Server — NAS

Private Sicherheitskopien vor Erdbeben, kosmischer Hintergrundstrahlung und dem BKA schützen

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Easy vs. Awesome

Easy:
D-Link DNS-320

- **CPU:** Marvell 88F6281, 800MHz, ARMv5
- **RAM:** 128 MB
- **SATA:** 2x SATA II
- **OS:** Firmware (Embedded Linux)

Easy vs. Awesome

Easy:
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Awesome:
HP Proliant Microserver N40L

- **CPU:** AMD Turion II Neo N40L, 2x 1,5 GHz, AMD64
- **RAM:** 2 – 16 GB
- **SATA:** 5x SATA II
- **OS:** n/a

KVM

Kernel-based Virtual Machine

- Hypervisor
- Benötigt Prozessor-Unterstützung für Hardware-Virtualisierung: Intel (Intel VT) oder AMD (AMD-V)

```
$ egrep 'vmx|svm' /proc/cpuinfo
```

- Im Linux-Kernel seit 2.6.20
- Paravirtualisierung durch Virtio

QEMU

- "Quick Emulator"
- Kann verschiedene Prozessorarchitekturen emulieren:
  i386, x86_64, arm, mips, ppc, …
- Emulator für Geräte (Festplatten, Netzwerk-, Sound- und Grafikkarten)

libvirt & virt-manager

libvirt

- Bibliothek/API/Daemon zur Konfiguration/Steuerung von verschiedenen Virtualisierungsumgebungen

virt-manager

- Grafisches Frontend für libvirt
- Remote-Zugriff auf verschiedene libvirt-Instanzen

RAID

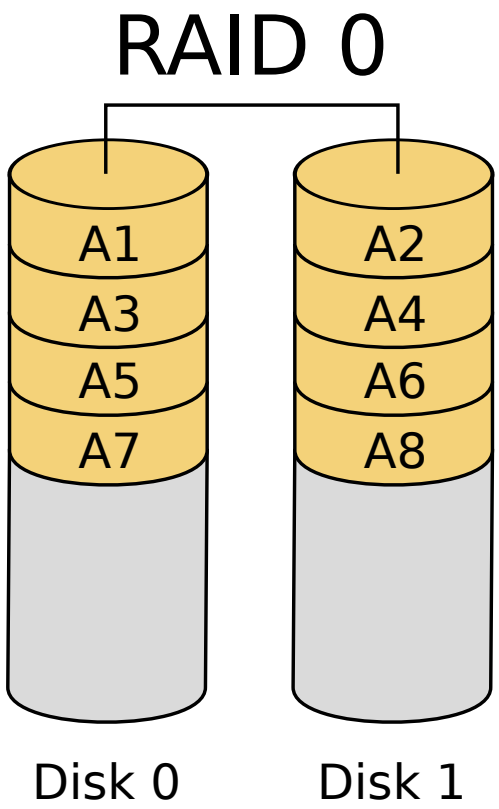
Redundant Array of Independent/Inexpensive Disks

RAID

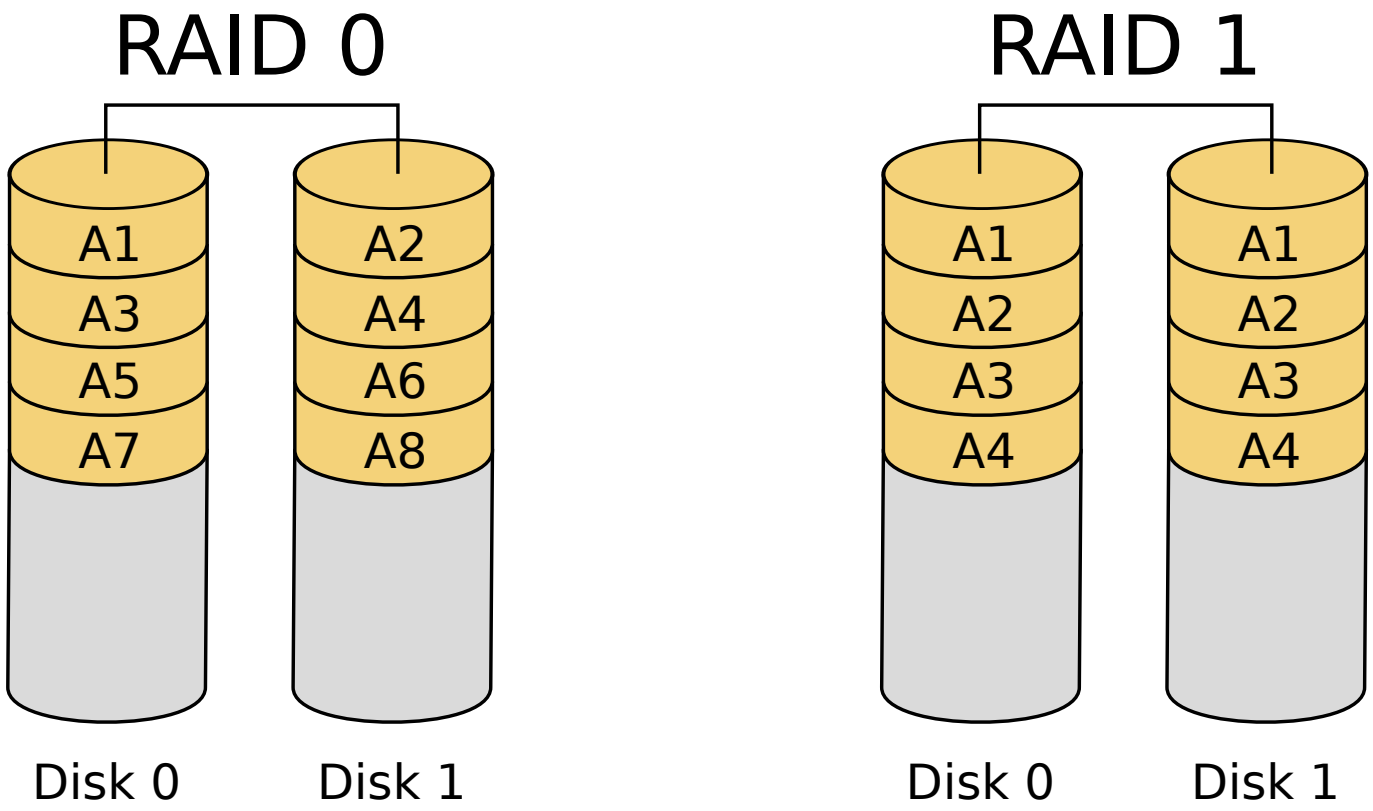
Erhöhung von Ausfallsicherheit/Performance von Festplatten

- Hardware-RAID
- Host-RAID
- Software-RAID

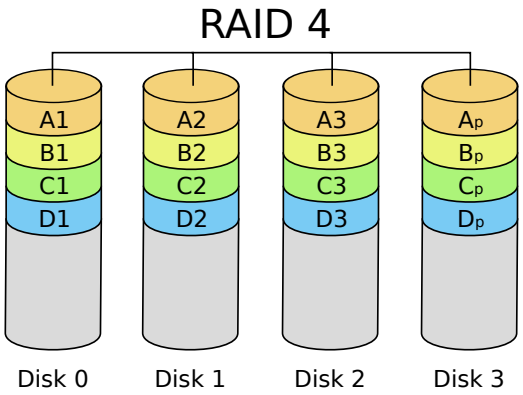
RAID



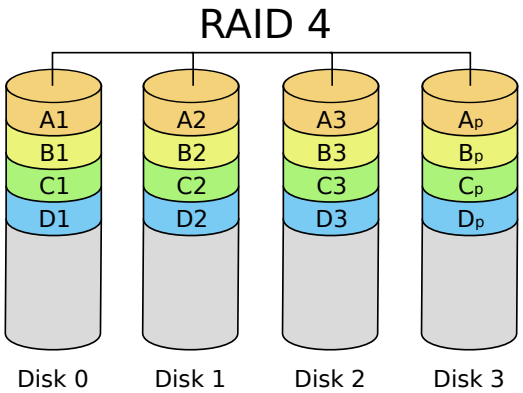
RAID

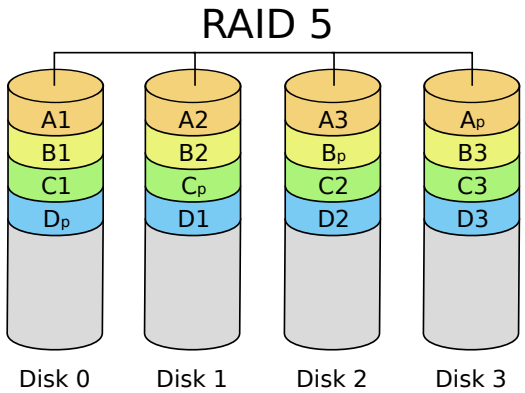

RAID 0
A1
A3
A5
A7
A2
A4
A6
A8
Disk 0
Disk 1
RAID 1
A1
A2
A3
A4
A1
A2
A3
A4
Disk 0
Disk 1

RAID

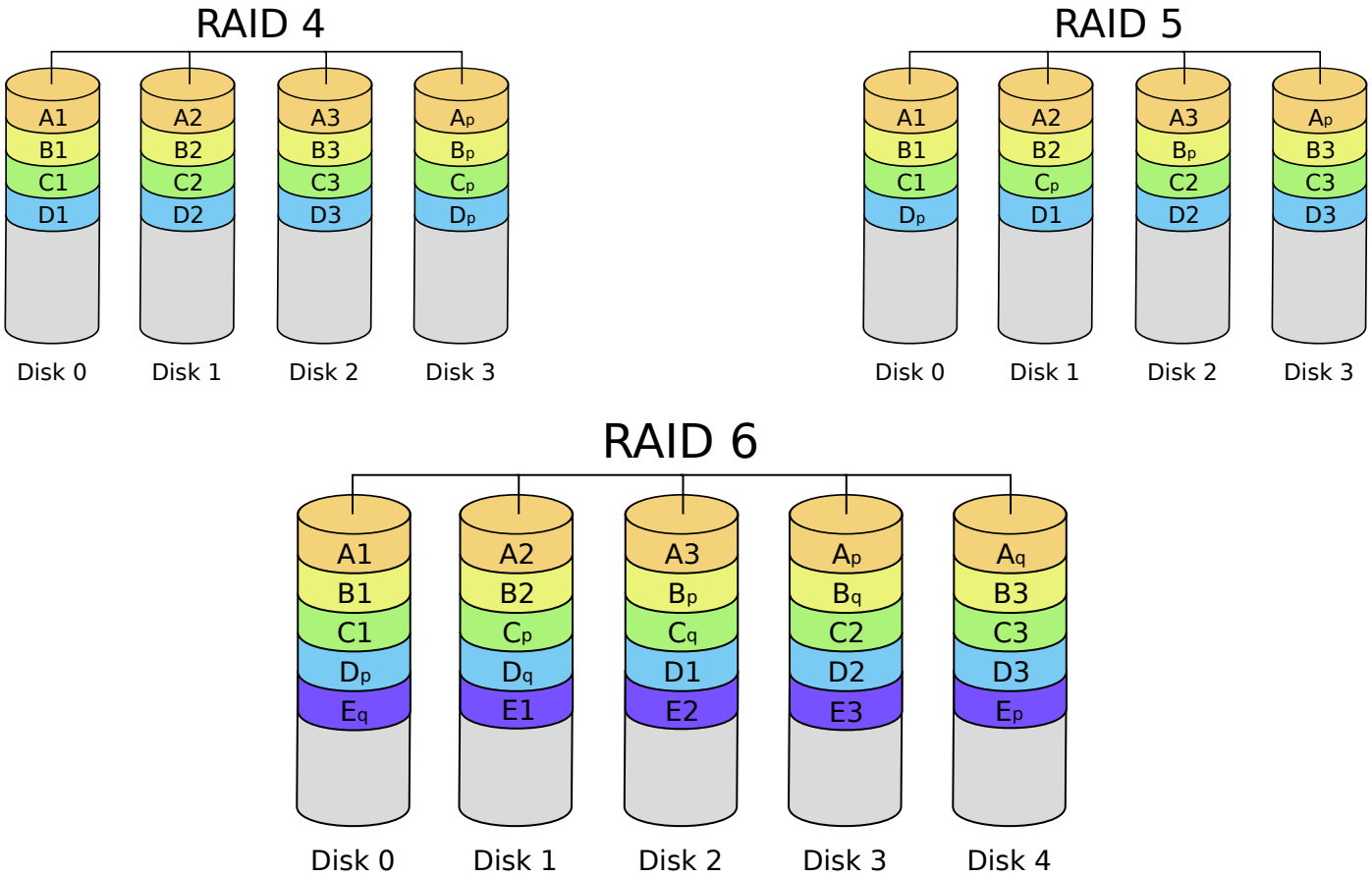

RAID 4
A1
B1
C1
D1
A2
B2
C2
D2
A3
B3
C3
D3
Ap
Bp
Cp
Dp
Disk 0
Disk 1
Disk 2
Disk 3

RAID

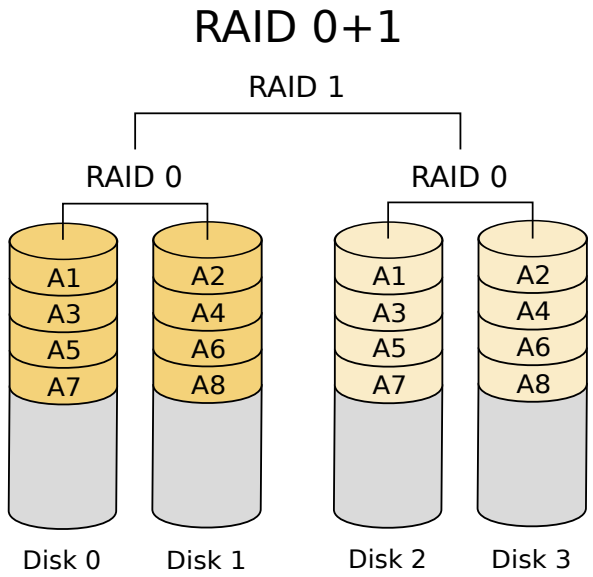

RAID 4
A1
B1
C1
D1
A2
B2
C2
D2
A3
B3
C3
D3
Ap
Bp
Cp
Dp
Disk 0
Disk 1
Disk 2
Disk 3


RAID 5
A1
B1
C1
Dp
A2
B2
Cp
D1
A3
Bp
C2
D2
Ap
B3
C3
D3
Disk 0
Disk 1
Disk 2
Disk 3

RAID

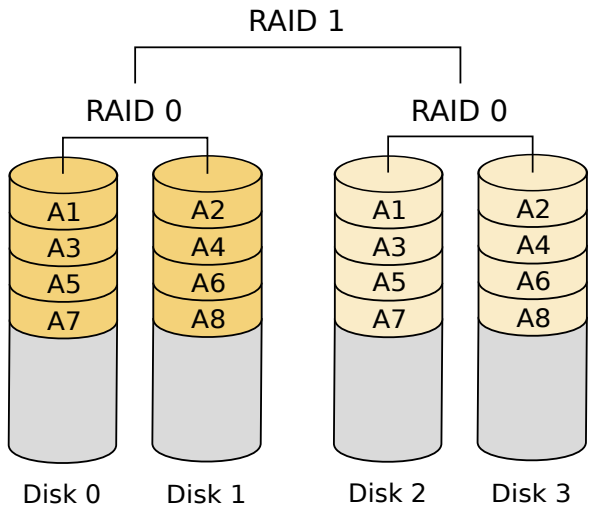

RAID 4
A1
B1
C1
D1
A2
B2
C2
D2
A3
B3
C3
D3
Ap
Bp
Cp
Dp
Disk 0
Disk 1
Disk 2
Disk 3
RAID 5
A1
B1
C1
Dp
A2
B2
Cp
D1
A3
Bp
C2
D2
Ap
B3
C3
D3
Disk 0
Disk 1
Disk 2
Disk 3
RAID 6
A1
B1
C1
Dp
Eq
A2
B2
Cp
Dq
E1
A3
Bp
Cq
D1
E2
Ap
Bq
C2
D2
E3
Aq
B3
C3
D3
Ep
Disk 0
Disk 1
Disk 2
Disk 3
Disk 4

RAID

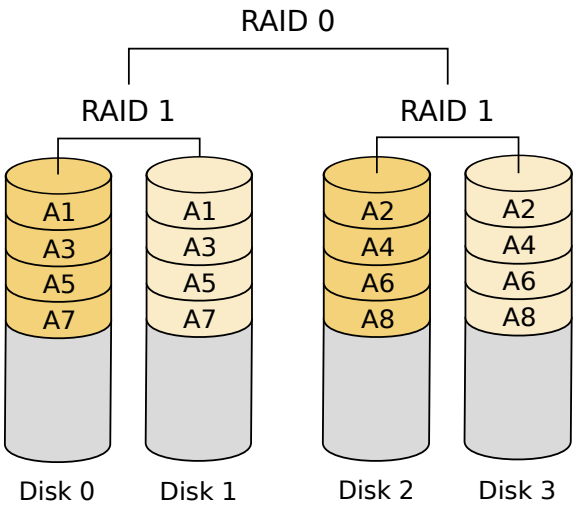

RAID 0+1
RAID 1
RAID 0
RAID 0
A1
A3
A5
A7
A2
A4
A6
A8
A1
A3
A5
A7
A2
A4
A6
A8
Disk 0
Disk 1
Disk 2
Disk 3

RAID

RAID 0+1

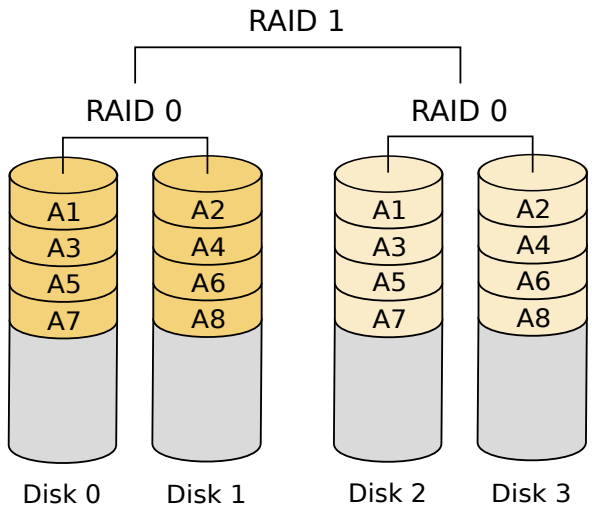


RAID 1+0

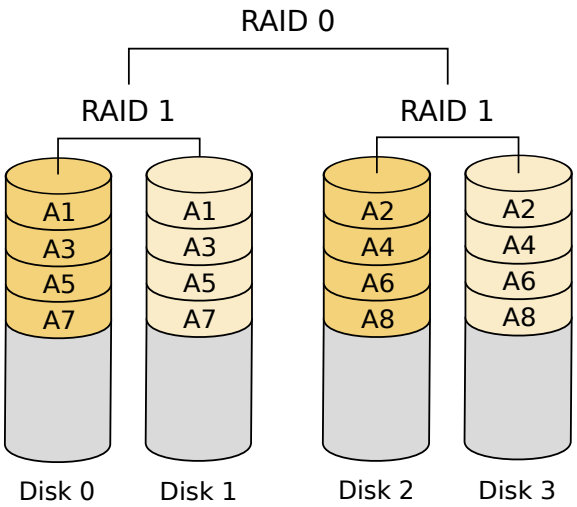


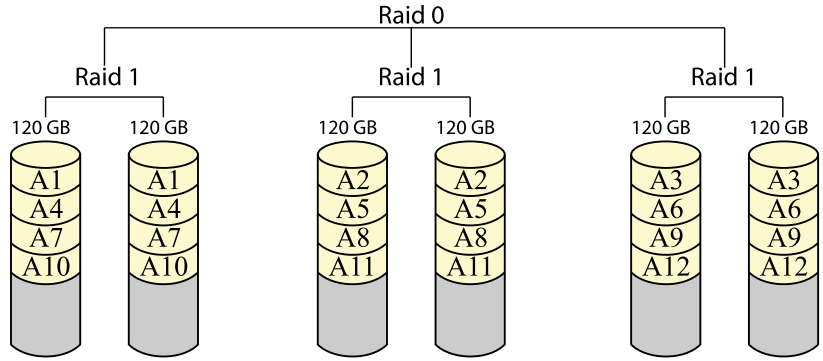
RAID

RAID 0+1



RAID 1+0





RAID

Redundant Array of Independent/Inexpensive Disks

RAID-Level	n (Anzahl Festplatten)	k (Nettokapazität)	S (Ausfallsicherheit)
0	≥ 2	n	0
1	≥ 2	1	$n-1$
4 5	≥ 3	$n-1$	1
6	≥ 4	$n-2$	2
1+0	$i \times j \ (i,j \geq 2)$	$\frac{n}{2}$	$S_{min} = i-1$ $S_{max} = j(i-1) = ji-j$
0+1	$i \times j \ (i,j \geq 2)$	$\frac{n}{2}$	$S_{min} = j-1$ $S_{max} = (j-1)i = ji-i$
⋮	⋮	⋮	⋮

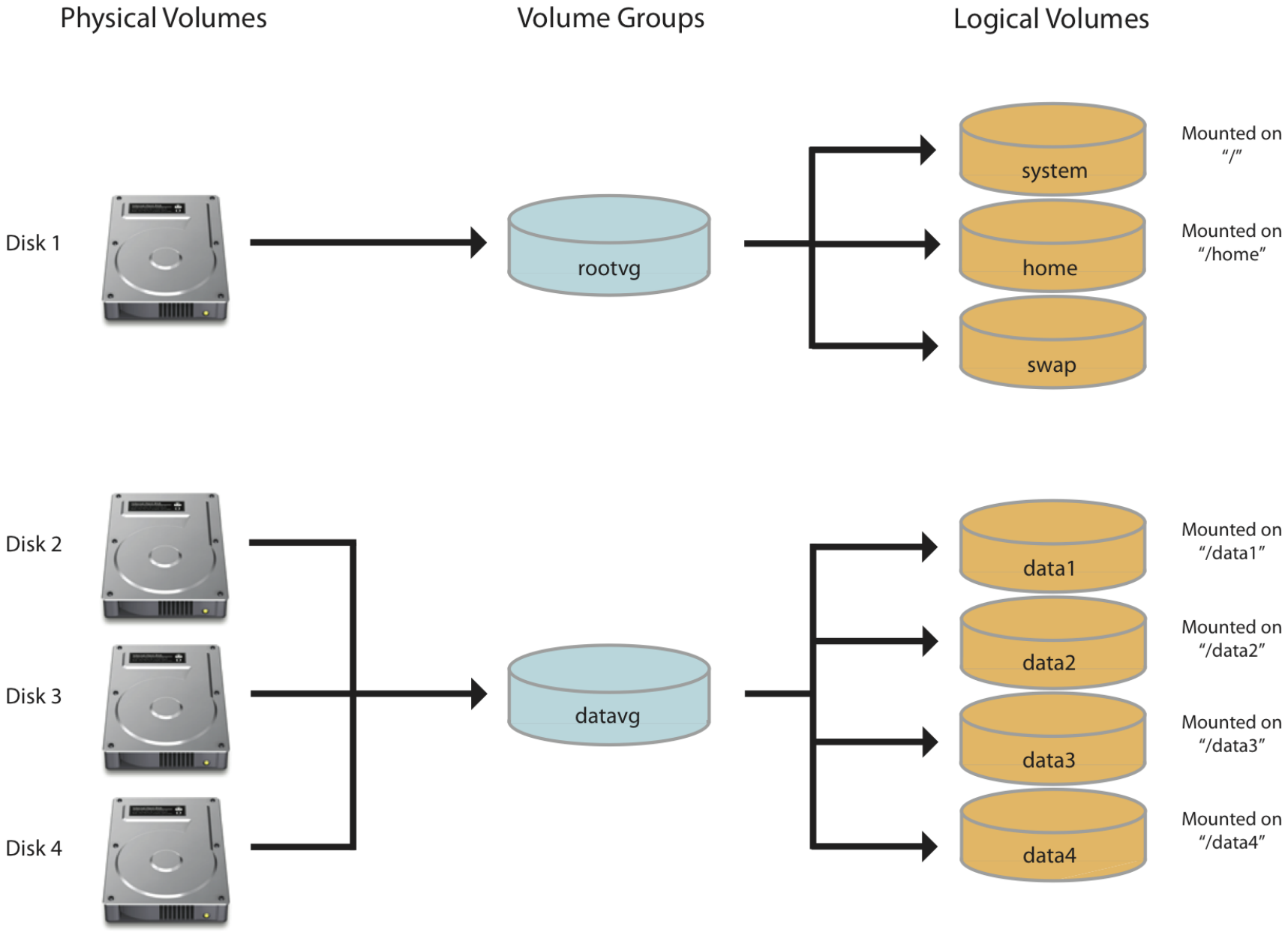
LVM

Logical Volume Manager

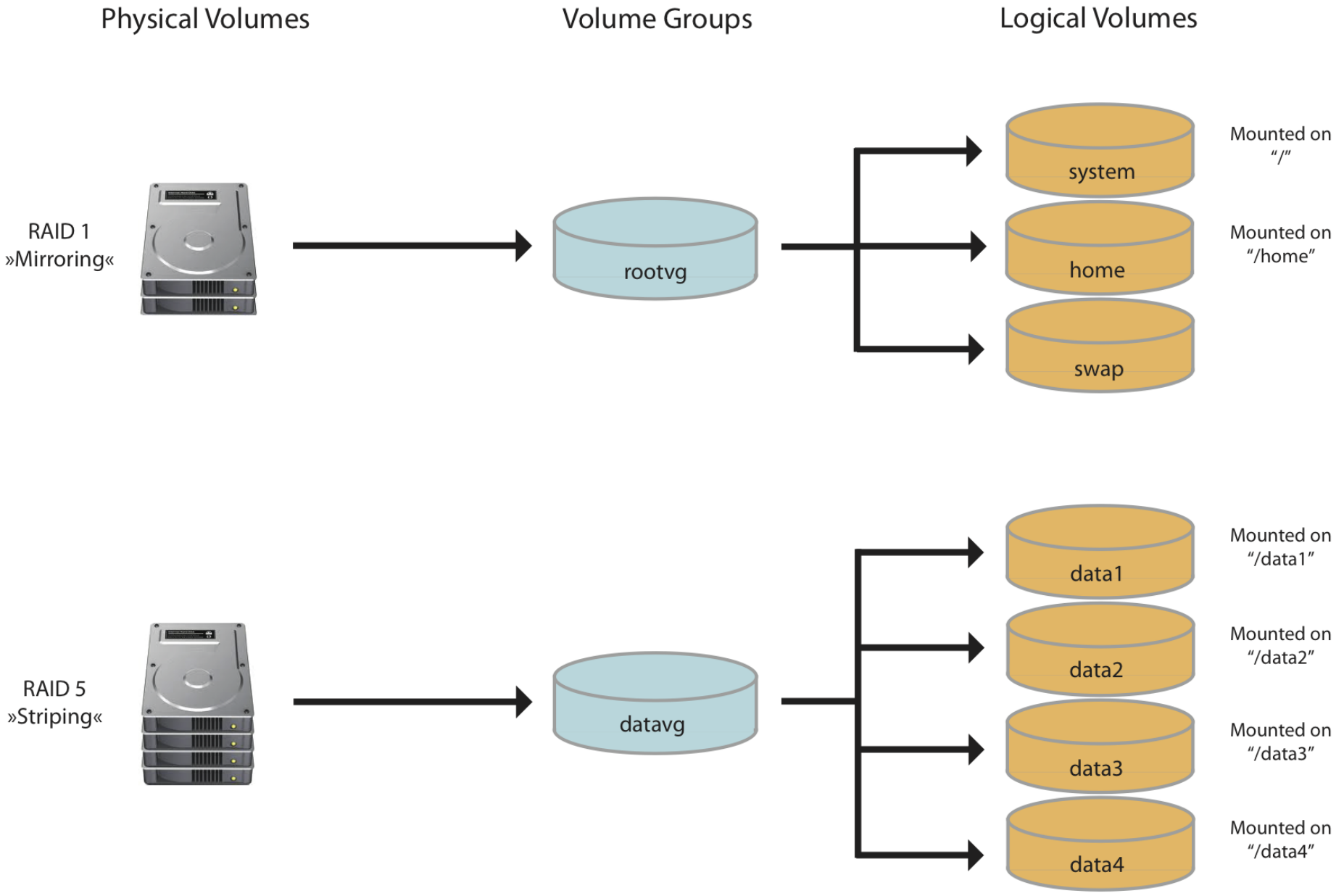
LVM

Dynamische Partitionierung über Festplattengrenzen hinweg

- Physical Volume
- Volume Group
- Logical Volume



URL: `http://www.helios.de/support/manuals/vsa-e/volume-management.html`



URL: `http://www.helios.de/support/manuals/vsa-e/volume-management.html`

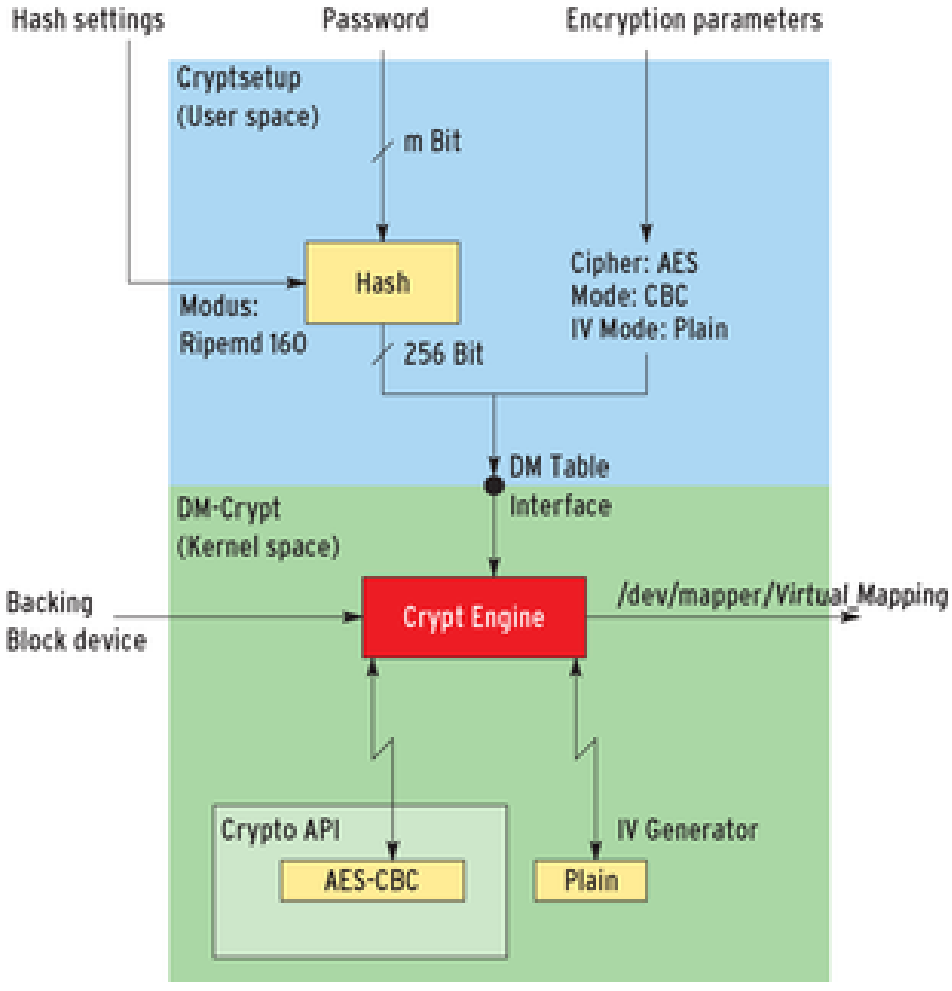
LUKS

Linux Unified Key Setup

LUKS

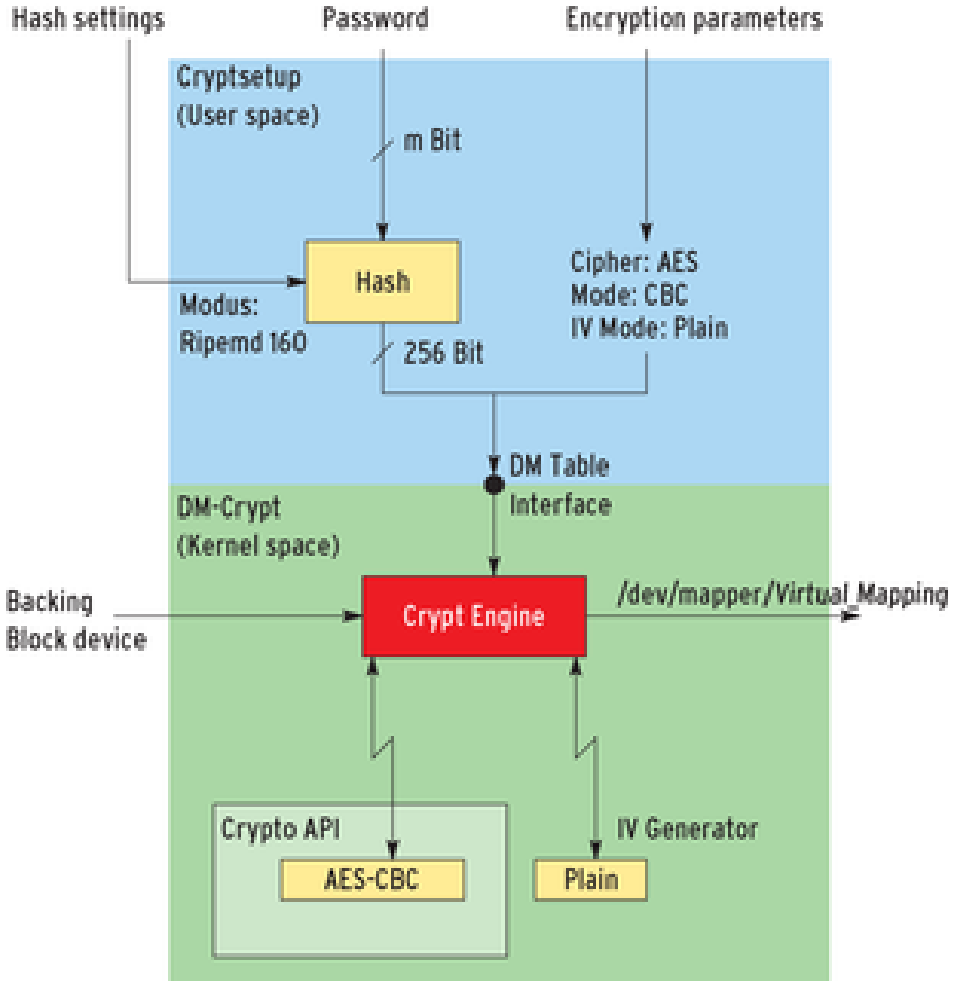
Festplattenverschlüsselung mit Header

- dm-crypt (Kerneltreiber)
- cryptsetup (Userspace-Tool)

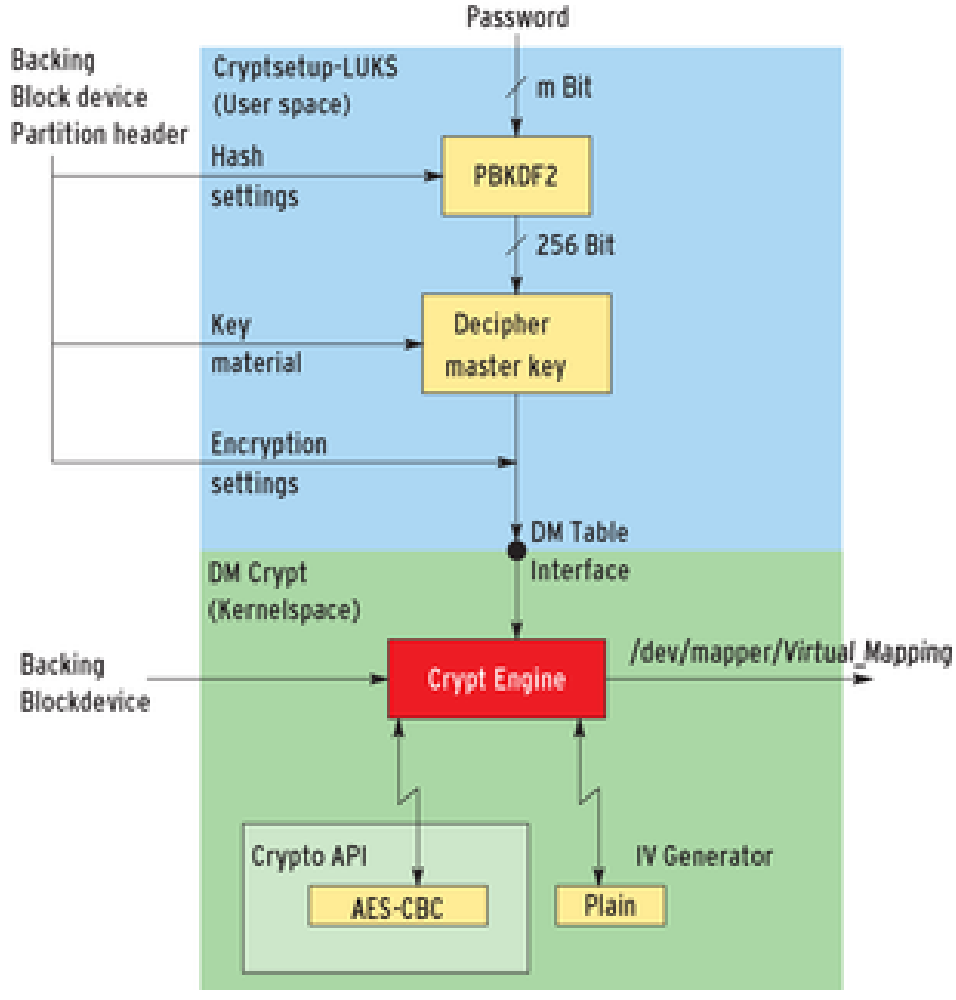


Plain cryptsetup

URL: `http://www.markus-gattol.name/ws/dm-crypt_luks.html`



Plain cryptsetup



cryptsetup with LUKS

URL: `http://www.markus-gattol.name/ws/dm-crypt_luks.html`

ZFS

Features

- Integrierte RAID- und LVM-Funktionen
- Sicherstellung von (Nutz-)Datenintegrität
- Scrubbing
- Copy-on-write
  - Transaktionen
  - Snapshots
- Verschlüsselung, Komprimierung

Historie

- Solaris 10 → OpenSolaris → OpenIndiana (illumos) → FreeBSD

ZFS

ZFS on Linux

Don’t try this at home!

ZFS on Linux is experimental software! (leider)

ZFS

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Don’t try this at home!

ZFS on Linux is experimental software! (leider)

Kernel-Treiber

`http://zfsonlinux.org/`

FUSE

`http://zfs-fuse.net/`

CIFS

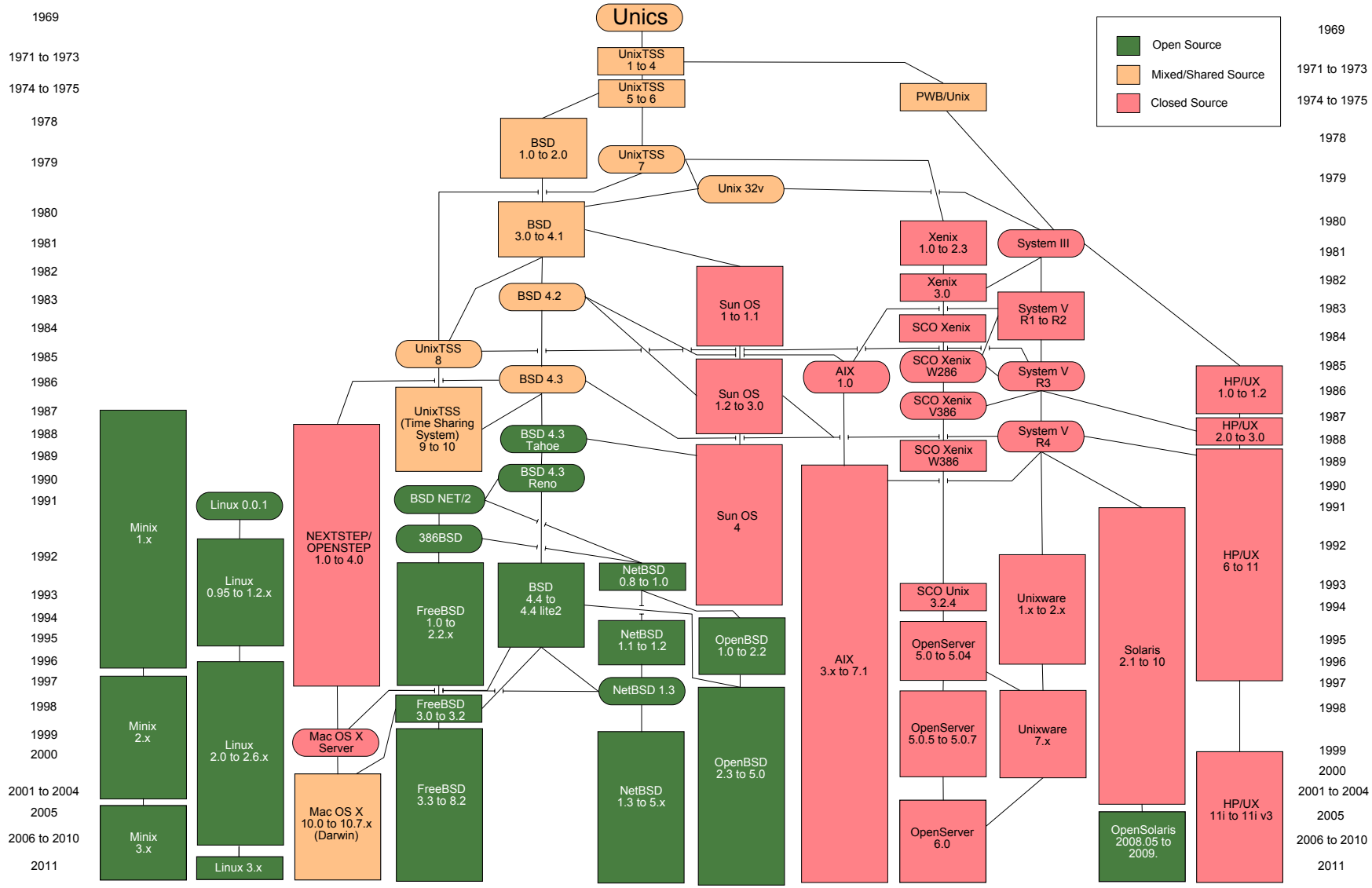
Common Internet File System

- Datei- und Druckerfreigabe
- Erweiterung von SMB (Server Message Block)
  - Freie Server-Implementierung Samba
- SMB2 (Windows Vista/Windows Server 2008) — ab Samba 3.5
- SMB 2.1 (Windows 7/Windows Server 2008 R2)
- SMB 3 (Windows 8/Windows Server 2012)

NFS

Network File System

- NFSv3 (1995)
- NFSv4 (2000)
- UNIX-spezifisch



File:Unix history-simple.svg, Revision as of 17:10, 23 June 2012 – Source: Wikimedia Commons, License: CC-BY-SA-3.0

URL: `http://commons.wikimedia.org/w/index.php?title=File:Unix_history-simple.svg&oldid=73135501`

GPL vs. the Rest

GPL Free Software

Free as in Freedom

GPL-kompatibel

- LGPL
- BSD-2, BSD-3
- MIT

Nicht GPL-kompatibel

- BSD-4
- CDDL-1.0
- Apache-2.0
- MPL-2.0
- EPL-1.0