สยามชำนาญกิจ
SIAM CHAMNAN KIT

# Solution Architect


Somkiat Puisungnoen

Somkiat | Home

Somkiat Puisungnoen

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When did you work at Opendream?

22 Pending Items

Intro

Software Craftsmanship

Software Practitioner at สยามชำนาญกิจ พ.ศ. 2556

Agile Practitioner and Technical at SPRINT3r

Post | Photo/Video | Live Video | Life Event

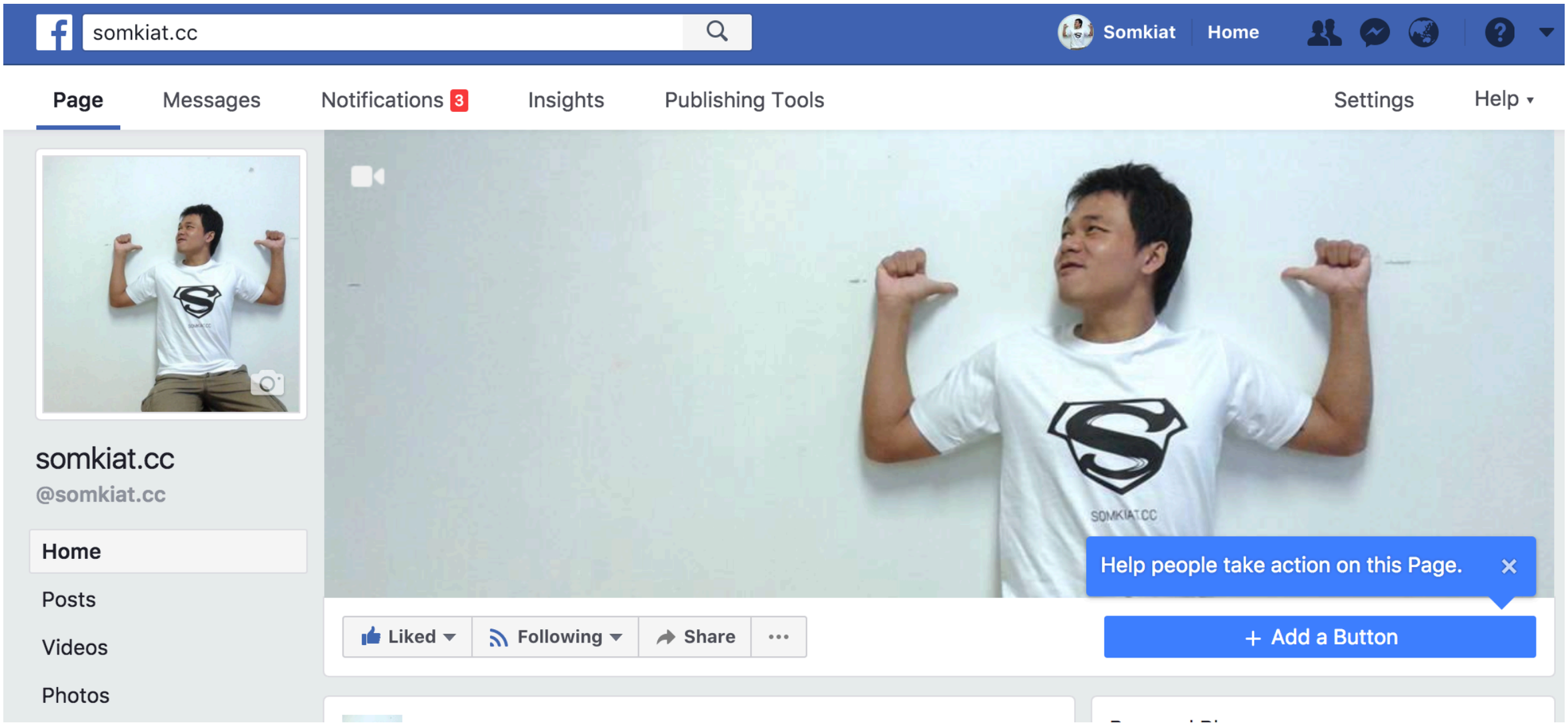
What's on your mind?

Public | Post

Somkiat Puisungnoen

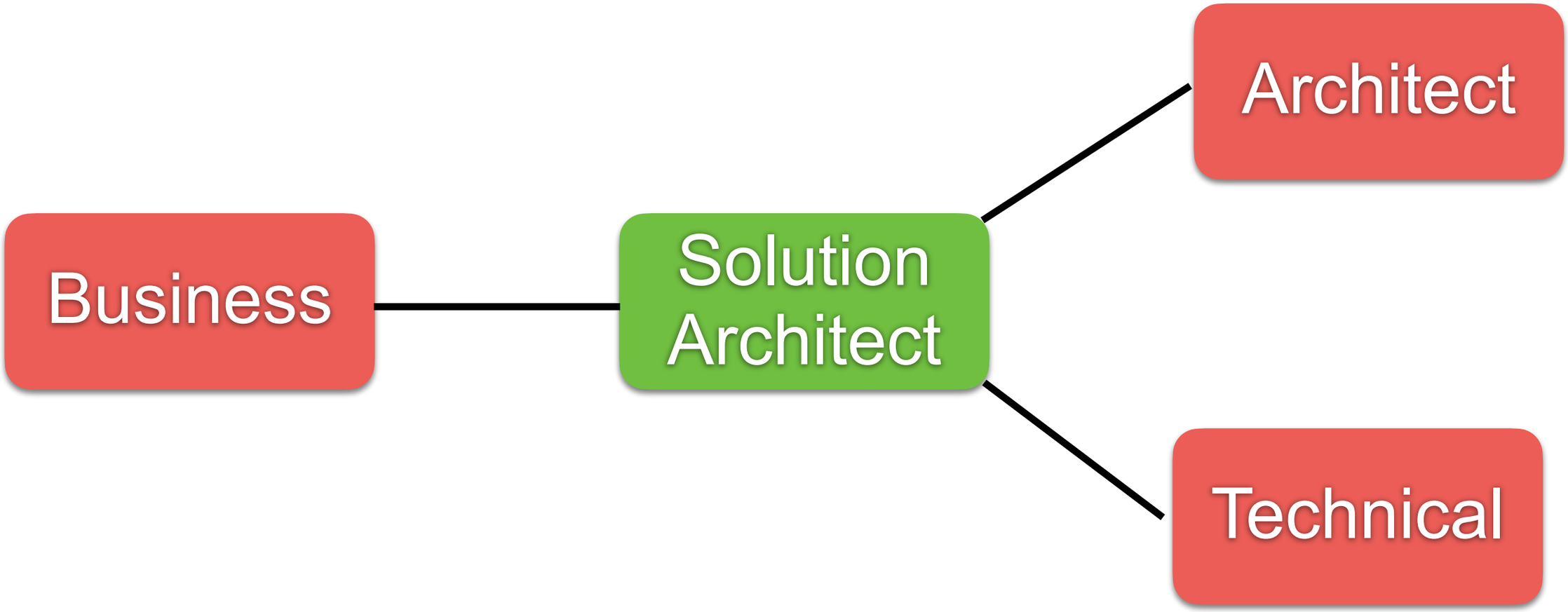
15 mins · Bangkok ·

Java and Bigdata



https://github.com/up1/course_microservices-3-days

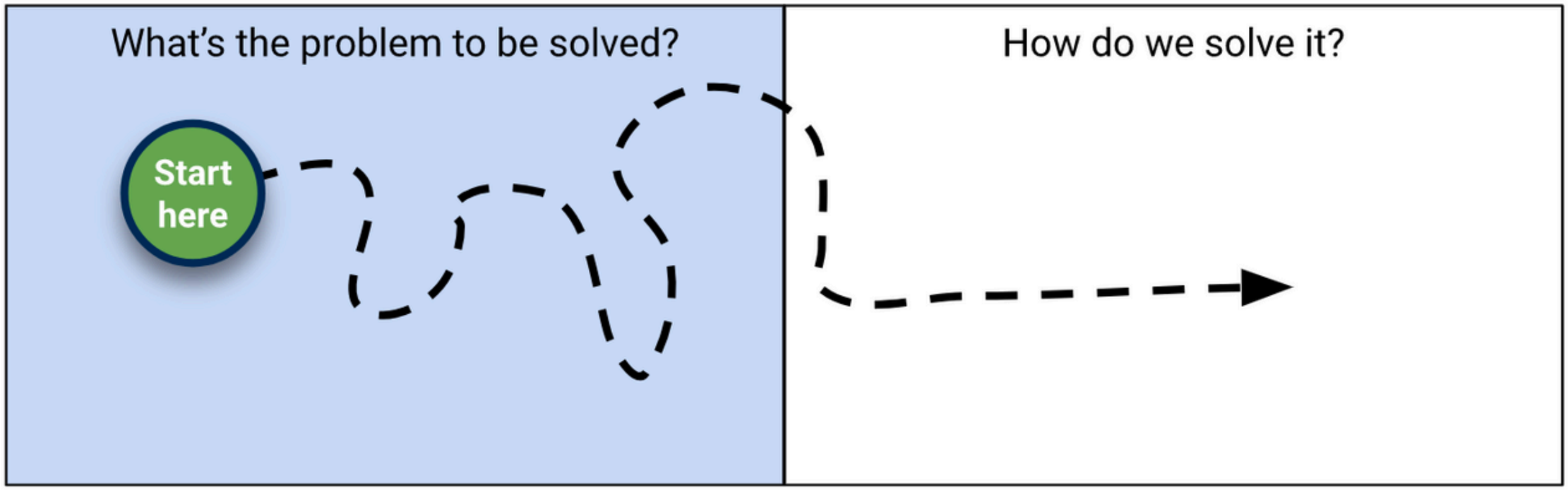
# Road to Solution Architect



# Problem Space

# Solution Space

# Problem and Solution Space



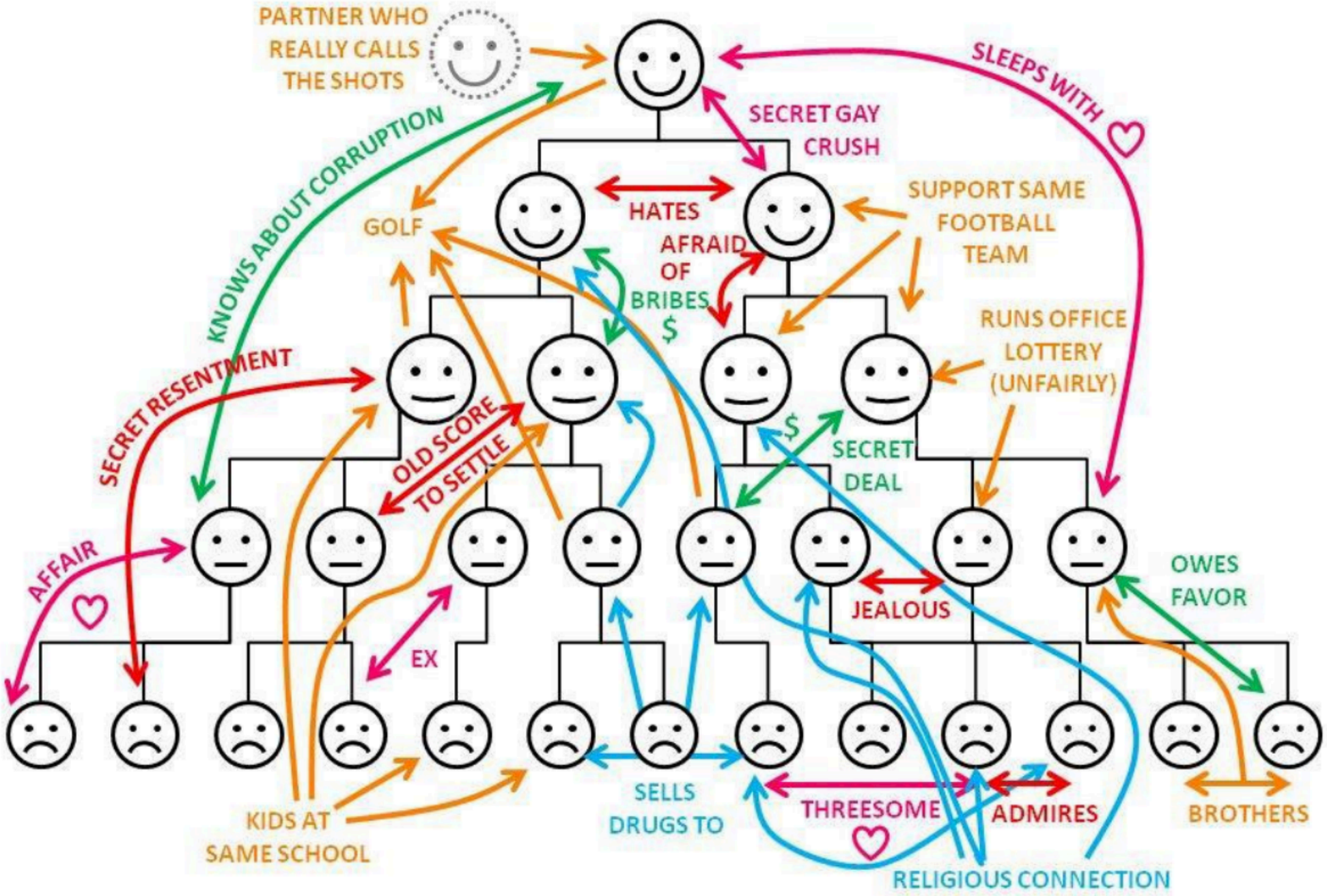
# Solution Architecture

the building block for an overall enterprise software **solution** that addresses specific **problems** and **requirements**.

# Long-term sustainability and solid foundation

# Complex vs Complicate


https://www.inc.com/theodore-kinni/smart-leaders-know-the-difference-between-complex-.html



# Types of Solution Architect

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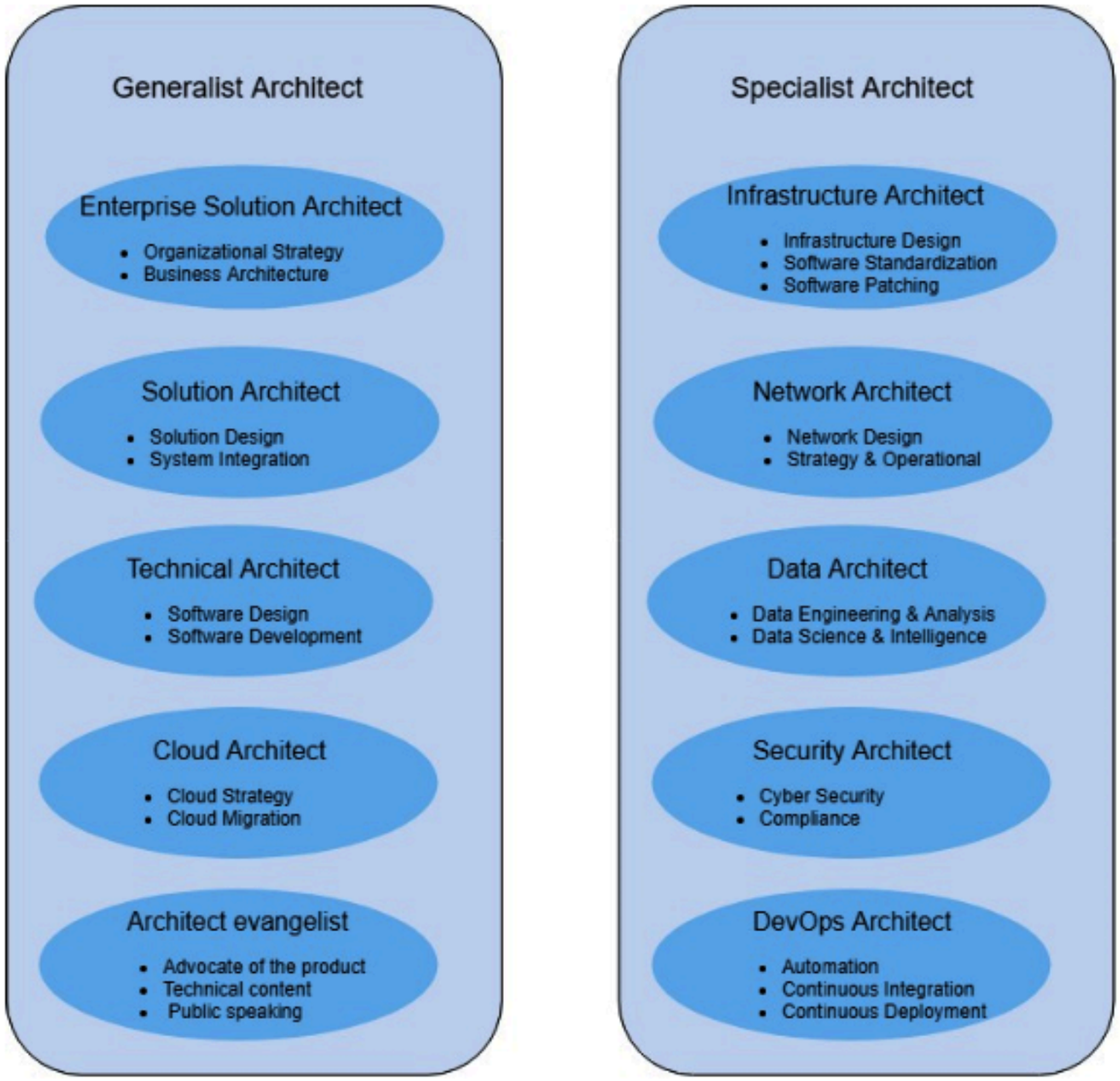
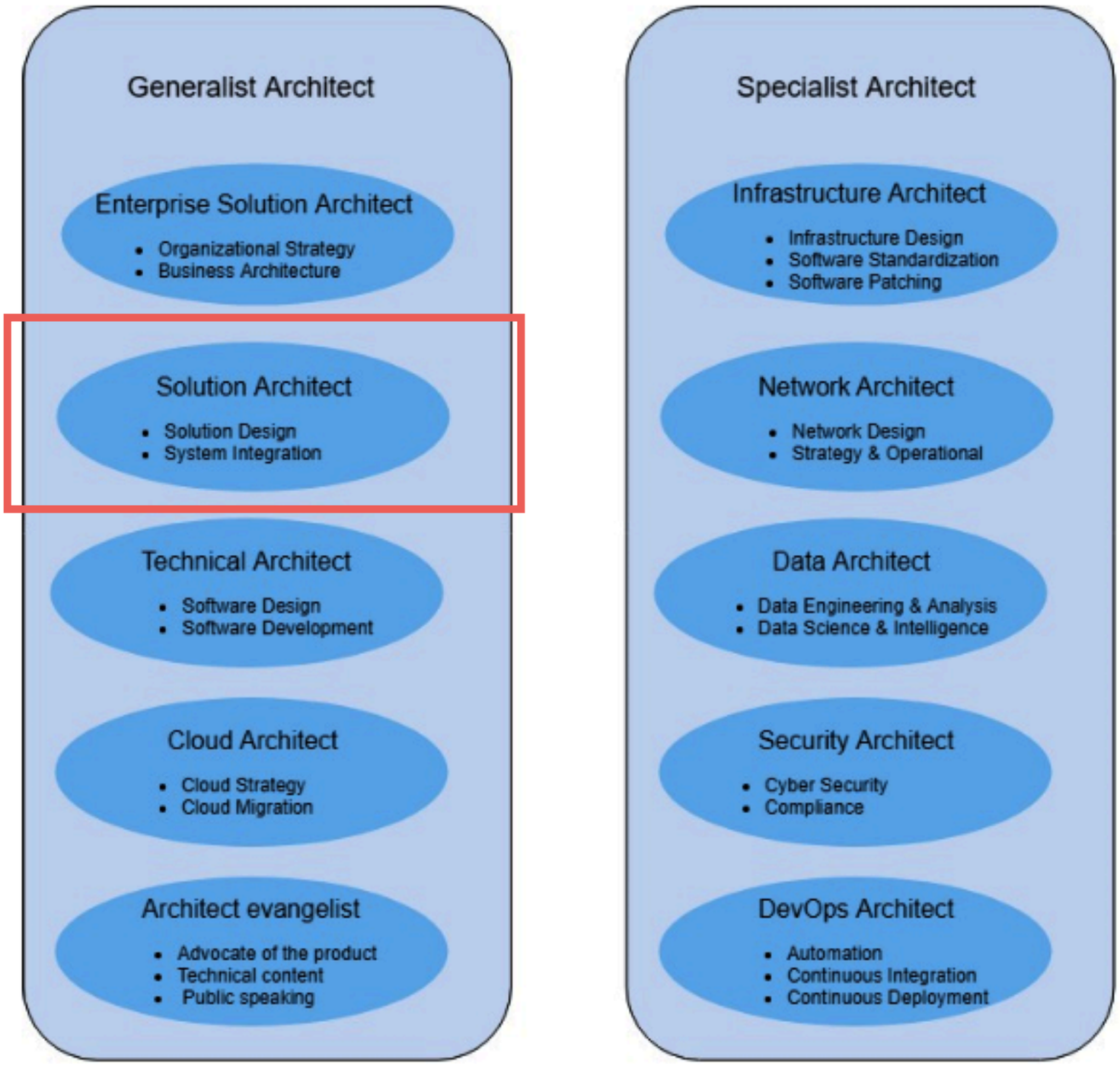


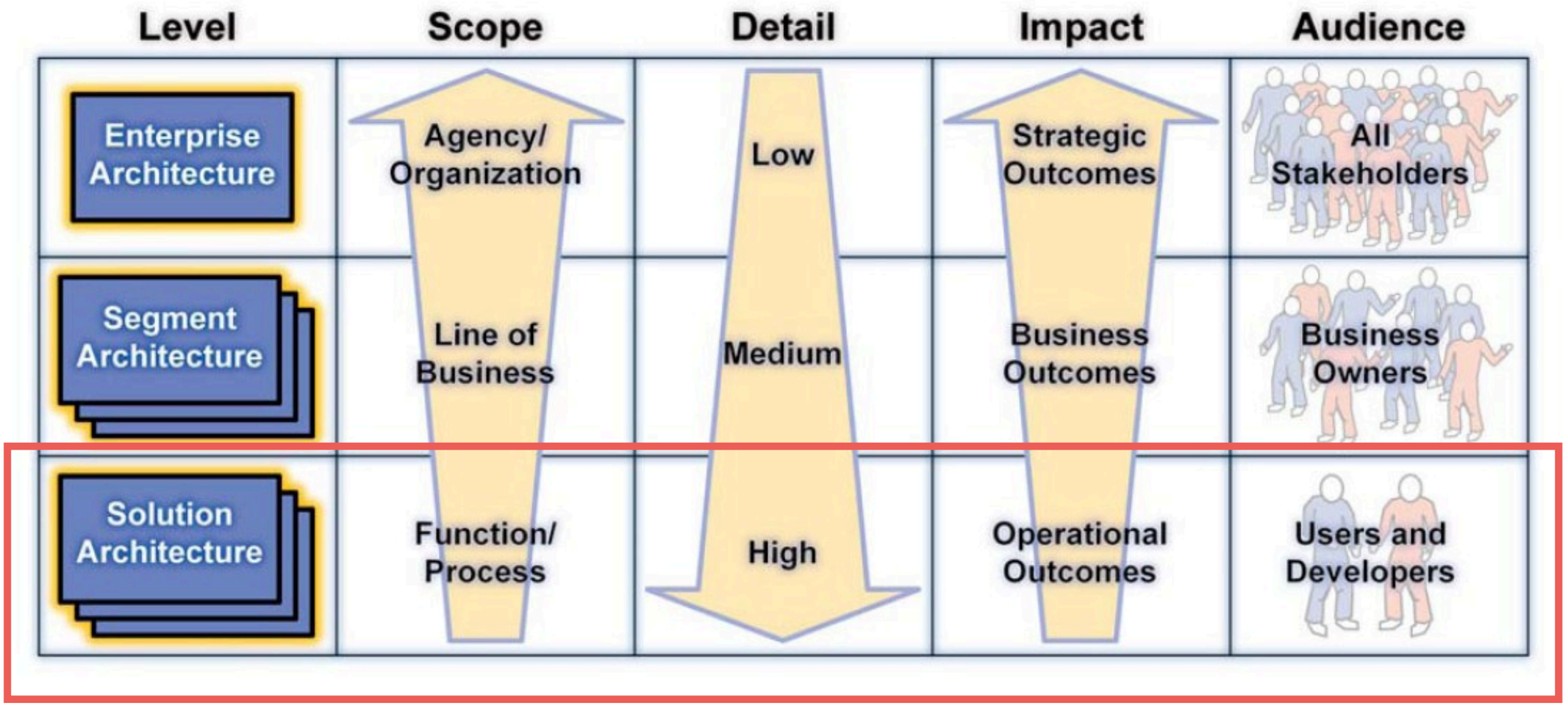
# Types of Solution Architect



# Solution Architect

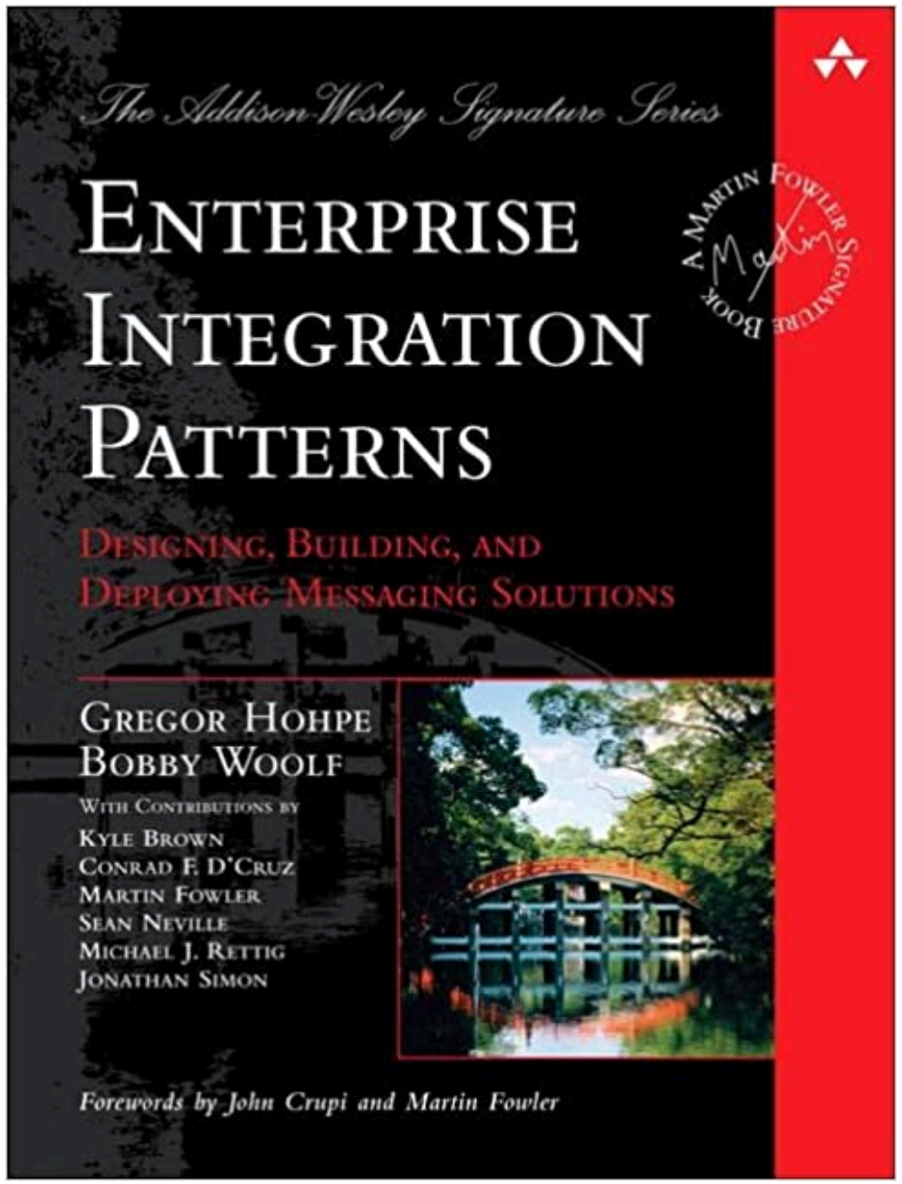
Solution design
System integration

# Solution Architecture

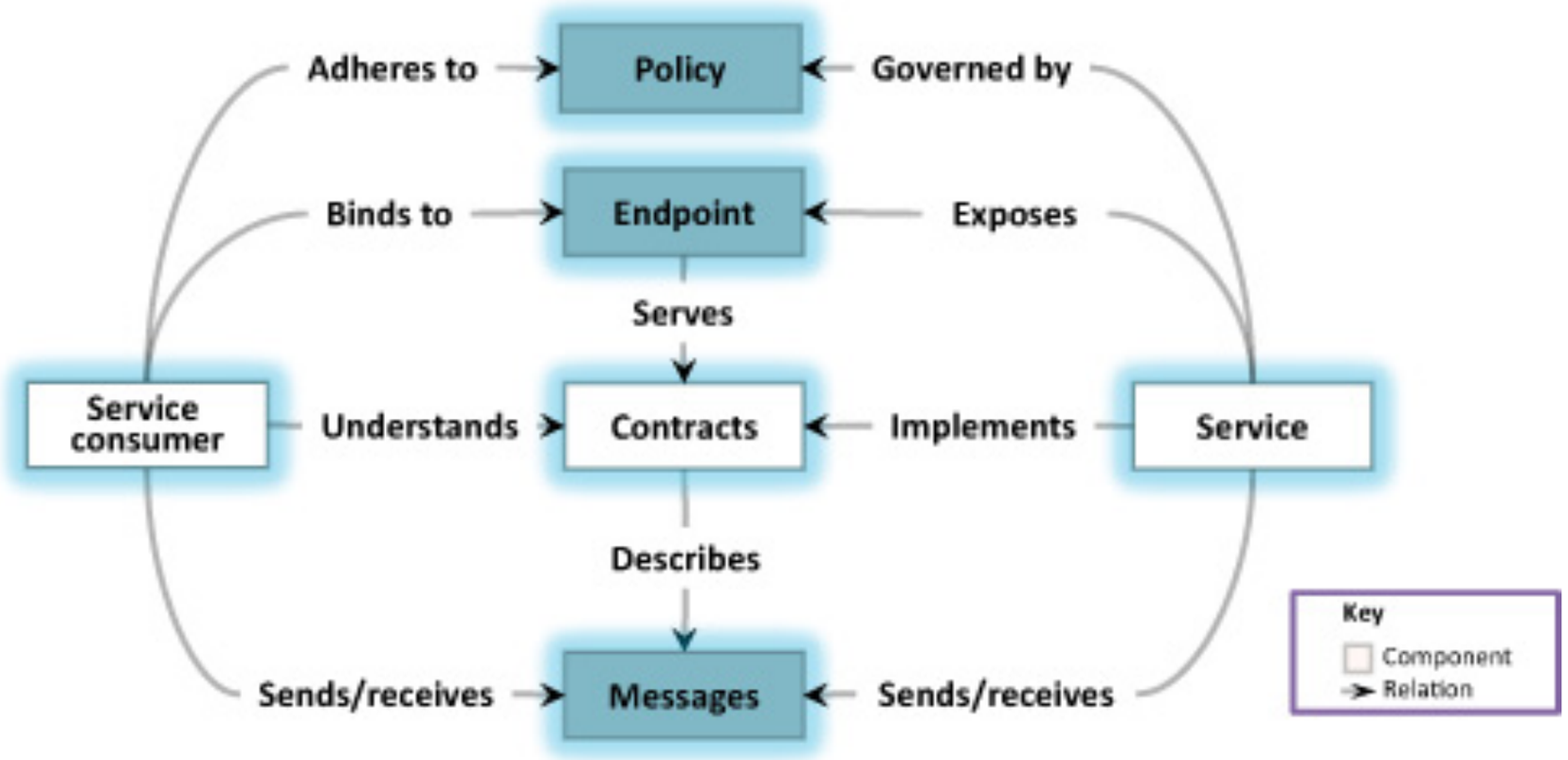



https://en.wikipedia.org/wiki/Solution_architecture

# Enterprise integration patterns



# System Integration



# Context Mapping

## Context Map Cheat Sheet

### Context Map Patterns

#### Open / Host Service

A Bounded Context offers a defined set of services that expose functionality for other systems. Any downstream system can then implement their own integration. This is especially useful for integration requirements with many other systems. Example: public APIs.


#### Conformist

The downstream team conforms to the model of the upstream team. There is no translation of models. Couples the Conformist's domain model to another bounded context's model.


#### Anticorruption Layer

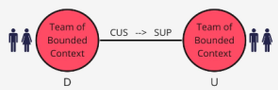
The anticorruption layer is a layer that isolates a client's model from another system's model by translation. Only couples the integration layer (or adapter) to another bounded context's model but not the domain model itself.


#### Shared Kernel

Two teams share a subset of the domain model including code and maybe the database. Typical examples: shared JARs, DLLs or a shared database schema. Teams with a Shared Kernel are often mutually dependent and should form a Partnership.


#### Customer / Supplier

There is a customer / supplier relationship between teams. The downstream team is considered to be the customer. Downstream requirements factor into upstream planning. Therefore, the downstream team gains some influence over the priorities and tasks of the upstream team.




#### Partnership

Partnership is a cooperative relationship between two teams. These teams establish a process for coordinated planning of development and joint management of integration.


#### Published Language

A Published Language is a well documented shared language between Bounded Contexts which can translate in and out from that language. Published Language is often combined with Open Host Service.Typical examples are iCalendar or vCard.


#### Separate Ways

Bounded Contexts and their corresponding teams have no connections because integration is sometimes too expensive or it takes very long to implement. The teams chose to go separate ways in order to focus on their specific solutions.


#### Big Ball Of Mud

A (part of a) system which is a mess by having mixed models and inconsistent boundaries. Don't let this lousy model propagate into the other Bounded Contexts. Big Ball Of Mud is a demarcation of a bad model or system quality.


### Team Relationships

#### Mutually Dependent

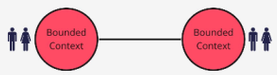
Two software artifacts or systems in two bounded contexts need to be delivered together to be successful and work. There is often a close, reciprocal link between data and functions between the two systems.


#### Free

Changes in one bounded context do not influence success or failure in other bounded contexts. There is, therefore, no organizational or technical link of any kind between the teams.


#### Upstream / Downstream

Actions of an upstream team will influence the downstream counterpart while the opposite might not be true. This influence can apply to code but also on less technical factors such as schedule or responsiveness to external requests.



# Responsibilities

Define the solution **architecture**
Assess and mitigate **risk**
Lead the development team
Evaluate and select **technology**
Ensure **scalability** and **maintainability**
**Communicate** with stakeholder
(technical and non-technical)

# Responsibilities

# Ensure the org's IT solution Effective, Efficient and align with business goal

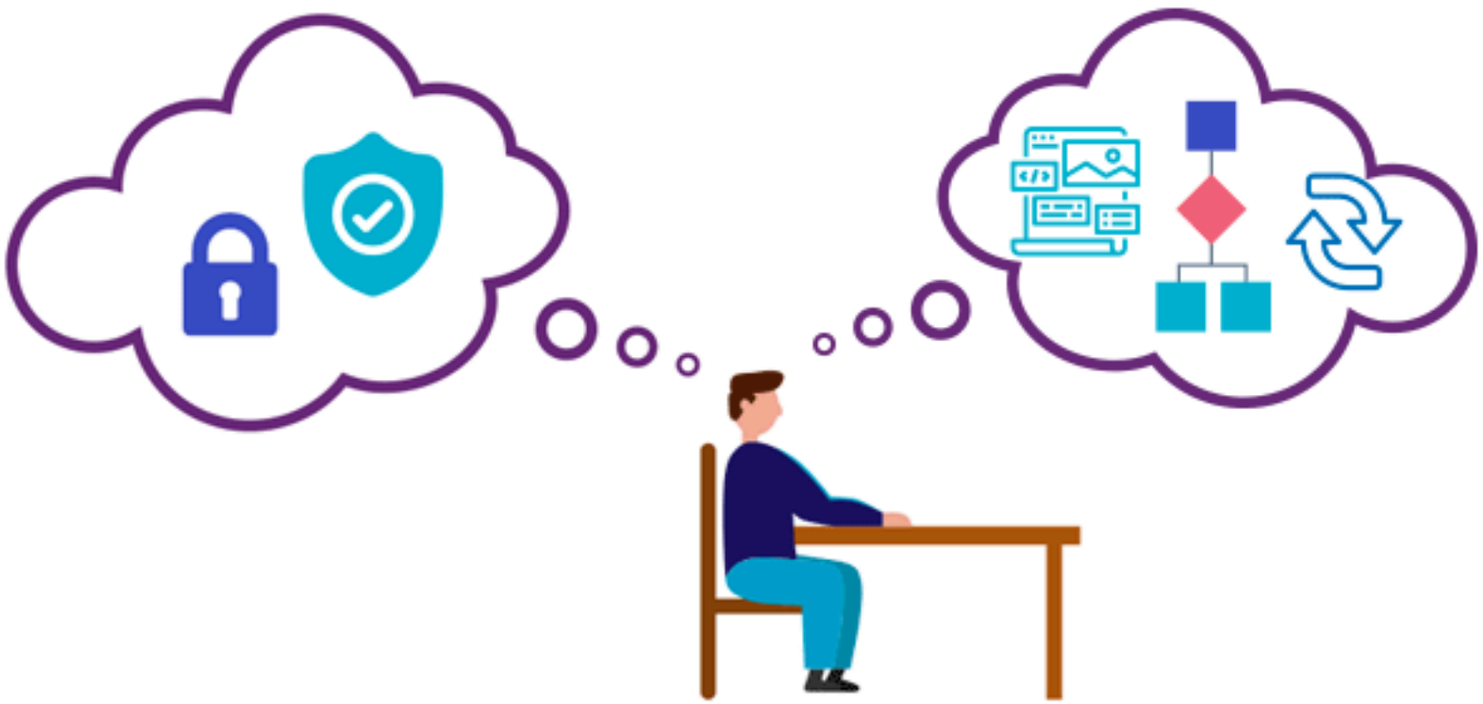
# Define the solution architecture

Identify business requirement
Overall solution architecture
Provide technical specification

# Balance between Functional and Non-Functional

Non-Functional Requirements

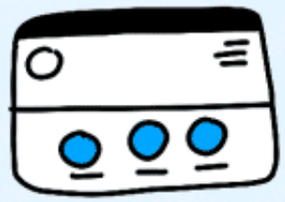
Functional Requirements



# examples of

## FUNCTIONAL REQUIREMENTS

## NON-FUNCTIONAL REQUIREMENTS



the website will have a homepage

the homepage should load within 1.5 seconds


the website will store customer data

customer data will be encrypted to level 4 encryption standards

website customers can log into their accounts

the website has the capacity for 5.000 logged-in users at any one time

the website will always be available to customers

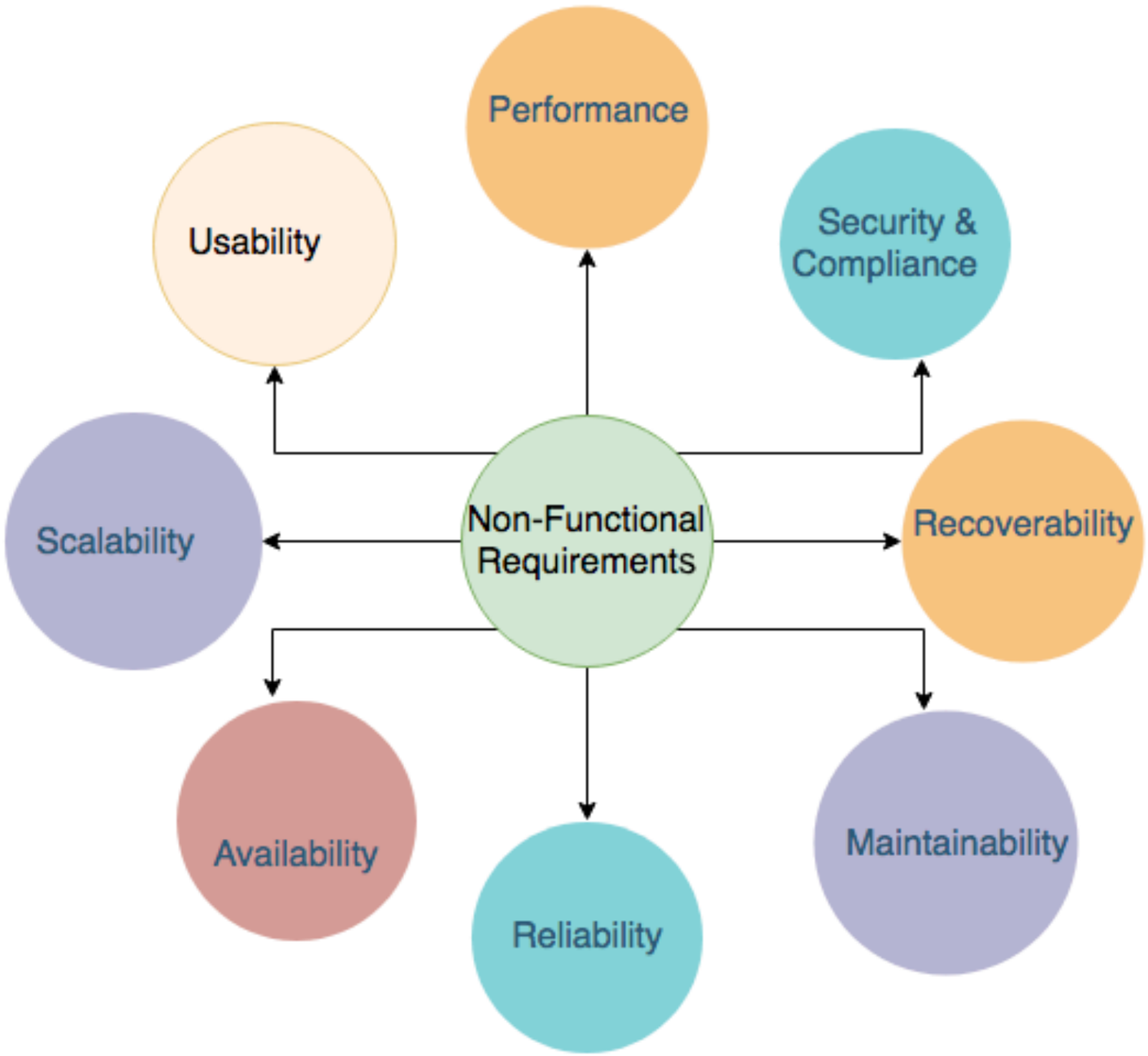
the website must have a 99.7% uptime

customers can access the websites on their phones

the website will be compatible with iOS 12.8 and above

planio

# NFRs ?



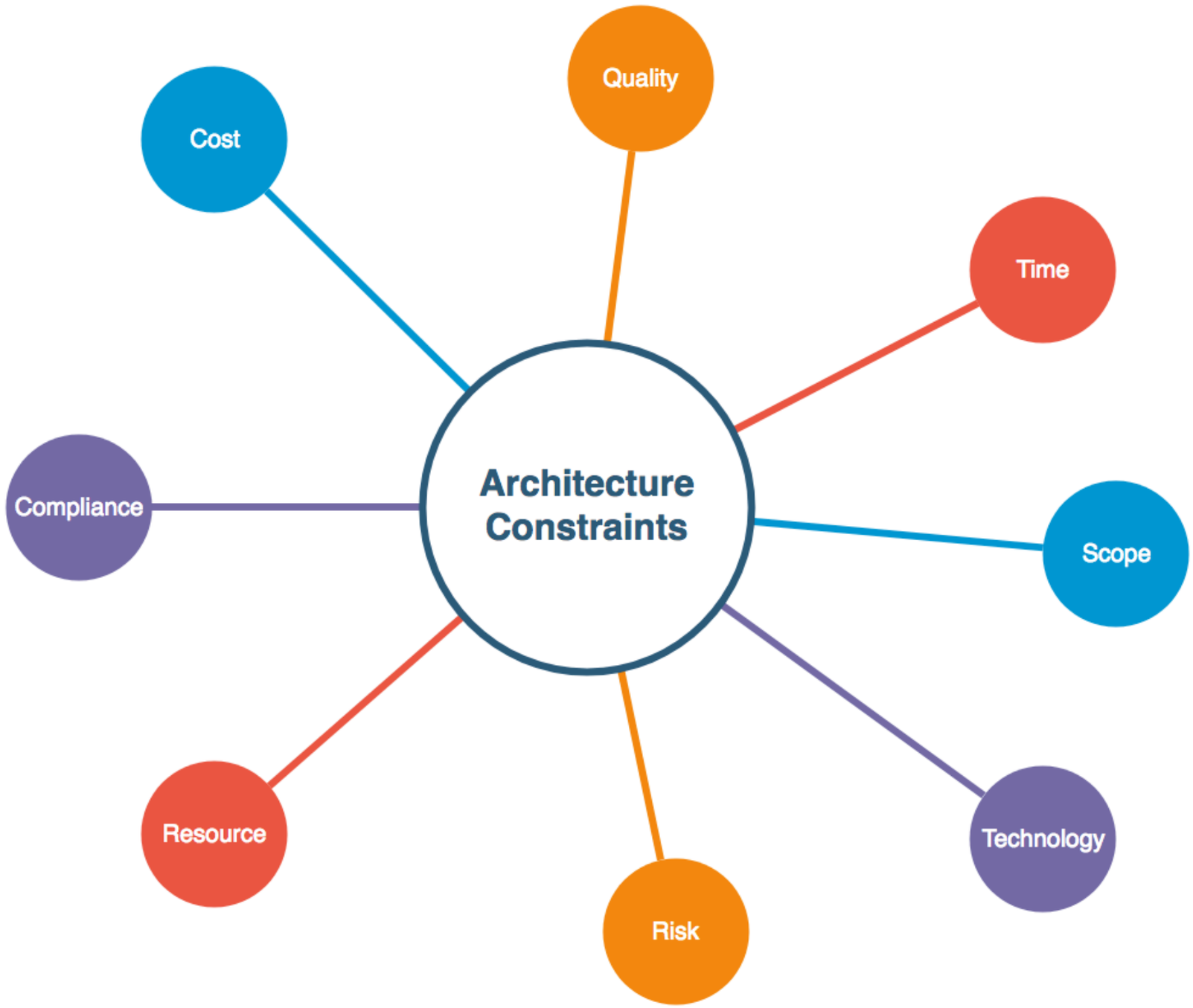
# NFRs in most project

High availability
Scalability
Application performance
Network request/response latency
Disaster recovery
Security and compliance

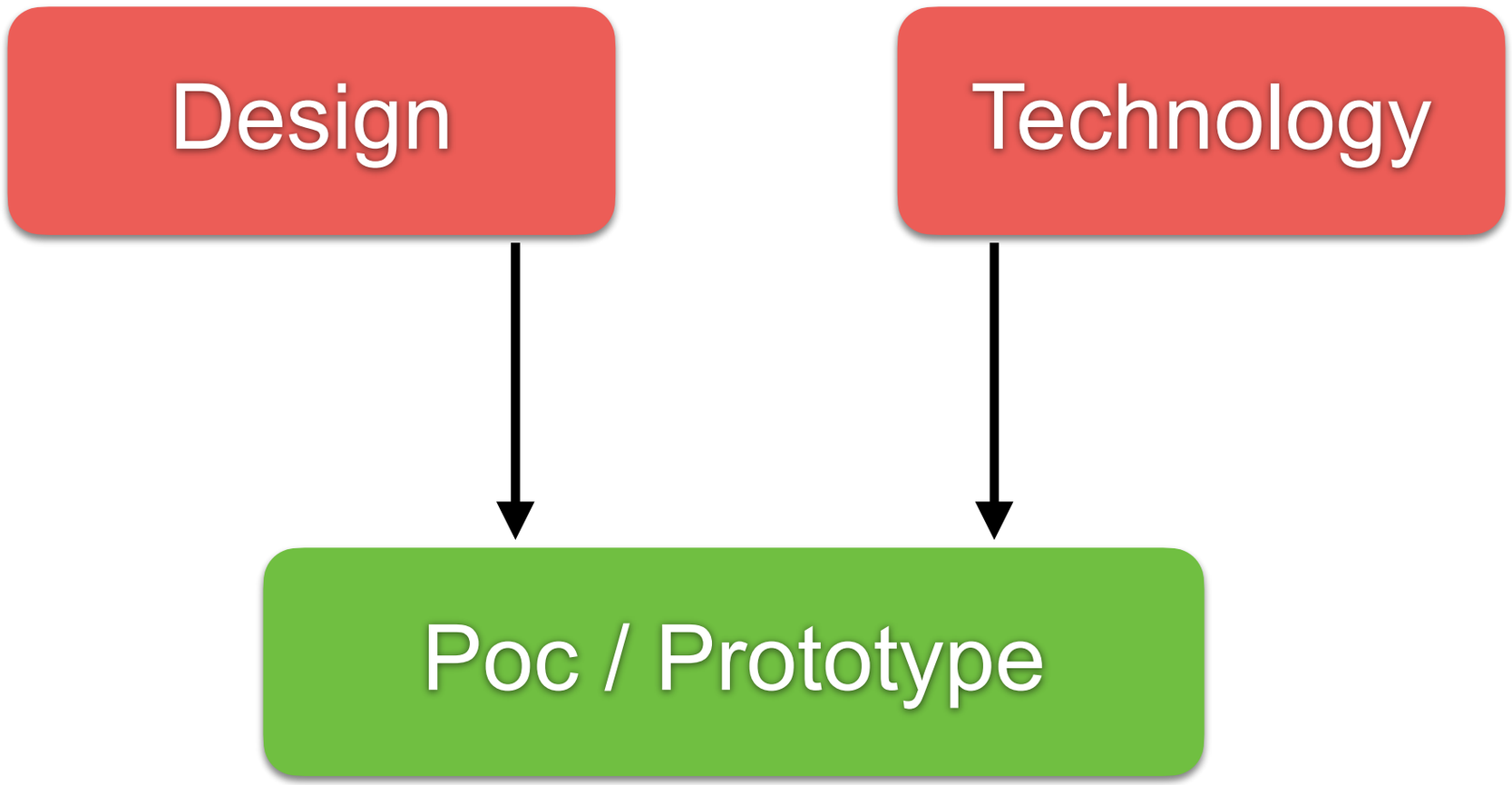
# Solution with constraints

Cost
Budget
Timeline
Regulatory
etc …

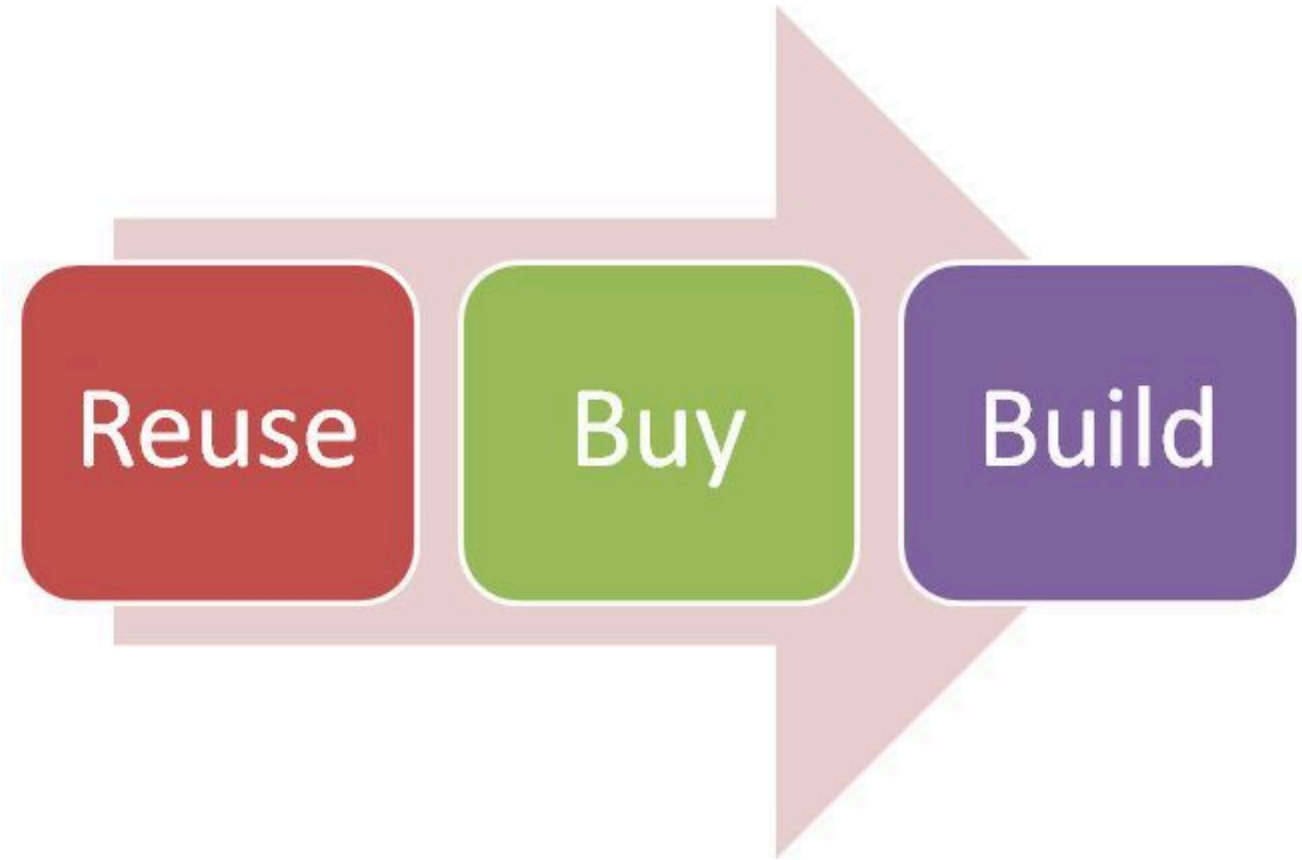
# Solution with constraints



# Solution with constraints



# Solution with constraints



# Thinking about Reuse !!

Real resume ?
Client side ?
Site effect from change ?

# Just enough
# Solution Architecture

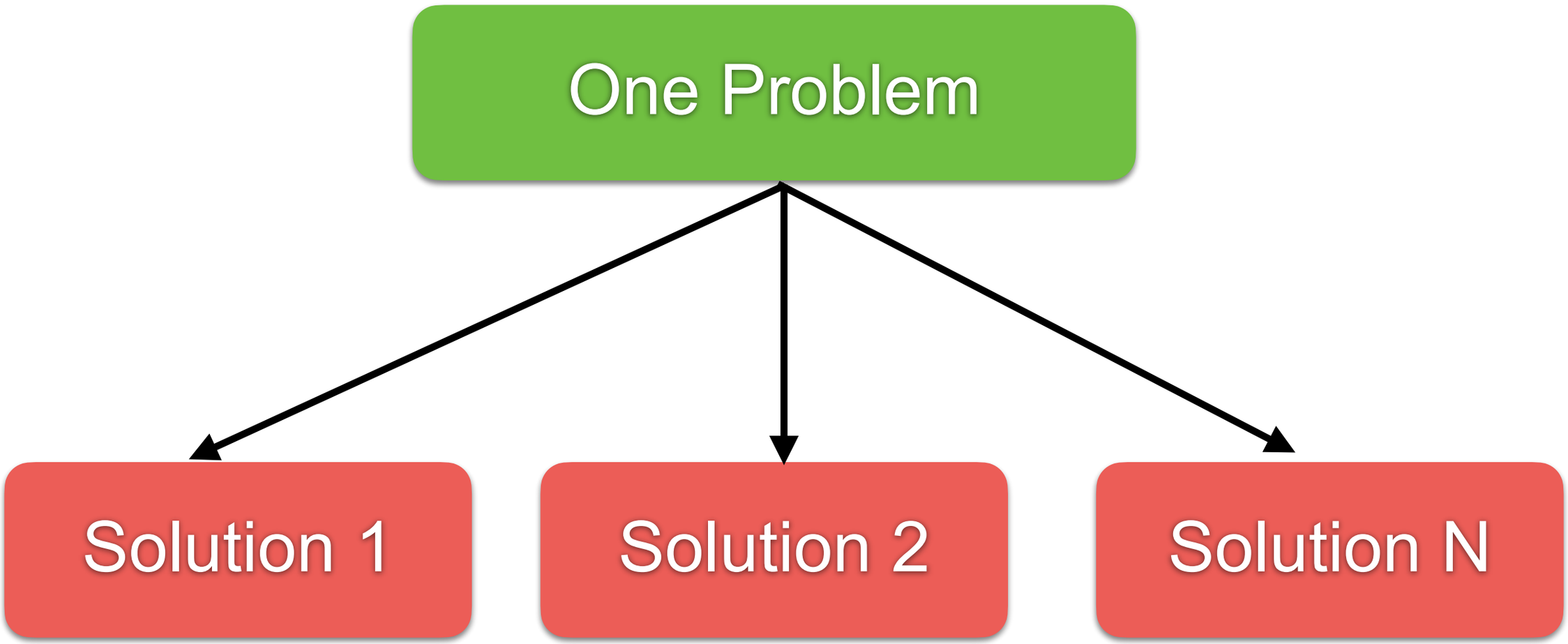
Minimal impact

# Just enough Solution Architecture

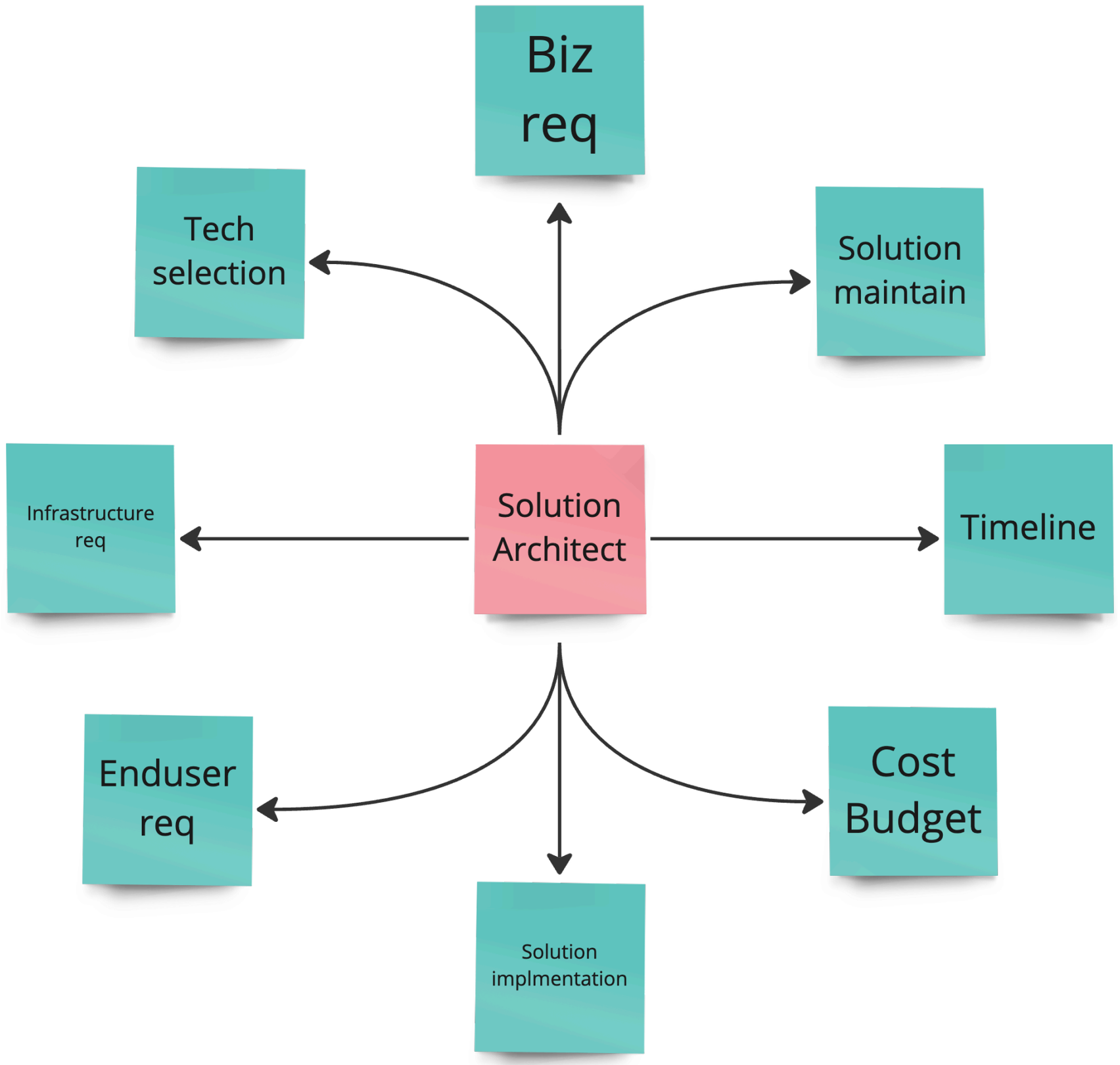
Fit with current environments

# Mazimize
# Return on Investment (ROI)

# Best Solution ?

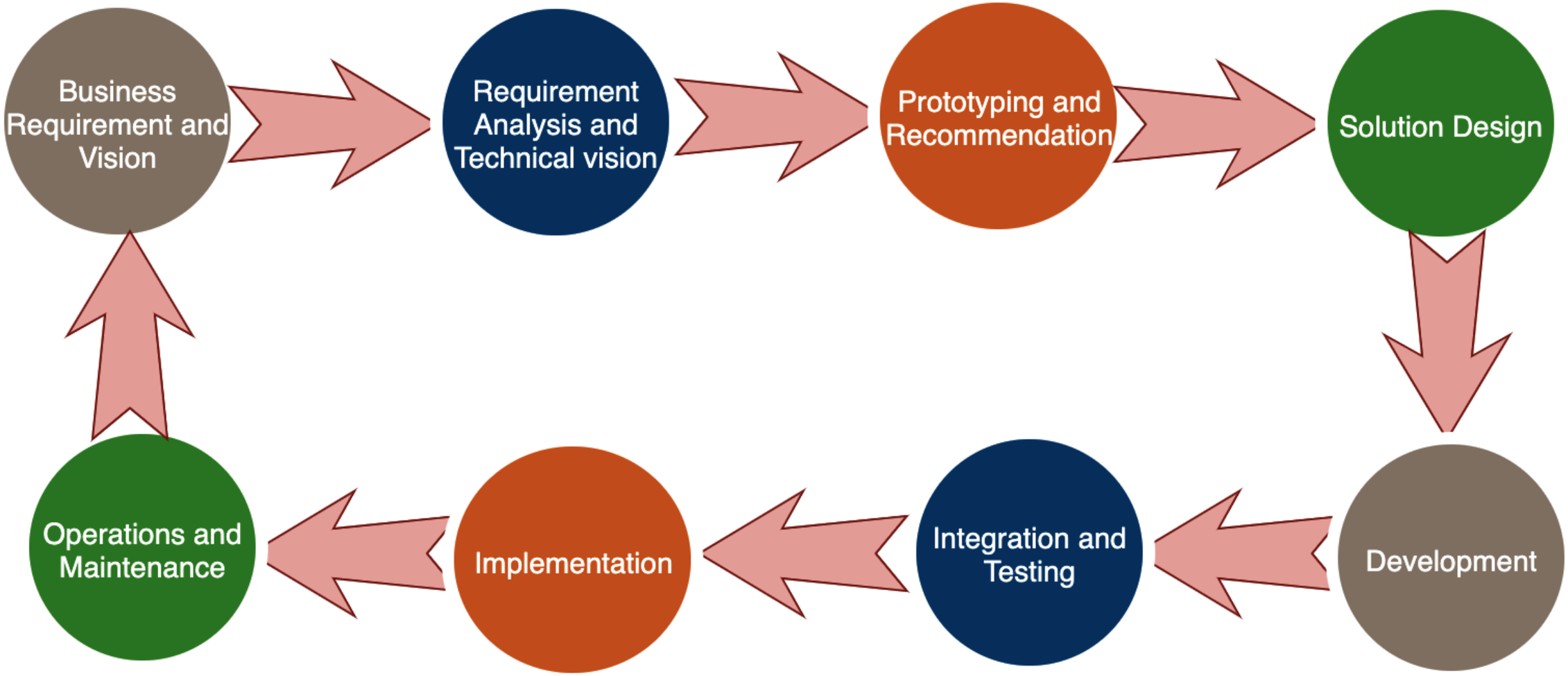


# Business needs
# Quality of delivery



# Solution Delivery Life Cycle

## Iterative process

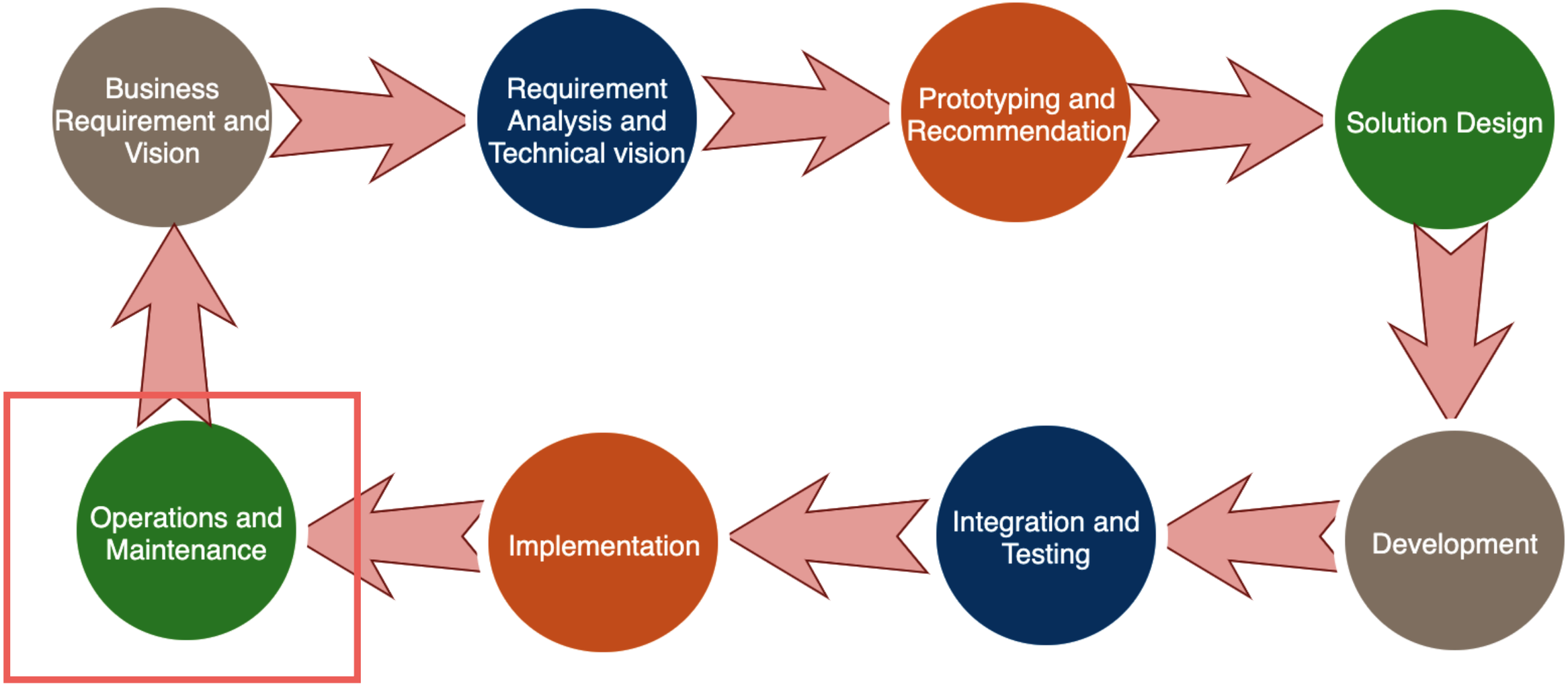


# TODOs with Documents

Solution standard
High-level design
Cross-system integration
Implementation approach
Monitoring/observability approach
Pros/Cons of design choices
Audit and compliance requirements

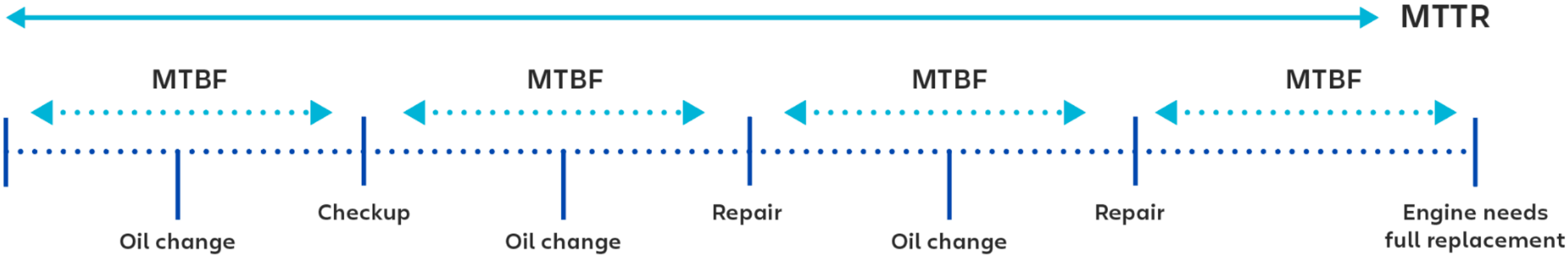
# Solution Delivery Life Cycle

## Iterative process

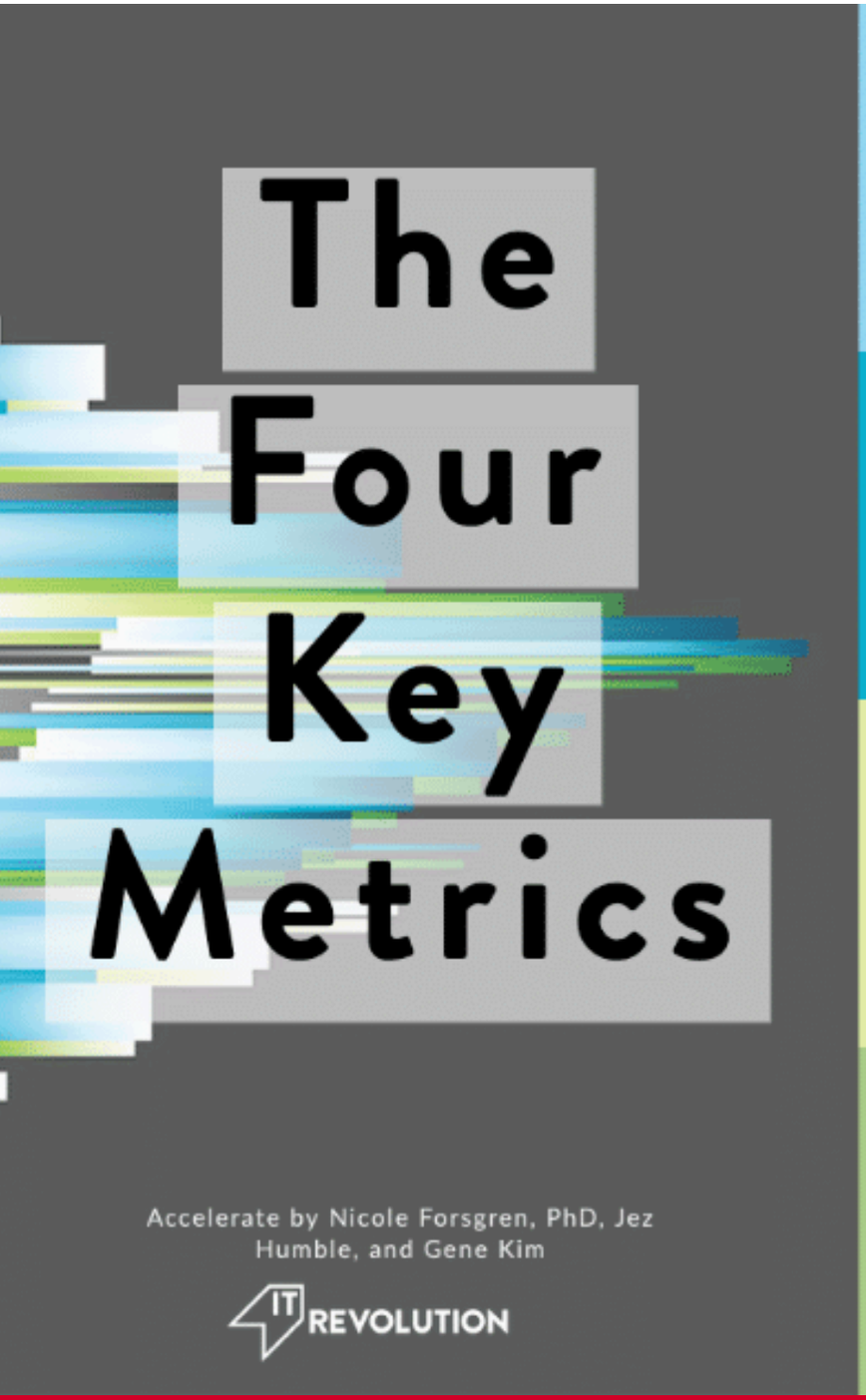


# Operation and Maintenance

How to scale product to meet demand
Ensure High H/A without impact



# DevOps key metrics




1

## LEAD TIME

Lead time is the time it takes to go from a customer making a request to the request being satisfied. Shorter lead times enable faster feedback.

## DEPLOYMENT FREQUENCY

2

Deployment frequency is a proxy metric for batch size; the more frequently you deploy the smaller the size of the batch. Small batch sizes reduce cycle times, reduce risk and overhead, improve efficiency, increase motivation and urgency, and reduce costs and schedule growth.

3

## MEAN TIME TO RESTORE

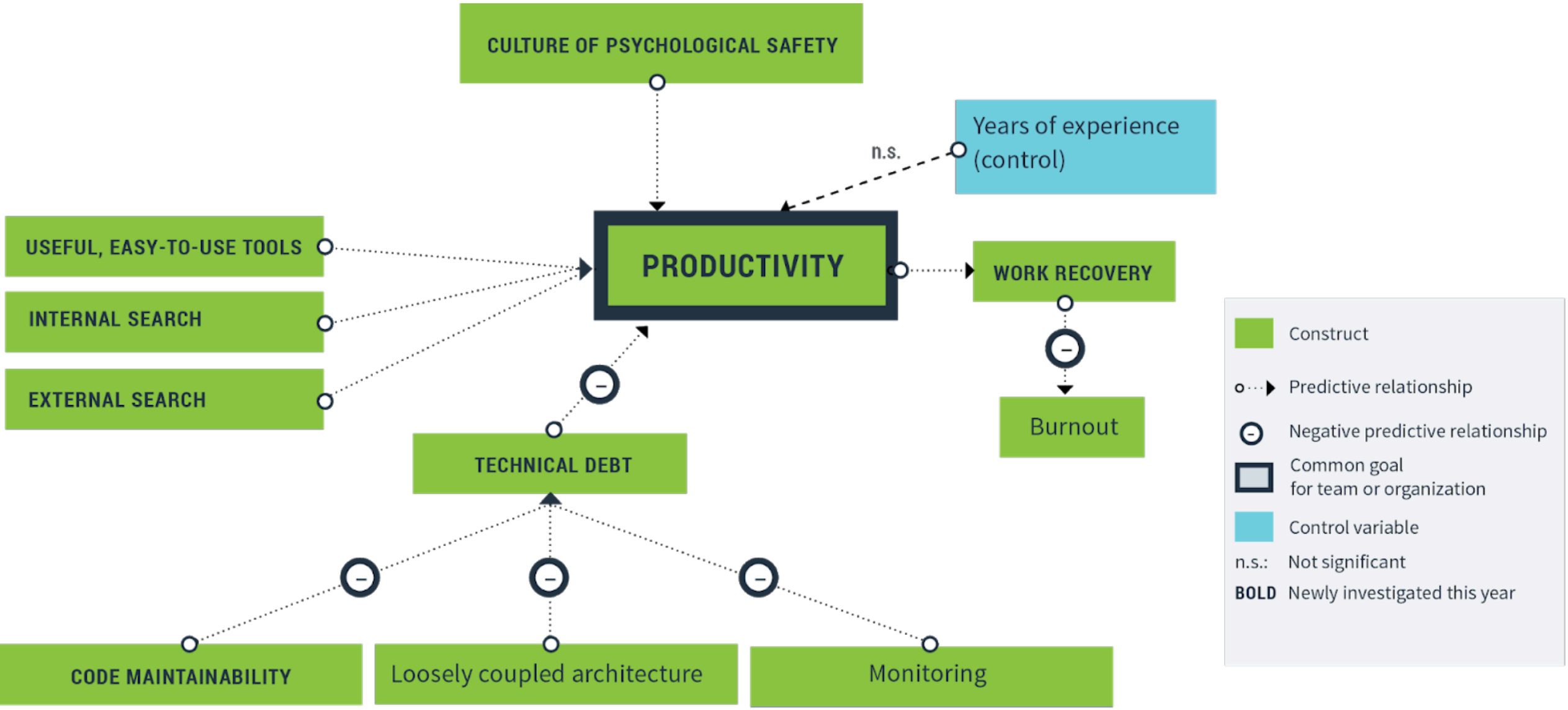
Reliability is traditionally measured as time between failures, but in a modern software organization failure is inevitable. Thus, reliability is measured by how long it takes to restore service when a failure occurs.

## CHANGE FAIL PERCENTAGE

This metric looks at the percentage of changes made to production that fail; the same as percent complete and accurate in Lean product delivery.

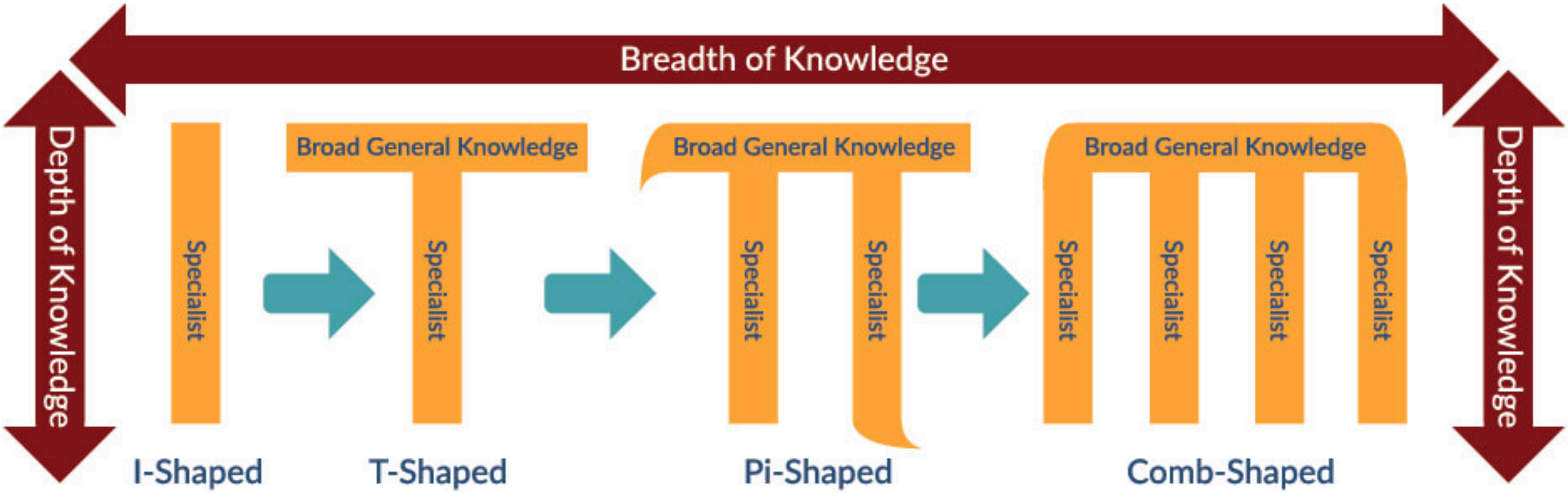
4

# Productivity



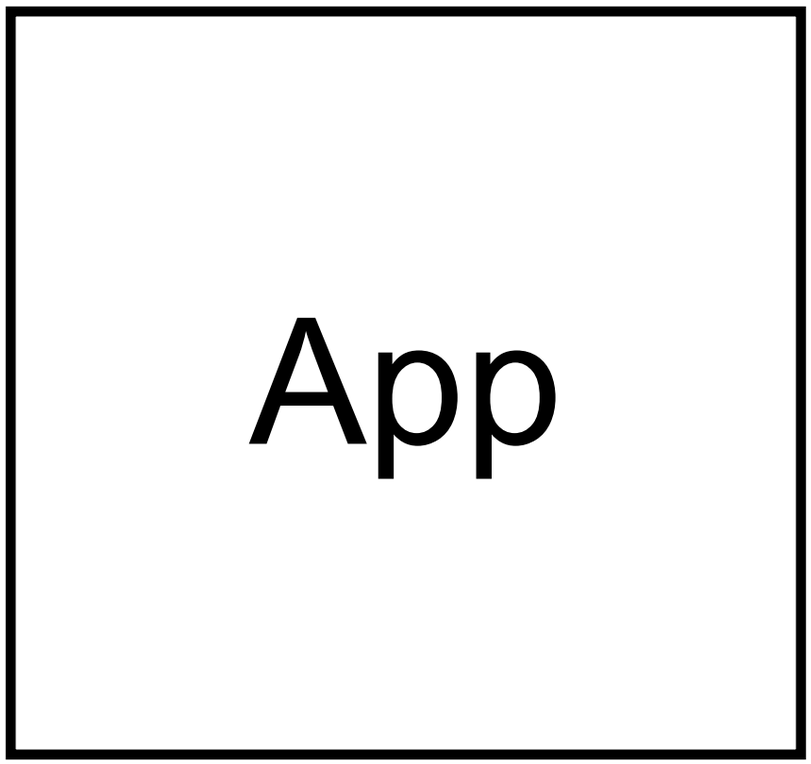

https://cloud.google.com/blog/products/devops-sre/the-2019-accelerate-state-of-devops-elite-performance-productivity-and-scaling

# Shape of Skills

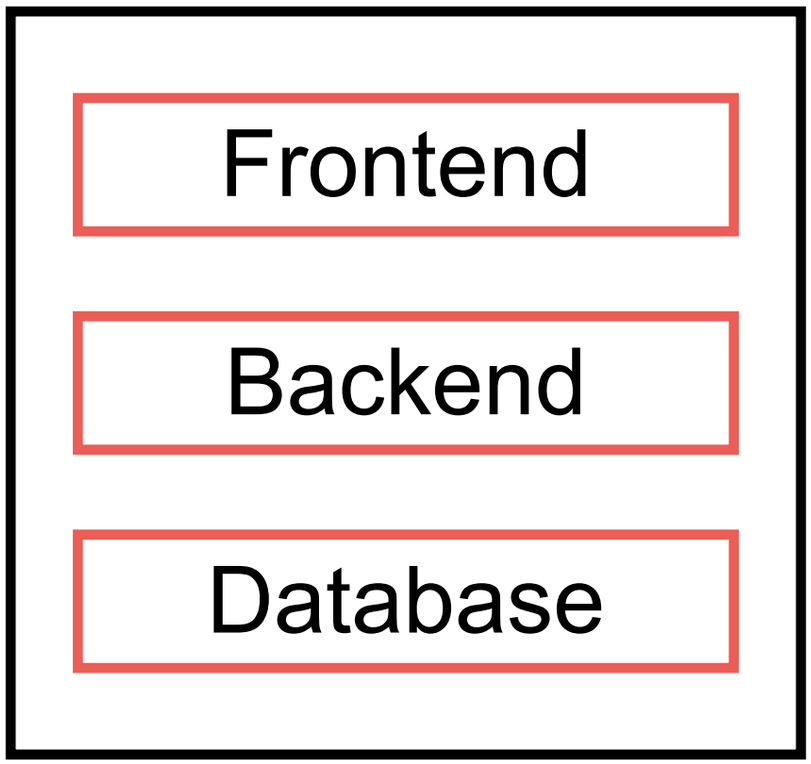


# Evolution of Architecture

# Monolith



# Layer/Tier



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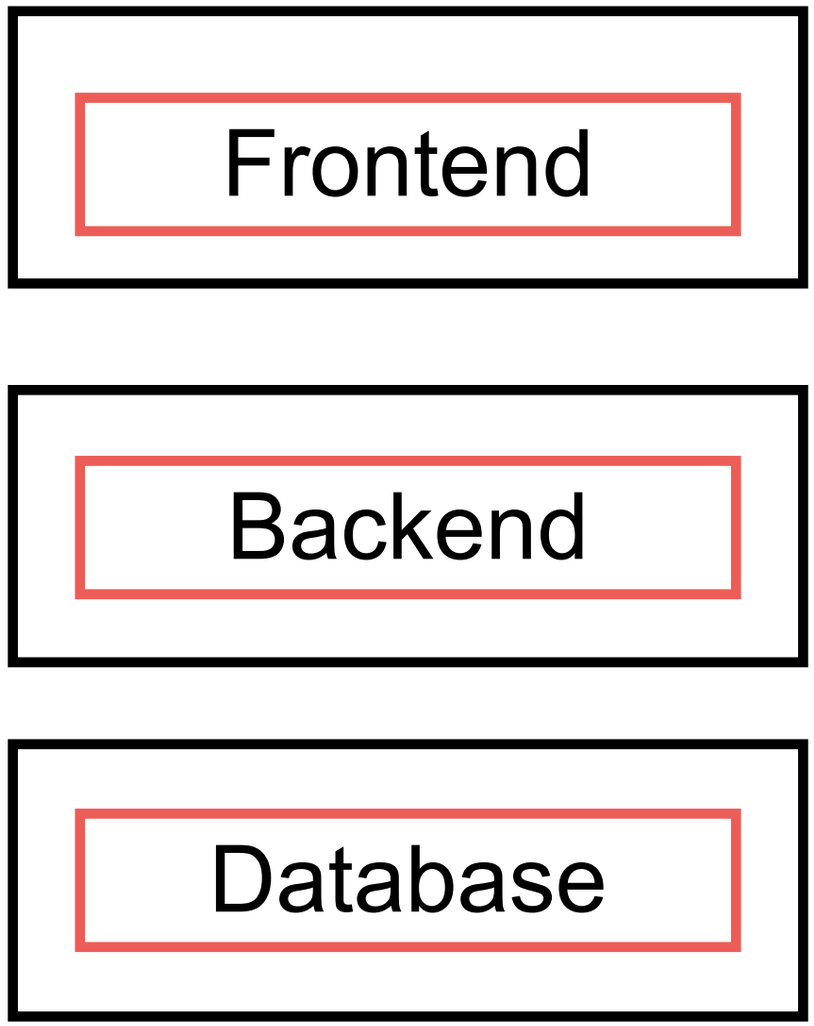

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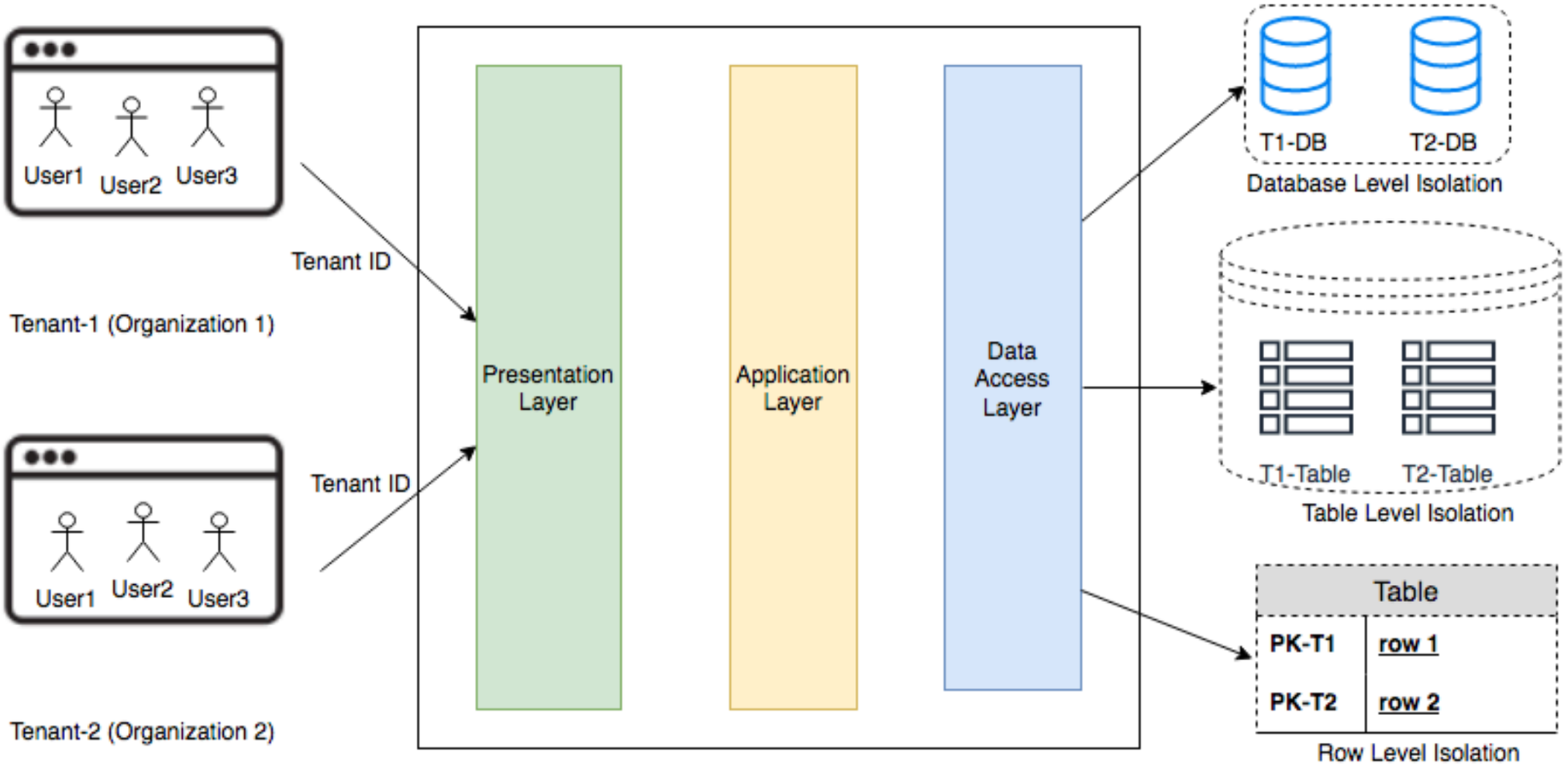
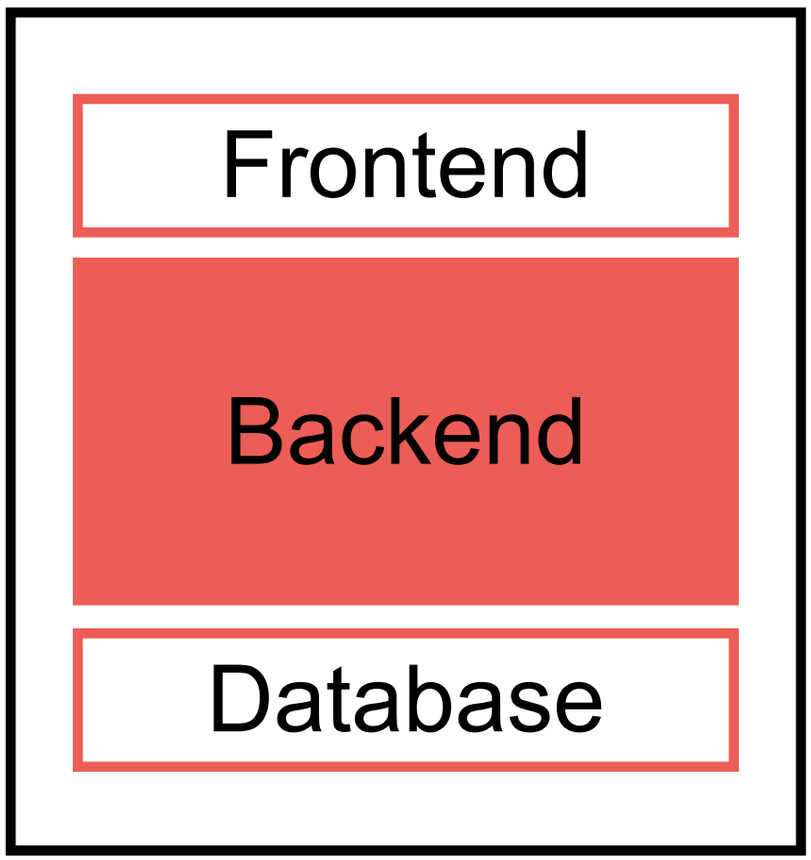
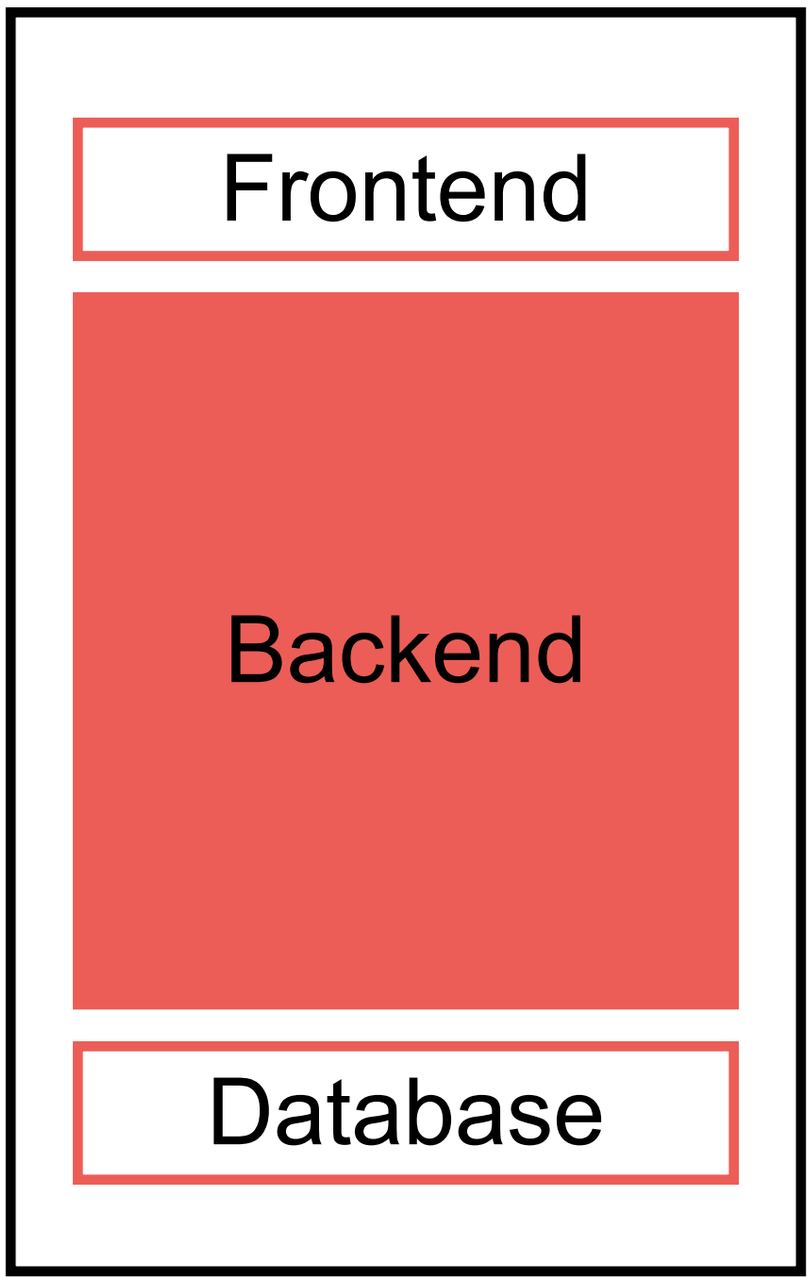


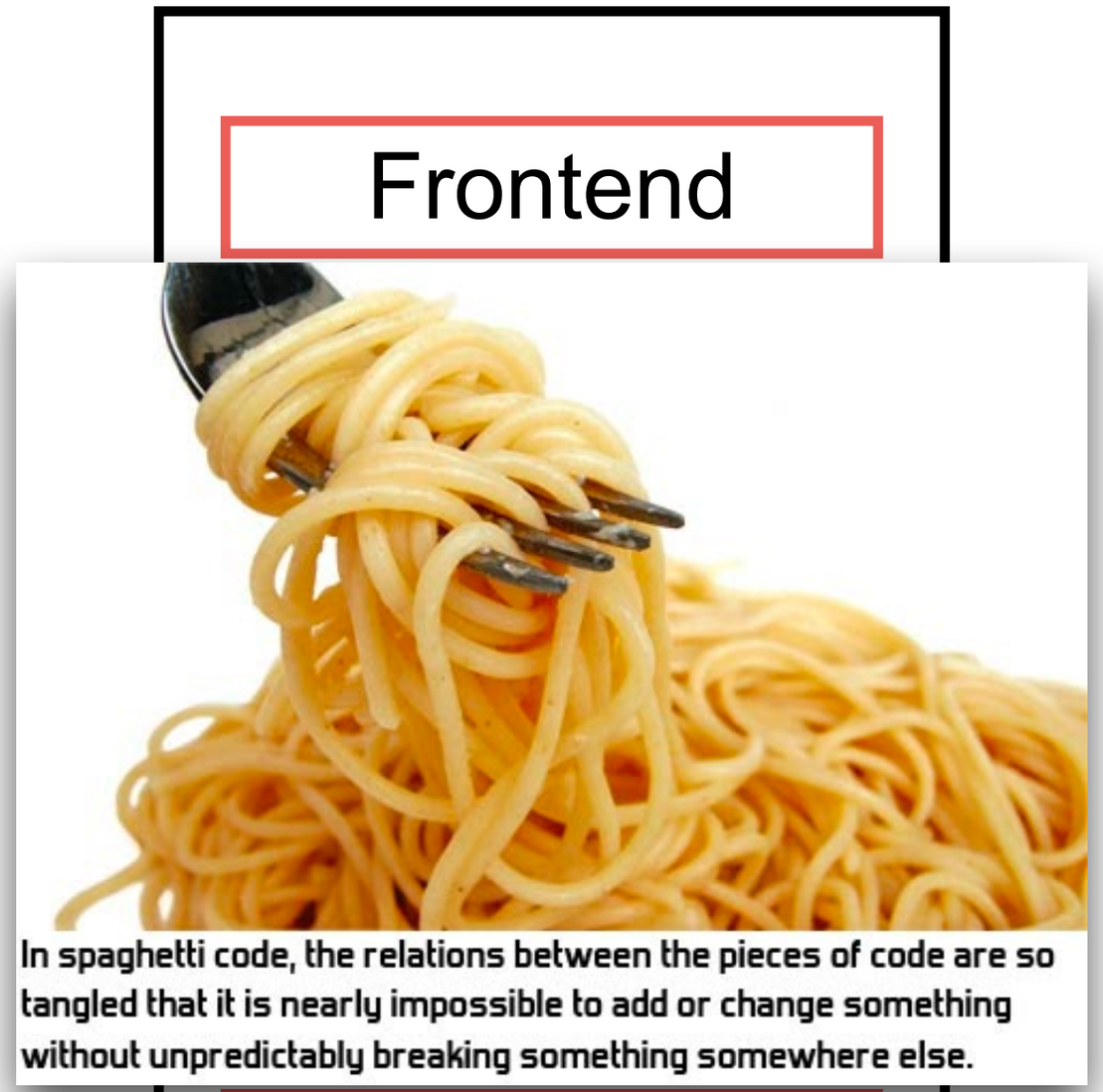
# More features ...



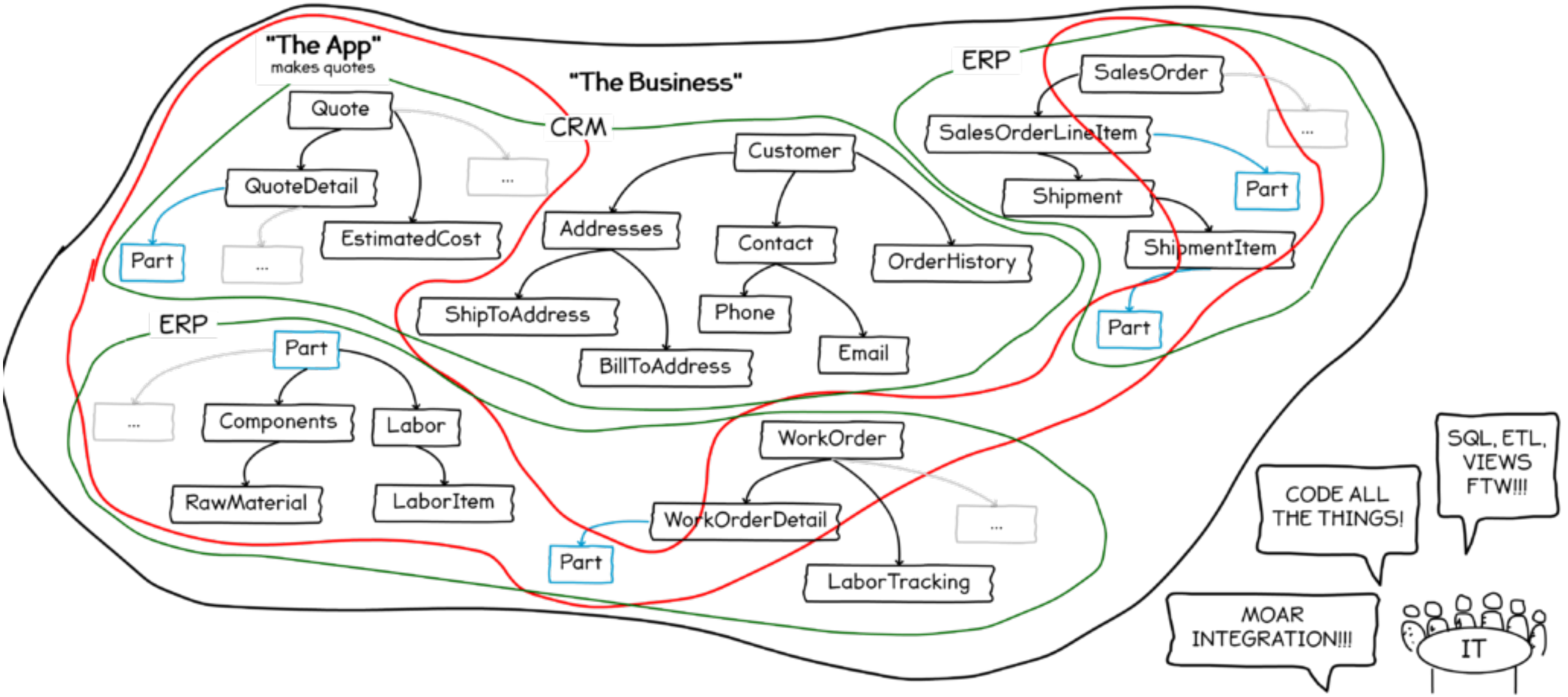
# More features ...



# More features …



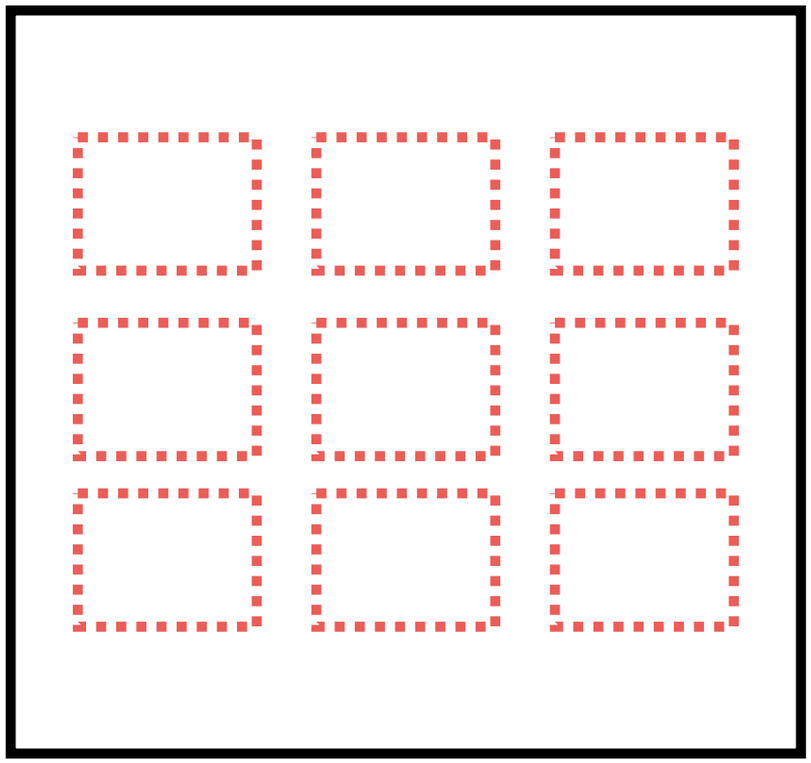
# Monolith Hell



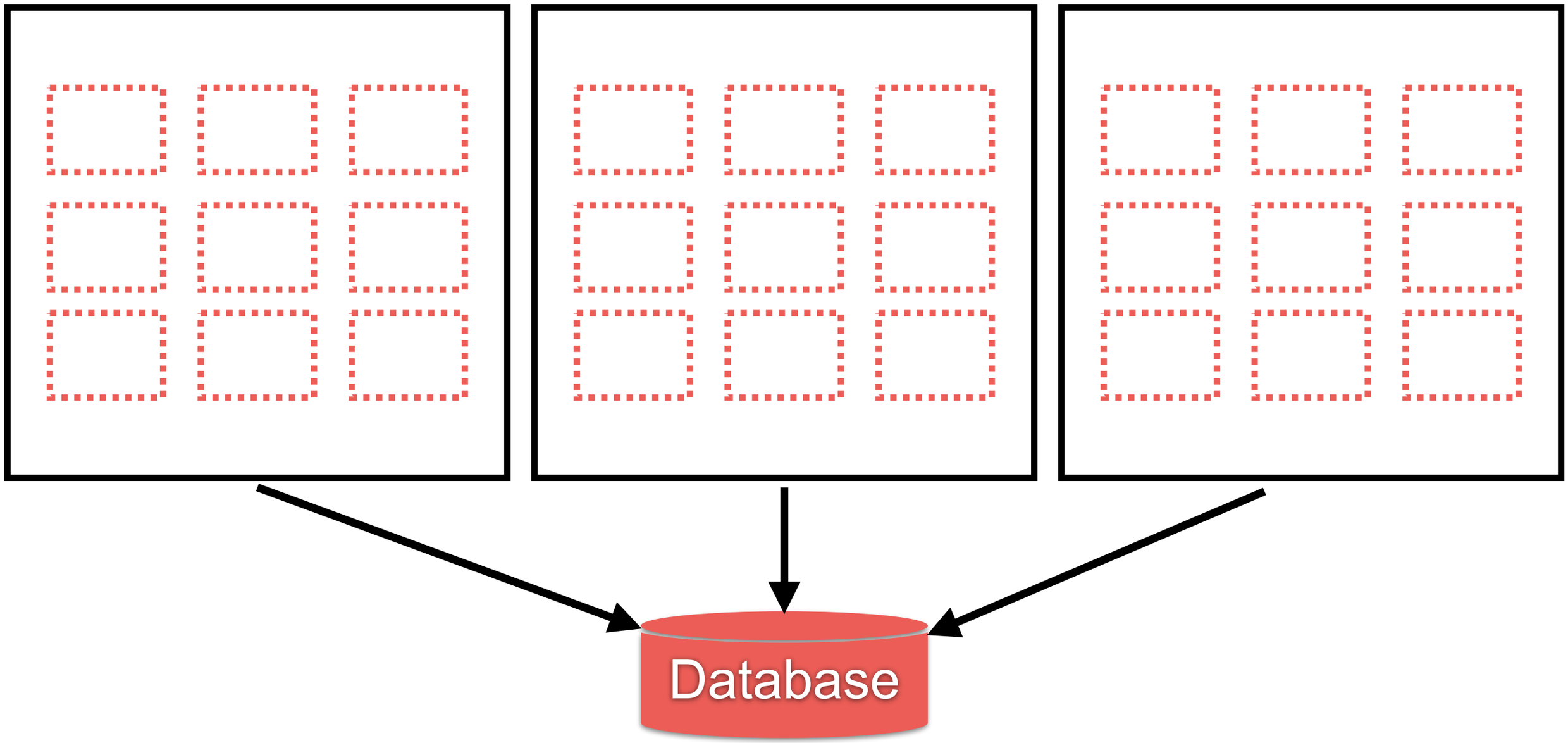
# We need to improve

# We need to get better

# Modules



# How to scale services ?



# What happens when we need more servers ?

# What if we don’t use all modules equally ?

# How can we update individual models/database ?

# Do all modules need to use the same Database, Language and Runtime … ?

# We need to improve

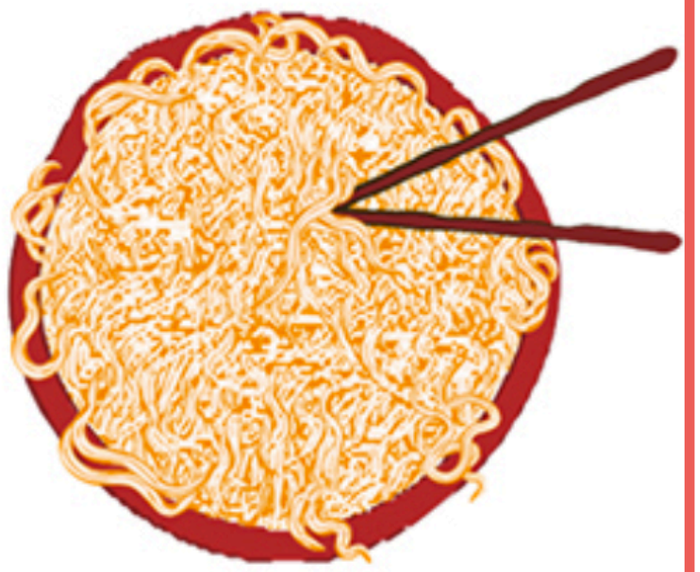
# We need to get better

# Service-Oriented Architecture

# SOA

**1990s and earlier**

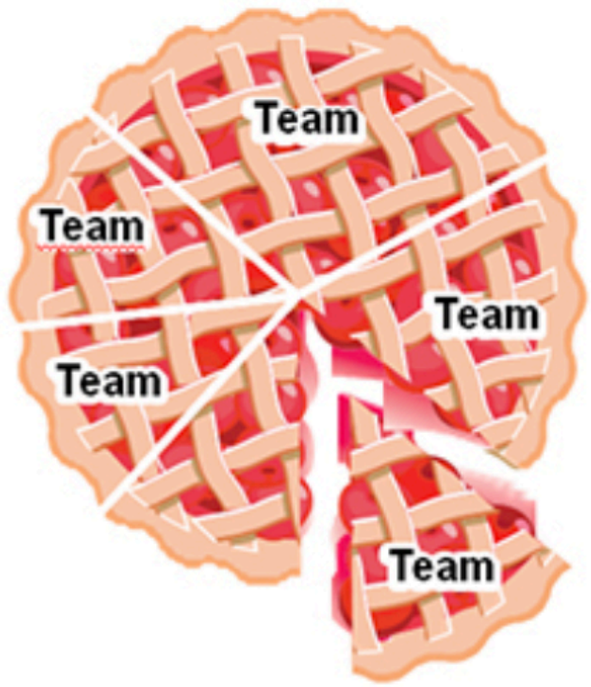
Pre-SOA (monolithic)
Tight coupling



For a monolith to change, all must agree on each change. Each change has unanticipated effects requiring careful testing beforehand.

**2000s**

Traditional SOA
Looser coupling



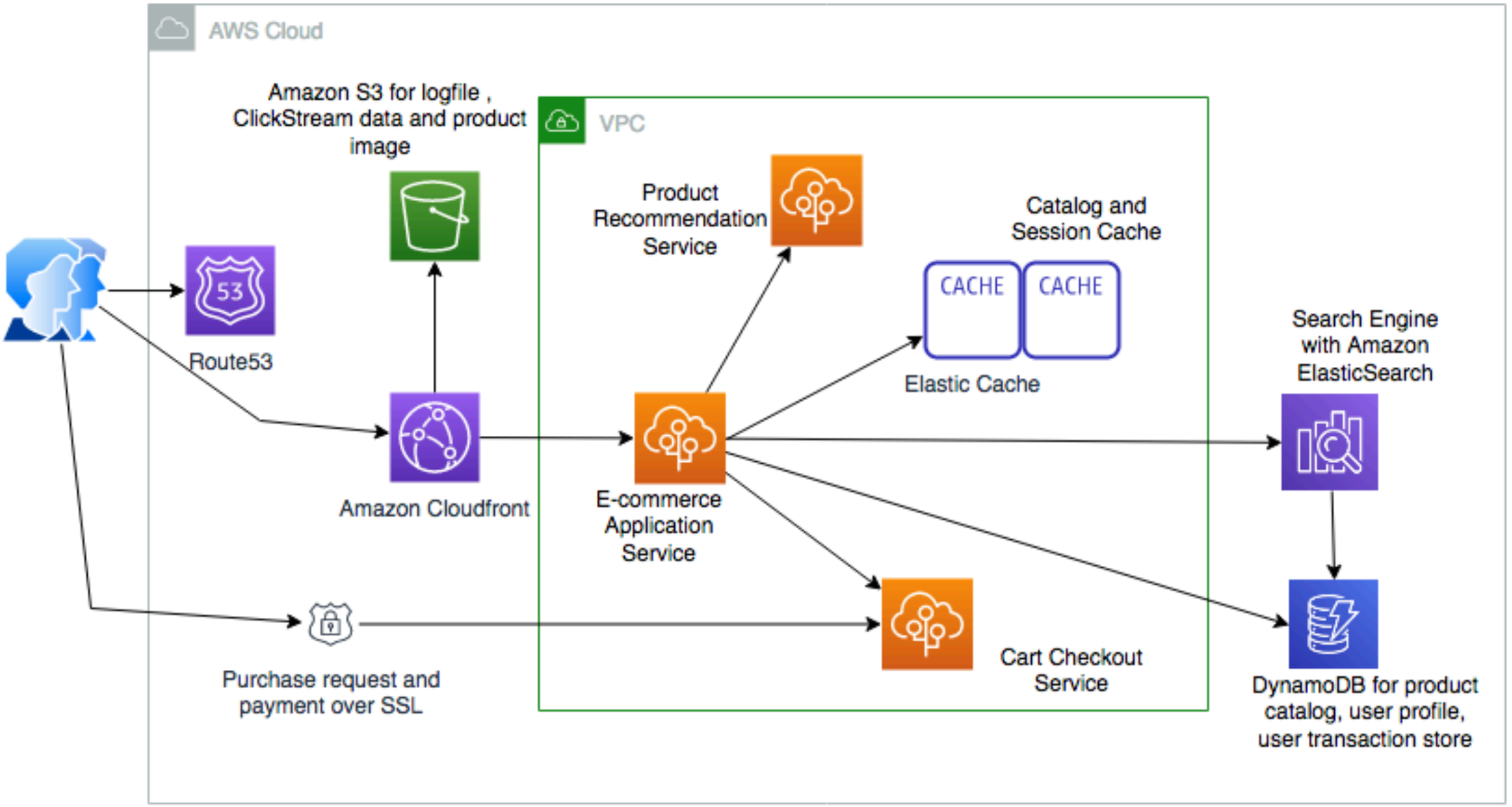

Elements in SOA are developed more autonomously but must be coordinated with others to fit into the overall design.

**2010s**

Microservices
Decoupled

Developers can create and activate new microservices without prior coordination with others. Their adherence to MSA principles makes continuous delivery of new or modified services possible.

# SOA

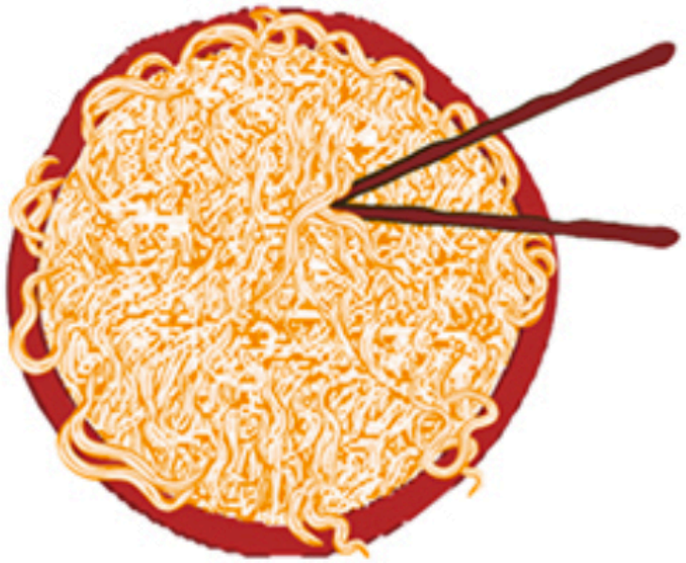


# Microservices

# Microservices

**1990s and earlier**

Pre-SOA (monolithic)
Tight coupling



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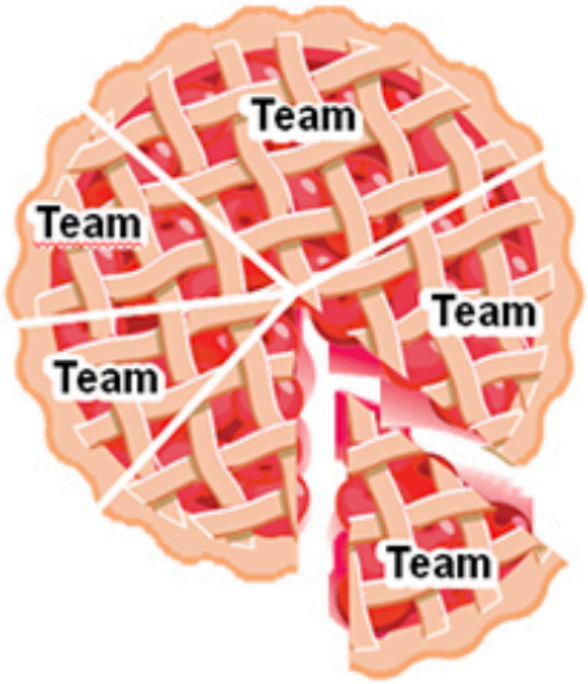
Traditional SOA
Looser coupling




Elements in SOA are developed more autonomously but must be coordinated with others to fit into the overall design.

**2010s**

Microservices
Decoupled

Developers can create and activate new microservices without prior coordination with others. Their adherence to MSA principles makes continuous delivery of new or modified services possible.

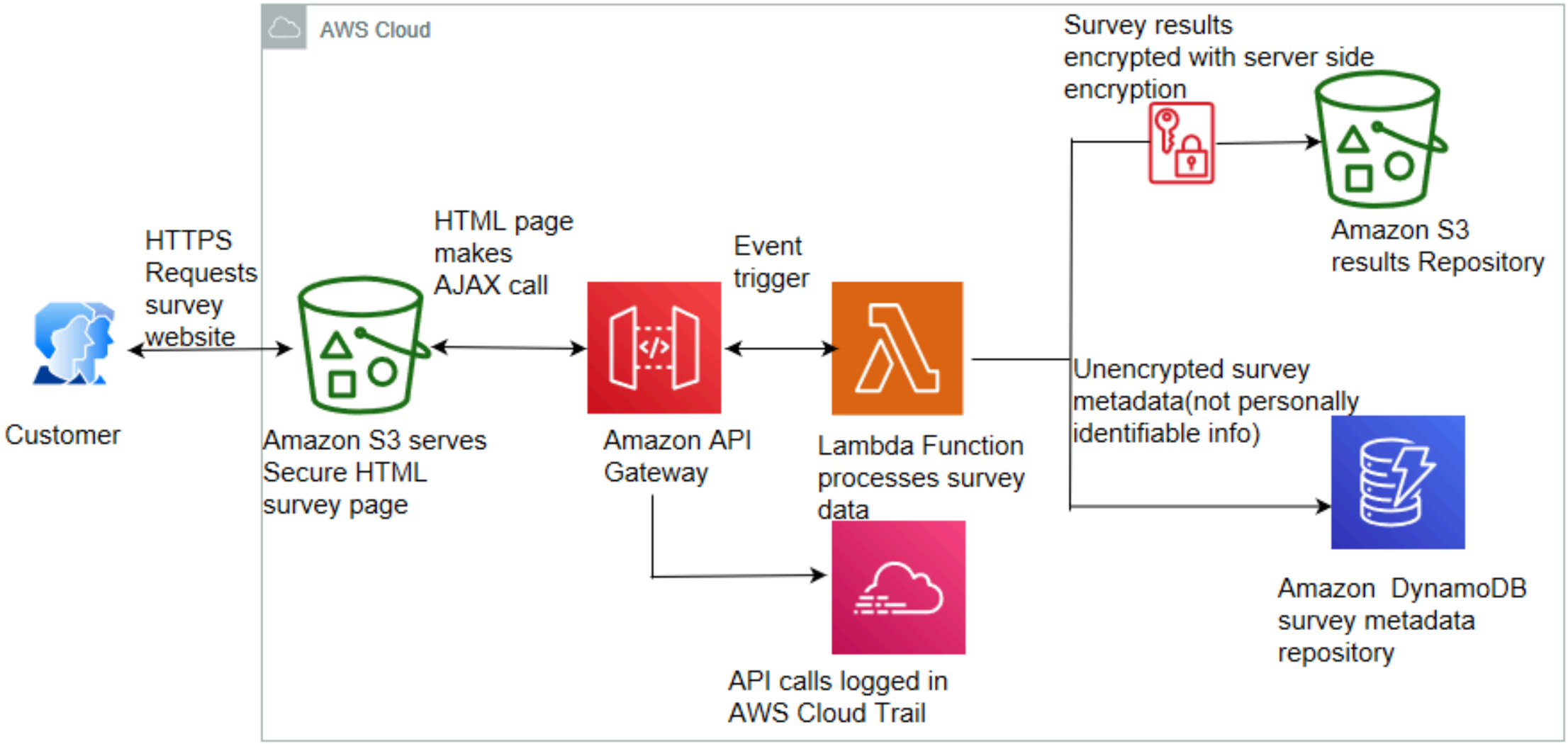
# What is service ?

Standalone and loosely couple
Independently deployable software component
Implement some useful functionality

# Serverless

# Function as a Service

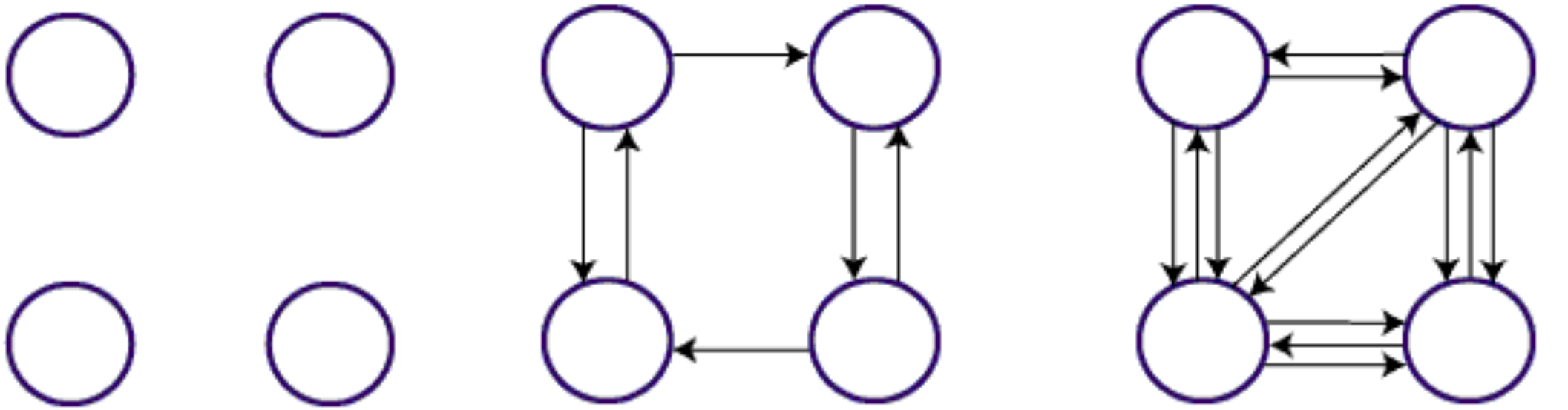
# Serverless



# Think about

# Loosely couple architecture

# Types of coupling



Uncoupled: no dependencies

(a)

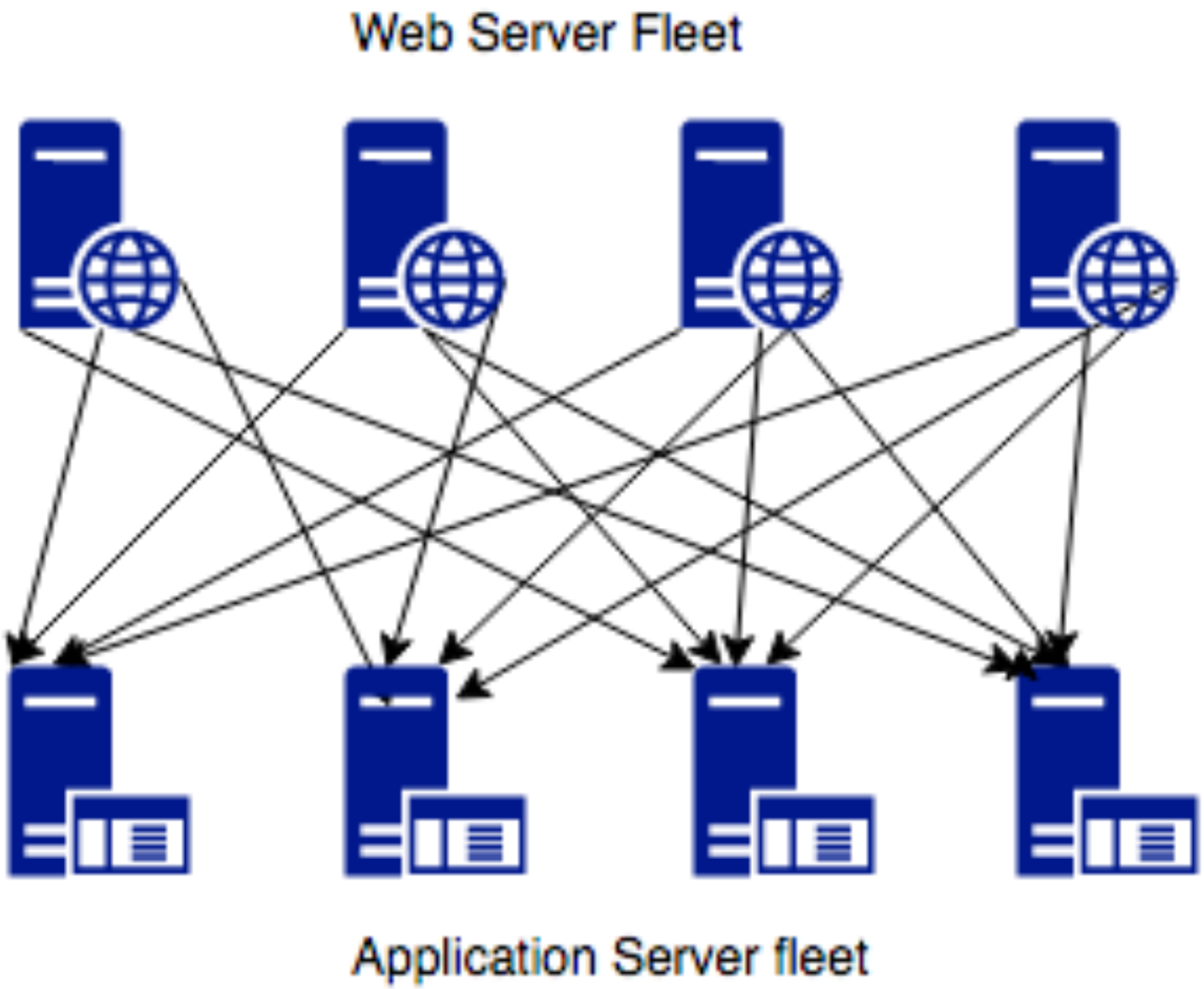
Loosely Coupled: Some dependencies

(b)

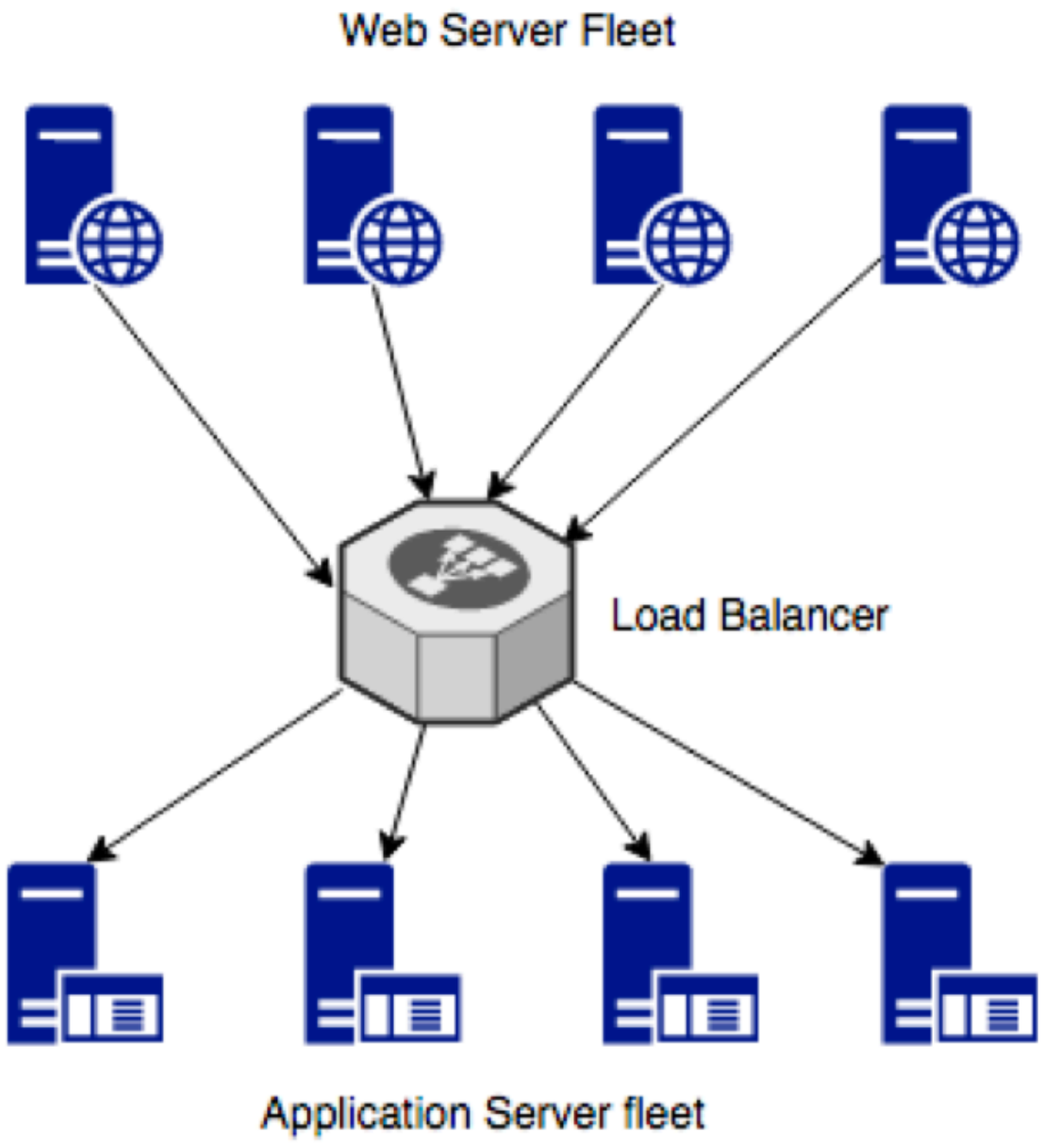
Highly Coupled: Many dependencies

(c)

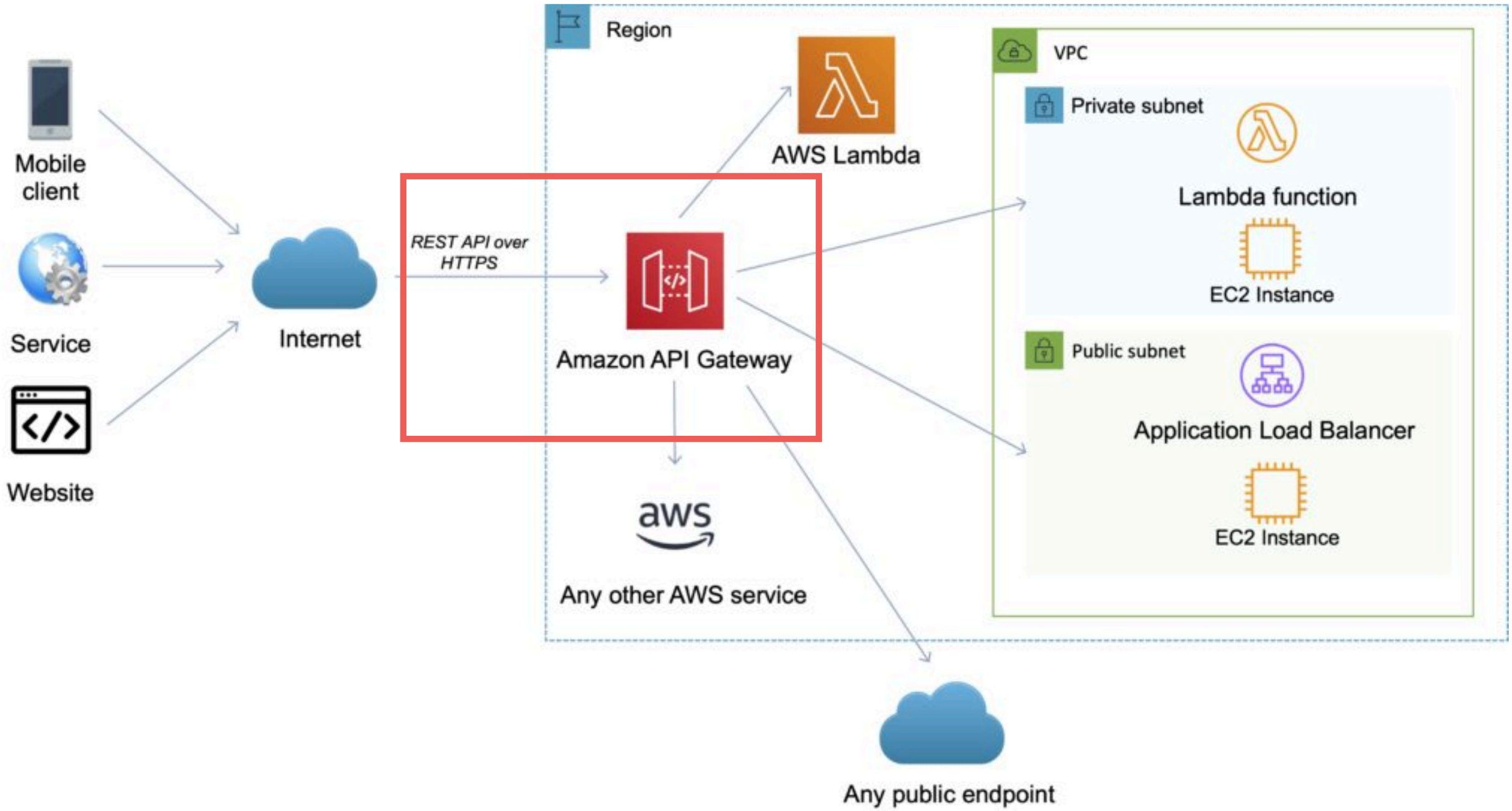
# Tight coupling



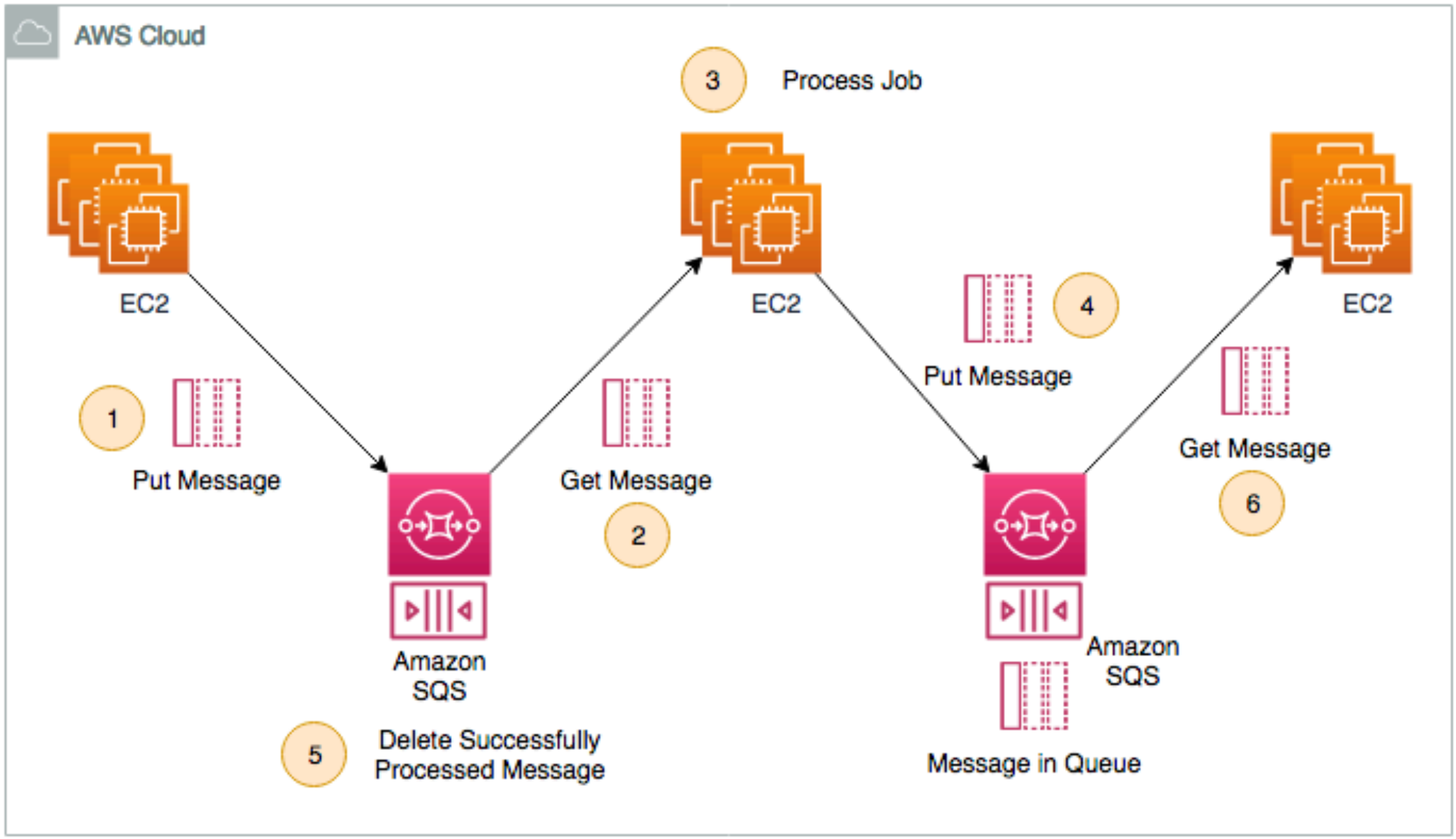
# Load balance



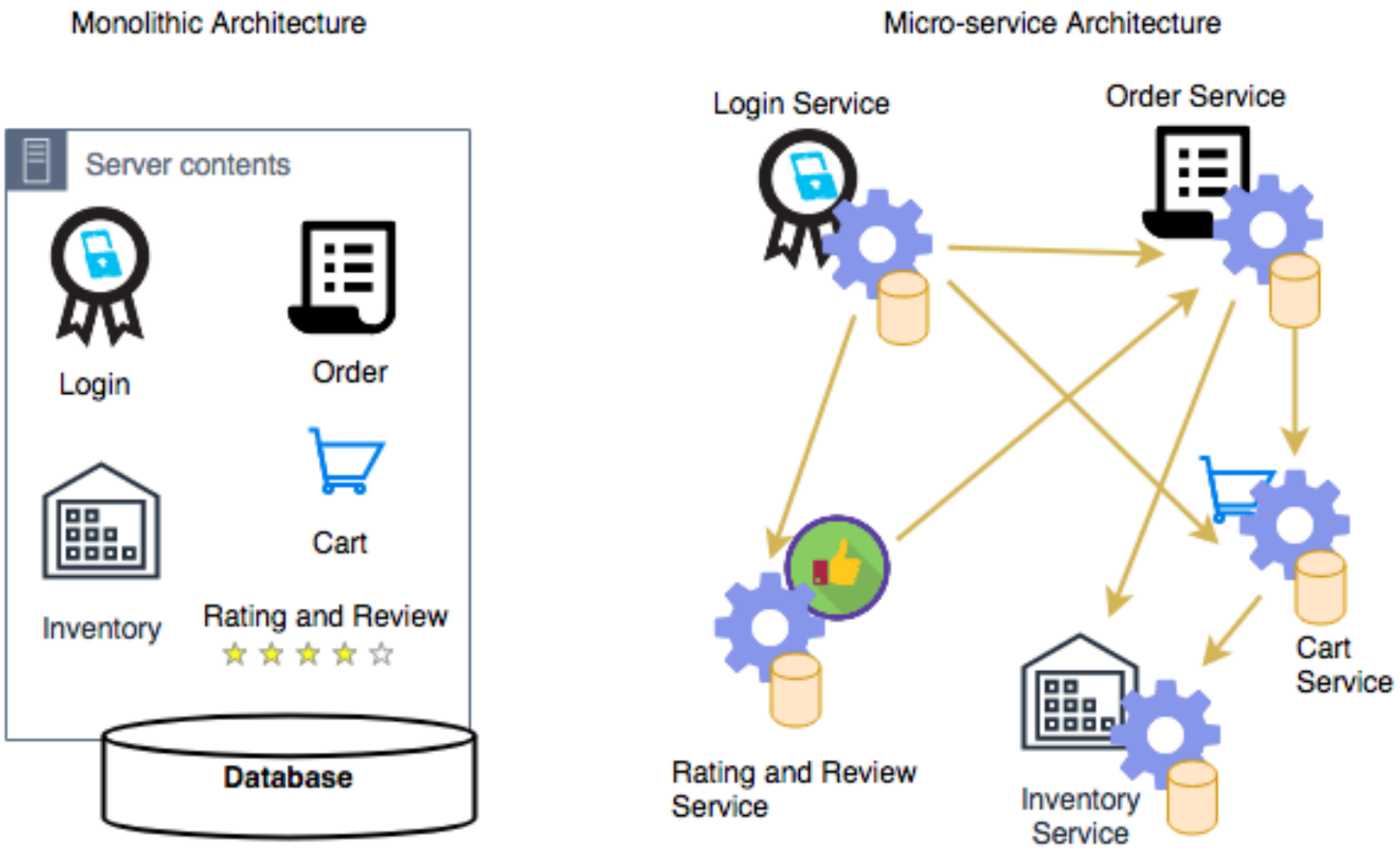
# API gateway



# Messaging :: Queue



# Microservices



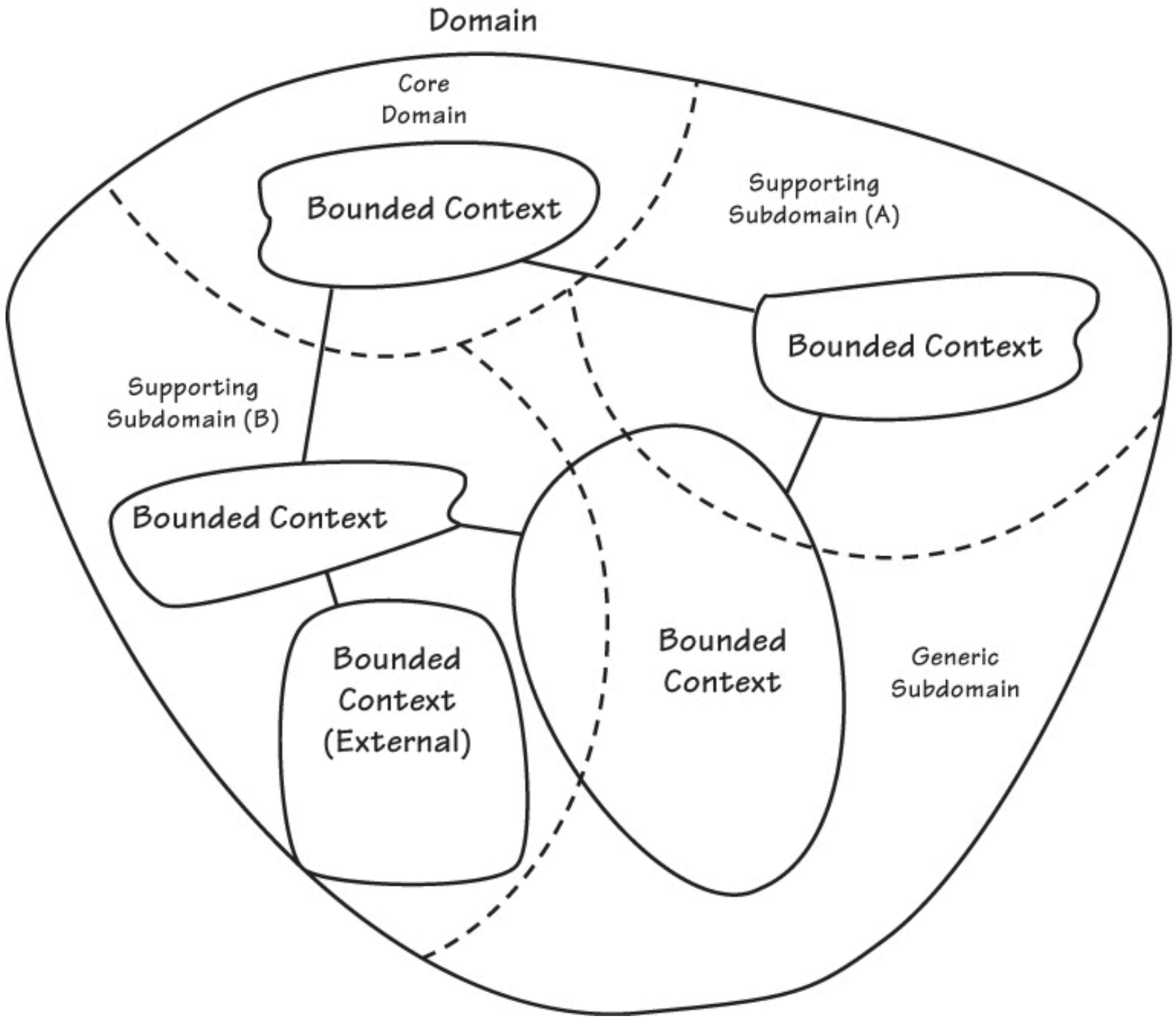
# Caching ?

Solution Architecture Layers

| | |
|---|---|
| Client Side (Mobile and Desktop) | Fast retrieval of web content from websites using HTTP Cache Headers, Browsers |
| Internet (Domain Name Server - DNS) | Fast Domain to IP Resolution from DNS Server |
| Web Content (Web Layer) | Fast retrieval of web content from web servers and manage web sessions at server side |
| Application (App Layer) | Improve application performance and data access with Key/Value data stores and local caches |
| Database (DB Layer) | Reduce latency associated with database query requests using database buffers and Key/Value data stores |

# Strategic Design

# Subdomain in DDD

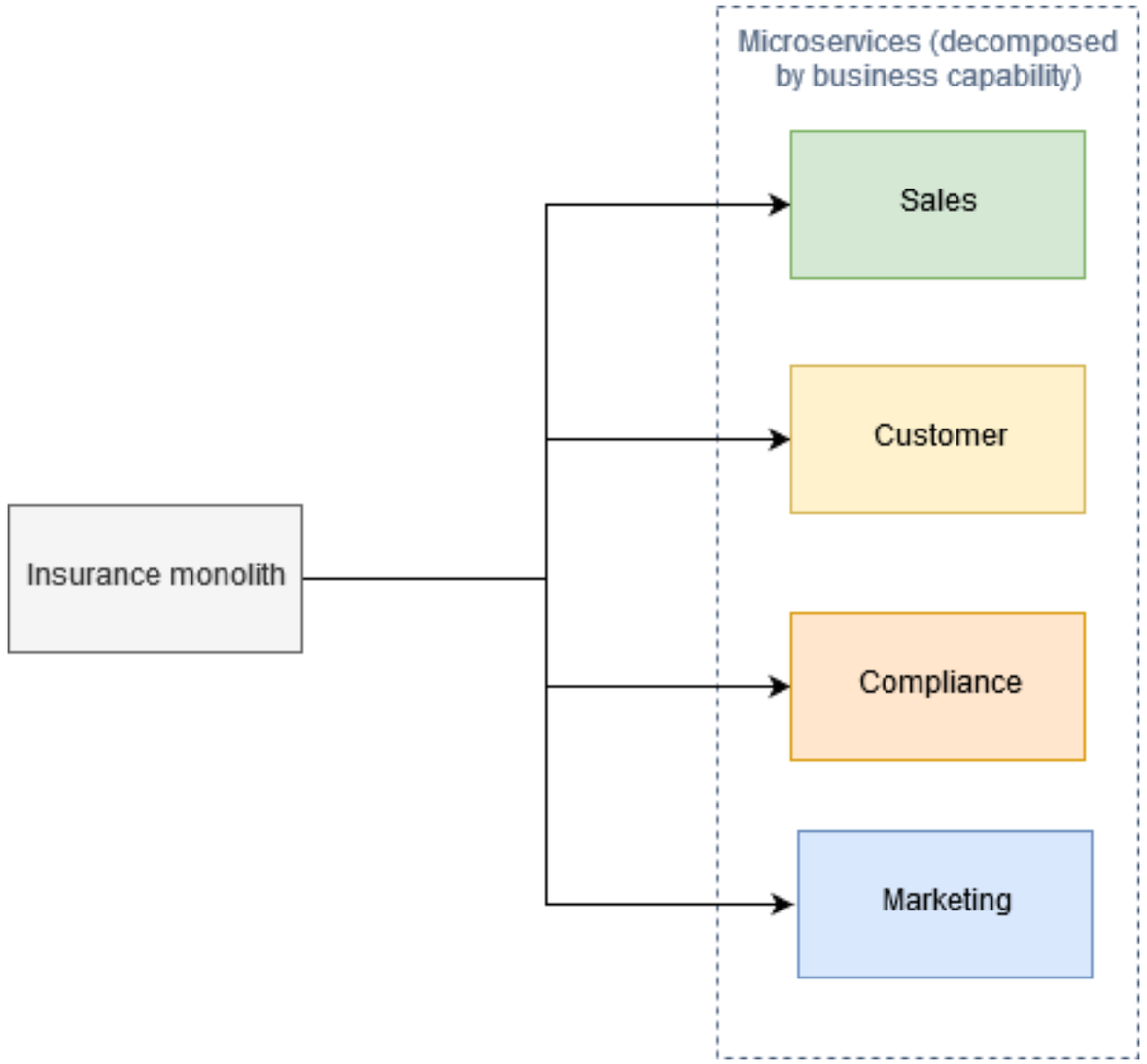


# Domain in DDD

Core domain
Supporting subdomain
Generic subdomain

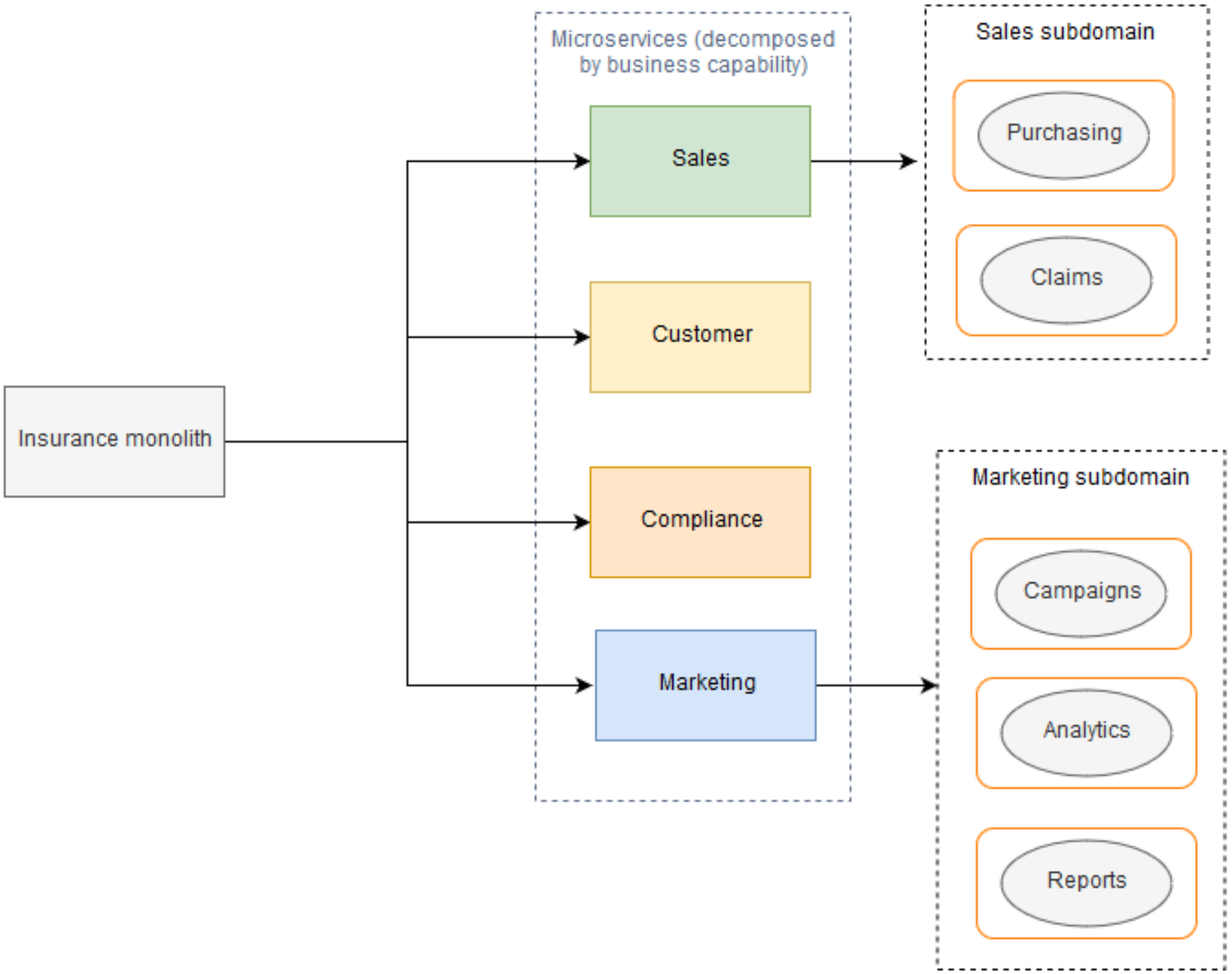
# Decoupling from Monolith

# Decompose by Business

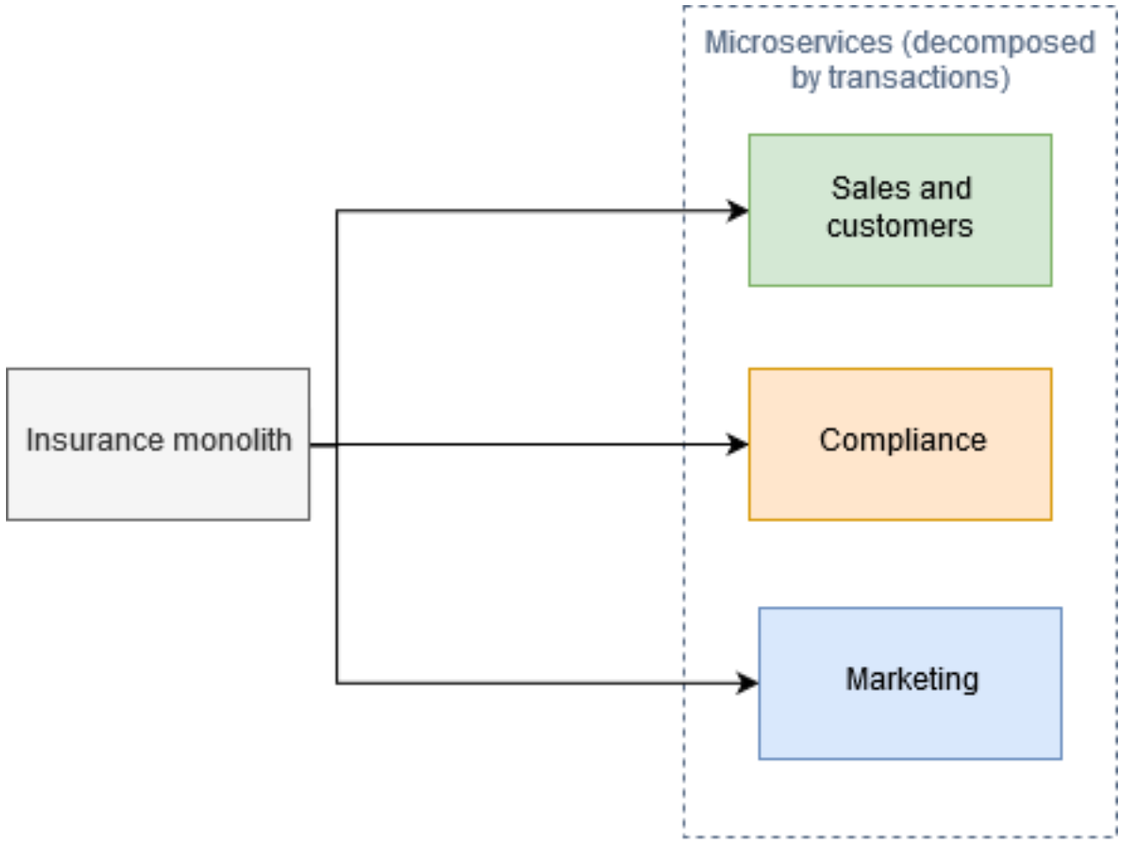



https://docs.aws.amazon.com/prescriptive-guidance/latest/modernization-decomposing-monoliths/decomposing-patterns.html

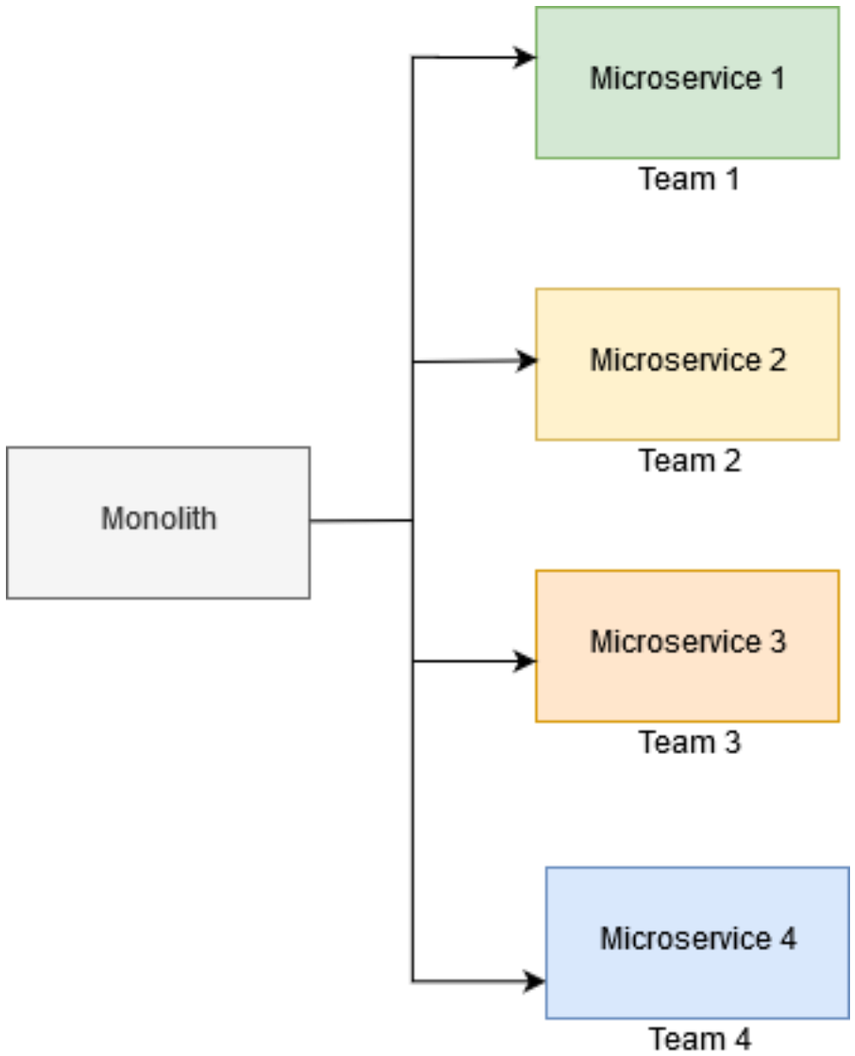
# Decompose by Subdomain



# Decompose by Transaction

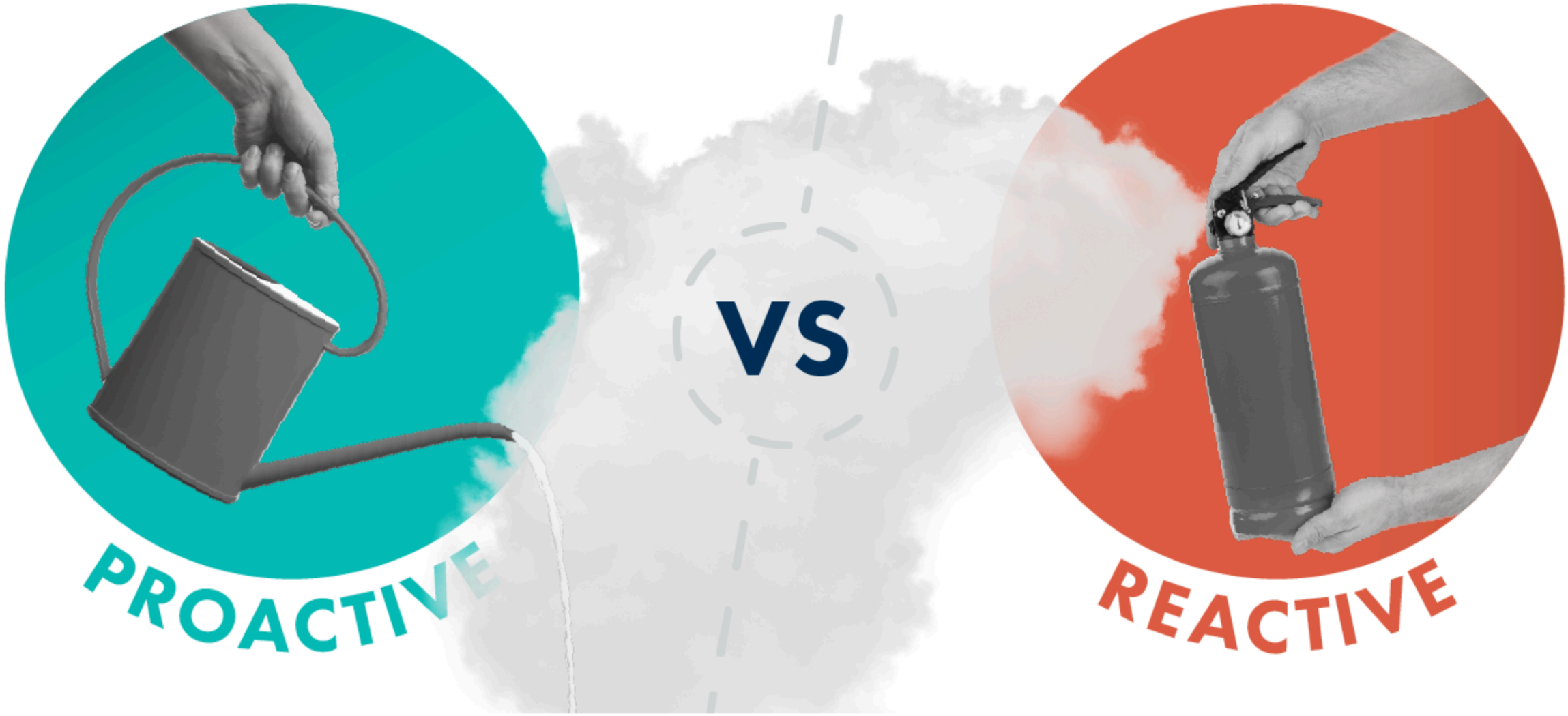


# Decompose by Team pattern



# Solution Architecture in Agile World

# Respond to change faster
# Need more flexible
# Working with stakeholder

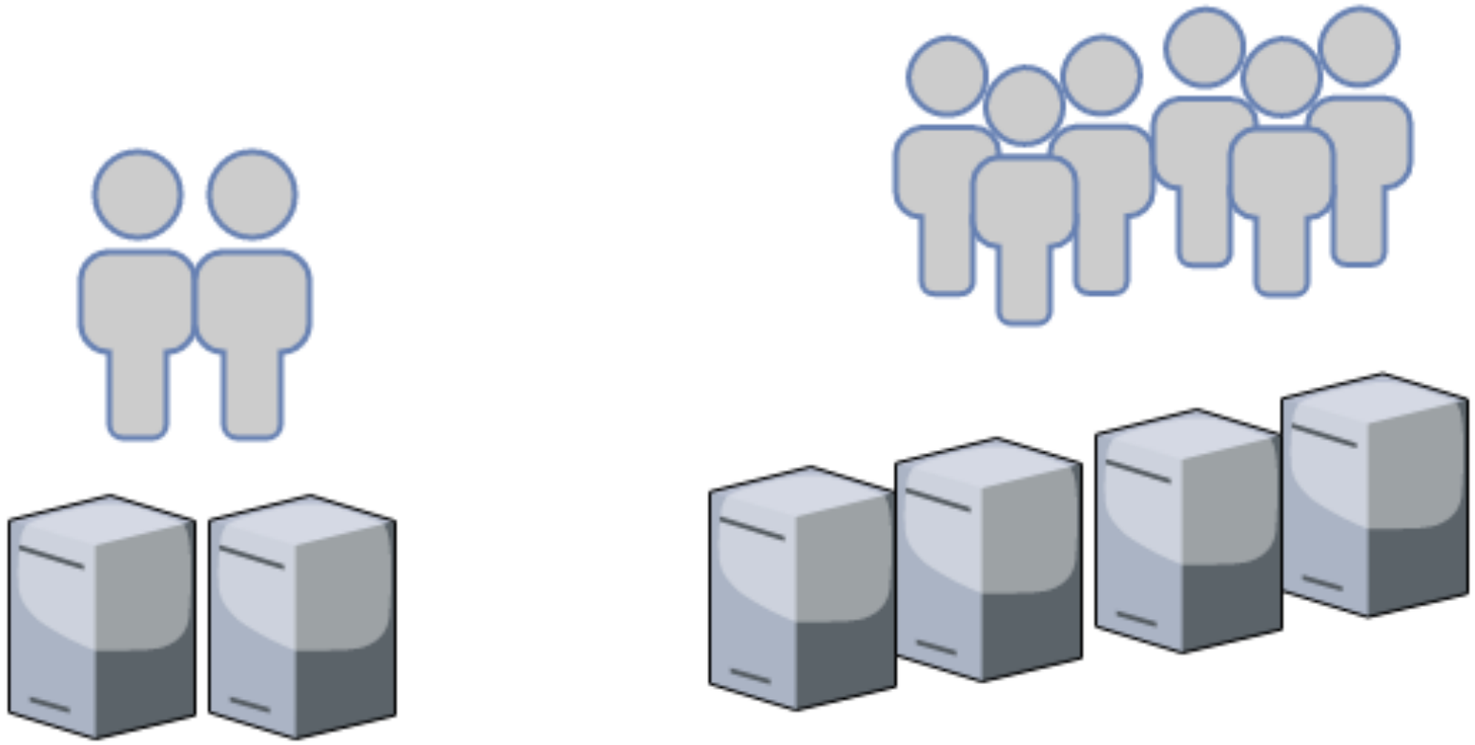


# Architecture Scaling

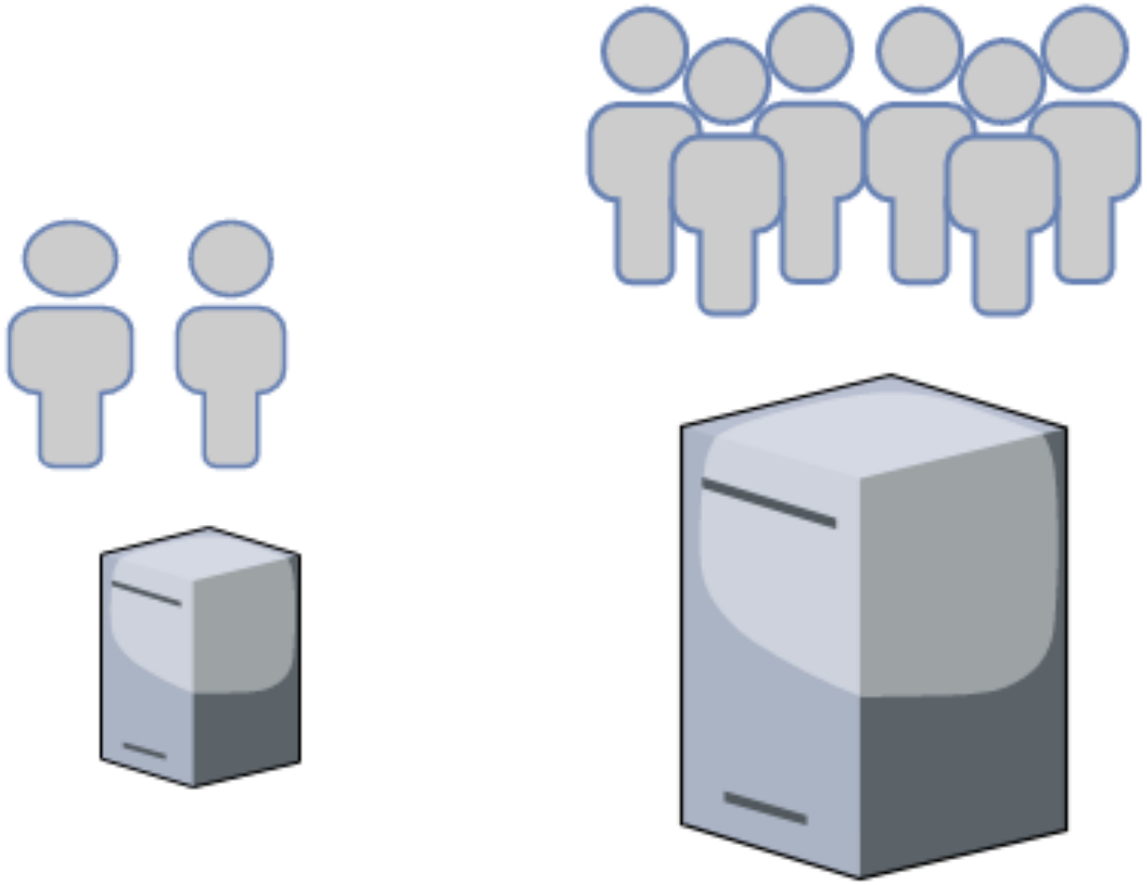
# Architecture Scaling

Horizontal
Vertical
Elastic

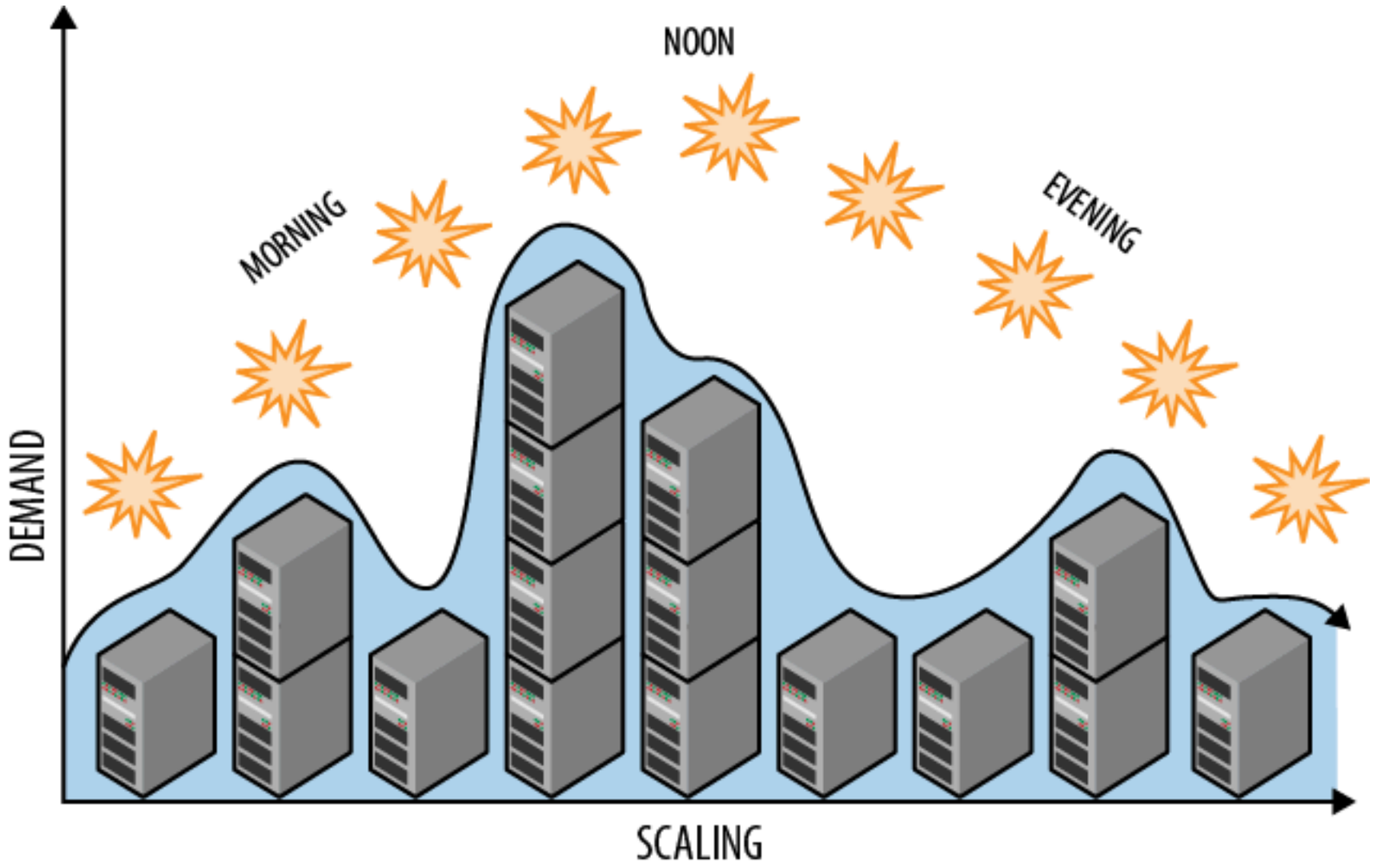
# Horizontal Scaling



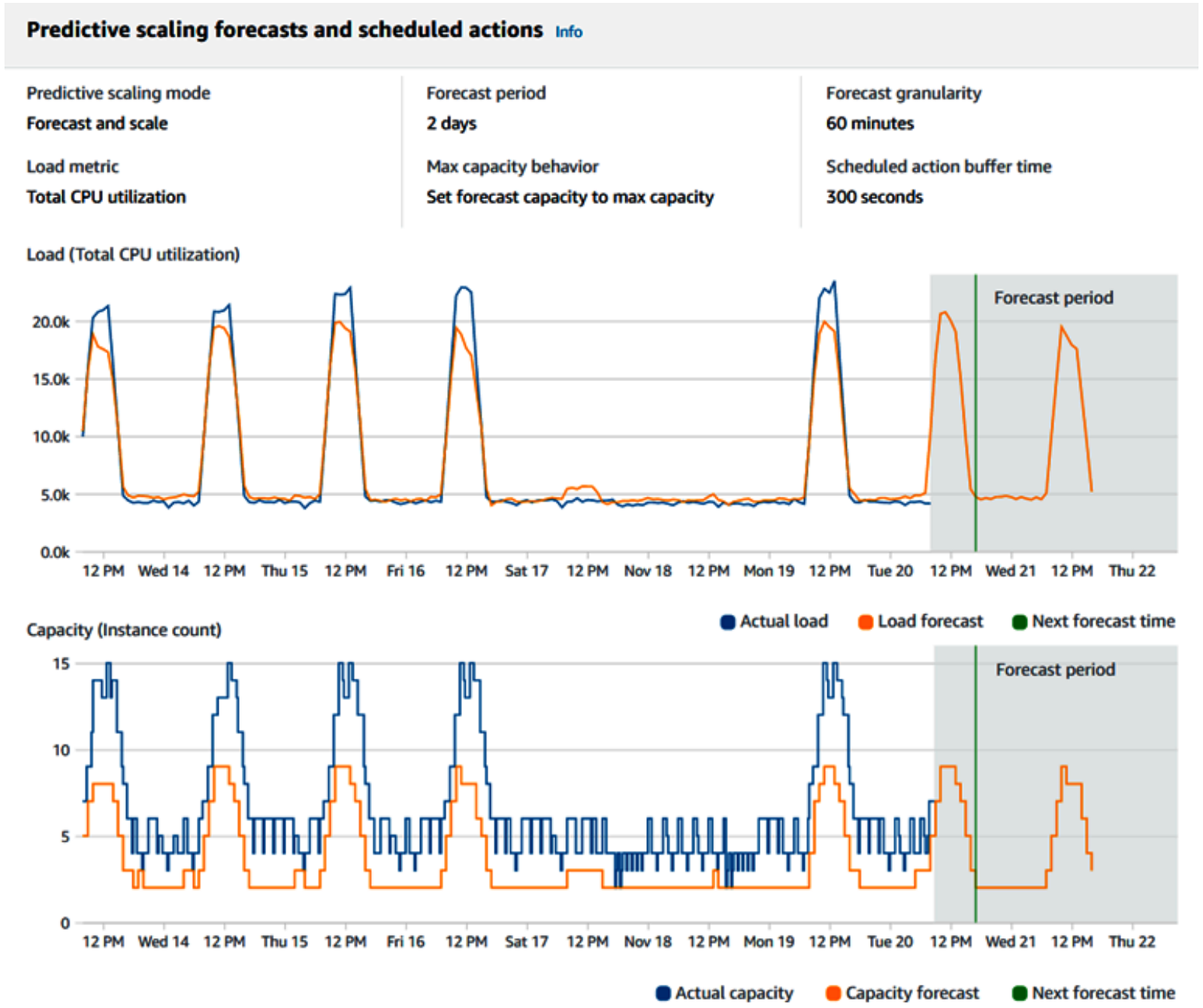
# Vertical Scaling



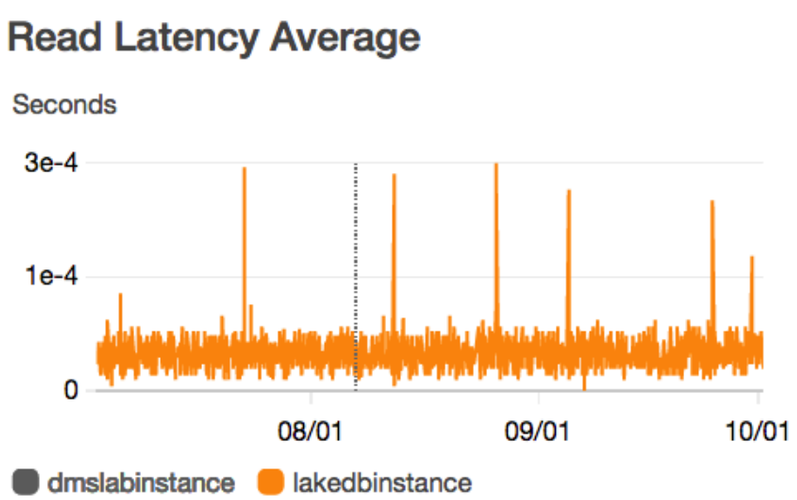
# Elastic Scaling

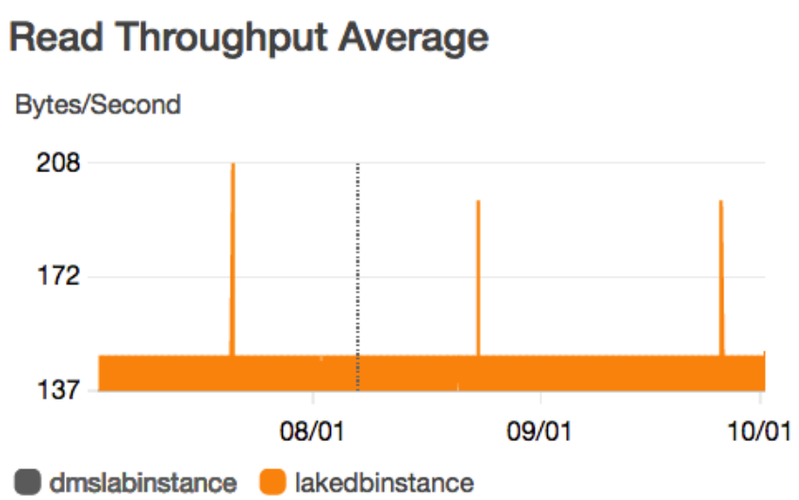


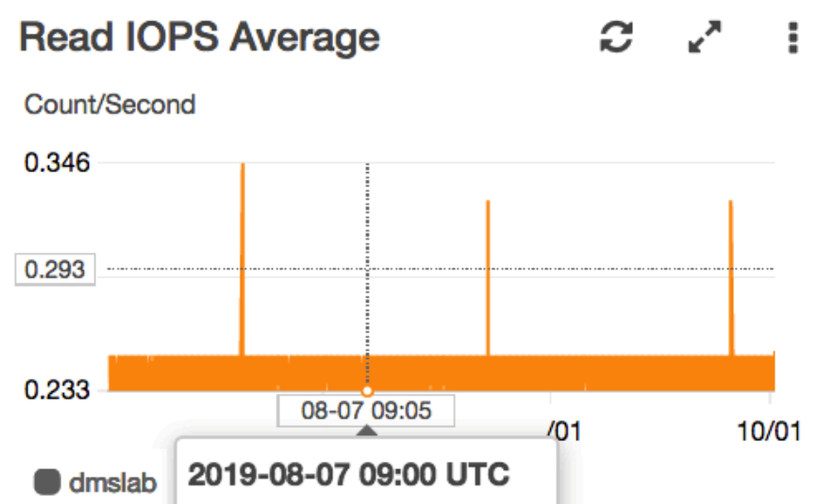
# Predictive Scaling ?

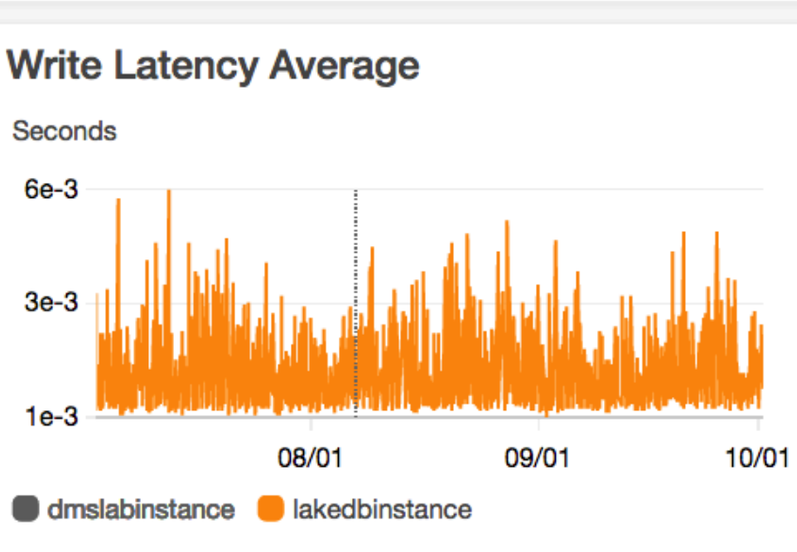


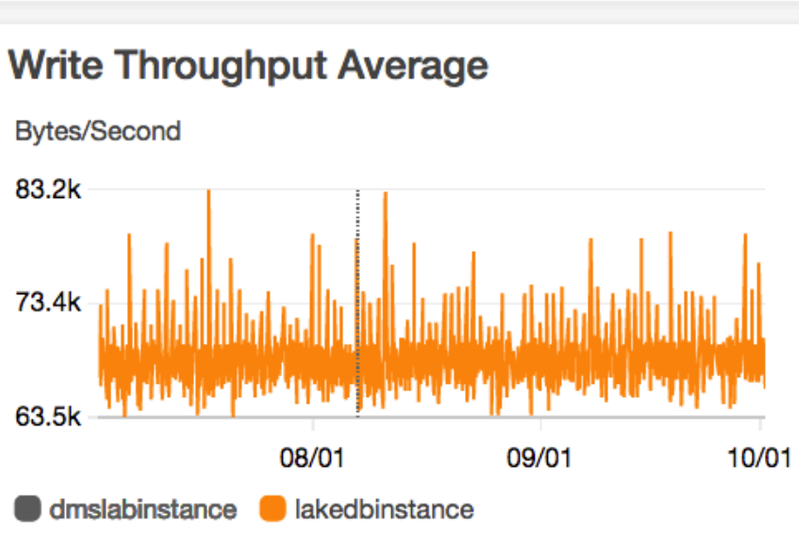
# Predictive Scaling ?

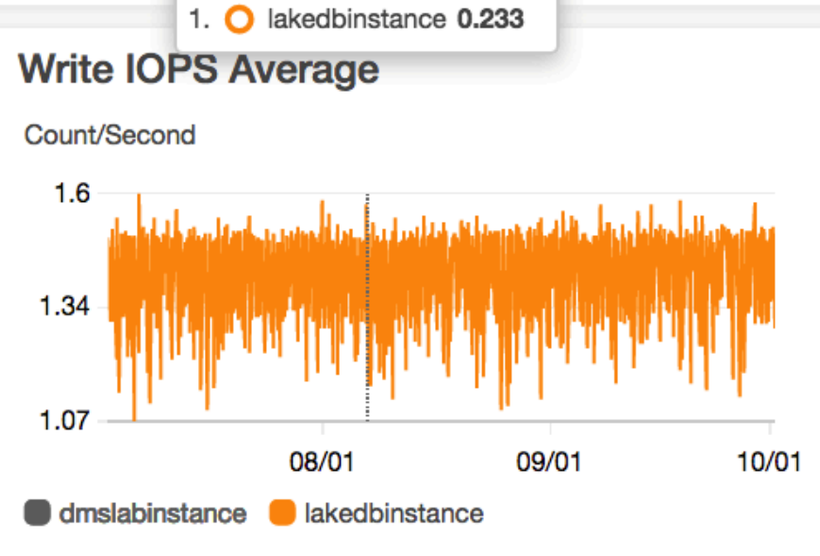


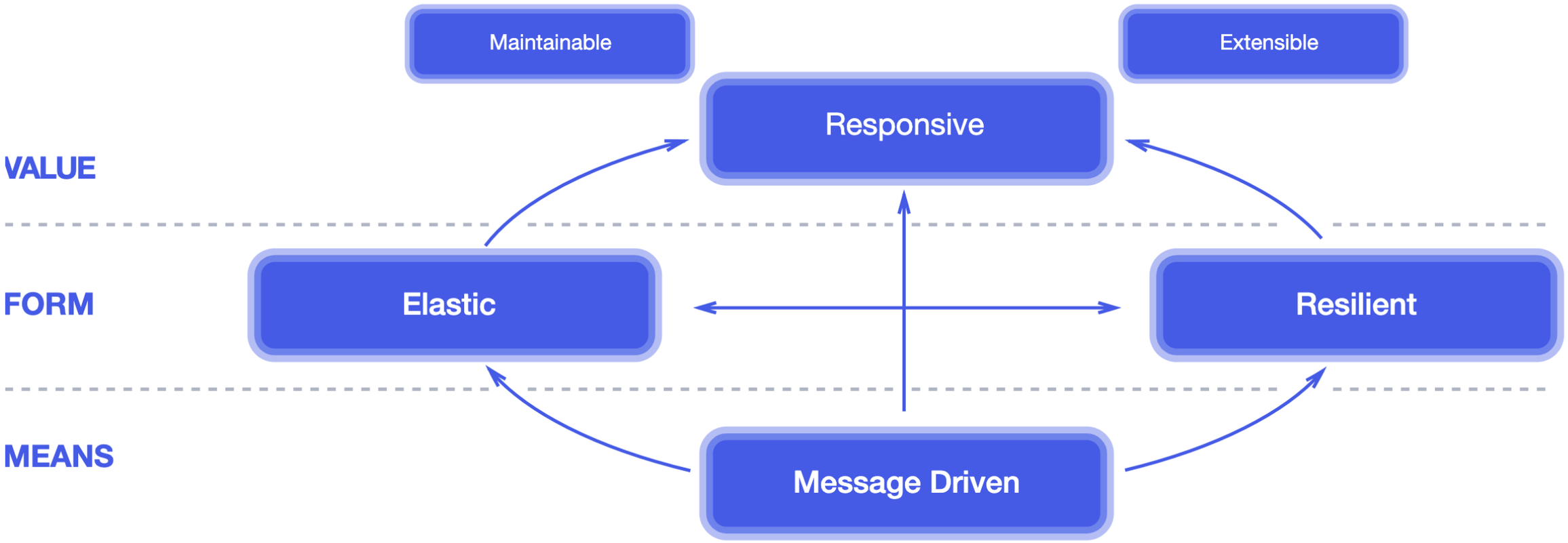



# Collect your data ?

# Predictive Scaling from Patterns

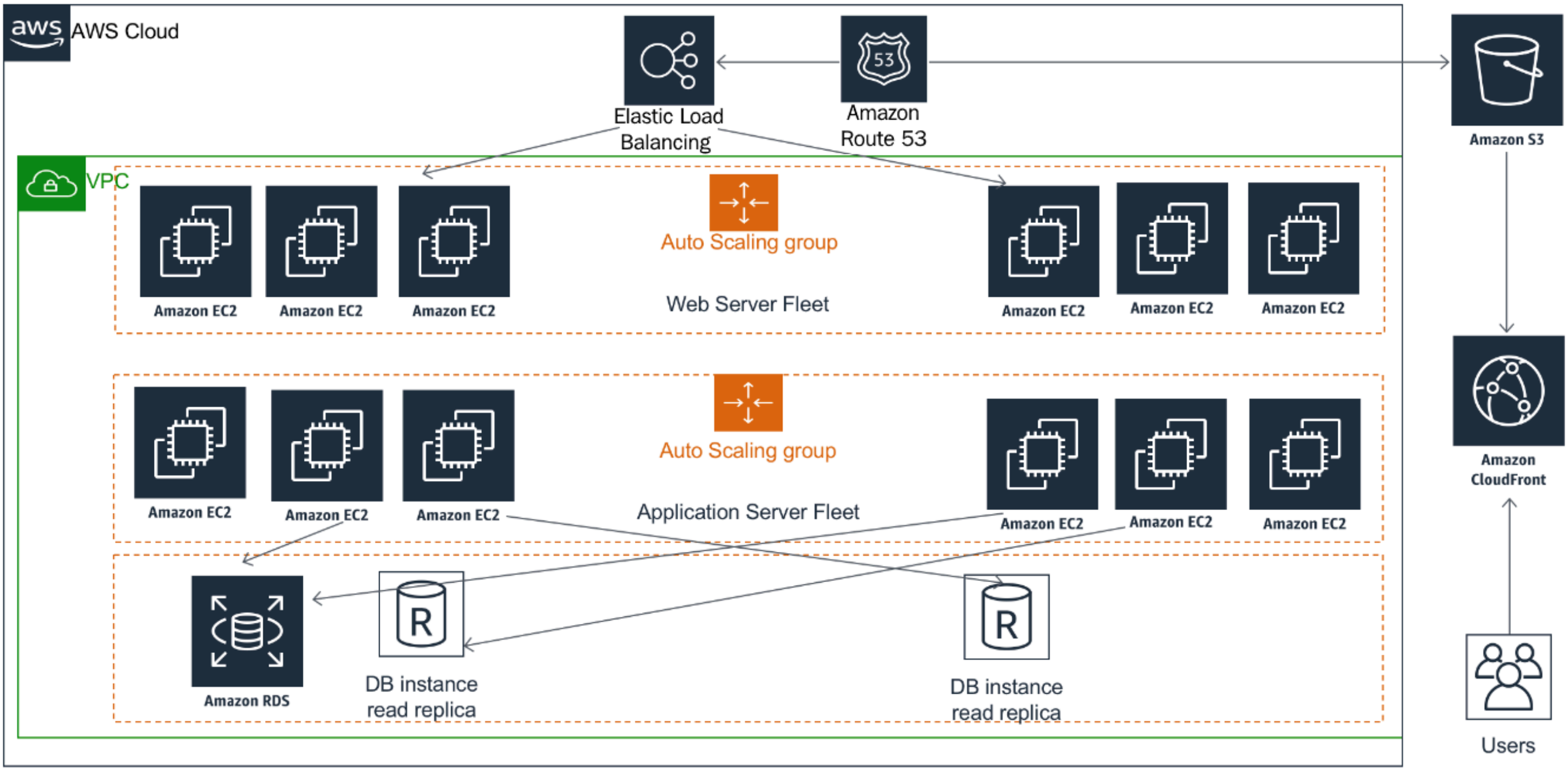
Weekend 5X than weekday ?
Daytime 10X that night time ?
Shopping season
Holiday
End of month
1st and 15th in every month

# Reactive Architecture

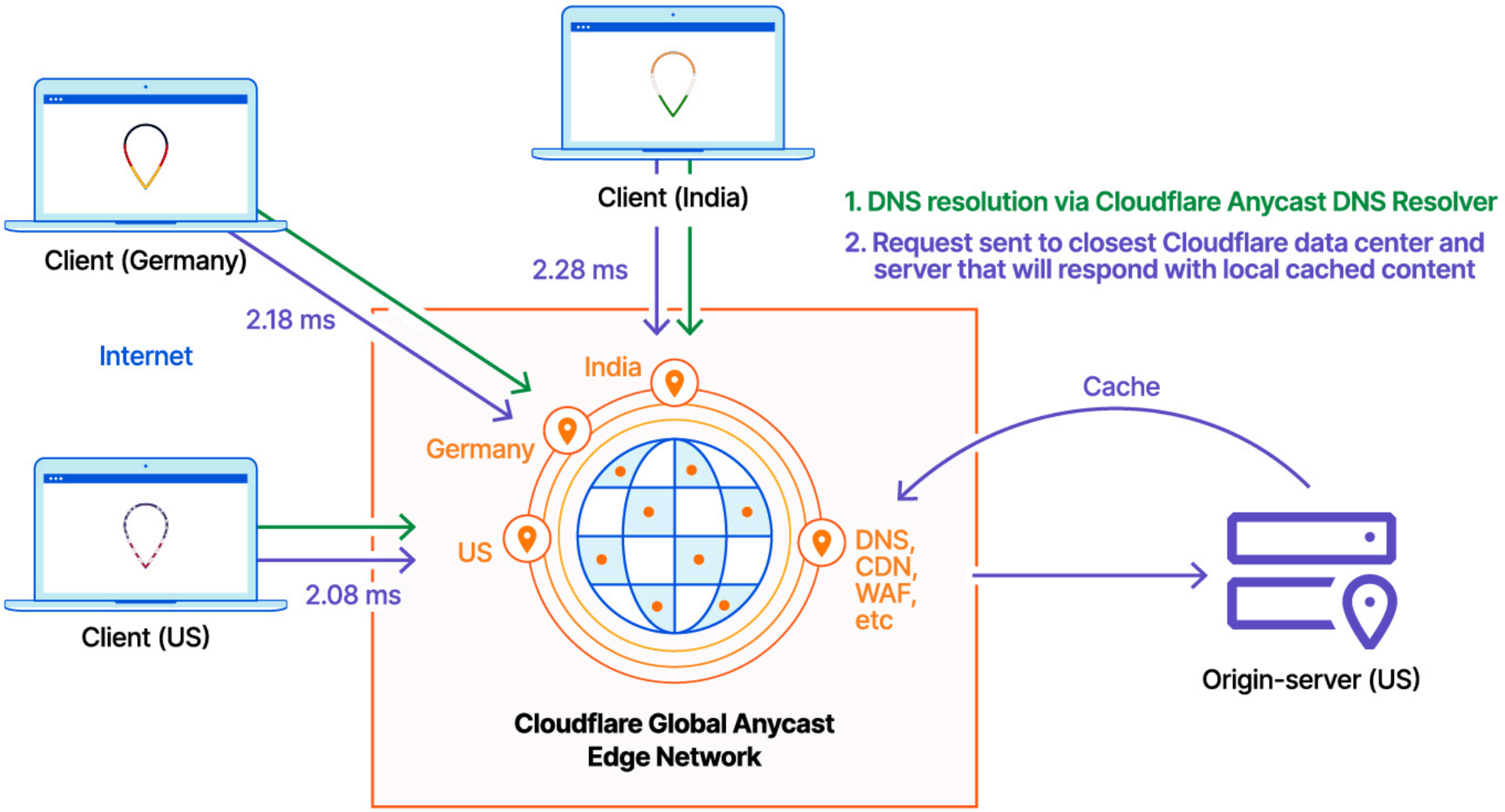



https://www.reactivemanifesto.org/

# Example :: Solution

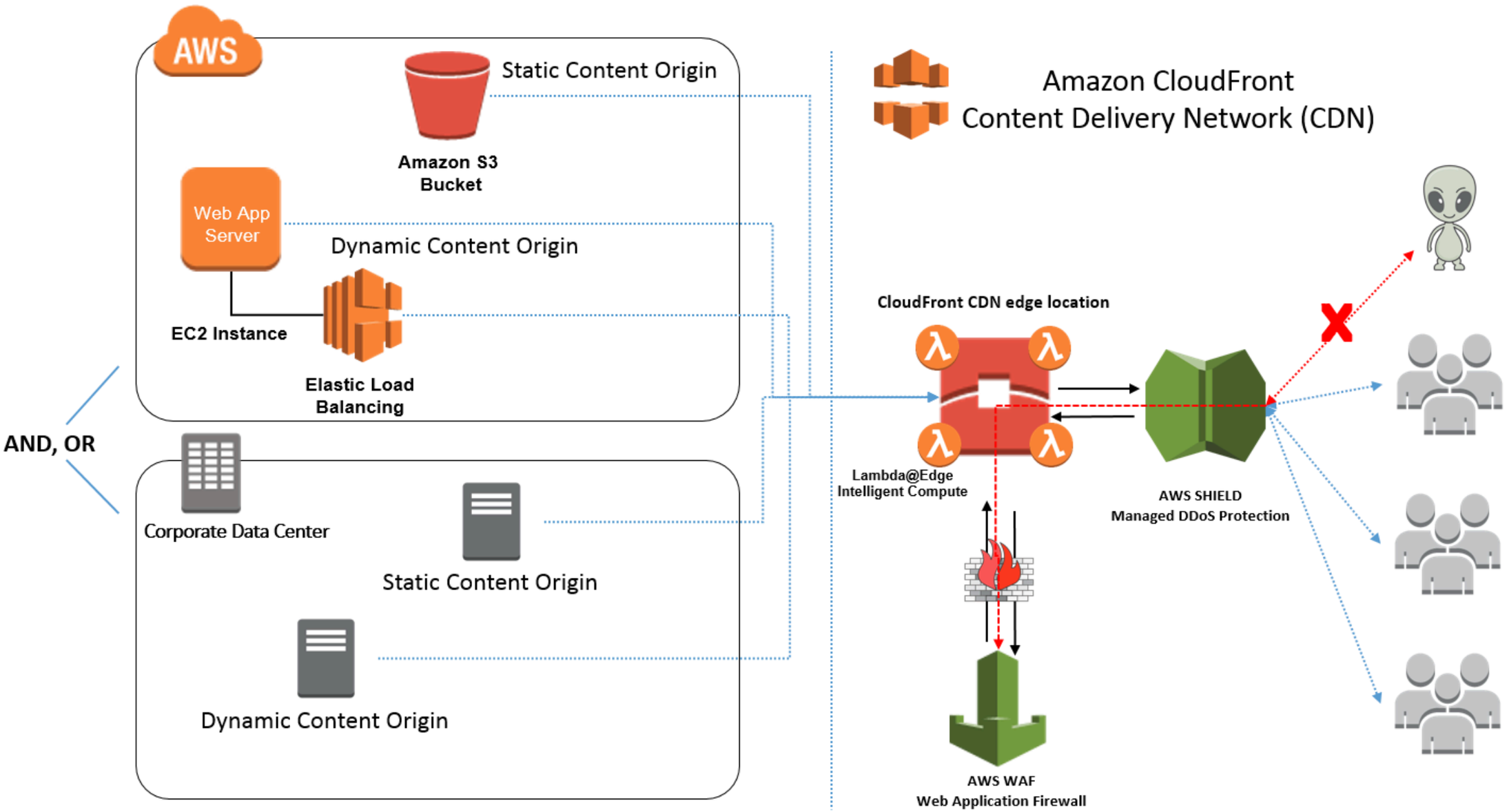


# CDN with Cloudflare




https://developers.cloudflare.com/reference-architecture/cdn-reference-architecture/

# CDN with AWS




https://aws.amazon.com/caching/cdn/

# Database Scaling ?

Horizontal
Vertical
Sharding
Working with NoSQL

# Database model ?

410 systems in ranking, March 2023

| Rank Mar 2023 | Rank Feb 2023 | Rank Mar 2022 | DBMS | Database Model | Score Mar 2023 | Score Feb 2023 | Score Mar 2022 |
|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | Oracle | Relational, Multi-model | 1261.29 | +13.77 | +9.97 |
| 2. | 2. | 2. | MySQL | Relational, Multi-model | 1182.79 | -12.66 | -15.45 |
| 3. | 3. | 3. | Microsoft SQL Server | Relational, Multi-model | 922.01 | -7.08 | -11.77 |
| 4. | 4. | 4. | PostgreSQL | Relational, Multi-model | 613.83 | -2.67 | -3.10 |
| 5. | 5. | 5. | MongoDB | Document, Multi-model | 458.78 | +6.02 | -26.88 |
| 6. | 6. | 6. | Redis | Key-value, Multi-model | 172.45 | -1.39 | -4.31 |
| 7. | 7. | 7. | IBM Db2 | Relational, Multi-model | 142.92 | -0.04 | -19.22 |
| 8. | 8. | 8. | Elasticsearch | Search engine, Multi-model | 139.07 | +0.47 | -20.88 |
| 9. | 9. | ↑ 10. | SQLite | Relational | 133.82 | +1.15 | +1.64 |
| 10. | 10. | ↓ 9. | Microsoft Access | Relational | 132.06 | +1.03 | -3.37 |
| 11. | ↑ 12. | ↑ 14. | Snowflake | Relational | 114.40 | -1.26 | +28.17 |
| 12. | ↓ 11. | ↓ 11. | Cassandra | Wide column | 113.79 | -2.43 | -8.35 |
| 13. | 13. | ↓ 12. | MariaDB | Relational, Multi-model | 96.84 | +0.03 | -11.47 |
| 14. | 14. | ↓ 13. | Splunk | Search engine | 87.97 | +0.89 | -7.39 |
| 15. | 15. | ↑ 16. | Amazon DynamoDB | Multi-model | 80.77 | +1.08 | -1.03 |
| 16. | 16. | ↓ 15. | Microsoft Azure SQL Database | Relational, Multi-model | 77.44 | -1.31 | -7.23 |

https://db-engines.com/en/ranking

# Use right storage for write need !

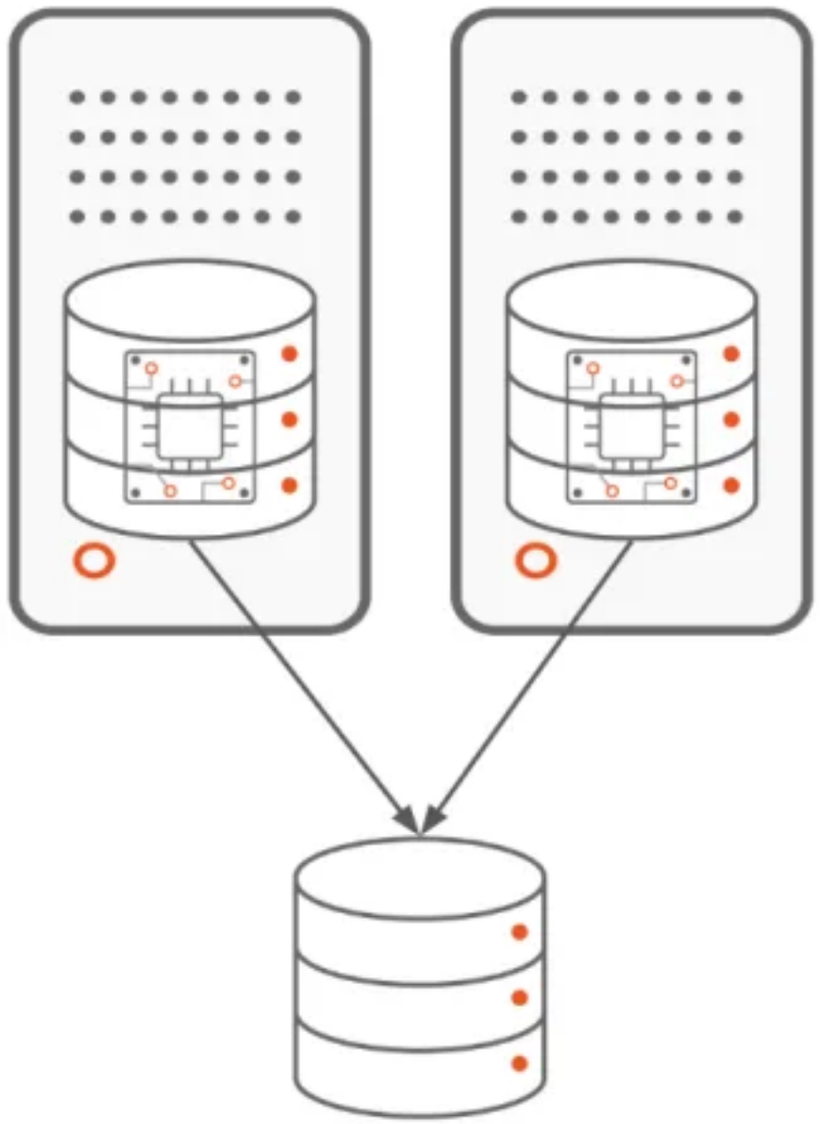
Data durability
Data availability
Data integrity
Data throughput (read/write)
Data size
Data load
Data query

# HA for Database

Redundancy/Clustering
Supporting subdomain
Generic subdomain

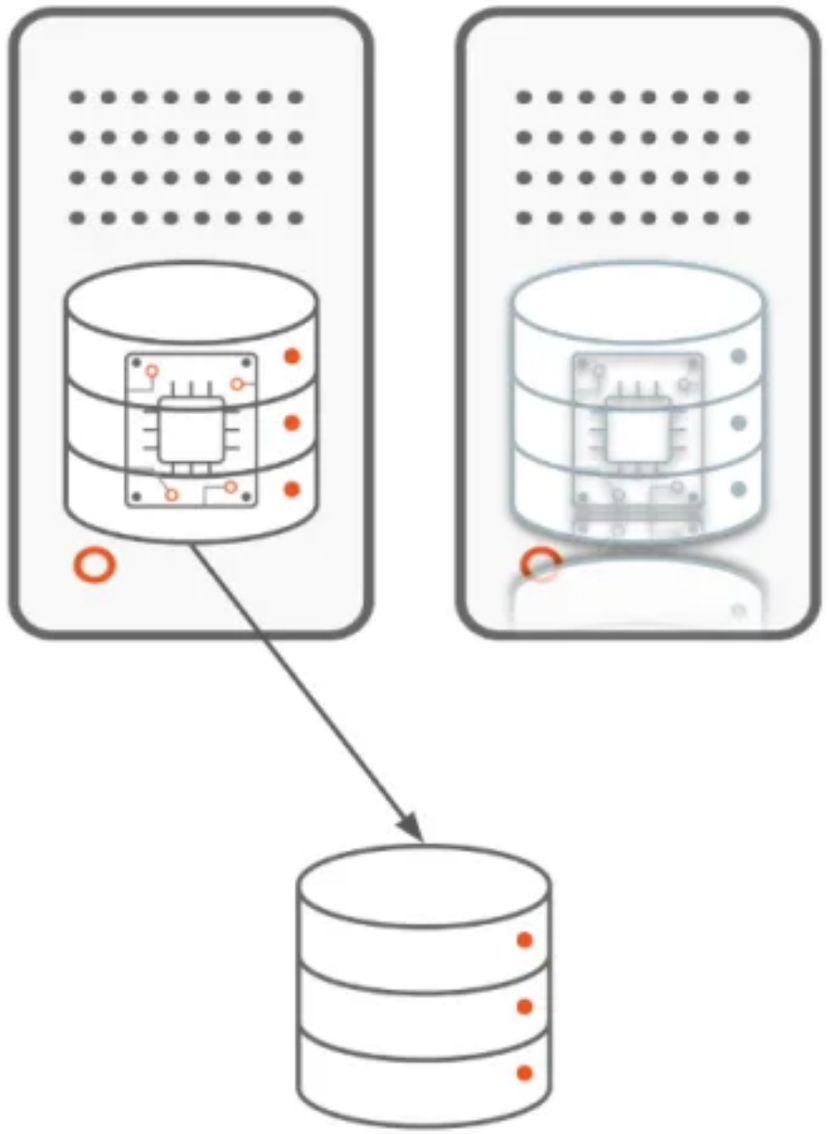
# Redundancy/Clustering

## Active/Active



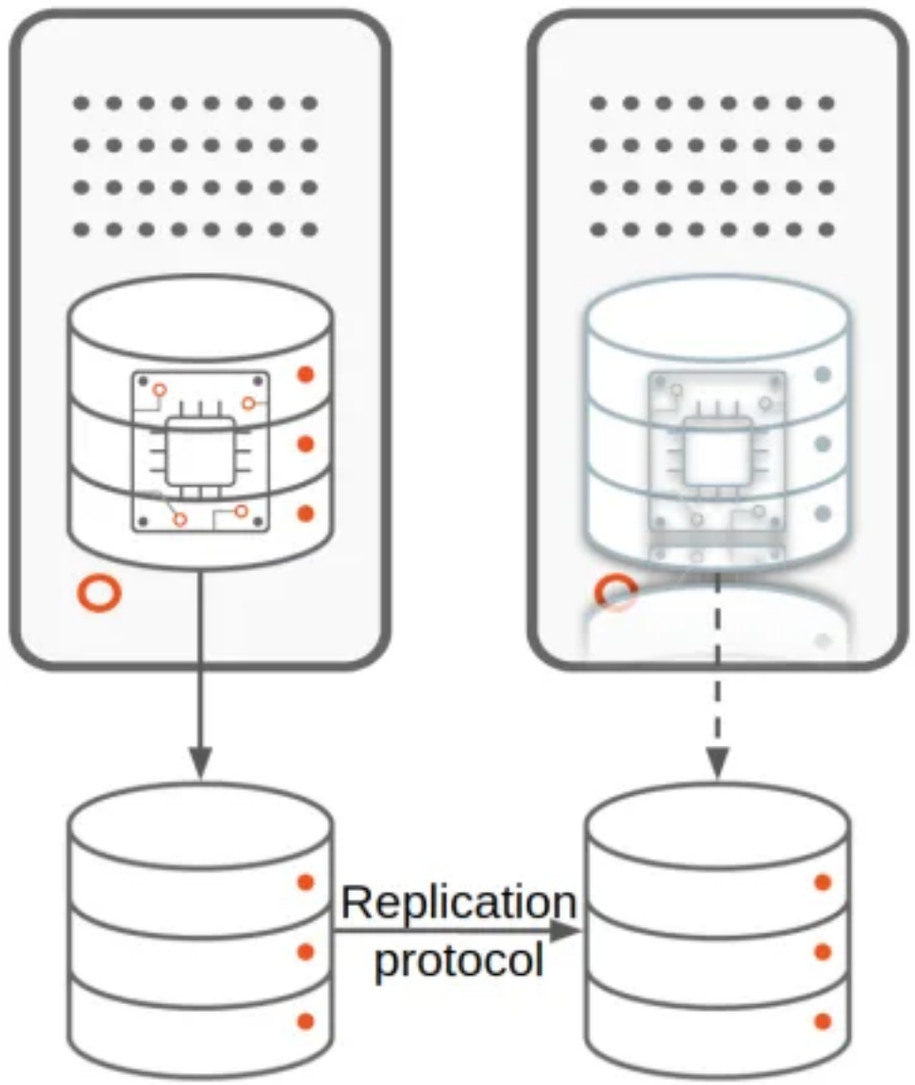
# Redundancy/Clustering

## Active/Passive



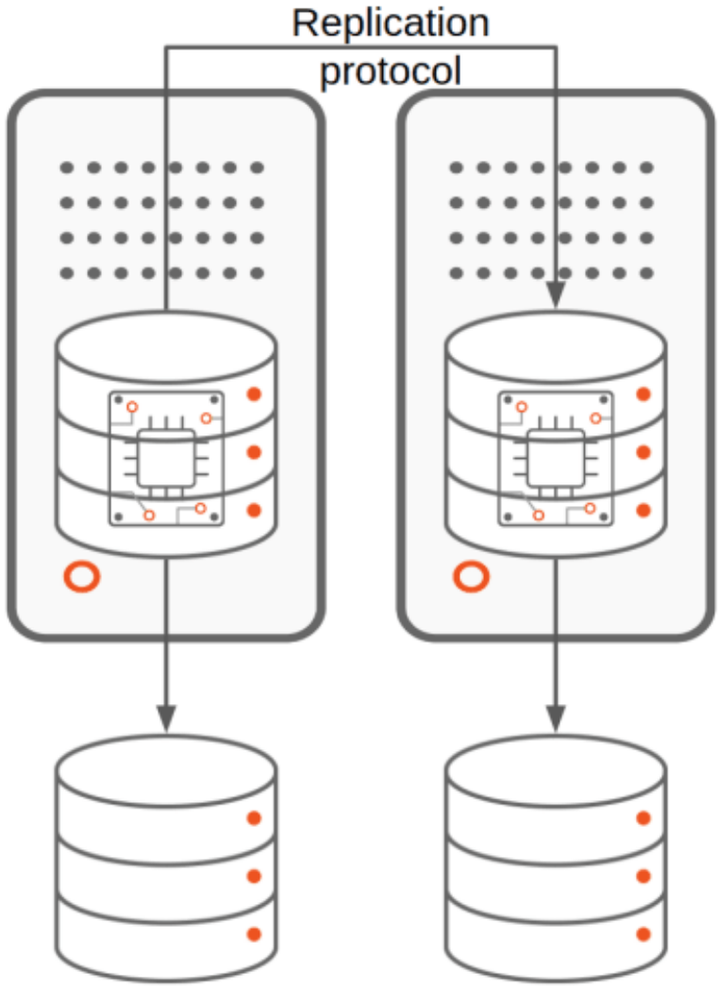
# Redundancy/Clustering

## Storage-based replication for database clustering

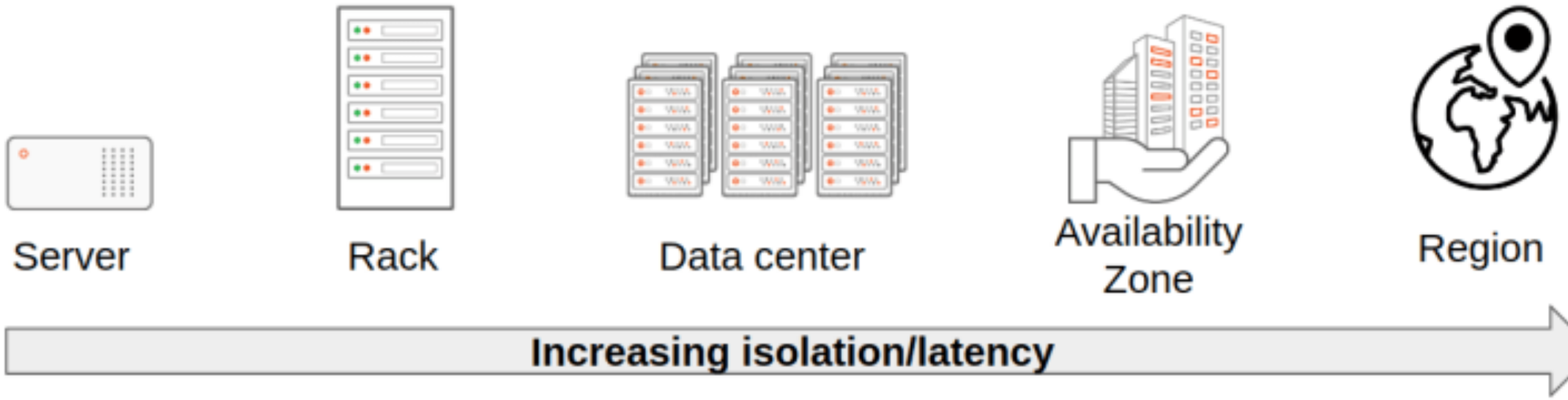


# Redundancy/Clustering

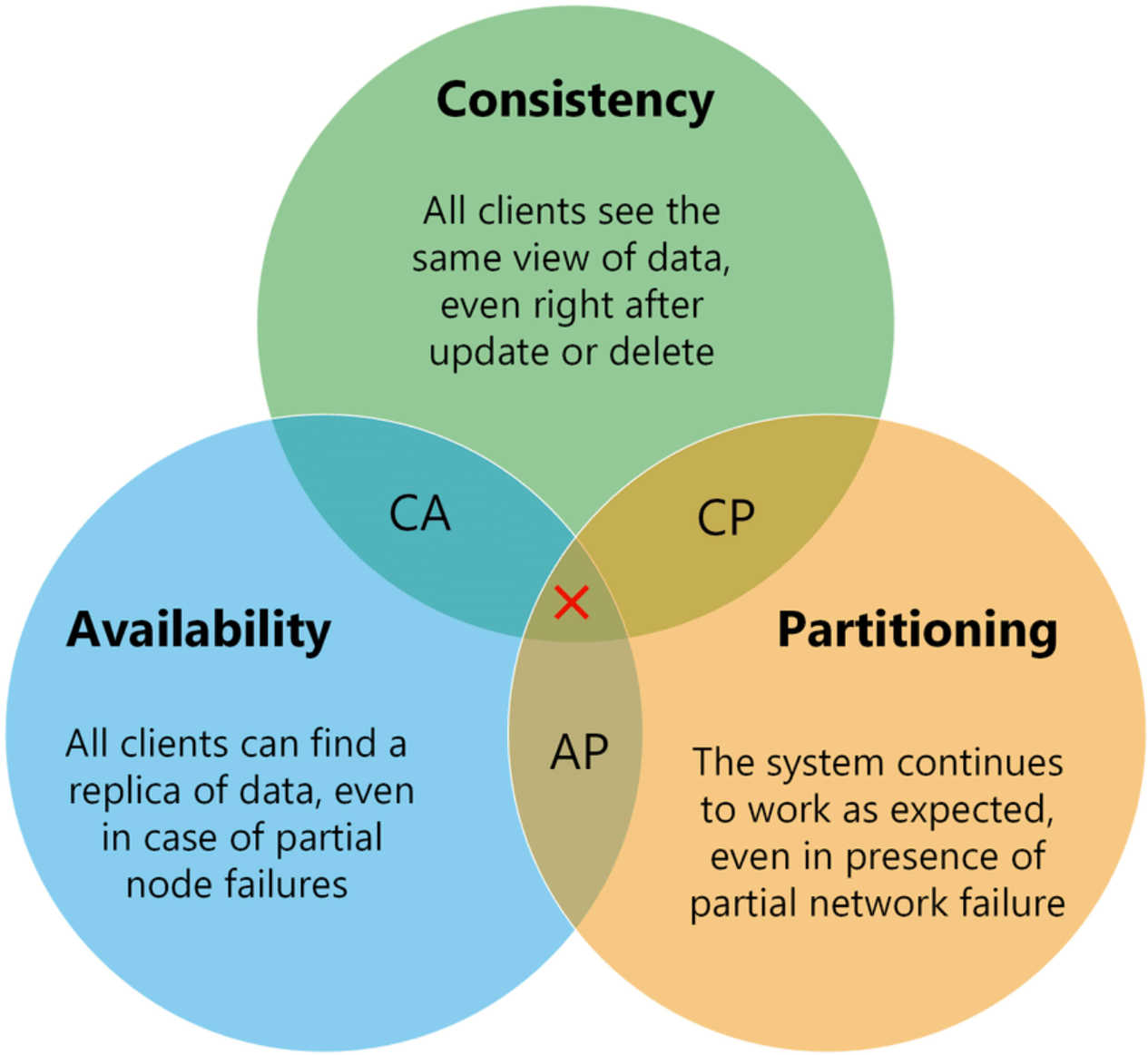
## Database solution-based replication for database clustering



# Isolation of  Database ?



# CAP theorem

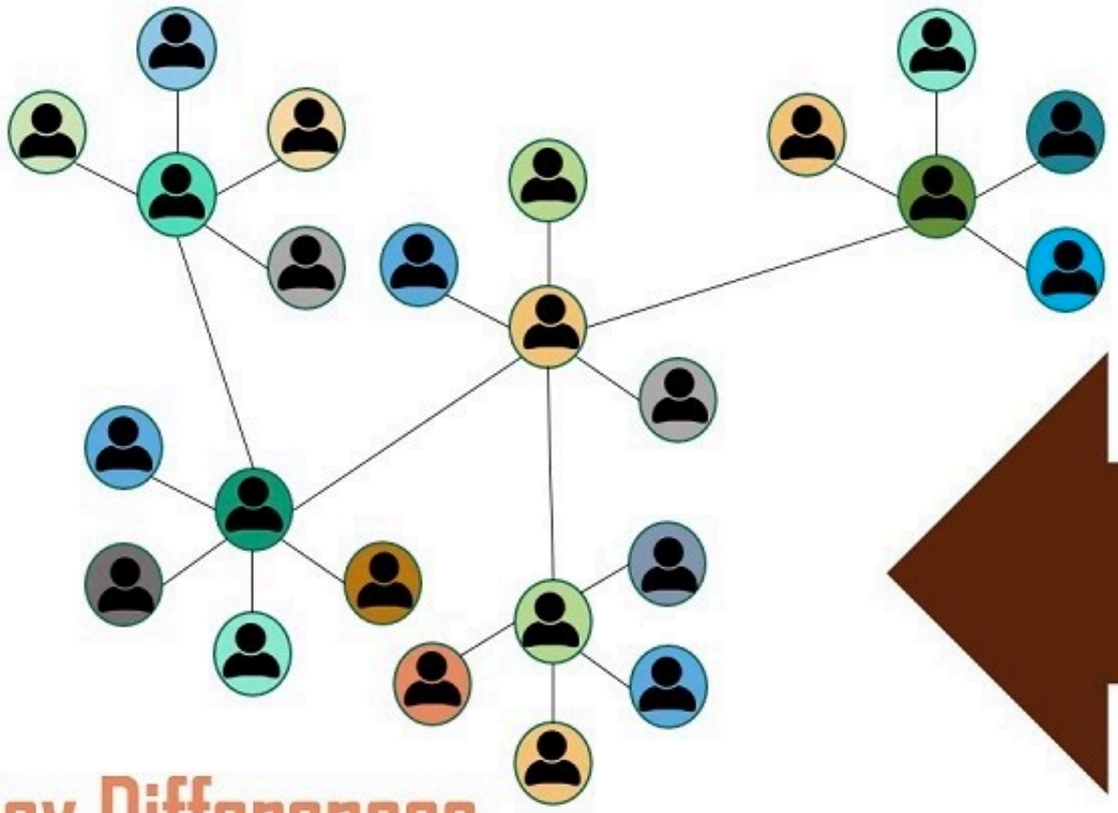


# Data types ?

| Data Type | Database model | Example |
|---|---|---|
| Transactional<br>Structured | Relational | MySQL<br>PostgreSQL |
| Key-value<br>semi-structured<br>Unstructured | NoSQL | MongoDB<br>Cassandra |
| In-memory | Cache (key-value) | Redis<br>Memecached<br>ElasticCached |
| Streaming | Temporary storage | Apache Kafka<br>Amazon Kinesis<br>Spark streaming |
| Object | File-based | Amazon S3<br>Google Storage<br>SAN |
| Search | Searching | Apache Solo<br>Elasticsearch |

# Architecture Reliability
# Architecture Resilience

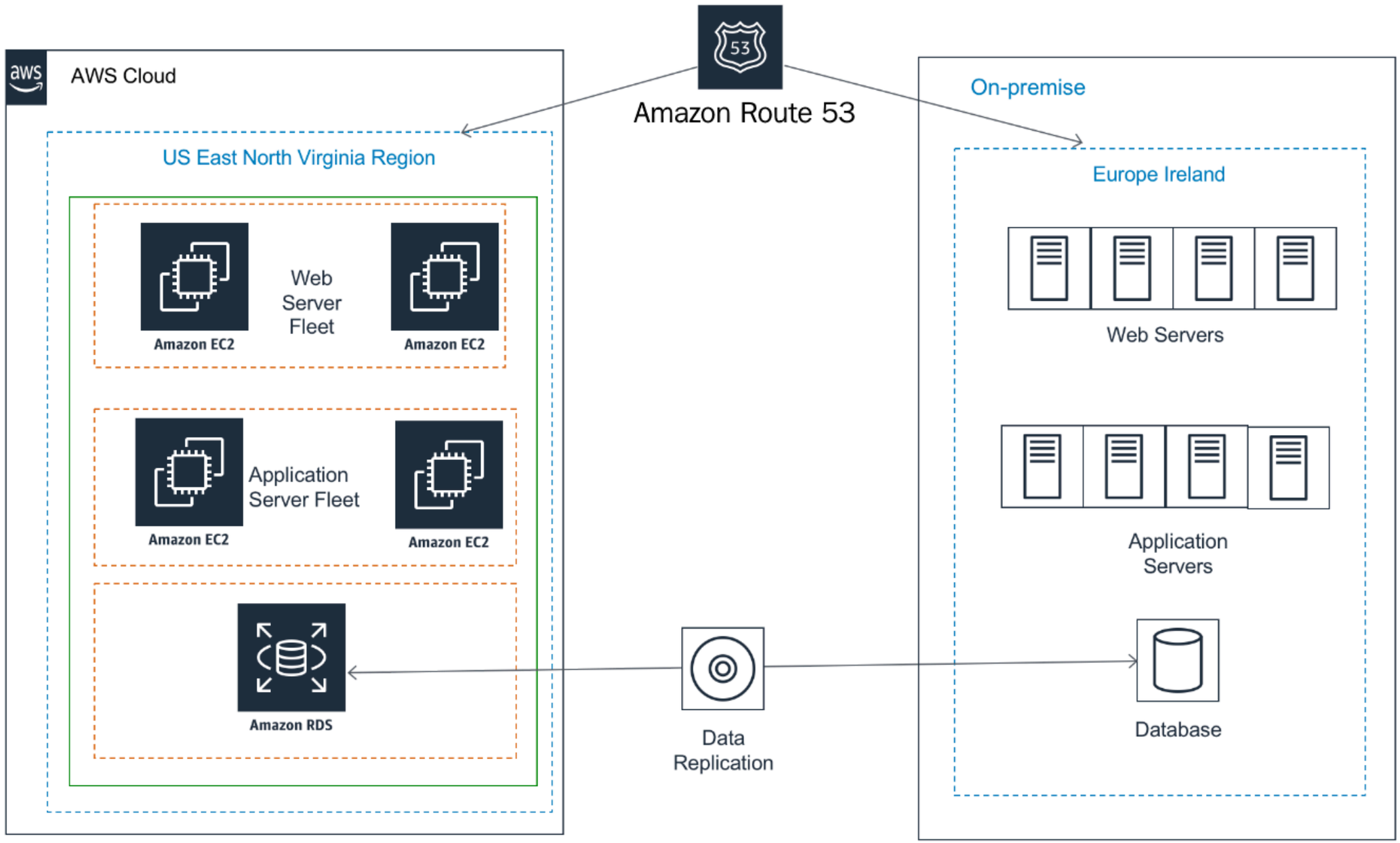
Centralization



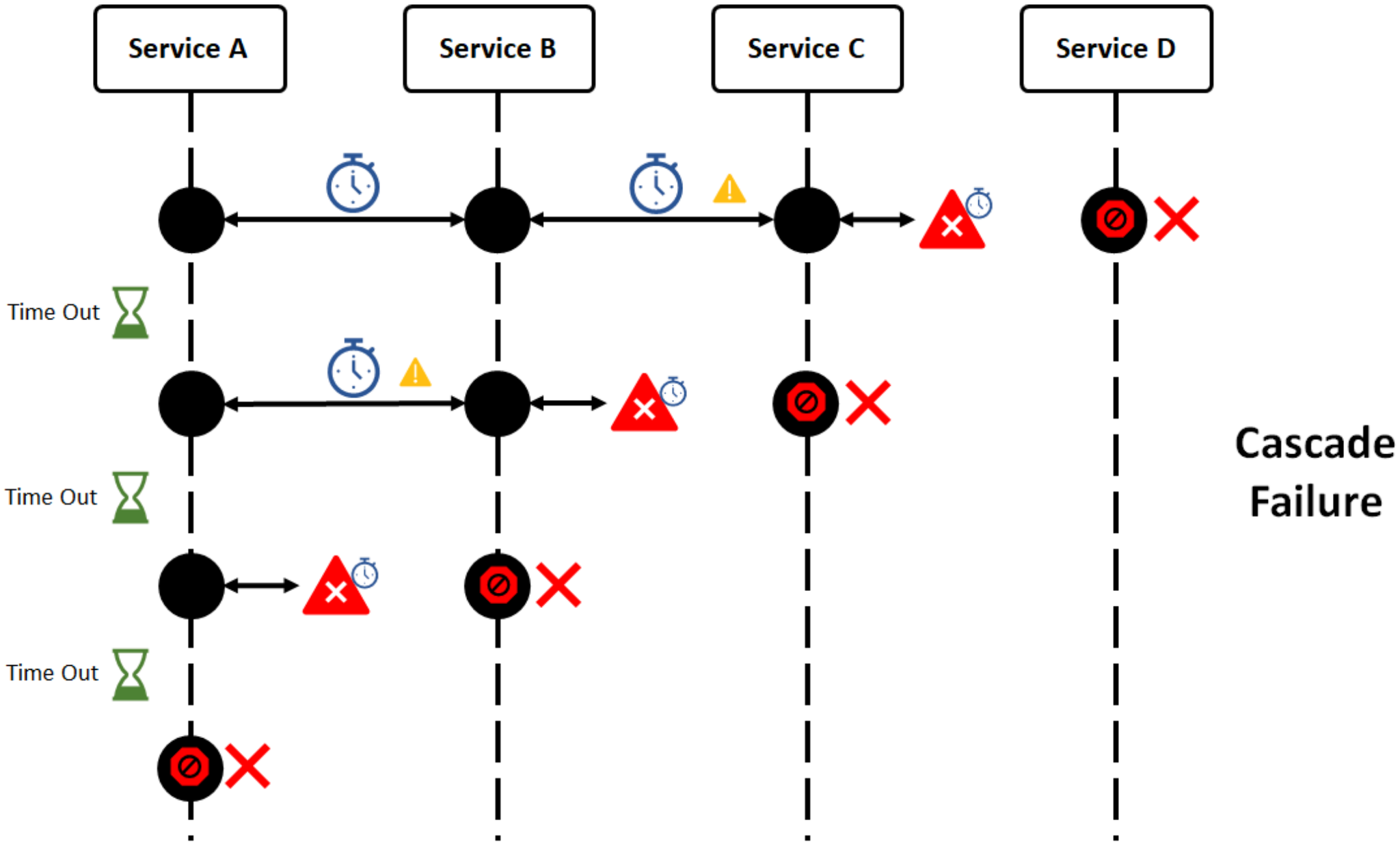
Key Differences

Decentralization

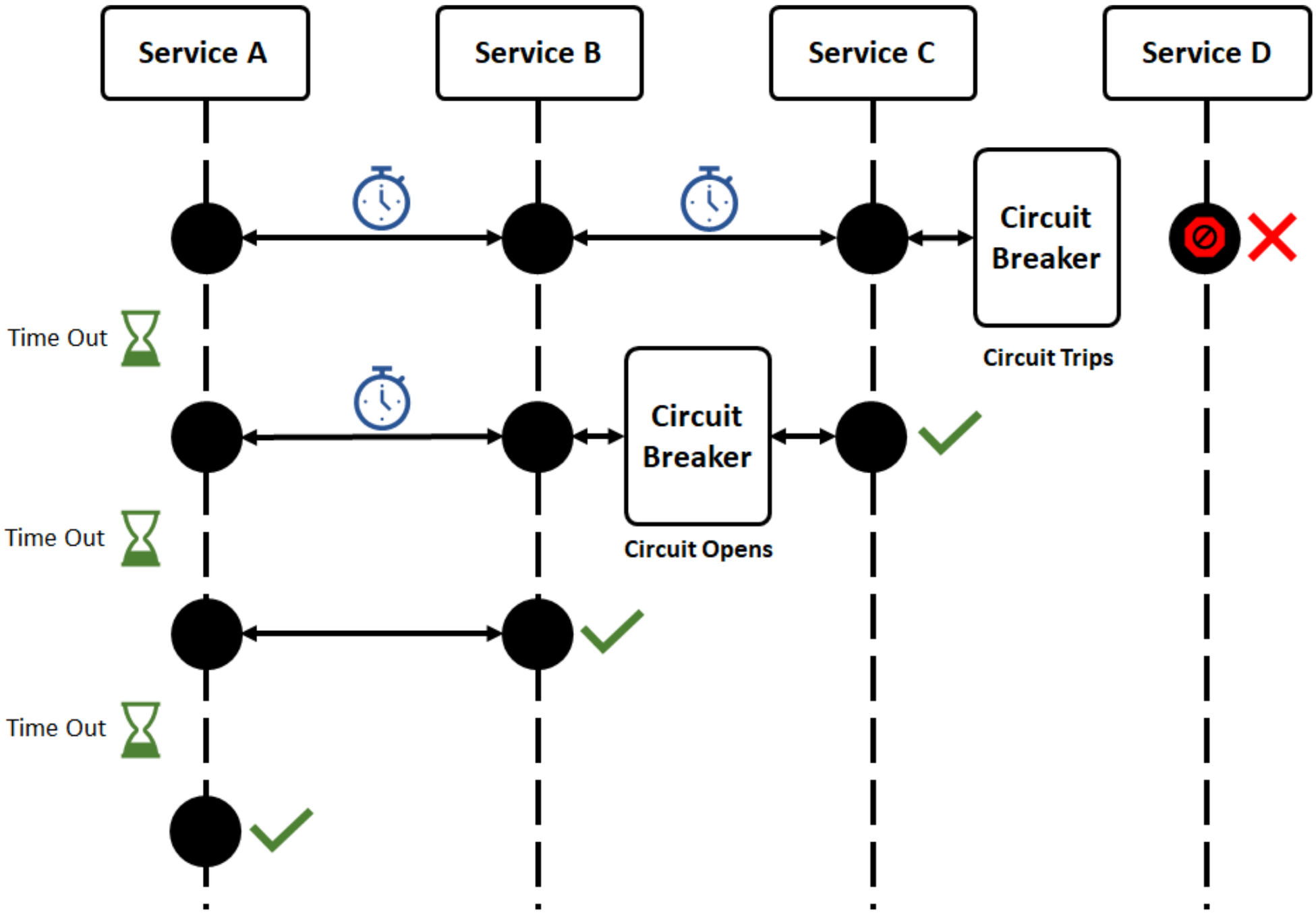
# Disaster Recovery Architecture



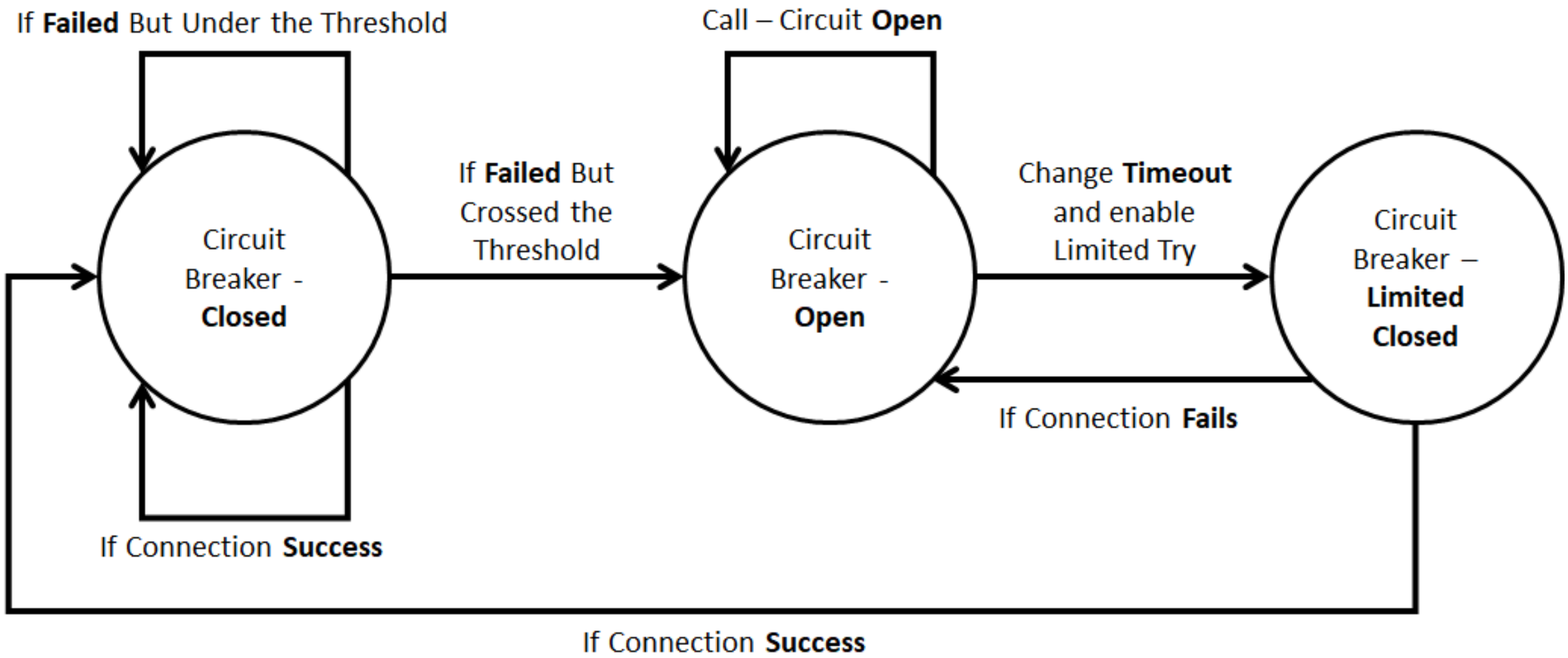
# Without Circuit breaker



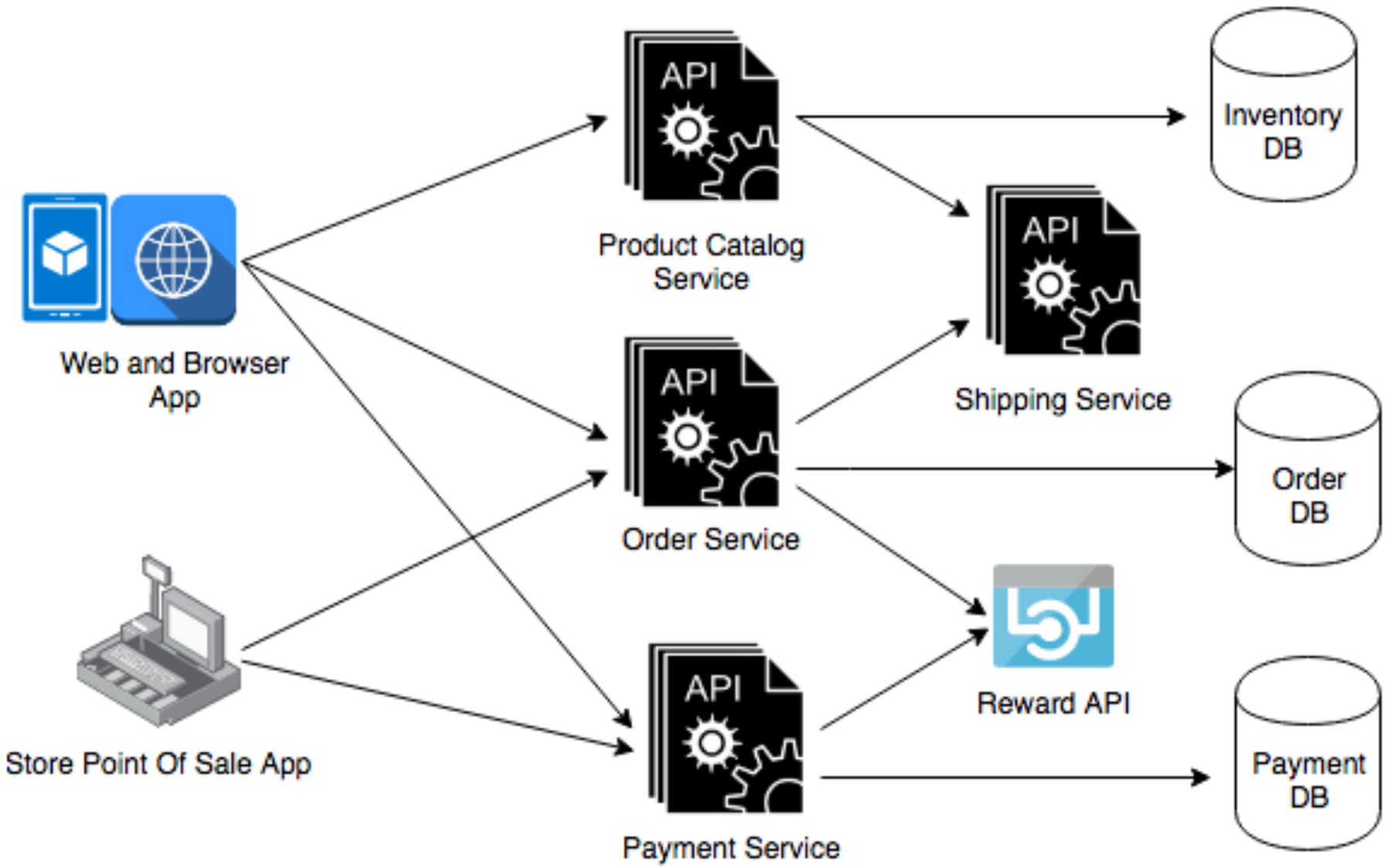
# With Circuit breaker



# Circuit breaker



# Extendability and Reusability !!

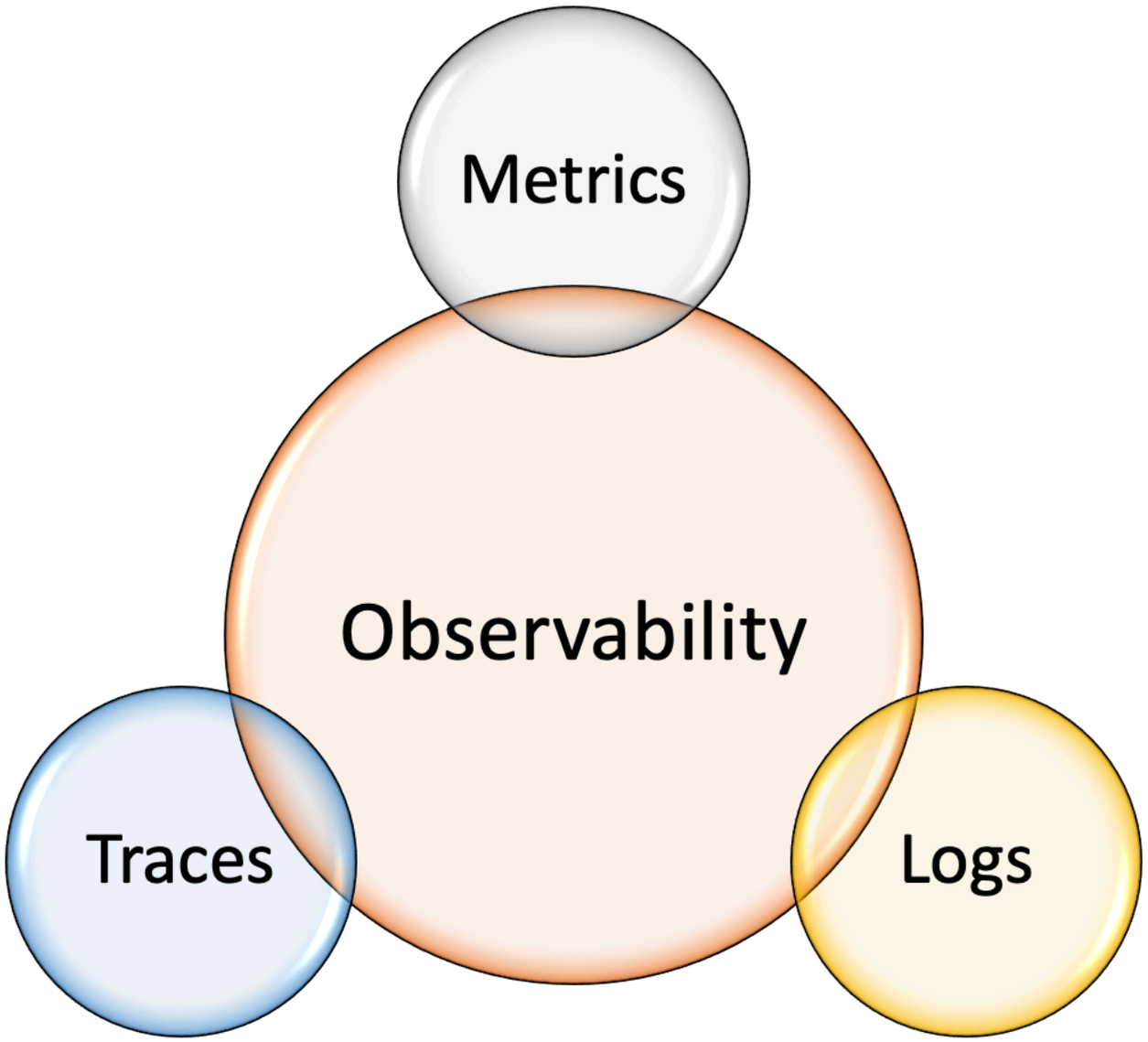


# Excellence Operation

# Excellence operation and maintain

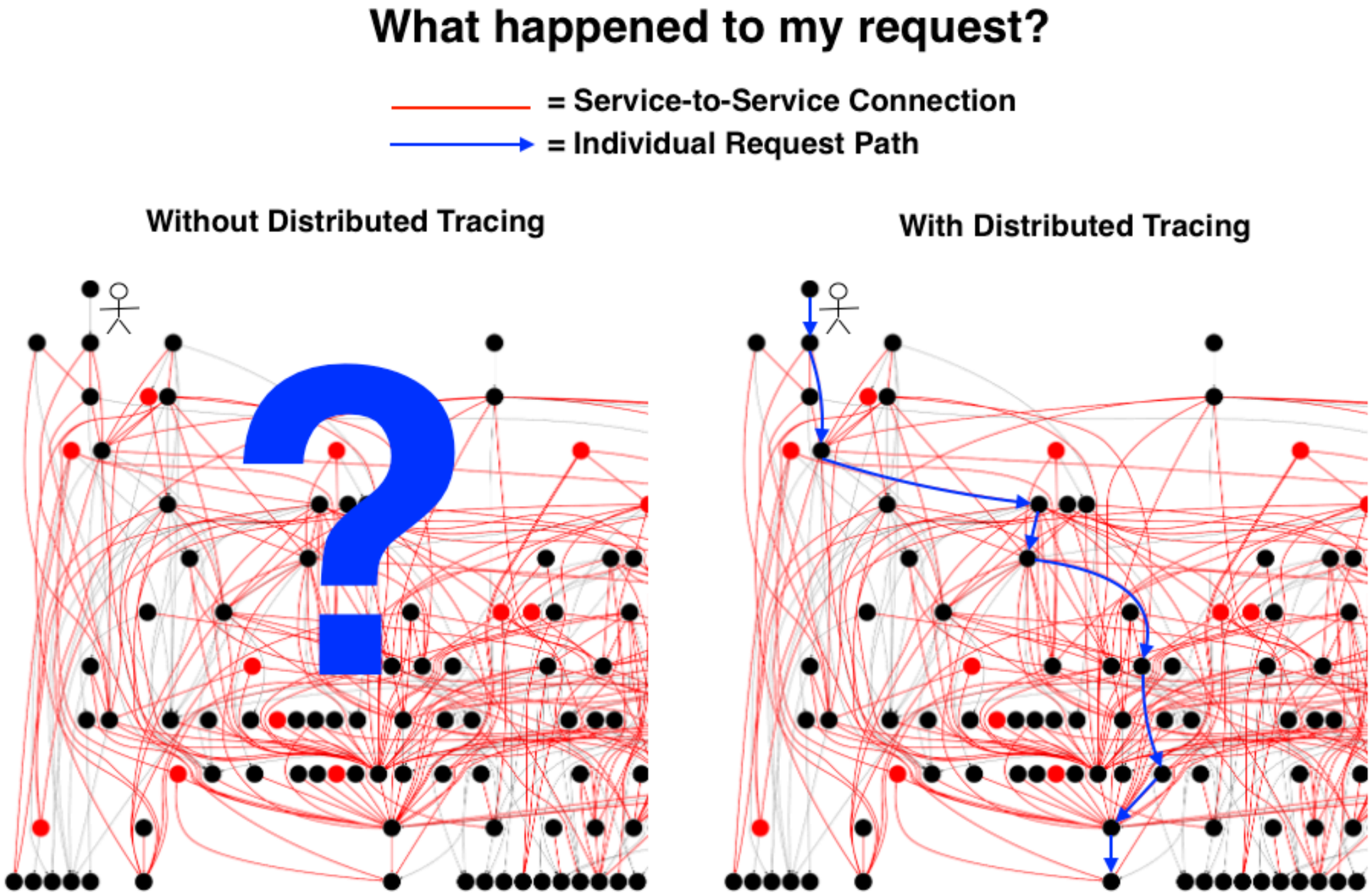
Zero downtime !!
Minimal outage
High quality
Proactive

# Better understand the system

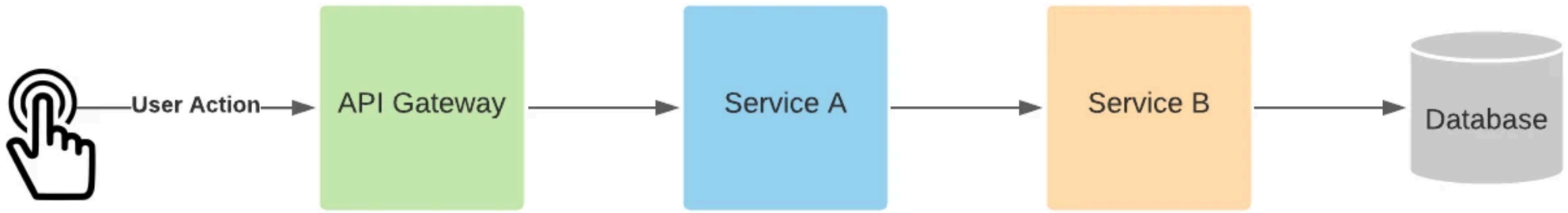


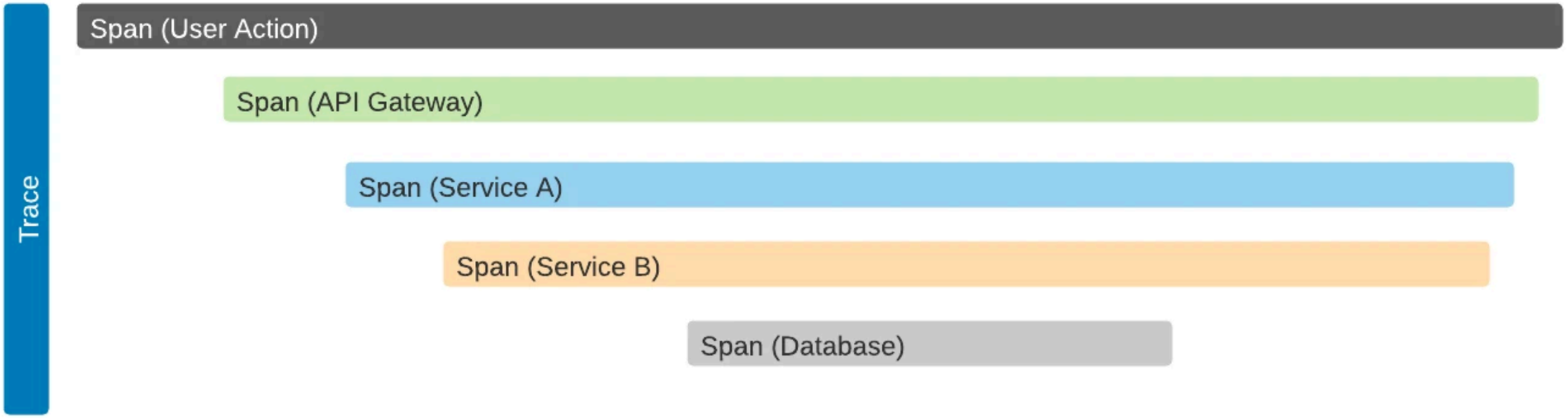

https://linkedin.github.io/school-of-sre/level101/metrics_and_monitoring/observability/

# Distributed Tracing



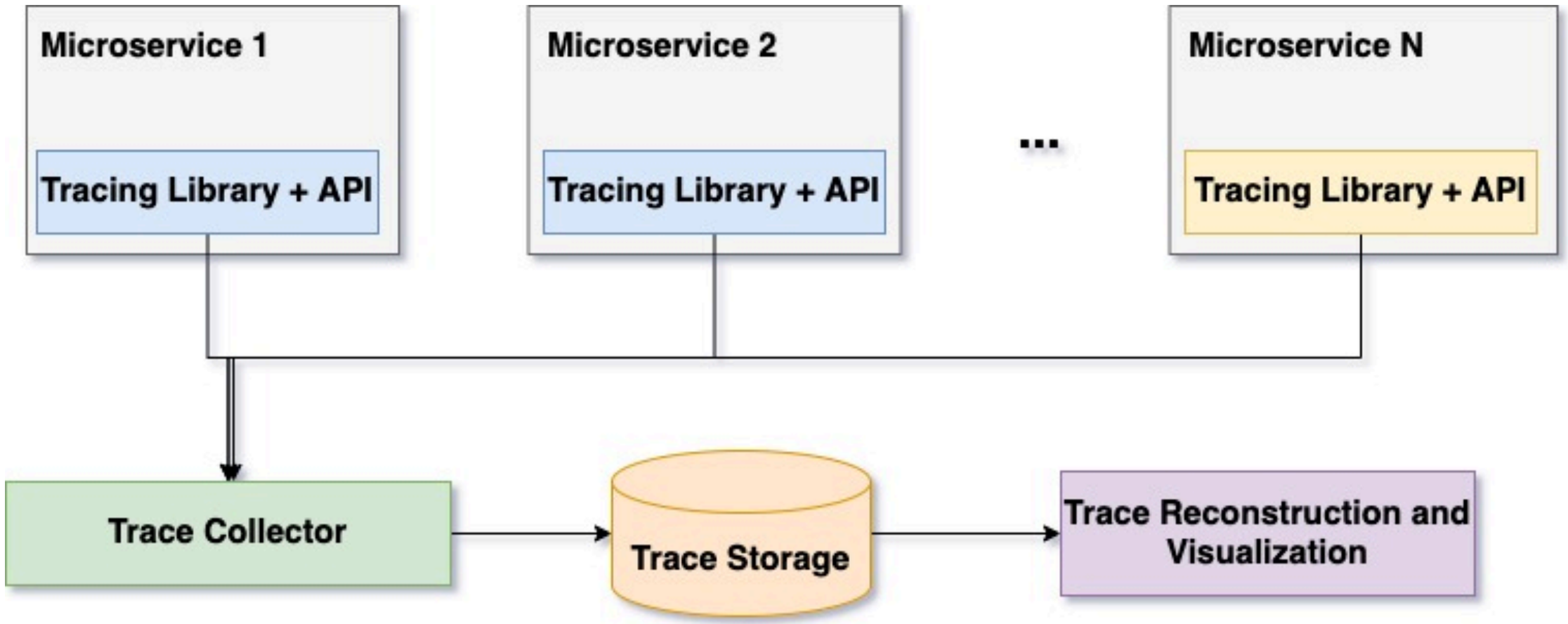
# Distributed Tracing




https://www.dynatrace.com/news/blog/open-observability-distributed-tracing-and-observability/

# Distributed Tracing



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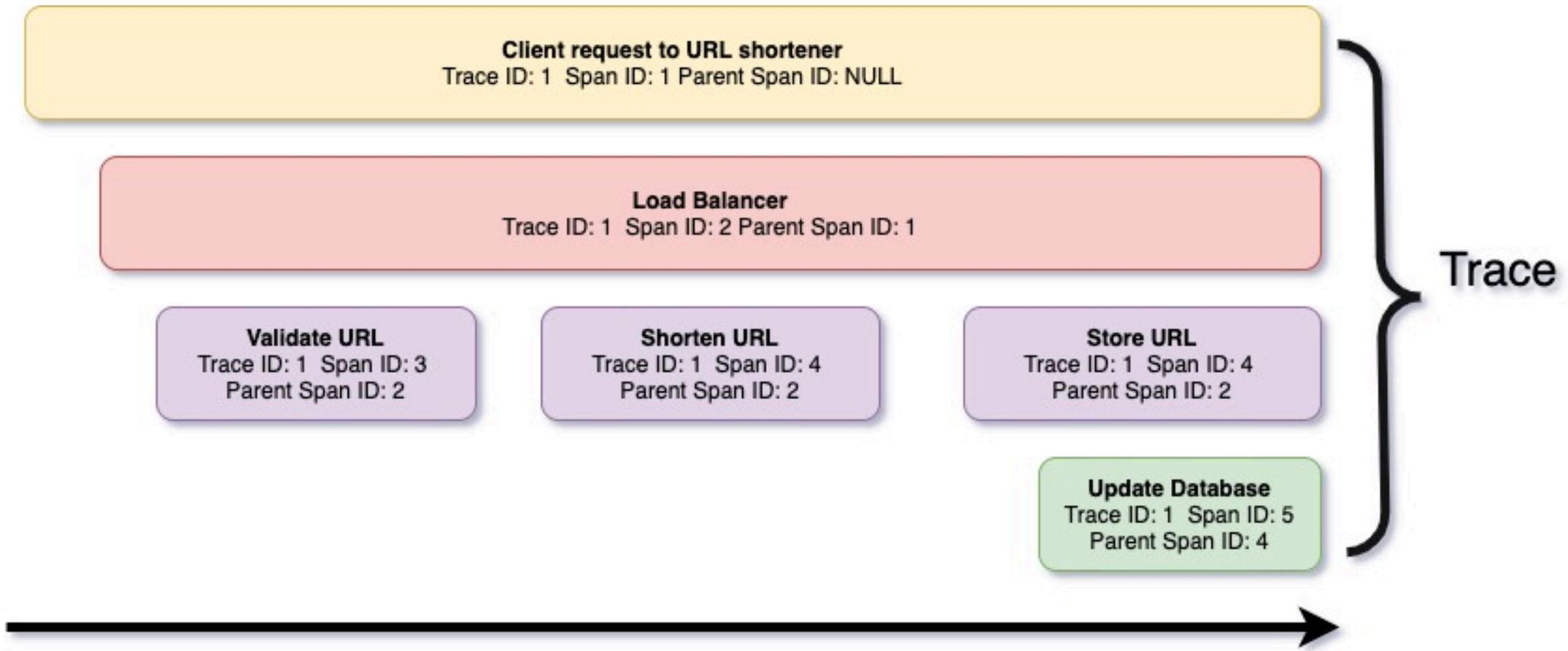
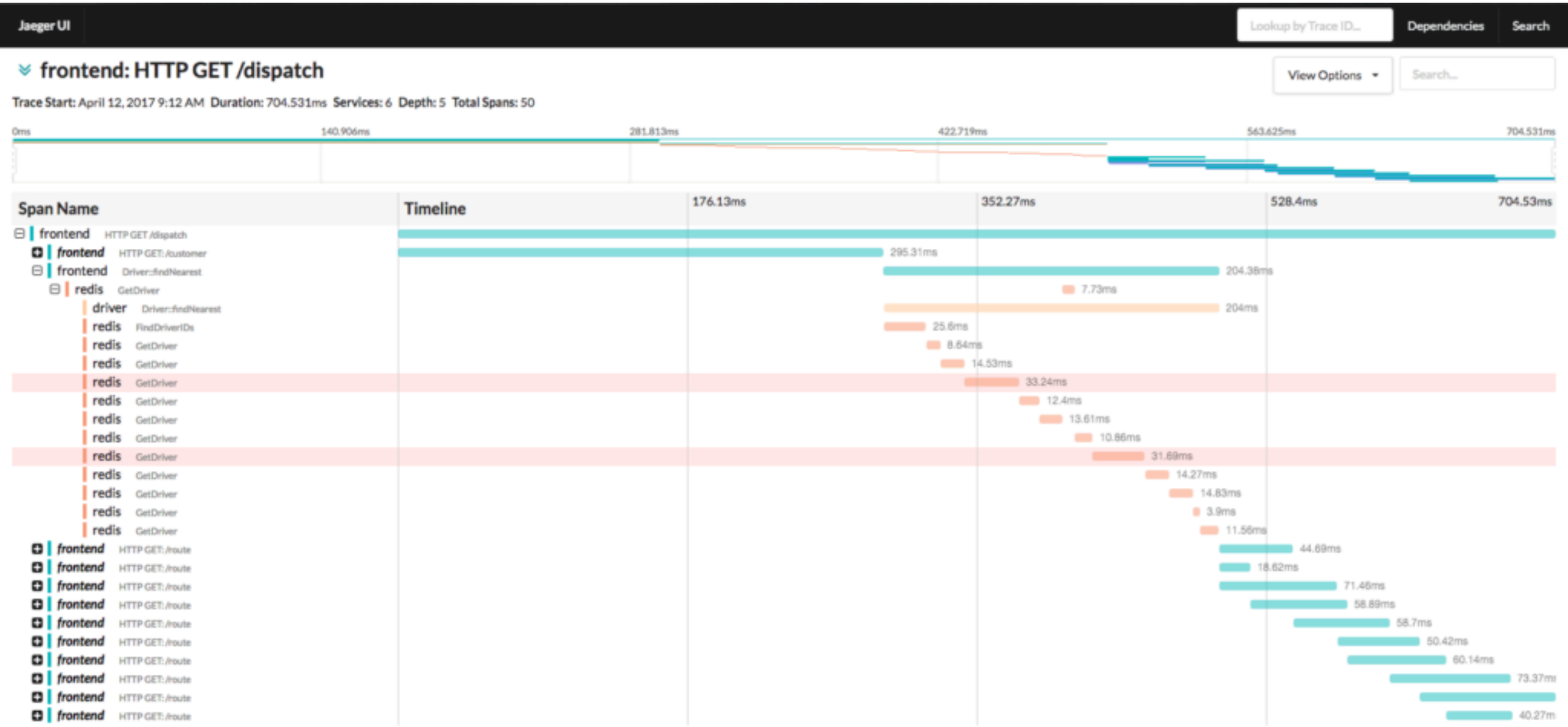
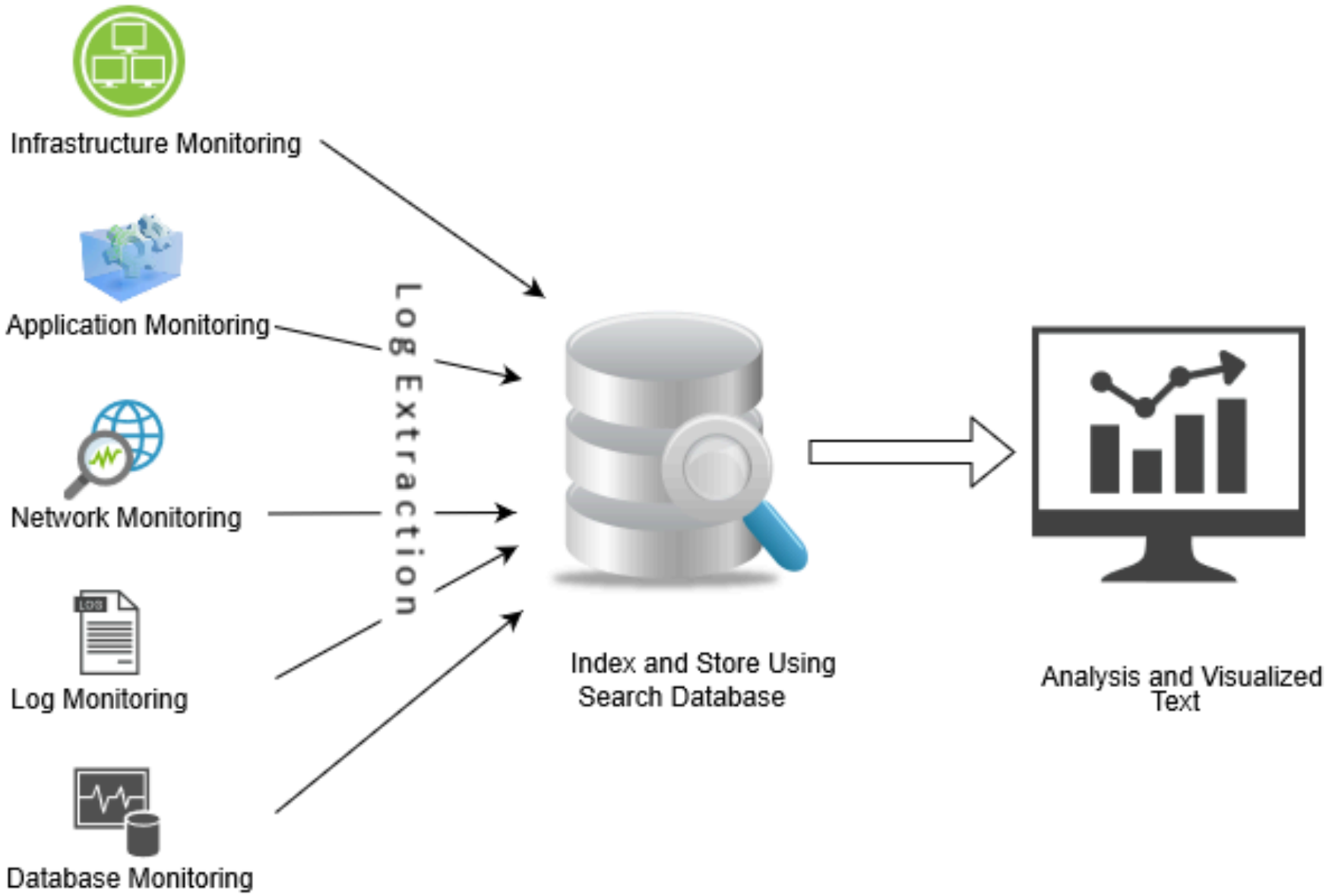


# Distributed Tracing

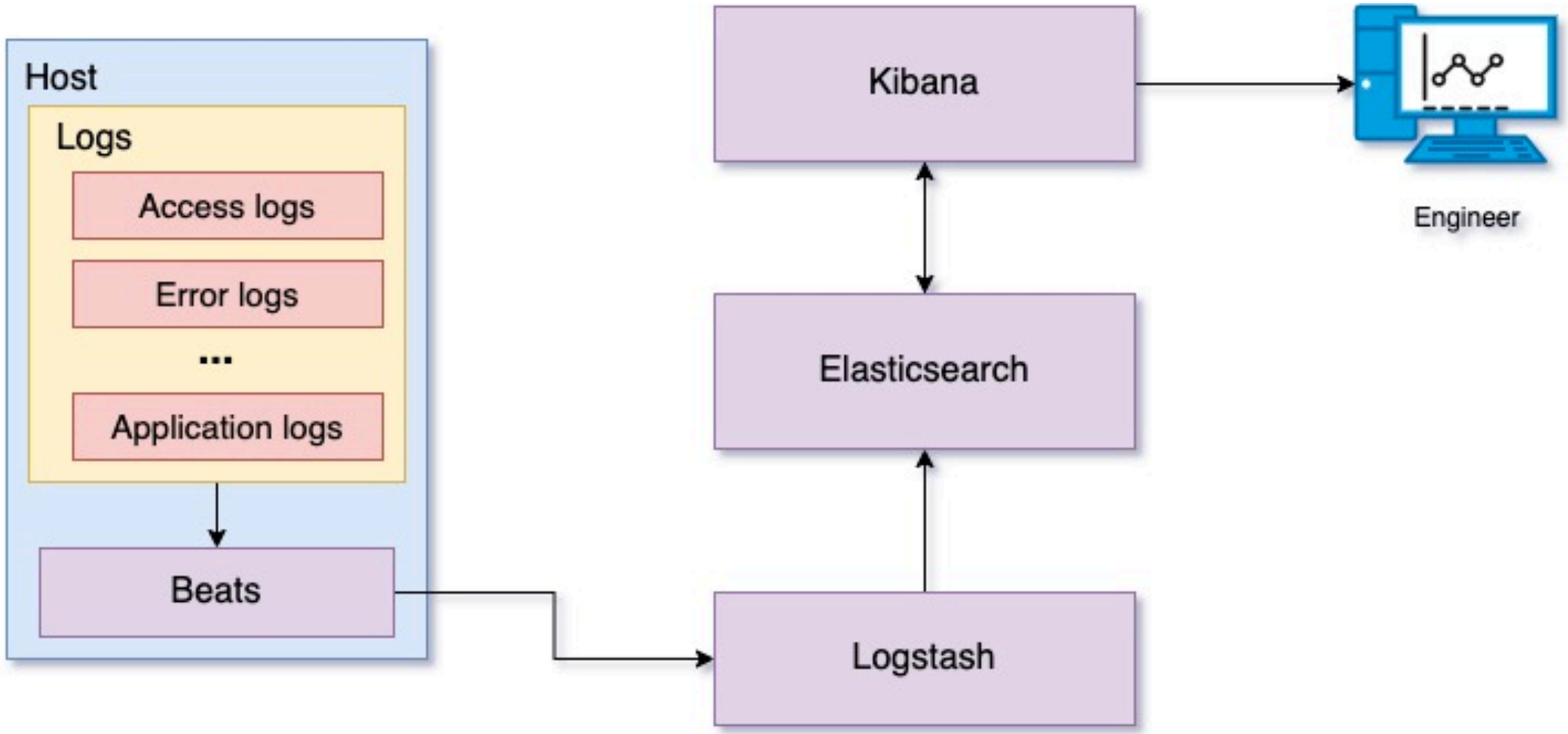



https://zipkin.io/

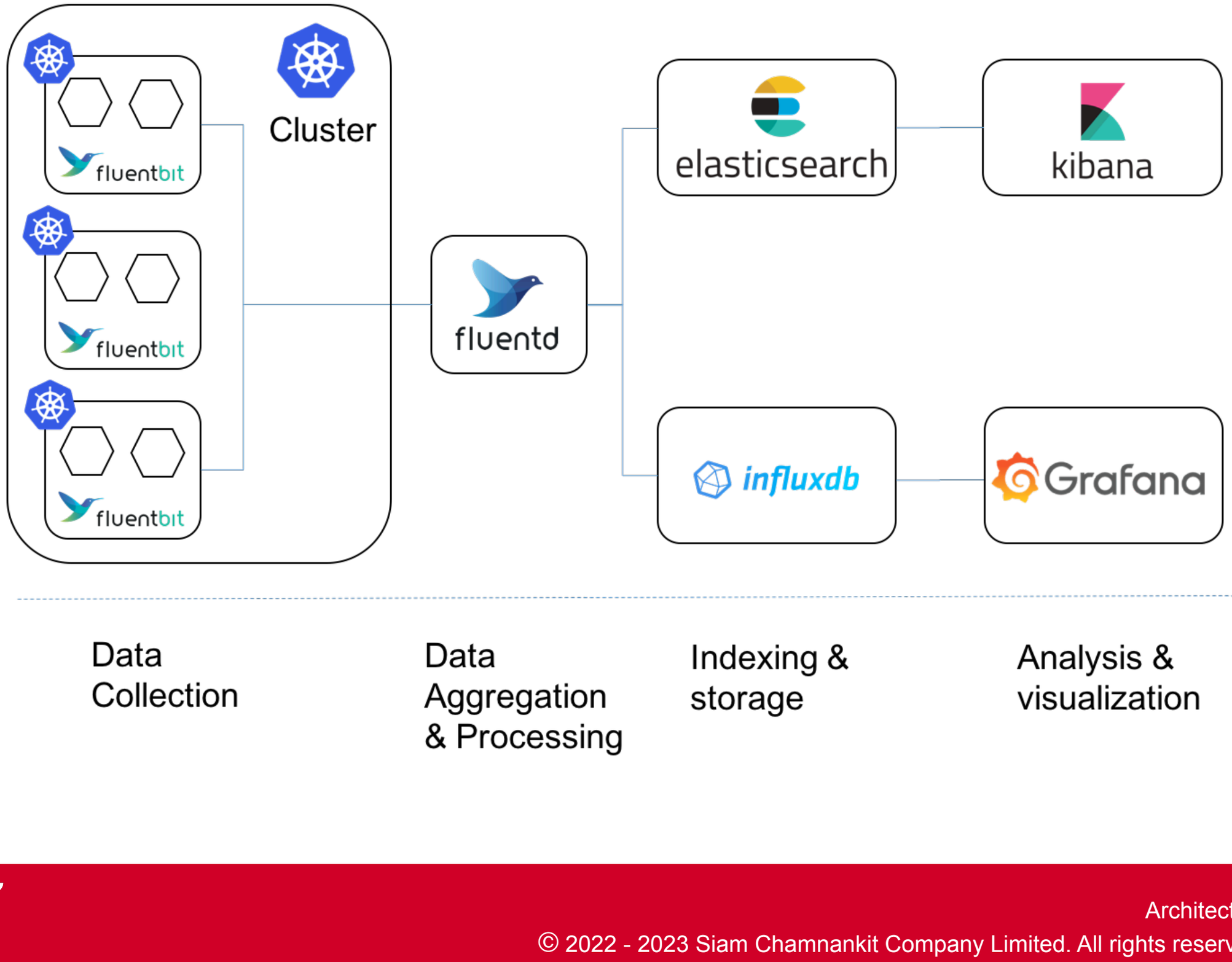
# Centralized Logging



# Centralized Logging



# Centralized Logging



# Automating Everything

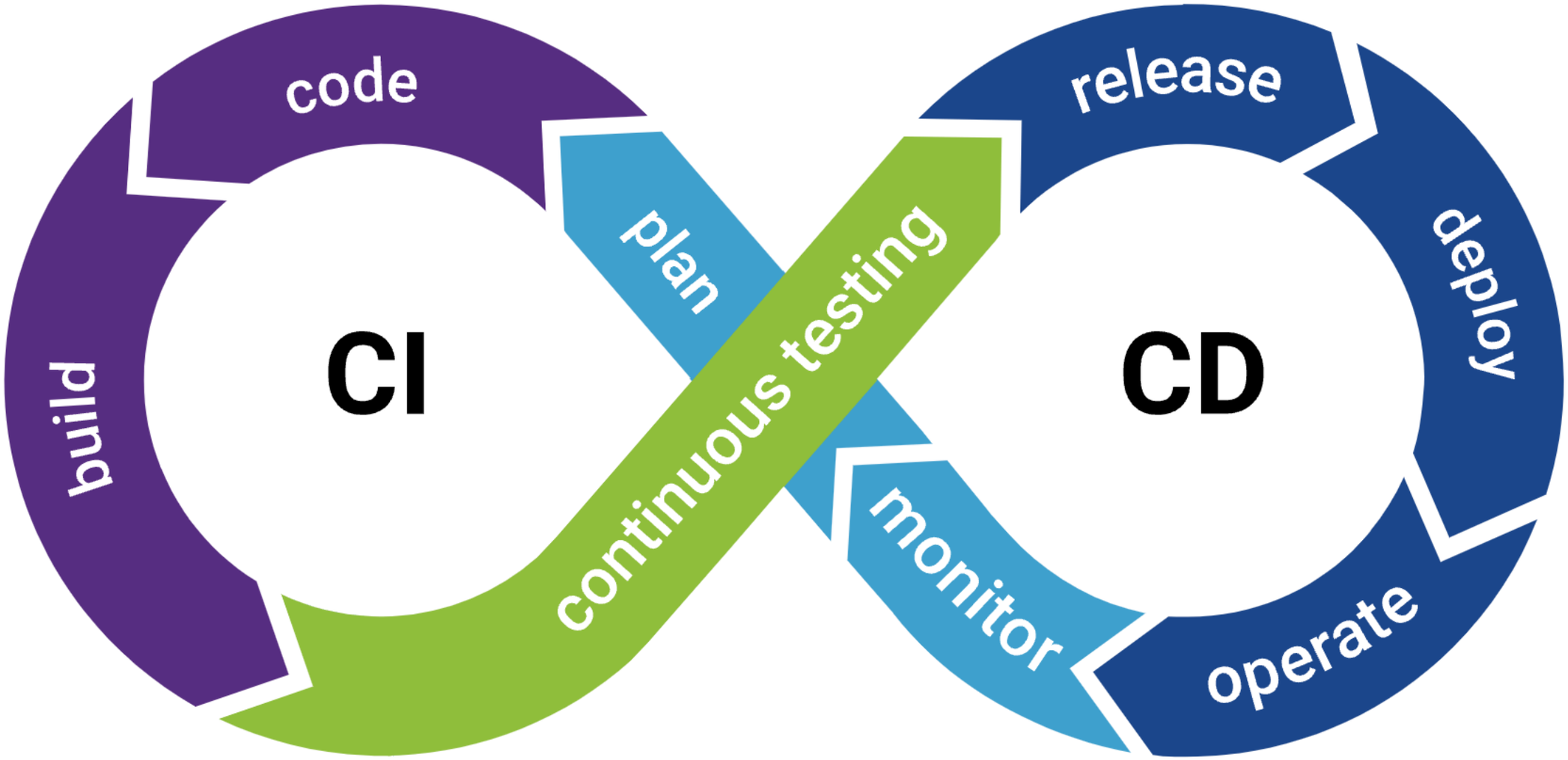
# Automated

Most accidents come from human error
Increase productivity
Save cost

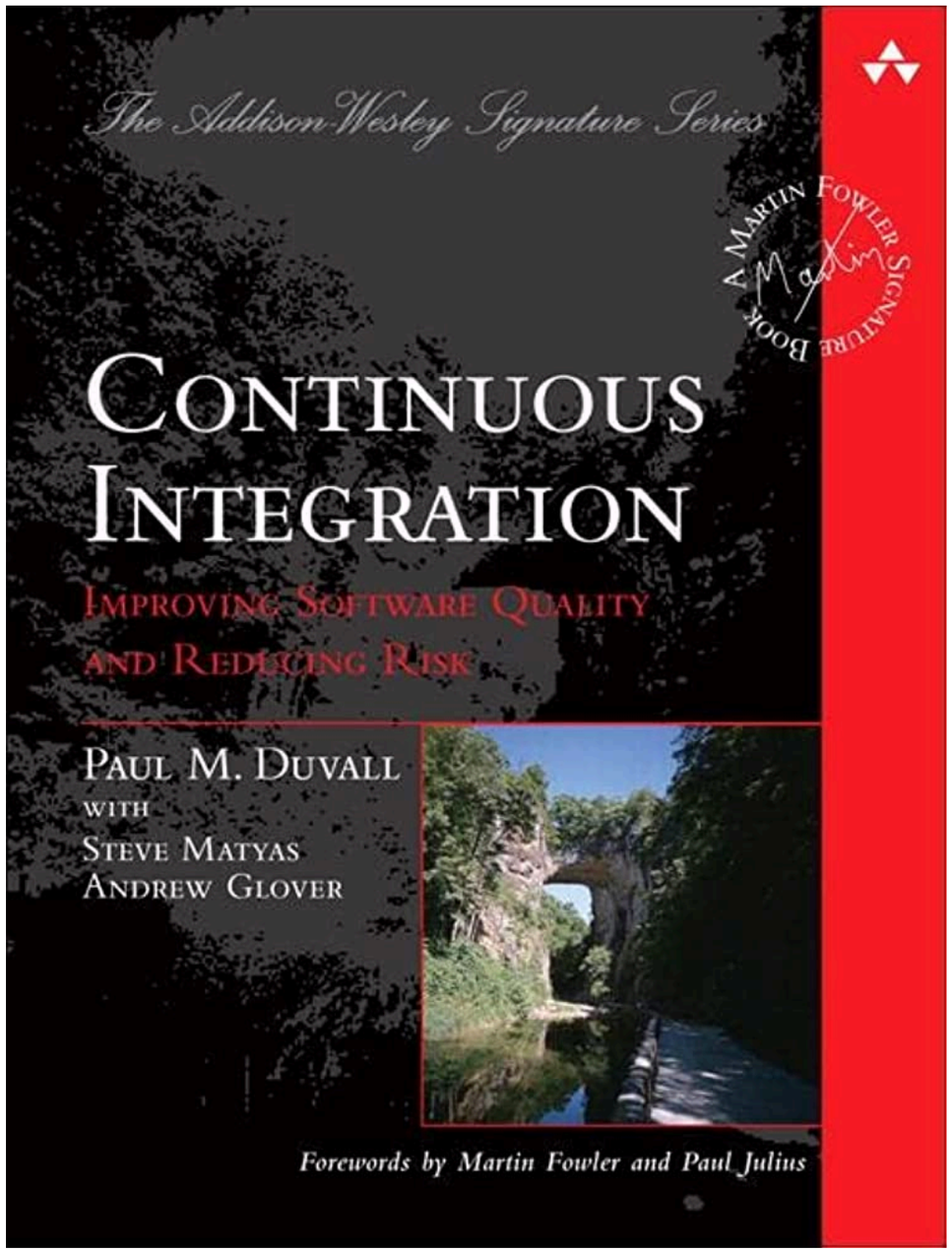
# Automated ?

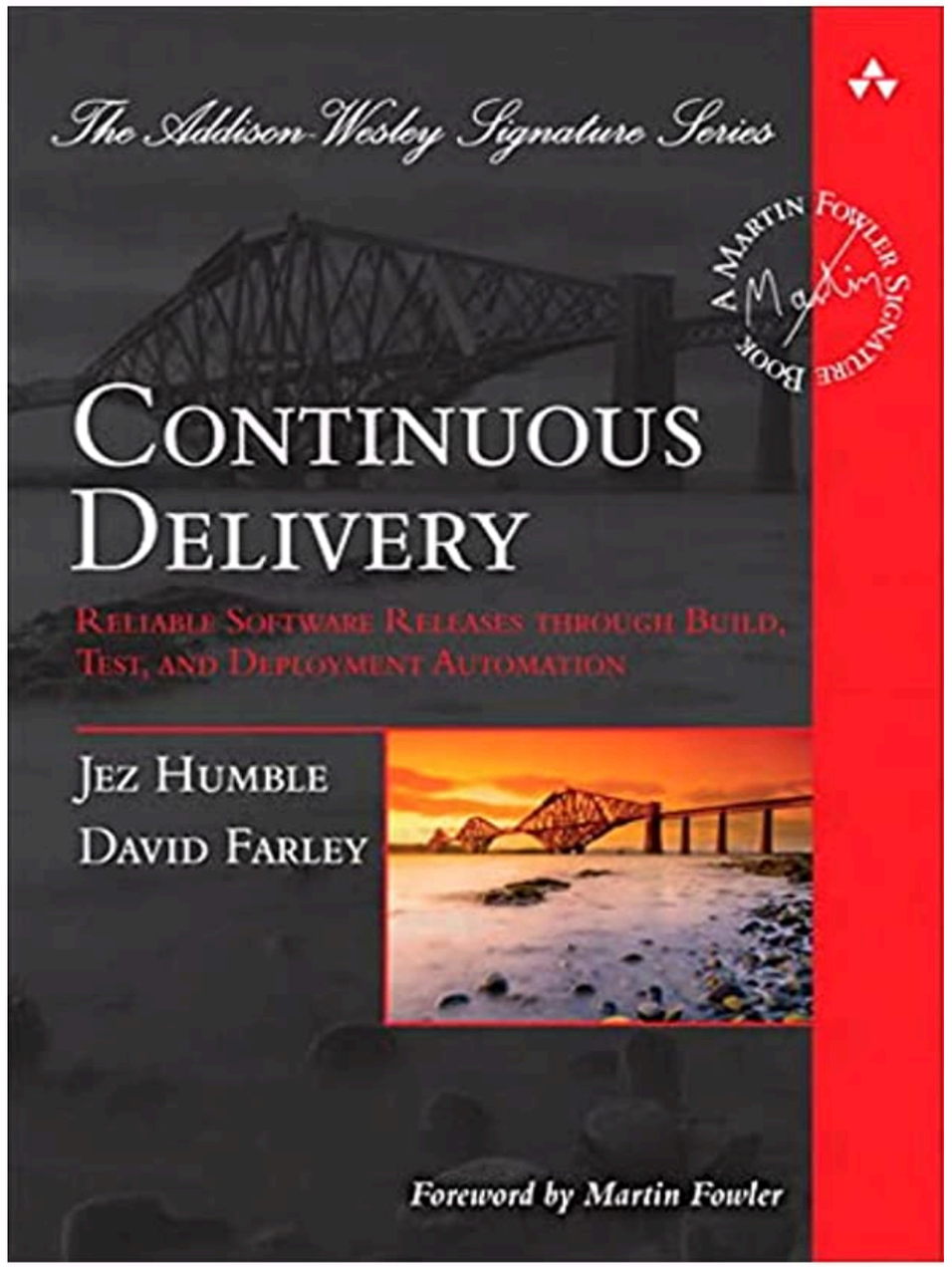
Testing
Infrastructure
Logging, monitoring, alerting
Deployment
Security

# CI/CD

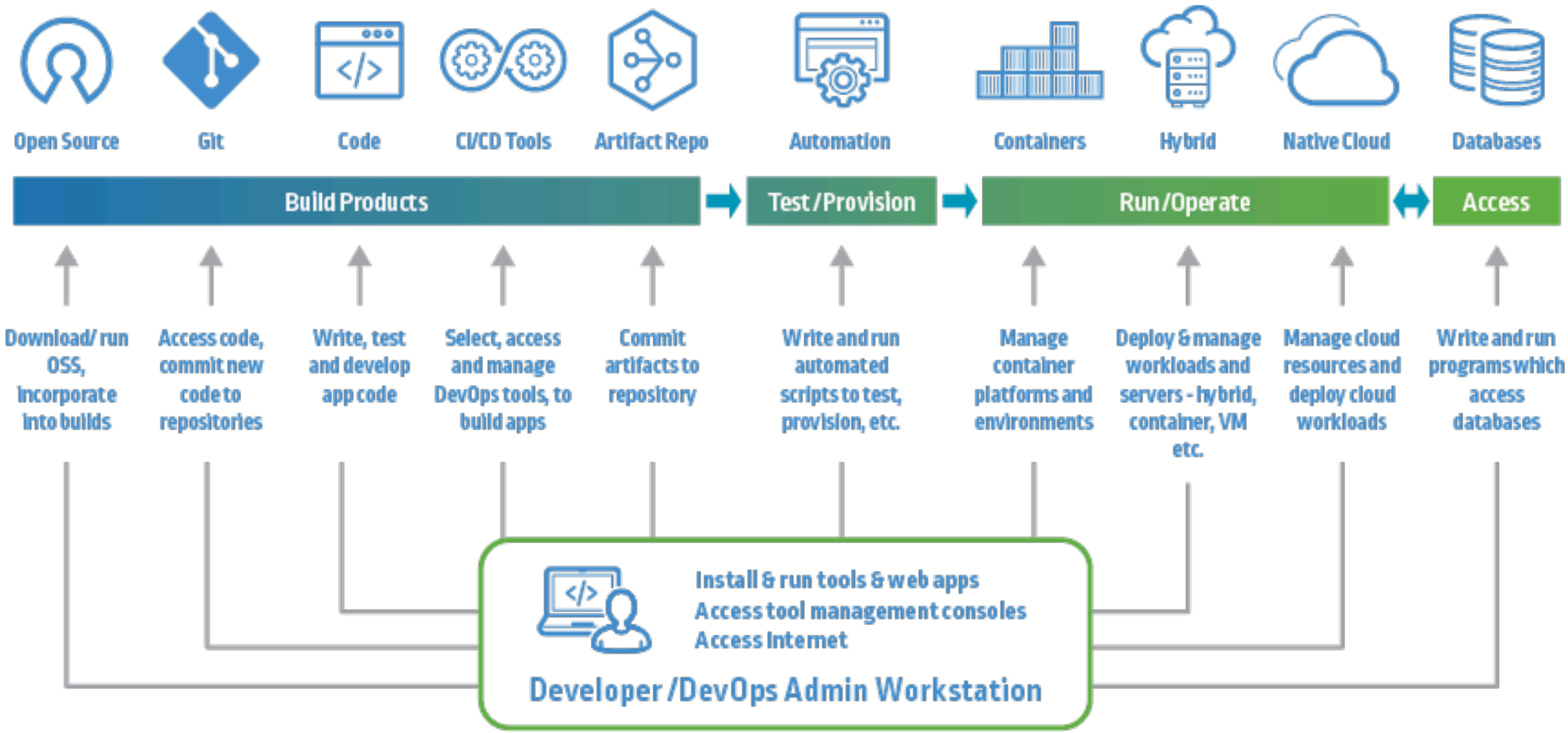


# CI/CD



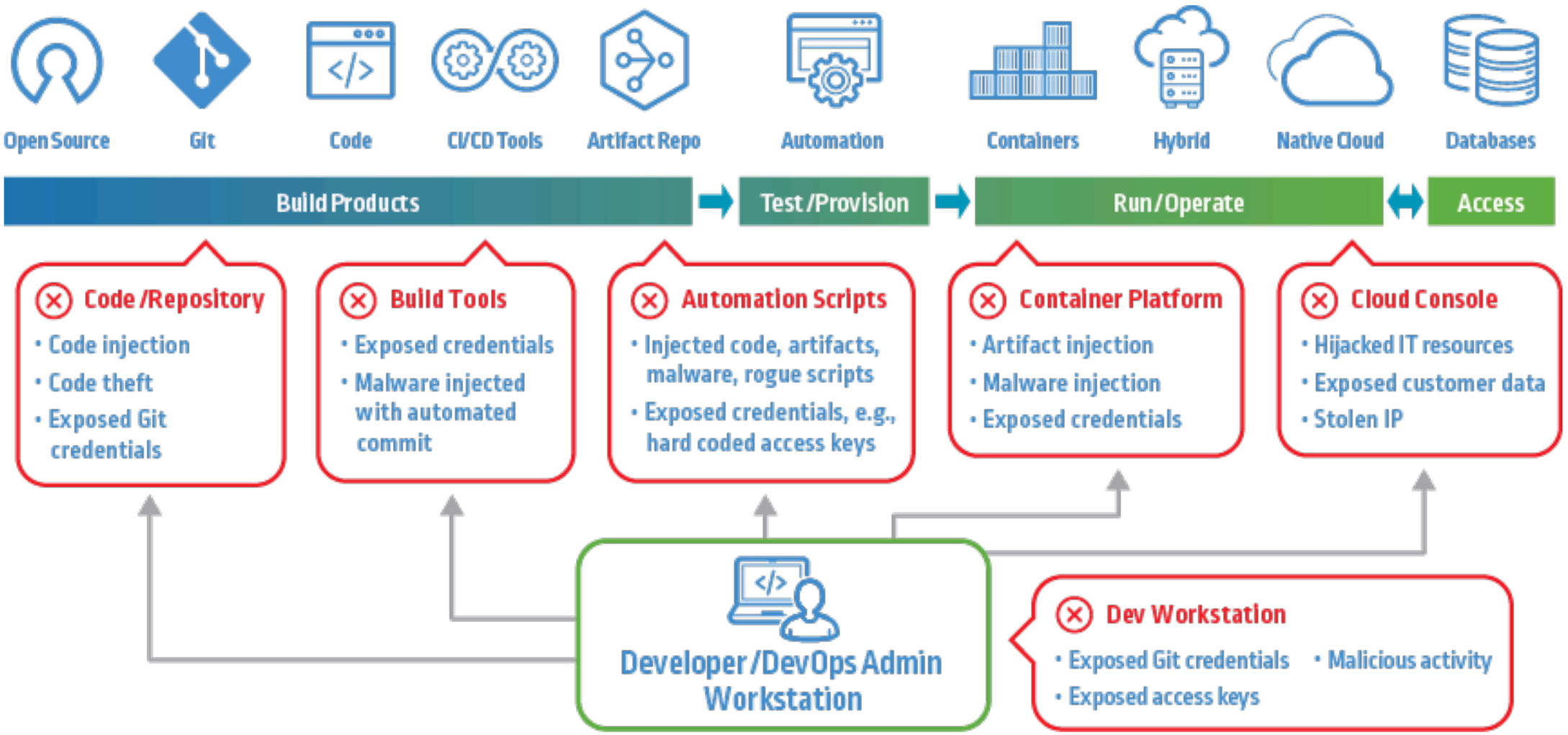



# CI/CD




https://www.cyberark.com/what-is/ci-cd-pipeline/

# CI/CD with secret management

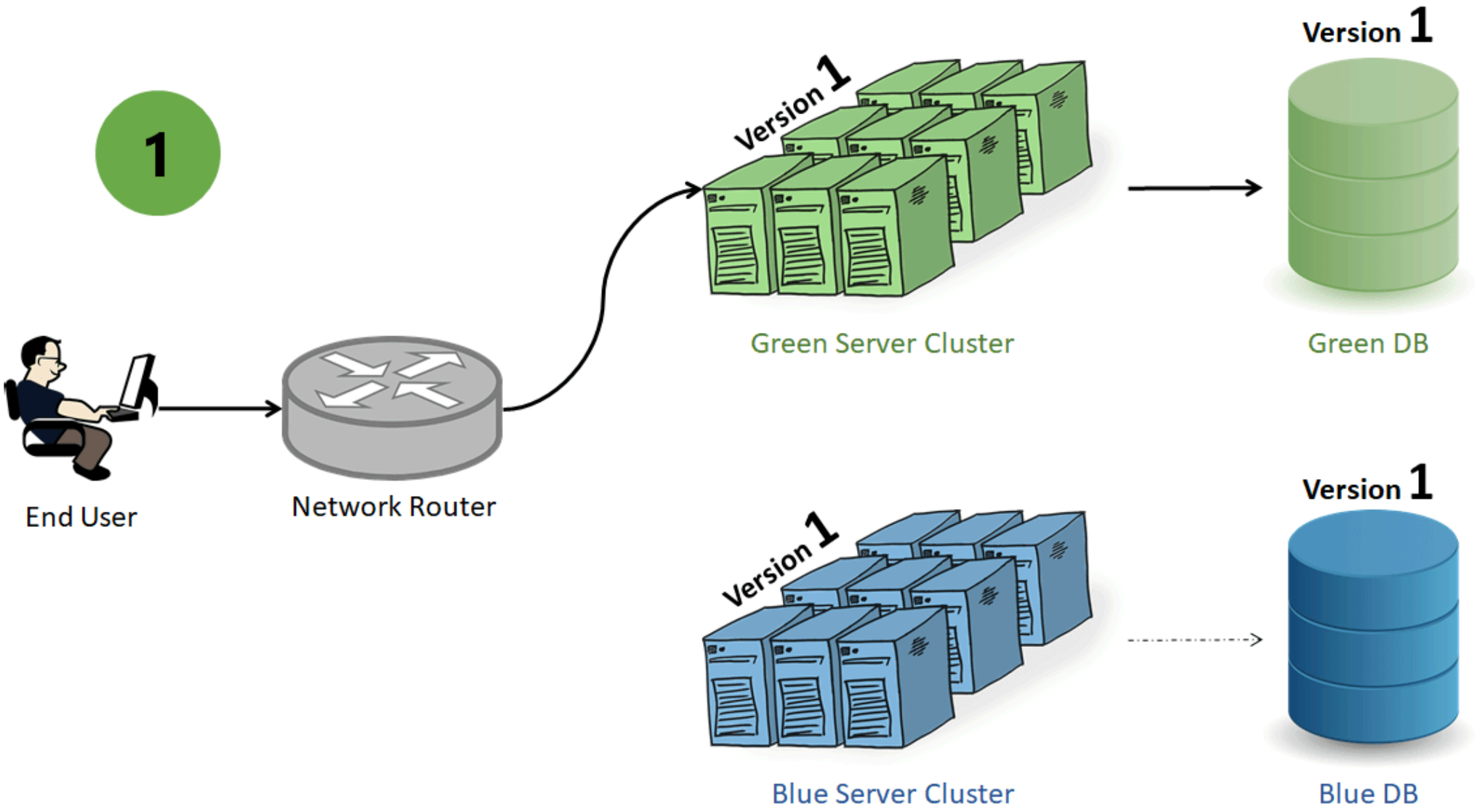



https://www.cyberark.com/what-is/ci-cd-pipeline/

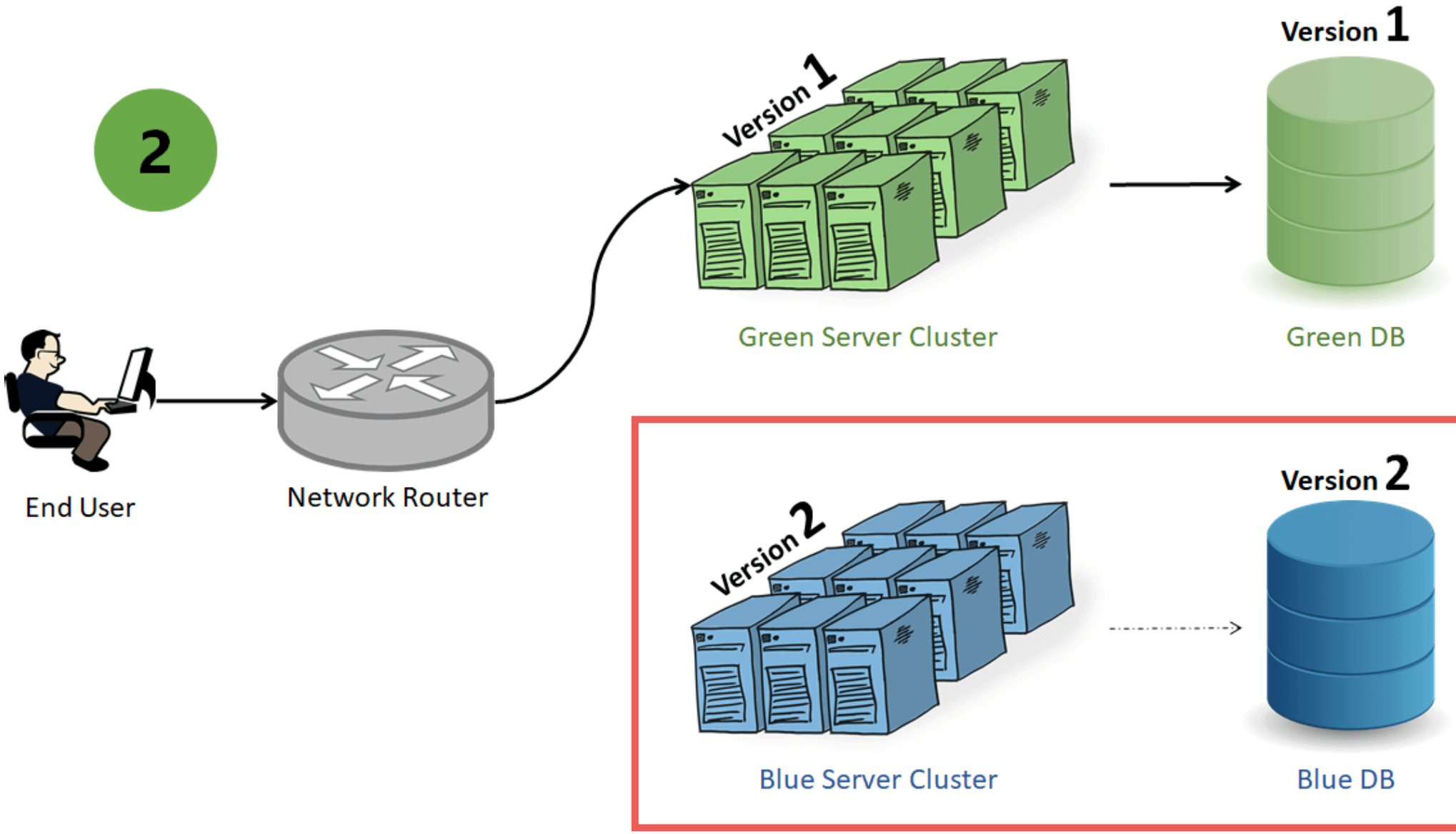
# Deployment strategies

Big bang !!
Blue-green deployment
Canary release
Proactive

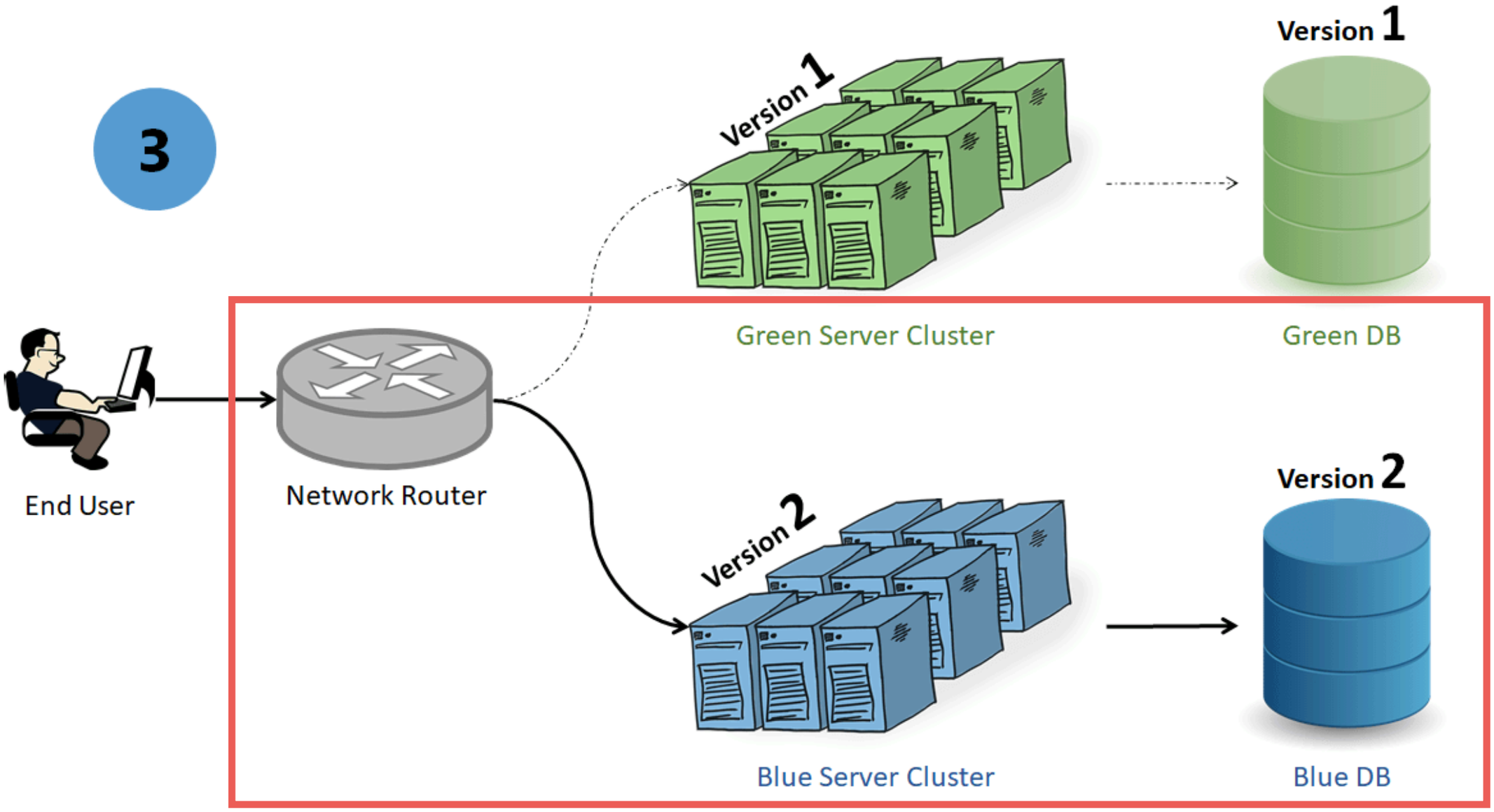
# Blue-green deployment



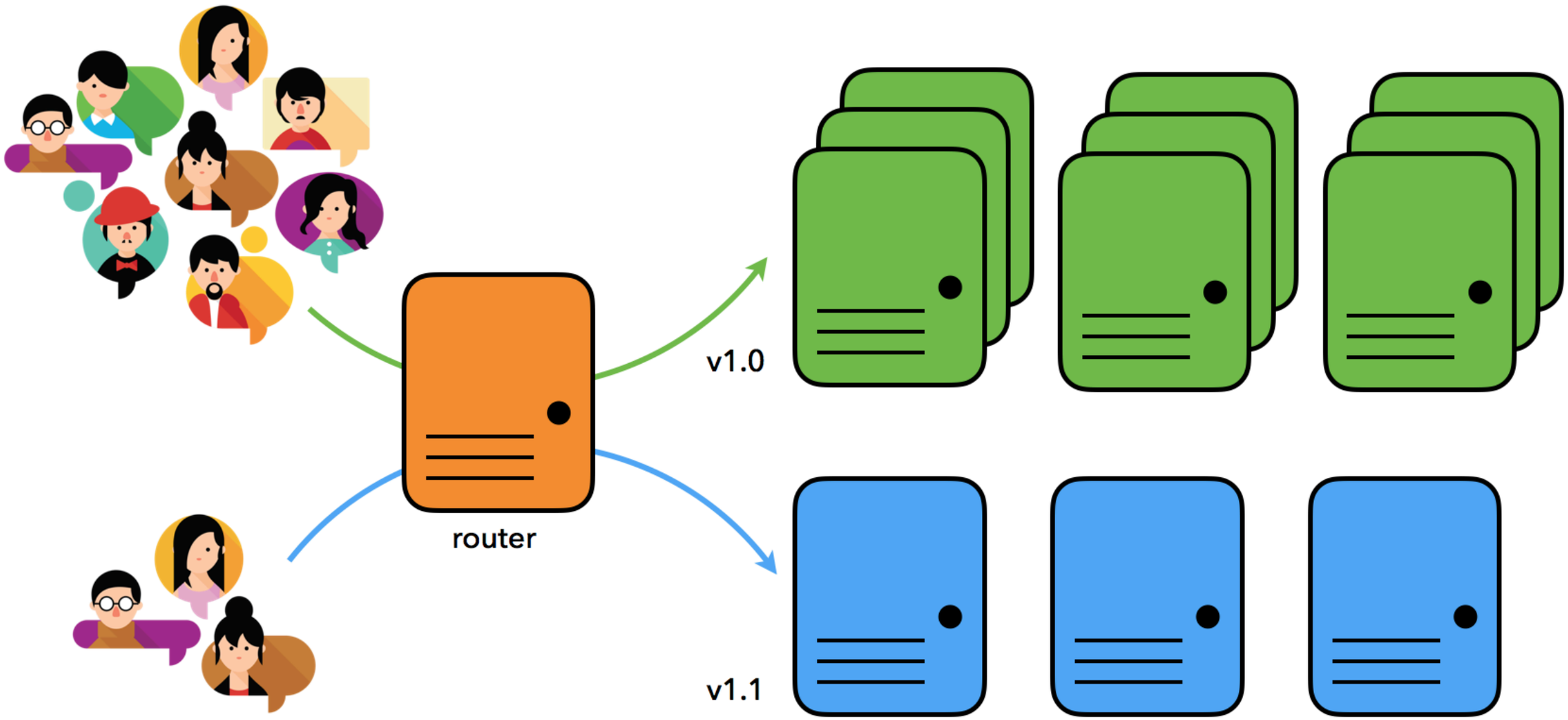
# Blue-green deployment



# Blue-green deployment

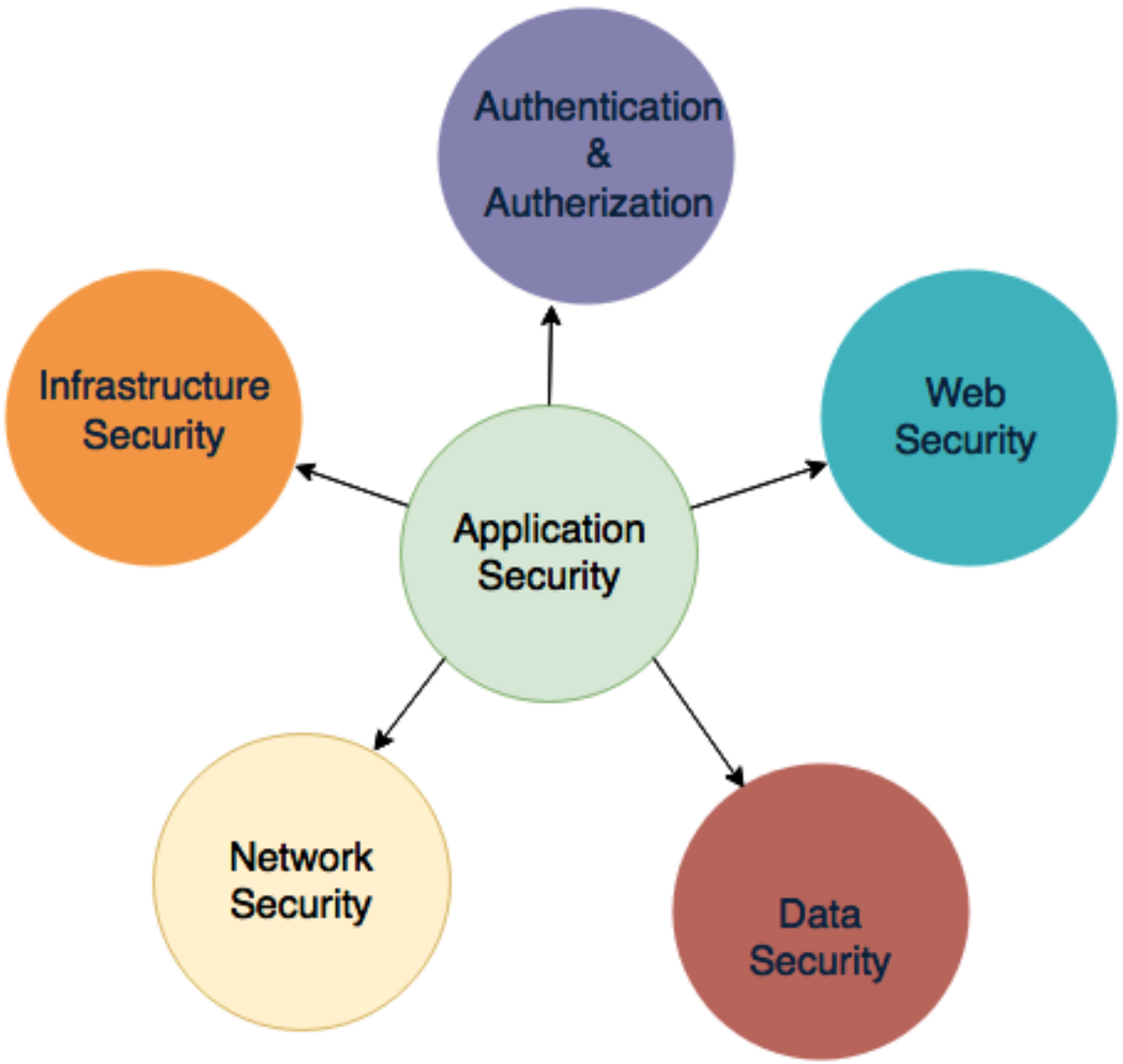


# Canary release




Canary Releases

# Security and Compliance



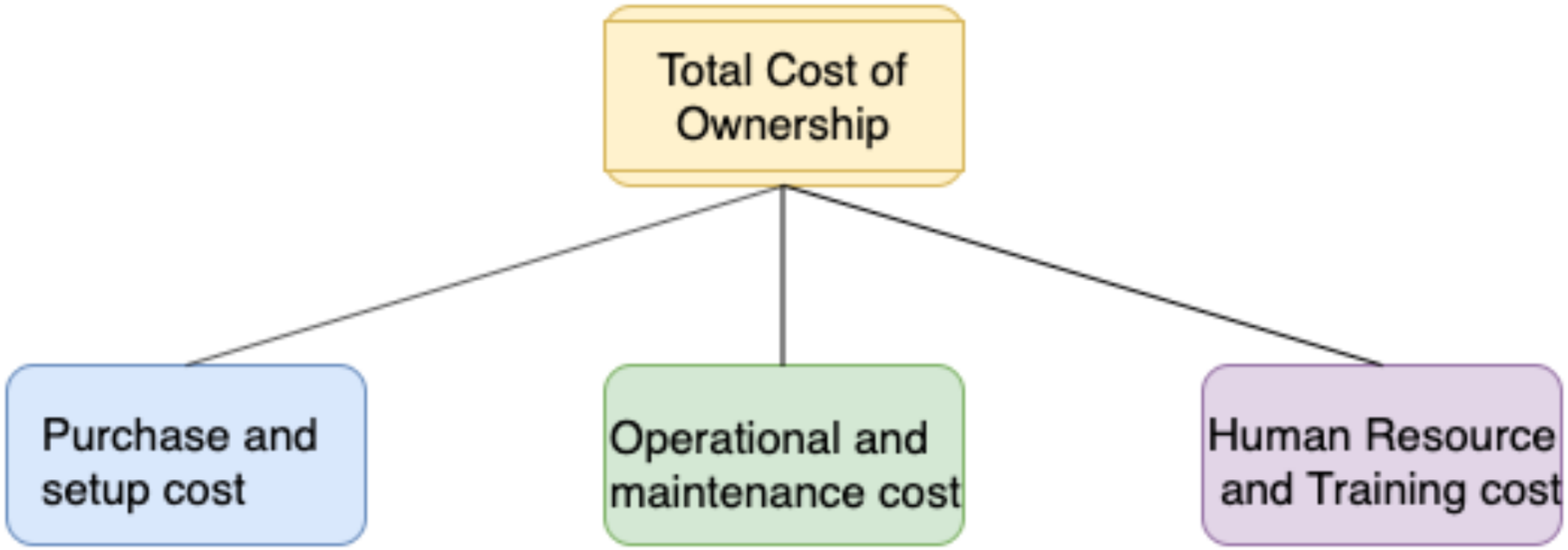
# Security and Compliance

OWASP Top 10
Web/API/Mobile/Docker/Kubernetes

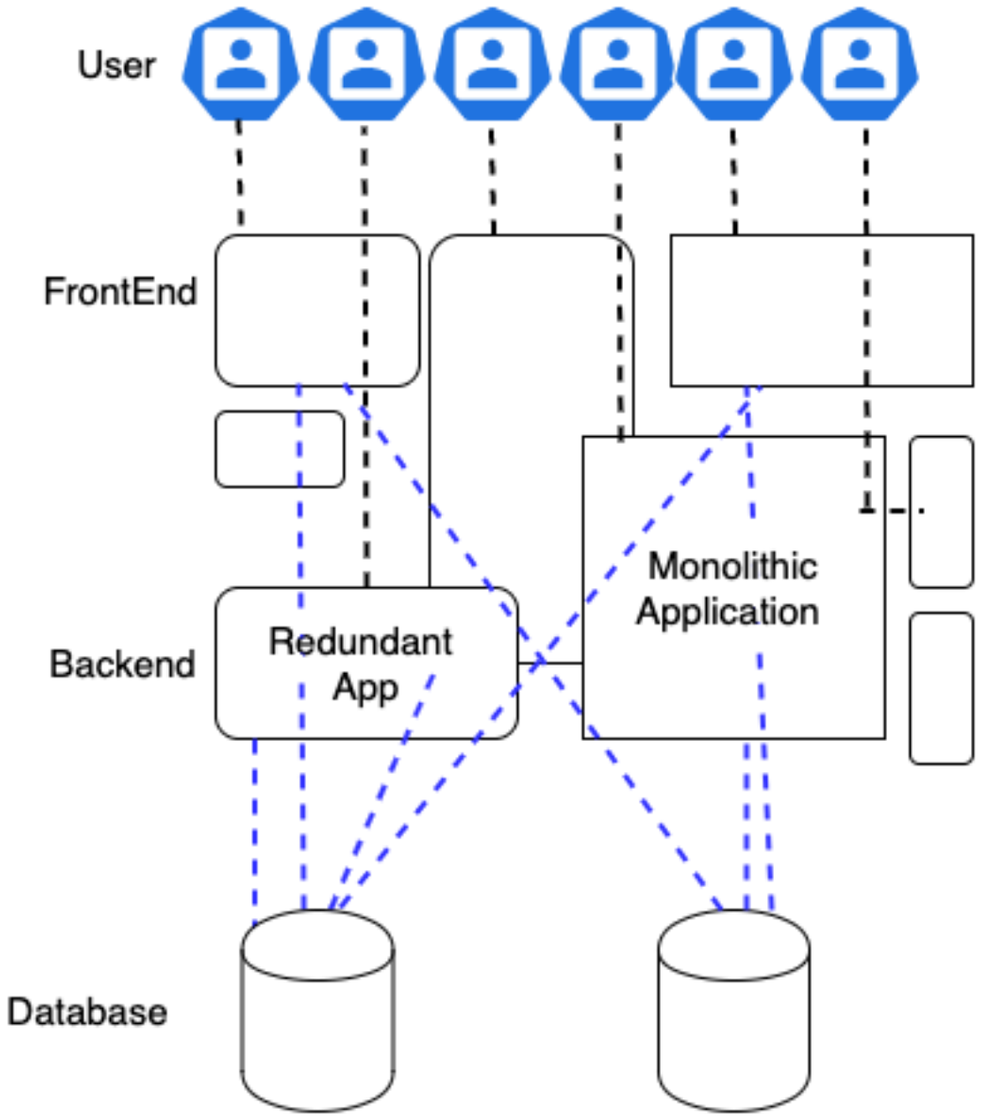

https://owasp.org/www-project-top-ten/

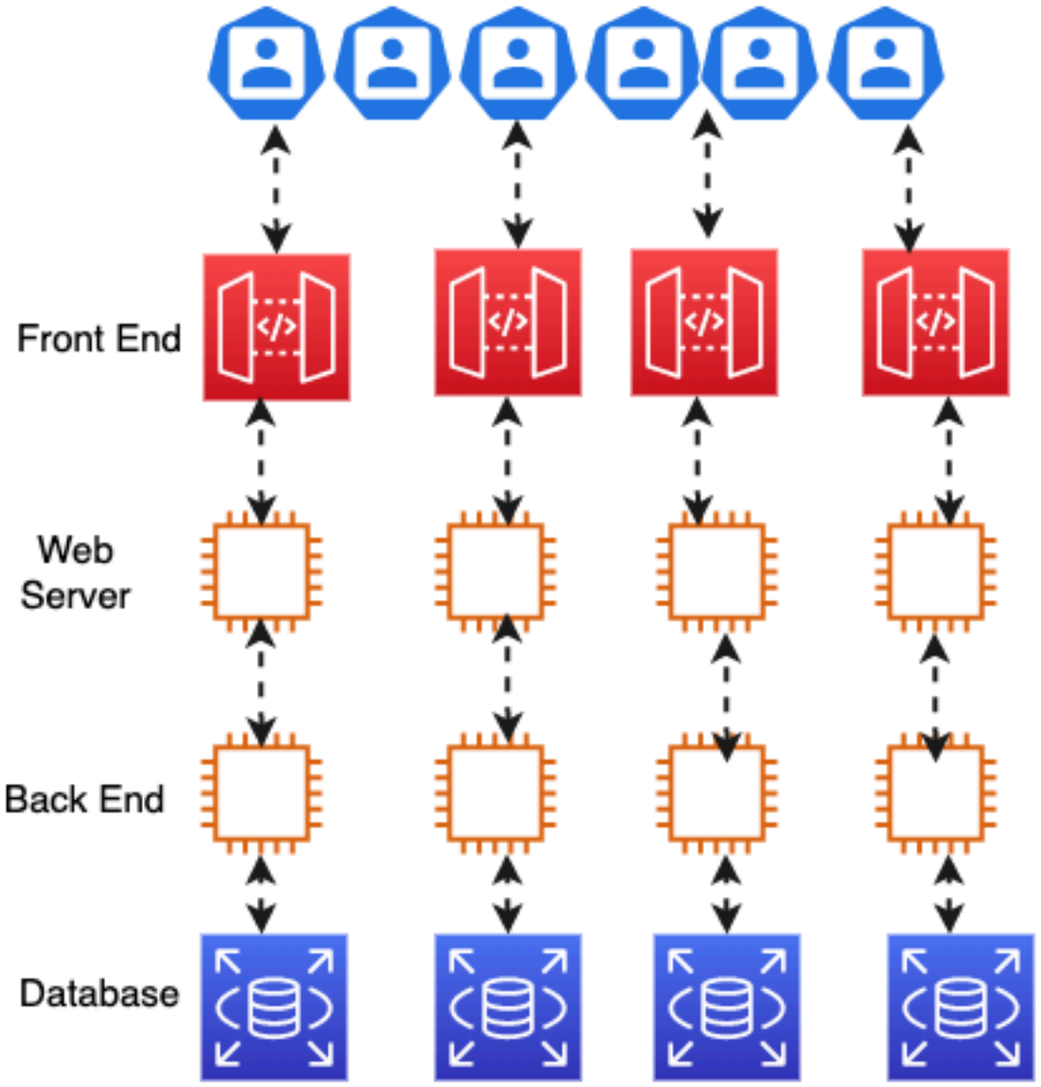
# Reduce architecture complexity

## Reduce cost

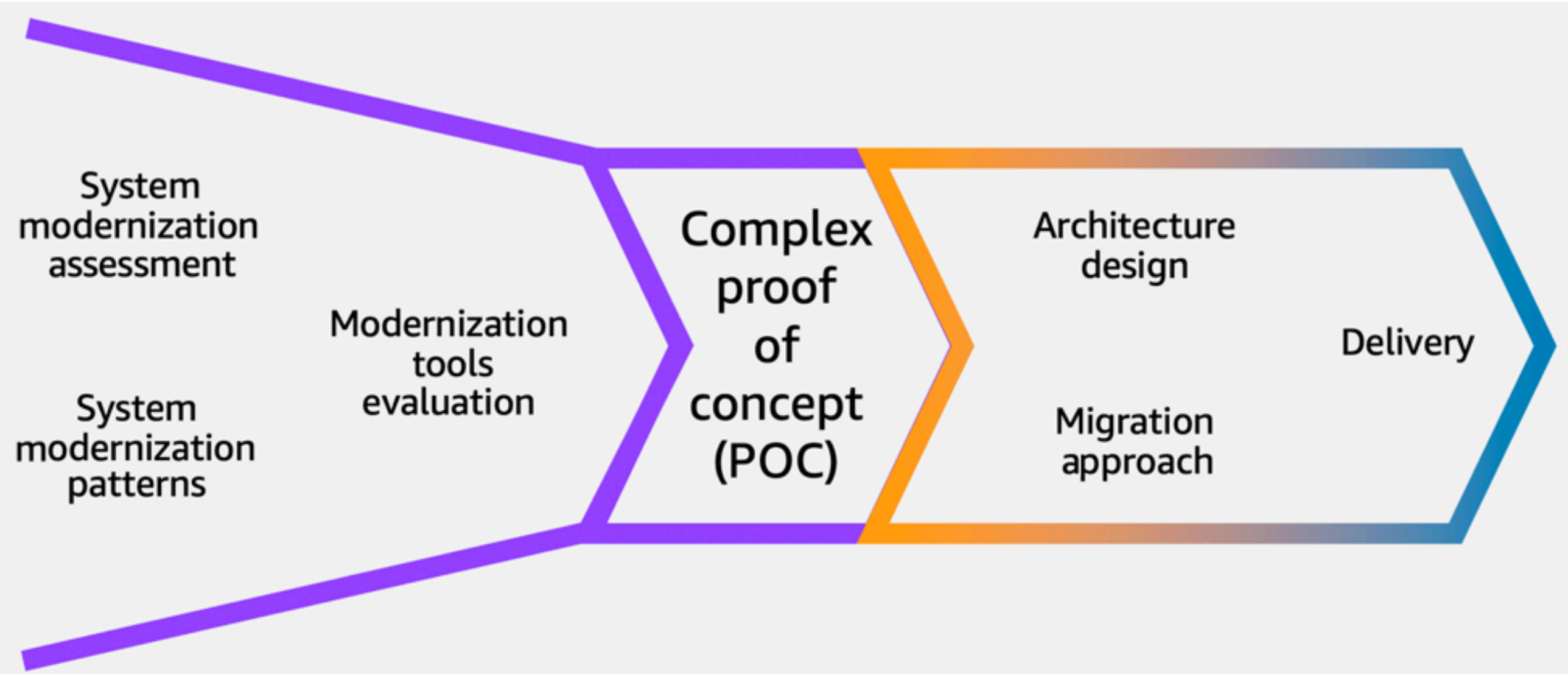


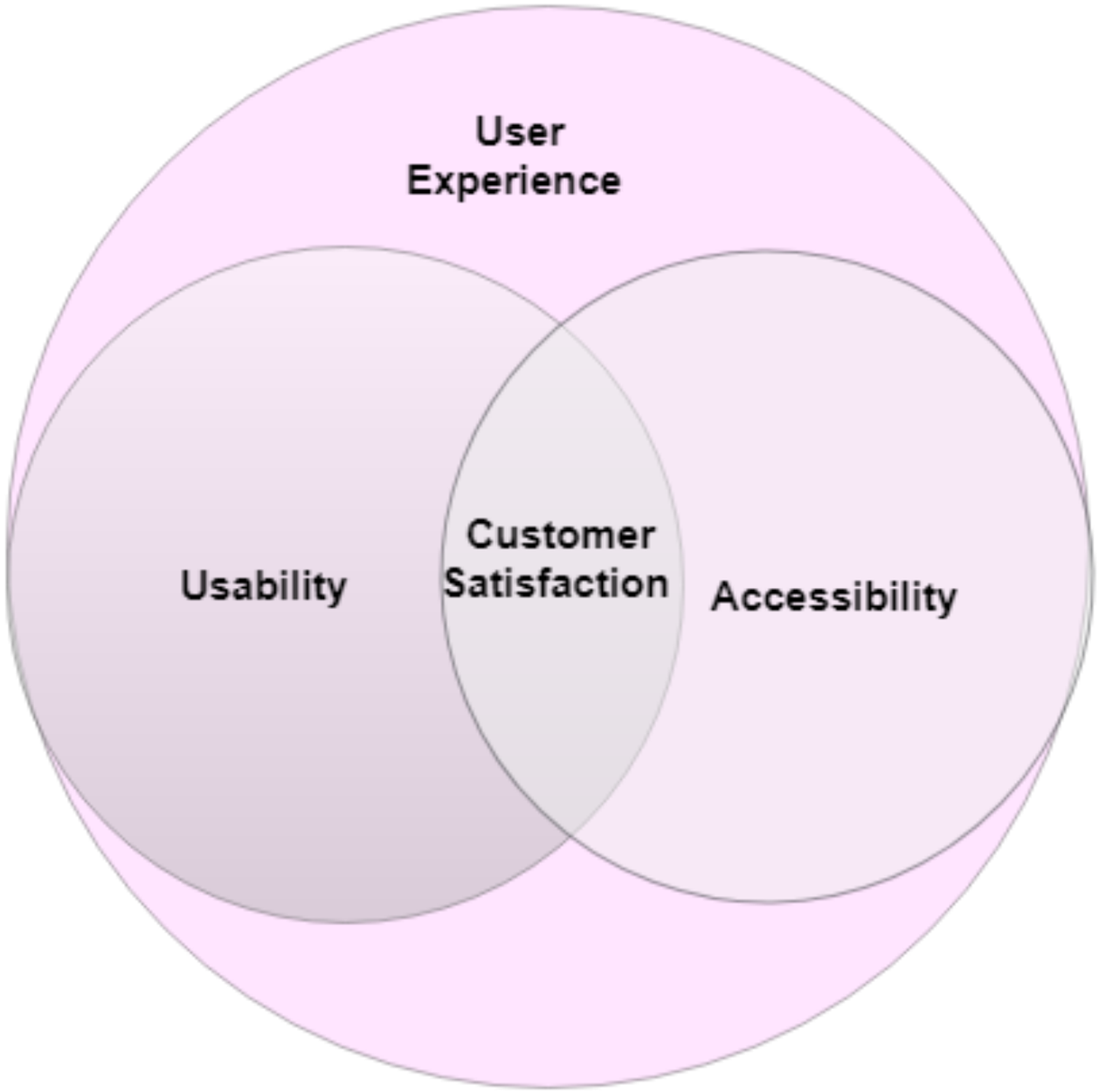
# Reduce architecture complexity



# Working with Legacy

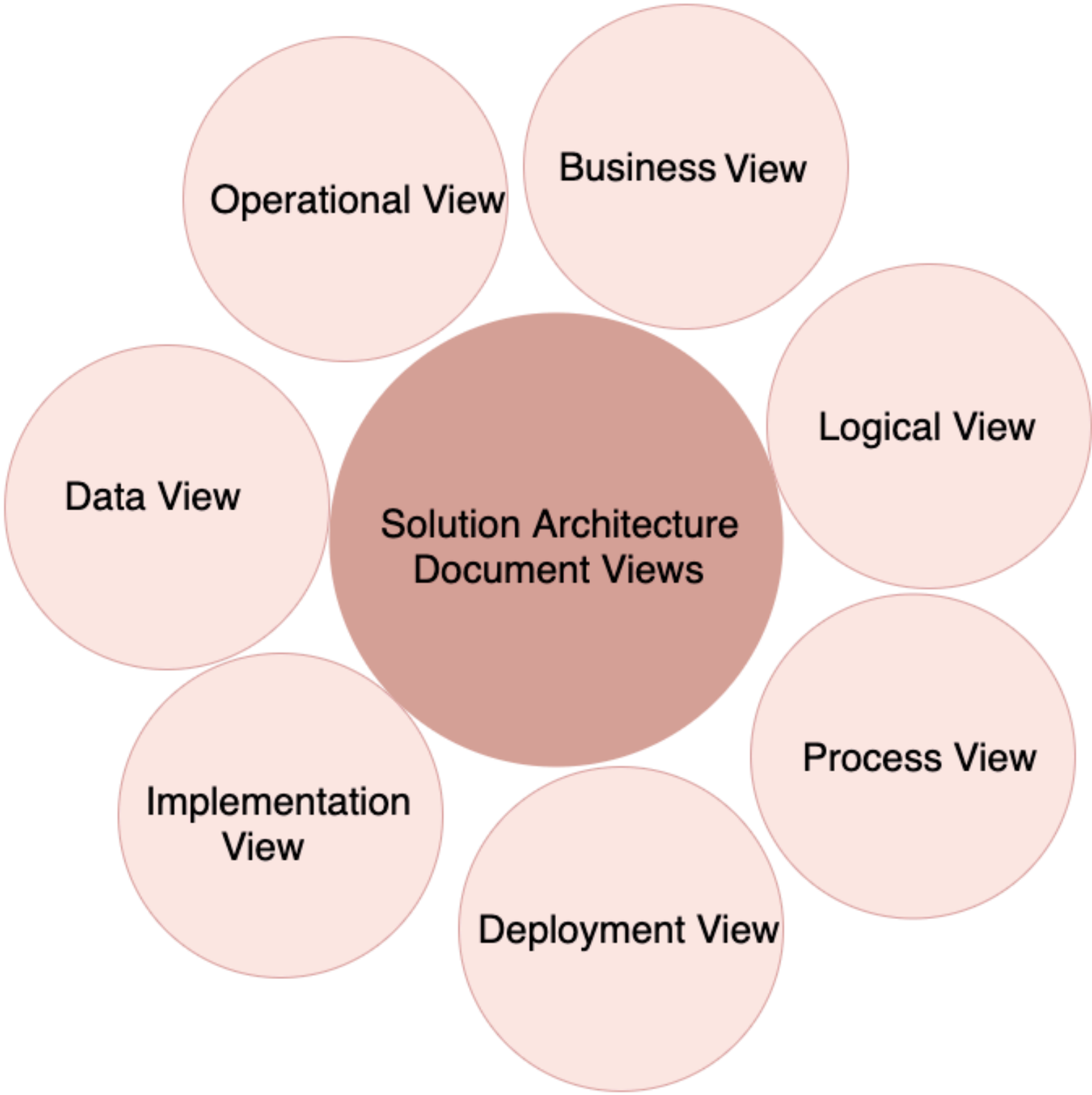




# Solution Architect Document

# Deployment strategies

Big bang !!
Blue-green deployment
Canary release
Proactive



# Working with
# C4 architecture modeling

# ADR
# Architecture Decision Record

https://github.com/joelparkerhenderson/architecture-decision-record

# Deployment strategies

Big bang !!
Blue-green deployment
Canary release
Proactive