



# Network Attached Storage NAS Applications

## White paper

Author: Ray Quattromini - Fortuna Power Systems Ltd

15<sup>th</sup> July 2003



What is Network Attached Storage? ..... 3  
How does it work? ..... 3  
What can Network Attached Storage provide? ..... 3  
Why are NAS servers faster than normal file servers? ..... 4  
How reliable are NAS Servers? ..... 4  
Applications and uses for Network Attached Storage ..... 5  
    Notebook / Desktop Backup ..... 5  
    Remote Offices ..... 5  
    Virtual Disk Library ..... 5  
    7x24 Backup / DR Backup ..... 5  
    E-mail Archiving ..... 7  
    Reducing Networking Traffic ..... 7  
    Consolidating Servers ..... 7  
    Archival Storage ..... 8  
    Software Distribution ..... 8  
    How can I backup my NAS Server? ..... 8  
Applications for NAS ..... 8  
Summary ..... 9  
About Fortuna Power Systems Ltd ..... 9

## ***What is Network Attached Storage?***

Network Attached Storage separates the application server from the storage. This increases overall system performance by allowing the servers to perform application requests and the NAS to serve files or run applications.

As the name suggests Network Attached Storage allows disk-based storage to connect directly on a network using a 10/100Mbit or Gigabit Ethernet connection, many now also feature dual Gigabit connectivity. It is a fully self-contained file server that can be used to serve files or run applications. A wide variety of networking protocols can also be supported TCP/IP, IPX, NetBEUI, Appletalk, NFS v3, HTTP 1.1, FTP this allows a wide variety of operating systems access to the NAS Storage.

The disk capacities range from a single spindle disk of 80GB all the way up to a multi-terabyte disk solution.

## ***How does it work?***

All NAS Servers use an operating system; this operating system is typically Windows 2000 or Linux. Once the NAS is connected to the network the NAS Server becomes a virtual OS server mimicking a Windows 2000, MAC, Unix, Linux server etc. One of the major benefits of using Network Attached Storage is there are no software licences payable.

You can now easily create users shares, integrate it into Microsoft Active Directory or create drive letters on the users desktop.

A NAS server has all the components of a traditional server but has no keyboard, monitor and mouse connected. The NAS servers have hard disks, processors, motherboards, memory, SCSI controllers, power supplies, fans and networking for connectivity.

Management of the NAS Server is via a web browser or Windows Terminal Services. From this you can configure and monitor all the functionality the NAS Server offers. The typical configuration time for a NAS device is about 15 minutes from connection.

## ***What can Network Attached Storage provide?***

A primary usage of a NAS server is instant disk space. Whilst many of the early adopters chose NAS and used it purely for this purpose many of today's NAS devices can be used in a wide variety of applications and uses.

It's also a solution that can scale easily, so you can add more storage hardware when it is needed. Easy to use and manage through GUI or Terminal Services. Faster than traditional file servers, so the operating system and architecture has been optimised. Increased reliability due to reduced component count and less lines of operating system code.

## ***Why are NAS servers faster than normal file servers?***

A NAS Server is designed to provide performance file serving in a heterogeneous networking environment. The NAS operating system is fully optimised for file I/O activity, this makes it faster than a traditional file server which is designed to perform a multitude of functions as well as file serving. Whilst a NAS server's operating systems code is optimised, it also makes the NAS server OS more reliable and better suited to file serving, which delivers information faster to the clients.

## ***How reliable are NAS Servers?***

All the components in a NAS server are designed for providing optimised data transfer to the client/server. Because of the nature of a NAS it has a reduced component count and an optimised operating system. These two things make a NAS server more reliable than a traditional file server. Many of the "true" NAS Servers feature full redundancy and no single point of failure.

One major benefit of deploying a NAS server in place of a normal file server is less downtime. Traditional Servers from time to time need upgrading or replacing whether to add more disk drives, processors or memory. This server downtime is not always planned and when it is planned, it is at an inconvenient time or date.

By separating the storage from the server, cost savings can be made by purchasing smaller profile file servers that need less space. If the need arises to upgrade the server processor/memory the important data is held on the NAS and therefore available at all times even though the application server is being upgraded or replaced.

Many of the Network Attached Storage servers offer various levels of RAID configurations. These can be no RAID so the whole useable NAS capacity is available or RAID levels 0, 1, 5. This ensures that the data is protected in the event of disk failure.

Some of the higher end Network Attached Storage servers also offer high levels of redundancy against component failure. Some of the features found on these models are redundant fans, power-supplies, processors, memory and motherboards.

## ***Applications and uses for Network Attached Storage***

### **Notebook / Desktop Backup**

An increasing amount of valuable information is stored on local hard disks and notebook computers including Outlook's PST files, spreadsheets, multi-media presentations, financial information etc. This information costs many times the cost of the hardware but the data is never or rarely backed up. Most NAS devices are now supplied with backup software that automatically backs up the file changes that were made since the last backup to the local NAS device when the user logs in or connects to the network. Should the notebook be stolen or desktop crash due to hard disk failure the data is now available for restore from the network.

### **Remote Offices**

Many small remote offices have numerous client PC's and a single server with connection over WAN to HQ. The data on this server should be backed up regularly and removed for safekeeping. Typically what happens is the person in charge of the backups is on holiday, leaves or off sick and backups do not get done. Should the server fail no one can now access the server for information. A way to overcome this would be to deploy a NAS device in the local office whereby user access is granted to the data and every night the data is synchronised with the remote office. This way the data is secured off-site and if the server fails users can still access the information locally.

### **Virtual Disk Library**

With ever decreasing backup windows the cost of managing and maintaining a backup of information is becoming problematic. The normal way to increase backup performance and decrease the backup window is to buy faster higher capacity tape drives and automate the backup solution. The problem is cost, unless you have purchased a tape library that can be expanded new tape hardware will need to be bought making your old tape technology obsolete, including all the tapes with the valuable information. A simple cost effective solution would be to deploy a Virtual Disk Library this mimics a real library with slots and cartridge capacities but is based on hard disks. Data can now be backed up at disk-to-disk speeds. When these virtual tapes are full the data can then be transferred to your real tape library and then the tapes stored for safekeeping. Should you need to increase the number of media slots or require additional tape drives all that is needed is to reconfigure the Virtual Tape Library.

### **7x24 Backup / DR Backup**

Most companies perform a backup once a day and typically at night. Should the backup fail for some reason, that night backups are never completed. This is especially critical at weekends when weekly full backups are run. Now herein lies the problem as full backups are run once a week and either incremental or differential are run daily should a server suffer failure, the backup tapes for that server would probably run into many tapes and take considerable time to restore. At best with backups being performed nightly you would lose a days work should server or disk failure occur, if you're an animation house this could run into many thousands of pounds.

Why not every hour replicate user selected files or entire volumes from one or more source servers to one or more target NAS servers over standard network connections. By doing this the data loss suffered is minimised to the last snap shot backup.

Many companies today have a Business Continuity or Disaster Recovery plan. Normally this consists of:

- Off-site location
- Room full of servers
- Backup tapes for restore
- Communication links
- Networking connections

These organisations then run periodic tests to check that they can recover information and be operating within the minimum timeframe.

In an ideal world “less is best” by this I mean less data = faster restores and availability. In reality many companies today have more than a terabyte of data. Now lets assume the following:

- Servers are all functioning correctly
- Backup tapes are free from defects
- Tapes are fully labelled and correctly marked
- Tape library hardware fully functional
- Backup software is working
- Operating systems are fully patched
- Communication & Networking links functioning

As a Disaster Recovery site is normally a scaled down version of the real site. Only critical data is restored first using a smaller robotic library or device.

Company “X” has 1 terabyte of critical information to restore within a 12-hour period. They have four LTO-2 tape drives 30MB/sec native transfer rate x 4.

$4 \times 30\text{MB/sec} = 120\text{MB/sec} \times 60 \text{ secs} \times 60 \text{ minutes} = 432\text{GB/hour}$

Now company “X” can restore the 1 terabyte of information in 2-½ hours right?

Well yes and no. It’s true restoring the data can take 2-½ hours but we live in the real world:

- How many companies are using LTO-2 tape drives in their Disaster Recovery site? They are probably still using LTO-1, Super DLT, DLT or DAT for recovery.
- How many companies backup critical individual server data to a single tape for restore?
- How many Disaster Recovery sites run Gigabit networking connections to the critical servers?
- How many companies interleave multiple server backups on a single tape?

In reality just to recover the critical data would take 2 or more days. This in the banking/trading house world runs in to Millions of Dollars/Pounds etc.

As explained above many companies with Disaster Recovery plans have:

- Two tape libraries one for the main site and one for the DR site

- Backup tapes are transported from the main site to the DR site for storage
- Tapes are duplicated at the main site to aid restores
- Two copies of backup/restore software are required

By utilising the disk snapshot utility, information can be restored in minutes with the minimum of fuss and inconvenience.

If you install a NAS at your main site and a NAS at your Disaster Recovery site and Snap shot the information from one site to the other or mirror the whole NAS and backup the information at your DR site cost savings can easily be achieved.

## **E-mail Archiving**

In light of the recent scandals involving WorldCom, Enron and Tyco regarding the deletion of e-mails. There is currently 63% growth in storage usage attributed to e-mail. Governments now have legislation in place regarding the storing and retrieval of e-mail and attachments for 7 years or more. Many companies have more than 200 employees and backing up either Exchange or Notes is a major headache for IT departments. The problems are the size of peoples mail boxes grow to utilise all the available disk space available, backups and restores of the whole mail system or individual mailboxes take longer due to the files types and information stored .avi, .jpg, .mov, .doc, .xls, .mp3 .pst etc.

Why not deploy a NAS server and automatically migrate aged files from the main mail server to the NAS. The user is unaware this has happened as he still sees the files as he would normally with the attachments. By doing this the backups on the mail server will be considerably quicker and in the event of failure the server can be restored much faster.

## **Reducing Networking Traffic**

If you have users within your organisation that regularly transfer large image files around the network i.e. movies, graphics, animations, pictures. Why not segment the users using a network switch and install a NAS device on their local network segment.

## **Consolidating Servers**

A server consists of four key components these being the storage, processor, memory and operating system. When you buy a server you would pay for disk drives, CD/DVD drives, SCSI controllers, RAID controllers, processors, memory, case, tape device and operating system license. These servers normally act as file & print servers or run applications. When the server becomes fully populated with disks another server is bought and so the cycle continues. These new servers sit alongside the older server or are complete replacement models. The valuable information stored on these servers then has to be moved/backed up and migrated to the new server all this takes considerable time, looking for service packs, software license numbers, patches, checking the new server will run the same applications as the old etc.

Why not deploy a NAS Server for disk storage or to run applications. These can be easily added and integrated in to your existing server framework with the minimum of fuss and no server downtime and be remotely managed via browser. Should you reach the capacity of your NAS Server create a virtual storage pool. For example, you can "pool" multiple NAS Servers together. Data that is not accessed frequently can be automatically migrated off of critical front-line servers

to NAS Server, freeing up overloaded servers for application use. When needed, users have immediate and transparent access to all of their critical stored data with no administrator intervention.

## **Archival Storage**

Traditionally information has been stored on magnetic media, typically in a RAID system. This provides a level of redundancy and fast access to information. On most RAID systems only about 20% of this information is active, the remaining 80% infrequently accessed. When the RAID system is full of information the IT manager has some options to choose:

- Install new hard disks - This creates a problem the server needs to be taken offline whilst the new disks are added formatted and partitioned.
- Archive the information - The problem when Archiving information is what are you actually going to archive? Do you send round a memo asking people to let the IT person know what files they frequently use or access? The answer is NO! So this is an ineffective way of moving files.
- Just delete or copy files to tape and keep a copy - This is great if no one wanted to access old information, but in the real world, people will always want to refer to an aged document.
- By having RAID systems with data that is infrequently accessed can cause the tape backup system to overrun or span multiple tapes as well as causing unnecessary wear and tear on the drives by backing up the same old files every night.

By implementing a HSM Software solution the user will free up valuable disk space, reduce the backup window, migrating the data to a NAS Server will be able to manage the data storage in a more flexible way.

## **Software Distribution**

How often do businesses need to send software updates to remote offices or stores? Some of these updates maybe price lists, brochure changes, service packs or anti-virus software updates. By having a centralised NAS Server updates can be put on the main office NAS and then these updates can be synchronised to the remote offices for use. The software works with one-to-many or many-to-one. Another use is estate agents have lots personnel and important data relating to house sales, this information is usually held on the various PC's around the office. If you install a small capacity NAS Server, every night this information can be synchronised with the remote office. Should anything happen to the office PC's the data is still secured remotely.

## **How can I backup my NAS Server?**

Many of the popular brand of NAS Servers have a built-in SCSI controller for which you can attach a tape drive, autoloader or library to backup locally or you can mirror the data from one NAS to another or back the data up to a central location across your network.

## **Applications for NAS**

- There are an estimated 5 million NT 4 servers in the world today with support ending in 2003, by moving the information from these file servers to NAS Servers will increase productivity and support.
- File/Print server
- Application specific server
- Video Imaging



- Graphical image store
- Centralised heterogeneous file sharing
- File system mirroring
- Snap shot critical data
- Replacement of traditional backup methods
- Medical imaging
- CAD/CAM
- Portable centralised storage for offsite projects

## **Summary**

As mentioned above Network Attached Storage NAS provides an excellent answer to serving files or running applications. They allow flexible easily managed storage to be controlled and deployed and used in a wide and diverse range of applications and environments.

## **About Fortuna Power Systems Ltd**

Founded in 1994 are a UK based ISO 9001:2000 registered company. Who specialise in providing Data Storage solutions to a large number of corporate, military, education and government sites.

The solutions we supply can be based on disk, optical (all formats), tape, NAS, SAN, iSCSI and application specific software.

For information on the Network Attached Storage devices we supply, please visit [www.naszone.com](http://www.naszone.com).