OPTICAL MEDIA WHITEPAPER

Lowering the cost of UNIX and Linux hardware with *Backup**EDGE***™

*Backup**EDGE*** was designed to optimize the capabilities of optical media for backups.

Using Optical Media With *Microlite BackupEDGE*

Optical media combines high reliability with low initial investment and media costs to provide excellent backup and disaster recovery capabilities for Linux and UNIX systems.

Microlite Corporation began supporting CD and DVD-RAM media in September of 2001. Since then the product has been kept up-to-date with support for new media types and higher performance devices as they have become available.

Background

There are eleven primary optical media types in worldwide use today. The write-once formats include BD-R, DVD-R, DVD-R DL[1], DVD+R, DVD+R DL, and of course CD-R. The re-writable formats are BD-RE, DVD-RAM, DVD-RW, DVD+RW and CD-RW.

Each has a potential use in an effective data archiving and disaster recovery strategy. This document discusses the general media types as well as where and when they are most useful.

The first DVD writers were single use, slow devices with a low 2.6 gigabyte (GB) capacity. Through a progression of generations, today's devices run faster, store more information, and are typically capable of writing on multiple types of Blu-ray Disc™, DVD and CD media.

CD/DVD/Blu-ray write speeds are typically referenced with an "x" value. Data CDs are described in multiples of 150 kilobytes per second (KB/sec) or around 8.8 megabytes per minute (MB/min). DVDs are described in multiples of 1,385KB/sec or around 81MB/min. Blu-ray Discs are described in multiples of 4,608KB/sec or around 270MB/min. Current write speeds range up to 52x (457MB/min) for CD, 24x (over 1,944MB/min) for DVD, and 12x (over 3,240MB/min) for Blu-ray Disc.

It is important to note that optical drives do not deliver their fastest speeds all the time. They typically start at around half their rated speed on their inner tracks, increasing speed as the tracks get larger, and delivering full speed writing only on their outer tracks. DVDs tend to deliver their full rated speed as long as you are sending them information fast enough.

Current generation DVD devices deliver speeds that are more than adequate for common backup tasks. In addition, the *Backup**EDGE 3.x*** state-of-the-art software compression algorithm maximizes the usefulness of these devices.

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1. As of this writing, DVD-R DL is not supported.

BD-R
BD-RE

The Blu-ray Disc^{tm} write-once (BD-R) and read/write (BD-RE) formats are gaining market acceptance. Prices for both drives and media are getting lower. BD-RE is currently supported by *Backup**EDGE***, including support for multiple archives per medium. These formats are capable of 25GB to 50GB per medium, depending on the type of media purchased.

DVD-RAM

DVD-RAM was designed as a data storage medium first and a video storage medium second.

DVD-RAM is unique in that it is the only DVD format originally designed for data storage. Media is typically encased in a protective cartridge, providing maximum protection for the write surfaces. This also allows for double-sided media, since there is little chance of damage during handling. All drives that handle cartridge-based media can also handle non-cartridge CD and DVD media. Newer devices can write at up to 12x. DVD-RAM is currently supported by *Backup**EDGE***, including support for multiple archives per medium.

DVD-RAM media has a design life of **100,000 re-writes**.

DVD-RAM has an on-media error correction strategy and can be re-written over 100,000 times, which is why it tops our list as favorite optical storage medium. As true random access media, there is no media preparation, initializing, blanking or finishing required. This provides speed advantages that cannot be expressed in write speed alone. The DVD-RAM format is maintained by the DVD Forum, an international association of hardware manufacturers and software vendors.

DVD+RW

DVD+RW has a "background format" capability. New media must go through a short formatting process of about 40 seconds. After that, no formatting or erasing needs to be done. Standards are maintained by the DVD+RW Alliance. Media may be re-used approximately 1,000 times. There is random access capability during both read and write. DVD+RW is currently supported by *Backup**EDGE***.

DVD-RW

DVD-RW is a non-cartridge, re-writable format supported by the same industry standards group that maintains the DVD-RAM standard. New media may be written on immediately, but a minimum amount of data must be written (around 1GB). If less than this amount is written, the drive writes blank data until this amount has been filled. This can take up to 14 minutes on some devices. Media may be re-used approximately 1,000 times. There is no random access during write, only during read. DVD-RW is currently supported by *Backup**EDGE***, allowing single archives per medium.

DVD-R

This format is again supported by the same industry group as DVD-RAM and DVD-RW, but may only be written to once. It is subject to the same minimum data requirements as DVD-RW. DVD-R is currently supported by *Backup**EDGE***, allowing single archives per medium.

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DVD+R

DVD+R can be written to immediately. It has the longest finalize, or fixate, time of any of the DVD types. It is also managed by the DVD+RW Alliance. This format was not available on first generation DVD+RW drives. It appeared in second generation drives, and like DVD-R, is write-once. DVD+R is currently supported by *Backup**EDGE***, allowing single archives per medium.

DVD+R DL (Dual Layer)

DVD+R Dual Layer Media is the latest DVD type. It holds approximately 8.5 gigabytes (uncompressed) of data. DVD+R DL is currently supported by *Backup**EDGE***, allowing single archives per medium.

CD-RW

CD-ReWritable has traditionally been the slowest optical data format. Recent media and device advances have moved it to mainstream status. Although media is generally considered to have re-write properties similar to DVD-RW and DVD+RW, read speed tends to deteriorate after 10 or 20 re-writes. CD-RW media must be "blanked" (erased) before re-use.

CD-R

New devices using this write-once format are very fast when used with the right media. As with CD-RW, common capacities are 190MB for mini-discs and 650MB and 700MB for full size discs.

Common Characteristics

Optical devices have certain common traits with regard to computer and *Backup**EDGE*** use...

- They are seeking devices, allowing **instant** access to files being restored.
- They are all able to read standard CD-ROMs.

Operating System Support

*Backup**EDGE*** does not need a special "device driver" to make use of CD or DVD devices. They are all detected by the operating system as a standard CD-ROM drive. *Backup**EDGE*** handles all of its own reading and writing. No "native" operating system write support is needed.

Some newer Linux releases add detection of DVD-RAM devices. In these instances, *Backup**EDGE*** also works fine through the DVD-RAM driver, although in most cases this can be significantly slower than using the *Backup**EDGE*** writer.

*Backup**EDGE*** can make full nightly system backups with our *Recover**EDGE*** bare metal disaster recovery component included, making each nightly CD or DVD backup a self-contained disaster recovery solution. They will boot like CD-ROMs into *Recover**EDGE*** (much faster than booting from floppies), then restore the backups as if they were coming from tape.

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Media-Specific Considerations

Although classified as "4.7GB", in fact each of the five single layer DVD types stores a different amount of data. CDs from two different manufacturers, even if they say they are both "650MB", may have different real capacities. Of course, 8cm media has a far lower capacity than full-sized media. Additionally, each media type needs to be prepared and written to differently.

As media is used, we query it and determine its type and capacity, and set our volume size and write strategy appropriately. We format or blank the media automatically as necessary to prepare it for use/re-use, even in the middle of a multi-volume backup. We suggest for consistency that the same media type be used for all volumes of a single backup, but in fact it is possible to insert a DVD-RAM as volume 1, a CD-RW as volume 2, then a DVD+RW as volume 3, or any imaginable combination, and *Backup**EDGE*** will properly handle writes strategies and volume sizes as long as the device supports the inserted media.

The user technically doesn't need to care what type of media has been inserted, again as long as the device supports it. This is especially useful as modern devices tend to be "DVD-Multi" devices and support any media type that can be inserted.

Bus Considerations

Linux products with 2.6.x and later support virtually and optical drive on any bus.

OpenServer 6.0.0 supports SCSI, ATAPI, SATA and USB writable optical devices. Current Xinuos (formerly SCO) Maintenance Packs and drivers are recommended for optimal operation.

OpenServer 5.0.7 supports SCSI, ATAPI and USB writable optical devices. Current Xinuos Maintenance Packs and drivers are recommended for optimal operation. For ATAPI devices the "wd" supplement found at **ftp://ftp.xinuos.com/pub/openserver5/drivers/OSR507/btld/** is also recommended.

OpenServer 5.0.6 with RS506a also works well with SCSI and ATAPI devices. ATAPI requires the OpenServer 506 "wd" supplement (**ftp://ftp.xinuos.com/pub/openserver5/drivers/OSR506/btld/**).

OpenServer 5.0.5 works well only with SCSI writable optical devices.

OpenServer 6.0.0 and UnixWare 7.1.4 support SCSI, ATAPI and USB writable optical devices, or SATA devices with the optional ahci Driver version 1.0 or later. Version 1.2 is highly recommended.

OpenServer 6.0.0 and 7.1.4 users should use the updated ide7.1.4h driver found in the driver supplement CD at **ftp://ftp.xinuos.com/pub/unixware7/714/drivers/osr600_mp4drivers/**.

All of the SCO / Xinuos "V" and "Definitive" series are supported.

Firmware

Manufacturers are constantly improving the firmware in CD and DVD drives to support new media formulations. It is important to periodically check your manufacturer's web site for new firmware periodically.

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Summary

On systems with the proper data storage requirements, a CD or DVD drive can replace **both** the CD-ROM drive and the tape drive, and probably allow elimination of the floppy drive entirely, making for inexpensive, very small footprint systems. Our high quality compression extends the usefulness of the devices far beyond their stated capacities, and our encryption provides data security.

On large systems, CD and DVD devices make excellent supplements to the tape backup system for performing *Differential* and *Incremental* backups, as well as backups of specialized *Domains* such as "The Accounting System" or "The filePro Databases".

For replicated sites, bootable system backups could easily be used for new installations and system upgrades.

Market conditions and manufacturing economies have brought prices for CD/DVD combo devices under $18.00, and Blu-ray Disc devices for under $35.00[1]. Media is also very inexpensive. Our reseller partners have been adopting these technologies rapidly, especially in the SMB and replicated site marketplaces.

The *BackupEDGE* Advantage

*Backup**EDGE** fully integrates* optical technologies with *no compromises*.

- We fully support nine optical technologies.
- Our higher compression ratios ensure that the maximum amount of data can be stored on an archive.
- Our *exclusive* DVD / Blu-ray Disc BD-RE writer ensures the fastest possible performance, in some instances over twice as fast as other products.
- Our media detector allows us to determine the perfect write strategy and volume size for any optical media type. No space is wasted, and even 8cm and "business card" type media work perfectly.
- Instant File Restore functions perfectly.
- Full compatibility with "BootableBackups" for disaster recovery is maintained, even when compression and encryption are employed.

About Microlite Corporation

Microlite Corporation has been in the UNIX backup software marketplace since 1987, and in the Linux marketplace since 1997. More information on our products can be found at

https://www.microlite.com.

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1. Prices Checked on Amazon.com January 2022.