

DVD : The Storage Media

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Abstract

Digital Video Disc or Digital Versatile Disc (DVD) is a new optical storage technology having a large capacity CD with advanced multimedia support with atleast seven times the storage capacity of CD-ROM and can be manufactured for about the same price. DVD technology consists of five different formats : DVD-Video, DVD-Audio, DVD-ROM, DVD-R and DVD-RAM. The authors mention about the storage capacity of different formats, their usefulness and compact, standardisation aspects and few limitations. The next generation of consumer and computer electronic products will be built using DVD technology, replacing the VHS player, CD-ROM, CD-A, and CD-R devices.

Introduction

DVD stands for Digital Video Disc or Digital Versatile Disc and it is the next generation of Optical Disc storage technology. Optical Disk technology has made a great impact on the Information Technology with its outstanding feature of massive storage capacity, low storage cost, and faster access time. DVD is a very large capacity CD with advanced multimedia support with atleast seven times the storage capacity of CD-ROM and a near perfect format for movies, video, and large database storage technology that will change how people buy movies, music and software. DVD is making its transition from consumer electronics to computing industry and opening up tremendous opportunities for title developers, multimedia vendors and content providers to deliver an exciting new entertainment medium for PCs.

DVD Features

DVD is basically a CD technology. DVD packs seven times data onto the same surface areas as that of the CD-ROM. Packing tricks such as two-side disk boost the capacity further, upto 25 times that of a CD-ROM. DVD-RAMs are expected to hit the market in the near future, which will enable to record and erase data on special read / write DVD-RAM discs. In its single side form, a DVD can hold 4.7 GB, a two-layer

version boots capacity to 8.5 GB, doubling to 17 GB for a double-sided version. This enormous capacity is enough to hold two hours of compressed video, assuming 720 x 480 resolution, delivering 30 frames per second. This is higher resolution than that of broadcast, cable, satellite, videodisc, or VHS. Three tracks of CD quality audio, with 5.1 channels per track, one DVD can hold a movie with voice and soundtrack in three languages.

DVD will deliver movies on CD sized discs that won't wear out, have lower material costs than videocassette, deliver better video and audio than any other home viewable medium, and contain format, soundtrack, and language choices. One can quickly skip to any point in the movie, there is no quality loss during freeze-frames or slow advances, never need to rewind.

DVD drives and players have the usual VCR controls, plus additional features for scanning, searching, freezing, playing in slow motion and move forward, or backward and frame at a time with each frame distinct from others. Menus let one jump to any part of a video, and one can change the dimensions of the image to fit into a monitor and the controls lock out specific sequences from the kids.

DVD Technology

DVD consists of five different formats

- DVD-Video
- DVD-Audio
- DVD-ROM
- DVD-R
- DVD-RAM

It is important to understand the difference between DVD-Video and DVD-ROM. DVD-Video (often simply called DVD) holds video programs and is played in a DVD player hooked up to a TV. DVD-ROM holds computer data and is read by a DVD-ROM drive hooked up to a computer. The difference is similar to that between Audio CD and CD-ROM. DVD-ROM also includes future variations that are recordable one time (DVD-R) or many times (DVD-RAM). It is very clear that the DVD-ROM is going to be much more successful than DVD-Video. Most new computers with DVD-ROM drives will also be able to play DVD-Videos.

DVD stores data in pits in a single spiraling track on a reflective metal surface embedded in plastic. A laser in the drive reads these pits as ones or zeros. The challenge in developing DVD was to increase data

capacity by packing as many pits as possible onto a disc, using an inexpensive technology. The laser in an ordinary CD-ROM drive has a 780 nanometer (nm) wavelength, DVD drives use lasers with 650 nm or 638 nm wavelengths supporting more than double the pits per track and move double the tracks per recording surface.

Other advances include a new sector format better error-correction code, and improved channel modulation. Altogether, these improvements raise the data density to additional one and a half times. Tighter manufacturing tolerances, and a slightly bigger record in surface, enable a DVD to store data ranging from a minimum 4.7 GB capacity to maximum 17 GB. DVD drive is built around a laser that produces shorter-wavelength and lets the laser produce smaller spots. This, combined with tighter track spacing, yields that DVD's higher single sided density. By using both sides of the disc and bounding a semitransparent second layer over the primary layer, DVD capacity can be boosted to a maximum storage capacity of 17 GB.

To take advantage of DVD content, one needs more than just the drive. Typically, a DVD bundle includes a PCI video card with specialized hardware needed to decompress the MPEG-2 video signal coming from the disc. The decoder video goes directly to the computer's monitor, bypassing CPU and regular video card though DVD-ROM's will not be readable by TV based players. DVD's MPEG 2 video offers a vast improvement over VHS, and Dolby AC3 (recently renamed Dolby digital) audio provide a superb surroundsound listening experience with six audio channel. The liner DVD-Video format also provides for multiple language and subtitle tracks, parental control, pseudo interactive branching and other features.

Standard DVD-R and DVD-RAM disk hold 3.9 GB and 2.58 GB of data, respectively, instead of the 4.7 GB offered by read only DVDs. The capacity is likely to be doubled with the two sided disks appearing shortly. It is to be expected that by the year 2001 blue-laser technology will spawn DVDs that hold 14 GB on a single layer.

DVD drives currently available in the market spin slightly slower than an old fashioned 3x CD-ROM drive. But since data is packed much more tightly on a DVD, the throughput matches that of a 9x CD-ROM drive, about 1.3MB / sec. DVD-R and DVD-RAM drives, which will enable to store data on special recordable DVDs are now available. DVD-RAM drives, allow to rewrite DVD-RAM discs many times and should be out in the market by the middle of this year.

DVD Impact

DVD will have its greatest impact to start with in the entertainment and consumer electronic industries. The effect will of course be determined by how extensively and quickly it is adopted. DVD will be available in two forms : DVD movie players dedicated to movie watching and DVD-ROM PCs with DVD-ROM drives and supporting hardware.

Mass data delivery and storage some years ago, no one thought a 10MB hard drive could be filled. A few years ago it seemed unlikely that a regular CD would someday be too small. Everyday there are more ideas for using mass storage in a small, portable medium content that currently fills several CDs, such as geographic information systems, nationwide telephone directories on one DVD, a data backup medium, writeable DVD provides far shorter seek and retrieval times than magnetic tape. DVD will make video content far easier to deliver in computer titles, making possible innovation such as : MPEG2 and AC3 decompression built onto motherboards, video and sound adapters, and CPUs.

Standardisation

There is lack of compatibility and standardization among the manufacturers. The rush to market and the shifting nature of DVD technology are making manufacturers edgy and casting consumers as potential victims. Early DVD drives, for example, are unable to read CD-R discs. More recent drives overcome this limitation and claim to read CD-RW discs as well.

Limitations of DVD as on today resolve around copy protection, lack of titles and software developers, availability of operating system support. DVD-Audio format's technical specifications are not yet determined and it may take more time.

Like CD-ROM, DVD technology is evolving towards a rewritable version, but at a greatly accelerated pace. Currently, the DVD forum is attempting to negotiate a standard, but the battle is furious. Nothing less than control of the industry and sizable future royalties are at stake. DVD Recordable (DVD-R) is a write once technology with more than passing similarity to CD-R. DVD-R's use of a wavelength sensitive dye means it will probably suffer incompatibility problems with future short wavelength DVD drives.

Conclusion

A DVD consortium was championing, with some success, a 2.6 GB capacity rewriteable format dubbed DVD-RAM and based on phase

change technology. But recently, Sony and Philips Electronics have broken away and joined by Hewlett-Packard, Mitsubishi Chemical, Ricoh, and Yamaha, are pursuing an independent DVD rewriteable format. This new format, referred to unofficially as DVD+RW, will store 3 GB on a single side. This split, combined with the copyright concerns of content publishers and high hardware costs, is likely to delay rewriteable DVD for a few more years. Buying into DVD technology one should proceed carefully, this will be an expensive battle to stay at the edge of current technology.

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