napp-it

napp-it cs
Client Server Edition

Storageserver workgroup
First Steps

published: 2026-Apr-17 (c) napp-it.org

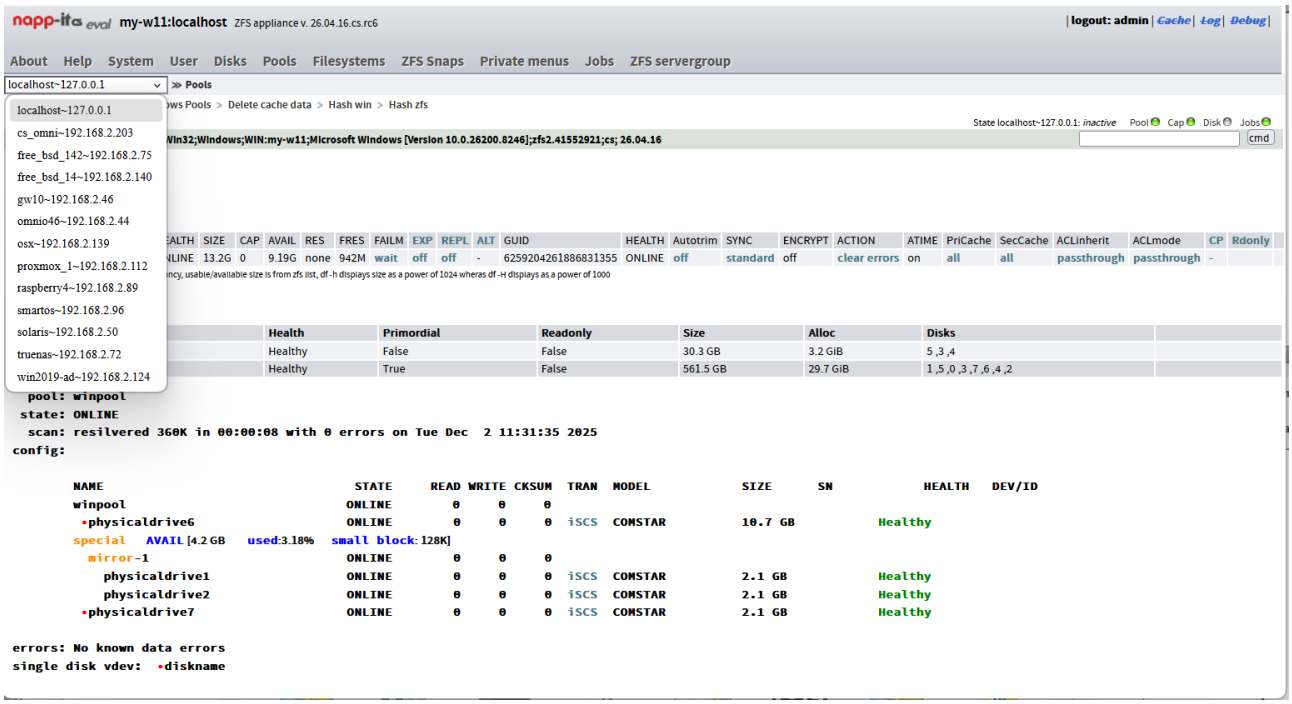
First Steps

other manuals
https://www.napp-it.org/doc/downloads/napp-it_cs.pdf
https://www.napp-it.org/doc/downloads/freebsd-aio.pdf
https://www.napp-it.org/doc/downloads/osx-aio.pdf
https://www.napp-it.org/doc/downloads/proxmox-aio.pdf
https://www.napp-it.org/doc/downloads/windows-aio.pdf
https://www.napp-it.org/doc/downloads/windows-rdma.pdf

1. What is „napp-it cs“ ?

Napp-it cs (client server) is a webbased (storage) server management tool. It is based on napp-it se (Solaris edition), available since 2009. Napp-it cs has three parts

- **Web-gui frontend** (Apache webserver + Perl web-gui scripts + user editable menus)
- **Server backend services** (low ram services, ca 60KB RAM for remote control, monitoring and job management)
- **Keyserver backend** for public https server (optional cgi script)



napp-it cs frontend on Windows with a Storage Spaces and ZFS pool and a servergroup of differen hosts,

1.1 Concept

Unlike many other web-gui tools, the napp-it cs frontend and backend can run on any OS (Free-BSD, Illumos, Linux, OSX and Windows) where you only need a Apache webserver and Perl. Main platform is Illumos (OmniOS), Linux (Proxmox) and Windows (Windows 11 or Windows Server). One frontend setup can manage multiple hosts (locally and remote) with a select option for localhost and remote hosts. Any menu option affects then the selected host.

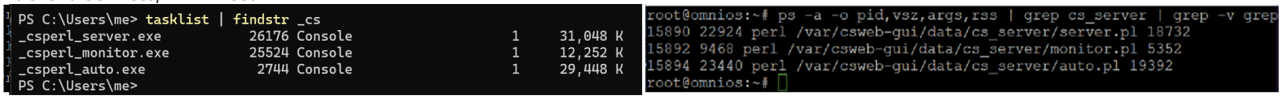
Napp-it cs is Copy and Run. This means that installation = download csweb-gui app folder and deinstallation=delete csweb-gui app folder, Update and downgrade (last 5 versions) can be done online (menu About > Update.

Napp-it cs can manage any service and server. You can extend napp-it cs by private menus (update save). Default menus are intended to manage storage, either Storage Spaces on Windows or ZFS (any OS including Windows).

The frontend server with an Apache webserver can be any average desktop or server with 4GB Ram or more. Use whatever is ok for your OS. For any GUI based OS (OSX, Windows etc) 8-16GB is suggested.

The background services server (remote control), monitor (caching) and auto.pl (jobs) are ultra resource efficient. They need less than 80KB on a frontend server plus the RAM you need for GUI and to process storage tools like zfs or zpool plus the RAM you want for storage performance (read/write caching)

Backend services, RAM need



Backend services server, monitor and auto, example on Windows and Unix (frontend)
Backend services run well on ARM or X86 ultra tiny devices like a low RAM Raspberry (backend only server around 30KB RAM).

2. Hardware and Software options

2.1 Single disk minimal system

with OS and data on a single bootdisk system
example Intel Nuc or old laptop

pro
- very cost and energy efficient

contra
- during a possible OS reinstall, you may delete all data unintenionally
- no redundancy, backup is mandatory

This is a possible but not recomended setup
For low capacity need, use 1x NVMe otherwise 1x hd.

2.2 Bootdisk + dedicated data disk(s)

with OS on first disk (32GB min) and data on other disk(s)with or without redundancy
example 2-4 bay NAS or mini server

pro
- easy to setup and maintain
- cost and energy efficient
- easy to move data pools

contra
- limited expansion options

2.3 Bootdisk + dedicated data disks in a Hybrid setup (hd + NVMe)

with OS on first disk and data on other disk(s), best with redundancy. Data can be on hd or flash with a tiering option to move
example iTX, uATX or ATX server, M.2 bootdisk + hd + NVMe (M.2/U.2/U.3 or PCIe adapter) or tiny system

pro
- easy to setup and maintain
- with recsize vs small blocksize you can define per dataset where data (metadata, small files or all files) is stored
- data move hd vs flash with zfe rewrite (OprnZFS)-
 for high capcity + high performance and medium costs

2.4 RAM

Ultra compact systems like a 2GB Raspberry are possible when performance is not so important.

In general, you need a 64bit OS that wants 1-2 GB RAM. With modern Copy on Write filesystems on hd (btrfs, ReFS, ZFS)
you need RAM for caching or performance sucks. For low RAM systems prefer SSD/NVMe disks.

If you want a ZFS storage system with good performance

- consider 4-8GB or more for an Illumos/OmniOS NAS and ZFS in its native Unix environment
  This is the most resource efficient and stable ZFS option.
- consider 8-12 GB or more for OpenZFS or Windows Storage Spaces
- consider 8-12GB or more If you want a local desktop or web-gui.

- If you want to local add services or container virtualisation, add 2-4GB RAM
- If you want full OS virtualisation, add 4-16GB RAM per VM

- Add RAM for performance (rambased read/write caching)

2.5 OS options for fileserver

Free-BSD + OpenZFS + SAMBA
- very stable storage systems with ZFS
- advanced NFS4 ACL for permissions (Windows ntfs alike)

Illumos + Illumos ZFS + ZFS based /inkernel SMB (OpenIndiana, OmniOS)
- the most resource efficient and stable ZFS
- compatible to OpenZFS
- NFS4 ACL with Windows SID as ZFS attribute, SMB groups in groups
- remote permission management via Windows desktop (property > security) based on local users
- ZFS snapshots = Windows previous versions with zero setup

OSX + APFS/OpenZFS + SAMBA
- OpenZFS released
- if you know or have it, best for desktop use, not so perfect for a server

Linux + OpenZFS + SAMBA
- best mainstream option but lacks modern NFS4 ACL (only simple Posix ACL)
- best All in One Linux (barebone storage + hypervisor) is Proxmox that comes with ZFS

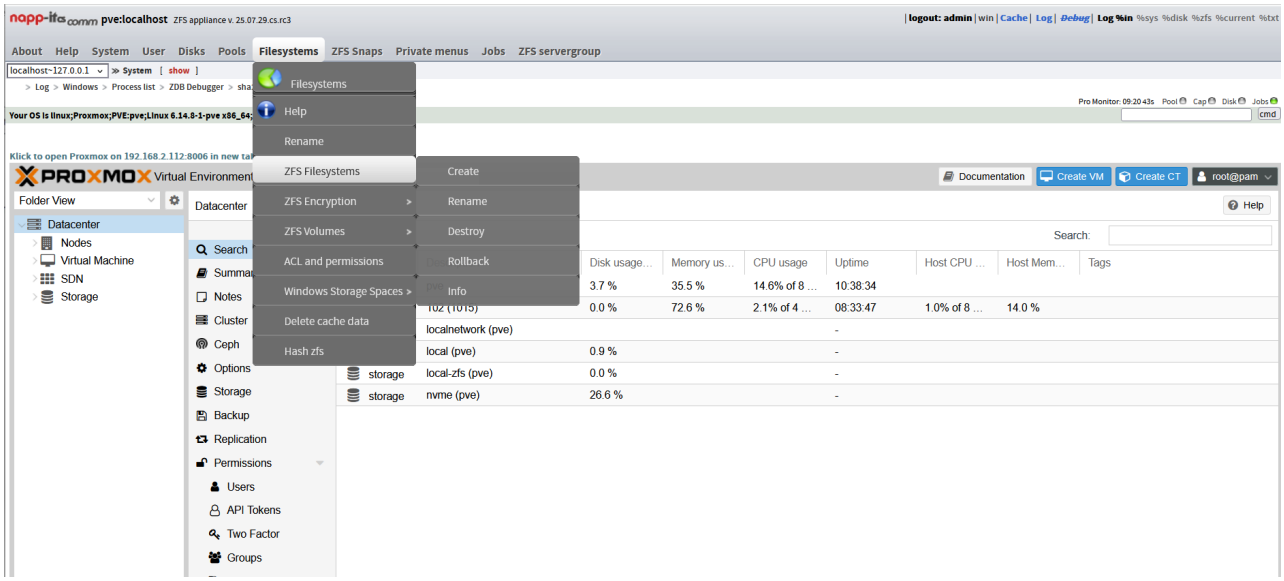
Solaris + native Solaris ZFS + ZFS based /inkernel SMB
- only for large enterprises if you need best of all stability and commercial support
- incompatible zu OpenZFS

Windows + ntfs/ReFS/OpenZFS + native kernel Windows SMB
- origin of NFS4 ACL with worldwide unique Windows SID as ACL attribute instead simple uid numbers, SMB groups in groups
- remote permission management via Windows desktop (property > security) based on local users
- best of all SMB performance with SMB Direct (Windows Server or cheap Server Essentials requires for SMB Direct)
- auditing and network Raid over Lan with fast virtual disks .vhdx over SMB
- OpenZFS is release candidate (beta)

2.6 OS options for All in One (fileserver + hypervisor)

while any OS can virtualize, there are some with premium features

- ProxMox, this is Debian optimized for hypervisor use and web-gui for VM management
ZFS and add ons like Proxmox backup server included, for advanced storage management combine with napp-it cs



Proxmox and napp-it cs web-gui combined

- Windows + HyperV
if you know it or need Windows or want Raid over Lan with fast virtual disks .vhdx over SMB

3. Setup and first steps

after installing a base OS like Free-BSD, Linux, OmniOS, OSX or Windows

3.1 Download napp-it cs application folder csweb-gui (all OS beside Windows)

https://www.napp-it.org/doc/downloads/napp-it_cs.zip
- upload csweb-gui to /var (WinSCP)
- start napp-it via Putty ex Proxmox: sh /var/csweb-gui/startup/backend+web-gui/proxmox/apache/apache_proxmox.sh

on Windows you need an additiona Apache/Perl stack like Xampp, download (and unzip to c:\xampp)
https://www.napp-it.org/doc/downloads/xampp.zip (Xampp with napp-it cs)
- start napp-it cs (C:\xampp__start_zfs-gui_as_admin.bat)

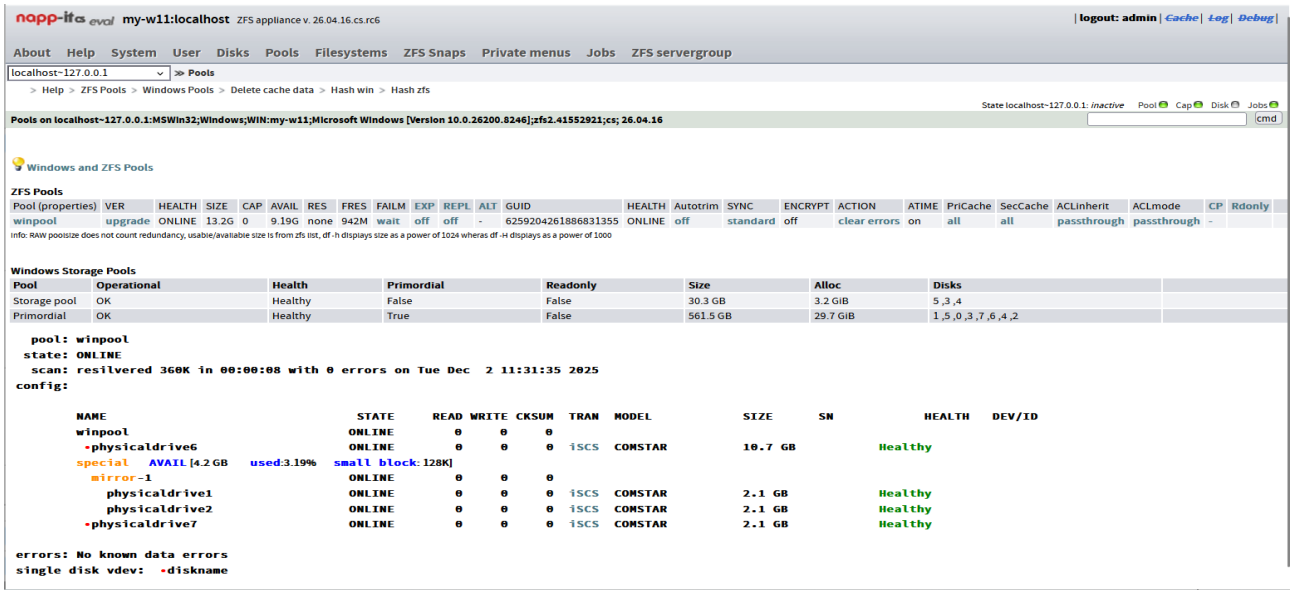
If you want OpenZFS on Windows,
- install newest OpenZFS filesystem driver: https://github.com/openzfsonwindows/openzfs/releases
- read issue tracker: https://github.com/openzfsonwindows/openzfs/issues

Manuals per OS:
https://www.napp-it.org/doc/downloads/napp-it_cs.pdf

https://www.napp-it.org/doc/downloads/freebsd-aio.pdf
https://www.napp-it.org/doc/downloads/osx-aio.pdf
https://www.napp-it.org/doc/downloads/proxmox-aio.pdf
https://www.napp-it.org/doc/downloads/windows-aio.pdf

3.2 napp-it cs web-gui (any OS)

Open browser at adress https://localhost (local call) or https://ip (remote call)



napp-it cs web-gui (example on Windows with Storage Spaces and ZFS Pool)

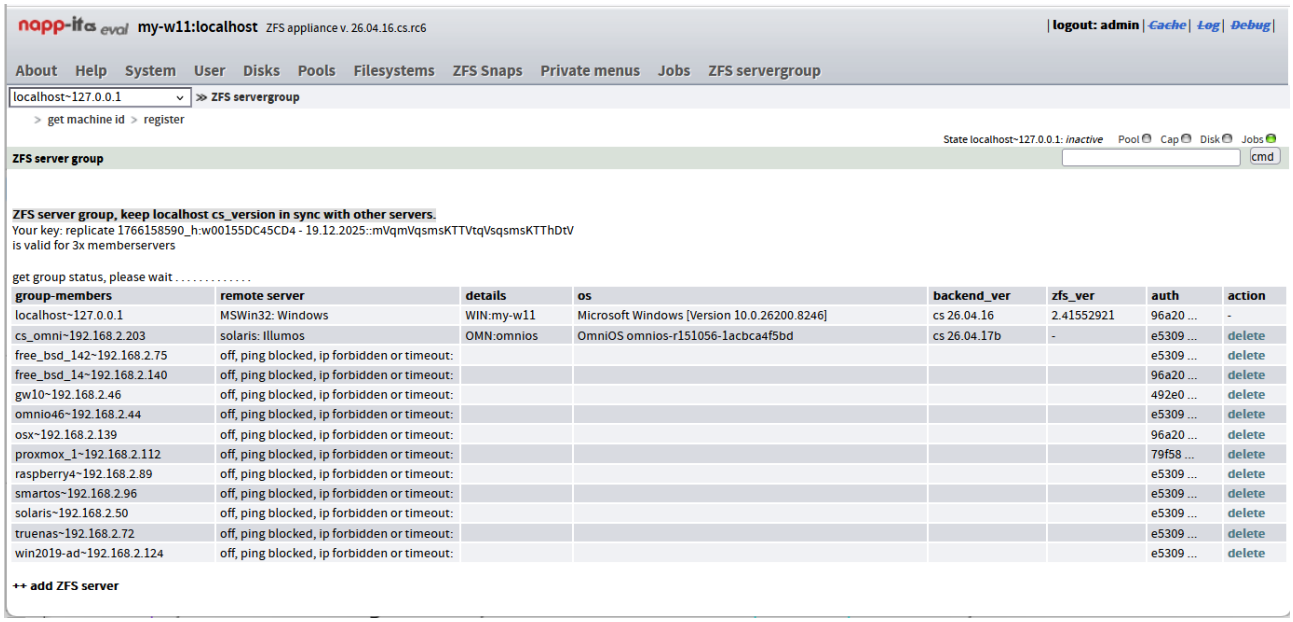
Prior further settings, check for bug and security updates
- is OS up to date, optionally update OS
- is napp-it cs up to date, optionally update with menu About > Update

- is ZFS up to date, optionally update (mainly Windows and OSX othewise distribution maintains ZFS)

3.3 napp-it cs servergroup

If you want to manage not only a local installation but other servers remotely:
Open menu „ZFS Servergroup" and click on „++ add ZFS server" below serverlist
Enter ip, name and authvalue (for added server from /var/csweb-gui/cfg/server.auth)

You can then select a server from the group and all menu actions affect the selected server



menu ZFS Servergroup with option to add ZFS server

Local management of a single server with napp-it cs is free even commercially.

After setup, a 30 day eval of grouping features is activated

Management of a servergroup of up to three servers is free for noncomercial home use
Get a free 3x home key or 2day evalkey for tests: https://www.napp-it.org/extensions/evaluate_en.html

Remote management of a servergroup outside evaluation or 3x homeuse requires a license
https://www.napp-it.org/extensions/quotation_en.html

3.4 Create a Storage Pool

1st step: you need to create a Storage Pool

ZFS: use menu „Pools > ZFS Pools > create new Pool" ex tank
This creates a new pool with a first vdev
- select one disk for a basic pool (no redundancy) or multiple disks for a raid array (mirror. raidZ, Draid, AnyRaid)

Windows: use menu „Pools > Windows Pools > create new Pool"
This creates a new Storage Spaces Pool. A Storage Spaces Pool is a basket for disks of any type or size without diskbased redundancy. Redundancy on a Storage Spaces Pool is done per Space and data copies.

2nd step: you need to create a Storage Space (Windows) or ZFS filesystem

ZFS: use menu „Filesystems > ZFS Fileystem > create new Filesystem" ex tank/data
This creates a new ZFS filesystem where size can grow up to poolsize without settings
- manage usage with quotas (max size) and reservations (guaranteed size))

Windows: use menu „Filesystems > Windows Spaces > create Storage Space"
This creates a new Space (virtual disk) with a given size and ntfs/ReFS. Redundancy on a Storage Spaces Pool is done per Space and data copies. You can also define if a Space is created on hd or flash or automatic data tiering between hd and flash.

3.5 Extend a Storage Pool

ZFS: use menu „Pools > ZFS Pools > add vdev to extend pool capacity
- select a single disk for a basic vdev (Raid-0) or multiple disks for a Raid vdev

!! Data is striped over all vdevs in a ZFS Pool. A vdev lost means a Pool lost,
so care about a similar redundancy on any vdev.

If you add a Special Vdev, you need redundancy too as a Special Vdev is the final destination of data,
this is not a cache drive that can fail. With a SpeciaL Vdev, recsize and small block size defines data storage.
A zfs rewrite can move data between hd and flash.

Windows: use menu „Pools > Windows Pools > expand Pool" to extend pool capacity
- this adds the disk(s) of any type or size to a Storage Spaces Pool (no redundancy on Pool level).
You can set type of disk (hd or NVMEe for data location or auto tiering)

3.6 Repair a Storage Pool

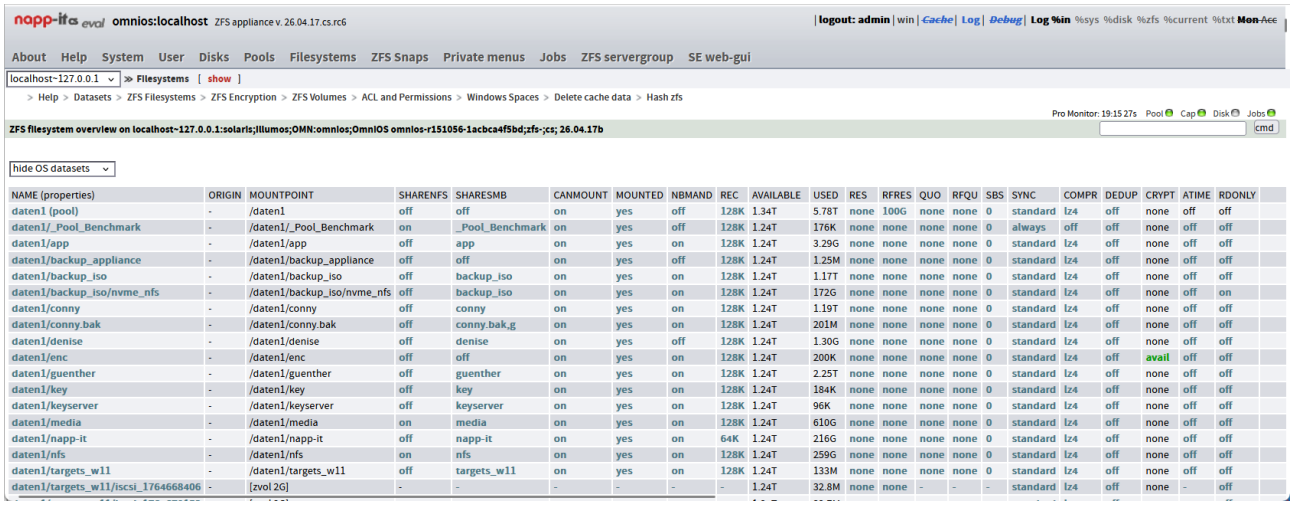
ZFS: use menu „Disks > ZFS Management > Replace a disk"
- this replaces a bad disk with a new or cold spare disk. A hot spare replaces automatically

Windows: use menu „Pools > Windows Pools > expand Pool" to add new disks and menu
„Pools > Windows Pools > Shrink" to remove bad disks. Data that were on a bad disk is lost without a redundancy on Spaces level that makes data copies on multiple disks

3.7 Share data over SMB

The best option to share data over lan is SMB as a client for this protocoll is available everywhere and it is best at all for multiuser access with ACL restrictions. With SMB Direct and Windows Server this is also the fastest.
https://www.napp-it.org/doc/downloads/windows-rdma.pdf

To enable a NFS/SMB share, click „off" under NFS or SMB (Windows SMB only).
To disable, click on on or the sharename



Menu „ZFS Filesystem" with most important ZFS settings incl sharing

Warning: Share ZFS filesystems only, not regular folders as snaps and critical settings are ZFS properties
Do not use nested ZFS filesystems below a share as such a nested filesystem can have different settings like casesensitivity, charset or locking behaviour
Hint: **Set zfs acltype** to nfs4 (Linux: posix) and aclinherit + aclmode to passthrough for Windows alike behaviour

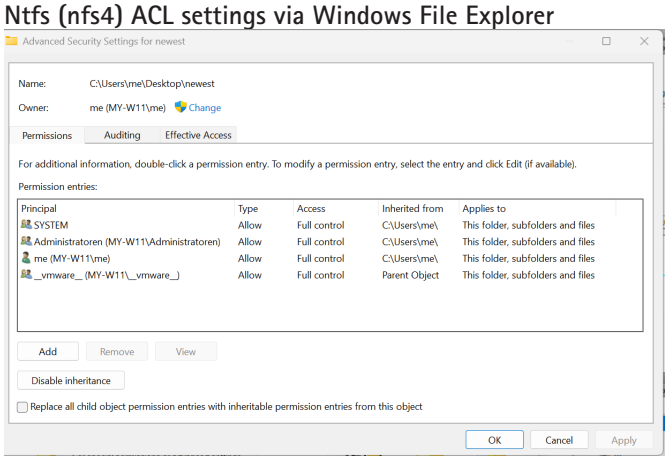
3.8 Protect data with ACL (access control list)

When you enable SMB shares with guest access disabled, you must enter a login name and passwort to access a share and you can restrict access based on login either for files and folders (file attribute) or shares (share setting). You should set ZFS acltype to nfs4 (if supported) or posix (Linux) and aclinherit + aclmode to passthrough for a Windows alike SMB behaviour (SMB is basically a Microsoft Windows development)

Set ACL on Windows or Solaris and Solaris forks (native/ kernelbased SMB):

Use Windows File Explorer and „Property > Security" for files or folders (locally or remote over lan)
Set ACL for local or AD user and groups (On Windows or Solaris SMB groups can contain groups with fine granular ntfs/nfs4 permissions and ACL inheritance. This is not an option on other Linux or Unix) .

Ntfs (nfs4) ACL settings via Windows File Explorer



Advanced ACL settings with Windows File Explorer

Problems !!

If you move a pool or replicate a ZFS filesystem on Windows or Solaris/ Illumos, ACL remain intact as both use real Windows SID as ACL file reference. On Free-BSD, OSX , other Unix or Linux the file ACL references are simple uid/gid numbers like101 what can mean a different user on any other server. You need complicated mappings uid-> gid to go around or you must re-assign all ACL after a move.

Another problem is SMB groups in SMB groups. Only Windows or Solaris/ Illumos supports this.
All other Linux/Unix do not (Linux/Unid groups cannot contain groups)

Another problem are simple Posix ACL (Linux) vs ntfs/nfs4 ACL. with inheritance. On Linux you use Posix ACL where you can allow read/write/execute for a list of users . Ntfs or nfs4 ACL have more options like create file or folder in this folder only or also in subfolders (inheritance). Posix do not offer ACL inheritance from parent folder(s) that have an immediate effect after modification on parents). With Posix you can only define default behaviours. If something changes, you must redefine all ACL for all files and folders

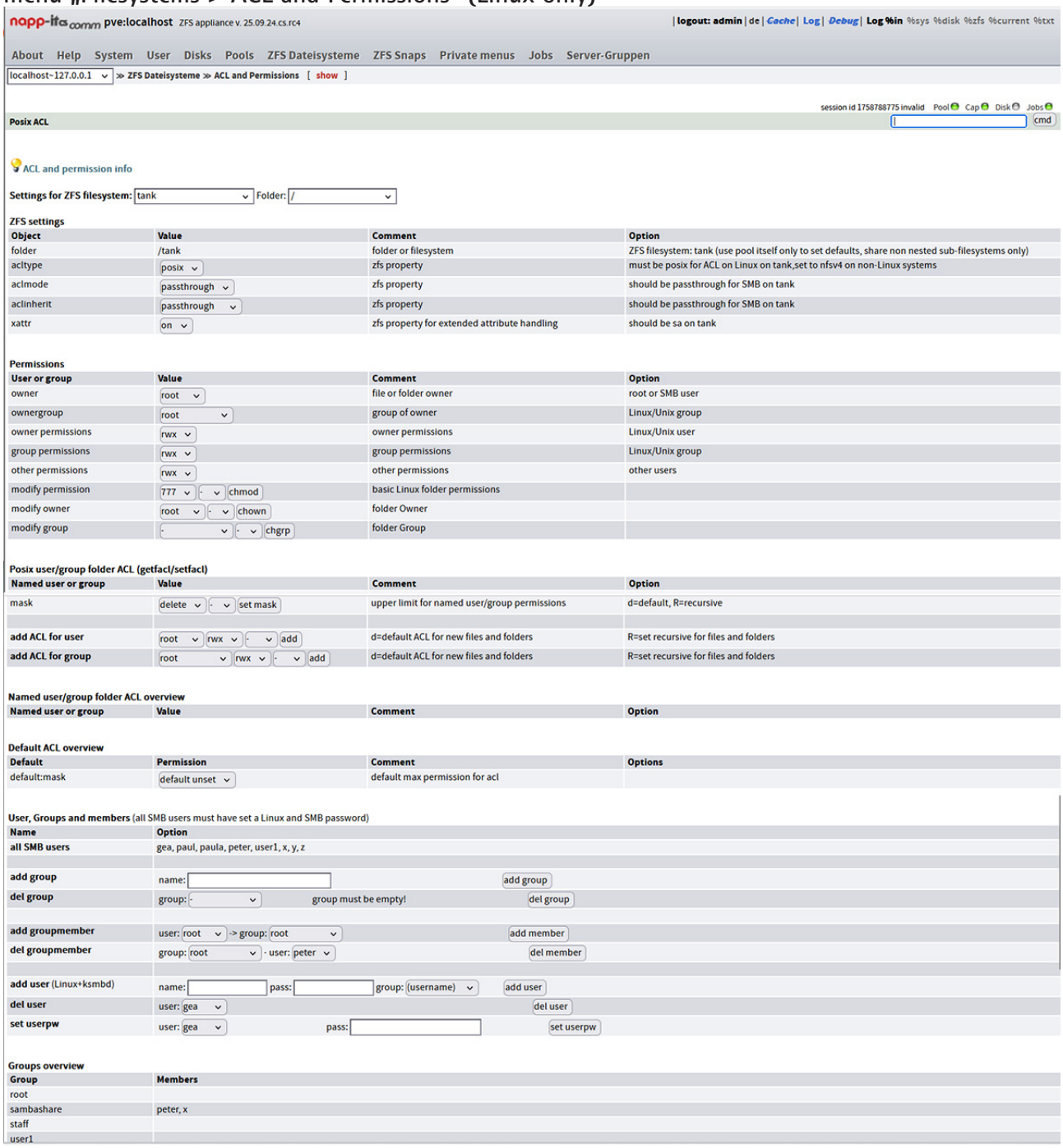
Set ACL on Linux (SAMBA or the faster kernelbased ksmbd):
To use ACL on Linux, situation is quite complicated and a pain compared to Illumos, Solaris and Windows as you

- must create a local user and assign additional SMB passwords with special commands
- must edit smb.conf for general ACL settings
- must change file and folder ACL with setfacl (locally or remote via Putty)

optionally set share ACL

3.9 Posix ACL settings on Linux via napp-it cs

menu „Filesystems > ACL and Permissions“ (Linux only)



menu „Filesystems > ACL and Permissions“(Linux only)

In this menu you can create users, assign to Linux groups.
You can display, modify and create Posix ACL and Posix defaults.

Warning

If you move or replicate ZFS pools or filesystems between Linux and Windows or Illumos you must re-assign ACL

If you move or replicate ZFS pools or filesystems between Linux hosts you must re-assign ACL or care about mappings or you must create identical users with same uid/gid on any host.

4. Special Functions

4.1 napp-it ZFS Autoscrub

Napp-it cs autoscrub jobs can verify all data and autorepair corrupt datablocks or bitrot from redundancy, Autoscrub should be run with desktop disks once per month and with enterprise disks twice a year.

4.2 napp-it ZFS Autosnap

Napp-it cs autosnap jobs can create snaps per filesystem or recursive with complex keep and hold options based on numbers or age to preserve. You can auto delete zero size snaps or include regular folder in a snap. This is important for Proxmox to include VM settings from /etc/pve in ZFS snaps. Optionally you can call scripts prior or after a job is run.

4.3 napp-it ZFS Replication

Napp-it cs replication jobs can replicate ZFS filesystems and zvols from any host with any os to any host (beside OpenZFS to/from Solaris with native ZFS) based on netcat. Netcat is quite the fastest option and is available on any Linux or Unix. For Windows netcat is included in napp-it cs for a copy and run experience. Netcat is the best tool in secure lan environments. Do not use netcat over Internet or insecure lans without VPN. To debug replication jobs, enter rl in napp-it cmd field (both hosts)

Napp-it replication offers complex retension policies like run every 15min and preserve x snaps in last hour, run every hour and preserve y snaps for current day, run every day and preserve z snaps for current month (or per current year).

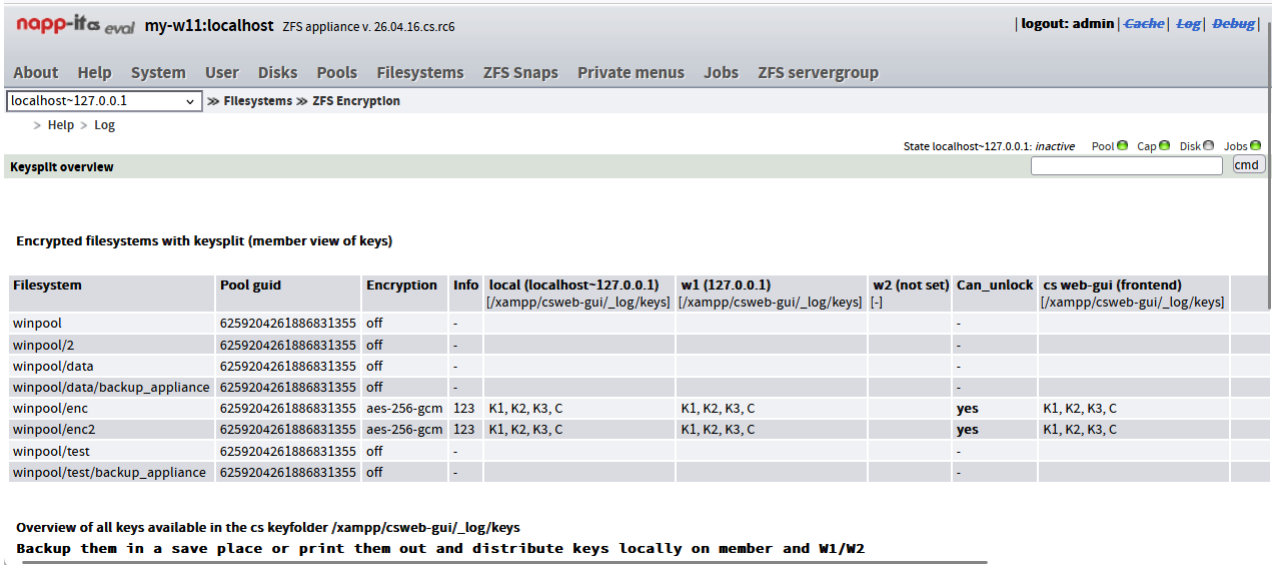
4.4 napp-it ZFS Encryption

You can encrypt whole ZFS pools but you should avoid this. It is better to encrypt filesystems below an unencrypted pool. This allows different keys for different filesystems, you can unencrypt filesystems via zfs send filesystem -> pool and you can use unencrypted filesystems in special cases like VM data with sync enabled. This is quite slow with encrypted filesystems.

When you create an encrypted filesystem in napp-it cs, you can use a short simple and easy to remember passwort (or any other key). Nappit cs creates a 256hex password hash from this password and the path (pool+filesystem+pw). Such a password has 64 Bytes and avoids characters like `ilIO0` that are hard to read correctly. You can also send them via email or print out for backups. A 64 Byte passphrase is long enough to divide it in three parts where each part has at least 20 Bytes. Each keypart (or the whole key) can be stored on the web-gui host, locally on a server backend host or on one or two (public or private) https servers. For a public https keyserver ex a company or university webserver a cs_connect script is included.

To unlock such a filesystem, you can simply click on unlock. Napp-it cs tries then to find all three keyparts (or a complete key) from the options. You can also enter the whole key or the short and easy to remember passwort to unlock.

Keypart overview



ZFS Keypart overview in menu „Filesystems > ZFS Encryption“

4.5 Data versioning and disaster backup

Even with the best filesystem and Raid, you can loose data due theft, fire, flash, amok hardware, human errors or bugs

A strategy to avoid dataloss should cover different problems

- Hardware/disk failure
you need redundancy for data (Storage Spaces) or data disks (ZFS Raid) to preseve most current data
(backup is good but like bread, always from yesterday)

- Unintenionally deleted files or Ransomware
you need snaps ex 4x for current hour, 24x for current day, 30x for current month, 12x for current year and enough versions

- corrupt OS, example after a bad security or bugfix update
you want ZFS bootenvironments (bootable snaps) and a revovery image to restore OS with an USB bootstick from USB or SMB.
This can be Aomei backupper on Windows or Clonezille for any bootdisk, create an image from time to time

- a real disaster like theft, fire, flash, amok hardware, human errors or bugs
For this you need a classic 321 backup, 3x data copies, 2x media, 1x external

External can be cloud, a remote storage server (not same building) or several offline USB disks (beside sync run)

With USB disks and ZFS
- create a sync job (ZFS replication or rsync/robocopy)
- attach disk, with ZFS import pool

- sync datapool -> USB
- export ZFS datapool (or eject with ntfs/ReFS volumes)

With ZFS Export prior USB disconnect is critical. If you disconnect without export, you have waiting io, blocking the USB pool.
You need a reboot to regain access to the ZFS USB pool

Copy on Write filesystems like btrfs, ReFS and ZFS are uncritical regarding a disconnect during write,
If your USB filesystem is Fat* or ntfs, there is a chance for a corrupted filesytem with dataloss, eject prior disconnect