

Scaling Btrfs in an Enterprise

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This talk is about

- Btrfs cut our storage costs by 74%.
- Productionized Btrfs in Chronosphere and Google Cloud Platform.

Our business & size (mid 2025)

- Observability SaaS, lots of time-series data.
- Customers so big we run thousands of VMs *per customer*.
- Multi-terabyte disks per VM.
- All on ext4.

⇒ Some PiB in Google's Persistent Disks.

Why Btrfs?

1. Compression saves disk space.
2. Compression is fully transparent.
3. Checksums can save on CPU and application complexity.

Disk compression demo

Initial tests showed ~65% disk savings.



r/btrfs • 5 yr. ago
WishCow

Is it normal that BTRFS loses data if a power loss occurs while writing?

I can consistently reproduce a data loss scenario on my laptop:

Btrfs at Facebook

By **Jonathan Corbet**
July 2, 2020

[OSSNA](#)

The Btrfs filesystem has had a long and sometimes turbulent history; LWN first [wrote about it](#) in 2007. It offers features not found in any other mainline

BTRFS - Reliable, or no? : r/linuxquestions - Reddit

reddit.com/r/linuxquestions/comments/1dr01jl/btrfs_reliable_or_no

Jun 29, 2024 BTRFS is Rock Solid for single volumes, but its RAID5/RAID6 are asking for trouble, they're busted, don't use them. And if the volume does crash, you have better odds of recovering your data than with EXT4.

Is BTRFS stable and reliable enough? : r/linux - Reddit

In my experience Btrfs is mostly stable. However when things go wrong, the recovery tools (btrfs check --repair) can make things worse if you use them incorrectly (that means: unless you contact Btrfs experts).

Is BTRFS really not stable? : r/linuxquestions - Reddit

BTRFS doesn't have a disk management layer like ZFS has. So, when rebuilding an array, it'll throw errors during read/write operations... and you have no idea if the errors are real (actual) errors, or if they're just...

Why is btrfs still so unfinished? : r/btrfs - Reddit

I've been using BTRFS for ~6 years without losing data, making extensive use of RAID-1, scrub, snapshots and send/receive. I have the same sentiment and plan on abandoning it this year.

Is Btrfs considered stable? What are your experiences? : r/btrfs - Reddit

I've used btrfs for well more than 5 years with no problems that weren't self-inflicted. However, I have not tried using raid-5, only raid-0. I proactively maintain my btrfs filesystems with defragment, balance, and...

Is BTRFS stable and reliable enough? : r/linuxquestions - Reddit

So far, ext4 has been 100% reliable for me. I don't want to do any kind of BTRFS-related system maintenance. If BTRFS is not at least as stable and reliable as ext4, I'll stick to LVM-ext4. Even if the...

on a btrfs root partition recently as an experiment. What a pain.

Hurdles

1. Confidence & reputation.
2. ENOSPC.
3. Unsupported by Google — why?
4. How will IO patterns affect performance?
 - a. Will get to that 😈.
5. Unknown unknowns?

Knowns

1. Confidence & Reputation: savings seem good enough to worth trying.
2. ENOSPC: bg_reclaim_treshold + dynamic_reclaim.
 - a. Huge & special thanks Josef Bacik and Boris Burkov!

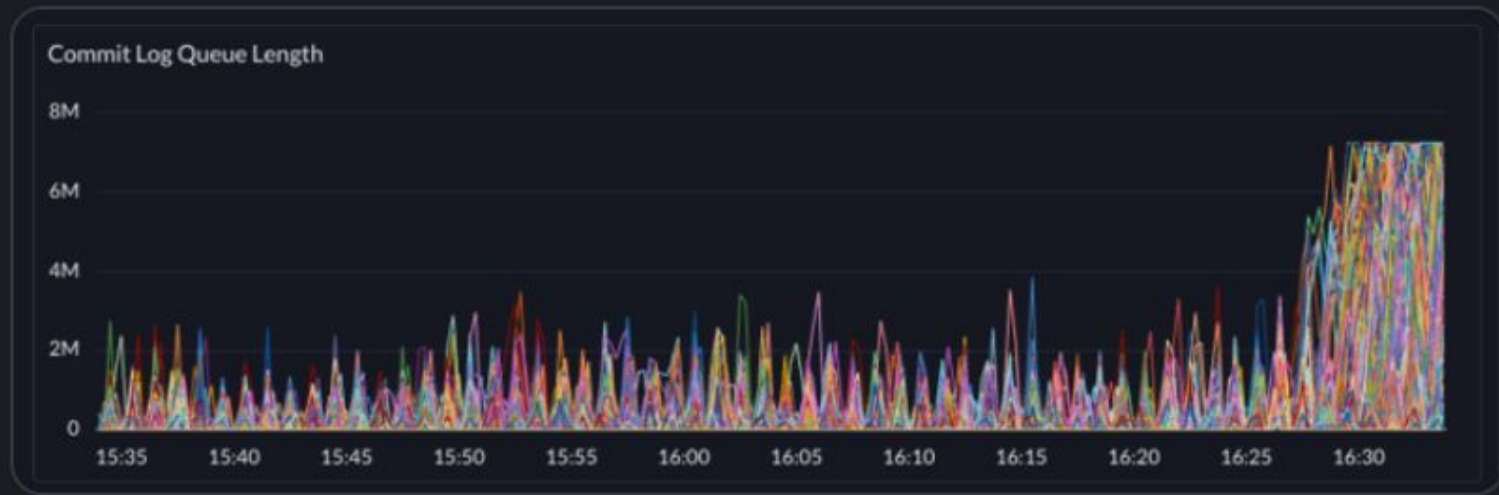
Surprises came up

Reclaim causing massive IO on large deletes

Faustas (EET) Jul

something bad is happening

image.png ▼



Surprises came up

Read Ahead!

`/sys/block/<...>/queue/read_ahead_kb`

128

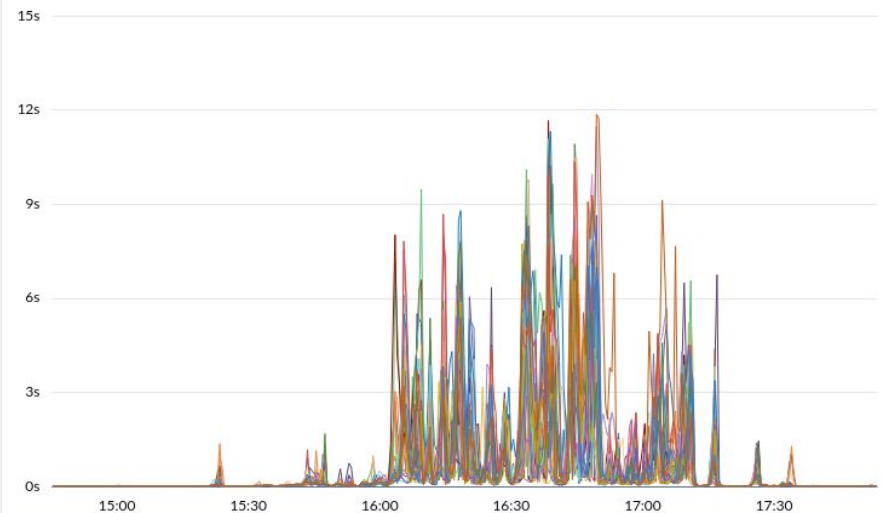
`/sys/fs/btrfs/<...>/bdi/read_ahead_kb`

4096

Can you tell the difference?

Read Ahead!

Server Side Fetch RPC Latency (p99)



Node IO throughput — Read



Timeline

- 2024-06: Wrote a doc and redirected everyone there.
 - Every question ever asked was put to the doc.
- 2024-08: kick off infra work.
- 2025-01: first internal cluster.
- 2025-06: first customer cluster.
- 2025-08: mass migration.
- 2025-10: done.
- 2026-01: yours truly @ FOSDEM.

Take-aways

- All metrics data @ Chronosphere is on Btrfs.
 - Our savings: 65% predicted, 74% actual.
- Btrfs is available upstream in GKE:
 - [\(CSI\) driver](#) and [Container Optimized OS \(COS\)](#).
 - Planning to go full-upstream in the next 1-2 months.
- You know one more company trusting Btrfs.

Special thanks

- Boris Burkov, Josef Bacik from Meta.
 - Btrfs stewardship in kernel, especially reclaim.
 - Spreading the word!
- All Btrfs maintainers.
- GCP Storage team for being Btrfs champions.

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