

How to do Continuous Delivery with Jenkins Pipeline, Docker and Kubernetes

James Strachan



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How to do Continuous Delivery with Jenkins Pipeline, Docker and Kubernetes

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Software is eating the world
Marc Andreessen - 2011

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*It is not necessary to change.
Survival is not mandatory.*
W. Edwards Deming

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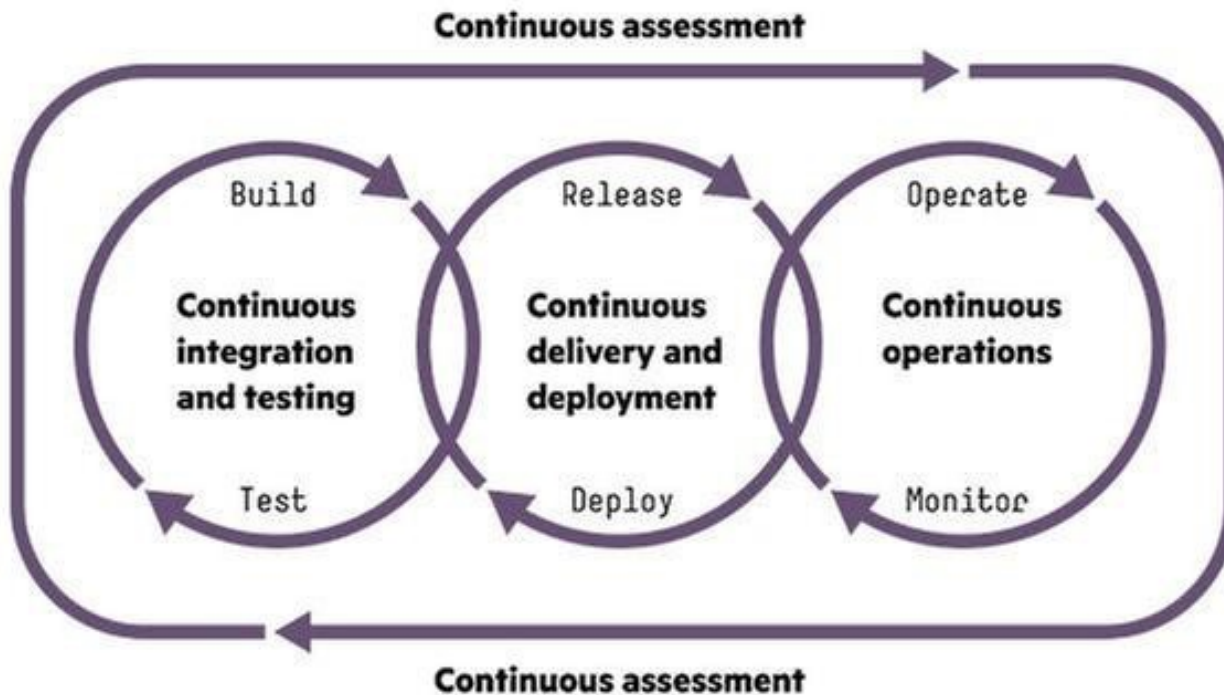
*creating value through software is all about
speed, iteration and Continuous Improvement*

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Continuous Assessment



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how do we deliver software value fast?



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Continuous Delivery of Containerised Microservices

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microservices, microservices, microservices, ...



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microservices are a way to develop software faster



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- split monoliths into smaller microservices which release **independently**
- have small teams which look after the **entire lifecycle** of each microservice

Jenkins Pipeline rocks for Continuous Delivery!



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- Isn't my Jenkins server enough?



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challenges of microservices



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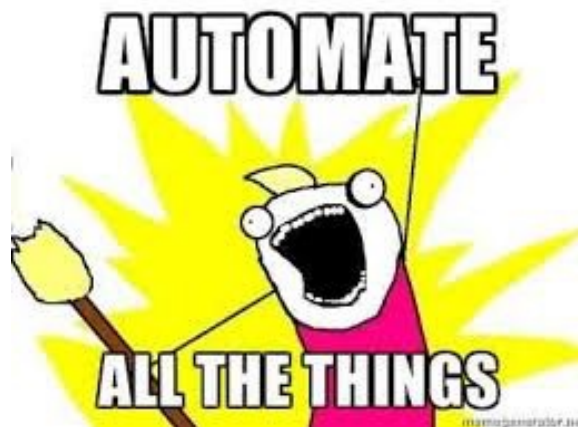
- lots of independent teams each want their own:
 - Jenkins server with their own pipelines
 - environments (Dev, Test, Staging, Production) to test/deploy in
 - resources (compute, network, storage)
- automation as **lots** of microservices
 - creation of projects, CD Pipelines, environments, releases etc!

we need a microservices platform!



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- easy for independent teams to create, develop, manage microservices
- self service for speed



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fabric8 microservices platform



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<https://fabric8.io/>

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fabric8 features



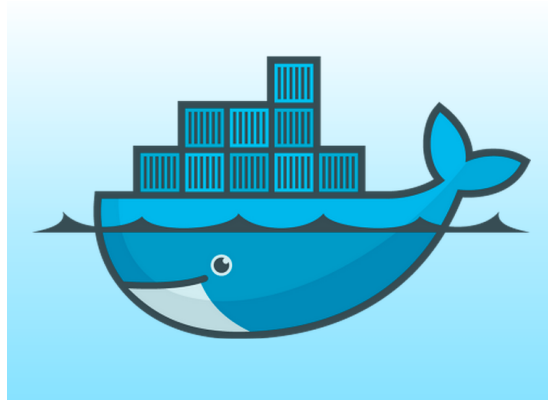
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- **Create** wizards to create microservices
- **Build** packaging into immutable container images
- **Release** rolling upgrades across different environments
- **Runtime** service discovery, elastic scaling, failover, load balancing
- **Manage** centralise logs, metrics, alerts, tracing, circuit breakers
- **Feedback** dashboards and metrics to get feedback!
- **Platform** on premise, public or hybrid cloud

fabric8 stands on the shoulders of giants



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fabric8 is microservices all the way down!



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The screenshot shows the fabric8 console interface. At the top, there's a browser address bar with the URL `fabric8.vagrant.fb/kubernetes/namespace/default/templates?returnTo=%2Fworkspaces%2Fdefault%2Fnamespace%2Fdefault%2Fapps%3F%3D`. Below the browser, the fabric8 logo and navigation tabs (Teams, default, Runtime) are visible. A search bar labeled "Filter templates..." and a "Target namespace: default" dropdown are present. The main content is a grid of 15 microservice templates, each with an icon, name, description, and a green play button. The templates are:

- apiman**: The Apiman Package provides the core Apiman platform using Apiman... More...
- artifactory**: JFrog provides open source communities with solutions to automate software package management. Artifactory, JFrog's open source project, was released to speed up development cycles using binary... More...
- cd-pipeline**: Provides the core Continuous Delivery platform using Gogs, Jenkins, More...
- chaos-monkey**: Randomly kills pods to help check your environment can withstand failures
- chat-irc**: Provides Chat using Hubot as the bot framework and IRC as the chat service
- chat-letschat**: Provides Chat using Hubot as the bot framework and Let's... More...
- chat-slack**: Provides Chat using Hubot as the bot framework and Slack as the chat service
- content-repository**: Nexus is a maven repository manager
- example-message-consumer**: Consumes messages via Apache Camel from a queue on Apache ActiveMQ. Communicates with the broker using a More...
- example-message-producer**: Sends messages via Apache Camel to a queue on Apache ActiveMQ. Communicates with the broker using a More...
- fabric8-docker-registry**: Private Docker Registry
- fabric8-forge**: Fabric8 : Forge
- gerrit**: Gerrit is a web based code review system, facilitating online code reviews for projects using the Git version control system.
- git-collector**: Git Collector will watch all apps in the current project and for all git based projects it will watch and capture all the git commit
- gitlab**: Gitlab is a self-hosted Git service

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lets fabric8 microservices!!!!



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get started with fabric8 on your laptop!



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- download `gofabric8` binary:
 - <https://github.com/fabric8io/gofabric8/releases>
- run this command:
 - `gofabric8 start`

get started with fabric8 on multi-node cluster



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- create a kubernetes cluster:
 - Google cloud
 - <https://cloud.google.com/container-engine/>
 - Amazon, Azure, DigitalOcean etc:
 - <https://stackpoint.io/>
 - on premise:
 - <http://kubernetes.io/docs/getting-started-guides/scratch/>
- or create an OpenShift cluster:
 - <https://www.openshift.com/>
- then deploy fabric8 on the cluster:
`gofabric8 deploy`



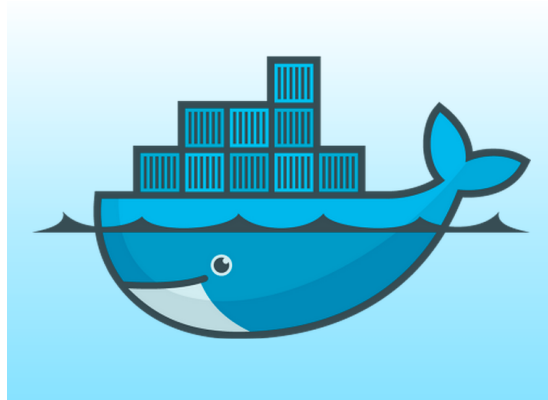
local Java development (pre-commit) with Maven

- fabric8 maven plugin: <https://maven.fabric8.io/>
- setup your existing maven project for kubernetes:
`mvn io.fabric8:fabric8-maven-plugin:3.1.42:setup`
- create a local cluster for development:
`mvn fabric8:cluster-start`
- build and deploy your project into kubernetes:
`mvn fabric8:run`

fabric8 stands on the shoulders of giants



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- Jenkins for Pipelines
- Docker for packaging software as immutable images that are easy to run anywhere
- Kubernetes for orchestrating containers
 - keep containers running across a number of machines
 - deal with software, hardware and network failures
 - scales elastically
- Each team gets their own
 - Dev / Test / Staging / Production environments
 - each one is a separate kubernetes namespace
 - Jenkins master
 - Team dashboard, metrics, git repos etc

lessons learnt with Jenkins Pipelines for microservices...



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- prefer docker images to ‘Jenkins tools’
 - its nicer to specify docker image + versions of tools inside Jenkinsfile!
 - works today with kubernetes-pipeline-plugin
 - coming soon in the new kubernetes plugin
 - mount secrets into build containers via kubernetes Secrets
 - copy the Jenkinsfile into each microservice git repo
- Jenkins master per team helps you go faster
 - teams can then configure their own Jenkins version, plugins and pipeline library
- use a library of Jenkinsfiles
 - most microservices of the same tech stack need very similar pipelines
 - then reuse common DSL / functions via plugins or shared library
- Jenkins Pipelines are awesome!!! :)






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more giants...









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Development

 Spring Boot	Spring based microservices	 WildFly Swarm	JavaEE based microservices
 Spring Cloud	Kubernetes integration with Spring Cloud	 Kubeflix	Kubernetes integration with Netflix OSS like Hystrix, Ribbon and Turbine
 Funktion	lambda style event based programming model for Kubernetes		

Continuous Improvement

 Developer	Developer Console to help you create, build, manage microservices with deep visualisation into projects, apps and environments	 Chaos Monkey	Randomly kills pods to help check your environment can withstand failures
 Elasticsearch	Elasticsearch is a distributed fault tolerant scalable search engine for logs, events and documents	 Prometheus	Service monitoring, metrics and alerting system with a time series database
 Kibana	Lets you view, filter and search all logs and events that have been written to Elasticsearch.	 Grafana	Rich metrics dashboard and graph editor for Prometheus and InfluxDB

Social

 Slack	Public hosted chat service	 Let's Chat	Open source on premise chat service
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and more giants!...








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Systems Availability

 Docker	Linux container API, runtime, tooling and image registry	 Kubernetes	Container orchestration
 OpenShift	A PaaS (Platform As A Service) based on Docker and Kubernetes	 Kansible	orchestrate operating system processes on Windows or Unix like Docker containers using Ansible

Automation

 Jenkins	Continuous Integration and Continuous Delivery using reusable Jenkins Workflows	 Nexus	Maven repository manager for Canary and Promoted releases along with a mirror of central maven repositories
 Hubot	Chat bot with gateways to various chat services like Slack, Let's Chat, IRC and many others	 Arquillian	System testing of Docker containers and Kubernetes resources in JUnit and Jenkins
 JBoss Forge	A Java toolbox to help create apps faster		

Transparency

 Gerrit	Code review of changes	 Gogs	On premise git repository hosting
 Taiga	Project Management Tool (i.e. issue tracker and kanban board)		

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grafana dashboards for metrics - prometheus back end



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ChatOps via hubot for IRC, Slack, LetsChat, HipChat etc



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James Rawlings @rawlings
cheese

cheese #cheese


James Rawlings @rawlings
fabric8 help

fabric8 @fabric8

```
fabric8 adapter - Reply with the adapter
fabric8 all subscriptions - show all existing subscriptions
fabric8 animate me <query> - The same thing as 'image me', except adds a few parameters to try to return an animated GIF instead.
fabric8 echo <text> - Reply back with <text>
fabric8 help - Displays all of the help commands that fabric8 knows about.
fabric8 help <query> - Displays all help commands that match <query>.
fabric8 image me <query> - The Original. Queries Google Images for <query> and returns a random top result.
fabric8 map me <query> - Returns a map view of the area returned by 'query'.
fabric8 mustache me <query> - Searches Google Images for the specified query and mustaches it.
fabric8 mustache me <url> - Adds a mustache to the specified URL.
fabric8 ping - Reply with pong
fabric8 publish <event> <data> - triggers event
fabric8 pug bomb N - get N pugs
fabric8 pug me - Receive a pug
fabric8 subscribe <event> - subscribes current room to event. To debug, subscribe to 'unsubscribed.event'
fabric8 subscriptions - show subscriptions of current room
fabric8 the rules - Make sure fabric8 still knows the rules.
fabric8 time - Reply with current time
fabric8 translate me <phrase> - Searches for a translation for the <phrase> and then prints that bad boy out.
fabric8 translate me from <source> into <target> <phrase> - Translates <phrase> from <source> into <target>. Both <source> and <target> are optional
fabric8 unsubscribe <event> - unsubscribes current room from event
fabric8 unsubscribe all events - unsubscribes current room from all events
fabric8 youtube me <query> - Searches YouTube for the query and returns the video embed link.
ship it - Display a motivation squirrel!
```

James Rawlings @rawlings
ship it

fabric8 @fabric8



Got something to say?

Send

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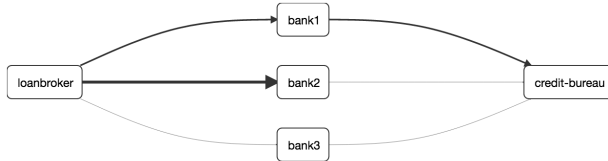
tracing with zipkin



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Zipkin Investigate system behavior Find a trace Dependencies

Start time 11:51 End time 11:51



Zipkin Investigate system behavior Find a trace Dependencies

Duration: 328.000ms Services: 6 Depth: 6 Total Spans: 13
Expand All Collapse All Filter Se...
bank1 x3 bank2 x3 bank3 x3 credit-bureau x6 loanbroker x4

Services	Duration	Span Name	Start	End	Parent		
loanbroker	328.000ms	http/quote	65.600ms	131.200ms	196.800ms	262.400ms	328.000ms
loanbroker	69.000ms	http/quote	-	-	-	-	-
loanbroker	69.000ms	http/quote	-	-	-	-	-
bank1	41.000ms	http/eval	-	-	-	-	-
bank1	12.000ms	http/eval	-	-	-	-	-
loanbroker	71.000ms	http/quote	71.000ms	131.200ms	196.800ms	262.400ms	328.000ms
bank2	71.000ms	http/quote	71.000ms	131.200ms	196.800ms	262.400ms	328.000ms
bank2	45.000ms	http/eval	45.000ms	131.200ms	196.800ms	262.400ms	328.000ms
credit-bureau	16.000ms	http/eval	16.000ms	131.200ms	196.800ms	262.400ms	328.000ms
loanbroker	52.000ms	http/quote	52.000ms	131.200ms	196.800ms	262.400ms	328.000ms
bank3	52.000ms	http/quote	52.000ms	131.200ms	196.800ms	262.400ms	328.000ms
bank3	28.000ms	http/eval	28.000ms	131.200ms	196.800ms	262.400ms	328.000ms
credit-bureau	9.000ms	http/eval	9.000ms	131.200ms	196.800ms	262.400ms	328.000ms

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circuit breakers with Hystrix



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```
@RequestMapping("/hello")
@HystrixCommand(fallbackMethod = "helloFallback", commandProperties = {
    @HystrixProperty(name = "execution.isolation.thread.timeoutInMilliseconds", value = "5000")
})
public String hello() {
    return restTemplate.getForObject("http://something/hello", String.class);
}

public String helloFallback() {
    return "Hello Fallback";
}
```

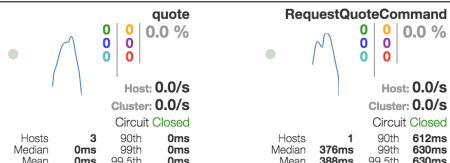
Hystrix Stream: <http://turbine-server/turbine.stream>



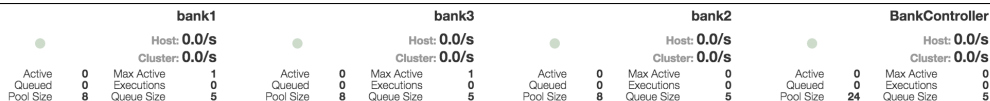
HYSTRIX
DEFEND YOUR APP

Circuit Sort: [Error then Volume](#) | [Alphabetical](#) | [Volume](#) | [Error](#) | [Mean](#) | [Median](#) | [90](#) | [99](#) | [99.5](#)

[Success](#) | [Short-Circuited](#) | [Bad Request](#) | [Timeout](#) | [Rejected](#) | [Failure](#) | [Error %](#)



Thread Pools Sort: [Alphabetical](#) | [Volume](#) |



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```
@RunWith(Arquillian.class)
public class KubernetesIntegrationKT {

    @ArquillianResource
    KubernetesClient client;

    @Test
    public void testAppProvisionsRunningPods() throws Exception {
        assertThat(client.deployments().pods().isPodReadyForPeriod());
    }
}
```

<http://fabric8.io/guide/testing.html>

conclusions



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- Jenkins Pipelines rock for Continuous Delivery
 - you all knew that right? :)
- Kubernetes is an ideal platform for CD, containers and microservices
 - <https://kubernetes.io/>
- Fabric8 an awesome open source microservices platform based on:
 - Jenkins, Docker, Kubernetes (and lots more great OSS)!
 - <https://fabric8.io/>
- need help? - join the fabric8 community:
 - <https://fabric8.io/community/>
 - or I'm [@jstrachan](https://twitter.com/jstrachan) on twitter - thanks for listening!!!

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