Homework 1, 2

Leveled structure & Limited size of L_0

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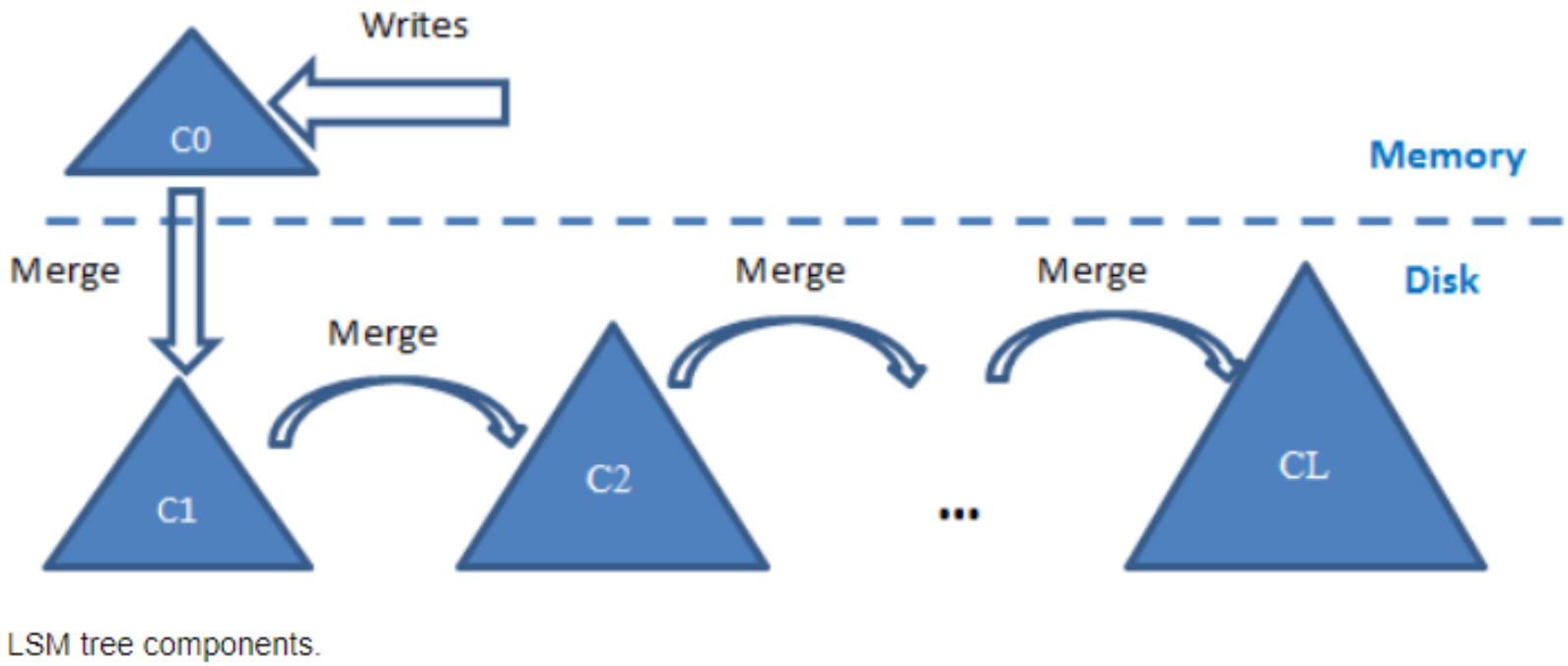
1. Leveled structure
2. Limited size of L_0
3. References

- Goal
  1. Leveled structure in Level DB
  2. Limited size of L_0

1. Leveled structure in Level DB

- **Q1. Why do Level DB use leveled structure?**

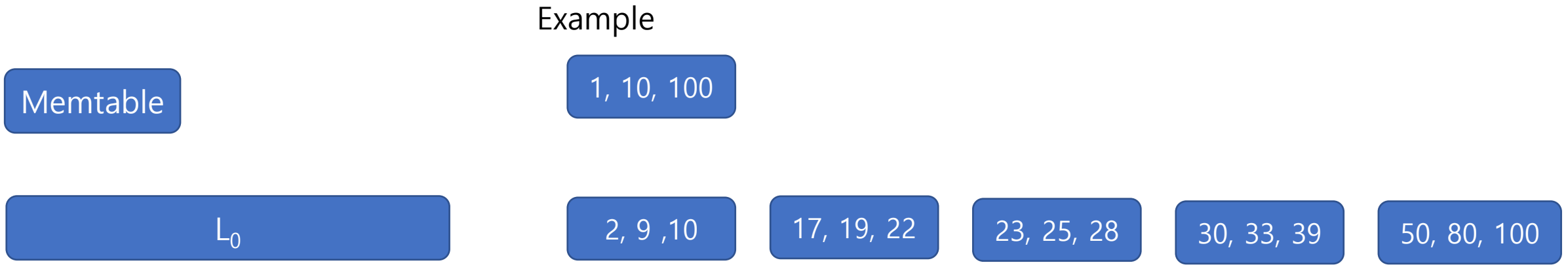


LSM tree components.

Source : [LSM tree components. | Download Scientific Diagram (researchgate.net)]

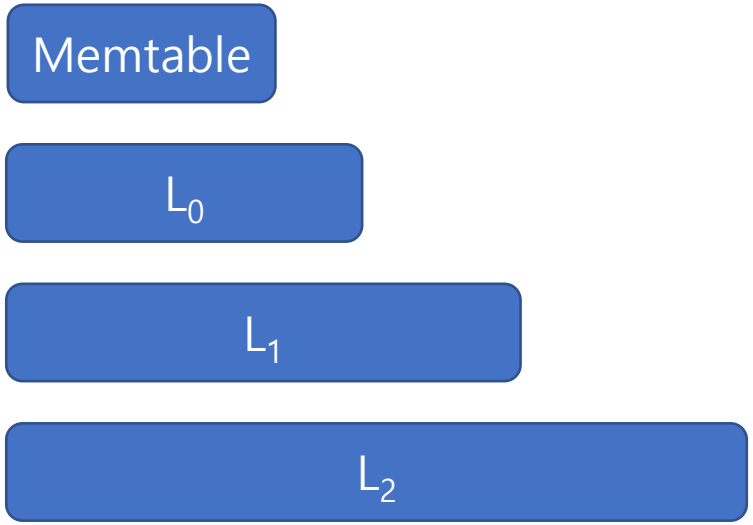
Leveled structure in Level DB

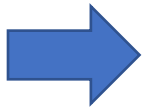
- Single level
  - “The lager the database size, the larger the write amplification”



Leveled structure in Level DB

- Multi level





"**Reduce Write Amplification**"

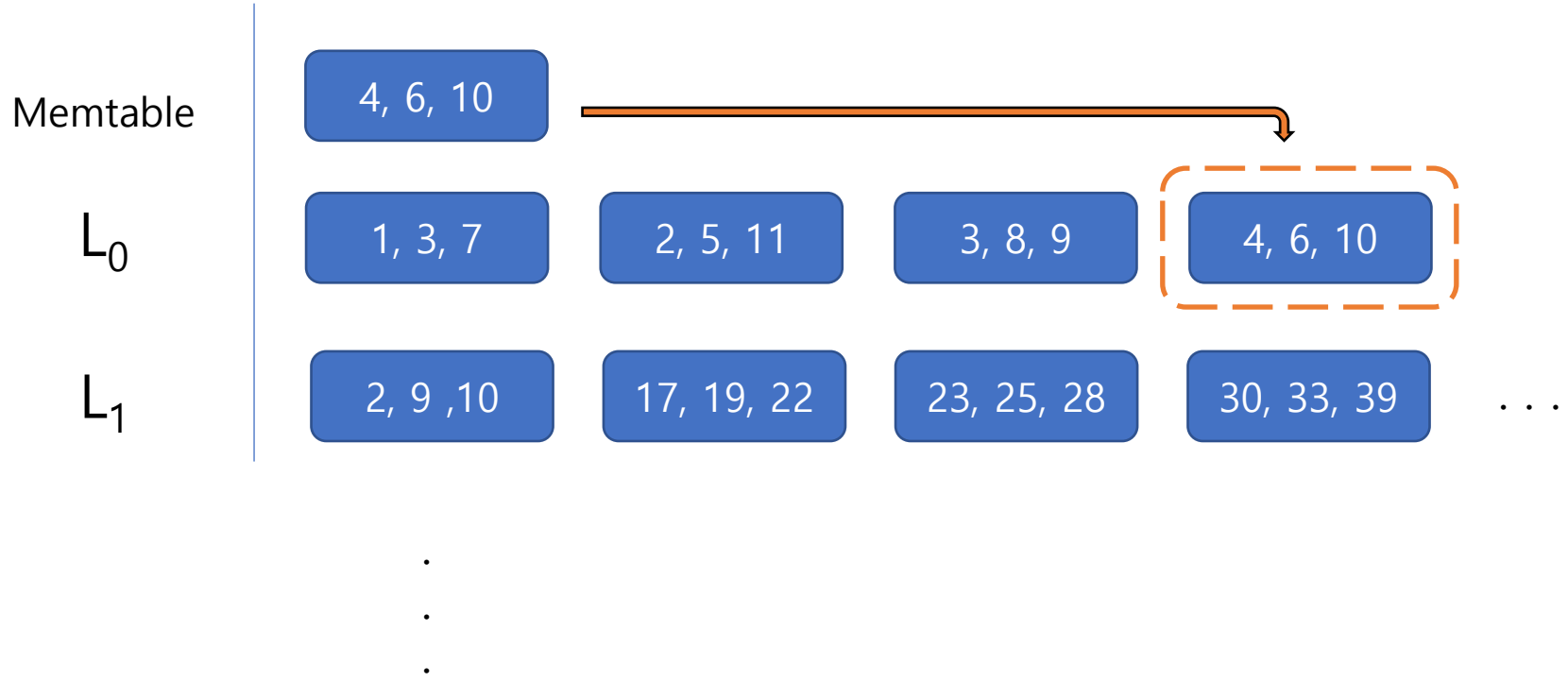
2. Limited size of L_0

- **Q2. In Level DB, max size of level i is 10^i MB.**

  But max size of level 0 is 8MB. Why?

Limited size of L_0

- Special level L_0
  - L_0 allows overlapped key range (Flush)



Limited size of L_0

- **Tradeoff** : read performance and compaction
  - Find key “5”

Better read performance,
(but compaction will be triggered frequently)

3. References

- [1] LSM tree components. | Download Scientific Diagram (researchgate.net)
- [2] https://velog.io/@emplam27/
- [3] Lanyue yu, Wisckey paper (FAST'16)
- [4] Patrick O'Neil Log-Structured Merge Tree, 1996
- [5] https://www.researchgate.net/figure/
- [6] Bourbon paper (OSDI'20)
- [7] https://hideoushumpbackfreak.com/algorithms/data-struct-bloom-filter
- [8] the cache memory book(2nd second edition)
- [9] Jongmoo Choi, 『Key-Value Store: Database for Unstructured Bigdata (KOR)』, 2021
- [10] google/leveldb (github.com)
- [11] LSM Tree (secmem.org)

Thank you