# JavaScript on the Client Side

# Outline

1. DOM Manipulation using JavaScript
2. Consume Web API using Fetch API
3. jQuery

# DOM Manipulation using JavaScript

# What Can JavaScript Do?

- **Server Side Web applications**
  - Write server-side application logic (using Node.js)
- **Client Side Dynamic Behavior**
  - **React to user input** i.e., handle client side events such as button clicked event. e.g., Changing an image on moving mouse over it
  - **Updating the page**
    - Add/update page content: **Manipulate the Document Object Model** (DOM) of the page: read, modify, add, delete HTML elements
    - Change how things look: CSS updates
  - **Validate form input** values before being submitted to the server
  - **Perform computations**, sorting and animation
  - **Perform asynchronous server calls** (AJAX) to load new page content or submit data to the server without reloading the page

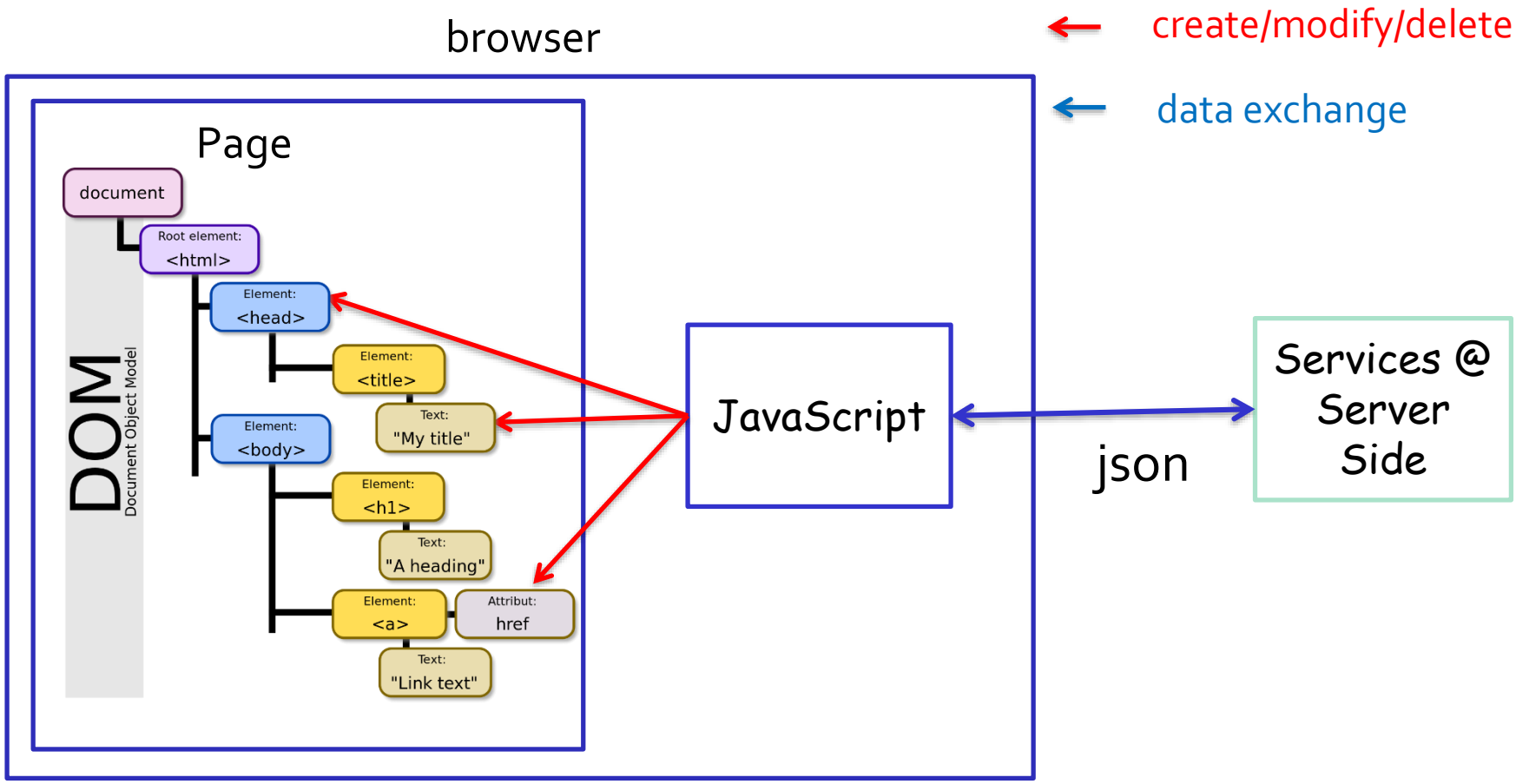
# Where to place JavaScript Code?

- The JavaScript code can be placed in:
  - `<script>` tag in the head
  - `<script>` tag in the body - not recommended
  - In an external file and add a reference to it in the HTML file. This is the recommended way
    - Reference via `<script>` tag in the **head** or at the end of the **body**
    - Files usually have `.js` extension

```
<script src="script.js">
        <!- code placed here will not be executed! -->
</script>
```

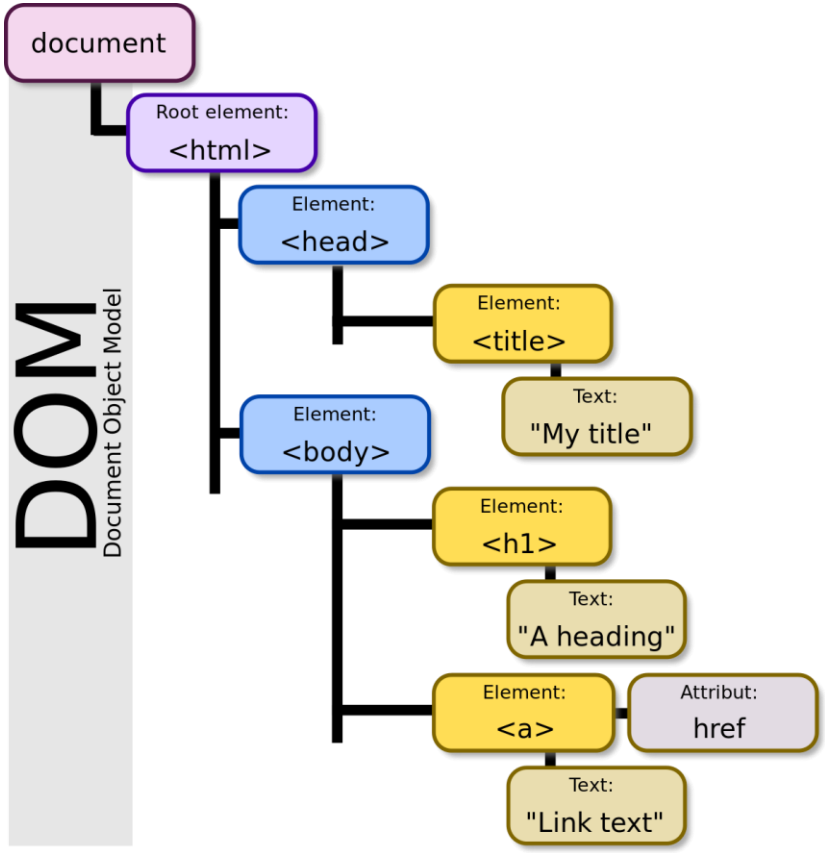
    - The `.js` files get cached by the browser

# Role of JavaScript on the Client Side



# Document Object Model (DOM)

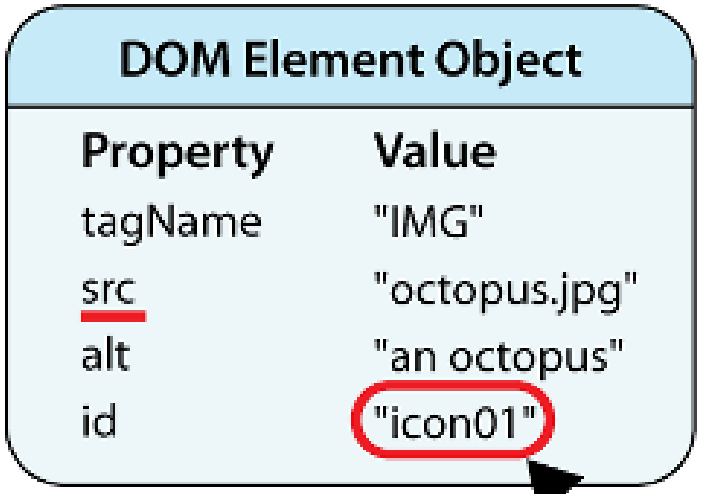
- DOM API consist of objects and methods to interact with the HTML page
  - **Select** page elements
  - **Add**, **update** or **remove** page elements
  - **Apply styles** dynamically
  - **Listen** to and **handle** events



# Example DOM Element

HTML

```
<p>
  Look at this octopus:
  <img src="octopus.jpg" alt="an octopus" id="icon01" />
  Cute, huh?
</p>
```




JavaScript

```
var icon = document.getElementById("icon01");
icon.src = "kitty.gif";
```

# Selecting HTML Elements

- Elements must be **selected first** before changing them or listening to their events
  - **querySelector**() returns the first element that matches a specified *CSS selector* in the document
  - **querySelectorAll**() returns all elements in the document that matches a specified CSS selector

Example CSS selectors:

1. By tag name: `document.querySelector("p")`
2. By id : `document.querySelector("#id")`
3. By class: `document.querySelector(".classname")`
4. By attribute: `document.querySelector("a[target]")`

- `Examples`
- https://www.w3schools.com/jsref/met_document_queryselector.asp
- https://www.w3schools.com/jsref/met_document_queryselectorall.asp

# Selecting Elements – old way!

- Access elements via their ID attribute

```
let element = document.getElementById("some-id")
```

- Via the **name** attribute

```
let elArray = document.getElementsByName("some-name")
```

- Via tag name

```
let imgTags = document.getElementsByTagName("img")
```

  - Returns array of `<img>` elements

# DOM Manipulation

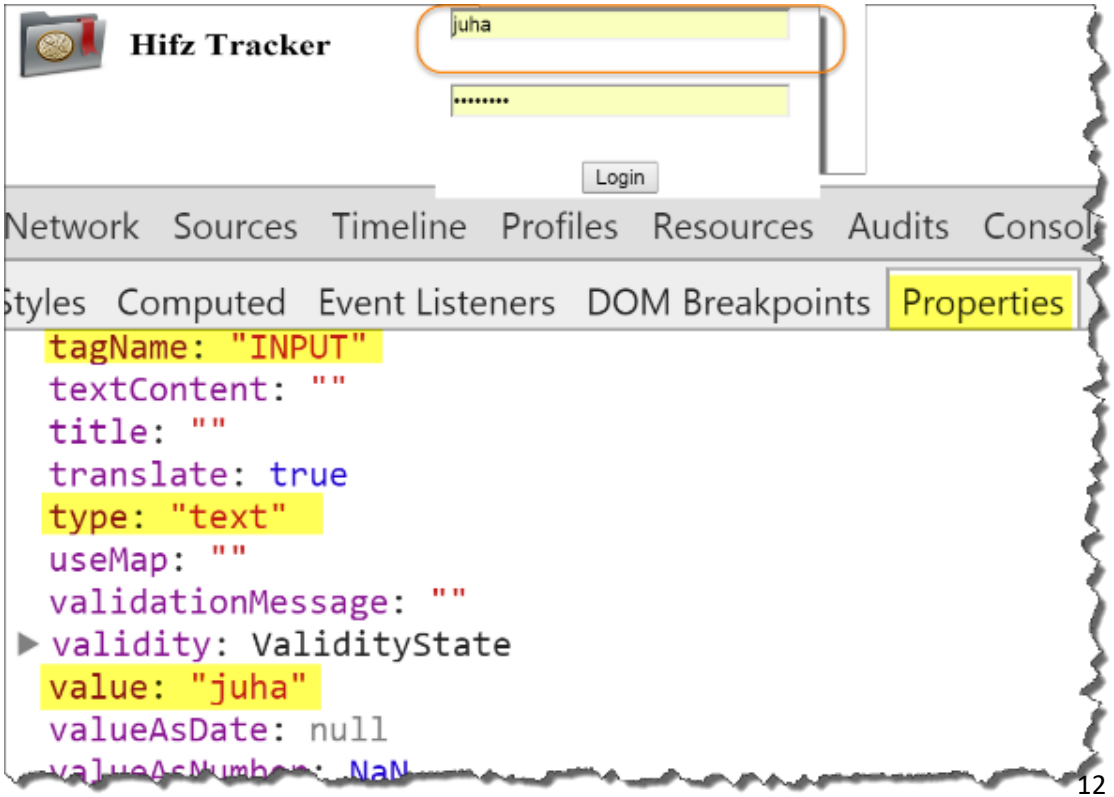
- Once we **select** an element, we can read and write its attributes

```
function change(state) {
  let lampImg = document.querySelector("#lamp")
  lampImg.src = `lamp_${state}.png`
  let statusDiv =
    document.querySelector("#statusDiv")
  statusDiv.innerHTML = `The lamp is ${state}`
}
…
<img src="test_on.gif"  id="lamp"
  onmouseover="change('off')"
  onmouseout="change('on')" />
```

# Common Element Properties

- `Value` - get/set value of input elements
- `innerHTML` - get/set the HTML content of an element
- `className` - the `class` attribute of an element

User Chrome Dev Tool to see the Properties of Page element



# Events Handling

- JavaScript can register event handlers
  - Events are fired by the Browser and are sent to the specified JavaScript **event handler** function
  - Can be set with HTML attributes:

```
<img src="test.gif" onclick="imageClicked()" />
```

  - Can be set through the DOM:

```
let img = document.querySelector("#myImage")
img.addEventListener('click', imageClicked)
```

Ask to be notified of clicks on element **#myImage**

# Event Handler Example

```
<script>
document.querySelector("#btnDate").
    addEventListener("click", displayDate)

function displayDate() {
    document.querySelector("#date").innerHTML =
        Date()
}
</script>
```

Try it @
http://www.w3schools.com/js/tryit.asp?filename=tryjs_addeventlistener_displaydate

# Common DOM Events

- Mouse events:
  - `onclick`, `onmousedown`, `onmouseup`
  - `onmouseover`, `onmouseout`, `onmousemove`
- Key events:
  - `onkeypress`, `onkeydown`, `onkeyup`
  - Only for input fields
- Interface events:
  - `onblur`, `onfocus`, `onscroll`
- Form events
  - `onsubmit` : allows you to cancel a form submission if some input fields are invalid

# DOMContentLoaded

- DOMContentLoaded is fired when the DOM tree is built, but external resources like images and stylesheets may be not yet loaded
  - Best event for adding event listeners to page elements

```
//When the document is loaded in the browser then listen to studentsDD on change event
document.addEventListener("DOMContentLoaded", () => {
    console.log("js-DOM fully loaded and parsed");
    document.querySelector('#studentsDD').addEventListener("change", onStudentChange)
})
```

# Commonly used methods

- Add Element

```
document.body.appendChild(document.createElement('p'))
```

- Add div element and assign it *foo* css class

```
let newDiv = document.createElement('div')
newDiv.classList.add('foo')
```

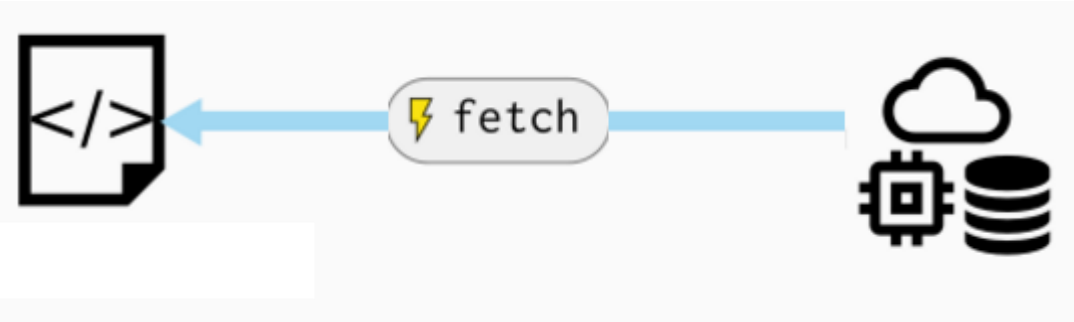
- DOM Traversal

```
let parent = document.querySelector('#about').parentNode
let children = document.querySelector('#about').children
```

- Hide & Show

```
document.querySelector('myDiv').style.display = 'none';
document.querySelector('myDiv').style.display = '';
```

# Consume Web API using Fetch API




- AJAX is acronym of Asynchronous JavaScript and XML
  - AJAX is used for **asynchronously** loading (in the background) of dynamic Web content and data from the Web server into a HTML page
  - Allows dynamically adding elements into the DOM
- Two styles of AJAX
  - Partial page rendering
    - Load an HTML fragment and display it in a **`<div>`**
  - Call REST service then use the received JSON object to update the page at the client-side using JavaScript / jQuery

# Call REST Service using Fetch API

- Fetch content from the server

```
async function getStudent(studentId) {
    let url = `/api/students/${studentId}`
    let response = await fetch(url)
    return await response.json()
}
```

- **.json()** method is used to get the response body as a JSON object

# Posting a request to the server using Fetch API

- Fetch could be used to post a request to the server

```
let email = document.querySelector( "#email" ).value,
  password = document.querySelector("#password").value

fetch( "/login", {
    method: "post",
    headers: { "Accept": "application/json",
               "Content-Type": "application/json" },
    body: JSON.stringify({
        email,
        password
    })
})
//headers parameter is optional
```


https://jquery.com/

No longer popular. **Use plain JavaScript instead**

# jQuery

- jQuery is a fast, small and feature-rich JavaScript library that works across a multitude of browsers
- Simplifies HTML document traversing, event handling and animation
- To include jQuery in your website, all you need is a script tag with its *src* pointed to the hosted location

```
<script
src="https://code.jquery.com/jquery-3.1.1.slim.min.js">
</script>
```

# jQuery Syntax

- You can use the **$()** function to **select** HTML elements and perform some **action** on the element(s)
- Basic syntax is: **$(*selector*).*action*()**
  - A **$** sign to access jQuery
  - A (***selector***) to find HTML elements
  - A ***action***() to be performed on the element(s)

# jQuery Selectors

jQuery supports CSS selectors:

1. By tag name: `$("p")`
2. By id : `$("#id")`
3. By class: `$(".classname")`
4. By attribute: `$("a[href]")`
5. …

| DOM method | jQuery equivalent |
|---|---|
| querySelector("#id") | $("#id") |
| querySelector("tag") | $("tag") |
| querySelector(".classname") | $(".classname") |

# jQuery Syntax

- Examples:
  - $("p").hide() - hides all <p> elements
  - $(".test").hide() - hides all elements with class="test"
  - $("#test").hide() - hides the element with id="test"
  - $('div').css('background', 'blue') - Make all DIVs blue

# *.ready()* event

- jQuery provides a *ready* event that is fired when the document is ready to be manipulated

- You'll put most of your code in this method

```
$(document).ready( () => {
   // Your code here e.g.,
   alert("Ok document is ready…")
})
```

# Creating Elements

- Creating new elements is also easy

```
let divElement = $('<div>')
let paragraph = $('<p>Some text</p>')
```

- Creating complex node

```
$("<p>", {
      "id": "myParagraph",
      "class": "special",
      "text": "My paragraph is awesome!"
})
```

# Adding Elements

- Adding elements can be done on the fly
  - **jQuery.appendTo() / jQuery.prependTo()**
  - **jQuery.append() / jQuery.prepend()**

```
<h2>QU Greetings</h2>
<div id="wrapper">
  <div>Hello, student</div>
  <div>Goodbye, student</div>
</div>
```

```
<h2>QU Greetings</h2>
<div id="wrapper">
  <div>Hello, student<p>Test</p></div>
  <div>Goodbye, student<p>Test</p></div>
</div>
```

```
$('#wrapper div').append('<p>Test</p>')
```

```
<div>First</div>
<h2>QU Greetings</h2>
<div id="wrapper">
  <div>Hello, studentdiv>
  <div>Goodbye, student<div>
</div>
```

```
$('<div>First</div>').prependTo('body')
```

# Removing Elements

- You can also easily remove elements from the DOM

```
<div>
  <p>Red</p>
  <p>Green</p>
</div>

<script>
  $('p').remove() // Remove all paragraphs
</script>
```

```
<!-- Result: -->
<div>
</div>
```

# jQuery Events

- jQuery has a convenient way for attaching and detaching events Using methods **on()** and **off()**

```
$('#button').on('click', onButtonClick)

function onButtonClick() {
  $(this).hide()
  // "this" is the event source (the button clicked)
}
```

# Looping over the DOM

- Using the DOM

```
let elems = document.querySelectorAll("li")
for ( let e of elems )
      // do stuff with e
}
```

- Using jQuery

```
let elems = $("li")
for ( let e of elems )
     // do stuff with e
}
```

# jQuery css method parameters

- **Getter:**

```
$("#myid").css(propertyName)
```

- **Setter:**

```
$("#myid").css(propertyName, value)
```

- **Multi-setter:**

```
$("#myid").css({
        'propertyName1': value1,
        'propertyName2': value2,
        ...
        })
```

# More node manipulation with jQuery

| jQuery method | functionality |
|---|---|
| .hide() | Hides an element |
| .show() | Shows an element |
| .empty() | remove the content of an element, equivalent to innerHTML = "" |
| .html() | get/set the content of an element in HTML format |
| .text() | get/set the content of an element as plain text |
| .val() | get/set the value of a form input, select, textarea, ... |

# Summary

- jQuery – the most popular client-side JS library
- Select DOM elements with jQuery
  - **`$([selector])`**
- DOM Traversal:
  - **`$([selector]).next()`** / **`parent()`**
- Altering the DOM:
  - **`$([selector]).html(…)`** / **`append(…)`**
- jQuery Events
  - **`$([selector]).on([event], [callback])`**

# Resources

- W3C School:

  http://www.w3schools.com/jquery/

- Code School:

  http://www.codeschool.com/courses/jquery-air-first-flight