



The typical NAS installation involves three steps: (1) Plug in the electrical power. (2) Plug in the network cable. (3) Use your web browser to make adjustments to a couple configuration settings. In most situations, a NAS can be installed without any disruption of network services.

Another cost saving of a NAS unit: When a new server is purchased, it requires a new operating system. There must be enough Client Access Licenses (CAL's) purchased to allow everyone in the organization to access the new server. The operating systems on new servers come with 5 CAL's. All additional CAL's must be purchased. In a large organization, that could amount to thousands of additional dollars added to the cost. CAL's are not required on a NAS unit.

How does it work?

It works just like a file server. A NAS unit is essentially a self-contained computer connected to a network, with the sole purpose of supplying file-based data storage services to other devices on the network. It connects to a network just like a file server does. Users access data on the NAS the same way that they would access data on a file server. A NAS unit can coexist on networks with file servers or other NAS units. In fact, the average computer user would not notice any difference between accessing data on a NAS or accessing data on a file server.

What's in the Box?

If a network attached storage unit and a file server were placed next to each other, most IT professionals would not be able to tell the difference – unless they knew something about the specific devices in front of them. The hardware is pretty much

the same. A NAS contains a computer and a bunch of hard drives, often arranged into logical, redundant storage containers or RAID arrays (Redundant Arrays of Inexpensive/Independent Disks). For a more detailed explanation of RAID, refer to the article "What is RAID?" on the bottom of page 4.

The computer in the NAS runs a specialized operating system that provides the functionality of data access and storage, file system management, and network communication. It also provides the management of these functionalities. The operating system might be loaded from a USB thumb drive, its own separate disk drive, or from the disks in the common storage space.

What is the storage capacity of NAS?

A single NAS unit can store as little as 320 Gigabytes – that's not much more storage than the hard drive in a typical computer workstation. Depending on the needs of the organization -- regardless of how much capacity is needed -- there is a NAS unit that could meet the need. The typical NAS may range in capacity from 1 Terabyte (1 terabyte = 1,000 gigabytes) to around 40 Terabytes. A unit of that capacity would be rackmounted and occupy 14" of space in the rack. If that isn't enough storage, there are some units available today that measure storage capacity in Petabytes (1 petabyte = 1,000 terabytes!).

If a NAS is so great, why is a file server needed?

A NAS has a single function, storage and retrieval of data. A file server has many more functions to perform as it stores and retrieves data. Unlike NAS units, file servers control network security, they assign IP addresses to



workstations on the network, they can host the organization's Internet web site, they can process all of the organization's email – a NAS can't do that. If you have a file server now, you will continue to need a file server. But the addition of a NAS unit to your network would add significant amounts of data storage without adding any workload to the current server. And by moving some high-use files to the NAS, it might actually reduce the file server workload, prolonging its useful life.

What does it cost and what do I get for my money?

Entry level: For small offices that have only a peer-to-peer network (no file server) there are several interesting choices. For street price of about \$125, you could purchase a 500 GB drive in a desktop enclosure that will communicate over the network at up to gigabit speeds (LaCie Ethernet Disk Mini Home Edition, manufacturer's part# 301269U). Need more storage space? LaCie also makes a 1 TB version (manufacturer's part# 301257U) and a 2 TB version (manufacturer's part# 301259U). The units provide basic functionality. The manufacturer provides a 3 year limited warranty.

Midrange: Moving up in price, storage capacity and functionality, LaCie has another desktop unit with a storage capacity of 2 TB, 3 TB, or 4 TB (LaCie Ethernet Disk RAID, manufacturer's part#'s 301161U, 301162U, 301235U). There is also a rackmount version of the same product (manufacturer's part#'s 301298U, 301299U, 301300U). This unit has 2 10/100/1000 network connections and supports up to 25 users. It also has 2 USB connections to which additional USB

devices could be attached. The disk drives in these units are hot-swappable, and can be configured as RAID 1, 5, 5 w/spare, or 10. It includes Windows Client Backup and Recovery. Prices on the street are \$900, \$1,300, and \$1,700 for the 2, 3, 4 TB units respectively. It also has a 3 year warranty

Netgear also makes a product with the same storage capacities as the previously mentioned devices, but with more features. The Netgear ReadyNAS also comes in desktop or rackmount versions. These units will support up to 100 users. In addition to all of the previously mentioned capabilities, these units come with EMC Retrospect backup and recovery software and an integrated backup manager. The units have USB connections and integrated print server support. Its operating system provides features that make it more desirable for use with networks that have file servers. The rackmounted versions of this product are known as Netgear ReadyNAS 1100, have capacities of 1, 2, 3, 4 TB (manufacturer's part# RNR4425, RNR4450, RNR4475, RNR4410), and range in price from \$1400 to \$2600 on the street. The desktop version, known as Netgear ReadyNAS NV+, have similar capacities, and range in price from \$900 to \$2250 on the street. All of the Netgear units have a manufacturer's 5 year warranty.

High-End: Once the capacity exceeds 4 TB, the NAS units are all rackmounted and the number and variety of hardware and software options increases dramatically. Purchasers get to choose number of slots for hard drives (usually in multiples of 4), size and type of hard drive, number of processors, operating system, backup



software package, network connection type (10/100/1000 is standard, but there are ways to connect storage into a data network at phenomenally higher speeds via fiberoptic cable) – Almost like configuring a file server. And how much would a fully tricked out 40TB NAS device cost? About \$25,000. If your needs are more modest, the drop in price will be approximately equal to the drop in desired storage capacity. There's something for everybody.

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In these uncertain economic times, it is even more critical that organizations extract maximum value from every dollar spent. When faced with the need to purchase desperately needed hardware to allow staff members to do their jobs, administrators are often faced with the unpleasant choice of paying too much or going without.

When the need for additional data storage space arises, network attached storage is one way to focus the money spent on the problem at hand.

What is RAID?

RAID is an acronym for **Redundant Array of Inexpensive (or Independent) Disks**. A RAID array is a series of hard drives which together act as a single storage unit. There are many different ways that RAID can be configured. It is all about tradeoffs among capacity, performance, redundancy, and recovery from errors. This usually requires a compromise between cost and speed. There are 3 concepts that are important to RAID:

- **Striping:** RAID can intersperse pieces of data across multiple drives
- **Mirroring:** RAID can duplicate pieces of data on multiple drives
- **Parity:** RAID uses this to determine if the data has been corrupted and also to reconstruct missing or corrupted data

Each RAID level defines a different way to spread data across multiple drives for performance or data integrity. Here are the more commonly used RAID configurations:

RAID 0 - Disk striping only, which interleaves data across multiple disks for performance. This level is intended to provide maximum storage capacity and maximum performance, but has no safeguards against failure.

RAID 1 – Disk mirroring only, which provides 100% duplication of data. This yields the highest reliability, but doubles storage cost. It has no performance improvements.

RAID 5 - Data is striped across three or more drives for performance, and parity bits are used for fault tolerance. The parity bits from two drives are stored on a third drive and are interspersed with user data. This level of RAID can recover from the failure of one drive in the array. RAID 5 is widely used in file servers.

RAID 6 – This level has the highest reliability since it can recover from a failure of two disks, but not widely used. It is similar to RAID 5, but performs two different parity computations or the same computation on overlapping subsets of the data.

RAID 10 – This level of RAID is RAID 1 + 0. The drives are striped for performance (RAID 0), and all striped drives are duplicated (RAID 1) for fault tolerance.

RAID-50 (or RAID-5+0) - This type consists of a series of RAID-5 groups and striped in RAID-0 fashion to improve RAID-5 performance without reducing data protection.



Is Metered Internet Usage Coming?

In June of this year, new Time Warner Cable Internet subscribers in Beaumont, Texas, will be limited in the amount of data that they will be allowed upload and/or download. Those who go over the limit will be charged \$1 per gigabyte, a Time Warner Cable executive told the Associated Press.

According to Kevin Leddy, Time Warner Cable Executive Vice President of Advanced Technology, the new pricing plan is a means to deal fairly with Internet usage which varies wildly among Time Warner Cable's subscribers. Supposedly, just 5 percent of the company's subscribers take up half of the capacity on local cable lines. Other cable Internet service providers report a similar statistic.

"We think it's the fairest way to finance the needed investment in the infrastructure," Leddy said.

The Internet service plans announced for Beaumont, Texas start at \$30 per month for a relatively slow 768Kbps connection that has a meager 5 Gigabyte (GB) cap, to a \$55 per month service that caps the data uploads plus downloads at 40 GB. For anyone who only uses the Internet for Web surfing or email, the imposed limits will be no issue. If however, the user regularly downloads movies or other video, it won't take long to use up the monthly upload/download allotment, since viewing a standard definition movie will consume about 1.5 GB, and a high definition movie can easily use 6 – 8 GB.

Commentary on the billing change is decidedly mixed. One group feels that those who hog the Internet resources should pay more. On the flip side are those who feel that Time

Warner is only trying to maximize its profits by setting unreasonably low limits on Internet usage. The critics of the new billing plan point out that Comcast, the largest cable company in the U.S., has made it known that they are considering an absolute usage cap of 250 GB per month, which is more than 6 times the high limit imposed by Time Warner. Other companies that have usage caps have set them at 100 GB per month, with overage charges of \$1.50/GB.

Other than the commentary regarding how many gigabytes per month is fair, other critics have pointed out another possible motivation for the upload/download caps. Cable companies make money by offering pay-per-view and video-on-demand services. Other Internet video services are competition. By placing data limits on their subscribers, cable companies indirectly reduce the volume of competitive services.

At first glance, these upload/download caps may seem like acceptable limitations arrived at by careful consideration. But increasingly, the Internet is being used to distribute software applications, provide video conferencing, facilitate file backups, and other data-intensive activities.

Cable service providers are not the only purveyors of high speed Internet access. Verizon offers DSL almost everywhere today and its new FiOS service (telephone + internet + television + movies) is becoming more available. Time Warner Cable might find its subscriber base decreasing if it attempts to force all users onto a capped usage plan. Meanwhile, other ISP's will be closely watching the results of the Time Warner experiment.



WNYLC Web Statistics For July 2008

Total Hits.....501,243
 Number of Pages Viewed.....166,891
 Total Visitors.....72,413
 Average Hits/Day.....16,169
 Average Pages /Day.....5,383
 Top Web Browsers Used:
 Internet Explorer 7.x.....51%
 Internet Explorer 6.x.....24%
 Firefox.....7%
 Safari.....<1%

Top 5 Operating Systems Used:
 Windows XP.....66%
 Windows 2000.....4%
 Windows Vista.....8%
 Windows 98.....<1%
 Mac OS.....1%



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