Architecture in Motion

How Adyen achieved 100x

Bert Wolters Angel Bravo

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Business. Not boundaries.

Traditional vs Today

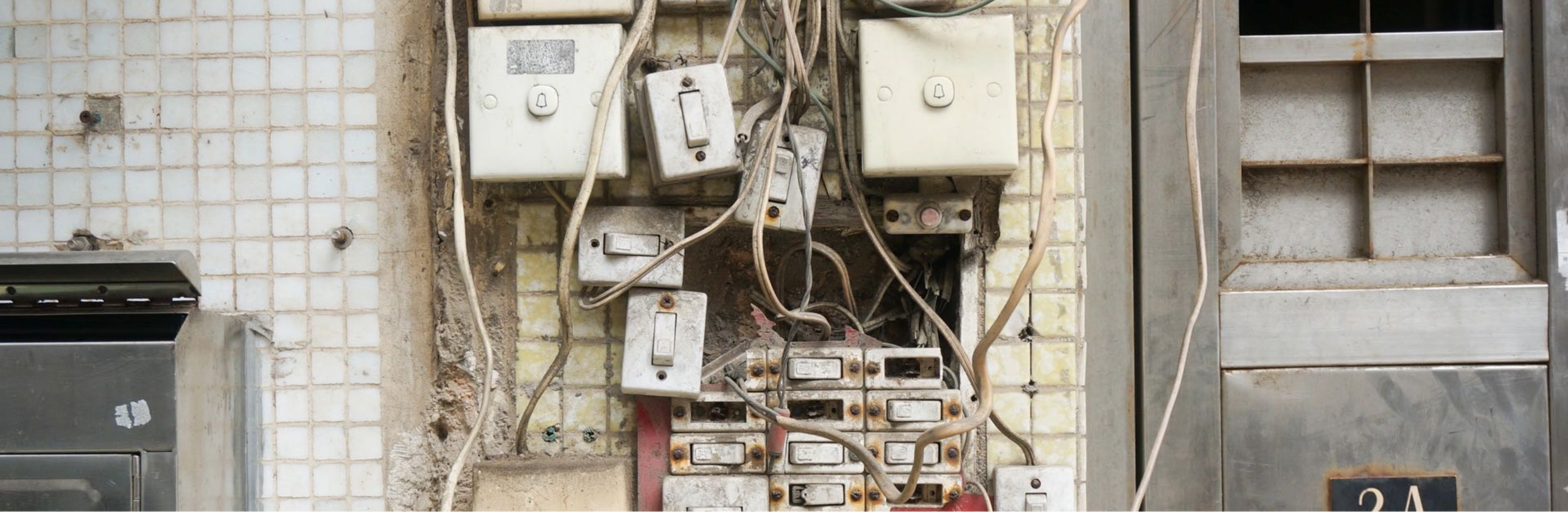
Customers are in full control

$10B

On Singles' Day in China, $10Billion was processed in the first hour

80%

On Black Friday in the U.S., nearly 80% of retailers' online traffic took place on mobile.



Companies face a lack of functionality, flexibility and innovation

Stuck with legacy technology that lead to poor user experience.

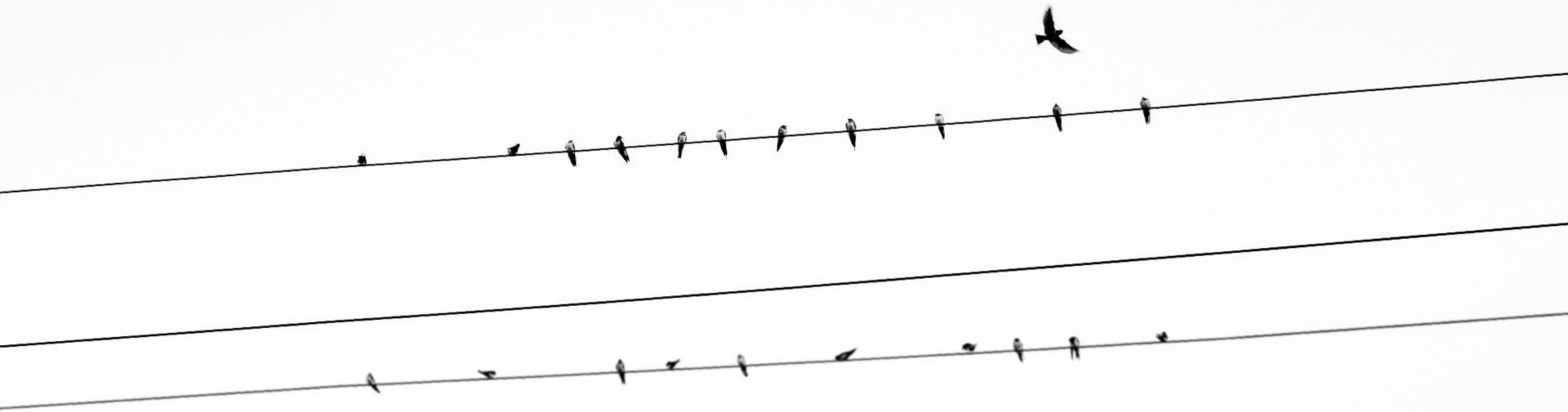
Innovative brands are reinventing commerce

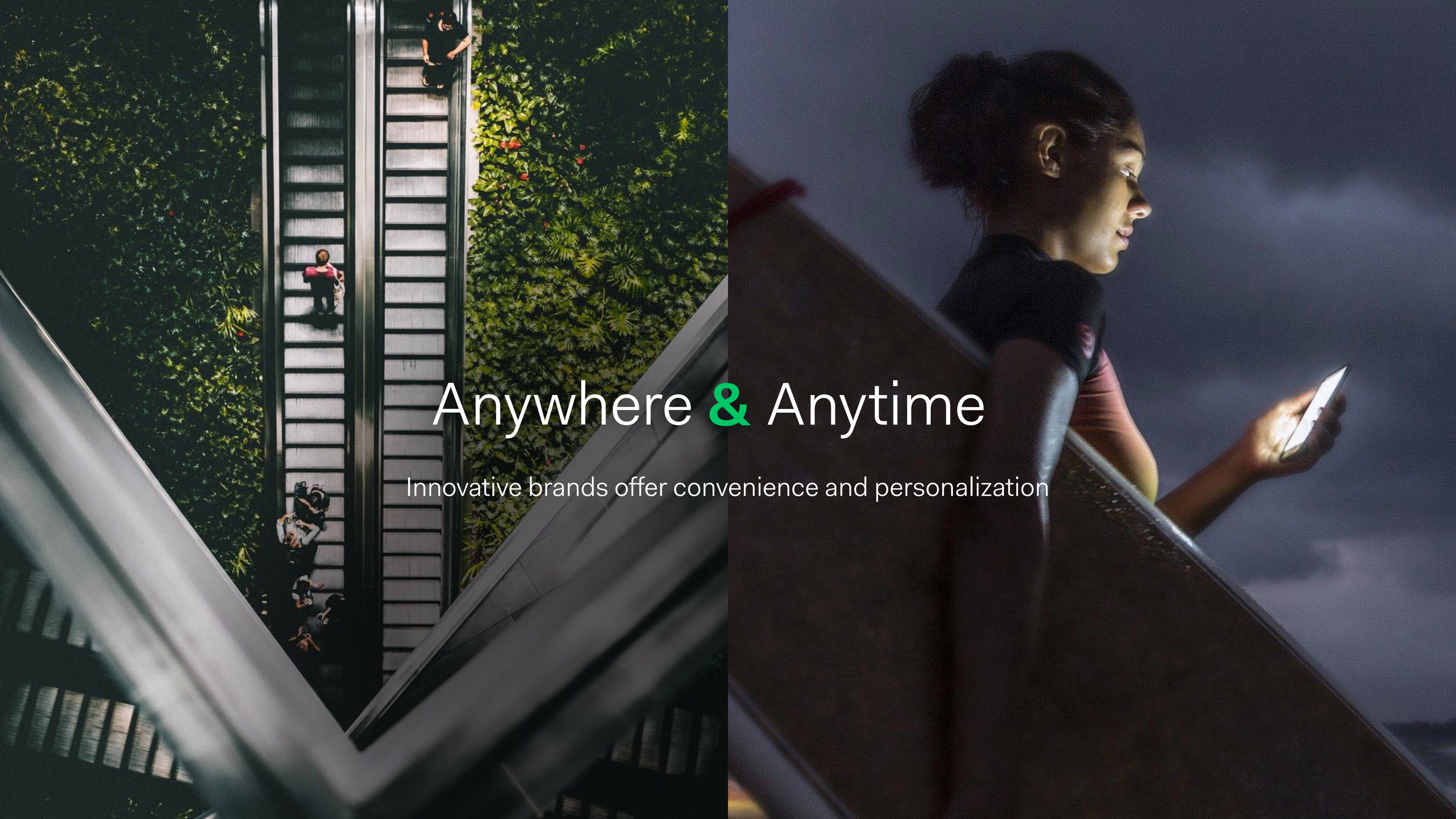
Tech companies

Traditional brands

So what's the common thread?

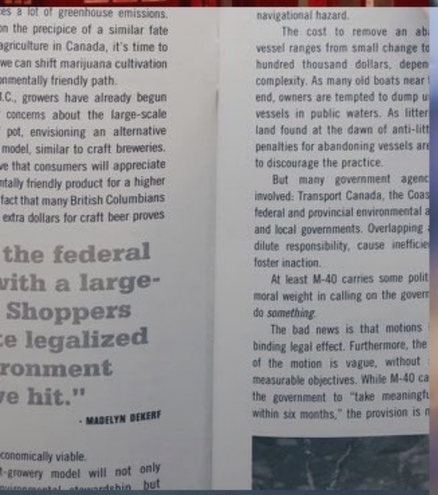
Dare to take a different approach.



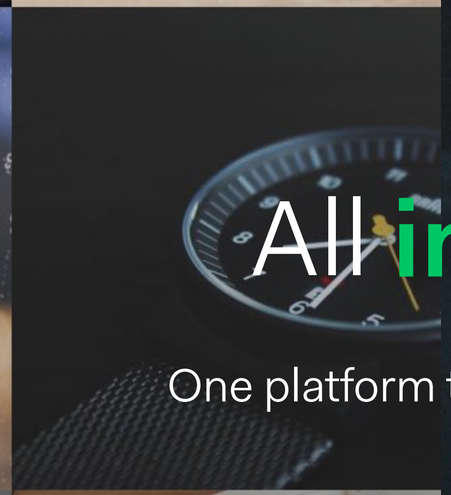


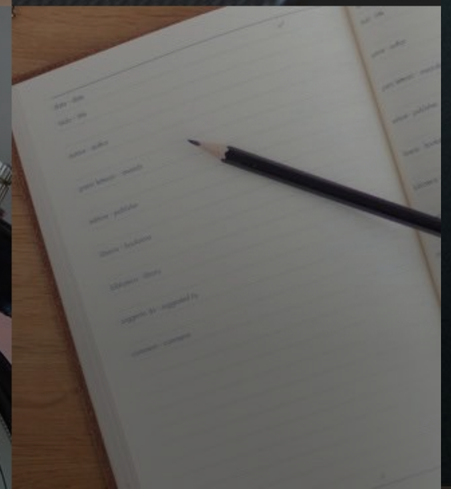
Anywhere & Anytime

Innovative brands offer convenience and personalization


es a lot of greenhouse emissions.
on the precipice of a similar fate
agriculture in Canada, it's time to
we can shift marijuana cultivation
onmentally friendly path.
.C., growers have already begun
concerns about the large-scale
pot, envisioning an alternative
model, similar to craft breweries.
ve that consumers will appreciate
ntally friendly product for a higher
fact that many British Columbians
extra dollars for craft beer proves
the federal
with a large-
Shoppers
te legalized
ronment
ve hit."
- MADELYN DEKERF
conomically viable.
-growery model will not only

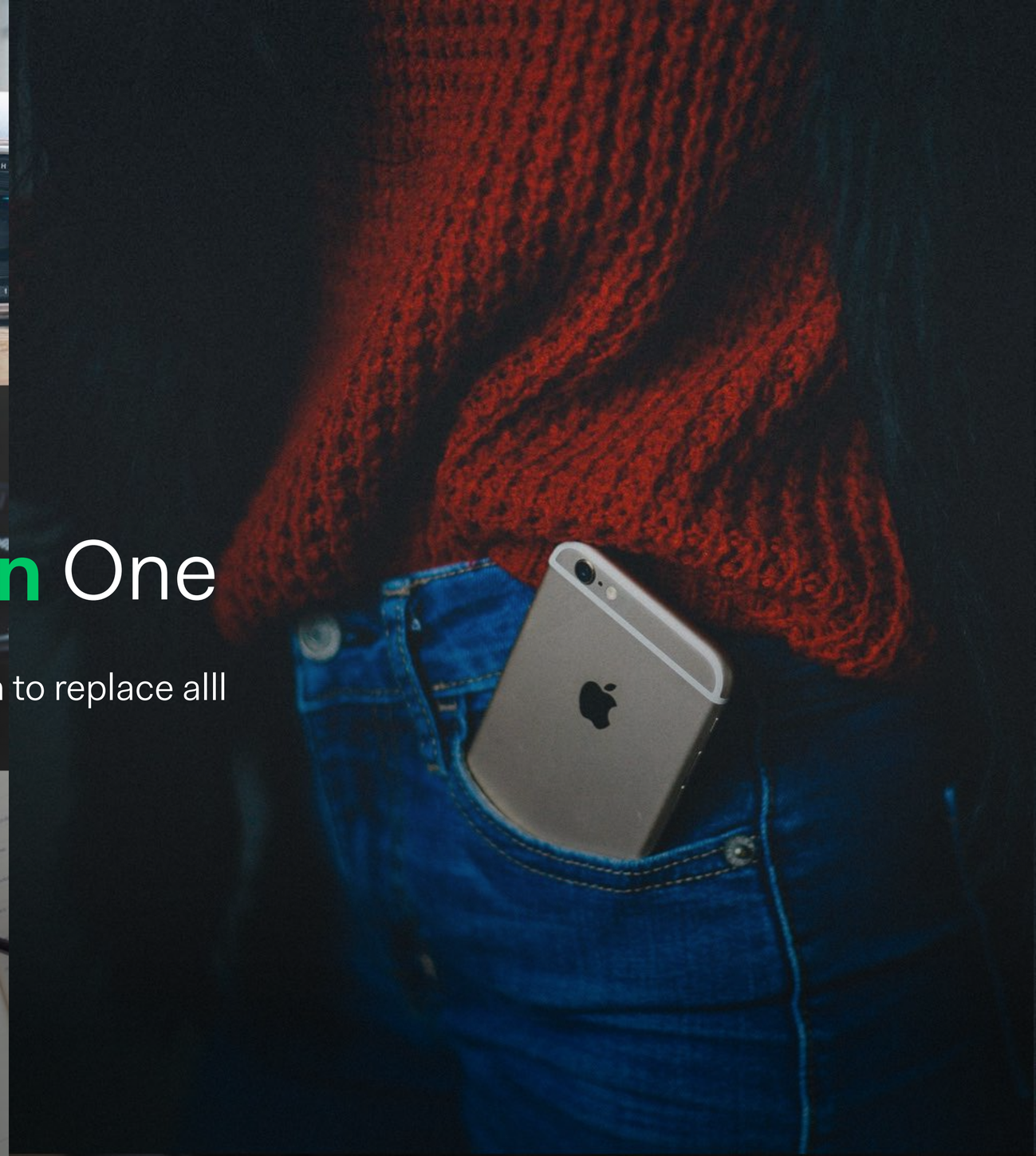
navigational hazard.
The cost to remove an ab
vessel ranges from small change t
hundred thousand dollars, depen
complexity. As many old boats near
end, owners are tempted to dump u
vessels in public waters. As litter
land found at the dawn of anti-litt
penalties for abandoning vessels are
to discourage the practice.
But many government agenc
involved: Transport Canada, the Coas
federal and provincial environmental a
and local governments. Overlapping
dilute responsibility, cause inefficie
foster inaction.
At least M-40 carries some polit
moral weight in calling on the goverr
do *something*.
The bad news is that motions
binding legal effect. Furthermore, the
of the motion is vague, without
measurable objectives. While M-40 ca
the government to "take meaningfu
within six months," the provision is n





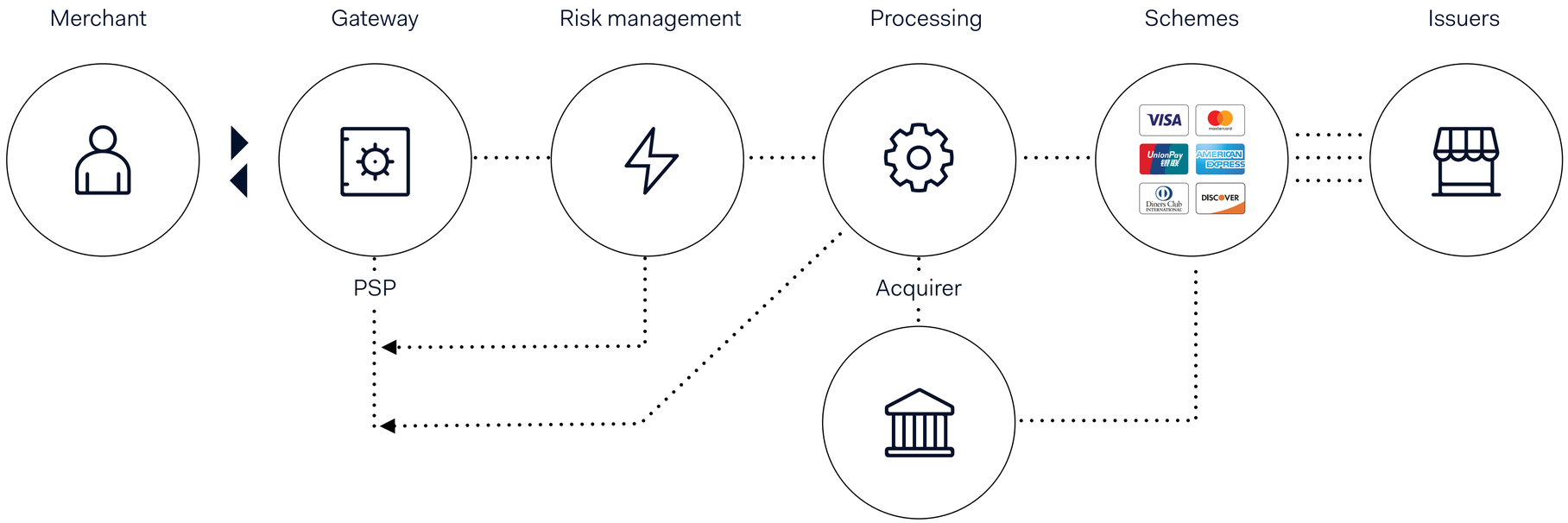
All in One

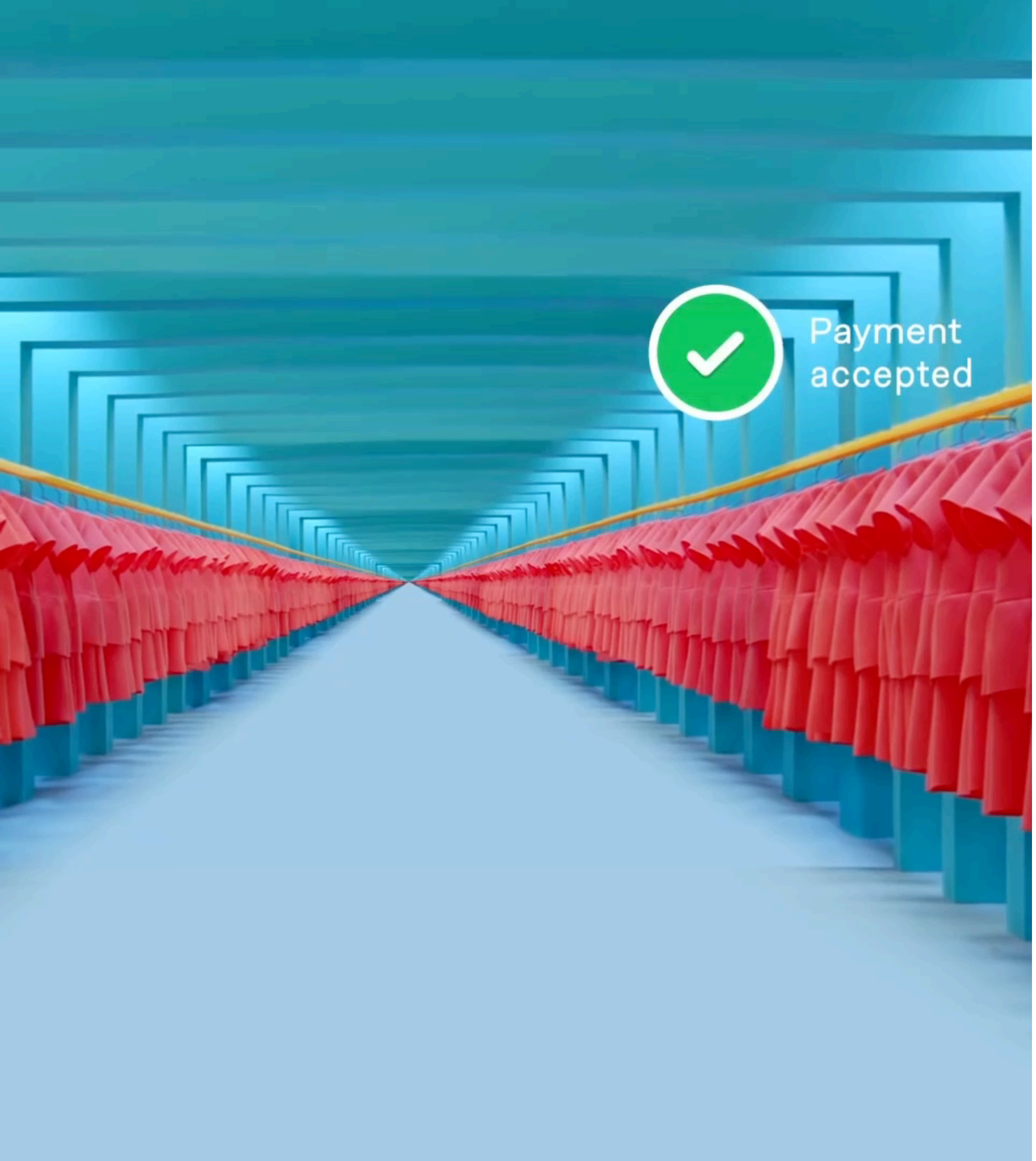
One platform to replace alll



One modern platform

Traditional value chain





We believe that our technology will help you sell more

- Rich data insights
- A frictionless shopper experience
- Global reach in one platform

WAVE
LEADER 2016

WAVE
LEADER 2018

WAVE
LEADER 2020

"Adyen's omnichannel payments processing product and global acquiring footprint mean that merchants can avoid the operational headaches that a multi-back-end architecture creates, it does so without losing its tech focus, leveraging its data and machine learning to effectively boost authorization rates.

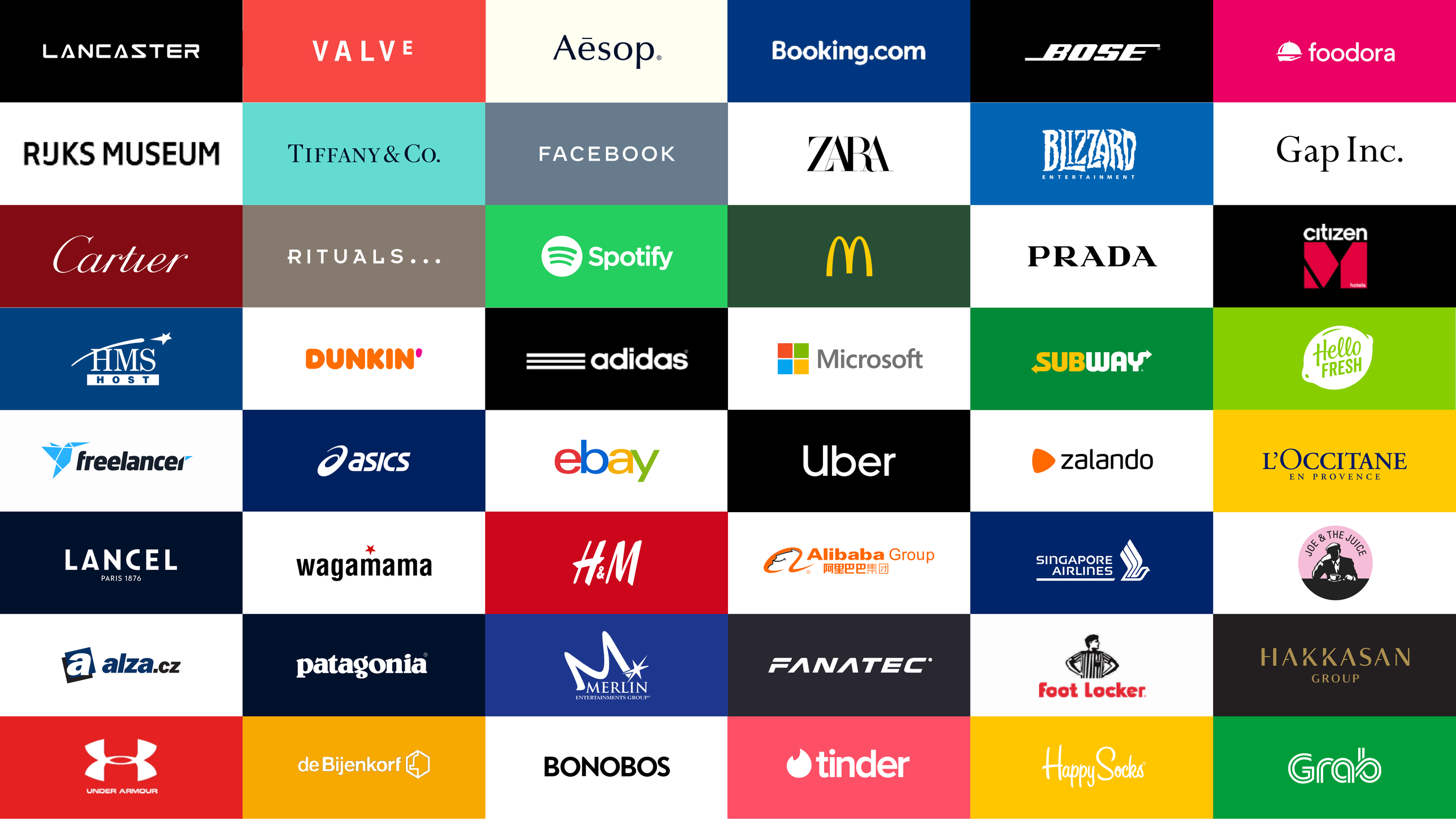
FORRESTER®

“Adyen has exploded along with its customers, startup Internet giants including Facebook, Uber and Spotify.”

THE WALL STREET JOURNAL.

“Adyen has carved out a powerful place by laying down smooth payment rails all over the world for the biggest names in tech.”

Forbes


LANCASTER
VALVE
Aēsop
Booking.com
BOSE
foodora
RIJKS MUSEUM
TIFFANY & CO.
FACEBOOK
ZARA
BLIZZARD ENTERTAINMENT
Gap Inc.
Cartier
RITUALS...
Spotify
PRADA
citizen hotels
HMS HOST
DUNKIN'
adidas
Microsoft
SUBWAY
HelloFRESH
freelancer
asics
ebay
Uber
zalando
L'OCCITANE EN PROVENCE
LANCEL PARIS 1876
wagamama
H&M
Alibaba Group 阿里巴巴集团
SINGAPORE AIRLINES
JOE & THE JUICE
alza.cz
patagonia
MERLIN ENTERTAINMENTS GROUP
FANATEC
Foot Locker
HAKKASAN GROUP
UNDER ARMOUR
de Bijenkorf
BONOBOS
tinder
Happy Socks
Grab

This is Adyen

All technology built in-house

Full control
Control over software and value chain providing more control over the payment and fast rollout of innovations and updates

Worldwide platform
250+ payment methods

1700+ global employees

23 Global offices

Simple integration
Unrivalled simple integration and self boarding terminals

The Adyen Way of Engineering

We prioritise **current merchant experience** over future features

To think like the **merchant** we **go meet them**

We design for **20x**

Expose your work **early**

We are all **designers**, **architects**, **coders**, **testers**, **security officers** and **operations engineers**

We all make mistakes, but we **seek help** as soon as we find out

You own when, where and how **your code goes live**

Your code should be understandable **at 4am** under stress

We embrace **new technology** when it has clear benefits

Our tech stack is **open source** or **built in-house**

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Business. Not boundaries.

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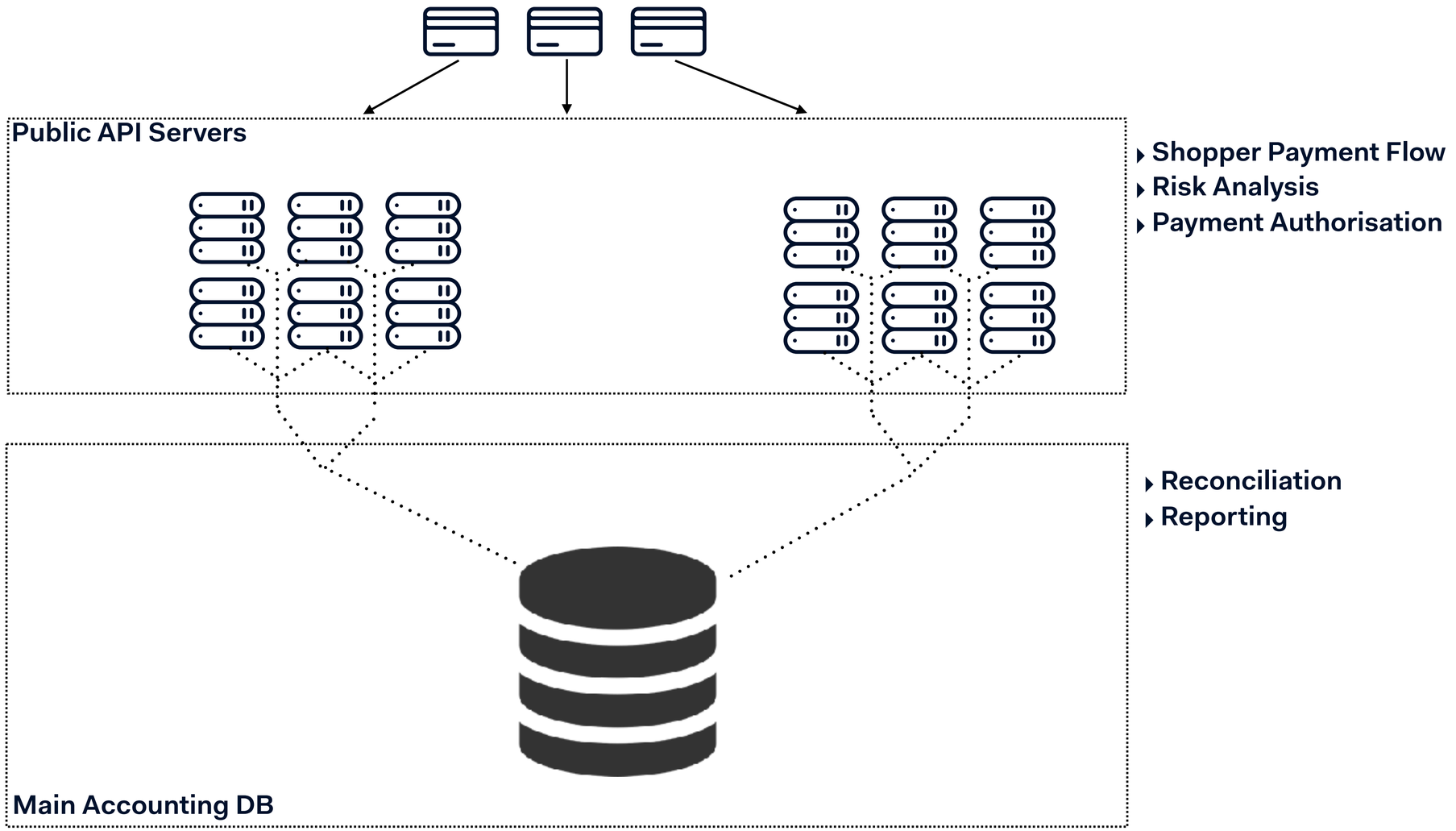
High Level Architecture

(Pre-Adyen)

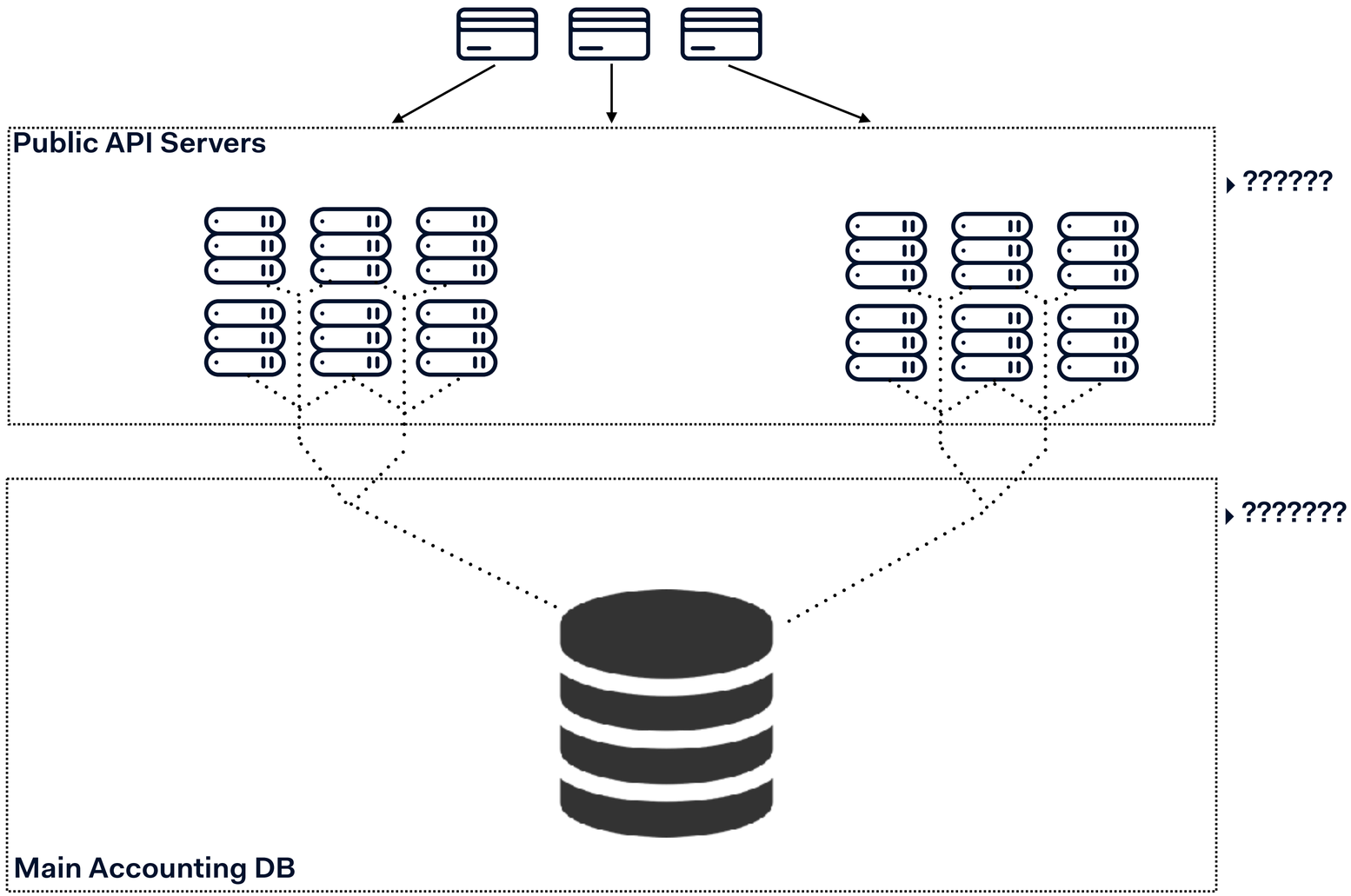


- Shopper Payment Flow
- Risk Analysis
- Payment Authorisation

- Reconciliation
- Reporting

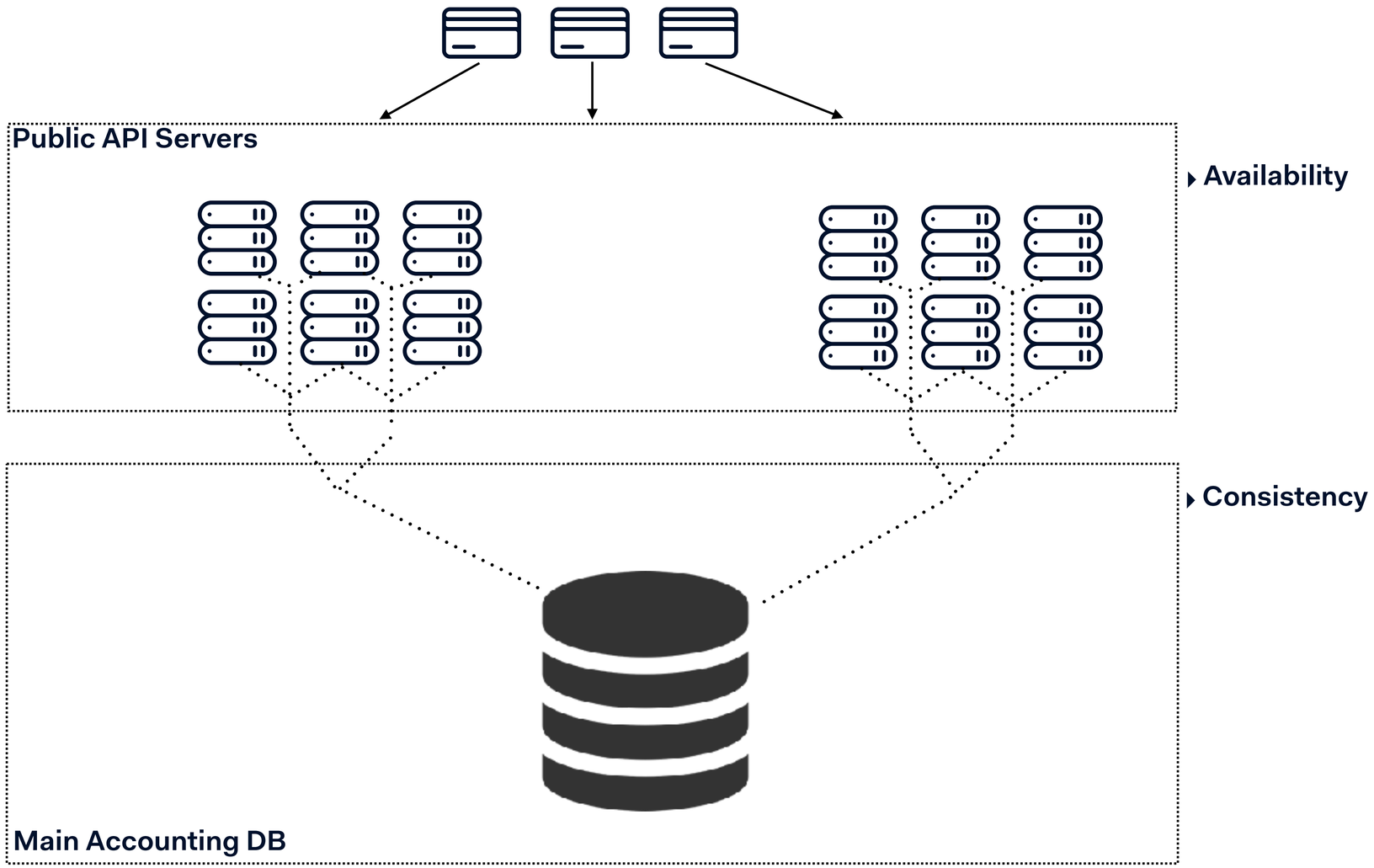
High Level Architecture

(Pre-Adyen)



High Level Architecture

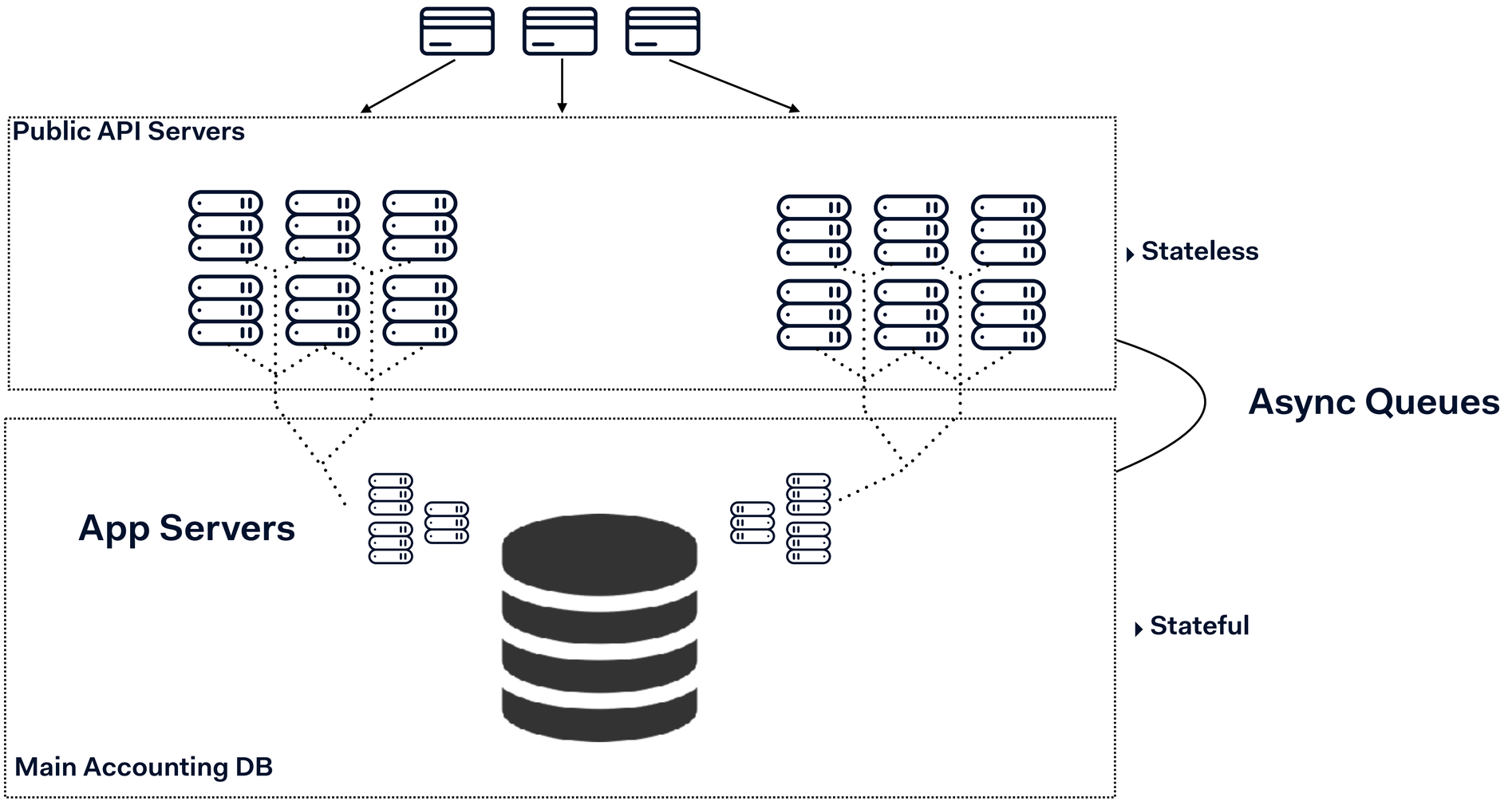
(Pre-Adyen)



Design for
breakage

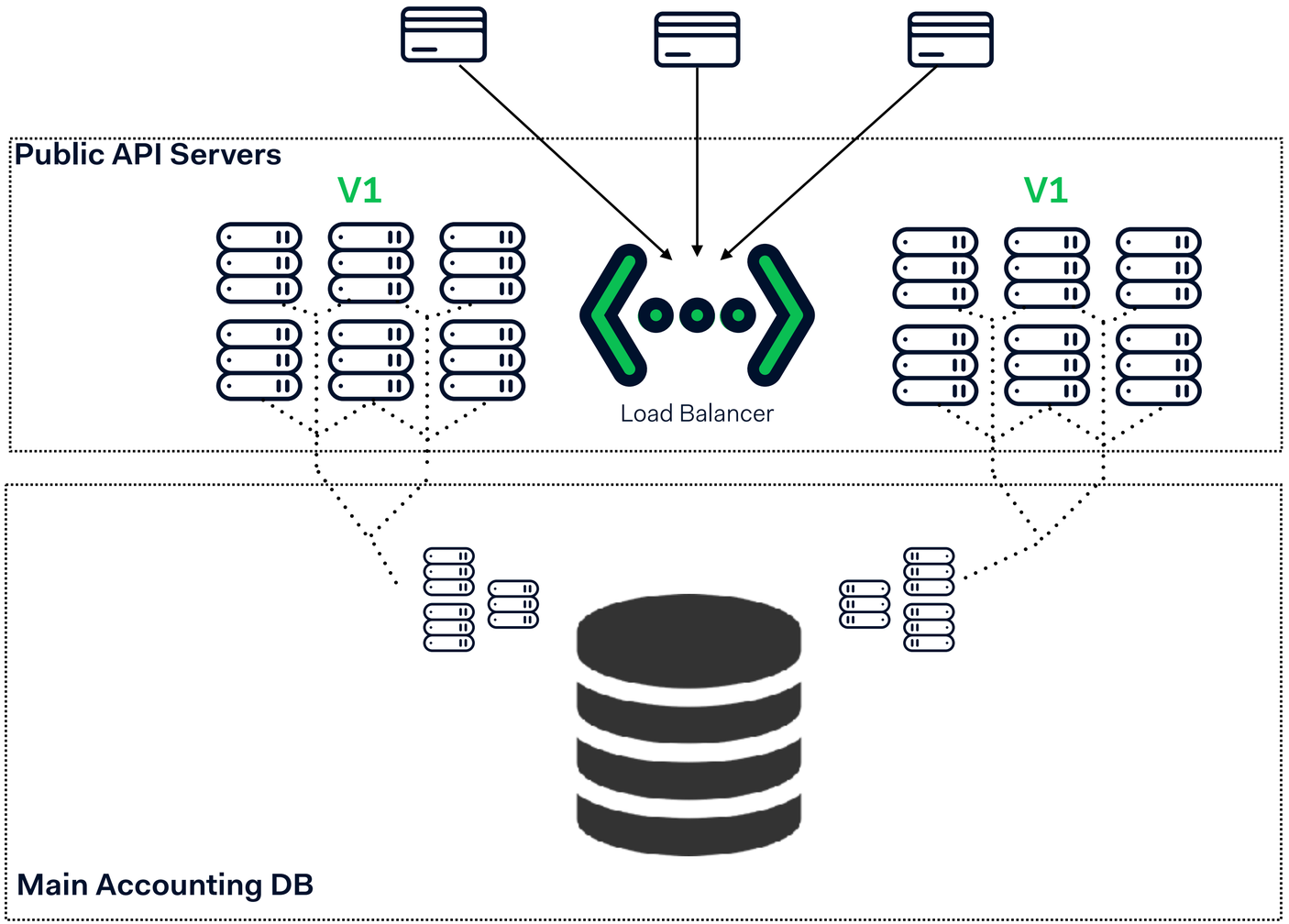
High Level Architecture

(First years)



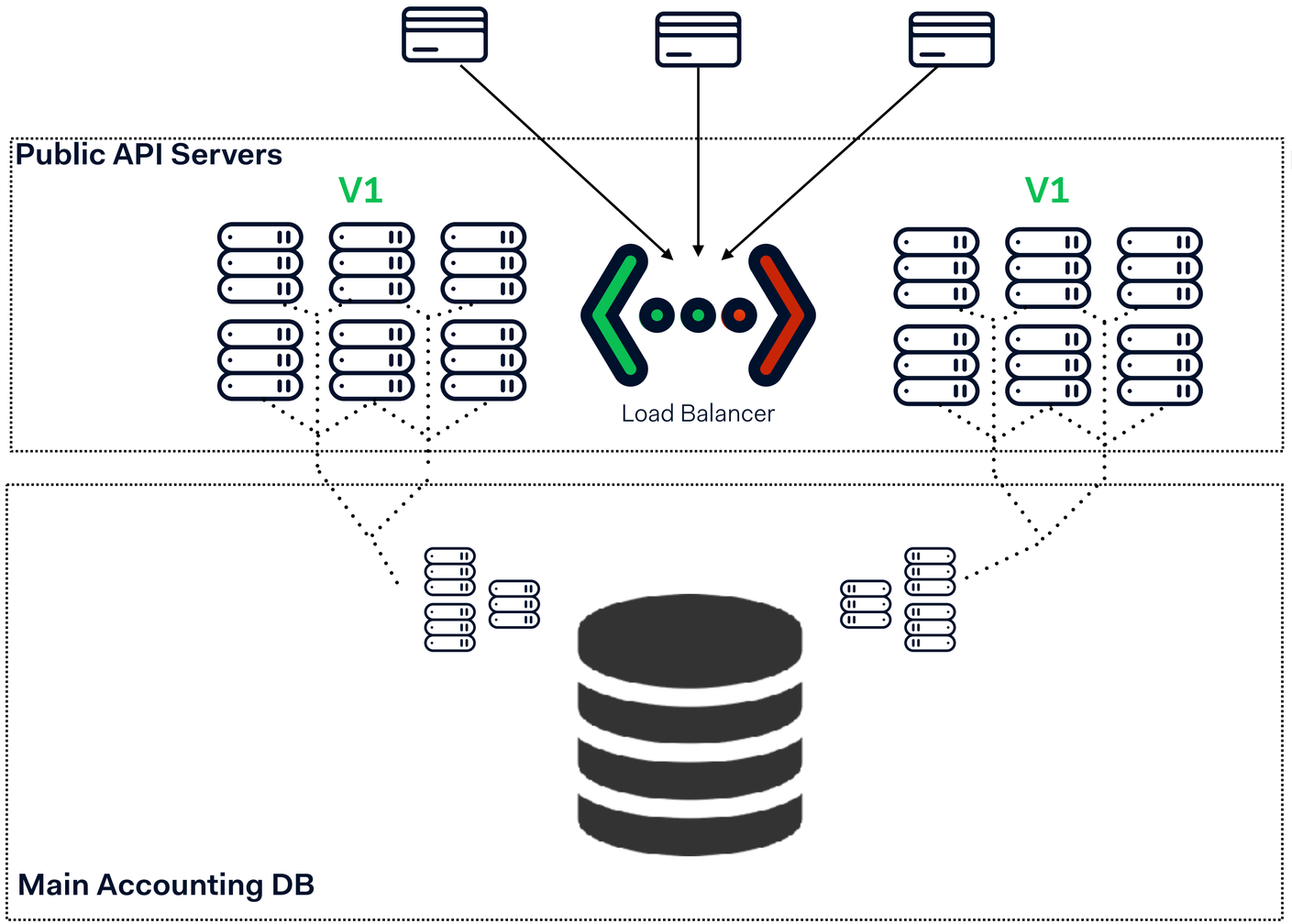
High Level Architecture

Front End Maintenance



High Level Architecture

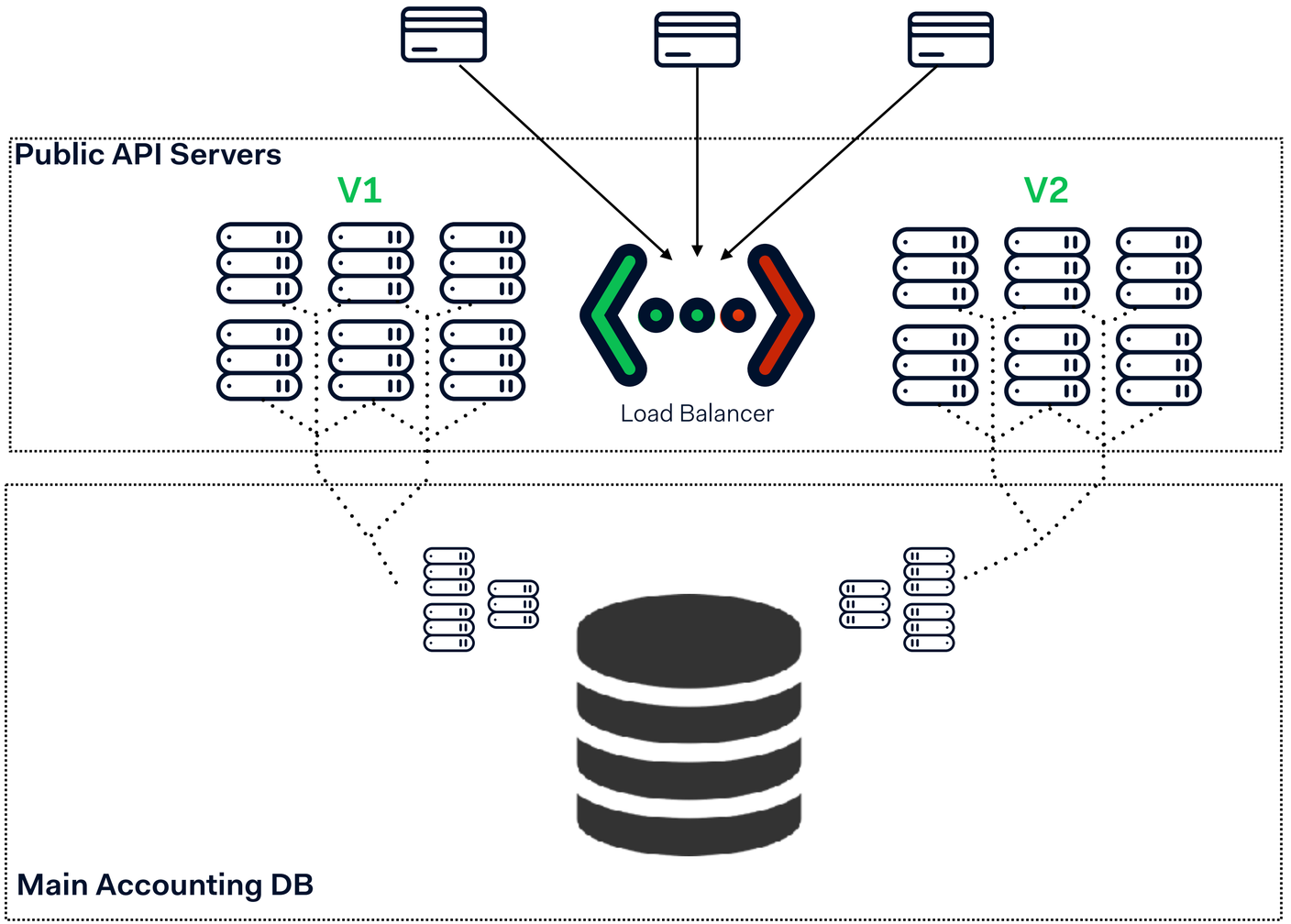
Front End Maintenance



Drain traffic from one DC by removing from the LB

High Level Architecture

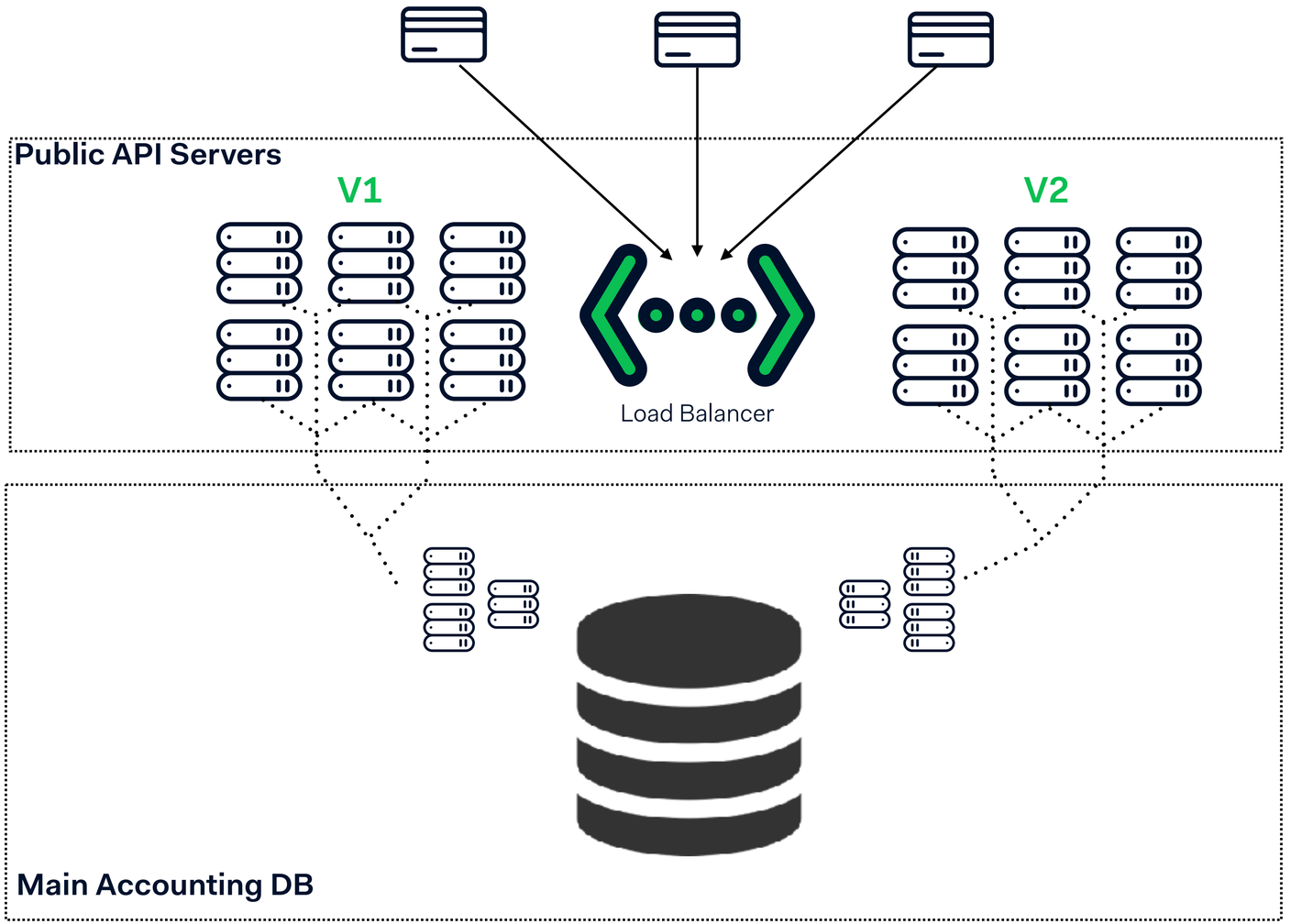
Front End Maintenance



- Drain traffic from one DC by removing from the LB
- Install new version of application

High Level Architecture

Front End Maintenance



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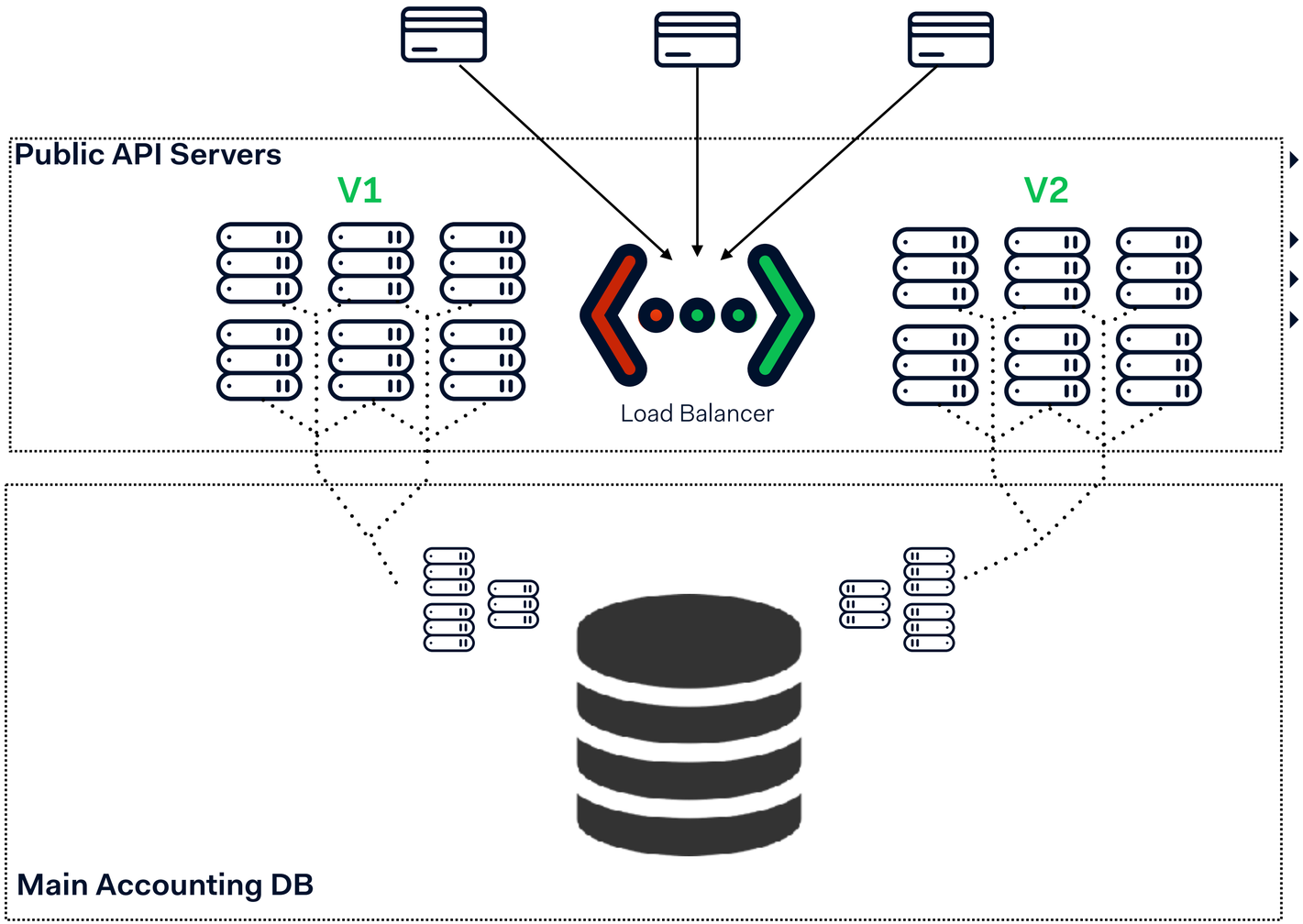
High Level Architecture

Front End Maintenance



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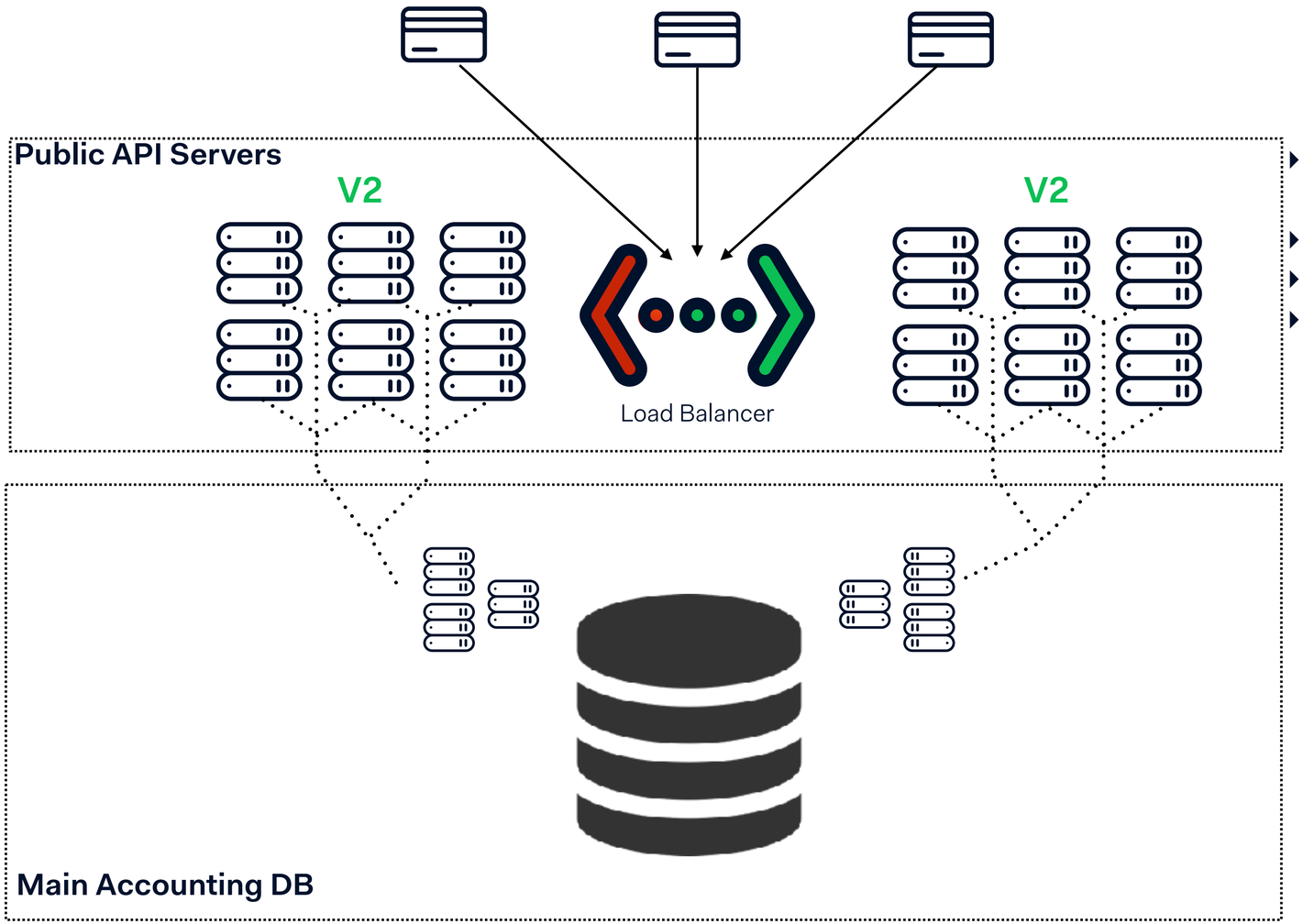
- Repeat

High Level Architecture

Front End Maintenance



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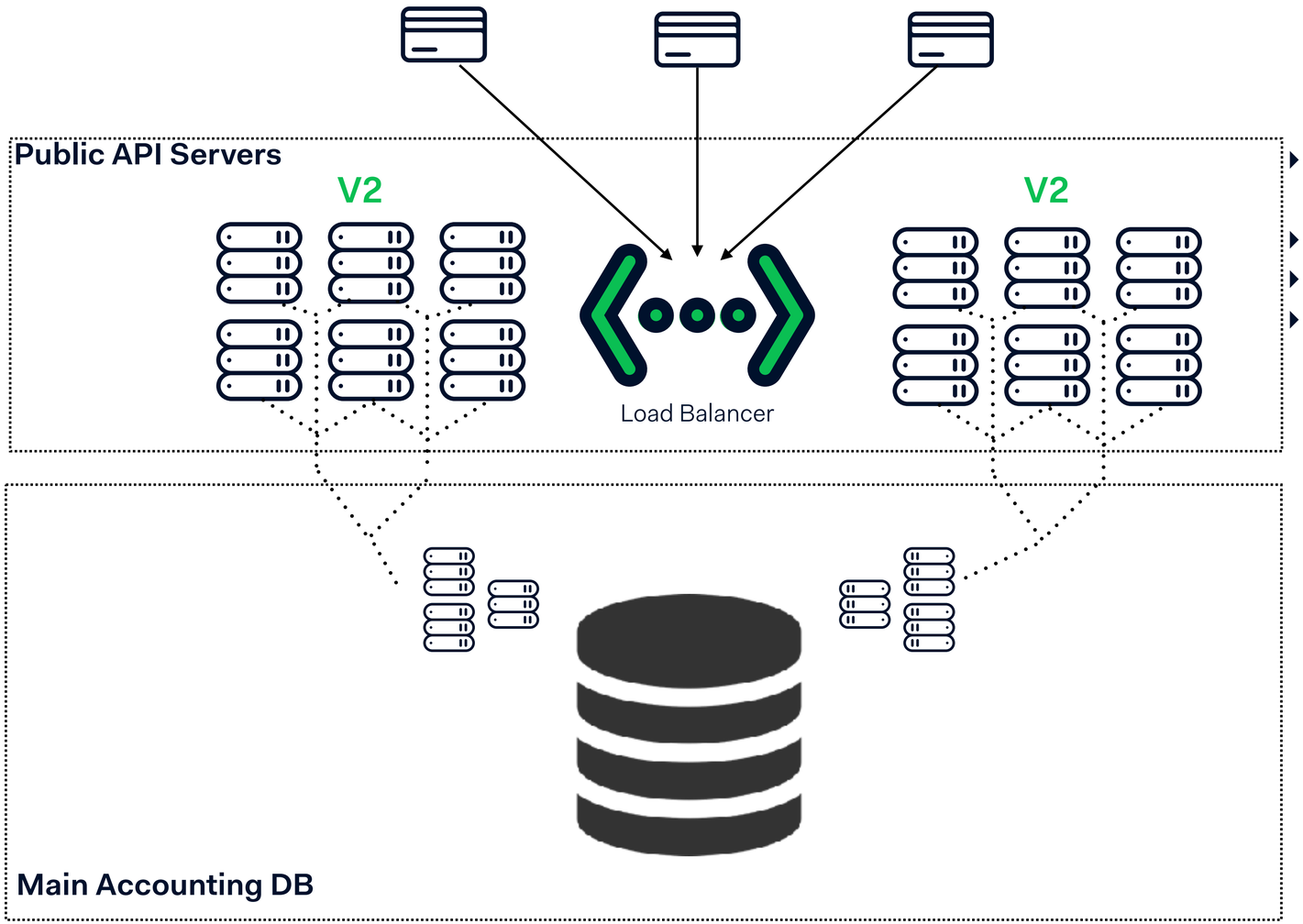
High Level Architecture

Front End Maintenance



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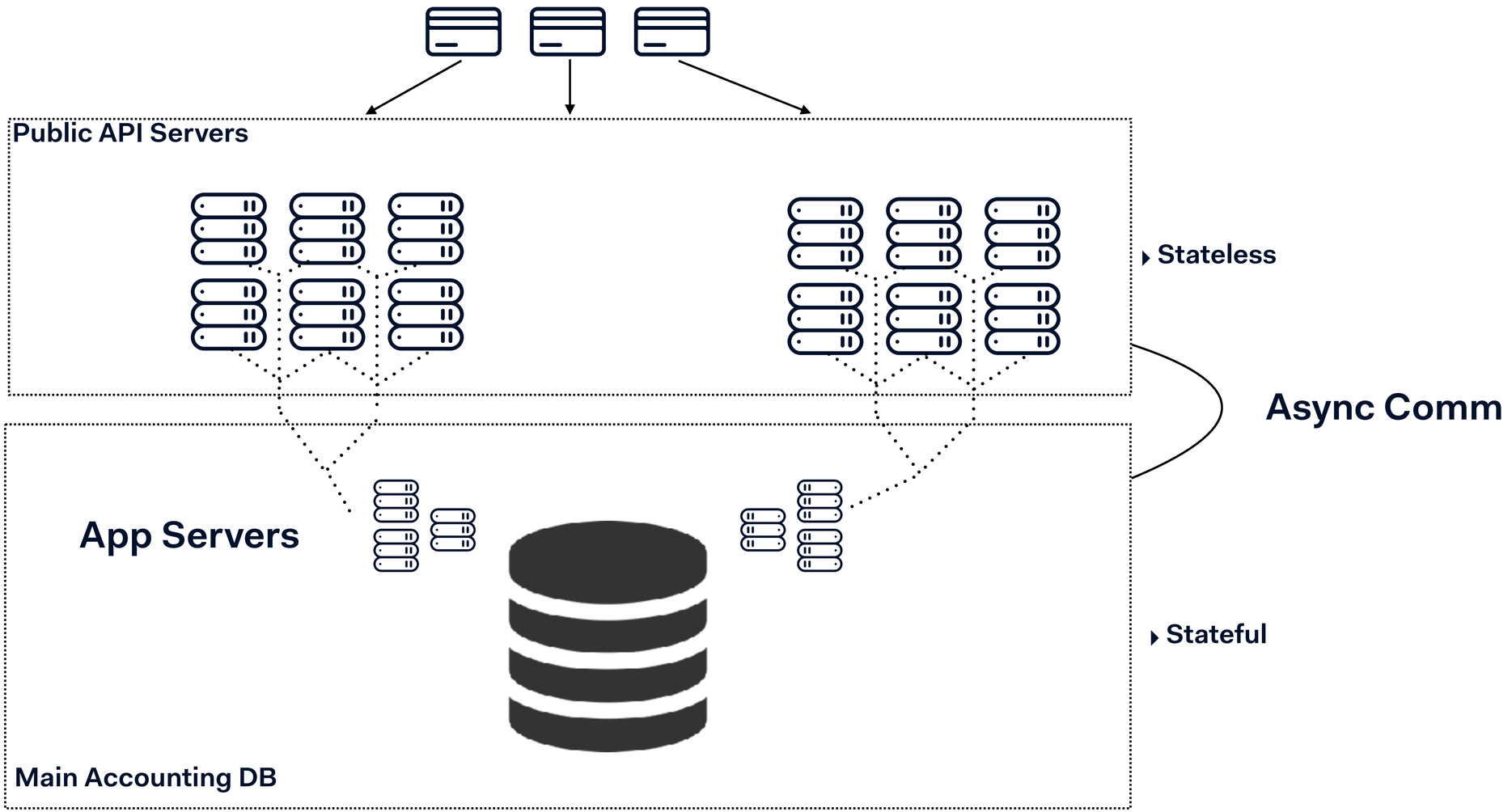
High Level Architecture

Consequence of being Stateless



High Level Architecture

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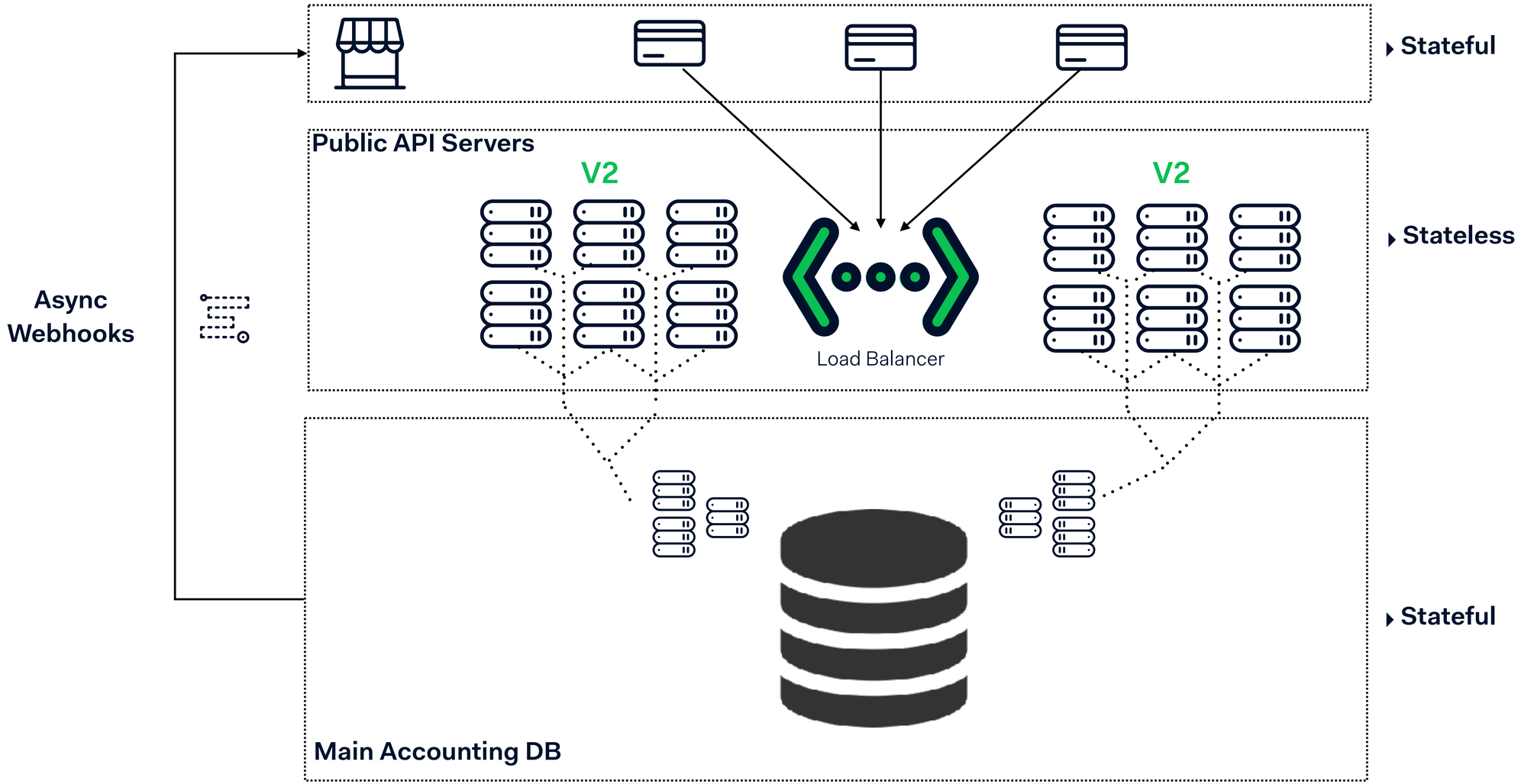
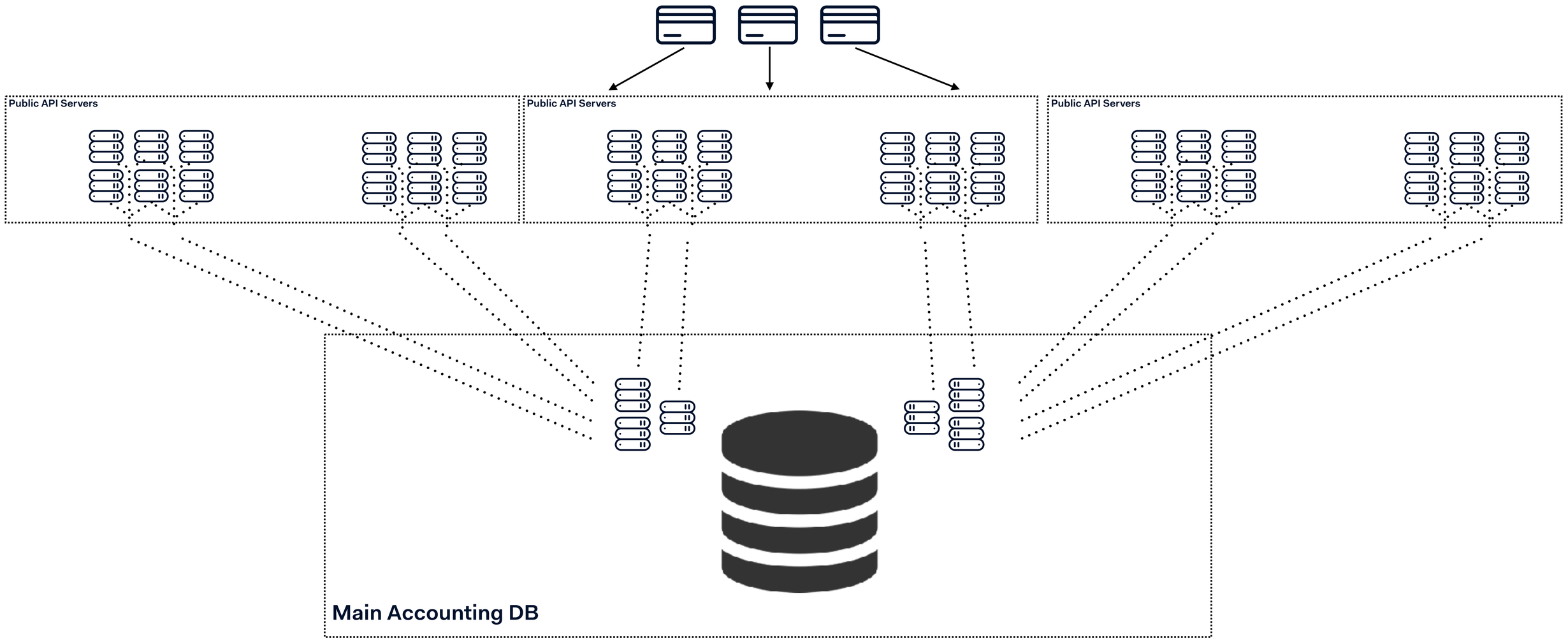


High Level Architecture

The Challenge



Growing Exponentially

Going to the $1 Trillion in processed volume

Scalability Challange

API (micro)services designed to be highly redundant and stateless.

Scale linearly with more hardware.

However main payment accounting system was running > 70TB on a single PostgreSQL instance at up to 25k tps.

At 2-4x, optimisation and/or bigger hardware solve the problem.

At 20x this is no longer sufficient and requires re-architecting.

Marbles

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Generating Reports/ Batch Files

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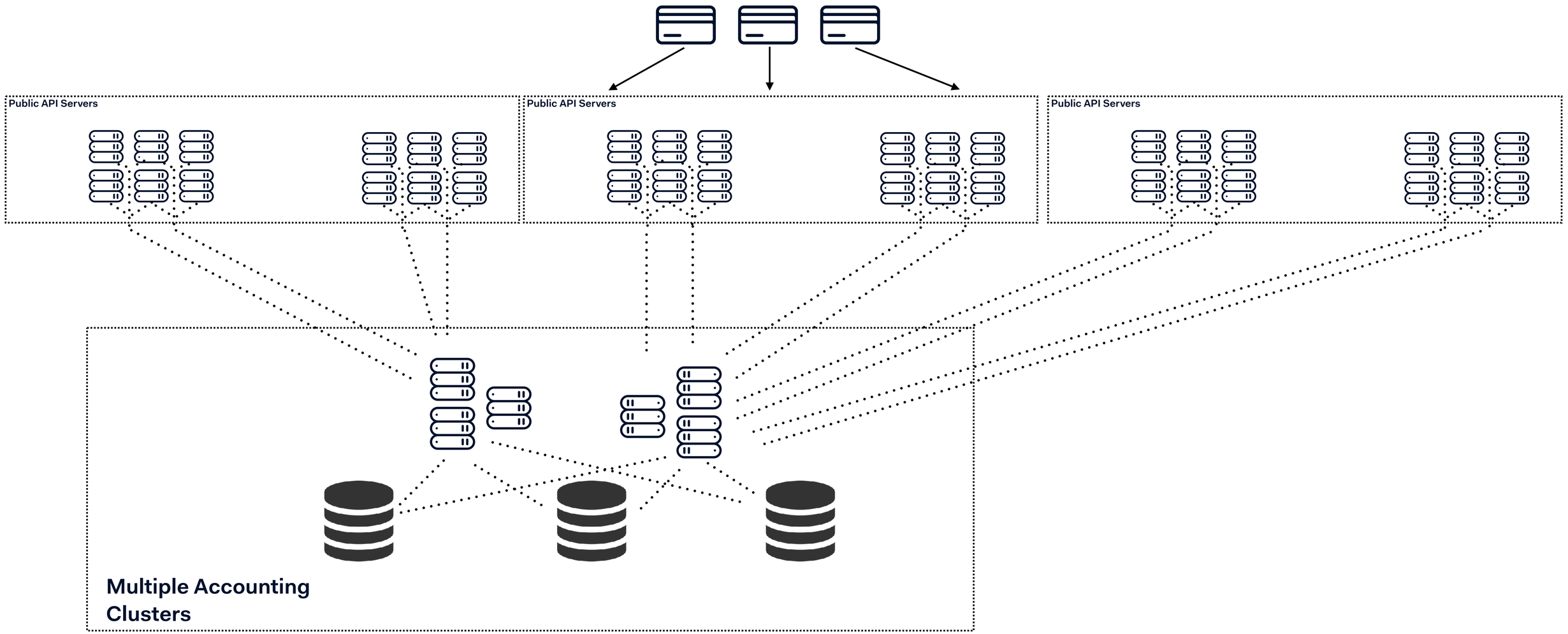
High Level Architecture

The Solution



More Marbles

ad

undaries.

Request:

```
{
  "merchantAccount" : "TestMerchant",
    "modificationAmount" : {
    "value" : 500,
    "currency" : "EUR"

  },
  "originalReference" : "931354792477061O",
  "reference" : "YourModificationReference"
}
```

Response:

```
{
  "pspReference" : "8312534564722331",
  "response" : "[refund-received]"
}
```

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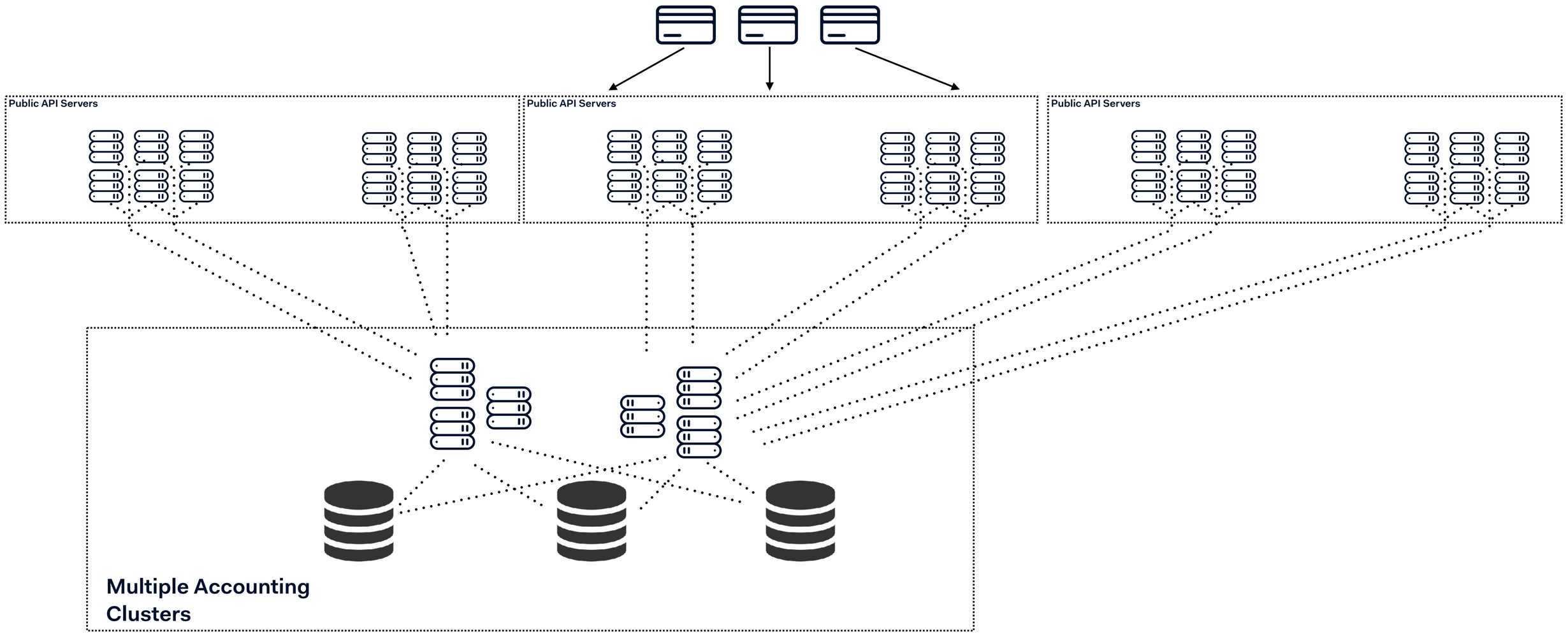
High Level Architecture

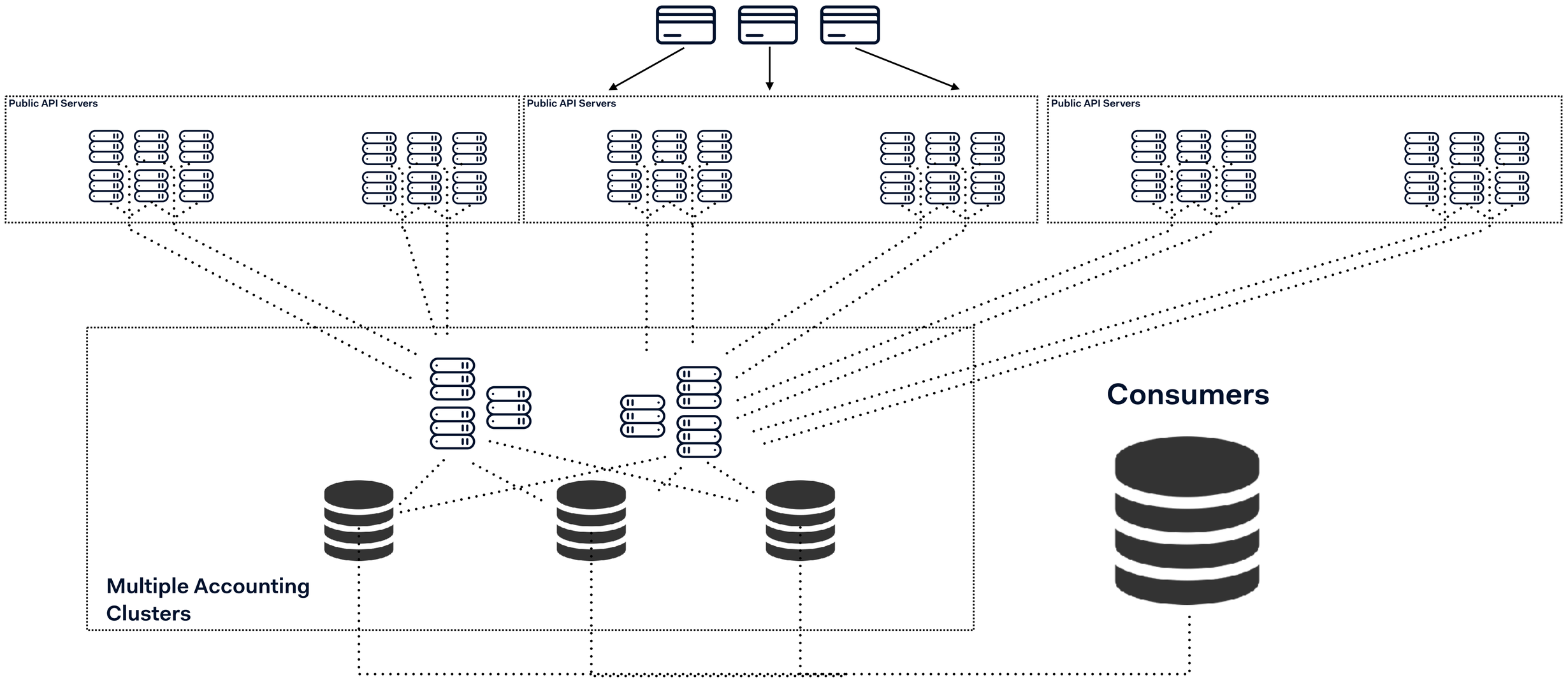
The Solution



Putting it into Production

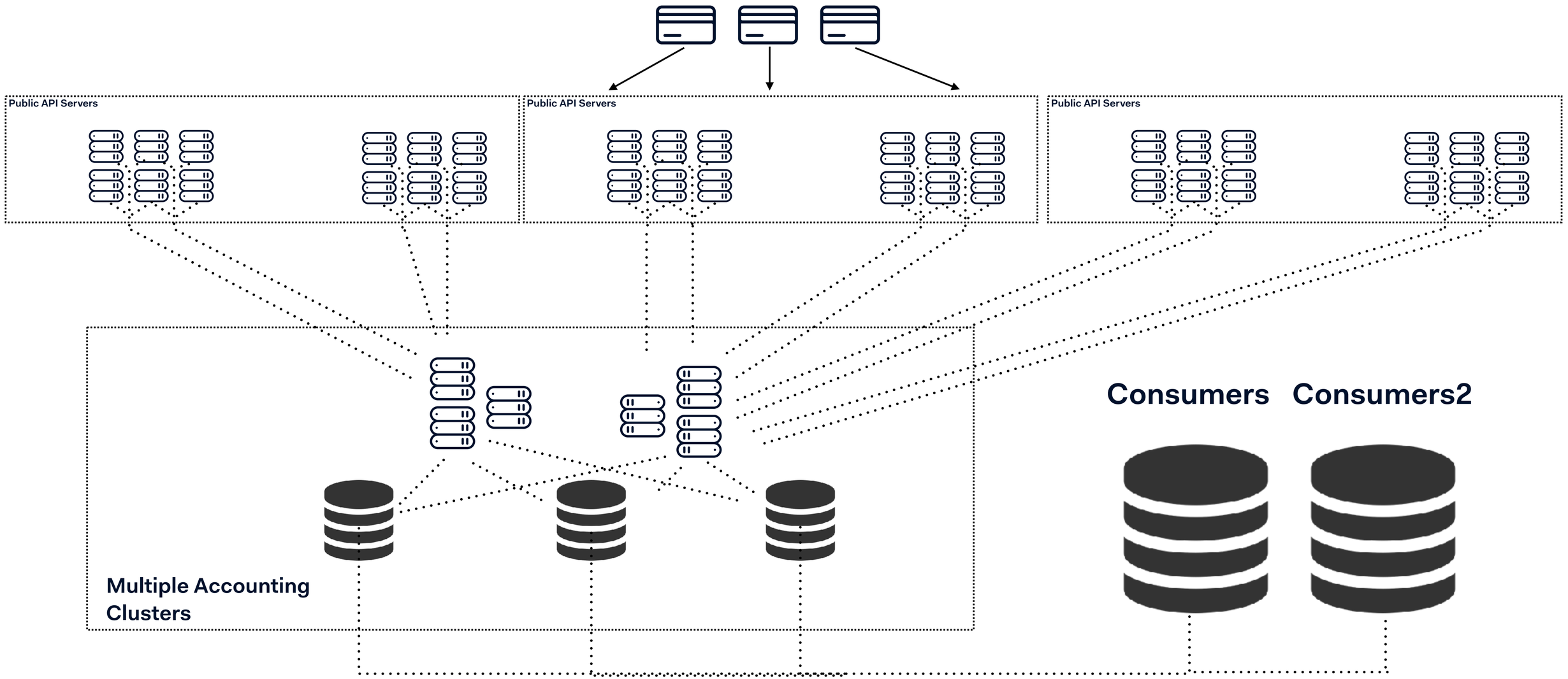
High Level Architecture

The new challenge



High Level Architecture

The new challenge

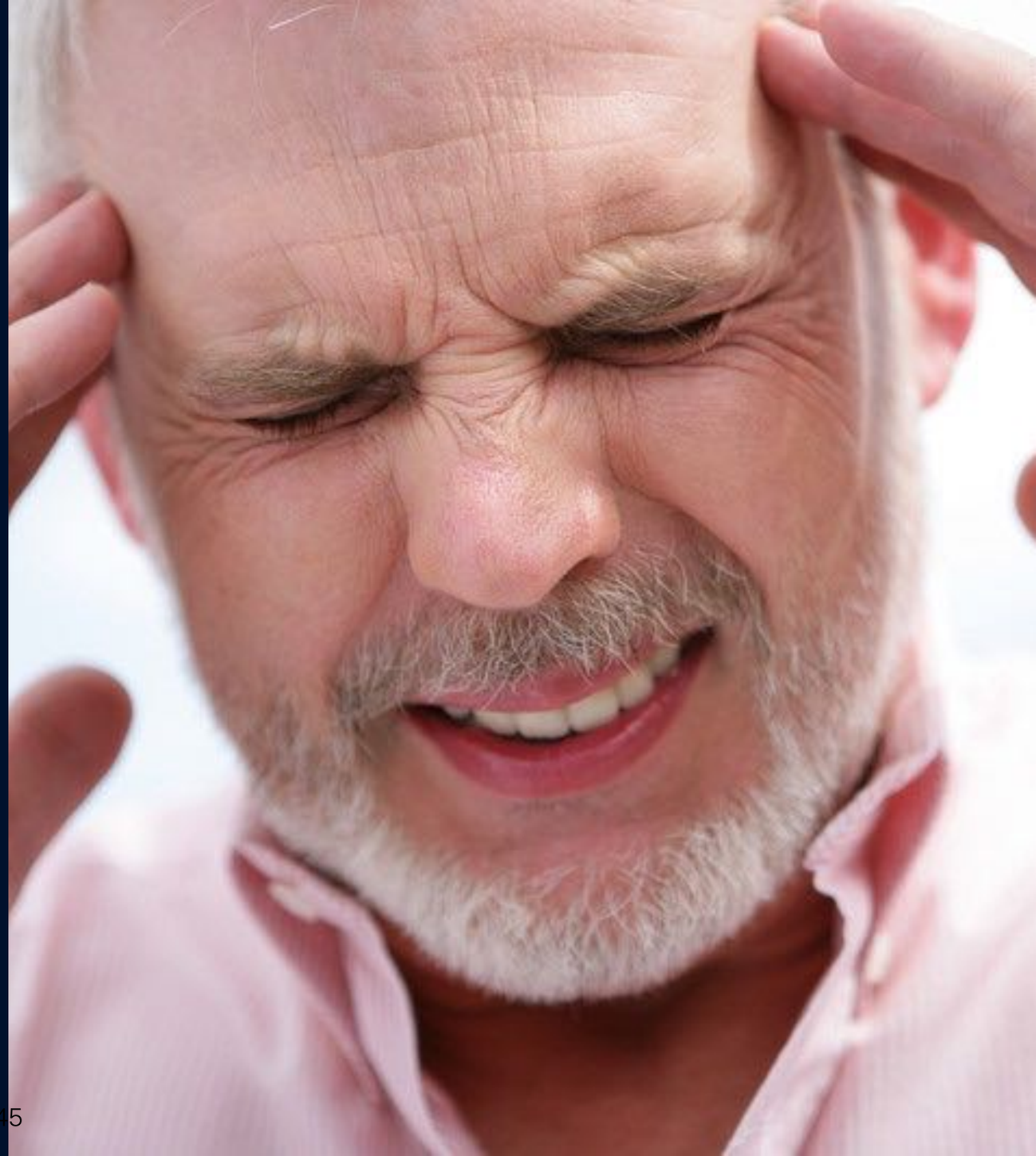


There are quite some difficulties with this approach

Data is used mostly to generate reports for merchants.

It would be quite intense to query that from multiple databases so for this use case this does not make sense

At the same time we would be increasing a marble jar to be a very big marble jar



Partitioning

Splitting up data in smaller tables.

Postgresql provides inheritance (newer versions also provide native partitioning).

Select and insert can be optimised by selecting or inserting only in a partition

Adding check constraints on the data can allow Postgresql to take shortcuts

Data Retention Strategy

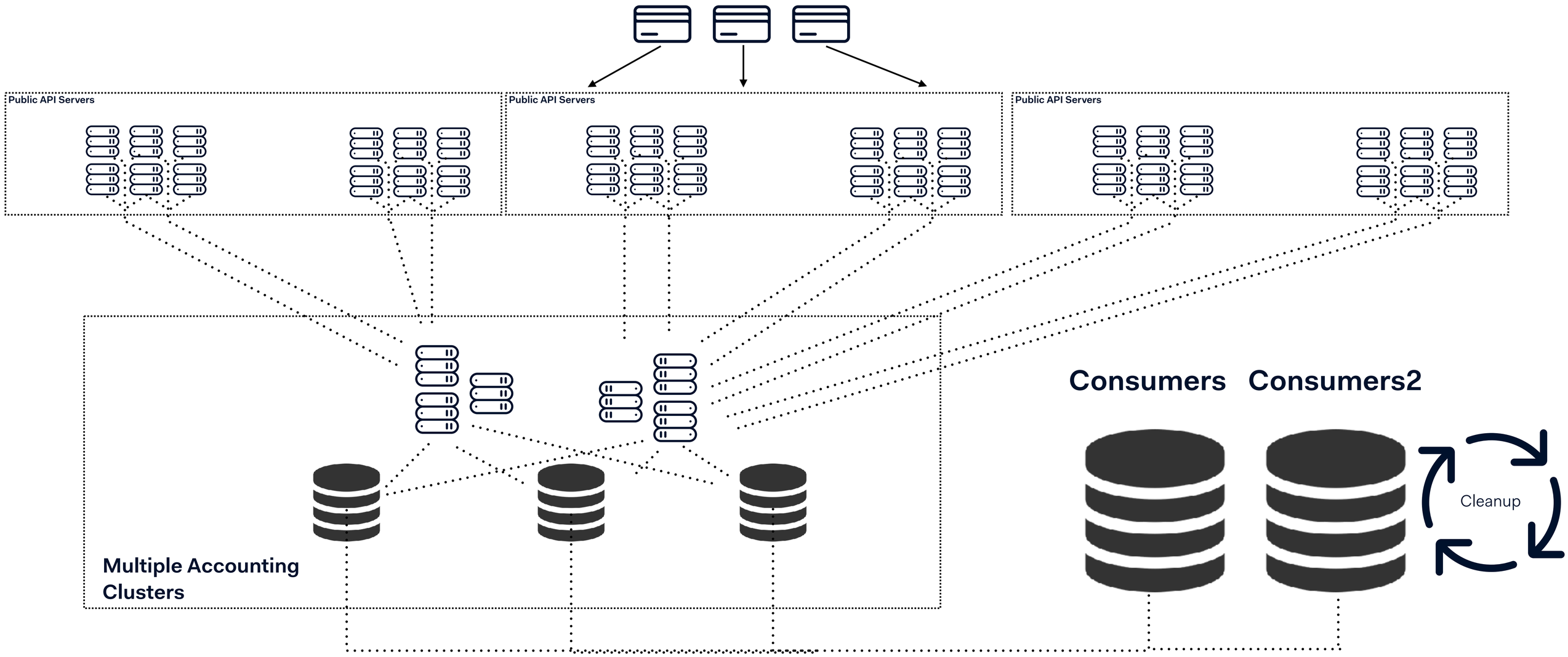
Don’t keep data indefinitely!

Deletion is a very heavy operation on a database that will trigger a vacuum very often

Think of partitioning, and use a truncate or drop operation (much cleaner).

High Level Architecture

The new challenge



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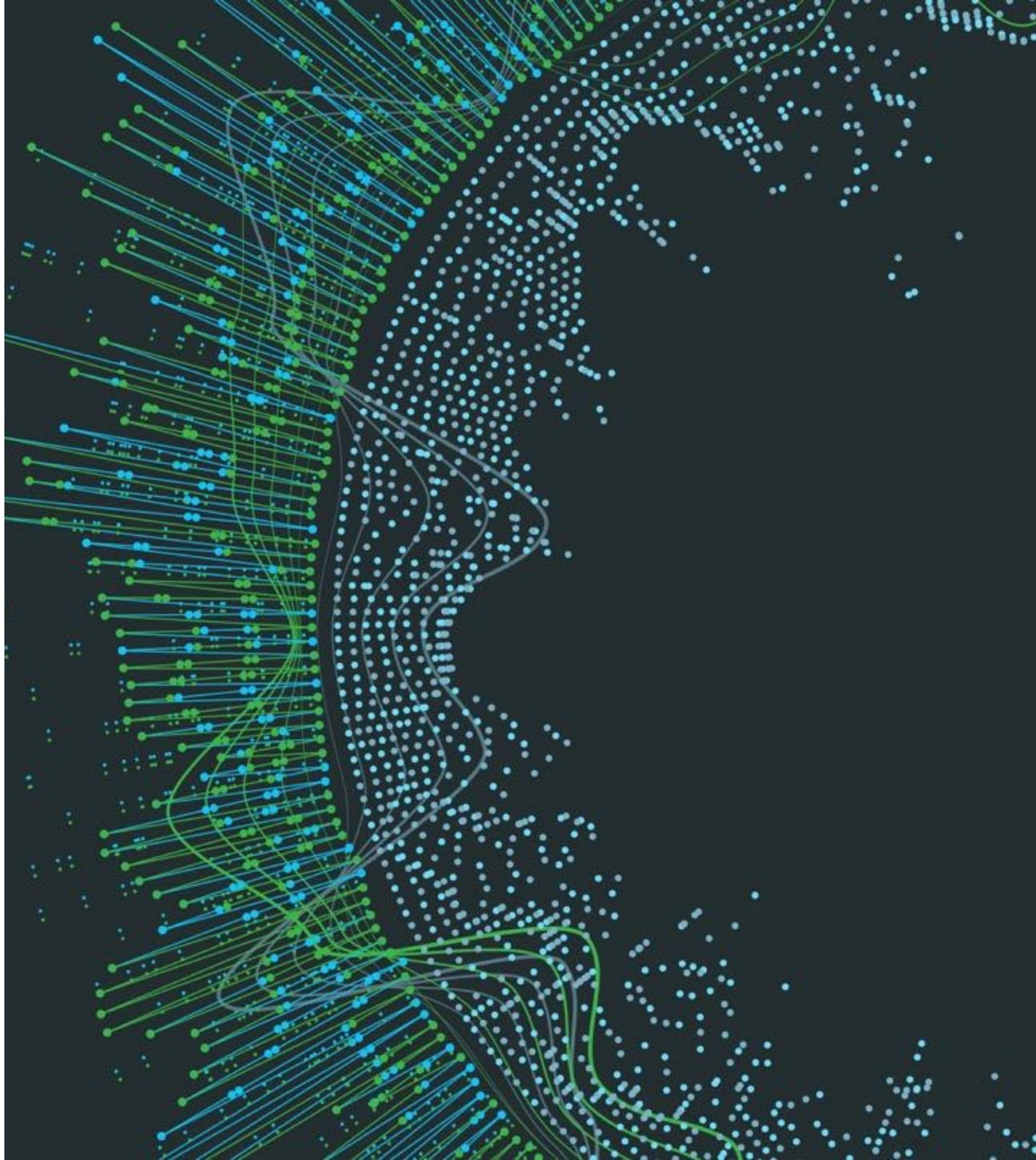
What can you do?

There are many opportunities for students to contribute!

- Part-time student
- Starter program
- Development

Just send us an e-mail !

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bert.wolters@adyen.com