ThoughtWorks®

PRINCIPLES OF MICROSERVICES

Sam Newman

Microxchg, Berlin 2015

ThoughtWorks®

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There is no hyphen in “microservice”

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micro-service

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micro-service

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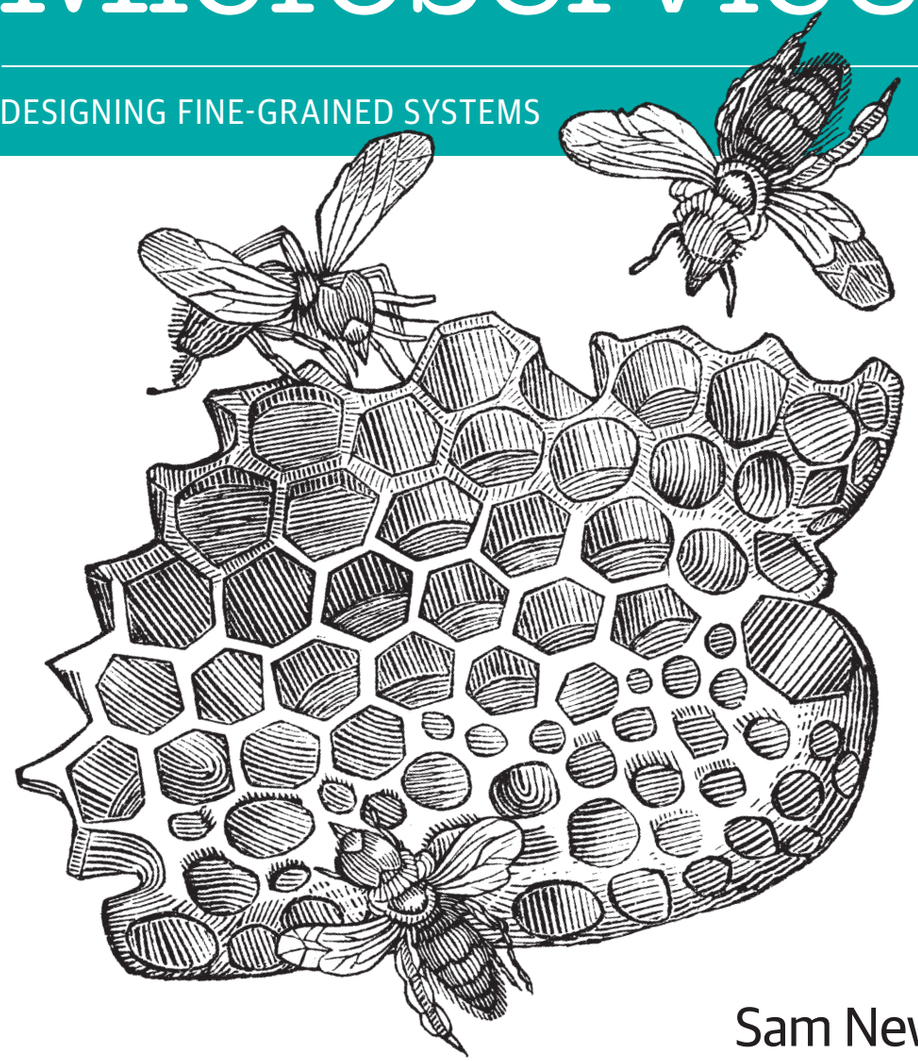
O'REILLY®

Building Microservices

DESIGNING FINE-GRAINED SYSTEMS



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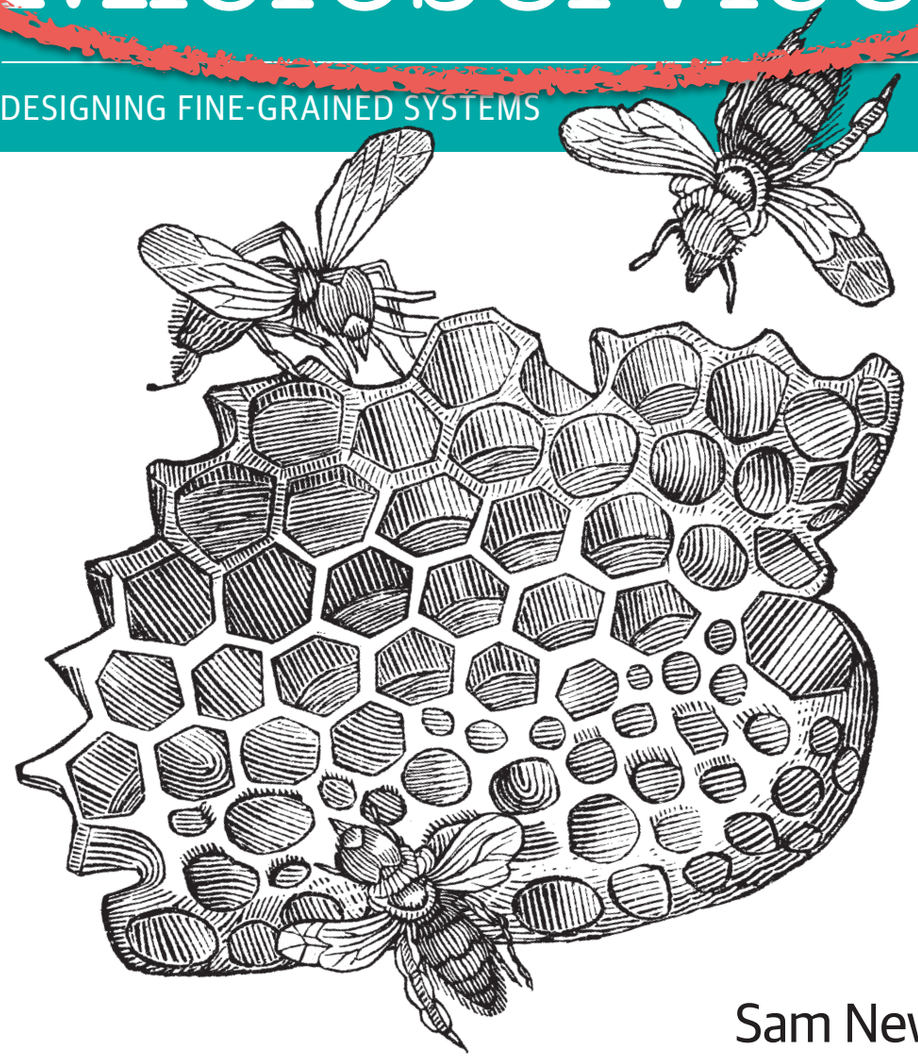
Building Microservices

DESIGNING FINE-GRAINED SYSTEMS



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Article Talk

Microservices

From Wikipedia, the free encyclopedia

In computing, **microservices** is a software architecture design pattern, in which complex applications are composed o
language-agnostic APIs.[1] These services are small, highly decoupled and focus on doing a small task.[2]

Contents [hide]

Details [edit]

Properties of the Microservices architecture:

- The services are easy to replace
- Services are organized around capabilities, e.g. user interface frontend, recommendation, logistics, billing, etc.
- A microservices-based architecture
  - lends itself to a continuous delivery software development process.
  - is distinct from a Service-oriented architecture (SOA) in that the latter aims at integrating various (business) ap

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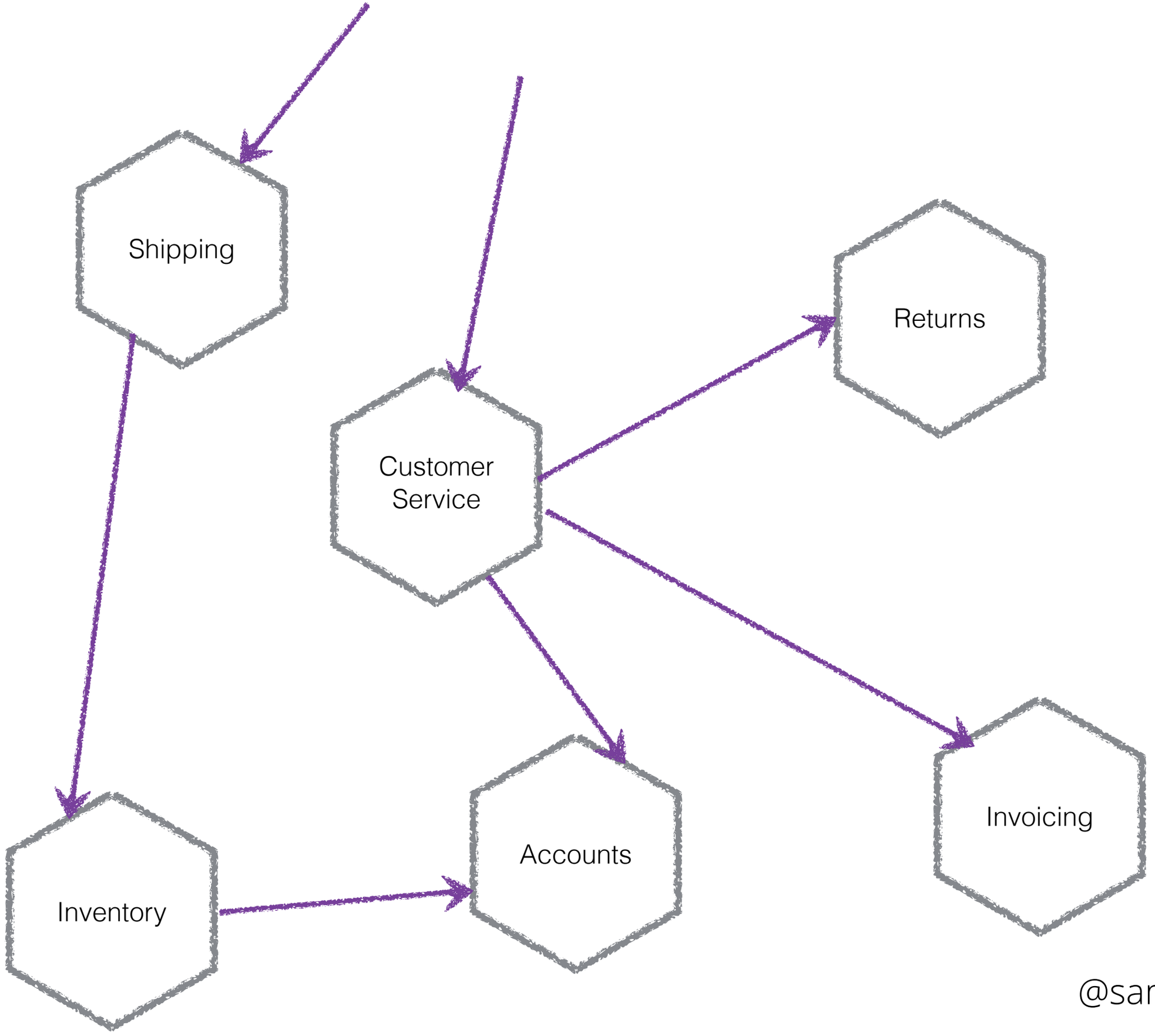
Shipping
Customer Service
Returns
Inventory
Accounts
Invoicing

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Small ***Autonomous*** services that ***work together***

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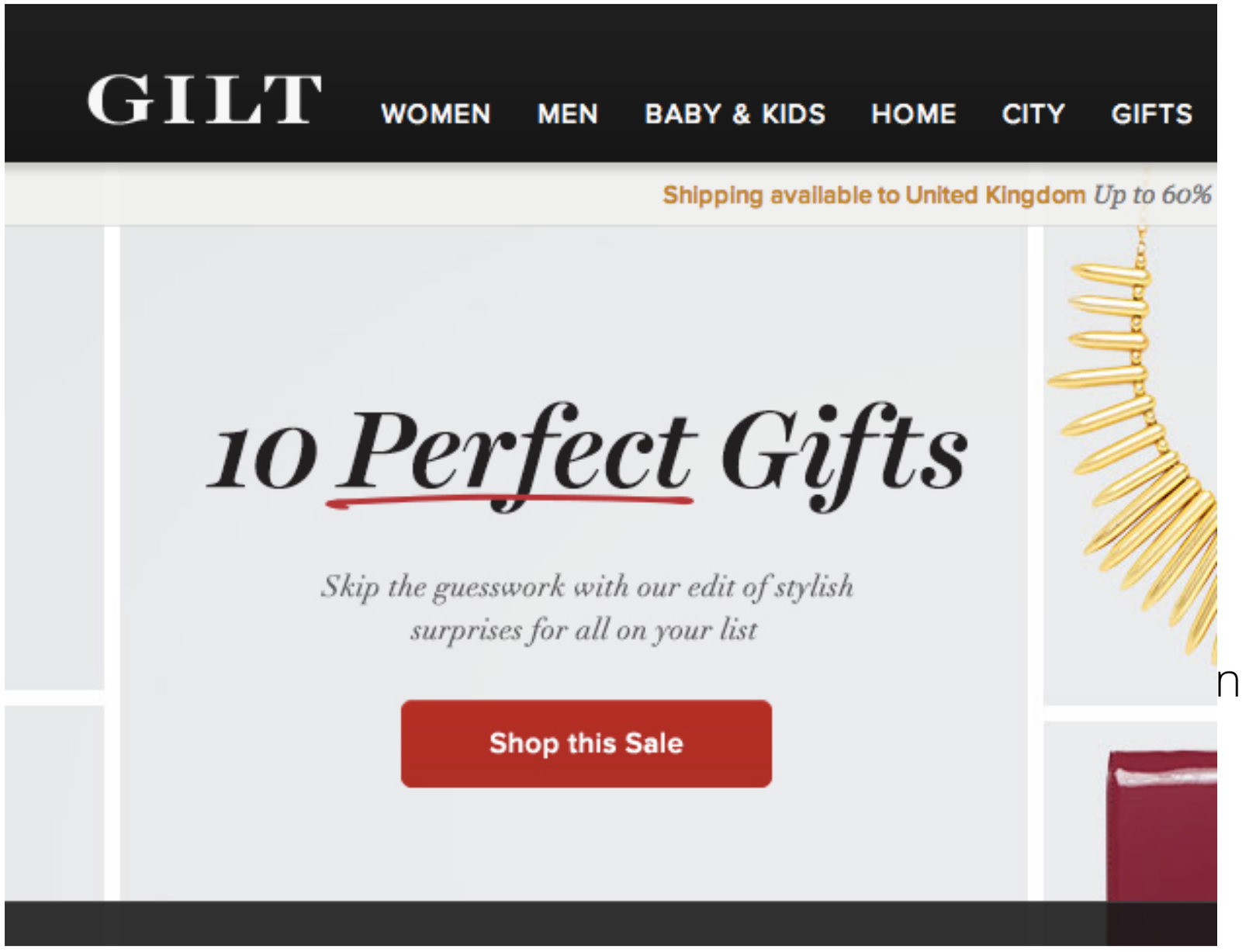
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WOMEN
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BABY & KIDS
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Shipping available to United Kingdom Up to 60%
10 Perfect Gifts
Skip the guesswork with our edit of stylish surprises for all on your list
Shop this Sale

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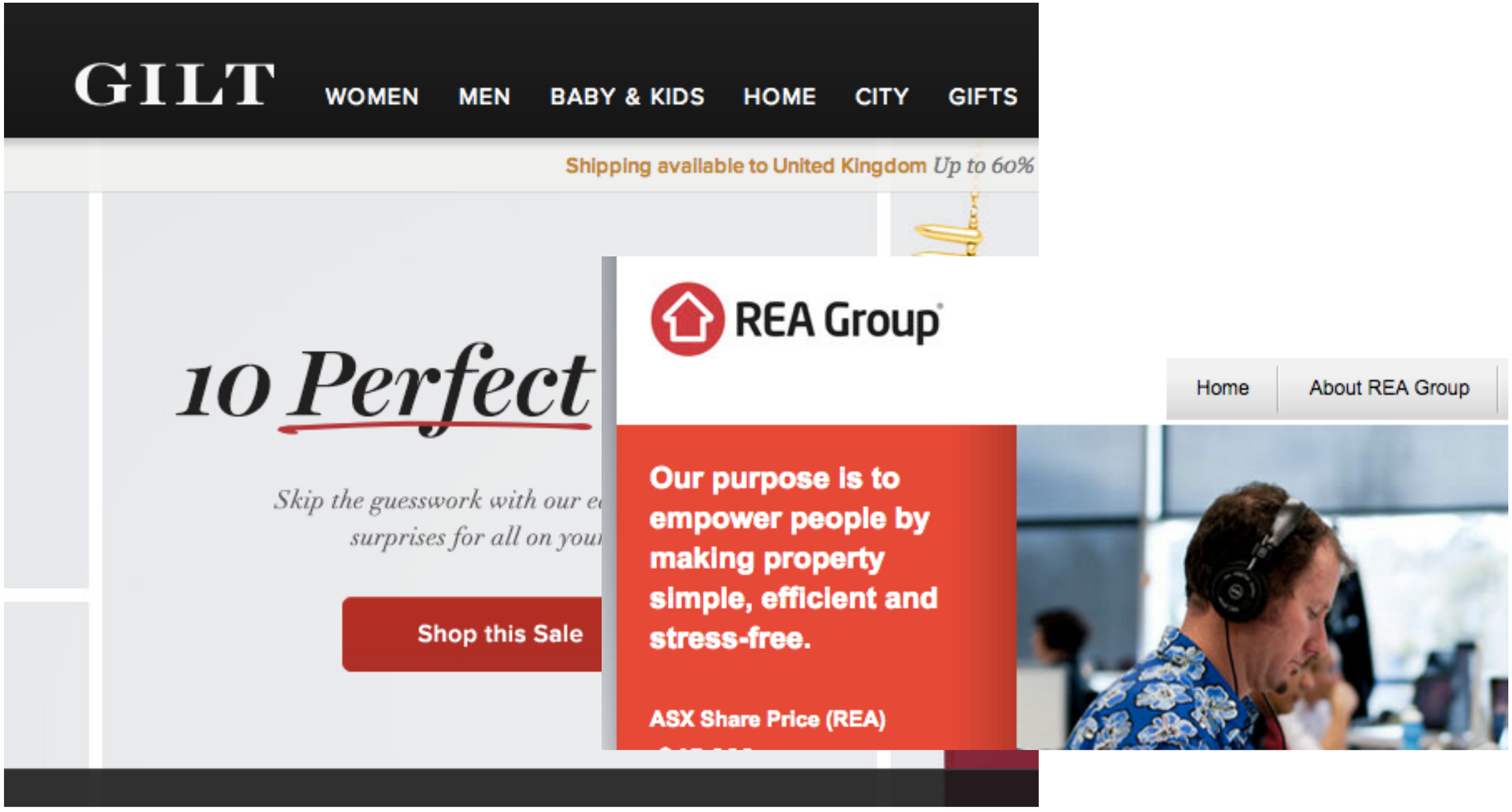
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Our purpose is to empower people by making property simple, efficient and stress-free.
ASX Share Price (REA)

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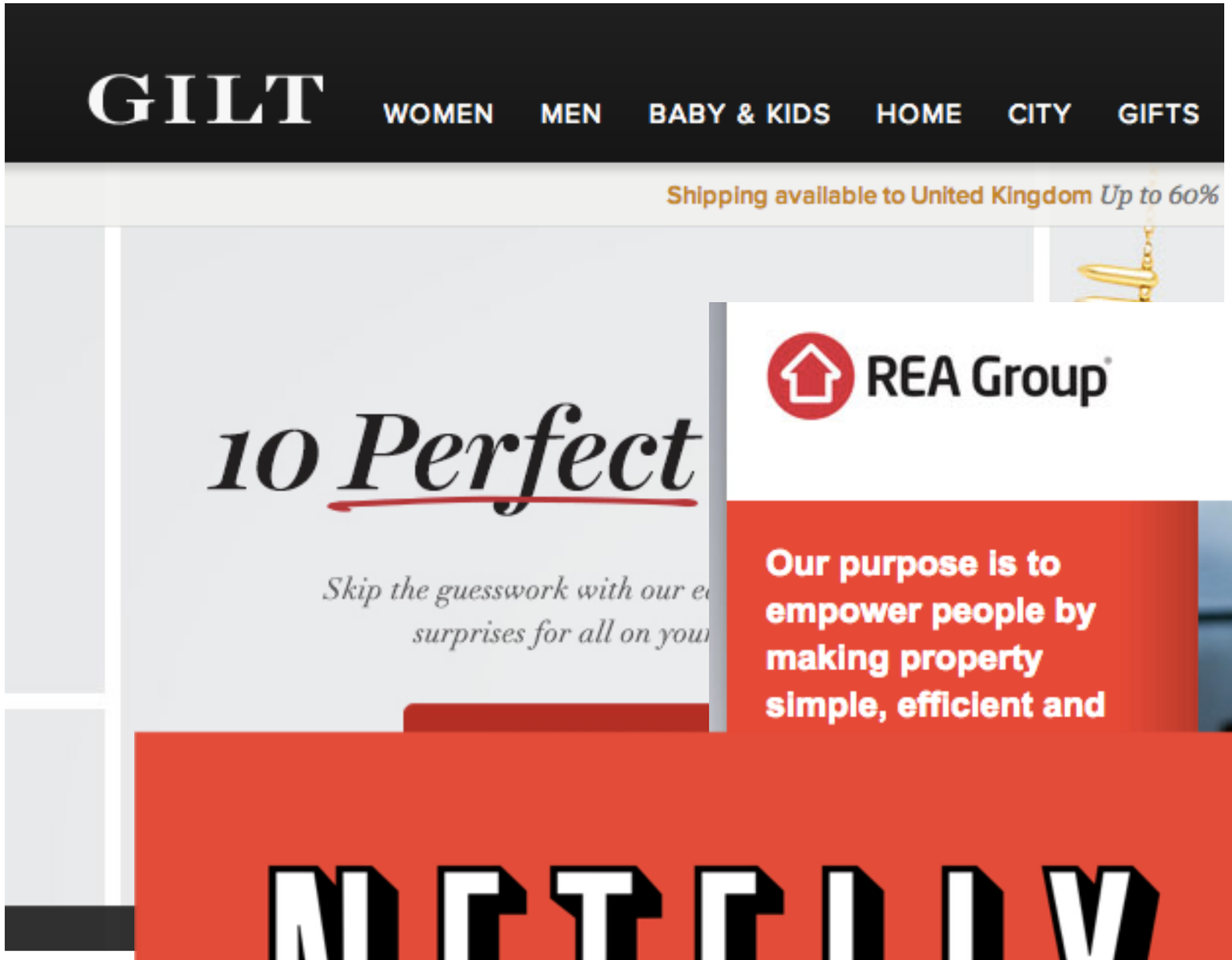
GILT
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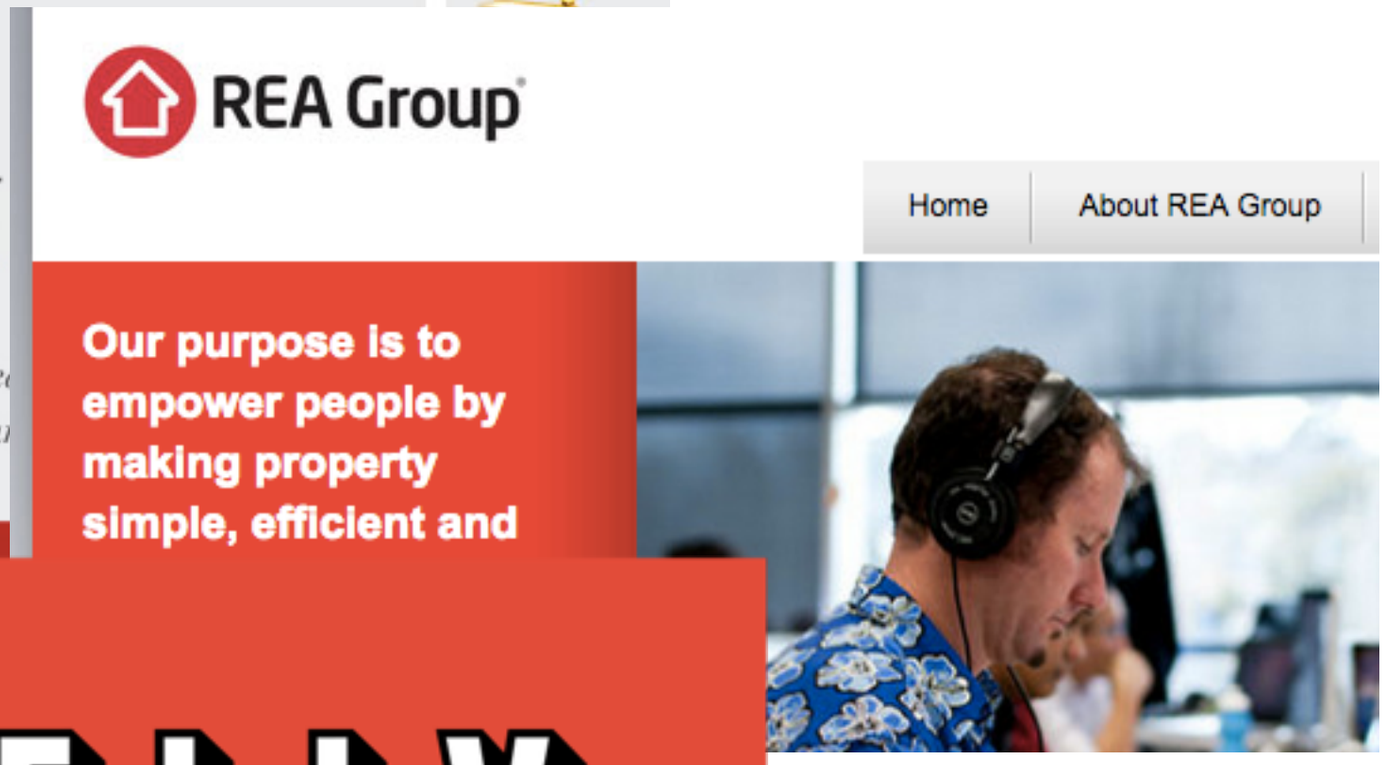
REA Group
Home
About REA Group
Our purpose is to empower people by making property simple, efficient and


NETFLIX

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The Twelve Factors

I. Codebase
One codebase tracked in revision control, many deploys

II. Dependencies
Explicitly declare and isolate dependencies

III. Config
Store config in the environment

IV. Backing Services
Treat backing services as attached resources

V. Build, release, run
Strictly separate build and run stages

VI. Processes
Execute the app as one or more stateless processes

VII. Port binding
Export services via port binding

VIII. Concurrency
Scale out via the process model

IX. Disposability
Maximize robustness with fast startup and graceful shutdown

X. Dev/prod parity
Keep development, staging, and production as similar as possible

XI. Logs
Treat logs as event streams

XII. Admin processes
Run admin/management tasks as one-off processes

http://www.12factor.net/

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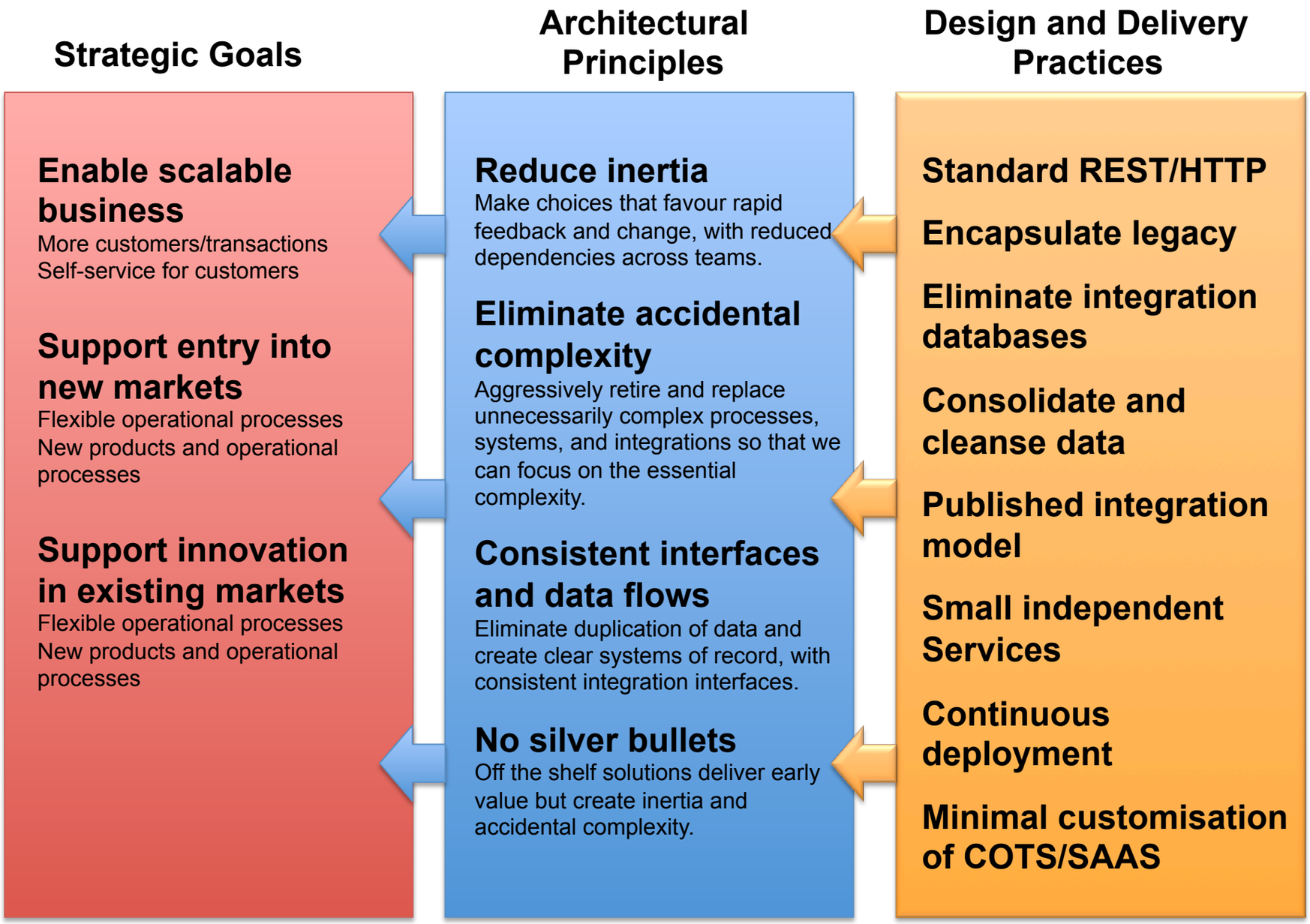
Strategic Goals
Enable scalable business
More customers/transactions
Self-service for customers
Support entry into new markets
Flexible operational processes
New products and operational processes
Support innovation in existing markets
Flexible operational processes
New products and operational processes
Architectural Principles
Reduce inertia
Make choices that favour rapid feedback and change, with reduced dependencies across teams.
Eliminate accidental complexity
Aggressively retire and replace unnecessarily complex processes, systems, and integrations so that we can focus on the essential complexity.
Consistent interfaces and data flows
Eliminate duplication of data and create clear systems of record, with consistent integration interfaces.
No silver bullets
Off the shelf solutions deliver early value but create inertia and accidental complexity.
Design and Delivery Practices
Standard REST/HTTP
Encapsulate legacy
Eliminate integration databases
Consolidate and cleanse data
Published integration model
Small independent Services
Continuous deployment
Minimal customisation of COTS/SAAS

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Small ***Autonomous*** services

that ***work together***

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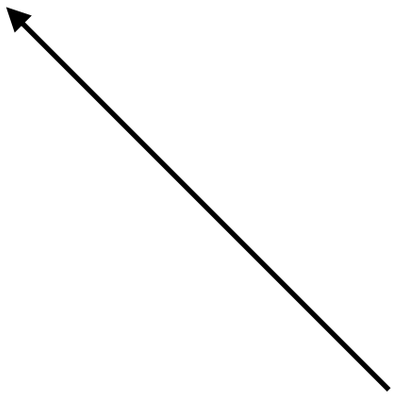
Principles Of Microservices

Modelled Around
Business Domain



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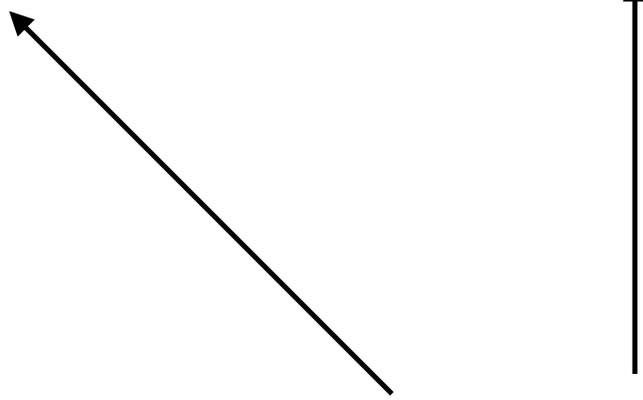
Modelled Around Business Domain

Culture Of Automation



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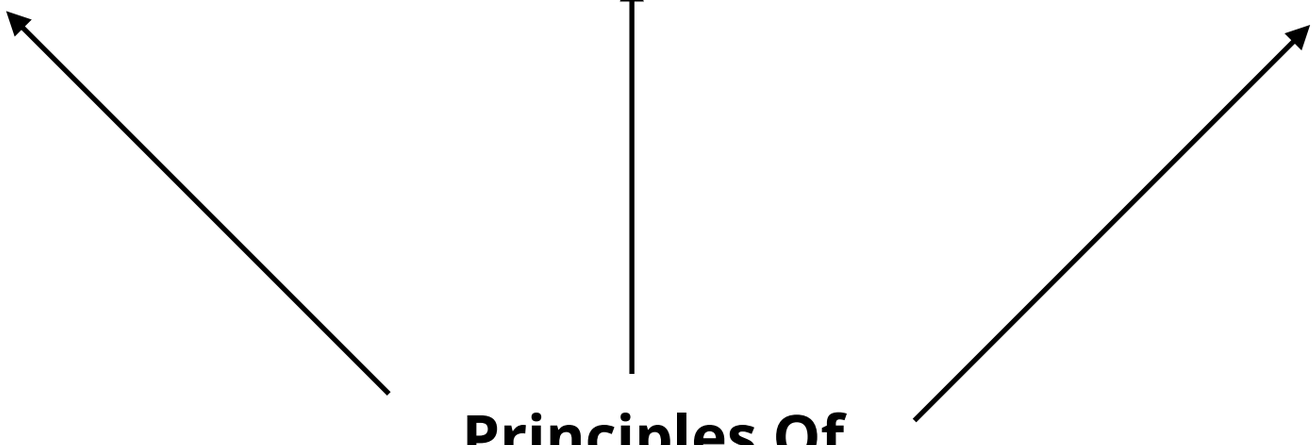
Hide Implementation Details



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Principles Of Microservices

Decentralise All The Things

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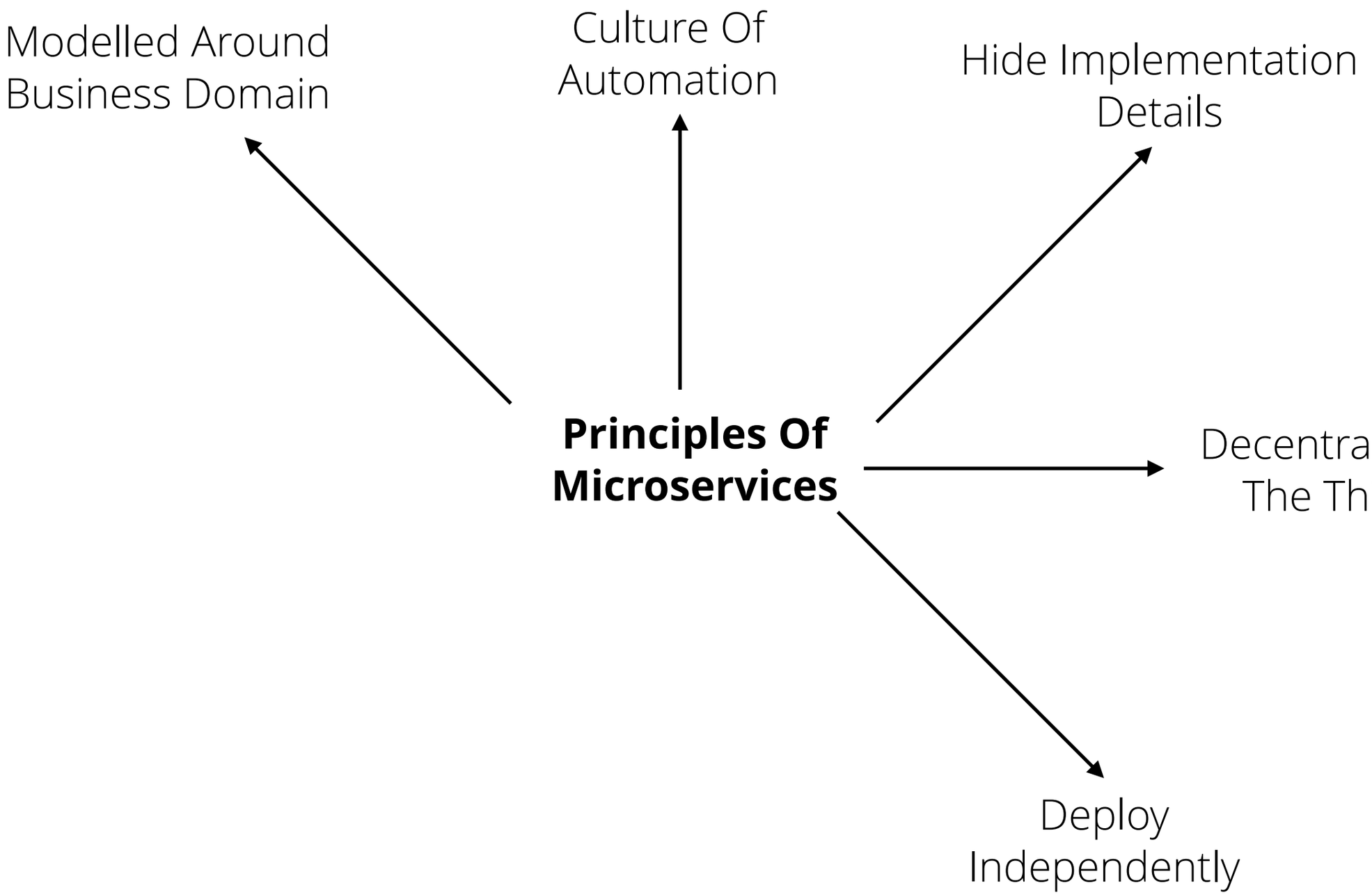
Modelled Around Business Domain
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Deploy Independently

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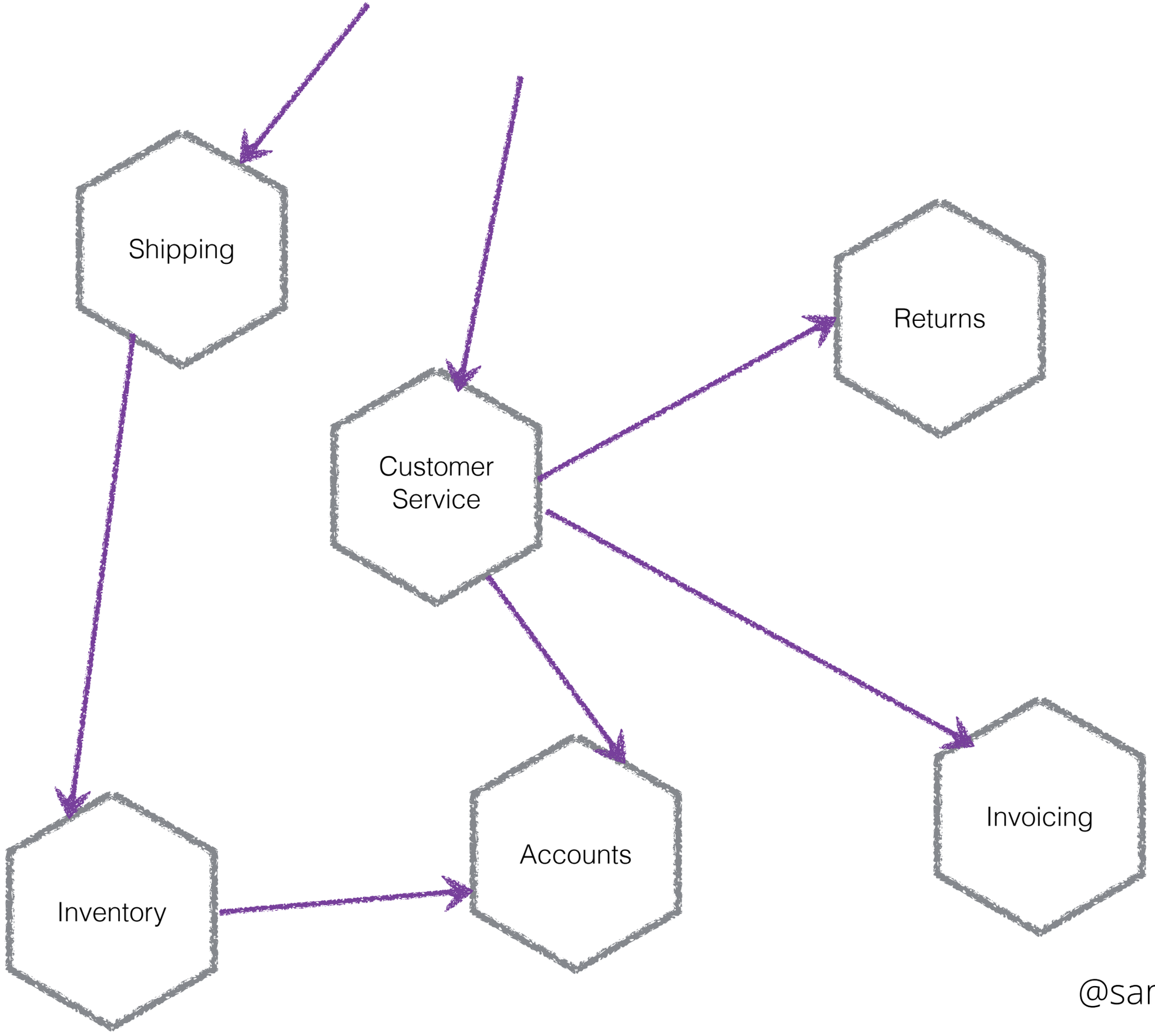
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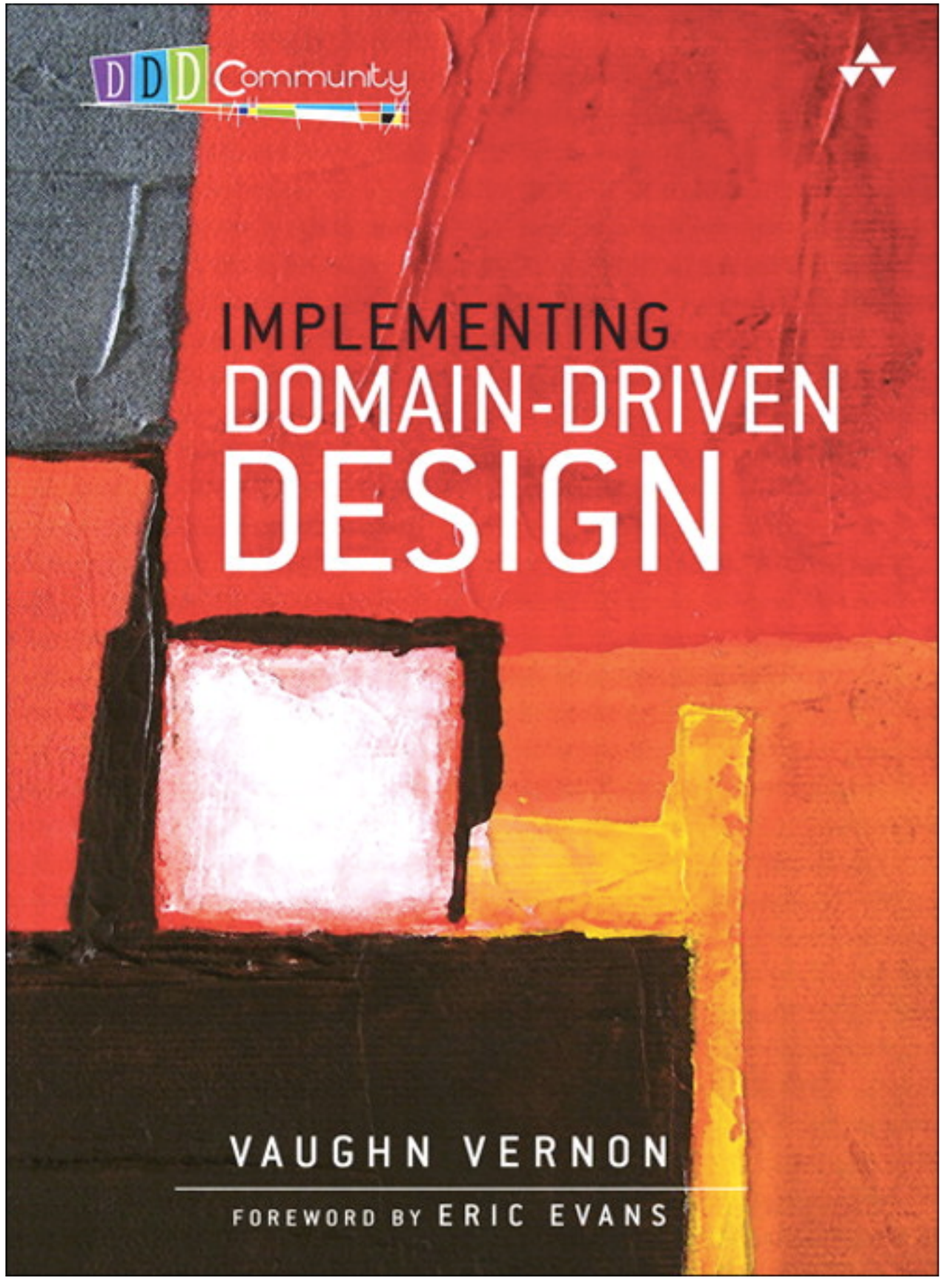
DDD Community
IMPLEMENTING
DOMAIN-DRIVEN
DESIGN
VAUGHN VERNON
FOREWORD BY ERIC EVANS

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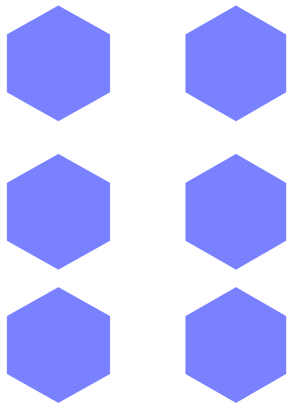
2 Microservices

3 Months

10 Microservices

2 Microservices

3 Months

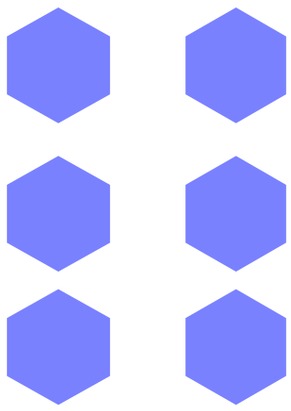


12 Months

2 Microservices

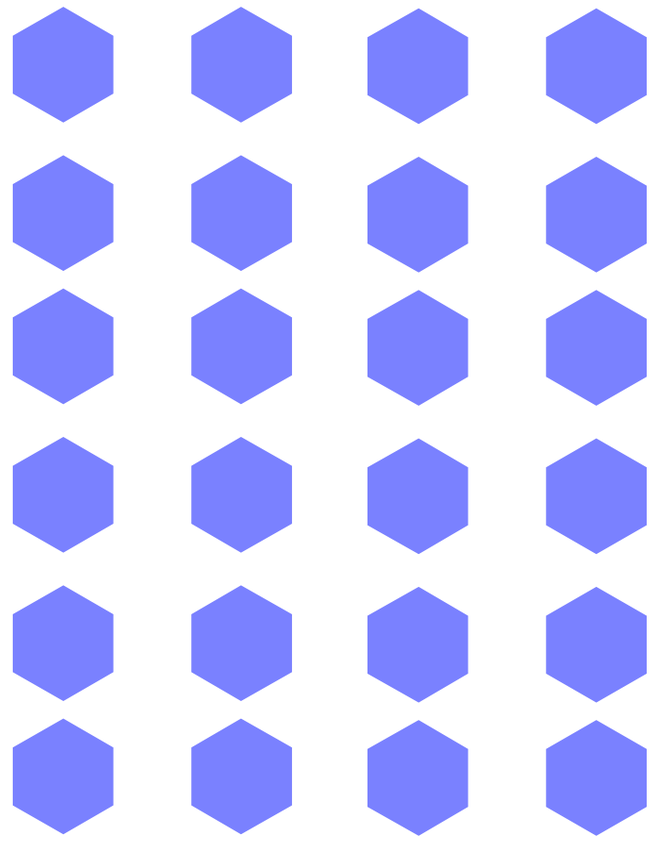
3 Months

10 Microservices



12 Months

60 Microservices



18 Months

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Infrastructure Automation

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Infrastructure Automation

Automated Testing

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Infrastructure Automation

Automated Testing

Continuous Delivery

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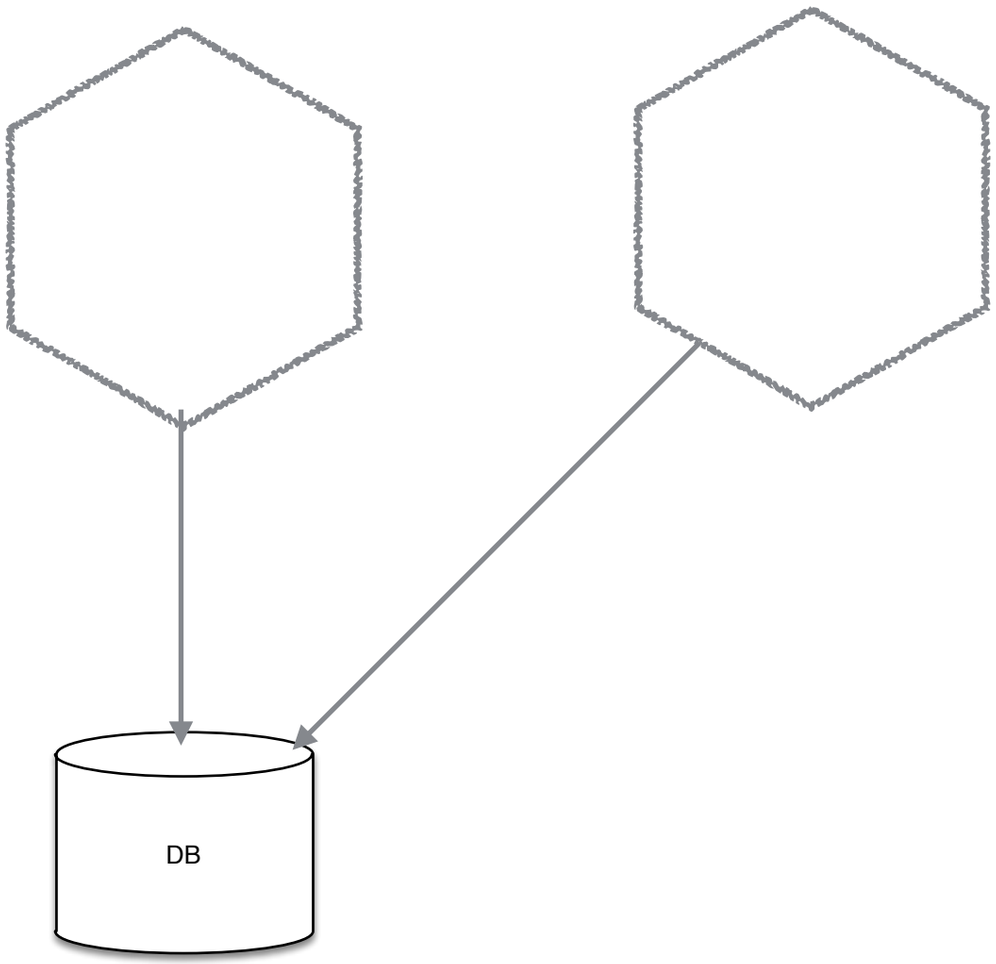
DB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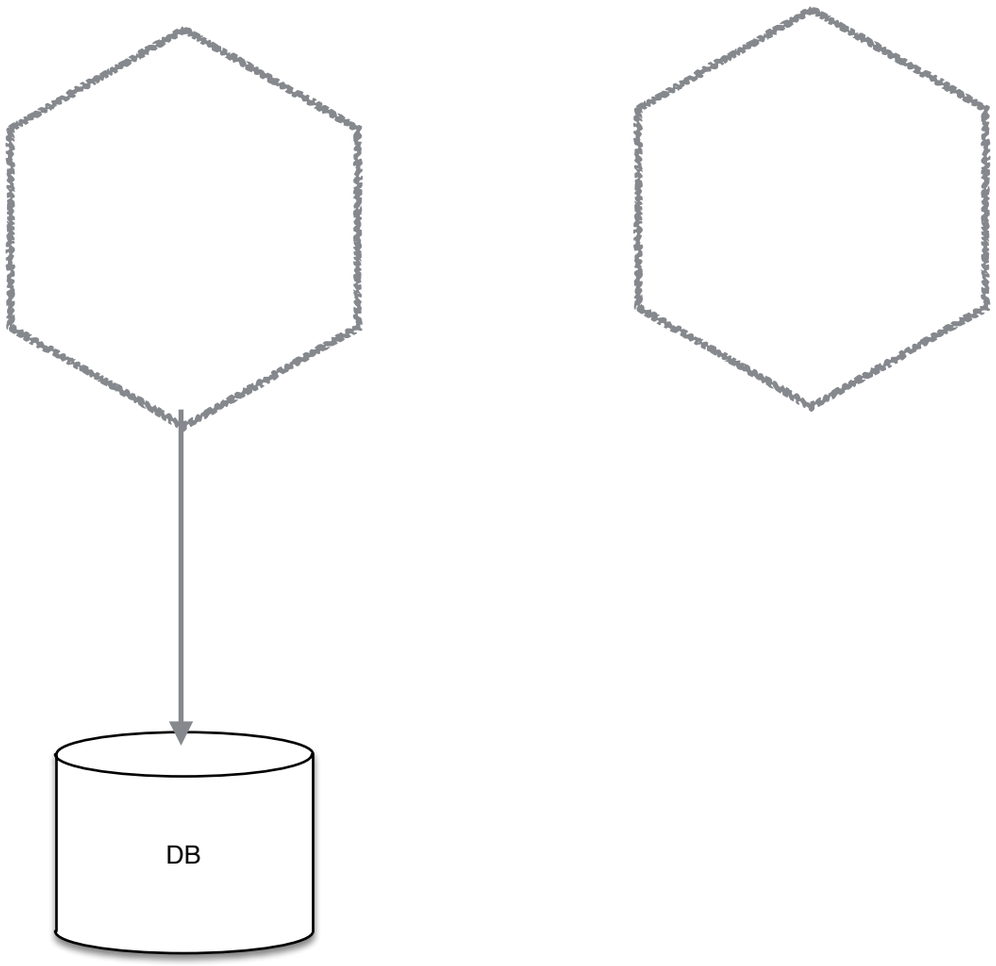
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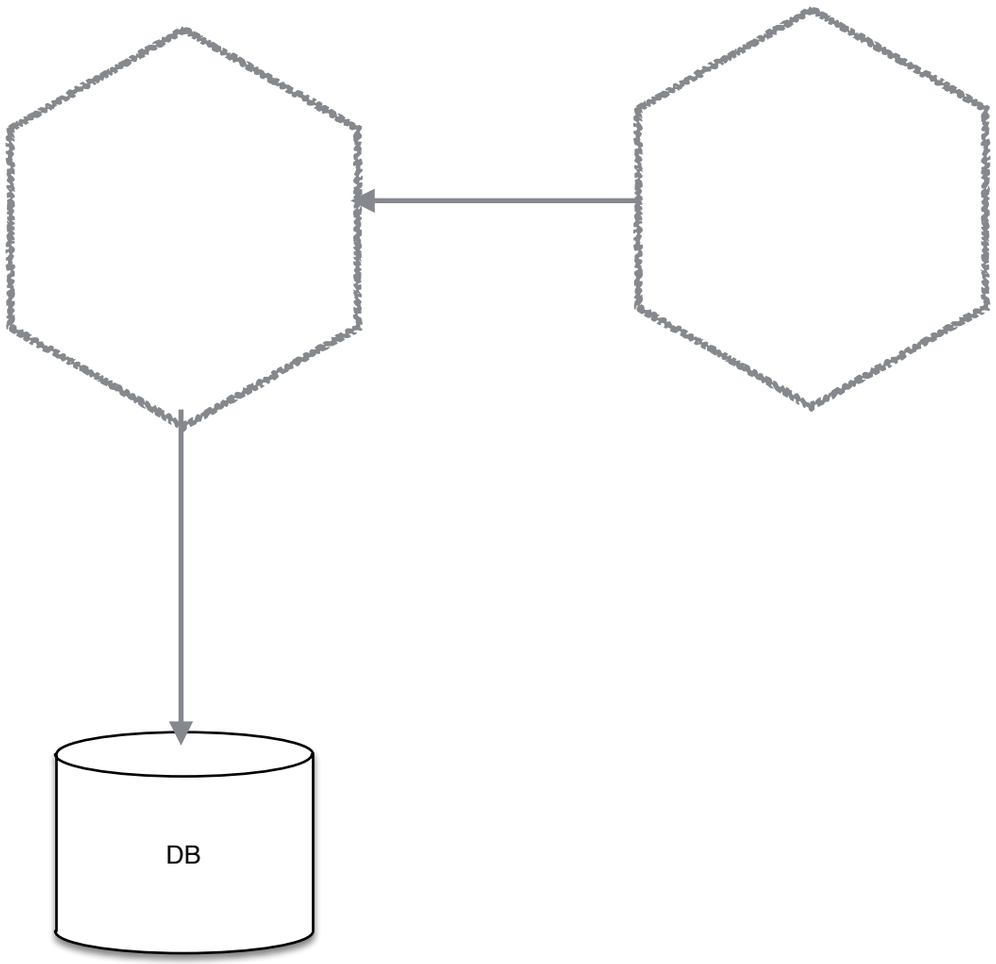
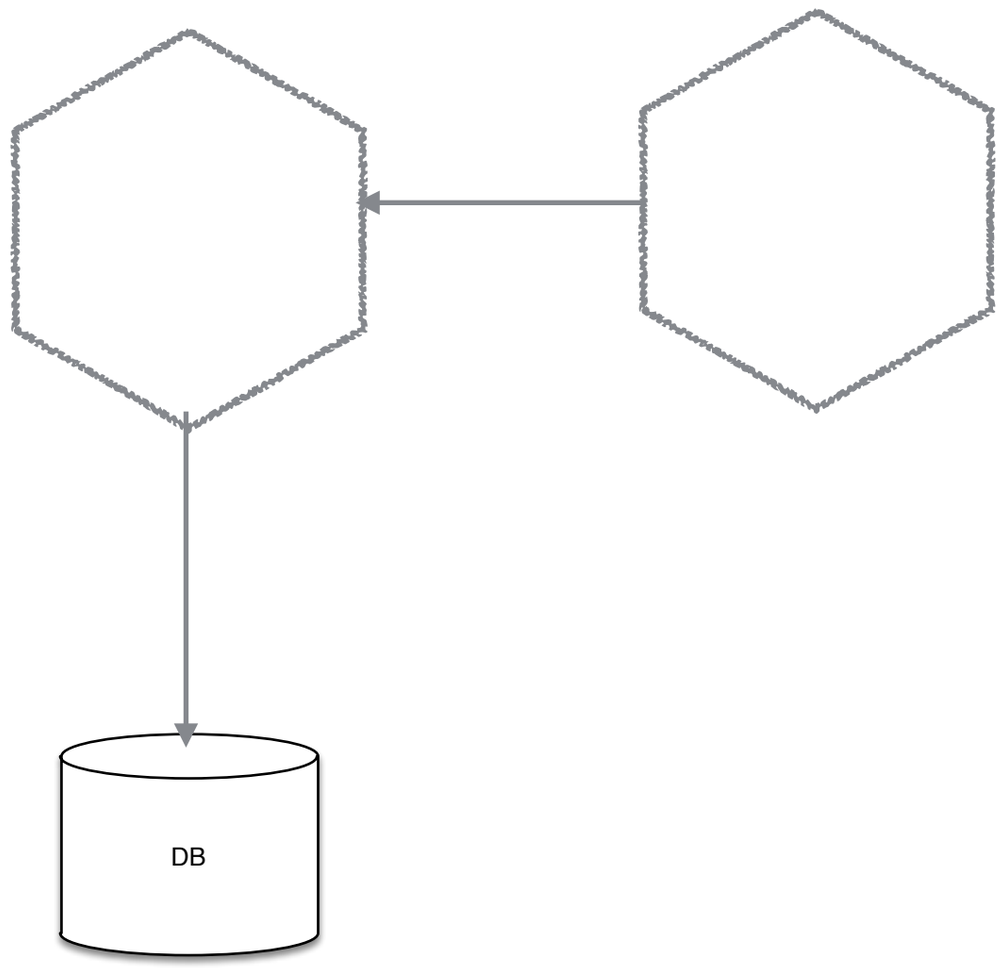
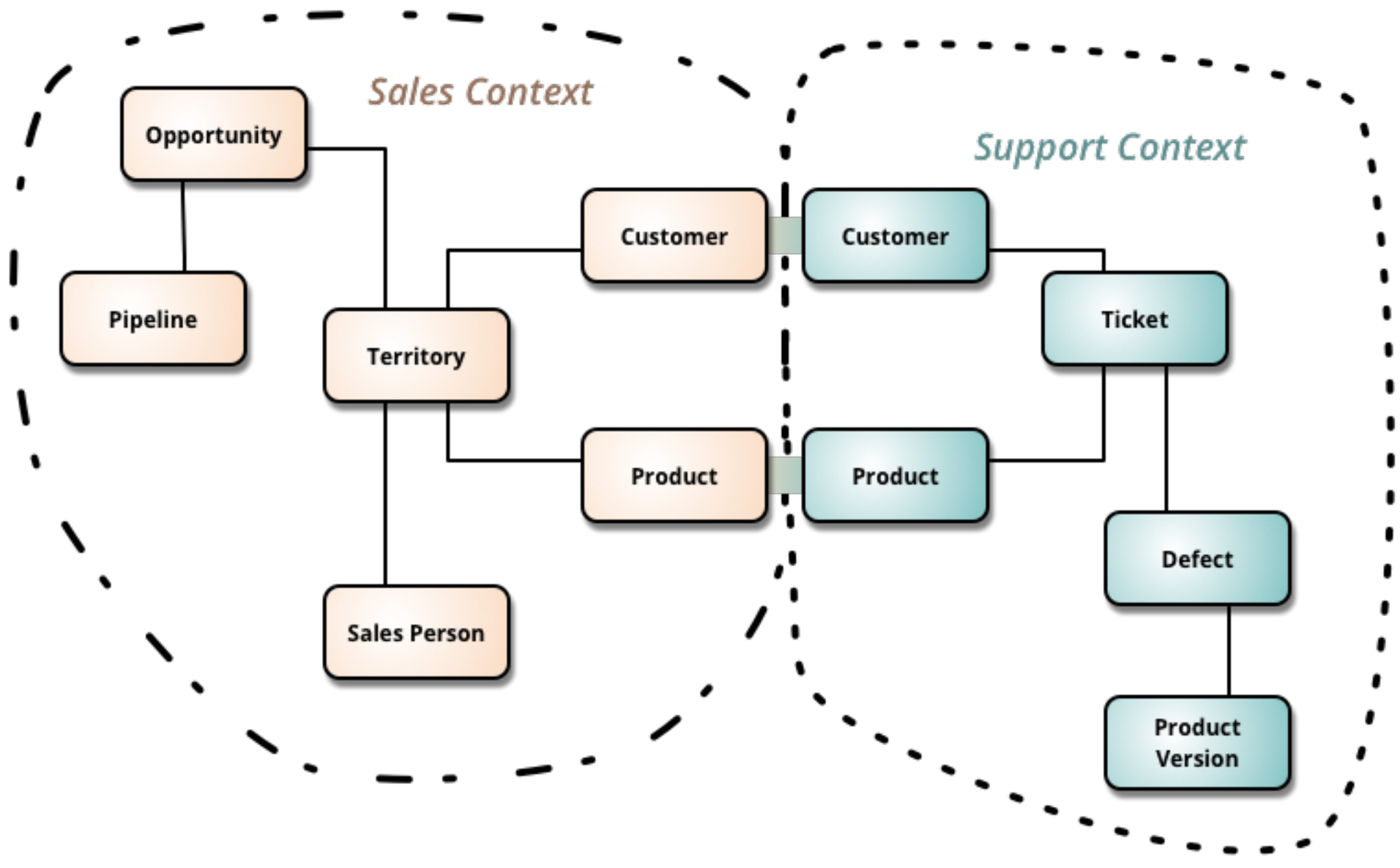

DB

HIDE YOUR DATABASE





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http://martinfowler.com/bliki/images/boundedContext/sketch.png

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What is autonomy?

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Giving people as much freedom as possible to do the job at hand

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DEVOLUTION?

SELF-SERVICE

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GILT TECH

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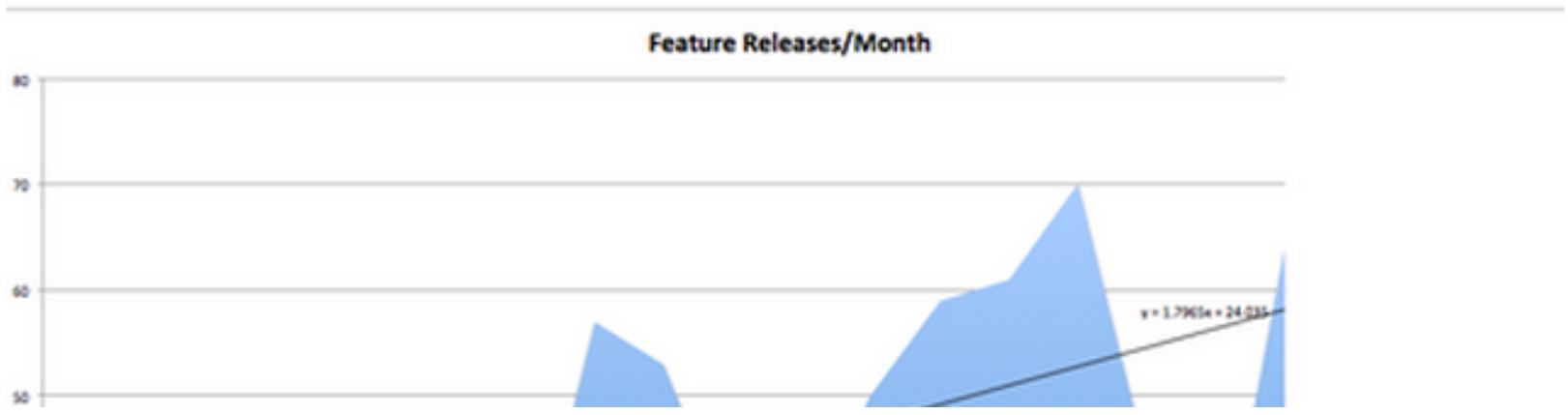
Making Architecture Work in Microservice Organizations



http://tech.gilt.com/post/102628539834/making-architecture-work-in-microservice

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OWNER-OPERATOR

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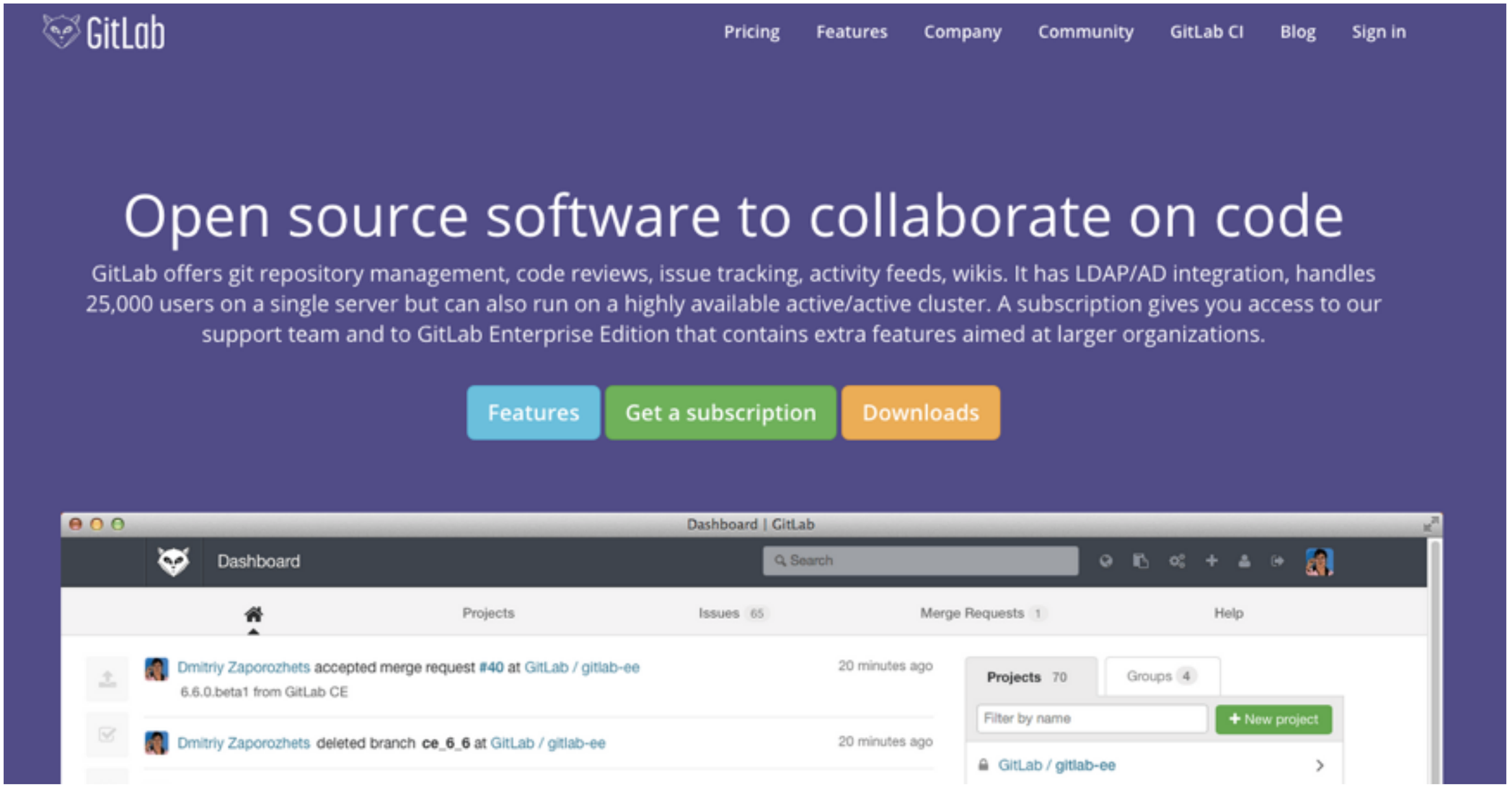
INTERNAL OPEN SOURCE



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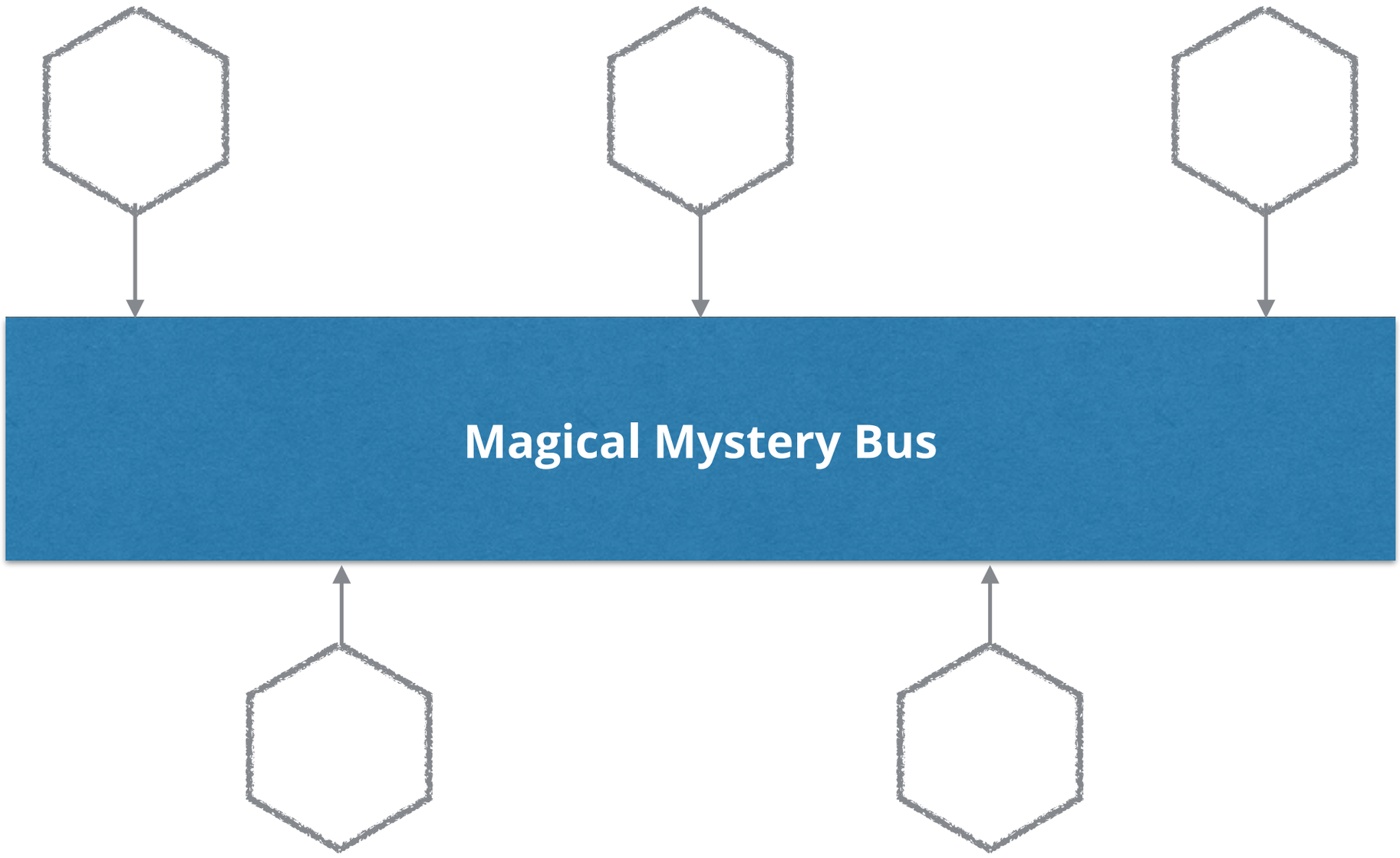
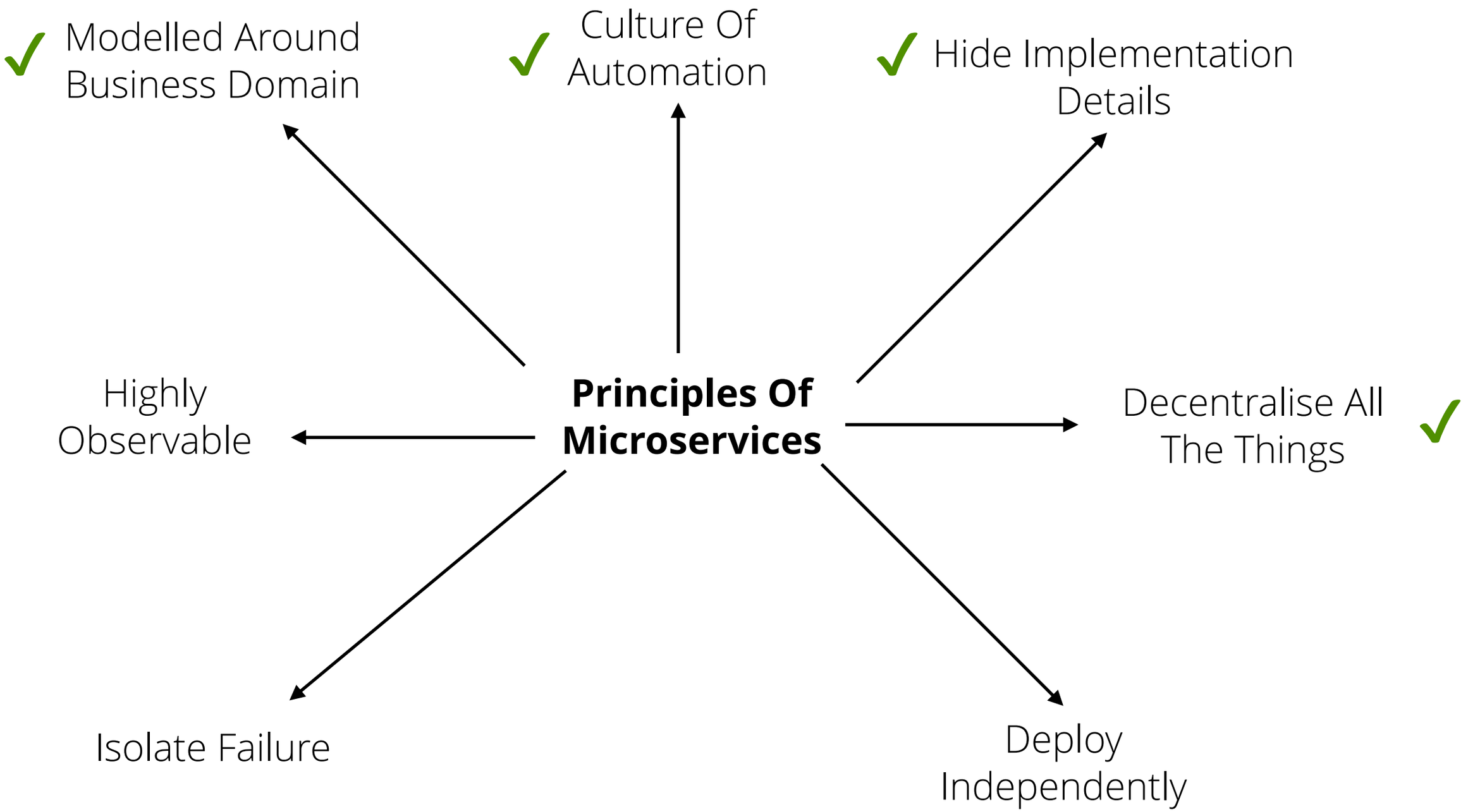
DUMB-PIPES, SMART ENDPOINTS



Magical Mystery Bus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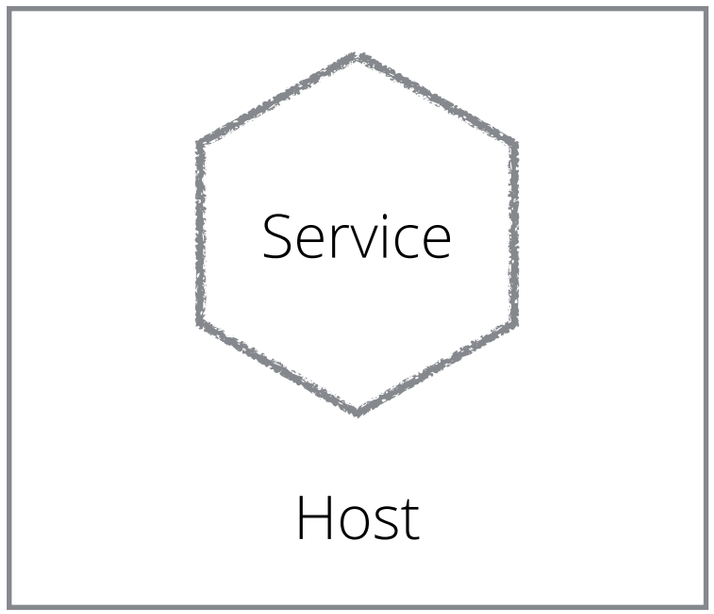
ONE SERVICE PER-HOST



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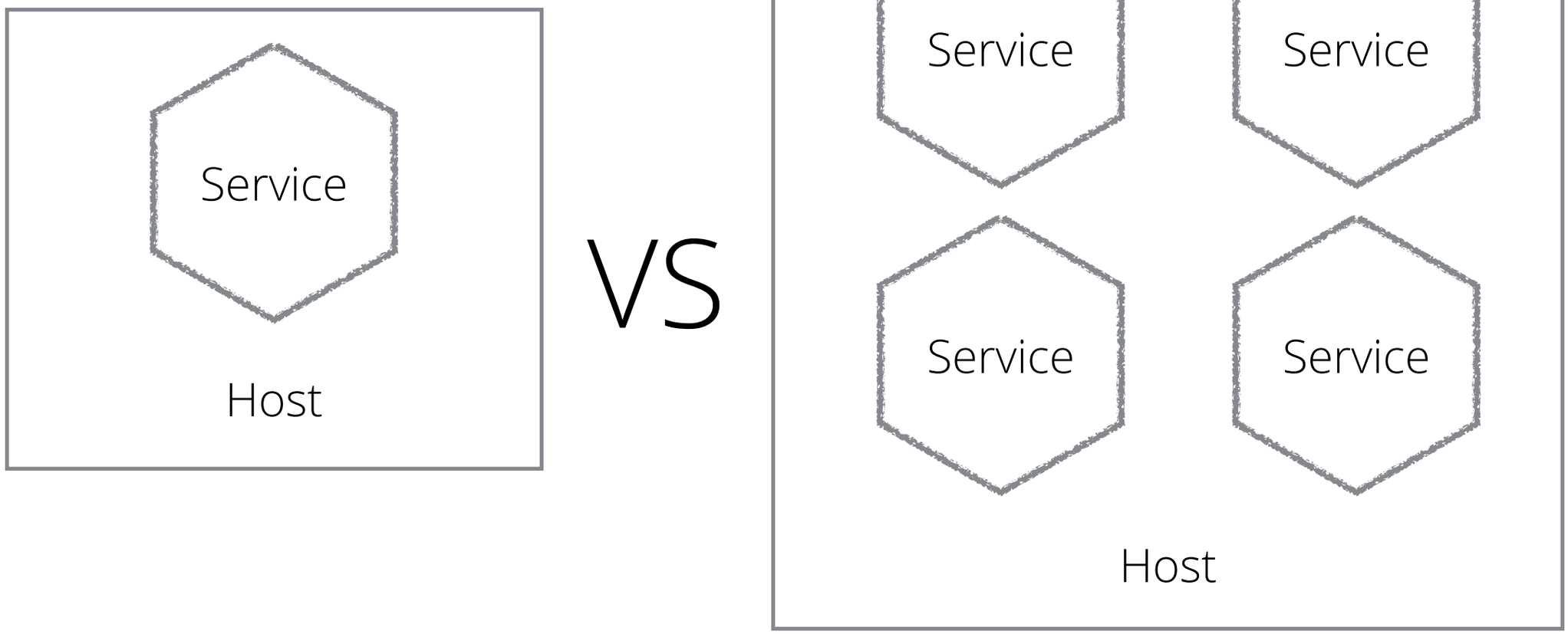

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CONSUMER-DRIVEN CONTRACTS

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Expectations

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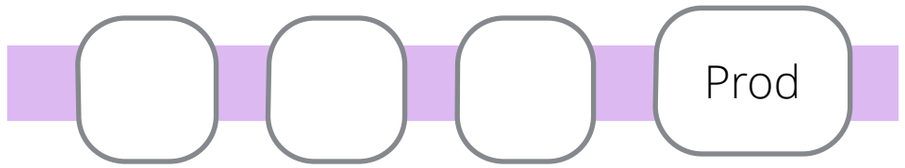


```
def asHtml(): Node = {
  <html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
    <head>
        <link rel="stylesheet" href="/static/common.css" type="text/css" />
        <link rel="stylesheet" href={ cssForDisplayType } type="text/css" />
        <meta http-equiv="refresh" content="30" />
    </head>
    <body>
      { content(builds) }
    </body>
  </html>
}

private def content(builds: List[Build]): Elem = {
  displayType match {
    case "single" => <div> { builds.map(build => asTable(build)) } </div>
    case "smart" => {
      if (builds.length == 1) {
        <div> { builds.map(build => asTable(build)) } </div>
      } else {
        <ul class="builds">{ builds.map(build => buildToHtml(build)) }</ul>
      }
    }
    case _ => <ul class="builds">{ builds.map(build => buildToHtml(build)) }</ul>
  }
}

private def asTable(build: Build): Elem = {
  <table class={ "build " + build.getStatus.name.toLowerCase }>
          <tr valign="middle" align="center">
            <td>{ linkToBuild(build) }</td>
          </tr>
        </table>
}
```

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CONSUMER-DRIVEN CONTRACTS

Expectations

```
def asHtml(): Node = {
  <html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
    <head>
        <link rel="stylesheet" href="/static/common.css" type="text/css" />
        <link rel="stylesheet" href={ cssForDisplayType } type="text/css" />
        <meta http-equiv="refresh" content="30" />
    </head>
    <body>
      { content(builds) }
    </body>
  </html>
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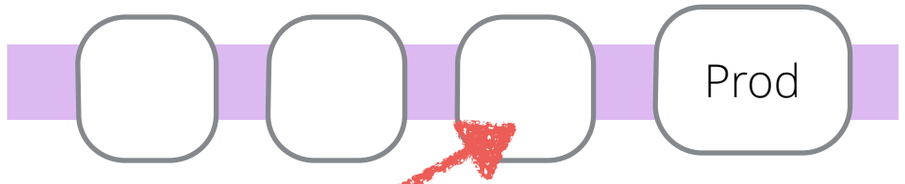

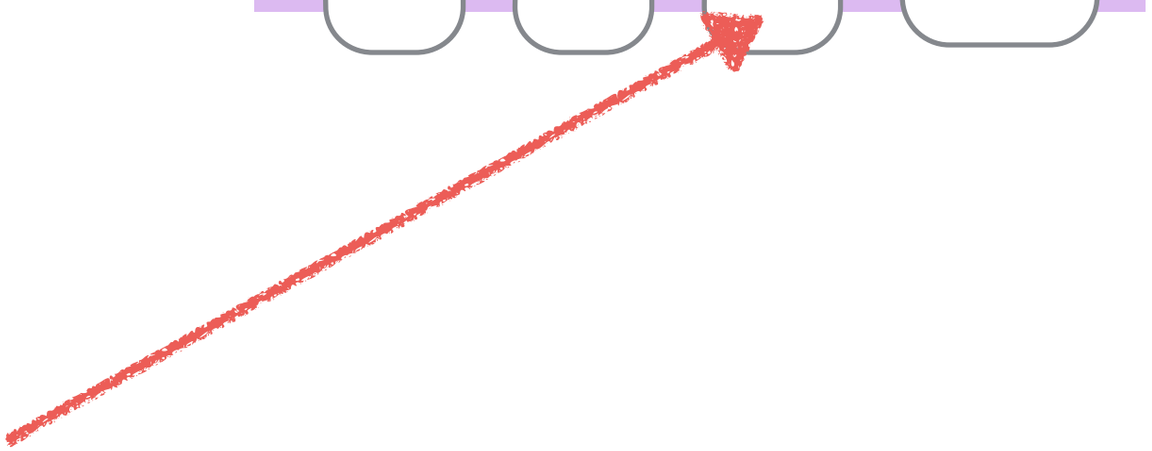

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README.md

Pact

Define a pact between service consumers and providers, enabling "consumer driven contract" testing.

Pact provides an RSpec DSL for service consumers to define the HTTP requests they will make to a service provider and the HTTP responses they expect back. These expectations are used in the consumers specs to provide a mock service provider. The interactions are recorded, and played back in the service provider specs to ensure the service provider actually does provide the response the consumer expects.

This allows testing of both sides of an integration point using fast unit tests.

This gem is inspired by the concept of "Consumer driven contracts". See http://martinfowler.com/articles/consumerDrivenContracts.html for more information.

Travis CI Status: build passing

https://github.com/realestate-com-au/pact

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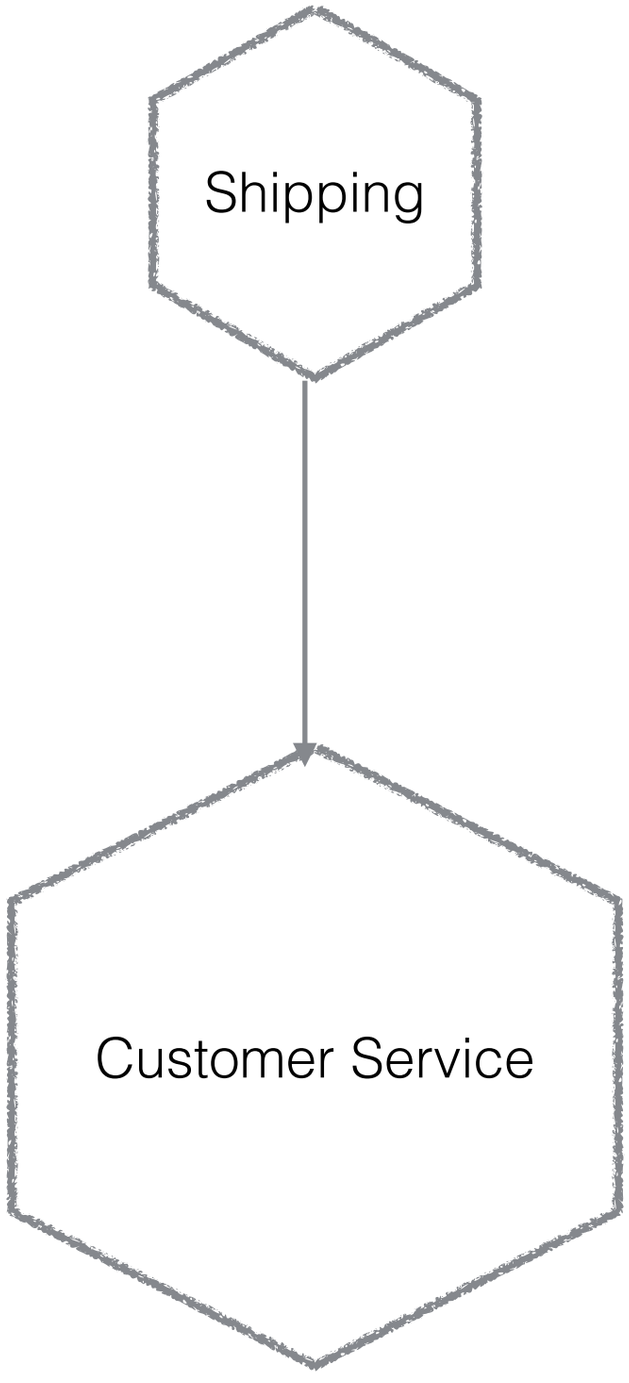
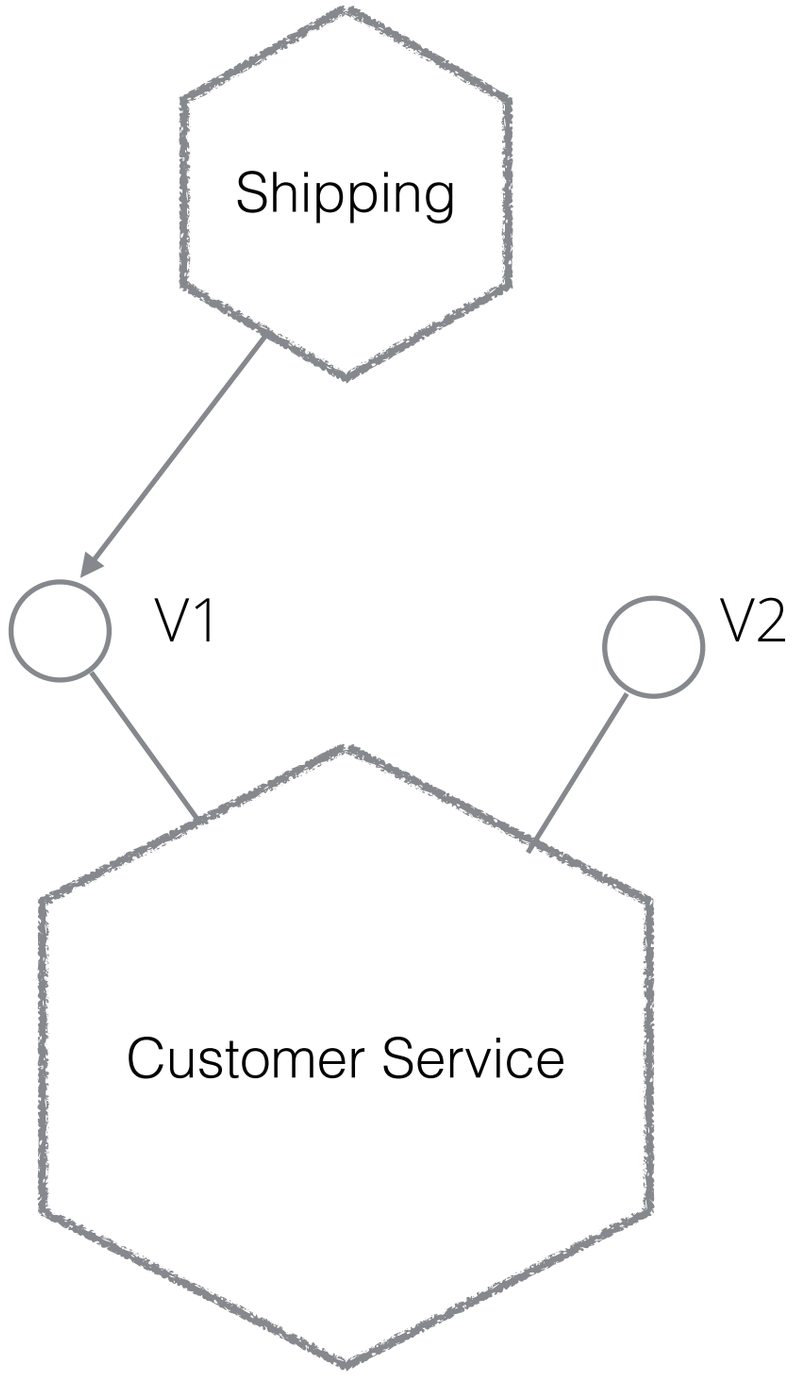
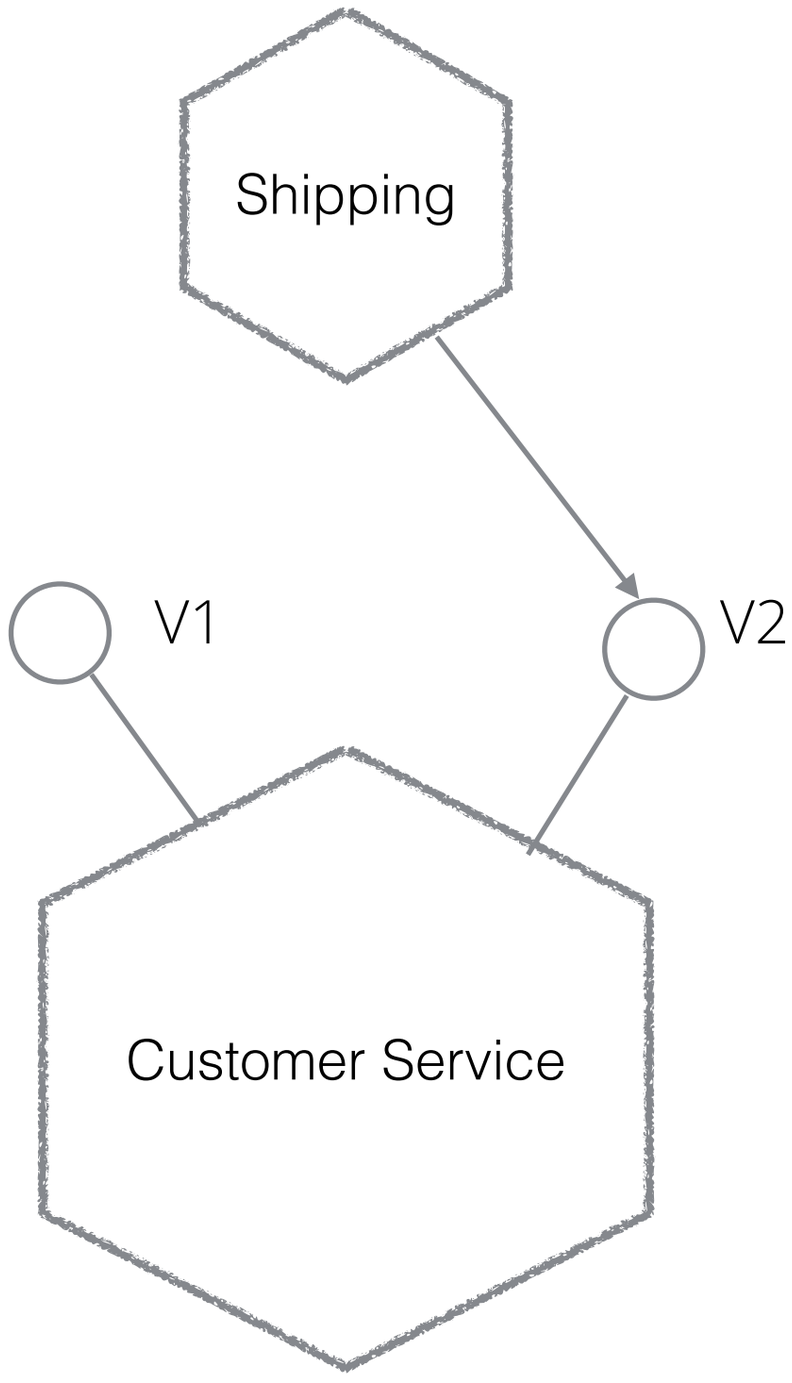
CO-EXIST ENDPOINTS



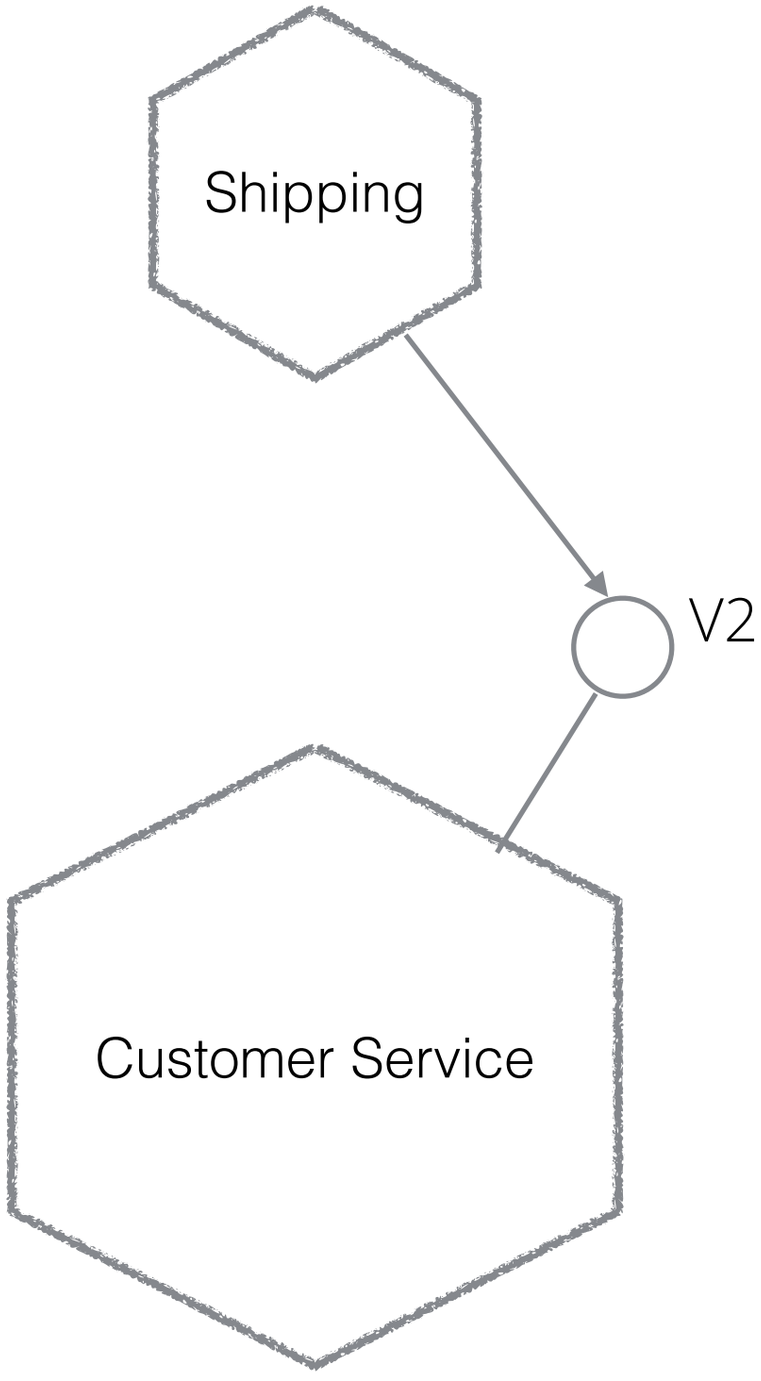
CO-EXIST ENDPOINTS

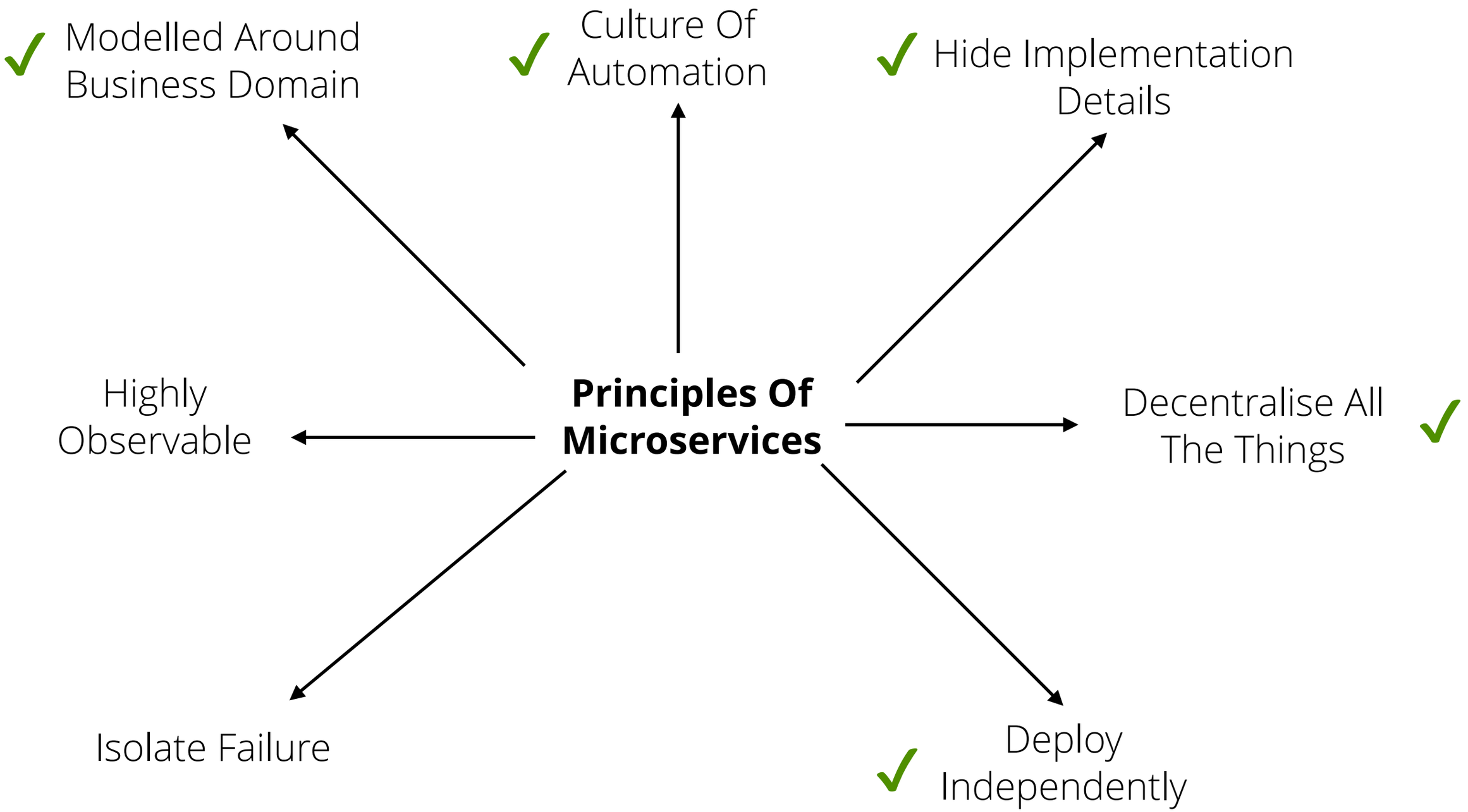


CO-EXIST ENDPOINTS



CO-EXIST ENDPOINTS




✓ Modelled Around Business Domain
✓ Culture Of Automation
✓ Hide Implementation Details
Highly Observable
Principles Of Microservices
Decentralise All The Things ✓
Isolate Failure
✓ Deploy Independently

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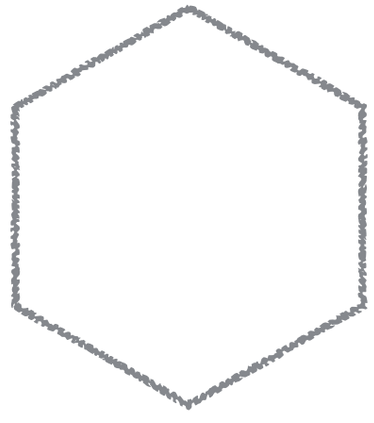

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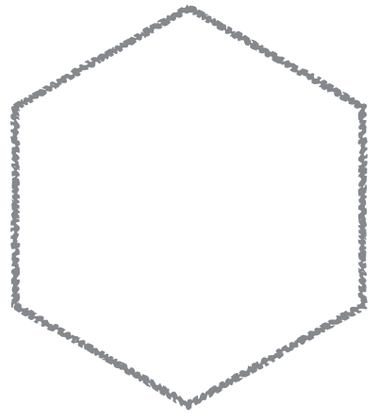

1 in 100

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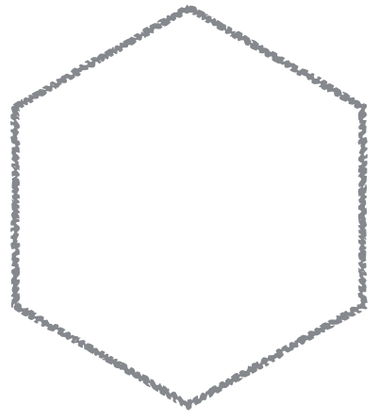

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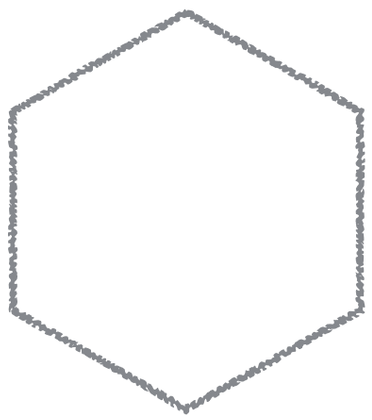

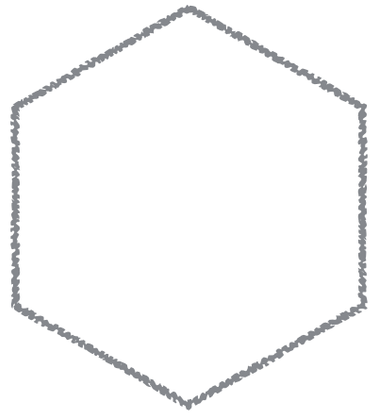

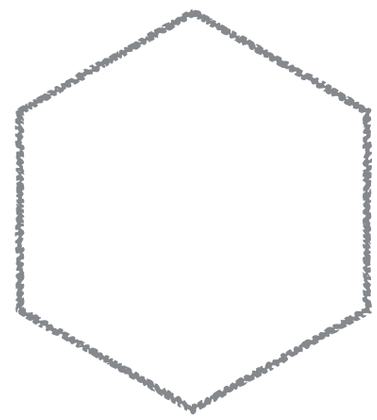

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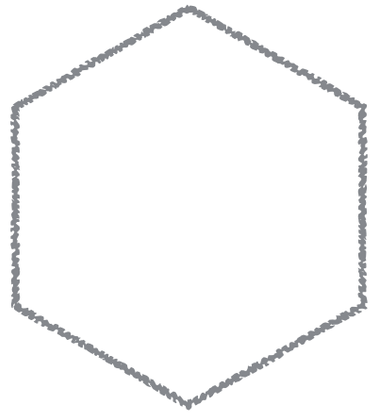
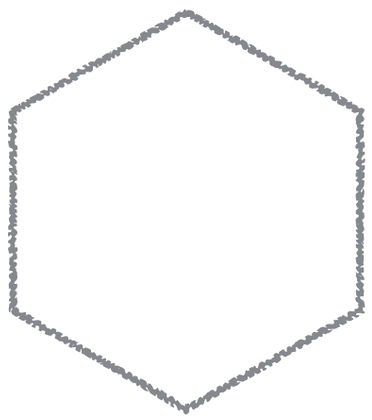
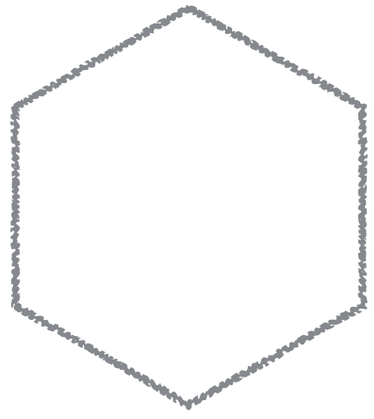
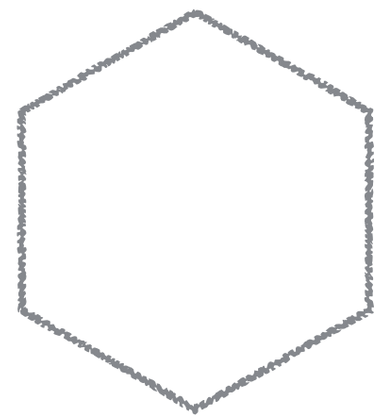


4 in 100







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Strangler App

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Strangler App

Legacy App

Legacy App

Legacy App

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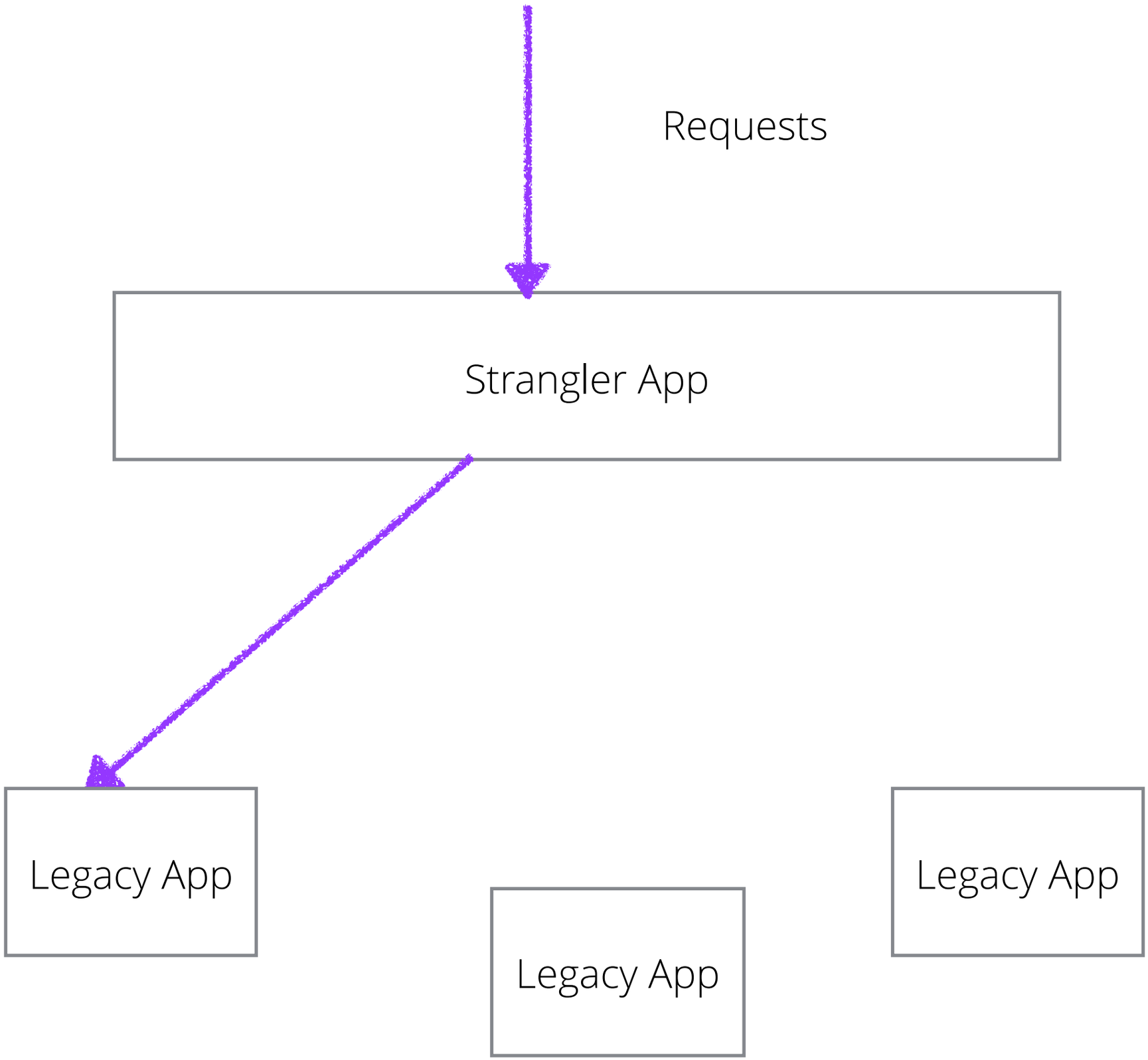

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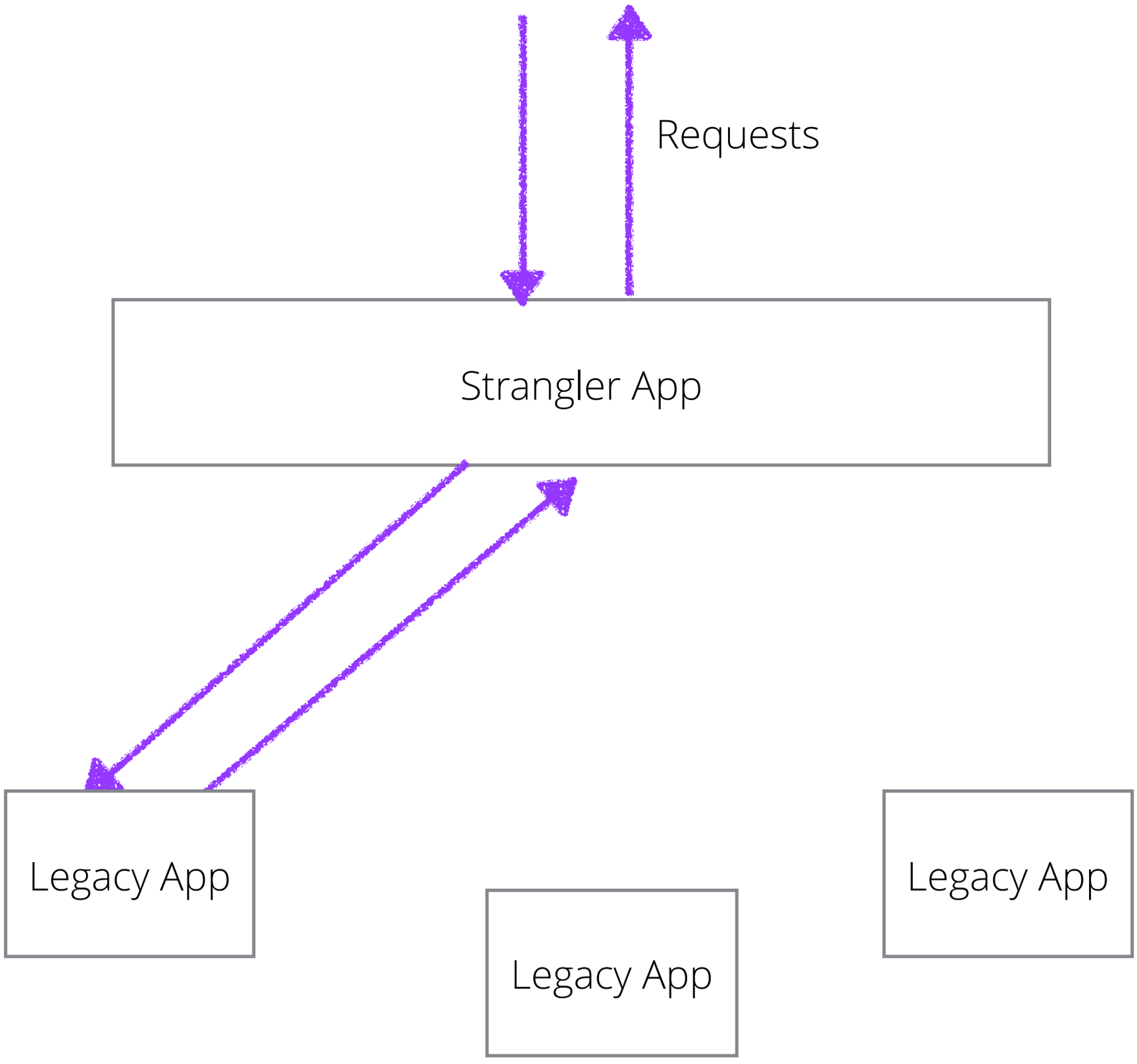

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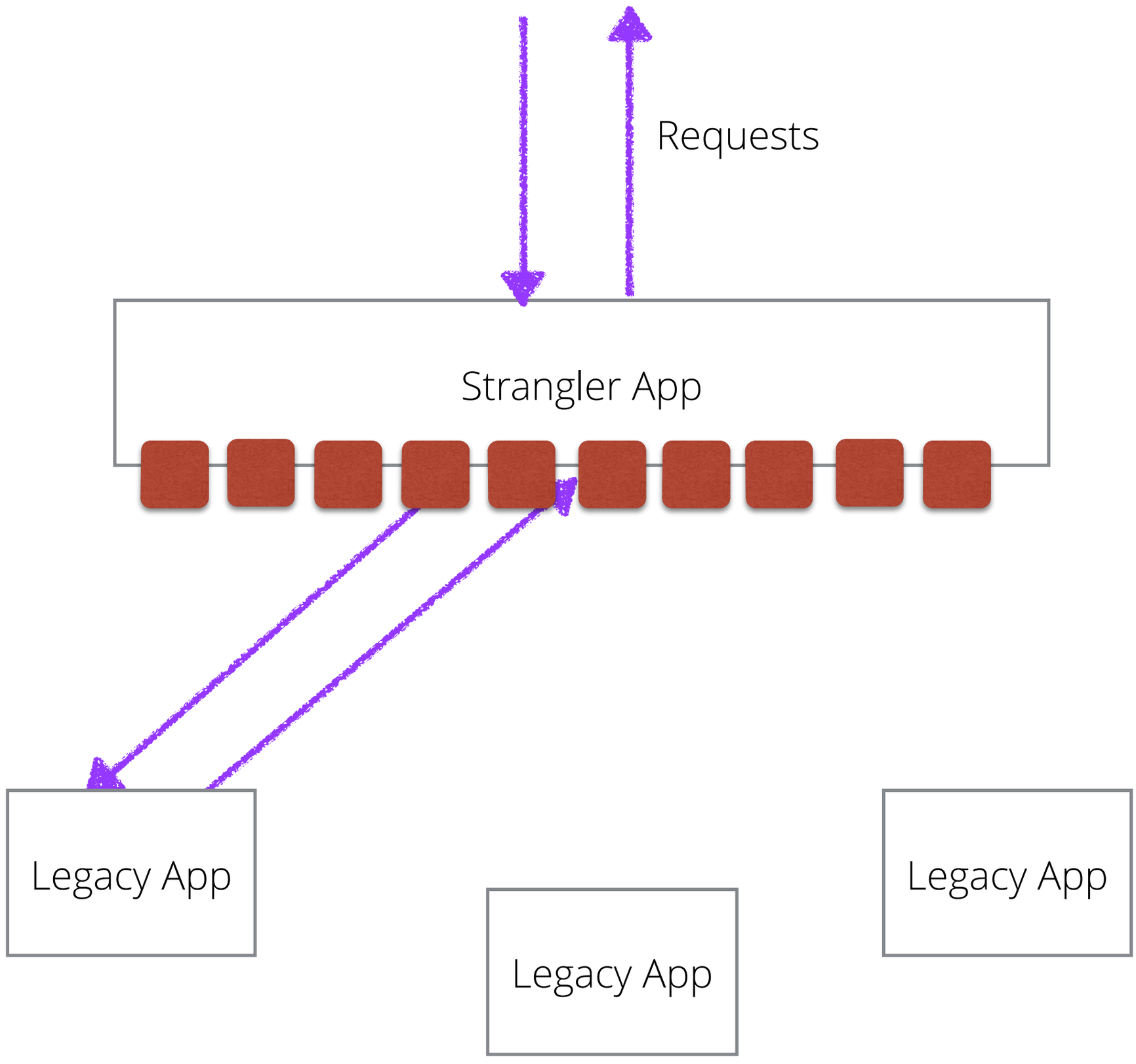

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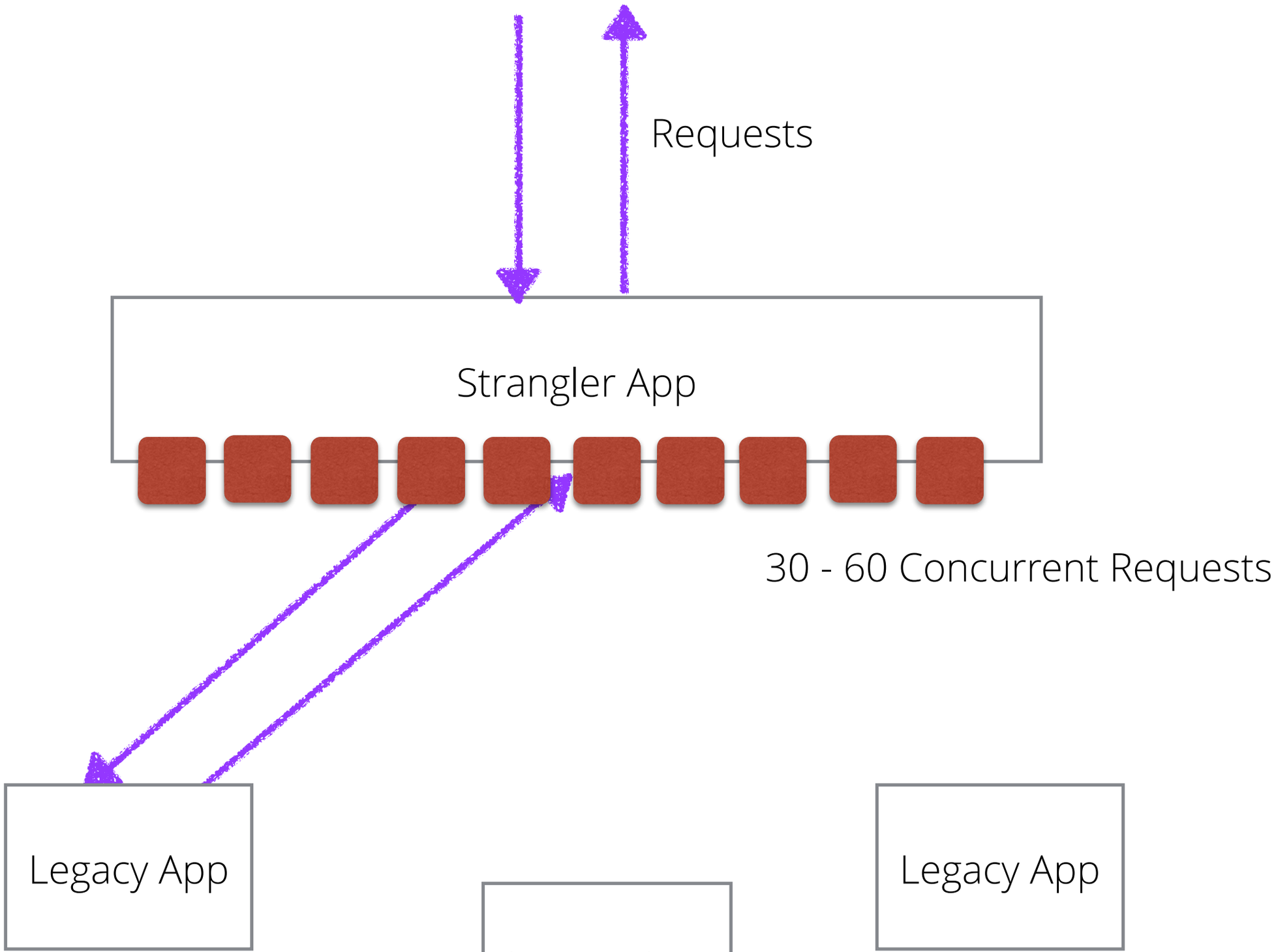
Requests
Strangler App
30 - 60 Concurrent Requests
Legacy App
Legacy App
Legacy App

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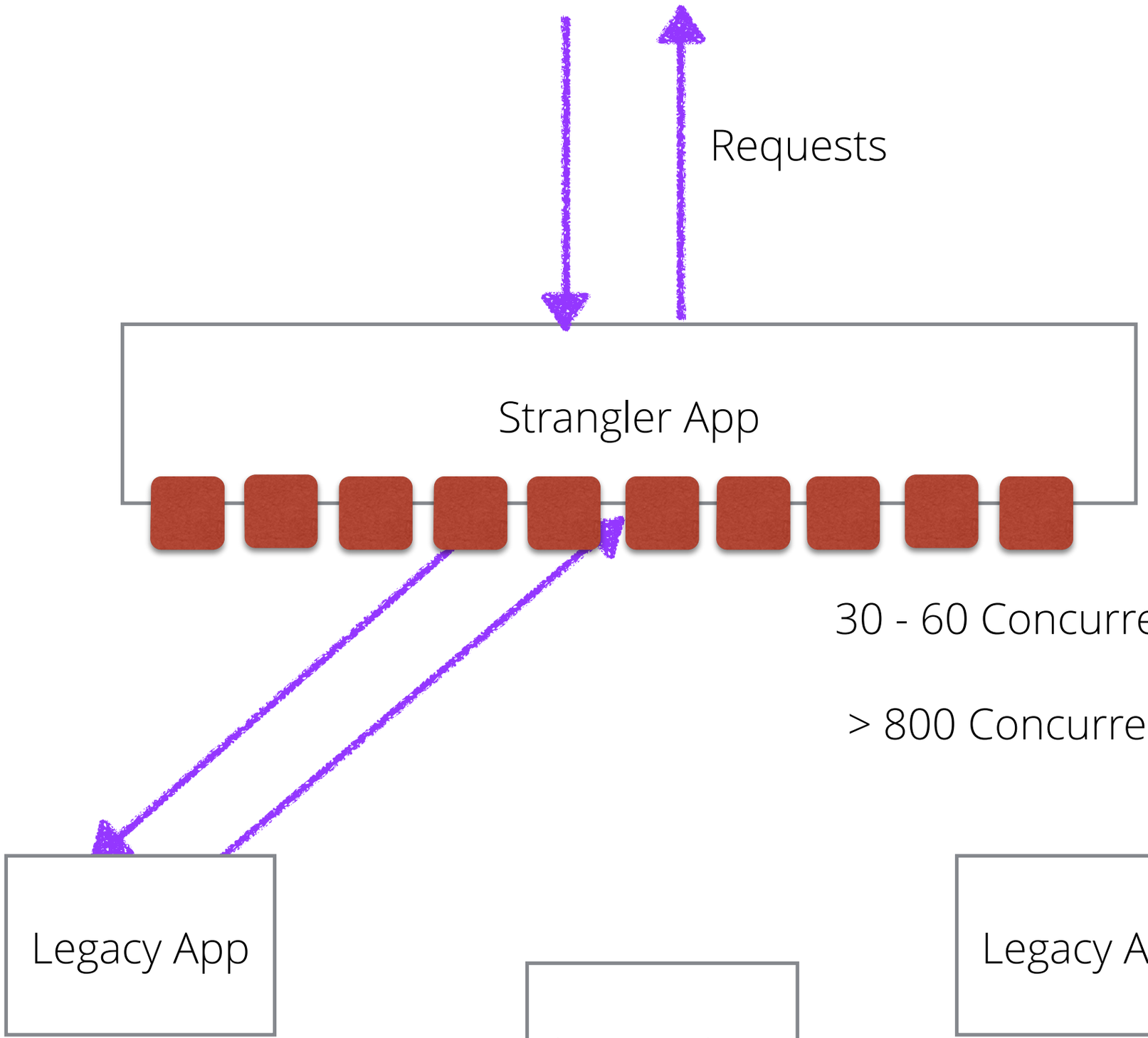
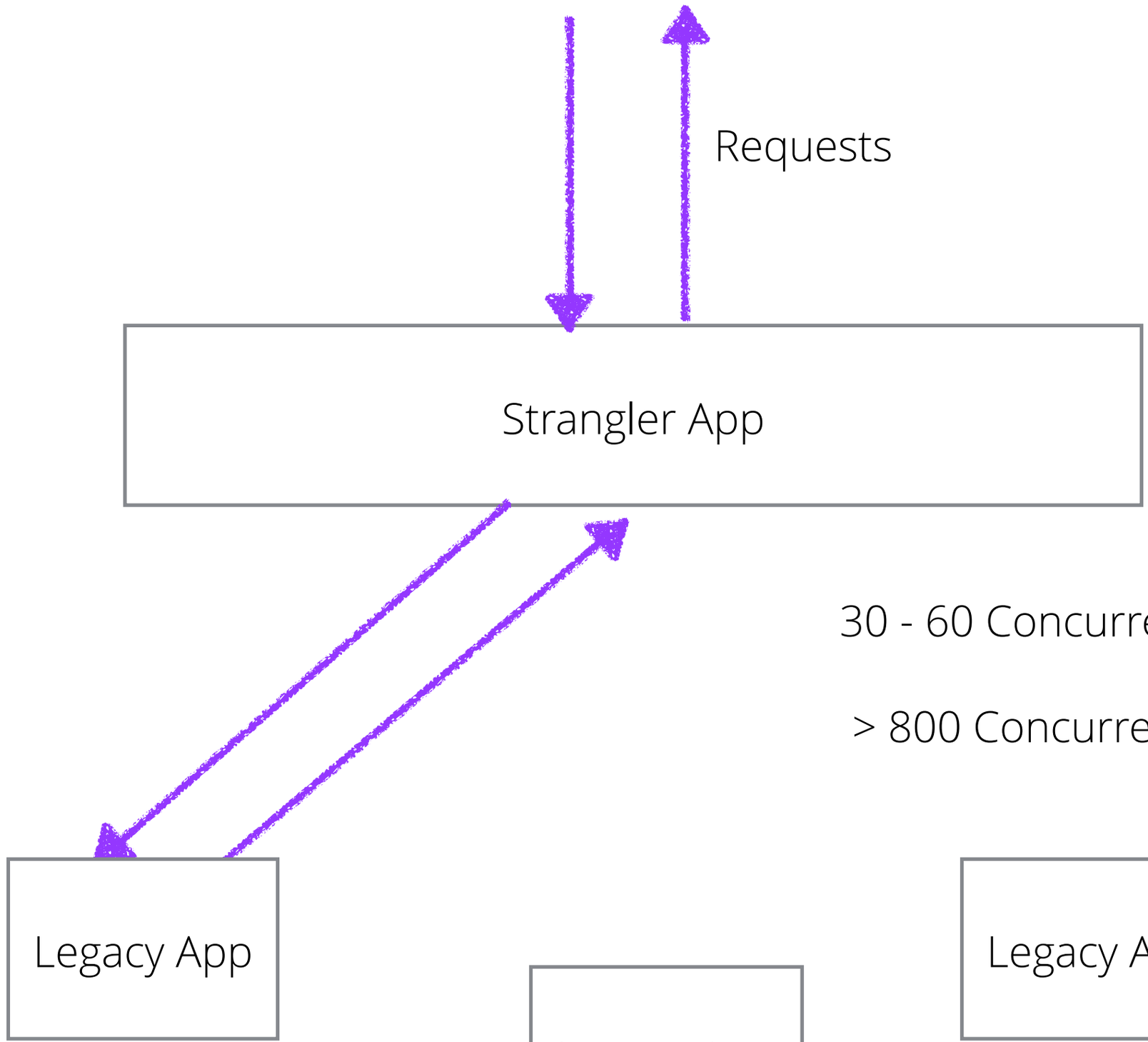


30 - 60 Concurrent Requests

> 800 Concurrent Requests



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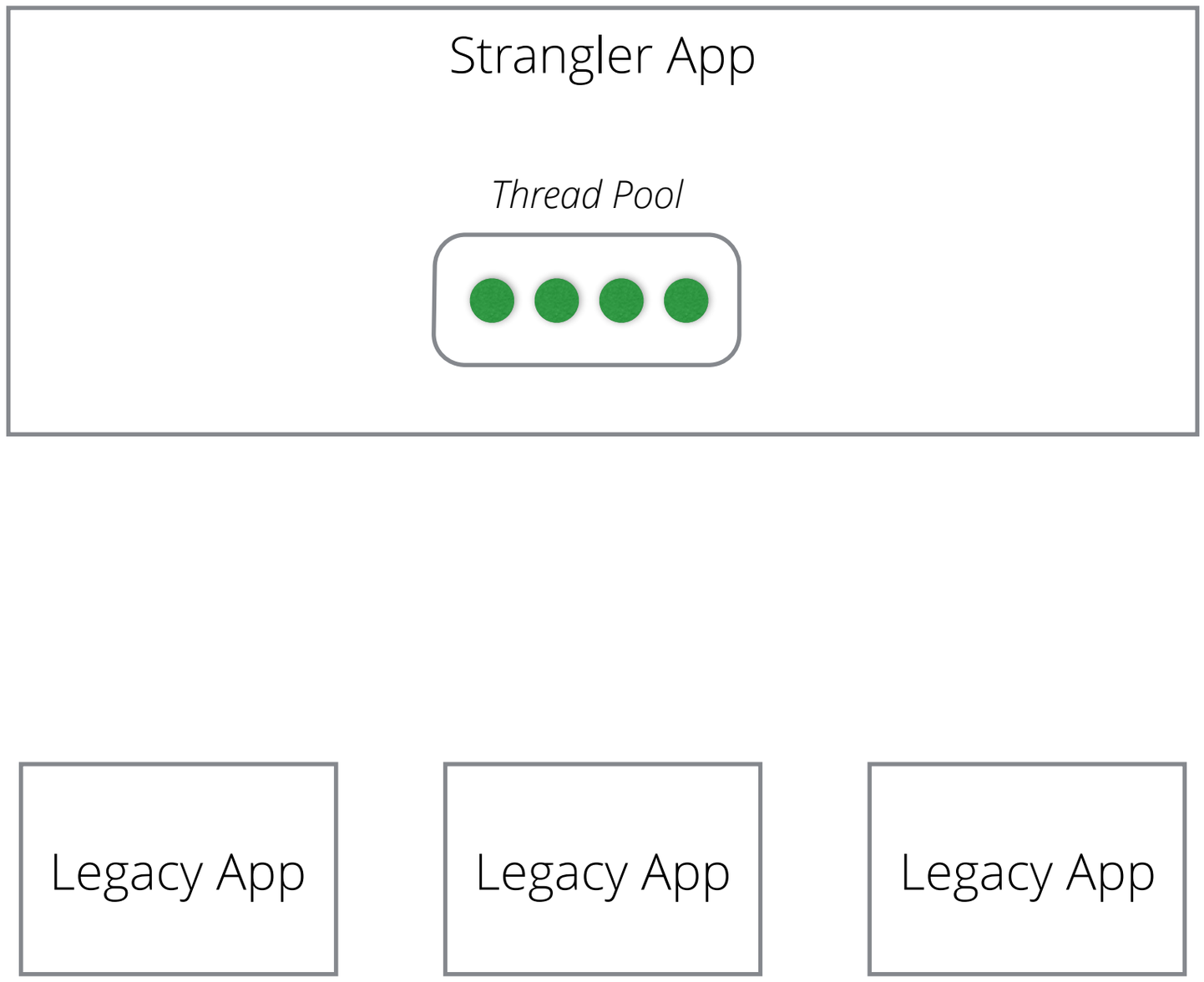

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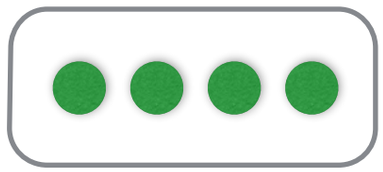
Strangler App

Thread Pool



Failing...slowly!

Legacy App

Legacy App

Legacy App

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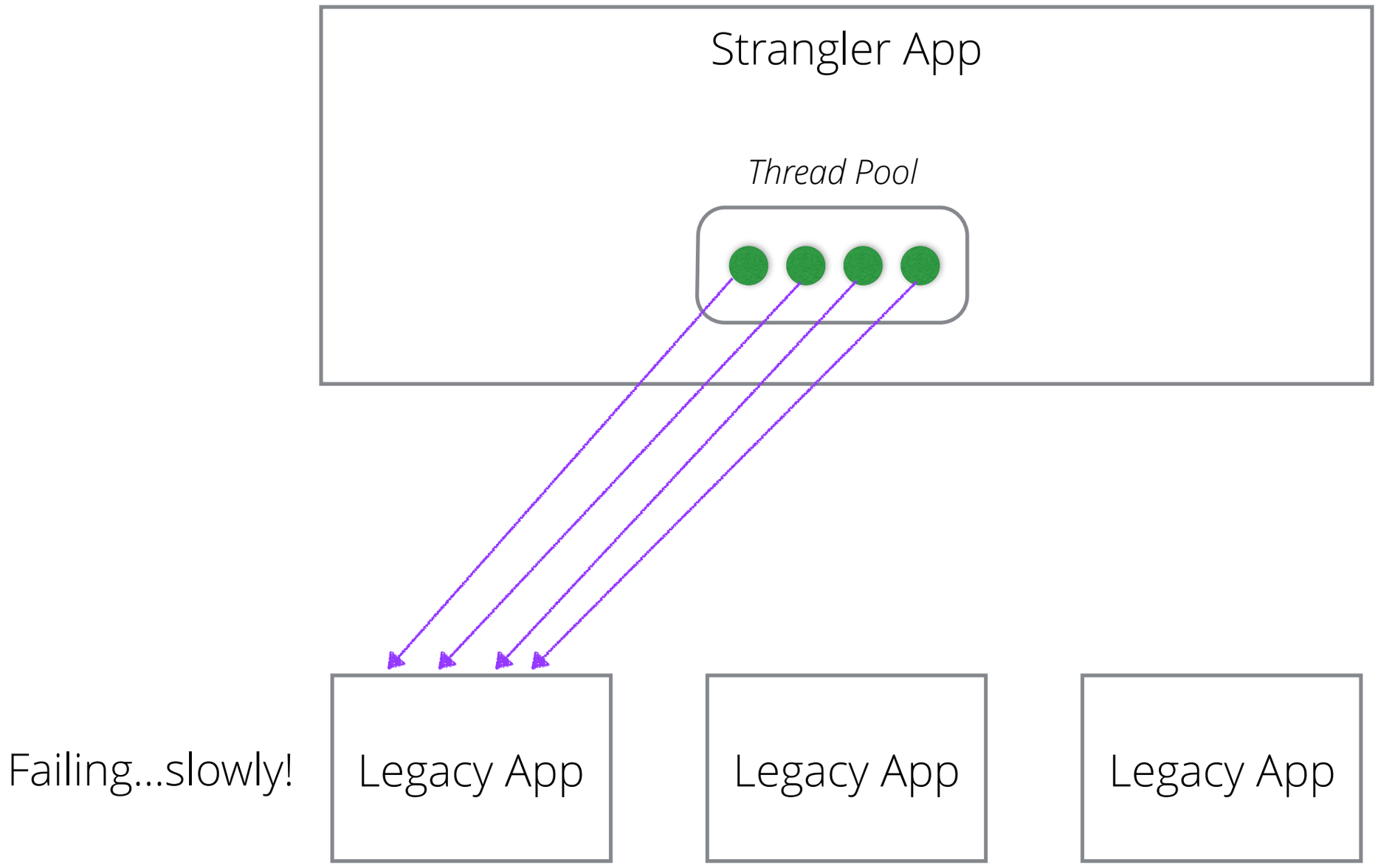
Strangler App
Thread Pool
Failing...slowly!
Legacy App
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Legacy App

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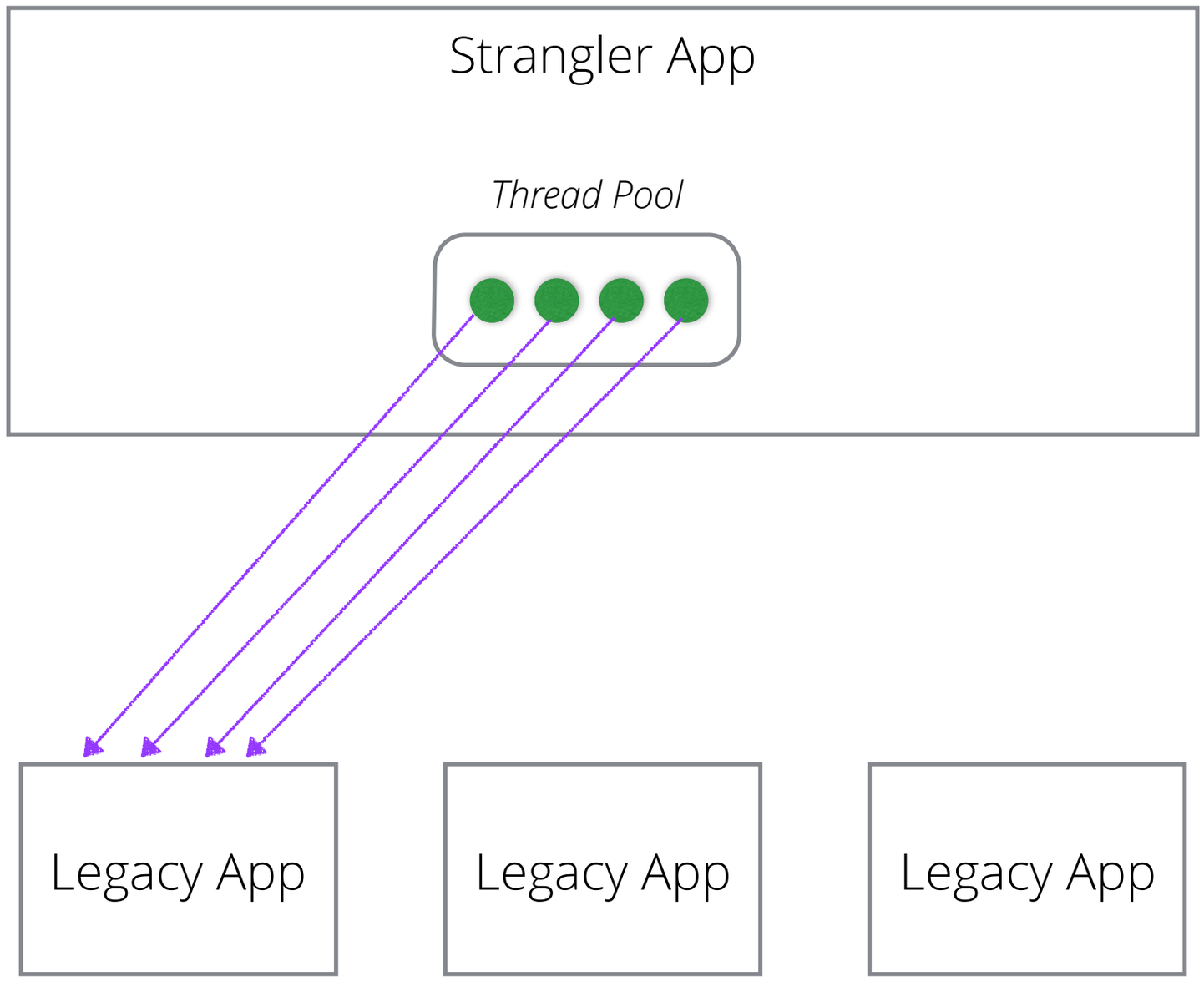
Thread-pool exhausted



Failing...slowly!

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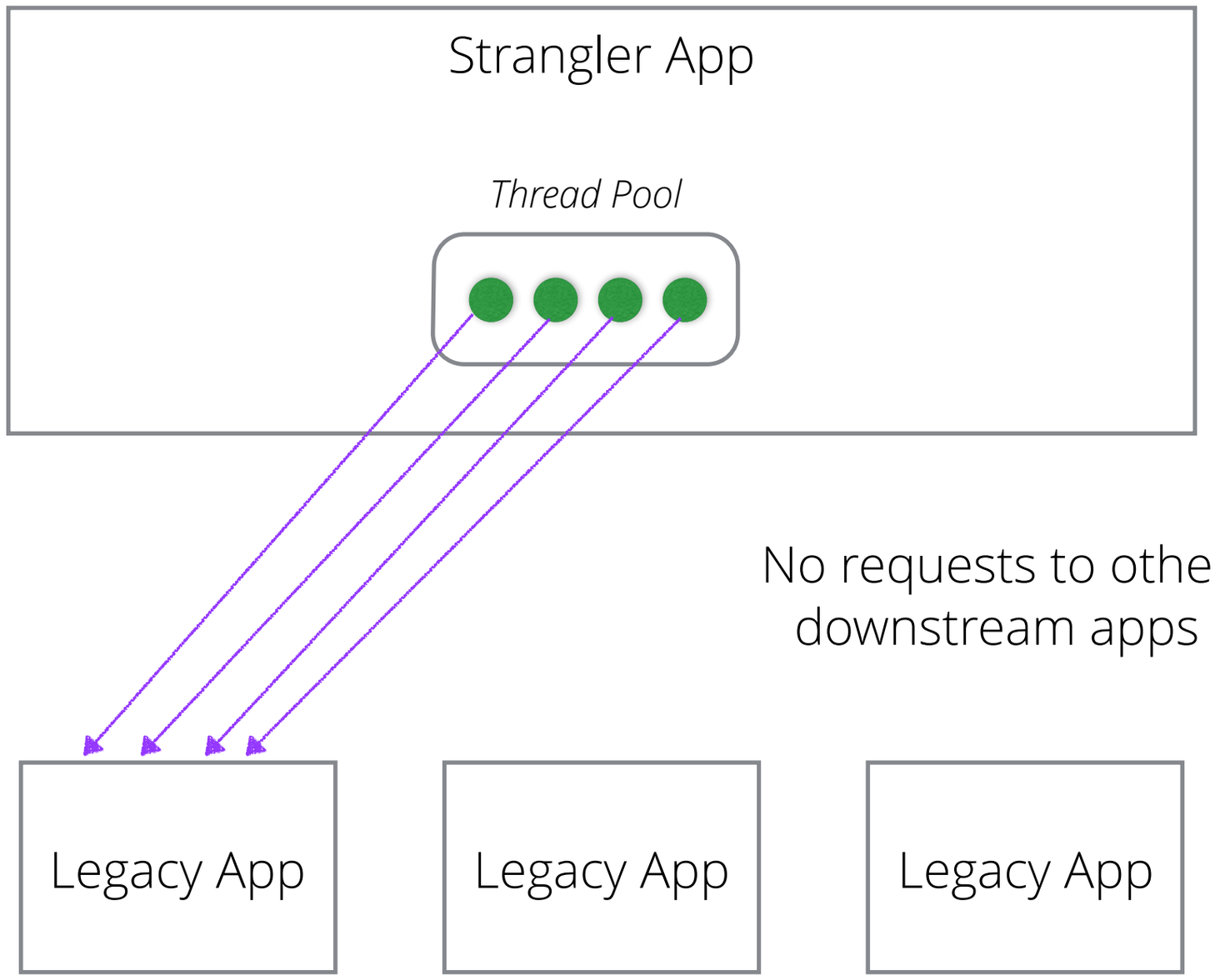
Thread-pool exhausted



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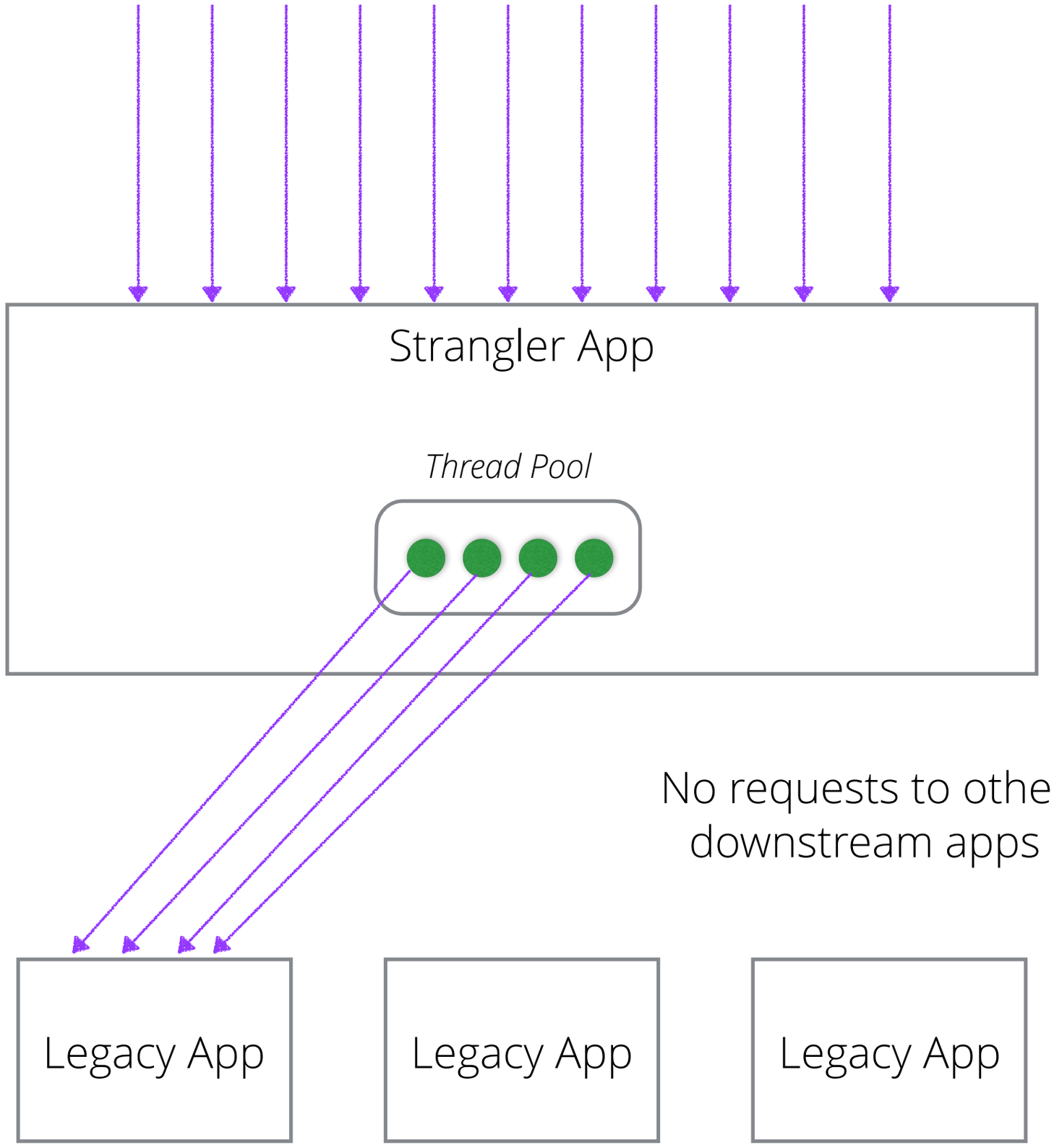
Thread-pool exhausted



No requests to other downstream apps

Failing...slowly!

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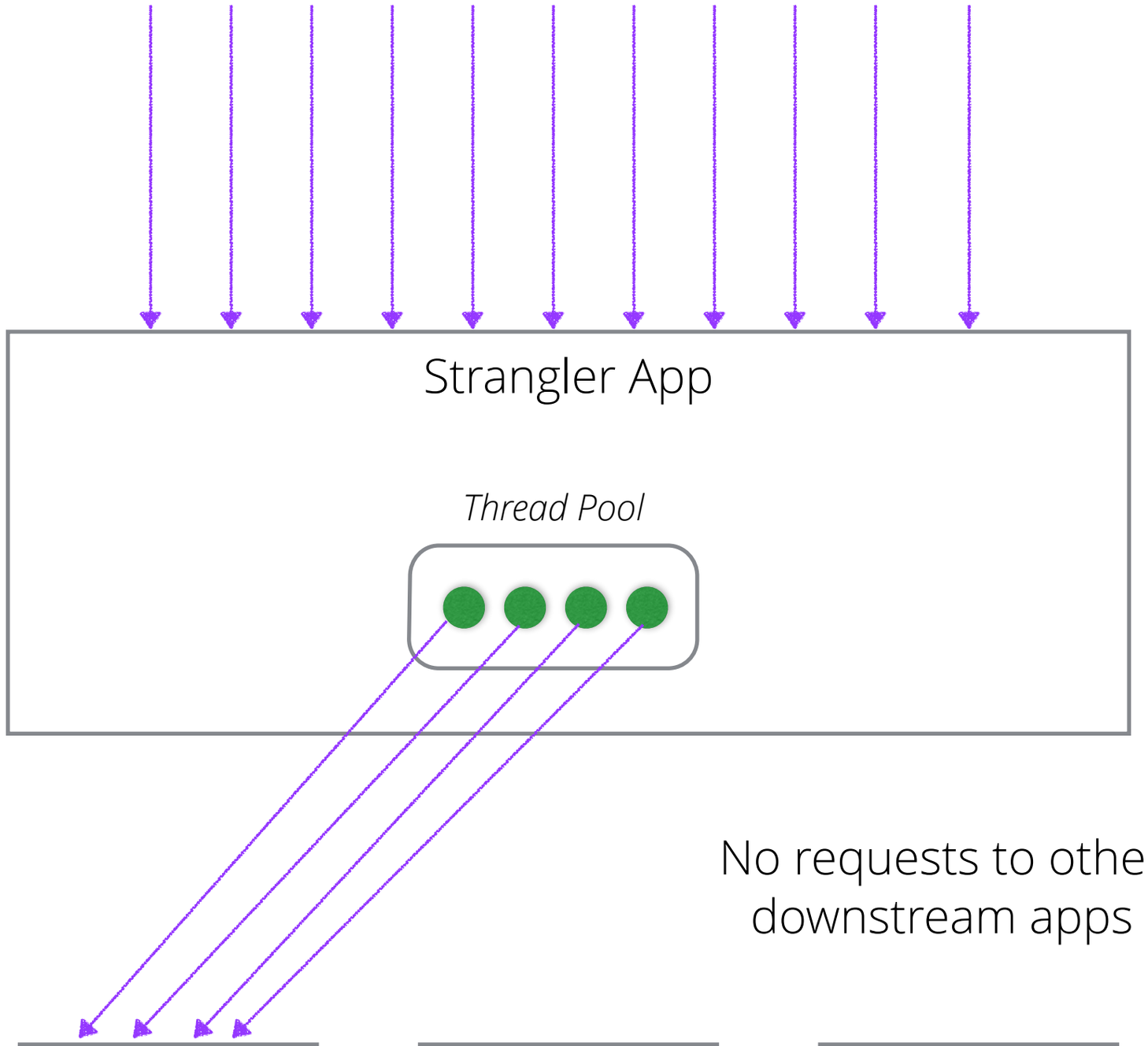
Requests Building Up



Thread-pool exhausted

No requests to other downstream apps

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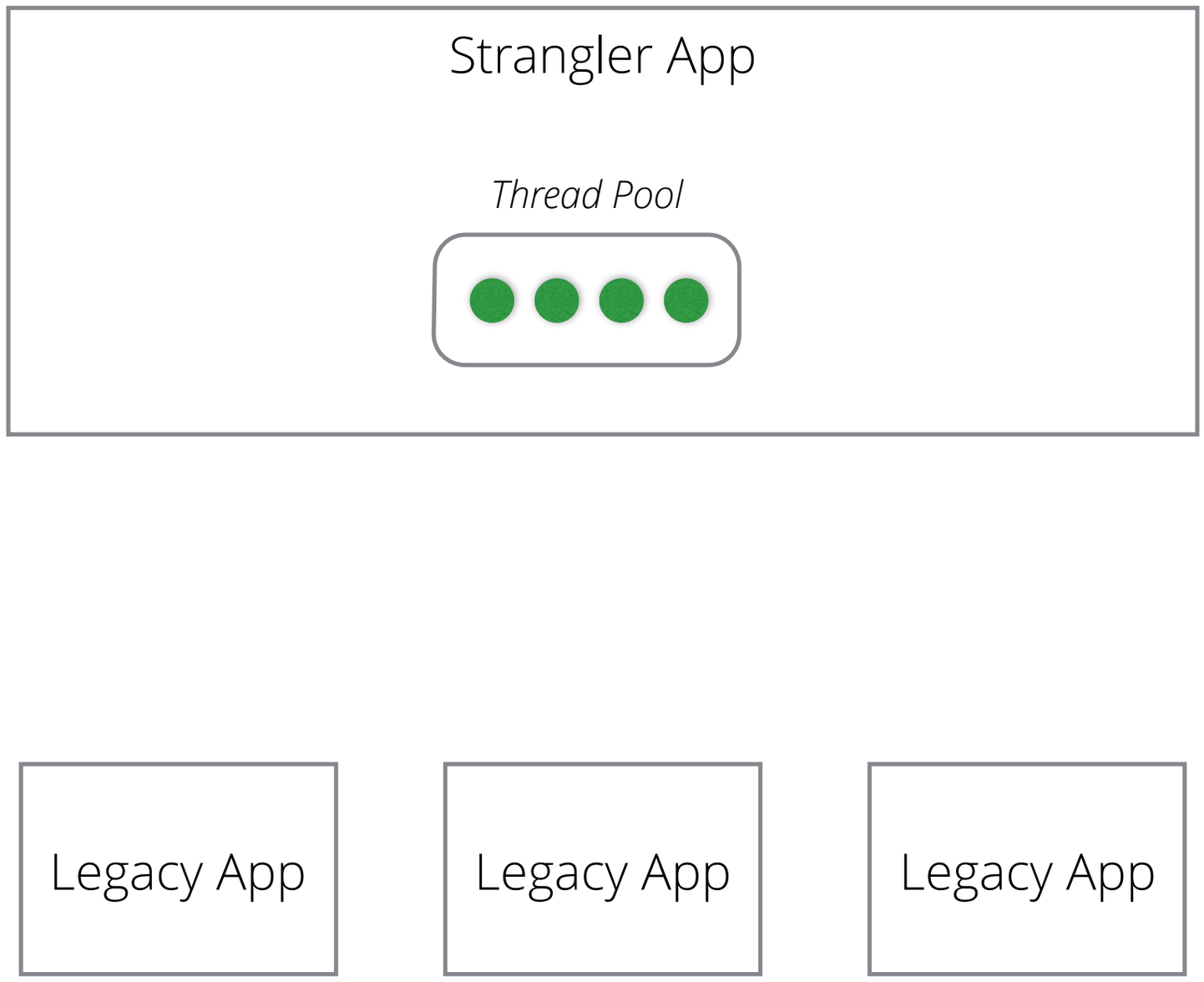

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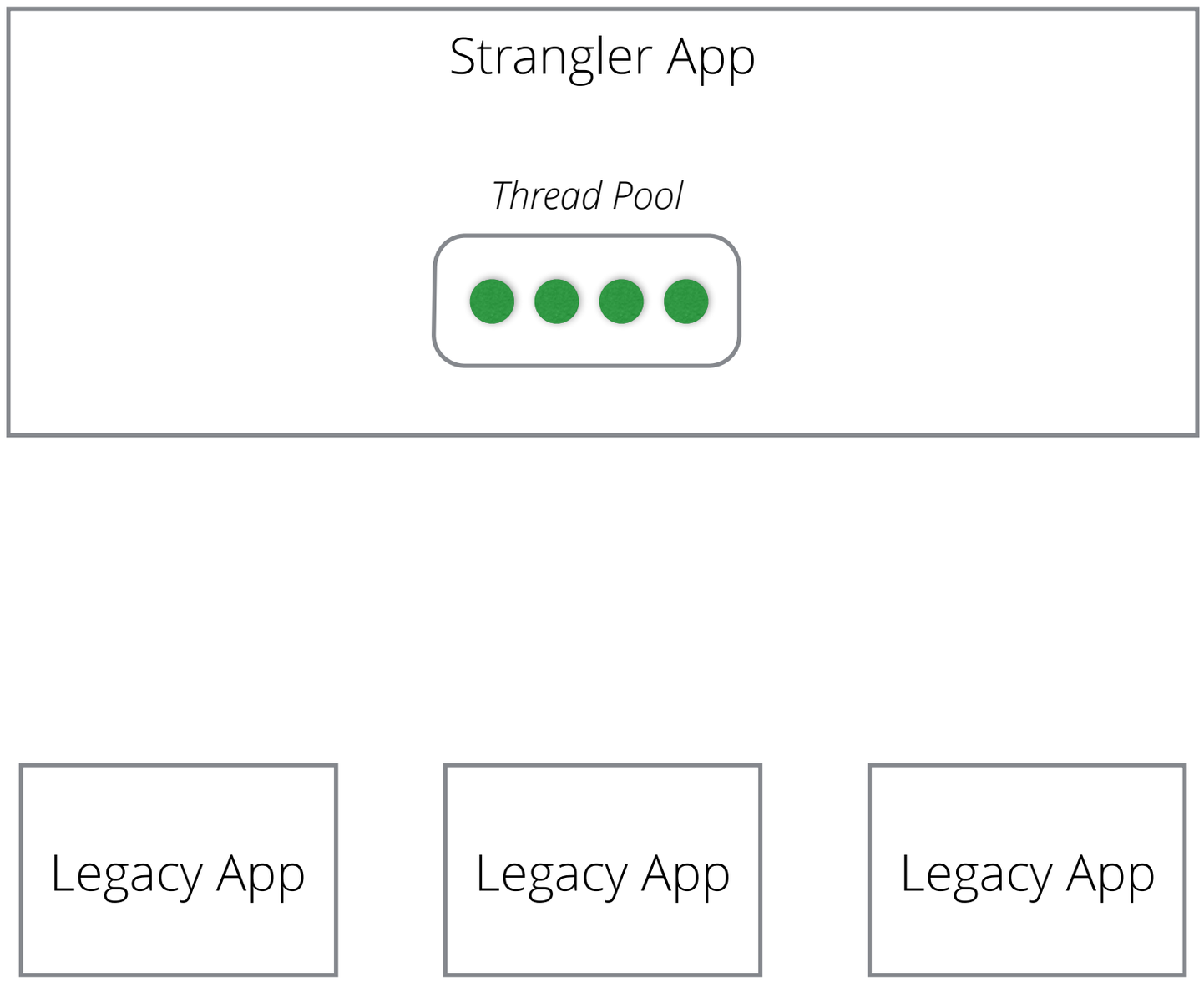
Fix **Timeouts**



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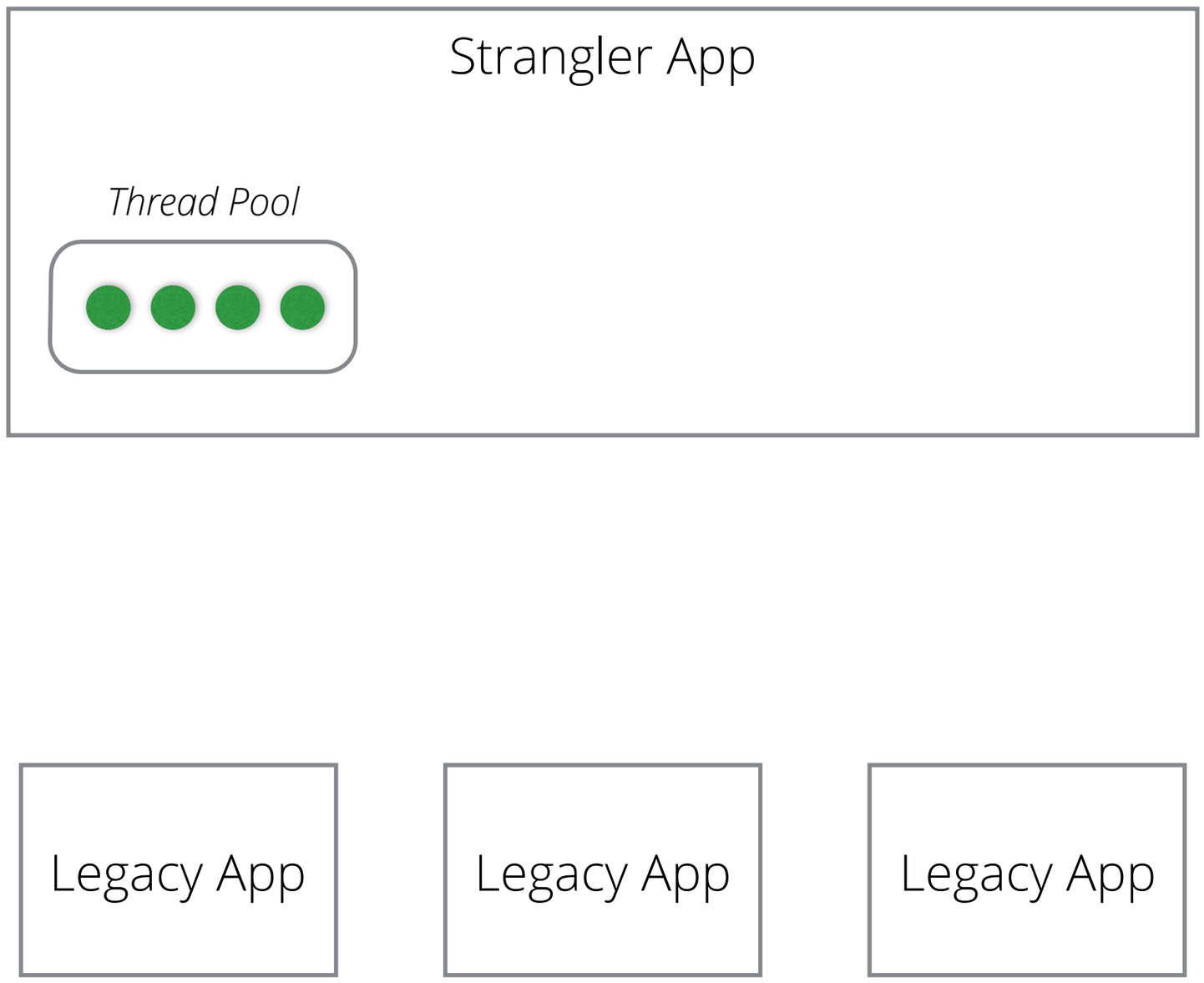

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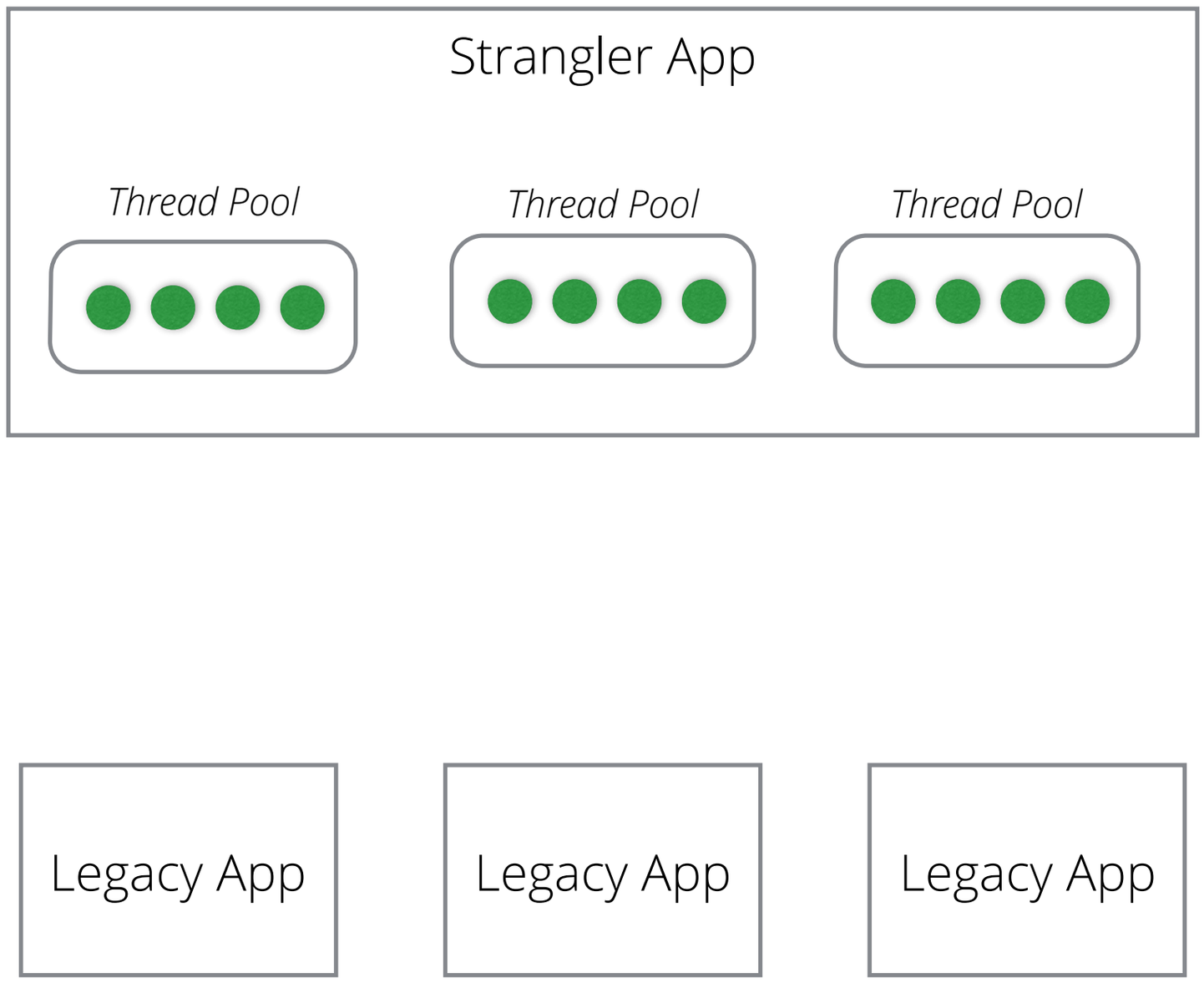

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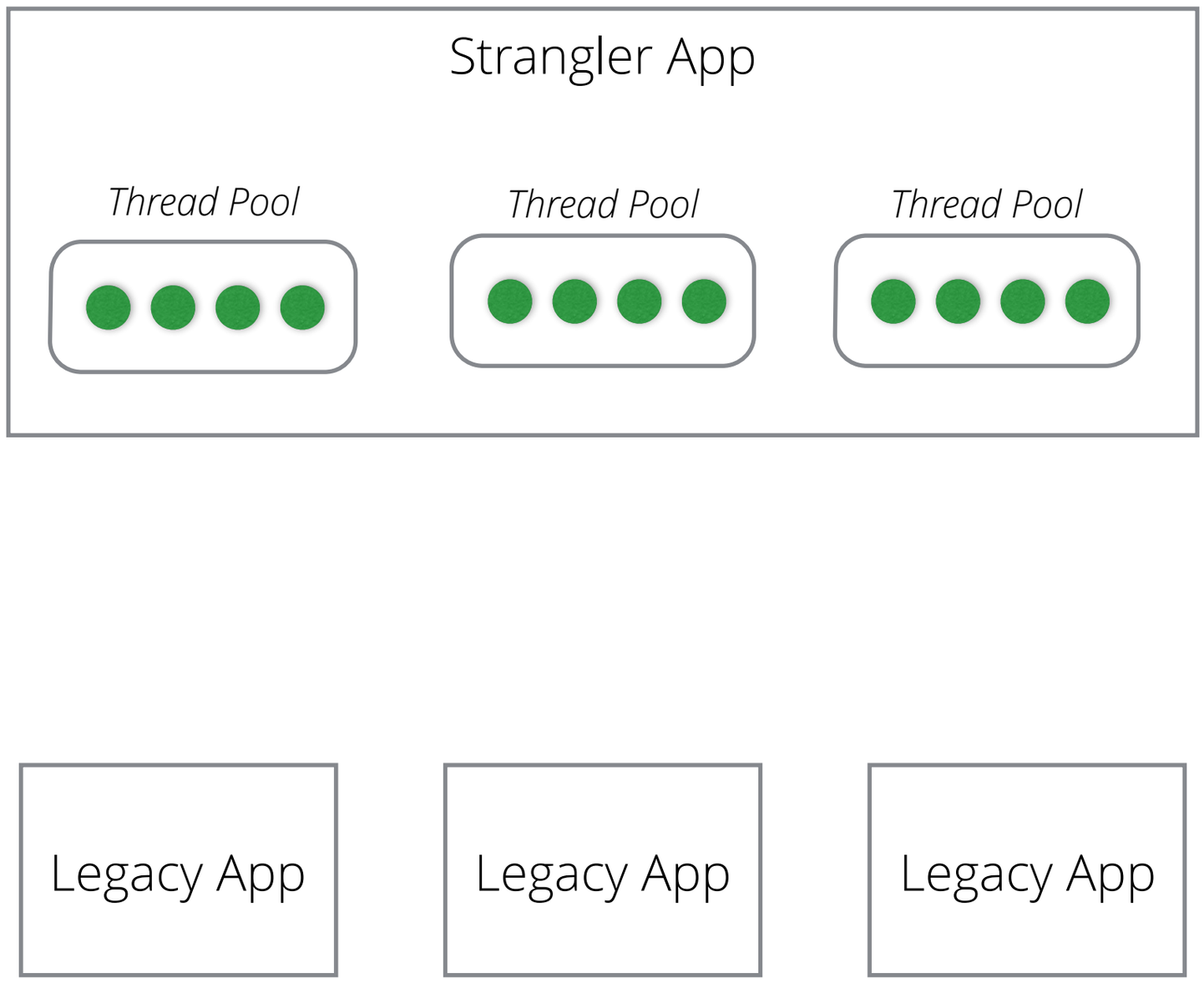

Bulkhead
Downstream
Connections

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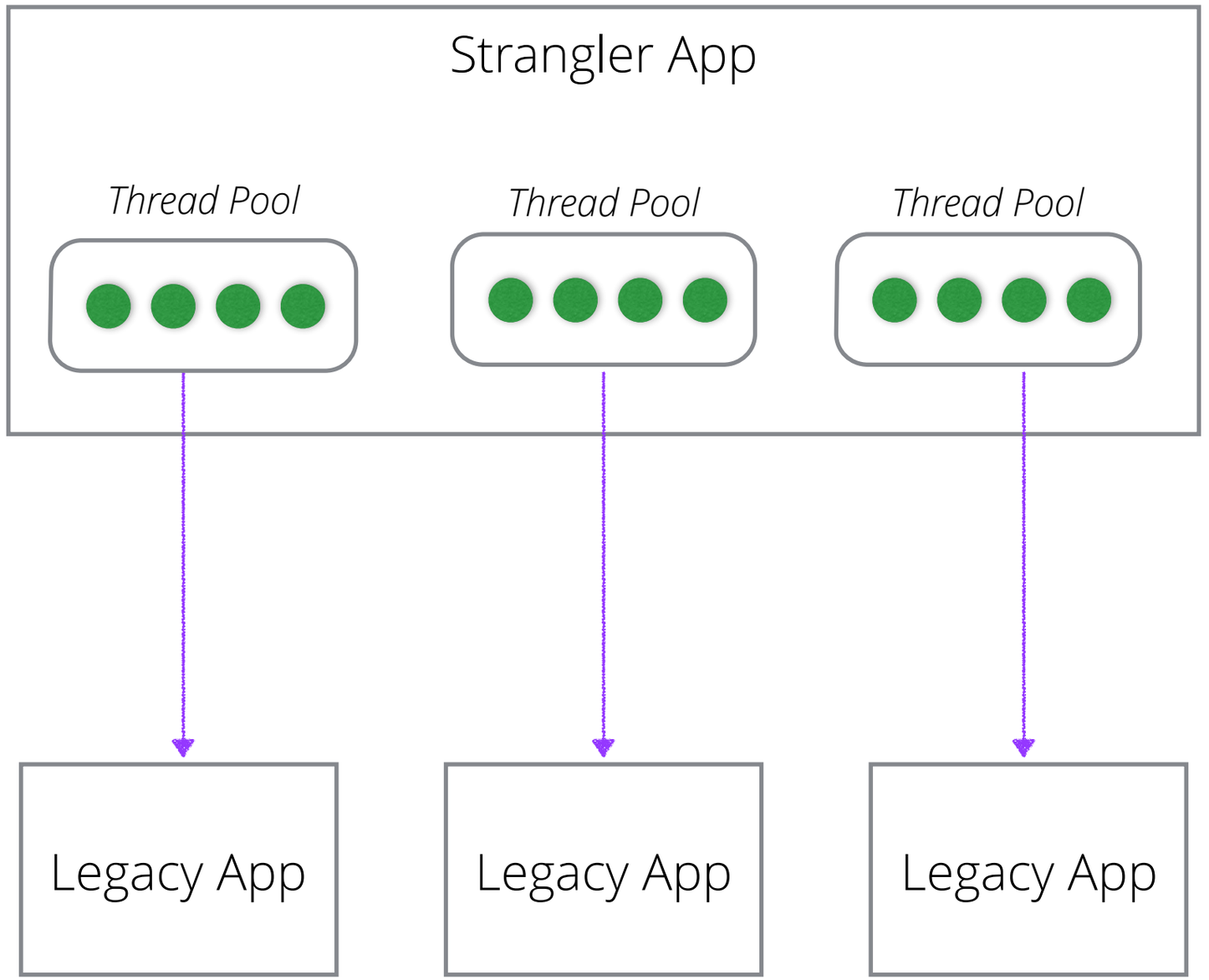

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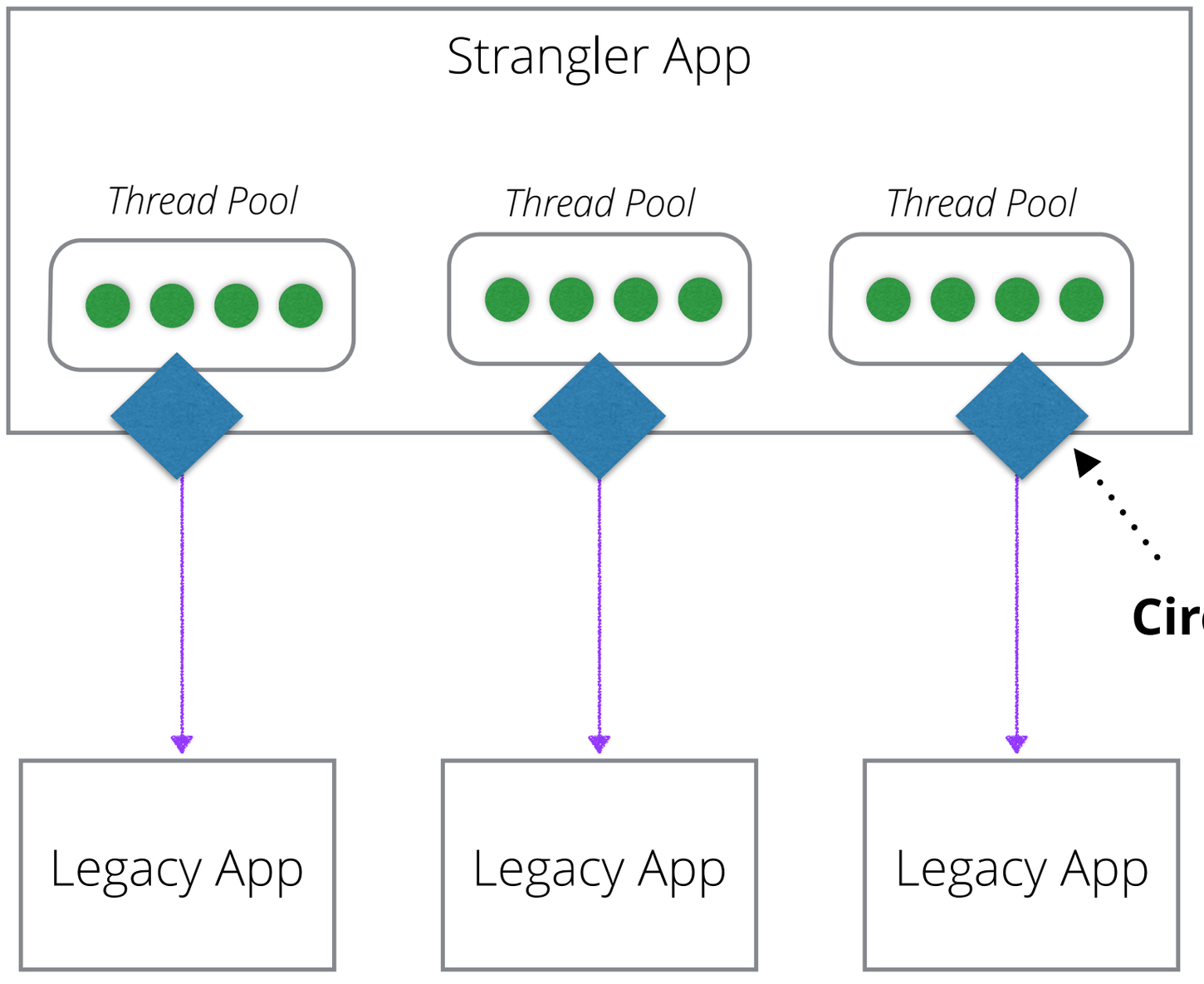

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Downstream
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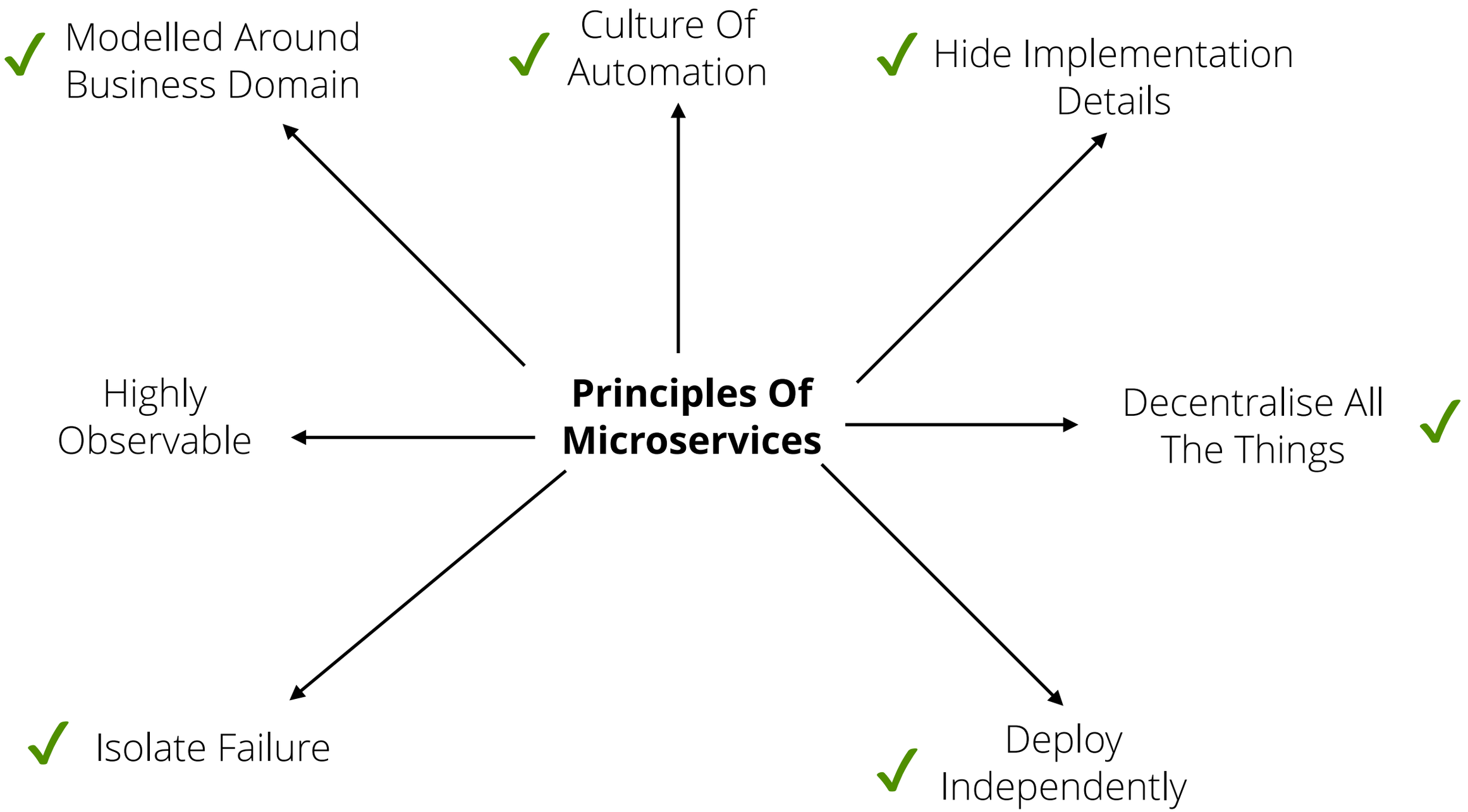
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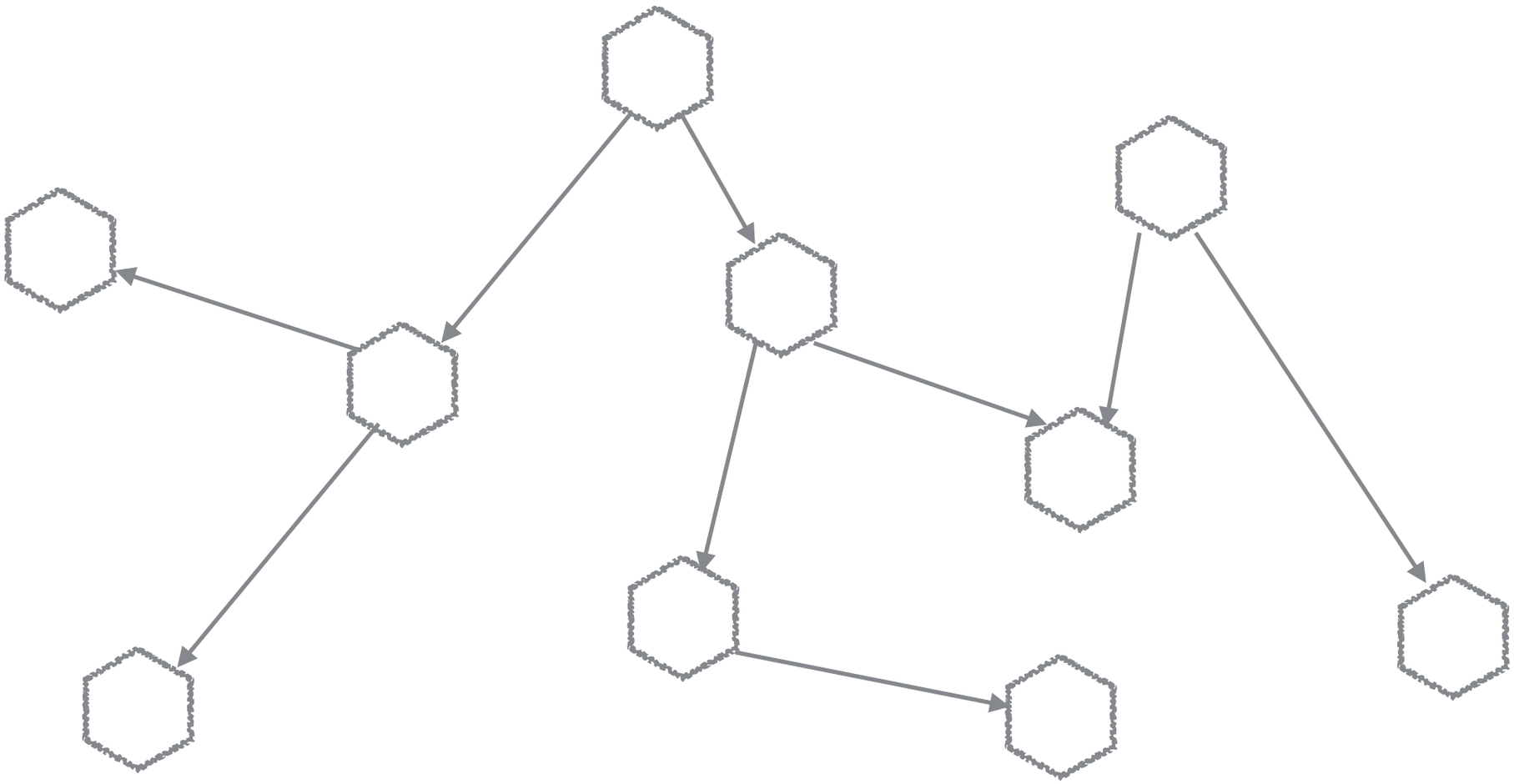
AGGREGATION



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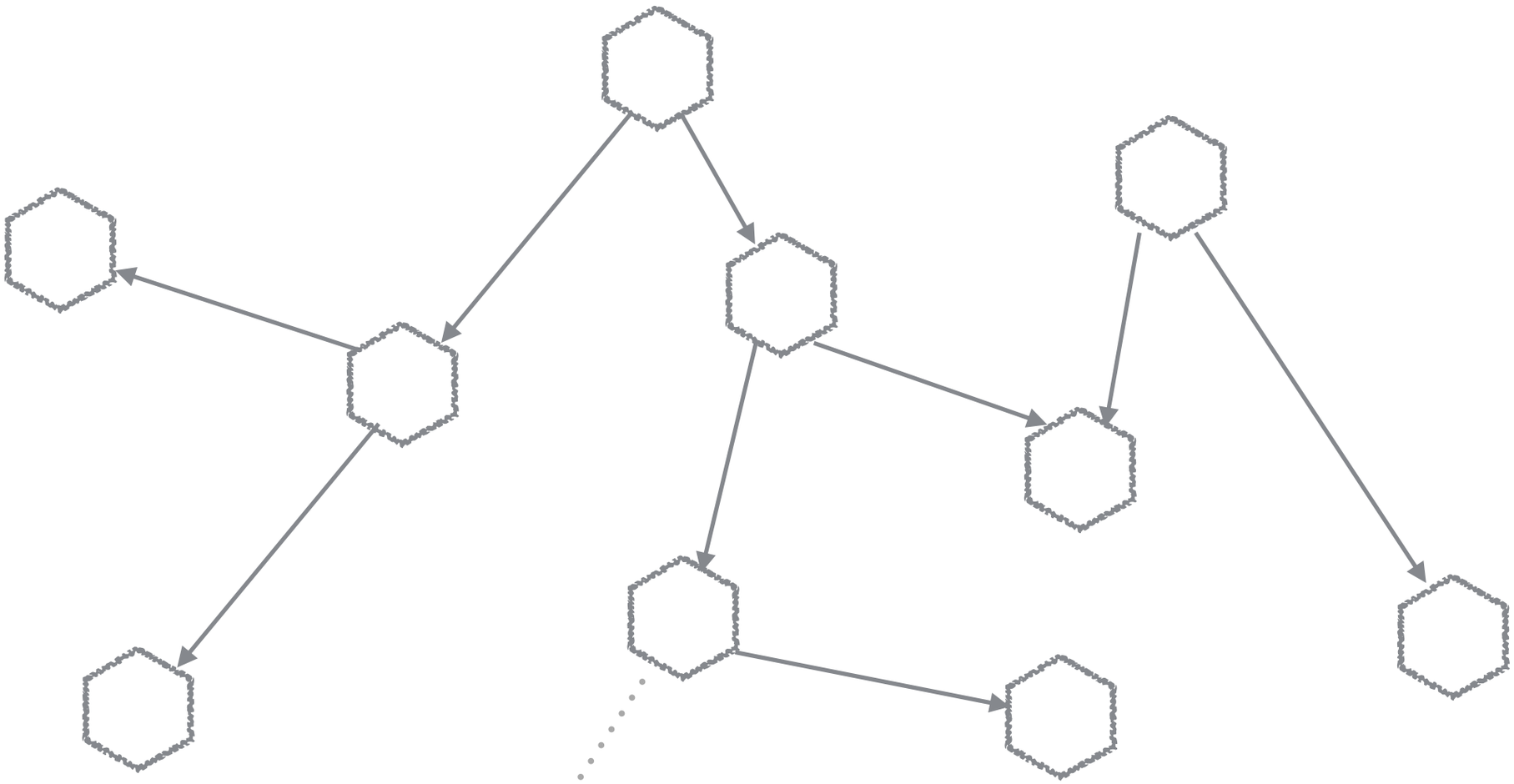
AGGREGATION



LOGS

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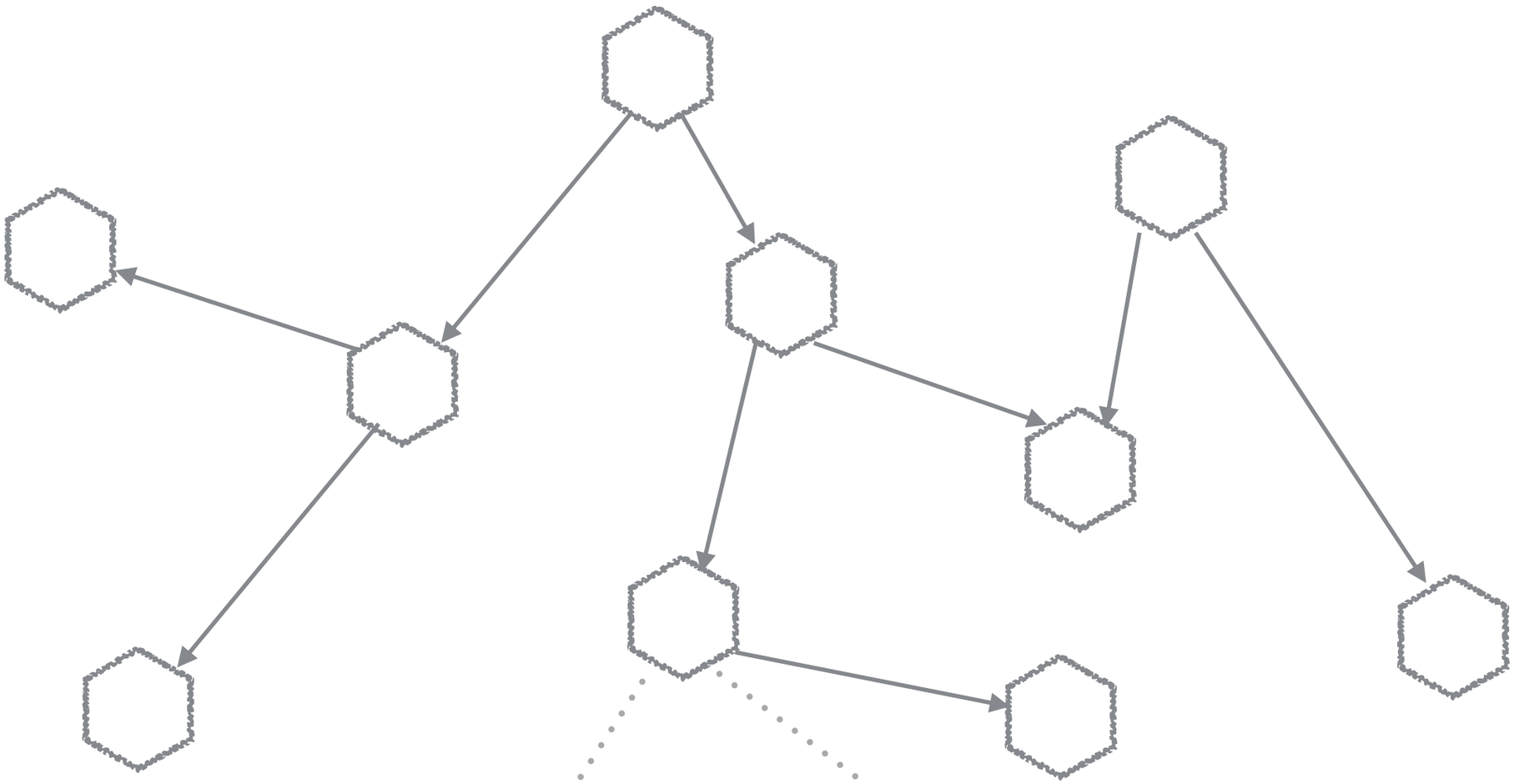
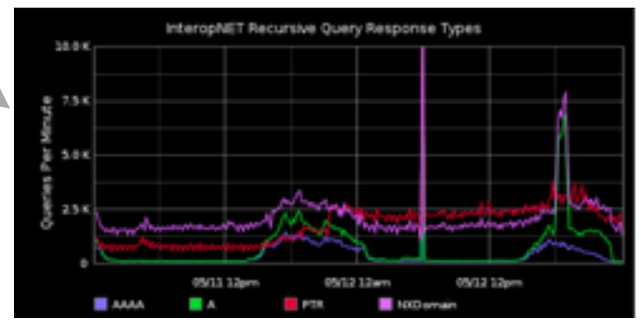
AGGREGATION



LOGS

STATS



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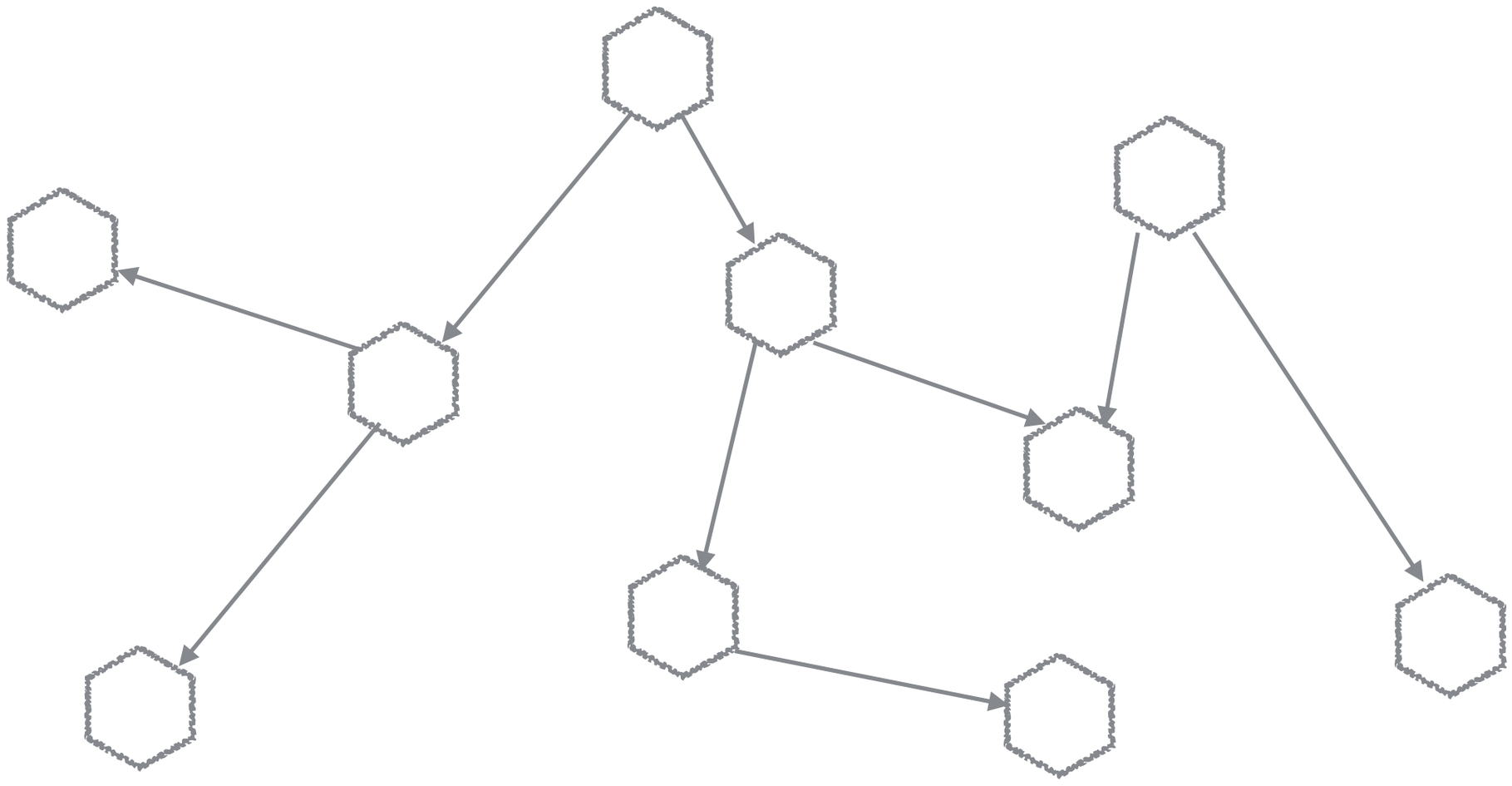
CORRELATION IDS



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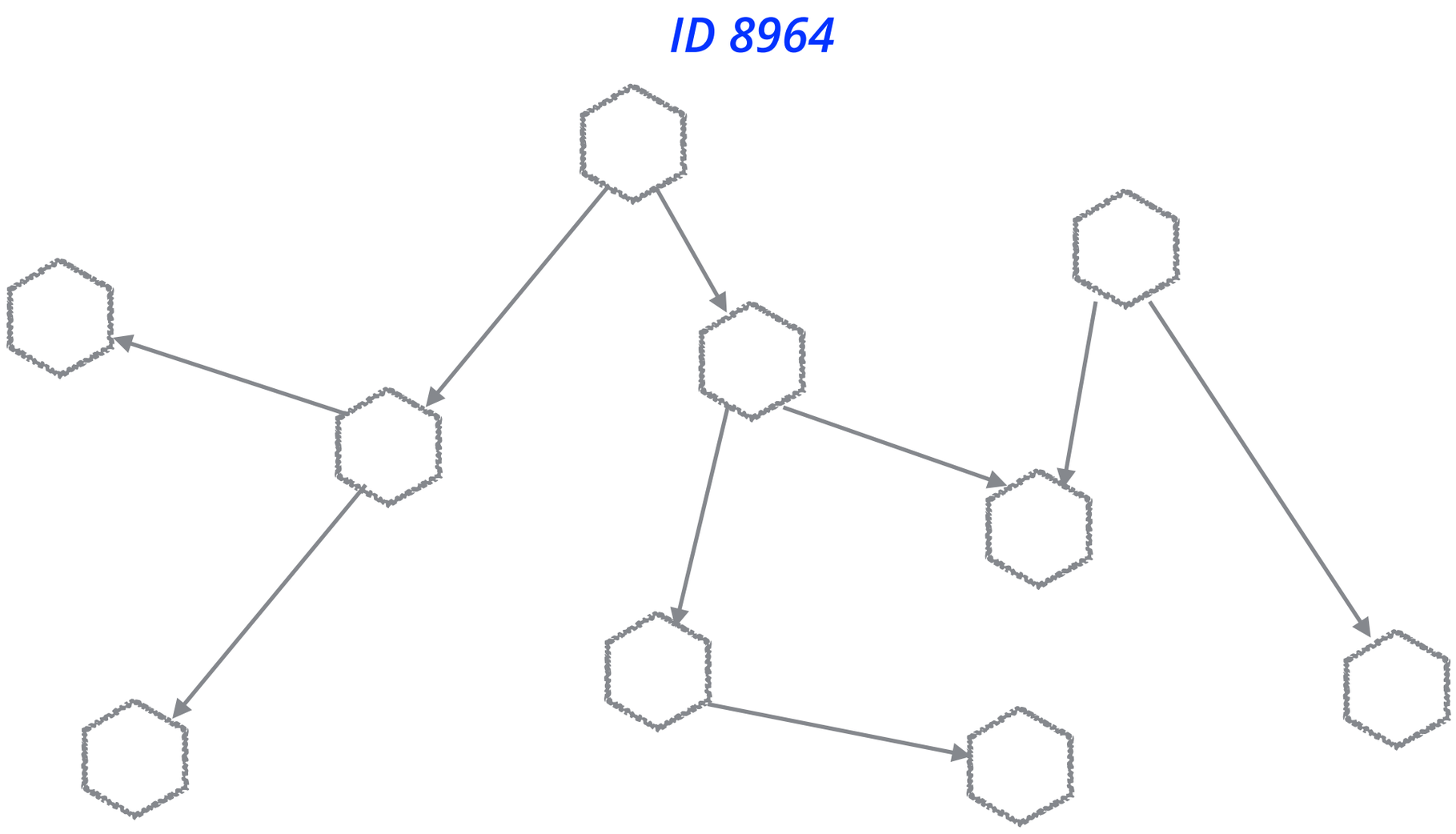

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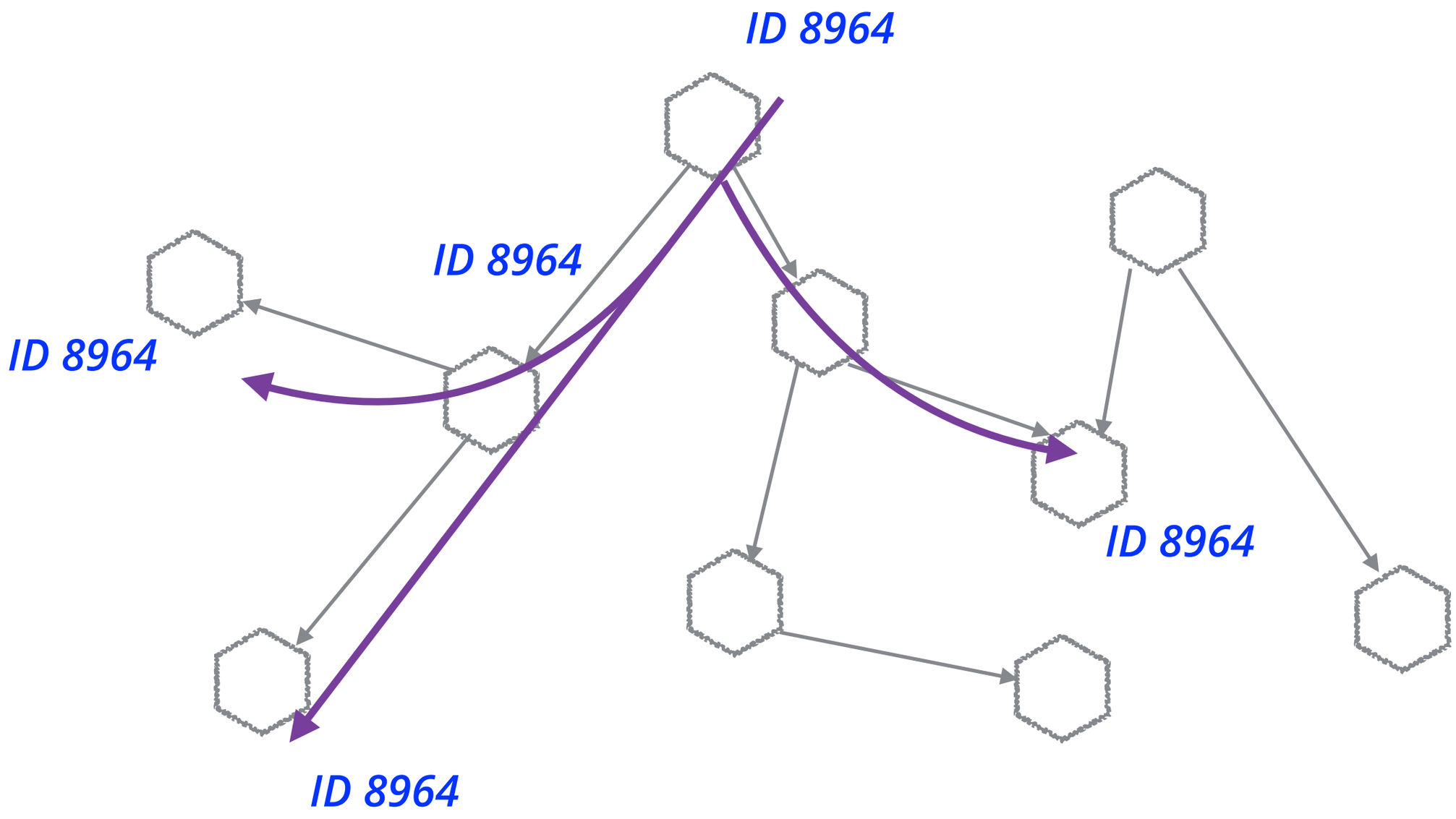

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Principles Of Microservices

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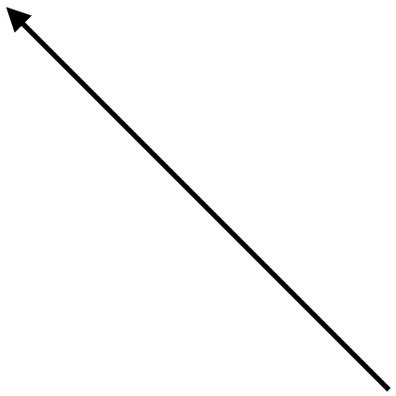
Modelled Around
Business Domain



Principles Of Microservices

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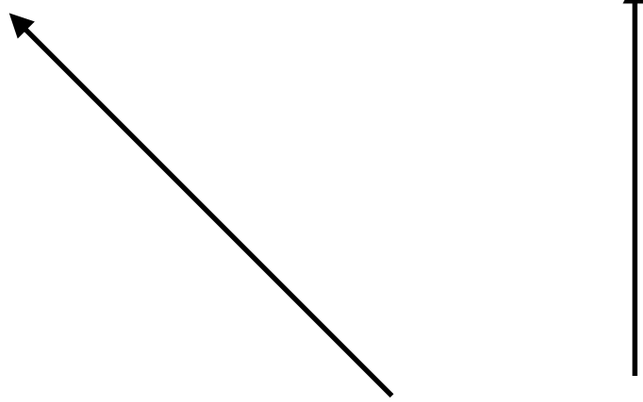
Modelled Around
Business Domain

Culture Of
Automation

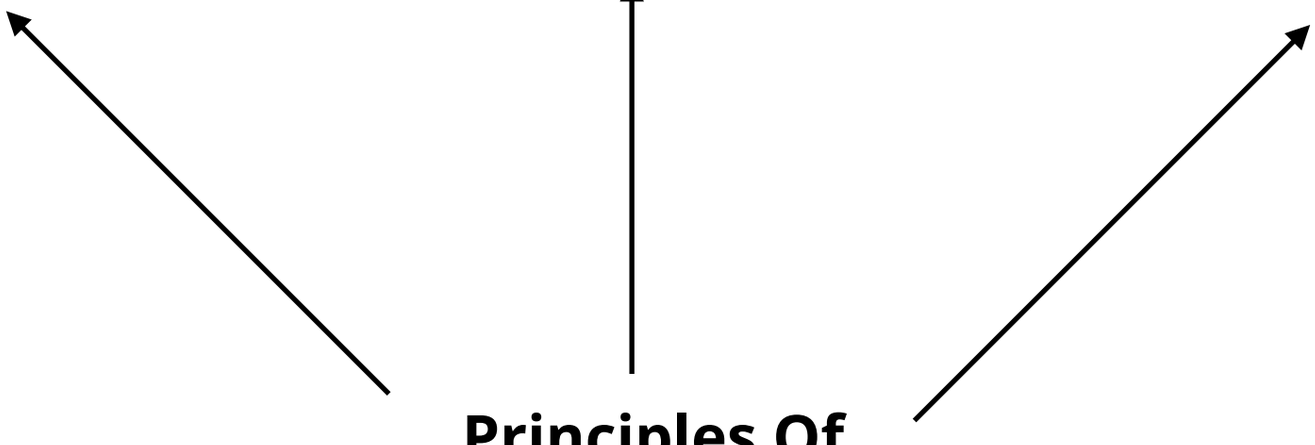


Principles Of Microservices

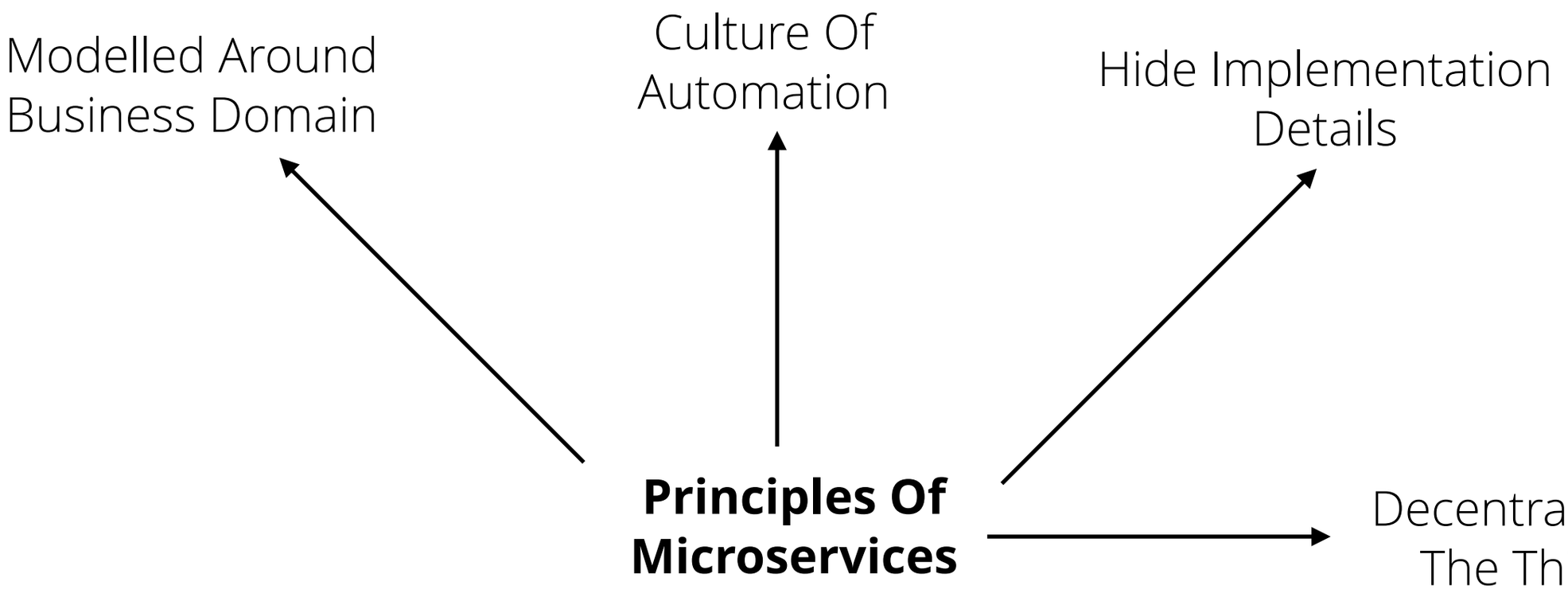
Modelled Around Business Domain

Culture Of Automation

Hide Implementation Details



Principles Of Microservices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Deploy Independently

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Modelled Around Business Domain

Culture Of Automation

Hide Implementation Details

Highly Observable

Principles Of Microservices

Decentralise All The Things

Isolate Failure

Deploy Independently

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Natural
FEEDBACK MACHINE
1 SELECT TALK
2 VALUE TALK
RELEVANCE OF CONTENT
not relevant
very relevant
PRESENTATION
poor
great
OVERALL IMPRESSION
no way
definitely yes
3 SUBMIT FEEDBACK

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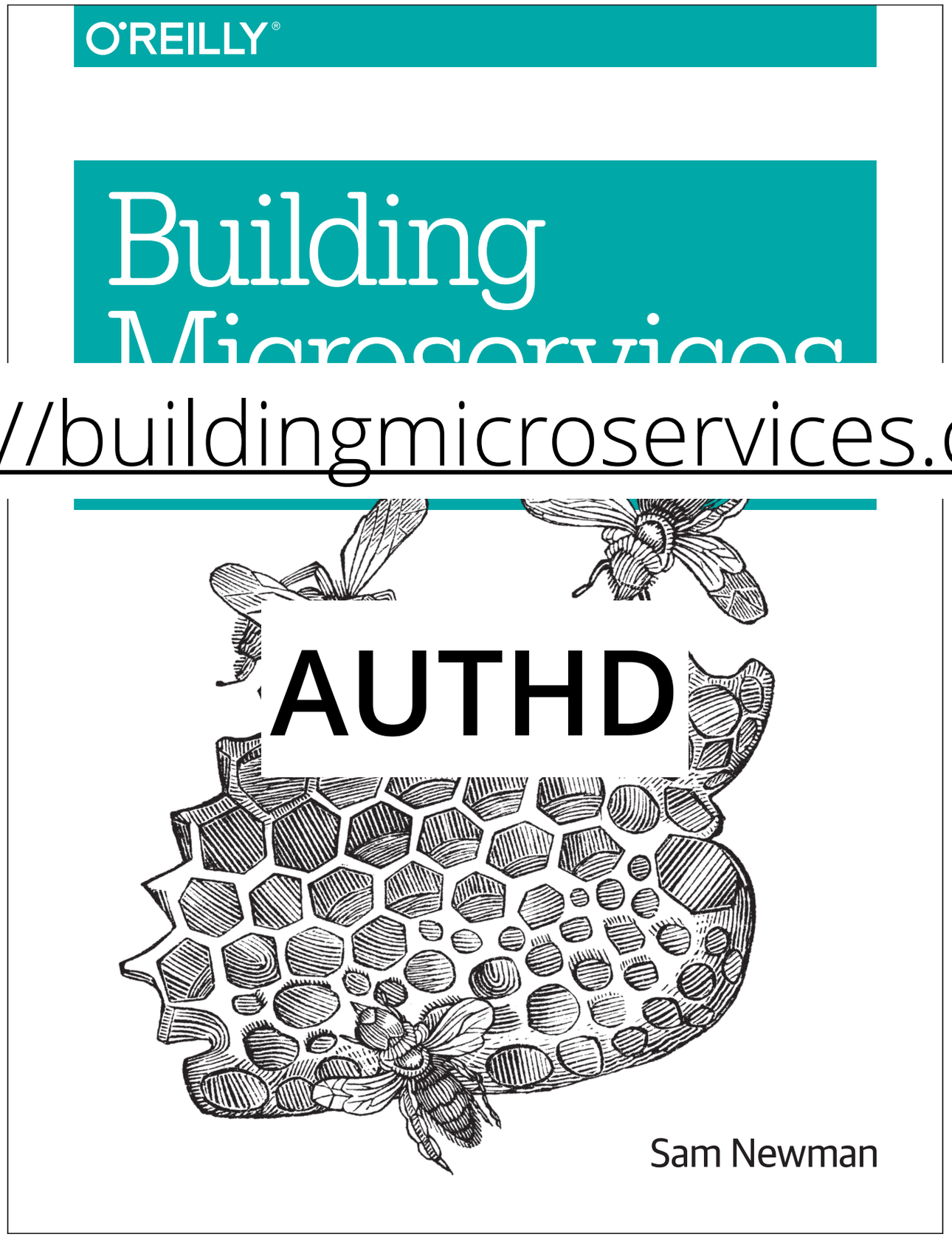

http://buildingmicroservices.com/

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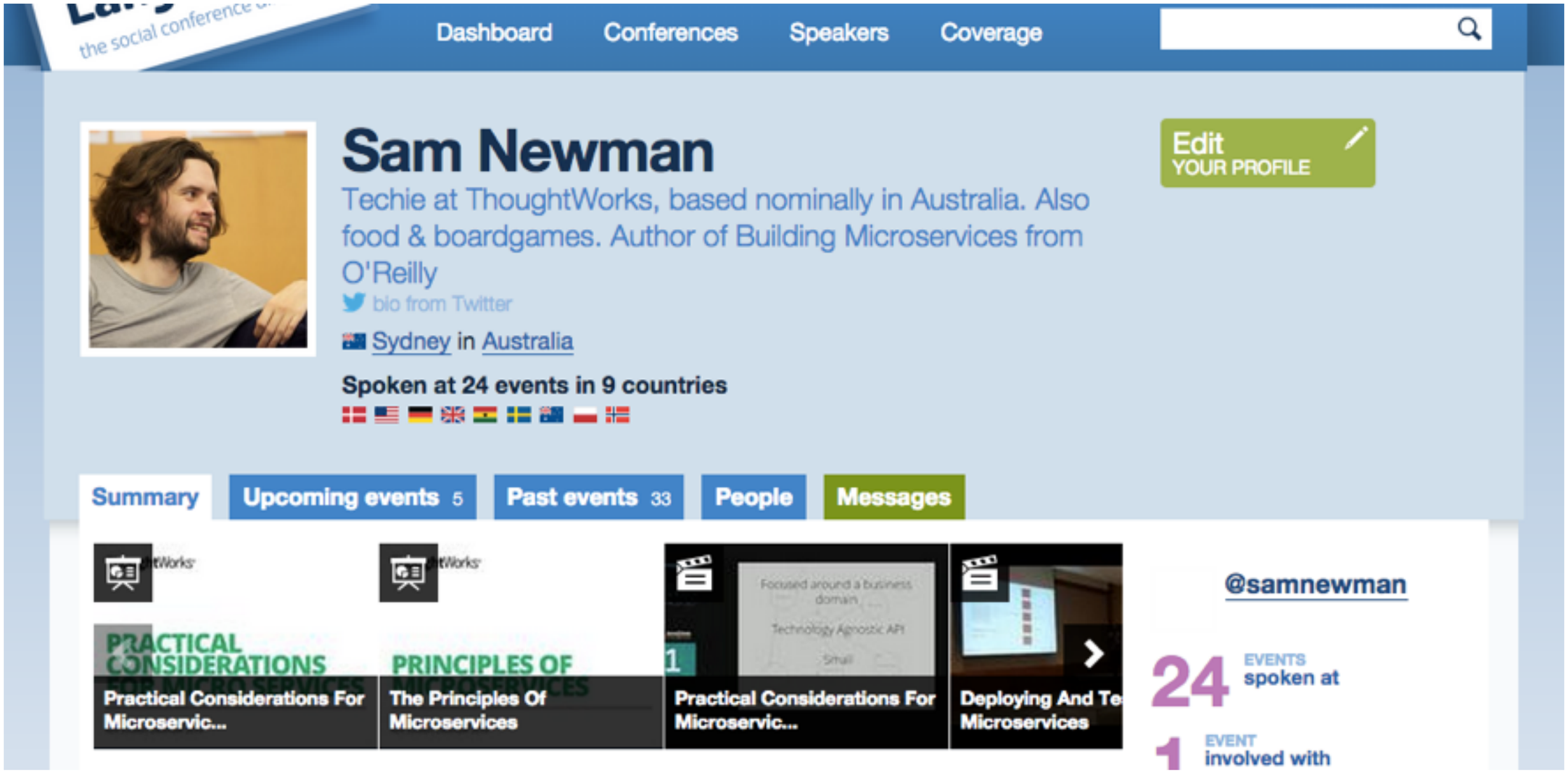

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THANKS!

Sam Newman
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