



Running a CDN for open source mirror.albony.in

By Albony Networks

\$ whoami

Shrirang Kahale

- Also known as “albony” or “albonycal” on the internet.
- I have strong interest in telecommunication, devops and RF.
- Big supporter of the FOSS philosophy.
- 1st Year B. Tech CSE student at Ramdeobaba College of Engineering and Management, Nagpur

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\$ whoami

Albert Sebastian

- Endless curiosity to learn new things but biased towards Computer Science
- Currently into Linux, Networking and CyberSec but more of a generalist.
- Big supporter of the FOSS philosophy.
- 4th Year B. Tech CSE student at SRM Institute of Science and Technology, Chennai

Telegram: @lonelypotat

GitHub: github.com/alou-S

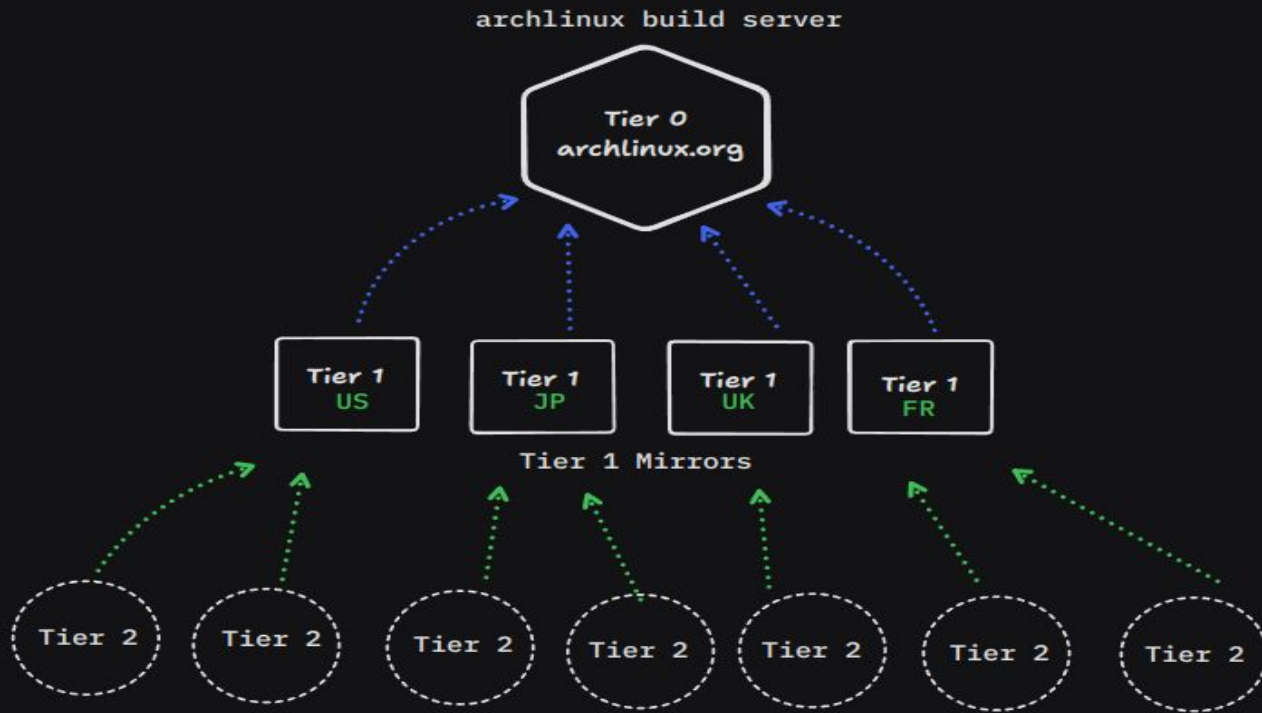
What is a mirror?

- Server or repository that hosts copies of software.
- Mirrors are used to distribute the load of downloading Linux distributions and software among multiple servers.
- Users may choose a mirror server closer to their location for faster and more reliable downloads.
- Mirrors are synchronized regularly to ensure they have the latest updates and packages.
- They play a crucial role in providing redundancy and scalability for distributing FOSS globally.

But why does FOSS use mirrors ?

- Unlike tech giants (Google, Microsoft), most FOSS projects can't afford massive global infrastructure.
- While commercial distros (e.g., RHEL, Ubuntu) can fund centralized servers, many community-driven distros and FOSS projects cannot.
- Most projects depend on volunteer-run servers (known as mirrors) to share the load and ensure availability worldwide.

Typical mirror architecture



Mirror Presence in India

Let us take a look at mirror presence of popular distros in India

Distribution Name	Number of mirrors present in India
Debian	3
Fedora	2 (only EPEL edition)
EndeavourOS	2 (including ours)
Archlinux	10 (including ours)
Ubuntu	12 (including ours)

Why do we need local Mirrors?

- Local Linux mirrors (generally) reduce latency and offer faster download speed.
- Using a local mirror conserves international bandwidth which is expensive.
- More reliable? Using a mirror outside the country adds more points of failure along the path, so a local one might be more reliable.

Effects of cable cuts

→ Rare, but can cause reduced international capacity, leading to congestion.

Ex. Recent cable cuts in the Red Sea

→ Share of mirror traffic is tiny compared to general internet, but still significant.

→ Local mirrors = 🕶️



Geographically closer doesn't always mean it's closer on the network layer

- Let's take an example of connectivity between Vi (Vodafone Idea) and Airtel to understand this better:
India (Airtel) → Germany (HE.net) → UK (Level3) → India (Vi)
- Physical proximity $\neq$ network proximity: Traffic between Airtel and Vi often detours internationally (via Europe) before returning to India, adding >200 ms latency.
- Poor inter-ISP routing mean data between nearby users can still suffer from low speeds and high RTT.

Why did I start hosting a mirror?

Archived copy of archlinux's mirrorlist from 2021^{#1}

INTERNET ARCHIVE

Wayback Machine

https://archlinux.org/mirrors/

397 captures

6 Jan 2011 - 27 Feb 2024

asia-mirror.pkgbuild.com	 Hong Kong
xtom.com.hk	 Hong Kong
wtako.net	 Hong Kong
ek-cer.hu	 Hungary
hbit.sztaki.hu	 Hungary
quantum-mirror.hu	 Hungary
system.is	 Iceland
cse.iitk.ac.in	 India
piconets.webwerks.in	 India
cloudweeb.com	 Indonesia
faizuladib.com	 Indonesia

Only two Indian mirrors were present.

^{#1} <https://web.archive.org/web/20211214035259/https://archlinux.org/mirrors/>

India's Mirror Woes

- Long standing problem.
- Organisations which have storage don't have bandwidth, and organisations which have bandwidth don't have storage :)
- Lack of incentive for companies to support FOSS Infra.
- Management overhead
- Old forum posts from 2000s, problem still the same.

Hi

If you can contact anyone who might be help out with providing the space and bandwidth for a public mirror of Fedora in India, we need that like yesterday.

<http://mmcgrath.livejournal.com/8797.html>

Usually educational institutions are good choices so if you are a college student, do ask your management about this. A pitch on the viability of learning with open code might work. Corporates might be interested in being sponsors in exchange for a banner or something like that.

Details on becoming a mirror is available at

<http://fedoraproject.org/wiki/Infrastructure/Mirroring>

Forum post from 2007

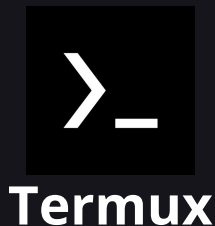
I need to do something!

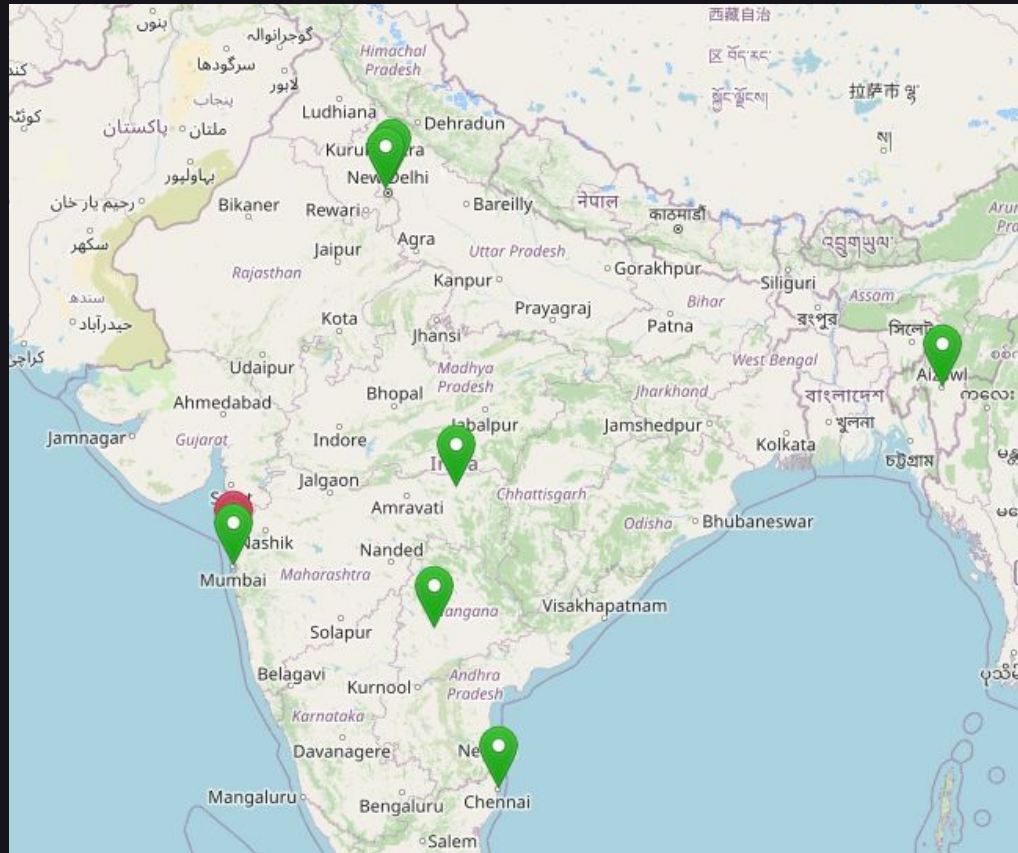
- The Albany Mirror project was born out of frustration.
- Gone will be the days of slow mirrors, A country of 1.4B people needs faster and more mirrors.
- Liberalisation of software.

mirror.albony.in

- Started hosting it in 2022
- Around **50k daily users**
- **8 Servers** spread across India
- Around **700TB** traffic served / month
- That's ~ **8.5 PETABYTES / year!**
- ~ 20 Gbits/s aggregated bandwidth
- 99.1% uptime (since last 2 years)

Projects we Host





Naming Convention

- Mirror nodes are named as per IATA Airport codes.
- Standard convention in telecom sector.

`mirror.<iata_code><id>.albony.in`

`mirror.hyd.albony.in`

`mirror.bom2.albony.in`

Our current traffic statistics

ISP Nodes

- mirror.del2.albony.in (CITYLINE Networks)
450+ TB Monthly Traffic (1.50 Gbit/s Avg. Rate)
- mirror.ajl.albony.in (Hyosec Solutions Private Limited)
200+ TB Monthly Traffic (750 Mbit/s Avg. Rate)
- mirror.del.albony.in (EXTREME IX)
20+ TB Monthly Traffic (80 Mbit/s Avg. Rate)
- mirror.bom2.albony.in (EXTREME IX)
20+ TB Monthly Traffic (80 Mbit/s Avg. Rate)

```
> curl https://mirror.del2.albony.in/stats
Database updated: 2025-09-19 18:30:00

ens33 since 2025-03-28
      rx: 46.46 TiB      tx: 2.12 PiB      total: 2.17 PiB

monthly
-----
      rx      |      tx      |      total      |      avg. rate
-----
2025-08      | 9.31 TiB      | 440.67 TiB      | 449.99 TiB      | 1.48 Gbit/s
2025-09      | 6.66 TiB      | 296.35 TiB      | 303.01 TiB      | 1.64 Gbit/s
-----
estimated    | 10.65 TiB      | 473.64 TiB      | 484.28 TiB      |
-----

daily
-----
      rx      |      tx      |      total      |      avg. rate
-----
yesterday    | 306.33 GiB      | 10.45 TiB      | 10.75 TiB      | 1.09 Gbit/s
today        | 209.09 GiB      | 6.99 TiB      | 7.19 TiB      | 949.58 Mbit/s
-----
estimated    | 271.26 GiB      | 9.06 TiB      | 9.33 TiB      |
```

Our current traffic statistics

Self Hosted Nodes

- mirror.hyd.albony.in
30+ TB Monthly Traffic (110 Mbit/s Avg. Rate)
- mirror.nag.albony.in
20+ TB Monthly Traffic (80 Mbit/s Avg. Rate)
- mirror.maa.albony.in
20+ TB Monthly Traffic (80 Mbit/s Avg. Rate)
- mirror.bom.albony.in
10+ TB Monthly Traffic (40 Mbit/s Avg. Rate)

```
> curl https://mirror.hyd.albony.in/stats
Database updated: 2025-09-19 03:50:00

enp1s0 since 2025-01-17

      rx:  10.98 TiB      tx:  221.38 TiB      total:  232.36 TiB

monthly
      rx  | tx  | total | avg. rate
-----|-----|-----|-----
2025-08  | 1.39 TiB | 31.03 TiB | 32.42 TiB | 106.46 Mbit/s
2025-09  | 846.38 GiB | 19.66 TiB | 20.49 TiB | 114.86 Mbit/s
-----|-----|-----|-----
estimated | 1.37 TiB | 32.48 TiB | 33.85 TiB |

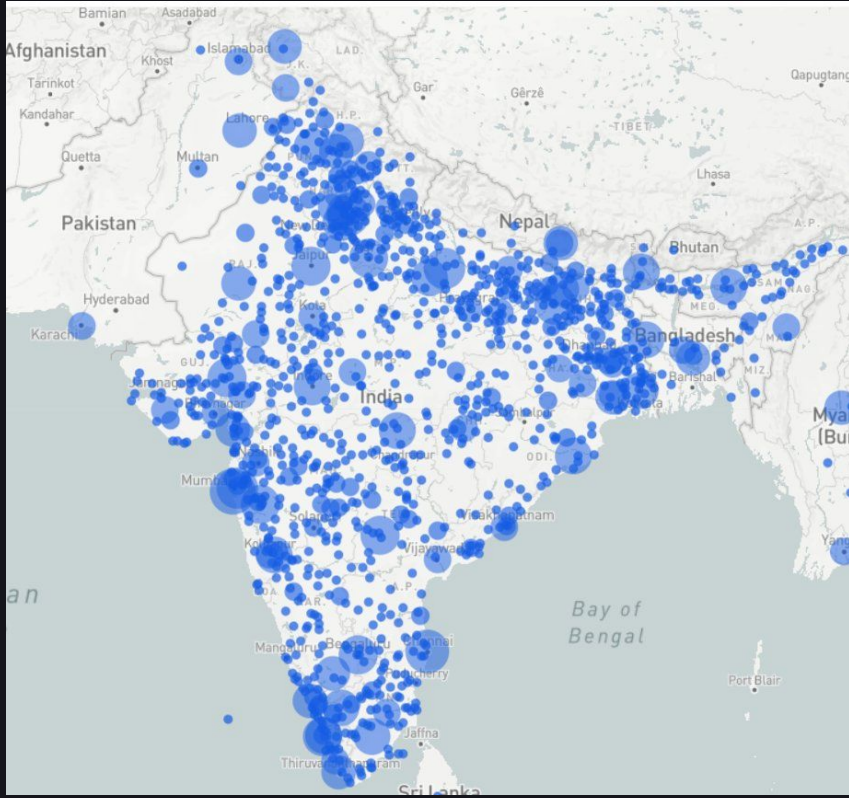
daily
      rx  | tx  | total | avg. rate
-----|-----|-----|-----
yesterday | 66.30 GiB | 1.46 TiB | 1.52 TiB | 155.11 Mbit/s
today     | 11.40 GiB | 98.52 GiB | 109.91 GiB | 68.42 Mbit/s
-----|-----|-----|-----
estimated | 71.35 GiB | 616.80 GiB | 688.16 GiB |
```

Our current traffic statistics

Project based traffic usage from 1st Sept - 14th Sept (AJL BOM DEL DEL2 HYD)

Ubuntu	204.35 TB
Kali Linux	112.29 TB
VideoLAN	19.06 TB
Linux Mint	6.72 TB
GIMP	3.33 TB
Jenkins	2.75 TB
LibreOffice	2.60 TB
ArchLinux	2.46 TB

EndeavourOS	1.89 TB
Chaotic AUR	1.78 TB
KDE	1.51 TB
Linux Mint	133.67 GB
Armbian	123.75 GB
Artix Linux	26.15 GB
F-Droid	12.39 GB
Lyx	1.29 GB

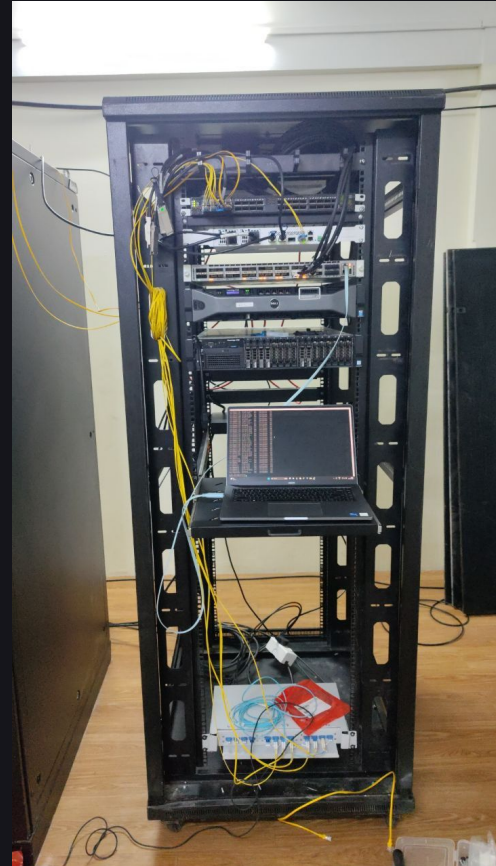


This heatmap shows the approximate distribution of our Linux mirror users based on GeoIP data.

How do our servers look like?

AJL Node

- One of our first ISP hosted nodes, located at Aizawl, Mizoram
- Provided by Hyosec Solutions Private Limited at their Point of Presence.
- Doesn't have lots of storage but very high bandwidth (upto 5 Gbit/s)
- Has ports to EIX and NIXI in Delhi, Kolkata, and Mumbai, and also to DE-CIX in Mumbai
- Have plans to send dedicated hardware to improve compute and storage capacity



NAG Node



The setup when I
started hosting the
mirror



New server!

HYD Node



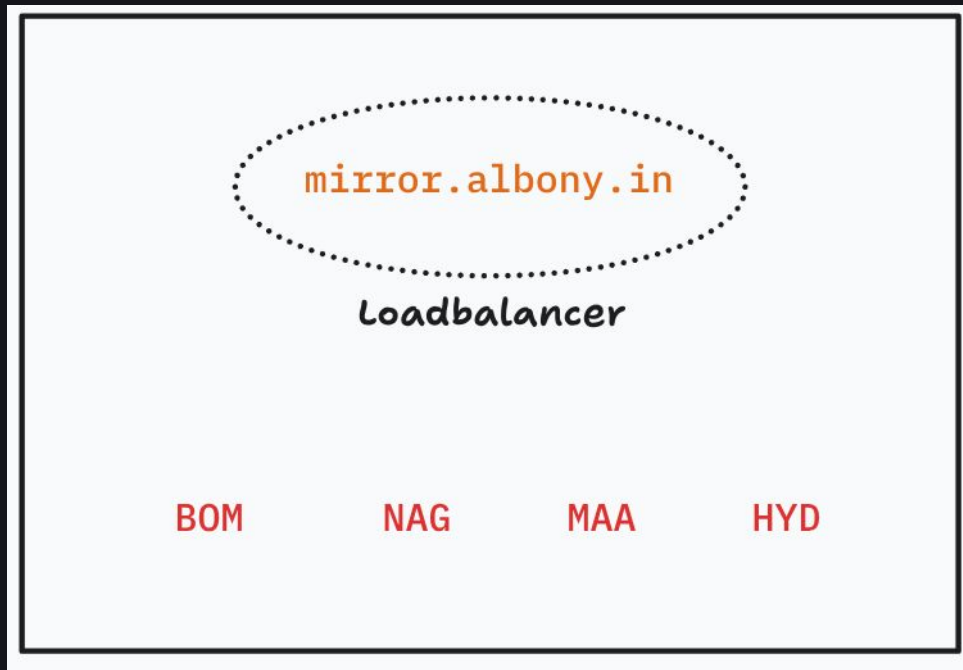
MAA Node



Our Software Infrastructure

Our Loadbalancer

- Periodically monitors status of mirror nodes.
- Redirects users using HTTP 301
- Takes geographical location into account (geoip db)
- Based upon armbian/router project.



DNS

- We use in-house infrastructure for authoritative DNS.
- Internet was meant to be distributed, not centralised.
- Self hosted DNS = More control.
- 4x PowerDNS authoritative nameservers. 3 in India, 1 in Europe.

```
;; ANSWER SECTION:
```

albony.in.	3600	IN	NS	ns1.albony.in.
albony.in.	3600	IN	NS	ns3.albony.in.
albony.in.	3600	IN	NS	ns2.albony.in.
albony.in.	3600	IN	NS	ns4.albony.in.

Infrastructure As Code (IaC)



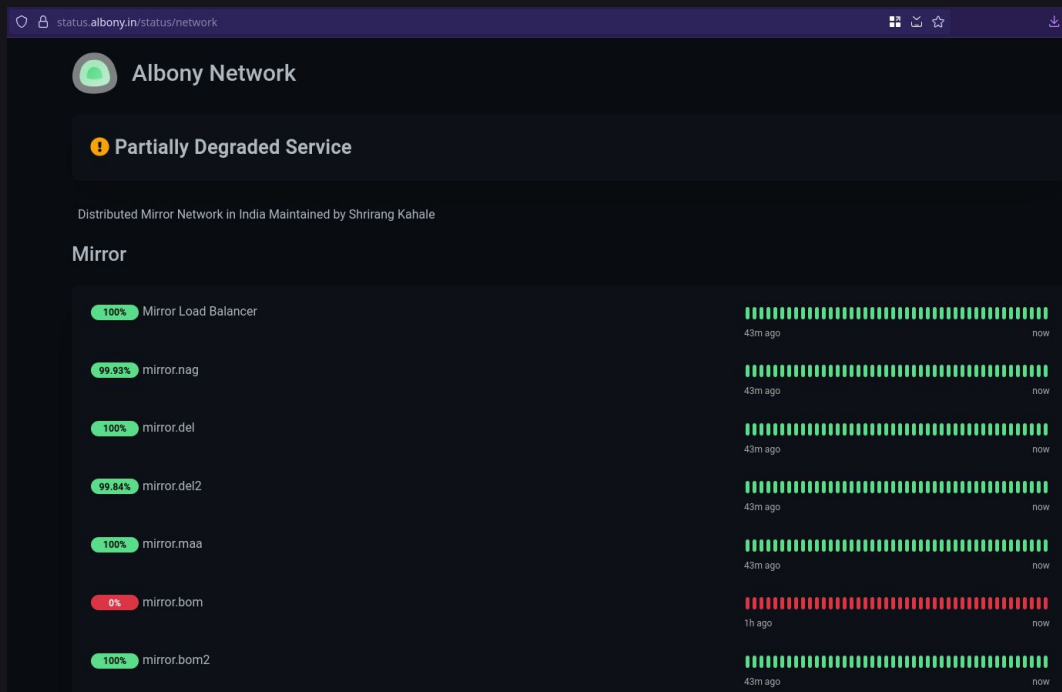
NixOS

- Current setup: debian + docker + shell scripts.
- Experimental mirror node using NixOS.
- Previous experiments with Ansible.
- Fully declarative config.
- Easy deployment and changes.

```
1 {
2   modulesPath,
3   lib,
4   pkgs,
5   ...
6 };
7 {
8   imports = [
9     (modulesPath + "/installer/scan/not-detected.nix")
10    (modulesPath + "/profiles/qemu-guest.nix")
11    ./disk-config.nix
12    ./caddy.nix
13    ./update-mirror.nix
14  ];
15   boot.loader.grub = {
16     # no need to set devices, disk will add all devices that have a EF02 partition to the list already
17     devices = ["/dev/vda1"];
18     efiSupport = true;
19     efiInstallAsRemovable = true;
20   };
21   services.openssh.enable = true;
22   environment.systemPackages = map lib.lowPrio [
23     pkgs.curl
24     pkgs.gitMinimal
25     pkgs.traceroute
26     pkgs.rsync
27     pkgs.vim
28     pkgs.btop
29   ];
30
31   users.users.root.openssh.authorizedKeys.keys = [
32     # change this to your ssh key
33     "ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAINK66dBmqKUOWrLNGtn+3n7kZPzDqWOSNhr77gc6U00J"
34   ];
35 };
36
37 NORMAL configuration.nix
```

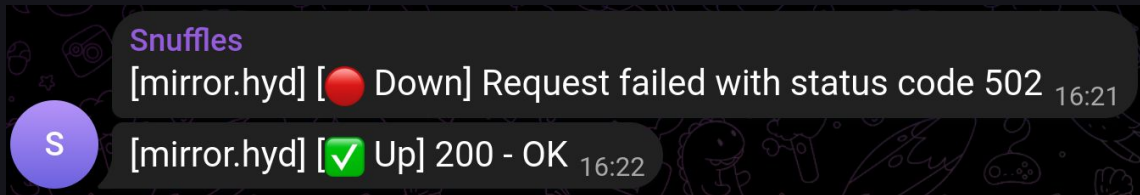
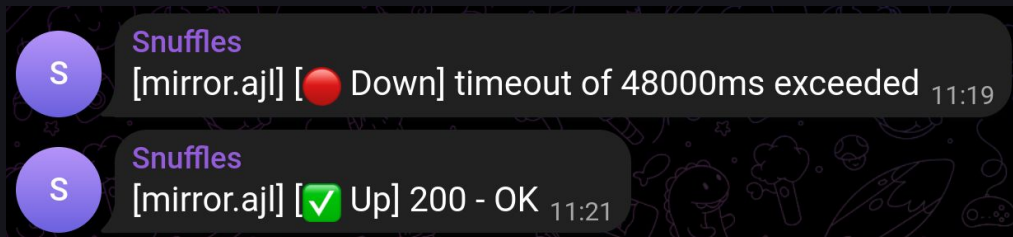
Monitoring

Hosted on a VPS at Amsterdam (status.albony.in)



Notification

Messages from monitoring bot when specific nodes go down or come back up:



Storage Drive Monitoring



Drive Details - /dev/sda - sat - ST1000LM048-2E7172

Dive into S.M.A.R.T data

PASSED						
Status						
SAT						
Device Type						
ST1000LM048-2E7172						
Device Model						
Serial Number						
0*5000c500d8c90c6						
LU WWN Device Id						
0001						
Firmware Version						
931.5 GiB						
Capacity						
5400 RPM						
Rotation Rate						
ATA						
Protocol						
30						
Power On Hours						
S.M.A.R.T ATA ATTRIBUTES						
7 visible, 17 hidden						
Status	ID	Name	Value	Threshold	Ideal	Failure Rate
PASSED	5 (0x05)	Reallocated Sectors Count	0	36	low	3%
PASSED	19 (0x13)	Spin Retry Count	0	97	low	5%
PASSED	184 (0x88)	End-to-End error	100	99		9%
PASSED	187 (0x8b)	Reported Uncorrectable Errors	0	0	low	3%
WARN	185 (0x8d)	Command Timeout	100	0		
PASSED	197 (0x95)	Current Pending Sector Count	0	0	low	3%
PASSED	188 (0x8c)	Critical Unrecoverable Sector Count	0	0	low	3%

- Gathers data via S.M.A.R.T once a day
- Can be used to send warnings using email if the drive fails a test.

https://en.wikipedia.org/wiki/Self-Monitoring_Analysis_and_Reporting_Technology

Causes of downtime

- Failures pre 2024 due to USB storage drives (now upgraded to NVMe/SATA)
- S.M.A.R.T Monitoring isn't reliable for drives. (4 dead drives so far)
- Power outages (UPS exhausted) (mostly nag)
- Accidental disconnection of some cable. (mostly maa)
- ISP outage (rare) (mostly hyd)

Server had died due to accidental disconnection of the 12V PSU

12:51 ✓✓

Incident report : A ball went and hit laptop causing HDD to reset

00:49 ✓✓

Mitigated almost within a minute

00:49 ✓✓

lonely potat

Incident report : A ball went and hit laptop causing HDD to reset
playing cricket inside the house? :P

12:35

Operational and Technical Challenges

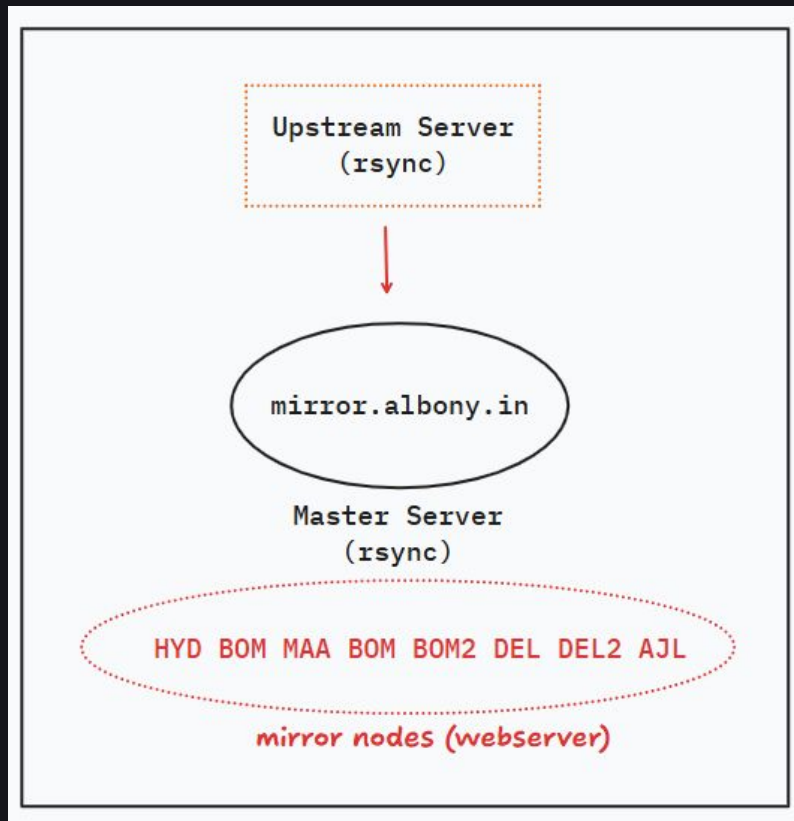
Lack of Funding

- Bandwidth is manageable, but storage demands significant capital.
- Grants from FOSSUnited and NMG helped, plus a lot of supportive friends!
- These donations help buy crucial components.
- Still a long way to go :)

Mirror nodes out of sync

- Initially planned a complex state tracker for managing multiple mirror nodes.
- Abandoned that idea for a simpler solution of tiered synchronisation.
- Master server fetches from upstream project, mirror nodes fetch from master server.

Result: Faster syncing to upstream with mirrors always being in sync

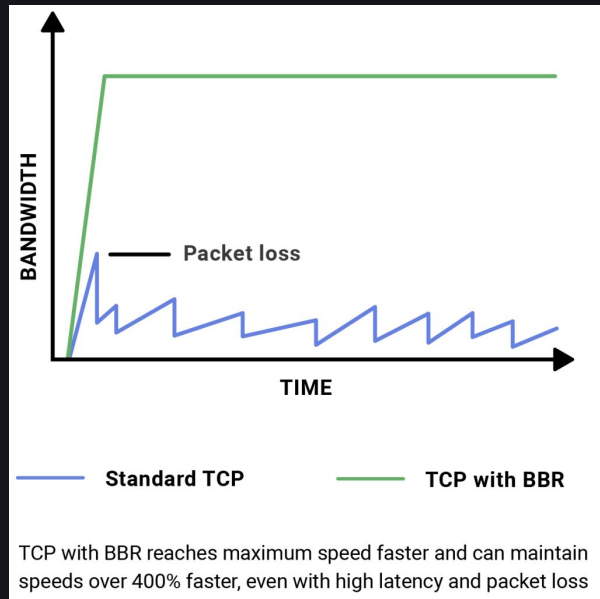


Bandwidth Underutilization

- Clients unable to fully utilize server's available bandwidth
- Node to node rsync were also not reaching max bandwidth
- Originally thought it was some weird ISP related issues

Solution: Enabling TCP BBR on all our nodes

Result: Severely improved average throughput across all nodes



Our Sponsors



Support us in keeping the network alive

Donate: mirror.albony.in/donate.html

Hardware donations are also accepted.

Contact: me@shrirangkahale.com



Any Questions?

Thank You!

Contact:

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