Faster Backup Restore from Proxmox Backup Server

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NOT NULL
Makers

Proxmox

Proxmox Virtual Environment (PVE) – all-in-one virtualization solution

Proxmox Backup Server (PBS) – backup appliance suitable for use with PVE

Both based on Debian with extra components

Introduction 1

Introduction 2

→ Service Level Agreements (SLA)

→ Recovery Time Objective (RTO)

→ Restore 1 GBps (~ saturate a 10 Gbps link) even with hardly compressible data

→ Supported and maintainable solution

The Challenge

Slow for unknown reason, even on powerful HW

Slower with more incremental backups

Veeam expensive

Investigation 1

- Two bare metal nodes at Hetzner with a direct 10 Gbps connection (< 200 €/ month)
- ZFS for easier setup changes
- Utilization, Saturation, Errors (Brendan Gregg)
- small representative test environment
- build environment for Proxmox

Investigation 2

- `qmrestore` → just a perl script calling `pbs-restore`

→ restore.rs in proxmox-backup-qemu

→ need to learn a bit of Rust to understand

→ use Gemini 2.5 Pro within Workspace Business Standard for prototypes

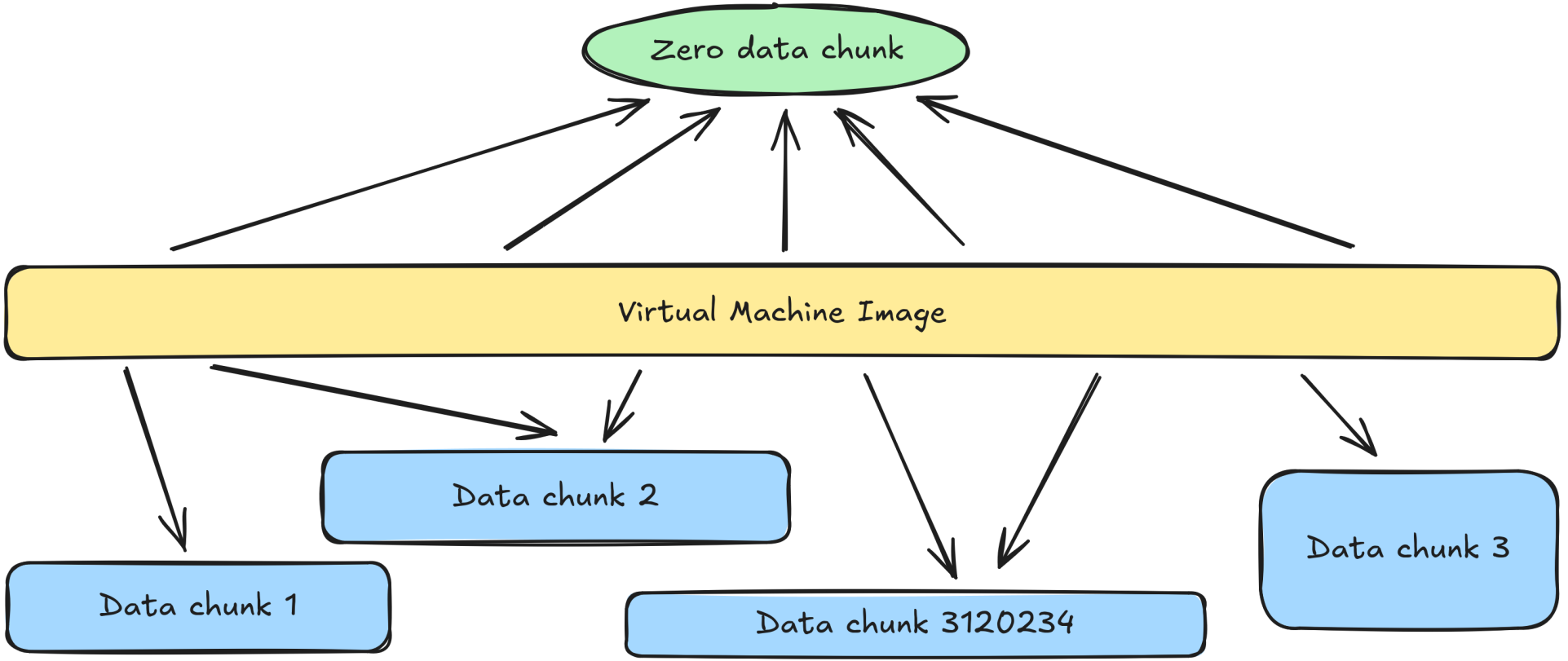
Investigation 3

Add print statements for debugging, build `libproxmox-backup-qemu0` for testing

Test ideas:

- two connections to PBS because network latency seems to be the problem

Chunking & chunk types



Index file


Data chunk 1
Data chunk 2
Zero data
Data chunk 3
Zero data
Data chunk 3120234

Diagnosis

It seems we are waiting for chunks and doing one at a time!

→ Go through all indexes and restore zero chunks immediately, for data chunks store a future. Realize futures in multiple threads.

Results

→ Much faster, hitting 1 GBps with multiple threads

→ Proves single encrypted HTTP/2 connection wasn't the main bottleneck

→ **But**: Writes chunks out of order now, could be bad for hard disks, change of behavior, brute force

Integration Into Proxmox

Dominik Csapak → async + worker threads solution

→ More resource conscious, writes chunks in order, somewhat slower on older multi-socket servers

Now in Proxmox VE 9 or as update for Proxmox VE 8.4

Other Speedups

- Similar approach with concurrency in other places
- Speedup verify speed by parallel chunk loading on PBS (concerns about DDoS → ability to opt out)

Takeaways

- About 2.5x to 4x faster now depending on latency, HW (clock, SHA / AES acceleration), settings
- Feasible to replace Veeam with PBS in more cases
- More speedups possible
- Open source systems improvements by 3rd party
- Performance debugging saves money

- qmrestore
- pbs-restore
- restore.rs
- RemoteChunkReader
- Rust tutorial, Derek Banas
- Forum complaints about slow restore
- Lupa article by Jan Sedlák, 2025-08-12

Thank You 🎉

For later questions, feedback:

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