

2026 Winter RocksDB Study Topics

Yongmin Lee, Dayeon Wee

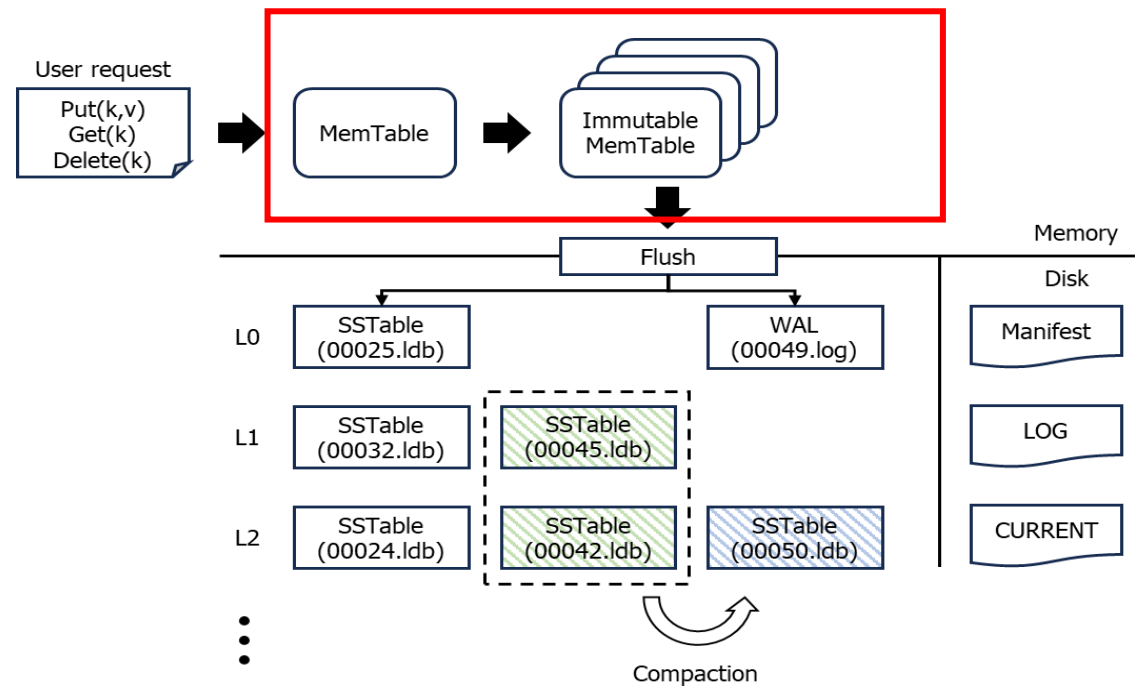
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Potential Research Topic

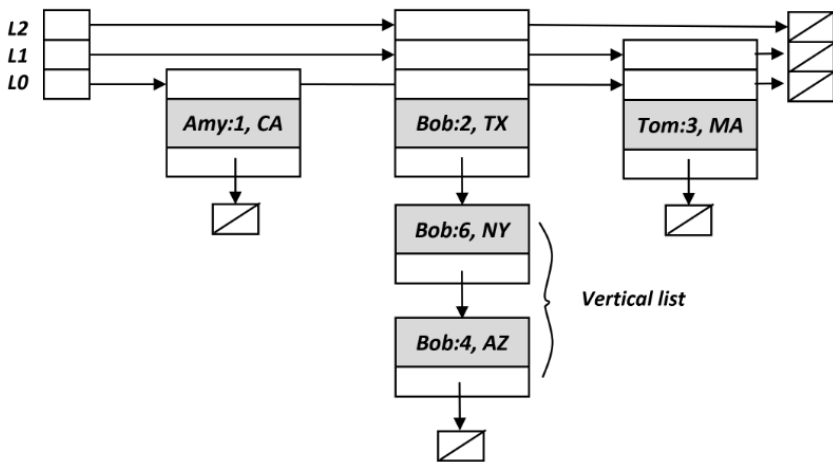
(1) In-memory Index Optimization

- © SkipList (LevelDB, RocksDB, Redis)
- © Hash Table (Memcached, Redis)



LevelDB, RocksDB Architecture

JellyFish (Middleware'20)



8 Data Structures That Power Your Databases ByteByteGo.com

Types	Illustration	Use Case	Note
Skiplist		In-memory	used in Redis
Hash index		In-memory	Most common in-memory index solution
SSTable		Disk-based	Immutable data structure. Seldom used alone
LSM tree		Memory + Disk	High write throughput. Disk compaction may impact performance
B-tree		Disk-based	Most popular database index implementation
Inverted index		Search document	Used in document search engine such as Lucene
Suffix tree		Search string	Used in string search, such as string suffix match
R-tree		Search multi-dimension shape	Such as the nearest neighbor

Potential Research Topic

(1) In-memory Index Optimization

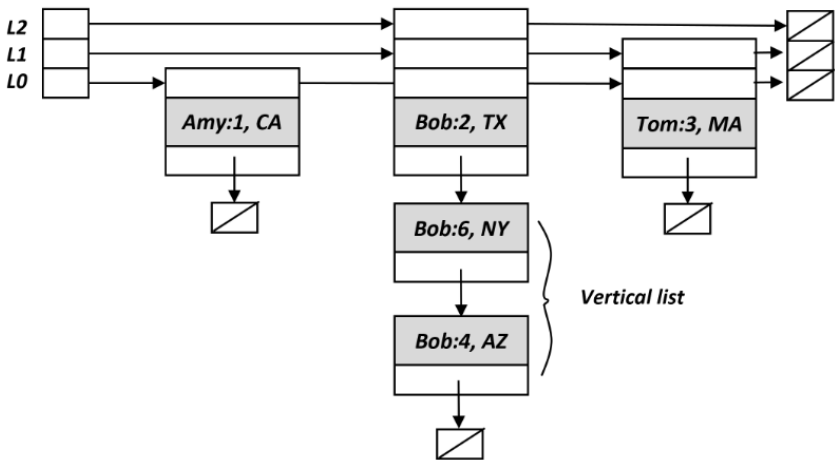
◎ Example

◎ Difference between SkipList / Hash Table

◎ Set a hypothesis: which one is better? Skiplist or HashTable?

◎ Experiment: throughput, latency...

JellyFish (Middleware'20)



8 Data Structures That Power Your Databases

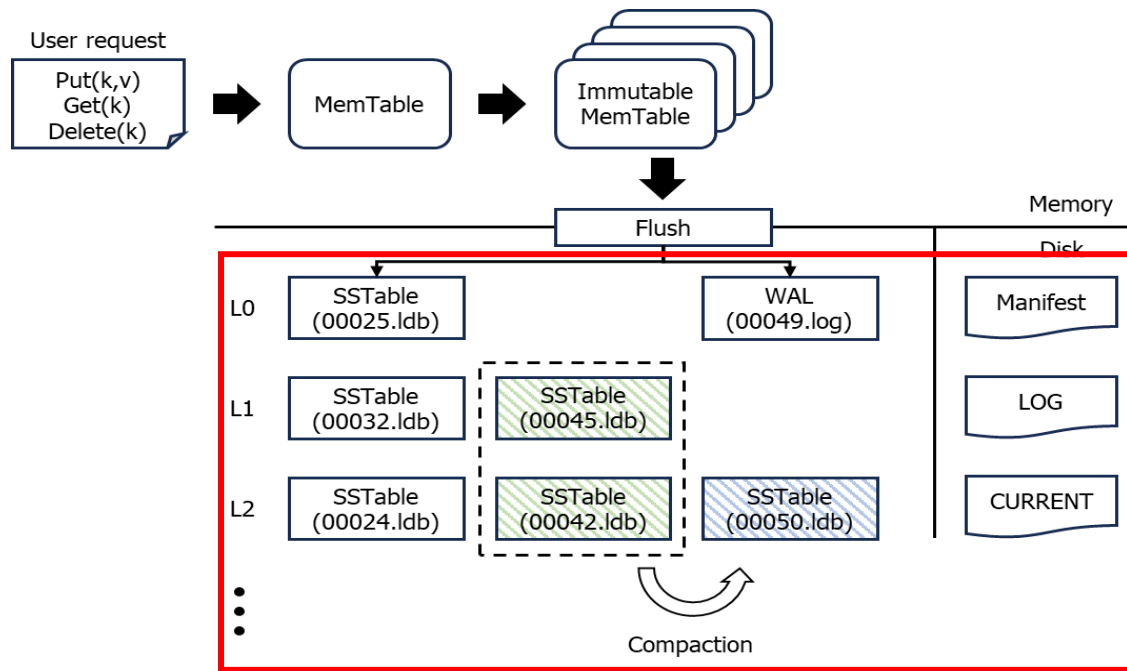
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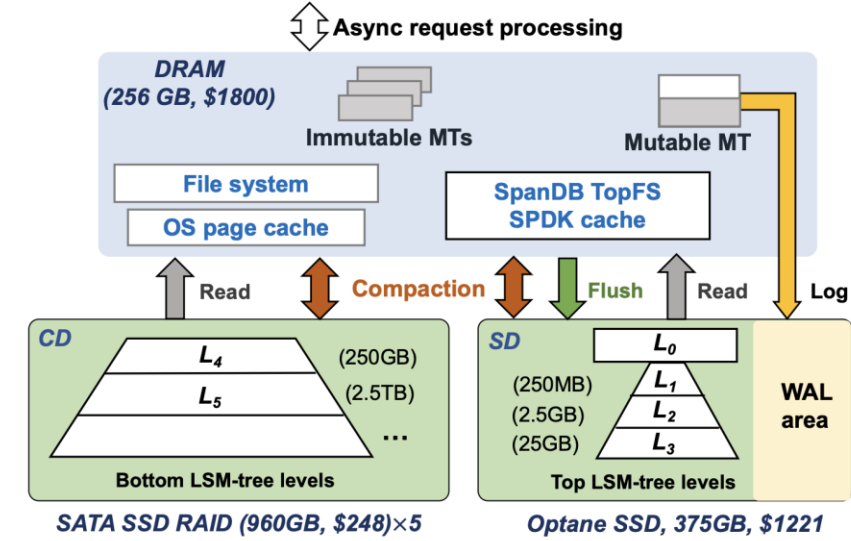
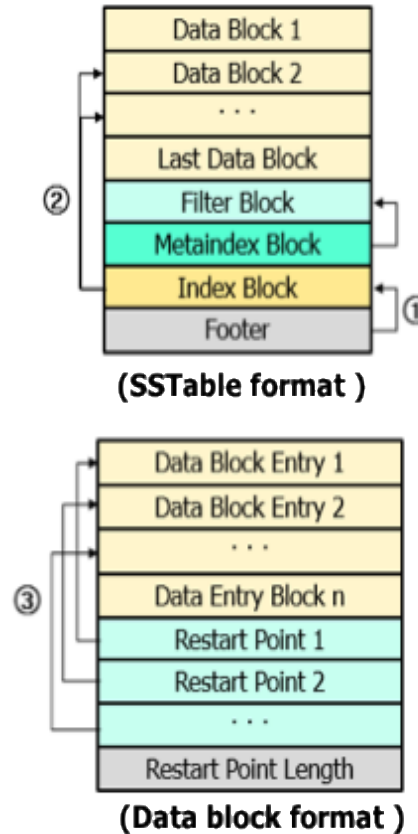
Potential Research Topic

(2) Storage Optimization

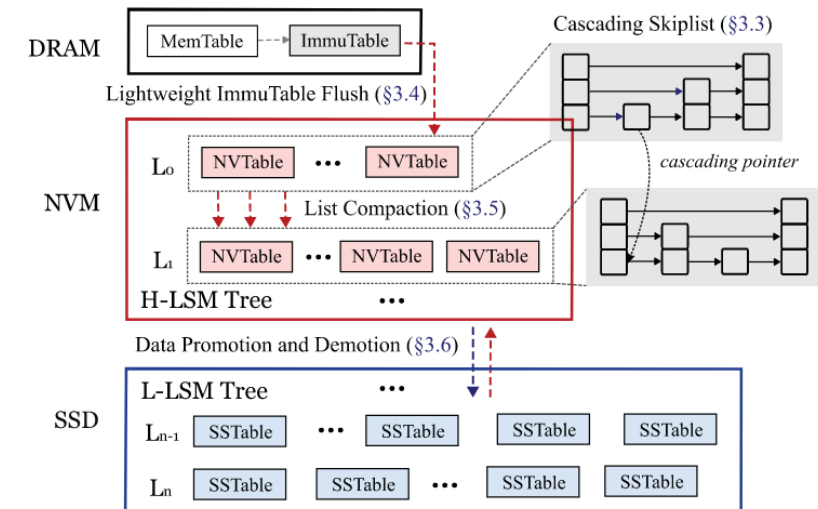
- ◎ Tiered Storage (Slow / Fast Disks)
- ◎ Non-Volatile Memory



LevelDB, RocksDB Architecture



SpanDB (FAST'21)



SplitDB (IEEE ToC'24)

Potential Research Topic

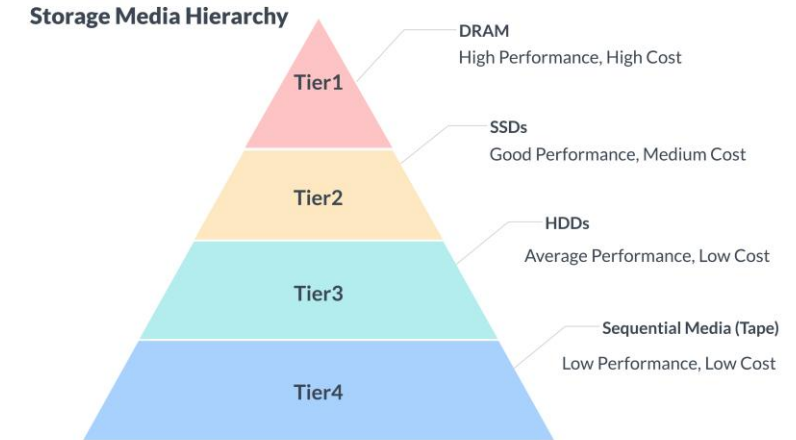
(2) Storage Optimization

◎ Example

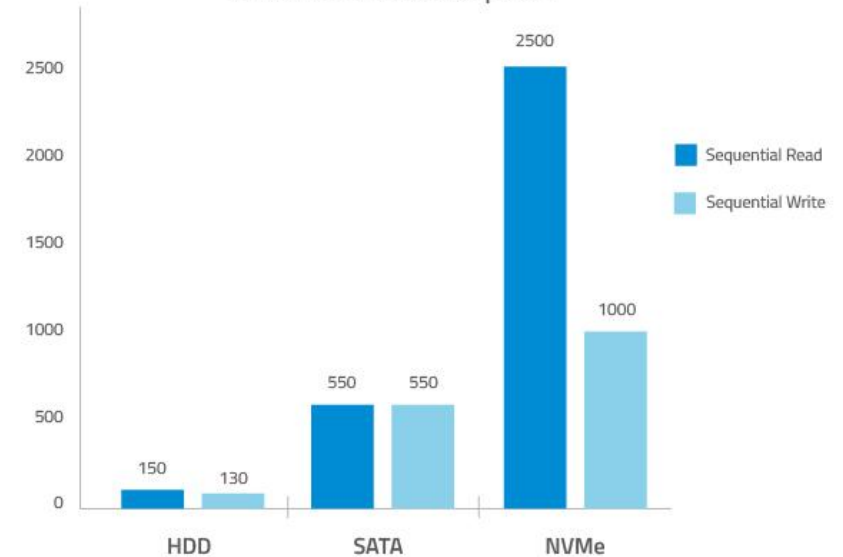
- ◎ Definition of Slow / Fast Disks (SATA HDD/SSD, NVMe SSD)
- ◎ Characteristics of each disks
- ◎ Separate experiment: Using a single device
- ◎ Throughput, latency, **write stall**, ...



<https://www.rgosaja.co.kr/winseton25/?bmode=view&idx=165268558>



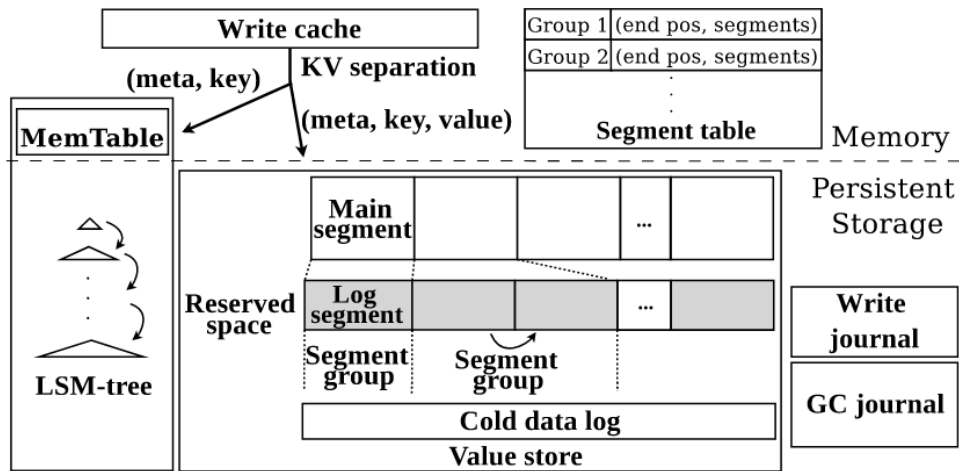
HDD vs. SATA vs. NVMe
Maximum Theoretical Speeds



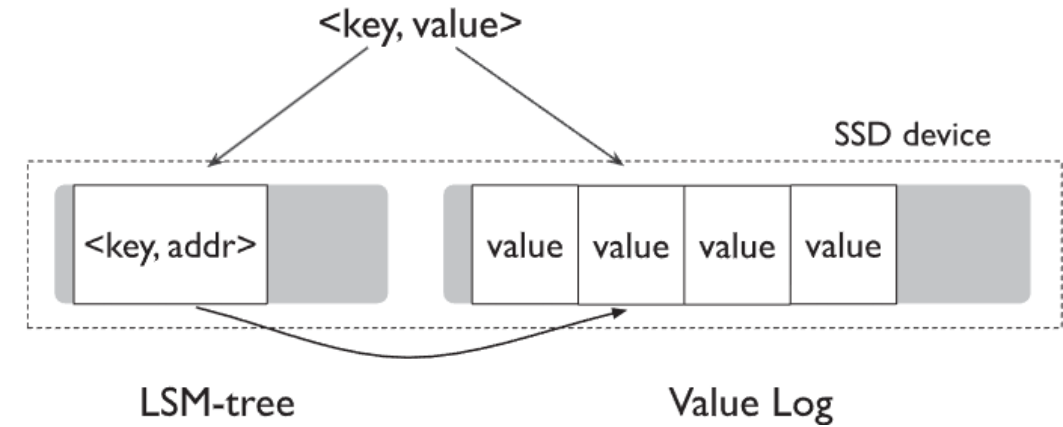
Potential Research Topic

(3) KV Separation Mechanism

- © For handle Large Key-Value size
 - © WiscKey (FAST'16): Pioneer
 - © HashKV (ATC'18): Hash Based Data Grouping
 - © DiffKV (ATC'21): Various Key-Value Size



HashKV (ATC'18)



WiscKey (FAST'16)

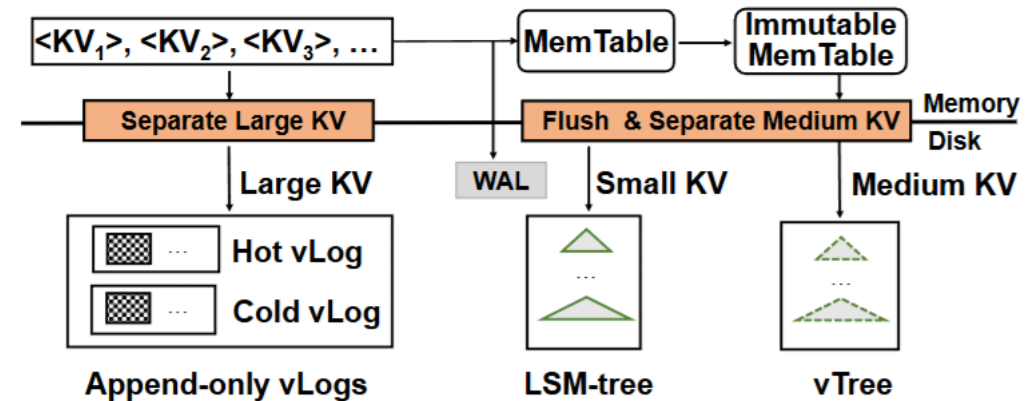


Figure 8: Fine-grained KV separation.

DiffKV (ATC'21)

Potential Research Topic

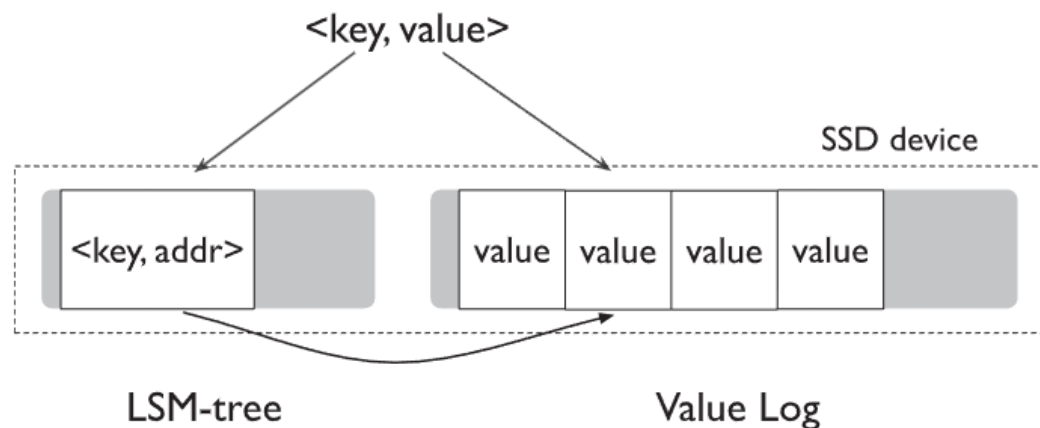
(3) KV Separation Mechanism

◎ Example

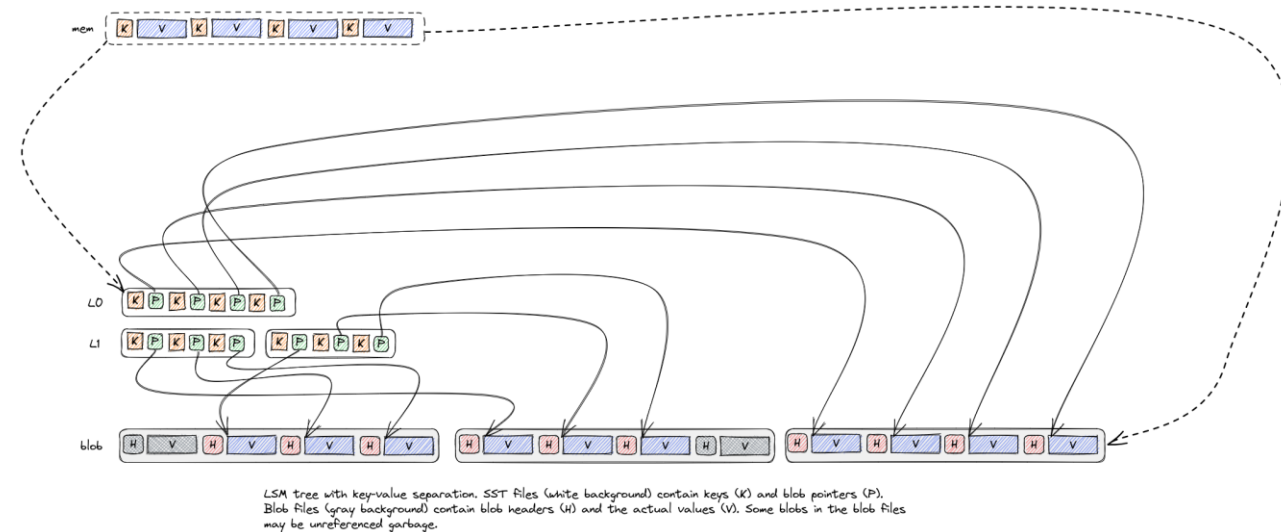
◎ RocksDB's BlobDB

◎ What is BlobDB? How does it work?

◎ Experiments between large/small value



WiscKey (FAST'16)



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Thank You Q & A ?

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