CSC 443: Assignment 1

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1. General Setting

I run these two programs on 2 different machines and 3 different storage medium. Macbook 2016 test with both its internal SSD and external Hard Drive, and the size of the file is 100 MBytes. Linux machine test with USB, and the size of the file is 40 MBytes. The figure and analysis following *General Setting* is organized in the following order:

- Macbook 2016 Solid State Drive
- Macbook 2016 with SEAGATE 2TB External Hard Drive
- Linux Machine with Kingston 8GB USB Drive

10 different block size is set as following:

- 128 Bytes
- 1 KBytes
- 4 KBytes
- 8 KBytes
- 64 KBytes
- 128 KBytes
- 512 KBytes
- 1 MBytes
- 2 MBytes
- 3 MBytes

Note: In order to make the experiment more precise and general, for every single block size, I have 30 tests for each to avoid accidental case, thus graph is distributed in each block size.

2. Sequential write to file

Graph order is SSD, External Hard Drive, USB

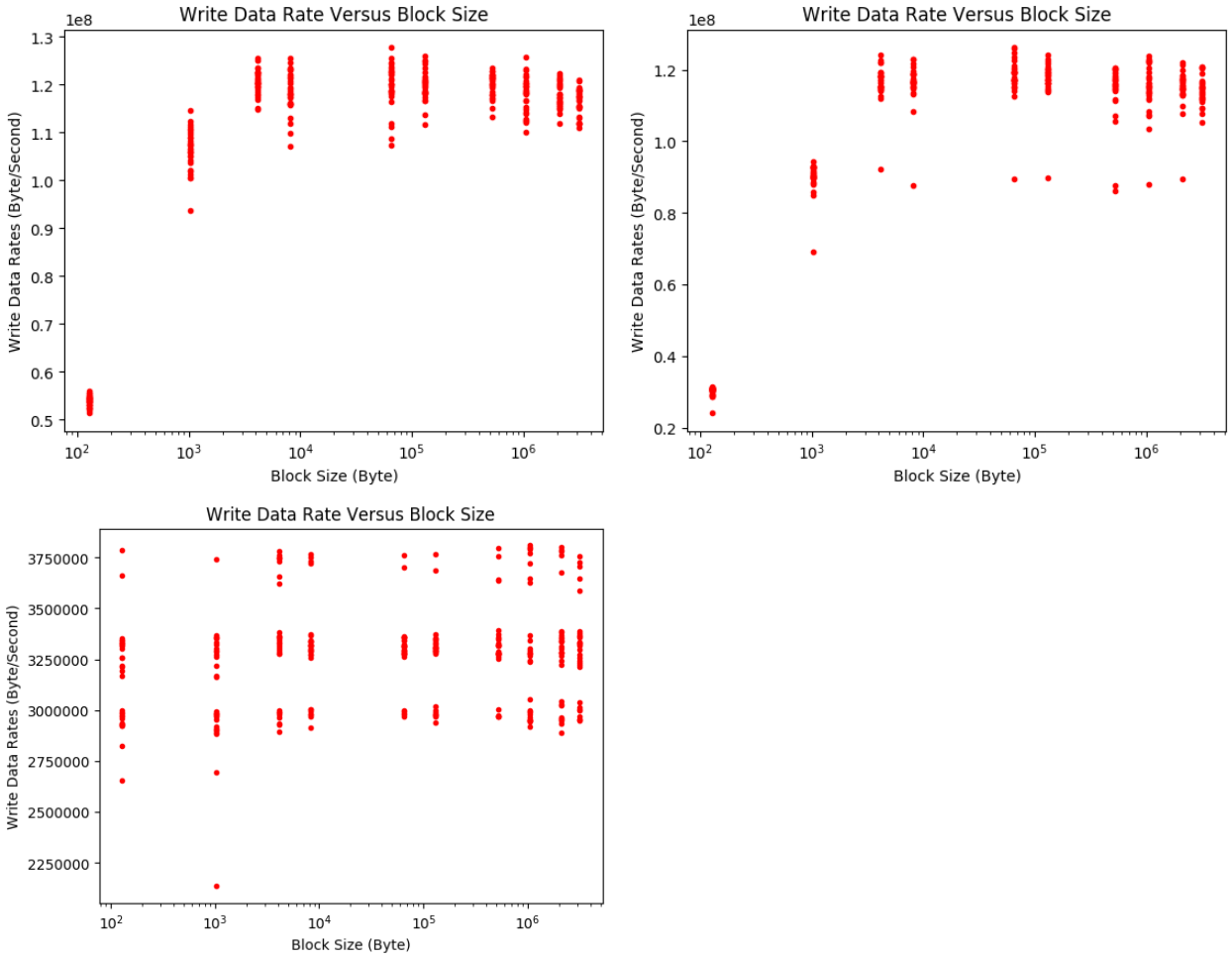

Figure 1: SSD, External Hard Drive, USB

(1) Plot the observation of write data rate versus block size. Provide a simple explanation of the observation:

For the SSD and External Hard Drive, the write data rates increase as block size increase until it reaches around 4 KBytes. At the peak, the rate is around 125,000,000 Bytes/Second for SSD and 120,000,000 Bytes/Second for External Hard Drive. After reaching 4 KBytes, the rates seems to be stable and does not increase as block size increase. While USB seems to be staying at same level through the test. The rate is around 3,500,000 Bytes/Second for USB.

(2) Discuss the existence of the optimal block size for write:

We can form a conclusion from the figure that the optimal block size for SSD and HDD is 4 Kbytes which is the same as the page size in my machine. While for the USB, we draw no conclusion about the optimal size from the figure.

3. Sequential read from file

Graph order is SSD, External Hard Drive, USB

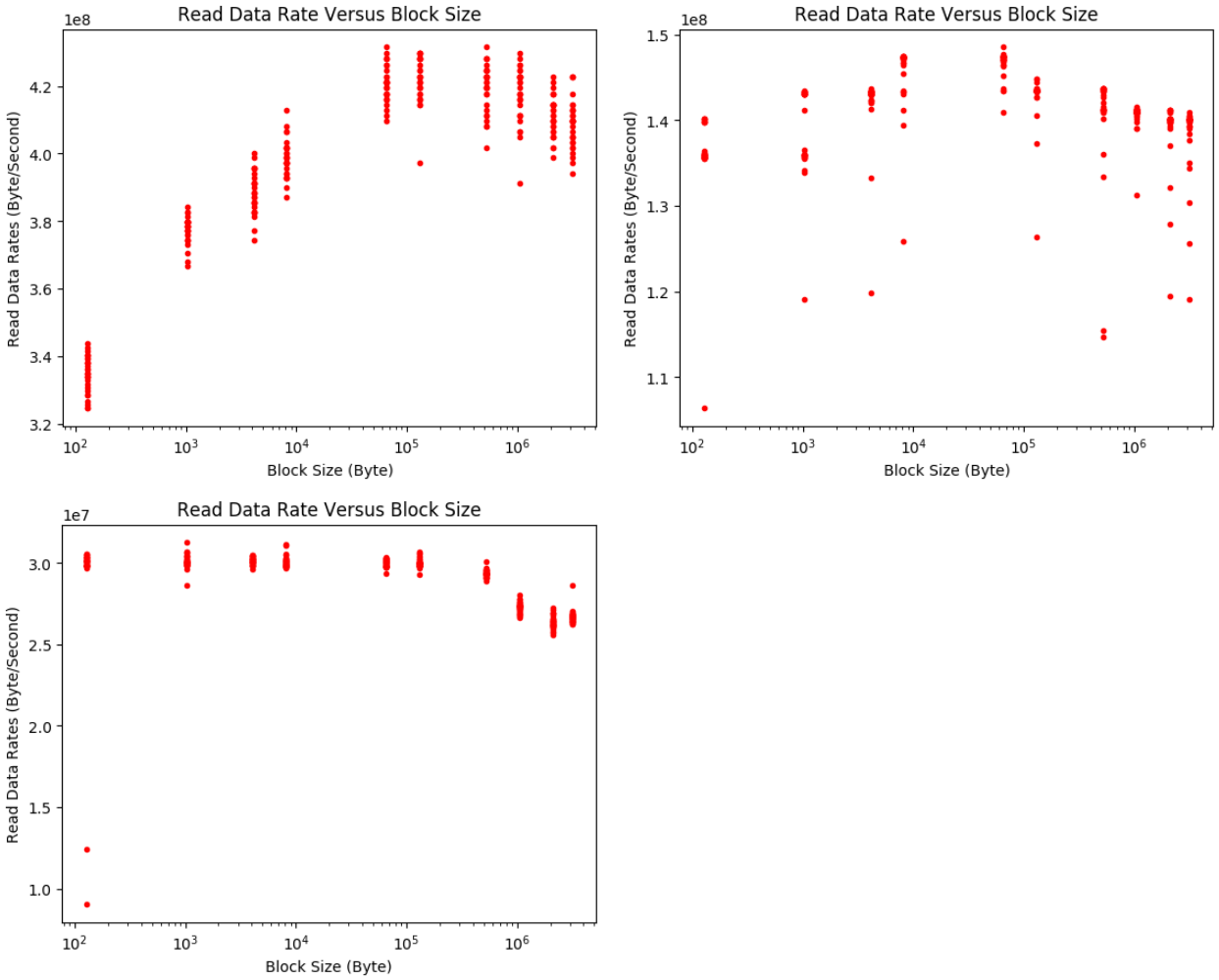

Figure 2: SSD, External Hard Drive, USB

(1) Plot the observed read data rate versus block size. Explain the curve:

For the SSD and External Hard Drive, the read data rates increase as block size increase until it reaches 64 KBytes. At the peak, the rate is around 430,000,000 Bytes/Second for SSD and 145,000,000 Bytes/Second for External Hard Drive. After reaching 64 KBytes, the rates seems to be stable and decrease a little bit from the figure. While USB seems to stay a certain level for the whole test and drop a little bit after passing 512 KBytes block size. For USB, the rate is around 30,000,000 Bytes/Second.

(2) Discuss the existence of an optimal block size for read. Compare this with the case for write:

We can form a conclusion from the figure that the optimal block size for SSD and External Hard Drive is 64 Kbytes. While for USB, from the figure we have the optimal block size to be less than 1 MByte.