ORACLE

Truffle Framework

Introduction + New and Noteworthy

GraalVM Community Workshop - Christian Humer

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Safe harbor statement

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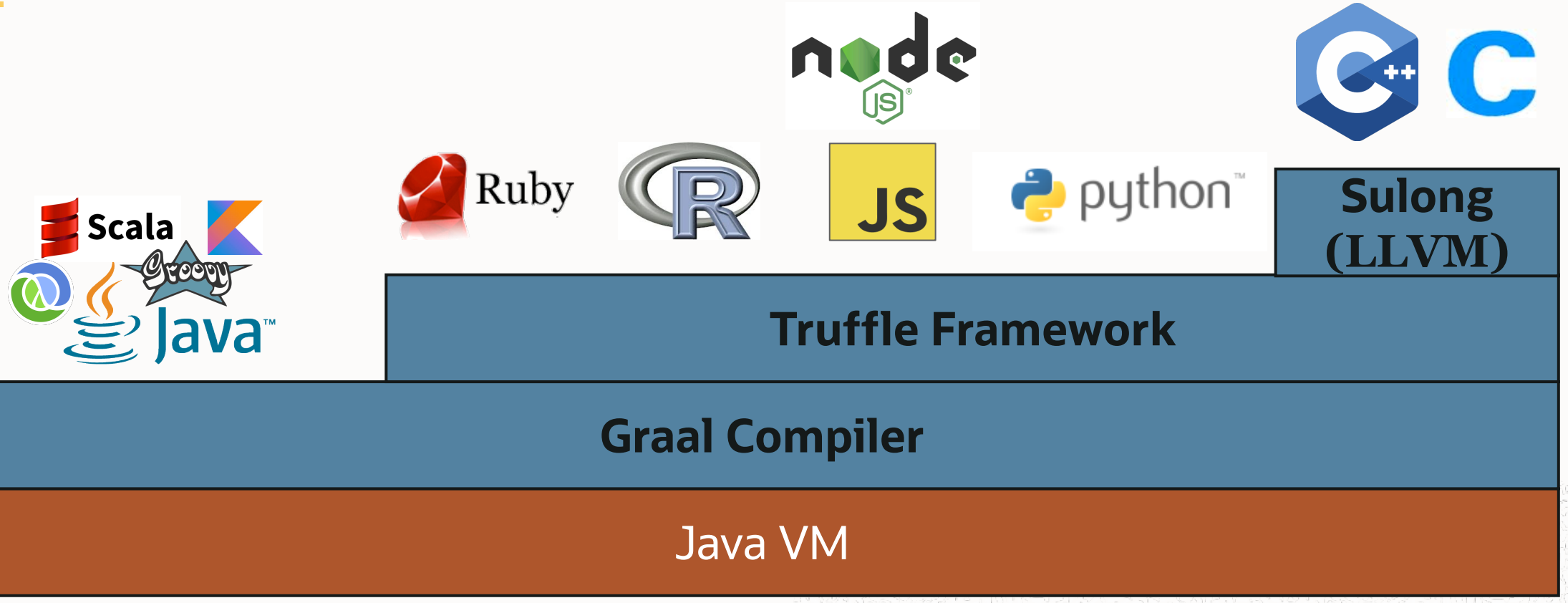
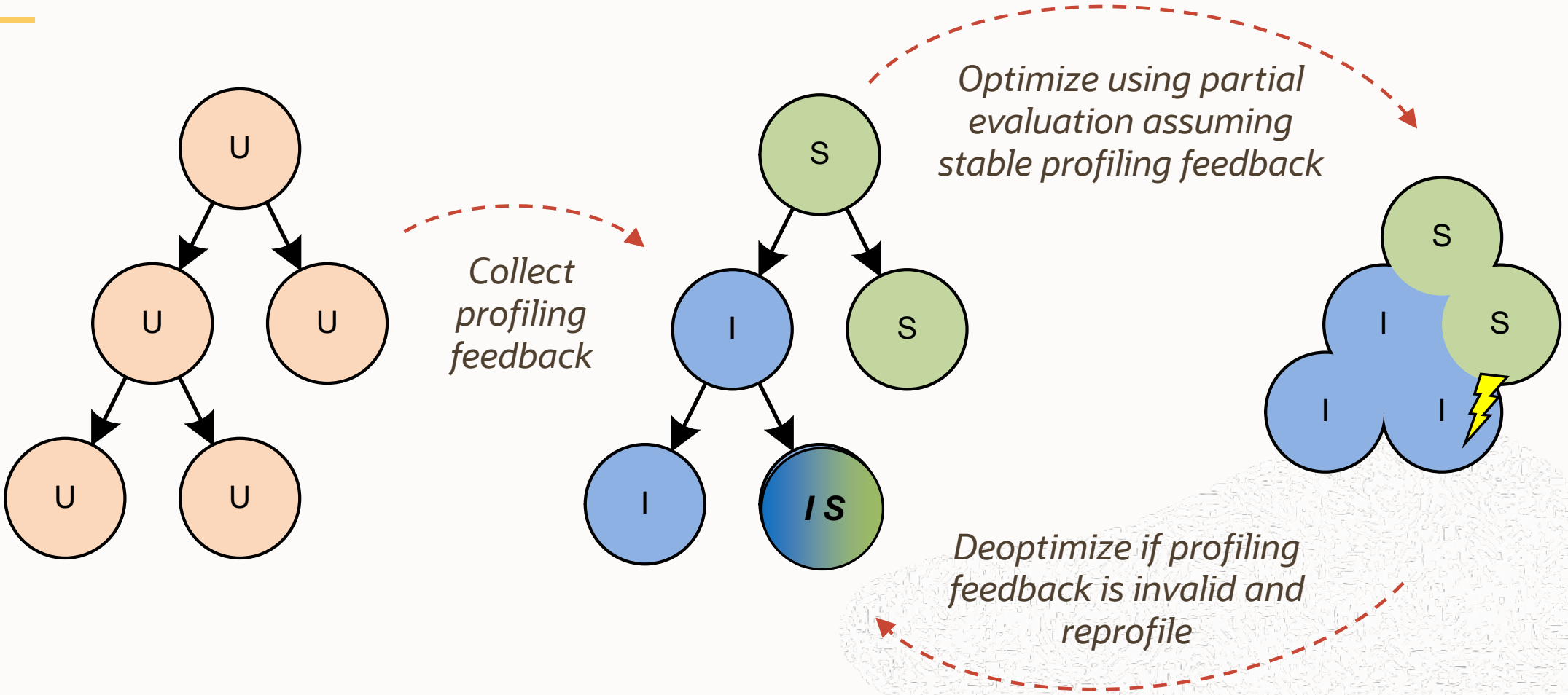
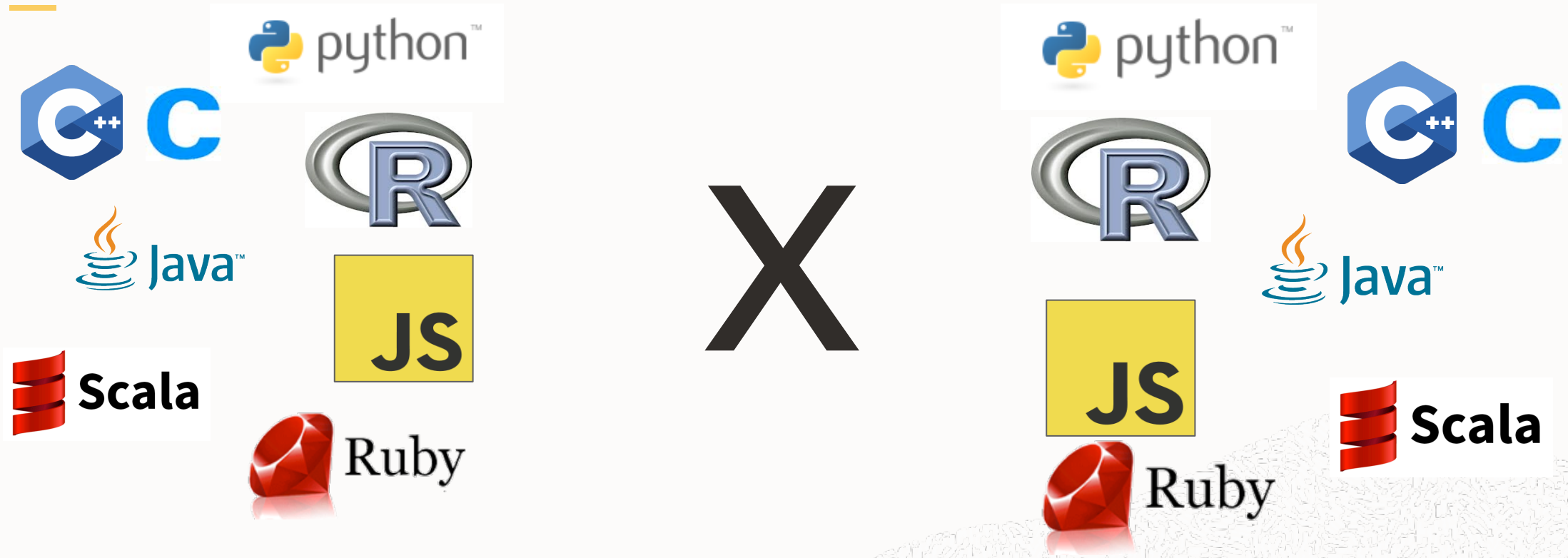
What is Truffle?



Automatic Transformation of Interpreters to Compilers



Truffle: Composing Languages



Truffle: Composing Languages

X

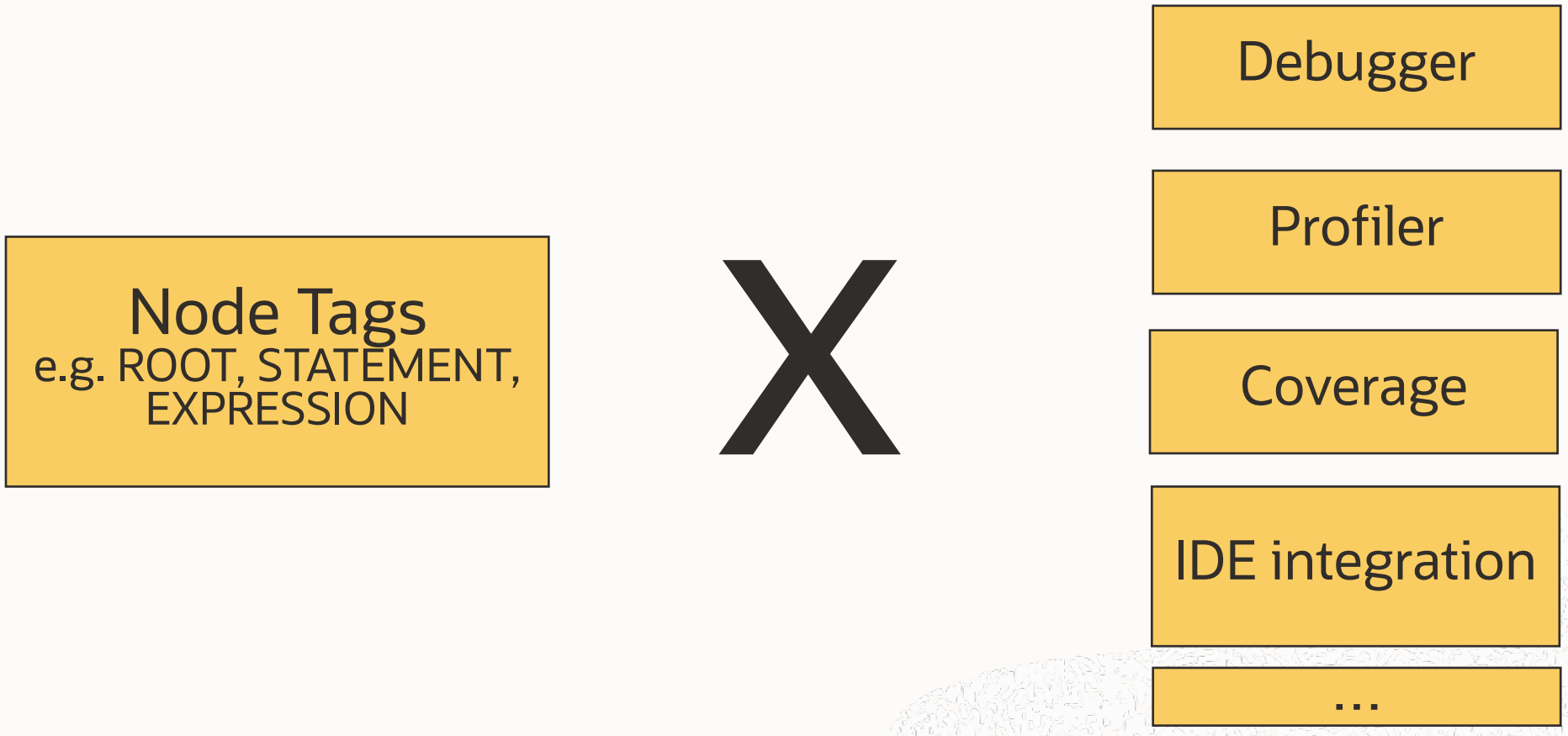
Interoperability Message Protocol

Truffle: Composing Tools

X

- Debugger
- Profiler
- Coverage
- IDE integration
- ...

Truffle: Composing Tools



Truffle: Polyglot Embeddability

```
import org.graalvm.polyglot.*;


try (Context context = Context.create()) {
    context.eval("js",     "print('Hello JavaScript!');");
    context.eval("R",      "print('Hello R!');");
    context.eval("ruby",   "puts 'Hello Ruby!'");
    context.eval("python", "print('Hello Python!')");
}
```

Embed once run all the languages.

Truffle: Focus Areas 19.0 -19.3

- Hardening the security boundary for polyglot contexts
  - Whitelist accessibility by default
- Environment Variable, Process and File System Abstractions
- Truffle Libraries: a new general framework for active libraries
  - Allows for better modularity and encapsulation in and between language implementations
- Migration of Polyglot Interoperability APIs to Truffle Libraries
  - Improved footprint and better usability

Truffle: New features in 19.3

- New embedding APIs for context specific time and statement count resource limits

```
ResourceLimits.newBuilder()
    .cpuTimeLimit(Duration.ofMillis(100),
                  Duration.ofMillis(10))
    .statementLimit(1000, null)
.build();
```

```
try (Context context = Context.newBuilder()
                    .resourceLimits(limits).build()) {
    context.eval("js", "while(true);");
    assert false;
} catch (PolyglotException e) {
    assert e.isCancelled();
}
```

- Support for temporary files and directories
- Partial Compilation with BlockNode
- New experimental language agnostic inlining heuristic.

New Inlining Example

```
function foo(a) {
    return a + a + a + a + a + a + a + a +
           ...
           a + a + a + a + a + a + a + a;
}
function bar() { return foo(22) + foo(20); }
```

```
[truffle] inline start   bar        |ASTSize    10
[truffle] inline failed    foo      |ASTSize  2814 |reason totalNodeCount > 2250
[truffle] inline failed    foo      |ASTSize  2814 |reason totalNodeCount > 2250
[truffle] inline done    bar        |ASTSize    10
```

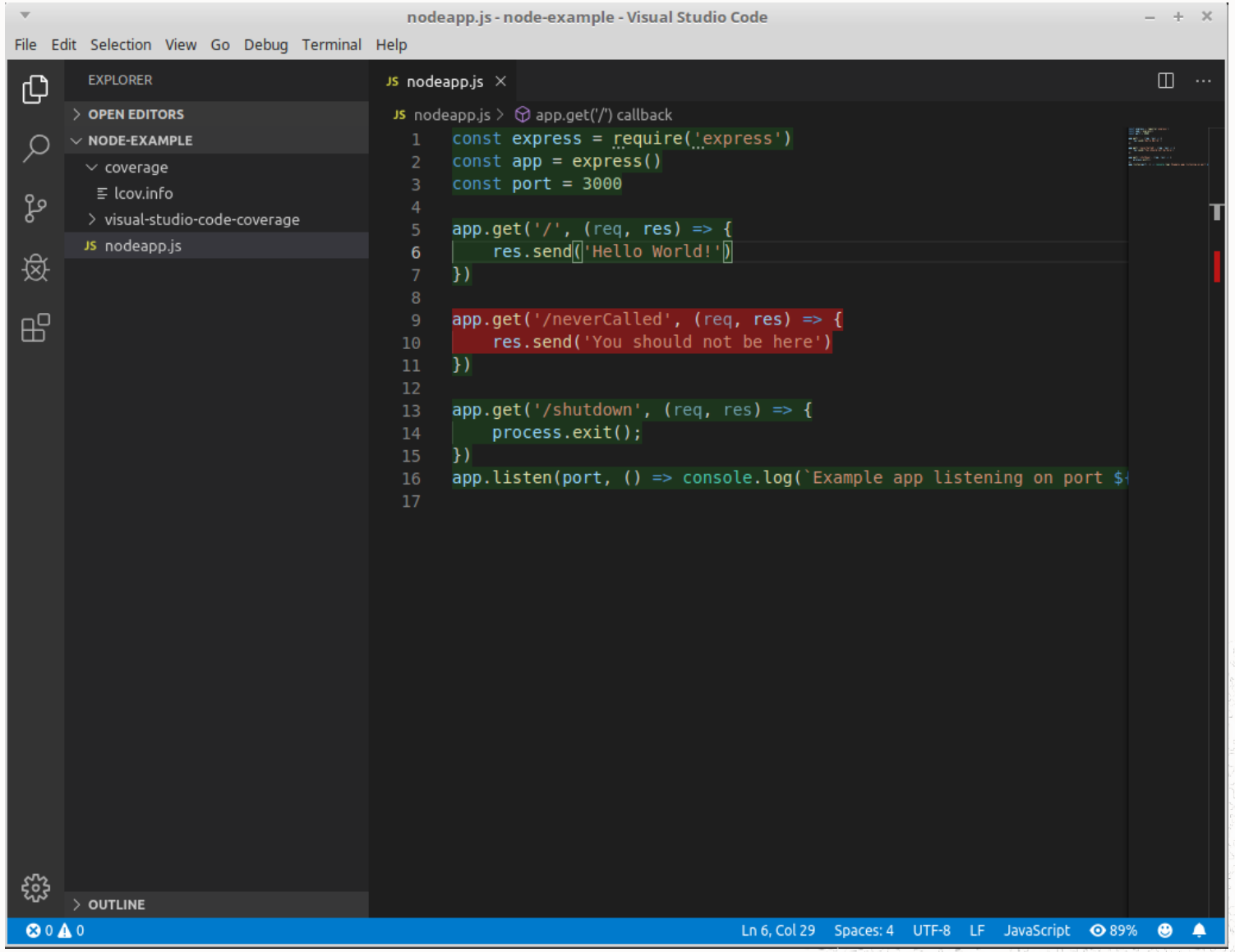
Enable New Inlining: `-Dgraal.TruffleLanguageAgnosticInlining=true`

```
[truffle] inline start   bar        |IR Nodes   162
[truffle] inline success   foo      |IR Nodes    16
[truffle] inline success   foo      |IR Nodes    16
[truffle] inline done    bar        |IR Nodes   162
```

Truffle: New features in 19.3

- New Version API for Embedders in Graal SDK
  - `Version.getCurrent().compareTo(19, 3) <= 0`
- Class Loader Isolation For JDK 11
  - No dependency conflicts with host applications.
- Code Coverage Support (`--coverage`)
  - No changes in the Truffle Languages required (uses statement and root tags)
  - `--coverage.Output = histogram | detailed | json | lcov`

Truffle Code Coverage in VS Code



Focus areas for Truffle 20.0 and Beyond

- Tooling Support for Language Server Protocol Support
- Better Interoperability (Dictionaries, Meta-Access)
- Improvements for Bytecode Interpreters
  - Instrumentation + Frames + OSR + Partial Compilation
- Memory Resource Limits
- Sharing Code/Warmup across multiple Processes
  - A new solution for polyglot FaaS platforms?