

EMERGING TECHNOLOGIES FOR THE ENTERPRISE CONFERENCE



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ETE2019



HASHTAG
#PhillyETE



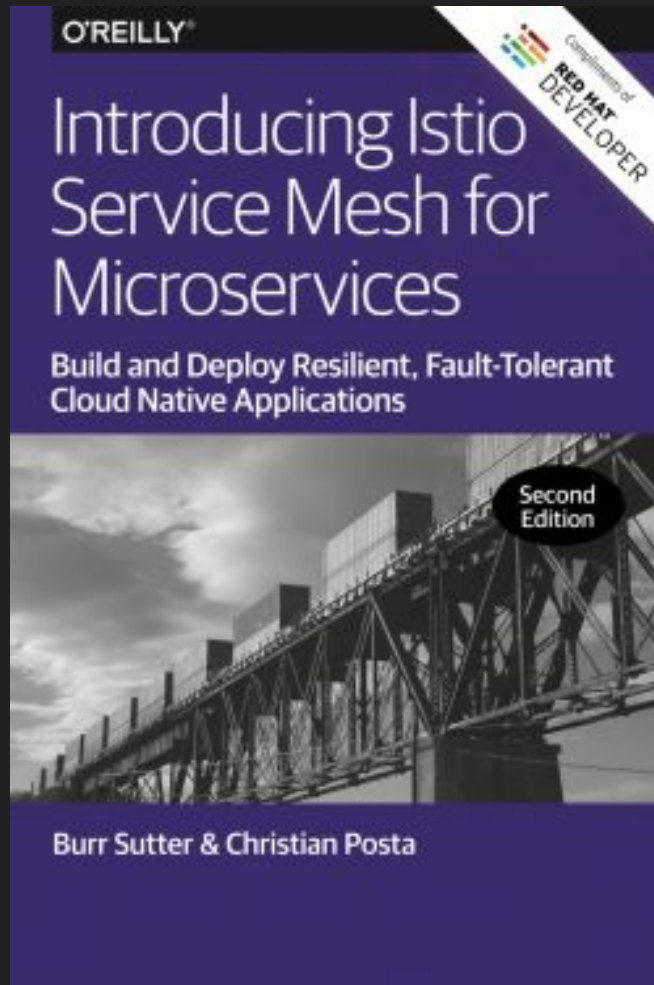
SESSION Q&A
Visit sli.do
#PHILLYETE

Presented By



Kubernetes: Your Next Java Application Server

Burr Sutter (bursutter.com)



bit.ly/istiobook

"Kubernetes" and "Application Server" ?

Application Server Defined

An application server is a software framework that provides both facilities to create web applications and a server environment to run them.

...An application server acts as a set of components accessible to the software developer through a standard **API** defined for the platform itself. ... they implement services like **clustering**, **failover**, and **load-balancing**,

so **developers** can **focus** on implementing the **business logic**.

https://en.wikipedia.org/wiki/Application_server

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https://en.wikipedia.org/wiki/Application_server

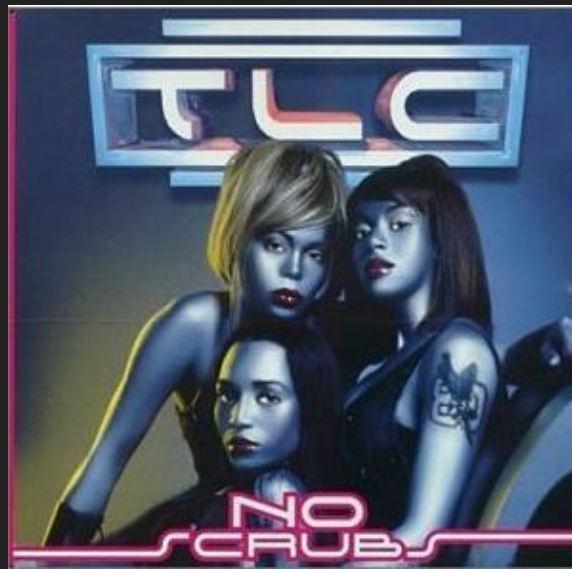
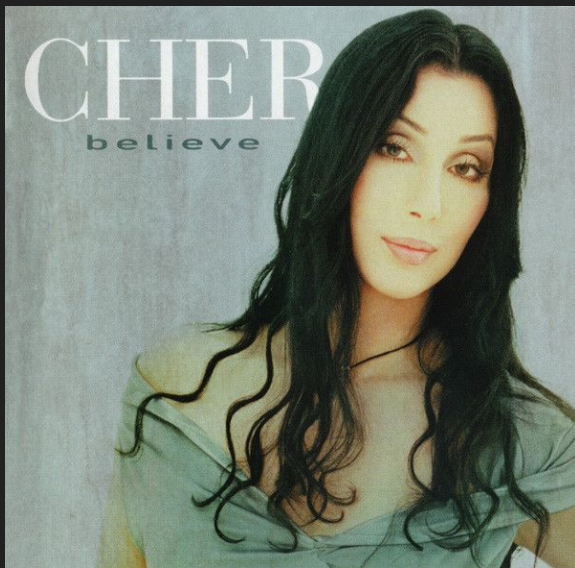
Demo

1999

1999



1999



#3 "Angel of Mine" - Monica

#4 "Heartbreak Hotel" - Whitney Houston

#5 "Baby One More Time" - Britney Spears

https://en.wikipedia.org/wiki/Billboard_Year-End_Hot_100_singles_of_1999

1999

USA Wins FIFA World Cup



1999



<https://www.si.com/soccer/video/2016/03/02>

1999

Java Developer

Java tug-of-war

Sun's decision to keep control of the development of Java — and not to hand it to a standards body — gets a mixed reaction from those in the industry

By Michael Lattig

JAVA MARKET HEATS UP DESPITE DOUBTS

Amid the wrangling over Java standards and questions about Sun Microsystems' willingness and ability to act as a proper steward for the cross-platform technology, the market for Java tools and related technologies continues to gain steam.

As one indicator of the market's health — despite the politics — International Data Corp. (IDC), a market research company in Framingham, Mass., predicts that Java developers worldwide will number more than a million by the end of this year and almost 4 million in 2003.

For the period 1998 to 2003, developer licenses of Java tools will increase more than 40 percent, according to IDC figures.

This robust forecast points to strong demand for the programming advantages, cross-platform reach, and electronic-business applications that play to Java's strengths, according to analysts.

"It's got all the good things going for it. It's cross-platform, relatively easy to learn, and as long as the major players maintain this swirl of activity, the outlook is good," says Sally Cusack, an analyst at IDC.

Recent advances in server-side Java develop-

ment have sparked even stronger interest in the technology, according to Cusack.

"The market is extremely healthy, and it's only being helped by the devotion [of vendors and developers] to EJB [Enterprise JavaBeans]. Also, the fact that the CORBA community is coming forward to support EJB will help," Cusack says. "The only proverbial fly in the ointment is the rift between Sun and ECMA [European Computer Manufacturers' Association]. That's the only cautionary flag, but I don't know that that [rift] will slow development."

Although it may be somewhat premature to declare Java an unqualified success, indicators are positive, according to Steve Hendrick, another IDC analyst.

"I'm comfortable with the idea of Java continuing to be a successful language and platform for development, mostly because of the needs of e-business, and [also] given the newness of Java, its ability to embrace very well component models and the notion of component-based development," Hendrick says. "This will give Java a significant advantage over other, older languages."

— Ted Smalley Bowen

a fair and beneficial shepherd of the standard to date, the time has come to turn the process over to an independent organization with no interests outside of developing the most useful technology possible.

Such vendors and developers are encouraging Sun on its current course, believing that whether or not Sun can continue to maintain its dichotomous role as both corporate entity and guiding light, the end result would

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Of course, history always has two sides. Those who feel it is time for Java to grow on its own can point to just as many, if not more, examples of nonproprietary technologies that have flourished and are currently flourishing on their own. The most obvious recent example is Red Hat's Linux, which in a short time has grown from a hobbyist's operating system to a competitor that even Microsoft is taking seriously — without the restraint of a controlling entity.

Mark Field, president of Sterling Software's application development group, believes that success should send a signal to Sun.

"Once you open the source code, let it out into the community, you create a powerhouse," Field says. "Sun should learn from Red Hat and learn to let go a little bit."

As with any discussion of standards, the presence of Microsoft has to be taken into

and that
The exis

Java takes lead as preferred e-business programming language

Despite being just a de facto standard, Java has attracted more developers than two officially sanctioned standards.

Percentage of developers who said they are using each language for developing e-business applications



SOURCE: CUTTER CONSORTIUM

account when discussing the future of Java.

Although weakened by legal troubles, including the recent Department of Justice rul-

ensuring

who has

evolutio

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ensuring

who has evolution

Integrated Java development environments

COMPARED

Borland JBuilder 3, Enterprise
Inprise Corp.

VisualAge for Java 3.0, Enterprise Edition
IBM Corp.

VisualCafé for Java, Enterprise Suite 3.1
Symantec Corp.

Microsoft Visual J++ 6.0, Professional Edition
Microsoft Corp.

Teaming with Java tools

Setting a Java development-tool standard for your development team can increase manageability, productivity and interoperability

Your development team is likely speeding along, working to put your new electronic-business initiatives and other application projects in place as fast as possible. But if you haven't bothered to

Very Good	0.8	Satisfactory	0.4	Excellent	1.0
Despite having the highest license cost — about \$30,000 for 10 developers — VisualAge offers unlimited support for 80 developers at less than \$4,000 per year. This sets the cost for VisualAge at \$41,784 over three years, making it the second most affordable tool.		At \$25,000 for 10 developers, the license cost for VisualCafé is moderate, but the support options are not. Unlimited calls for two contacts are \$25,000 per year. This put the cost of VisualCafé at an astonishing \$100,000 over three years for our 10-person team.		The JBuilder license is the second most affordable in our group at \$24,950 for 10 developers. You can place unlimited support calls, albeit funneled through two contacts, for \$5,000 per year. Thus, JBuilder swept the category with a cost of just \$39,950 for our team.	

Java 2

Continued from page 73

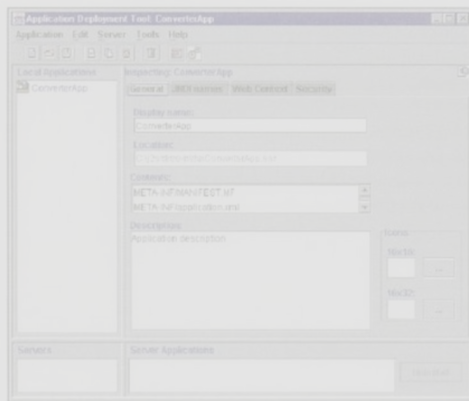
The J2EE server

Sun's J2EE server provides naming and directory services via the Java Naming and Directory Interface (JNDI), authentication, HTTP, as well as the capability to work with Enterprise JavaBeans. The JNDI, which is a standard extension to the Java platform, provides Java-enabled applications with a unified interface to naming and directory services in the enterprise, including Lightweight Directory Access Protocol.

The J2EE server also takes advantage of Java servlet technology. A servlet (think of it as an applet that runs on the server) provides the developer with a component-based, platform-independent method for building Web-based applications without the perfor-

mance limitations of some other approaches, such as using CGI programs. Servlets are a simple, consistent mechanism for extending the functionality of a Web server, and, because they are written in Java, they have access to the entire

ability to develop and present interactive Web pages from the server. JSPs go one step further, making it easier to create and support HTML and Extensible Markup Language pages that combine static templates with dynamic content.



J2EE's EJB component support enables developers to easily implement business logic on the midtier.

library of Java APIs, including the Java Database Connectivity API for accessing enterprise databases.

The JSP is an extension to the Java servlet. While servlets provide

Peace of mind

While we've talked at some length about the technologies that compose the platform, we haven't yet discussed the new features of the SDK. One essential feature is the Compatibility Test Suite. Used primarily as a vehicle to verify the conformity of a Java application to the J2EE platform specification, the tool comes packaged as three testing components. The first, a test for basic API-

level compatibility, uses method signature testing to ensure that all the implemented APIs are neither a superset nor a subset of the required API set.

J2EE under the covers

Read on to see what's inside Sun's newest Java architecture.

- **J2EE Application Programming Model:** a model for developing applications that conform to Sun's J2EE standard
- **J2EE applications:** one or more standard deployment units in a J2EE-compliant system that include one or more functional components (such as Enterprise JavaBeans), a standard deployment descriptor, and the J2EE declarations
- **J2EE declarations:** a simple and declarative way to specify behaviors such as security roles, transaction semantics, and the linking of components
- **J2EE Platform:** the standard one uses for architecting a system to host J2EE applications
- **J2EE Compatibility Test Suite:** tests that verify an application's compliance with Sun's J2EE
- **J2EE Reference Implementation:** Sun's J2EE "gold standard," it gives vendors and companies something against which to test their implementations.

The second test is really nothing more than a superset of tests to make sure that all individual components work and behave properly. The third test checks for end-to-

end compatibility. The Compatibility Test Suite lets users rest assured that their J2EE applications will interoperate properly with others.

J2EE also includes a reference implementation, which, aside from being the operational definition of the J2EE platform used by vendors and companies, is a guideline used by developers to verify the portability of an application.

Enterprise worthy

If you want to ensure that your applications are created in a consistent fashion — that is, scalable, reliable, and compatible with other enterprise applications — then I would strongly advise you look at J2EE. Its deployment and development wizards, increased execution speeds, and security improvements make it a worthy technology on which to base your enterprise-application framework. With its ability to remove some of the burden of the midtier plumbing, developers will actually have fun coding again.

Tim Fielden (tim_fielden@infoworld.com) is a senior analyst in the InfoWorld Test Center.

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"...developers will actually have fun coding again."

BEA WebLogic Server 4.02

THE MIDTIER SEGMENT of the market was a hotbed of activity in 1999. Companies began expanding the migration of business logic off client machines and away from back-end platforms. The increasing use of distributed application architectures offers a competitive advantage that lets organizations meld application components during rapid deployments and achieve a quicker time to market.

The growth of the midtier has created a bevy of new and maturing products and solutions that can complicate corporate strategies as well as IT purchasing decisions. Of the many midtier services we evaluated last year, we were most impressed by BEA Systems WebLogic Server 4.0.2.

WebLogic Server stands out among the more than 53 commercial and open-source application servers on the market today. This solution integrates neatly into existing environments, offers flexible integration with development and database products, and scales easily as your application framework grows.

We found WebLogic Server's clustering

capabilities especially compelling. In particular, WebLogic Server supports dynamic clustering operations, such as bringing servers online and offline without affecting application services. Additionally, developers can cluster Web pages and Java-

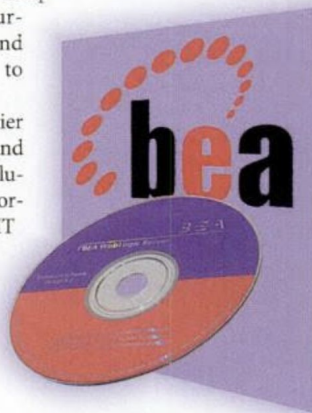
Beans to manage closely load, fail-over, and recovery mechanisms within individual applications.

Developers will find WebLogic Server an easy fit with any number of tools, including IBM's VisualAge for Java and Symantec's VisualCafé. Likewise, WebLogic Server can integrate a wide variety of data sources via Java Database Connectivity (JDBC), including major relational data-

base products, object databases, and any other database that has a JDBC driver.

One of the many application servers available for the midtier, WebLogic Server is well worth your consideration as a solid platform on which to deploy distributed electronic-business applications.

— Maggie Biggs, InfoWorld Test Center



"We found WebLogic Server's clustering capabilities especially compelling."

"...manage closely load, fail-over and recovery mechanisms..."

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"WebLogic Server stands out among the more than 53 commercial and open source application servers"

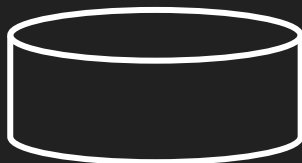
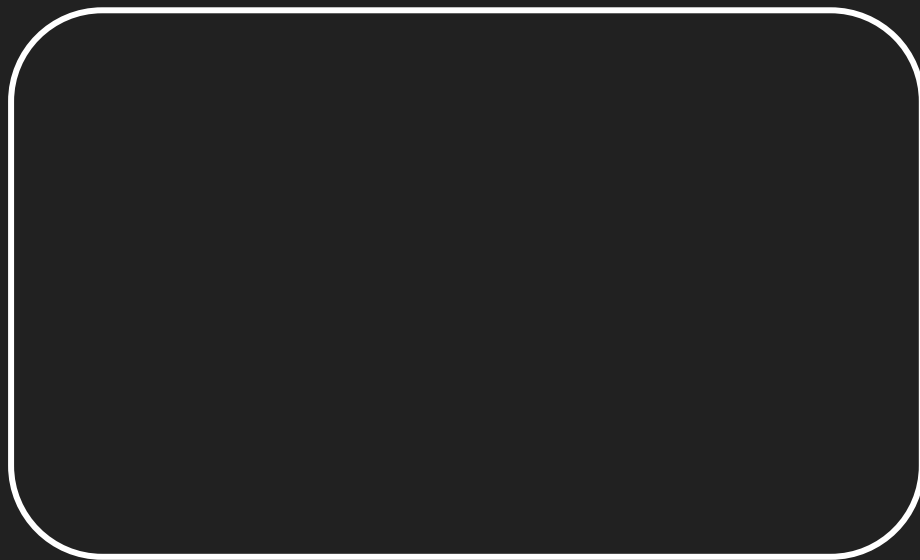
Cost of a Java-based Web App circa 1999

\$18,000 Sun Sparc App Server Box (4 CPUs)
+ \$60,000 BEA Weblogic
+ \$92,000 Sun Spark DB Server Box (8 CPUs)
+ \$243,000 Oracle RDBMS
+ \$50,000 Symantec Visual Café for 10 developers

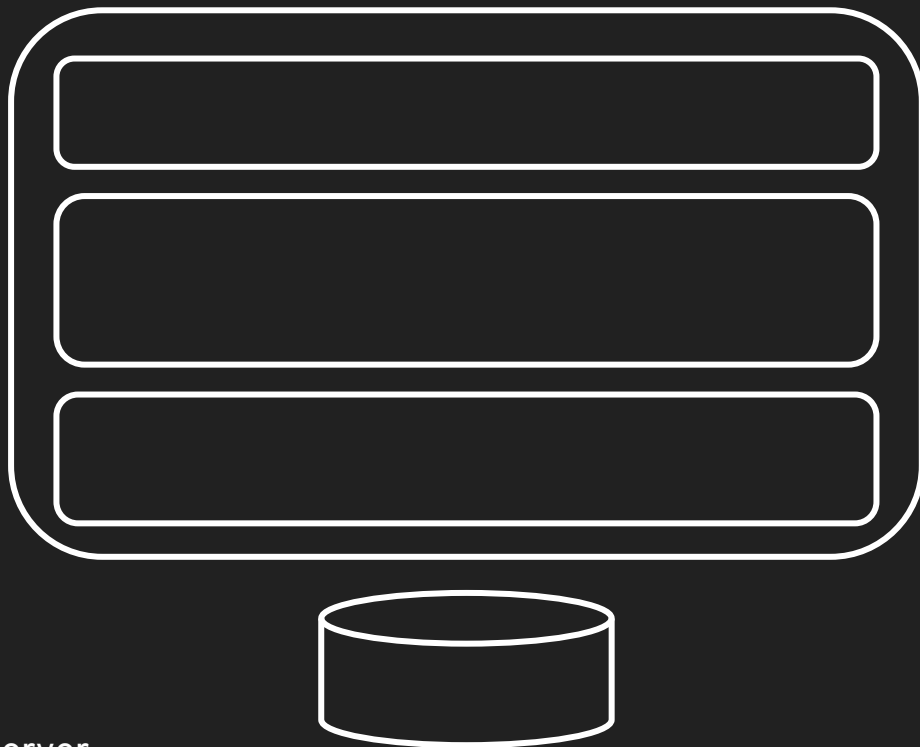
\$463,000 (capex) + ~\$80,000 annual maint (opex)

APIs

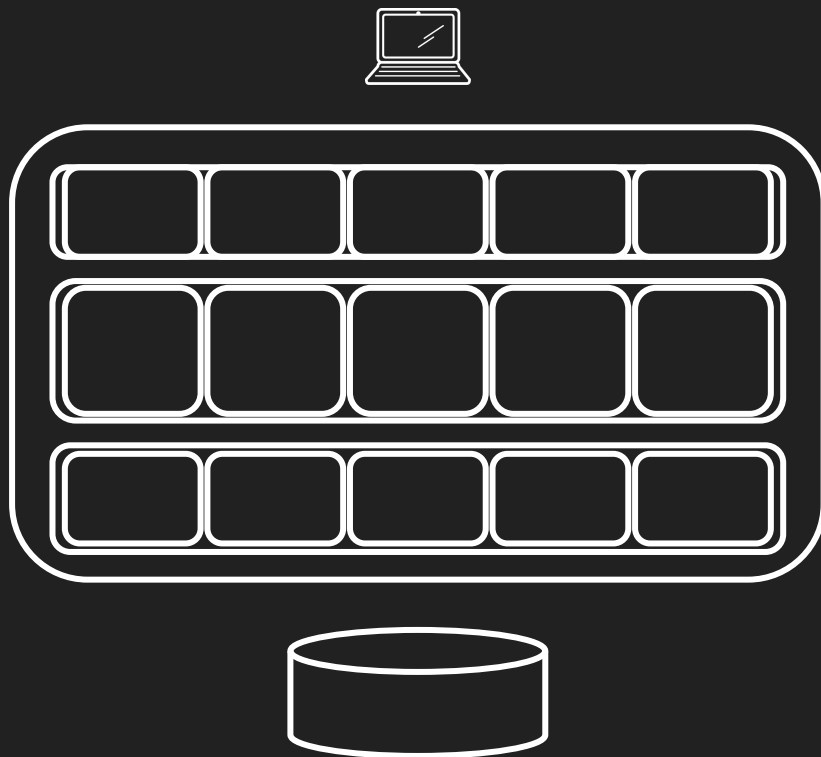
Application on Whiteboard



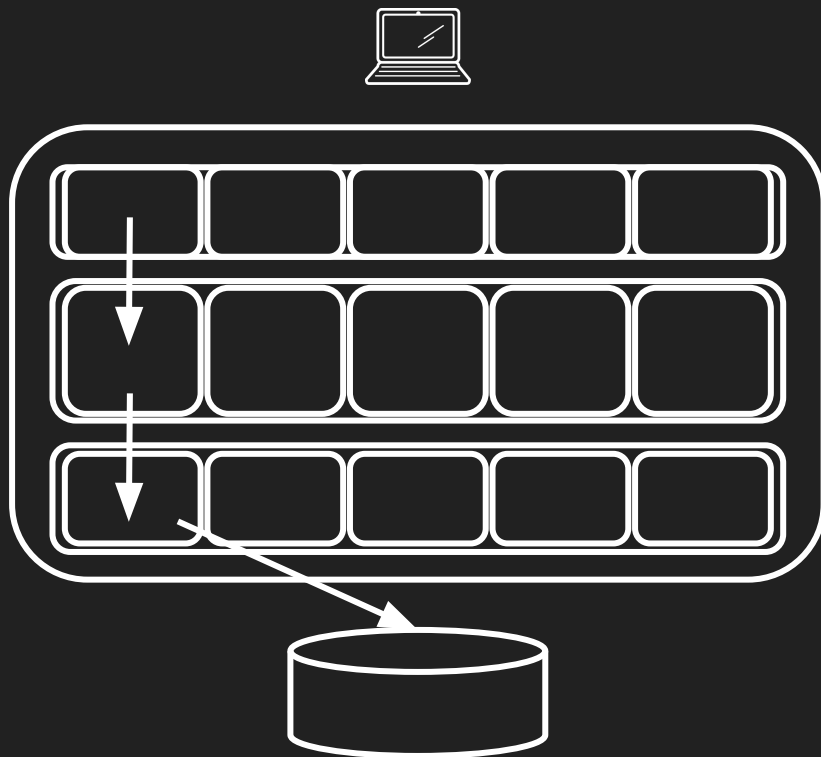
Whiteboard had 3 Tiers



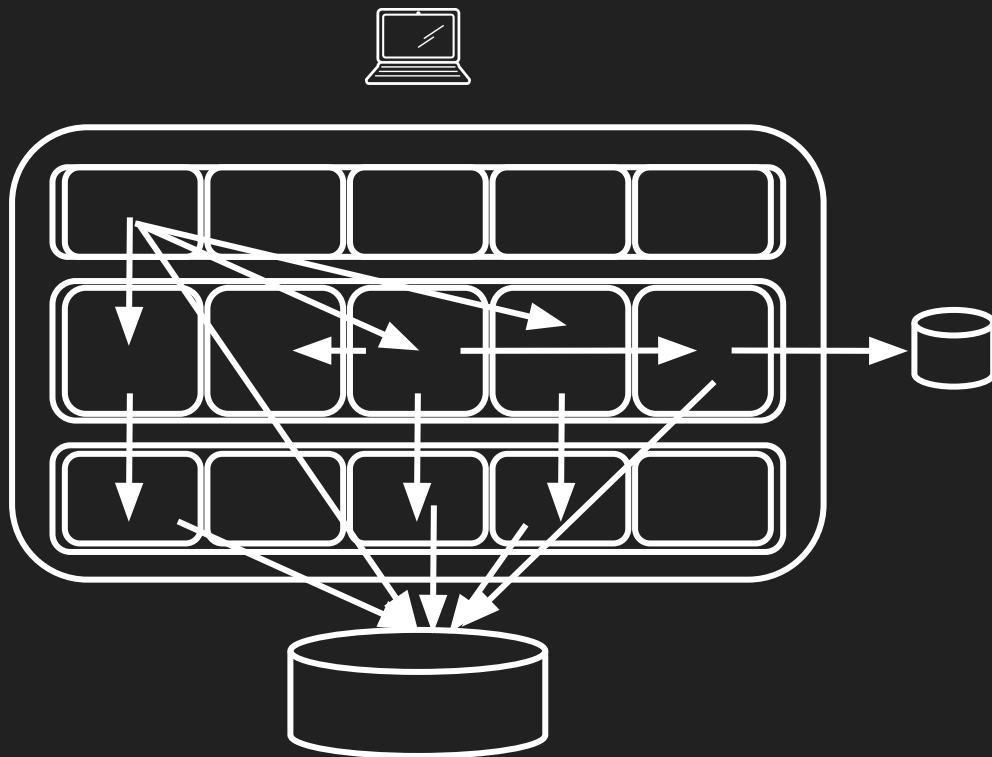
UI, Logic, Data



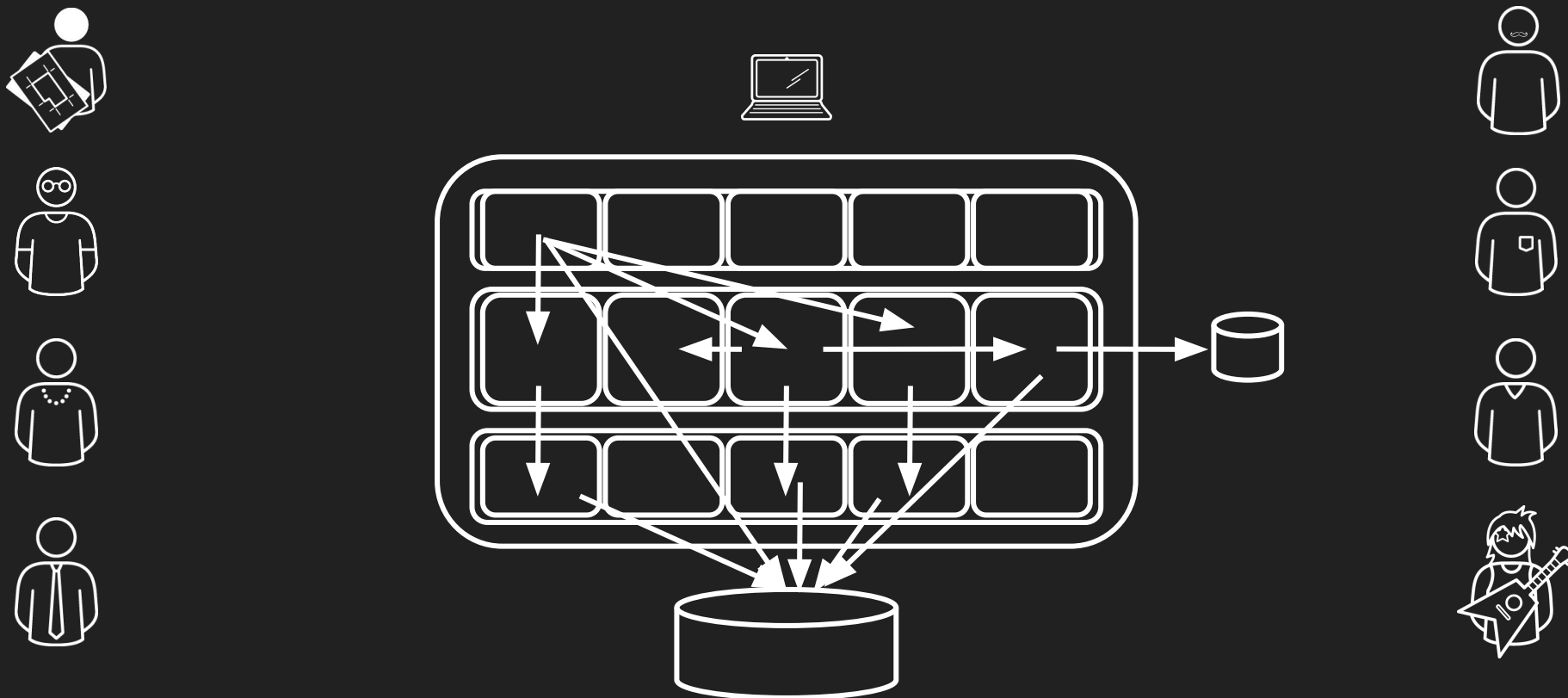
Clean Architecture



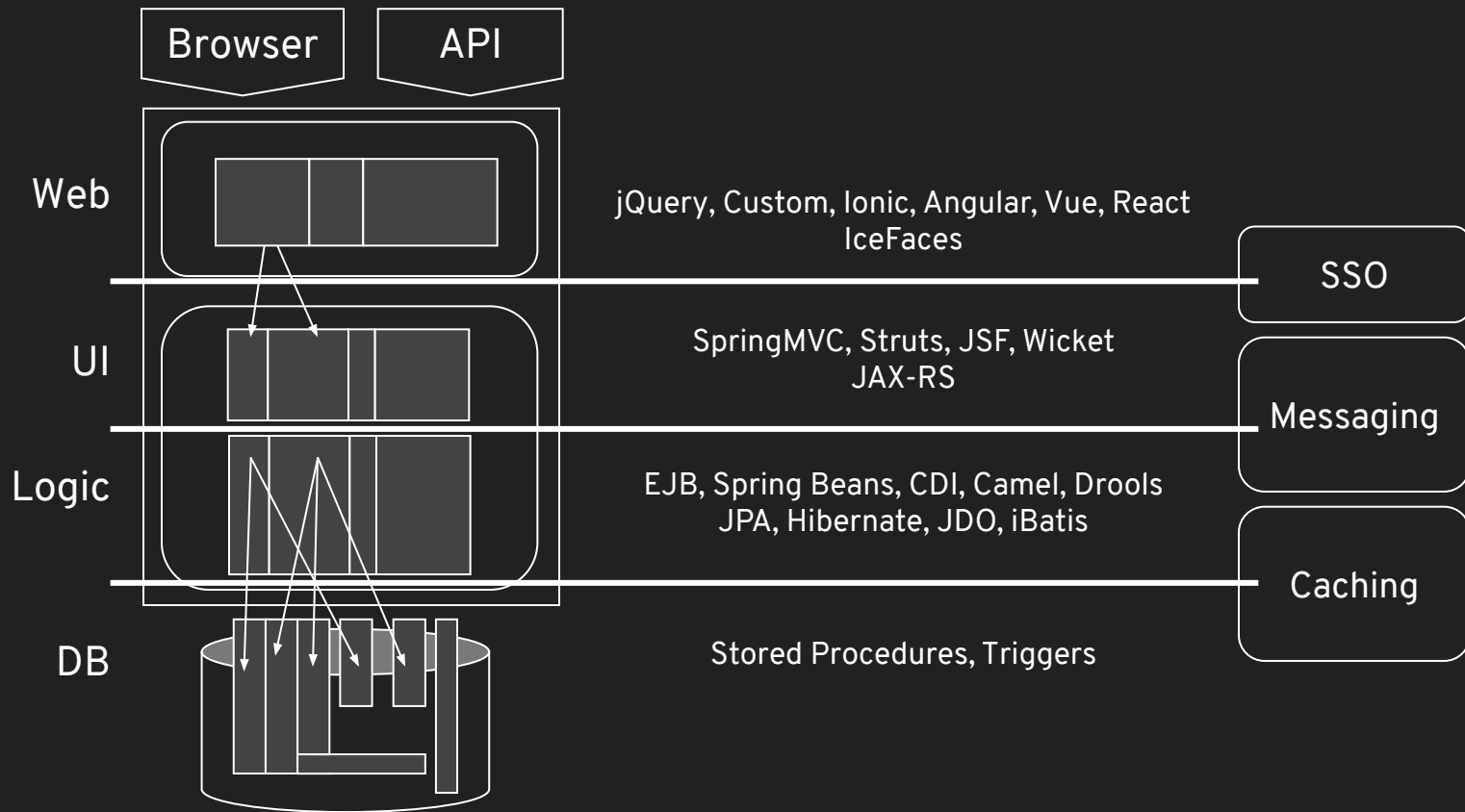
Real Life: Non-Majestic Monolith



Years of Many "Cooks in the kitchen"



Stack

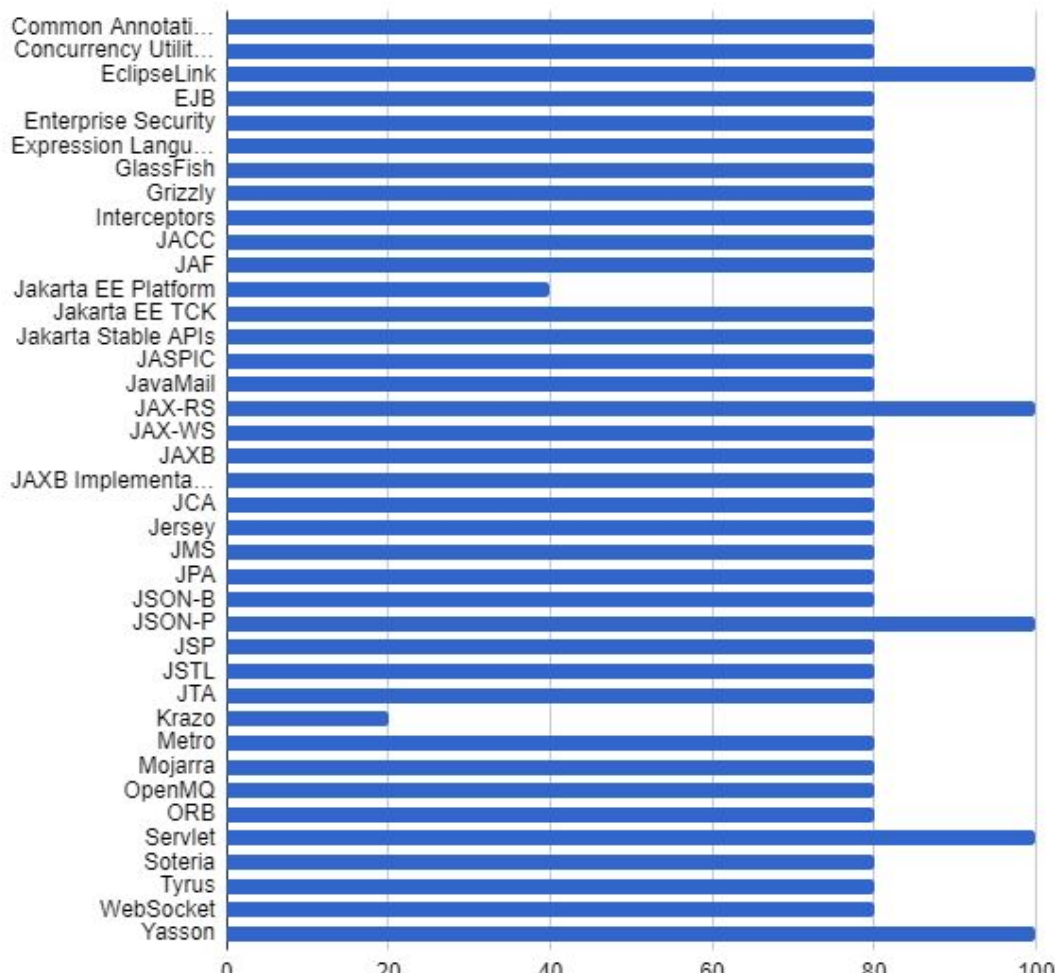


Standard APIs

Java Database Connectivity (JDBC)	JavaServer Pages (JSP)	Servlet	JavaServer Pages Standard Tag Library (JSTL)	Unified Expression Language (EL)
Enterprise Java Beans (EJB)	JavaServer Faces (JSF)	Java EE Connector Architecture (JCA)	Java API for RESTful Web Services (JAX-RS)	Java API for XML Web Services (JAX-WS)
Java Message Service (JMS)	Java Transaction API (JTA)	Java Persistence API (JPA)	Java API for JSON Processing (JSON-P)	Contexts and Dependency Injection (CDI)
		Bean Validation		



JAKARTA EE



<https://blogs.eclipse.org/post/mike-milinkovich/jakarta-ee-status-%E2%80%93-september-2018-update>



MICROPROFILE™

OPTIMIZING ENTERPRISE JAVA

- 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) :

JSON-P 1.0

Health
Check

JWT
Propagation

Config

OpenAPI

REST
Client

CDI 1.2

JAX-RS 2.0

Fault
Tolerance

Metrics

Open
Tracing

Community - individuals, organizations, vendors



java -jar myapp.jar

DropWizard

www.dropwizard.io

JAX-RS API

First to market

DropWizard
Metrics



Vert.x

vertx.io

Reactive
Async
non-blocking

RxJava

vertx run
myhttp.java



Spring Boot

[spring.io/projects/
spring-boot](http://spring.io/projects/spring-boot)

Spring API
(@RestController)

'Starter' POMs:
start.spring.io

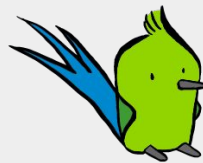


Thorntail

thorntail.io

MicroProfile.io

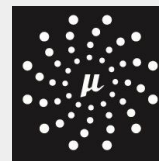
'Starter' POMs:
[thorntail.io/genera
tor](http://thorntail.io/generator)



Micronaut

micronaut.io

"Compile-time"
dependency
injection



Quarkus: Supersonic, Subatomic Java



Java compiled to native executable



Kubernetes Native

Java Ecosystem APIs



GRPC



Gson



Jackson



Apache Commons
<http://commons.apache.org/>



Joda Time



OkHttp



Project Lombok

Guice



MyBatis



Protobuf



Guava



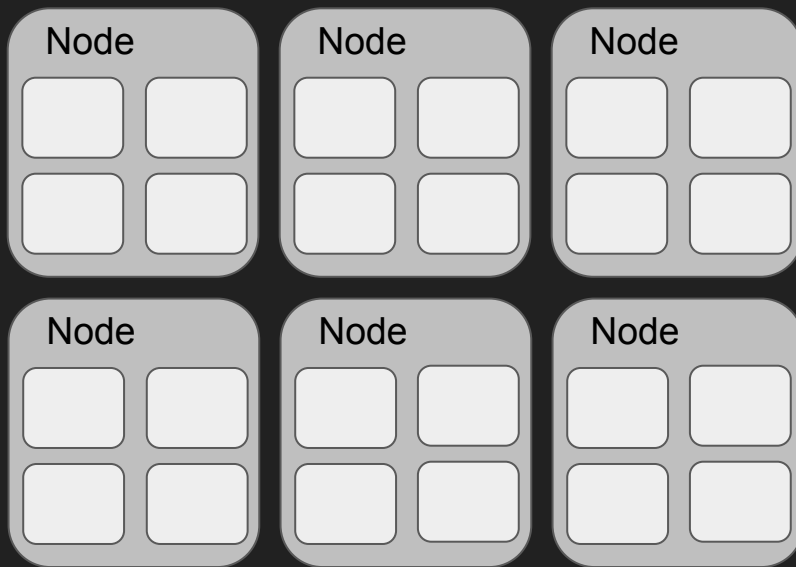
Clusters

Demo

<https://github.com/redhat-developer-demos/popular-movie-store>

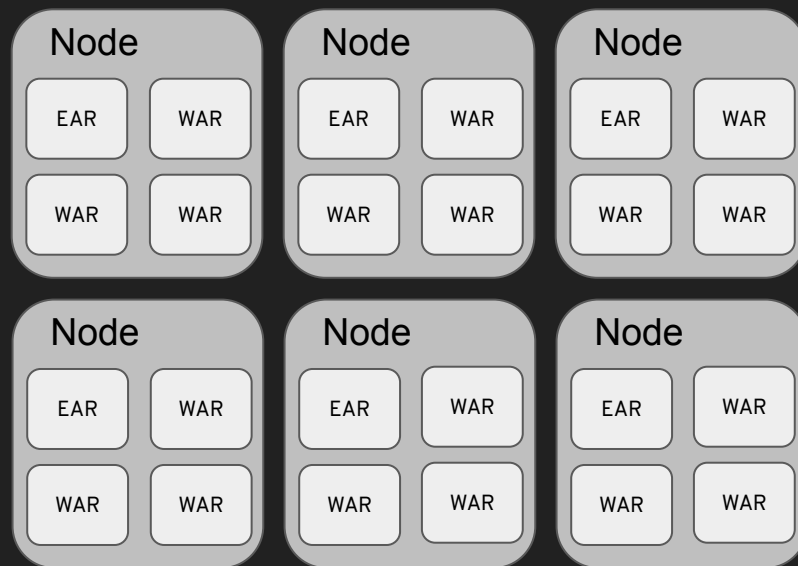
Cluster

- Start/Stop/Restart
- Add/Remove Node
- "Farm" Deployment
- Configuration
- Load-balancing
- Fail-over
- Service Discovery
- Logging



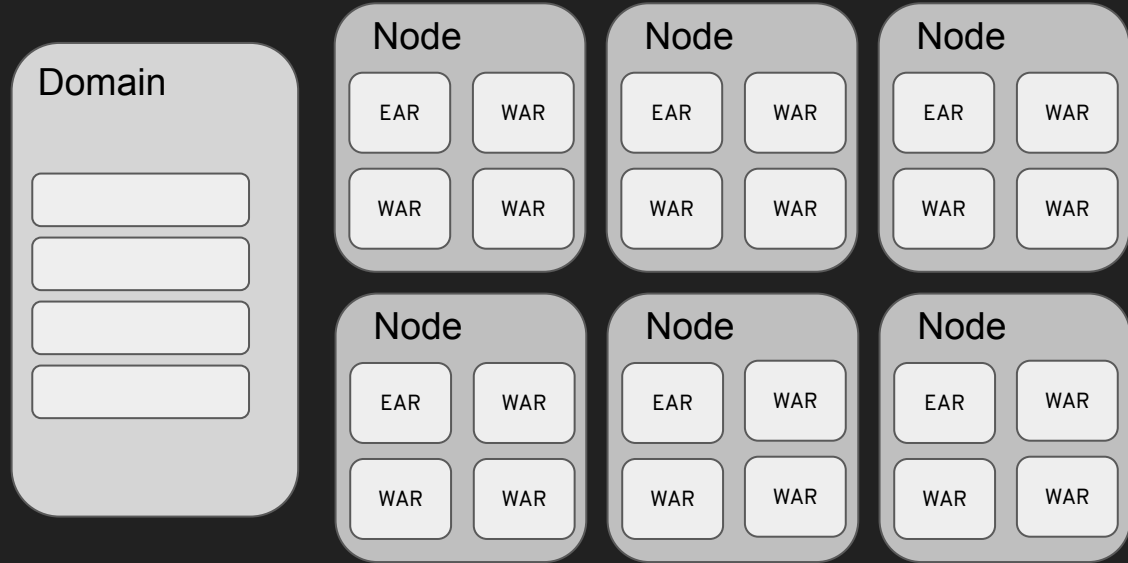
JARs, WARs, EARs

- Start/Stop/Restart
- Add/Remove Node
- "Farm" Deployment
- Configuration
- Load-balancing
- Fail-over
- Service Discovery
- Logging



Domain Controller

- Start/Stop/Restart
- Add/Remove Node
- "Farm" Deployment
- Configuration
- Load-balancing
- Fail-over
- Service Discovery
- Logging



Kubernetes Cluster

- Start/Stop/Restart
- Add/Remove Node
- "Farm" Deployment
- Configuration
- Load-balancing
- Fail-over
- Service Discovery
- Logging



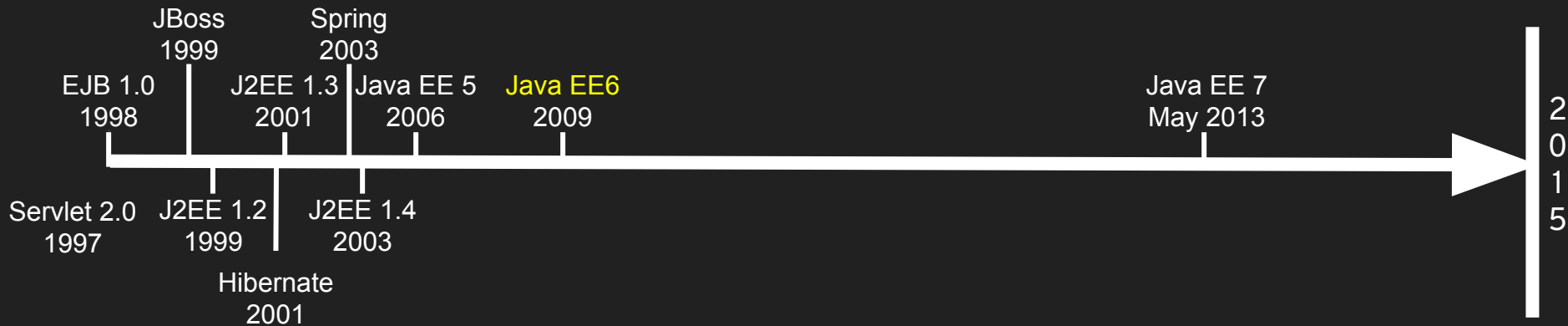
History of Enterprise J2EE/Java EE



History of Enterprise J2EE/Java EE



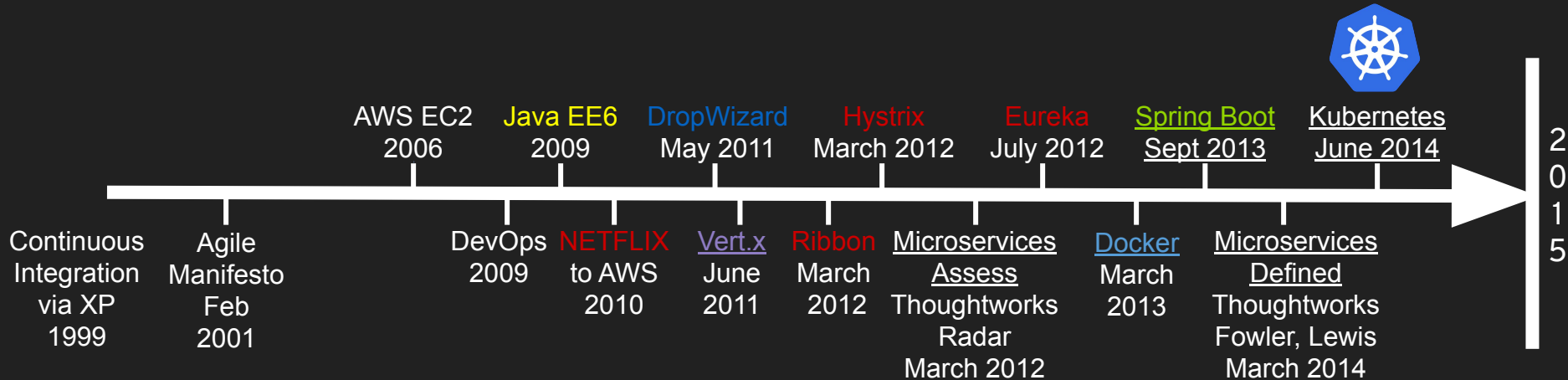
History of Enterprise J2EE/Java EE



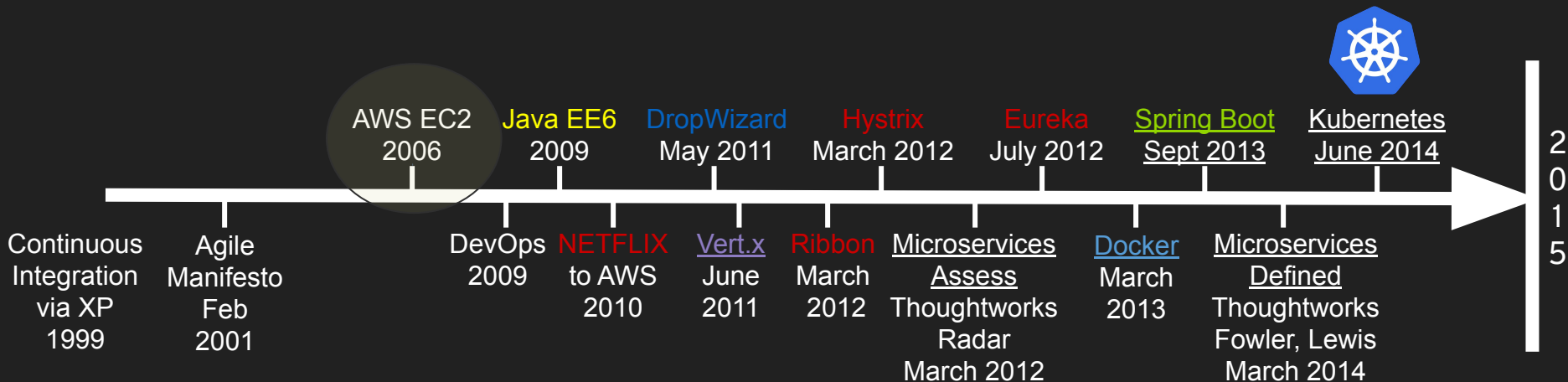
History of Enterprise J2EE/Java EE



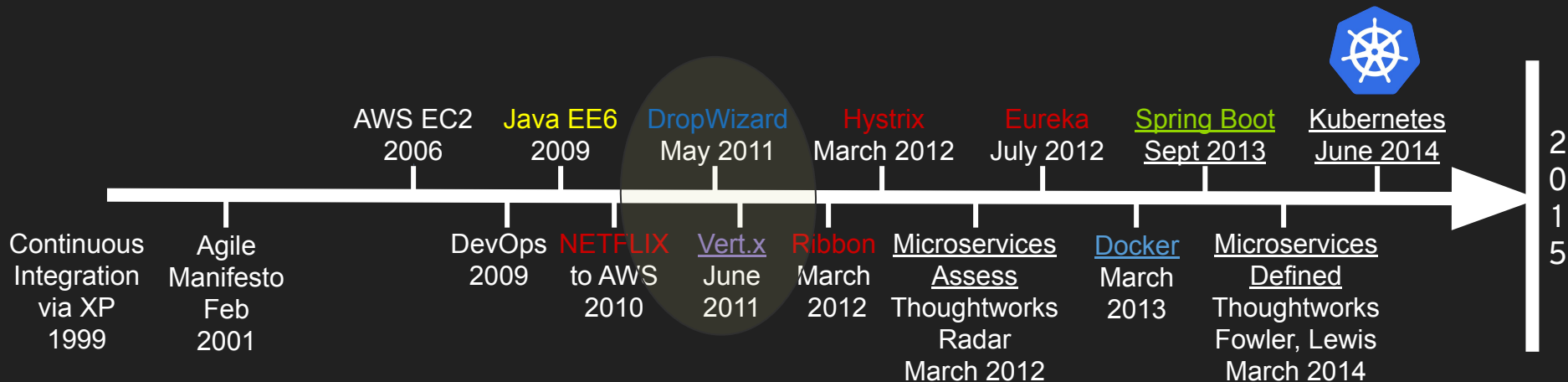
History of Microservices



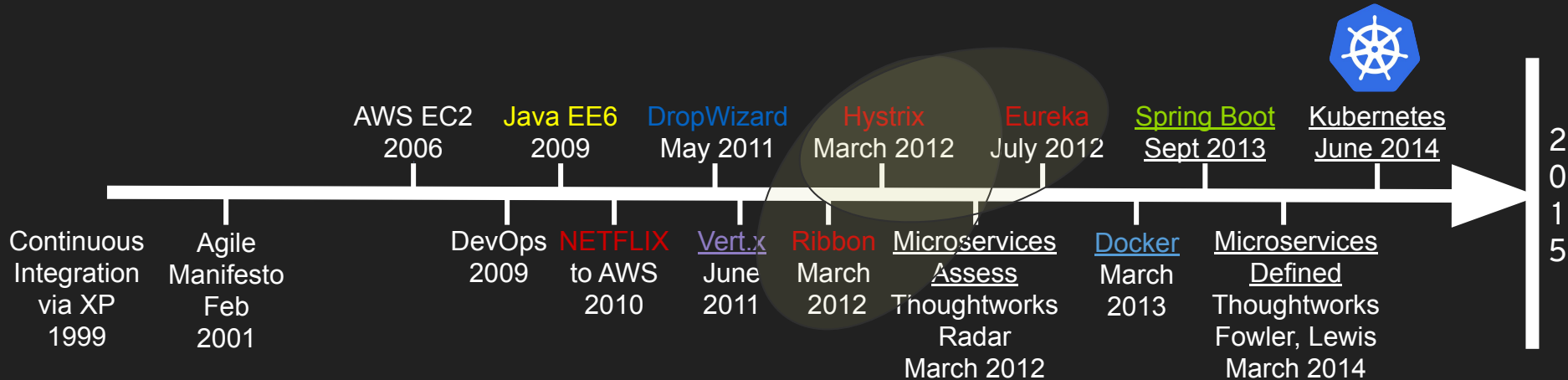
The Cloud is Born



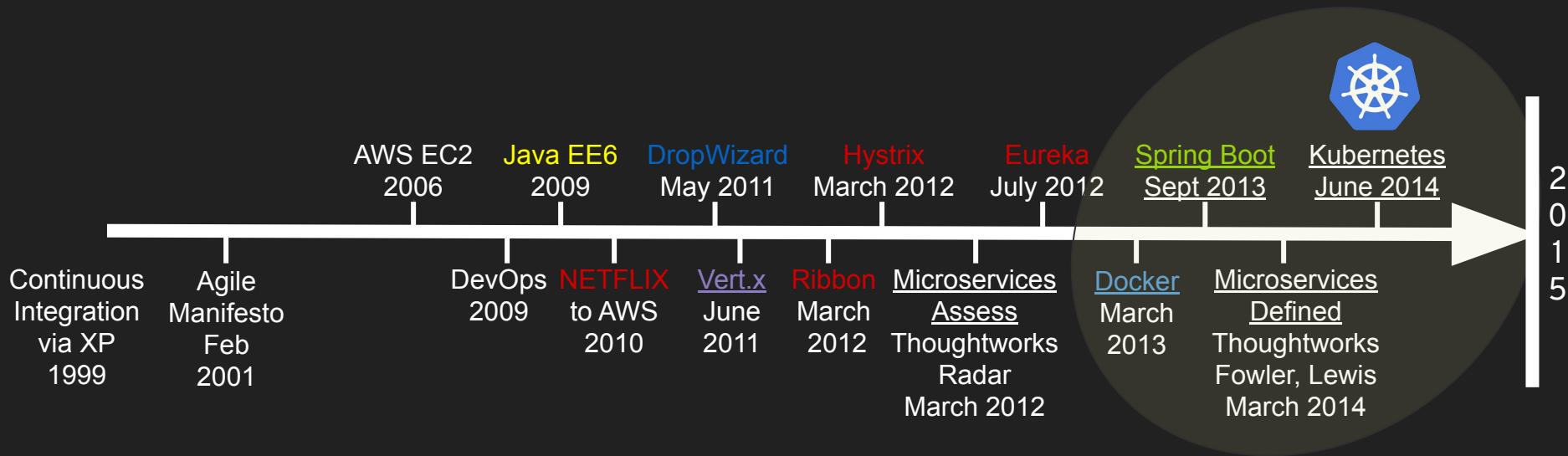
Fat Jars

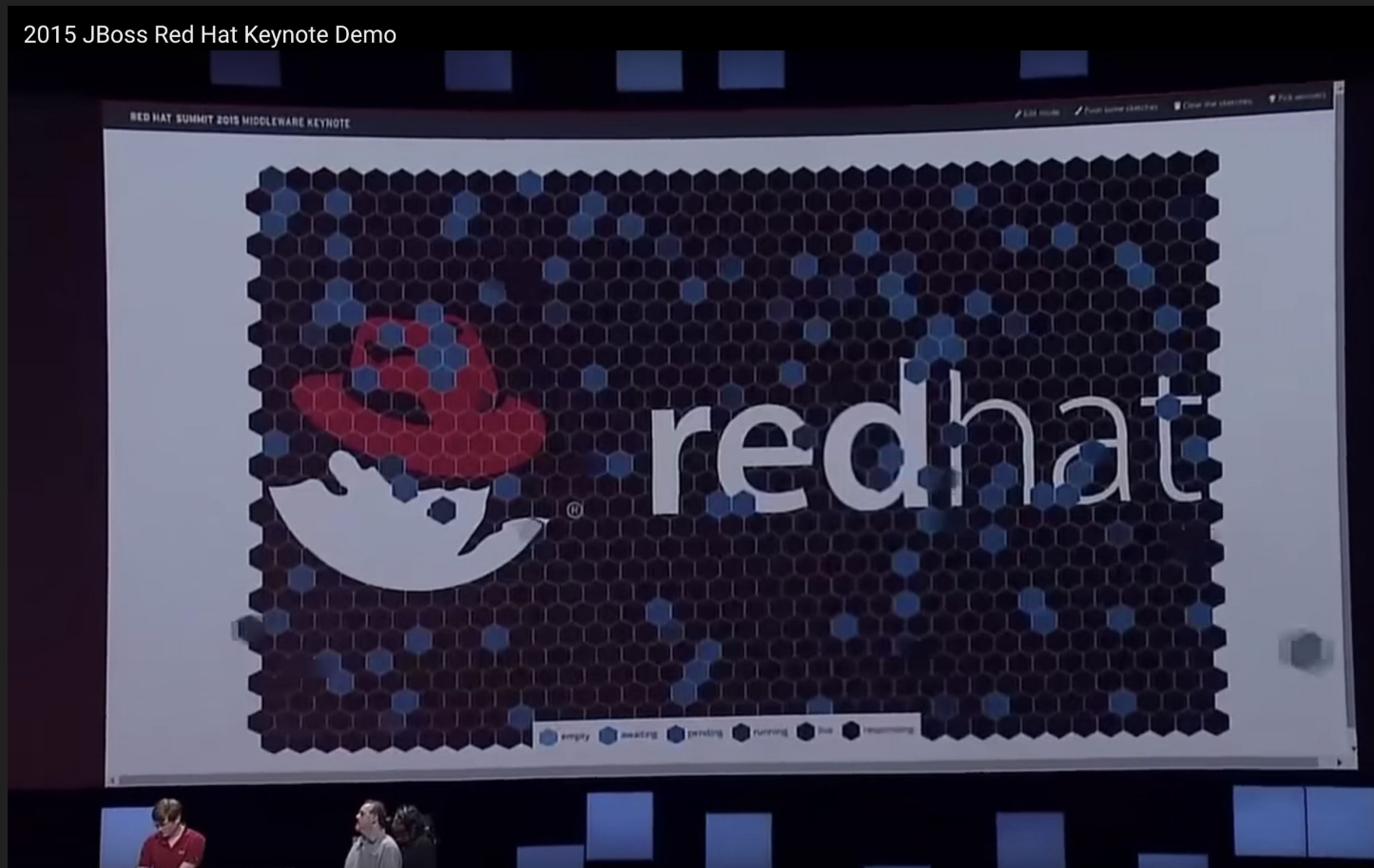


Netflix goes Open Source



Perfect Storm for Microservices





2015

Launch 1000+
Containers

Audience
Claims a
Container

<https://www.youtube.com/watch?v=GCtpncA0Ea0&feature=youtu.be&t=1031>

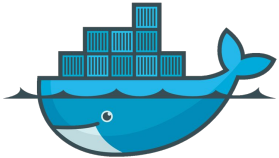
@burrsutter - bit.ly/kubeappserver

Pivotal™

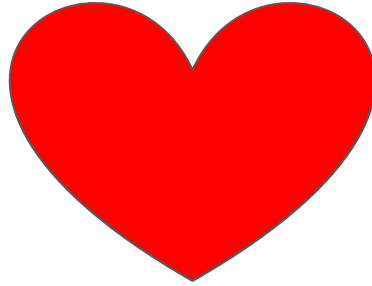
2017



MESOSPHERE



docker

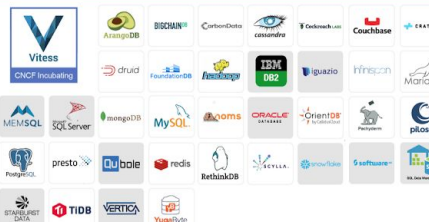


aws

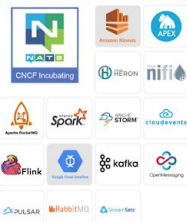


kubernetes

Database and Data Warehouse



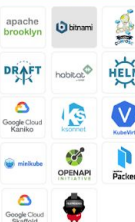
Streaming



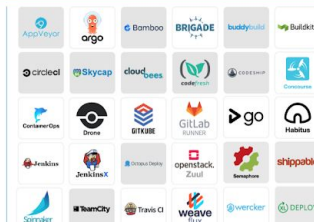
Source Code Management



Application Definition and Image Build



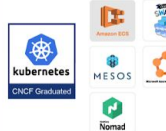
Continuous Integration / Continuous Delivery (CI/CD)



App Definition and Development

Orchestration & Management

Scheduling & Orchestration



Coordination & Service Discovery



Service Management

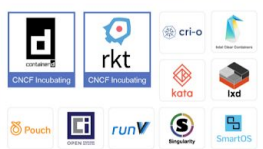


Runtime

Cloud-Native Storage



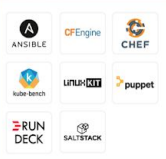
Container Runtime



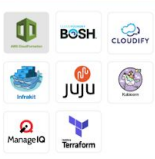
Cloud-Native Network



Host Management / Tooling



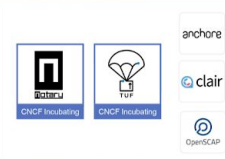
Infrastructure Automation



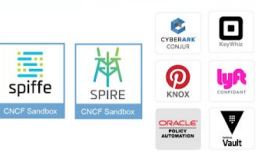
Container Registries



Secure Images



Key Management

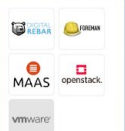


Cloud

Public



Private



l.cncf.io

This landscape is intended as a map through the previously uncharted terrain of cloud native technologies. There are many routes to deploying a cloud native application, with CNCF Projects representing a particularly well-traveled path.

CLOUD NATIVE Landscape
CLOUD NATIVE COMPUTING FOUNDATION
Redpoint Amplify

Platforms

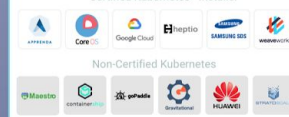
Certified Kubernetes - Distribution



Certified Kubernetes - Hosted



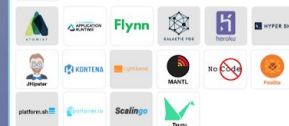
Certified Kubernetes - Installer



Non-Certified Kubernetes

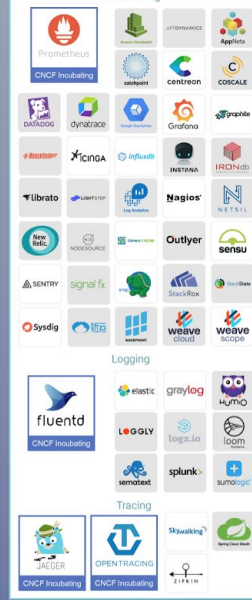


PaaS/Container Service

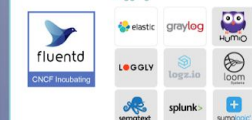


Observability & Analysis

Monitoring



Logging



Tracing



Serverless



Kubernetes Certified Service Provider



Kubernetes Training Partner



Special

Kubernetes Cluster



Dev



Ops

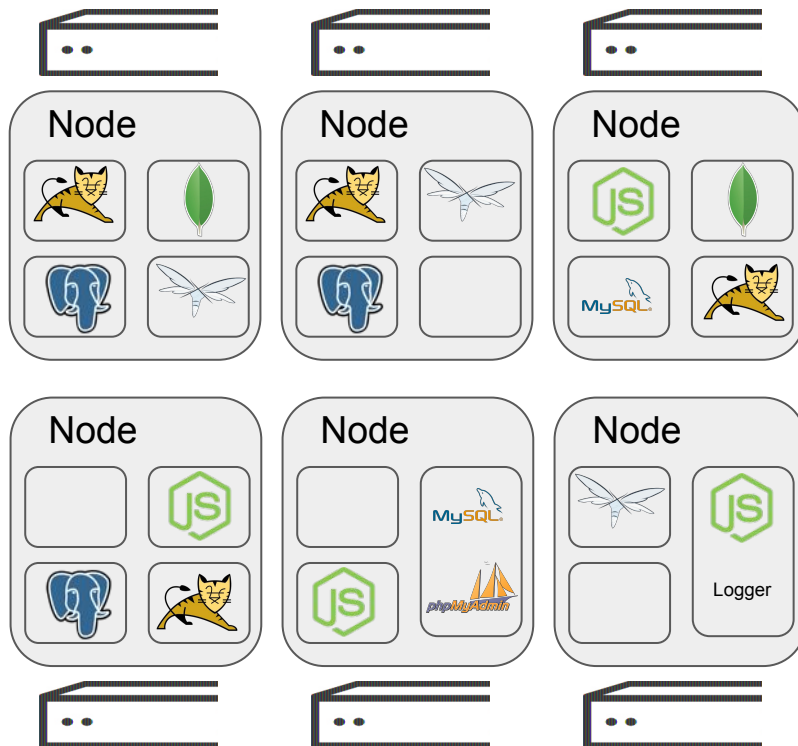
Master

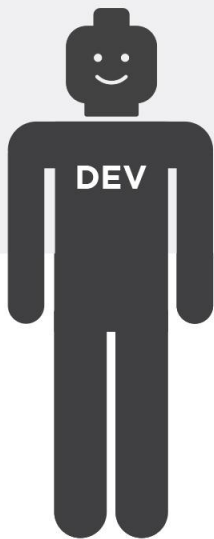
api

etcd

scheduler

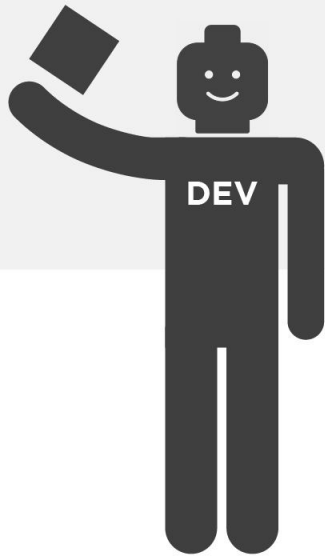
controllers



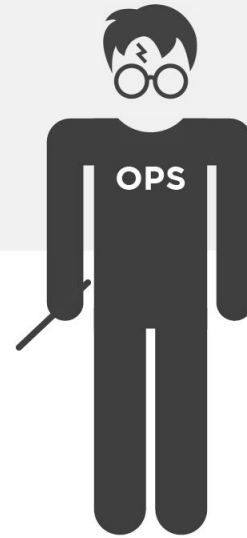


WALL OF CONFUSION





WALL OF CONFUSION





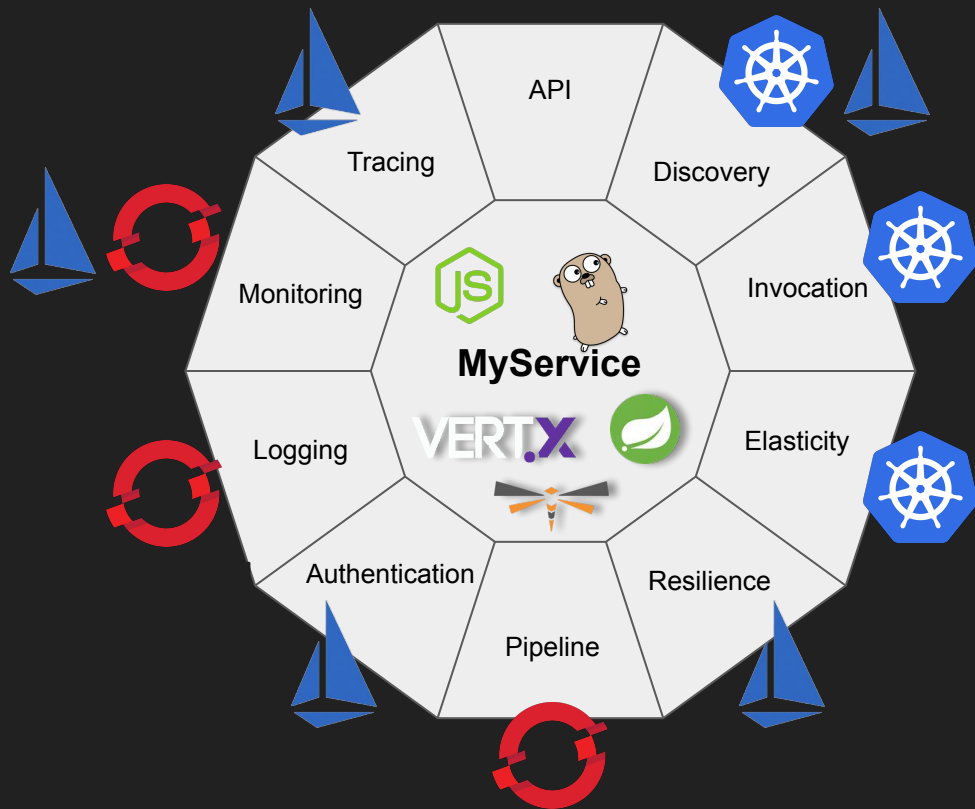
Polyglot Microservices Platform circa 2018



NETFLIX Ribbon



Polyglot Clustering Platform



Demo

<https://github.com/burrsutter/demo2-amq>

Infinispaaan

<https://github.com/redhat-developer-demos/popular-movie-store>

bit.ly/popmovie1



JMS and AMQP 1.0 with
Artemis



enmasse

Apache ActiveMQ Artemis
Apache Qpid Dispatch Router
As-a-service on OpenShift

enmasse.io

Apache Qpid Dispatch Router

<https://github.com/burrsutter/demo2-amq>



STRIMZI

Apache Kafka on Kubernetes & OpenShift
strimzi.io

Debezium

Debezium.io

Database to Kafka

Debezium is an open source distributed platform for change data capture. Start it up, point it at your databases, and your apps can start responding to all of the inserts, updates, and deletes that other apps commit to your databases



SSO - Identity and Access Management

OpenID Connect, OAuth2, SAML

www.keycloak.org

<https://github.com/stianst/keycloak-demo>



Eclipse Che

[Deploy to Kubernetes](#)
[Deploy to OpenShift](#)
che.openshift.io

Container Native IDE

Allows you to launch a browser-based IDE inside of a Linux container that matches your production environment

<https://www.eclipse.org/che/docs/kubernetes-single-user.html>

<https://www.eclipse.org/che/docs/openshift-single-user.html>

Try it bit.ly/che-workshop

Create - OpenShift.ioOpenShift Eclipse Che | myvertxVert.x HTTP Booster

Secure | https://che-burrzinga-che.8a09.starter-us-east-2.openshiftapps.com/che/myvertxhello5-atanh

WorkspaceProjectEditAssistantRunGitProfileHelpEXECdev-machine: debug#1 00:56

Projects Explorer

Projects

Commands

myvertxhello5 (master)

src

licenses

main

fabric8

java

io.openshift.booster

HttpApplication.java

resources

test

target

Jenkinsfile

LICENSE

README.adoc

HttpApplication

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

40:1

// Retrieve the port from the configuration, default to 8080.
config().getInteger("http.port", 8080), ar -> {
 if (ar.succeeded()) {
 System.out.println("Server starter on port " + ar.result().actualPort());
 }
 future.handle(ar.mapEmpty());
 }
}

private void greeting(RoutingContext rc) {
 String name = rc.request().getParam("name");
 if (name == null) {
 name = "World";
 }

 JsonObject response = new JsonObject()
 .put("content", String.format(template, name));
}

UTF-8Java

Debug

OpenJDK 64-Bit Server VM 1.8.0_144

Breakpoints:
HttpApplication.java:40

Frames:
"vert.x-eventloop-thread-0"@3 in group "main": RUNNING
greeting(RoutingContext):40, HttpApplication
handle():-1, HttpApplication
handleContext(RoutingContext):217, io.vertx.ext.web.impl.RoutImpl
iterateNext():78, io.vertx.ext.web.impl.RoutingContextImplBase
next():118, io.vertx.ext.web.impl.RoutingContextImpl

Variables:
{HttpApplication.java:40}
> template="Hello, %s!"
> context=instance of io.vertx.core
> vertx=instance of io.vertx.core.Ir
> rc=instance of io.vertx.ext.web.Ir

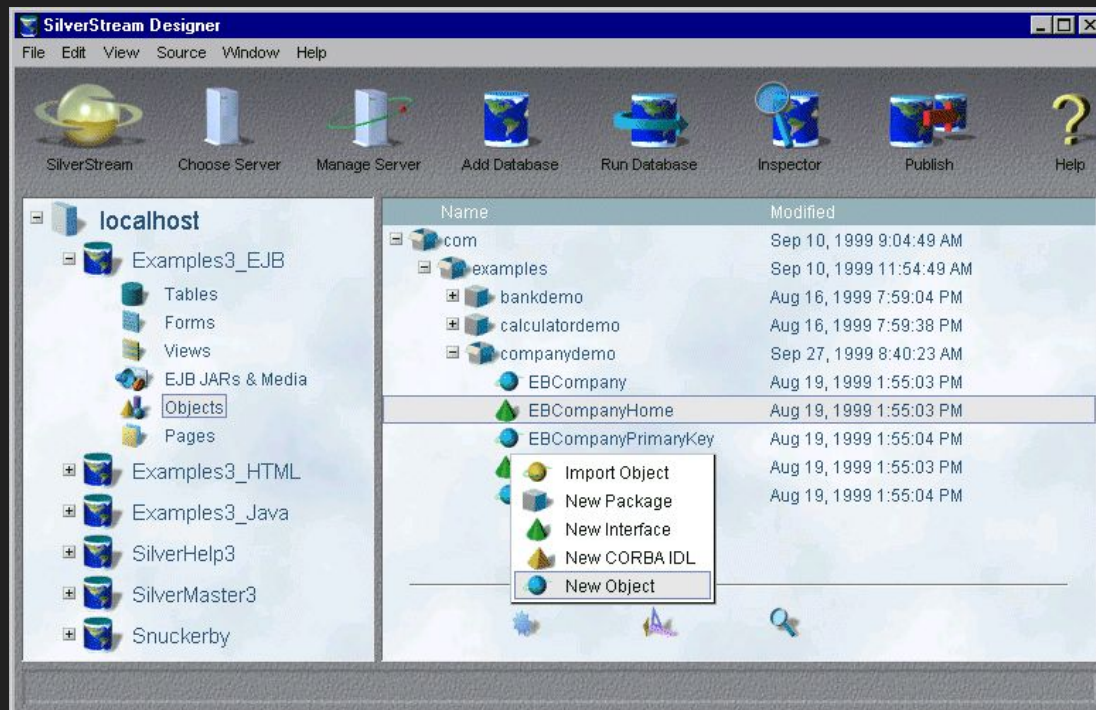
EventsProcessesDebug

The End

Under Development

<https://developers.redhat.com/blog/2018/06/28/why-kubernetes-is-the-new-application-server/>

BEA Weblogic
IBM Websphere
Sun iPlanet
[Borland Enterprise Server](#)
SilverStream
[Macromedia JRun](#)
[JBoss](#)



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Volume II

March 2000

SilverStream Success Vol I

January 2001

SilverStream Success Vol II



Editorial Reviews

About the Author

Our authors, Paul R. Allen, John Aubrey, Joseph J. Bambara, Peter Horwood, Rajeev Kapoor, Steve Lopez, William (Bill) Norman, Burr Sutter, Michael Warren & Brian Westrich have a wide range of expertise in the SilverStream, Internet Web development & Java arenas. They have been involved as authors, consultants, senior architects, systems designers and have hands on experience with the material they present.

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3.0 out of 5 stars ▾



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★★★★☆ **SilverStream "Success" - A good overview**

By [HANS-DIETER MADER](#) on April 4, 2001

I had great expectations to this book because there were not many books about SilverStream available. I thought of a library of code examples with tips and tricks how to use SilverStream in an enhanced way. Now I'm using SSSW for about 3 years and I was not always successful with it, so I would welcome a compendium for SilverStream software. The chapters one to four are (SilverStream) JAVA basics. You should know that content if you are a J2EE developer! Chapter five (Servlets) is not very exciting, it shows basics too. The "Exception" Chapter gives you an overview of SilverStream exceptions and how to use them. Chapter seven, "JSP's" gives you an introduction to JSP's using on SilverStream. Chapter eight, "EJB's" are much more interesting to me, because EJB's are very complex and there are many differences on deployment on different EJB containers. I think this is the best chapter in this book. If you have got a little experience with EJB's this chapter guide's you to use EJB's on the SilverStream server. Chapter nine, "Form Views" is basic information. The last two chapters are case studies. So far, if you have much experience with SilverStream, you will not find much tips and tricks to get more benefit from the application server. I missed HTML client side tips regarding specific browser types (Netscape, IE,...) or 3rd party products integration. Summary: This book gives you a good overview of SSSW 3.5.x. It provides too much basics. It does not guide you through the depth of SilverStream...

4 people found this helpful



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HANS-DIETER MADER

"Enterprise Java Beans (EJB) is one of the pillars of Sun's J2EE initiative and provides the e-business developer with a substantial amount of new functionality for creating distributed n-tier business applications."

"The EJB API specification and accompanying interfaces create a standard for application server vendors to adhere to, as well as a programming model for application developers to work with."

Burr Sutter - SilverStream Success Vol II Jan 1 2001
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Chapter 8

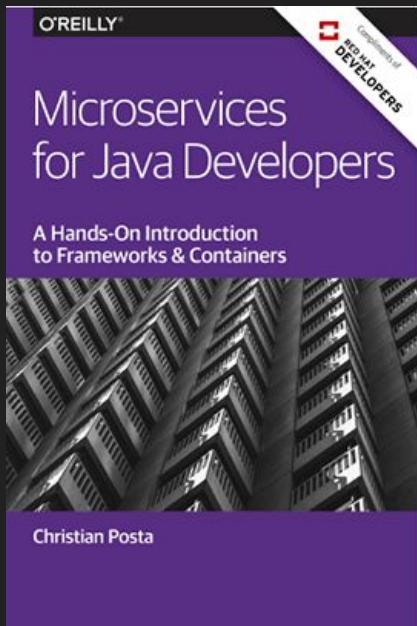
Enterprise Java Beans, by Burr Sutter

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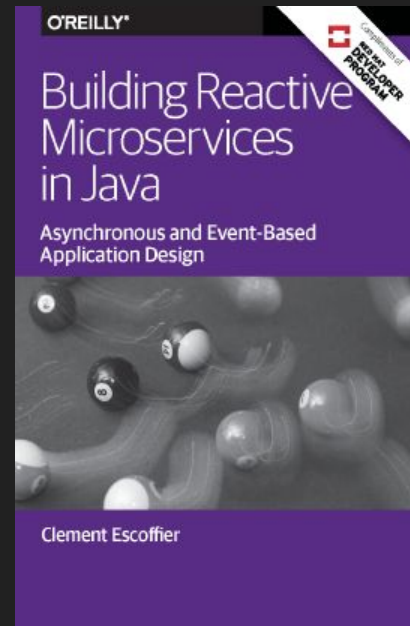
[Kubernetes for Java Developers](#)

Advanced Materials

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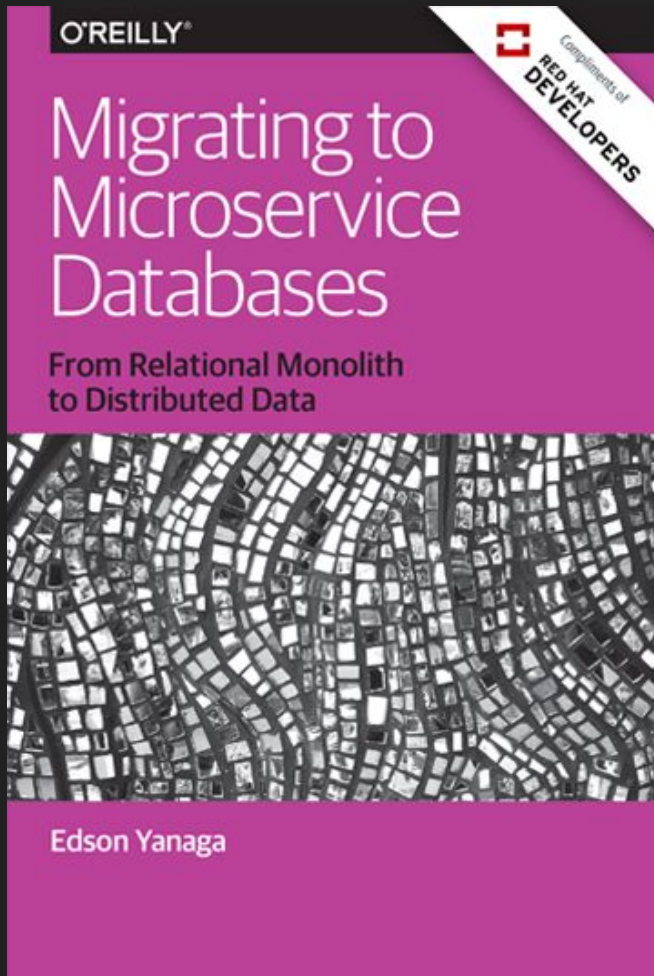
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