



Scala.js



Safety & Sanity in the wild west of the web

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1.1 Who am I and what is Scala.js?

- Haoyi works on devtools @ Dropbox
 - Previously web-infra
 - Previously-previously DfB web
- Scala.js isn't a Dropbox thing
 - Originally PhD project from some guy in Switzerland
 - Reasonably active open-source community
 - Not used @ Dropbox at all

1.2 What is Scala.js?

Write Scala, Run Javascript, Make Website!

Compiler takes care of in between

100s of kb of code, ~0.9-4x slower as “raw” JS

Supports entire Scala language, many libraries

1.3 Javascript

```
var xhr = new XMLHttpRequest()
xhr.open("GET",
    "http://api.openweathermap.org/" +
    "data/2.5/weather?q=Singapore"
)
xhr.onload = function(e){
    if (xhr.status === 200)
        document.body.textContent = xhr.responseText
}
xhr.send()
```

1.4 Javascript ES6

```
let xhr = new XMLHttpRequest()
xhr.open("GET",
    "http://api.openweathermap.org/" +
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1.4 Javascript ES6

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1.5 Scala.js

```
val xhr = new XMLHttpRequest()
xhr.open("GET",
    "http://api.openweathermap.org/" +
    "data/2.5/weather?q=Singapore"
)
xhr.onload = (e: Event) => {
    if (xhr.status == 200)
        document.body.textContent = xhr.responseText
}
xhr.send()
```

1.6 Scala.js

```
val xhr = new XMLHttpRequest()
xhr.open("GET",
    "http://api.openweathermap.org/" +
    "data/2.5/weather?q=Singapore"
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xhr.onload = (e: Event) => {
    if (xhr.status == 200)
        document.body.textContent = xhr.responseText
}
xhr.send()
```


1.7 Scala.js to Javascript

```
val (obj, misc) = objects(i)
val t = obj.intersectionTime(ray)
if (t > Epsilon &&
    t < length - Epsilon){
  visible = false
}
```

```
var tup = self.Ve.objects[i]
if (null !== tup)
  obj = tup._1, misc = tup._2
else
  throw (new MatchError).init(tup)
```

```
var t = obj.intersectionTime(ray)
t > Example$.Epsilon &&
t < length - Example$.Epsilon &&
(visible = !1)
```

1.7 Scala.js to Javascript

```
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val t = obj.intersectionTime(ray)
if (t > Epsilon &&
    t < length - Epsilon){
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1.7 Scala.js to Javascript

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1.7 What is Scala.js

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val t = obj.intersectionTime(ray)
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```
var t = obj.intersectionTime(ray)
t > Example$.Epsilon &&
t < length - Example$.Epsilon &&
(visible = !1)
```

Live Demo

Starting Out

1.8 Notes from the Demo

Fast turn-around time

Compile errors when you make a mistake

Accurate in-editor autocomplete

2.1 How does Scala.js compare to...

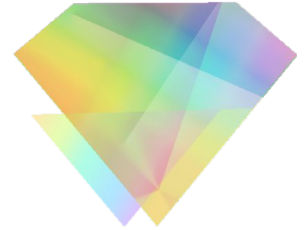


Dart



HAXE

Opal



CoffeeScript



clojure / clojurescript

WebSharper



elm

TypeScript

Emscripten: An LLVM-to-JavaScript Compiler

opa

2.2 Everyone wants a better web

Safer

More modular, expressive, reusable code

One language across client/server

Async support

More tool-able & better tooling

Fewer warts

2.3 Safety

Uncaught TypeError: undefined is not a function

o.extend.trim

b

d.fx.step.(anonymous function)

o.fx.update

o.fx.step

F

o.fx.custom

2.4 More Expressive

```
race = (winner, runners...) ->  
  print winner, runners
```

```
race = function() {  
  var winner = arguments[0]  
  var runners =  
    2 <= arguments.length ?  
    slice.call(arguments, 1) : [];  
  print(winner, runners);  
};
```

2.5 One language for client/server

```
# This has been ported to our Python Emstring class
# Please keep them both in sync if you need to change something!
class Emstring
  @em_snippet: (s, maxchars=50, location=0.75) ->
    new Emstring(s.toString()).snippet(
      maxchars, location
    ).toString()
```

2.6 Async

```
ajaxFoo((a) =>
  bar(a, (b) =>
    baz(a, (c) =>
      b + c
    )
  )
)
```

```
async{
  var a = wait(ajaxFoo())
  wait(bar(a)) + wait(baz(a))
}
```

2.7 More Toolable/Better Tooling

```
a(tabi)(
```

```
  v tabindex
```

```
Attr[Int]
```

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

```
p(float.left)(
```

```
  "This is
```

```
Documentation for left
```

```
),
```



```
scala
```

```
Pattern: left: StylePair
```

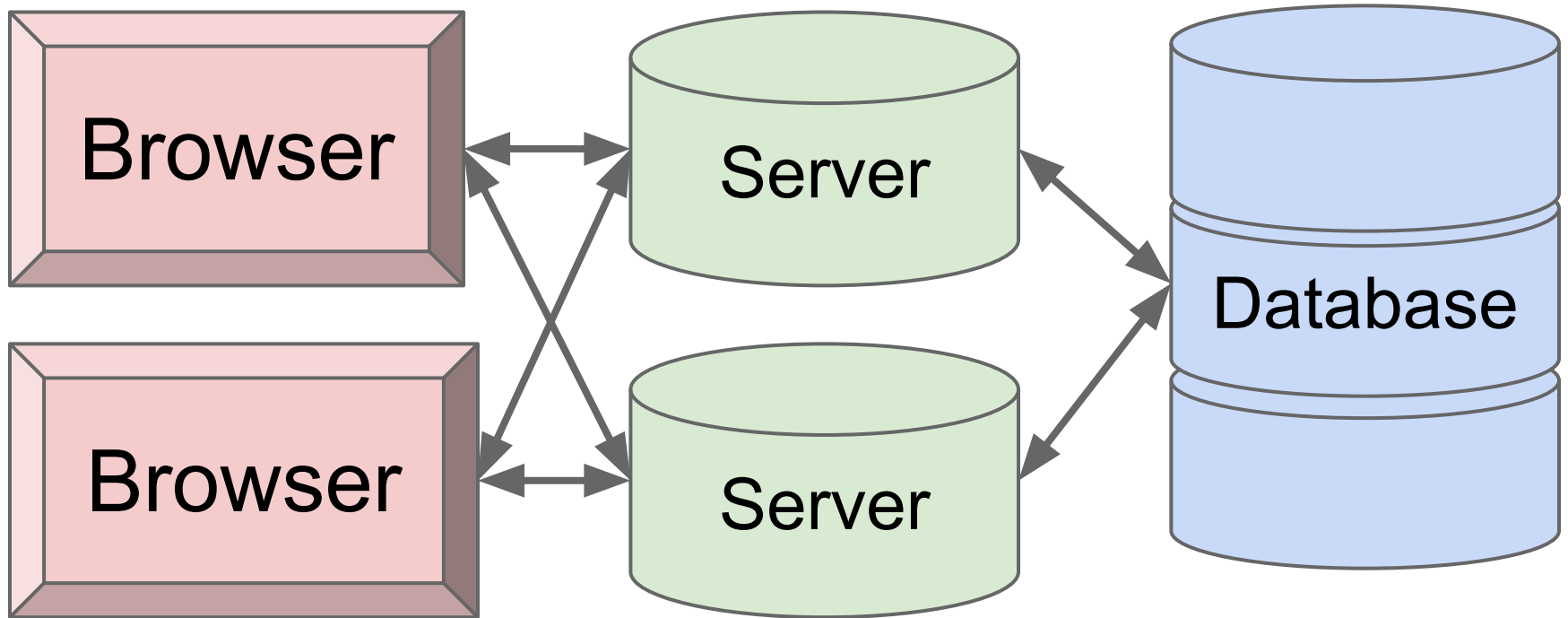
```
Is a keyword indicating that the element must float on the left side of its containing block.
```

```
MDN
```

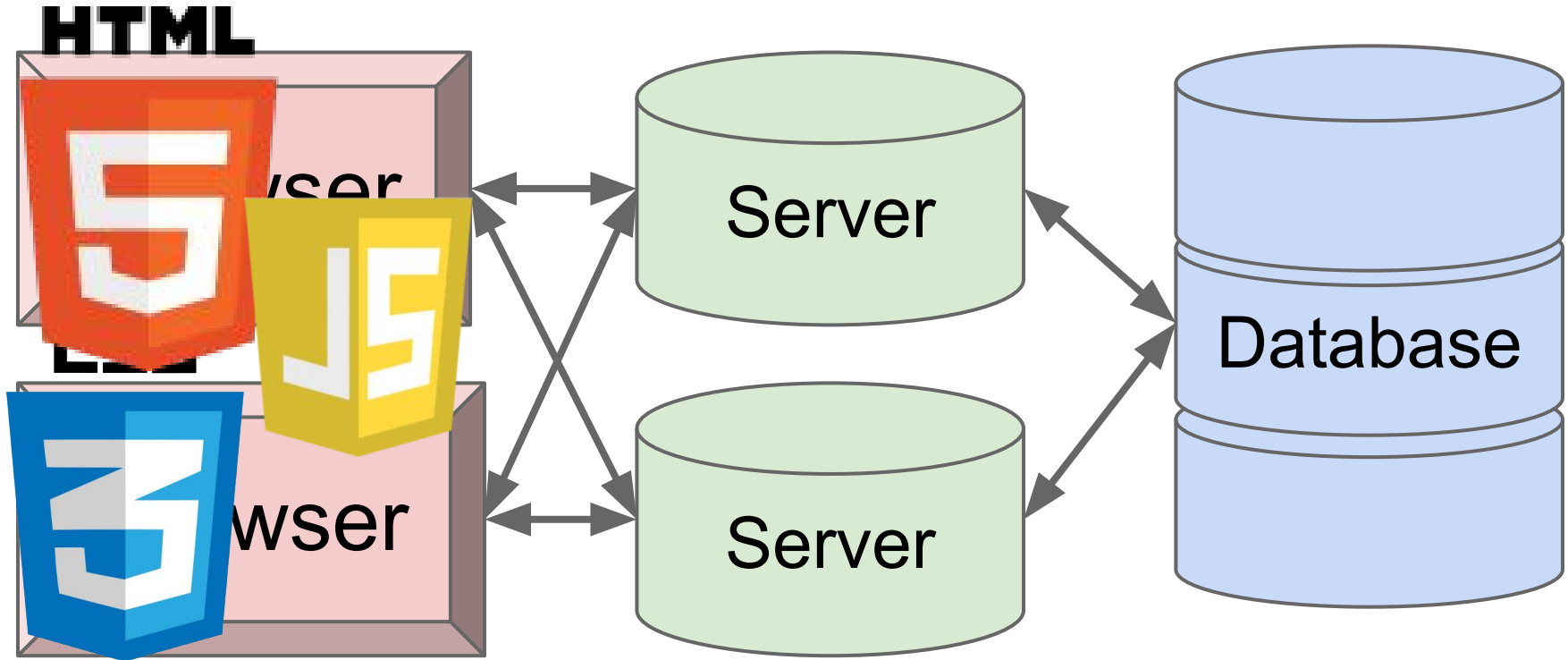
2.8 Fewer Warts

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

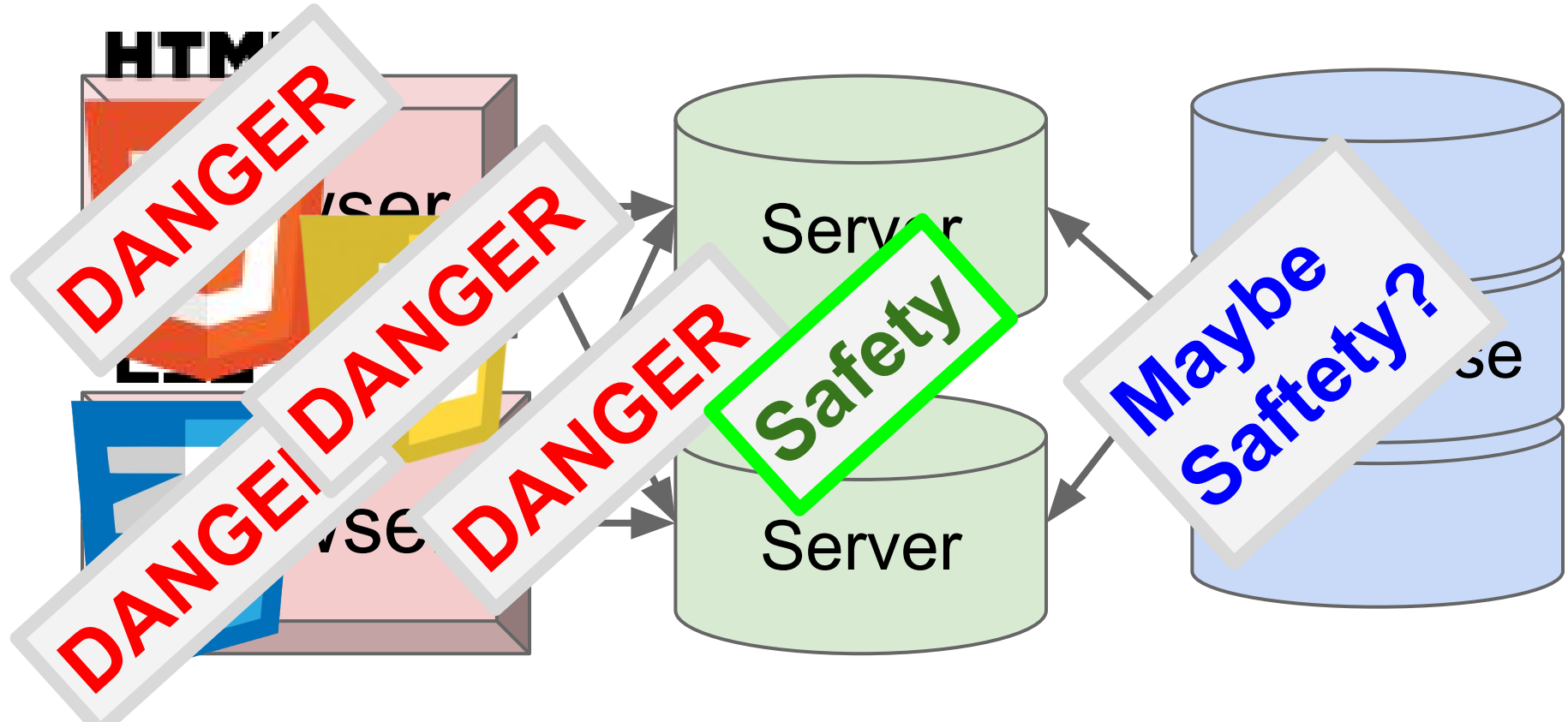
4.1 What is a web application?



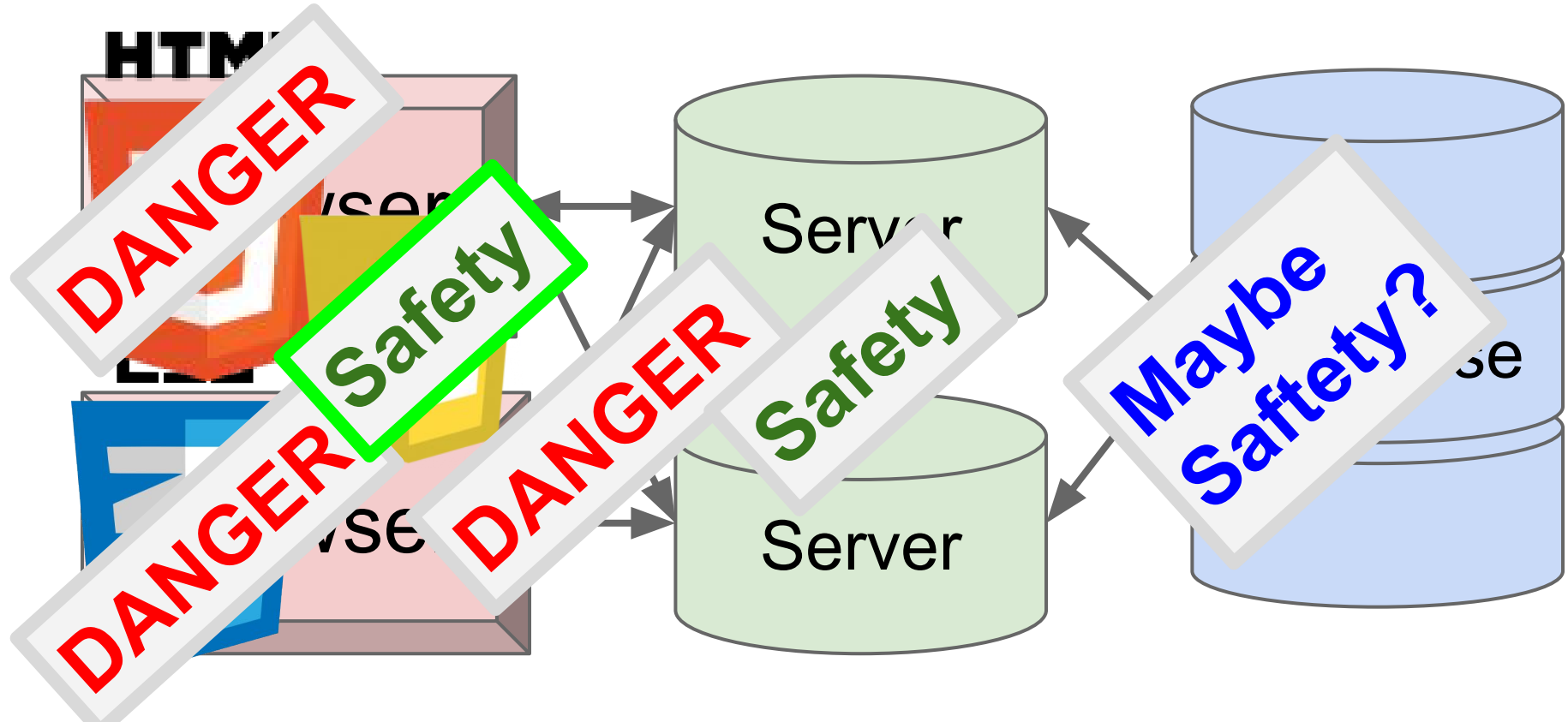
4.1 What is a web application?



4.1 What is a web application?



4.1 What is a web application?



4.2 Typed HTML!



```
div(  
  float.left,  
  p("I am cow"),  
  p("Hear me moo")  
)
```

```
<div  
  style="float: left">  
  <p>I am cow</p>  
  <p>Hear me moo</p>  
</div>
```

4.2 Typed HTML!



```
div(  
  float.elft,  
  p("I am cow"),  
  p("Hear me moo")  
)
```

```
value elft is not a  
member of object float  
float.elft,  
      ^
```

Compilation failed

4.2 Typed HTML!

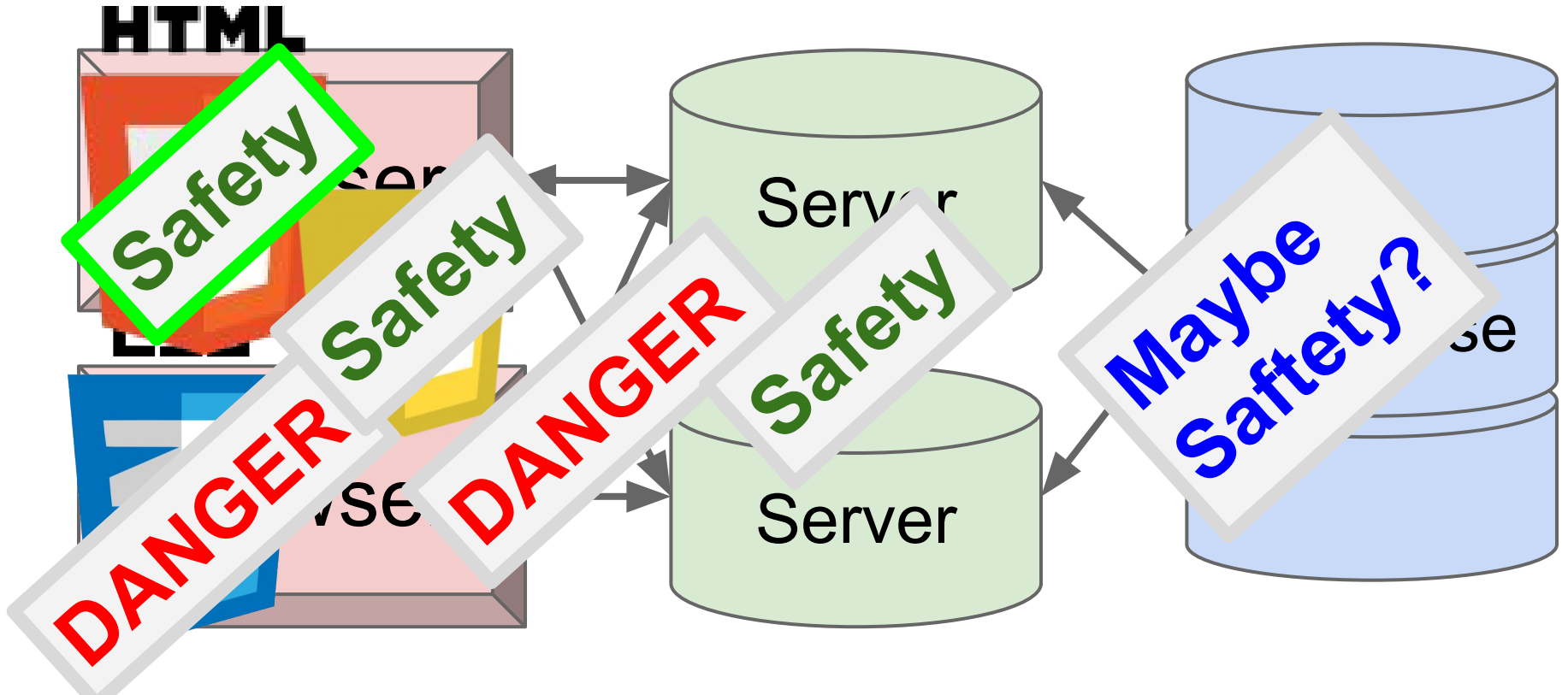


```
dvi(  
  float.left,  
  p("I am cow"),  
  p("Hear me moo")  
)
```

```
Not found: value dvi  
dvi(  
^
```

Compilation failed

4.3 What is a web application?



4.4 Hygienic, Typed CSS!



```
trait Simple{  
  def btn = cls(  
    color := "red",  
    height := 125  
  )  
  def fade = cls.hover(  
    opacity := 0.5  
  )  
}
```

```
.$pkg-Simple-btn{  
  color: red;  
  height: 125px;  
}  
.$pkg-Simple-fade:hover{  
  opacity: 0.5;  
}
```

4.4 Hygienic, Typed CSS!



```
trait Simple{  
  def btn = cls(  
    color := "red",  
    height := 125  
  )  
  def fade = cls.hover(  
    opacity := 0.5  
  )  
}
```

```
.$pkg-Simple-btn{  
  color: red;  
  height: 125px;  
}  
.$pkg-Simple-fade:hover{  
  opacity: 0.5;  
}
```


4.4 Hygienic, Typed CSS!



```
trait Simple{  
  def btn = cls(  
    colro := "red",  
    height := 125  
  )  
  def fade = cls.hover(  
    opacity := 0.5  
  )  
}
```

```
Not found: value colro  
colro := "red"  
^
```

Compilation failed

4.4 Hygienic, Typed CSS!



```
trait Simple{  
  def btn = cls(  
    color := "red",  
    height := 125  
  )  
  def fade = cls.hovre(  
    opacity := 0.5  
  )  
}
```

value hovre is not a member of
object cls

```
    def fade = cls.hovre(  
                        ^
```

Compilation failed

4.5 Hygienic, Typed CSS!



```
val x = div(  
  cls := ""  
    $pkg-Simple-btn  
    $pkg-Simple-fade  
  """,  
  h1(...),  
  p(...)  
)
```

```
<div class="  
  $pkg-Simple-btn  
  $pkg-Simple-fade">  
  <h1>...</h1>  
  <p>...</p>  
</div>
```

4.5 Hygienic, Typed CSS!



```
import Simple._
```

```
val x = div(  
  btn,  
  fade,  
  h1(...),  
  p(...)  
)
```

```
<div class="  
  $pkg-Simple-btn  
  $pkg-Simple-fade">  
  <h1>...</h1>  
  <p>...</p>  
</div>
```

4.5 Hygienic, Typed CSS!

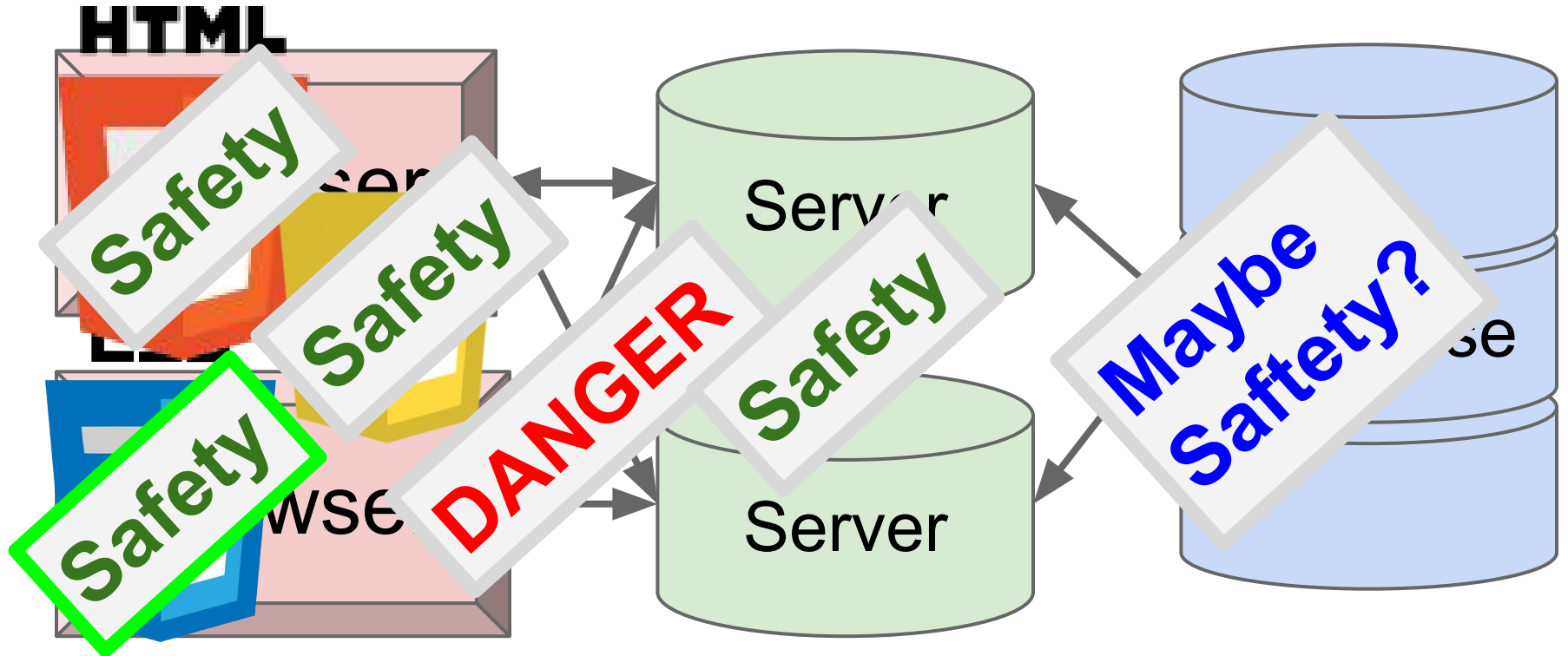


```
import Simple._  
val x = div(  
  btn,  
  fadee,  
  h1(...),  
  p(...)  
)
```

```
Not found: value fadee  
  fadee,  
  ^
```

Compilation failed

4.6 What is a web application?



4.7 Ajax!



```
var xhr = new XMLHttpRequest()
xhr.open("http://www.bit.ly")
xhr.onload = (x) => {
    ...
}
xhr.send()
```

```
import dom._
var xhr = new XMLHttpRequest()
xhr.open("http://www.bit.ly")
xhr.onload = (x: Event) => {
    ...
}
xhr.send()
```

4.7 Ajax!



```
// Javascript
$.ajax("/api/list", {
  data: inputBox.value,
  onComplete: function(res){ ... }
})
```


4.7 Ajax!



```
// Javascript
```

```
$j.ajax("/api/list", {  
    data: inputBox.value,  
    onComplete: function(res){ ... }  
})
```

How do we know this correct?

4.7 Ajax!



```
// Javascript
```

```
$j.ajax("/api/list", {  
  data: inputBox.value,  
  onComplete: function(res){ ... }  
})
```

How do we know this correct?

And this value?

4.7 Ajax!



```
// Javascript
```

```
$j.ajax("/api/list", {  
  data: inputBox.value,  
  onComplete: function(res){ ... }  
})
```

How do we know this correct?

And this value?

And that we're using
this res the right way?

4.7 Typed Ajax!



```
// Javascript
```

```
$j.ajax("/api/list", {  
  data: inputBox.value,  
  onComplete: function(res){ ... }  
})
```

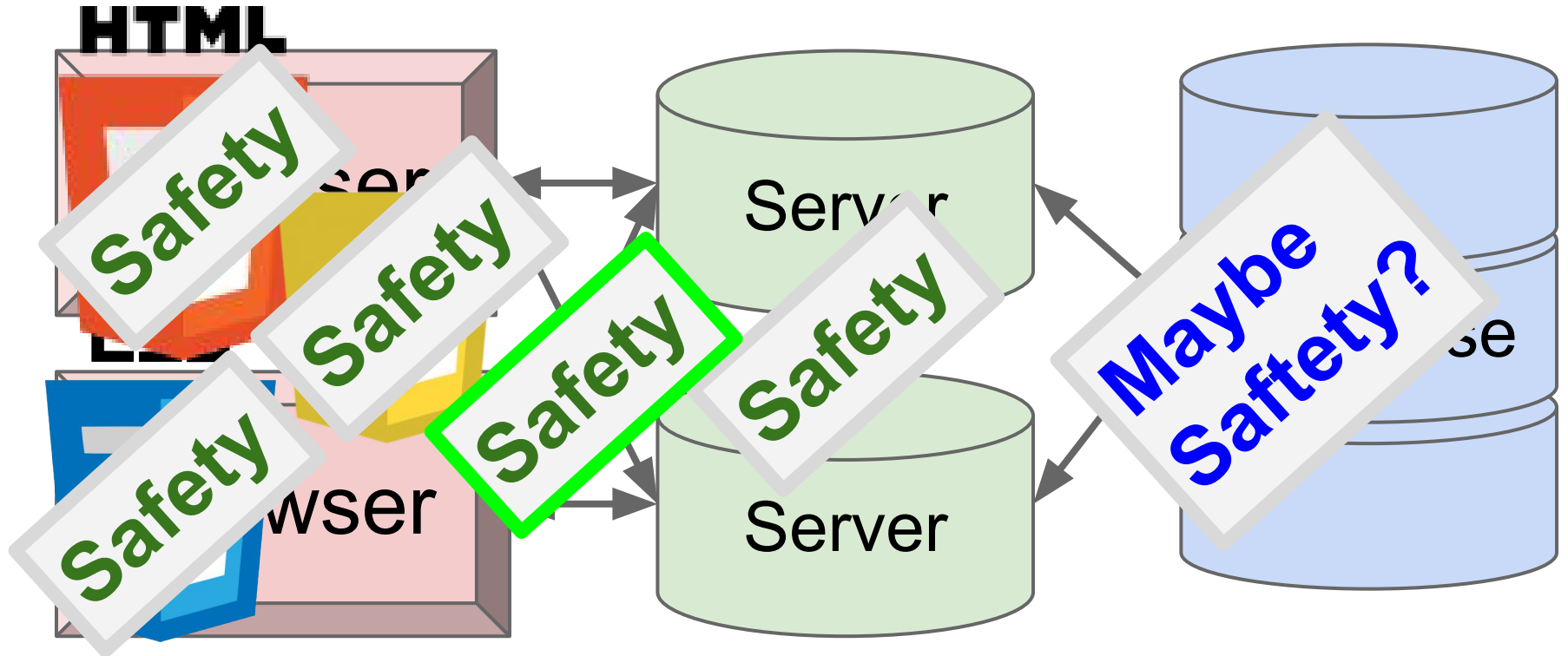
```
// Scala.js
```

```
val res = Ajax[Api].list(inputBox.value).call()
```

Live Demo

Typed Ajax

5.1 What is a web application?



5.2 Scala.js gives you...



- Shared client-server code
- Shared client-server *libraries*
- A reasonable language to write the client in

5.3 Scala.js gives you...



Everything that

- ES6 gives (string-interp, const, class, =>, ...)
- Typescript gives (types, generics, ...)

- Persistent collections,
- Monads, macros, mixins, ...
- Higher kinded types, virtual classes, ...

5.3 Scala.js does *not* give you



undefined is not a function

Mal-formed HTML

Un-used CSS classes

Using un-defined CSS classes

CSS class-name collisions

Mal-formed Ajax requests

Fun uses of Scala.js

[Ray Tracing](#)

[Platform Games](#)

[TodoMVC](#)

[Djinni.js](#)

5.4 Safety & Sanity on the Web



Shared code between Client & Server

Enforce safety throughout the entire application, not just the Javascript

Not 12 months from now, but today!

Questions?