Hybrid Serverless Development using Quarkus

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Red Hat

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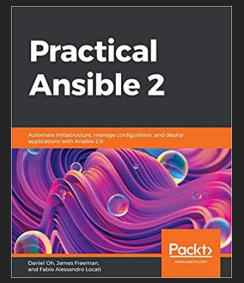
About Me

Daniel Oh

- Principal Technical Marketing Manager at Red Hat
  - Cloud Native App Development
  - Agile & DevOps practices
- Ambassador for CNCF and DevOps Institute
- Opensource.com Correspondents
- Public Speaker & Developer
- Author of Practical Ansible 2



@danieloh30 bit.ly/danielohtv danieloh30

IN THE BEGINNING...

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1999

Cost of a Java-based Web App circa 1999

```
     $18,000  Sun Sparc App Server Box (4 CPUs, 2GB of RAM)
+    $60,000  BEA Weblogic
+    $92,000  Sun Sparc DB Server Box (8 CPUs)
+   $243,000  Oracle RDBMS
+    $50,000  Symantec Visual Café for 10 developers
-------------------------------------------------------
   $463,000 (capex) + ~$80,000 annual maint (opex)
```

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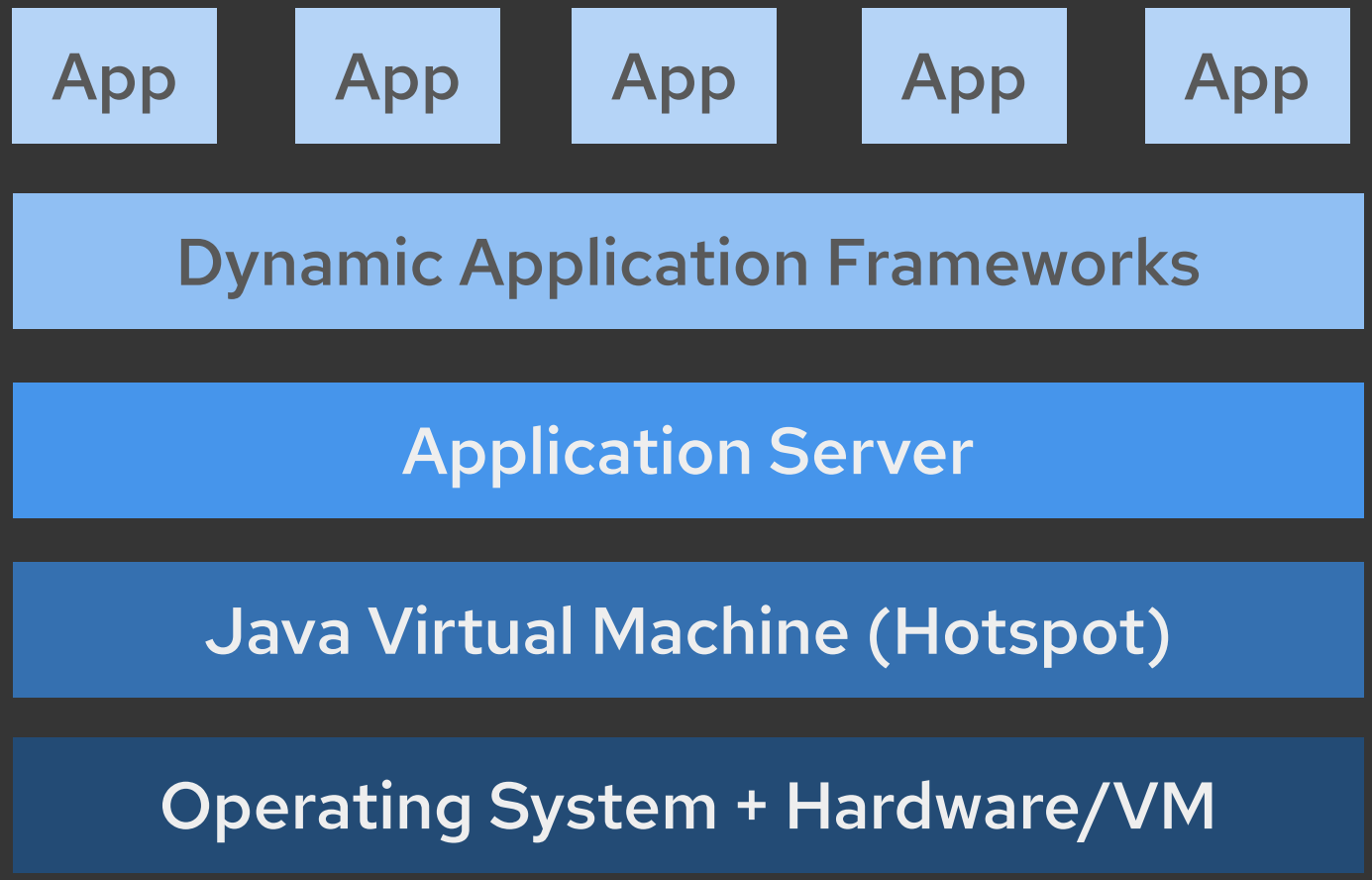
1999 Enterprise Java Stack

Architecture: Monolith
Deployment: Multi-app, App server
Lifecycle: Months
Memory: 1GB+ RAM
Startup: 10s of secs



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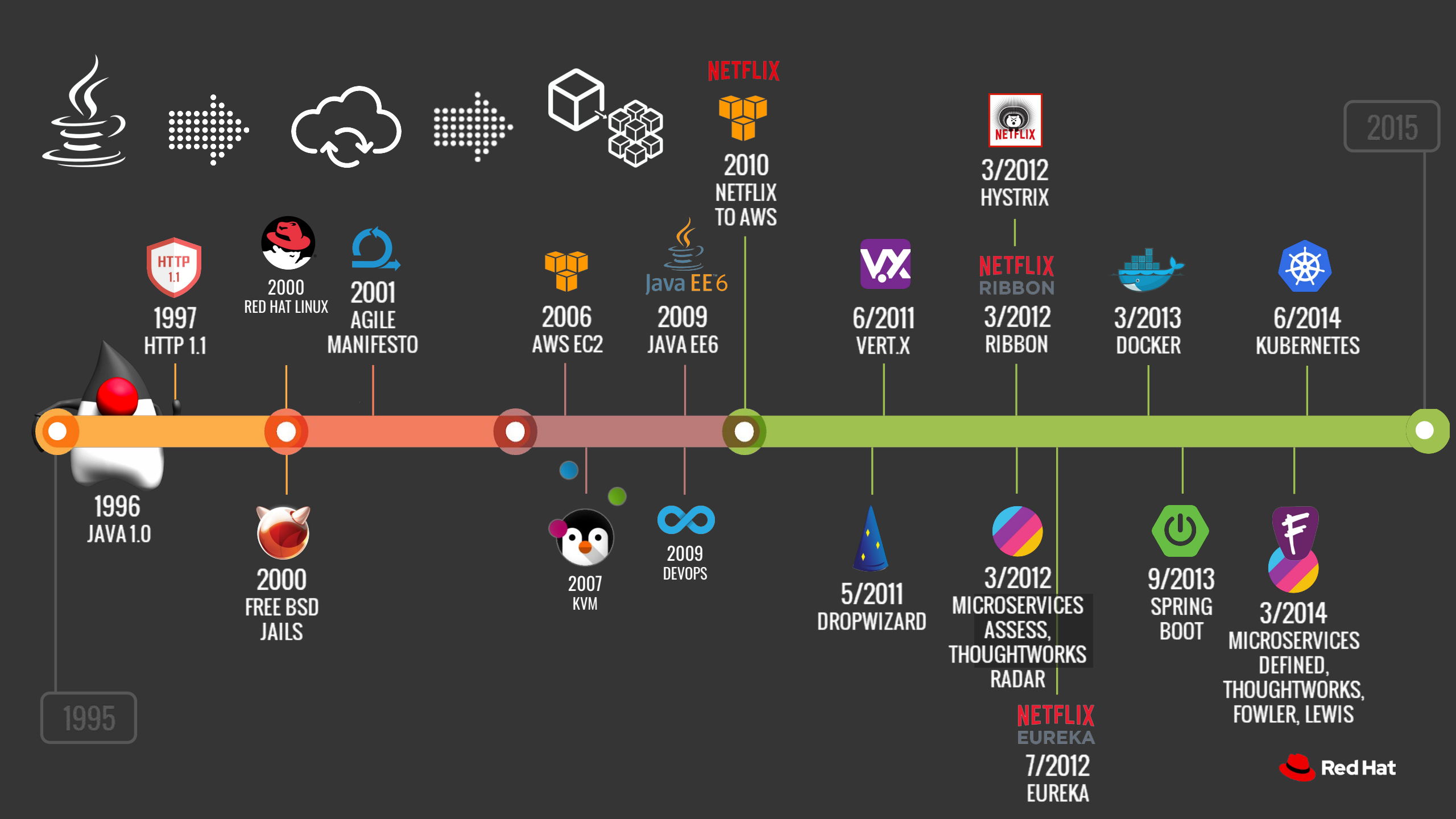
1995
1996
JAVA 1.0
1997
HTTP 1.1
2000
FREE BSD
JAILS
2000
RED HAT LINUX
2001
AGILE
MANIFESTO
2006
AWS EC2
2007
KVM
2009
JAVA EE6
2009
DEVOPS
NETFLIX
2010
NETFLIX
TO AWS
6/2011
VERT.X
5/2011
DROPWIZARD
3/2012
HYSTRIX
NETFLIX
RIBBON
3/2012
RIBBON
3/2012
MICROSERVICES
ASSESS,
THOUGHTWORKS
RADAR
NETFLIX
EUREKA
7/2012
EUREKA
3/2013
DOCKER
9/2013
SPRING
BOOT
6/2014
KUBERNETES
3/2014
MICROSERVICES
DEFINED,
THOUGHTWORKS,
FOWLER, LEWIS
2015
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m5ad.4xlarge	16	N/A	64 GiB	2 x 300 NVMe SSD	$0.824 per Hour
m5ad.12xlarge	48	N/A	192 GiB	2 x 900 NVMe SSD	$2.472 per Hour
m5ad.24xlarge	96	N/A	384 GiB	4 x 900 NVMe SSD	$4.944 per Hour
m5d.large	2	8	8 GiB	1 x 75 NVMe SSD	$0.113 per Hour
m5d.xlarge	4	16	16 GiB	1 x 150 NVMe SSD	$0.226 per Hour
m5d.2xlarge	8	31	32 GiB	1 x 300 NVMe SSD	$0.452 per Hour

aws

MEMORY	VCPUS	SSD DISK	TRANSFER	PRICE
1 GB	1 vCPU	25 GB	1 TB	$5/mo $0.007/hr
2 GB	1 vCPU	50 GB	2 TB	$10/mo $0.015/hr
3 GB	1 vCPU	60 GB	3 TB	$15/mo $0.022/hr
2 GB	2 vCPUs	60 GB	3 TB	$15/mo $0.022/hr
1 GB	3 vCPUs	60 GB	3 TB	$15/mo $0.022/hr
4 GB	2 vCPUs	80 GB	4 TB	$20/mo $0.030/hr
8 GB	4 vCPUs	160 GB	5 TB	$40/mo $0.060/hr
16 GB	6 vCPUs	320 GB	6 TB	$80/mo $0.119/hr

INSTANCE	VCPU	RAM	TEMPORARY STORAGE	PAY AS YOU GO
D2 v3	2	8 GiB	50 GiB	$0.096/hour
D4 v3	4	16 GiB	100 GiB	$0.192/hour
D8 v3	8	32 GiB	200 GiB	$0.384/hour

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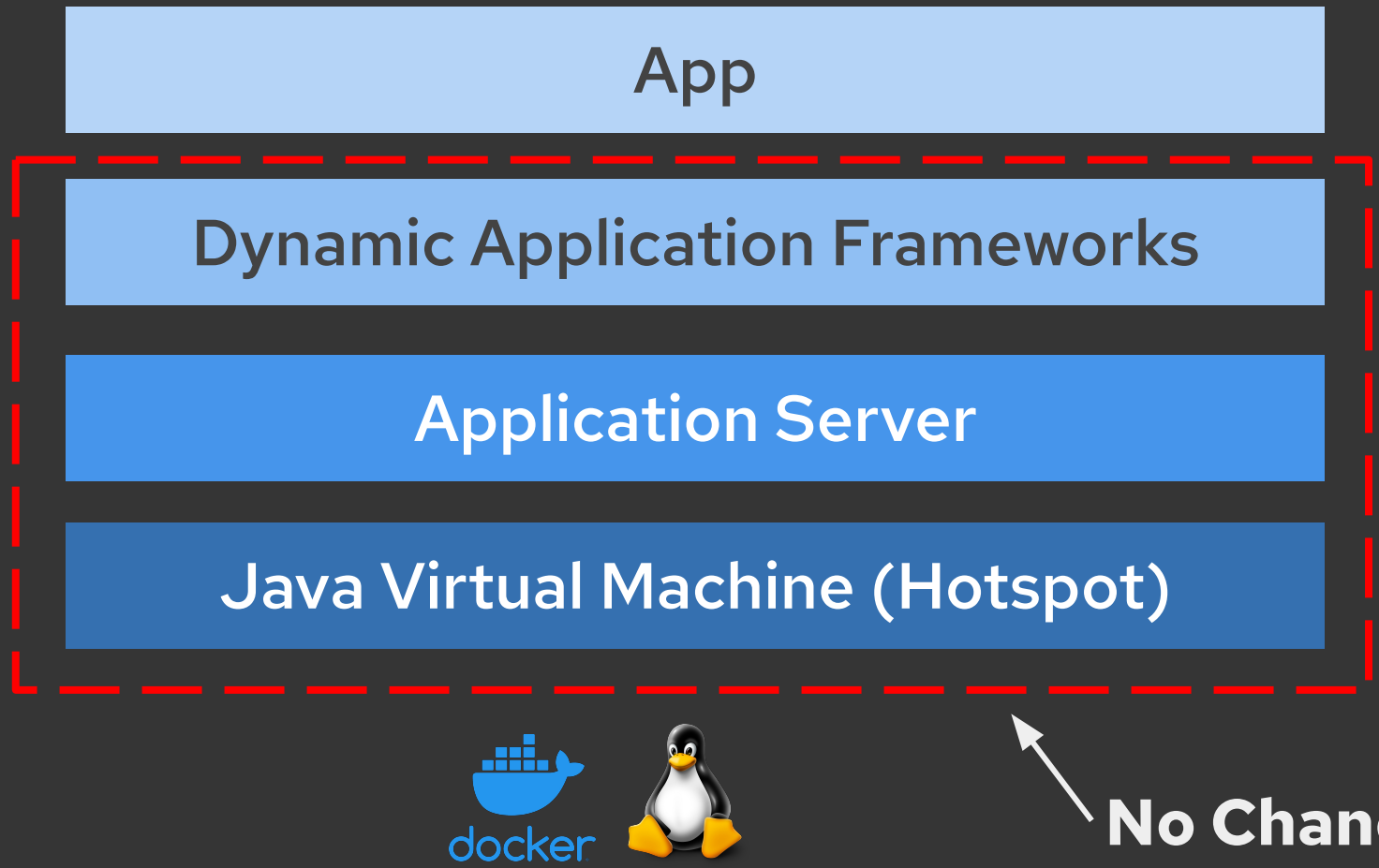
“Cloud Native” Java Stack

Architecture: Microservices
Deployment: Single App, Container
Lifecycle: Days
Memory: 100MBs+ RAM
Startup: Seconds



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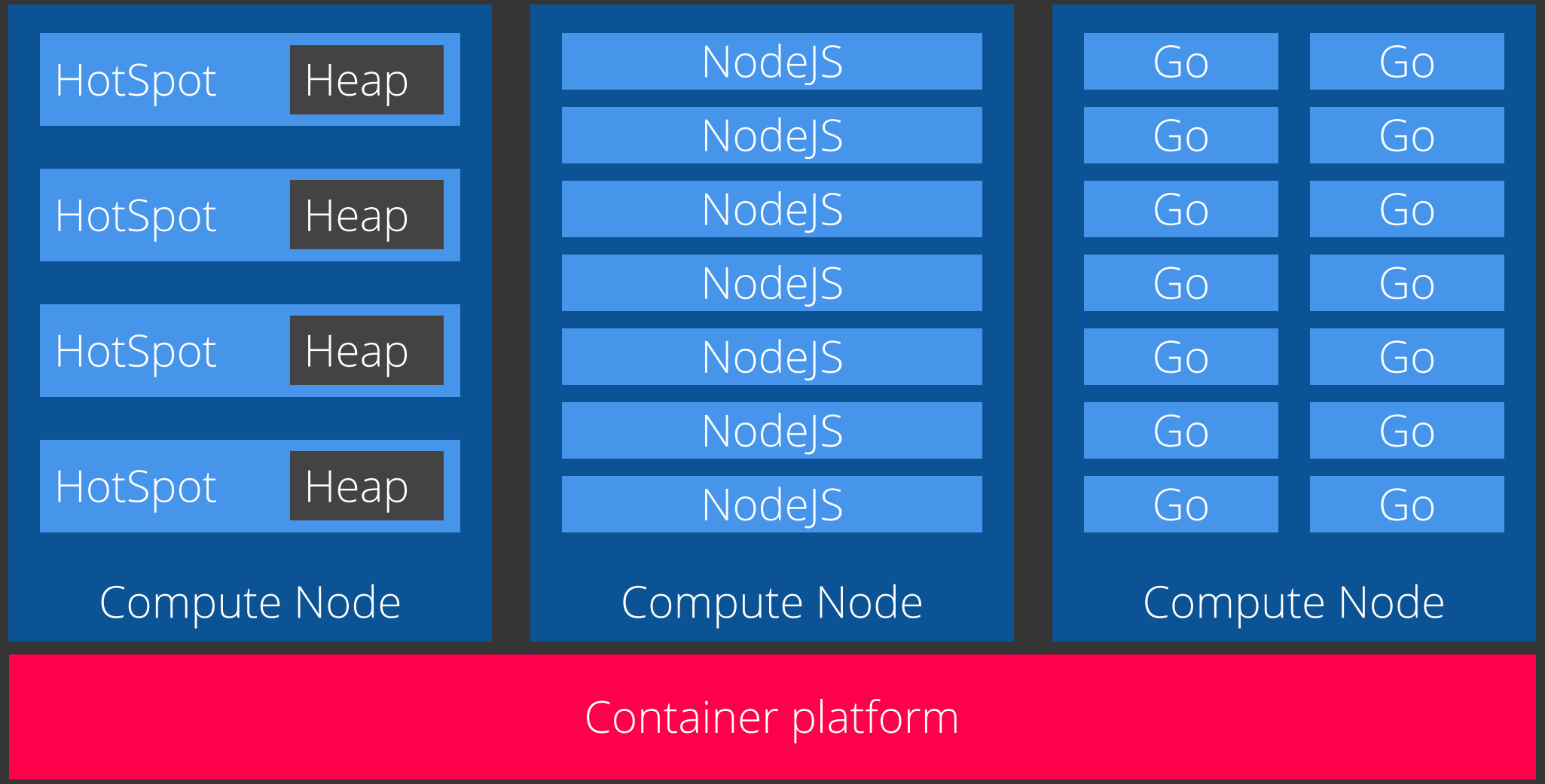
Designed for
Throughput
At the expense
of **footprint**


Designed to be **long-running**
At the expense of **startup speed**


Rich dynamic behavior
built for **mutable**
systems
Yet containers
are primarily
immutable

Java + Containers: The Hidden Truth



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Languages used on AWS Lambda

51%
Node.js

38%
Python

6%
Java

Source: https://newrelic.com/resources/ebooks/serverless-benchmark-report-aws-lambda-2020

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Serverless Landscape

Source: https://landscape.cncf.io/format=serverless&zoom=150

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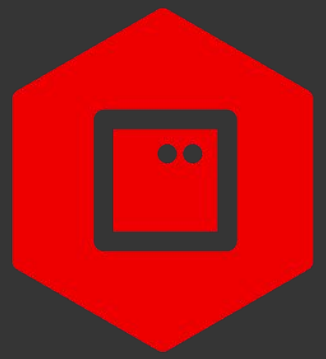
Java has tried to pivot before

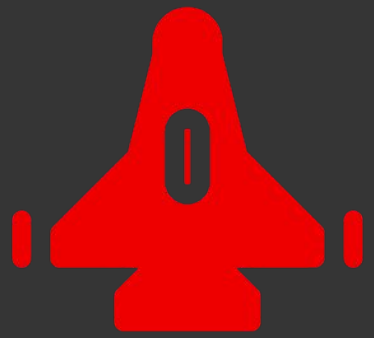


LINUX CONTAINERS

MEMORY UTILIZATION

CPU UTILIZATION

SHENANDOAH GC



ECLIPSE OPENJ9

JIT AS A SERVICE

GCJ

DALVIK

AVIAN

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WE
NEED
SOMETHING
DIFFERENT

QUARKUS

An Open Source
stack to write Java apps

Cloud Native

Microservices

Serverless

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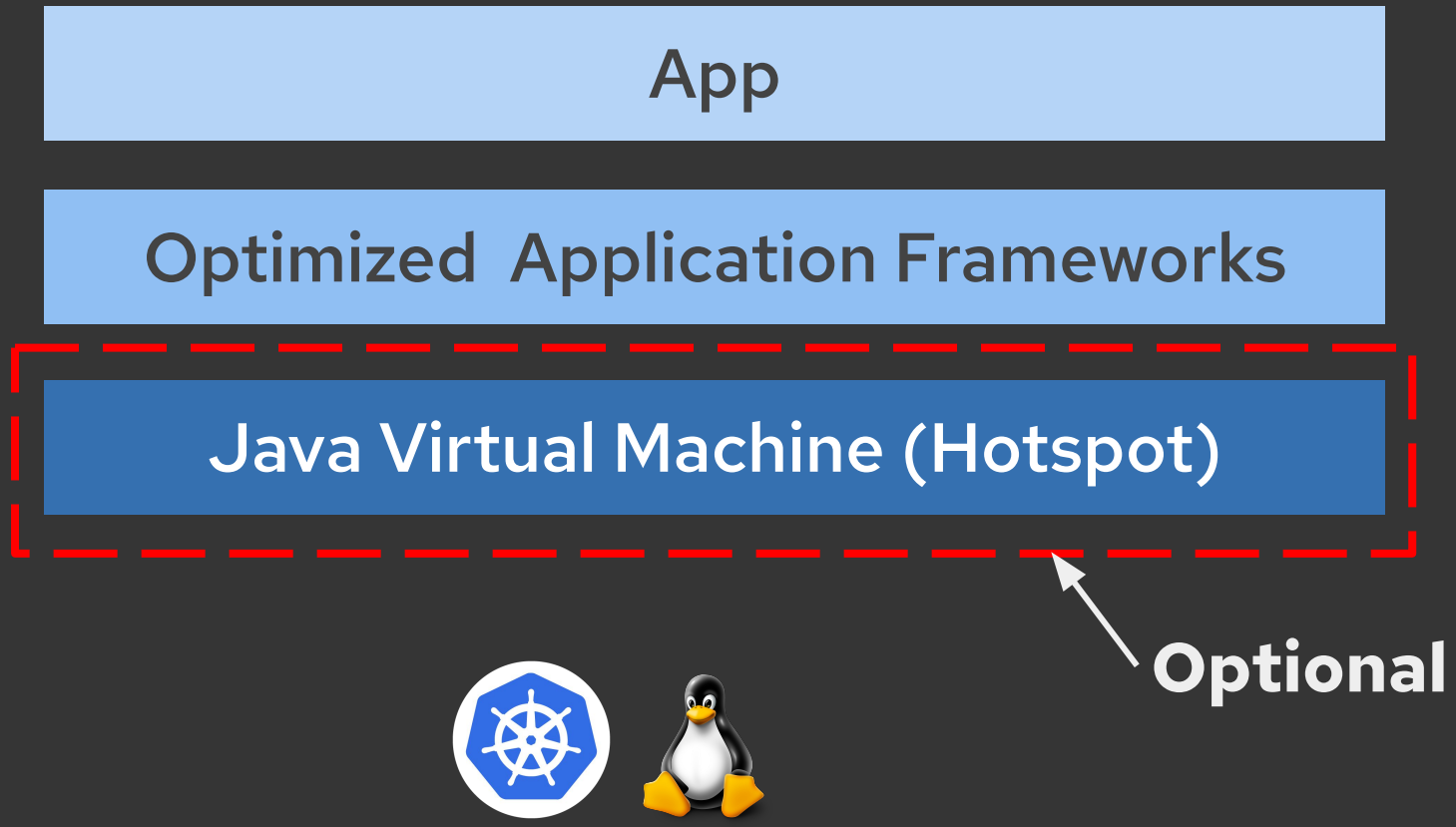
Quarkus - Optimizing the Stack

Architecture: Microservices,
Deployment: Serverless
Single App
Lifecycle: ms to Days
Memory: 10MBs+ RAM
Startup: Milliseconds



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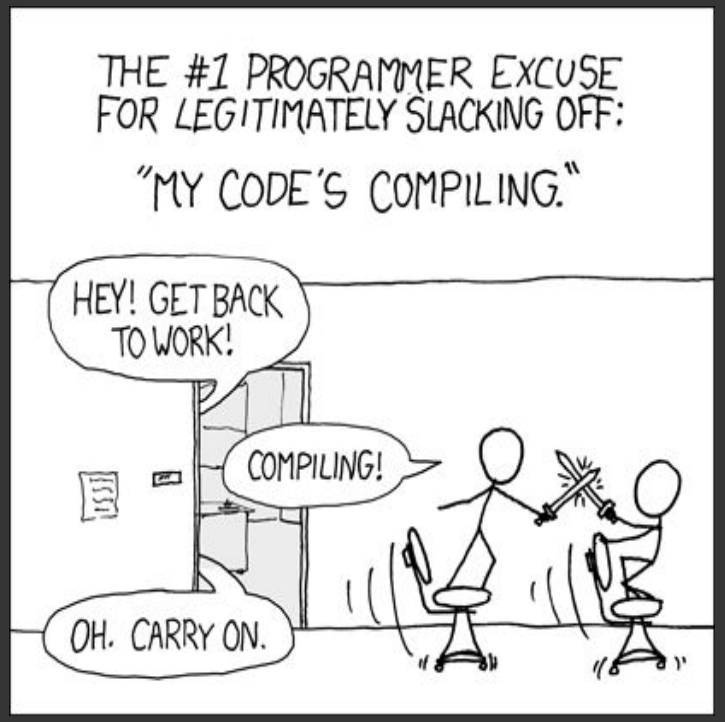
How does a Framework start?

Build the app

1. Bytecode compilation
2. Packaging (Maven, Gradle)



Run the app

1. Load config files and parse them
2. Load classes, enable/disable features
3. Verify bytecode, warm up the JIT
4. Scan classes to process annotations
5. Build framework meta-models, proxies
6. Start the management (threads, pools)

Red Hat

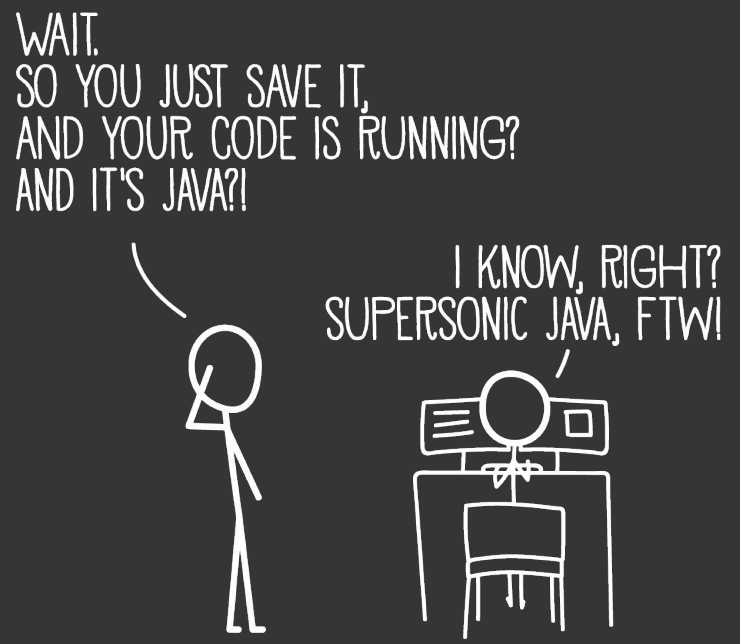
How does Quarkus start?

Build the app

1. Bytecode compilation
2. Load config files and parse them
3. Process annotations
4. Build framework meta-models
5. Packaging (Maven, Gradle)
6. [Optional] Native compilation / dead code elimination

Run the app

1. Start the management (threads, pools)



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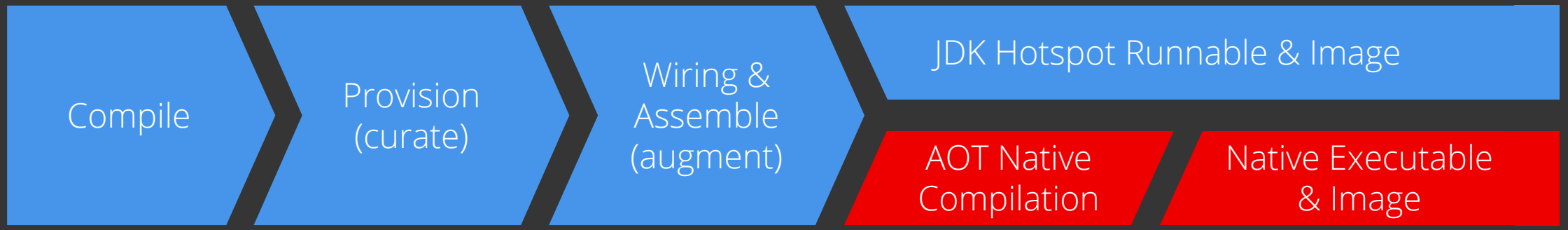
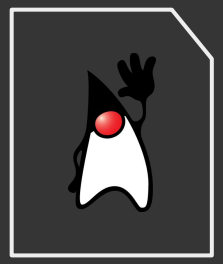
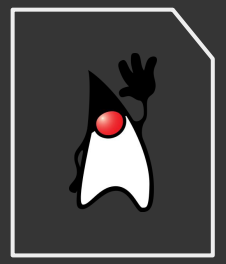
Quarkus native compilation





app.jar



Frameworks

Runnable Java app

Runnable Native app

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Quarkus Funqy for Serverless

Cloud

Quarkus Funqy

This guide explains basics of the Funqy framework, a simple portable cross-provider cloud function API.

Quarkus Funqy HTTP

This guide explains Funqy's HTTP binding

Quarkus Funqy Amazon Lambdas

This guide explains Funqy's Amazon Lambda binding

Quarkus Funqy Amazon Lambdas HTTP

This guide explains Funqy's Amazon Lambda HTTP binding

Quarkus Funqy Knative Events

This guide explains Funqy's Knative Events binding

Quarkus Funqy Azure Functions HTTP

This guide explains Funqy's Azure Functions HTTP binding

Quarkus Funqy Google Cloud Platform

This guide explains Funqy's Google Cloud Platform binding

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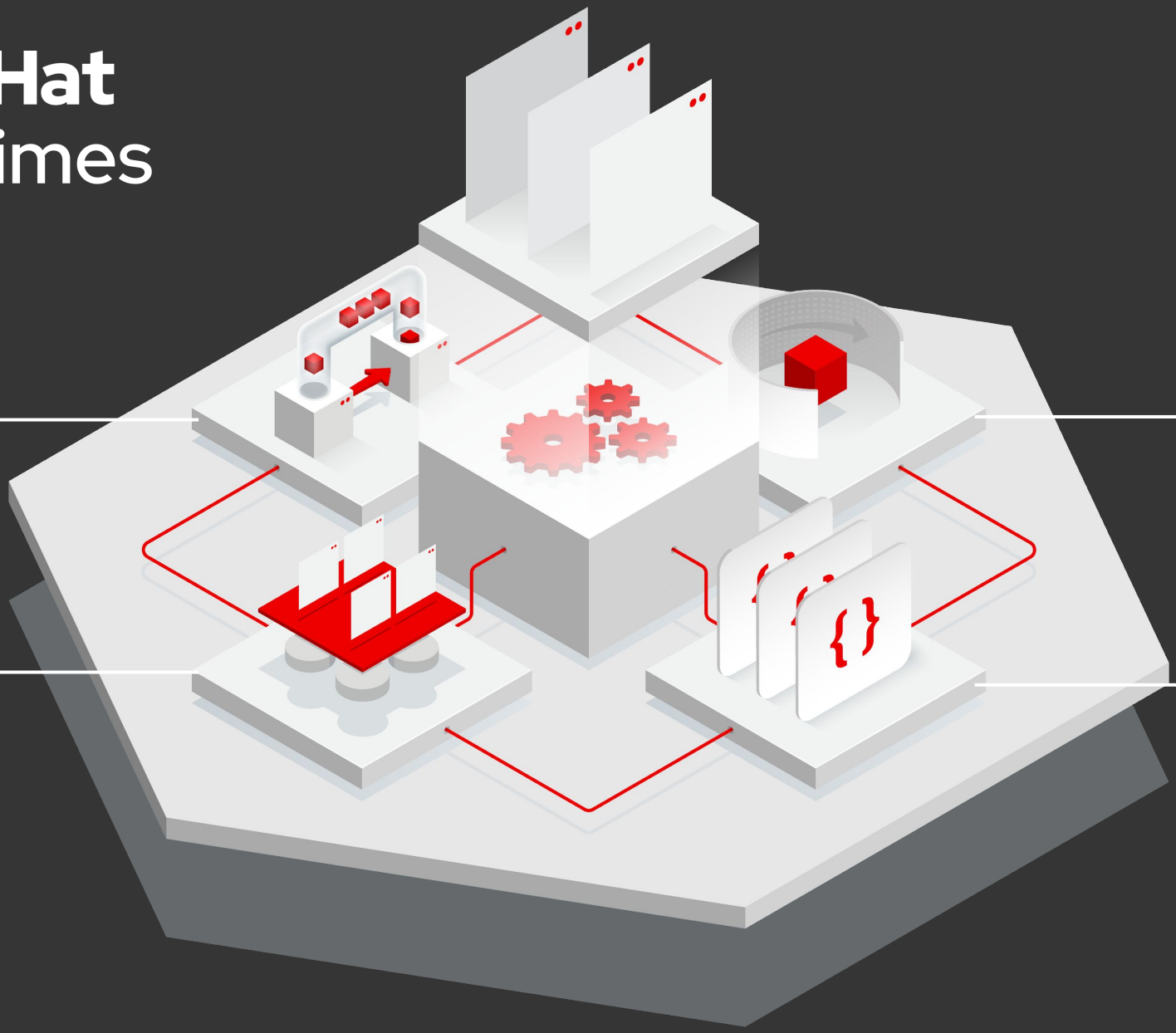
#LiveCoding
PAPERIZE

Red Hat Runtimes



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AMQ Broker

Red Hat
Data Grid

Red Hat
Migration Toolkit
for Applications

Red Hat
Cloud-Native
Runtimes
including **Quarkus**

Red Hat
Single Sign-On

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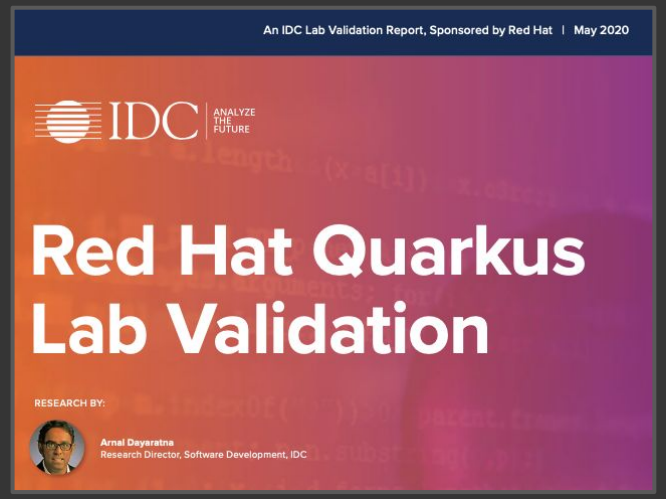
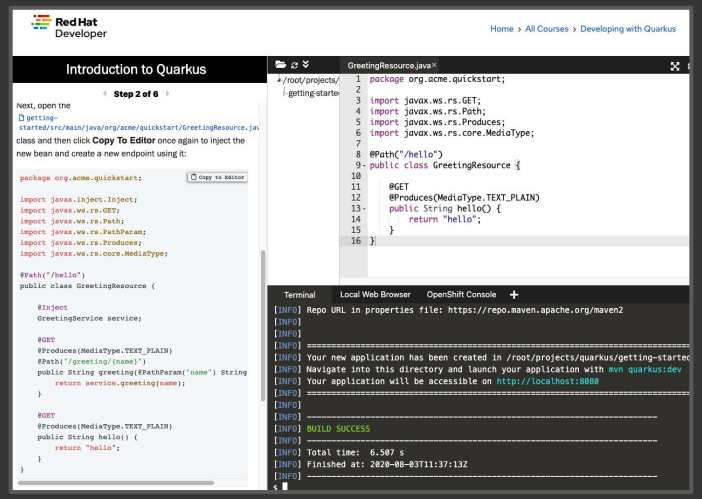
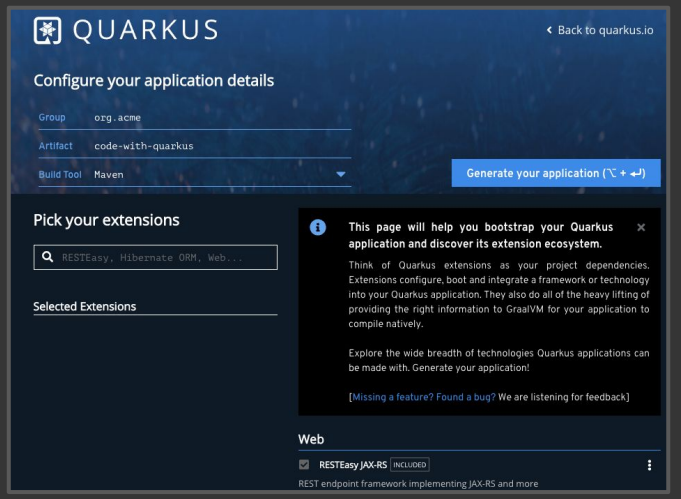
How to get started



red.ht/idc-quarkus-study



bit.ly/try-quarkus



code.quarkus.io

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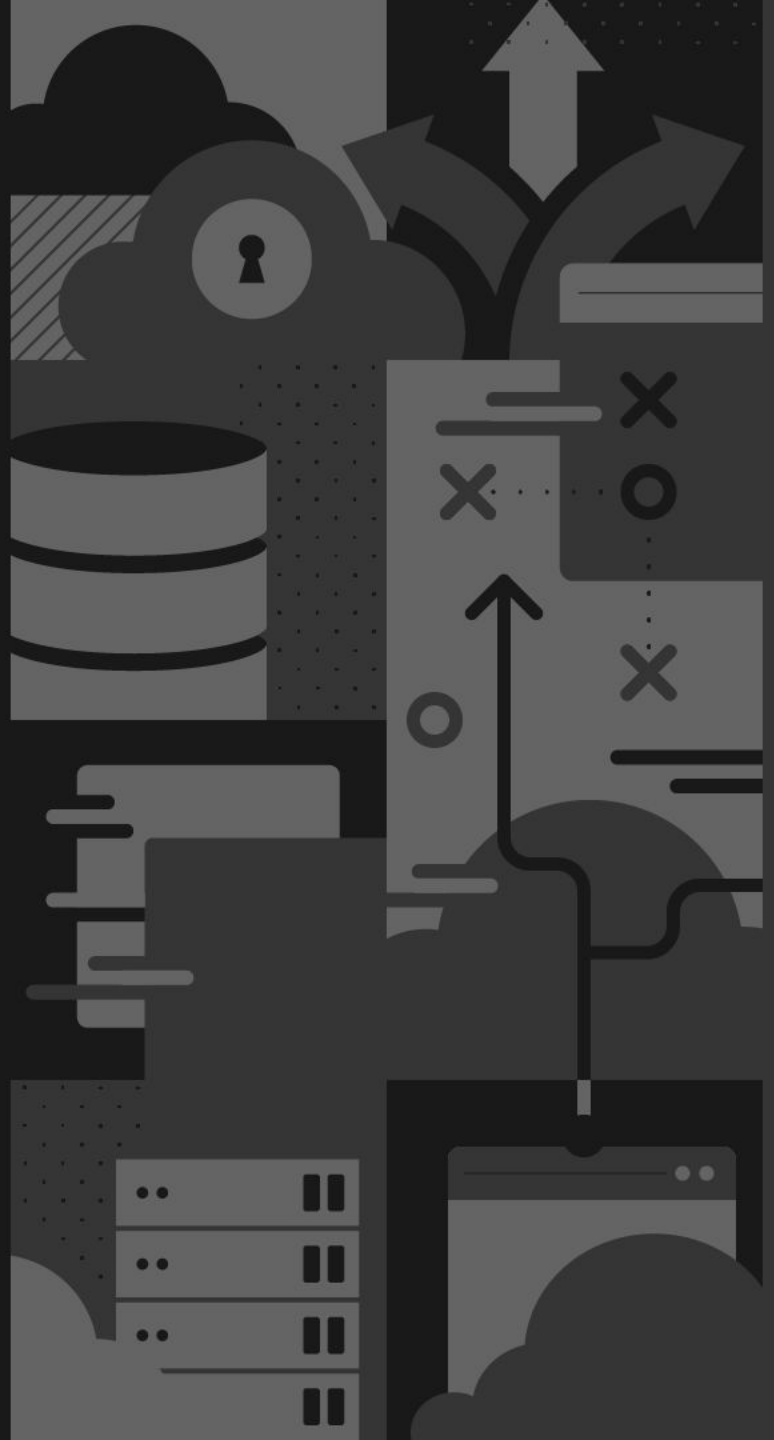

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