

Partially-Decompressible Dictionary Based Compression Format for All Flash Array

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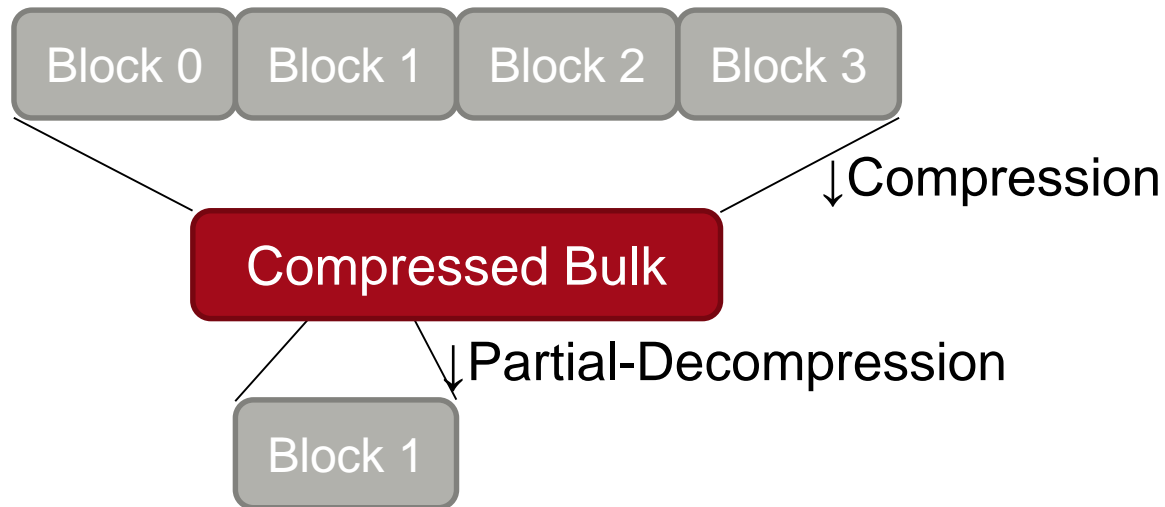
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- **All flash array (AFA)** provides high-bandwidth, low latency data management
 - Upper limit of writing times of SSD shorten lifespan of the memory cells
 - **We need a smart compression technique to solve this lifetime problem**

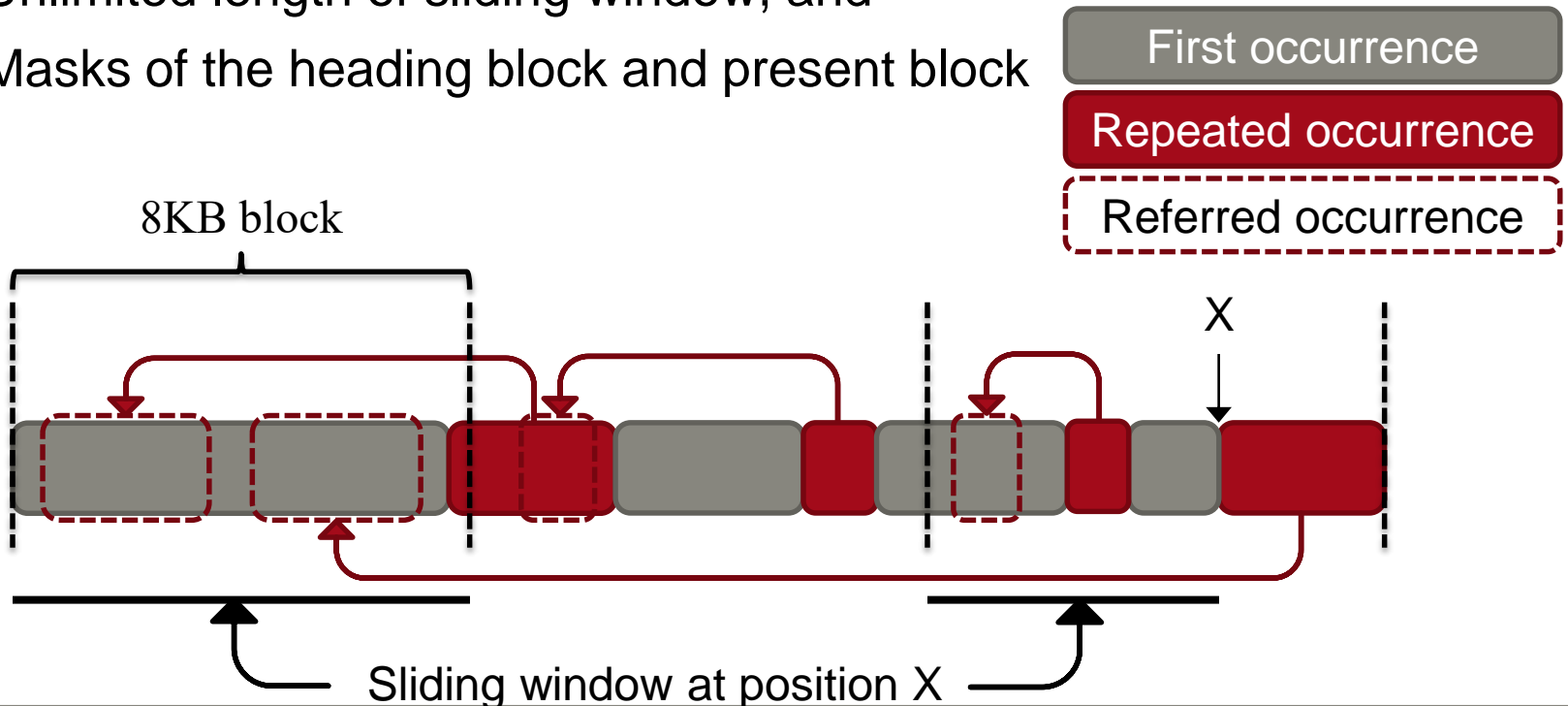
“Partially-Decompressible Format” ?

- Bulk compression possibly improve compression ratio from individual compression
 - Several blocks are compressed in bulk
- **How can we effectively decompress one block only with fraction of compressed data?**



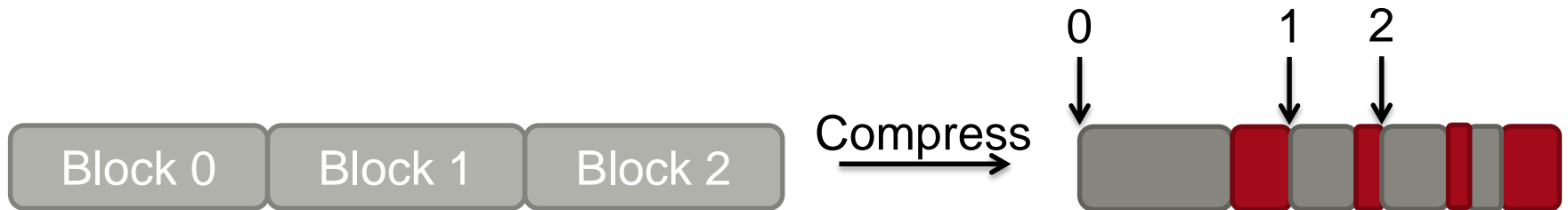
Proposal

- We modified LZ4[1], a fast LZ77-like compression format
- The sliding window is the intersection of
 - Unlimited length of sliding window, and
 - Masks of the heading block and present block

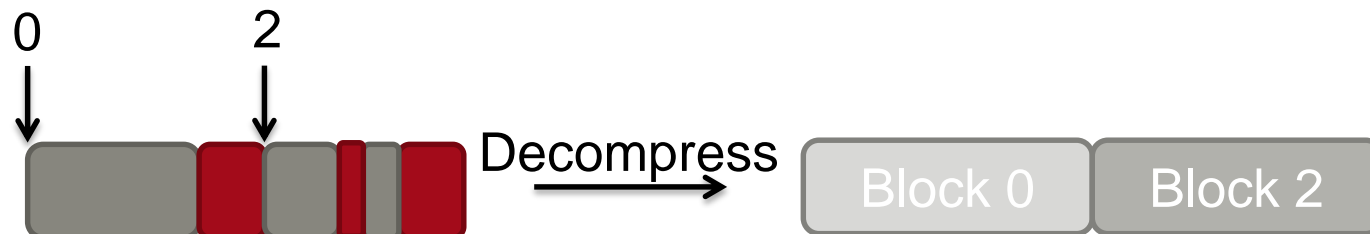


Proposal (cont.)

- Compression function returns offsets of compressed blocks as well as compressed bulk



- Each block can be decompressed only with compressed heading block and compressed desired block



■ Hardware

- Intel Xeon E5-2697 @ 2.7 GHz

■ Dataset

- Eight CentOS 7.2 images with various applications are combined
- Blocks are deduplicated in advance, consequently the data size is reduced from 4 GB to 770 MB

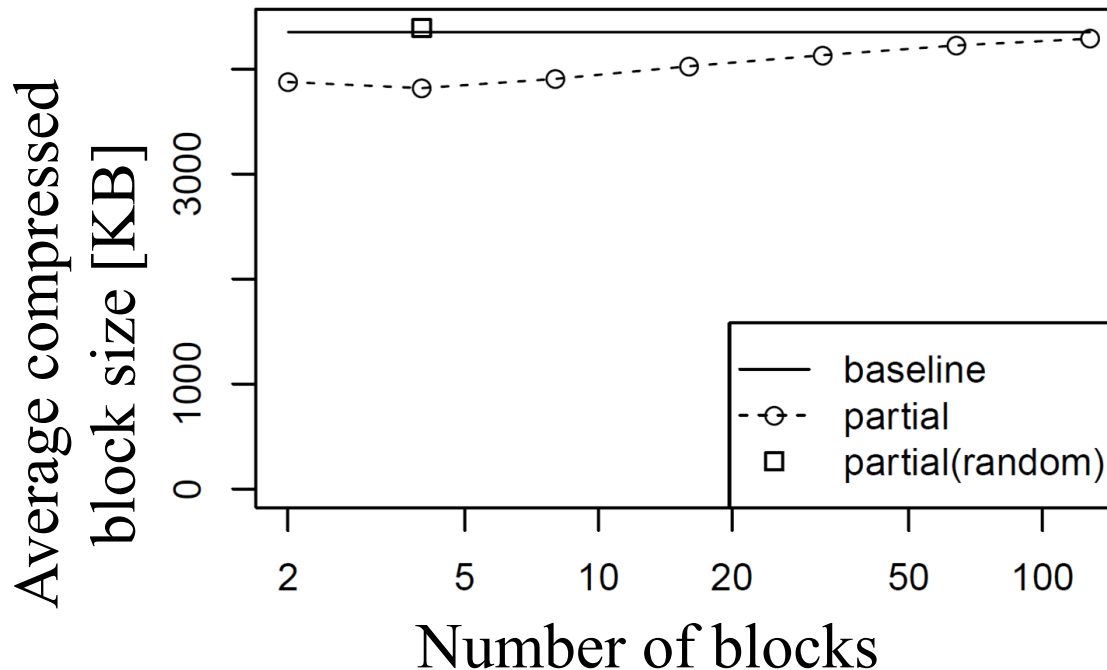


Dataset (770 MB after deduplicated)

Evaluation

1. Compressed Size

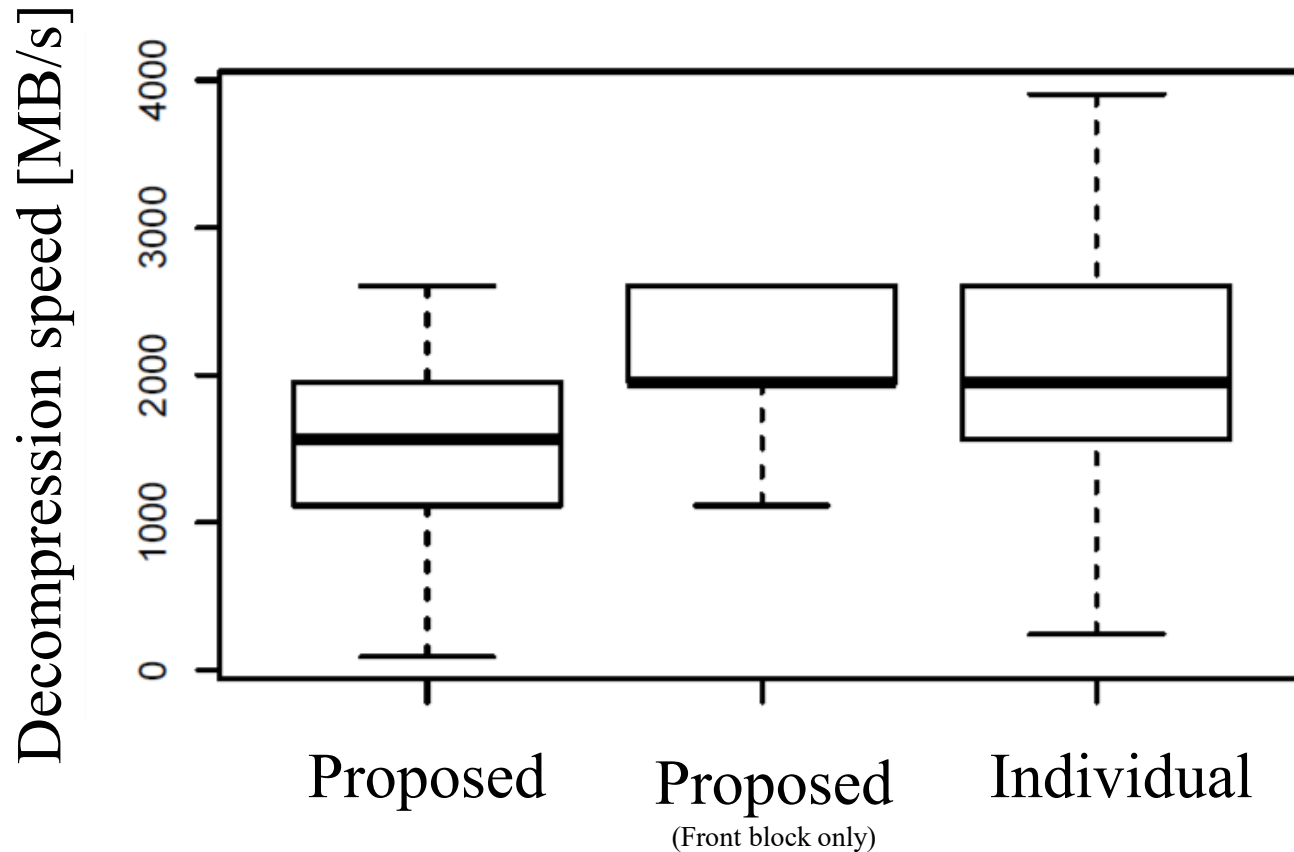
- The averaged compressed size of 8 KB blocks was 3.73 KB when four blocks are combined
 - which is 0.88x of individually compressed size, 4.25 KB




Evaluation

2. Decompression Speed

- The average decompression speed of one block in four blocks group is 0.85x of the individual case



- Detect and cluster “similar” blocks to improve compression ratio
- Evaluate compression/decompression speed and compression ratio in real AFA



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