

DevOps





Somkiat Puisungnoen

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When did you work at Opendream? X

... 22 Pending Items

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What's on your mind?

Public Post

Intro

Software Craftsmanship

Software Practitioner at สยามชั่นนาคุกิจ พ.ศ. 2556

Agile Practitioner and Technical at SPRINT3r

Somkiat Puisungnoen 15 mins · Bangkok ·

Java and Bigdata

This image shows a screenshot of a Facebook profile page for 'Somkiat Puisungnoen'. The top navigation bar includes the Facebook logo, the user's name, a search bar, and profile picture. Below the profile picture is a collage of several photos, with one prominent photo of a man in a white t-shirt flexing his biceps. The main menu below the collage includes 'Timeline', 'About', 'Friends 3,138', 'Photos', and 'More'. On the left, there's a sidebar with a pending items section and an 'Intro' section listing professional roles. The right side features a status update input field and a recent post from the user about Java and Bigdata.



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Agenda

- Cloud Native Application
- Overview of DevOps
- DevOps cultures
- Unify process between Dev and Ops
- Continuous Integration
- Continuous Delivery/Deployment
- Continuous Testing



Agenda

- Configuration an management
- Release management
- Monitoring and feedback
- Unify process between Dev and Ops
- The Twelve Factors



Current Situation ?



Customers



“The Business”



Product Teams

Platform Teams

Infrastructure Teams

Operations Teams

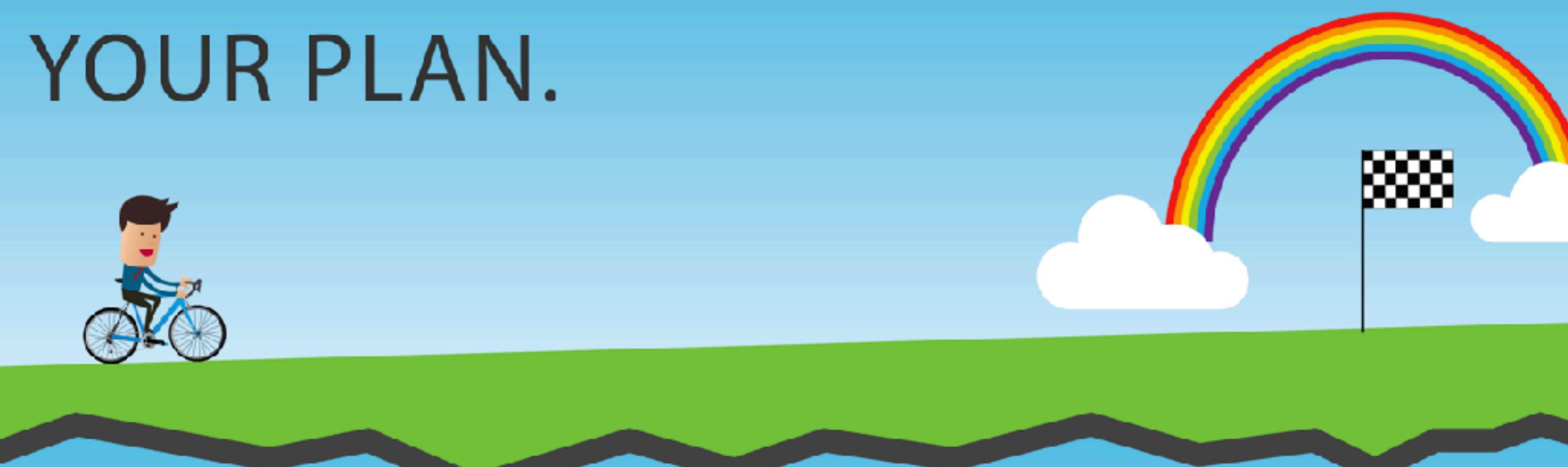


Google/Amazon

<https://bravenewgeek.com/>

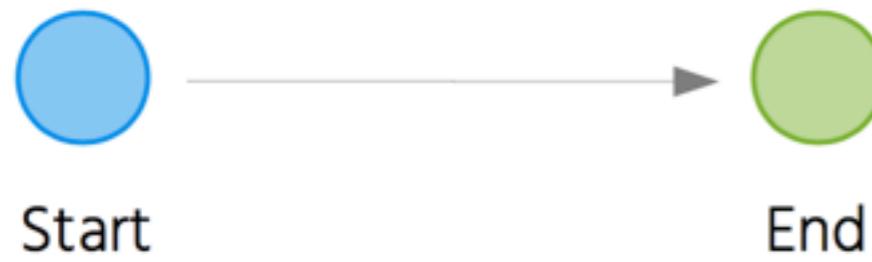


YOUR PLAN.

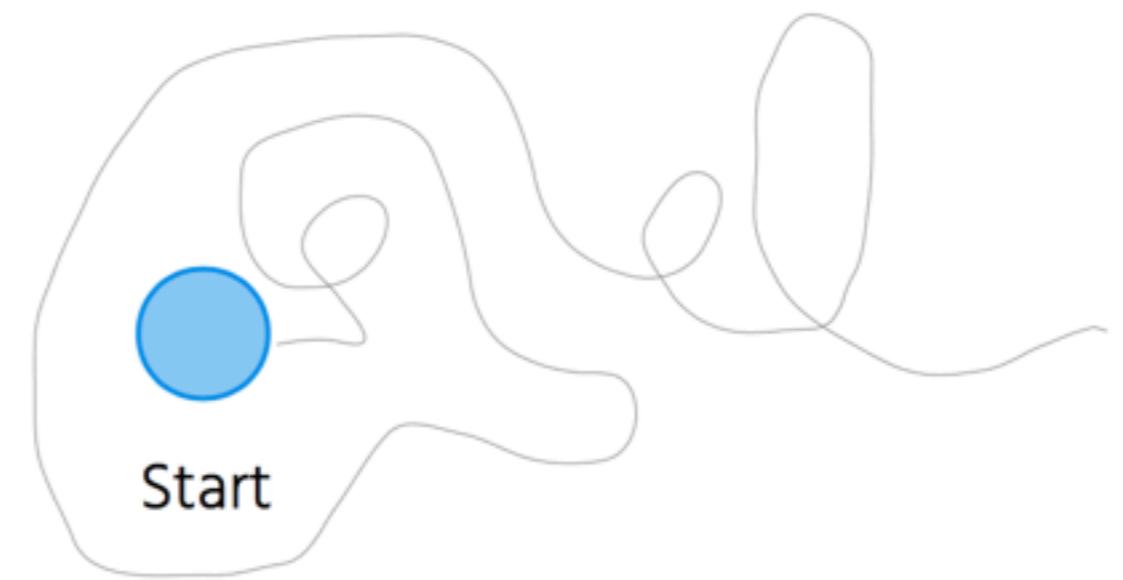


REALITY.





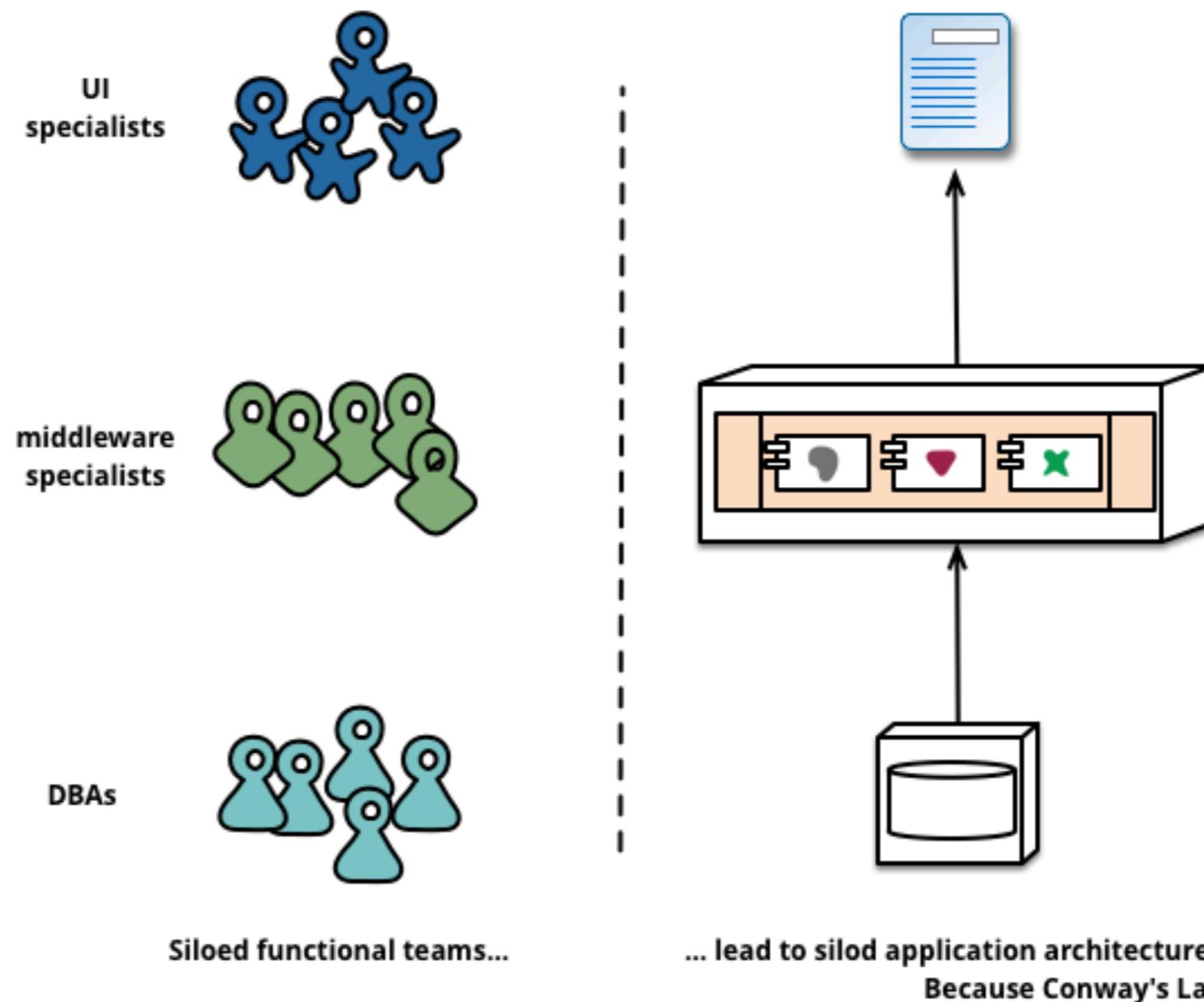
Theory



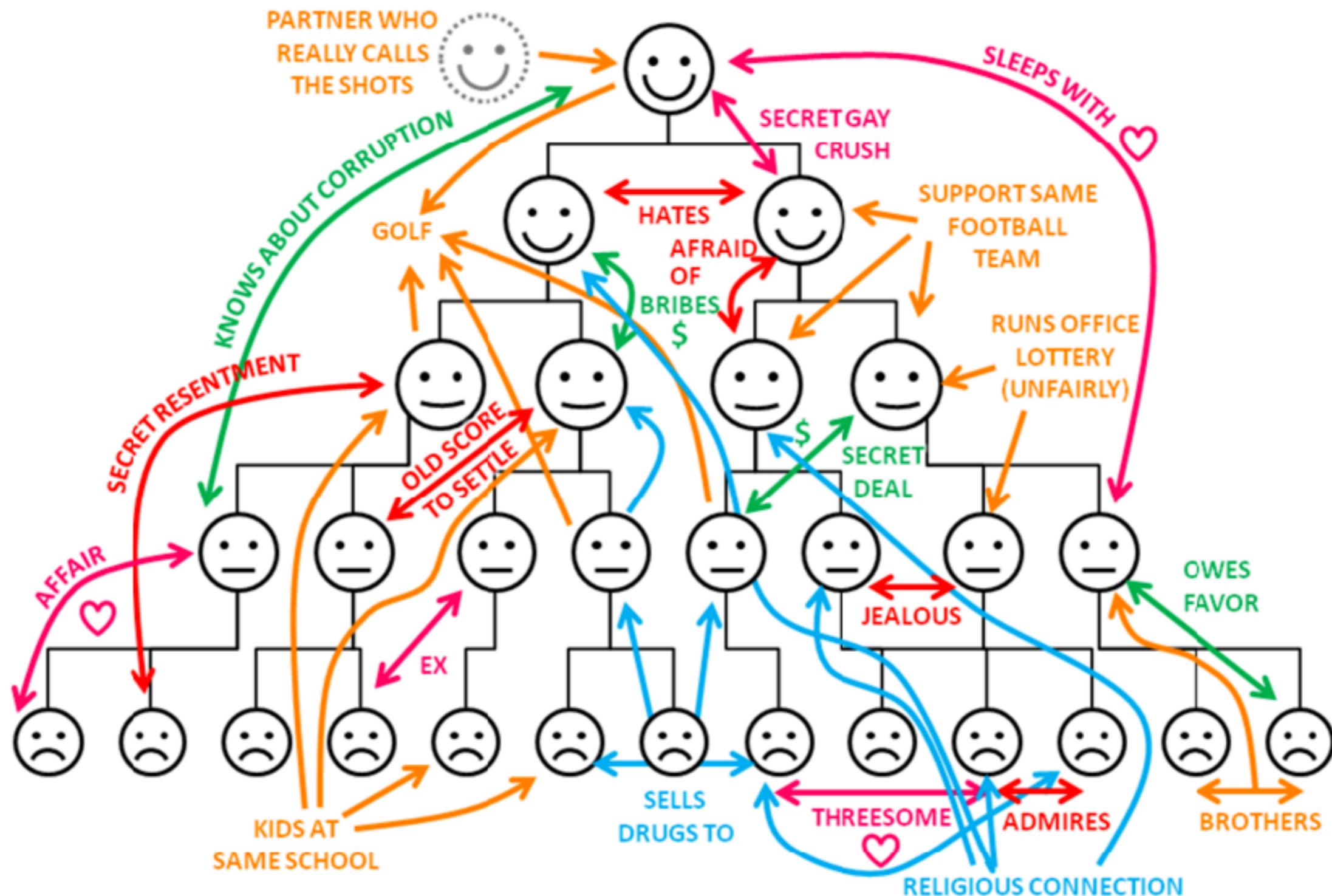
Reality



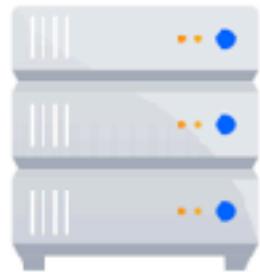
Conway's Law



Real Organization Chart



Problem ?



Grow Fat

Code base grows. All the things slow down.



Age

Your code base will become a jurassic park introducing new tech becomes hard



Ownership

Who is responsible for which part and more important: who has the pager



Economies of Scale

The bigger the team the more they interrupt each other

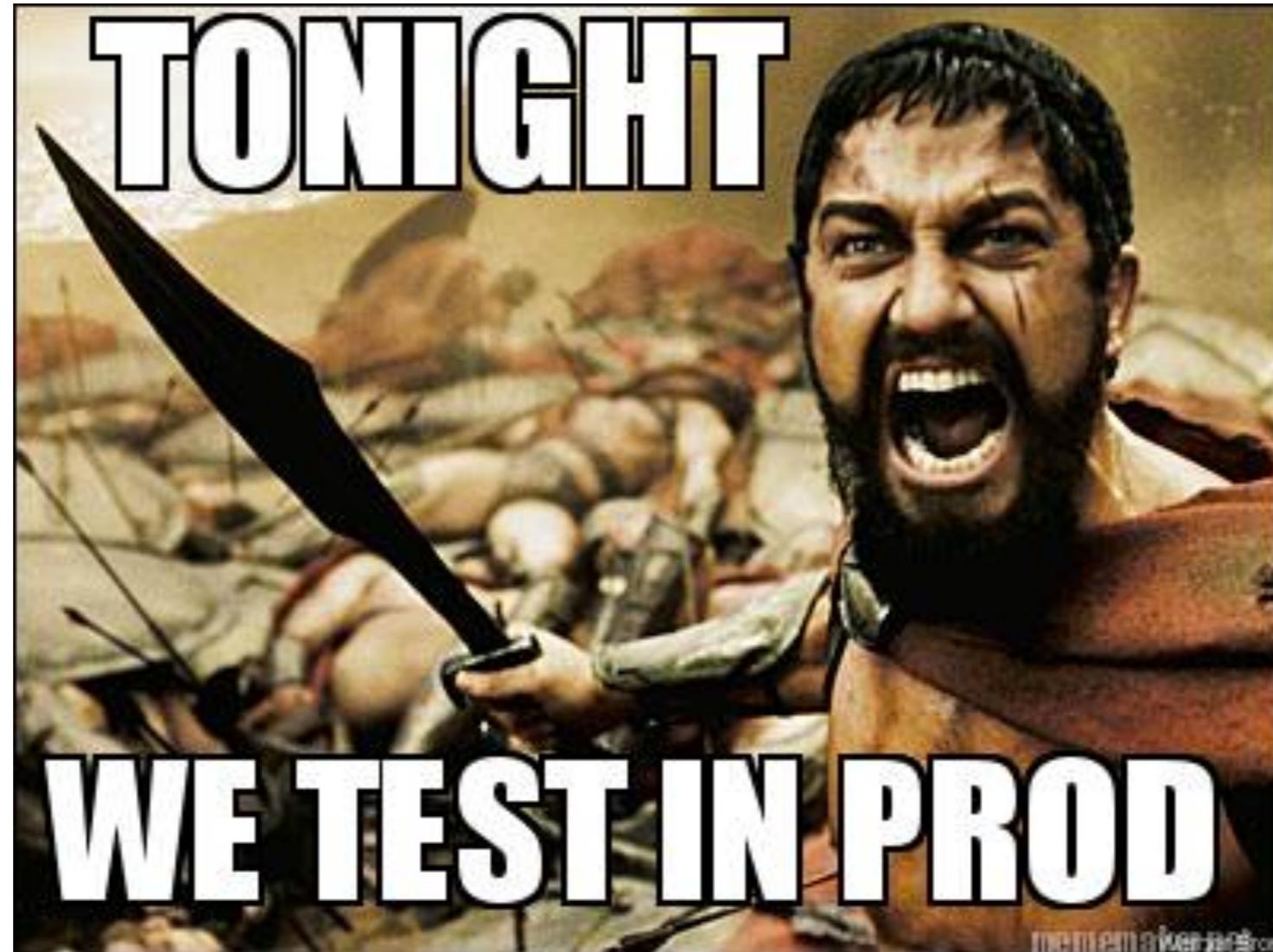
<https://trello.com/>



Problem ?



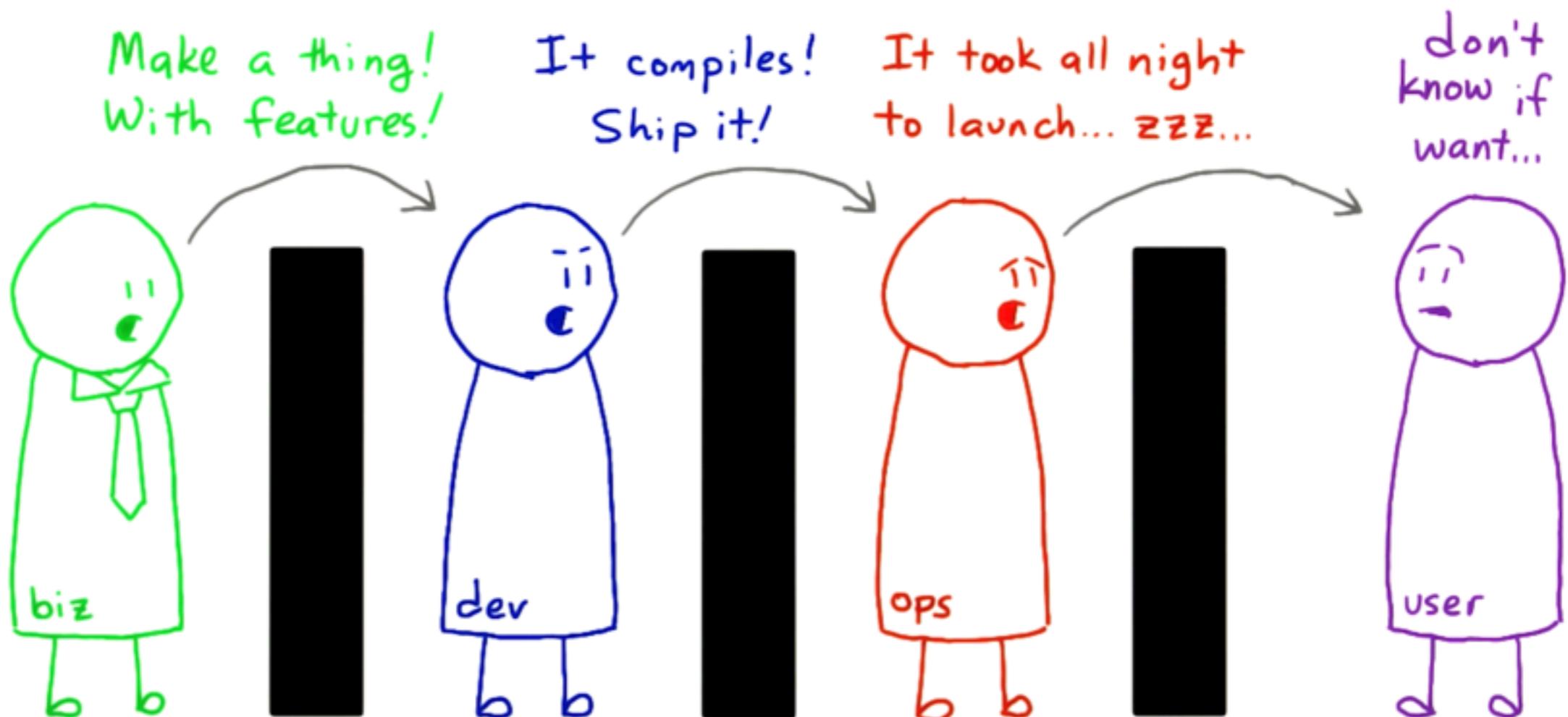
Problem ?



Problem ?



Problem ?



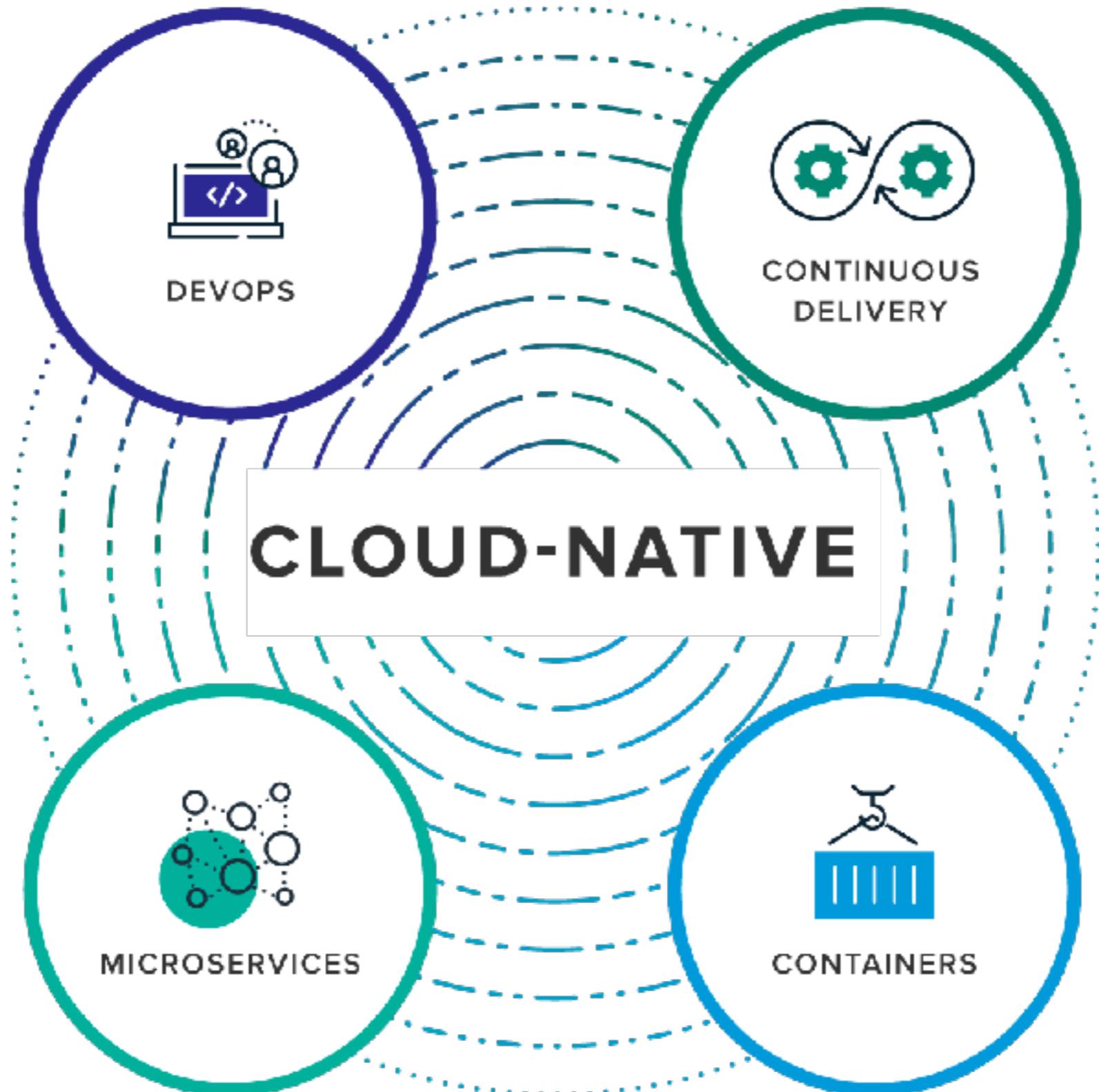
A photograph of a beach at sunset. The sky is a gradient from blue to orange and yellow. The ocean waves are breaking onto the shore. In the foreground, a couple is sitting on the sandy beach, facing each other. The overall atmosphere is peaceful and romantic.

$Trust = \frac{Consistency}{Time}$



We need Change





<https://pivotal.io/cloud-native>



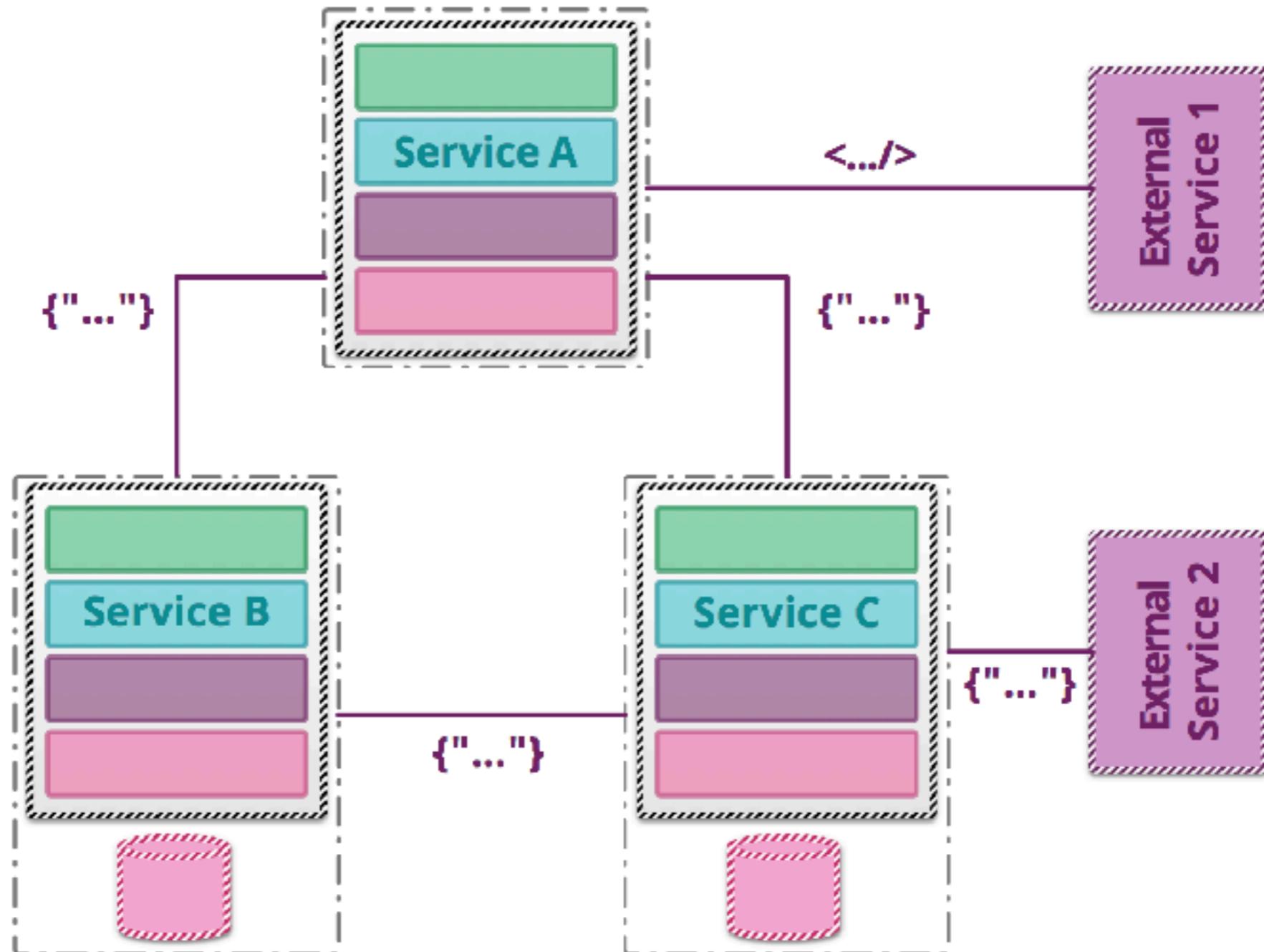
Let's start with basic



How to Test ?



Multiple services



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

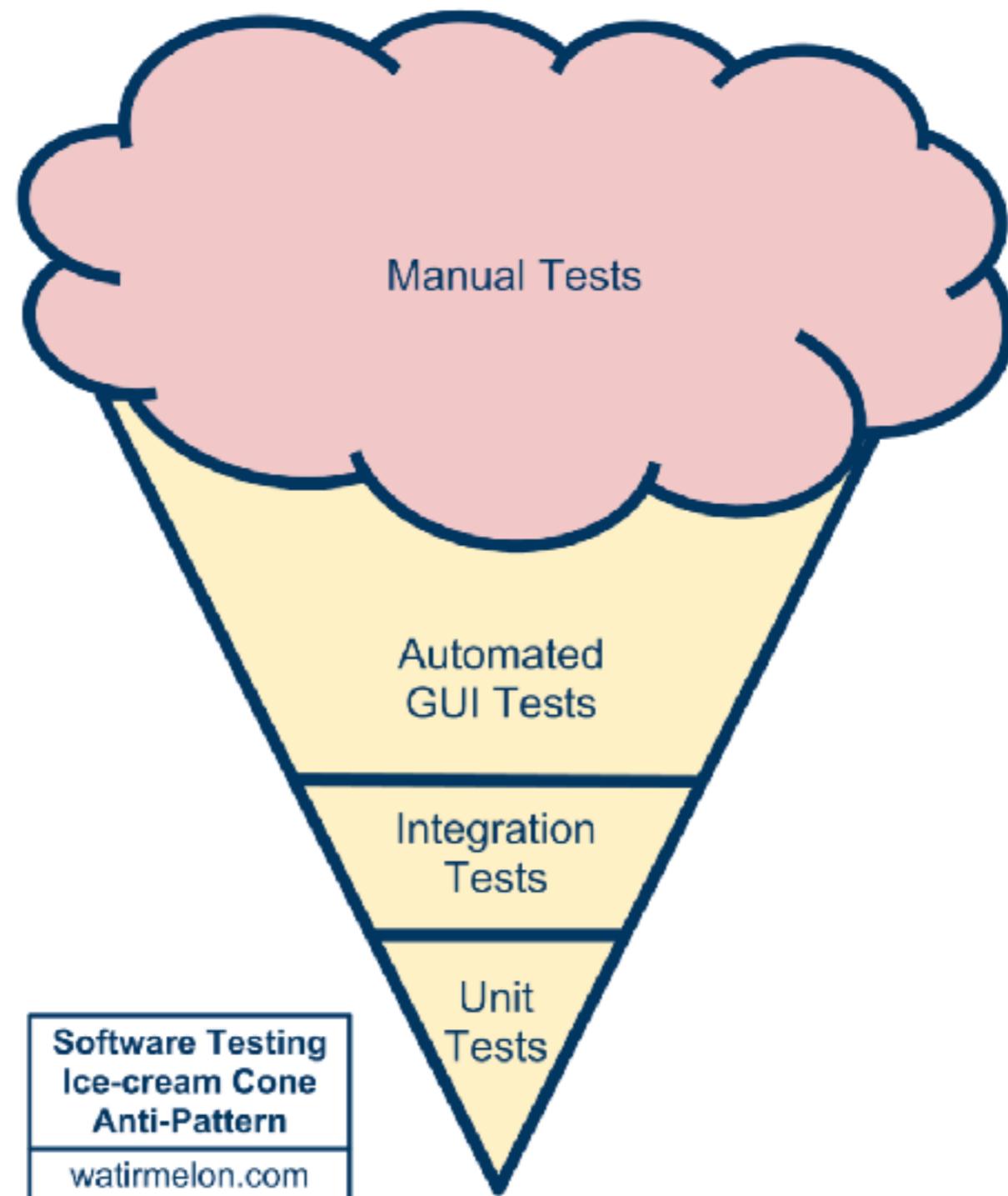


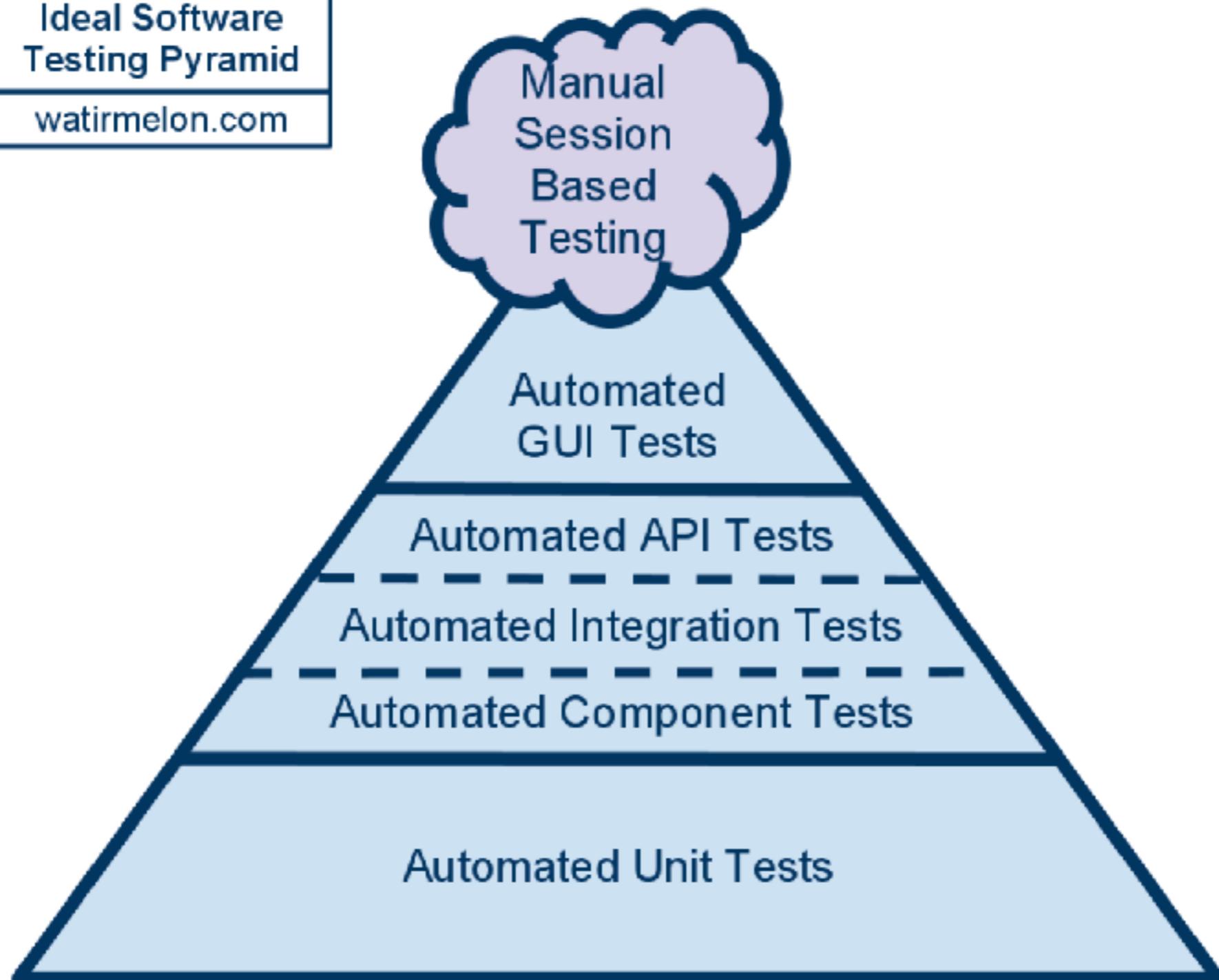
THE #1 PROGRAMMER EXCUSE
FOR LEGITIMATELY SLACKING OFF:
"TESTS ARE RUNNING"

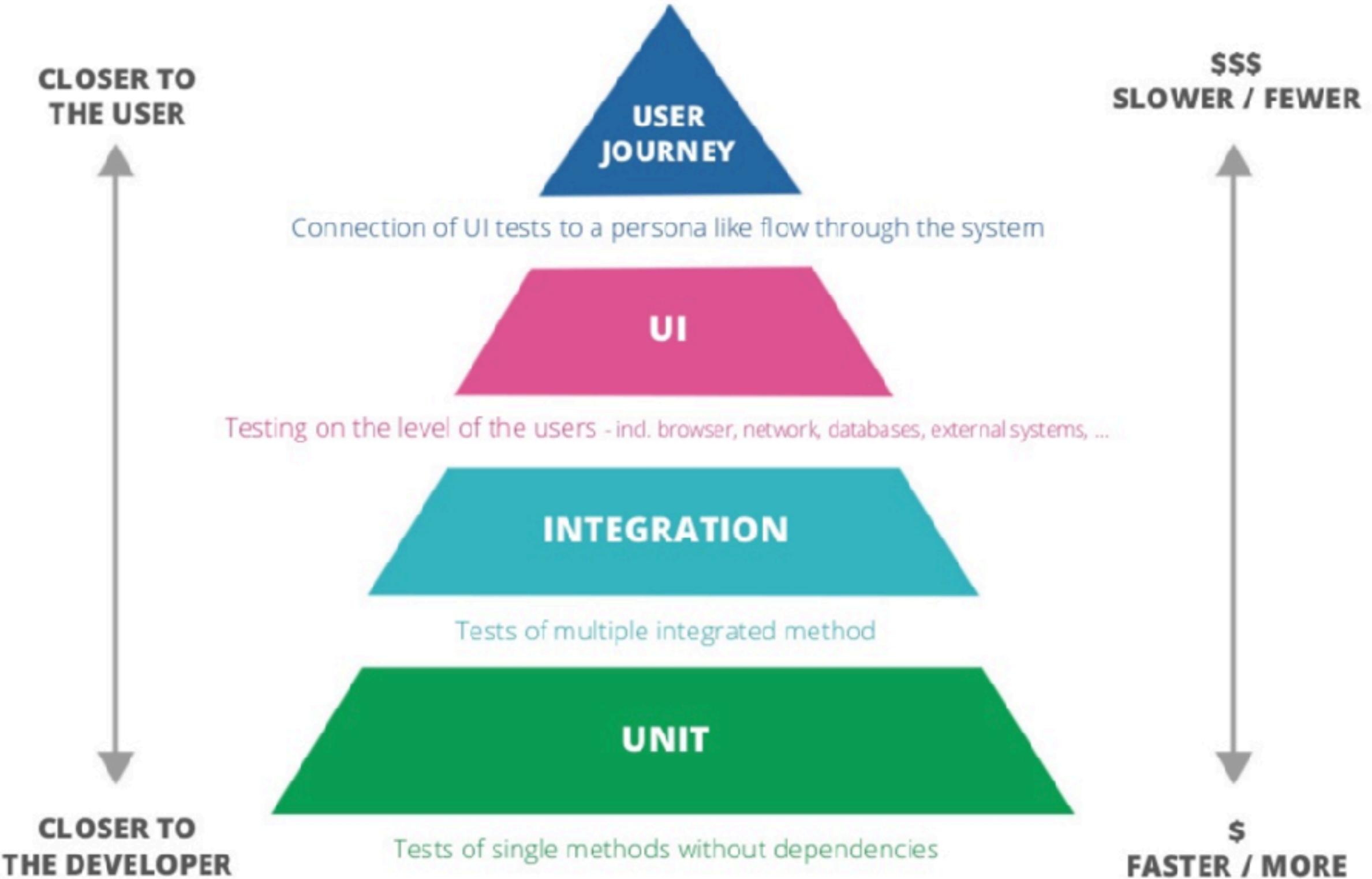


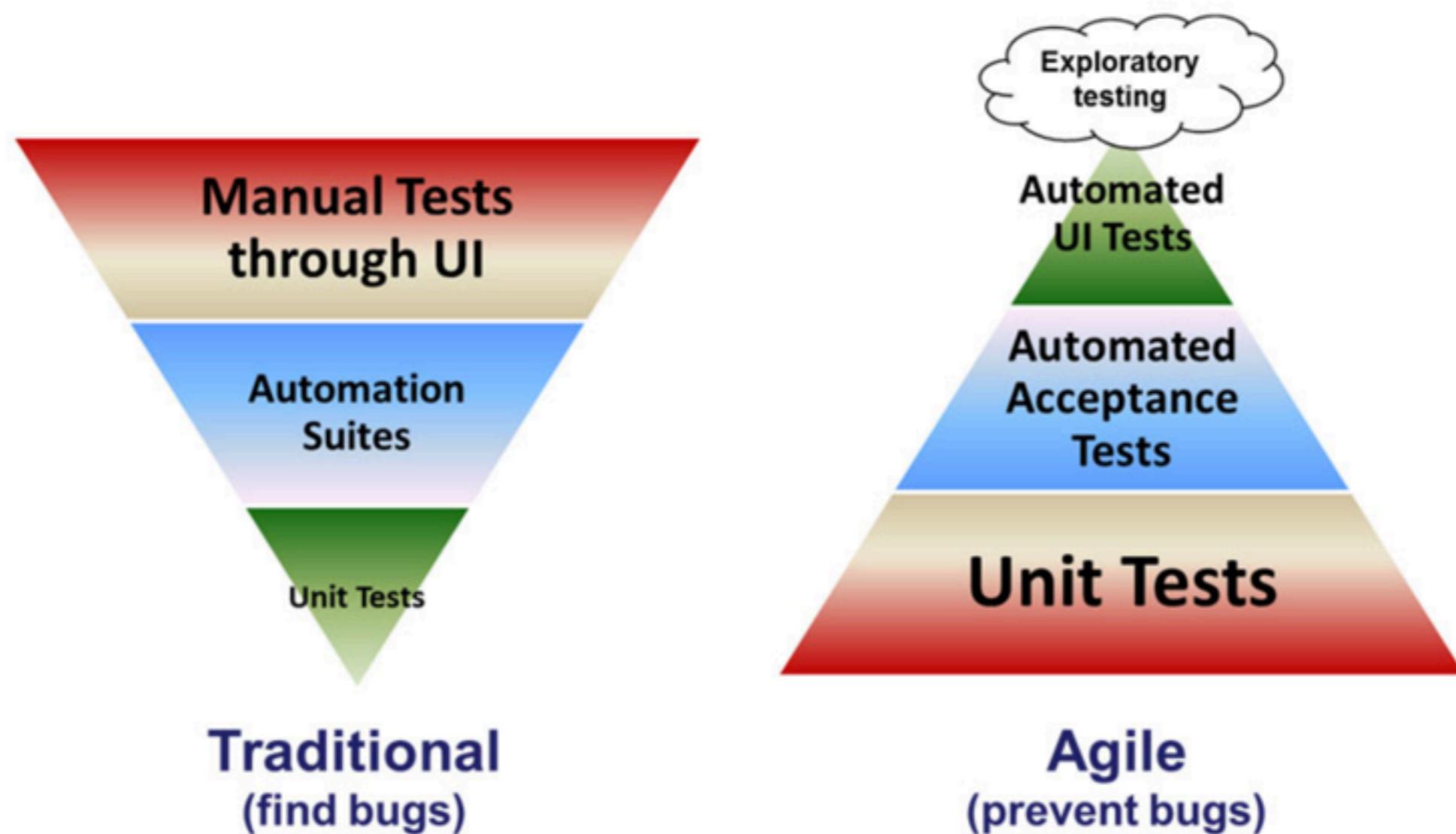
Testing

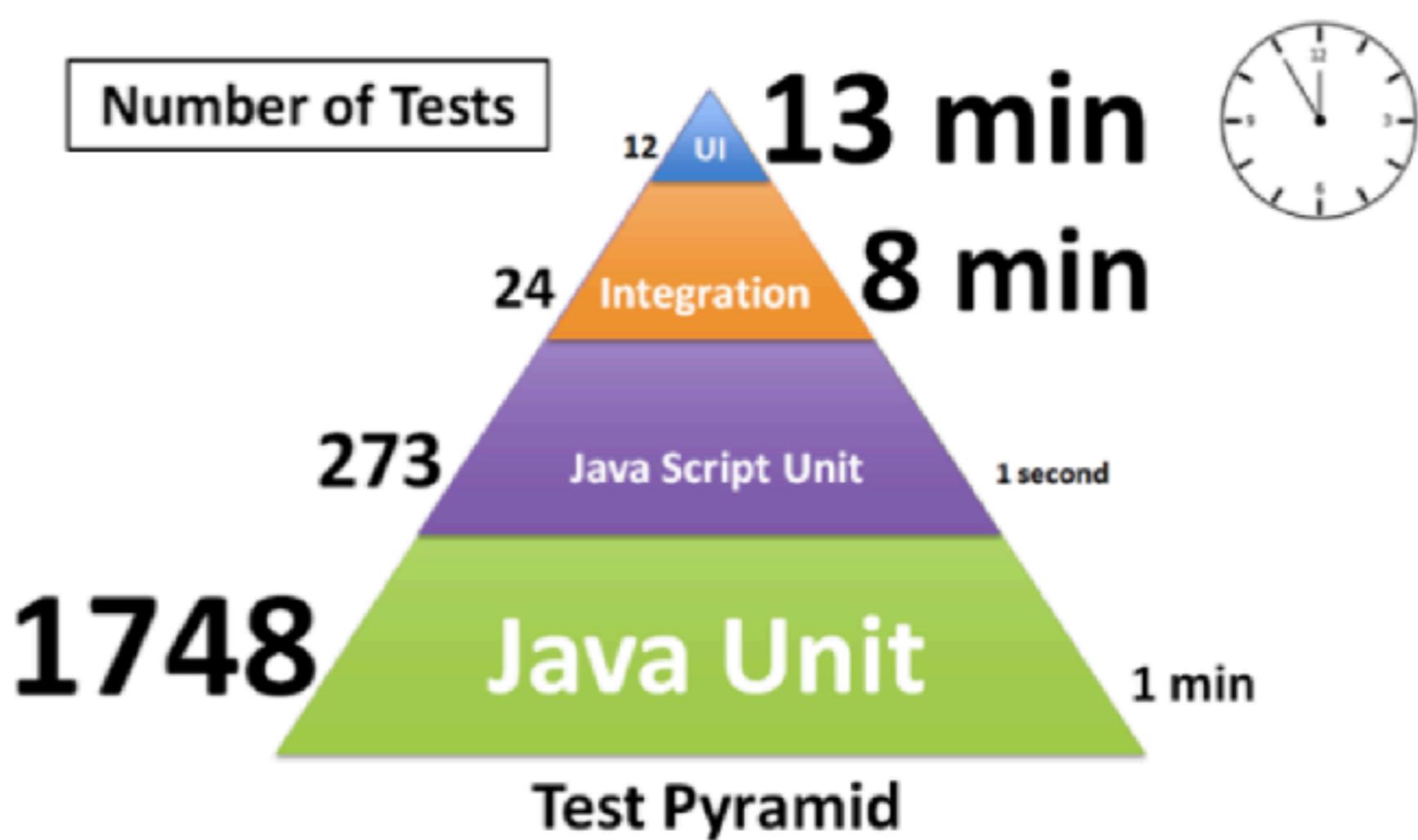






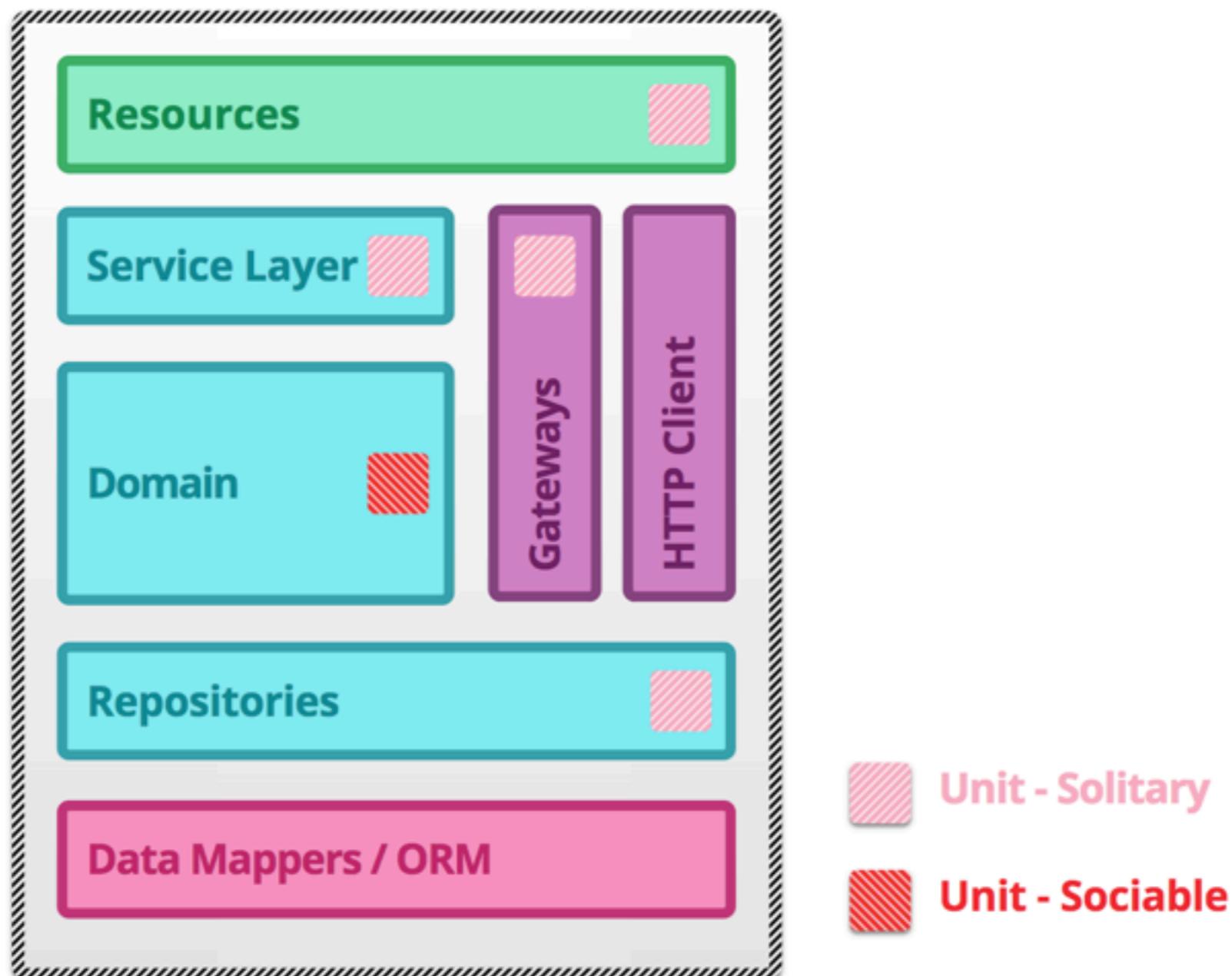




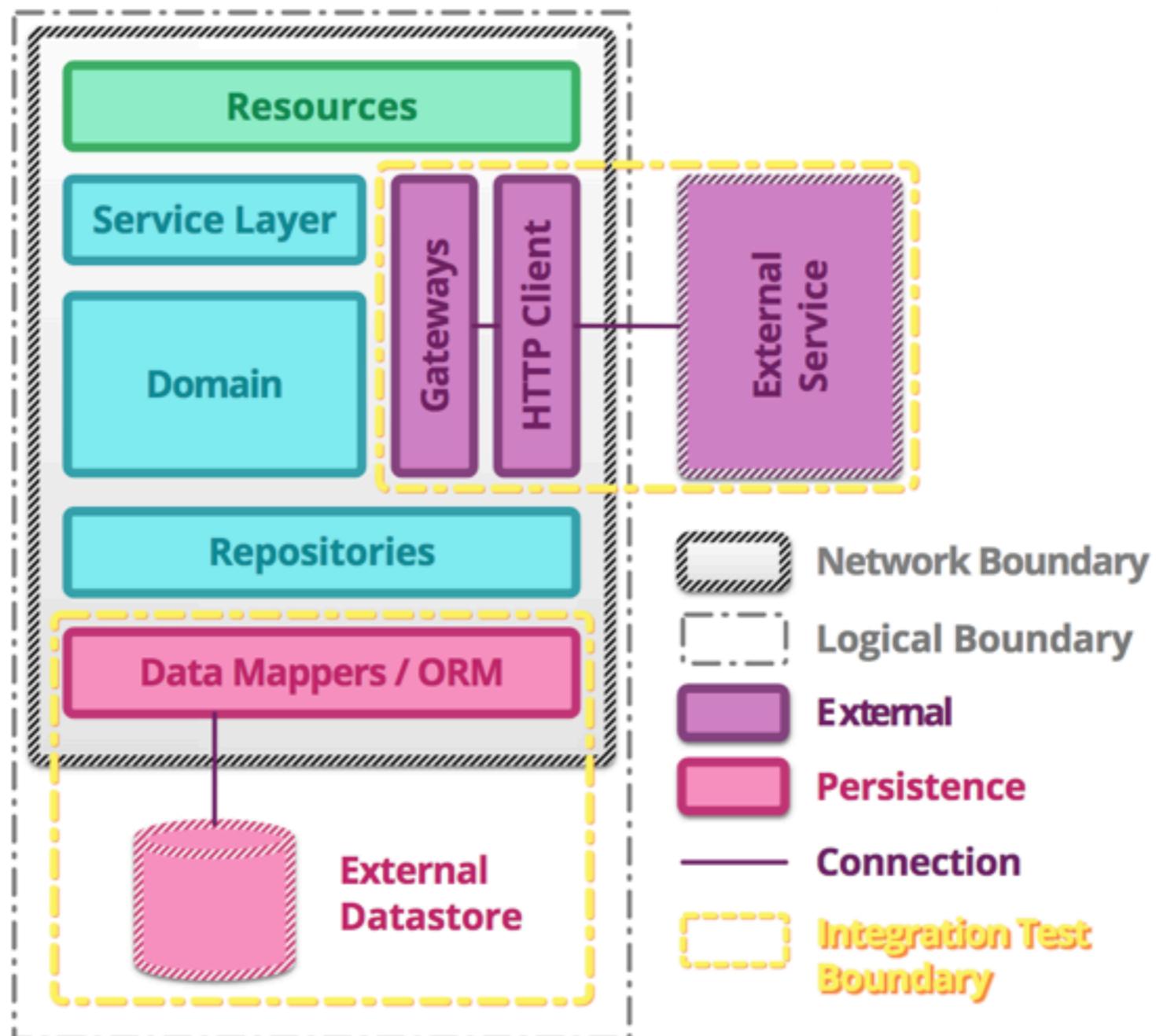




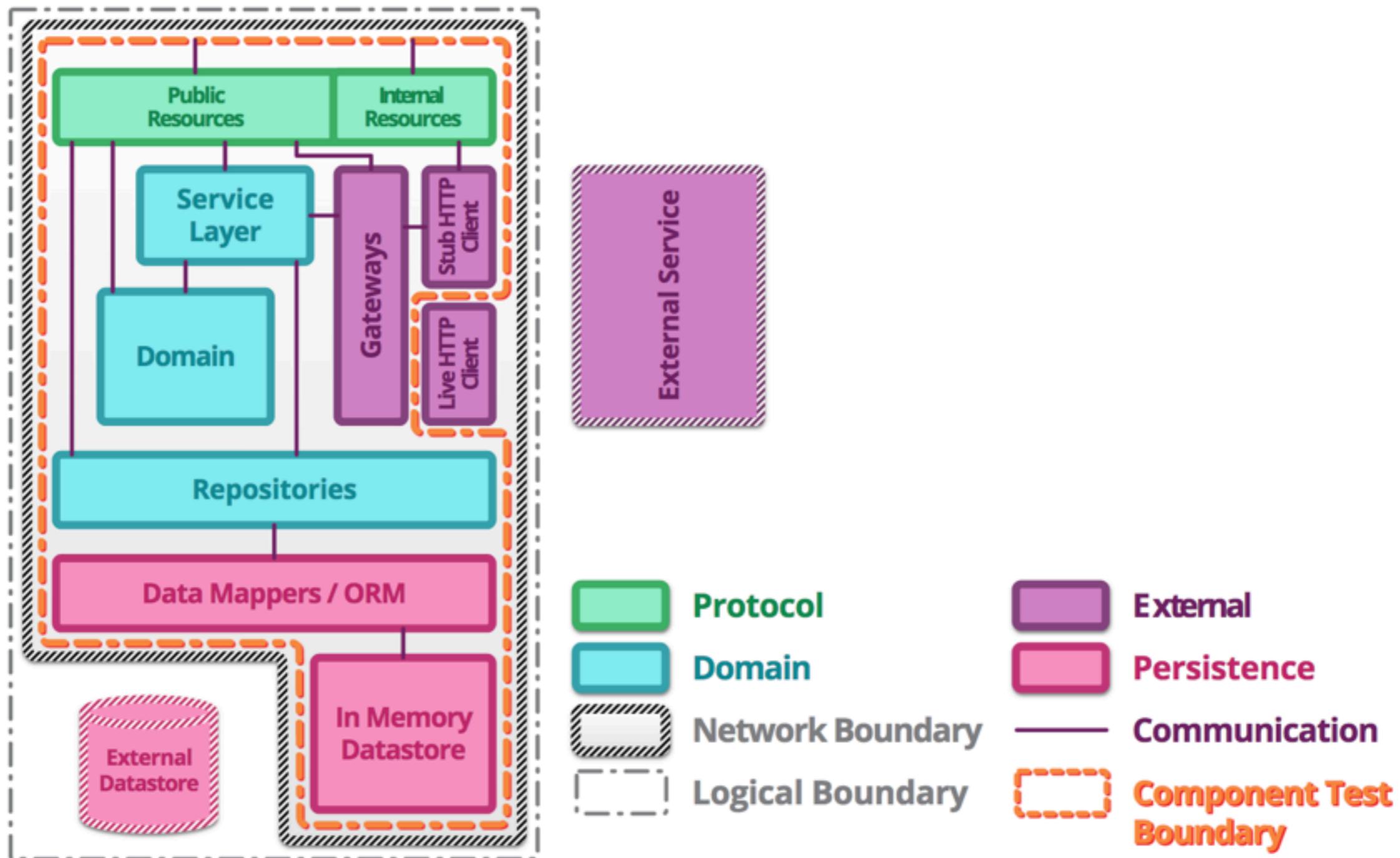
Unit testing



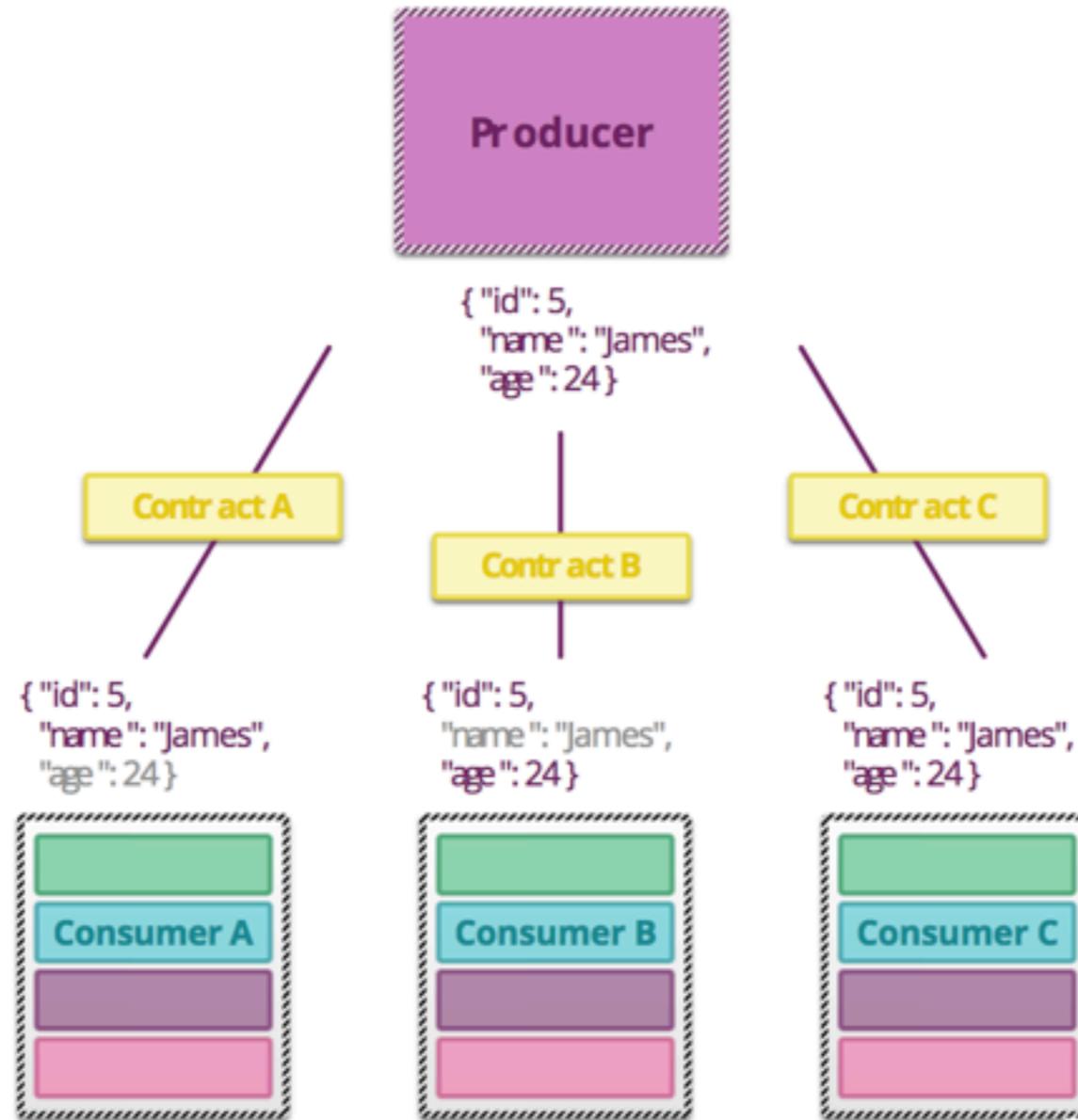
Integration testing



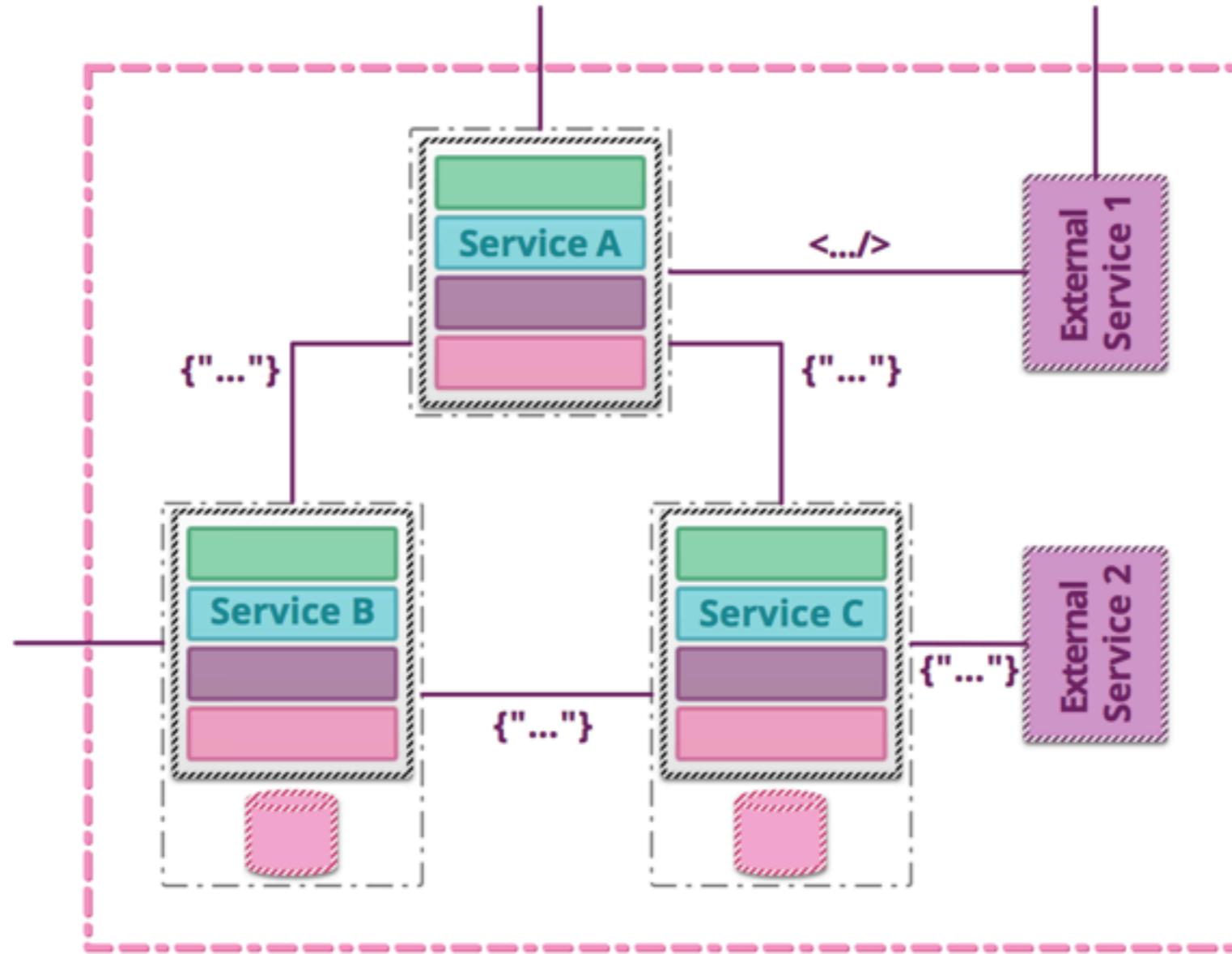
Component testing



Contract testing



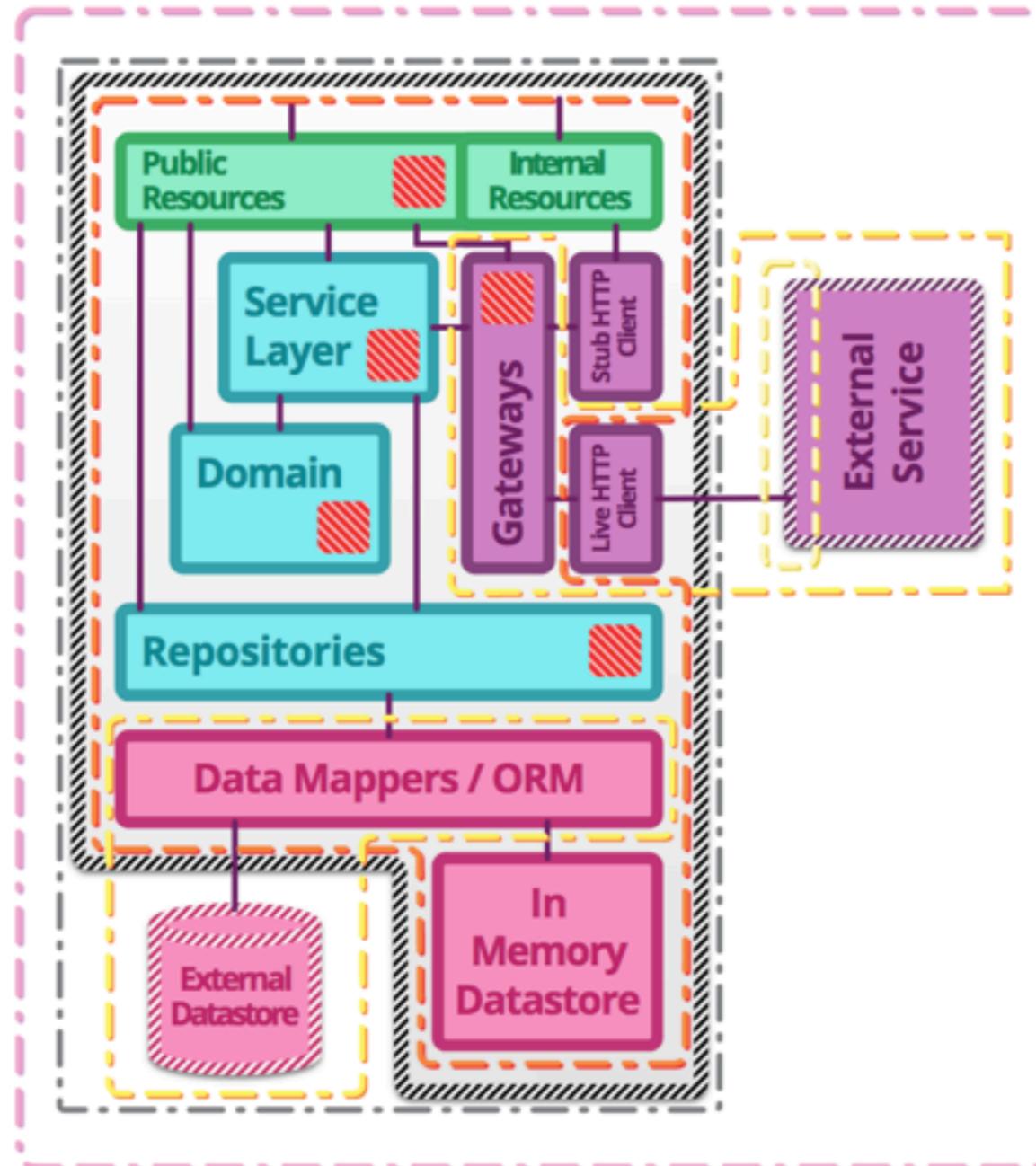
End-to-End testing



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.



What is your testing strategy ?



more ...



Performance testing ?



Security testing ?



How to Deploy ?



Deployment Smells



Requires a ticket

A ticket for the deployment team



Only one person

There is only one person in the team that owns it



Takes more than 15 mins

Setting it up should be quick and initial deployment should quick

<https://trello.com/>



Deployment

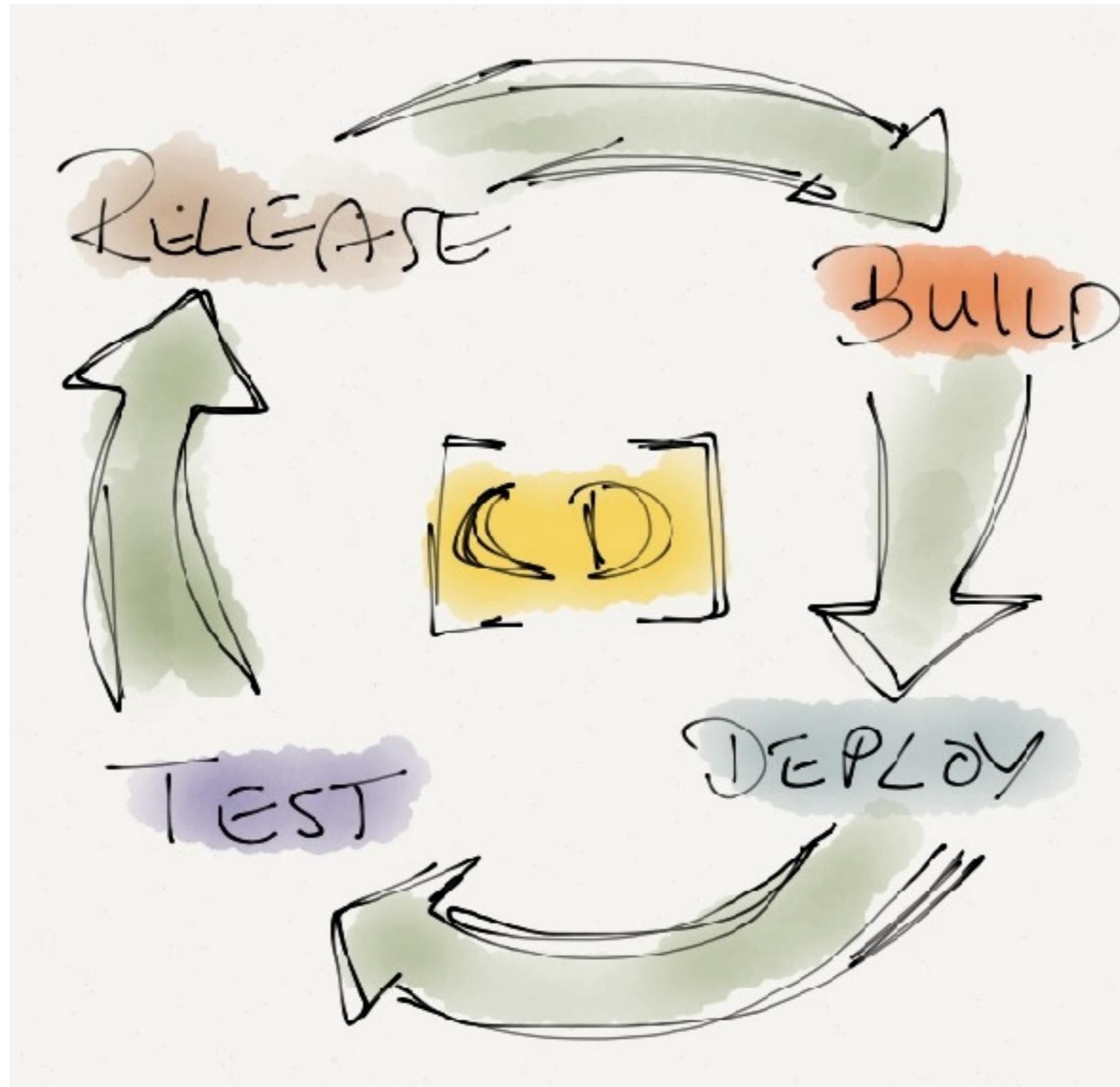




Deploy vs Release



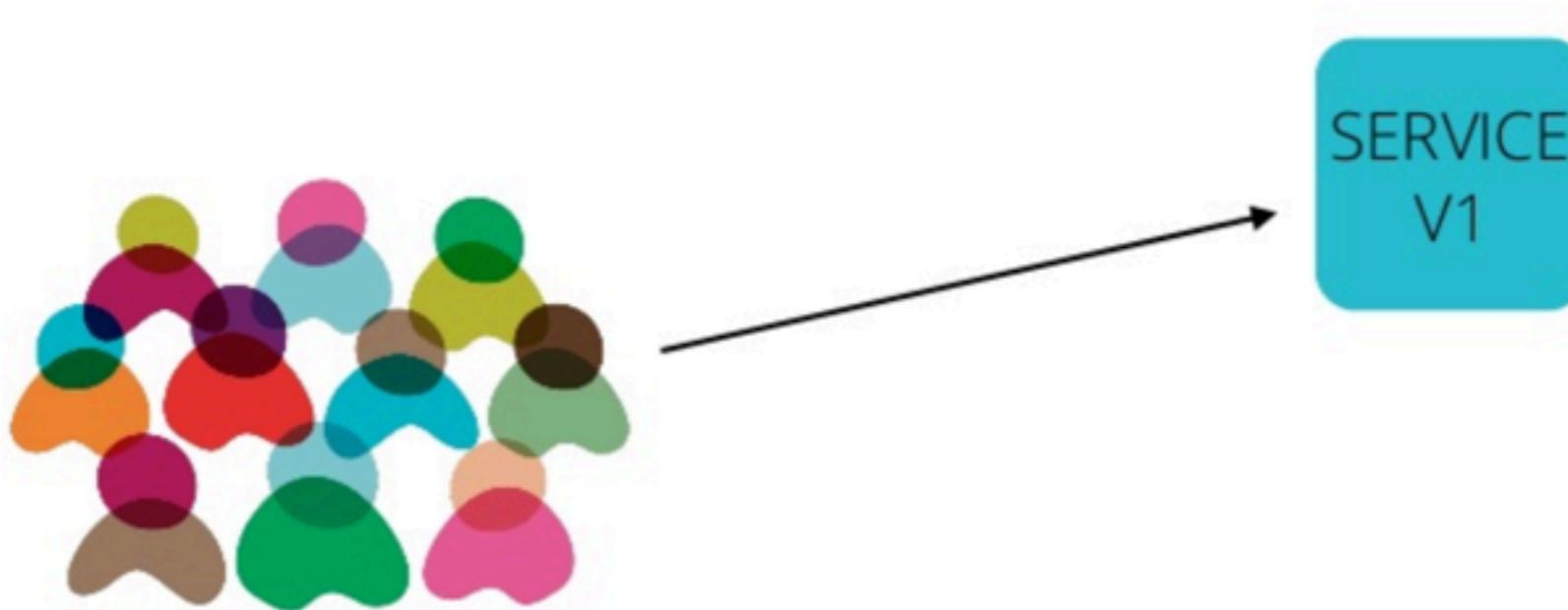
Deploy vs Release



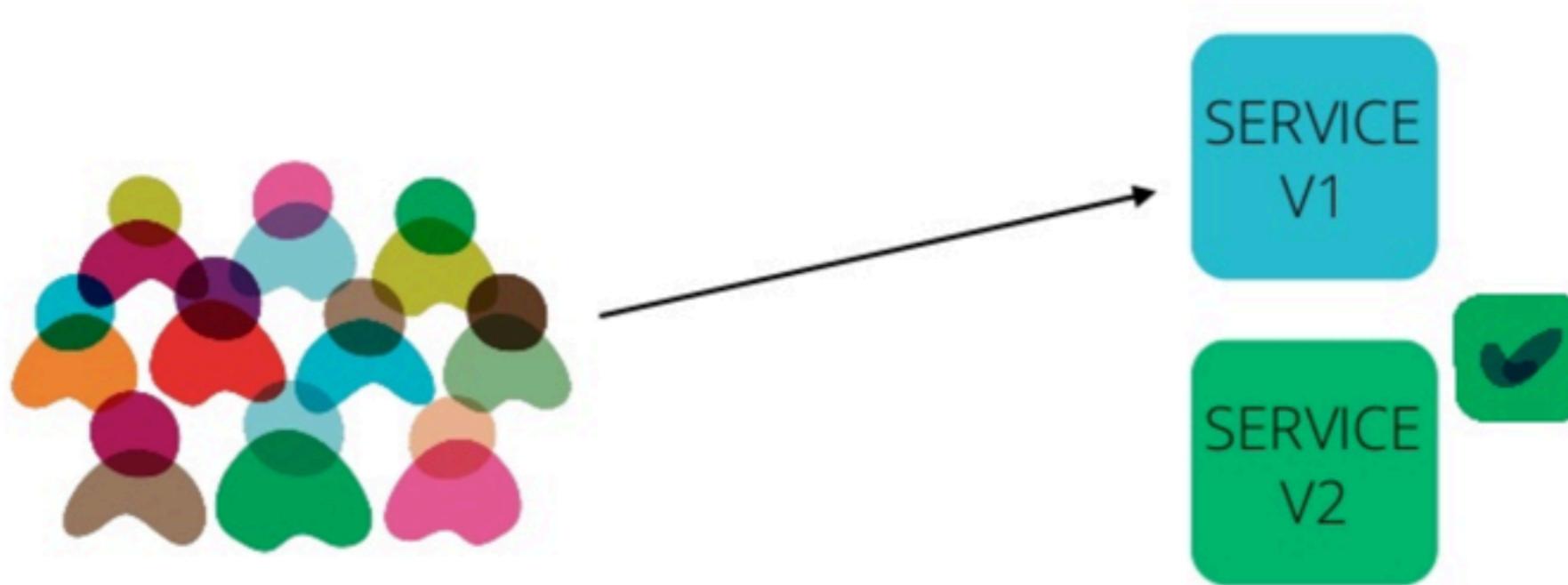
Blue Green Deployment



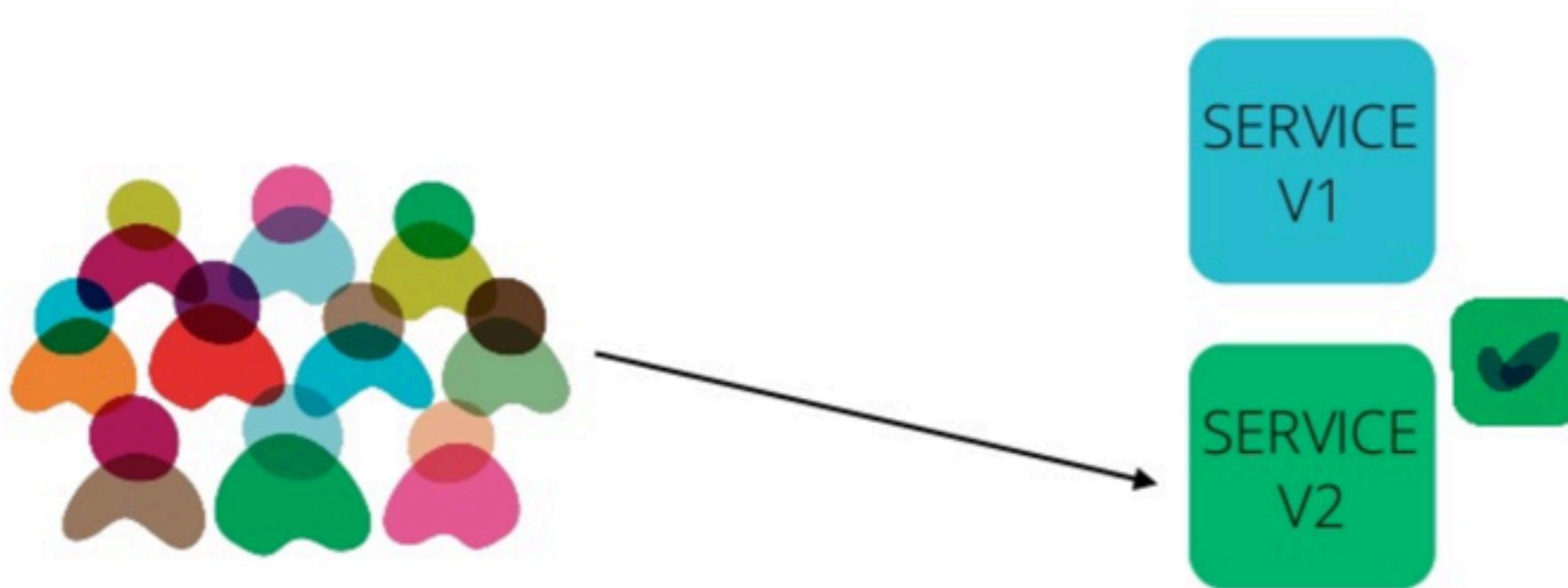
Blue Green Deployment



Blue Green Deployment



Blue Green Deployment



Canary Release



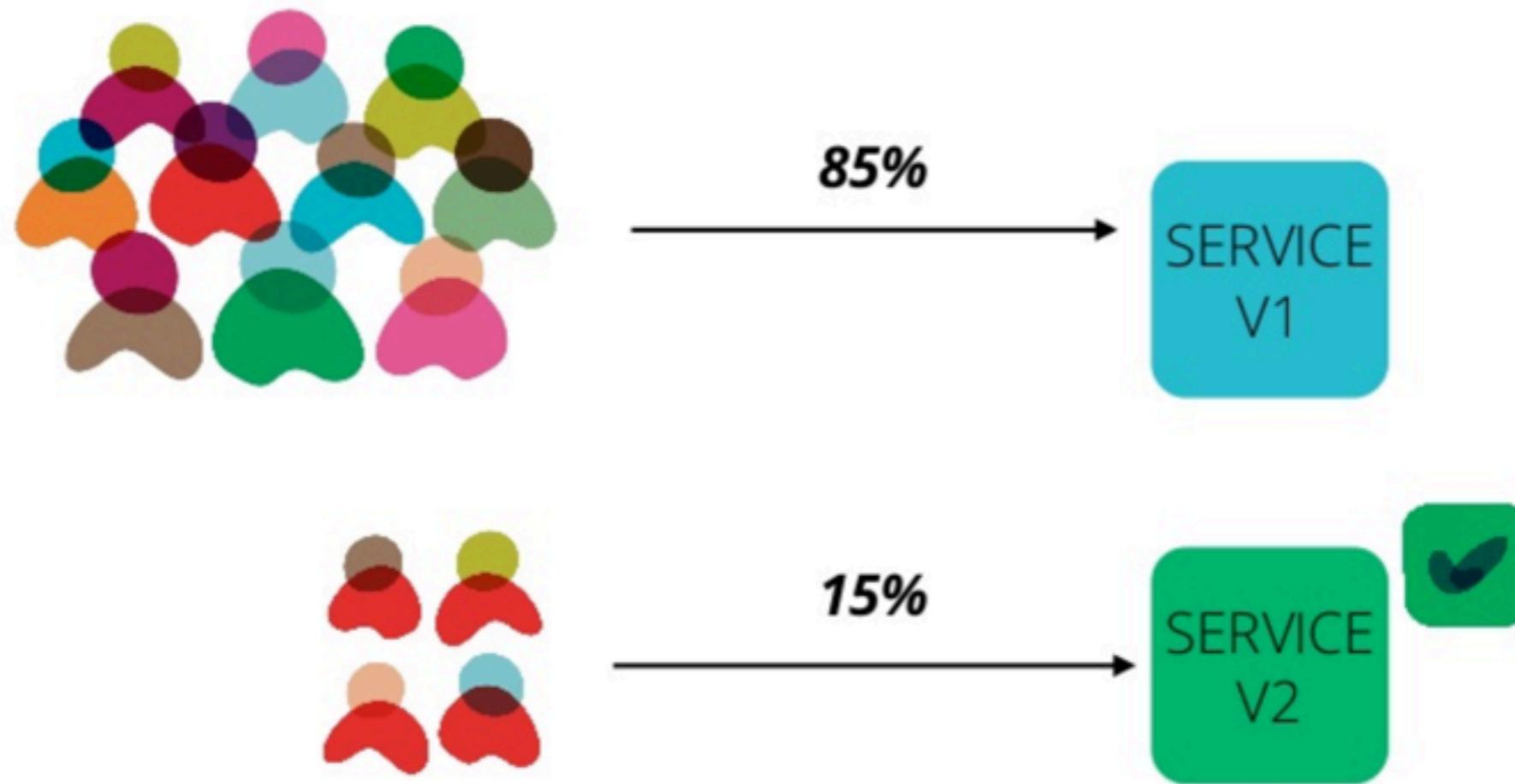
Canary Release



Canary Release



Canary Release



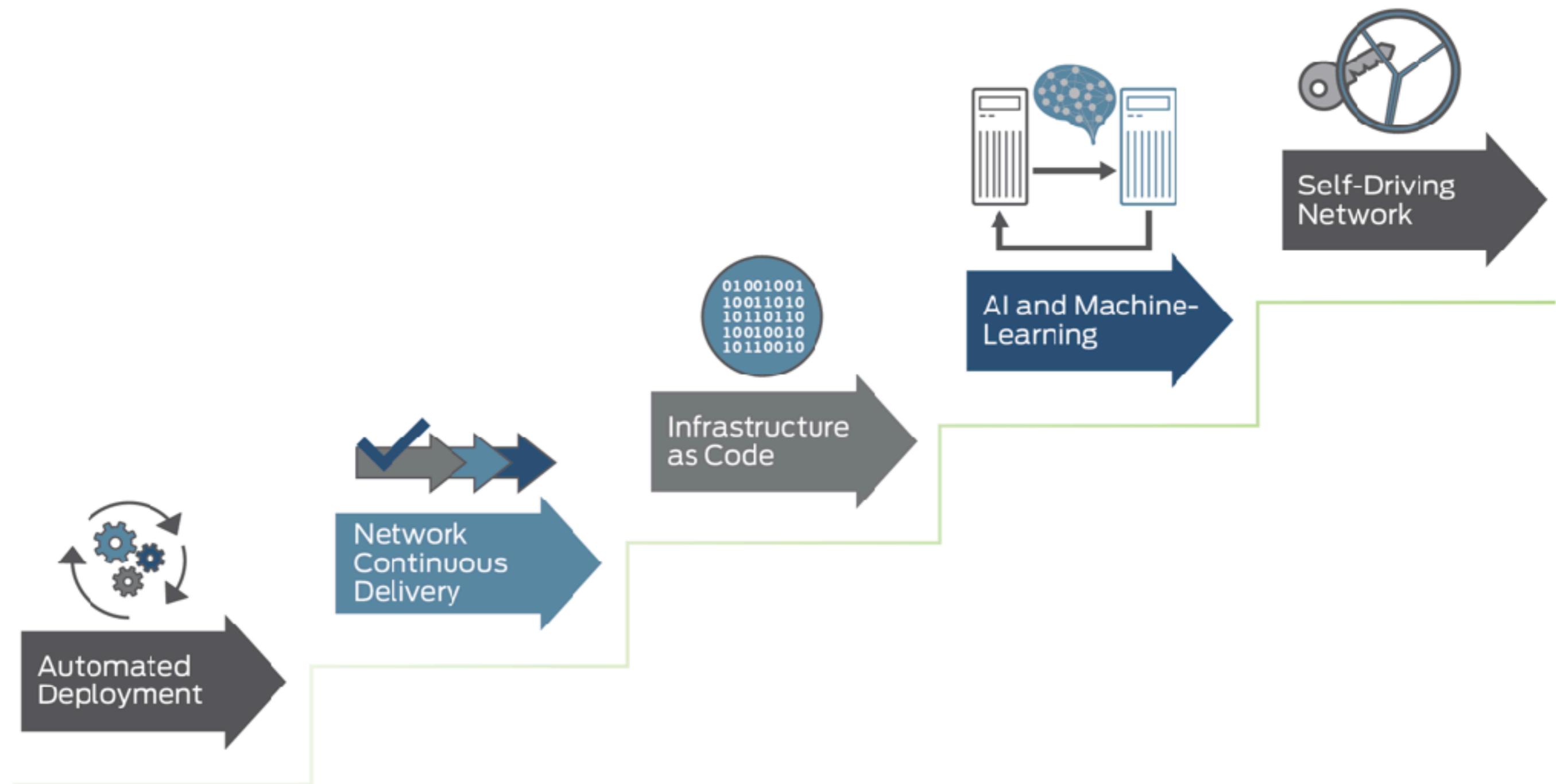
> 500 services !!



Declarative deployment

```
1 apiVersion: extensions/v1beta1
2 kind: Deployment
3 metadata:
4   name: webapp-deployment
5 spec:
6   replicas: 4
7   template:
8     metadata:
9       labels:
10      app: webapp-pod
11   spec:
12     containers:
13       - name: webapp
14         image: arungupta/wildfly-app:1
15     ports:
16       - containerPort: 8080
```





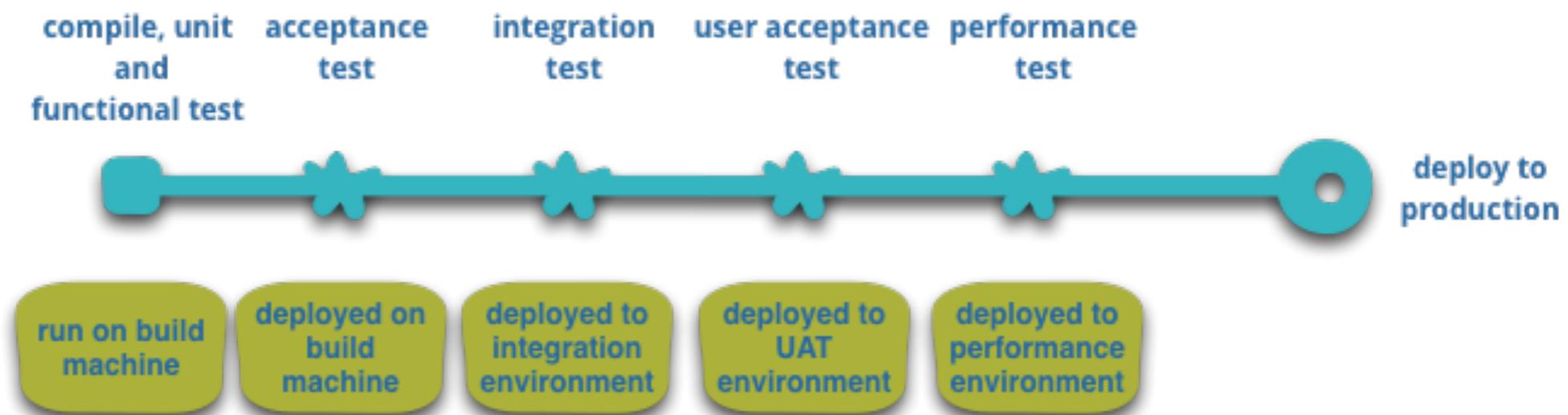
<https://www.juniper.net/us/en/products-services/what-is/iac/>



Current situation !!

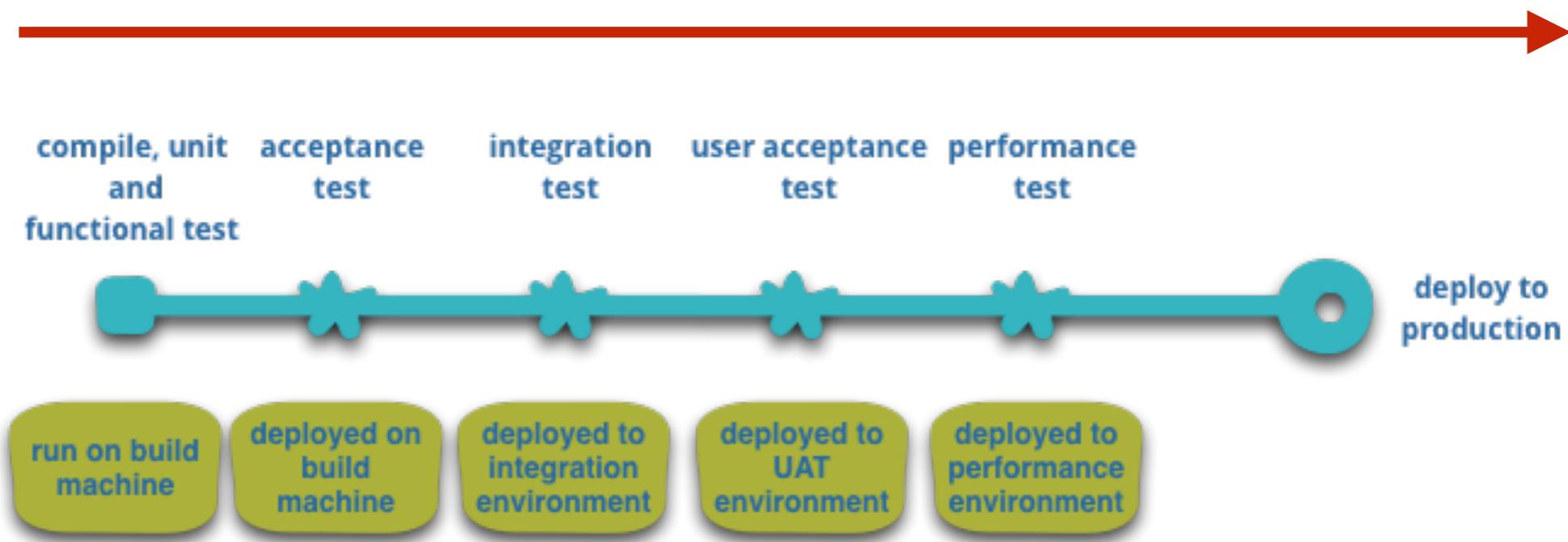


Infrastructure Automation

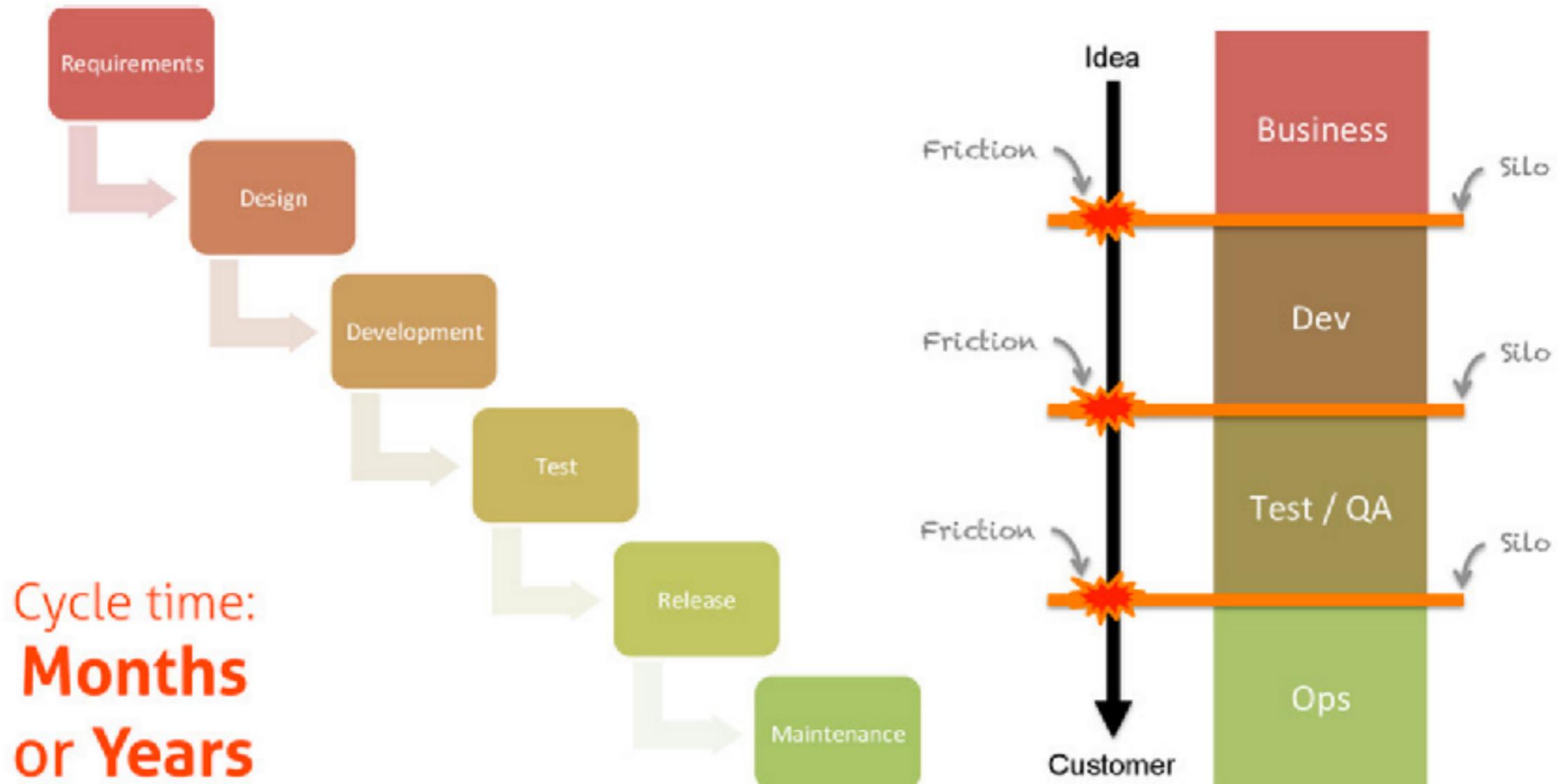


Infrastructure Automation

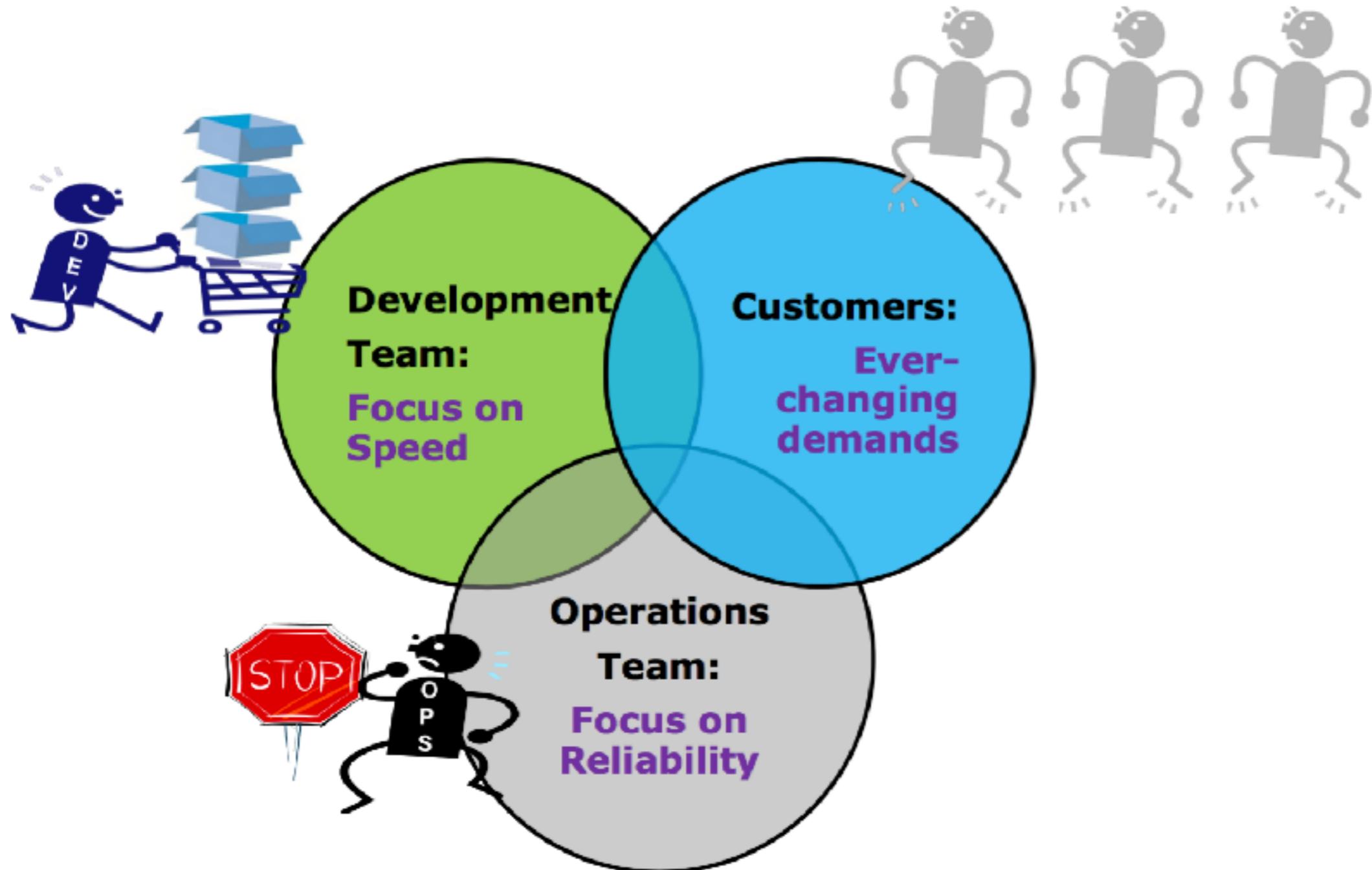
Lead time ?



Traditional development



Conflict of Interest



Conflict of Interest

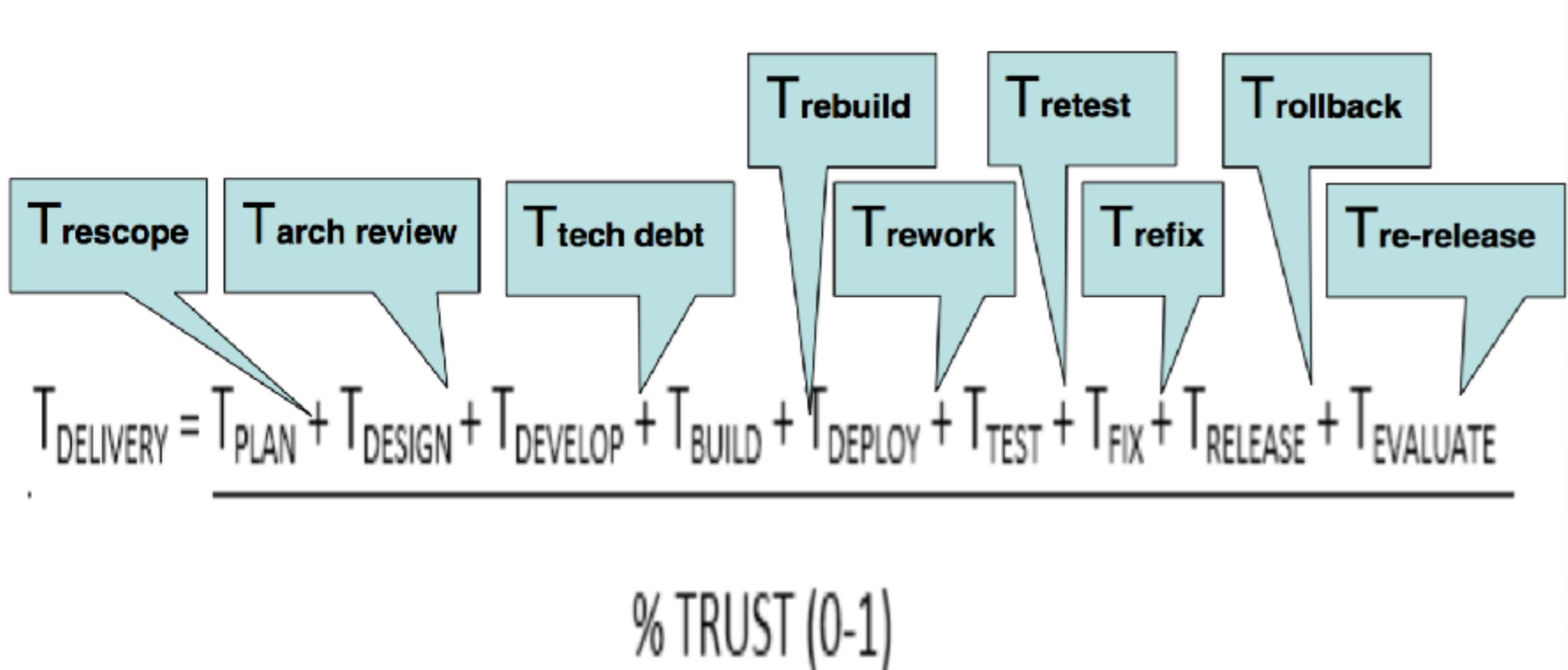


Conflict of Interest

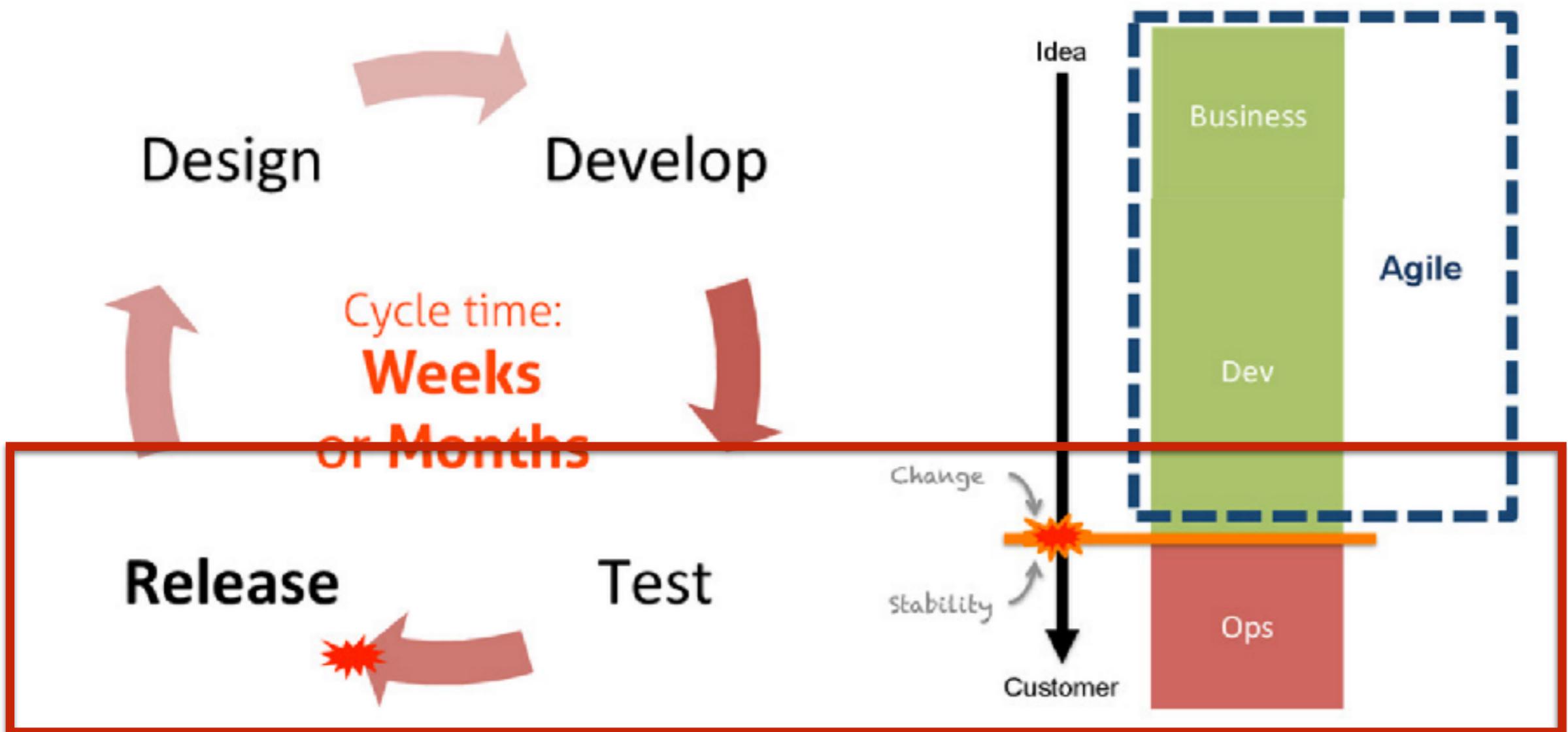




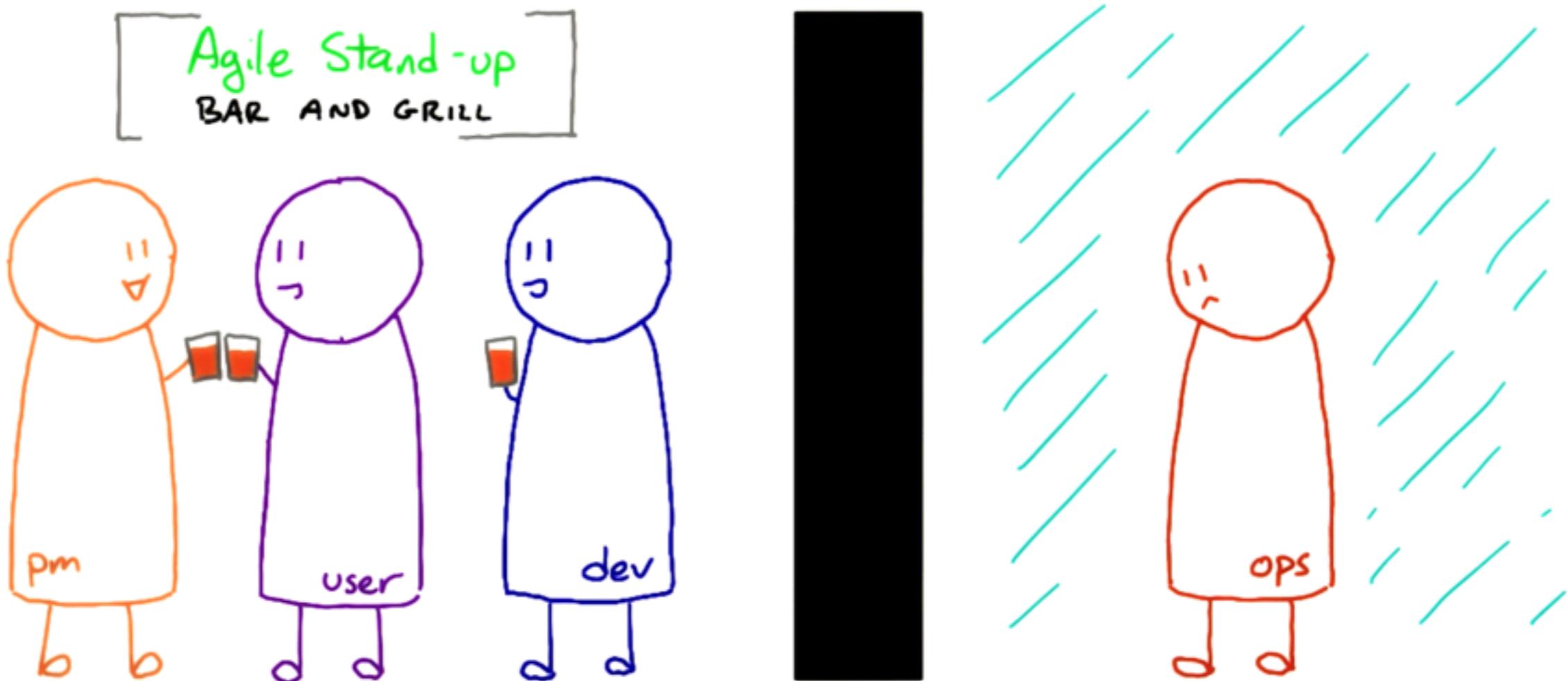
Low trust create extra steps



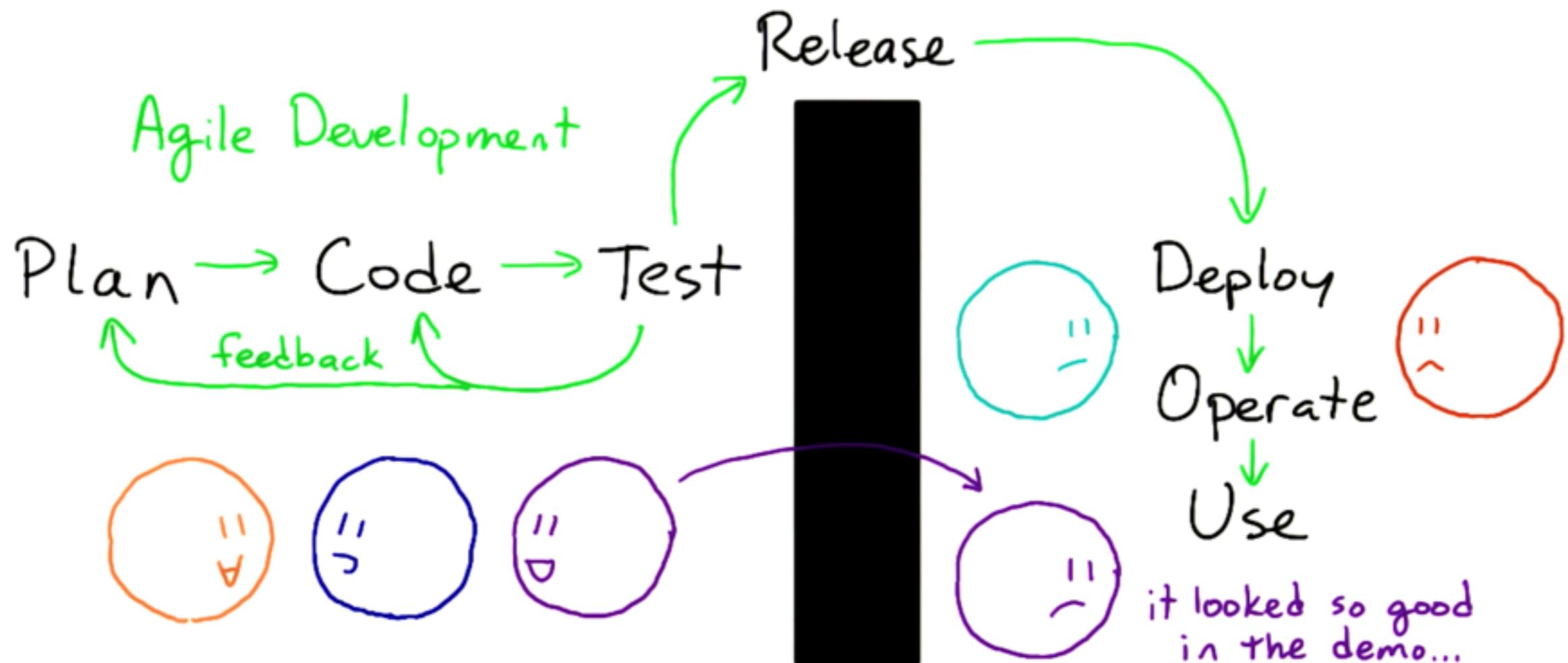
Iterative/Agile development



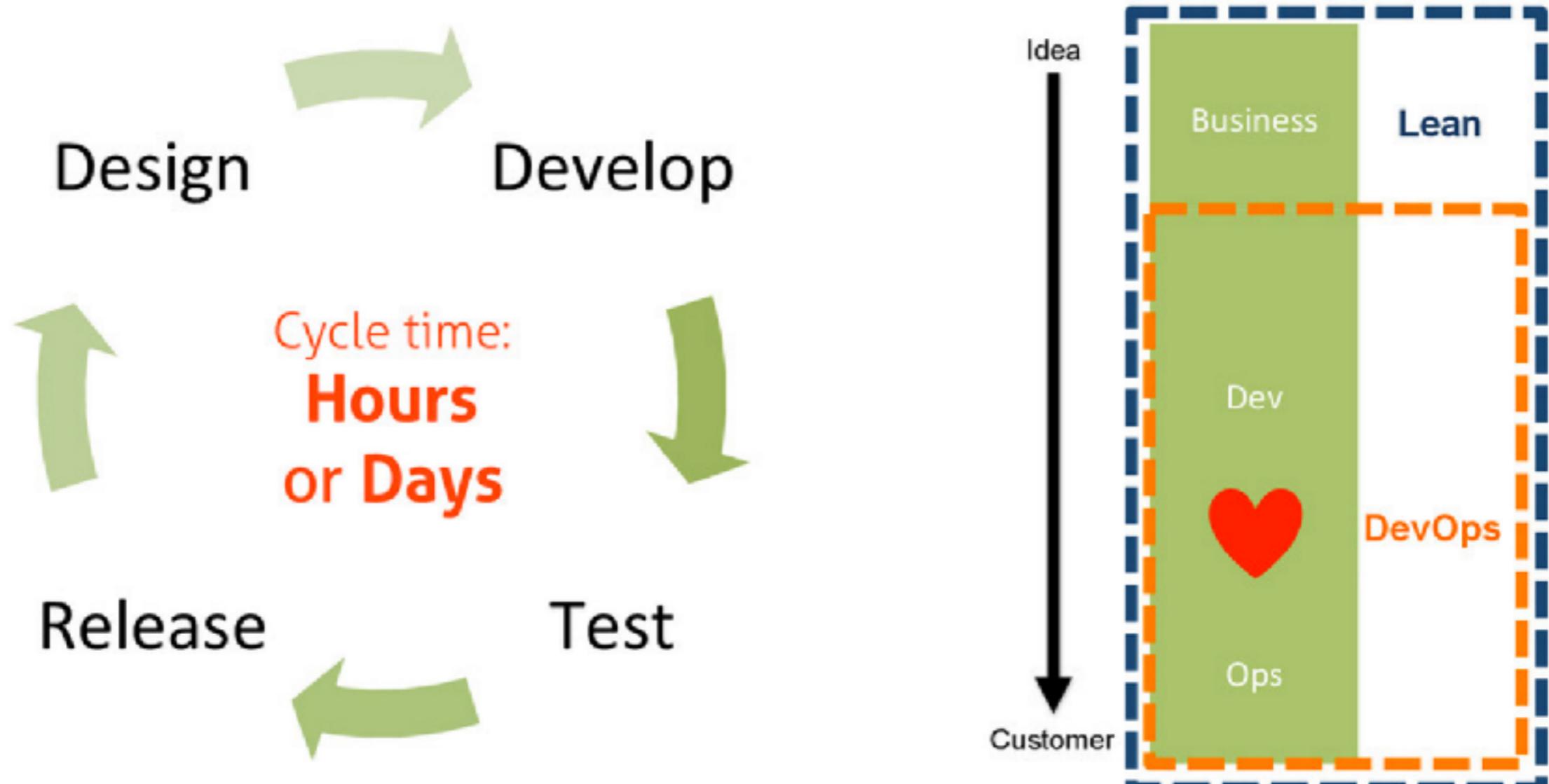
Iterative/Agile development



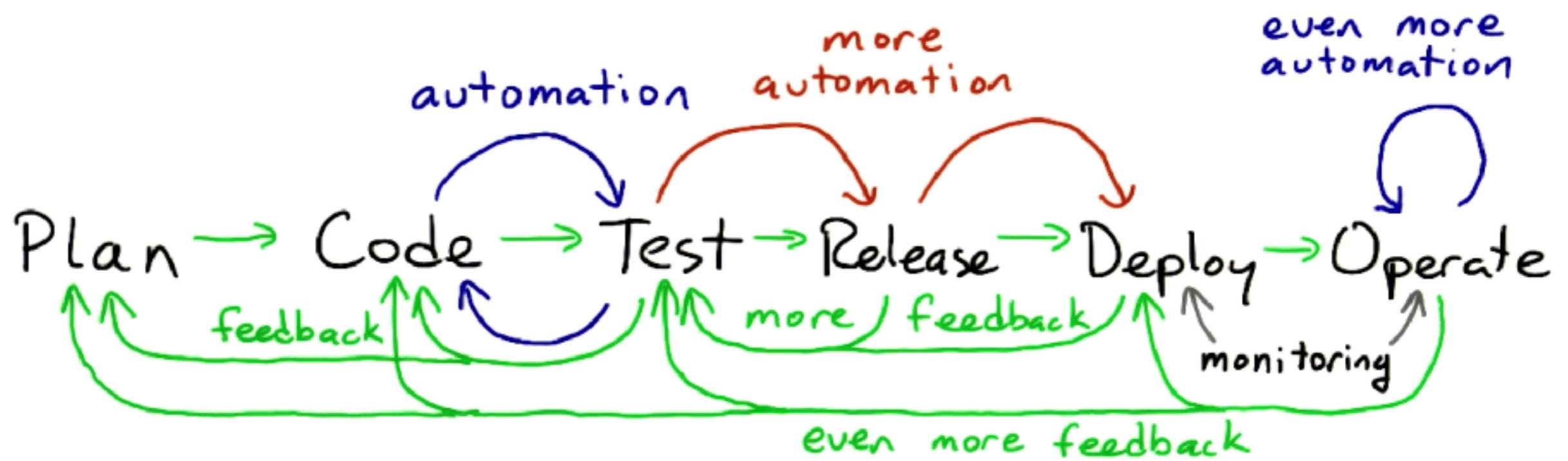
Iterative/Agile development



Rise of DevOps

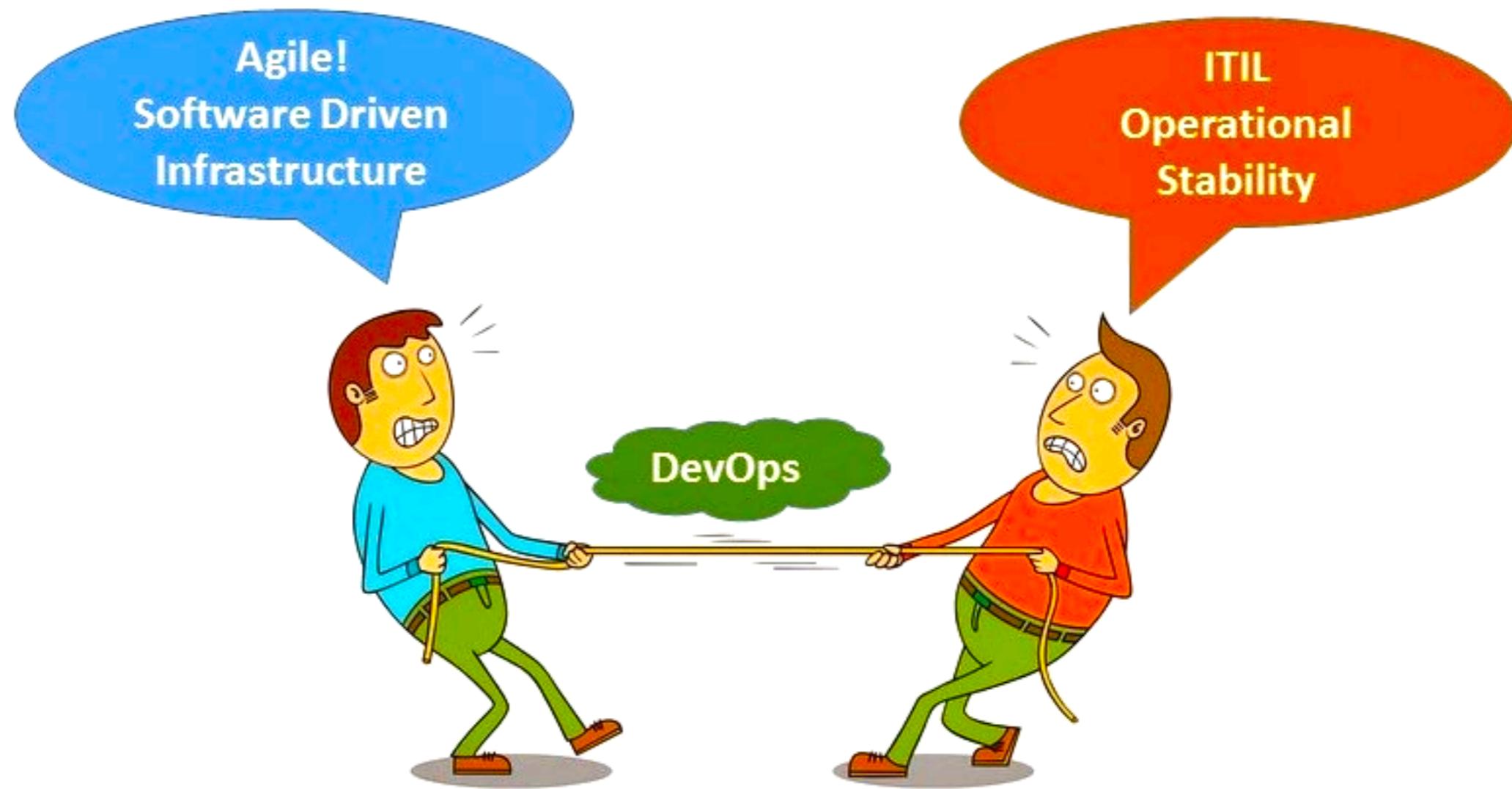


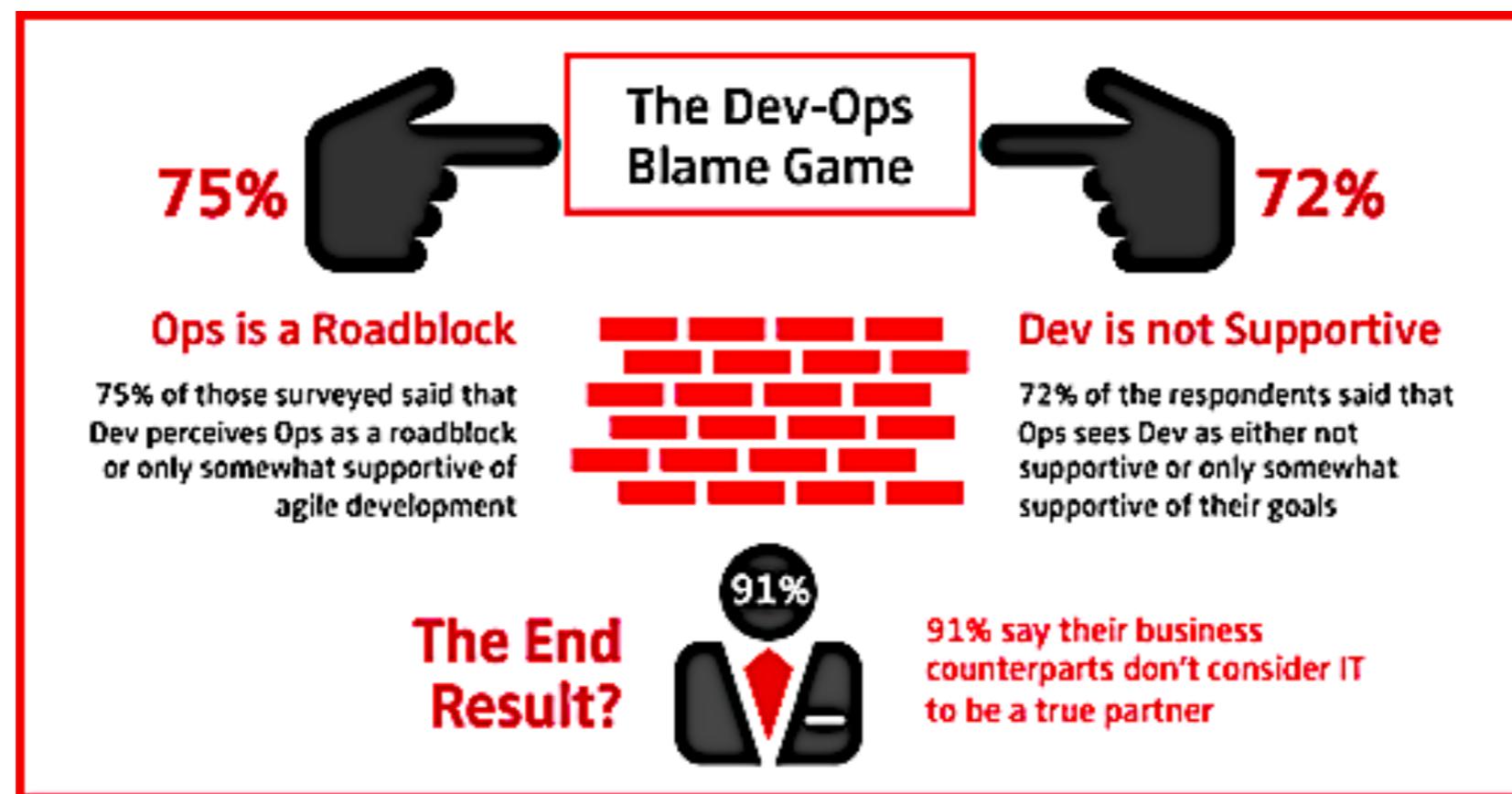
Rise of DevOps

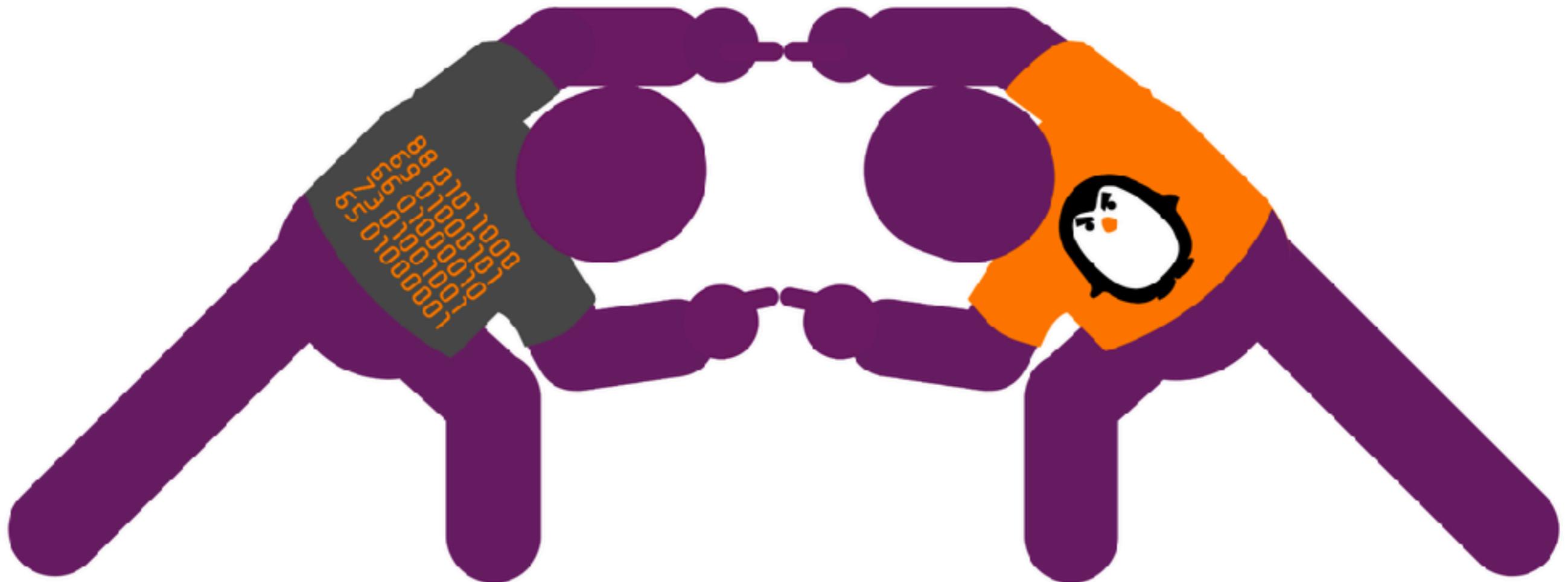


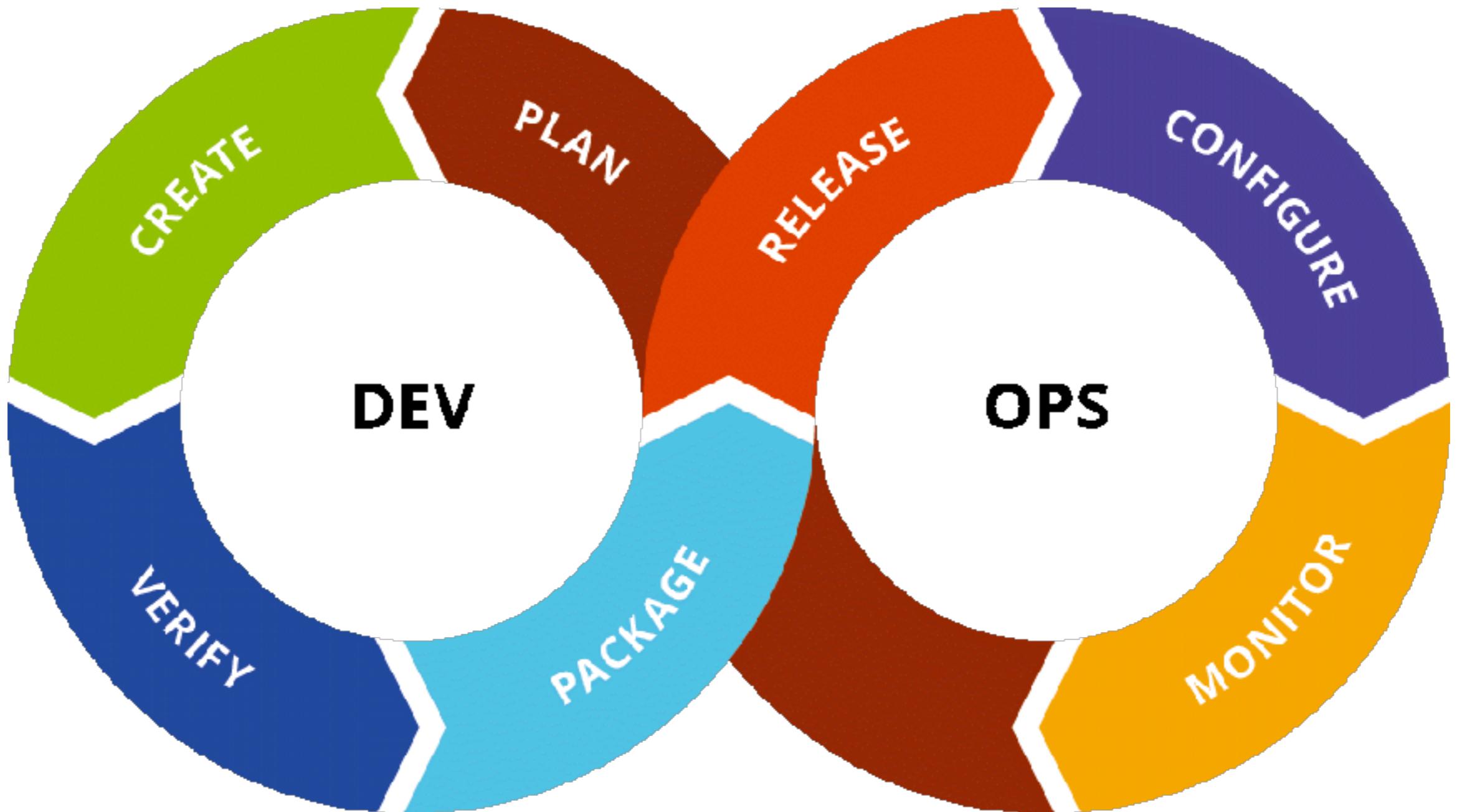
Agile Development → Continuous Integration + Delivery → DevOps?











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



OPS

 **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



DevOps ?

"DevOps is
development
and operations
collaboration"

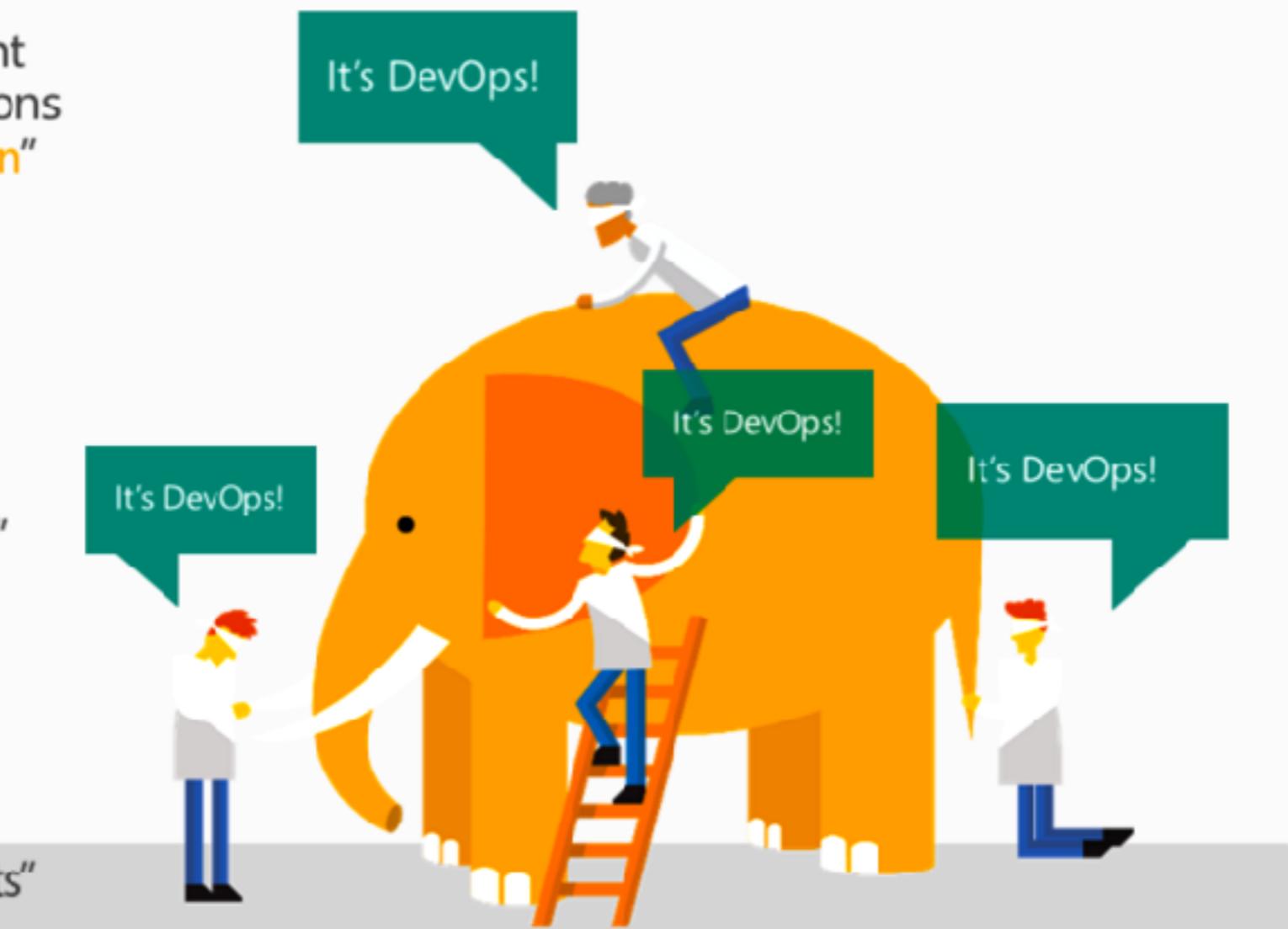
"DevOps
is using
automation"

"DevOps
is **small**
deployments"

"DevOps is
treating your
infrastructure
as code"

"DevOps
is feature
switches"

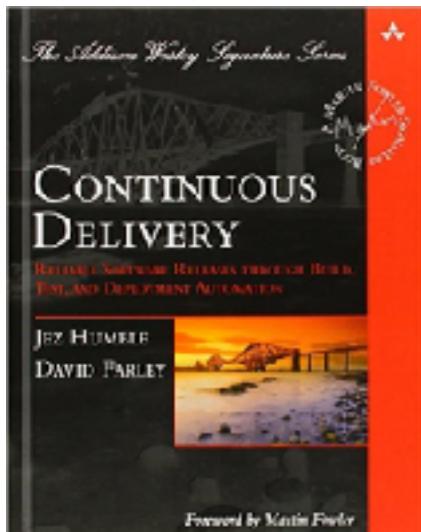
"Kanban
for Ops?"



DevOps ?

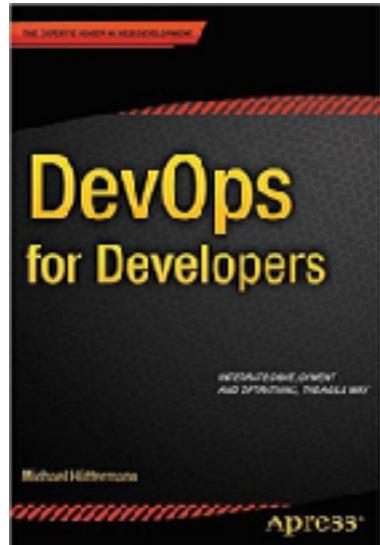
“A movement of people who care about developing and operating reliable, secure, high performance systems at scale.”

- Jez Humble -



DevOps ?

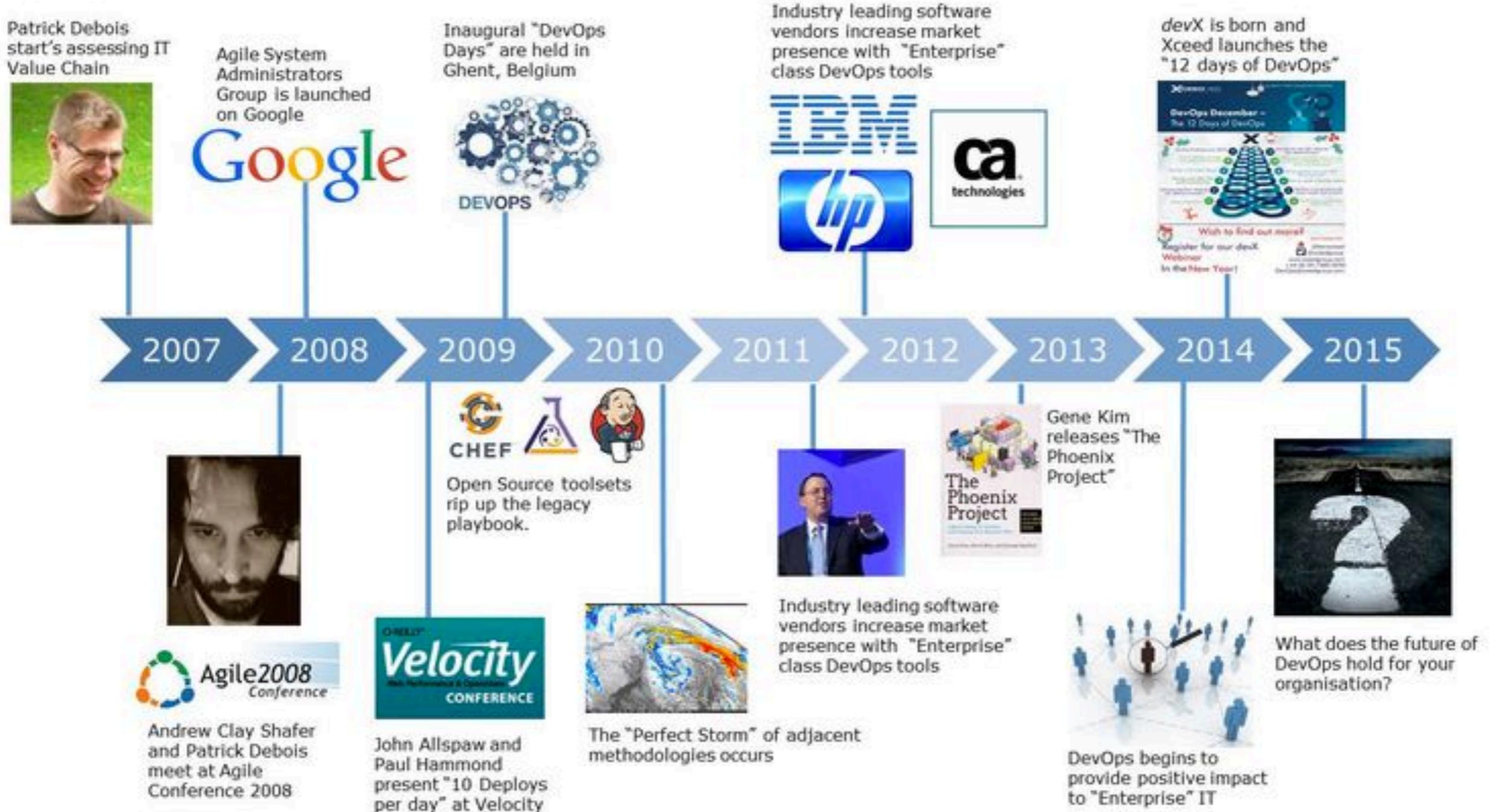
“A mix of patterns intended to **improve collaboration** between development and operations. DevOps addresses **shared goals and incentives** as well as **shared processes and tools.**”



- Michael Huttermann -



DevOps Timeline

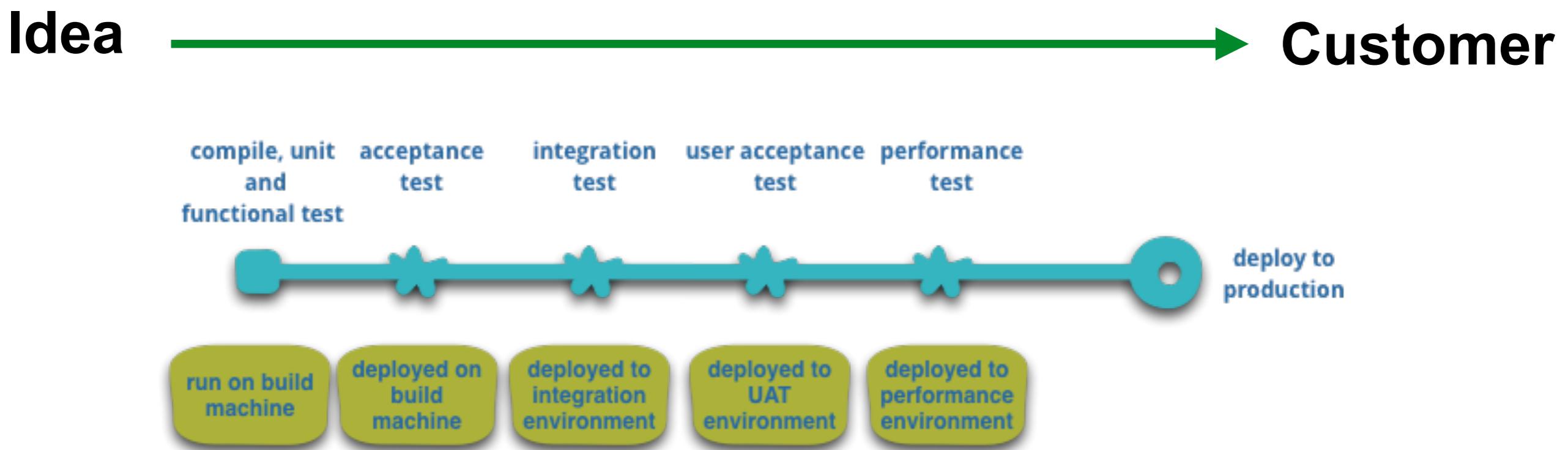


<https://www.pinterest.com/pin/263390278185605258/?lp=true>



Goal of DevOps

“Improve the delivery of value for Customer and Business”



DevOps

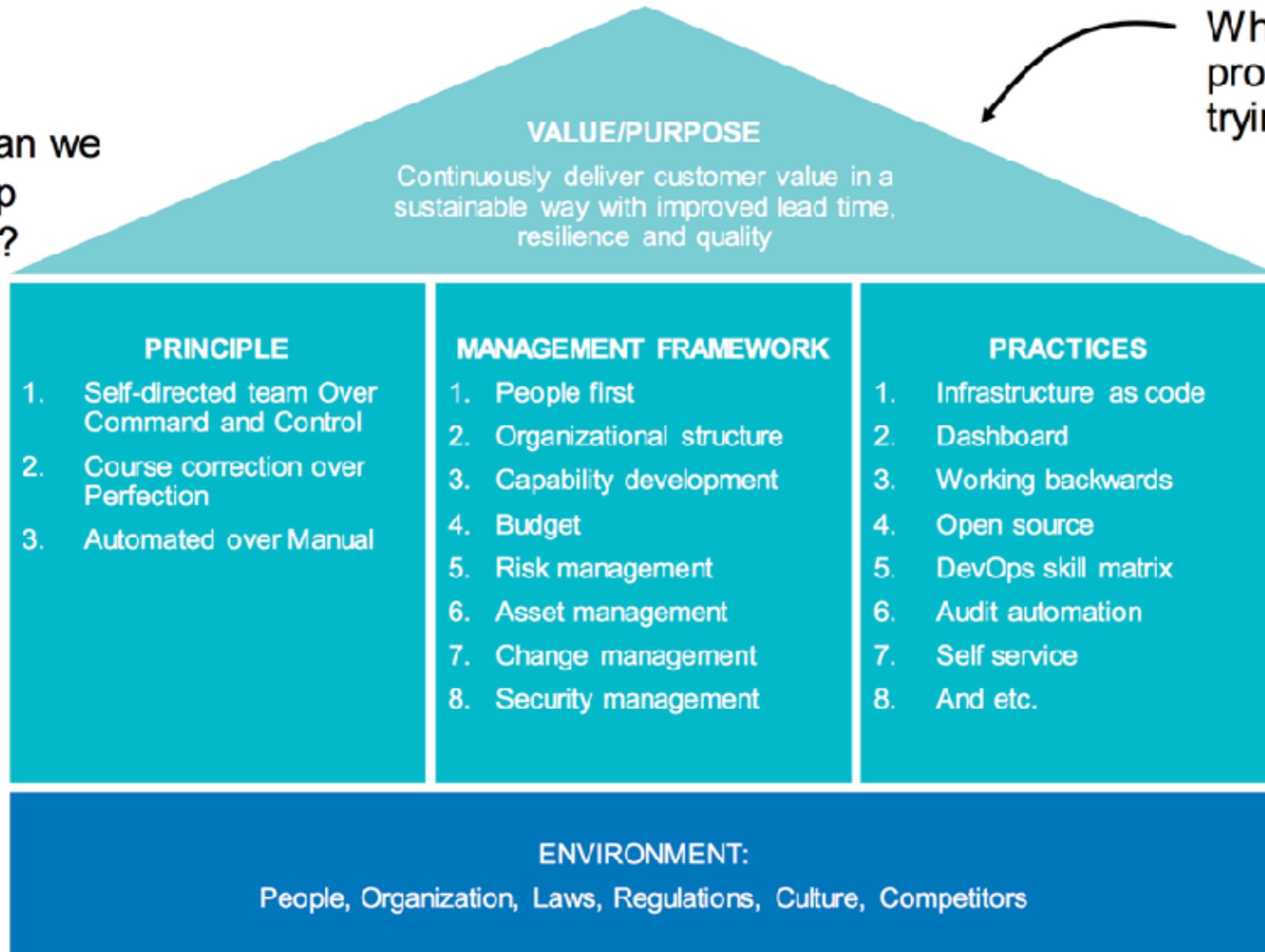


to enable the continuous delivery of value to customer



DevOps adoption model

How can we develop people?

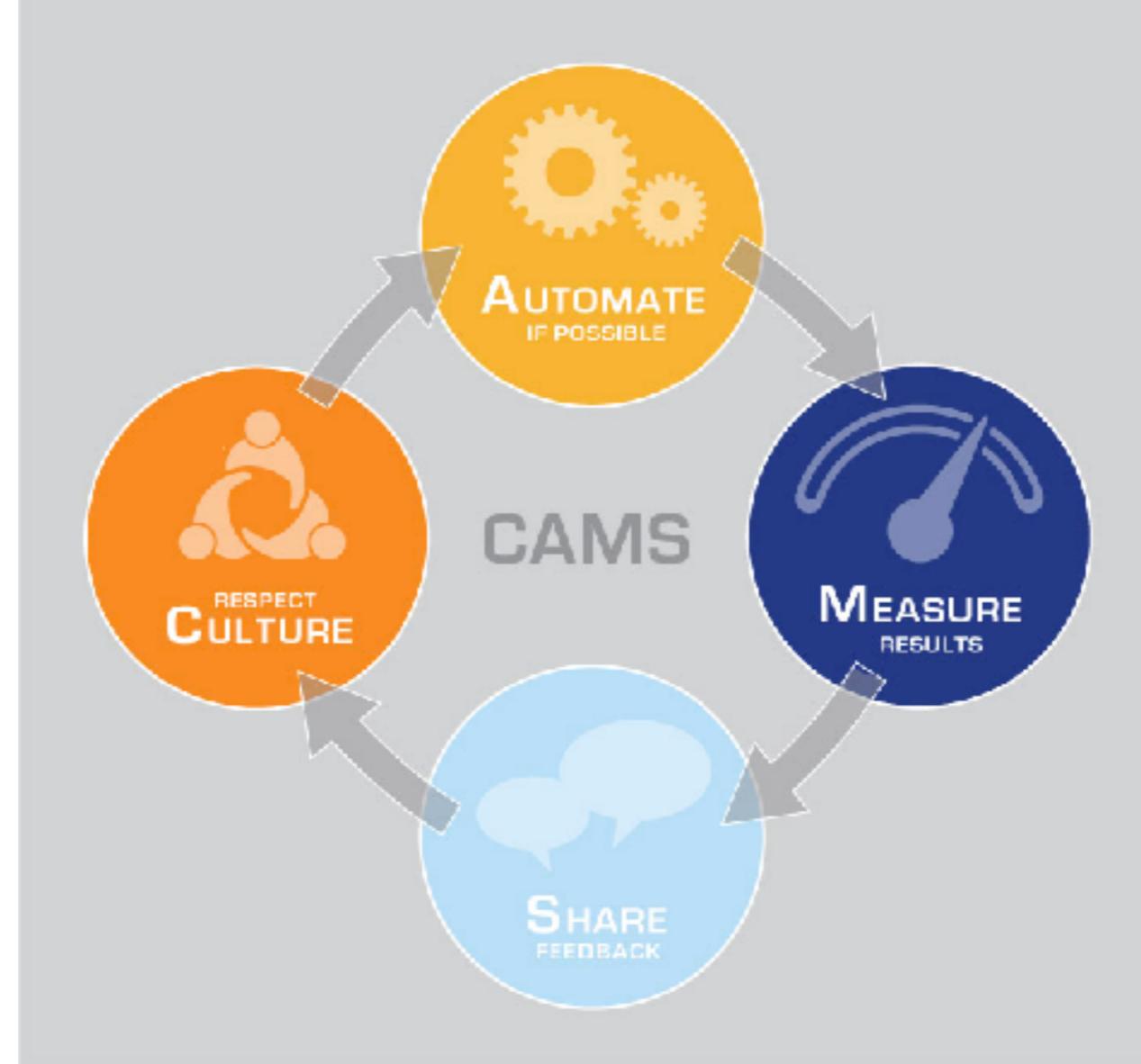


What kind of problem are we trying to solve?

How can we improve the work



DevOps Principles



DevOps Principles

Culture => People, Process, Tools

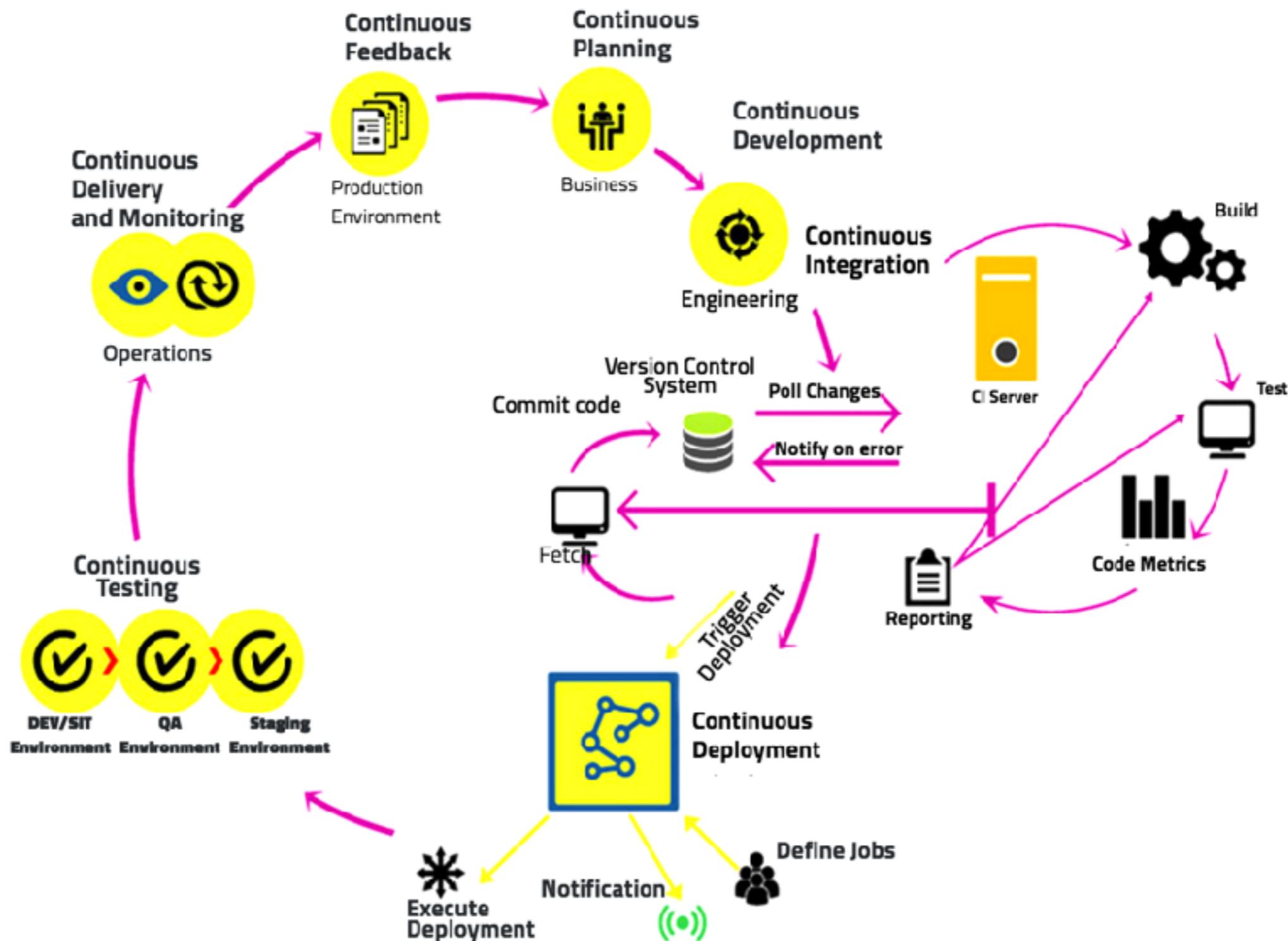
Automation => Infrastructure as Code

Measurement => Measure everything

Sharing => Collaboration/Feedback

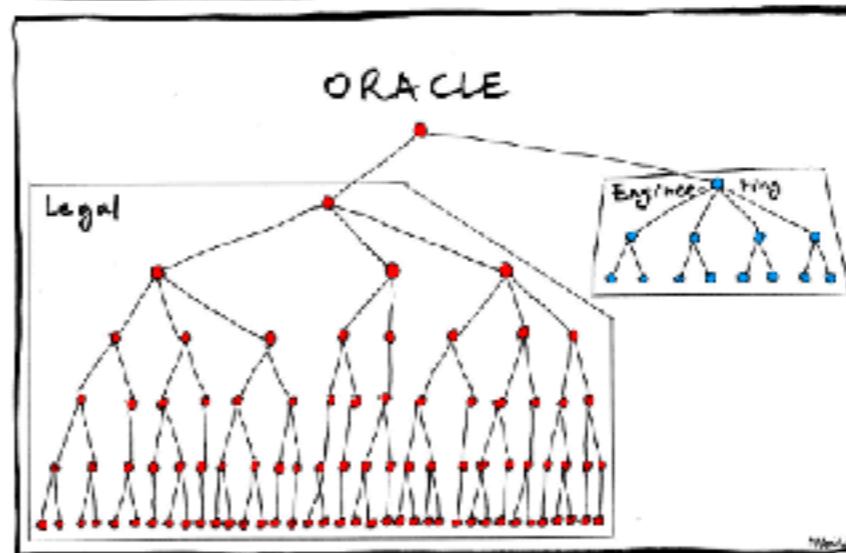
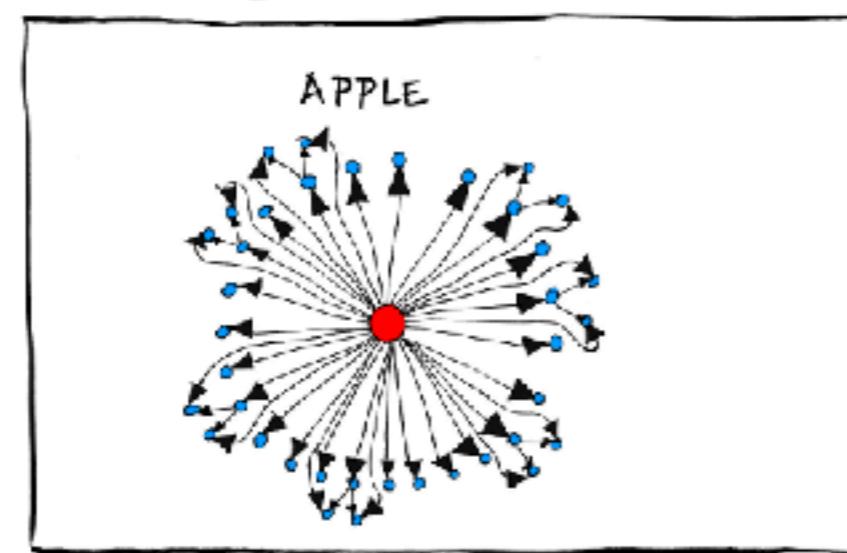
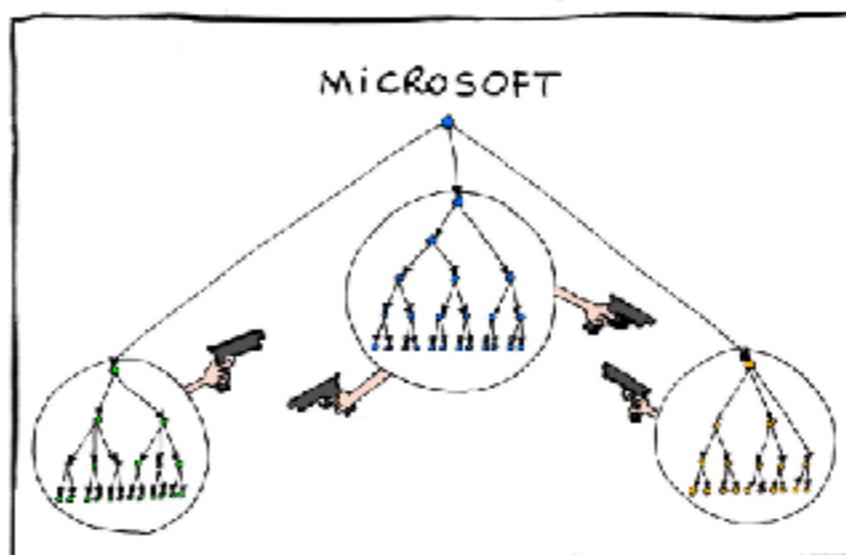
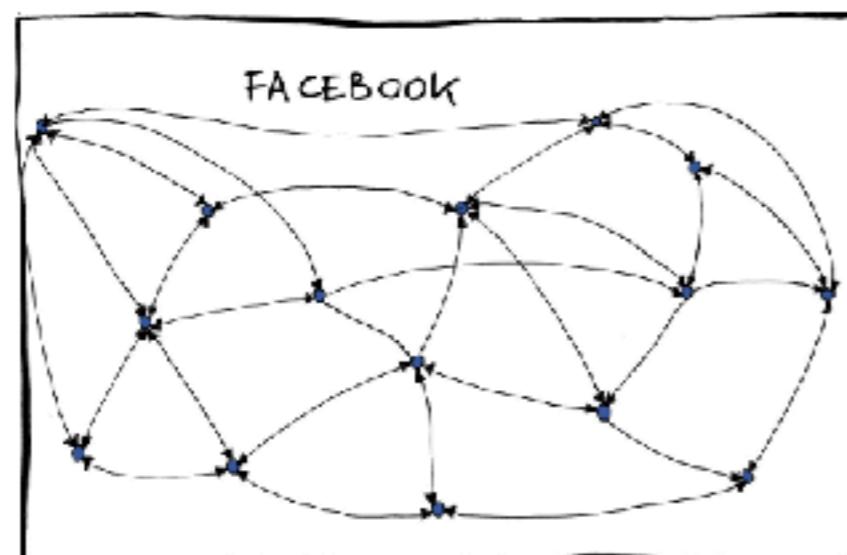
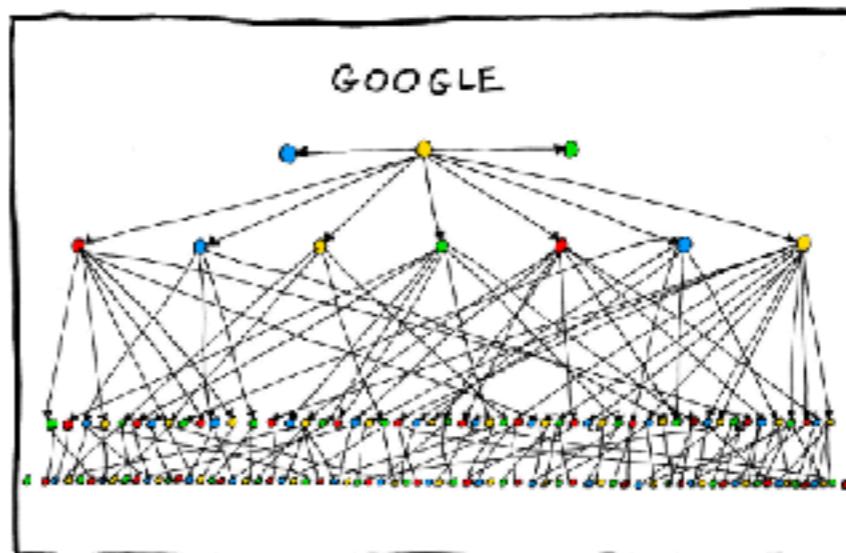
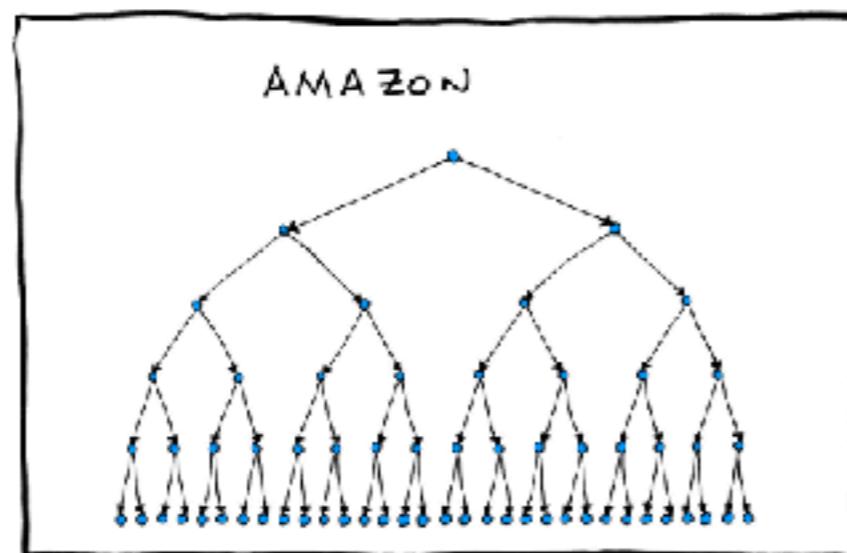


DevOps Practices

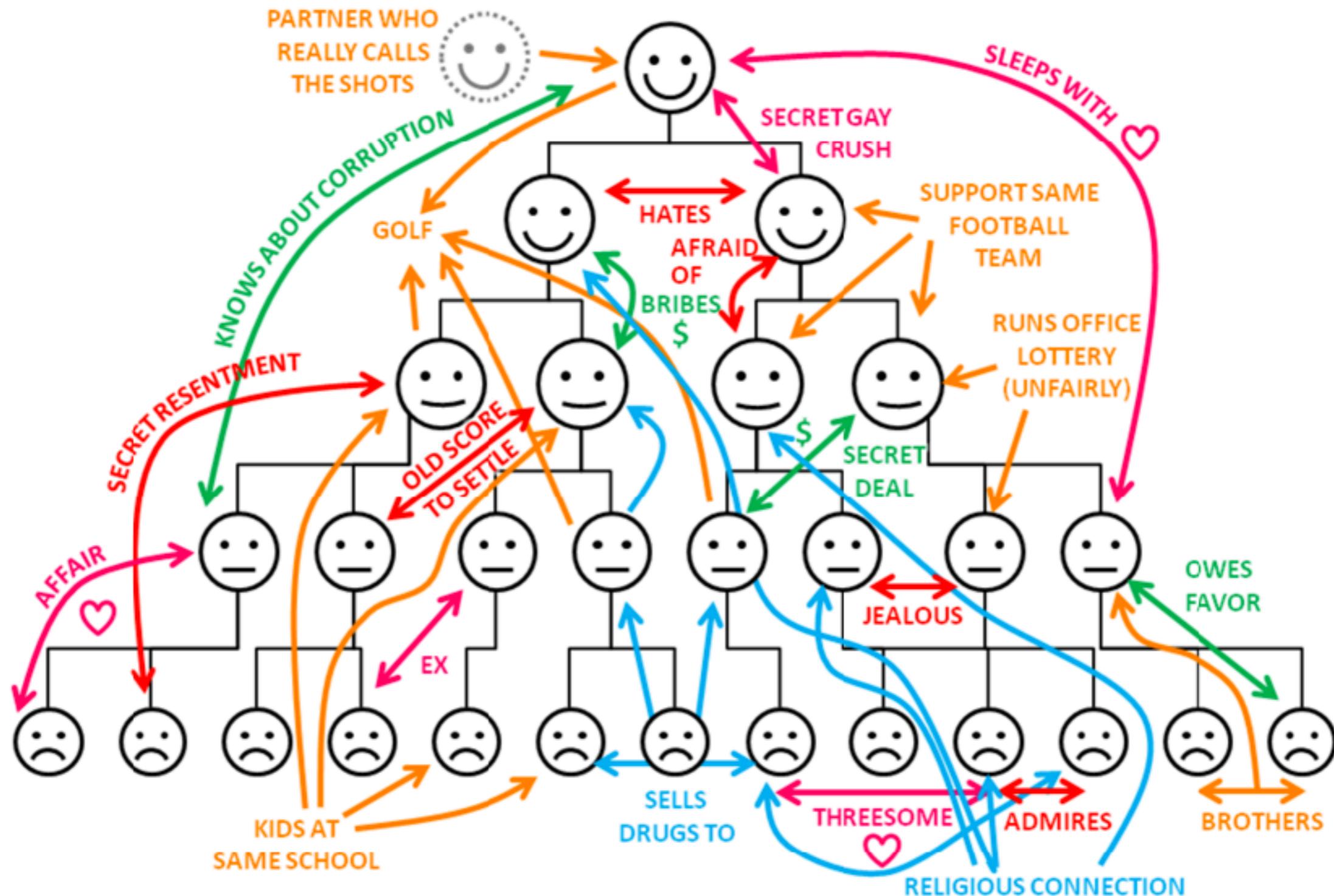


All about Organization structure and culture

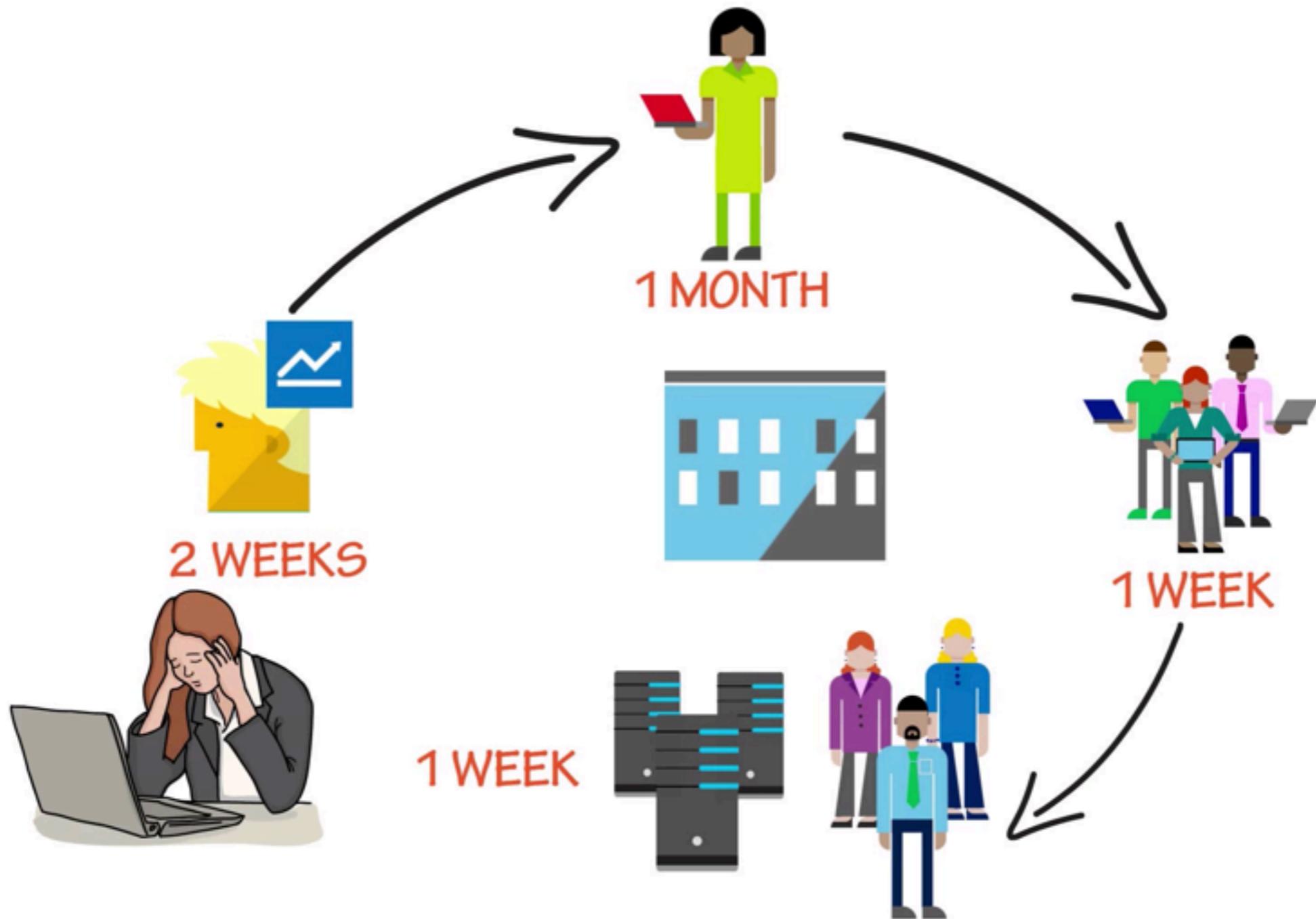




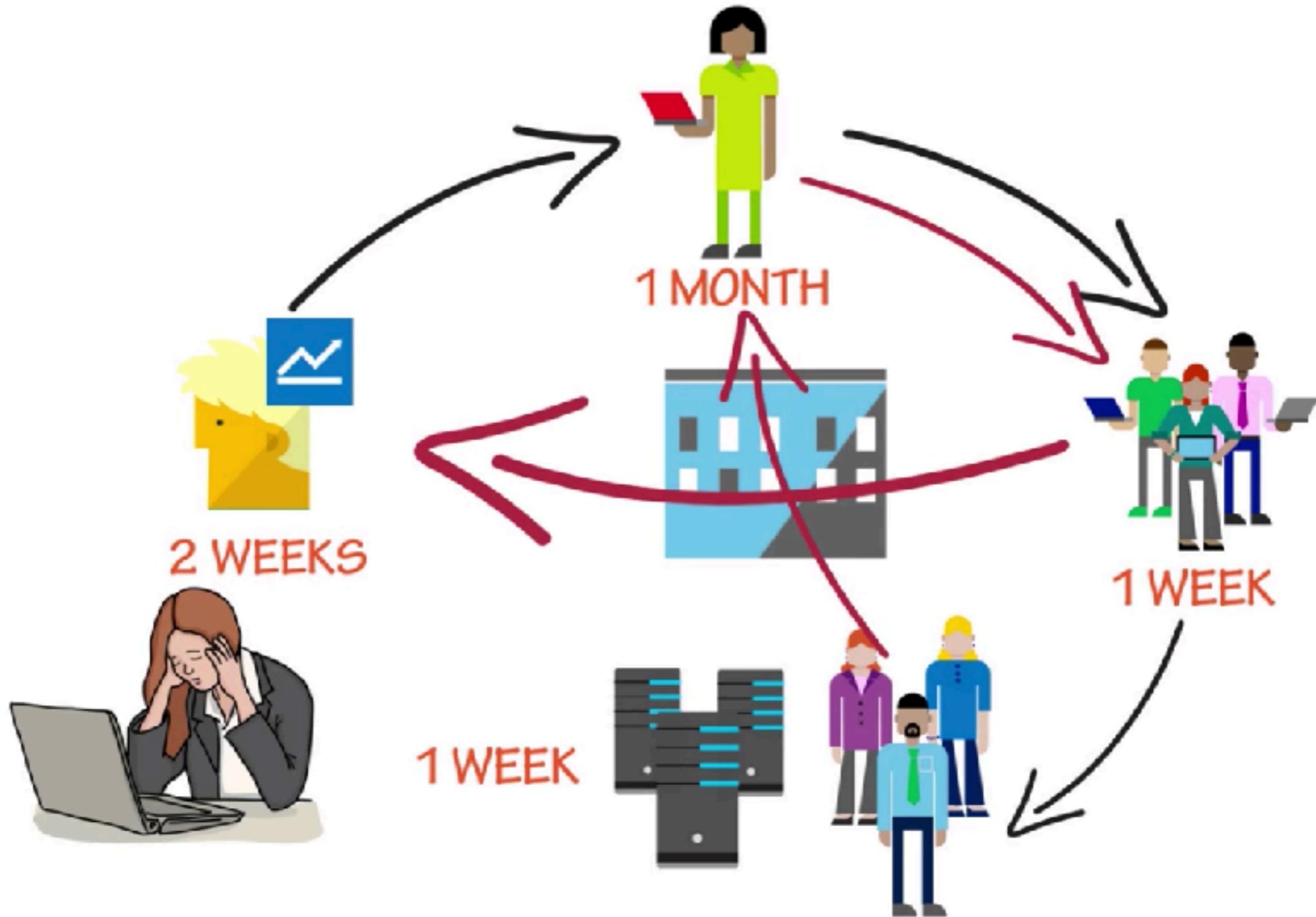
Problem ?



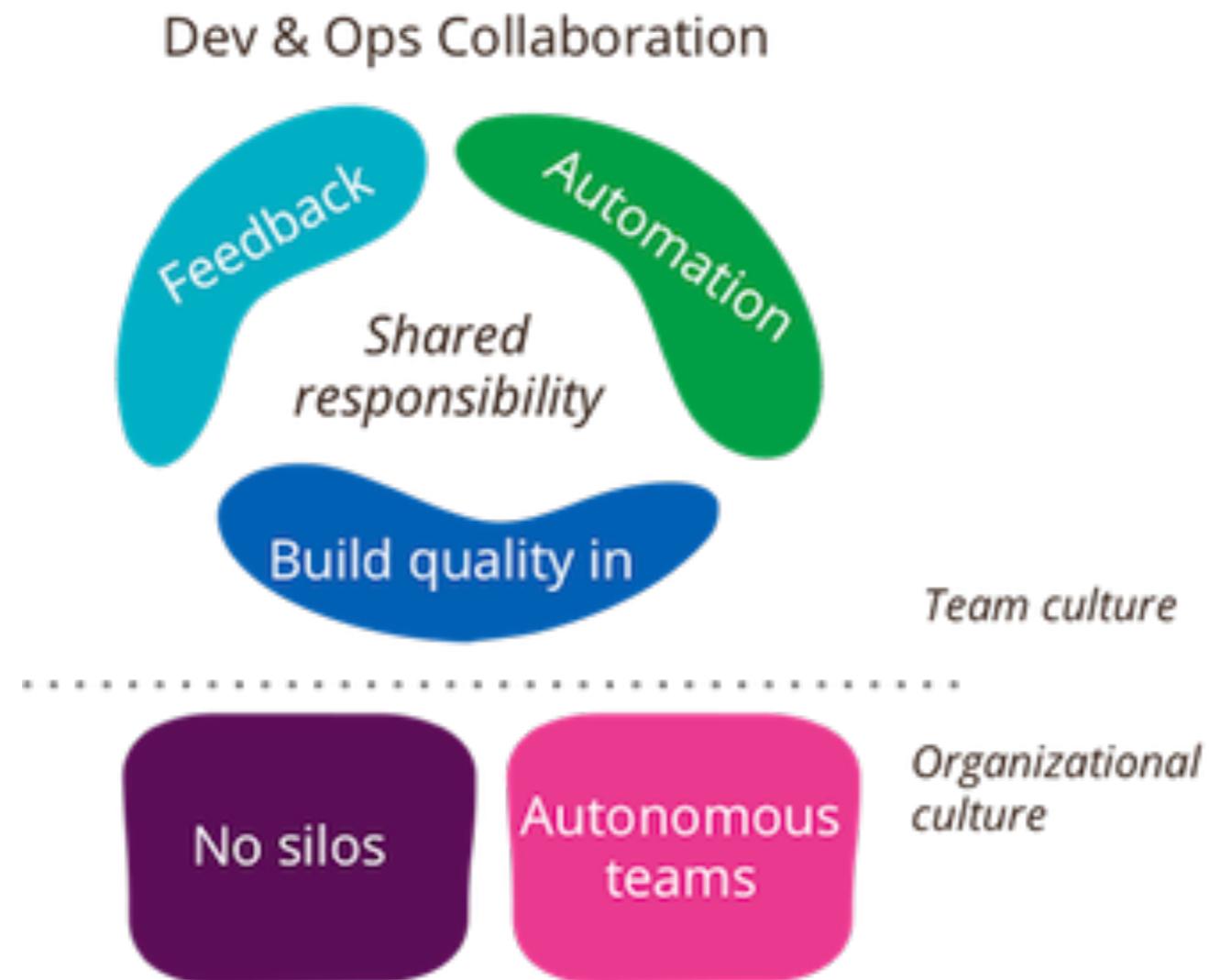
Problem ?



Problem ?



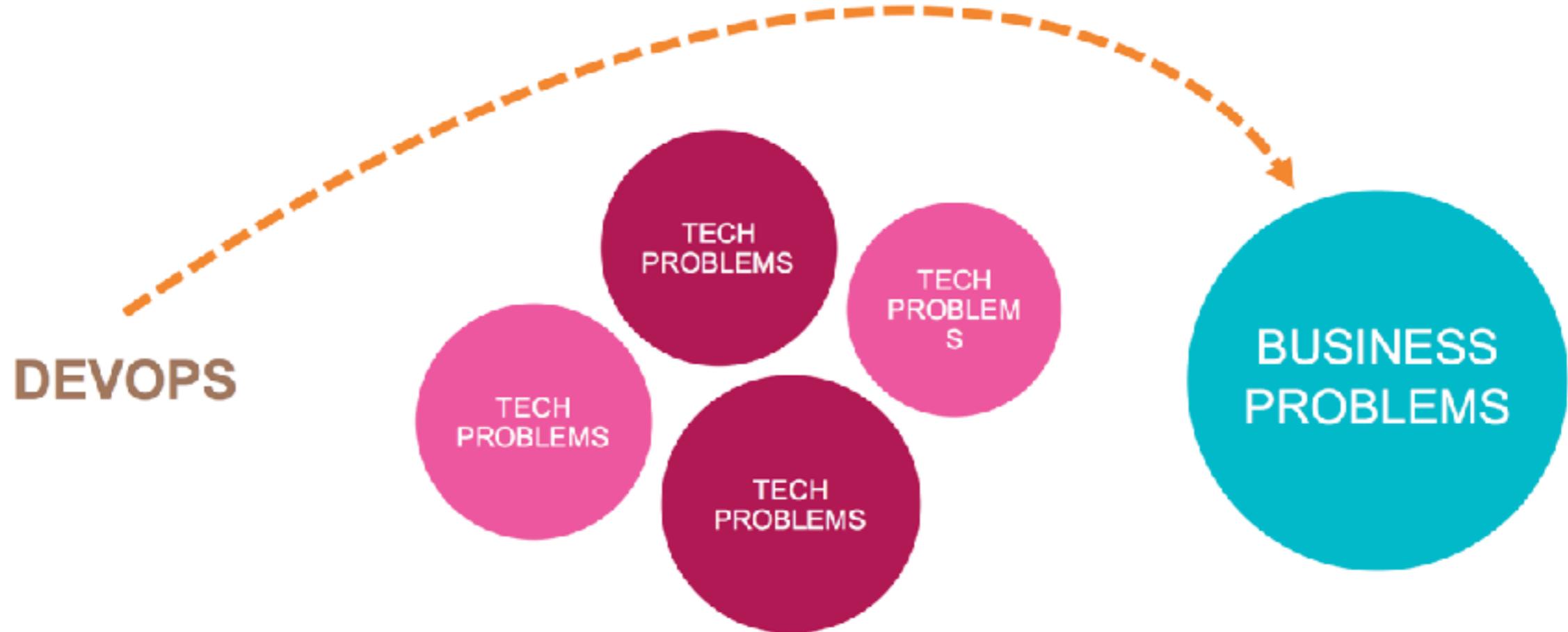
Team and Organization culture



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



Explore business value



DevOps solves **business problem**, not
technical problem



Don't talk to business

DevOps

Continuous Integration/Delivery

Automation

Configuration management

Test-Driven development

Infrastructure as a code



Talk to business

Reduce time to market

Reduce lead time

Improve quality

Improve resilience



“DevOps is not a goal,
But a process of continuous
improvement”



DevOps

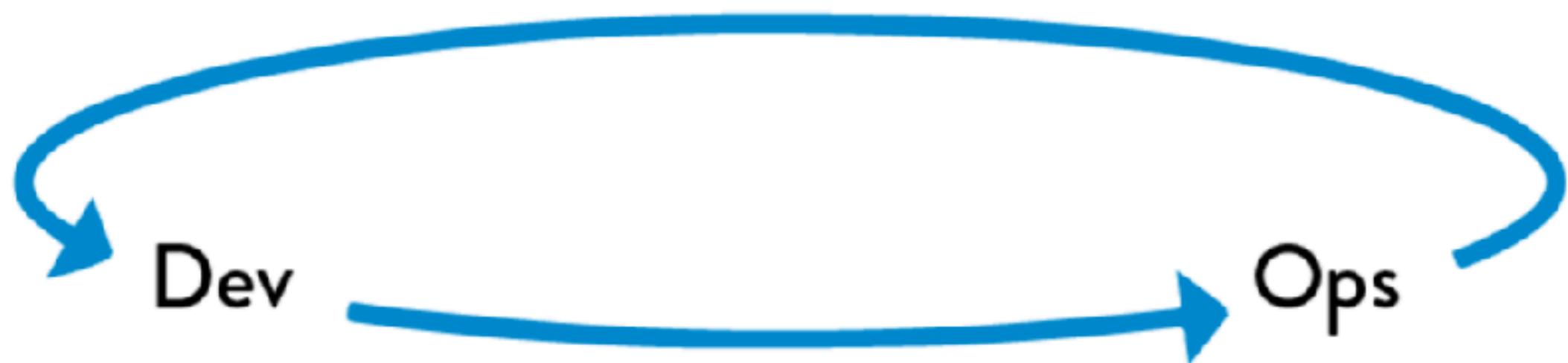
3 ways principle



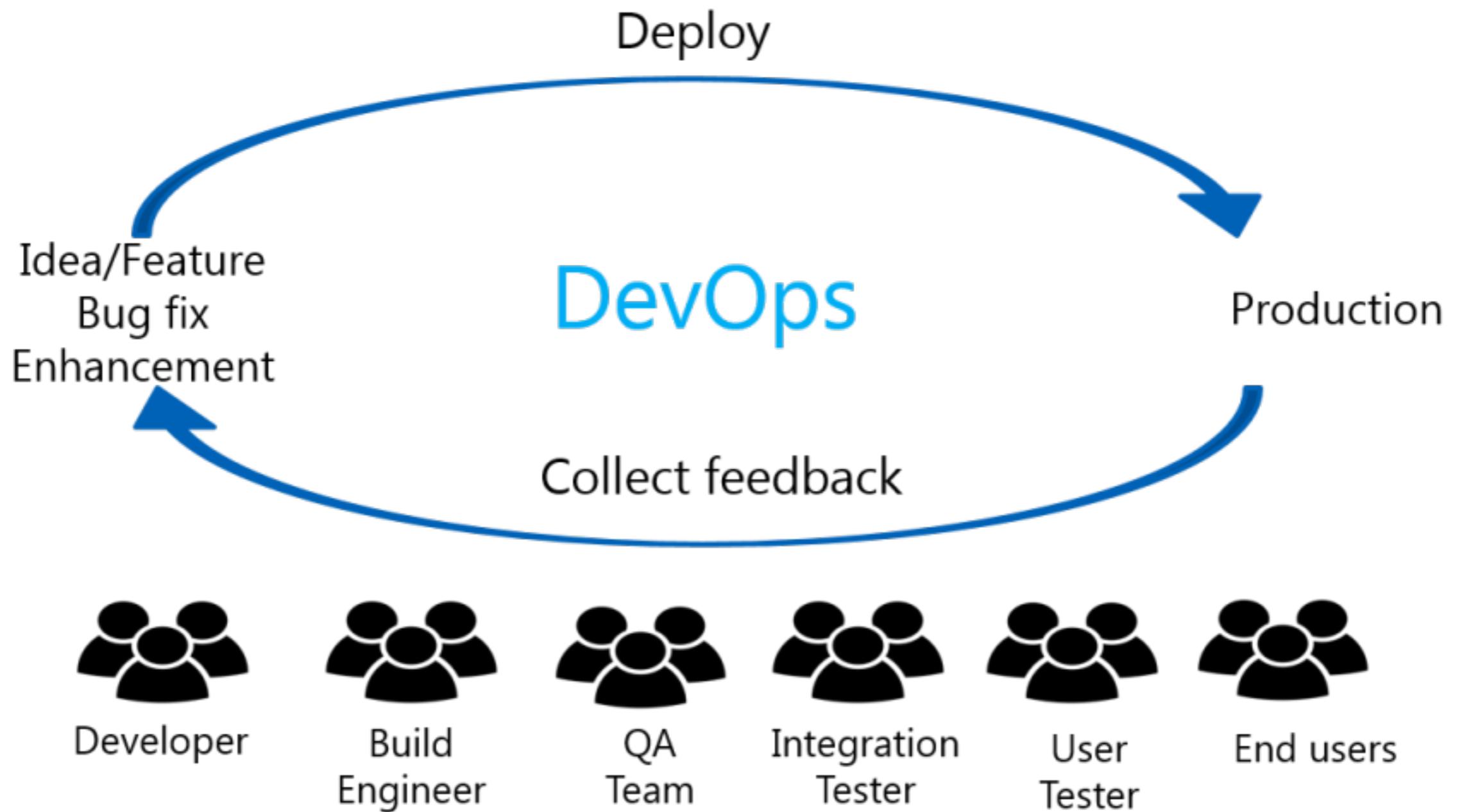
1. Flow principle



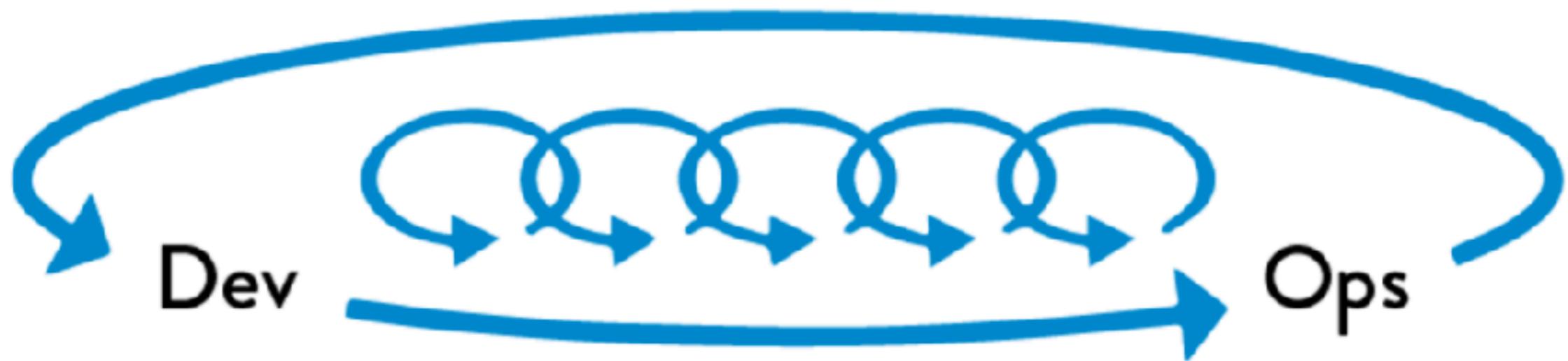
2. Feedback principle (1)



2. Feedback principle (2)



3. Continuous learning principle



DevOps Topologies

<https://web.devopstopologies.com/>

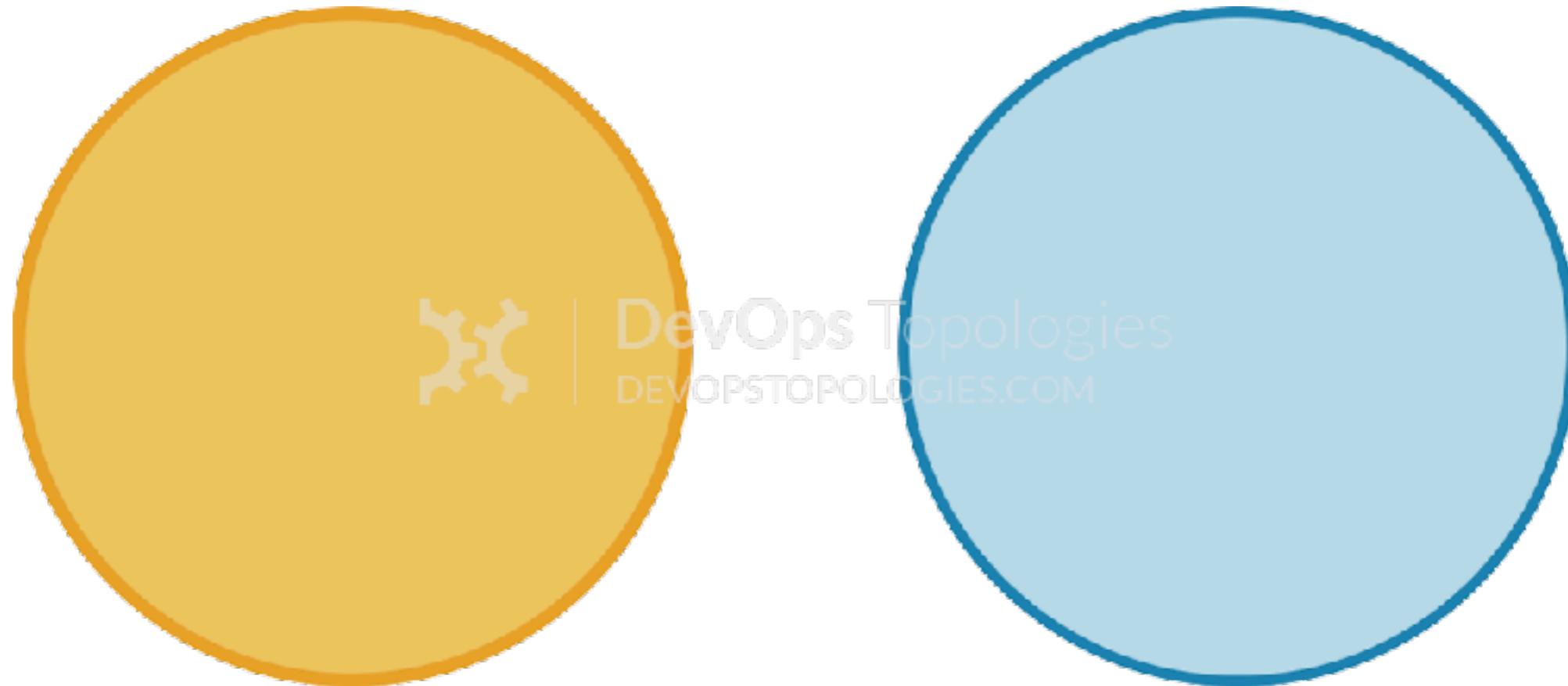


DevOps Anti-Types

<https://web.devopstopologies.com/>



Anti-type A : Dev and Ops silos

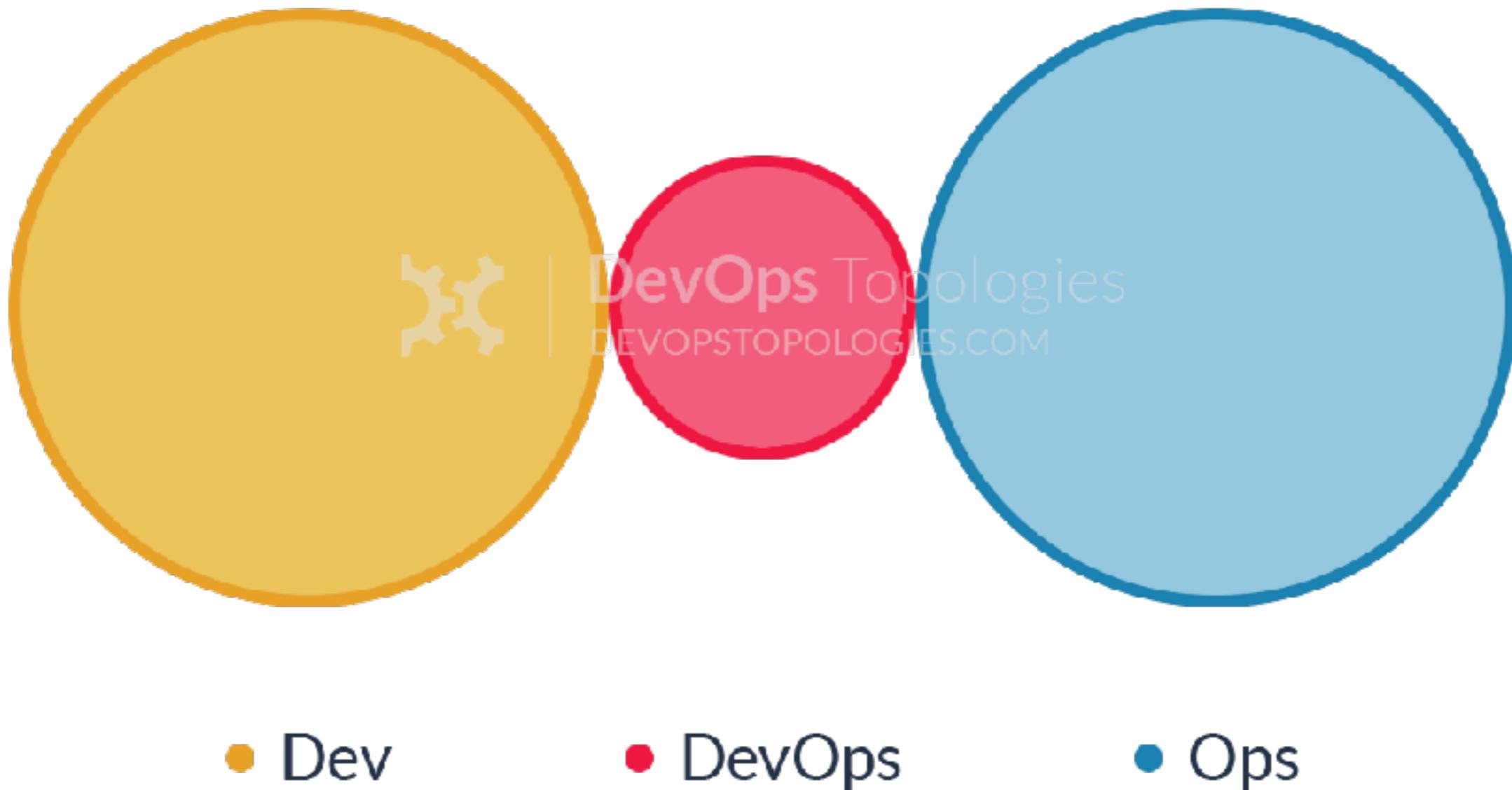


- Dev

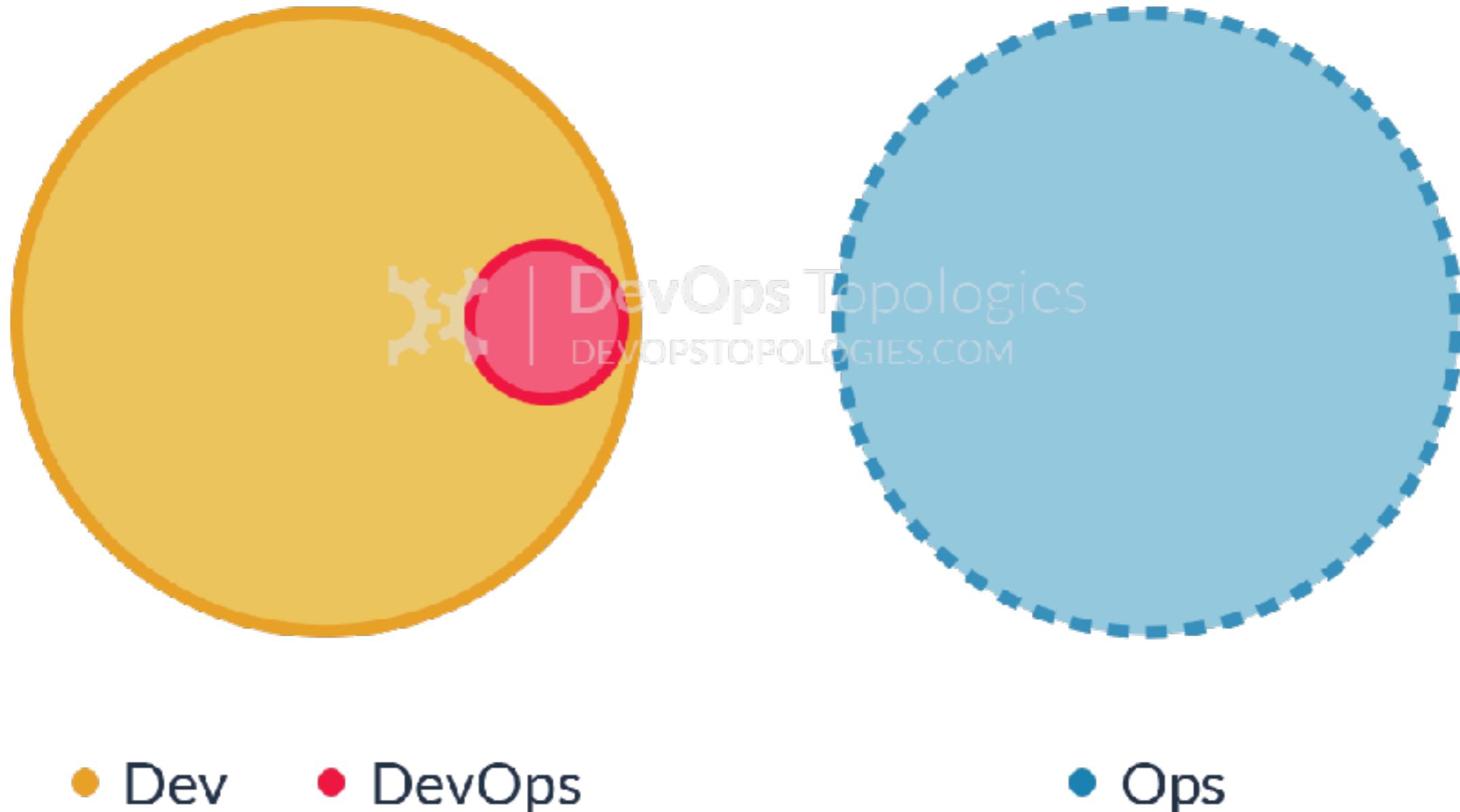
- Ops



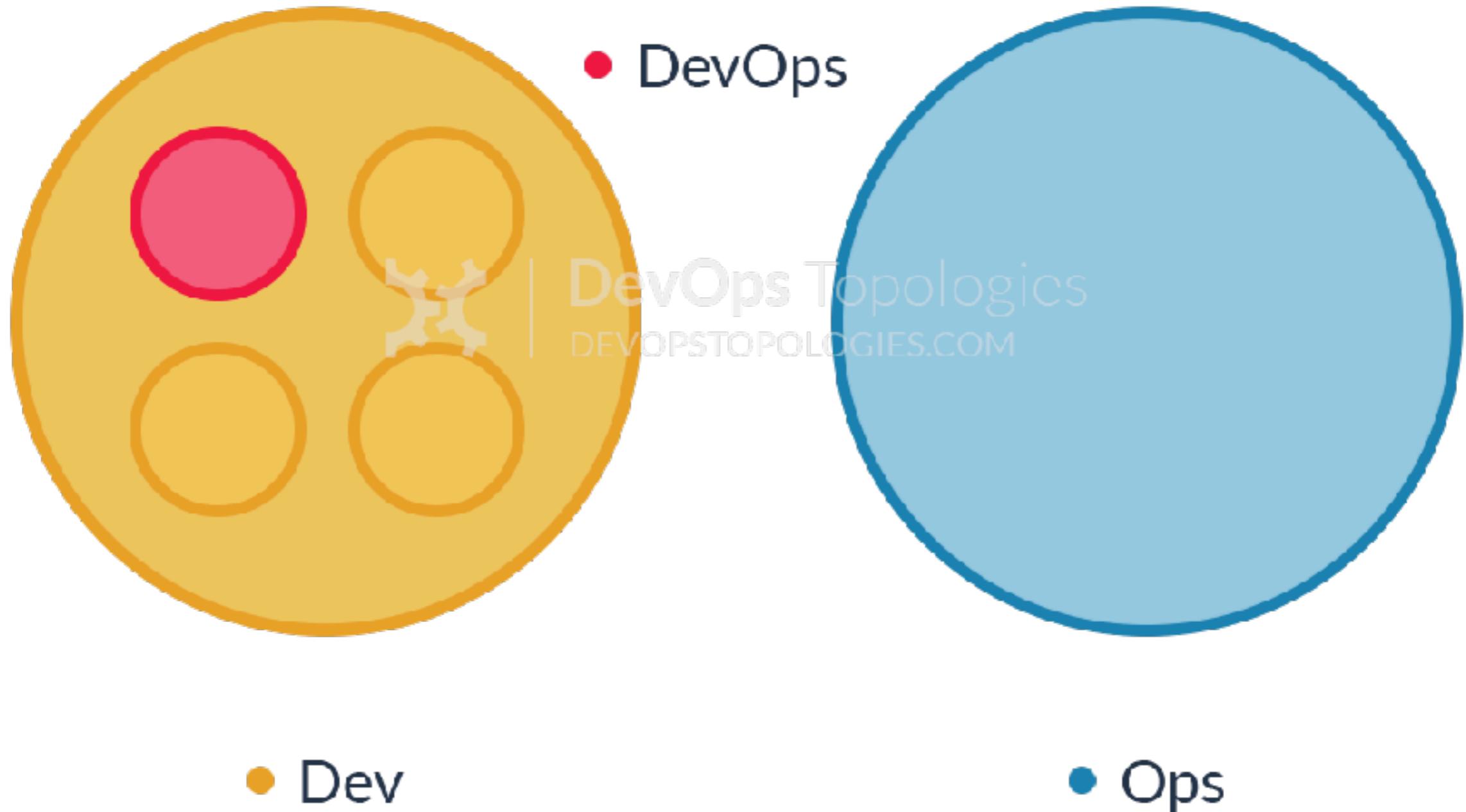
Anti-type B : DevOps team silos



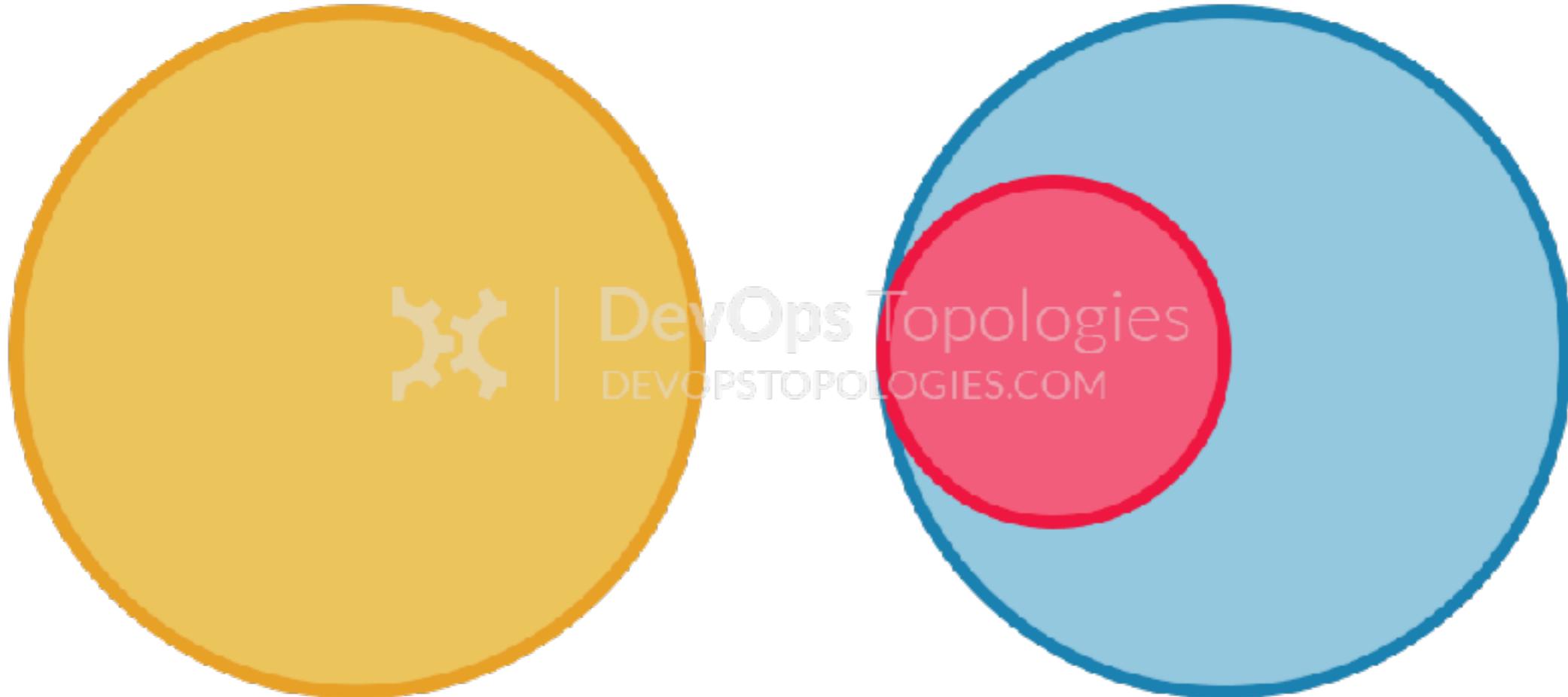
Anti-type C : Dev don't need Ops



Anti-type D : DevOps as a tool team



Anti-type E : Rebranded SysAdmin



● Dev

● DevOps ● Ops

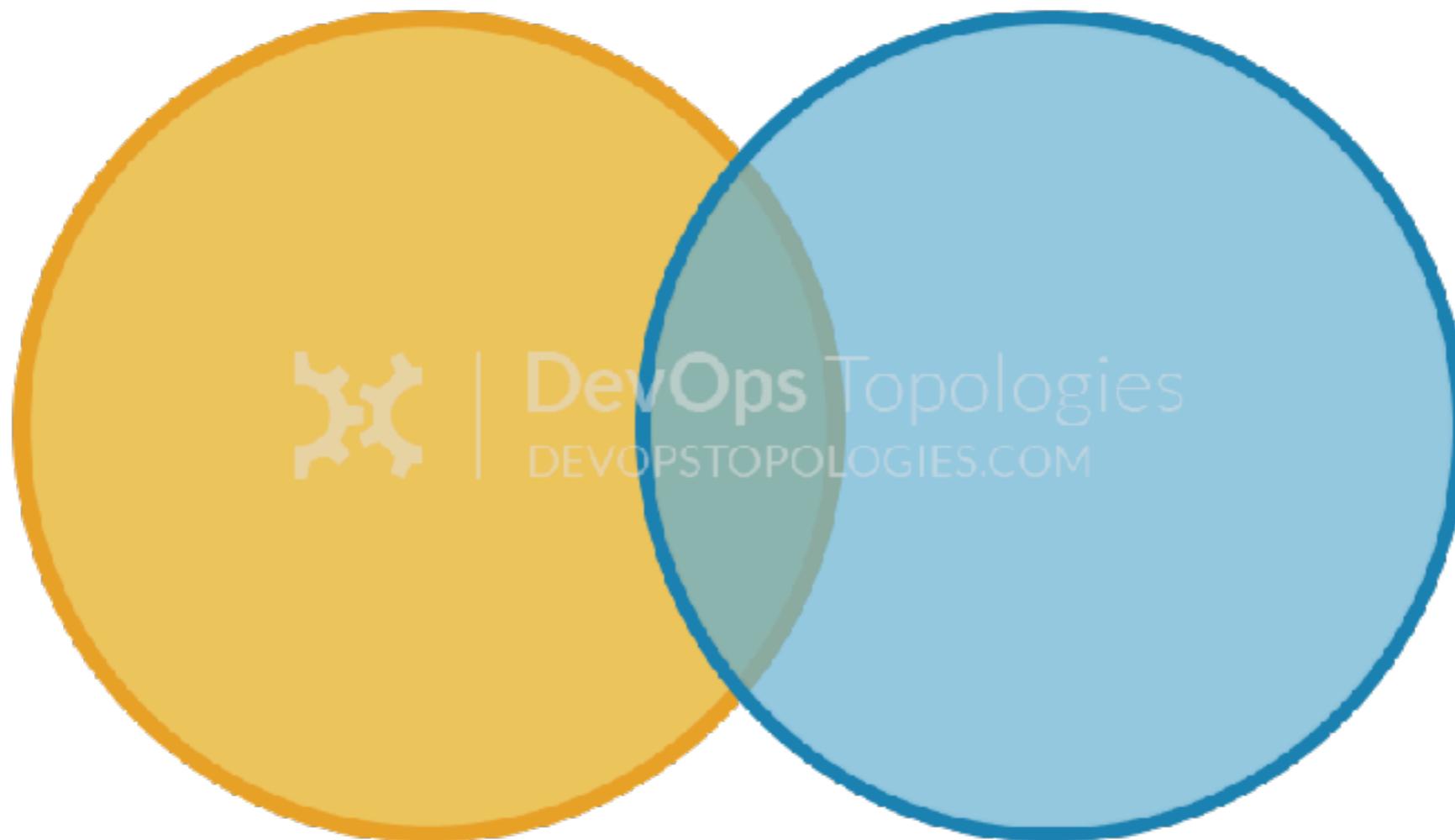


DevOps Team Topologies

<https://web.devopstopologies.com/>



Type 1 : Dev and Ops collaboration



● Dev

● Ops



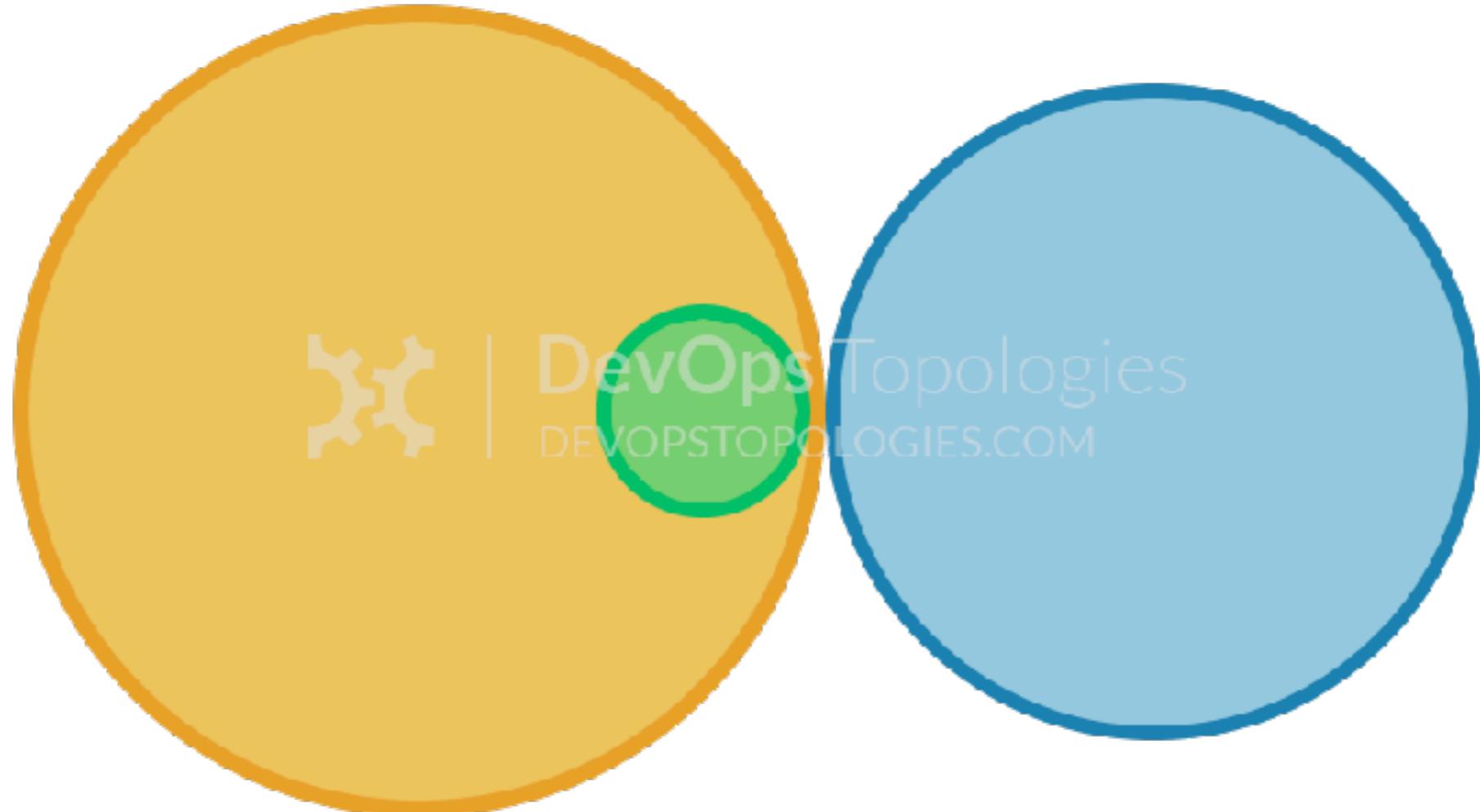
Type 2 : Fully share ops responsibility



● Dev ● Ops



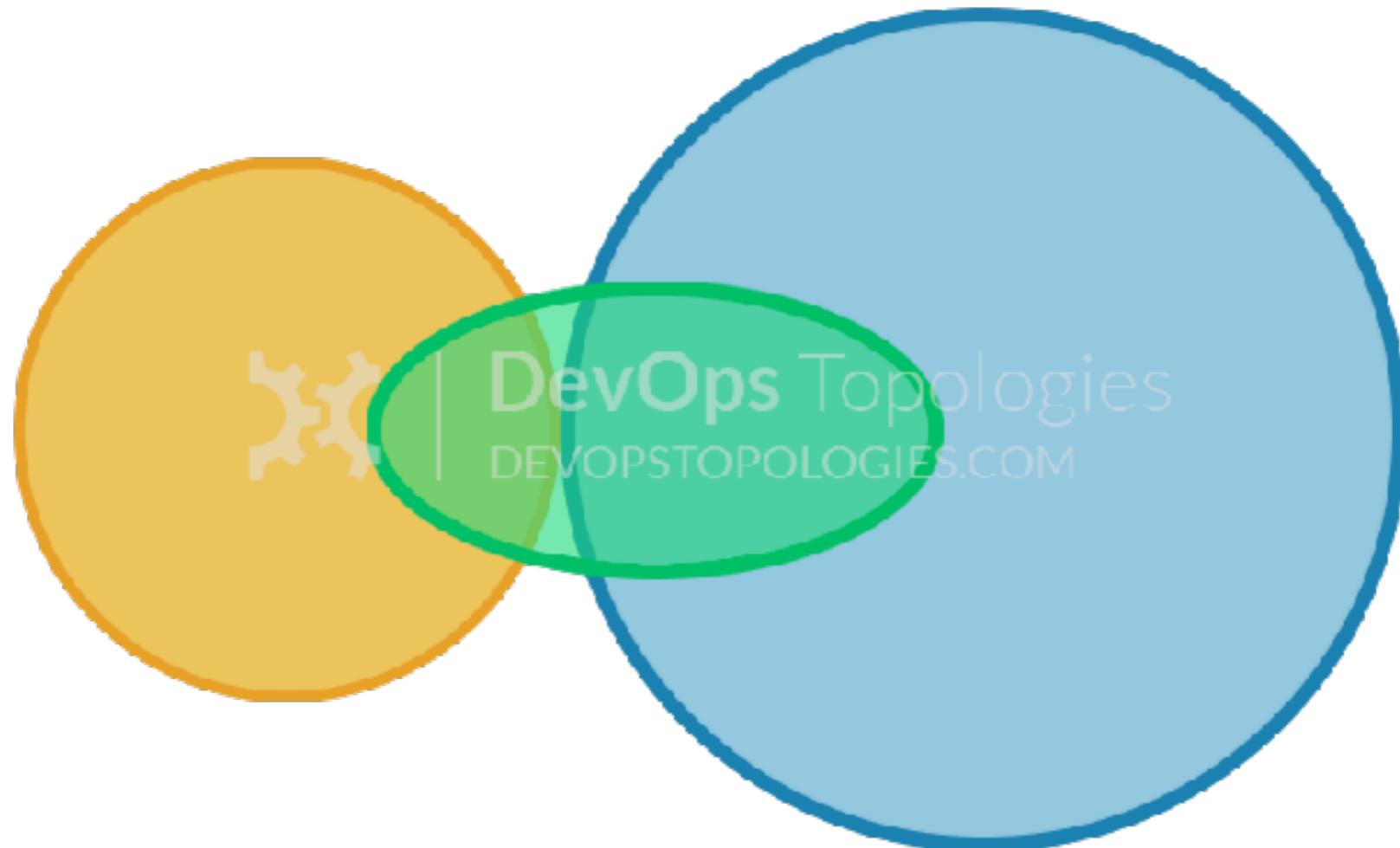
Type 3 :Ops as infra as a service



- Dev
- DevOps
- Ops



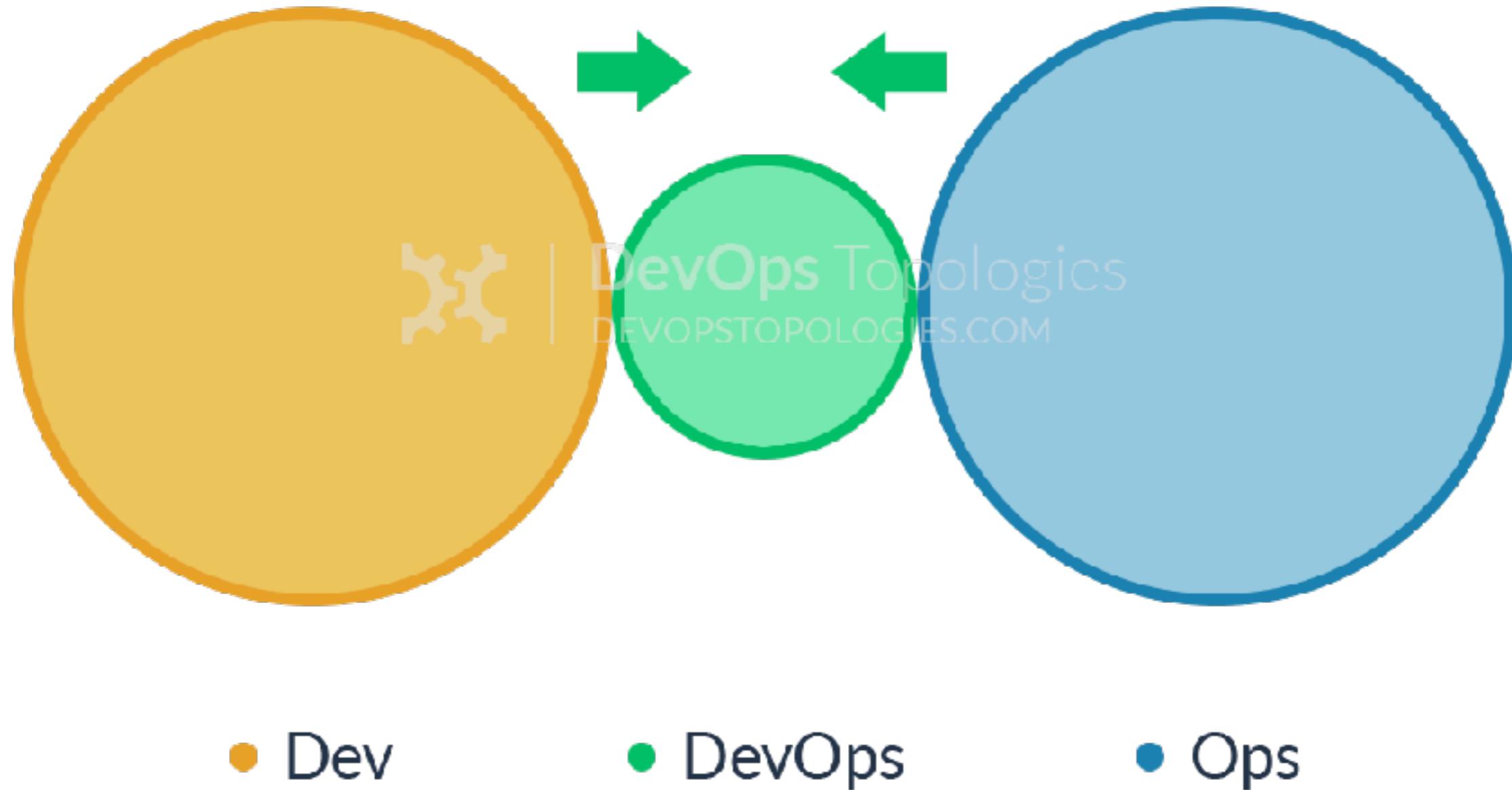
Type 4 : DevOps as external service



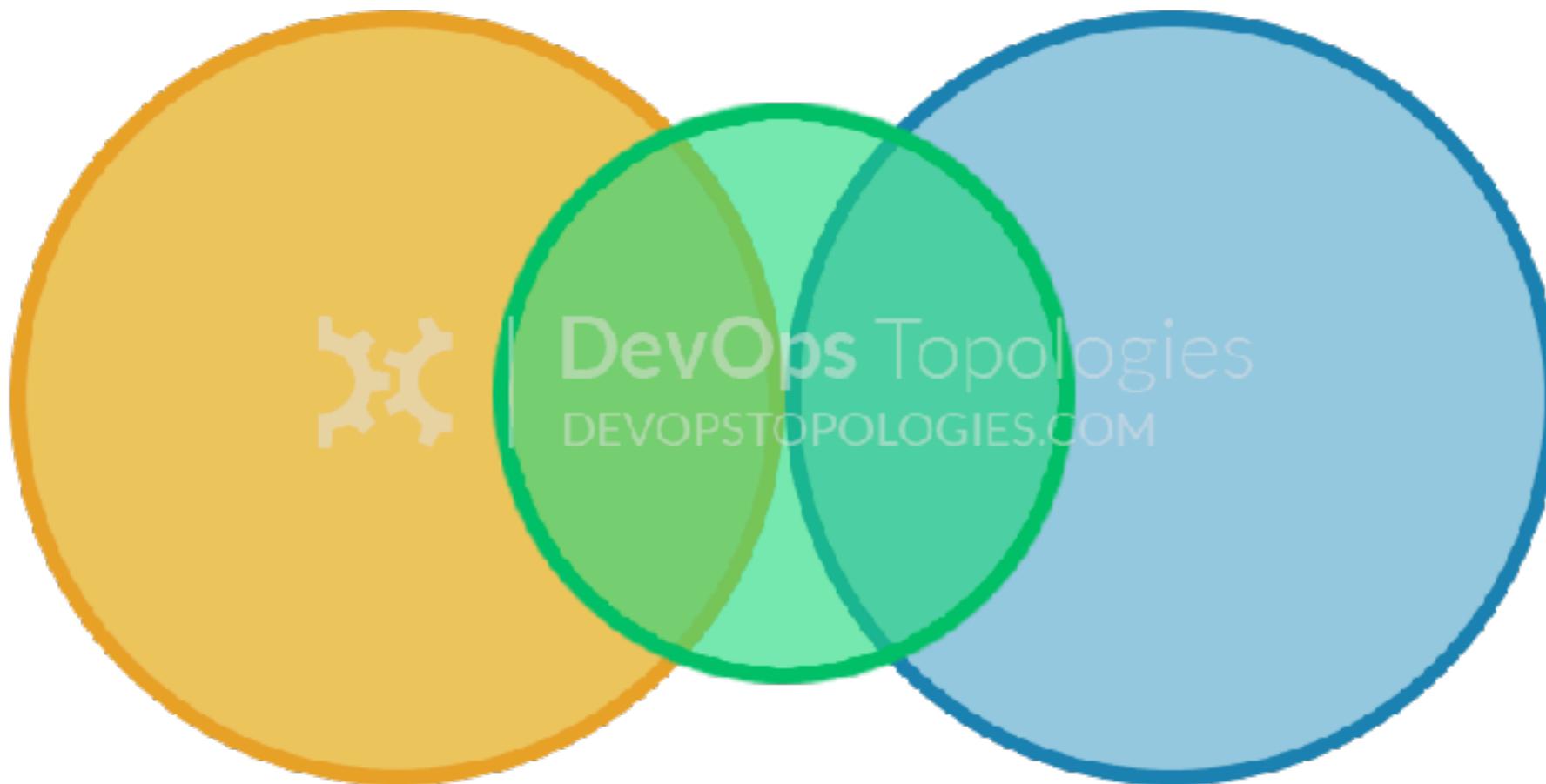
- Dev
- DevOps
- Ops



Type 5 : DevOps team with expire date



Type 6 : DevOps evangelist team



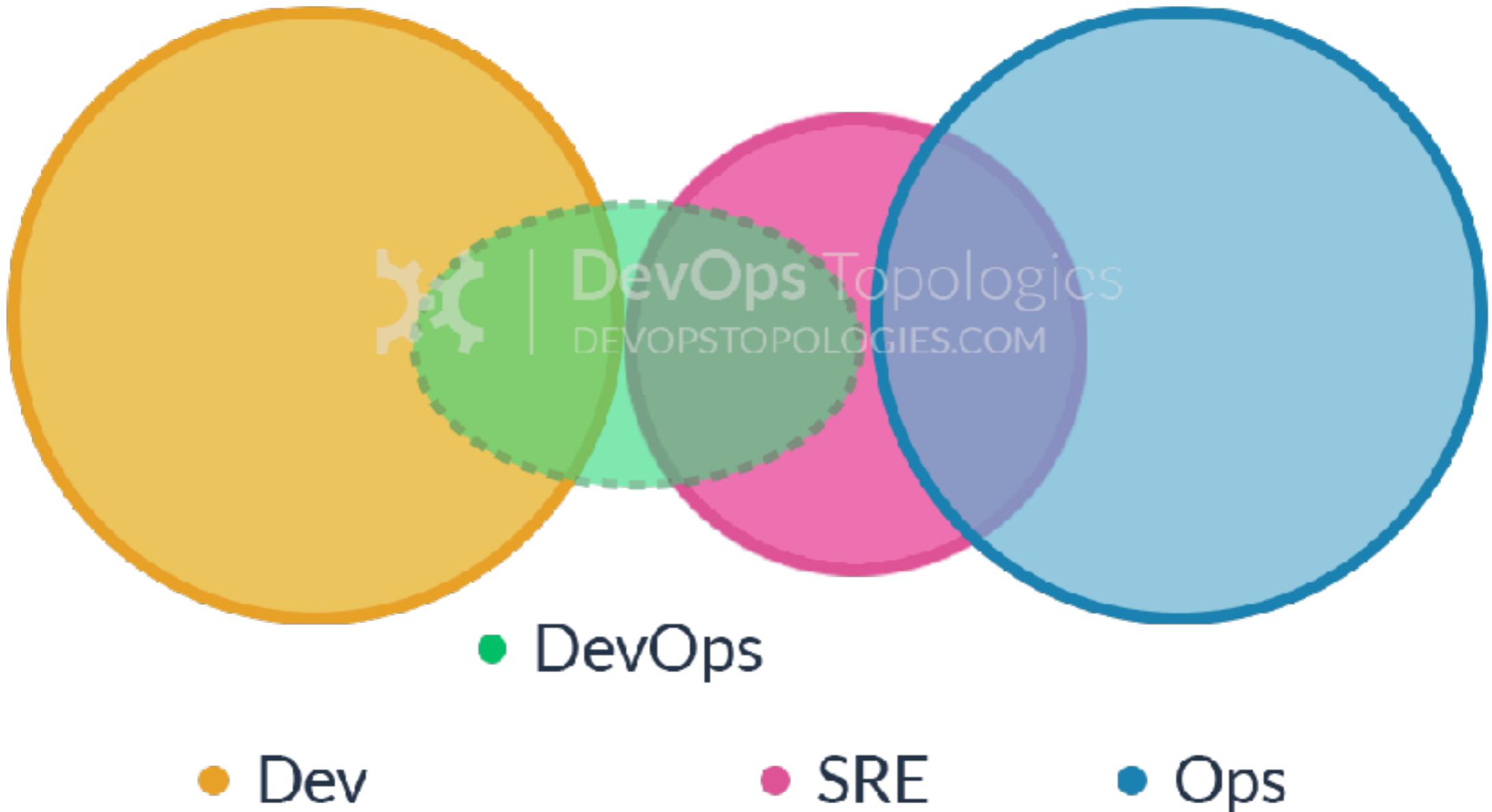
● Dev

● DevOps

● Ops



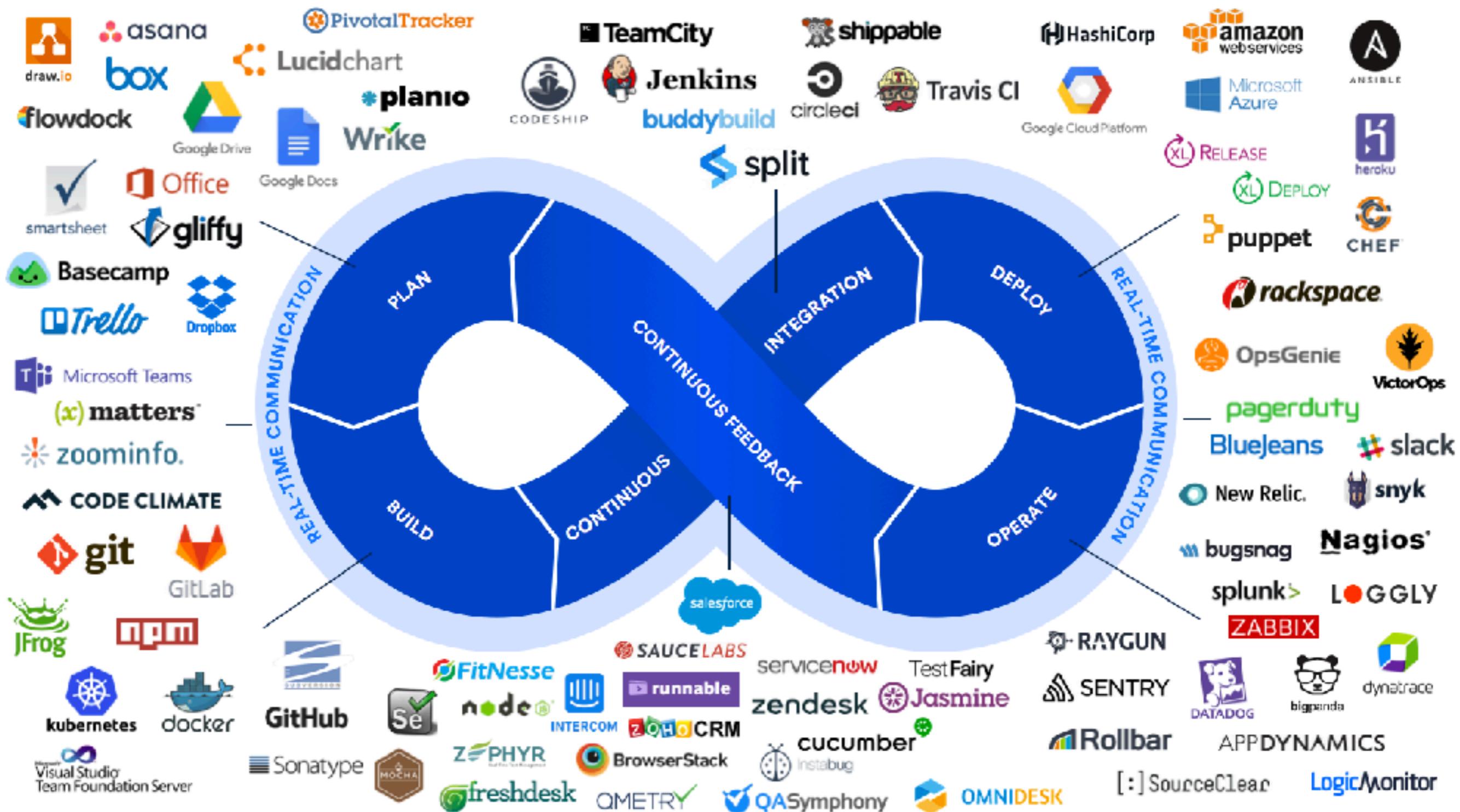
Type 7 : SRE team (Google model)



DevOps Tools



DevOps Tools



DevOps Tools

PERIODIC TABLE OF DEVOPS TOOLS (V2)

EMBED DOWNLOAD ADD

1	1m	Gh	Github	Os	OpenSource	ScM	Database Mgmt	Build	Aws	Amazone Web Services																																																																																																																																																																																																																									
3	Os	Gt	Git	Fr	Free	CI	Repo Mgmt	Testing	Az	Azure																																																																																																																																																																																																																									
4	En	Dm	DBmaestro	Fm	Freemium	Deployment	Config / Provisioning	Containerization	Gc	Google Cloud Platform																																																																																																																																																																																																																									
5				Pd	Paid	Cloud / IaaS / PaaS	Release Mgmt	Collaboration																																																																																																																																																																																																																											
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37	Os	38	En	39	Os	40	Os	41	Os	42	Fr	43	Cs	44	Fr	45	Os	46	Fm	47	Pd	48	Fm	49	Fr	50	Fr	51	Os	52	Os	53	Fr	54	Os	55	En	56	En	57	Fr	58	Fr	59	En	60	Fr	61	Fr	62	Fr	63	Os	64	Fm	65	Fm	66	Os	67	En	68	Fm	69	En	70	En	71	Os	72	Fm	73	En	74	En	75	Os	76	Os	77	Fr	78	Os	79	En	80	Os	81	Os	82	Os	83	Fm	84	Pd	85	En	86	En	87	Fm	88	En	89	Os	90	En	91	Fr	92	En	93	Fr	94	En	95	En	96	Fr	97	Fr	98	Fr	99	Fm	100	Pd	101	Fm	102	Fm	103	Fr	104	Fr	105	En	106	Os	107	Fm	108	Os	109	Cs	110	En	111	Os	112	En	113	En	114	Fm	115	Fm	116	Os	117	Os	118	Os	119	Os	120	En	Xlr	Ur	Bm	Hp	Au	Pi	Sr	Tfs	Tr	Jr	Rf	Sl	Fd	Pv	Sn	Xl Release	UrbanCode Release	RMC Release Process	HP Cedar	Atomic	Plutora Release	Serena Release	Team Foundation	Telco	Jira	HipChat	Slack	Flowdock	Putnial Tracker	ServiceNow	Ki	Nr	Ni	Zb	Dd	Ei	St	Sp	Le	Si	Gr	Sn	Tr	Ff		Kibana	New Relic	Nagios	Zabbix	Datadog	Elasticsearch	StackState	Splunk	Logentries	Sumsologic	Logstash	Graylog	Short	Tripwire	Fortify

XebiaLabs
Deliver Faster

Follow @xebialabs

91	Fm	92	Fr	93	Fr	94	Fr	95	Fr	96	Fr	97	Fr	98	Pd	99	Fm	100	Pd	101	Fm	102	Fm	103	Fr	104	Fr	105	En	106	Os	107	Fm	108	Os	109	Cs	110	En	111	Os	112	En	113	En	114	Fm	115	Fm	116	Os	117	Os	118	Os	119	Os	120	En	Xlr	Ur	Bm	Hp	Au	Pi	Sr	Tfs	Tr	Jr	Rf	Sl	Fd	Pv	Sn	Ki	Nr	Ni	Zb	Dd	Ei	St	Sp	Le	Si	Gr	Sn	Tr	Ff		Xl Release	UrbanCode Release	RMC Release Process	HP Cedar	Atomic	Plutora Release	Serena Release	Team Foundation	Telco	Jira	HipChat	Slack	Flowdock	Putnial Tracker	ServiceNow	Kibana	New Relic	Nagios	Zabbix	Datadog	Elasticsearch	StackState	Splunk	Logentries	Sumsologic	Logstash	Graylog	Short	Tripwire	Fortify
106	Os	107	Fm	108	Os	109	Cs	110	En	111	Os	112	En	113	En	114	Fm	115	Fm	116	Os	117	Os	118	Os	119	Os	120	En	Ki	Nr	Ni	Zb	Dd	Ei	St	Sp	Le	Si	Gr	Sn	Tr	Ff		Kibana	New Relic	Nagios	Zabbix	Datadog	Elasticsearch	StackState	Splunk	Logentries	Sumsologic	Logstash	Graylog	Short	Tripwire	Fortify																																																												

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



DevOps

120

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No DevOps Team

Problem department !!



DevOps != Tools
Tools enable DevOps



DevOps success ?



How do i know something is wrong ?

Missed deadline

Site is always down

Unhappy customers

Long waits for small changes or fixes

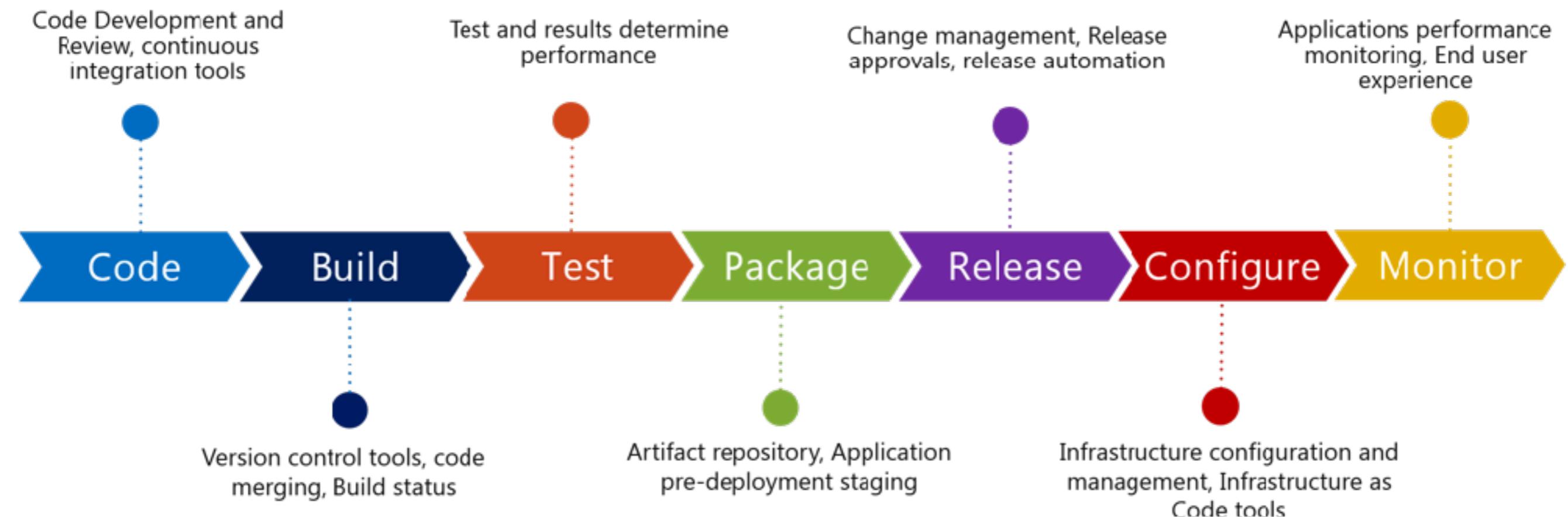
Changes cost too much



What can i measure ?



DevOps Process & Tools



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



What can i measure ?

Application Usage and Traffic

Application Performance

Automated Test Pass (%)

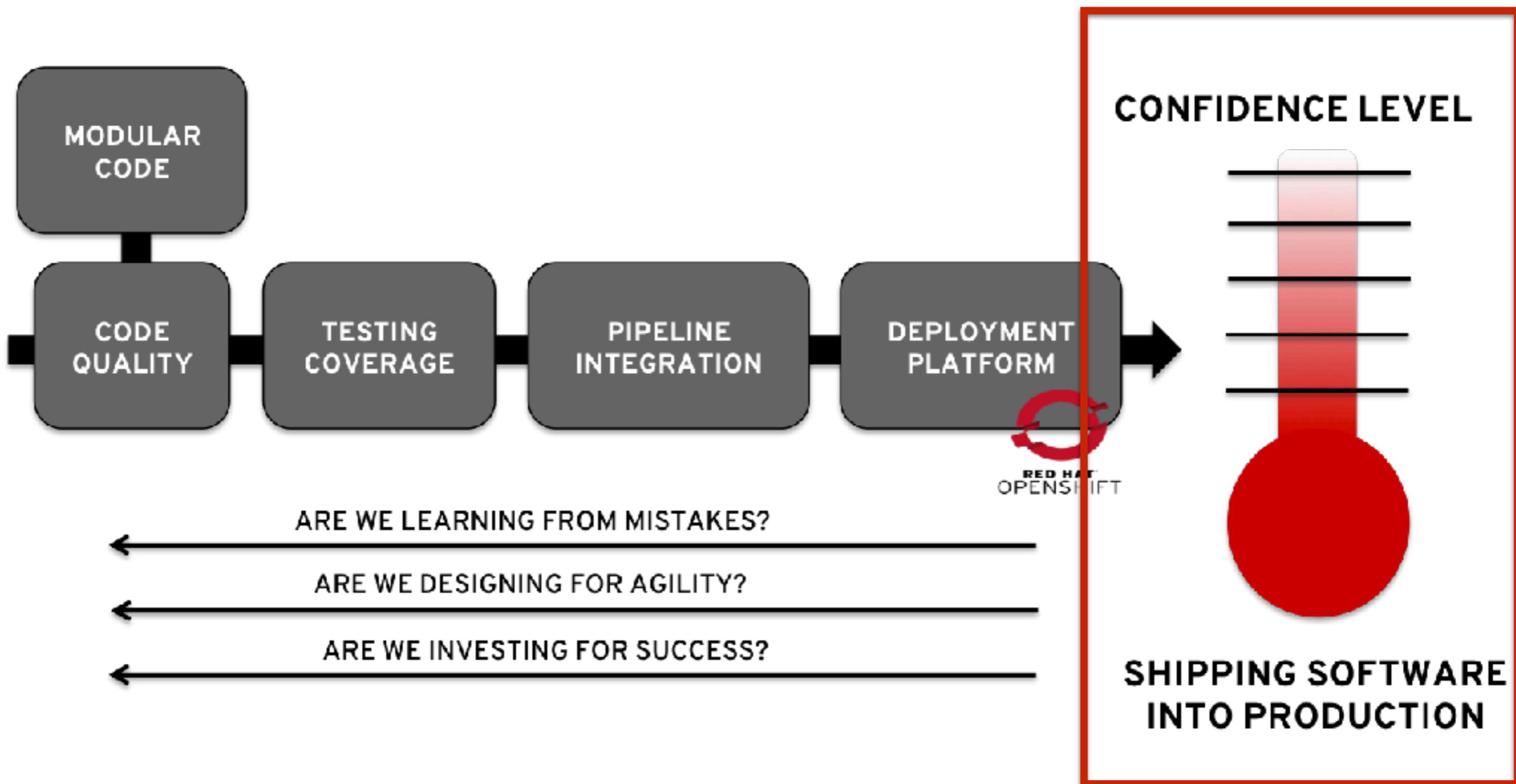
Defect Rate

Failed Deployments

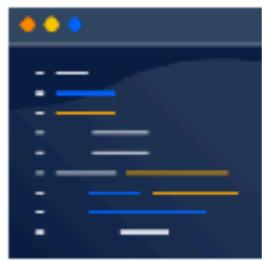
Availability



What can i measure ?



Three must haves



Log aggregations

Stream all logs into one place.

Circuit breakers

Write code with failure in mind

Request tracing

Don't spend hours debugging

<https://trello.com/>



Circuit breakers



Response times

How much time do services spend calling other services.



Back pressure

Stop putting pressure on a system that is in trouble and fail fast



Fallback

How do you handle failure. A mandatory step in the programming model.

<https://trello.com/>



Do you know your system ?

The image displays six terminal windows arranged in a 3x2 grid, each showing the output of the 'top' command on a Linux system. The terminals are labeled as follows:

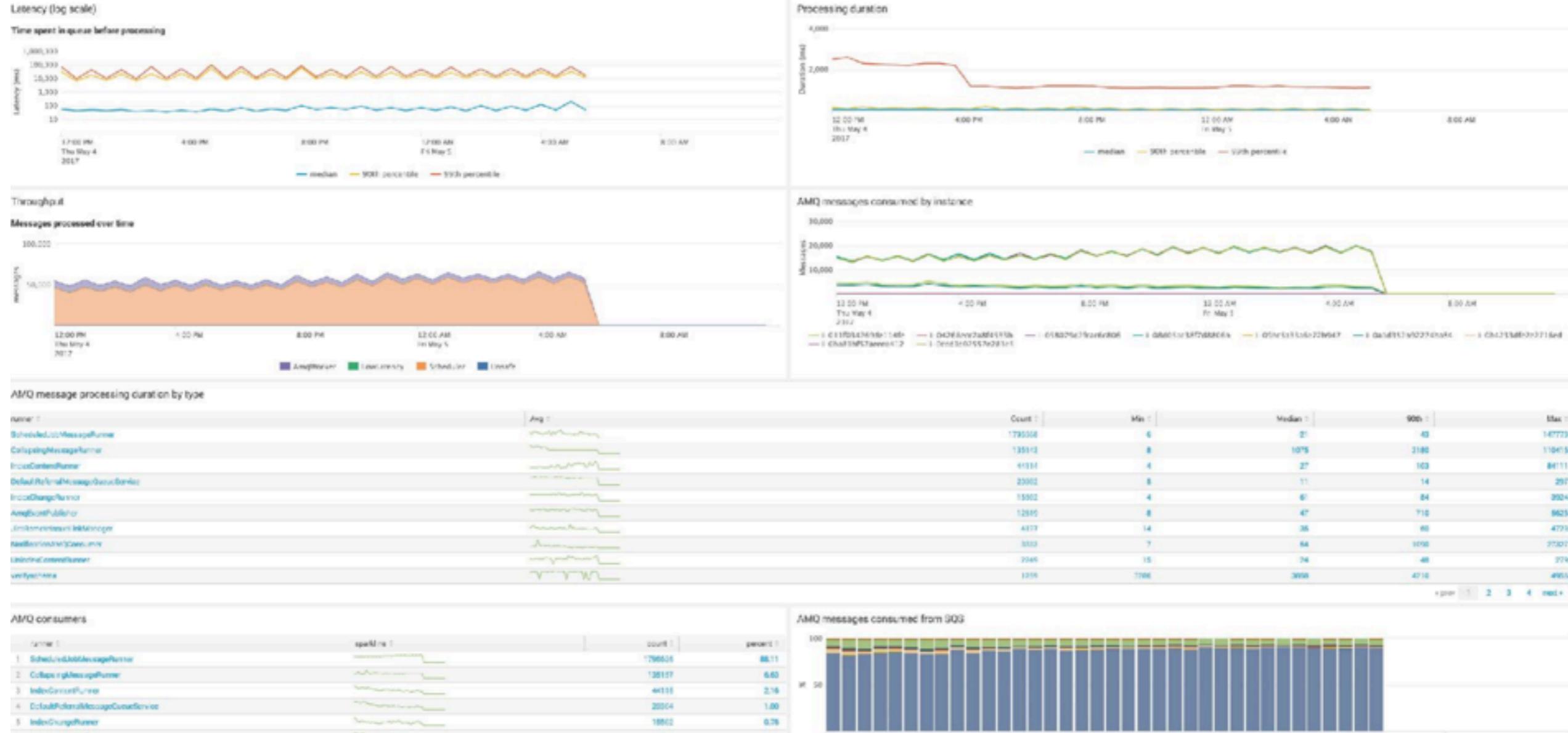
- Top-left: sshX - root@localhost:1111 - ssh - perl5.10.0 - Visor - ttys006 - 63x7
- Top-right: sshX - root@localhost:1112 - ssh - perl5.10.0 - Visor - ttys007 - 63x7
- Middle-left: sshX - root@localhost:1113 - ssh - perl5.10.0 - Visor - ttys008 - 63x7
- Middle-right: sshX - root@localhost:1114 - ssh - perl5.10.0 - Visor - ttys009 - 63x7
- Bottom-left: sshX - root@localhost:1115 - ssh - perl5.10.0 - Visor - ttys010 - 63x7
- Bottom-right: sshX - root@localhost:1116 - ssh - perl5.10.0 - Visor - ttys011 - 63x7

Each terminal window shows the following system status:

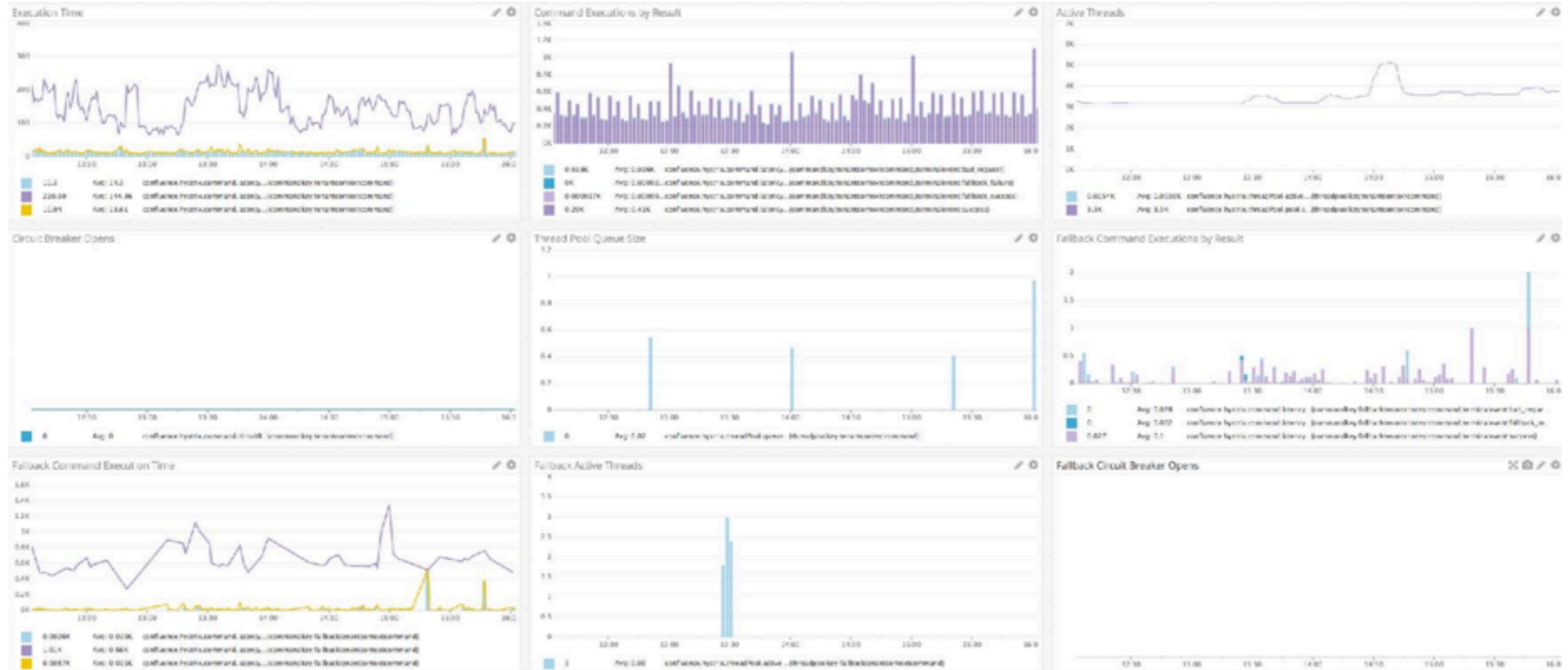
- Uptime: 547 days, 1:50, 2 users.
- Load average: 0.6 to 1.2.
- Tasks: 130 to 129 total, 1 to 2 running, 129 sleeping, 0 stopped.
- Cpu(s): CPU usage details (e.g., 10.2%us, 3.1%sy, 0.0%ni, 85.7%id, 0.0%wa, 0.1%hi).
- Mem: Total memory 4051984k, used 3975528k, free 76456k, swap 4184924k, used 866144k, free 3318780k, swap free 319199k.
- Swap: Swap space 4184924k total, 535520k used, 3649404k free, 270435k available.



Do you know your system ?



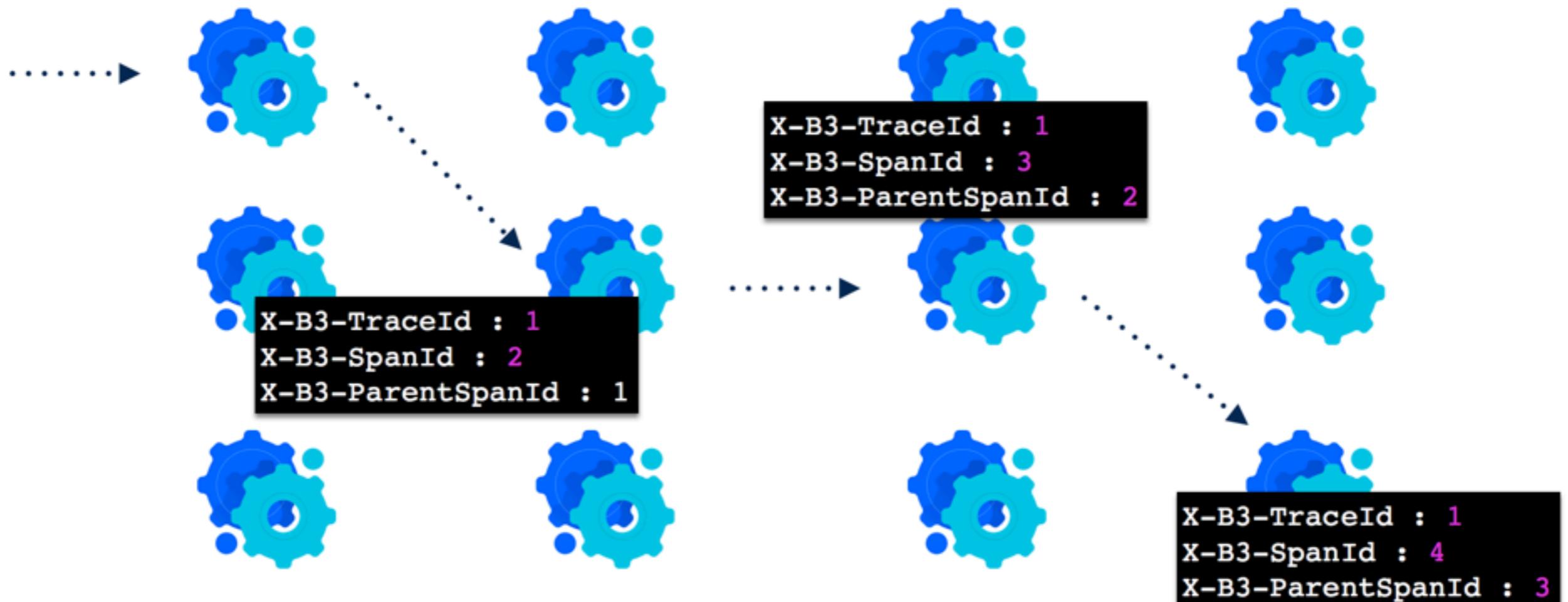
Do you know your system ?



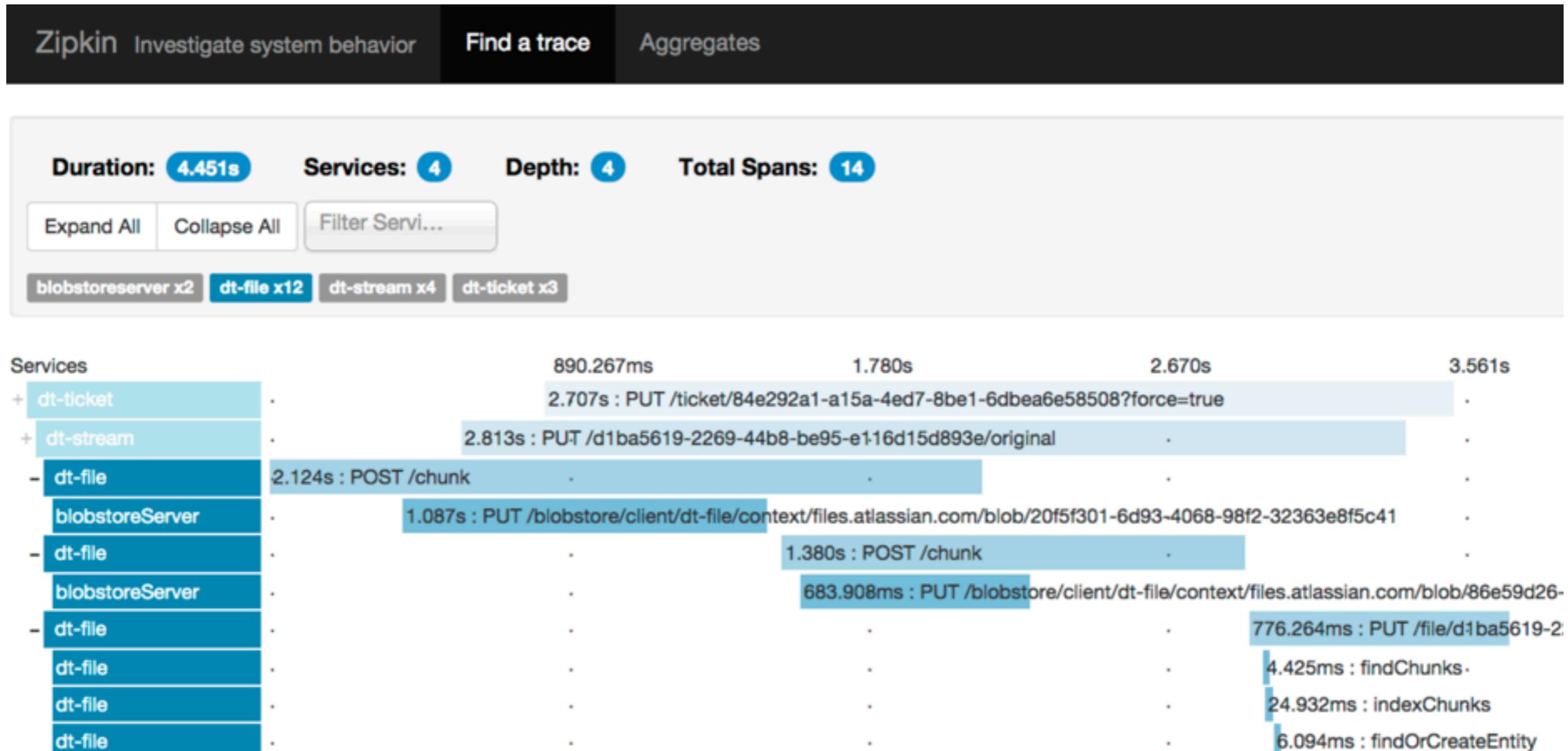
Do you know your system ?

X-B3-TraceId : 1
X-B3-SpanId : 1

Request Tracing



Do you know your system ?





You Build It You Run It

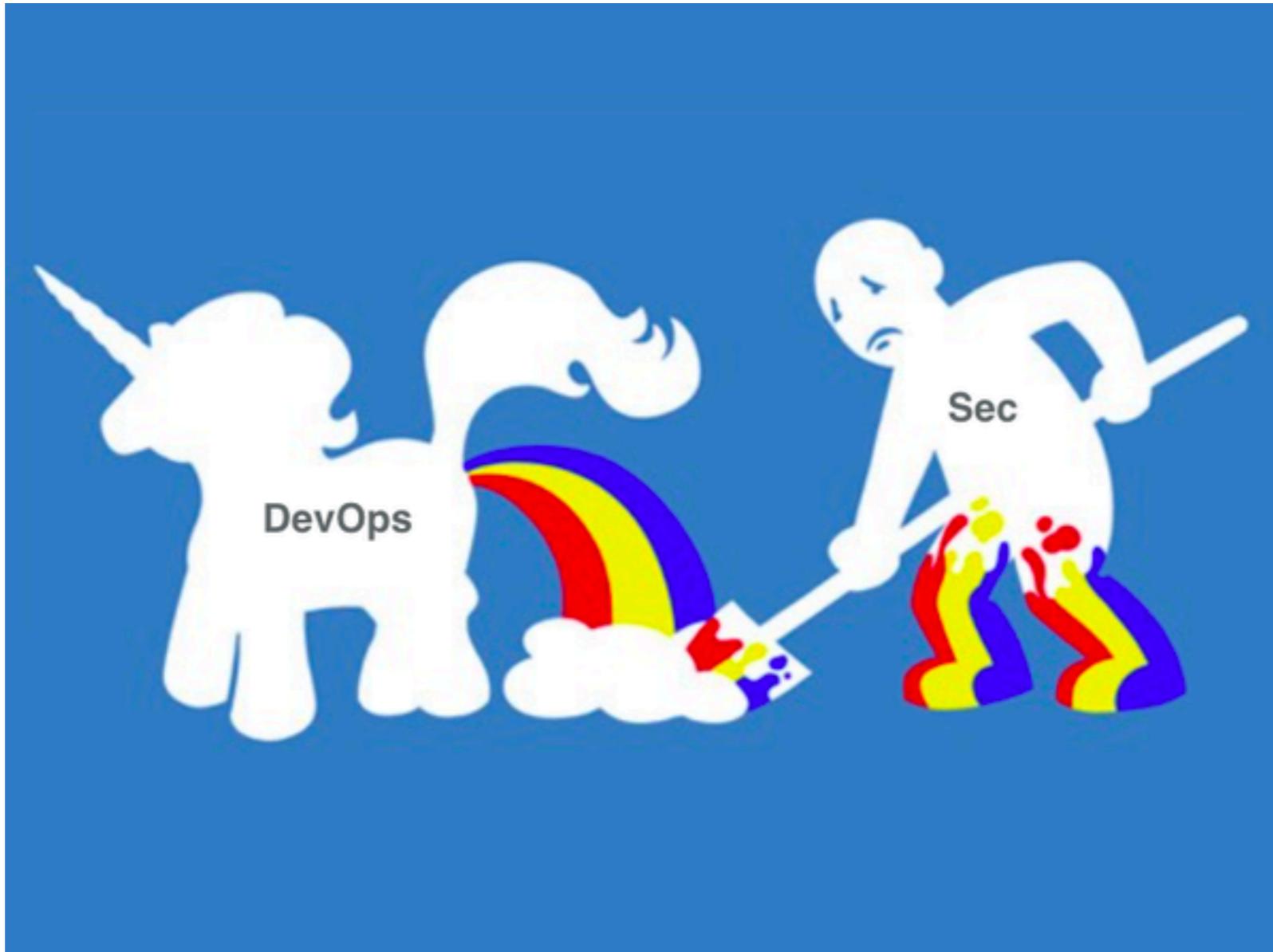
The team who builds it looks after it.

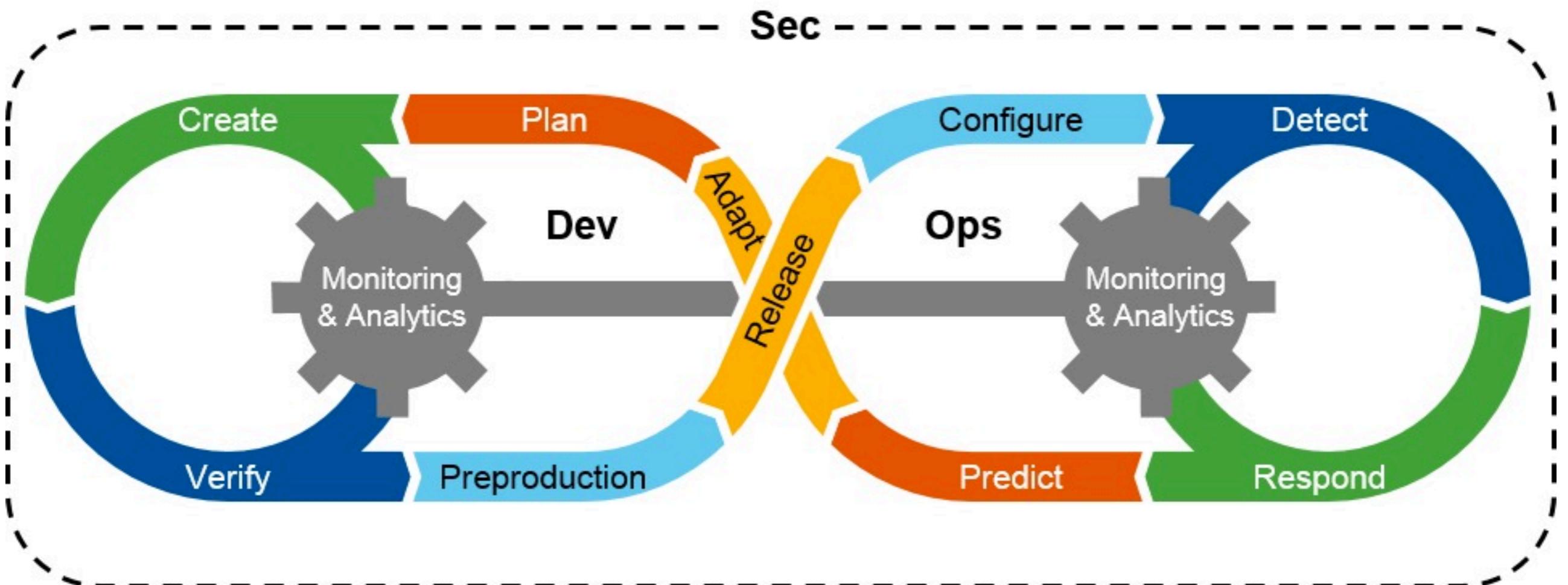


more ...

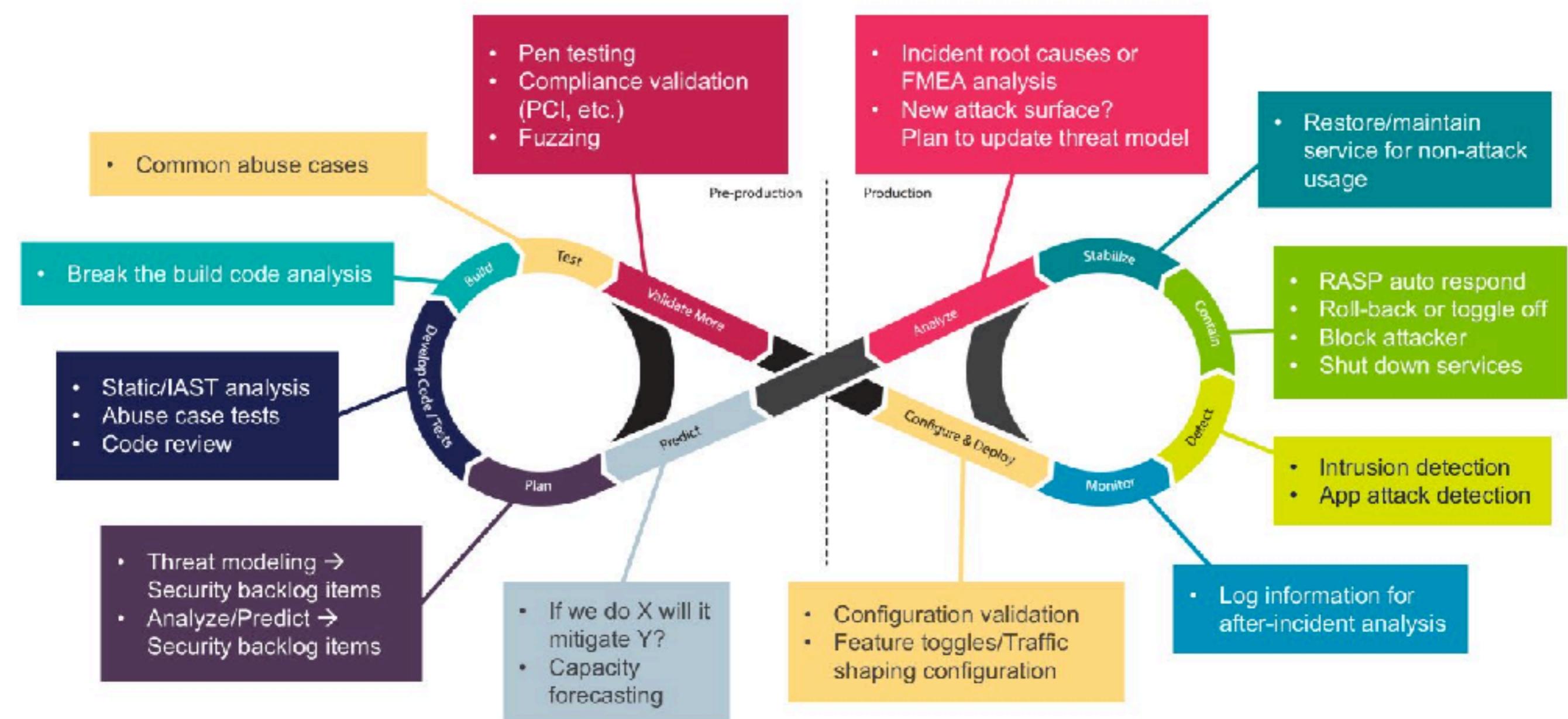






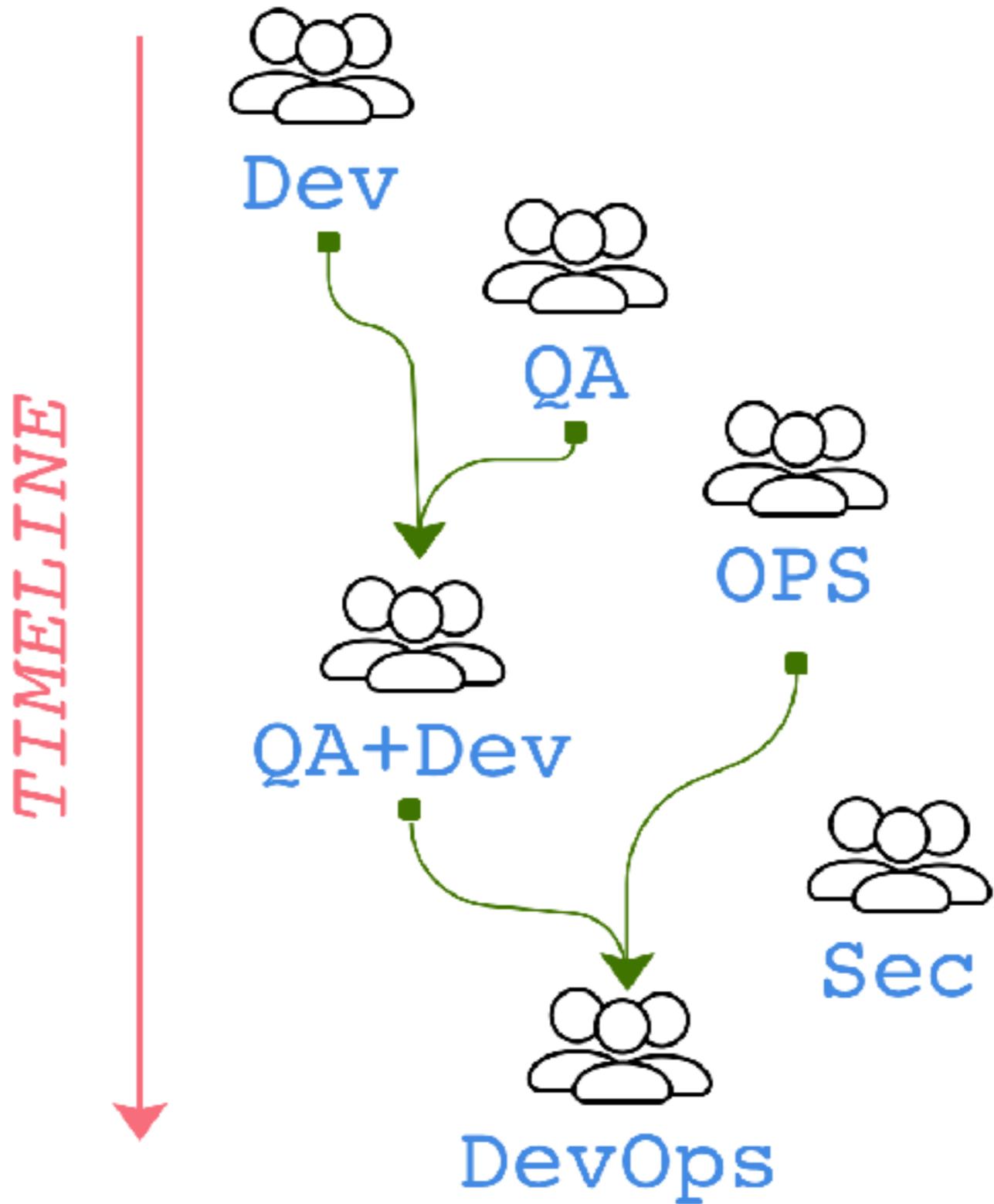


DevSecOps Cycle



[LinkedIn.com/in/LarryMaccherone](https://www.linkedin.com/in/LarryMaccherone)

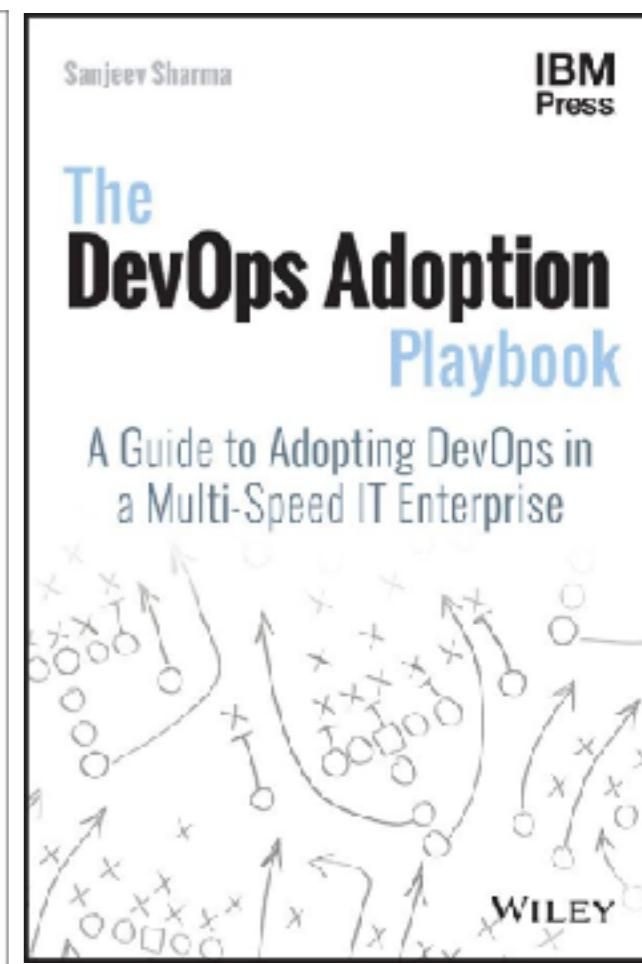
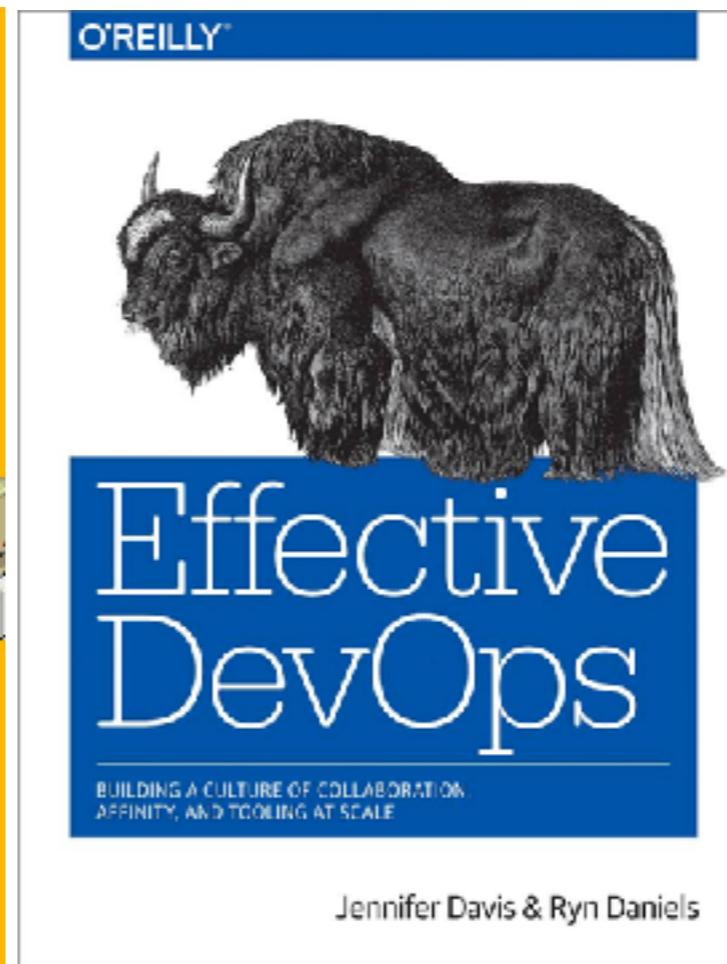
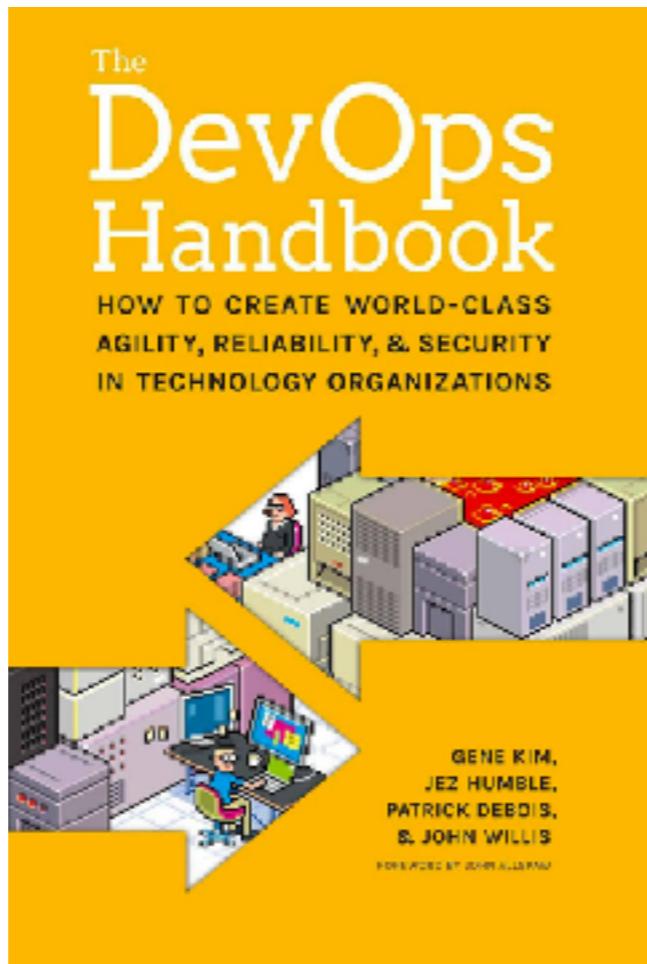
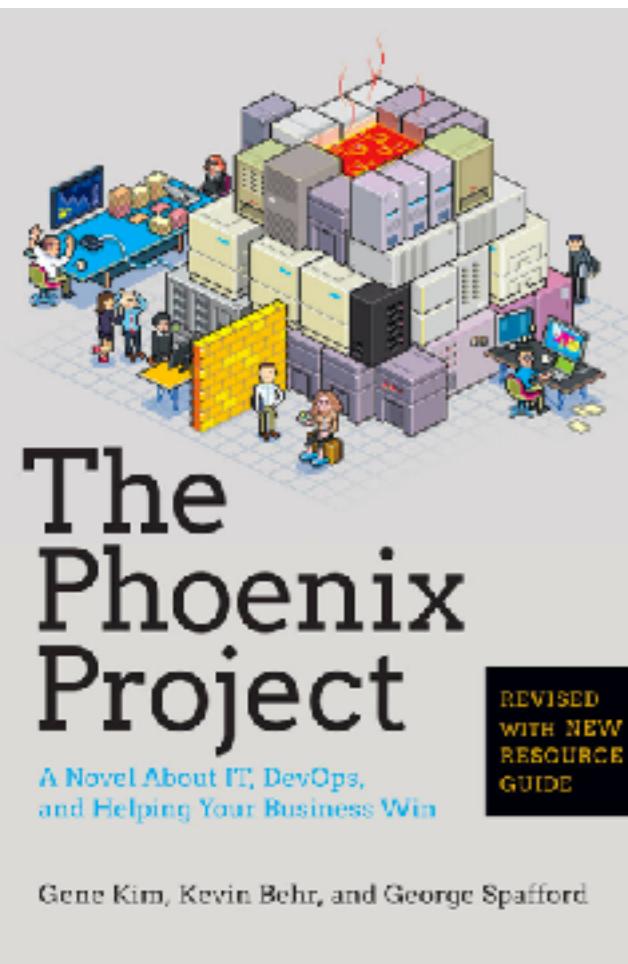




<https://medium.com/odds-team/%E0%B8%AA%E0%B8%A3%E0%B8%B8%E0%B8%9B-devops-is-dev%EA%9D%8B%EA%9E%A9-by-chai-feng-bb61b0460af0>



Resources



DevOps !!



Back to basic



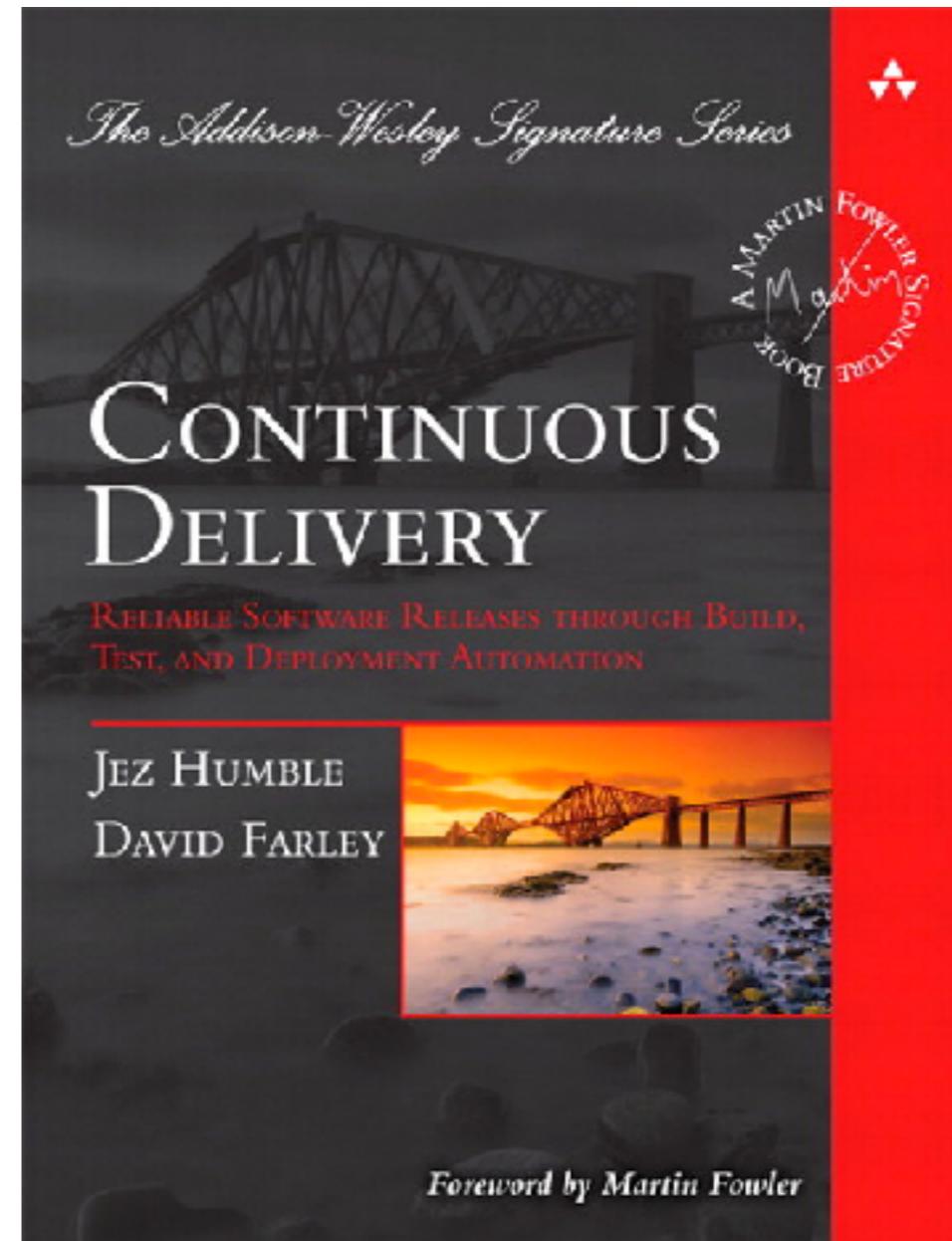
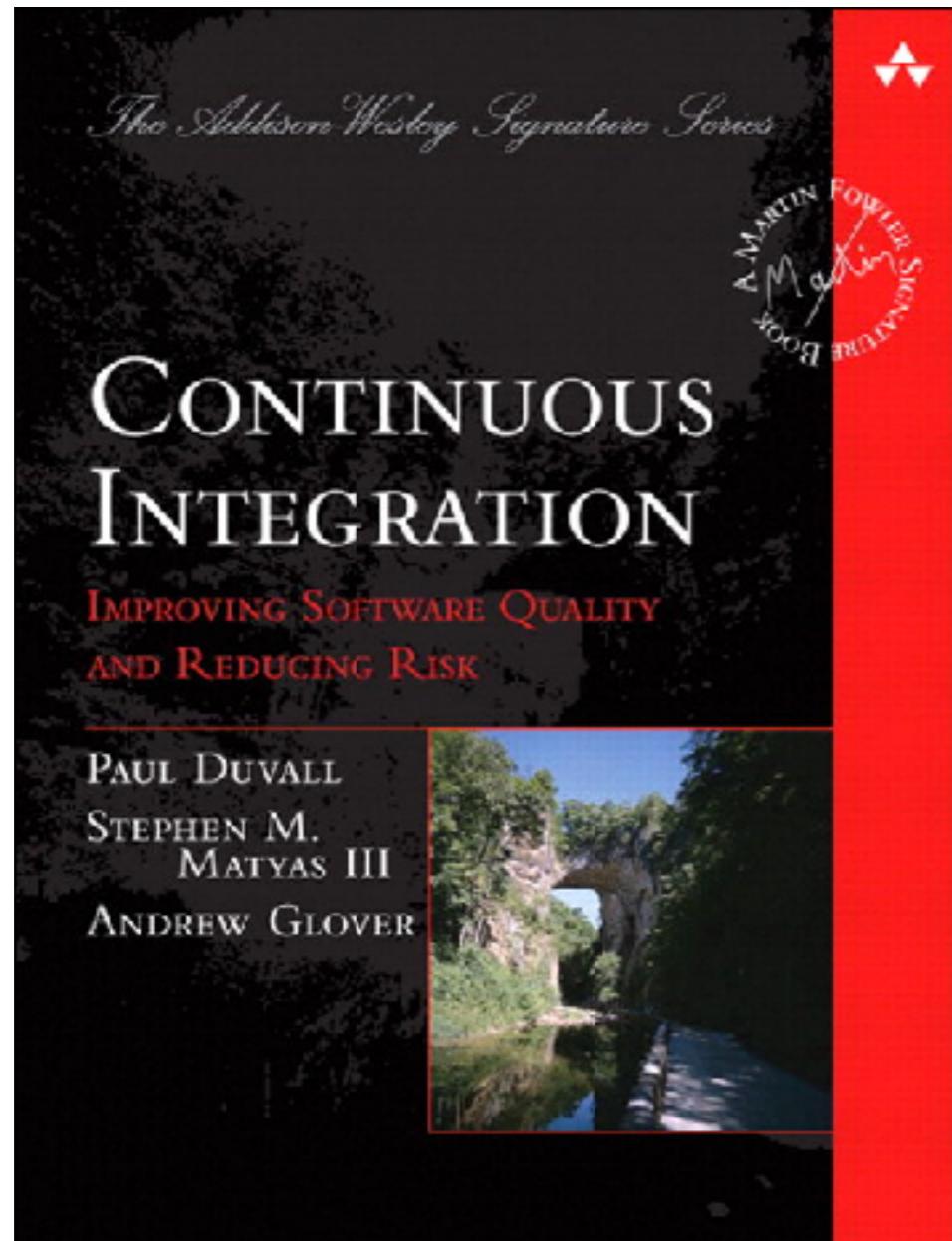
**“Behind every successful agile
project, there is a
Continuous Integration”**



Start with Continuous Integration Continuous Delivery



Improve quality and reduce risk

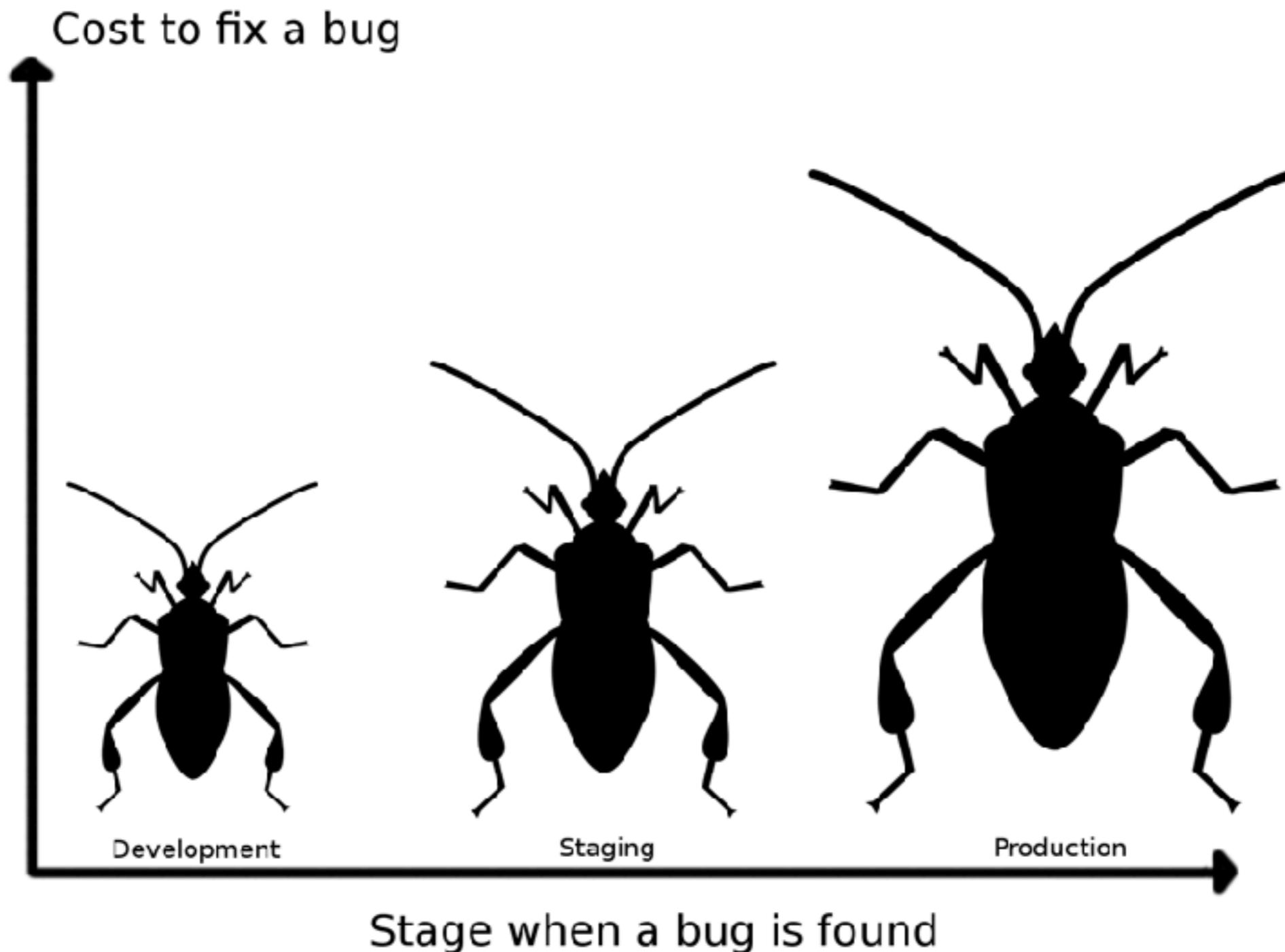


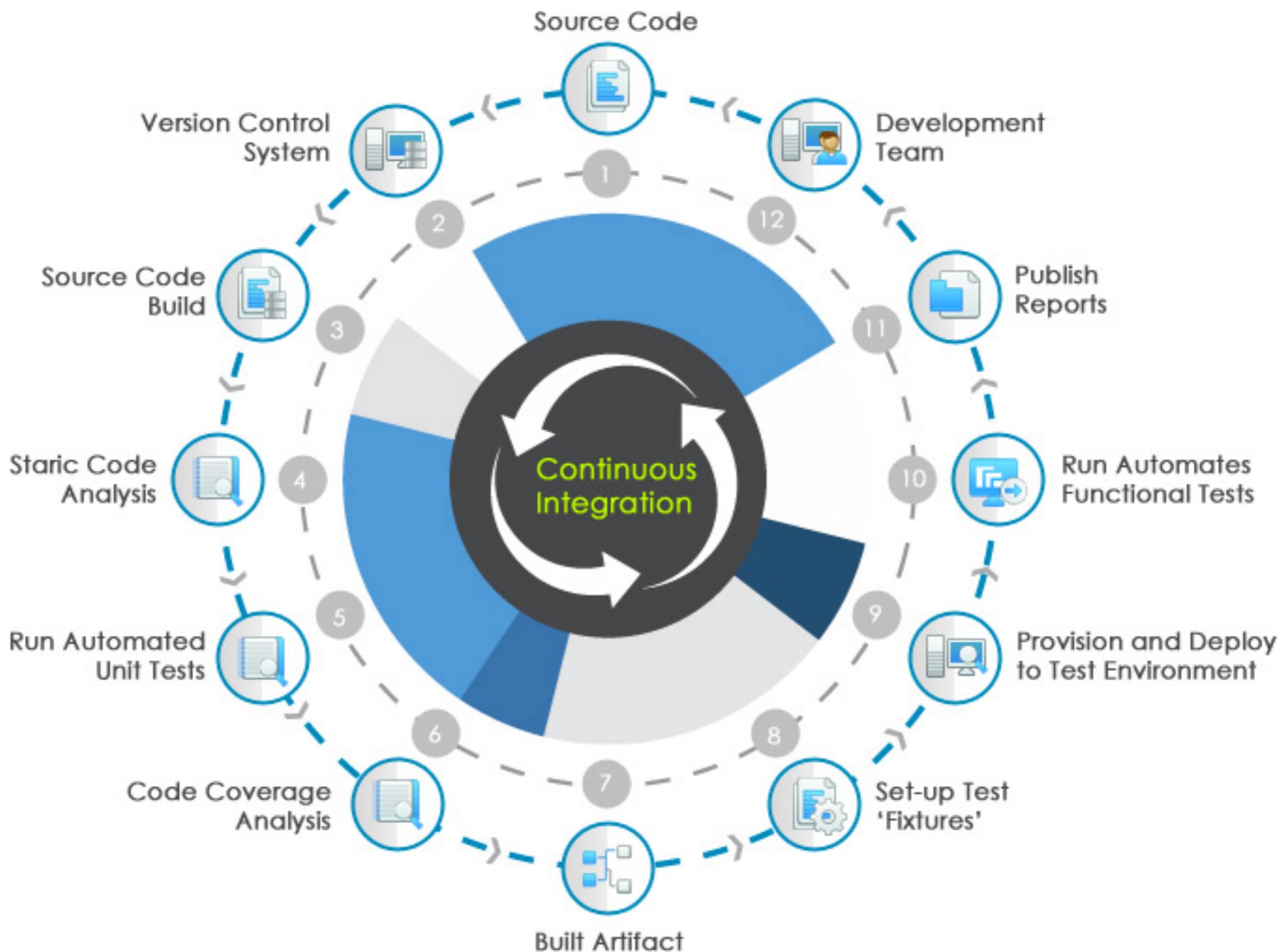
The cost of integration

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



The cost of integration







Jenkins

Bamboo



TeamCity

> goTM



Hudson

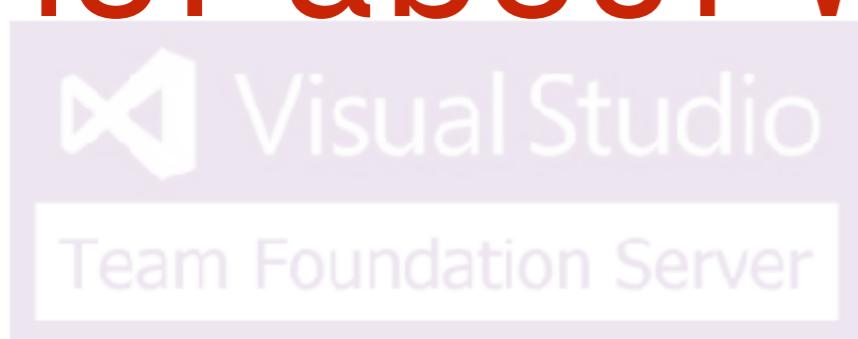




Jenkins

Bamboo

CI is about what people do
not about what tools they use



Hudson



Continuous Integration

Discipline to integrate frequently



Continuous Integration

Strive to make **small change**

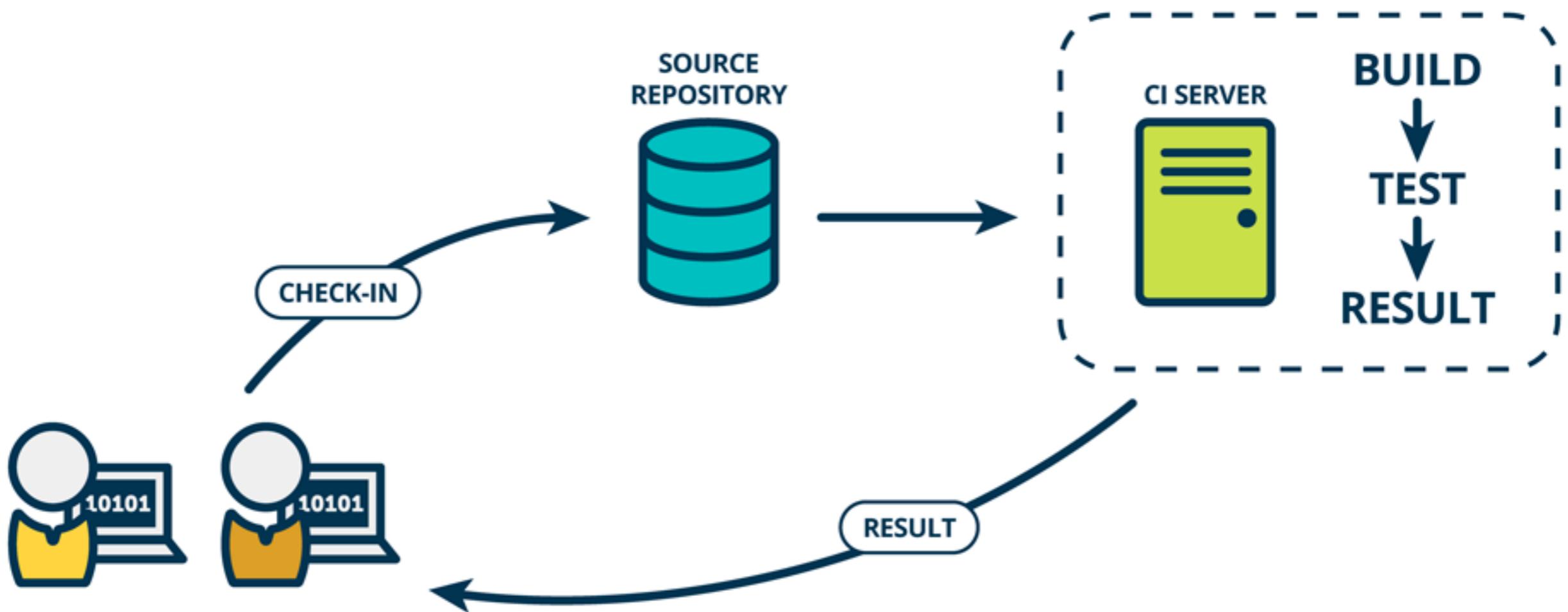


Continuous Integration

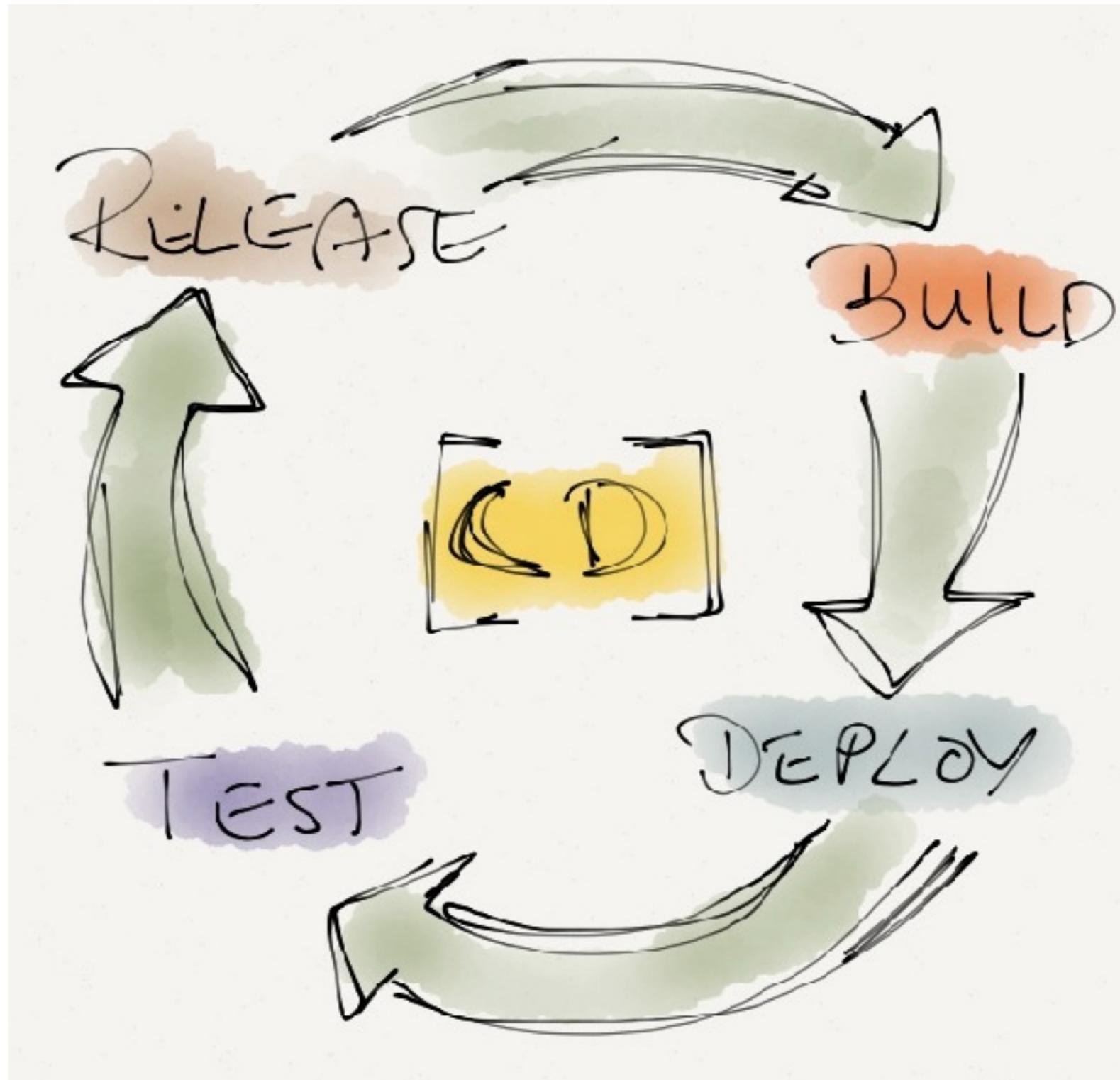
Strive for **fast feedback**



Continuous Integration



CD ?



CD ?

CONTINUOUS DELIVERY



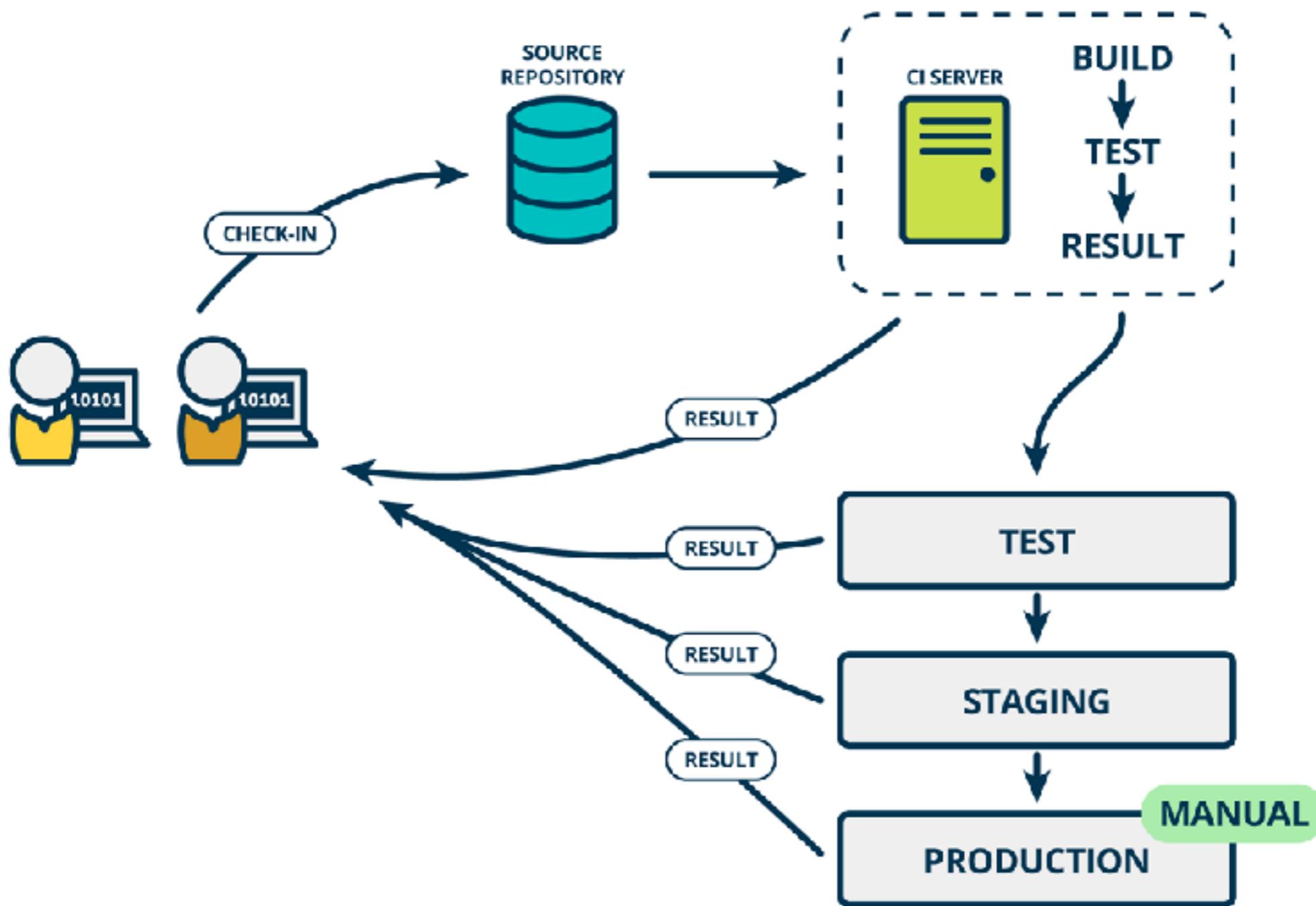
CONTINUOUS DEPLOYMENT



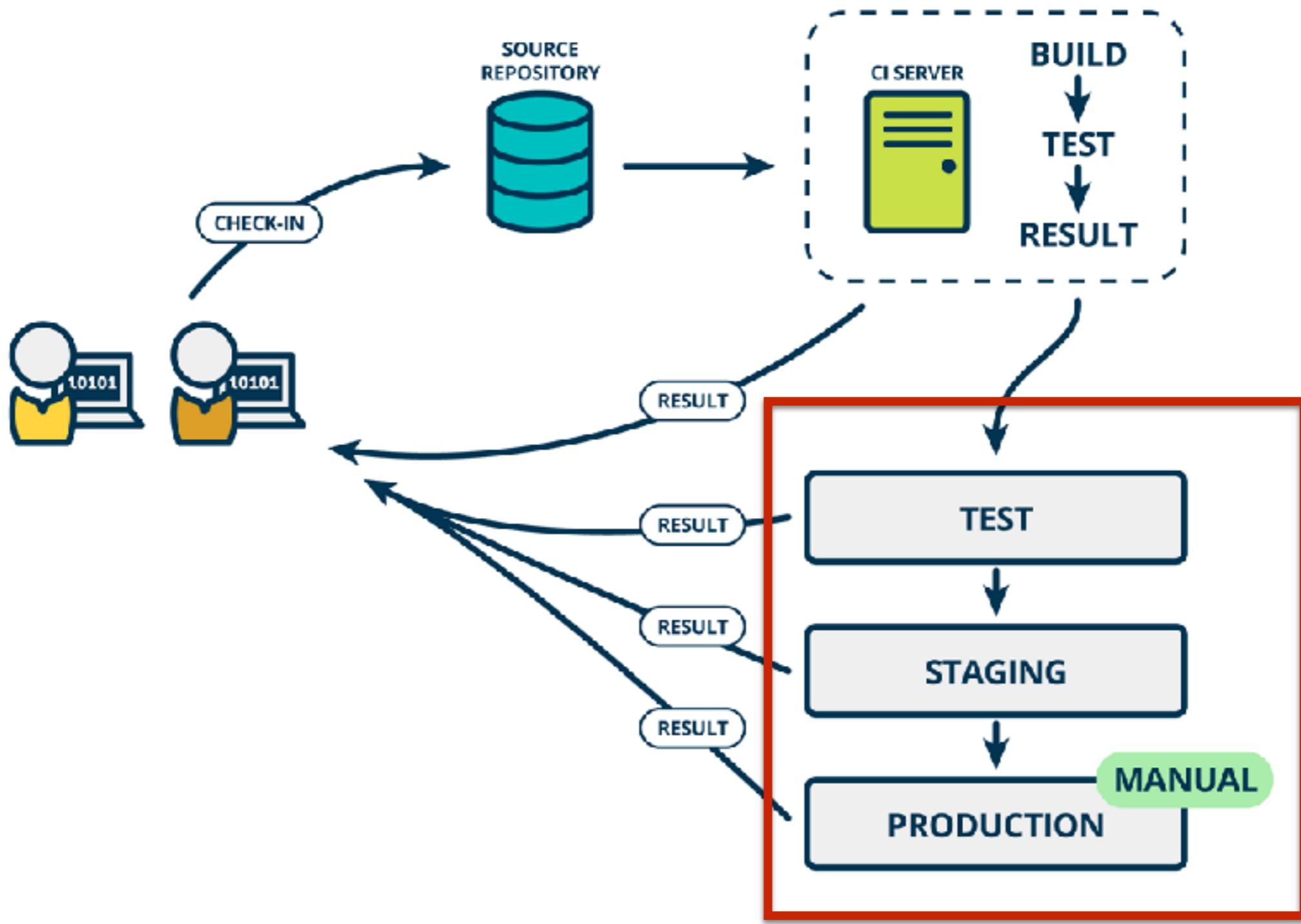
<http://blog.crisp.se/2013/02/05/yassalsundman/continuous-delivery-vs-continuous-deployment>



Continuous Delivery



Rise of DevOps



Continuous Integration

is a Software development practices



Practice 1

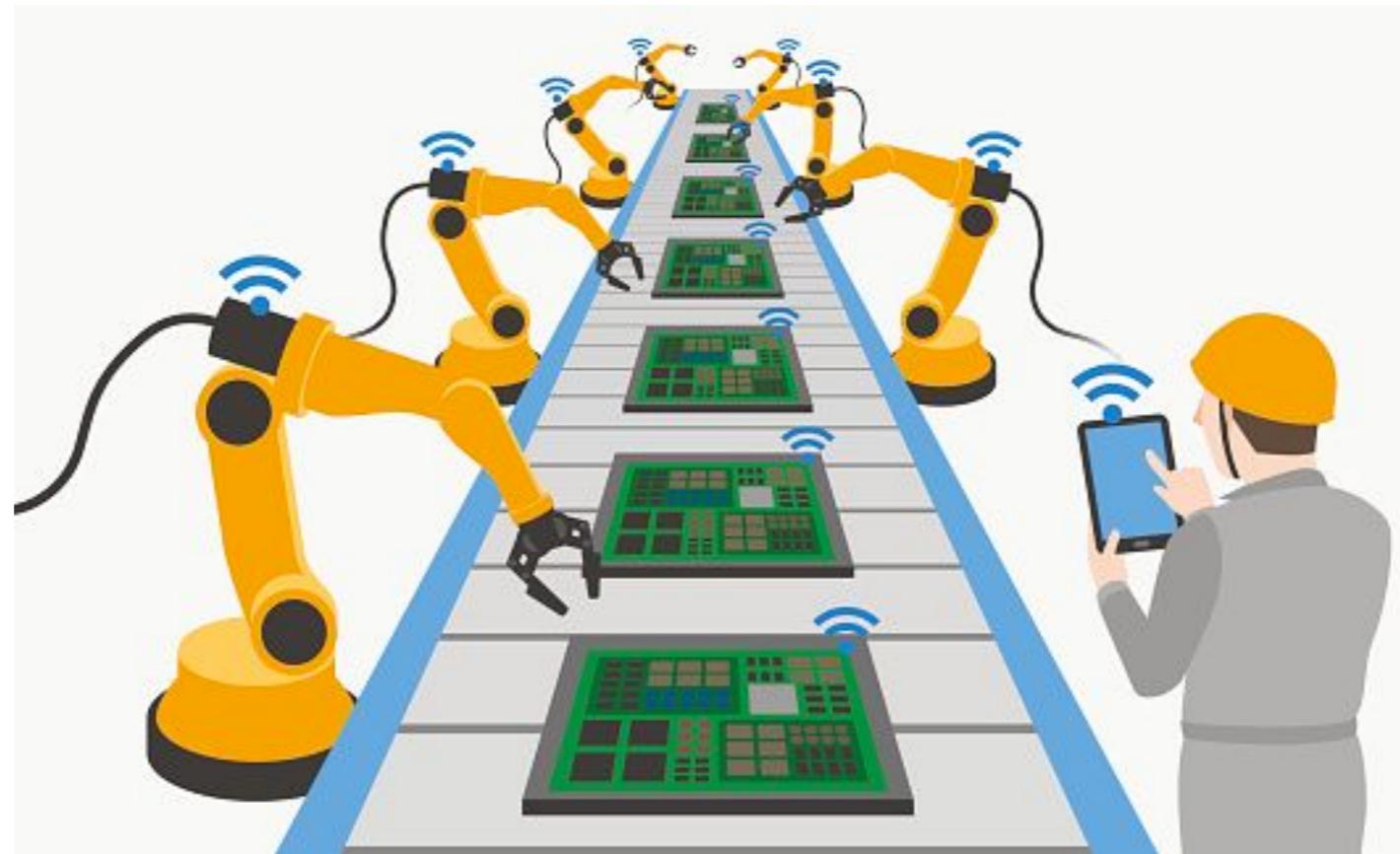
Maintain a single source repository

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



Practice 2

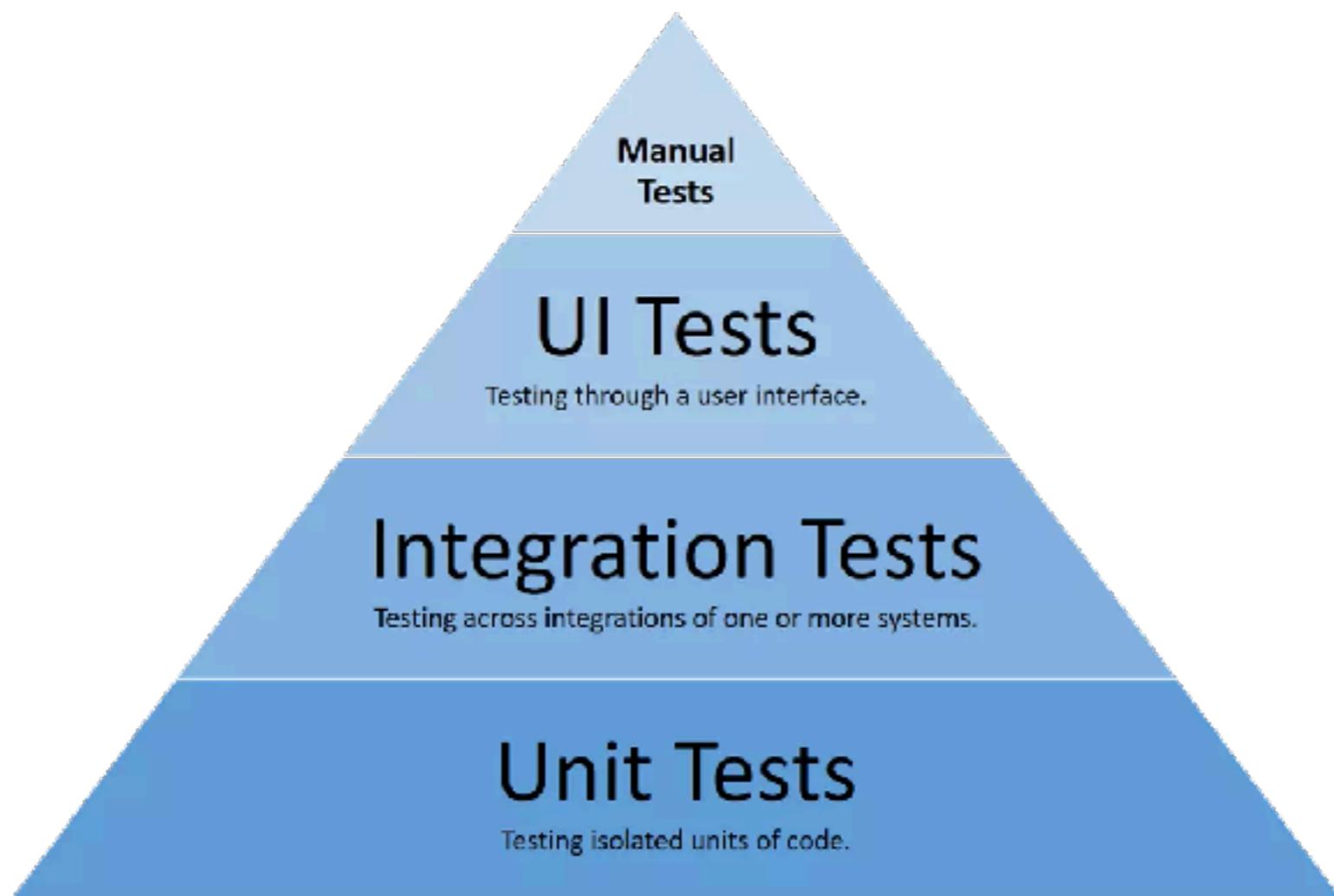
Automated the build
Automated environment for builds



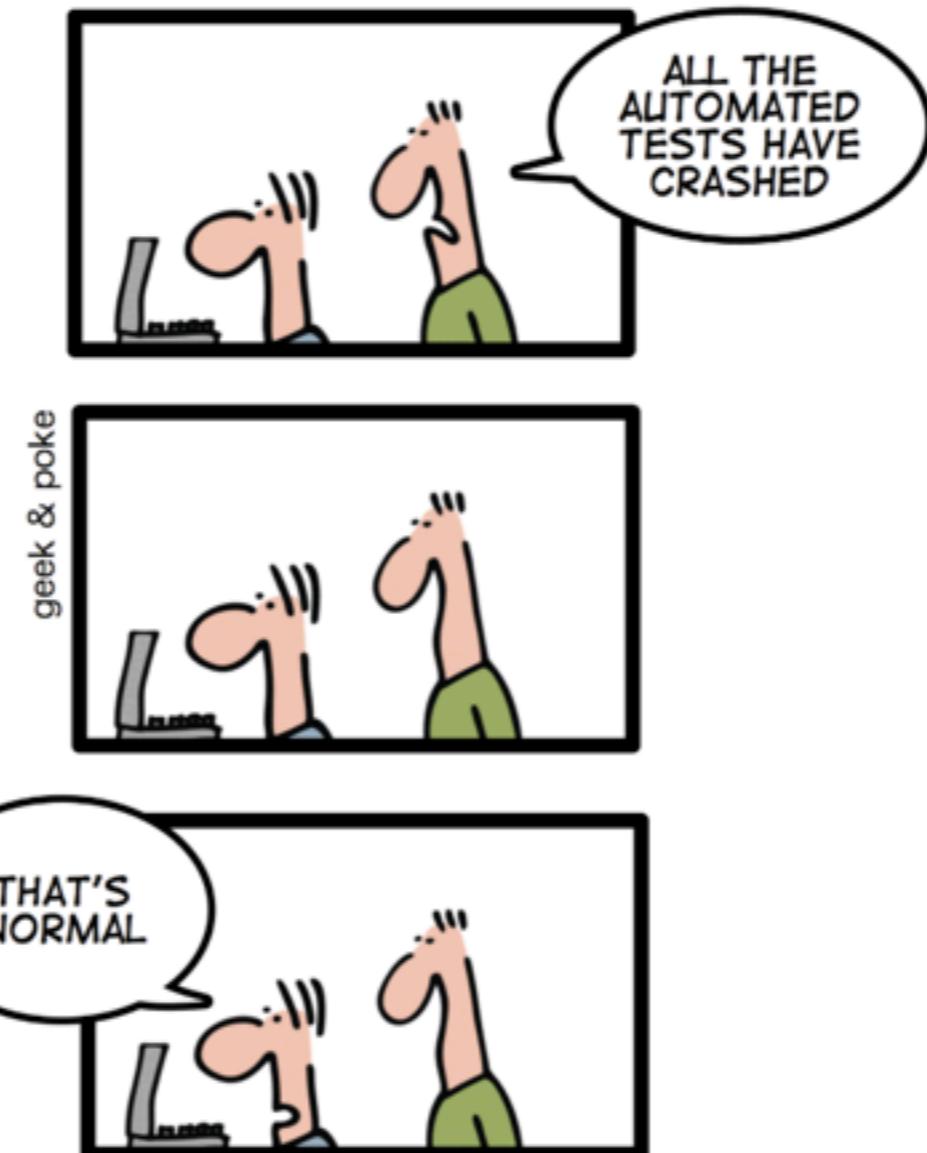
Practice 3

Make your build **self-testing**

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



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

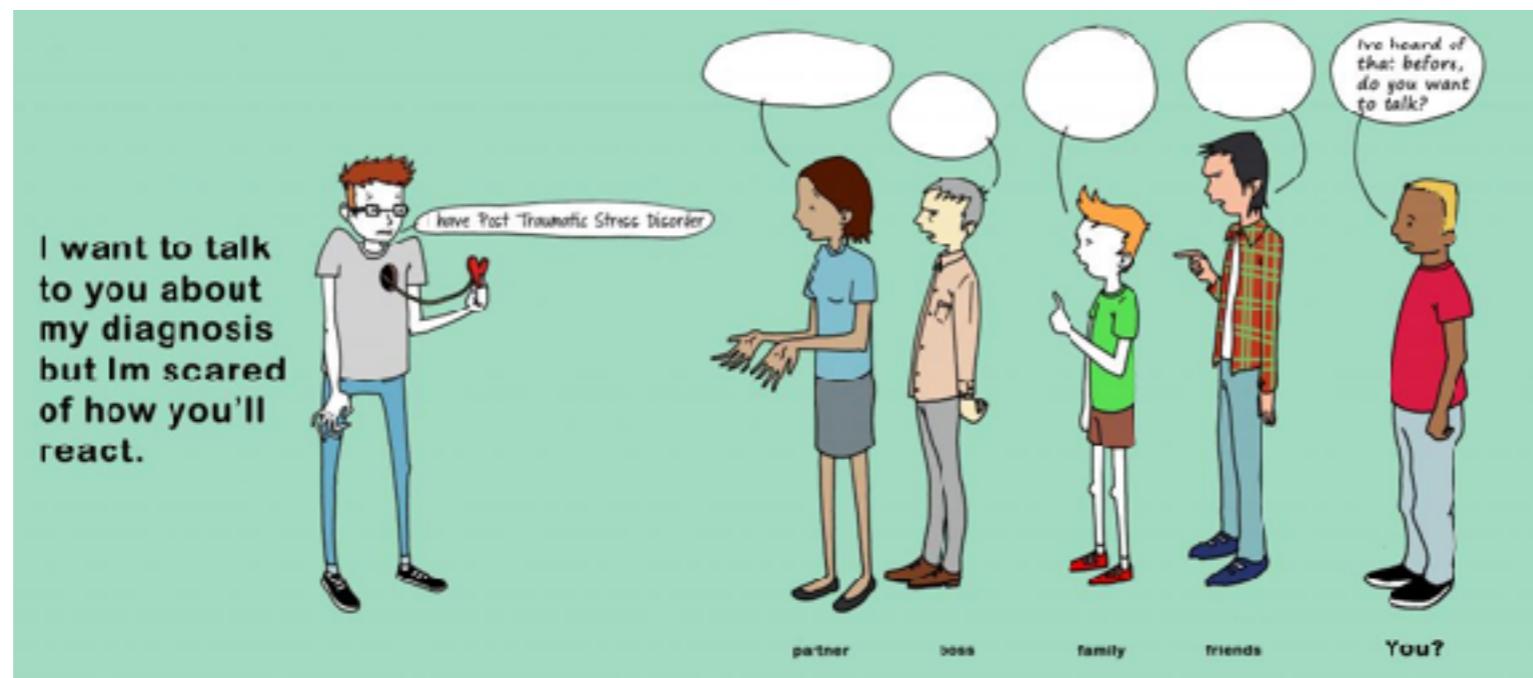


Practice 4

Everyone **commits** to the mainline everyday

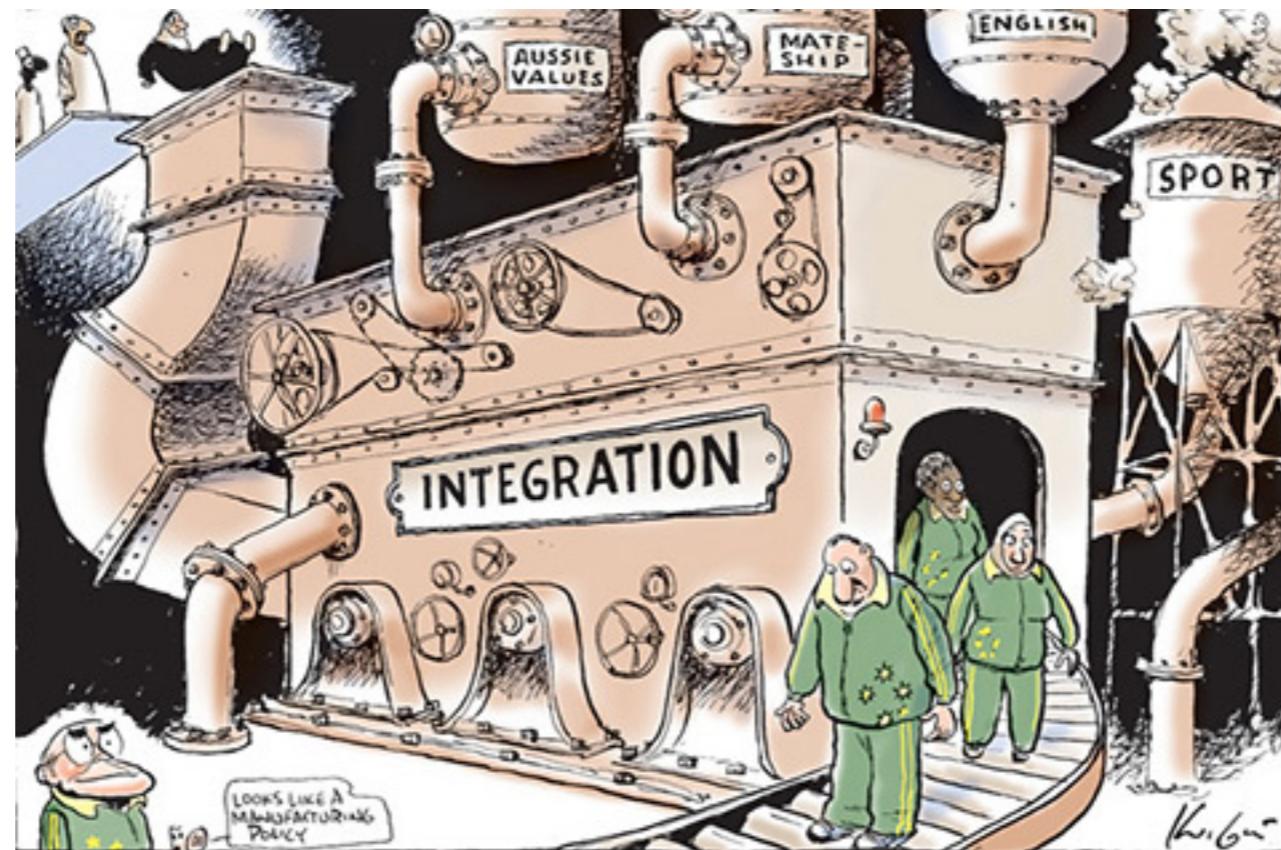
Integration is about **communication**

Integration allows developers to **tell** other developers



Practice 5

Every commits should build the mainline on an
Integration machine



Nightly build is not enough for Continuous Integration



Practice 6

Fix broken builds immediately

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



Practice 7

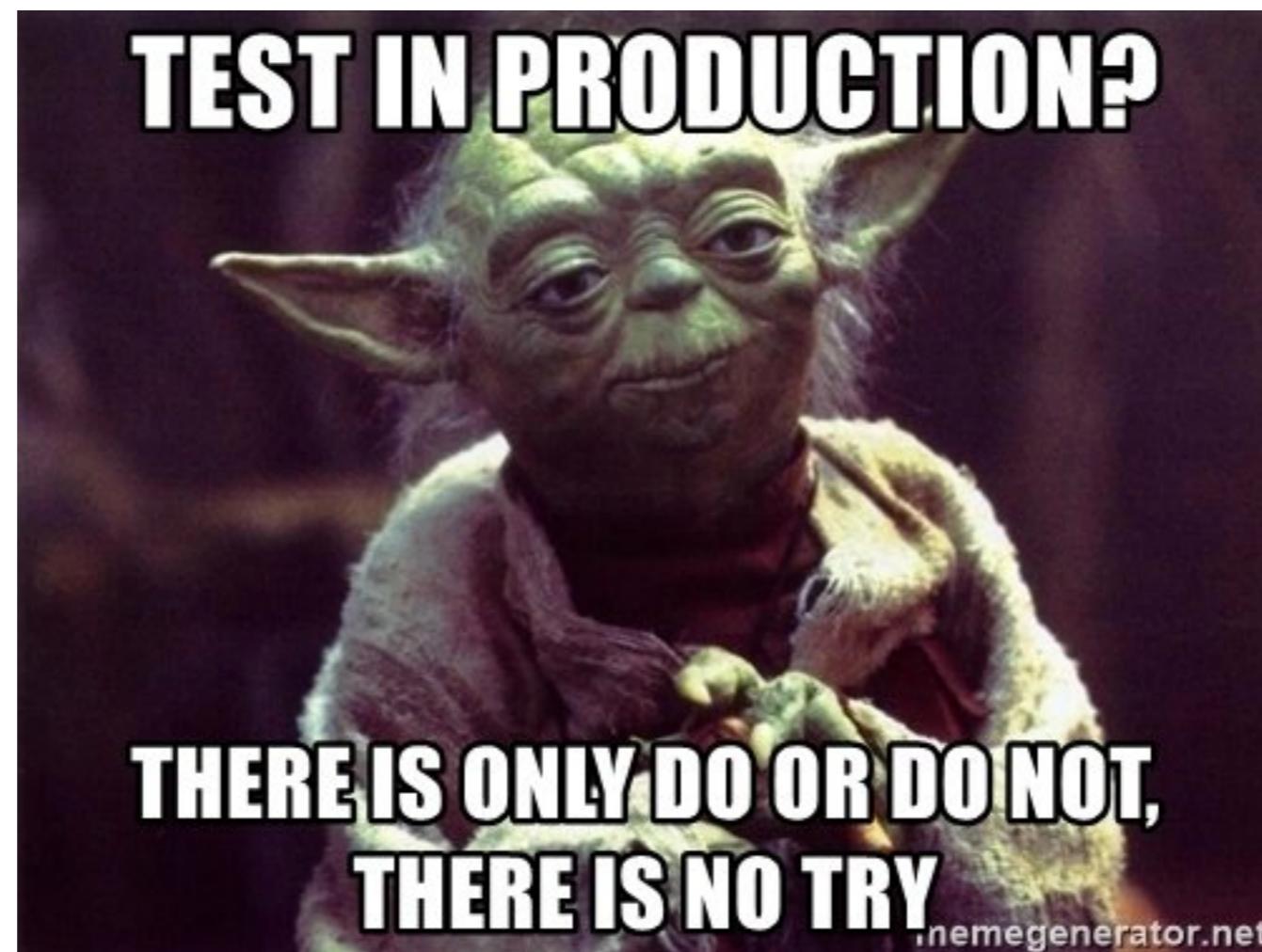
Keep the build **fast**

Continuous Integration is to provide rapid feedback



Practice 8

Test in clone of the **Production** environment



Practice 9

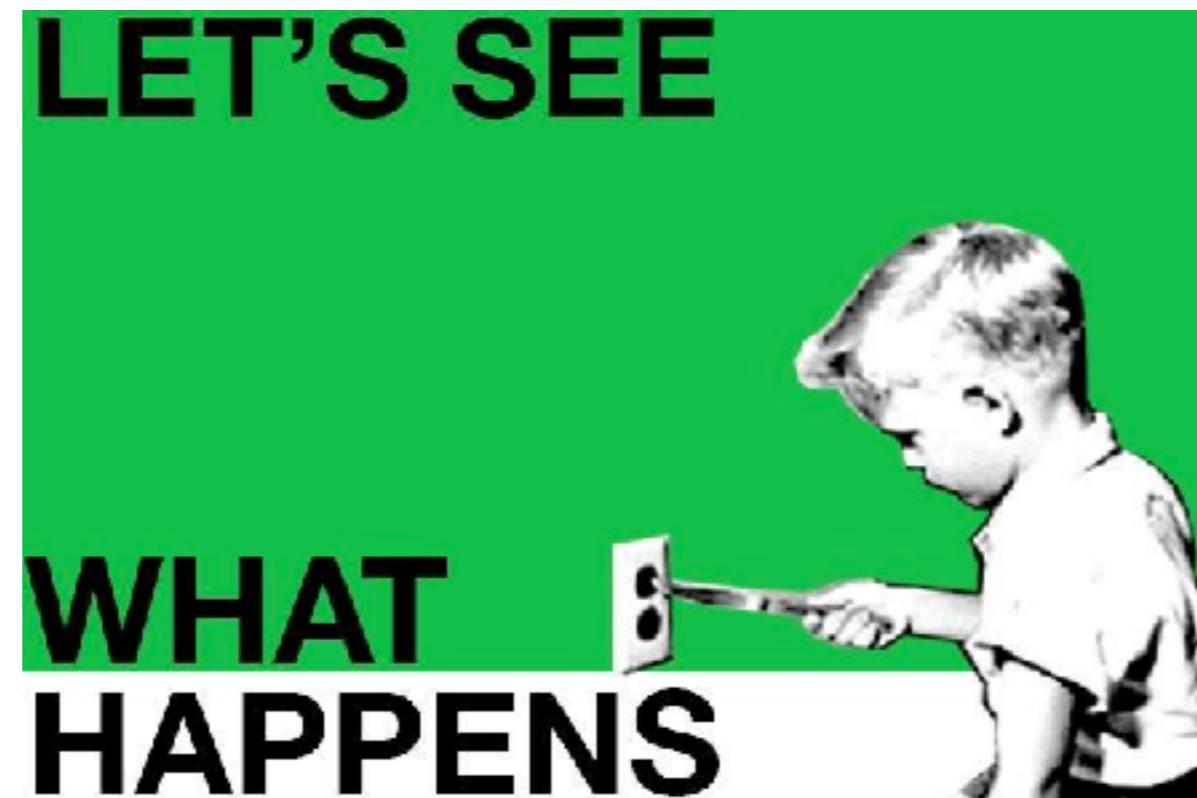
Make it easy for anyone to get
the latest executable

Make sure well known place where people can find



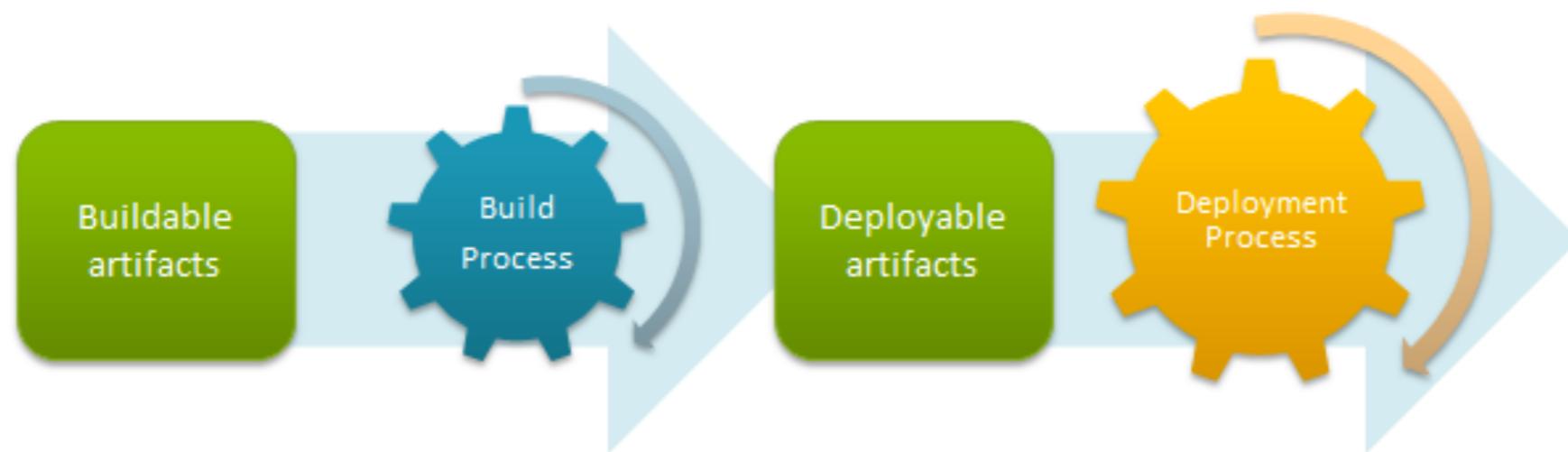
Practice 10

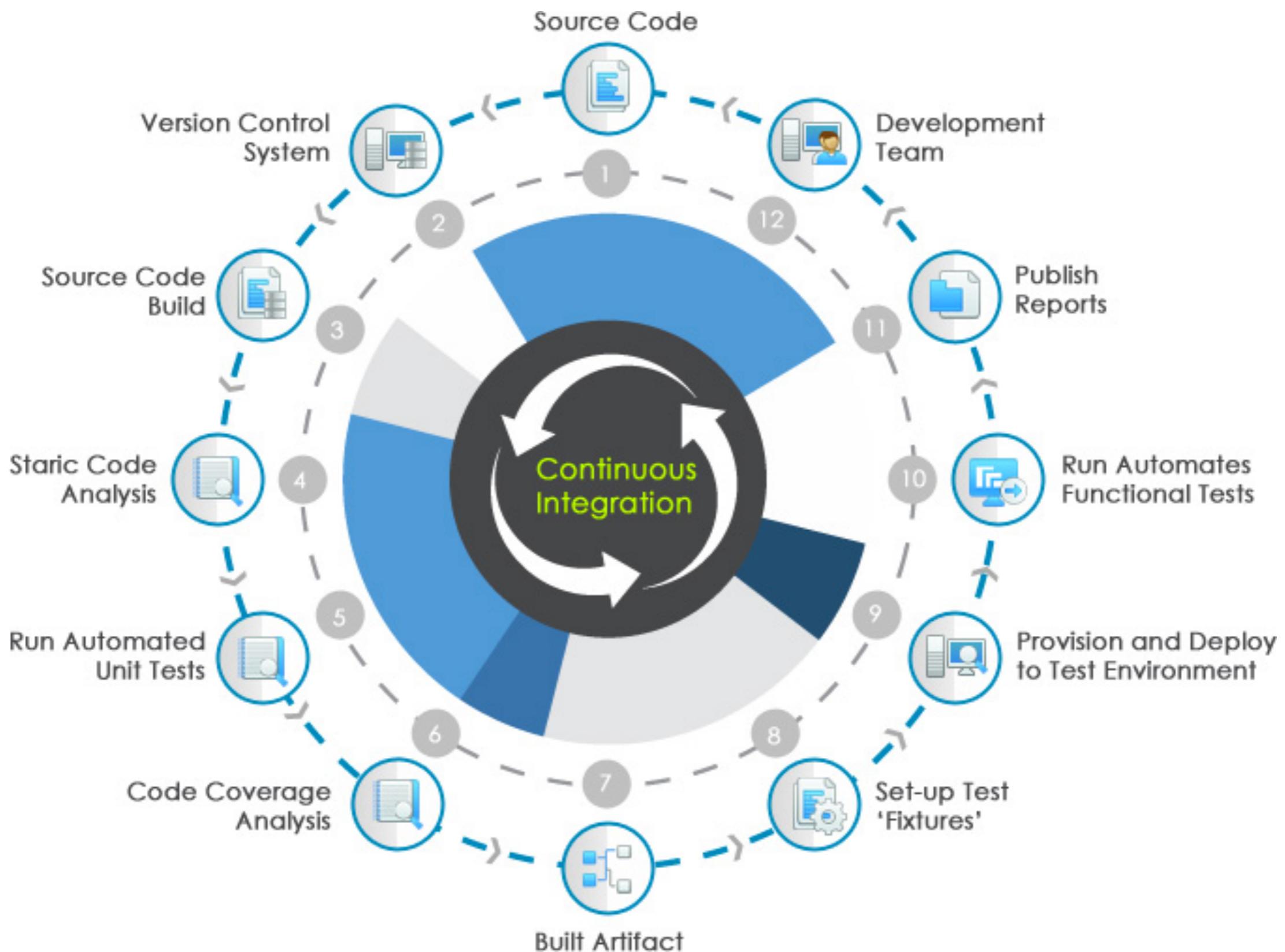
Everyone can see what's happening
Easier to see the state of the system and changes
Show the good information



Practice 11

Automated deployment





The Twelve Factors

<https://12factor.net/>



THE TWELVE FACTORS

I. Codebase

One codebase tracked in revision control, many deploys

II. Dependencies

Explicitly declare and isolate dependencies

III. Config

Store config in the environment

IV. Backing services

Treat backing services as attached resources

V. Build, release, run

Strictly separate build and run stages

VI. Processes

Execute the app as one or more stateless processes

VII. Port binding

Export services via port binding

VIII. Concurrency

Scale out via the process model

IX. Disposability

Maximize robustness with fast startup and graceful shutdown

X. Dev/prod parity

Keep development, staging, and production as similar as possible

XI. Logs

Treat logs as event streams

XII. Admin processes

Run admin/management tasks as one-off processes



Code and Build



1 repository



1 build

<https://trello.com/>



Minimal services

Expose a port

Only access to the service

..... **Health check**

200 app is alive. 500 app is unhealthy,
destroy the node



Stateless*

Run as many nodes as you need

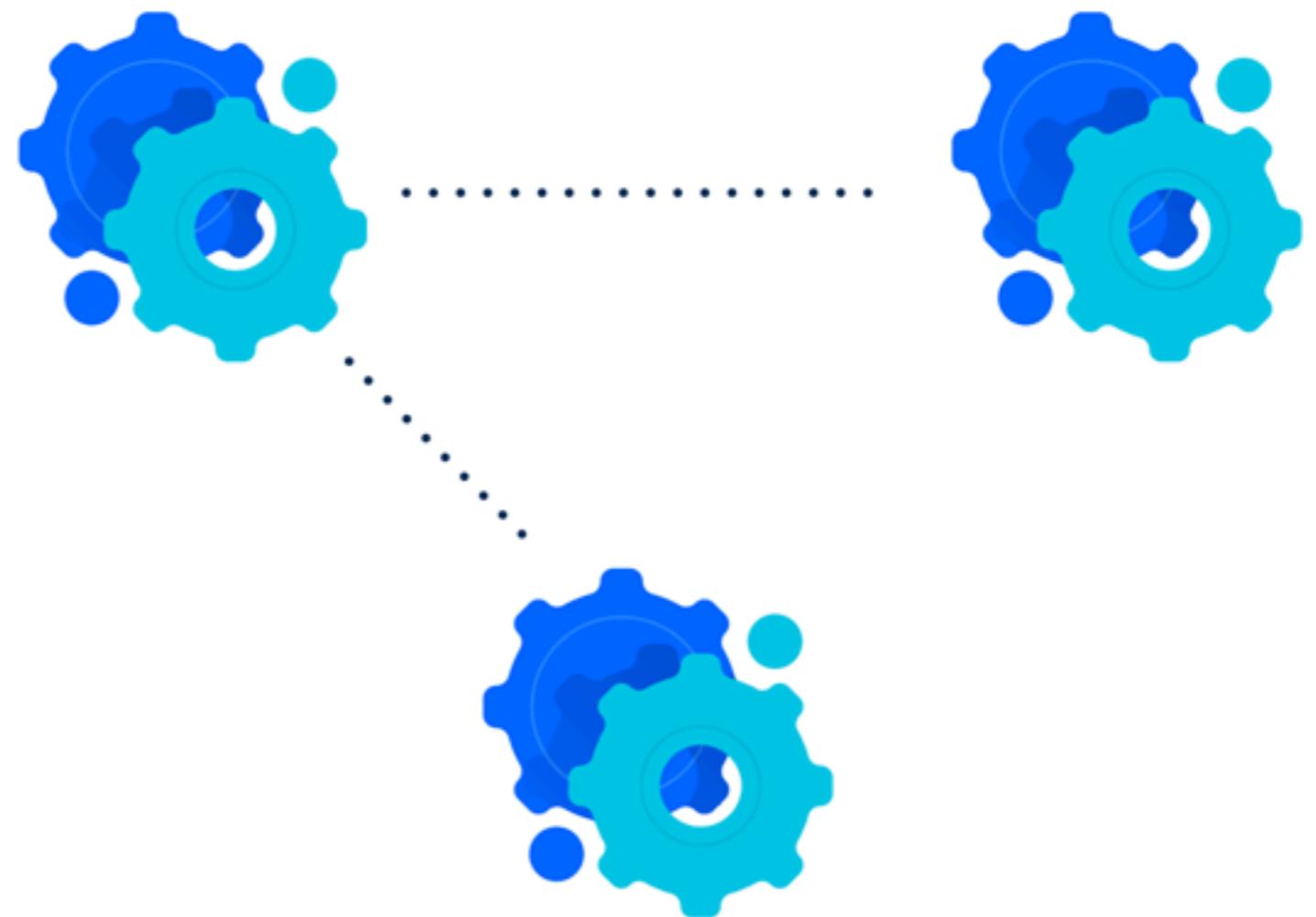
<https://trello.com/>



Health check services

Deep check

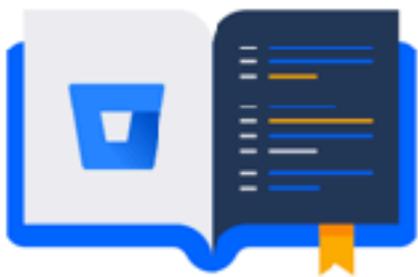
Quickly discover if a service fails to connect to a dependency



<https://trello.com/>



Decouple



Libraries

Feel free to use
shared libraries but
keep them loose



Schemas

Make sure that
services are resilient
to schema changes



Testing

Test in isolation.



Config

Config is part of the
service don't have
dependencies

<https://trello.com/>



“Strict separation of config from code”

12 factor app



Configuration lifecycle



Rebuild

Rebuild to apply changes



Redeploy

Part of the service configuration.



Instant change

Switches you would like to enable/disable straight away

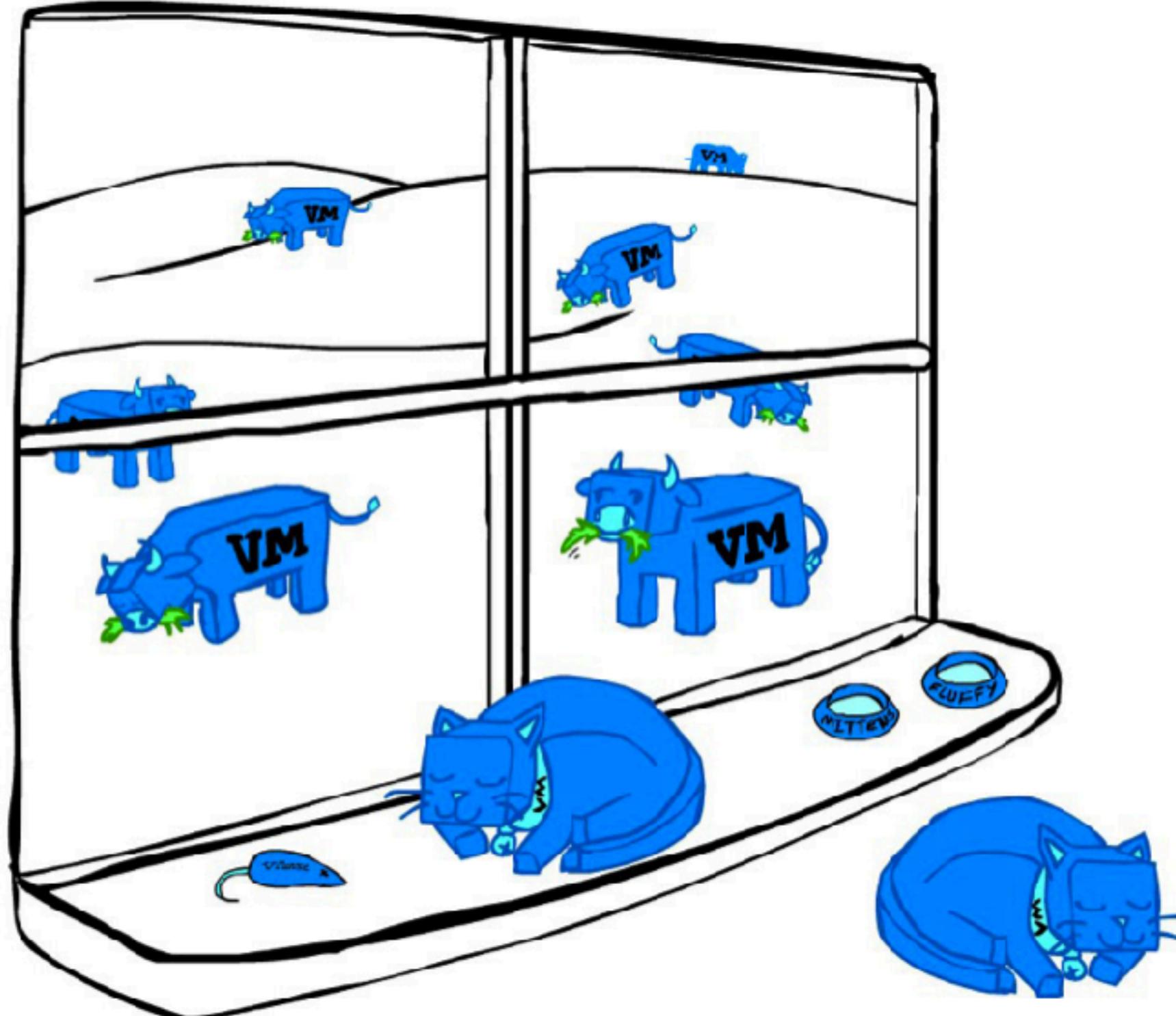
<https://trello.com/>



**“Treat them as cattle,
not pets”**

Bill baker





<https://turbonomic.com/blog/on-technology/old-virtualization-conundrum-pets-cattle/>



“Pets vs Cattle” (Yes, again)



Scale Up

- **Servers are like pets.**

Pets are given names, are unique, lovingly hand raised and cared for. When they get ill, you nurse them back to health



Scale Out

- **Servers are like cattle.**

Cattle are given numbers and are almost identical to each other. When they get ill, you get another one.

“

“Future application architectures should use Cattle but Pets with strong configuration management are viable and still needed”

- Tim Bell, CERN

The above adapted from Tim Bell, CERN

<http://www.slideshare.net/noggin143/20121017-openstack-cern-accelerating-science>

<https://cohesive.net/2017/10/5-concepts-to-truly-understand-cloud-computing.html>



Summary





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

**RESPONDING TO
CHANGE**
over following a plan

**INDIVIDUALS AND
INTERACTIONS**
over processes and tools

**WORKING
SOFTWARE**
over full documentation



Agile principles

1 Satisfy the **customer**



Welcome **change**



Deliver **frequently**



4 Work **together**



5 Trust and **support**



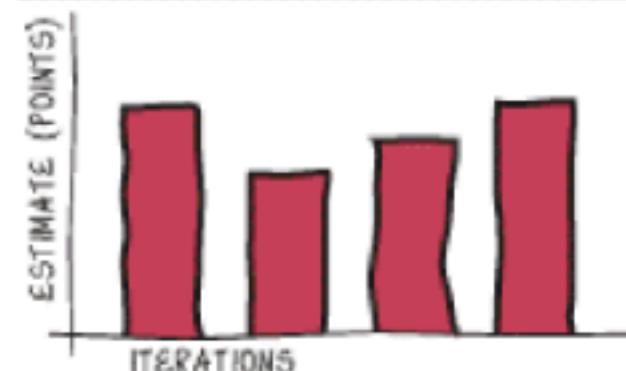
Face-to-face **conversation**



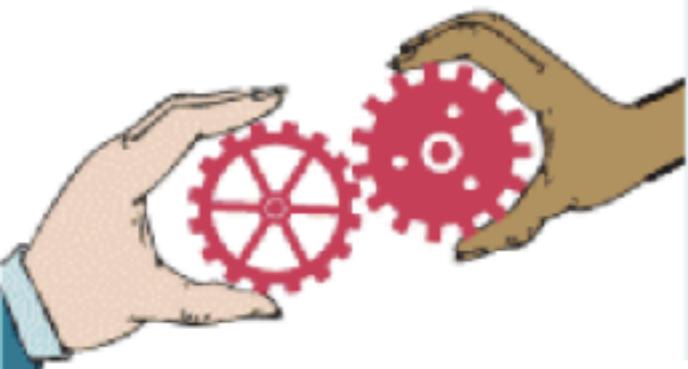
Working **software**



8 Sustainable **development**



9 Technical **Excellence**



10 Maintain **simplicity**



11 Self-organizing **teams**

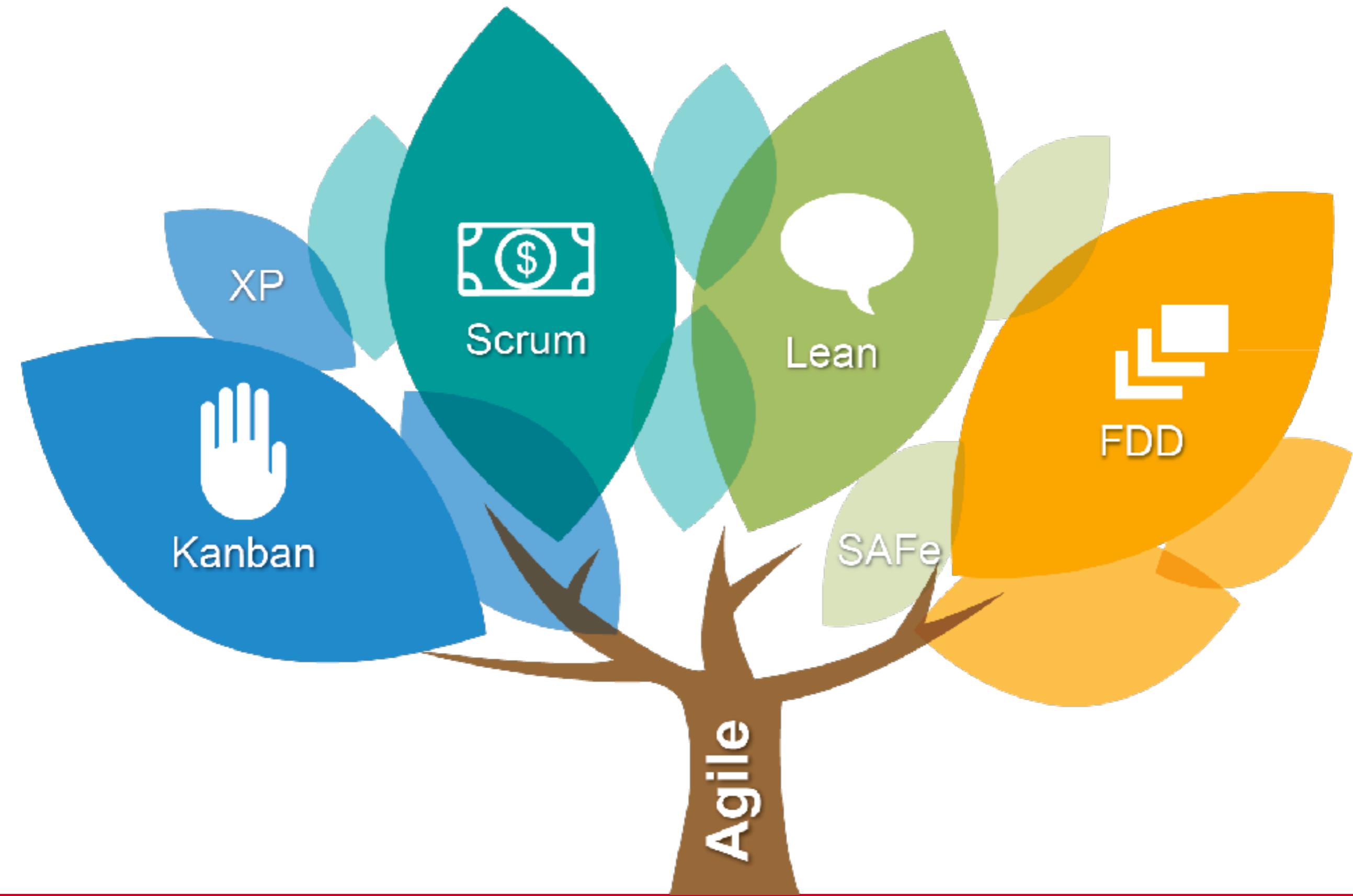


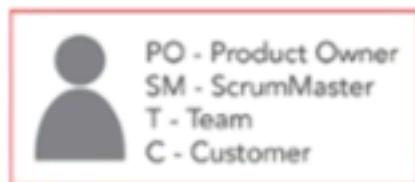
12 Reflect and **adjust**



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







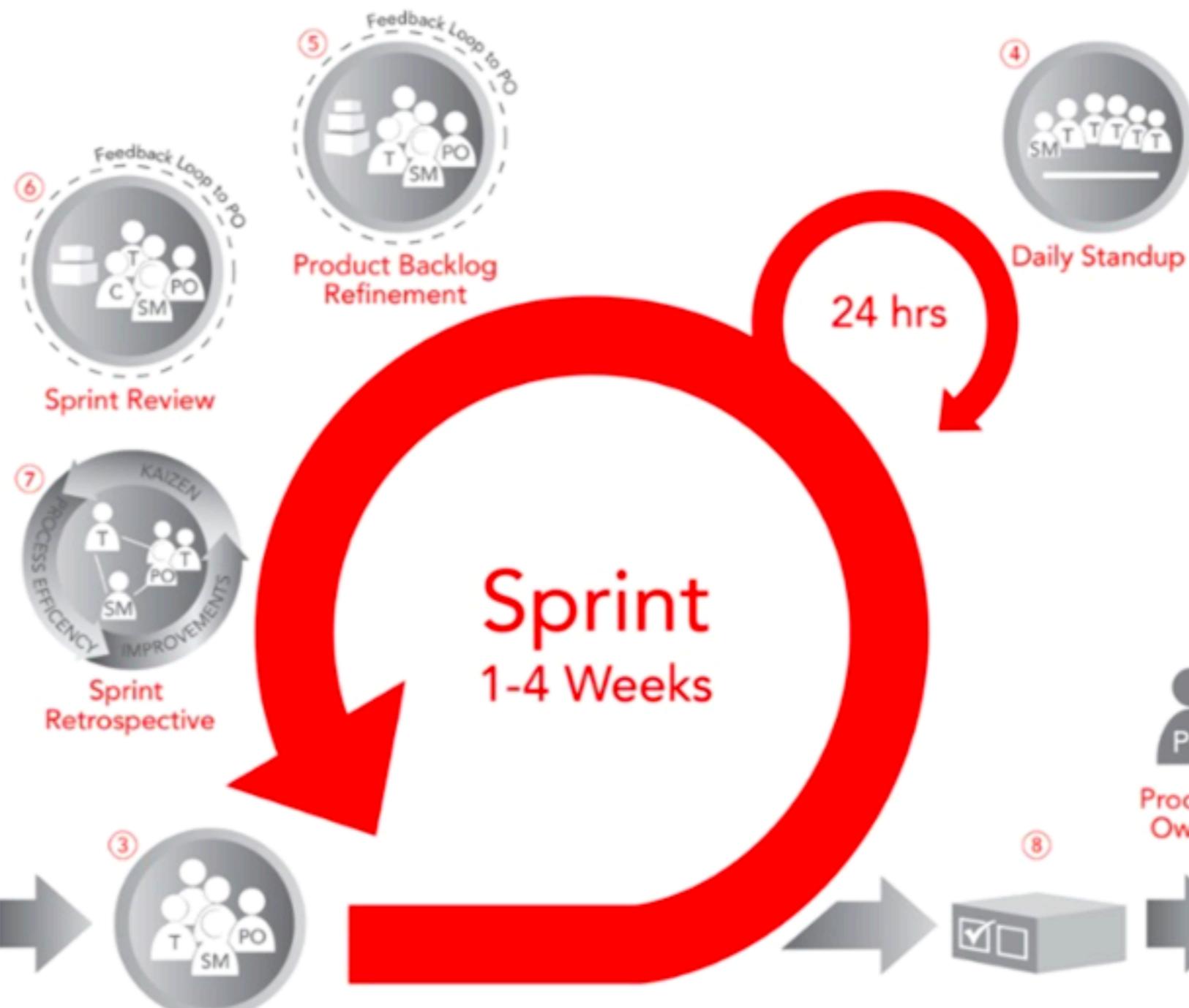
Product Owner



Product Backlog (Features)

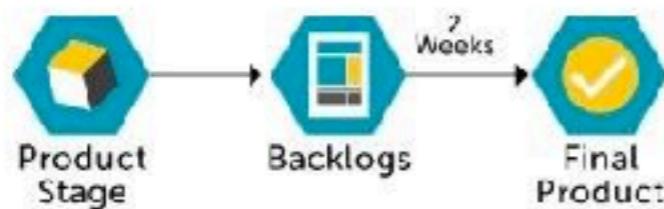
② Sprint Backlog (Stories)

Sprint Planning



AGILE DEVELOPMENT

Daily Standup



Process Flow Chart



User Inputs

CONTINUOUS INTEGRATION

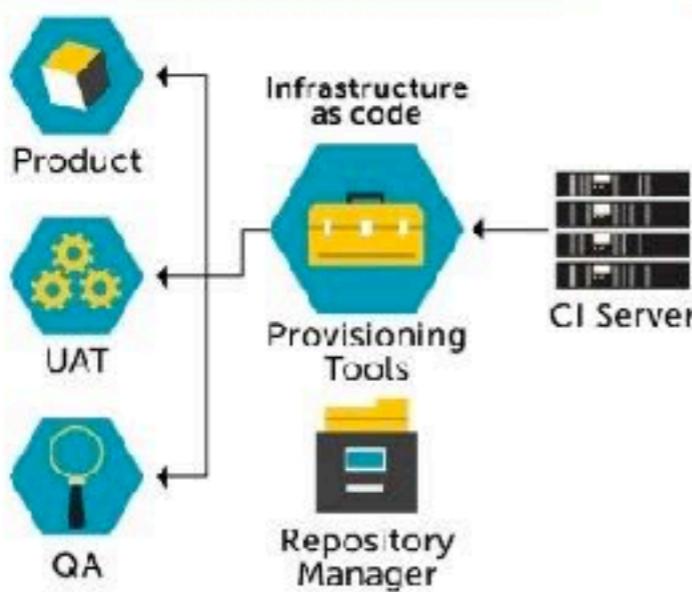


Code Quality Metrics

Repository Manager

Agile DevOps

CONTINUOUS DELIVERY



Product

UAT

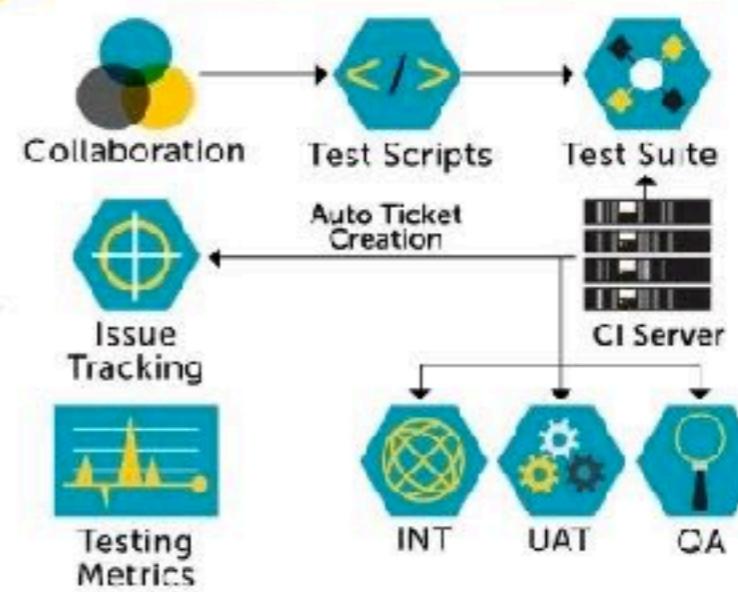
QA

Infrastructure as code

Provisioning Tools

Repository Manager

CONTINUOUS TESTING



Collaboration

Test Scripts

Test Suite

Issue Tracking

Testing Metrics

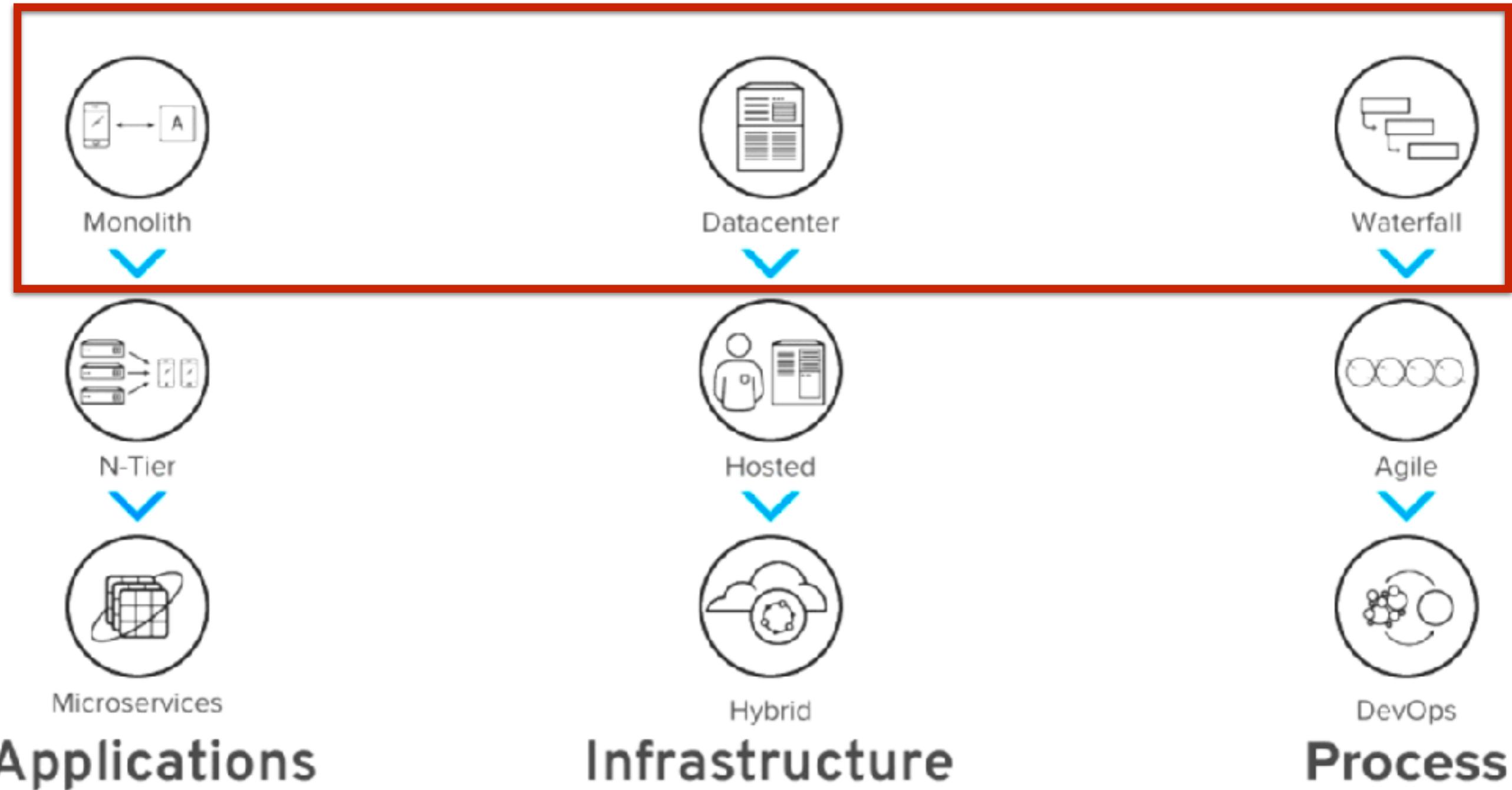
INT

UAT

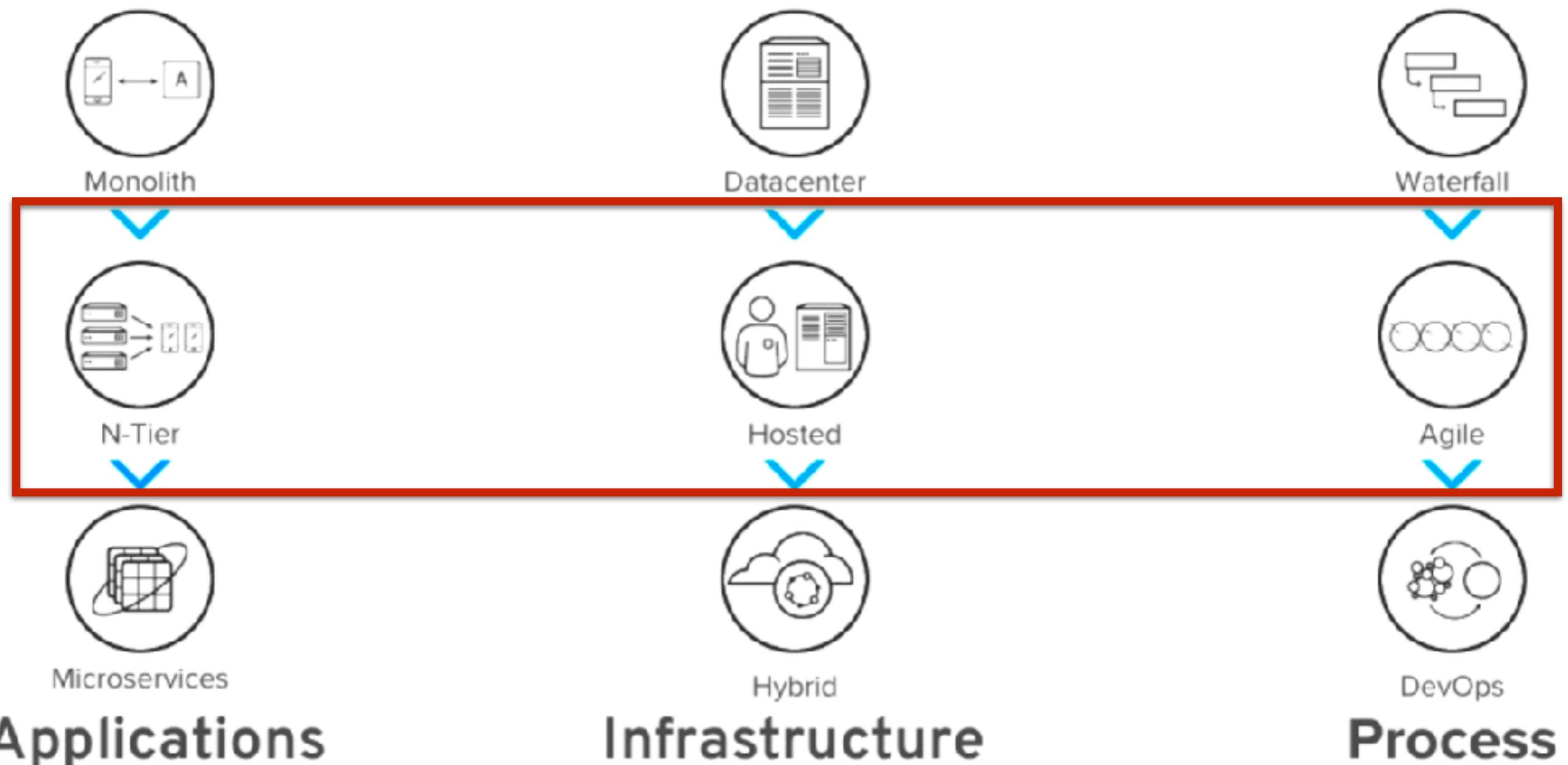
QA



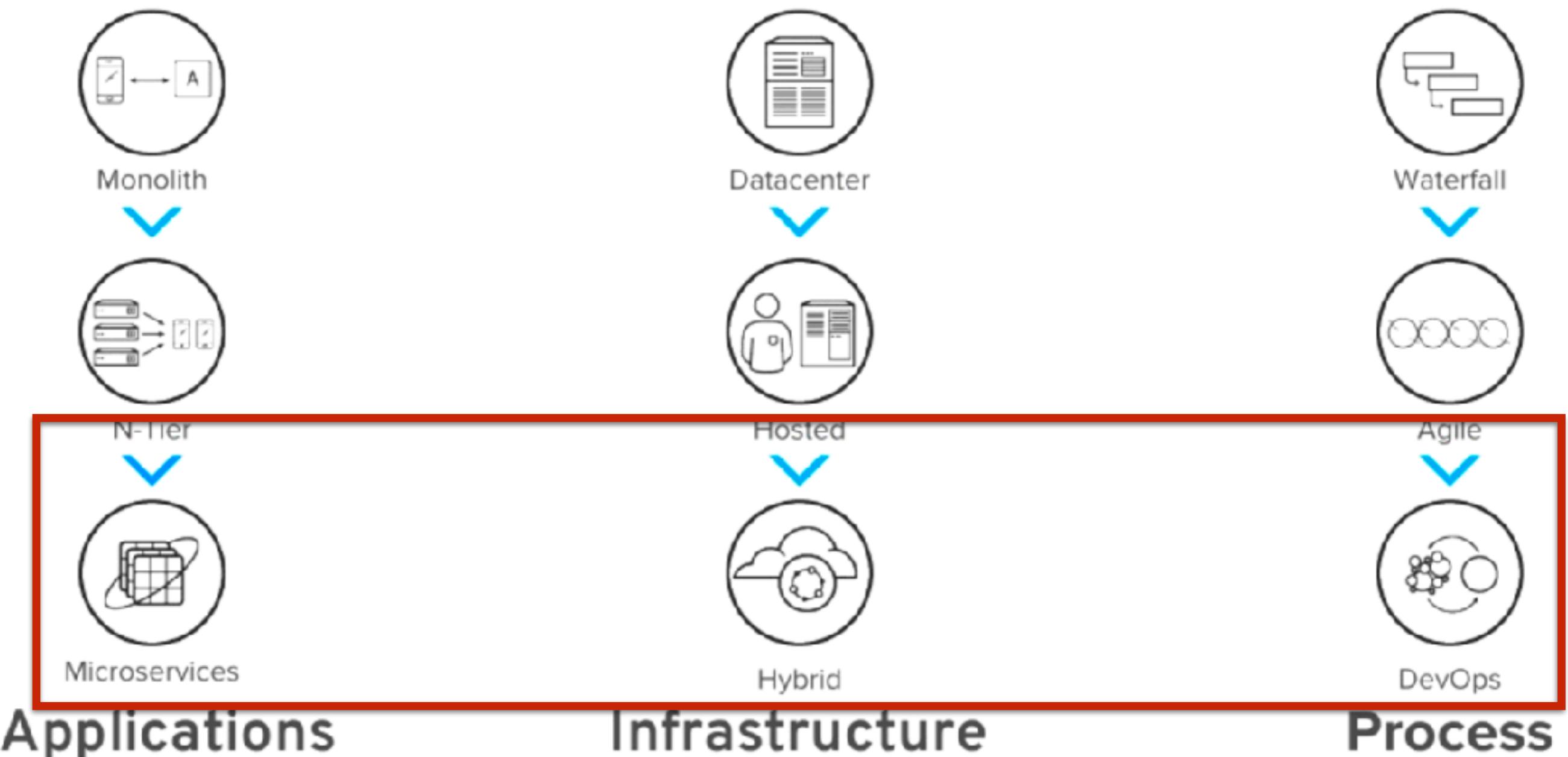
Continuous Improvement



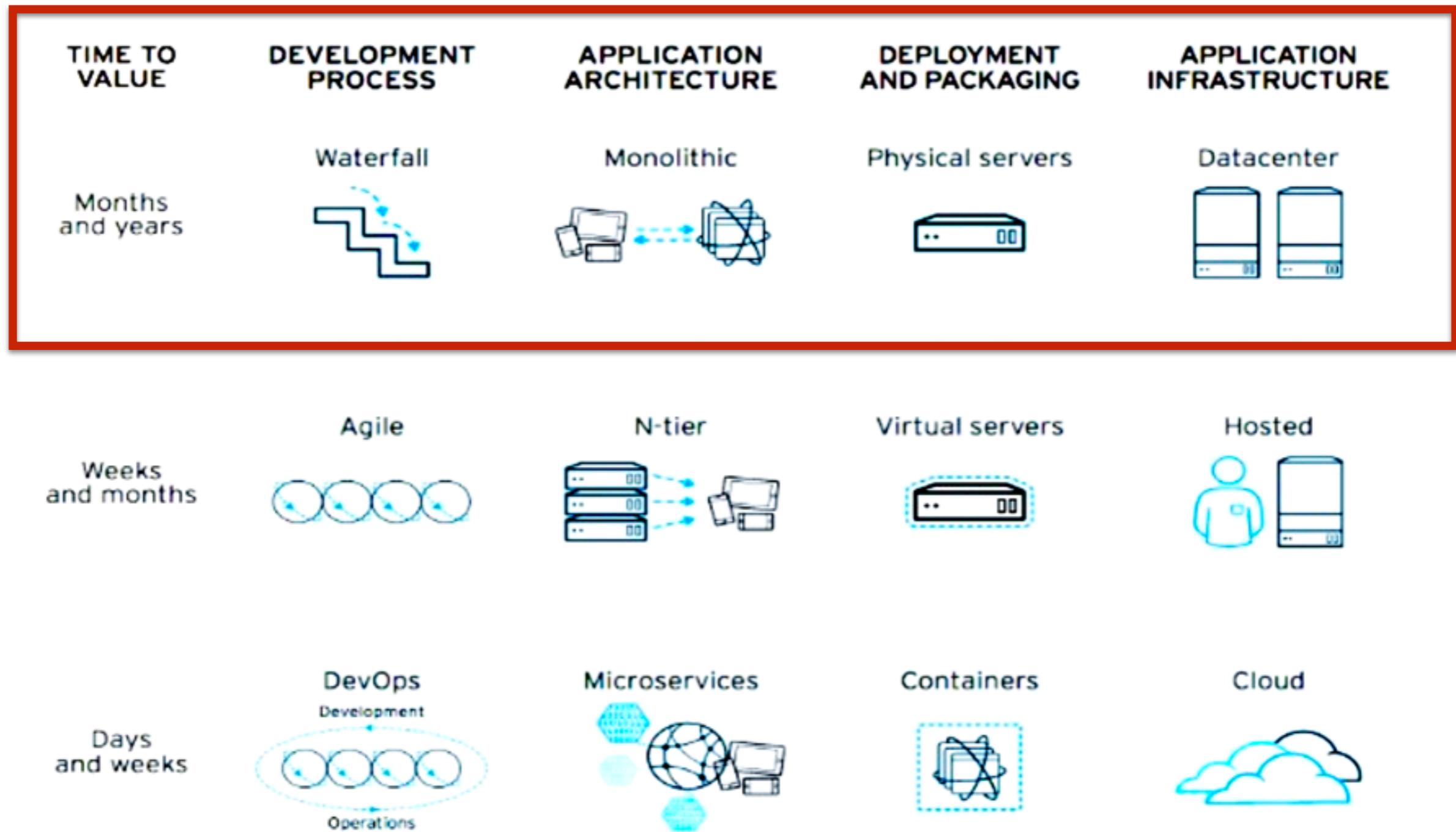
Continuous Improvement



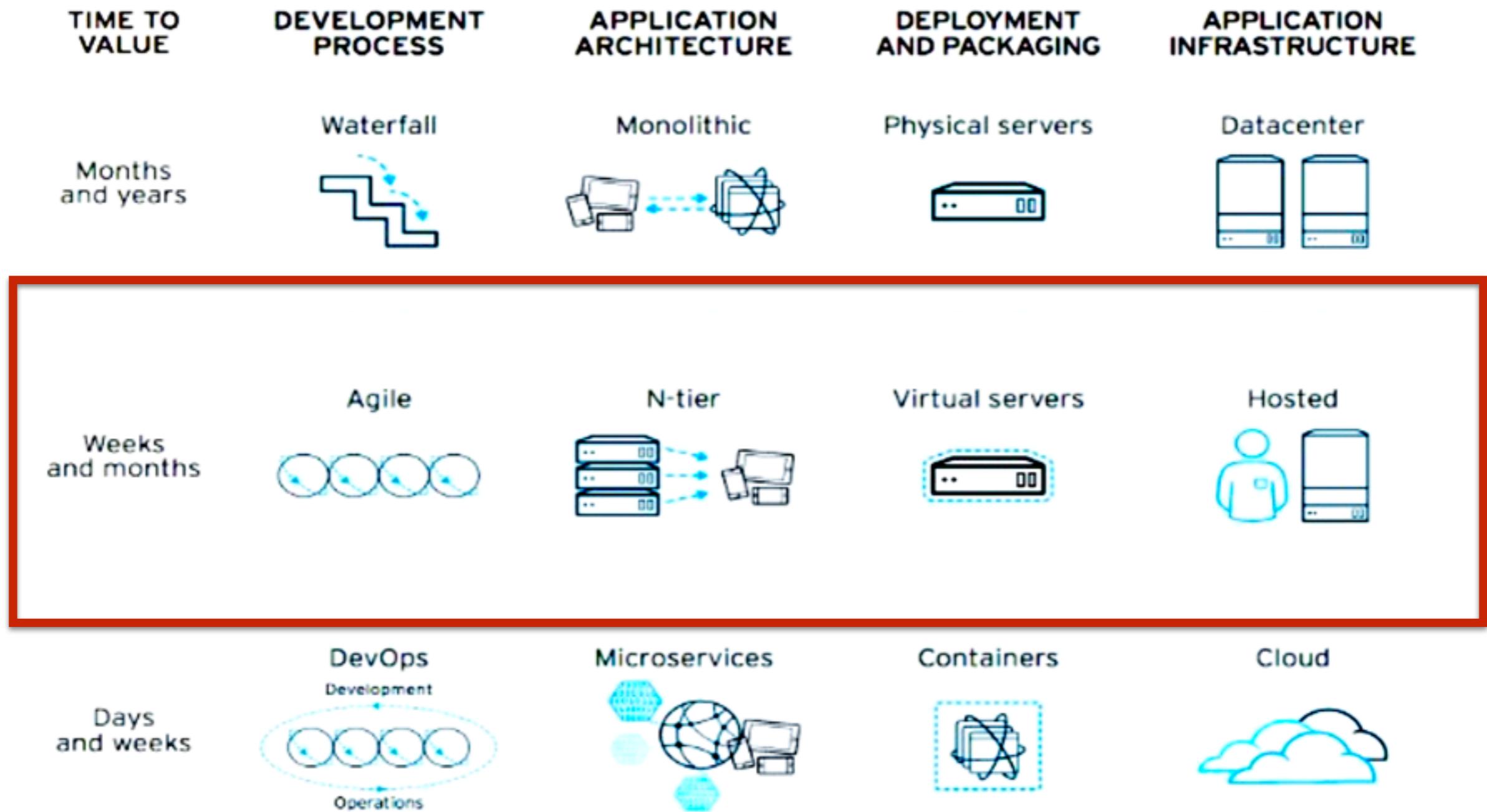
Continuous Improvement



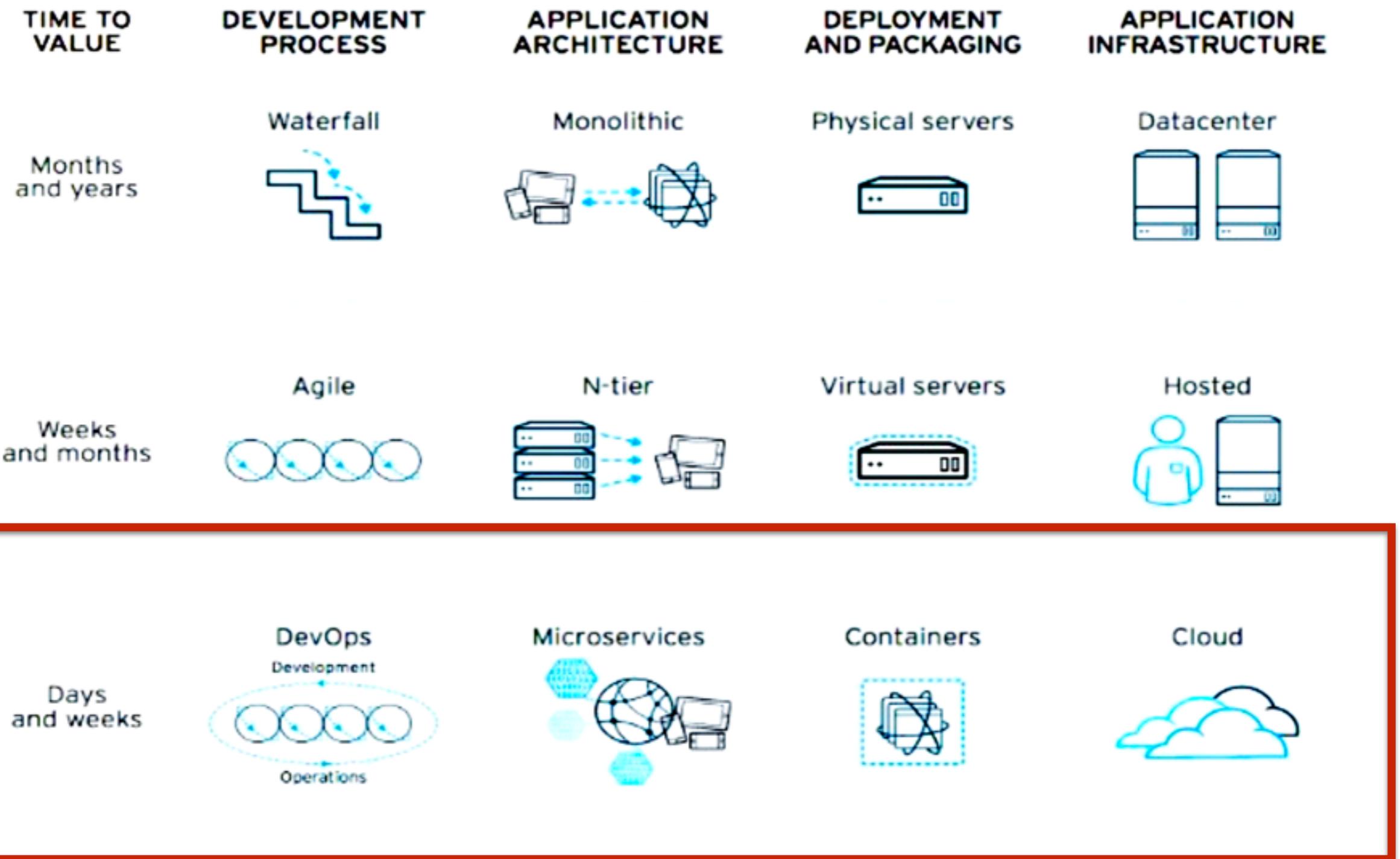
Improve Time to Value



Improve Time to Value



Improve Time to Value



Take to your home (1)

People are #1 asset



Take to your home (2)

DevOps is not a recipe, work out your own flavor



Take to your home (3)

Start with business, even if you don't have a trust relationship



Take to your home (4)

Success sustainable requires both
bottom-up practices and
top-down management support



Take to your home (5)

DevOps adoption is not easy, but rewarding



Take to your home (6)

Focus on **value**, not **quantity**



Are you too busy to improve?



Thank you
Q/A



