

Self-Sorting SSD: Producing Sorted Data Inside Active SSDs

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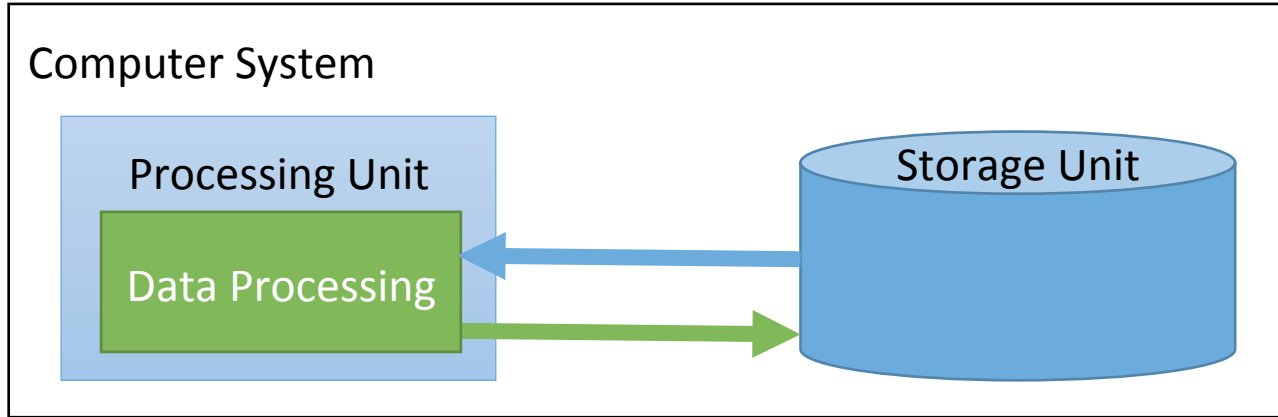
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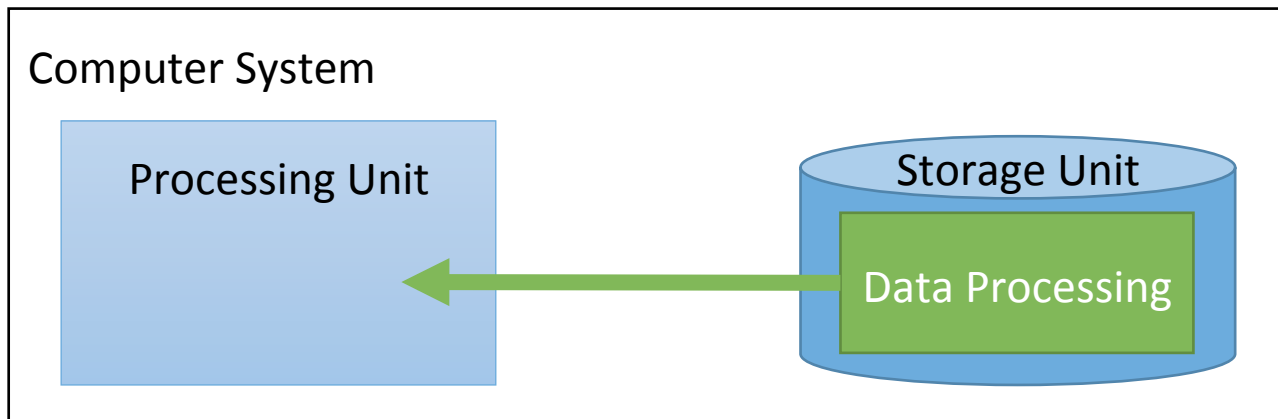
Sungkyunkwan University

Processing Data & Active SSDs

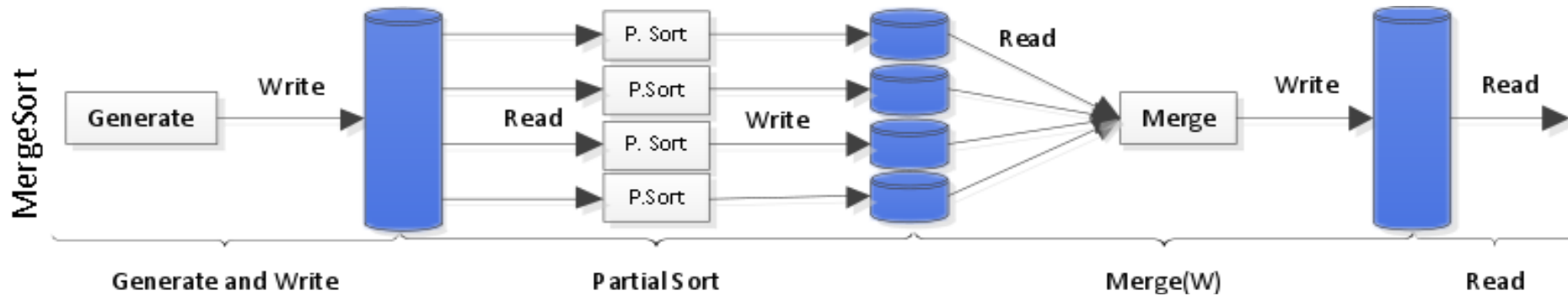
Traditional Processing



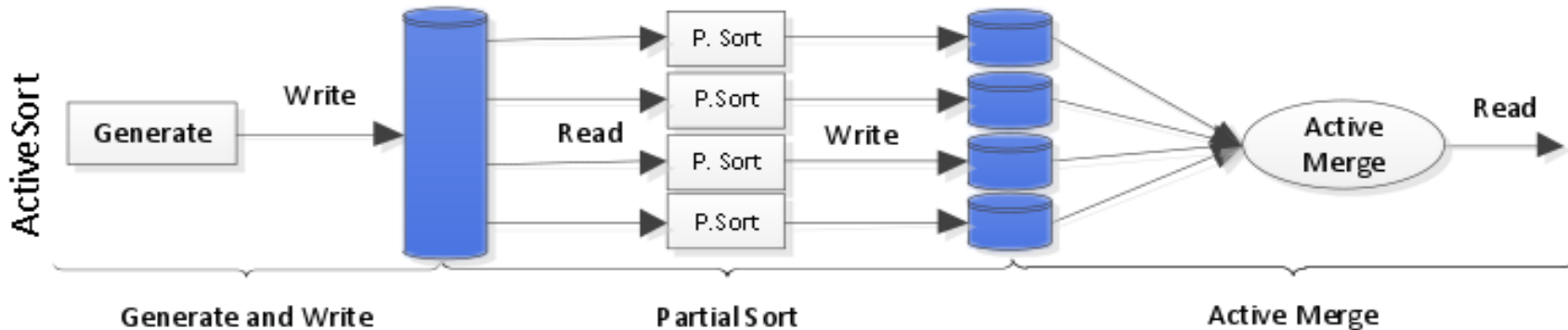
Active SSD Processing



External Sort



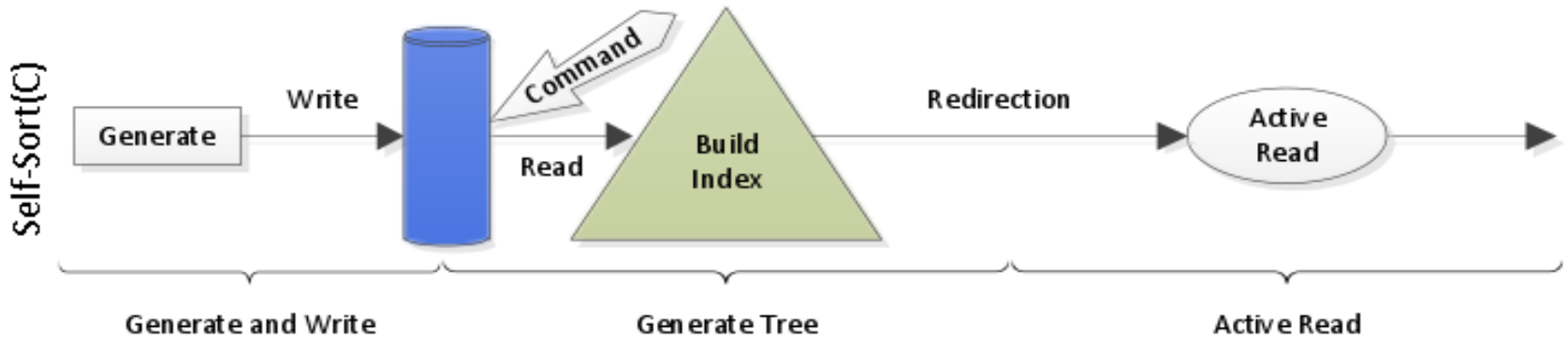
ActiveSort [HotStorage 2014*]



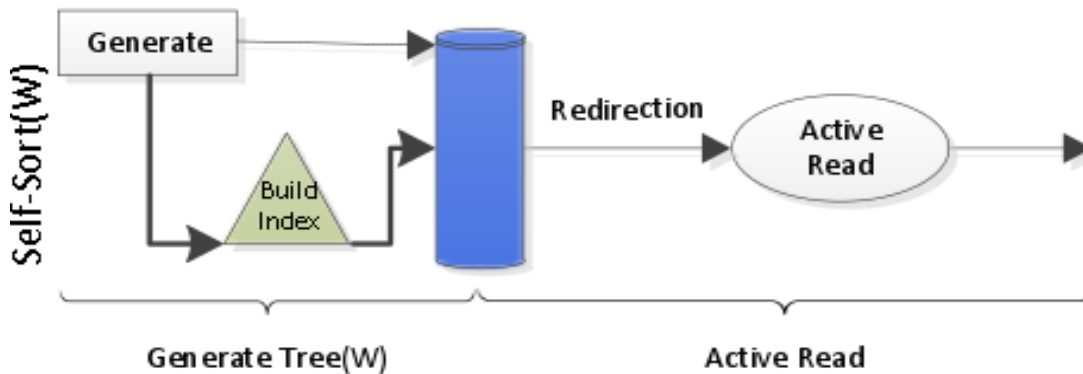
*Young-Sik Lee, Luis Cavazos Quero, Youngjae Lee, Jin-Soo Kim, and Seungryoul Maeng, "Accelerating External Sorting via On-the-fly Data Merge in Active SSDs," *Proceedings of the 6th USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage 2014)*, Philadelphia, PA, USA, June 2014.

Self-Sorting SSD

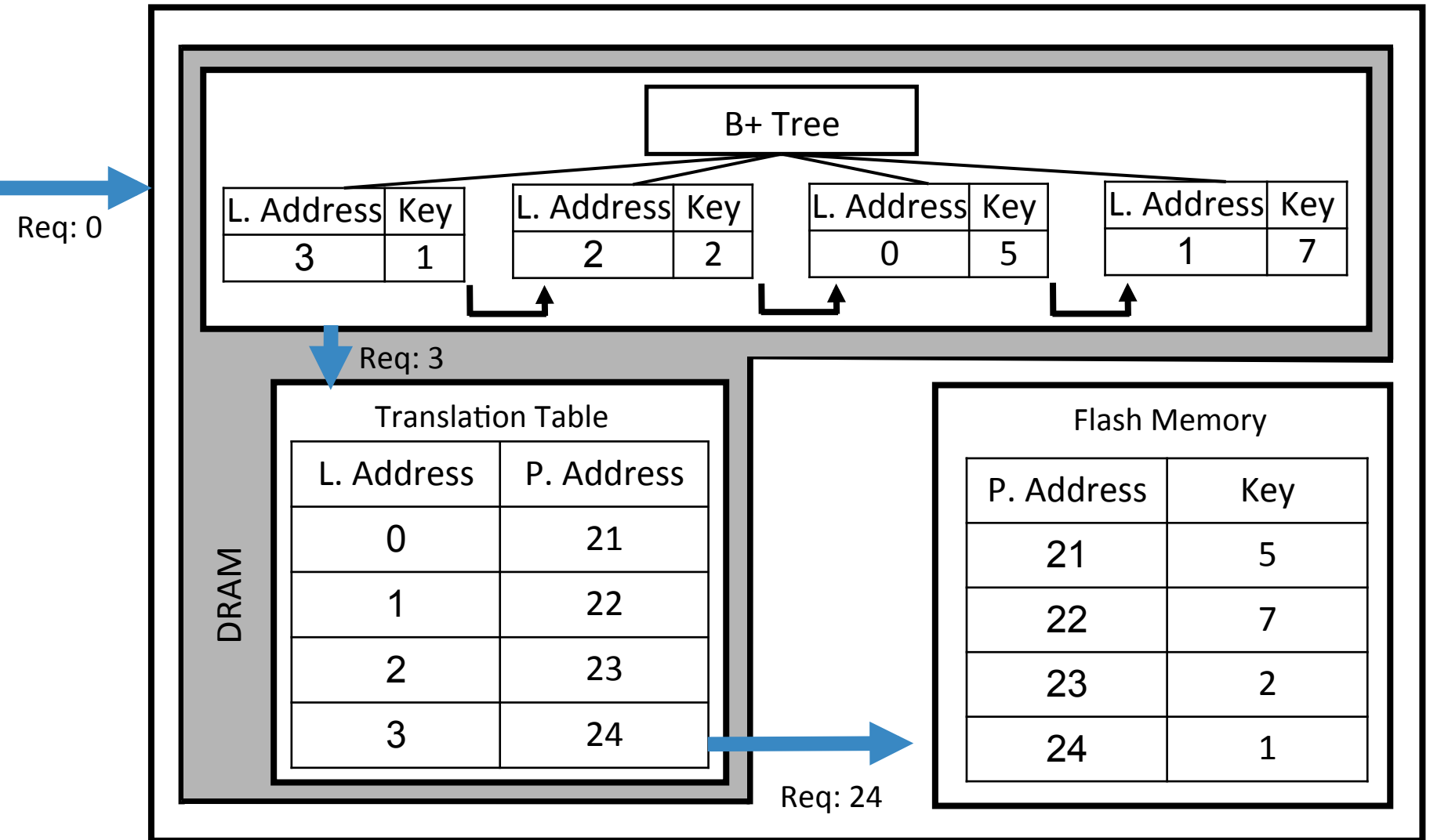
SORT-ON-COMMAND



SORT-ON-WRITE



Index – Redirection process



Prototype

Jasmine OpenSSD Platform

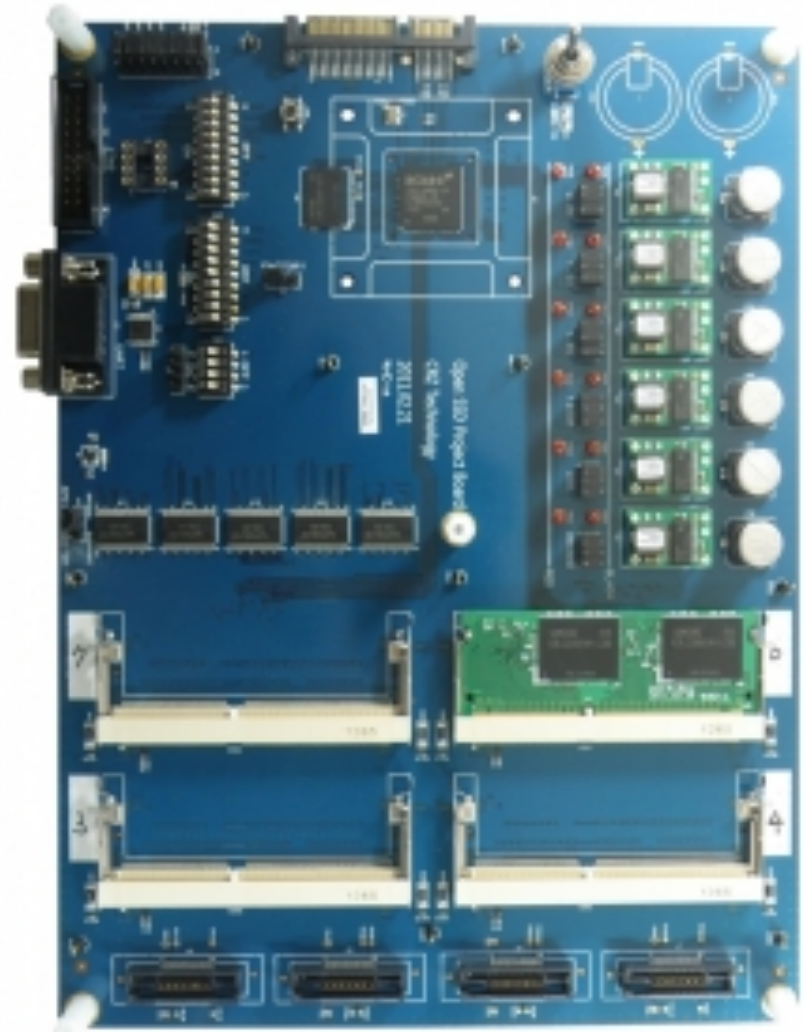
Indilinx Barefoot SSD controller
ARM7TDMI-S core 87.5MHz
96KB SRAM
SATA 2.0 host interface (3Gbps)
64MB SDRAM 175MHz
Physical page: 16 KB

Host

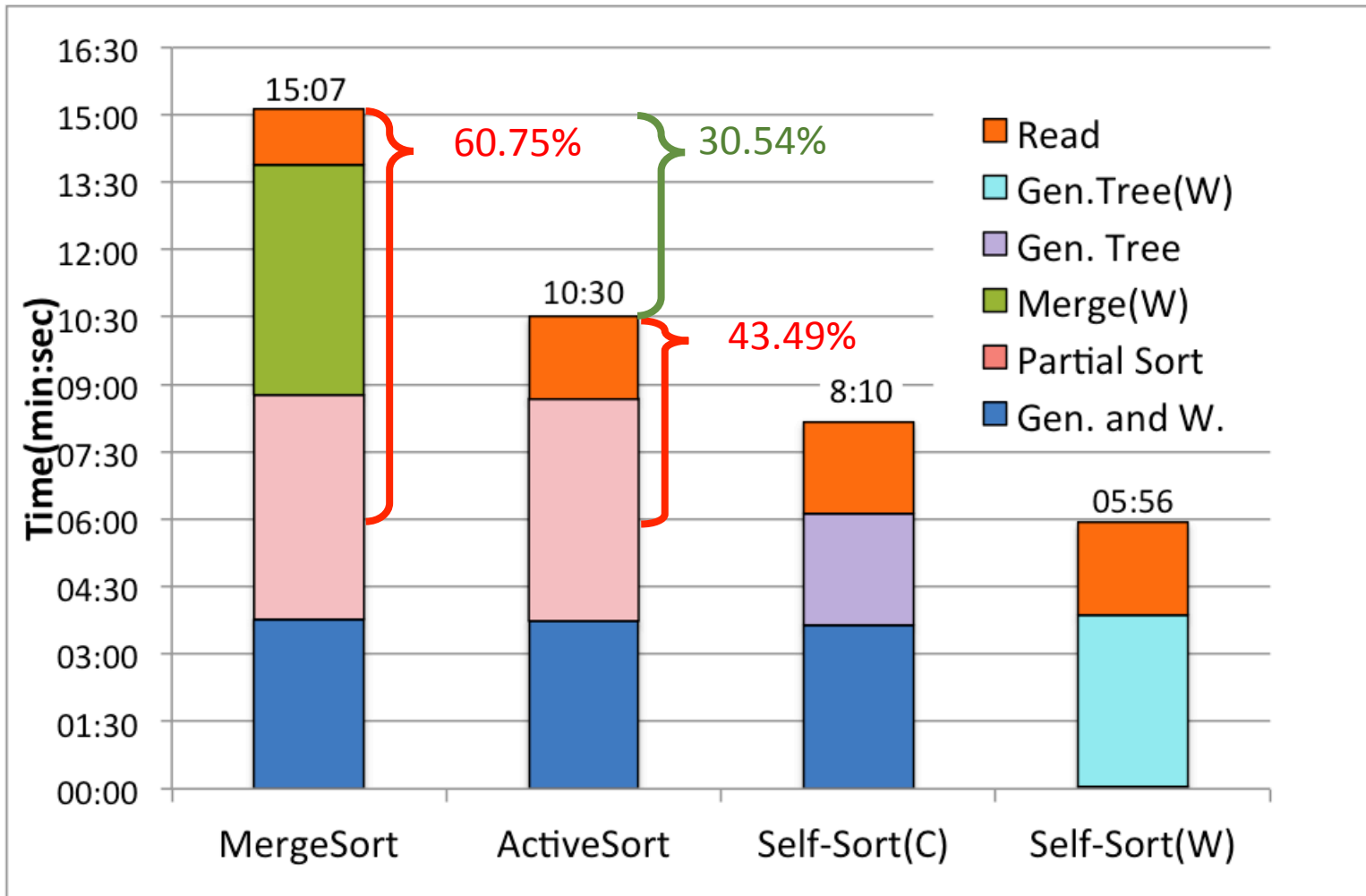
Intel Core i5 3.4 GHz
16GB RAM (reduced to 3GB)
Ubuntu 12.04
DIRECT IO

Input data

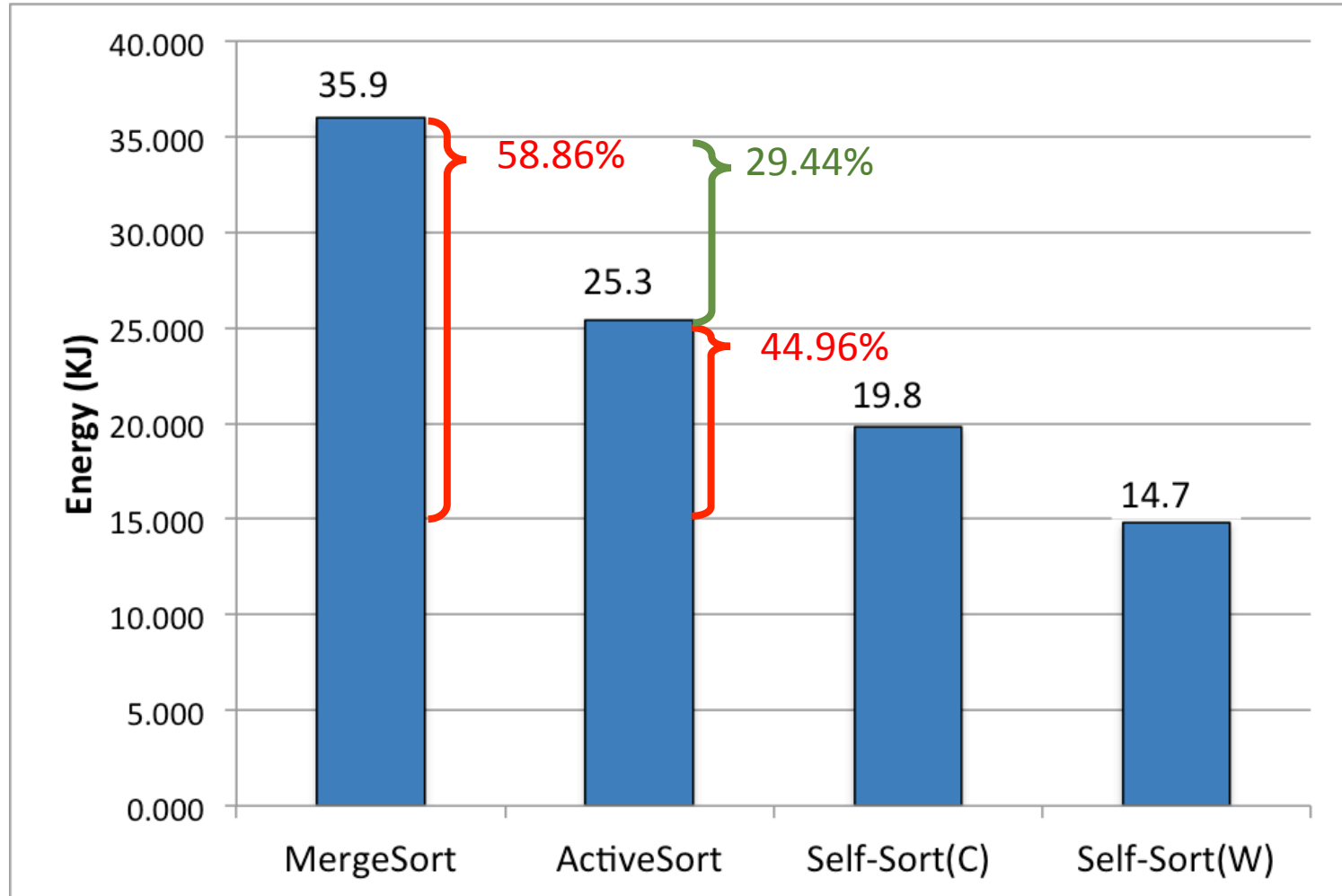
8GB (524,288 records)
16 KB record size
10 byte keys
Index size 12 MB
Fanout 128



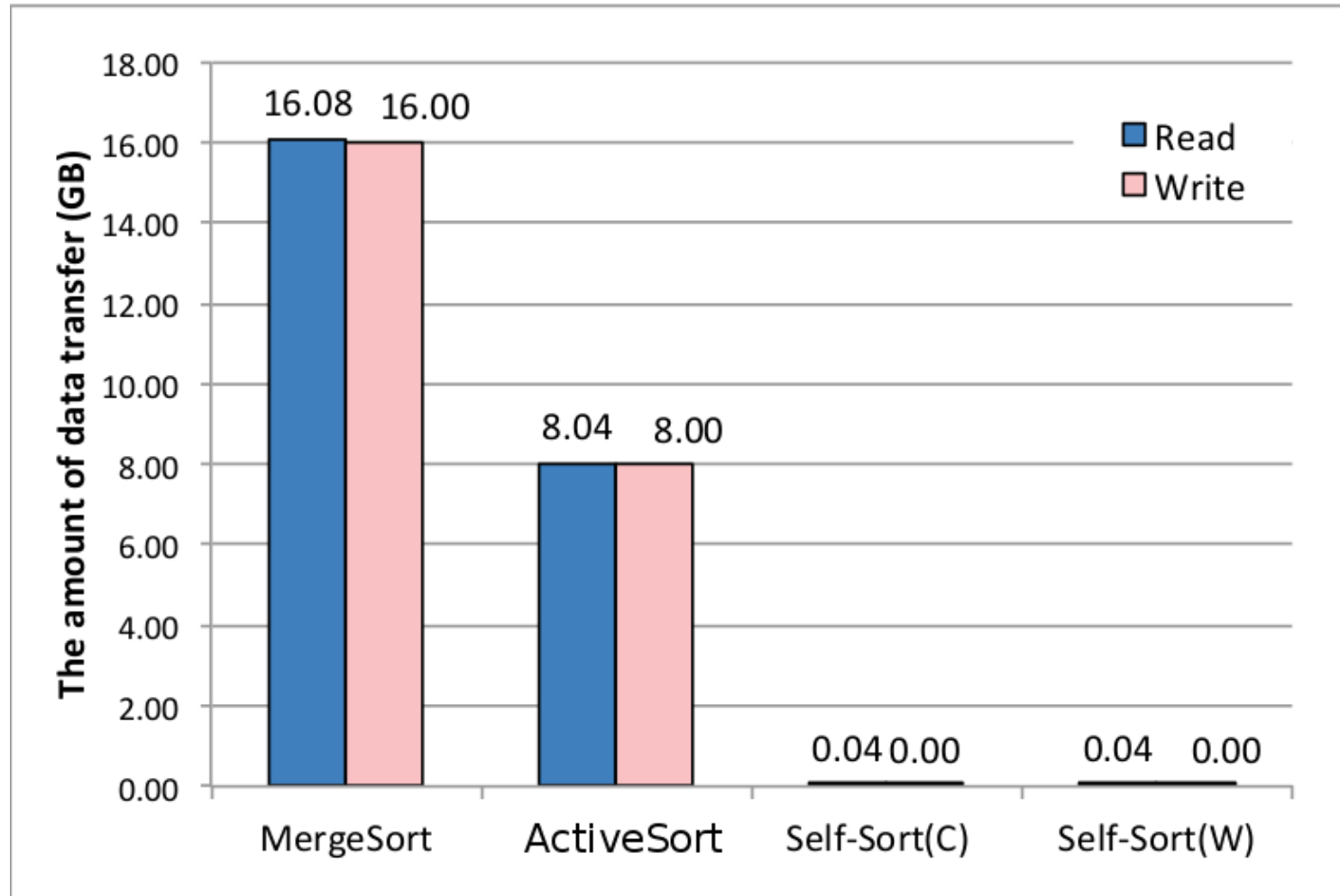
Performance



System Energy



I/O Overhead



Conclusions

- Completely remove write from external sort process
- Performance and SSD's lifetime improved
- More powerful SSDs will speedup the offline process and enable offloading more complex functions

Thank you!

Q/A