

## White Paper

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# Running CD-ROM Applications Concurrently

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## I. CD-ROM Applications

During recent years a vast number of multimedia applications have been developed by software publishers. The use of multimedia is now ubiquitous in any modern application and this increases the size of applications enormously. Partly due to the publishers' desire to protect copyrighted software but also due to the customers' need to minimize the use of hard disk on workstations, many of these applications are delivered as CD-ROM applications.

Most CD-ROM applications are designed to run as single user applications on one PC with each PC requiring its own copy of the CD-ROM. In general, each CD-ROM application must be installed on the PC once before it is used. This installation process copies certain information to the PC and configures the PC to be able to run the application. However, much of the data that is required by the application when it is run remains on the original CD-ROM. This means that the application expects to be able to access the original CD-ROM every time it is run.

DVDs are also increasingly being used due to their higher capacity. In this document, where reference to CD-ROM is made, it also includes DVD.

### Concurrency

“Concurrency” means the ability for the PC user to run multiple applications at the same time and to be able switch between each at the click of a mouse without having to first close the other applications.

Given that a typical PC only has one CD-ROM drive, only one CD-ROM application can be run at any one time. In other words – concurrency of CD-ROM applications is impossible.

Although, concurrency is rarely a fundamental requirement, it is often very desirable.

## I.1 CD-ROM Networking

Whilst the evolution that is described above is understandable, it has not provided a viable solution for organizations. An individual in an organization may require access to several hundred CD-ROM applications in order to be able to perform their job effectively or, in the case of a school, for the student to be able to learn effectively. Therefore every person requires a copy of every CD-ROM application that they need and must manually insert and remove the appropriate CD-ROM each time they wish to use it. In some environments this can create a headache of significant proportions. Imagine trying to hand out CD-ROMs in a school classroom – the CD-ROMs get lost, stolen or damaged. PC CD-ROM drives are also notoriously slow and unreliable and prone to mechanical failure.

The solution to this problem is generally known as a CD-ROM Network. A CD-ROM Network provides a centralized network based solution in which the CD-ROM (or the CD-ROM data) is retained centrally on a server and accessed via the network in a way that is compatible with conventional CD-ROM drive access. In this way, individuals never need to handle CD-ROMs and the organisation avoids the issues outlined above.

A CD-ROM Network can also be a solution to the concurrency problem if implemented correctly.

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## **1.1.1 Evolution of CD-ROM Network Solutions**

The first generation of CD-ROM Networking solutions utilized arrays of CD-ROM drives attached to conventional network servers. Although many PC users could access and share the same CD-ROM, the optical mechanisms of CD-ROM drives are too slow to operate effectively for more than 2 or 3 users at once and so users experienced significant delays when running applications. Jukebox solutions provided a way to cost effectively handle a large number of CD-ROMs but at the expense of performance. Each time a different CD-ROM is required several tens of seconds are required to access and mount the required CD-ROM.

## **1.1.2 Hard Disk CD-ROM Images (Hard Disk Caching)**

In 1995, Avantis pioneered the concept of using images of CD-ROMs stored on hard disk based servers. Due to the higher performance of hard disks, this solved the performance issue associated with multiple users accessing the same (or multiple) CD-ROMs at the same time. Many of Avantis’ competitors have now adopted hard disk imaging / caching as well. With the huge capacities of hard disks now available, a hard disk based server can hold as many CD-ROMs as a jukebox without a significant cost penalty.

## **1.1.3 Virtual CD-ROM Drives**

The second problem commonly found with CD-ROM network solutions is that CD-ROMs (or CD-ROM images) on the server are only accessible to the PCs as network file shares. In other words, the CD-ROM servers simply emulate conventional file servers. This technique works satisfactorily if the CD-ROM application is implemented using a simplistic file & directory based architecture. However most modern multimedia CD-ROM applications are more complex than this and include other data such as audio or video tracks on the CD-ROM. These cannot be accessed using conventional file sharing techniques and render the application unusable over the network. Furthermore, even where these techniques are not required by the design of application, publishers often still use them to make copying of the CD-ROM harder (copy protection). Avantis estimates that approximately 50% of the CD-ROM applications that are in common circulation today will not work in this way.

Avantis pioneered the use of Multimedia Virtual CD-ROM Drive (MVDTM) software technology that allows any type of CD-ROM application to work correctly on the PC. Special software is installed on every PC which emulates real CD-ROM drives in such a way that the operating systems and applications cannot tell that they are accessing remote CD-ROMs via a network. These CD-ROM drives are known as “Virtual” because although they appear and operate like real CD-ROM drives, they do not actually exist in the PC.



### 1.1.4 Insertion and Ejection (Mapping) of CD-ROMs

At its basic level CD-ROMs are inserted or ejected (mapped) to/from Virtual CD-ROM Drives using some kind of software controls or a special application. However this requires the user to remember to insert the correct CD-ROM into a Virtual CD-ROM Drive each time they wish to run the associated application.

### 1.1.5 Dynamic Mapping of CD-ROMs

An advanced Virtual CD-ROM Drive based CD-ROM Network solution also provides a means to automatically insert (map) the required CD-ROMs into the associated Virtual CD-ROM Drives when applications are launched. This is often referred to as “Dynamic Mapping”. It is important that tools are provided with the CD-ROM Network Solution that automate the setup of this functionality. For Avantis products this tool is called the “CD Installation Wizard”.

It is worth noting that the above techniques effectively allow a single PC to use a large number of CD-ROM applications with a lesser number of Virtual CD-ROM Drives.

## 1.2 Minimum Requirements for an effective CD-ROM Network

The conclusion to the above discussion is that to ensure fast reliable CD-ROM networking, the chosen solution must implement both Virtual CD-ROM Drive(s) and the server must use Hard Disk Images of CD-ROMs. The Virtual CD-ROM Drive solution must fully support all formats of CD-ROM and must provide automatic insertion (mapping) of CD-ROMs with the minimum of configuration.

## 1.3 Concurrency

Using the Virtual CD-ROM Drive solution described above requires that each CD-ROM application have its own CD-ROM drive (or in some cases multiple CD-ROM drives if the application requires more than one CD-ROM). For concurrency, the launching of a further CD-ROM application must not cause CD-ROMs which are still in use by open applications be ejected from their CD-ROM drives.

Therefore to achieve concurrency, you must allocate the most commonly used applications and their CD-ROMs to dedicated Virtual CD-ROM Drives. Typically other applications can be designated as “occasional” and allocated to share one virtual CD-ROM drive. These occasional applications cannot be run concurrently.

The limit on concurrency depends on how many virtual CD-ROM drives the system can support. This is a function of the product employed and also depends on how many spare drive letters there are on the PCs. The Avantis Client software provides an unlimited number of virtual CD-ROM drives. A typical PC may have up to 21 spare drive letters allowing up to 20 concurrent applications to be supported as well as an unlimited number of occasional applications.

Please note that there are other limits to the level of concurrency that can be achieved:

- (a) PC Operating System. Windows 95/98/Me do not handle concurrent applications well and we recommend that concurrency be discouraged. Windows NT and 2000 handle concurrency effectively.
- (b) PC Memory. For each application that is being run concurrently, memory will be used up. For example typically to allow 10 concurrent applications under Windows 2000 you should aim to install at least 192MB of RAM on each PC and preferably more.



## 2. Virtual CD-ROM Drives and Installing Applications

This section discusses the use of Avantis Virtual CD-ROM Drives and how they should be used to achieve reliable CD-ROM application usage.

### 2.1 Setting Up Applications

Once images of all the required CD-ROMs have been created and stored on the Avantis CD-ROM Server, they can be easily set up at each PC using the Avantis 'CD Installation Wizard' software. This program monitors the CD-ROM application's own setup program installing on the PC and then adjusts the shortcuts and menu items that it creates so that in future when the application is launched, the correct CD-ROMs are automatically inserted (mapped) to the appropriate virtual CD-ROM drive(s).

Note: If for any reason the CD is required to be mapped to a different 'Virtual CD-ROM Drive' in the future, the CD application can be uninstalled locally and the 'CD Installation Wizard' run again but specifying a different 'Virtual CD-ROM Drive'.

If more than one CD-ROM is needed to run an application, e.g. Encarta that requires 2 CD-ROMs, the CD-ROMs will be mapped to a series of Virtual CD-ROM Drives when the application is launched.

### 2.2 Usage Scenarios

#### 2.2.1 Concurrency not required, limited Drive Letters

In this scenario, the Avantis Client would be configured with a small number of Virtual CD-ROM Drives, perhaps only one.

The Avantis CD Installation Wizard is used to configure each application.

As applications are started, the correct CD-ROM is mapped to the correct drive automatically.

#### 2.2.2 Concurrency is required

The administrators of the system must assess which applications are likely to be used concurrently in the context of availability of PC drive letters. Each concurrent application must be allocated a permanent Virtual CD-ROM Drive (or more if the application requires multiple CD-ROMs). Other applications will be treated as "occasional" applications and share a single Virtual CD-ROM Drive.

Assuming that all concurrent applications require one CD-ROM then the number of virtual CD-ROM drives that will be required will be:

Number\_of\_Concurrent\_Applications\_required + ONE.

### Setting Up Concurrent Applications

The installation process will not require the use of the Avantis CD Installation Wizard to install the concurrent applications. The mappings required for these are established manually once and will not change. However Avantis recommend that CD Installation Wizard be still used because then in the event that the mappings are lost they will self-heal each time the application is run.

The Avantis mapping tools (CDserve Explorer / OpenCD Explorer / OpenCD Shell Extension) may be excluded from the PCs to avoid issues of users fiddling with permanent drive mappings.

### Setting Up Occasional Applications

Avantis CD Installation Wizard must be used for installing the occasional (non- concurrent) applications.

A particular Virtual CD-ROM Drive (or multiple if any of the occasional applications requires more than one CD-ROM) should be nominated and used for all of the occasional applications.

Each time an occasional CD-ROM application is launched, it will map the correct CD-ROM(s) to the nominated Virtual CD-ROM Drive(s). If a prior application had inserted a different CD-ROM in the drive then this is ejected (unmapped) automatically before the new CD-ROM is inserted (mapped).

## 2.3 Rolling Out Multiple Workstations

Using these techniques can create a substantial amount of work for the system administrators if a large number of workstations need to be configured. There are a number of ways to minimise or avoid this problem including (but not limited to):



1. Workstation Cloning/Ghosting
2. Group Policies (requires Windows 2000 Servers on the network).
3. Using other third party applications such as Veritas WINSTALL, Microsoft Systems Management Server, Novell ZenWorks (Snapshot and Novell Application Launcher).

Please contact Avantis Technical Support for further assistance.

For further information on Avantis, please contact:

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