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RAID TECHNOLOGY

In our December issue we mentioned Radio-Assist software security. But there is also another security for hardware, using RAID technology. This is how it works:

RAID is an acronym for "Redundant Array of Inexpensive (or Independent) Disk".

A RAID type array is a set of disks acting as a single storage unit supporting disk fault tolerance with no loss of data and which operates independently of the other sub-systems.

It is important to differentiate between a software solution combined with RAID technology – a Windows NT solution for the construction of aggregates per band (RAID 0), construction of aggregates per band with parity (RAID 5) or use of mirror disks (RAID 1) – and a hardware solution of RAID type. A software solution has limitations (RAID 5 is not authorised in system partition) which a hardware solution can handle. Furthermore, with most RAID control units on the market, the disk can be changed during operation (Hot Plug). All this explains why only a hardware solution can ensure high fault tolerance, with disk restoration if needed, without interrupting the system.

RAID levels

There are six RAID levels, each one corresponding to the way data is stored on the disks (for reasons of cost, security and speed). It is important to understand these levels because each one is optimised for a specific use and a different security level. This is why Nétia adapts its solutions to match the constraints and requirements of each radio.

RAID 0: "STRIPING" mode

In RAID 0 mode, data for storage is spread across multiple synchronised drives and no redundant data is stored, resulting in high-speed transfer. However, any disk failure means that data is irretrievably lost. The minimum requisite number of disks is two. This RAID level is also called "STRIPING" mode.

RAID 1: "Mirroring" and "Duplexing" mode

In RAID 1 mode, data is duplicated in full from one disk to another, giving high redundancy if disk failure occurs. Performance is obviously greater than with a single disk since both disks are identical. So if one fails, the other takes over completely because it contains the same information. This mode requires at least two disks and is generally known as "MIRRORING" when it is on the same SCSI channel and "DUPLEXING" when two SCSI channels are used.

RAID 2: algorithm code

In RAID 2 mode, each data word bit is stored on one or more drives and the system generates and stores on one or more ECC disks an error correction code based on an algorithm. The advantage of this system is its high rate of transfer and ongoing error correction without

affecting performance. But it has a high cost-performance ratio and furthermore, all SCSI devices now have their own internal error correction management, so RAID 2 is hardly ever used any more.

RAID 3: Parallel transfer with parity management

In RAID 3 mode, data to be stored is "STRIPED", i.e., written one byte at time to different synchronised drives. The system generates and stores parity on a single drive. This not only gives a high rate of transfer in read mode but also in write mode. The minimum number of disks required is 3. Control unit complexity is average in RAID 3 mode but very difficult to operate by software alone. In fact, very few manufacturers implement a true RAID 3 level because the information stored is at least the size of a sector (typically 512 bytes). This solution is also less common because it requires the same number of drives as for mode 5 but does not have the same security level.

RAID 4: Separate data drives with shared parity management

In RAID 4 mode, a whole block of data is stored on a single drive and the system generates and stores parity of blocks from other data drives on its parity drive. Transfer rate is very high in read mode for large files but performance is low in write mode. Furthermore, parity sharing on whole blocks of data means that data reconstruction can be difficult when there is disk failure.

RAID 5: Separate data drives with shared and distributed parity management

In RAID 5 mode, information is stored in the same way as mode 4, but parity is generated and stored over multiple drives (so the information is spread horizontally). Thus, if a drive fails, the information can be reconstructed from the other drives. Performance is high in read mode for large and small files and in write mode. Megabyte consumption is relatively low in mode 5, yet this solution has the highest security performance. This mode requires at least 3 drives.

INTERNET BROADCASTING

Internet broadcasting is expanding rapidly, both for radio and television. Such expansion is easy to understand because of it its advantages. With a single Web site, it is possible to broadcast "Live" or "On demand" anywhere in the world both sound and images without having to worry about cover zones. Text information can also be synchronised with sound and/or image output. So at the same time the sound and/or image are played, a page of HTML text can provide information on the broadcast or any other topic.

But how does Internet broadcasting work?

- *Principle*: the surfer just connects to a Web page (on a Web server) and asks to listen to a sound or view an image. The server sends the request to the database (which seeks the requested information) and to the media server which delivers an audio stream.

Web Server_____Database_____Media Server_____Broadcast to surfer
(Web page) (stream allocation)

- *Technique*: a number of Internet outputs are available for audio streaming:
33.6 Kb, corresponding to data transfer of up to 4.2 Kb per second

56 Kb, up to 7 Kb per second
64 Kb, up to 8 Kb per second
56 Kb is considered the minimum necessary for adequate quality. So the situation can only get better with the gradual generalisation of Broadband. This is a generic term applied to the Internet for all procedures resulting in greater efficiency and ease of use through much higher output than currently possible, "always on" connections to dispense with dialling and fixed rate rather than timed connection costs.

In addition, the number of simultaneous outgoing media server-to-client streams is defined. If this number is 150, then 150 people can be connected to the site at the same time. This depends on the mode used, because there are certain methods for optimising streaming.
In Unicast mode, the point-by-point client-server connection protocol, there is one stream per person connected and the sound broadcast is pre-recorded.
In Broadcast Unicast mode, there is also one stream per person connected, but the sound is broadcast live.
In Multicast mode, the routing method is different, since it involves sending the same data packet to several people at a time, which lightens the network load considerably. The addressee does not need to be known because the data is broadcast to whoever wants to receive it. However, this implies modification of network routers to access multiple transmission because not all network cards support this. The advantage of the system is that it uses only one stream, even though several people receive the information.

Then there are two more aspects to Internet broadcasting: the broadcasting mode and the format of files in the database.

There are two broadcasting modes: downloading and streaming:
With downloading, the sound file must be loaded (saved) to the hard disk of your computer to be able to read it. This means data transfer which can be a lengthy operation depending on the size of the file.
With streaming, you don't need to wait for the file to be loaded and copied on your disk since you can listen to it as soon as the server connection is made. A further advantage is that it takes up no disk space.

As for the sounds in the database, they must first be digitised and encoded before they can be broadcast on the Web. This can be done with a separate encoder, but the operation can also be effected from the Nétia Radio-Assist system database with the Export tool.

The most widely broadcast formats on the Internet are the following:
- Real Audio
- MPEG Layer 3
- MPEG Layer 4
- Quick Time 4: itself based on MPEG Layer 4.

About 90% of the audio and video files on the Internet are in these formats, other formats still being embryonic.