Network Attached Storage (NAS)

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Synology 5-bay DiskStation DS1522+

I ended up getting the Synology 5-bay Diskstation DS1522+ from Amazon for $699. Never having dealt with NAS before my decision was based more on trying to buy a high-end unit so I would be covered in case I realized I needed something later. Now that I know more about NAS, I probably would have bought a more middle of the road (and cheaper) unit in retrospect because my needs are not that great.

My overall opinion about this product is very good. I was very impressed about how easy it was to get up and running even though I knew very little about NAS units. The unit has so many features that it's hard to imagine a scenario that it would not cover. My only disappointment was Synology's technical support which, in my one attempt to get an answer, was so pathetic that I will never use them again. It took days to get an answer and then it was clear the representative hadn't even bothered to read my questions and just gave an inane stock answer that had nothing to do with my questions.

Cost

By the time I ended up buying all the extra pieces required to properly configure the NAS in my basic configuration, it had cost me about $1,500.

If I continue to expand it to support new uses, that cost could easily go up to around $2,000 or so.

RAID Support

RAID support gives your server extra performance or reliability at the expense of higher cost for extra disk drives. RAID 0 gives you extra speed (used for streaming video) whereas RAID 1 gives you extra reliability (used for critical data.) There are other more esoteric RAID types but you would rarely use these for home use.

I chose to use RAID 1 which will guide some of the other topics in this document.

In RAID 1 the data is mirrored across two drives so that if either drive fails, the data can still be read from the other.

Some NAS (including the Synology DS1522+) support a "hot swap" feature which allows you to install a 3rd physical drive which normally sits idle but gets automatically switched in to replace a failing drive in the core set of two drives. This is a very nice feature that further enhances data reliability but does require an extra drive bay.

Disk Drives

I ended up using Seagate (Recertified) IronWolf Pro 18TB Enterprise NAS Internal HDD drives but there are many other good options available as well. These cost about $200 when recertified and several hundred more if new.

Drive Type

Typically spinning disk drives are used for speed in a read-write environment rather than SSD due to SSD high write times. However, if you had a special application that mostly only read data, I suppose you could use SSD.

Drive Speed

Data access times are based on several factors, rotational speed is prime factor here. For fast access you would want the fastest rotation speed possible. Typically, 7200RPM is used.

Drive Size

Since rotating disk drives are limited by sequential access you would, ideally, want to size each RAID drive to one specific application. To illustrate this point, if you were going to backup data and stream video on the same physical drives they would end up "fighting" each other for access to the drive. So, in some applications it is actually better to have several smaller RAID drives rather than one big one.

Enterprise Class Drives

Frequently, a RAID controller is configured to "drop" a component drive (that is, to assume a component drive has failed) if the drive has been unresponsive for eight seconds or so; this might cause the array controller to drop a good drive because that drive has not been given enough time to complete its internal error recovery procedure. Consequently, using consumer-marketed drives with RAID can be risky, and so-called "enterprise class" drives limit this error recovery time to reduce risk.

Write-cache Reliability

There are concerns about write-cache reliability, specifically regarding devices equipped with a write-back cache, which is a caching system that reports the data as written as soon as it is written to cache, as opposed to when it is written to the non-volatile medium. If the system experiences a power loss or other major failure, the data may be irrevocably lost from the cache before reaching the non-volatile storage. For this reason, good write-back cache implementations include mechanisms, such as redundant battery power, to preserve cache contents across system failures (including power failures) and to flush the cache at system restart time.

Synology Approved Drive Support Issues

The Synology DS1522+ (and most of their other NAS products) try to force you to buy only Synology drive products – for obvious business reasons and to lower their support calls to products they have already tested.

For spinning disk drives, this results in a cautionary warning which you can bypass.

Problem Using Non-Synology SSD Drives

However, for M2 SSD drives, it simply WON'T allow you to use any other manufacturer drives when creating a Storage Pool. The Synology SSD drives are about 2x as expensive, and limited in size, as other brands. This is colossally annoying to find out after you already spent hundreds of dollars on SSD drives!

You can, however use non-Synology SSD drives as cache for your spinning drive Storage Pool. This can be useful in some cases, but in a simple file server, the cache is generally a waste and may even slow down access.

Work-Around to use ANY Drive

Some clever guys figured out a work around for this which you can get here:

> Add your HDD, SSD and NVMe drives to your Synology's compatible drive database

I have not tried this out yet, but it looks like it should work. You need to enable SSH support on the NAS (Control Panel – Terminal & SNMP – Enable SSH AND Set Security Level to LOW), SSH in, install the scripts, run them and reboot. Please read the full documentation before starting this.

This essentially detects all of the 'actual' drives installed on your NAS, and then updates the list of 'approved' drives to include all of them. Remember to reboot after running the script so that the updated list of 'approved' drives is read in by the OS.

UPS Support

If you are at all serious about data integrity, you will want to provide power backup for your NAS using a UPS. If you buy a NAS with UPS support, you don't need a huge UPS, just one that will hold the power up long enough for the NAS to gracefully shut down.

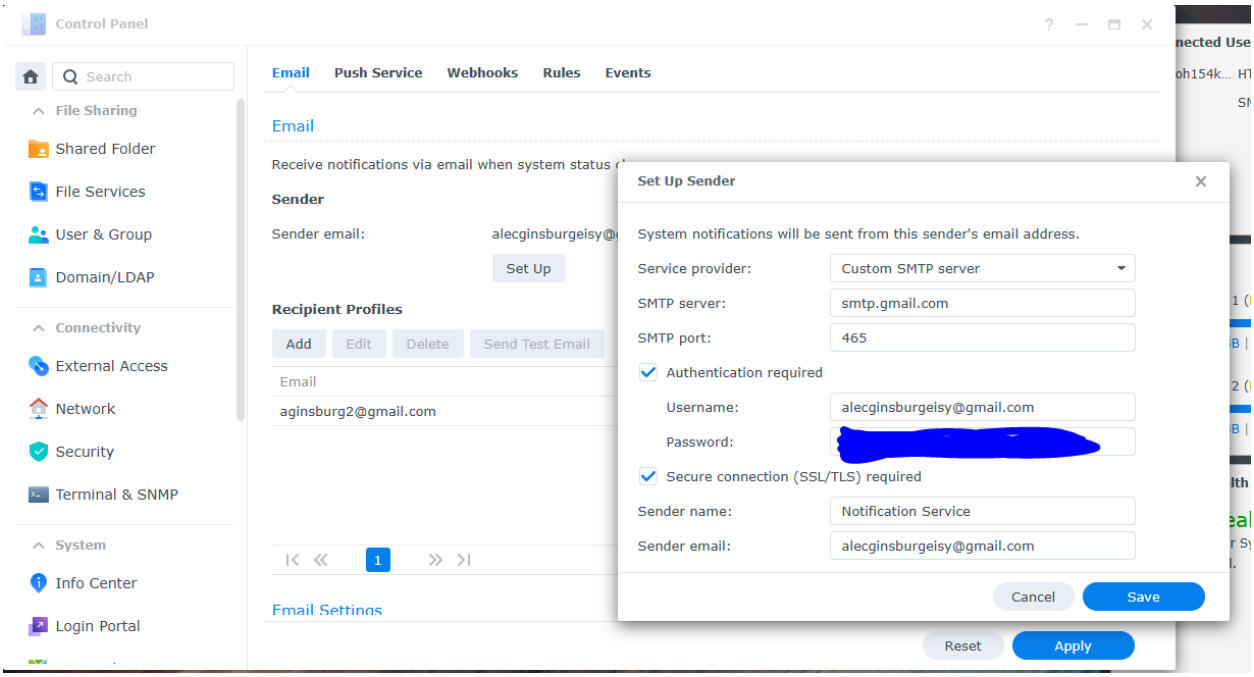
If on the other hand you need your NAS to continue operating through a long power failure, you will need to properly size your UPS and spend significantly more money on a larger unit.

NAS Notifications

Typically, you will want your NAS to support features where it can notify you (via email) of any problems encountered. In order to this you need to configure your outgoing email server.

First of all, for security, I would recommend configuring a separate (from your everyday used) email account so that you don't risk compromising your main email password. This is very easy since you can setup as many Gmail accounts if you like.

One annoying flaw in the Synology DS1522+ is that using the "Gmail" drop-down option in the "Set Up" button below locks you into whatever you initially configured – i.e. there is no way to change it later. It took me about an hour of frustration before I realized I could use the "Custom" (instead of "Gmail") Set Up choice which is much more flexible and allows you to change your mind afterwards.



Other Features

There are many other NAS features, like sharing your data on the internet, but I chose not to use them in my application.

Where to put your NAS

If you have never had a NAS before you will be surprised at how NOISY they are! Ideally you will want to put them as far away from your work area as possible, however this may not be practical in all cases.

One thing I did was to put some 2” foam underneath the NAS to dampen the drive noise (see picture below.) This was quite effective and relatively inexpensive. I would guess that about 50% of the noise was eliminated by this simple trick.

IMPORTANT – you must cut out an air channel in the foam (as shown in the image on the right above) so that the SSD cooling slots on the bottom of the chassis can receive air flow. Failure to do this results in the SSD and logic board running about 25 degrees fahrenheit hotter than normal.