สยามชำนาญกิจ
SIAM CHAMNAN KIT

Microservices

In Practices

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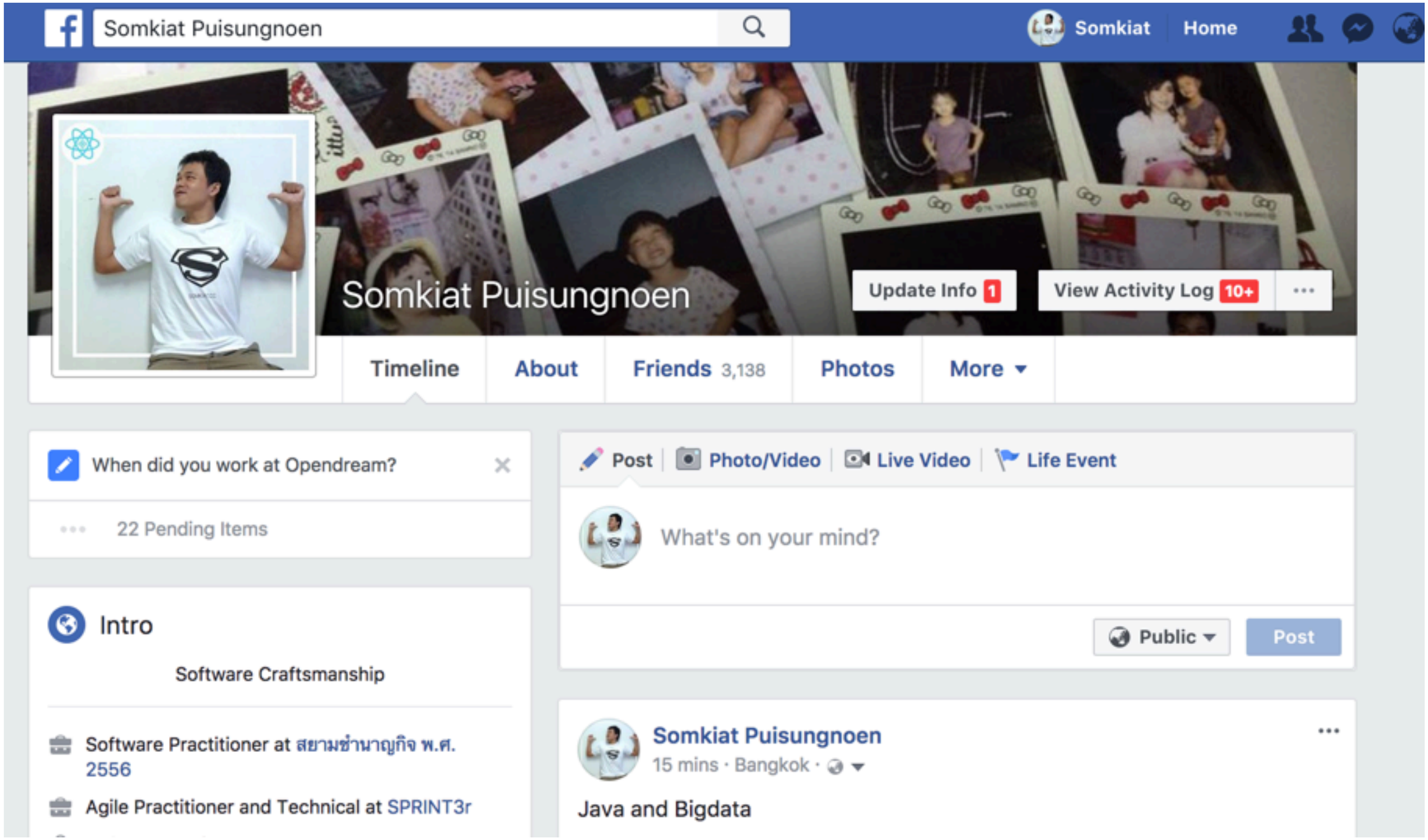

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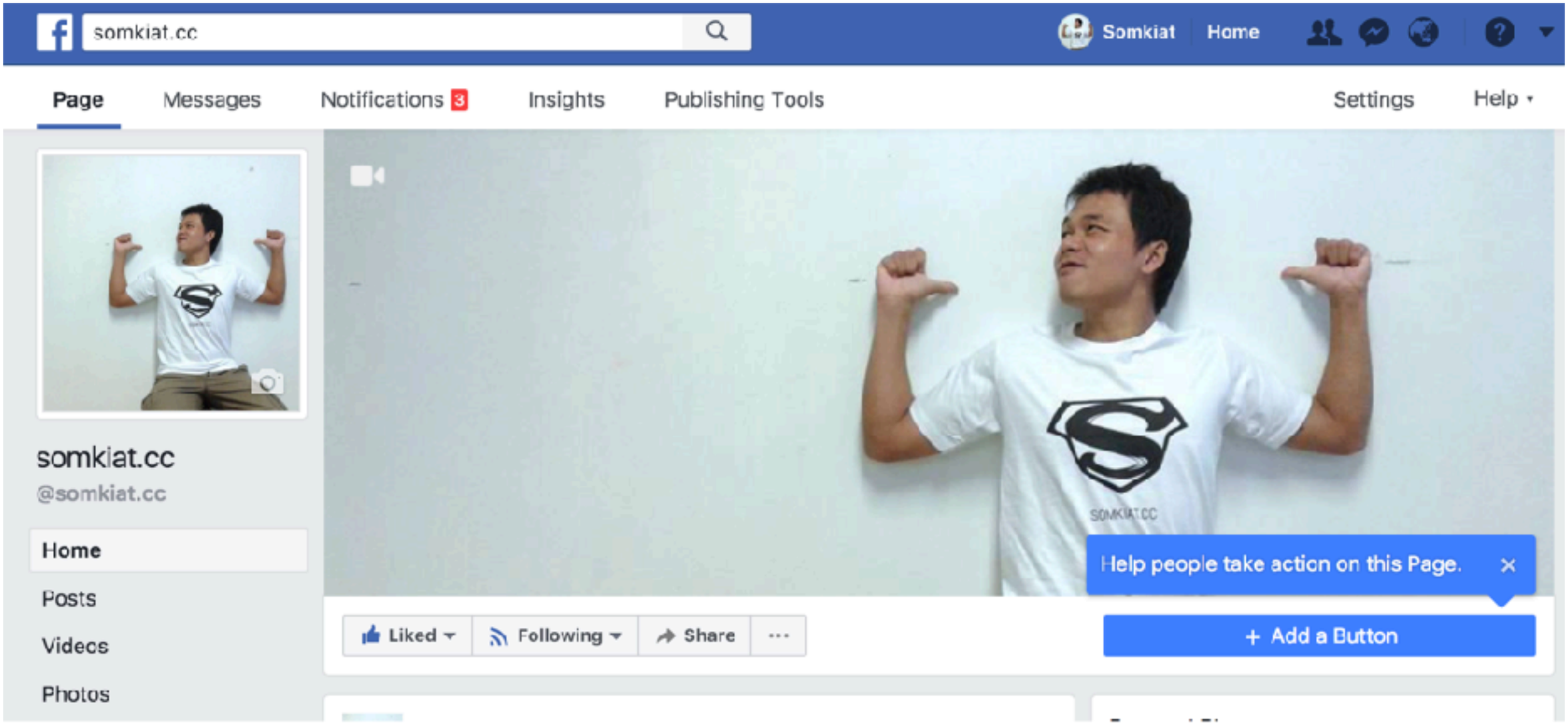

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Agenda Day 1

1. Cloud Native Application
2. Microservices and DevOps
3. The architecture of Microservices
4. How to model Microservices
5. Integrating multiple Microservices
6. Workshop

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Agenda Day 2

1. Testing and Developing Microservices
2. Deploying Microservices
3. Maintaining healthy Microservices
4. Monitoring Microservices
5. Scaling up your Microservices
6. Workshop

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https://github.com/up1/course-microservice

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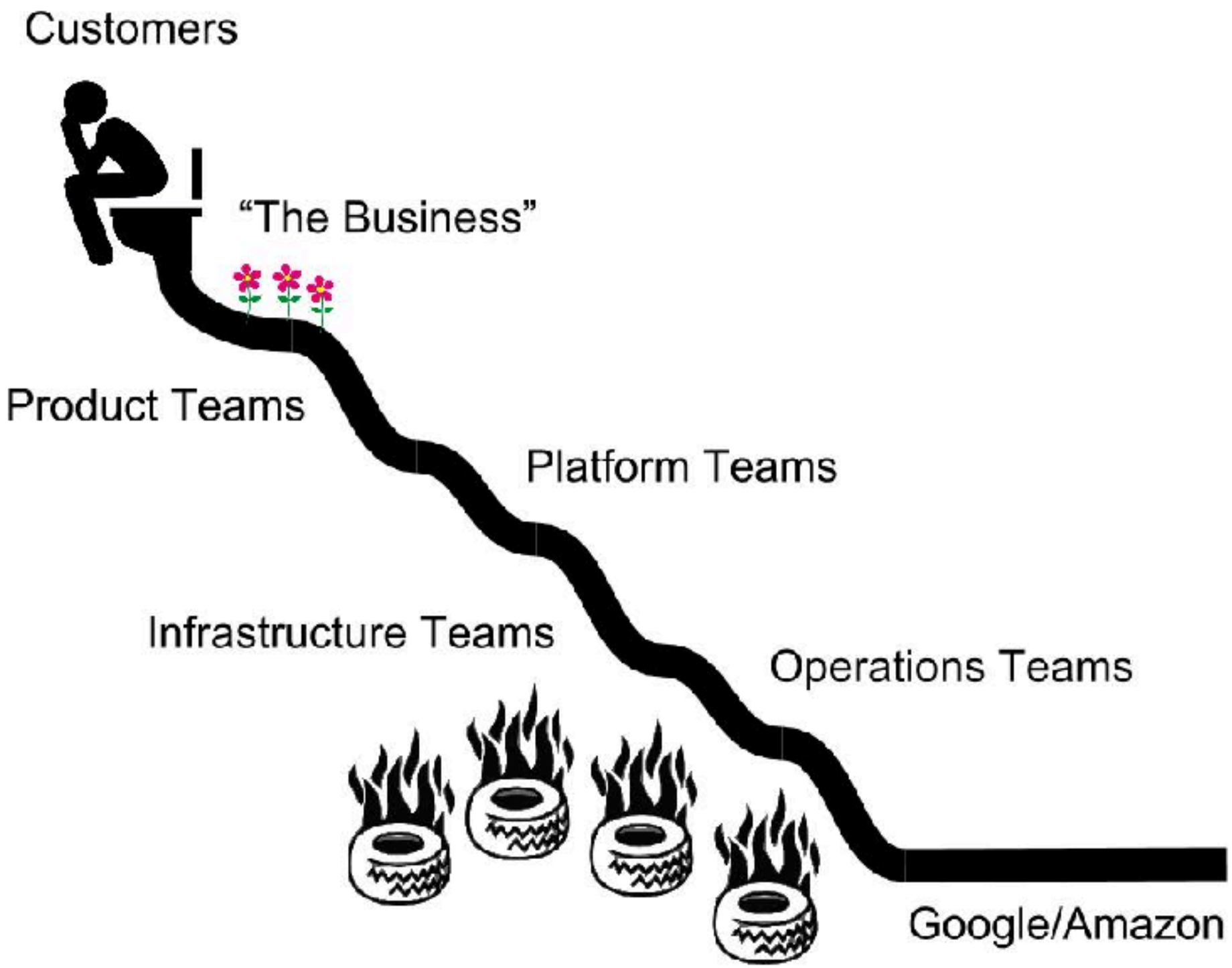

https://bravenewgeek.com/

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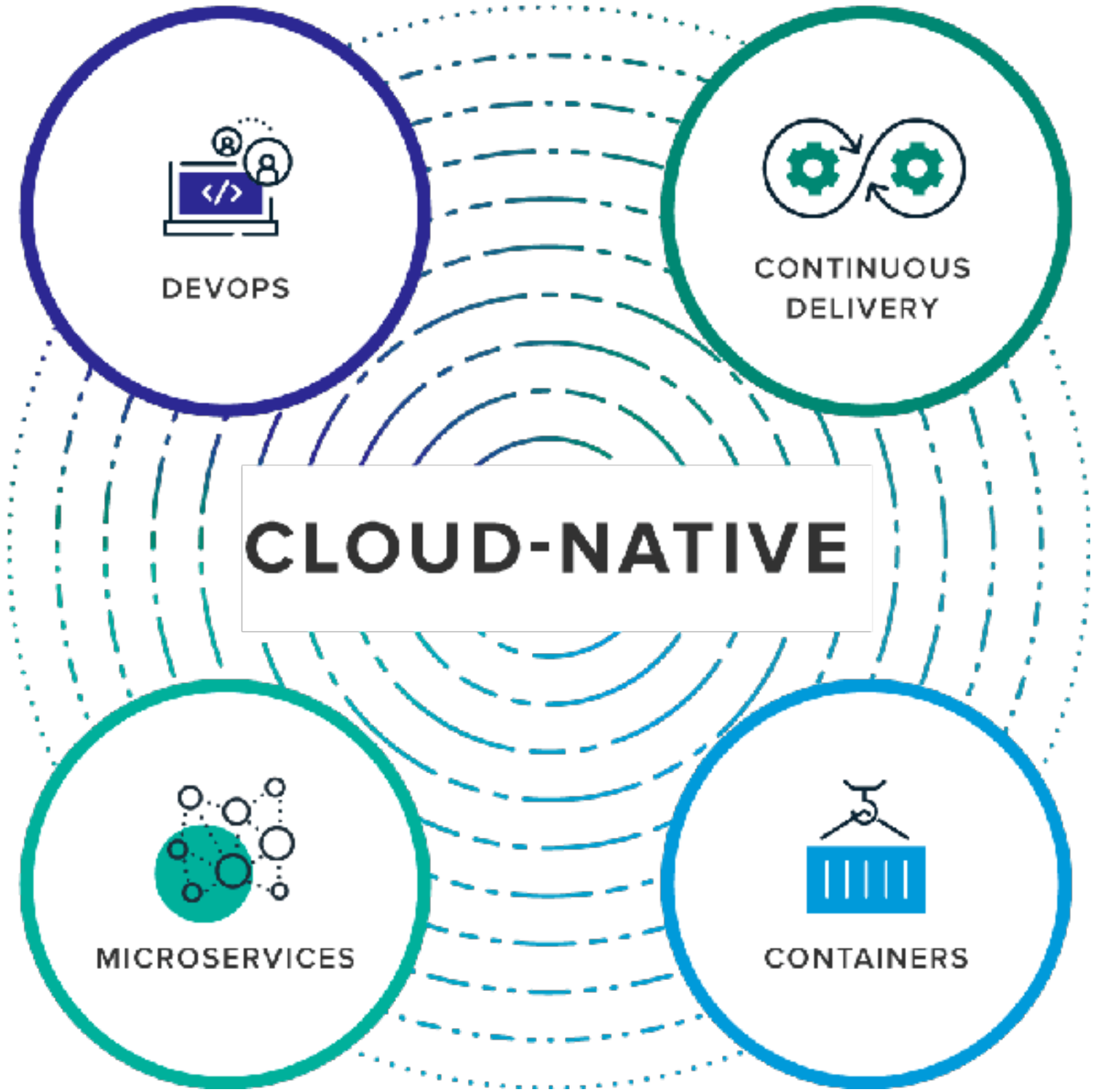

https://pivotal.io/cloud-native

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Evolution of Architecture

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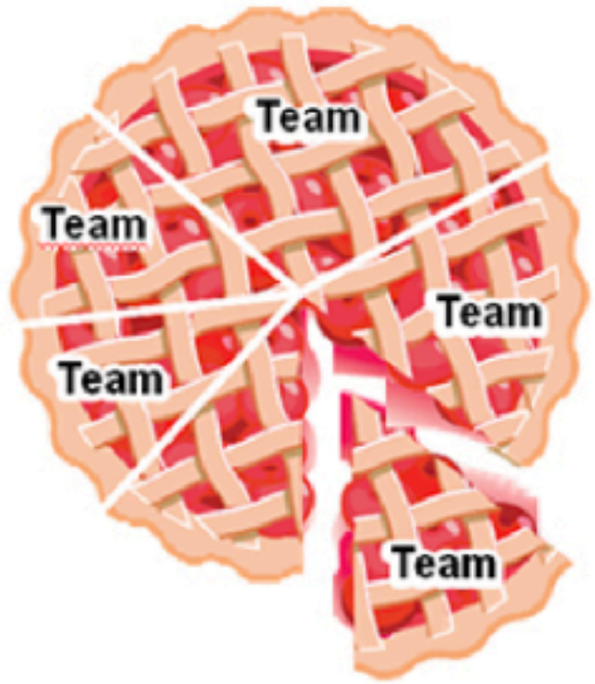
1990s and earlier

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.

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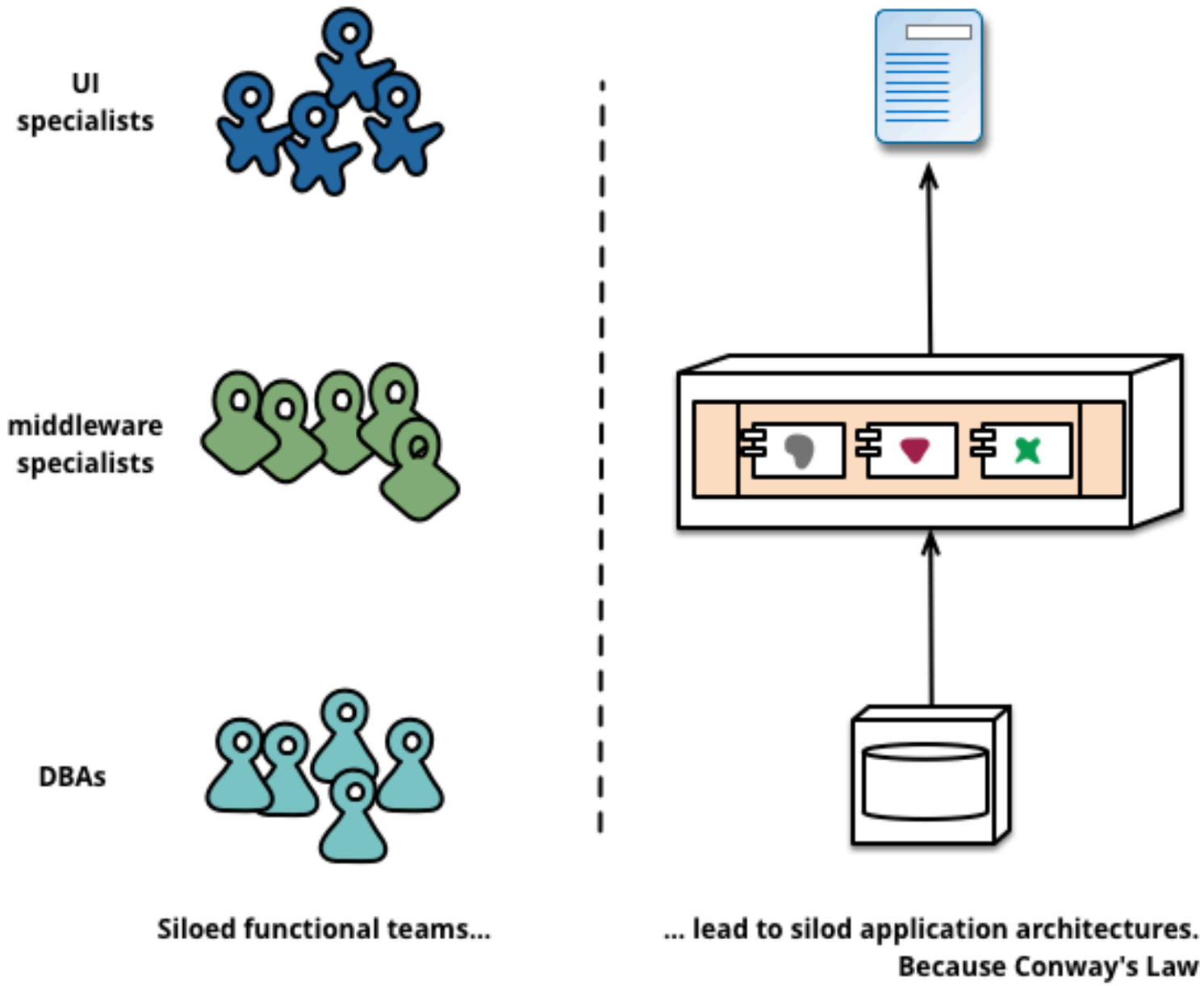
Conway’s Law



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Microservices

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Microservices

Small, Do one thing
Modular
Easy to deploy
Scale independently

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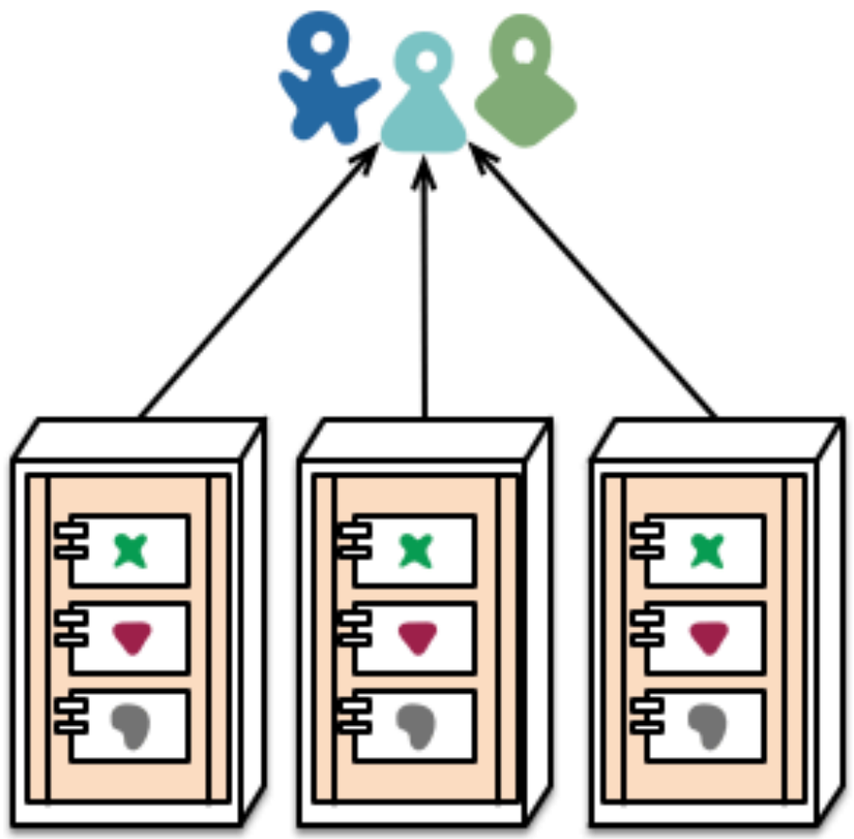
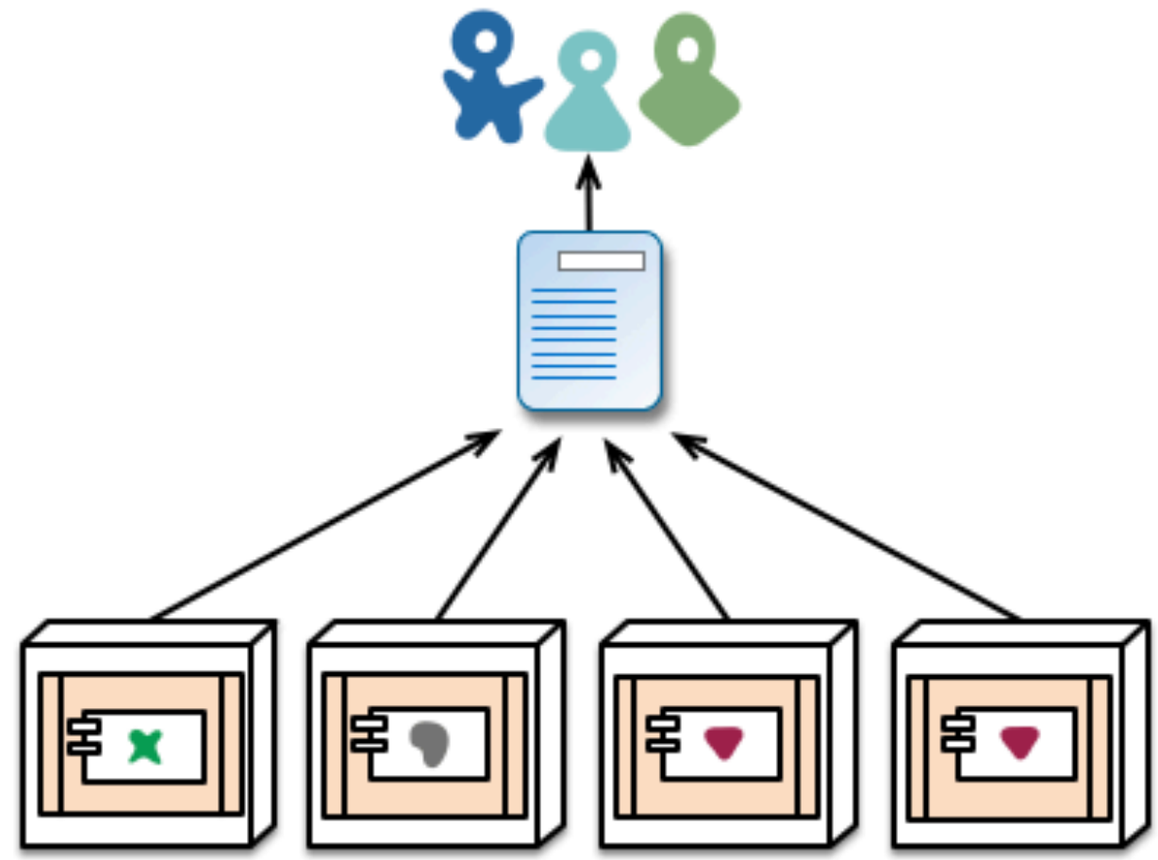
Conway's Law



monolith - multiple modules in the same process



microservices - modules running in different processes

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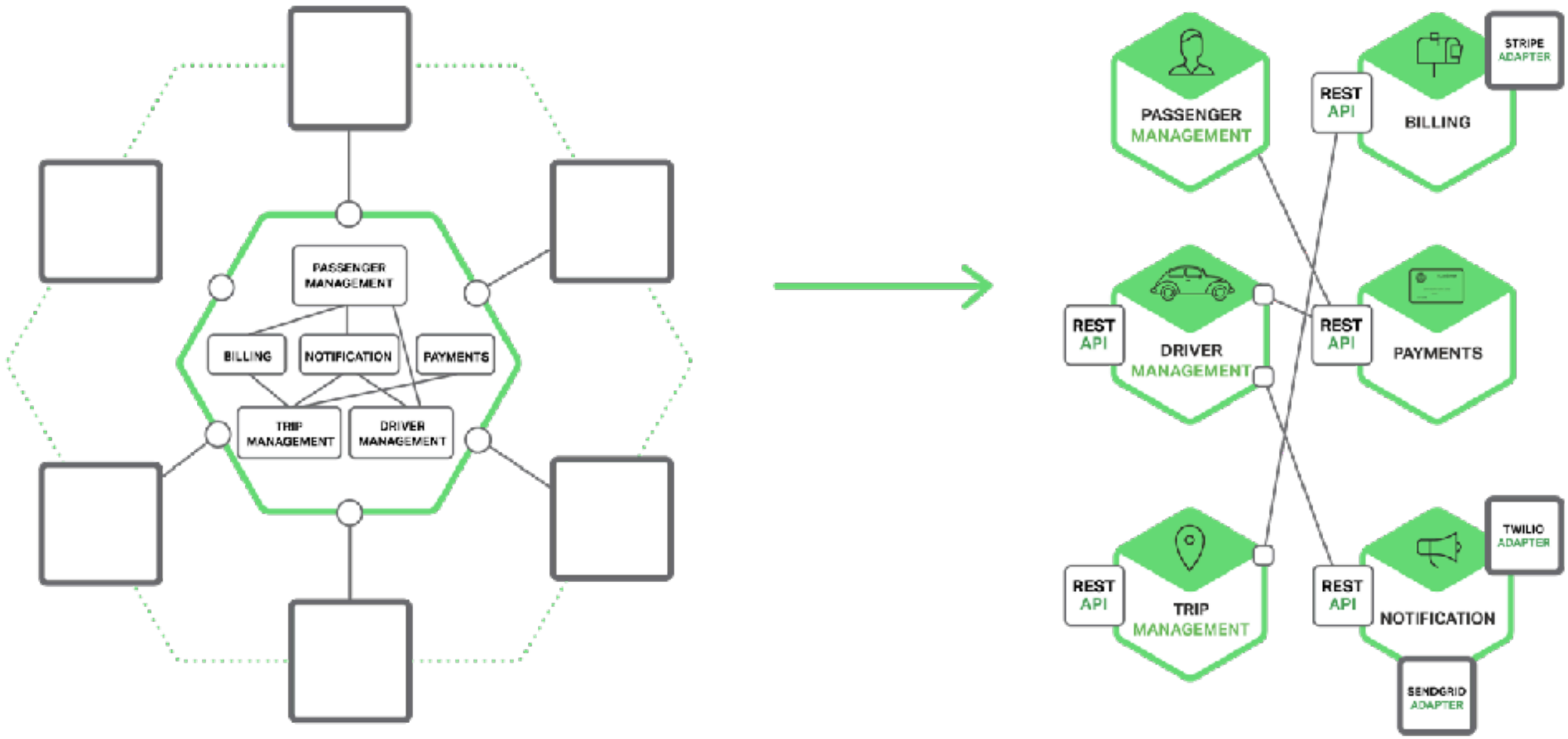
Conway's Law



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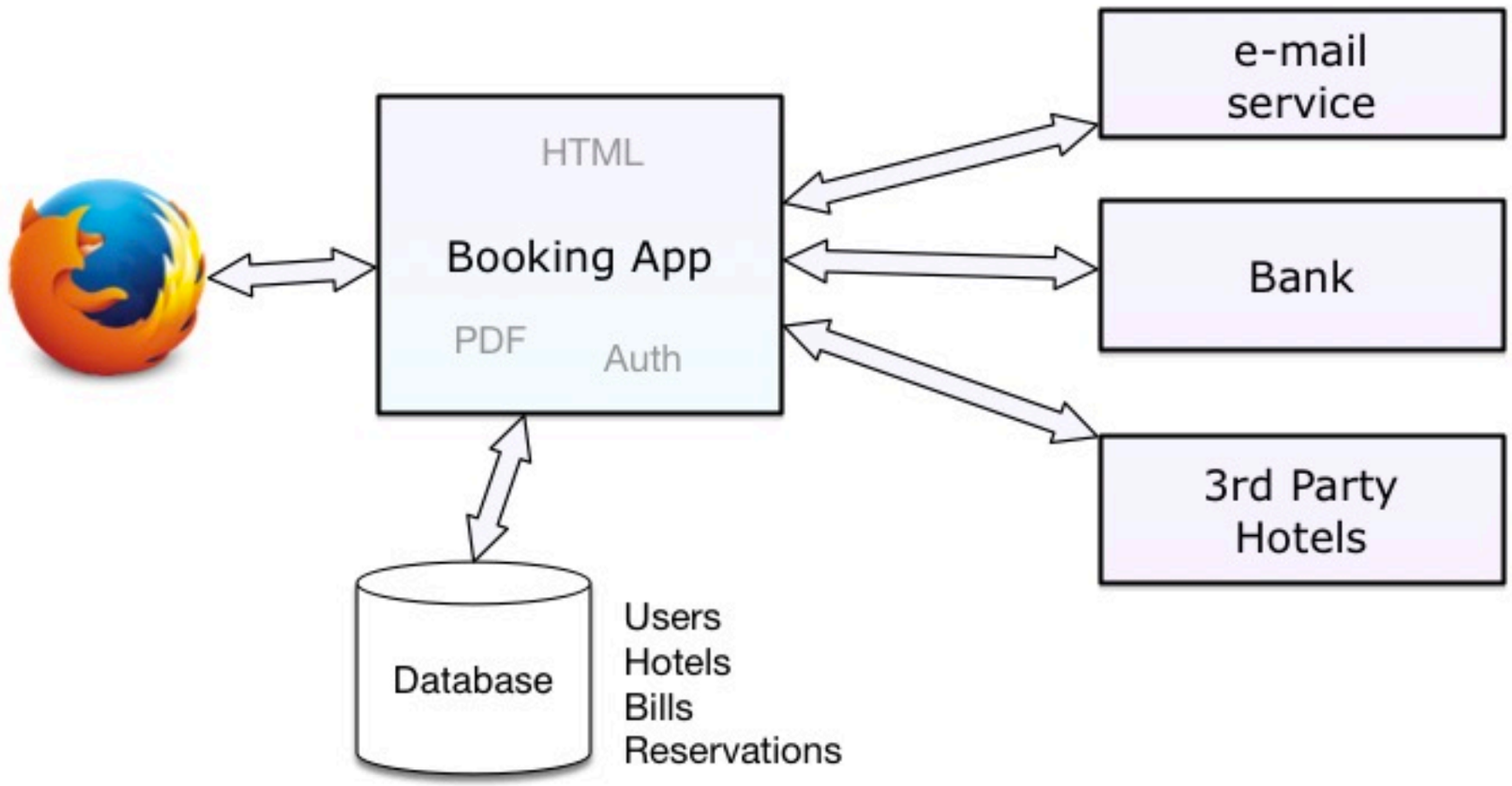
Monolithic



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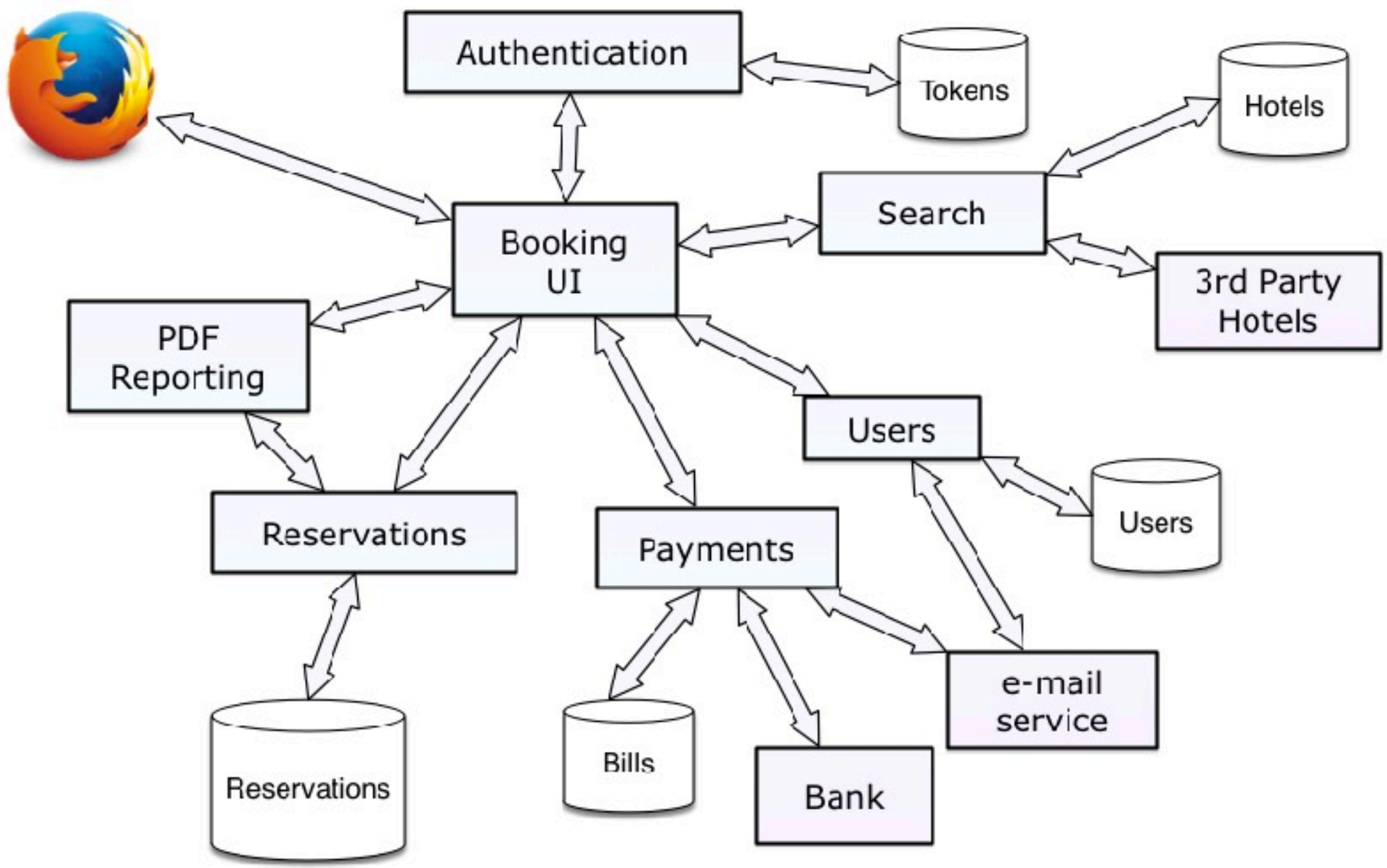
Microservices



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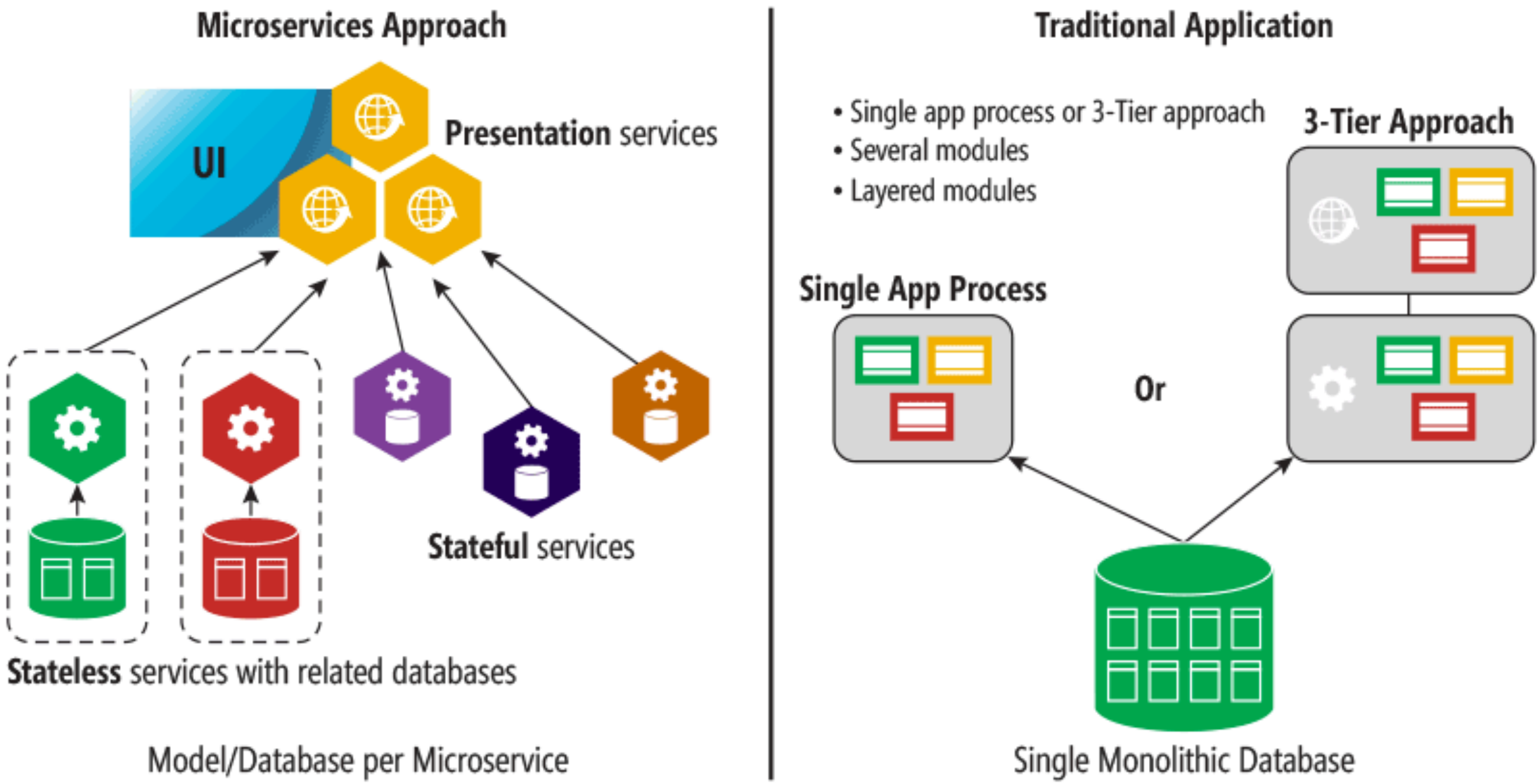
Microservices



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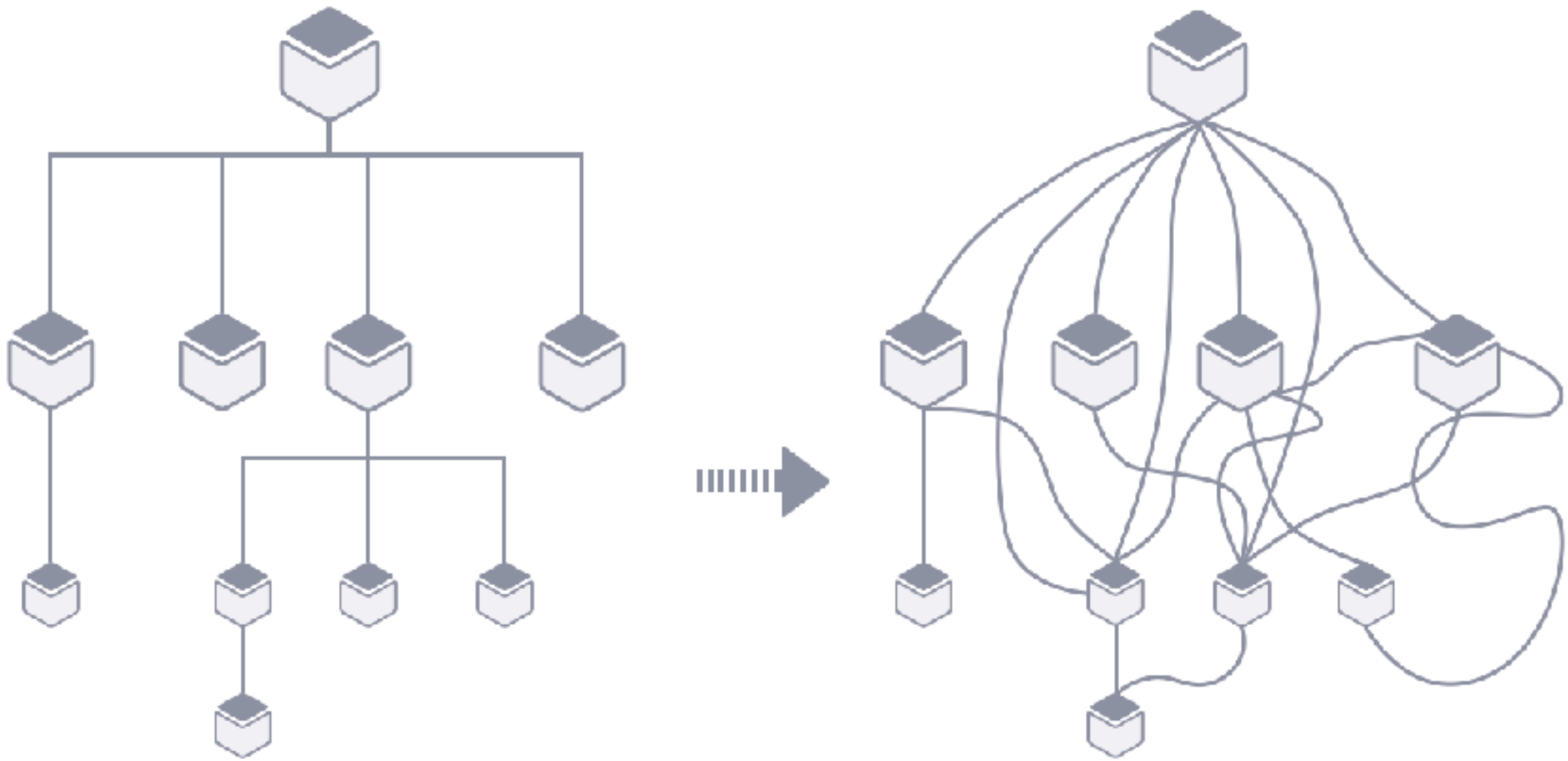
Microservices spaghetti



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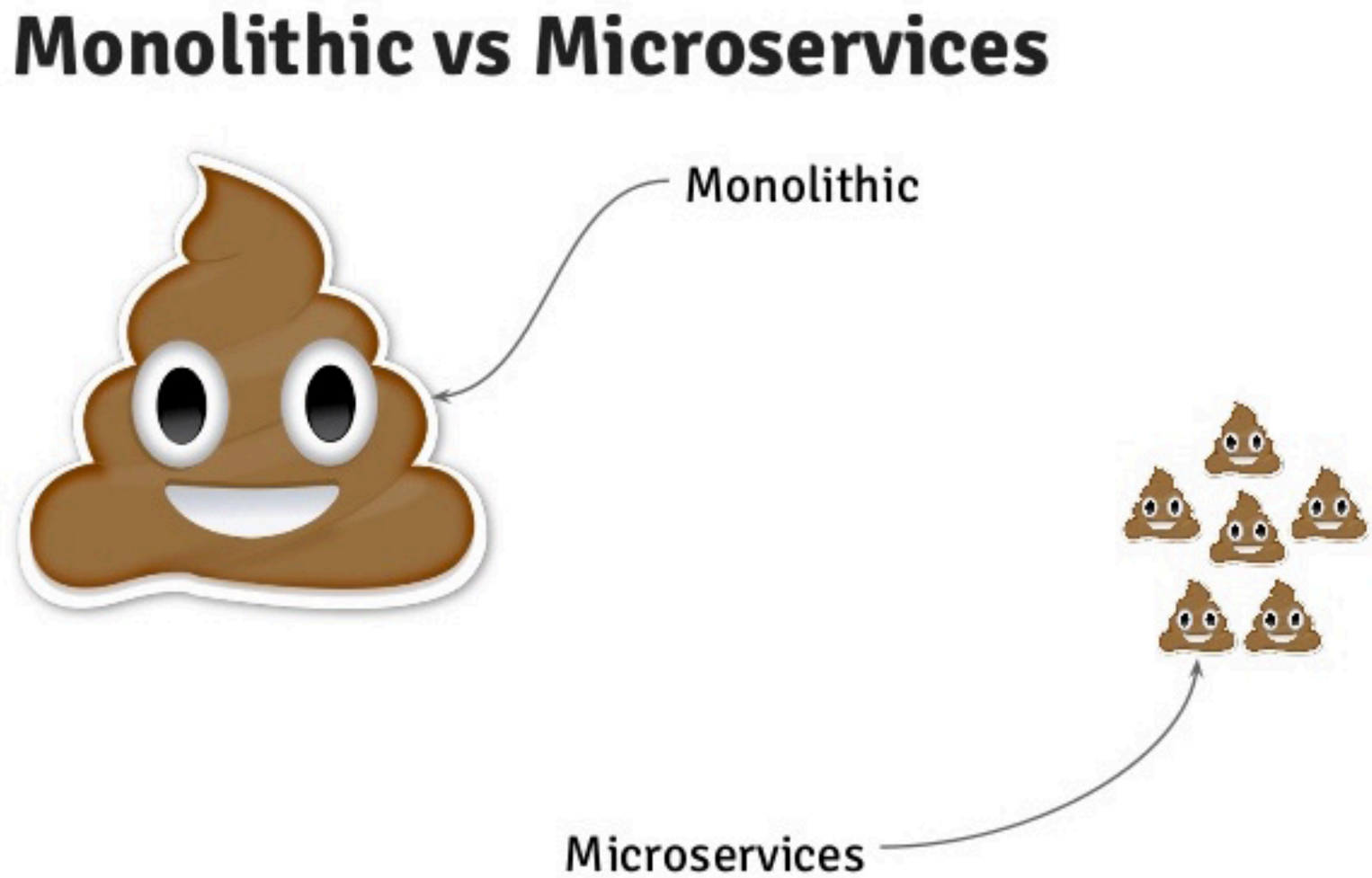
Microservices spaghetti



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Key Benefits

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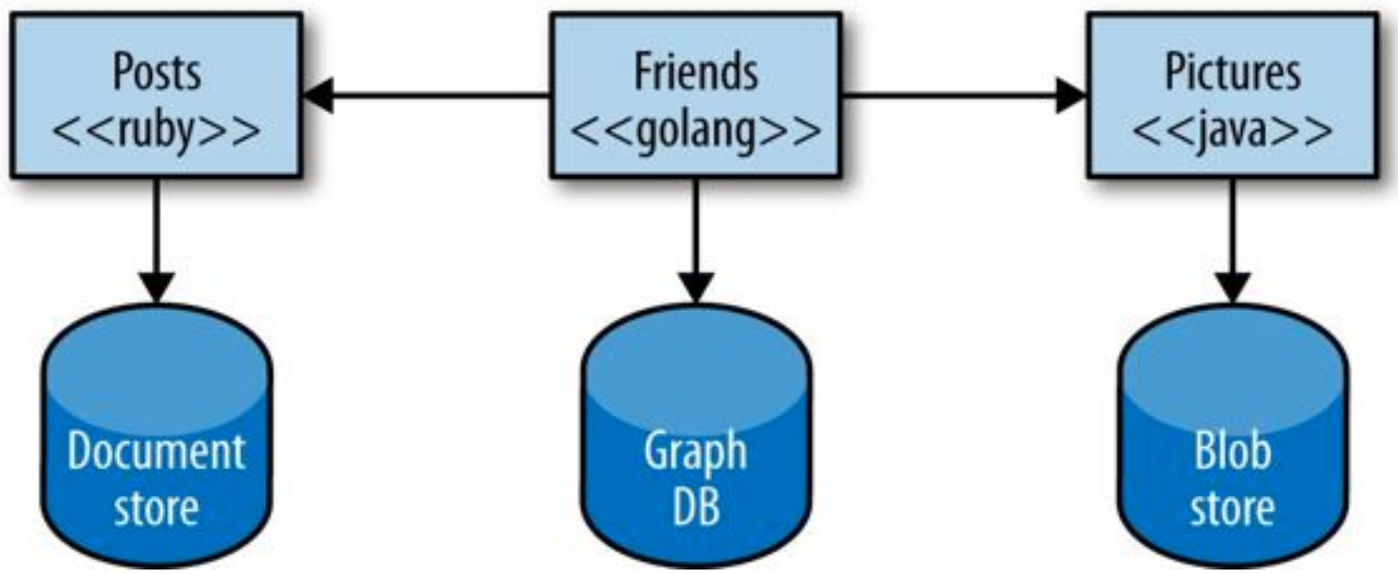
1. Technology heterogeneity

The right tool for each job



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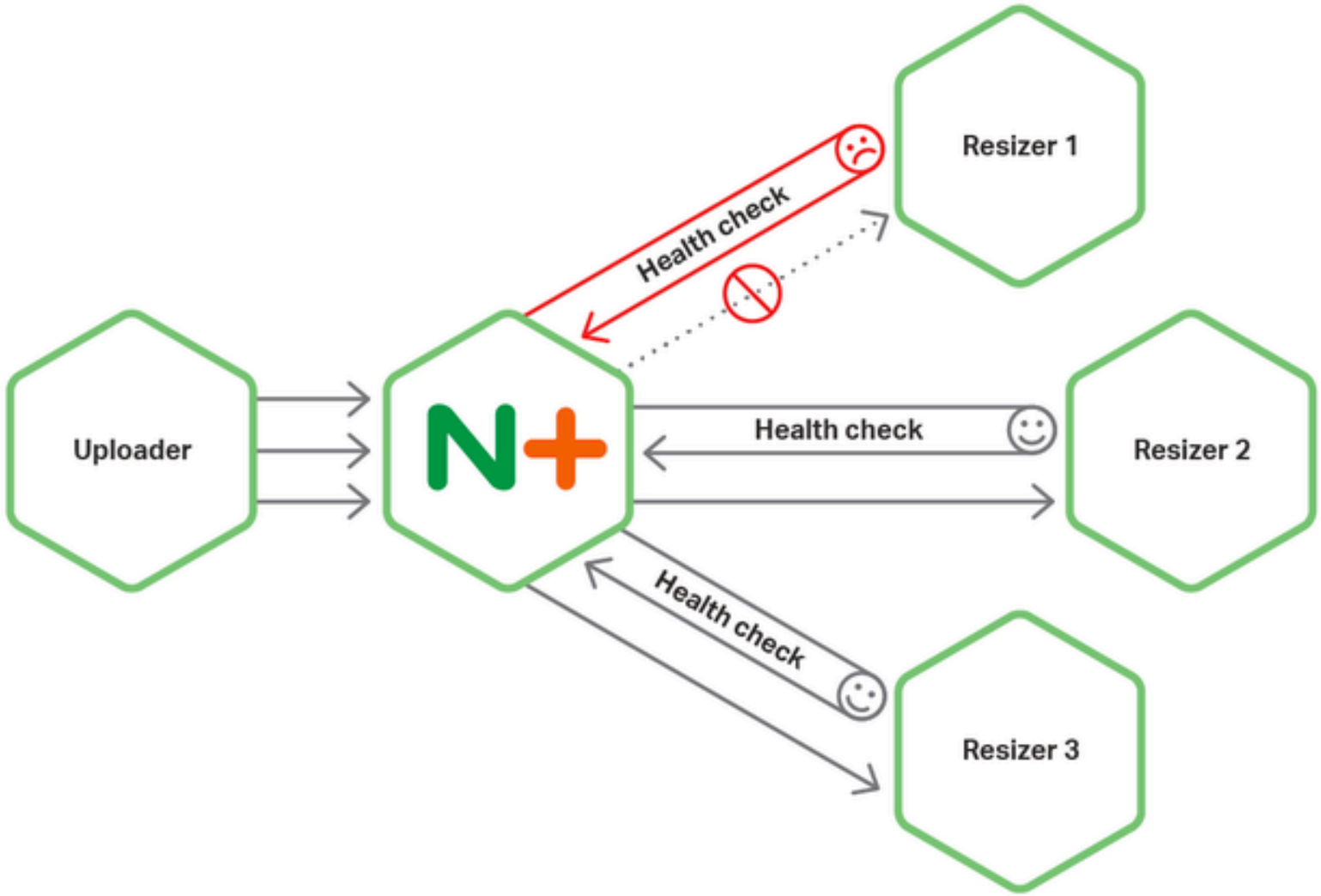
2. Resilience



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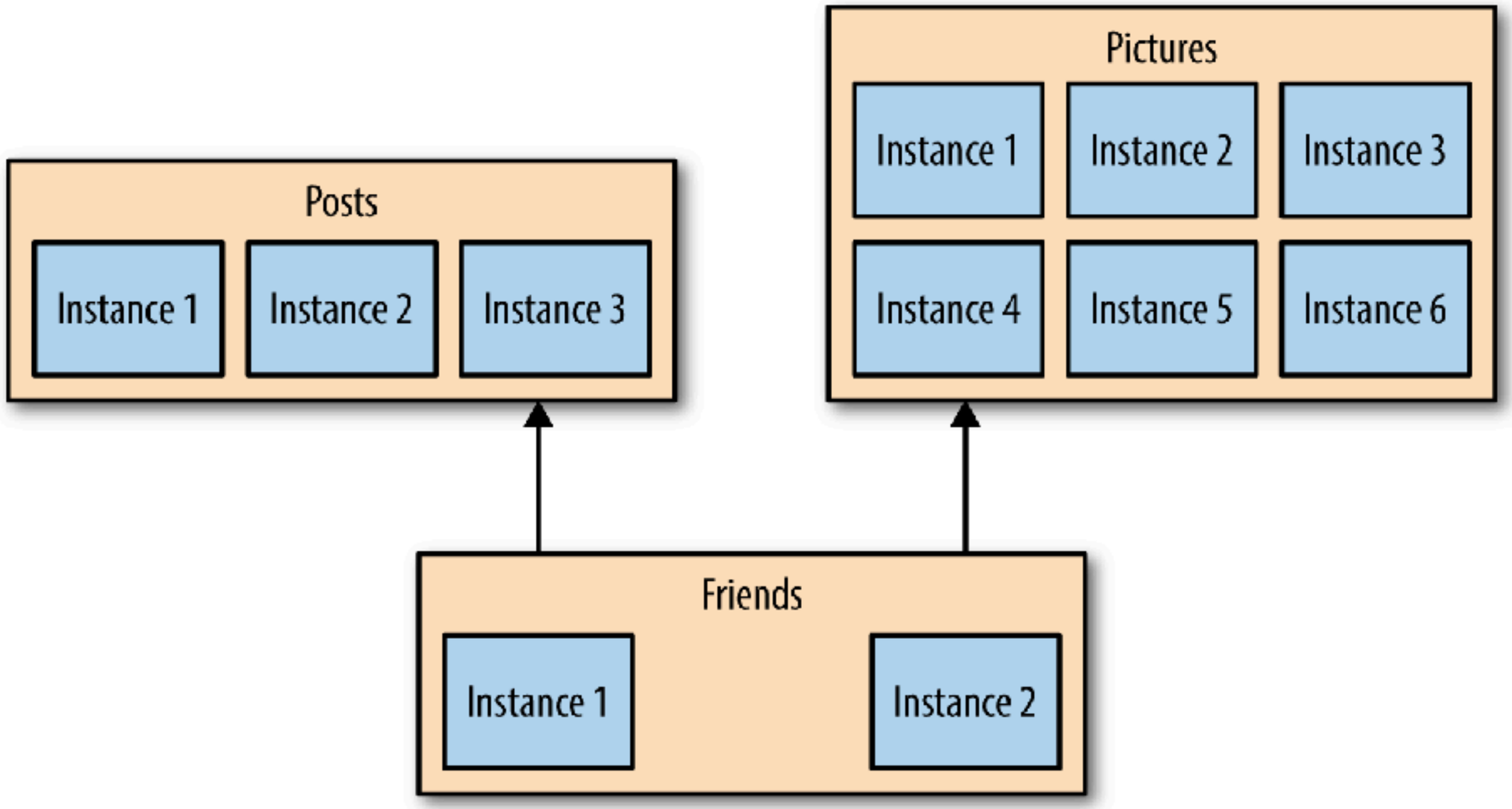
3. Scaling



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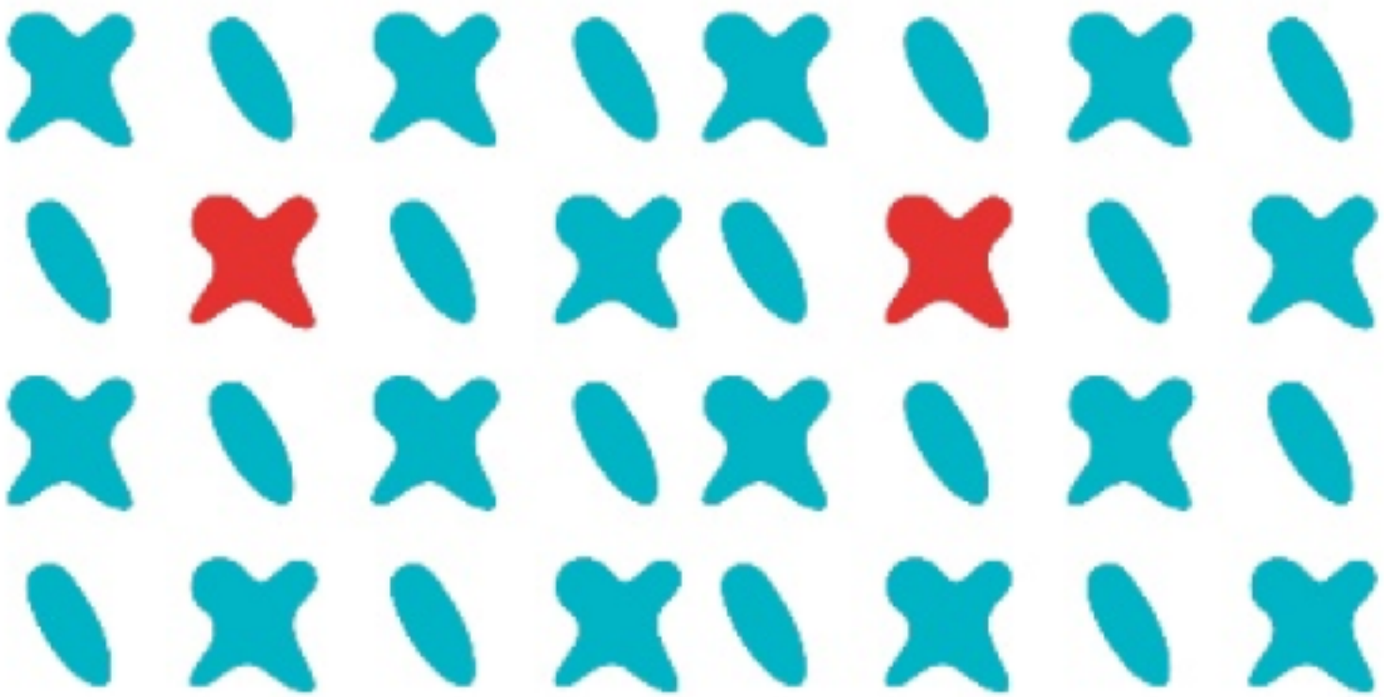
4. Ease of deployment

Deploys are faster, independent and problems can be isolated more easily



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5. Organization alignment

Small teams and smaller codebases

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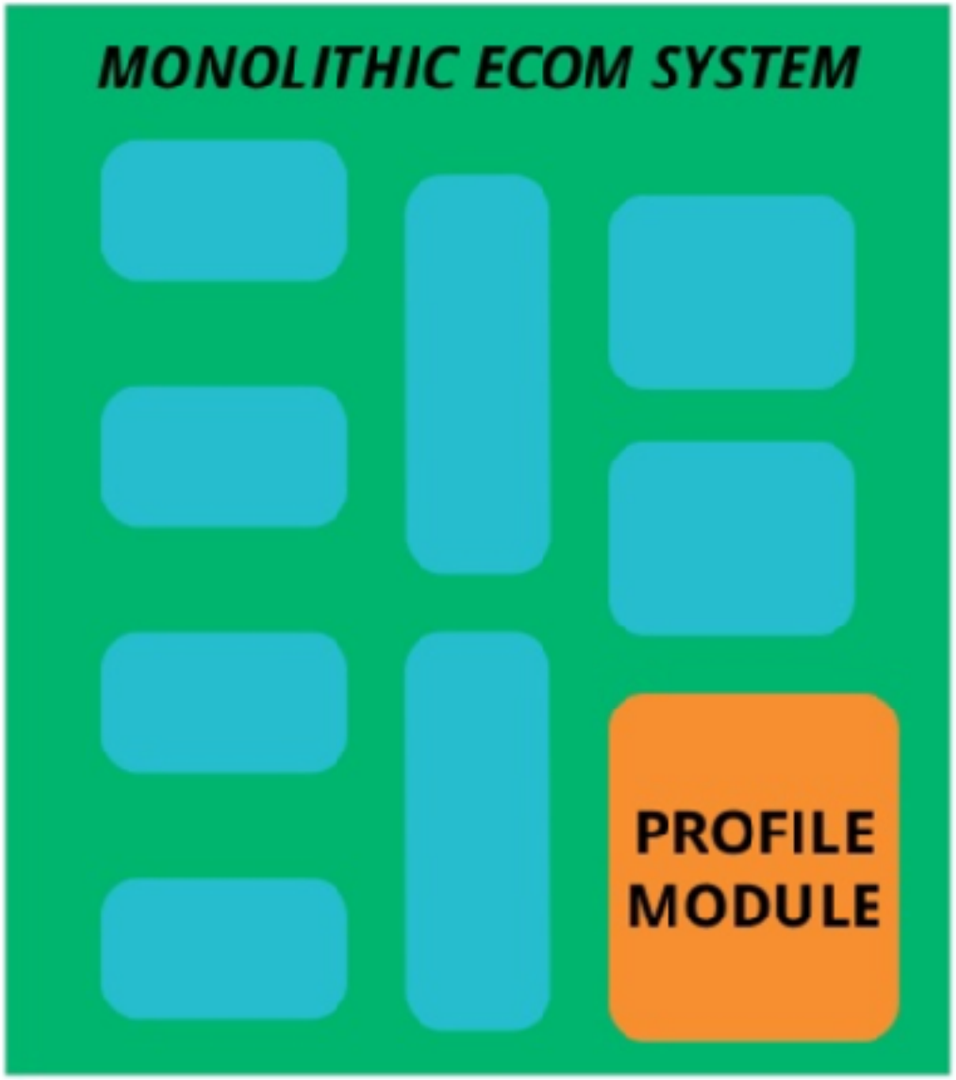
6. Composability and replaceability



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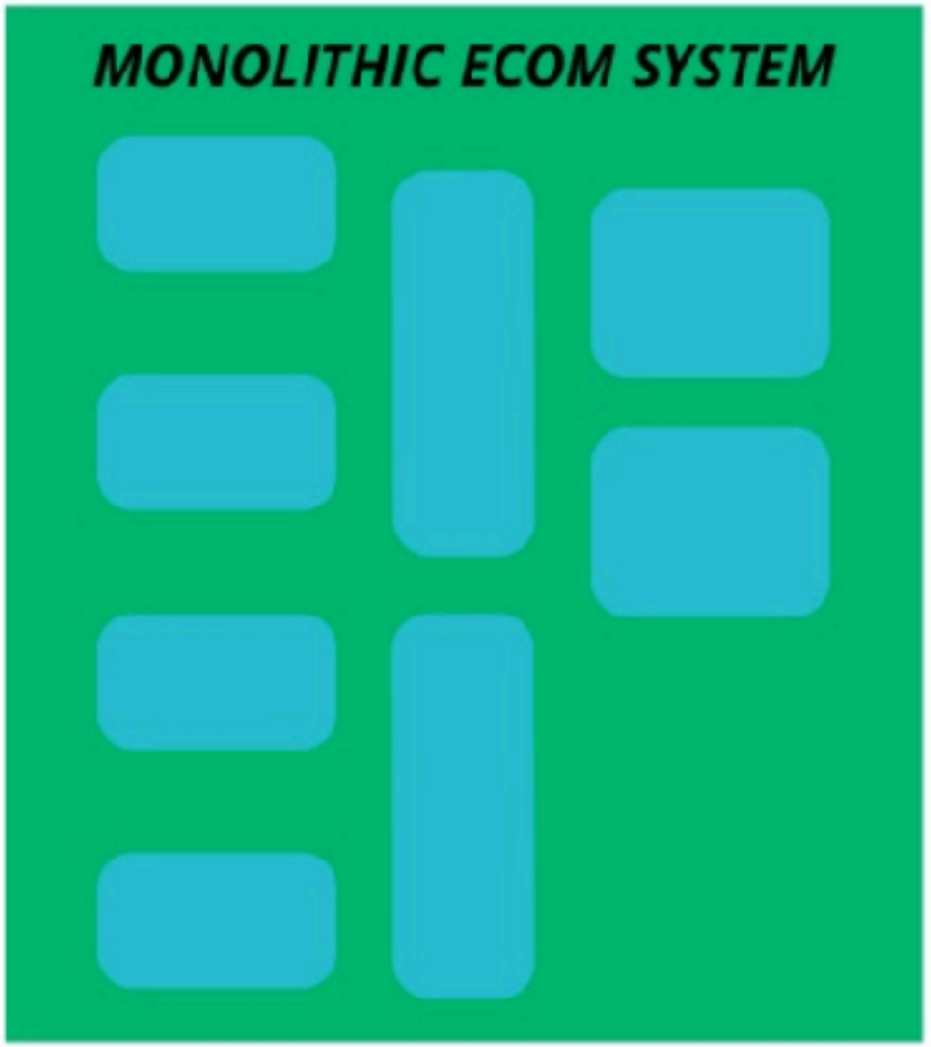
6. Composability and replaceability



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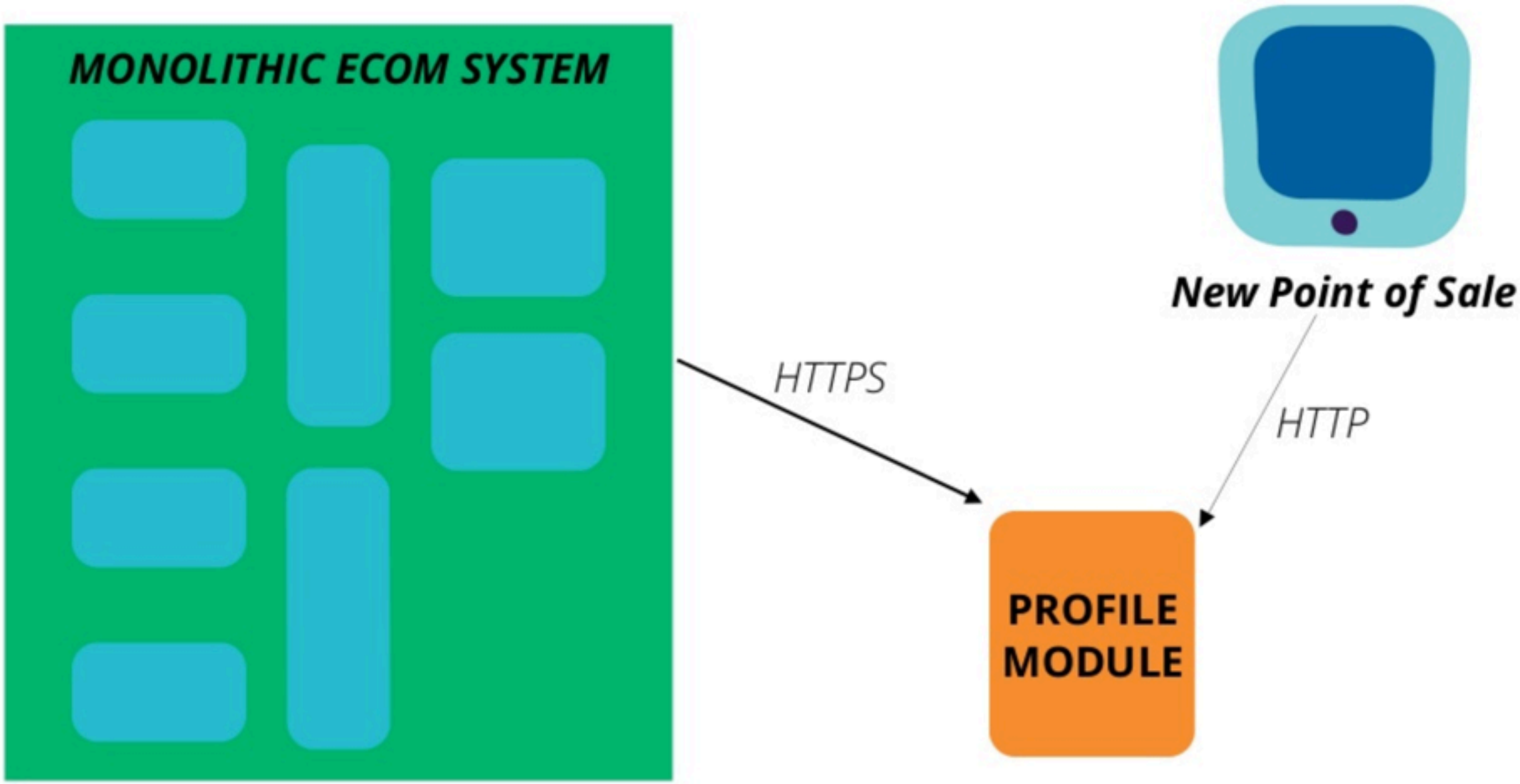
6. Composability and replaceability



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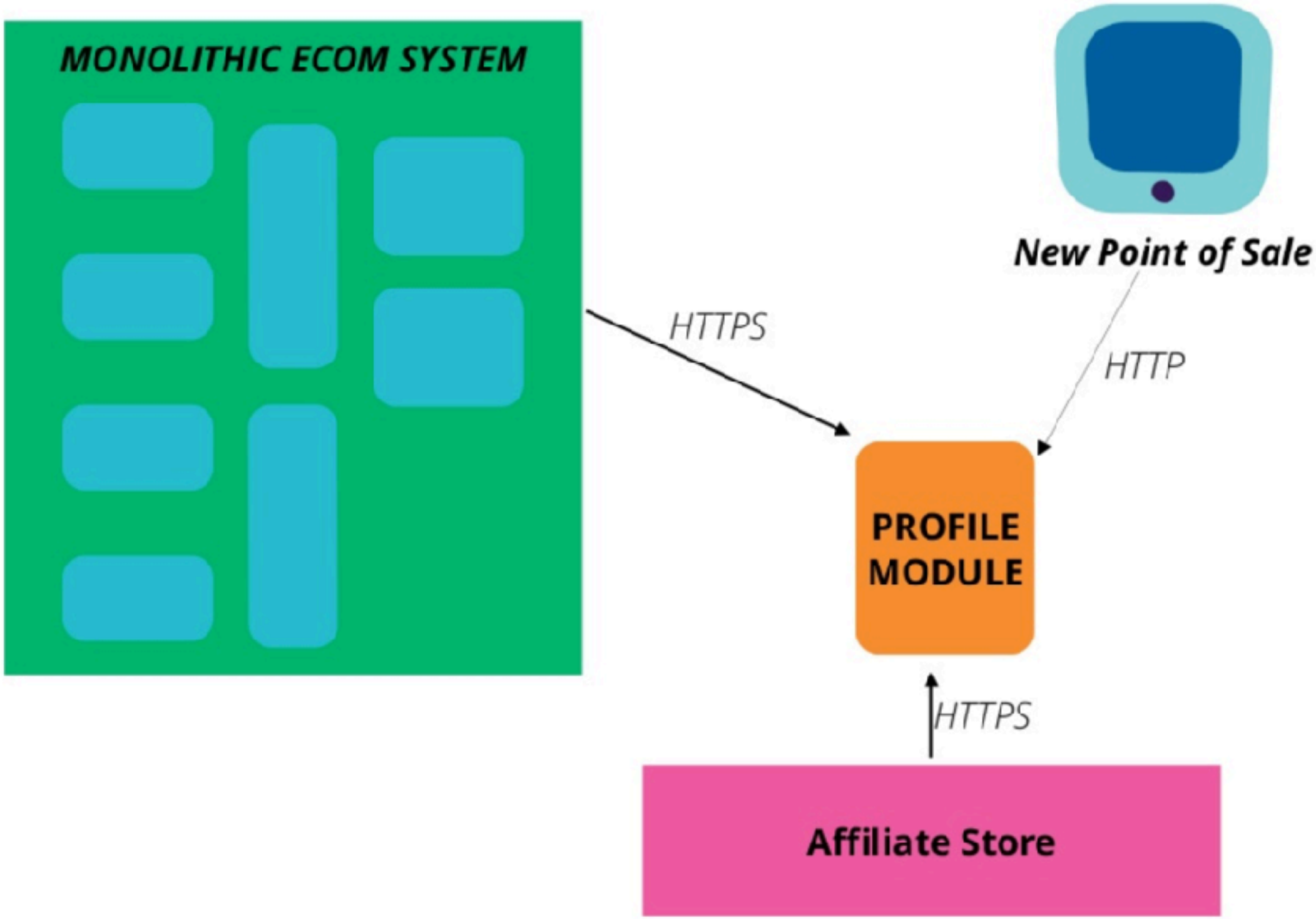
6. Composability and replaceability



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Characteristics

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1. Responsible for a single capability

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Types of capabilities

Business capability
Technical capability

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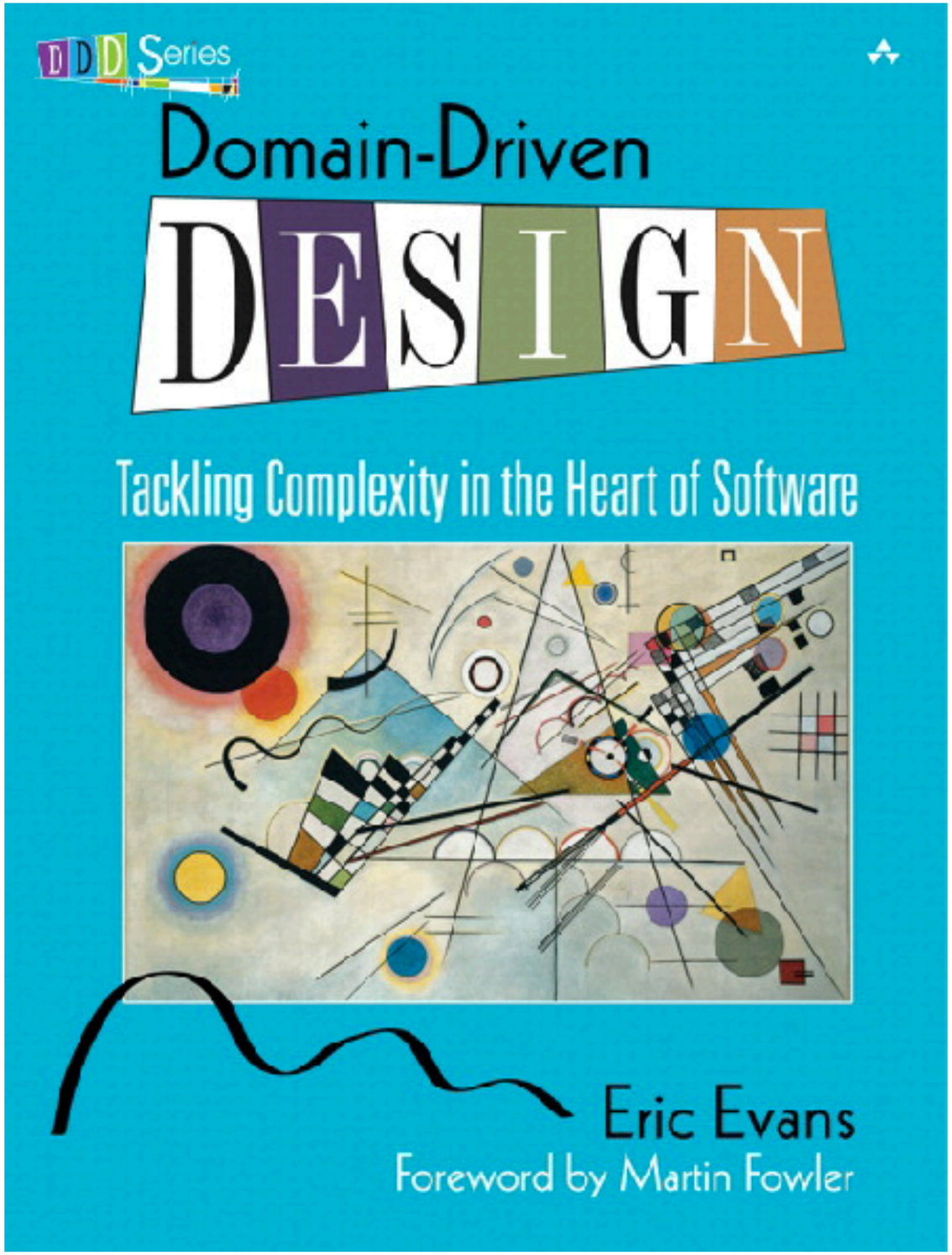

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2. Individually deployable

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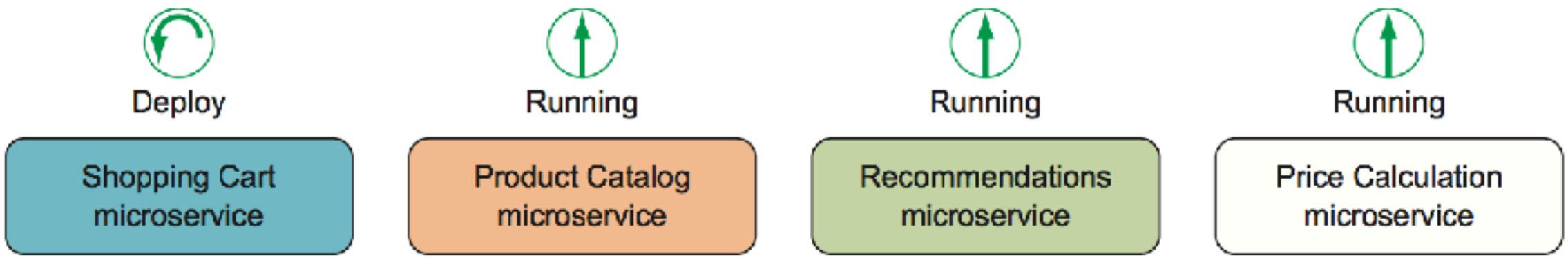

Figure 1.2 Other microservices continue to run while the Shopping Cart microservice is being deployed.

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3. Consists of one or more processes

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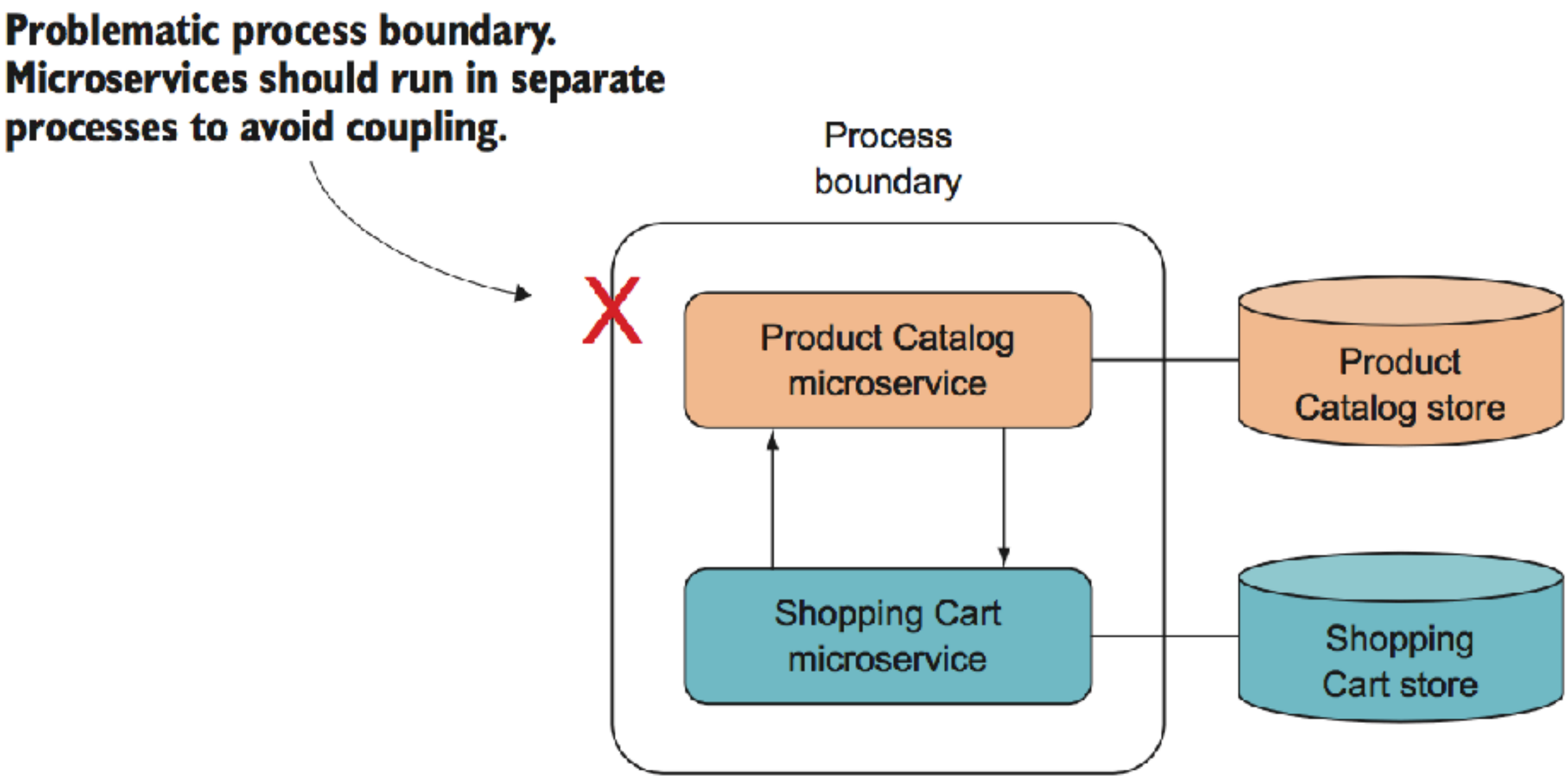

Figure 1.3 Running more than one microservice within a process leads to high coupling.

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4. Own data store

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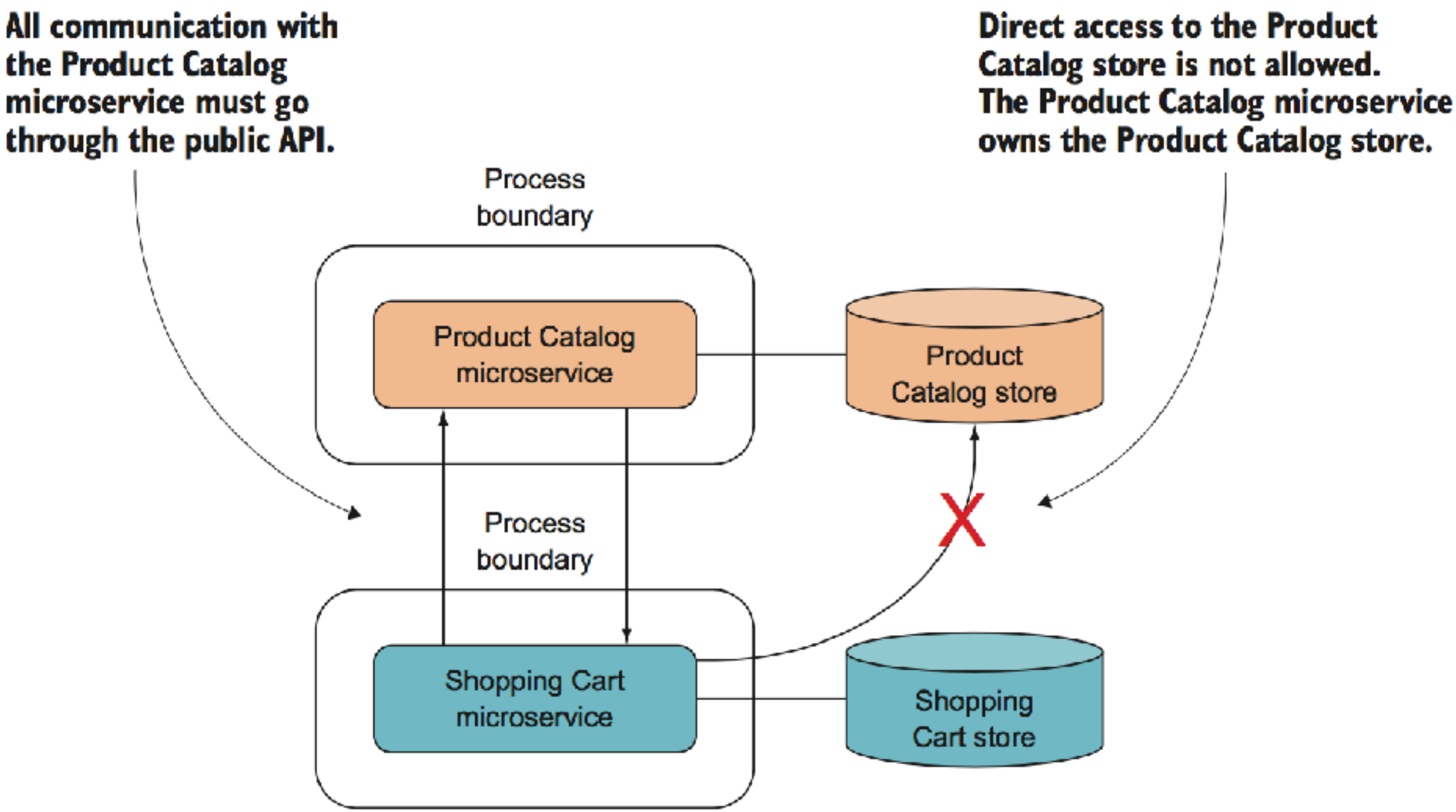

Figure 1.4 One microservice can't access another's data store.

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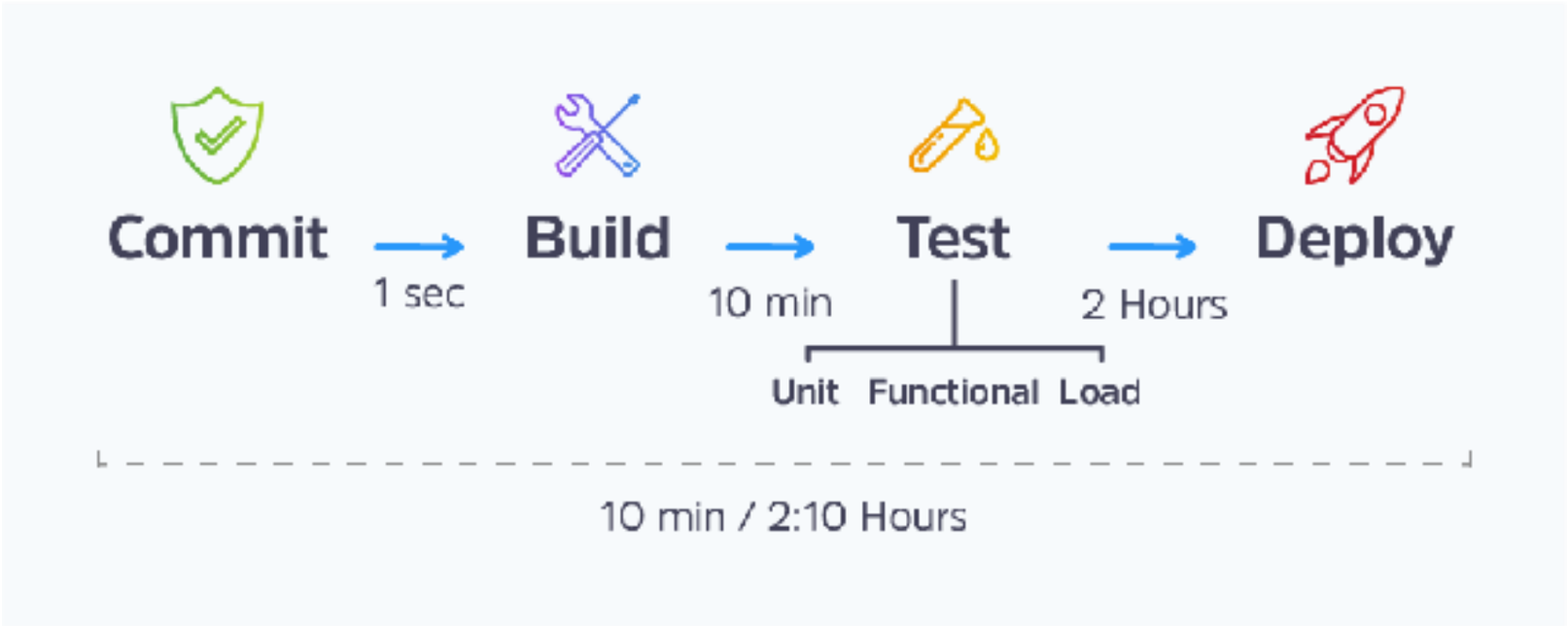
5. Small team can maintain



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6. Replaceable

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Challenges with Microservices ?

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1. How to define the boundaries of each microservices ?

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2. How to create queries that retrieve data from several microservices ?

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Popular solutions

API Gateway
CQRS with query/read tables
Cold data in centralize database

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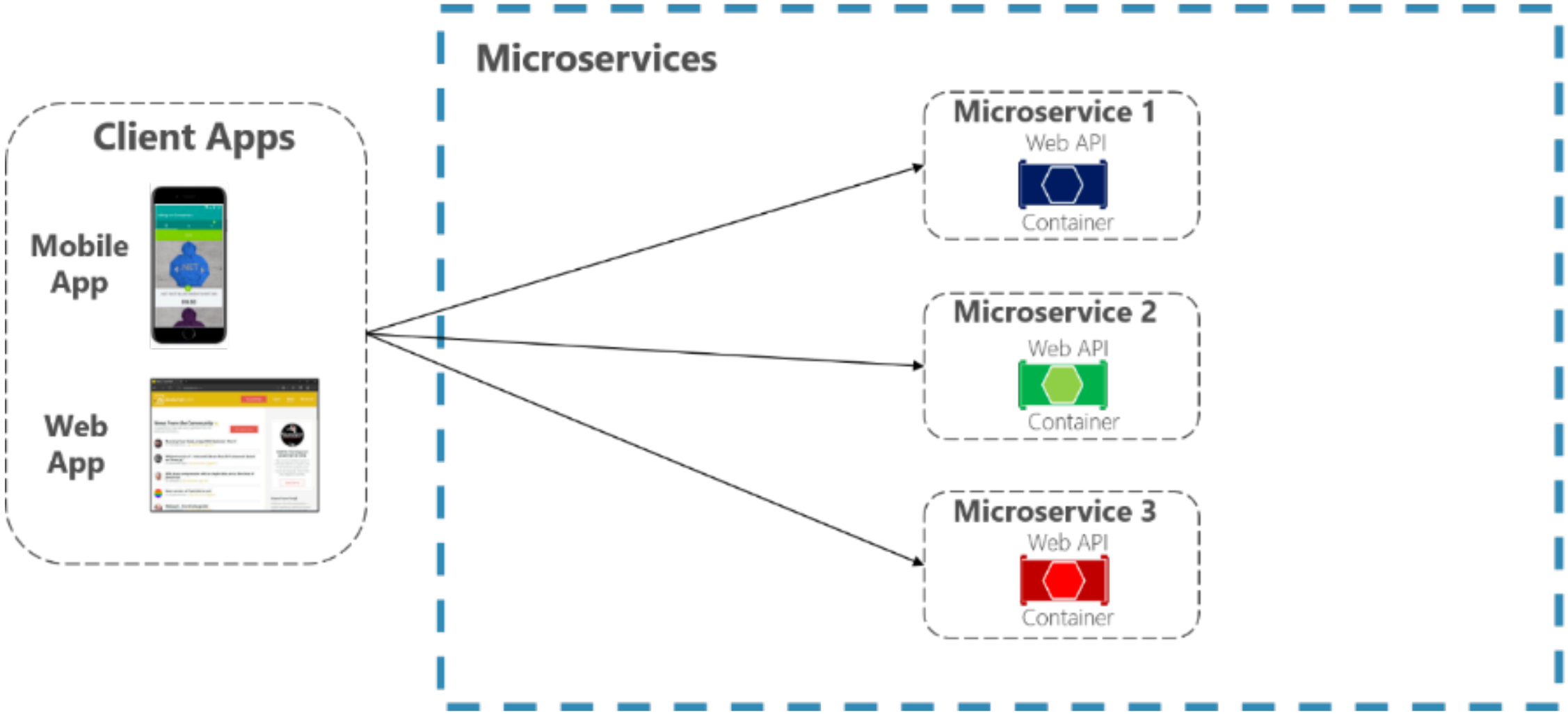
Direct Client-To-Microservice communication

Architecture



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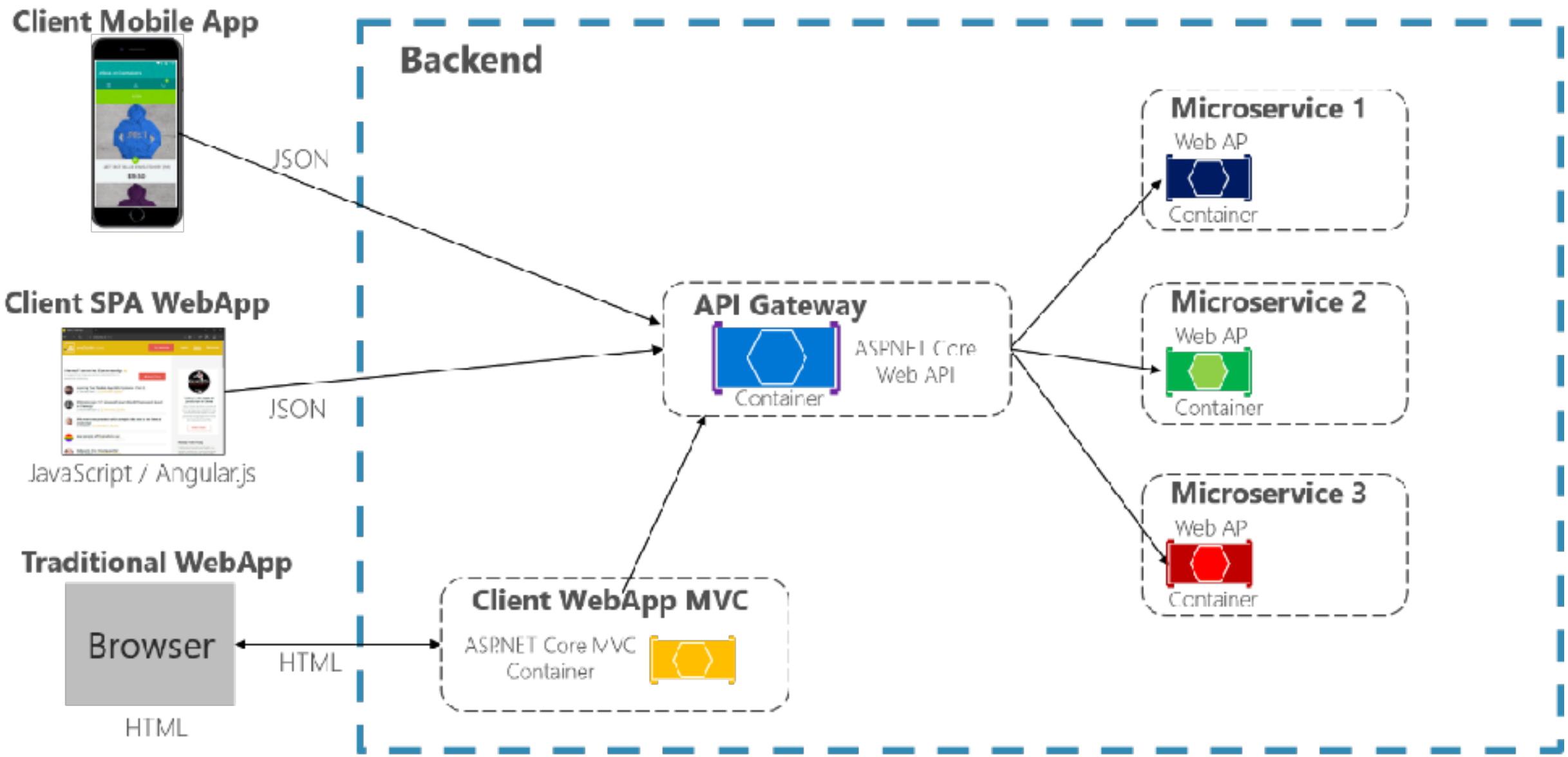
Using the **API Gateway Service**



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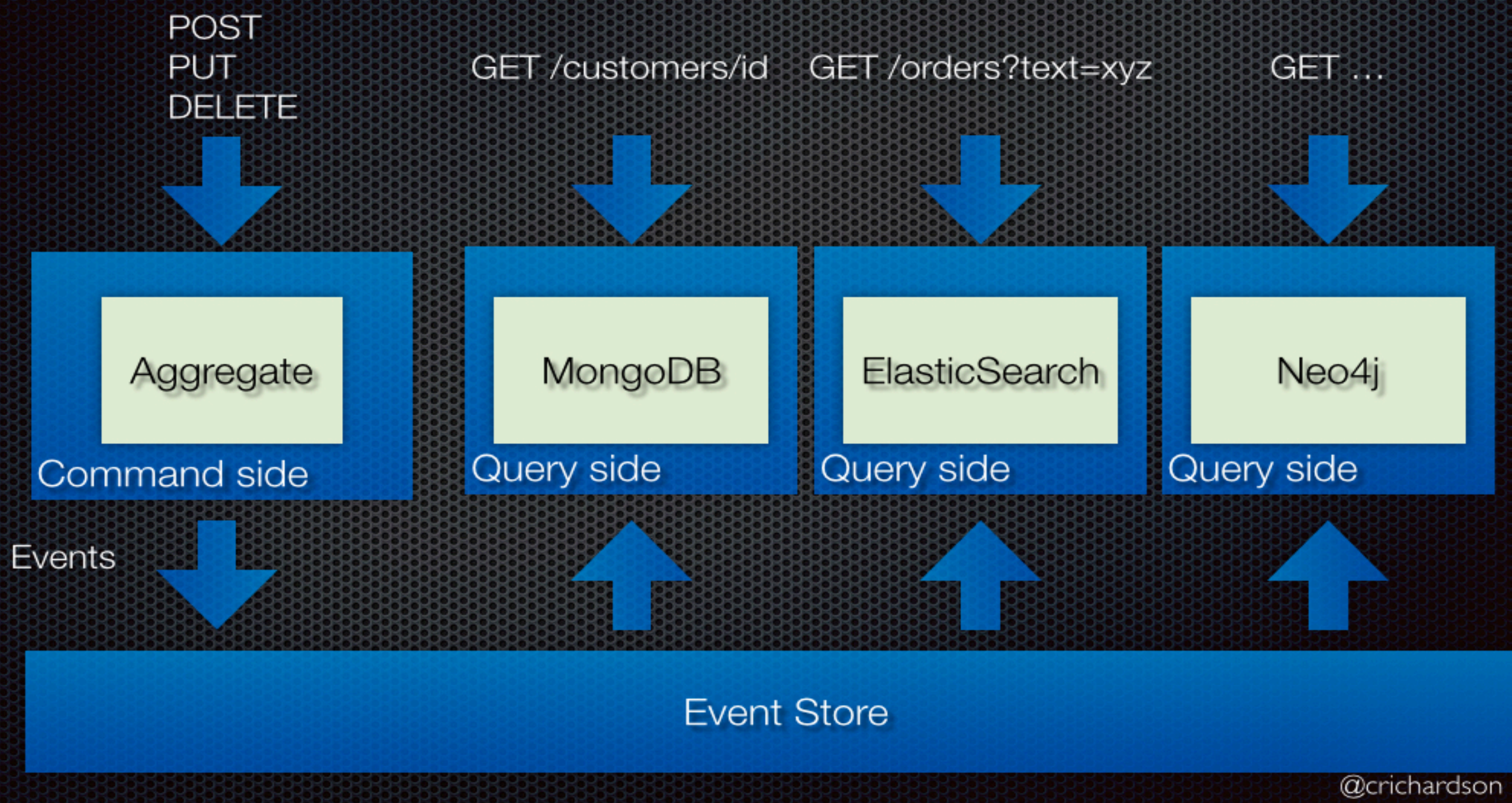
Queries ⇒ database (type)



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3. How to achieve consistency across multiple microservices ?

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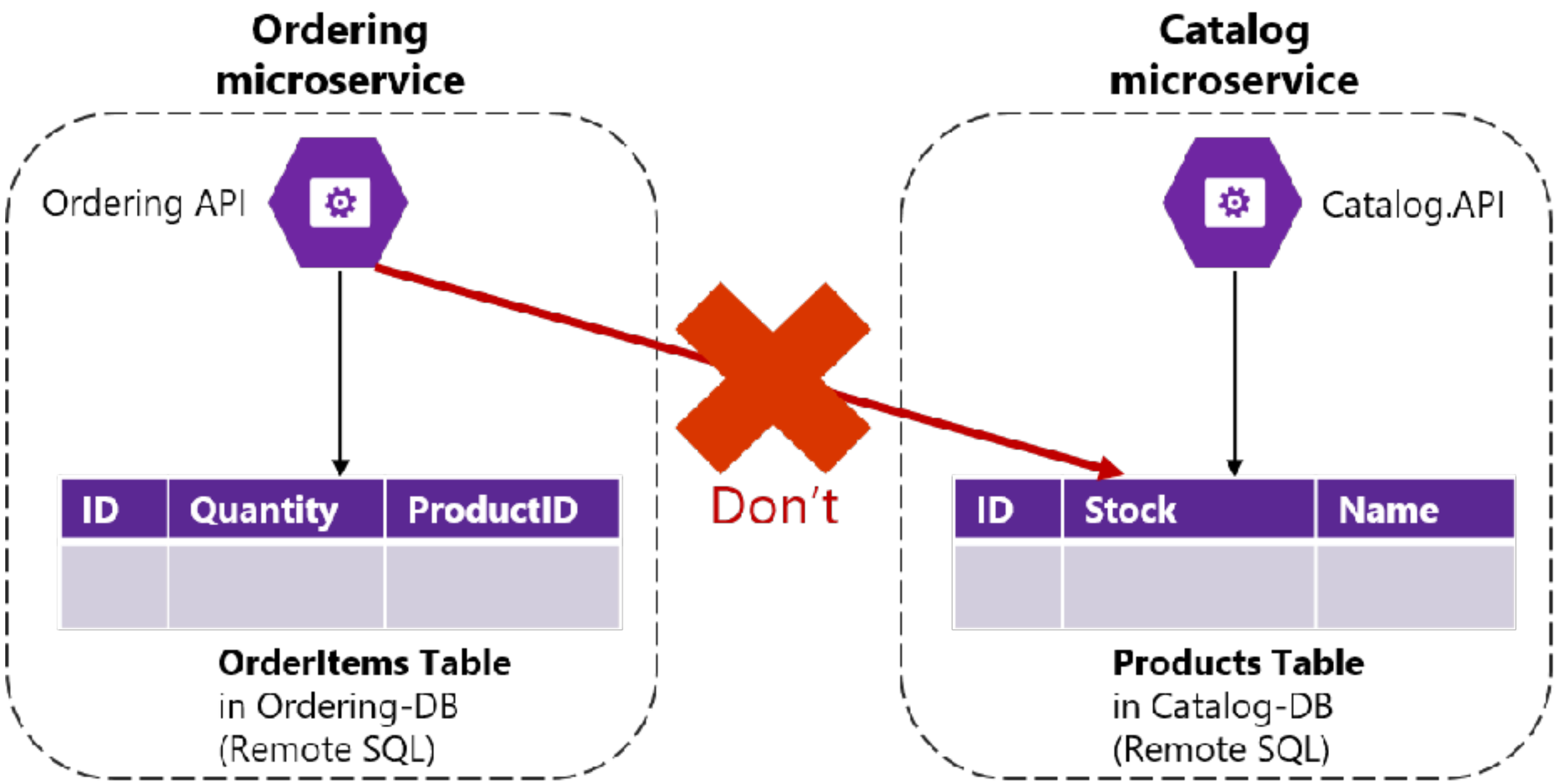

Databases are private per microservice

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CAP Theorem

Consistency

Availability

Partition Tolerance

http://robertgreiner.com/2014/08/cap-theorem-revisited/

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4. How to design communication across microservices boundaries ?

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Protocols

HTTP and REST
AMQP
Messaging

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Communication

Request-Response model
Observer model

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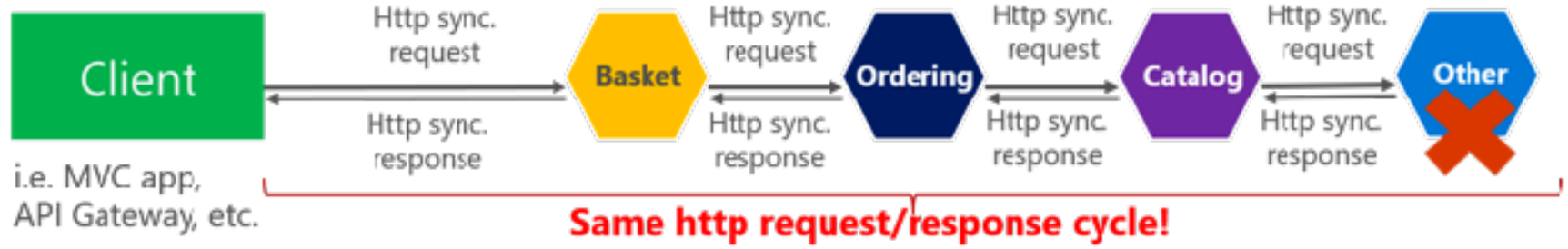
Communication

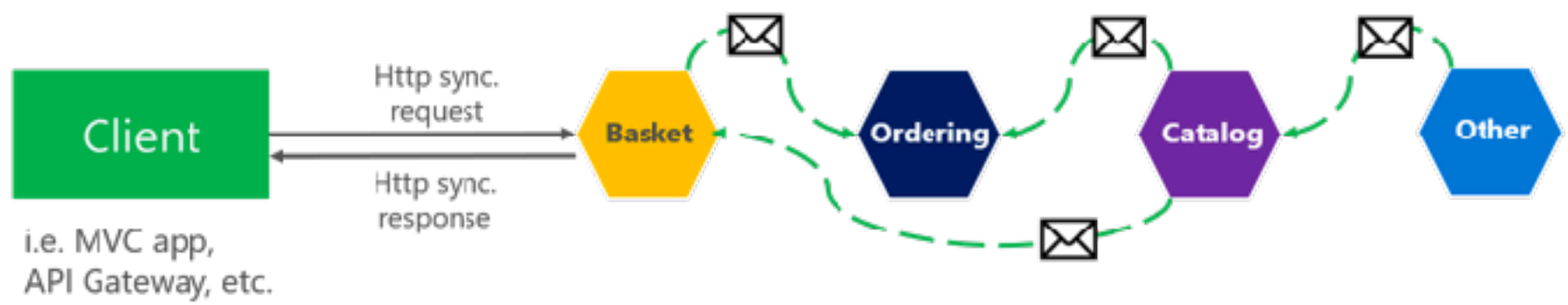
Synchronous vs. async communication across microservices

Anti-pattern

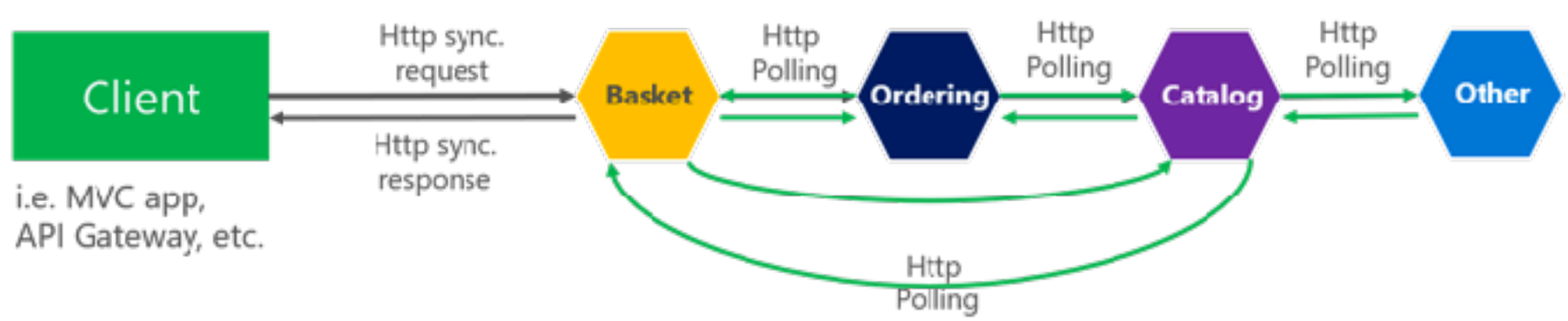
Synchronous
all req./resp. cycle



Asynchronous
Comm. across
internal microservices
(EventBus: i.e. **AMPQ**)



"Asynchronous"
Comm. across
internal microservices
(Polling: **Http**)



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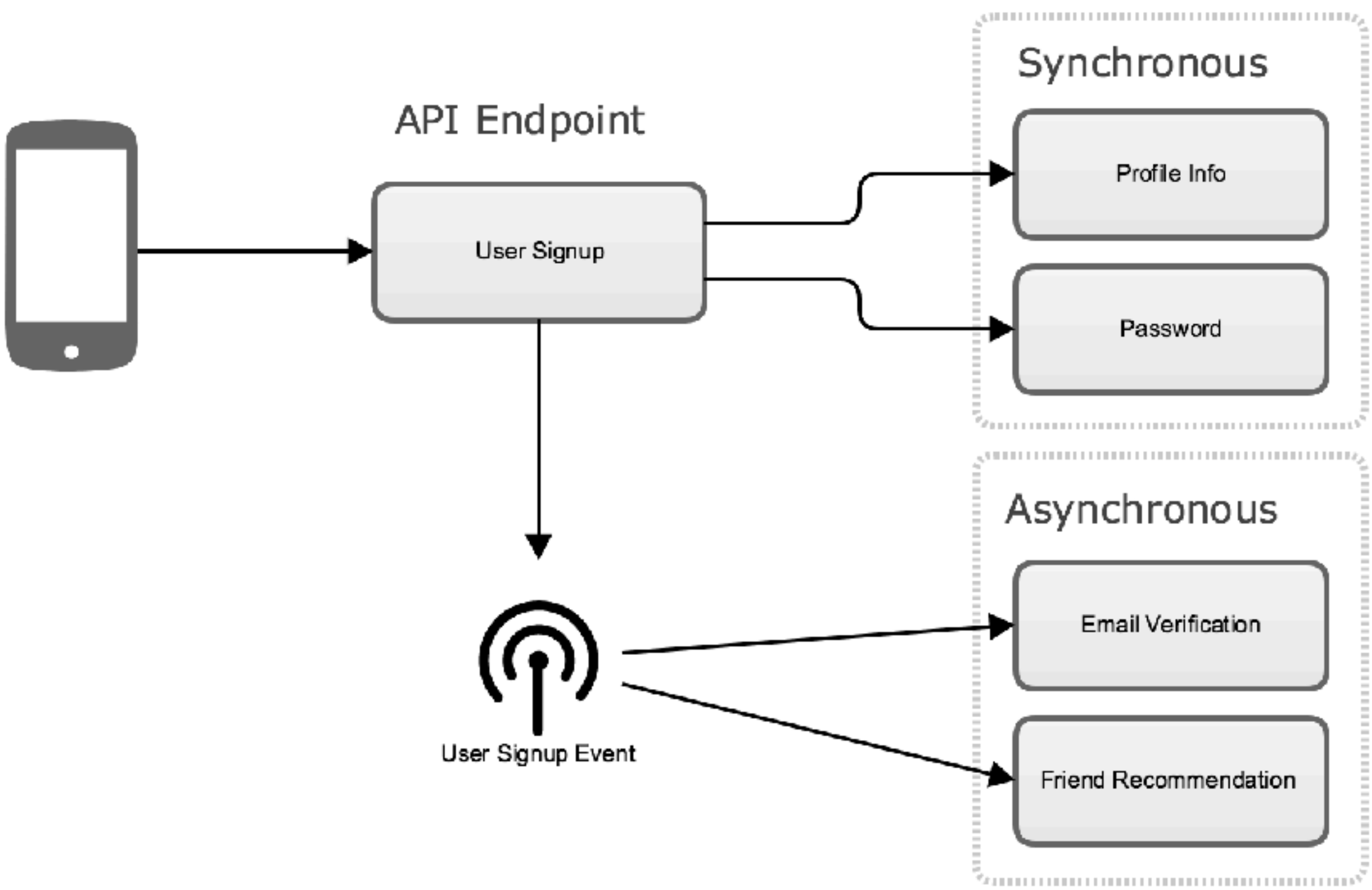
Communication



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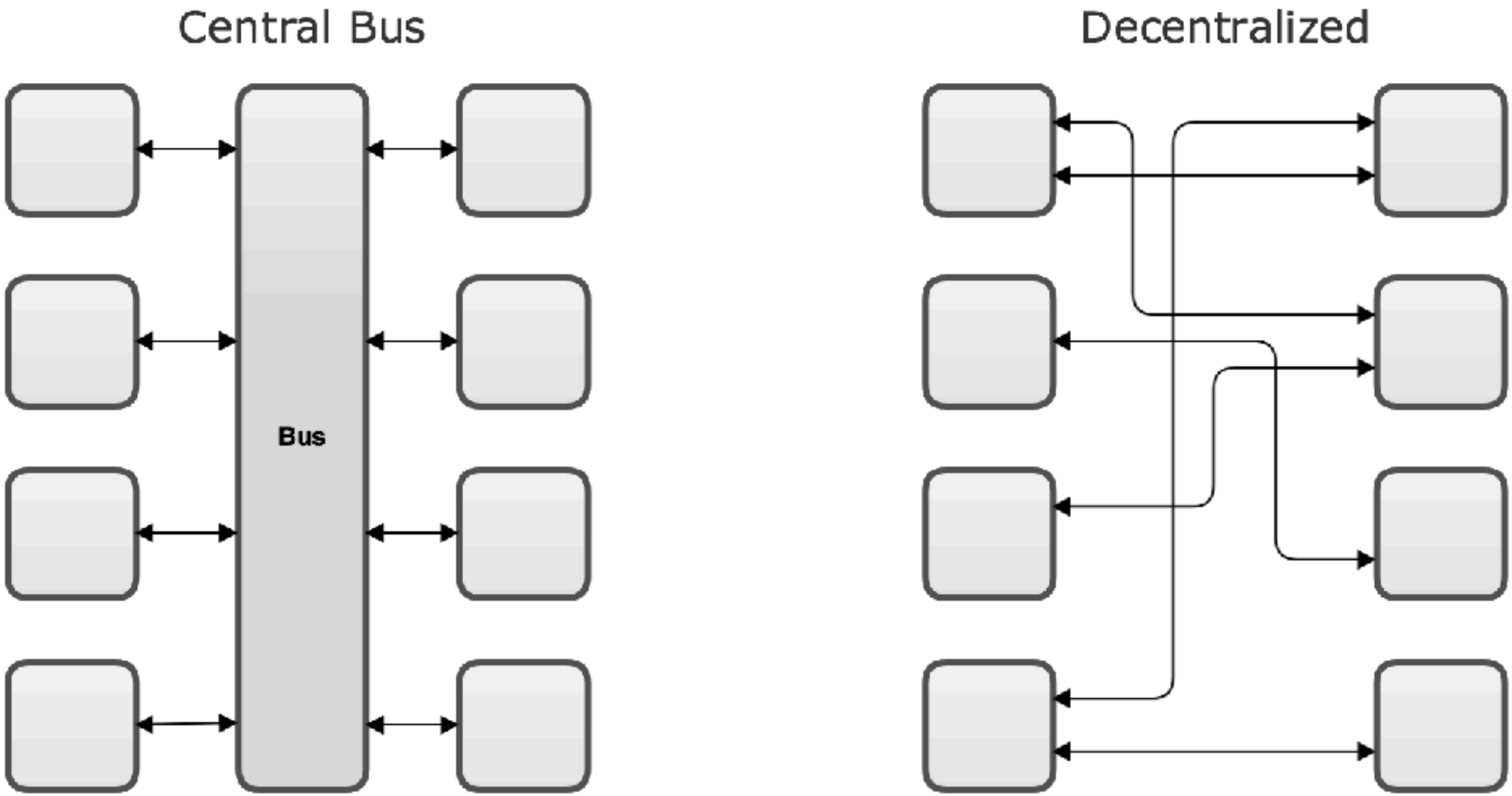
Anti-pattern :: centralize bus service



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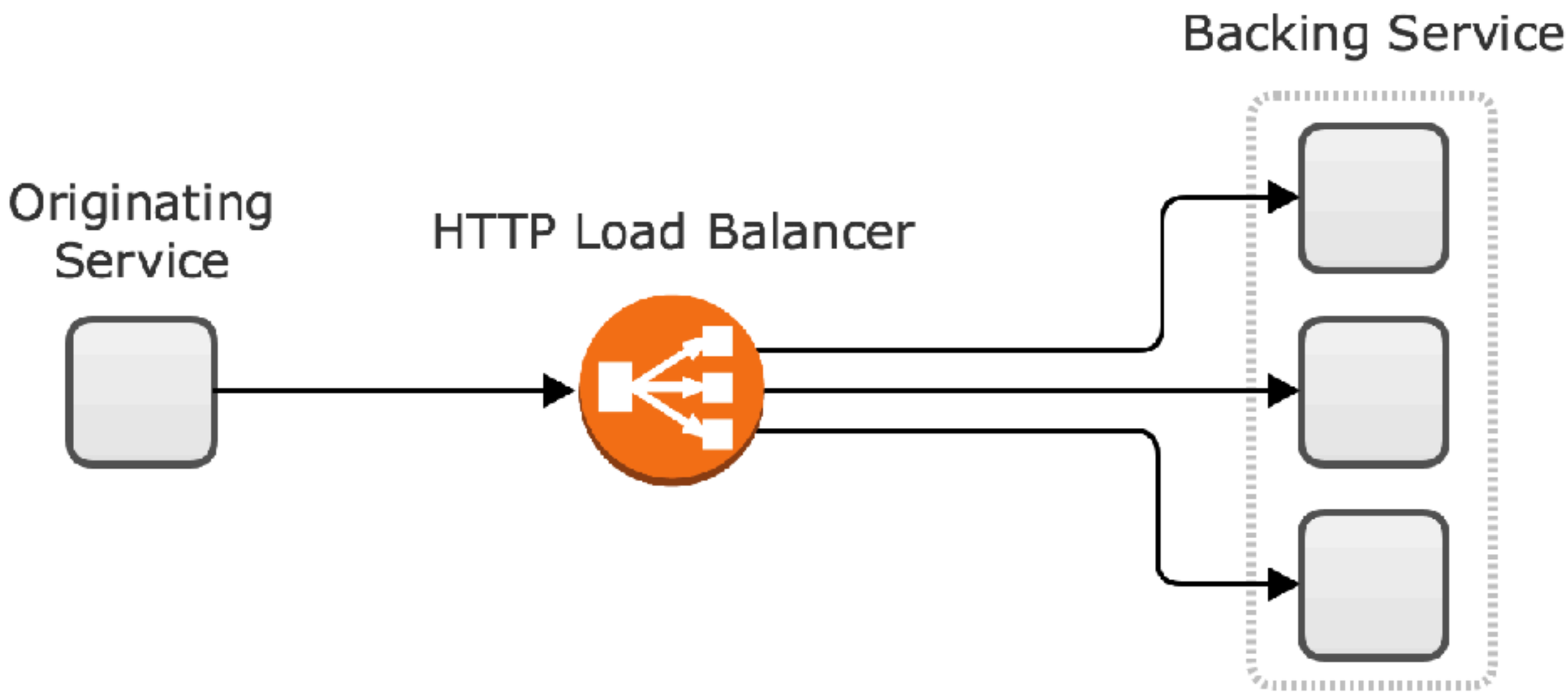
Request-response model



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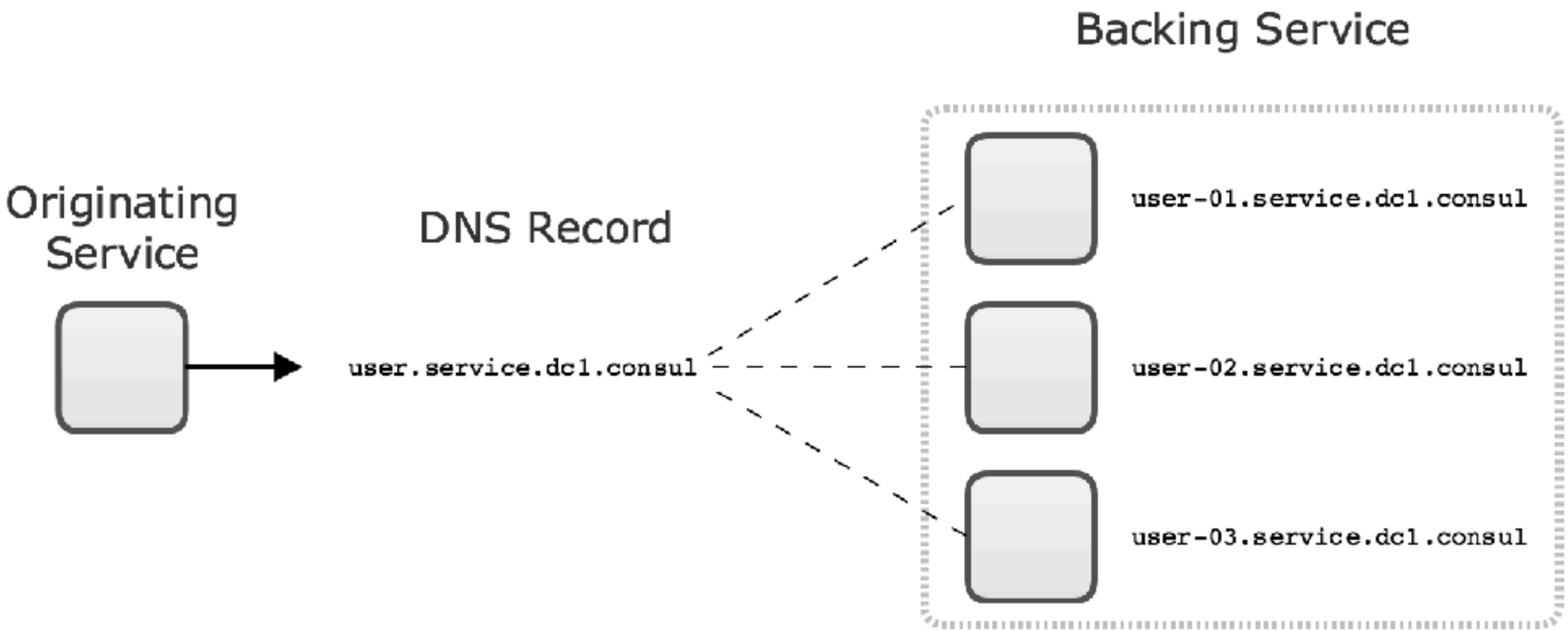
Request-response model



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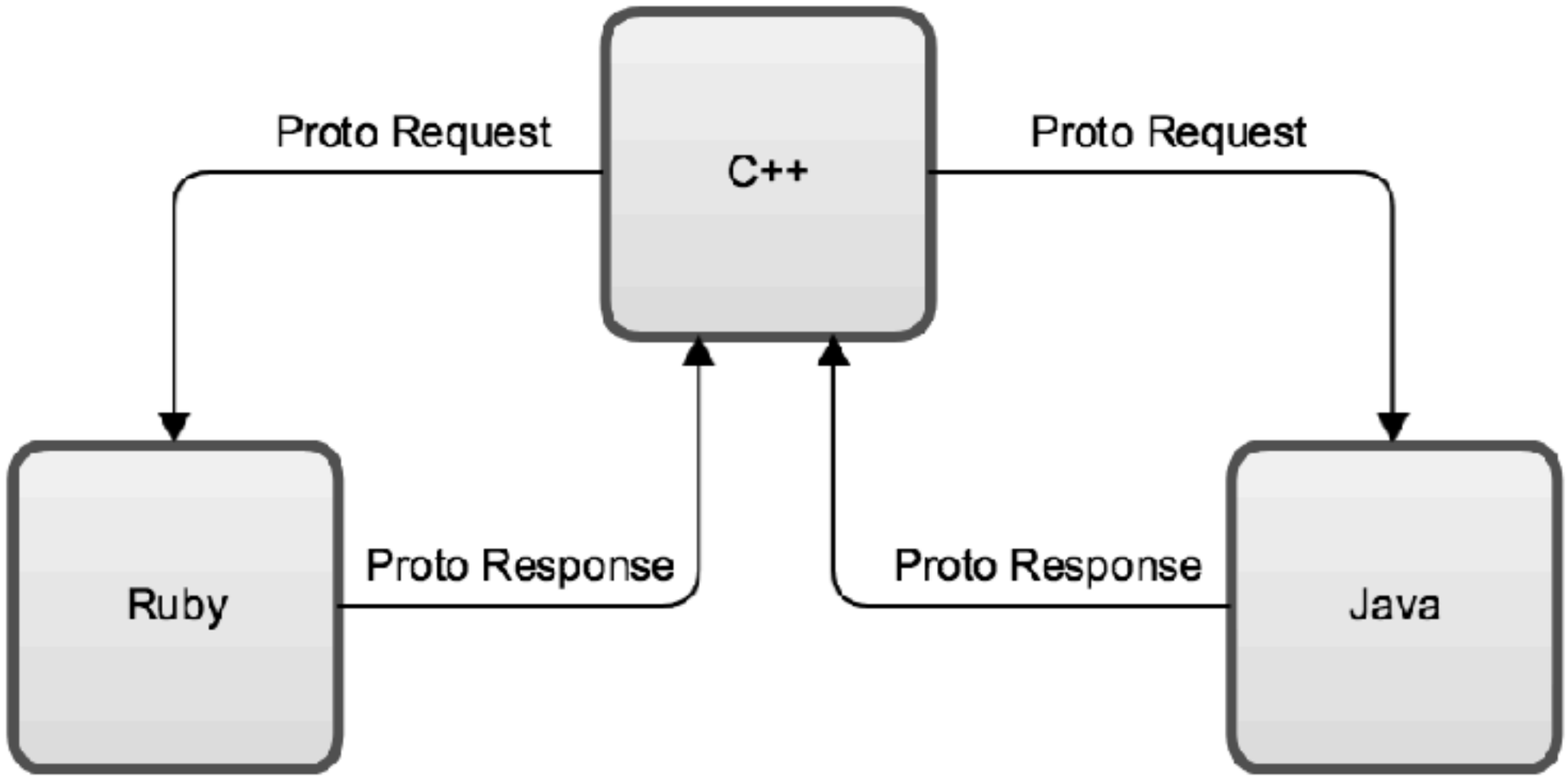
Request-response model



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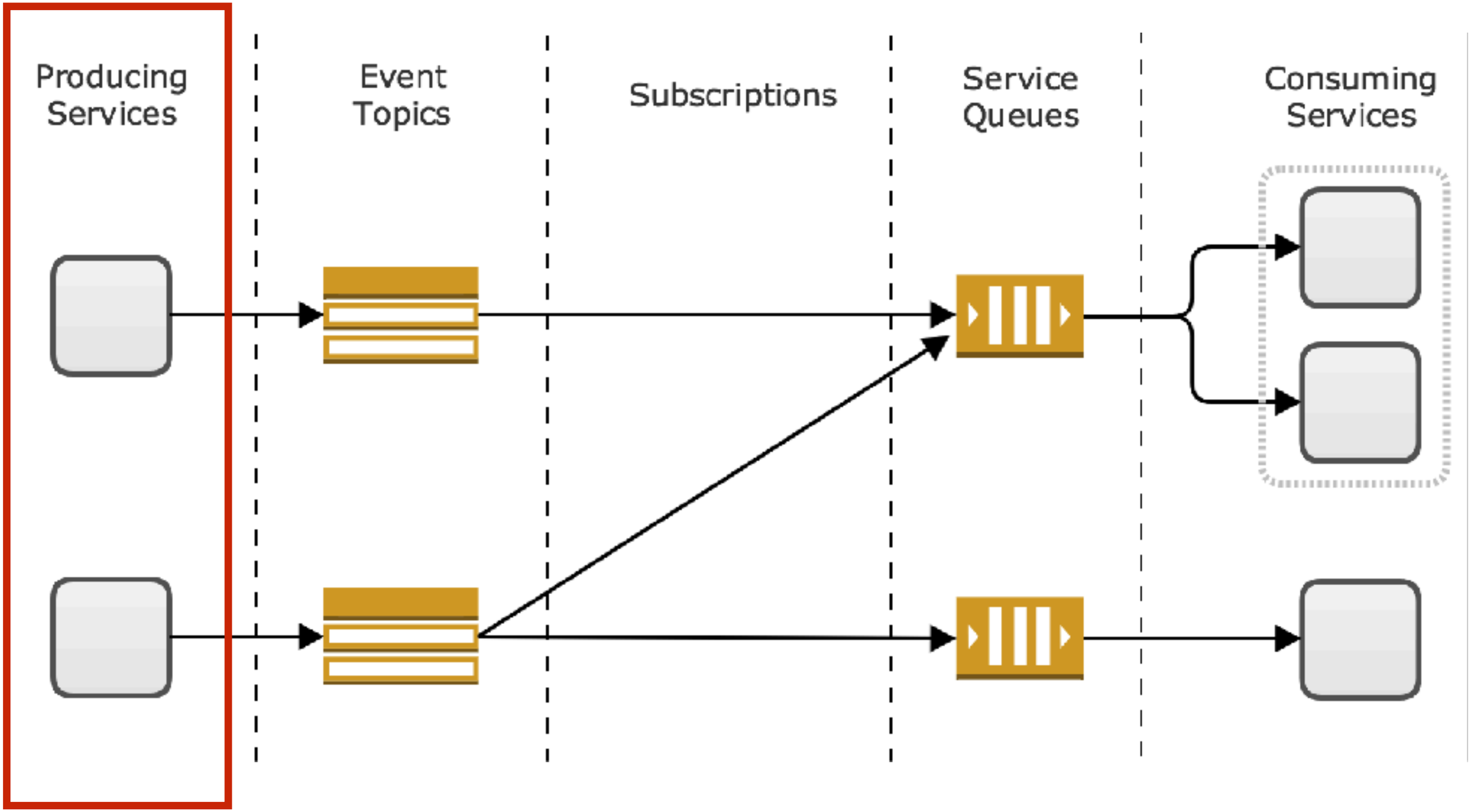
Observer model



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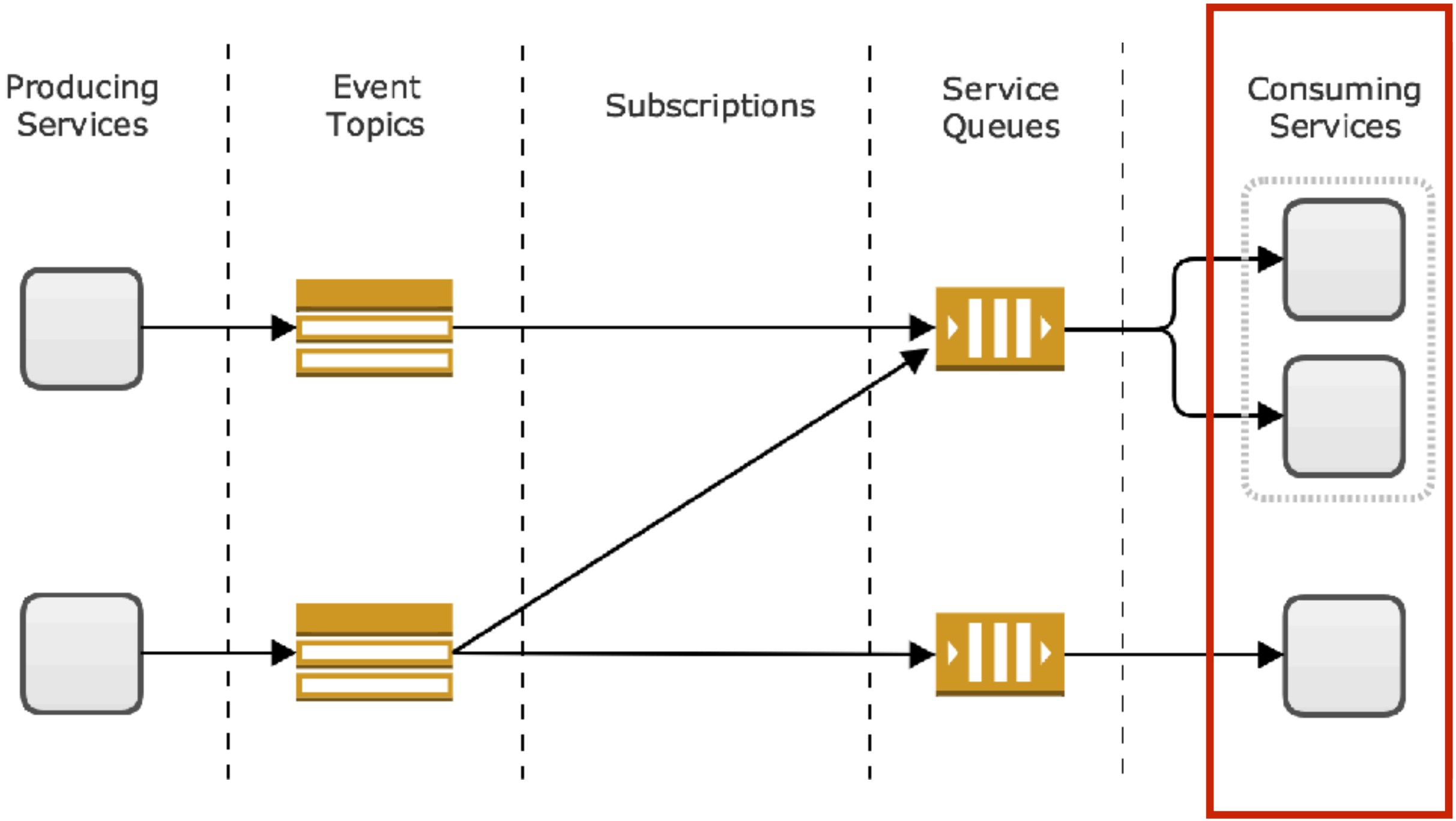
Observer model



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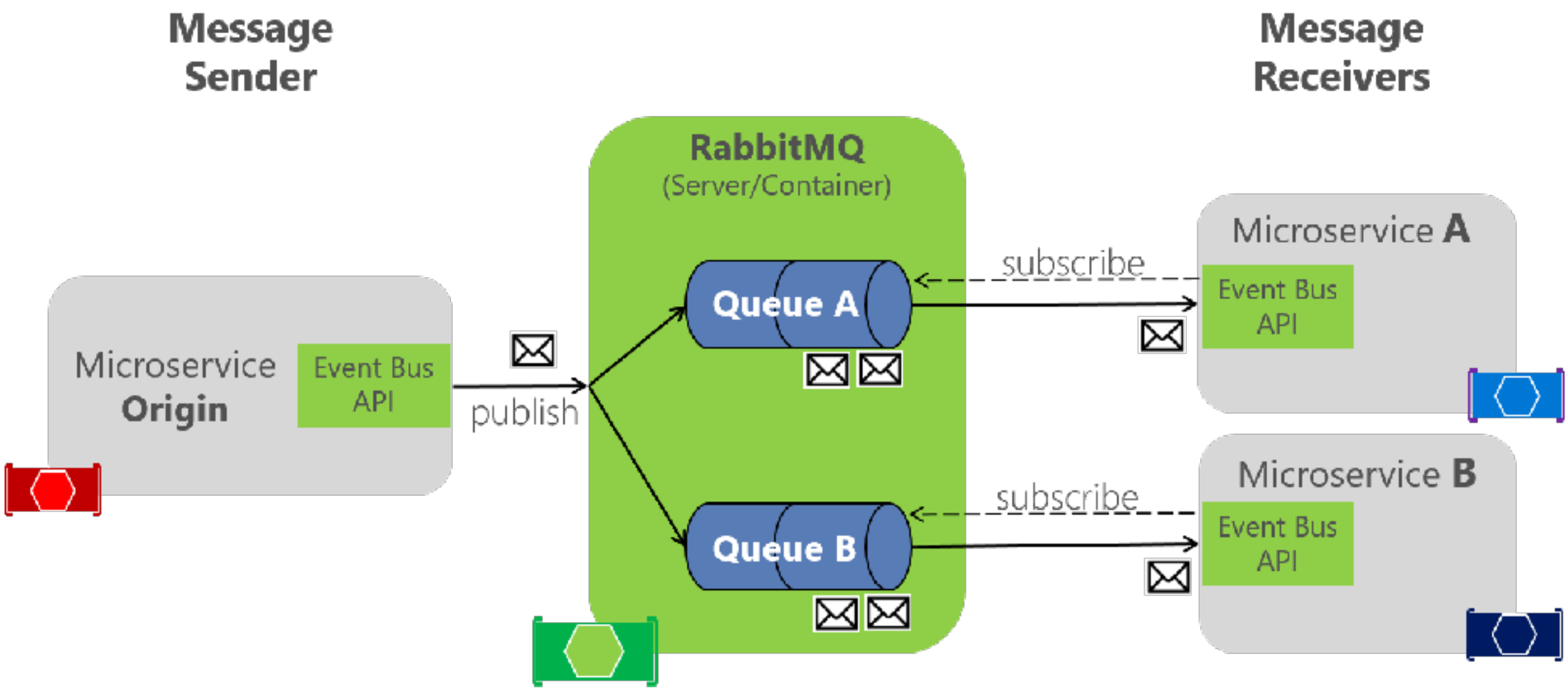
Observer model



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Services Integration

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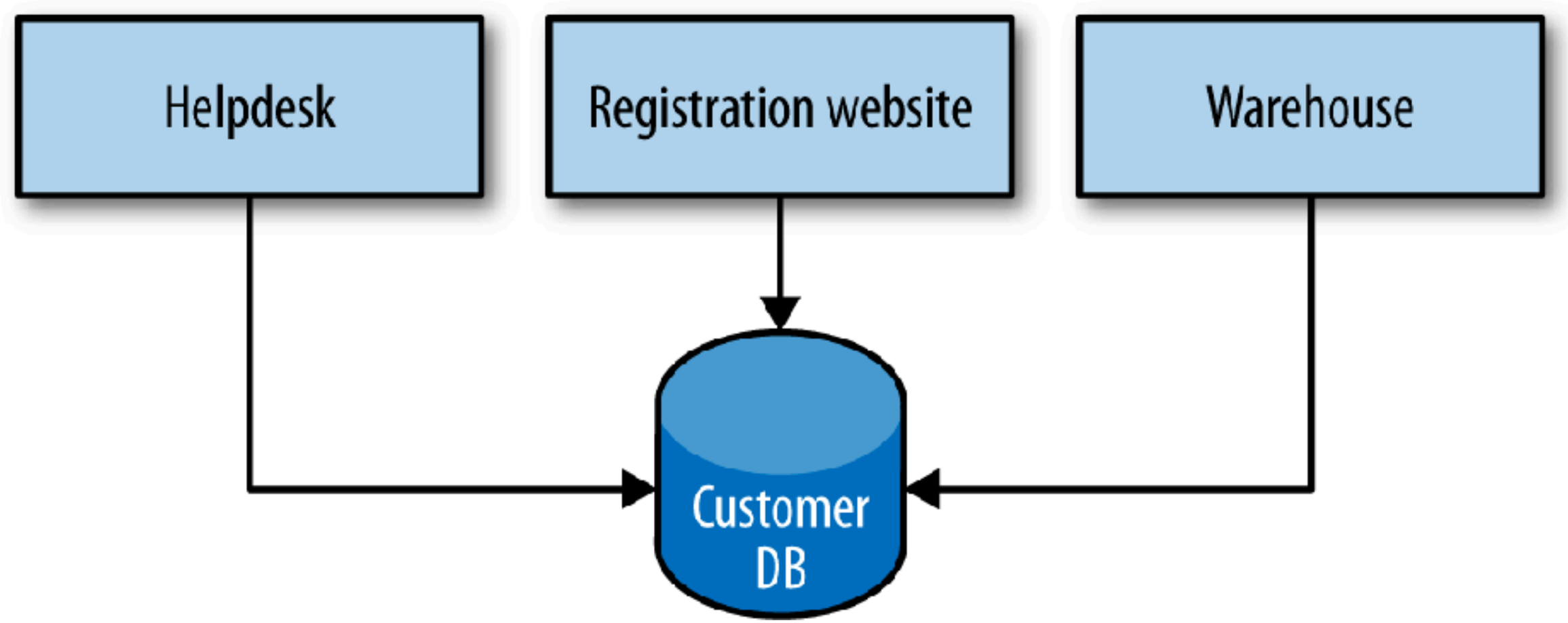
Shared database



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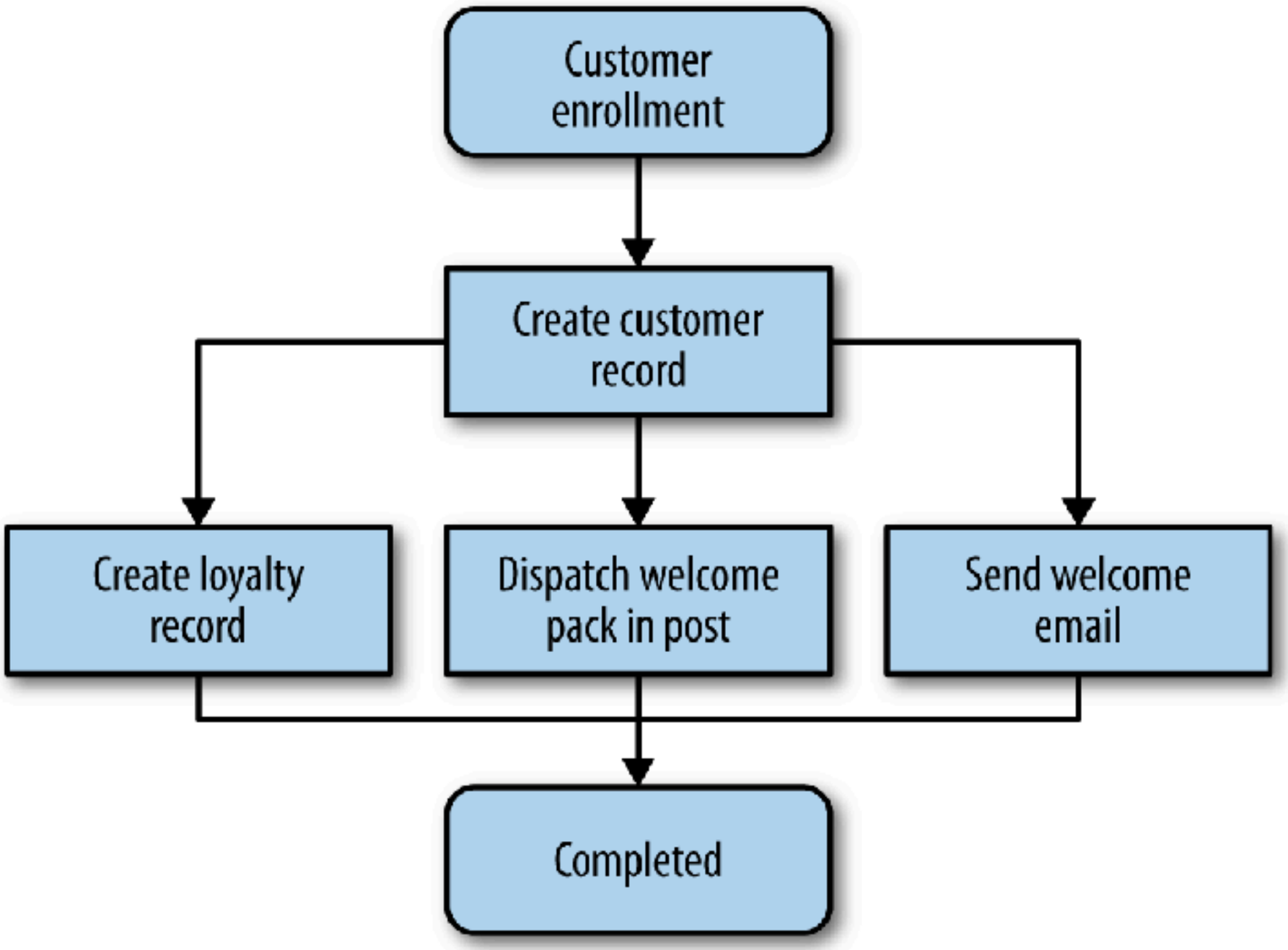
Orchestration vs Choreography



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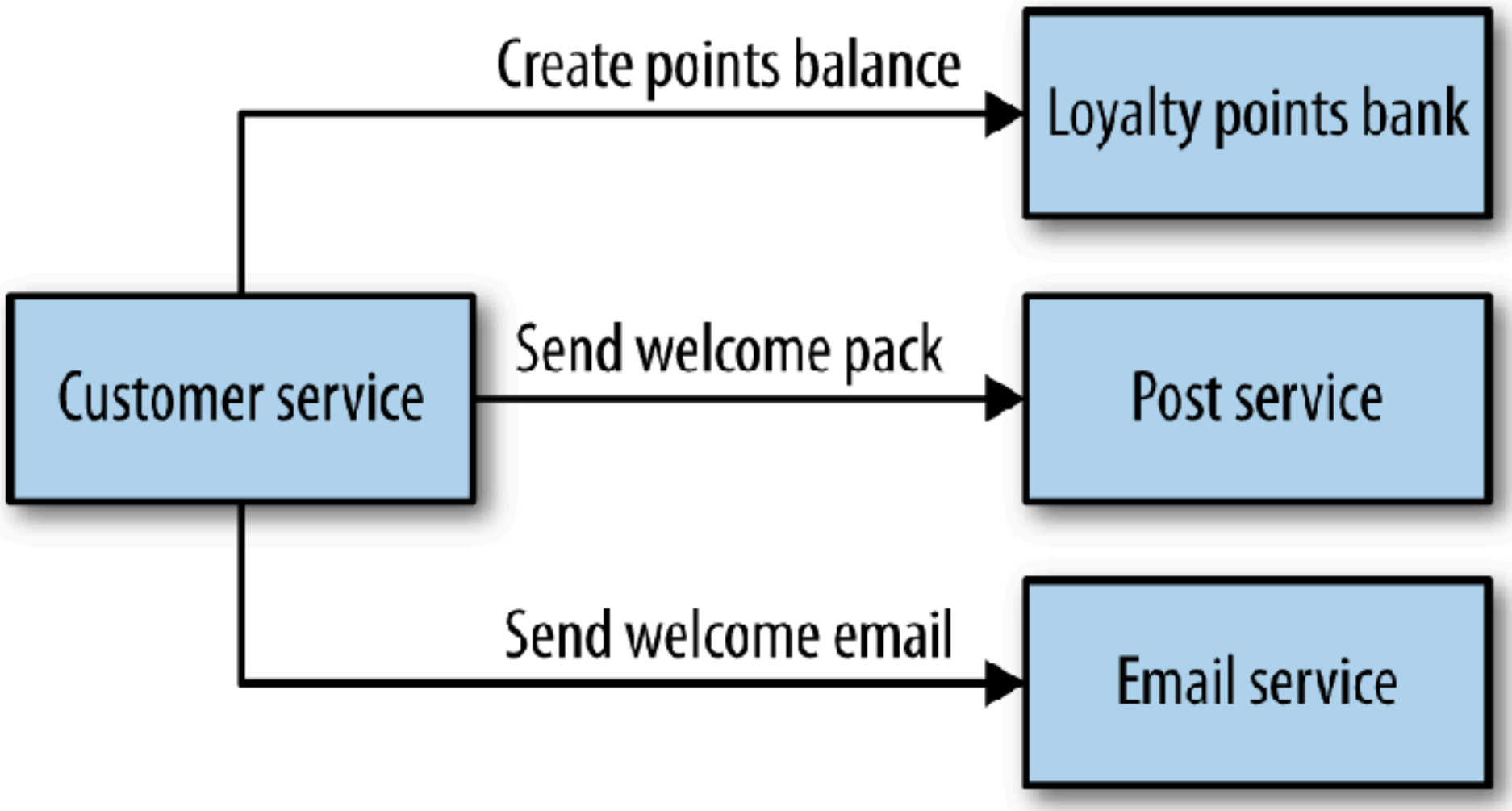
Orchestration



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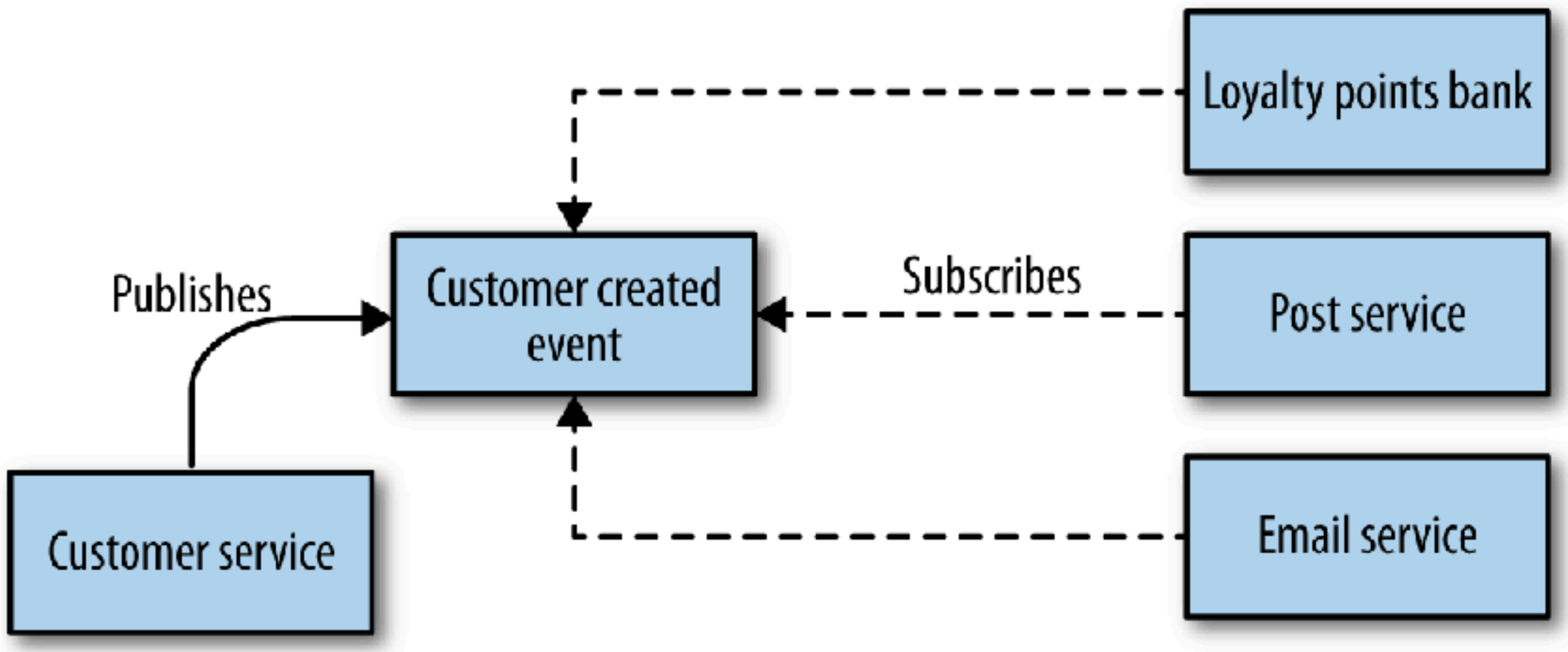
Choreography



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Integrate with User Interface

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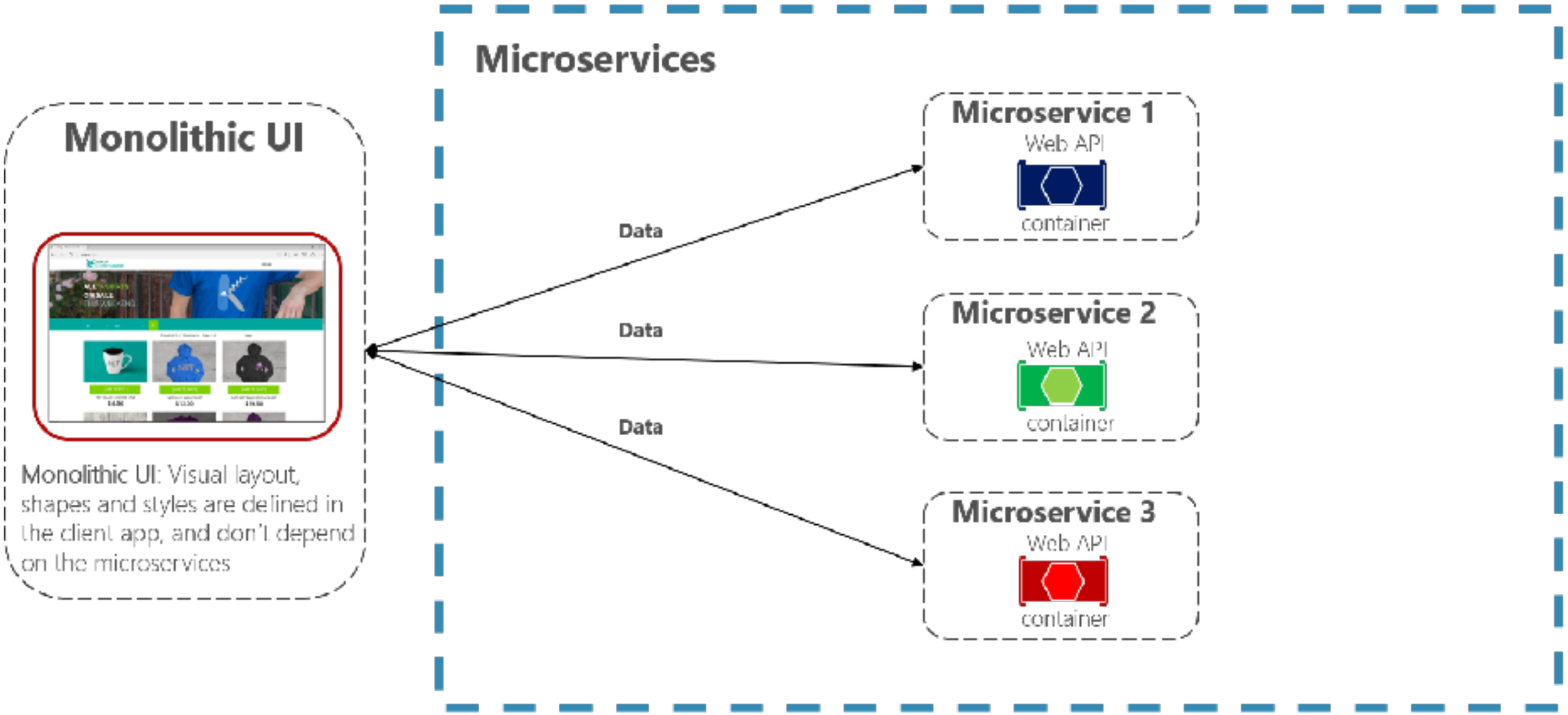
Monolithic UI consuming microservices



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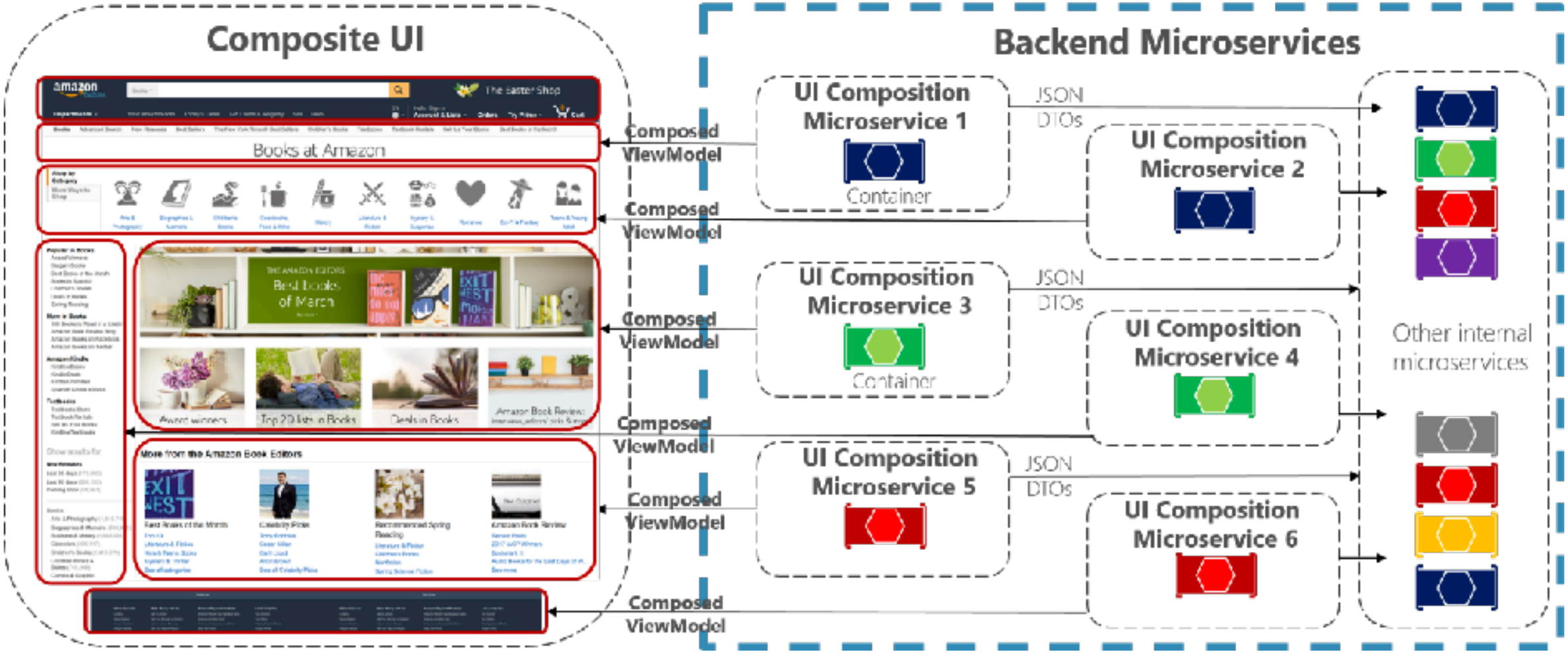
Composite UI *generated* by microservices



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Microservices pitfalls

More/Low splitting
More network interaction
Data storing and sharing
Compatibility issues
Testing
Operation & Monitoring

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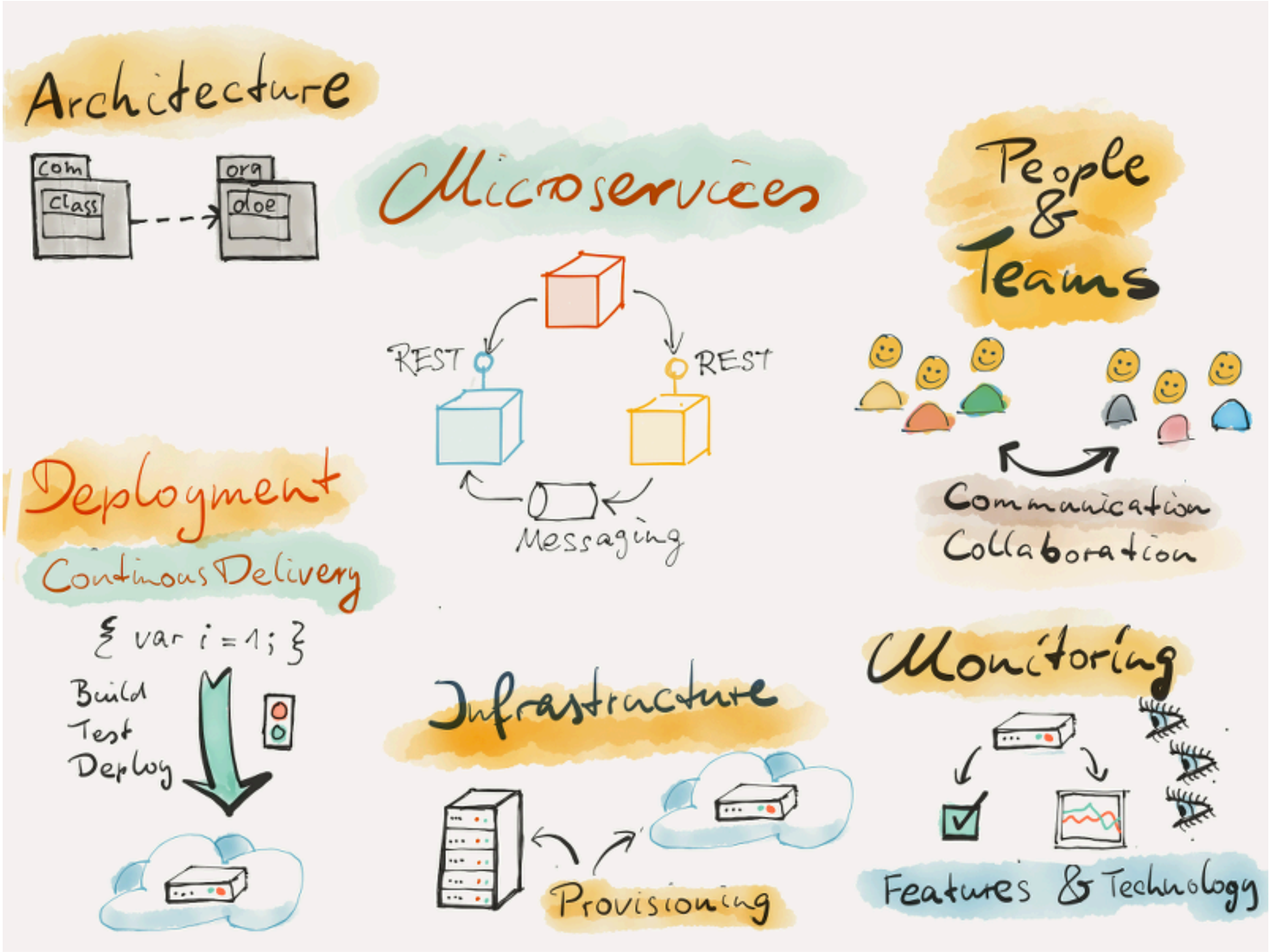

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Evolution Architecture

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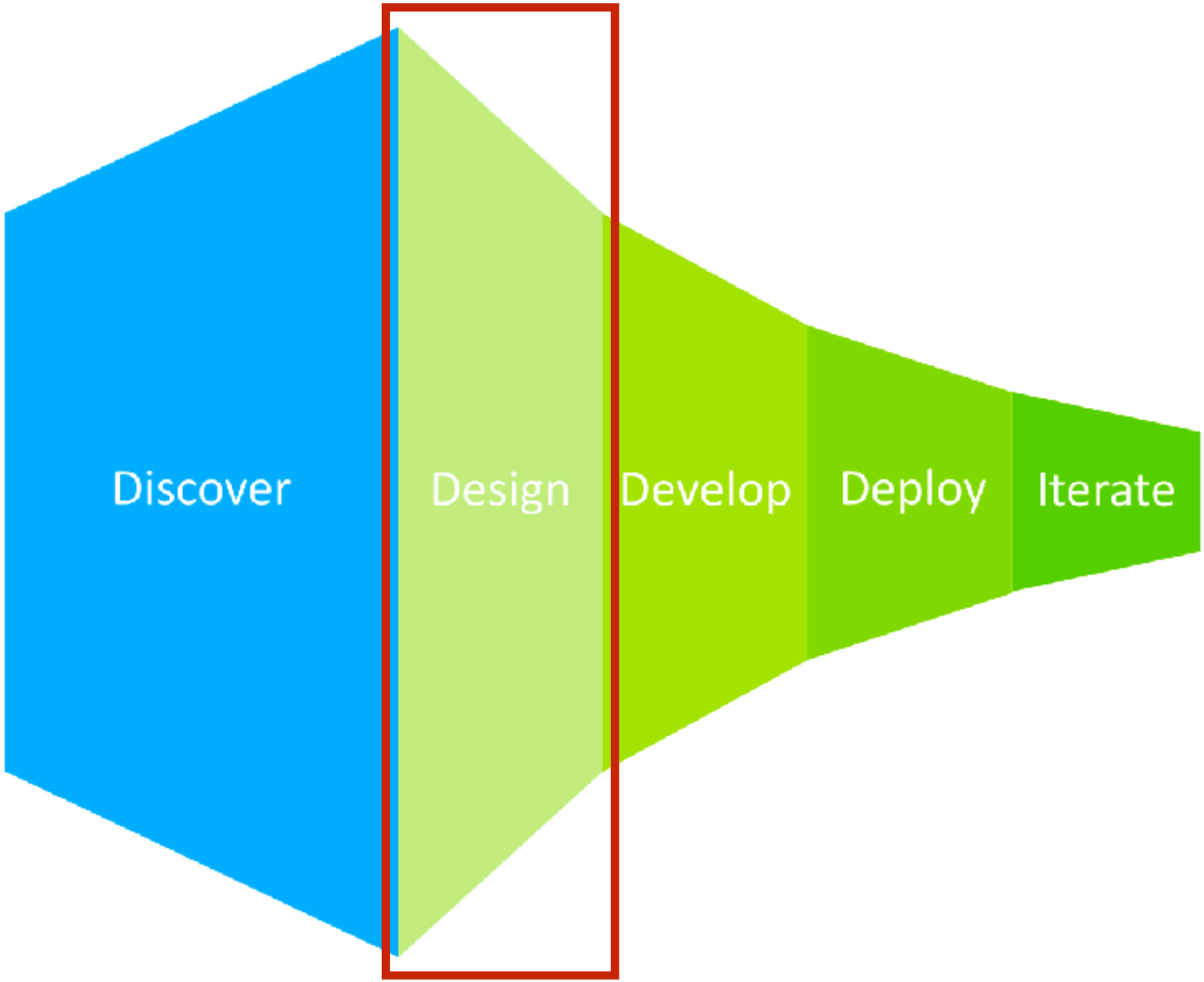

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Let’s workshop with Design

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E-commerce system

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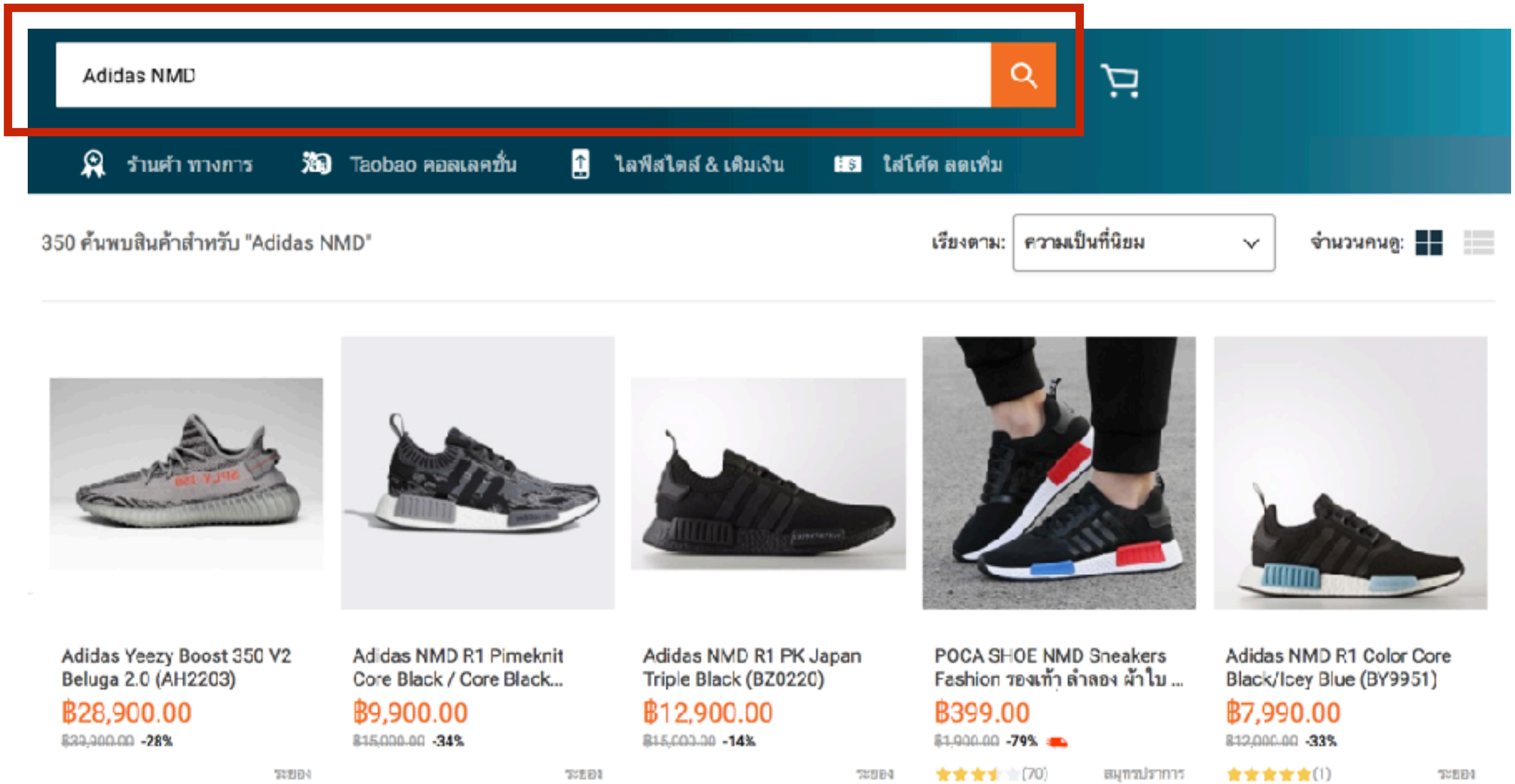
1. Search product by name



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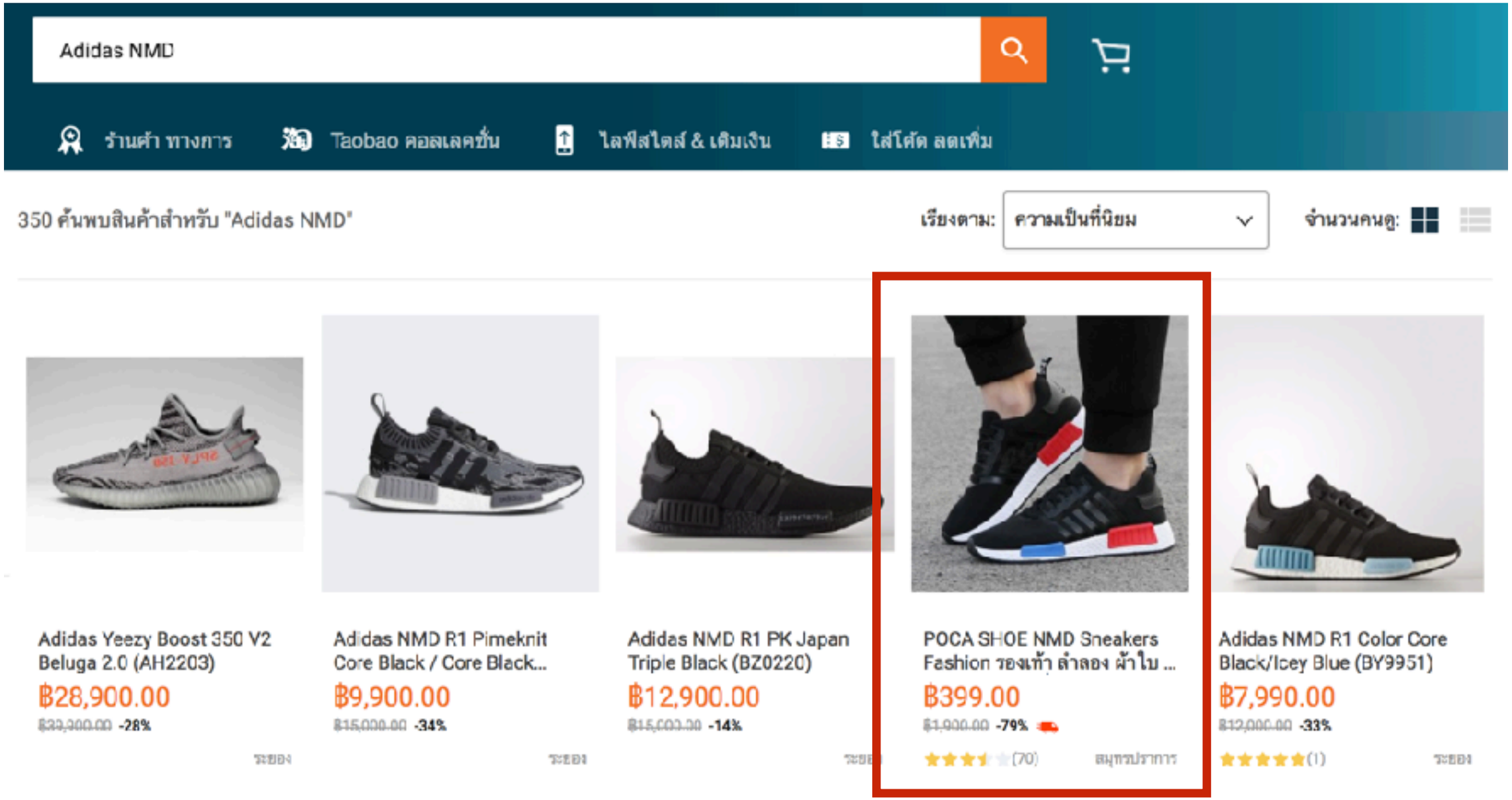
2. Choose a product



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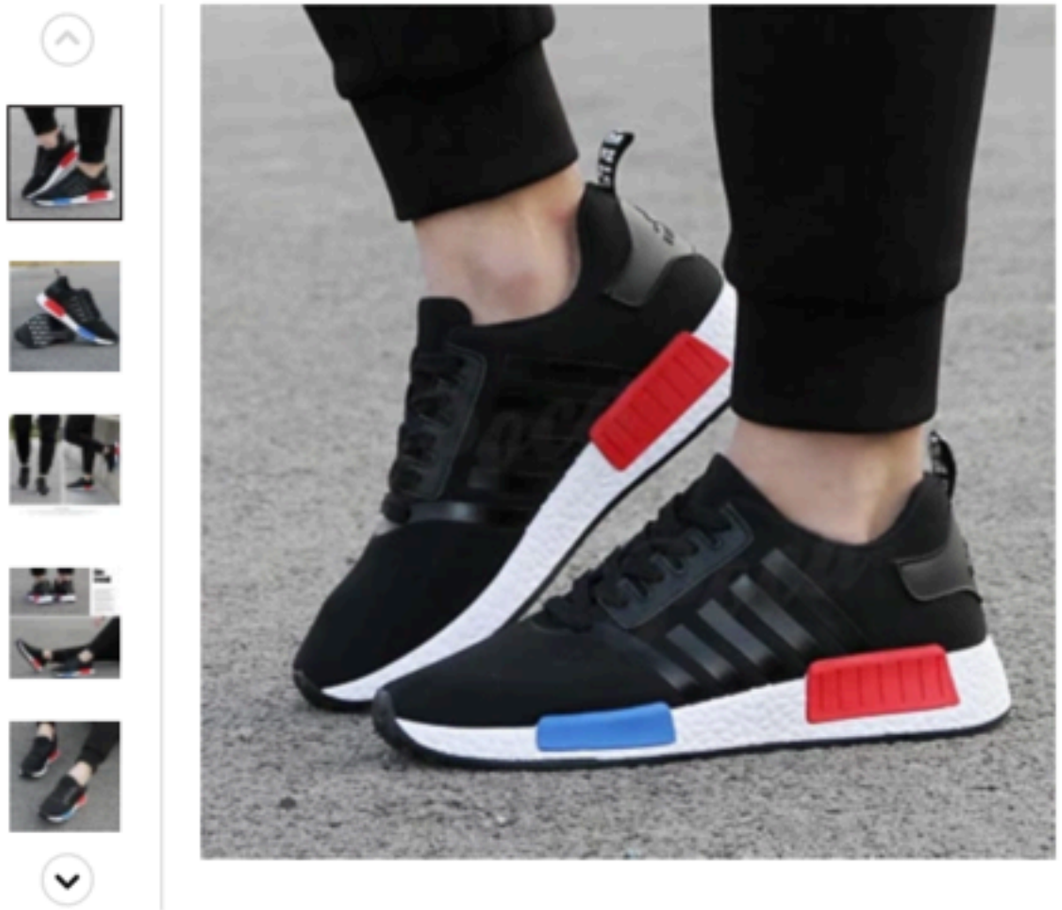
3. Show product detail

POCA SHOE NMD Sneakers Fashion รองเท้า ลำลอง ผ้าใบ ผู้หญิง-ผู้ชาย แฟชั่น ราคาถูกสวยๆ Sport Unisex รุ่น PSN-Black/White

(70) แสดงความคิดเห็น

ยี่ห้อ Poca Shoes | เพิ่มเติม สุภาพบุรุษ จาก Poca Shoes



2 Weeks Warranty by Seller เพิ่มเติม

- สวมใส่สบาย

เพิ่มเติม

เลือก ขนาด

ขนาด

ขนาด

399 บาท

ราคาปกติ ~~1,900 บาท,~~
ประหยัดทันที **79%**
ราคาโปรโมชั่นสามารถใช้ได้กับ 25/2/2018

ใส่ตะกร้า

วิธีการสั่งซื้อ

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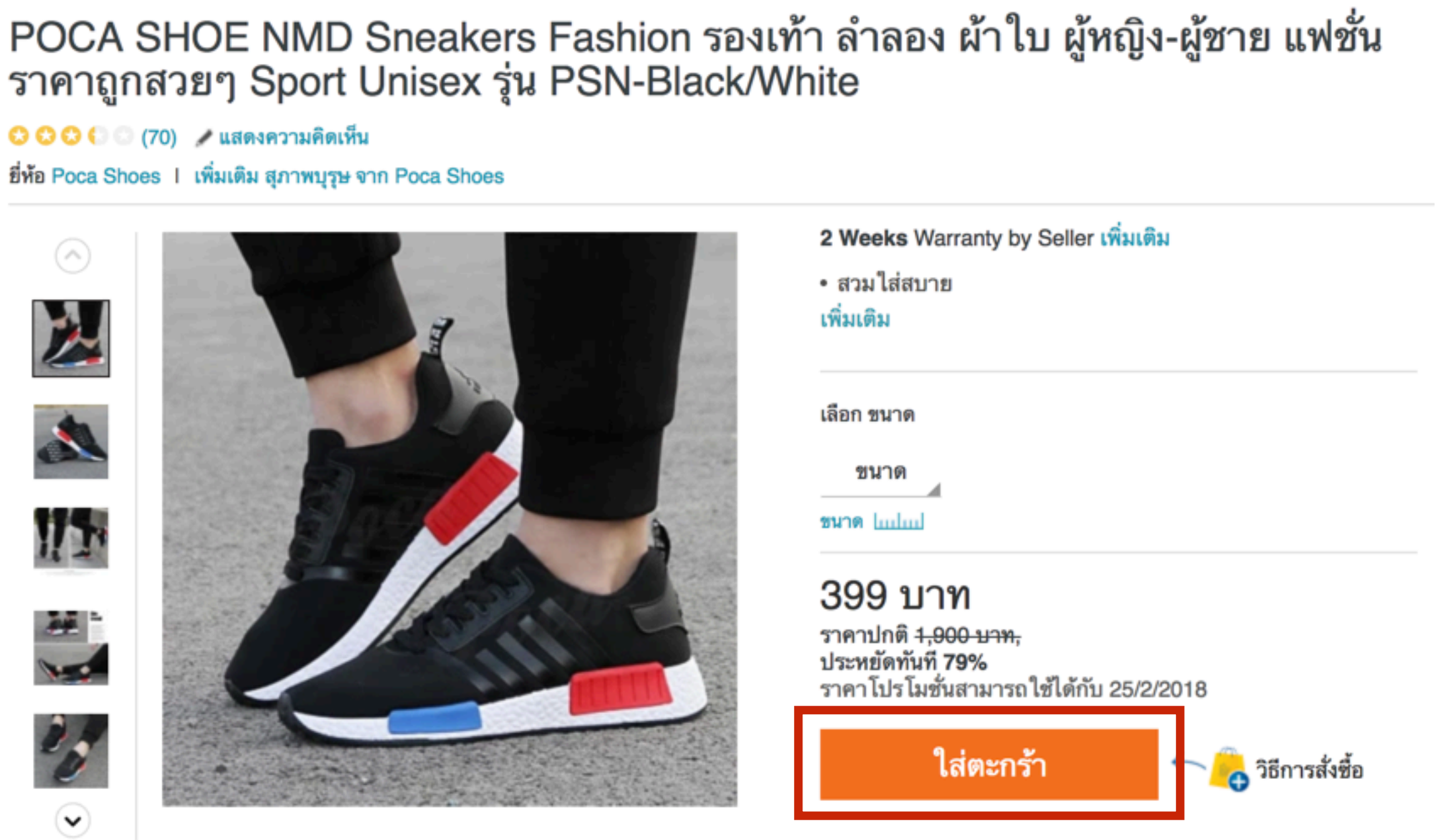
4. Add product to basket



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5. Show data in basket

✓ สินค้า 1 ชิ้น ได้ถูกเพิ่มเข้าไปยังตะกร้าสินค้าของคุณ

POCA SHOE NMD Sneakers Fashion รองเท้า ลำลอง ผ้าใบ ผู้หญิง-ผู้ชาย แฟชั่น ราคาถูกสวยๆ Sport Unisex รุ่น PSN-Black/White

ไซส์: EU:40

Poca Shoes

399 บาท

~~1,900 บาท~~ 79% ปิด

ตะกร้าสินค้าของคุณ (1 สินค้า)

มูลค่าสินค้า:	399 บาท
ยอดสุทธิ ราคารวมภาษีมูลค่าเพิ่ม (ถ้ามี):	**399 บาท**

เลือกซื้อสินค้าต่อ | ชำระค่าสินค้า

People Who Bought This Item Also Bought

กางเกงสแลคขายาว Hopper Progress ผ้ายืด ทรงเข้ารูป

~~900 บาท~~

67% ปิด

299 บาท

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6. Checkout

✓ สินค้า 1 ชิ้น ได้ถูกเพิ่มเข้าไปยังตะกร้าสินค้าของคุณ

POCA SHOE NMD Sneakers Fashion รองเท้า ลำลอง ผ้าใบ ผู้หญิง-ผู้ชาย แฟชั่น ราคาถูกสวยๆ Sport Unisex รุ่น PSN-Black/White

ไซส์: EU:40

Poca Shoes

399 บาท

~~1,900 บาท~~ 79% ปิด

ตะกร้าสินค้าของคุณ (1 สินค้า)

มูลค่าสินค้า:	399 บาท
ยอดสุทธิ ราคารวมภาษีมูลค่าเพิ่ม (ถ้ามี):	**399 บาท**

เลือกซื้อสินค้าต่อ

ชำระค่าสินค้า

People Who Bought This Item Also Bought

กางเกงสแลคขายาว Hopper Progress ผ้ายืด ทรงเข้ารูป

~~900 บาท~~

67% ปิด

299 บาท

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7. Shipping

LAZADA .CO.TH

1. ค่าซื้อขั้นต่ำ | 2. ชำระเงิน

ที่อยู่ที่จะจัดส่ง Login for speedy checkout

อีเมล: กรุณาใส่ อีเมล์ ของท่าน

ชื่อ และ นามสกุล: ชื่อและนามสกุล

ที่อยู่: ที่อยู่

รหัสไปรษณีย์: รหัสไปรษณีย์ — ทางเราจะทำการตรวจสอบเมืองและจังหวัดของคุณ

เขต: เขต

จังหวัด: กรุงเทพมหานคร/ Bangkok

โทรศัพท์มือถือ: +66 เบอร์โทรติดต่อ — เพื่อให้มั่นใจว่าทำการจัดส่งได้

☐ ที่อยู่สำหรับใบเสร็จ/ใบกำกับภาษี - กรุณาเลือกและกรอกข้อมูลเพื่อทำการขอใบกำกับภาษี

ข้อมูลการส่งสินค้า

ส่งแบบธรรมดา: ฟรี

Get it วันอังคาร, 27 ก.พ. - วันจันทร์, 5 มี.ค. 2018

ดำเนินการต่อ

สรุปการสั่งซื้อ (1 items)

สินค้า	จำนวน	ราคา
POCA SHOE NMD Sneakers Fashion รองเท้า ลำลอง ผ้าใบ ผู้หญิง-ผู้ชาย แฟชั่น ราคาถูกสวยๆ Sport Unisex รุ่น PSN-Black/White ขนาด: EU:40	1	399

มูลค่าสินค้า 399 บาท

ยอดสุทธิ 399 บาท

ราคารวมภาษีมูลค่าเพิ่ม (ถ้ามี)

คุ้มครองลูกค้า 100%

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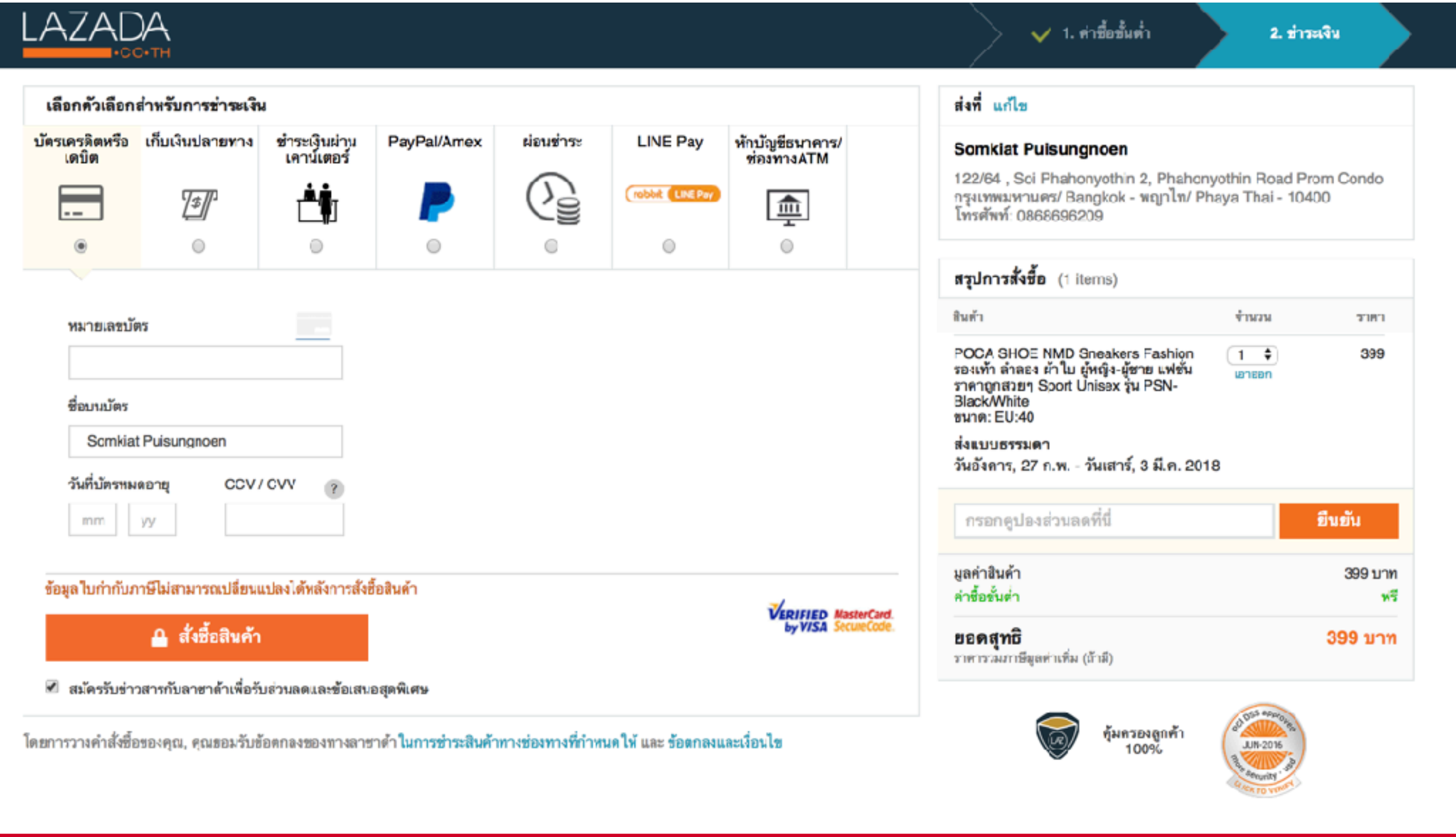
8. Payment



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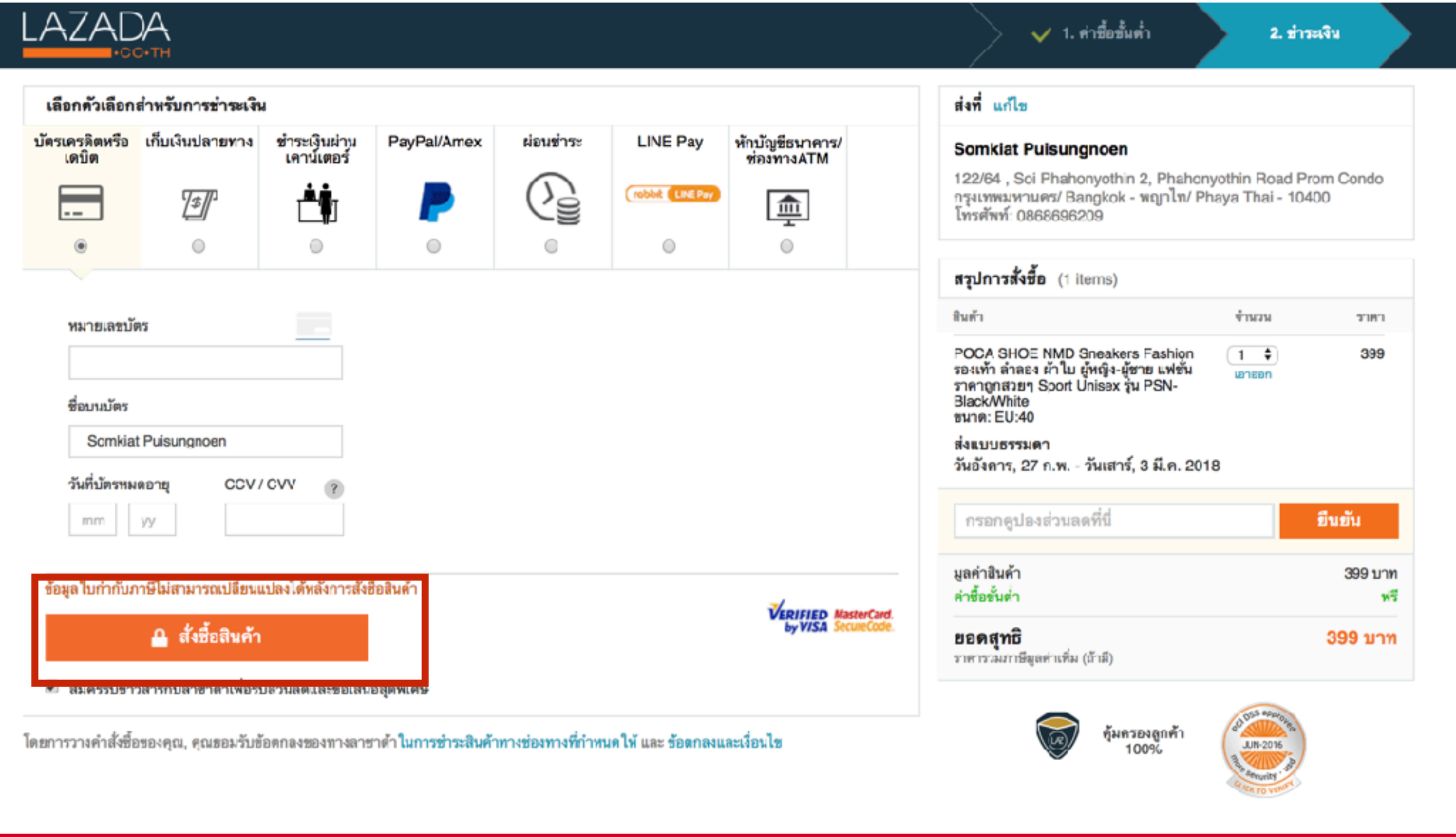
9. Confirm to order



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10. Summary

LAZADA .CO.TH

Pay@All by counterservice

ใบแจ้งการชำระเงิน(PaySlip)

Counter Service Co., Ltd.

เลขที่ใบแจ้งสินค้า/Invoice No:	**3779254692**
ผู้ชำระเงิน/Payer:	Somkiat Puisungnoen
วันที่ทำรายการ / Transaction Date:	25/02/2018 23:33
กำหนดชำระเงิน / Expired Date:	**27/02/2018 23:33**
เพื่อเข้าบัญชี / Payee:	www.lazada.co.th Tel: **020180000**
รายละเอียด / Detail:	Lazada

806010855864737

จำนวนเงินที่ชำระ / Amount:

399.00 บาท /THB

* ไม่รวมค่าธรรมเนียมของเคาน์เตอร์เซอร์วิส
(Excluding service fees at Counter Service)

คลิกปุ่ม **"Print"** พิมพ์ใบแจ้งการชำระเงิน
หรือ
จด **"รหัส 15 หลักใต้บาร์โค้ด"** เพื่อนำไปชำระเงินที่
Press "Print" button or write down paycode 15 digits for pay in cash at counter service(7-11)

Back to merchant | Print

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Try to design system

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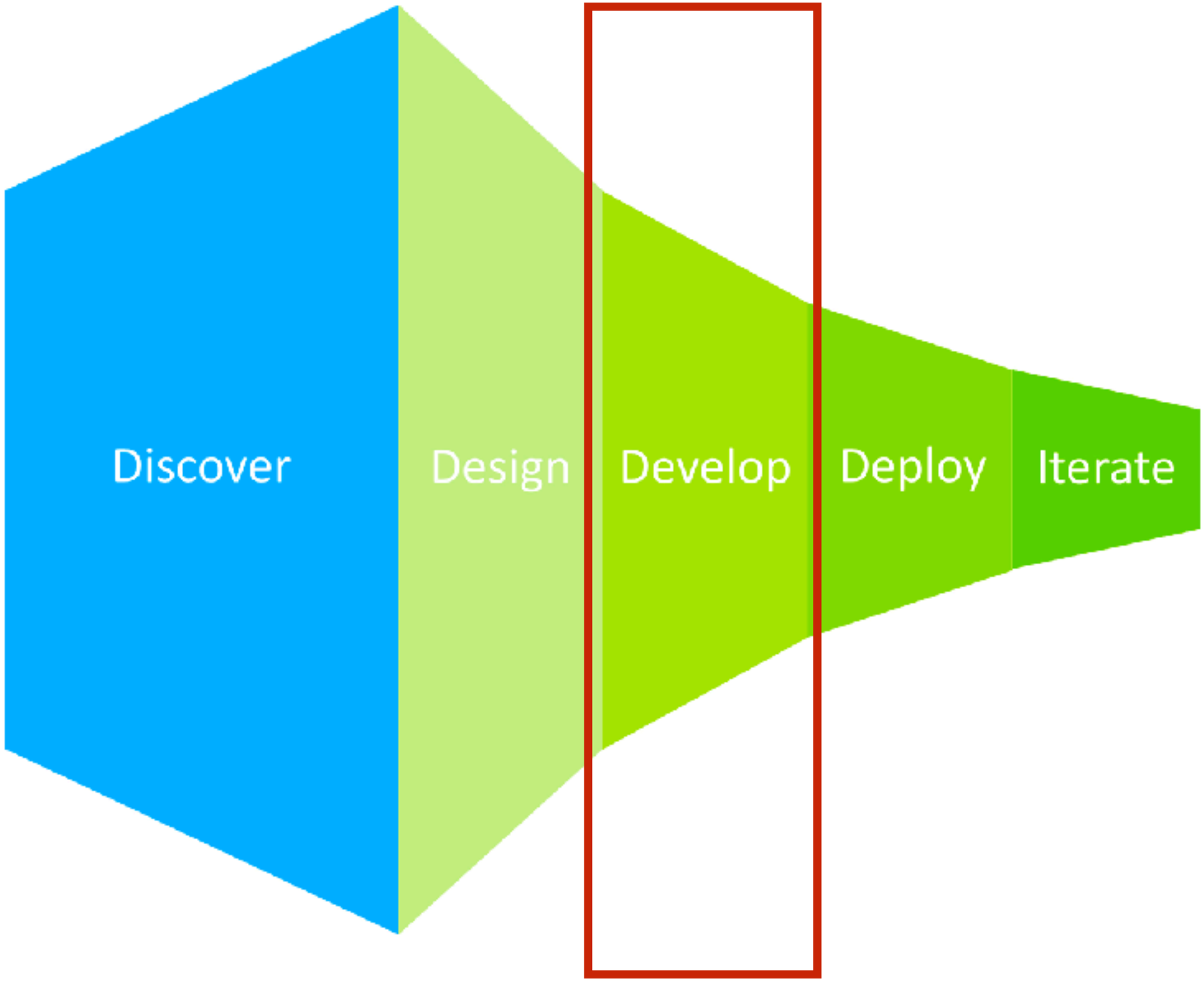

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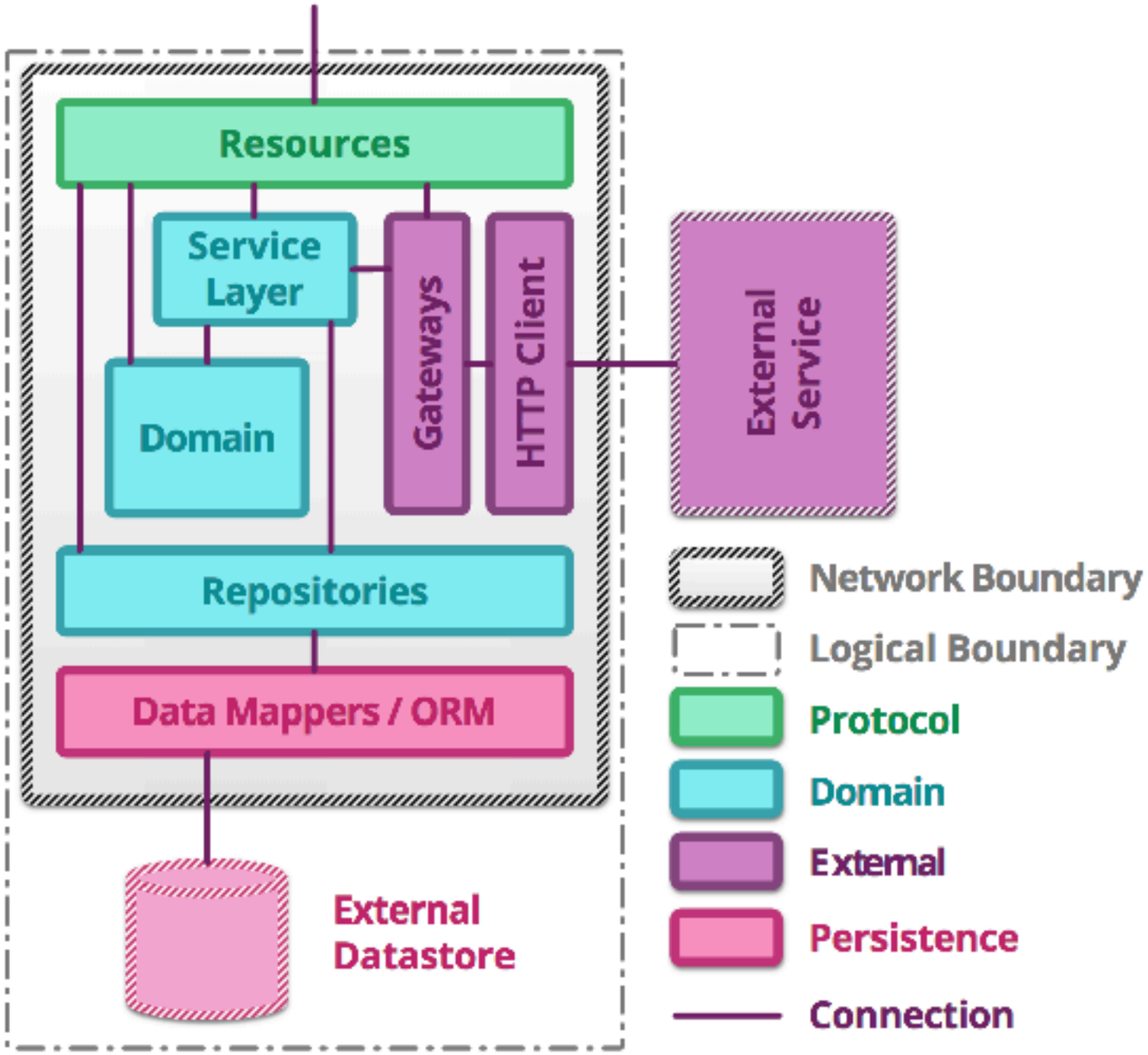
Service structure



https://martinfowler.com/articles/microservice-testing

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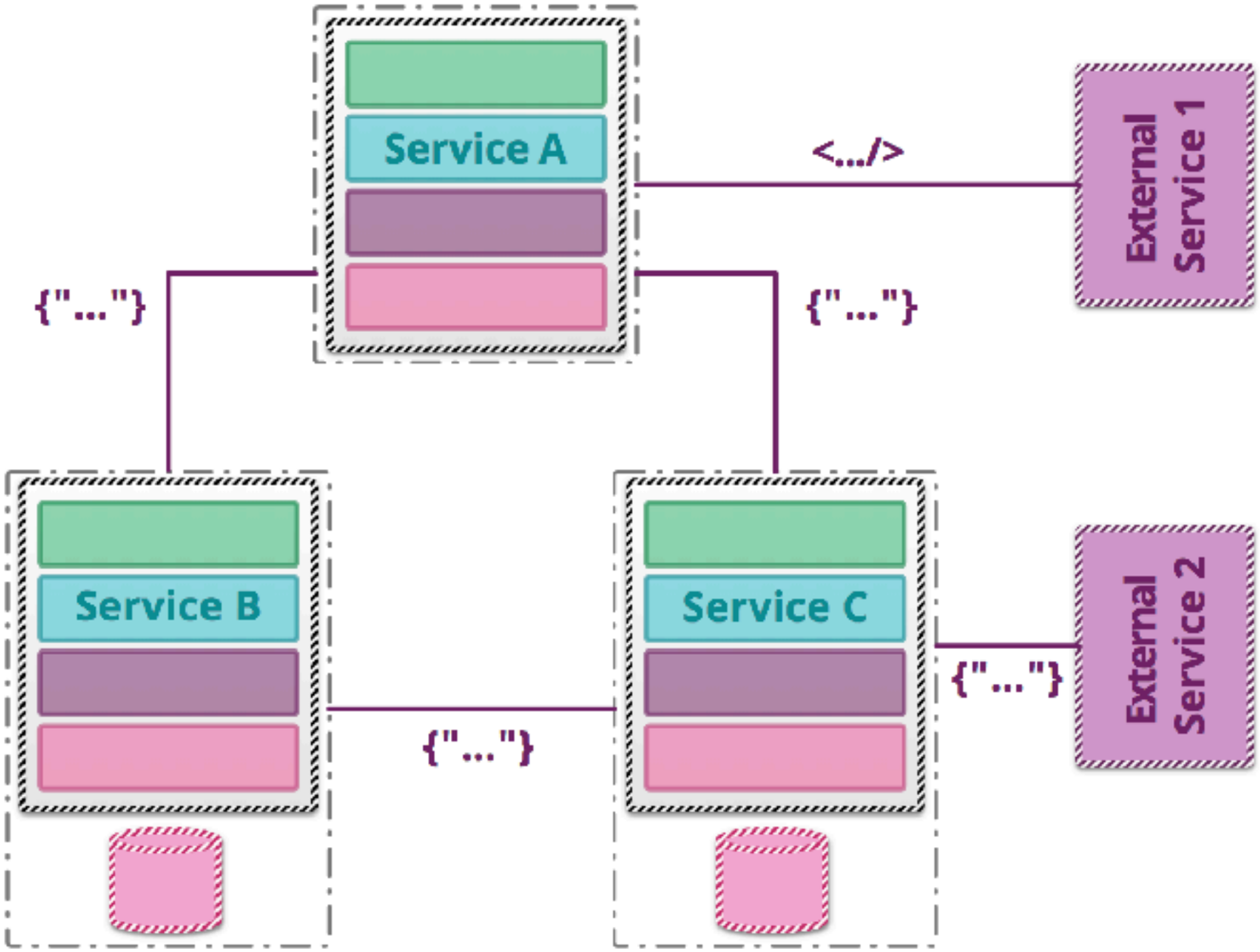
Multiple services



https://martinfowler.com/articles/microservice-testing

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Microservice Testing

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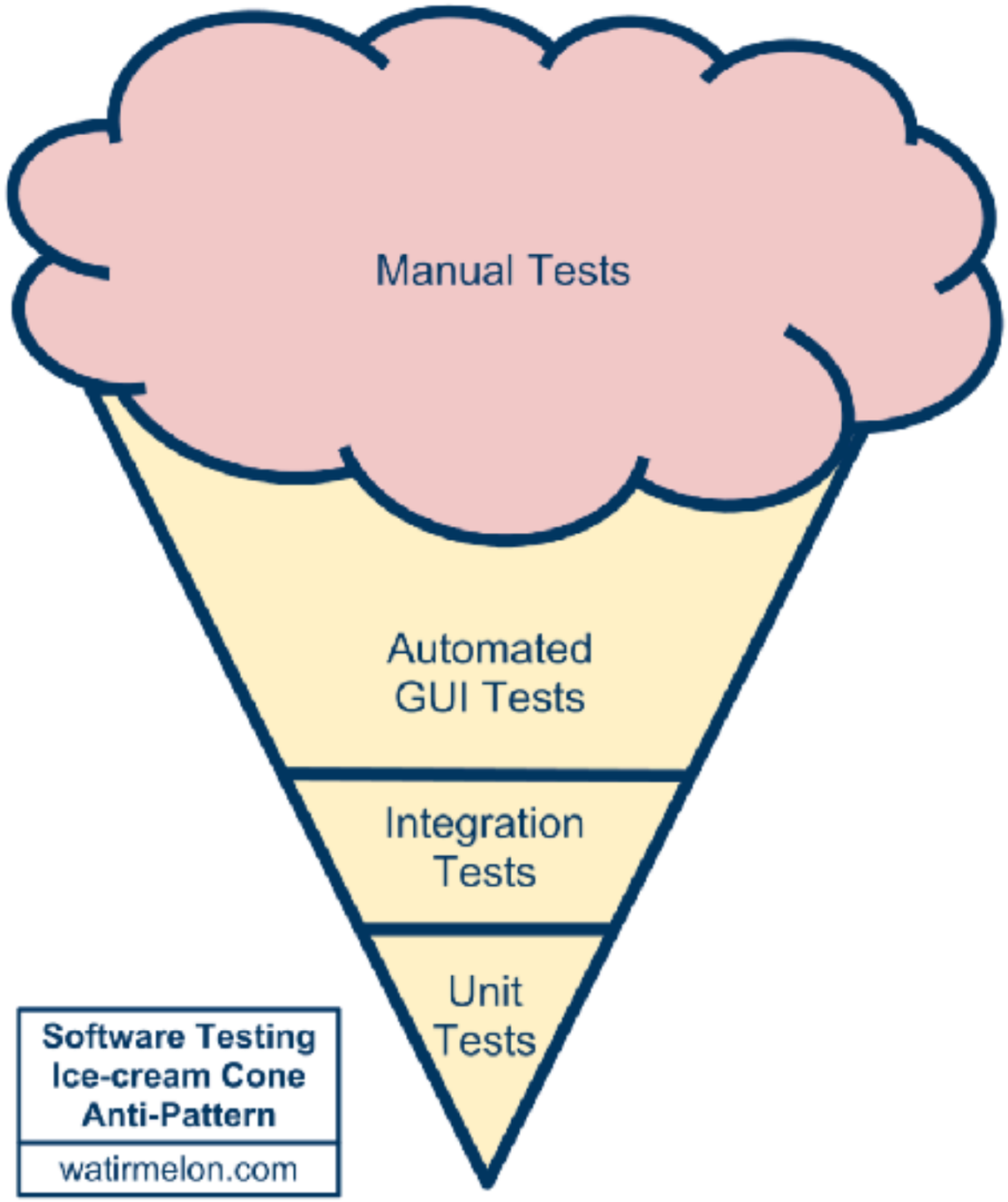

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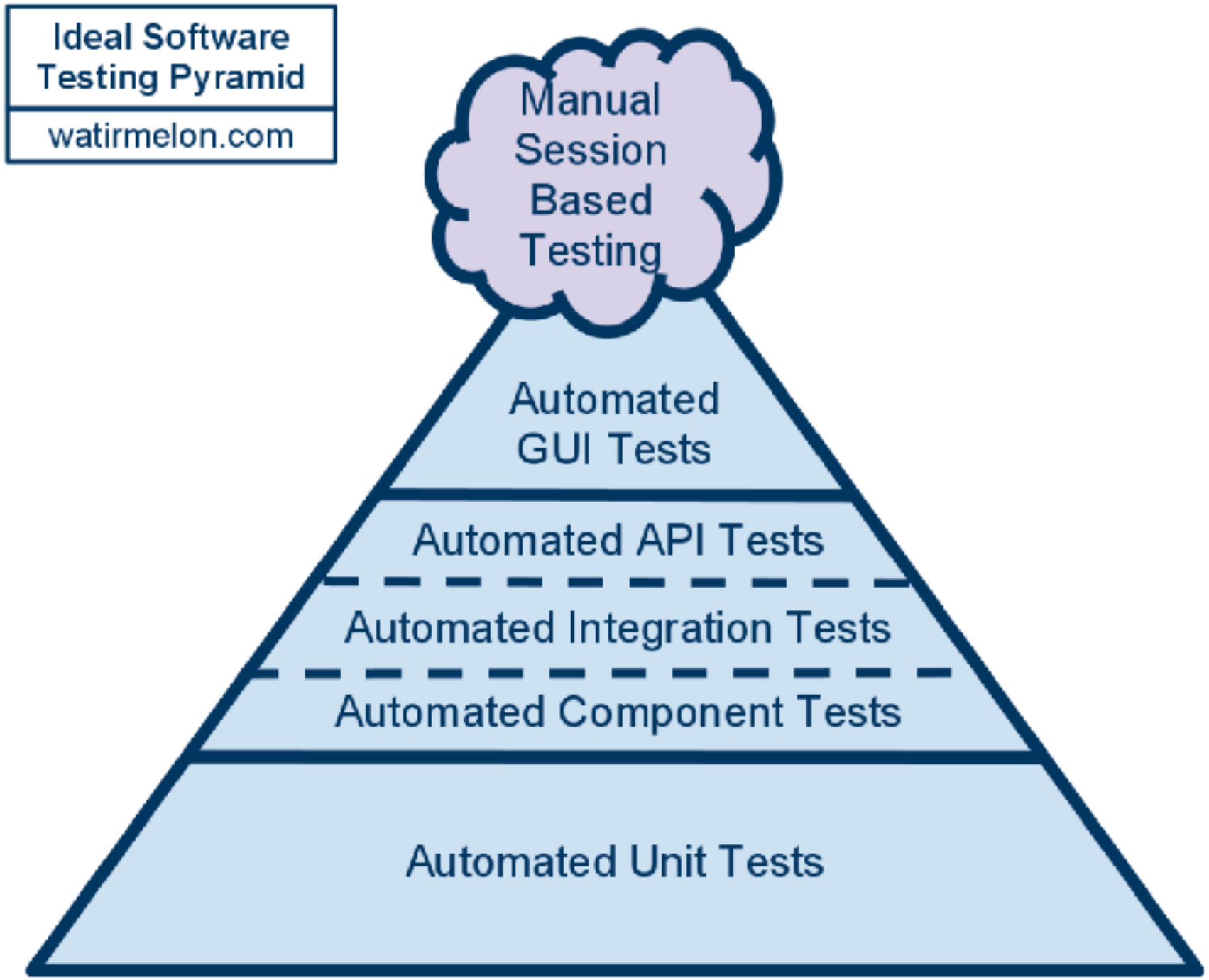

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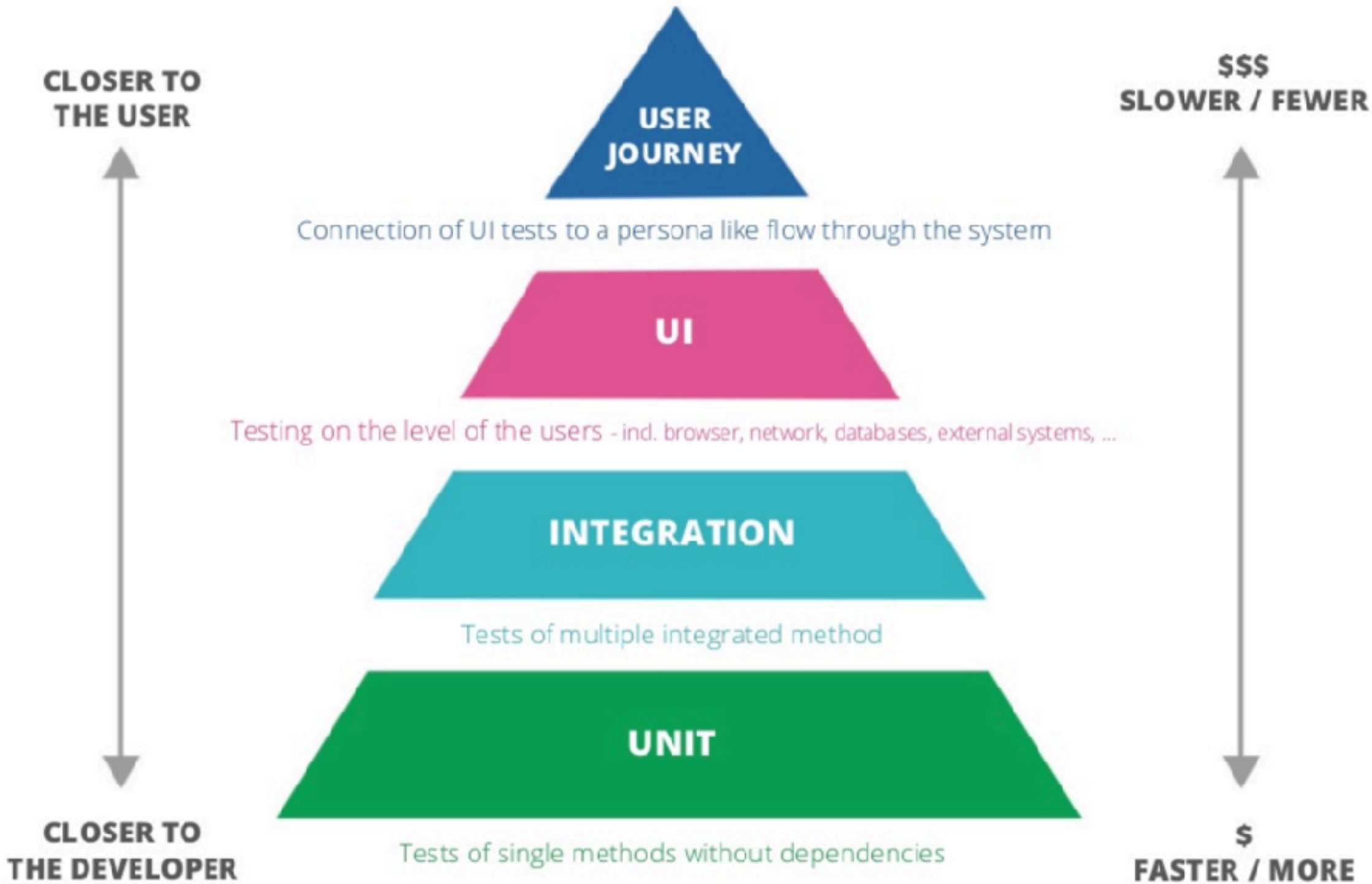

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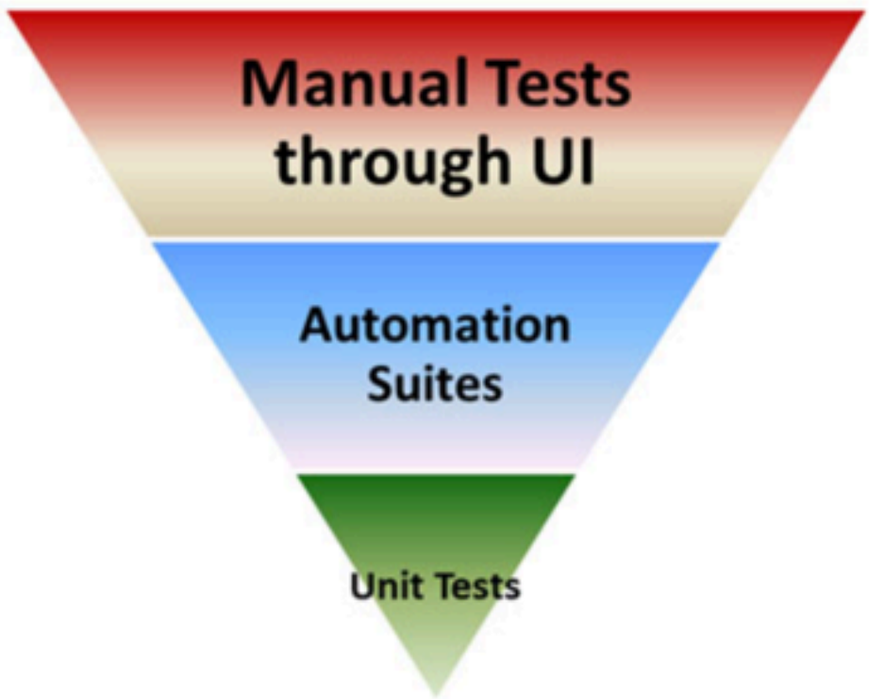
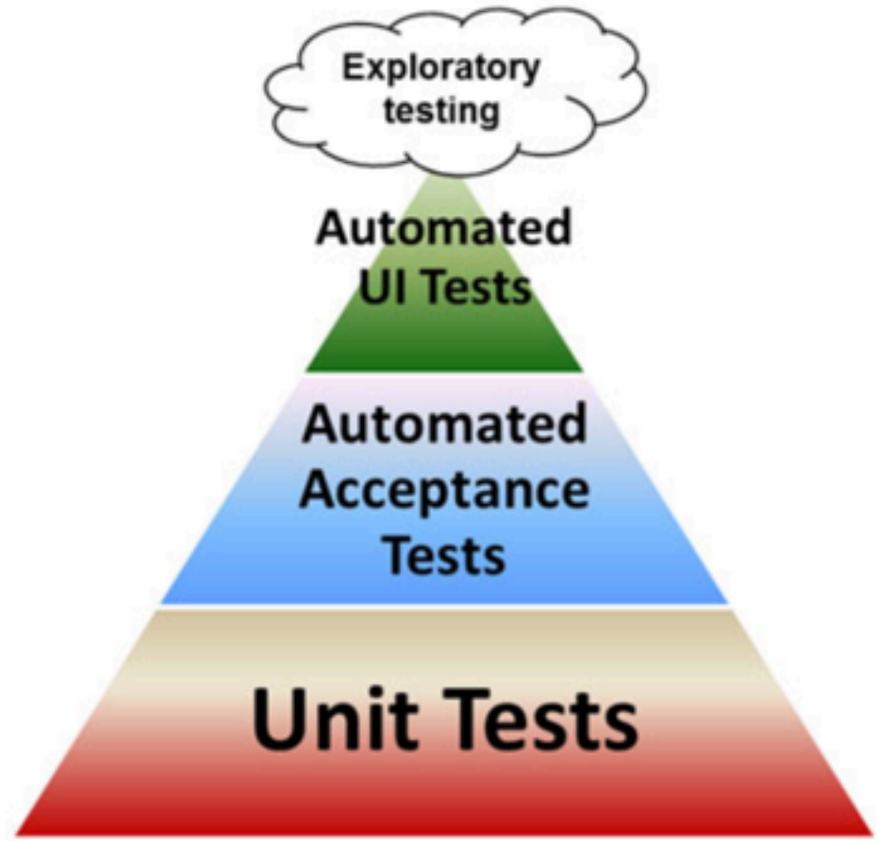


Traditional
(find bugs)



Agile
(prevent bugs)

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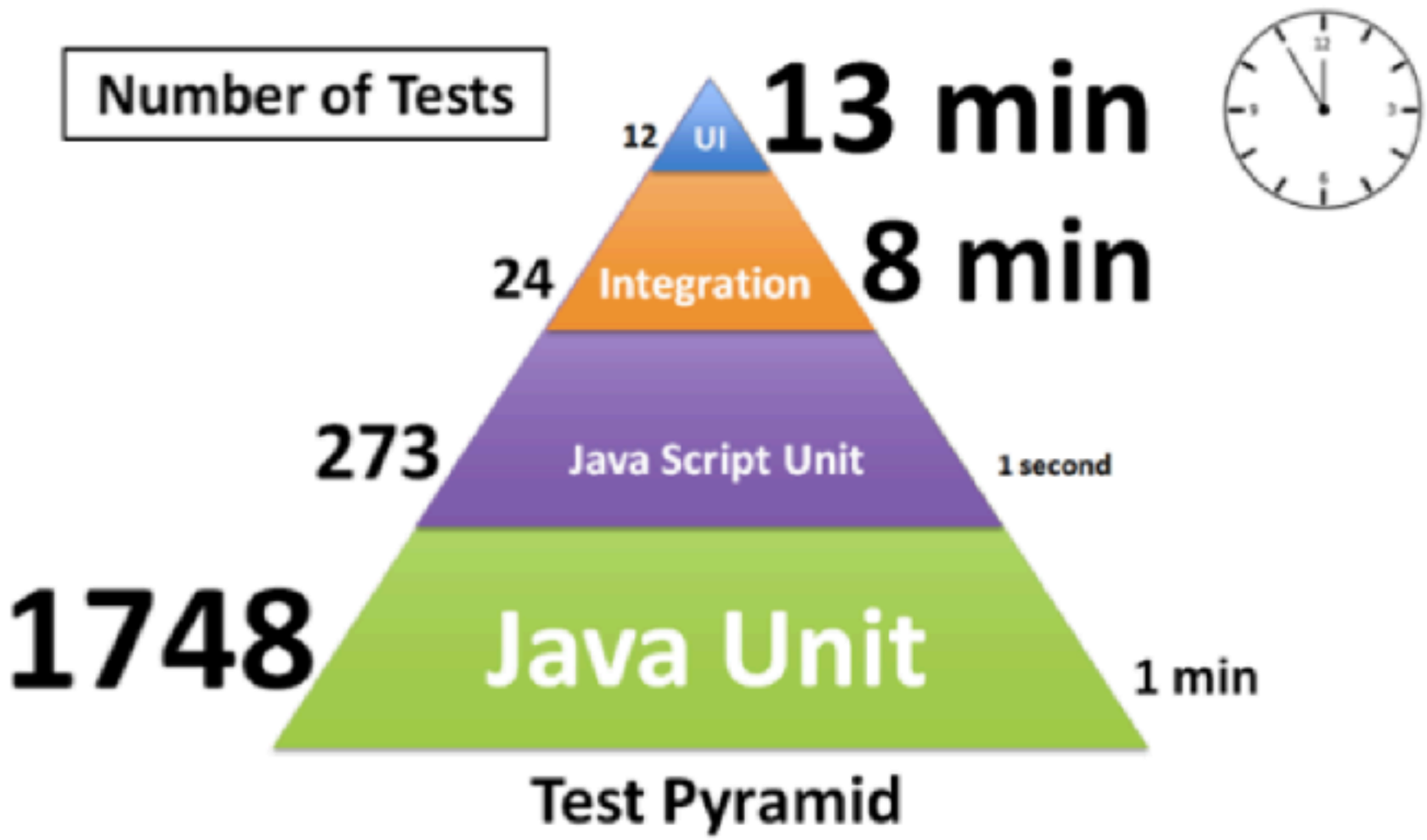

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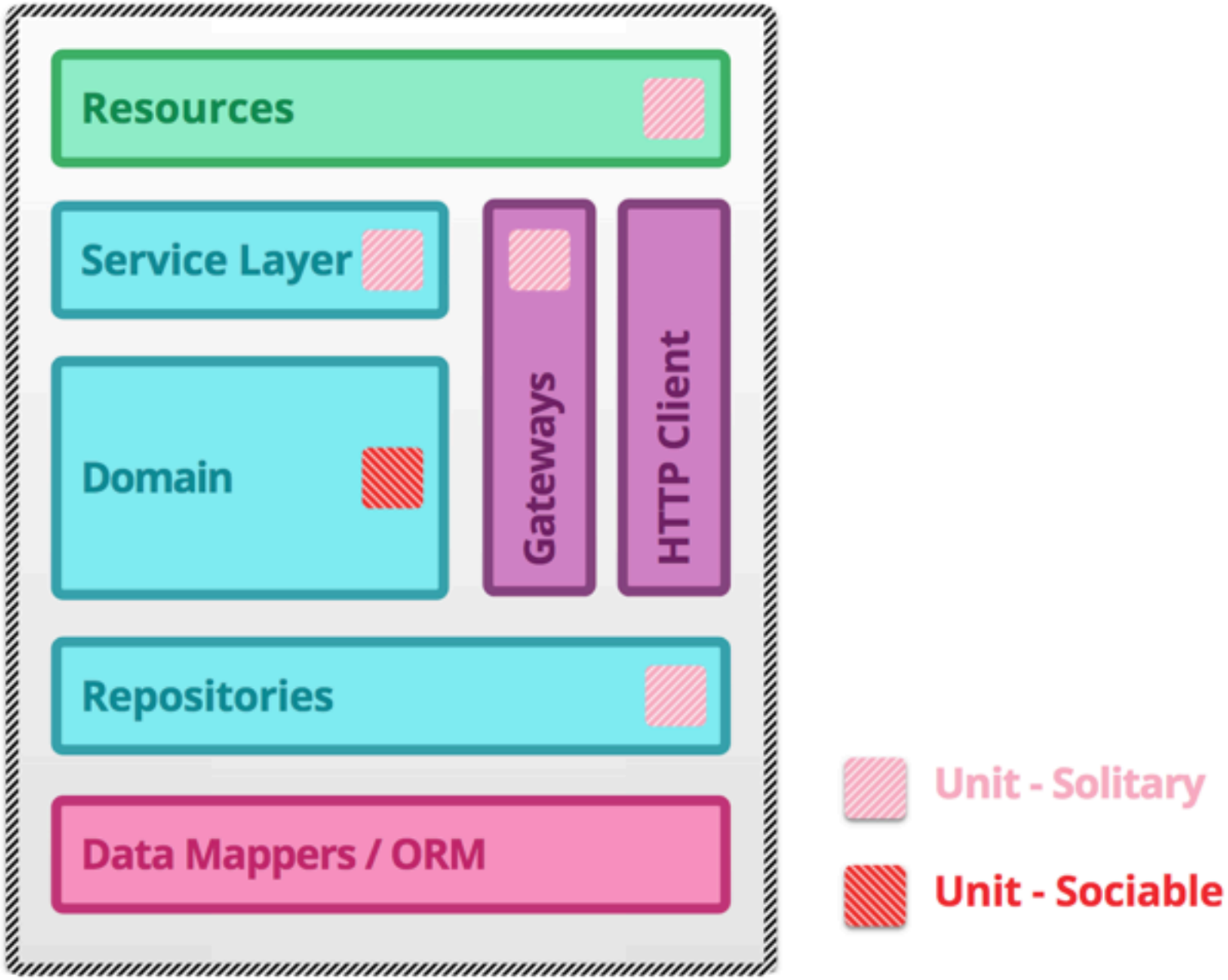
Unit testing



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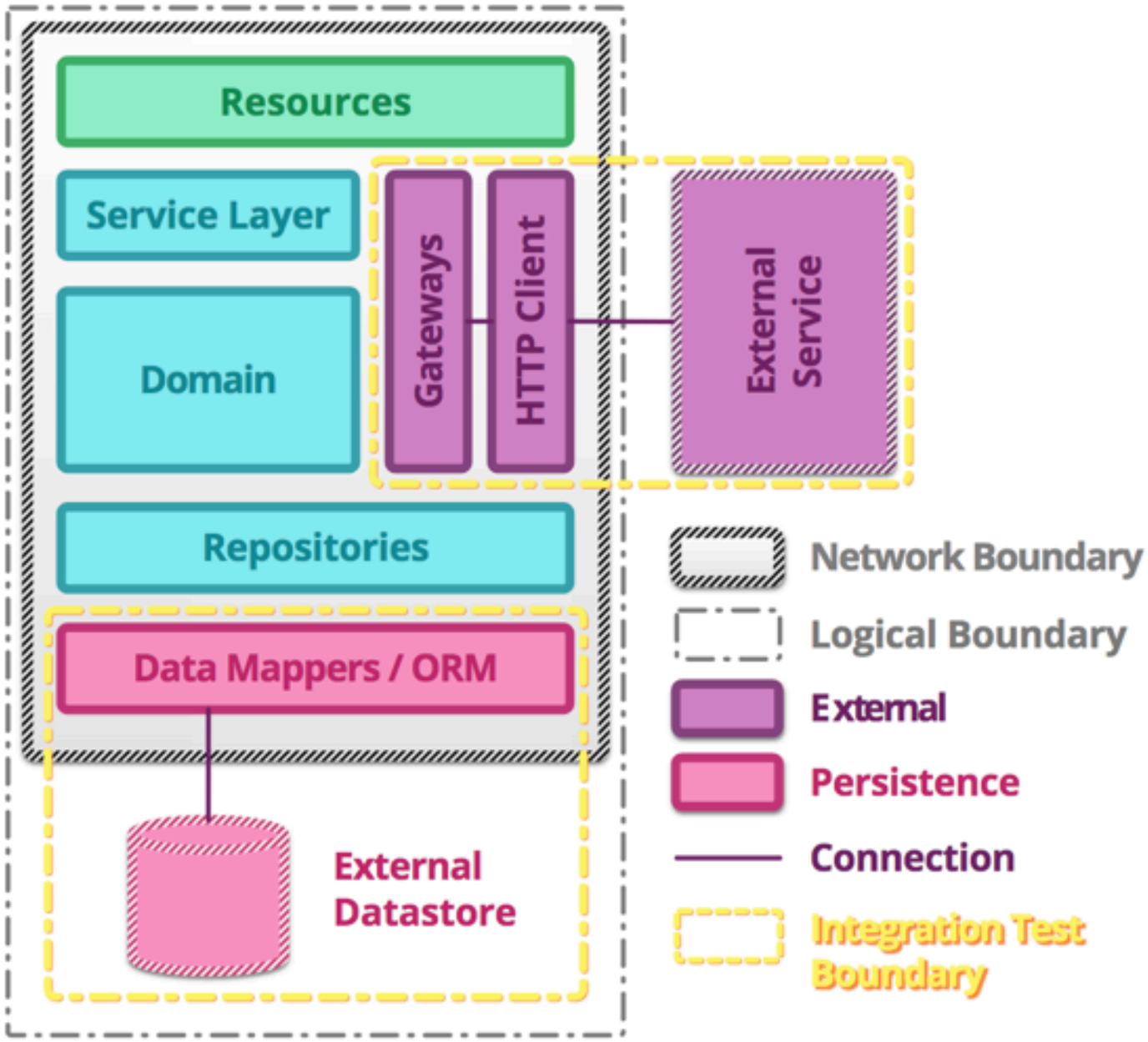
Integration testing



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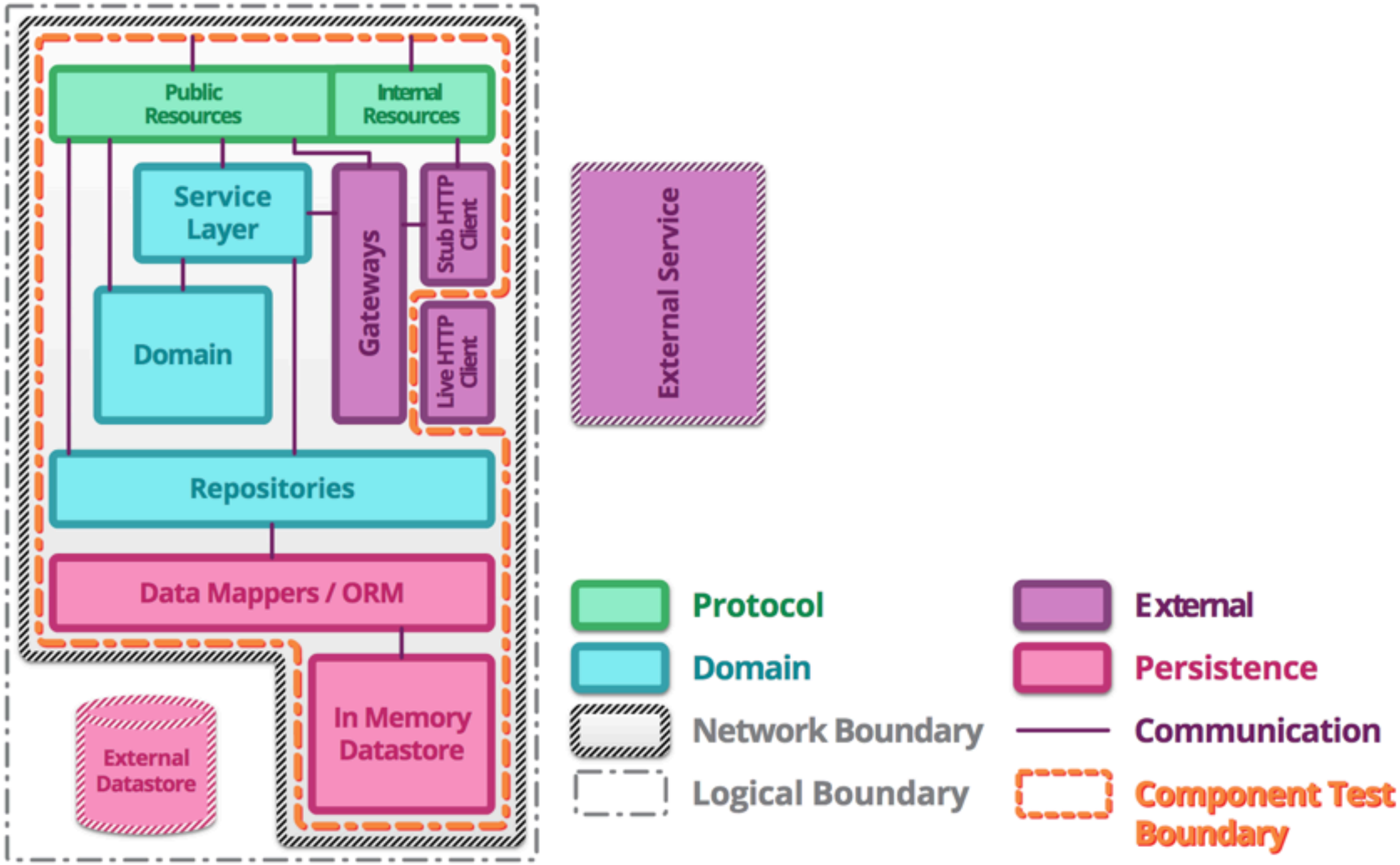
Component testing



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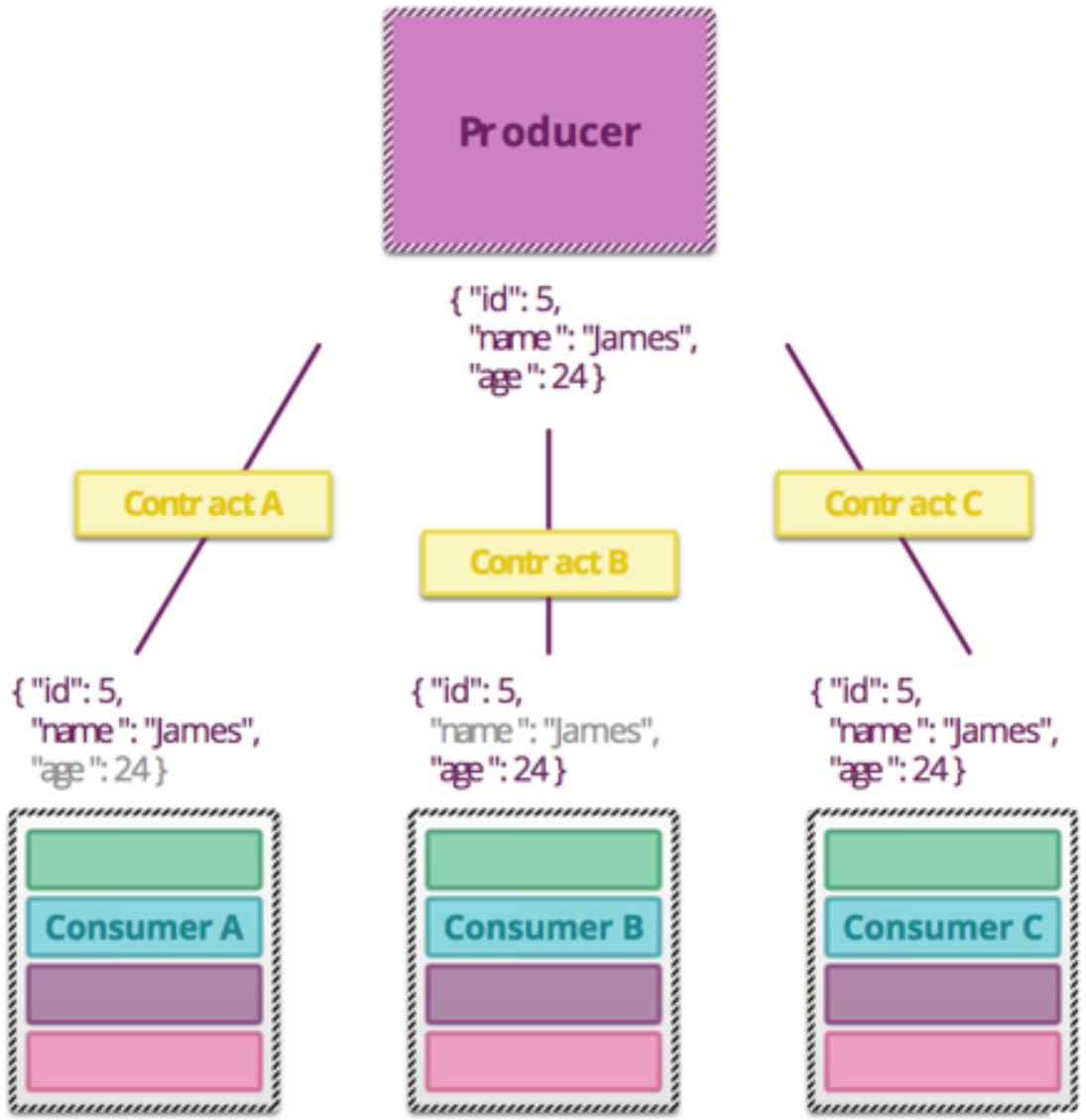
Contract testing



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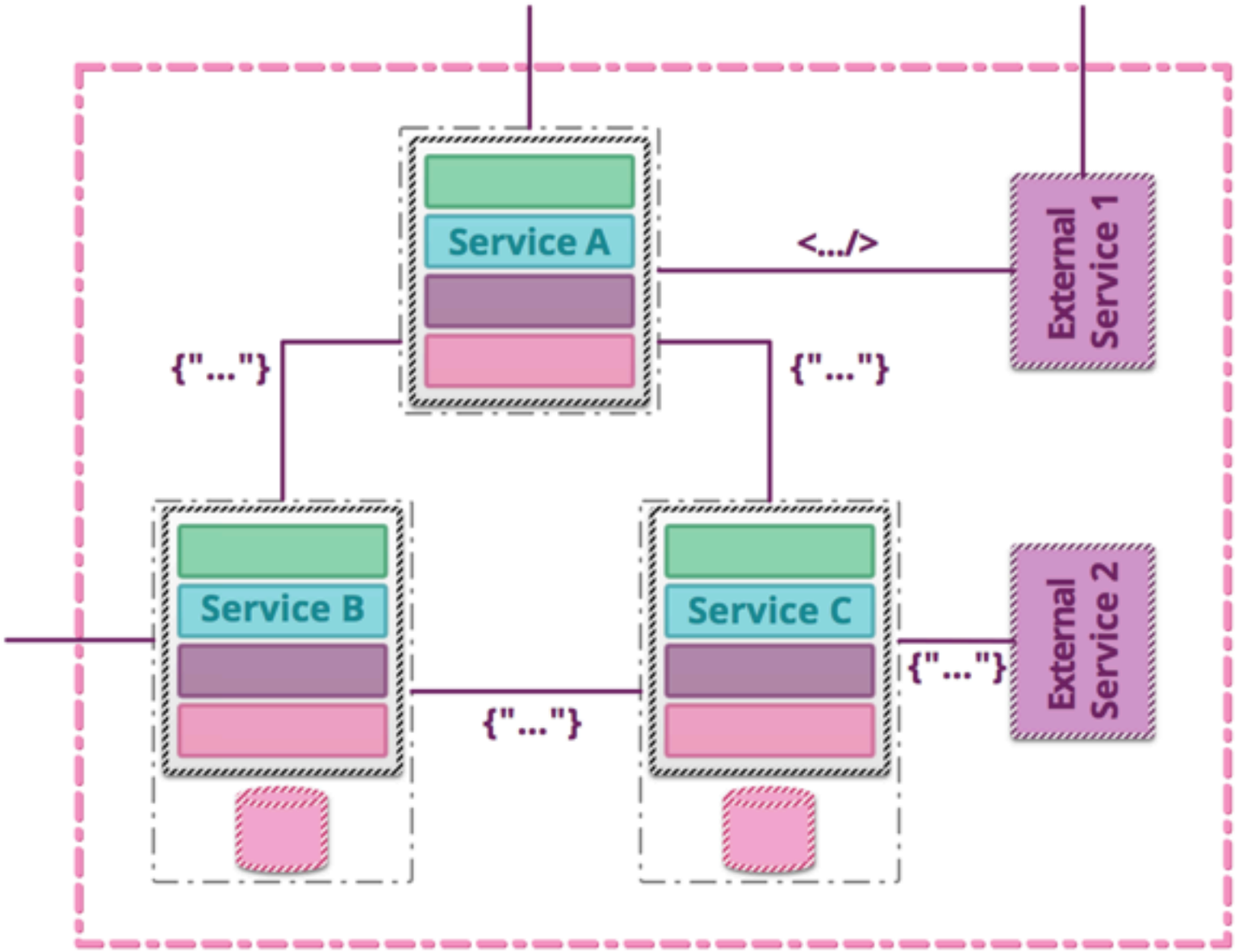
End-to-End testing



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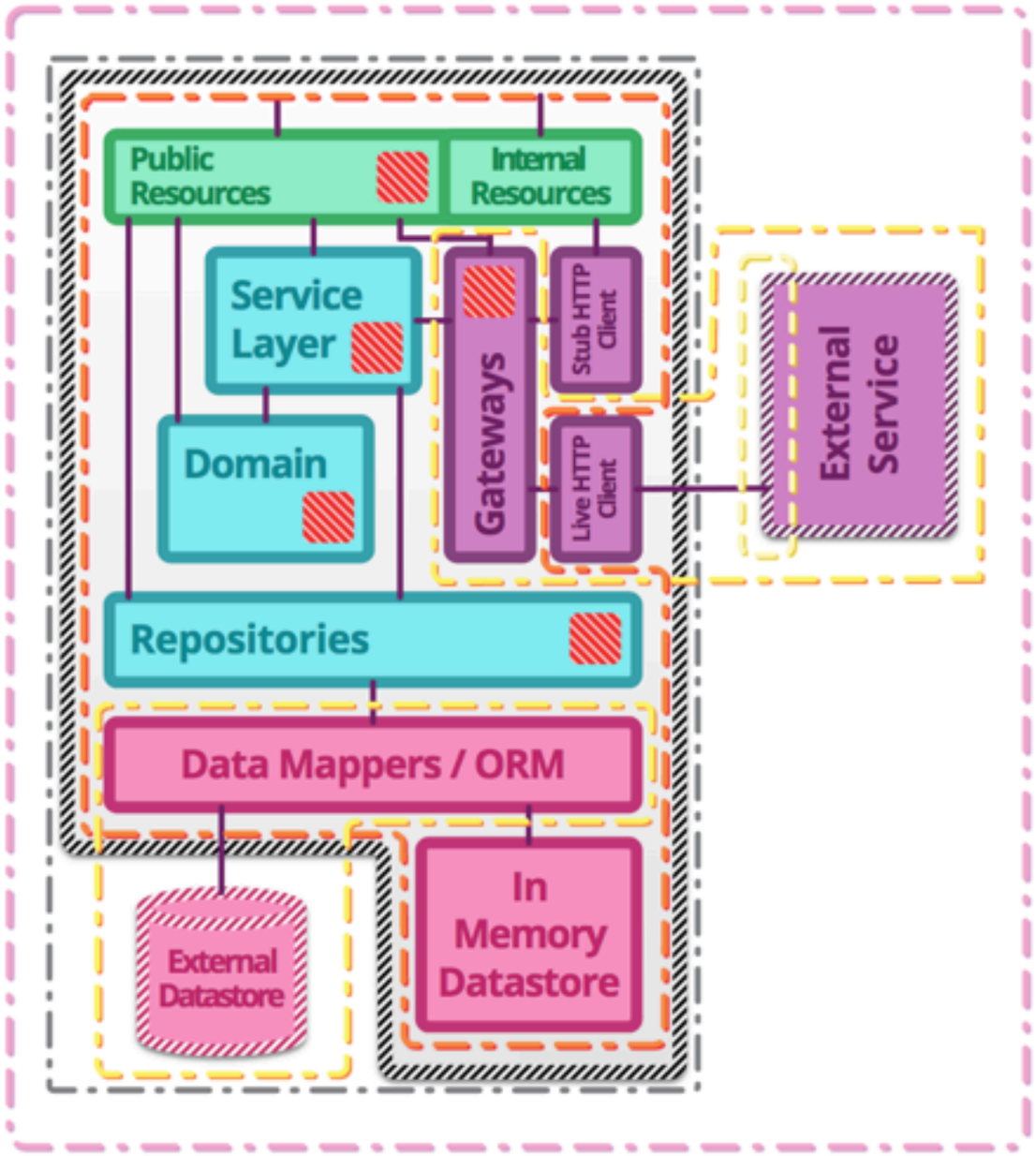
Summary

Unit tests : exercise the smallest pieces of testable software in the application to determine whether they behave as expected.

Integration tests : verify the communication paths and interactions between components to detect interface defects.



Component tests : limit the scope of the exercised software to a portion of the system under test, manipulating the system through internal code interfaces and using test doubles to isolate the code under test from other components.

Contract tests : verify interactions at the boundary of an external service asserting that it meets the contract expected by a consuming service.

End-to-end tests : verify that a system meets external requirements and achieves its goals, testing the entire system, from end to end.

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What is your testing strategy ?

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Workshop

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Workshop

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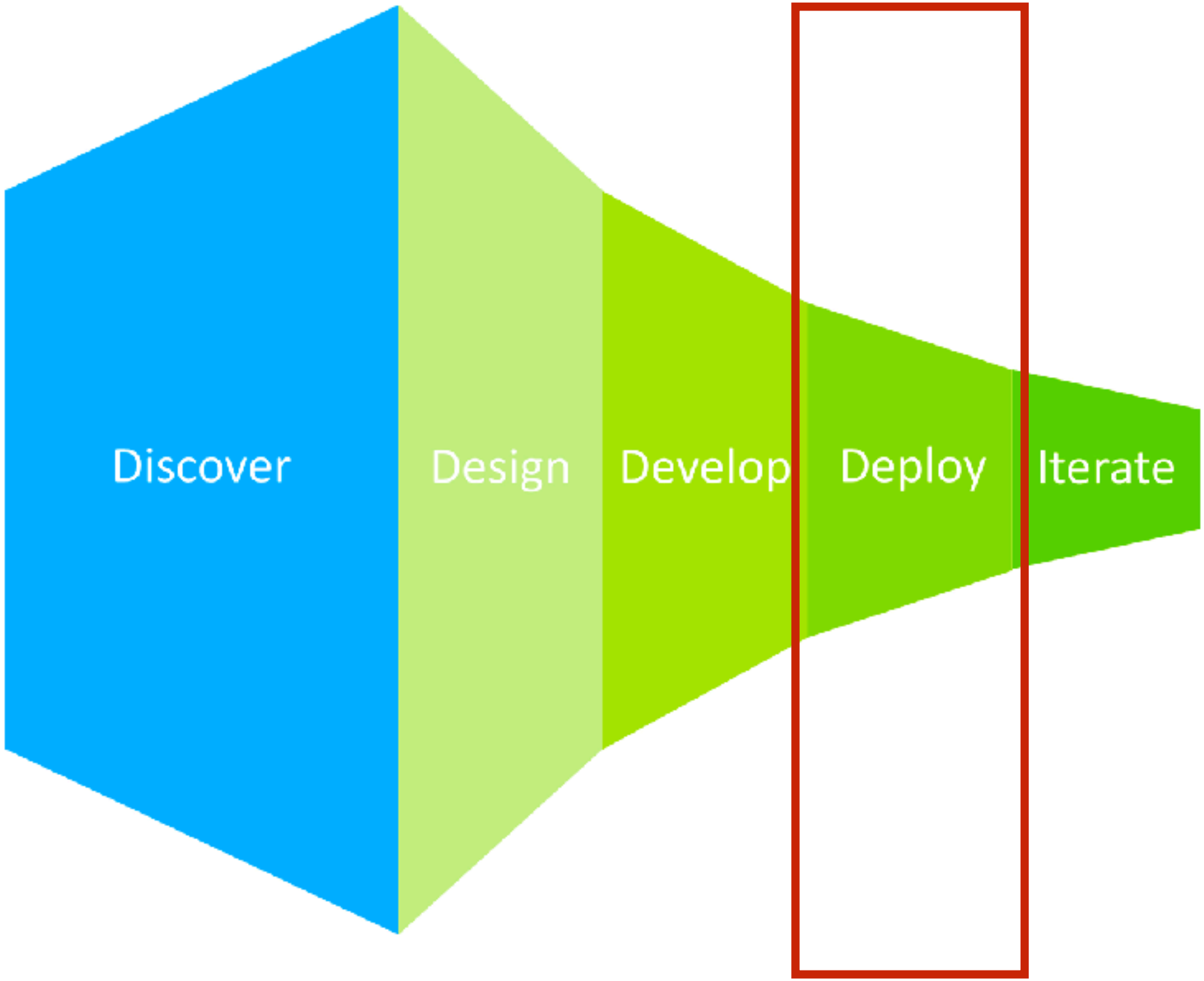

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Deployment

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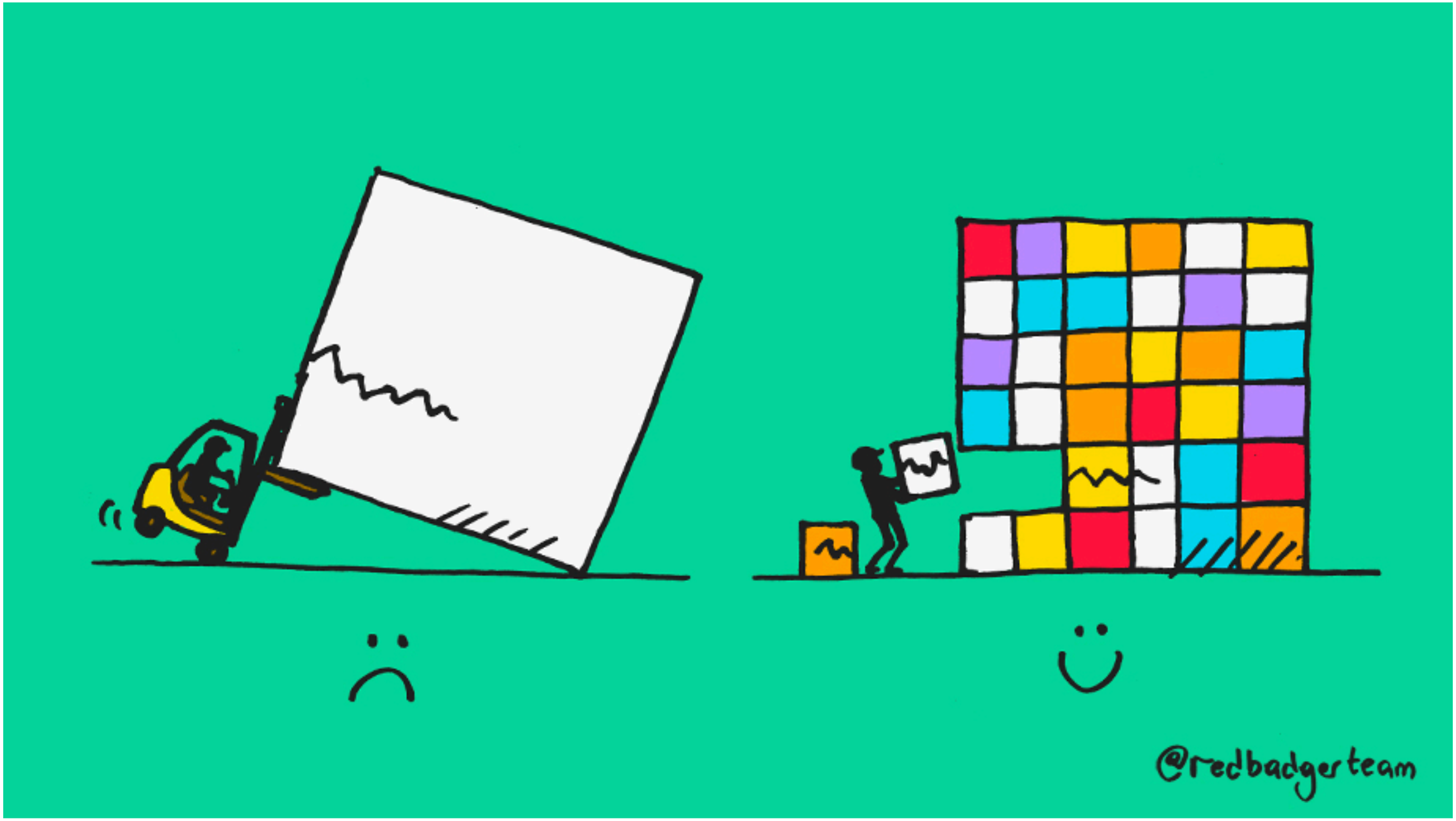

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Deploy vs Release

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Blue Green Deployment

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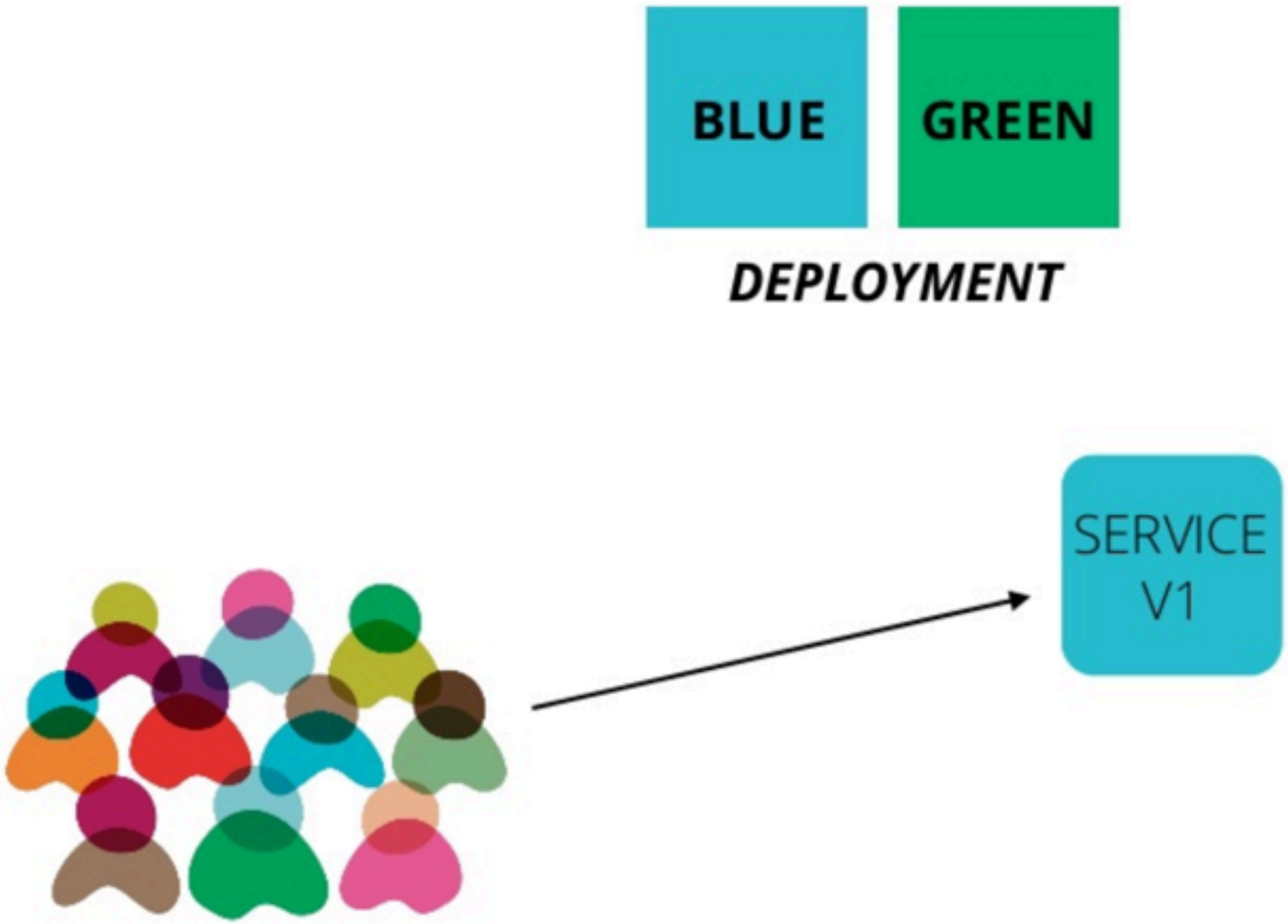
Blue Green Deployment



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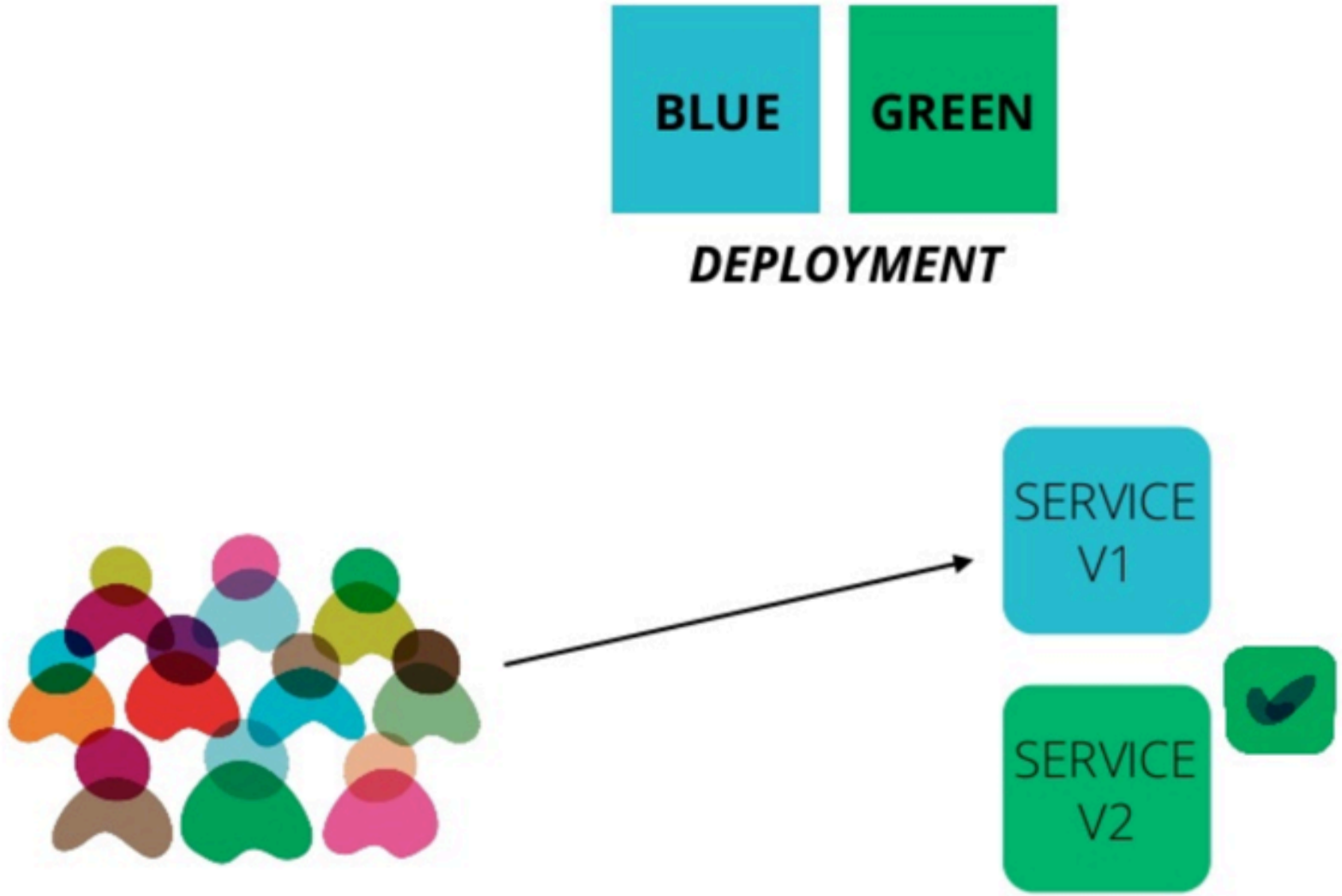
Blue Green Deployment



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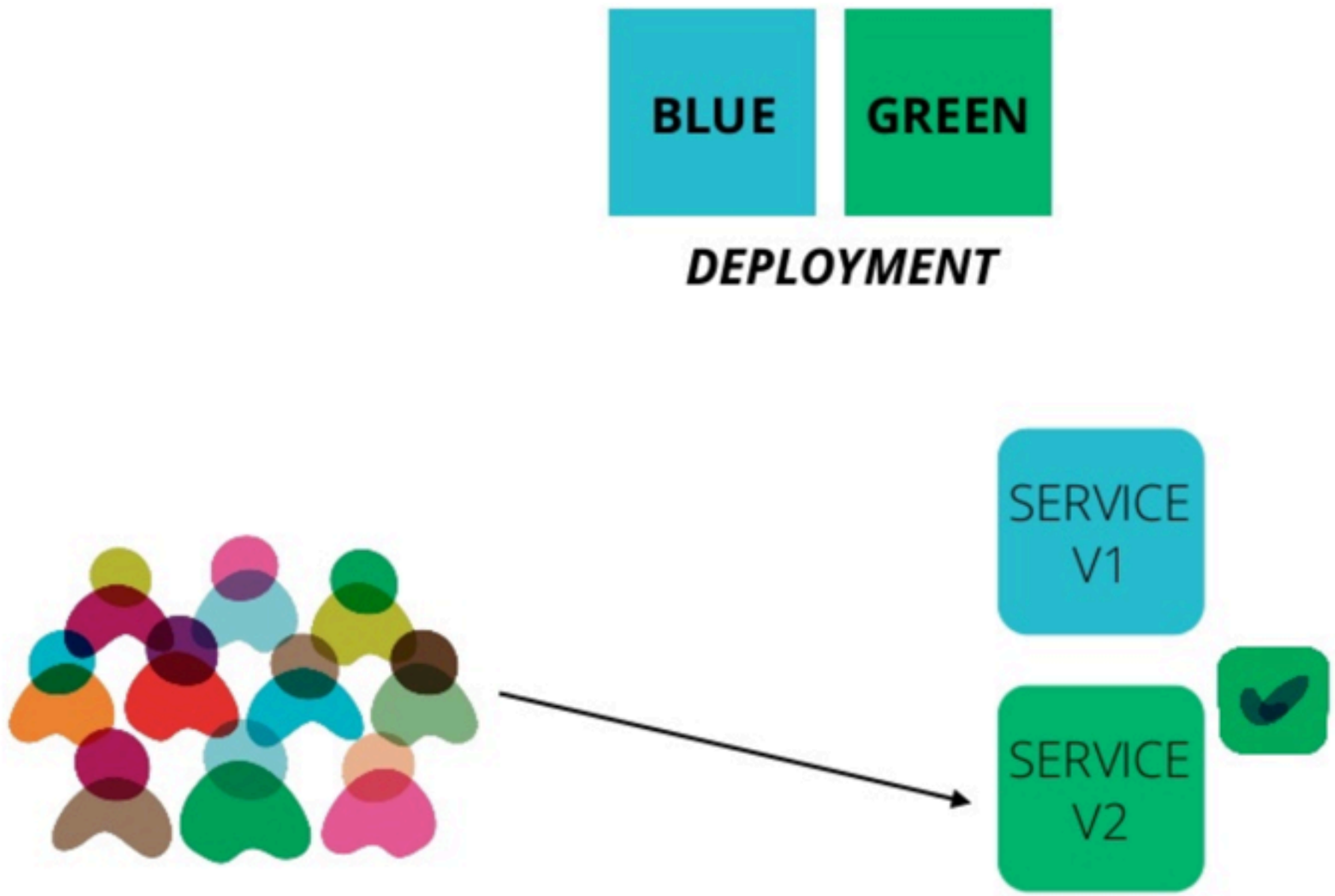
Blue Green Deployment



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Canary Release

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Canary Release

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Canary Release

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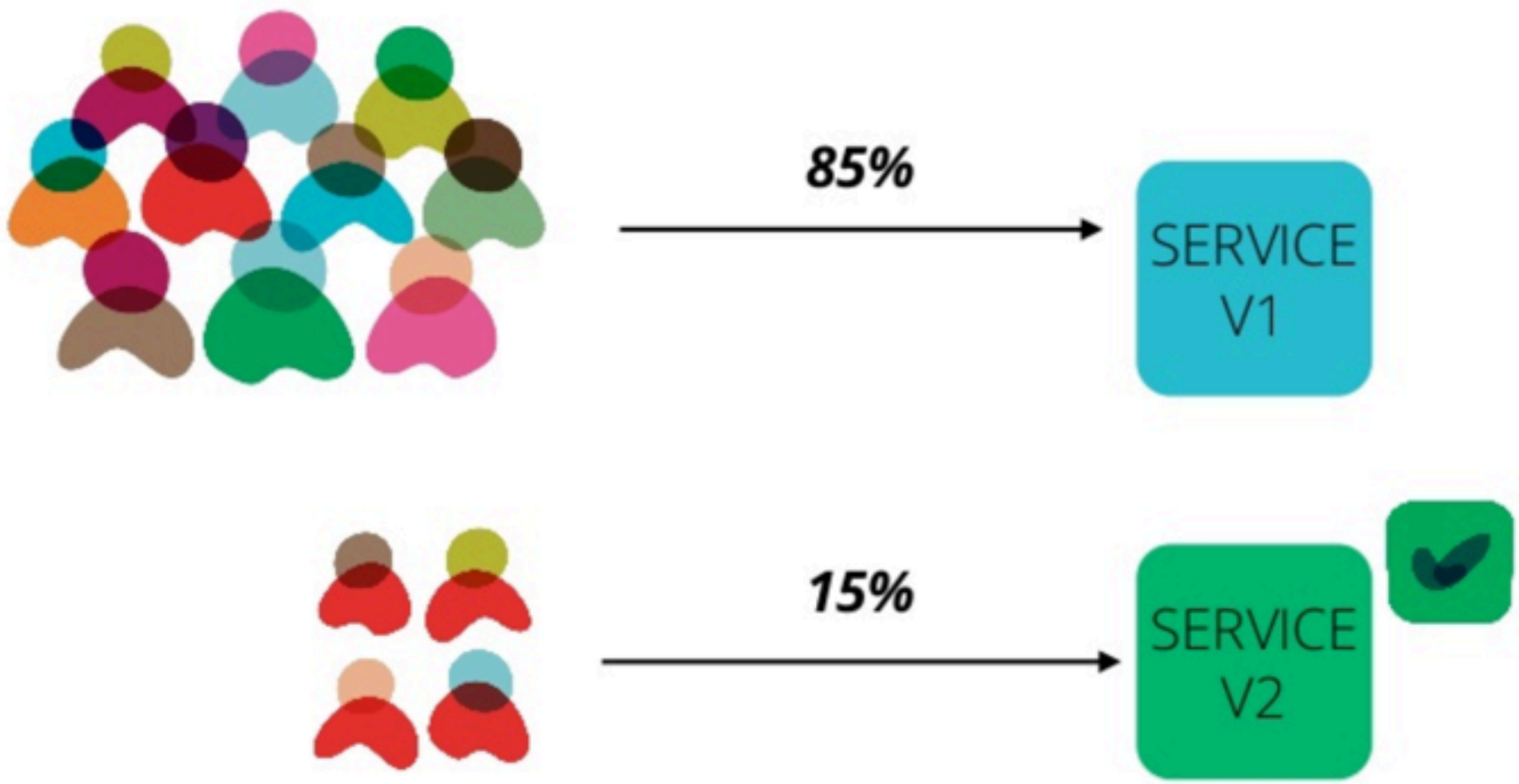
Canary Release



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Mean Time to Recover (MTTR)

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Mean Time to Recover (MTTR)

Tests are very important to reduce amount of defects in your systems. However, it's important to acknowledge that bugs will always happen in production.

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Mean Time to Recover (MTTR)

How **fast to recover** from them will help determining our success !

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Current situation !!

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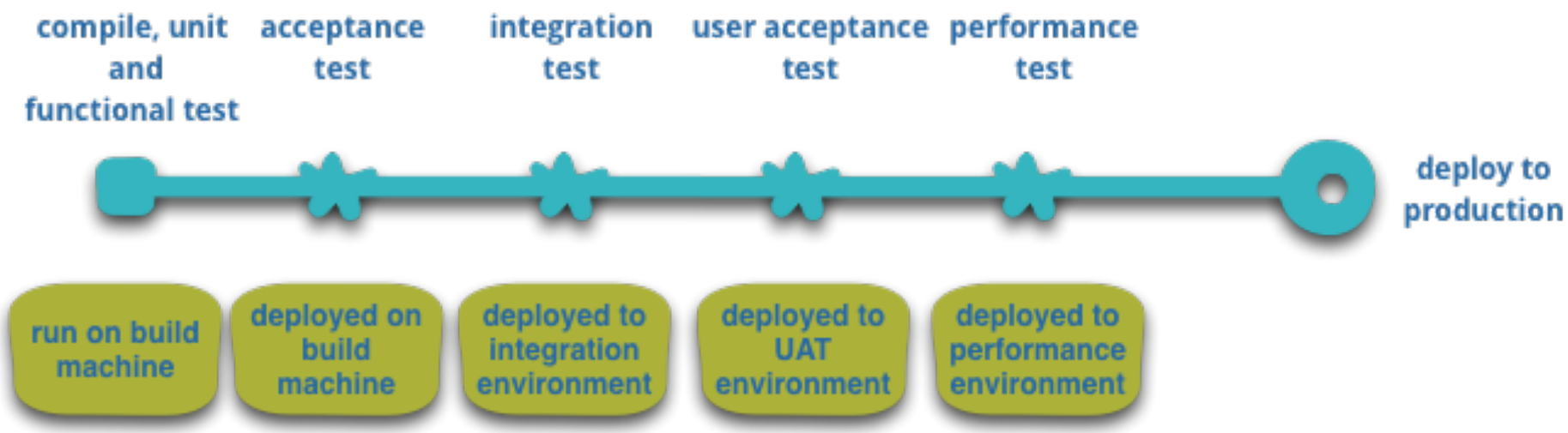
Infrastructure Automation



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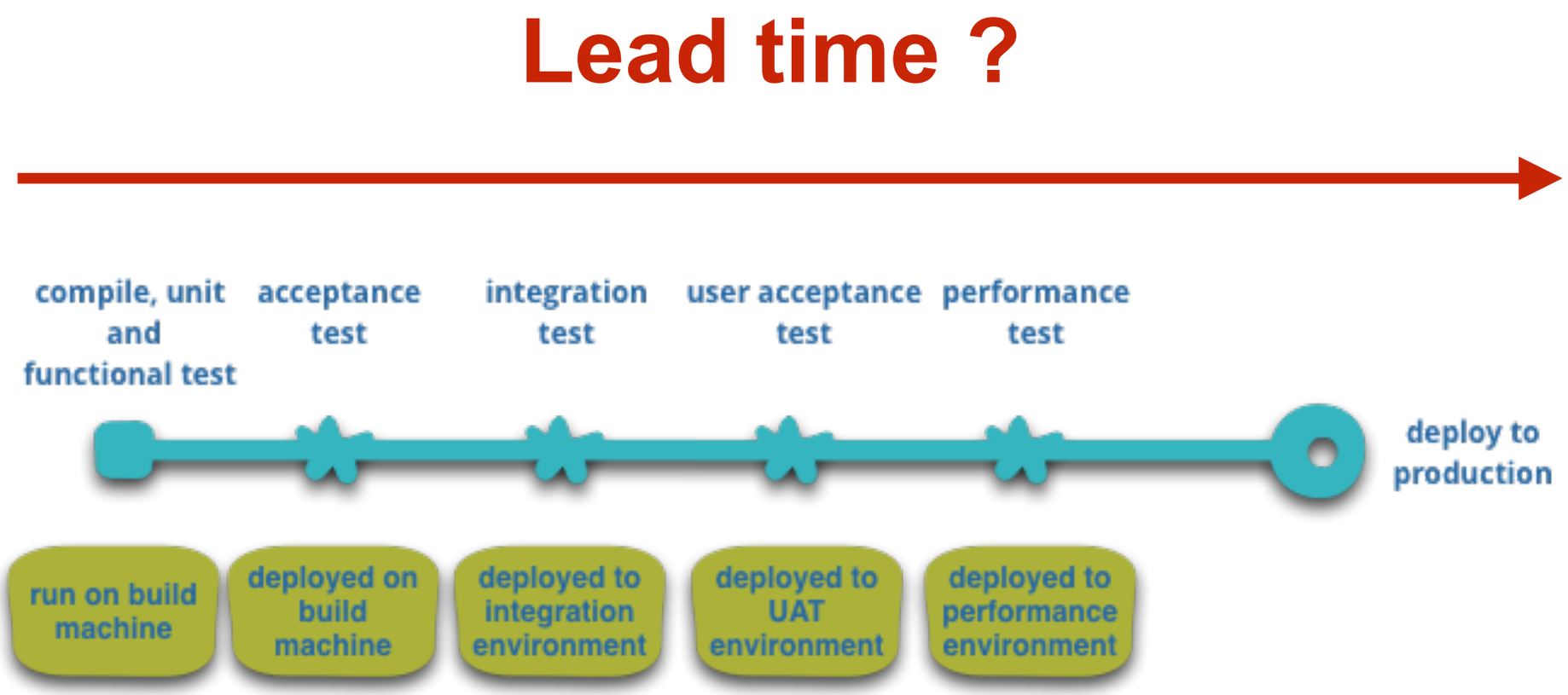
Infrastructure Automation



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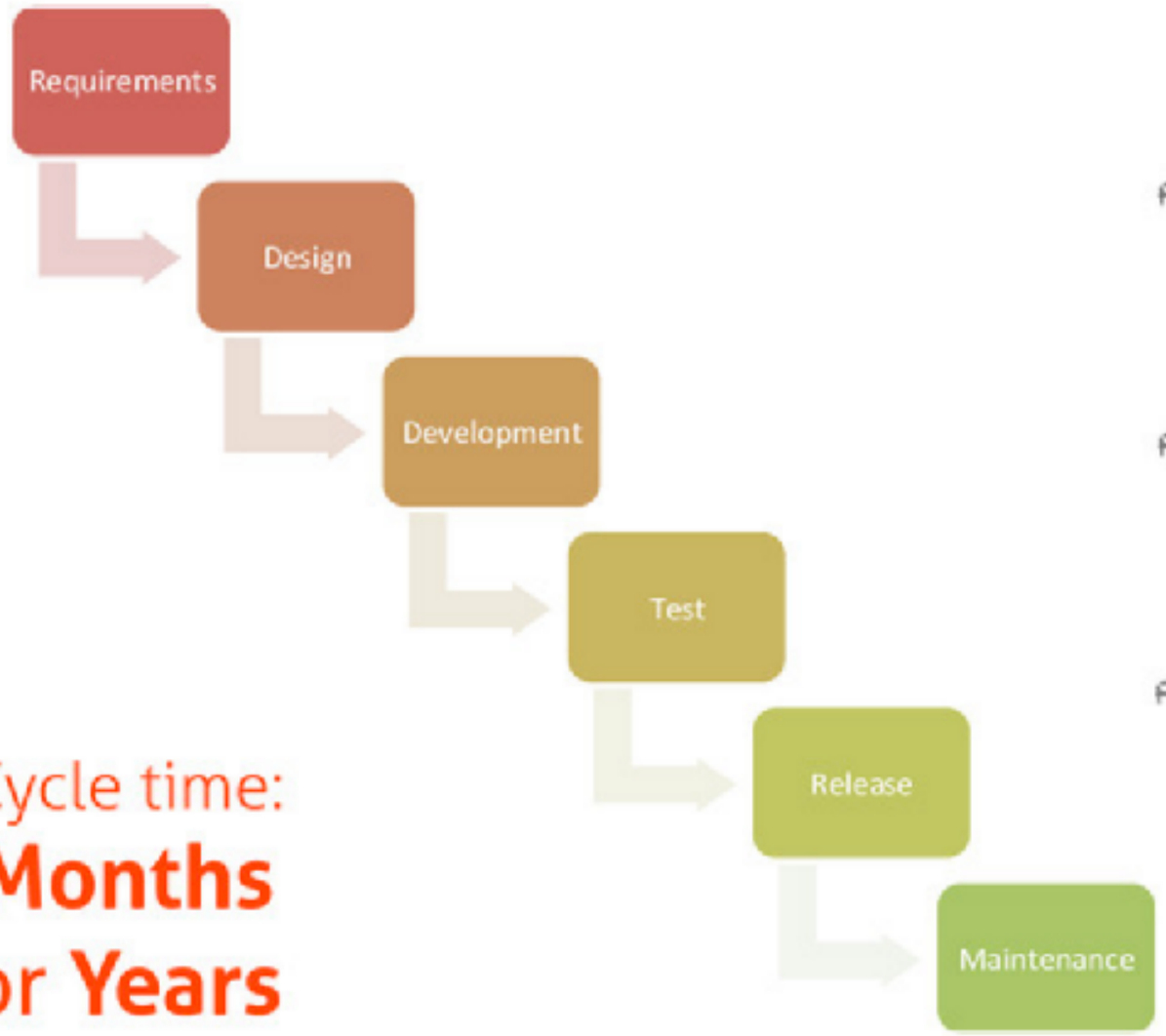
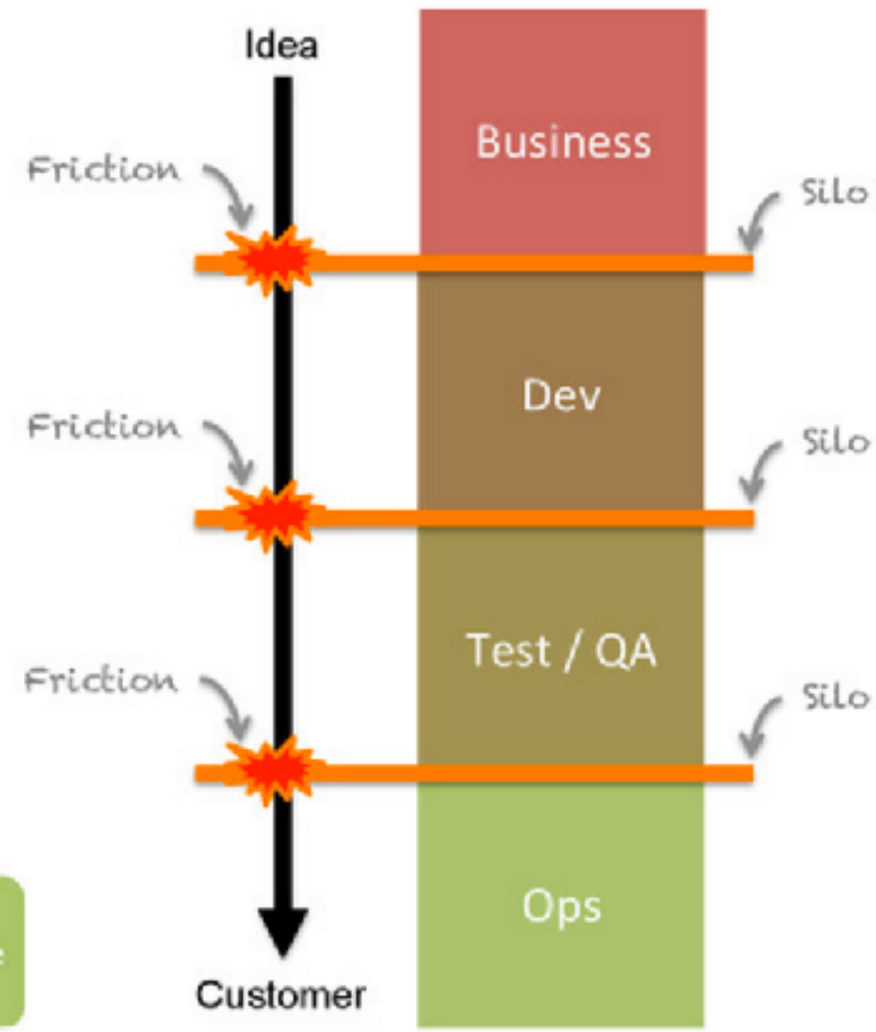
Traditional development



Cycle time:
Months
or **Years**



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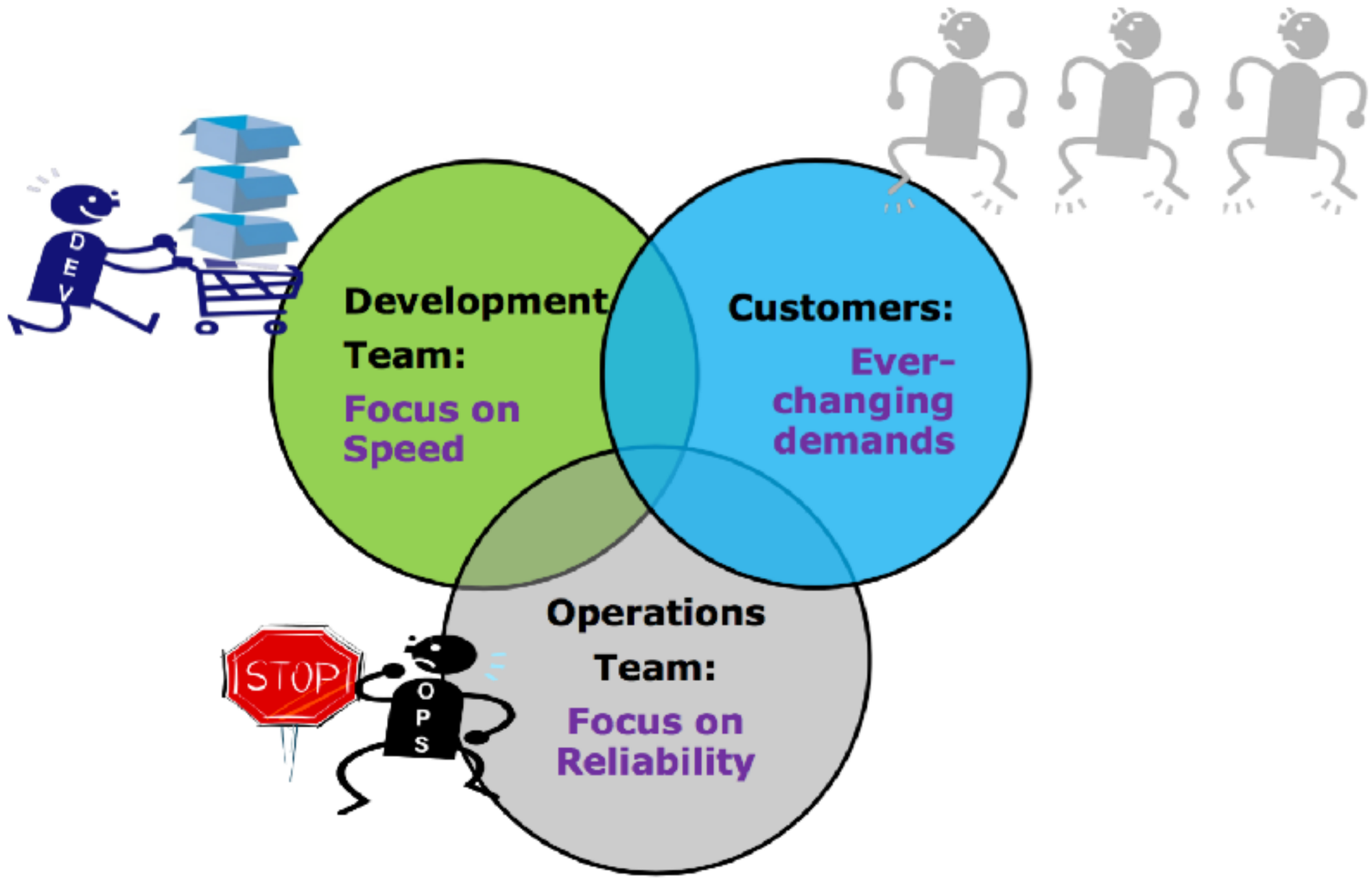
Conflict of Interest



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Conflict of Interest

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Conflict of Interest

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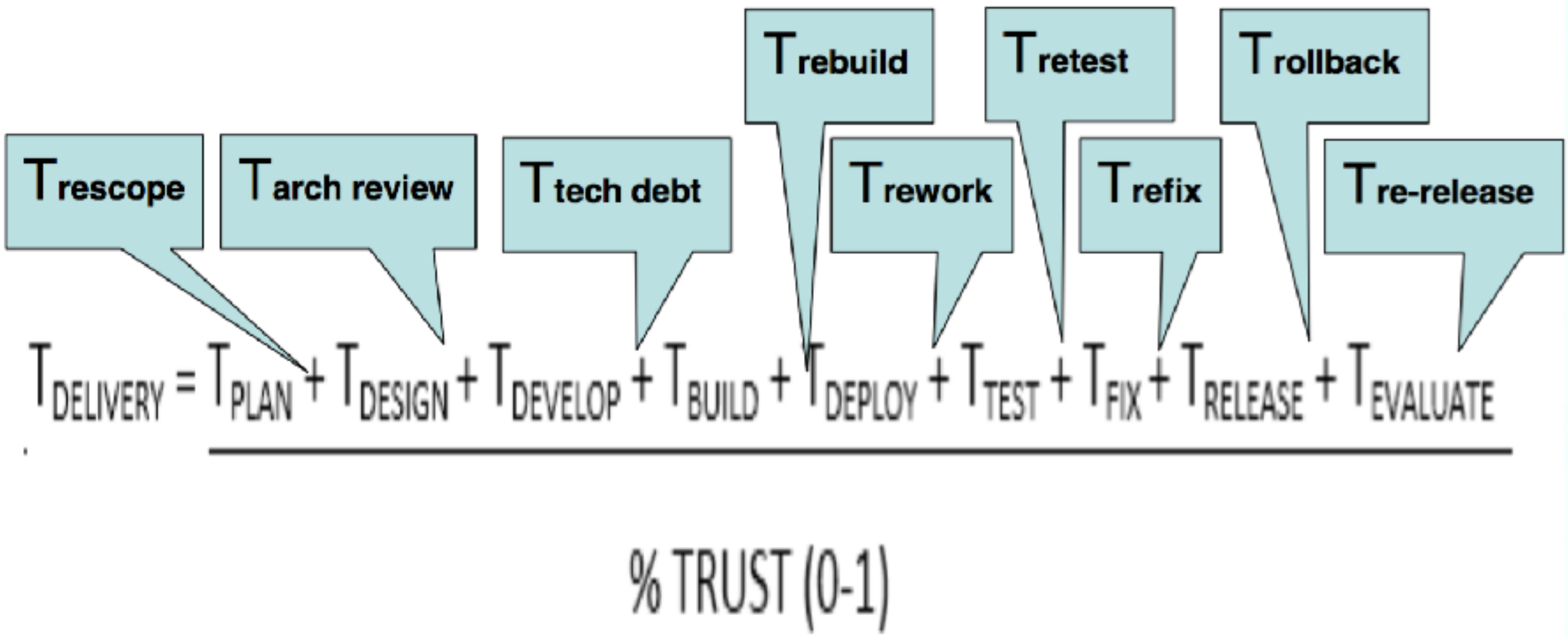
Low trust create extra steps



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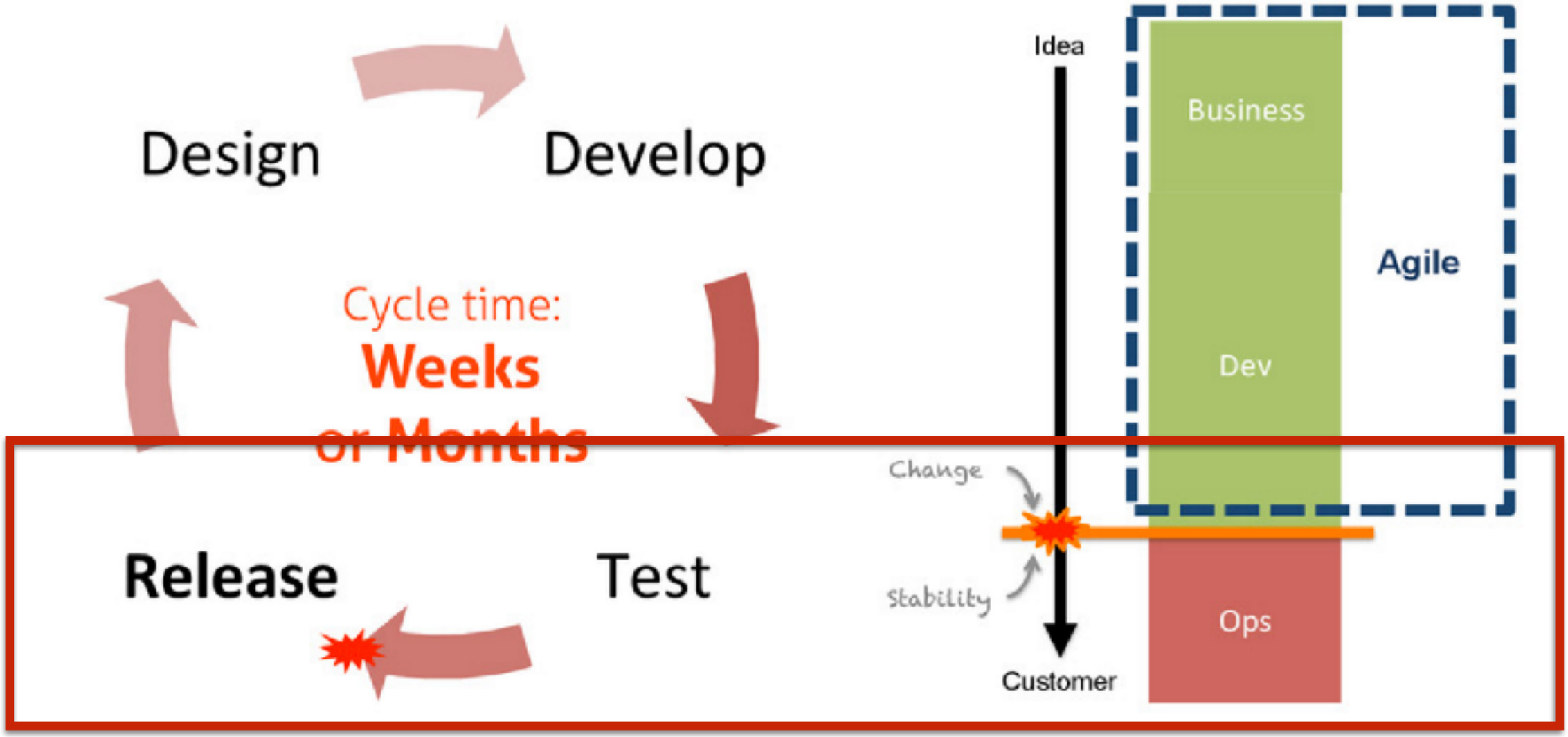
Iterative/Agile development



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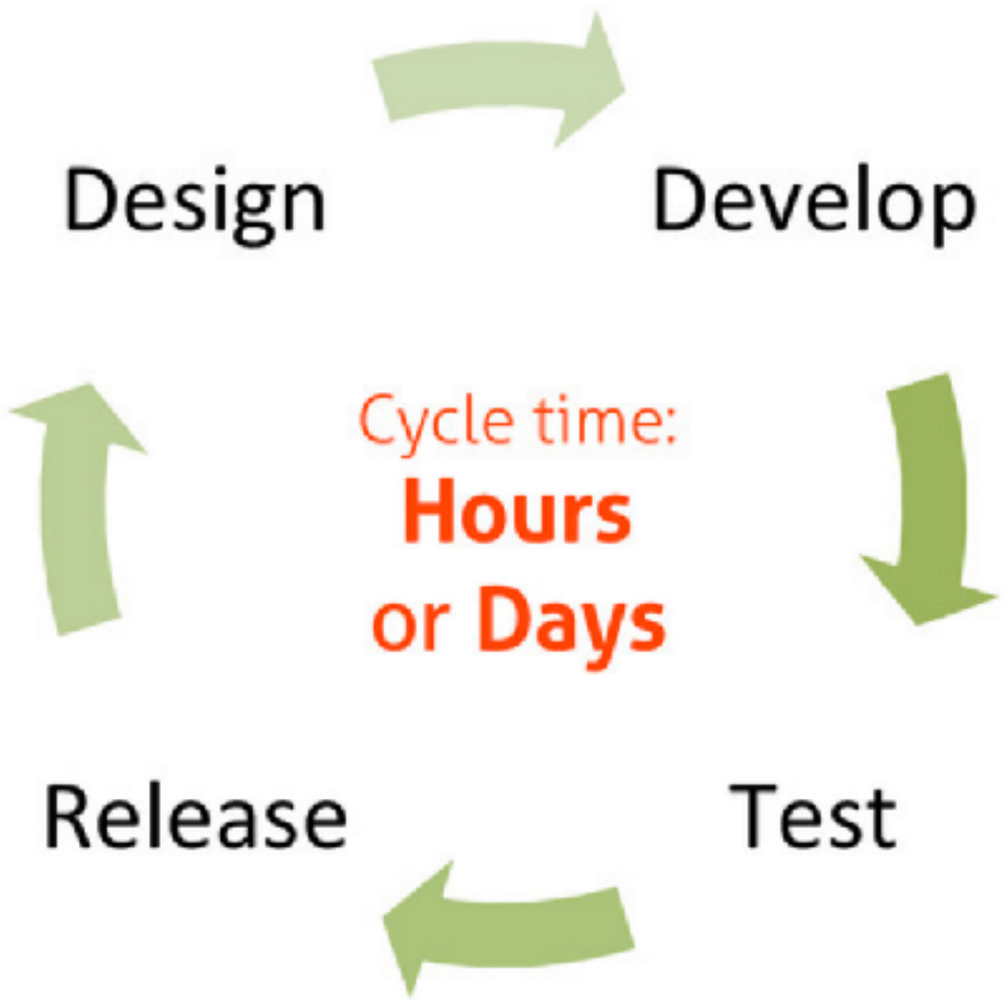
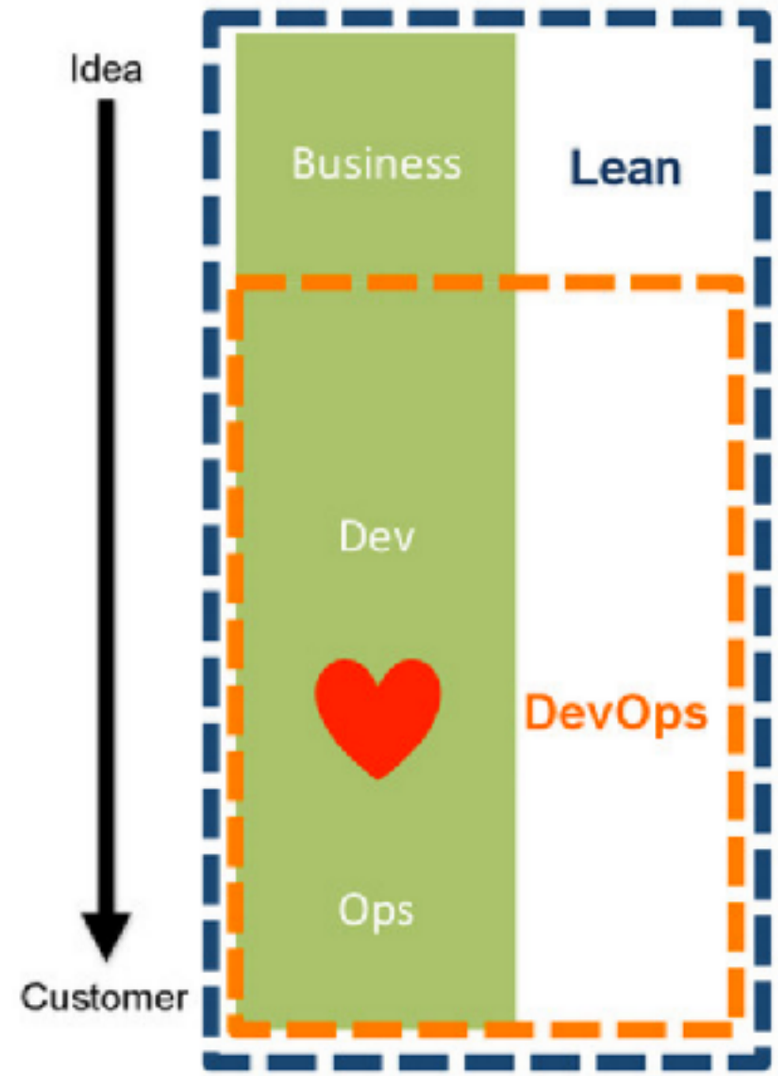
Rise of DevOps





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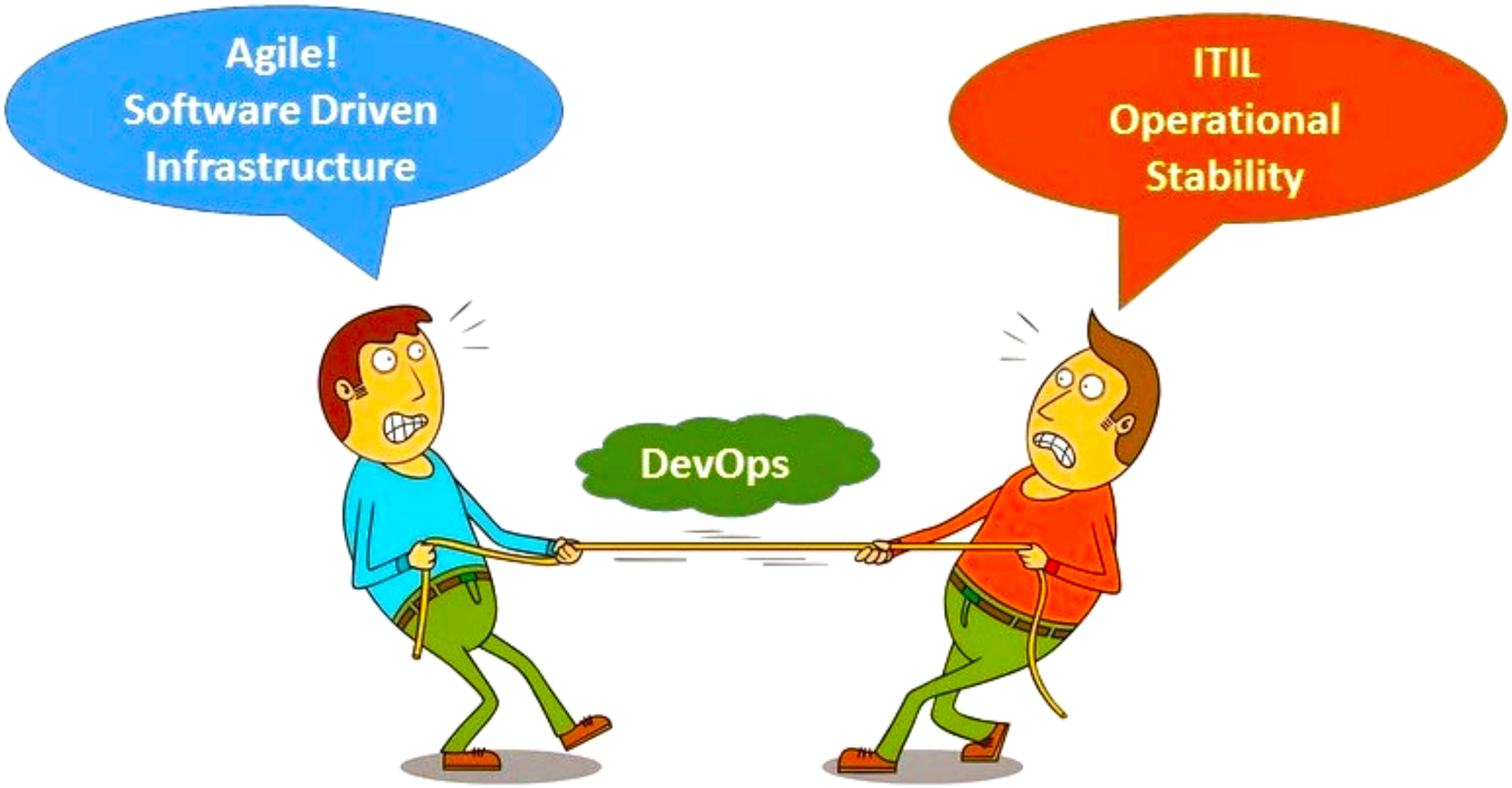

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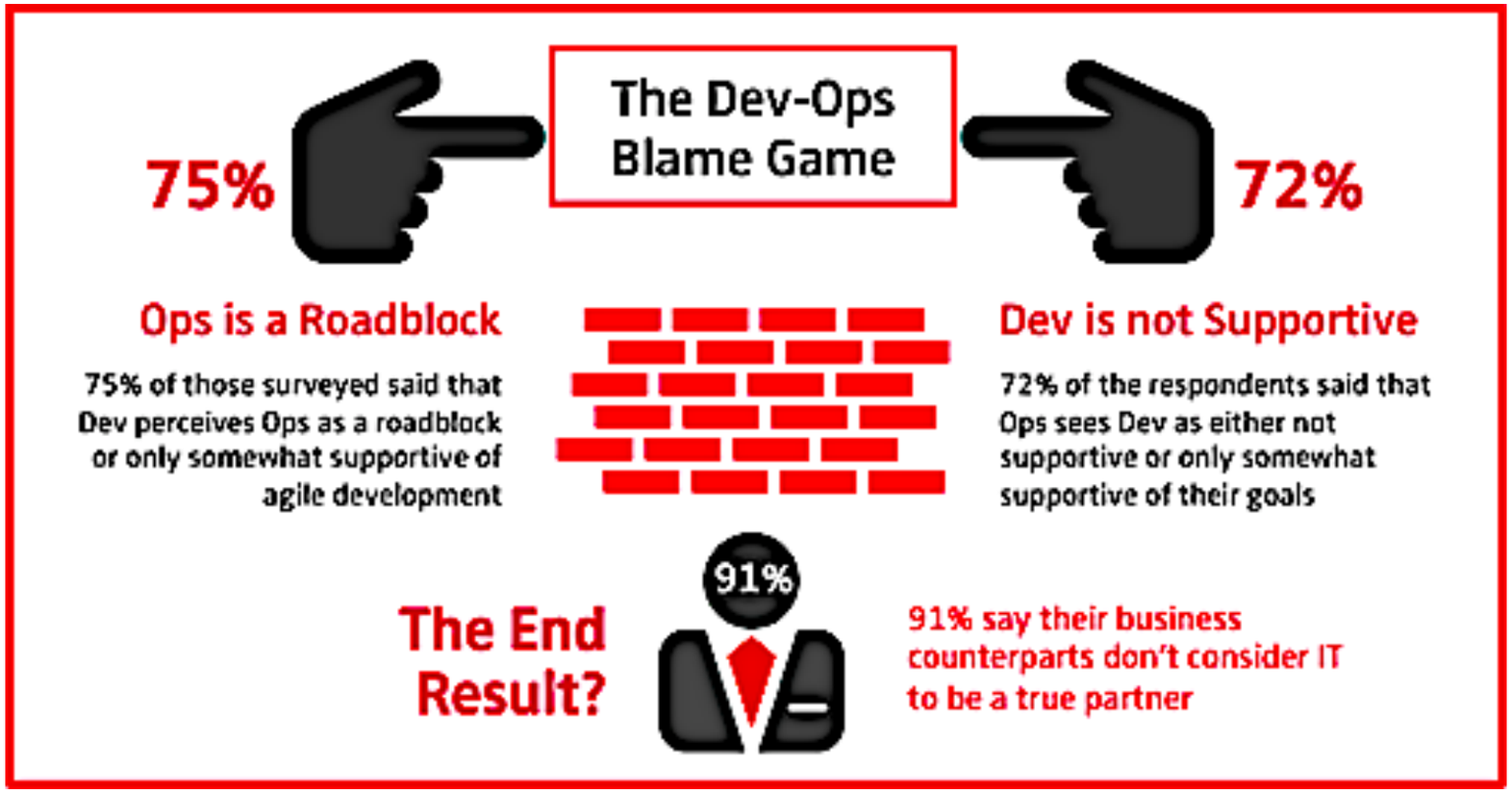

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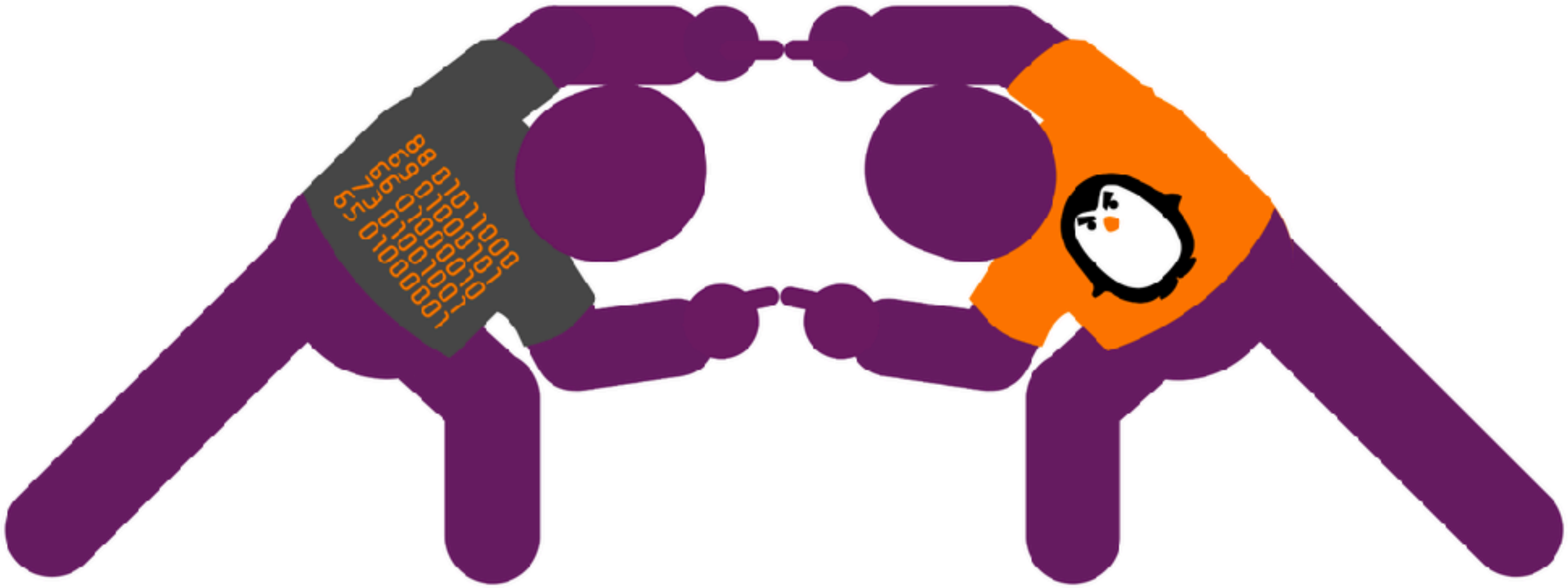

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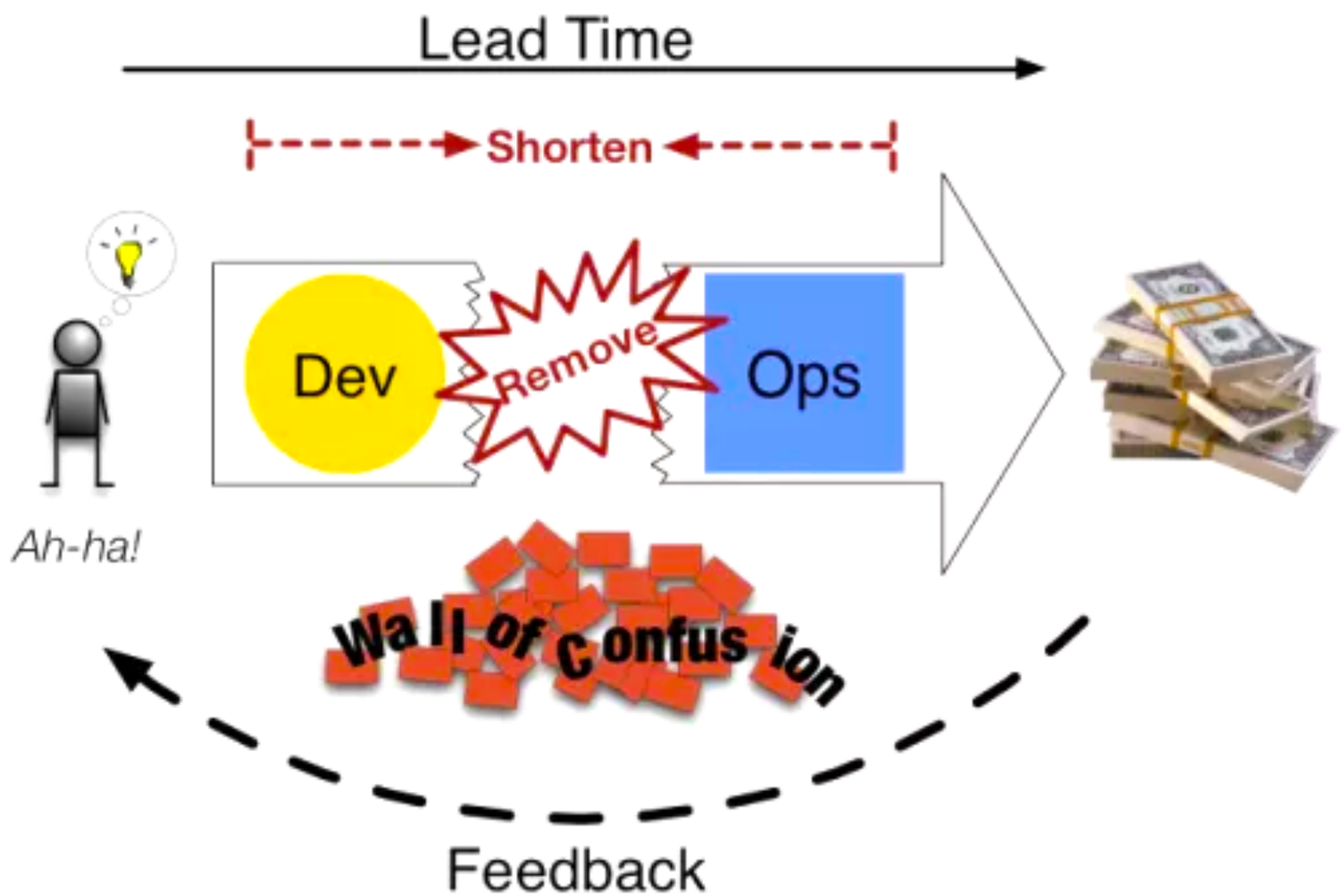

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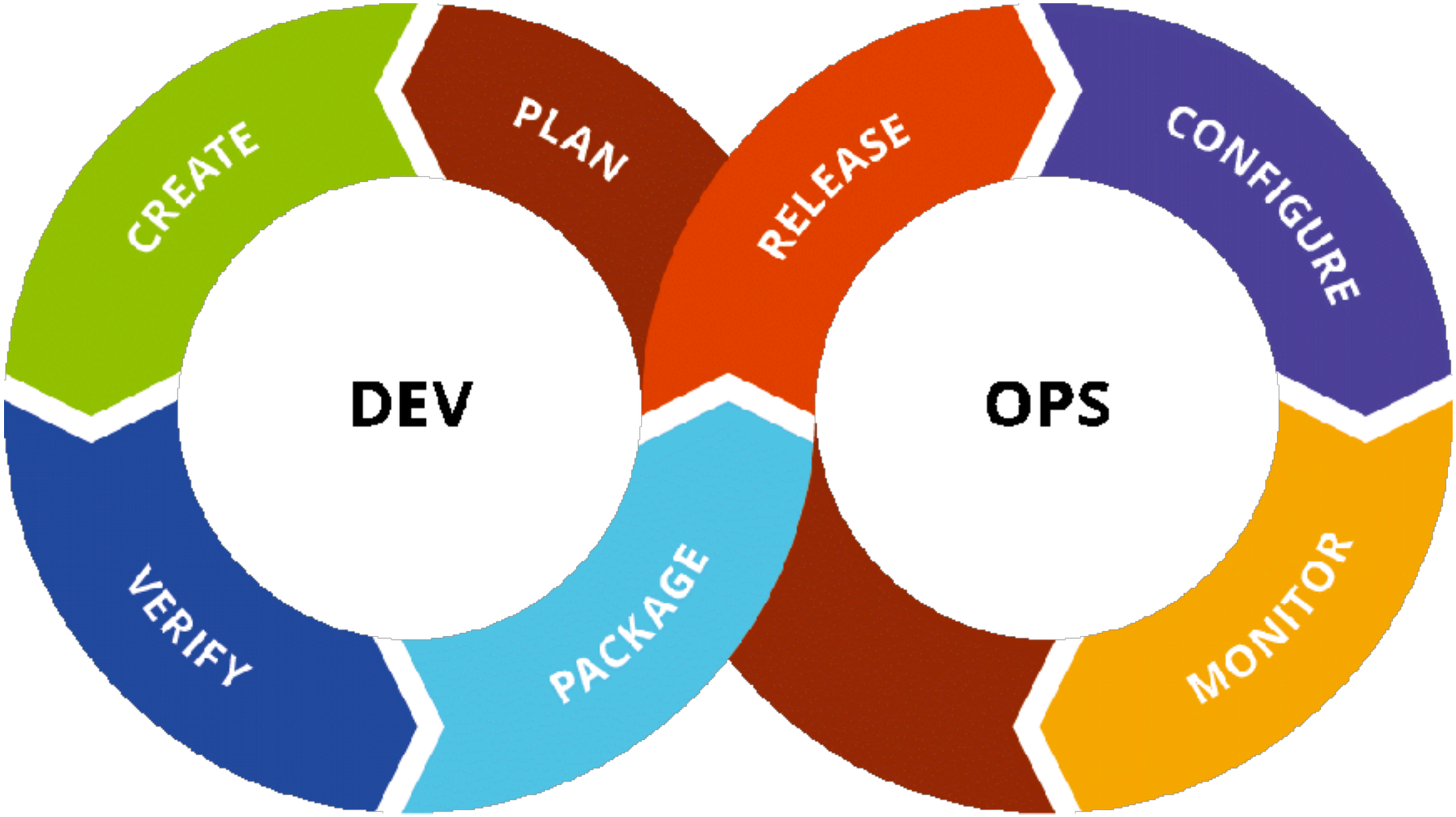

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DEV + OPS

Application Performance

Decrease latency by using APM Tools.

End User Analytics

Monitor end user latency and check device performance

Quality Code

Ensure deployments don't degrade performance

Code-Level Errors

Lower MTTR by finding error root causes

Application Availability

Make sure Uptime and SLAs are in order

Application Performance

Solve problems by correlating infrastructure and application metrics

End User Complaints

Fix problems before end users complain

Performance Analytics

Use automatically generated baselines to focus troubleshooting

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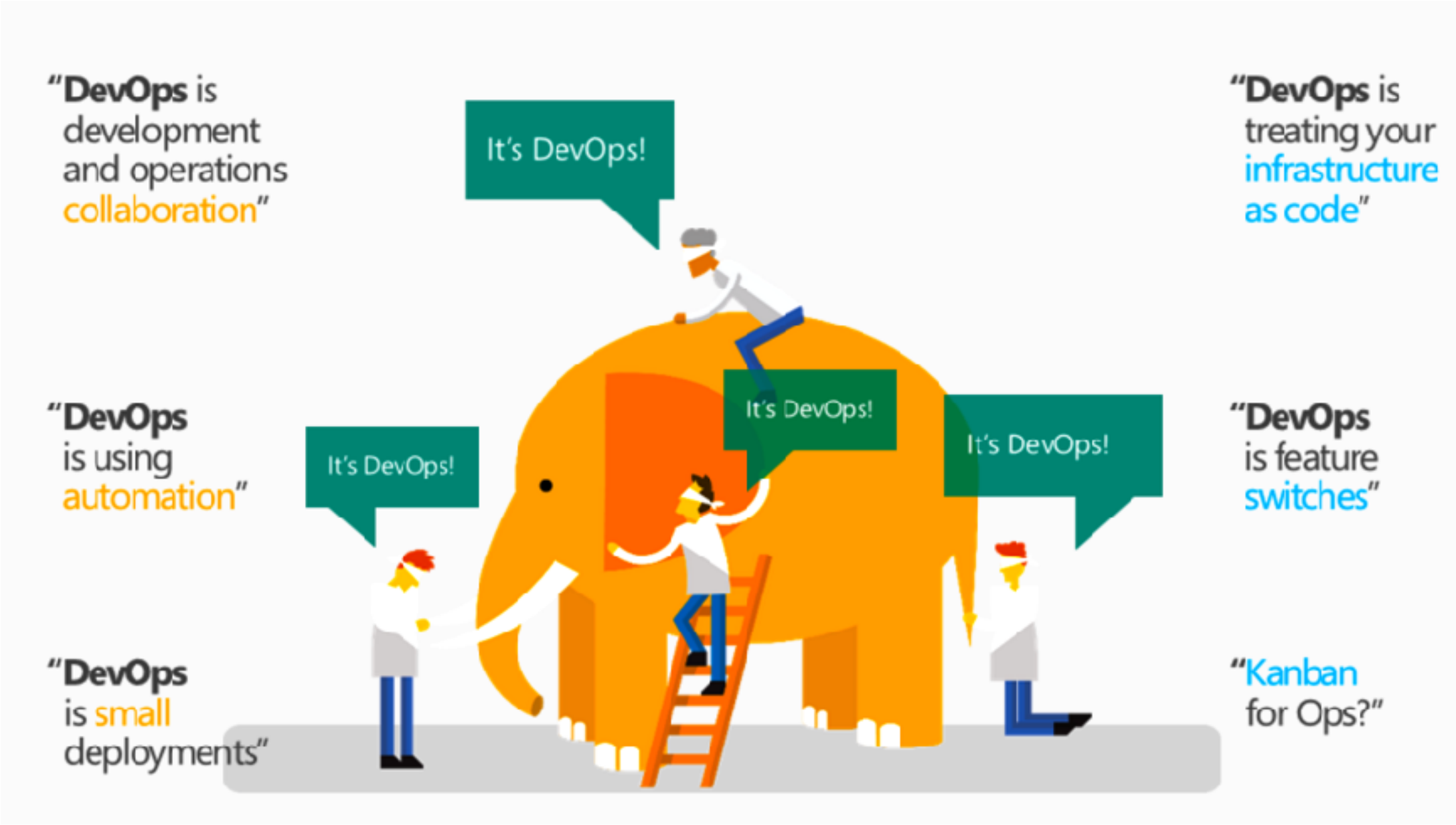
DevOps ?



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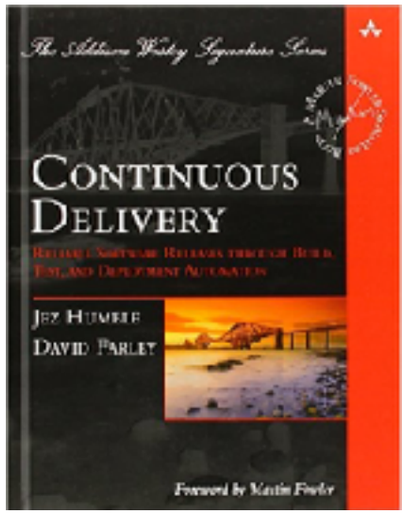
DevOps ?

"A **movement of people who care** about **developing** and **operating** reliable, secure, high performance **systems at scale**."



– Jez Humble –

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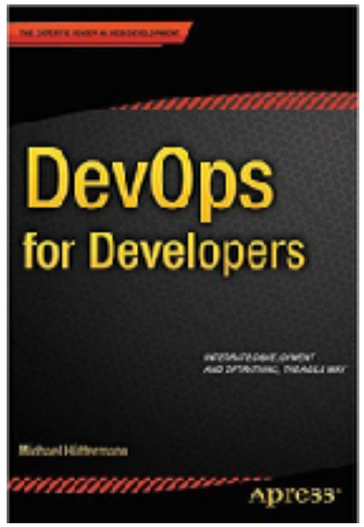
DevOps ?

"A **mix of patterns** intended to **improve collaboration** between development and operations. DevOps addresses **shared goals and incentives** as well as **shared processes and tools**."



- Michael Huttermann -

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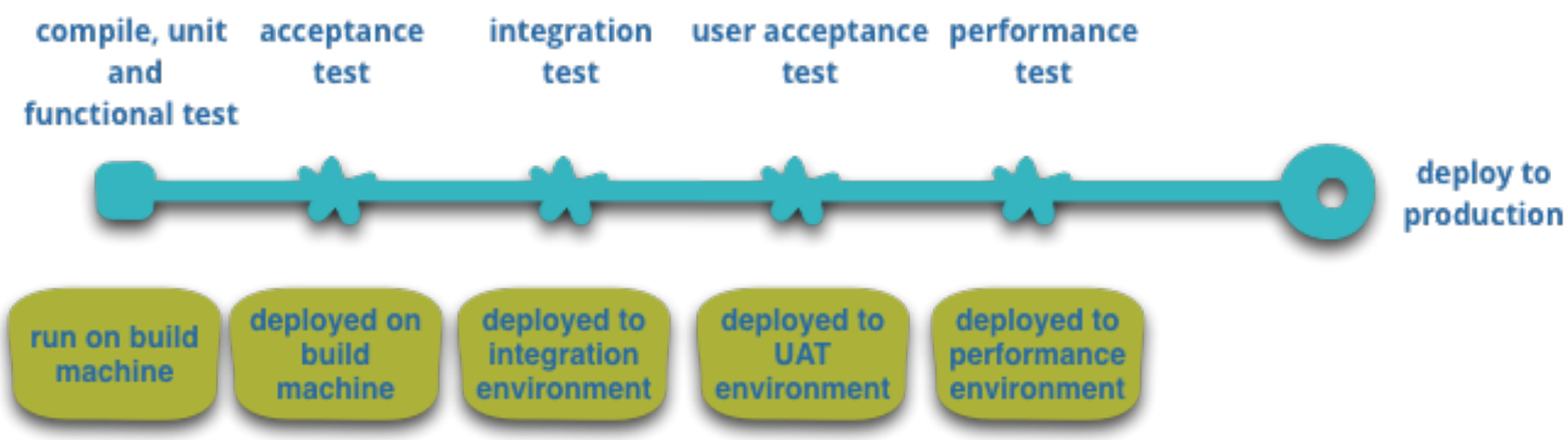
Goal of DevOps

"Improve the delivery of value for Customer and Business"

Idea → **Customer**



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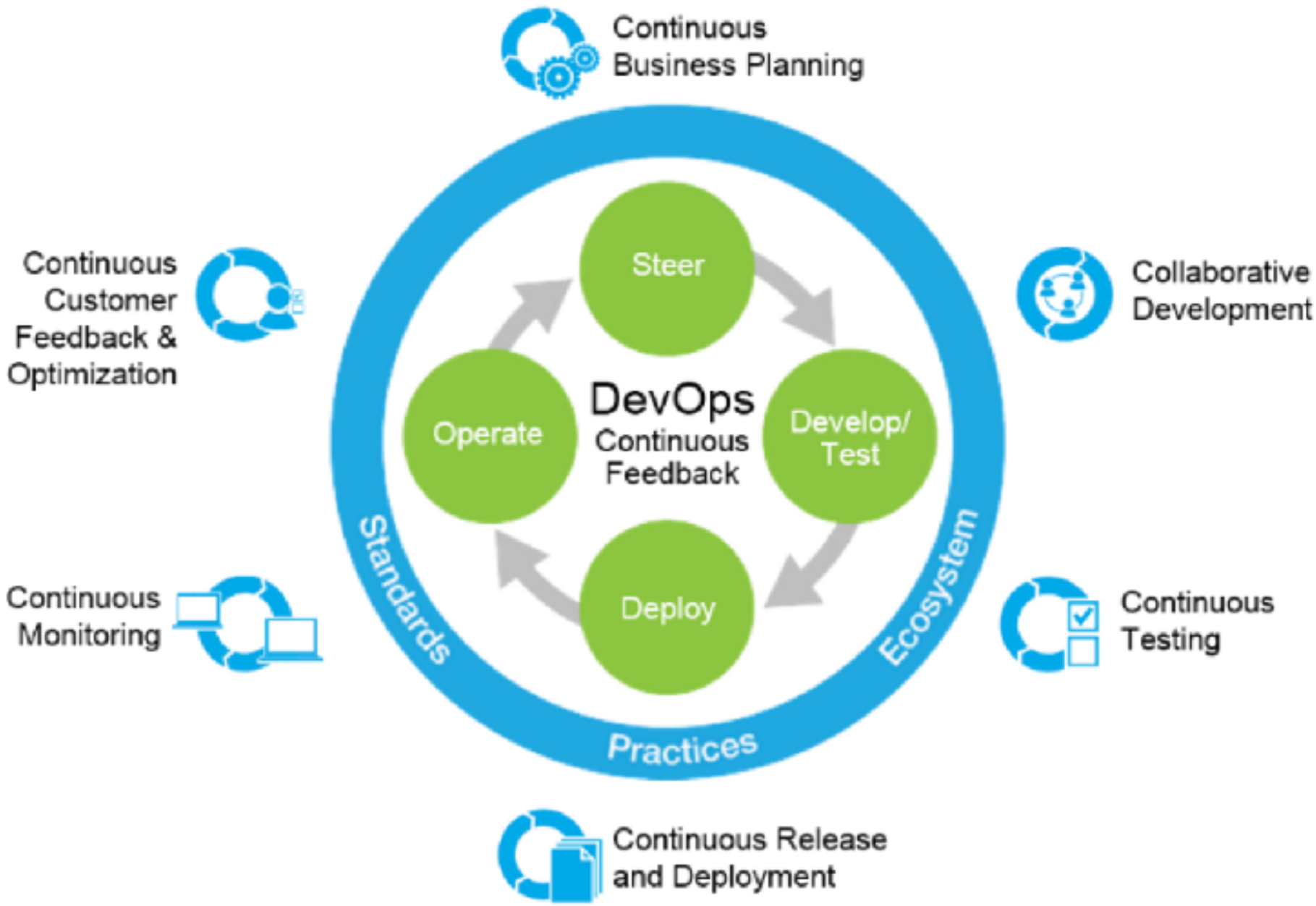
DevOps Life Cycle



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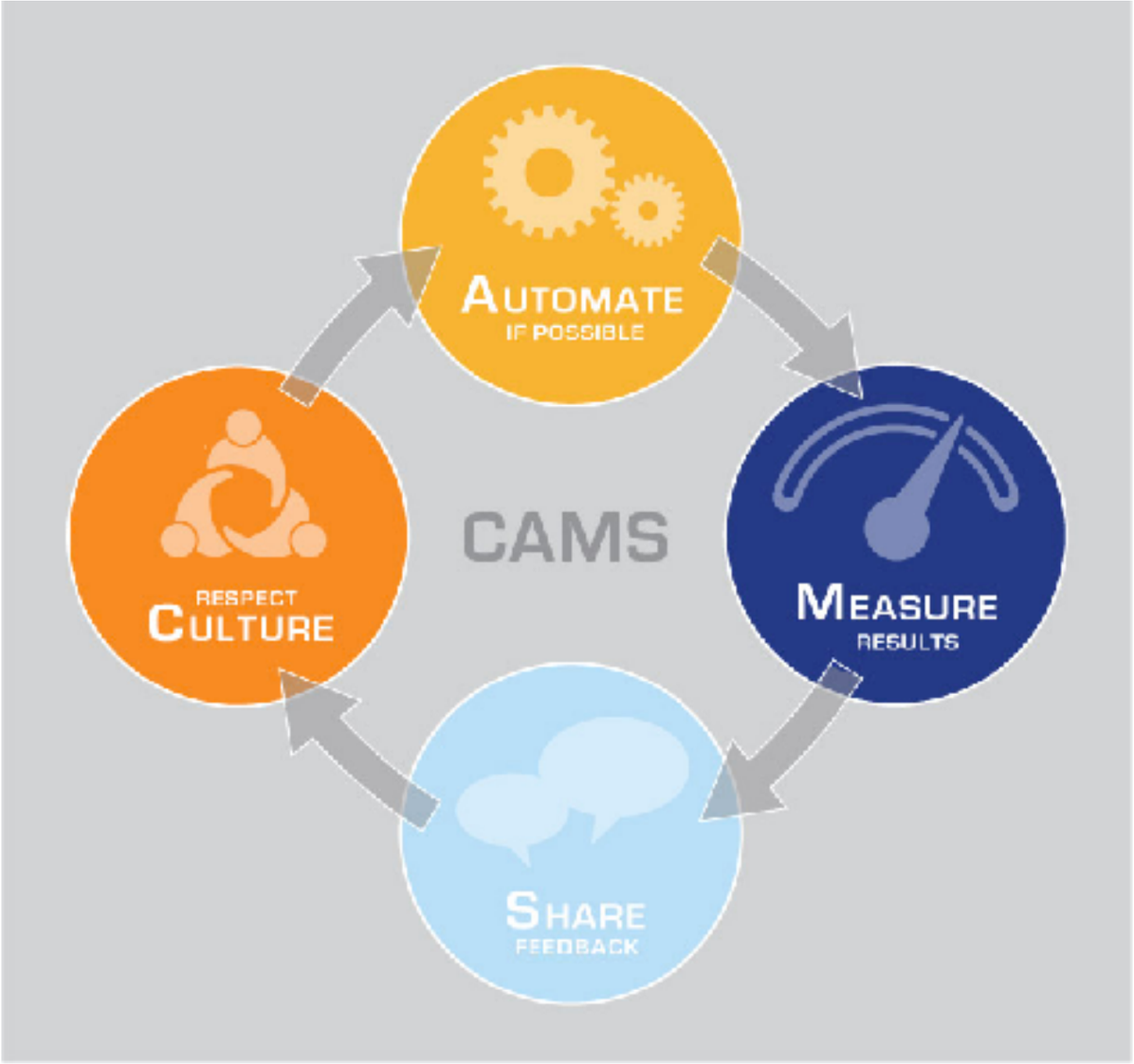
DevOps Principles



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DevOps Principles

Culture => People, Process, Tools

Automation => Infrastructure as Code

Measurement => Measure everything

Sharing => Collaboration/Feedback

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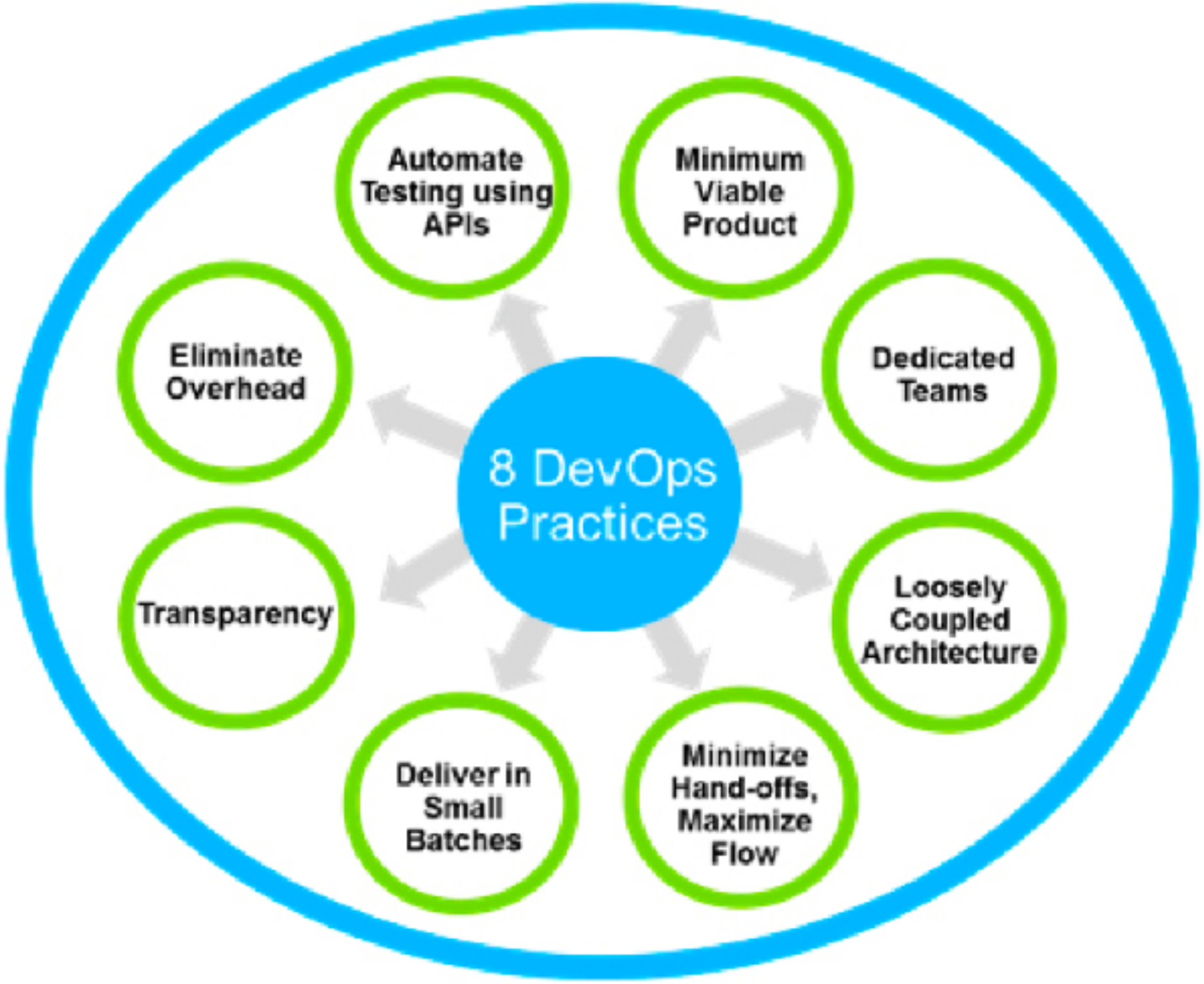
DevOps Practices



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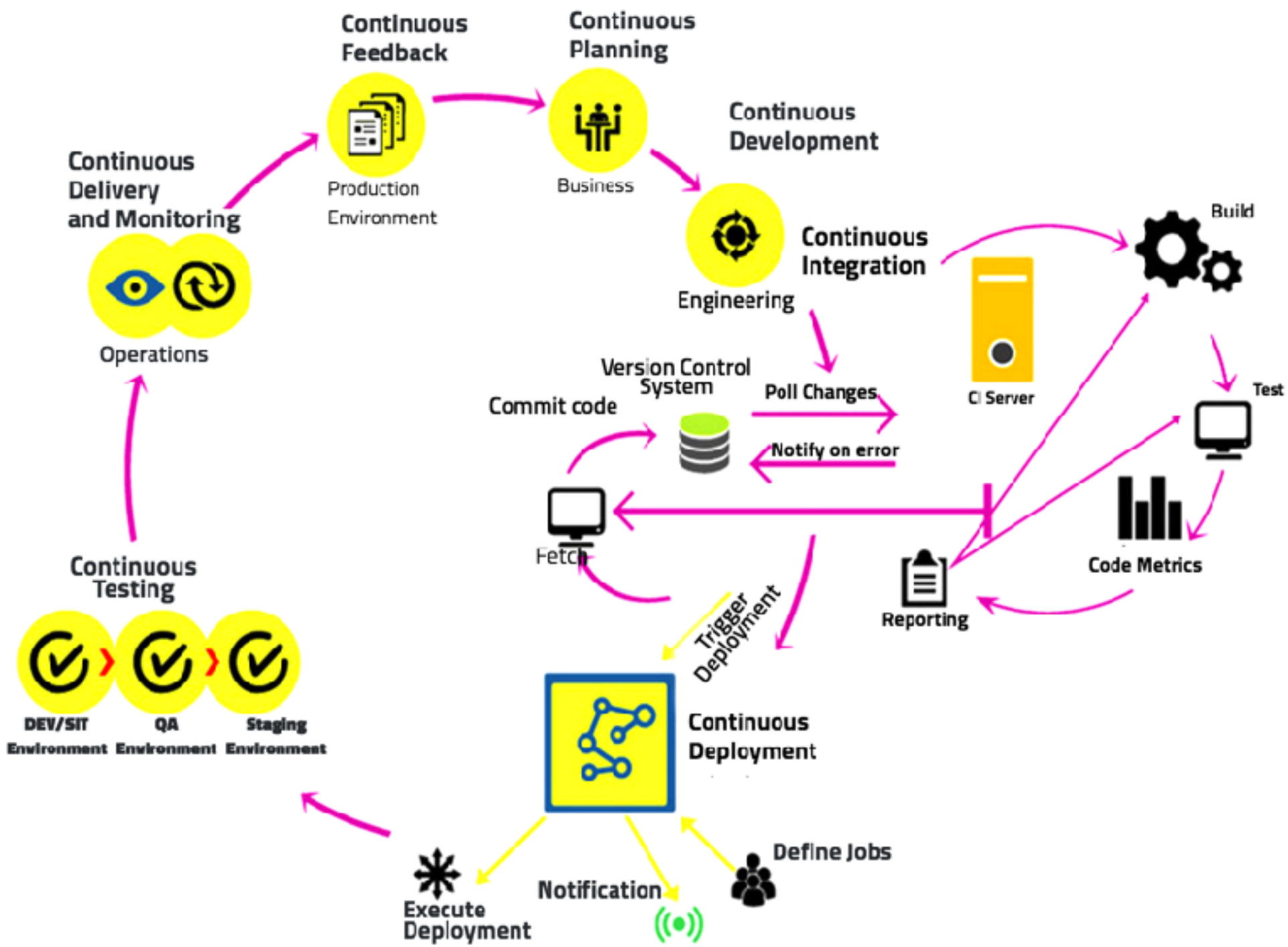
DevOps Practices



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DevOps
3 ways principle

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Flow principle

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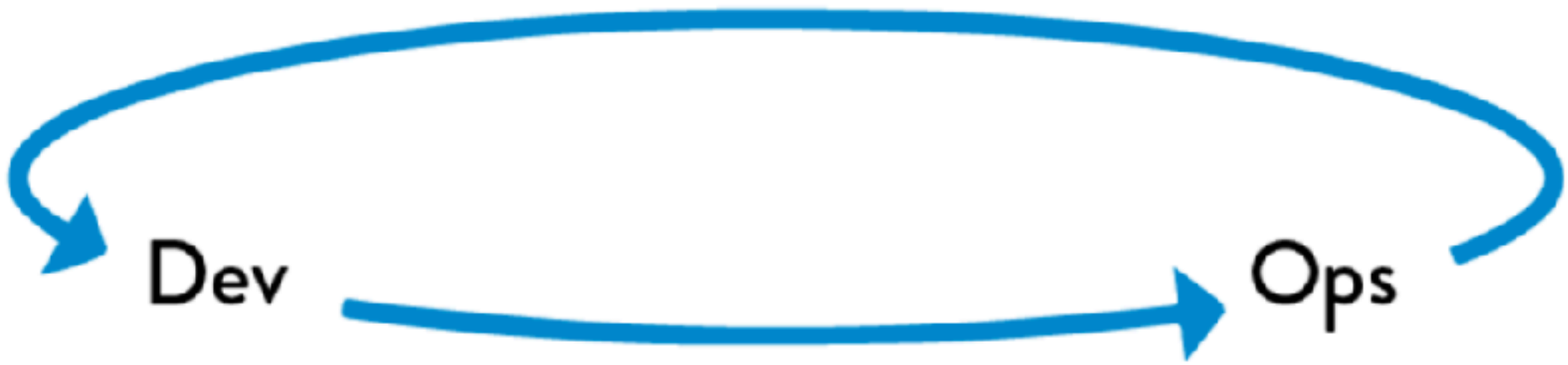
Feedback principle



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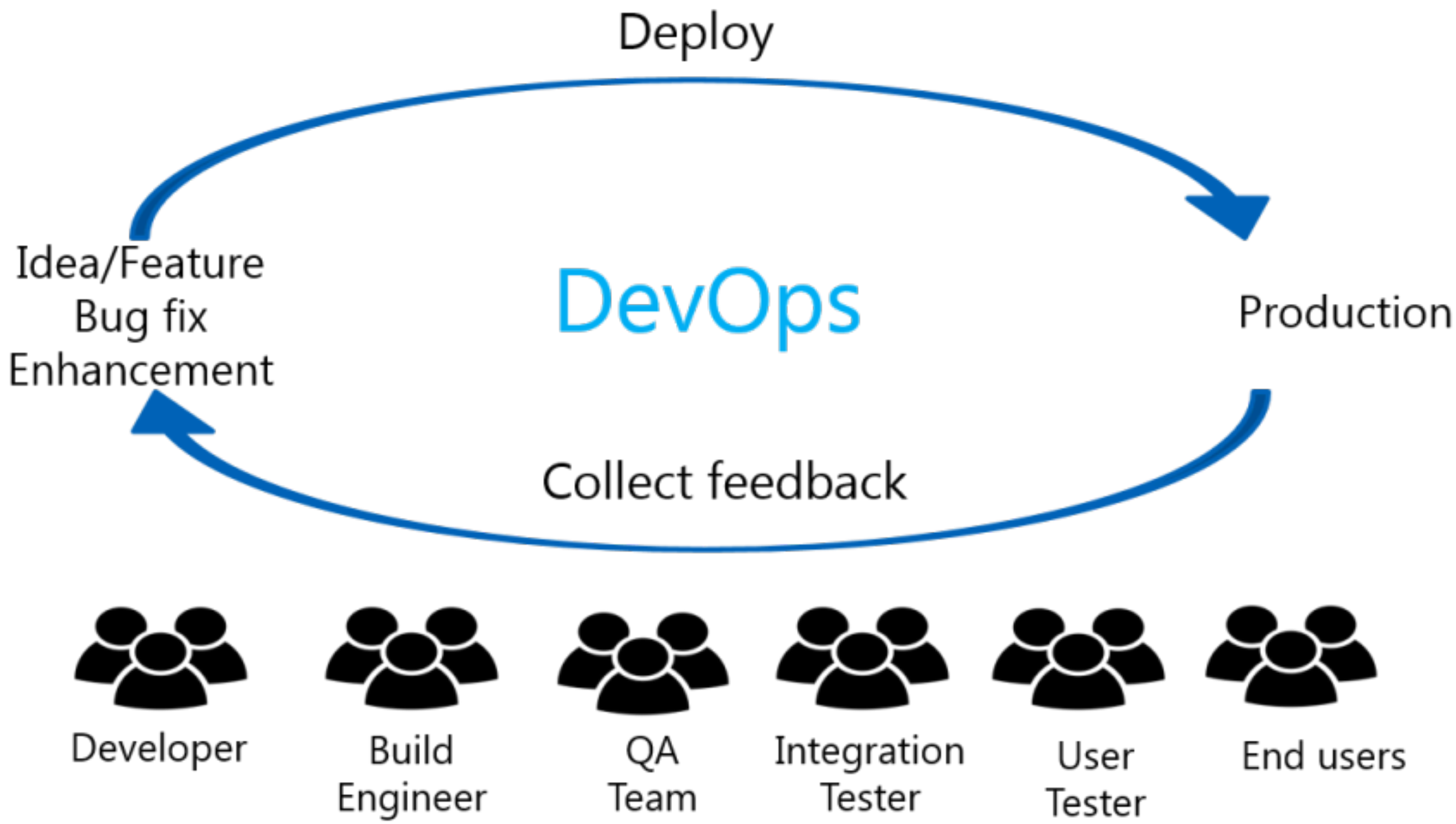
Feedback principle



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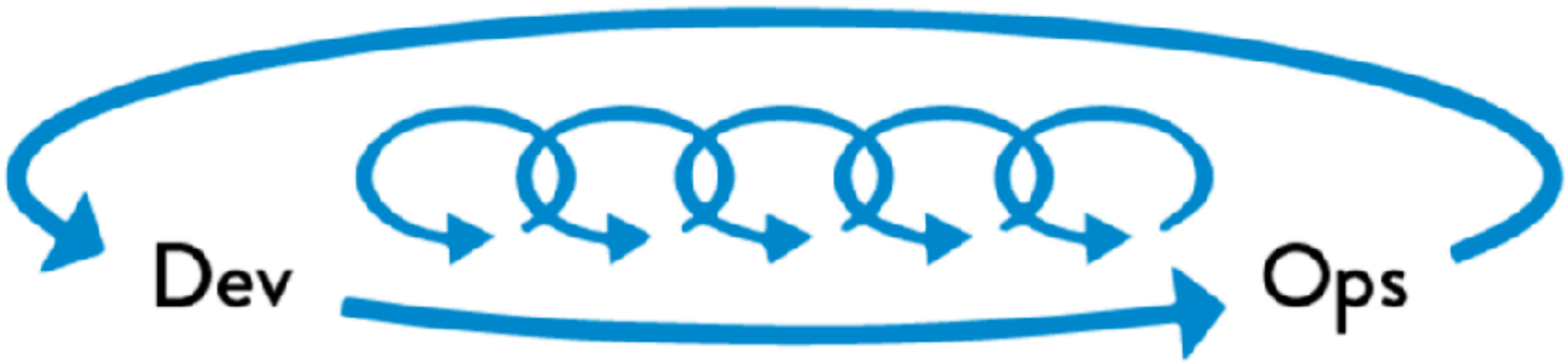
Continuous learning principle



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All about Organization structure and culture

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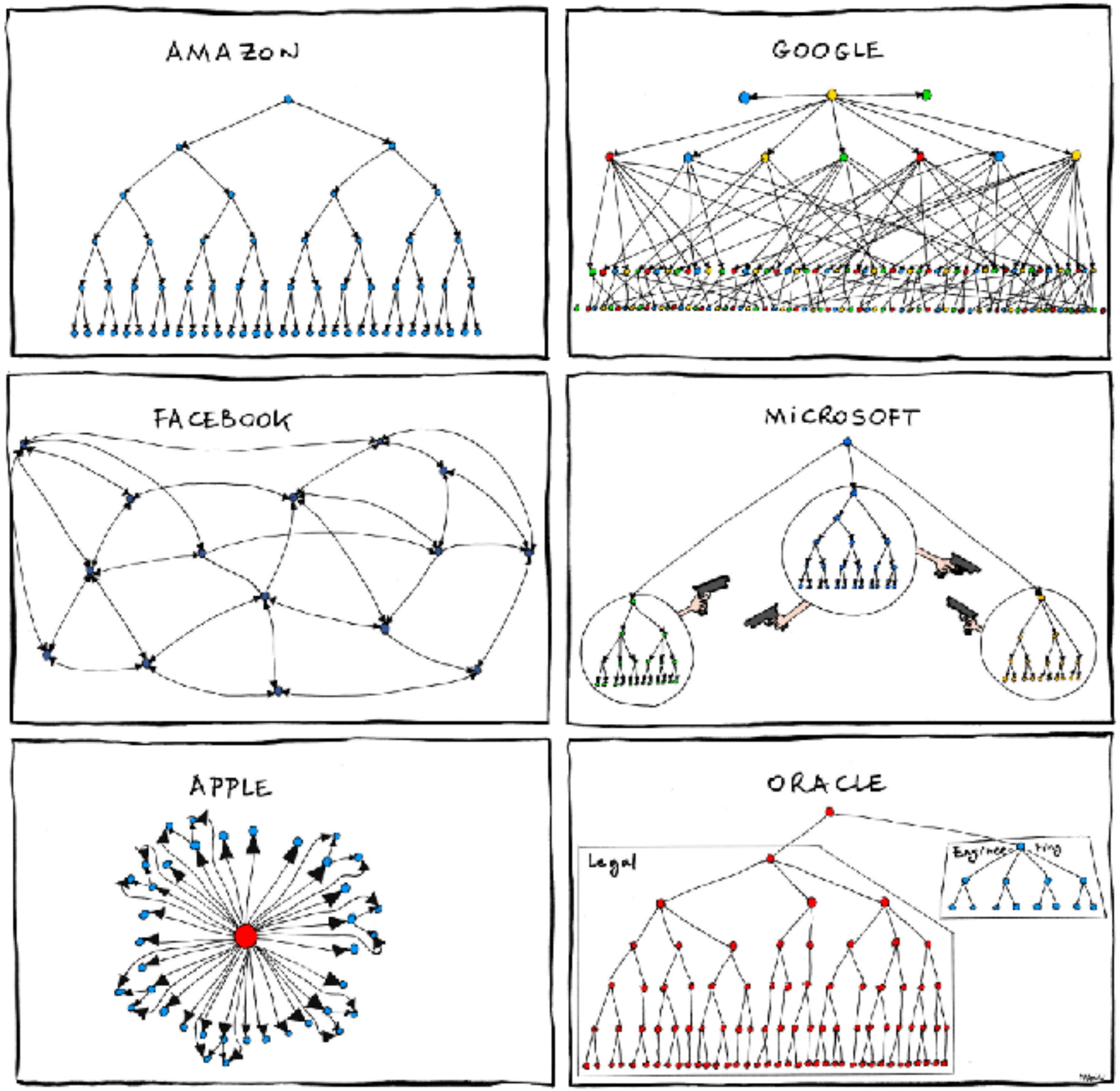

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People -> Process -> Tool

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Autonomous

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DevOps Topologies

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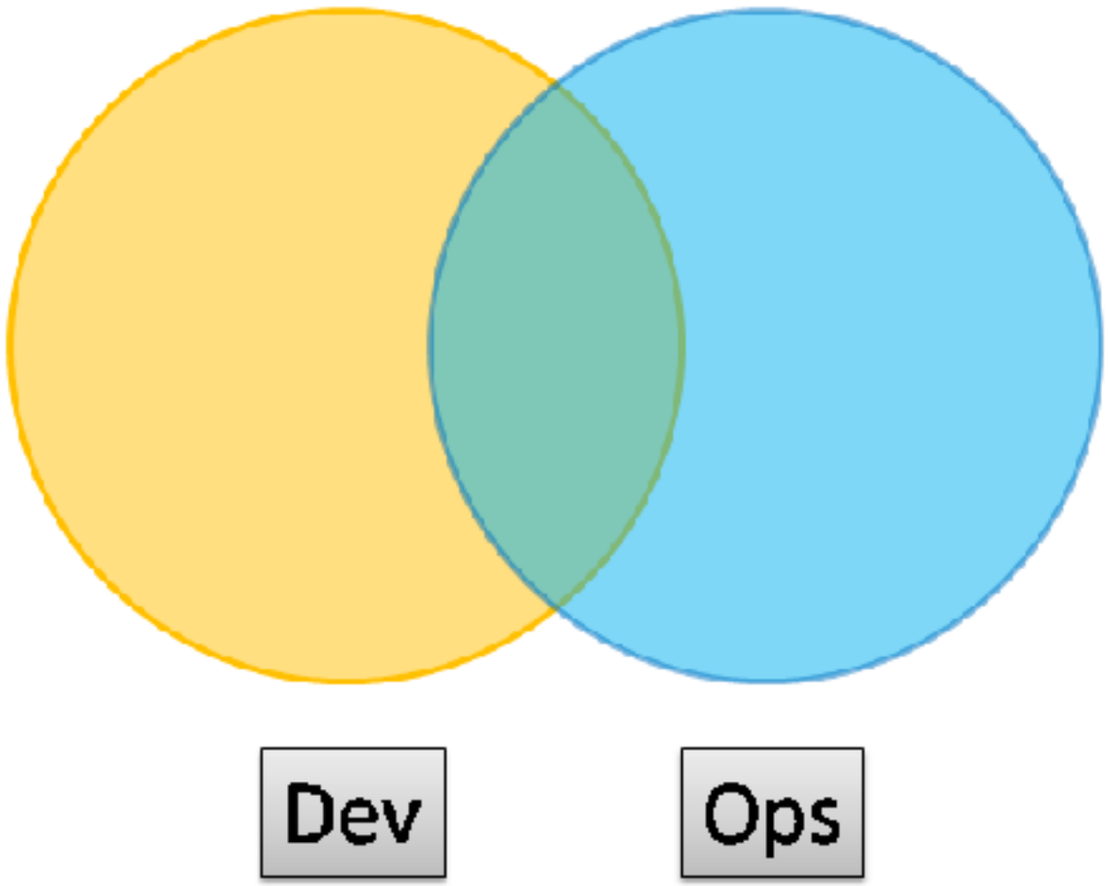
Type 1 – Smooth Collaboration



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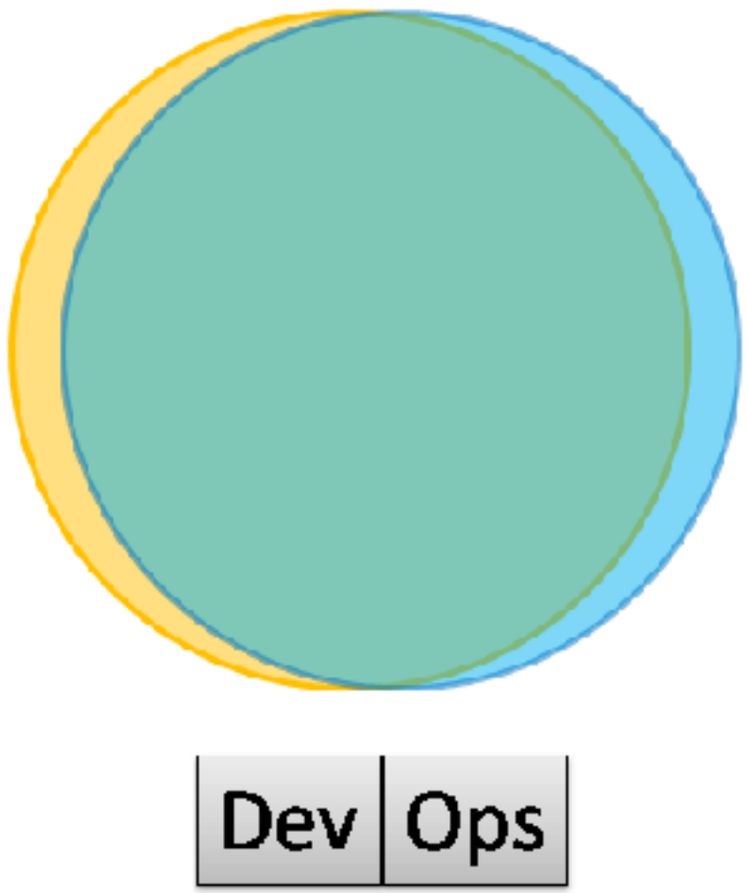
Type 2 – Fully Embedded



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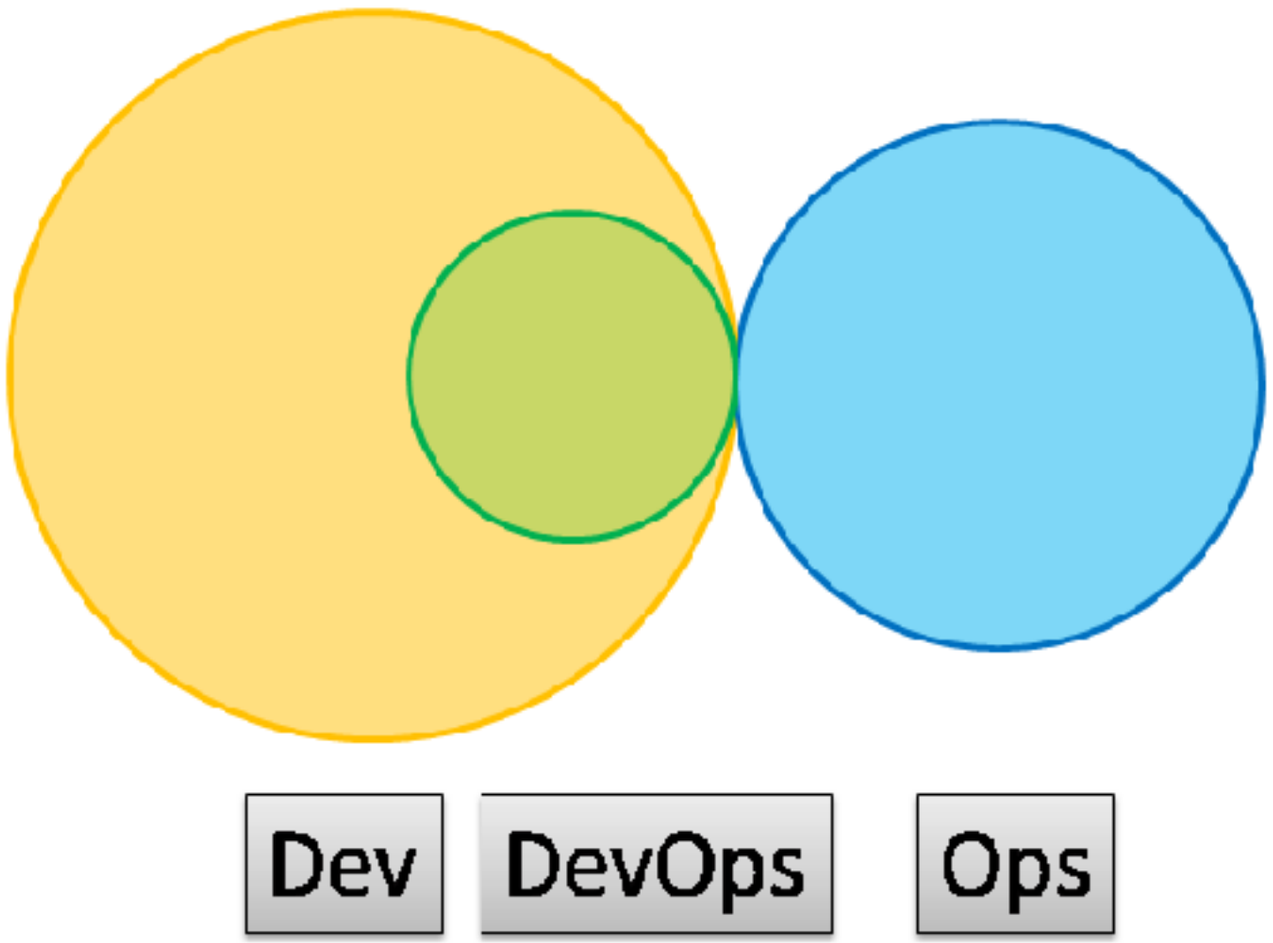
Type 3 – Infrastructure-as-a-Service



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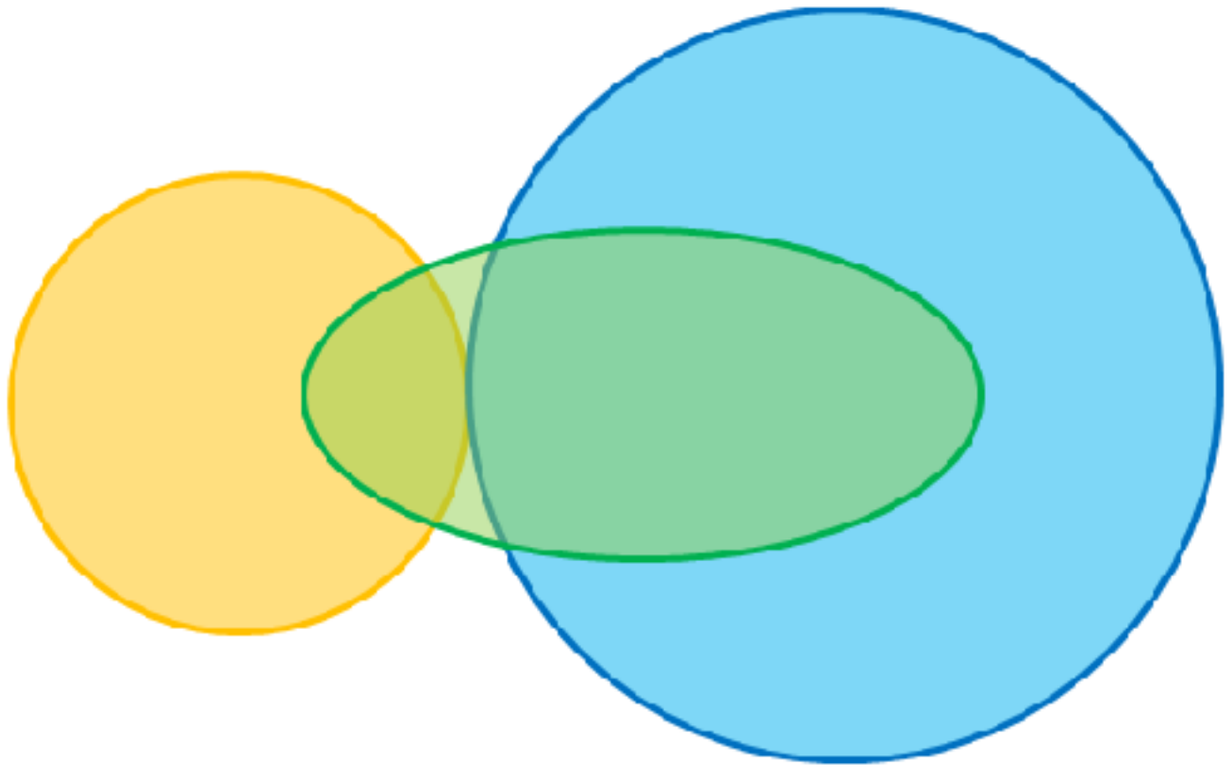
Type 4 – DevOps-as-a-Service



Dev DevOps Ops

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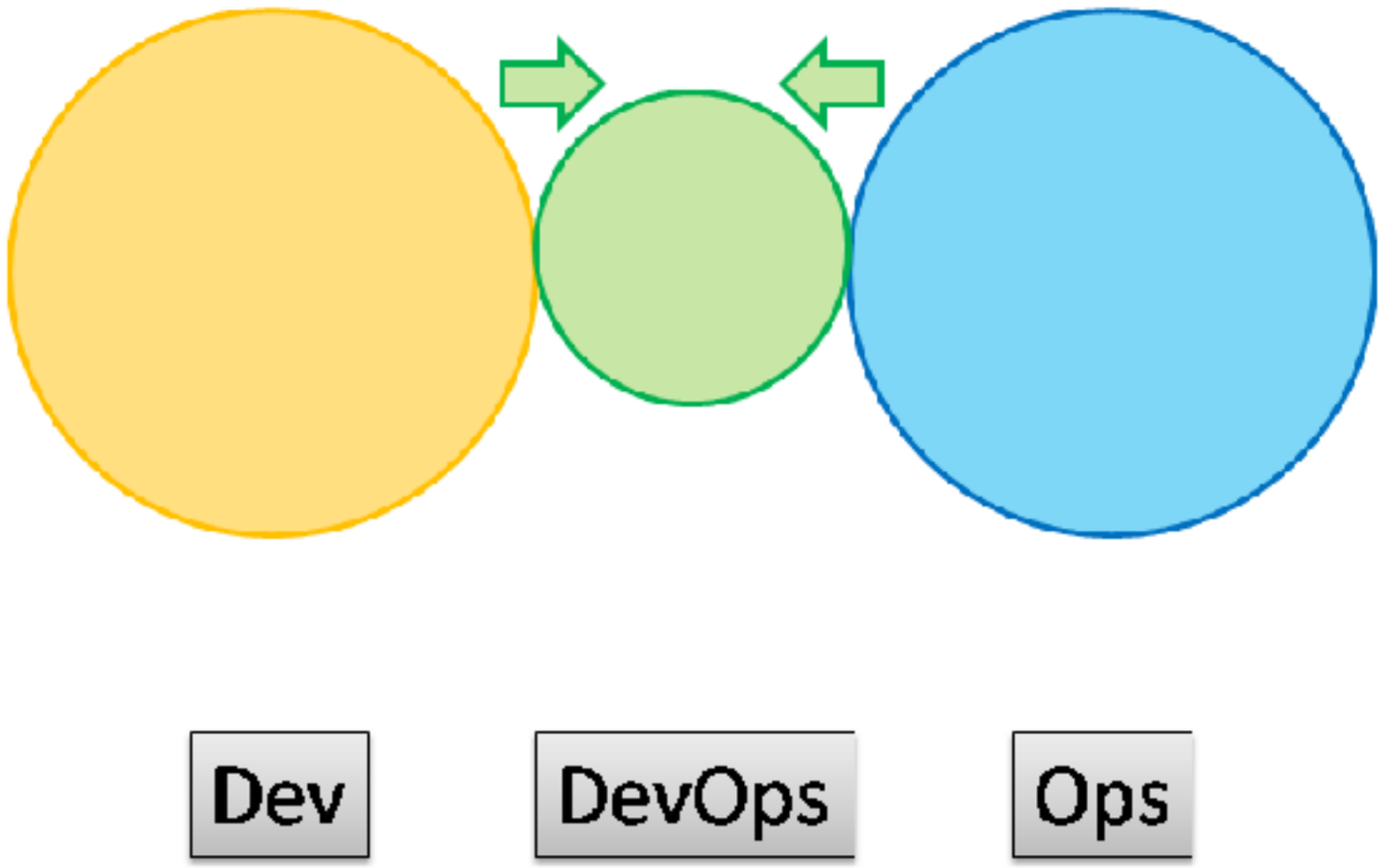
Type 5 – Temporary DevOps Team



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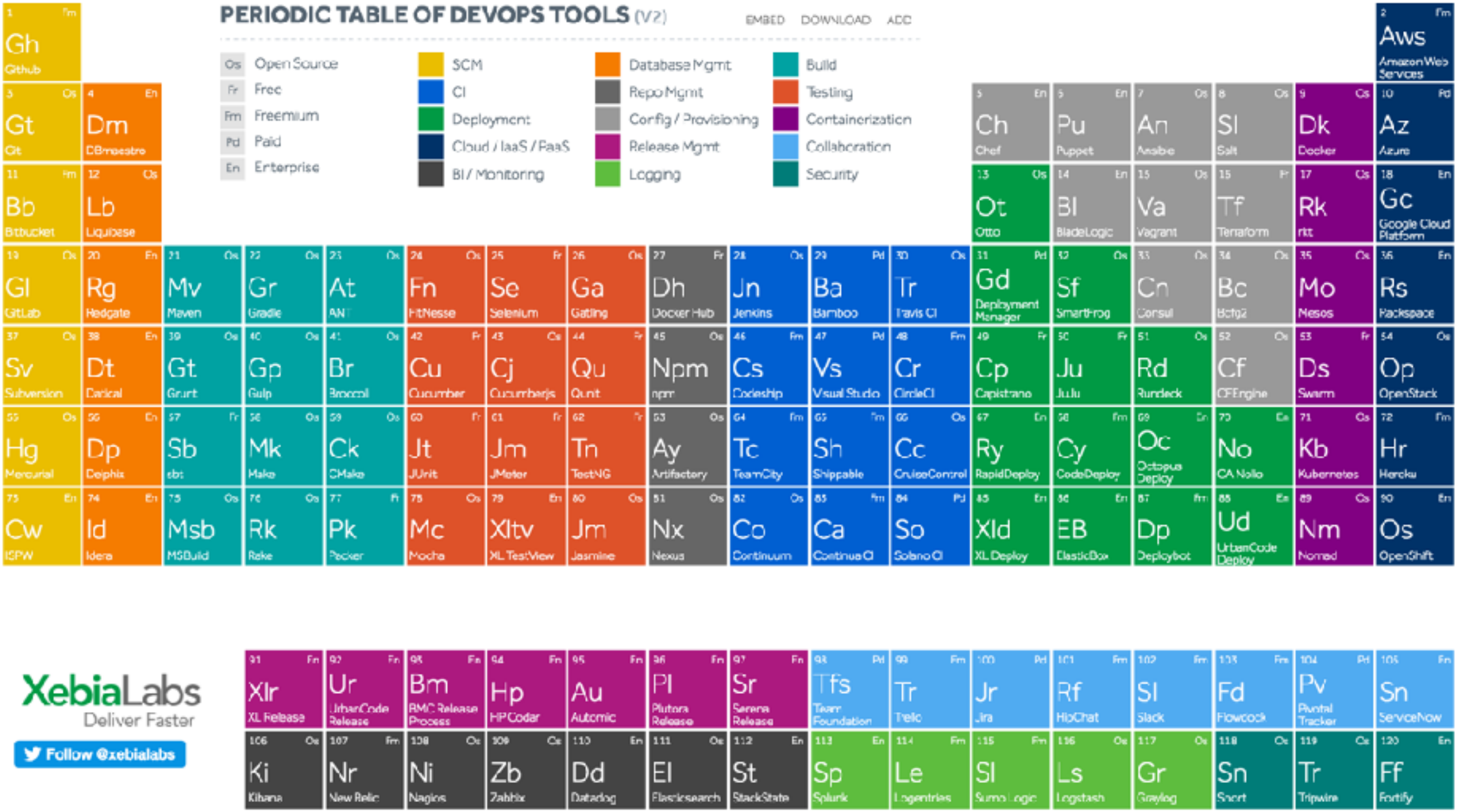
DevOps Tools



https://xebialabs.com/periodic-table-of-devops-tools/

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No DevOps Team

Problem department !!

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DevOps != Tools

Tools enable DevOps

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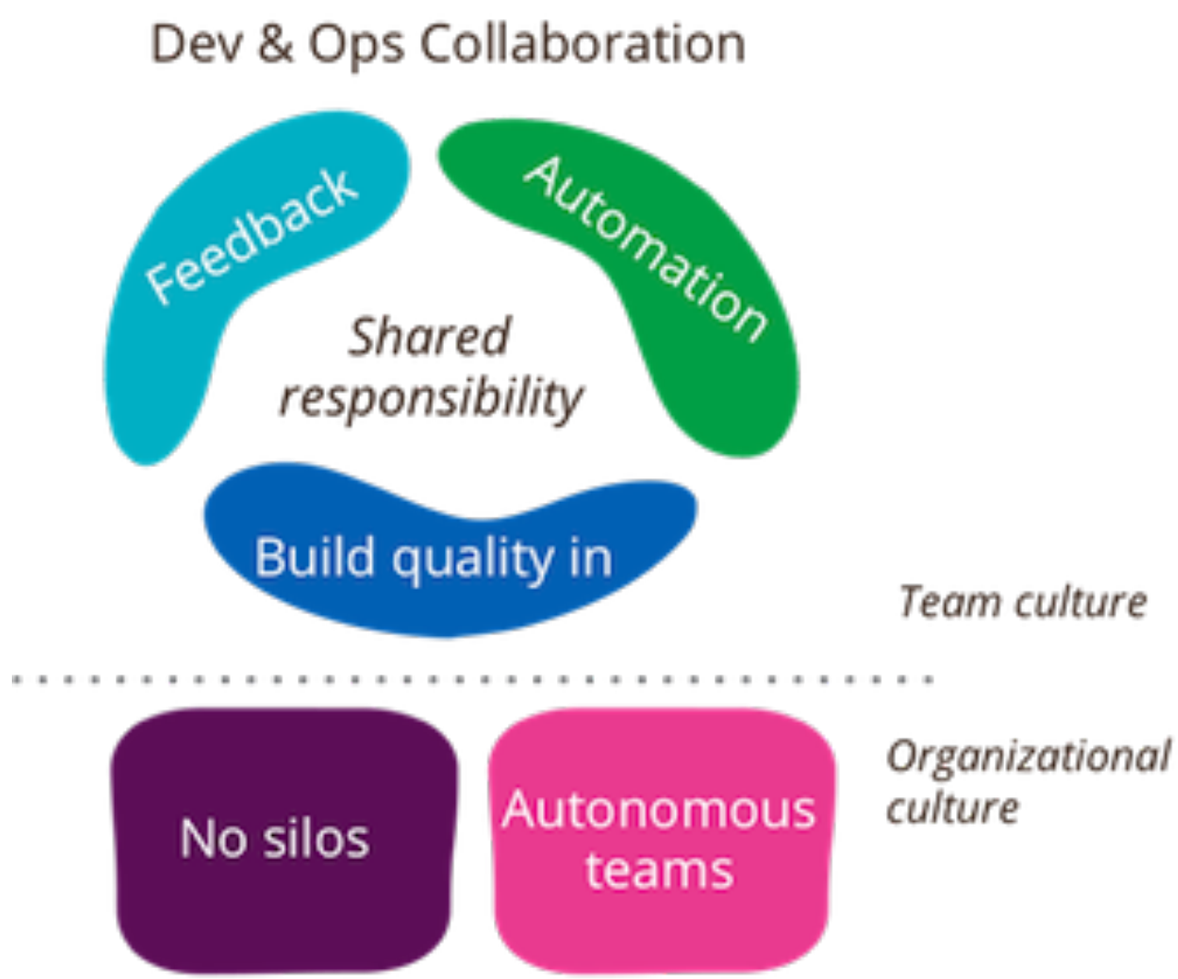
Team and Organization culture



https://martinfowler.com/bliki/DevOpsCulture.html

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DevOps success ?

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How do i know something is wrong ?

Missed deadline

Site is always down

Unhappy customers

Long waits for small changes or fixes

Changes cost too much

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What can i measure ?

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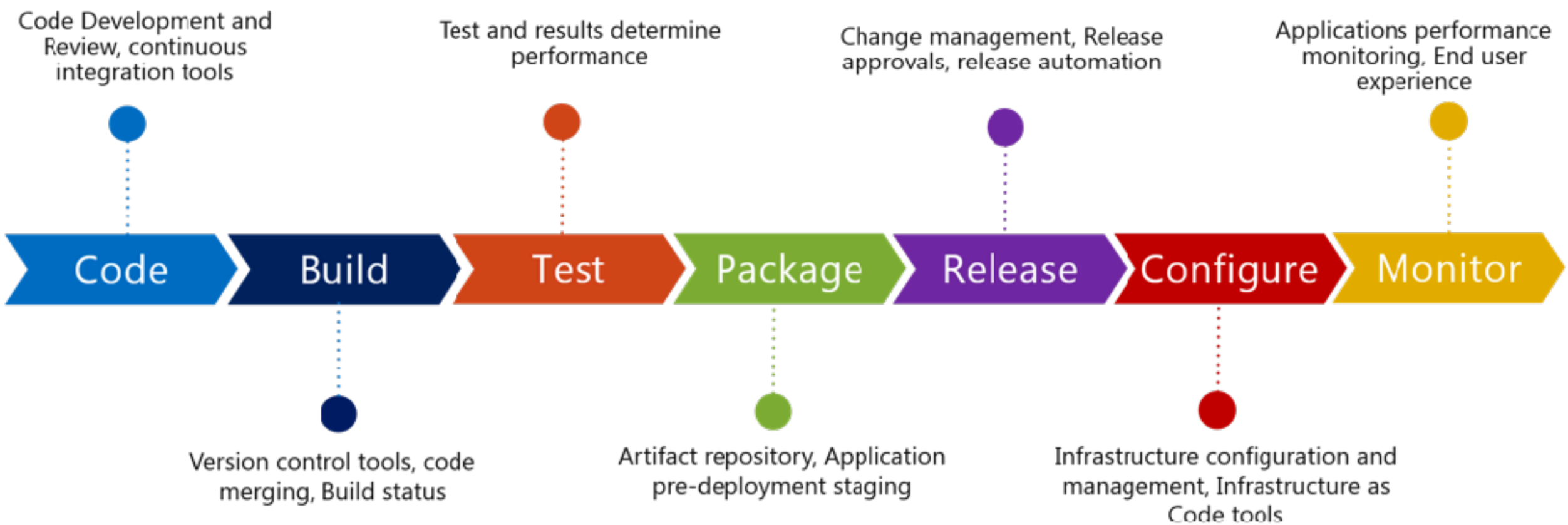
DevOps Process & Tools



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What can i measure ?

Mean Time to Recover/Repair (MTTR)

Mean Time to Detection (MTTD)

Change Lead Time

Change Failure Rate

Deployment or Change Frequency

Deployment Time

Percentage of successful deployments

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What can i measure ?

Application Usage and Traffic

Application Performance

Automated Test Pass (%)

Defect Rate

Failed Deployments

Availability

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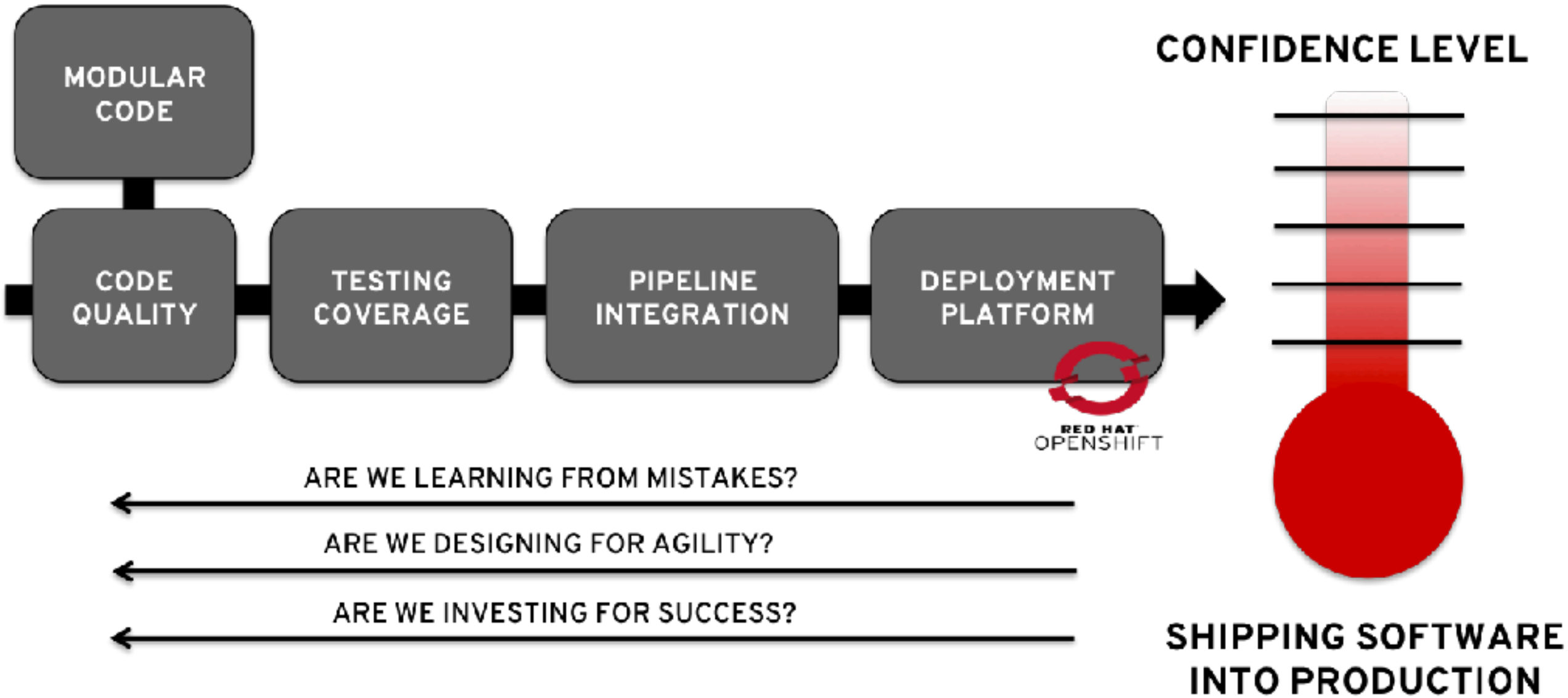
What can i measure ?



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Start with
Continuous Integration
Continuous Delivery

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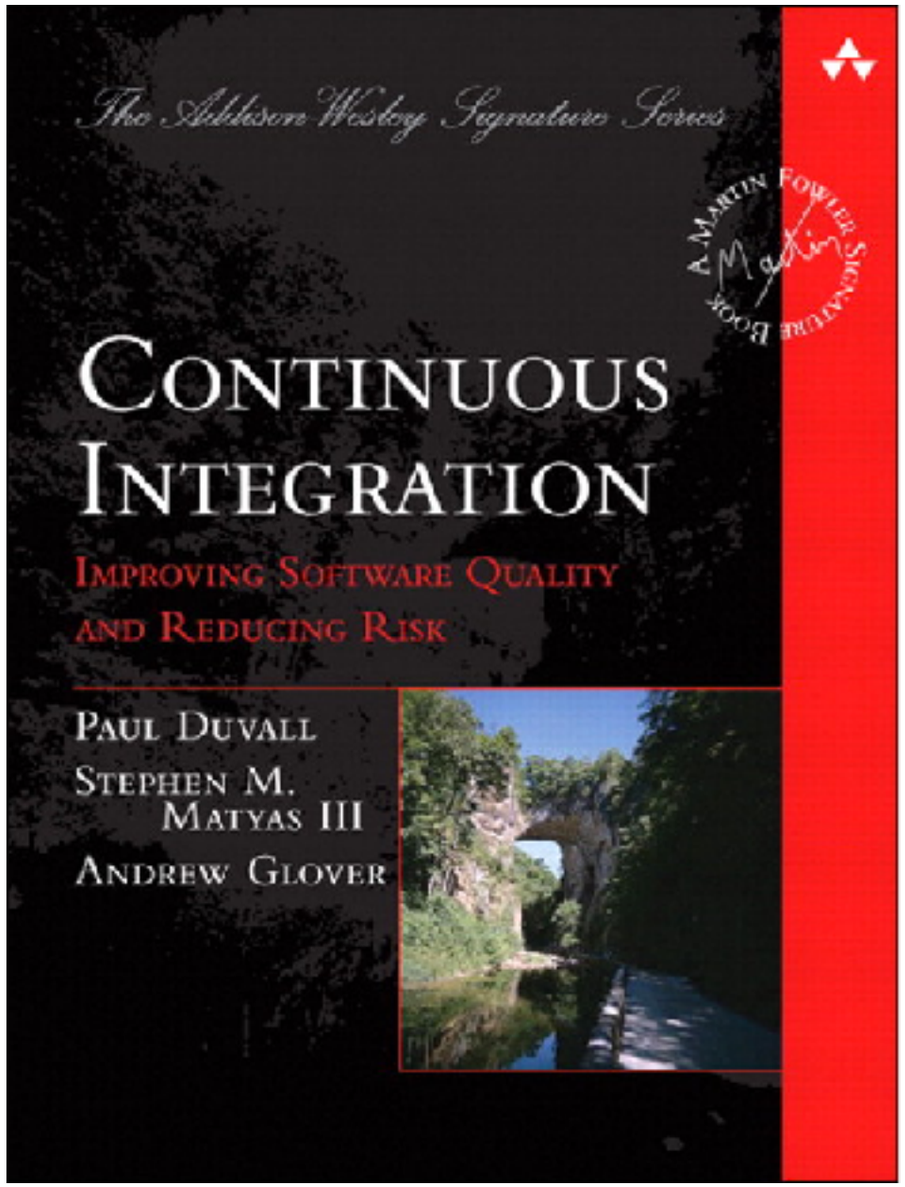
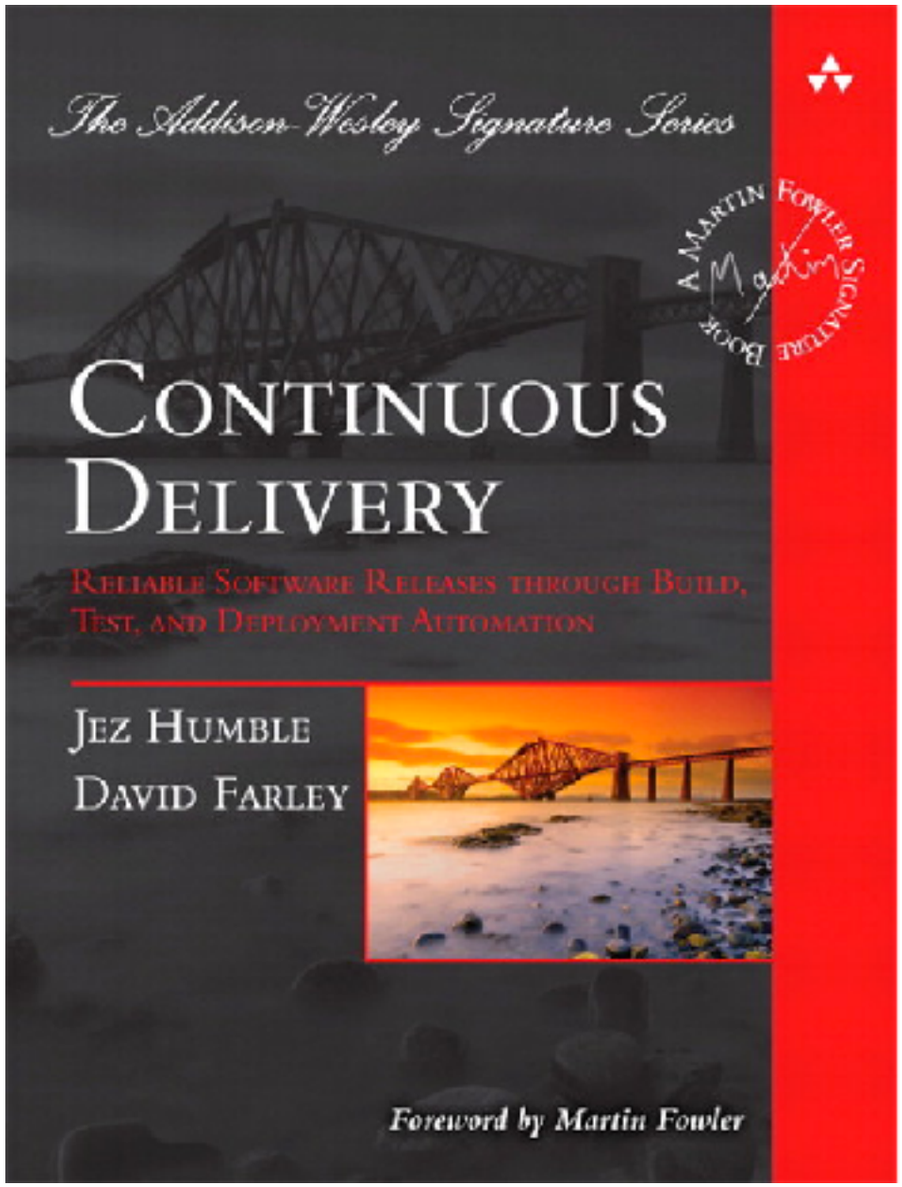
Improve quality and reduce risk





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The cost of integration

1. Merging the code
2. Duplicate changes
3. Test again again !!
4. Fixing bugs
5. Impact on stability

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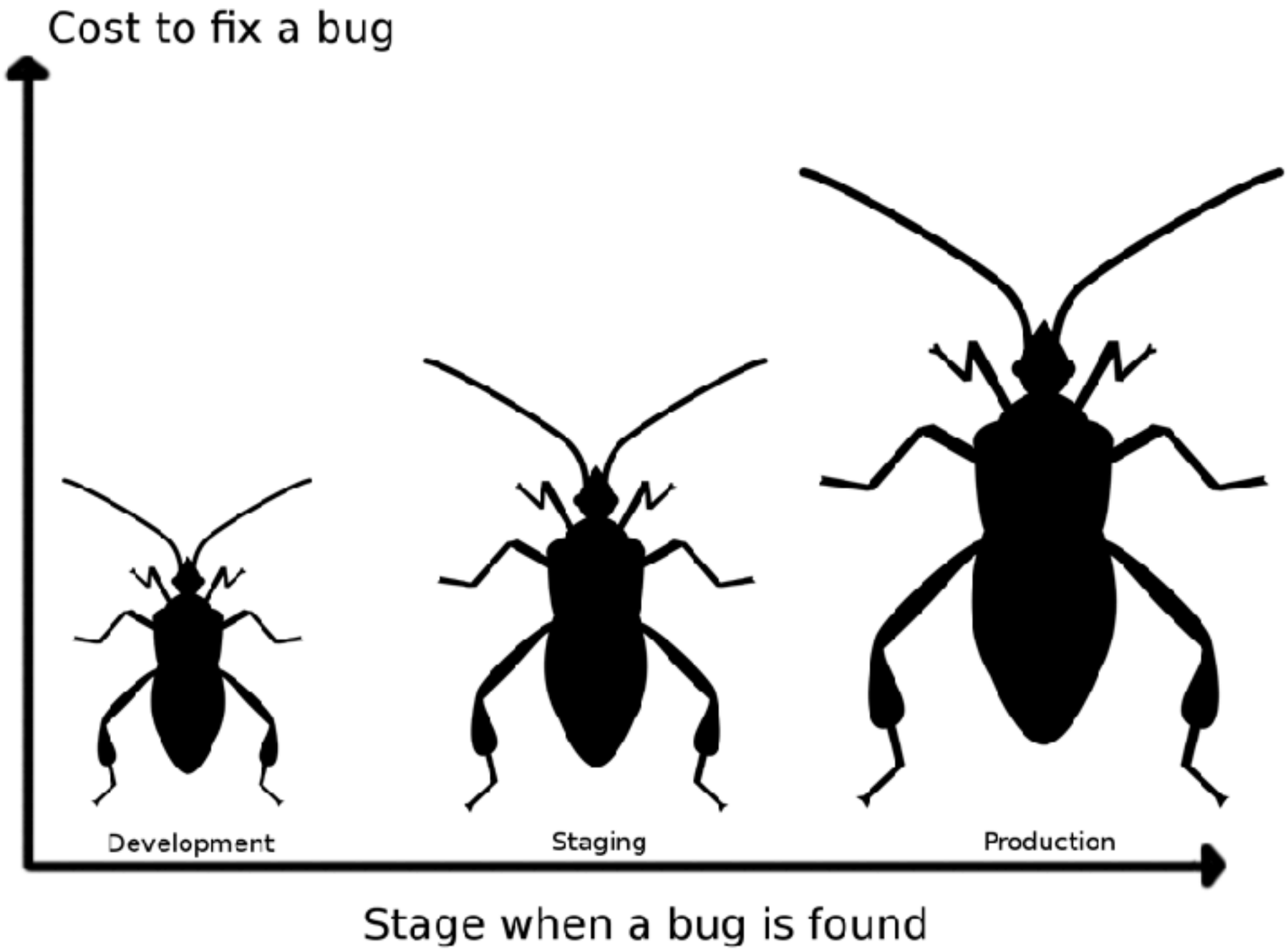
The cost of integration



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Jenkins

Bamboo

TeamCity

go™

Visual Studio
Team Foundation Server

Hudson

Travis

wercker

circleci

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CI is about what people do

not about what tools they use

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Continuous Integration

Discipline to **integrate frequently**

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Continuous Integration

Strive to make **small change**

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Continuous Integration

Strive for **fast feedback**

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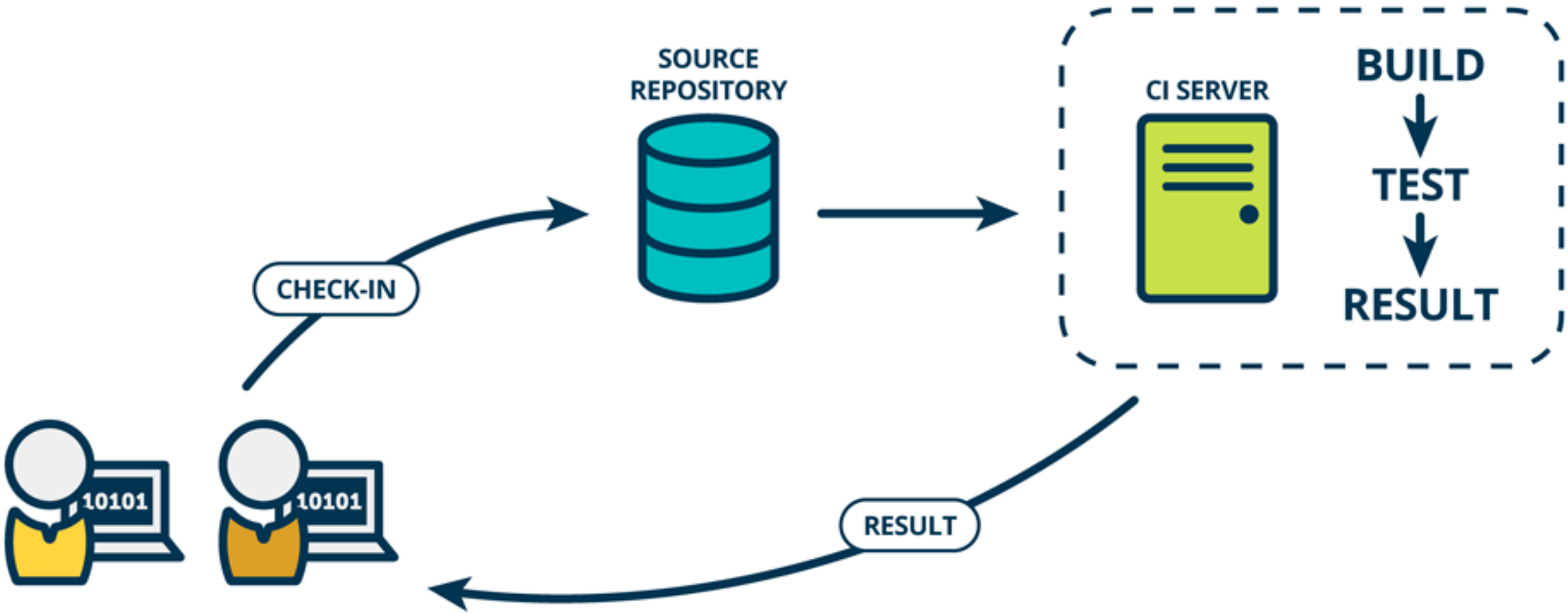
Continuous Integration



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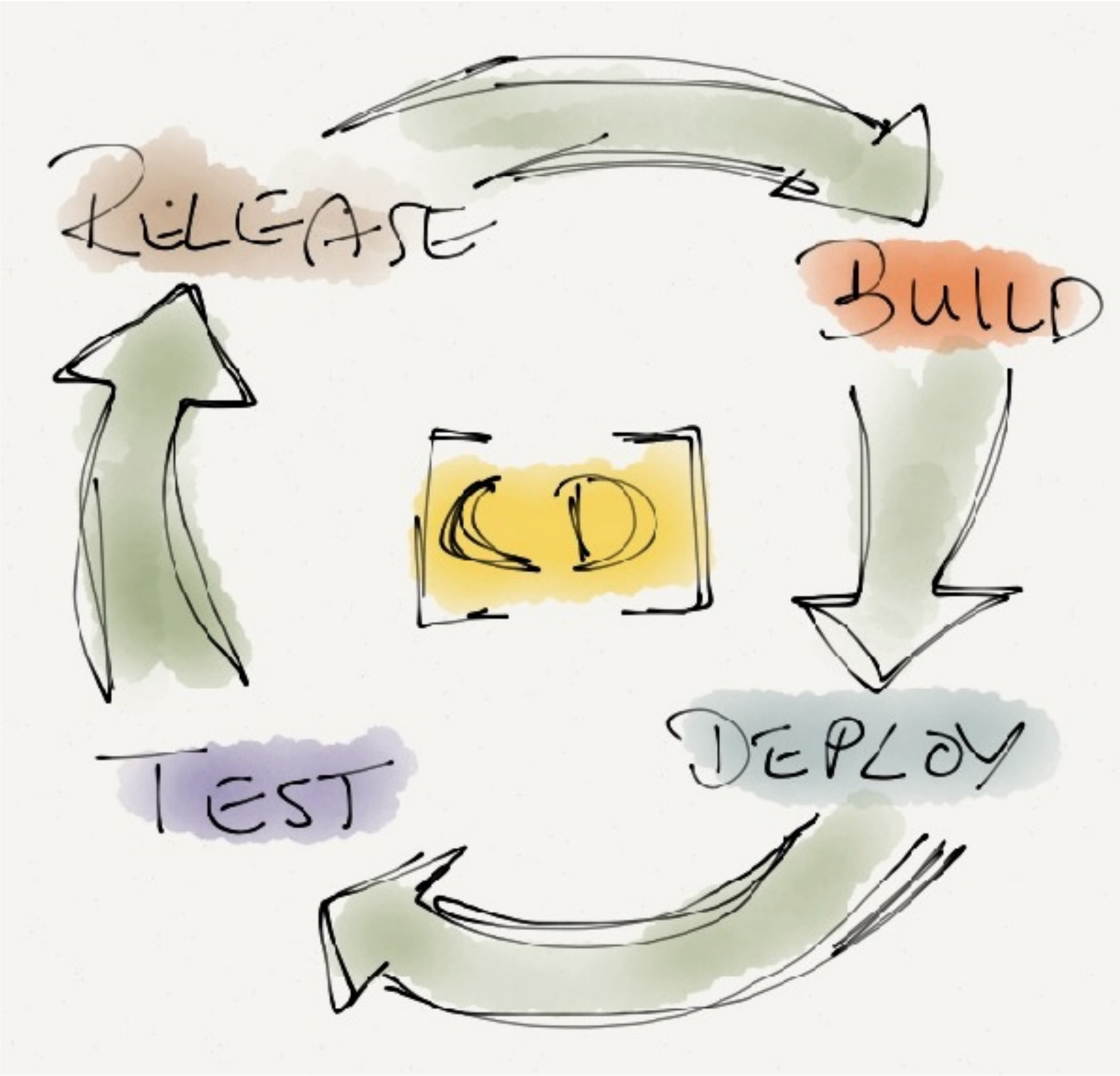
CD ?



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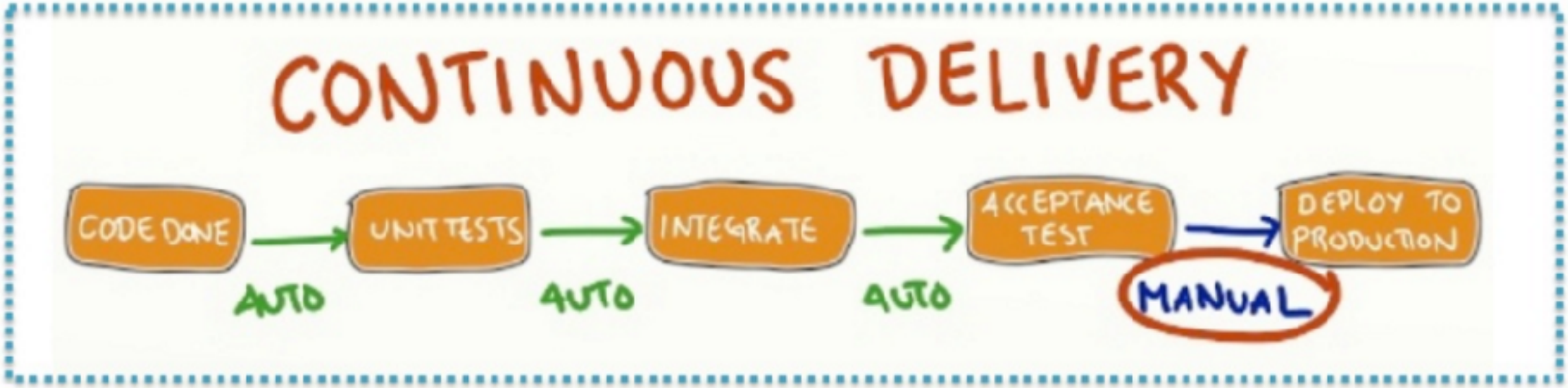
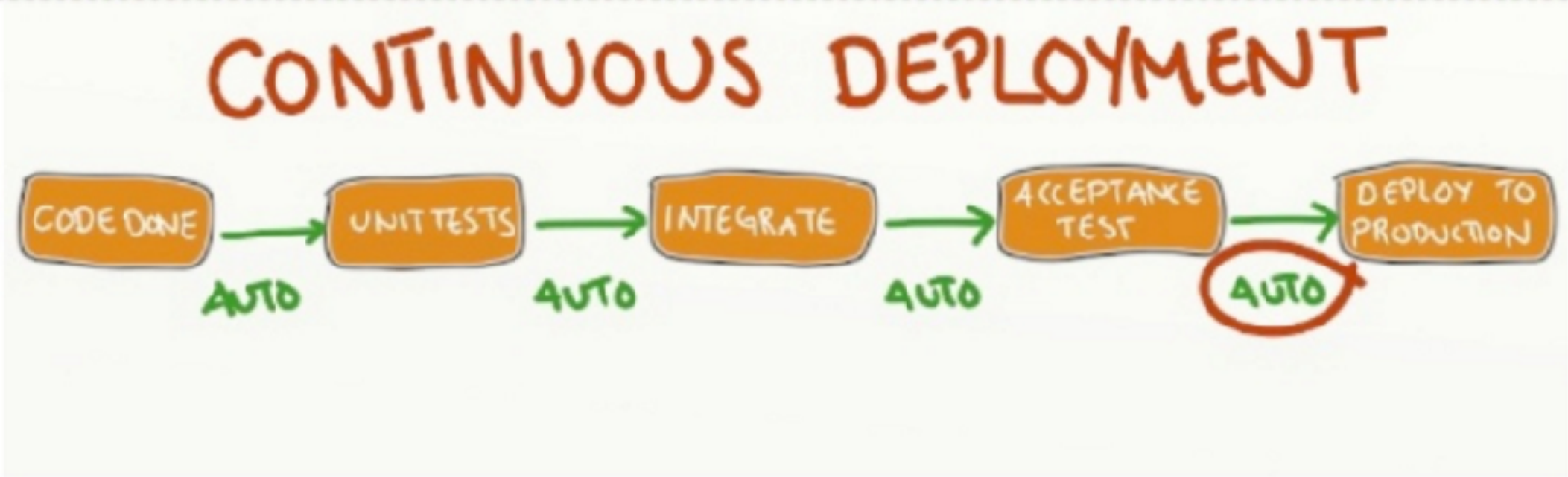
CD ?





http://blog.crisp.se/2013/02/05/yassalsundman/continuous-delivery-vs-continuous-deployment

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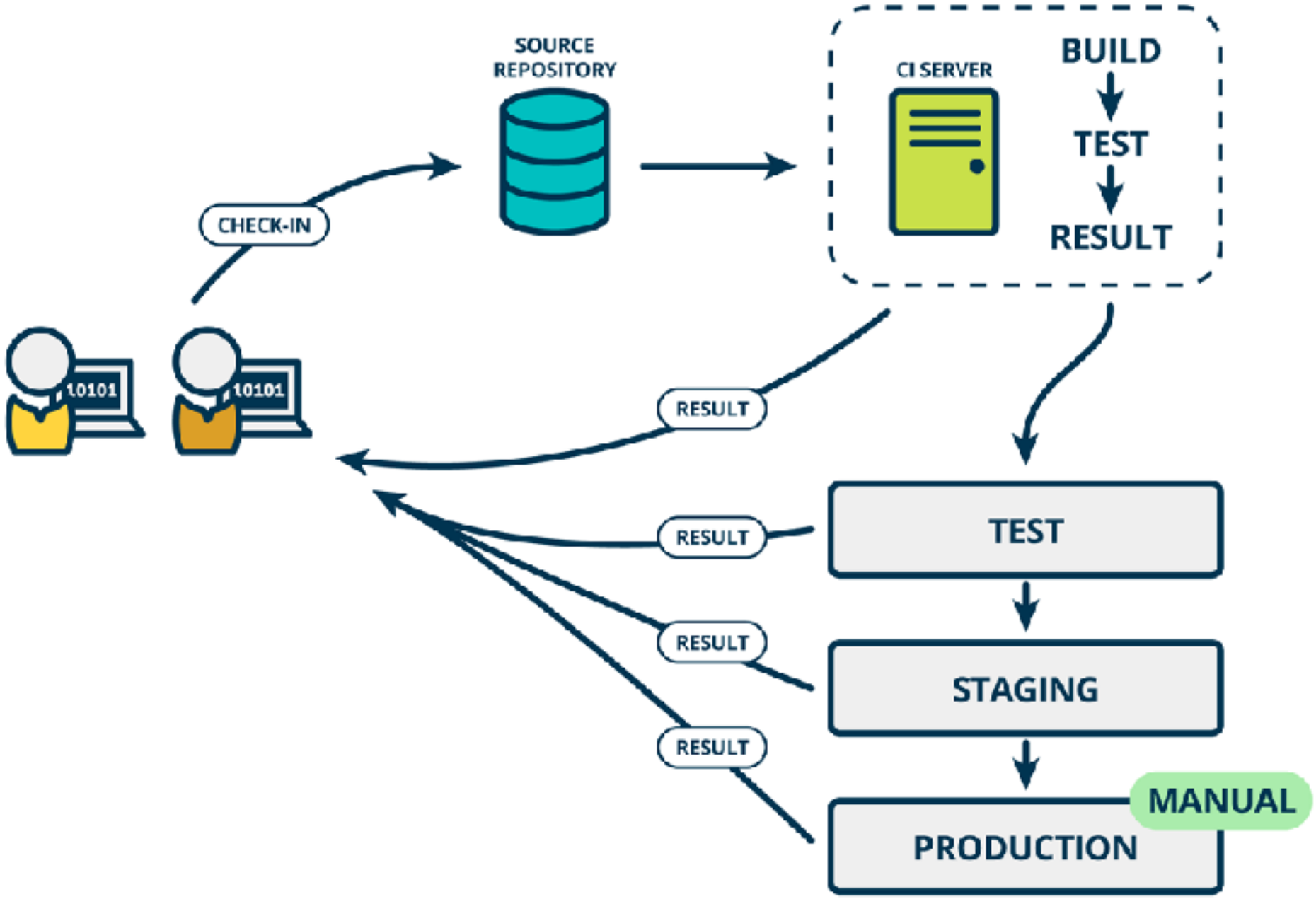
Continuous Delivery



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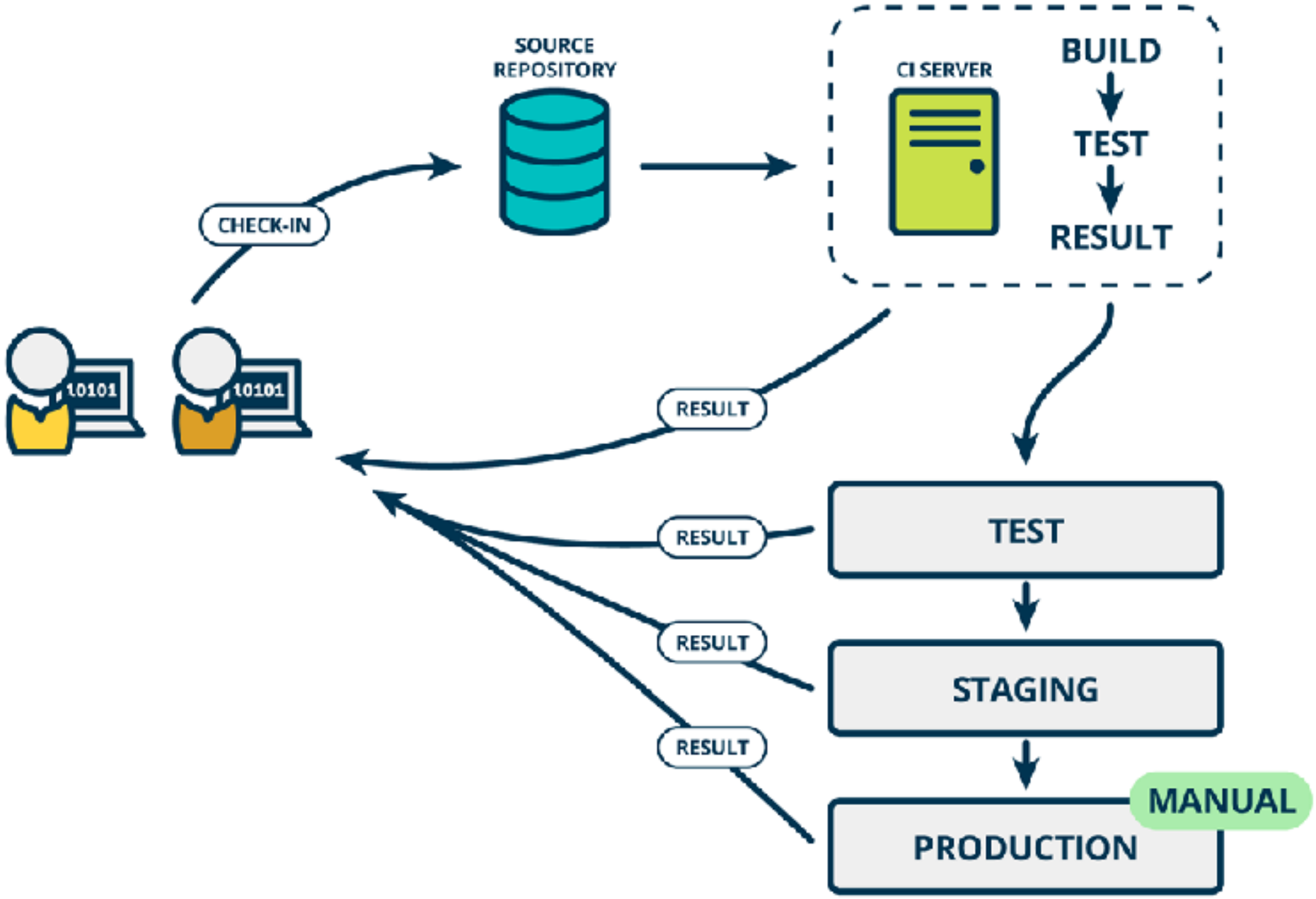
Rise of DevOps



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Continuous Integration

is a Software development **practices**

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Practice 1

Maintain a single source repository

In general, you should store in source control everything you need to build anything

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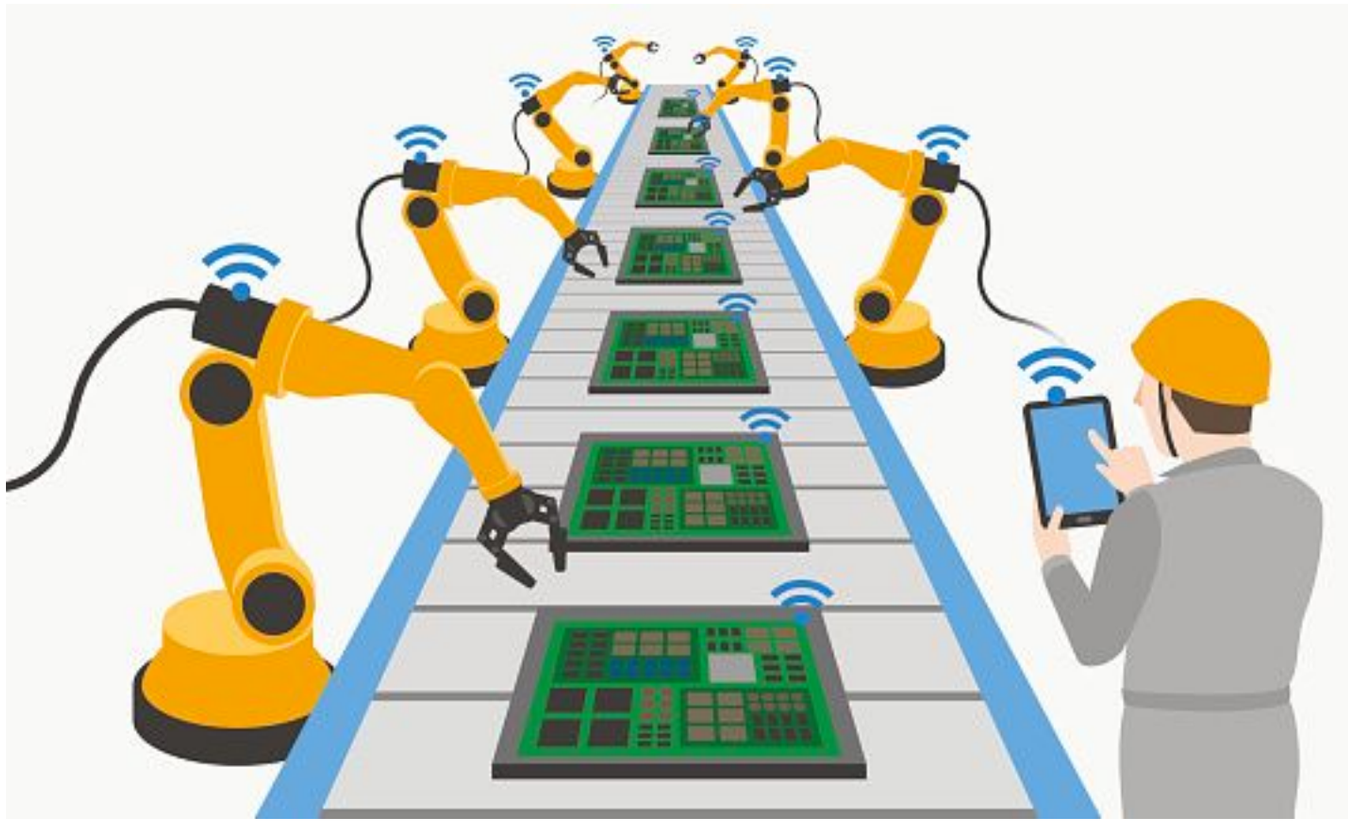
Practice 2

Automated the build

Automated environment for builds



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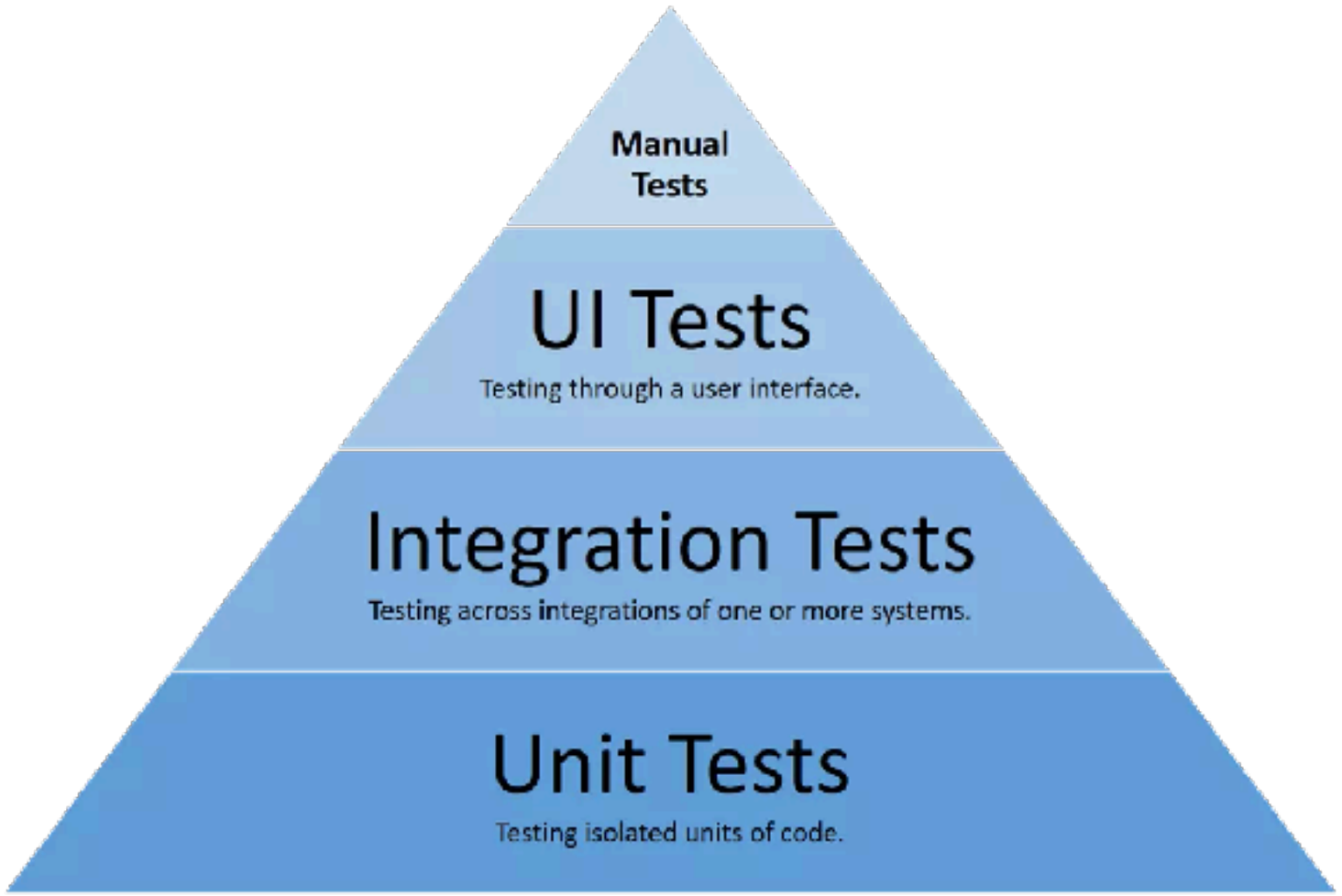
Practice 3

Make your build **self-testing**

Build process => compile, linking and **testing**



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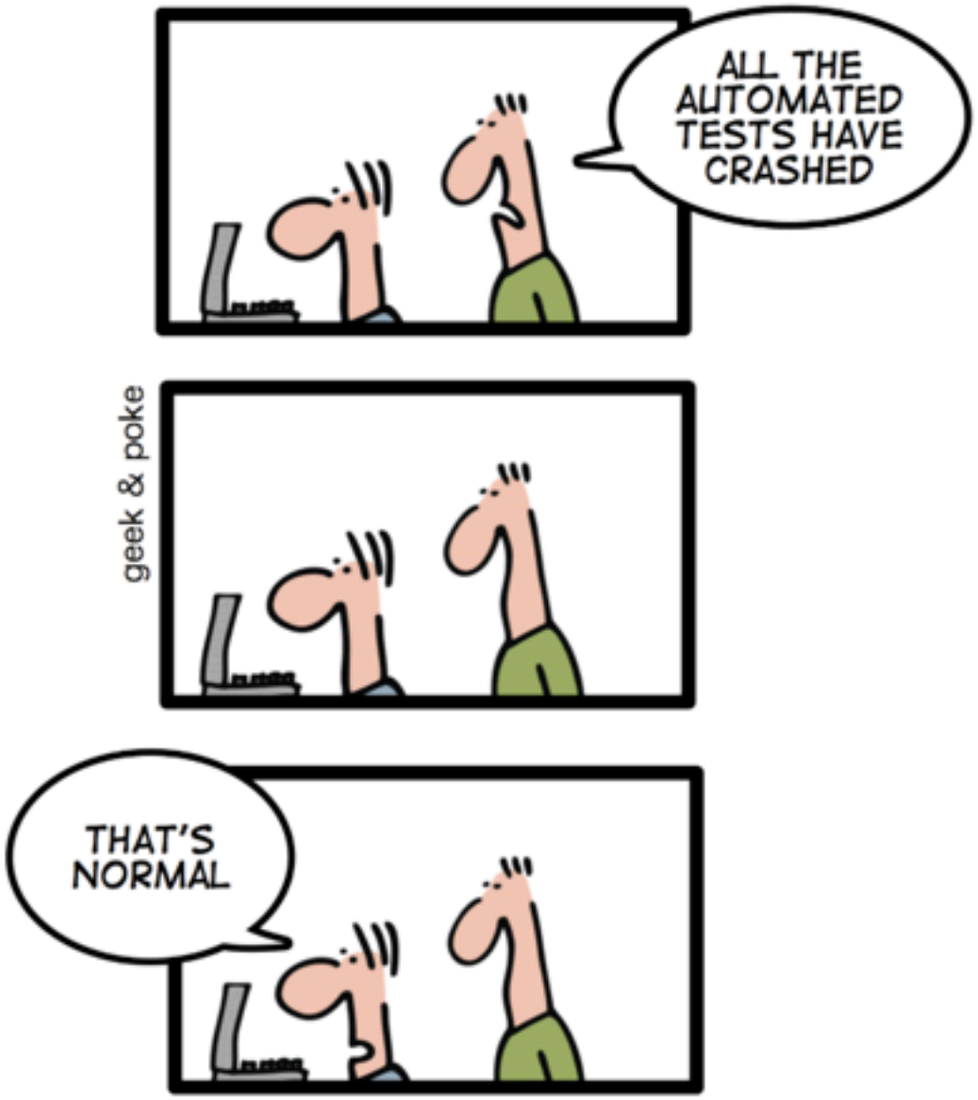
TODAY: CONTINUOUS INTEGRATION GIVES YOU THE COMFORTING FEELING TO KNOW THAT EVERYTHING IS NORMAL



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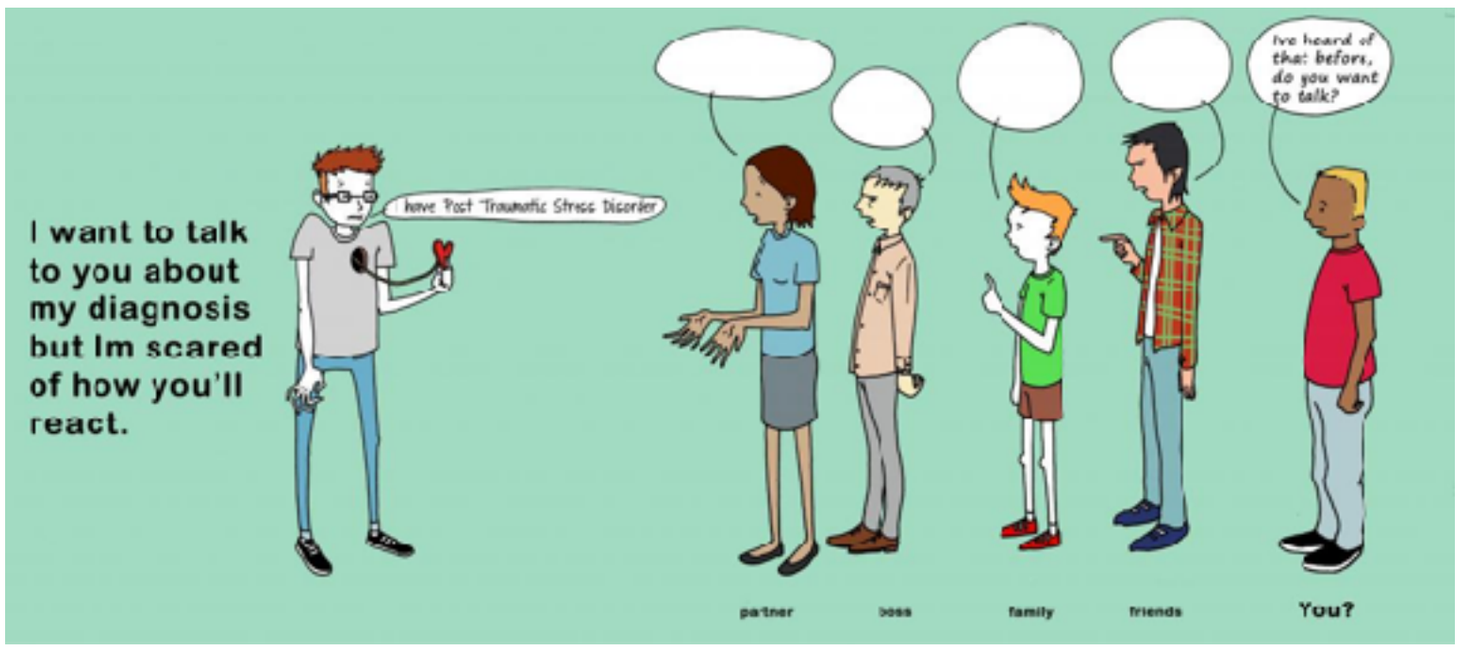
Practice 4

Everyone **commits** to the mainline everyday

Integration is about **communication**

Integration allows developers to **tell** other developers



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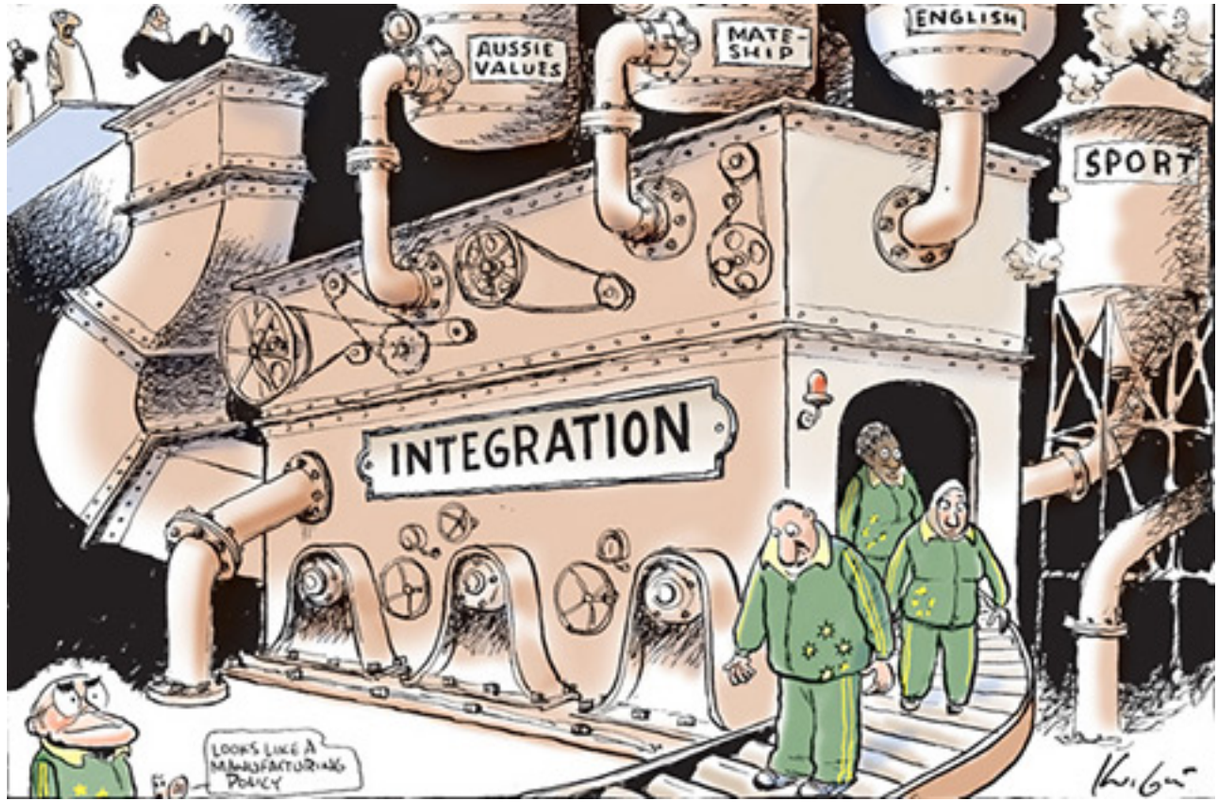
Practice 5

Every commits should build the mainline on an **Integration machine**



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Nightly build is not enough for Continuous Integration

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Practice 6

Fix broken builds **immediately**

“Nobody has a higher priority task than fixing the build”

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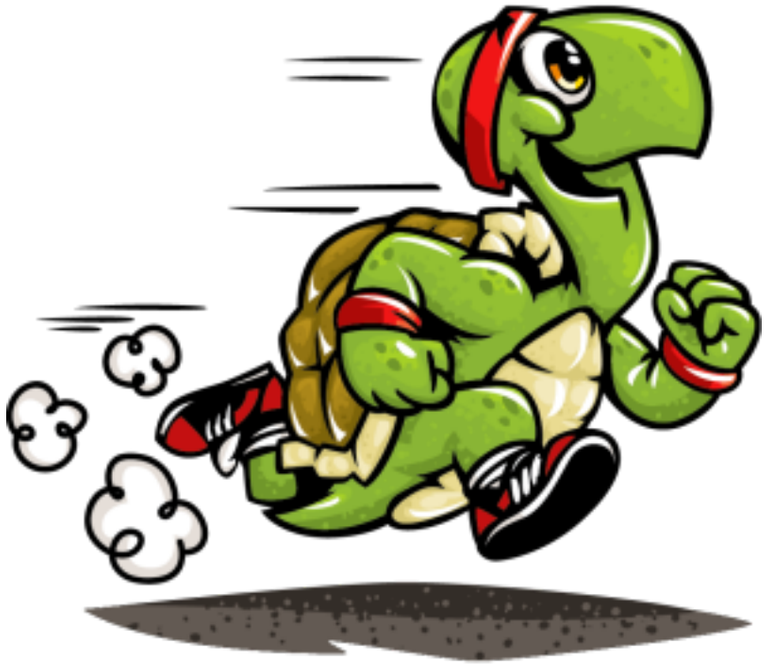
Practice 7

Keep the build **fast**

Continuous Integration is to provide rapid feedback



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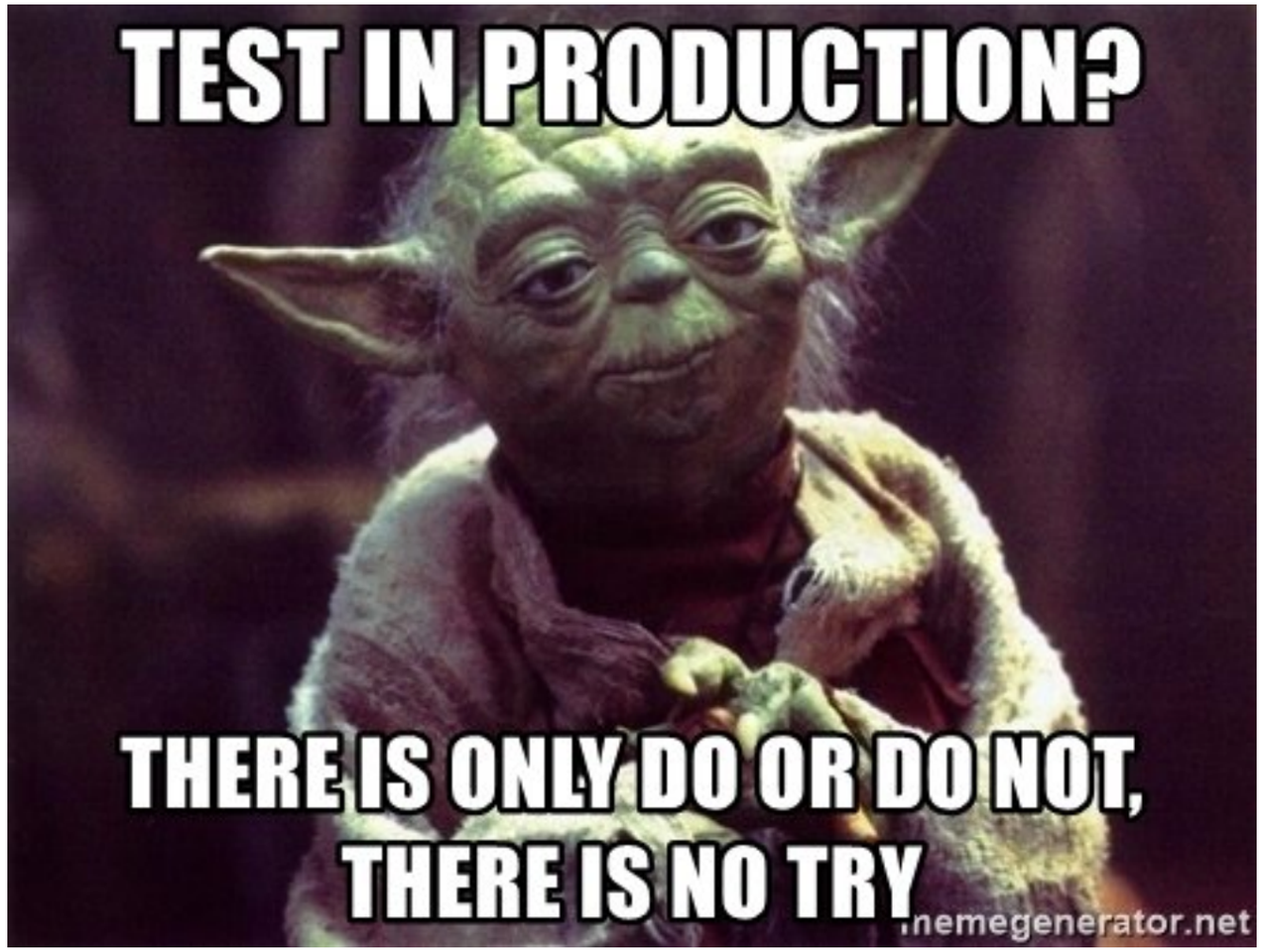
Practice 8

Test in clone of the **Production** environment



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Practice 9

Make it easy for anyone to get
the latest executable

Make sure well known place where people can find

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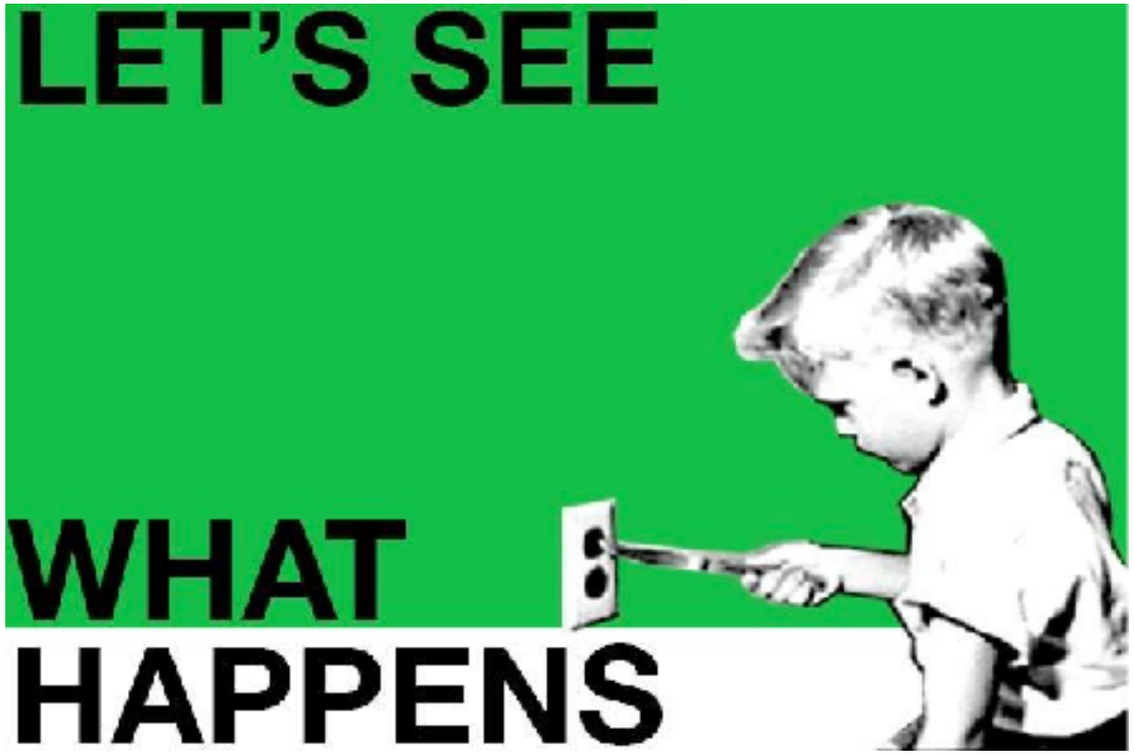
Practice 10

Everyone can see what's happening

Easier to see the state of the system and changes

Show the good information



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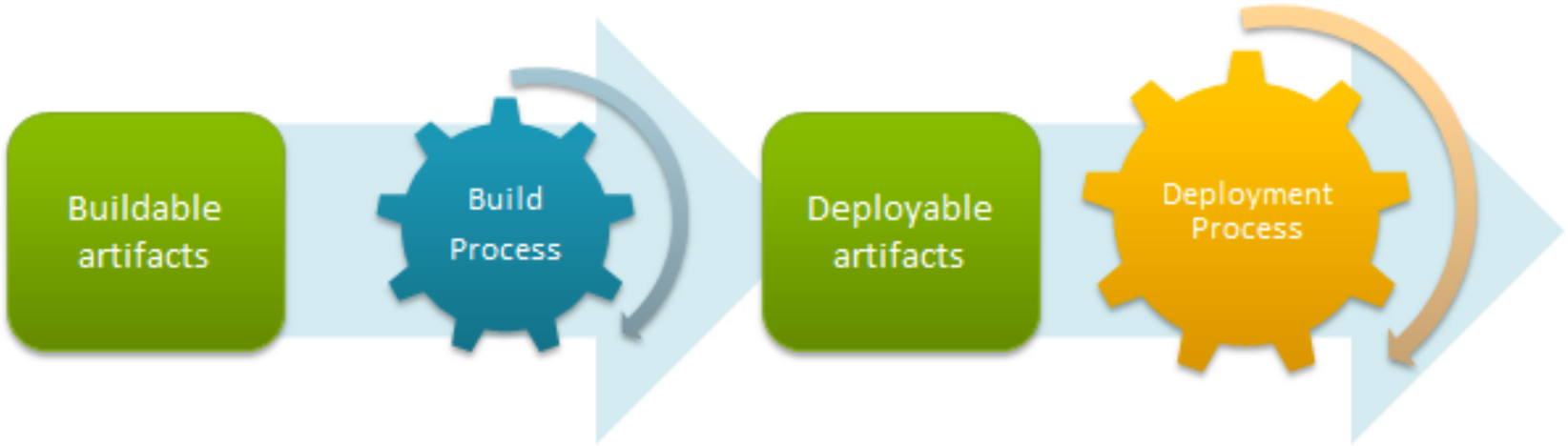
Practice 11

Automated deployment



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“Behind every successful agile project, there is a **Continuous Integration Server**”

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Let’s workshop

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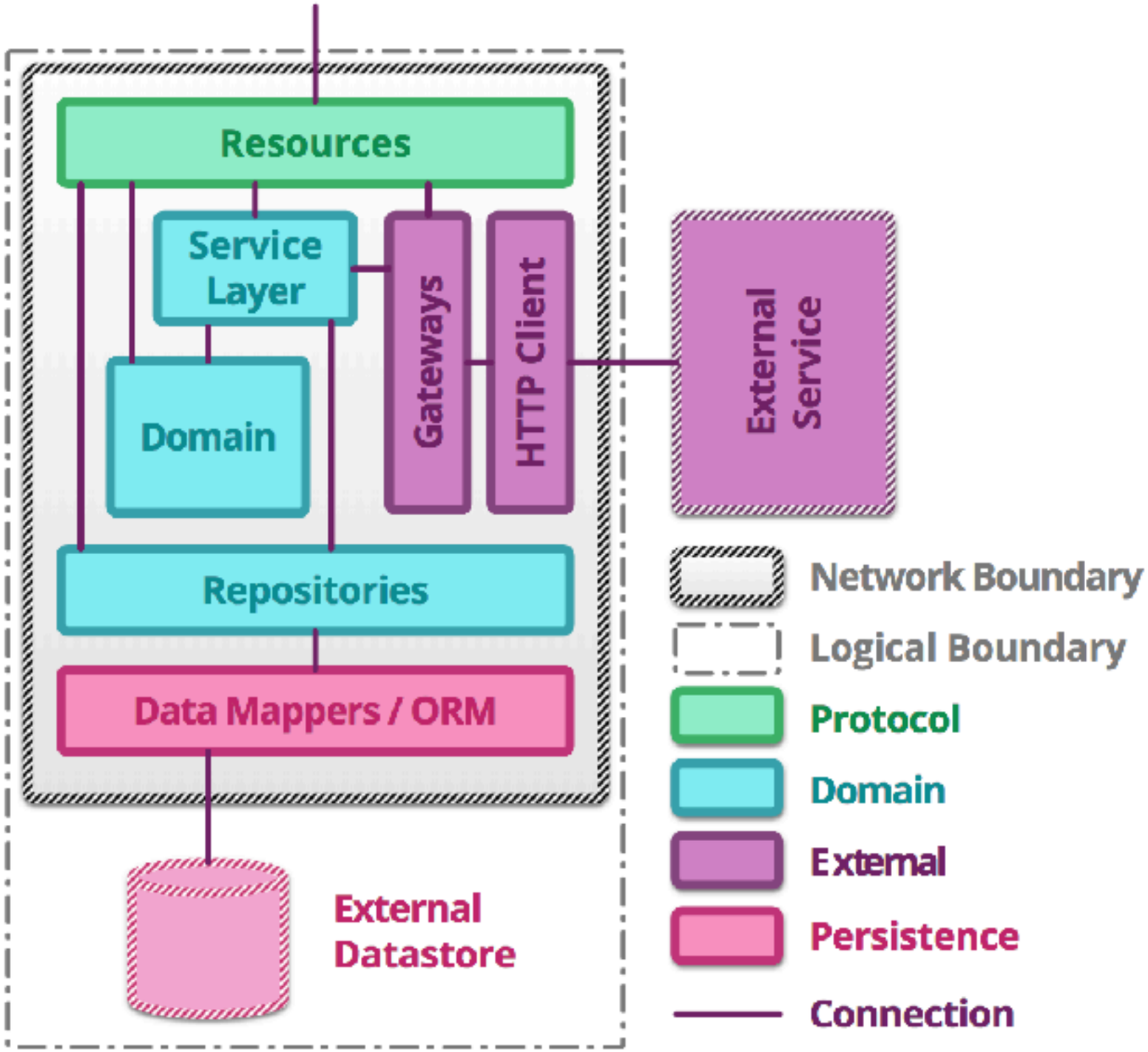

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Development

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Testing

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Deployment

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Summary

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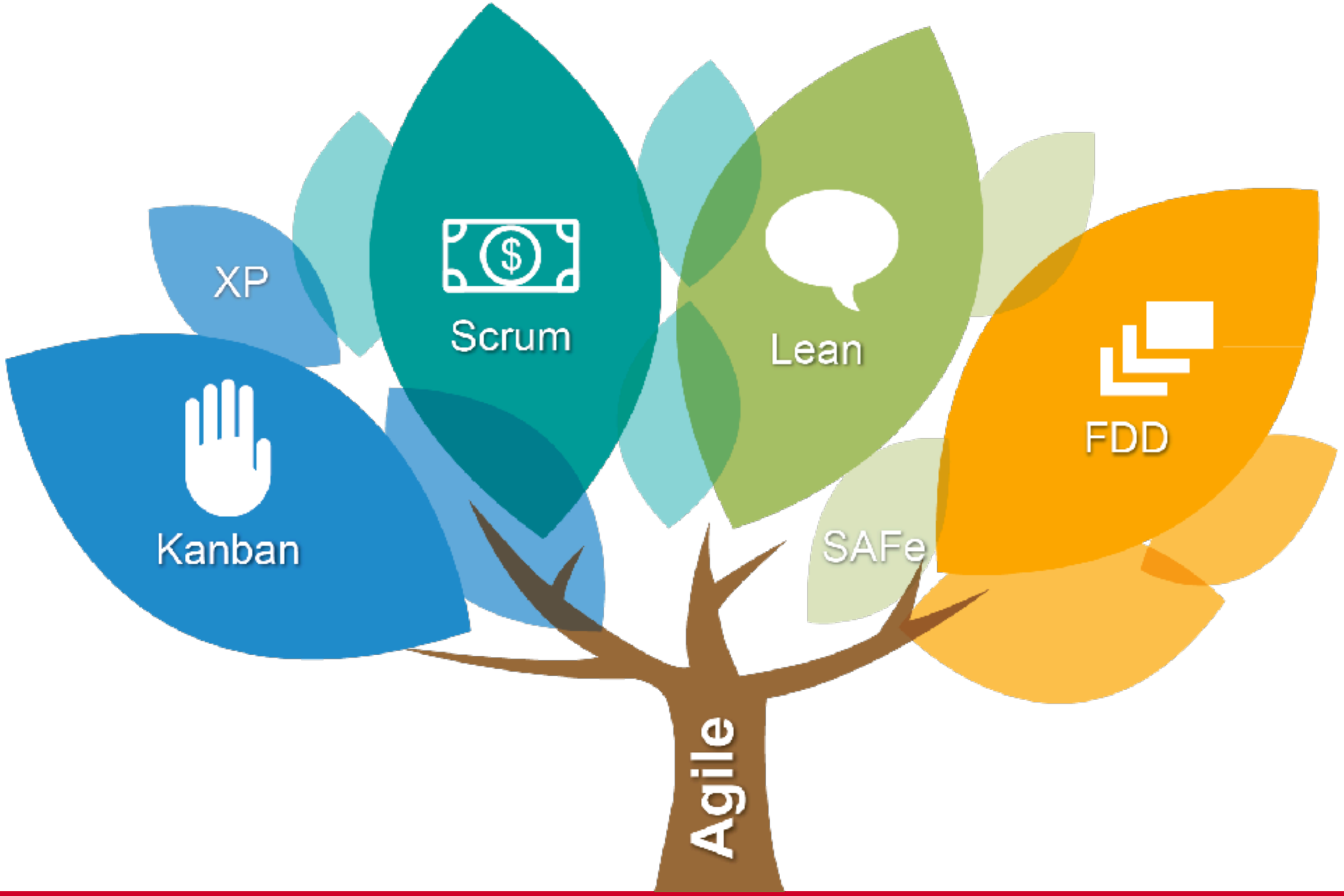

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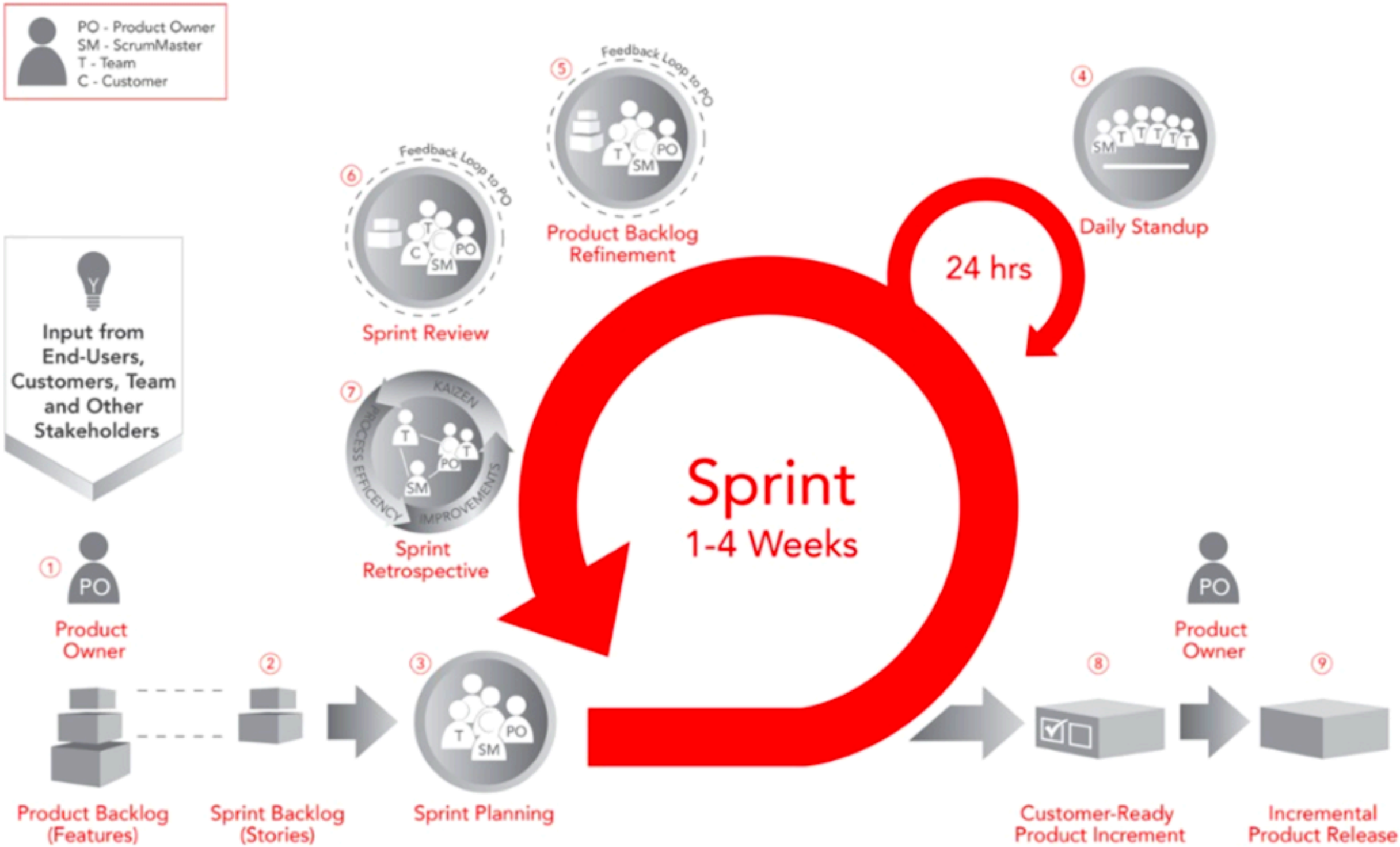

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Agile manifestos

THE AGILE MANIFESTO

We are uncovering better ways of developing software by doing it and helping others do it.

CUSTOMER COLLABORATION over contract negotiation

INDIVIDUALS AND INTERACTIONS over processes and tools

RESPONDING TO CHANGE over following a plan

WORKING SOFTWARE over full documentation

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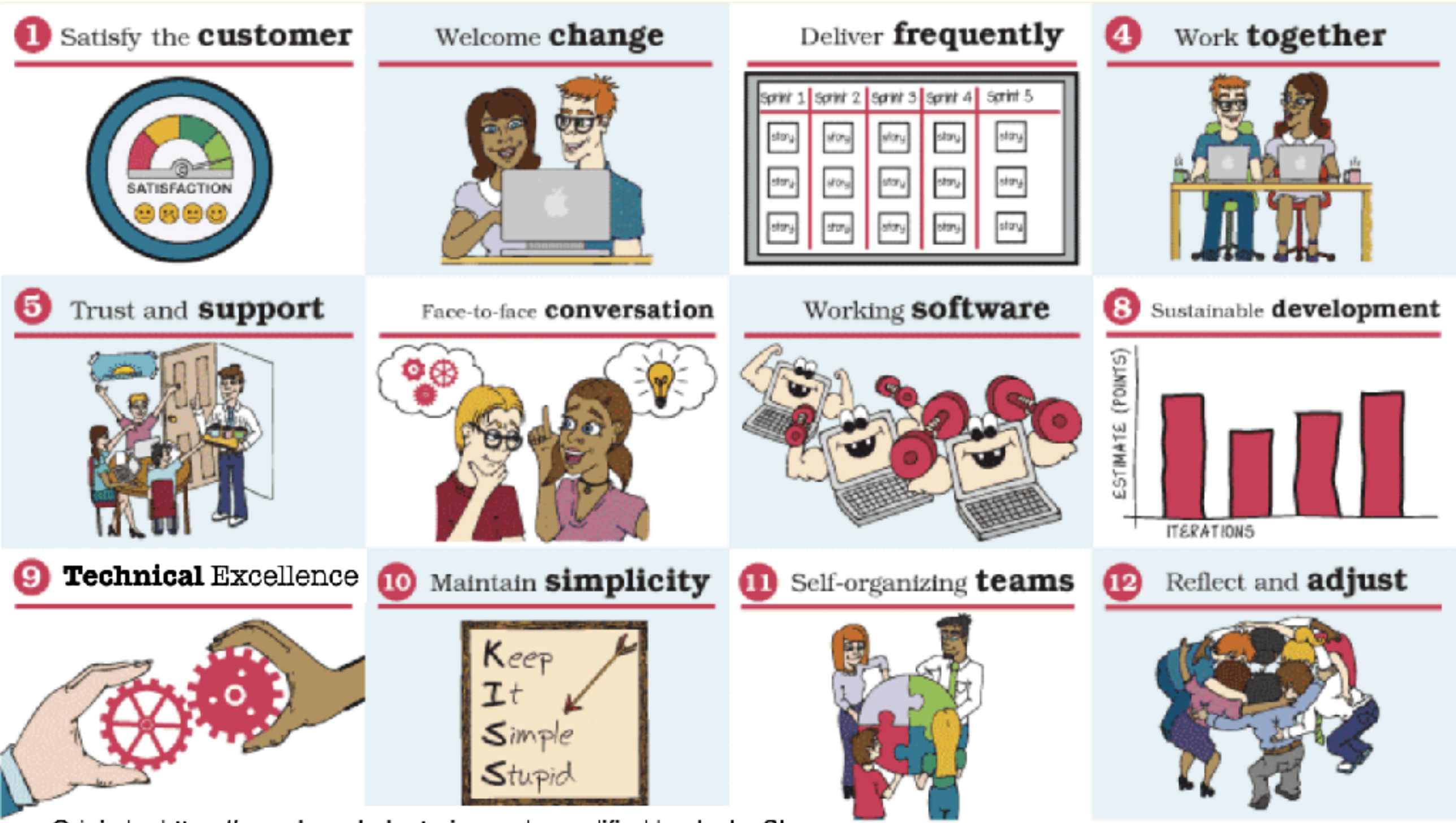
Agile principles



Origin by https://www.knowledgetrain.co.uk, modified by Jacky Shen

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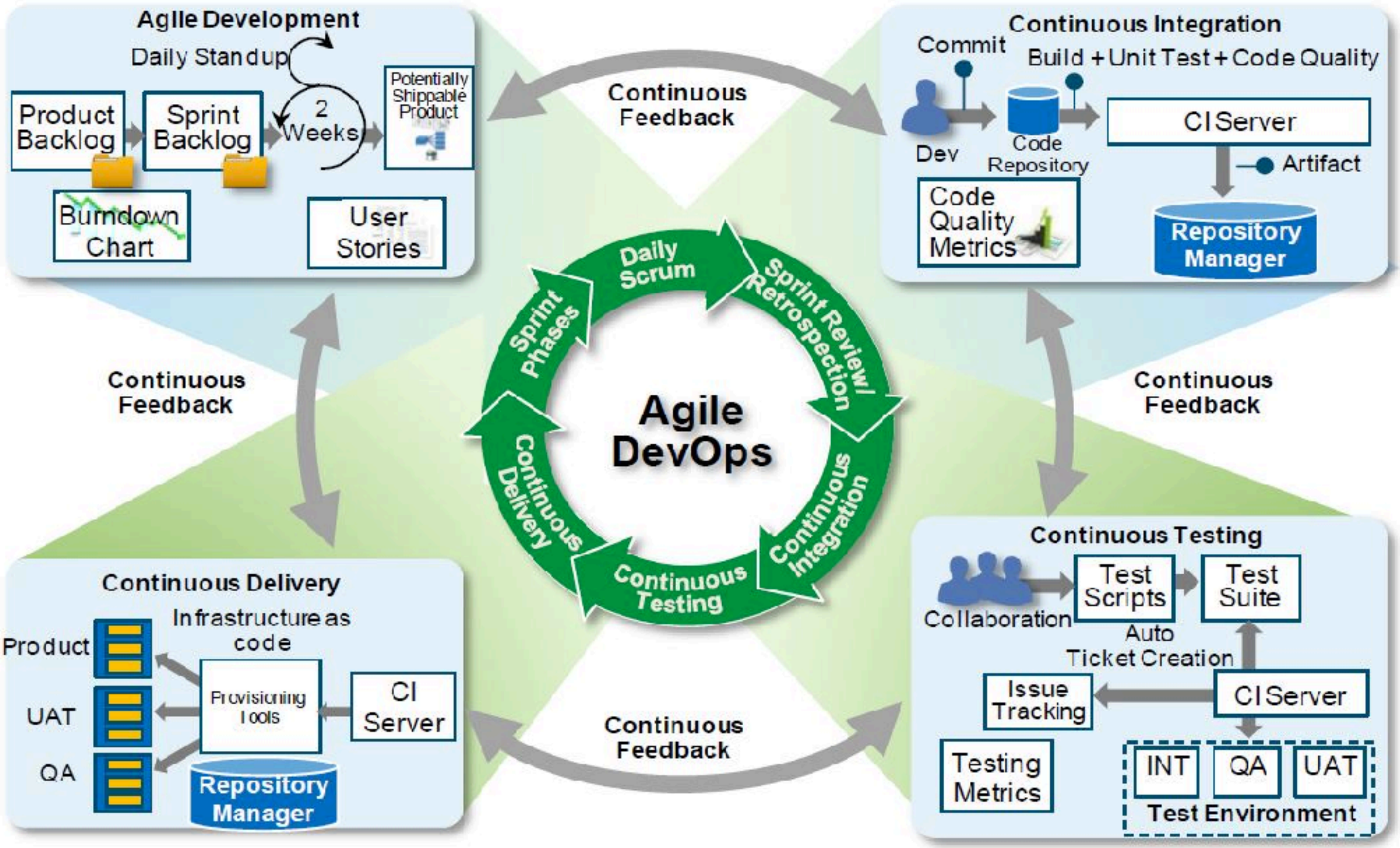

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Continuous Improvement

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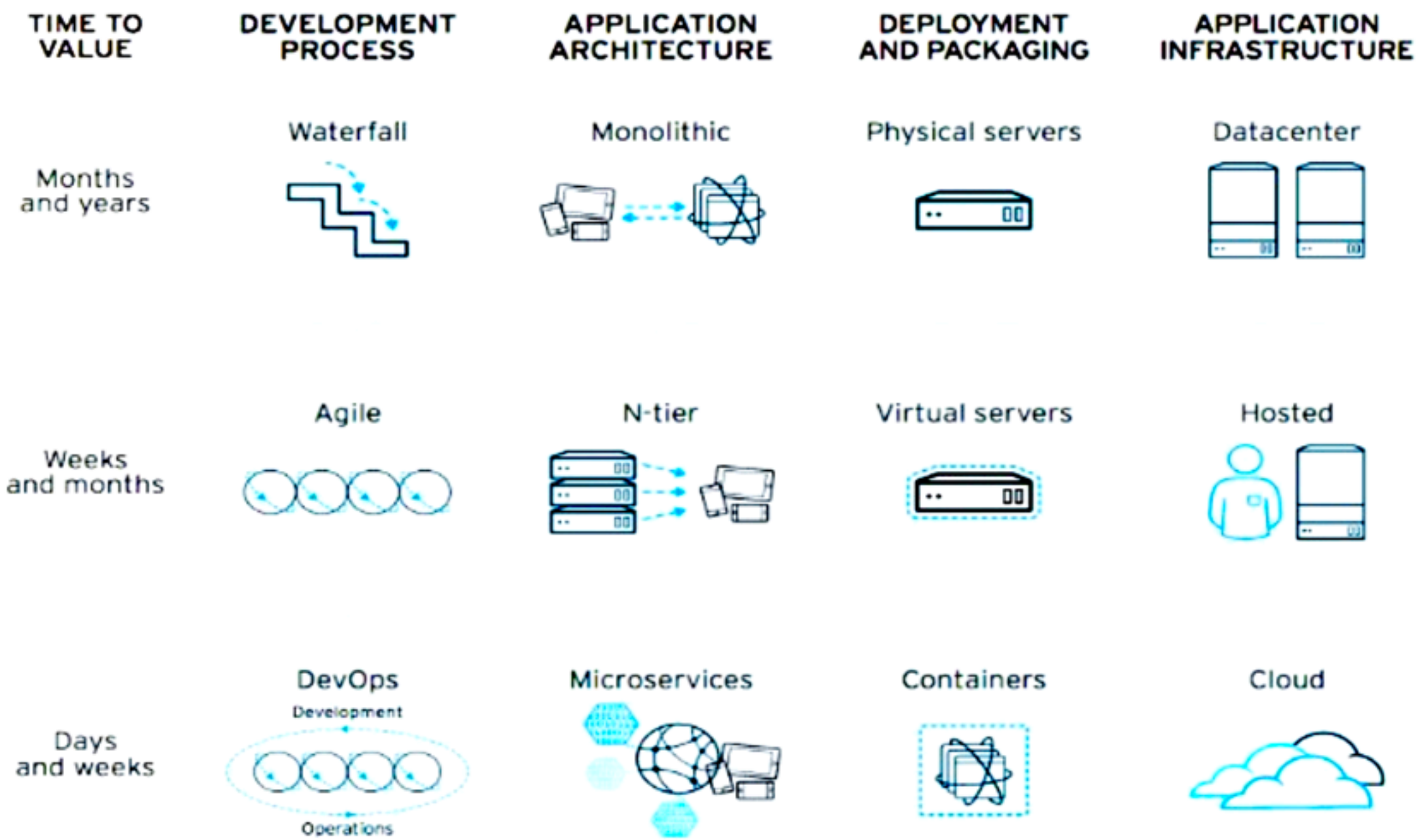
Improve Time to Value



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