


Test read/write speed of usb and ssd drives with dd command on Linux

By [Silver Moon](#) | January 25, 2019

Drive speed

The speed of a drive is measured in terms of how much data it can read or write in unit time. The dd command is a simple command line tool that can be used to read and write arbitrary blocks of data to a drive and measure the speed :

 In this post we shall use the dd command to test and read and write speed of usb and ssd drives using the dd command.

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The data transfer speed does not depend solely on the drive, but also on the interface it is connected to. For example a usb 2.0 port has a maximum operational speed limit of 480Mbps. The same applies to SSD. SSD connect via SATA ports which have different versions. Sata 2.0 has a maximum theoretical speed limit of 3Gbits/s which is roughly 375 Mbyte/s.

Test Method - The dd command

Mount the drive and navigate into it from the terminal. Then use the dd command to first write a file using fixed sized blocks. Then read the same file out using the same block size.

The general syntax of the dd command looks like this

```
dd if=/path/to/input_file of=/path/to/output_file bs=block_size count=number_of_blocks
```

When writing to the drive, we simply read from /dev/zero which is a source of infinite useless bytes. And when read from the drive, we read the file written earlier and send it to /dev/null which is nowhere. In the whole process, dd keeps

SSD Drive

The SSD that we are using is a "Samsung Evo 120GB" ssd. It is a beginner level ssd that comes within a decent budget and is also my first SSD. It is also one of the best performing ssds, in the market.

In this test the ssd is connected to a sata 2.0 port.

Write speed

Lets first write to the ssd

```
$ dd if=/dev/zero of=./largefile bs=1M count=1024
1024+0 records in
1024+0 records out
1073741824 bytes (1.1 GB) copied, 4.82364 s, 223 MB/s
```

Block size is actually quite large. You can try with smaller sizes like 64k or even 4k.

Read speed

Now read back the same file. However, first clear the memory cache to ensure that the file is actually read from drive.

Run the following command to clear the memory cache

```
$ sudo sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"
```

Now read the file

```
$ dd if=./largefile of=/dev/null bs=4k
165118+0 records in
165118+0 records out
676323328 bytes (676 MB) copied, 3.0114 s, 225 MB/s
```

The Arch Linux wiki has a page full of information about the read/write speed of various SSDs from different vendors like Intel, Samsung, Sandisk etc. Check it out at the following url.

https://wiki.archlinux.org/index.php/SSD_Benchmarking

USB Pen drives

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In this test we shall measure the read and write speed of ordinary usb/pen drives. The drives are plugged to standard usb 2 ports. The first one is a sony 4gb usb drive and the second is a strontium 16gb drive.

First plug the drive into the port and mount it, so that it is readable. Then navigate into the mount directory from the command line.

Sony 4GB USB 2.0 Drive

Sony 4GB - Write

In this test, the dd command is used to write 10,000 chunks of 8 Kbyte each to a single file on the drive.

```
# dd if=/dev/zero of=./largefile bs=8k count=10000
10000+0 records in
10000+0 records out
81920000 bytes (82 MB) copied, 11.0626 s, 7.4 MB/s
```

So the write speed is around 7.5 MBytes/s. This is a low figure.

Sony 4GB - Read

The same file is read back to test the read speed. Run the following command to clear the memory cache

```
$ sudo sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"
```

Now read the file using the dd command

```
# dd if=./largefile of=/dev/null bs=8k
8000+0 records in
8000+0 records out
65536000 bytes (66 MB) copied, 2.65218 s, 24.7 MB/s
```

The read speed comes out around 25 Mbytes/s which is a more or less the standard for cheap usb drives.

USB 2.0 has a theoretical maximum signaling rate of 480 Mbits/s or 60 Mbytes/s. However due to various constraints the maximum throughput is restricted to around 280 Mbit/s or 35 Mbytes

And the above usb drive was plugged inside a USB 2.0 port and it achieved a read speed of 24.7 Mbytes/s which is not very bad. But the write speed lags much behind

Strontium USB 2.0 16GB Pen drive

Now lets do the same test with a Strontium 16gb drive. Strontium is another very cheapy brand, although usb drives are reliable.

Write speed

```
# dd if=/dev/zero of=./largefile bs=64k count=1000
1000+0 records in
1000+0 records out
65536000 bytes (66 MB) copied, 8.3834 s, 7.8 MB/s
```

Strontium 16gb read speed

```
# sudo sh -c "sync && echo 3 > /proc/sys/vm/drop_caches"

# dd if=./largefile of=/dev/null bs=8k
8000+0 records in
8000+0 records out
65536000 bytes (66 MB) copied, 2.90366 s, 22.6 MB/s
```

The read speed is lower than the Sony drive.

SanDisk Cruzer Blade 32GB USB Flash Drive

This is a popular cheap USB 2.0 drive available on amazon.in

Lets test its read and write speed.

Read Speed - CPU Case USB Port

Reading a simple iso file present on the drive using the dd command.

```
$ dd if=./ubuntu.iso of=/dev/null bs=8k
90355+1 records in
90355+1 records out
740195568 bytes (740 MB, 706 MiB) copied, 27.0821 s, 27.3 MB/s
```

The read speed is about 27.3 MB/s

Write Speed - CPU Case USB Port

Now lets test the write speed

```
$ dd if=./ubuntu-16.04.5-desktop-i386.iso of=./ubuntu-16.04.5-desktop-i386.iso bs=1M
1587+1 records in
1587+1 records out
1664614400 bytes (1.7 GB, 1.6 GiB) copied, 374.269 s, 4.4 MB/s
```

The write speed is quite low at 4.4 MB/s.

Sandisk Ultra CZ48 USB 3.0 16 GB Pen Drive

Read speed - Motherboard USB Port

```
$ dd if=./backup.rar of=/dev/null bs=8k
51108+1 records in
51108+1 records out
418678907 bytes (419 MB, 399 MiB) copied, 4.82621 s, 86.8 MB/s
```

This one has a decent read speed.

Write speed - Motherboard USB Port

Lets copy the same ubuntu iso file from disk to the usb drive

```
$ dd if=~/.ubuntu-16.04.5-desktop-i386.iso of=./ubuntu-16.04.5-desktop-i386.iso bs=1M
1587+1 records in
1587+1 records out
1664614400 bytes (1.7 GB, 1.6 GiB) copied, 128.624 s, 12.9 MB/s
```

The write speed this time is better than the earlier Sandisk USB 2.0 drive.

Motherboard USB Port vs CPU case USB Port - Big Difference!

The speed also depends on whether you connect the USB drive to the front ports on your cpu case or directly on the motherboard usb ports. As you might be able to guess already, the speed on motherboard usb ports is significantly high

Front of CPU Case - Sony USB 3.1 Gen 16GB - Read Speed

```
$ dd if=./ubuntu.iso of=/dev/null bs=8k
90355+1 records in
90355+1 records out
740195568 bytes (740 MB, 706 MiB) copied, 17.6587 s, 41.9 MB/s
```

Motherboard USB Port - Sony USB 3.1 Gen 16GB - Read Speed

```
$ dd if=./ubuntu.iso of=/dev/null bs=8k
90355+1 records in
90355+1 records out
740195568 bytes (740 MB, 706 MiB) copied, 6.11666 s, 121 MB/s
```

So the motherboard usb port speed is almost 3X higher than the cpu case usb ports. So if you are planning to do heavy data transfer, then it would be a better idea to make the extra effort of connecting the usb drive to the back of your C

Motherboard USB Port - Sony USB 3.1 Gen 16GB - Write Speed

```
$ dd if=~/.ubuntu-16.04.5-desktop-i386.iso of=./ubuntu-16.04.5-desktop-i386.iso bs=1M
1587+1 records in
1587+1 records out
1664614400 bytes (1.7 GB, 1.6 GiB) copied, 176.581 s, 9.4 MB/s
```

The write speed of this Sony USB 3.1 drive is lower than the Sandisk Ultra USB 3.0 Drive. Both of them were tested on motherboard usb ports.

Resources

<http://en.wikipedia.org/wiki/USB>

https://wiki.archlinux.org/index.php/SSD_Benchmarking

Last Updated On : 25th January 2019

CATEGORY: [HARDWARE](#)

TAGS: SSD

5 thoughts on "Test read/write speed of usb and ssd drives with dd command on Linux"



hjs

[June 4, 2017 at 3:03 am](#)

```
anon@nux-16:/home/home$ sudo dd if=/dev/zero of=./largefile bs=1M count=1024
[sudo] password for anon:
1024+0 records in
1024+0 records out
1073741824 bytes (1.1 GB, 1.0 GiB) copied, 0.989448 s, 1.1 GB/s
```

how is this possible?



Stephen Lynx

[March 25, 2017 at 12:12 am](#)

dd if=/dev/zero of=./largefile bs=1M count=1024 is just writing to ram, tho.



dega

[January 23, 2017 at 2:02 am](#)

Nice post!

On my machine (distro: Mageia), pendrives are cached by kernel.

So, a simple dd do not measure the real write speed (dd reports 63MB/s).

So I disabled the cache with the sync option of mount.

dd now reports 170 KB/s (big difference)

Looking at your write speed results, I suspect that your pendrive is also cached by the kernel.



mrh

[June 24, 2015 at 8:08 pm](#)

if dd command is used to monitor performance of a drive especially for a usb disk, conv=fsync should be set in order to flush the memory each time during the write operation.



Ger

[August 10, 2014 at 5:05 pm](#)

sudo hdparm -t /dev/sdxx is far safer than dd which I would never recommend anyone run to benchmark a drive ever

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