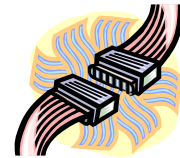


Keep your data highly available.

QSnap is a very efficient, reliable and easy-to-use tool. You never know when disasters will strike you. In case the following troubles come upon you, you know you have the right tool to resolve them with no fear and confidence!

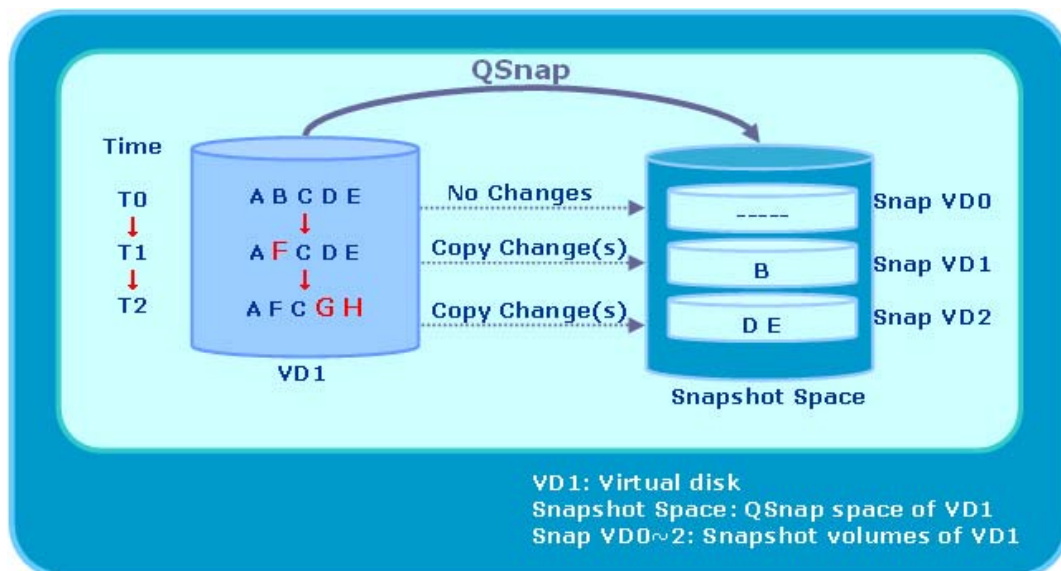
Incidents such as

- Virus attack causing files corrupted or partition contaminated
- Files deleted accidentally
- Files overwritten accidentally
- Partition deleted accidentally
- IT manager encounters a faulty bus connection or the bus system is somehow crashed, which leads to data files lost in transaction.



How QSnap works

The Qsan QSnap uses the copy-on-write on the Virtual Disk (VD) to copy the changed blocks, just before they are going to be overwritten, to a preserve space which is configured in advance on RAID Group which the Virtual Disk resides in.



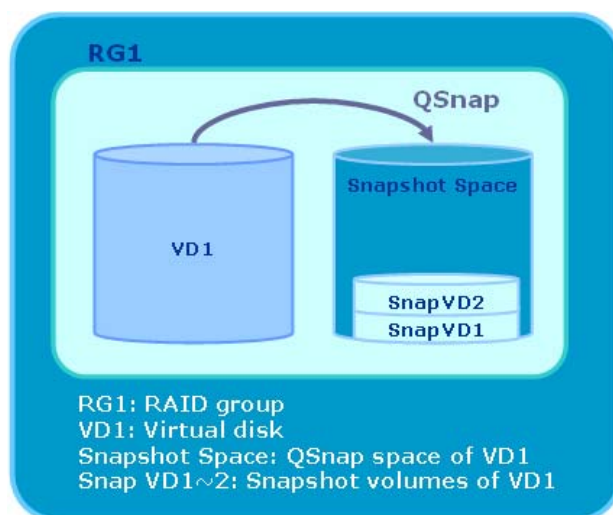
Because of the copy-on-write mechanism, it is fast to take a snapshot on the Virtual Disk to make a copy image. The space needed by the snapshot to backup the data depends variously on how much data changes on the Virtual disk. And because the snapshot copies the data changes at block level in RAID system rather than file level, users will need the target Virtual Disk which the snapshot is taken from, to restore the data. Snapshots with

the same target Virtual Disk also have dependence on each other. If one snapshot (VD₂) is damaged or deleted, all the precedent snapshots (VD₁ VD₀) will become invalid.

By attaching a LUN# to QSnap VD, you may read, write, and verify files in snapshot VD before you roll it back to the target VD. Our snapshot space is always expandable as long as there is space in the raid group (RG).

QSnap Advanced Planning

Qsan QSnap employs source volume (VD – virtual disk), snapshot space, and snapshot volumes (Snap VDs) as the following figure. The QSnap planning consists of determining the frequency that Snap VDs are taken, the lifespan of Snap VDs, and the size of snapshot space. The answers are determined by analyzing the application needs and measuring write workload.



The planning consists of the followings:

1. Analyzing application needs
The application needs are related to the data availability rate and how long the application can tolerate before data is retained.
2. Determining the frequency of Snap VDs
The frequency of Snap VDs is determined by how long data can be lost in downtime without significant impact to your business. Ideally, we all want no data loss. But it may cost a lot from infrastructure to storage system investment. The IT administrators have to make reasonable decision with reasonable cost. If losing a day of data is acceptable, the frequency of Snap VDs should be setup as daily.
3. Determining the lifespan of Snap VDs
The lifespan of Snap VDs is the length of time a Snap VD is held, before a new Snap VD overwrites. The lifespan is determined by two factors.
 - The frequency of the Snap VDs: Each VD can support up to 32 Snap VDs. If the snapshot space is bigger than the size of 32 Snap VDs, the lifespan can last for 32 times.

- The size of snapshot space: If the snapshot space is only designed for 15 Snap VDs, when the 16th Snap VD is taken, the 1st or oldest Snap VD is overwritten.

For example:

- How many Snap VDs are held: 14 (at least)
- Snap VD frequency: Daily (every 24 hours)
- 14×1 (daily) = 14 days
- Lifespan of Snap VDs = 14 days (at least)

4. Sizing the snapshot space

The size of the snapshot space can be determined by your system requirement.

- Measuring the amount of write workload over a specific time
- Calculating the amount of data during the lifespan of a Snap VD
- Multiplying times of the number of Snap VDs

5. Measuring the write workload of your application

Workload data can be collected by using performance monitoring software. The major purpose is to collect data that can show the actual workloads during high peaks and spikes. The collecting period should be longer than or multiples of your lifespan of the Snap VDs to give more accurate prediction to the snapshot space.

6. Safety factor and annual increase factor

It is recommended to calculate a safety factor of 20%. It is also advisable to consider that data increases every year. If the annual growth is predictable, multiply your factor or use 20% for common growth rate every year.

For example: the application needs 2 weeks of backup and cannot lost data more than a day. Accordingly, the lifespan is 14 days, and the frequency of Snap VDs is daily.

The peak data change over one day: 20GB

The number of Snap VDs: 14 at least

The lifespan of Snap VDs: 14 days at least

The base snapshot space size = 20GB x 14 Snap VDs = 280GB

Considering the safety factor:

The snapshot space size = 280GB x 1.2 = 336GB

Considering the annual increase factor for 3 years:

The snapshot space size = 336GB x $1.2^{(3-1)}$ = 484GB

Note: Qsan QSnap is array-based local backup. If the data grows faster than we expect, the snapshot space can always be extended later as long as there is still free space in the RAID group.

Why QSnap is your choice?

Statistics show that 30% of Raid Group space is left unutilized. With this extra space, we can add an extra layer of safety procedure to your file system. Cost per gigabyte storage goes from \$6.33 in 2005 to \$1.50 in 2010. The trend is you will get larger but cheaper storage space in the future. So using extra space for security protection is really worth your investment. If you do have extra space left unused in the VD, don't hesitate. Go straight to enable QSnap!!

How to setup/enable QSnap?

1. In web UI, select "/ Volume configuration / Virtual disk".
2. Check the gray button next to the VD number; click "Set snapshot space".
3. If you are not sure what size of snapshot space should be, set the size of snapshot VD as 100% , and click "OK".

Take snapshots

1. "Automatic" is recommended.
2. In "/ Volume configuration /Virtual disk", check the gray button next to the VD number; click "Auto snapshot". Or in "/ Volume configuration / Snapshot", click "Auto snapshot".
3. Set the time period as daily.

Recover your files or rollback

1. Select which snapshot (VD₀, VD₁, or VD₂) you want to go back in time when the snapshot was taken.
2. "Expose" the snapshot VD and attach a LUN# to it.
3. Check the new drive and verify the data files.

Or

1. Select the snapshot VD you want to rollback, click "Rollback".
2. Data files in snapshot VD will be rolled back into the working VD.

With QSnap, you can use least efforts and manpower involved to make the best use of your extra/unused space in the Raid Group to get the best error-proof solution for your file systems. Better and more efficient use of your disk array space with even lower TCO (Total Cost of Ownership). This is what YOU GET.

Qsan delivers total storage applications to reduce data risks and increase service availability. For more information, please call us at +886-7720-2118, or visit our website at www.QsanTechnology.com.