

Mt Rainier

Mt Rainier An Explanation

INTRODUCTION

Market Success of CD-RW

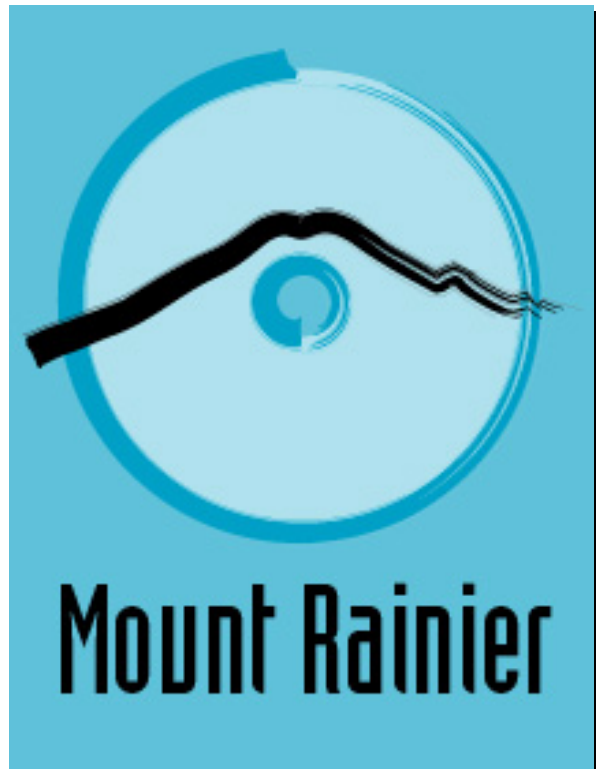
The market for CD-ReWritable drives has been growing at an unmatched speed for the past quarters.

In 1999 16 million drives were sold and the volumes are expected to surpass 30 million units in 2000. PC-OEM's are rapidly adopting CD-RW as a standard option on their PC's. On the media side, 3 billion CD-R/RW discs are expected to be sold this year, compared to 1.8 billion floppy discs (Source: Japan Recording-Media Industries Association).

In short, CD-RW has become a mainstream product in PC's. The challenge to the industry is now to secure that the product continues to be useful and enjoyable for the users, and that it is easy to support by the supplying companies.

Abstract

Compaq, Microsoft, Philips, and Sony (The Mt. Rainier Group) propose an open industry standard for making CD-RW easier to use by enabling OS support and increasing compatibility and performance.



Key Success Factors

The main factors that have been driving this success are:

- **Compatibility**
within the data world and with the world of consumer electronics. The devices that can read a CD include data drives (e.g. CD-ROM, DVD-ROM, CD-R/RW) and audio/video players (e.g. CD-Audio and DVD-Video). The installed base of these taken together is approaching 1 billion devices.
- **Ease of use.**
This is the primary request of the users. It has come a long way, but must still improve.
- **Performance**
keeps improving as new drives and new media continue to be launched.



- **Application support.**
CD-RW drives support a large scope of applications, ranging from audio and video creation to back-up, archiving, and general data storage.
- **Durability of media.**
Optical media is more durable than magnetic media, which makes it a safer choice for archiving and backup.
- **Low cost of media.**
The cost of CD-RW has dropped fast in the last years and is now below 3 USD per disc, or less than half a cent per MB of data.
- **High capacity.**
The capacity of a CD-RW is still sufficient for most applications, but for others the upgrade path towards DVD is secured.

lagging performance, and the need for special software to support the drive letter access functionality. However, CD-RW technology has the potential to overcome these issues and thus become the only removable storage drive most users need for their PC's. That single drive would be able to replace the CD-ROM drive, the floppy, and any other high capacity drive the end-user will need. This would reduce the overall system cost of the PC and make it easier to use.

In the following we will first look at the requirements towards this application from the end-user point of view and see what gaps must still be closed to fulfil these.

DRAG&DROP DATA ON CD-RW

Main Applications

The most widely used applications, so far, are audio creation, back-up, archiving, and general data for temporary storage and interchange.

Audio creation builds on the compatibility of recorded CD's with the hundreds of millions of audio players in homes, cars, and elsewhere. The main advantage is that compatibility is secured and that the application is easy to use.

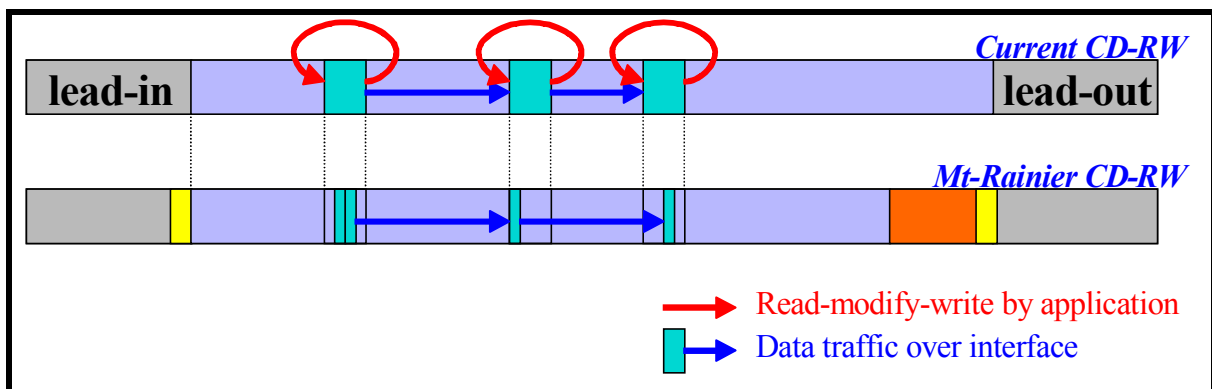
Back-up and archiving require high performance, more than compatibility. Compatibility is, however, also important, to enable other users to read the archived material, and to enable the same user to read it on later generations of equipment.

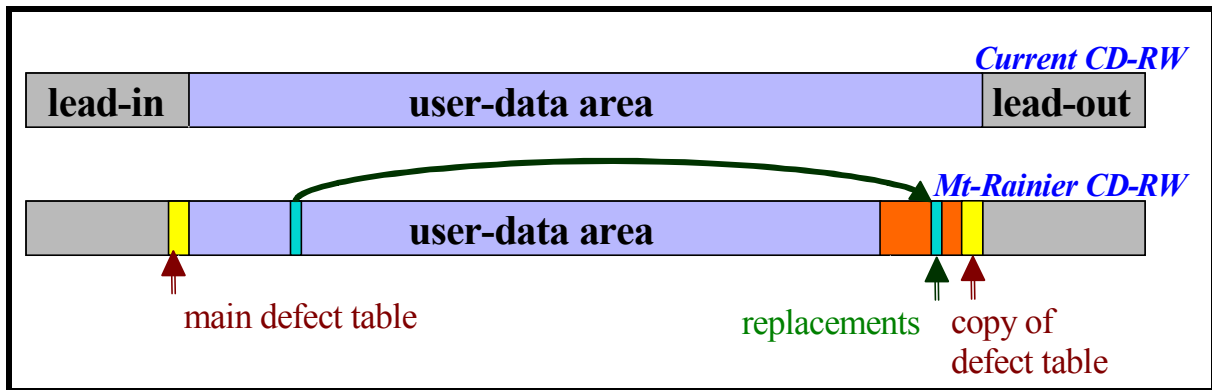
General data storage, or "Drag&Drop Data on CD-RW", is the focus of this paper. The success in serving that application has in the past been hampered by limited file system compatibility,

Requirements

The overall requirement for "Drag&Drop Data on CD-RW" is that it just works like any other storage. The user should have drive letter access support in the operating system, without any need for additional application software. This means being able to drag&drop files to and from a drive within Explorer, save files directly to the drive from any application (word processing, presentations, video creation), or download files directly from the Internet.

Media formatting should be completely transparent, not causing any delays for the user. The media should be read and write compatible with other CD-RW drives, and readable in ROM drives.





Current Shortcomings

Writing data (drag&drop) on CD's is currently not supported by any operating system. The functionality is so far handled by special applications, that need to be installed on the PC running the drive. The discs, that are written this way, are not automatically readable by other CD-RW drives or CD-ROM drives, but require a proprietary read driver. New CD-RW discs need to be formatted before data files can be written to them. This still takes too long and is difficult for the end-user, keeping in mind the format choices required.

THE FIX: THE MOUNT RAINIER SOLUTION

The objective of the Mount Rainier solution is to overcome the mentioned shortcomings, by enabling native OS support of the drives and allowing CD-RW to be used as a drag&drop device of choice.

Below a high-level description is given of the key technical elements of Mount Rainier.

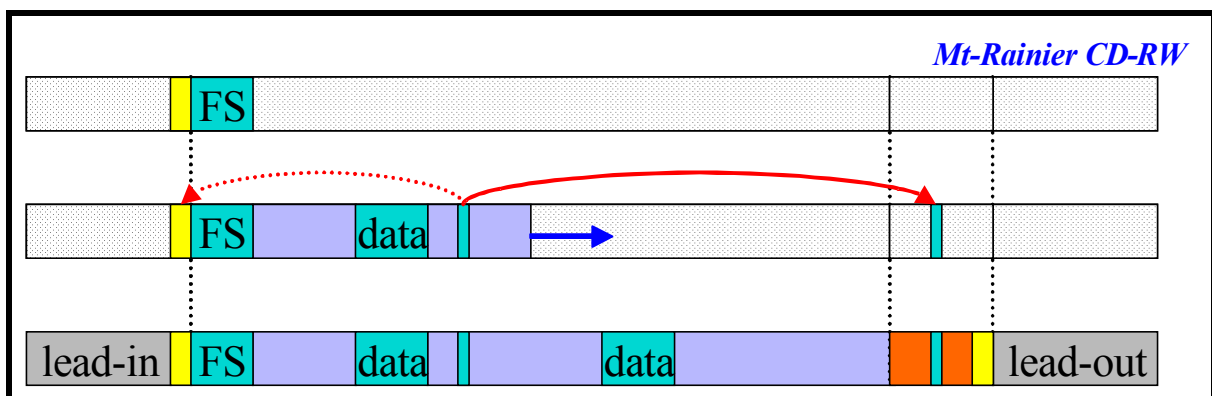
The 5 key elements this paper will focus on are:

- 1 Physical defect management by the drive
- 2 Logical write-addressing at 2k
- 3 Background formatting
- 4 Command set implementation
- 5 Compatibility and standards-compliance

DEFECT MANAGEMENT IN THE DRIVE

In the last few years, applications have been developed allowing drag & drop on CD-R and CDR-W media. The leading solution for this use is currently based on UDF1.5, in which defect management handling in the UDF file-system is specified.

However, a solution allowing more commonality with standard data-drives (MO, DVD...) and file-systems is strongly preferred. This requires adding physical defect-management into the drive. As a result, the responsibility for handling physical defects is where the defects can be handled optimally: inside the drive. Otherwise, file-systems (or/and applications) need to have knowledge of drive/media defect characterization & capabilities, which is more complex.



Furthermore, although CD-ROM drives have no knowledge how to handle defect-sparing, care has been taken by the Mount Rainier group, that CD-ROM's will be able to read Mount-Rainier compliant disks though a generic read-driver, allowing read-back in legacy systems.

2 K Addressing

The logical addressing capability is another important factor. Where currently for CD-RW a block-size of 64 kB is required, most data systems are based on 2k or 4k addressing capabilities. The Mount-Rainier functionality has defined 2k logical addressing as a mandatory support requirement for drives. This will allow file-system and caching capabilities of the host to be transparent for the media related block-size.

Background Formatting

"Time to use" is one of the key improvement areas of Mount Rainier, adding high value to the end-user. With current CD-RW, the user must wait for the formatting process to complete before writing data to a new disc.

The Mount Rainier specification will allow a user to drag and drop data within seconds after insertion & spin-up of the disk. Invisible to the host, a background formatting sequence will be performed by the drive. The use-experience is optimized by ensuring that drag & drop data-storage tasks will get priority above progress of "de-icing" and "finalization" in the background by the drive. Furthermore, measures have been taken to allow fast eject, keeping full compatibility with CD-ROM readers.

Command Set

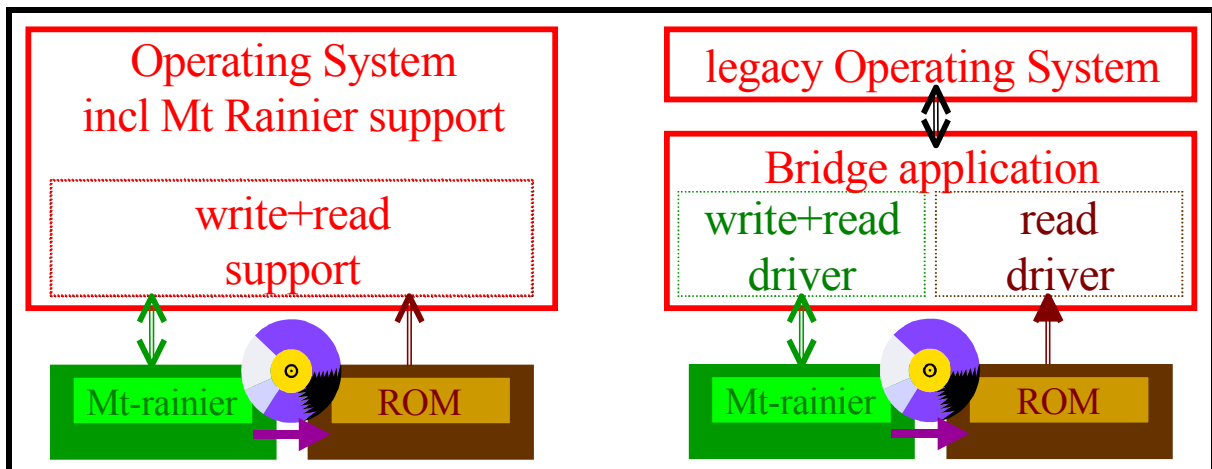
Although some MMC-1 and MMC-2 adherence is present within current CD-RW drive solutions, there is currently a strong need for supporting vendor-unique feature implementations (commands and mode-pages) by ISV's. For the Mount-Rainier compliant drive, implementing a mandatory command-set for data-use will be required (fitting MMC-2 structure).

Compatibility and Standardization

The Mount Rainier group is focusing strongly to assure compatibility of the solution with future and existing hardware-platforms. Below is demonstrated how the CD-ROM read compatibility will be assured for systems with native-OS support and for legacy systems. For the latter case, a generic read-driver will be made available.

Another key focus of the Mount Rainier group is driving standardization, and reducing the need for vendor-related legacy support. This will be handled through 3 paths

- 1 Driving drive/media level standardization by a specification from the Mount Rainier group.
- 2 Defining interface level standardization through MMC.
- 3 Proposing to the drive- and PC-industry the function-implementation (PC-200X requirements) and checking the drive-level support through WHQL.



BENEFITS

Once the Mount Rainier solution is fully functional in the market, the end-user can have a single drive in his PC, running all the applications he may now need three or four devices for. This will be easy to use, since the functionality will be fully transparent and the discs will be compatible with other reading devices.

To the industry, this opens an opportunity for having added functionality with fewer devices. This will reduce the overall system cost and decrease the need for legacy support. Taken together, this initiative has the potential to grow the market by fulfilling customer needs.

THE MOUNT RAINIER GROUP

Compaq Computer Corporation, Microsoft Corporation, Royal Philips Electronics, and Sony Corporation have formed the Mount Rainier group to define and implement the proposals presented in this paper. Additionally, a group of companies has endorsed the initiative as early adopters.

CALL TO ACTION

CD-RW drive makers are encouraged to incorporate the Mount Rainier functionality in their drives by first half of 2001. By that time, the PC-OEM's should request that functionality from their drive suppliers. ISV's are encouraged to leverage the benefits to the end-user, by adapting their applications to the basic functionality supported by the Mount Rainier implementation.

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Acronyms

Main abbreviations used:

cmd: Command

FS: File System

ISV: Independent Software Vendor

MMC: Multi Media Command set

OS: Operating System

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