

# ORACLE®



# Jaroslav Tulach

- 1 NetBeans Founder
- 2 NetBeans Initial Architect
- 3 Practical API Design book
- 4 Oracle Labs: GraalVM.org



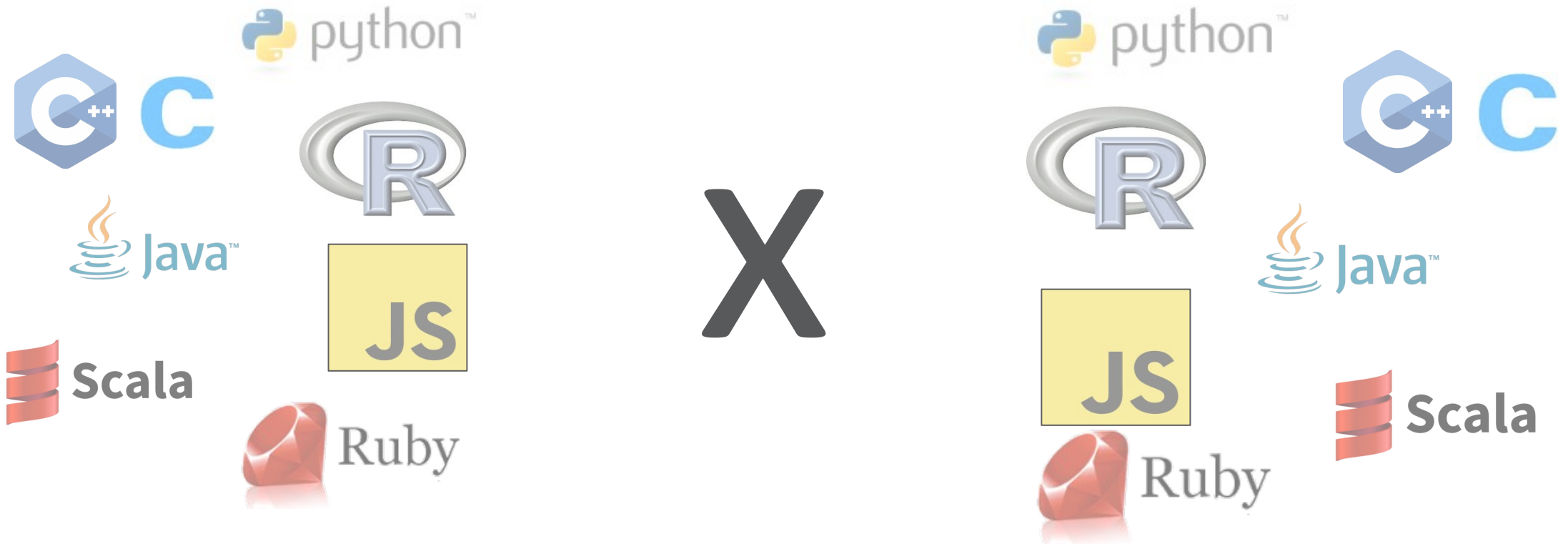
# Safe Harbor Statement

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# Program Agenda

- 1 T-Trace
- 2 Instrumentation with GraalVM
- 3 Demo
- 4 Q/A

# Composing Languages



# Composing Languages

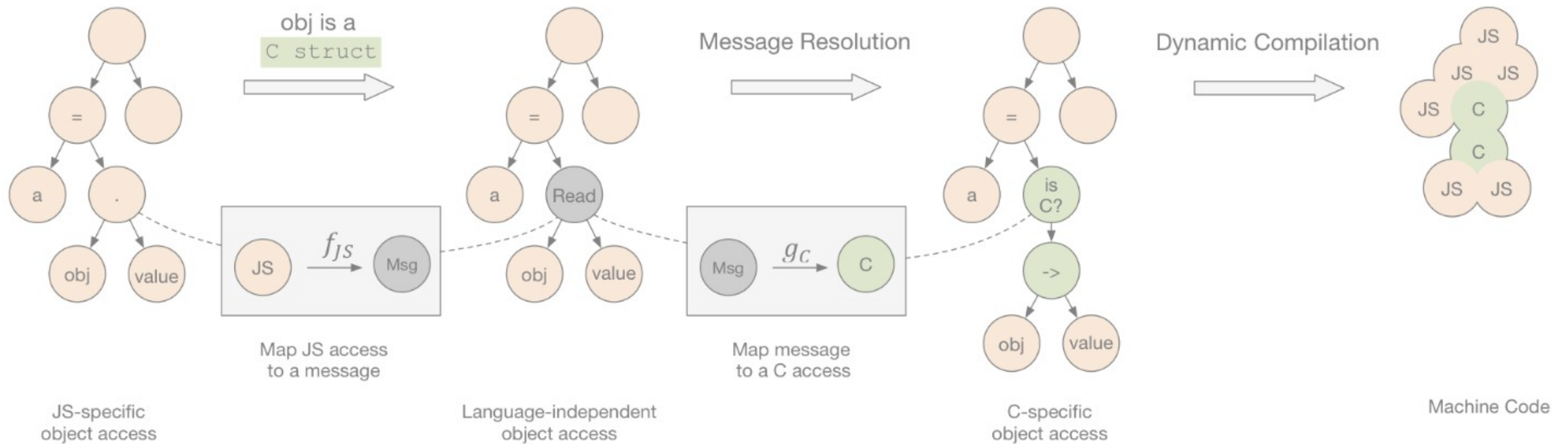


X

Interoperability  
Message  
Protocol

# Mixing of GraalVM Languages

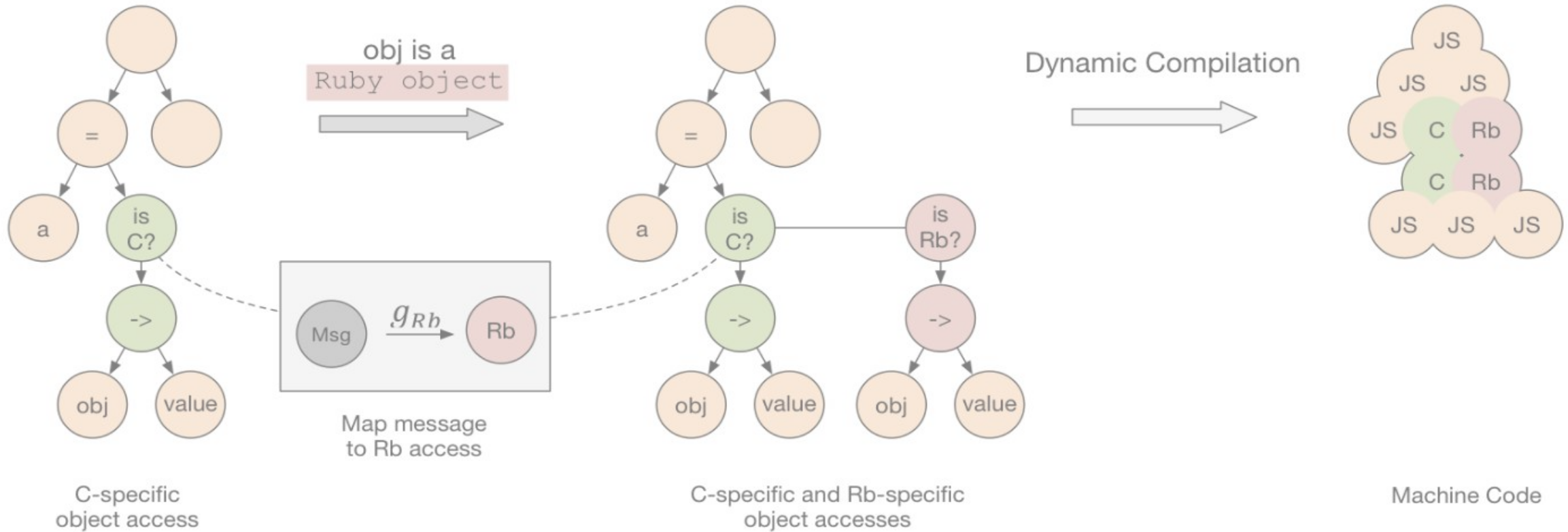
```
var a = obj.value;
```





# Mixing of GraalVM Languages

```
var a = obj.value;
```



# Composing Tools



X

Debugger

Profiler

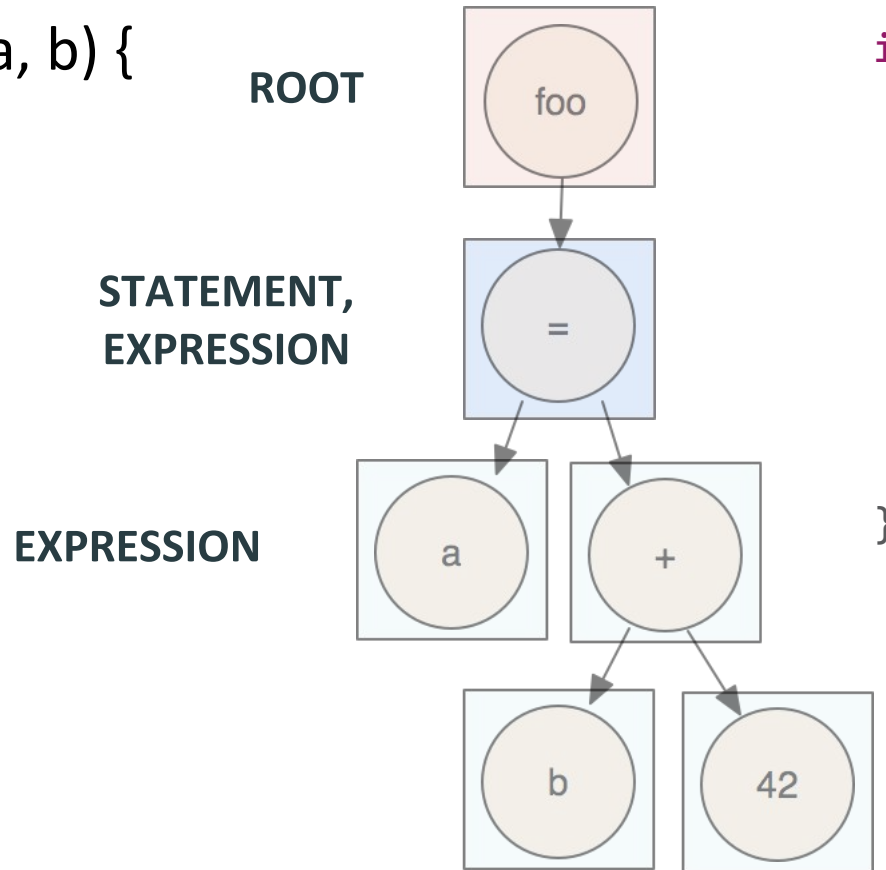
Coverage

IDE integration

...

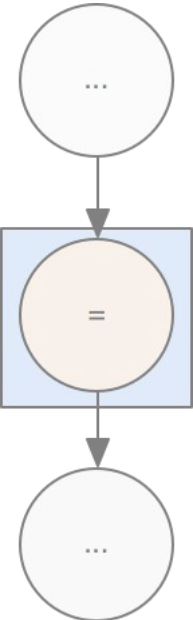
# Node Tagging Example

```
function foo(a, b) {  
  a = b + 42  
}
```



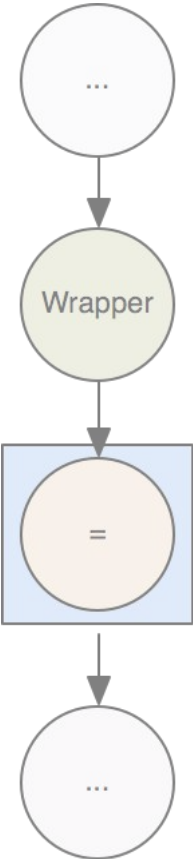
```
interface InstrumentableNode {  
    boolean isInstrumentable();  
    boolean hasTag(Class<Tag> tag);  
    WrapperNode createWrapper(ProbeNode probe);  
    ...  
}
```

# Instrument in Java



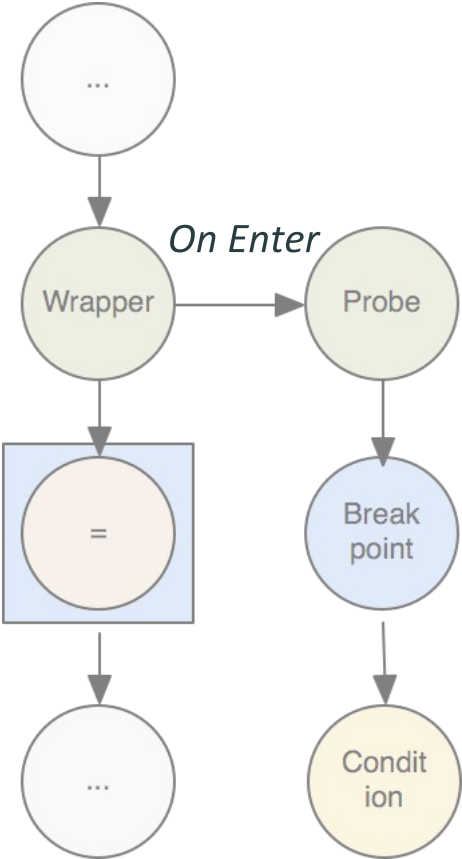
*Asynchronous  
breakpoint  
Installation*

*installs wrapper and  
triggers external  
invalidation of the  
AST*



*Next Execution*

*lazily installs  
instrument  
condition  
AST*



# T-Trace in 19.3.0

<https://github.com/oracle/graal/blob/master/tools/docs/T-Trace-Manual.md>