Holographic Versatile Discs: The Future of Storage?

By Josephine Ann A. Aparte

New DVD formats was one of the topics featured on a recent episode of the CNN program “Next.” The short segment tackled Blu-ray DVDs (BDs), High-Definition DVDs (HD-DVDs), and how different manufacturers are supporting one format over another (e.g., Sony for Blu-ray and Toshiba for HD-DVD) leading to a format war. Other industry players (hardware makers, content providers, disc-pressing firms, etc.) are aligned behind one format or the other making standardization even more problematic.

But even before a clear winner could emerge, another contender is poised to enter the fray. That contender is the Holographic Versatile Disc or HVD.

So who (or what) is this new kid on the block named HVD? And should Blu-ray and HD-DVD be consigned to the dustbin of storage history even before they’ve had a chance to take off?

Super-size Me

Regular DVDs hold about 4.7 gigabytes (GB) of data for the single-layer version and about 8.5GB for the double-layer version.

On the other hand, BDs can store 25/50GB of data (single-/dual-layer) while HD-DVDs can store 15/30GB (single-/dual-layer). But apparently, even that is not enough for some people. Big, bigger, biggest seems to be the mantra of the data-storage industry.

The initial version of HVD to be released by Japan’s Optware in 2006 will have a 200-GB capacity. Later versions are projected to be able to store up to 1 terabyte (TB) of data or even more on one disc. For those of us less familiar with these units of measurement, 1TB is equivalent to 1,000GB or 200 standard DVDs.

Of Lasers and Layers

HVDs store information on light-sensitive crystal material using interference of light.

Optware developed a technique known as Collinear Holographic Data Storage System. Collinear holography uses two laser beams to read and encode data onto a disc. A red laser acts as the “reference” beam while a blue or green laser serves as the “read” or “information” beam. Both are projected along the same axis and strike the recording medium at the same angle. That is where the collinear part of the technique’s name came from.

The blue/green laser reads data encoded as laser interference fringes from the holographic layer near the top, which serves as the recording layer. The red laser passes through the holographic layer to read the servo data from the CD-style aluminum layer underneath. The servo data is used to monitor the position of the “read” head over the disc and enables accurate disc tracking. A dichroic holographic versatile disc promises a whooping 200-gigabyte storage capacity.

Vocabulary Booster

- **Collinear** – lying on or passing through the same straight line
- **Holography** – a method of recording patterns of light to produce a 3D object
- **Servo or Servomechanism** – an automatic device for controlling large amounts of power using very small amounts of power and automatically correcting the performance of the mechanism
mirror layer located in-between the holographic layer and the servo layer reflects the blue/green laser while allowing the red laser to pass through to gather servo information. This mirror stops the scattering of light within the disc, which would otherwise cause noise and reduce signal quality.

**Writing and Reading Holographic Data**

The process of writing data on an HVD involves having the information beam (the blue/green laser) pass through an image, after which the beam will carry that image in its waveforms. The intersection of the information and reference beams will create a pattern of light interference. If this pattern of light interference is recorded on the photopolymer layer of a disc, what is actually recorded is the light pattern of the image.

To read or retrieve the information stored in a hologram, the reference beam is shone directly onto the hologram. When the beam reflects off it, it will hold the light pattern of the image recorded there. This “reconstruction beam” is sent to a CMOS sensor to recreate the original image.

**How HVD Stacks Up**

HVD is touted to be a high-capacity, high-speed data-storage technology that will outclass all the so-called “next-generation” DVD technologies such as Blu-ray and HD-DVD.

HVD’s 1-TB capacity is 200 times more than what a single-layer regular DVD can hold and at least 20 times more than a double-layer Blu-ray. To put this massive storage capacity in clearer context, the entire content of one of the largest libraries in the world, the U.S. Library of Congress, which is estimated at 20TB of text, can be stored on approximately six HVDs. What’s more, the HVD has a transfer rate of more than 1Gbps (gigabytes per second), which is 40 times the speed of a regular DVD.

Greater storage capacity and speed of data access—these are the two major factors that HVD has going for it. And speed and capacity are what count in the high-definition TV and video market that these three DVD formats are targeting.

**Sources**


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**Table 1. Comparison points for new DVD formats**

<table>
<thead>
<tr>
<th>Comparison Points</th>
<th>Blu-ray</th>
<th>HD-DVD</th>
<th>HVD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial cost for</td>
<td>Approx.</td>
<td>Approx.</td>
<td>Approx.</td>
</tr>
<tr>
<td>recordable disc</td>
<td>$18</td>
<td>$10</td>
<td>$100</td>
</tr>
<tr>
<td>Initial cost for</td>
<td>Approx.</td>
<td>Approx.</td>
<td>Approx.</td>
</tr>
<tr>
<td>recorder/player</td>
<td>$2,000</td>
<td>$2,000</td>
<td>$3,000</td>
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<tr>
<td>Initial storage capacity</td>
<td>54 GB</td>
<td>30 GB</td>
<td>200 GB</td>
</tr>
<tr>
<td>Read/write speed</td>
<td>36.5 Mbps</td>
<td>36.5 Mbps</td>
<td>1 Gbps</td>
</tr>
</tbody>
</table>

Search Me!

Find and encircle the following words mentioned in the article. The words read forward, backward, up, down, or diagonally.

Beam
Holographic
Polymer

Collinear
Image
Servo

Dichroic
Interference
Storage

Gigabytes
Laser
Terabytes

Grid:

S C I H P A R G O L O H A D
E I D R A E N I L L O C H K
T Y I Q H I X Y R V L T R Q
Y Z C J Z N W S B B O S U Q
B P H J G T E E J U W I Z E
A O R L S E G T R Q X D T U
R L O P T R U Y E E G A M I
E Y I Z O F F B S A L W F K
T M C V R E Z A A L S B P S
N E G Z A R E G L P E E F D
J R Y R G E M I S E R V O D
P T T X E N A G I M R G N N
X H T J X C E I K F O L O N
U T F U K E B C S X J Q S G
Answer to activities

Safe Wireless Computing

1. False. Avoid accessing sensitive financial and personal information when using a public hotspot. Public wireless networks are designed to be accessed by anyone within the hotspot’s broadcast range and by accessing confidential information you’re making yourself a target for hackers.

2. Update your antivirus protection and security patch. Back up your data and, if possible, temporarily move the really sensitive files off the machine. Make sure your friend understands the dos and don’ts of using public hotspots before you lend him your machine.

3. Change SSID, enable WEP, set MAC address, and turn off DHCP. These steps will make it harder for anyone to break into your machine. Not doing them is like leaving your front door open to intruders.

4. False. Keeping your wireless access point always on is a good way to open yourself to a virus or wireless attack.

5. A good idea when using Wi-Fi. Installing an extra level of protection will boost your online security and protect your data and your machine.

Search Me

Answers:

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S C I H P A R G O L O H A D
E I F R A E N I L L O O H K
T Y I Q H I X Y R V L T R Q
Y Z C J Z N W S B B O S U Q
B P H J G T E E J U W I Z E
A O R L S E G T R Q X D T U
R L O P T R U Y E E G A M I
E Y I Z O F F B S A L W F K
T M C V R E Z A A L S B P S
N E G Z A R E G U P E E F D
J Y R G E M I S E R V O D
P T T X E N A G I M R G N N
X H T J X C E I K F O L O N
U T F U K E B C S X J Q S G
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