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by: DevOps INSTITUTE

Tech Tips for Getting Started Building Cloud-Native Java Apps

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Agenda

- Cloud-Native Software Capabilities
- Enterprise Java Journey
- What looks like Kubernetes Native Java
- Faster, Easier, and More Natural w/ Quarkus
- Demo

Daniel Oh

Principal Technical Marketing Manager at Red Hat

@danieloh30

- Cloud Native App Development
- Agile & DevOps practices
- CNCF Ambassador
- DevOps Institute Ambassador
- Developer
- Opensource.com Correspondents
- Public Speaker and Author

6 requirements of cloud-native software

- Kubernetes-native Runtimes
- Security in a Multi-cloud and Hybrid cloud
- Observability with Real-Time metrics
- Resources Efficiency
- Interoperability with open source technologies
- Dev(Sec)Ops

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https://opensource.com/article/20/1/cloud-native-software

4 things cloud-native Java must provide

- Increase development productivity
- Enable reactive programming
- Optimize serverless
- Adopt common open source projects and tools

https://opensource.com/article/20/1/cloud-native-java

COST

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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Historical Enterprise Java Stack

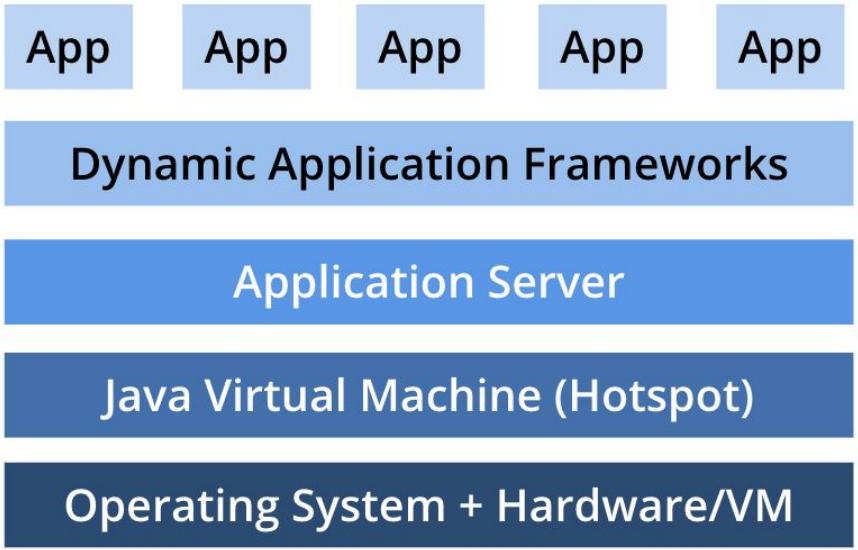
Architecture: Monoliths

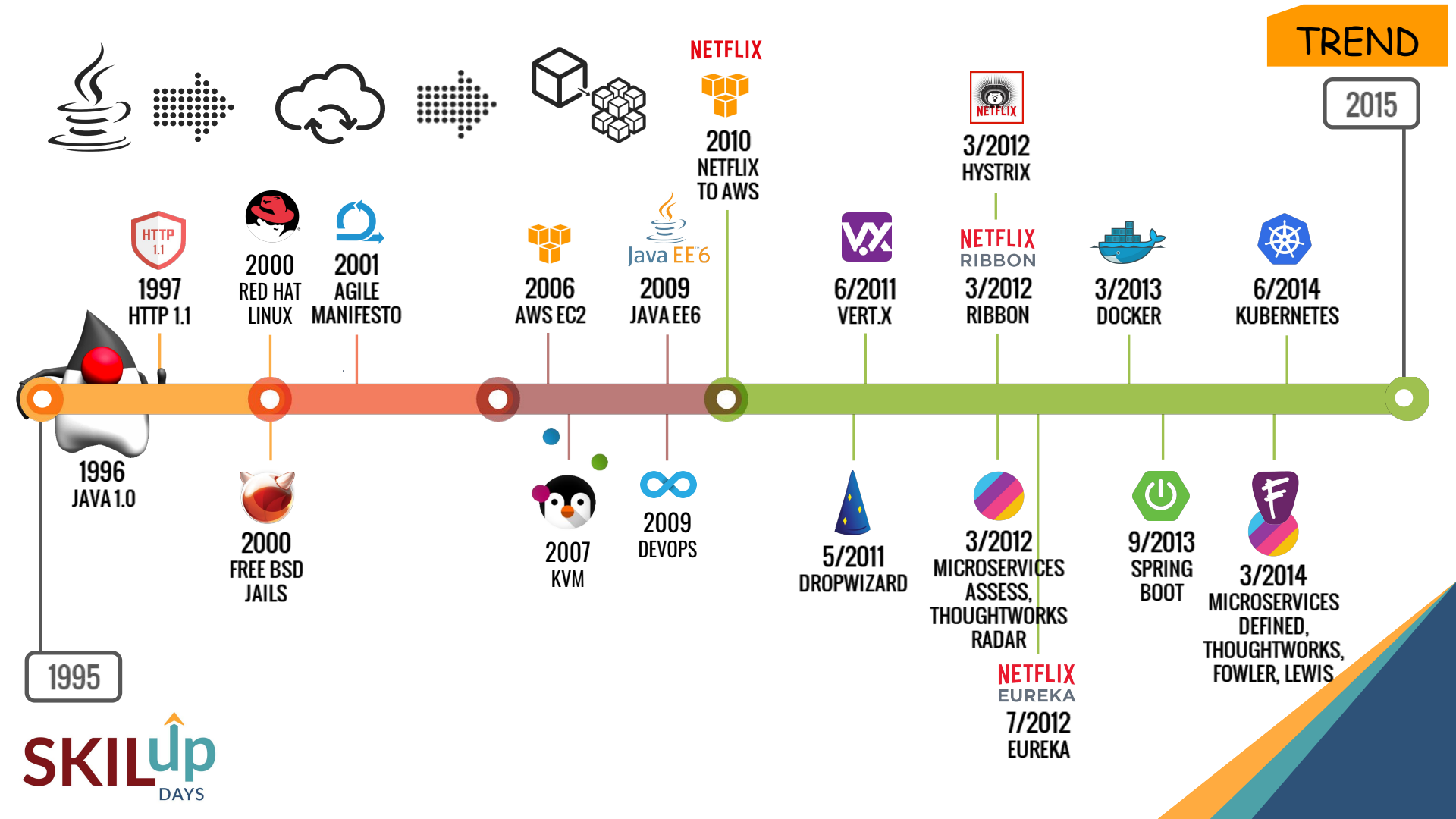
Deployment: multi-app, appserver

App Lifecycle: Months

Memory: 1GB+ RAM

Startup Time: 10s of sec




TREND
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
5/2011
DROPWIZARD
6/2011
VERT.X
3/2012
MICROSERVICES
ASSESS,
THOUGHTWORKS
RADAR
NETFLIX
3/2012
HYSTRIX
NETFLIX
RIBBON
3/2012
RIBBON
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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COST

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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Modern Enterprise Java Stack

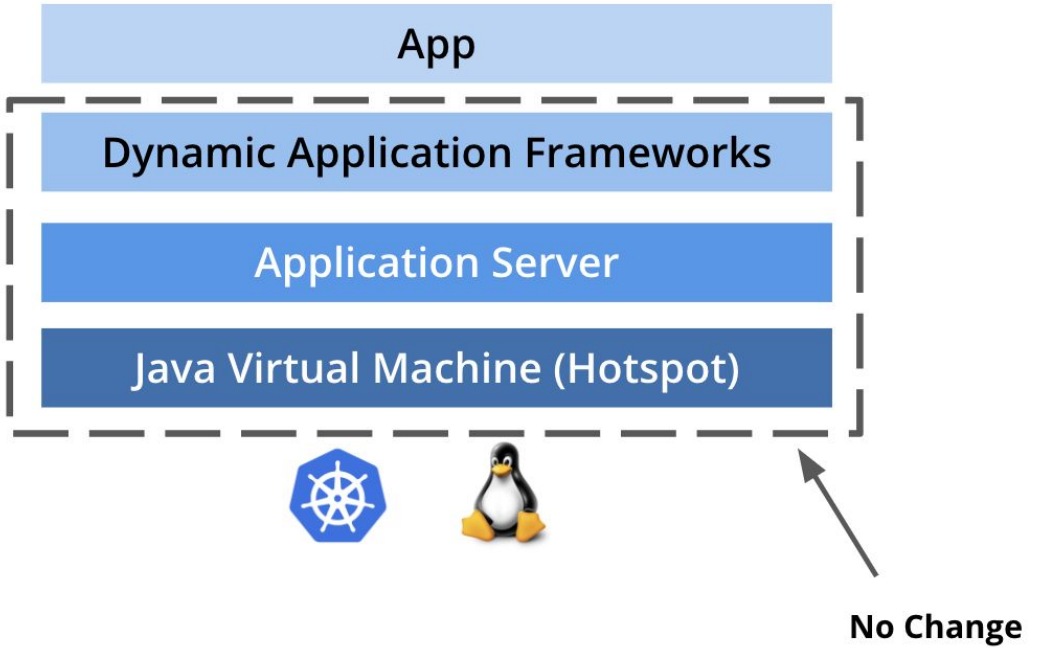
Architecture: Microservices

Deployment: Single App

App Lifecycle: Days

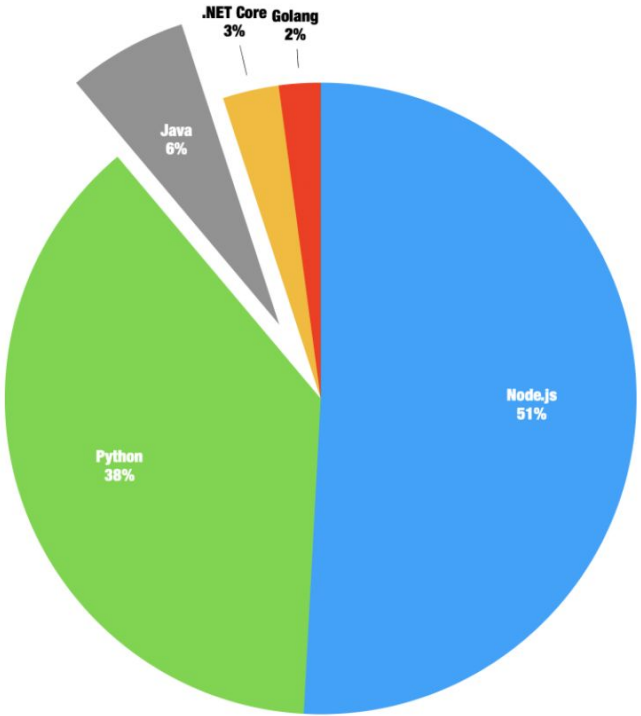
Memory: 100MBs+ RAM

Startup Time: Seconds



Languages used on AWS Lambda

TREND



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

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Java: The “hidden” truth

FACT

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 is trying to pivot, but **architectural changes to frameworks** are required to truly benefit

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QUARKUS

Supersonic. Subatomic. Java.

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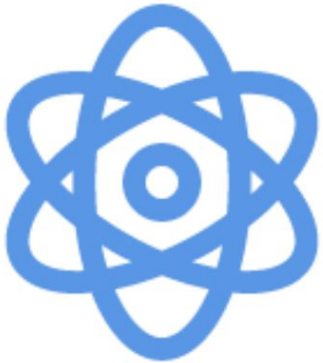
An Open Source stack to write Java apps



Cloud Native, Microservices, Serverless

DEMO

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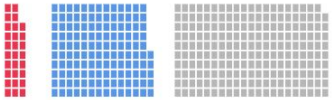
Kubernetes-Native Development with Quarkus

TIOBE : #1
IEEE : #1
SlashData : #2
RedMonk : #2



Solid Foundation

Java consistently ranks in the Top 3 of programming languages in use today with a community of 7-10 million developers.

Stunning Performance

Optimized to provide native-level memory footprint and startup time, allowing for increased density, performance and elasticity at lower cost.

Toolchain

End-to-end toolchain including OpenShift Developer Console, Code Ready Workspaces, project generators in IDE and web, live-reload for lightning fast inner loop workflow, and CI/CD integration.

Community

Massive catalog of extensions connects your applications with best of breed-technologies including Camel, Jaeger, Prometheus, Istio, Kafka and more.

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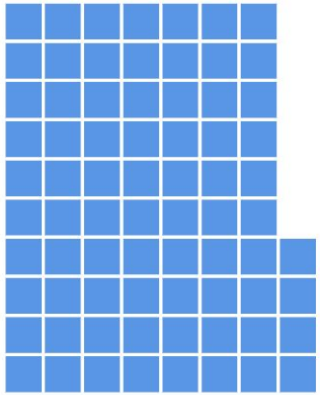
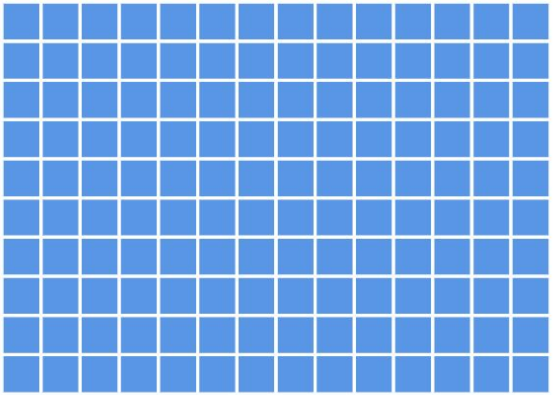
Quarkus Improves Memory Utilization

REST

Quarkus + GraalVM
13 MB



Quarkus + OpenJDK
74 MB



Traditional Cloud-Native Stack
140 MB

https://quarkus.io/blog/runtime-performance/

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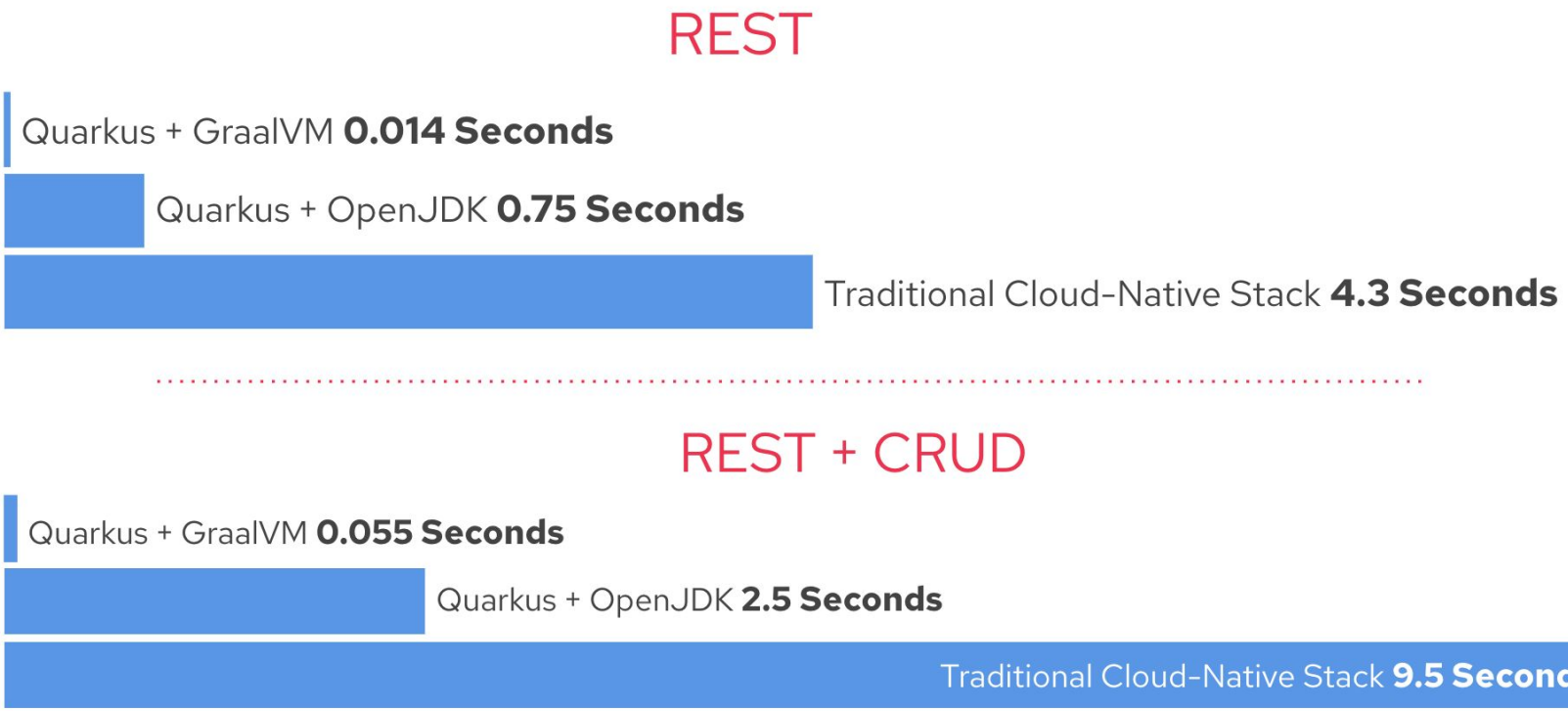
Quarkus Improves Startup Time



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Quarkus Unifies Imperative and Reactive

```
@Inject
SayService say;

@GET
@Produces(MediaType.TEXT_PLAIN)
public String hello() {
    return say.hello();
}
```

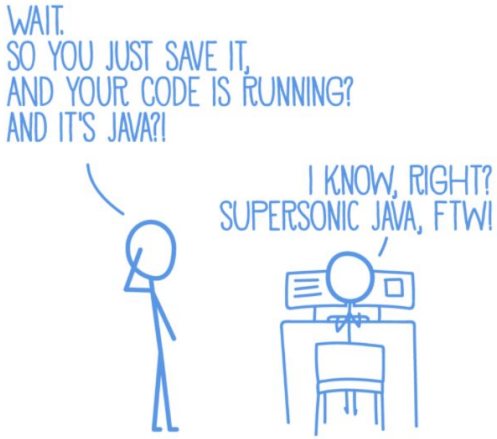
```
@Inject @Stream("kafka")
Publisher<String> reactiveSay;

@GET
@Produces(MediaType.SERVER_SENT_EVENTS)
public Publisher<String> stream() {
    return reactiveSay;
}
```

- Combines both Reactive and imperative development in the **same** application
- Reactive Messaging - Apache Kafka, MQTT, AMQP…
- Reactive Services

Quarkus brings real Developer Joy

A cohesive platform for optimized developer joy:

- Based on standards, but not limited
- Unified configuration
- Reactive & Imperative, all in one
- Zero config, live reload in the blink of an eye
- Streamlined code for the 80% common usages, flexible for the 20%
- No hassle native executable generation



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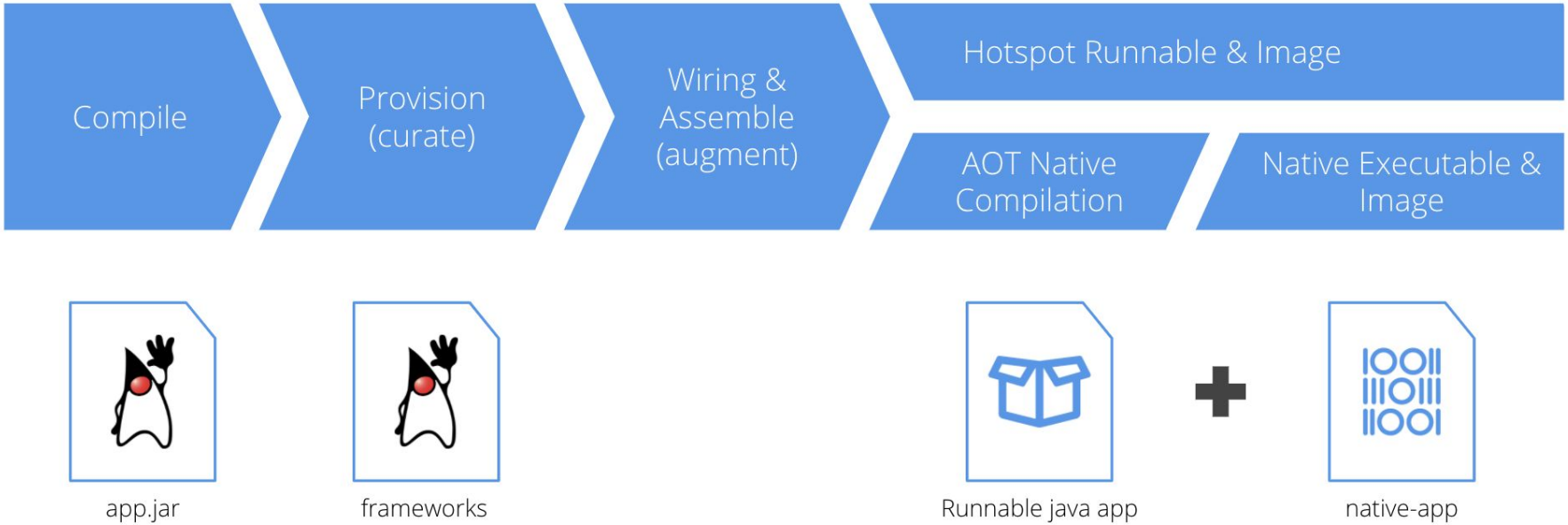
Build Process



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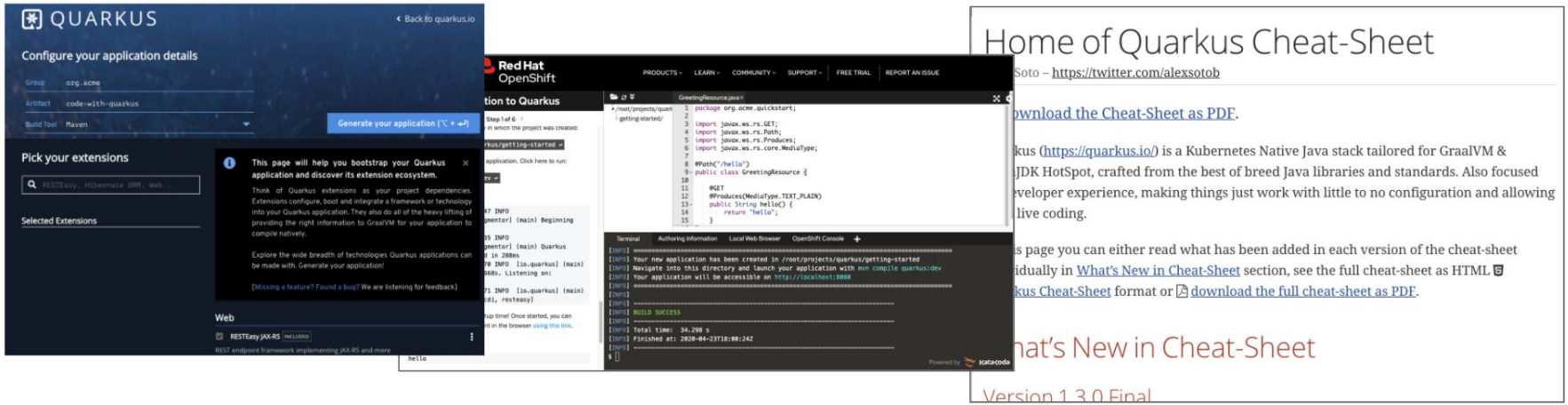
Getting Started

code.quarkus.io

bit.ly/cheat-sheet-quarkus



bit.ly/try-quarkus

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THANK YOU!

Meet me in the Network Chat Lounge for questions

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