



# How to create Polyglot Applications using GraalVM

 @owais\_zahid

 @owaiszahid



# Know your speaker

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- Software Development Manager at Autodesk
- Over 14 years of experience working around the globe
- Focus areas
  - Cloud Platforms
  - Resiliency and Scalability
- Love to code in JavaScript

• Avid fan of AS ROMA



@owais\_zahid



@owaiszahid



Interoperability

# What to do for Interoperability

Apache Thrift

Swig

Protocol Buffer

Java Native Interface

AWS Layers and Runtime

GraalVM

And many more...

# What is GraalVM



GraalVM is a polyglot (multi-lingual) Virtual Machine

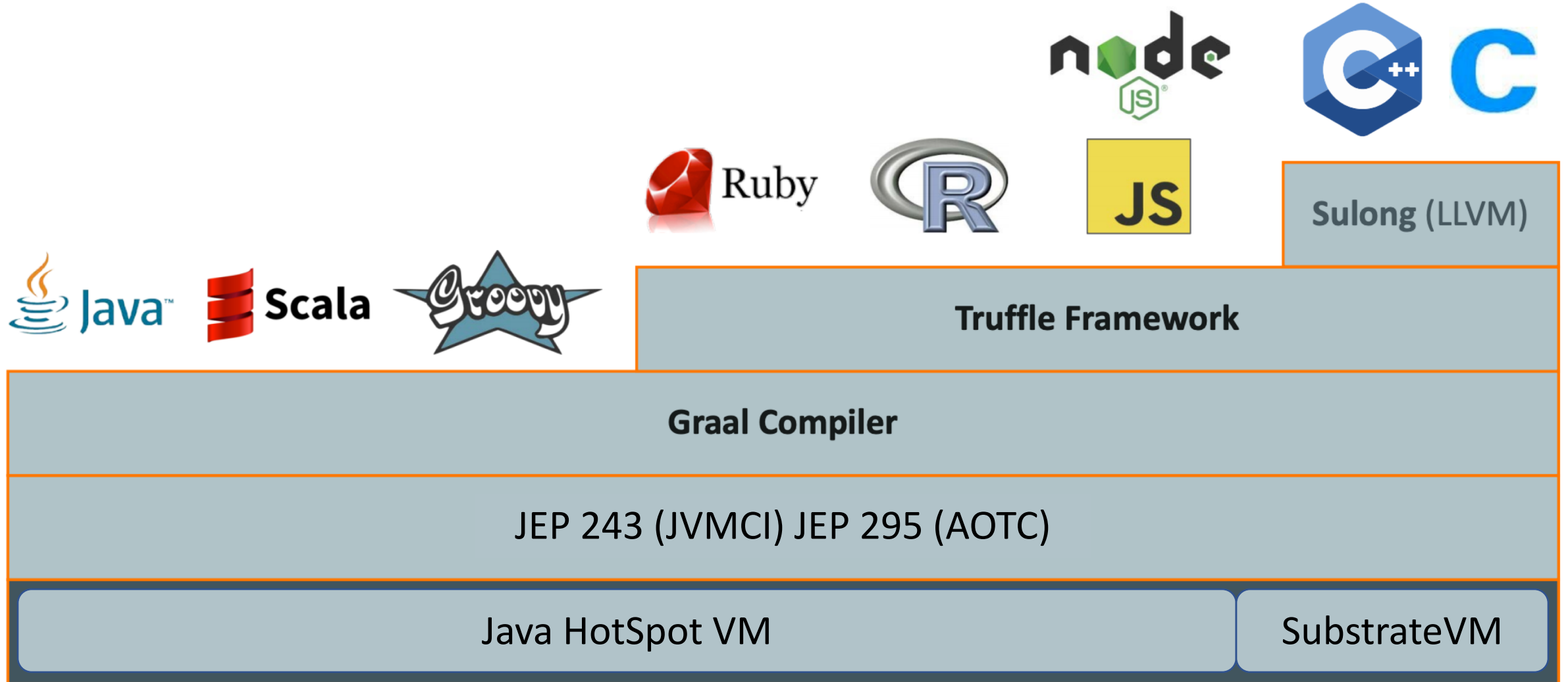


Allows a common stack for applications running in JavaScript, Python, Ruby, Java, Scala, C / C++ n many more.

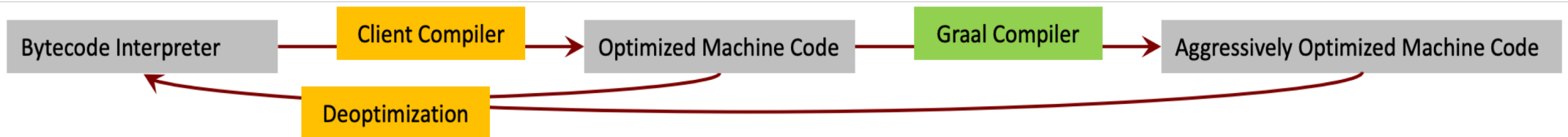


Provides interoperability in a shared runtime

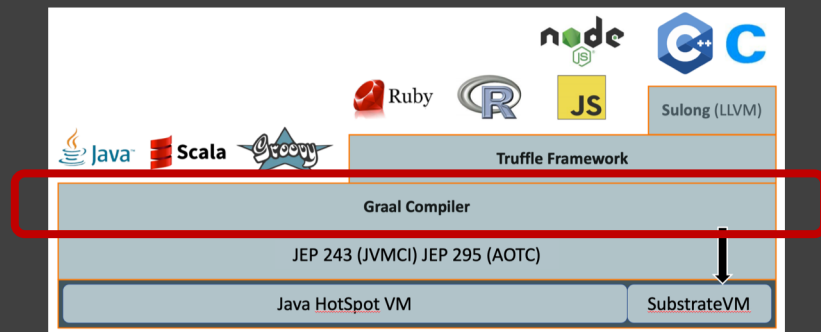
# Graal VM Architecture



# Graal Compiler



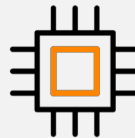
# Graal



Written in Java



Easy to maintain

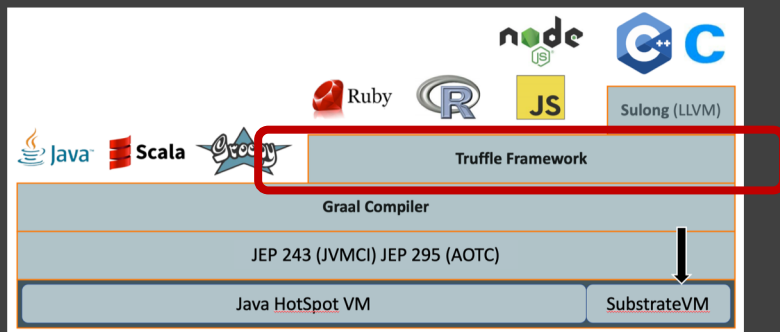


Embeddable



Support for Truffle based Languages

# Truffle



Language implementation framework



Currently supports Ruby, Python, R



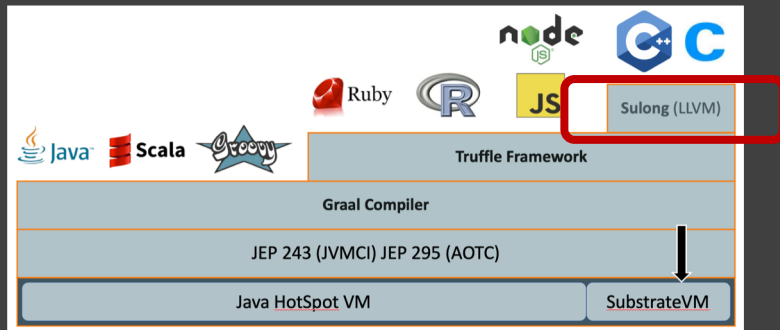
Provision to support new languages



Works with Graal  
Compiler to provide

Low-overhead language  
interoperations  
Language agnostic  
instrumentation

# Sulong

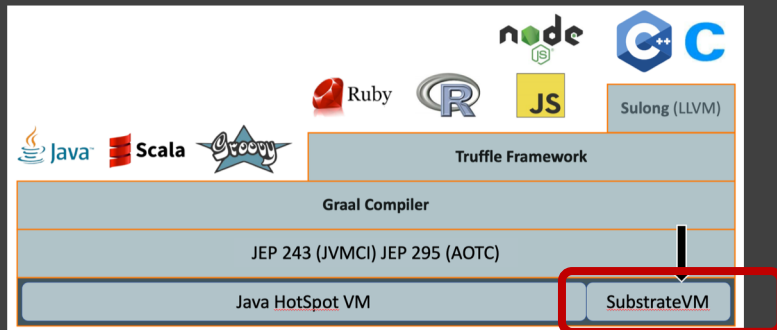


LLVM bitcode interpreter based on truffle framework



Support C/C++, Fortran and all languages that can be converted to LLVM bitcode

# Ahead of Time Compilation



Create Native Image with Graal AOT  
Compilation



Substrate VM executes native code



Reduces startup time and lower runtime  
memory overheads

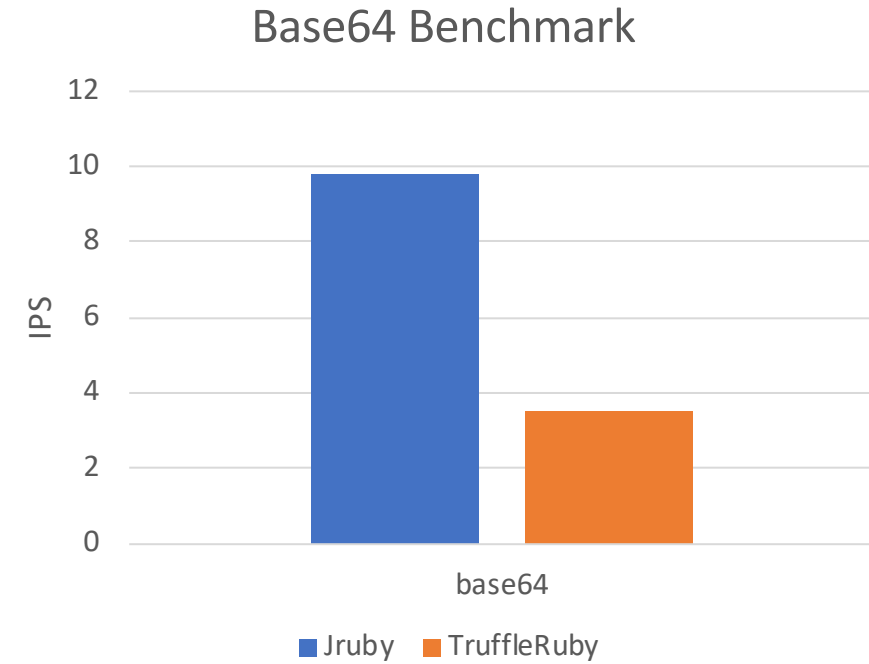
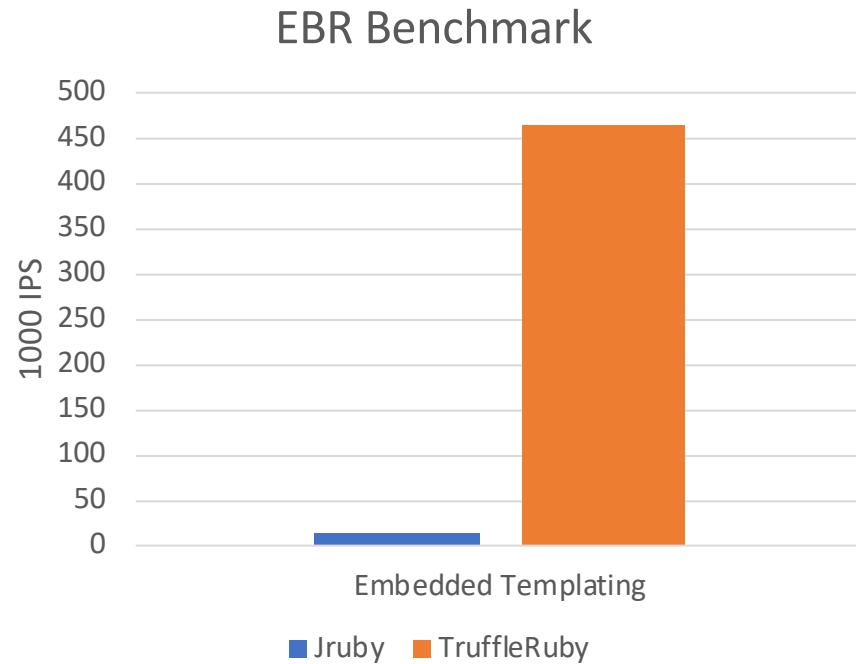


AOT support added in JDK 9  
(experimental). See JEP 295

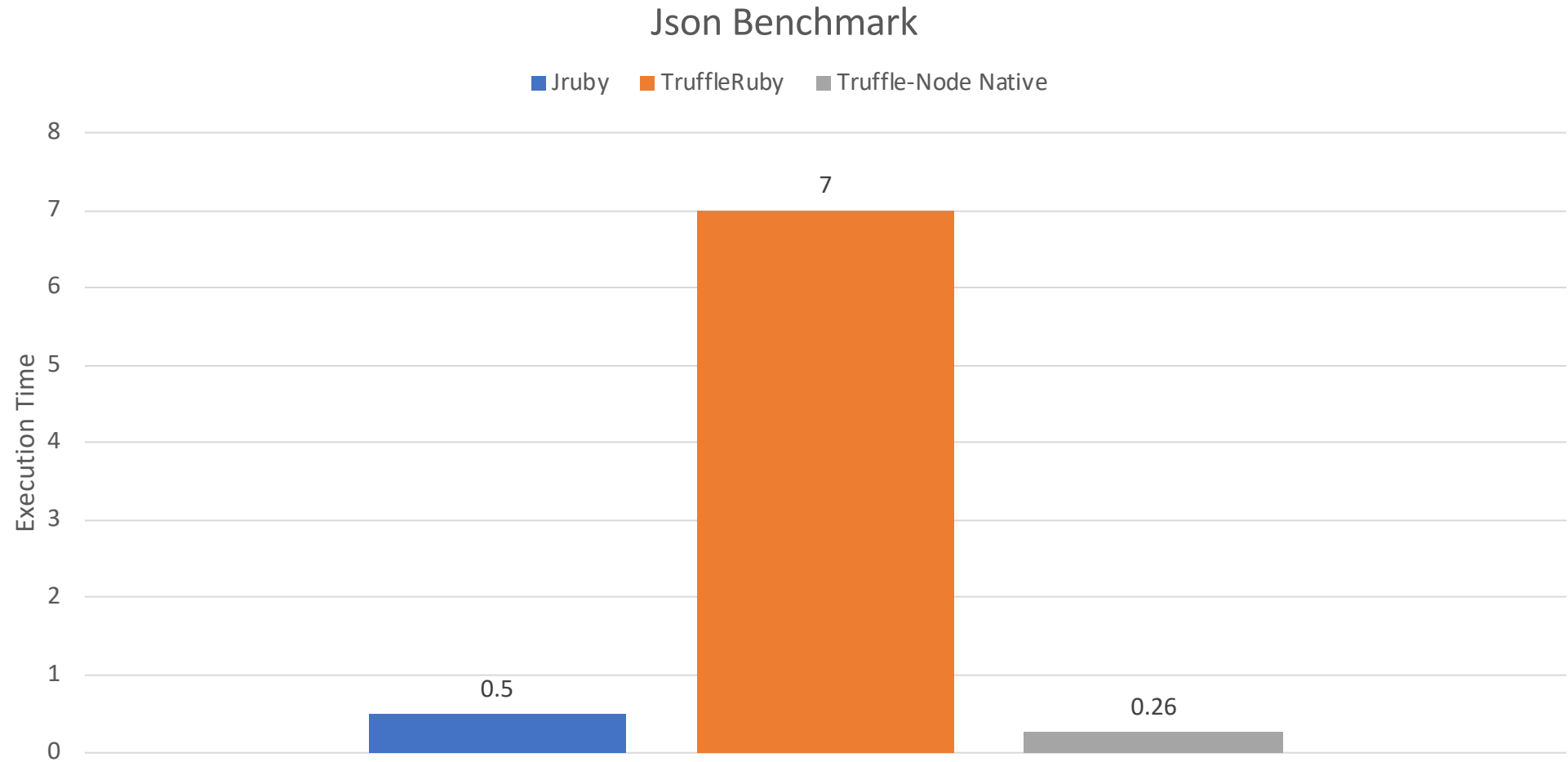
A young boy with glasses is sitting at a desk, holding a pencil to his chin. He is surrounded by stacks of books on both sides. The image is dimly lit, and the text "Should I be using Graal?" is overlaid in white. 

Should I be using Graal?

# Benchmarks



# Benchmarks



# Demo # 1

Ruby - Node Interop

# Demo # 2

Java - NodeJS Interop

## Lesson Learns

Better suited for custom code, libraries and SDKs

There are some performance gaps in truffle implementations

JDK 10+ is recommended for containerize applications

Not widely used in production apps (yet!)

# References

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## Git

<https://github.com/zaknuces/graal-benchmarks>

<https://github.com/oracle/graal>

<https://github.com/graalvm/>

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## Autodesk Cloud Platform

<https://forge.autodesk.com/>

<https://knowledge.autodesk.com/>

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## Open JDK

<https://openjdk.java.net/jeps/295>

<https://openjdk.java.net/jeps/243>

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## Research Papers

<https://chrisseaton.com/truffleruby/ropes-manlang.pdf>

<https://2016.ecoop.org/event/icooolps-2016-sulong-execution-of-llvm-based-languages-on-the-jvm>

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Thank you

For questions or comments:  @owais\_zahid  
#FOSSASIA-GRAAL