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MONOLITHS TO MICROSERVICES: APP TRANSFORMATION

Hands-on Technical Workshop

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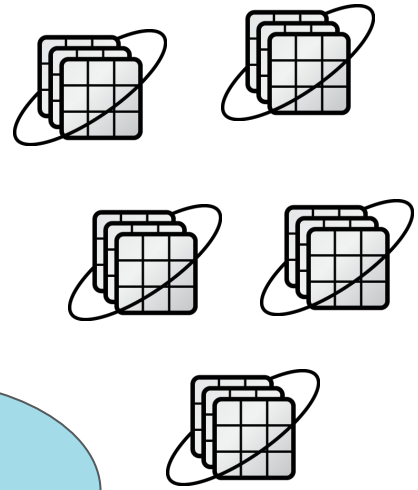
PART 3: MONOLITHS TO MICROSERVICES WITH JAVA EE AND SPRING BOOT

MICROSERVICES



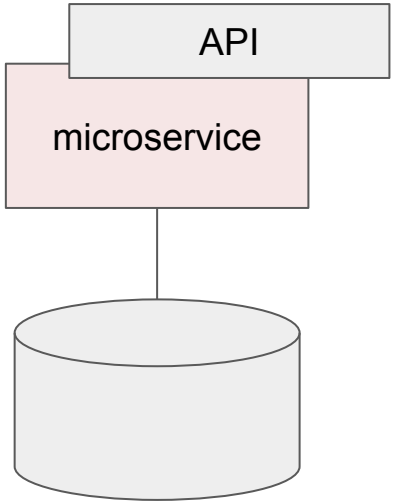
Faster Software Delivery

Resource Scalability

Failure Isolation

MICROSERVICES

- Simple,small
- Boundary and Replaceable
- Independence



WHY MONOLITH TO MICROSERVICES

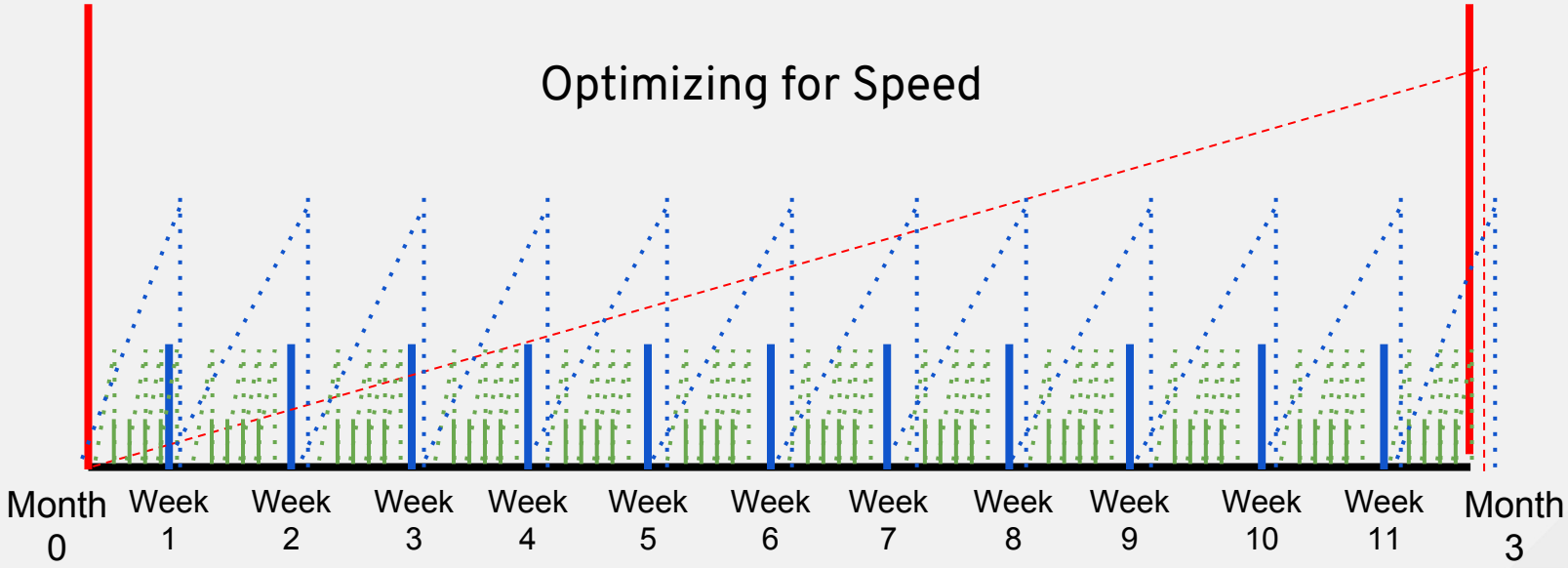
Break things down (organizations, teams, IT systems, etc) down into smaller pieces for greater parallelization and autonomy and focus on reducing time to value.

REDUCING TIME TO VALUE

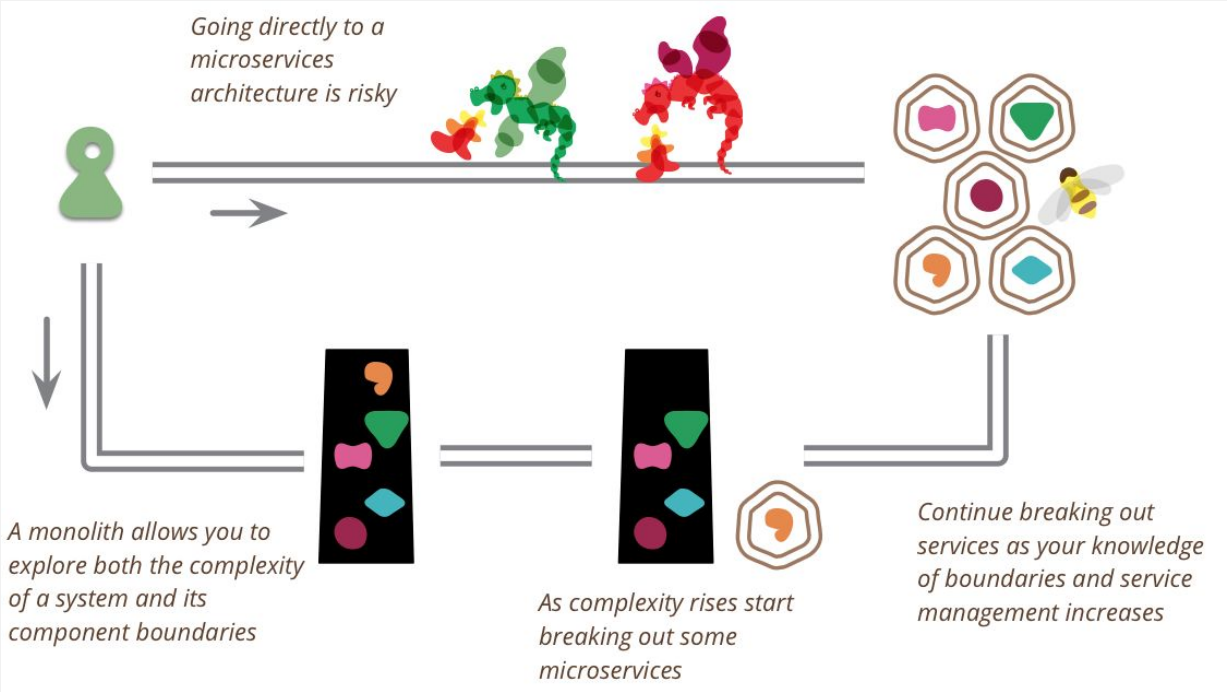
Monolith Lifecycle

Fast Moving Monolith

Microservices



MONOLITH FIRST?



http://martinfowler.com/bliki/MonolithFirst.html

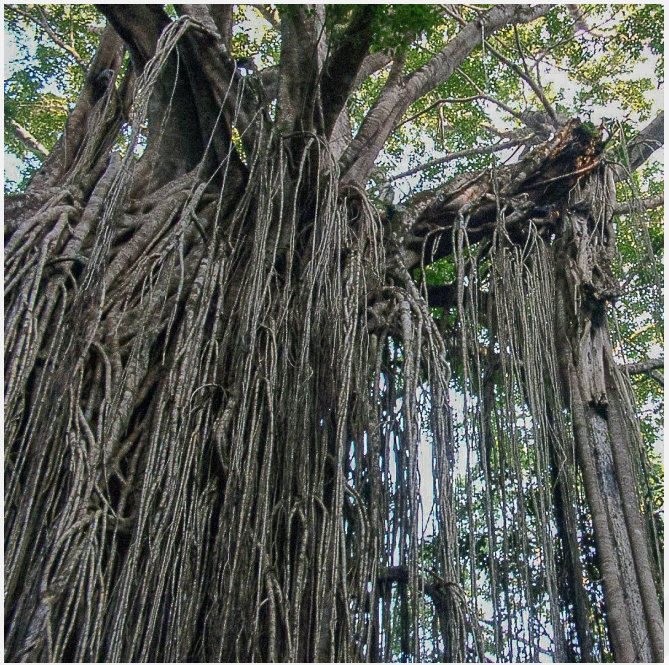
THE BIGGER PICTURE: THE PATH TO CLOUD-NATIVE APPS

A DIGITAL DARWINISM

MARTIN FOWLER'S STRANGLER APPLICATION

Going directly to a microservice architecture is risky.

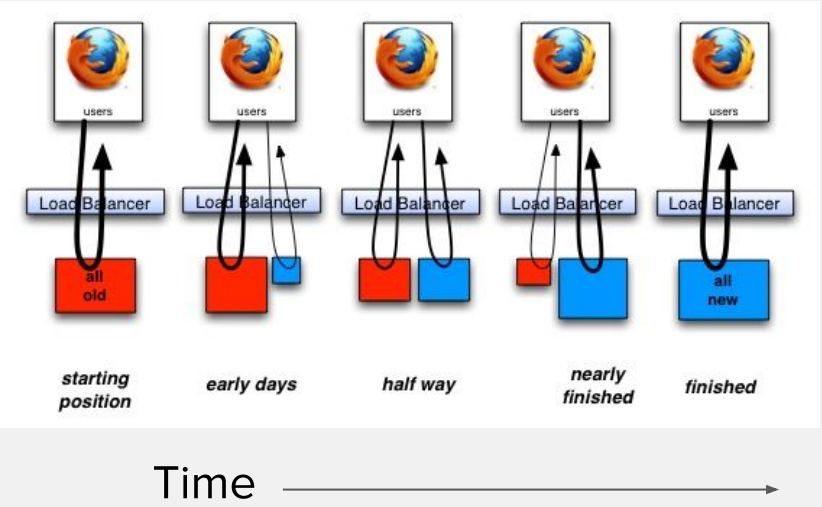
An alternative route is to gradually create a new system around the edges of the old, letting it grow slowly over several years until the old system is strangled.



https://www.martinfowler.com/bliki/StranglerApplication.html

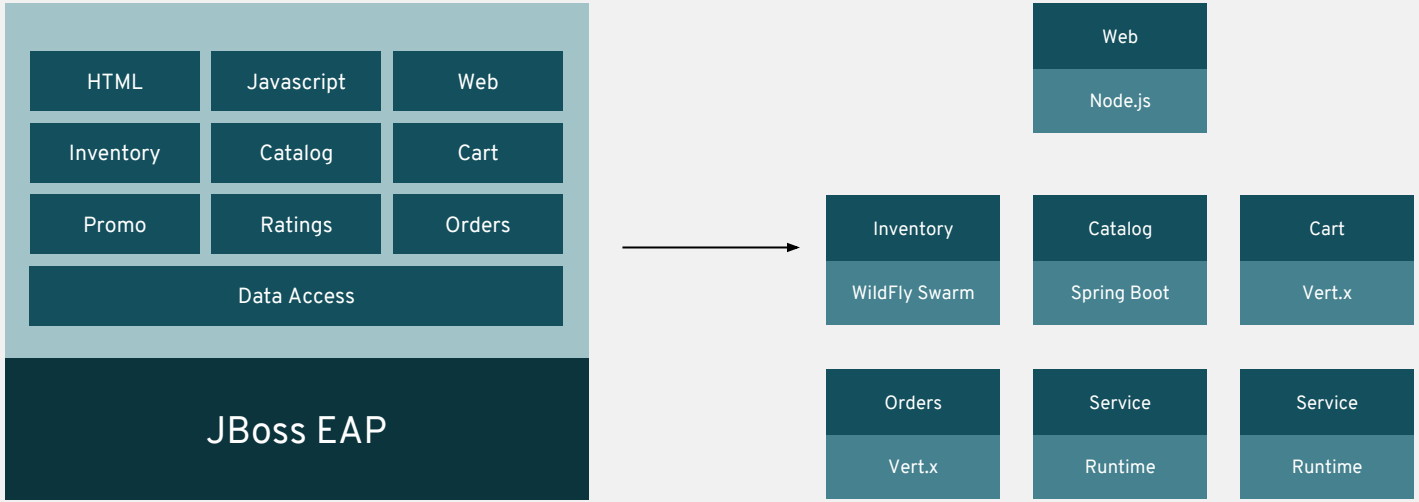
STRANGLING THE MONOLITH

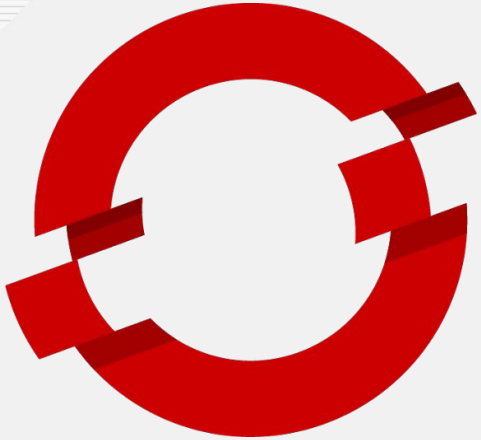
- Strangling - **incrementally** replacing functionality in app with something better (cheaper, faster, easier to maintain).
- As functionality is replaced, “dead” parts of monolith can be removed/retired.
- You can also wait for all functionality to be replaced before retiring anything!
- You can optionally include new functionality during strangulation to make it more attractive to business stakeholders.



STRANGLING THE MONOLITH

- In this lab, you will begin to ‘strangle’ the coolstore monolith by implementing its services as external microservices, split along business boundaries
- Once implemented, traffic destined to the original monolith’s services will be redirected (via OpenShift software-defined routing) to the new services

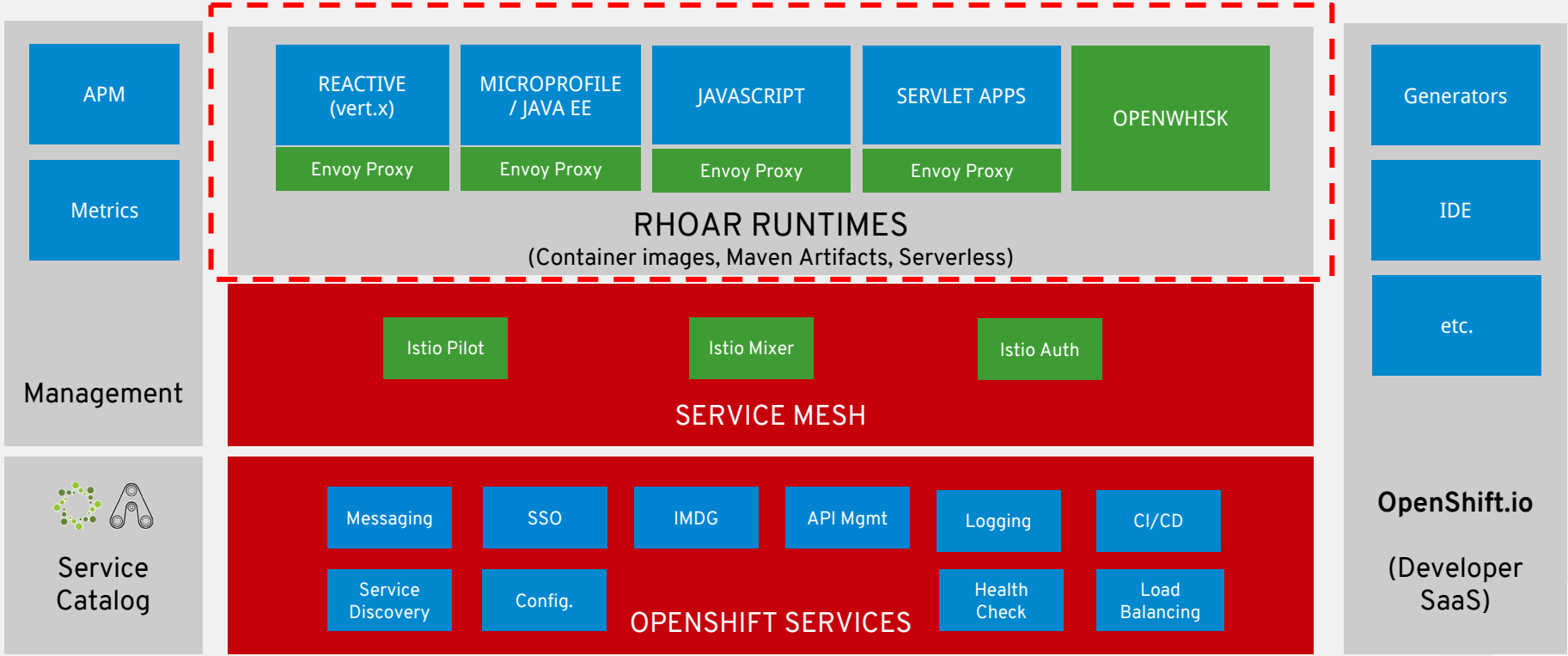




RED HAT® OPENSHIFT

Application Runtimes

RHOAR PRODUCT ARCHITECTURE



== Future

ENTERPRISE JAVA

RED HAT JBOSS
ENTERPRISE
APPLICATION PLATFORM

SERVLET APPS

JAVA MICROSERVICES

JAVASCRIPT FLEXIBILITY

REACTIVE SYSTEMS

TOMCAT SIMPLICITY

RED HAT JBOSS
WEB SERVER

WILDFLY SWARM

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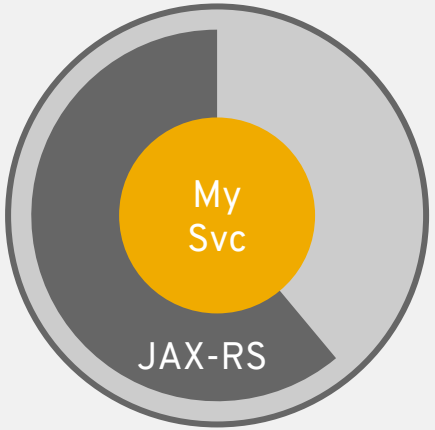
WildFly SWARM

JAVA EE MICROSERVICES

- Leverage Java EE expertise
- Open standard
- Microservices focus
- Optimized for OpenShift
- Super lightweight
- Tooling for Developers
- MicroProfile Implementation



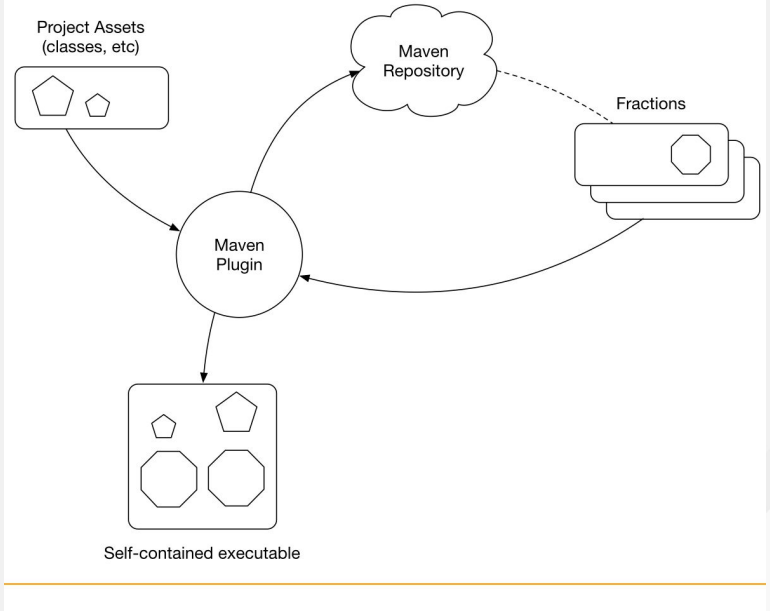

```
$ java -jar my_microservice.jar
```

WHAT IS WILDFLY?

- Packaged as an Uber Jar (self-contained, executable Java archive)
- Implementation of MicroProfile specification
- Not intended as JBoss EAP in an uber jar!
  - Focused on Microservice use cases.
  - Not recommended for systems containing a UI.
  - No session replication support.

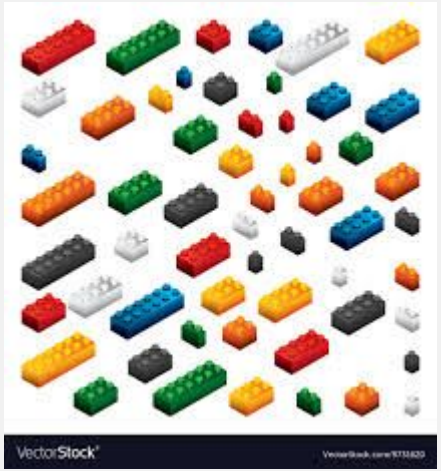
WILDFLY SWARM “PIECES” - FRACTIONS

- A tangible unit providing a specific piece of functionality
- Embodied in a maven artifact
- To support the compositional aspect in WF Swarm
- Provides the “runtime” capabilities
- Means to add API dependencies (e.g. JAX-RS)
- Means to configure the system
  - With reasonable defaults
- Means to discover other components (topology)
- Means to alter deployments (e.g. keycloak)
- Can be auto-detected or explicitly declared



CLOUD NATIVE SUPPORT IN WILDFLY SWARM

- Health Checks
- Externalized Config
- Client-side discovery / load balancing
- Circuit Breaking / Bulkheading
- Logging / Monitoring / Tracing / Metrics
- Secure deployments with Keycloak
- MicroProfile
- API Documentation



RHOAR

Build microsevices

- Embeddable (Fat Jar)
- Lightweight
- Modular & extensible
- Built from WildFly (Trusted and Reliable)

Upstream (Unsupported)

Flyway	JMS	Jolokia
Logstash	Vert.x Integration	Infinispan
Fluentd	Consul	jGroups
Swagger	Spring	

Tested and Verified

Hystrix | Ribbon | MySQL | Oracle DB

Additional Supported Fractions

Metrics	Health
Configuration	Monitor
Keycloak	Topology

Supported Specifications

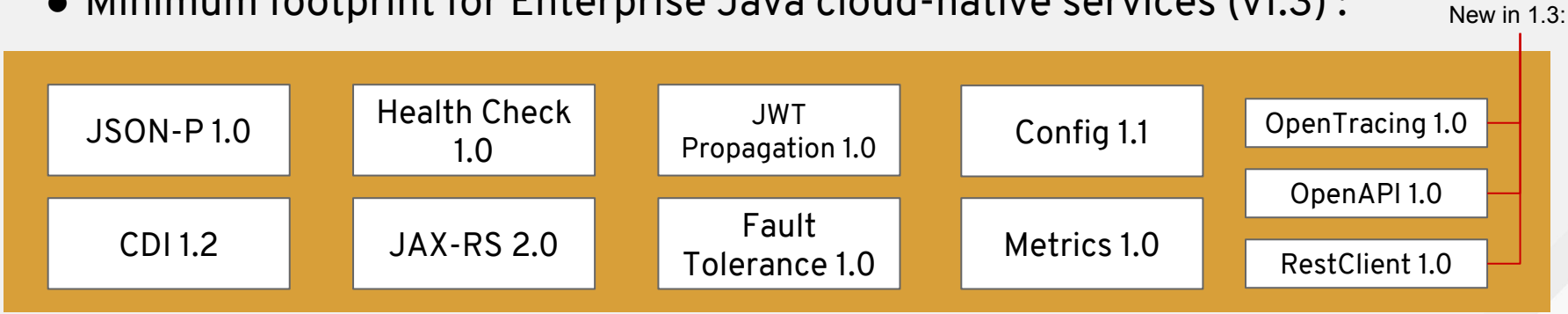
Java EE 7 Web Profile | MicroProfile 1.0

MICROPROFILE™

OPTIMIZING ENTERPRISE JAVA

eclipse

- Defines **open source** Java **microservices** specifications
- Industry Collaboration - Red Hat, IBM, Payara, Tomitribe, London Java Community, SouJava, Oracle, Hazelcast, Fujitsu, SmartBear...
- **WildFly Swarm** is **Red Hat's** implementation
- Minimum footprint for Enterprise Java cloud-native services (v1.3) :



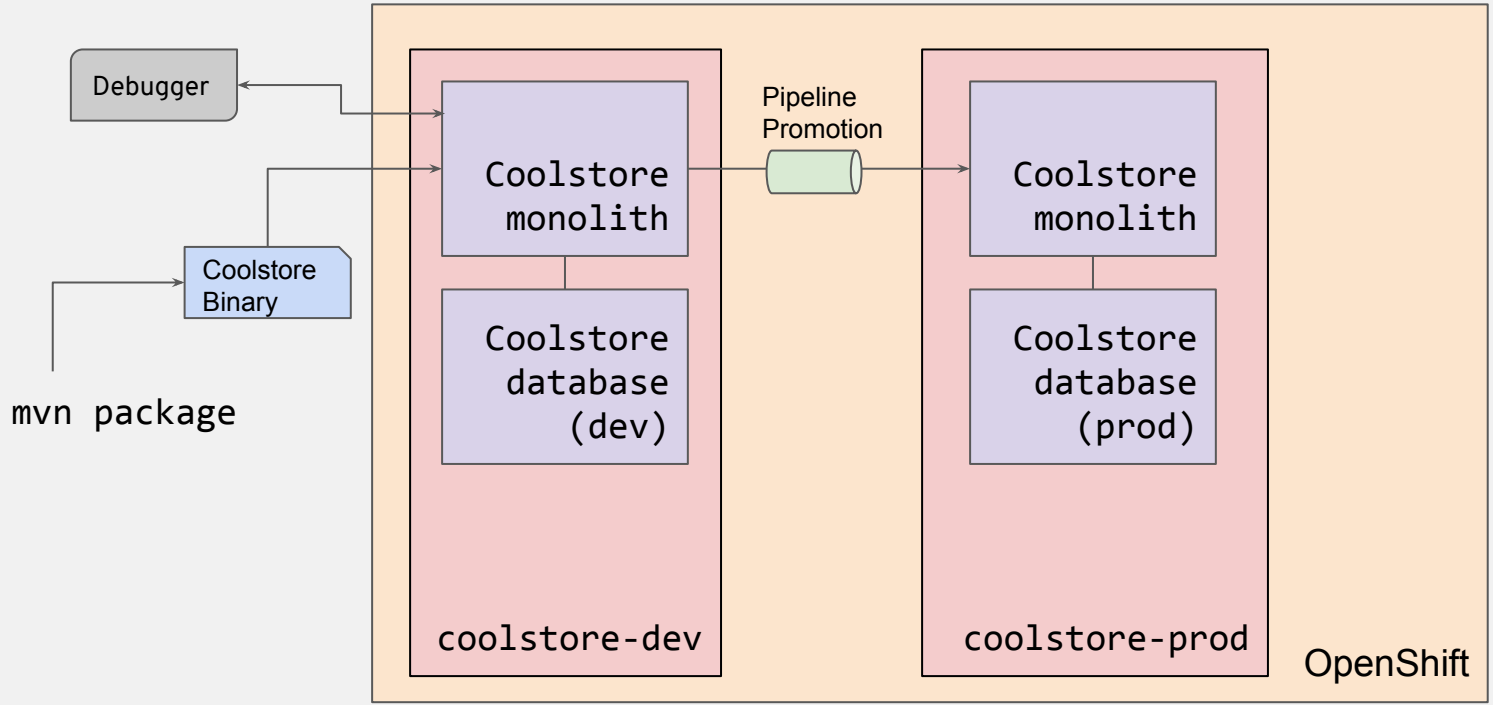
LAB: MONOLITHS TO MICROSERVICES WITH JAVA EE AND SPRING BOOT

GOAL FOR LAB

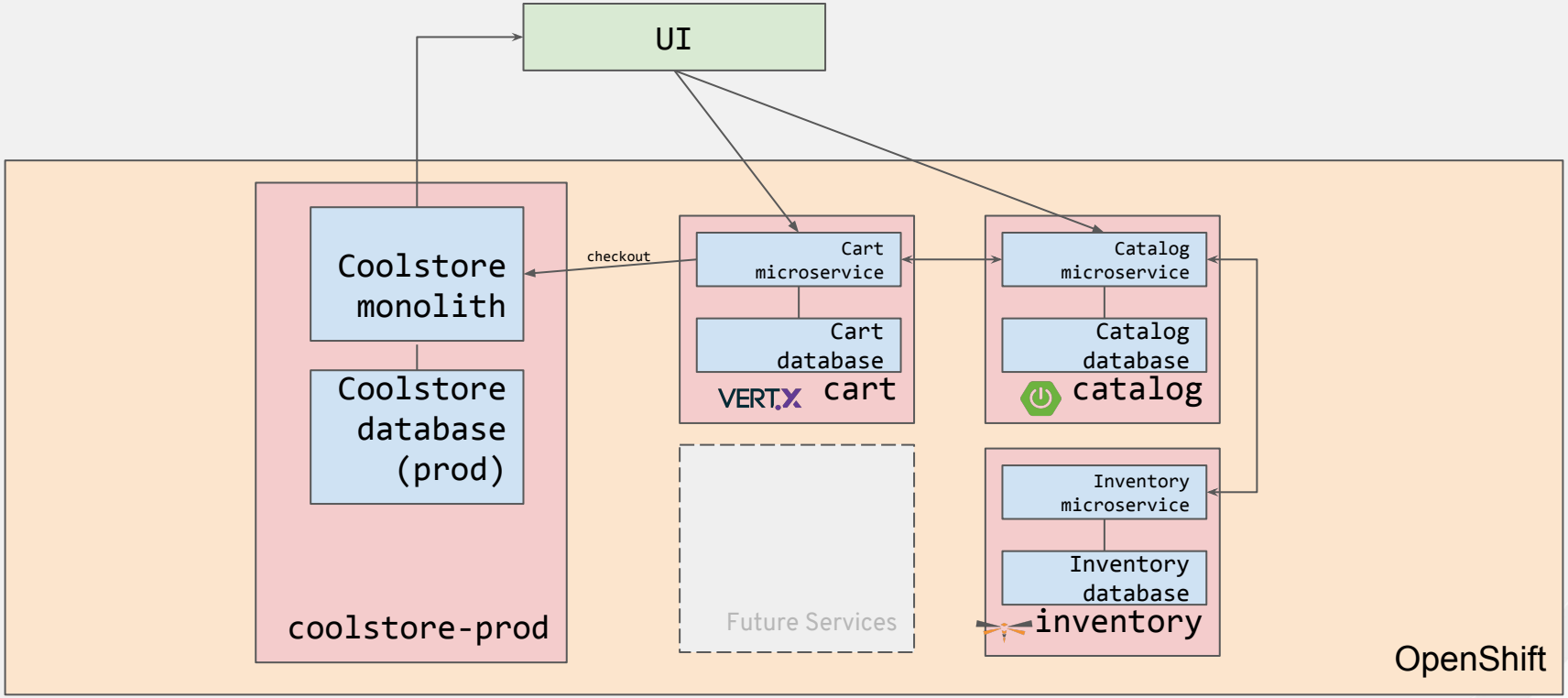
In this lab you will learn:

- How Red Hat OpenShift and Red Hat OpenShift Application Runtimes (RHOAR) help jumpstart app modernization
- Benefits and challenges of microservices
- How to transform existing monolithic applications to microservices using strangler pattern and 12-factor app patterns.
- Use modern app dev frameworks like WildFly Swarm and Spring Boot to implement microservice applications on OpenShift

CURRENT STATE - THE MONOLITH



TARGET STATE - MICROSERVICES-BASED

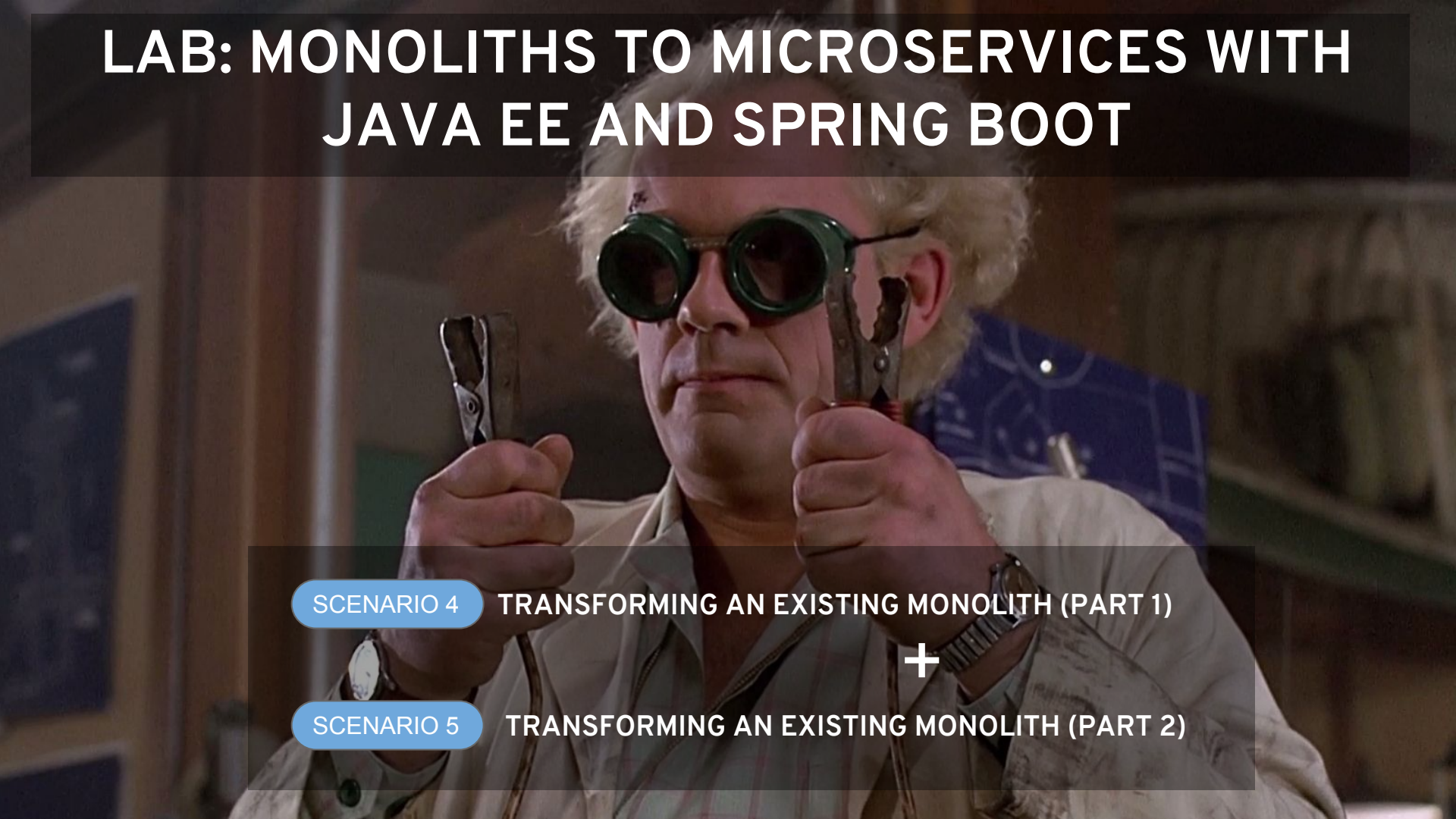


THE MICROSERVICES

In the following labs you will develop the following microservices to break up the monolith:

- The Inventory Service using WildFly Swarm
- The Catalog Service using Spring Boot
- The Shopping Cart Service and Shipping Service using Vert.x

LAB: MONOLITHS TO MICROSERVICES WITH JAVA EE AND SPRING BOOT



SCENARIO 4 TRANSFORMING AN EXISTING MONOLITH (PART 1)

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SCENARIO 5 TRANSFORMING AN EXISTING MONOLITH (PART 2)

SPRING

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- Microservices for Developers using Spring Framework
- An opinionated approach to building Spring applications
- Historical alternative to Java EE
- Getting started experience
- Spring MVC / DI / Boot most popular

SPRING BOOT

- Provide a radically faster and widely accessible getting started experience for all Spring development.
- Create Java applications that can be started using java -jar (but still allow for more traditional war deployments).
- Take an opinionated view of building Spring applications. Provide default component dependencies and automatic configuration of components. Convention over Configuration.
- Provide non-functional features common to most projects (metrics, health checks, security, externalized configuration, embedded servers)
- No code generation and no requirement for XML configuration.

SPRING BOOT STARTERS

- Dependency descriptors that you can include in your application
- Organized around technologies or features
- Define and manage all the transitive dependencies required for a particular technology
- The complete list of Spring provided starters can be found in the documentation
- Third parties can also provide starters for Spring Boot
  - Apache Camel: camel-spring-boot-starter

SPRING CLOUD KUBERNETES

- PropertySource Reload to trigger a application reload when changes are detected in ConfigMap
  - Disabled by default
  - Levels of reload: refresh (default), restart_context, shutdown
- Pod Health indicator adds pod-specific health data to Spring Actuator health endpoint
- Kubernetes Profile auto-configuration when running on Kubernetes
- Ribbon discovery for Kubernetes
- Archaius (Netflix OSS configuration management library) ConfigMap property source
- Transparent: does not break when application is running outside of Kubernetes/OpenShift

SPRING IN RHOAR

- **It's the same Spring you know and love**
- Tested and Verified by Red Hat QE
  - Spring Boot, Spring Cloud Kubernetes, Ribbon, Hystrix
- Red Hat components fully supported
  - Tomcat, Hibernate, CXF, SSO (Keycloak), Messaging (AMQ), …
- Native Kubernetes/OpenShift integration (Spring Cloud)
    - Service Discovery via k8s (DNS), Ribbon
    - Spring Config via ConfigMap
- Developer Tooling (launch.openshift.io, starters)
- Additional planned support for
  - Transactions (Naryana), Messaging (Rabbit MQ -> AMQ), more

CLOUD NATIVE SUPPORT IN SPRING

- Health Checks (actuator)
- Externalized Config (spring-cloud-kubernetes)
- Client-side discovery / load balancing (Eureka/Kubernetes)
- Circuit Breaking / Bulkheading (Hystrix)
- Logging / Monitoring / Tracing / Metrics
- Secure deployments with Keycloak
- API Documentation (Swagger)

LAB: MONOLITHS TO MICROSERVICES WITH JAVA EE AND SPRING BOOT

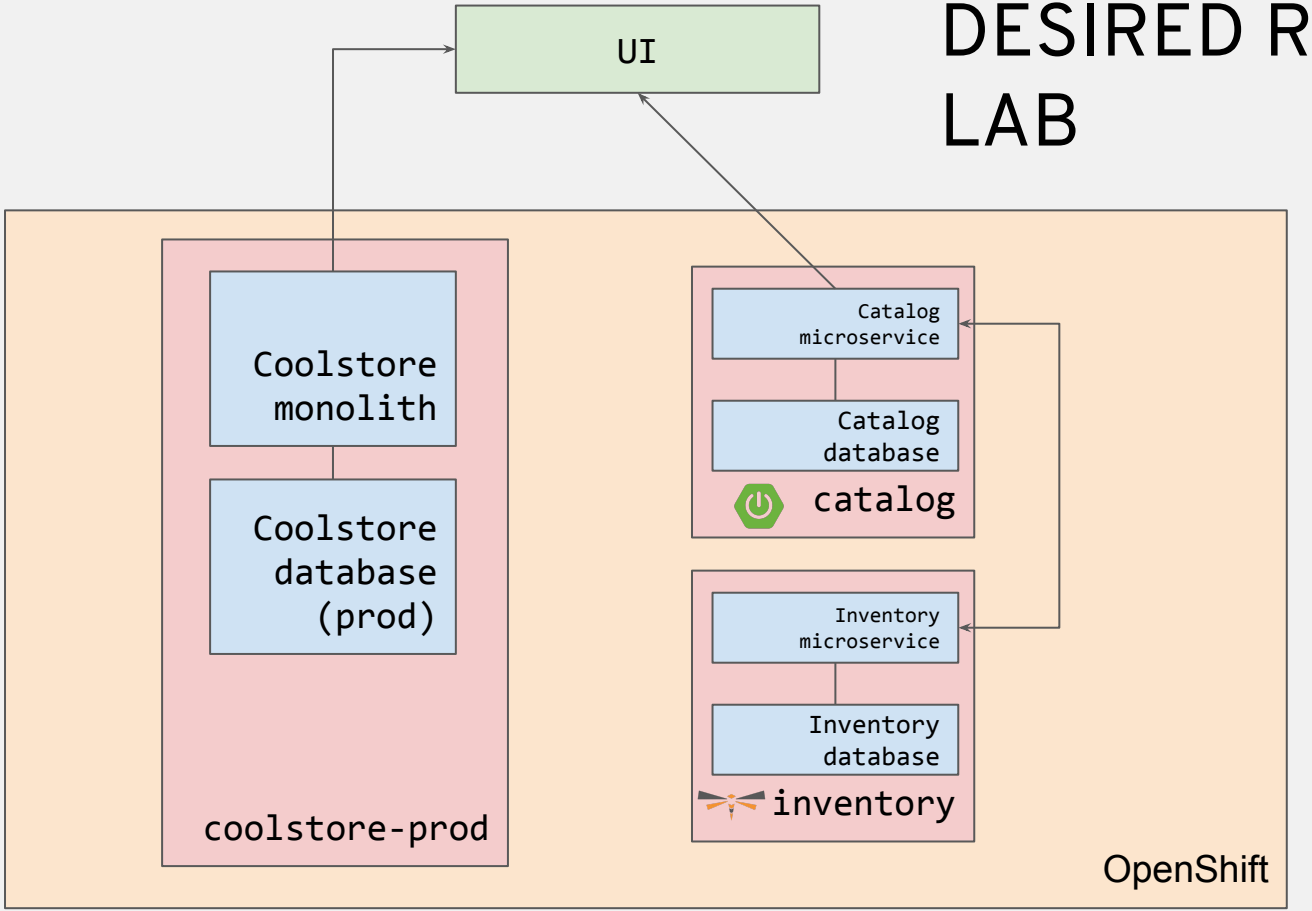
WRAP-UP AND DISCUSSION

RESULT OF LAB

In this lab you learned how to:

- Implement a Java EE microservice using WildFly Swarm
- Implement a Java EE microservice using Spring Boot
- Develop container-based testing
- Add microservice concerns like Health checks, externalized configuration and circuit breaking
- Use the strangler pattern to slowly migrate functionality from monolith to microservices

DESIRED RESULT OF LAB



TRAINING COURSES

- **DO180**: Introduction to Containers, Kubernetes, and Red Hat OpenShift
- **JB183**: Red Hat Application Development I: Programming in Java EE
- **DO288**: Red Hat OpenShift Development I: Containerizing Applications
- **JB283**: Red Hat Application Development II: Implementing MicroServices Architectures and Red Hat Certified Enterprise MicroServices Developer - scheduled to be released in May
- **DO292**: Red Hat OpenShift Development II: Creating MicroServices with Red Hat OpenShift Application Runtimes (RHOAR) - scheduled to be released in July

NEXT STEPS - SELF LEARNING

- App Modernisation
- Openshift
- Monoliths to Microservices 1
- Monoliths to Microservices 2
- App Resiliency and Istio.
  - https://learn.openshift.com/servicemesh/
  - https://github.com/VeerMuchandi/istio-on-openshift

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