

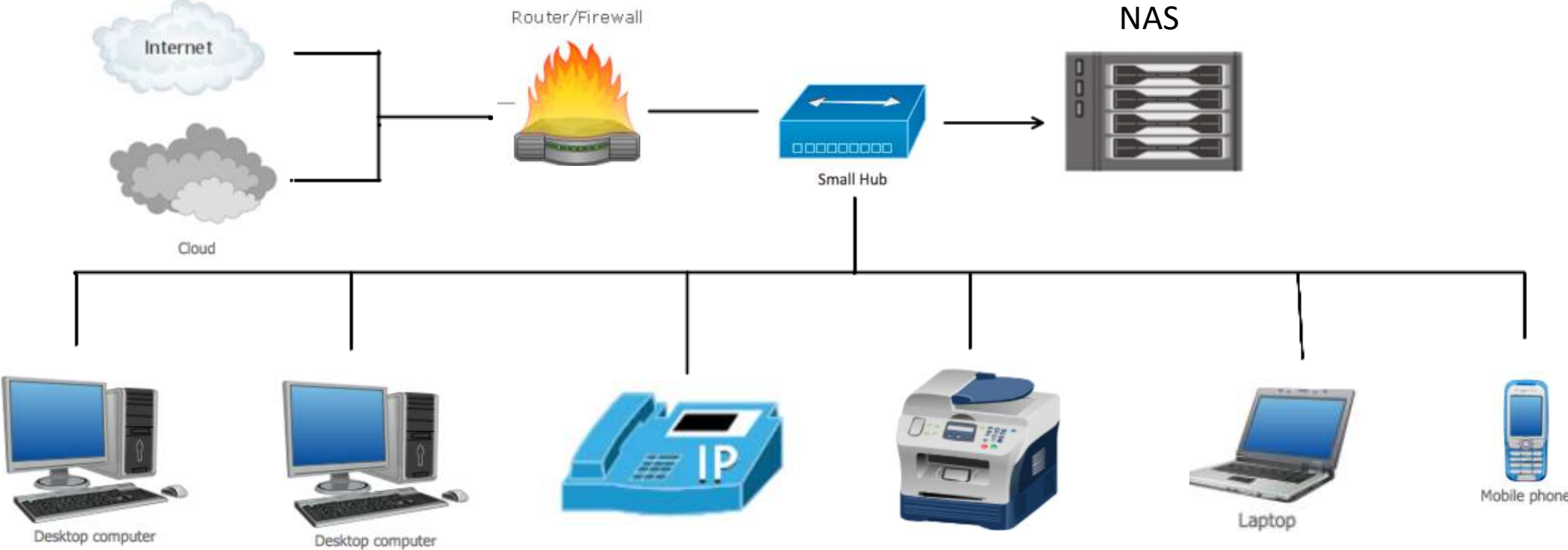
# NAS units for the home environment

Just the name **N**etwork **A**ttached **S**torage unit barely begins to explain what it is, what they do out of the box, what can they do for you, or how to use them effectively. Do you even need one? How do they connect to your network? If you do need / want one, which one?

# NAS or DAS?

- Most people are familiar with a DAS (Direct Attached Storage) device, these include mostly USB devices, they can be hard drives, memory sticks, etc.
- Typically, A DAS device is accessible only to the user whose computer it is attached to. Although it is possible to share it with other users on the network, this requires some special setup. And that availability is only when the computer it is attached to is running.
- Some routers are capable of sharing a DAS device attached to it; but options are very limited there.

# How does a NAS connect to your computer?



- A NAS is typically hardwired to the network, and wireless connectivity is possible via your router. The reason for this is that the WIFI connection is just too slow (compared to hardwire), has too much latency, is more susceptible to interference and range issues, and is considered more secure.
- A NAS shines when servicing multiple clients, it can stream video or sound, run a backup in the background, and service multiple users at the same time without hesitation.
- A NAS is secure:
  - It can be “divided” in multiple “drives” accessible only to the user it is assigned to. If you have kids for instance, they can have their own area, while you keep your data secure.
  - It can provide a group access, so in addition to the individual profile, you can provide a “shared” drive for everyone to use.
  - For instance, the picture albums can be shared. Now to be safe, you can set those to read only so no one can accidentally delete something.
  - Data is copied to multiple drives; if a drive fails, it will give you an alert. When you replace the drive, it will rebuild the data on the new drive automatically. Everything continues to work as normal, although service may slow somewhat during the rebuild process.
  - Even if someone gains access to your network, they will not see any of your data if the NAS is configured properly.
  - If properly setup, the NAS can give you access to your data from remote locations via the internet. That function is often referred to as a private cloud service.



A NAS will have minimum 2 hard drives, most common for small networks is the 4-drive unit, but units with 6 or 8 drives are often used in small office environments.

## Why multiple drives?

Quick answer: Speed and redundancy. A **2-drive** unit has three configuration options, Mirror, Stripe or Span:

1. Mirroring is easy to picture, both drives are written with the same data. Advantage: redundancy. If one drive fails, no data is lost. Disadvantage: capacity of a single drive, speed of a single drive. This is referred to as RAID 1
2. Second option: Stripe. In this case data is split in two parts, each part written to a different drive. Advantage: speed is much greater since parts of the data is now written to two drives. Total data capacity is twice that of a single drive. Disadvantage: if either drive fails, all data is lost! This is referred to as RAID 0
3. Spanning the drives is simply adding the two drives into one unit. This is a useless option with the only benefit of double the space of a single drive. No speed advantage, and if one drive fails, most or all data is lost.



A **4-drive** NAS has more options, I suppose all four drives could be mirrored, but that would be paranoia to the extreme, and I'm not even sure if that is an option on any units. Striping or spanning all drives would create an unacceptable high risk if a single drive would fail.

The perfect option therefore is to stripe two drives, and mirror that pair. This is known as RAID 10 (actually 1 + 0). This configuration can survive 2 simultaneous drive failures, provided they are not in the same mirror pair. Double the speed of a single drive, double the space of a single drive. That is a lot of performance and security!



A 6-drive (or more) provides for more drives to stripe and mirror, or in some cases to create virtual NAS units. All of these are large (expensive) enterprise options, and not suitable for home use.

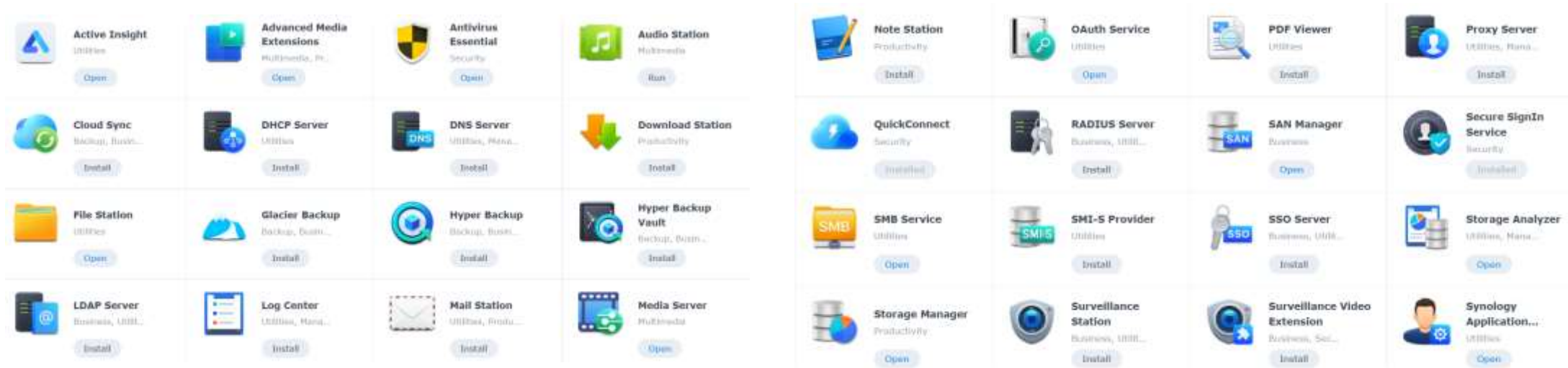
The hard drives used in any NAS unit are not the same drives as used in your PC, although they will work. NAS drives are optimised for the way they are used in the NAS, and provide better performance and reliability vs. regular hard drives. Since they are only marginally more expensive (if at all) using these drives is highly recommended.

In order to replace a failed drive, most home / small office units need to be powered down. Replacement is usually easy, and takes only a couple of minutes, and often can be done without tools. Hot Swapping options are available in high end and enterprise units where even a few minutes of downtime cannot be tolerated.



External connections are simple; aside from the obligatory power cord, there will be one, sometimes two ethernet connections. In the home network only one will be used, and usually connected to either a switch, or a port in your router. In the home you could use the second port to give dedicated access to the NAS to for instance security video cameras. USB ports are usually provided for communication with a UPS unit, or even a thumb drive if you wish. It may have a port for a monitor.

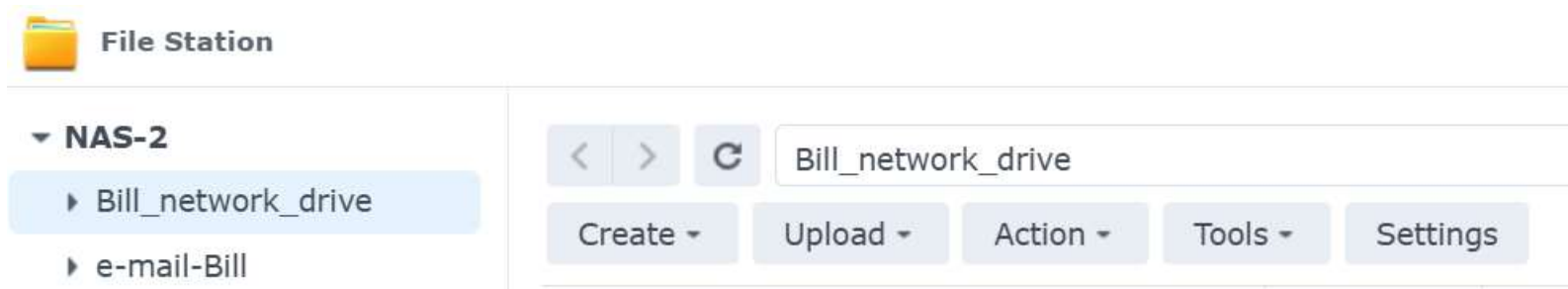
A UPS is highly recommended. The NAS unit may have cache memory to speed up drive access. This memory can be turned on / off in the unit configuration. If the NAS is used without a NAS, it is recommended to disable the cache. A UPS will ensure that in case of a power interruption all the data sent to the NAS will be written to the disks. A proper UPS will communicate its status to the NAS, and the NAS will use that communication to properly and safely shut the system down when battery power gets low.



The NAS supports a plethora of apps, many of them advanced items, but also a number of potentially useful ones. I like my media server; I can play movies and music directly from my smart TV. I can also view my pictures on the big screen.

When I travel, I set my NAS up as a virtual private cloud, and I can access all my data where ever I go. Nice at the cottage!

It has backup options, You can host your own webserver (Apache), mail server, and many other things I don't understand either.

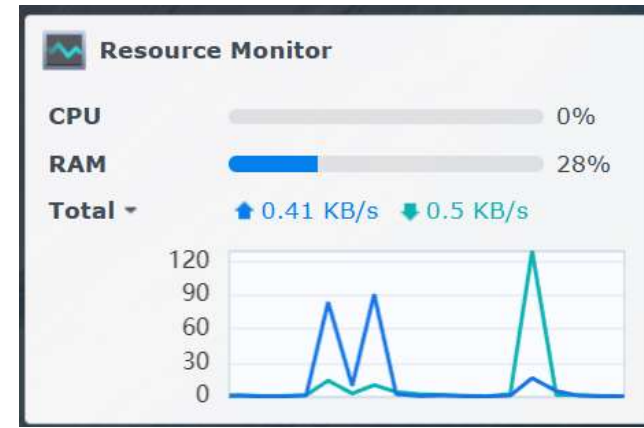


The file station (or whatever your NAS calls it) is where a lot of the magic resides. Here you configure users, groups, folder access, access credentials, quota's etc.

In my house I have 6 users, my wife and I, three kids, and a guest. The kids are all moved out, but can still access their account remotely, allowing them to off-site backup of important information. A cloud service hosted at my house.

Each user maps a drive (we use H: for Home) to my NAS, and they see their own stuff. In that drive they have full authority to do what they want. Within my house access is fast, indistinguishable from a local drive. All applications that produce data are configured to save to that drive, so absolutely NO DATA is stored on the PC or laptops.

This also means that regardless what device I use, I always see my data as if it was all on that device.



Do **YOU** need a NAS?

Many years ago, I started with a Novel network server running on an Arcnet network. It was eventually replaced with a Windows NT server running 10BT ethernet. Now I run a NAS with 2.5 Gbps ethernet.

I like the flexibility and security the NAS provides me, in all the years of computing I have never lost important data. Twice I have experienced catastrophic HD failures, one in a NAS, one in a PC. Neither caused loss of data; the PC only has applications (which are also backed up on the NAS), the NAS drive was simply replaced and rebuilt itself.

I love my media server.

I like the flexibility of being able to access my data from any device, in any location.

# The cheap “NAS”

Many of us have an old HD somewhere in a drawer we saved from a discarded or unused computer or laptop. That HD may be useful yet! If your router has a USB port, and supports file sharing, you may be able to put those to good use.

You can purchase a HD enclosure with USB connection for your spare HD from a lot of places for not much money. Plug it into your router, and set it up for sharing.

It is of course not the same as a fully qualified NAS (hence the quotation marks), but it will be very useful as an additional backup unit, or just to share pictures with others on your network. Just be aware that this would be visible also to visitors you give access to your network unless you have a “visitor only” option enabled. Many routers do, but router setup is a bit beyond the scope of this presentation.

## **A little more about speed.....**

- A 1 Gbps ethernet connection has a theoretical 125MBs throughput, realistic speed is about 105 – 115 MBs, and is the most common today.
- A single HDD supports about 150 – 200 MBs
- WIFI 4 (802.11n) theoretical: 18.7 – 75 MBs, realistic speed is only about 5 – 18.7 MBs. One of the (several) problems with WIFI is that it only supports half duplex, meaning it can not support send and receive at the same time. It has much greater protocol overhead compared to ethernet. Interference and distance loss result in lost or damaged data packets, needing to be resent.

### **What does this all mean in the context of this discussion?**

- For home use with only a few users, a NAS with two drives, mirrored for redundancy is sufficient.
- Ethernet connection is preferred over WIFI.
- When working on WIFI, keep data files local, backup often to the NAS (preferably any time a change is made so a current copy is available when working on another computer.
- When connected to ethernet, data files can be comfortably saved directly to the NAS. Very intense work (such as video editing) is best done locally, saved to the NAS when done.
- A NAS with 4 drives is probably overkill, unless you want a very large drive set (> 30TB or so)
- A solid state HD based NAS is definitely a waste of money (especially with the cost of those today)

# For the techies.....

- The NAS uses SMB to communicate with the network
- The Bonjour service is used to make the NAS discoverable on the network
- The optional DNS server can speedup multiple consecutive look-ups, as well as hosting internal custom addresses. Many will also allow blocking of unwanted websites. Not needed in most home setups.
- Web Station is used to host your own websites. Best used in conjunction with DHCP and DNS service for stability. Most will support Apache HTTP server.
- Can host a DHCP server, but in most home networks the router would host this service. If it is an “air gapped” network, DHCP would need to be installed to guarantee internal network connectivity.
- Many will support a Mail service, it will connect to multiple mail servers, and store all your mail in one local place.
- A number of media servers are available, some may be included, others are readily available for download.
- Language support packages are available: PHP, Python, Perl, Node, etc.
- A number of backup services are available, including Time Machine.
- Will support Apple and Microsoft Windows simultaneously.

Questions?