QNAP

Best Practice Reveal

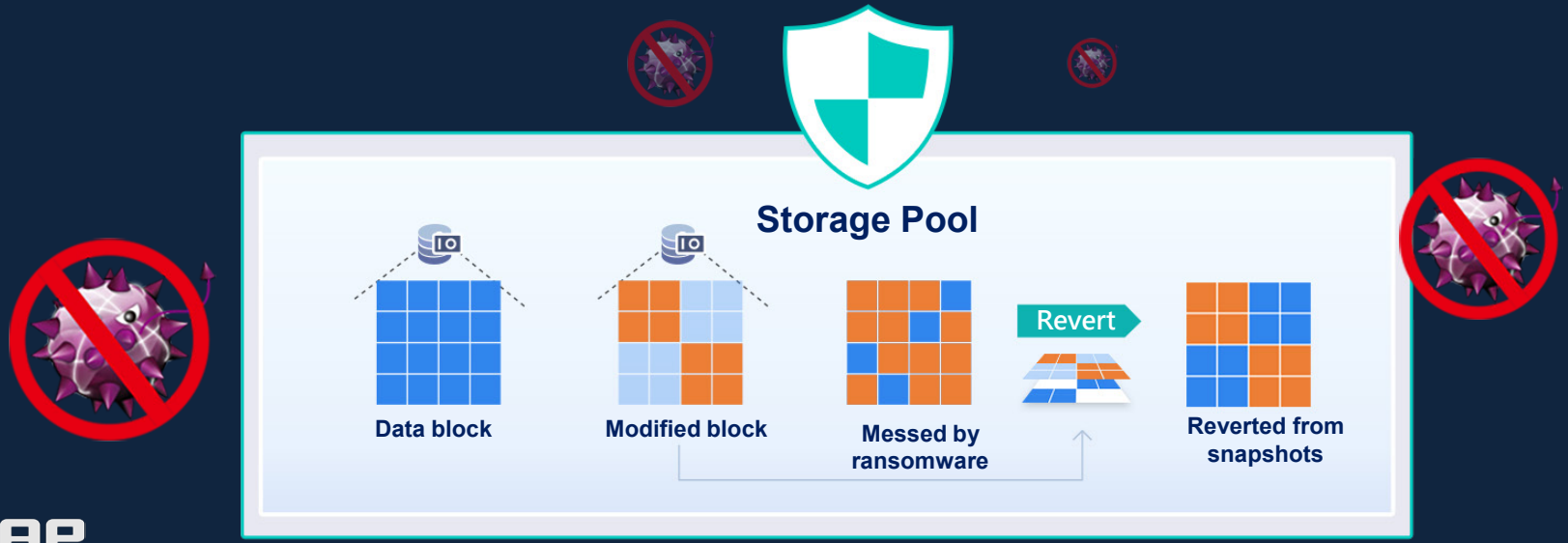
QNAP NAS
Snapshot & Storage Management

Your Challenges, Our Solution

How Much Space Will Snapshots Take? Will Snapshots Cause Service Interruptions?

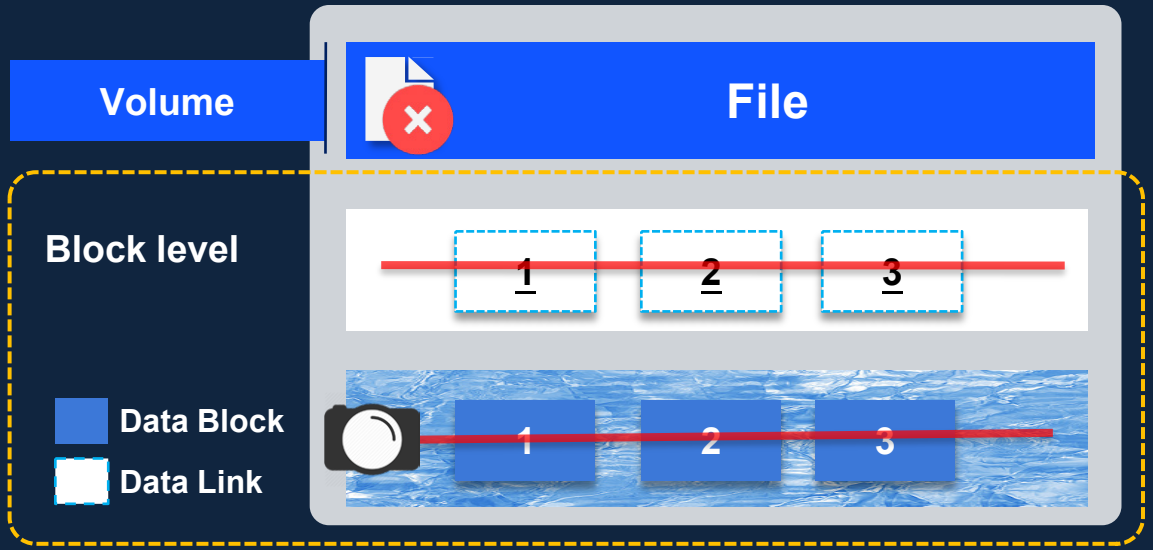
Snapshots are important to everyone

- Both enterprises and individuals could be targets of ransomware
- Data needs to be backed up, while backups also need to be protected
- **QNAP block-based snapshots protect your data from being damaged by ransomware**



Ideas behind QNAP snapshots: conservative but complete

- With snapshots enabled, delete files still take up storage space
- Space will only be released when associated snapshots are deleted
- Is a healthy snapshot retention recycle mechanism necessary?

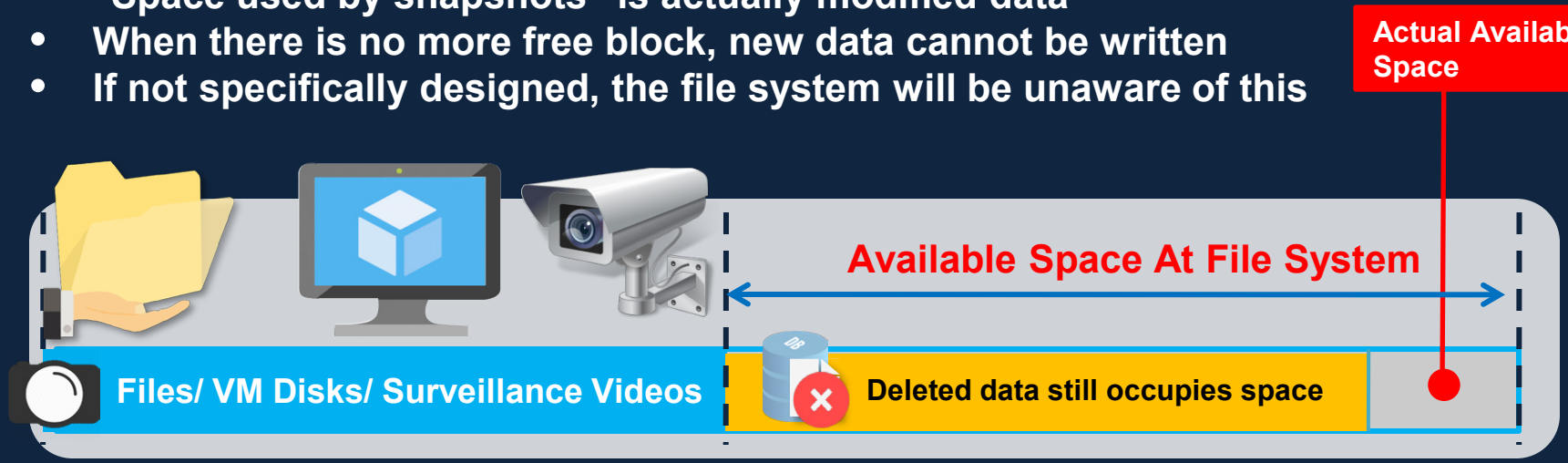


Observation:
QNAP snapshots default retention:
1 Week

S** snapshots default retention:
Forever

When the storage is full of snapshots, programs requesting to write new data will fail immediately

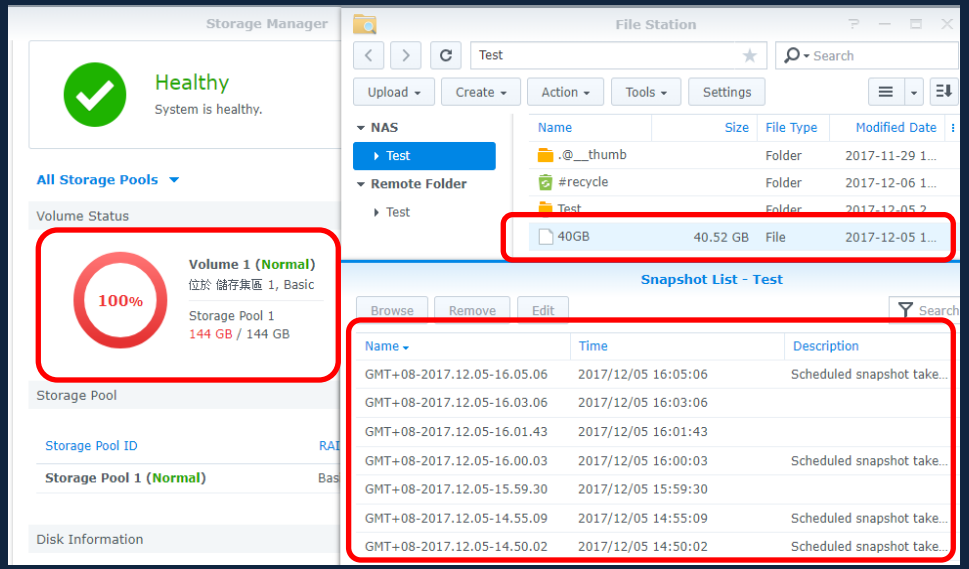
- "Space used by snapshots" is actually modified data
- When there is no more free block, new data cannot be written
- If not specifically designed, the file system will be unaware of this



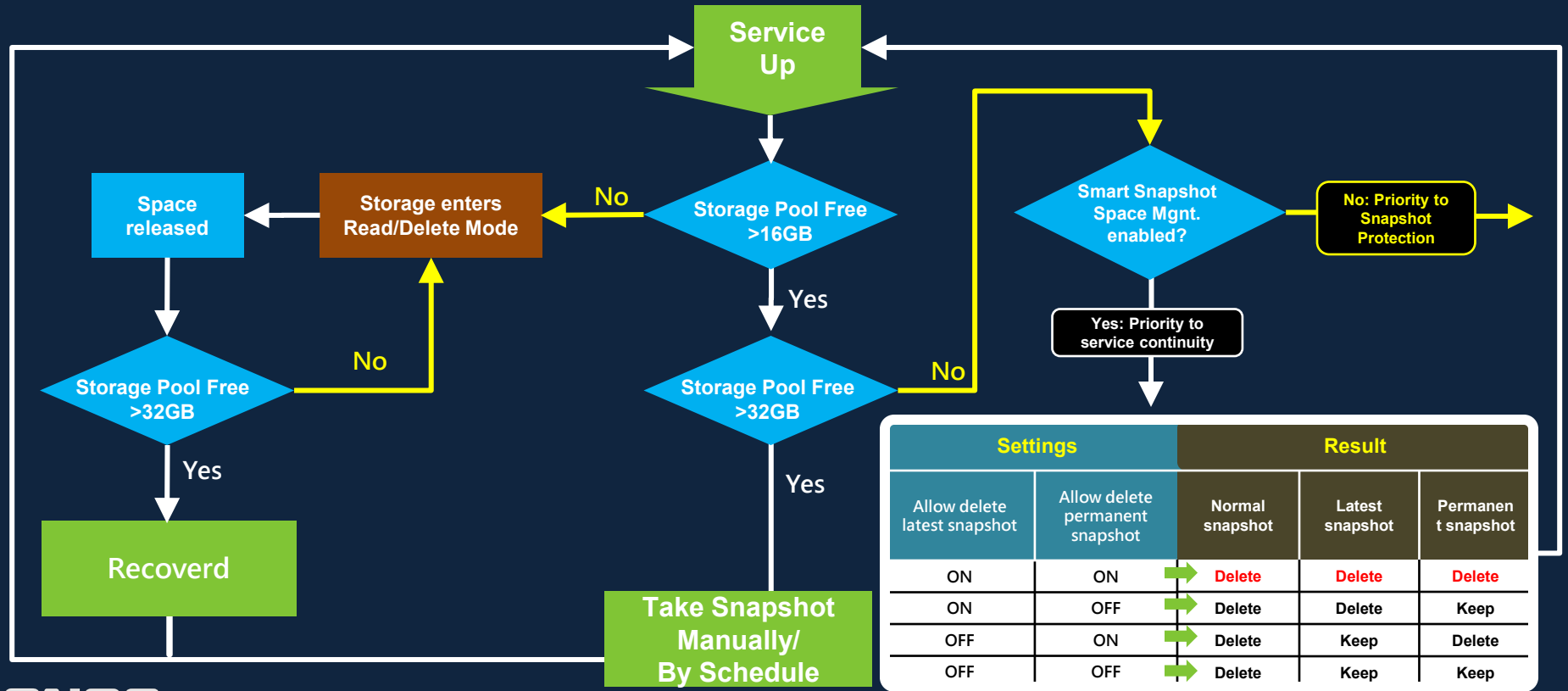
Disasters caused by data write failures

- File servers: **Interruptions of daily operations**
- Surveillance/ IOT Log servers: **Key data loss**
- Web/database servers: **Complaints from customers and partners**

Space issues associated with snapshots may occur with all storage venders that provide the snapshot feature. Below is an UI screenshot from one of the other brands:



Space is limited, so you need snapshot space management

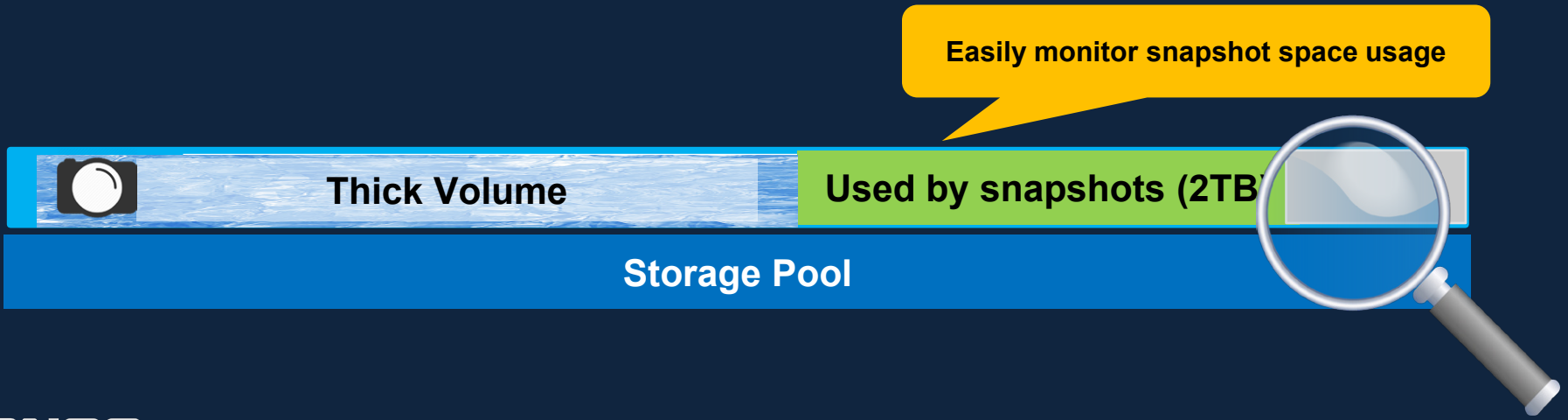


Settings		Result		
Allow delete latest snapshot	Allow delete permanent snapshot	Normal snapshot	Latest snapshot	Permanent snapshot
ON	ON	Delete	Delete	Delete
ON	OFF	Delete	Delete	Keep
OFF	ON	Delete	Keep	Delete
OFF	OFF	Delete	Keep	Keep

Tip 1

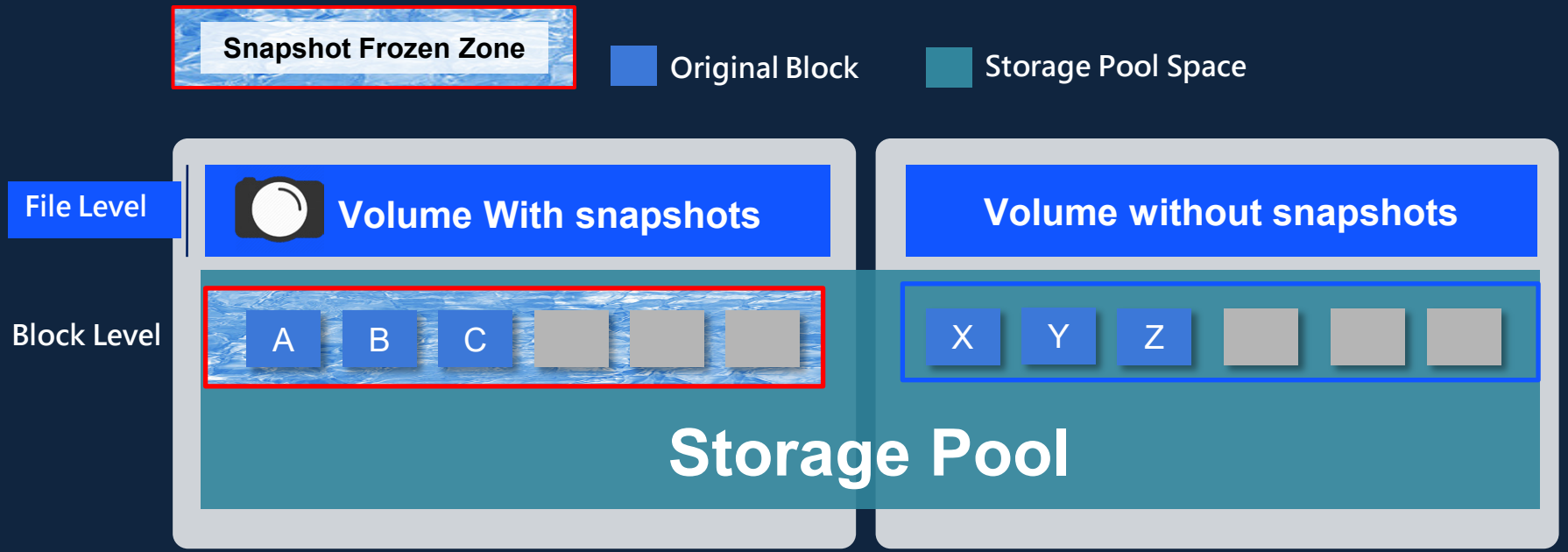
QNAP snapshots:
Stored outside of the thick volume

Changed data will be stored outside of the volume (unallocated space of the pool) :
Allows planning & reserving free space for snapshots
Allows monitoring space used by snapshots
Allows delete data without recycle snapshots if pool has space
Allows multiple volumes/LUNs to share space for snapshots



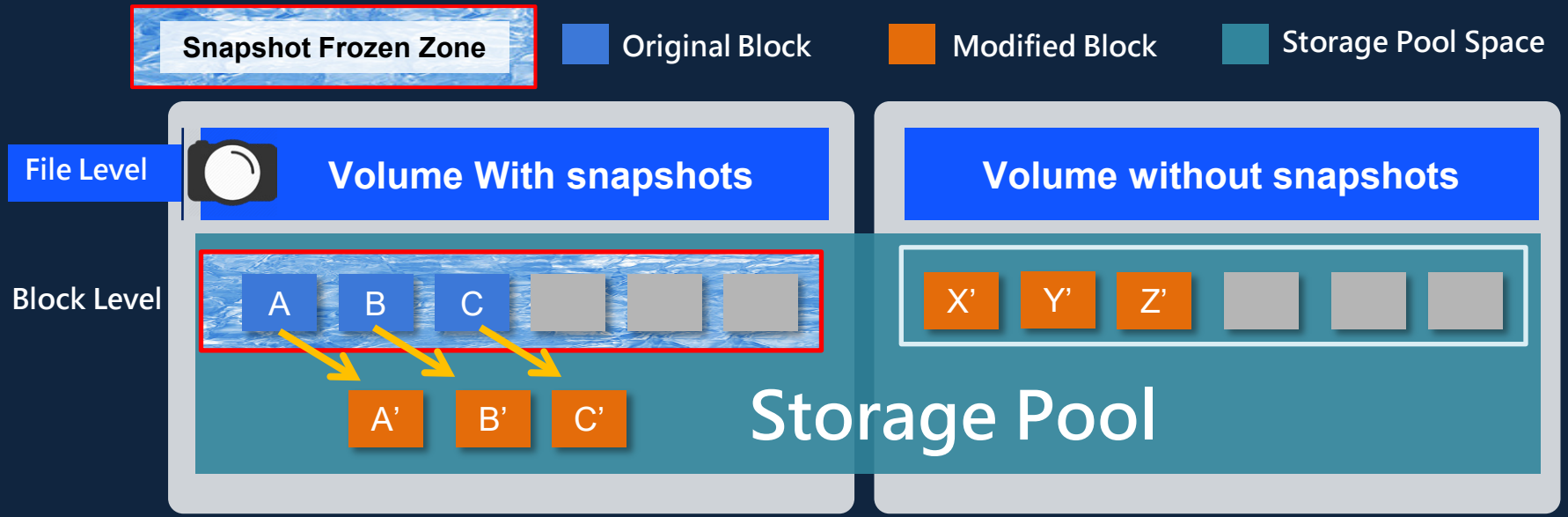
The "outside of the volume" snapshots operation (1)

- Snapshot (Copy On Write) Technology
- When taking snapshots, blocks inside of the volume are frozen



The "outside of the volume" snapshots operation (2)

- When frozen data blocks is to be modified, new data (A', B' and C') will be stored in data blocks outside of the volume
- For volumes without snapshots, data blocks will be overwritten directly with guaranteed space usage

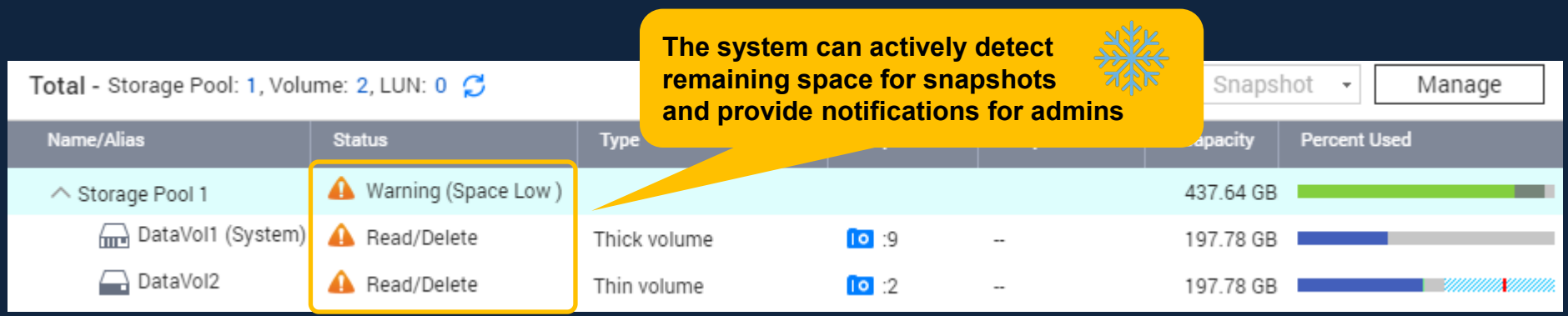


Tip 2

Priority snapshots:
Freeze the volume when space is insufficient

- The volume/LUN can actively detect snapshot space usage and enter Read/Delete Mode when space for snapshots is not enough
- This is to prevent data from being changed and to ensure snapshots can be reverted
- User can further assign Snapshot Guaranteed Space to ensure snapshot can be stored

The thick volume with no snapshots will not be affected

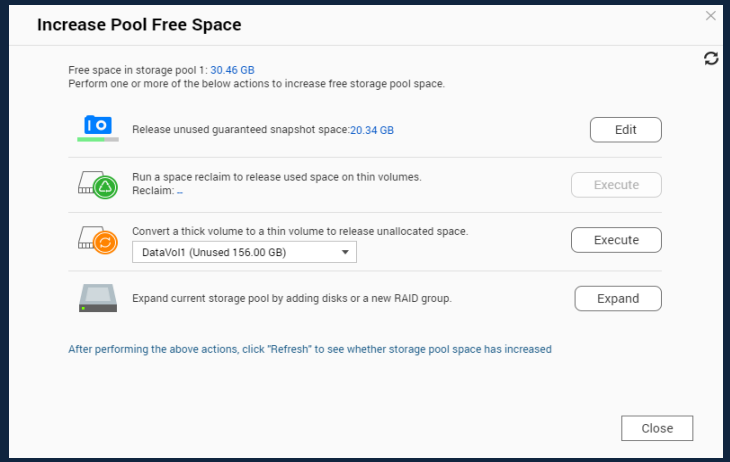


How to recover from read/delete mode

- When storage pool space is released, volumes will be auto-recovered
- Recovers by manually or **automatically deleting snapshots**

Other methods: Expand Storage Pool, Change Guaranteed Snapshot Space or Convert a thick volume to a thin volume to release unused space

Status List			
Snapshot Mgnt	**(Free) Pool + Guaranteed Snapshot Space**	**Volume Status**	**Pool Free Space**
Start Recycling Snapshot	**<= 32GB**	**Enter Read/Delete**	**<= 16GB**
Stop Recycling Snapshot	**>= 32GB**	**Auto Recovery**	**>=32GB**



Tip 3

Priority services:
Active smart snapshot space management

- Same as Time Machine for Mac, enable this option to let the system automatically delete snapshots until enough space is recovered
- Delete some or all snapshots for service continuity

QNAP

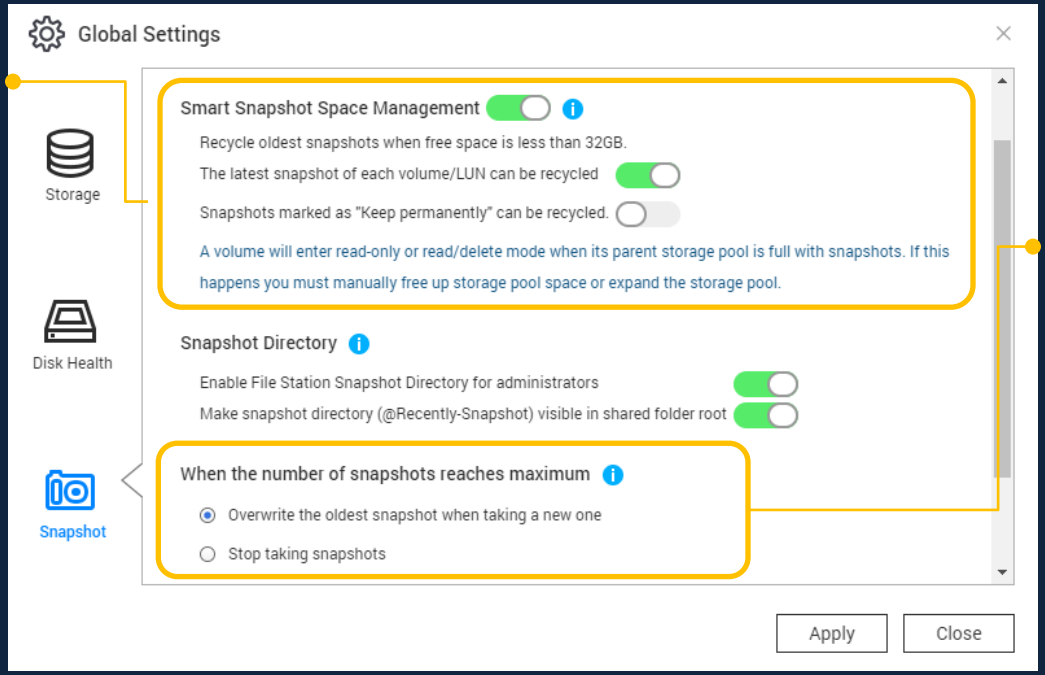
Snapshot “Space" & “Quality“ Management

Smart Snapshot Space Management options:

Recycle latest snapshot:
When disabled, last snapshot will not be recycled.

Recycle permanent snapshot:
When disabled, the snapshot that is set as permanently will not be recycled.

Disable those options can lead to Read/Delete mode



When number of snapshots Reaches System Max.:

- **Replace oldest snapshot with new snapshot**
- **Stop taking new snapshot**

Demo：Snapshot space that can be monitored and auto recycled

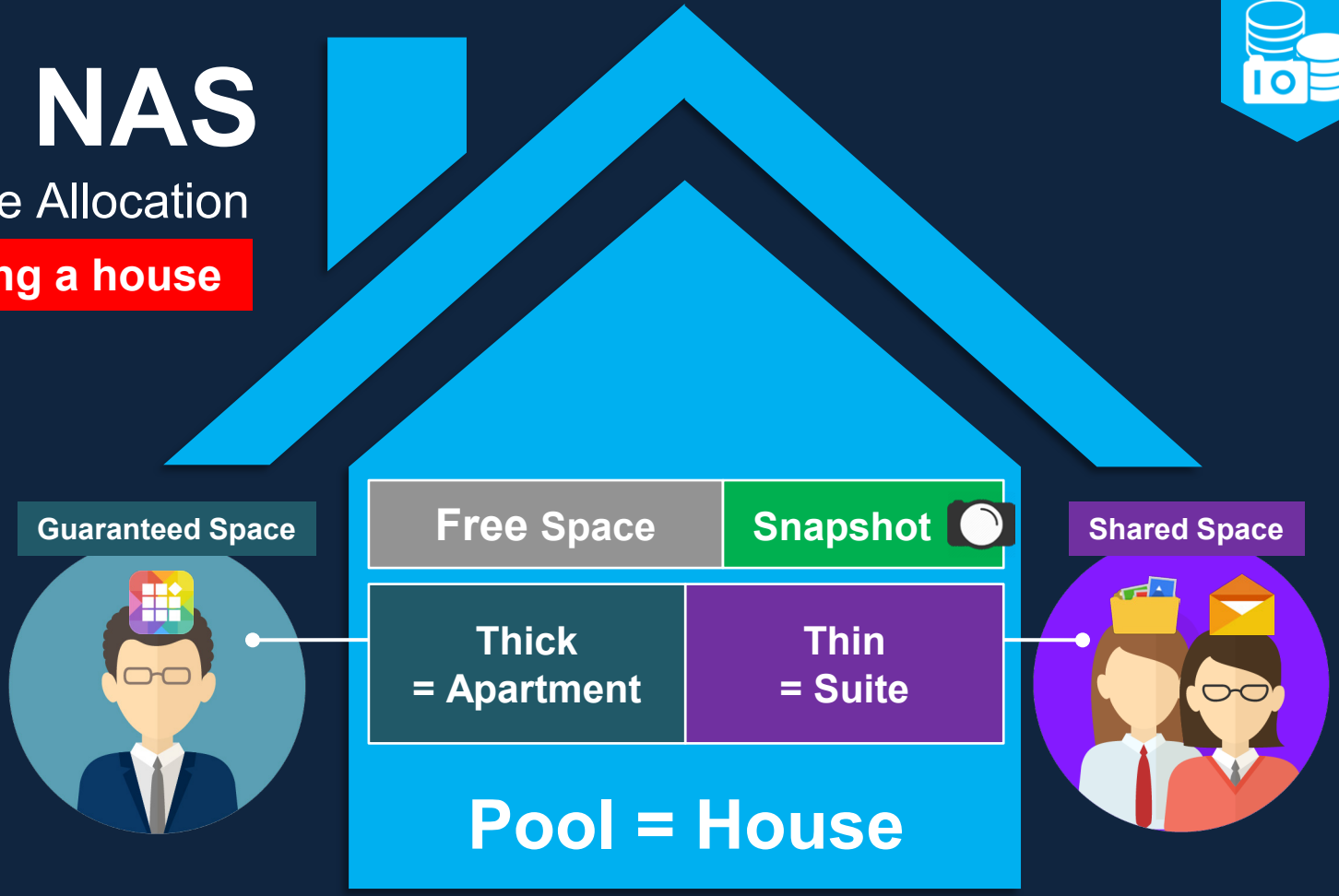
Your Challenges, Our Solutions:

How can I optimize storage space for both services & snapshot protections?

QNAP NAS

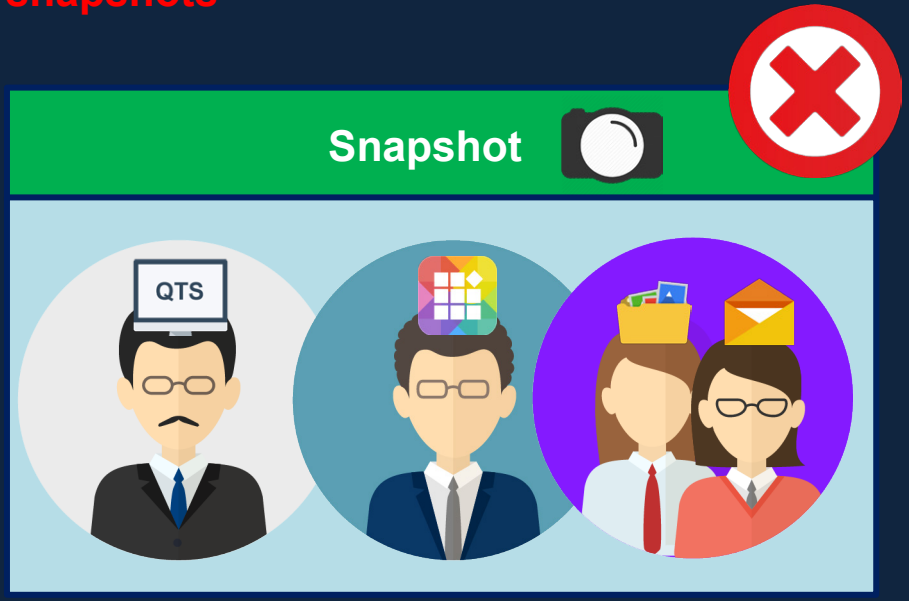
Tips For Space Allocation

Just like renting a house

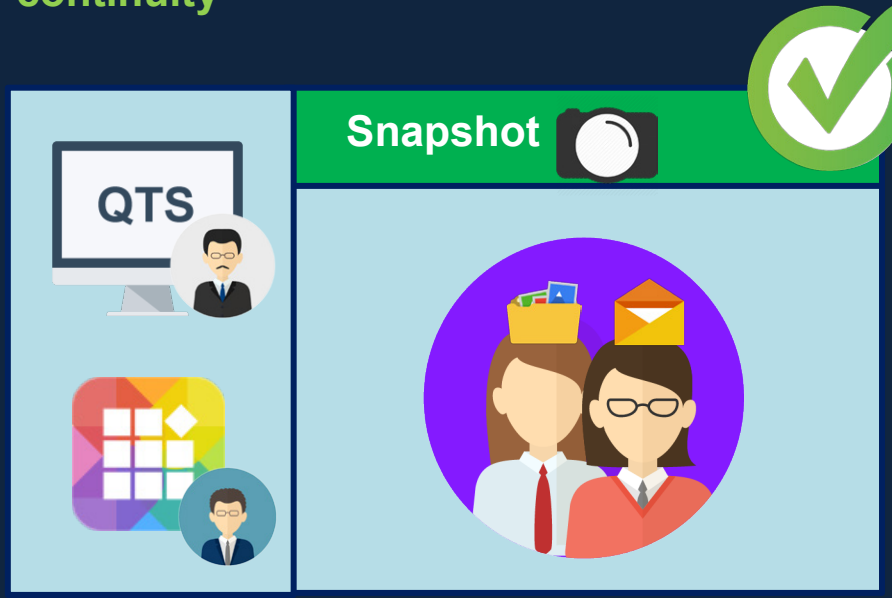


Separating system volume from snapshots

When system & files share the same volume, application can be affected by snapshots



Set a dedicated thick volume with no snapshots to guarantee application continuity

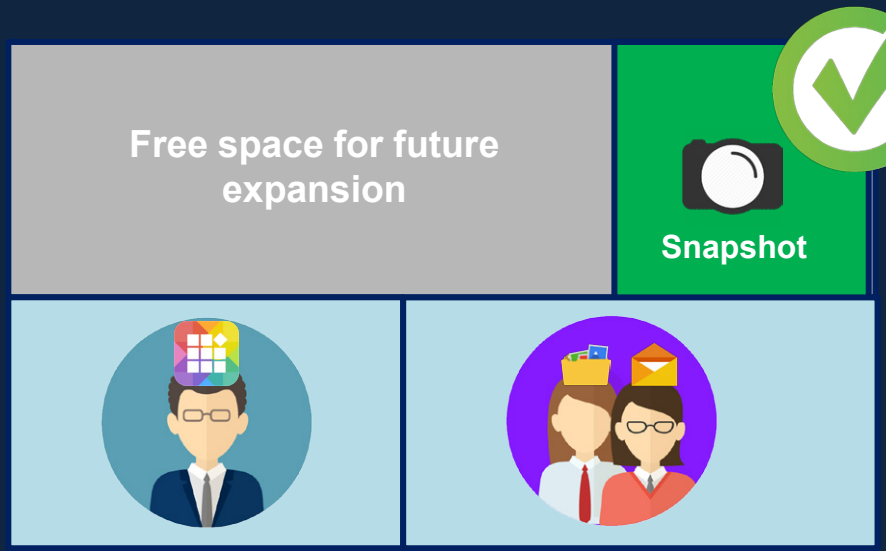


QNAP

Reserve space for snapshots

When all space is allocated
Snapshot (take/revert) functions will be disabled

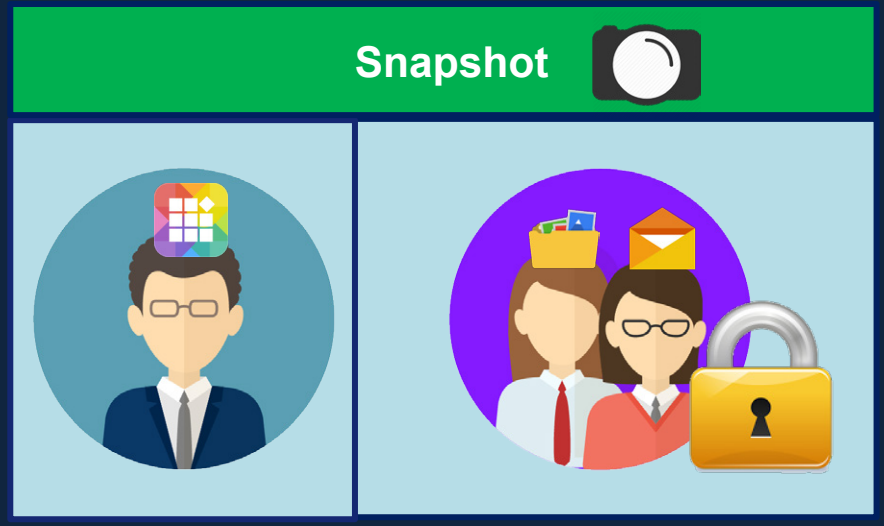
When using thick volumes, allocate less space initially for future expansions and snapshots

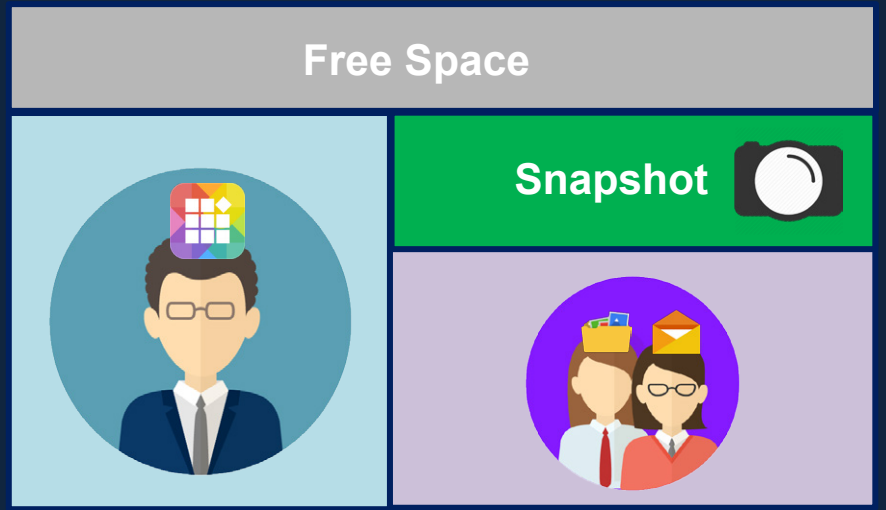


Convert to thin for more free space

- When the pool cannot be expanded , you can convert the thick volume to thin for releasing unused space to "share" this space with snapshots
- Thin volumes should used with thresholds for monitoring usage

Converting a thick volume to thin will require all existing snapshots be deleted.

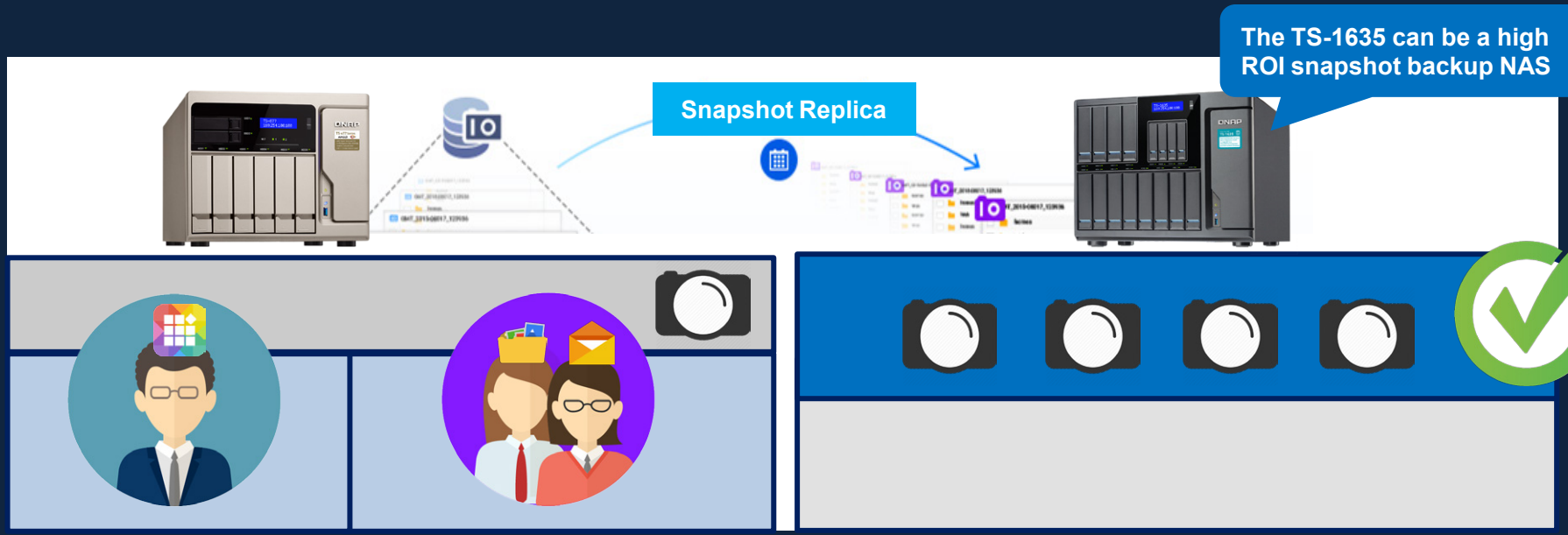




Use snapshot replica to store more snapshots

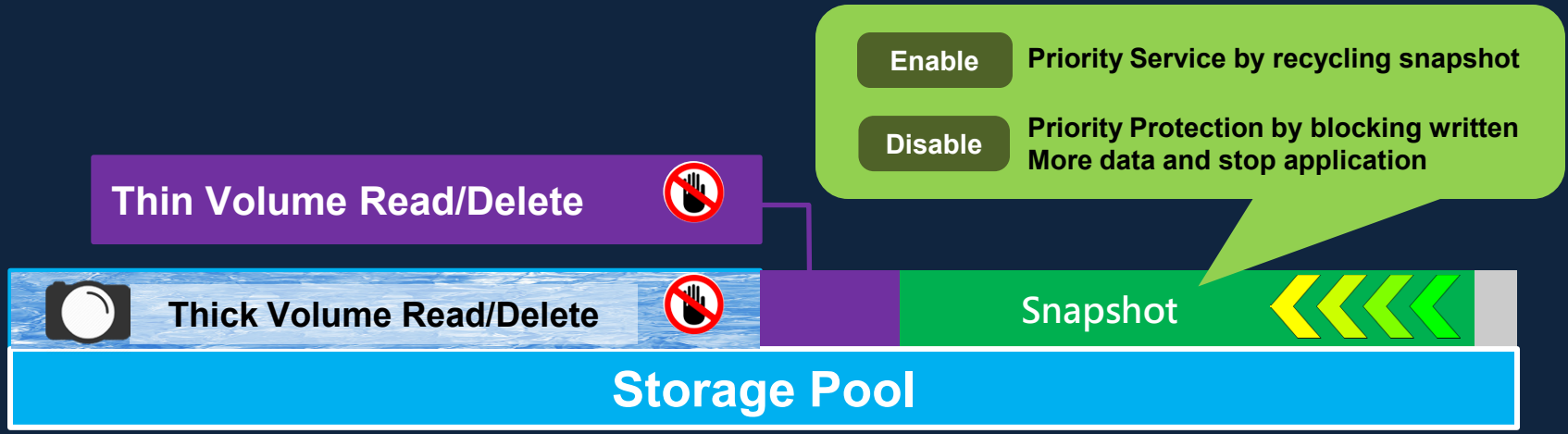
Keeping too many snapshots at the local NAS can take up all usable space

Choose a NAS with higher capacity or deploy snapshot replica to store snapshots: Advanced NAS for services, Entry-level NAS for backup



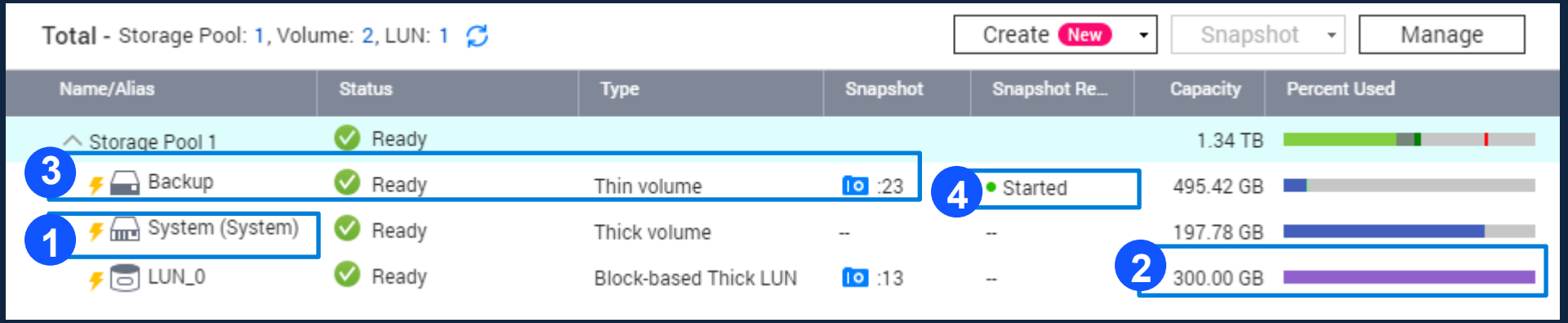
Recap: Using snapshots has its own risks

- Snapshot can take up space, a healthy retention cycle is required
- QNAP "outside of the volume" snapshot for manageable space monitoring
- Volume/LUN Read/Delete Mode to detect space issues
- Using Smart Snapshot Space Management to ensure application Continuity



Best practice for space allocation

1. Separate system volume from files, and disable snapshots on system volume
2. When using thick volumes, reserve space in advance for snapshots
3. When space is insufficient, convert a thick volume into a thin one
4. Using Snapshot Replica to store more snapshot versions



QNAP

Thanks You!