LINBIT

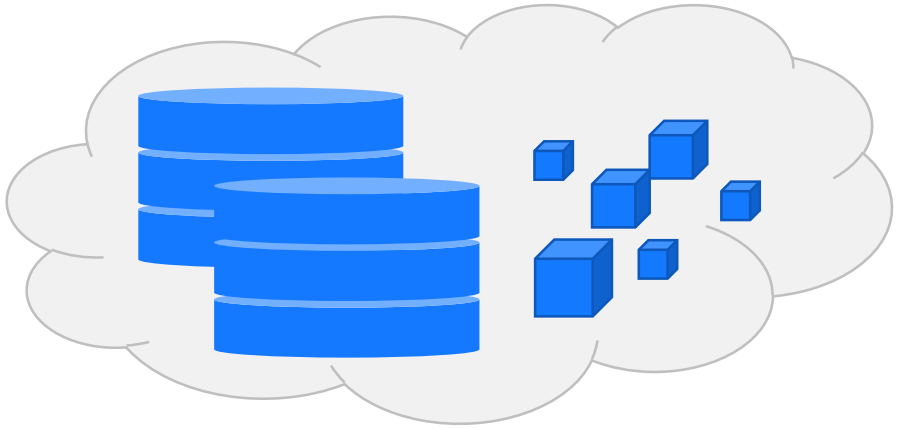
Software Defined Storage (SDS)

ALWAYS ON
AVAILABLE
EFFICIENT

LINBIT SDS

The obvious approach to enterprise grade SDS

LINBIT Software-Defined Storage



Must be

Highly reliable

Cost effective

Easy to provision

Easy to scale

LINBIT HA

NFS / CIFS / iSCSI

KVM / VMWare / Xen

Databases

Fileservers

Webservers

NagiosXI

Messaging (MQ)

Nearly any other app

LINBIT SDS

Container-native

OpenShift

Kubernetes

Docker

Cloud-native

OpenNebula

OpenStack

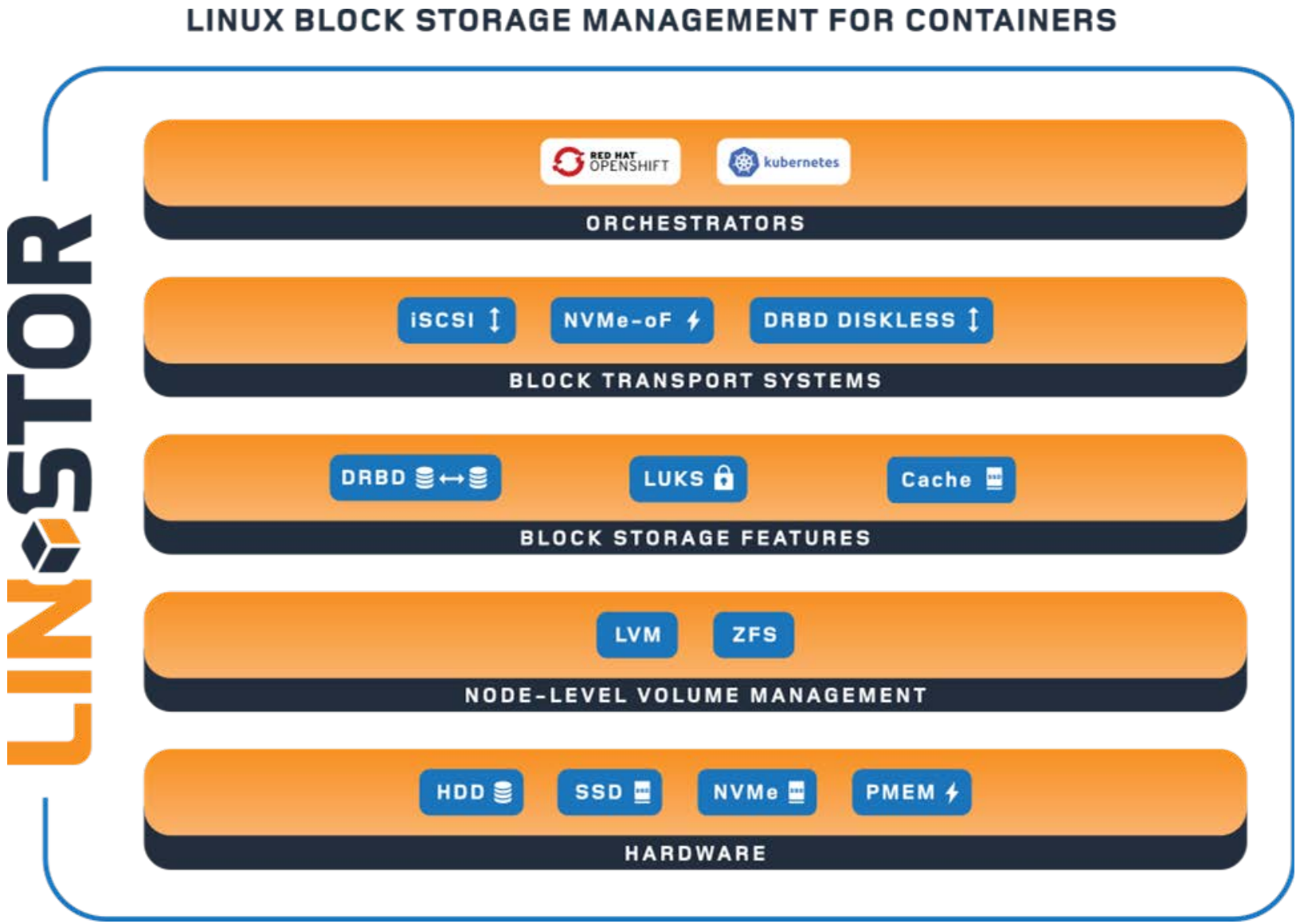
Proxmox VE

OS-Based Storage Technology

- Linux already provides several storage gems:
  - LVM
  - RAID
  - SSD cache tiers
  - De-duplication
  - Targets & initiators

Native Storage Management Capabilities

Container Storage

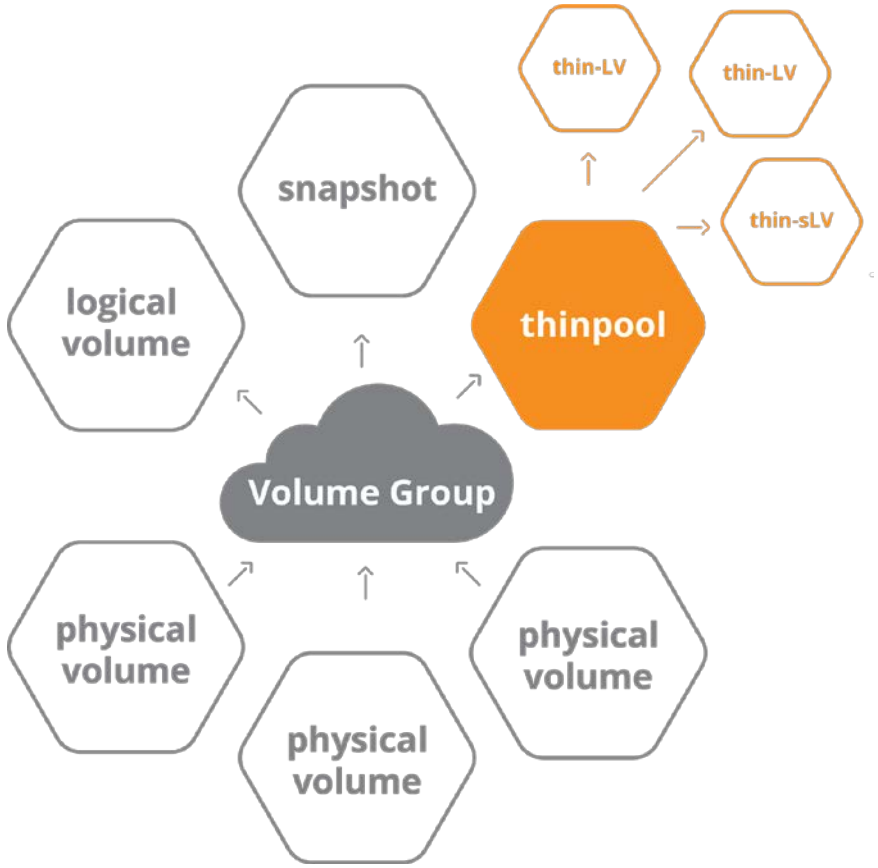


LVM

Capabilities

- Based on device mapper
- Original objects
  - PVs, VGs, LVs, snapshots
  - LVs can scatter over PVs in multiple segments
- thinlv
  - thinpools = LVs
  - Thin LVs live in thinpools
  - Multiple snapshots are efficient!

Linux LVM

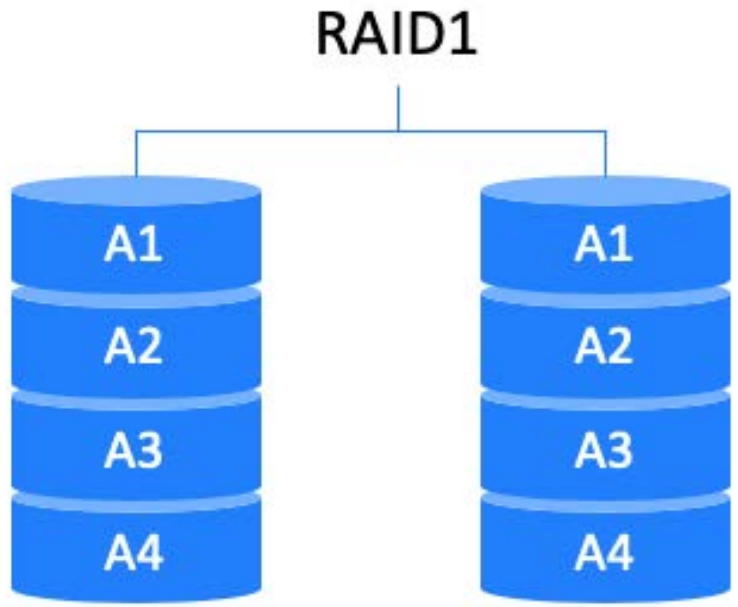


RAID

Capabilities

- Original MD code
  - mdadm command
  - Raid Levels: 0,1,4,5,6,10
- Now available in LVM as well
  - Device mapper interface for MD code
  - Do not call it ‘dmraid’; that is software for hardware fake-raid
  - lvcreate --type raid6 --size 100G VG_name

Linux RAID



ZFS on Linux

- Ubuntu eco-system only

- Has its own
  - logic volume manager (zVols)
  - thin provisioning
  - RAID (RAIDz)
  - caching for SSDs (ZIL, SLOG)
  - and a file system!

Cache Devices

- dm-cache
  - device mapper module
  - accessible via LVM tools

- bcache
  - generic Linux block device
  - slightly ahead in the performance game

Linux's Inline Deduplication

- Virtual Data Optimizer (VDO) since RHEL 7.5
  - Red hat acquired Permabit and is GPLing VDO
- Linux upstreaming is in preparation
- In-line data deduplication
- Kernel part is a device mapper module
- Indexing service runs in user-space
- Asynch or synchronous writeback
- Recommended to be used below LVM

Targets & Initiators

Capabilities

- Open-ISCSI initiator
- Ietd, STGT, SCST
  - mostly historical
- LIO
  - iSCSI, iSER, SRP, FC, FCoE
  - SCSI pass through, block IO, file IO, user-specific-IO
- NVMe-OF
  - target & initiator

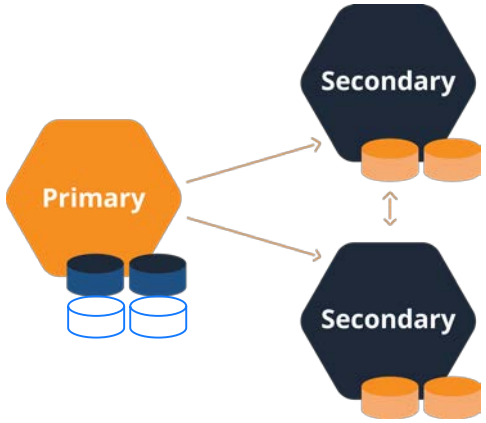
Targets & initiators

DRBD – Mainline Linux Kernel

Capabilities

- 1000's of Nodes
  - Up to 32 Synchronous or async replicas per volume
  - Automatic partial resync after connection outage
  - Multiple resources per node possible (1000s)
- Diskless nodes
  - Intentional diskless (no change tracking bitmap)
  - Disks can fail
- Reliable
  - A node knows the version of the data is exposes
  - Checksum-based verify & resync
  - Split brain detection & resolution policies
  - Fencing
  - Quorum
  - Dual Primary for live migration of VMs only!

DRBD



LINSTOR

Capabilities → Products → Solution

LINBIT

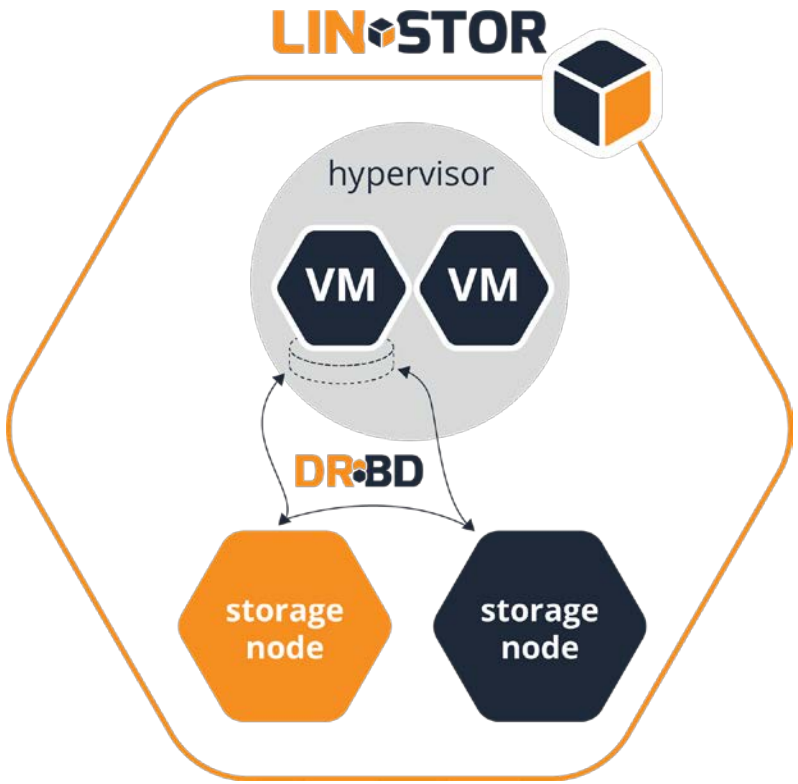
LINSTOR - Goals

Goals

Build storage from generic (x86) nodes

- Serve SDS consumers (OpenStack Cinder, Kubernetes, Custom platforms)
- Allow muliti-tenancy
- Enable multiple Deployment architectures
  - Distinct storage nodes
  - Hyperconverged with hypervisors / container hosts
- Don’t recreate the wheel
  - Use existing Linux storage components

Approach

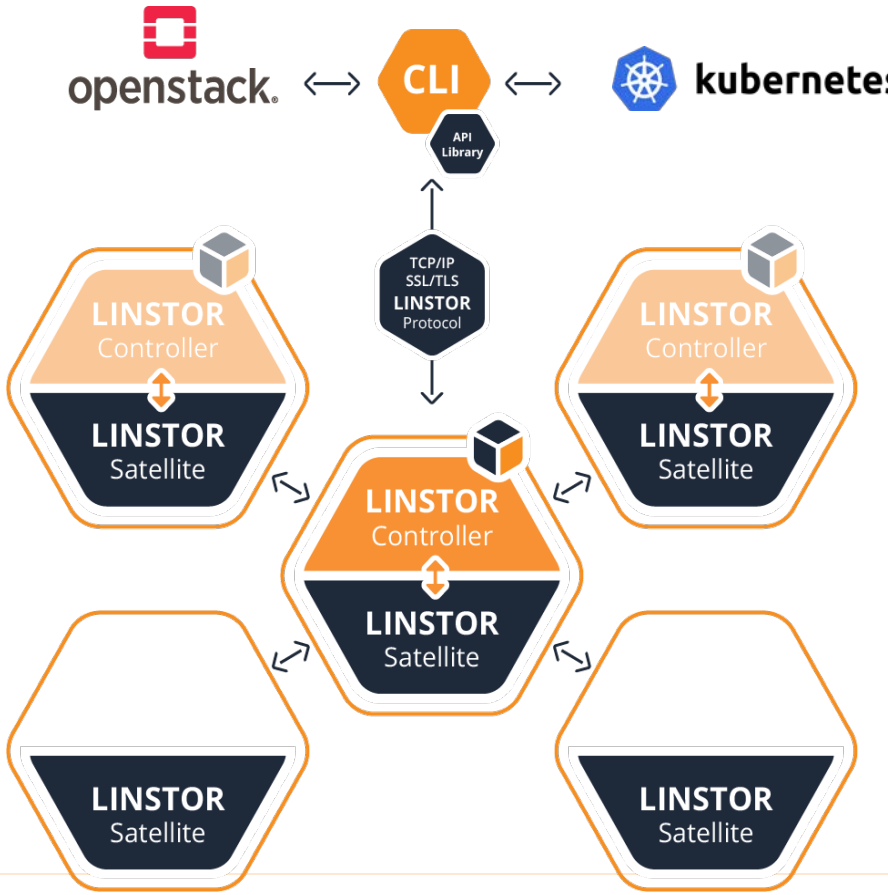


LINSTOR

Capabilities

- Controls LVM/ZFS
  - Snapshots
  - Thin
- Multiple VGs
  - For caching SSDs
  - Different pools
- Controls DRBD

LINSTOR



New LINSTOR Features

Complete

- Snapshot support
- Multiple geo-diverse sites with DRBD Proxy
- File-based backing storage (via “loop”)
- Secure REST API (HTTPS)
- Multi-user REST API support (LDAP)
- PMEM backing storage for DRBD metadata
- Support for several orchestrators and cloud platforms
- Swordfish API
  - Can manage NVMe-oF targets and initiators

Roadmap

- iSCSI Targets: creating and attaching (Q4 2019)
- VDO deduplication (2020)
- DRBD 10 (already in alpha)
  - Performance Improvements
  - PMEM caching + journaling
  - Erasure Coding
  - Request Forwarding (“resource chaining”)

Resources

High Availability

- https://www.linbit.com/en/resources/documentation/
- https://www.linbit.com/en/drbd-community/drbd-download/

Disaster Recovery

- Video Demo (6 minutes) https://www.youtube.com/watch?v=Sf0lPCllDWk
- Blog post with LINSTOR + LINBIT DR Video demo: https://www.linbit.com/en/demo-extending-linstor-managed-drbd-volume-linbit-dr-node/

Software-Defined Storage

- Container Storage: https://www.linbit.com/en/linbit-sds-container-storage/
- Private Cloud: https://www.linbit.com/en/linbit-sds-private-cloud/
- Public Cloud: https://www.linbit.com/en/linbit-sds-public-cloud/
- LINSTOR: https://www.linbit.com/en/linstor/