

Scaling ↑↓



Derek Stride

- **Studied @ Carleton**
 - graduated 2018
- Intern @ Shopify for 18 months
- **Full-time @ Shopify** since 2018
 - Worked on Product:Orders
 - Last 6 years: Scaling Shopify's Storefront

Josh Faigan

- Career pivot from banking
- **Studied @ Dominican University of California**
 - graduated 2025
- DevDegree Intern @ Shopify
 - Aug 2022 - April 2025
- **Full-time @ Shopify** since May 2025
 - Worked with Derek in Storefronts
 - Currently working with Developer Tools

Scalability is the property of a system to handle a growing amount of work.

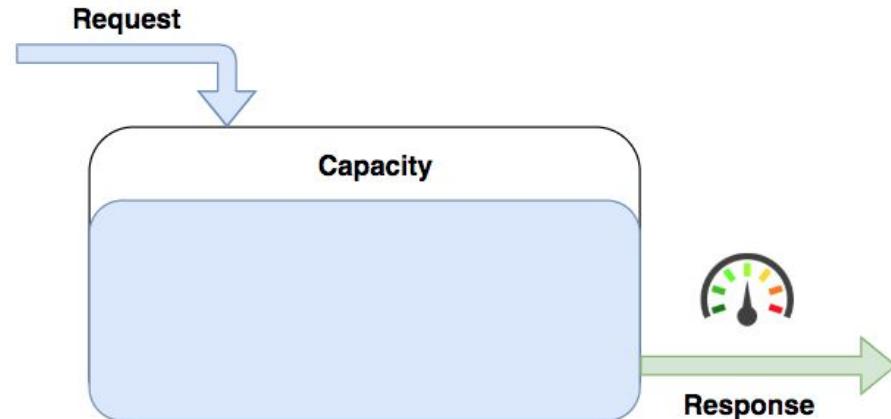
System Capacity

Exit rate:

- How many requests you can serve per unit of time (Requests per Second - RPS)

Service time:

- The average response time for a request (Latency - measured in units of time)



How do you increase your capacity?

Horizontal
&
Vertical
Scaling

Caching

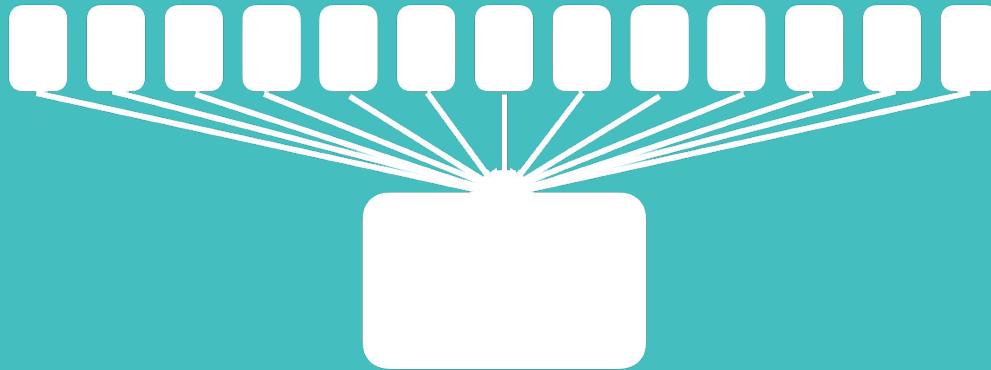
Load
Control

Sharding

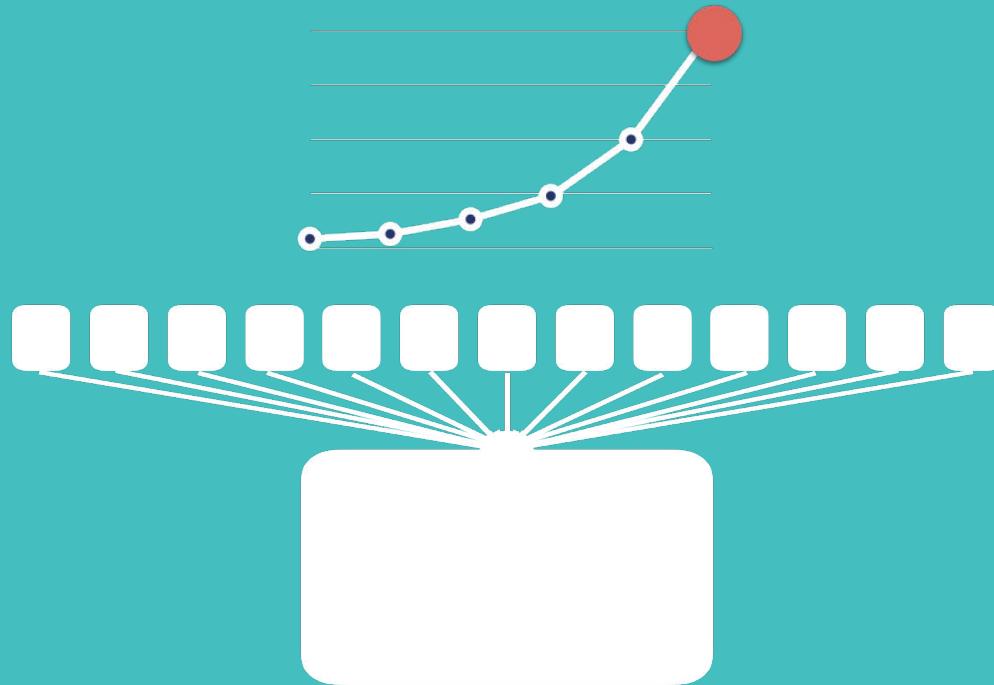


Horizontal & Vertical Scaling

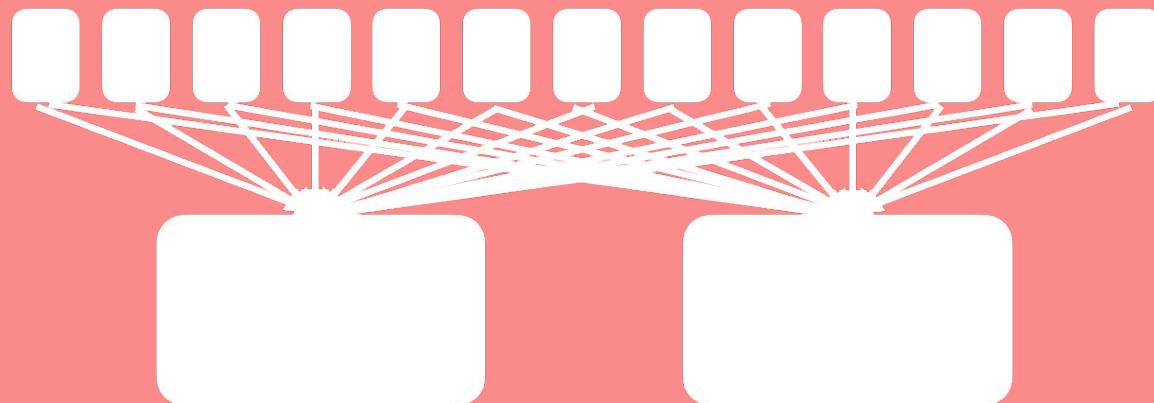
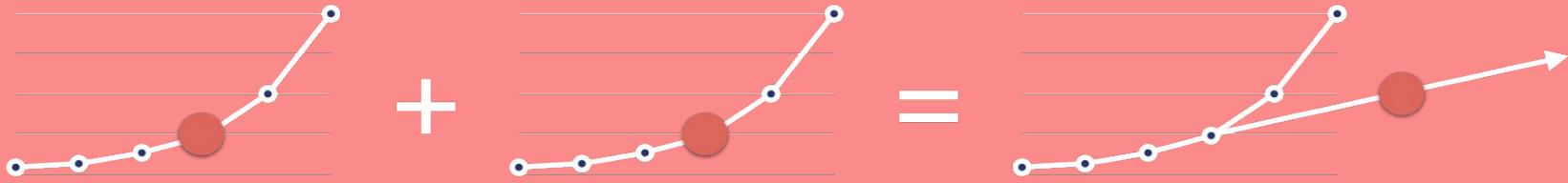
Vertically Scaling



Vertically Scaling



Horizontally Scaling

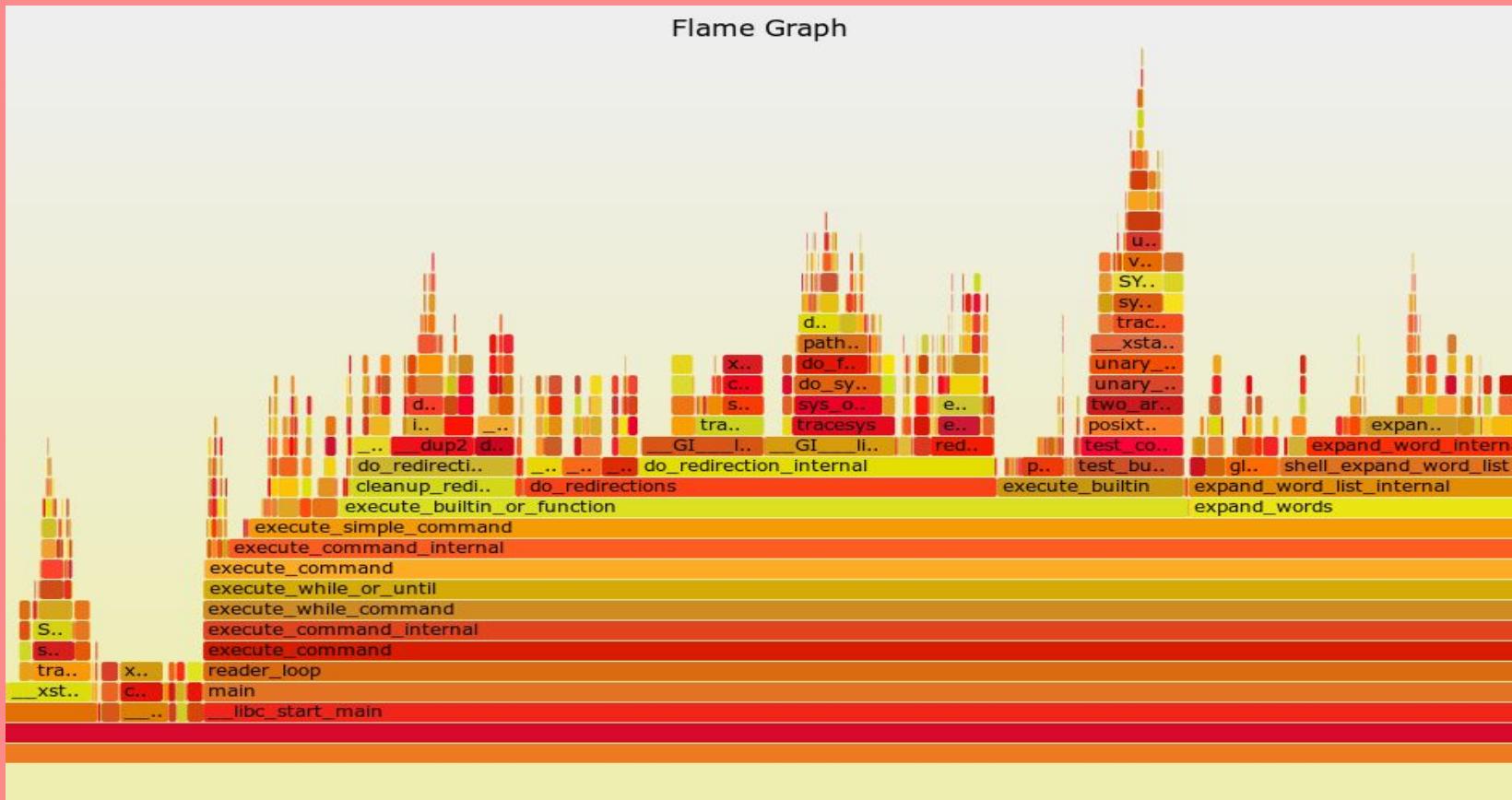


Reducing Service Time (performance tuning)

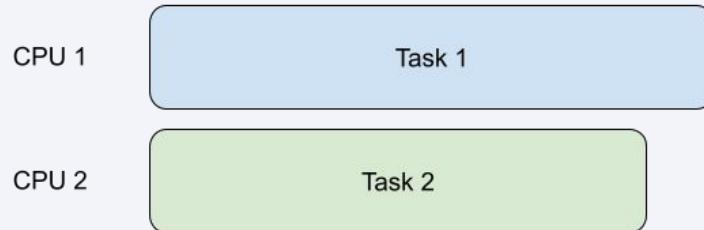
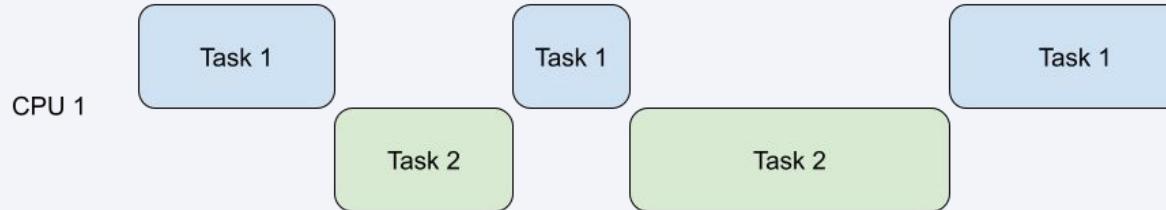
- Buy faster machines
- Profiling and optimization
- Caching

Vertical scaling has a limit and is expensive

Reducing Service Time



Concurrency & Parallelism

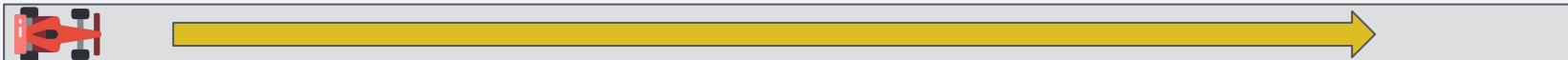


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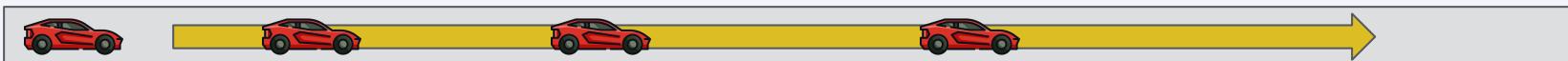
Unicorn and Falcon

Single vs Multi threaded

Unicorn - One Worker | One Lane



Falcon - Multi Worker | Multi Lane





Caching



Caching



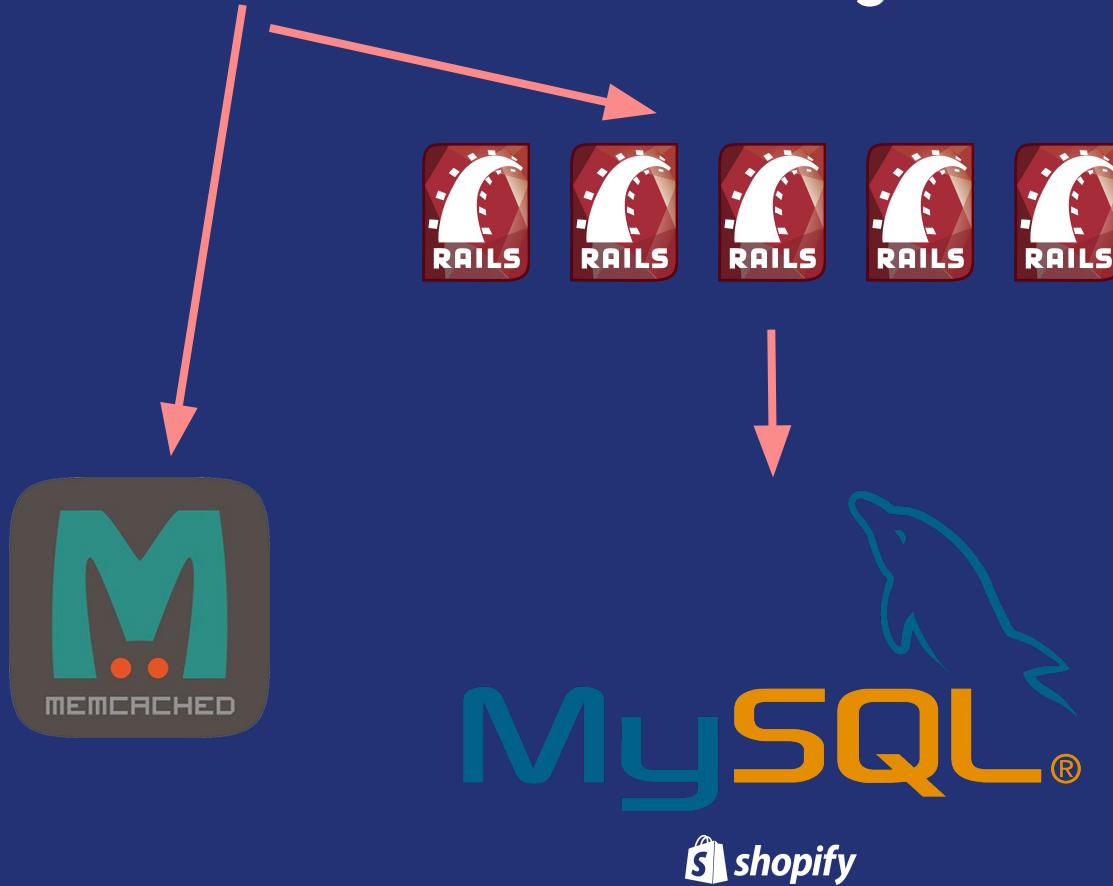
MySQL®



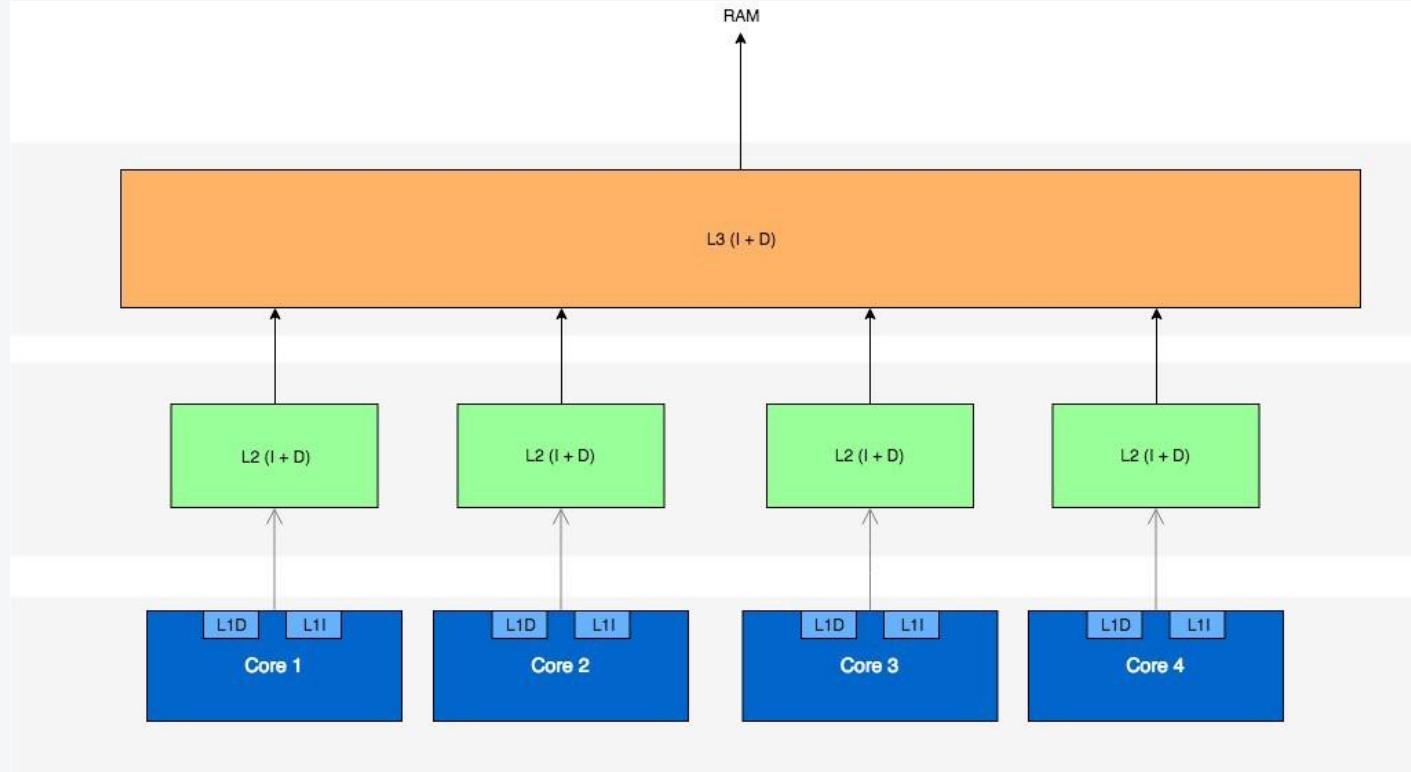
Caching



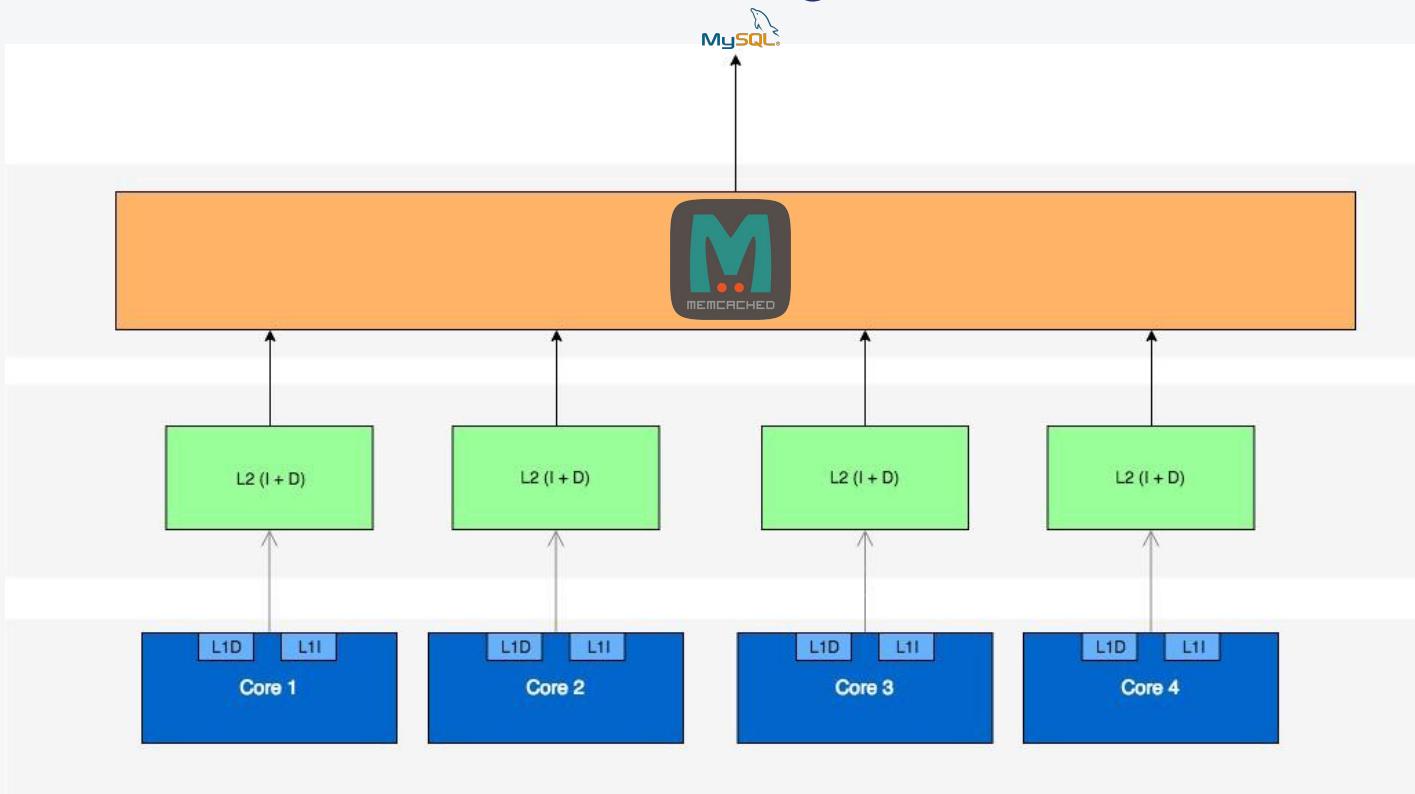
Caching



Caching



Caching



Load Control



Load shedding (handling overload)

Without a doubt, your system **will** experience capacity overload.

- More demand than you can handle
- Slower response times
- Combination of both

No amount of scaling or capacity planning will save you

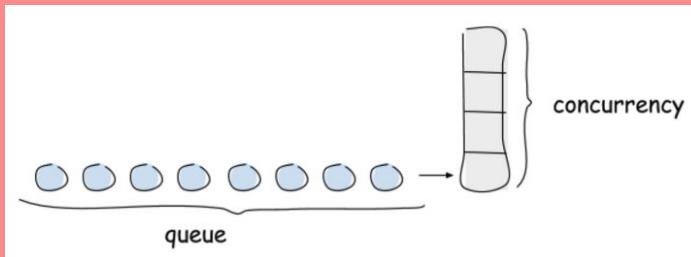
At Shopify, this happens almost every day

- Flash sales (too much demand)
- Unoptimized endpoints (known problems)
- System failures (unknown problems)

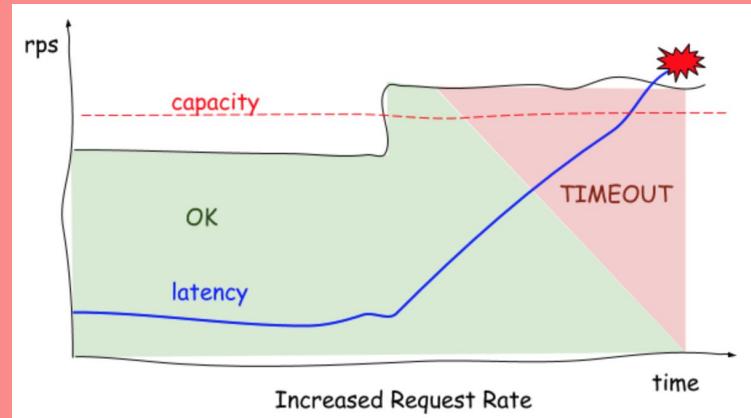
Load shedding

What happens when you have more demand than you can handle?

- New requests get queued (increased end-user latency)
 - Eventual timeouts (error response)



Source: <https://medium.com/@NetflixTechBlog/performance-under-load-3e6fa9a60581>

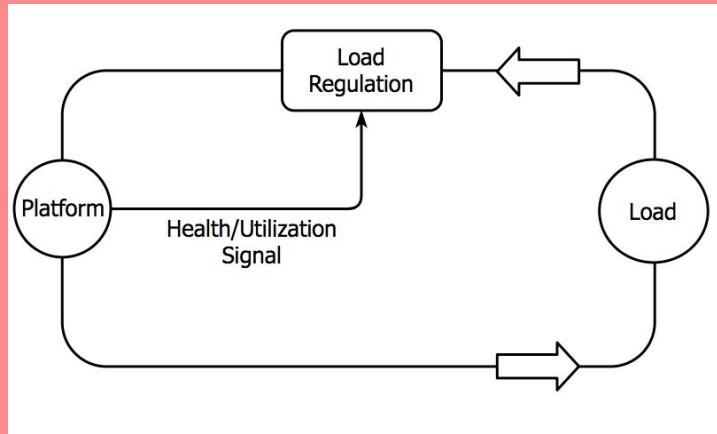


Load shedding

To gracefully protect from overload scenarios:

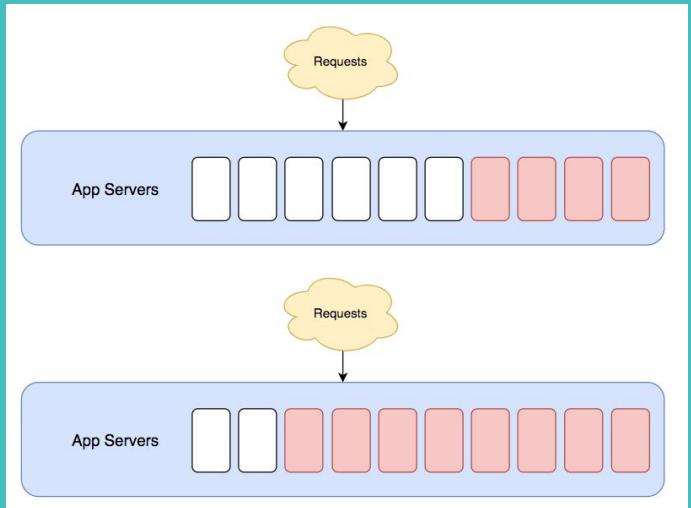
- Monitor capacity usage (utilization)
- Take action when overload does occur

Handling overload is especially important in a **multi-tenant** environment!



Measuring your capacity

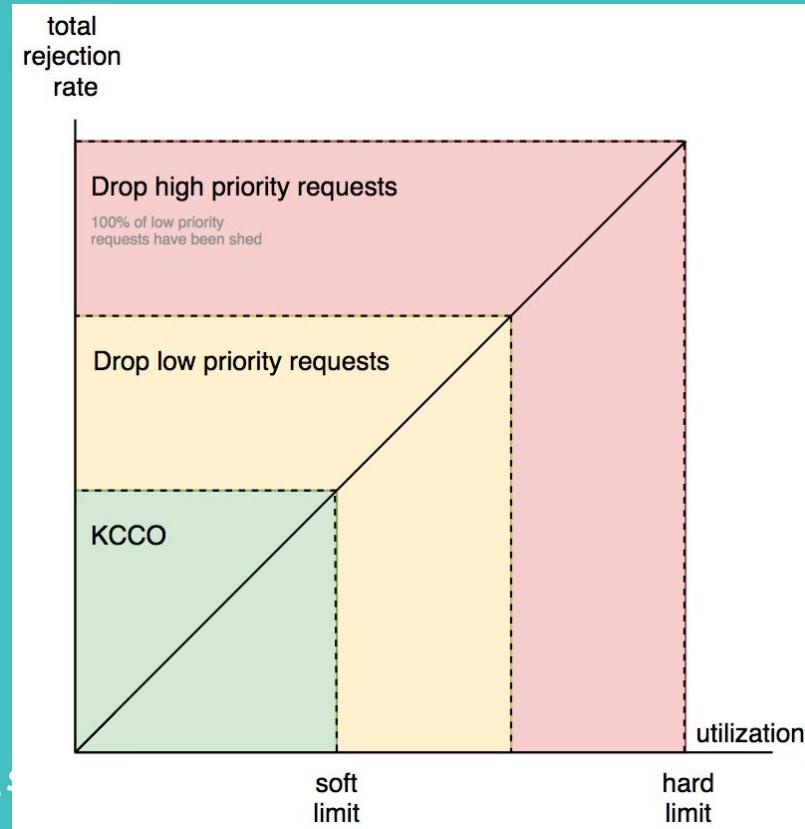
- Utilization: a ratio of how close you are to your capacity



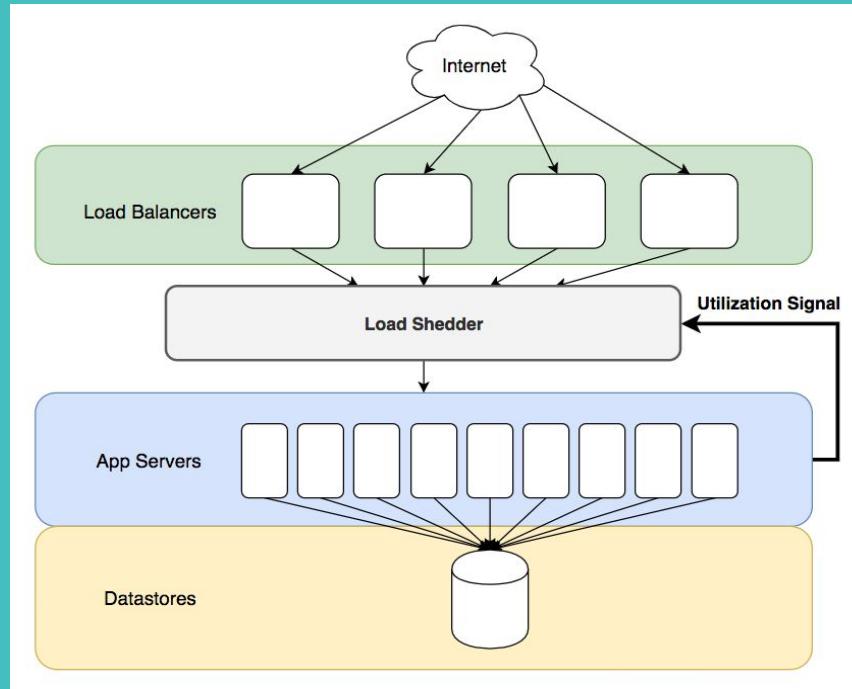
Priority-aware load shedding

The limits range can be divided into equal parts to achieve a priority bucketing scheme:

- Each bucket is 100% dropped before we shed any requests from the next bucket



Implementation in Practice



Sharding

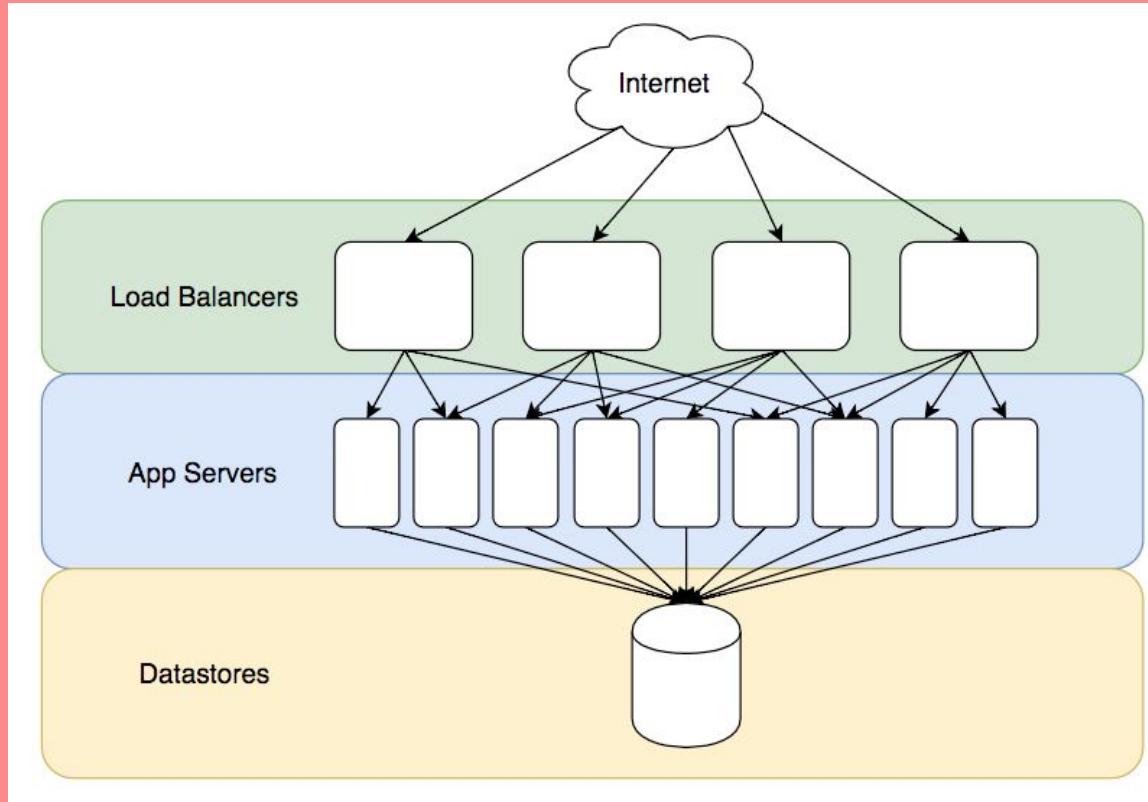


Scaling Shopify

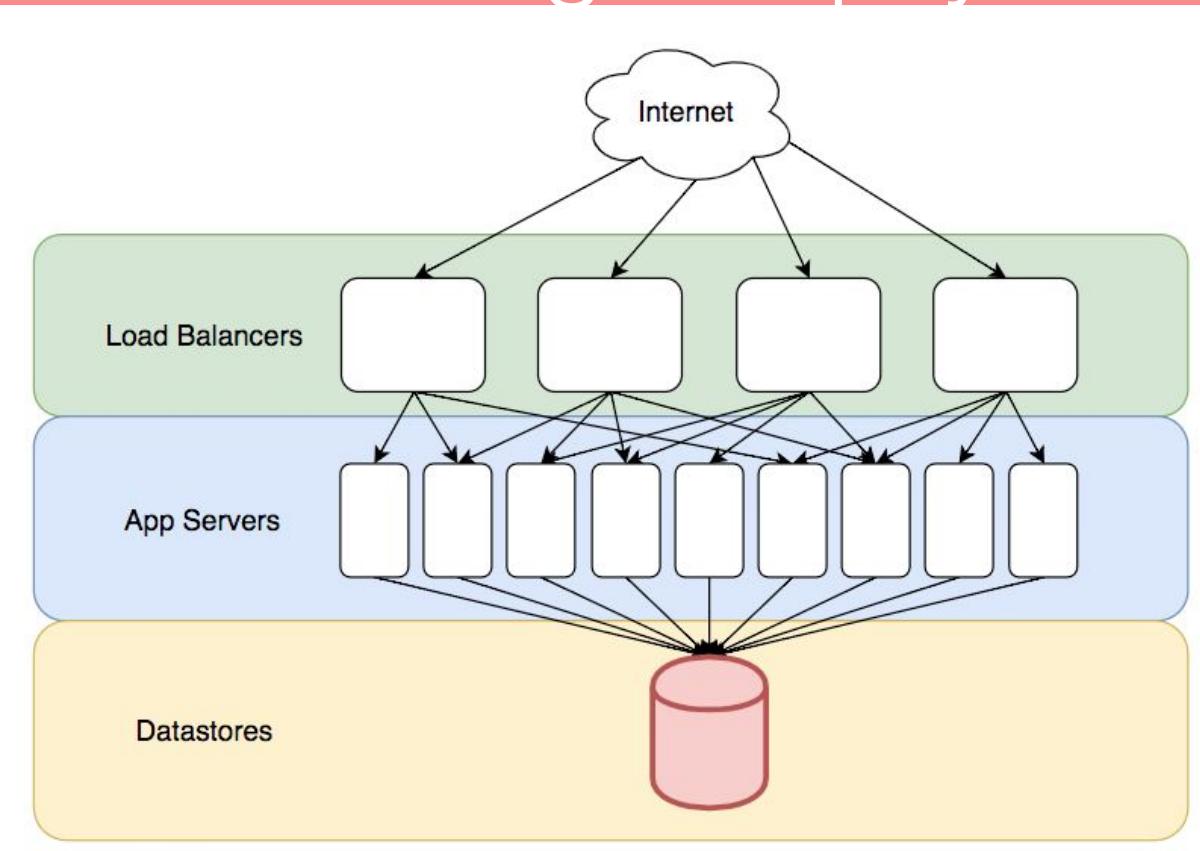
- 2004: Snowdevil (single-tenant)
- 2005: Shopify (multi-tenant)
- **2013: Database split into multiple shards**
- 2015: Backup datacenter for disaster recovery
- 2016: Multiple active datacenters
- 2020: Dedicated Storefront Renderer
- 2020: Dedicated Storefront Renderer
- 2022: Put Servers Close to the Users
- 2025: Data Shaping



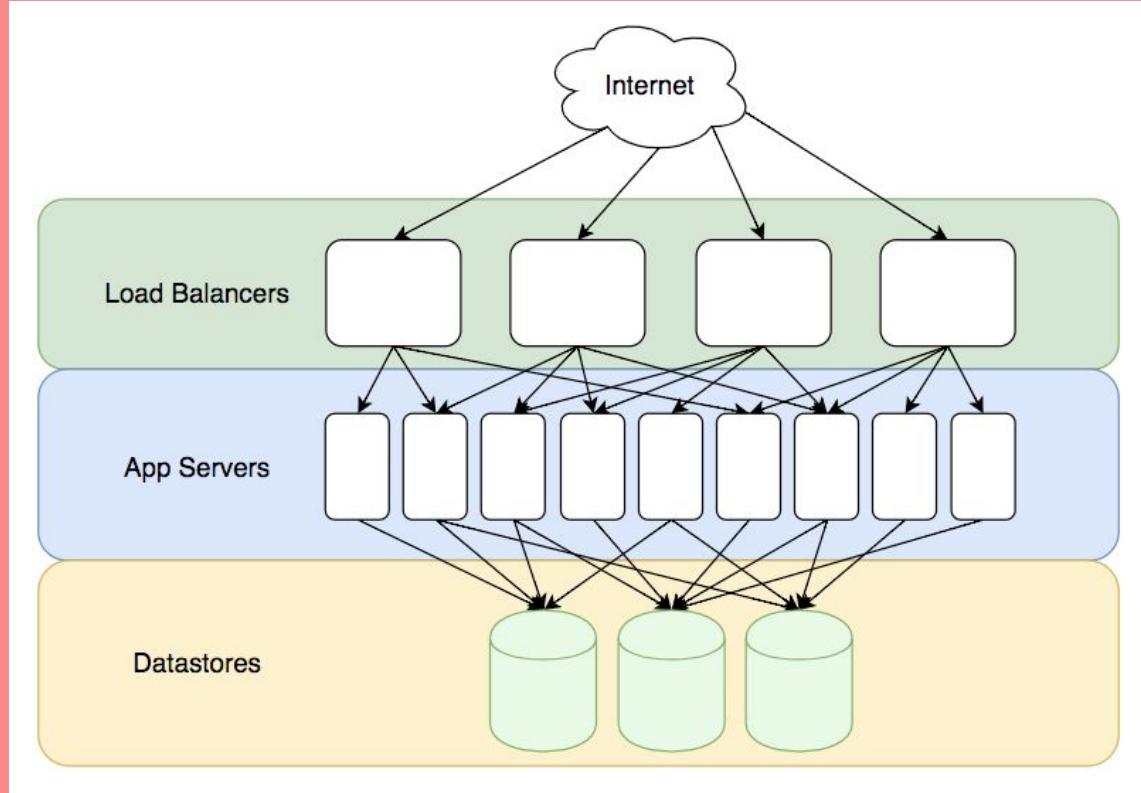
Scaling Shopify



Scaling Shopify



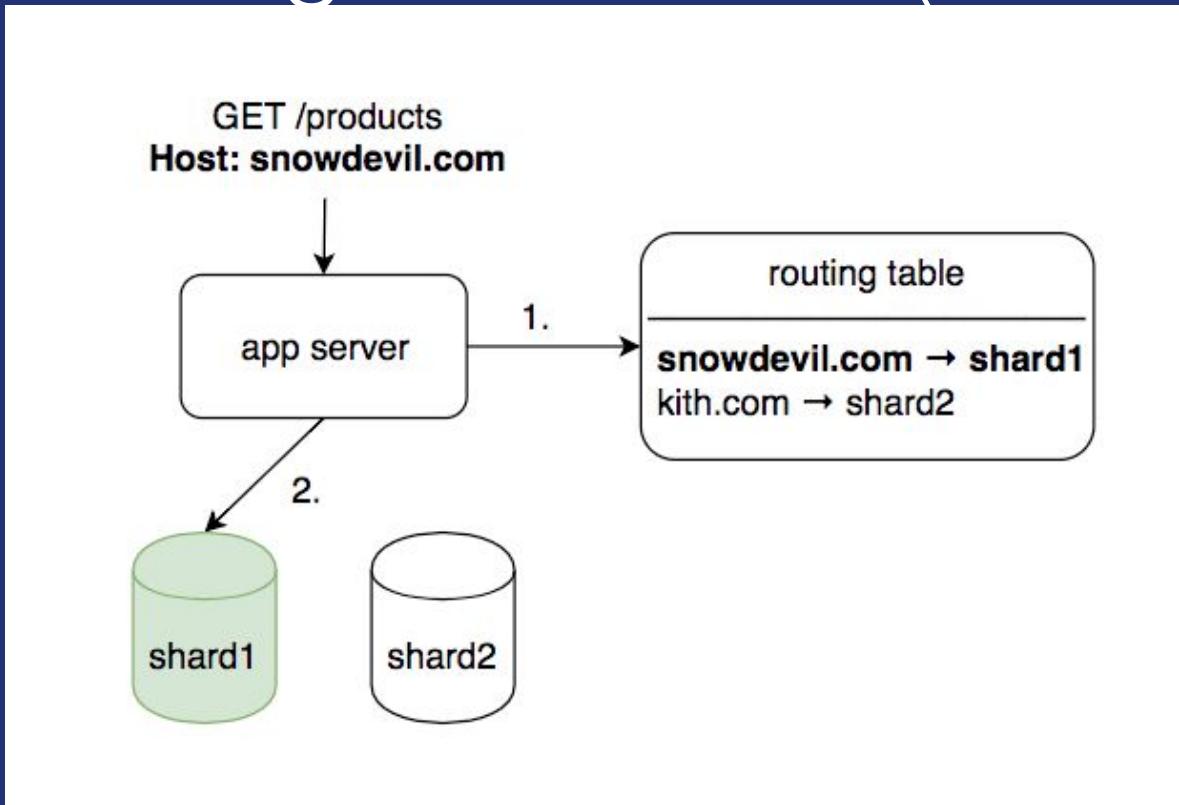
Scaling Shopify (database sharding)



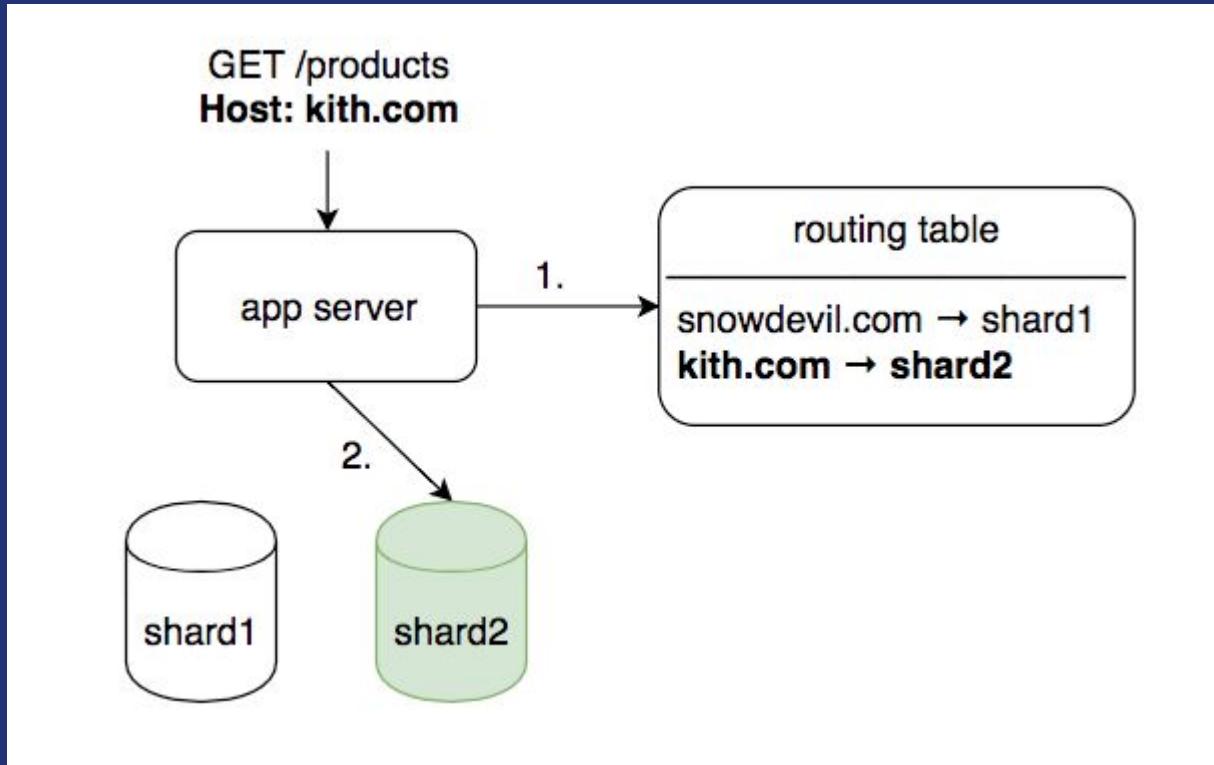
Sharding in Practice

1. Choose a good sharding key (shop_id, user_id, hash(id))
2. Spread data among multiple shards
3. Route requests to correct shard
4. Keep shards well-balanced

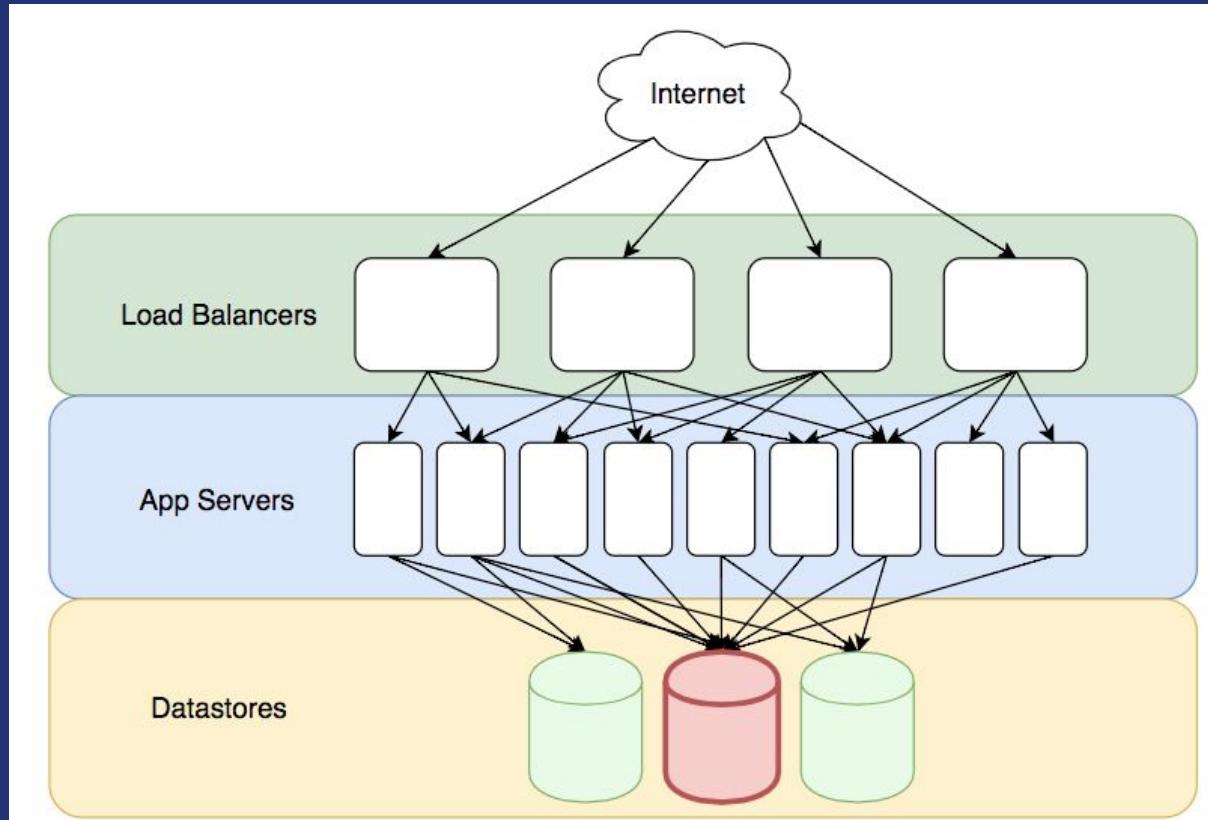
Sharding in Practice (routing)



Sharding in Practice (routing)



Sharding in Practice (balancing)



Sharding in Practice (balancing)

How do you move a shop like snowdevil.com?

- Copy data from shard1 to shard2
- Make shop read-only (acquire a lock on shop writes)
- Update routing table (UPDATE domains SET shard_id=2 WHERE ...)
- Unlock shop

db0

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | socks |
| 3 | 77 | laptop |
| 5 | 42 | hat |
| 7 | 42 | shirt |
| 9 | 77 | watch |

db1

| id | shop_id | data |
|-----------|----------------|-------------|
| 2 | 58 | umbrella |
| 4 | 58 | vase |

db0

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | socks |
| 3 | 77 | laptop |
| 5 | 42 | hat |
| 7 | 42 | shirt |
| 9 | 77 | watch |

db1

| id | shop_id | data |
|-----------|----------------|-------------|
| 2 | 58 | umbrella |
| 4 | 58 | vase |
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db0

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | socks |
| 3 | 77 | laptop |
| 5 | 42 | hat |
| 7 | 42 | shirt |
| 9 | 77 | watch |

db1

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | socks |
| 2 | 58 | umbrella |
| 4 | 58 | vase |
| 5 | 42 | hat |
| 7 | 42 | shirt |

db0

| id | shop_id | data |
|-----------|----------------|-------------|
| 3 | 77 | laptop |
| 9 | 77 | watch |
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db1

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | socks |
| 2 | 58 | umbrella |
| 4 | 58 | vase |
| 5 | 42 | hat |
| 7 | 42 | shirt |

db0

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | socks |
| 3 | 77 | laptop |
| 5 | 42 | hat |
| 7 | 42 | shirt |
| 9 | 77 | watch |

db0 binlog

| id | shop_id | data |
|-----------|----------------|-------------|
| 2 | 58 | umbrella |
| 4 | 58 | vase |
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db0

| id | shop_id | data |
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| 1 | 42 | socks |
| 3 | 77 | laptop |
| 5 | 42 | hat |
| 7 | 42 | shirt |
| 9 | 77 | watch |

db0 binlog

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| 707 | |
| 708 | |
| 709 | |
| 710 | |
| 711 | |
| 712 | |
| 713 | |
| 714 | |
| 715 | |
| 716 | |
| 717 | |
| 718 | |
| 719 | |
| 720 | |
| 721 | |
| 722 | |
| 723 | |
| 724 | |
| 725 | |
| 726 | |
| 727 | |
| 728 | |
| 729 | |
| 730 | |
| 731 | |
| 732 | |
| 733 | |
| 734 | |
| 735 | |

db0

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | socks |
| 3 | 77 | laptop |
| 5 | 42 | hat |
| 7 | 42 | shirt |
| 9 | 77 | watch |

db0 binlog

| | |
|---|---------------------------|
| 1 | 1 42 socks 1 42 gloves |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

db1

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | gloves |
| 2 | 58 | umbrella |
| 4 | 58 | vase |
| 5 | | |
| 6 | | |

db0

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | mitts |
| 3 | 77 | laptop |
| 5 | 42 | hat |
| 7 | 42 | shirt |
| 9 | 77 | watch |

db1

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | gloves |
| 2 | 58 | umbrella |
| 4 | 58 | vase |
| | | |
| | | |

db0

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | mitts |
| 3 | 77 | laptop |
| 5 | 42 | hat |
| 7 | 42 | shirt |
| 9 | 77 | watch |

db0 binlog

| | |
|---|---------------------------|
| 1 | 1 42 socks 1 42 gloves |
| 2 | 1 42 gloves 1 42 mitts |

db1

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | mitts |
| 2 | 58 | umbrella |
| 4 | 58 | vase |

db0

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | mitts |
| 3 | 77 | laptop |
| 5 | 42 | hat |
| 7 | 42 | pants |
| 9 | 77 | watch |

db0 binlog

| | |
|---|-------------|
| 1 | 1 42 socks |
| | 1 42 gloves |
| 2 | 1 42 gloves |
| | 1 42 mitts |
| 3 | 7 42 shirt |
| | 7 42 pants |

db1

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | mitts |
| 2 | 58 | umbrella |
| 4 | 58 | vase |
| 5 | 42 | hat |
| 7 | 42 | shirt |

db0

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | mitts |
| 3 | 77 | laptop |
| 5 | 42 | hat |
| 7 | 42 | pants |
| 9 | 77 | watch |

db0 binlog

| | |
|----------------------------|-------------|
| 1 | 1 42 socks |
| | 1 42 gloves |
| 2 | 1 42 gloves |
| | 1 42 mitts |
| 3 | 7 42 shirt |
| | 7 42 pants |
| shop locked, no new writes | |

db1

| id | shop_id | data |
|-----------|----------------|-------------|
| 1 | 42 | mitts |
| 2 | 58 | umbrella |
| 4 | 58 | vase |
| 5 | 42 | hat |
| 7 | 42 | pants |

How do you increase your capacity?

Horizontal
&
Vertical
Scaling

Caching

Load
Control

Sharding

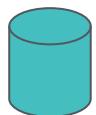
Scaling Shopify

- 2004: Snowdevil (single-tenant)
- 2005: Shopify (multi-tenant)
- 2013: Database split into multiple shards
- **2015: Backup datacenter for disaster recovery**
- **2016: Multiple active datacenters**
- 2020: Dedicated Storefront Renderer
- 2022: Put Servers Close to the Users
- 2025: Data Shaping

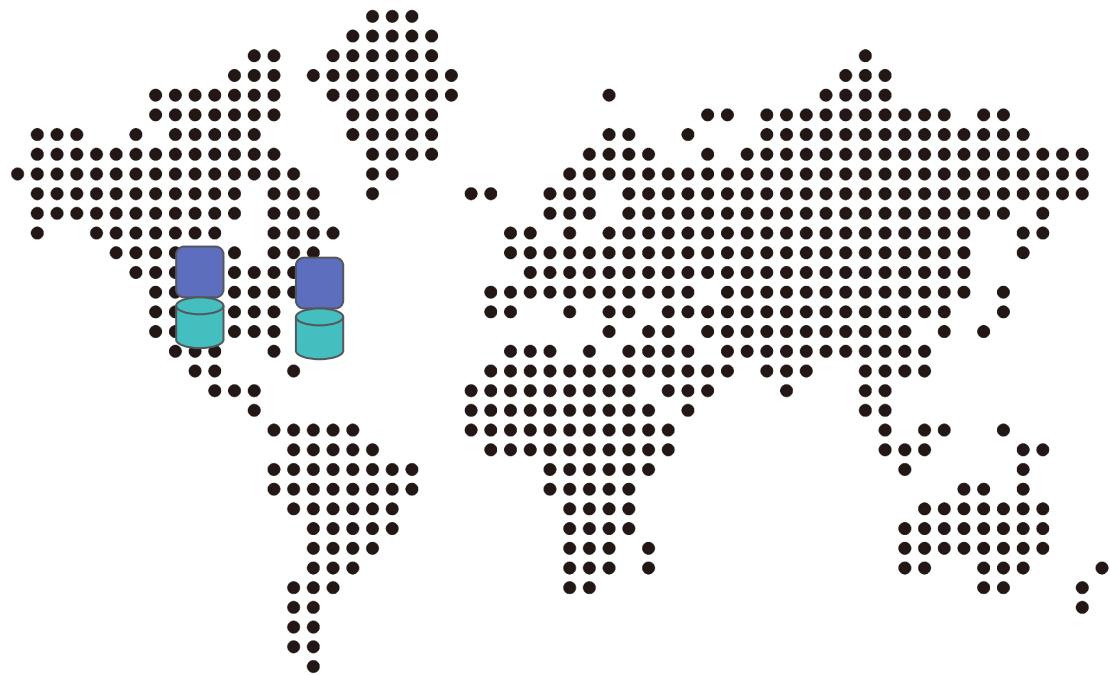




App Servers



Databases



Scaling Shopify

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- Home
- Orders 329
- Products
- Customers
- Analytics
- Marketing
- Discounts
- Apps

- SALES CHANNELS
- Online Store
- Facebook Shop
- Point of Sale

- Settings
- Open in services/internal
- Logged in as Shopify
- Hide DevUI

Here's what's happening with your store today.

No store activity

Your sales, orders, and sessions will show here.

Facebook Shop is not connected. Select a Facebook Page to use this sales channel.

[Dismiss](#)[Learn more](#)

Congratulations! It's time to get paid.

To receive money owed to you, we need a bit more information about your business

[Submit details](#)

50+ orders to fulfill

[>](#)

15 payments to capture 3 expiring soon

[>](#)

Keep your account secure by verifying your email address

[...](#)

If you get locked out of your account, Shopify can email you instructions to reset your password. To verify your email address, follow these steps:

Send a verification email to derek.stride@shopify.com
This confirms that Shopify can reach you.

Follow the link in the verification email
This confirms that you can access your email account.

[Send verification email](#)[Edit email address](#)[All channels](#)[Today](#)

TOTAL SALES

[Today](#)

There were no sales during this time.

TOTAL SALES BREAKDOWN

[Today](#)

There were no sales during this time.

TOTAL SALES BY CHANNEL

[Today](#)

There were no sales during this time.

TOP PRODUCTS

[Today](#)

There were no products sold during this time.

PAYOUT SCHEDULE

Balance

CA\$0.00

[View all payouts](#)

ACTIVITY

Online Store hid a theme: [Venture](#).

November 6, 2019, 2:28 PM EST

Online Store published a theme: [Jumpstart](#).

November 6, 2019, 2:28 PM EST

You published a collection: [Custom 2](#).

October 23, 2019, 5:26 PM EDT

[View all recent activity](#)

6s

Women

Curve

Men

FASHION NOVA MEN

Search



NEW ARRIVALS ▾ JEANS ▾ GRAPHIC TEES ▾ ACTIVE ▾ TOPS ▾ JACKETS & SWEATERS ▾ BOTTOMS ▾ BASICS ▾ ACCESSORIES ▾ PLUS+ ▾

SHOP ALL MENS ▾ SALE ▾



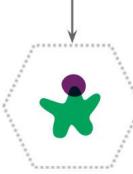
Monolith



Old
authentication
capability

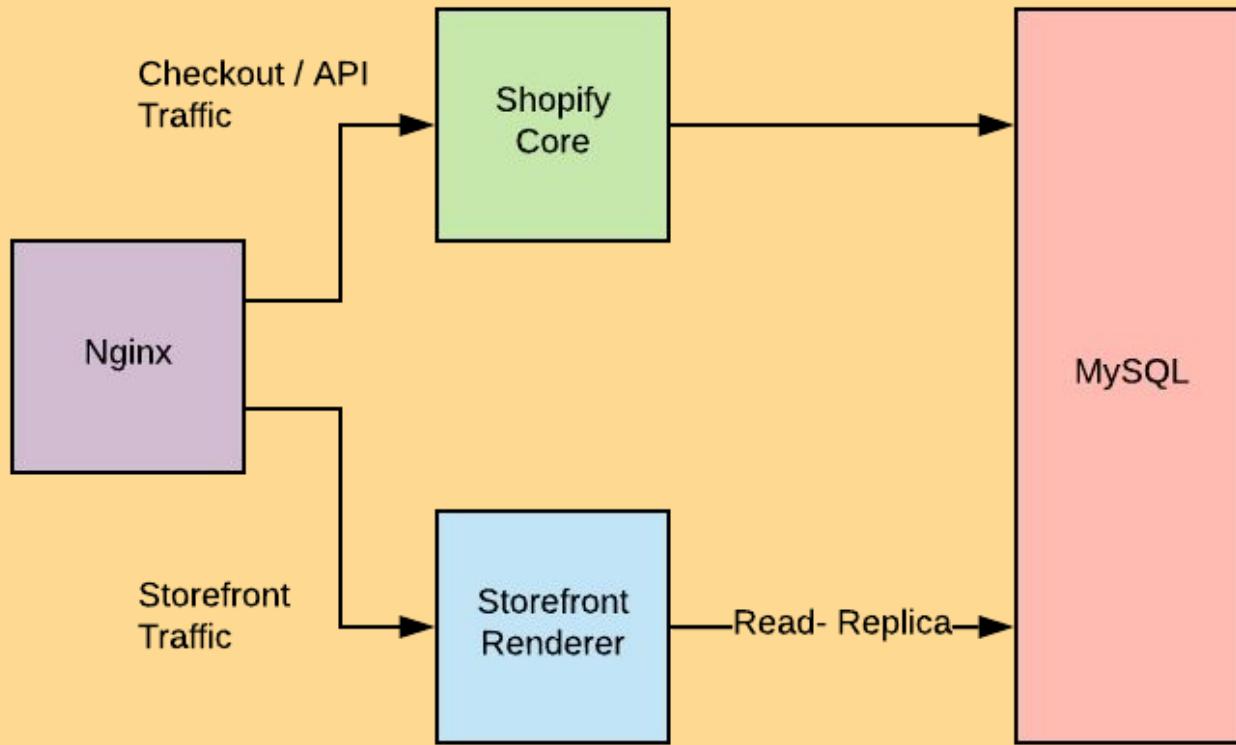


Monolith

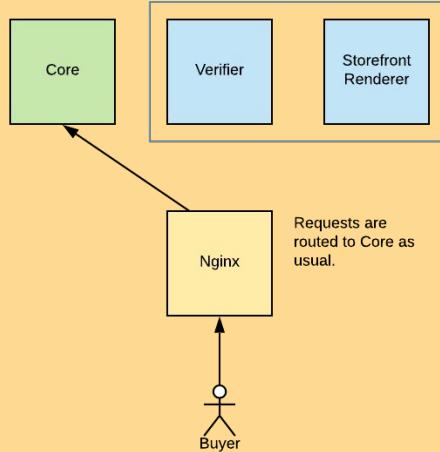


New
authentication
service

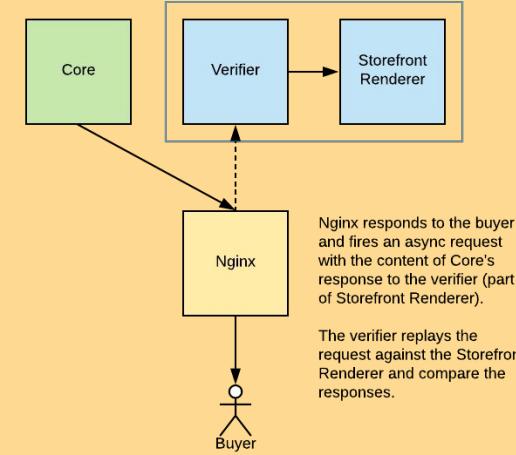
Splitting the Monolith



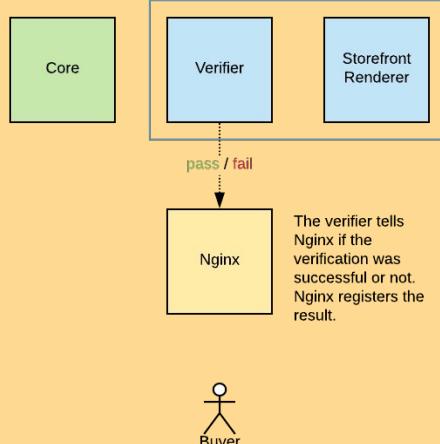
1.



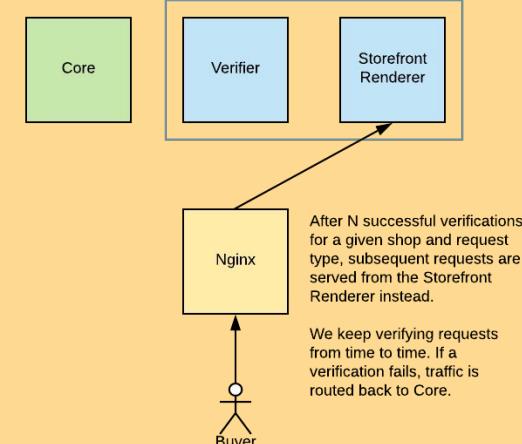
2.



3.



4.



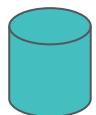
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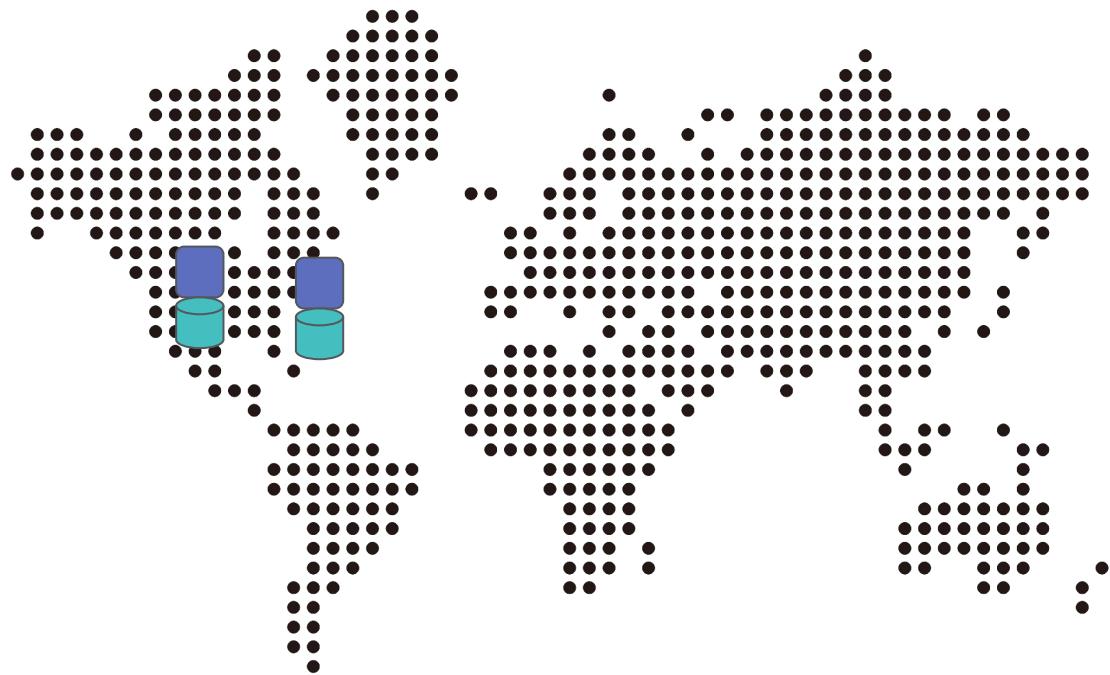




App Servers

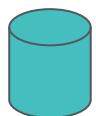


Databases

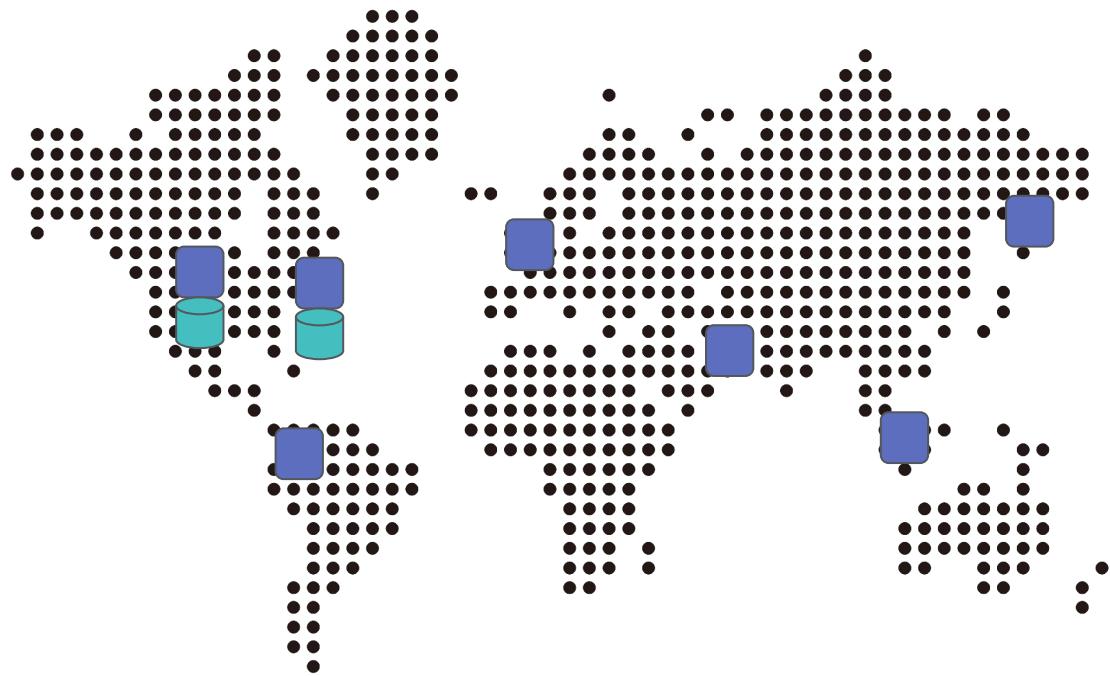




App Servers

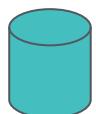


Databases

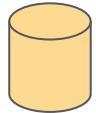




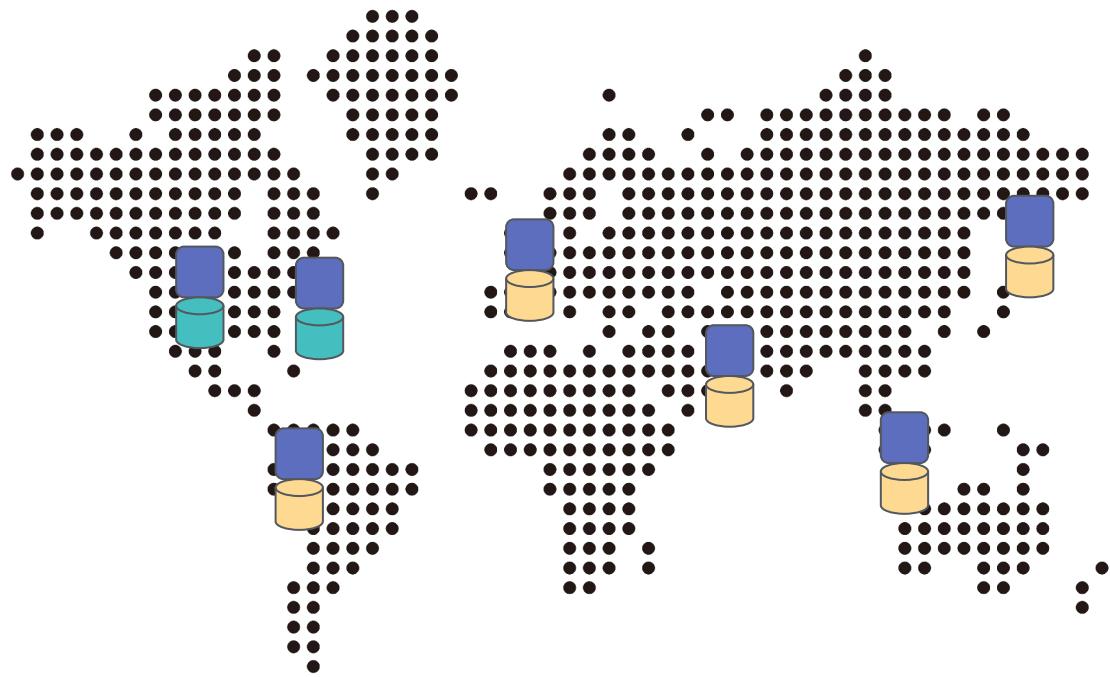
App Servers



Full Databases



Partial Databases



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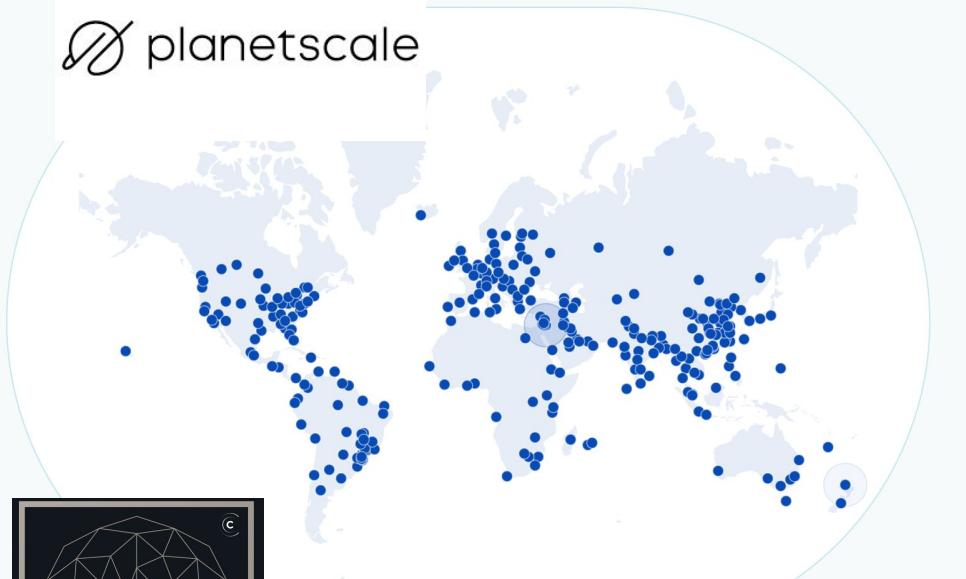


Thanks ↑↓



Put your servers close to your users

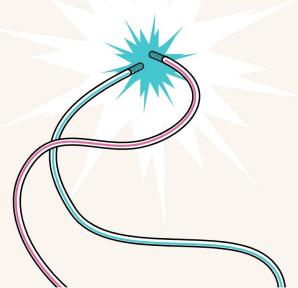
∅ planetscale



CLOUDFLARE



HOTWIRE
HTML OVER THE WIRE



Thanks ↑↓



Hi, I'm Derek Stride

Studied @ Carleton graduated 2018

- Intern @ Shopify for 16 months

Full-time @ Shopify since 2018

- Worked on Product: Orders
- Last 6 years: Scaling Shopify's Storefront

