

Maximizing SSD Performance and Endurance with Overprovisioning

Overprovisioning, often referred to as OP, is the practice of setting aside free space on an SSD that the user and operating system cannot write to. This free space area is available to the on-board SSD controller to do the massive amounts of complex background processing tasks that an SSD has to perform under normal operation. These processes include garbage collection, wear leveling, bad block management and other data management tasks.

This Technical Brief will illustrate the benefits of OP on Kingston SSDs; these benefits could apply to other SSDs as well.

One way to think about OP is as an area reserved for the SSD controller to use as a temporary workspace to perform its many operations. Consider this analogy: You are moving to a new house and you have to move all of your belongings but you only have one box to move everything in. You will have to fill, move and empty the box each time you move your things. This may take 100 trips and you will eventually wear out the box. What if you had 100 boxes that you could fill and move just once? An SSD works the same way. Give the SSD more room to work and it will do so quickly and efficiently.

Kingston engineers have always recognized the many benefits that OP provides and have been delivering SSDs to customers with some level of OP configured for many years now. These engineers believe that the small reduction in user capacity (typically 7 percent) far outweighs the long-term performance, endurance and reliability gains that OP delivers.

Why should I use OP?

Overprovisioning has a direct affect on sustained random workload performance and reduces access latency time. OP also helps maintain high performance levels as the drive capacity is filled by reducing the dependency on the controller from having to prepare space on demand to move, erase and re-write data (called Program/Erase or P/E Cycles).

Another benefit of OP is the effect it has on drive endurance and service life expectancy. Having OP configured on an SSD helps to reduce the Write Amplification Factor (WAF), a phenomenon of all Flash storage devices where more data is written to Flash memory than was actually written from the host.

