

A Simple Method to Measuring Hard Disk Performance: Red Hat Linux 7.2, SuSE Linux 7.3, and Mandrake Linux 8.2

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1. Summary

The data transfer rate of hard disk is critical to overall system performance. This document describes a simple method to measuring hard disk performance under Linux. We found out that the hard disk may fail to operate at its maximally permissible transfer speed in some cases, even though the IDE controller in VIA's south bridge chips VT82C686B, VT8231, and VT8233 can support up to ATA/100 (Ultra DMA mode 5). As a result, it may require re-building the kernel to enhance disk performance. We report our test results covering those three chips under Red Hat Linux 7.2, SuSE Linux 7.3, and Mandrake Linux 8.2; and with or without kernel rebuild. The information in this document is provided "AS IS," without guarantee of any kind.

2. File descriptions

The package contains 2 files as described below.

ide-test	261	2002/05/09	04:00p
Readme.doc	this	file	

The "ide-test" file is a simple shell to help you measure and verify file copy times.

3. Measurement of hard disk performance

The following example shows the step to identify the transfer mode and measure the transfer rate of the hard disk.

- (1) Assume you have already successfully installed the operating system. In command shell run "df -h" to display currently mounted file systems. You might see a similar result as below that shows that hda5 is the mounted file system for the hard disk.

Filesystem	Size	Used	Avail	Use%	Mounted on
/dev/hda5	8.2G	1.6G	6.1G	21%	/
/dev/hdc	638M	638M	0	100%	/mnt/cdrom
/dev/fd0	1.4M	193k	1.2M	14%	/mnt/floppy

- (2) Run “hdparm -I /dev/hda5” to identify the transfer mode of the hard disk. You may need to modify “hda5” according to your actual system settings. You might see a similar result as below. The hard disk operated at UDMA2 (ATA/33) even though it can support up to ATA/100 with an 80-conductor cable.

```
/dev/hda5:
Model =BI-MTDAL3-7010 5, FwRev=XT025AC0, Serial No=          Y DFFYAG6538
Config={ HardSect NotMFM HdSw>15uSec Fixed DTR>10Mbs }
RawCHS=16383/16/63, TrkSize=0, SectSize=0, ECCbytes=40
BuffType=Dual PortCache, BuffSize=1916kB, MaxMultSect=16, MultSect=16
CurCHS=16383/16/63, CurSects=-66060037, LBA=yes, LBASects=30003120
IORDY=on/off, tPIO={min: 240,w/IORDY: 120}, tDMA={min: 120, rec: 120}
PIO modes: pio0 pio1 pio2 pio3 pio4
DMA modes: mdma0 mdma1 mdma2 udma0 udma1 *udma2 udma3 udma4 udma5
```

- (3) Run “hdparm -t /dev/hda5” to measure the transfer rate. You may need to modify “hda5” according to your actual system settings. You might see a similar result as below. Note the measured transfer rate may vary from run to run.

```
/dev/hda5:
Timing buffered disk reads: 64 MB in 4.29 seconds = 14.92 MB/sec
```

4. Test results

Two methods exist for enhancing hard disk performance. One is to directly modify the native IDE driver source code and the other is to use a patch file. For further information, refer to related documents posted at <http://www.viaarena.com/?PageID=60>.

The following tables summarize the IDE data transfer rate of VIA's south bridge chips VT82C686B, VT8231, and VT8233 under Red Hat Linux 7.2, SuSE Linux 7.3, and Mandrake Linux 8.2; and with or without kernel rebuild. For completeness, the version of the native IDE driver, via82cxxx.c, used in each Linux distribution is also listed. Each transfer rate was computed by averaging 5 test runs of “hdparm” for better accuracy. Because the test result may vary from system to system and from application to application, users are strongly advised to measure hard disk performance by using more sophisticated methods under their specific hardware and software configurations.

(1) Red Hat Linux 7.2 test result

	Native IDE driver ver 3.23				
	Native UDMA Mode	Native data transfer rate (MB/sec)	New UDMA Mode	New data transfer rate (MB/sec)	Rebuild kernel?
VT82C686B	ATA/33	14.92	ATA/100	19.39	Yes
VT8231	ATA/100	7.46	ATA/100	21.33	Yes
VT8233	ATA/100	5.12	ATA/100	27.95	Yes

(2) SuSE Linux 7.3 test result

	Native IDE driver ver 3.29				
	Native UDMA Mode	Native data transfer rate (MB/sec)	New UDMA Mode	New data transfer rate (MB/sec)	Rebuild kernel?
VT82C686B	ATA/100	39.26	ATA/100	39.75	No
VT8231	ATA/100	19.10	ATA/100	18.93	No
VT8233	ATA/100	40.00	ATA/100	39.75	No

(3) Mandrake Linux 8.2 test result

	Native IDE driver ver 3.29				
	Native UDMA Mode	Native data transfer rate (MB/sec)	New UDMA Mode	New data transfer rate (MB/sec)	Rebuild kernel?
VT82C686B	ATA/33	29.63	ATA/100	45.07	Yes
VT8231	ATA/33	28.70	ATA/100	45.07	Yes
VT8233	ATA/33	29.63	ATA/100	45.07	Yes

5. Test configuration

The following systems were used for test.

(1) Red Hat Linux 7.2

Mother Board	VT5368F (VT8361+VT82C686B)
CPU	AMD Athlon 1 GHz
BIOS	Award Modular BIOS v6.00PG
Memory	128 MB PC-133
HDD	Seagate 40G 720 0rpm ATA/100

Mother Board	VT5311C (VT8363A+VT8231)
CPU	AMD Athlon 1 GHz
BIOS	Award Modular BIOS v6.00PG
Memory	128 MB PC-133
HDD	Seagate 40G 7200 rpm ATA/100

Mother Board	VT5432A (VT8633+VT8233)
CPU	C3 667 MHz
BIOS	Award Modular BIOS v6.00PG
Memory	128 MB PC-133
HDD	IBM 40G 7200 rpm ATA/100

(2) SuSE Linux 7.3

Mother Board	VT5291E1 (PL133+VT82C686B)
CPU	Intel PIII 866 MHz
BIOS	Award Modular BIOS v6.00PG
Memory	128 MB PC-133
HDD	Seagate 40G 7200rpm ATA/100

Mother Board	VT5366C (PM133+VT8231)
CPU	C3 750 MHz
BIOS	Award Modular BIOS v6.00PG
Memory	128 MB PC-133
HDD	Seagate 40G 7200rpm ATA/100

Mother Board	VT8057D (P4X333+VT8233)
CPU	P4 1.4 GHz
BIOS	Award Modular BIOS v6.00PG
Memory	256 MB DDR
HDD	Seagate 40G 7200rpm ATA/100

(3) Mandrake Linux 8.2

Mother Board	VT 5519F (VT8372+VT8233)
CPU	AMD Athlon 1 GHz
BIOS	Award Modular BIOS v6.00PG
Memory	128 MB PC133
HDD	Seagate 40G 7200rpm ATA/100

Mother Board	VT5368D (VT8361+VT82C686B)
CPU	AMD Duron 800 MHz
BIOS	Award Modular BIOS v6.00PG
Memory	128 MB PC-133
HDD	IBM 40G 7200 rpm ATA/100

Mother Board	VT5311C (VT8605+VT8231)
CPU	C3 750 MHz
BIOS	Award Modular BIOS v6.00PG
Memory	256 MB DDR
HDD	Seagate 40G 7200rpm ATA/100

Appendix A simple shell for measuring IDE data transfer speed

We provide the simple test shell “**ide-test**” for you to measure and verify the IDE transfer rate. First, create two directories named “temp1” and “temp2”. Next, prepare large files in directory “temp1”, with a combined size over than 500 MB recommended. Finally, run “./ide-test” and you might see a similar result as below from which you may compute the data transfer rate.

```

-----Start copy files time-----
Thu May  9 15:57:32 EDT 2002
-----End copy files time-----
Thu May  9 15:59:02 EDT 2002
-----Source data size-----
total 1059552
-rwxr-xr-x  1 root    root      117687778 May  7 09:40 test.1
-rwxr-xr-x  1 root    root      342773144 May  7 09:43 test.2
-rwxr-xr-x  1 root    root      623439045 May  7 09:44 test.3
-----Destination data size-----
total 1059552
-rwxr-xr-x  1 root    root      117687778 May  9 15:57 test.1
-rwxr-xr-x  1 root    root      342773144 May  9 15:58 test.2
-rwxr-xr-x  1 root    root      623439045 May  9 15:59 test.3

```

Note if you cannot run the “./ide-test” command, make sure to change its file attributes by the “chmod 755” command.