



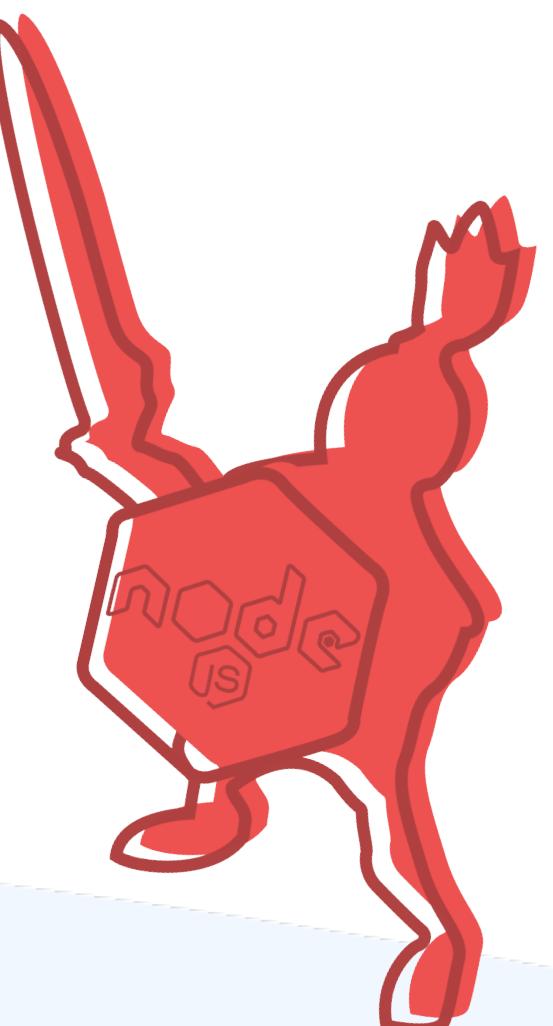
Node 101

Troubleshooting Node.js Production Issues

Matheus Marchini

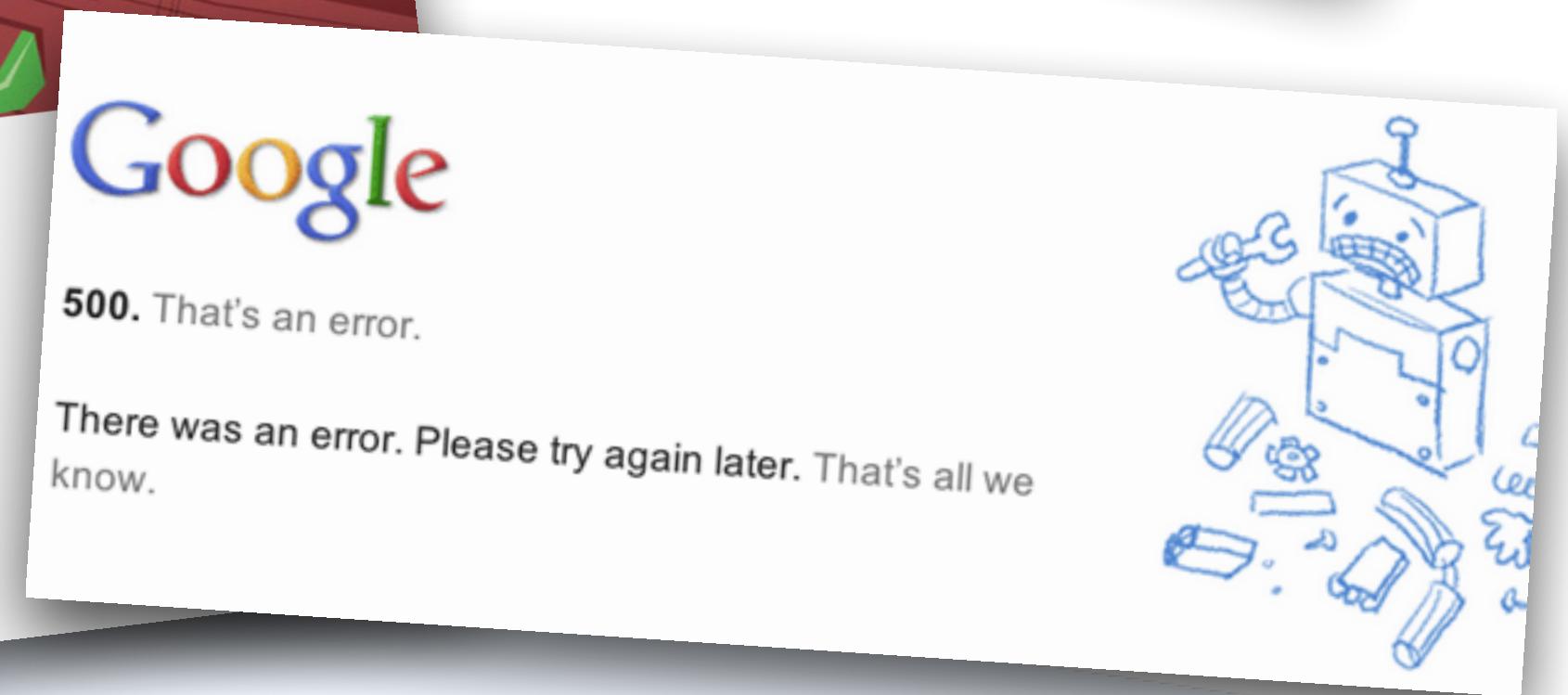
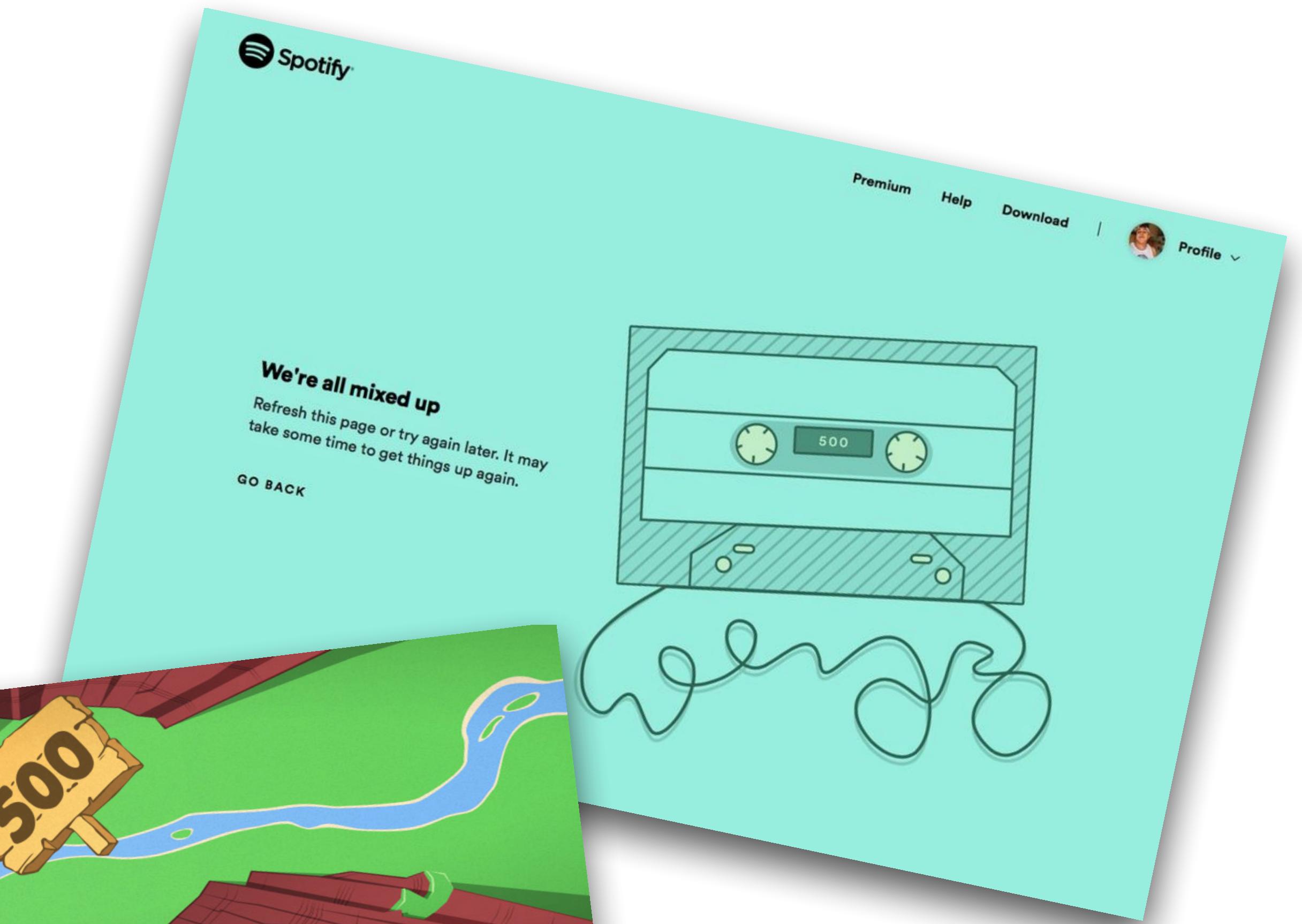
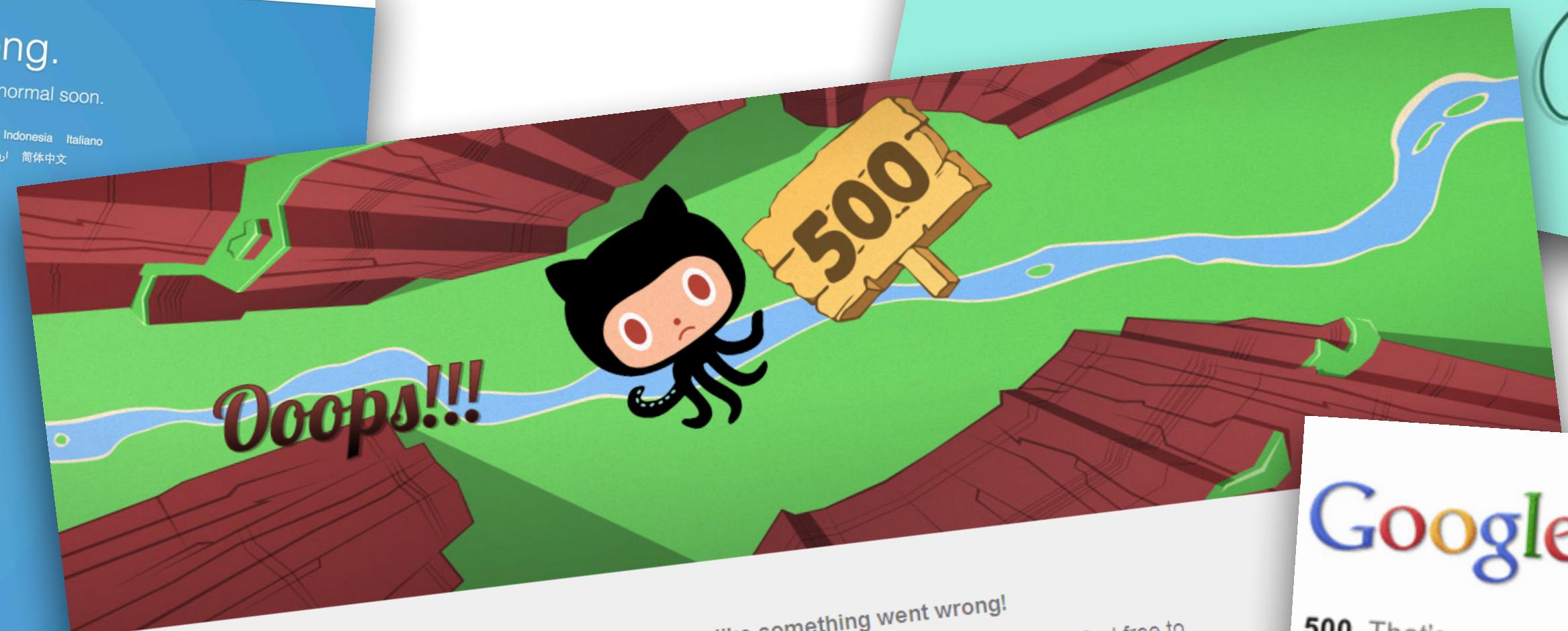
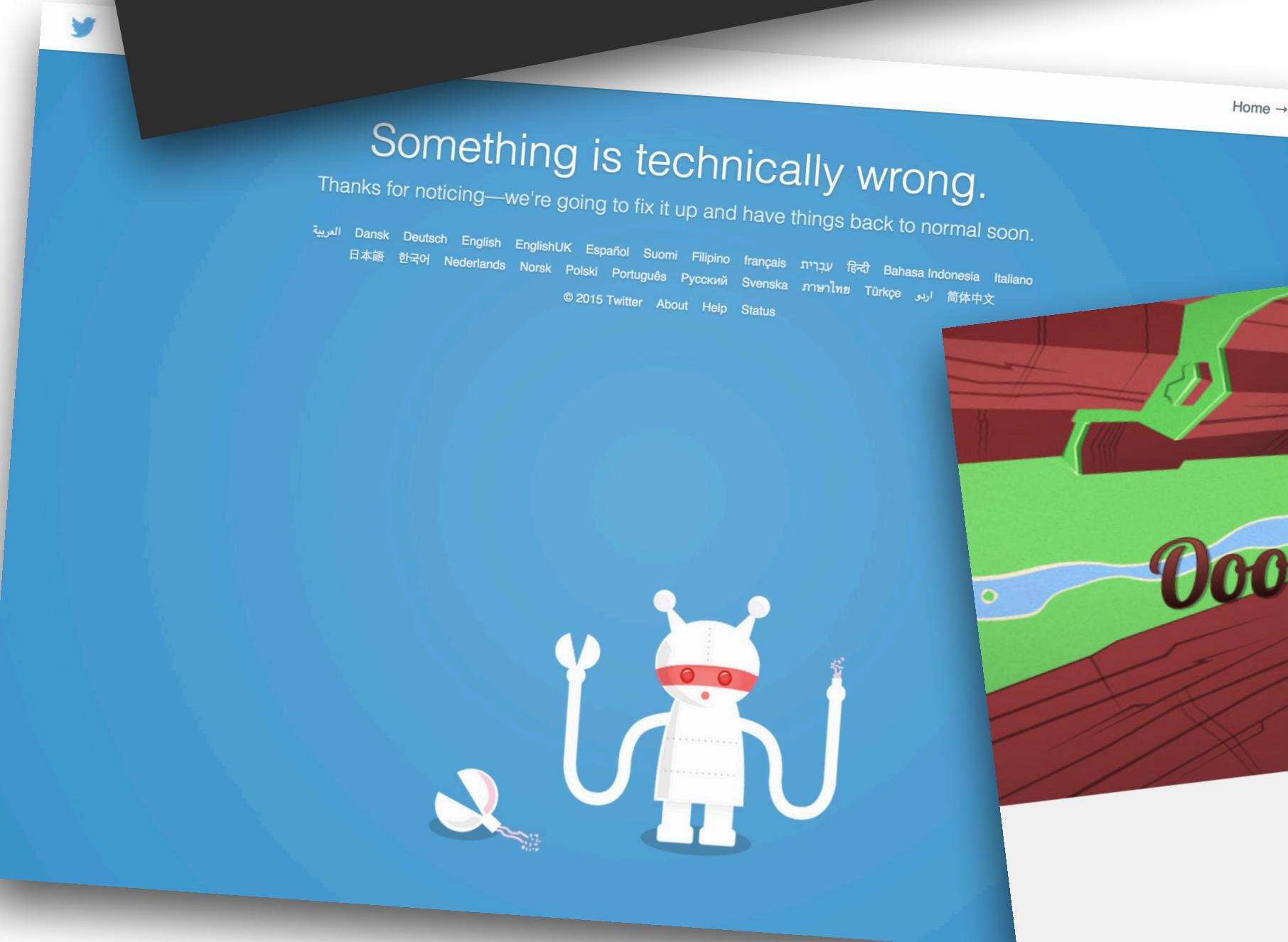
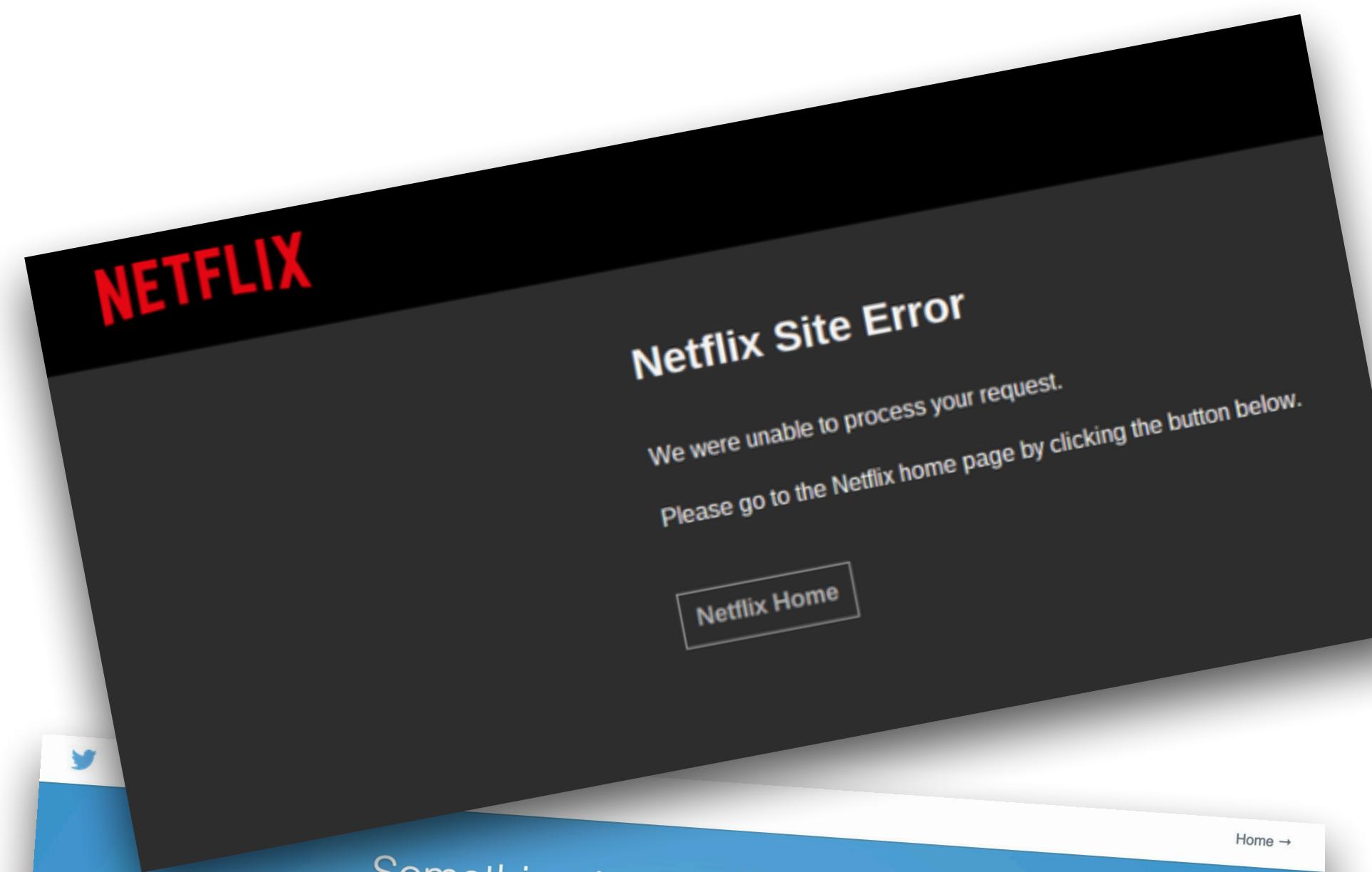
 @mmarkini

sthima



500 Internal Server Error

nginx/1.7.9





← → C chrome-devtools://devtools/bundled/inspector.html?experiments=true&v8only=true&ws=127.0.0.1:9229/b0b26839-9686-466... ⌂ ☆ JB O P E S G A : ·

Console Sources Profiles

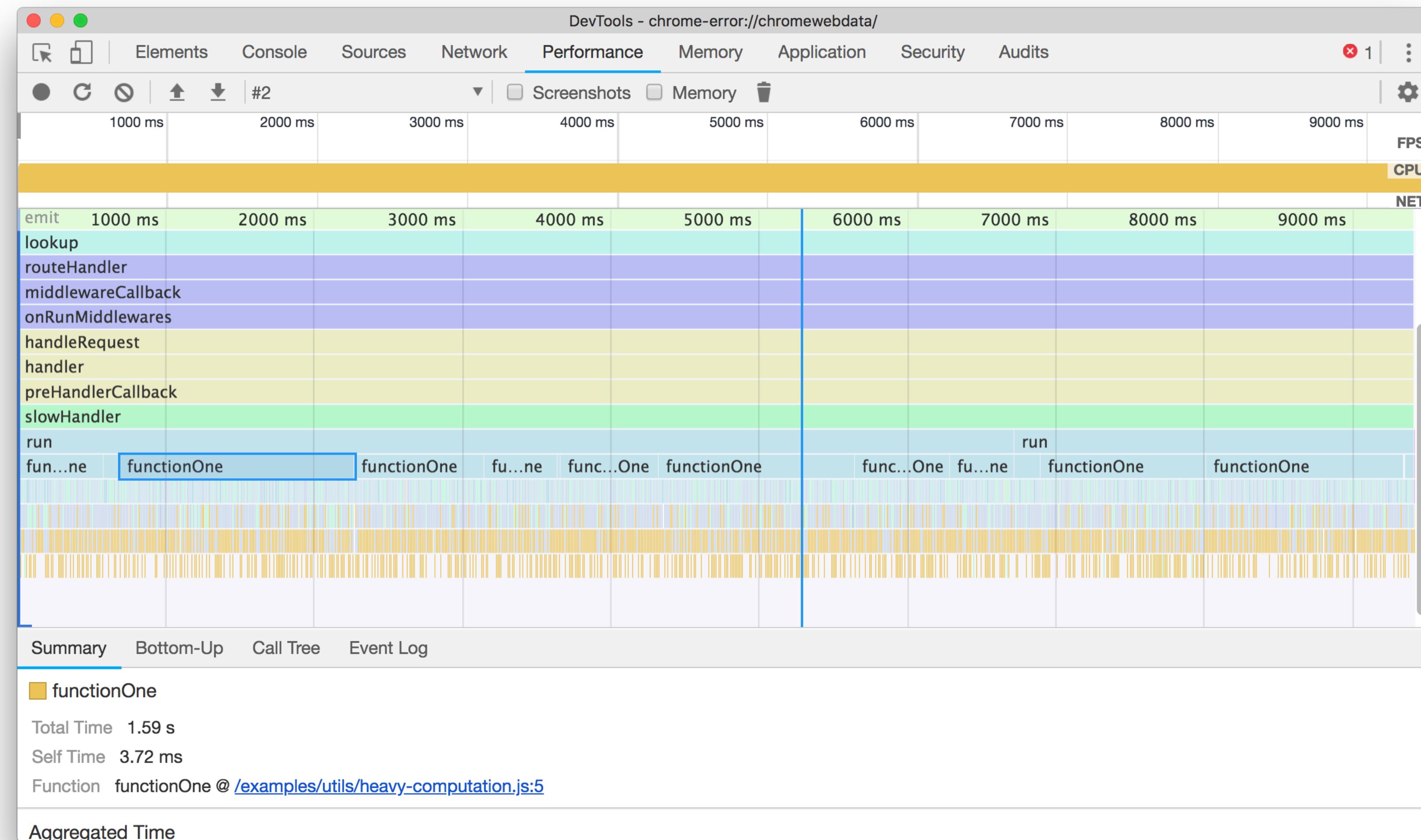
Sources Content scripts » · index.js x

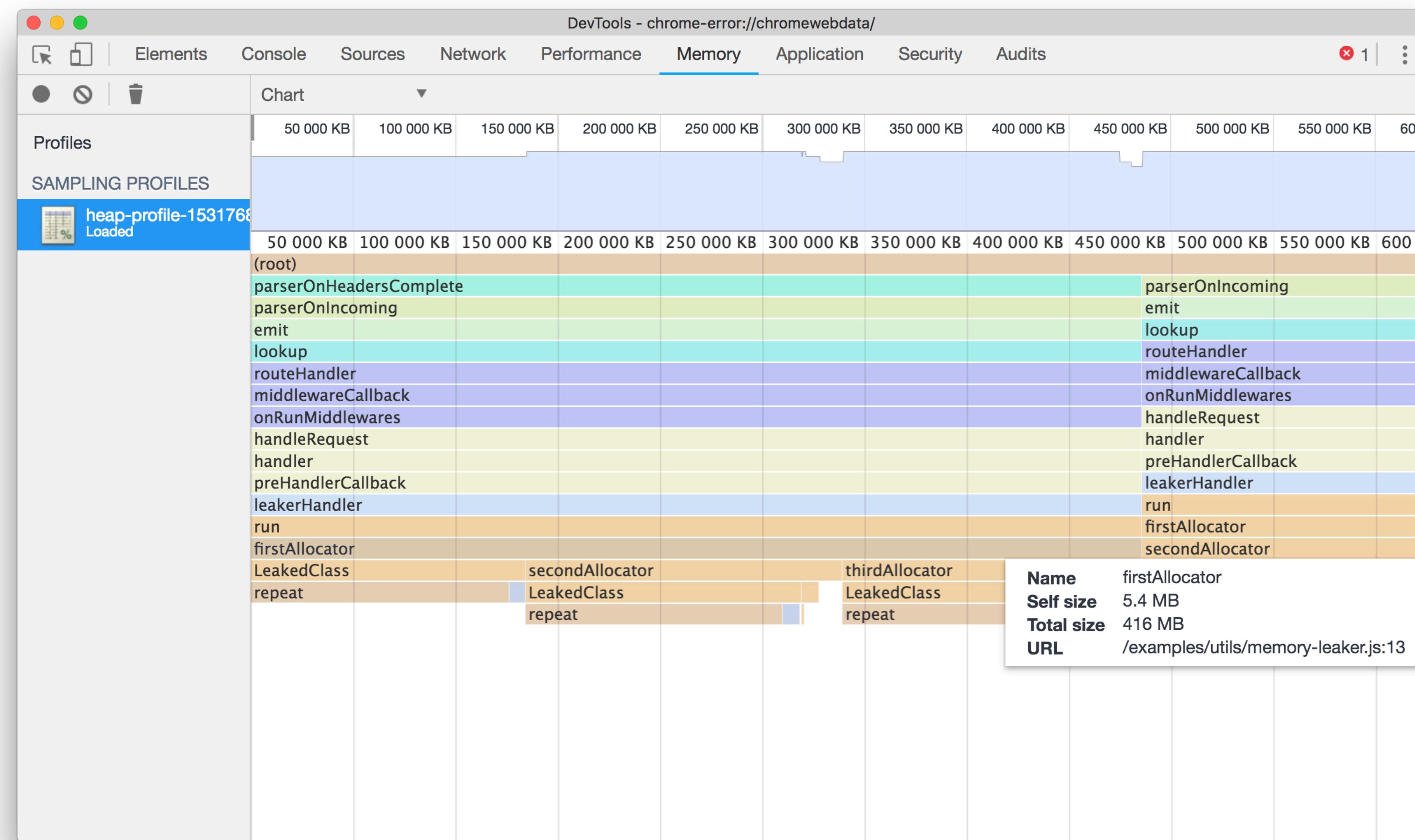
▶ Cloud (no domain)
▼ Cloud file:///
 private/tmp/node
 index.js

```
1 (function (exports, require, module, __filename, __dirname) {  
2  
3   http.createServer((req, res) => { req = IncomingMessage { _re  
4     res.end('Hello Client');  
5   }).listen(8181, () => {  
6     console.log('Server listening on port 8181');  
7   );  
8  
9 });
```

{ } Line 5, Column 1

▶ Watch
▼ Call Stack
 ▶ http.createServer index.js:5
 emitTwo events.js:106
 emit events.js:191
 parserOnIncoming _http_server.js:547
 parserOnHeader _http_common.js:99
 sComplete
▼ Scope
▼ Local
 Return Value: undefined
 ▶ req: IncomingMessage
 ▶ res: ServerResponse
 ▶ this: Server
 ▶ Global global
▼ Breakpoints
 index.js:4
 res.end('Hello Client');
 ▶ XHR Breakpoints





Elements Console Sources Application Network Timeline Profiles Security Audits

Profiles

ALLOCATION TIMELINES

Snapshot 1 8.0 MB Save

Snapshot 2 10.4 MB

Snapshot 3 10.4 MB

Summary Class filter Selected size: 7.9 MB

5.00 s 10.00 s 15.00 s 20.00 s 25.00 s 30.00 s

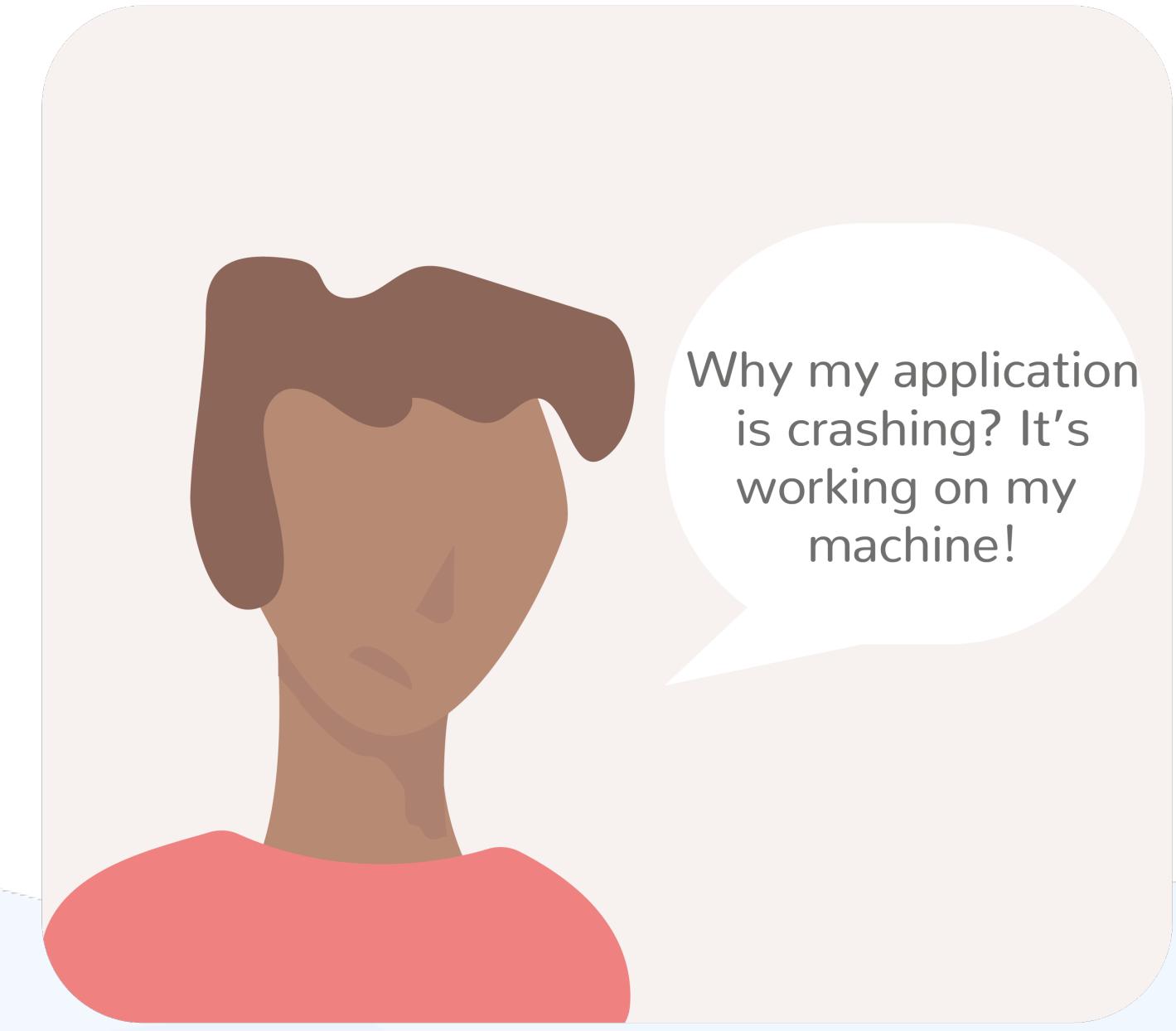
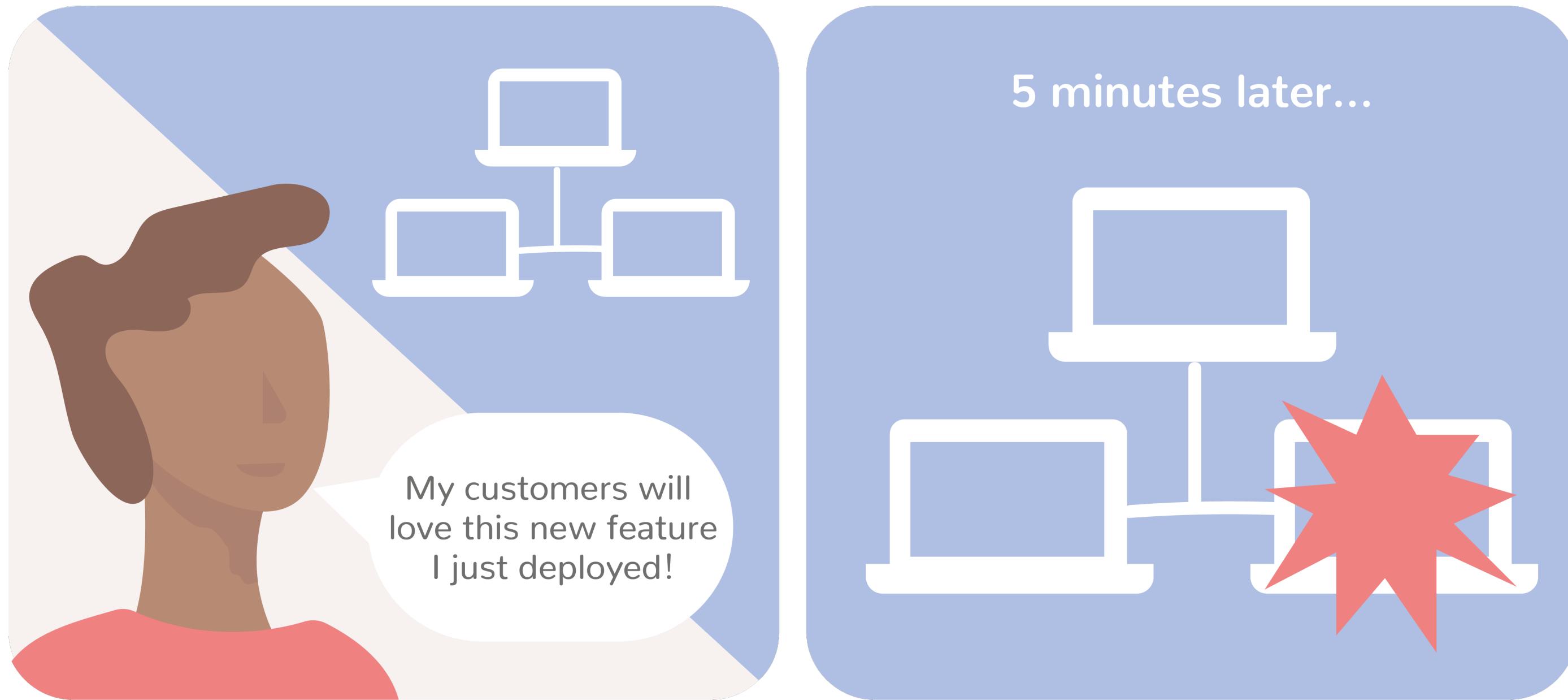
500 KB

	Constructor	Distan...	Objec...	Shallow ...	Retained ...	
▶ (string)	-	10 %	2	61 %	2	61 %
▶ Array	2	0 %	8	0 %	8	60 %
▶ (system)	-	37 %	0	7 %	0	16 %
▶ (array)	-	10 %	2	8 %	8	10 %
▶ (closure)	-	12 %	2	4 %	4	7 %
▶ (compiled code)	3	6 %	4	4 %	92	7 %
▶ Object	-	4 %	0	1 %	8	4 %
▶ system / Context	3	1 %	4	0 %	6	3 %

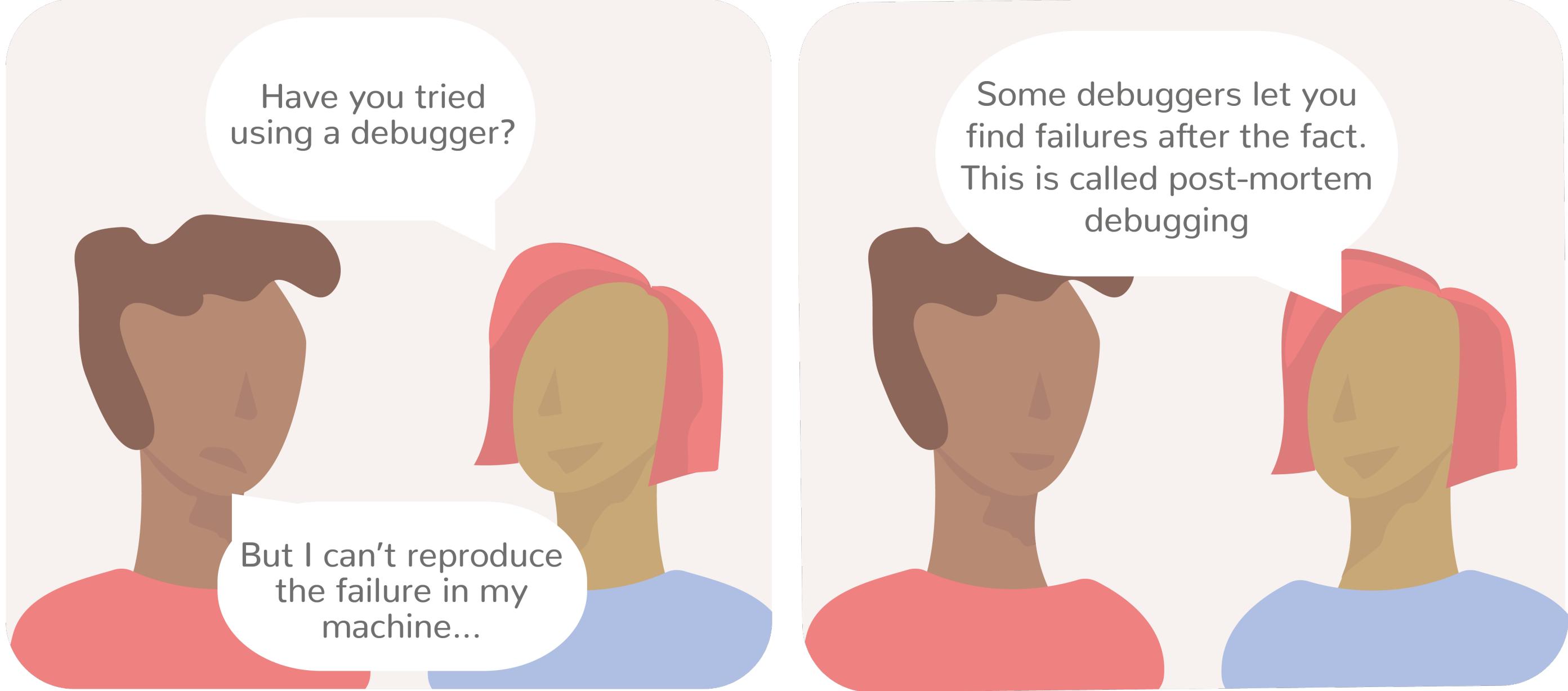
Retainers

Object	Distan...	Shallow ...	Retained ...

Why another tool?



Post-mortem debugging



Have you tried
using a debugger?

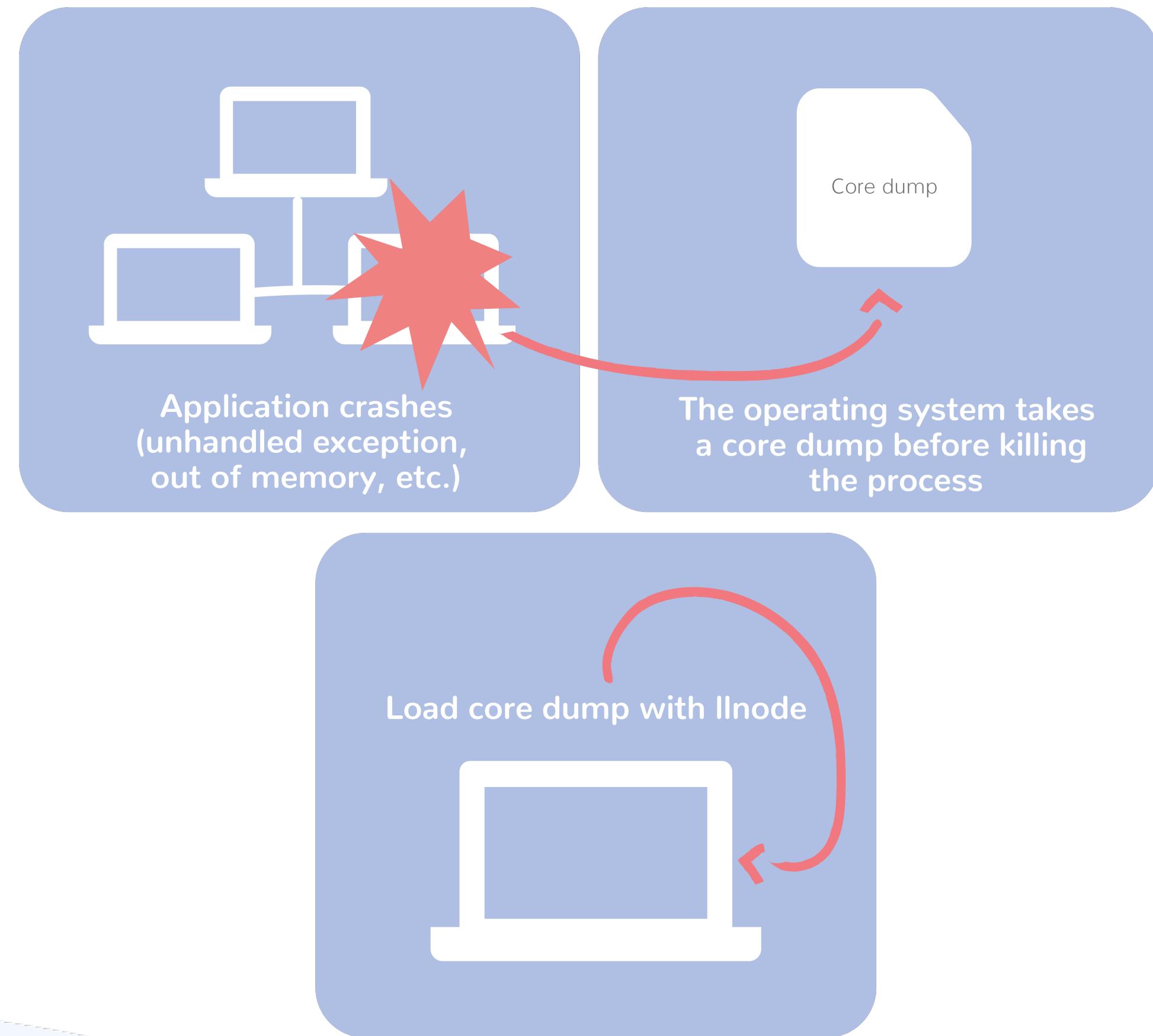
But I can't reproduce
the failure in my
machine...

Some debuggers let you
find failures after the fact.
This is called post-mortem
debugging

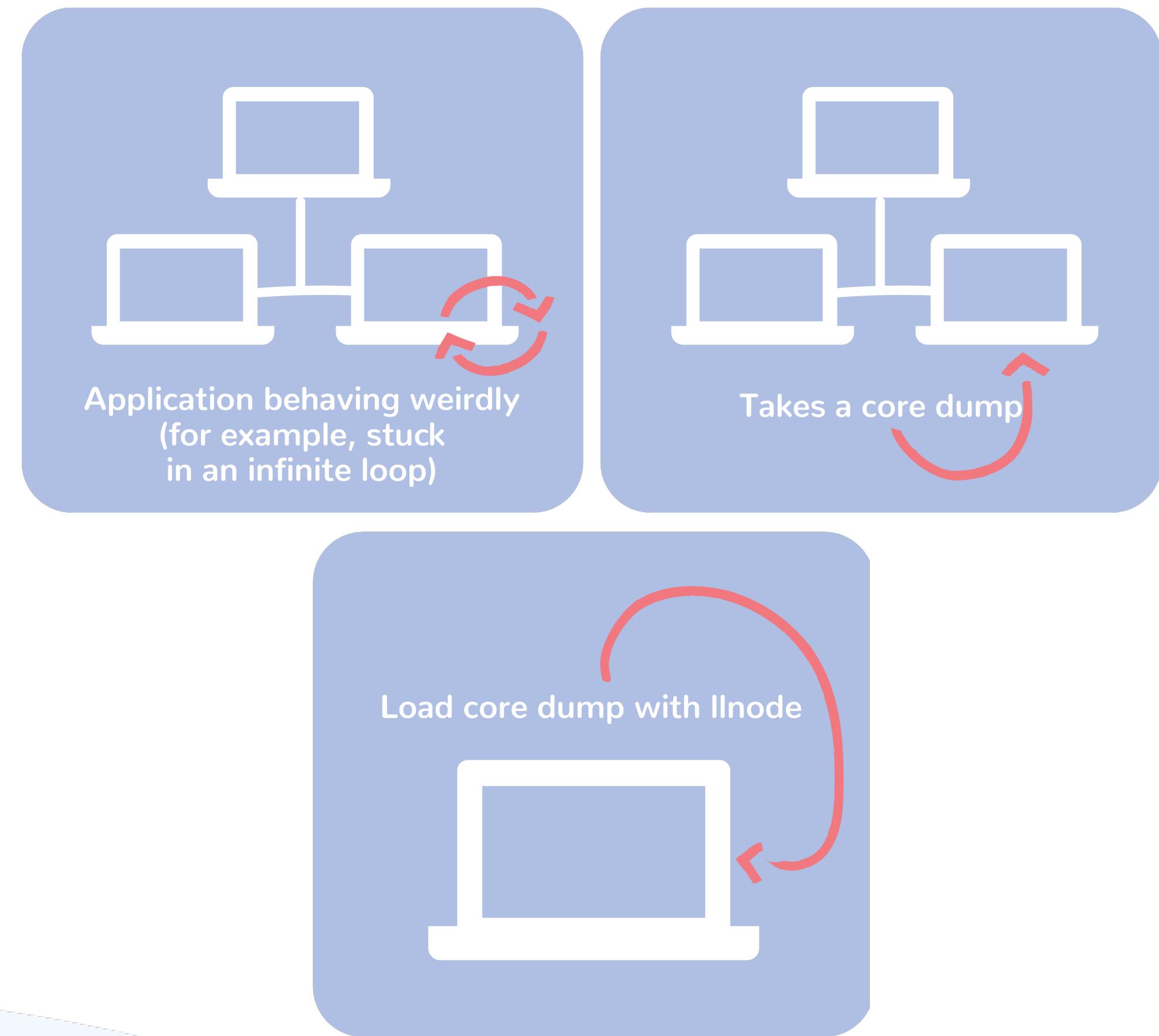


This way you'll be able
to find the failure much
faster!

How it works (on crash)



How it works (on demand)



Post-mortem & Node.js

mdb_v8 - Node.js postmortem origin

- Module for mdb
- First postmortem tool for Node.js
- Available for Solaris-based OSs
 - Not available for Linux, Windows, OS X
- Don't work with Node.js v8.x or later

llnode - making postmortem cross-platform

- Inspired on mdb_v8
- Plugin for lldb
- Works on Linux, OS X, FreeBSD
 - Windows support on the way
- Is working for current Node.js releases
 - (v6.x, v8.x and v10.x)

llnode features

- Complete call stack
- Objects Statistics
- List all allocated objects of a given type
- Inspect JavaScript objects
- Find all references to a given object
- Inspect the workqueue

Stack Traces

Complete Stack Trace

**method at index.js:27:43
closure at index.js:18:17
startup at internal/bootstrap/node.js:1:10
bootstrapNodeJSCore at internal/bootstrap/node.js:1:10**

```
v8::base::OS::Abort()
v8::internal::Isolate::Throw(v8::internal::Object*, v8::internal::MessageLocation*)
<exit> [V8 Builtin]
<stub> [V8 Builtin]
method(this=<Object: Class>) at index.js:27:43
closure(this=<undefined>) at index.js:18:17
startup(this=<undefined>) at internal/bootstrap/node.js:1:10
bootstrapNodeJSCore(this=<null>, ...) at internal/bootstrap/node.js:1:10
<internal> [V8 Builtin]
<entry> [V8 Builtin]
v8::Function::Call(v8::Local<v8::Context>, v8::Local<v8::Value>, int, v8::Local<v8::Value>*)
node::LoadEnvironment(node::Environment*)
node::Start(v8::Isolate*, node::IsolateData*, int, char const* const*, int, char const* const*)
node::Start(uv_loop_s*, int, char const* const*, int, char const* const*)
node::Start(int, char**)
start
```

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v8::base::OS::Abort()
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node::Start(uv_loop_s*, int, char const* const*, int, char const* const*)
node::Start(int, char**)
start
```

Argument Types

```
function foo(arg1, arg2) {}  
  
foo(1);  
foo("bar");  
foo(42, "bar");  
foo(42, true, "biz");
```

```
function foo(arg1, arg2) {}
```

```
foo(1);
```

```
foo("bar");
```

```
foo(42, "bar");
```

```
foo(42, true, "biz");
```

```
foo(this=0x94c34e9aa19:<Global proxy>, <Smi: 1>, <undefined>)
```

```
function foo(arg1, arg2) {}  
  
foo(1);  
foo("bar");  
foo(42, "bar");  
foo(42, true, "biz");
```

foo(this=0x94c34e9aa19:<Global proxy>, 0x35d26fed7761:<String: "bar">, <undefined>)

```
function foo(arg1, arg2) {}  
  
foo(1);  
foo("bar");  
foo(42, "bar");  
foo(42, true, "biz");
```

foo(this=0x94c34e9aa19:<Global proxy>, <Smi: 42>, 0x35d26fed7761:<String: "bar">)

```
function foo(arg1, arg2) {}  
  
foo(1);  
foo("bar");  
foo(42, "bar");  
foo(42, true, "biz");
```

foo(this=0x94c34e9aa19:<Global proxy>, <Smi: 42>, <true>)

What is *this*

```
class Foo {  
    func() {}  
}  
  
class Bar {};  
  
const foo = new Foo();  
foo.func();  
foo.func.bind(new Bar)();
```

```
class Foo {  
    func() {}  
}  
  
class Bar {};  
  
const foo = new Foo();  
foo.func();  
foo.func.bind(new Bar)();  
  
func(this=0x3c3a90765529:<Object: Foo>)
```

```
class Foo {  
    func() {}  
}  
  
class Bar {};  
  
const foo = new Foo();  
foo.func();  
foo.func.bind(new Bar)()  
  
func(this=0x3c3a9076afb1:<Object: Bar>)
```

Objects Statistics

Instances	Total Size	Name
1	24	WebAssembly
1	24	console
1	32	(Object)
1	56	AssertionError
...
66	2272	ContextifyScript
195	10920	NodeError
402	12864	(Array)
599	34968	Object
7721	53960	(String)
9273	123412	Foo
9129	127816	

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7721	53960	(String)
9273	123412	Foo
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List Objects

```
class Foo {}  
const foo1 = new Foo();  
const foo2 = new Foo();
```

0x00001582160c21e9:<Object: Foo>
0x00001582160c2371:<Object: Foo>
0x00001582160c23d9:<Object: Foo>

```
class Foo {} —————→ 0x00001582160c21e9:<Object: Foo>
const foo1 = new Foo();————→ 0x00001582160c2371:<Object: Foo>
const foo2 = new Foo();————→ 0x00001582160c23d9:<Object: Foo>
```

List Retainers

```
class Foo {};  
class Bar {};  
  
const foo = new Foo();  
foo.bar = new Bar();
```

*0x00001e3d092c2701 :<Object: Bar > Retainers:
- 0x1e3d092c2601: Foo.bar=0x1e3d092c2701*

```
class Foo {};
class Bar {};

const foo = new Foo();
foo.bar = new Bar();
```

→ **0x00001e3d092c2701 :<Object: Bar >** Retainers:

- 0x1e3d092c2601: Foo.bar=0x1e3d092c2701

```
class Foo {};  
class Bar {};  
  
const foo = new Foo();  
foo.bar = new Bar();
```

0x00001e3d092c2701 :<Object: Bar > Retainers:
- 0x1e3d092c2601: Foo.bar=0x1e3d092c2701

```
class Foo {};  
class Bar {};  
  
const foo = new Foo();  
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```

0x00001e3d092c2701 :<Object: Bar > Retainers:
- 0x1e3d092c2601: Foo.bar=0x1e3d092c2701

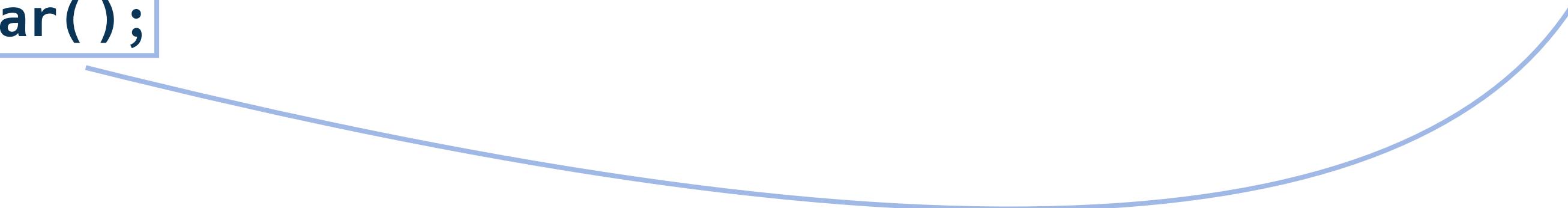
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const foo = new Foo();  
foo.bar = new Bar();
```

0x00001e3d092c2701 :<Object: Bar > Retainers:
- 0x1e3d092c2601: **Foo.bar** 0x1e3d092c2701



```
class Foo {};  
class Bar {};  
  
const foo = new Foo();  
foo.bar = new Bar();
```

0x00001e3d092c2701 :<Object: Bar> Retainers:
- 0x1e3d092c2601: Foo.bar 0x1e3d092c2701



Object Inspection

```
class Foo {  
    constructor() {  
        this.attr1 = 42;  
    }  
}  
  
const foo1 = new Foo();  
const foo2 = new Foo();  
foo2.attr2 = "my string";
```

```
0x273071542269:<Object: Foo properties {  
    .constructor=0x2229:<function: Foo at demo.js:2:14>}>  
0x2730715423f1:<Object: Foo properties {  
    .attr1=<Smi: 42>}>  
0x273071542489:<Object: Foo properties {  
    .attr1=<Smi: 42>,  
    .attr2=0x7881:<String: "my string">}>
```

```
class Foo {  
    constructor() {  
        this.attr1 = 42;  
    }  
}  
  
const foo1 = new Foo();  
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0x273071542489:<Object: Foo properties {
 .attr1=<Smi: 42>,
 .attr2=0x7881:<String: "my string">>

Inspect Workqueue

```
const fs = require('fs');

setTimeout(() => {}, 1000);

fs.readFile(__filename, () => {});
```

<Object: Timer properties {
 .list=0x3bb42b11:<Object: TimersList>}
internal fields {
 0x000000002800380}>

<Object: FSReqWrap properties {
 .context=0xbb472f1:<Object: ReadFileContext>,
 .oncomplete=0x599f5d1:<function: ...>
internal fields {
 0x000000002809db0}>

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const fs = require('fs');

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```

<Object: Timer properties {
 .list=0x3bb42b11:<Object: TimersList>}
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<Object: FSReqWrap properties {
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setTimeout(() => {}, 1000);
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 .context=0xbb472f1:<Object: ReadFileContext>,
 .oncomplete=0x599f5d1:<function: ...>
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11node main use cases

- Memory Leaks / Out of Memory
- Uncaught Exceptions
- Infinite Loops
- Native Modules / Node.js / V8 Crashes

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Live Demo

Future Features

Inspect Promise Objects



color output



JavaScript API

List retainers tree

JavaScript mode

Simpler Installation Process

Current Challenges

Postmortem with Promises

Keeping up with latest Node.js and V8 versions

**Want to help the
project?**

Give Us Feedback

<http://bit.ly/llufb>

Issues · nodejs/linode

GitHub, Inc. (US) | https://github.com/nodejs/linode

Issues 35 Pull requests 6 Wiki Releases More

Filters is:issue is:open sort:updated-desc Labels M

Clear current search query, filters, and sorts

35 Open ✓ 75 Closed Author Labels

- Landing PRs policy #242 opened 2 days ago by mmarchini updated 18 hours ago meta
- linode team on GitHub #241 opened 2 days ago by mmarchini updated 2 days ago meta
- Make `v8 findjsobjects` faster #240 opened 3 days ago by mmarchini updated 3 days ago enhancement
- Simplify installation process #236 opened 6 days ago by mmarchini updated 3 days ago enhancement
- Inspect Promises #235 opened 6 days ago by mmarchini updated 3 days ago enhancement

nodejs/linode: An lldb plugin for X

GitHub, Inc. (US) | https://github.com/nodejs/linode

JIRA Sthima Dashboard OSS Dashboard Node.js Dashboards Issues for Later Useful Prometheus SAVE Mailbox | LinkedIn R... Engineer's Guide to ... 7 months ago

logo.svg doc: add logo to the project 2 days ago

package.json src: colorize output for findjsinstances 2 days ago

 linode

npm v2.0.0

Node.js v4.x+ C++ plugin for the LLDB debugger.

The linode plugin adds the ability to inspect JavaScript stack frames, objects, source code and more to the standard C/C++ debugging facilities when working with Node.js processes or core dumps in LLDB.

Demo

asciinema.org/a/29589

Build Status

Version	v6.x	v8.x	v10.x	master	v8-canary
Trusty	build passing	build passing	build passing	build failure	build failure
OS X	build passing	build passing	build passing	-	-

We have nightly test runs against all Node.js active release lines. We also test against Node.js master and Node.js v8-

<https://github.com/nodejs/linode>

Node.js Collaborator Summit

Diagnostics Session

Oct. 12th - 3:30 PM

Vancouver Convention Centre West Building

Join us!

Questions?

Try it yourself!

```
docker run --rm --privileged --it mmarchini/linode-101:latest
```

<https://github.com/mmarchini/linode-101>