Performance Improving with Virtual Copy at Multi-Core Solid State Drives

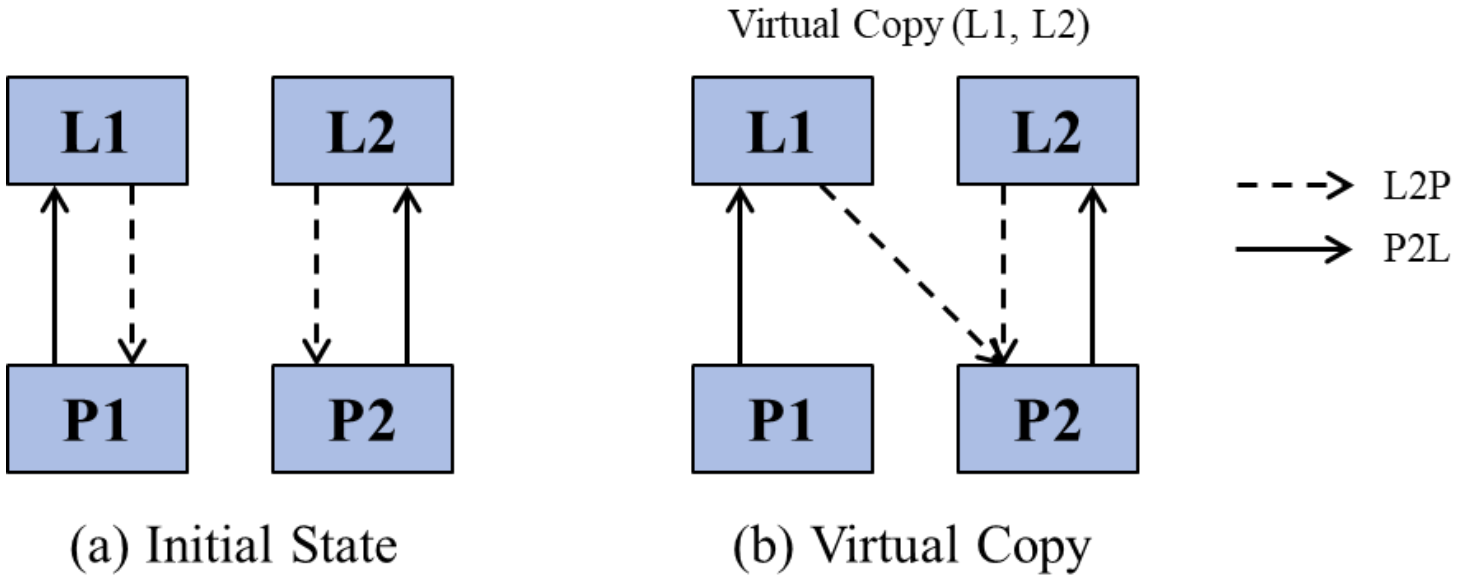
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Concept of Remapping Scheme: Virtual Copy

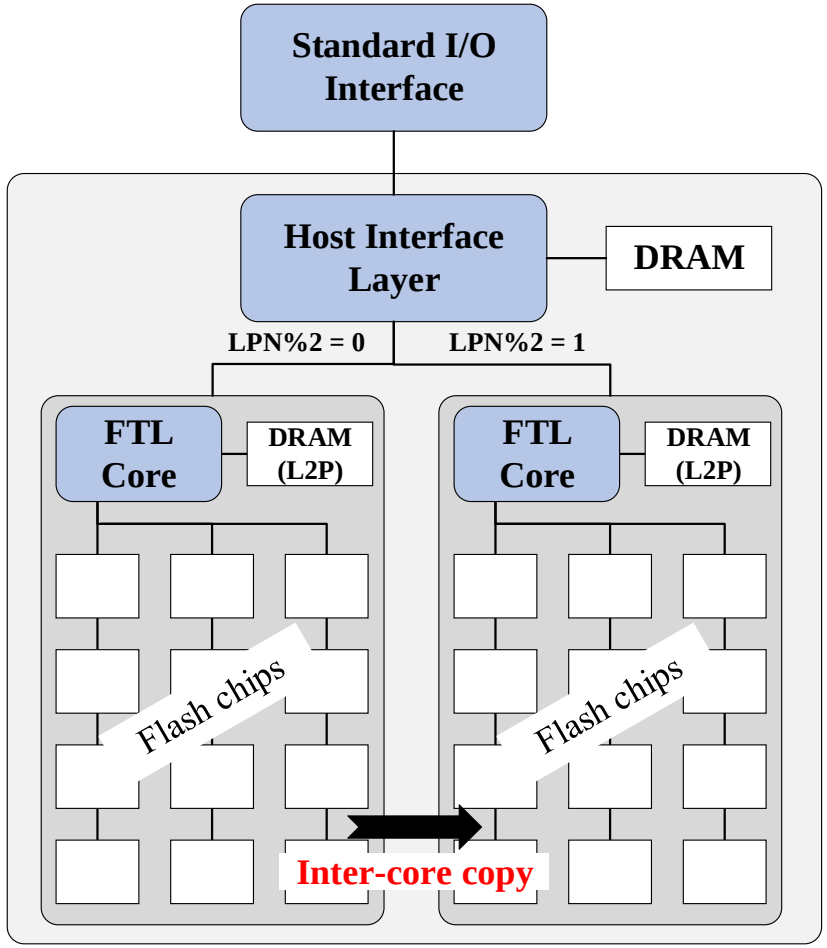
- Modify L2P mapping table in SSD to remove duplicated data



- Previous studies: No consideration of multi-core SSD

Design Issues of VC-Supporting Multi-core SSD

- Need mapping table management for VC supporting SSD
  - ➔Need modifiable P2L mapping tables
- In multi-core SSD, inter-core copies are required
  - ➔Redirection & delayed IC technique
- Durability Issue of VC operation
  - ➔ Batched VC operation



Multi-core SSD Architecture

Use case

- Single write journaling

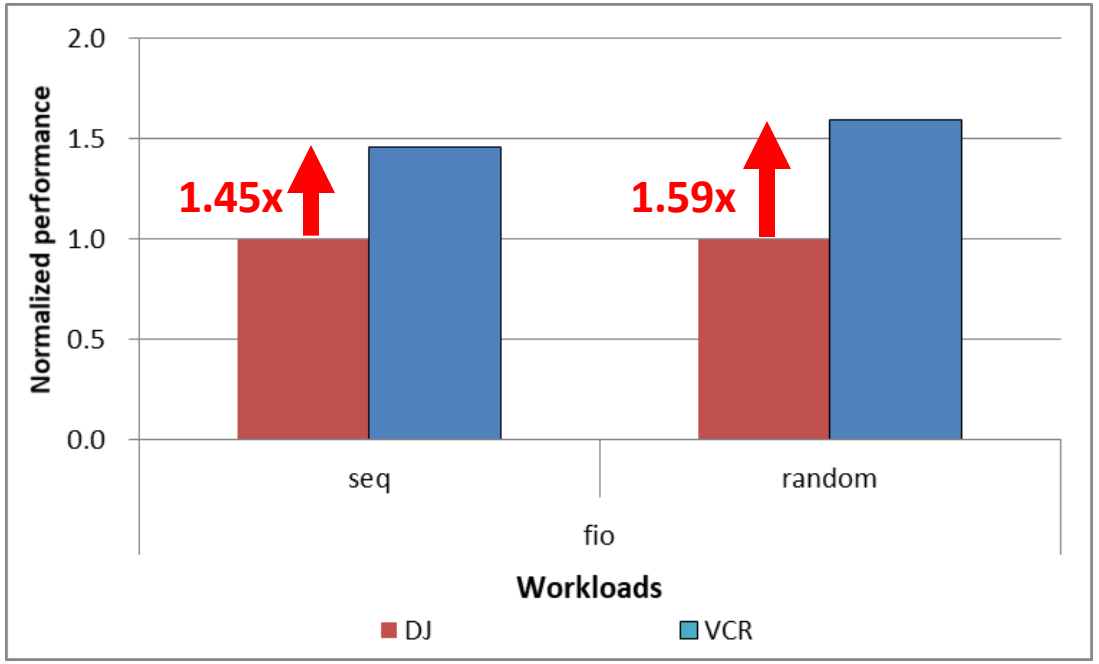
  1) Both data and metadata pages are written at the journal area

  2) They are remapped to the original home locations without write back operations

- Single write journaling with VC
  - After a journal transaction is committed, the related pages in the page cache are changed to clean pages.
  - To reduce the remap overhead, multiple transactions are checkpointed as a batch

Evaluation – Single Write Journaling

- Fio: seq_write, rand_write - 4GB file * 8 thread
- Samsung 843 SSD (modified firmware)



Performance

*W_{remap}: number of requests processed by remap
*W_{IC}: number of requests processed by IC
*WAF: W_{NAND} / (Host write+W_{remap}+W_{IC})
*VCR:VC + re-ordering

	Fio - seq			
	Host write (%)	W_{remap} (%)	W_{IC} (%)	WAF (%)
DJ	100.0	0.0	0.0	100.3
VCR	50.2	45.4	4.4	53.0

Write Amplification Factor

Thank you.