

GraalVM and MicroProfile

A Polygot Microservices Solution

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Who am I?

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Agenda

- Microservices!
- What is GraalVM?
- What is MicroProfile
- Demos

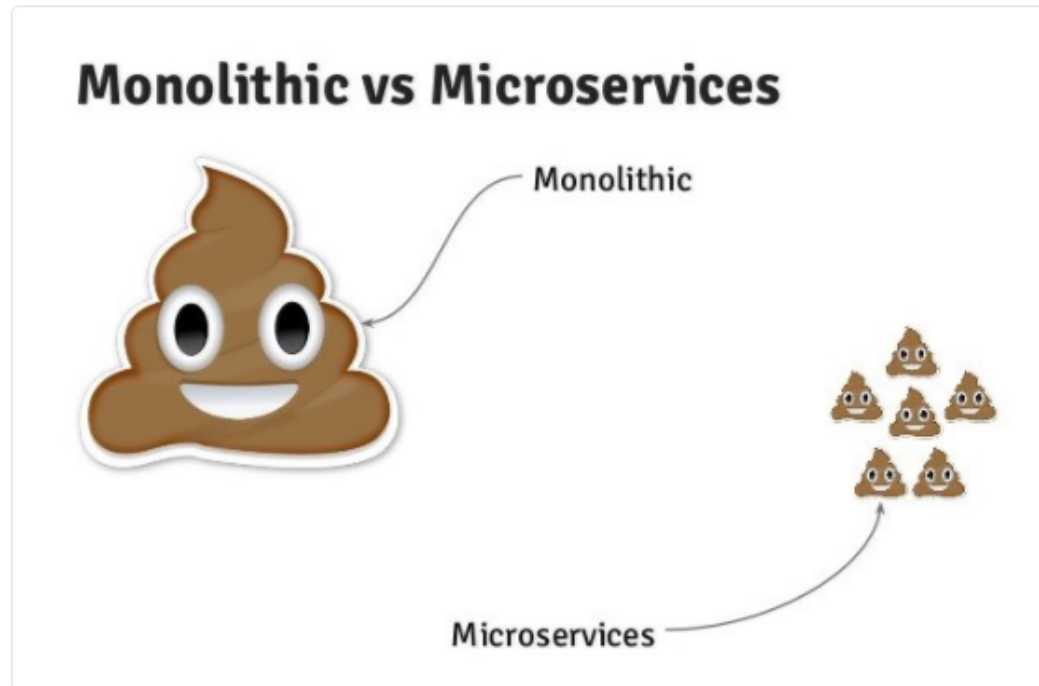
Microservices Anyone?



Microservices

- Have you heard about Microservices?
- How big is a micro?
- Who develops Microservices?
- Who deploys Microservices?
- Who likes Microservices?

What do others think?



What do others think?



Architect's dream, developer's nightmare.

What do others think?



Jérôme BaToN

@wadael

One day, microservices will share some libs
and will be called servlets



Why Microservices?

- Deliver new features quicker
- Smaller, agile teams
- Scale services independently
- Cloud



Microservices Hell?

- Supporting multiple Languages
 - Java (and JVM languages), Node, Python, Ruby, PHP, Go, etc. etc.
- Different Libraries to cover same features
- Increased complexity
- Research time
- May need to rewrite your libraries for all languages



GraalVM

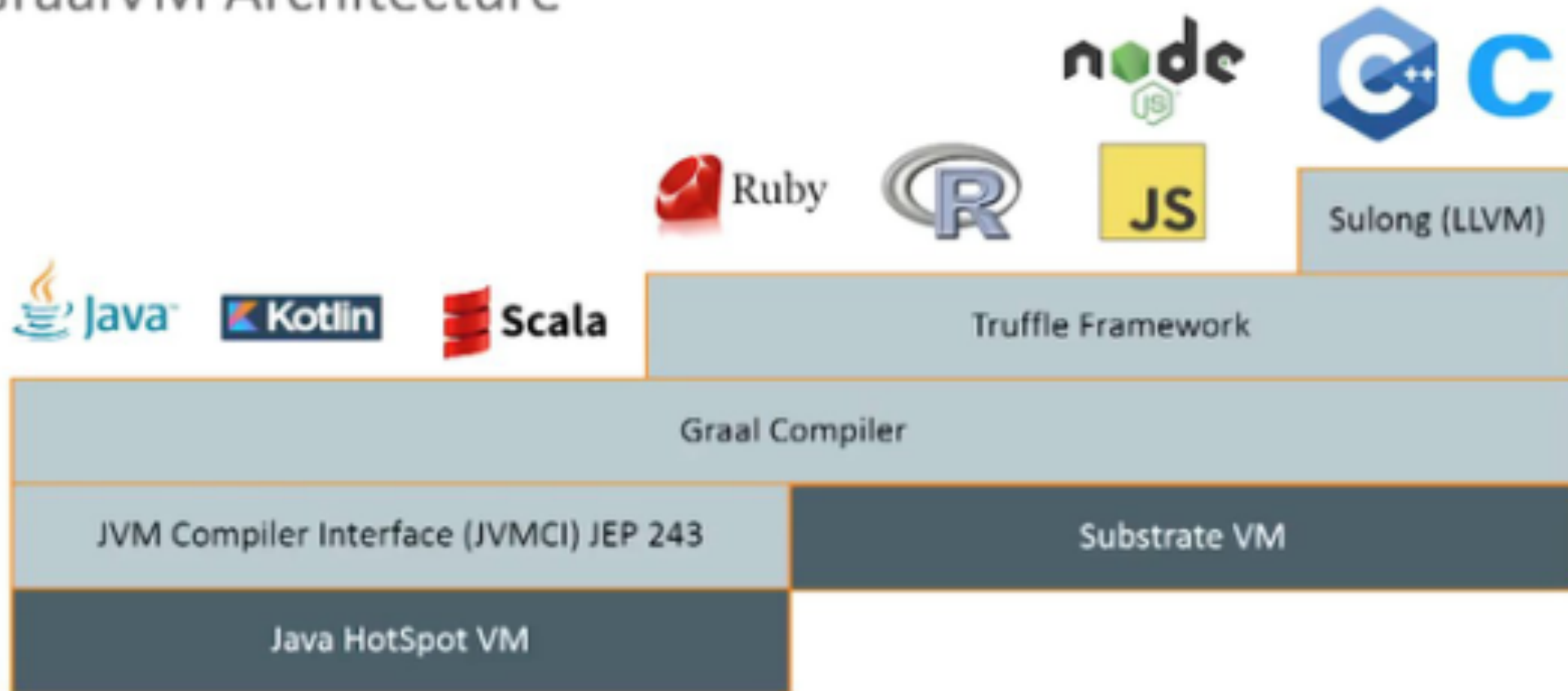
GraalVM

- Universal Virtual Machine
- JavaScript, Python, Ruby, R, JVM-based languages (Java, Scala, Kotlin), and LLVM-based languages (C and C++)
- Open Source Project (GPL2 /w CPE)
- <https://www.graalvm.org>
- <https://github.com/oracle/graal>



GraalVM

GraalVM Architecture



Demo

Installation and run a simple app with GraalVM

Community Edition

GraalVM Community is available for free for evaluation, development and production use. It is built from the GraalVM sources available on [GitHub](#). We provide pre-built binaries for Linux, macOS X, and Windows platforms on x86 64-bit systems. Windows support is **experimental**.

DOWNLOAD FROM GITHUB

LICENSE

- [Open Source Licenses](#)
- Free for development and production use

BENEFITS

- Open-source license
- Free community support via [public channels](#)
- Presence of all enterprise components
- Bug fixes and enhancements

AVAILABLE FOR



Enterprise Edition

GraalVM Enterprise provides additional performance, security, and scalability relevant for running applications in production. It is free for evaluation uses and available for download from the [Oracle Technology Network](#). We provide binaries for Linux, macOS X, and Windows platforms on x86 64-bit systems. Windows support is **experimental**.

DOWNLOAD FROM OTN

LICENSE

- [Oracle Master License Agreement](#)
- Free for evaluation and non-production use
- [Contact us](#) for commercial use and support options

BENEFITS

- Faster performance and smaller footprint
- Enhanced security features
- Managed capabilities for native code
- Premier 24x7x365 support via [MOS](#)

AVAILABLE FOR



<https://www.graalvm.org/downloads/>

<https://sdkman.io/>

Why GraalVM?

- Interoperability
- Reuse Libraries
- Shared Tools
- Run Java faster
- Native Images

Interoperability

```
var fileClass = Java.type("java.io.File");  
var file = new fileClass("file.txt");  
file.exists();
```

```
var file = new (Java.type("java.io.File"))("file.txt");
```

```
var pathSeparator = Java.type("java.io.File").pathSeparator;
```

Reuse Libraries

`--jvm` allows you to execute the application in the JVM and pass in a classpath to use libraries.

```
node --jvm --jvm.cp=library.jar app.js
```

```
ruby --jvm --jvm.cp=library.jar ruby.rb
```

```
graalpython --jvm --jvm.cp=library.jar python.py
```

NPM, Ruby or R compatibility

Quickly check if an NPM module, Ruby gem, or R package is compatible with GraalVM.

name[.version] (e.g., redis or redis:15.8)

CHECK!

Upload your package dependency lock file to check all your dependencies at once!



Drag your file here
or

UPLOAD

NAME	VERSION	STATUS
sqlite3	-> 3.1	100.00% tests pass

TruffleRuby

NAME	VERSION	STATUS
sqlite3	-> 1.3	99.57% tests pass

NAME	VERSION	STATUS
comments-api	*	library not yet tested
abbrev	1.1.1	100.00% tests pass
accepts	-> 1.3	100.00% tests pass
ajv	*	library not yet tested
body-parser	-> 1.18	100.00% tests pass
brace-expansion	*	library not yet tested
bytes	3.0.0	100.00% tests pass
caseless	*	library not yet tested
chownr	1.1.1	unknown
co	4.6.0	100.00% tests pass

Native Image

```
native-image -cp target/number.api.jar  
org.tomitribe.graalvm.microprofile.number.api.NumberResource
```

```
native-image -jar target/number-api.jar
```


Demo

Native image Java app with GraalVM

MicroProfile



What is MicroProfile?

- <http://microprofile.io/>
- Enterprise Java for Microservices
- Open Source (Eclipse)



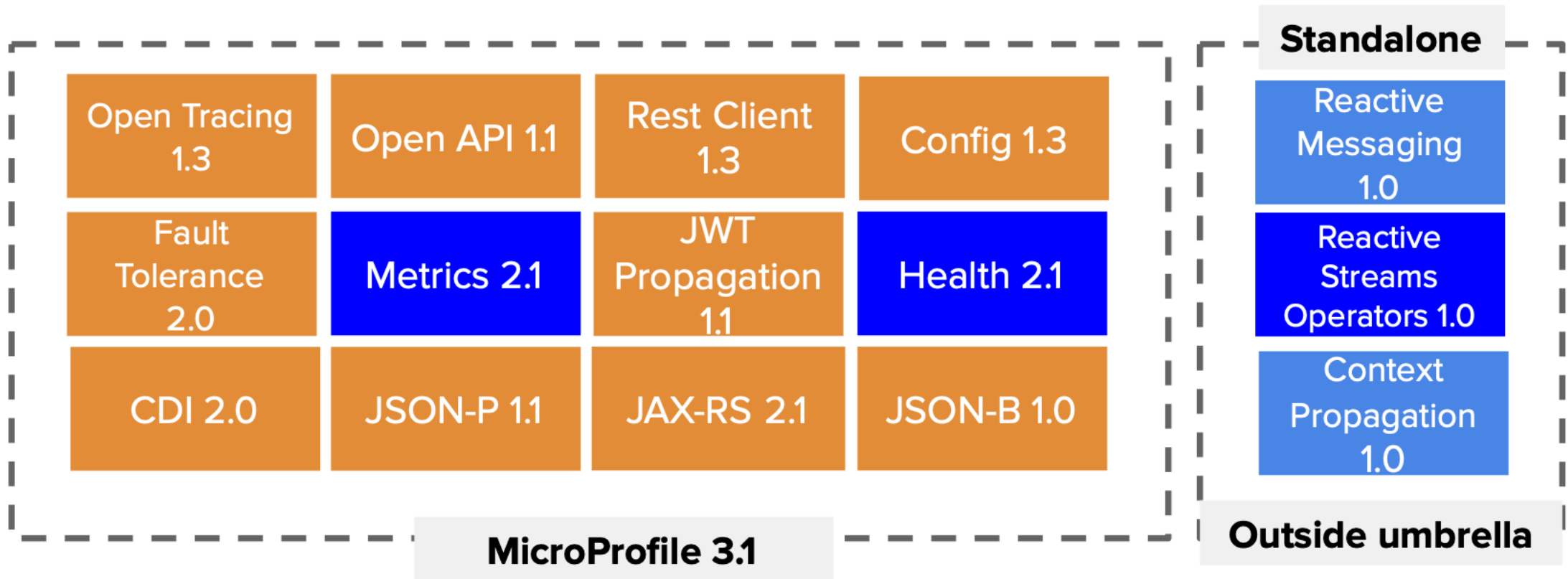
What is MicroProfile?

- Initial version 1.0 with CDI, JAX-RS, JSON-P in Sep 2016
- Application portability across runtimes

What is MicroProfile?

- Currently at version 3.1 since Oct 2019
- Configuration, Fault Tolerance, JWT Propagation, Health Check, Metrics, Open Tracing, Open API and REST Client
- JSOB-B imported from Jakarta EE

MicroProfile Specs



- Light Blue = New
- Dark Blue = Updated
- Orange = No change from last release (MicroProfile 3.0)

Who is involved in MicroProfile?



MicroProfile Implementations



Interoperability with MicroProfile

Configuration

- Applications need configuration based on their running environment
- It must be possible to change configuration without repacking the application
- Java - MicroProfile Config
- Node - Node Convict
- Ruby - dotenv?

Configuration

```
Config config = ConfigProvider.getConfig();  
  
String url = config.getValue("connection.url", String.class);  
  
String optionalUrl =  
config.getOptionalValue("connection.url",  
                        String.class).orElse("something");
```

Demo

MicroProfile Config in Node and Ruby app

Fault Tolerance

- Guide the execution and result of some logic
- Circuit Breaker, TimeOut, RetryPolicy, Fallback and Bulkhead
- Java - MicroProfile Fault Tolerance
- Node - Opossum
- Ruby - CircuitBox

```
@CircuitBreaker
@Fallback(NumberFallbackHandler.class)
public String getNumber() {
    final Response response = numberApi.request().get();

    if (OK.getStatusCode() == response.getStatusCode()) {
        return response.readEntity(String.class);
    }

    throw new WebApplicationException(INTERNAL_SERVER_ERROR);
}
```

```
@RequestScope  
public class NumberFallbackHandler  
    implements FallbackHandler<String> {  
  
    @Override  
    public String handle(final ExecutionContext context) {  
        return "FALLBACK_NUMBER";  
    }  
}
```


REST Client

- Microservices typically talk REST to other services
- Consistent and easy to reuse
- Java - MicroProfile Rest Client (inspired by Feign)
- Node - Node Rest Client
- Ruby - Ruby Rest Client

```
@RegisterRestClient
@Path("/number")
@Produces(MediaType.TEXT_PLAIN)
@Consumes(MediaType.TEXT_PLAIN)
public interface NumberResourceClient {
    @GET
    @Path("/generate")
    String getNumber();
}
```

Demo

MicroProfile Rest Client and Fault Tolerance in Ruby and Python app

Polyglot MicroProfile

- Wrap JS, Ruby, Python or R scripts with GraalVM
- Expose services
- Leverage MicroProfile
- All running in the same VM

Polyglot MicroProfile

- A huge ecosystem to explore
- Tailor your needs
- MicroProfile as a standard for all languages
- Expose as API or just as a library

Polyglot MicroProfile

- R (Maths, Statistics, Forecasts, etc.)
- Python (Natural Language Processing)

Demo

MicroProfile app with R functions

Final Thoughts

Limitations

- Java 8 only (11 support in the next few months)
- Lack of tooling
- Manage commands, manual classpath, etc.
- Not much information around (quickly outdated)

Challenges

- Python support still on early stages
- Not all libraries are (all languages) supported yet
- Upgrading broke stuff
- Living on the edge :)

Production Ready?

- OK for JVM Languages and JS
- Other languages may not work fully yet
- Twitter is using it in production already
- Try it out!

Final Thoughts

- GraalVM could improve *Microservices* development
- It could help bring technologies together
- Pick one of your favourites languages
- No boundaries

Resources

- <https://www.graalvm.org>
- <https://github.com/radcortez/graalvm-microprofile>



Questions?

Thank you!