White Paper

Innodisk iAnalyzer Technology for SSDs

Introduction

Data Pattern Recorder for SSDs

One limitation of NAND flash memory is the finite number of Program/Erase cycles. The current 2xnm SLC flash on the market is rated between 60,000 to 100,000 Program/Erase cycles and 1xnm MLC flash is rated between 1,500 and 3,000 Program/Erase cycles. Lower grade consumer type MLC and TLC flash is rated at under 1,000 Program/Erase cycles.

An industrial grade SSD uses highly reliable flash components selected for your application. Innodisk has designed a new iAnalyzer function that can record your system's behavior, such as read/write distribution, sequential/random read/write commands, the ratio of file sizes and total amount written to the disk. This information can help our customers understand their software behavior so they can select the best product for their system's lifespan.

How to record system application behavior

iAnalyzer is a new feature that is accessed through Innodisk's iSMART Windows utility. This is a free tool that records the read/write behavior of the disk without the need for a driver or external analyzer. When the iAnalyzer function is triggered, the GUI shows the distribution of read/write of the host's behavior. This information can be used to select a more cost-effective product for your application.

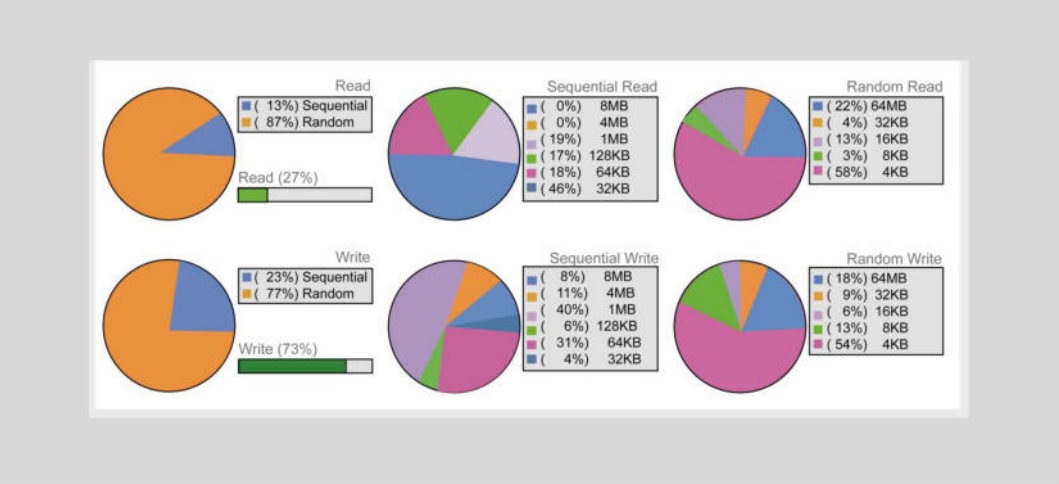

Figure 1: iAnalyzer shown on iSMART

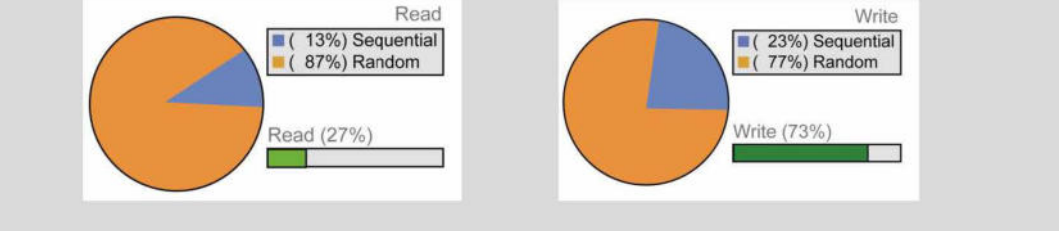

Figure 2: The distribution of read/write

This feature can separately monitor all read/write sector, multiple, DMA, DMA EXT, FPDMA commands. It will then sort all the command file sizes from 4KB up to 8MB. This information that is gathered can provide you more details about your system's behavior. This can also provide Innodisk's firmware team the ability to finely tune our product's firmware to meet the customer's additional requirements. The utility can calculate the total data written sent from the host to report an estimated life expectancy of the drive.

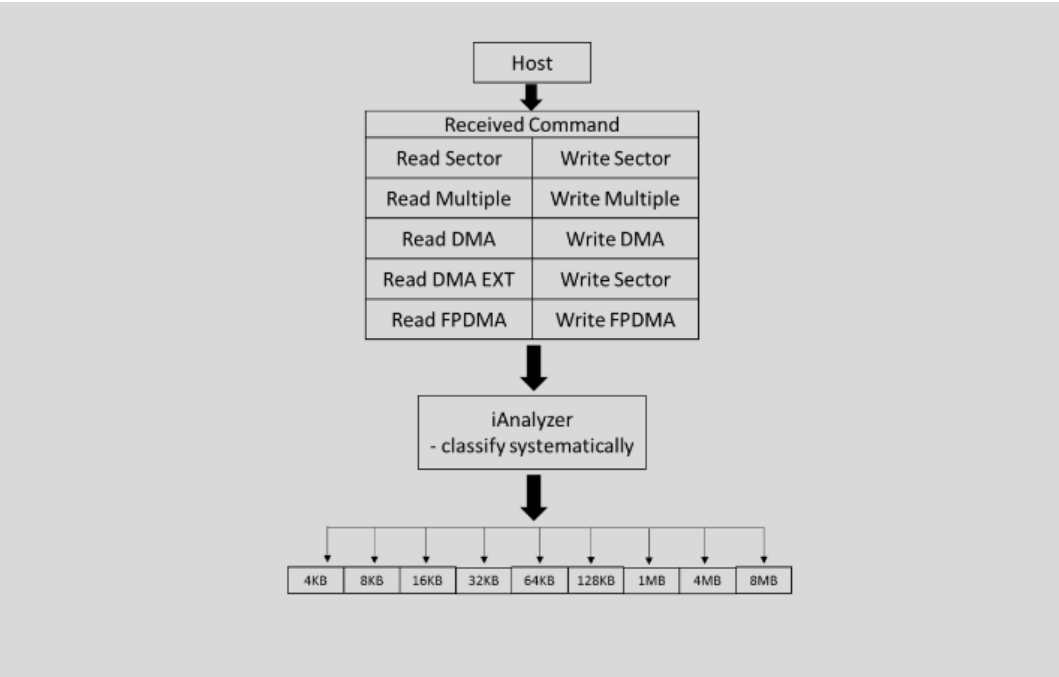

Figure 3: iAnalyzer flow chart

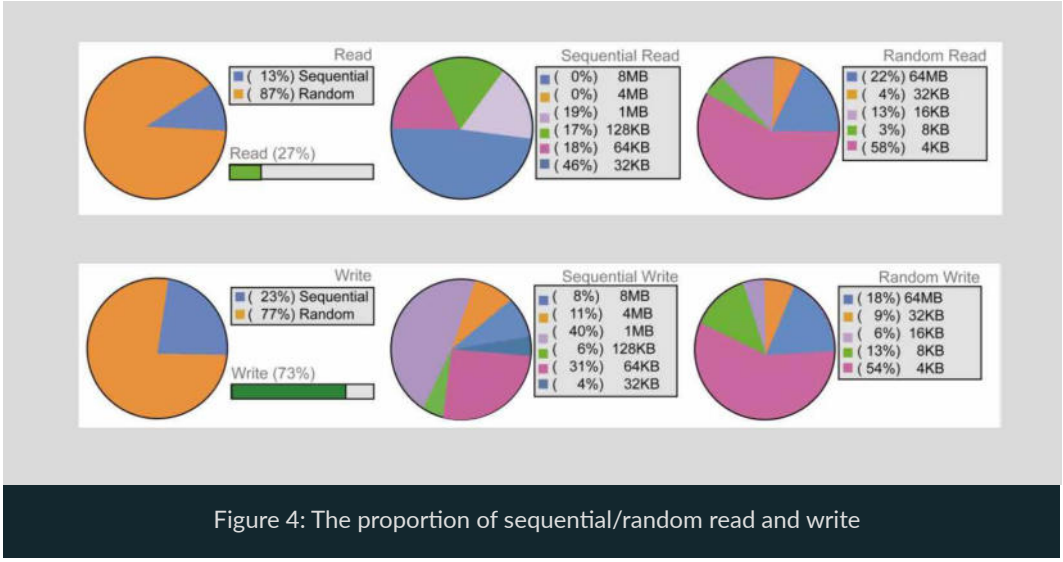

Figure 4: The proportion of sequential/random read and write

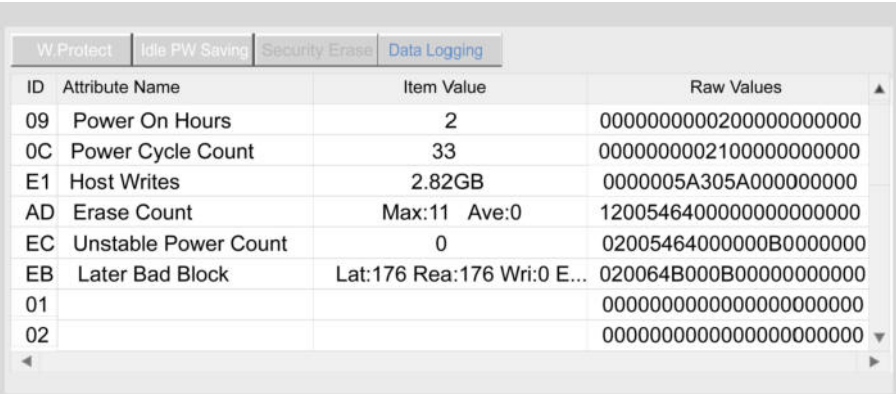

Figure 5: The total data written

Application

Innodisk uses our iAnalyzer to monitor the installation of three different operating systems. The real-time collection and analysis of Window XP, Window 7, and Linux Ubnutu are shown below. See Figure 6-8.

(1) Window XP- 73% write commands, 27% read commands, and host write is 1.69GB.

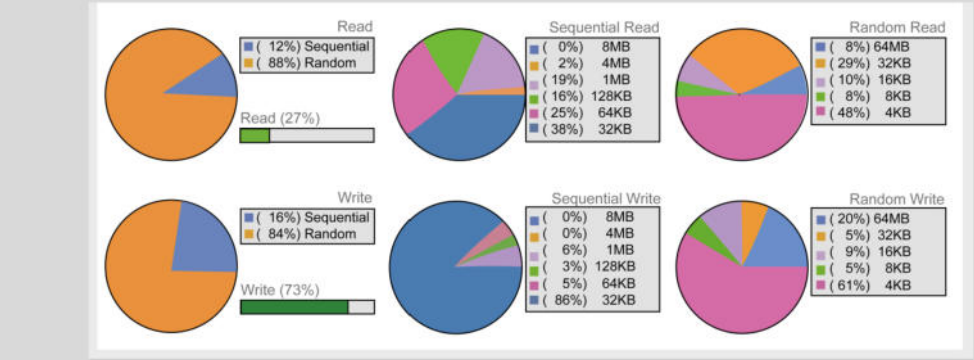

Figure 6: iAnalyzer information of Window XP

(2) Window 7- 76% write commands, 24% read commands, and host write is 6.03GB.

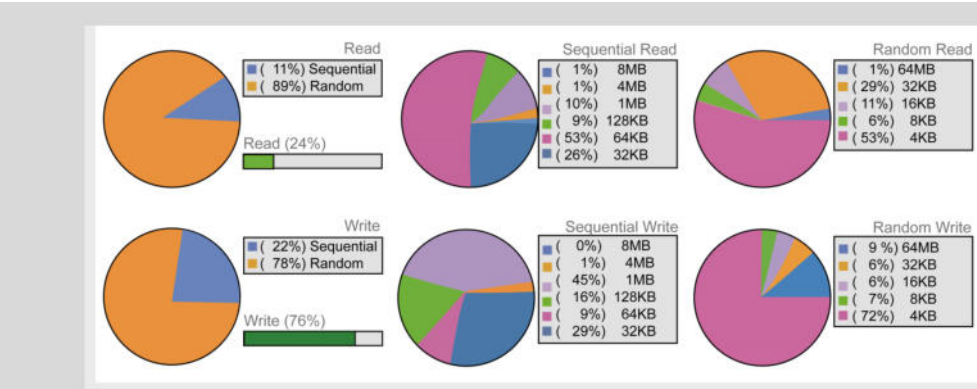

Figure 7: iAnalyzer information of Window 7

(3) Linux Ubuntu- 73% write commands, 27% read commands, and host write is 2.82GB.

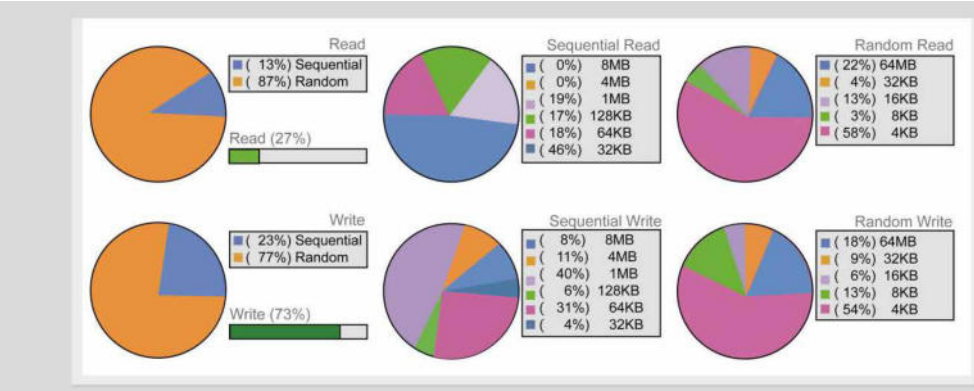

Figure 8: iAnalyzer information of Linux Ubuntu

According to iAnalyzer, the major behavior during the installation of these operating systems are 4K random writes with Windows XP at 61%, Windows 7 at 72%, and Linux Ubuntu at 54%. Knowing the application relies on a lot of 4K random writes, the customer can select the correct product that can meet their performance needs.

Conclusion

iAnalyzer is a powerful feature for collecting, analyzing and displaying data in Innodisk's iSMART utility. Through the iAnalyzer function, customers can easily to capture their application's data behavior. This real-time collection provides in-depth knowledge of the user's application, and aids them in choosing the best solution for their system. Innodisk iAnalyzer is able to work on a wide variety of embedded systems, including industrial, medical, transportation, automation, and gaming industries.

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