signageOS

How to migrate to AWS without a mental breakdown

Michal Artazov

Outline

- About signageOS
- How we migrated to AWS
- What went wrong
- How much did it cost
- What did we learn from it
- Some interesting ways we use AWS

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signageOS

Out-of-box solution for device management, monitoring and content delivery designed for **digital signage**

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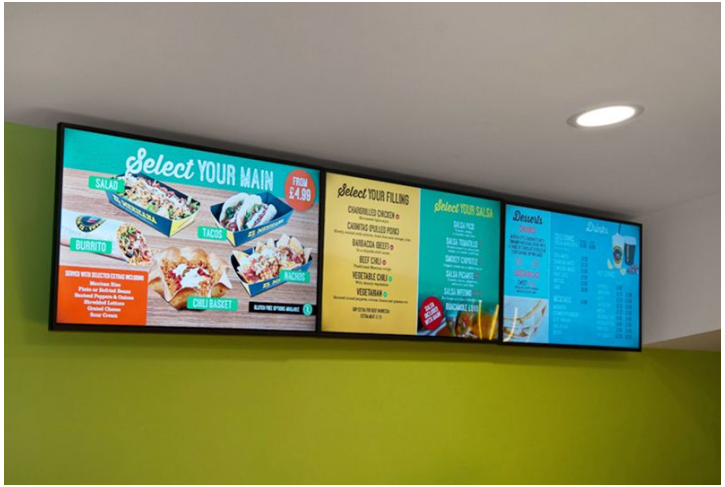
What is digital signage



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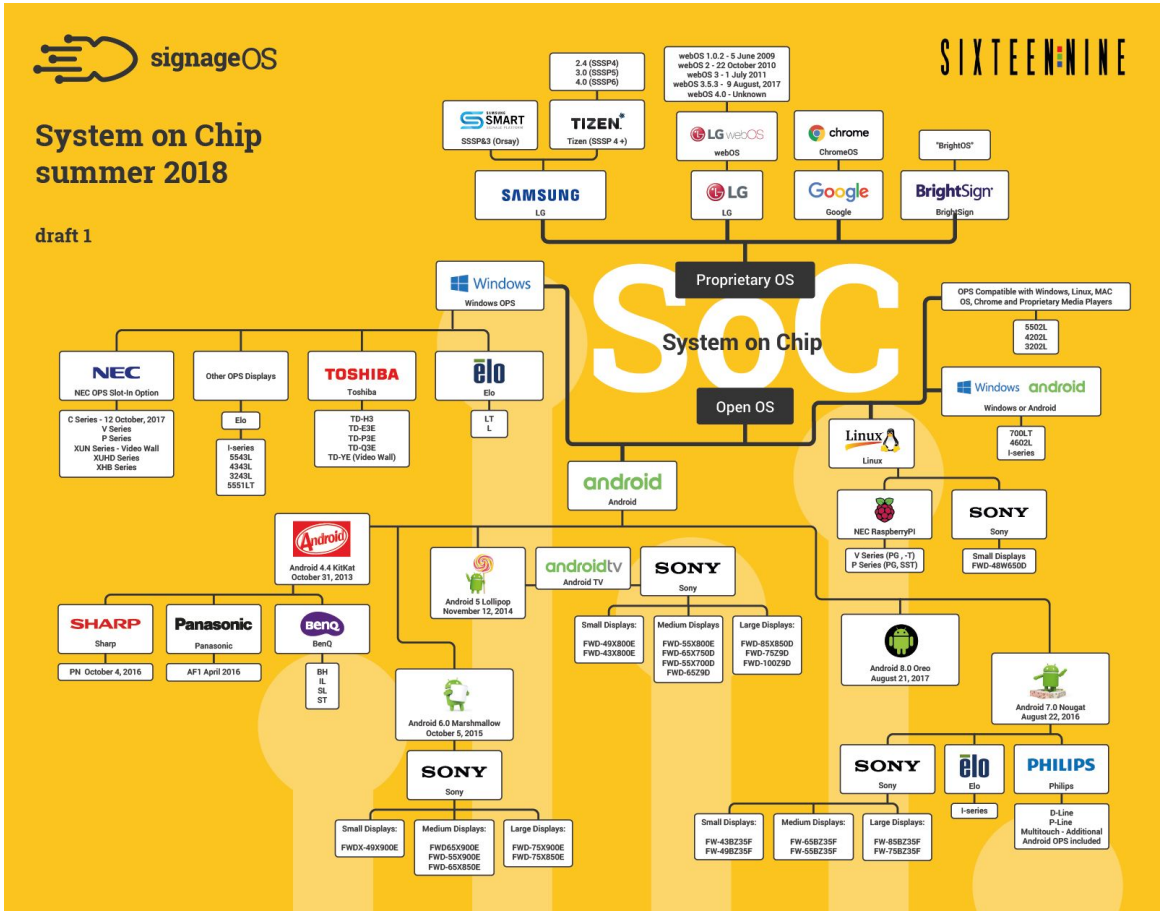
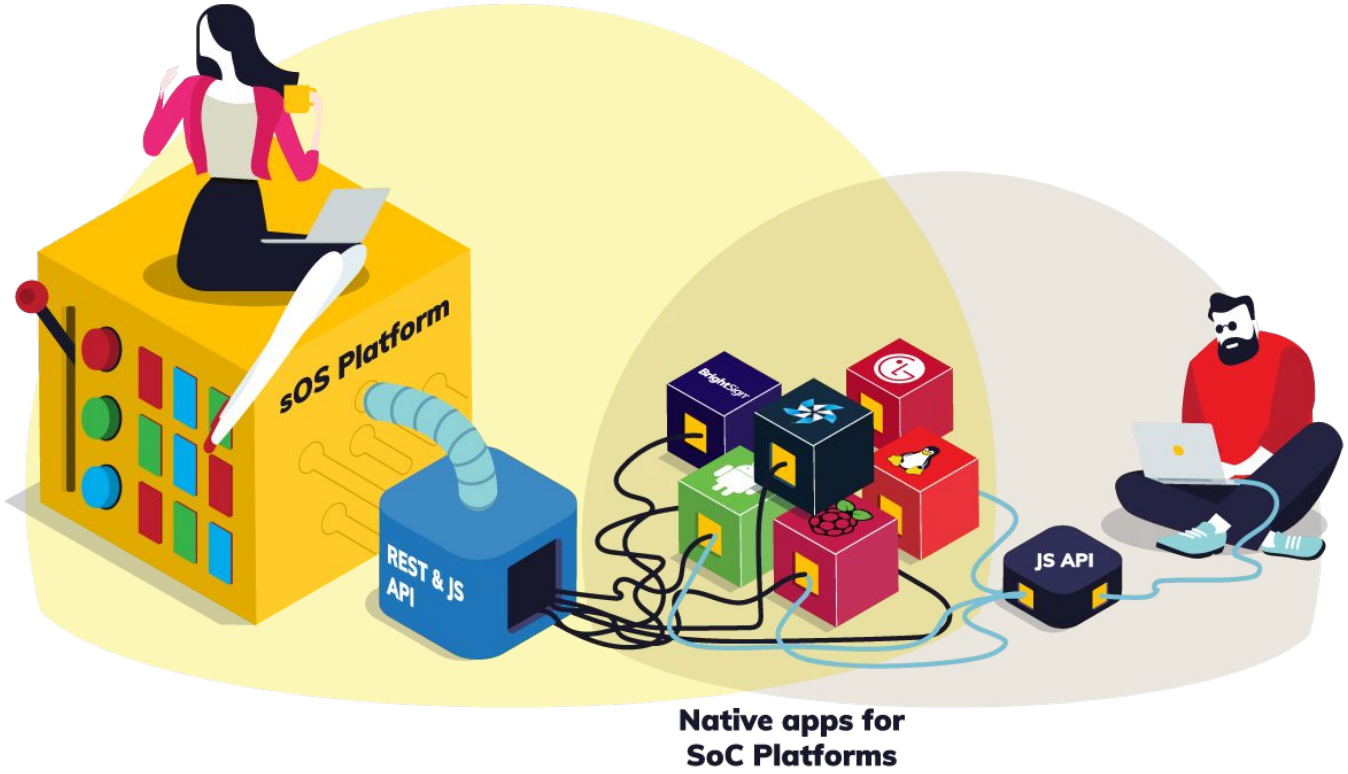


What is signageOS



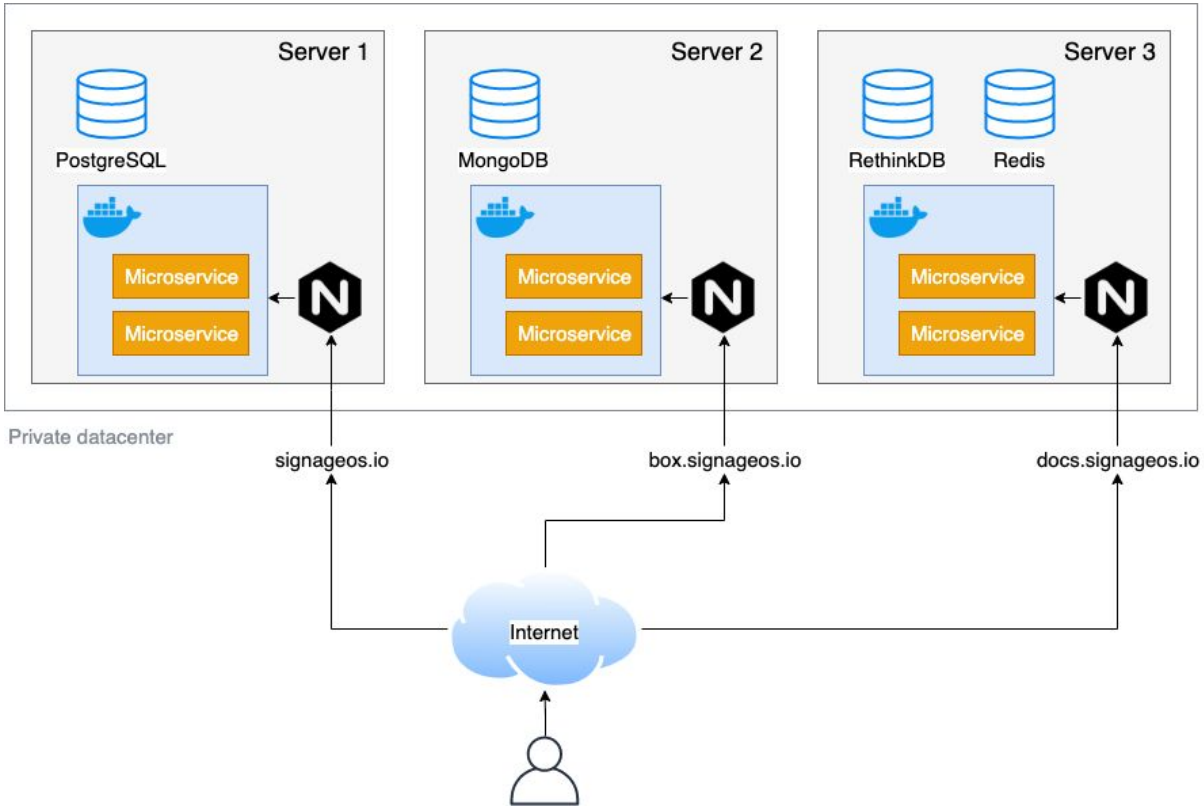
What is signageOS

- SDK + Cloud platform
- Install signageOS software on a device
- Write HTML/JS application using signageOS SDK
- Push your application to the cloud
- Application runs on the device in an embedded web browser
  - Show content
  - Control device
- Device can be controlled from the cloud
- Device constantly sends monitoring data to the cloud

What is signageOS

- Right now about 5000 devices in production and growing
- Customers all over the world (USA, Europe, Asia, Australia)

Before AWS



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Before AWS

Pros

- Easy to understand

Cons

- Manual
- Not flexible
- Unable to scale

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Why AWS

- Flexible
- Automation
- Better cost control
- More reliable

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Migration - main objectives

1. Replicate databases
2. Setup clone of the entire stack on AWS
3. Switch DNS to AWS
4. Cut off old database replicas
5. Profit

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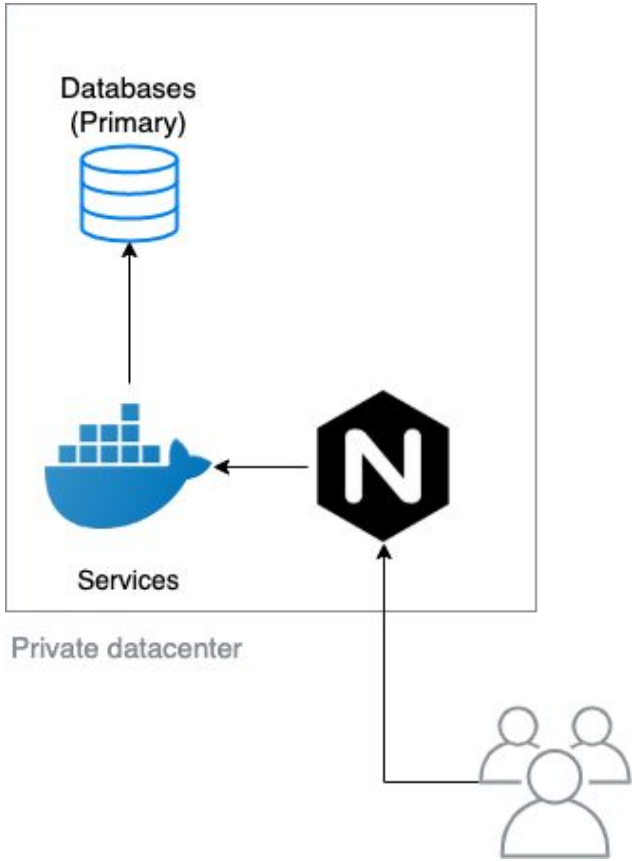

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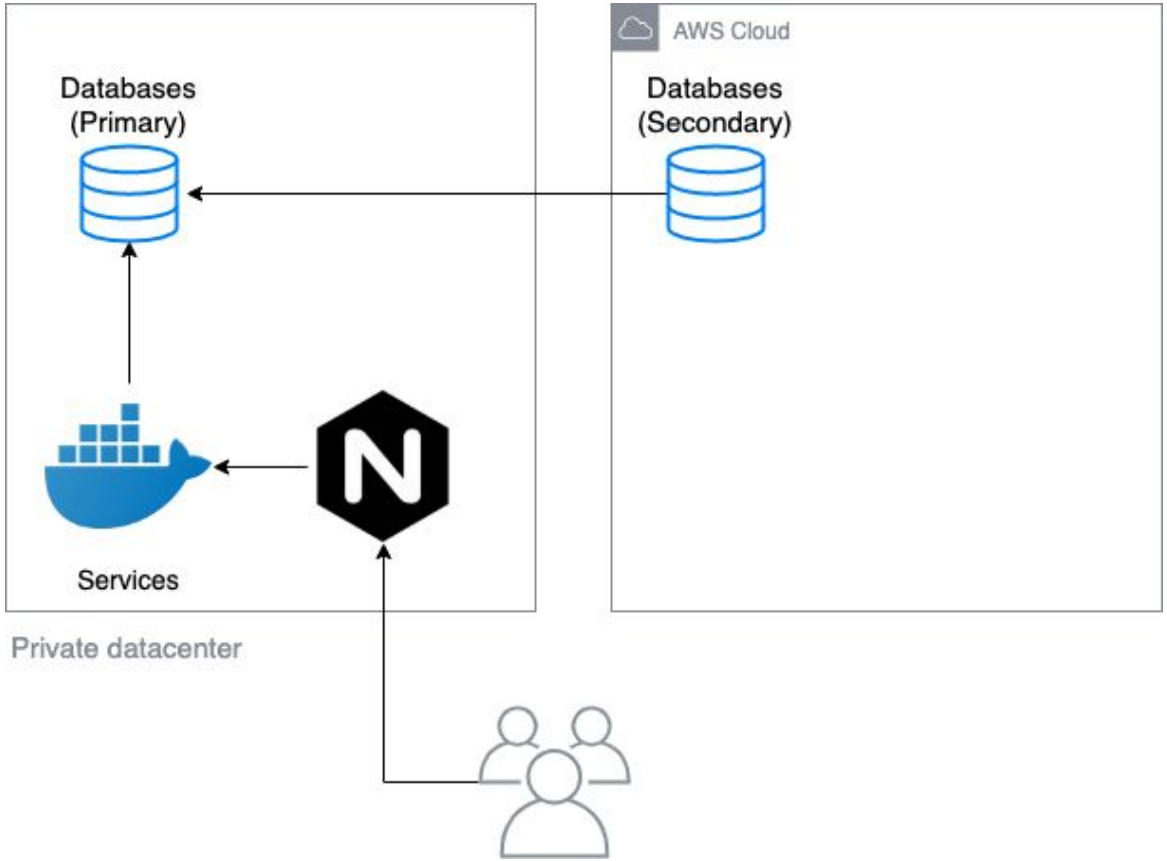
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Databases
(Primary)
Databases
(Secondary)
Services
Private datacenter

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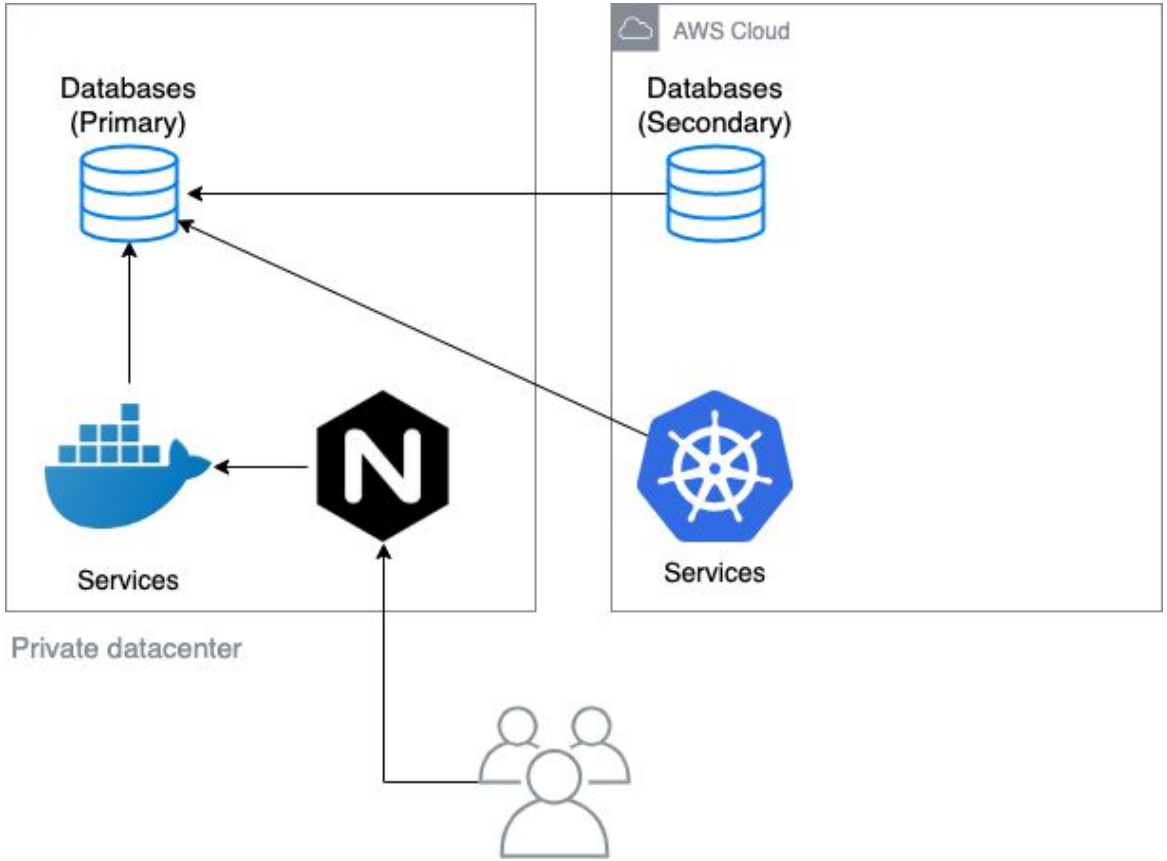
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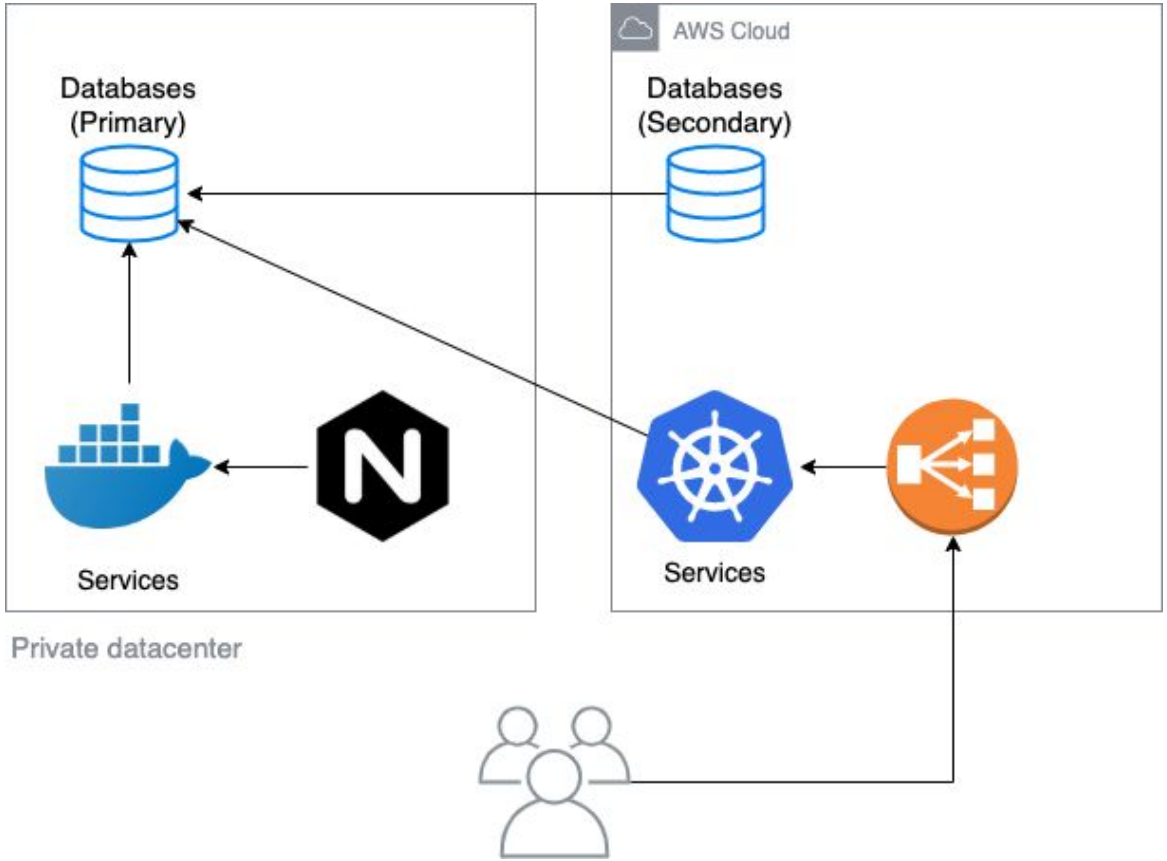
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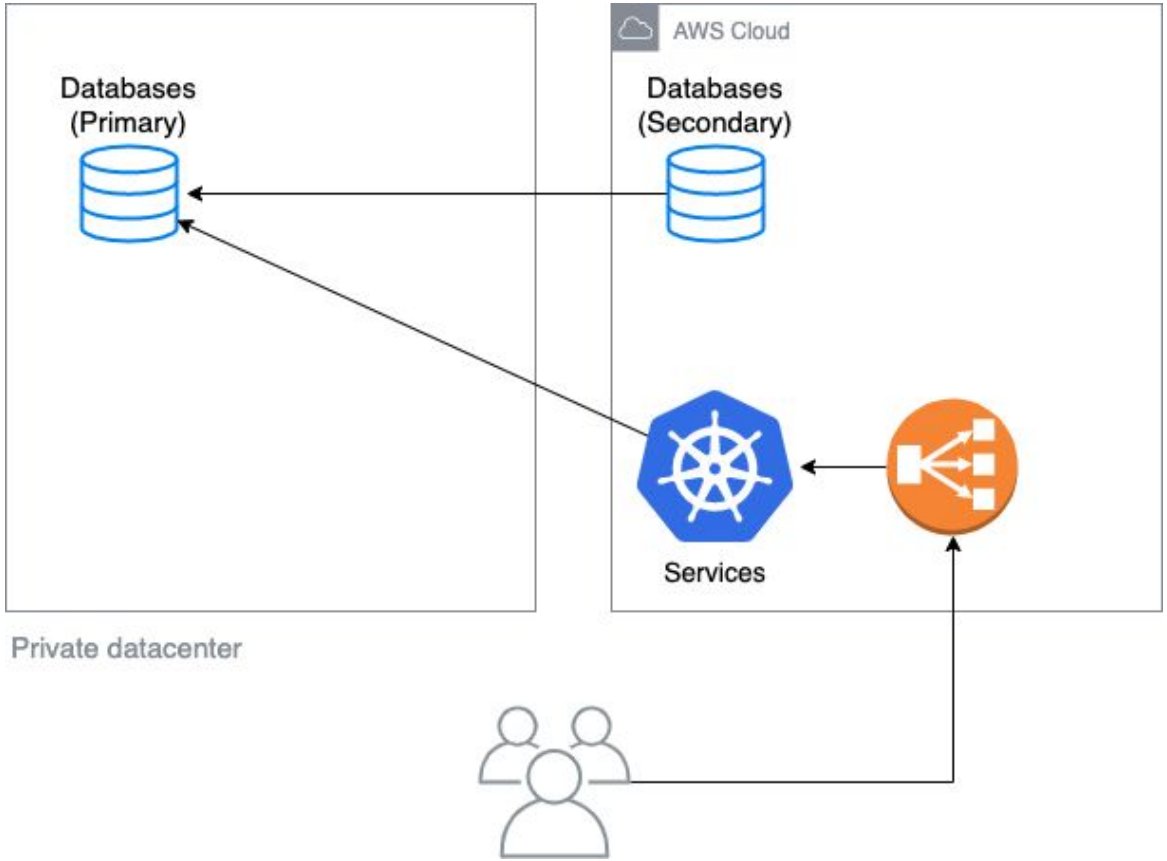
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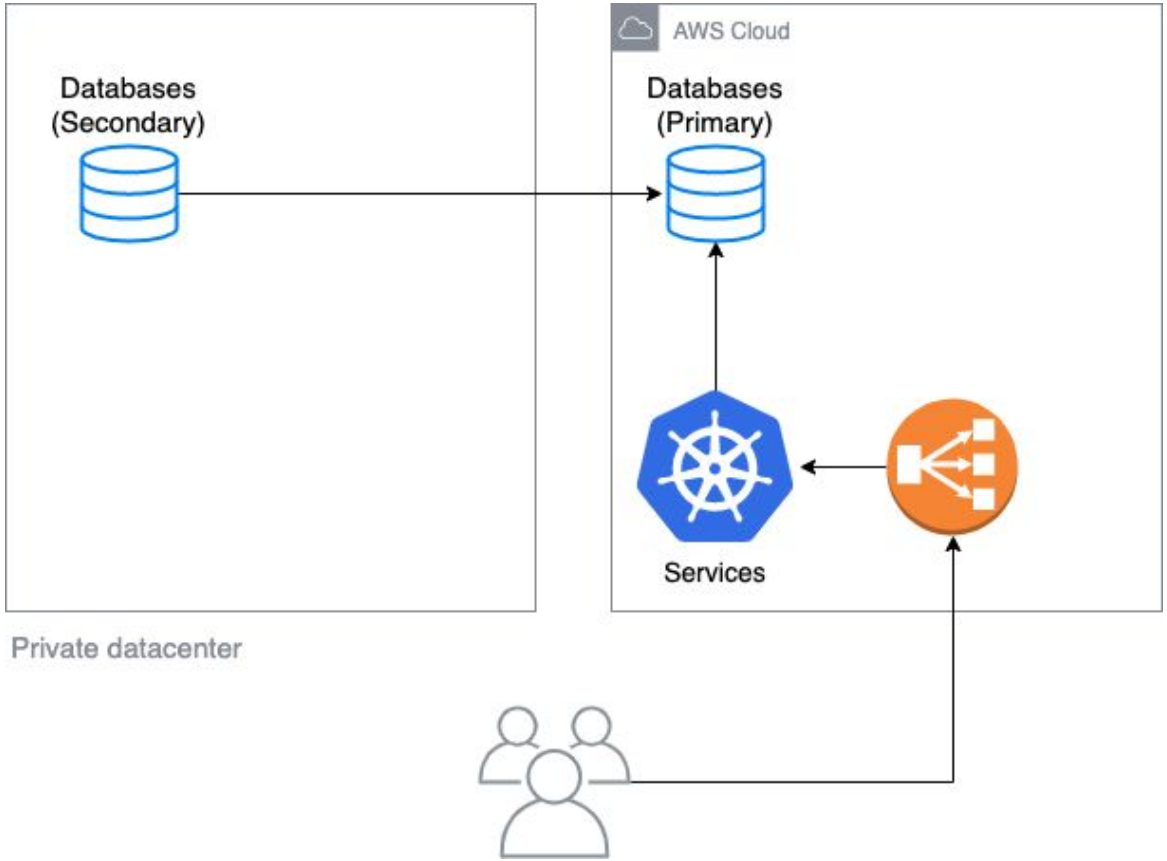
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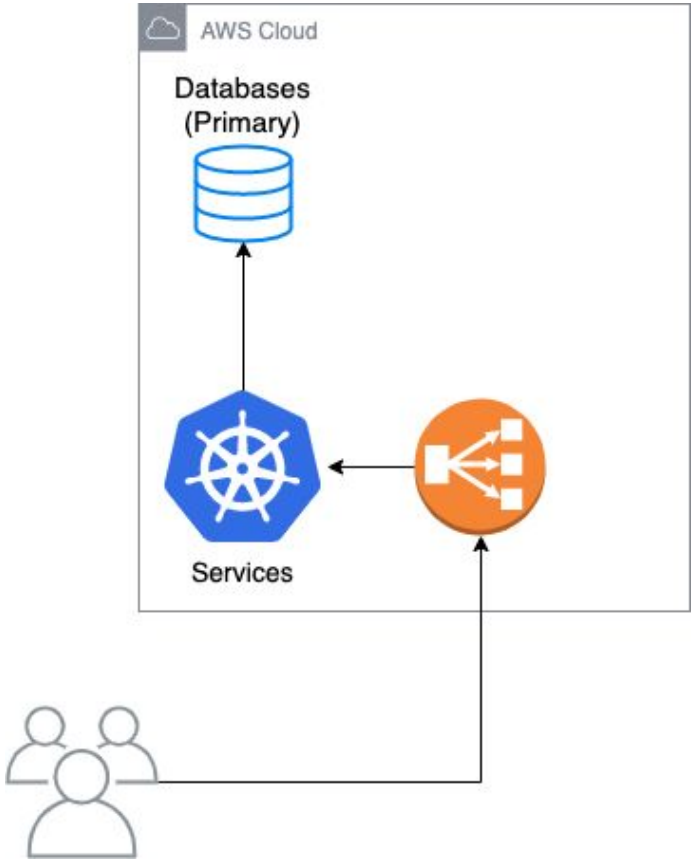

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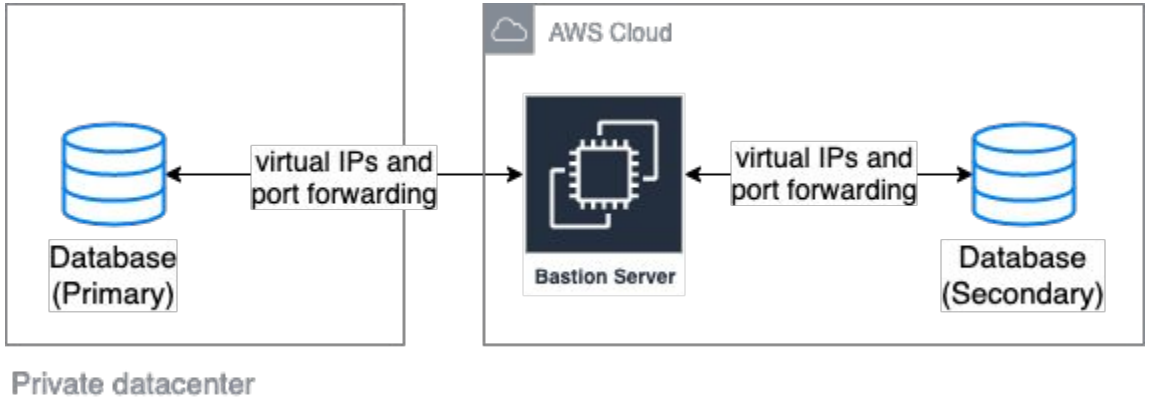
Database replication



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Why not give an Elastic IP to every EC2 instance?

Too many instances

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Kubernetes

- **EKS** (1.11)
- Already had Docker images for all services
- Used **Helm** to easier deploy to k8s
- Expose endpoints to the internet → nginx ingress
  - Creates ELB
  - Runs 1 or more instances of Nginx in k8s
  - Can run as DaemonSet → one instance per node

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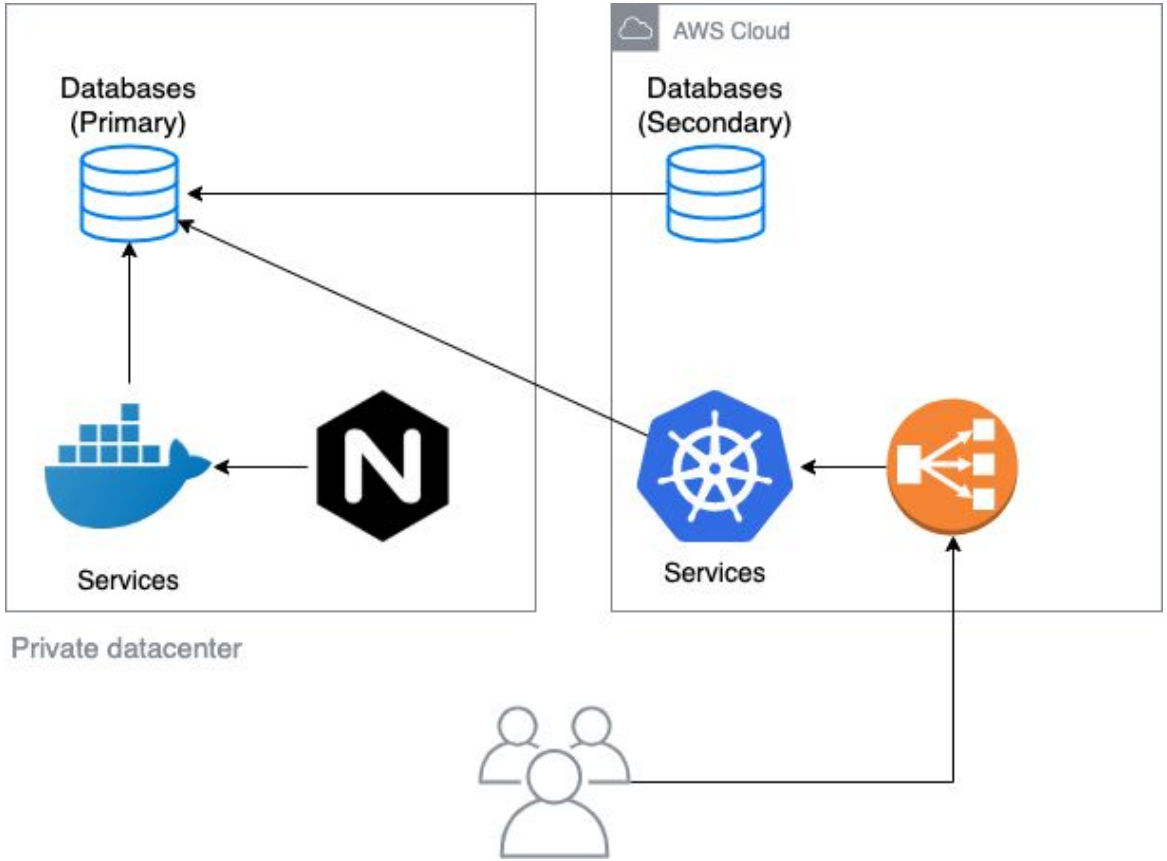
Helm

- In CI (Gitlab) build a Helm chart
- Publish chart to private repository
  - S3 - Helm S3 plugin
- Stack repo that combines all charts into **one big chart signageOS prod**
  - Defines all specific versions of services
  - Contains **complete production configuration**, encrypted with git-secret
  - Deploy changes to the production → push changes to Stack repo and deploy new chart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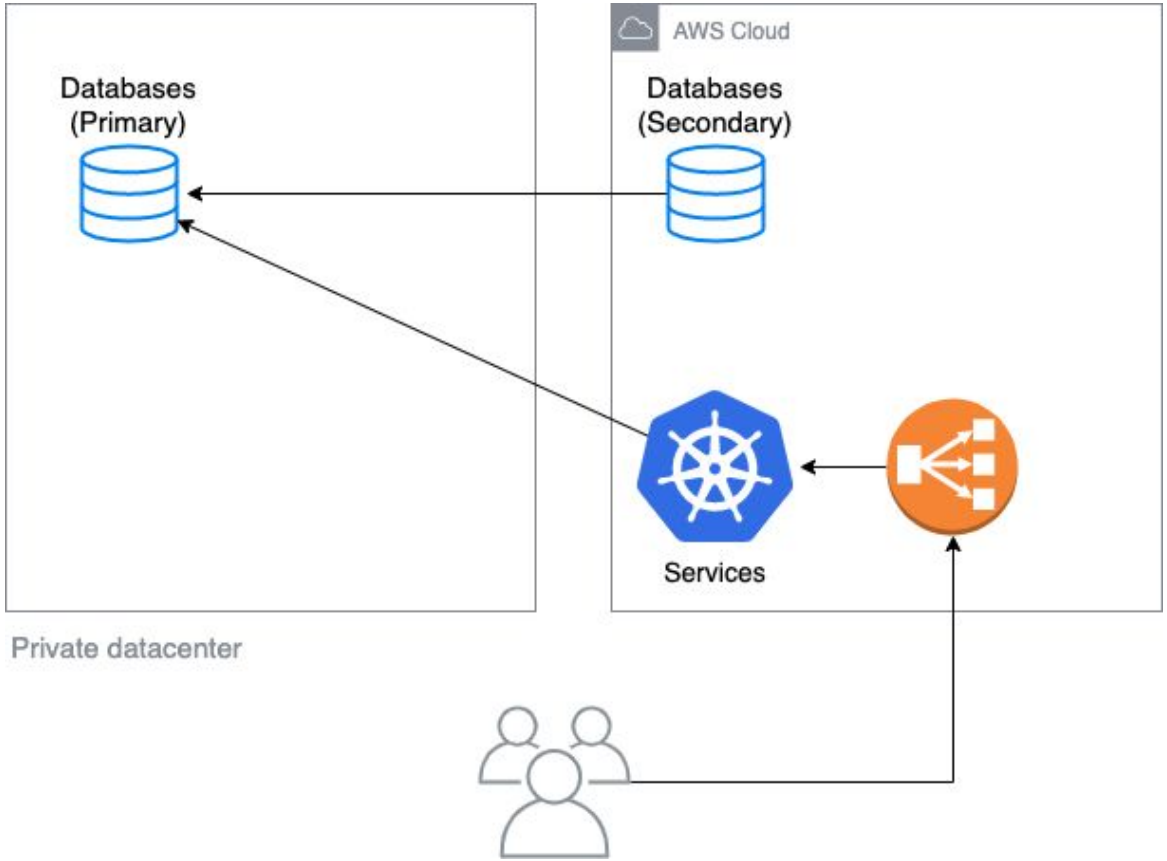
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Switch databases primaries to AWS

Switch databases primaries to AWS

- Can’t switch until all data is replicated
- Replication over the internet isn’t great
- New data coming in faster than replicating
- EC2 instances running out of resources
  - Adding more resources → higher cost
- Result
  - Never ending cycle of death
  - Databases dropping connections
  - Core services fail
  - Pretty much whole system down

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Solution

Sometimes the smart way isn't the best way

1. Only replicate the low volume collections
2. Temporarily stop all services that generate high volumes of data
    - Mostly read-only device monitoring and logs
    - New data not lost, just enqueued in RabbitMQ (millions of messages)
3. Rename high volume collections
4. Create new empty collections
5. Database finally replicated → switch primary to AWS
6. Manually copy the old data later

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Old database
Small collection 1
Small collection 2
Big collection 1
Big collection 2
Replication
New database
Small collection 1
Small collection 2
Big collection 1
Big collection 2

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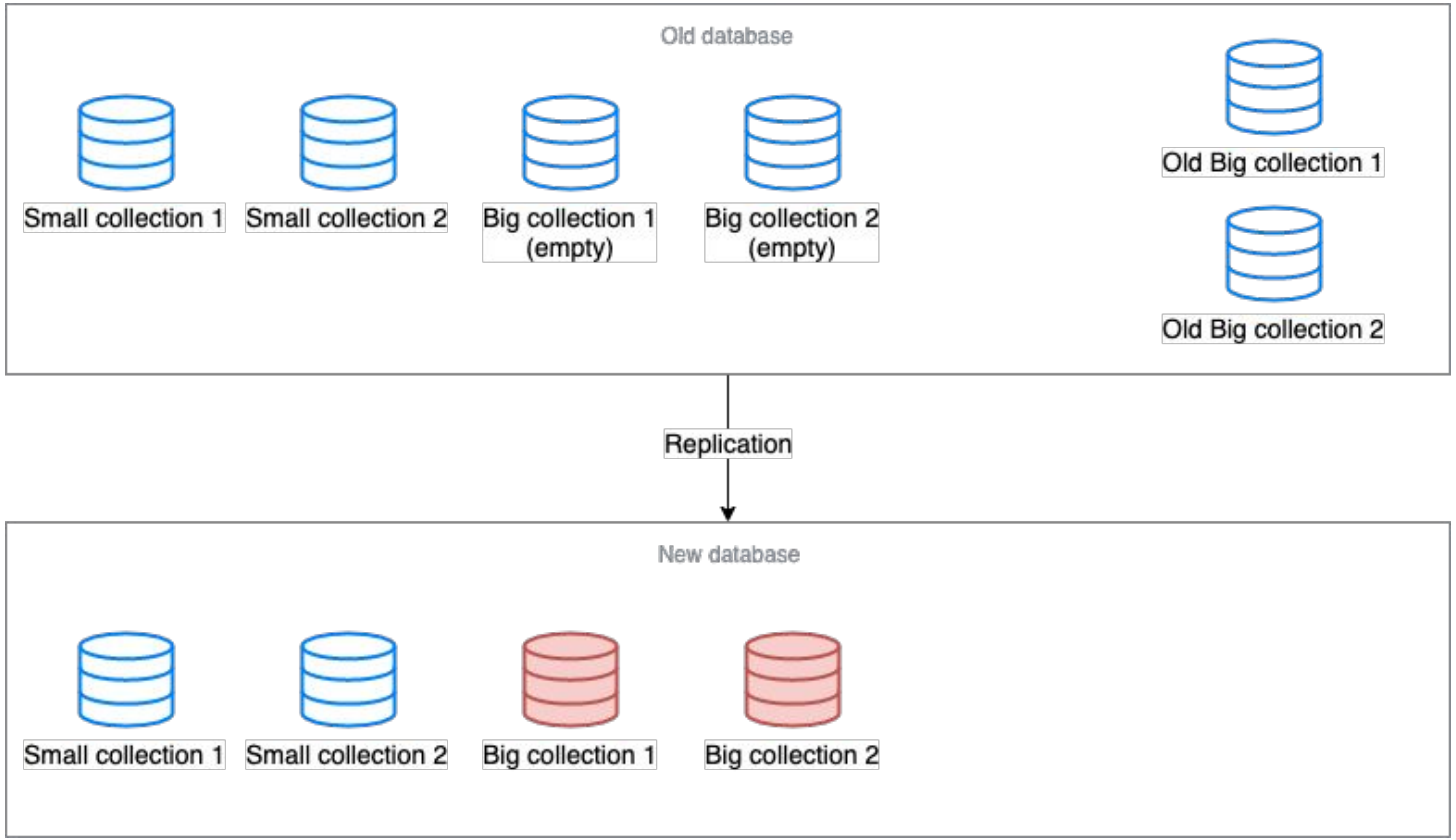
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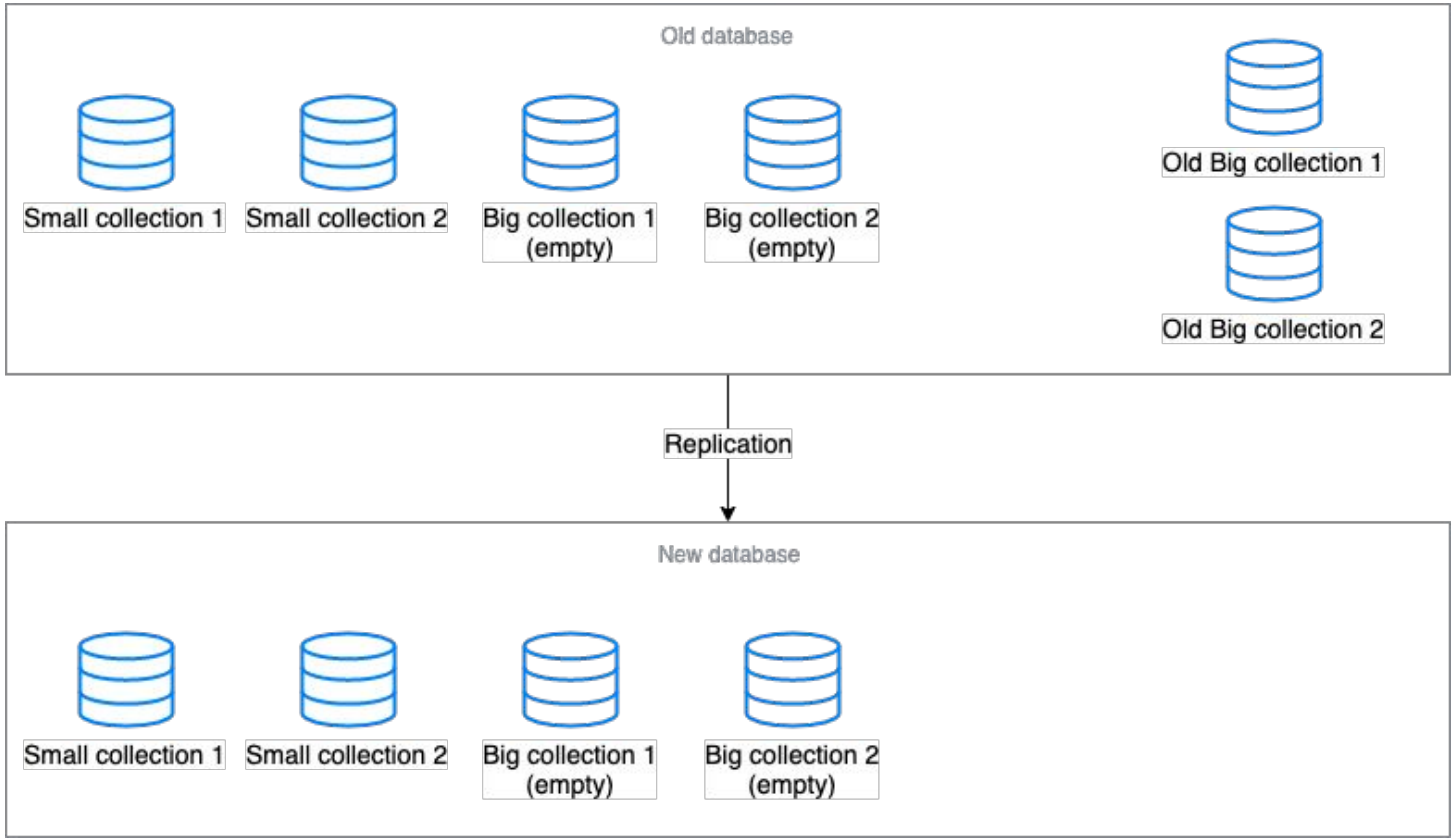
Small collection 2
Big collection 1 (empty)
Big collection 2 (empty)
Old Big collection 1
Old Big collection 2
Replication
New database
Small collection 1
Small collection 2
Big collection 1
Big collection 2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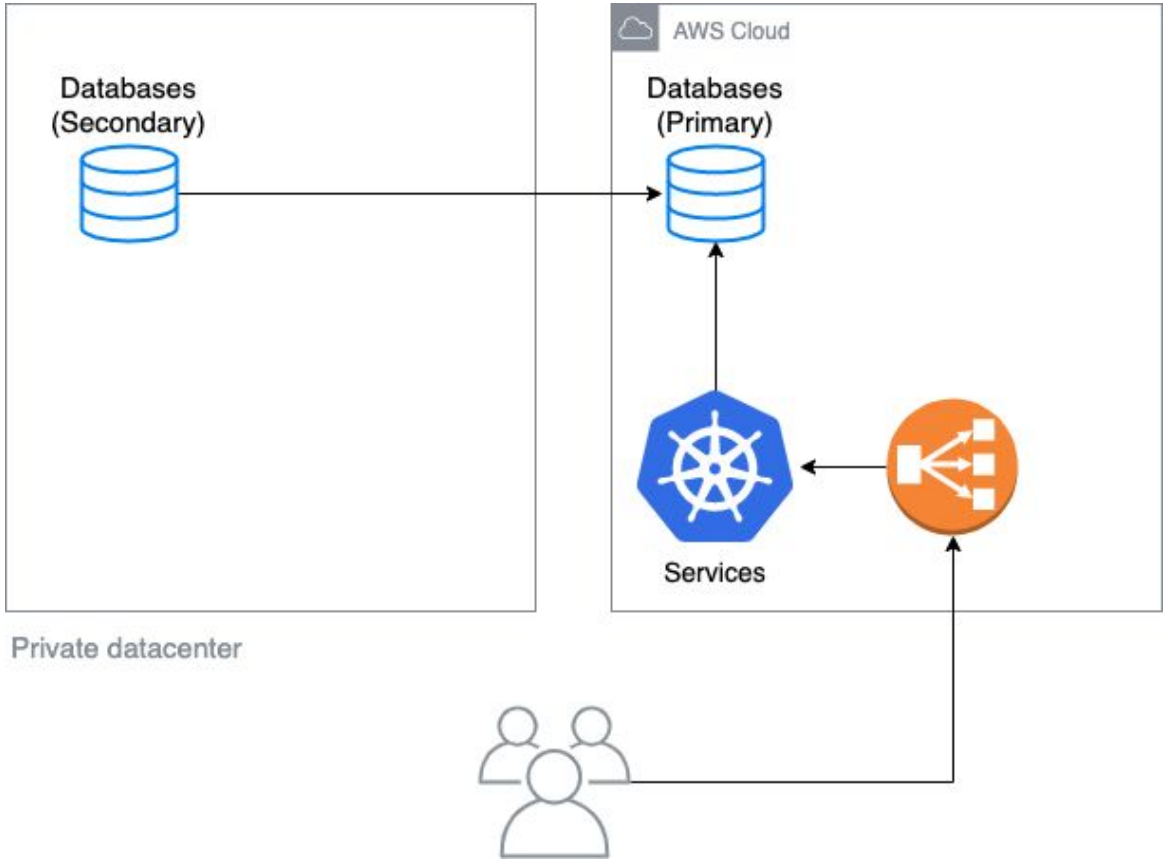
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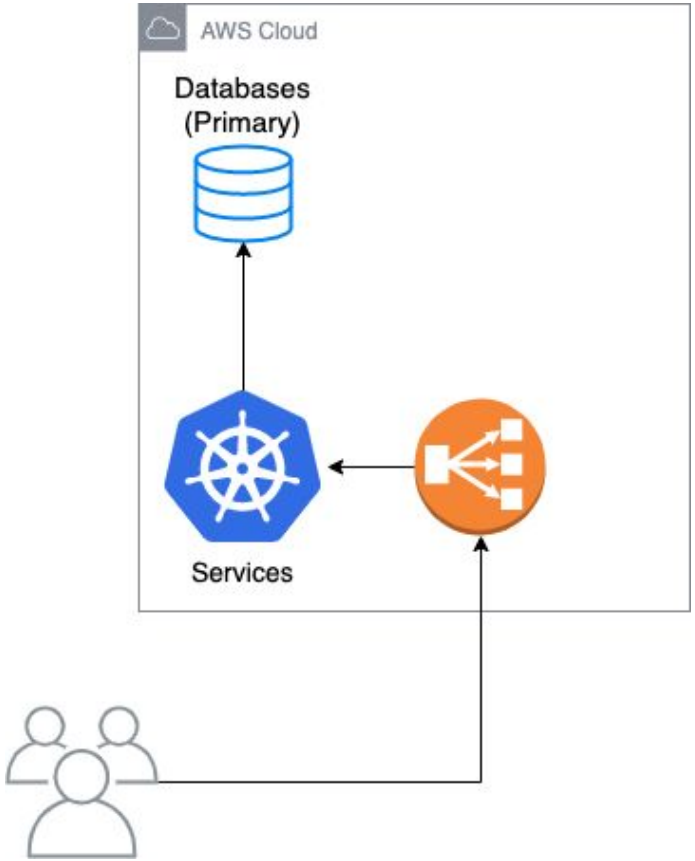

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Final AWS structure

Costs

- $3,000/month before AWS
- $15,500 3 months of migration
- $5,000 first month on AWS
- $3,000/month now

Other interesting facts about our infrastructure

Kubernetes nodes autoscaling

- Generic auto-scaling group
- RabbitMQ “dedicated” nodes
  - Run RabbitMQ instances (16 instances total)
  - Most of the time underutilized so kill other nodes and run as many services as possible here
  - When heavy traffic, start more generic nodes and move services there so these become dedicated to RabbitMQ
- Scale with CloudWatch
  - Collect metrics from nodes with CloudWatch agent
  - If both average CPU and memory consumption < 40% → less generic nodes
  - If average CPU or memory > 70% → more generic nodes

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Serverless

- Lambda for user defined automatic tests
- Our custom simple testing framework that allows users to write automatic tests that run on device and validate the content
- Javascript code, interacts with the device through signageOS REST API to test the application that’s running on the device
- Every test is converted into a lambda
  - Invoked from our services
  - Returns JSON with test results → save into our database
  - Test results available via REST API or management console (UI)

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Sources

- https://www.signageos.io
- https://github.com/nginxinc/kubernetes-ingress
- https://github.com/hypnoglow/helm-s3
- https://git-secret.io/
- https://docs.aws.amazon.com

Contact

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Questions