RAMDISK Benchmarks

Test system: Nehalem Core i7 950 and 4 GByte RAM
Software OS: WIN7 32-bit (max 4Gbyte RAM)
Setup: 2 GByte RAMDISKs from different software vendors
Hypothesis: RAMDISKs have different performance due to their implementations
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Used disk benchmark tools:

CrystalDiskMark   crystalmark.info
HDTach (trial)    www.simplisoftware.com
HDTune (trial)    www.hdtune.com
Atto              www.guru3d.com

Direct IO Disks   - can be mounted as virtual disk and can be used with drive letter
                  - are not seen by Windows Disk Manager or HDTune/HDTach
                  - faster than direct disk mode (SCSI)

Comments:        - Error may be as high as 20%;
                  - Older unsupported tools such as ATTO may have caching issues
                  - Direct IO is faster than direct disk mode
                  - Two test with two repeats, fastest result taken for table
                  - FAT and FAT32 and NTFS results mixed

See a collection of other HD benchmark tools at http://www.benchmarkhq.ru
### Ramdisk performance results for Windows 7

<table>
<thead>
<tr>
<th>Num</th>
<th>Name</th>
<th>Sequential [MB/s]</th>
<th>Random 512k [MB/s]</th>
<th>Random 4k [MB/s]</th>
<th>Average (ALL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Read</td>
<td>Write</td>
<td>Read</td>
<td>Write</td>
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<tr>
<td>1</td>
<td>QSOFT Ramdisk Enterprise</td>
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<td>6460</td>
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<td>4684</td>
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<td>4857</td>
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<td>4</td>
<td>Virtual Hard Drive 2 Pro</td>
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<td>4006</td>
<td>4365</td>
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<tr>
<td>5</td>
<td>StarPort iSCSI Initiator</td>
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<td>4500</td>
<td>3176</td>
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<td>3573</td>
<td>2902</td>
<td>3054</td>
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<td>17</td>
<td>Microsoft KDMF/DDK</td>
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</tr>
</tbody>
</table>

Testsystem: Core i7 @ 3.5GHz; DDR3 RAM; WIN7 32-bit; CrystalDiskmark 2.0; Error +/- 20%

- A fast Ramdisk or ramdrive can deliver more than 5 GByte/sec seq. throughput
- Good support and signed drivers are important; Backup option is important
- Easy installation and de-installation as well as convenient GUI are a large plus
- CPU penalty for Ramdisk use is one CPU core - due to RAMDISK and FS overhead
- Commercial and free versions can be used (performance is not ultimate measure)
Benchmark of HDs vs. RamDisks vs. SSDs

Single HD
Seagate 750 GByte HD
ST3750528AS

RAID10 (Intel Matrix RAID)
WD RE3 750 GByte HD
WD7502ABYS

Single RamDisk
QSOFT Ramdisk Enterprise

• How about consumer SSDs? They can reach several hundred MByte/sec but not more.
• IOPS for RAMDISKS: 30000-40000 @ 512 bytes and 4 kBytes
• How about external or PCI-X based SSDs like Fusion IO? The can reach 1000 Mbyte/sec.
• Cheapest DDR3 4Gbyte ~ 200 Dollars ; a 64 GByte RAMDISK would cost 3200 Dollar (4RAM)
• A fast SSD or disk RAID array (RAID10 or RAID6) should be used for the production system
• A small RAMDISK with few GBytes can be used when top performance is needed.
• Using a RAMDISK has a penalty of one CPU core in use due to filesystem and ramdisk overhead.
Utility: Easy to use, no installation issues; single program with Backup; WHQ certified no driver signature required
Price: RAMDISK plus 64-bit: 99 Dollar
Product name: SuperSpeed RamDisk Plus / RamDisk
Product version: 10.0.1.0
Max CPU utilization (8 logic CPUs): 25%
SuperSpeed RamDisk Plus with HDTACH READ (QuickBench 8 Mbyte Zones)

- FAT - 32 kByte
- FAT32 - 32 kByte
- NTFS - 4 kByte
- NTFS - 32 kByte
SuperSpeed RamDisk Plus
HDTune READ block size selection

512 byte in HDTUNE

32 kbyte in HDTUNE

8 Mbyte in HDTUNE
SuperSpeed RamDisk Plus
TEST with HDTune
block size 64k

Read test - FAT 32k

Write test

Read test - FAT32 - 4k

Read test - NTFS - 4k
SuperSpeed RamDisk Plus
HDTune IOPS

Read/write performance: RAMDISK 28,174 IOPS @ 4K || SSDs have around 10k-20k @ 4k
Read/write performance: 2 GByte RAM = 30 Dollars → 933 IOPS per dollar @ 4k
Product name: VSuite RamDisk
Product version: 4.1
Source: www.romexsoftware.com (trial and free version)
CN = SmartSource Shanghai Electronic Technology Co. Ltd

Utility: Easy to use, no installation issues; single program with Backup/Image file; Self signed certificate; Direct IO and SCSI disk
Price: RAMDISK plus 64-bit: 99 Dollar and free version available
VSuite Ramdisk Professional; Direct IO and SCSI Disk

FAT formatted (Direct IO)  
FAT32 formatted (Direct IO)  
NTFS formatted (Direct IO)

FAT formatted (SCSI)  
FAT32 formatted (SCSI)  
NTFS formatted (SCSI)
VSuite Ramdisk Professional; SCSI disk

NTFS

FAT

FAT32

FAT32

NTFS
Product name: **Virtual Hard Drive 2 Pro**  
Product version: 2.0  
Source: [http://www.farstone.com](http://www.farstone.com) (**trial version**)  
CN = **Farstone Technology Inc**

Utility: Easy to use, no installation issues; single program with Backup/Image file; Self signed certificate; Requires Reboot; Direct IO (no HDTUNE/HDTACH)

Price: 29 Dollars
Product name: Virtual Hard Drive 2 Pro
Direct IO (no HDTUNE/HDTACH)
Product name: **Gili Ramdisk**
Product version: 3.2
Source: [http://www.gilisoft.com](http://www.gilisoft.com) *(trial version)*

CN = Pepstyle International Limited

Utility: Easy to use, no installation issues; single program with Backup/Image file; No certificate; Direct IO (no HDTUNE/HDTACH)

Price: 25 Dollars
Product name: **Gili Ramdisk**

Direct IO (no HDTUNE/HDTACH)

**NTFS**

**FAT32**
Product name: **Cenatek Ramdisk (now Dataram)**
Product version: V3.5
Source: [http://memory.dataram.com](http://memory.dataram.com) (*free version*)
CN = Dataram; self signed

Utility: Easy to use, no installation issues; single program with Backup/Image file; Self signed certificate;

Price: Free version; For larger than 4GByte free registration req.; PopUp to 18004memory.com
**Product name:** Cenatek Ramdisk (now Dataram)

<table>
<thead>
<tr>
<th></th>
<th>ATTO NTFS</th>
<th>FAT</th>
<th>FAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seq</td>
<td>3215</td>
<td>3573</td>
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<tr>
<td>S12K</td>
<td>2902</td>
<td>3054</td>
<td></td>
</tr>
<tr>
<td>4K</td>
<td>224.8</td>
<td>196.6</td>
<td></td>
</tr>
<tr>
<td>Read [MB/s]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write [MB/s]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Read IOPS**

**Write IOPS**
Product name: AR RAM Disk
Product version:
Source: http://www.arsoft-online.com

Utility: Easy to use; does not mount under WIN7
Price: free
Product name: **Moio Systems Power RAMDisk**
Product version: 2009.3.8. Power RAMDisk v2.80 (trial)
Source: http://www.moiosystems.com/

Utility: Not signed, version 2.8 does not mount under WIN7; new version available (not tested)

Price: 10 Dollars
Product name: StarWind iSCSI
Product version: StarWind 4.0 (trial)
Source: www.starwindsoftware.com
CN- Rocket Division Software LTD

Utility: Use for net (TCPIP) access
Price: free or 395 Dollars (basic)
Problem: v4.0 does not mount under WIN7; new v5 available (not tested)
Product name: StarPort iSCSI Initiator
Product version: StarPort 3.6.3 (trial)
Source: www.starwindsoftware.com

Utility: Use for net (TCP/IP) access, Maximum 1024 Mbyte; NTFS, FAT and FAT32
Price: Free for personal use
Product name: **StarPort iSCSI Initiator**
Product name: **Cenatek RAMDISK XP**
Product version:  Any
Source: www.cenatek.com

Utility:  Only runs under WINXP see Dataram (former Cenatek) version for WIN7
Price:  Free for personal use (from Dataram, former Cenatek)
Product name: **QSOFT Ramdisk Enterprise**
Product version: 5.3.1.11 (trial)
Source: [http://members.fortunecity.com/ramdisk](http://members.fortunecity.com/ramdisk)
CN= Christiaan Ghijselinck

**Utility:** Not easy to install; in WIN7 use `hdwwiz`; however no installation issues
Self signed certificate; Direct IO (no HDTUNE/HDTACH)

**Price:** 25 Dollars (enterprise)
Product name: QSOFT Ramdisk Enterprise
Product name: **ImDisk Virtual Disk Driver**
Product version: 1.1.4
Source: http://www.ltr-data.se/opencode.html

Utility:  
Very hard to install and to remove; in WIN7 follow HOWTO (next page)
Direct IO (no HDTUNE/HDTACH)

Price:  
Free/open source
Product name: **ImDisk Virtual Disk Driver**

1) **Explorer** → Run as administrator

2) **System** → Start Imdisk Service

3) **Control Panel**

4) Install certificate

5) Open cmd as Administrator(!)

6) Enter at command line (thanks to dossi@bootland):

```
imdisk.exe -a -t vm -m R: -o rw,fix,hd -s 1440M -p "/fs:ntfs /q /c /v:RAMDISK /y"
```
Product name: **ImDisk Virtual Disk Driver**

Comment: To remove ImDisk type (use admin command): `imdisk -d -u 0`
Product name: ERAM for Windows
Product version: 2.20
Source: http://hp.vector.co.jp/authors/VA000363/index.htm
CN= Not available

Utility: No mount under WIN7; requires reboot;
Price: Free/open source
Product version: 2.0 (trial)
Source: http://www.everstrike.com/ramdisk
CN= Not available

Utility: Easy to install, current version not written for WIN7 (no drive actually mounted)
Price: 69 Dollar (business)
Utility: Easy to install and to use; no certificate; run as Administrator for install
Price: free
Product name: **RamPhantom 7**
Product version: v7 free
Source: [http://www.iodata.jp/](http://www.iodata.jp/)
CN: IO Data

Utility: Install ok under WIN7; requires reboot; Free version 256 MB max
Price: 27 Dollar (Enterprise)
Product name: **Microsoft DDK KMDF Ramdisk**

Product version: WIN 2000

Source:  
- [http://support.microsoft.com/kb/257405](http://support.microsoft.com/kb/257405)

Utility:  
- Ramdisk.sys sample driver for Windows 2000; No mount under WIN7; in WIN7 use **hdwwiz** (Hardware Wizard)

Price:  
- Free/open source
RAID of RAMDisks
(not recommended on production systems)

<table>
<thead>
<tr>
<th>Disk Type</th>
<th>Read [MB/s]</th>
<th>Write [MB/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mirrored Disks</td>
<td>Seq 3504</td>
<td>Seq 2674</td>
</tr>
<tr>
<td></td>
<td>512K 4193</td>
<td>512K 3019</td>
</tr>
<tr>
<td></td>
<td>4K 180.1</td>
<td>4K 186.1</td>
</tr>
<tr>
<td>Striped Disks</td>
<td>Seq 3367</td>
<td>Seq 2899</td>
</tr>
<tr>
<td></td>
<td>512K 3756</td>
<td>512K 3308</td>
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<tr>
<td></td>
<td>4K 151.8</td>
<td>4K 174.3</td>
</tr>
<tr>
<td>Spanned Disks</td>
<td>Seq 3469</td>
<td>Seq 2731</td>
</tr>
<tr>
<td></td>
<td>512K 4040</td>
<td>512K 3039</td>
</tr>
<tr>
<td></td>
<td>4K 174.3</td>
<td>4K 176.1</td>
</tr>
</tbody>
</table>

Windows Disk management allows striped, spanned, mirrored and RAID5 software disks
Example with SuperSpeed driver (volumes visible in WIN7 Disk Manager)
Software RAID system is slower than single drive alone