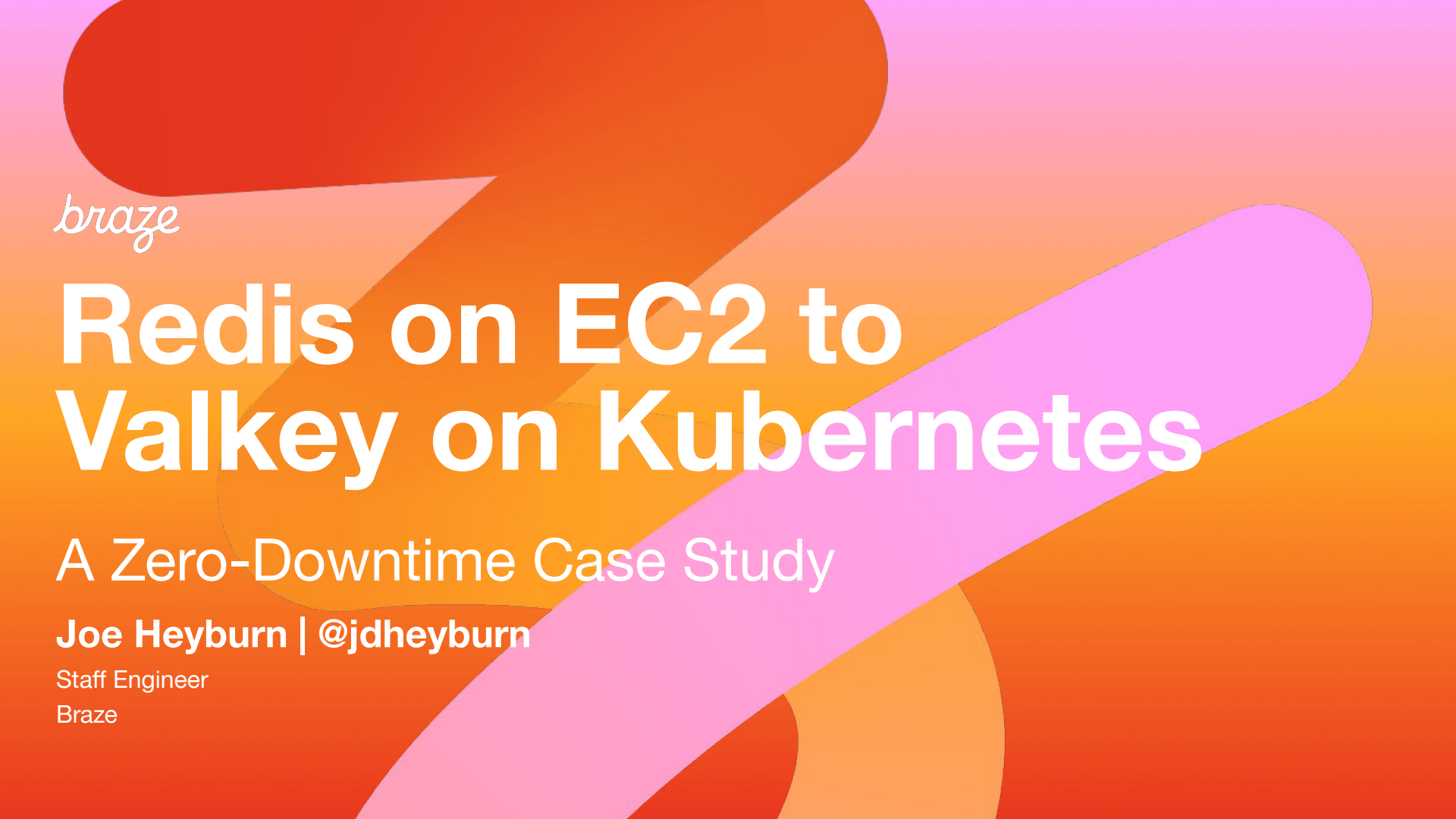




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Redis on EC2 to Valkey on Kubernetes

A Zero-Downtime Case Study

Joe Heyburn | @jdheyburn

Staff Engineer

Braze

bet365



Bolt

Adevinta



Delivery Hero



ASOS



braze
EMEA

chime®



miro



deliveroo

GYMSHARK 



Gumtree

Vinted



braze How it works





Headquartered in New York with 10+ offices across North America, Europe, and APAC, with presence in LatAm

Founded in 2011
Public in 2021
Nasdaq: BRZE

2,296
customers

300+
customers sending
over 1 billion messages
per year

8.6T
API calls
powering
sophisticated
engagement at
scale in
2024

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6.9B
monthly active users



over
\$130M
R&D expense
in 2024

3.9T
messages and
Canvas actions
across all
channels in 2024

Valkey by numbers

581

HA instances (shards)

36M

operations per second

6.6

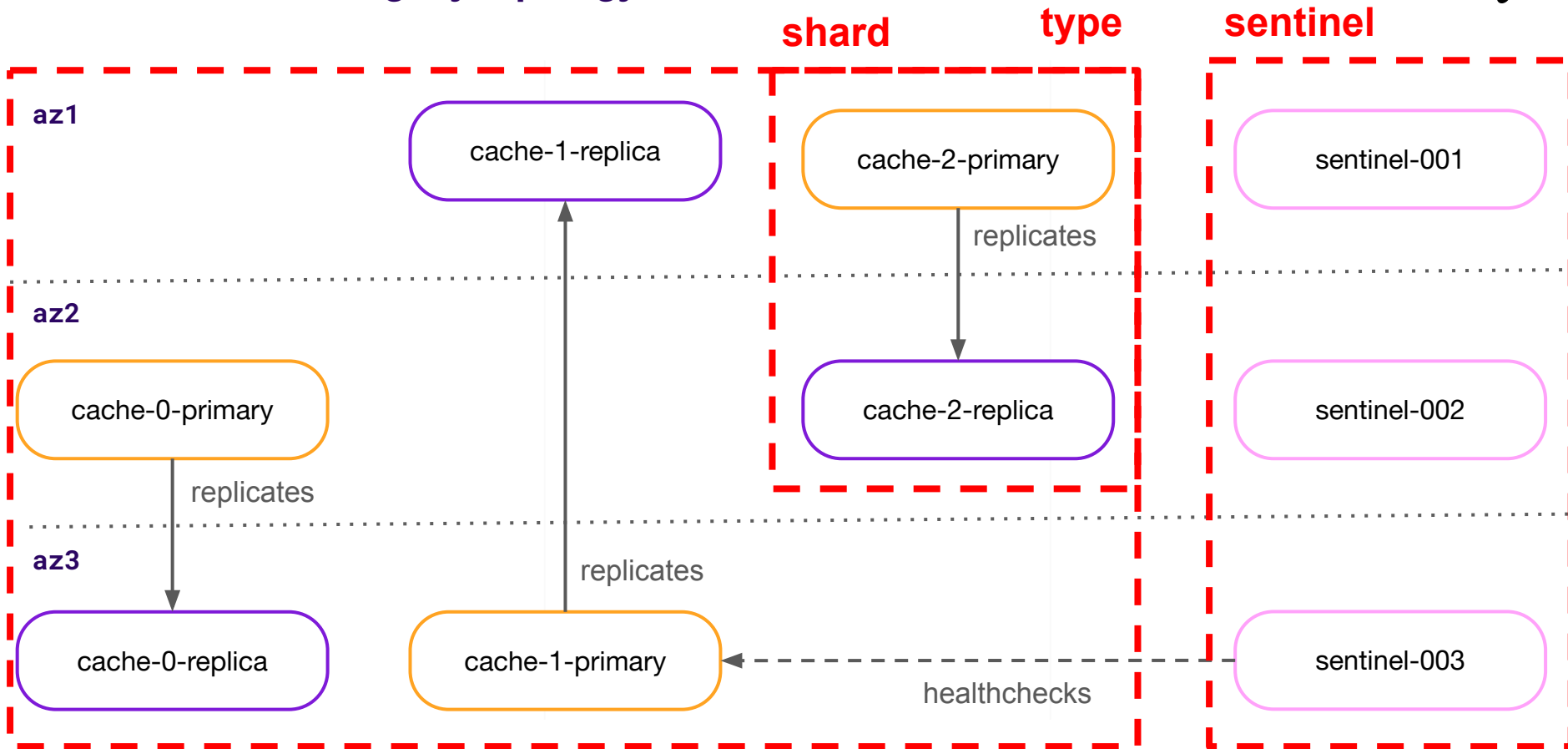
memory capacity (TiB)

Redis/Valkey @ Braze

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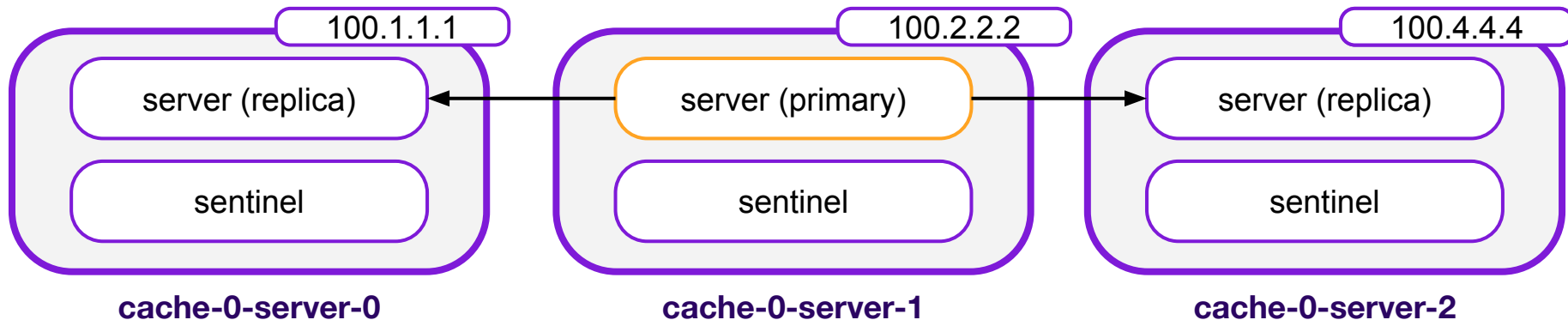
Redis @ Braze - Legacy topology

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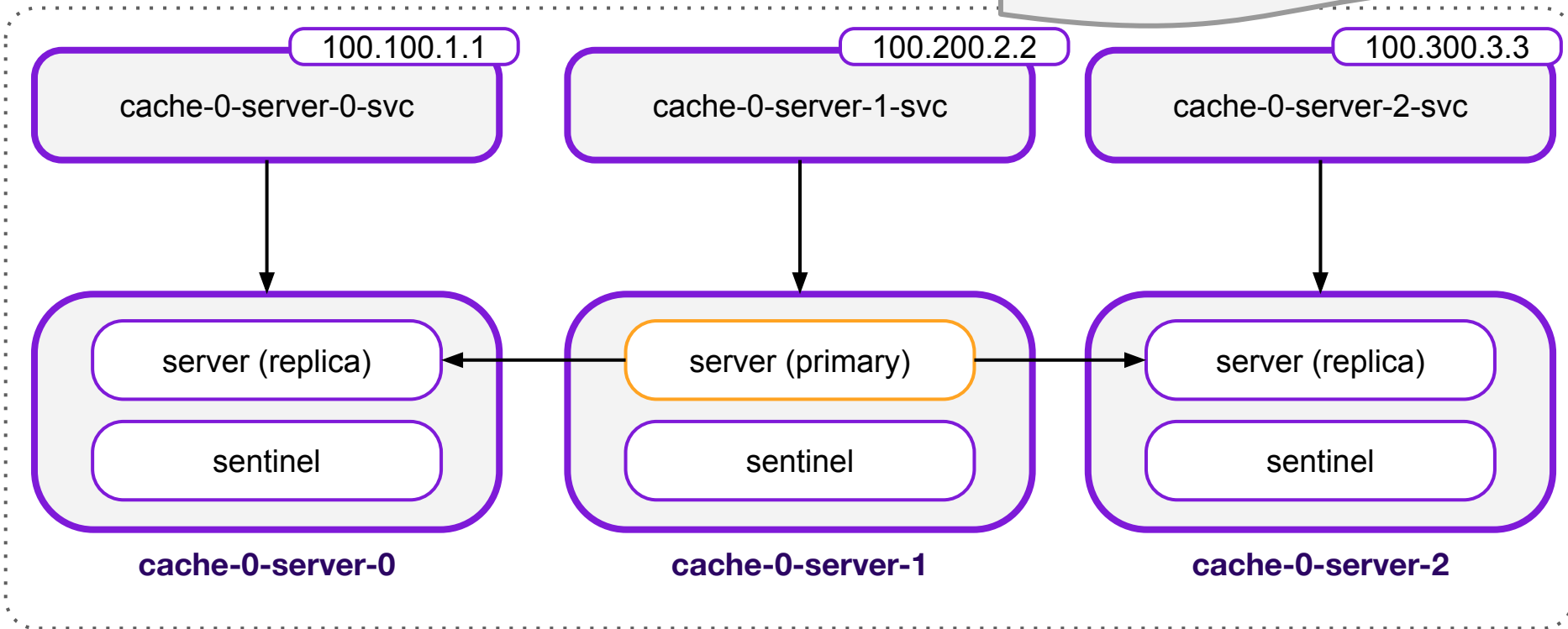
Redis @ Braze - Kubernetes shard topology

```
# sentinel replicas cache-0  
100.1.1.1      ok  
100.3.3.3      down  
100.4.4.4      ok
```



Redis @ Braze - Kubernetes shard topology

```
# sentinel replicas cache-0  
100.100.1.1      ok  
100.300.3.3      ok
```



How do we migrate Redis to Kubernetes?

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Zero downtime

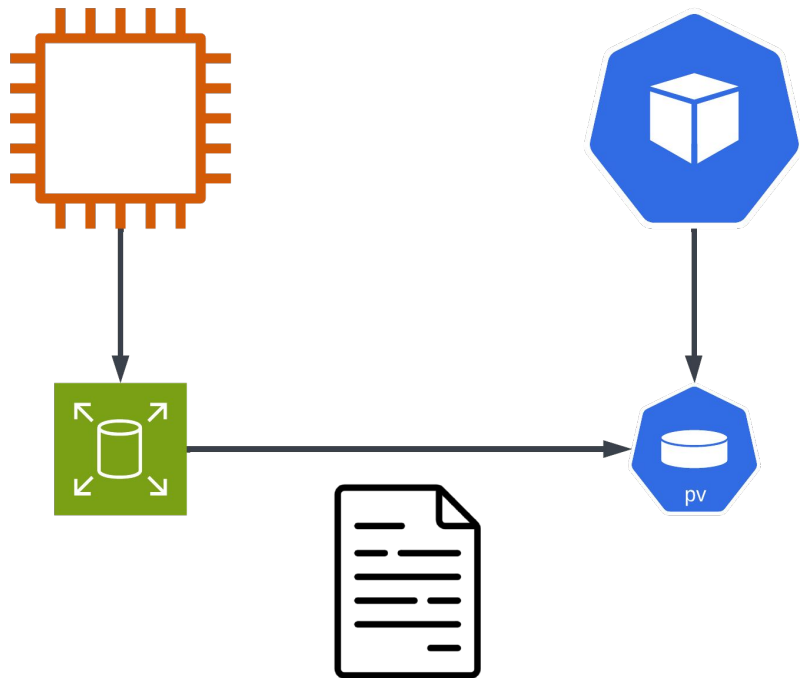
-  24/7 business
-  No messaging delays

Rollback without data loss

-  Option to revert to the previous state
-  Zero data loss

Migration option 1: RDB snapshot copy

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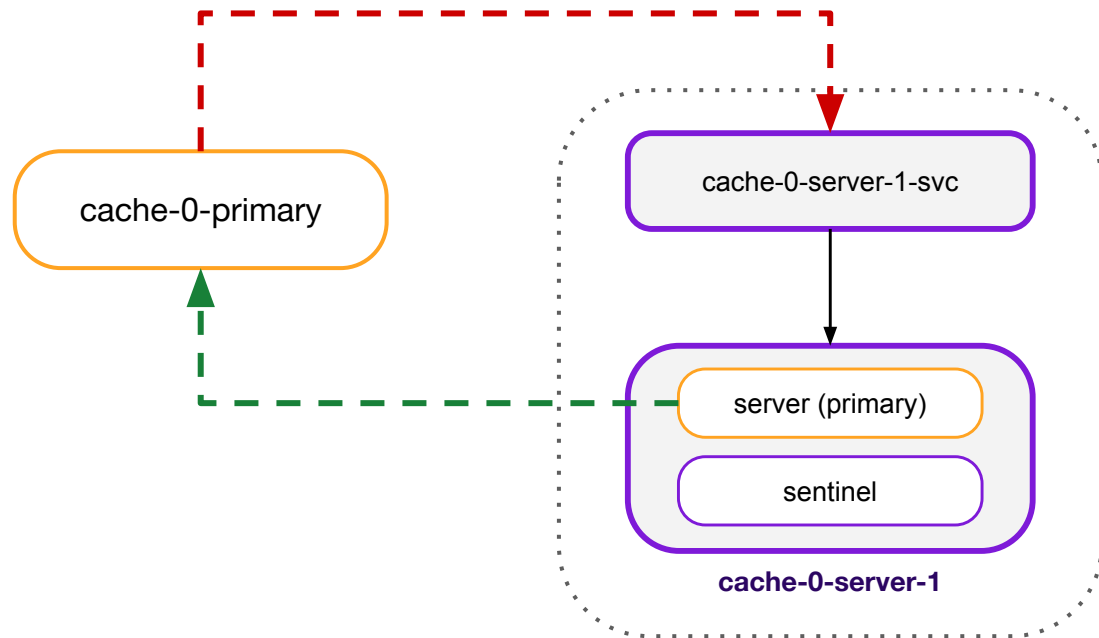
✓ Simple

✗ Downtime



Migration option 2: Internal replication only

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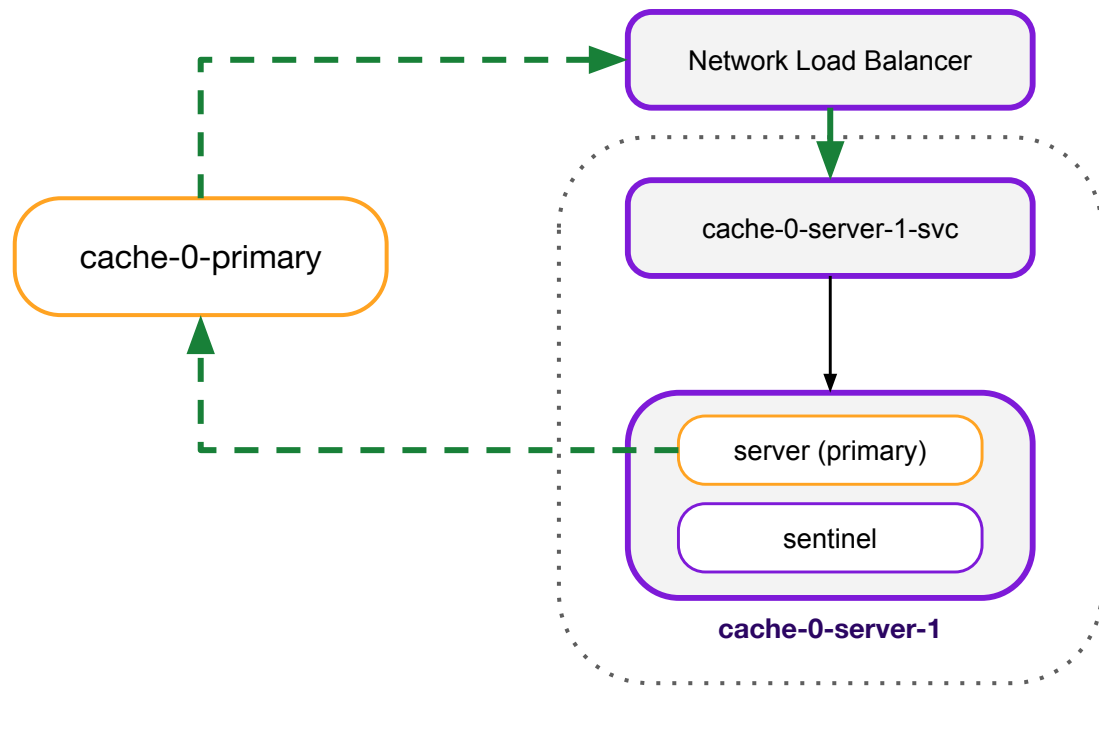


✓ No downtime

✗ Data loss on rollback

Migration option 3: Bidirectional replication

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No downtime



No data loss on rollback



Relatively complex

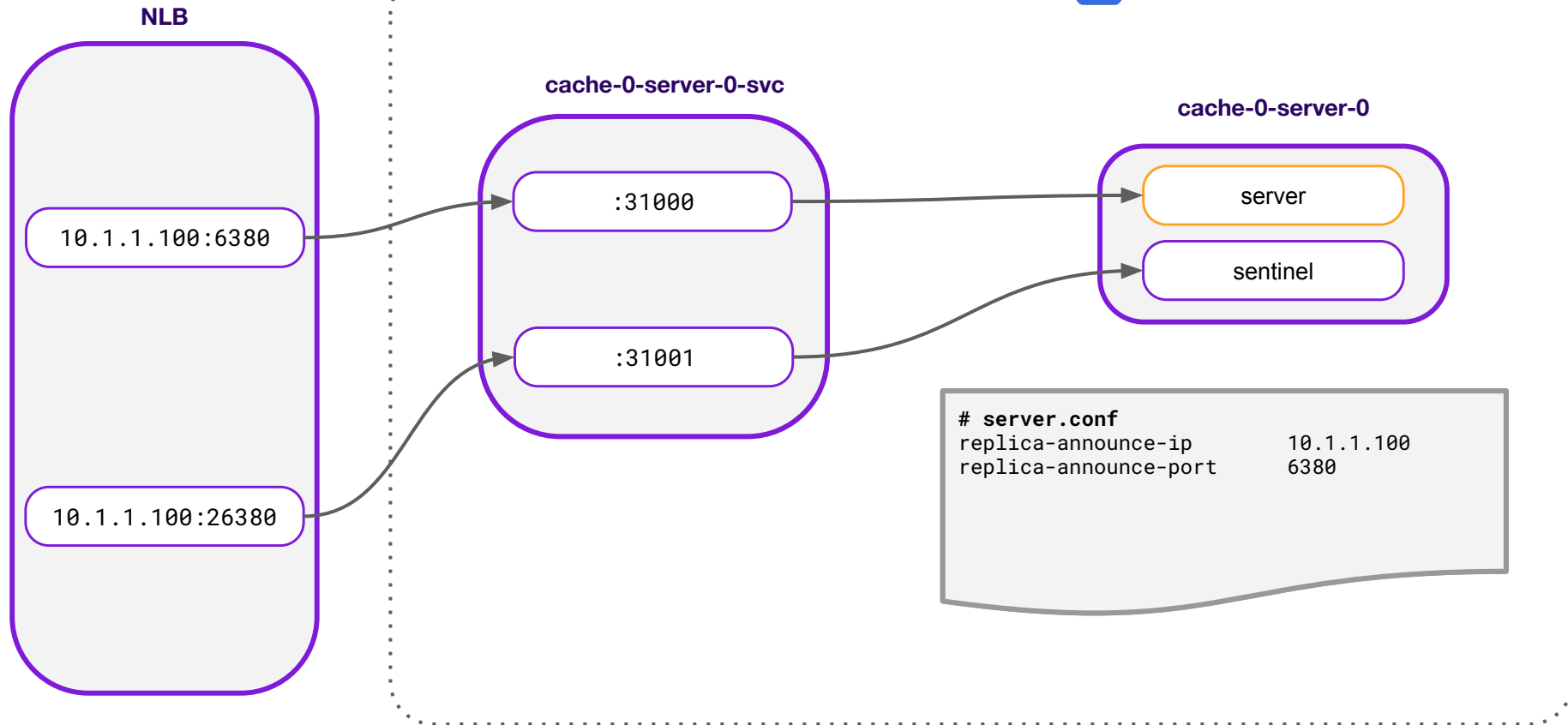
Solution

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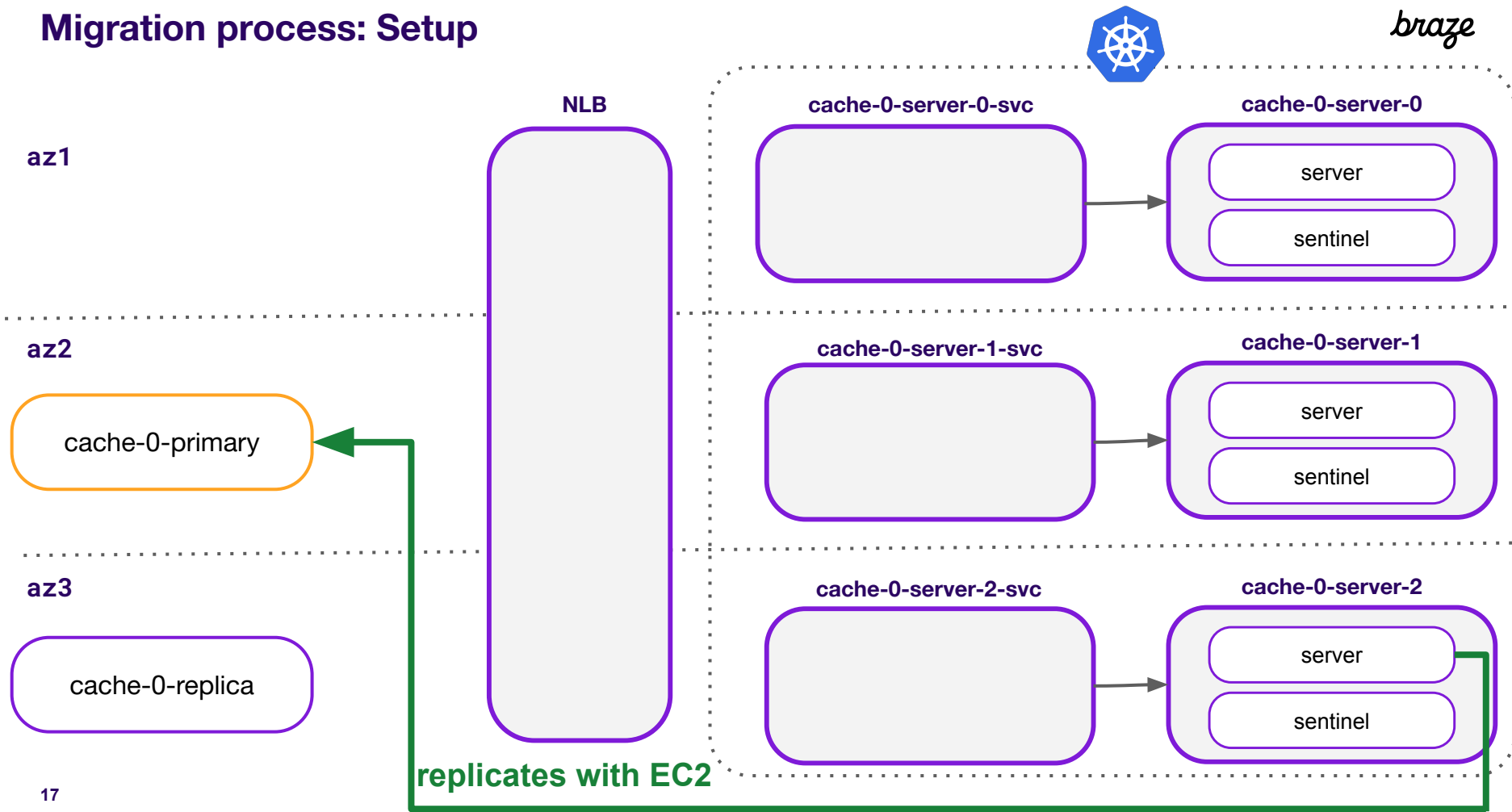
Migration architecture: Pod detail



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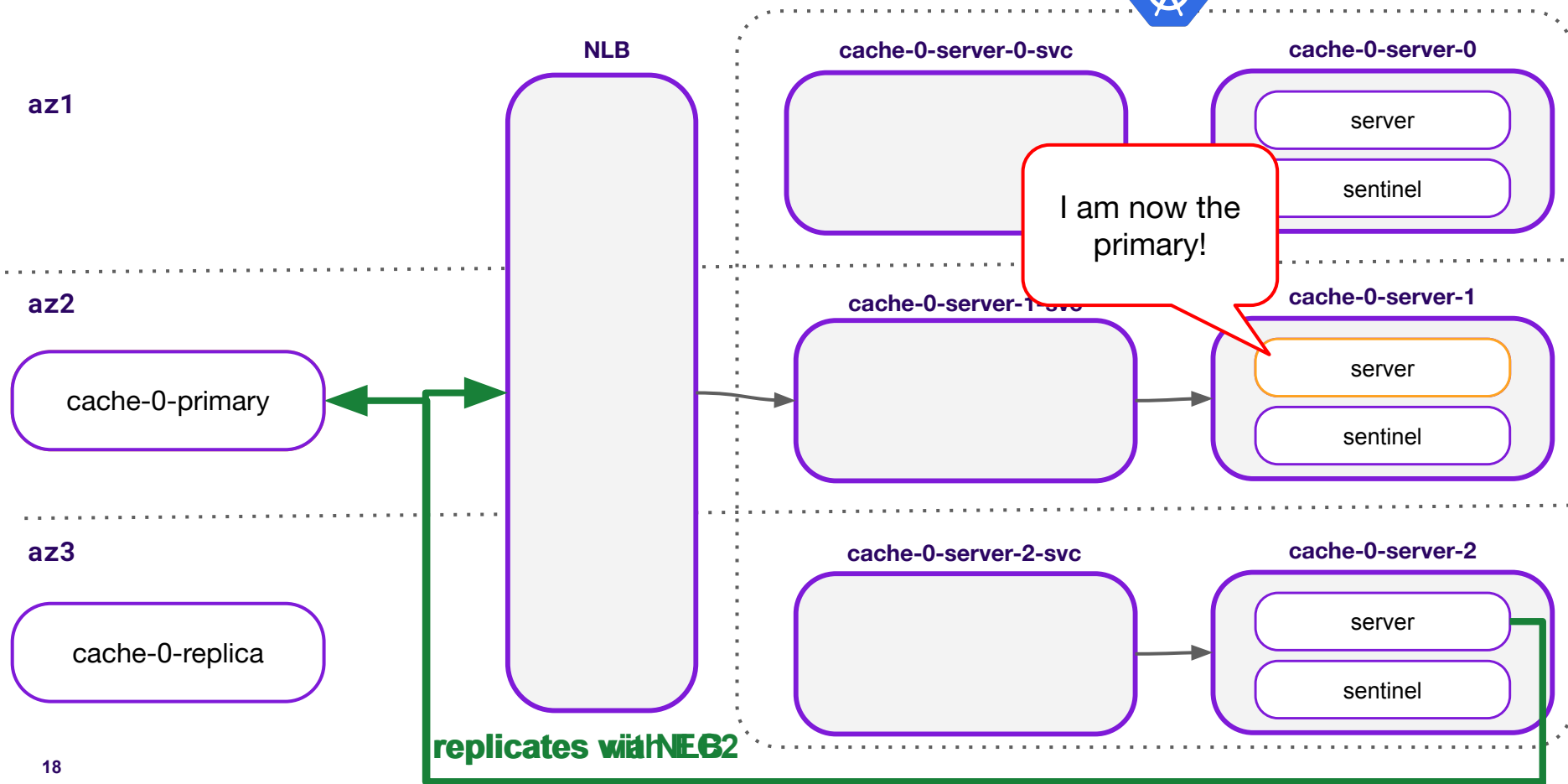
Migration process: Setup



Migration process: Migrate



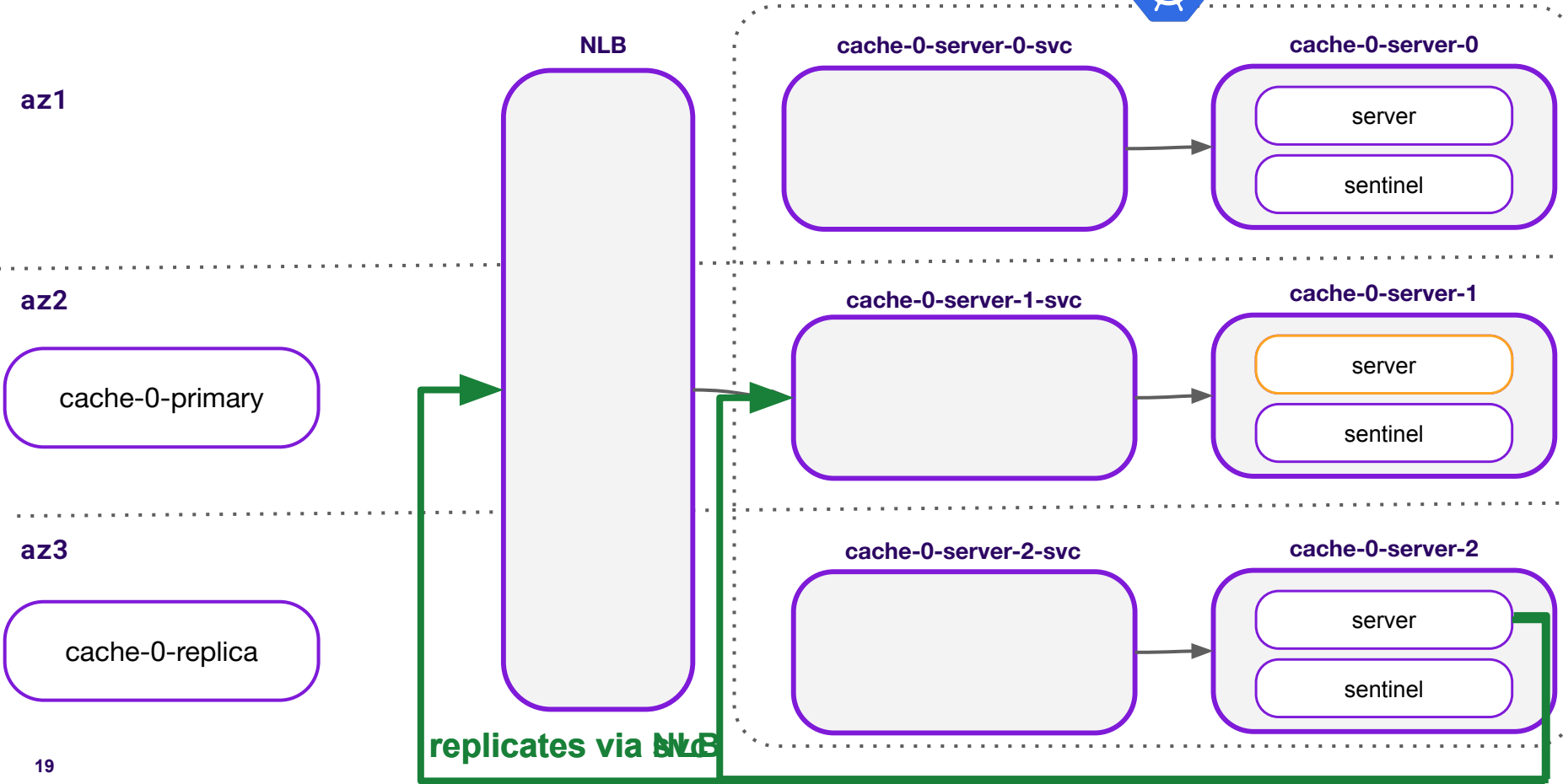
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Migration process: Remove NLB



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Things we didn't expect...

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Problem	Description	Solution
NLB traffic costs	Estimated \$100,000+ monthly cost on data transfer	Wait for all clients to migrate to K8s first
Sentinel split brain risk during migration	6 Sentinels during migration 3 legacy + 3 K8s	Add a fourth EC2 Sentinel during migration (7 total) Set quorum: 5 on Sentinel

Migration by numbers

274

HA instances (shards)

7

clusters

0

data loss

Migration to Valkey

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```
# _helpers.tpl
```

```
{{/*
```

```
Function to determine what flavor of Redis we are deploying out (Redis/Valkey)
```

```
*/}}

```

```
{{- define "redis-ha.flavor" -}}
```

```
{{ regexFind "[^/]+$" . }}
```

```
{{- end -}}
```

```
# statefulset.yaml
```

```
containers:
```

```
- name: server
```

```
  image: {{ $.Values.image.repository }}:{{ $.Values.image.tag }}
```

```
  imagePullPolicy: {{ $.Values.image.pullPolicy }}
```

```
  command:
```

```
    - {{(include "redis-ha.flavor" $.Values.image.repository)}}-server
```

From this

```
image:  
  repository: redis  
  tag: 7.2.4-alpine
```

To this

```
image:  
  repository: valkey/valkey  
  tag: 8.1.1-alpine
```

Valkey migration by numbers

350

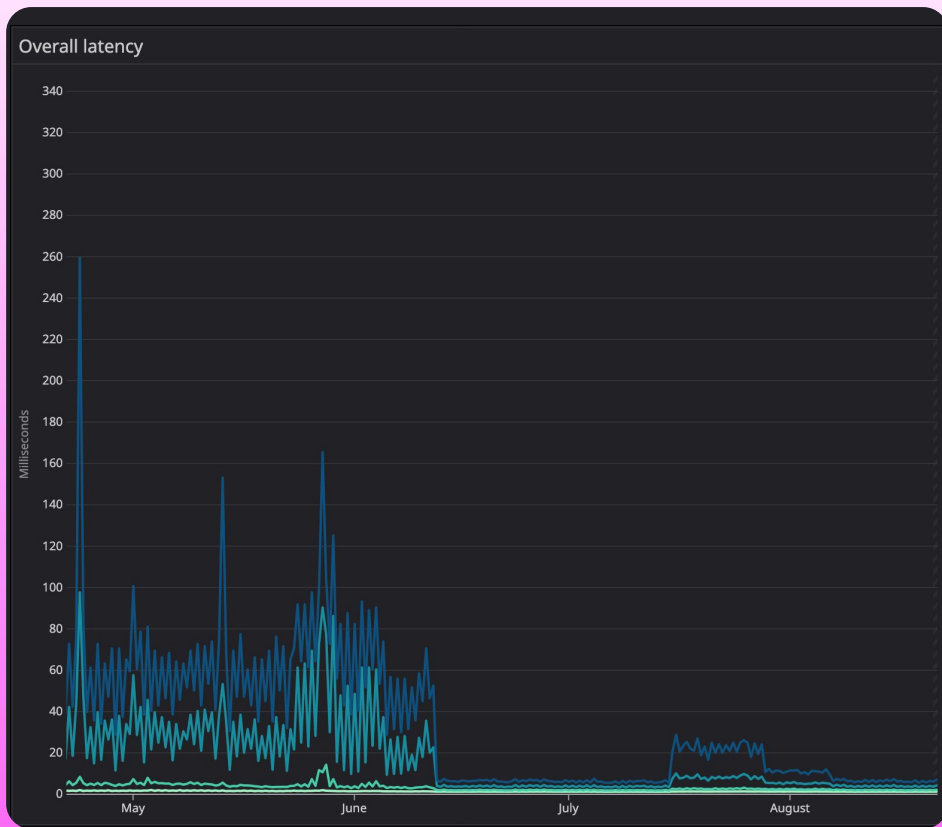
shards to migrate

10

clusters

6

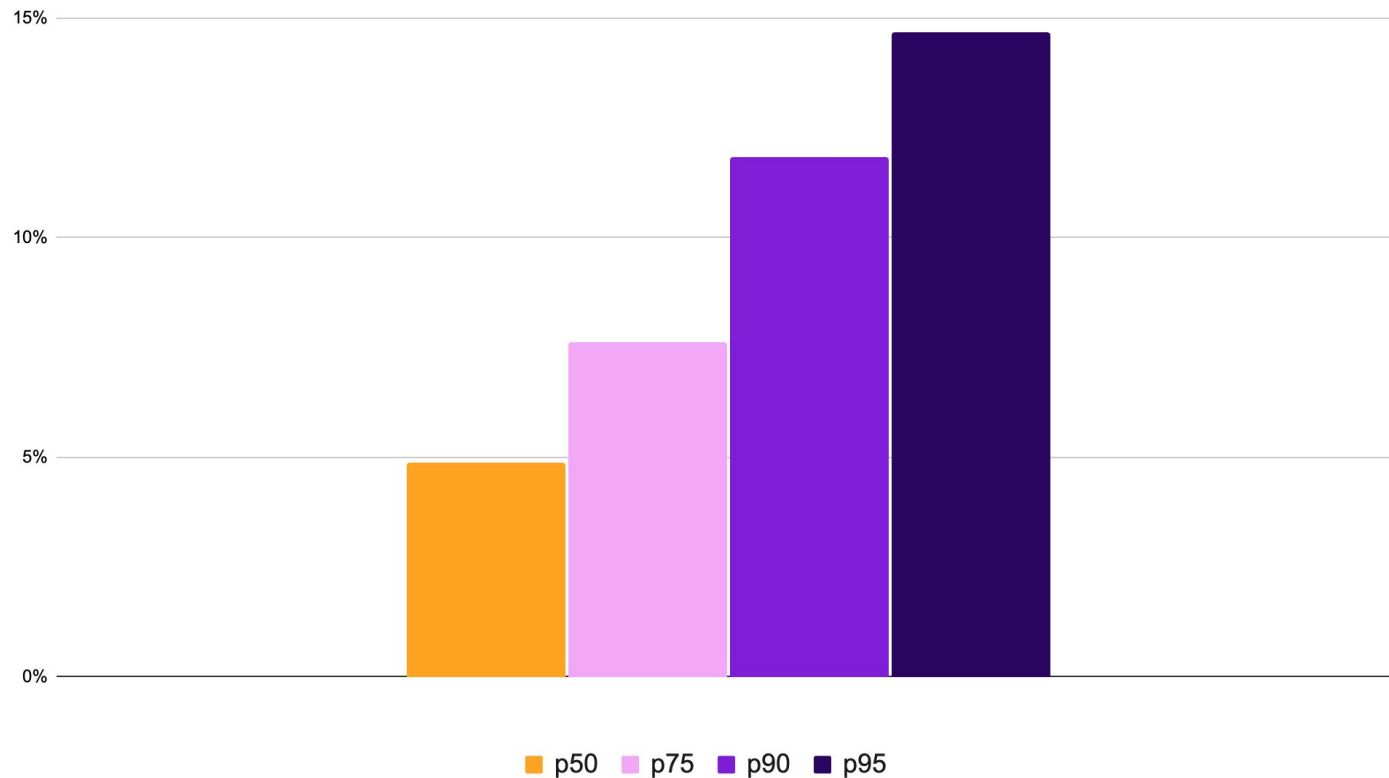
weeks



90%

p95 latency improvement

Average latency improvement after Valkey 8.1.1 migration

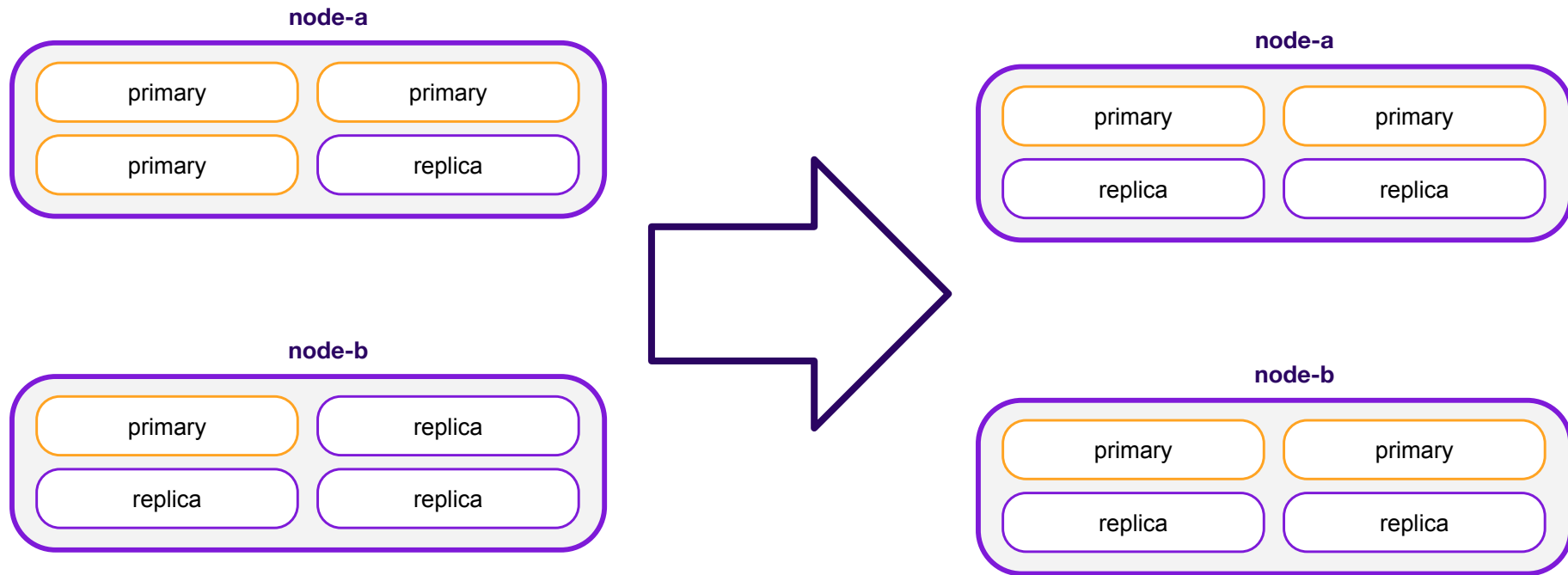


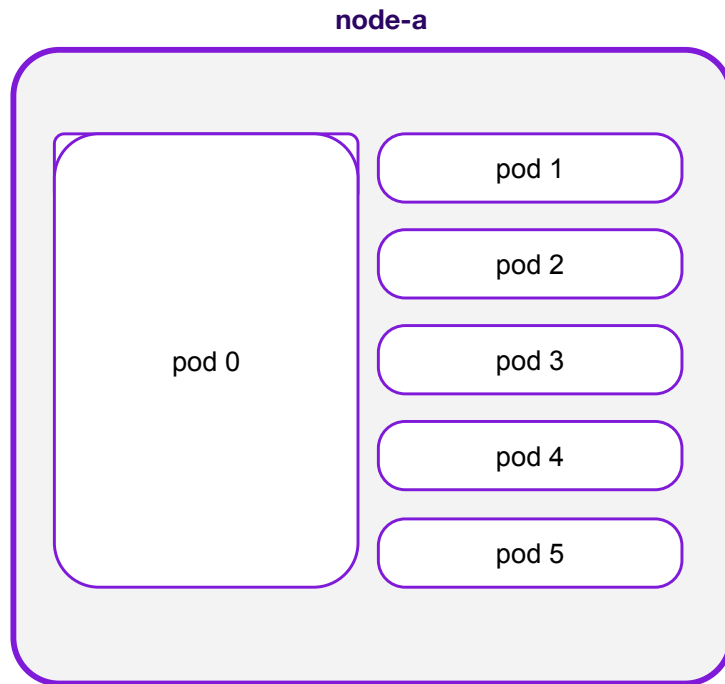
What's next?

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Intelligent bin-packing

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valkey-io/valkey-operator

About

Community-led operator for managing Valkey on Kubernetes

Goal: Best-in-class operator for scaling Valkey

In development today!

Planned supported modes

- Cluster
- Standalone
- HA-replication
 - Operator
 - Sentinel
- Cells
 - Non-clustered

Roadmap

- Autoscaling
- Cluster resharding
- Plugins
- ... and more!

Have any ideas? Submit them!

braze.com/careers



Joe Heyburn

@jdheyburn

Feedback



Migration architecture



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