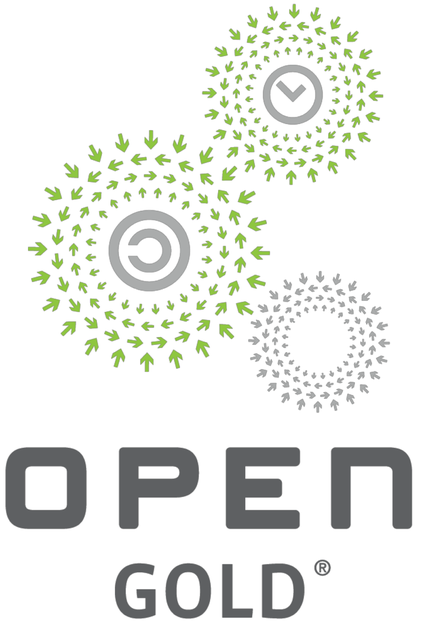
Open. Together.

OCP SUMMIT

SSD with Compression for the Compute and Storage Infrastructure: Implementation, Interface and Use Cases

Erich F. Haratsch, Managing Technologist, Seagate



SSD with Compression: Introduction

STORAGE

Data reduction techniques such as compression and deduplication have been employed in some storage systems, but are not widely available inside SSDs yet

Confusion exists about benefits, use cases and data integrity when SSDs implement compression

Compressibility of Data

Data bases, OS files, application data are typically highly compressible

	Typical Average Compressibility per Workload			
Compression Algorithm	MySQL	Oracle	Win8	Linux VM
gzip	60%	70%	50%	60%

Image and video files may have some small compressibility left

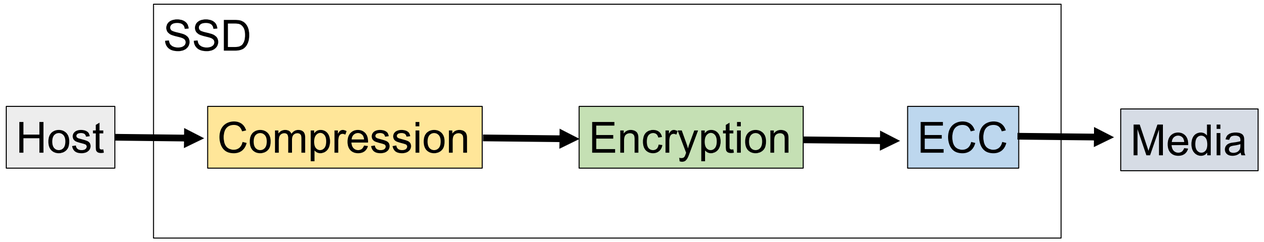
Encrypted data is not compressible

Compressibility =

(1 – OutBytes / InBytes) * 100%

SSD with Compression

- Compression algorithm needs to be lossless
- Compression needs to run inline at full data rate: low impact to write and read latencies
- Compression needs to be done before encryption and ECC encoding

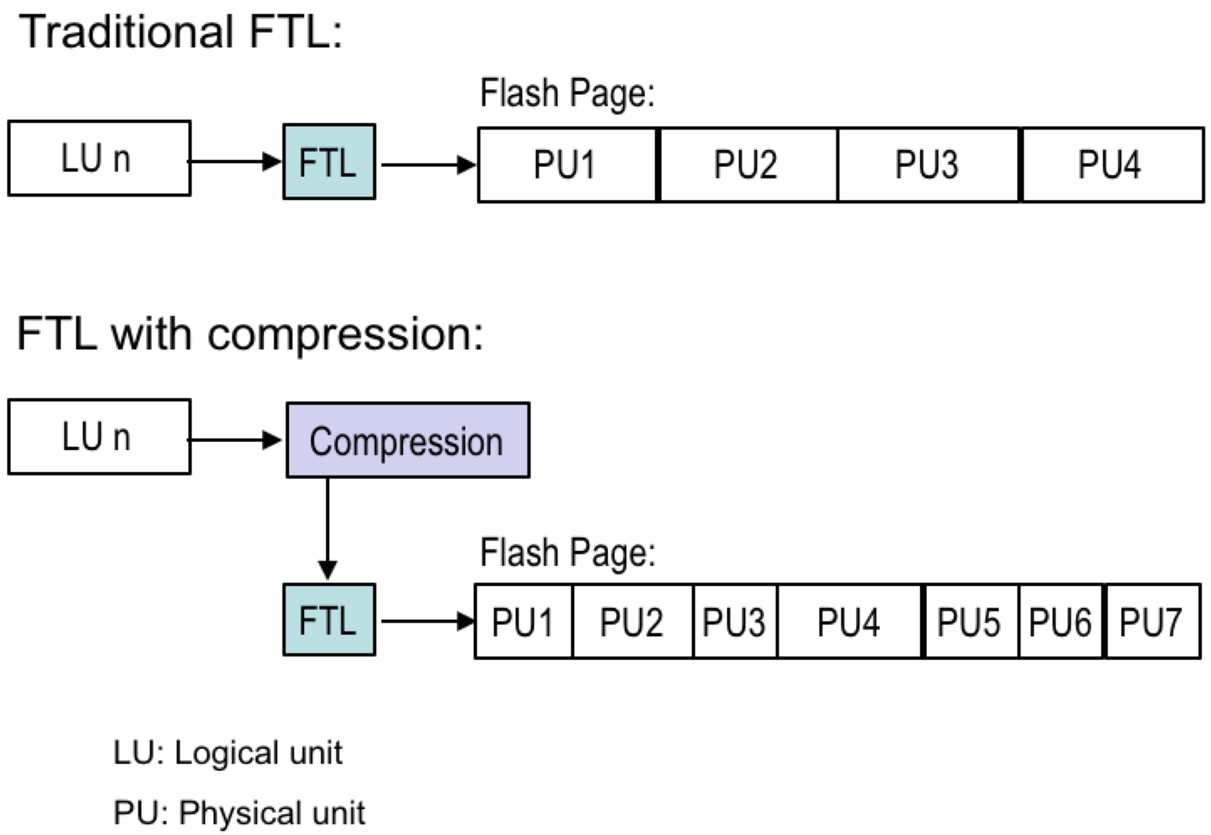


- Compression reduces data written to media
- Write original data if data is incompressible

SSD Flash Translation Layer with Compression

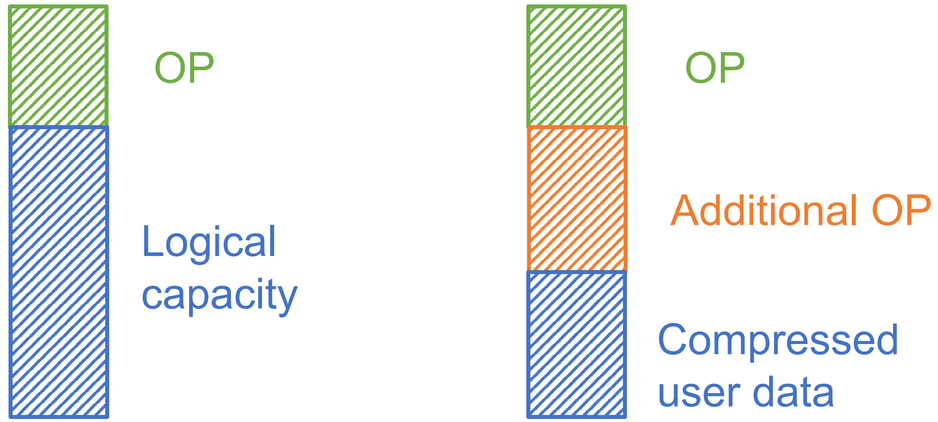
Traditional FTL writes data chunks with equal physical size that fit into a flash page

With compression, FTL needs to have ability to manage physical data units of variable size



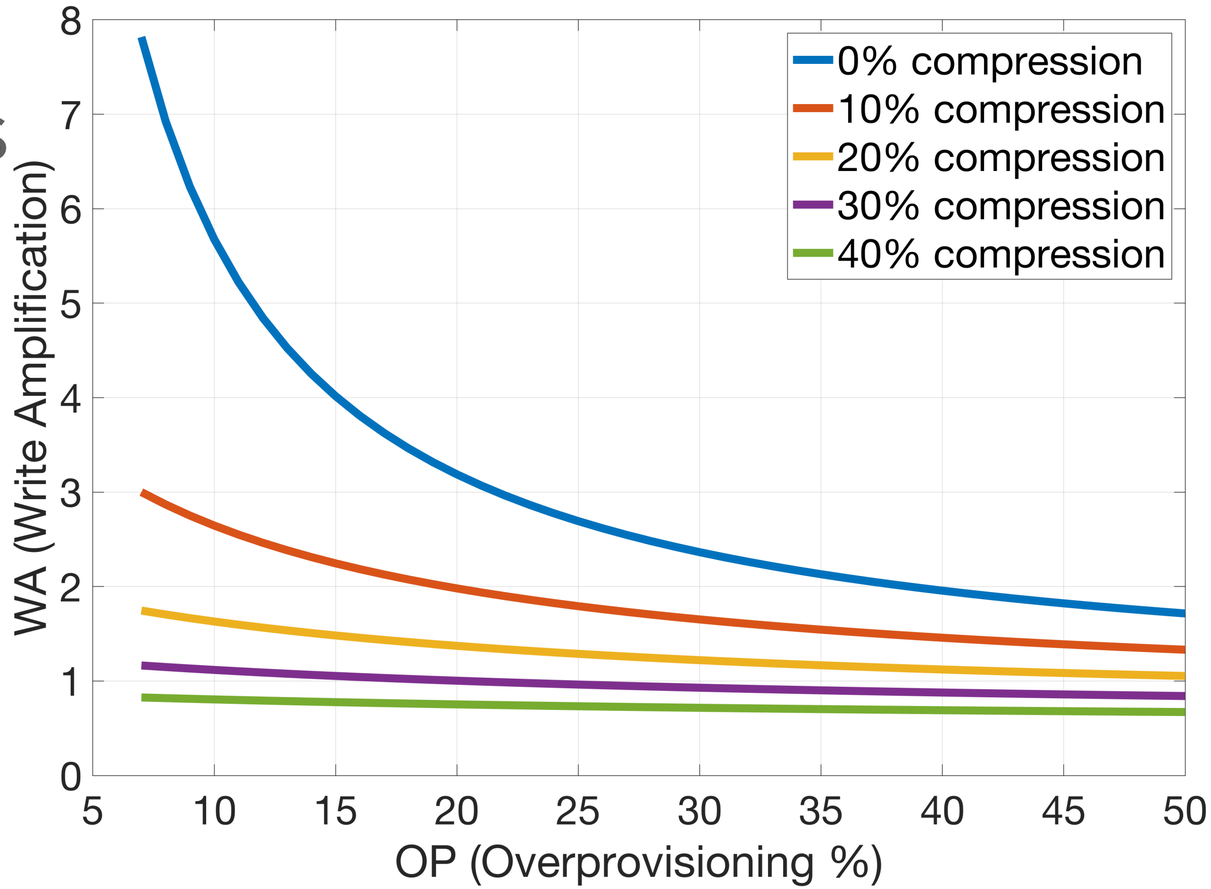
Use Compression to Increase Effective Overprovisioning

- Logical capacity does not change
- Reduces write amplification
- Increases random write and mixed read/write performance
- Increases endurance



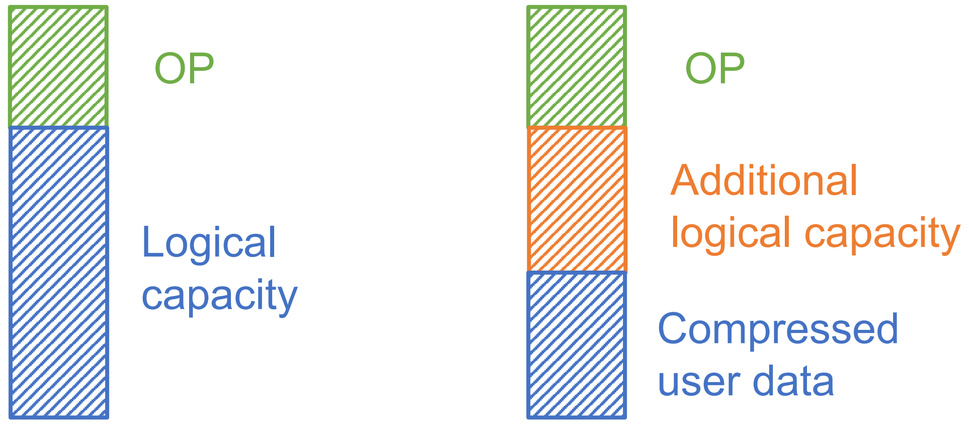
Write Amp, OP and Compression

- For random write workloads, write amplification increases as OP decreases
- Compression increases available OP
- Compression reduces WA and therefore increases endurance and performance



Use Compression to Increase Logical Capacity

- Report higher logical capacity to host
- Actual logical capacity depends on data entropy
- Host needs to monitor free physical space



QLC SSD with Compression

QLC NAND media has typically low endurance and performance characteristics

Compression can make QLC SSDs more attractive by increasing

- endurance
- performance
- user capacity

SSD Product with Compression

- Nytro® 1000 SATA SSD series
- Seagate DuraWrite™ lossless data reduction technology is designed to increase performance and deliver high-power efficiency
- Tunable capacity for performance- or capacity-optimized SSD solutions
- Seagate Secure technology with secure supply chain, SD&D, Seagate Instant Secure Erase, and SED options
- Easy deployment in legacy storage infrastructures with SATA 6Gb/s interface
- Consistent IOPS performance with low latency for faster random access
- Won Best of Show award at Flash Memory Summit 2018

Call to Action

Add compression-enabled SSD devices to the Open Compute Project by defining use cases, workloads and interfaces

Define guidelines to specify performance, endurance and QoS of compression-enabled SSDs

Define workloads to benchmark compression-enabled SSDs

Educate OCP Community about benefits

This will give the industry an additional attribute for optimizing SSD specifications such as performance, endurance and capacity

Open. Together.
OCP Global Summit | March 14–15, 2019
OCP
SUMMIT