ThoughtWorks®

PRINCIPLES OF MICROSERVICES

Sam Newman

GeeCon 2015

ThoughtWorks®

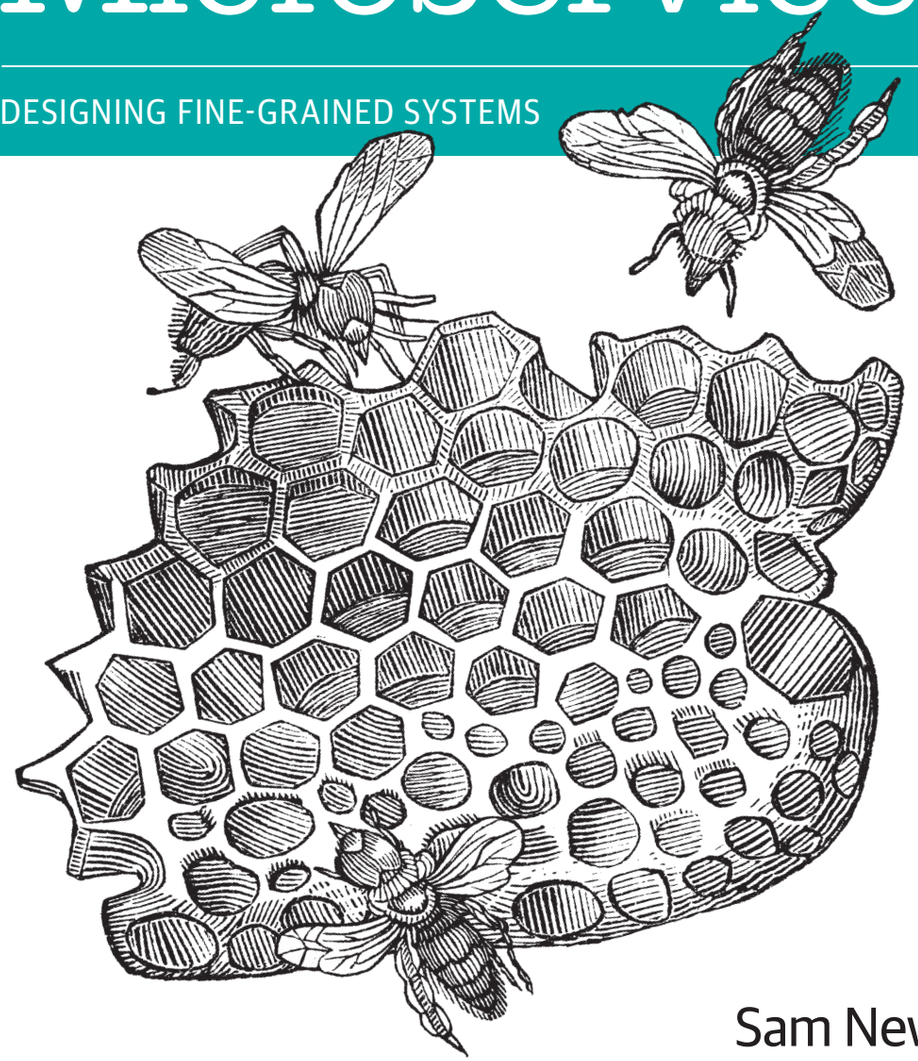
#geecon

@samnewman

O'REILLY®

Building Microservices

DESIGNING FINE-GRAINED SYSTEMS



Sam Newman

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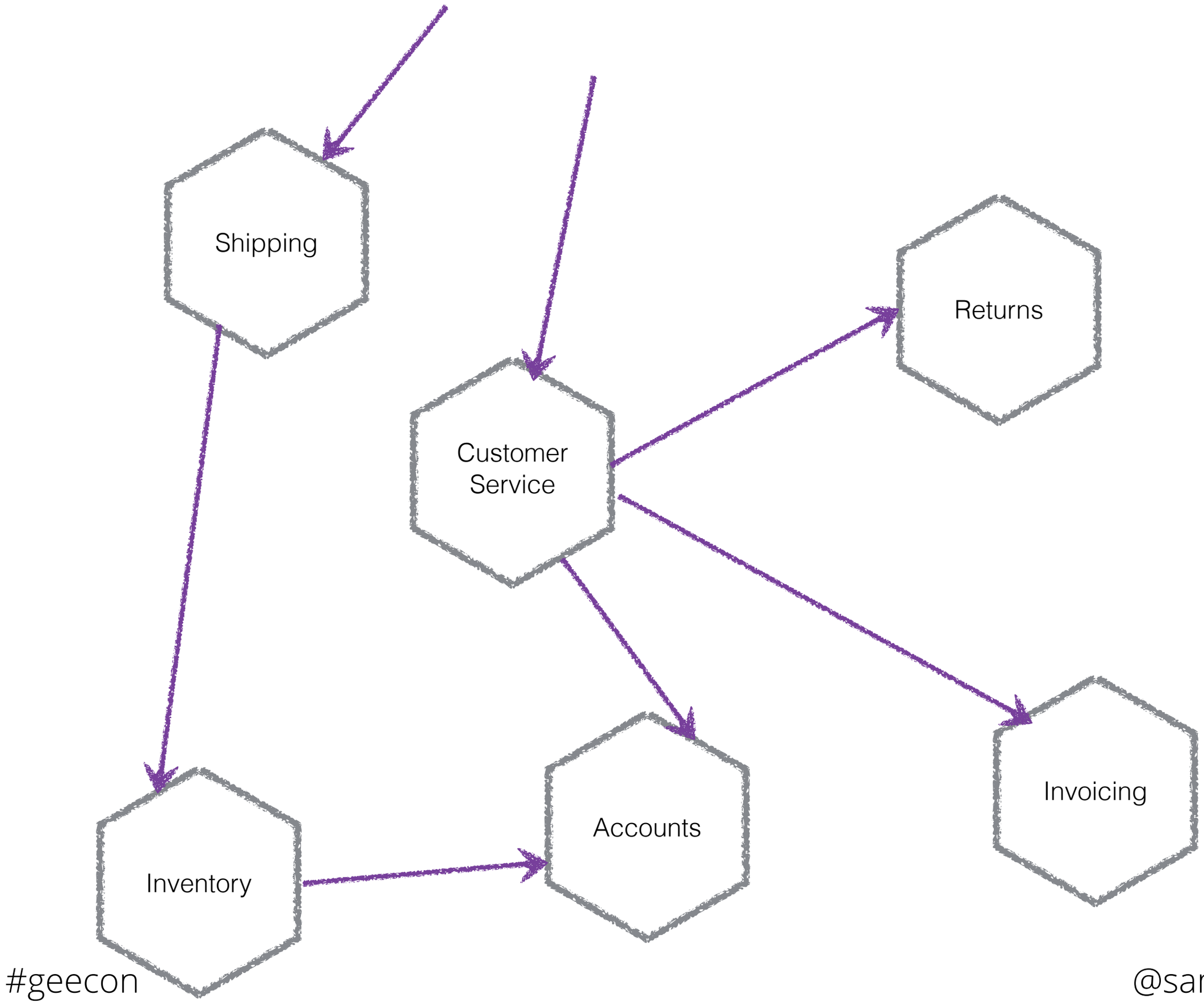
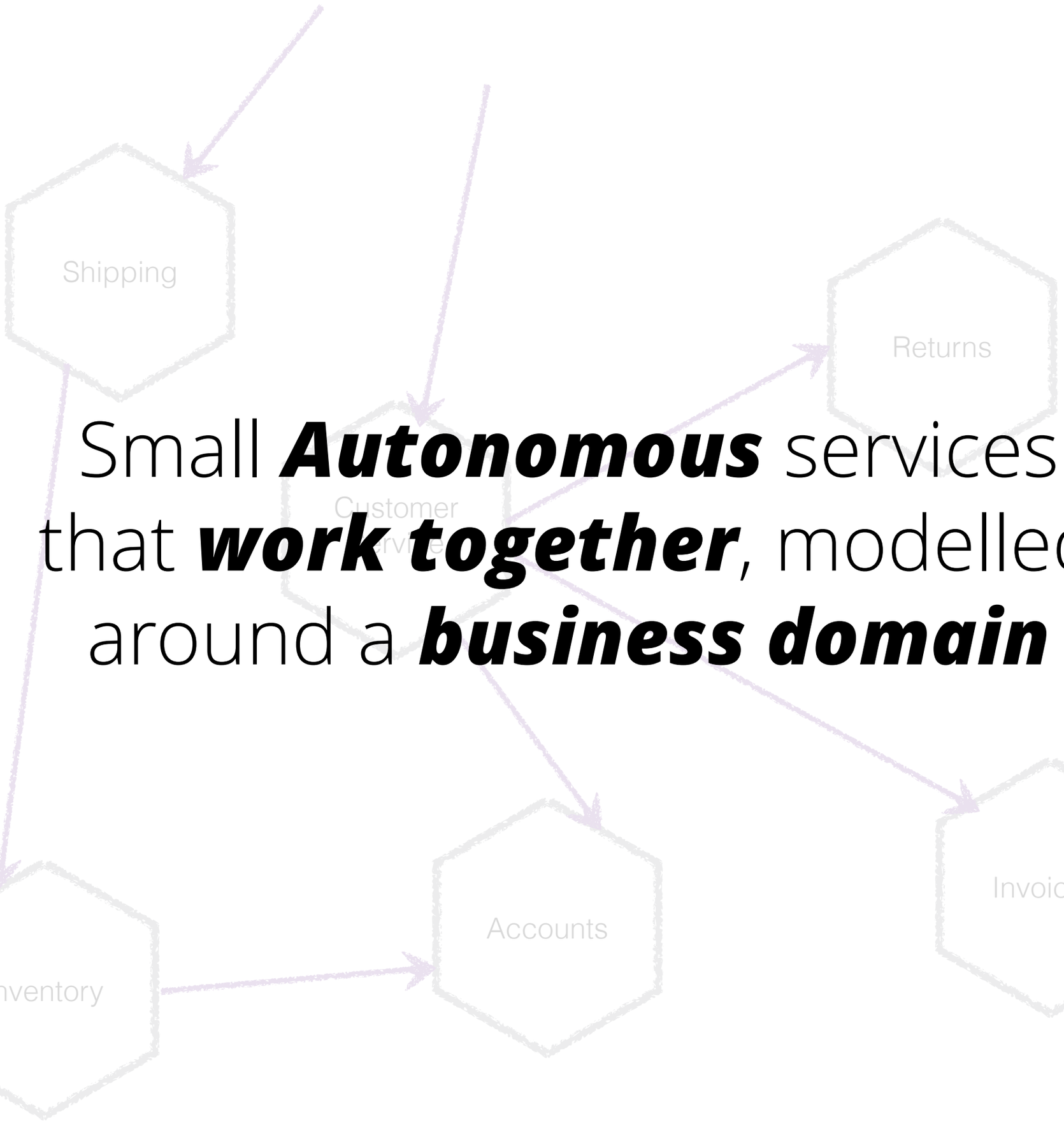
@samnewman


Shipping
Customer Service
Returns
Inventory
Accounts
Invoicing



Small ***Autonomous*** services that ***work together***, modelled around a ***business domain***

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

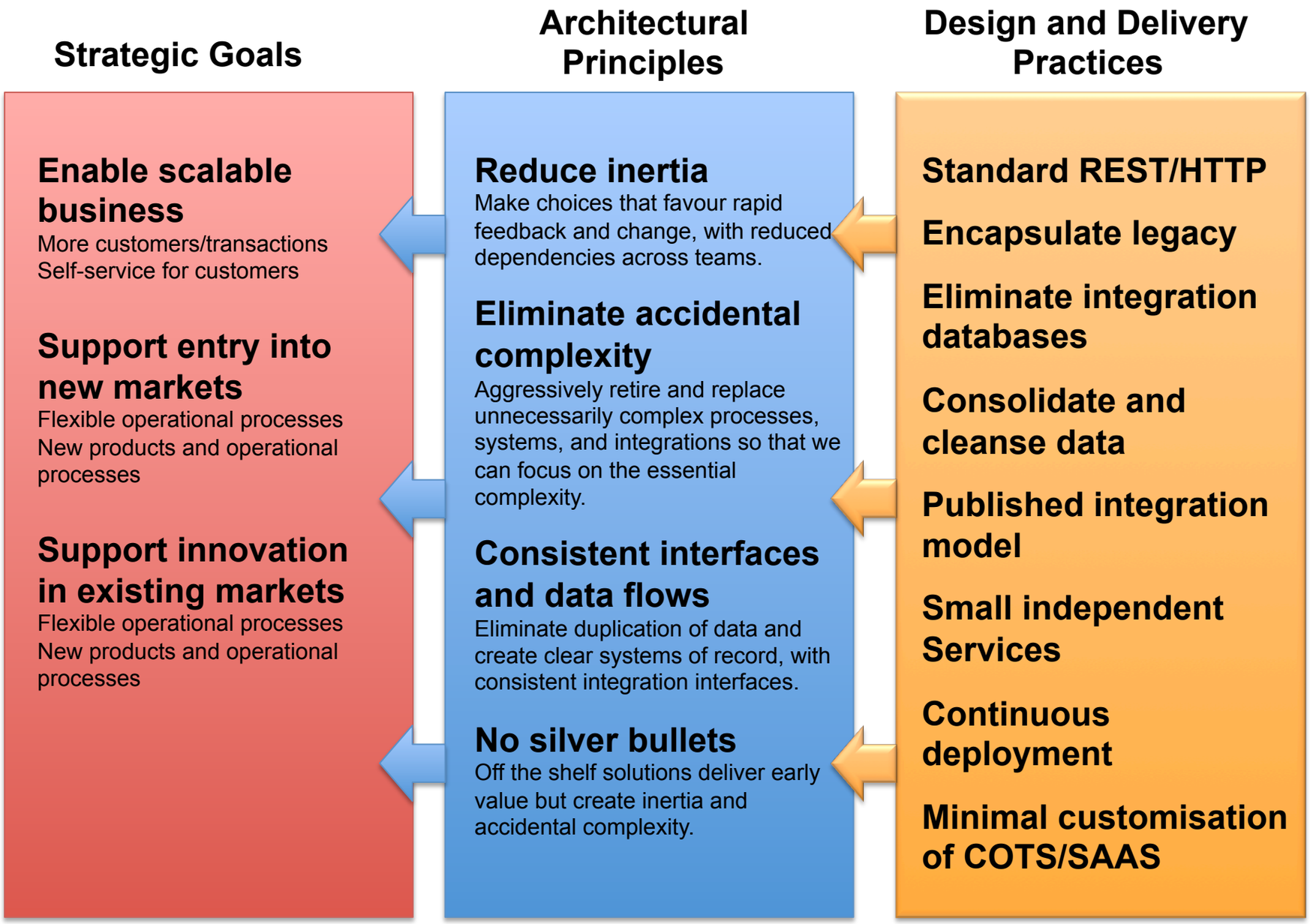
VIII. Concurrency
Scale out via the process model

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

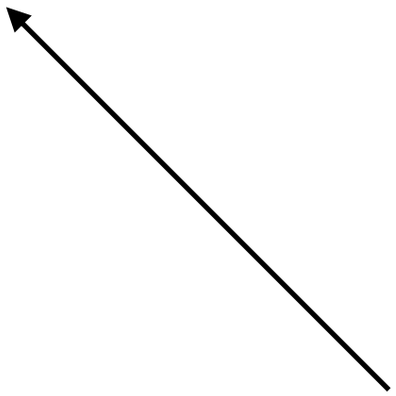

Strategic Goals
Enable scalable business
More customers/transactions
Self-service for customers
Support entry into new markets
Flexible operational processes
New products and operational processes
Support innovation in existing markets
Flexible operational processes
New products and operational processes
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

Small ***Autonomous*** services

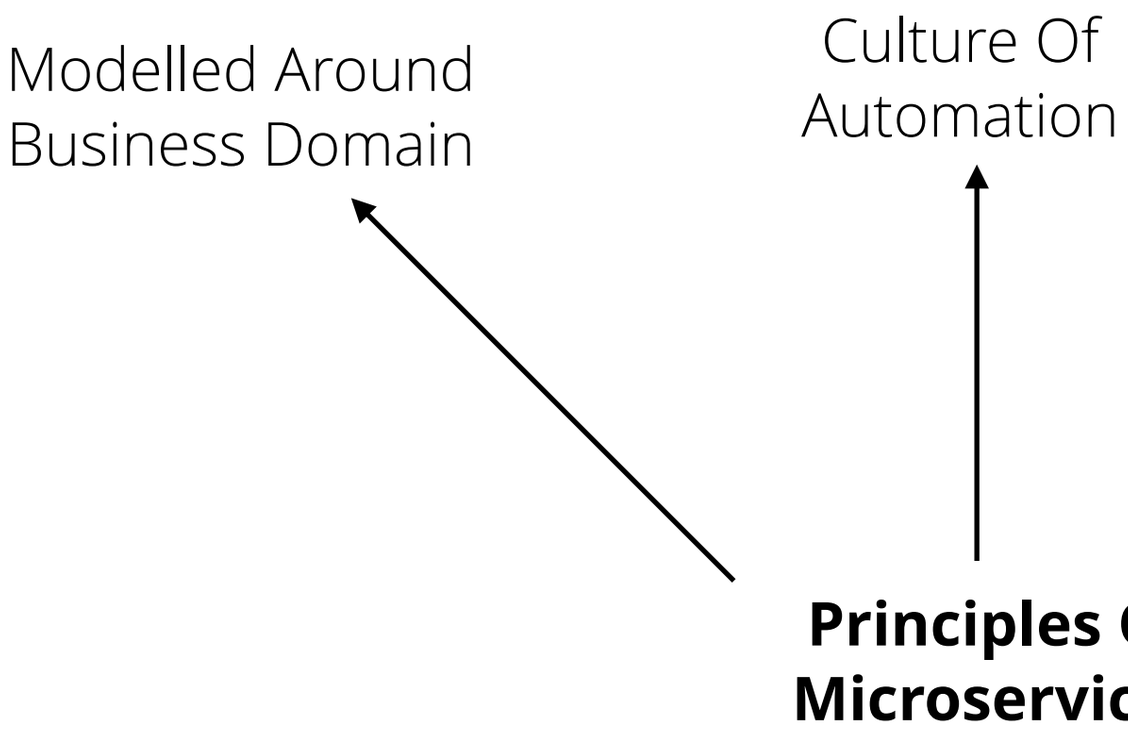
that ***work together***

Principles Of Microservices

Modelled Around
Business Domain



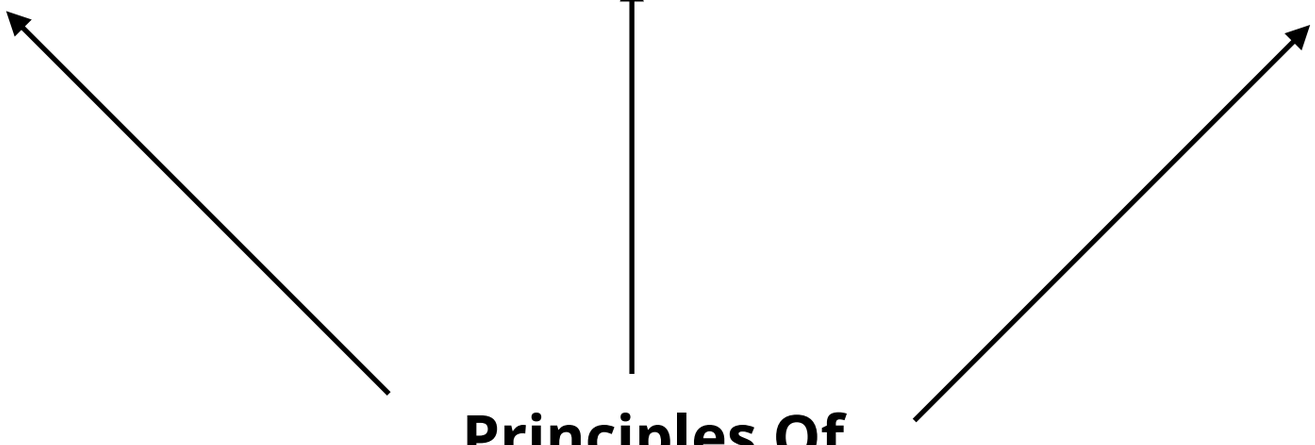
Principles Of Microservices


Modelled Around
Business Domain
Culture Of
Automation
Principles Of
Microservices

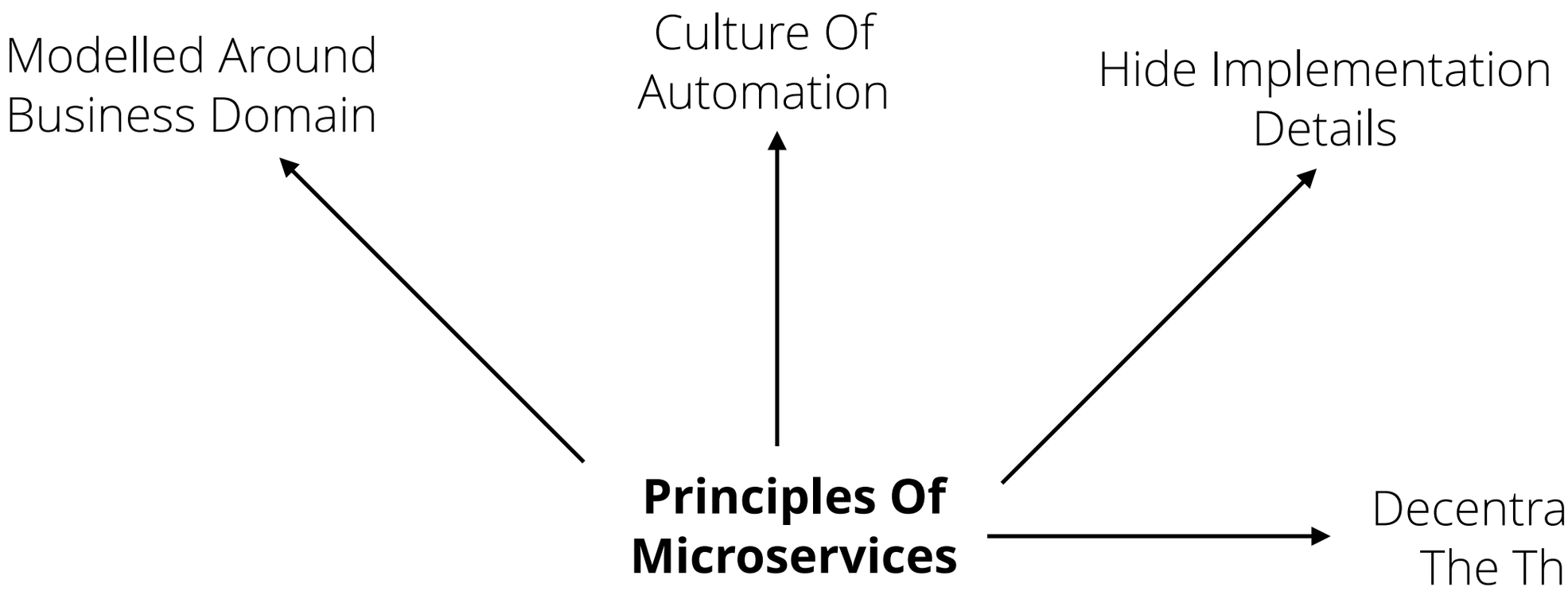
Modelled Around Business Domain

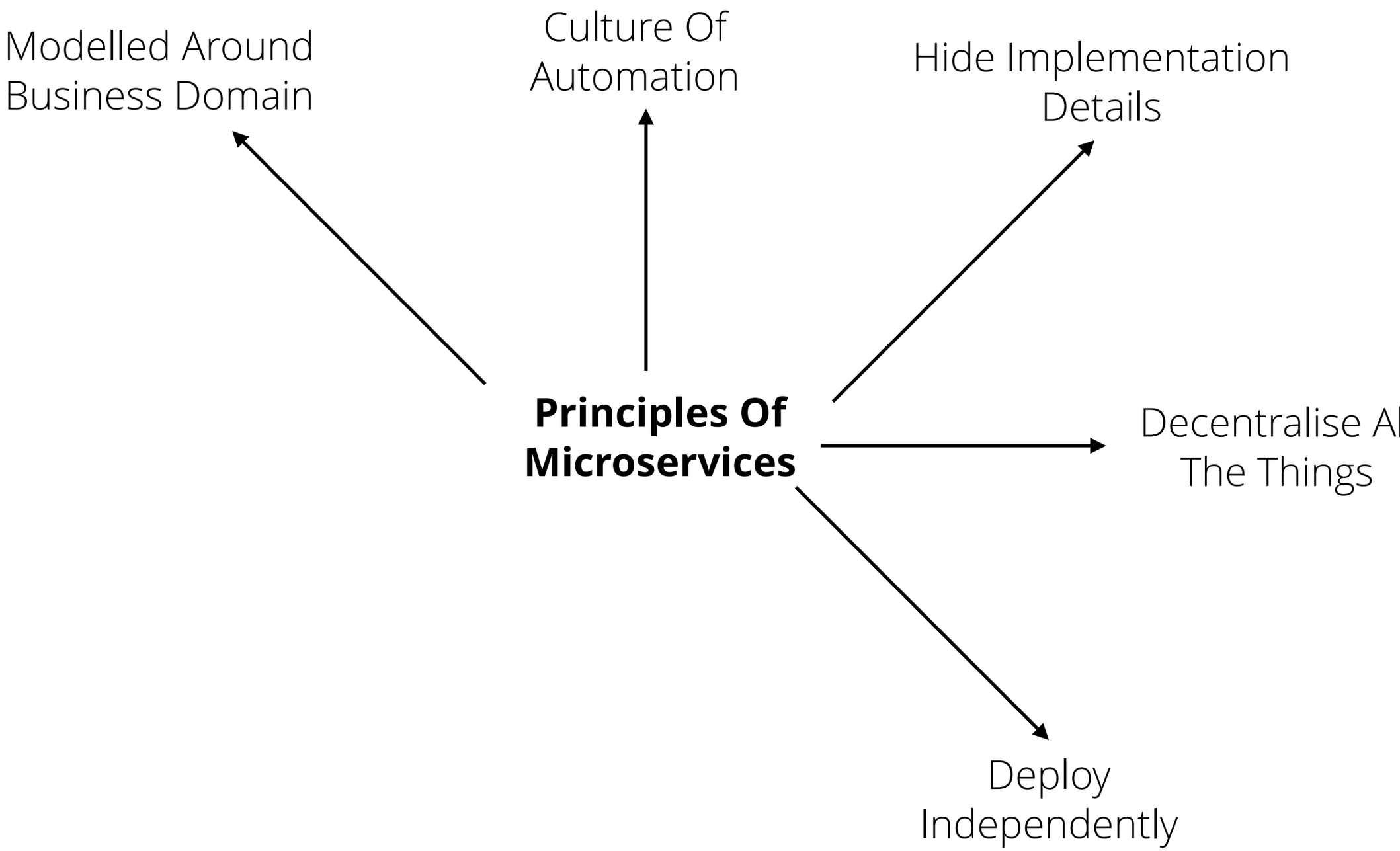
Culture Of Automation

Hide Implementation Details



Principles Of Microservices


Modelled Around Business Domain
Culture Of Automation
Hide Implementation Details
Principles Of Microservices
Decentralise All The Things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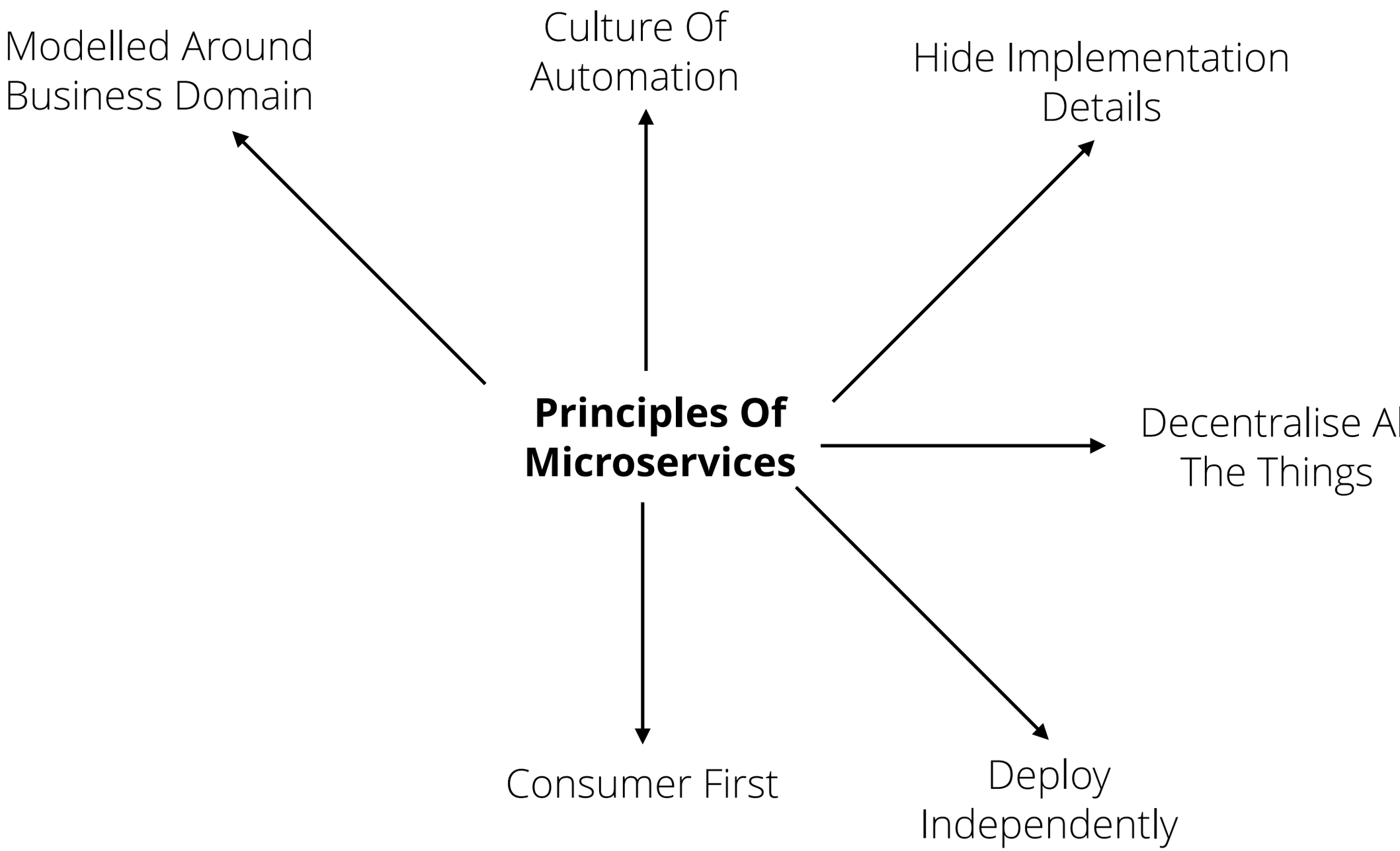
Culture Of Automation
Hide Implementation Details
Principles Of Microservices
Decentralise All The Things
Deploy Independently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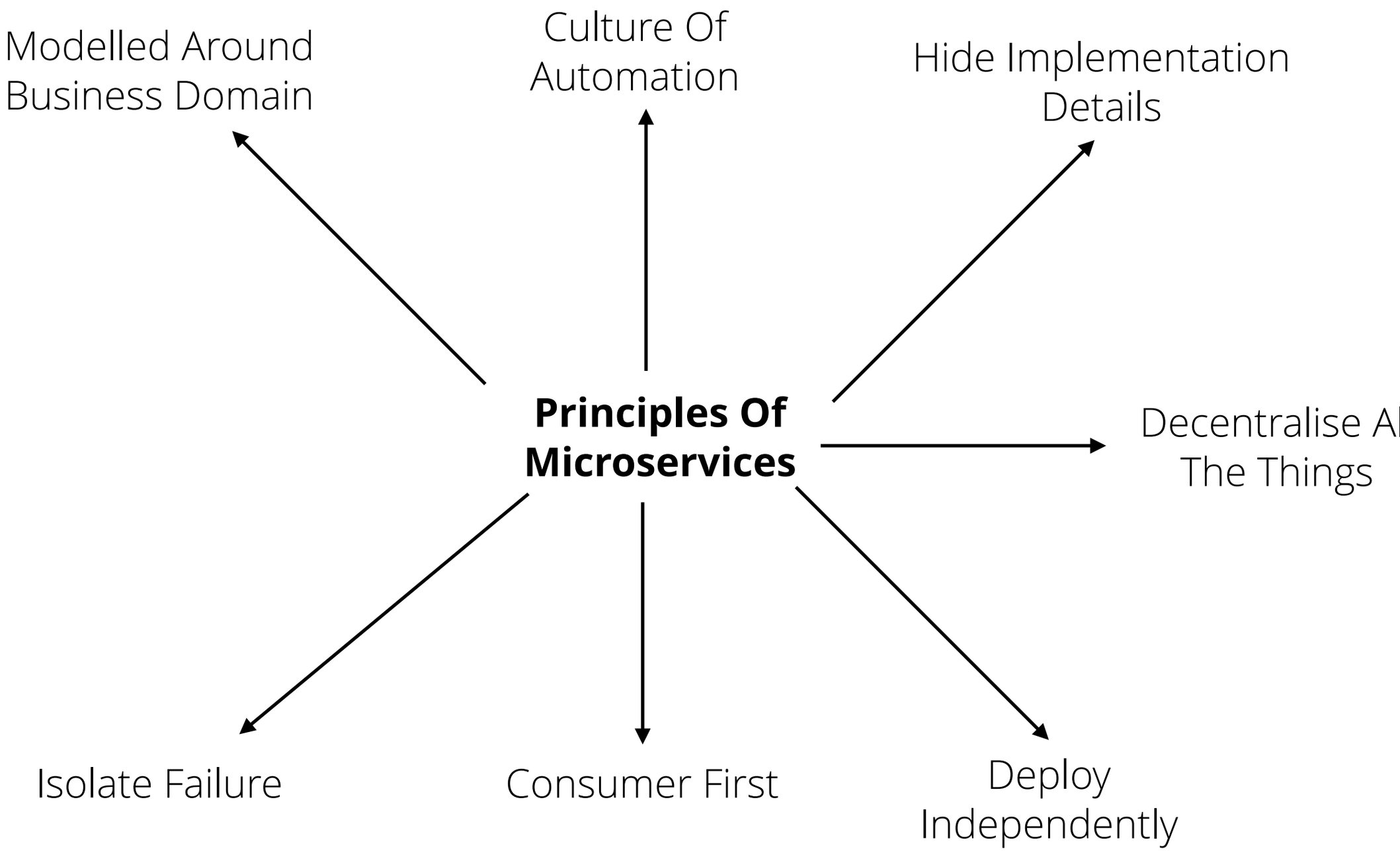
Principles Of Microservices
Decentralise All The Things
Consumer First
Deploy Independently


Modelled Around Business Domain
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Decentralise All The Things
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Modelled Around Business Domain

Culture Of Automation

Hide Implementation Details

Highly Observable

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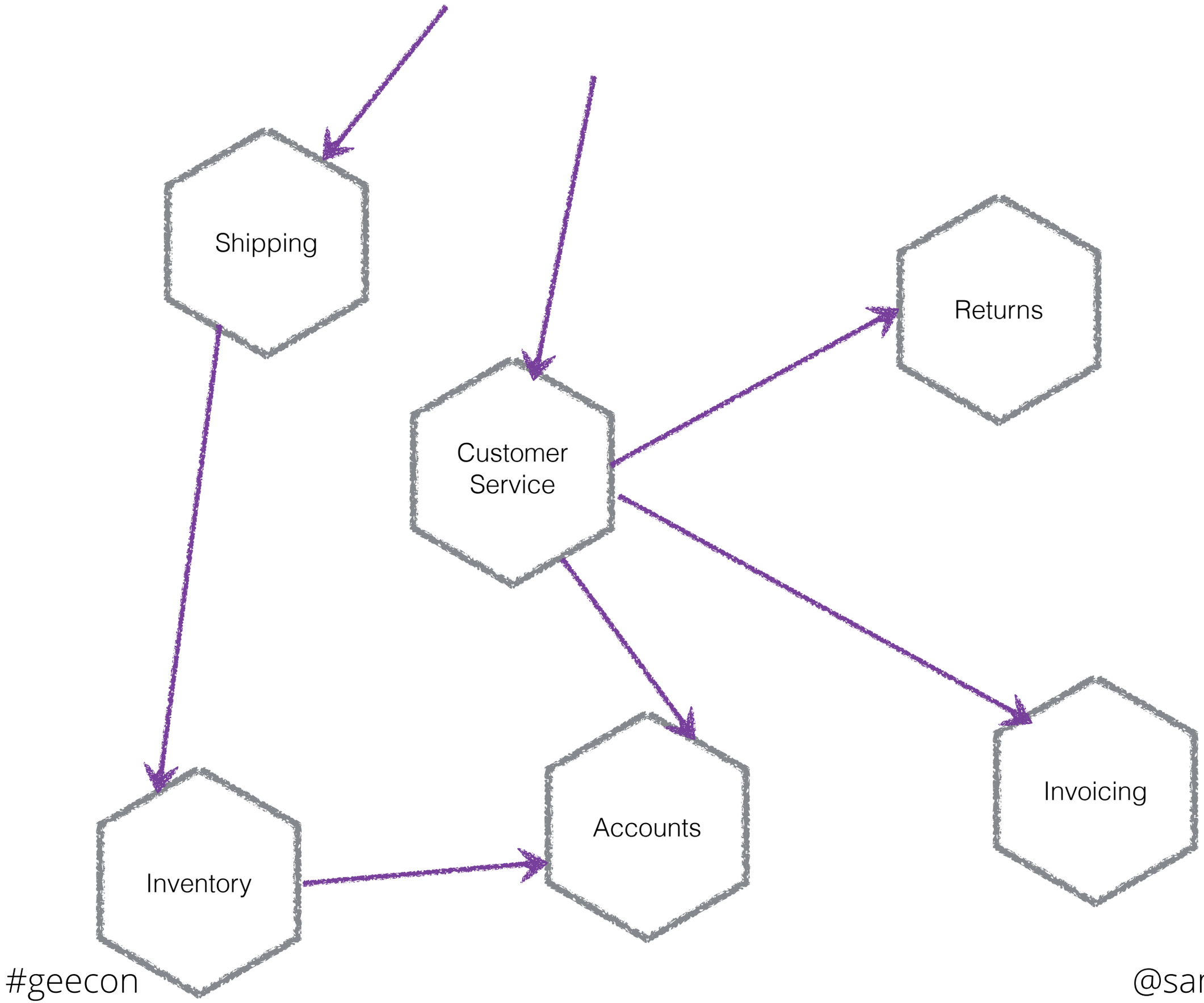
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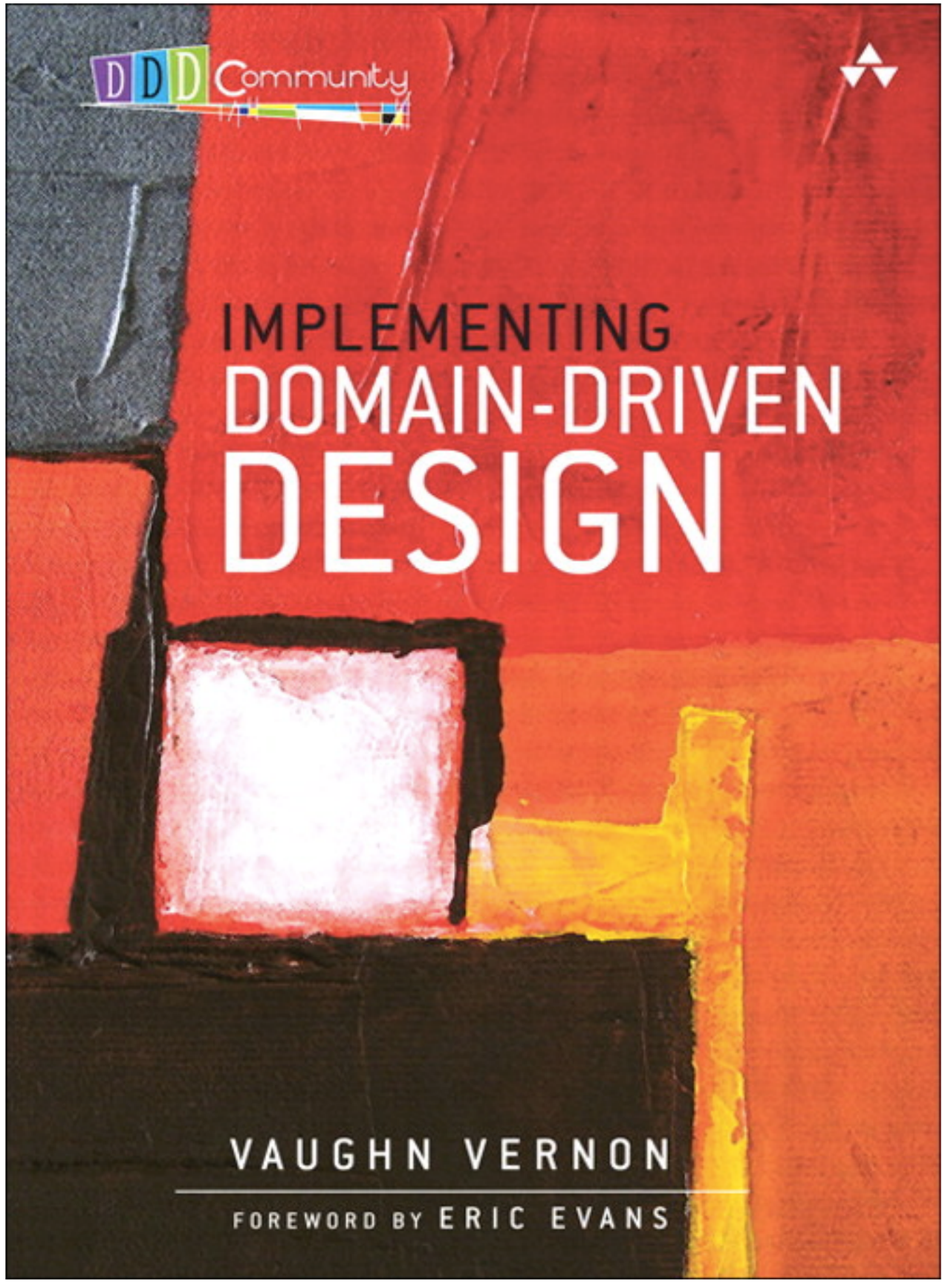
DDD Community
IMPLEMENTING
DOMAIN-DRIVEN
DESIGN
VAUGHN VERNON
FOREWORD BY ERIC EVANS

✓ Modelled Around Business Domain

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Highly Observable

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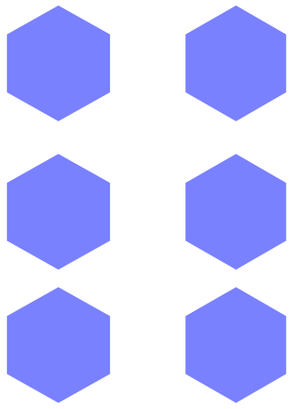
2 Microservices

3 Months

10 Microservices

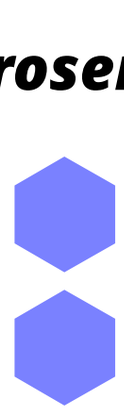
2 Microservices

3 Months



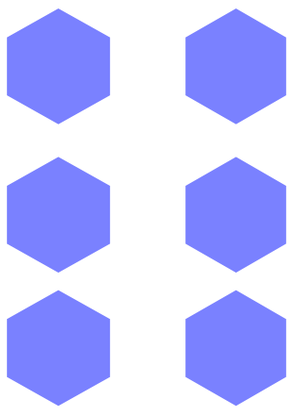
12 Months

2 Microservices



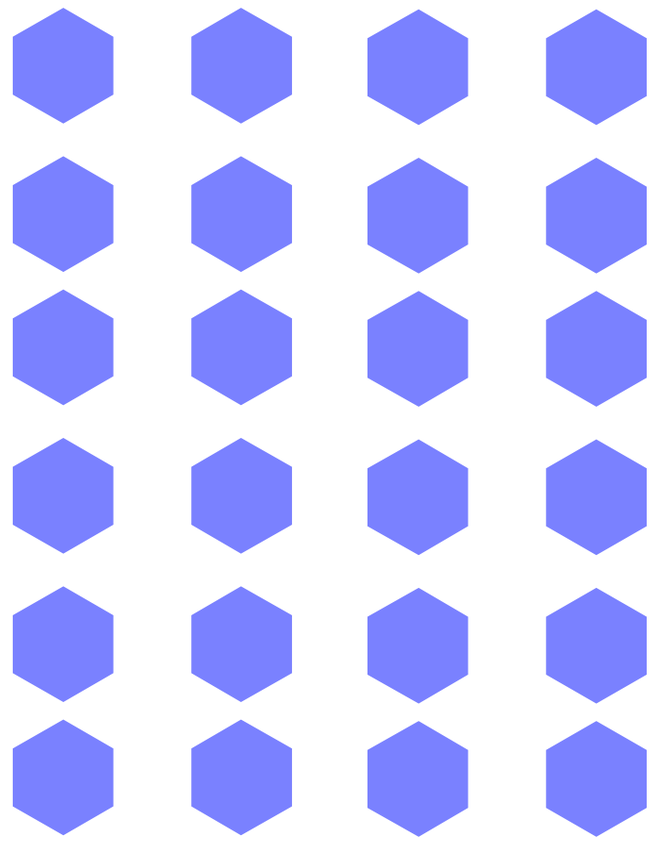
3 Months

10 Microservices



12 Months

60 Microservices



18 Months

Infrastructure Automation

Infrastructure Automation

Automated Testing

Infrastructure Automation

Automated Testing

Continuous Delivery

✓ Modelled Around Business Domain

✓ Culture Of Automation

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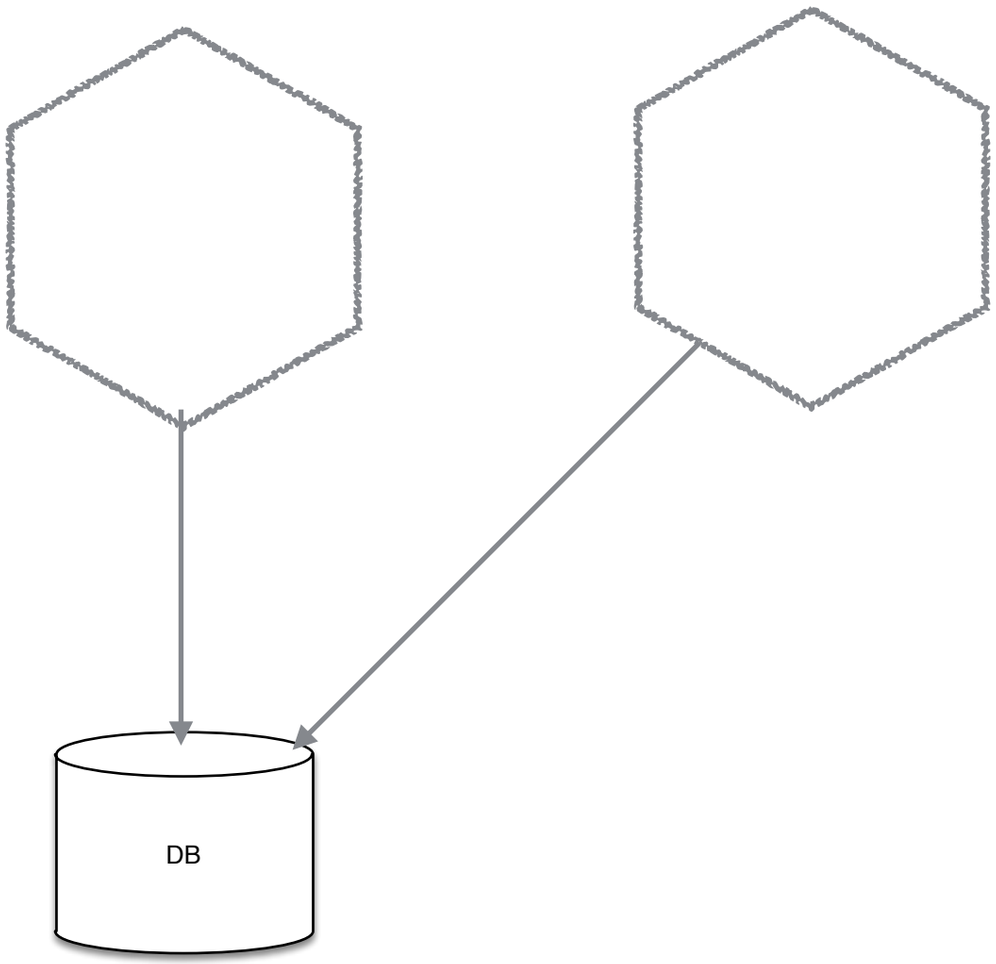
DB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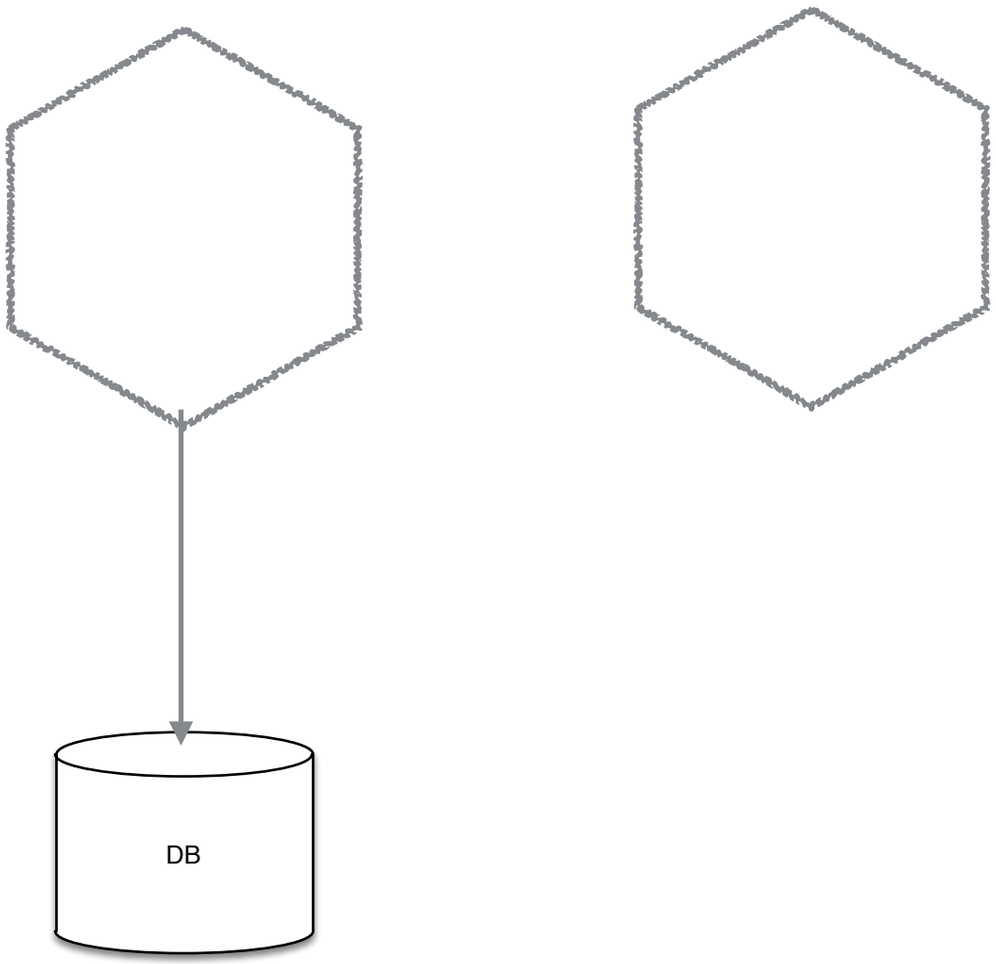
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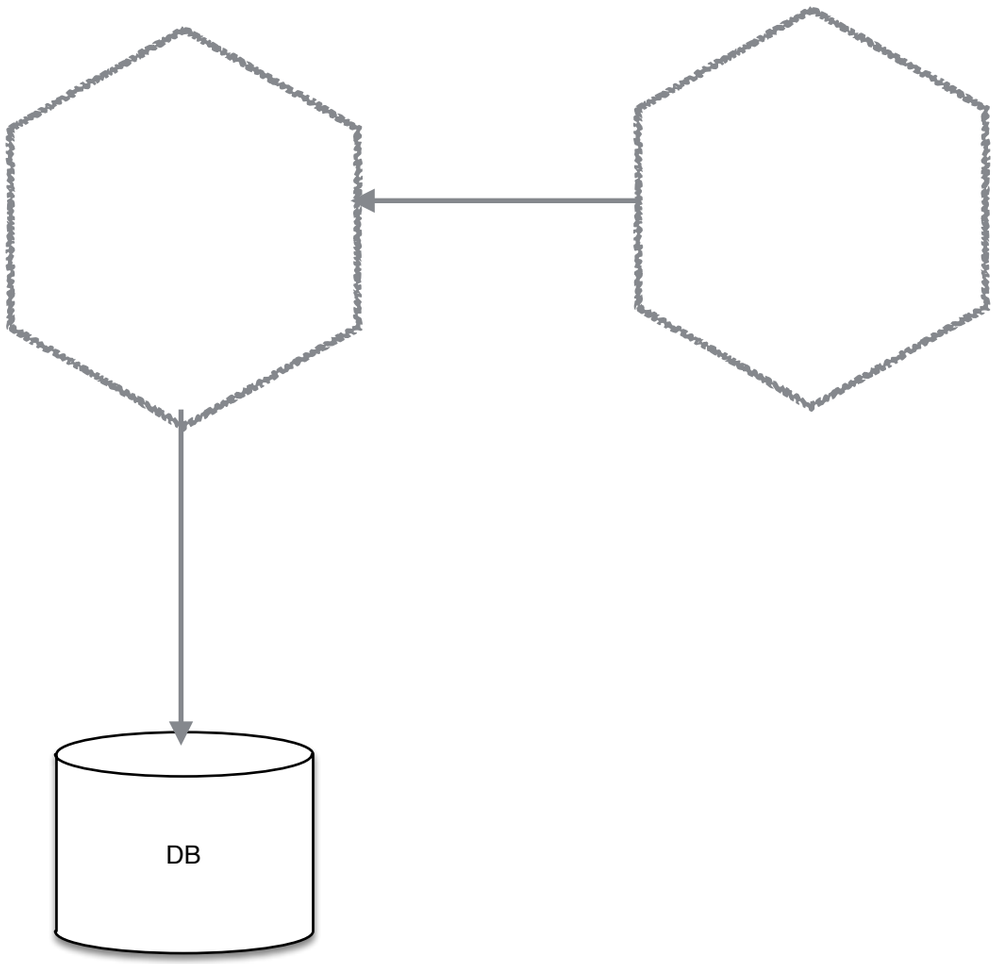
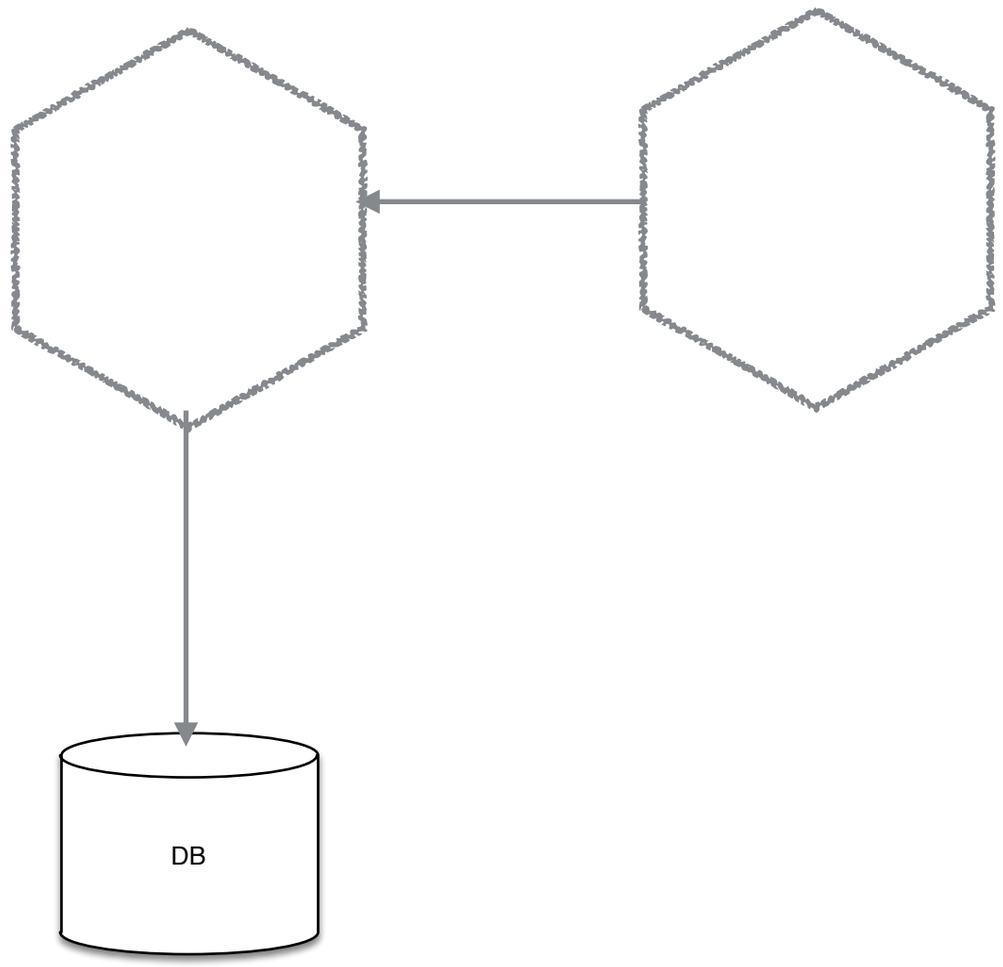
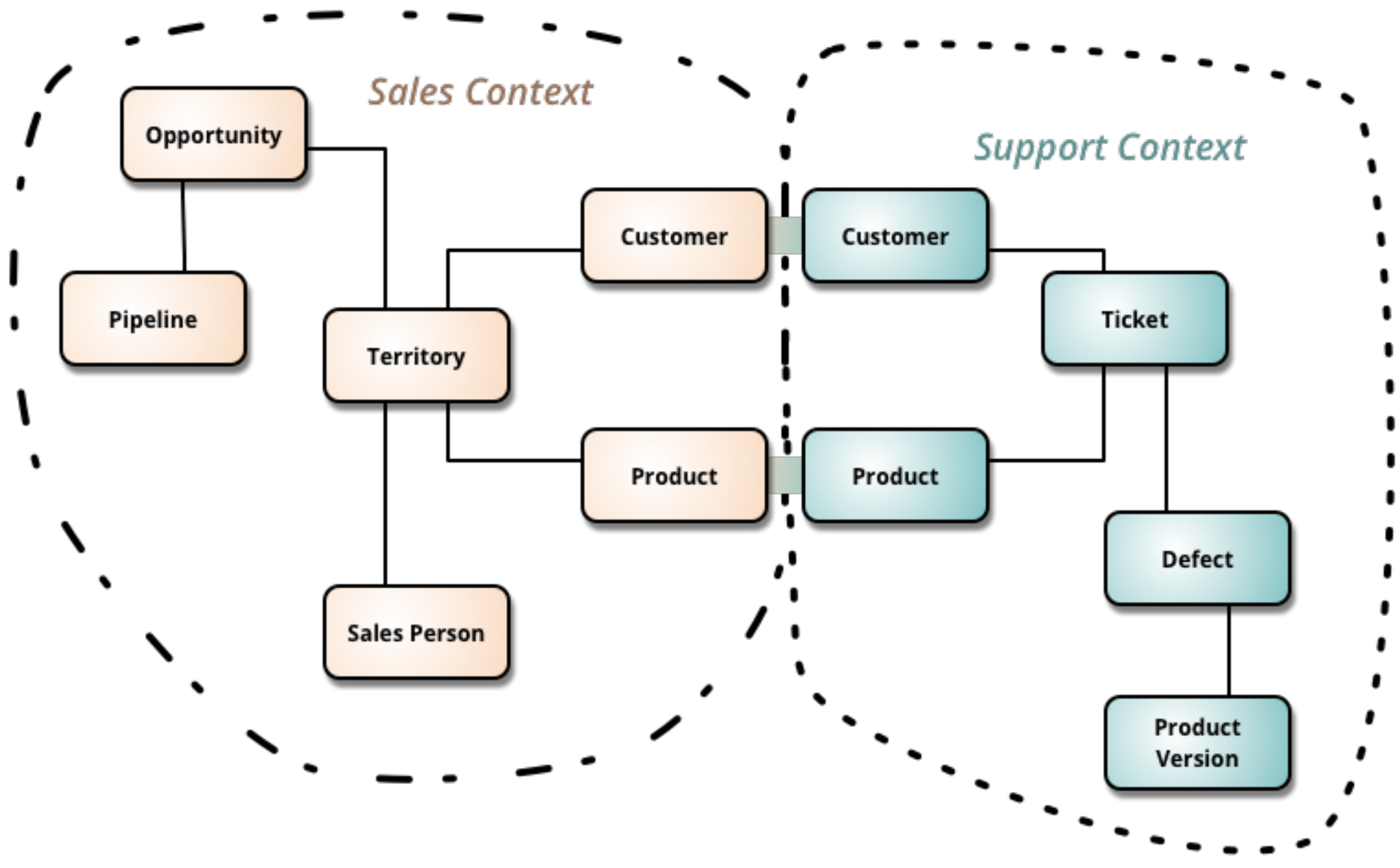

DB

HIDE YOUR DATABASE




Sales Context
Support Context
Opportunity
Pipeline
Territory
Sales Person
Customer
Customer
Product
Product
Ticket
Defect
Product Version

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✓ Culture Of Automation

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What is autonomy?

What is autonomy?

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

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

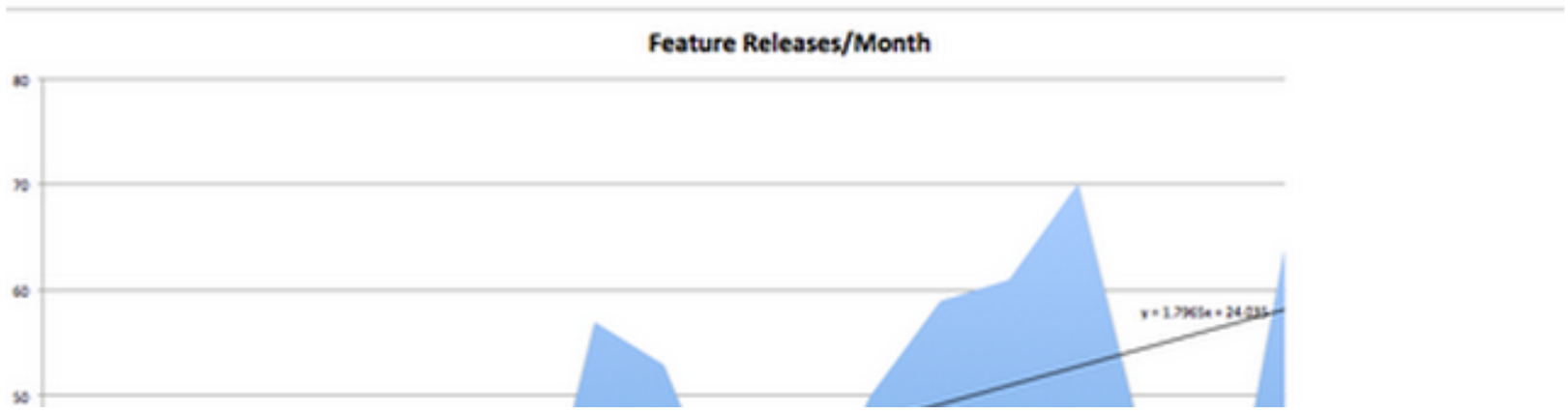
SELF-SERVICE

https://www.flickr.com/photos/katsrcool/15184711908/

GILT TECH

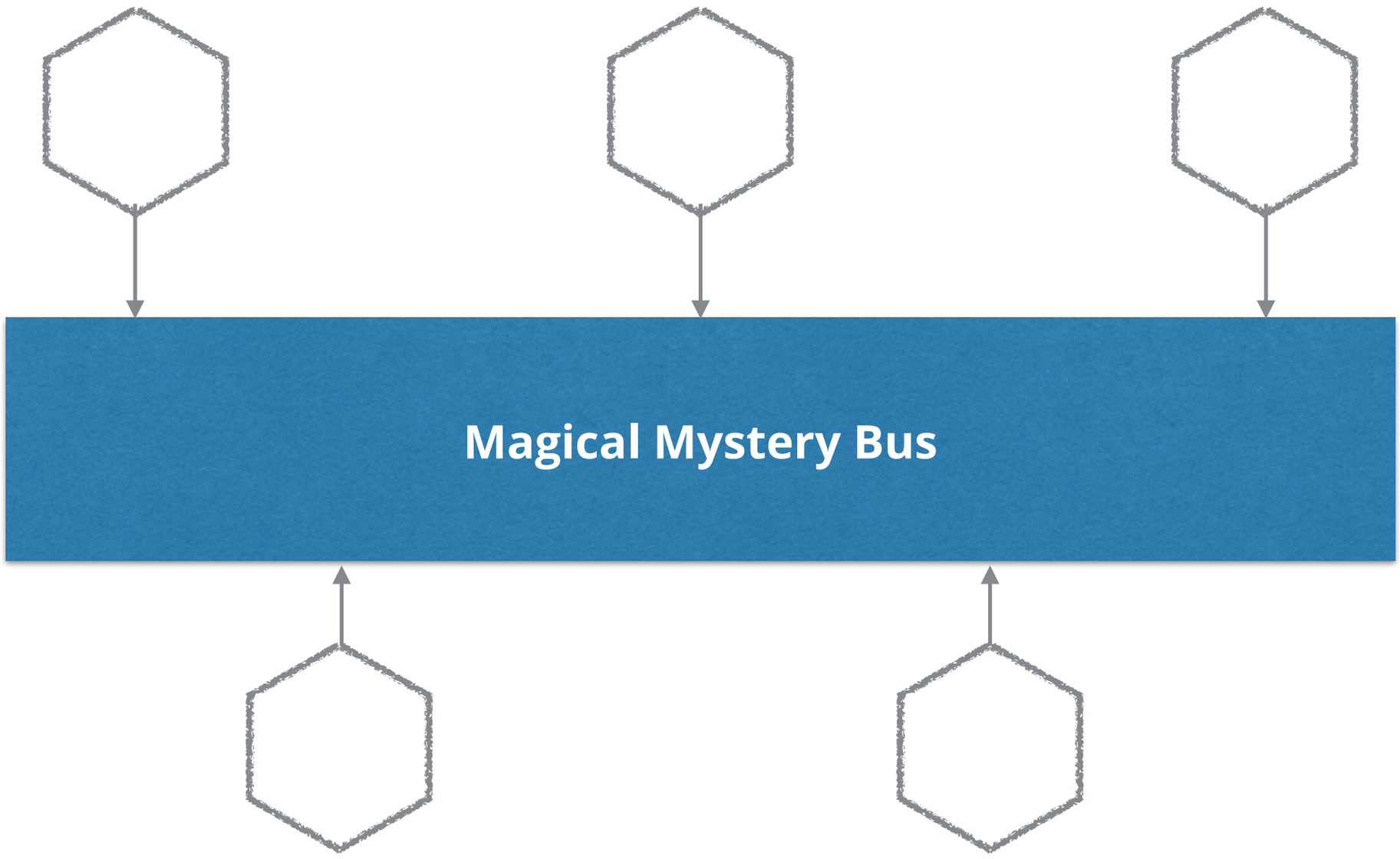
Search the blog

Making Architecture Work in Microservice Organizations

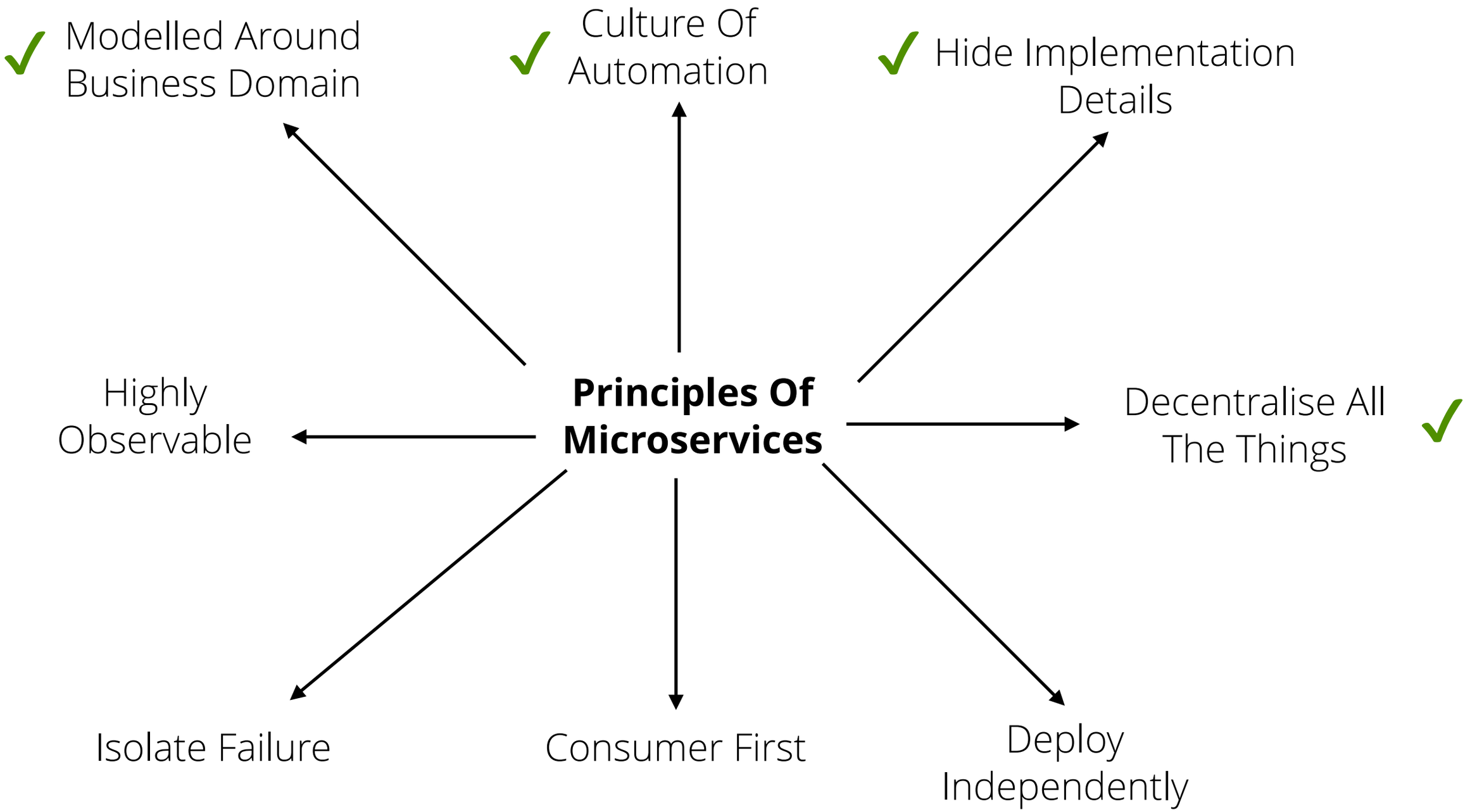


http://tech.gilt.com/post/102628539834/making-architecture-work-in-microservice

DUMB-PIPES, SMART ENDPOINTS



Magical Mystery Bus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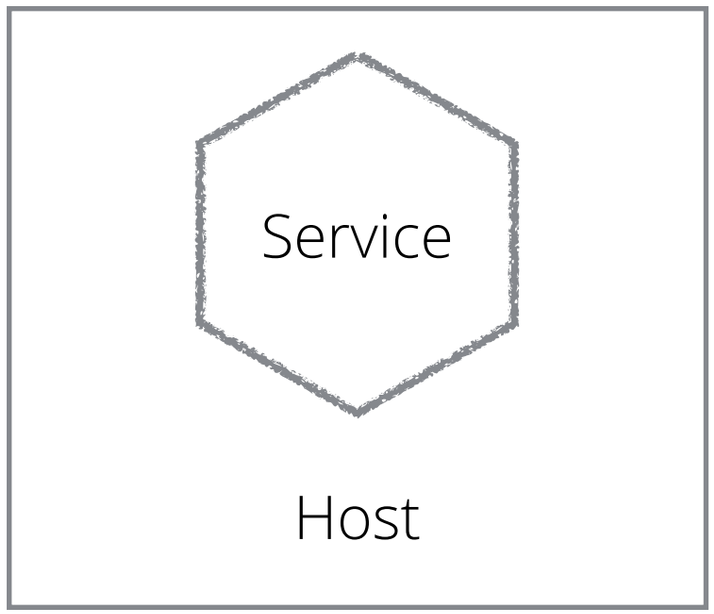
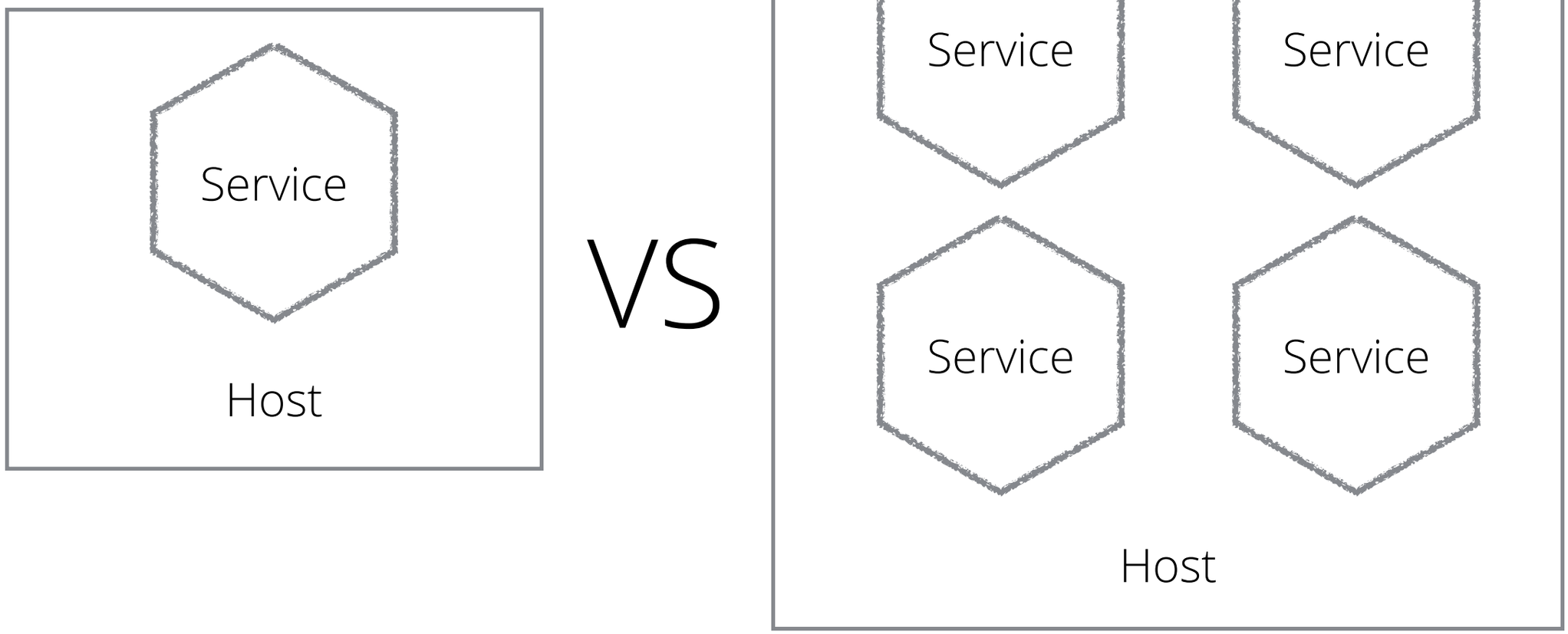
ONE SERVICE PER-HOST



ONE SERVICE PER-HOST



CONSUMER-DRIVEN CONTRACTS

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Expectations

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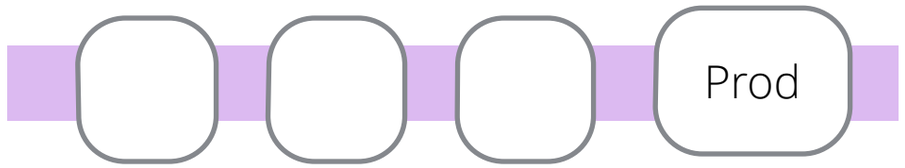
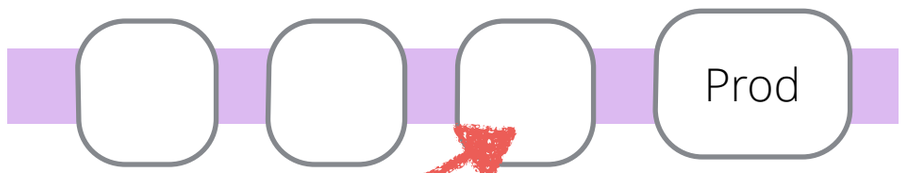
Expectations



CONSUMER-DRIVEN CONTRACTS

Expectations



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.

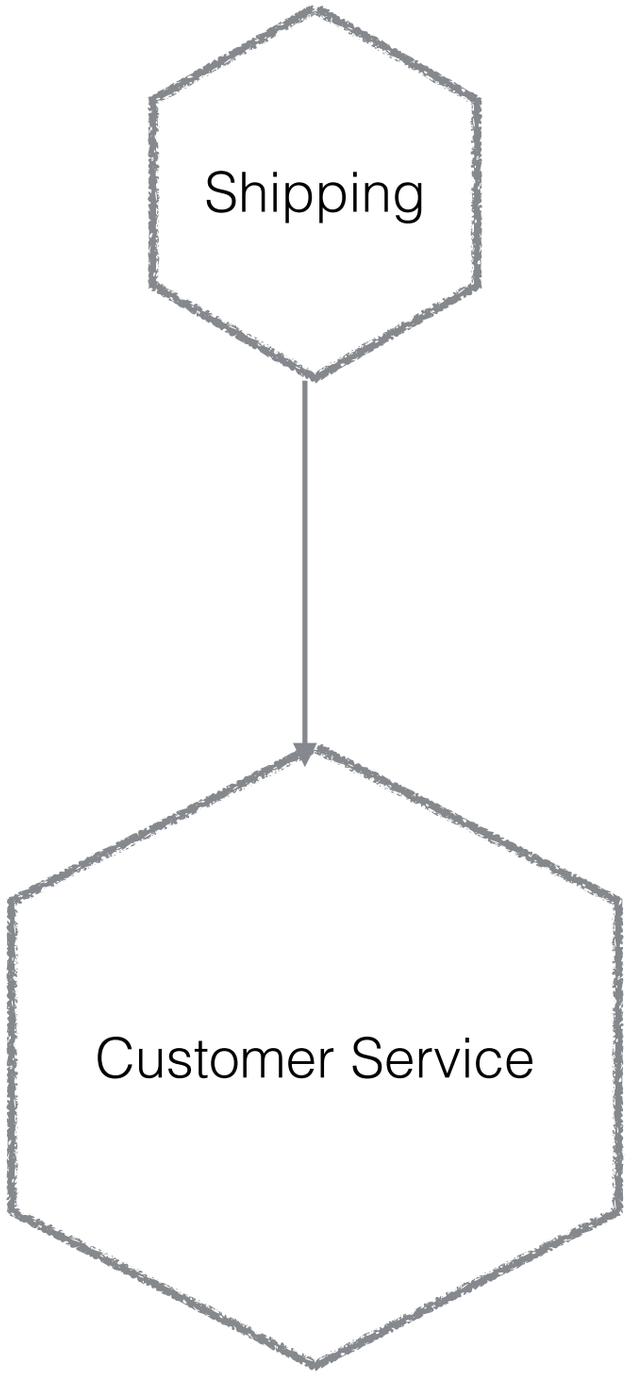
This allows testing of both sides of an integration point using fast unit tests.

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

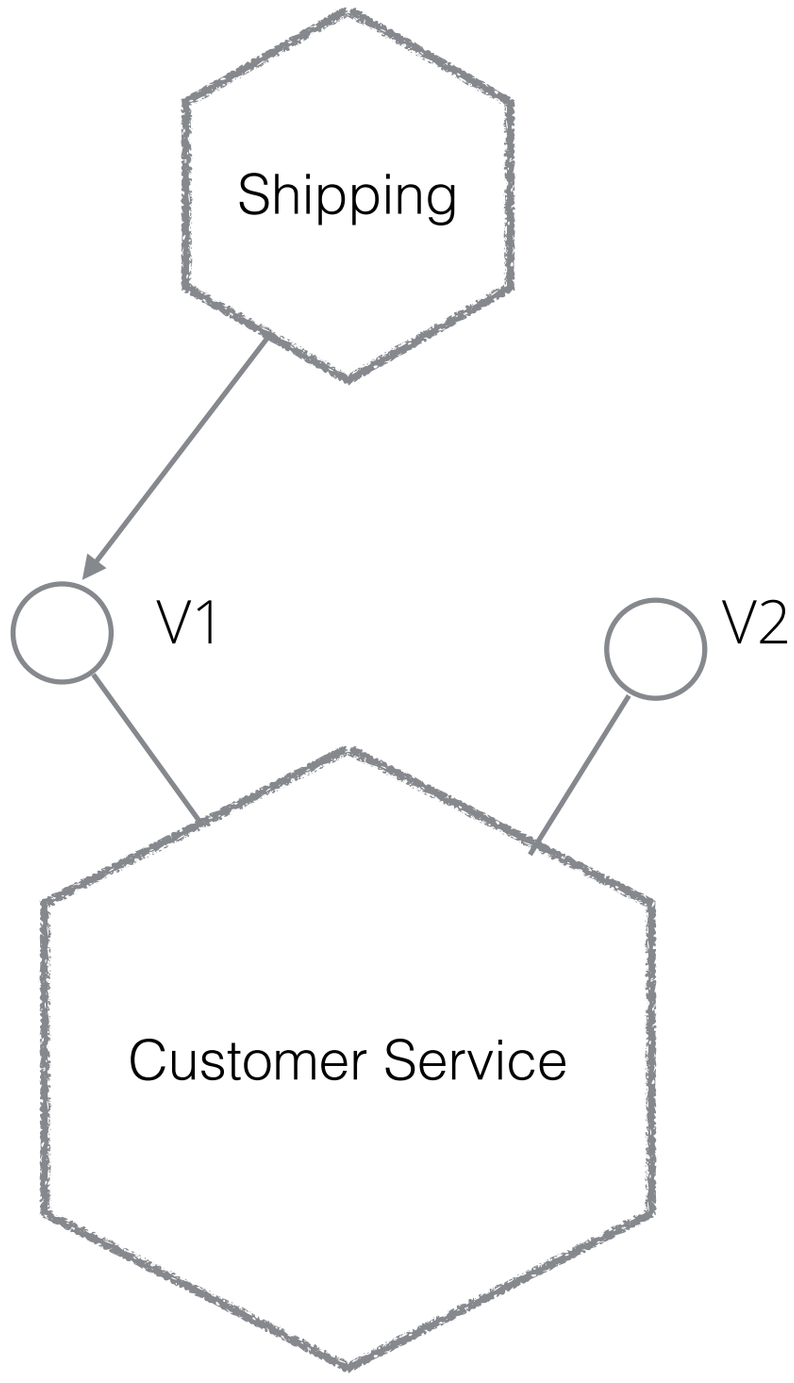
Travis CI Status: build passing

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

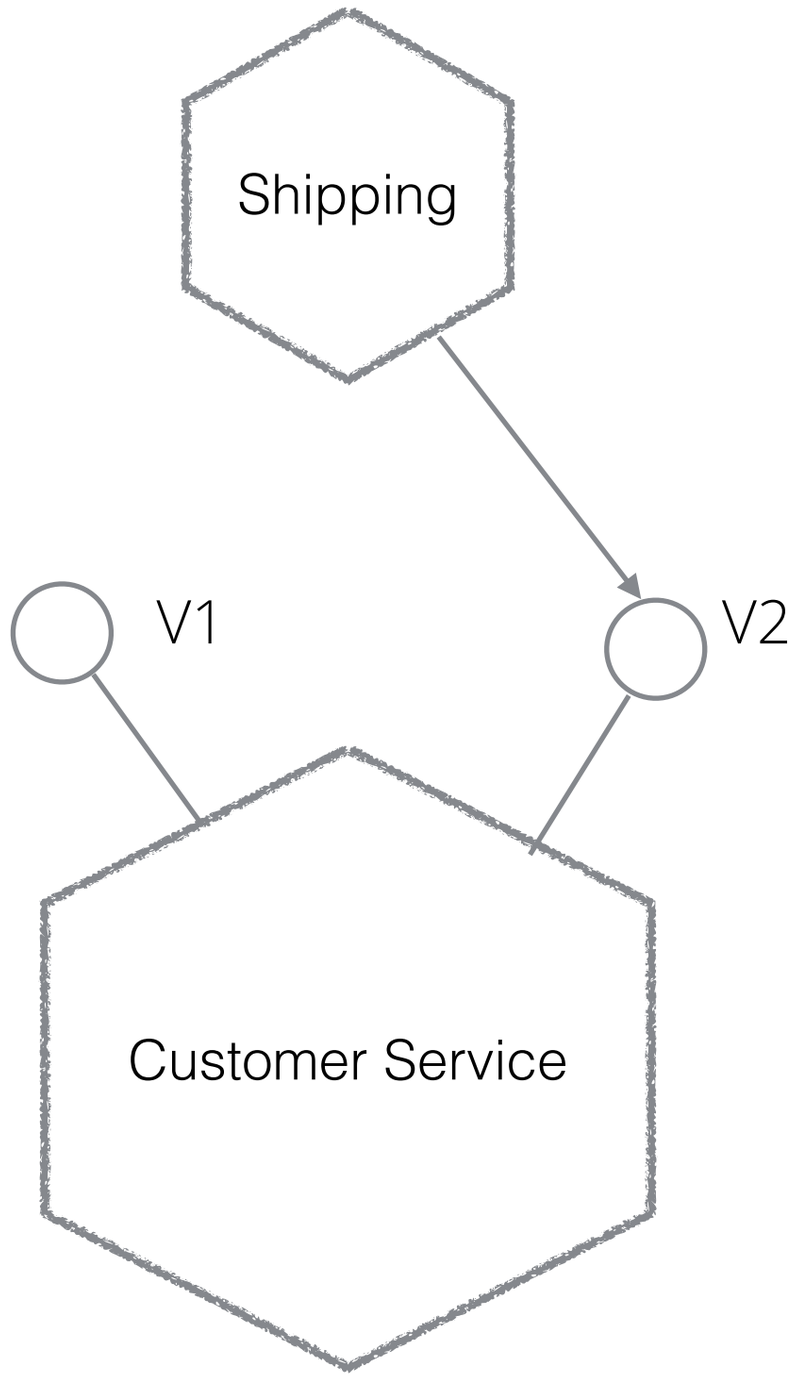
CO-EXIST ENDPOINTS



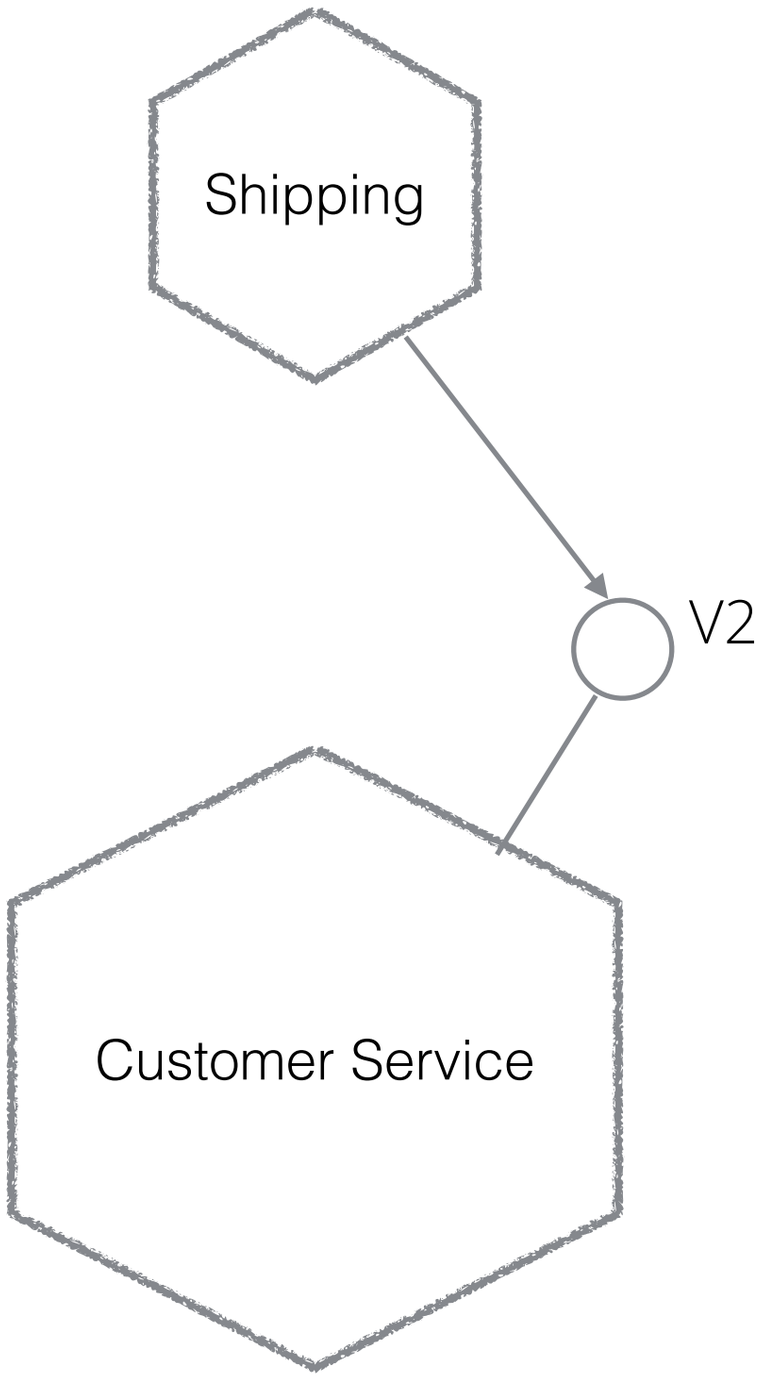
CO-EXIST ENDPOINTS

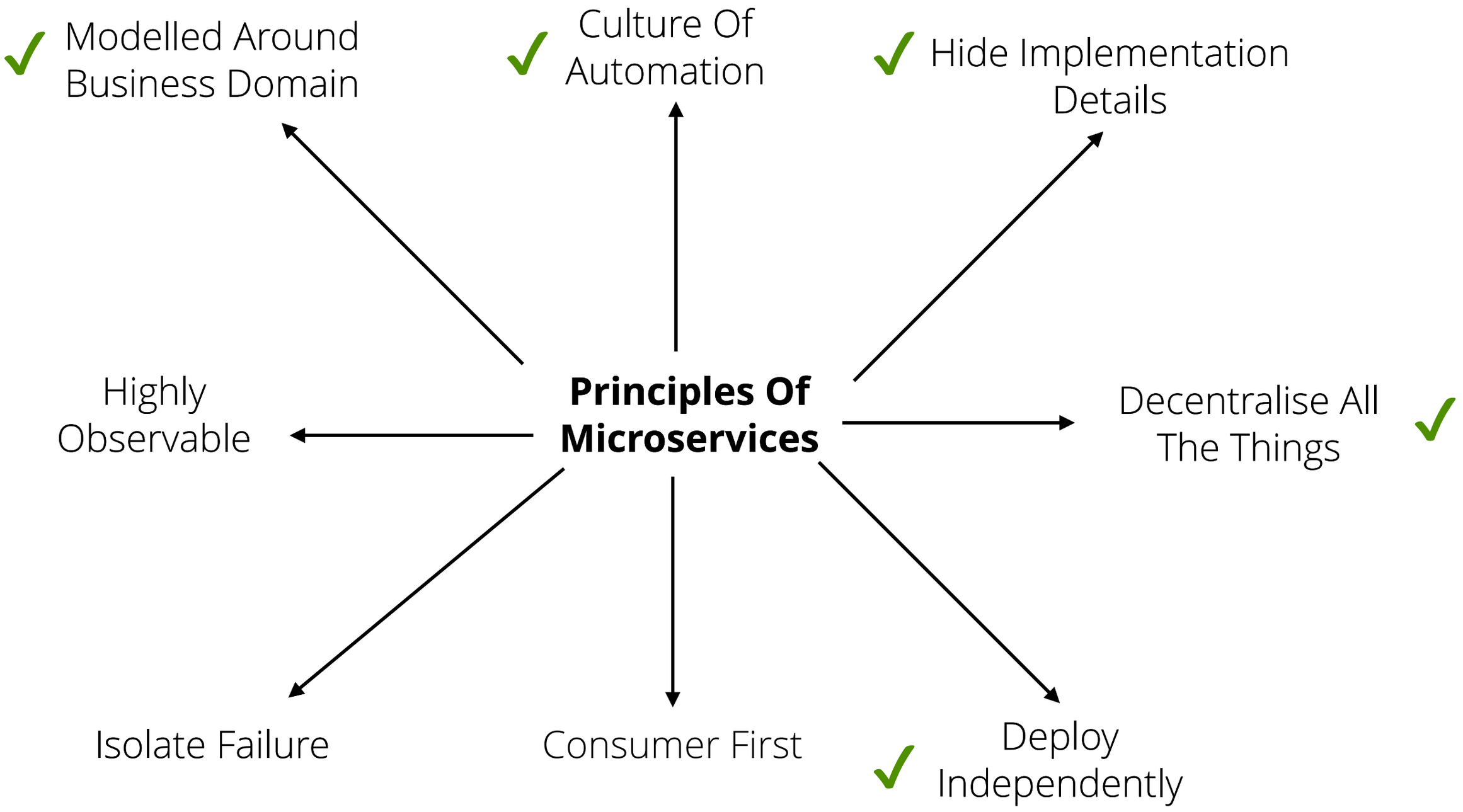


CO-EXIST ENDPOINTS



CO-EXIST ENDPOINTS




✓ Modelled Around Business Domain
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Highly Observable
Principles Of Microservices
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✓
Isolate Failure
Consumer First
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DOCUMENTATION

A POWERFUL INTERFACE TO YOUR API

Swagger is a simple yet powerful representation of your RESTful API. With the largest ecosystem of API tooling on the planet, thousands of developers are supporting Swagger in almost every modern programming language and deployment environment. With a Swagger-enabled API, you get interactive documentation, client SDK generation and discoverability.

Response Content Type application/json

Try it out!

POST /store/order — Place an order for a pet

Response Class (Status 200)

Model | Model Schema


```
{
  "id": 0,
  "petId": 0,
  "quantity": 0,
  "shipDate": "2015-05-11T05:03:29.879Z",
  "status": "placed",
  "complete": true
}
```


Response Content Type application/xml

Parameters

Parameter	Value	Description	Parameter Type	Data Type
body	Parameter content type: application/json	order placed for purchasing the pet	body	Model | Model Schema


```
{
  "id": 0,
  "petId": 0,
  "quantity": 0,
  "shipDate": "2015-05-11T05:03:29.800Z",
  "status": "placed",
  "complete": true
}
```

SERVICE DISCOVERY

SERVICE DISCOVERY

SERVICE DISCOVERY

HUMANE REGISTRIES

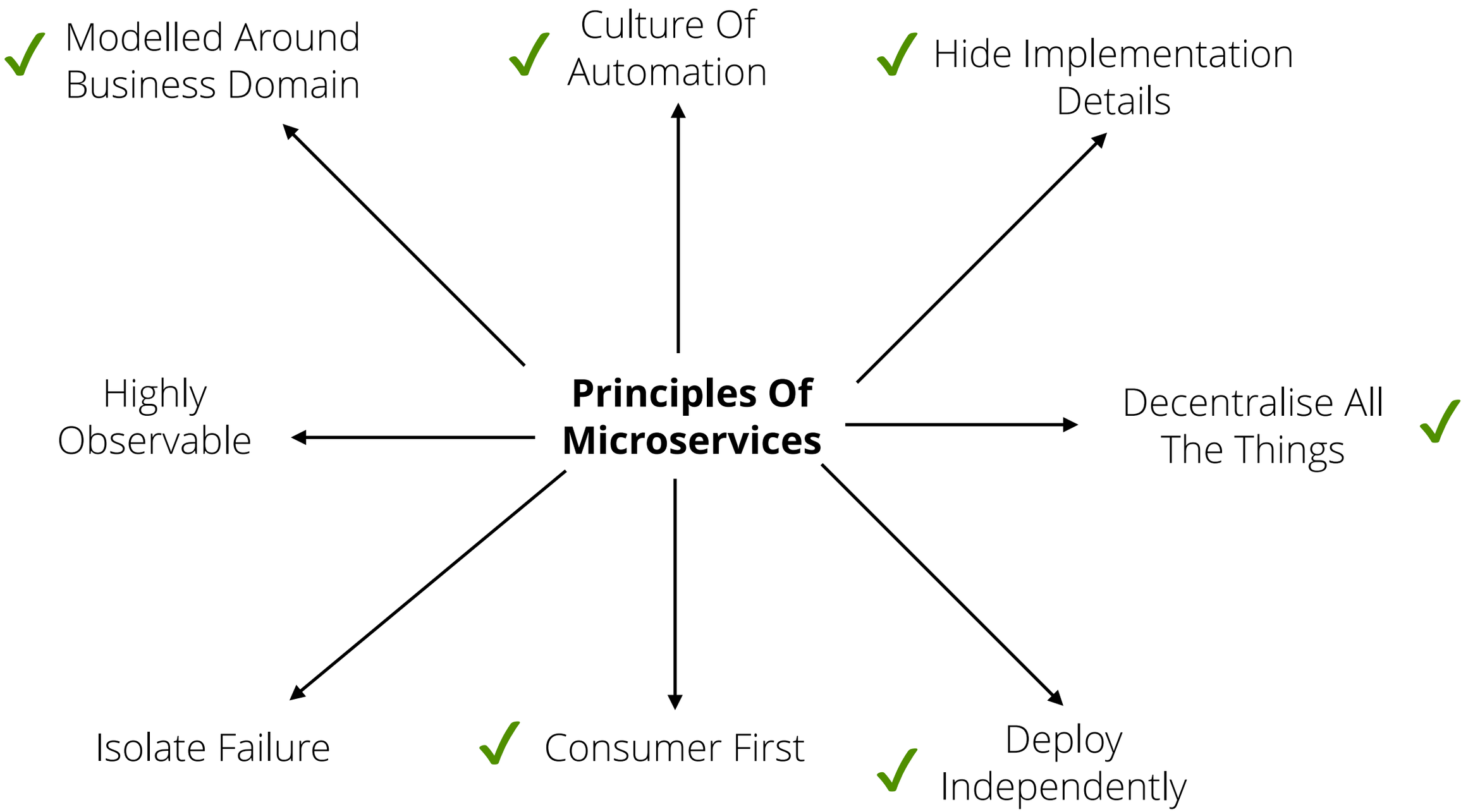
HumaneRegistry

Martin Fowler
1 December 2008

One of the features of the new world of services that SOA-gushers promoted was the notion of registries. Often this was described in terms of automated systems that would allow systems to automatically look up useful services in a registry and bind and consume those services all by themselves.

Well computers may look clever occasionally, but I didn't particularly buy that idea. While there might the be odd edge case for automated service lookup, I reckon twenty-two times out of twenty it'll be a human programmer who is doing the looking up.

I was chatting recently to my colleague Erik Dörnenburg about a project he did with Halvard Skogsrud to build a service registry that was designed for humans to use and maintain. The organization was already using ServiceCustodians to manage the development on the project, so the registry needed to work in that context. This led to the following principles: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Decentralise All The Things ✓

Isolate Failure

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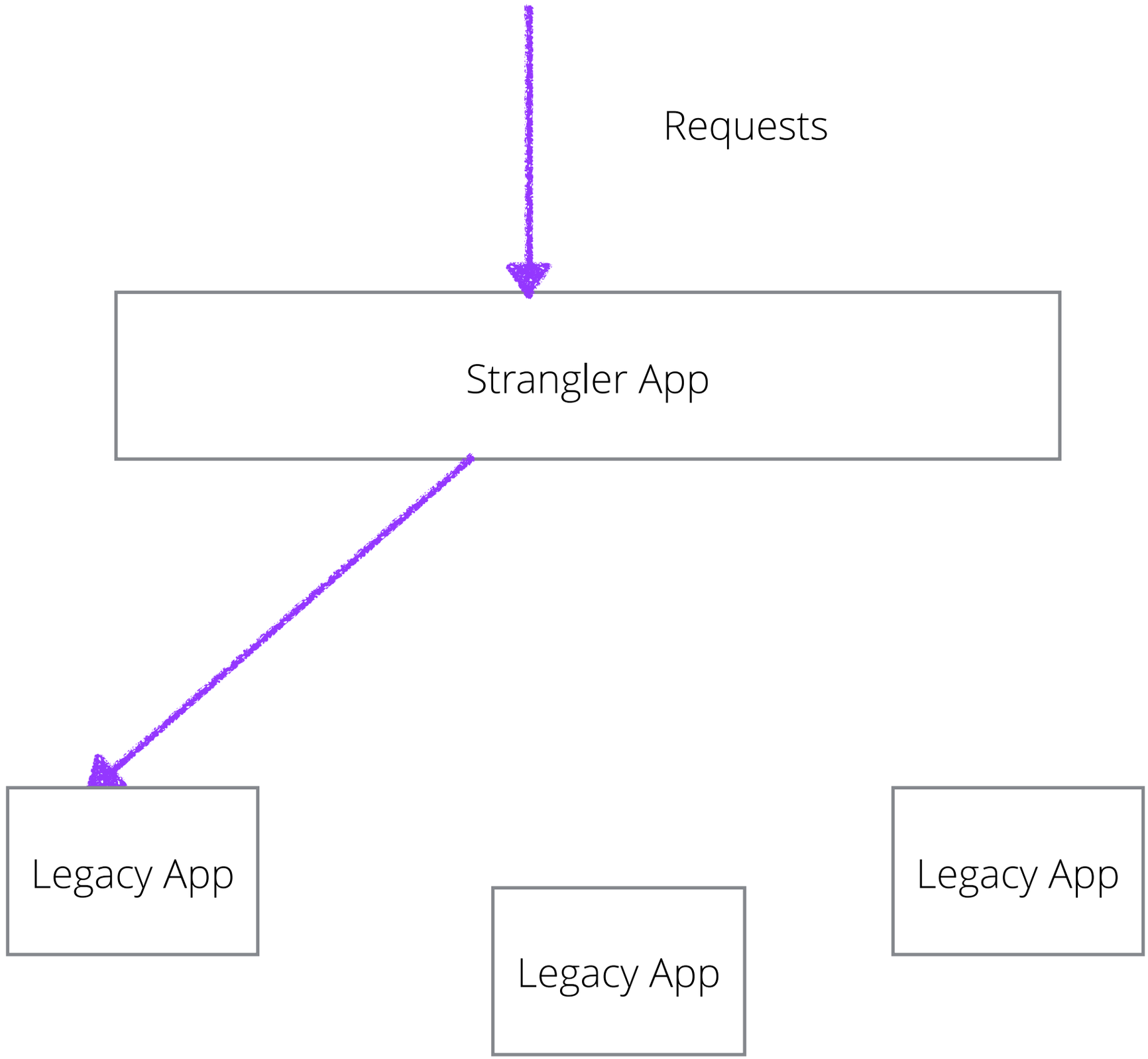
Strangler App

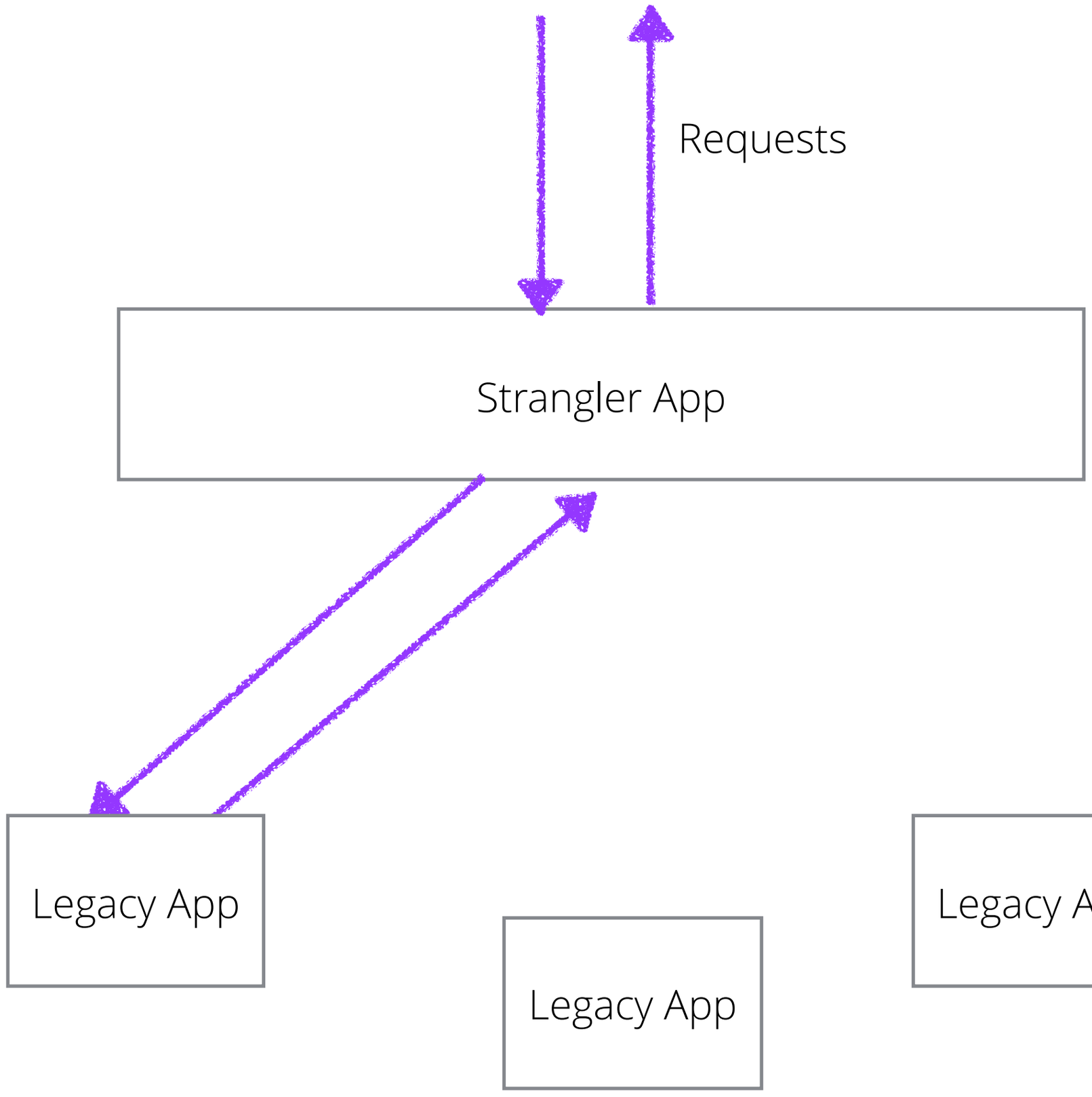
Strangler App

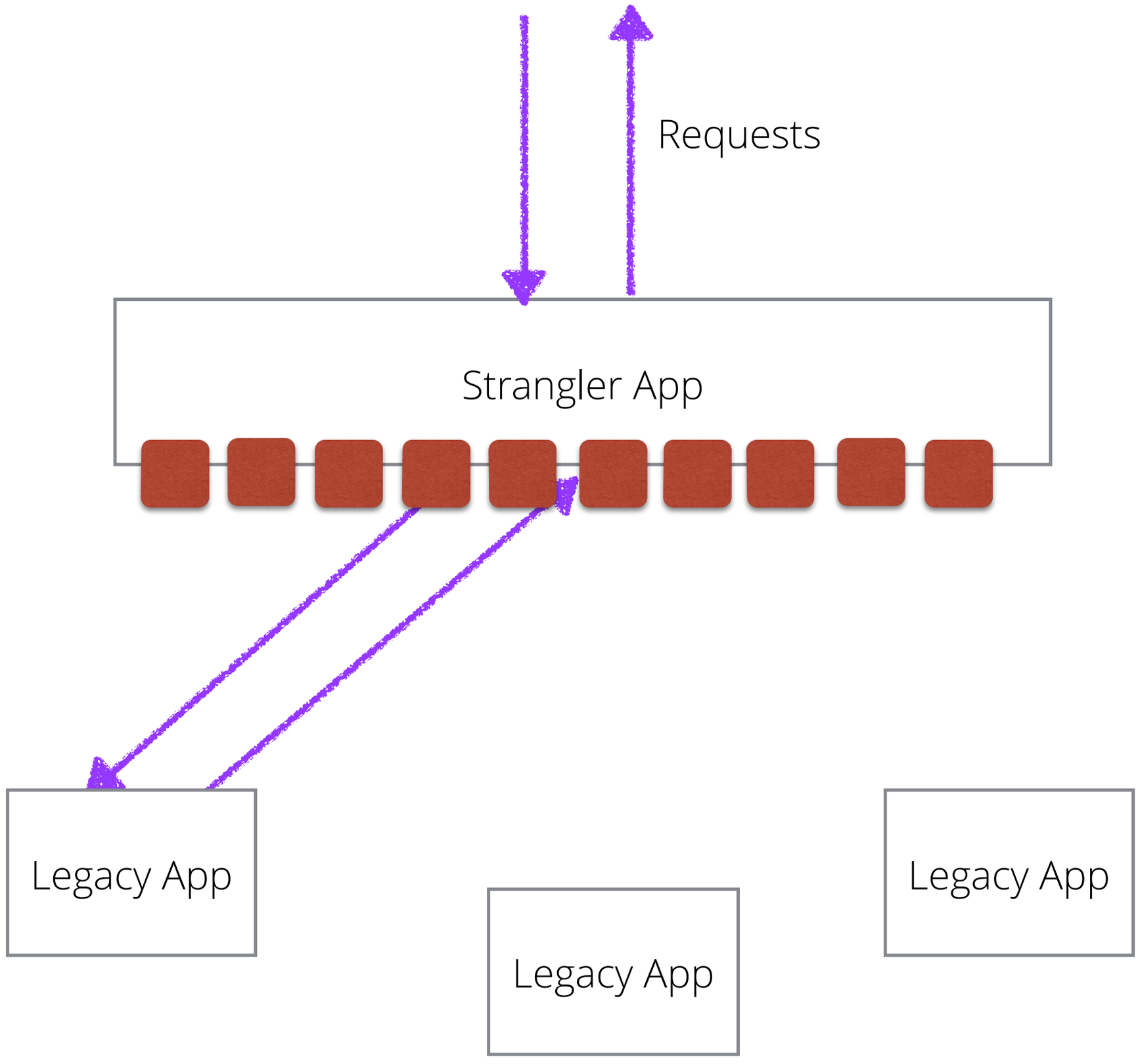
Legacy App

Legacy App

Legacy App


Requests
Strangler App
Legacy App
Legacy App
Legacy App


Requests
Strangler App
Legacy App
Legacy App
Legacy App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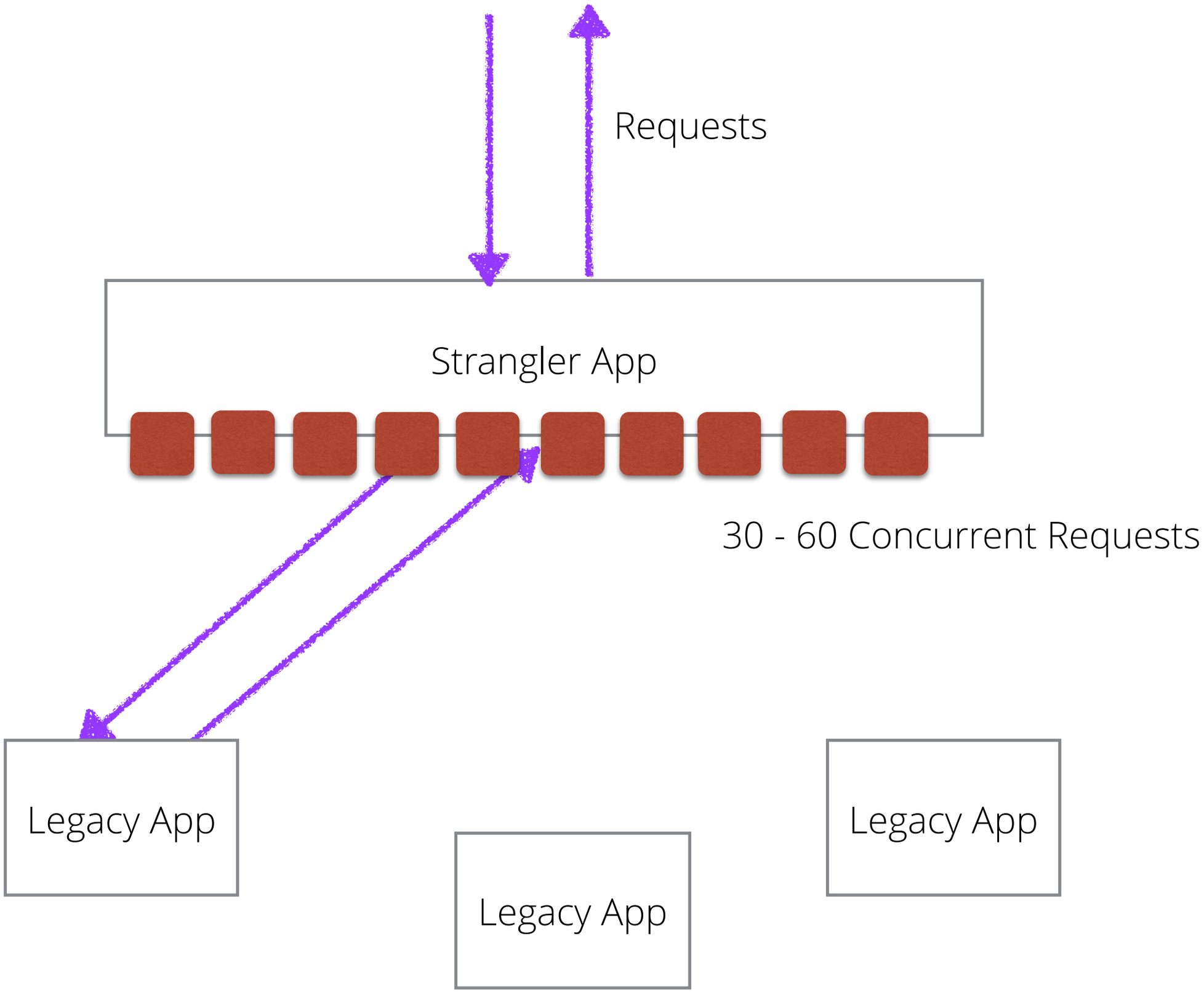
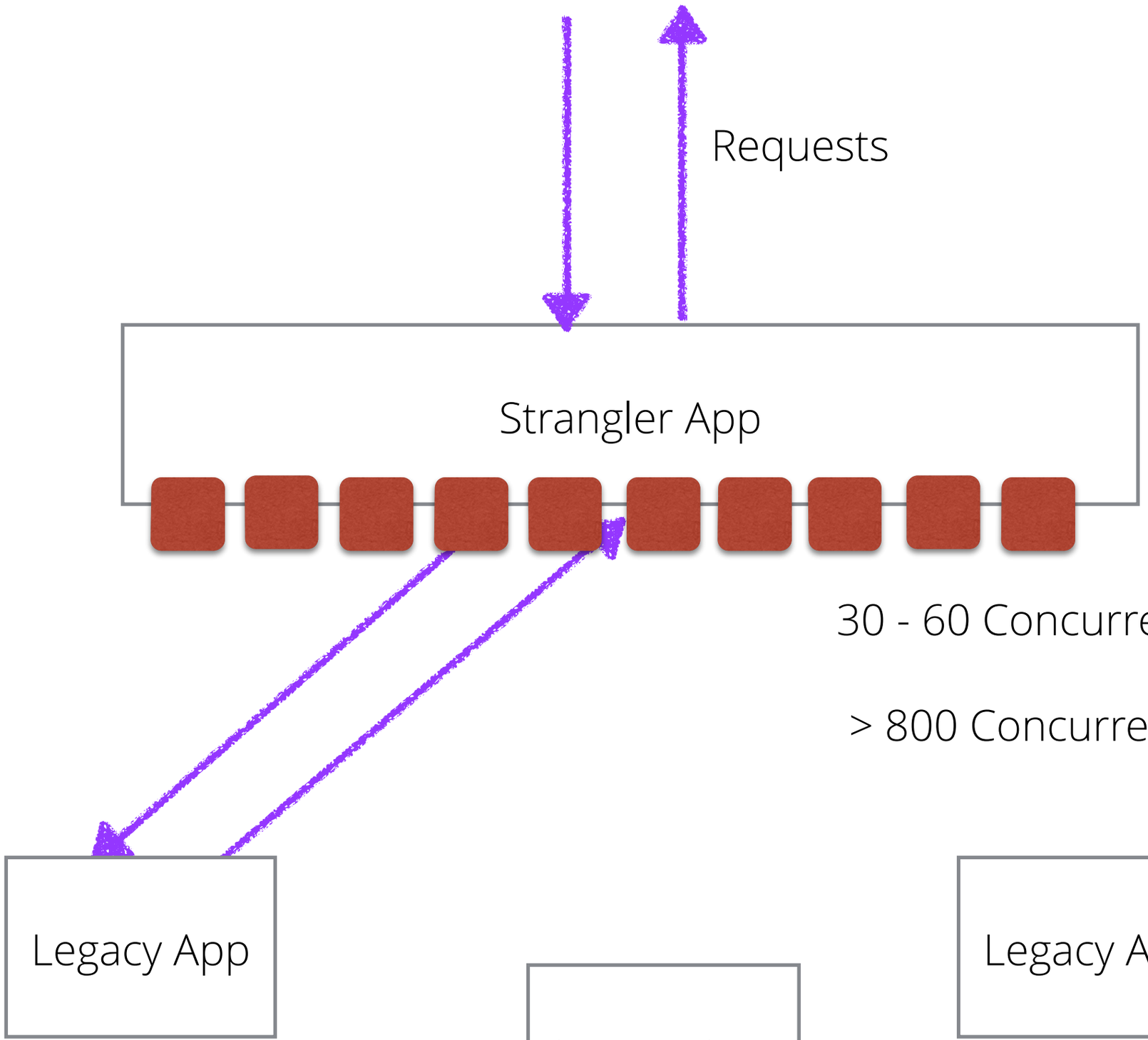
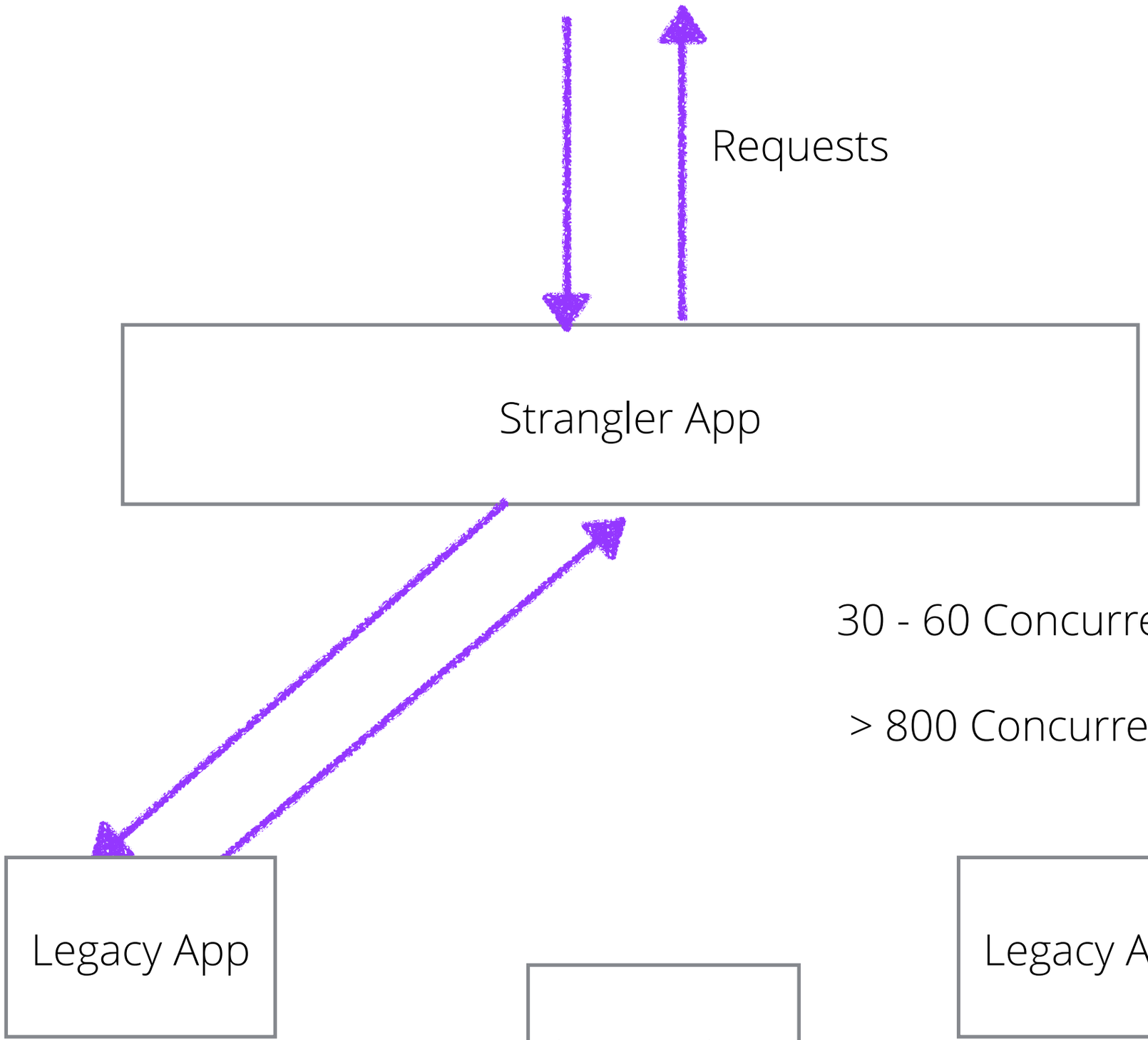
Strangler App
Legacy App
Legacy App
Legacy App


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



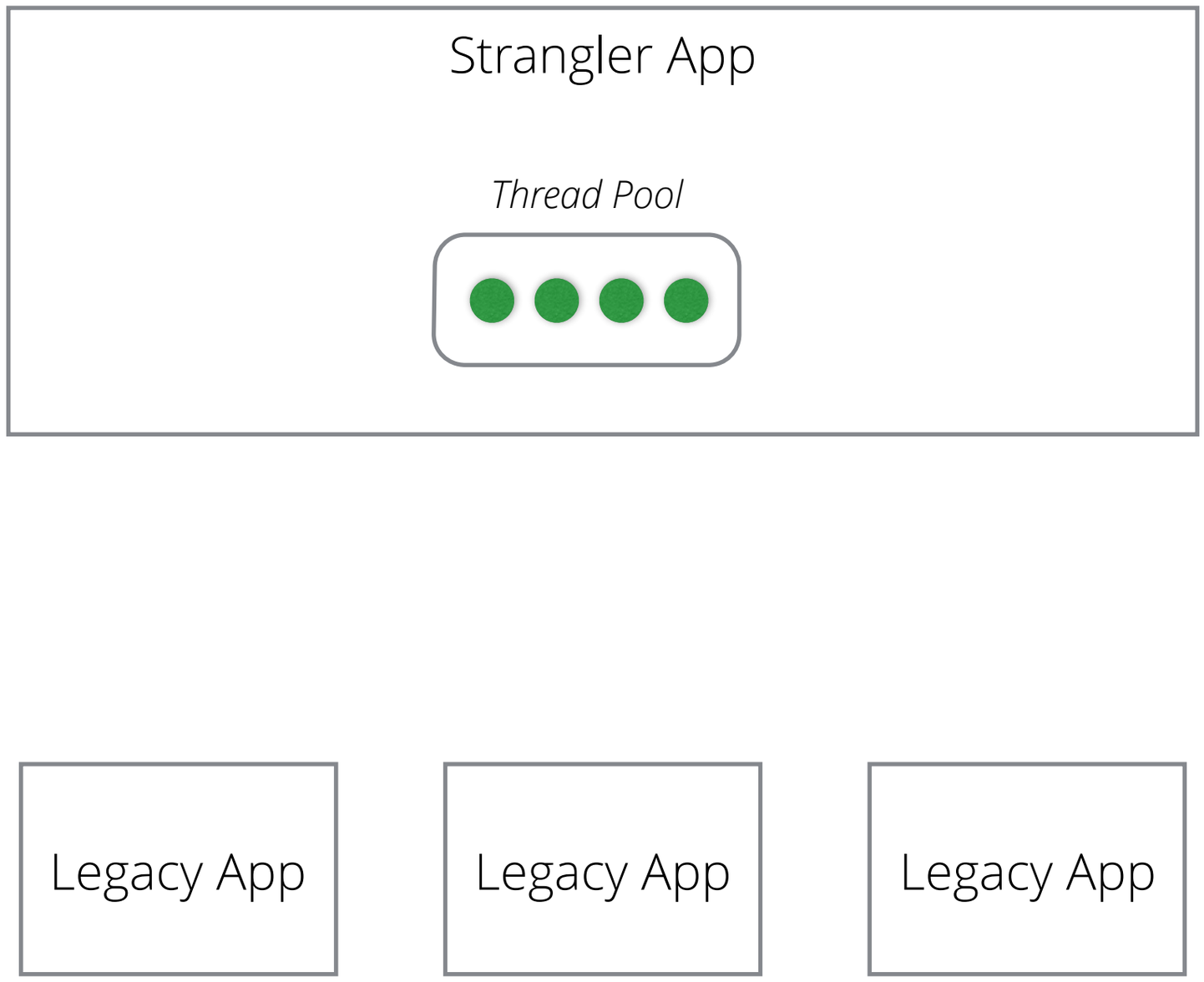
30 - 60 Concurrent Requests

> 800 Concurrent Requests



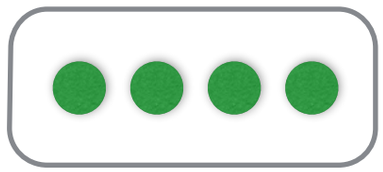
30 - 60 Concurrent Requests

> 800 Concurrent Requests


Strangler App
Thread Pool
Legacy App
Legacy App
Legacy App

Strangler App

Thread Pool

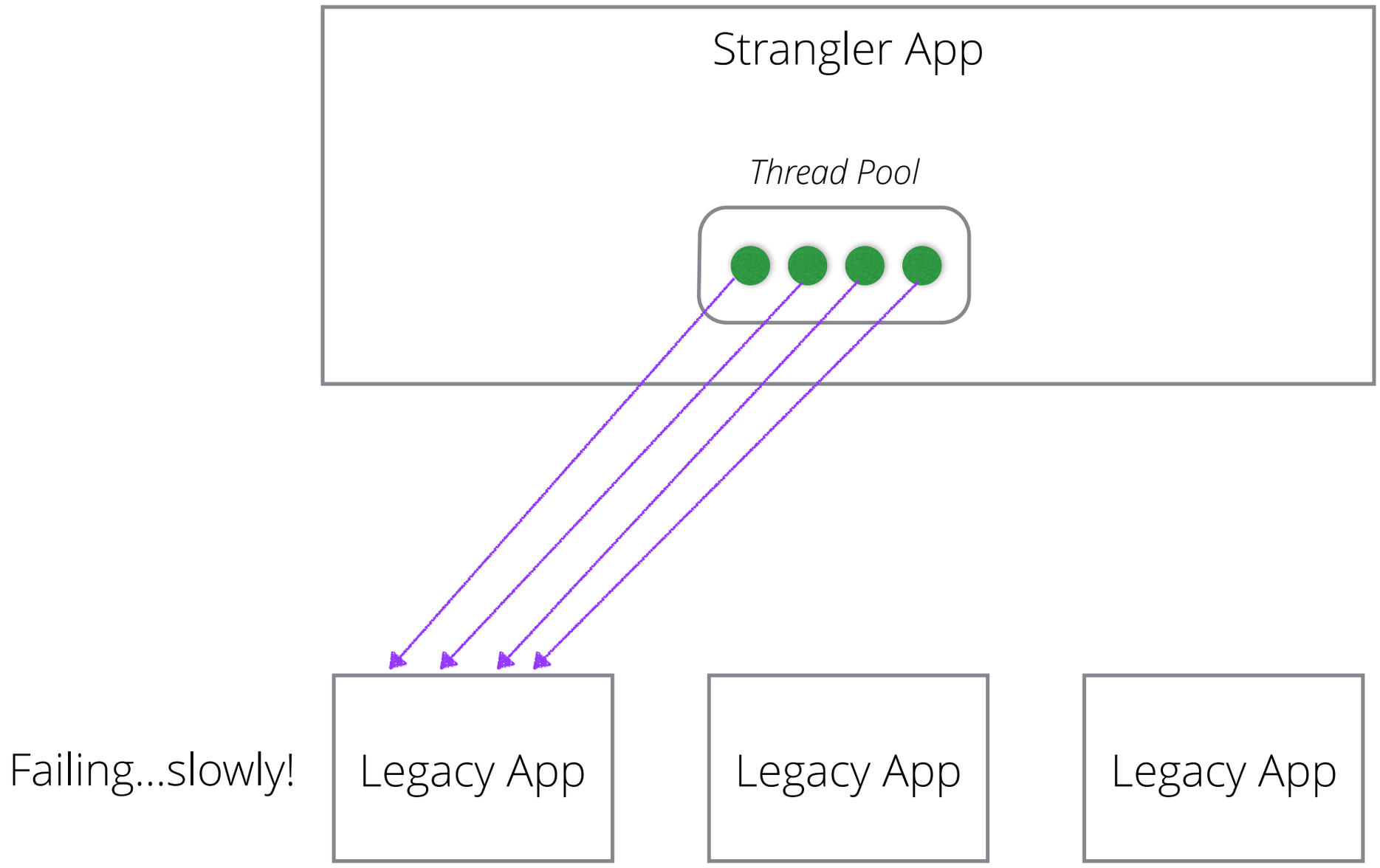


Failing...slowly!

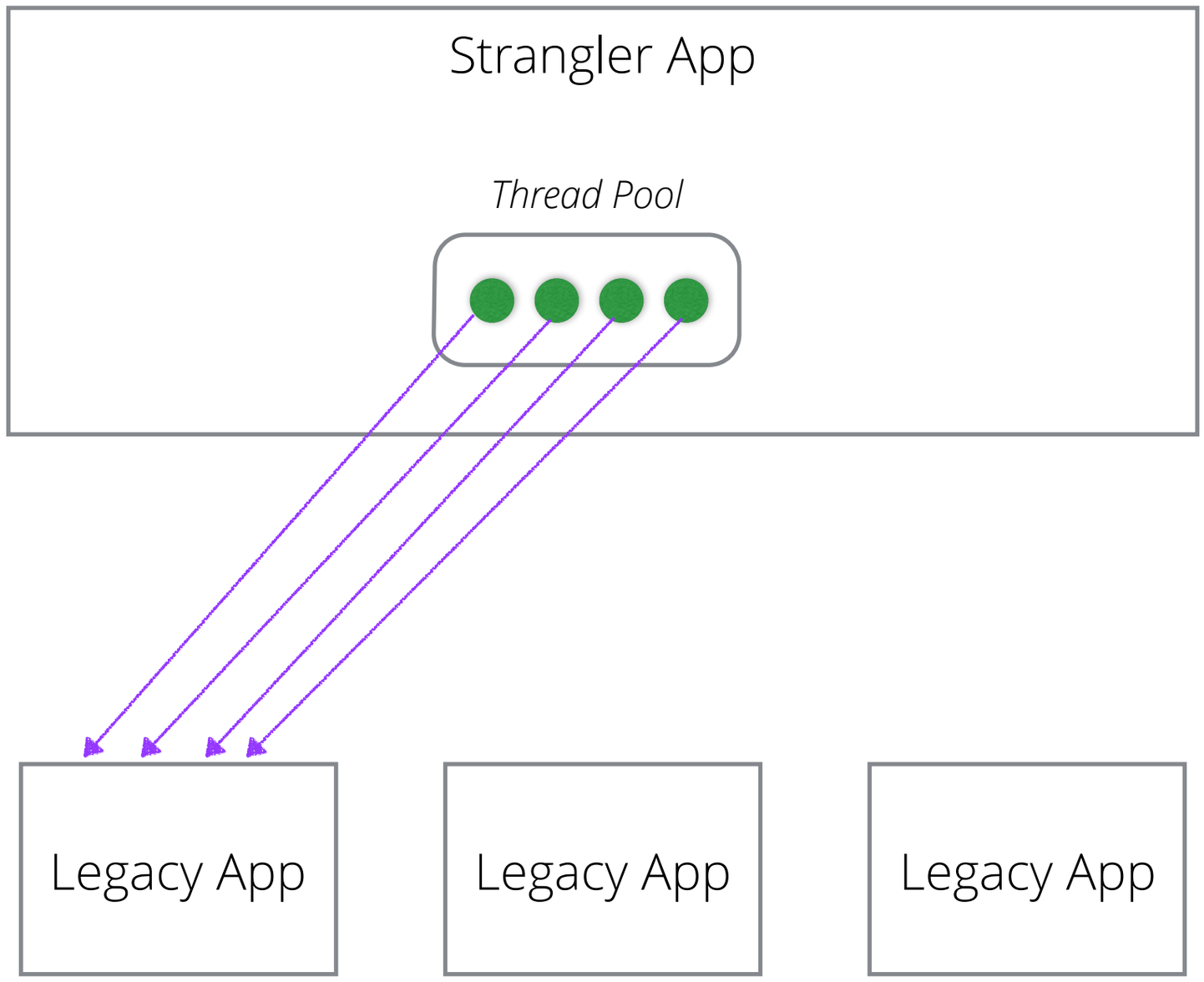
Legacy App

Legacy App

Legacy App

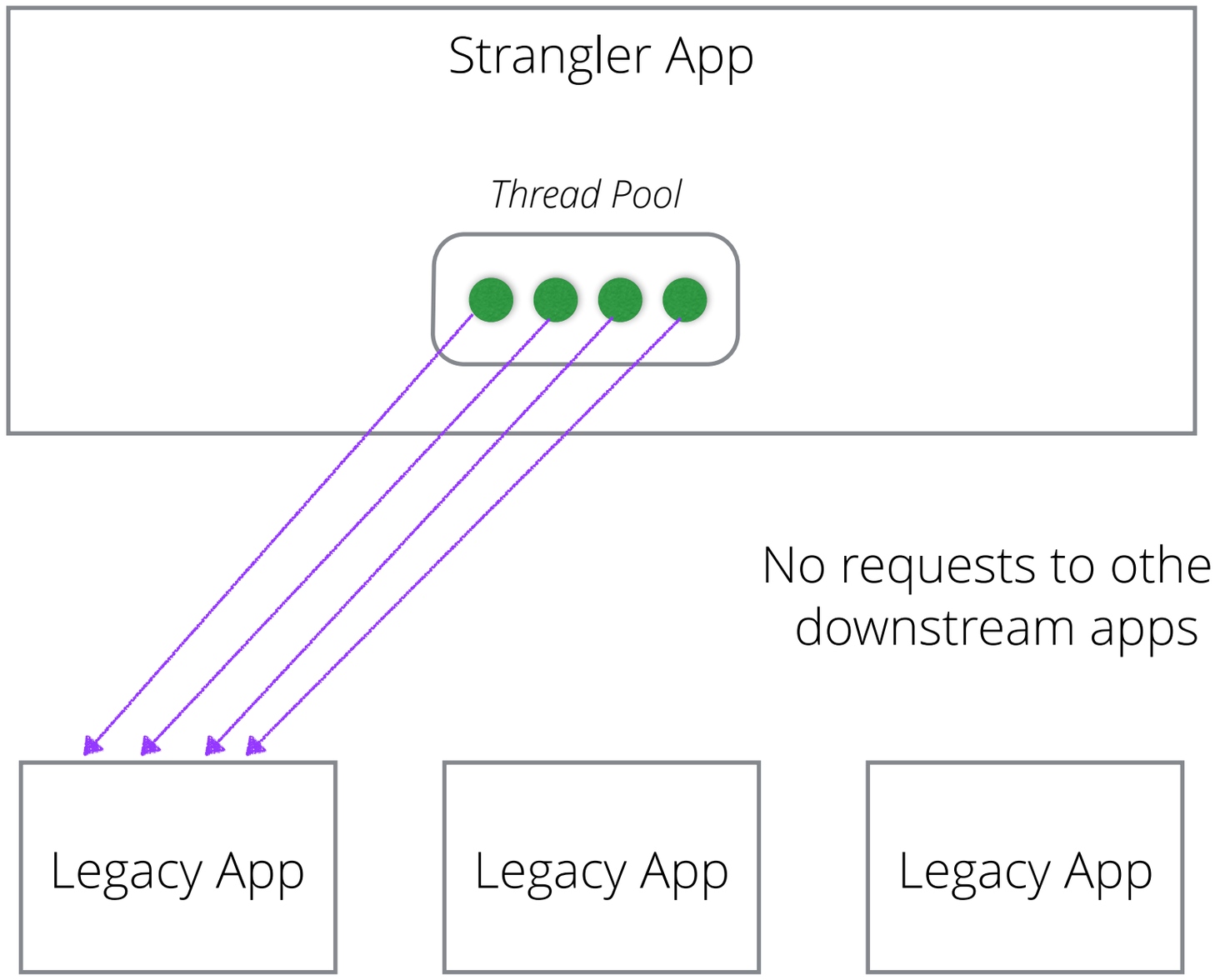

Strangler App
Thread Pool
Failing...slowly!
Legacy App
Legacy App
Legacy App

Thread-pool exhausted



Failing...slowly!

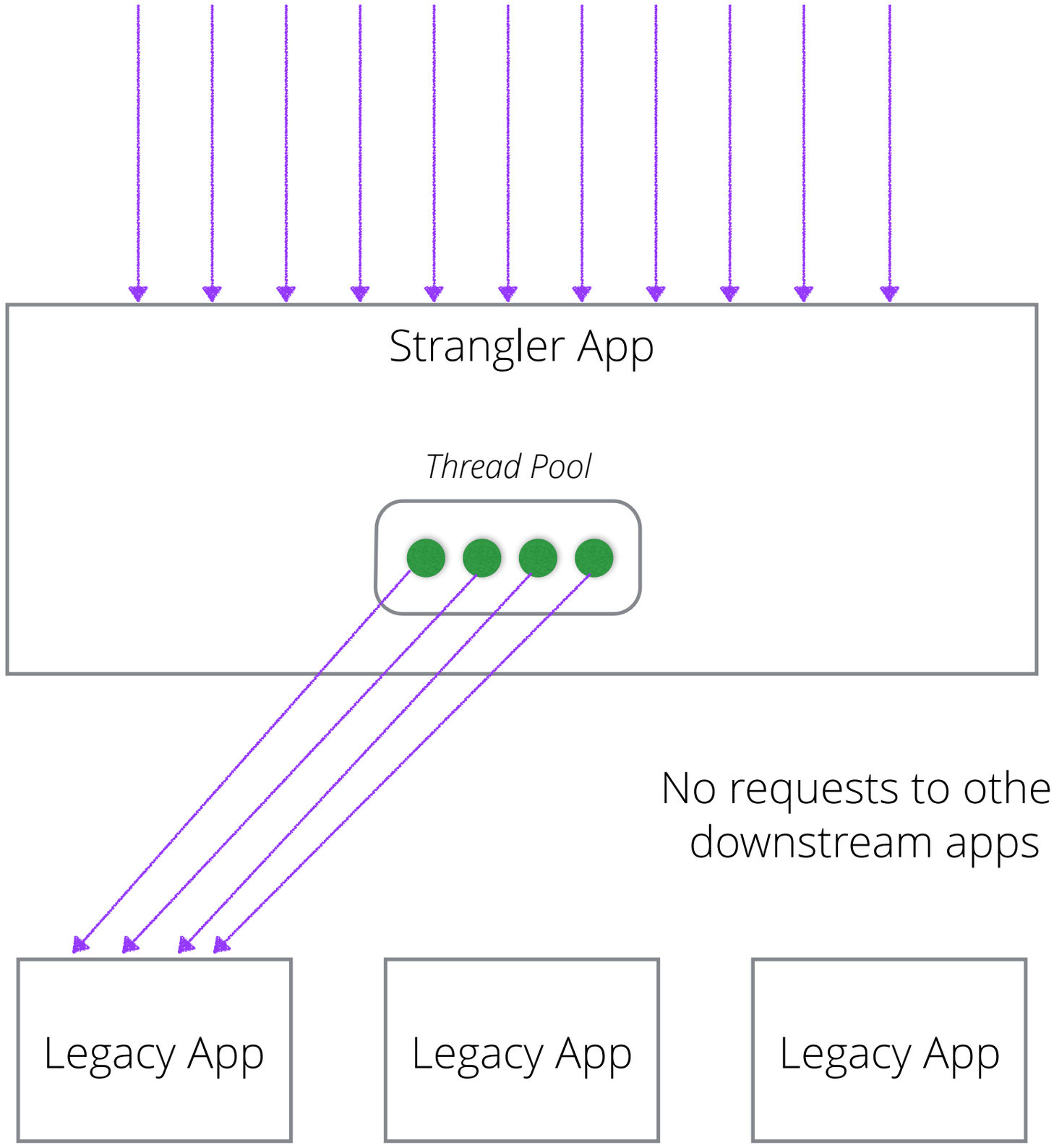
Thread-pool exhausted



No requests to other downstream apps

Failing...slowly!

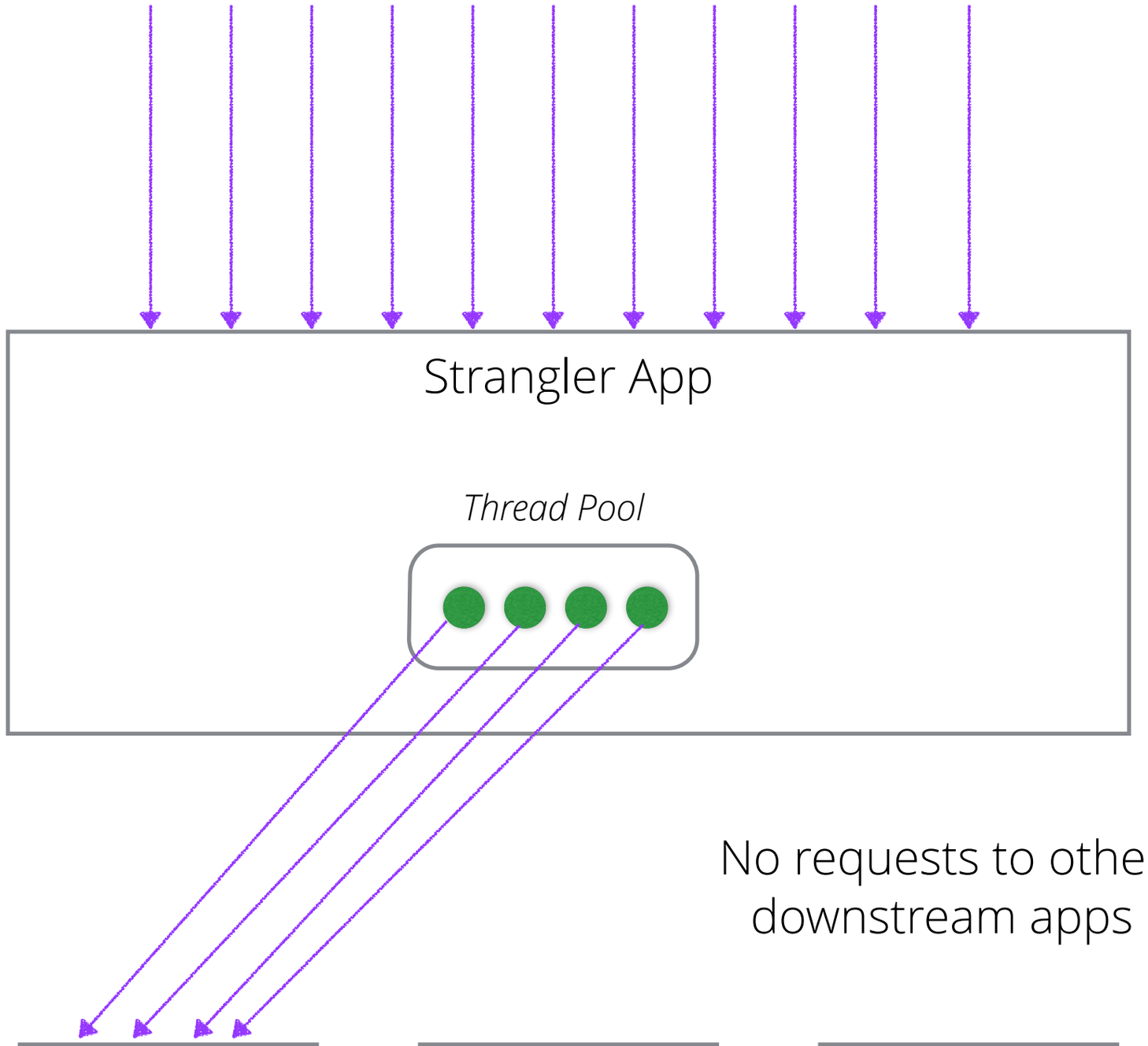
Thread-pool exhausted



No requests to other downstream apps

Failing...slowly!

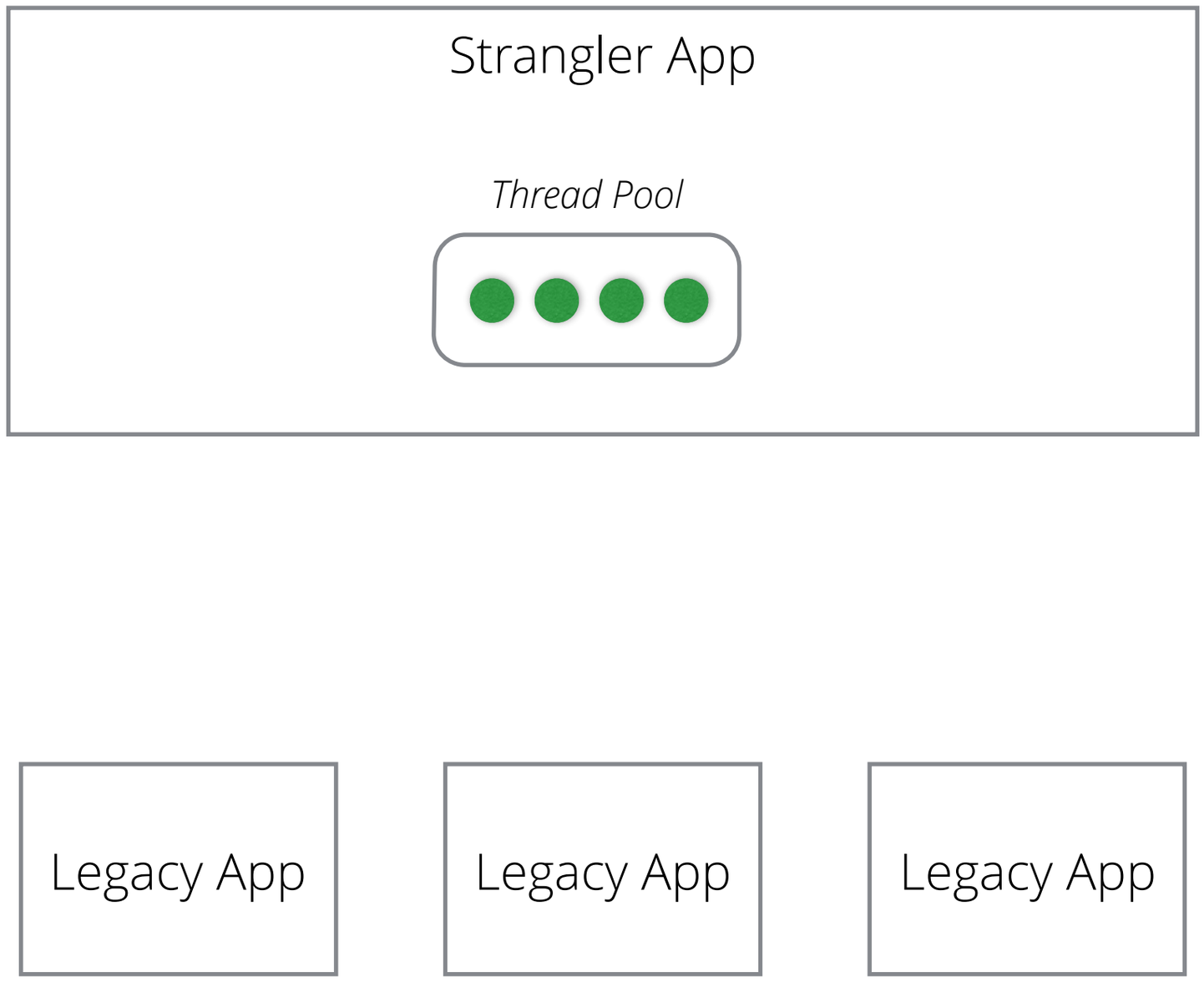
Requests Building Up



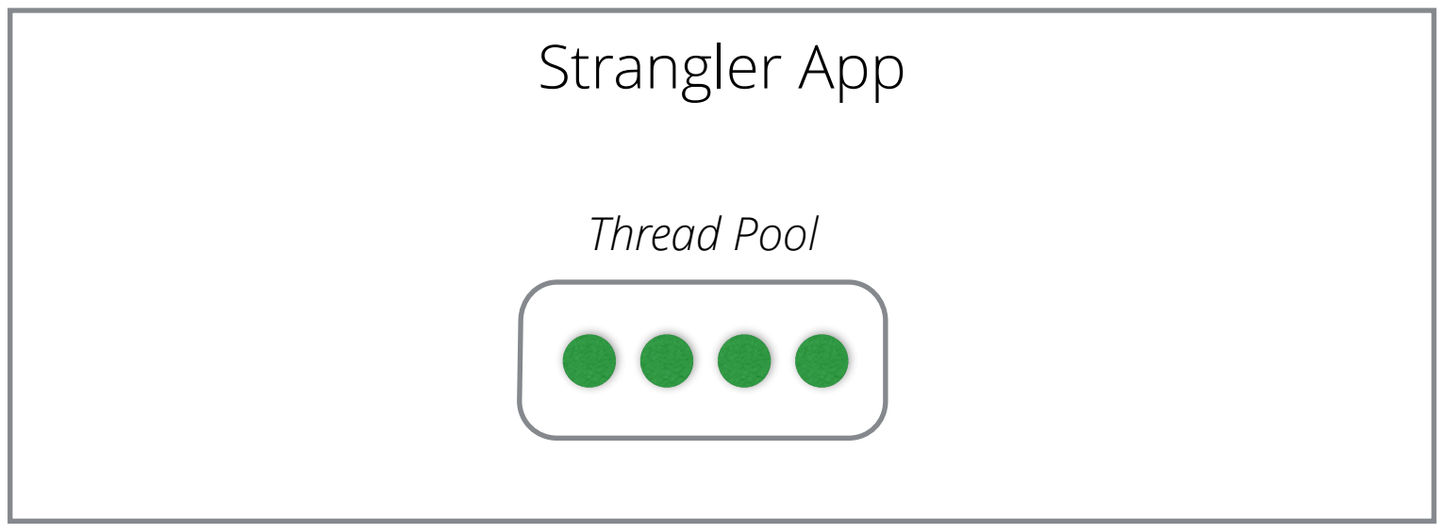
Thread-pool exhausted

No requests to other downstream apps

Failing...slowly!


Strangler App
Thread Pool
Legacy App
Legacy App
Legacy App

Fix **Timeouts**

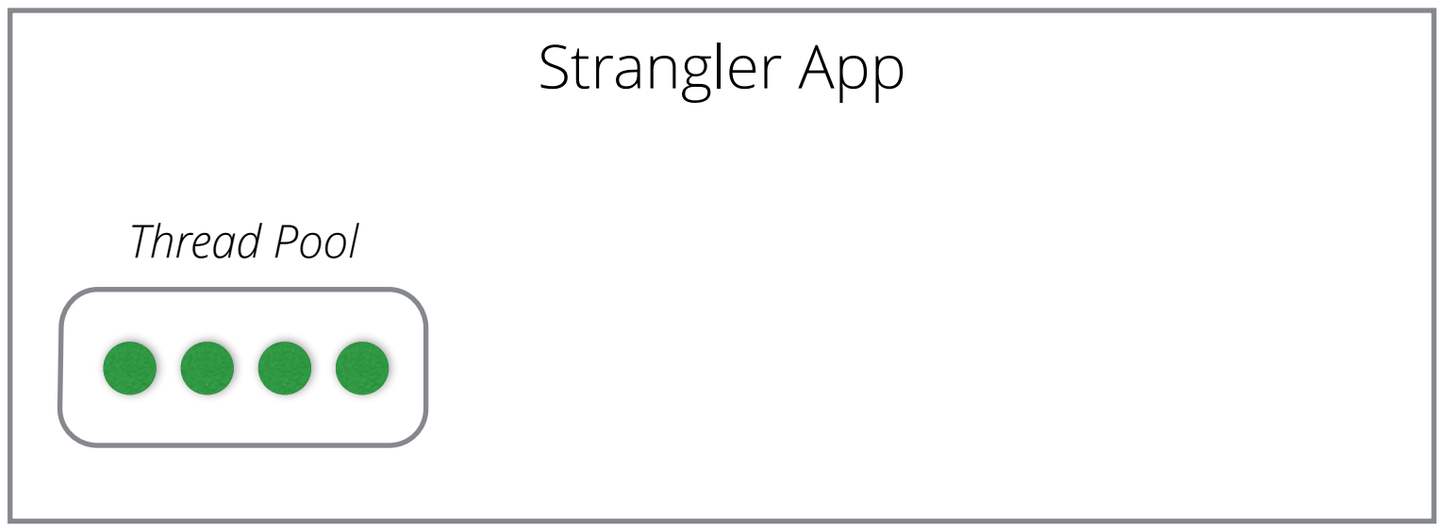


Legacy App

Legacy App

Legacy App

Fix **Timeouts**



Legacy App

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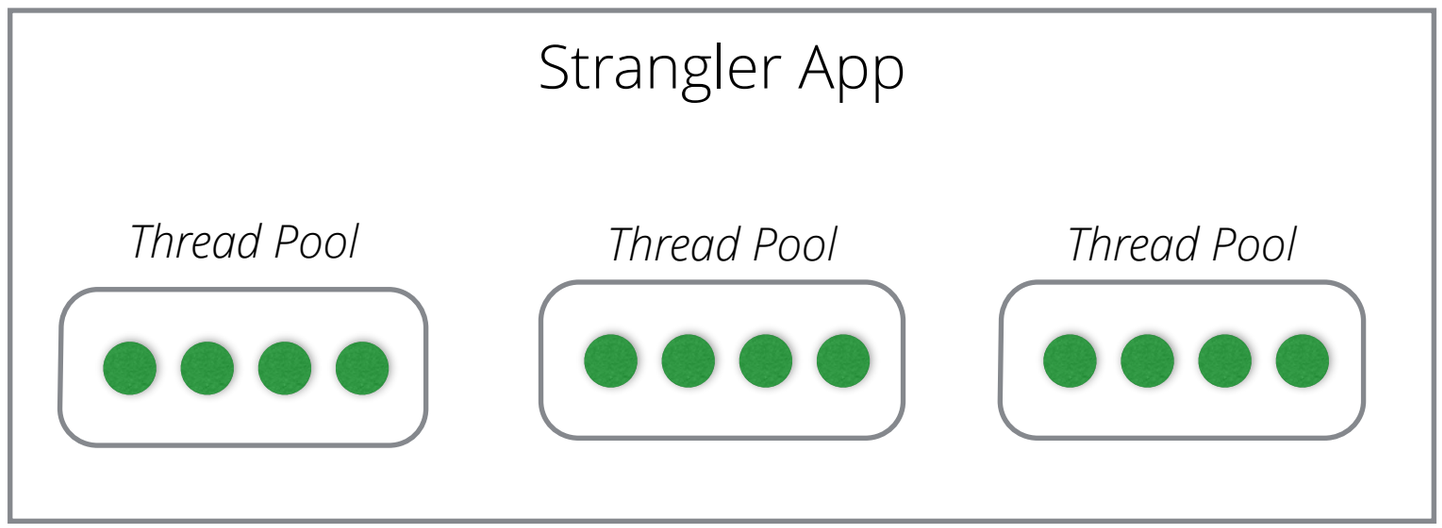
Fix **Timeouts**



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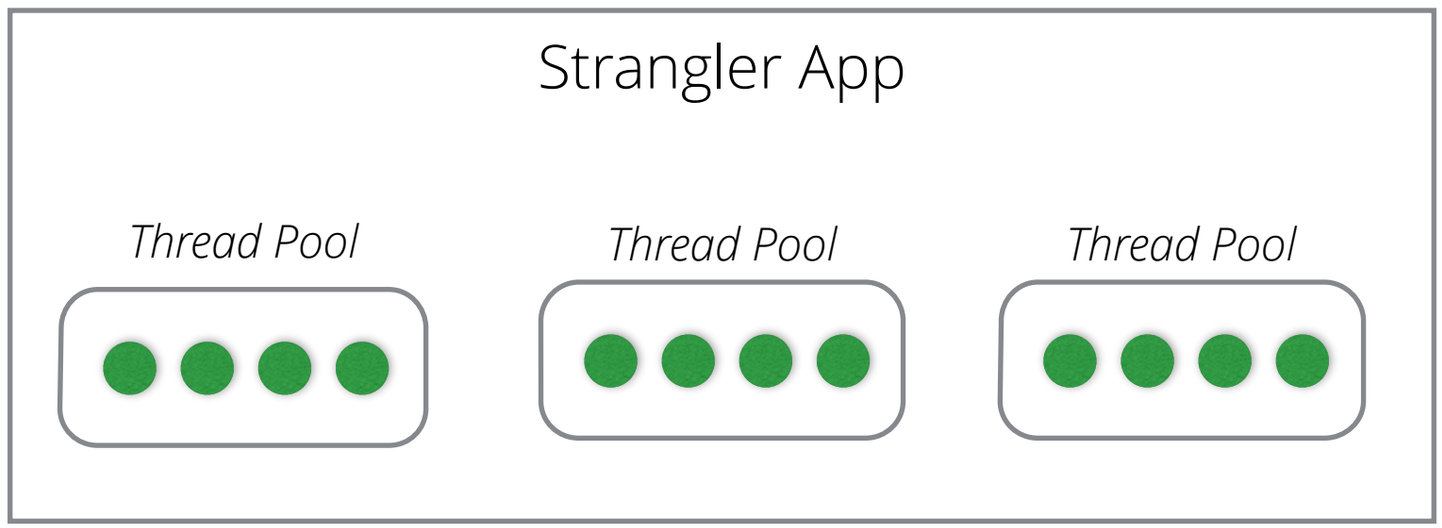


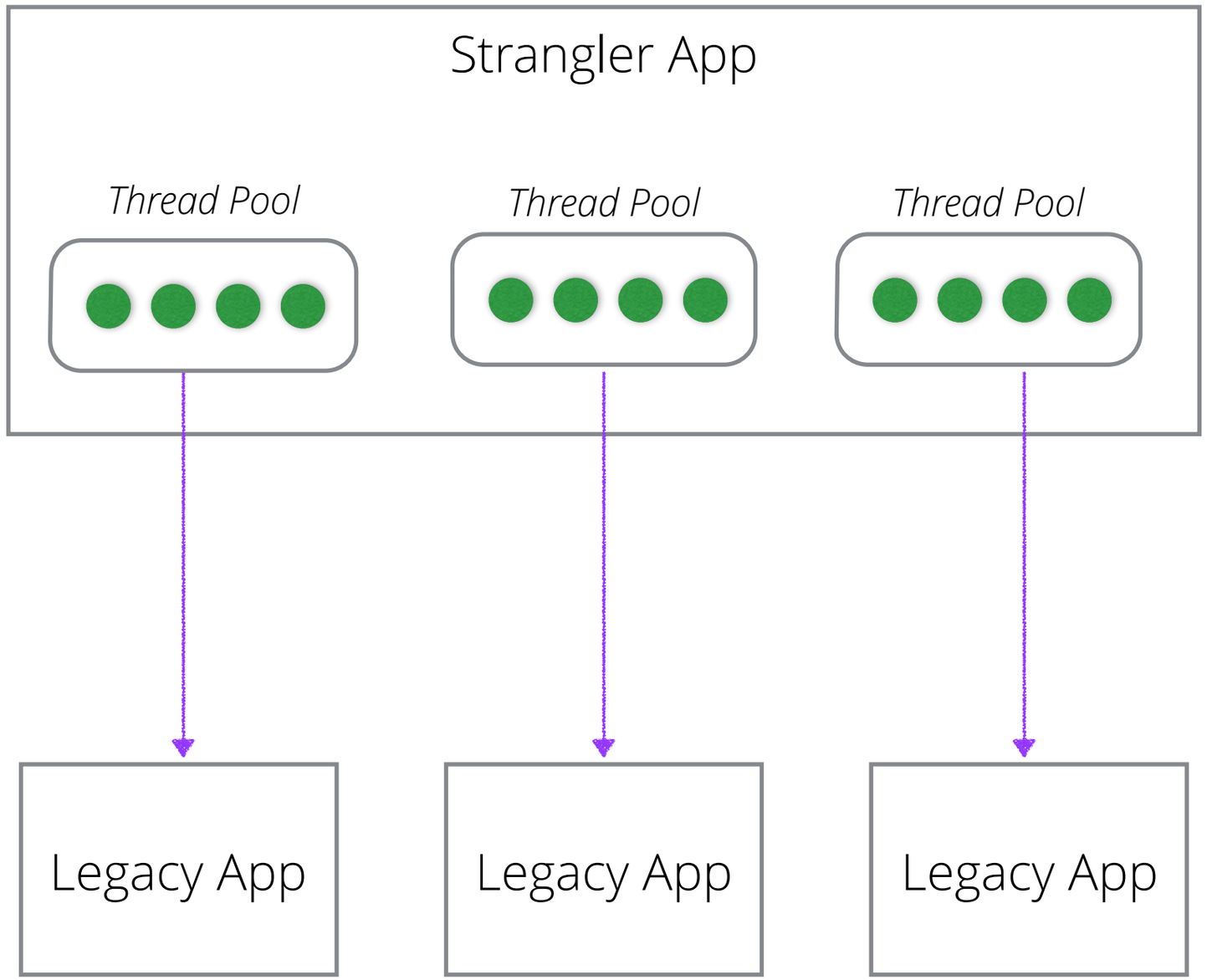
Bulkhead
Downstream
Connections

Legacy App

Legacy App

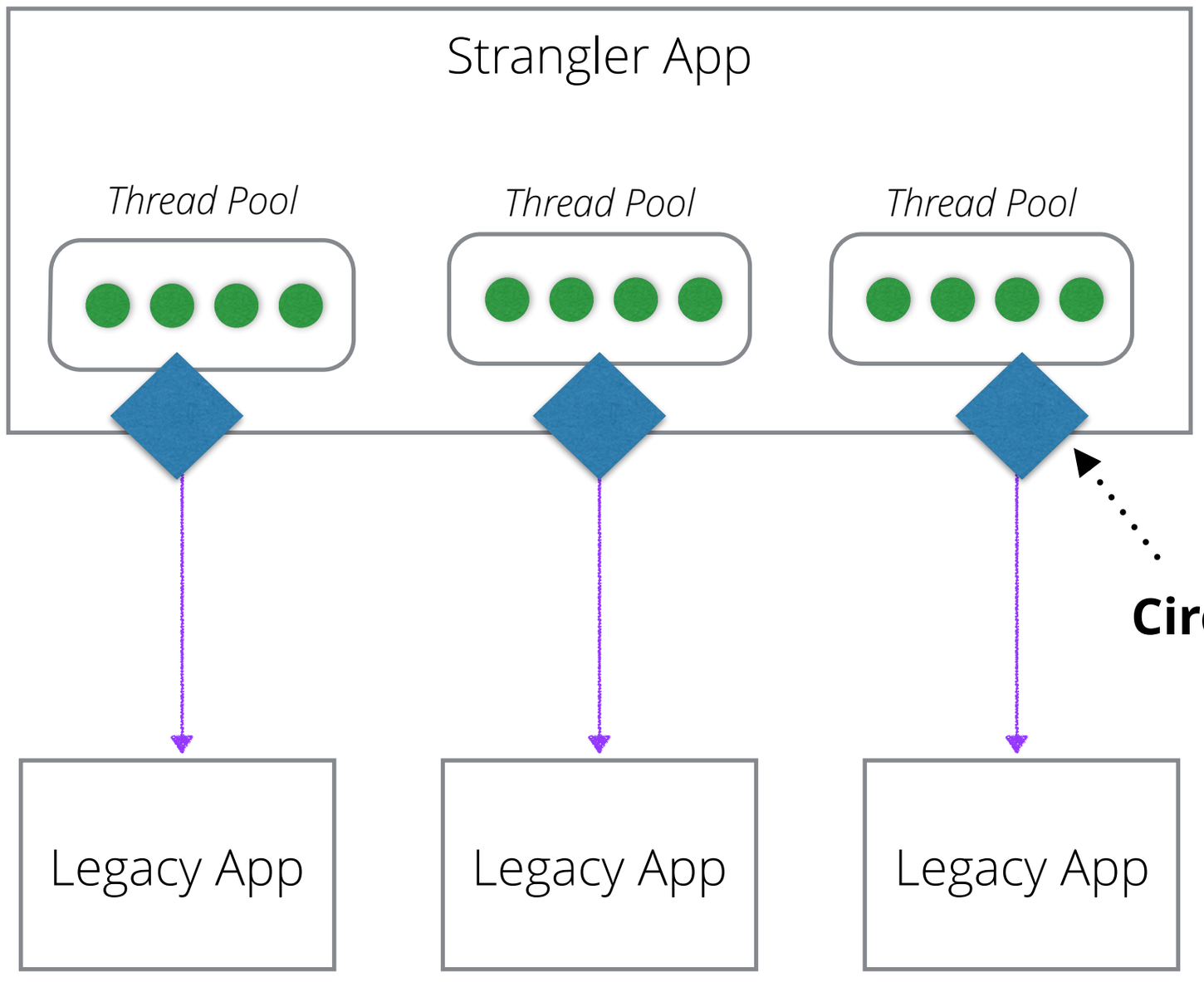
Legacy App

Fix **Timeouts**



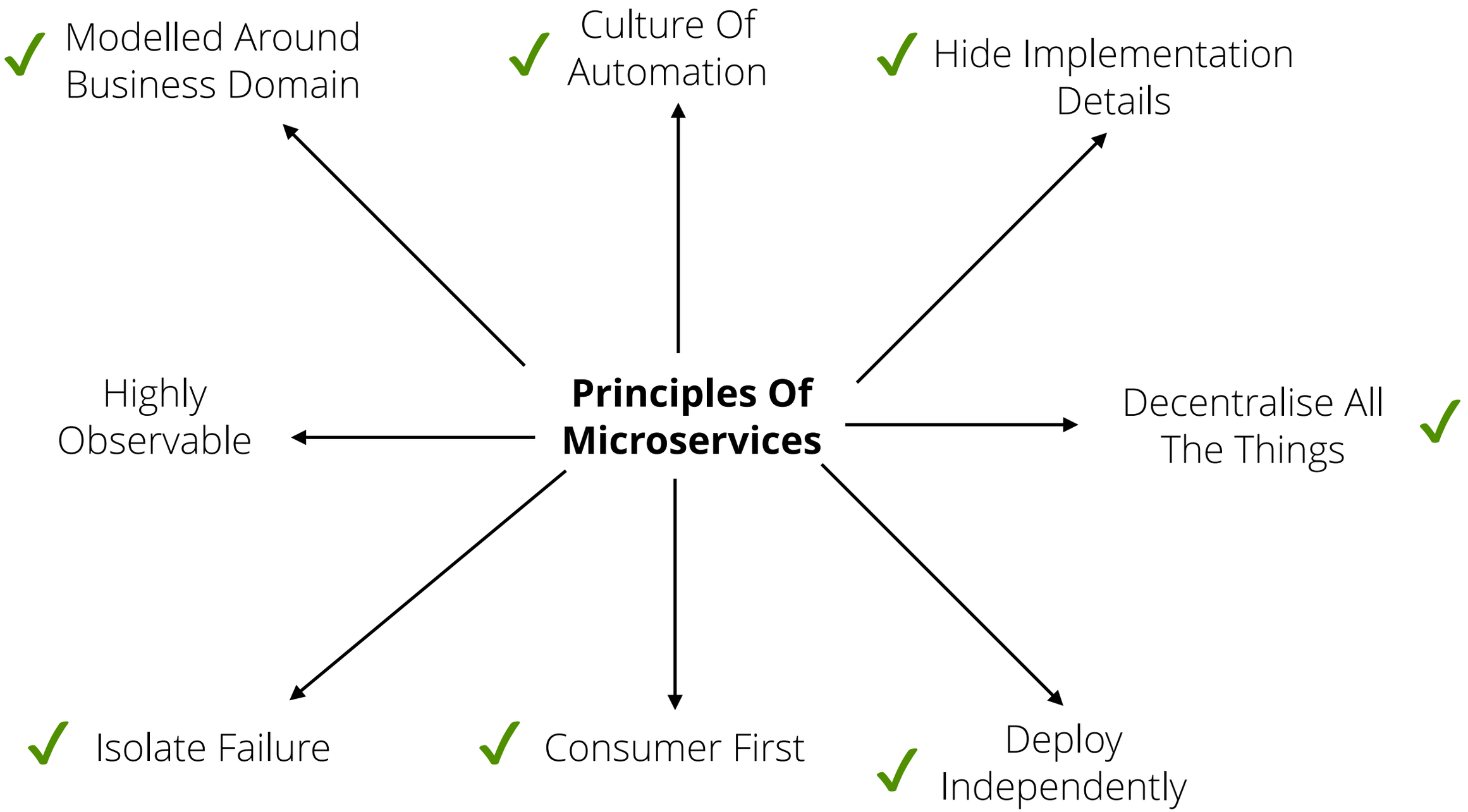
Bulkhead
Downstream
Connections

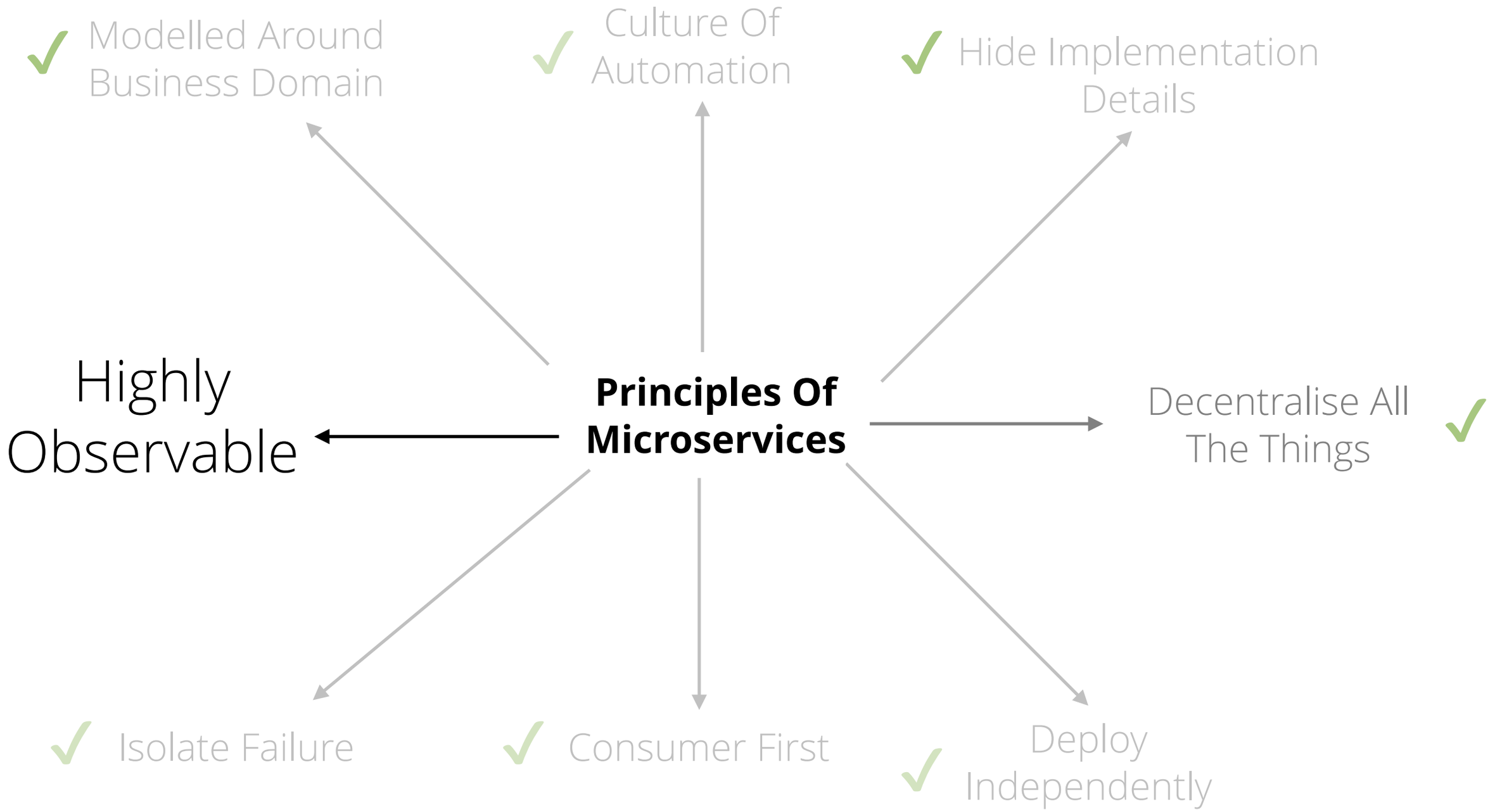
Fix **Timeouts**



Bulkhead
Downstream
Connections

Circuit Breakers


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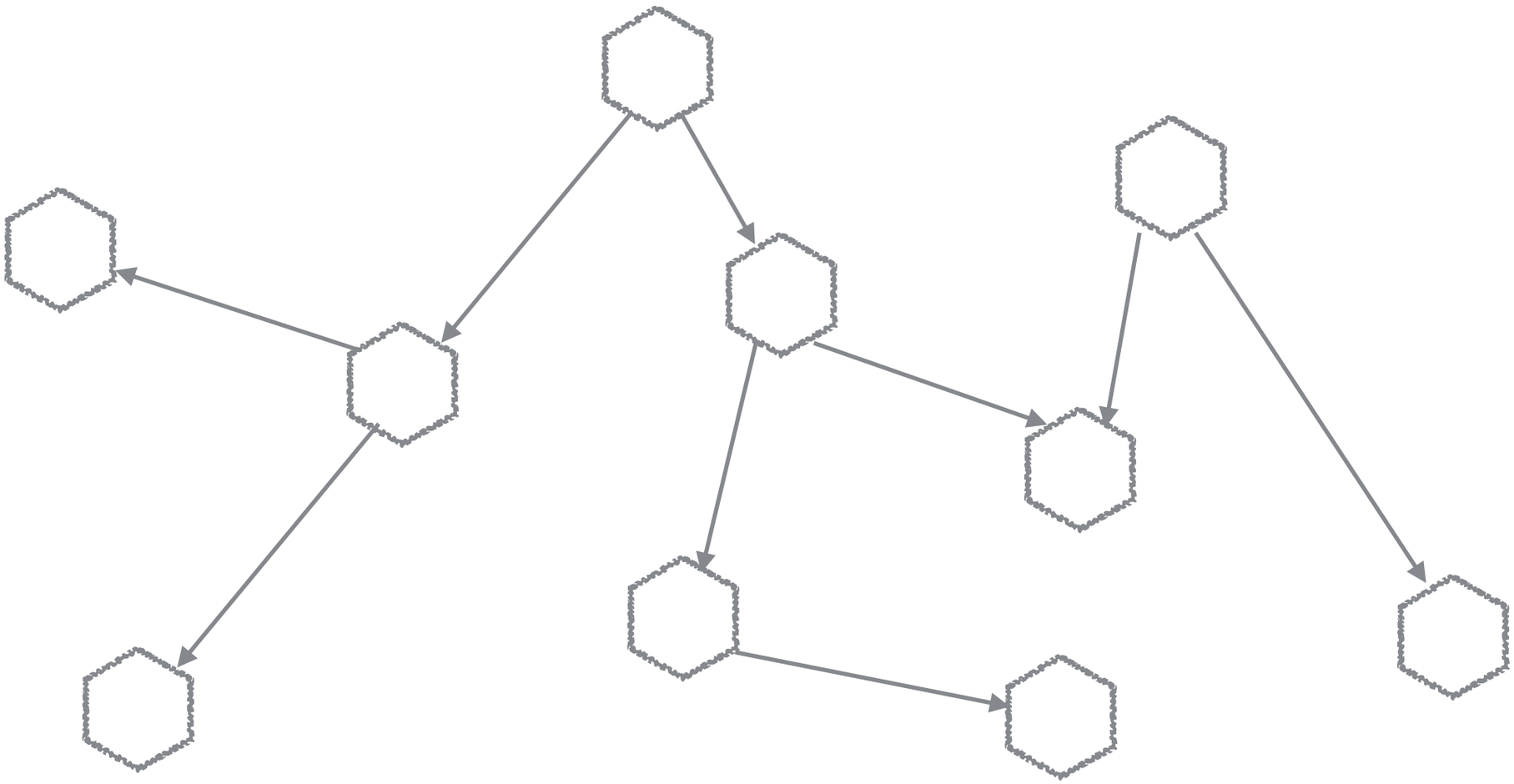
AGGREGATION



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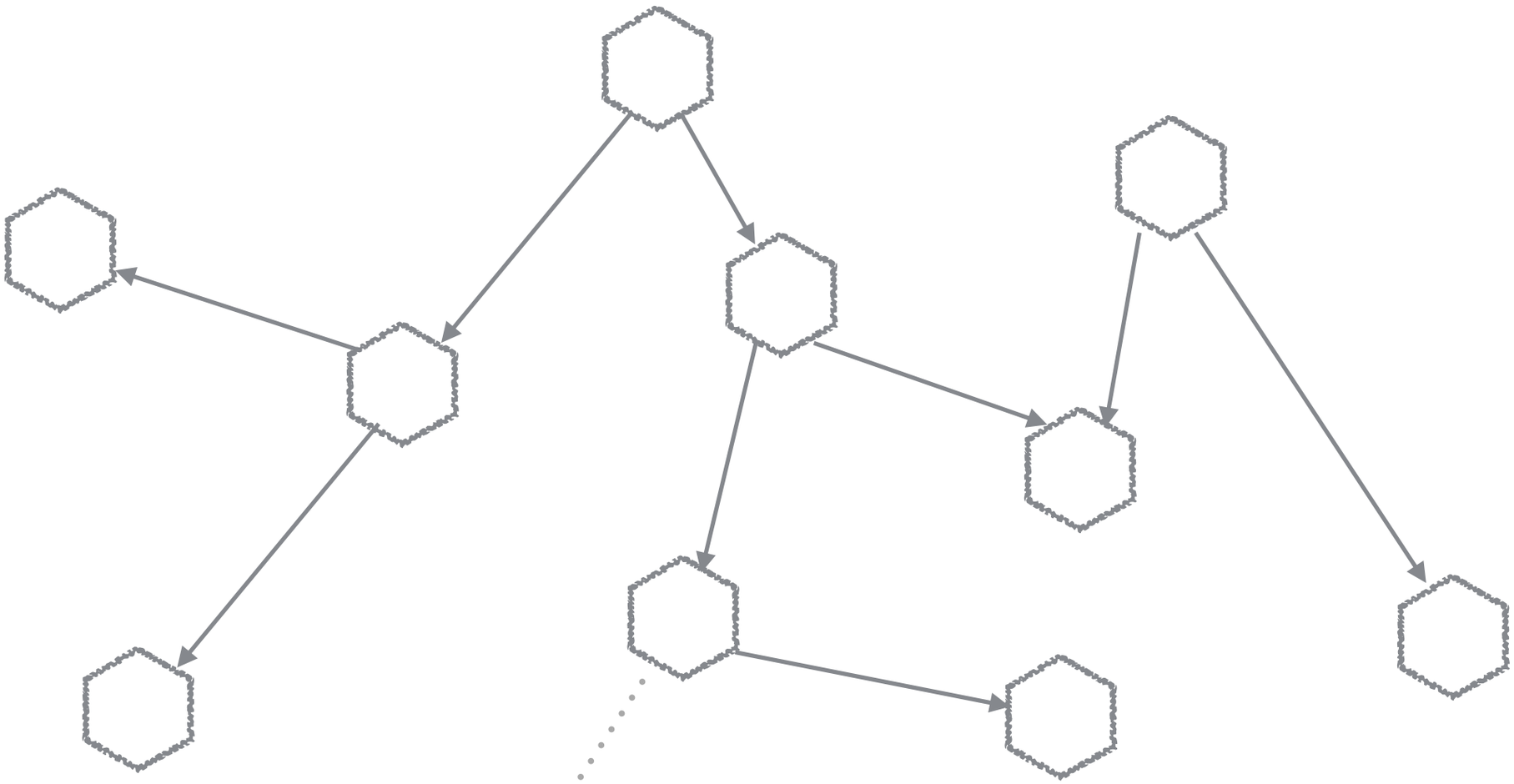
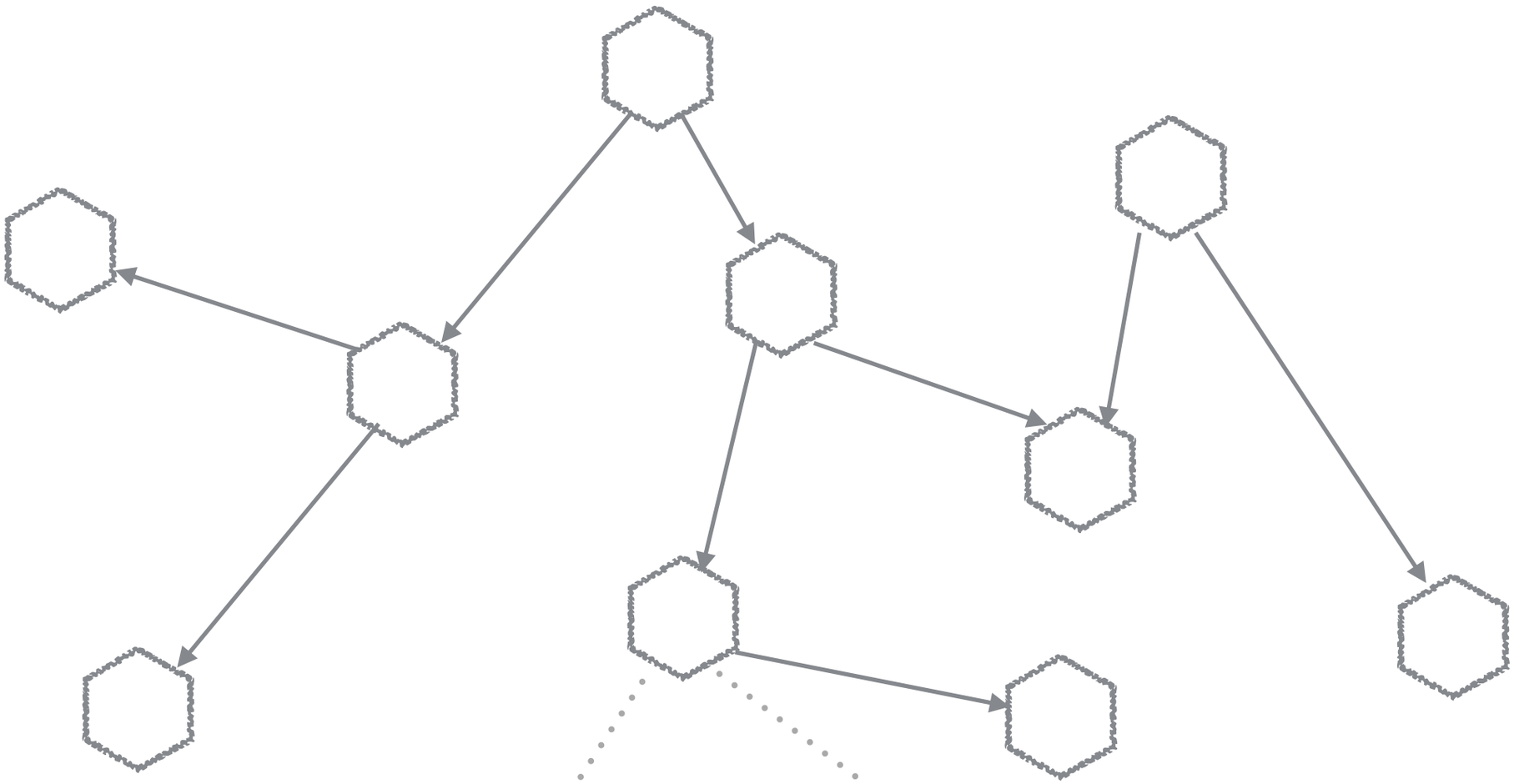


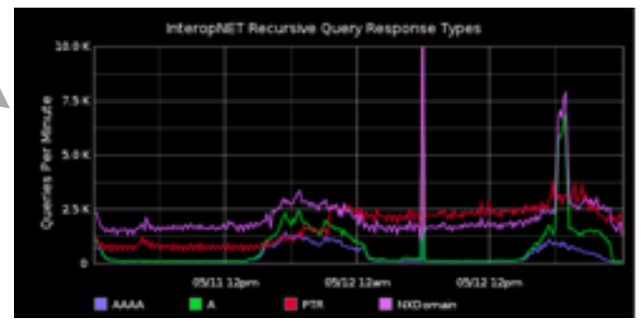
LOGS

AGGREGATION



LOGS

STATS



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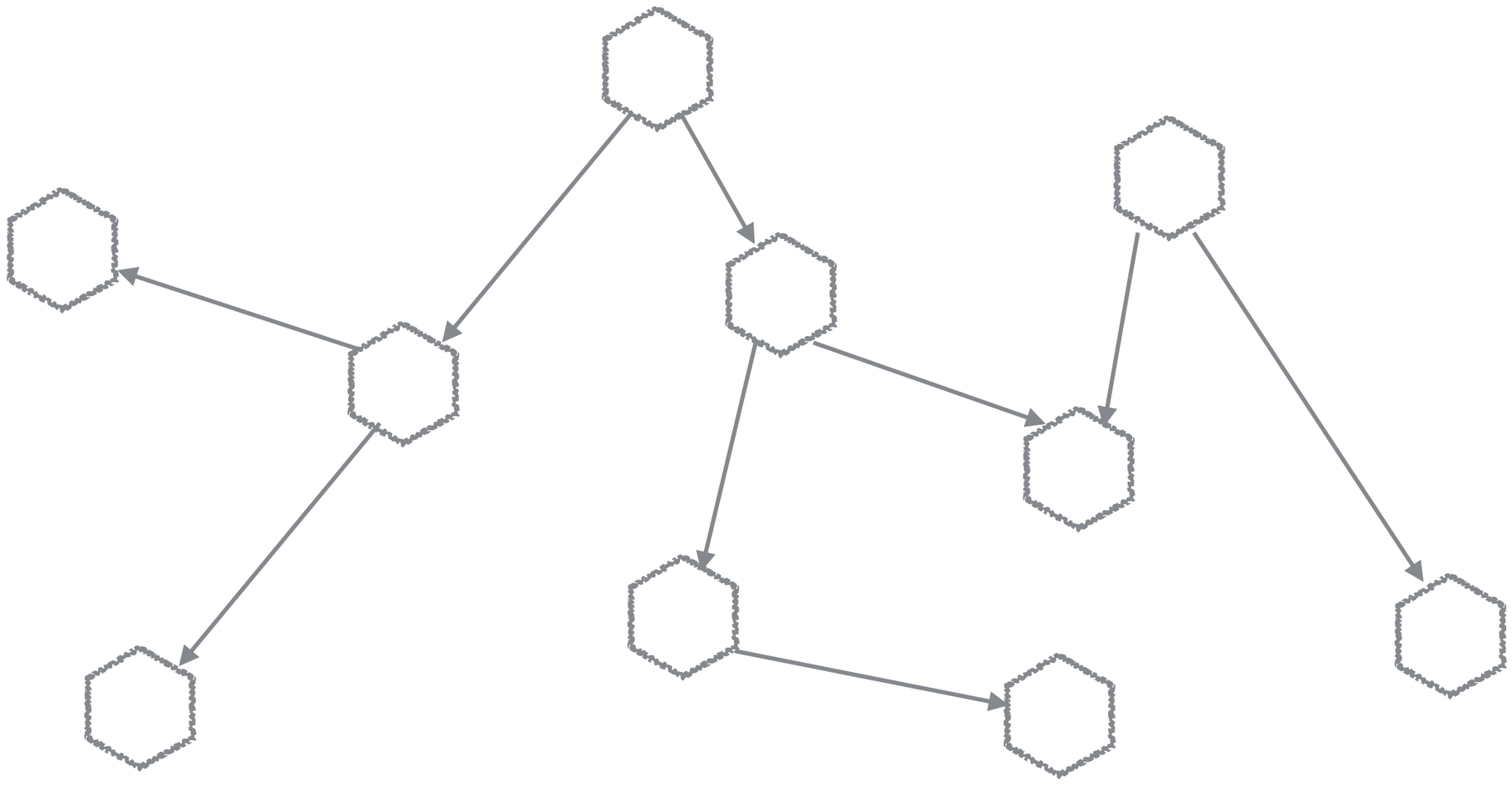

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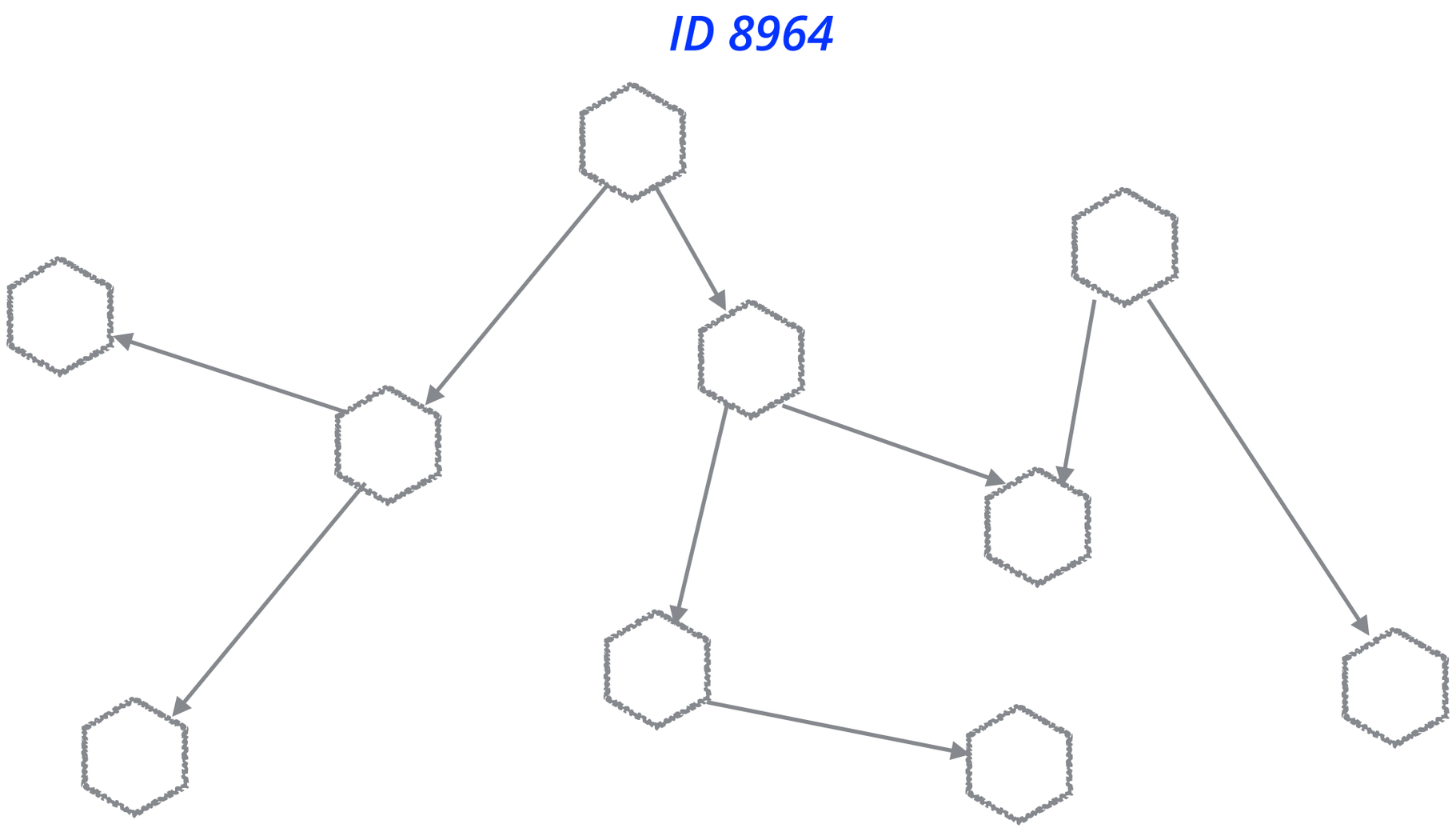

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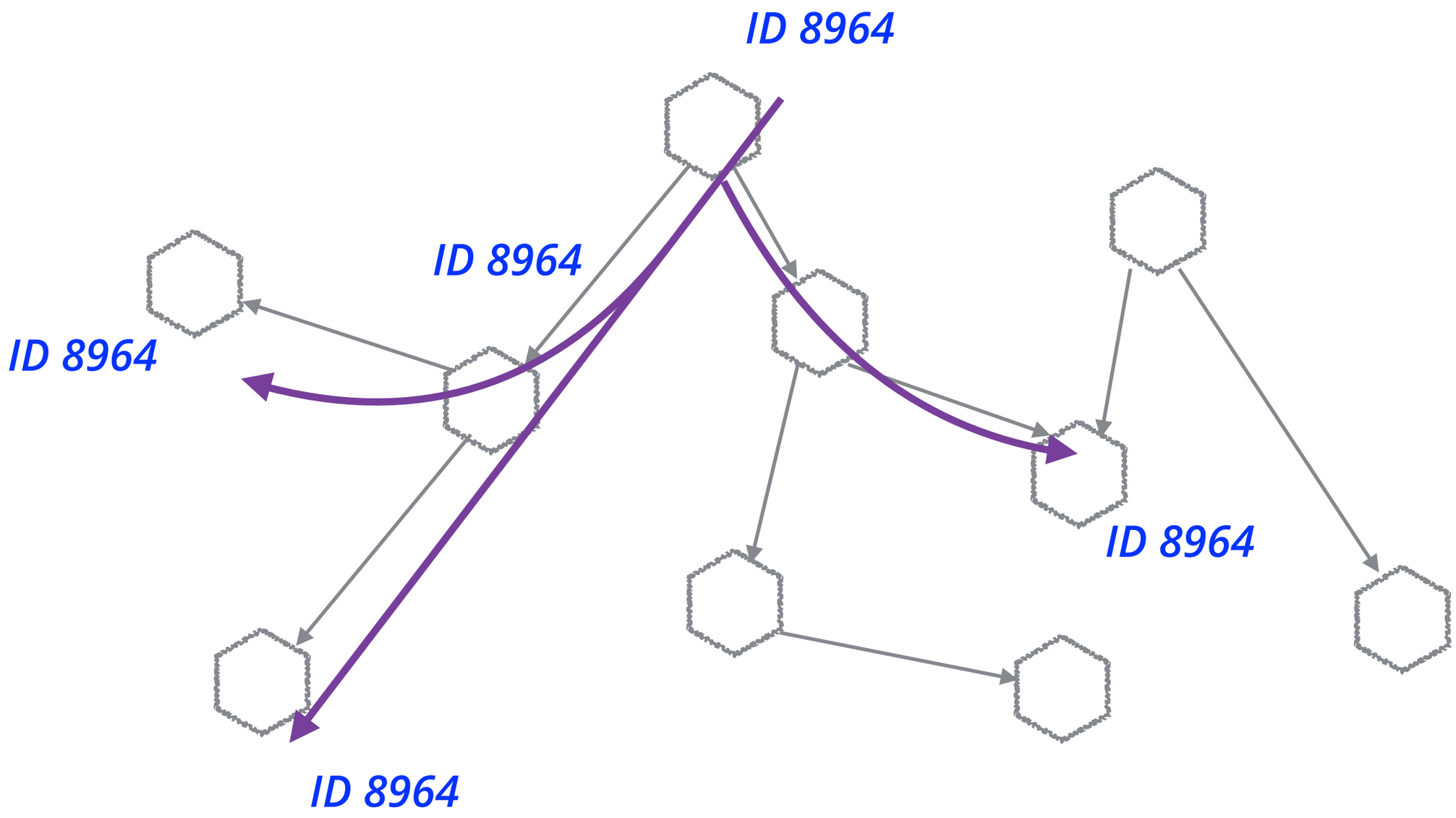
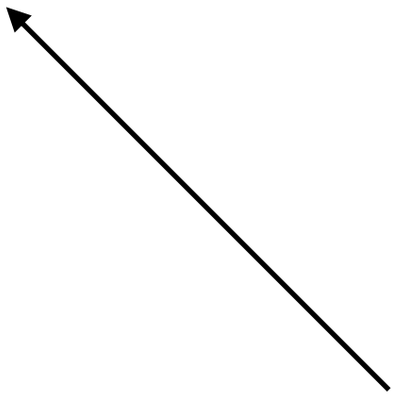


Principles Of Microservices

Modelled Around
Business Domain



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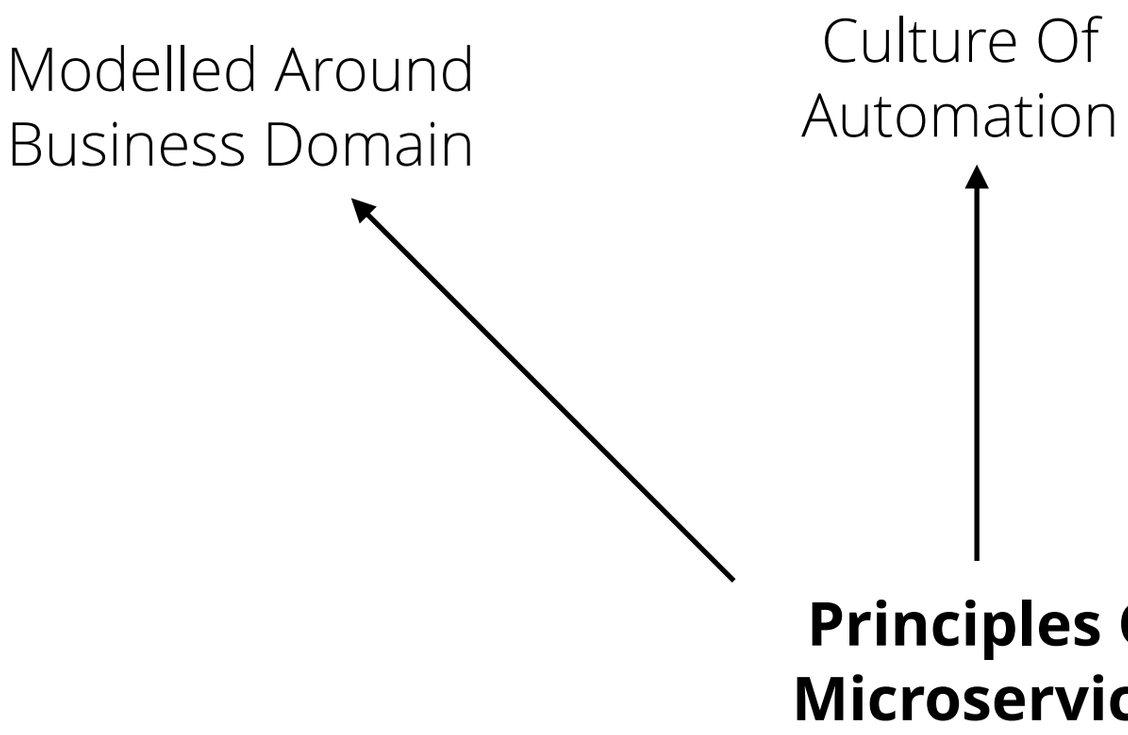
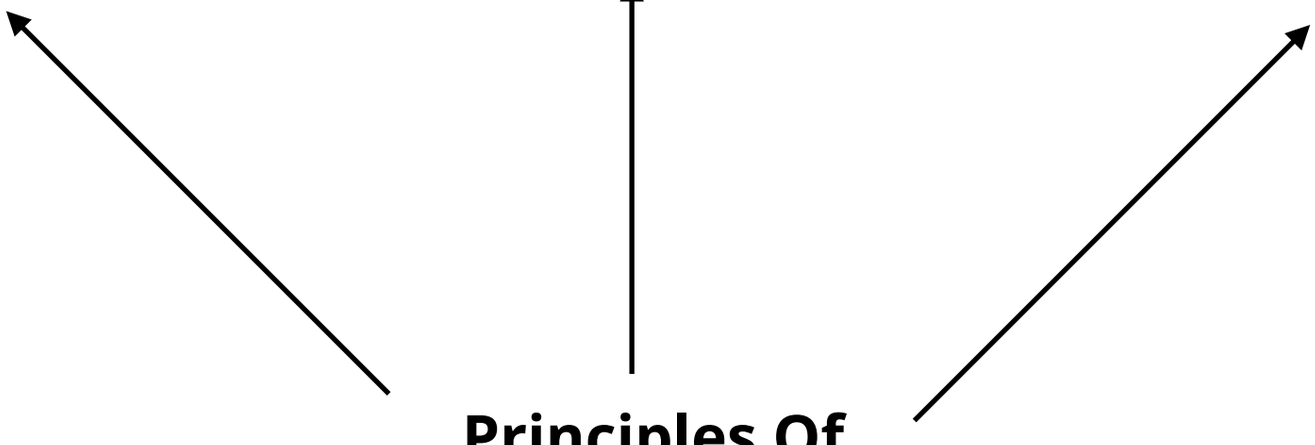

Modelled Around
Business Domain
Culture Of
Automation
Principles Of
Microservices

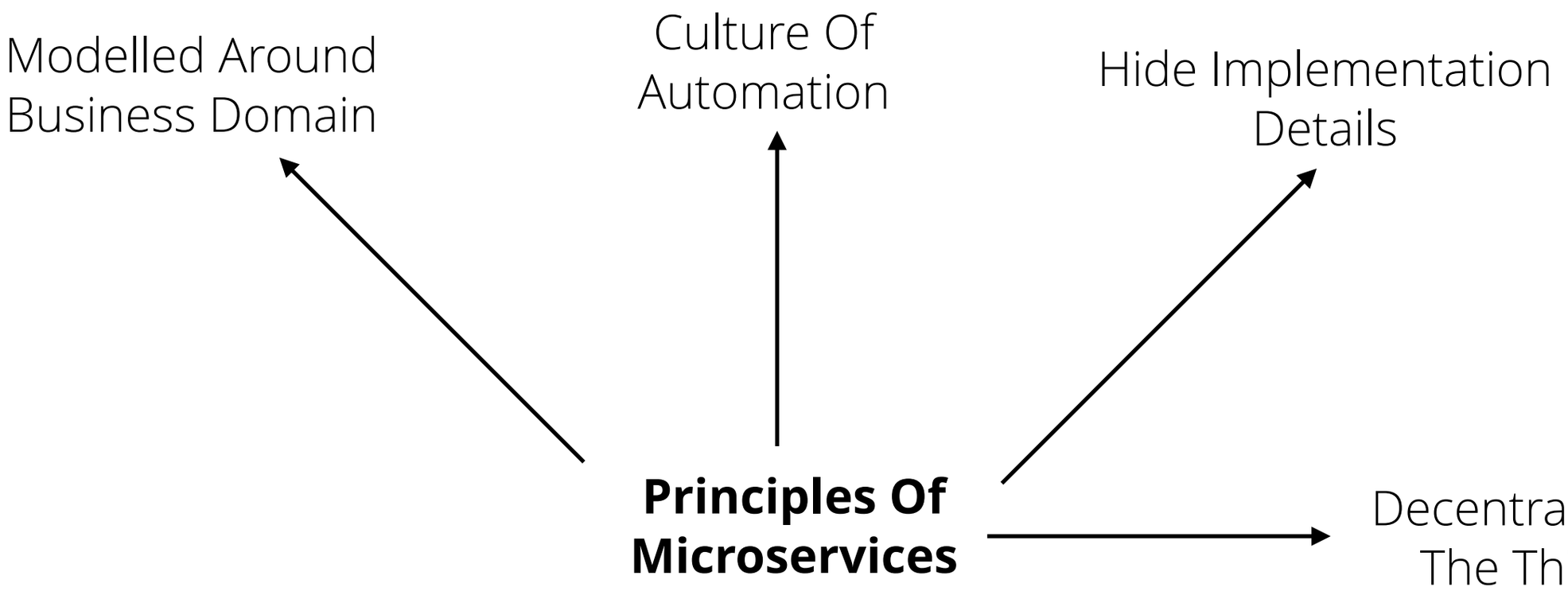
Modelled Around Business Domain

Culture Of Automation

Hide Implementation Details



Principles Of Microservices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Principles Of Microservices
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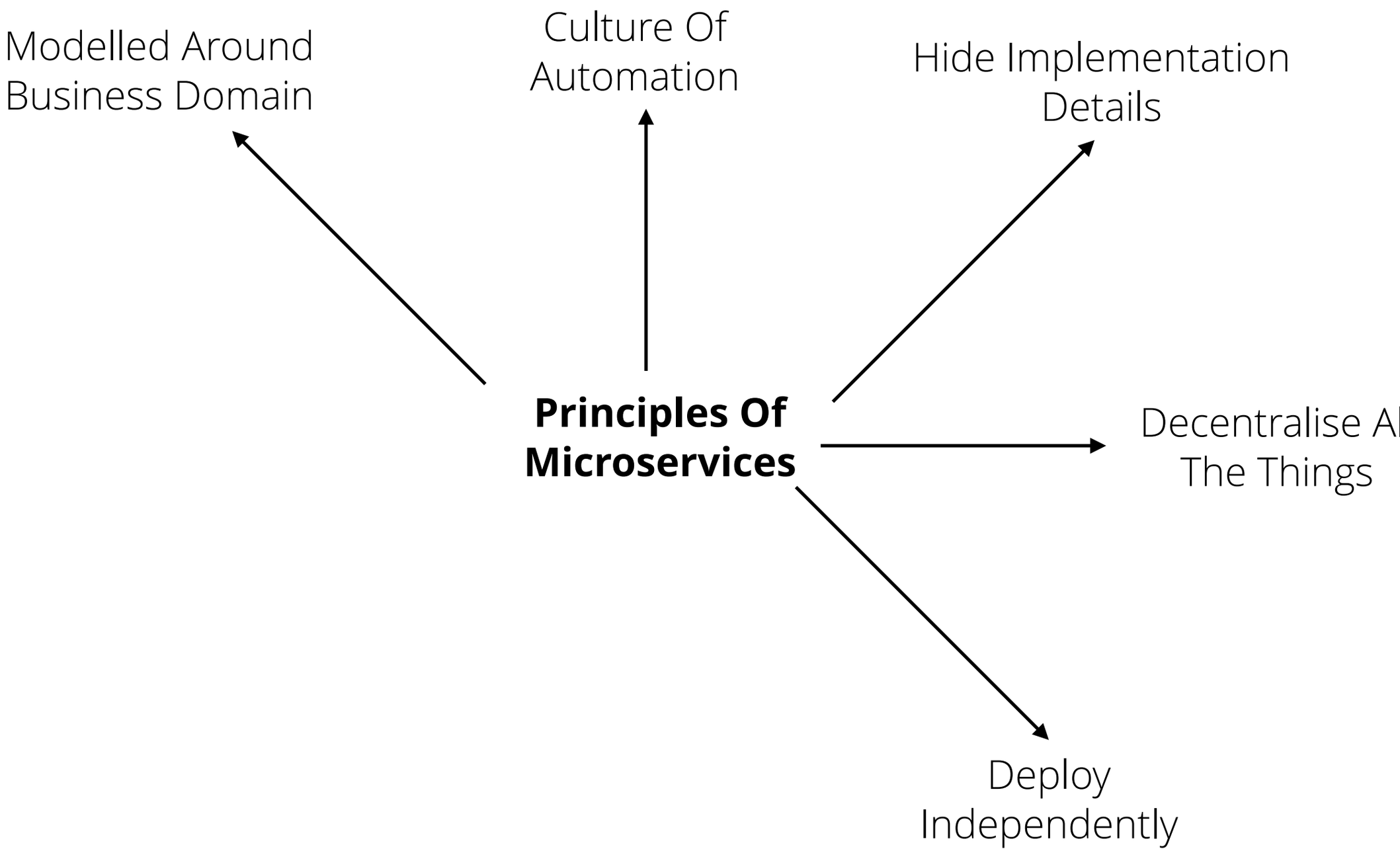
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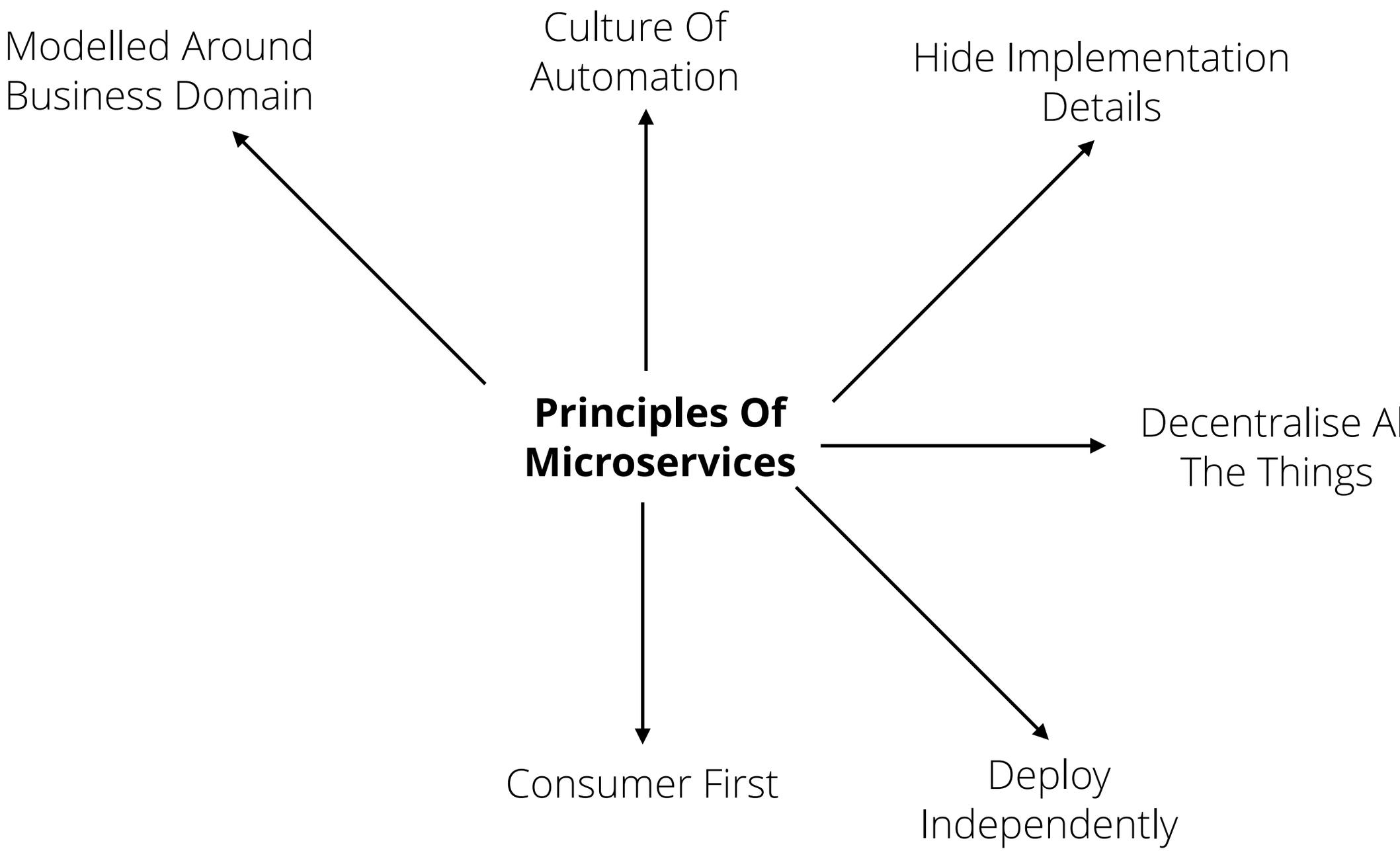
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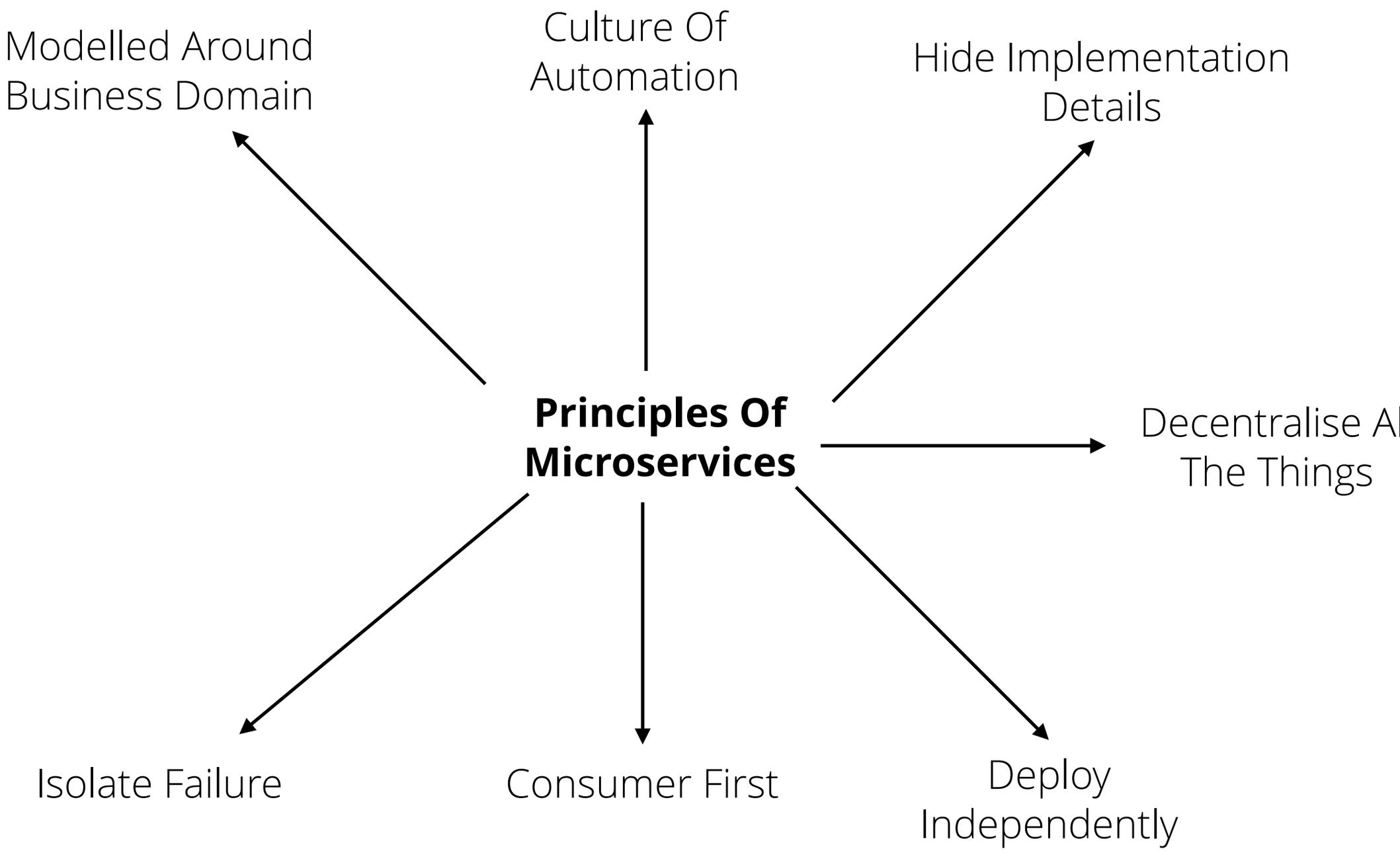
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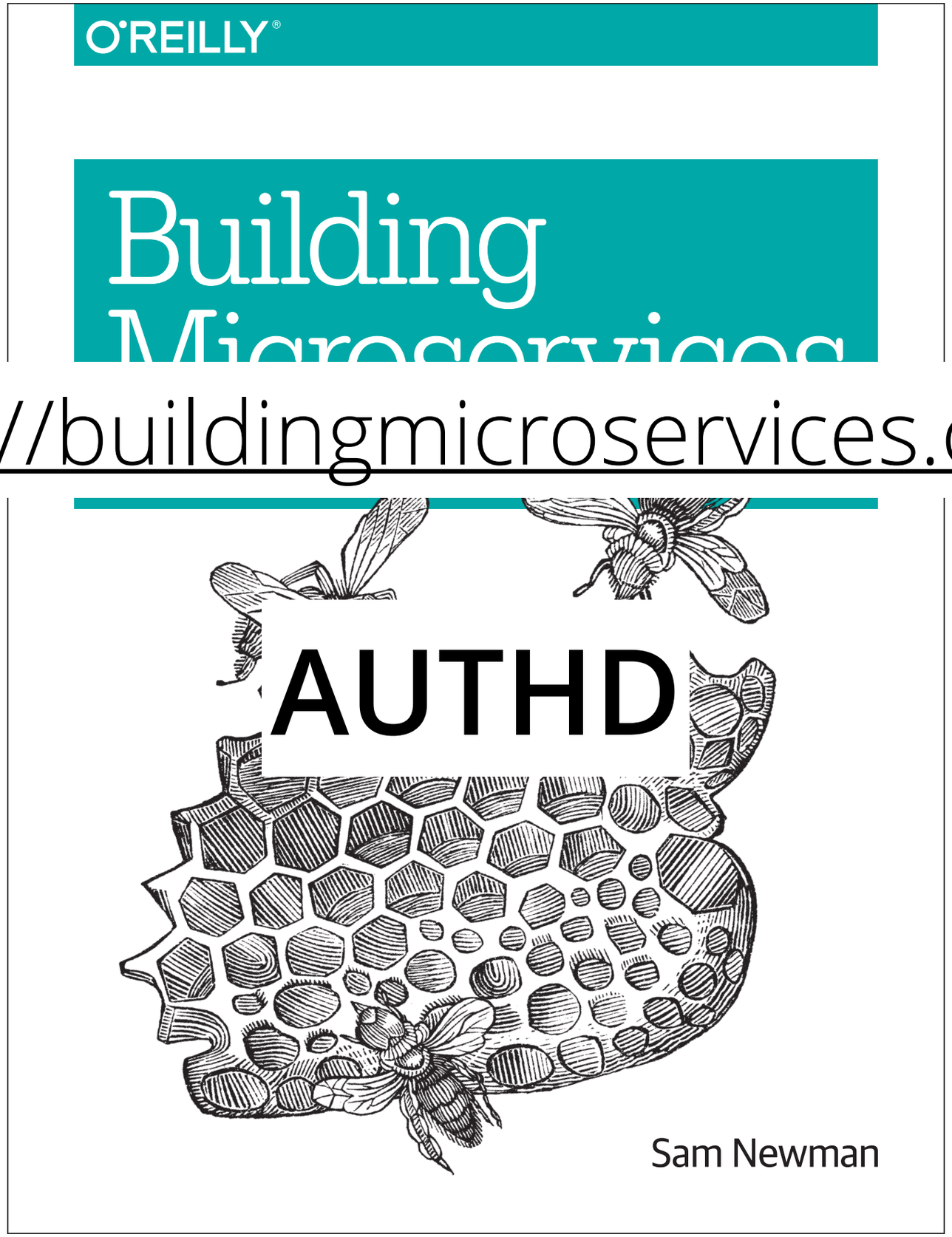

http://buildingmicroservices.com/

THANKS!

Sam Newman
@samnewman

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