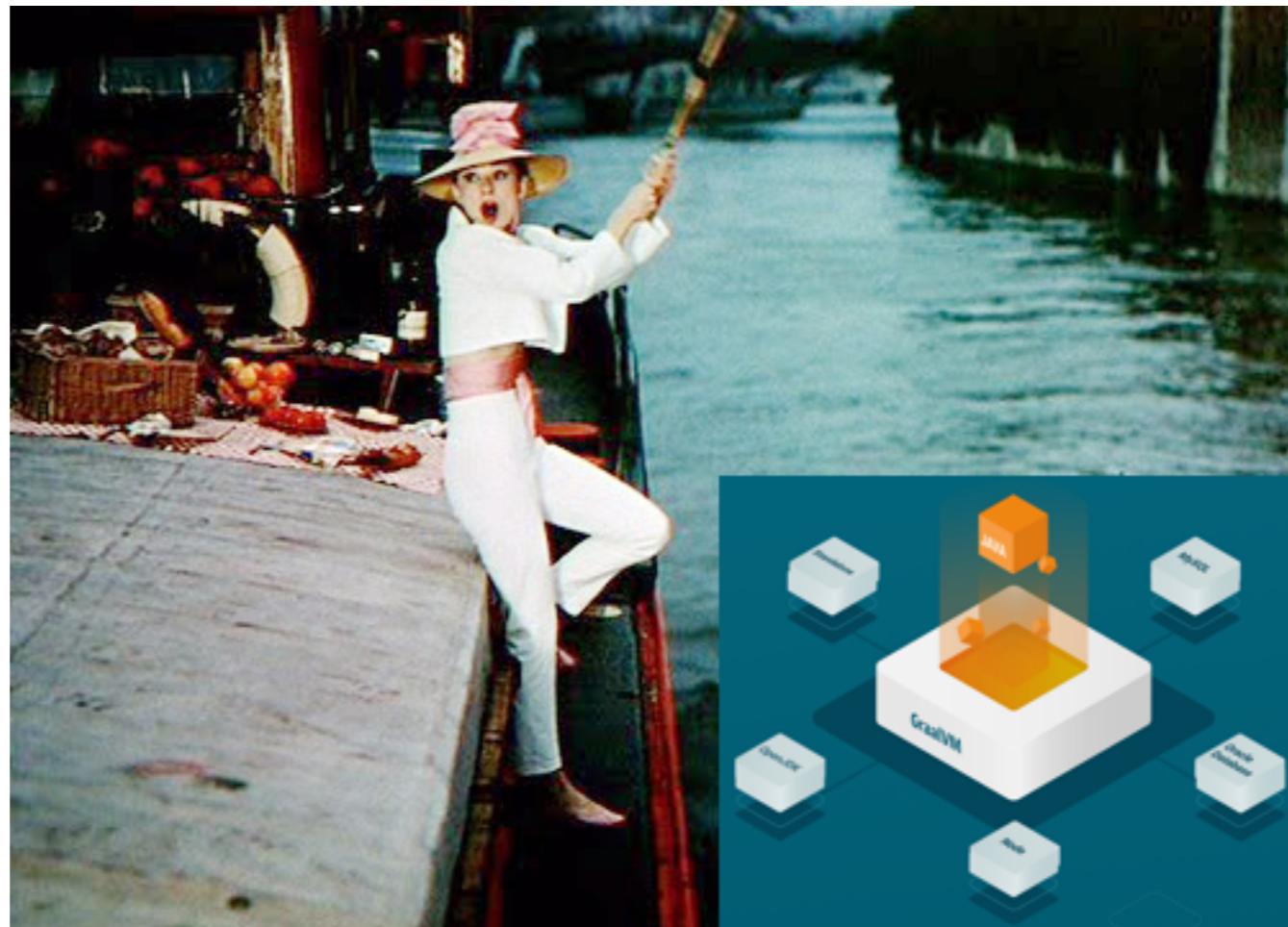


# Audrey

## On Demand Run time Information



Rathesan Iyadurai  
16. April 2019

Supervised by Haidar Osman, Boris Spasojević and Oscar Nierstrasz

```
function blend(c1, c2, w) {  
    var result = new Flog.RayTracer.Color(0,0,0);  
  
    result = Flog.RayTracer.Color.prototype.add(  
        Flog.RayTracer.Color.prototype.multiplyScalar(c1, 1 - w),  
        Flog.RayTracer.Color.prototype.multiplyScalar(c2, w)  
    );  
  
    return result;  
}
```

```
function blend(c1, c2, w) {  
    var result = new Flog.RayTracer.Color(0, 0, 0);  
  
    result = Flog.RayTracer.Color.prototype.add(  
        Flog.RayTracer.Color.prototype.multiplyScalar(c1, 1 - w),  
        Flog.RayTracer.Color.prototype.multiplyScalar(c2, w)  
    );  
  
return result;  
}
```

```
c1: Object
  {red: 0.15, green: 0.72959, blue: 0.72959}
c2: Object
  {red: 0.29160, green: 0.29160, blue: 0.29160}
w: number
0.3

function blend(c1, c2, w) {
  var result = new Flog.RayTracer.Color(0, 0, 0);

  result = Flog.RayTracer.Color.prototype.add(
    Flog.RayTracer.Color.prototype.multiplyScalar(c1, 1 - w),
    Flog.RayTracer.Color.prototype.multiplyScalar(c2, w)
  );

  return result;
}

Object
{red: 0.94499, green: 0.96459, blue: 0.96459}
```

# **Audrey in Action**

# Part I

Multi-language example gathering powered by Truffle

# Part I

Multi-language example gathering powered by Truffle

# Multi-language: Why?

The screenshot shows the Stack Overflow homepage. At the top, there is a navigation bar with the Stack Overflow logo, followed by links for "Questions", "Tags", "Tour", and "Users". Below the navigation bar, a banner states: "Stack Overflow is a question and answer site for professional and enthusiast programmers. It's 100% free, no registration required." A main question title "Why can't there be an “ultimate” programming language?" is displayed in bold black text. Below the question, a message indicates it was "closed as not constructive by Tim, Bo Persson, Devon\_C\_Miller, Mark, Graviton Jan 17 at 5:58".

Stack Overflow is a question and answer site for professional and enthusiast programmers. It's 100% free, no registration required.

**Why can't there be an “ultimate” programming language?**

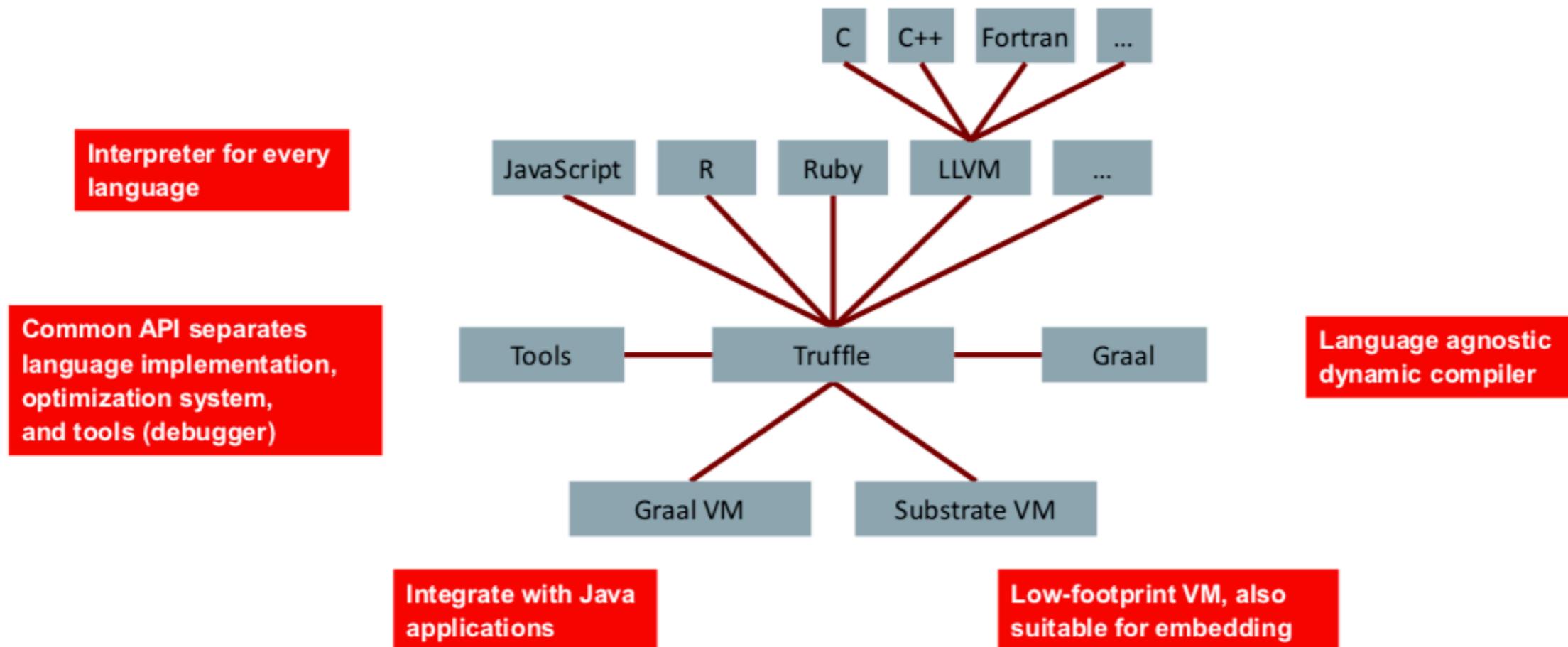
closed as not constructive by [Tim](#), [Bo Persson](#), [Devon\\_C\\_Miller](#), [Mark](#), [Graviton](#) Jan 17 at 5:58

# Part I

Multi-language example gathering powered by **Truffle**

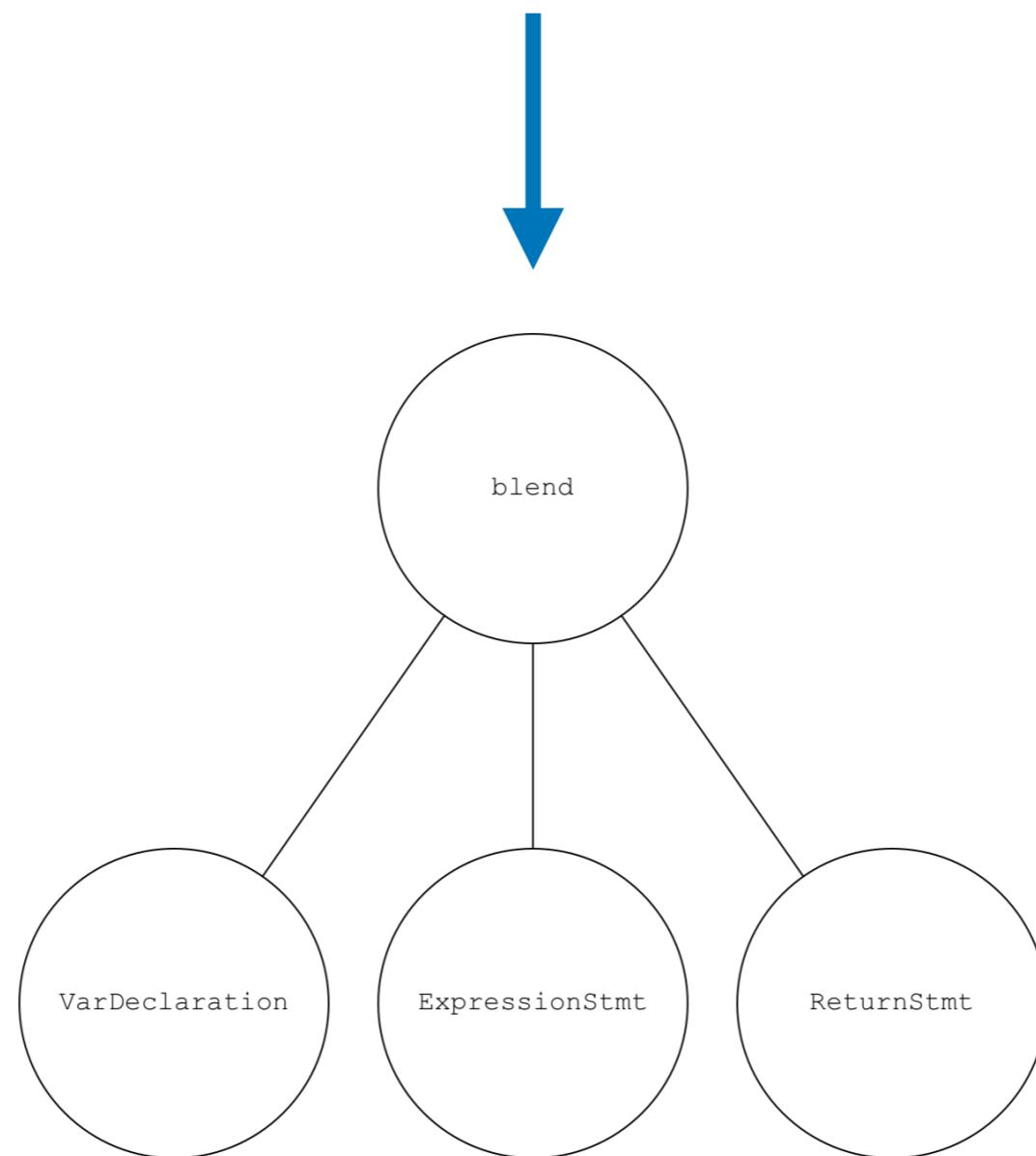
# A language implementation framework

## Overall System Structure



*From presentations given by Christian Wimmer, Christian Humer, Matthias Grimmer and Boris Spasojević*

```
function blend(c1, c2, w) {  
    var result = new Flog.RayTracer.Color(0,0,0);  
  
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        Flog.RayTracer.Color.prototype.multiplyScalar(c1, 1 - w),  
        Flog.RayTracer.Color.prototype.multiplyScalar(c2, w)  
    );  
  
    return result;  
}
```



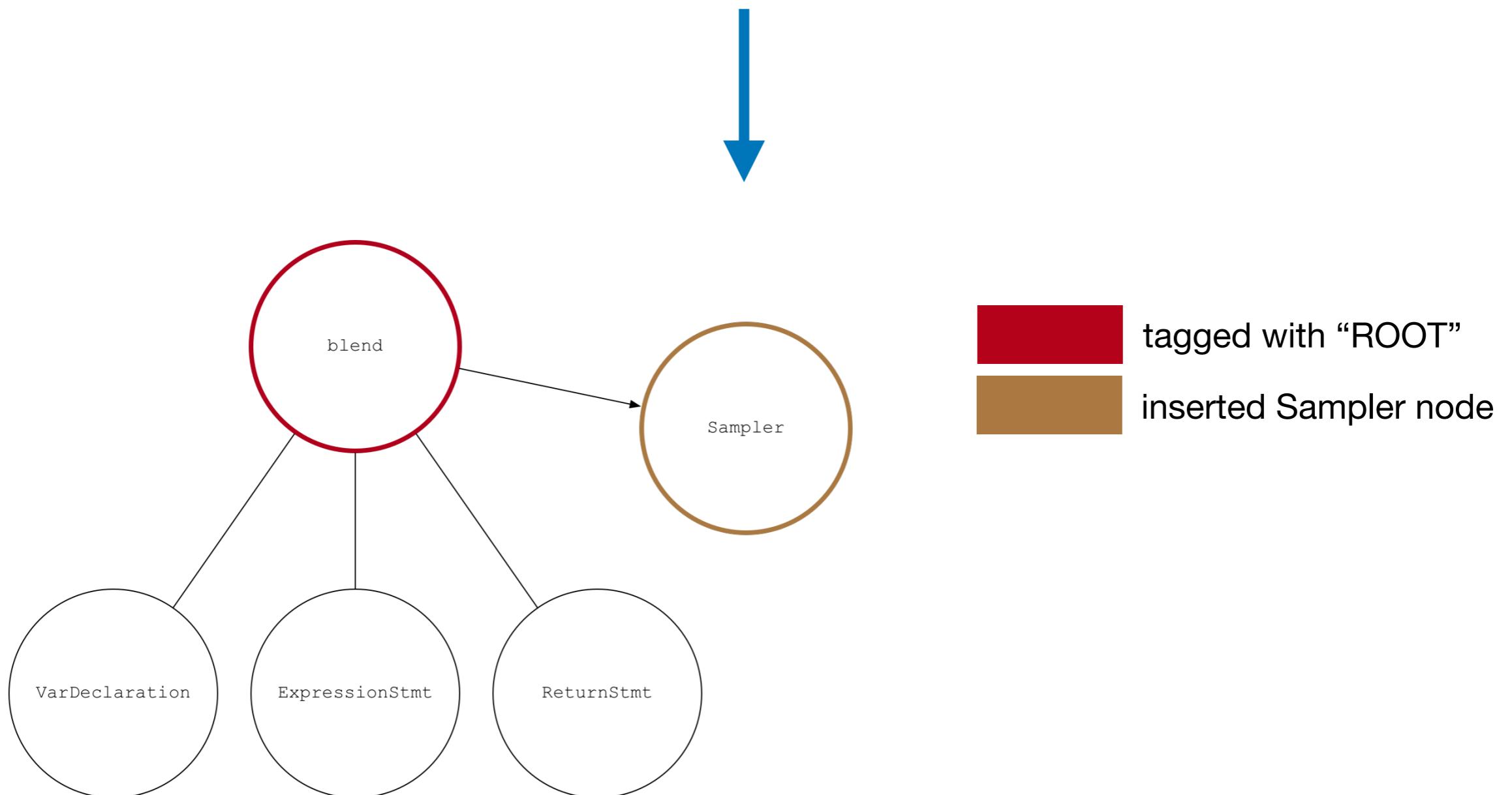
```

function blend(c1, c2, w) {
  var result = new Flog.RayTracer.Color(0,0,0);

  result = Flog.RayTracer.Color.prototype.add(
    Flog.RayTracer.Color.prototype.multiplyScalar(c1, 1 - w),
    Flog.RayTracer.Color.prototype.multiplyScalar(c2, w)
  );

  return result;
}

```



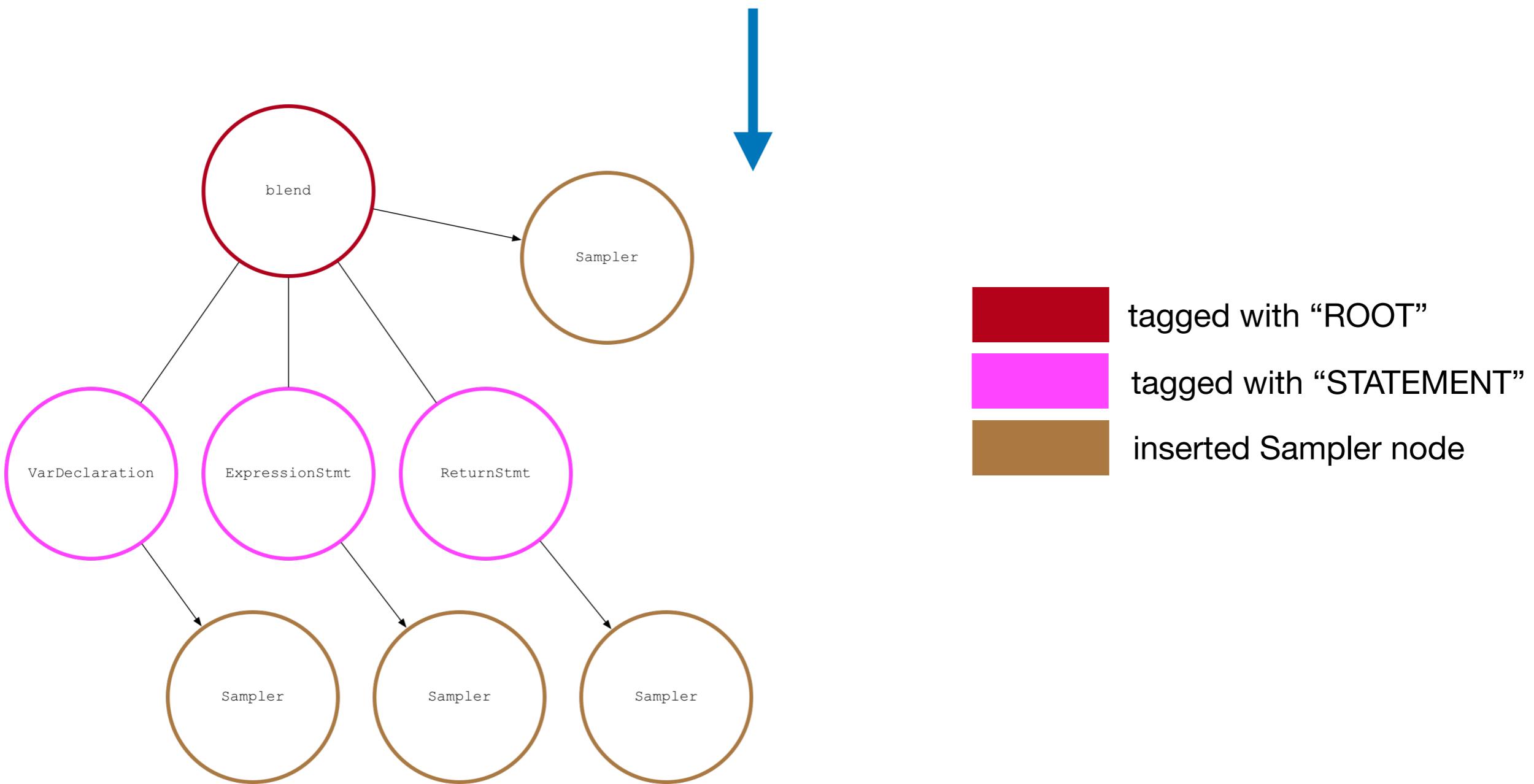
```

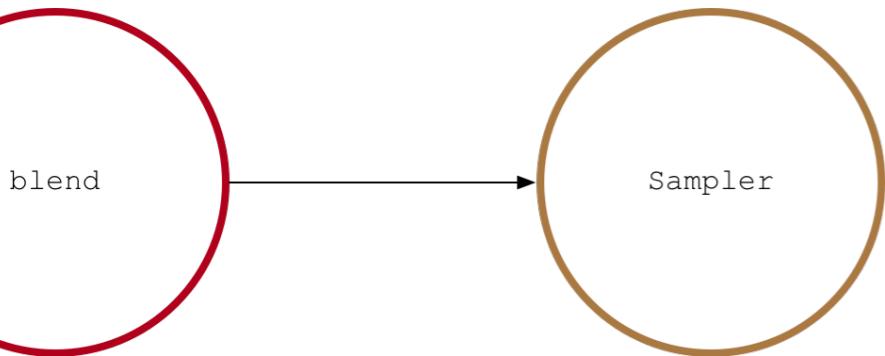
function blend(c1, c2, w) {
  var result = new Flog.RayTracer.Color(0,0,0);

  result = Flog.RayTracer.Color.prototype.add(
    Flog.RayTracer.Color.prototype.multiplyScalar(c1, 1 - w),
    Flog.RayTracer.Color.prototype.multiplyScalar(c2, w)
  );

  return result;
}

```





# Glorified Log Statements

```

function blend(c1, c2, w) {
    // ...

```

**1. Get run-time values of c1, c2 and w**

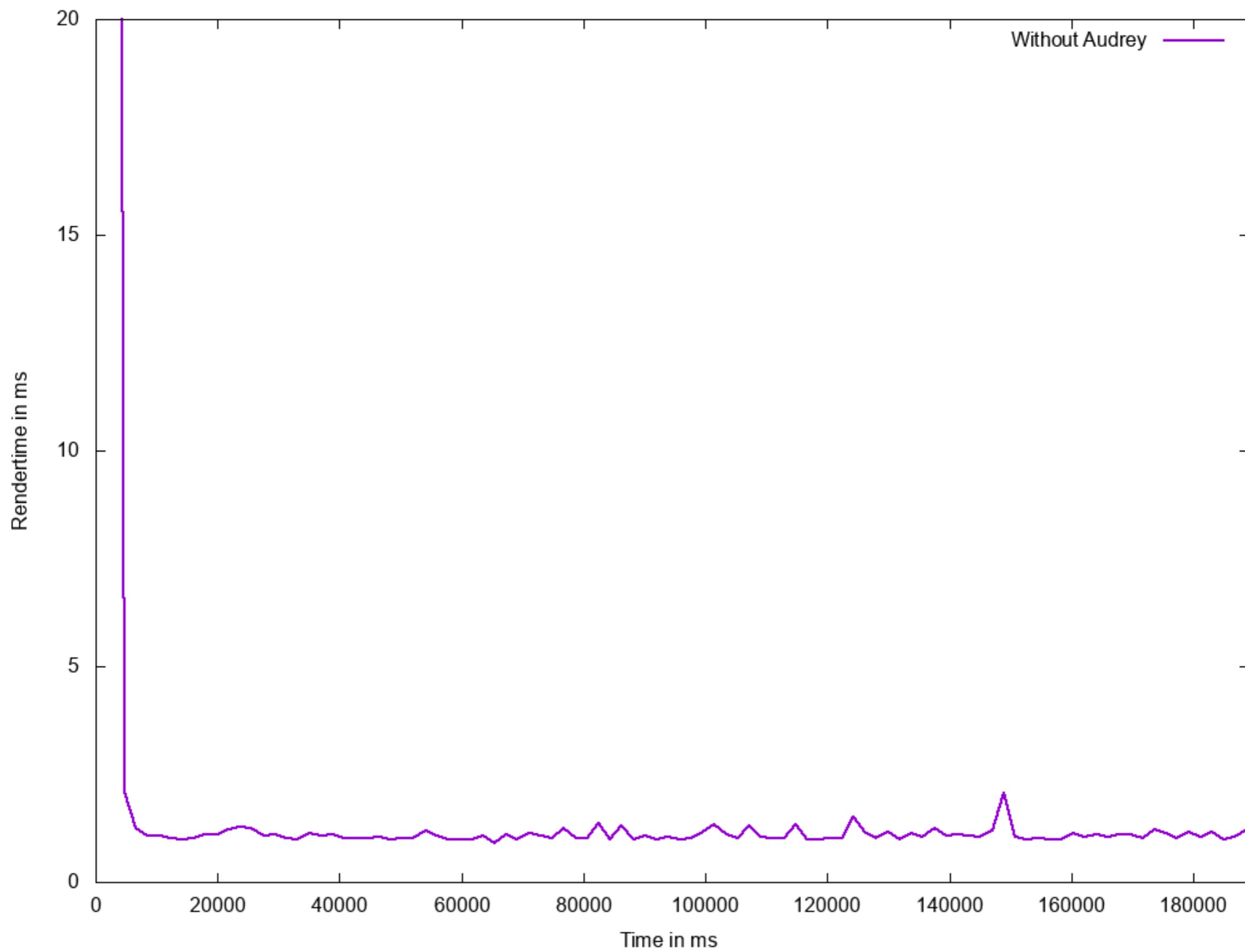
**2. Get a debug string representation, e.g. for c1:**

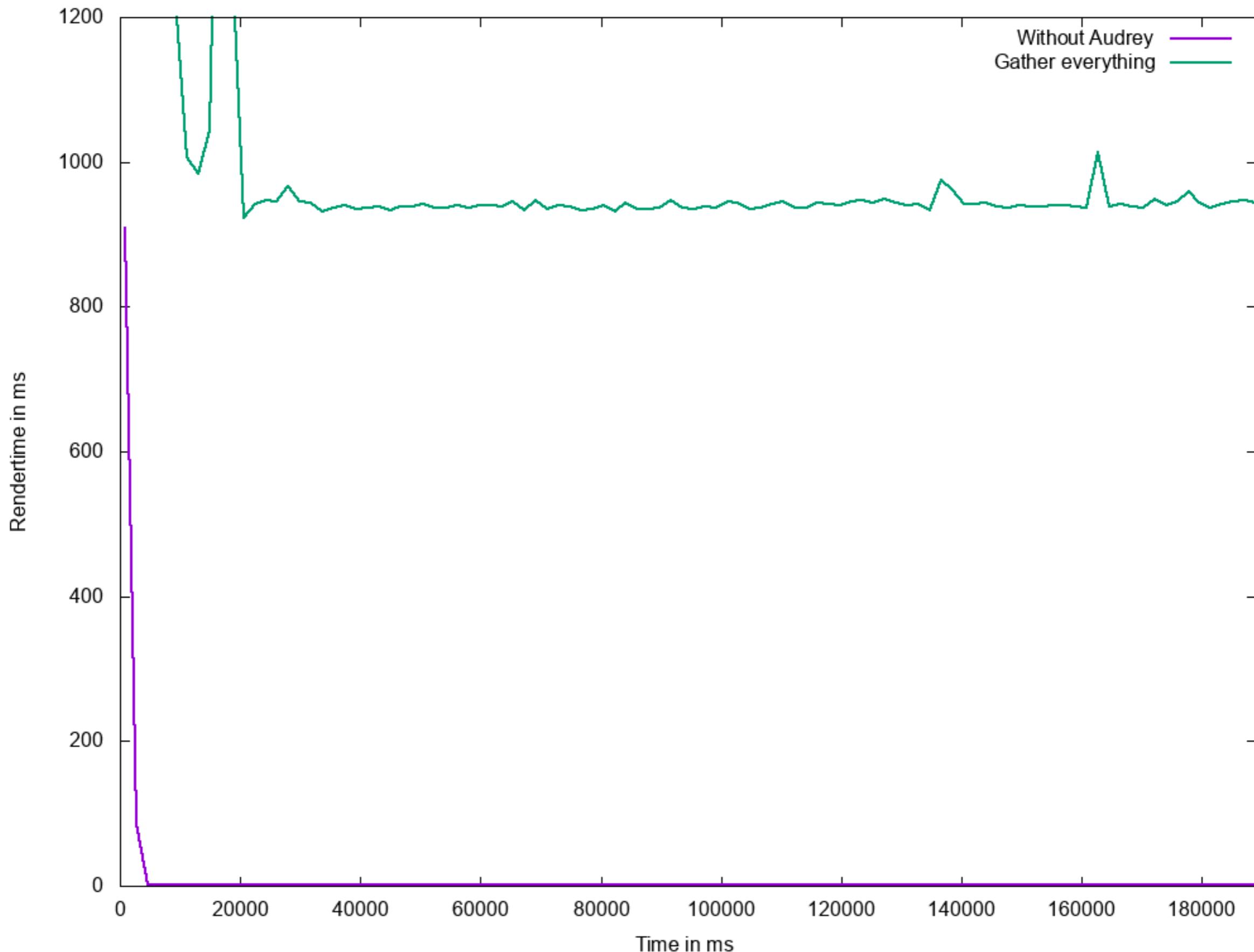
```
{red: 0.15, green: 0.72959, blue: 0.72959}
```

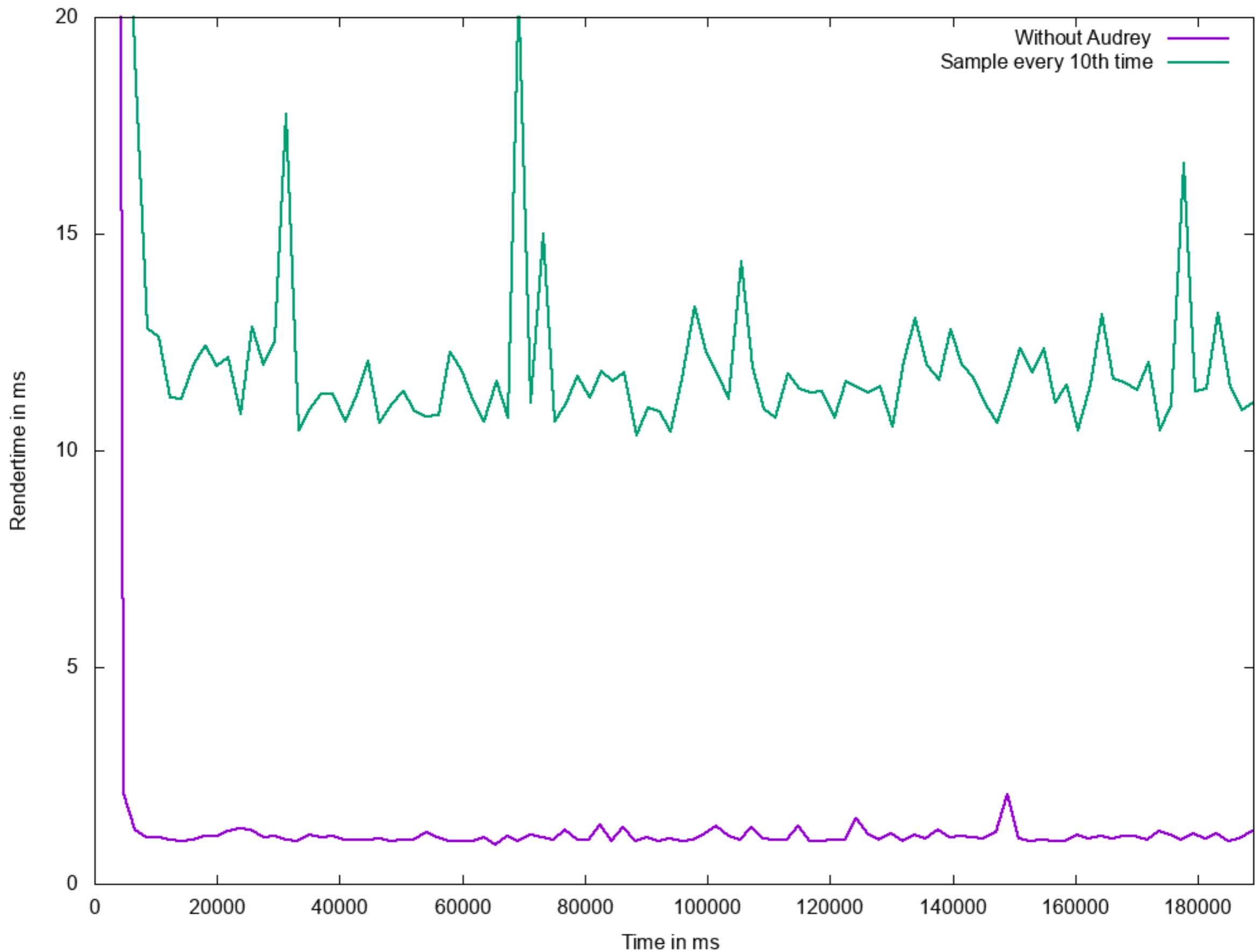
**3. Log with additional meta information to Redis:**

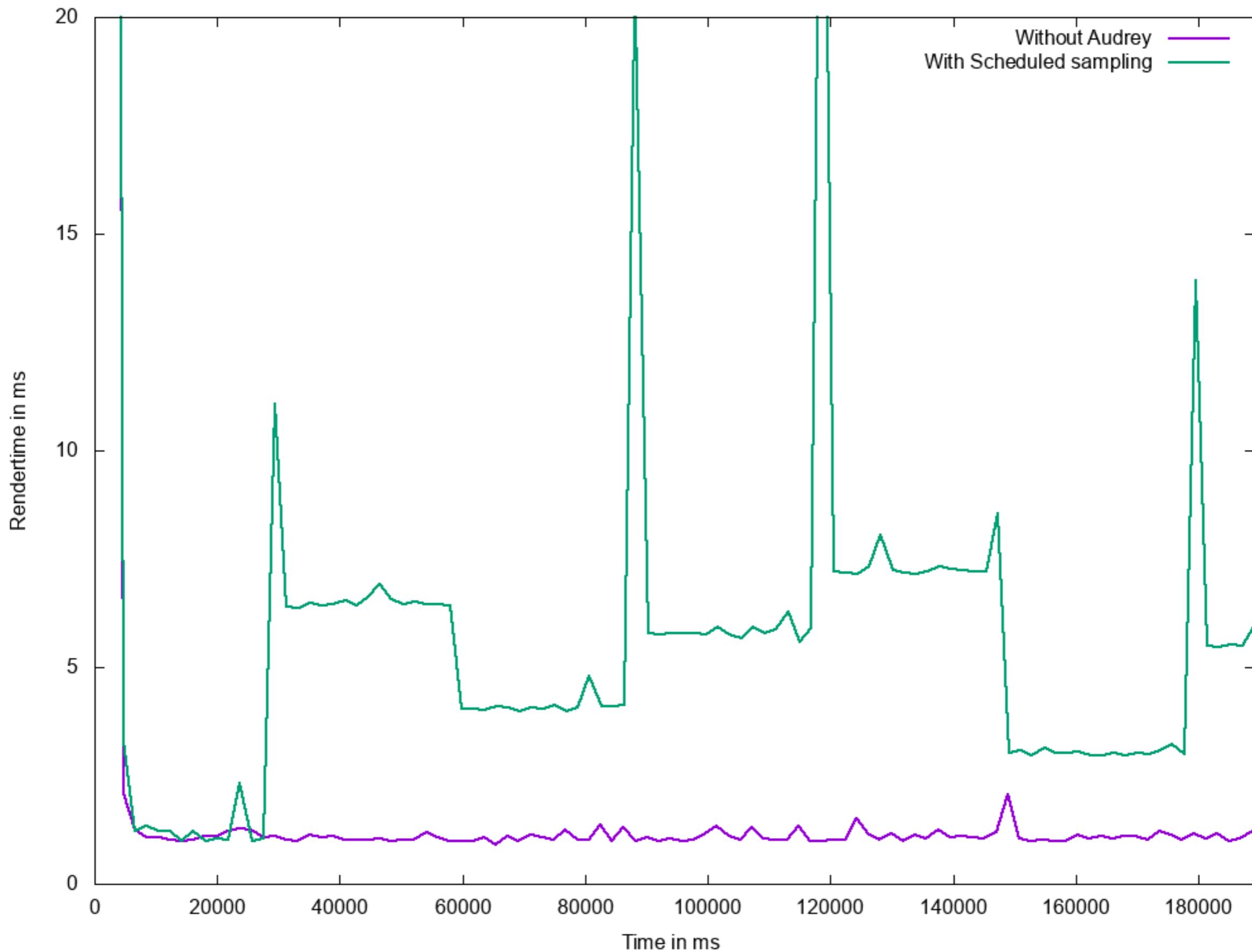
```
{
  "identifier": "c1",
  "identifierIndex": 0,
  "metaObject": "Object",
  "value": "{red: 0.15, green: 0.72959, blue: 0.72959}",
  "rootNodeId": "blend",
  "category": "ARGUMENT",
  "source": "/Users/radi/foo/bar/raytrace.js",
  "sourceLine": 166,
  "sourceIndex": 4464,
  "sourceLength": 328
}
```

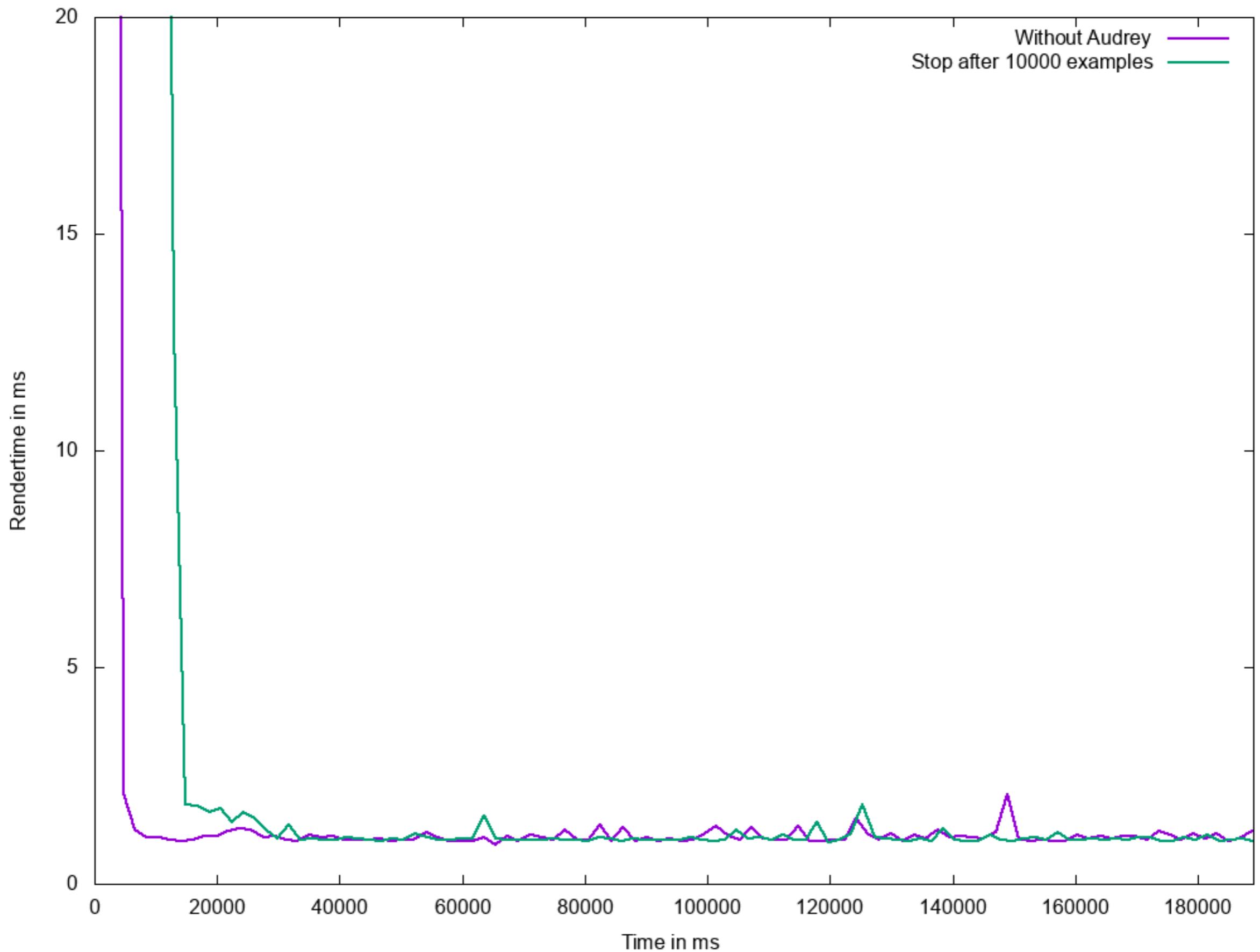












# Part II

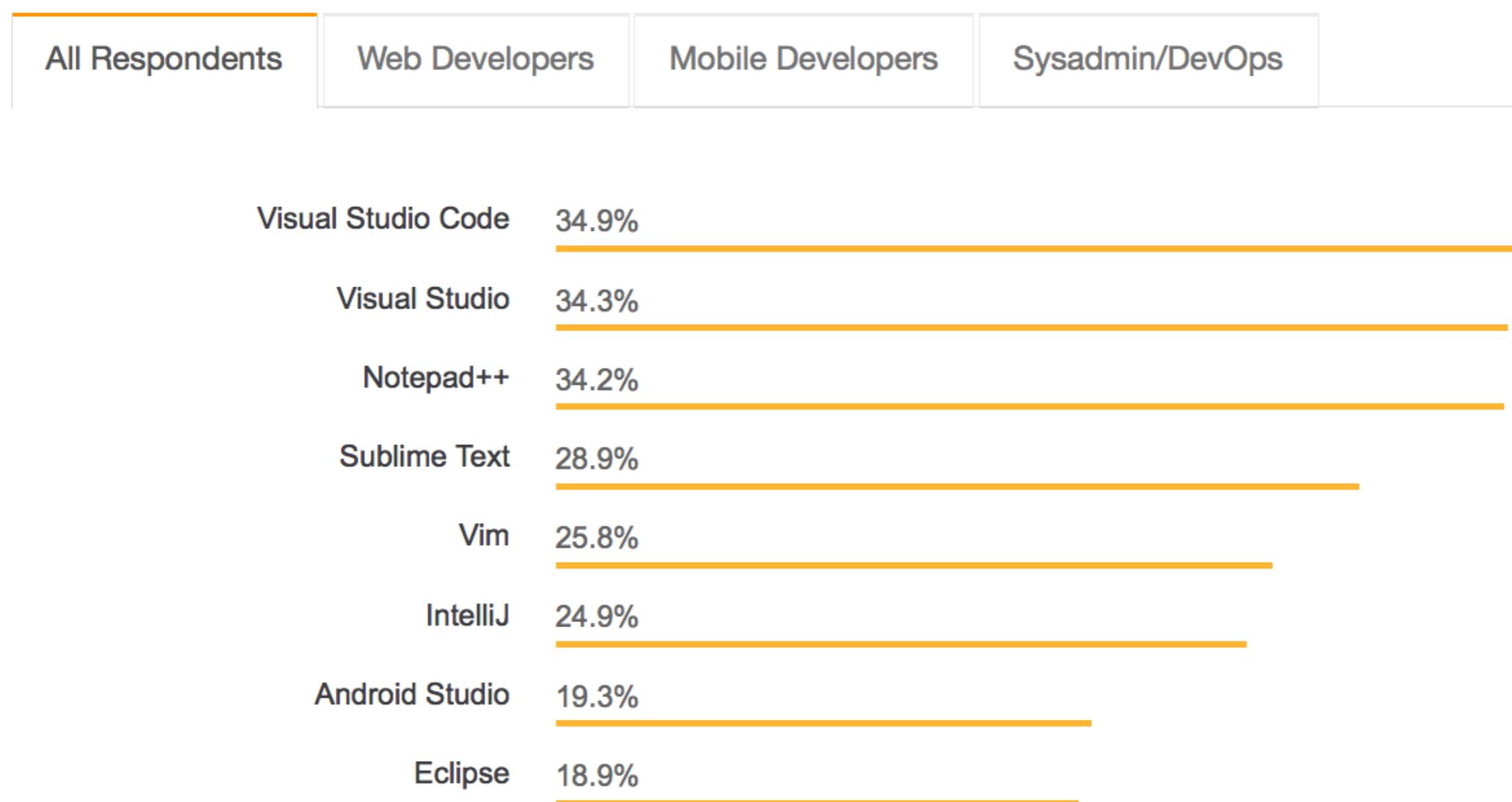
Getting the examples to multiple IDEs via the  
Language Server Protocol

# Part II

Getting the examples to **multiple IDEs** via the  
Language Server Protocol

# Multiple IDEs: Why?

## Most Popular Development Environments

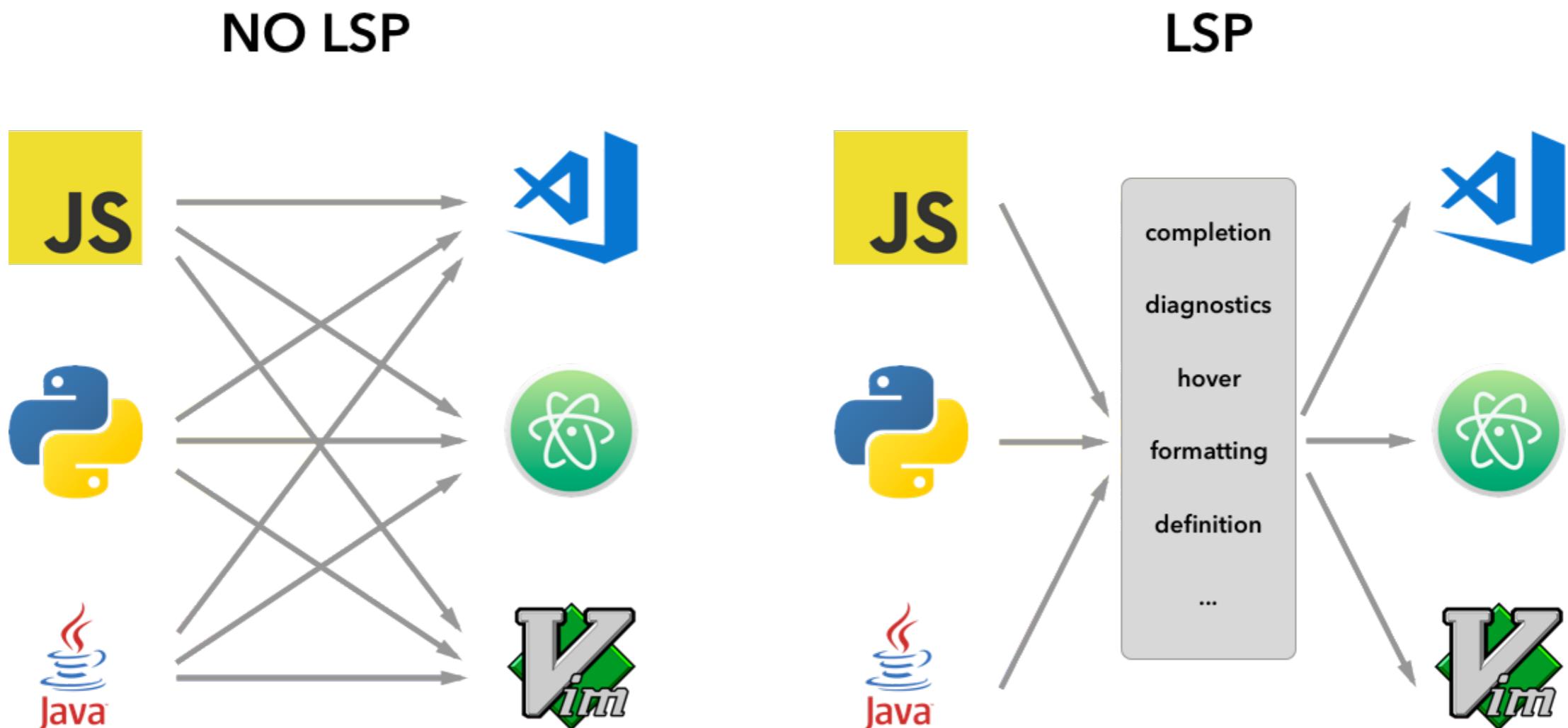


From the 2019 StackOverflow Developer Survey Results

# Part II

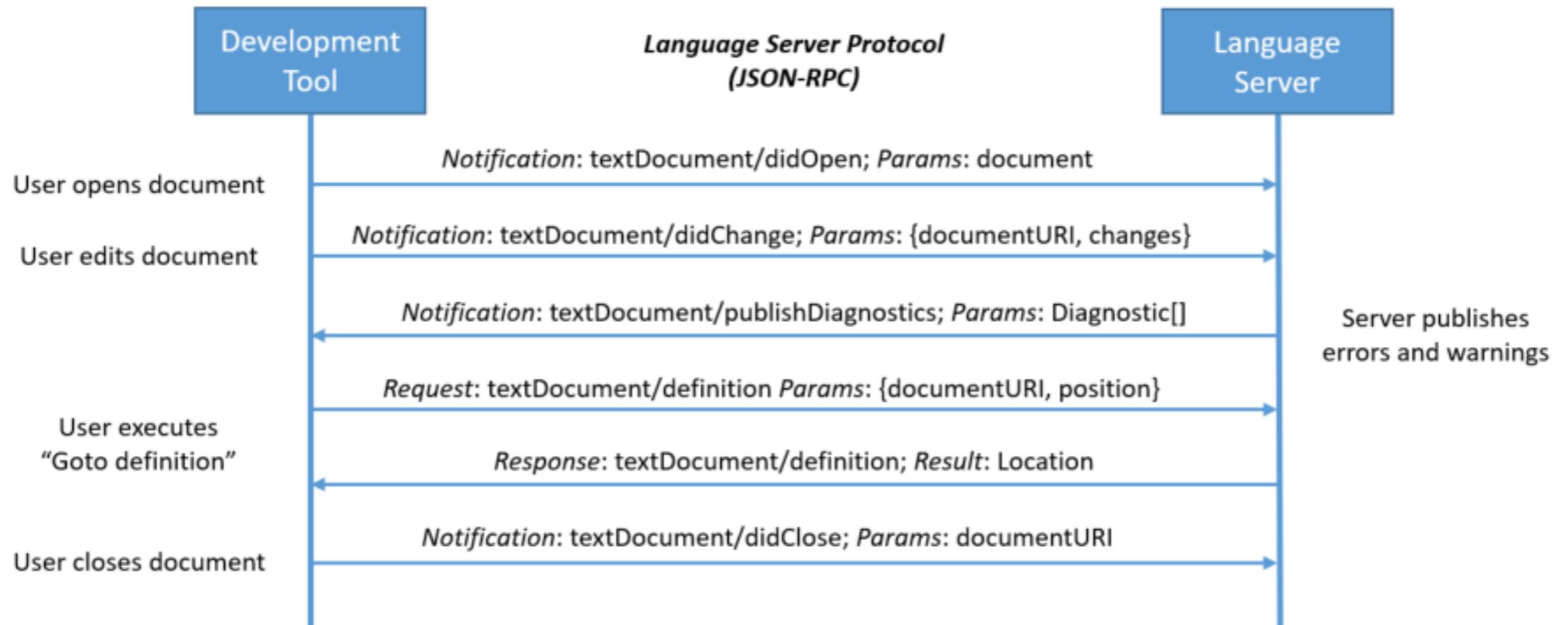
Getting the examples to multiple IDEs via the  
**Language Server Protocol**

# LSP: Why?



From <https://code.visualstudio.com/api/language-extensions/language-server-extension-guide#why-language-server>

# LSP Example



From <https://microsoft.github.io/language-server-protocol/overview>

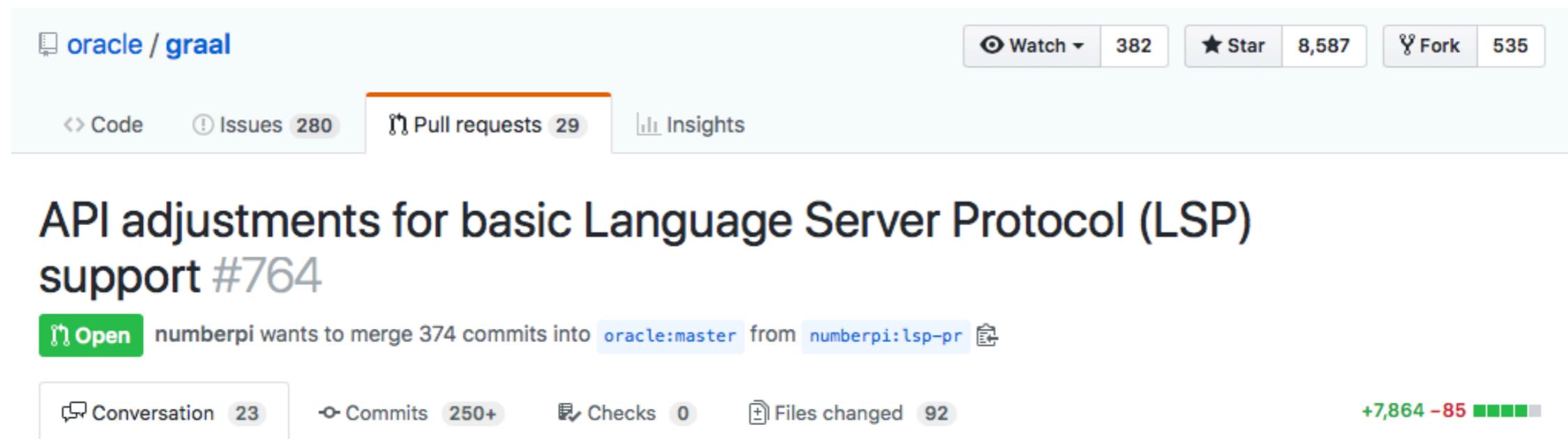
# Development Tool

# Audrey Server

```
function blend(c1, c2, w) {  
    // ...  
  
    Request: textDocument/hover;  
    Params: { documentURI, position }  
  
    // position  
    {  
        "line": 0,  
        "character": 15  
    }
```

**Can't you send  
more info??**

# Built-in LSP Support for Truffle Languages



<https://github.com/oracle/graal/pull/764>

## Development Tool

```
function blend(c1, c2, w) {  
    // ...
```

Notification: textDocument/didOpen



Request: textDocument-hover



Response: textDocument-hover



```
c1: Object  
{red: 0.15, green: ...}  
c2: Object  
{red: 0.29160, green: ...}  
w: number  
0.3
```

**Decides how to render the contents**

## Audrey Server

## JS Backend

delegate

delegate

relevant samples

# Least common denominator problem



yole ⚡ JetBrains Team

Sep '17

The LSP doesn't allow to build *outstanding* support for a language, it allows to build the "least common denominator" support only.

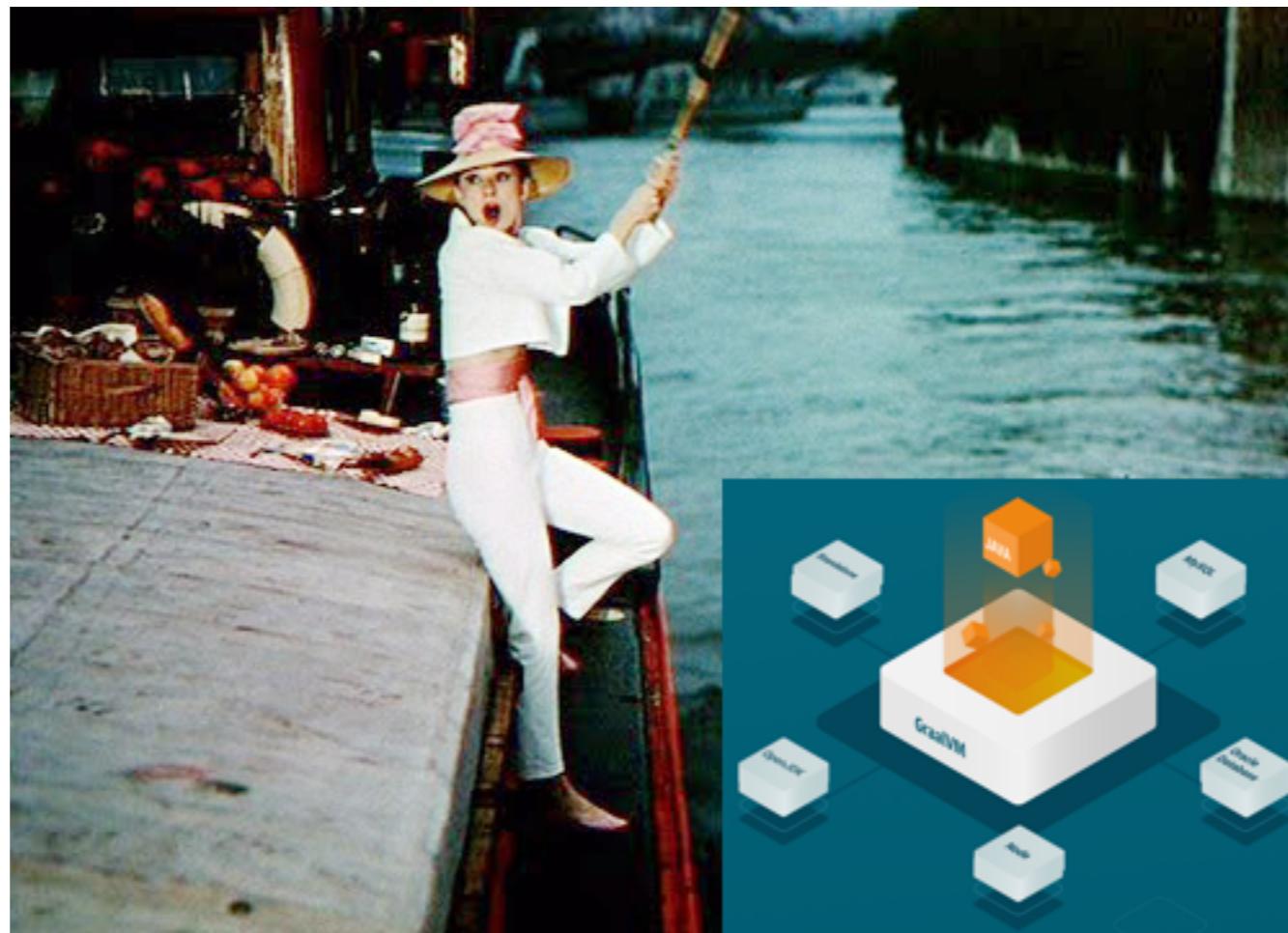
<https://discuss.kotlinlang.org/t/any-plan-for-supporting-language-server-protocol/2471/9>

# Future Work

- Handle source code change
- Transpilers
- Security / Privacy!
- Profile- and inlining-info-based scheduling
- Lots more use-cases: autocompletion, generate documentation, nullability-checks, generate type annotations, many more...

# Audrey

## On Demand Run time Information



An approach to gather run-time data for multiple languages  
and utilize them in multiple IDEs