Upgrading StorageOS 3 to SynetoOS 4

Technical Guide

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Introduction

This guide is a tutorial and reference to help you upgrade a StorageOS 3 HYPERSeries appliance to the brand new SynetoOS 4. SynetoOS 4 is a completely redesigned operating system that changes the focus from storage to hyperconvergence, file sharing and disaster recovery. To accommodate the redesign and new features, SynetoOS 4 uses a different configuration format.

The upgrade process will check the StorageOS 3 configuration and try to convert it to the SynetoOS 4 format automatically. In most instances, the conversion will happen without needing any user input.

However, some configurations may be incompatible with StorageOS 4. For these you will be required to change specific settings on StorageOS 3 before you can continue. Other particular settings may result in warnings. These are not blockers for the upgrade, but you may see limited functionality after the upgrade. Finally, there will cases where you need to provide information to the system before it can continue with the upgrade.

This document presents the differences between the two operating systems, the supported platforms for the upgrade, the steps to perform an upgrade and details on how to create mixed infrastructures using SynetoOS 4 and StorageOS 3.

Differences between StorageOS 3 and SynetoOS 4

StorageOS 3 is designed as an operating system for storage appliances. Starting with version 2.x, it incorporated some basic functionality to connect to VMware hosts. Nonetheless, the UI, the feature set, and user workflow remained storage oriented.

SynetoOS 4 targets a new generation of IT infrastructures, one in which hyperconverged appliances become the building blocks. Everything is now centered around virtualization and data protection. Virtual Machines, Datastores, Hypervisors and Backups are first class citizens. This means that most of the configuration is virtualization oriented. The storage part is automated in the background.

Here are the relevant differences:

1. On StorageOS 3 the user works with low-level storage containers: folders (NAS) and virtual disks (SAN). On SynetoOS 4 they will create datastores, shares and volumes.
2. On StorageOS 3 the user created an NFS share, and then had to go to the ESXi web configuration interface and manually mount the datastore. On StorageOS 4

the user just creates a new datastore. The datastore automatically appears on the ESXi host.

3. With StorageOS 3 all virtual machine operations were done using the ESXi web configuration interface. On SynetoOS 4 there is a dedicated page (*Virtual machines*) to view VMs status, start, stop, and suspend them. This page also allows you to recover individual virtual machines from snapshots.
4. On StorageOS 3 all virtualization related features are grouped under the *Datacenter* page. On SynetoOS 4 virtualization features are present on almost all screens:
    a. The *Dashboard* shows information about virtual machines, datastores, and hypervisor health.
    b. The *Alerts* page lists problems found on the local hypervisor.
    c. The *Datastores* page allows you to manage ESXi datastores directly from the SynetoOS 4 web UI.
    d. The *Virtual machines* page allows you to run operations on virtual machines running ESXi hosts.
5. To link two machines in a primary → secondary relationship, on StorageOS 3 you have to copy SSH keys between machines. On SynetoOS 4 you can add replication targets in a simpler way: using the IP/hostname and admin password.
6. StorageOS 3 supports volumes as VMware datastores, which grant you the option of selecting VM snapshot consistency levels (crash consistent, memory consistent, live snapshot). On SynetoOS 4, virtual disks become simple block volumes and there is no deeper support for VM-level snapshot consistency configuration. The assumption is that you will be using the (NFS-backed) datastores to control the consistency.

SynetoOS 4 simplifies workflows by choosing smart defaults:

1. Deduplication is disabled to limit contention on memory resources and avoid potential performance bottlenecks for primary workloads
2. The compression level is automatically configured to the best performance/space saving algorithm available
3. The management of VLANs, network interface aggregates and static routes is now done via ESXi, an environment that users are already familiar with
4. The operations performed on clones are reduced, to accelerate workflows in case of restore (both locally and on replication machines)

Finally, for NAS sharing the choices are now SMB and AFP, the most used options on StorageOS3 according to Syneto analytics.

The upgrade process performs about 20 different checks before enabling the system to migrate to SynetoOS 4. You can see them in more detail in *Appendix A*.

Supported platforms

Given that StorageOS 3 and SynetoOS 4 configurations differ quite significantly, you won't be able to upgrade all Syneto appliances. Only hyperconverged devices from HYPER series can be upgraded (HYPERSeries 3100, HYPERSeries 3200, HYPERSeries DR Play).

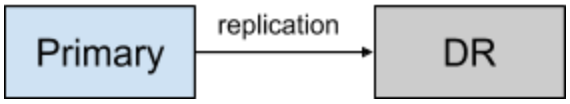
The following series and configurations cannot be upgraded:

- Ultra series
- Microstorage machines (Hyper DR Standard)
- Machines running an High Availability cluster
- Appliances with Fibre Channel devices in passthrough

Upgrade steps

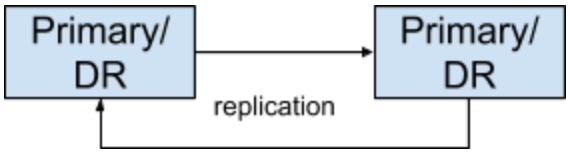
The upgrade steps are slightly different based on your solution configuration. Please review the scenarios below to determine which one more closely matches your solution.

Scenario one: one primary and one DR unit



1. Update primary machine to StorageOS 3.2.8
2. Update DR machine to StorageOS 3.2.8
3. Upgrade primary machine to SynetoOS 4
4. Upgrade DR machine to SynetoOS 4

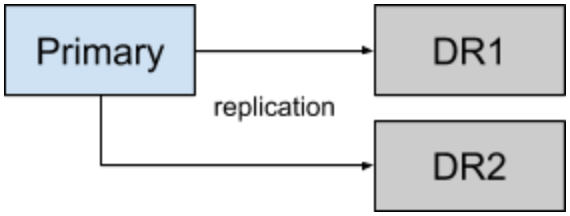
Scenario two: cross-replication with two units



1. Update both machines to StorageOS 3.2.8
2. Disable all replication schedules
3. Upgrade both machines to SynetoOS 4

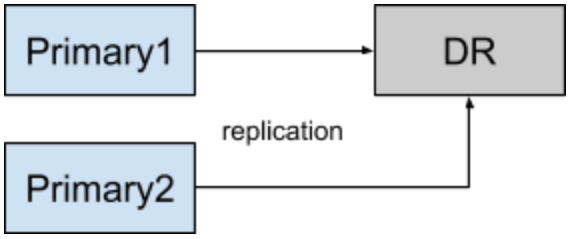
4. Enable all replication schedules

Scenario three: one primary and multiple DR machines



1. Update primary machine to StorageOS 3.2.8
2. Update each DR machine to StorageOS 3.2.8
3. Upgrade primary machine to SynetoOS 4
4. Upgrade each DR machine to SynetoOS 4

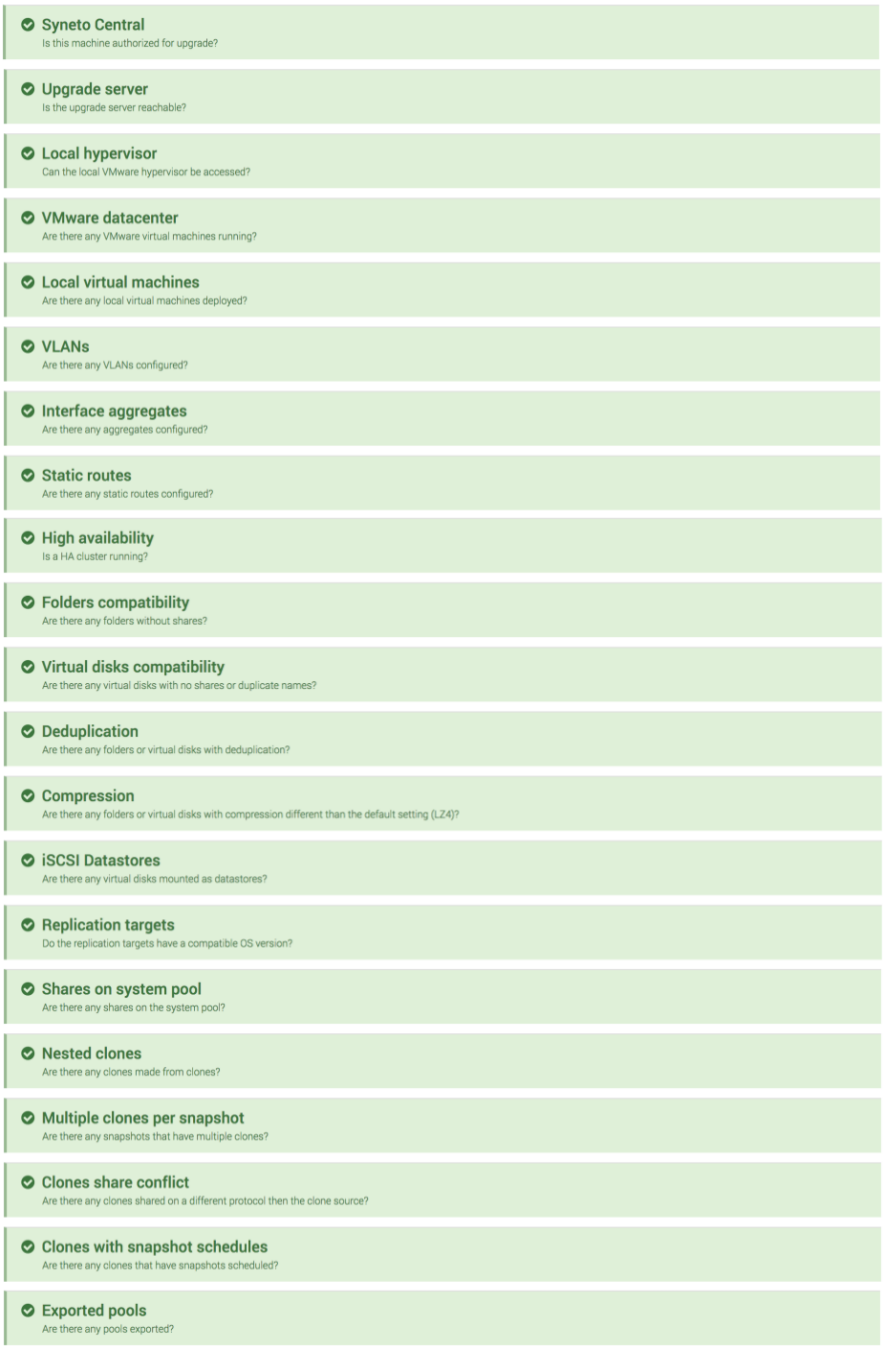
Scenario four: multiple primary and one DR machine



5. Update each primary machine to StorageOS 3.2.8
6. Update DR machine to StorageOS 3.2.8
7. Upgrade each primary machine to SynetoOS 4
8. Upgrade DR machine to SynetoOS 4

Ready for upgrade

If your machine is ready to upgrade to SynetoOS 4, the set of checks should look like the following image:



Mixed Syneto infrastructures using StorageOS 3 and SynetoOS 4

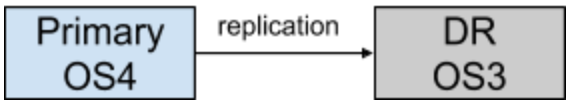
In some cases you will want to integrate SynetoOS 4 systems with previously purchased StorageOS 3 devices that cannot be upgraded. For example you may have an Ultra storage-only machine (without a hypervisor) that you'd like to use for the third copy. Or you may have older hyperconverged solutions for DR that do not support an upgrade to SynetoOS 4.

For these scenarios, SynetoOS 4 supports snapshot replication to units running StorageOS 3. Replication works out of the box and no additional settings need to be done.

However, because of the big differences between StorageOS 3 and SynetoOS 4, a mixed scenario will require a more complex recovery procedure.

Let's exemplify such a scenario using its three main steps: 1) defining a snapshot and replication schedule; 2) accessing data on the DR unit (failover); 3) restoring data from DR to primary after the disaster has passed (failback).

Define a snapshot and replication schedule



1. Update DR unit to StorageOS 3.2.8 or higher
2. Upgrade primary unit to SynetoOS 4 (if needed)
3. On the primary machine, under *Datastores* > *Replication Targets* add DR as target.
4. Create one replication schedule from primary to DR (eg. for datastore `WINSRV`)
5. On DR the replicated datastore will appear under the path
   `<dr_pool_name>/backups/<primary_machine_id>/<primary_pool_name>/datastores/WINSRV`

Access data on the DR unit

In case of a serious problem with the primary machine, the DR can be configured to take over the primary's responsibilities.

If the DR is hyperconverged, the local hypervisor can be used to access the VMs. Otherwise, you will need another server to run the compute.

To access backed up data, you will need to create the correct file/block shares. For datastores, create a NFS share. For file shares, create a SMB/AFP share. For volumes, share the virtual disk using iSCSI.

Restore data from DR to primary

After the primary unit is fixed and reconnected to the network, we need to replicate data from the DR to the primary. To do this, we must respect the following steps:

1. Open the web UI of DR, go to *System > Replication keys* and click *COPY*.
2. SSH into the primary machine, and drop to unsupported shell (`un sh`).
3. Paste the copied replication key into `~admin/.ssh/authorized_keys` at the end of the file. Make sure there is an empty line after the last key, at the end of the file.
4. On the DR unit, configure a replication schedule for the received data folder `(<dr_pool_name>/backups/<primary_machine_id>/<primary_pool_name>/datastores/WINSRV)`
5. After all data is replicated back to the primary machine, manually stop all virtual machines, shares and volumes running on the DR unit
6. Start VMs, shares and volumes on the primary machine.

NOTE: Except the scenario described above (restore data from DR to primary), using SynetoOS 4 as a replication target for a StorageOS 3 primary machine is not supported.

Appendix A: Checks being performed

Before upgrading a device to SynetoOS 4, a set of checks must be run to ensure compatibility with the new operating system. A check can have one these results:

1. Passed - Marked with a green box and a checkmark. This means that there is nothing to be done for that specific configuration.
2. Warning - Marked with an orange box and an exclamation mark. This means that a reduced functionality will be available on SynetoOS 4, but the specific setting is not a showstopper for the upgrade.
3. Failed - Marked with a red box and "X" sign. This means that a particular configuration is not compatible with SynetoOS 4. Depending on each case, the user will either need to change some configurations on StorageOS 3, or provide a set of required information.

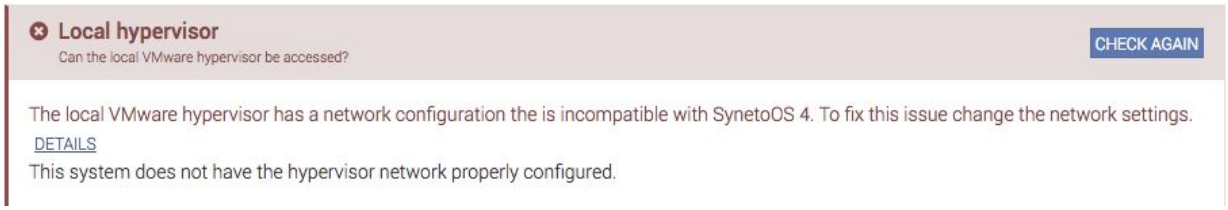
Appliance is allowed to activate using our Central server

- Why: We completely reorganized licensing mechanisms on SynetoOS 4. Instead of manually registering files to the storage device, users must activate the device using a centralized server called Syneto Central. This process is done only once, the first time SynetoOS 4 boots.
- Effect: Cannot upgrade
- User action: Contact Syneto technical support

The upgrade server is reachable and available to provide the upgrade

- Why: Verify the upgrade server is reachable and ready to provide updates
- Effect: Cannot upgrade
- User action: Check network settings. Contact support if there is still a problem.

Local hypervisor configured on the expected IP



- Why: As SynetoOS 4 and its local hypervisor are working together closely, we decided that a dedicated IP address and virtual network is necessary for private API calls. This ensures a robust collaboration between the two systems.
- Effect: Cannot upgrade
- User action: Configure IP 172.16.254.2/24 on StorageOS 3 interface vmxnet3s1, and 172.16.254.1/24 on the local hypervisor (ESXi) VMkernel on a dedicated network that vmxnet3s1 is also connected to. On SynetoOS 4 changing this IP is not possible and we heavily rely on it being present.

Local hypervisor runs on ESXi version 6.5.0 or newer

- Why: Only hypervisors with versions 6.5.0 or newer are supported in SynetoOS 4
- Effect: Cannot upgrade
- User action: Upgrade ESXi to at least version 6.5.0

Local virtual machines present on the system

- Why: SynetoOS 4 always runs as a virtual machine under VMware. Having a second layer of virtualization using KVM is redundant and unnecessary. Support for Local Virtual Machines using KVM is dropped in SynetoOS 4.
- Effect: Cannot upgrade
- User action: Migrate virtual-machines on VMware while running on StorageOS 3.

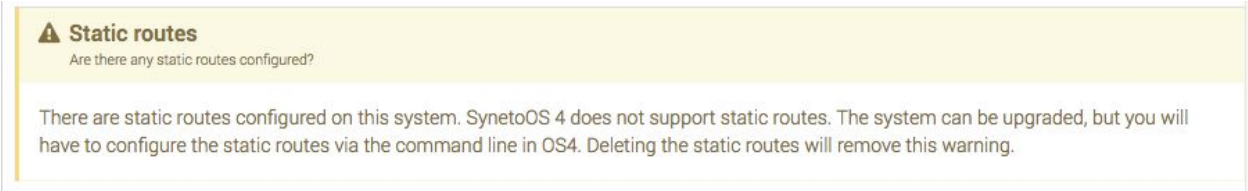
VLANs configured on StorageOS 3

- Why: Vlan support is not available in SynetoOS 4
- Effect: Cannot upgrade
- User action: Reconfigure the network so that you don't use Vlans

Network aggregates configured on StorageOS 3

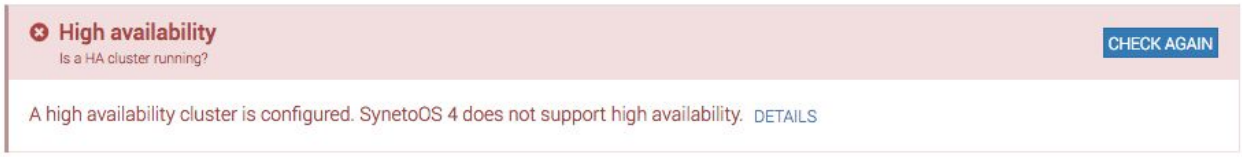
- Why: There is limited utility for aggregates in a virtualized environment over virtual network interfaces. In SynetoOS 4 this option was removed. If needed, create aggregates at the ESXi level over the physical interfaces.
- Effect: Cannot upgrade
- User action: Reconfigure the network to avoid aggregates while on StorageOS 3

Static routes configured on StorageOS 3



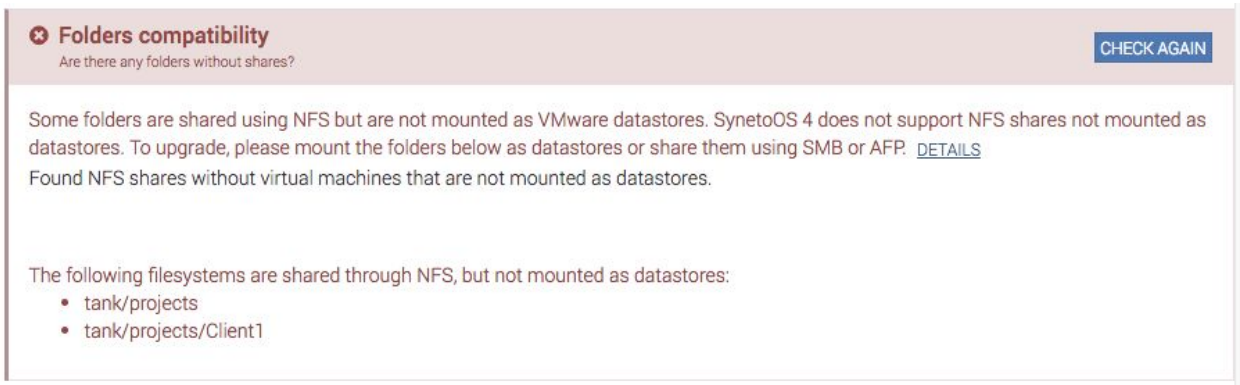
- Why: Static routes are not supported in SynetoOS 4
- Effect: Static routes will be preserved. Configuration on SynetoOS 4 will be possible from CLI only.
- User action: Remove the static routes

High availability is enabled



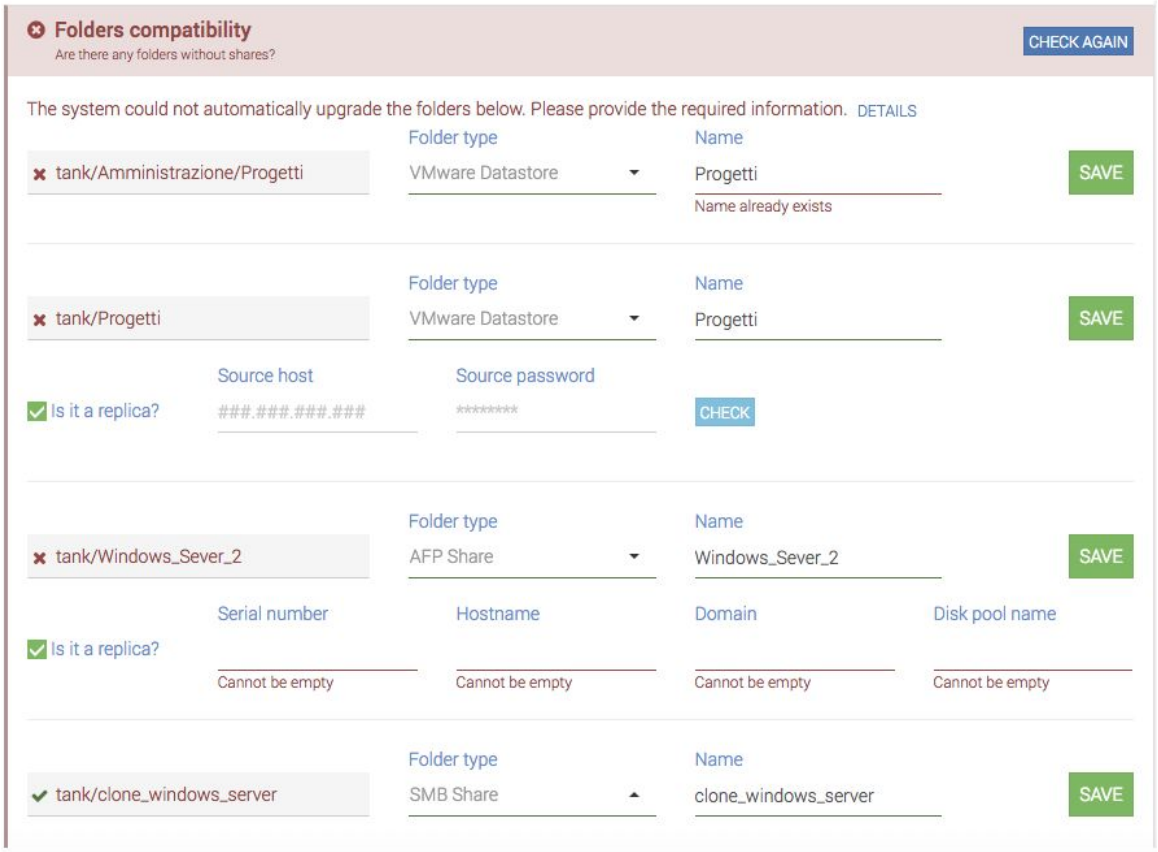
- Why: High availability is not supported by SynetoOS 4
- Effect: Cannot upgrade
- User action: Give up high availability for your system architecture. Or remain on StorageOS 3.x

NFS shares for scenarios different from ESXi datastore



- Why: NFS shares not mounted like datastore on ESXi are not supported in SynetoOS 4
- Effect: Cannot upgrade
- User action: Mount NFS shares as datastores or change the sharing to protocol to SMB or AFP while on StorageOS 3

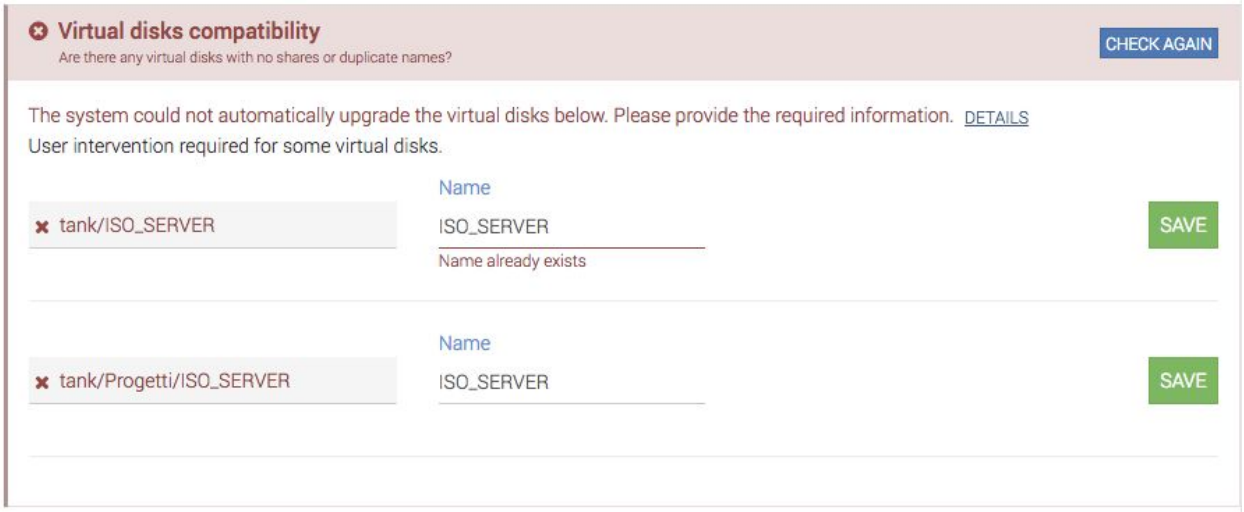
Not shared folders



- Why: Folders without shares are not supported in SynetoOS 4
- Effect: Cannot upgrade
- User action: During the upgrade process, specify the information requested by the system:
    - Share type for folders that are not shared (AFP/SMB/datastore)
    - Name for folders that are not shared (they will be guessed by the systems, duplicates are not allowed)
    - If the folder is a replica from a different unit, check "Is it a replica?"
        - Provide IP/hostname and password of the primary machine. The system will try to gather the information required by SynetoOS 4 from the primary machine automatically.
        - If the primary machine cannot be contacted (ie. it is behind a firewall) you will need to click "SET SOURCE" and provide the required information manually:
            - Serial number of the primary machine
            - Hostname of the primary unit

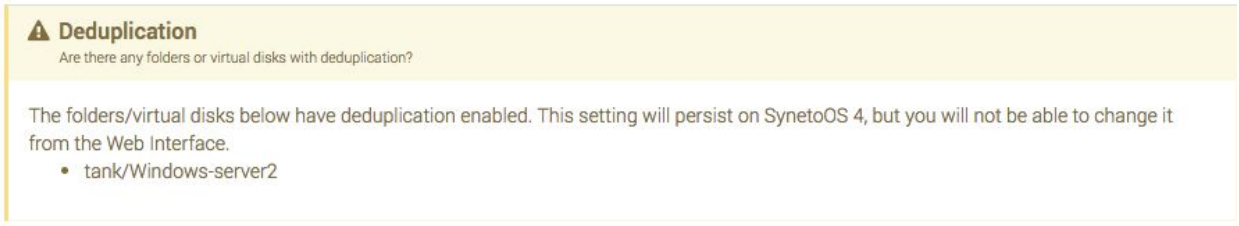
- Domain name of the primary unit
- Disk pool name of the filesystem on the primary unit

Folders or virtual disks which will generate duplicate names in SynetoOS 4



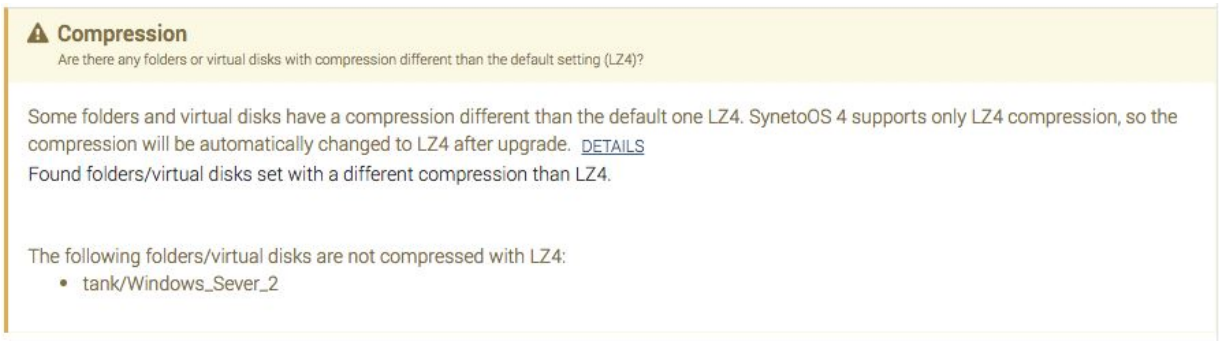
- Why: In SynetoOS 4 the views related to Datastores and Shares are much more simplified. As a consequence, there is a limitation. Duplicate names are not supported for the same type of objects. For example, you can have a Datastore and a Share with the same name. You can even have an SMB share and an AFP share with the same name. However you cannot have two datastores with the same name. The same is true for SMB/AFP shares. You cannot have two shares with the same name.
- Effect: Cannot upgrade
- User action: Specify different names to avoid conflicts

Folders or vdisks with deduplication enabled



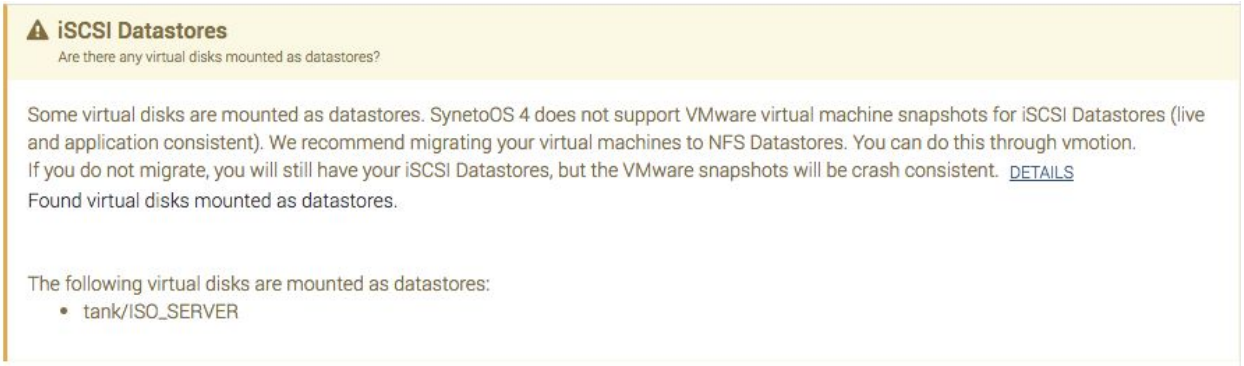
- Why: Deduplication requires a lot of RAM memory to work and we need the RAM to run VMs. In SynetoOS 4 we decided to drop the configuration of this feature from the web UI.
- Effect: Deduplication will continue to run after upgrade to SynetoOS 4 if it was previously enabled on StorageOS 3. Disabling it will be possible only from unsupported shell, with the help of Syneto Support.
- User action: none required

Datasets with compressions different than LZ4



- Why: LZ4 is by far the most efficient and most widely used compression level on our devices. SynetoOS 4 defaults to LZ4 and doesn't offer other options.
- Effect: Compression type will be changed to LZ4 during upgrade
- User action: None required

Virtual disks mounted as datastores

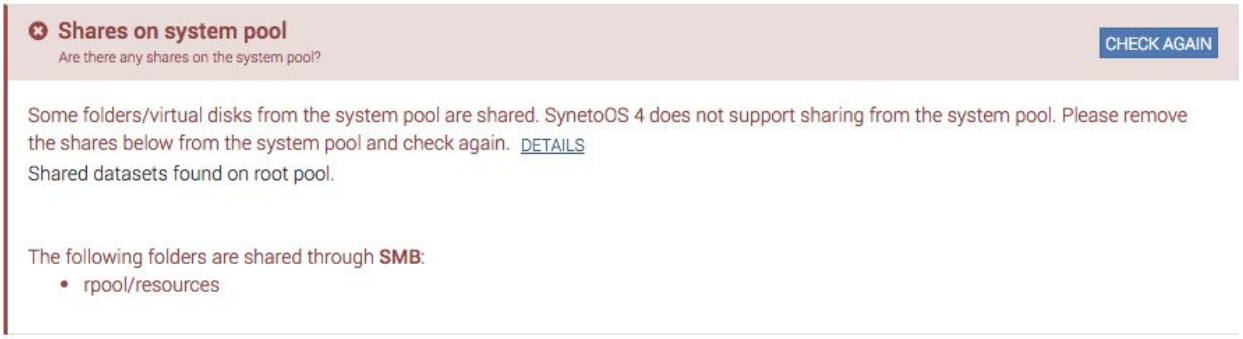


- Why: Datastores on SynetoOS 4 are exclusively created using the NFS protocol. Virtual disks are renamed as “Volumes” on SynetoOS 4. Volumes can be shared and used as VMware datastores in a similar way as on StorageOS 3. However, virtual machine snapshot configurations are not supported any more.
- Effect: Virtual Disks page is now called Volumes. Snapshot schedules on these volumes will work. All virtual machines will be crash consistent. No virtual machine snapshotting configurations will be available on SynetoOS 4.
- User action: In order to benefit from all the SynetoOS 4 snapshotting functionalities, move you virtual machines to an NFS datastore.

Replication targets compatibility

- Why: We are checking several things about detected replication targets: are they running StorageOS 3.2.8 or newer, or SynetoOS4; are they non-hyperconverged; are they reachable? Replication from StorageOS 4 is supported toward DR units running StorageOS 3.2.8 or newer.
- Effect: replications may fail when DR unit is running a version less than StorageOS 3.2.8
- User action: Ensure connection to DR units is established, check network settings, check that DR unit hostnames or IP addresses are correctly specified in replication schedules, check that DR units are updated to StorageOS 3.2.8 or newer

Shares on rpool

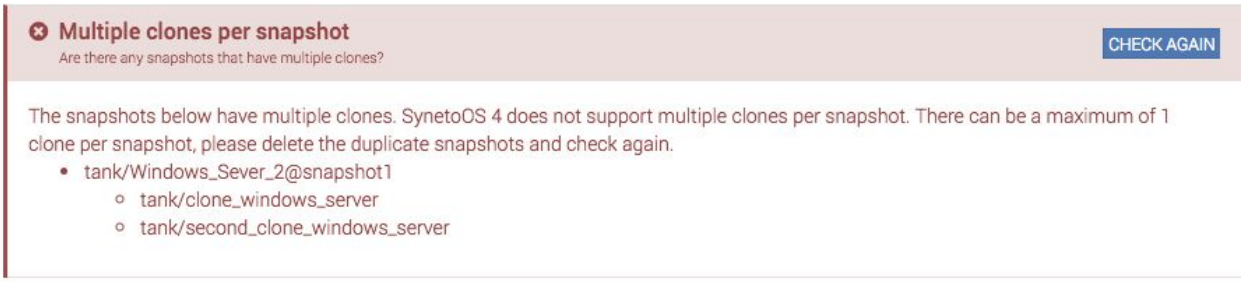


- Why: Rpool is the operating system's disk. Starting with SynetoOS 4, this pool will be completely hidden from the user.
- Effect: Cannot upgrade
- User action: Migrate data to a data pool (ie. tank or hybrid)

Clones from snapshots of other clones

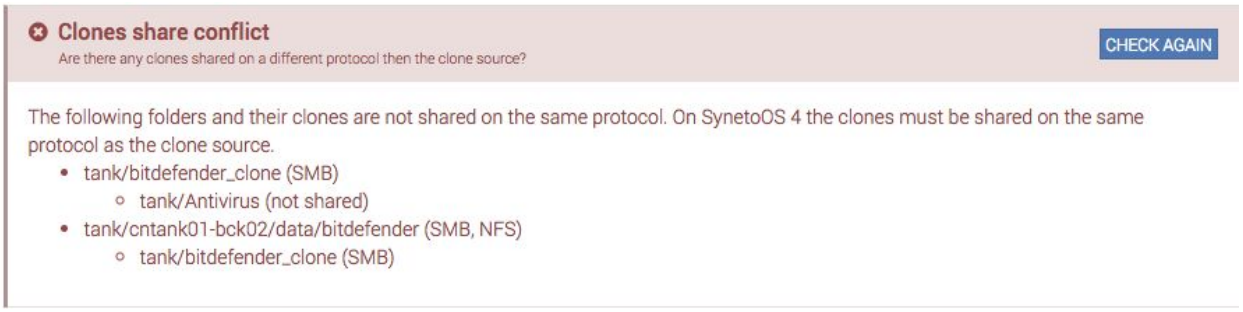
- Why: In order to offer a seamless integration of clones, datastores, virtual machines, and data recovery from clones, nested clones are not supported in SynetoOS 4
- Effect: Cannot upgrade
- User action: Delete all clones that were created from snapshots taken on other clones while on StorageOS 3.

Datasets with multiple clones for the same snapshot



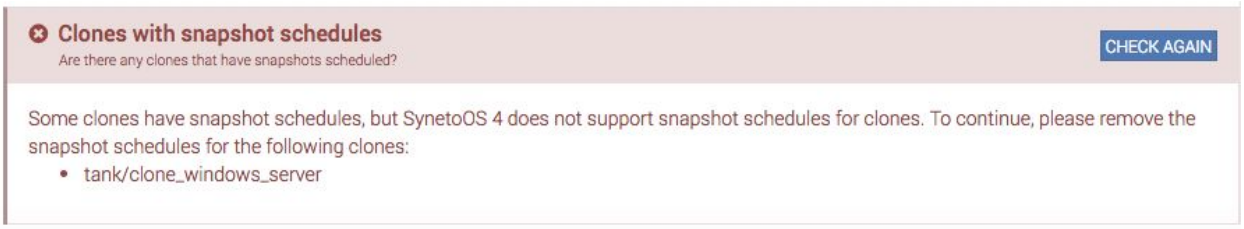
- Why: In order to offer a seamless integration of clones, datastores, virtual machines, and data recovery from clones, only one clone per snapshot is supported in SynetoOS 4
- Effect: Cannot upgrade
- User action: Delete all the extra clones while on StorageOS 3. You can keep one clone per snapshot

Clones shared with a different protocol than its parent dataset



- Why: As SynetoOS 4 works with high level concepts (Datastores, Shares), it doesn't support a clone of Share that is a Datastore or vice-versa. Clones must always have the same sharing protocol as their parents on SynetoOS 4.
- Effect: Cannot upgrade
- User action: Change the sharing protocol between clone and parent so that it’s the same

Replication schedules on clones

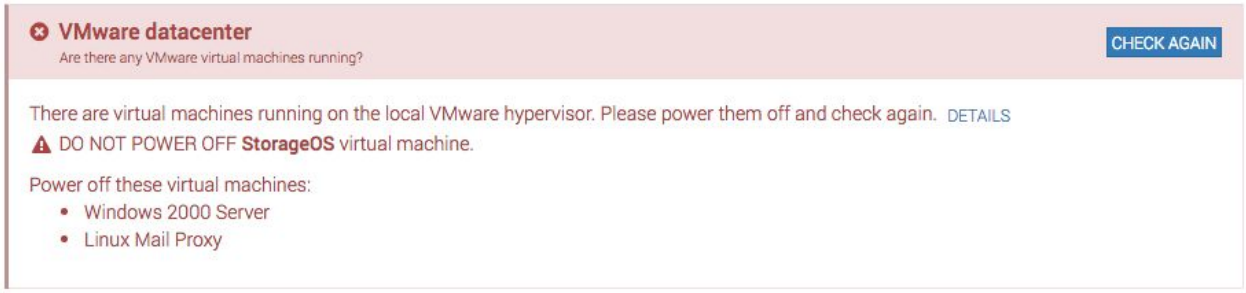


- Why: In the new SynetoOS 4 workflow, it's not possible to schedule replications on clones. Clones with snapshot schedules are not supported in SynetoOS 4
- Effect: Cannot upgrade
- User action: Delete schedules on the clones while on StorageOS 3.

Exported pools found on the system

- Why: Because during the update a lot of metadata is updated about pool structure, shares, datastores, etc. we need to have all pools present on the system imported and upgraded. This is necessary because SynetoOS 4 relies on these metadata to list datastores, shares, volumes, and their configurations.
- Effect: Cannot upgrade
- User action: Import all exported pools

Running virtual machines



- Why: All virtual machine should be stopped in order to upgrade to SynetoOS 4.
- Effect: Cannot upgrade
- User action: Stop the virtual machines