About me

Previously software engineer at Dropbox

Currently at Bright technology services (www.bright.sg)
  - data-science/software consulting

Early contributor to Scala.js, author of Ammonite REPL, Scalatags, FastParse, ...

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Agenda

What is this Scala.js thing?

Why should I care?

How does it work?
Compiling to Javascript
Why Compile to Javascript?
Why Compile to Javascript?

Share expertise between Client and Server

Share code between Client and Server

TECHNOLOGY LAB —
How Google Inbox shares 70% of its code across Android, iOS, and the Web

Google's open source tools allow it to use Android code on iOS and the Web.

RON AMADEO - 11/21/2014, 1:10 AM

Choose what language to build your website in
Scala.js

www.scala-js.org
Scala.js: What

```scala
def main() = {
  var x = 0
  while(x < 999){
    x = x + "2".toInt
  }
  println(x)
}
```
Scala.js: What

ScalaJS.c.LExample$.prototype.main__V = (function() {
  var x = 0;
  while ((x < 999)) {
    x = ((x + new ScalaJS.c.sci_StringOps().init___T(ScalaJS.m.s_Predef().augmentString___T__T("2").toInt___I()) | 0)
  }
  ScalaJS.m.s_Predef().println___O__V(x)
});
Scala.js: What

be.prototype.main=function()
{
  for(var a=0;999>a;)
    a=a+(new de).g(S(L(),"2")).ne()|0;
  ee(); L();
  var b=F(fe); ge();
  a=(new he).g(w(a)); b=bc(0,J(q(b,[a])));
  ie(bc(L(),J(q(F(fe),[je(ke(ge().Vg),b)]))));
}
Scala.js: Examples

Ray Tracing  
[scalafiddle.io/sf/4beVrVc/1](scalafiddle.io/sf/4beVrVc/1)

Online Games  
[www.lihaoyi.com/roll](www.lihaoyi.com/roll)

Web Apps  
[demo.fluentcode.com](demo.fluentcode.com)
Common patterns of using Scala.js

Client-side Scala.js

Client-Server Scala/Scala.js
Client-side Scala.js
Live Demo: Client-side Scala.js

github.com/lihaoyi/workbench-example-app
Type-checked by default

```scala
var paragraph = document.body
console.log(paragraph.children.length)
```

```scala
val paragraph = document.body
console.log(paragraph.children.length)
```

```
Externally defined symbol 'children' could not be resolved
```

```
ScalaJSExample.scala:12: value children is not a member of org.scalajs.dom.raw.Element
  console.log(paragraph.children.length)
  ^
```

```
Uncaught TypeError: Cannot read property 'length' of undefined
  (anonymous function) @ index-fastopt.html:22
```

Compilation failed
Fewer Warts

```javascript
javascript> ["10", "10", "10", "10"].map(parseInt)
[10, NaN, 2, 3] // WTF
```

```scalajs
scalajs> Seq("10", "10", "10", "10").map(Integer.parseInt)
List(10, 10, 10, 10)
```
Great editor support

```scala
def doThing(target: dom.Node) = {
  target.child
}
```

**childNodes**

- `appendChild(newChild: Node)`
- `firstChild`
- `lastChild`
- `replaceChild(newChild: Node, oldChild: Node)`

`hasChildNodes` (Boolean)

Press `.` to choose the selected (or first) suggestion and insert a dot afterwards.

**org.scalajs.dom.raw.Node**

Returns a live NodeList containing all the children of this node. NodeList being live means that if the children of the Node change, the NodeList object is automatically updated. MDN
Library Ecosystem

Use any JS library

- `val xhr = new XMLHttpRequest()`
- React
- D3
- ...

Along with lots of Scala libraries...
Client-side Scala.js: Limitations

**Can use:**
- Most of java.lang.*
- Almost all of scala.*
- Some of java.util.*
- Scala Macros: upickle, scala-async, scalaxy, etc
- Pure-Scala ecosystem: shapeless, scalaz, scalatags, utest

**Can’t use:**
- j.l.Thread, j.l.Runtime, ...
- s.c.parallel, s.tools.nsc
- org.omg.CORBA, sun. misc.*
- Reflection: scala-pickling, scala-reflect
- Java-dependent: Scalatest, Scalate
Client-side Scala.js: Limitations

**Can use:**
- JS stuff: XmlHttpRequest, Websockets, Localstorage
- HTML DOM, Canvas, WebGL
- JavaScript libraries: chipmunk.js, hand.js, react.js, jquery
- IntelliJ, Eclipse, SBT
- Chrome console, firebug

**Can’t use:**
- JVM stuff: Netty, akka, spray, file IO, JNI
- AWT, Swing, SWT, OpenGL
- Java ecosystem: guice, junit, apache-commons, log4j
- Yourkit, VisualVM, JProfiler
Client-side Scala.js: using Javascript libraries

// Chipmunk.js definition in javascript
```javascript
cp.Vect = function(x, y){
    this.x = x;
    this.y = y;
};
```

// using Chipmunk.js in javascript
```javascript
var p = new cp.Vect(50, 100)
console.log(p.x + p.y) // 150
```

// Chipmunk.js definition in Scala
```scala
package cp

@JSName("cp.Vect")
class Vect(var x: Double,
          var y: Double)
  extends js.Object
```

// using Chipmunk.js in Scala
```scala
val p = new cp.Vect(50, 100)
println(p.x + p.y) // 150
```
Client-Server Scala.js
Embed Scala in your JS

Server

Web Client
Embed Scala in your JS
Embed Scala in your JS

```scala
@JSExportTopLevel("Foo")
class Foo(val x: Int) {
  @JSExport
def square(): Int = x*x
  @JSExport("foobar")
def add(y: Int): Int = x+y
}
```

```javascript
var foo = new Foo(3);
console.log(foo.square()); // 9
console.log(foo.foobar(5)); // 8
```
Embed Scala in your JS

NetLogo Web: agent-based simulation engine

marianogappa/ostinato: re-usable chess engine

fommil.com/kerbal: kerbal space program calculator
Isomorphic Javascript

- Code
- Libraries
- Conventions

Server

Shared

Client
Isomorphic Scala

Server

Shared

Client
Isomorphic Scala: Shared Libraries

**Scalaz**: functional programming

**Scalatest**: test framework

**Shapeless**: generic programming

**Akka**: actors

**Accord**: data validation

**Monix**: asynchronous streaming

**Scala Async**: async & await

**QuickLens**: lenses for updating case classes

**Scalatags**: HTML templating

**uPickle**: JSON serialization

**BooPickle**: binary serialization

**Circe**: JSON handling

**Autowire**: type-safe routing

**RosHTTP**: HTTP client

**FastParse**: parser combinators

**Shocon**: Typesafe “HOCON” config parser
Why Scala.js?
What do Javascript developers get from Scala.js?

Everything in ES6/7 (=>, destructuring, string-interpolation, ...)

Everything in TypeScript (types, generics, ...)

Everything in Immutable.js (immutable collections)

Great language, extensive standard library, functional programming, shared client-server code, access to all JS libs, fearless refactoring
What do Scala developers get from Scala.js?

You can already write back-end servers

And compilers

You can now program web front-ends,

Browser extensions

Node.js servers: github.com/scalajs-io/nodejs

Microcontrollers (www.espruino.com, tessel.io)

Mobile apps with React-Native
Scala.js: Performance

- **Relatively quick**: 1-2s warm turnaround

- **Acceptable size**: small apps start at ~70kb, grow to 100s of kb pre-gzip

- **Efficient Code**: ~1-2x slower than “raw” Javascript