Springboard

Debugging + Errors

js-debugging-demo.zip 3.4KB

Goals

- Define three of the most common errors in JavaScript and how to debug them
- Examine the Chrome Dev Tools for debugging
- Catch errors using try/catch/finally blocks
- Throw errors with specific messages

Debugging

- You are going to make mistakes!
- Let's examine ways to better debug
- Let's first examine some common errors

SyntaxError

- You've seen this one before!
- You have to fix these right away!

```
"awesome function first( {} let = "nice!"
```

ReferenceError

- Thrown when you try to access a variable that is **not defined**
- This does not mean **undefined**

```
function sayHi(){ let greeting = "hi!"; } sayHi(); greeting; // ReferenceError
```

TypeError

- Trying to do something with a type that you can not
- Accessing properties on ***undefined*** or ***null***
- Invoking *("calling")* something that is not a function

```
"awesome".splice() // TypeError let obj = {} obj.firstName.moreInfo // TypeError
```

Two Kinds of Bugs

- An error is thrown — **easier**
- You didn't get what you wanted — **harder!**

A process for debugging

- Make assumptions
- Test assumptions
- Prove assumptions
- Repeat

console.log

- Be mindful about what you print out
- Great for a sanity check
- Even better when you add parameters

```
console.log("We made it!"); console.log("The value of x is --->", x);
```

JavaScript Debugger

- Watch execution of code and examine at any point
- Built into Chrome (other browsers have similiar abilities)
- Can debug in-browser code *or* Node

Starting Debugger

View code or adding "breakpoints":

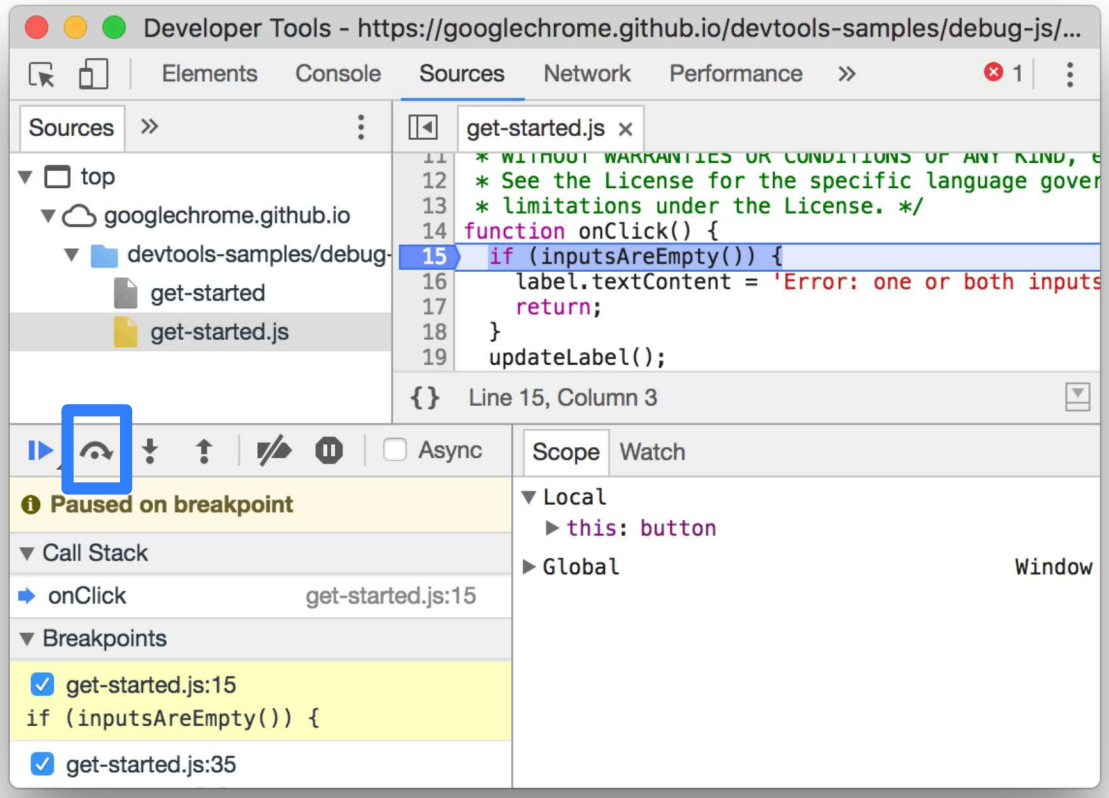
View → ***Developer*** → ***Developer Tools*** → ***Sources*** tab

Click left of line of code to add a blue breakpoint

Can put breakpoint into code itself:

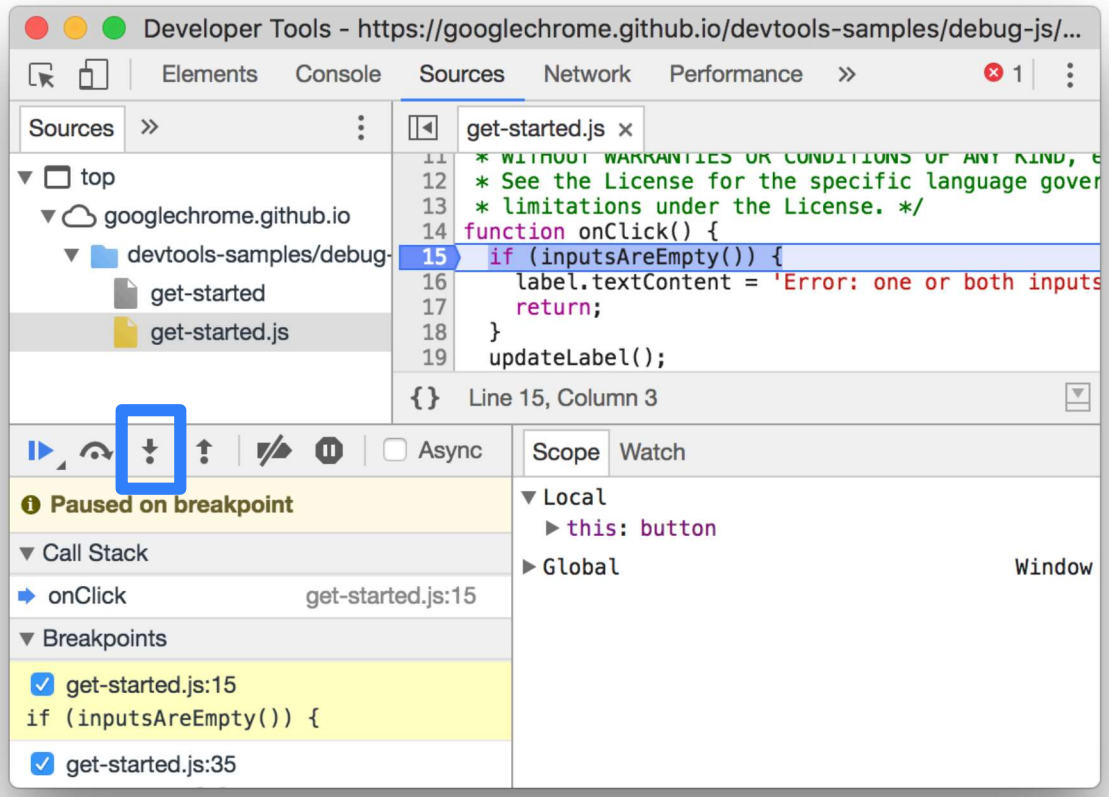
```
function myFunction() { let x = 1; debugger; // <-- will always stop here // rest of code follows ... }
```

Step Over



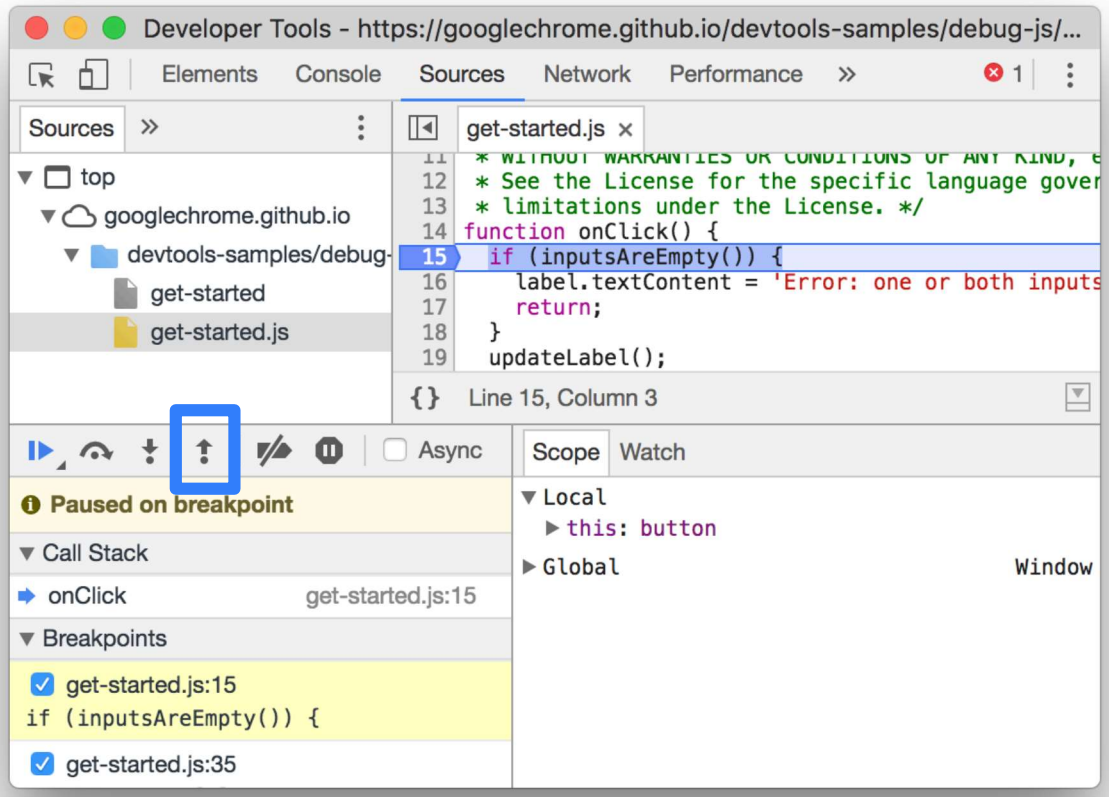
Run current line, but don't debug into any function calls

Step Into



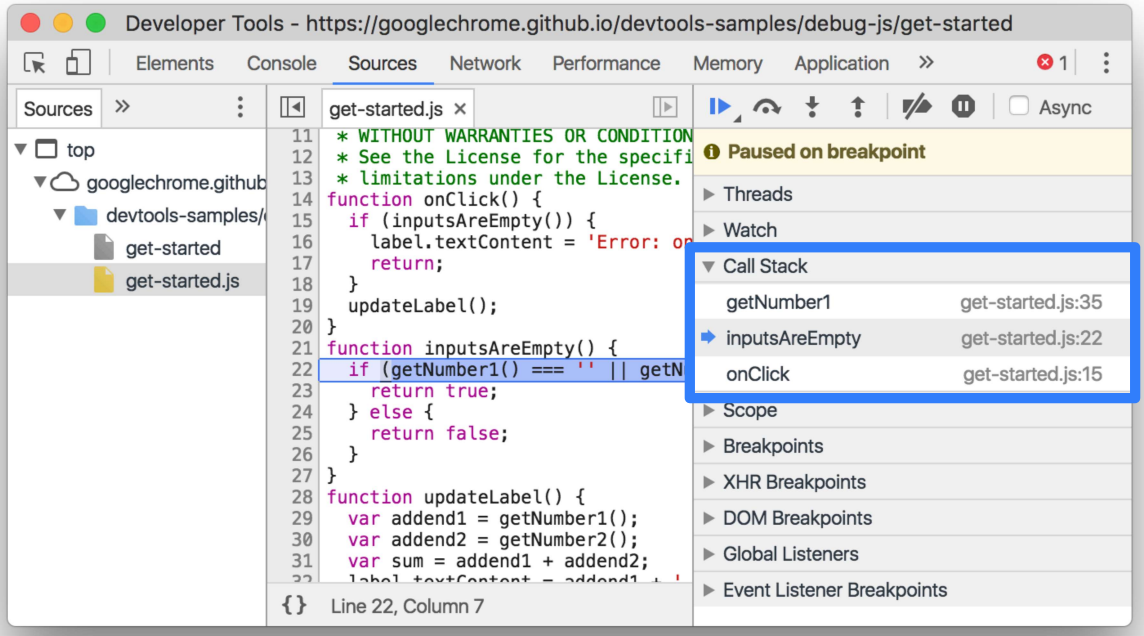
Run current line, stepping into any function calls

Step Out



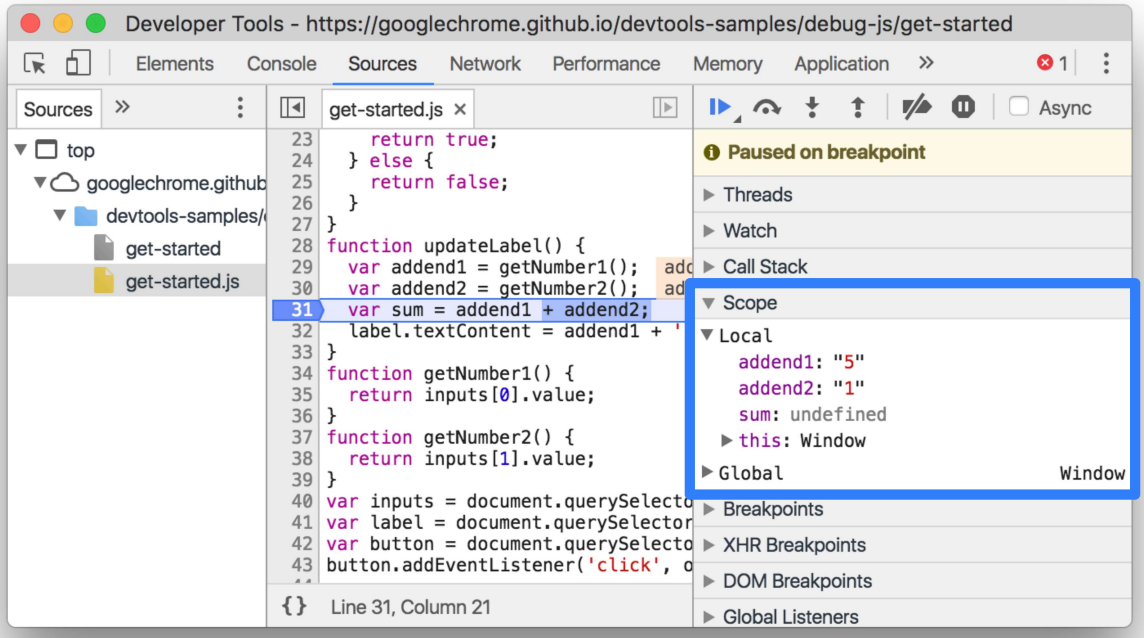
Return from this function to caller

Call Stack



Shows *stack* of function calls that got you here

Scope



Shows current value of variables

Can click to change value

Tips To Avoid Bugs

Plan First

> *Software and cathedrals are much the same — first we build them, then we pray.*

—Sam Redwine, 1988

Keep It Simple

> Everyone knows that debugging is twice as hard as writing a program in the first place. If you're as clever as you can be when you write it, how will you ever debug it?

—Brian Kernighan, The Elements of Programming Style

(That's a particularly excellent intermediate book, by the way)

Common JavaScript Bugs

- == is very loose about comparisons (=== isn't)
  - `7 == "7"`
- Objects & arrays are not equal to similar objects & arrays
  - `[1, 2, 3] !== [1, 2, 3]`
- Calling function with missing arguments makes those arguments ***undefined***
- Calling function with extra arguments is ignored (the extra arguments are ignored).
- Getting a missing property from object/index from array is ***undefined***

Good News

> *If debugging is the process of removing bugs, then programming must be the process of putting them in.*

—Edsger W. Dijkstra

- Bugs are an opportunity to improve debugging skills & to learn something
- You will have lots of chances to practice this valuable skill!

Error Handling

- Sometimes errors can not be avoided!
- This especially happens when working with external APIs / other people's data
  - Connection failures
  - The API is down
- Instead of errors crashing our program, let's handle them gracefully!

Let's "try" it out!

```
functionThatDoesNotExist(); console.log("did we make it?");
```

```
try { functionThatDoesNotExist(); } catch (err){ console.log("something went wrong!", err); } console.log("did we make it?");
```

Notice the important difference here!

Introducing try / catch

```
try { // place the code you would like to try to run } catch(err){ // if an error occurs, run whatever code we place in here! } // keep going!
```

try and ***catch*** create block scope, so if you define a variable inside using ***let*** or ***const*** it will only exist in that block.

The parameter to ***catch*** is optional, but we highly recommend using it so you can see what the error is and any information about it!

Another example

```
function displayInitials(user){ let firstNameLetter = user.firstName[0].toUpperCase(); let lastNameLetter = user.lastName[0].toUpperCase(); return `Hello ${firstNameLetter}.${lastNameLetter}`; }
```

What happens when we don't pass in an object?

What happens when our object does not have the correct keys or values?

Using try / catch

```
function displayInitials(user){ let firstNameLetter; let lastNameLetter; try { firstNameLetter = user.firstName[0].toUpperCase(); lastNameLetter = user.lastName[0].toUpperCase(); } catch(e){ return "Invalid input!"; } return `Hello ${firstNameLetter}.${lastNameLetter}`; }
```

Strive to only place code that will throw an error inside your try/catch block!

When to use try/catch

Think about using try/catch when:

- The output of your program is unpredictable
- There is any chance that an unexpected error may occur

- You don't want a tremendous amount of conditional logic

Making your own errors!

You can actually create your own errors in JavaScript using the ***throw*** keyword

```
console.log("an error is coming...."); throw "What just happened?!?"; console.log("did
we make it?");
```

Exploring with try/catch

```
console.log("an error is coming...."); try { throw "Oh no!"; }catch (err) { console.log
("what happened?", err); }
```

All we see here is the string that we passed to throw with no information about the kind of error or where it happened.

Throwing better errors

Instead of just using the ***throw*** keyword, you can make a new Error object using the ***new*** keyword.

```
console.log("an error is coming...."); try { throw new Error("Oh no!"); } catch (err) {
console.log("what kind of error?", err.name); console.log("what is the message?",
err.message); console.log("where did it happen?", err.stack); }
```

Notice that we get more information here including where the error occured!

We'll discuss what ***new*** does in much more detail later in the course, but for now you should use it when making your own errors.

When should you use this?