Shopify's architecture to handle the world's biggest flash sales

Bart de Water

QCon London - April 4, 2022

shopify

Introduction

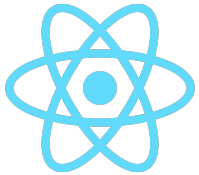
- Bart de Water
- Manager @ Shopify Payments
- 🇳🇱➡️🇨🇦
- https://twitter.com/bdewater

MAKE
COMMERCE
BETTER FOR
EVERYONE

Search anything
Remove customer
Add custom sale
Apply discount
Add note
Send cart
Ship to customer
Add tile
Clear cart
More actions
Miles Fitzsimmons
Returning customer (14 orders)
Assorted Berry Basket
Mint, Medium, Ceramic
€12.00
Assorted Berry Basket
Orange, Small, Ceramic
€24.00
Olive Stem Metal Wreath
€82.00
Total
7 items
€133.34
Checkout
Home
Alexandra Henderson
Connected

Shopify handles some of the largest flash sales in the world

+ MySQL + Redis + memcached



React (Native) + GraphQL

40

deploys per day

Working fully remote

T-shirt Hero

Home
Catalog

Home › Your Shopping Cart

Product	Price	Quantity	Total
2017 Summer Top quality clothing KSTBK / 10T Remove	$12.78	1	$12.78

Special instructions for seller

Subtotal $12.78

Shipping & taxes calculated at checkout

CONTINUE SHOPPING

CHECK OUT

Links

Home
Orders 47
Drafts
Abandoned checkouts
Products
Customers
Analytics
Marketing
Discounts
Apps
Sales channels
Online Store
Point of Sale
Google
Facebook
Shop
Settings
Shipping Label Replays

#1058 Paid Unfulfilled

December 7, 2021 at 4:50 a.m. from Online Store

Refund Edit More actions

Unfulfilled (1)

Location
test

2017 Summer Top quality clothing — $12.78 × 1 — $12.78
KSTBK / 10T
SKU: 11190149-kstbk-10t

Fulfill item

Paid

Subtotal	1 item	$12.78
Shipping	Free Shipping (0.0 kg)	$0.00
Total		**$12.78**
Paid by customer		$12.78

Timeline

Show comments

Leave a comment... Post

Notes

Edit

No notes from customer

Customer

Jamie Adams
No orders

CONTACT INFORMATION Edit

jamie.adams.email@user.email.com
No phone number

SHIPPING ADDRESS Edit

Jamie Adams
151 Rue O'Connor Street
Ottawa ON K2P 2L8
Canada

View map

BILLING ADDRESS

Same as shipping address

Storefront

Read heavy
Availability
Cacheable

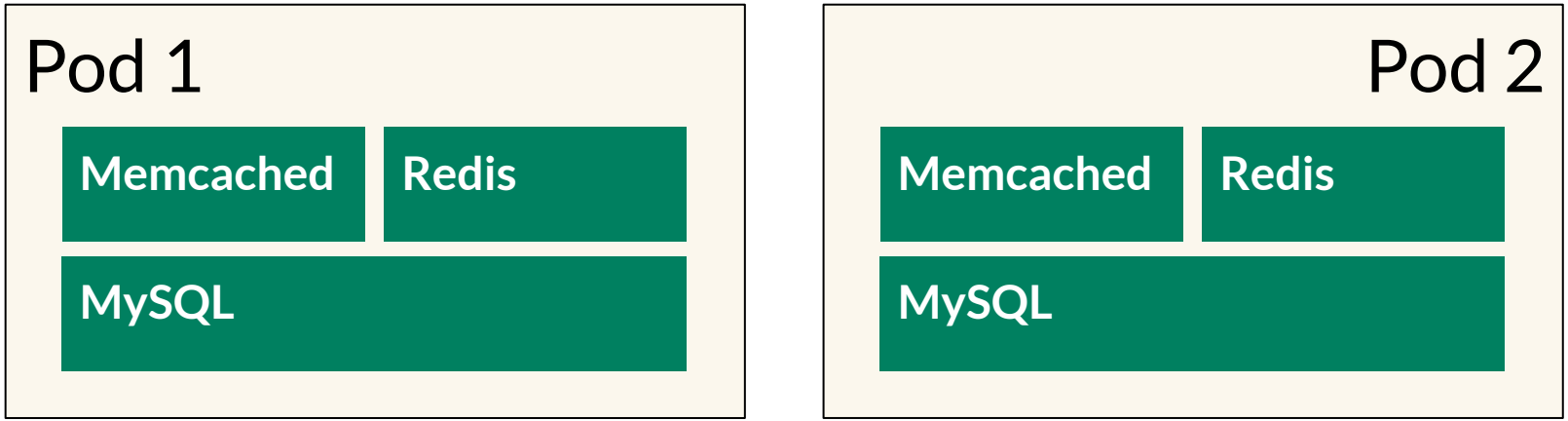
Checkout

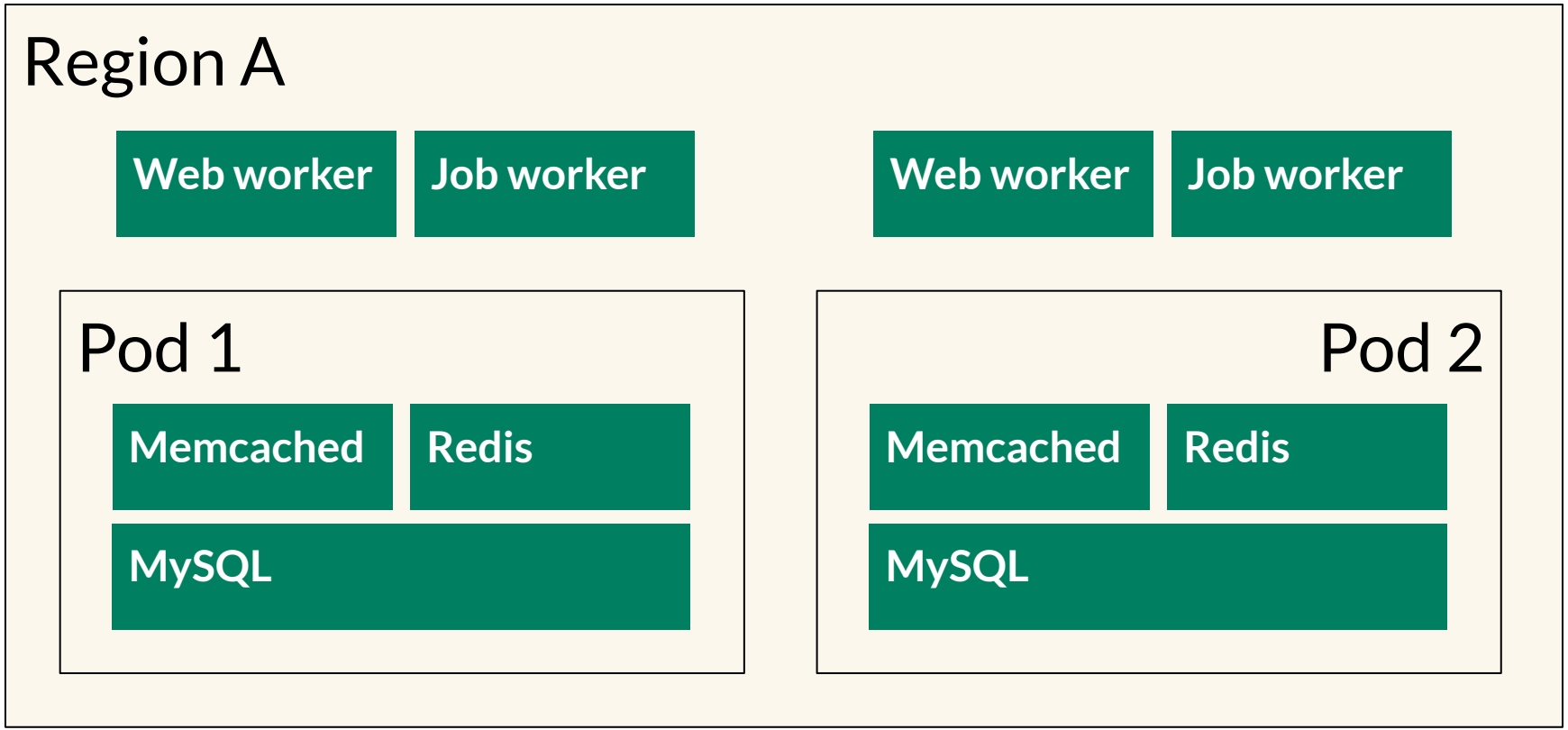
Write heavy
Consistency
External services

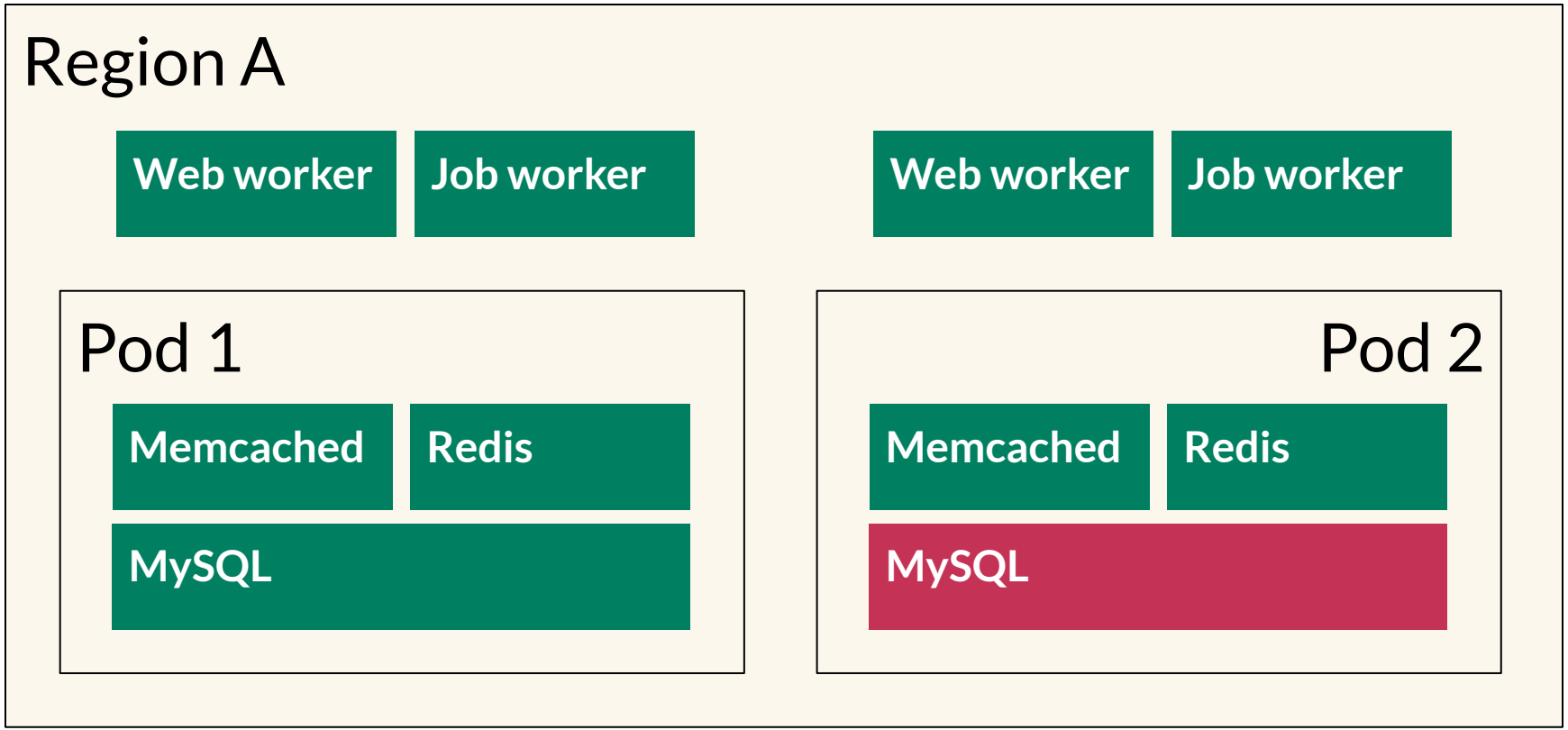
Admin

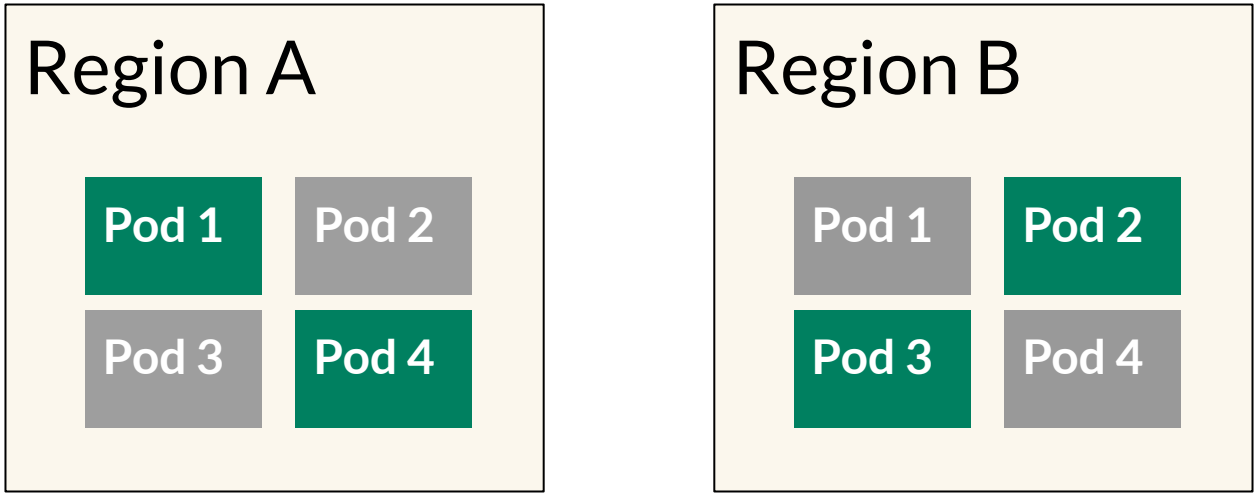
R/W mix
Consistency

A Shopify Pod contains data for one to many shops


Pod 1
Memcached
Redis
MySQL
Pod 2
Memcached
Redis
MySQL

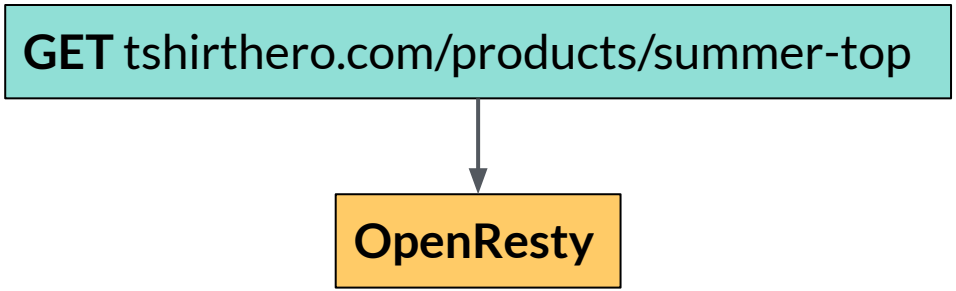

Region A
Web worker
Job worker
Web worker
Job worker
Pod 1
Memcached
Redis
MySQL
Pod 2
Memcached
Redis
MySQL


Region A
Web worker
Job worker
Web worker
Job worker
Pod 1
Memcached
Redis
MySQL
Pod 2
Memcached
Redis
MySQL


Region A
Pod 1
Pod 2
Pod 3
Pod 4
Region B
Pod 1
Pod 2
Pod 3
Pod 4

Domains

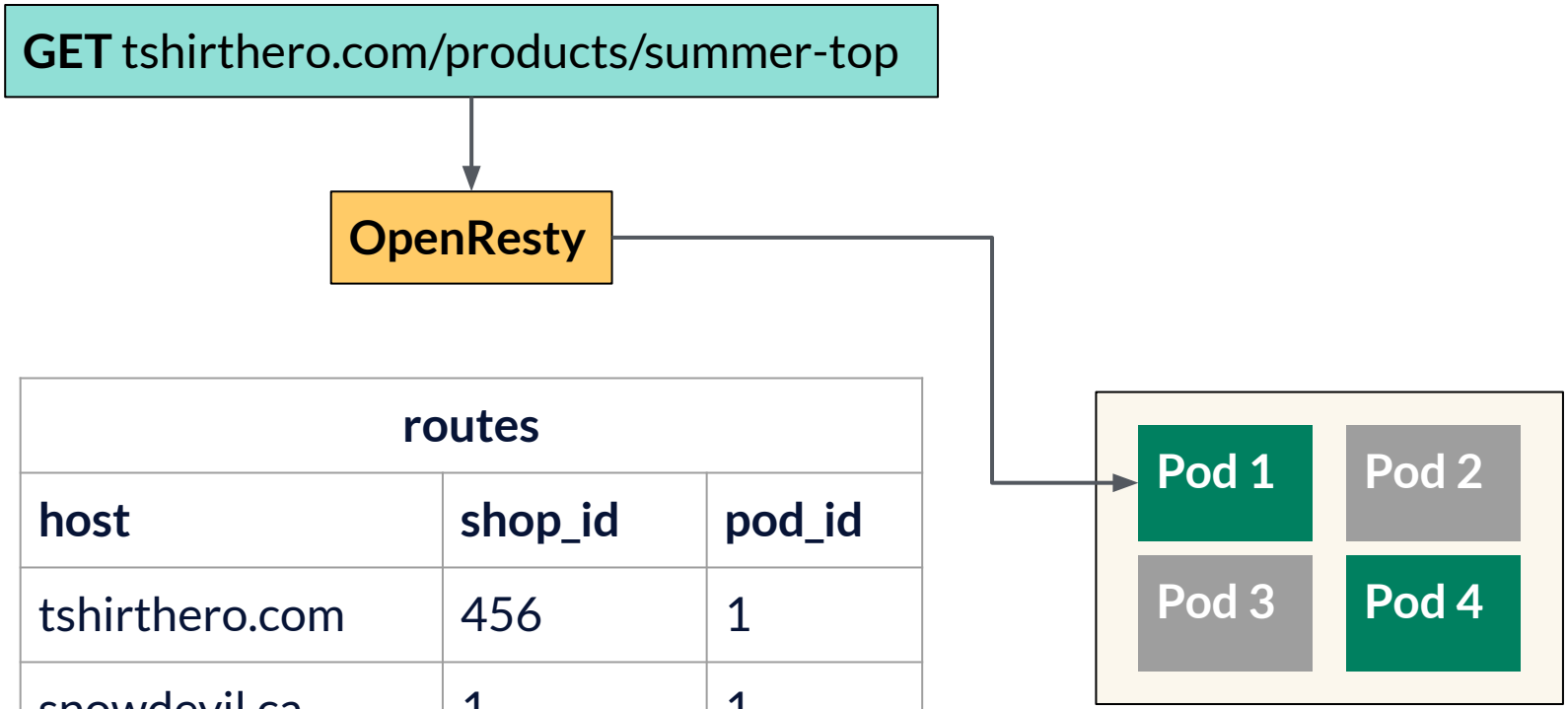
- Branding!
- Permanent domain: cooltshirts.myshopify.com
- Custom domains: tshirthero.com


GET tshirthero.com/products/summer-top
OpenResty

GET tshirthero.com/products/summer-top

OpenResty

routes		
host	**shop_id**	**pod_id**
tshirthero.com	456	1
snowdevil.ca	1	1



routes		
host	**shop_id**	**pod_id**
tshirthero.com	456	1
snowdevil.ca	1	1

"Monolith in Nurmijärvi, Finland," by Htm licensed under CC BY 4.0.

Merchandise

Pricing

Payments

Checkout

Inventory

Taxes

Shipping

Payment Card Industry Data Security Standard

- Build and Maintain a Secure Network and Systems
- Protect Cardholder Data
- Maintain a Vulnerability Management Program
- Implement Strong Access Control Measures
- Regularly Monitor and Test Networks
- Maintain an Information Security Policy

Payment Card Industry Data Security Standard

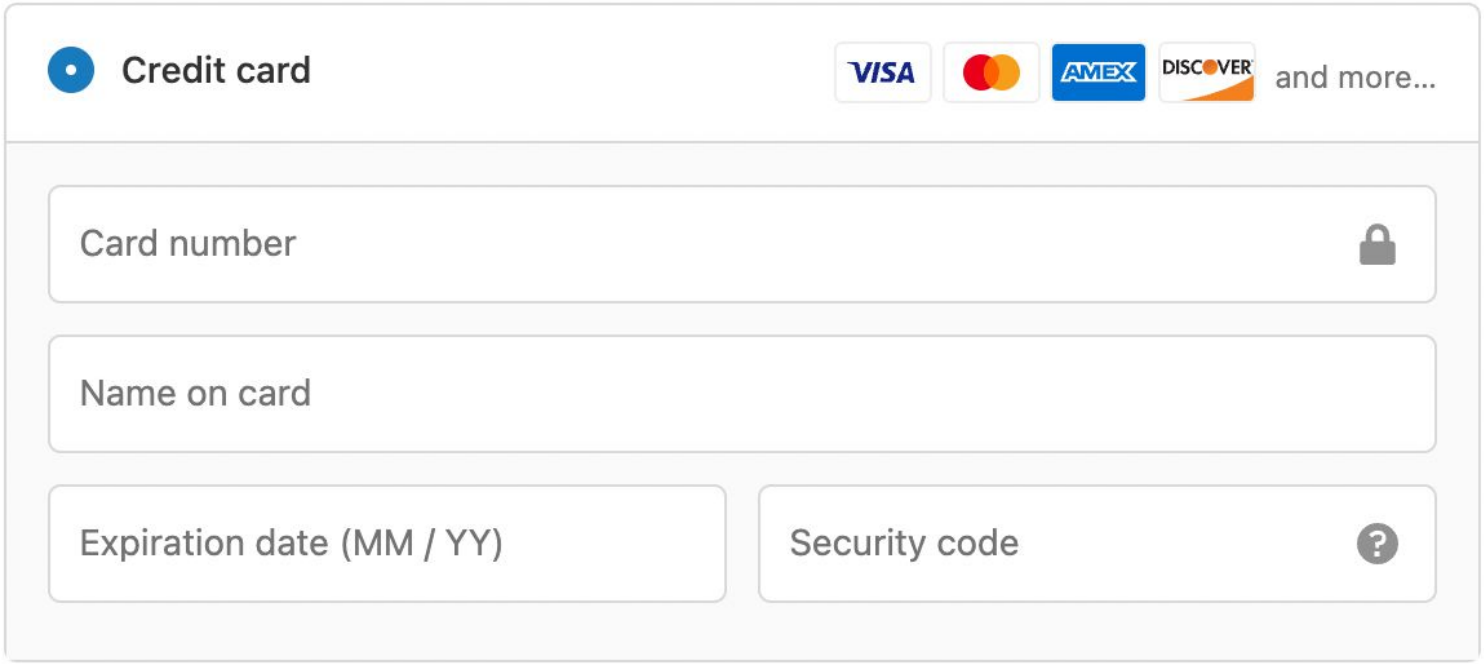
- Build and Maintain a Secure Network and Systems
- Protect Cardholder Data
- Maintain a Vulnerability Management Program
- Implement Strong Access Control Measures
- Regularly Monitor and Test Networks
- Maintain an Information Security Policy

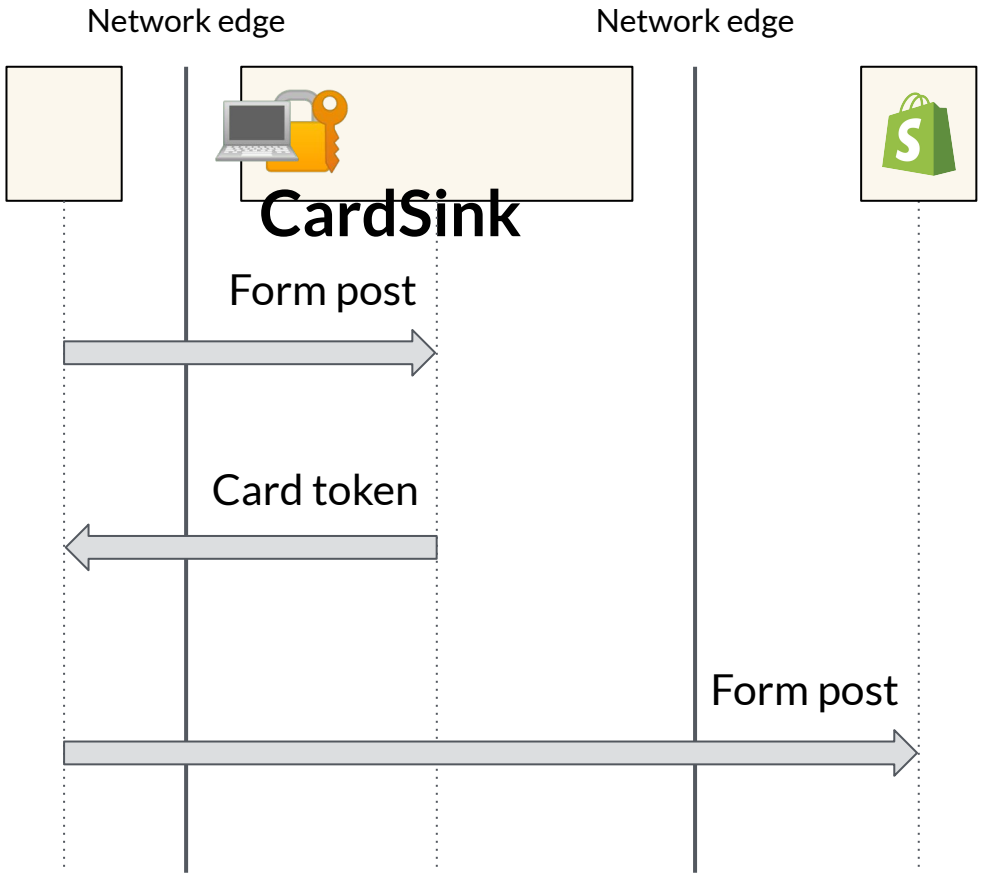
Payment Card Industry Data Security Standard

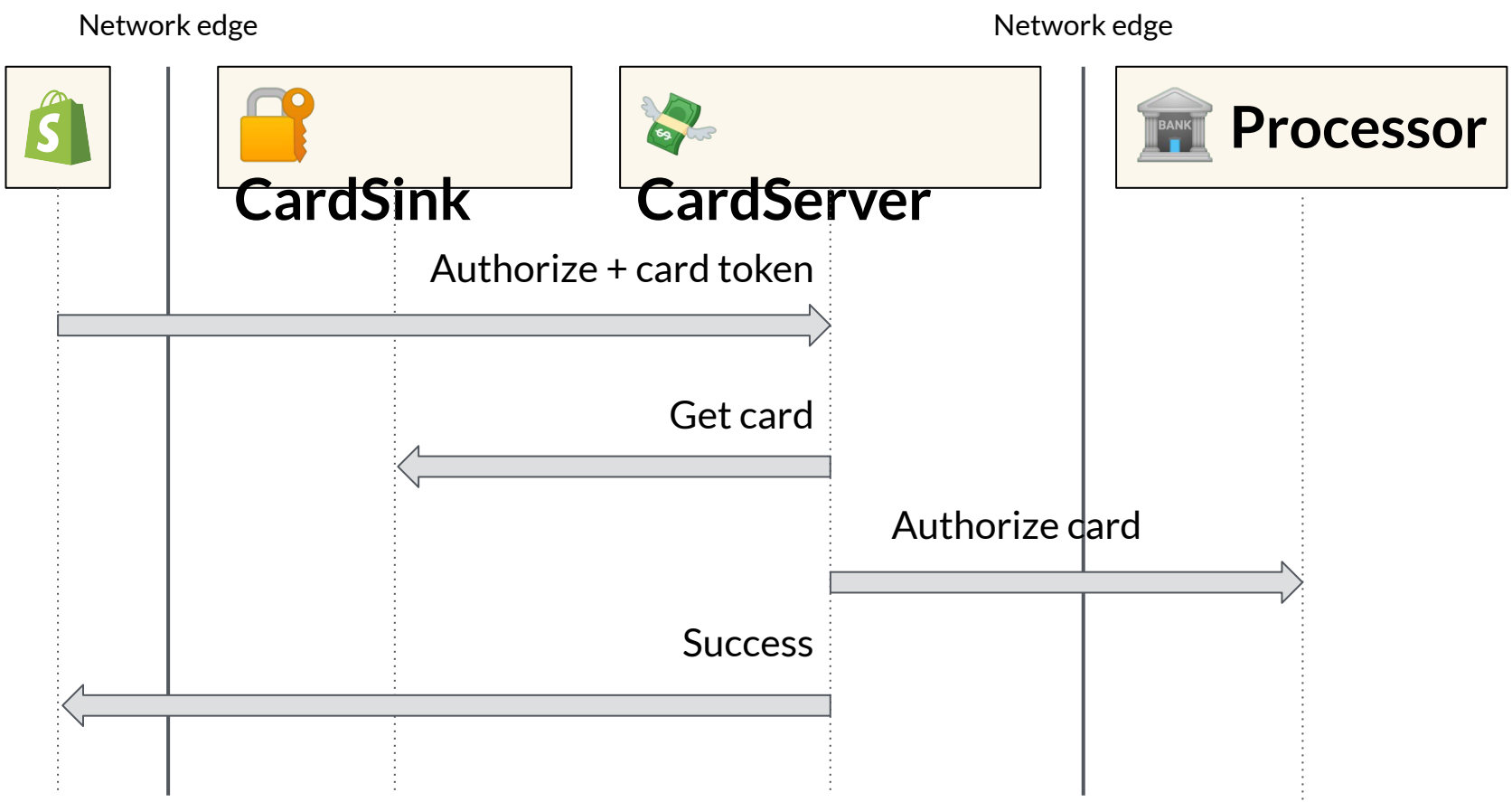
- Build and Maintain a Secure Network and Systems
- Protect Cardholder Data
- Maintain a Vulnerability Management Program
- Implement Strong Access Control Measures
- Regularly Monitor and Test Networks
- Maintain an Information Security Policy

Payment

All transactions are secure and encrypted.




Network edge
Network edge
CardSink
Form post
Card token
Form post


Network edge
Network edge
CardSink
CardServer
Processor
BANK
Authorize + card token
Get card
Authorize card
Success

T-shirt Hero

Order #1058

Thank you Jamie!

Your order is confirmed

You'll receive an email when your order is ready.

Track order with Shop

Email me with news and offers

Customer information

Contact information

jamie.adams.email@user.email.com

Payment method

VISA ending with 4242 - $12.78

Shipping address

Billing address

2017 Summer Top quality clothing
KSTBK / 10T

$12.78

Subtotal	$12.78
Shipping	Free
Total	CAD $12.78

Black Friday Cyber Monday 2021

6.3B

USD total sales

3.1M

USD sales per minute (peak)

32M

Requests per minute (peak)

11M

MySQL queries per minute (peak)

24B

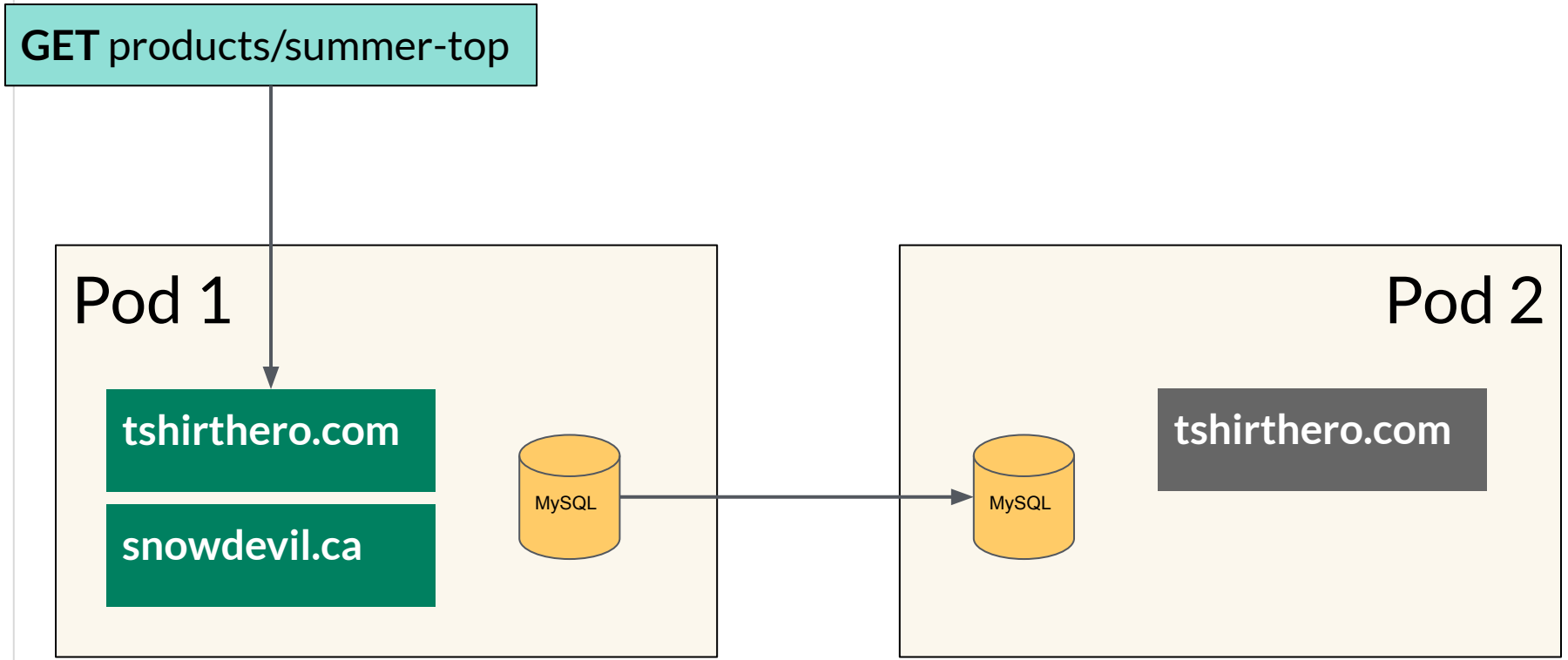
Background jobs performed

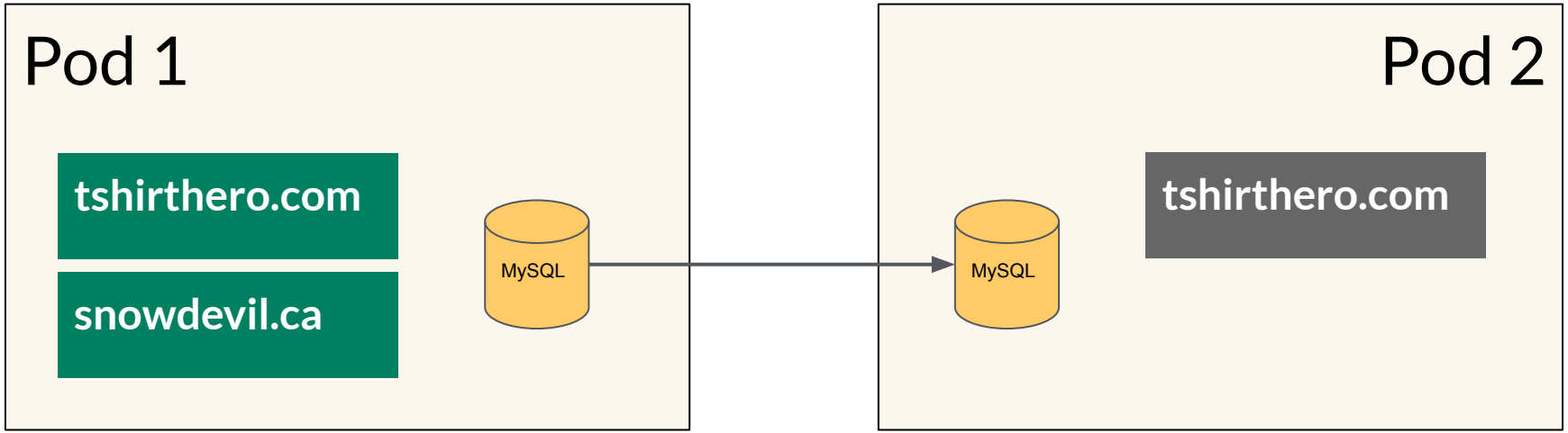
42B

API calls made to partner apps

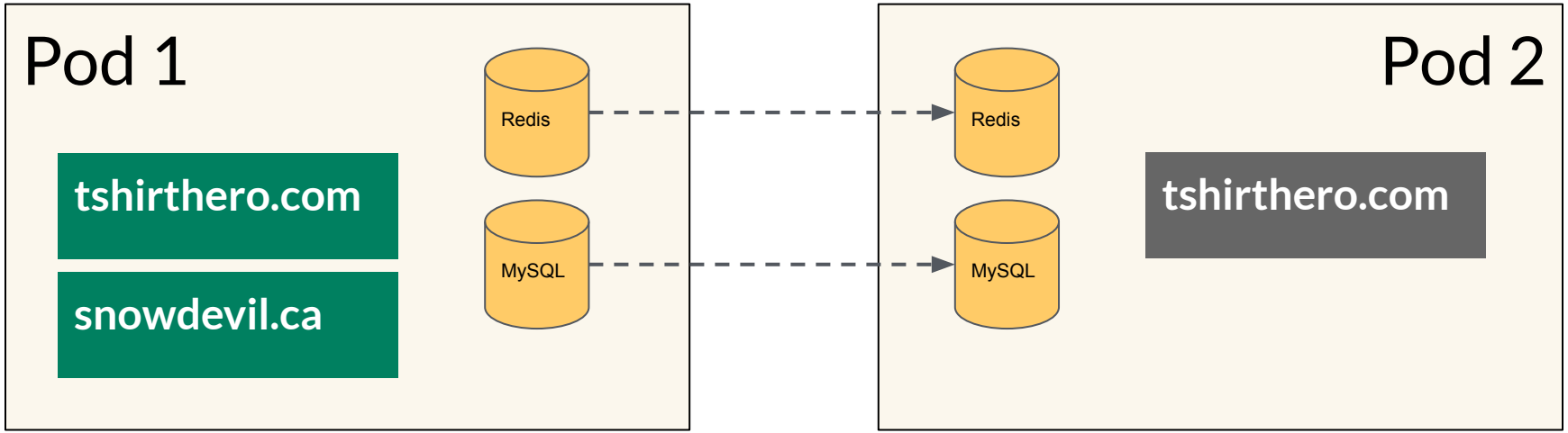
Tenant isolation principle

Each shop shouldn't know about any of the others


GET products/summer-top
Pod 1
tshirthero.com
snowdevil.ca
MySQL
MySQL
Pod 2
tshirthero.com

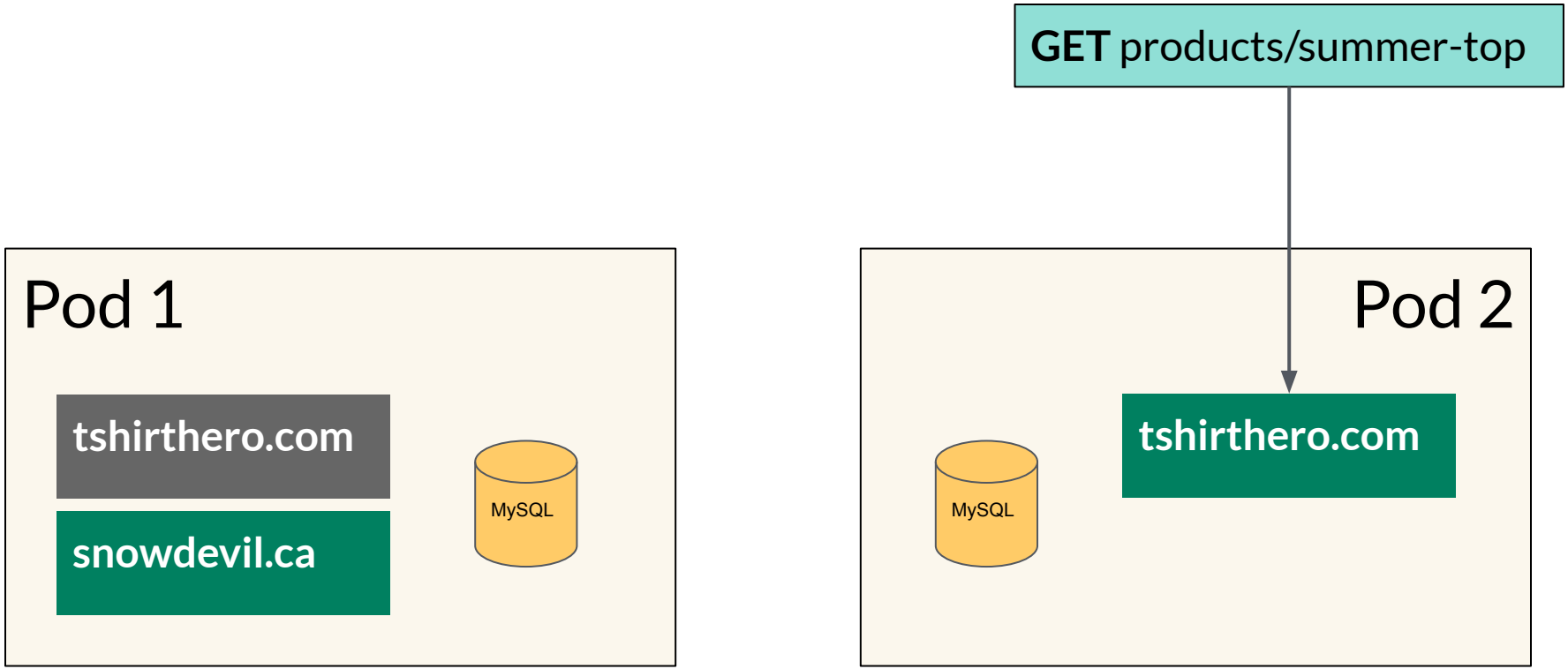


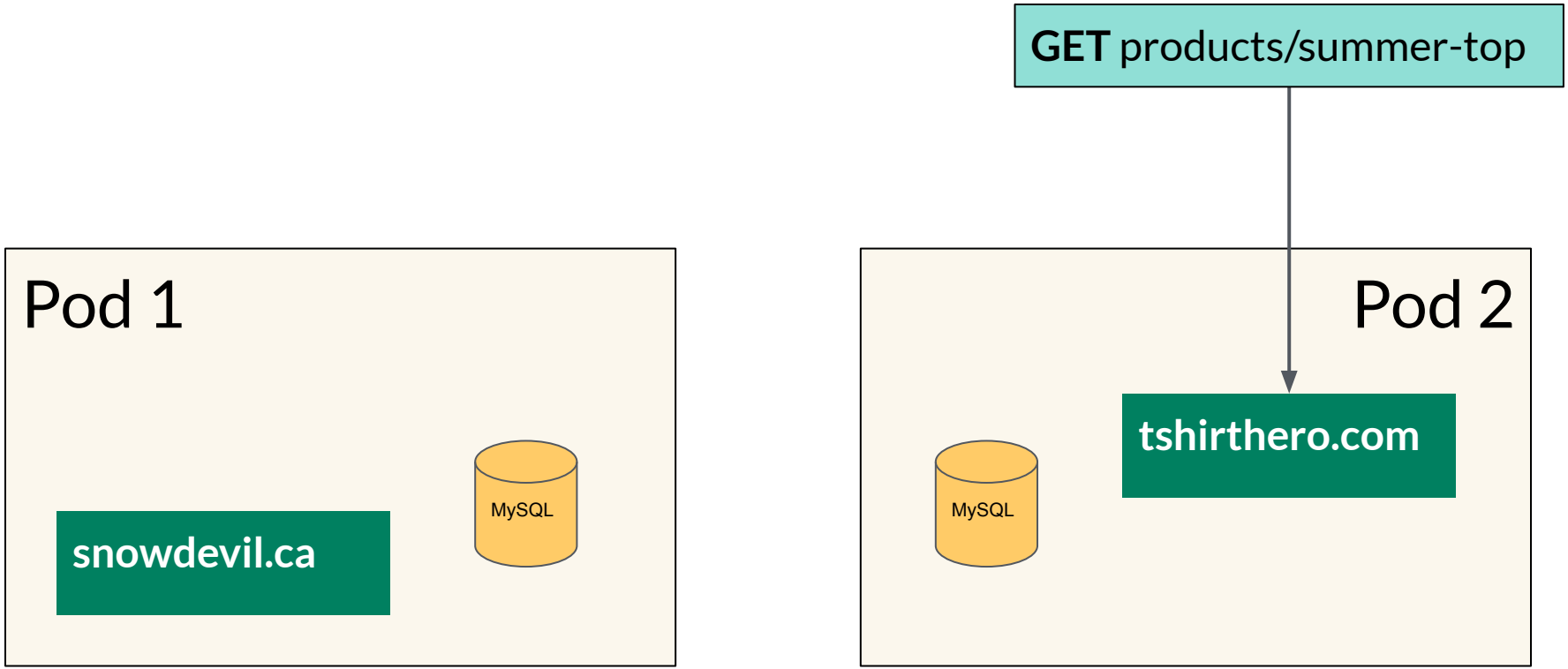
https://github.com/Shopify/ghostferry


Pod 1
tshirthero.com
snowdevil.ca
Redis
MySQL
Redis
MySQL
Pod 2
tshirthero.com

routes		
host	**shop_id**	**pod_id**
tshirthero.com	456	1
snowdevil.ca	1	1

routes		
host	**shop_id**	**pod_id**
tshirthero.com	456	2
snowdevil.ca	1	1


GET products/summer-top
Pod 1
tshirthero.com
snowdevil.ca
MySQL
Pod 2
MySQL
tshirthero.com


GET products/summer-top
Pod 1
snowdevil.ca
MySQL
Pod 2
tshirthero.com
MySQL

Storefront

Read heavy
Availability
Cacheable

Checkout

Write heavy
Consistency
External services

Admin

R/W mix
Consistency

Storefront

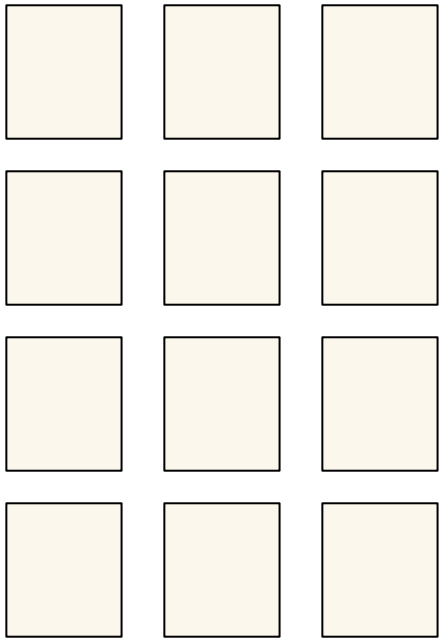
Read heavy
Availability
Cacheable

Checkout

Write heavy
Consistency
External services

Admin

R/W mix
Consistency



Checkout

Write heavy
Consistency
External services

Admin

R/W mix
Consistency

HYDROGEN

+

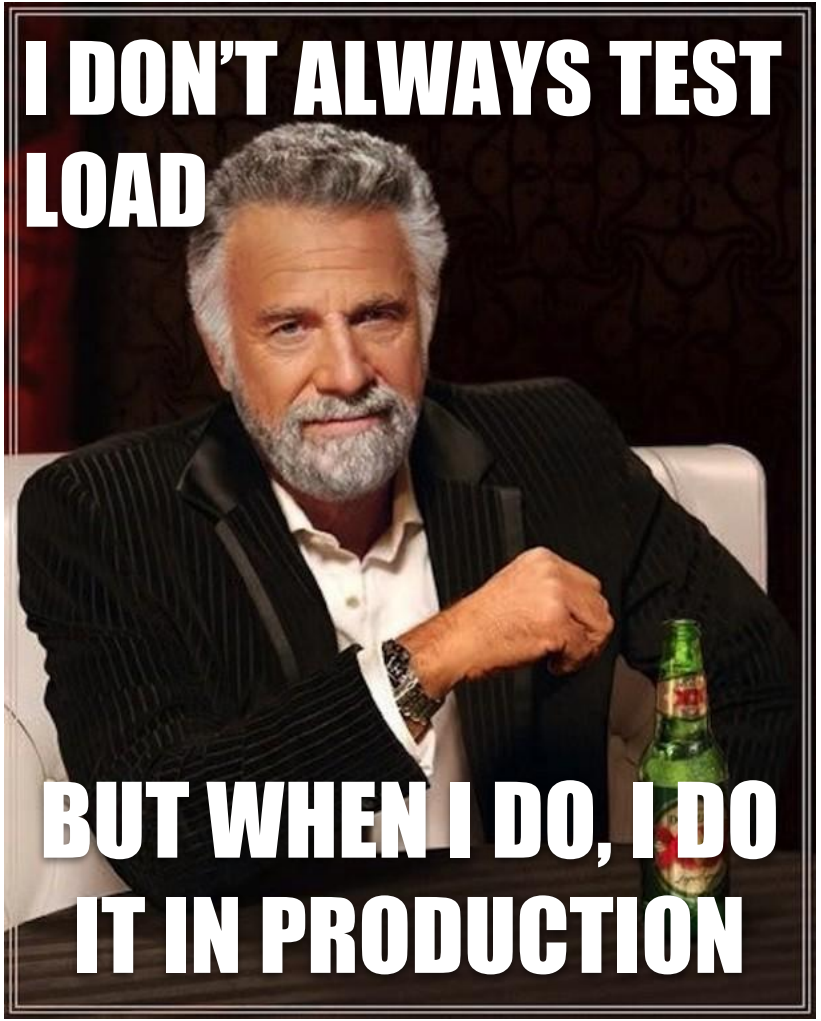
OXYGEN

Checkout

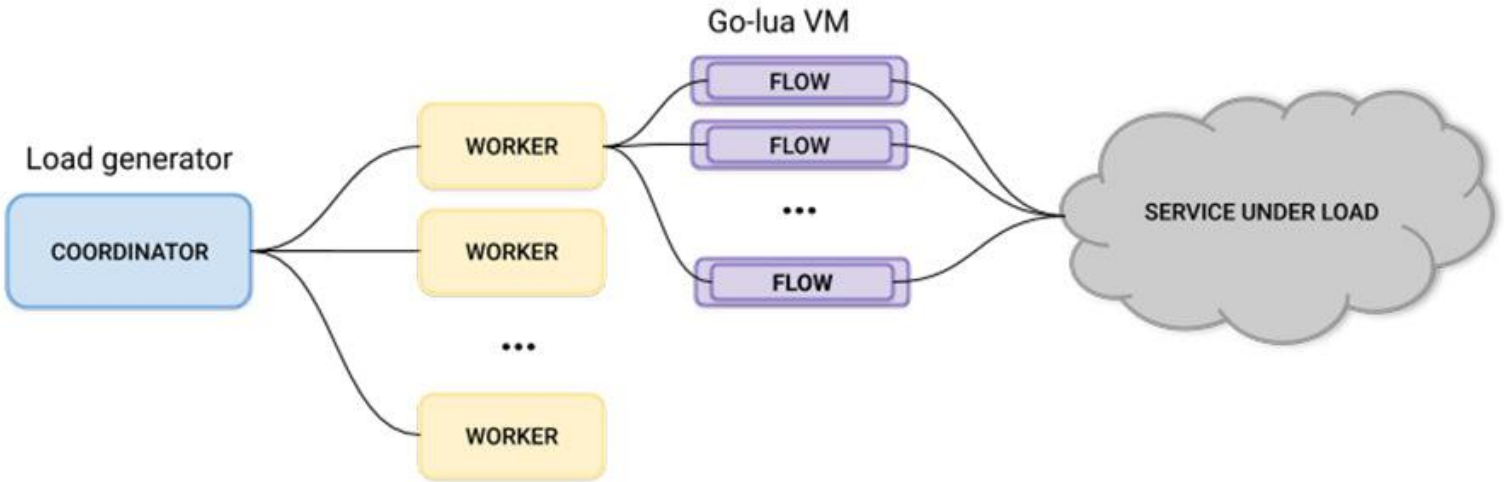
Write heavy
Consistency
External services

Admin

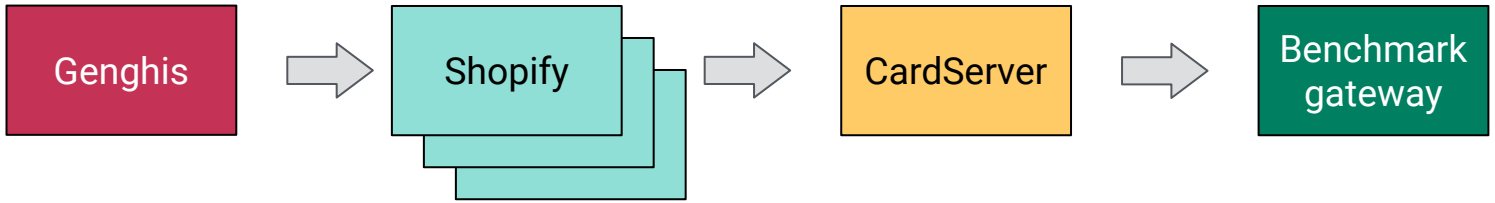
R/W mix
Consistency


I DON'T ALWAYS TEST LOAD
BUT WHEN I DO, I DO IT IN PRODUCTION

Genghis

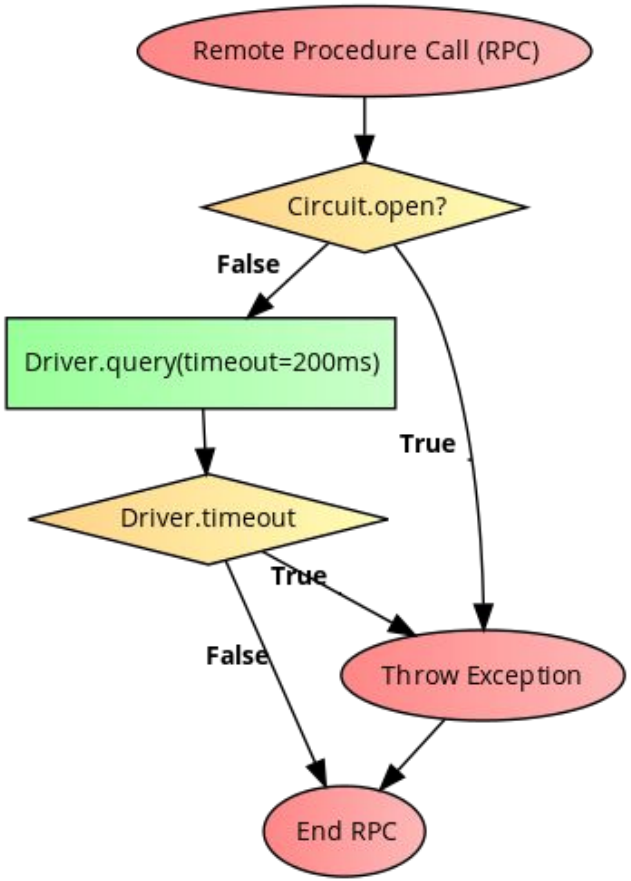

Go-lua VM
Load generator
COORDINATOR
WORKER
WORKER
WORKER
FLOW
FLOW
FLOW
SERVICE UNDER LOAD

Load testing setup

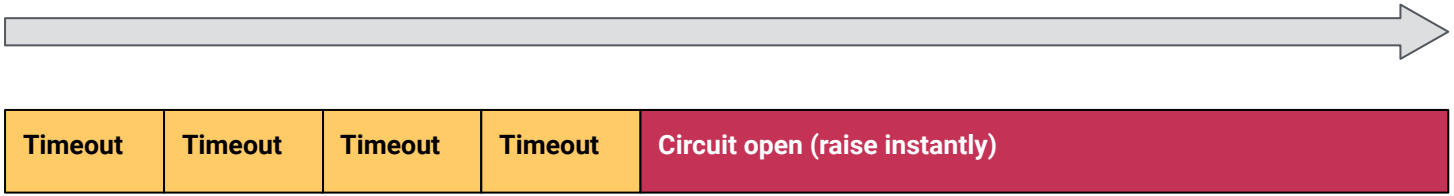


		Expected User Experience		
		User can browse	User can check out	User is served from a passive region
Possible Failures	MySQL (persistent storage dependency)			
	Down	Yes	No	Yes
	Slow	Yes	Yes	Yes
	Shipify (third party application dependency)			
	All providers down	Yes	No	Sometimes
	One provider down	Yes	Yes, except ...	Yes
	Regional (network architecture)			
	Network partition	Yes	Yes	Yes, if ...
	Routing mistake	Yes	No	Yes

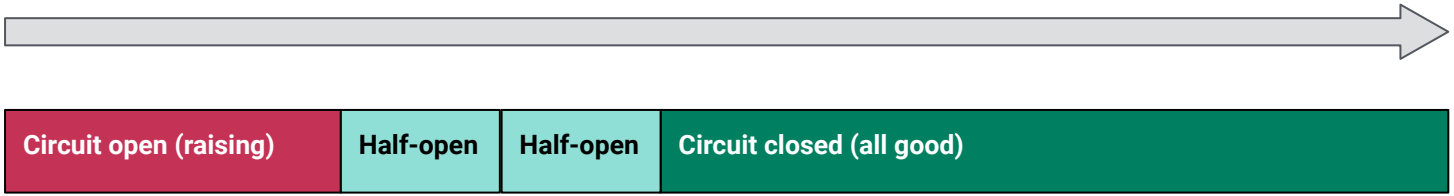
Spectra RMS
INDUSTRIAL
CIRCUIT BREAKER
ON
OFF


Remote Procedure Call (RPC)
Circuit.open?
False
Driver.query(timeout=200ms)
True
Driver.timeout
True
False
Throw Exception
End RPC

Circuit breaker



Circuit breaker



```
Toxiproxy[:mysql].downstream(:timeout, timeout: 1000).apply do
  assert(Database.unhealthy?)
end
```

```
Toxiproxy[:redis].down do
  user.get_session
end
```

https://github.com/Shopify/toxiproxy

```
SEMIAN_DEFAULTS = { success_threshold: 1,
                    error_threshold: 3,
                    error_timeout: 10 }

Semian::NetHTTP.semian_configuration = -> do |host, port|
  SEMIAN_DEFAULTS.merge(name: "#{host}_#{port}")
end
```

Idempotent request

```
{
  "amount": {
    "value": 100.00,
    "currency": "EUR"
  },
  "clientAccountId": 1234567,
  "clientBuyerId": 12345,
  "clientTransactionId": 6789,
   ...
  "test": true,
  "idempotencyKey": "d0814711-91cb-4c4e-bc71-64f4f0a7d27"
}
```

Idempotent action

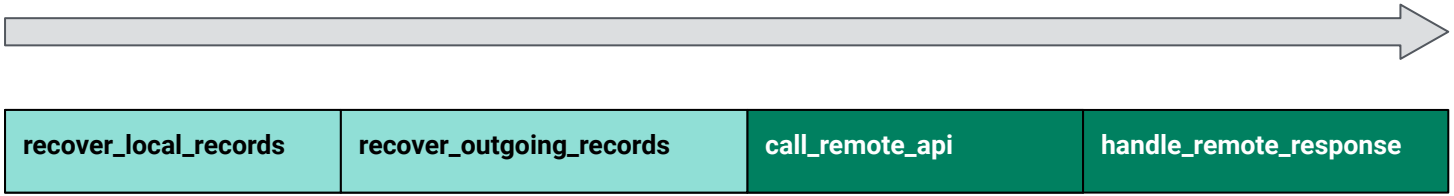
```
class CreateCharge
  include Resumption::Processor

  def initialize(progress:, amount:, currency:); end

  recovery_point run: :create_incoming_records,
    recover: :recover_incoming_records

  recovery_point run: :create_outgoing_records,
    recover: :recover_outgoing_records

  recovery_point run: :call_remote_api,
    recover: :call_remote_api, transactional: false

  recovery_point run: :handle_remote_response
end
```

Resumption

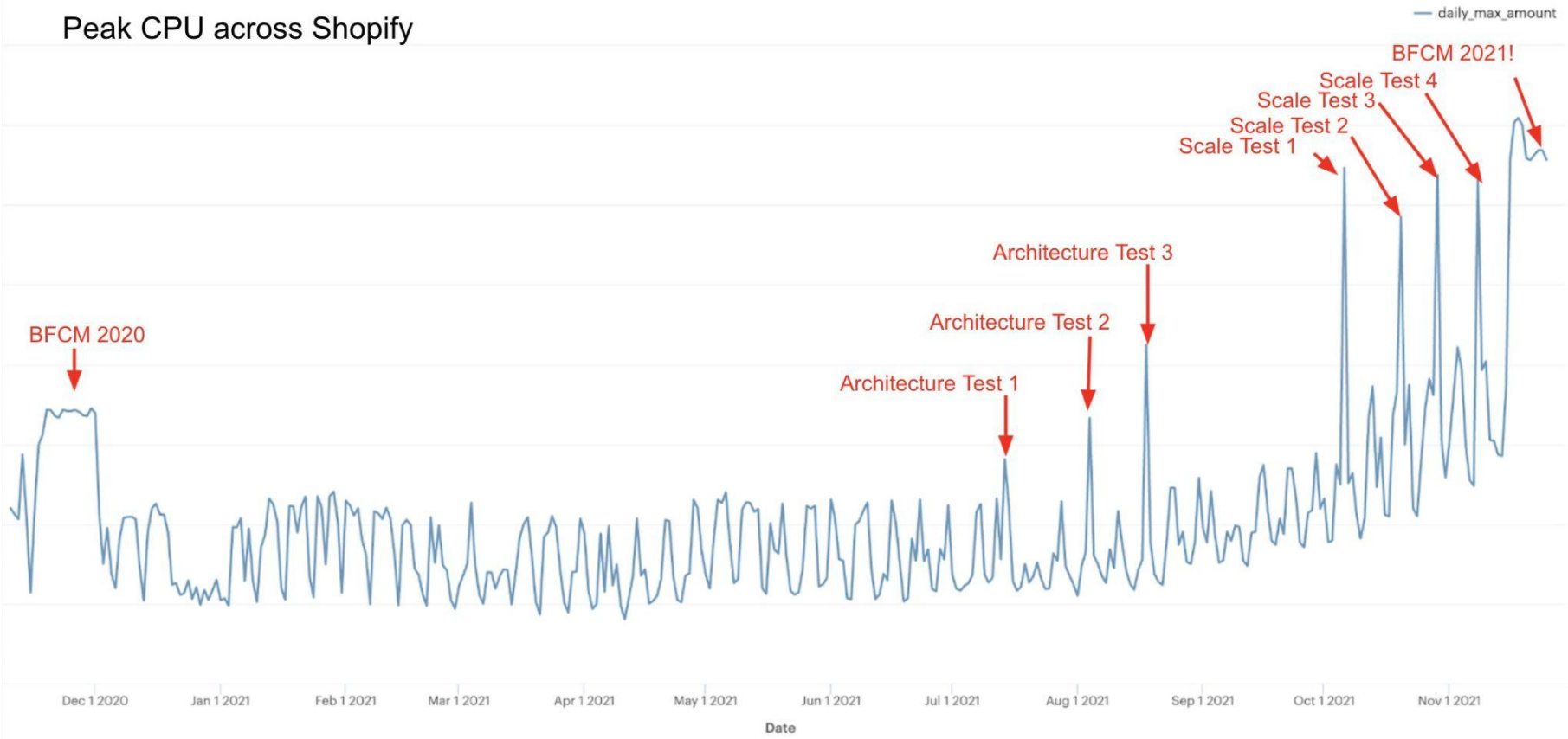
```
idempotency_key: "d0814711-91cb-4c4e-bc71-64f4f0a7d27"
```

Resumption

```
idempotency_key: "d0814711-91cb-4c4e-bc71-64f4f0a7d27"
```



Peak CPU across Shopify



Recap

01 The story of a single checkout

02 Scaling for BFCM

03 Testing scale and failure scenarios

Thanks!

📖 https://shopify.engineering
🤷‍♂️ https://twitter.com/bdewater