SoftServe | Empowering your Business through Software Development

Module 6:
Troubleshooting JavaScript Code

Agenda

1. Exception Handling
2. Debugging Code in Browser
3. Using Console API
4. Useful links

Exception Handling

Errors are Natural

- Any software solution faces **errors**: invalid user input, broken connection or bugs in code
- Errors break normal flow of the program execution and may lead to fatal results in case if not handled properly

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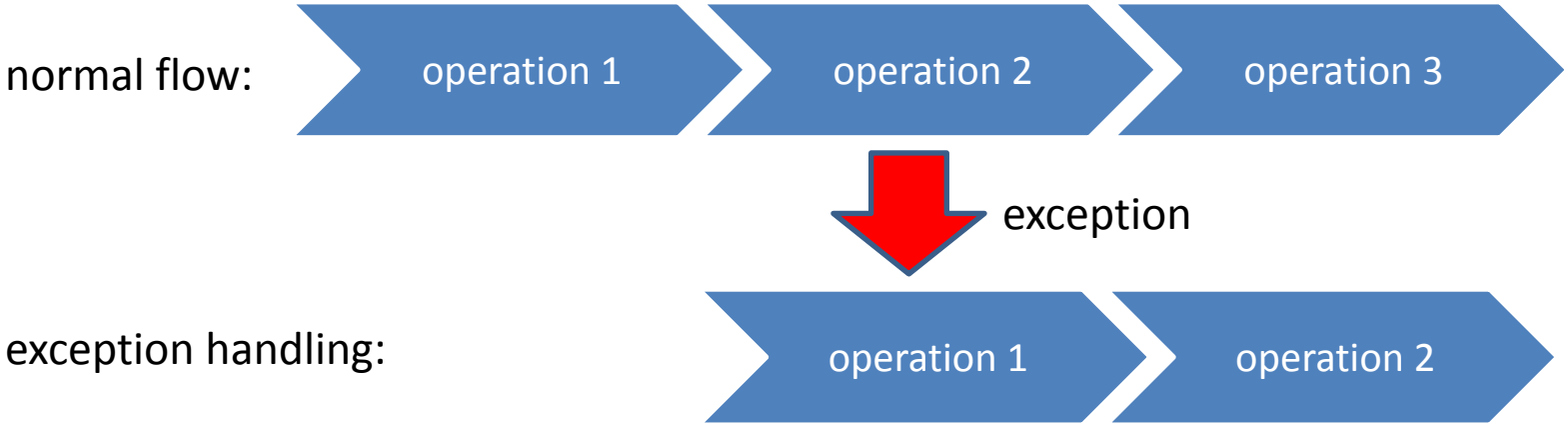
What is Exception and Exception Handling?

- **Exception** – is an event, which occurs during the execution of a program, that disrupts the normal flow of the program's instructions.
- **Exception handling** is convenient way to handle errors



Exception Syntax

To make exception handling possible we should use two keywords: **try** and **catch:**

```
try {
    // Block of code that may
    // raise an exception
} catch (err) {
    // Block of code to
    // handle an exception
}
```

Throwing Exceptions

To raise an exception we use **throw** keyword.

Throwing an exception will break normal code execution on a line when the keyword is met and will give control to the nearest catch block.

Syntax:

```
throw (new Error("Some meaningful message"));
```

Exception Handling Sample

- In a sample below we ask the user to enter age and convert it to a number. If conversion returns *NaN* we throw an exception and handle it with catch block.
- Note that JS itself does not throws exceptions on math errors, its returns NaN

```
01 var age = parseInt(window.prompt("Enter your age"));
02 try {
03    if (isNaN(age))
04        throw (new Error("You entered incorrect value!"));
05    var nextAge = age + 10;
06    alert("In ten years you will be " + nextAge);
07 }
08 catch (err) {
09     alert(err.message);
10 }
```

Using finally keyword

Keyword **finally** is used in **try..catch** construction to define block of code that is called whenever exception occurs or not.

The main purpose of it is to free resources allocated just before *try* keyword

```
try {
    // Block of code that may raise an exception
} catch (err) {
    // Block of code to handle an exception
} finally {
    // Block of code that called whenever
    // exception occurs or not
}
```

Method .onerror()

- Method **window.onerror()** called each time when unhandled exception occurs.
- The .**onerror()** event handler provides three pieces of information to identify the exact nature of the error:
  - **Error message**. The same message that the browser would display for the given error
  - **URL**. The file in which the error occurred
  - **Line number**. The line number in the given URL that caused the error

Sample .onerror() handler

In a sample below we assign .**onerror()** event handler that is called on button click because there is no function as *myFunc()* defined on the page:

```
<html>
<head>
    <script type="text/javascript">
        window.onerror = function (msg, url, line) {
            alert("Message : " + msg);
            alert("url : " + url);
            alert("Line number : " + line);
    </script>
</head>
<body>
    <p>Click the following to see the result:</p>
    <form>
        <input type="button" value="Click Me" onclick="myFunc();" />
    </form>
</body>
</html>
```

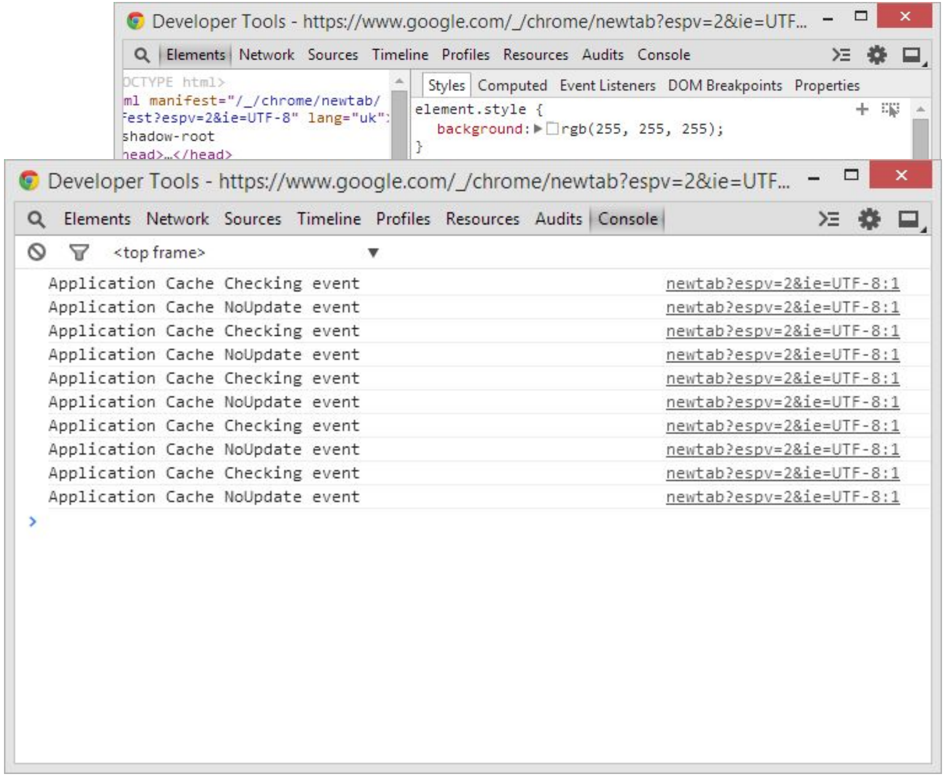
Debugging Code in Browser

What is Debugging?

- **Debugging** is a process of searching and removing *bugs* from the code
- The process of debugging might be not easy and sometimes becomes very tricky
- Writing clean, well-documented code that conforms coding conventions greatly simplifies debugging process
- Most modern browsers have built-in tools or addons for debugging JavaScript code

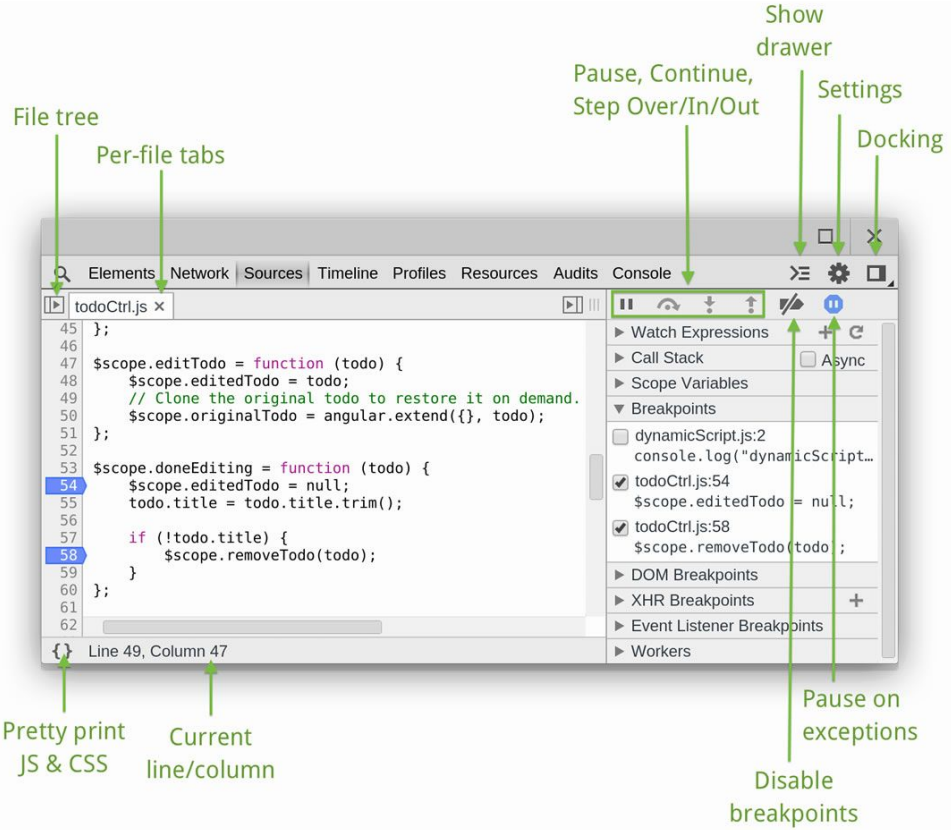
Using Developers Tools

- Press **F12** to access **Developers Tools** in most browsers
- **Console tab** allows to execute JS code and see output of commands including error messages



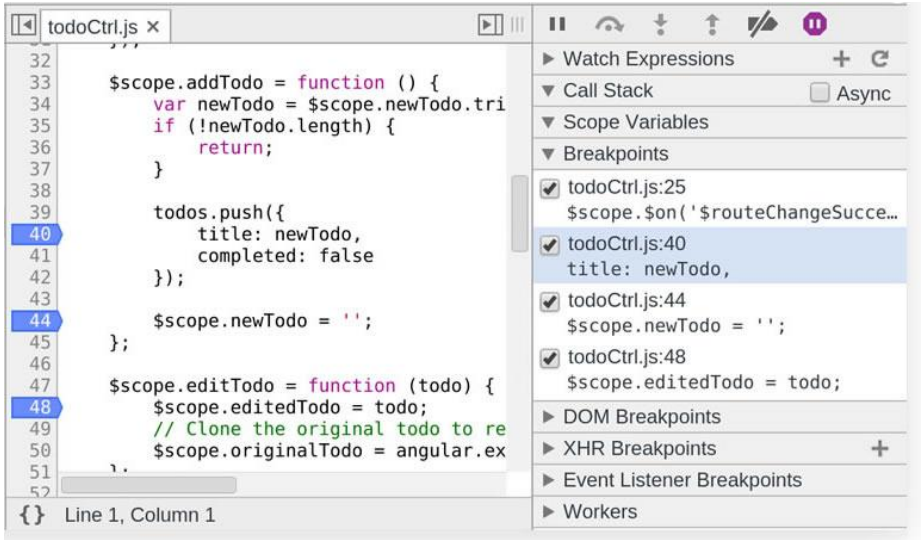
Code Executions Controls in Chrome Browser

- Google Chrome browser provides full-featured debugger that has execution control buttons
- Opening Sources tab allows to choose JS code of a solution in external files as well as in inside html file



Setting Breakpoints for JS Code in Chrome

- In Developer Tools open Sources tab and choose external JS file or navigate to JS code embedded In HTML file.
- Click the **line gutter** to set a breakpoint for that line of code, select another script and set another breakpoint.



Execution Control Buttons in Chrome

Continue: continues code execution to another breakpoint.

Step over: step through code line-by-line, do not enters functions

Step into: acts like Step over, however clicking Step into at the function call will cause the debugger to move its execution to the first line in the functions definition.

Step out: allows to run current function till the end move debugger's execution to the parent function.

Toggle breakpoints: toggles breakpoints on/off while leaving their enabled states intact.

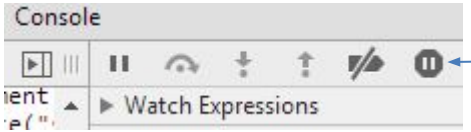
Pause on Exceptions

There are two buttons to pause on exceptions:

 – pause on all exceptions

 – pause on uncaught exceptions only

Second button becomes visible only if first is pressed

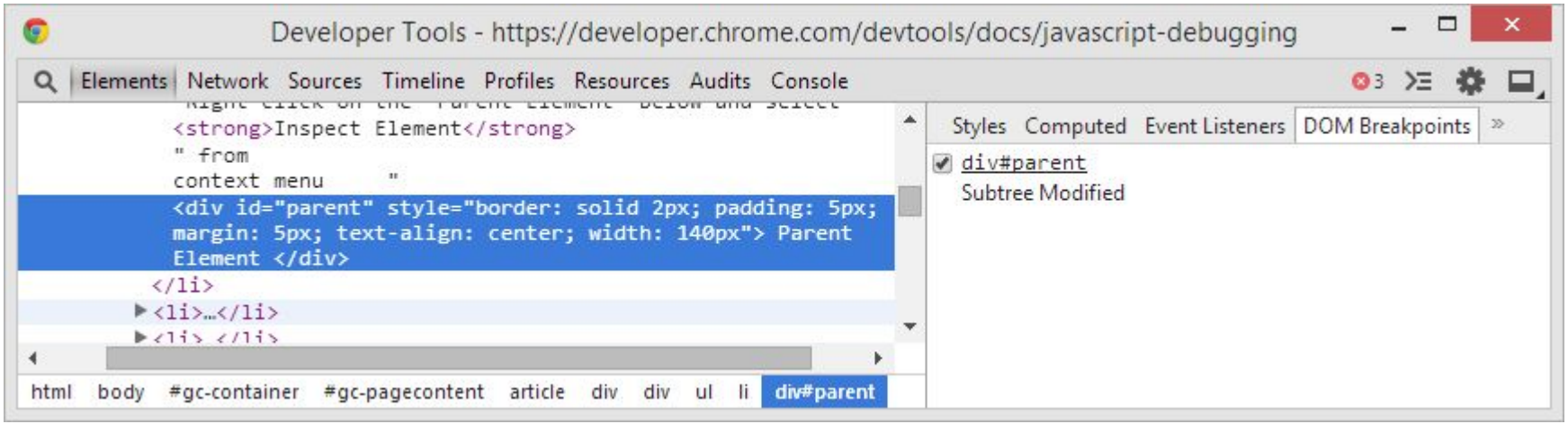


1. Pause on all exceptions

2. Pause on uncaught exceptions only

Breakpoints on DOM Mutation Events

To stop execution on DOM mutation events right click on element, select Inspect Element, right click on highlighted element and select **Break on Subtree Modifications**

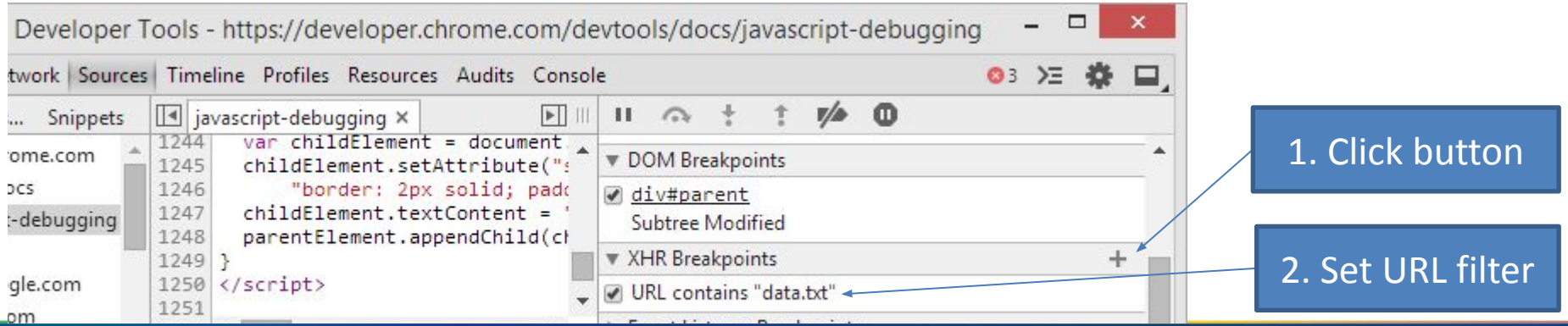


Breakpoints on XMLHttpRequest Events

XMLHttpRequest object is used to make *Ajax* requests. We'll learn Ajax in detail in module 10.

To make breakpoints on XMLHttpRequest:

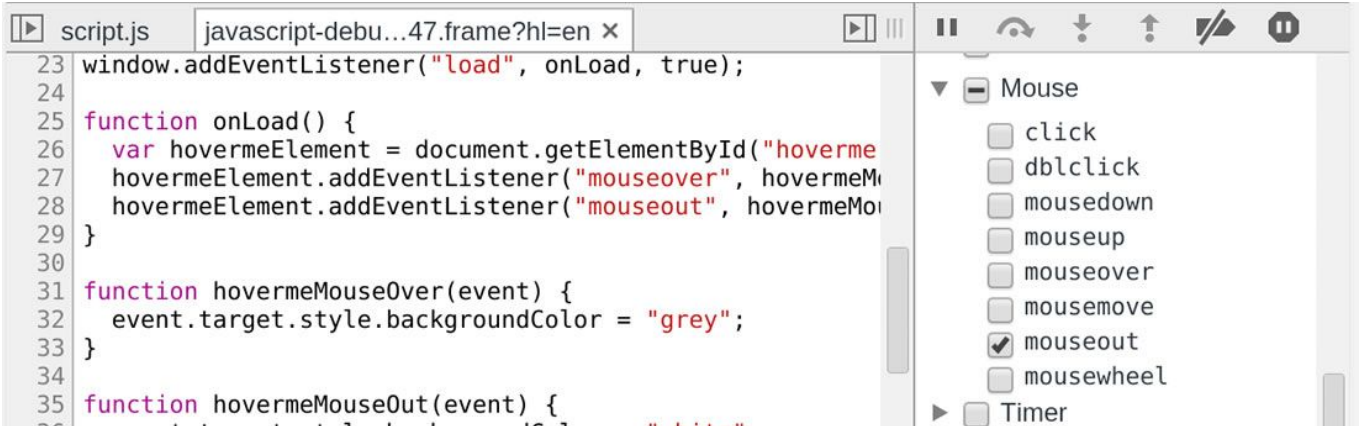
1. Click "+" button in XHR Breakpoints section;
2. Set URL filter in input field



Breakpoints on JavaScript Event Listeners

To set breakpoint on Event Listeners:

- Expand **Event Listener Breakpoints** sidebar pane on the right side of **Scripts** panel
- Expand **Mouse** entry
- Set a mouseout Event Listener breakpoint by clicking on the checkbox near the **mouseout** entry

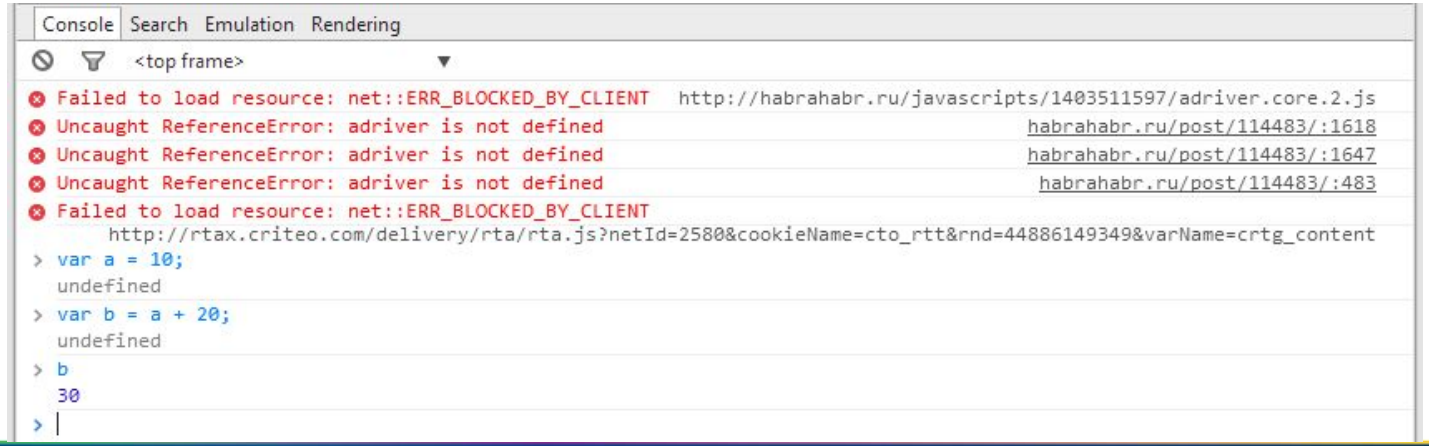


Using Console API

Console object

The **console object** provides access to the browser's debugging console. Console allows to log useful events and data while developing and debugging the solution.

Sample output of browser's console:



Useful Methods

Useful methods of **console** object:

- **.log()** – general output of logging information
- **.info()**, .**warn()**, .**error()** – same as log() but add notification icons
- **.dir()** – shows specific JS object
- **.dirxml()** – shows xml code or html code of DOM element
- **.group()**, .**groupCollapsed()**, .**groupEnd()** – grouping output
- **.time()**, .**timeEnd()** – setting timer
- **.profile()**, .**profileEnd()** – using profiling tools
- **.assert()** – asserting conditions

Method .log()

- Method .**log()** used for general output of logging information
- Method accepts any number of arguments
- It is possible to use string formatting commands (**%s** – string, **%d** – decimal, **%i** – integer, **%f** – floating point)
- Sample:

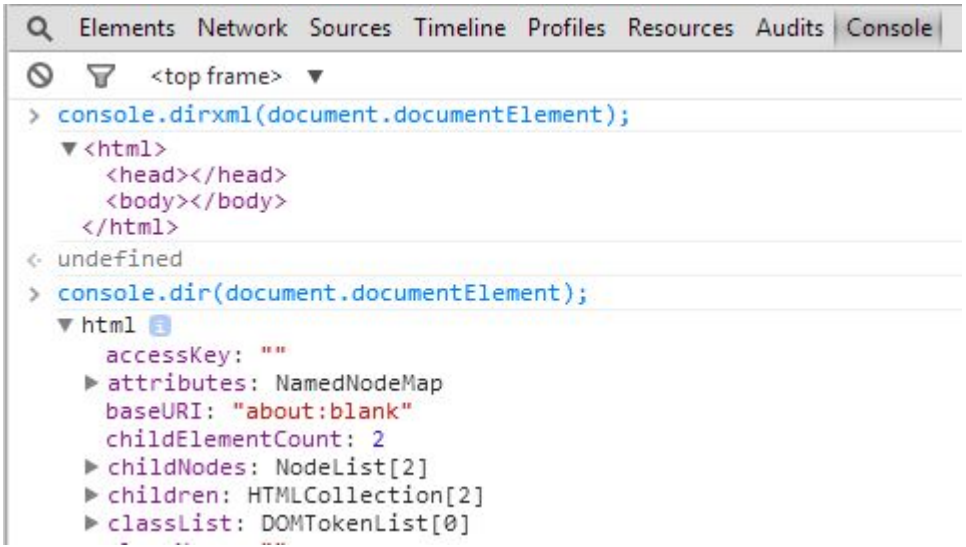
```
  console.log('Hello, my name is %s, my age is %i', 'John', 20);
> Hello, my name is John, my age is 20
```

Methods .info(), .warn(), .error()

Methods .**info()**, .**warn()**, .**error()** act almost as .**log()** but add icons to console output that allows to distinguish between different type of output

Methods .dirxml() and .dir()

Method **.dirxml()** – shows xml code or html code of DOM element, **.dir()** – shows specific JS object :



Grouping Console Output

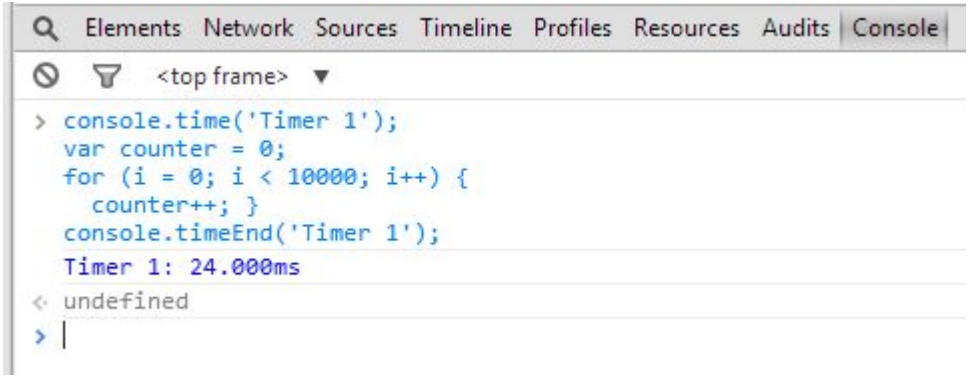
There are methods to group console output

- **.group()** – start group
- .**groupEnd()** – end group
- .**groupCollapsed()** – start group collapsed

Setting Timer

To measure execution time of code blocks use methods:

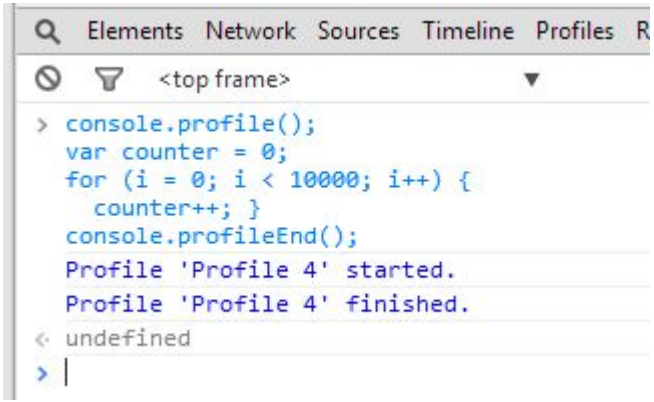
- **.time('Timer mark')** – start timer
- .**timeEnd('Timer mark')** – stop timer

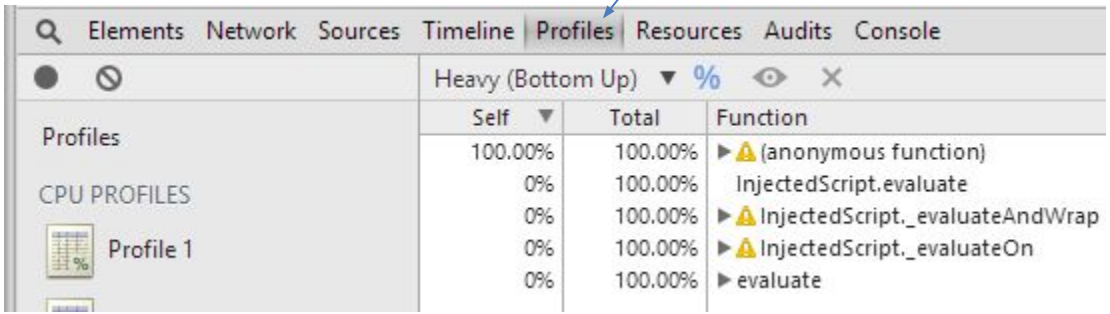


Profiling Code

To display profiling stack use methods:

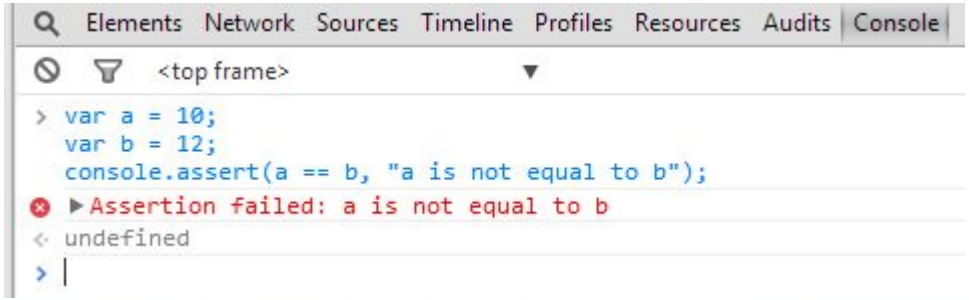
- **.profile()** – start profiler
- **.profileEnd()** – stop profiler





Making Assertions

- Method **.assert()** allows to make assertions about conditions in our code.
- Syntax: **`console.assert(condition, message);`**
  - **condition** – boolean condition to test;
  - **message** – error message to output if condition is not met.



Best Practices

- Assume your code will fail
- Log errors to the server
- You, not the browser, handle errors
- Identify where errors might occur
- Throw your own errors
- Distinguish fatal versus non-fatal errors
- Provide a debug mode

Useful links

Links

- JavaScript Errors on W3Schools.com: http://www.w3schools.com/js/js_errors.asp
- Error object on MDN: https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Error
- Enterprise JavaScript Error Handling: http://www.slideshare.net/nzakas/enterprise-javascript-error-handling-presentation
- Debugging JavaScript in Google Chrome: https://developer.chrome.com/devtools/docs/javascript-debugging#breakpoints-dynamic-javascript

Thank you!