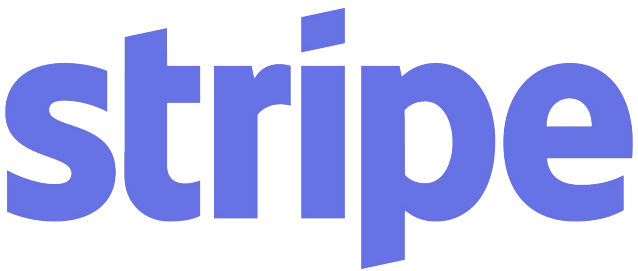
How Stripe invests in technical infrastructure

Will Larson
@lethain

2019


stripe


Uber


Will Larson
An Elegant Puzzle — Systems of Engineering Management
An
Elegant
Puzzle
Systems of
Engineering
Management
Will Larson

Prioritizing infrastructure investment...

...in a high autonomy environment...

...within a rapidly scaling business.

How to actually do useful things...

...without burning out.

What is technical infrastructure?

Technical infrastructure:
Someone’s biggest problem they dislike.

Examples of technical infrastructure

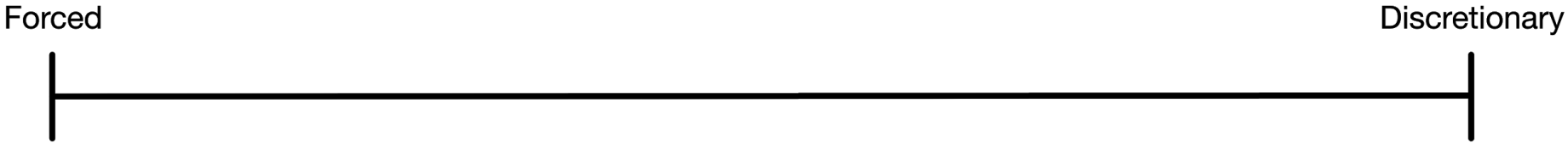
Developer tools
Data infrastructure
Core libraries and frameworks
Model training and evaluation

Technical infrastructure:
Tools used by 3+ teams for business critical workloads.

Introduction

1. **Fundamentals**
2. Escaping the firefight
3. Learning to innovate
4. Navigating breadth
5. Unifying approach

Closing

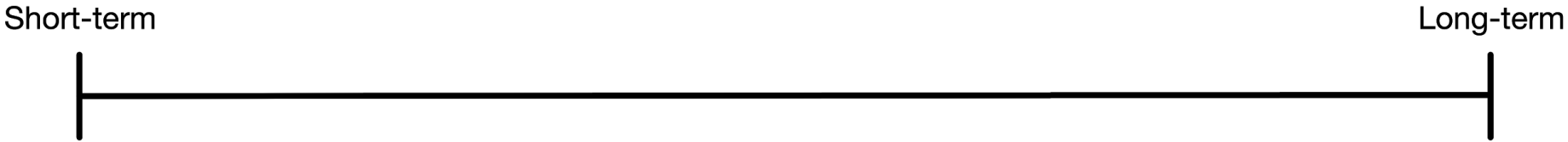

Forced
Discretionary

Forced

- Scale MongoDB
- Lower AWS costs
- GDPR

Discretionary

- Sorbet
- Server to service
- Deep learning

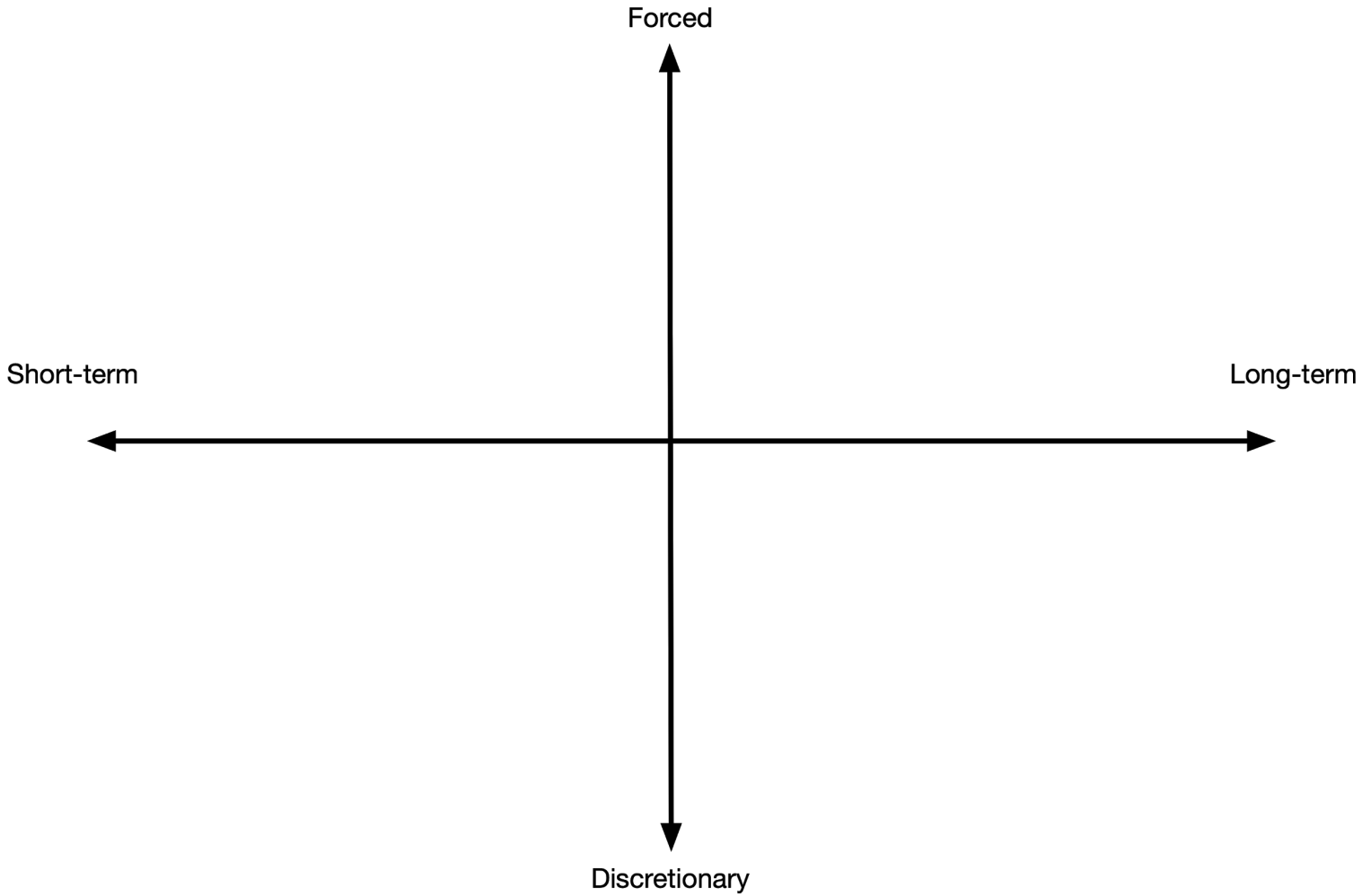

Short-term
Long-term

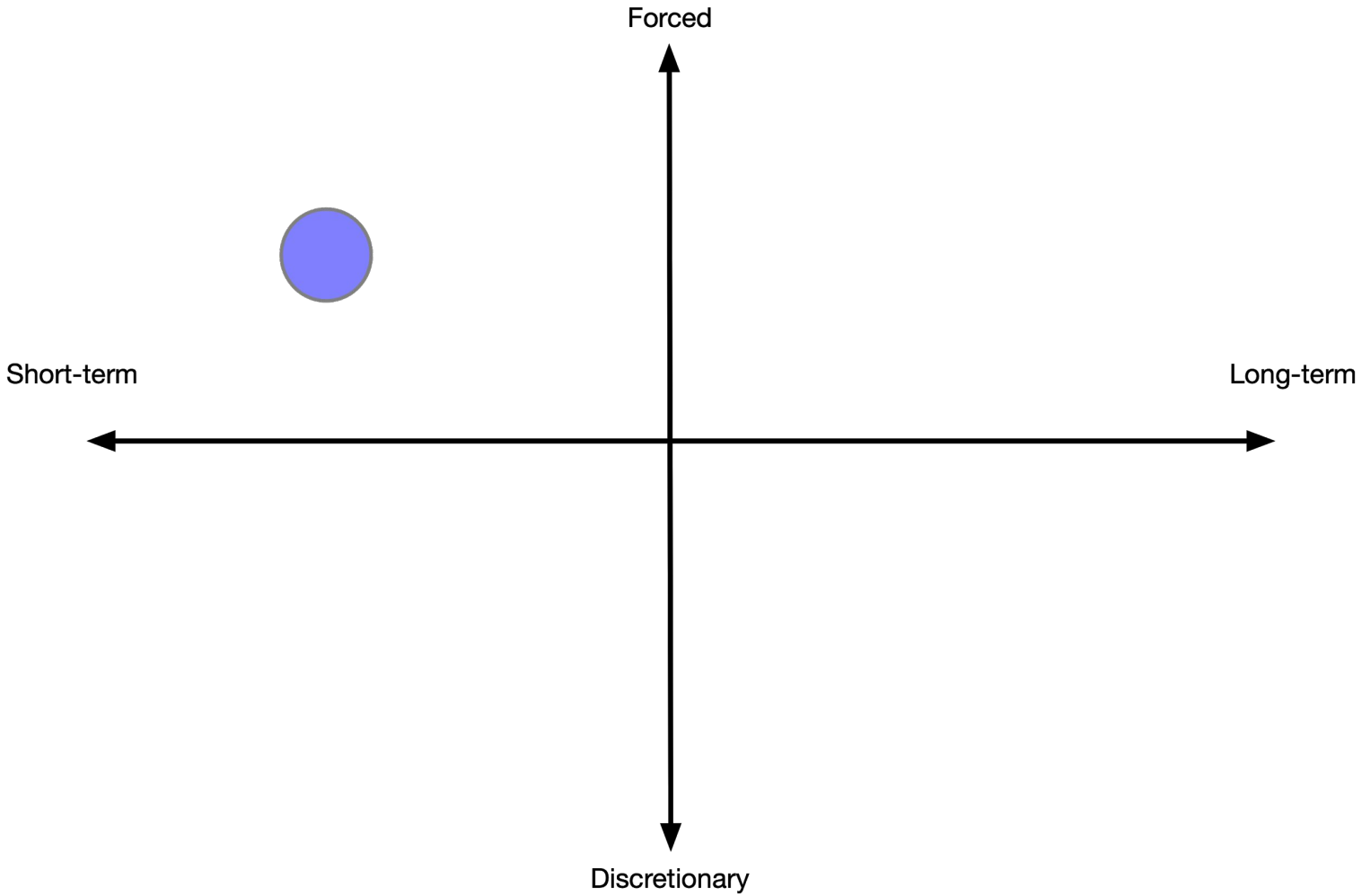
Short-term

- Critical remediation
- “Hit budget”
- Support launch

Long-term

- QoS strategy
- “Bend the cost curve”
- Rewrite monolith


Forced
Short-term
Long-term
Discretionary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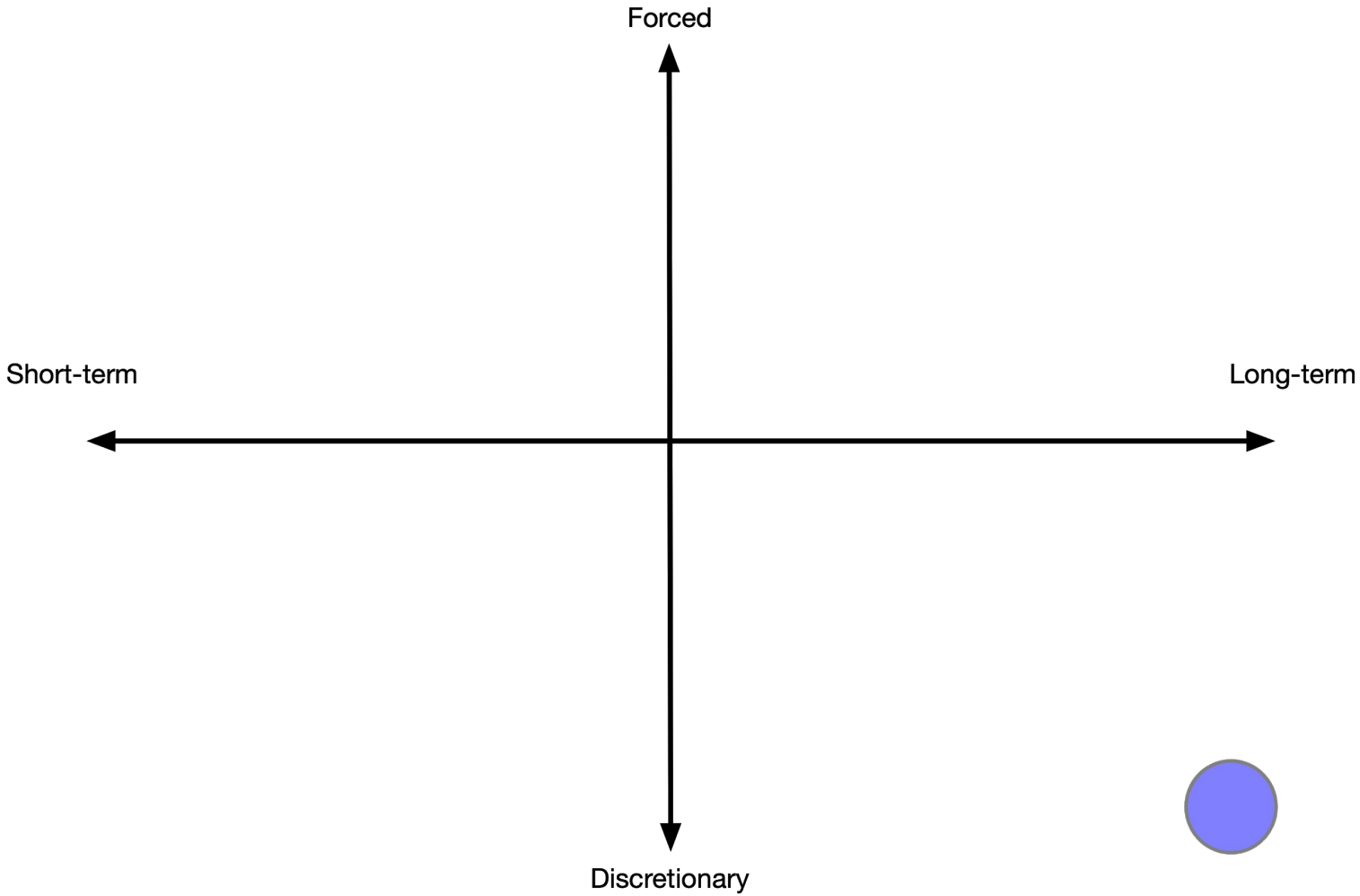
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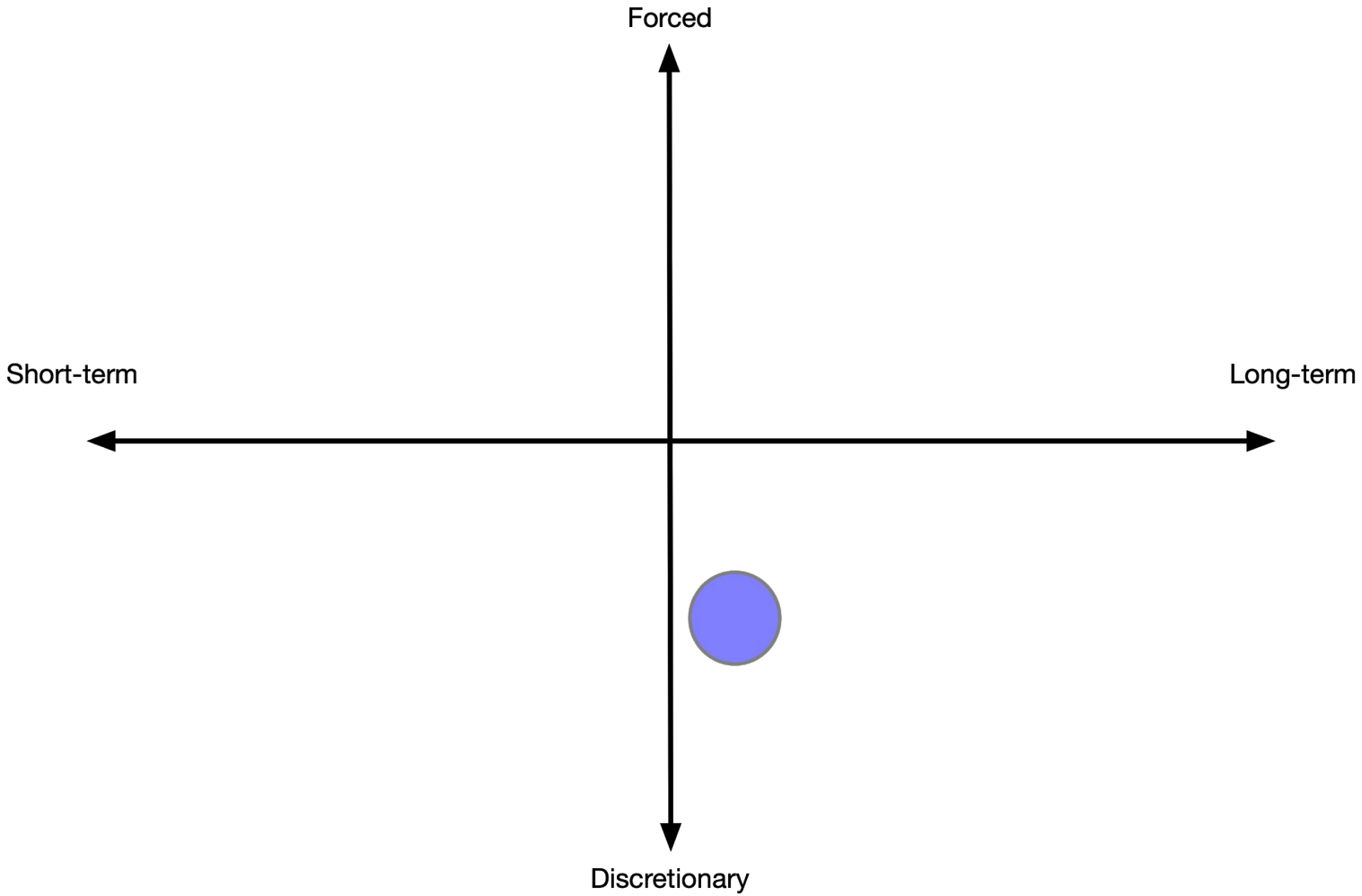
Long-term
Discretionary

Where is your team now?

Where do you want to be?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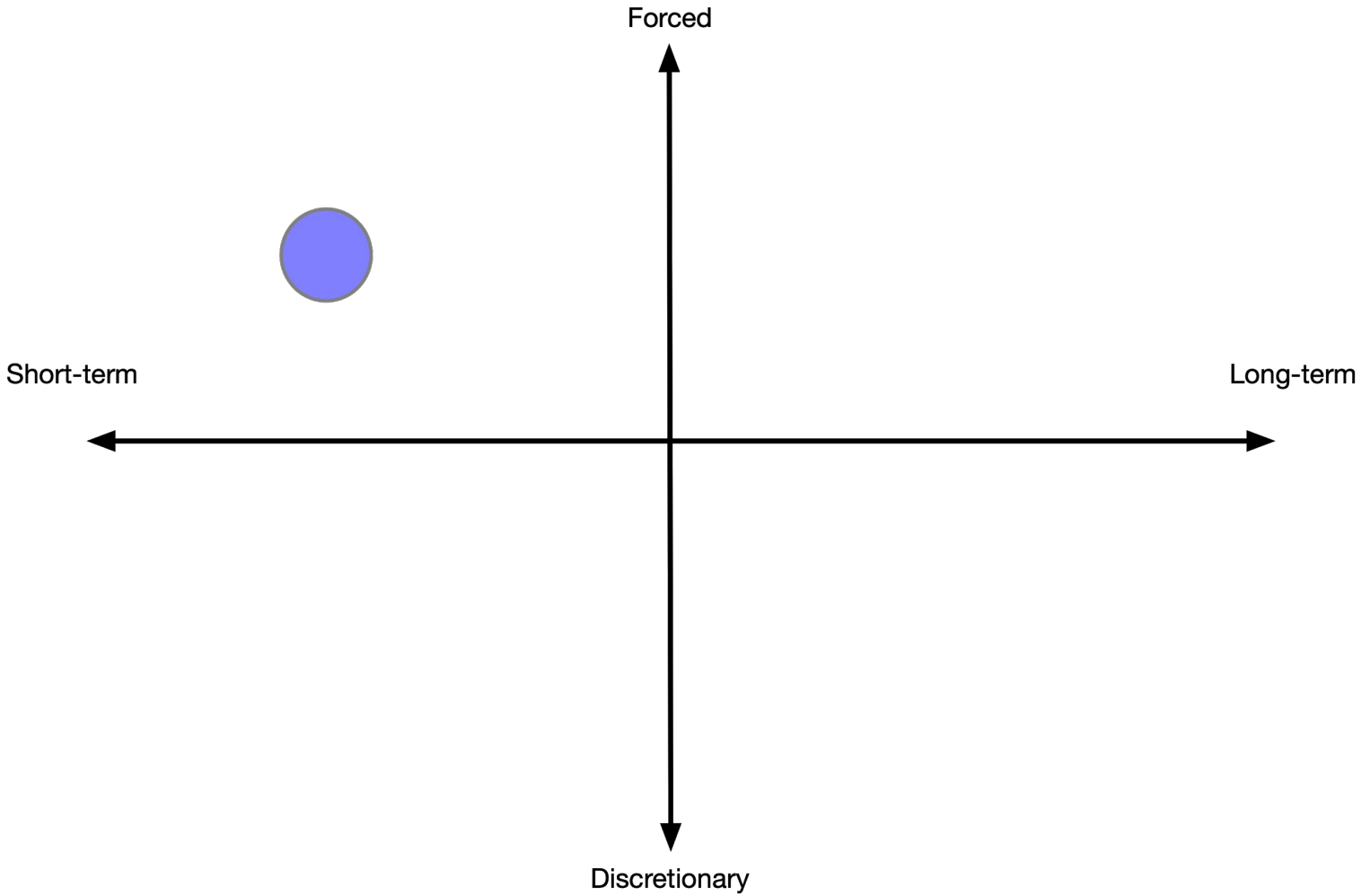
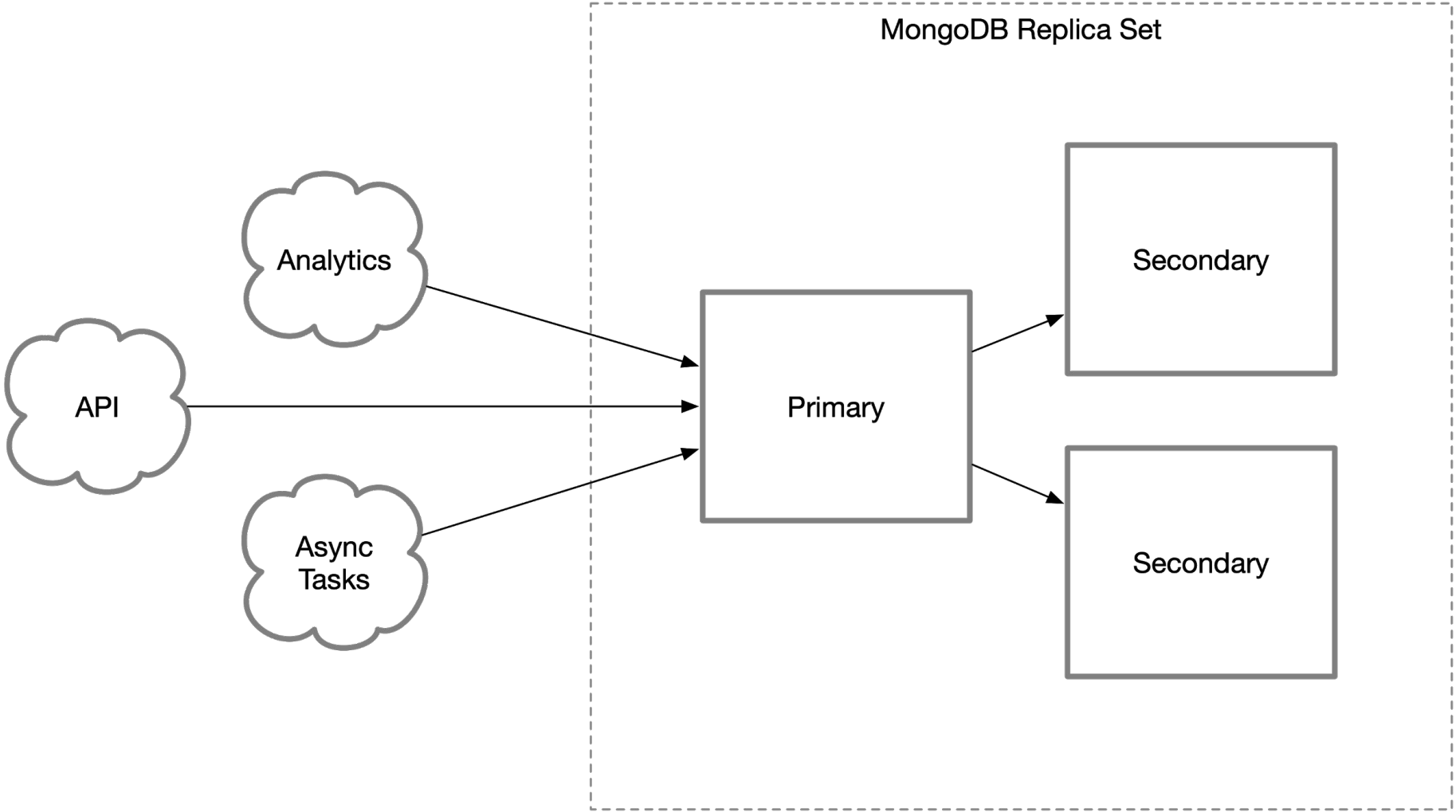

Forced
Short-term
Long-term
Discretionary

Even Stripe...

MongoDB


MongoDB Replica Set
Analytics
API
Async
Tasks
Primary
Secondary
Secondary

Shared replsets

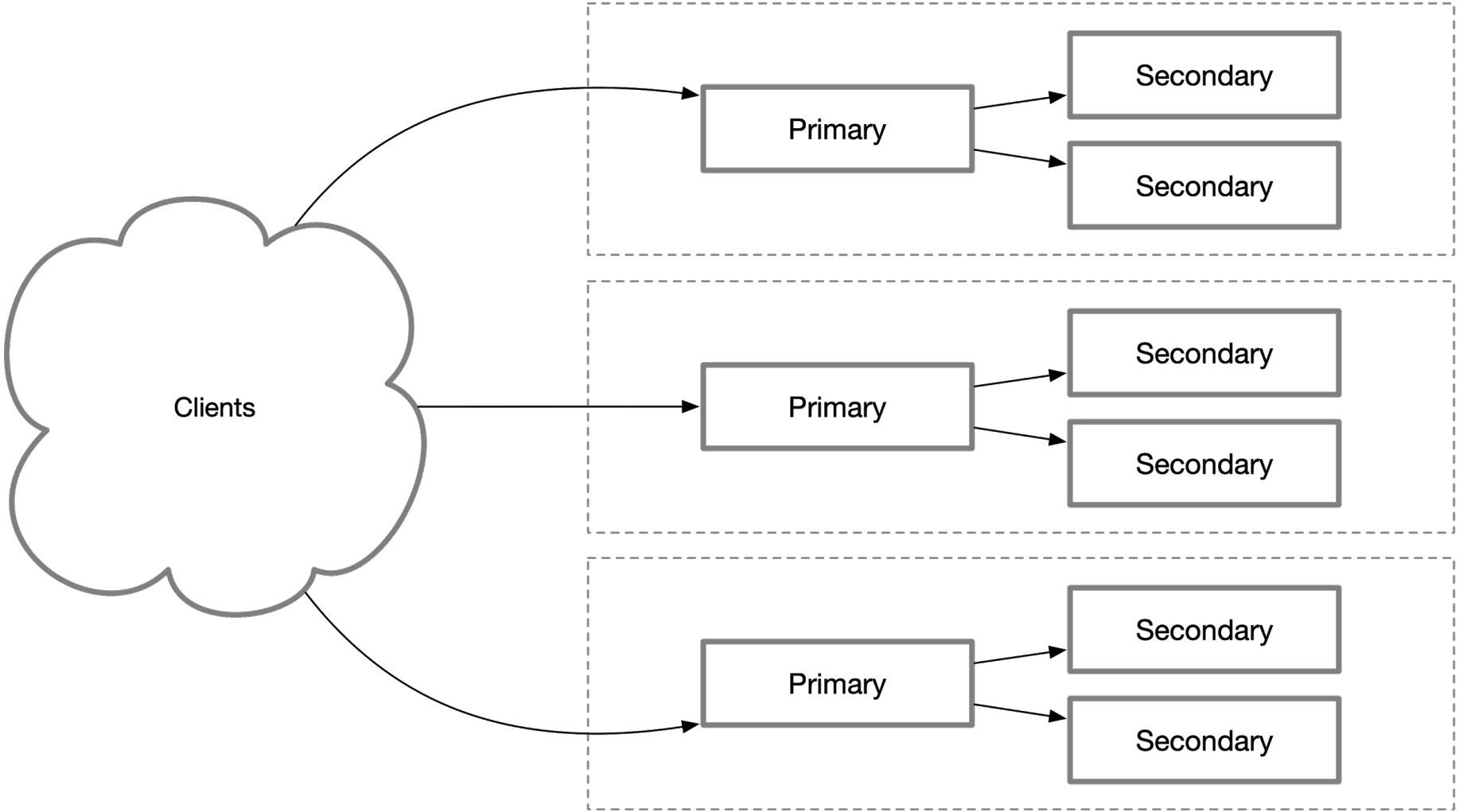
Easy to maintain :)
Don’t cost much :)
Limited isolation :(
Big blast radius :(

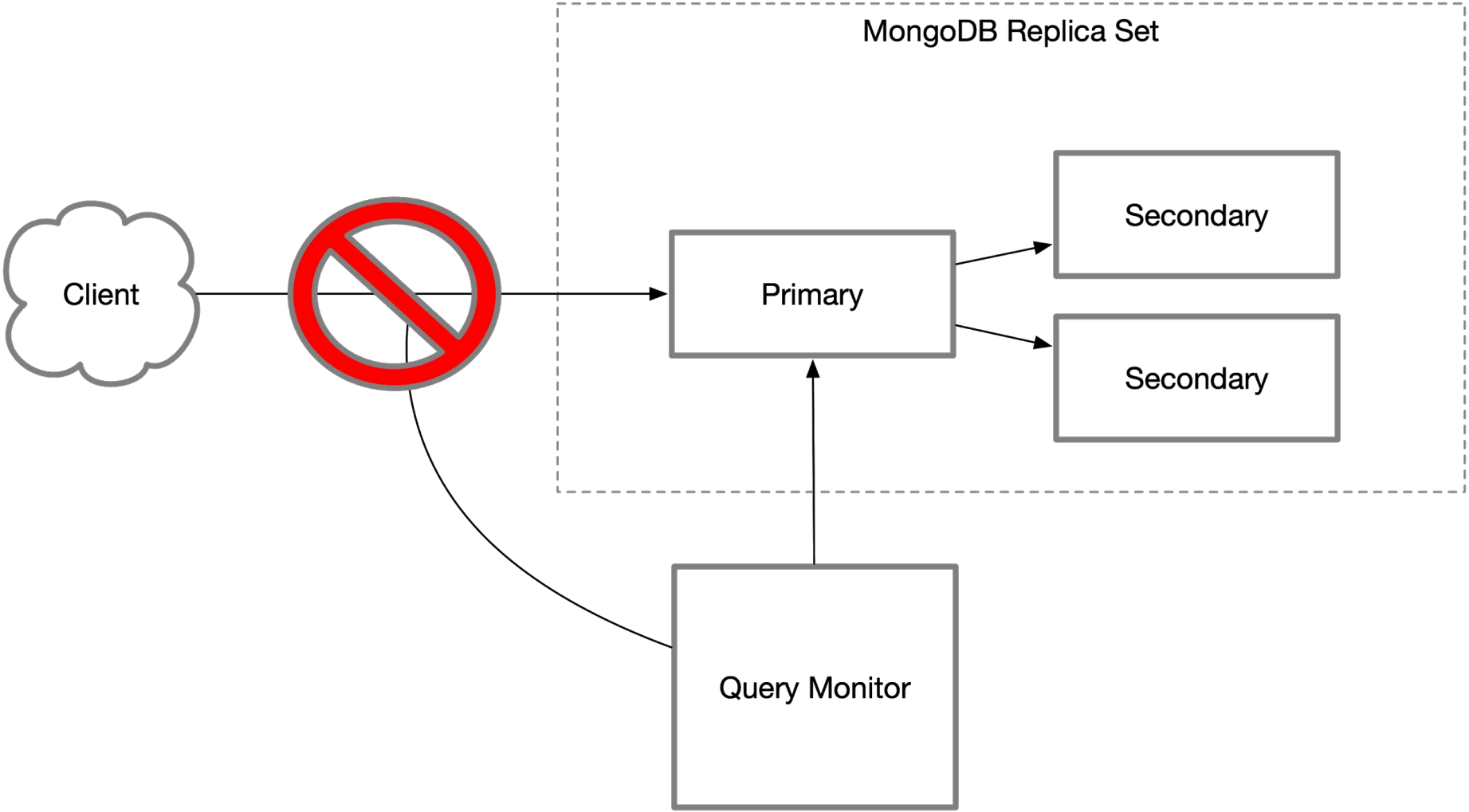
More time on incidents

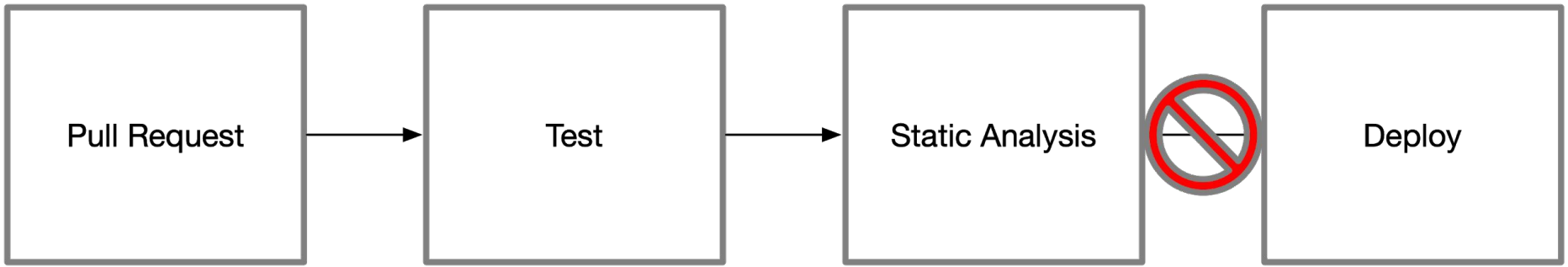
Incident impact increasing

When things aren’t getting better, they are getting worse

How to fix?


Clients
Primary
Secondary
Secondary
Primary
Secondary
Secondary
Primary
Secondary
Secondary


MongoDB Replica Set
Client
Primary
Secondary
Secondary
Query Monitor


Pull Request
Test
Static Analysis
Deploy

Ok, so what’s the firefighting playbook?

Reduce concurrent work

Finish something

Automate

Eliminate categories of problems

Are you seeing signs of progress?

No? You’ve gotta hire

Once there’s progress, stay the course!

btw, don’t fall in love with firefighting

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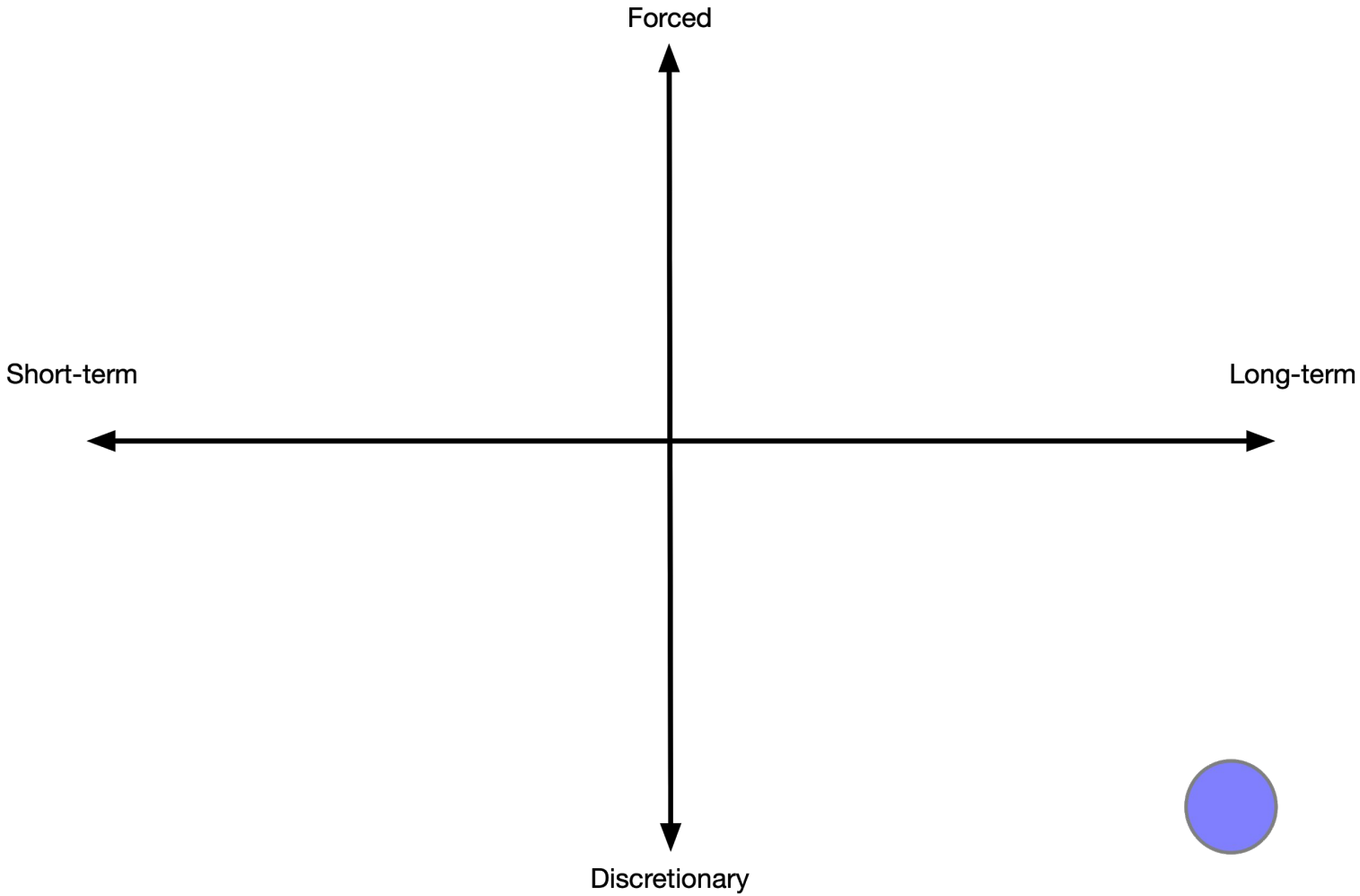
Forced
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Rare opportunity in infrastructure

Rare also means inexperienced

tl;dr

Talk to your users more

tl;dr

~~Talk~~ to your users more

tl;dr

Listen to your users more

Ways innovation goes wrong...

Problem

Making the most intuitive fix

Problem

Fixating on the local maxima

“Ruby is a terrible language.”

Discover

Discover

Benchmark with peer companies

Coffee chats with users

SLOs

Surveys

Sorbet:
A Typechecker for Ruby

Dmitry @darkdimius Petrashko
Nelson @nelhage Elhage
Paul @ptarjan Tarjan

Problem

Infinite possibilities, what to pick?

“The critical business outcome is me learning Elixir.”

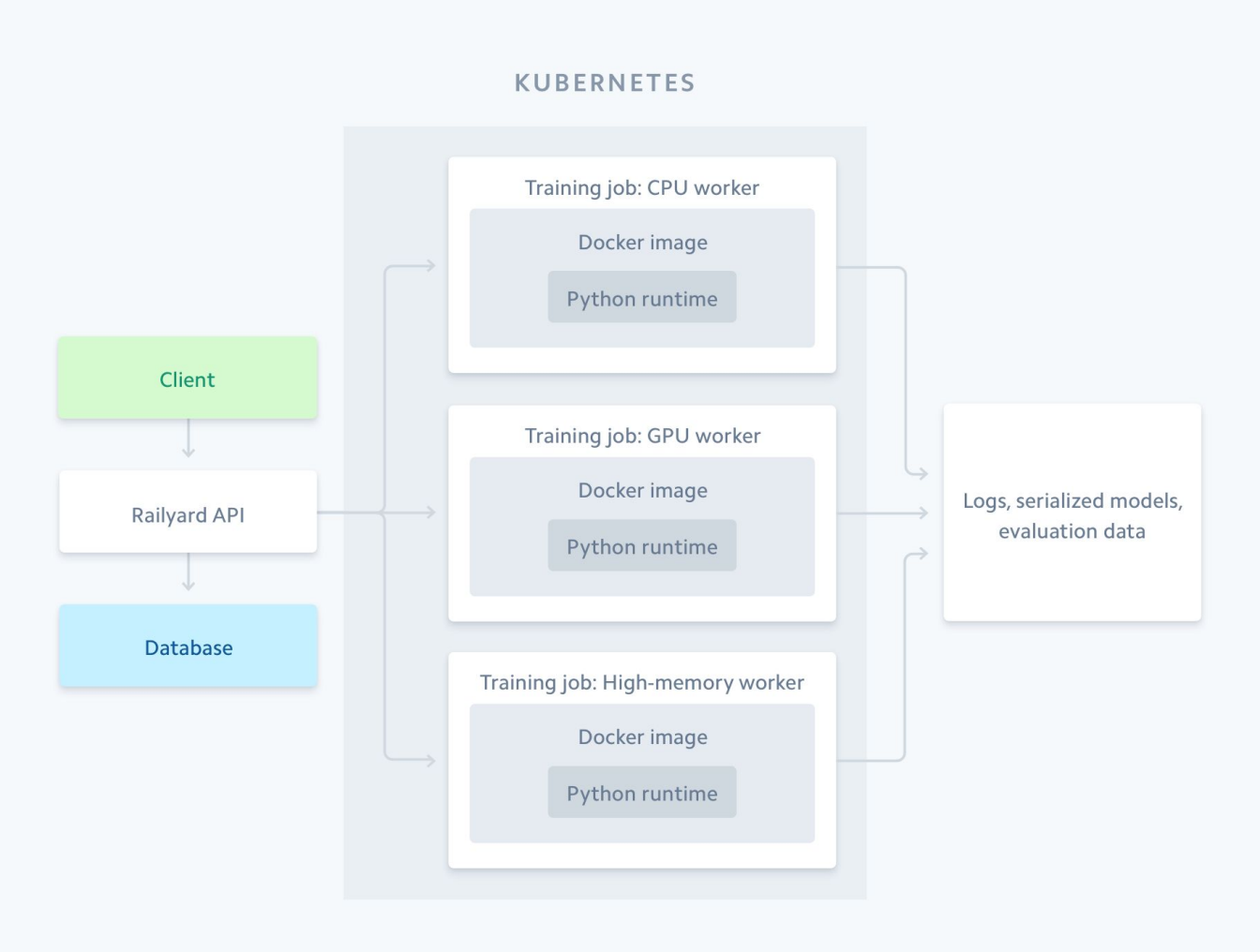
Prioritization

Prioritization

Order by return on investment

Don’t try without users in the room

Long-term vision


KUBERNETES
Client
Railyard API
Database
Training job: CPU worker
Docker image
Python runtime
Training job: GPU worker
Docker image
Python runtime
Training job: High-memory worker
Docker image
Python runtime
Logs, serialized models, evaluation data

Problem

Right opportunity with wrong solution

“Monster is too unreliable and slow!”

“Let’s just rewrite monster.”

“Let’s just rewrite monster. Again.”

“Let’s ~~just rewrite~~ harden monster.”

Validation

Validation

Cheaply disprove approach

Try hardest cases early

Embed with owners

“Can we provide a unified interface for task, cronjob and service orchestration?”

Kubernetes

Kubernetes

Chronos

Railyard

Services

tl;dr

Talk to your users more

Be valuable or go back to firefighting

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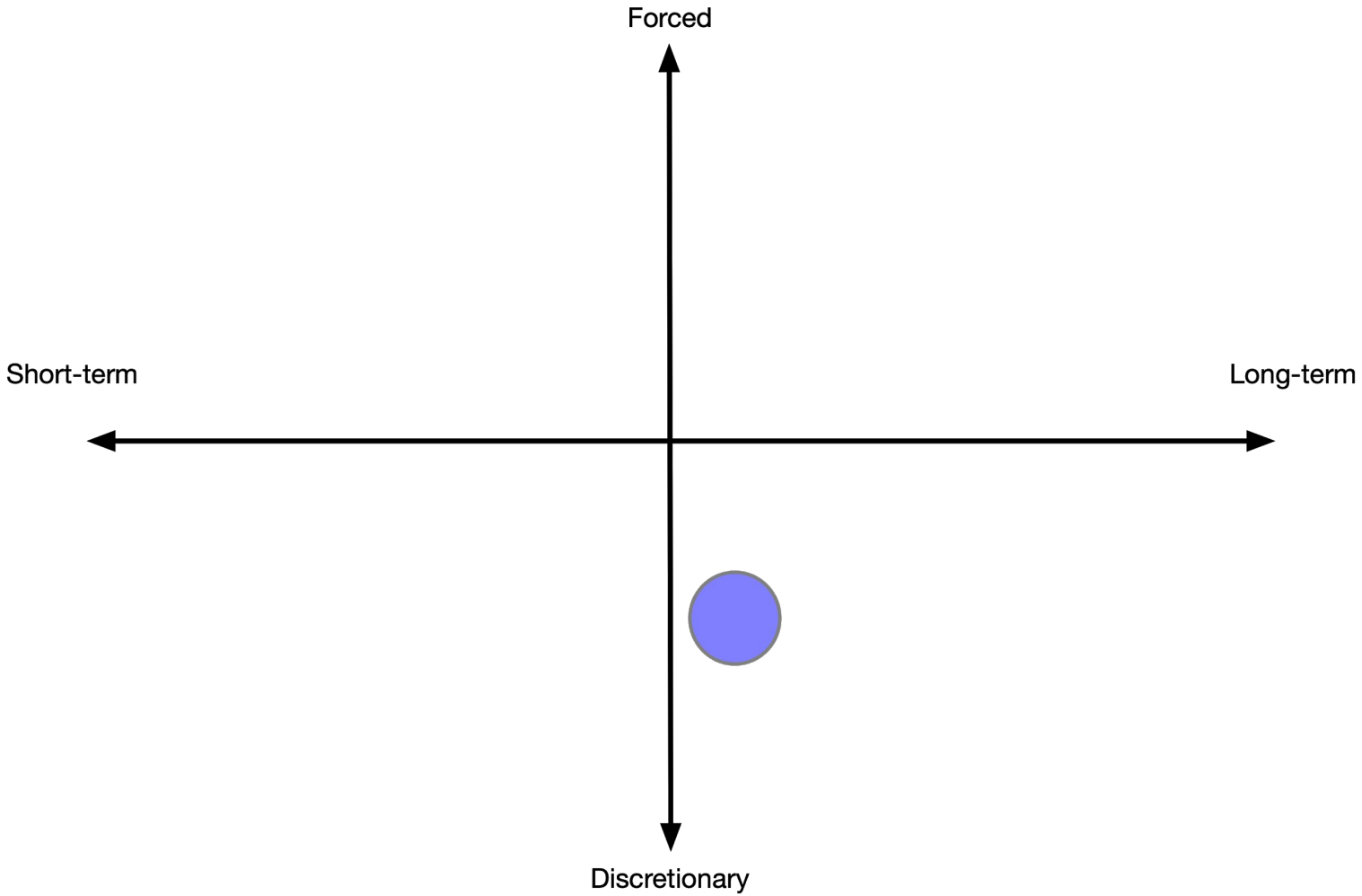
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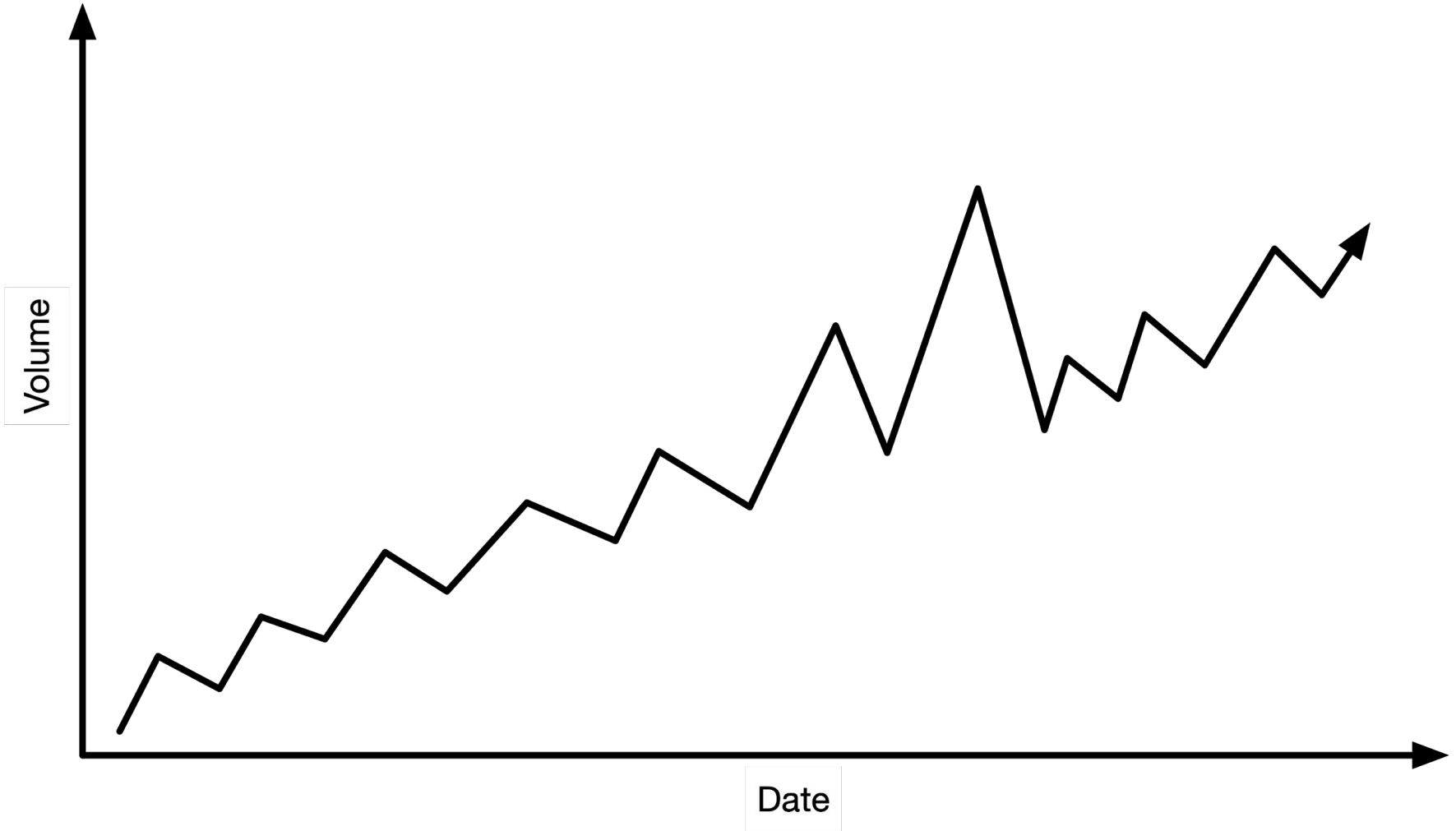
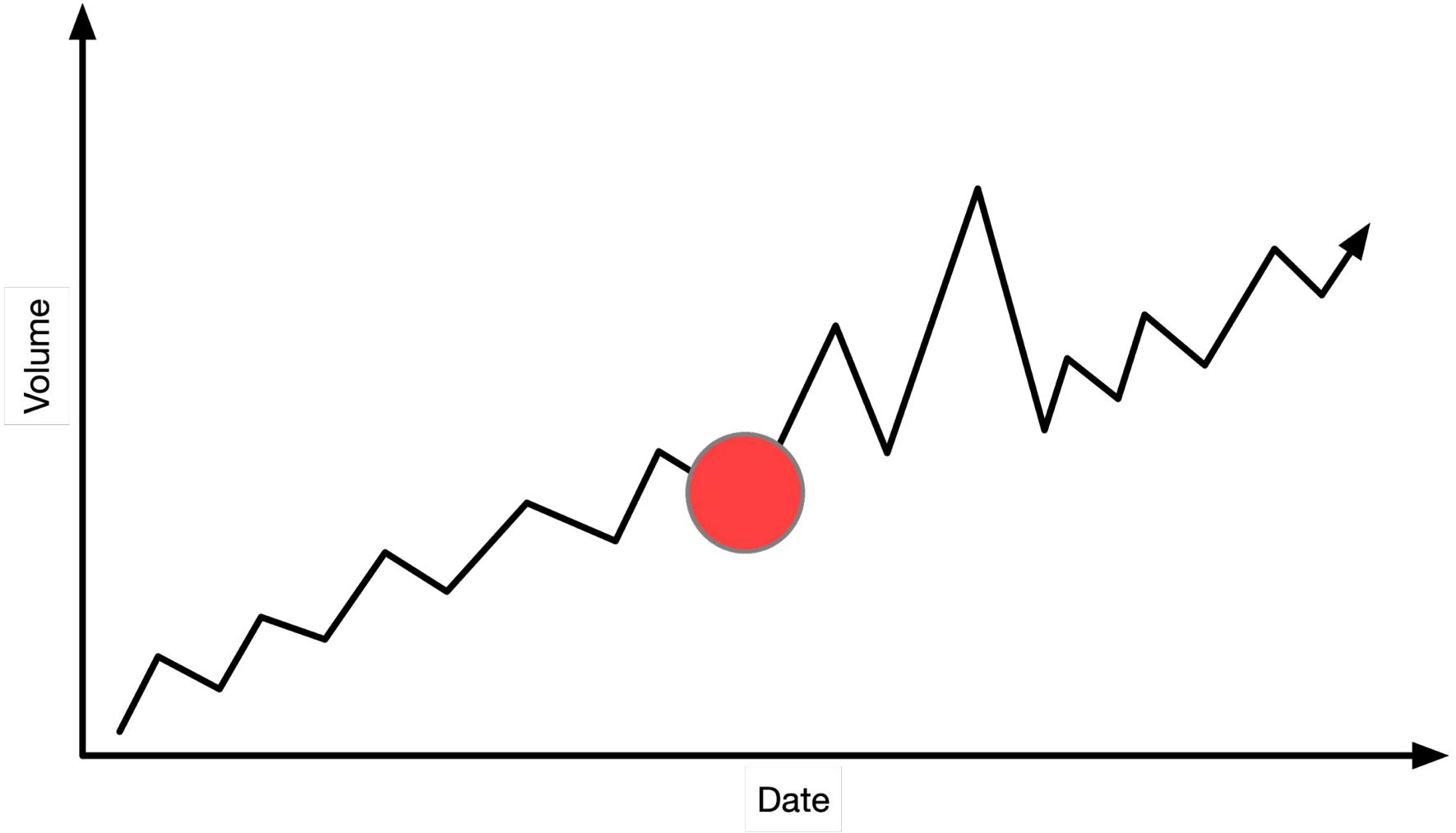
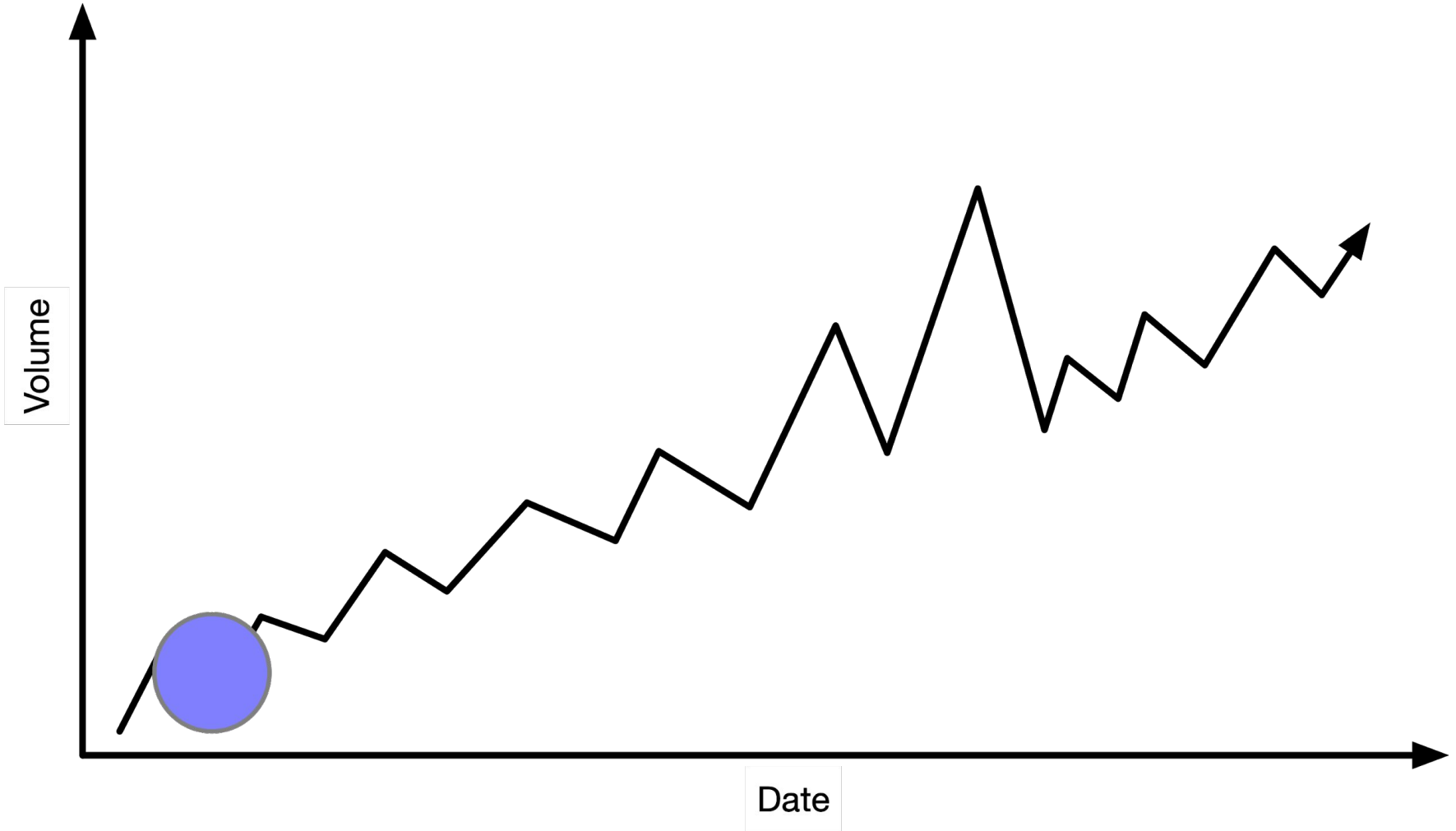
Fool me once, shame on you

Fool me twice, shame on me

Fool me every year on exact same date?


Volume
Date


Volume
Date


Volume
Date

“Convert unplanned scalability work into planned scalability work.”

Schedule manual load tests

Schedule automated load tests

Run continuous load tests

Solved out of a job

Great technology fix,
but what’s the organizational fix?

Infrastructure properties

Stripe’s infrastructure properties

Security
Reliability
Usability
Efficiency
Latency

Lightly ordered but not stack ranked

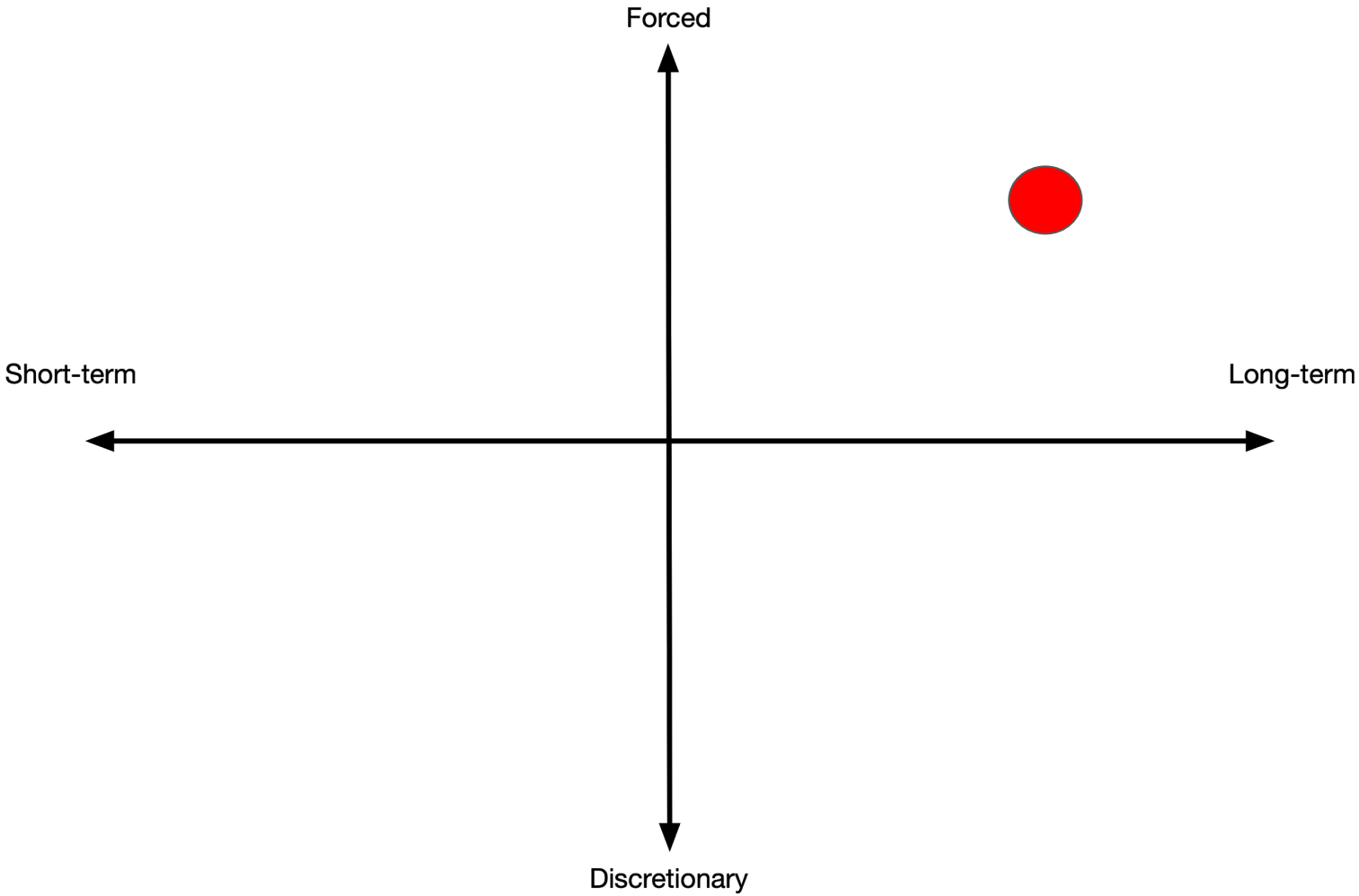
More a portfolio: invest in each

Baselines!

Invest to maintain your baselines

Maintain across timeframes

Long-term forced work!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Do it now or firefight it later

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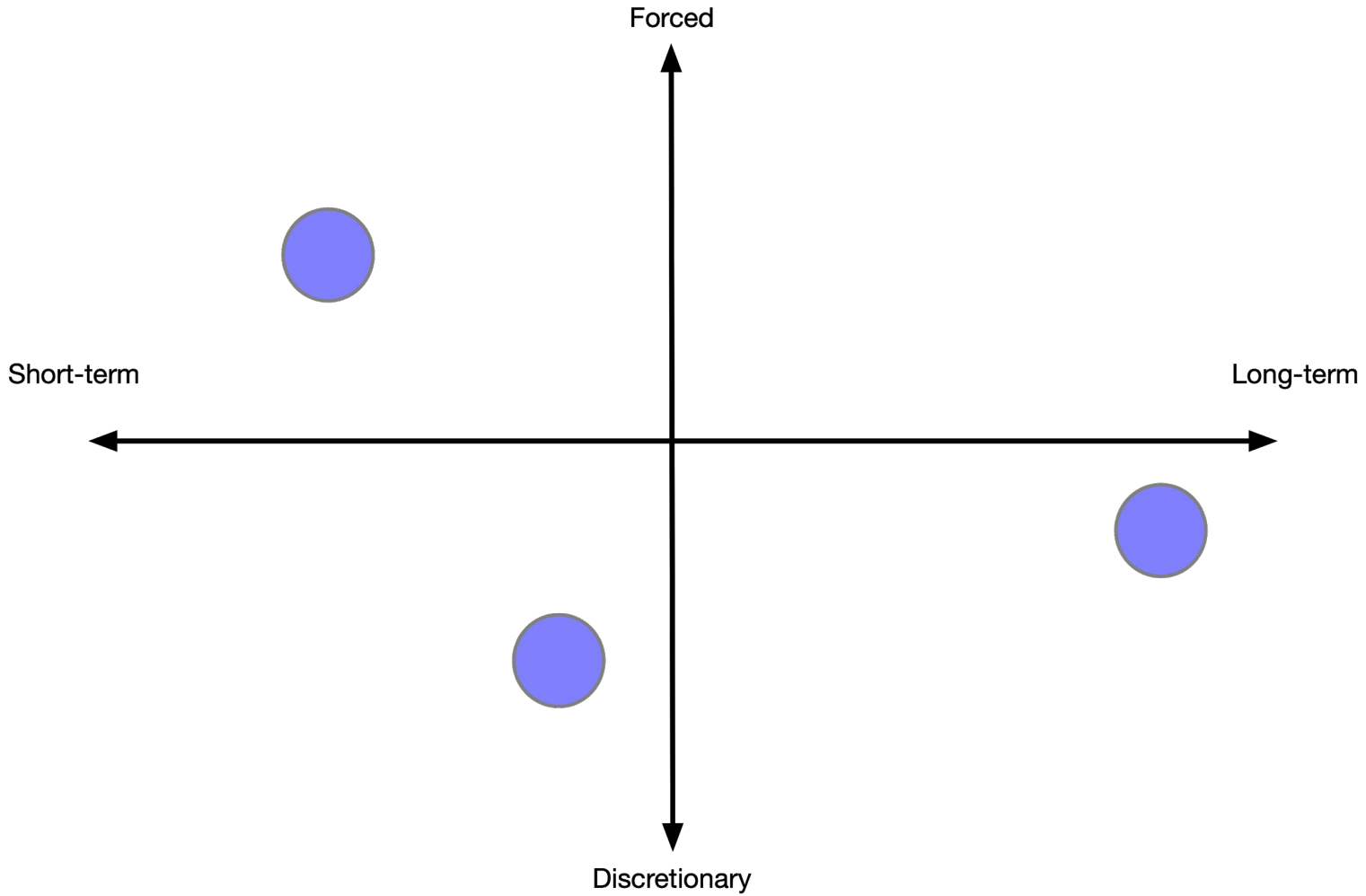
Wait… there’s more than one team?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What we actually do today

Investment strategy

40% user asks
30% platform quality
30% “Key Initiatives”

40/30/30?

Solve from your constraints

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Technical infrastructure:
Tools used by 3+ teams for business critical workloads.

Firefighting:
Limit work in progress.
Finish things.
If that’s not enough, hire.

Innovation:
Listen to your users.
Listen to your users.
Listen to your users.

Navigating breadth:
Identify principles.
Set baselines.
Plan across timeframes.

Bring it together:
Investment strategy.
Users, baselines and timeframes.

Q&A

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