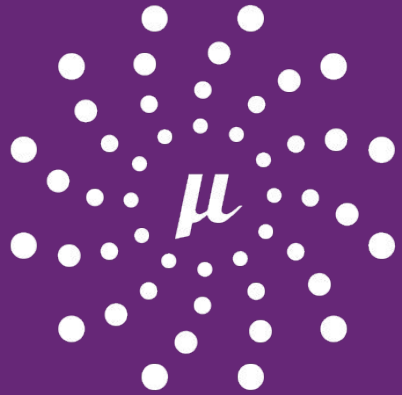


MICRONAUT™

A new way to build microservices

Luram Archanjo

Who am I?

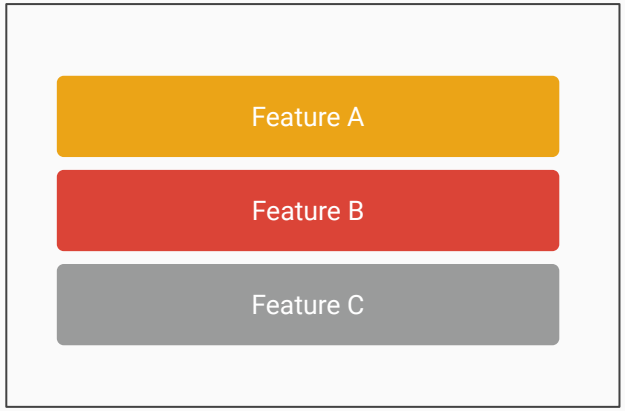
- Software Engineer at Sensedia
- MBA in java projects
- Java and microservice enthusiastic

Agenda

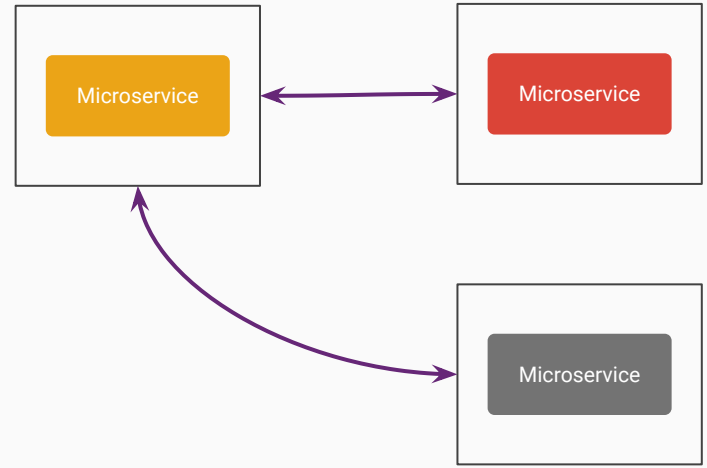
- Microservices
- Java & Frameworks
- Ahead of Time (AOT) Compilation
- GraalVM
- Micronaut
- Questions

Moving to Microservices

Monolith

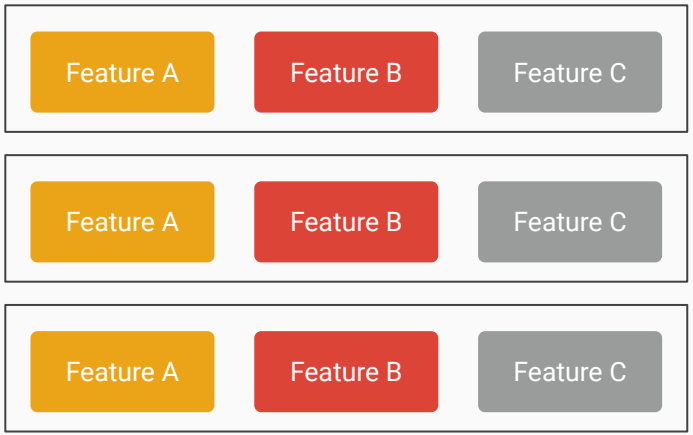


Microservices

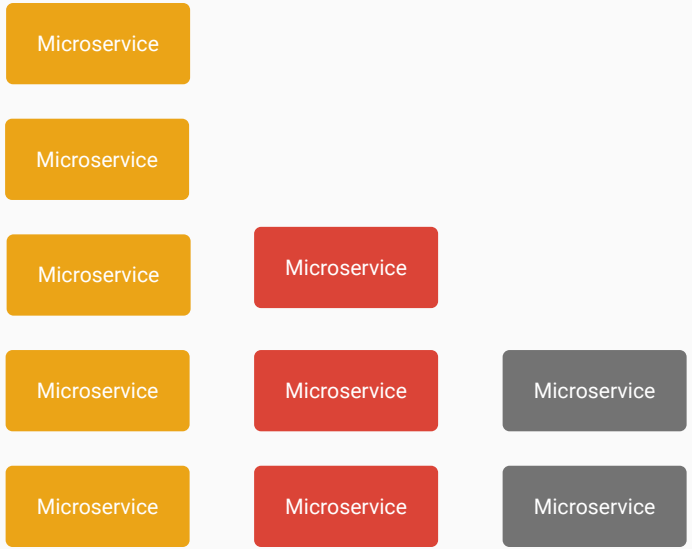


Scalability

Monolith Scalability



Microservices Scalability



Our resources are finite!

How to use less resources using Java language?

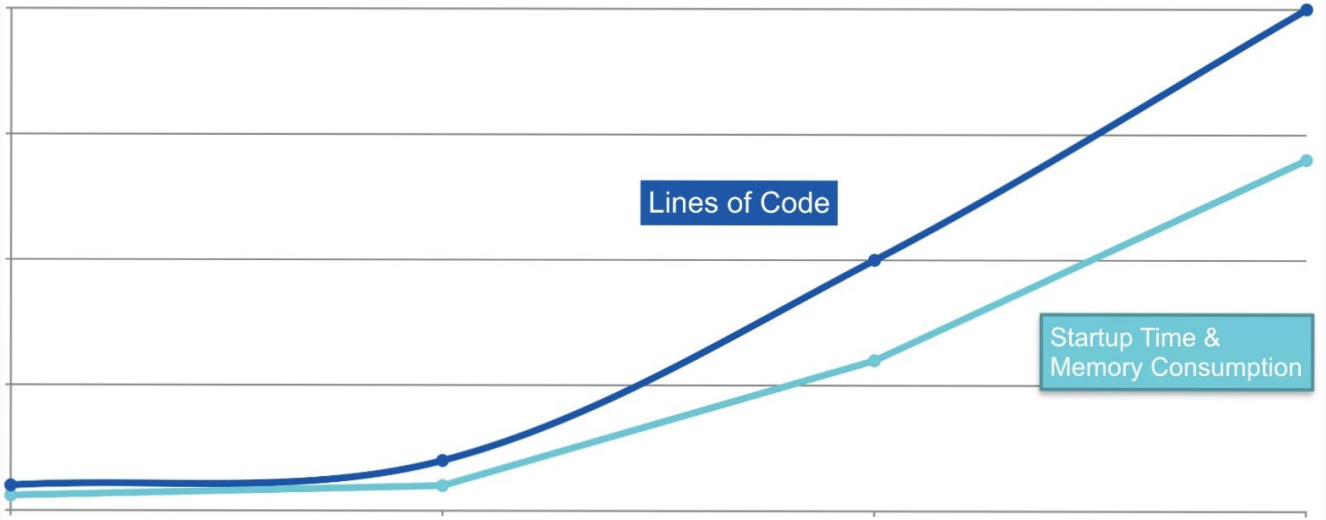
Our frameworks are design to low memory footprint?

No, because we’ve tried to adapt existing legacy technologies for Microservices

What do Spring and Jakarta EE undertaking? What are the results about it?

Spring is an amazing technical achievement and does so many things, but does them at **Runtime**.

- Reads the byte code of every bean it finds.
- Synthesizes new annotations for each annotation on each bean method, constructor, field etc. to support Annotation metadata.
- Builds Reflective Metadata for each bean for every method, constructor, field etc.

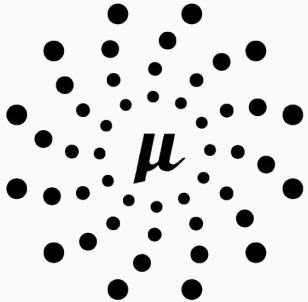


The rise of Java Microframeworks

Microframeworks

A microframework is a term used to refer to minimalistic web application frameworks:

- Without authentication and authorization
- Without database abstraction via an object-relational mapping.
- Without input validation and input sanitation.



Less modules, functions and dependencies are not enough!

Ahead of Time (AOT) Compilation

Ahead-of-time compilation (AOT compilation) is the act of compiling a higher-level programming language, or an intermediate representation such as Java bytecode, into a native machine code so that the resulting binary file can execute natively.

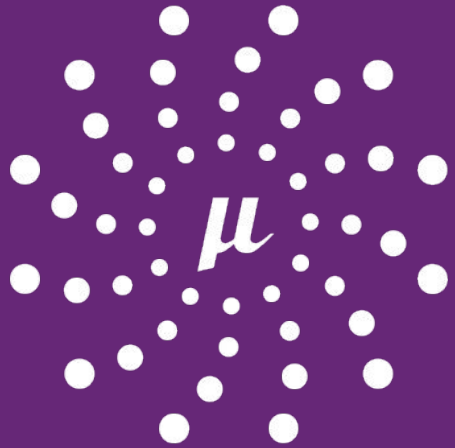
Web

Java

?

Android

Google Dagger 2



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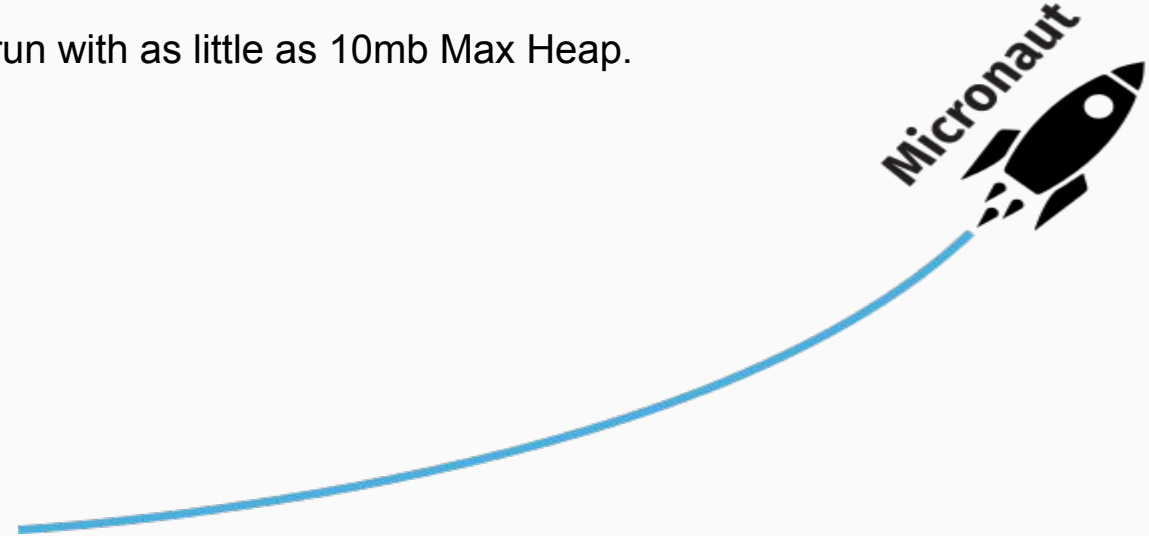
uses Ahead of Time (AOT) Compilation

What are the results of using Ahead of Time (AOT) Compilation?

The results of using Ahead of Time (AOT) Compilation

Data from Micronaut website:

- Startup time around a second.
- All Dependency Injection, AOP and Proxy generation happens at compile time.
- Can be run with as little as 10mb Max Heap.



I don't believe, show me!

Is it possible to improve more?

Yes, with 

GraalVM

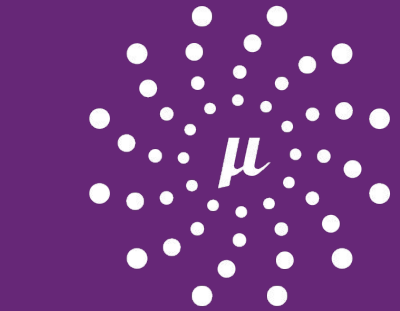
GraalVM is an universal virtual machine:

- Runs Java, Scala, Kotlin etc.
- Native image compiled with ahead-of-time improves the startup time and reduce the memory footprint of JVM-based applications.

GraalVM works well when:

- Little or no runtime reflection is used.
  - Use third party libraries selectively.
- Limited or no dynamic classloading.

Demo



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+ GraalVM™

What else does Micronaut do?

Blocking or Non-Blocking HTTP server built on Netty

With a smooth learning curve, Micronaut HTTP server makes it as easy as possible to expose APIs that can be consumed by HTTP clients.

Non-Blocking (RxJava + Netty)

```
@Controller("/hello")
public class HelloController {

        @Get
        public Single<String> hello() {
          return Single.just("Hello Micronaut");
        }

}
```

Blocking

```
@Controller("/hello")
public class HelloController {

        @Get
        public String hello() {
          return "Hello Micronaut";
        }

}
```

Dependency Injection and Inversion of Control (IoC)

This is a similar approach taken by Spring and Google Dagger, but without reflection and proxies. All the injections are done in compile time.

```java
@Singleton
public class HelloService {

    public String hello() {
      return "Hello Micronaut";
    }

}
```

```java
@Controller("/hello")
public class HelloController {

    @Inject
    private HelloService helloService;

    @Get
    public String hello() {
      return helloService.hello();
    }

}
```

Cloud Native Features

Distributed Tracing

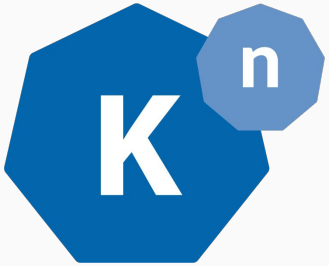
When operating Microservices in production it can be challenging to troubleshoot interactions between Microservices in a distributed architecture. Micronaut features integration with both Zipkin and Jaeger (via the Open Tracing API).

```
@Controller("/hello")
public class HelloController {

        @Inject
        private HelloService helloService;

        @Get("/{name}")
        @NewSpan("hello")
         public String hello(@SpanTag String name) {
           return helloService.hello();
         }

}
```

Serverless Functions

Serverless architectures where as a developer you deploy functions that are fully managed by the Cloud environment and are executed in ephemeral processes require a unique approach.

```
@FunctionBean("hello-function")
public class HelloFunction implements Supplier<String> {

        @Override
        public String hello() {
          return "Hello world";
        }

}

@FunctionClient
public interface HelloFunctionClient {

        String hello();

}
```



Summary

2º Place

- Productivity with annotations
- Blocking or Non-Blocking HTTP server built on Netty

1º Place

Ahead of Time (AOT) Compilation

- Low memory footprint
- Fast Startup
- IoC

3º Place

Cloud Native Features

- Service Discovery
- Distributed Tracing
- Serveless
- Distributed Configuration

Thanks a million!

Questions?

/larchanjo

/luram-archanjo