



WHITE PAPER

NETWORK CD/DVD SERVERS

AXIS STORPOINT CD E100

The Evolution in Technology for Sharing CD/DVDs Over the Network

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TABLE OF CONTENTS

| | |
|--|----------|
| <u>INTRODUCTION</u> | 3 |
| <u>1 MARKET DRIVERS FOR SHARING CDS: WHAT PROBLEMS DOES IT SOLVE?</u> | 4 |
| 1.1 CONVENIENT ACCESS | 4 |
| 1.2 SAVE SUBSCRIPTION COSTS | 4 |
| 1.3 ACCESS TO MULTIPLE CD COLLECTIONS | 4 |
| 1.4 VERSION CONTROL | 4 |
| <u>2 CD-ROM NETWORKING VERSUS THE INTERNET</u> | 5 |
| <u>3 ADVANTAGES OF FILE SERVER-INDEPENDENT CD SERVERS</u> | 5 |
| 3.1 NO NETWORK OPERATING SYSTEM LICENSE | 5 |
| 3.2 COMPREHENSIVE NETWORK SUPPORT | 5 |
| 3.3 EASE OF INSTALLATION | 6 |
| 3.4 EASE OF MANAGEMENT VIA WEB INTERFACE | 6 |
| 3.5 COST SAVINGS | 6 |
| <u>4 TECHNOLOGY TRENDS SHAPING THE FUTURE OF OPTICAL STORAGE</u> | 6 |
| 4.1 NETWORKED DVD-ROM DRIVES | 6 |
| 4.2 RE-WRITABLE OPTICAL MEDIA | 6 |
| 4.3 HARD DISK CACHING | 7 |
| 4.3.1 WHAT IS HARD DISK CACHING? | 7 |
| 4.3.2 CACHING BENEFITS | 8 |
| <u>5 NETWORK-ATTACHED CD/DVDS AND THE AXIS THINSERVER PARADIGM</u> | 8 |

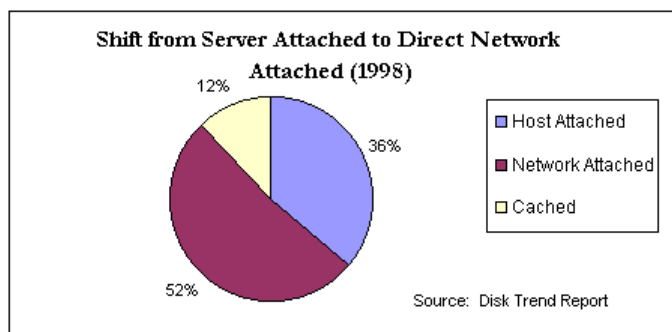
Introduction

There are few phenomena in the PC industry over the past ten years that have shaped the nature of distributing and publishing content more than the CD-ROM. According to DISK/TREND, annual CD-ROM shipments have grown from 24 million in 1994 to 75 million in 1997. By 2001 total optical drive revenues are forecasted by Disk Trend Report to be \$9.9 billion.

However, data storage needs are on the increase and the need for removable storage with an even higher capacity is now apparent. DVD is on track to become the new optical mass storage solution. With storage capacities of 4 to 18GB, DVD allows for full length videos or other high density multimedia data to be stored on one disc rather than several CDs. DISK/TREND predicts that DVD-ROM drive shipments will reach an annual shipment level of 92.8 million drives, three times the level projected for CD-ROM drives.

There are a lot of reasons why CDs, and now DVDs, is a successful data storage media. They are inexpensive to produce, are high capacity, rugged, and have a long shelf life. CD-ROM drives are a universal desktop appliance, and have come down in price to the point where they can be incorporated into even the least expensive home PCs. But having a single copy of a CD on a desktop PC for personal use is a lot different than sharing it over the network, available to many at the same time.

Networking CDs began much the same way as attached hard drives, with internal SCSI cards, heavy SCSI cables, daisy chained drives and the "black magic" of SCSI termination. Features soon appeared such as standalone dumb towers attached to a file server, and management software that allowed end user access. This method of CD-ROM drive attachment has peaked and is in swift decline, but still represents a significant number of networked drives.



Network-attached CD towers have taken a strong lead in the CD-ROM network market by displacing file server-attached CD towers. This change is driven by the obvious cost savings, easier installation and improved manageability. With the recent introduction of hard disk caching by several vendors, the network-attached towers are now getting into a new dimension challenging new market segments.

1 Market Drivers for Sharing CDs: What Problems Does it Solve?

Sharing CDs and DVDs over a network provides an efficient way to distribute valuable content among multiple users of data. Because bandwidth constraints have been lowered through ever-improved, high-speed network hardware, even users on an extended campus or wide area network can get reasonably fast access to server-based information from the comfort of their desktop. For example, the growth in Ethernet switching for both 10 and 100 MB is making it easier to pull rich data such as that often found on CD/DVDs, across complex, extended networks.

1.1 Convenient Access

Serving up data over the network is much more convenient and cost effective than purchasing CD drives for each user and then providing multiple copies of the same CD to each individual. And it avoids the problem of being lost if shared via the “sneaker-network”: Who borrowed the CD with the graphics package? Where is the CD with the corporate human resources database? This empowers the workforce to control their own information resources and work more effectively and efficiently.

1.2 Save Subscription Costs

When providing expensive content to multiple users, the need to network the content becomes even more critical. When content is accessible by many users at one time, it allows organizations to share the cost of subscription databases or other data that would be expensive to duplicate and distribute.

1.3 Access to Multiple CD Collections

Networking CDs allows instant access to multiple CDs. Typically, end users will have a single tray CD drive attached to their workstation. But if the CD data takes up several discs, they face the unpleasant task of shuffling CDs in and out, which curtails productivity.

1.4 Version Control

Last, much of corporate data is periodically updated - new versions of price lists, engineering code, product manuals, catalogues etc. get changed frequently. Getting old data out of users' hands is often so important that it can represent the singular, overriding reason to make shared CDs a requirement. When the new CD is on the network, everyone will use the latest version at the same time. License usage can be monitored and controlled.

2 CD-ROM Networking versus the Internet

As an ever-increasing number of organizations rely on the World Wide Web to distribute information on their products and services, it is often reported that the demand for networking CDs is in decline.

However, the need to share networked CDs and DVDs continues. This is because accessing information from a CD-ROM on a local network offers tremendous performance advantages over loading the same information via the Internet. Even an entry-level CD-ROM drive offers around 400 times the data transfer rate of a 56 kbps modem. For applications rich with multimedia content the ability to access that information from a CD or DVD network server can be an important benefit.

Until problems with managing security and access over the Internet are addressed, many publishers will continue to use media such as CD-ROM and DVD to distribute their products.

3 Advantages of File Server-Independent CD Servers

The advantages of networked CDs are clear. But the most efficient way to network CDs can result in considerable cost and resource advantages. An early way to accomplish this was through server-attached SCSI arrays of CD drives – unintelligent towers managed by software running on a file server. In the last few years, ThinServer-enabled CD-ROM towers have taken away much of the headache and cost associated with bringing a CD tower on line, and maintaining it.

Dataquest Analyst James Staten defines ThinServers as follows:

"Thin server is defined as a specialized, network-based hardware platform designed to perform a single or specialized set of server functions. It is characterized by running a minimal operating architecture, requiring no network operating system license, and being independent of any operating system or proprietary protocol. In addition, the device is a closed box delivering extreme ease of installation and minimal maintenance, and it is managed remotely via a web browser."

Some of these features are explained in greater detail below.

3.1 No Network Operating System License

The CD ThinServer has optimized, stripped-down versions of the popular network operating systems. Users connect to it the same way as they would to a file server with a per-seat license. The advantage is that an unlimited number of users can connect to a ThinServer without incurring any NOS license fees.

3.2 Comprehensive Network Support

Most CD-ROM network servers contain support for all popular operating systems and can handle them simultaneously. The same is true for various protocols running on the network. For example users on different parts of the network might be running NetWare, others may be operating under Windows NT, and others under OS/2. The protocols could include NFS, TCP/IP, NetBEUI and so forth. All users are accommodated, and have transparent access to data resident on the CD tower.

3.3 Ease of Installation

Without question, the primary advantage of file server-independent network-attached CD towers is the ease in which they connect to the network. Typically they can be removed from a shipping container, attached to an available network port via a standard cable (such as an Ethernet patch cable for 10/100baseT), powered up and brought online in a matter of a few minutes. No software installation is necessary on any server or client to accomplish this.

3.4 Ease of Management via Web Interface

The goal of managing a ThinServer device is to use a common human interface over any media, from anywhere on the network, from any device outfitted with a Web browser. There are no monitors or keyboards to attach to the device and no special standalone software. This means that non-technical people can monitor network-attached CD towers, and perform general security or other maintenance as needed, which is infrequent in any case.

3.5 Cost Savings

The costs savings for using a network-attached CD tower come in two forms. The initial hardware costs are generally lower than a comparable PC-based file server, and users get savings through lower maintenance and ease of installation with its minimal work flow disruption.

4 Technology Trends Shaping the Future of Optical Storage

There are three significant trends in the network optical storage market today:

- Networked DVD-ROM drives
- Re-writable optical media
- Hard disk caching

These are being adapted by the market in varying degrees.

4.1 Networked DVD-ROM Drives

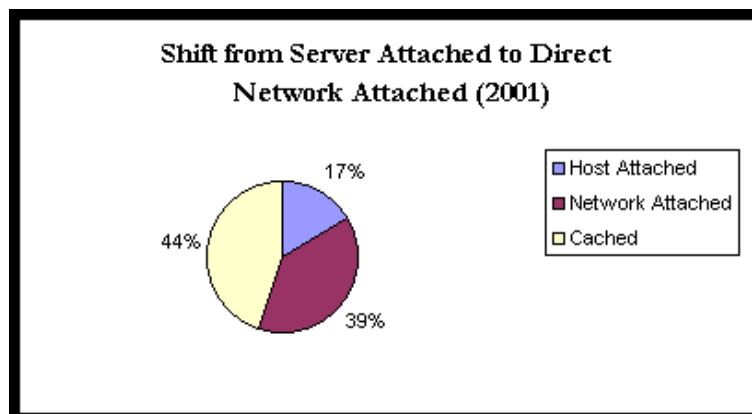
The capacity of DVD is several times larger than CD-ROM, allowing for full length videos and other high density data to be stored on one disk rather than several CDs. An increasing number of optical reading devices (drives) have the capability to read both CDs and DVDs. Network-attached CD server manufacturers are also supporting the DVD format over the network.

4.2 Re-writable Optical Media

The ability to re-write data onto optical media has been around for several years, primarily in the form of Magneto Optical drives. This media is in steep decline. Now, the CD re-writable format, CD-RW is widespread and relatively inexpensive.

4.3 Hard Disk Caching

Hard disk caching is another trend that has gained tremendous popularity over the past year. While it represents a small percentage of overall network-attached CD tower sales, devices with hard disk caching capability are growing the fastest. According to DISK TREND, devices with hard disk caching have been steadily growing in popularity since the late 1990's. In 1997, they represented just 5 percent; by 2001 demand is projected to grow to nearly 50 percent of shipments.



4.3.1 What Is Hard Disk Caching?

Hard disk caching is the ability for CD/DVD-ROM discs to be mirrored (copied) to a hard disk co-located in a CD-ROM tower with CD or DVD drives. The data that has been copied is now accessible directly over the network from the hard disk, rather than the CD itself.

The primary advantage of this is access speed. When the user clicks on a file icon, the response back to the user is faster than if the file was being pulled from the CD directly. This is very apparent in the case where the CD drive has stopped spinning or "idled down" because it has not been used for a period of time. Data access from a CD requires the drive to spin up and then find the file. This could take a couple of seconds. The difference is most apparent when you have a CD disk changer like the Nakamichi five disk changer. Since it is possible to only read from one disc in the changer at a time, if the data is on a disc that is not in position over the read mechanism, it could take several seconds to position the disc and spin it up to read the file.

With hard disk caching, users avoid this delay by having all the files from all the discs in the changer automatically copied to the hard disk, more readily available when needed.

4.3.2 Caching Benefits

There are several key benefits to hard disk caching:

- **Faster access times** - Access times are used to measure the amount of time taken for the drive to locate the requested information on the media. Data access from a CD or DVD is much slower than that from a hard disk drive, a problem that is compounded in a multi-user environment where concurrent access is required. The fastest CD-ROM drives have an average access time of about 100 ms, compared to less than 10 ms for hard disk drives.
- **Scalability** - Access to data from more CDs than the tower has drives. This is possible due to the low cost and high capacity available with hard disk drives. For example, a 40GB hard disk drive can easily hold 60 full-length CD titles.
- **Security of high value CDs or DVDs** - High value important titles can be cached to the hard disk and removed from the tower and placed in a secure location, possibly off-site for safe keeping.

These applications are discussed in greater detail in the “*Easy Guide to Hard Disk Caching*”.

5 Network-Attached CD/DVDs and the Axis ThinServer Paradigm

Networking and managing CD/DVDs is made easy with Axis ThinServer technology. ThinServer Technology is comprised of "thin" versions of the most popular network operating systems, Web management tools and a 100MHz RISC processor, the Axis ETRAX 100. It is built into the AXIS StorPoint CD E100 server, used by all major CD tower manufacturers.

Axis' ThinServer Technology is based on open architectures, and streamlined and optimized for device connectivity independent of any file server. CDs and DVDs communicate transparently over the network, with little or no administration that would normally be associated with traditional file servers.