB metablocks
(struct metablock_device)

after

data region
4KB blocks

writeboost-create

Create a DM device with no cache.

writeboost-create myLV 5 /dev/myBacking
--> dmsetup create myLV --table ¥
"0 $size writeboost 5 /dev/myBacking 0"

DM device
myLV (wb_target)

ID=5

struct wb_device

backing store
/dev/myBacking

dm_target
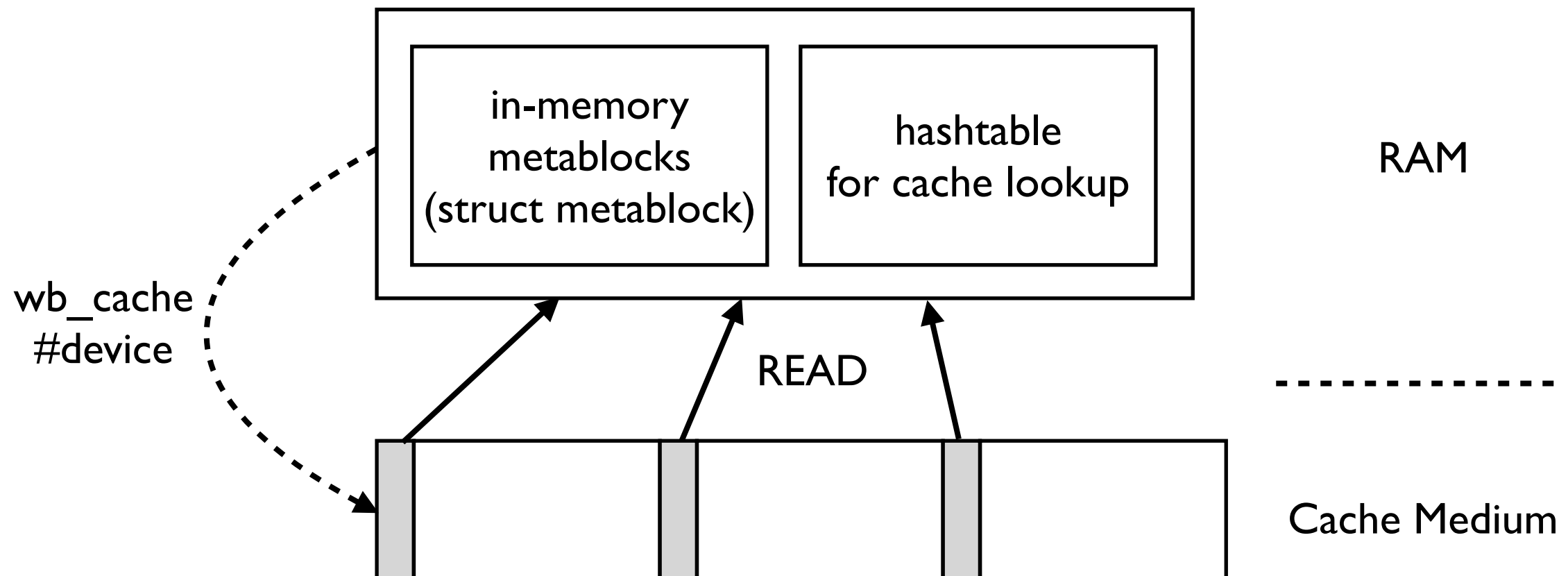#private
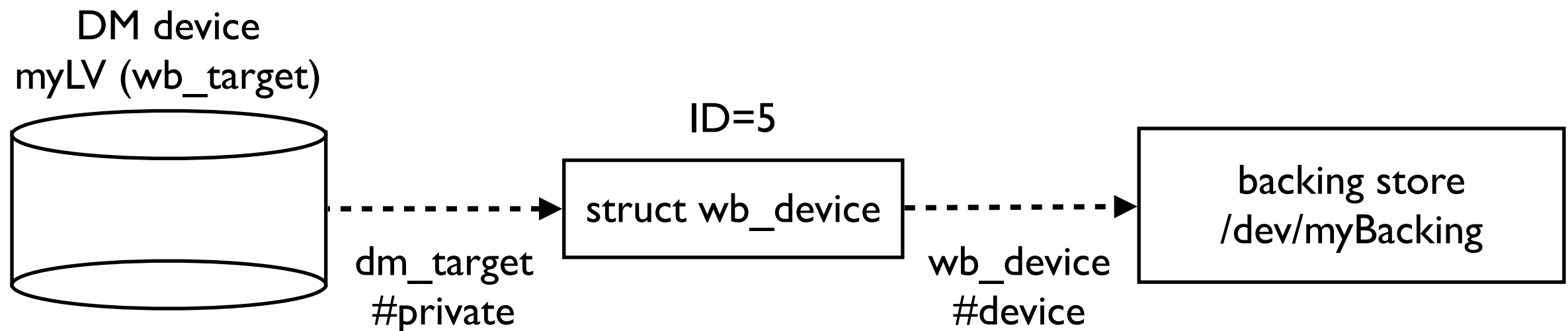
wb_device
#device

writeboost-resume-cache

Build up in-memory structures from on-disk metablocks.

writeboost-resume-cache 3 /dev/myCache
**-->** dmsetup message writeboost-mgr 0
resume_cache /dev/myCache

struct wb_cache (ID=3)

| in-memory metablocks (struct metablock) | hashtable for cache lookup |

RAM

wb_cache #device

READ

Cache Medium

writeboost-attach

Attach a DM device to a cache.
Caching is put into operation.

writeboost-attach 5 3
(writeboost-attach <device id> <cache id>)

DM device

ID=5

struct wb_device

dm_target
#private

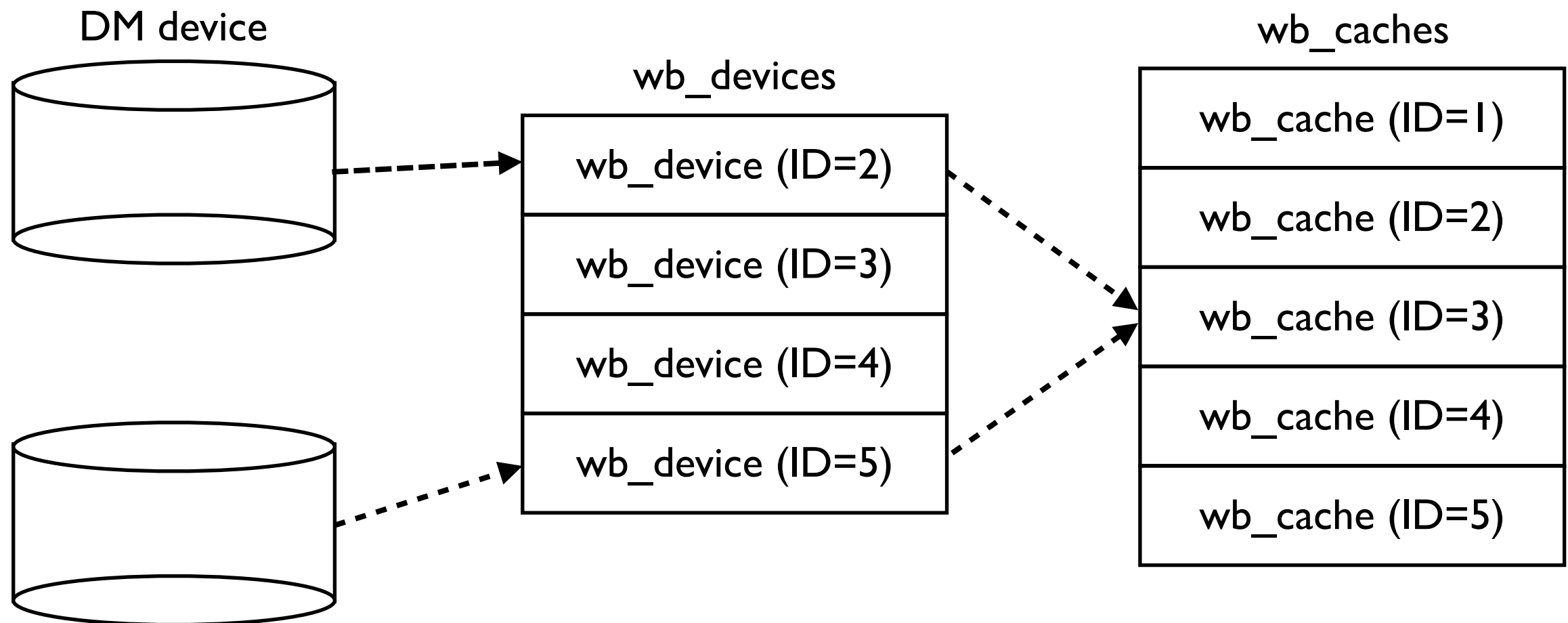wb_device
#cache

ID=3

struct wb_cache
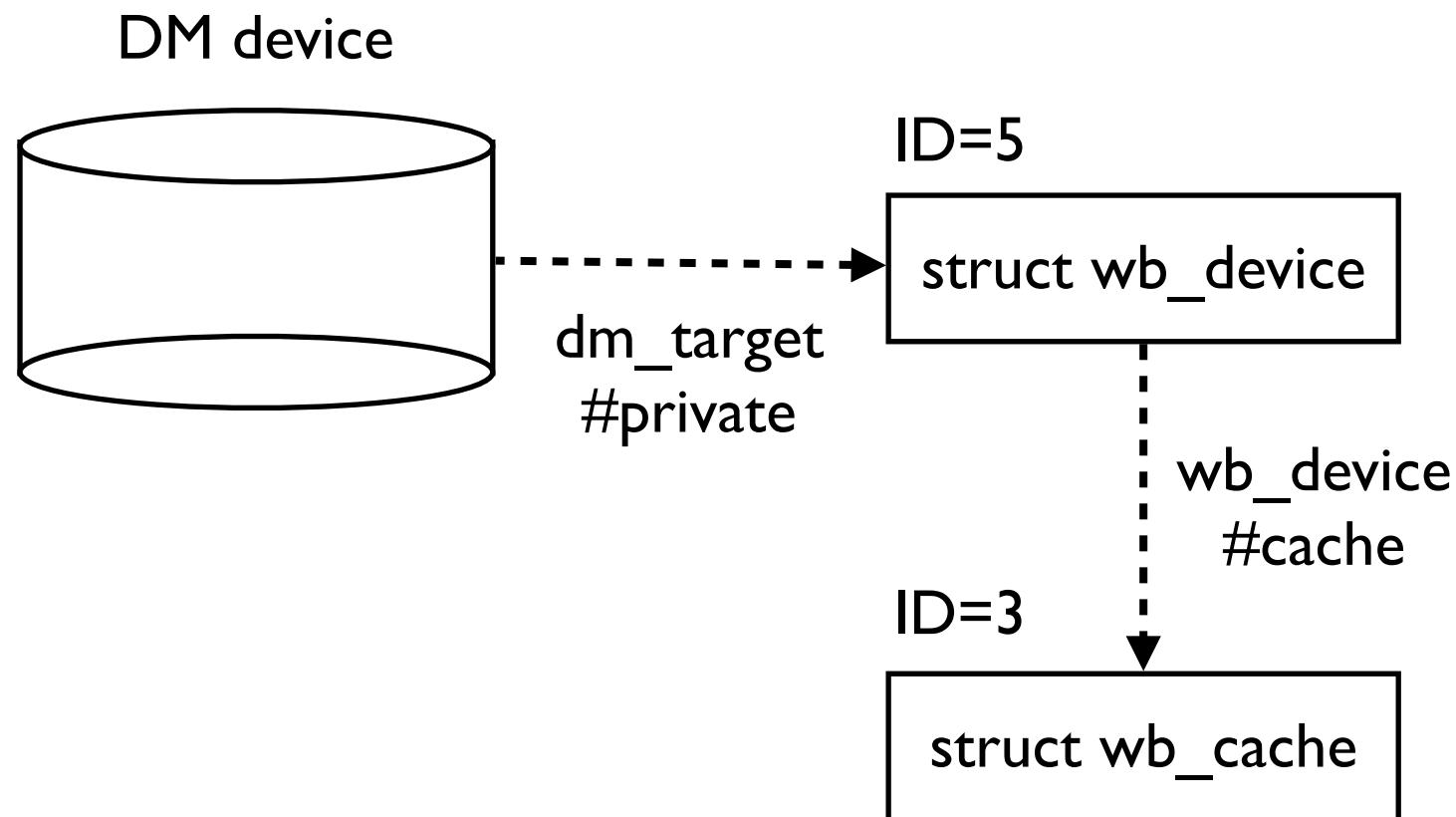
```
# Pseudo Code
writeboost_map(ti, bio):
  wb = ti->private;
  if not wb->cache:
    send bio to wb->device
    return
  ctx = wb->cache
  hit? = lookup(ctx, bio)
  if hit?:
    ...
  else:
    ...
```
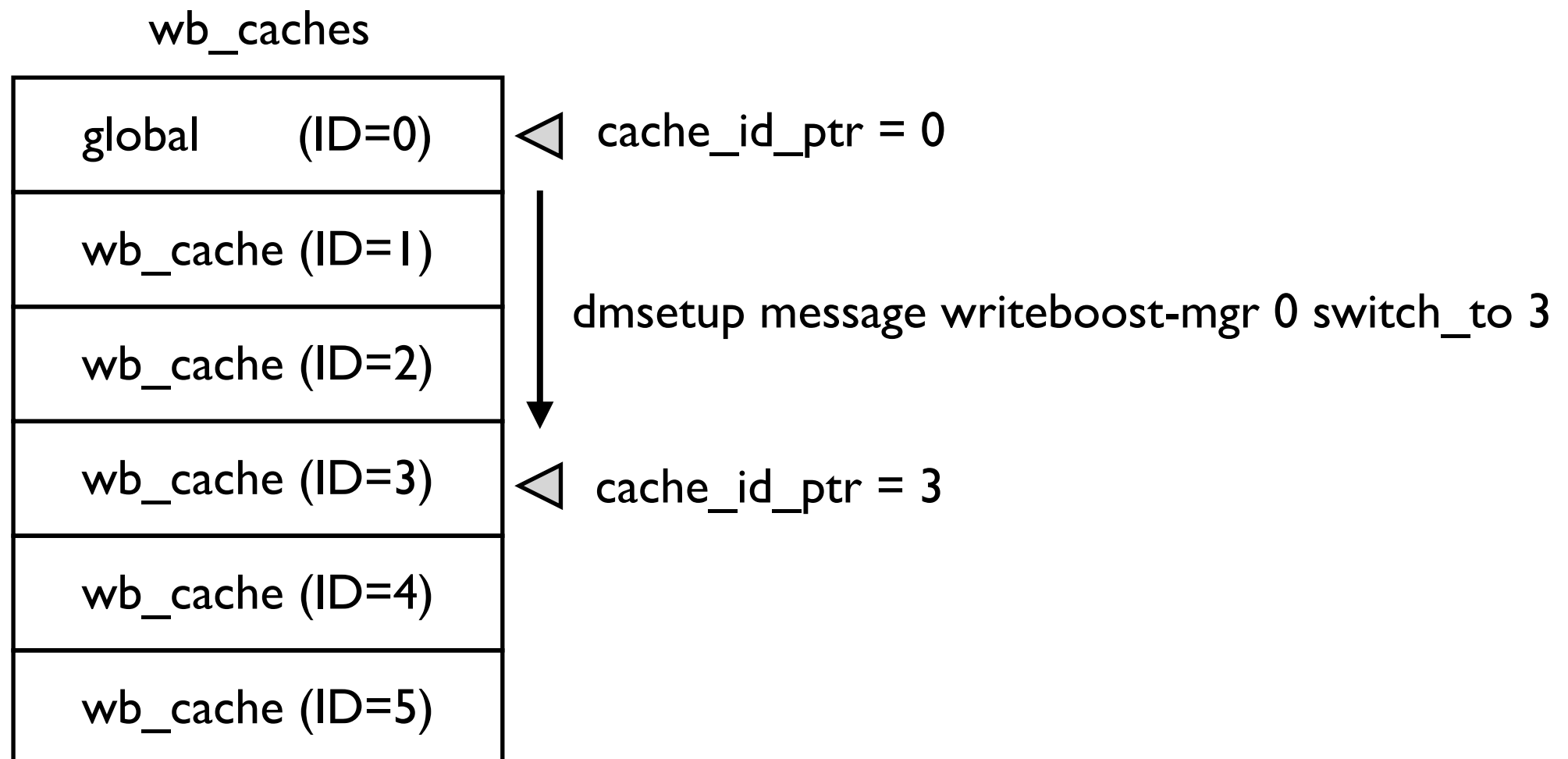
Shared Cache

Single cache can be shared
by multiple DM devices.

writeboost-attach 2 3
writeboost-attach 5 3

writeboost-mgr? (1)

All caches are managed by writeboost-mgr.
writeboost-mgr points to a particular cache to configure.

wb_caches

| |
|---|
| global   (ID=0) ◁ cache_id_ptr = 0 |
| wb_cache (ID=1) |
| wb_cache (ID=2) |
| wb_cache (ID=3) ◁ cache_id_ptr = 3 |
| wb_cache (ID=4) |
| wb_cache (ID=5) |

dmsetup message writeboost-mgr 0 switch_to 3

writeboost-mgr? (2)

writeboost-mgr changes its behavior
according to the current cache_id_ptr.

GLOBAL

root@Hercules:~/dm-writeboost#
dmsetup status writeboost-mgr
0 1 writeboost-mgr
current cache_id_ptr: 0
sizeof(struct metablock): 40
sizeof(struct metablock_device): 14
sizeof(struct segment_header): 10312
sizeof(struct
segment_header_device): 3583 (<=
4096)

wb_caches

global   (ID=0)
wb_cache (ID=1)
wb_cache (ID=2)
wb_cache (ID=3)
wb_cache (ID=4)
wb_cache (ID=5)
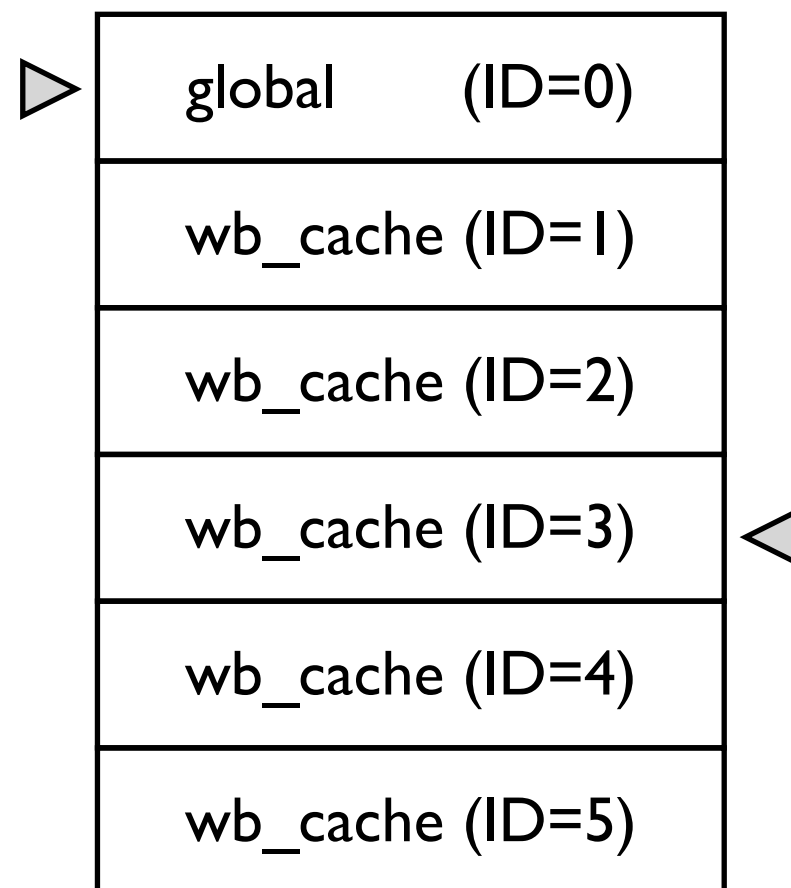
OF A CACHE

root@Hercules:~/dm-writeboost#
dmsetup status writeboost-mgr
0 1 writeboost-mgr
current cache_id_ptr: 3
static RAM(approx.): 37056 (byte)
allow_migrate: 1
nr_segments: 3
last_migrated_segment_id: 76
last_flushed_segment_id: 76
current segment id: 77
cursor: 255

write? hit? on_buffer? fullsize?
0 0 0 0 0
1 0 0 0 0
0 1 0 0 0
1 1 0 0 0
0 0 1 0 0
...

Any question or discussion is welcome either on dm-devel or via personal e-mails.