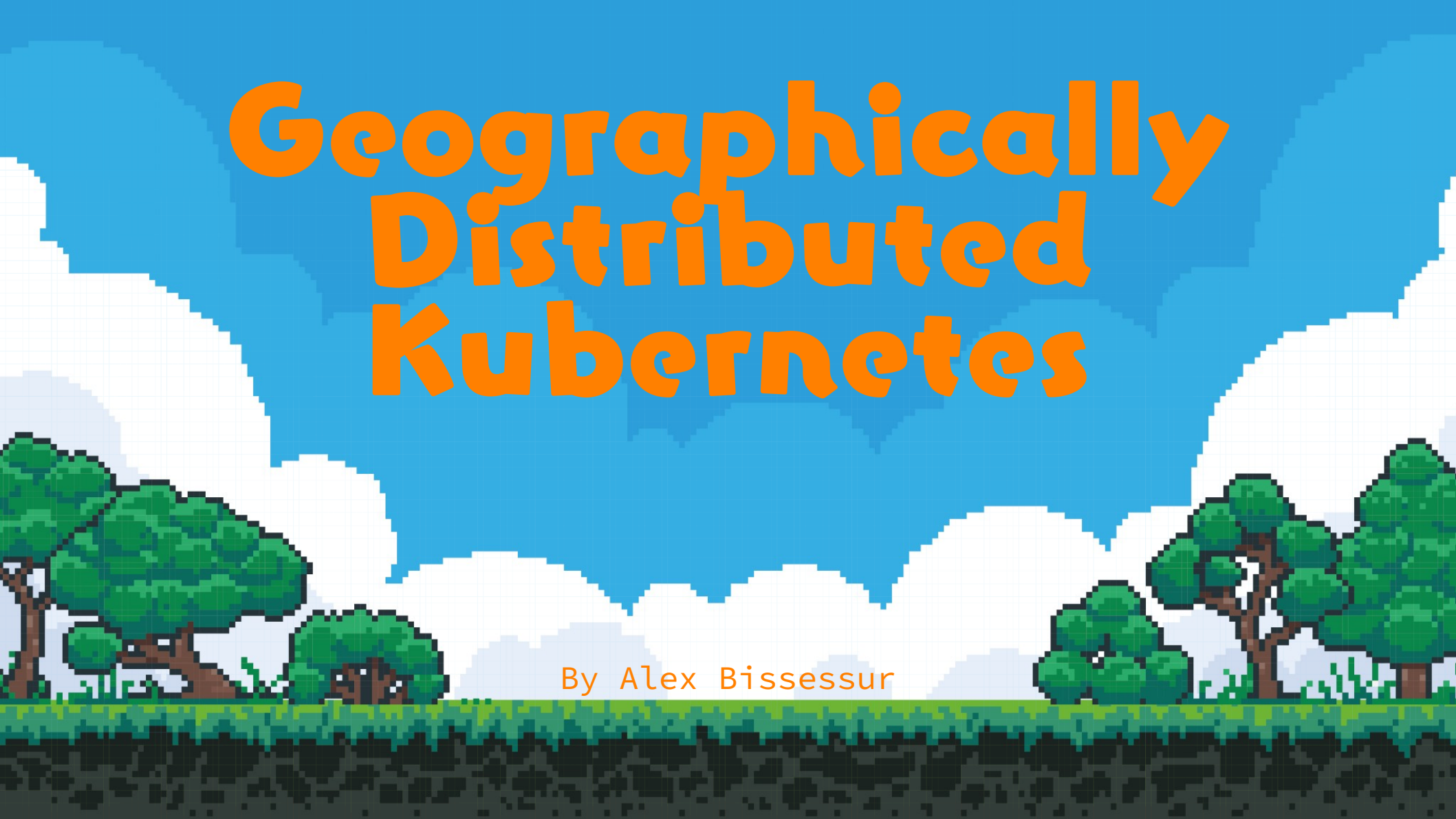
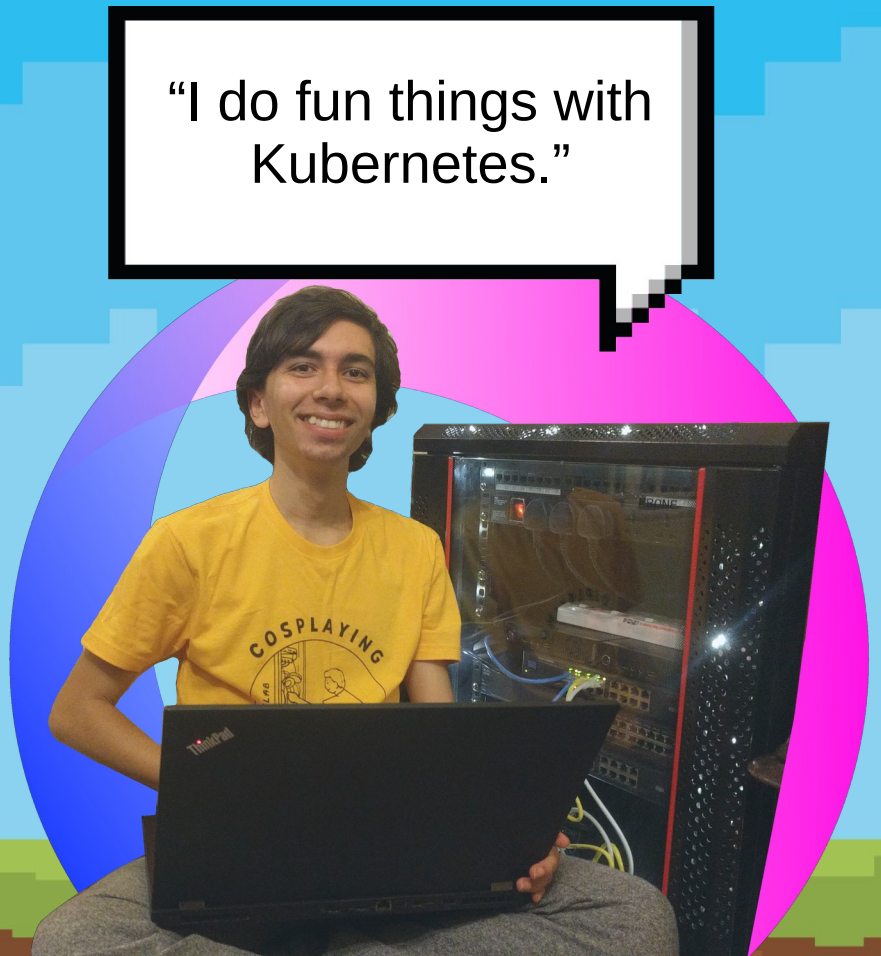
Geographically Distributed Kubernetes



By Alex Bissessur

alex.yaml

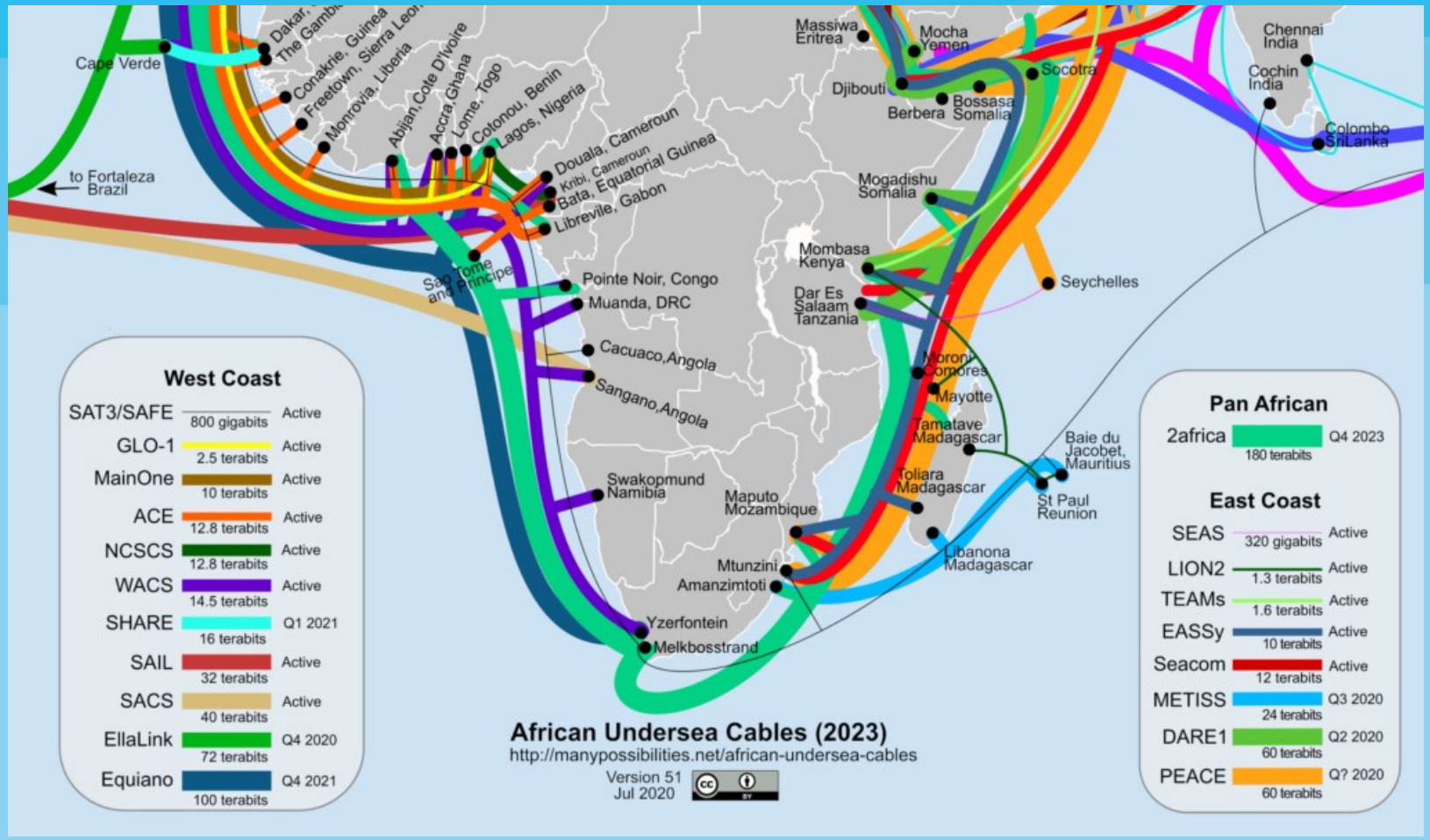
```yaml
---
apiVersion: v1
kind: Person
metadata:
 name: Alex Bissessur
spec:
  work:
    company: La Sentinelle
    role: Kubernetes Person
    location: Mauritius
  contact:
    website: alexbissessur.dev
    mastodon: moris.social/@AlexB
    github: github.com/xelab04
  interests:
    - Kubernetes
    - Linux
    - Free & Open Source Software
  hobbies:
    - Playing kubectl with Homelab
```

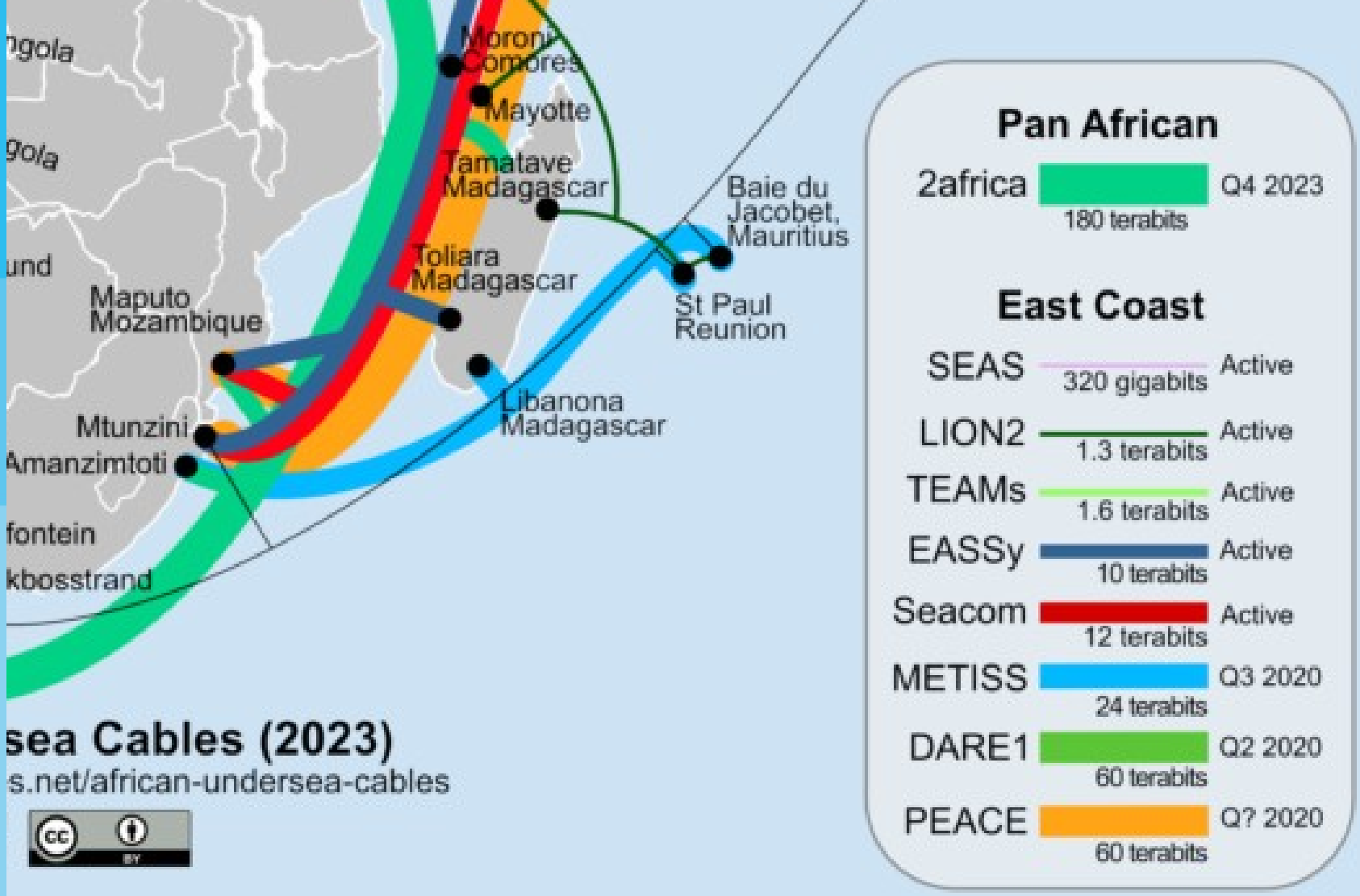


State of *The Cloud* in Mauritius

- Cloud ~~native~~ naive
- Until recently, the govt's official positon was that cloud = bad
- Still, most people/companies see the cloud as someone else's computer
  (or a server you don't need to maintain)

How Connected are We?





sea Cables (2023)

s.net/african-undersea-cables

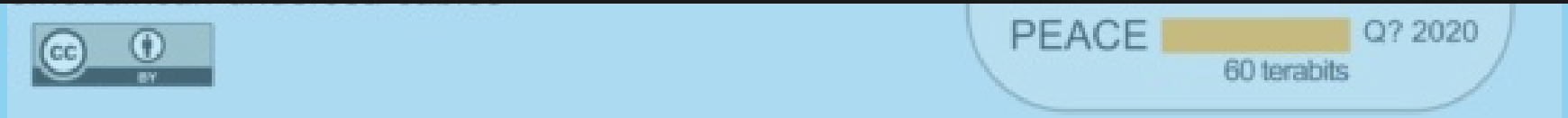
NEWS TECH

Major Internet Outages in Mauritius Due to Undersea Cable Damage

The damage to the SAFE cable highlights the delicate nature of global internet infrastructure and the far-reaching effects of its disruptions.

Elevation News
Last updated: April 29, 2024 12:29 pm

3 Min Read



No Internet?

Cable damage causes:

- 600ms latency to Europe
- 1500ms latency to North America
- Banking applications fail
- ATMs fail
- Insurance applications down
- Netflix inaccessible

CSPs in Mauritius

- Cloud.mu is the only(?) CSP in Mauritius
- AWS, GCP, Azure have strict requirements for setting up DCs in a country
  - network redundancy
  - power redundancy
  - distance between Dcs
- Closest CSP is in South Africa (60ms)
  and an undersea cable away

What This Means for High Uptime

- Running on-prem requires significant investments
- Running in a datacenter has no physical redundancy
- Running my homelab is victim to powercuts

Solution?

Alex, what are you talking about?

- Hosting on-prem is nice. My homelab is nice.
- Losing power is not nice → lose all running services (and nice uptime stats)
- Companies use multi-cloud for better reliability, right?
- Then let’s have multi-homelabs, connected together and coordinated with Kubernetes

Our Great Plan

- 3 Datacenters (also called houses)
- 3 machines per house
- Kubernetes cluster of 9 nodes

- Any one house can lose power/internet and services stay running

Tech Stack

- K3s

K3s is lightweight and has batteries included.

It makes setting up the cluster easy (one command).

Tech Stack

- K3s
- Longhorn

Longhorn provides persistent storage for the entire cluster

Easily creates volume replicas on nodes in the cluster for data redundancy

Fairly lightweight and performant

Tech Stack

- K3s
- Longhorn
- Minio/S3

Longhorn can use the S3 buckets for backups

Minio would allow us to have a distributed cluster for our backups

Tech Stack

- K3s
- Longhorn
- Minio/S3
- Tailscale

Tailscale gives a virtual mesh network for nodes to communicate

We only have 1 public IP per house, so we cannot expose several nodes to the internet

Potential Issues

- Latency
  default etcd heartbeat timeout 100ms
- Powercuts
  having the CP in one place makes the cluster vulnerable
- IP cycling
  routers cycle IPs every 24h
- Bandwidth
  good connection needed for Longhorn replication

Future Goals

- Community-focused cluster
  (owned by the people for the people)
- Run K3k or Vcluster to provision clusters within the larger cluster for people to use and play with
- Short-term, we want to get more people involved and replace old i3-3rd gen nodes

Thank You!

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github.com/xelab04/Slides

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