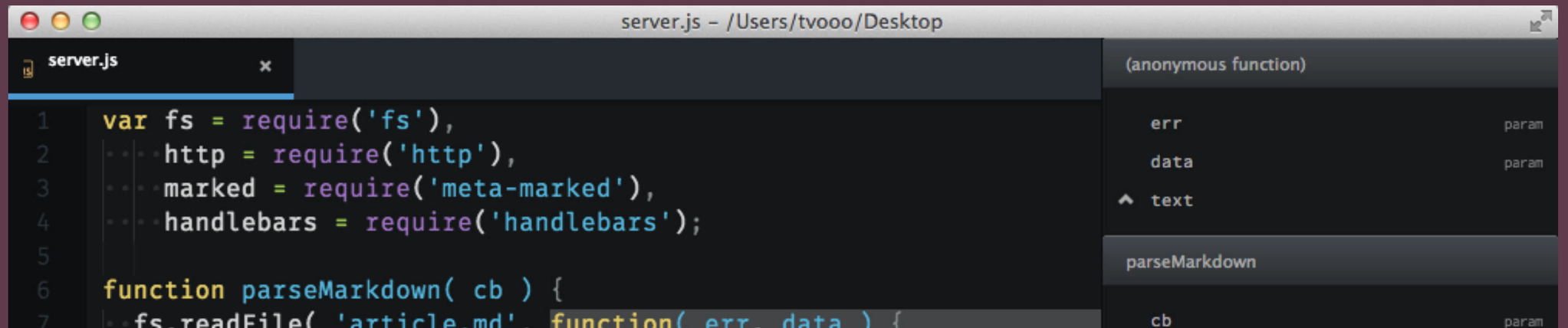
Making Scope Explorable in Software Development Environments

by *Tim von Oldenburg*

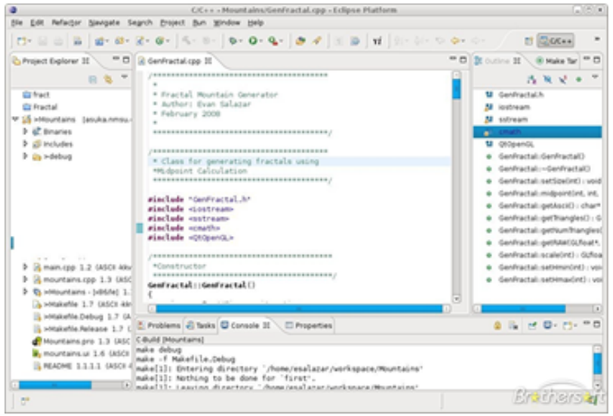


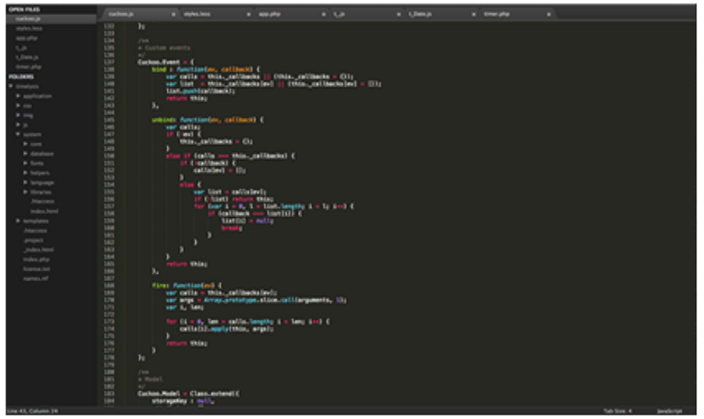
Integrated Development Environments (IDEs)

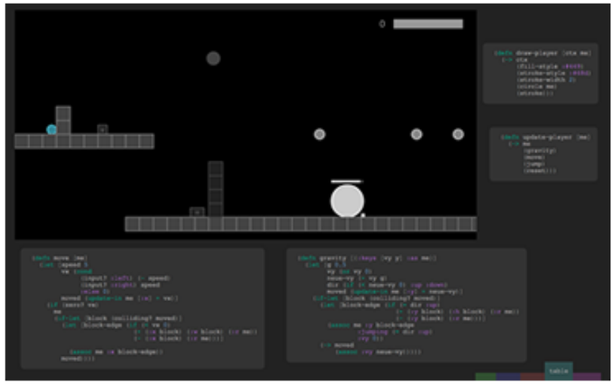
IDEs integrate a code editor with different tools for software development:

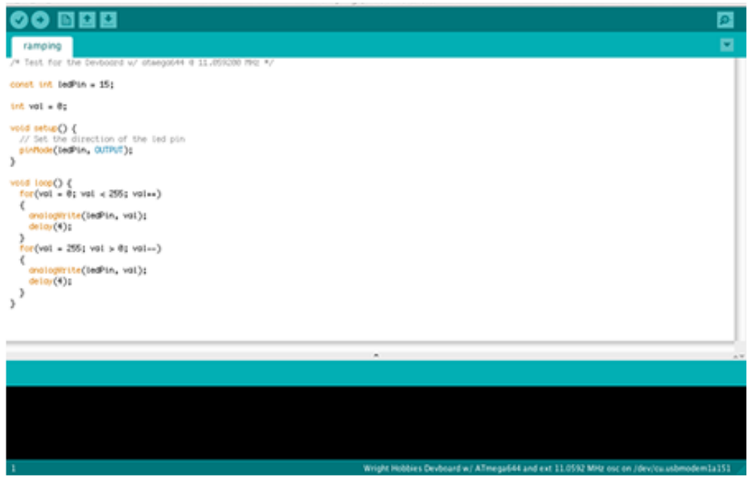
— workflow
— building and distributing
— collaboration
— quality assurance
— …

IDE Examples





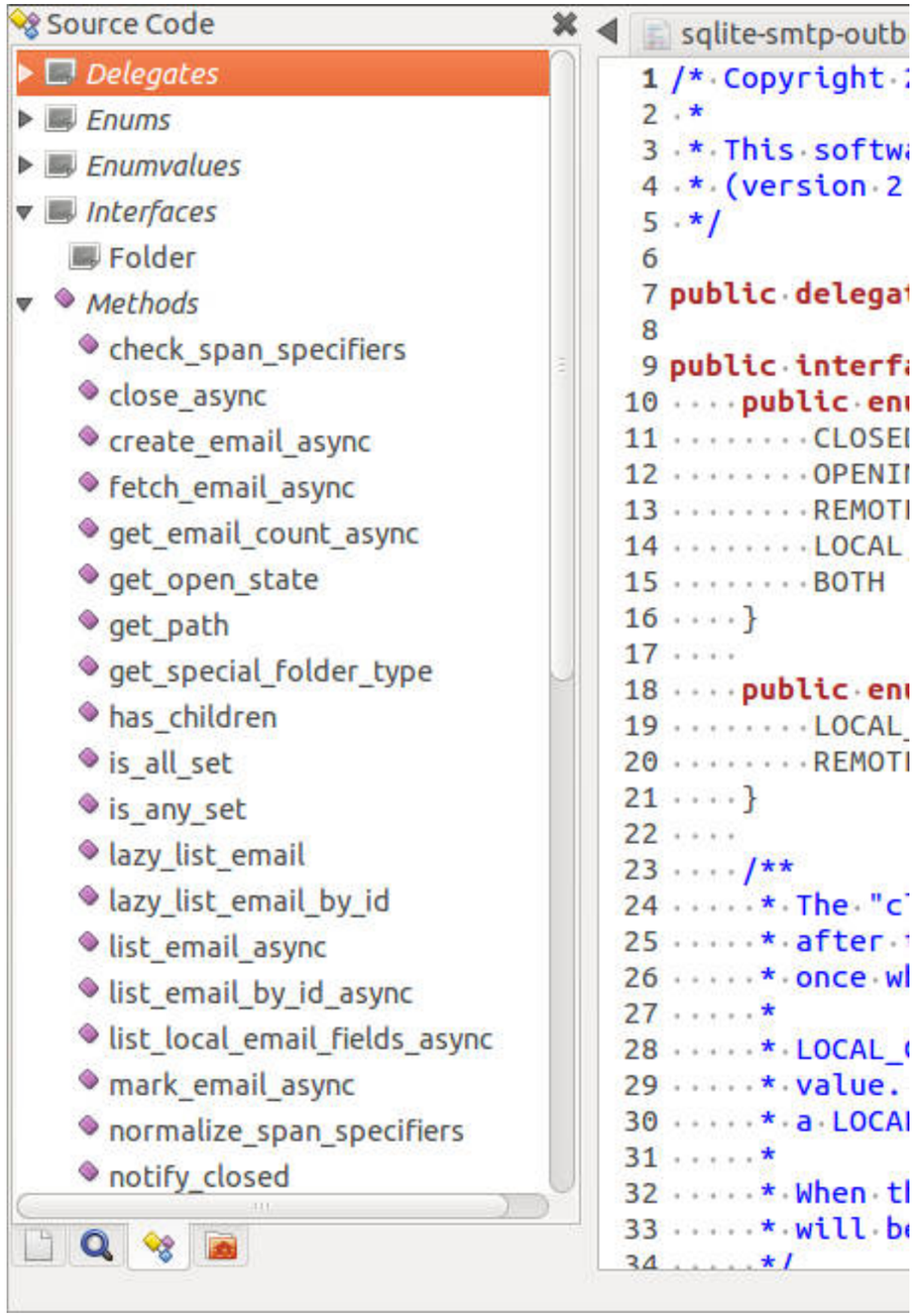




Syntax Highlighting

```
<!DOCTYPE html PUBLIC "-//W3C/DTD HTML
<html>
    <head>
        <title>Example</title>
        <link href="screen.css" rel="sty
    </head>
    <body>
        <h1>
            <a href="/">Header</a>
        </h1>
        <ul id="nav">
            <li>
                <a href="one/">One</a>
            </li>
            <li>
                <a href="two/">Two</a>
            </li>
```

Visually distinguish language elements.

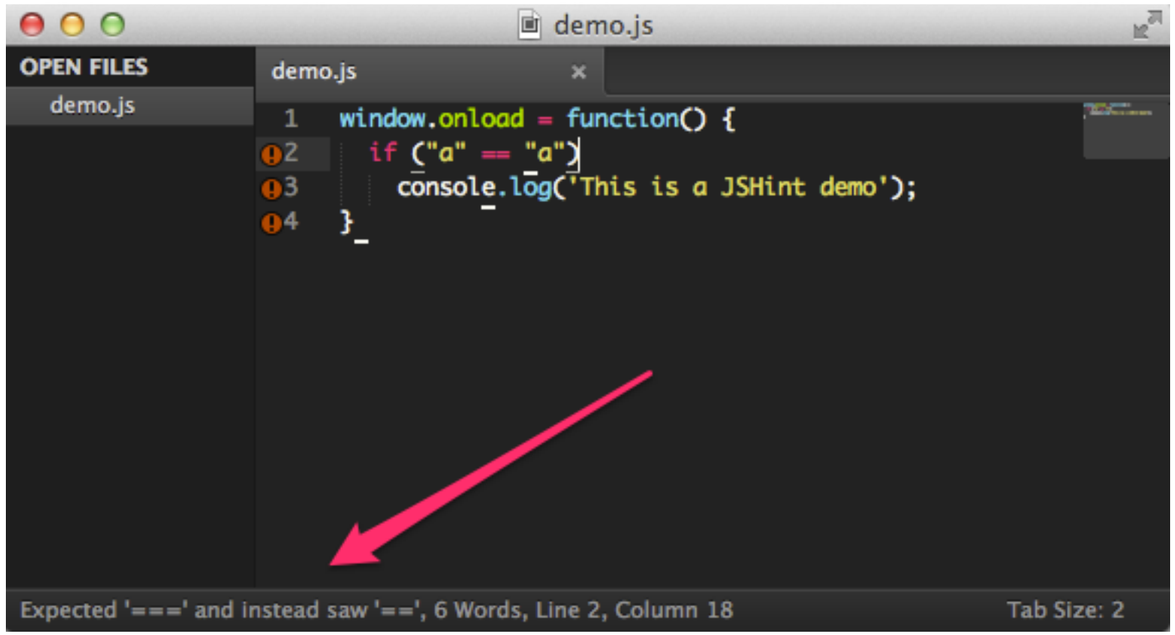


Class Browser

Browse language symbols, like variables and methods.

Linter

Find code smells (bad style).



Scope

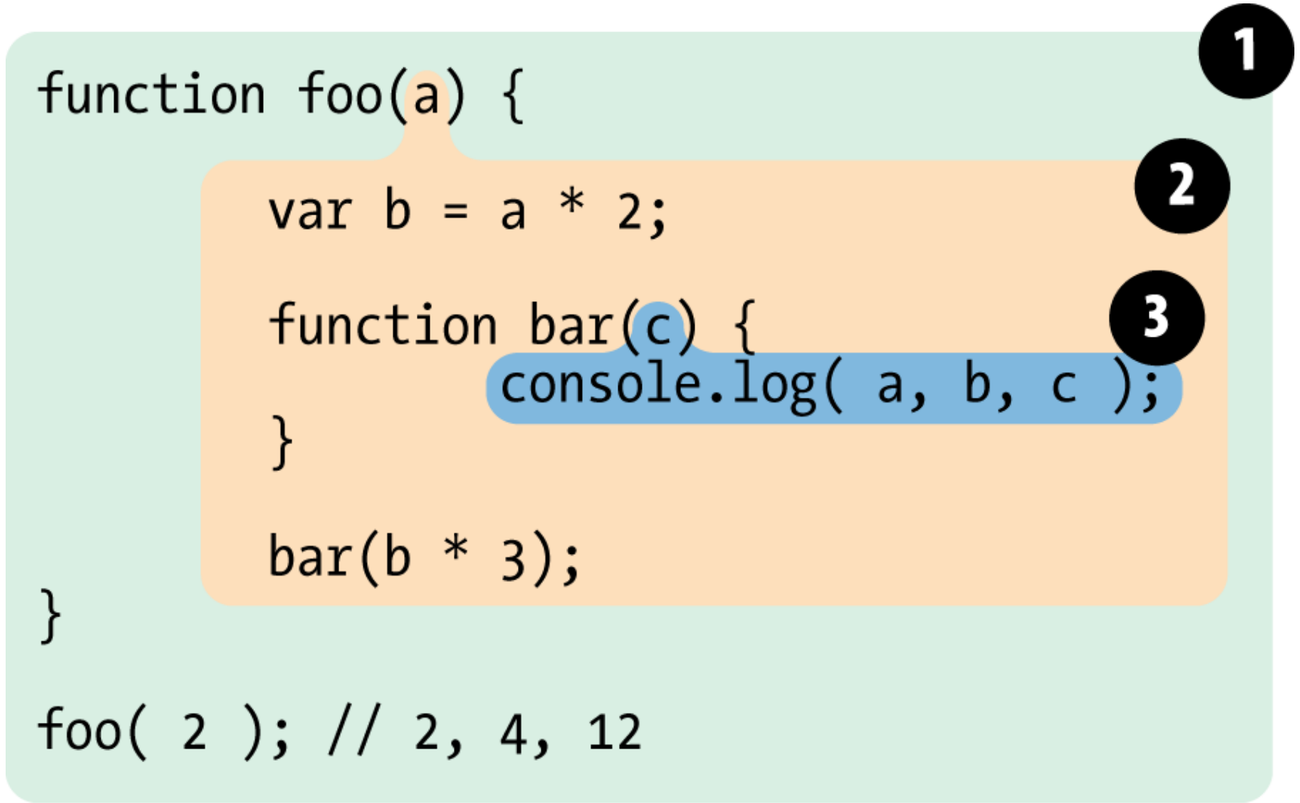
is *„the set of rules that determines where and how a variable (identifier) can be looked-up“* (Simpson 2014)

Different languages, different scoping models.

JavaScript

The language of the world wide web.

Nested function scope



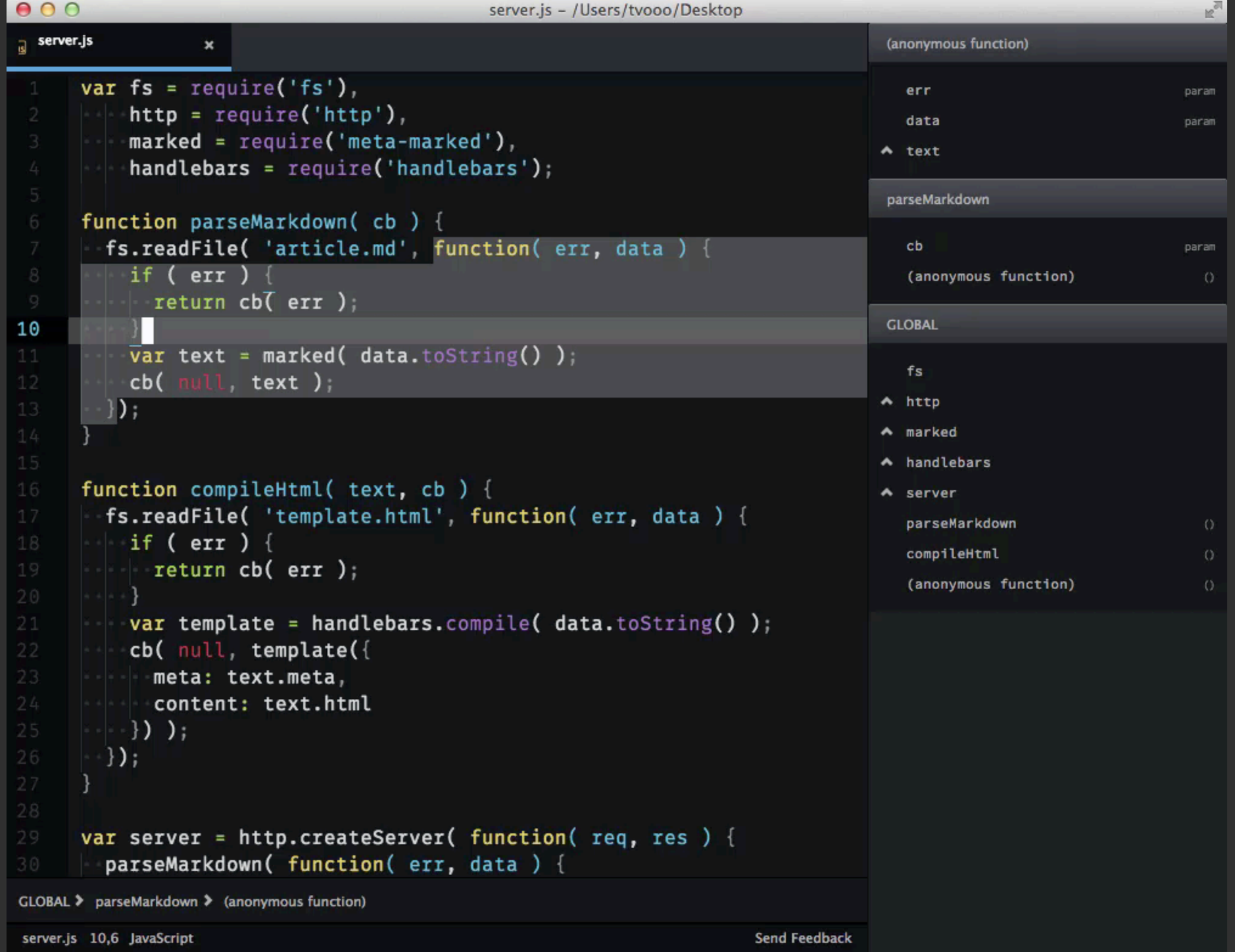
Phenomena/Problems with Scope in JavaScript

— Shadowing
— Hoisting
— Performance
— Closure

Goal: **making the user aware of those phenomena in their code**

Introducing

JavaScript Scope Inspector


server.js – /Users/tvooo/Desktop
server.js
var fs = require('fs'),
http = require('http'),
marked = require('meta-marked'),
handlebars = require('handlebars');
function parseMarkdown(cb) {
fs.readFile('article.md', function(err, data) {
if (err) {
return cb(err);
}
var text = marked(data.toString());
cb(null, text);
});
}
function compileHtml(text, cb) {
fs.readFile('template.html', function(err, data) {
if (err) {
return cb(err);
}
var template = handlebars.compile(data.toString());
cb(null, template({
meta: text.meta,
content: text.html
}));
});
}
var server = http.createServer(function(req, res) {
parseMarkdown(function(err, data) {
(anonymous function)
err param
data param
text
parseMarkdown
cb param
(anonymous function) ()
GLOBAL
fs
http
marked
handlebars
server
parseMarkdown ()
compileHtml ()
(anonymous function) ()
GLOBAL parseMarkdown (anonymous function)
server.js 10,6 JavaScript
Send Feedback

Process

User-Centered Design Process applied to the Open Source community.

— Exploration & Research
— Ideation
— Prototyping
— Testing

Survey

42 answers in 2 weeks

Which IDE features do you use, and how would you make them better?

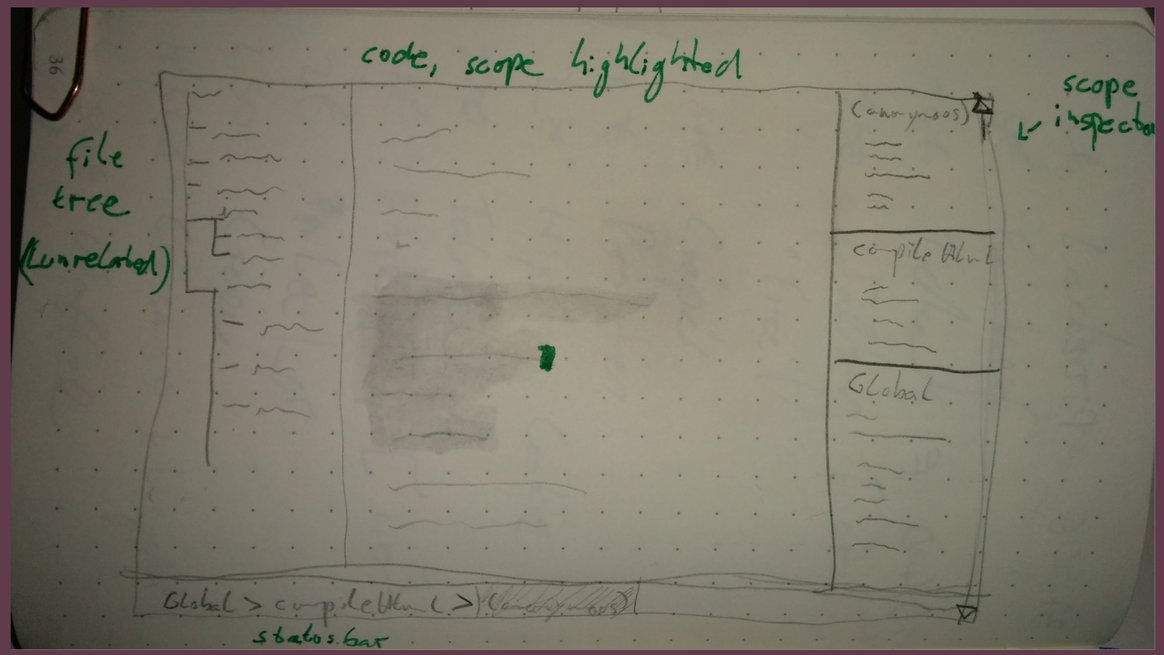
Interviews

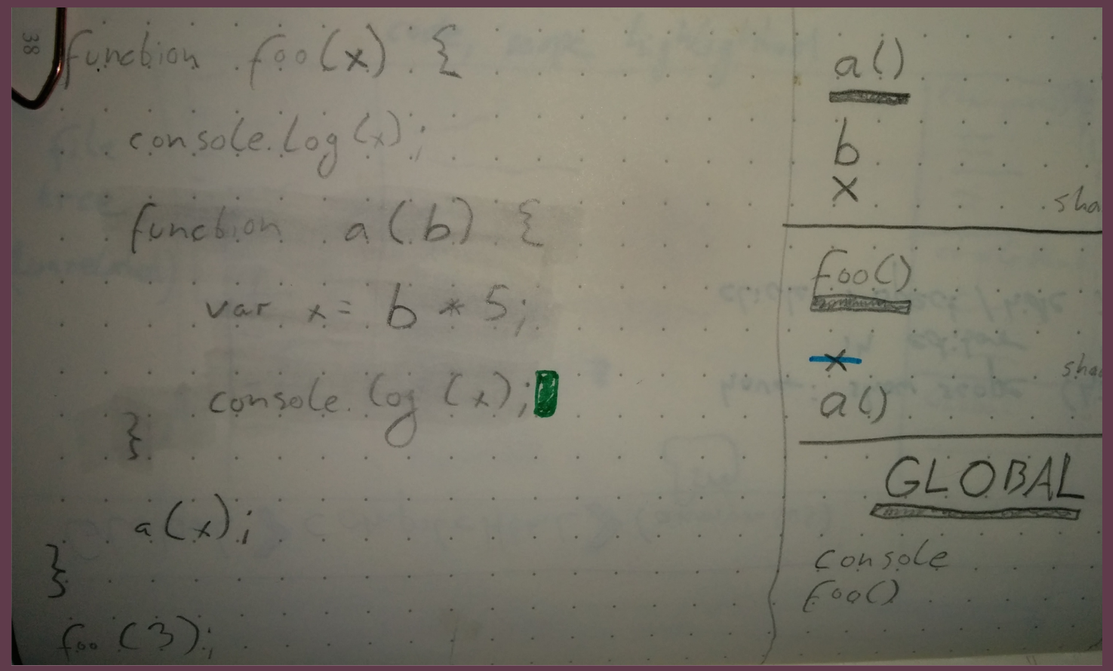
7 participants, about 10 hours of interview time

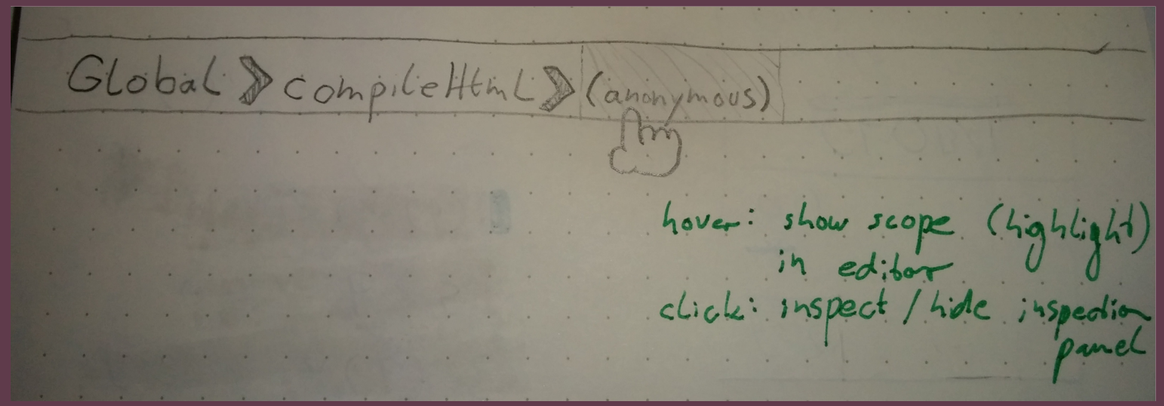
Result

- **Scope**
- **Characteristics of well-integrated language tools**
  - Performance
  - Modularity
  - Smartness
  - Focus on Code

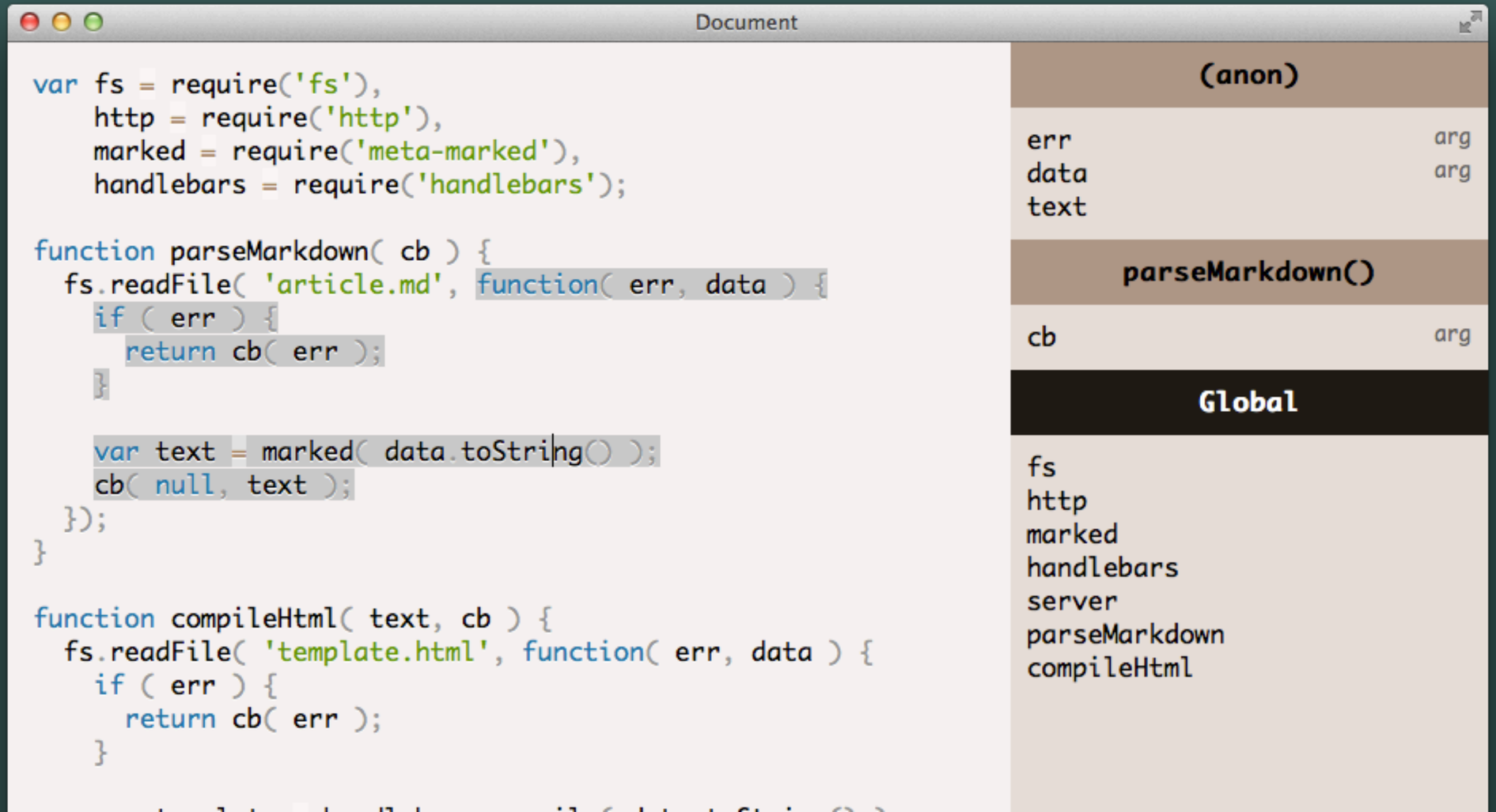
Sketches


code, scope highlighted
file tree (unrelated)
(anonymous)
compileHtml
Global
Global > compileHtml > (anonymous)
status bar

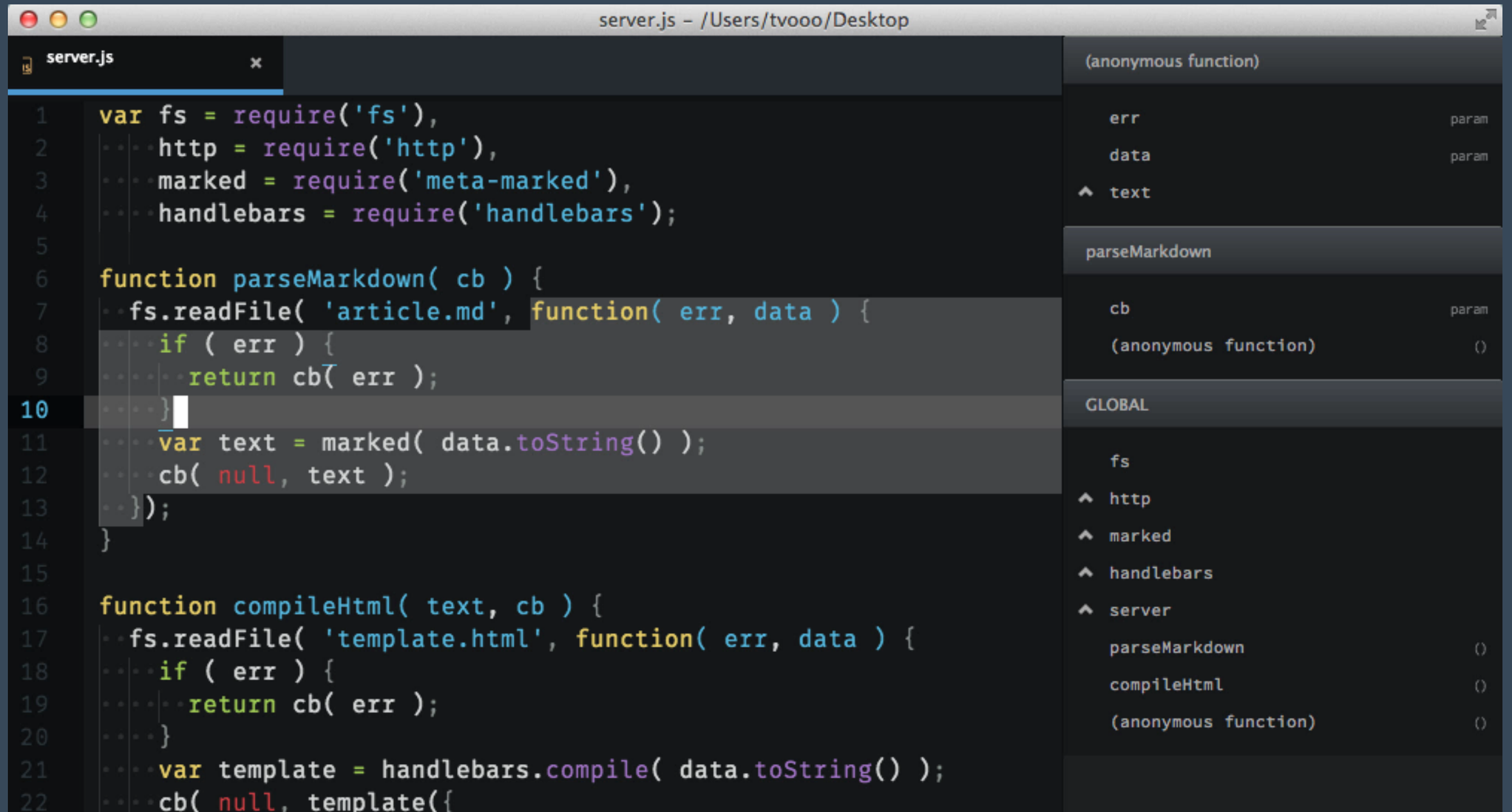

function foo(x) {
console.log(x);
function a(b) {
var x = b * 5;
console.log(x);
}
a(x);
}
foo(3);
a()
b
x
foo()
a()
GLOBAL
console
foo()


Global » compileHtml » (anonymous)
hover: show scope (highlight) in editor
click: inspect / hide inspection panel

Scripted Prototype



Working Prototype



Test installment

Test installment problems

The scheduled test users where not available for week-long testing.

Instead: **Remote contextual inquiry**.

Testing results (qualitative)

“Why can’t I navigate using the sidebar? Jump to variables?”

“I want to enable/disable the bottom bar and the highlighting.”

“It doesn’t get updated when I type.”

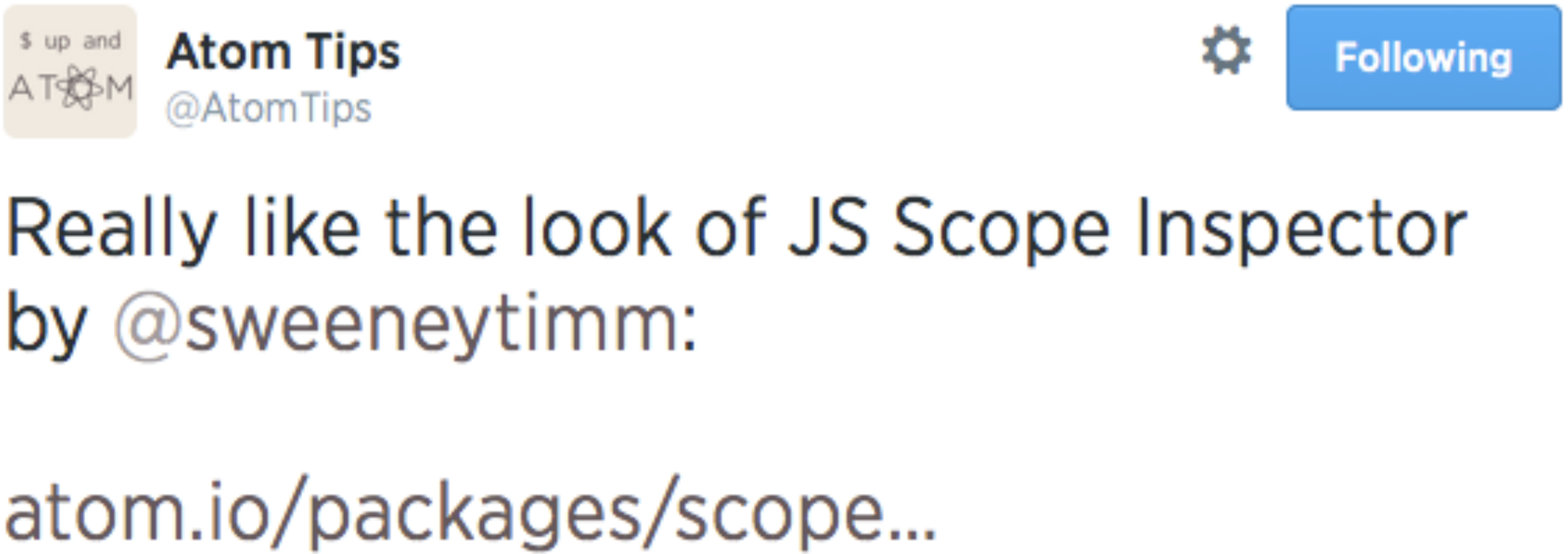
(paraphrased)

Testing results (quantitative)

After 1 week of tracking metrics:

150 downloads — 5 users tracking

Social Media Feedback



Social Media Feedback

Reginald Braithwaite
@raganwald

Following

How cool is this?

atom.io/packages/scope...

Social Media Feedback

Reflection (1)

- Disabling **tracking by default** was hindering
- **Testing** in the open source community **is hard**, especially with a narrow user group
- Using a **small-yet-growing platform** might not be ideal for prototyping
- **Social Media** are suitable channels for “marketing and communications”

Reflection (2)

“Every good work of software starts by scratching a developer's personal itch.” (Raymond 1999, paraphrased)

Interaction Design offers new impulses for the technology-driven area of development software—by *scratching other developer’s itches*.

Contributions

- **Four Characteristics** of well-integrated language tools: *Performance, Modularity, Smartness, Focus on Code*
- A **case study** of evaluating a design with a specific, narrow target group
- Working **prototype** (open source)
- **Library** for scope analysis (open source)

Thank you!

Post-Submit

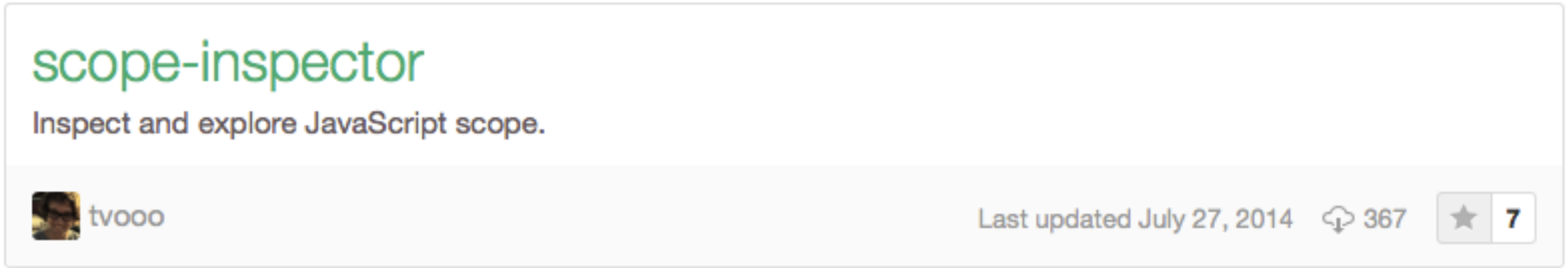
What happened in the past three months

What happened in the past three months

- Minor bug fixes
- Attended to user testing feedback
    1. navigation through sidebar
    2. enable everything separately
    3. re-evaluate while typing
- Context colouring as separate plugin by third party

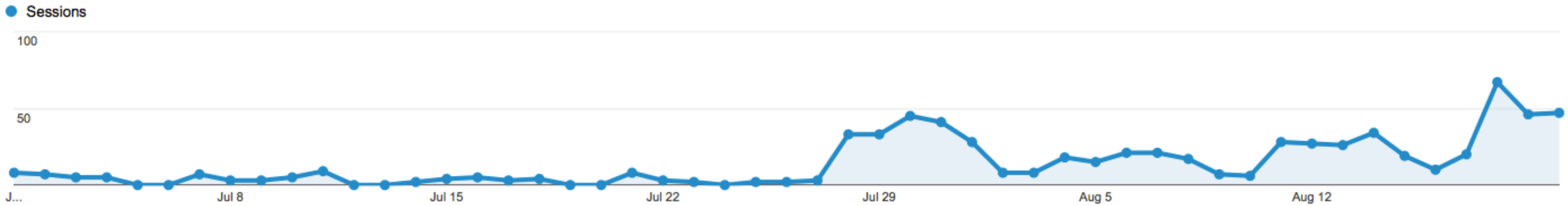
What happened in the past three months

Nearing 400 downloads



What happened in the past three months

Enabled GA tracking by default



The sidebar is enabled on demand; Breadcrumbs are usually enabled.