DUAL DISC MIRROR®

Application: Systems software and System utilities.

DUAL DISC MIRROR is a trademark of Twincom International BV, the Netherlands.

The **DUAL DISC MIRROR** software is a sub-system that will mirror on-line any **WRITE** operation on one disk to a physically different disk. This is done immediate and without delay. These writes are based on block updates and independent from any application or harware environment. This feature will safegaurd the disk data in case of a failure on one disk. Also, the system keeps on processing in case a disk fails, in the event of a disk problem on the system disk. This guarantees 100% uptime. The result of a write is checked for errors. If one of the two disk units reports an error, the erroneous disk is disabled and no longer accessible. Error messages are then reported by the system console and the *mirlogger utility*.

Disk reads are also intercepted and may be redirected to the secondary disk automatically because of:

(a) the primary disk is disabled,
(b) load sharing between the two disk units (alternate read),
(c) a read error on the primary disk.

Some **UNIX** implementations record disk unit specific information on the disk unit itself, such as a partition table and bad track information. This information is normally different for each individual disk unit, and it may therefore not be mirrored. The disk mirror knows which disk slice contains this information and will therefore not mirror any of this information. The **DUAL DISC MIRROR** can mirror disk units without a root file system. The disk unit containing the root file system and its corresponding secondary disk unit is set up for mirroring during the boot process. Other pairs are not activated during the boot process would normally be done by appropriate command in the ‘re’ command file and executed automatically after boot.

The user is informed about the current status of the disks by the “mirlogger” utility. Production loss (the time one needs to replace a bad disk unit) after a disk failure is *minimal* due to the on-line synchronization; copying time is eliminated and executed in the background. Disks can be handled by one or more controllers, depending on the disk-driver.

DUAL DISC MIRROR is *100% transparent for application and user.* **DDM** works independently from type of disk-controller as long as these are supported by the standard OS version. Raw devices are supported as well.

December 2000

NETWORK DISC MIRROR®

The **NETWORK DISC MIRROR** is an extension of the actual **DUAL DISC MIRROR®** package. It mirrors all operations from one disk onto a disk-unit located on a remote system in a "local area" network. The 2 servers communicate via the TCP/IP protocol. The remote system is available to take over within moments notice if the primary computer fails; *uninterruptable information access.* This will eliminate your risk of unrecoverable data-loss from system crashes and maximize production downtime.

The **NETWORK DISC MIRROR** requires each system to have at least a system disk. The remote system needs an extra disk for handling all data written to or read from the main disk in the primary system. Data (a block update) is actually transferrred to or from the remote disk, using a network connection such as TCP/IP. The NETWORK DISC installs during the sysgen procedure. It can be read from, or written to, and it can also be mounted as a file system. Instead of sending data to a physical disk, the data is sent through a daemon process on a remote system. This peer process will then transfer the data to the real physical on the remote system.

NETWORK DISC and the DUAL DISC MIRROR

NETWORK DISC can be made part of a mirrored DUAL DISC MIRROR disk pair. This will become the NETWORK DISC MIRROR. The NETWORK DISC depends on a pair of daemons to perform the data transfer between the systems, and these daemons depend on the network for the data communications. If you do mirror the system disk, it is *only necessary* to do a full disk copy whenever the system is completely restarted. The network and the daemons should be activated and operational before any of the mirrored data disks are mounted or used for the first time. If not, a full disk copy must be performed to synchronize the disks.

As the mirror disk system is able to schedule normal disk operations and the disk copy operations in such a way that no compromise is made effecting data integrity, user operation is possible while the copy is in progress. This results in minimal downtime after a failure. It is possible to mirror critical disk data between any of the systems which have installed a **NETWORK DISC MIRROR** kit. That is from base to remote system but also vice-versa.

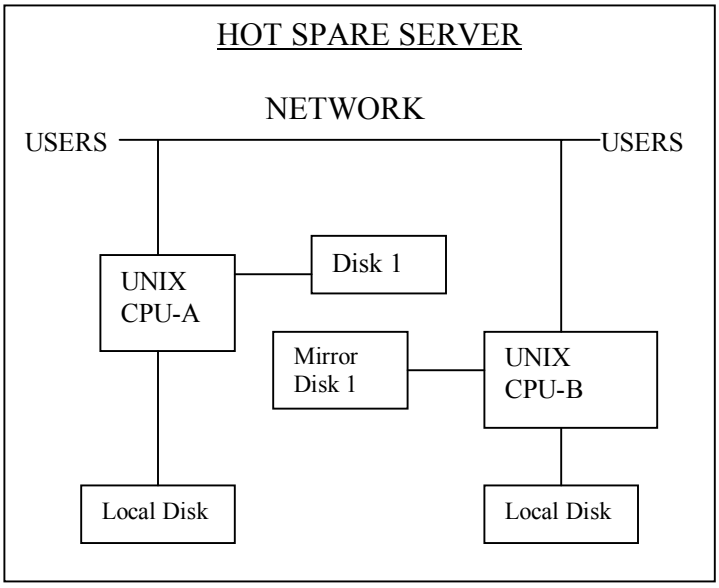
Benefits:

It used to be complex and expensive to protect organizations from production-loss due to disk failures or complete system crashes. Twincom changed that radically with the **DUAL DISC MIRROR** concept and goes even a step further towards fault tolerance with the design of the **NETWORK DISC MIRROR**. This software rules out data loss and minimizes system downtime by having all disk data on two separate hosts. This results in full redundancy!

The **NETWORK DISC MIRROR** mirrors *all operations* from one disk to a disk-unit located on a remote systems in a "local area" network. The remote system is available to

take over on a moments notice if the primary computer fails. This will eliminate your risk of unrecoverable data loss from system crashes and minimize production downtime.

TECHNICAL:



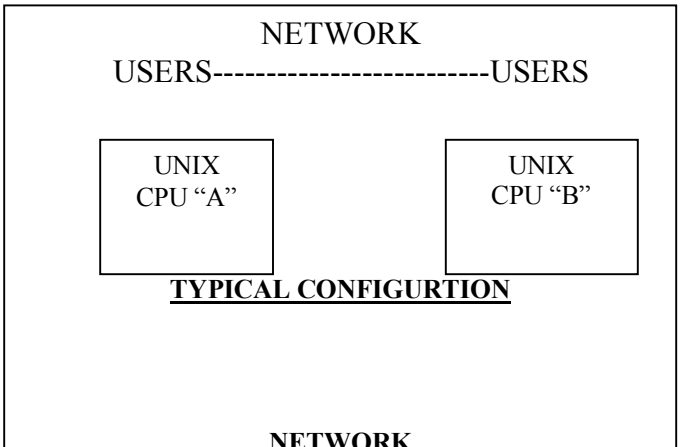
When **NETWORK DISC MIRROR** is installed, the real disk is located on a remote system, and all data written to or read from the remote disk using TCP/IP. The NETWORK DISC installs during the Sysgen procedure. It can be read from or written to and it can also be mounted as a file system. Instead of sending data to a physical disk, the data is sent through a daemon process on a remote system. This peer process will then transfer the data to the real physical disk on the remote system. Each system needs its own boot environment plus at least an extra disk for hte application and data.

The NETWORK DISC MIRROR depends upon a pair of daemons to perform the data transfer between the systems, and these daemons depend upon the network for the data communications. If you do mirror the system disk, it is only necessary to do a full disk copy whenever the systems are completely restarted. The network and the daemons should be activated and operational before any of the mirrored data disks are mounted or used for the first time.

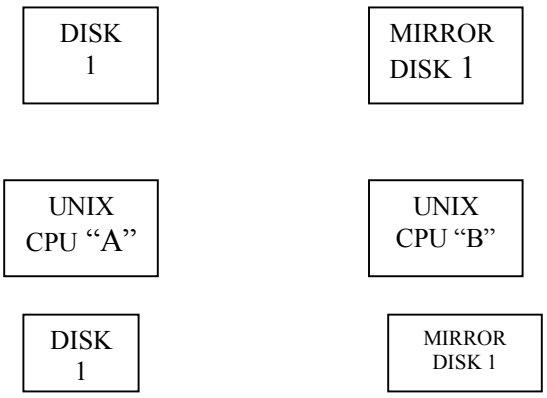
As the mirror disk system is able to schedule normal disk operations and the disk copy operations in such a way that the data integrity is not compromised, user operation is possible while the copy is in progress. This results in minimal downtime after a failure. One can mirror its critical data between any of the systems that has installed a NETWORK DISC MIRROR package.

Revolutionary operations:

If a disk becomes inoperative due to a headcrash or a breakdown, the remote disk of the pair AUTOMATICALLY takes over operations without any production loss. (HOT



STANDBY).
The NETWORK DISC MIRROR (NDM) Program is embedded in the UNIX OPERATING SYSTEM. The NDM Programs are fully transparent for user, hardware and the application programs. (FULL



TRANSPARENCY).

By redirecting (by flipping a switch or an automatic log-on by the terminal erver) the users to the remote system, data accessibility is maintained with minimum interruption should *the primary computer fail.*

There is no need to make a time consuming tape recovery in such event. Just login at the remote server and mount the filesystems on the mirrored volume. Because information is redundant in real time due to mirroring by the Twincom DUAL DISC MIRROR, the data is current up to the moment of a failure, even in the event of a disk or CPU problem: "OPTIMIZED FAULT TOLERANCE". In order to have a maximum integrity of data, verify the database transaction logger to be sure if "work-in-progress" is lost.

Monitoring function:

In the event of a disk controller failure, the system immediately notifies the console and simply continues data processing automatically. The status can be printed, displayed and/or reported via datacom (MIRROR STATUS REPORTS).

For more information:

CipherSoft Inc.
205, 279 Midpark Way SE
Calgary, Alberta
T2X 1M2
Canada

Telephone: 1-403-256-5699
Fax: 1-403-256-5695

Twincom BV

Van Coothplein 18
4811 NE Breda
The Netherlands

Telephone: +31 76 5436202
Fax: +31 76-5436203

Software Maintenance Agreement
TERMS AND CONDITIONS

Your initial **Twincom** order entitles you to technical telephone / fax / e-mail support and software upgrades and maintenance releases for a period of thirty (30) days from the date of shipment of your order. The purchase of the **Software Maintenance Agreement** allows you to continue receiving these benefits beyond the initial thirty (30) day period for a period of three years.

Benefits:

Your purchase of a **Software Maintenance Agreement, Twincom** provides your company with the following:

1) Telephone support, fax support, e-mail support
2) Software maintenance releases and bug fixes
3) Software upgrades within your selected operating system platform

Contract Period:

Three years, beginning when the current coverage expires (at the end of the initial thirty (30) day coverage or previously purchased maintenance agreement, if applicable) and when the first six (6) months period is paid in full.

Price/Payment:

15% per year of your **Twincom** package current list price. The maintenance contract fee is invoiced by **Twincom** twice a year, 6 months in advance.

Specifics:

Software Package: _____
Version: _____
License number: _____
Operating system: _____
Installed at: _____
_____
_____

Signature: _____
Name: _____
Date: _____

REFERENCES TWINCOM SOFTWARE

Company	Country	Line of business
DUPONT DE NEMOURS	Germany	Production Control
CIBA-GEIGY	Switzerland	Planning
Mobile Data International	USA	Research
The Regent Hotel	Hong Kong	Hospitality/Restauration
Gunay Construction Limited	Turkey	Construction
PHILIPS	Nederlands	Hospitals
Federal Express	Germany	Transportation
MOTOROLA	USA	Communications
Union Bank of Switzerland UBS	Switzerland	Banking
New York Times	USA	Newspaper
PharmaPartners	Netherlands	Pharmacy & Doctors
Trendar Corporation	USA	Truck Stops
SINGAPORE AIRLINES	Singapore	Planning
Health Base Foundation	Netherlands	Drug Interactions
Industrial Investment Bank	Turkey	Banking
Centre Hospitalier de Paris	France	Health Care
84 Lumber Co.	USA	Stock Control
Industrial Bank Budapest	Hungary	Banking
B.M.W.	Germany	Manufacturing
Banque Indosuez	France	Banking
MIGROS	Switzerland	Retailing
South West Airlines	USA	Planning
Advanced Systems	Japan	Research
CIMAT	Italy	Maritime Communications
Manufacturers Hannover Trust	USA	Banking
FUJI Photo & Film	Japan	Production Control
Apoteksbolaget	Sweden	Pharmacies
DENI-Nedlloyd	Netherlands	Transportation
Roumanian Government	Roumania	Customs
Baltimorre Fire & Police Dept.	USA	“911” Call Handling
S.I.P. (PTT)	Italy	Telecommunications
NewsWeek	USA	Magazine Printing
BUNDESHAUS BONN	Germany	Food and Beverage
LVS Price Waterhouse	Russia	Telecom Systems
EDF/GDF	France	Utilities (Electrical/Gas)
Disney Swan Hotel	USA	Hotel/Restauration
KLM Royal Dutch Airlines	Netherlands	Planning

December 2000