Microservices and Modularity

or the difference between

treatment and cure

Milen Dyankov
@milendyankov

jDays GÖTEBORG

MARCH 17, 2015

```
~$ pidof java
~$ pidof java
9927 2151
~$
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```
~$ pidof java
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MONOLITH

```
~$ pidof java
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~$ ps aux | grep java | grep -v grep | awk '{print $2}'
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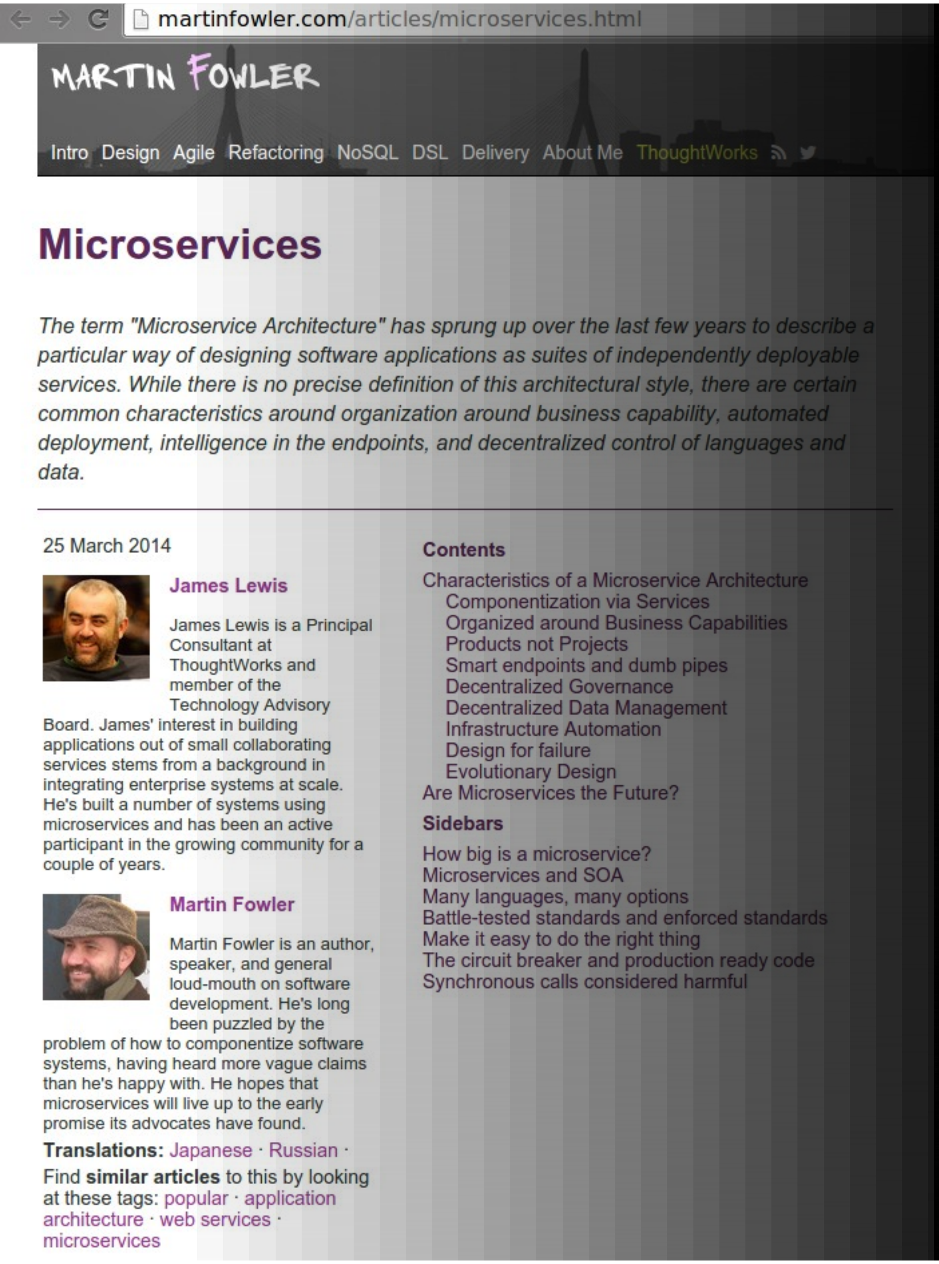
Microservices

What are

Microservices

?



martinfowler.com/articles/microservices.html

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Microservices

The term "Microservice Architecture" has sprung up over the last few years to describe a particular way of designing software applications as suites of independently deployable services. While there is no precise definition of this architectural style, there are certain common characteristics around organization around business capability, automated deployment, intelligence in the endpoints, and decentralized control of languages and data.

25 March 2014

James Lewis

James Lewis is a Principal Consultant at ThoughtWorks and member of the Technology Advisory Board. James' interest in building applications out of small collaborating services stems from a background in integrating enterprise systems at scale. He's built a number of systems using microservices and has been an active participant in the growing community for a couple of years.

Martin Fowler

Martin Fowler is an author, speaker, and general loud-mouth on software development. He's long been puzzled by the problem of how to componentize software systems, having heard more vague claims than he's happy with. He hopes that microservices will live up to the early promise its advocates have found.

Translations: Japanese · Russian ·

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Contents

Characteristics of a Microservice Architecture
- Componentization via Services
- Organized around Business Capabilities
- Products not Projects
- Smart endpoints and dumb pipes
- Decentralized Governance
- Decentralized Data Management
- Infrastructure Automation
- Design for failure
- Evolutionary Design

Are Microservices the Future?

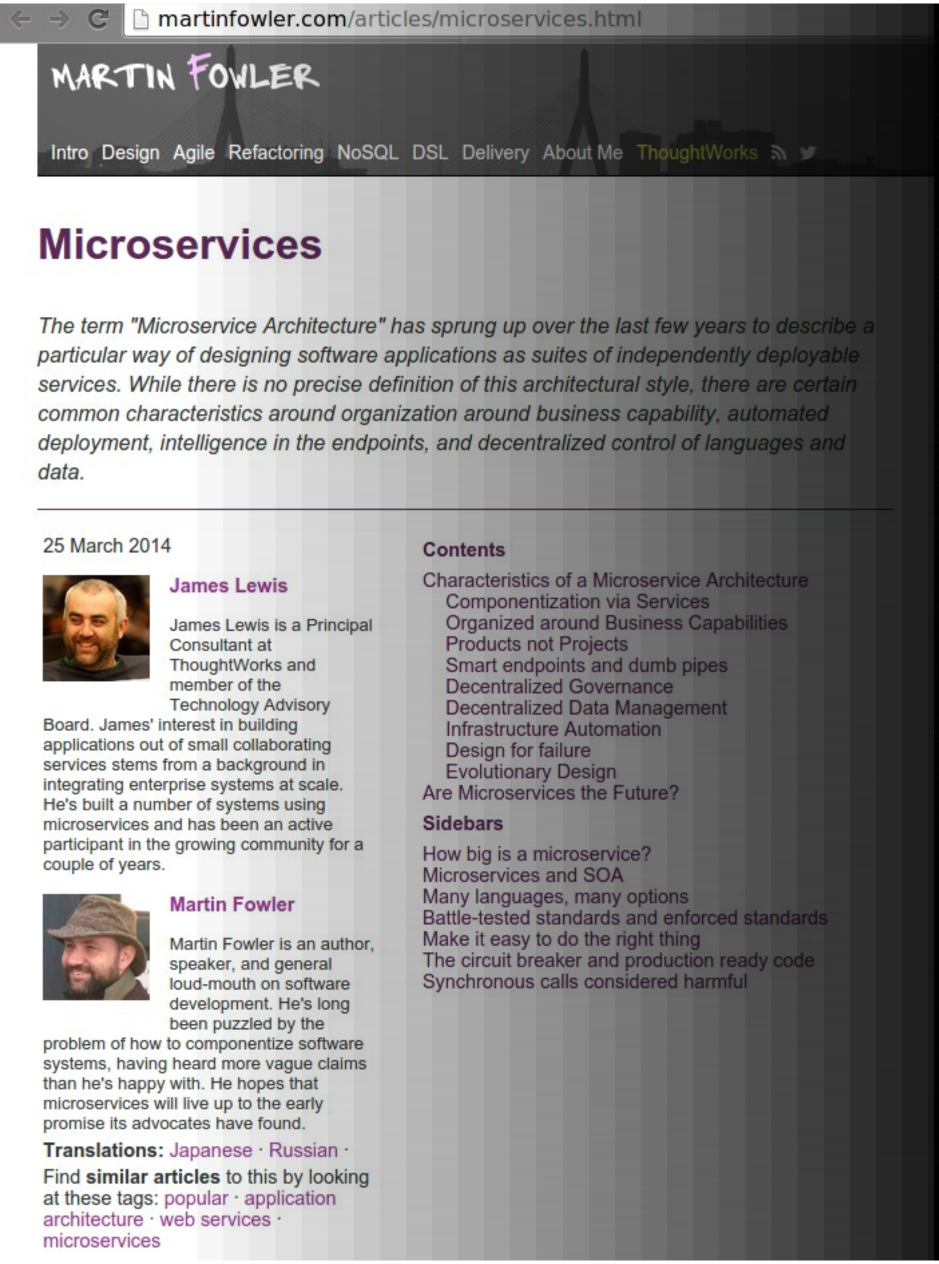
Sidebars

How big is a microservice?
Microservices and SOA
Many languages, many options
Battle-tested standards and enforced standards
Make it easy to do the right thing
The circuit breaker and production ready code
Synchronous calls considered harmful

Microservices characteristics!

- Componentization via Services
- Organized around Business Capabilities
- Products not Projects
- Smart endpoints and dumb pipes
- Decentralized Governance
- Decentralized Data Management
- Infrastructure Automation
- Design for failure
- Evolutionary Design

50% not strictly software but rather operations related!



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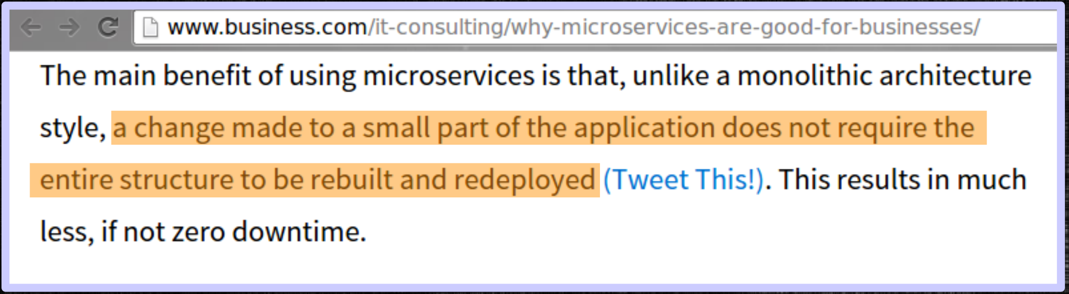
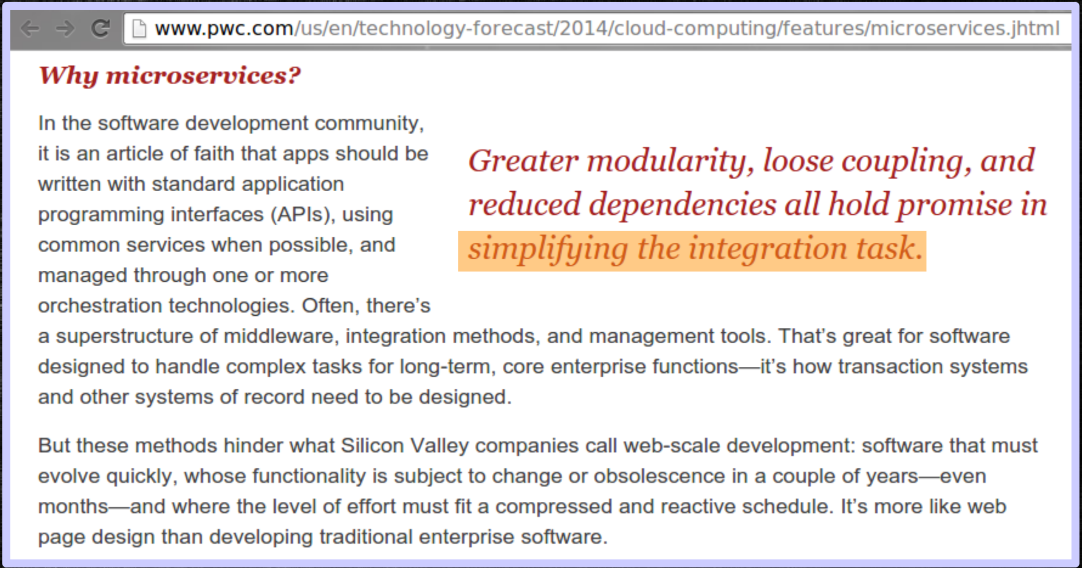
Why consider Microservices?

Reducing the complexity of Monoliths

wrong but common answer


www.business.com/it-consulting/why-microservices-are-good-for-businesses/

The main benefit of using microservices is that, unlike a monolithic architecture style, a change made to a small part of the application does not require the entire structure to be rebuilt and redeployed (Tweet This!). This results in much less, if not zero downtime.

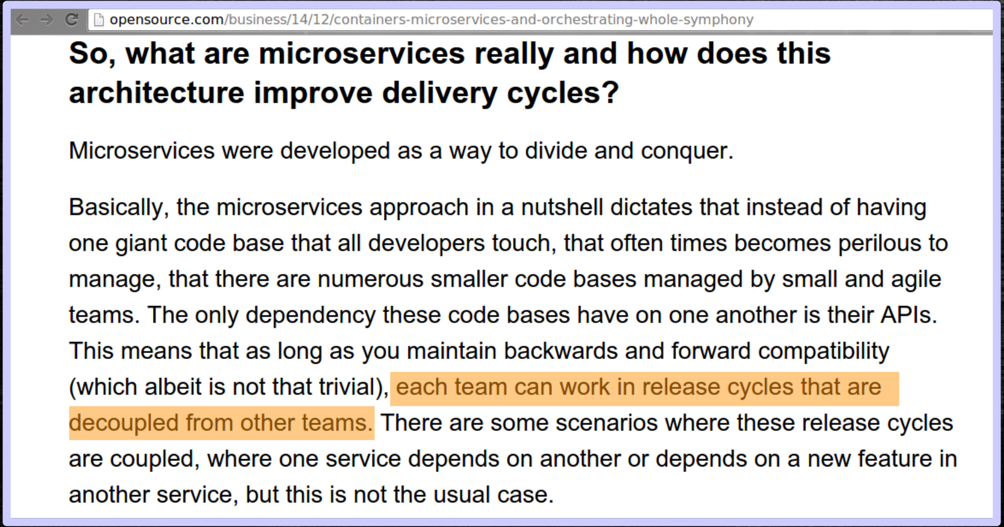

www.pwc.com/us/en/technology-forecast/2014/cloud-computing/features/microservices.jhtml

Why microservices?

In the software development community, it is an article of faith that apps should be written with standard application programming interfaces (APIs), using common services when possible, and managed through one or more orchestration technologies. Often, there's a superstructure of middleware, integration methods, and management tools. That's great for software designed to handle complex tasks for long-term, core enterprise functions—it's how transaction systems and other systems of record need to be designed.

Greater modularity, loose coupling, and reduced dependencies all hold promise in simplifying the integration task.

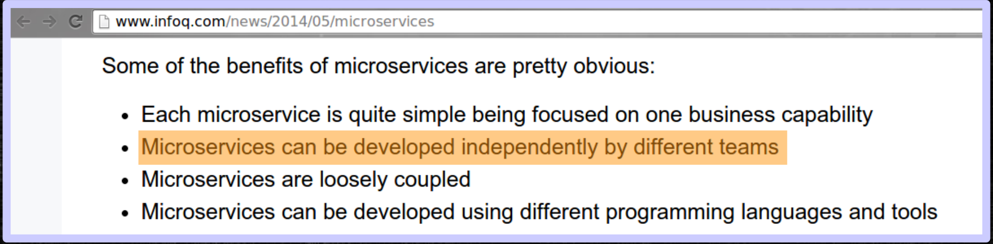
But these methods hinder what Silicon Valley companies call web-scale development: software that must evolve quickly, whose functionality is subject to change or obsolescence in a couple of years—even months—and where the level of effort must fit a compressed and reactive schedule. It's more like web page design than developing traditional enterprise software.


opensource.com/business/14/12/containers-microservices-and-orchestrating-whole-symphony

So, what are microservices really and how does this architecture improve delivery cycles?

Microservices were developed as a way to divide and conquer.

Basically, the microservices approach in a nutshell dictates that instead of having one giant code base that all developers touch, that often times becomes perilous to manage, that there are numerous smaller code bases managed by small and agile teams. The only dependency these code bases have on one another is their APIs. This means that as long as you maintain backwards and forward compatibility (which albeit is not that trivial), each team can work in release cycles that are decoupled from other teams. There are some scenarios where these release cycles are coupled, where one service depends on another or depends on a new feature in another service, but this is not the usual case.


www.infoq.com/news/2014/05/microservices

Some of the benefits of microservices are pretty obvious:

- Each microservice is quite simple being focused on one business capability
- Microservices can be developed independently by different teams
- Microservices are loosely coupled
- Microservices can be developed using different programming languages and tools

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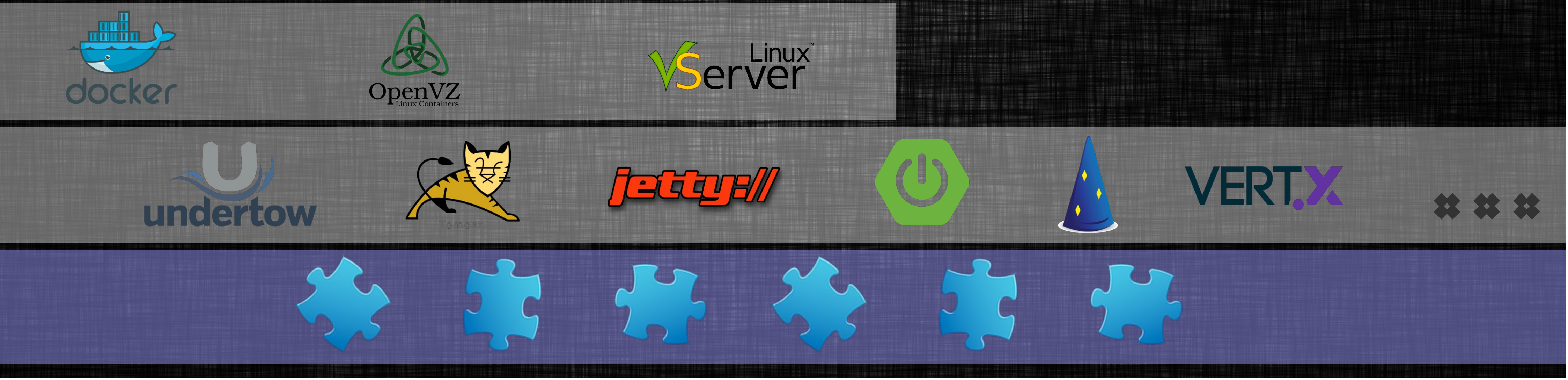
VERT.X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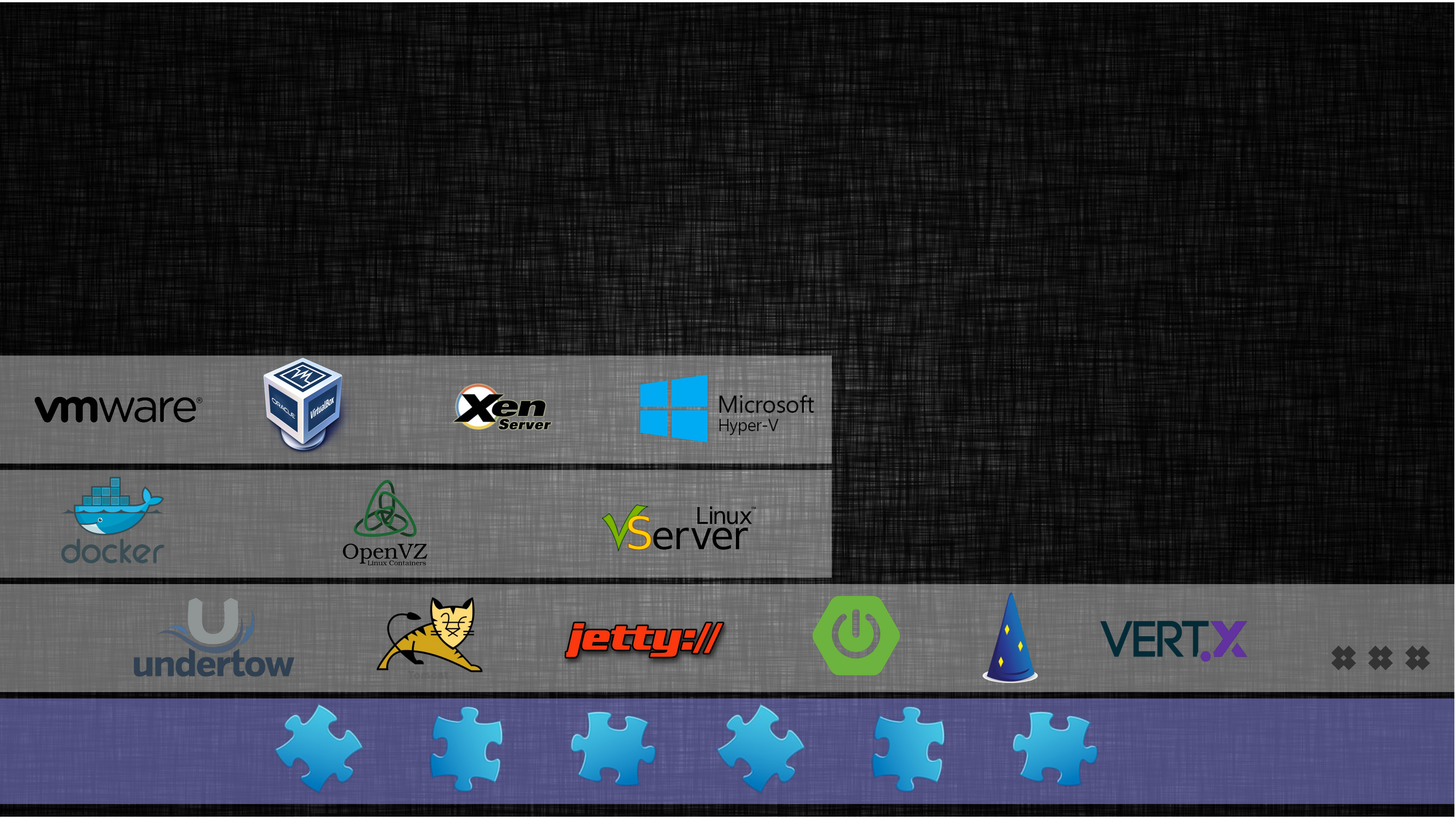
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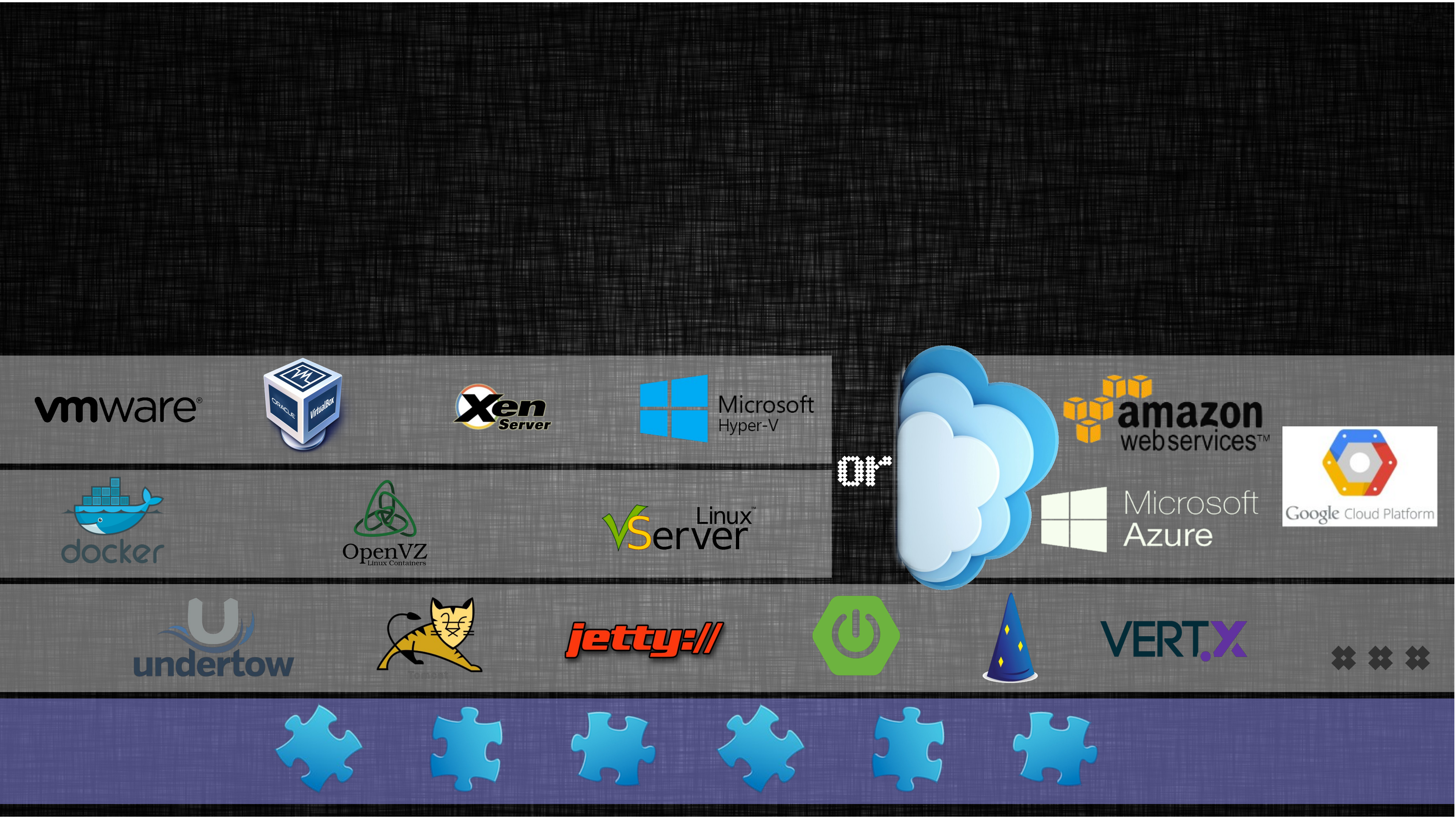
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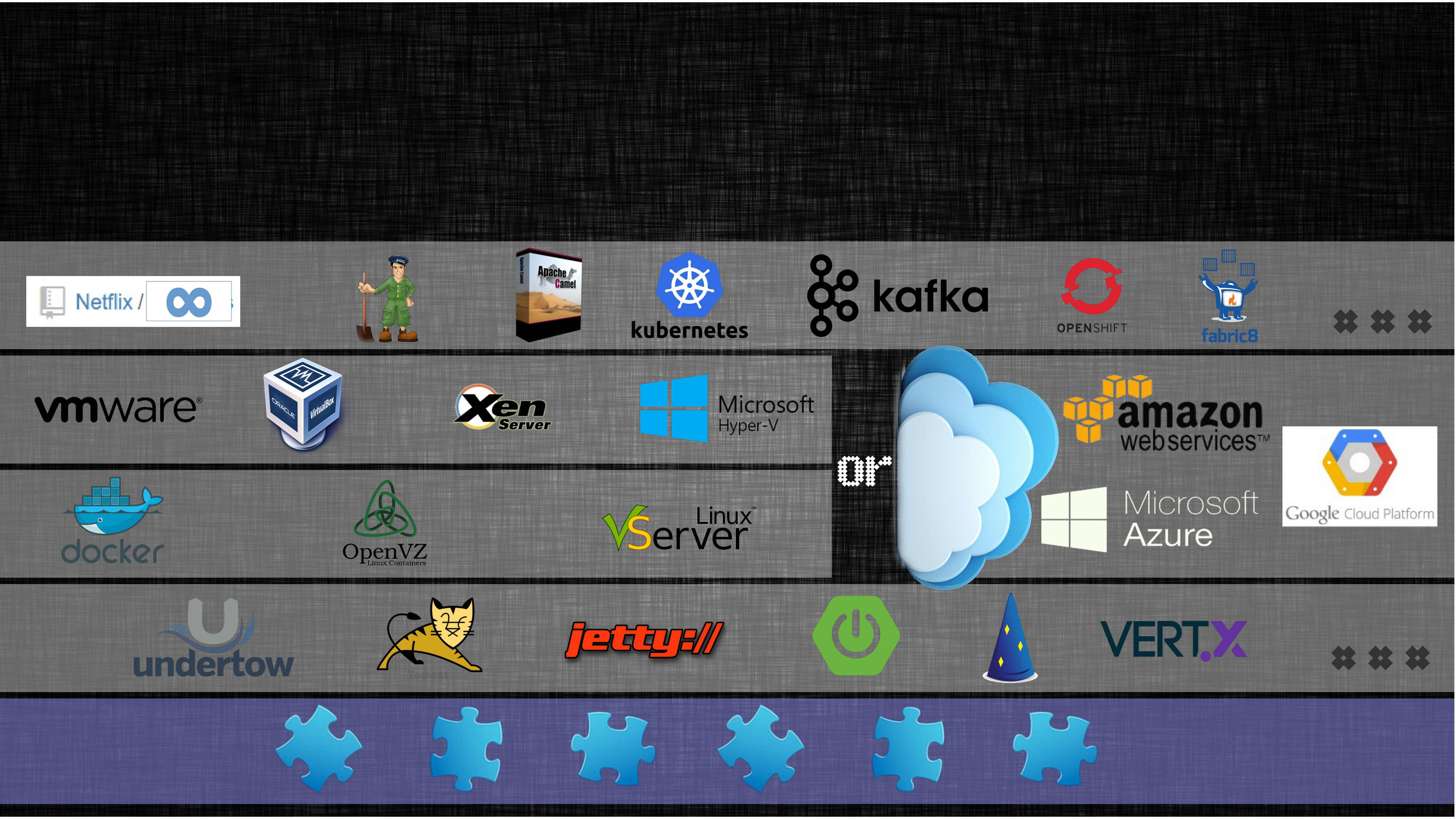
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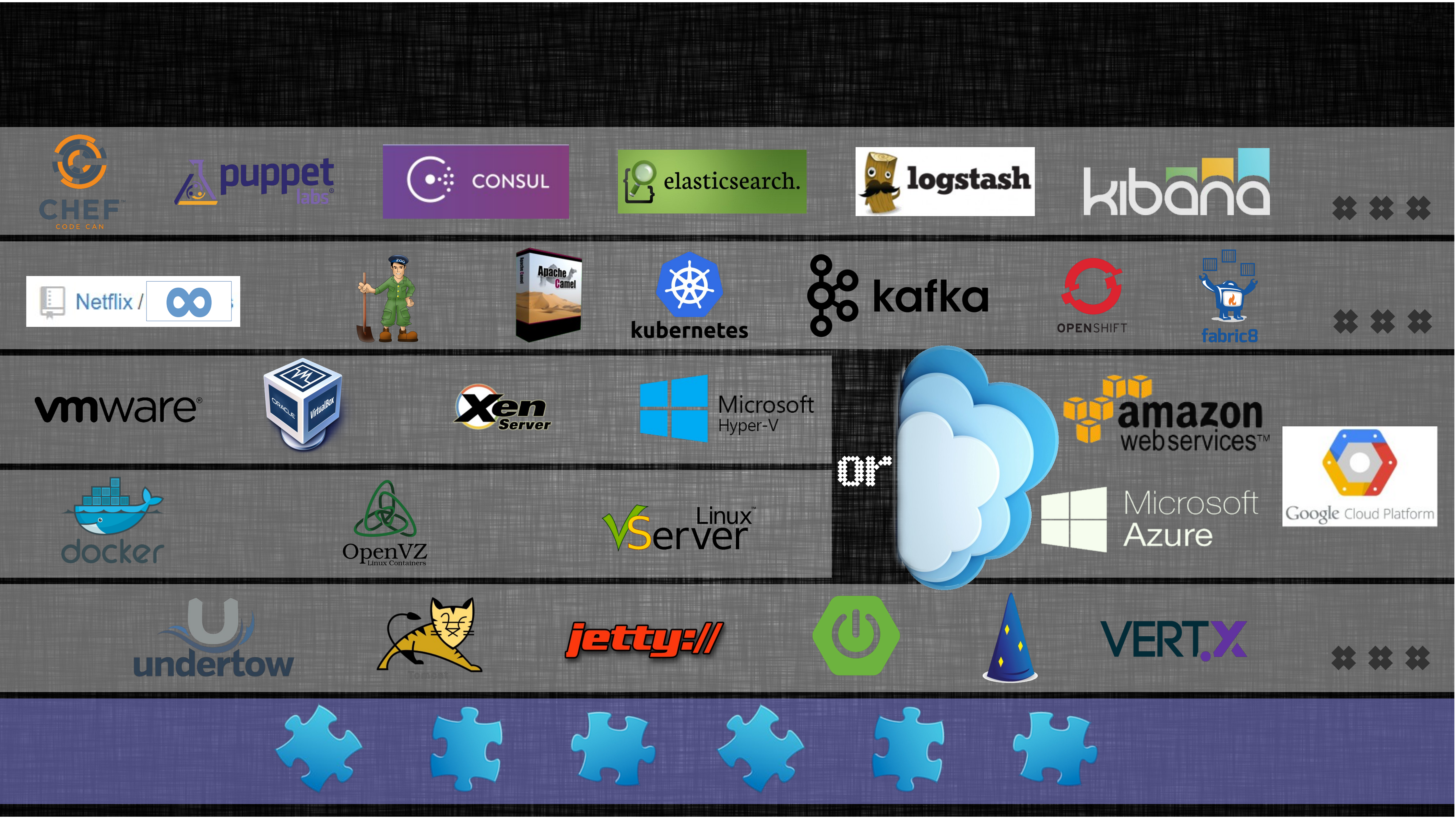
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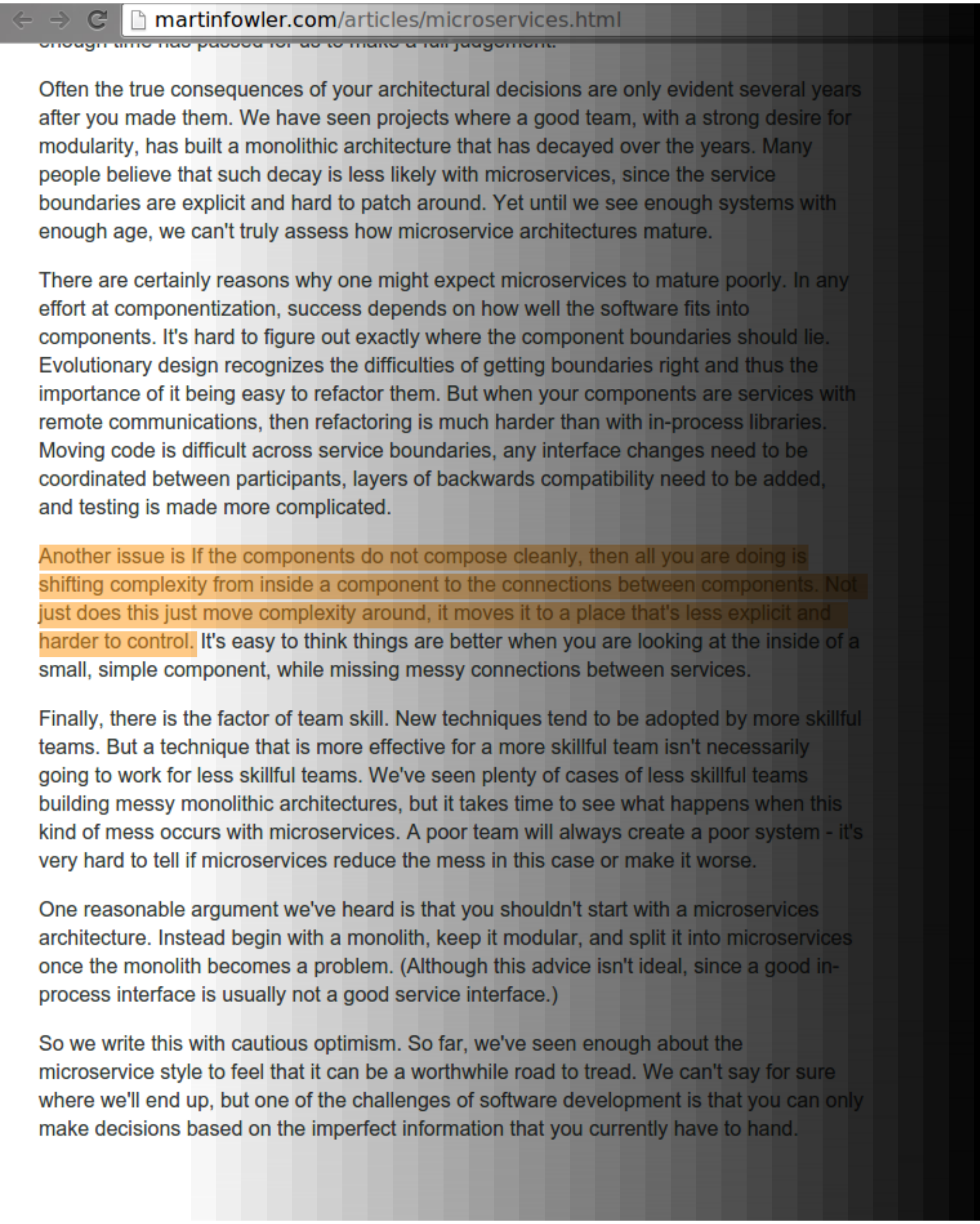
REDUCED COMPLEXITY !!



martinfowler.com/articles/microservices.html

Often the true consequences of your architectural decisions are only evident several years after you made them. We have seen projects where a good team, with a strong desire for modularity, has built a monolithic architecture that has decayed over the years. Many people believe that such decay is less likely with microservices, since the service boundaries are explicit and hard to patch around. Yet until we see enough systems with enough age, we can't truly assess how microservice architectures mature.

There are certainly reasons why one might expect microservices to mature poorly. In any effort at componentization, success depends on how well the software fits into components. It's hard to figure out exactly where the component boundaries should lie. Evolutionary design recognizes the difficulties of getting boundaries right and thus the importance of it being easy to refactor them. But when your components are services with remote communications, then refactoring is much harder than with in-process libraries. Moving code is difficult across service boundaries, any interface changes need to be coordinated between participants, layers of backwards compatibility need to be added, and testing is made more complicated.

Another issue is If the components do not compose cleanly, then all you are doing is shifting complexity from inside a component to the connections between components. Not just does this just move complexity around, it moves it to a place that's less explicit and harder to control. It's easy to think things are better when you are looking at the inside of a small, simple component, while missing messy connections between services.

Finally, there is the factor of team skill. New techniques tend to be adopted by more skillful teams. But a technique that is more effective for a more skillful team isn't necessarily going to work for less skillful teams. We've seen plenty of cases of less skillful teams building messy monolithic architectures, but it takes time to see what happens when this kind of mess occurs with microservices. A poor team will always create a poor system - it's very hard to tell if microservices reduce the mess in this case or make it worse.

One reasonable argument we've heard is that you shouldn't start with a microservices architecture. Instead begin with a monolith, keep it modular, and split it into microservices once the monolith becomes a problem. (Although this advice isn't ideal, since a good in-process interface is usually not a good service interface.)

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5

What's cool about

Microservices

“The real power … is the ability for a developer to develop a single entity and then deploy that component multiple times”

“Highly Scalable, Robust, Architecture”

“In very straightforward terms … is a component model for building portable, reusable and scalable business components … for distributed environment.”

Quotes from articles about EJB

(1999 - 2002)

"The real power … is the ability for a developer to develop a single entity and then deploy that component multiple times"

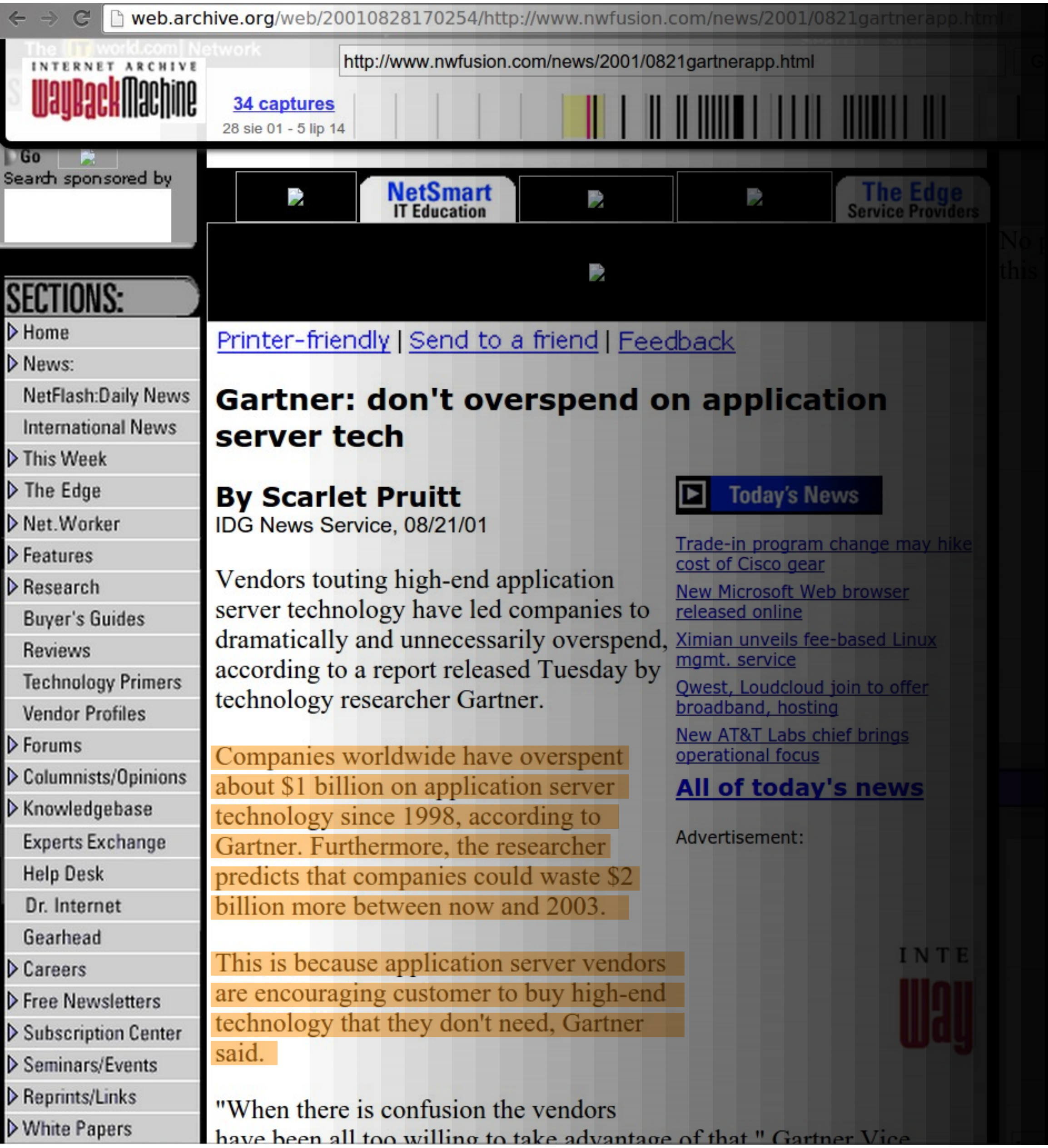
www.onjava.com/pub/a/onjava/2001/12/19/eejbs.html

"Highly Scalable, Robust, Architecture"

www.dhlee.info/computing/ejb/reference/seybold_ejb.pdf

"In very straightforward terms … is a component model for building portable, reusable and scalable business components … for distributed environment."

www.idt.mdh.se/kurser/ct3340/archives/ht08/papersRM08/37.pdf



web.archive.org/web/20010828170254/http://www.nwfusion.com/news/2001/0821gartnerapp.html

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Gartner: don't overspend on application server tech

By Scarlet Pruitt
IDG News Service, 08/21/01

Vendors touting high-end application server technology have led companies to dramatically and unnecessarily overspend, according to a report released Tuesday by technology researcher Gartner.

Companies worldwide have overspent about $1 billion on application server technology since 1998, according to Gartner. Furthermore, the researcher predicts that companies could waste $2 billion more between now and 2003.

This is because application server vendors are encouraging customer to buy high-end technology that they don't need, Gartner said.

"When there is confusion the vendors have been all too willing to take advantage of that," Gartner Vice

Today's News
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Companies worldwide have overspent about $1 billion

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Who is doing

Microservices

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amazon.com
GILT
SOUNDCLOUD
LinkedIn
allegro
karma
the guardian

MICROSERVICES
NETFLIX
amazon.com
GILT
SOUNDCLOUD
LinkedIn
allegro
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the guardian

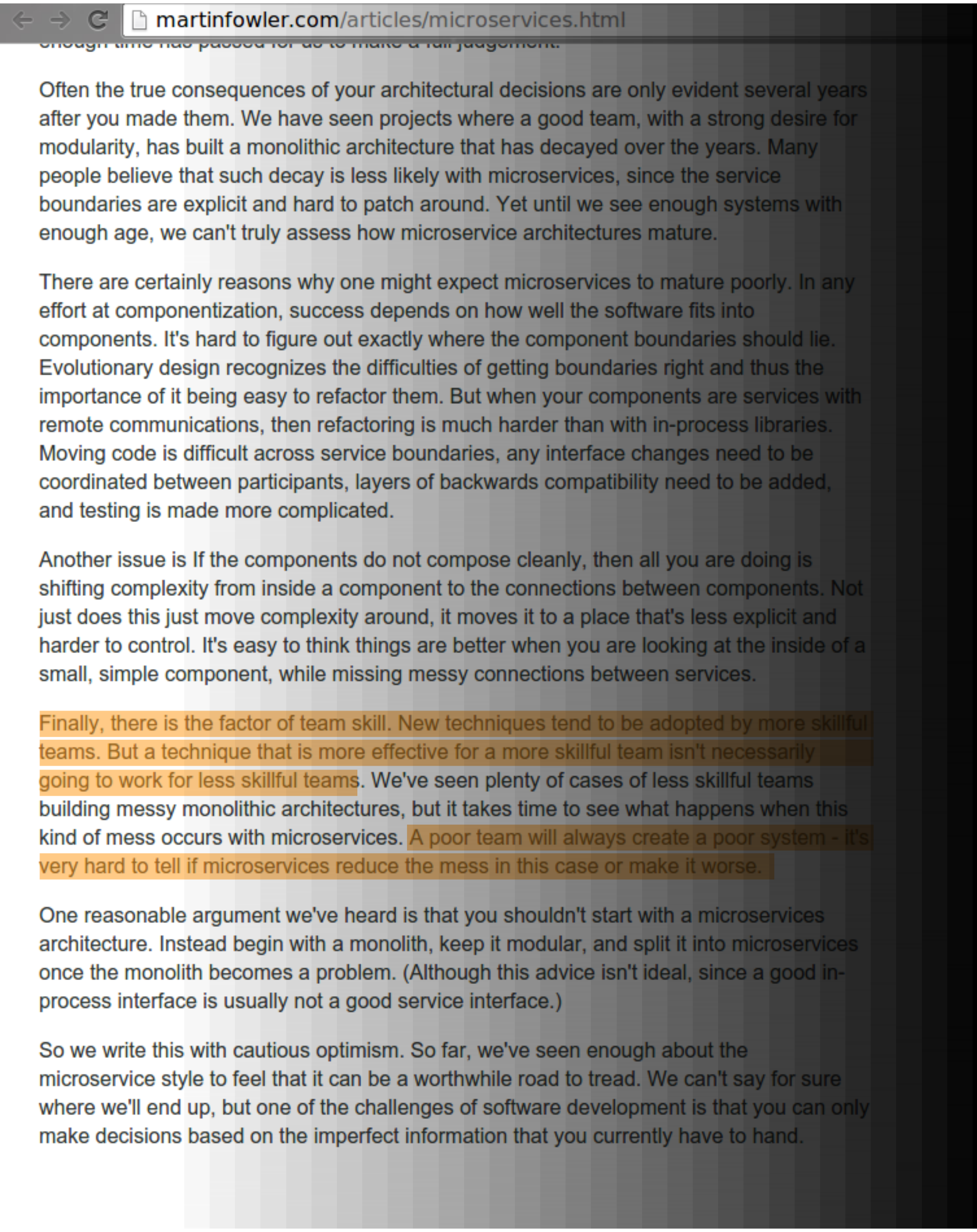
What do they have in common ?

They build microservices for **their own needs**!

They build microservices for **their own needs**!

This makes it easer for them to

- grow the DevOps culture
- hire the right people
- accept "Decentralized" approach
- automate infrastructure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a poor system
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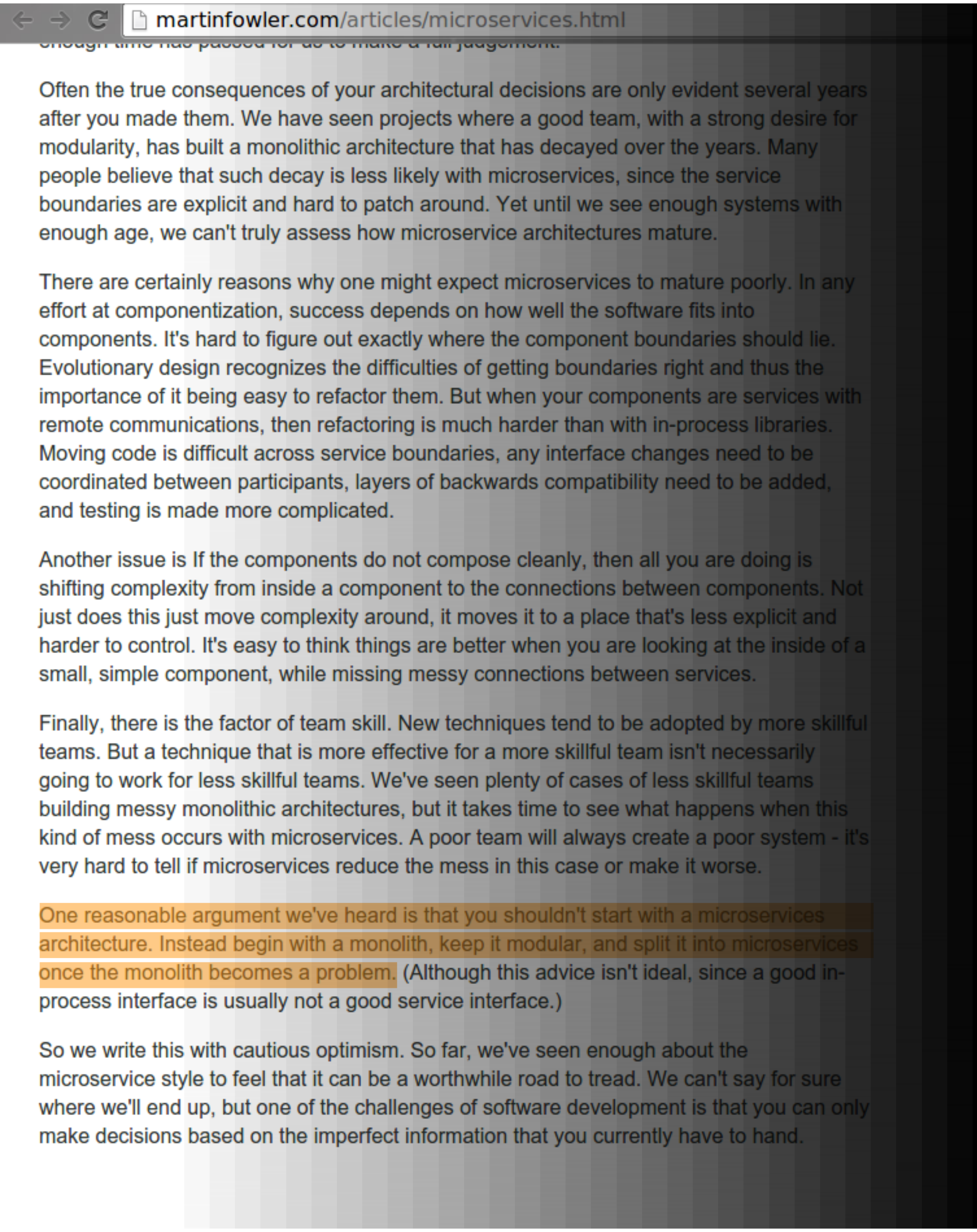
Should I do

Microservices

?

Does your organization fit into that space?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and split it into microservices
once the monolith
becomes a problem.

. . .

What else, if not ?

Microservices

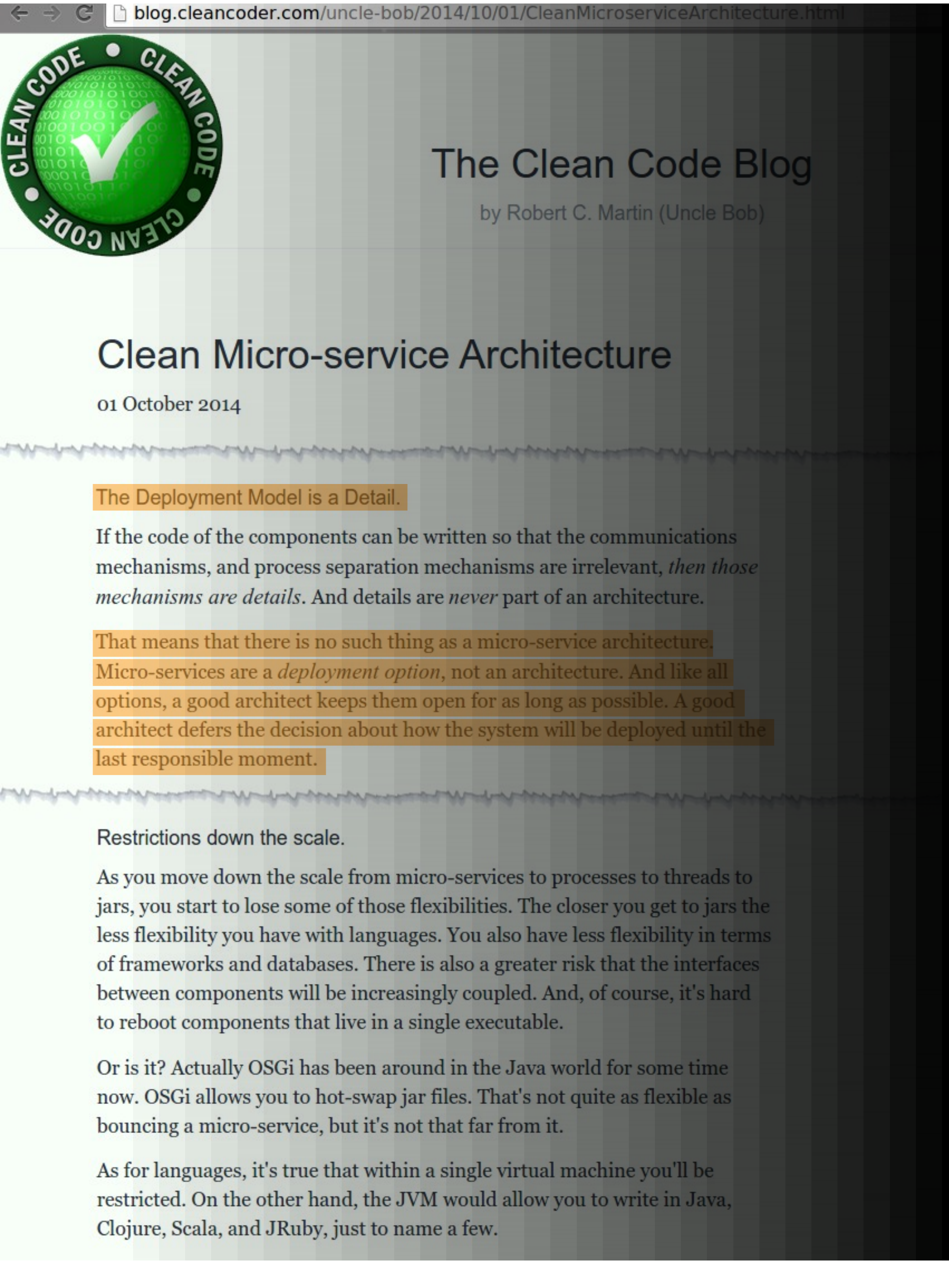
Microservices do not **cure** complexity!

Actually nothing does !

The term "**cure**" means that, after medical treatment, the patient **no longer has that particular condition anymore**.

Some diseases **have no cure**. The patient will always have the condition, but **treatment** can **help to manage it**.

Good **treatment** for complexity is enforcing **clean modular architecture**


blog.cleancoder.com/uncle-bob/2014/10/01/CleanMicroserviceArchitecture.html

The Clean Code Blog

by Robert C. Martin (Uncle Bob)

Clean Micro-service Architecture

01 October 2014

The Deployment Model is a Detail.

If the code of the components can be written so that the communications mechanisms, and process separation mechanisms are irrelevant, *then those mechanisms are details*. And details are *never* part of an architecture.

That means that there is no such thing as a micro-service architecture. Micro-services are a *deployment option*, not an architecture. And like all options, a good architect keeps them open for as long as possible. A good architect defers the decision about how the system will be deployed until the last responsible moment.

Restrictions down the scale.

As you move down the scale from micro-services to processes to threads to jars, you start to lose some of those flexibilities. The closer you get to jars the less flexibility you have with languages. You also have less flexibility in terms of frameworks and databases. There is also a greater risk that the interfaces between components will be increasingly coupled. And, of course, it's hard to reboot components that live in a single executable.

Or is it? Actually OSGi has been around in the Java world for some time now. OSGi allows you to hot-swap jar files. That's not quite as flexible as bouncing a micro-service, but it's not that far from it.

As for languages, it's true that within a single virtual machine you'll be restricted. On the other hand, the JVM would allow you to write in Java, Clojure, Scala, and JRuby, just to name a few.

. . .

The Deployment Model is a Detail.

. . .

there is no such thing as a micro-service architecture.

Micro-services are a deployment option

. . .

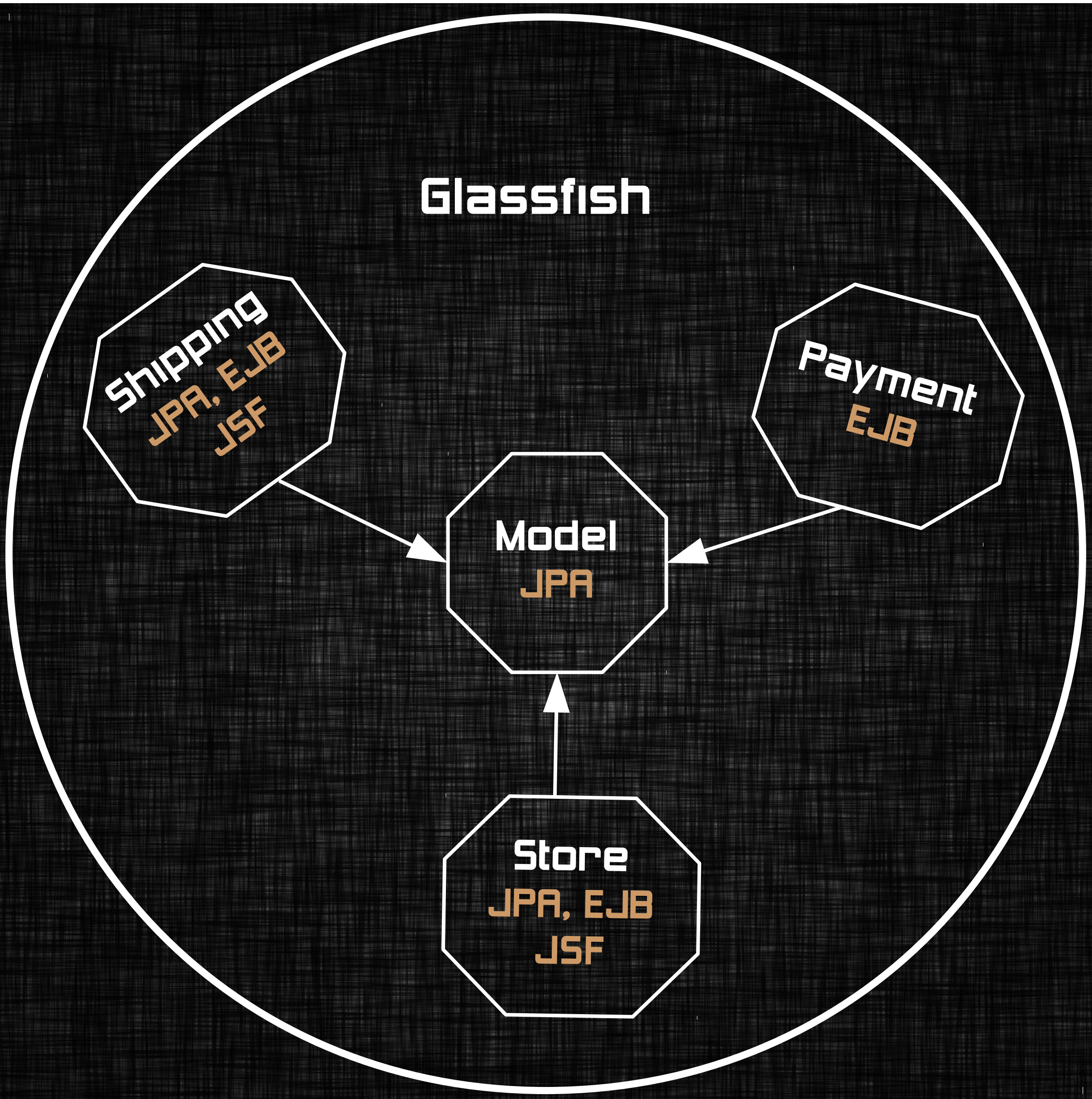
Interesting !?!

But in my project it's not possible because of . . .

Really ?!?

Modularizing "Duke's forest" JEE tutorial demo!

https://github.com/azzazzel/modular-dukes-forest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JSF
Payment
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Model
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JPA, EJB
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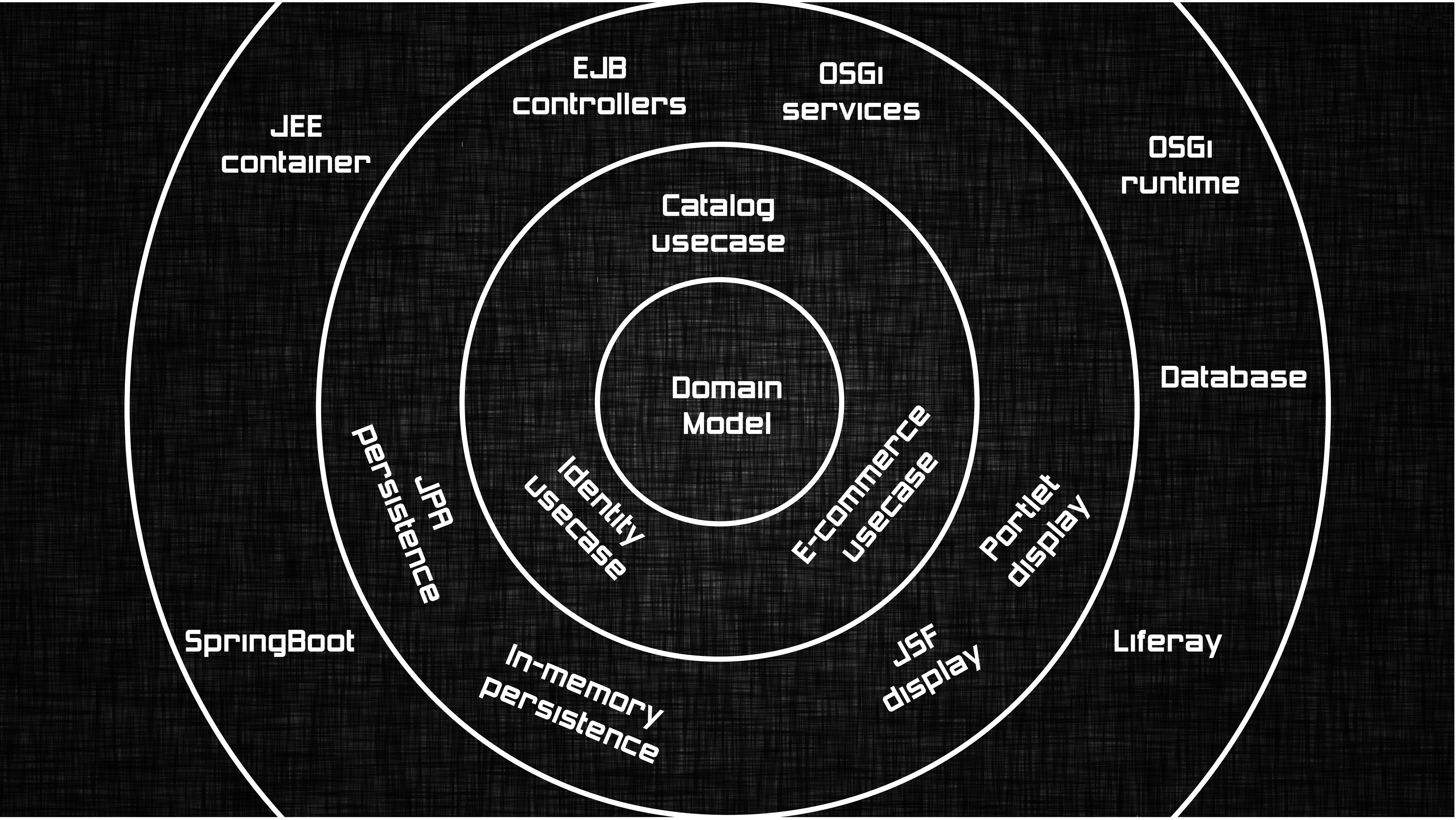
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Identity usecase
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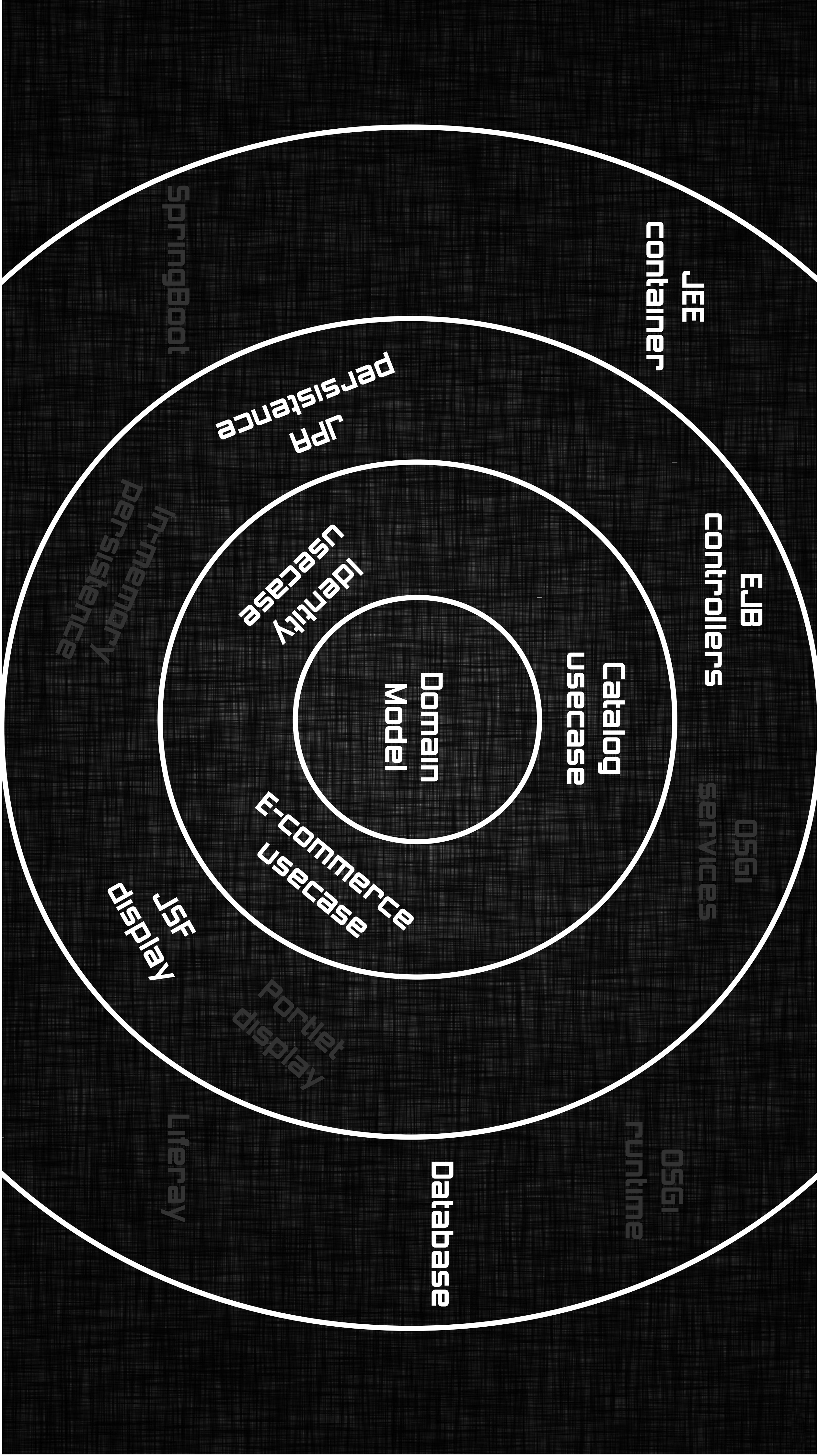
OSGi services
JPA persistence
In-memory persistence
JSF display
Portlet display
JEE container
OSGi runtime
Database
SpringBoot
Liferay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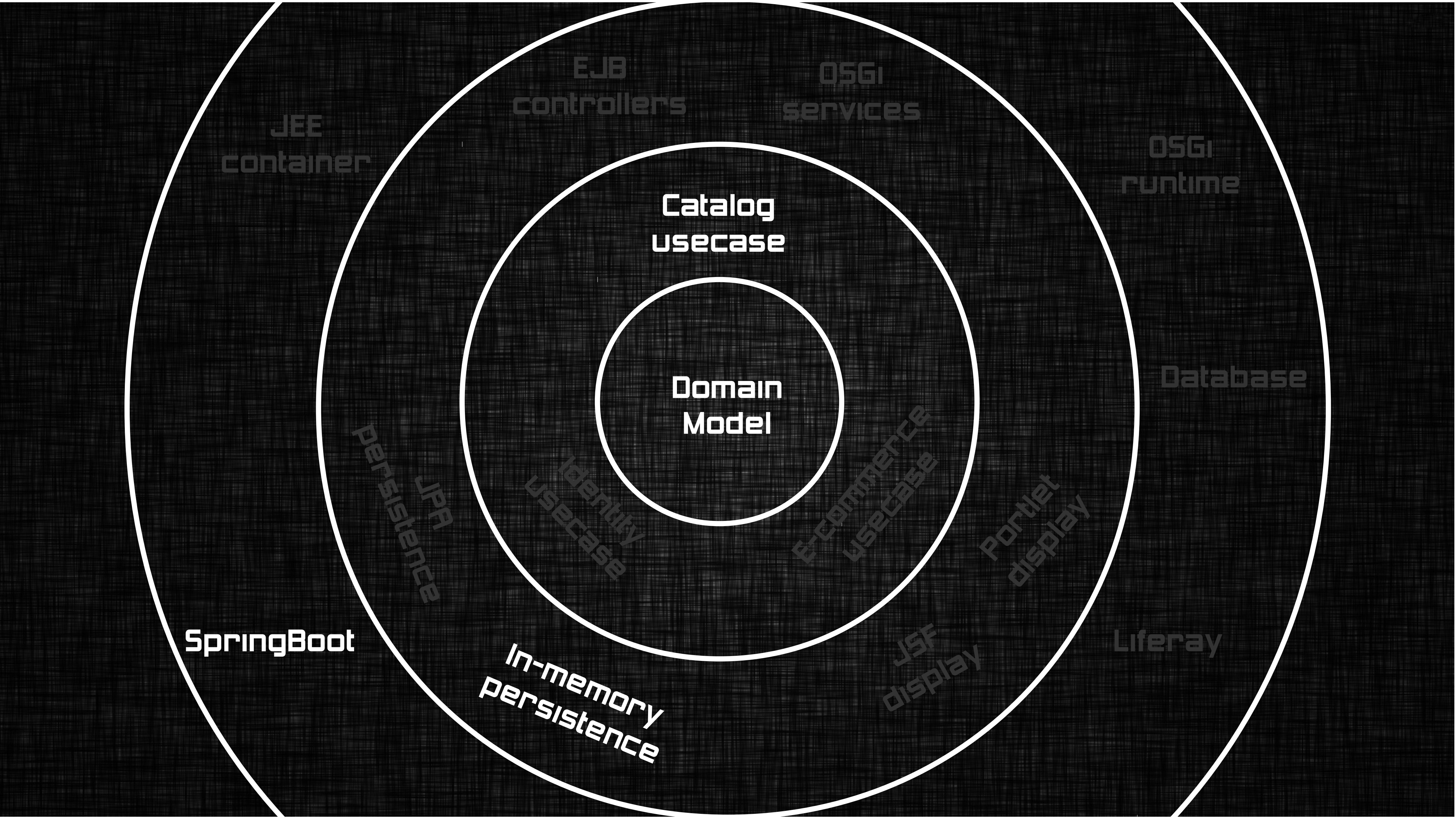
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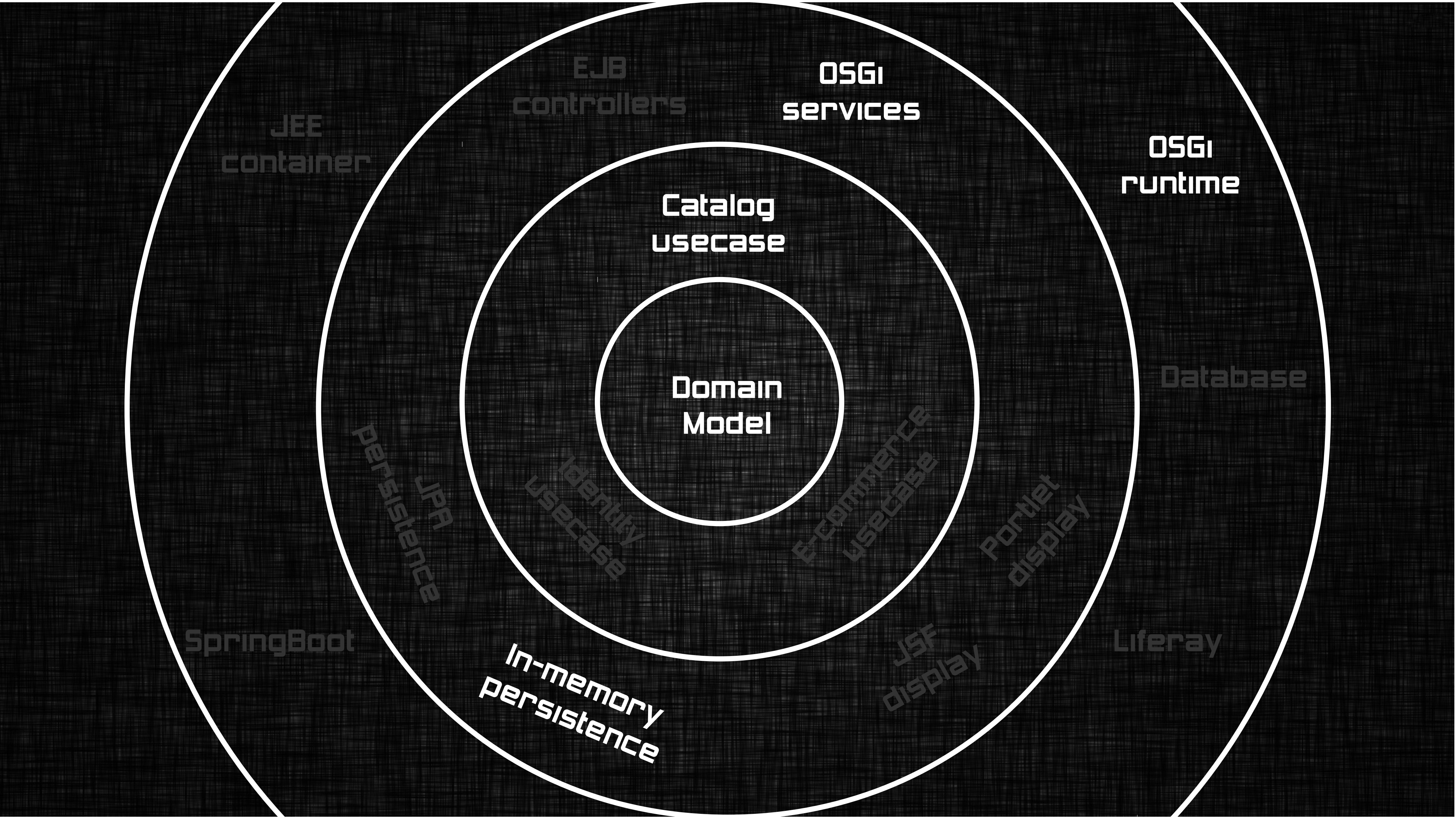

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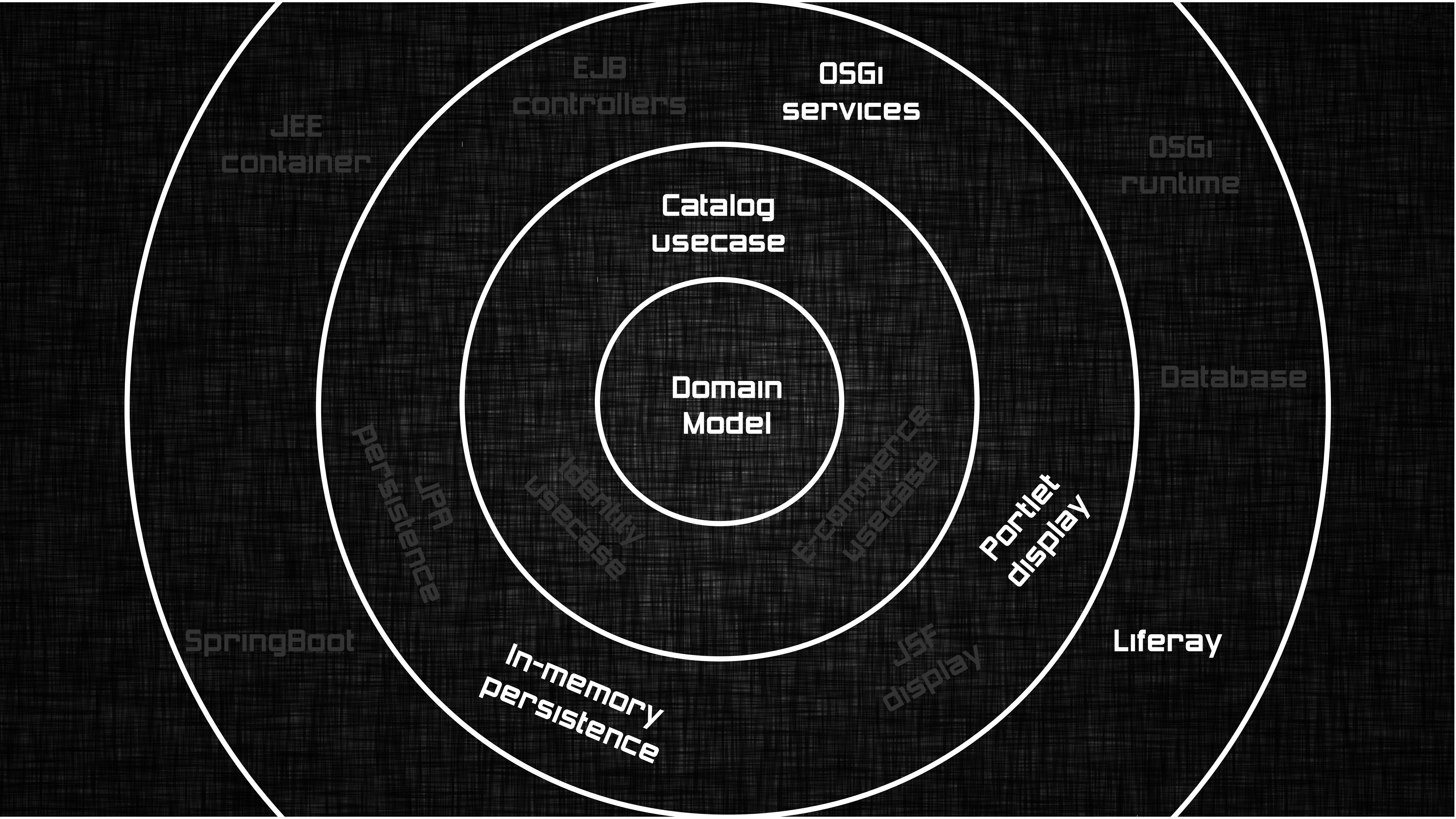
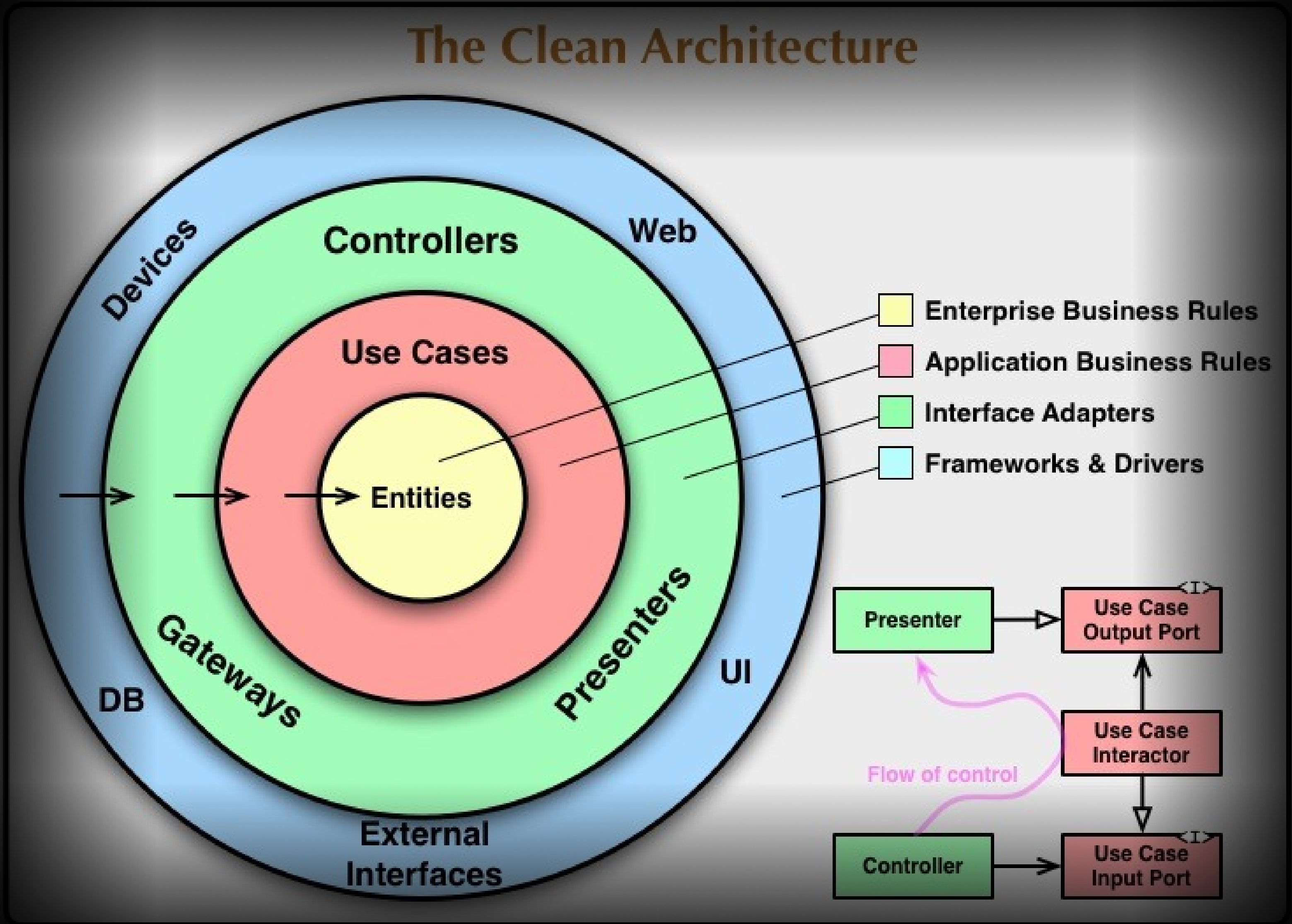
JSF display
In-memory persistence


Domain Model
Catalog usecase
Identity usecase
E-commerce usecase
OSGi services
EJB controllers
JPA persistence
In-memory persistence
JSF display
Portlet display
JEE container
SpringBoot
OSGi runtime
Database
Liferay



http://blog.8thlight.com/uncle-bob/2012/08/13/the-clean-architecture.html

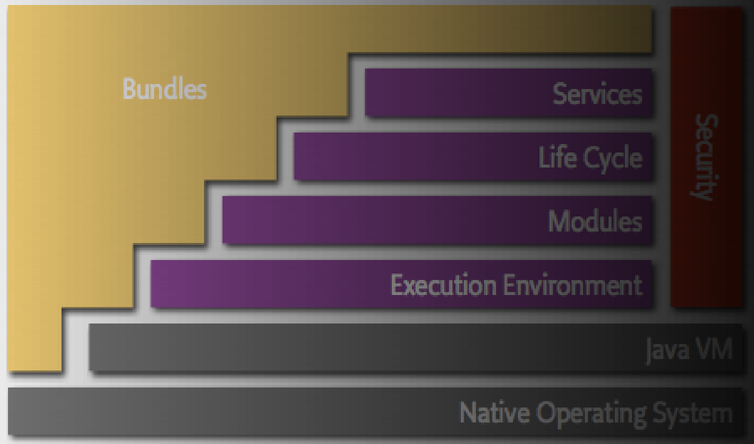
Modularity

Is a important software architecture concept!

One can design modular application without

Microservices

OSGi™ Alliance



The OSGi specification describes a modular system and a service platform for the Java programming language

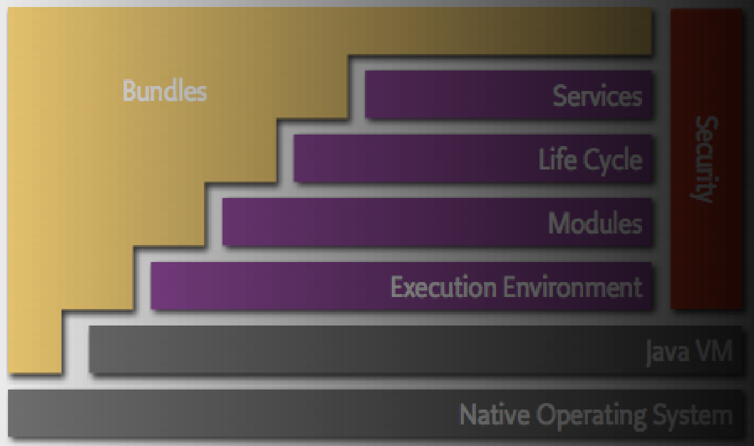
The architecture of choice for

LIFERAY®

and

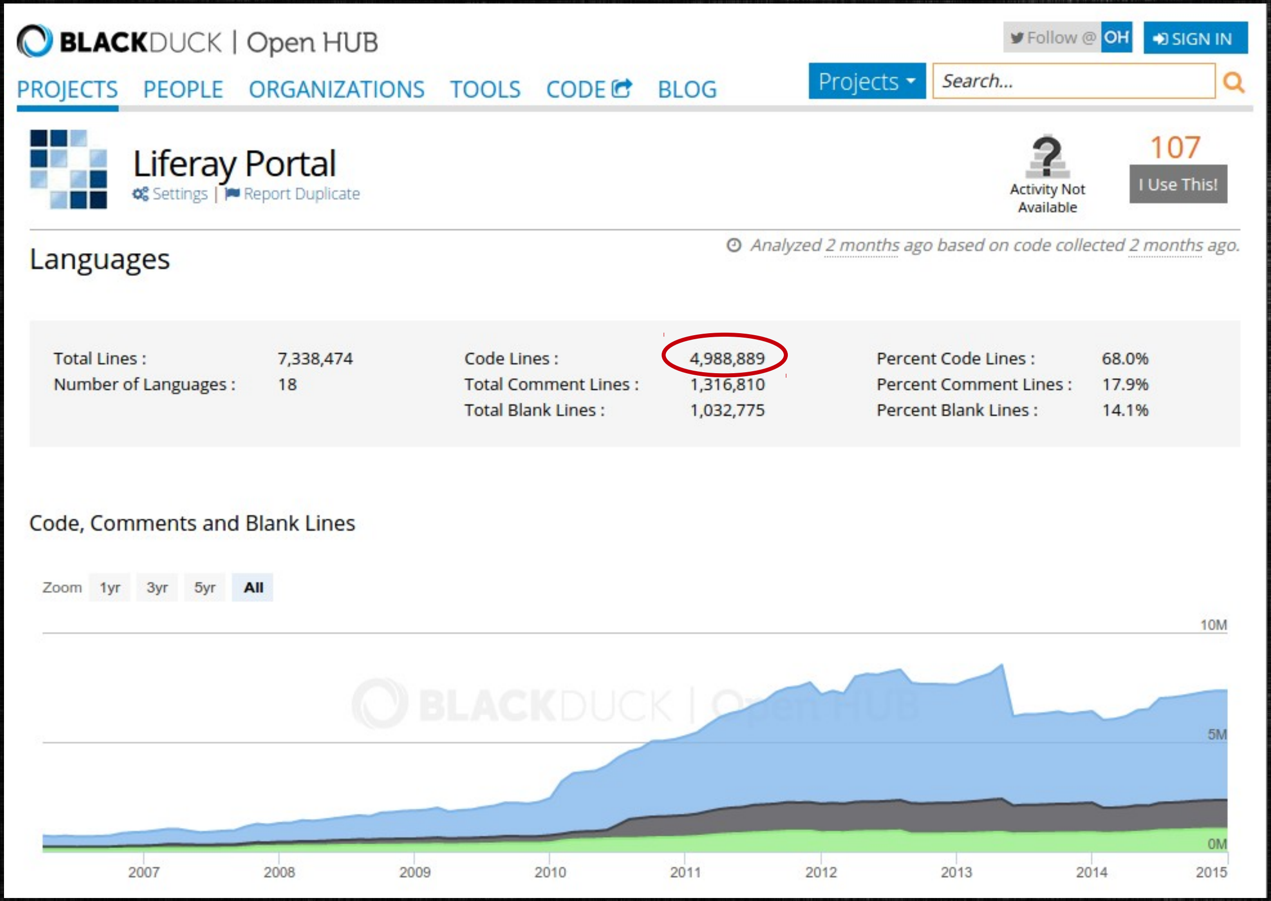
Confluence
Eclipse
Fuse ESB
Glassfish
Jboss
JIRA
JonAS
Service Mix
Weblogic
Websphere
. . .

Same characteristics but more flexible !



- Componentization via Services
- Organized around Business Capabilities
- Products not Projects
- Smart endpoints and dumb pipes
- Decentralized Governance
- Decentralized Data Management
- Infrastructure Automation
- Design for failure
- Evolutionary Design

This is not theory! We do this at LIFERAY®



BLACKDUCK | Open HUB

Liferay Portal

Analyzed 2 months ago based on code collected 2 months ago.

Languages

Total Lines :	7,338,474	Code Lines :	4,988,889	Percent Code Lines :	68.0%
Number of Languages :	18	Total Comment Lines :	1,316,810	Percent Comment Lines :	17.9%
		Total Blank Lines :	1,032,775	Percent Blank Lines :	14.1%

Code, Comments and Blank Lines

We are transforming
a huge code base
into small simple core and
OSGi (micro)services!

We have so far extracted
over 80 apps and we are
not done yet!

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