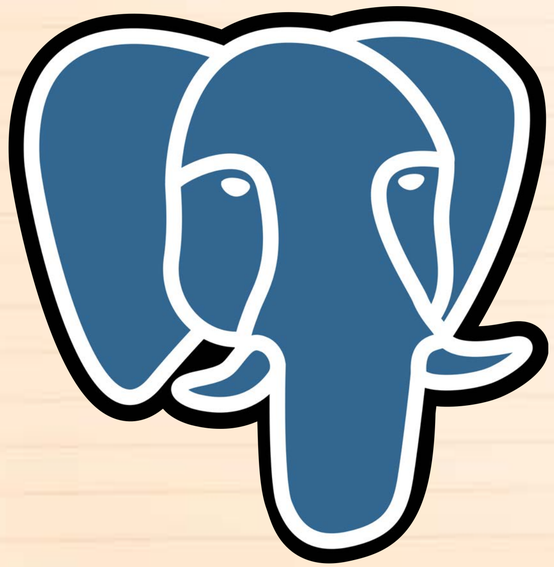
Do



Don't

https://www.marketingdonut.co.uk/pr-and-promotion/exhibitions/dos-and-don-ts-when-exhibiting

PostgreSQL  Kubernetes

simplyblock

Chris Engelbert

Devrel @ simplyblock

Previous fun companies:

- Ubisoft / Blue Byte
- Hazelcast
- Instana
- clevabit
- Timescale

Interests:

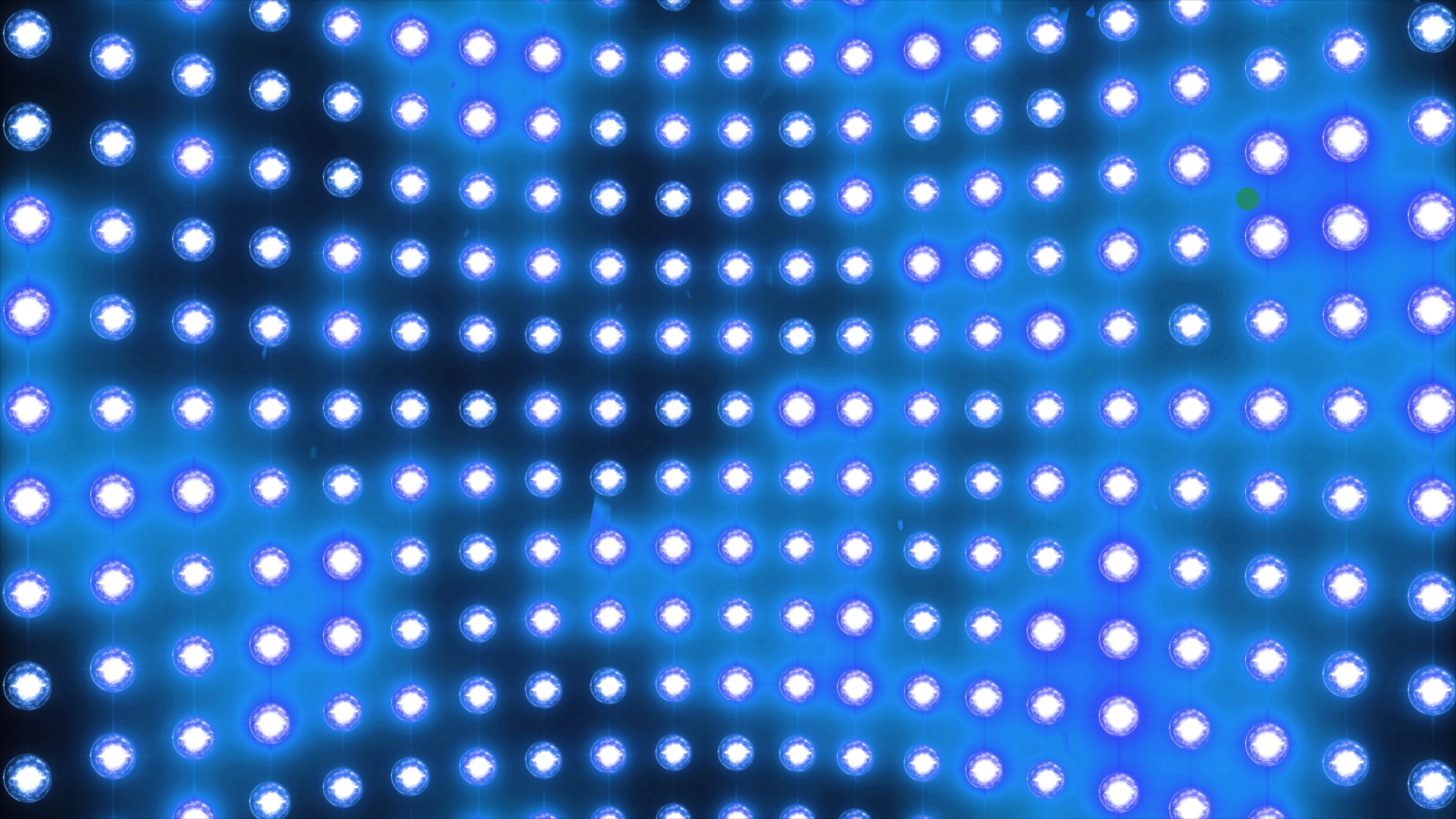
- Developer Relations
- Anything Performance Engineering
- Backend Technologies
- Fairy Tales (AMD, Intel, Nvidia)

@noctarius2k

@noctarius2k@mastodon.online

@noctarius.com


FAMILY
FEUD



Question 01

FAMILY FEUD

Question 01

Why you shouldn't run a database in Kubernetes?

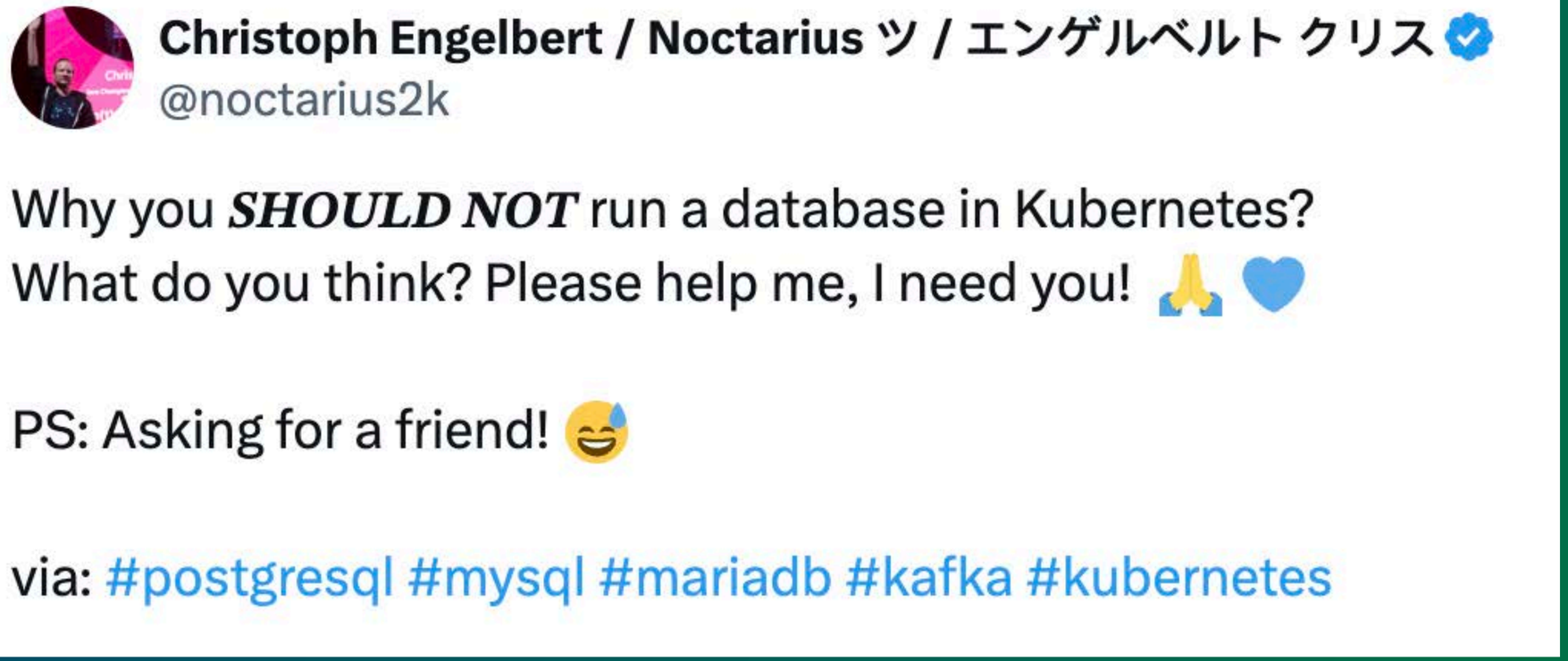
Why not to run a database in Kubernetes?

Christoph Engelbert / Noctarius ツ / エンゲルベルト クリス
@noctarius2k

Why you ***SHOULD NOT*** run a database in Kubernetes?
What do you think? Please help me, I need you! 🙏💙

via: #postgresql #mysql #mariadb #kafka #kubernetes

Why not to run a database in Kubernetes?



Why not to run a database in Kubernetes?

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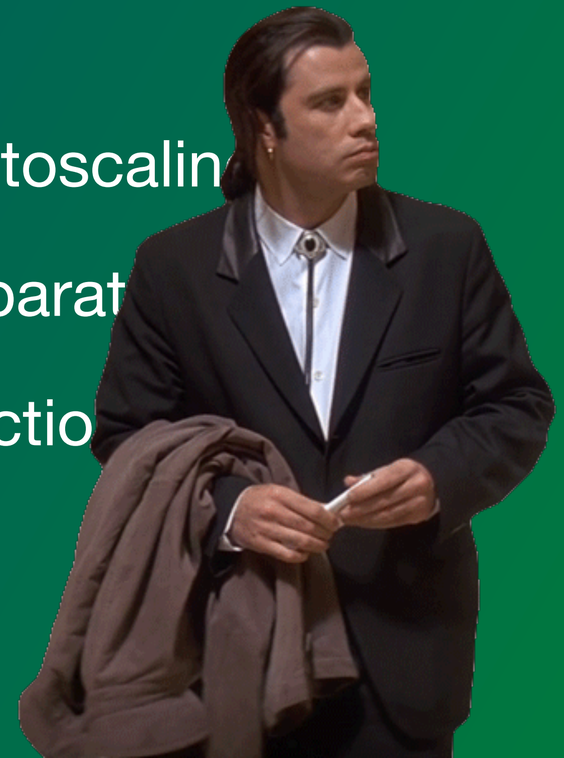

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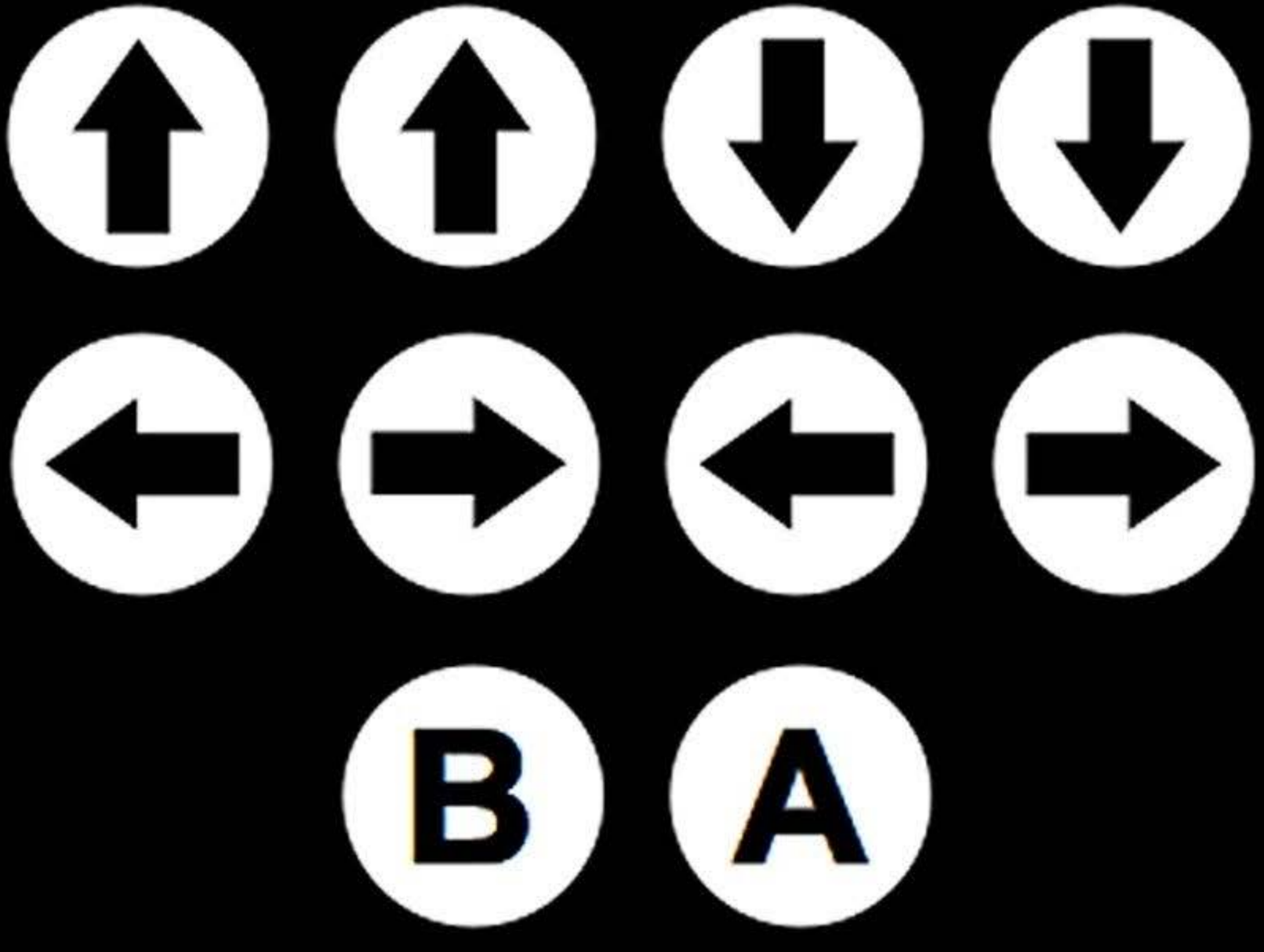
BURN IN HELL!
joyreactor.com

The Happy Place

So we need to cheat!?


B
A

Why?

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Why?

No Cloud-Vendor Lock-In

simplyblock

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Faster Time To Market

simplyblock

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Unified deployment architecture

simplyblock

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Faster Time To Market

Decreasing cost

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Unified deployment architecture

Need read-only replicas

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Let’s get something
out of the way first!

Call the Police!

simplyblock

Call the Police!

Enable TLS

simplyblock

Call the Police!

Enable TLS

Use Kubernetes Secrets

simplyblock

Call the Police!

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Use Cert-Manager

simplyblock

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simplyblock

Backup and Recovery

simplyblock

https://www.ovhcloud.com/de/bare-metal/backup-storage/

Backup and Recovery

You want Continuous Backup and PITR

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Roll your own pg_basebackup or pg_dump (don’t!)

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😅 Test Your Backups 😅

simplyblock

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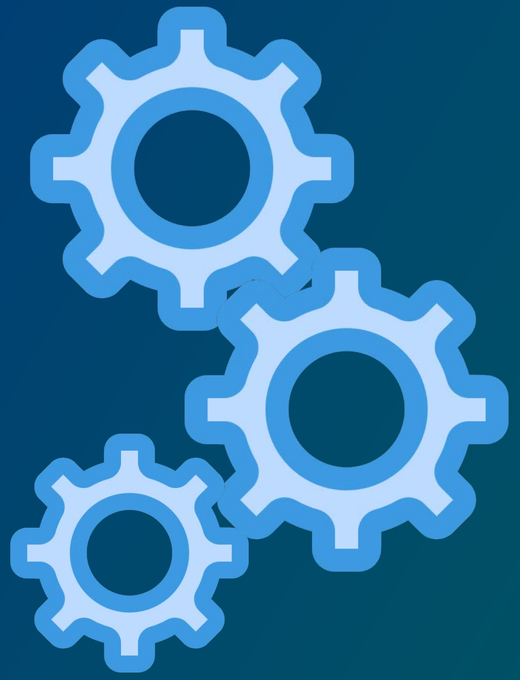
PostgreSQL Configuration



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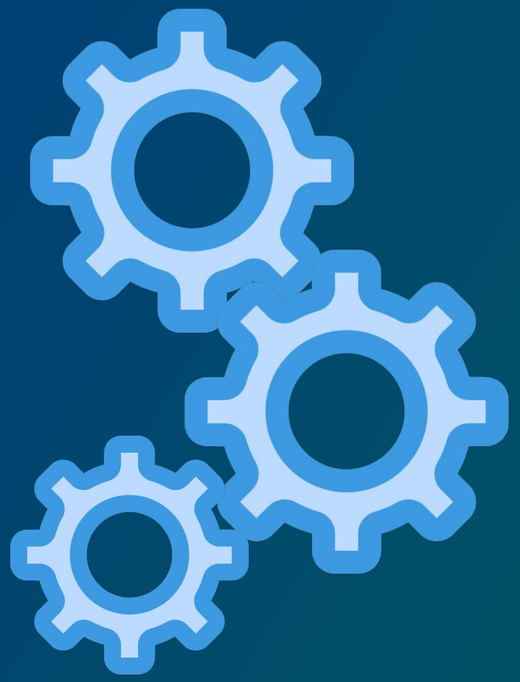
PostgreSQL Configuration



The PostgreSQL Configuration isn’t too much influenced

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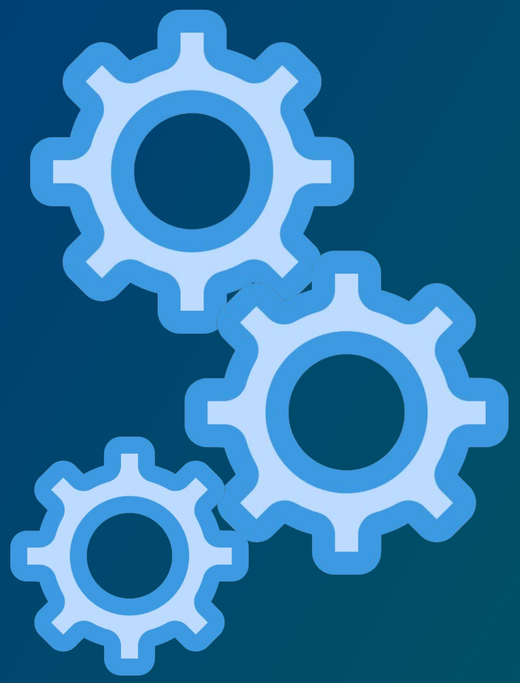

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shared_buffers

(maintenance_)work_mem

effective_cache_size

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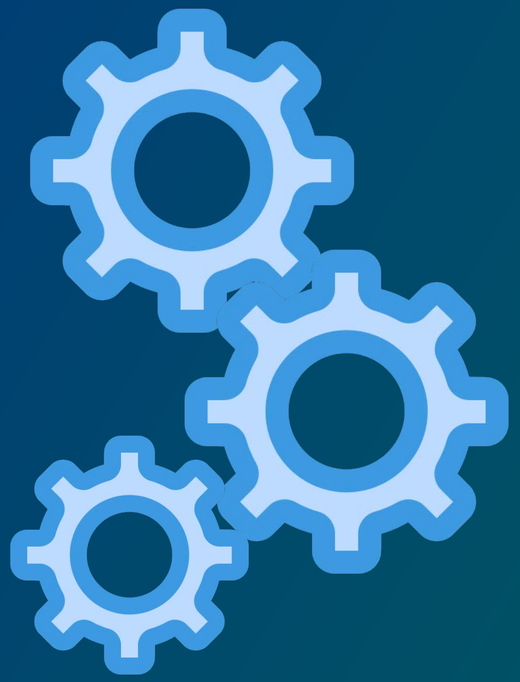
PostgreSQL Configuration



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Use Huge Pages!

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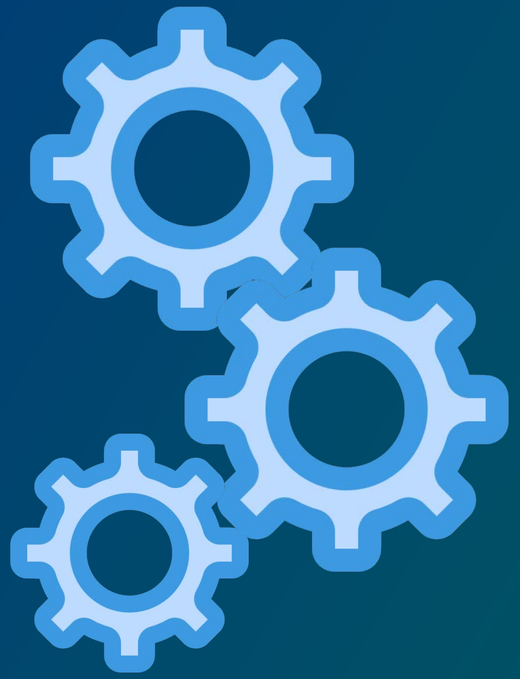

https://www.youtube.com/watch?v=S0LEDGbAnn8

https://www.crunchydata.com/blog/optimize-postgresql-server-performance

https://www.percona.com/blog/using-huge-pages-with-postgresql-running-inside-kubernetes/

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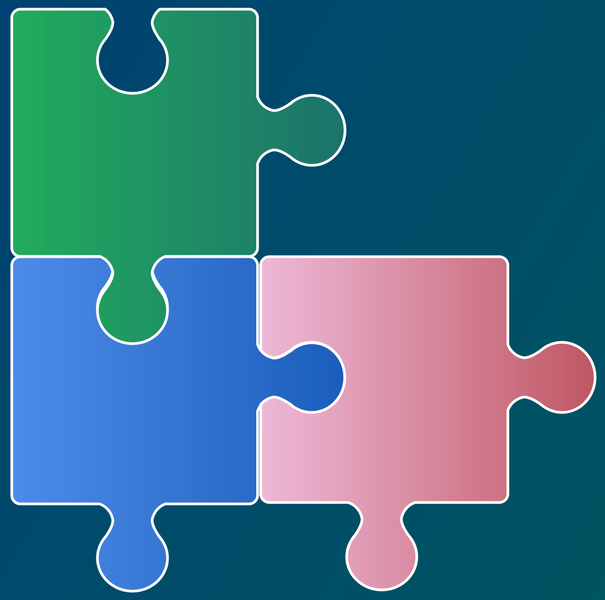
Do you need more? Extensions!



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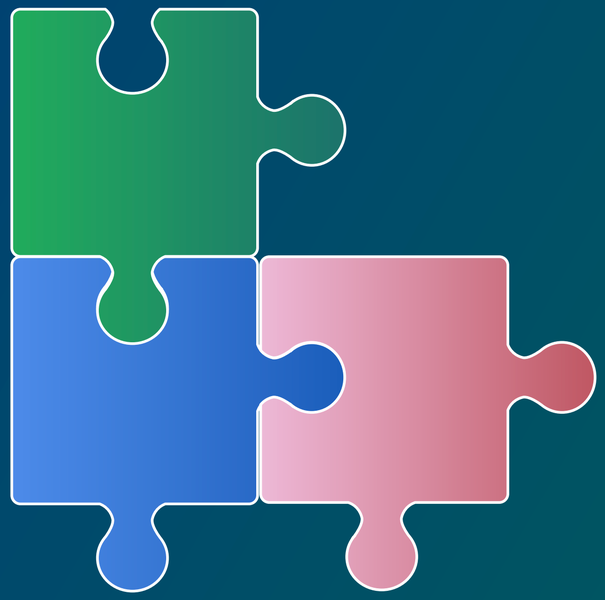

Do you need PG Extensions?

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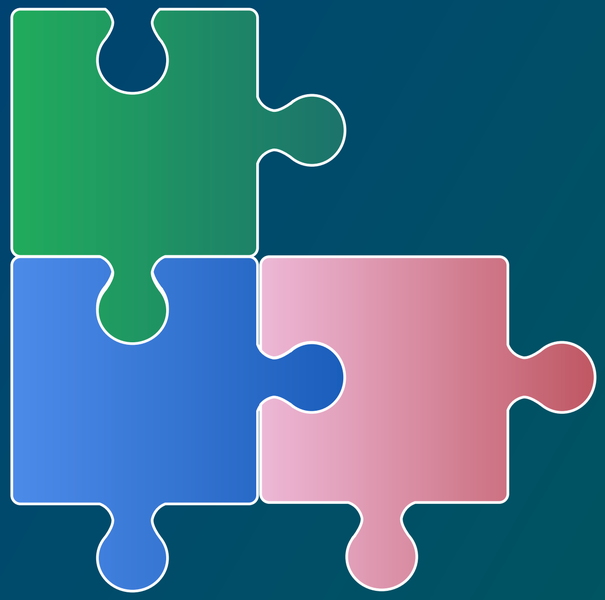

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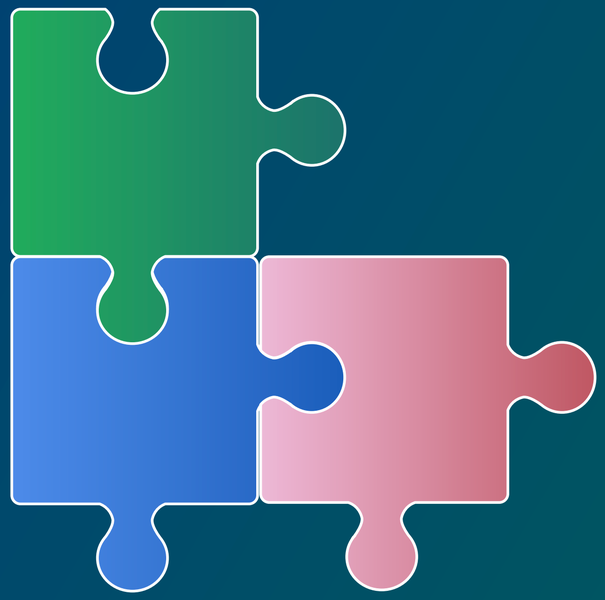
Is the extension part of the container image?

Do you need more? Extensions!



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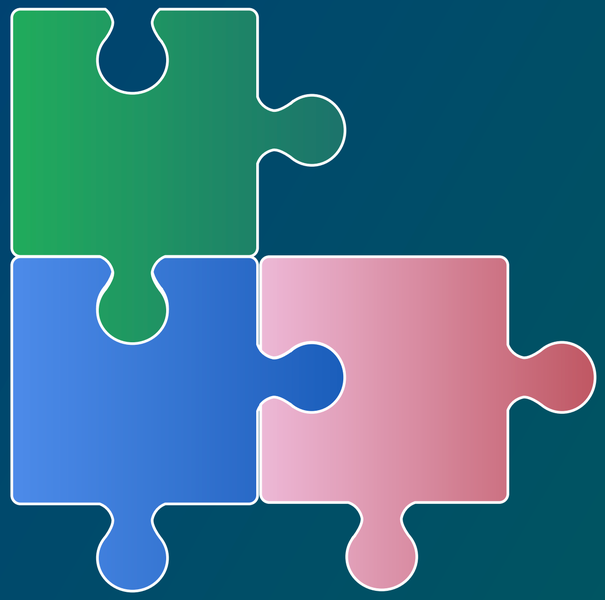

Do you need PG Extensions?

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If not, you need to build your own layer…

or use some magic (more on this later).

Keep an Eye on PG and Kubernetes Versions

So *What* is important or different?

Storage

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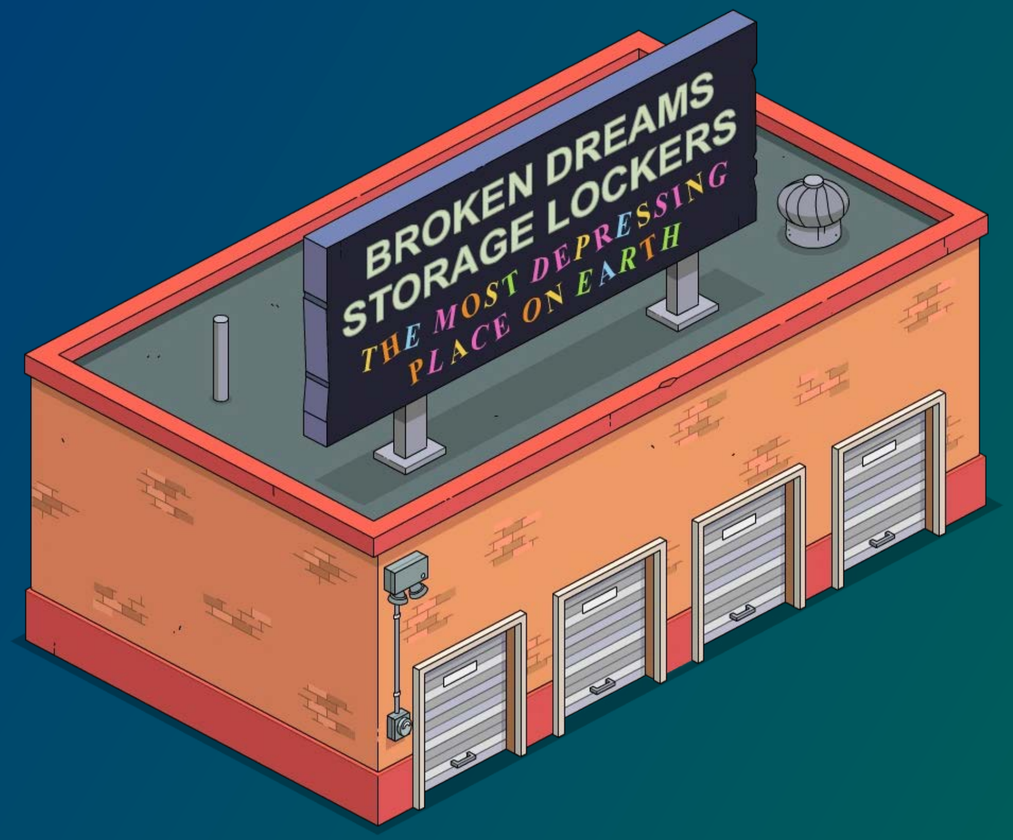
Storage



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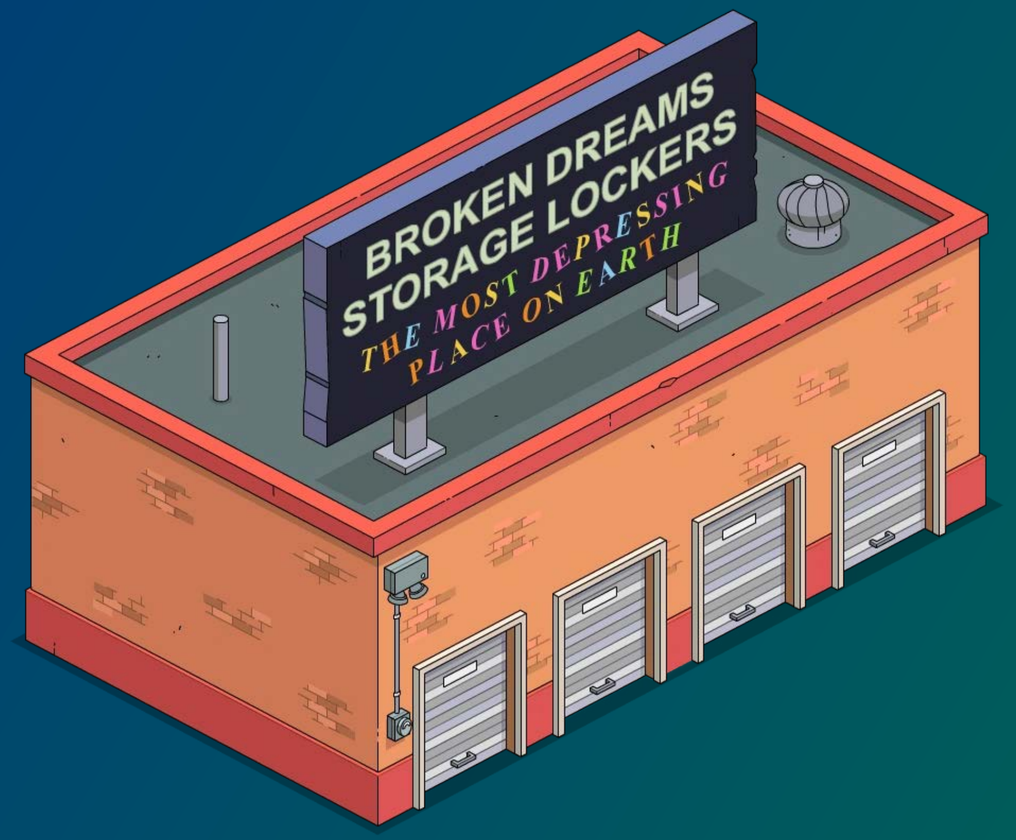
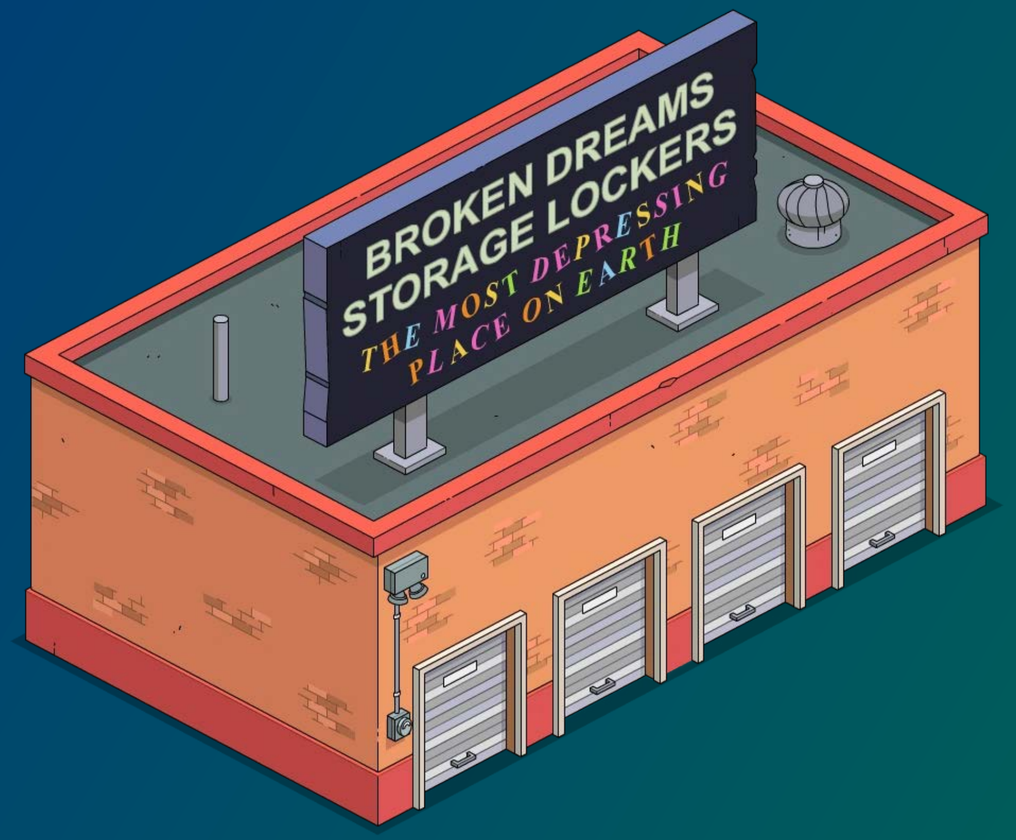


Use Persistent Volumes



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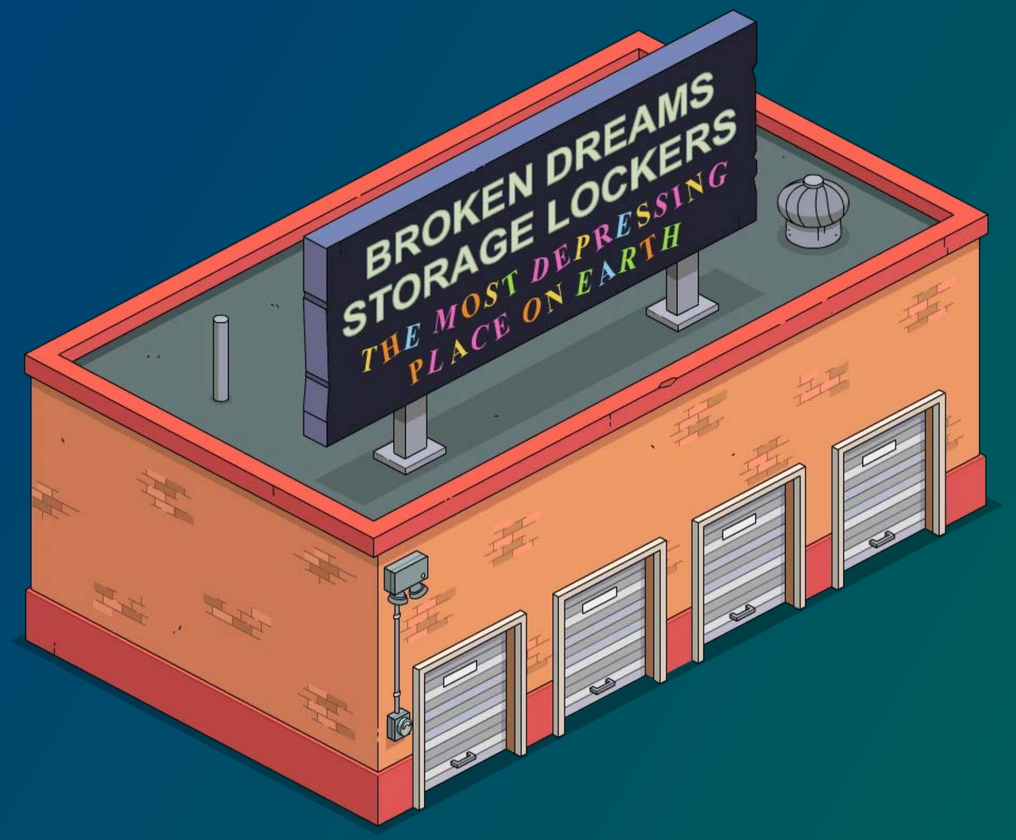
(local volumes are a bad idea)



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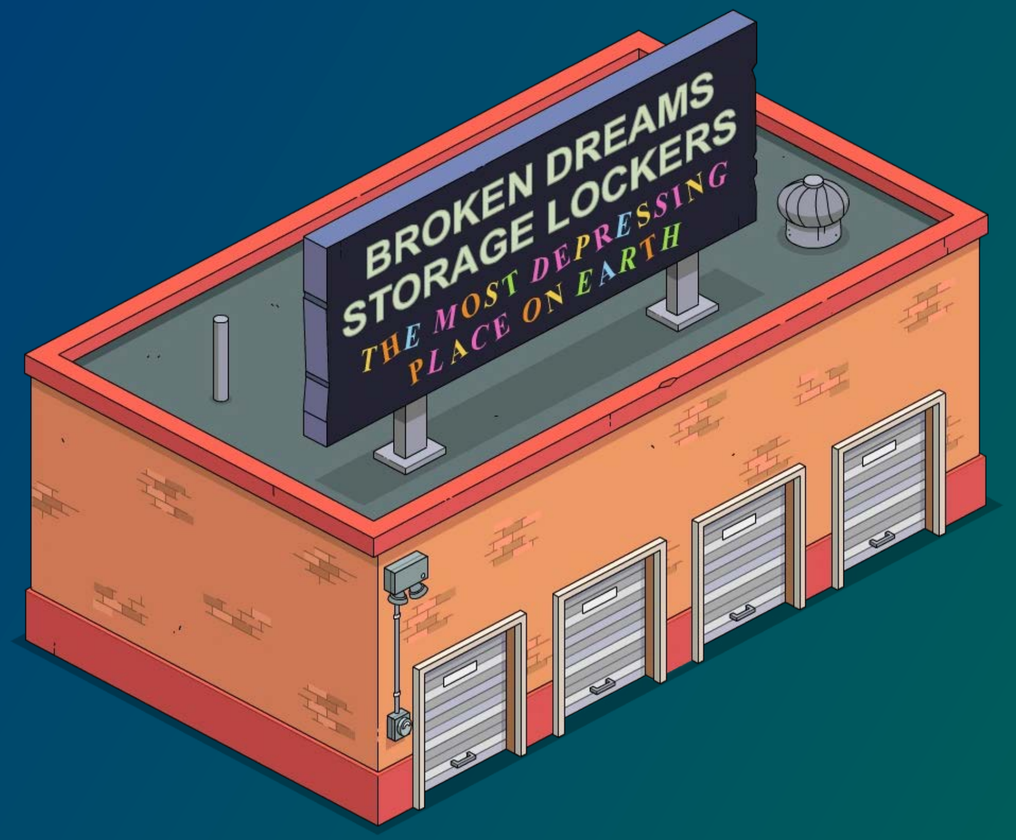
Should be dynamically provisioned



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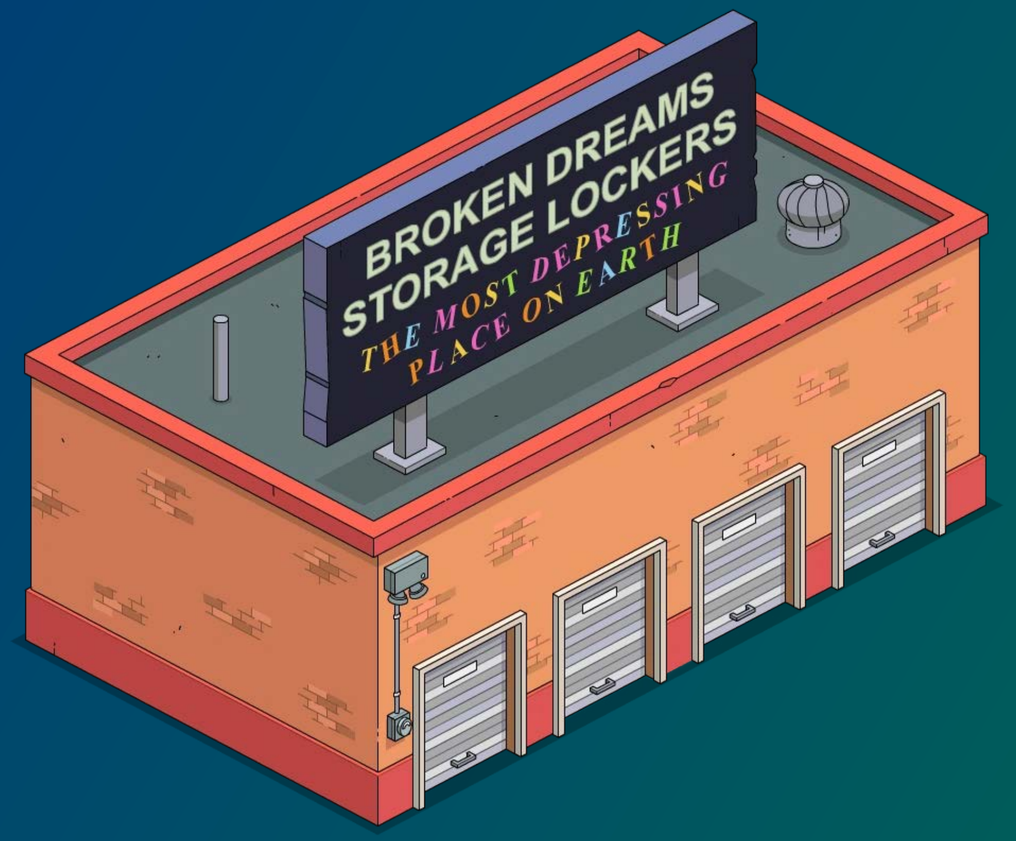
CSI provider enables encryption at rest



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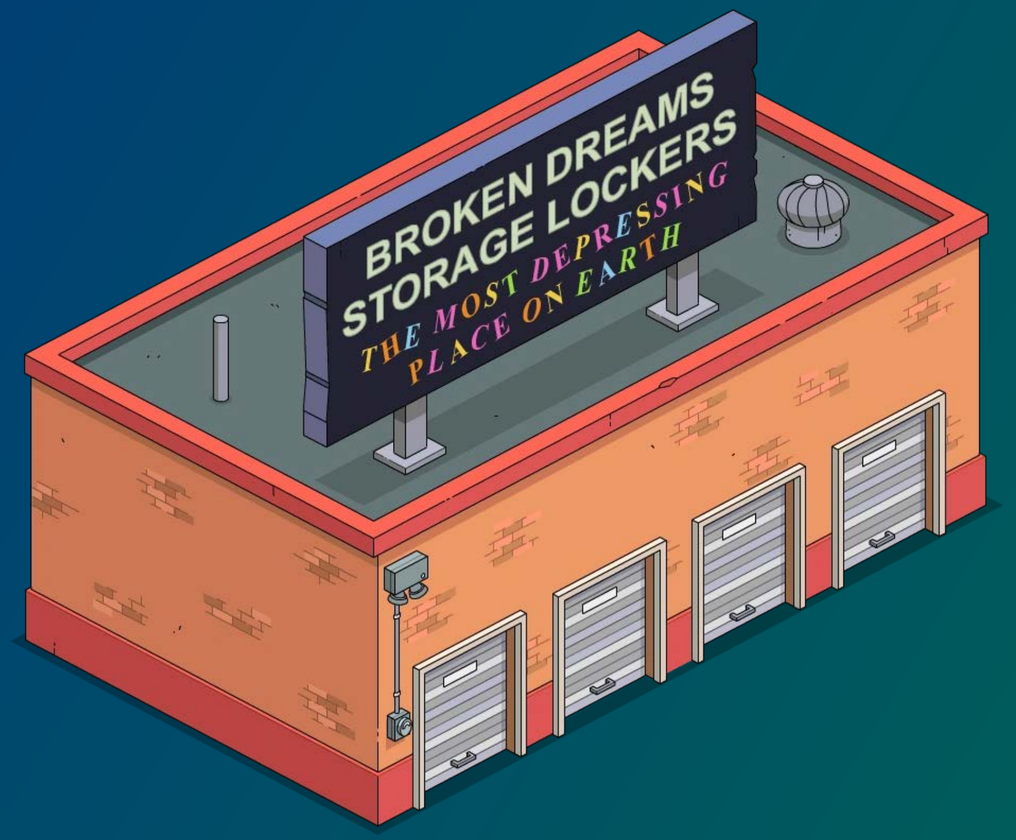

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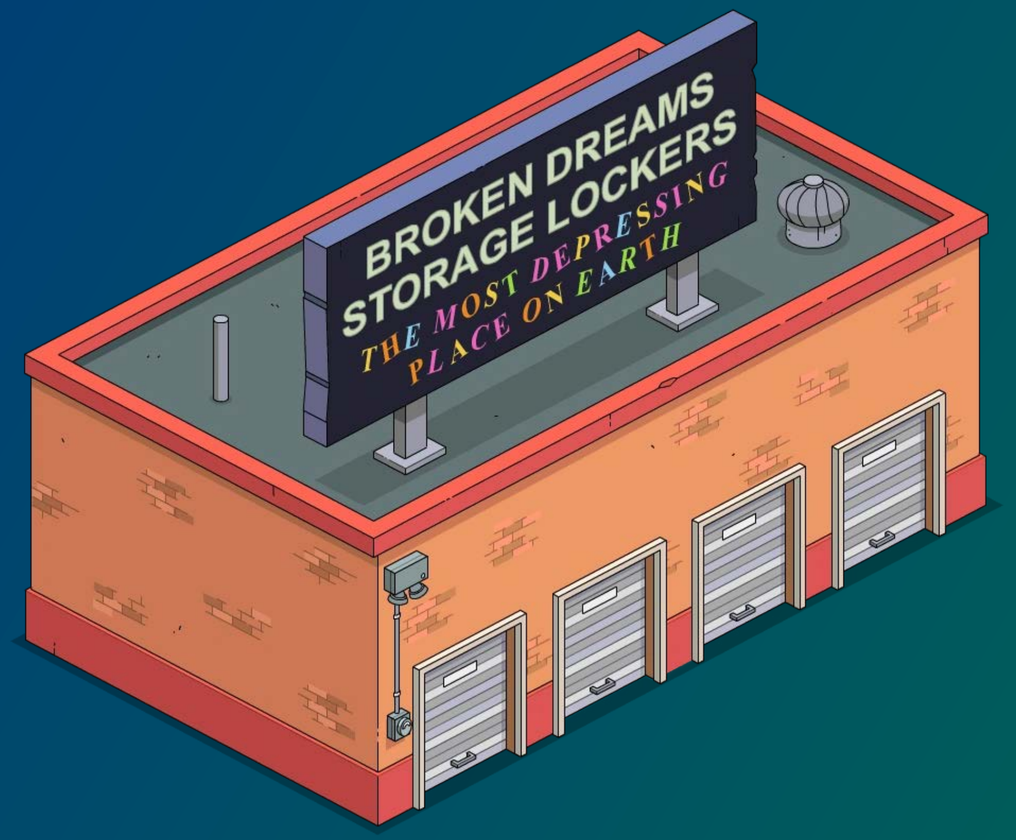
Low Latency



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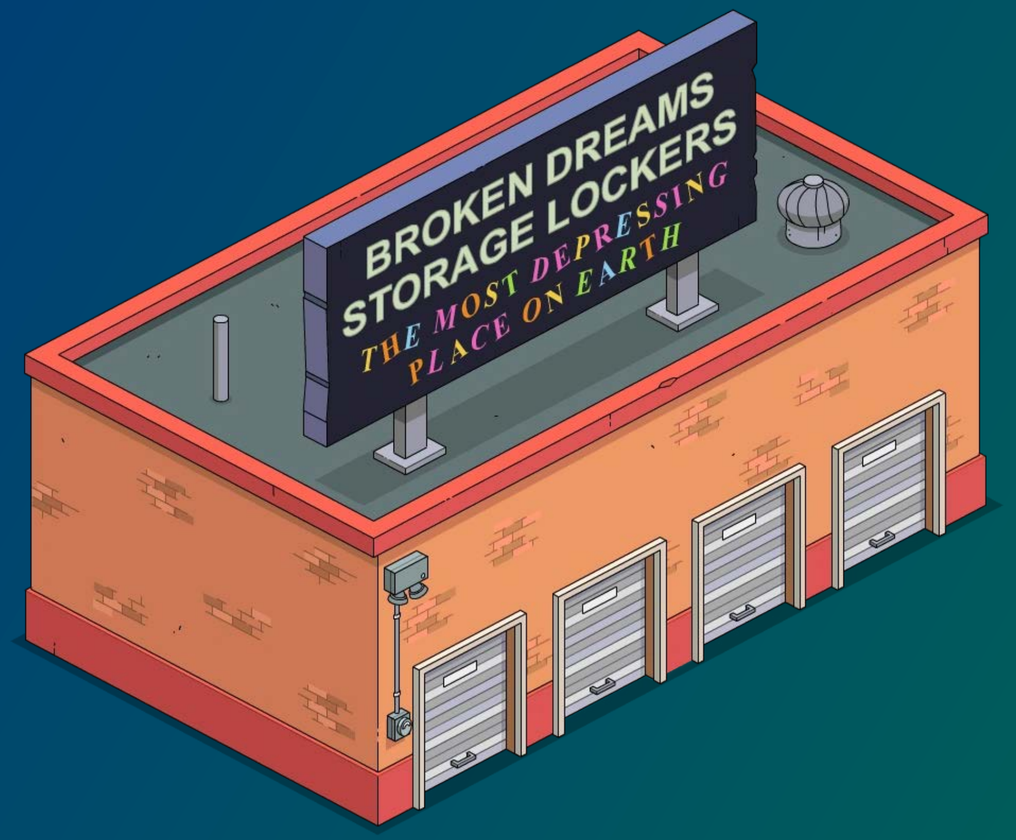

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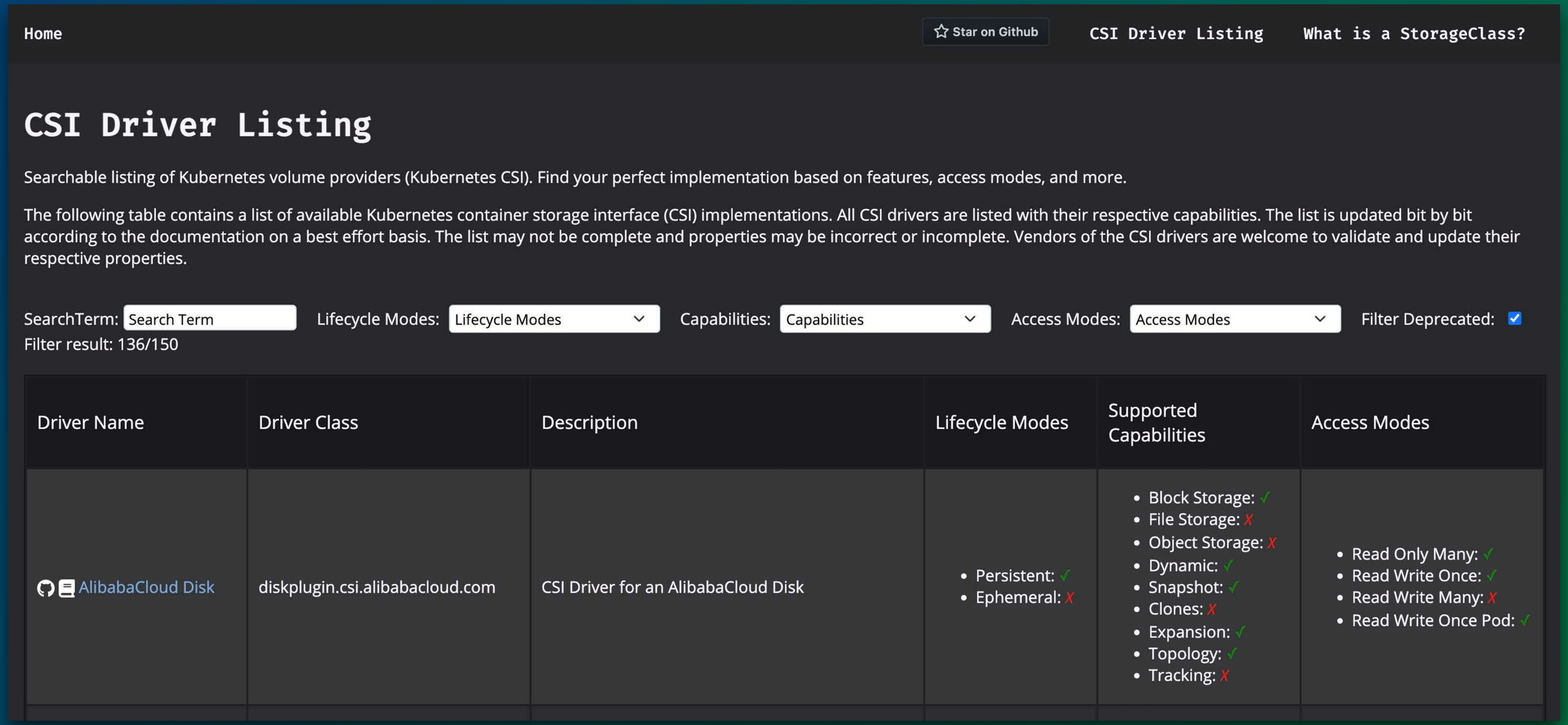
I’d recommend a disaggregated storage!



Home ☆ Star on Github CSI Driver Listing What is a StorageClass?

CSI Driver Listing

Searchable listing of Kubernetes volume providers (Kubernetes CSI). Find your perfect implementation based on features, access modes, and more.

The following table contains a list of available Kubernetes container storage interface (CSI) implementations. All CSI drivers are listed with their respective capabilities. The list is updated bit by bit according to the documentation on a best effort basis. The list may not be complete and properties may be incorrect or incomplete. Vendors of the CSI drivers are welcome to validate and update their respective properties.

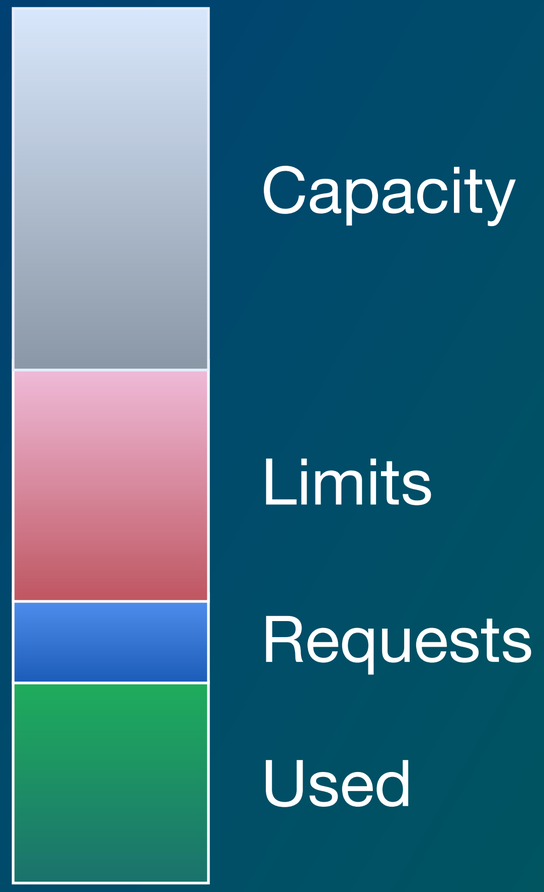
SearchTerm: Search Term Lifecycle Modes: Lifecycle Modes Capabilities: Capabilities Access Modes: Access Modes Filter Deprecated:

Filter result: 136/150

Driver Name	Driver Class	Description	Lifecycle Modes	Supported Capabilities	Access Modes
AlibabaCloud Disk	diskplugin.csi.alibabacloud.com	CSI Driver for an AlibabaCloud Disk	• Persistent: ✓ • Ephemeral: ✗	• Block Storage: ✓ • File Storage: ✗ • Object Storage: ✗ • Dynamic: ✓ • Snapshot: ✓ • Clones: ✗ • Expansion: ✓ • Topology: ✓ • Tracking: ✗	• Read Only Many: ✓ • Read Write Once: ✓ • Read Write Many: ✗ • Read Write Once Pod: ✓

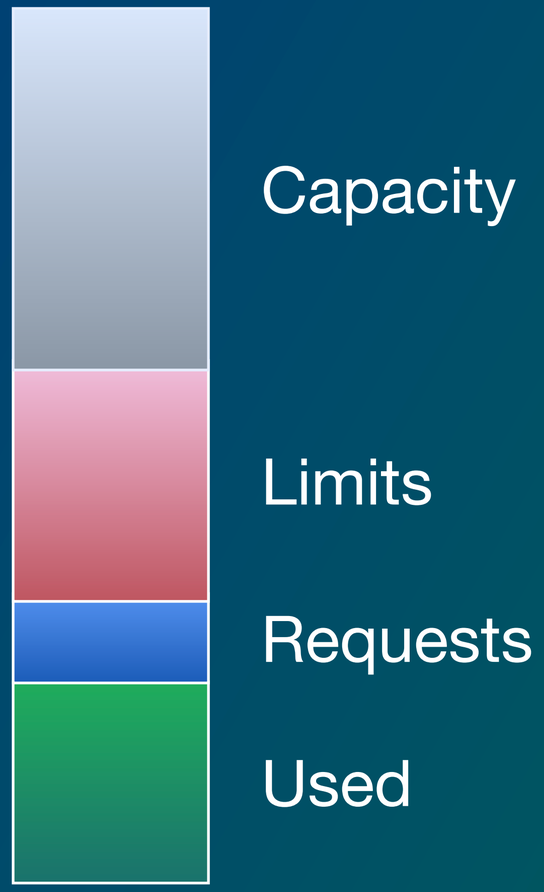
www.storageclass.info/csidrivers

Requests, Limits, and Quotas



simplyblock

Requests, Limits, and Quotas



Use Resource Requests, Limits, Quotas

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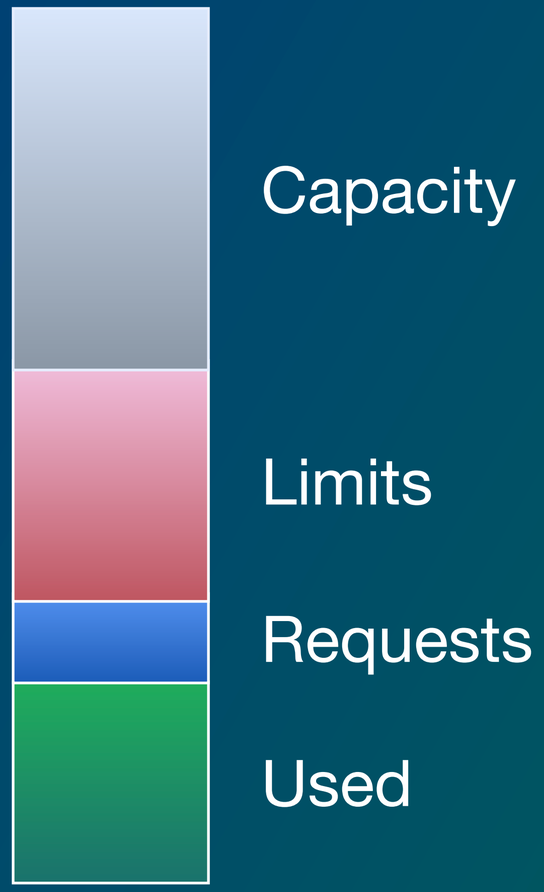
Requests, Limits, and Quotas



Use Resource Requests, Limits, Quotas

CPU and memory requests need to be accurate
to prevent contention and ensure predictable performance

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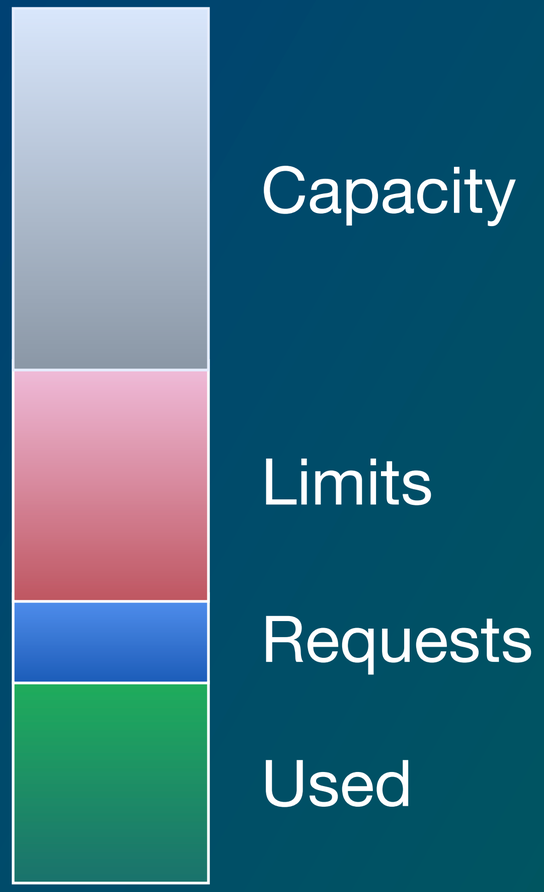
Requests, Limits, and Quotas



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https://codimite.ai/blog/kubernetes-resources-and-scaling-a-beginners-guide/

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Enable Huge Pages!

Make it big!

Enable Huge Pages!

In your OS and the Resource Descriptor.

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Make it big!

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https://www.percona.com/blog/using-huge-pages-with-postgresql-running-inside-kubernetes/

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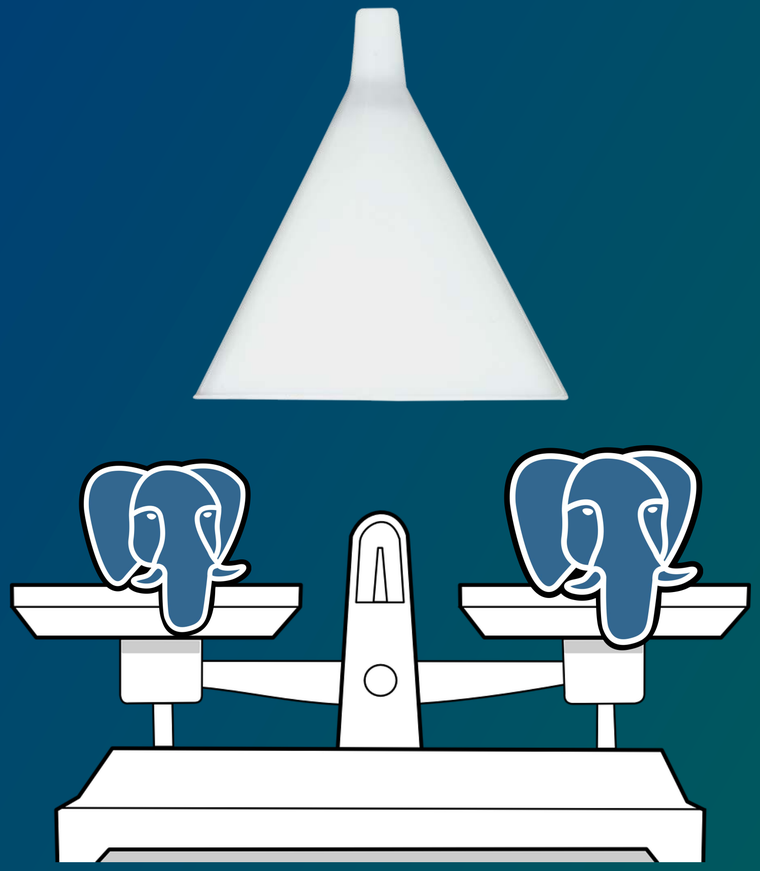
Resiliency and Overhead



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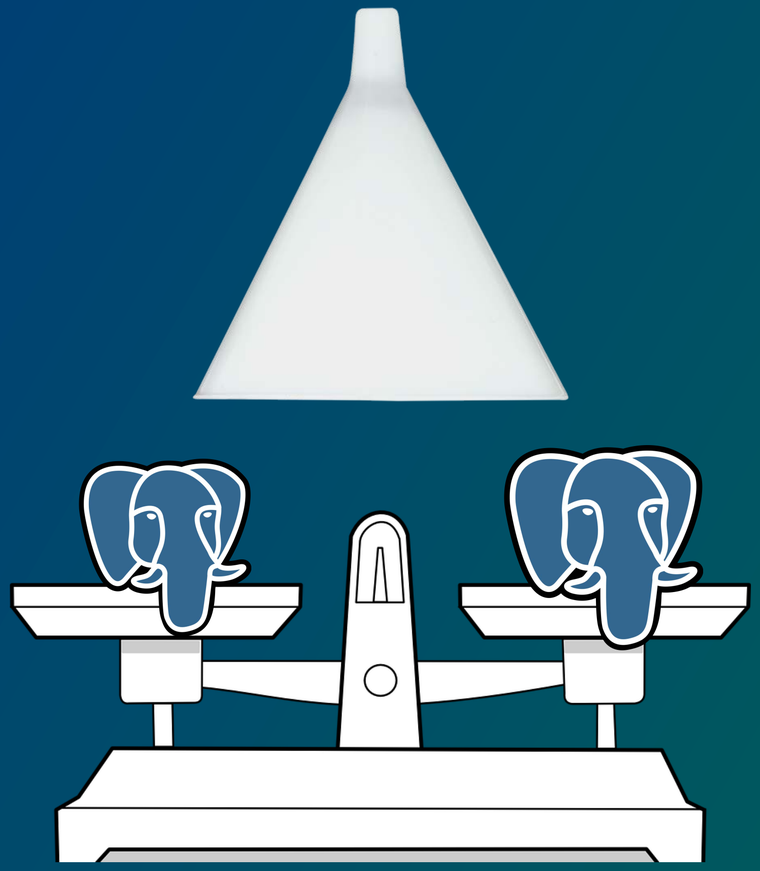
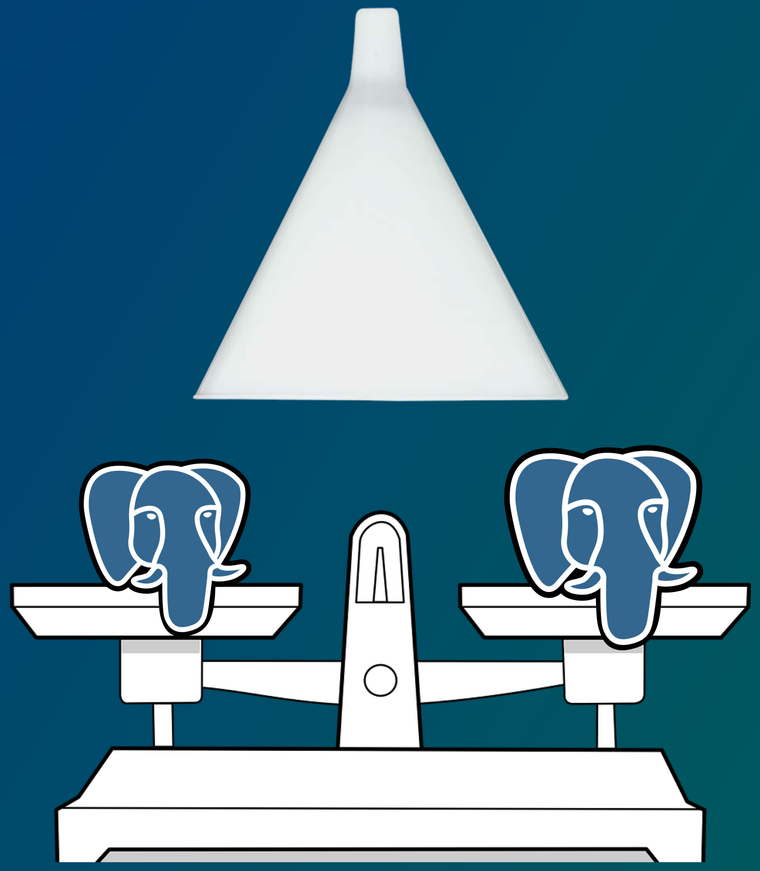


High Availability

Resiliency and Overhead



High Availability

Patroni, repmgr, pg_auto_failover, …

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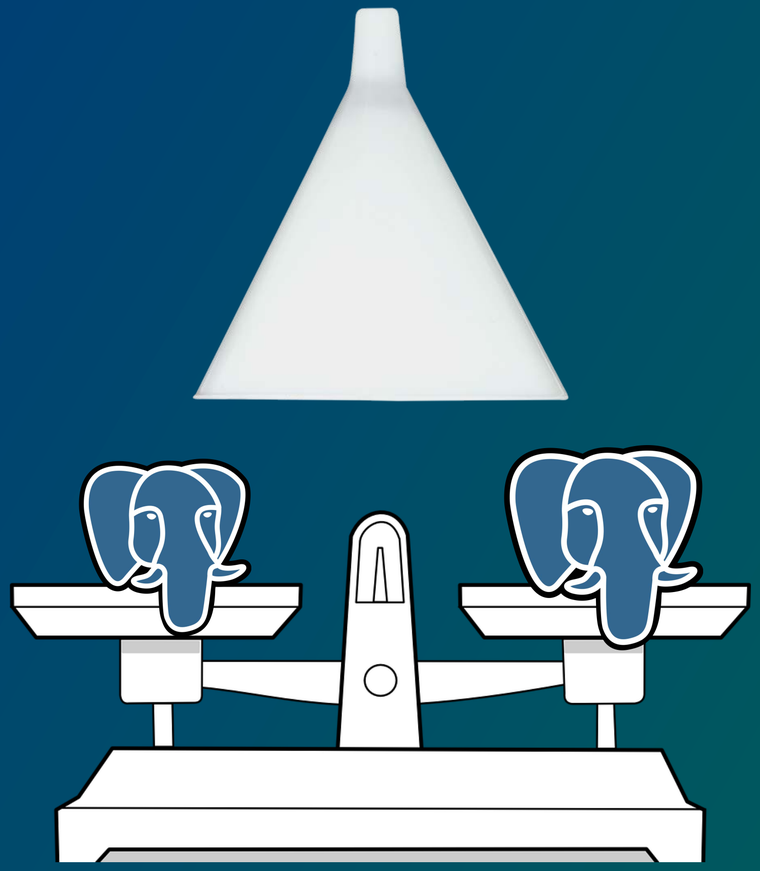
Resiliency and Overhead



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https://medium.com/@kristi.anderson/whats-the-best-postgresql-high-availability-framework...

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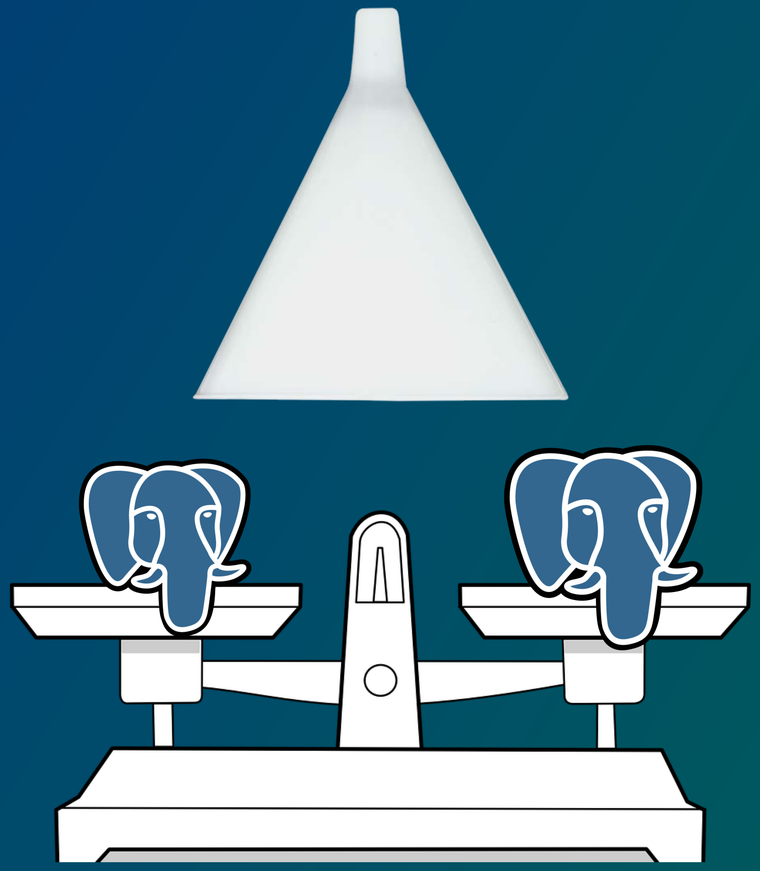

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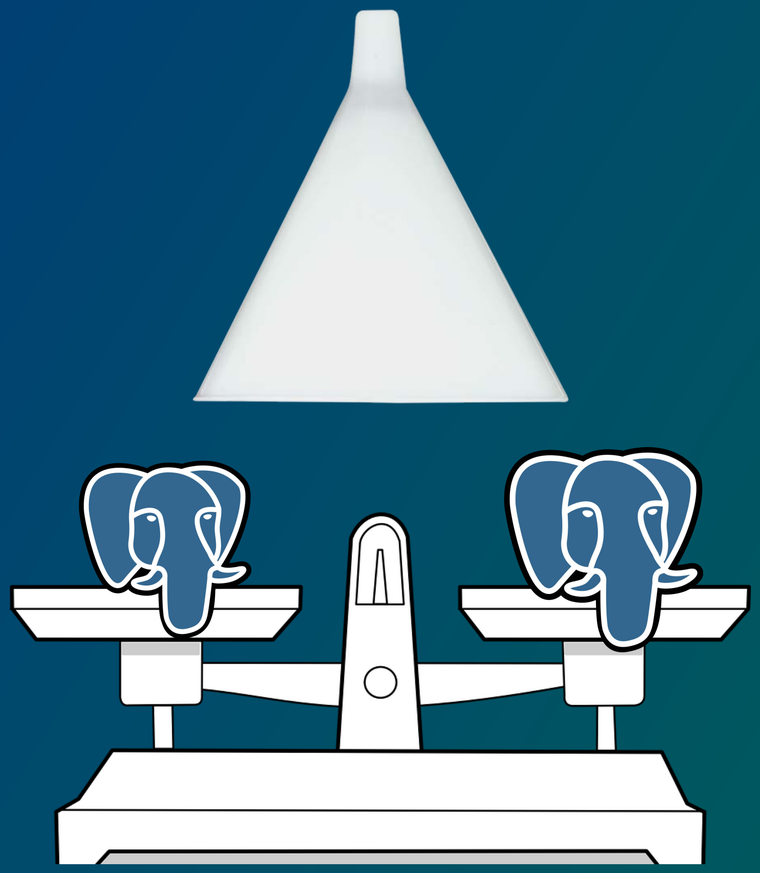

Connection Pooling

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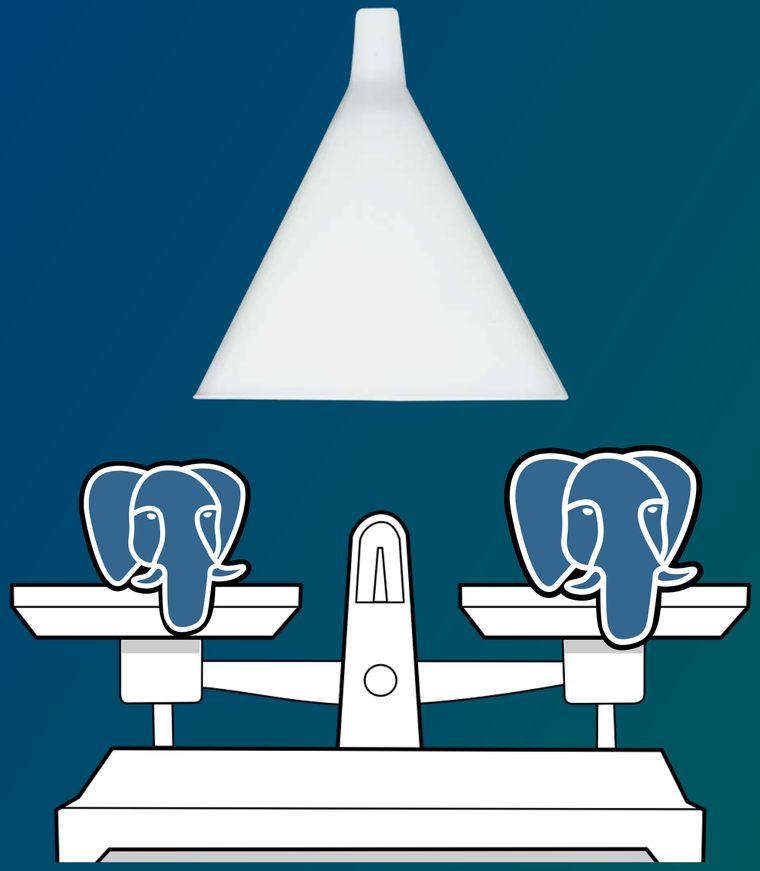
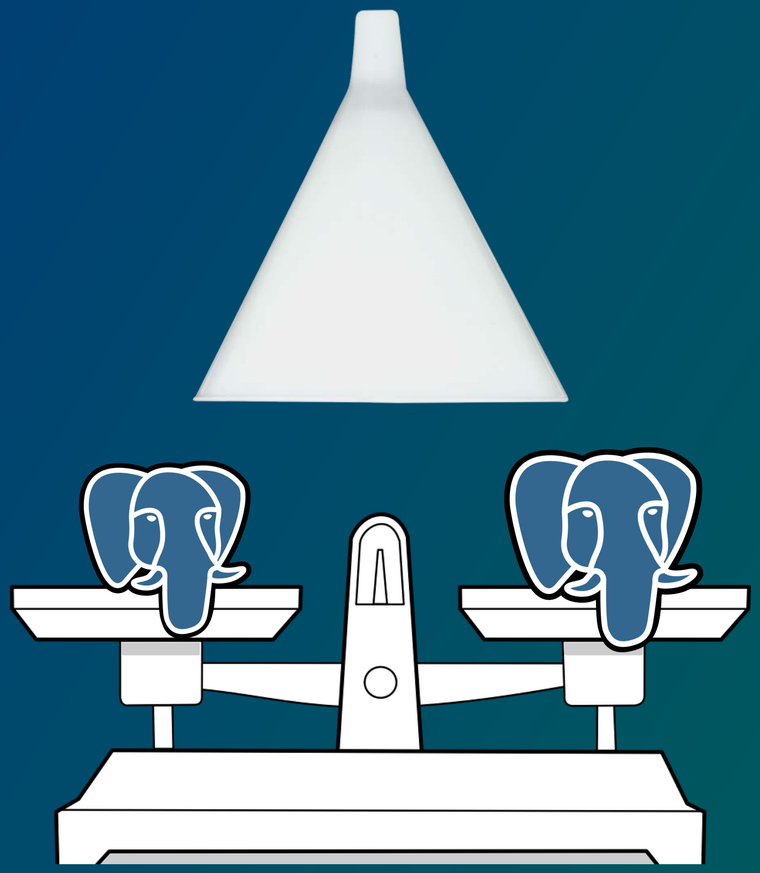


Connection Pooling

Never use PostgreSQL without Connection Pooling!



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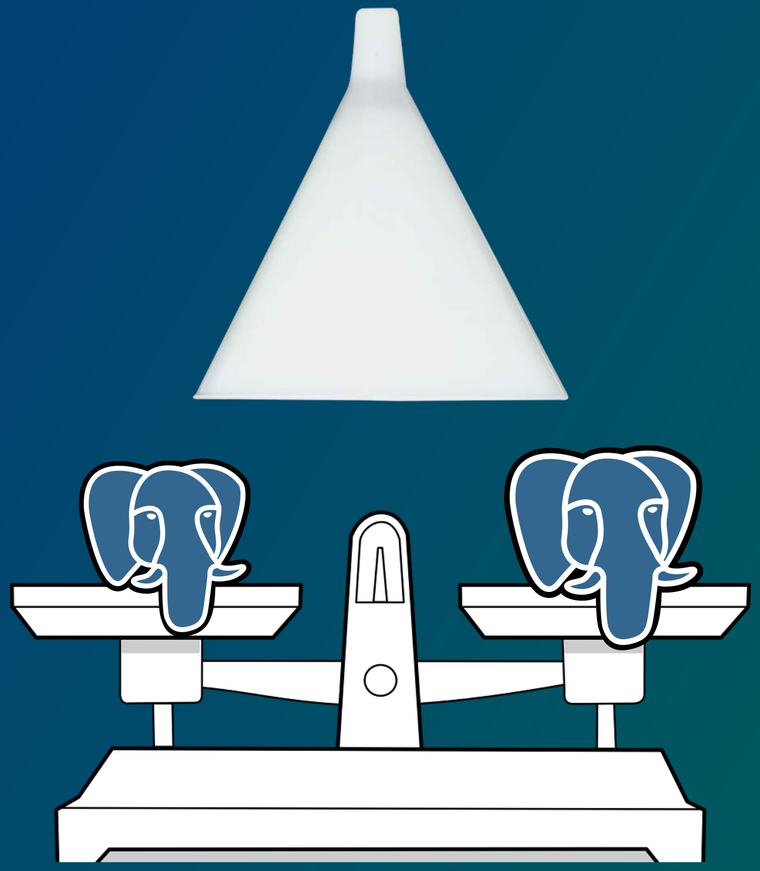

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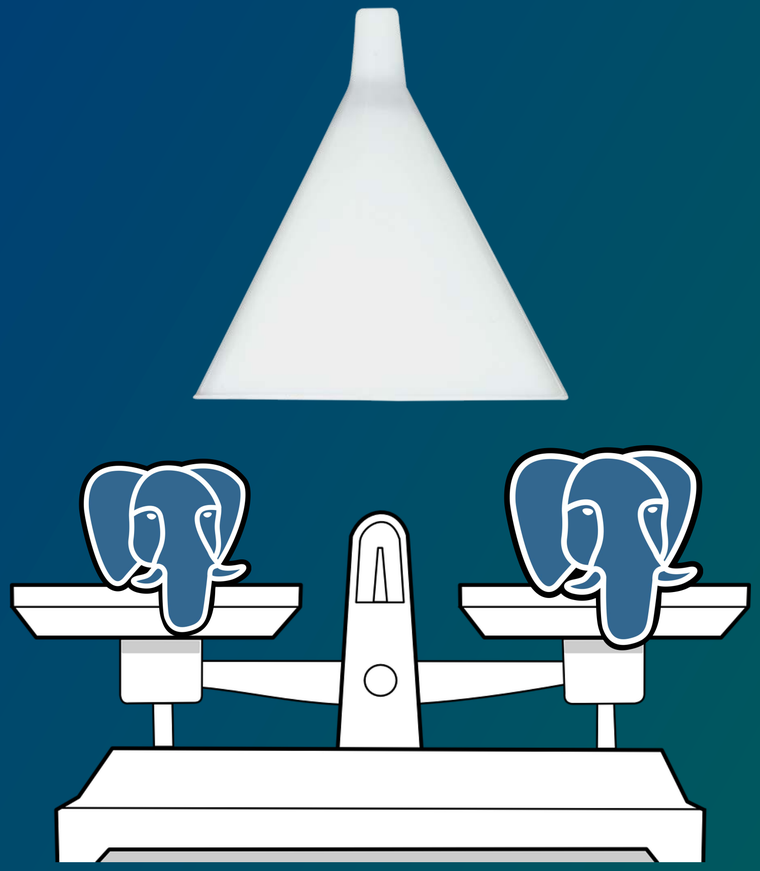
Optimizes Overhead and Resource Utilization

Handles failovers, central switching of Primary



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Never use PostgreSQL without Connection Pooling!

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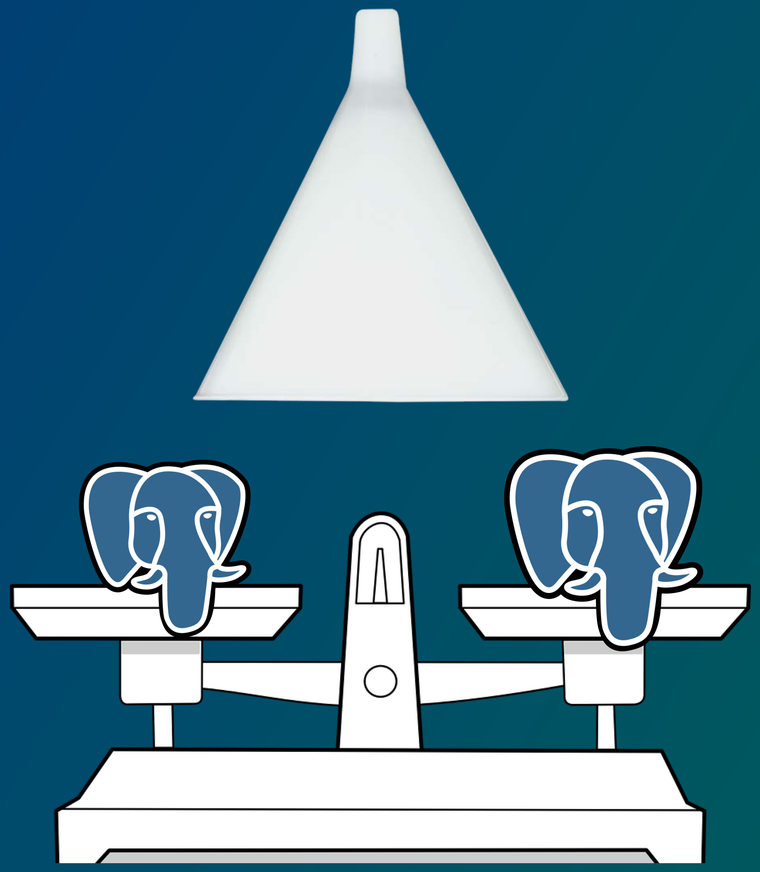

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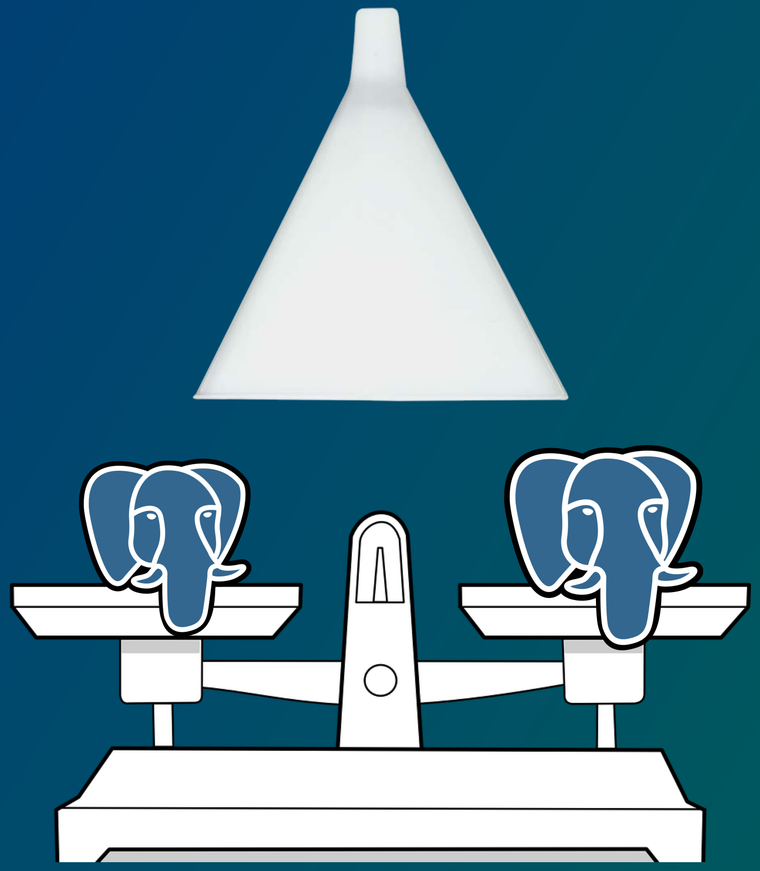
Resiliency and Overhead



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https://tembo.io/blog/postgres-connection-poolers

Where’s my Replicant?

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Where’s my Replicant?

Use available Kubernetes features

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Use available Kubernetes features

StatefulSet

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Networking and Access Control

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https://timeclock365.com/tc22-door-access-controller/

Networking and Access Control

Use Network Policies

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https://timeclock365.com/tc22-door-access-controller/

Networking and Access Control

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Enable TLS (you remember?!)

Setup Security Policies

Configure RBAC (Role-Based Access Control)

Think about a policy manager such as OPA or kyverno

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https://timeclock365.com/tc22-door-access-controller/

Observability and Alerting

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Like anything cloud, make sure you have monitoring (meaning observability) and alerting!

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Datadog, Instana, DynaTrace, Grafana, …

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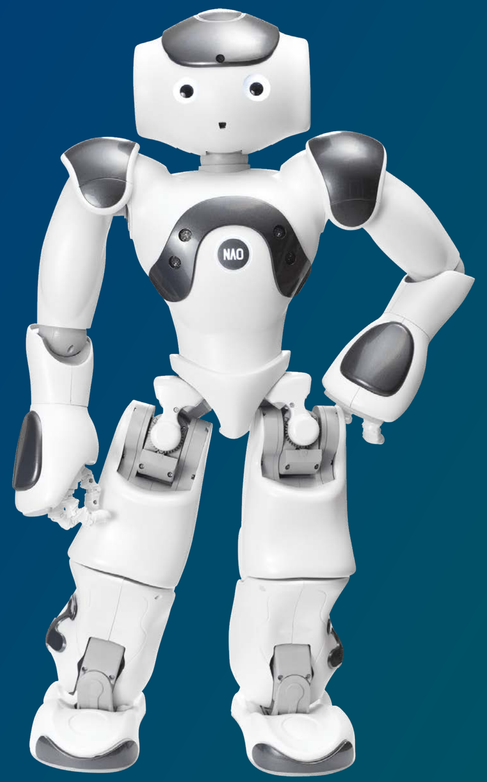
Operator



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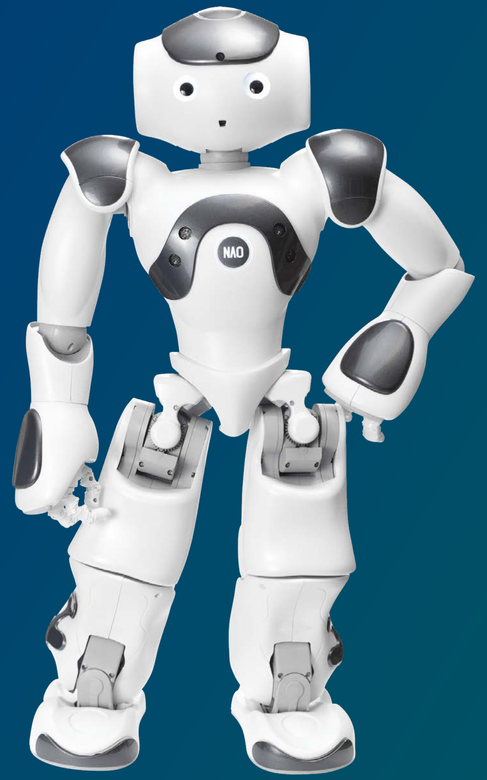
Operator



Use a Postgres Kubernetes Operator

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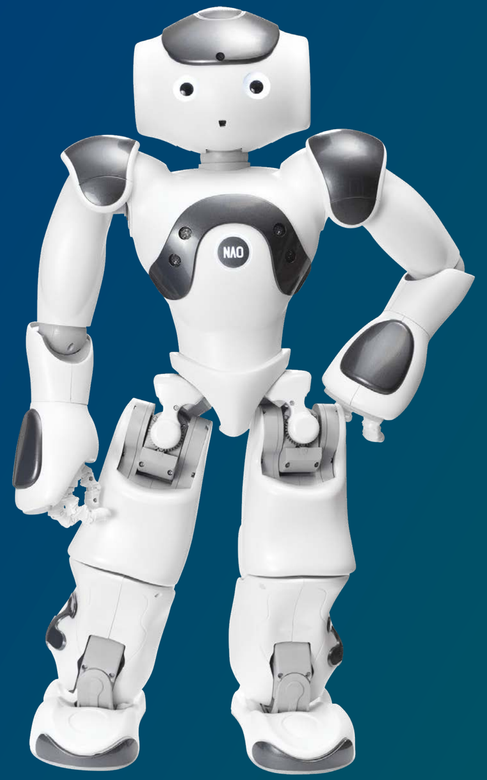
Operator



Use a Postgres Kubernetes Operator

Handles or configures many of the typical tasks (HA, backup, …)

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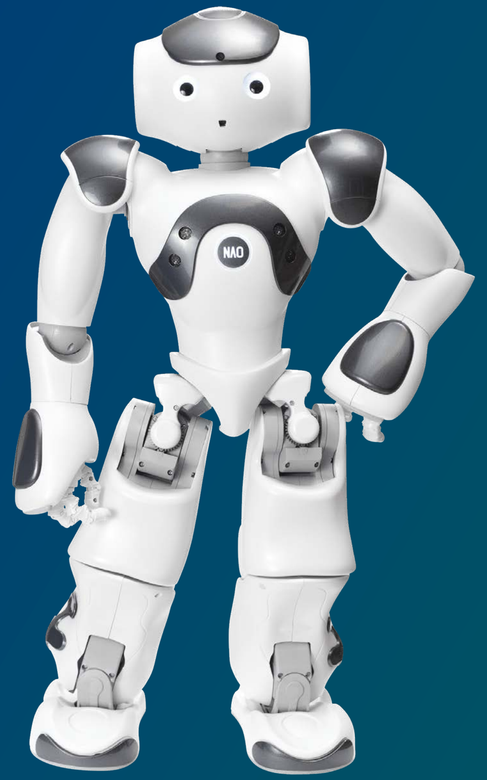
Operator



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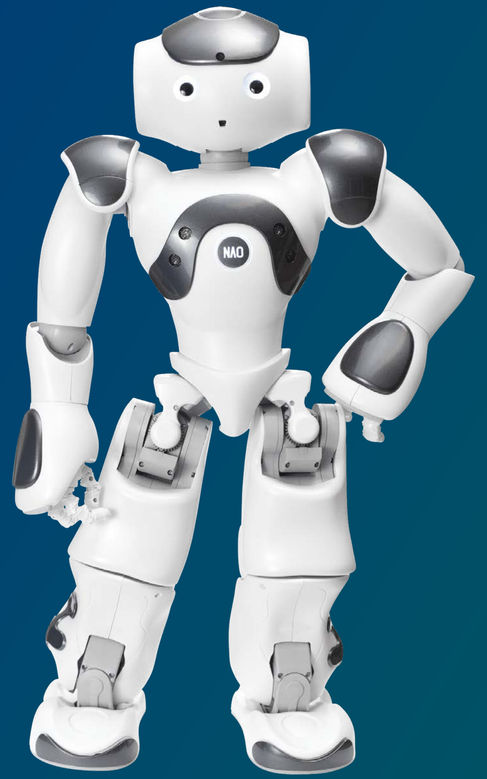

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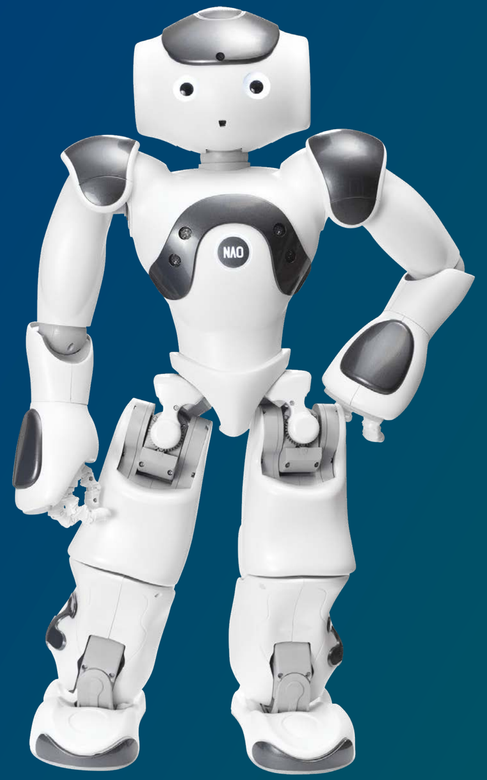

Use a Postgres Kubernetes Operator

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Brings cloud-nativeness to PG

Integrates PG into k8s

If not, use Helm Charts

Operator

	CloudNativePG	Crunchy Postgres for Kubernetes	OnGres StackGres	KubeDB	Zalando Postgres Operator
Supported versions	12, 13, 14, 15, 16	11, 12, 13, 14, 15, 16	12, 13, 14, 15, 16	9.6, 10, 11, 12, 13, 14	11, 12, 13, 14, 15, 16
Postgres Clusters	✔	✔	✔	✔	✔
Streaming replication	✔	✔	✔	✔	✔
Supports Extensions	✔	✔	✔	✔	✔

Operator

	CloudNativePG	Crunchy Postgres for Kubernetes	OnGres StackGres	KubeDB	Zalando Postgres Operator
Hot Standby	✔	✔	✔	✔	✔
Warm Standby	✔	✔	✔	✔	✔
Automatic Failover	✔	✔	✔	✔	✔
Continuous Archiving	✔	✔	✔	✔	✔
Restore from WAL archive	✔	✔	✔	✔	✔
Supports PITR	✔	✔	✔	✔	✔
Manual backups	✔	✔	✔	✔	✔
Scheduled backups	✔	✔	✔	✔	✔

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Operator

	CloudNativePG	Crunchy Postgres for Kubernetes	OnGres StackGres	KubeDB	Zalando Postgres Operator
Backups via Kubernetes	✔	✘	✔	✔	✘
Custom resources	✔	✔	✔	✔	✔
Uses default PG images	✘	✔	✔	✘	✘
CLI access	✔	✔	✔	✔	✘
WebUI	✘	✘	✔	✔	✘
Tolerations	✔	✔	✔	✔	✔
Node affinity	✔	✔	✔	✔	✔

Operator

https://www.simplyblock.io/post/choosing-a-postgres-kubernetes-operator

https://operatorhub.io/?keyword=postgres

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Pinning and Tainting

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(except the minimum necessary Kubernetes services, like KubeProxy)

Trust me, I’m Kelsey!

https://x.com/kelseyhightower/status/1624081136073994240

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Trust me, I’m Kelsey!

Kelsey Hightower
@kelseyhightower

You can run databases on Kubernetes because it's fundamentally the same as running a database on a VM. The biggest challenge is understanding that rubbing Kubernetes on Postgres won't turn it into Cloud SQL. 🧵

> **Soham Dasgupta** 🇮🇳 @thesobercoder · Feb 10, 2023
> @kelseyhightower Bust a myth for us please - running any sort of database on a Kubernetes instance is bad idea. I've heard this enough times to actually start believing it. #kubernetes #mythbuster

5:21 PM · Feb 10, 2023 · **326.7K** Views

43 149 839 224

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More Resources

Data on Kubernetes Community: https://dok.community

Data on Kubernetes Whitepaper

@noctarius2k
@noctarius2k@mastodon.online
@noctarius.com

Thank you very much!
Questions?

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