

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

James Strachan



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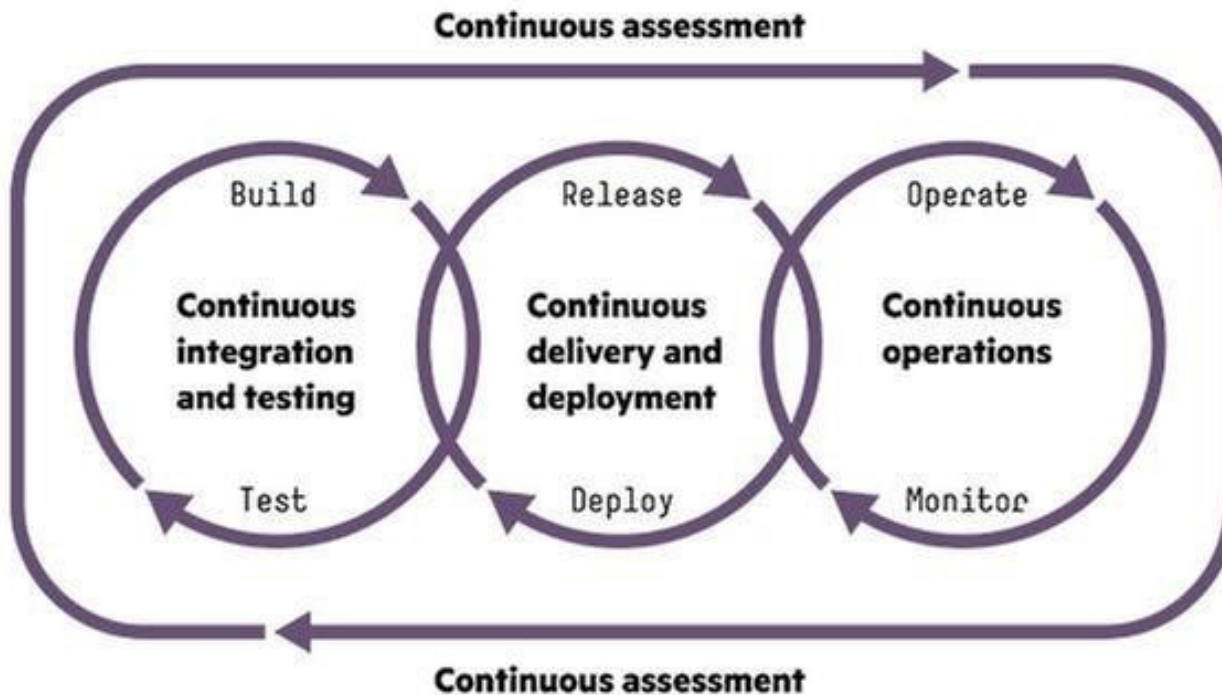
*creating value through software is all about
speed, iteration and Continuous Improvement*

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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



fabric8 microservices platform



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<https://fabric8.io/>

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fabric8 features



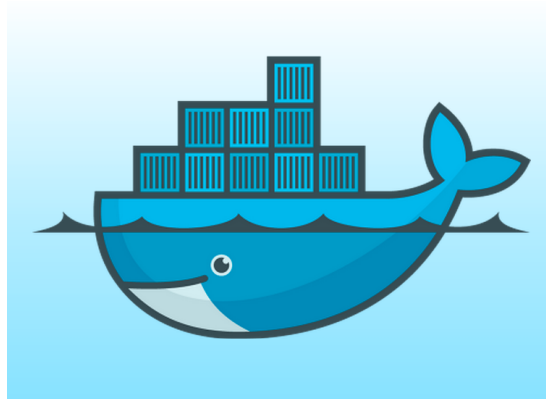
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- **Create** wizards to create microservices
- **Build** packaging into immutable container images
- **Release** rolling upgrades across different environments
- **Runtime** service discovery, elastic scaling, failover, load balancing
- **Manage** 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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fabric8-console

fabric8.vagrant.fb/kubernetes/namespace/default/templates?returnTo=%2Fworkspaces%2Fdefault%2Fnamespace%2Fdefault%2Fapps%3Fq%3D

fabric8 Teams default Runtime

Filter templates... x Target namespace: default Cancel

<p>apiman</p> <p>The Apiman Package provides the core Apiman platform using Apiman... More...</p>	<p>artifactory</p> <p>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...</p>	<p>cd-pipeline</p> <p>Provides the core Continuous Delivery platform using Gogs, Jenkins, More...</p>
<p>chaos-monkey</p> <p>Randomly kills pods to help check your environment can withstand failures</p>	<p>chat-irc</p> <p>Provides Chat using Hubot as the bot framework and IRC as the chat service</p>	<p>chat-letschat</p> <p>Provides Chat using Hubot as the bot framework and Let's... More...</p>
<p>chat-slack</p> <p>Provides Chat using Hubot as the bot framework and Slack as the chat service</p>	<p>content-repository</p> <p>Nexus is a maven repository manager</p>	<p>example-message-consumer</p> <p>Consumes messages via Apache Camel from a queue on Apache ActiveMQ. Communicates with the broker using a More...</p>
<p>example-message-producer</p> <p>Sends messages via Apache Camel to a queue on Apache ActiveMQ. Communicates with the broker using a More...</p>	<p>fabric8-docker-registry</p> <p>Private Docker Registry</p>	<p>fabric8-forge</p> <p>Fabric8 : Forge</p>
<p>gerrit</p> <p>Gerrit is a web based code review system, facilitating online code reviews for projects using the Git version control system.</p>	<p>git-collector</p> <p>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</p>	<p>gitlab</p> <p>Gitlab is a self-hosted Git service</p>

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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`



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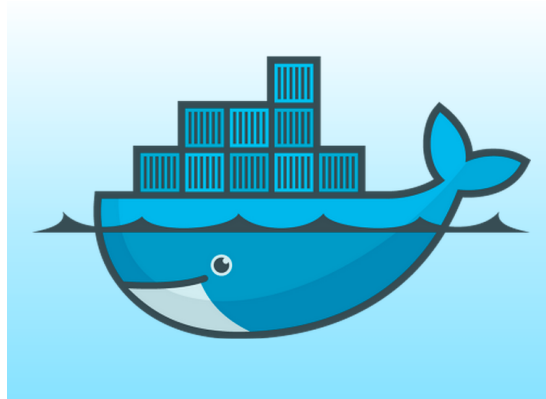
local Java development (pre-commit) with Maven

- 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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A screenshot of a Slack chat window. The channel is named '#cheese'. The user 'James Rawlings' has sent a message 'fabric8 help'. The bot 'fabric8' responds with a list of commands and their descriptions, including 'adapter', 'animate', 'echo', 'help', 'image', 'map', 'mustache', 'ping', 'publish', 'pug', 'subscribe', 'subscriptions', 'the rules', 'time', 'translate', 'unsubscribe', and 'youtube'. Below the text, there is an image of four chipmunks sitting together. The interface includes a sidebar with the channel name, a top bar with the channel name and a 'Who's Here' button, and a bottom bar with a 'Send' button and a 'Got something to say?' prompt.

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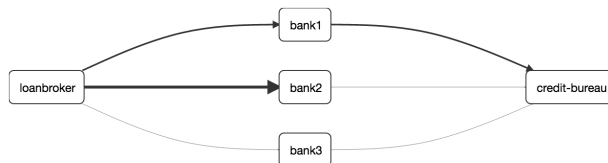
tracing with zipkin



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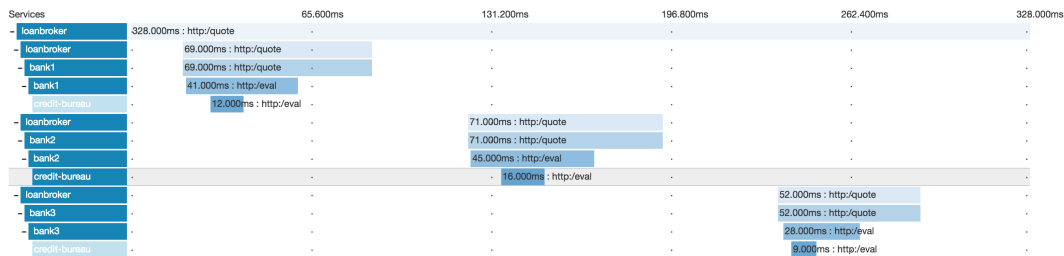
Zipkin Investigate system behavior Find a trace Dependencies

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



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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](#) |

bank1				bank3				bank2				BankController			
Host: 0.0/s				Host: 0.0/s				Host: 0.0/s				Host: 0.0/s			
Cluster: 0.0/s				Cluster: 0.0/s				Cluster: 0.0/s				Cluster: 0.0/s			
Active	0	Max Active	1	Active	0	Max Active	1	Active	0	Max Active	0	Active	0	Max Active	0
Queued	0	Executions	0	Queued	0	Executions	0	Queued	0	Executions	0	Queued	0	Executions	0
Pool Size	8	Queue Size	5	Pool Size	8	Queue Size	5	Pool Size	8	Queue Size	5	Pool Size	24	Queue Size	5

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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](#) on twitter - thanks for listening!!!

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