

# DEBUGGING

PREVENTION  
DETECTION  
DIAGNOSIS  
FIXING



# DETECTION

- 🐛 Program crashes or “bugs out”
- 🐛 Build/compile error
- 🐛 Automated testing fails

# DIAGNOSIS





# MANDATORY





# MANDATORY



Browser console open



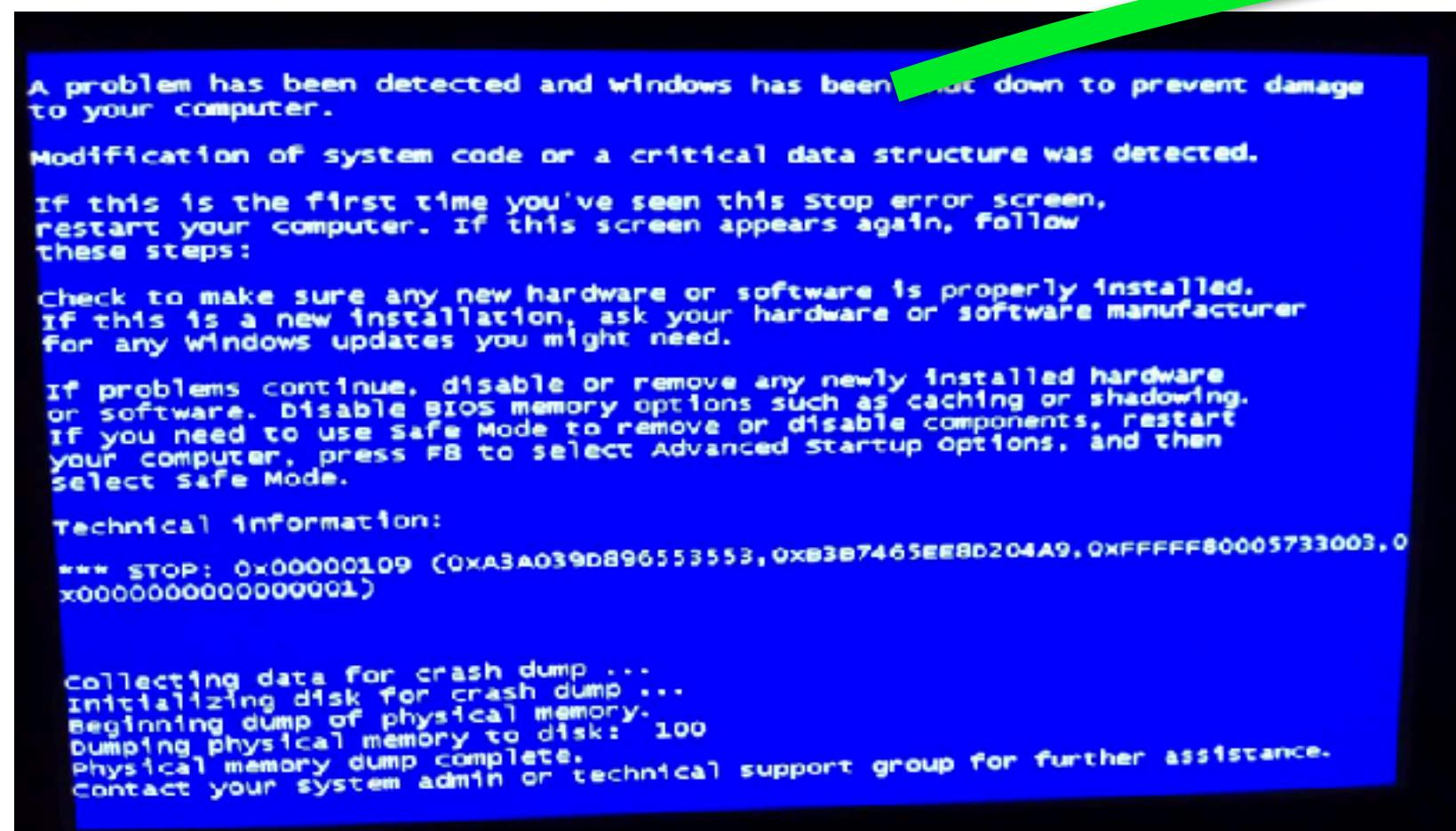
Server console open



Read the stack trace

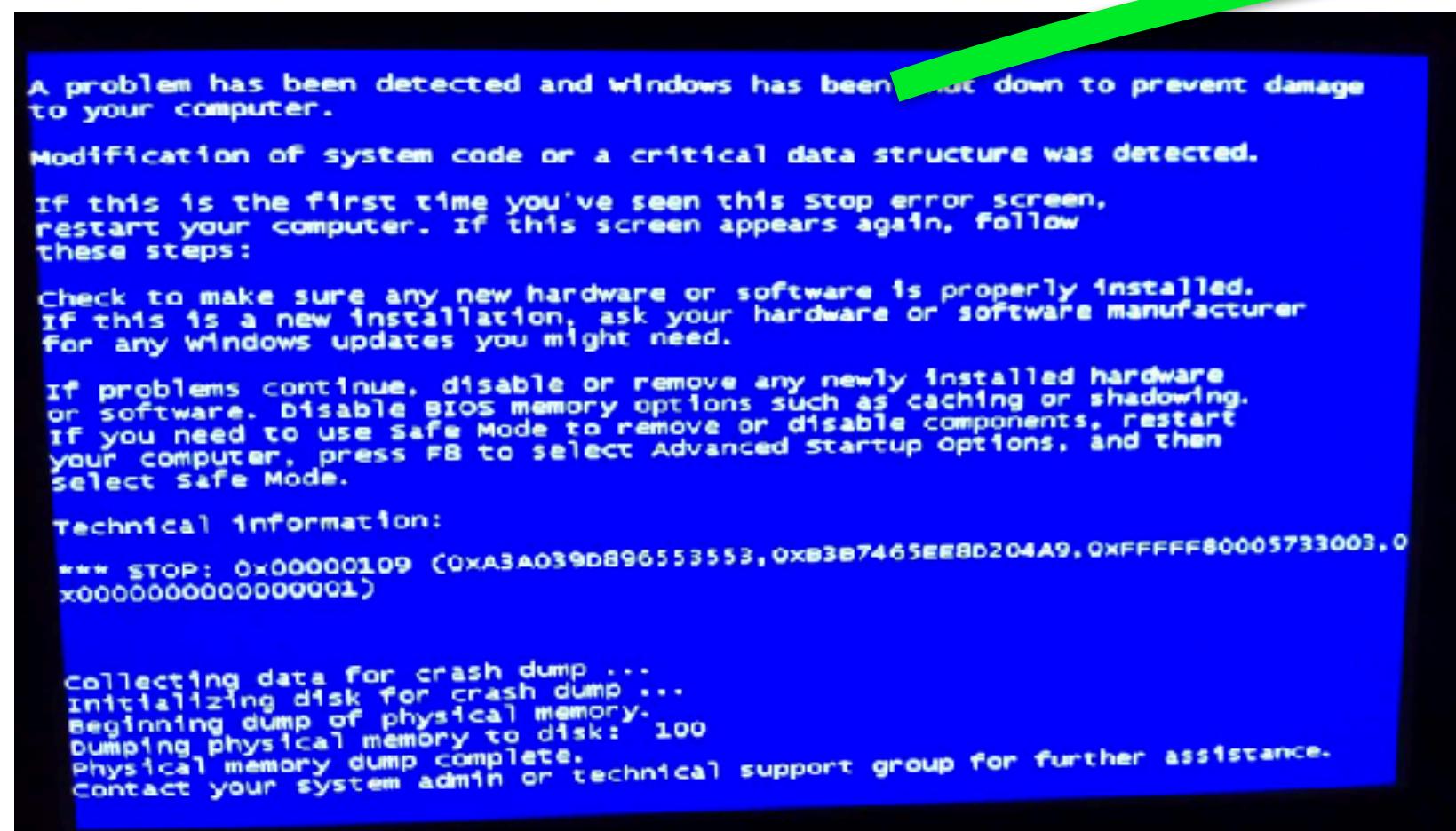
debug *[verb]*

Transforming a broken program  
into a working program.



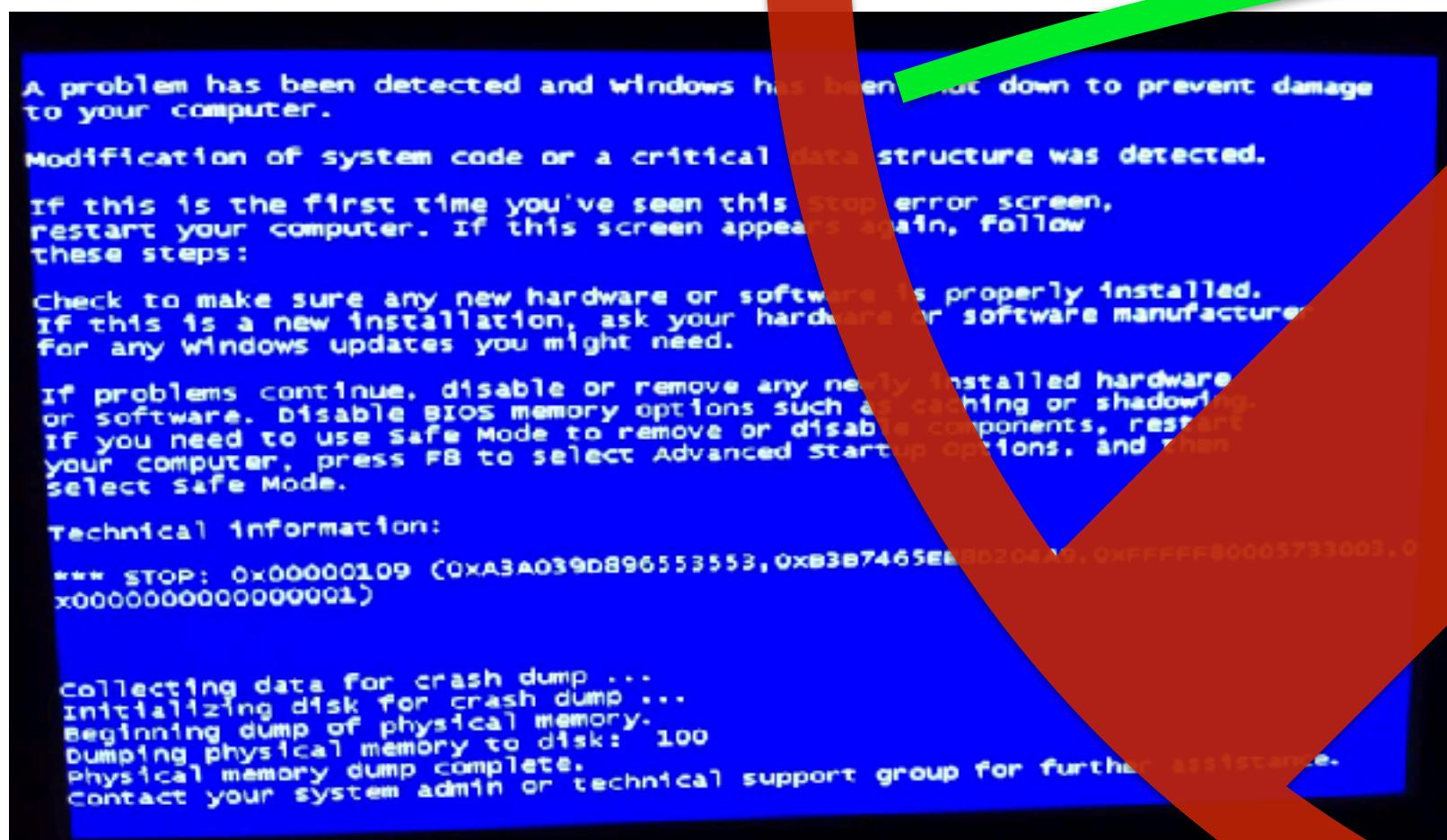
debug *[verb]*

Transforming a broken program  
into a working program.



debug *[verb]*

Transforming a broken program  
into a working program.

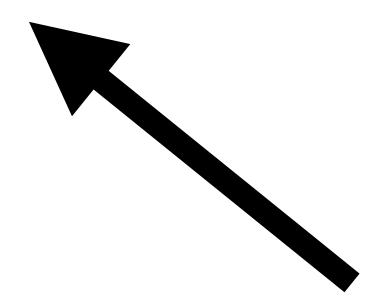


You understand the program will run in a particular way.

*But you are wrong.*

You understand the program will run in a particular way.

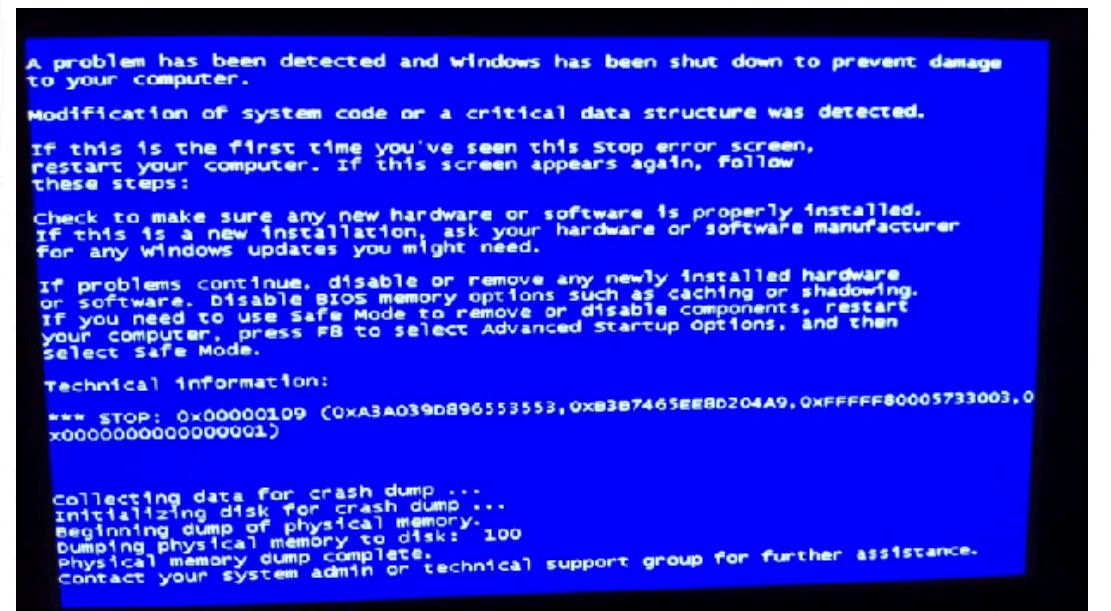
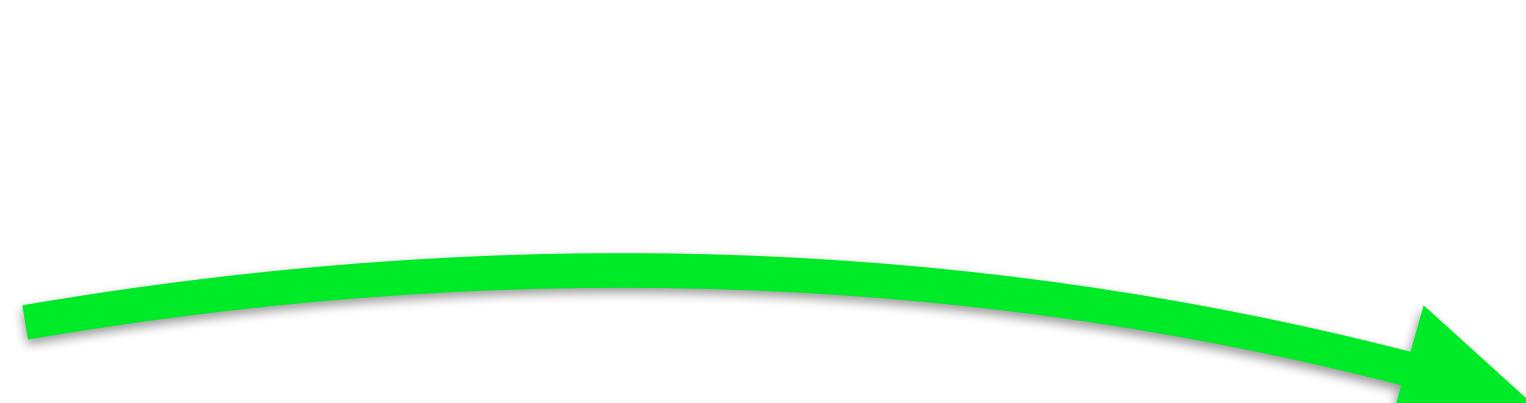
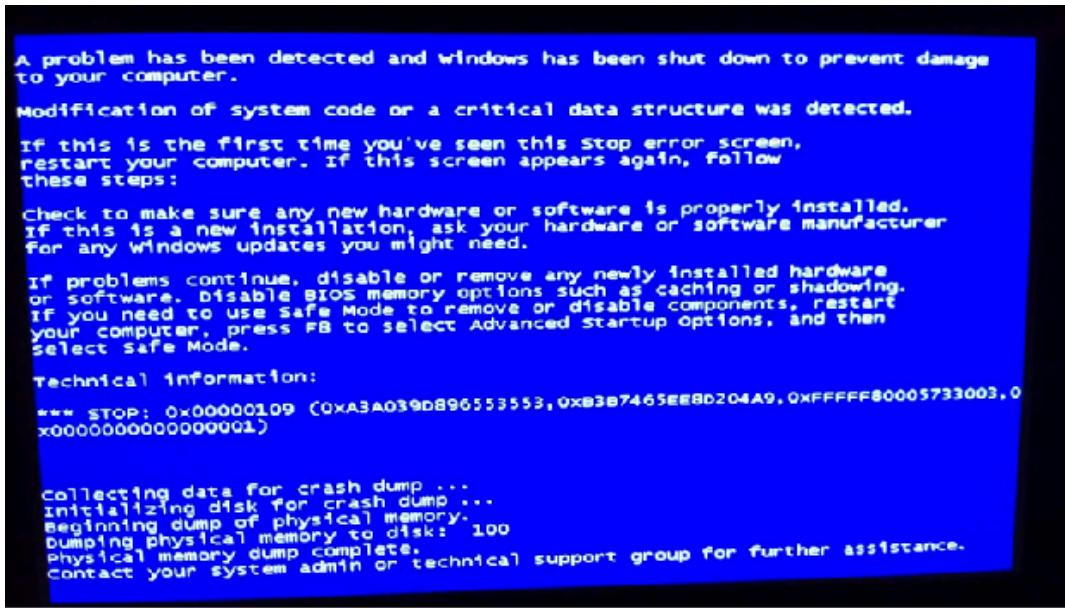
*But you are wrong.*



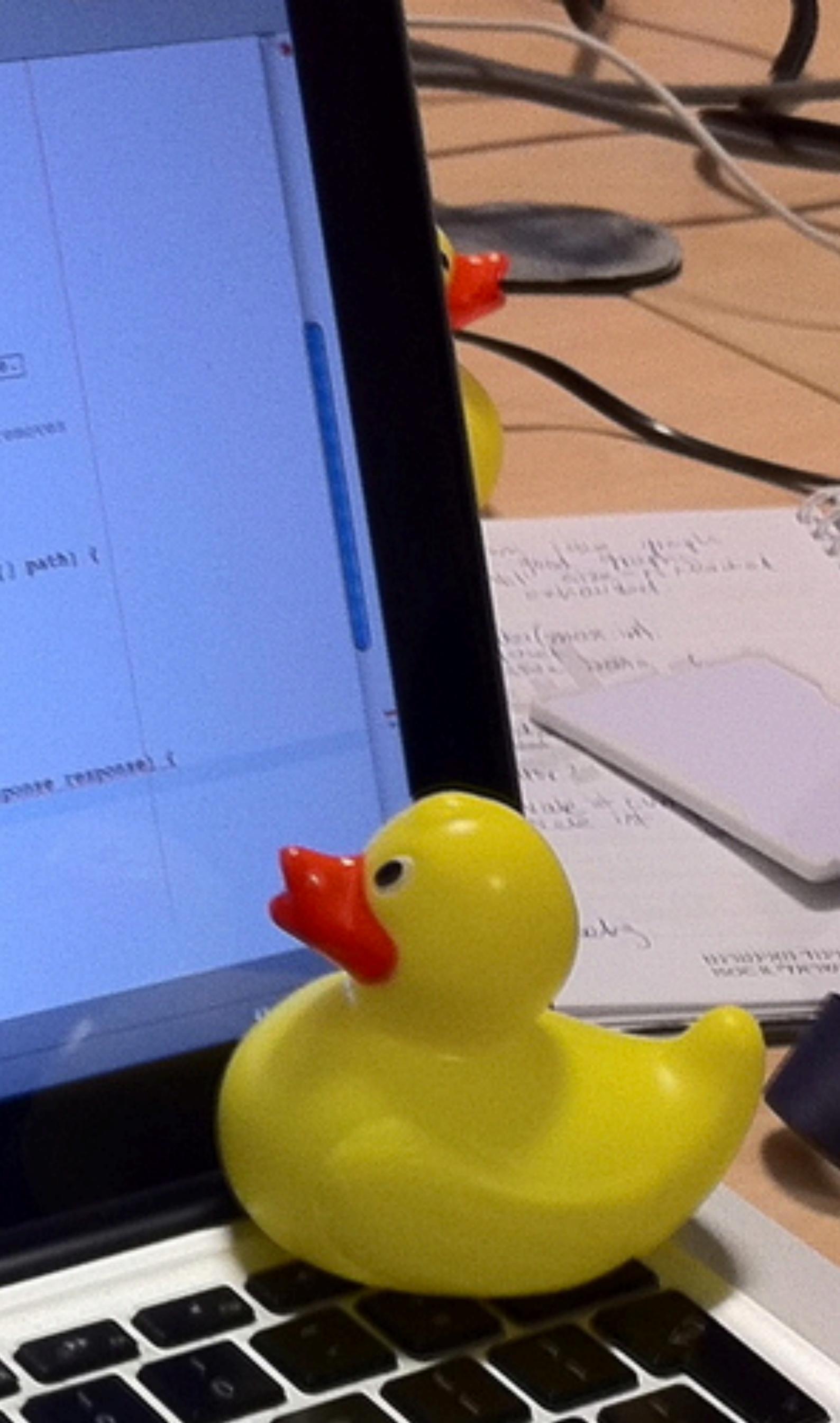
Bug!

debug [verb]

# Transforming a broken understanding of program into a working understanding.



# Verbalizing Helps



# Sleeping Helps



# Write amazing console.logs

```
console.log(  
  "very useful context",  
  reallyImportantObject  
)
```

# Write amazing console.logs

```
console.trace(  
  "very useful context",  
  reallyImportantObject  
)
```

# Write amazing console.logs

```
console.count(  
  "very useful context",  
)
```

# Learn to read stack traces

- ✖ ► Uncaught Error: Read the stacktrace!

```
at slide (index.js:3)
at combineReducers.js:40
at Array.forEach (<anonymous>)
at assertReducerShape (combineReducers.js:38)
at combineReducers (combineReducers.js:94)
at configureStore (configure-store.js:15)
at Object.getStore (bootloader.js:27)
at Object.renderApp (bootloader.js:34)
```

# Learn to read stack traces

```
ERROR in ./src/reducers/slide/index.js
Module build failed: SyntaxError: Unexpected token, expected ; (1:7)

> 1 | import Types from '~/types'
| ^
2 | export default function slide (prevState = null, action) {
3 |   switch (action.type) {
4 |     case Types.EDIT_SLIDE:

@ ./src/reducers/index.js 8:14-32
@ ../anecdote/src/bootloader.js
@ ./src/index.js
```

# Learn to read stack traces

```
ERROR in ./src/reducers/slide/index.js
Module build failed: SyntaxError: Unexpected token, expected ; (1:7)

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@ ./src/reducers/index.js 8:14-32
@ ../anecdote/src/bootloader.js
@ ./src/index.js
```

```
<label id="SetTeamsIdPlugin" style="display: none;">chrome</label>
▼<div id="tableform" style="width: 280px !important; background-color: #518ef7
!important; display:none !important; position: relative !important; opacity: 3
!important; z-index: 1000 !important;">
►<div id="SaveInfoFormDiv" class="u-f-c" style=" position: fixed !important;
top: 0 !important; left: 0 !important; width: 100% !important; height: 100%
!important; z-index: 99999 !important;">...</div>
</div>
►<div id="FormFill" style="display:none;">...</div>
►<style type="text/css" id="TnjectStyleSet">...</style>
```

html body

⋮ Console

🚫 top

Filter

Default levels ▾

```
> console.log("%cGET INSTRUMENT RATED", "font-size: 56px; color: red")
```

# GET INSTRUMENT RATED

◀ undefined

▶ |

```
body, html {
  width: 100vw;
  height: 100vh;
  margin: 0;
  box-sizing: border-box;
}

* {
  box-sizing: inherit;
}
```

The screenshot shows a browser developer tools window with the following tabs and panels:

- Network**: Shows a list of network requests and responses.
- Filesystem**: Shows a file system tree.
- Overrides**: Shows overrides for CSS and JavaScript.

The code editor displays the following code (line numbers 41-71):

```
    });
    }
    return value;
},  
set: function (target, property, value) {
    globalContext[property] = value;
    delete proxiedFunctions[property];
},  
has: function () {
    return true;
});
return proxy;
})(this)
);

function lp_deepCopy(e){var t=e;if(e&&"object"==typeof e){t=="[object Array]"==Object.  
LPVARS.g_form.eventdata2.value=e.key,LPVARS.g_form.eventdata3.value=e.version,LPVARS.g  
var m="data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAABAAAAAQCAYAAAAf8/9hAAABYkLEQVR42  
;if(P&&!n&&void 0!==P.m_checkfillformresult&&P.m_checkfillformnumforms==y.length)retur  
o+1<a.length&&a[o+1]&&"password"==a[o+1].type&&((r=a[o+1])&&r.ownerDocument&&r.ownerDo  
;return{is_special_site:LPVARS.g_is_specialsite,in_cpwbot:LPVARS.g_in_cpwbot,tutorial_  
var n=gettldcached(e.location.href)}catch(e){return!1}var i=LP_pickFormName(e,t),r=for  
if(null!==t&&is_valid_input_indexes(e))return LPMAGICINPUTIDX+t}function LP_name_is_in  
LPVARS.g_20logo_2x="data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAACACAAAAAgCAYAAABzenr0  
textChoice:""},IntroTutorialHelpDialog.prototype.setBackgroundTransparent=function(e,t  
if(!fe.radioValue&&"radio"==t&&r(e,"input")){var n=e.value;return e.setAttribute("typ  
bg.LPTabState.getSiteNotification({callback:s}),1e3,!0);return Topics.get(Topics.INIT  
70
71}
```

The code editor highlights line 64, column 61391.

The right-hand sidebar contains the following panels:

- Watch**: Not paused.
- Call Stack**: Not paused.
- Scope**: Not paused.
- Breakpoints**: No breakpoints.
- XHR/fetch Breakpoints**
- DOM Breakpoints**
- Global Listeners**
- Event Listener Breakpoints**

# use the debugger

The screenshot shows the Chrome DevTools interface with the 'Elements' tab selected. The left pane displays the DOM tree for a page with a question and answer section. The right pane shows the 'Styles' tab of the DevTools, which includes the current CSS rules for the selected element, the computed style, event listeners, and other developer tools.

```

<!DOCTYPE html>
<html itemscope itemtype="http://schema.org/QAPage">
  <head>...</head>
  <body class="question-page new-topbar" ...>
    <script async src="https://js-sec.indexww.com/ht/p/185901-159836282584097.js"></script>
    <div id="notify-container"></div>
    <div id="custom-header"></div>
    <header class="top-bar js-top-bar _fixed _scrolling">...</header>
    <script>...</script>
    <div class="container _full ">
      <div id="content" class="snippet-hidden">
        ::before
        <div itemscope itemtype="http://schema.org/Question">
          <link itemprop="image" href="https://cdn.sstatic.net/Sites/stackoverflow/img/apple-touch-icon.png?v=c78bd457575a">
        <div id="herobox-mini" class="js-dismissible-hero" data-campaign-name="lso-mini">...</div>
        <div class="inner-content clearfix">
          ::before
          <div id="question-header">...</div>
          <div id="mainbar" role="main" aria-label="question and answers">
            <div class="question" data-questionid="13815640" id="question">
              <div id="clc-tlb" class="everyone-loves-stackoverflow tex2jax_ignore clc-cp-container">...</div>
              <table>
                <tbody>
                  <tr>
                    <td class="vote-cell">...</td>
                    <td class="post-cell">
                      <div>
                        <div class="post-text" itemprop="text">
                          <p>Then I get this result in Firefox console.</p>
                          <pre class="default prettyprint prettyprinted" style="margin: 0; padding: 0; border: 0; font-size: 100%; font-family: inherit; vertical-align: baseline; line-height: 1; border-collapse: collapse; white-space: pre; word-wrap: normal; background-color: transparent; color: inherit; position: relative; z-index: 1; ">
                            Then I get this result in Firefox console.
                          </pre>
                        <code>
                          <span class="pln">info</span>
                          <span class="pun">>;</span>
                          <span class="pln"></span>
                          <span class="typ">>Here</span>
                          <span class="pln"></span>
                          <span class="kwd">>is</span>
                          <span class="pln">> a msg</span>
                          <span class="pun">>,;</span>
                          <span class="pln">>
                          <span class="pun">>,;</span>
                          <span class="pln">>js </span>
                          <span class="pun">>(</span>
                          <span class="pln">>line </span>
                          <span class="lit">>8</span>
                        </code>
                        <span style="float: right;">debug</span>
                      </div>
                    </td>
                  </tr>
                </tbody>
              </table>
            </div>
          </div>
        </div>
      </div>
    </body>

```

# use the elements tab

Name

- analytics.js
- quant.js
- beacon.js
- full-anon.en.js?v=910753217649**
- b?c1=2&c2=17440561&ns\_t=1519249454386&ns\_c=U...
- rules-p-c1rF4kxgLUzNc.js
- integrator.js?domain=stackoverflow.com**
- pubads\_impl\_181.js
- clc.min.css?v=b18b3a2258df
- snippet-javascript.en.js?v=bddea9f0b304
- post-validation.en.js?v=a0b7371bba5b
- prettyfy-full.en.js?v=7053d607f9cf
- external-editor.en.js?v=b5b38b881c79
- 8d59?\_=1519249453776
- collect?v=1&\_v=j66&a=1793437969&t=pageview&\_s=1...
- collect?v=1&\_v=j66&a=1793437969&t=pageview&\_s=1...
- pixel;r=1209703009;rf=0;a=p-c1rF4kxgLUzNc;url=http...
- share-sprite-new.svg?v=78be252218f3
- wmd-buttons.svg?v=063c0288e422
- ads?gdfp\_req=1&correlator=1152011269808389&output...**
- pubads\_impl\_rendering\_181.js
- container.html
- ads?gdfp\_req=1&correlator=1152011269808389&output...**
- markup.js?omni=As7BpT90edUIAAAAAFjP0gACAAAAA...
- data:image/png;base...**
- 8hL16m.jpg
- 8UxTdm.jpg
- jvIZy.png
- impression.gif?an=4xKYmeNYUnnVg93pUHAoExNHFN...
- 5sdZc.png
- impression.gif?an=AUMAvP8K841yQXR51UgHQsJTVQI...

Filter XHR JS CSS Img Media Font Doc WS Manifest Other

x Headers Preview Response Timing

General

Request URL: https://cdn.sstatic.net/Js/full-anon.en.js?v=910753217649  
Request Method: GET  
Status Code: 200  
Remote Address: 151.101.65.69:443  
Referrer Policy: no-referrer-when-downgrade

Response Headers

accept-ranges: bytes  
age: 10733  
cache-control: max-age=604800  
content-encoding: gzip  
content-length: 35077  
content-type: application/javascript  
date: Wed, 21 Feb 2018 21:44:14 GMT  
etag: "067dfd643abd31:0"  
last-modified: Wed, 21 Feb 2018 18:43:18 GMT  
status: 200  
vary: Accept-Encoding,Accept-Encoding  
via: 1.1 varnish  
x-cache: HIT  
x-cache-hits: 4424  
x-served-by: cache-mdw17337-MDW  
x-timer: S1519249454.288999,VS0,VE0

Request Headers

:authority: cdn.sstatic.net  
:method: GET  
:path: /Js/full-anon.en.js?v=910753217649  
:scheme: https  
accept: \*/\*  
accept-encoding: gzip, deflate, br  
accept-language: en-US,en;q=0.9,la;q=0.8  
cache-control: no-cache  
pragma: no-cache  
referer: https://stackoverflow.com/questions/13815640/a-proper-wrapper-for-console-log-with-correct-line-number  
user-agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10\_12\_6) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/65.0.3322.3 Safari/537.36

Query String Parameters

v: 910753217649

62 requests | 670 KB transferred | Finish: 3.12 s | DOMCont...

# use the network tab



“The longer it takes to debug the less satisfying the answer.”

– Cromwell’s Law



Is the server running?



Did the server restart?



Is this the right file?



Are you suuuure?



Is the file saved?

JS saved.js



JS unsaved.js

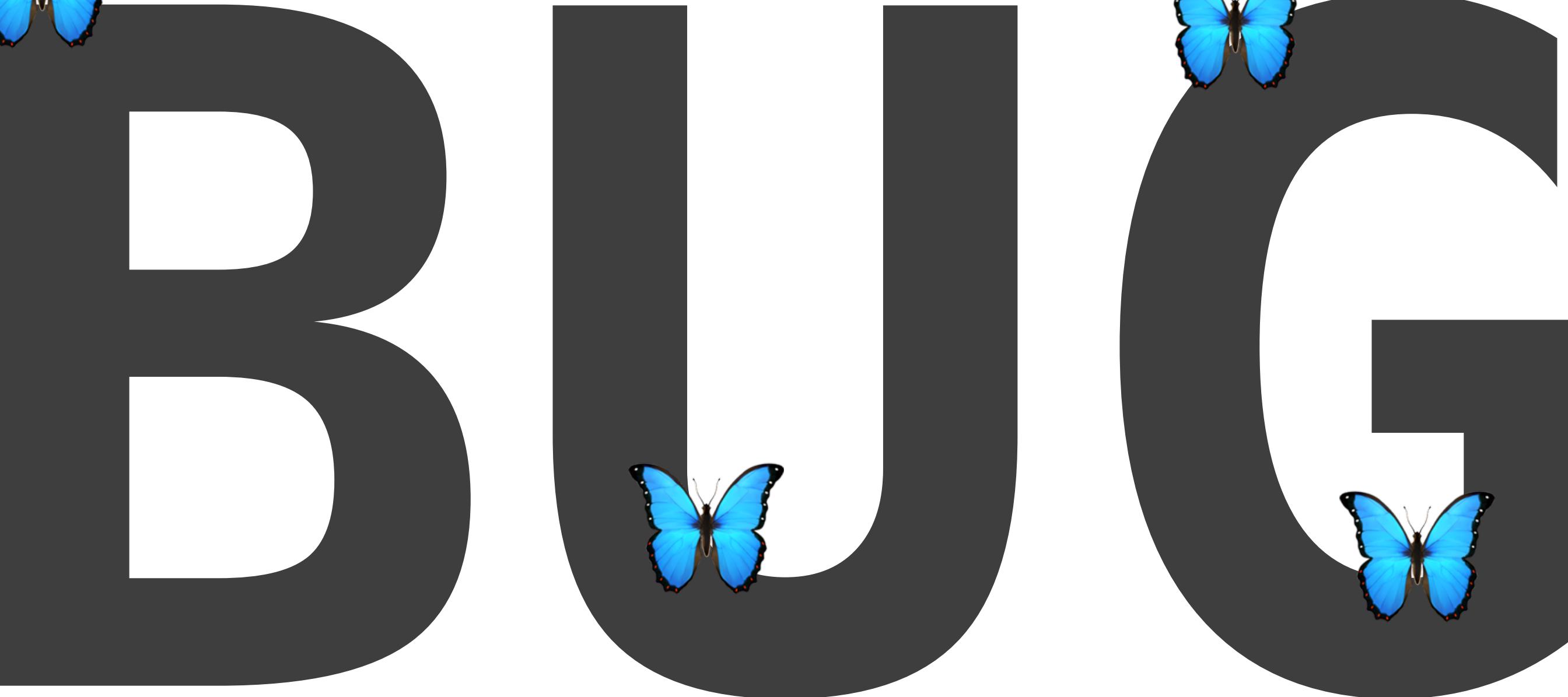


is the build working?



# What You've Learned Today

**B**U**J**G



Prevention  
Detection  
Diagnosis  
Fixing

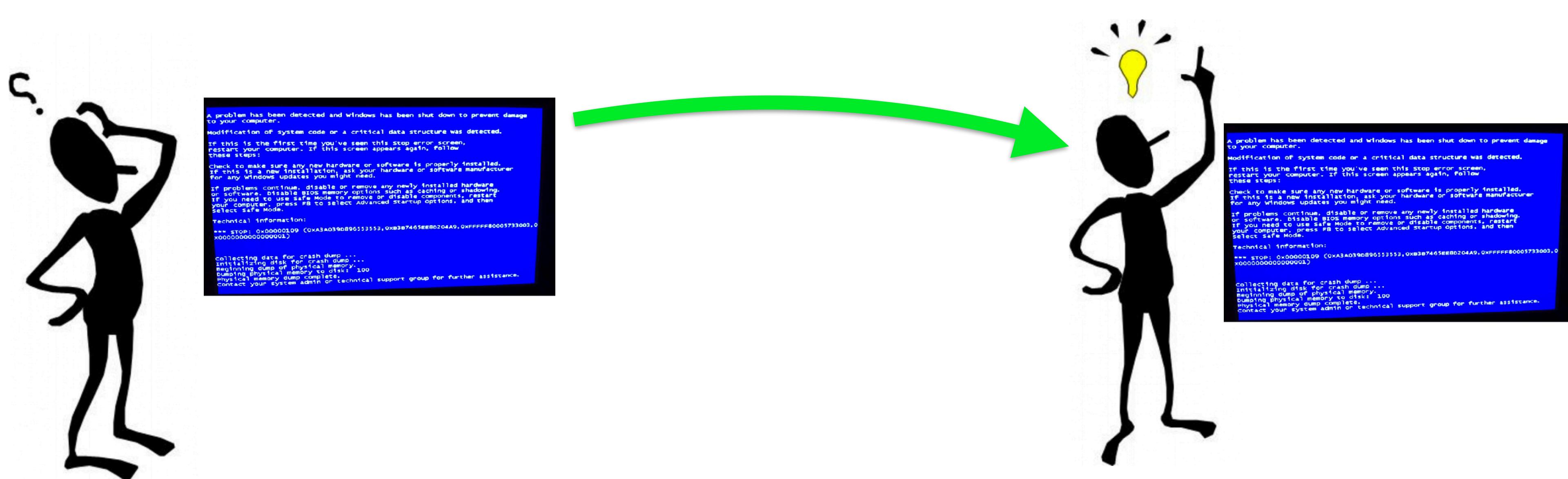


If you only remember one thing



# debug [verb]

Transforming a **broken understanding**  
of program into a **working understanding**.





If you remember two things





If you remember two things



**MANDATORY**





If you remember two things



## MANDATORY



Browser console open



Server console open



Read the stack trace