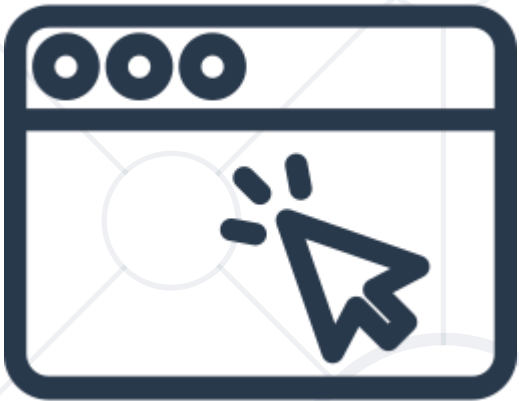


# DOM Events

## Handling DOM Events, Propagation & Delegation



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Technical Trainers



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# Table of Contents

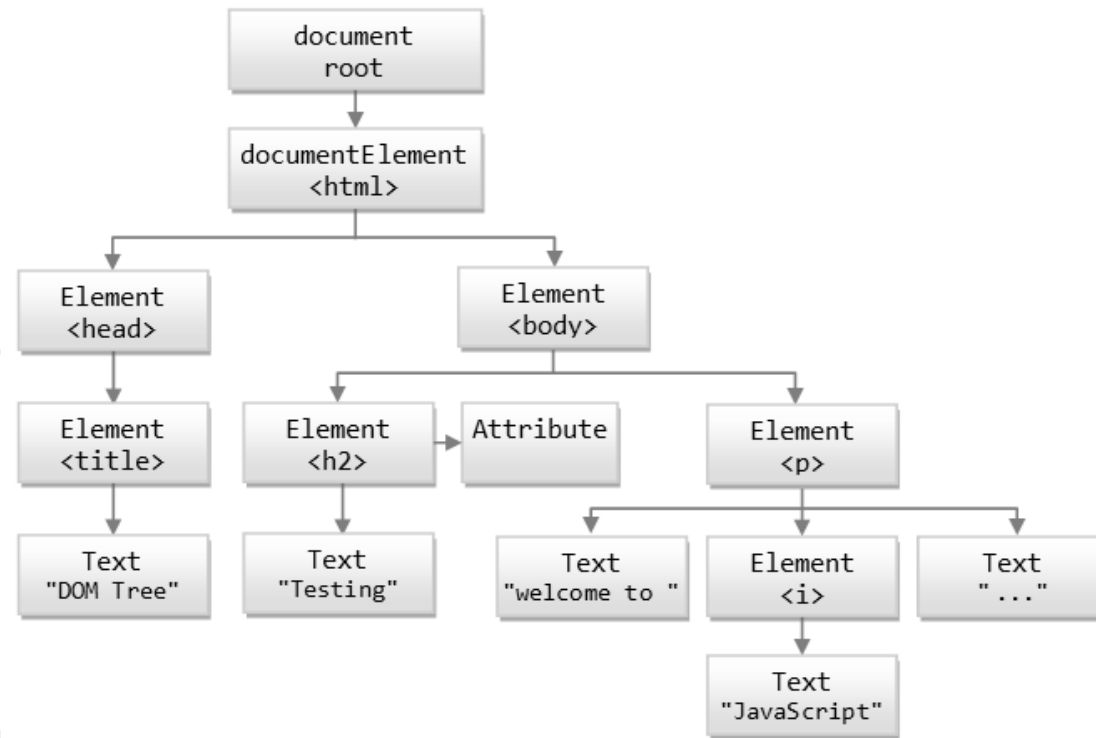
1. Creating DOM Elements
2. Browser Events
3. Handling Events
4. Event Propagation





sli.do

#js-advanced

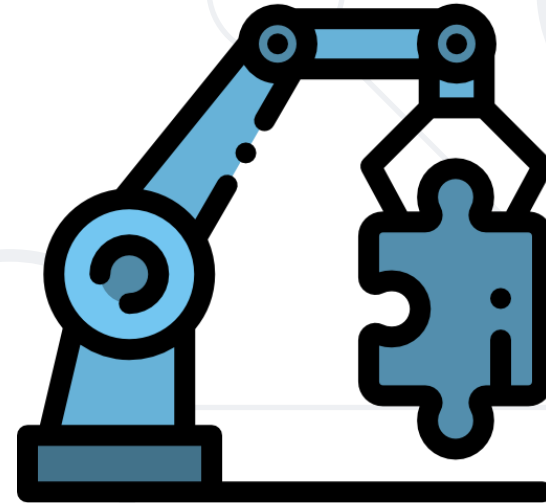


# DOM Manipulation

## Modify the DOM Tree

# DOM Manipulations

- We can **create**, **append** and **remove** HTML elements dynamically
  - **appendChild()**
  - **removeChild()**
  - **replaceChild()**



- HTML elements are created with **document.createElement**
  - This is called a **Factory Pattern**
- Variables holding HTML elements are **live**:
  - If you **modify** the contents of the variable, the DOM is **updated**
  - If you **insert** it somewhere in the DOM, the original is **moved**
- Text added to **textContent** will be **escaped**
- Text added to **innerHTML** will be **parsed** and turned into actual HTML elements → beware of **XSS attacks**!

- Creating a new DOM element

```
let p = document.createElement("p");  
let li = document.createElement("li");
```

Tag name

- Create a copy / cloning DOM element

```
let li = document.getElementById("my-list");  
let newLi = li.cloneNode(true);
```

- Elements are created **in memory** – they don't exist on the page
- To become visible, they must be **appended** to the DOM tree

- **appendChild** - Adds a new child, as the **last child**

```
let p = document.createElement("p");  
let li = document.createElement("li");  
li.appendChild(p);
```

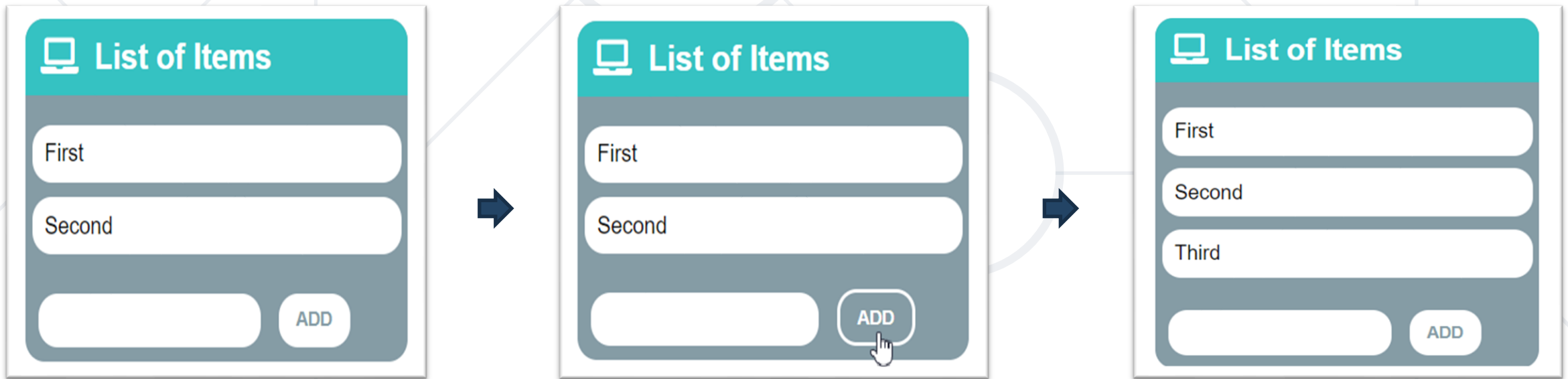
- **prepend** - Adds a new child, as the **first child**

```
let ul = document.getElementById("my-list");  
let li = document.createElement("li");  
ul.prepend(li);
```



# Problem: List of Items

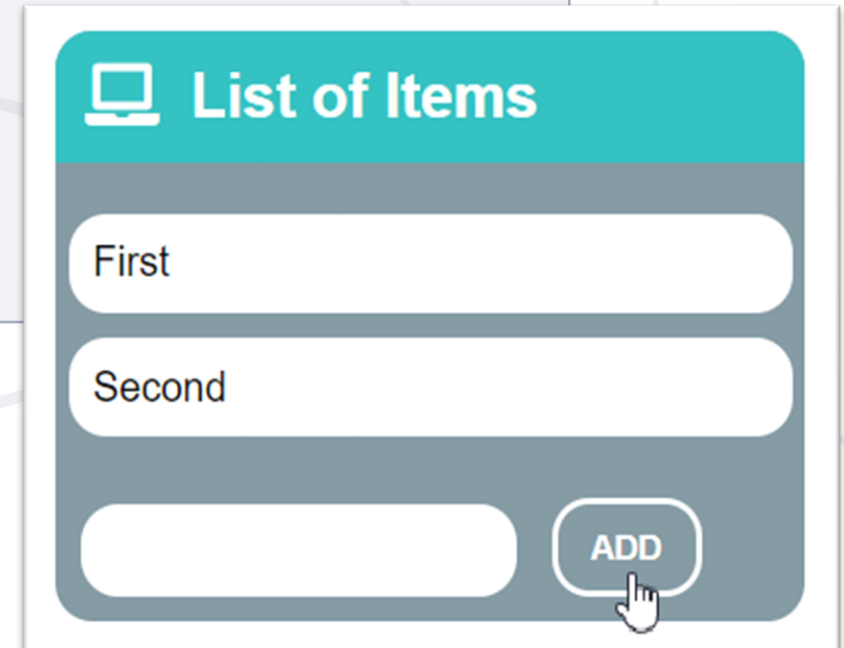
- Create a HTML page holding a **list of items** + **text box** + **button** for adding more items to the list
  - Write a function to **append** the specified text to the list



Check your solution here: <https://judge.softuni.bg/Contests/Practice/Index/2762#0>

# Problem: List of Items – HTML

```
<h1>List of Items</h1>
<ul id="items"><li>First</li><li>Second</li></ul>
<input type="text" id="newItemText" />
<input type="button" value="Add" onclick="addItem()">
<script>
function addItem() {
  // TODO: Add new item to the list
}
</script>
```



# Solution: List of Items

```
function addItem() {  
  let text = document.getElementById('newItemText').value;  
  let li = document.createElement("li");  
  li.appendChild(document.createTextNode(text));  
  document.getElementById("items").appendChild(li);  
  //clearing the input:  
  document.getElementById('newItemText').value = '';  
}
```

# Deleting DOM Elements

```
<ul id="items">  
  <li class="red">Red</li>  
  <li class="blue">Blue</li>  
</ul>
```

```
▼ <body>  
  ▼ <ul id="items">  
    <li class="red">Red</li>  
    <li class="blue">Blue</li>  
  </ul>  
</body>
```

```
let redElements =  
  document.querySelectorAll("#items li.red");  
redElements.forEach(li => {  
  li.parentNode.removeChild(li);  
});
```

```
▼ <body>  
  ▼ <ul id="items">  
    <li class="blue">Blue</li>  
  </ul>  
</body>
```

# Problem: Delete from Table

```
<table border="1" id="customers">
  <tr><th>Name</th><th>Email</th></tr>
  <tr><td>Eve</td><td>eve@gmail.com</td></tr>
  <tr><td>Nick</td><td>nick@yahooo.com</td></tr>
  <tr><td>Didi</td><td>didi@didi.net</td></tr>
  <tr><td>Tedy</td><td>tedy@tedy.com</td></tr>
</table>
Email: <input type="text" name="email" />
<button onclick="deleteByEmail()">Delete</button>
<div id="result" />
```

Name	Email
Eve	eve@gmail.com
Nick	nick@yahooo.com
Didi	didi@didi.net
Tedy	tedy@tedy.com

Email:

Check your solution here: <https://judge.softuni.bg/Contests/Practice/Index/2762#2>

# Solution: Delete from Table

```
function deleteByEmail() {  
  let email = document.getElementsByName("email")[0].value;  
  let secondColumn = document.querySelectorAll(  
    "#customers tr td:nth-child(2)");  
  for (let td of secondColumn)  
    if (td.textContent == email) {  
      let row = td.parentNode;  
      row.parentNode.removeChild(row);  
      document.getElementById('result').  
        textContent = "Deleted";  
      return;  
    }  
  document.getElementById('result').textContent = "Not found";  
}
```

Name	Email
Nick	nick@yahooo.com
Didi	didi@didi.net
Tedy	tedy@tedy.com

Email:

Deleted.



# **The DOM Event**

Event Object and Types

# Event Object

- Calls its **associated function**
- Passes a **single argument** to the function - a **reference** to the event object
- Contains **properties** that describe the event
  - Which **element** triggered the event
  - Screen **coordinates** where it occurred
  - What is the **type** of the event
  - And more





# Event Types in DOM API

## ▪ Mouse events

click  
mouseover  
mouseout  
mousedown  
mouseup

## ▪ Touch events

touchstart  
touchend  
touchmove  
touchcancel

## ▪ DOM / UI events

load  
unload  
resize  
dragstart / drop

## ▪ Keyboard events

keydown  
KeyPress  
keyup

## ▪ Focus events

focus (got focus)  
blur (lost focus)

## ▪ Form events


input  
change  
submit  
reset



**Event Handling**

# Event Handler

- Event registration is done by providing a **callback function**
- Three ways to register for an event:
  - With **HTML Attributes**
  - Using **DOM element properties**
  - Using **DOM event handler** – preferred method



```
function handler(event){  
    // this --> object, html reference  
    // event --> object, event configuration  
}
```

# Event Listener

- `addEventListener();`

```
htmlRef.addEventListener( 'click' , handler , false );
```

- `removeEventListener();`

```
htmlRef.removeEventListener( 'click' , handler);
```



# Attaching Click Handler

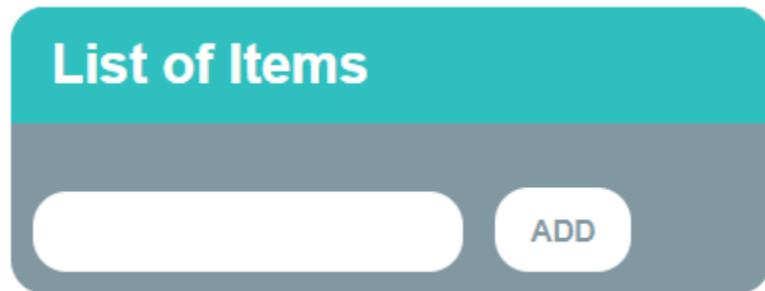
```
const button = document.getElementsByTagName('button')[0];  
  
button.addEventListener('click', clickMe);  
  
function clickMe(e) {  
  const target = e.currentTarget;  
  const targetText = target.textContent;  
  target.textContent = Number(targetText) + 1;  
}
```

Just click the button


0

# Problem: Add / Delete Items

- Extend the previous problem
  - Implement **[Delete]** action as link after each list item



The diagram illustrates the transformation of a simple form into a list. On the left, a box titled 'List of Items' contains a single text input field and an 'ADD' button. A large blue arrow points to the right, where a more complex version of the 'List of Items' is shown. This version contains a list of items, each with a text input field and a '[Delete]' link. Below the list is another text input field and an 'ADD' button.

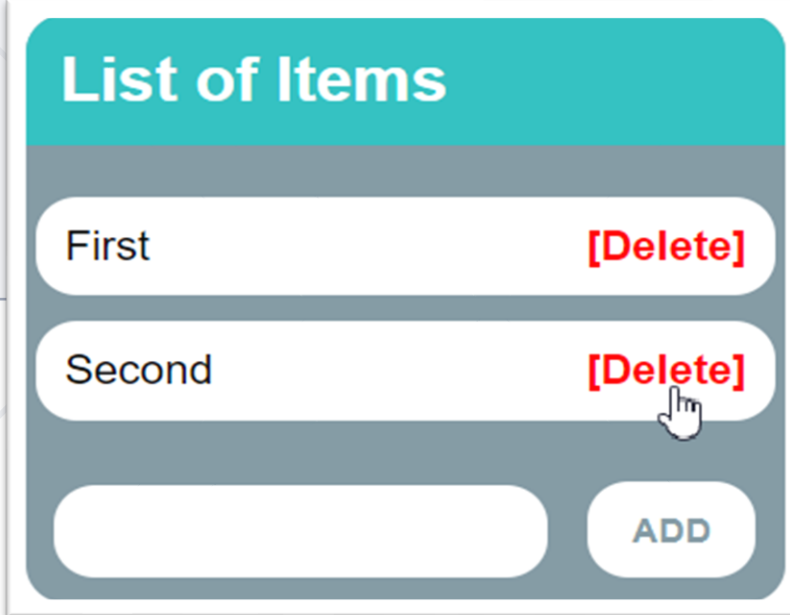


The diagram illustrates the transformation of a simple form into a list. On the left, a box titled 'List of Items' contains a single text input field and an 'ADD' button. A large blue arrow points to the right, where a more complex version of the 'List of Items' is shown. This version contains a list of items, each with a text input field and a '[Delete]' link. Below the list is another text input field and an 'ADD' button.

Check your solution here: <https://judge.softuni.bg/Contests/Practice/Index/2762#1>

# Problem: Add / Delete Items – HTML

```
<h1>List of Items</h1>
<ul id="items"></ul>
<input type="text" id="newText" />
<input type="button" value="Add" onclick="solve()">
<script>
function solve() {
    // TODO...
}
</script>
```



List of Items

First	[Delete]
Second	[Delete]
<input type="text"/>	ADD

# Solution: Add / Delete Items

```
function solve() {  
  let newElement = document.getElementById("newText").value;  
  let list = document.getElementById("items");  
  
  if (newElement.length === 0) return;  
  
  let listItem = document.createElement("li");  
  listItem.textContent = newElement;  
  
  let remove = document.createElement("a");  
  let linkText = document.createTextNode("[Delete]");  
  // Continued on the next slide ...  
}
```

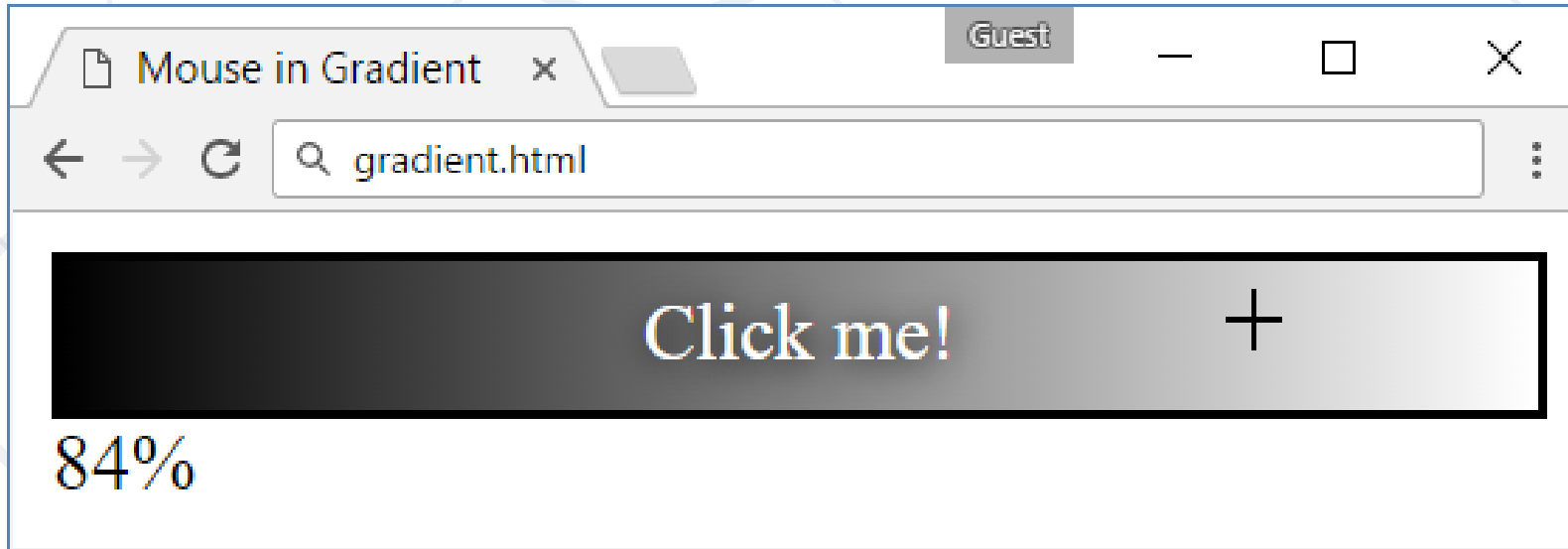


# Solution: Add / Delete Items

```
remove.appendChild(linkText);  
remove.href = "#";  
remove.addEventListener("click", deleteItem);  
  
listItem.appendChild(remove);  
list.appendChild(listItem);  
  
function deleteItem() {  
    listItem.remove();  
}  
}
```

# Problem: Mouse in Gradient

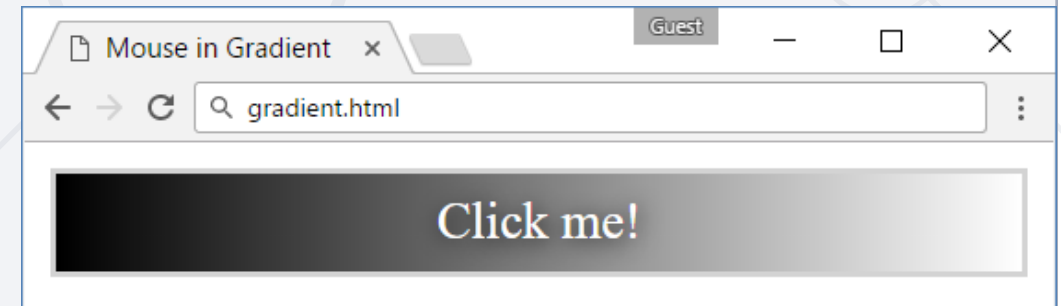
- A HTML page holds **linear gradient** box
  - Moving the mouse should show **percentage** [0% ... 100%], depending on the **location of mouse**
  - Left side → **0%**; middle → **50%**; right side → **100%**



Check your solution here: <https://judge.softuni.bg/Contests/Practice/Index/2762#3>

# Problem: Mouse in Gradient – HTML

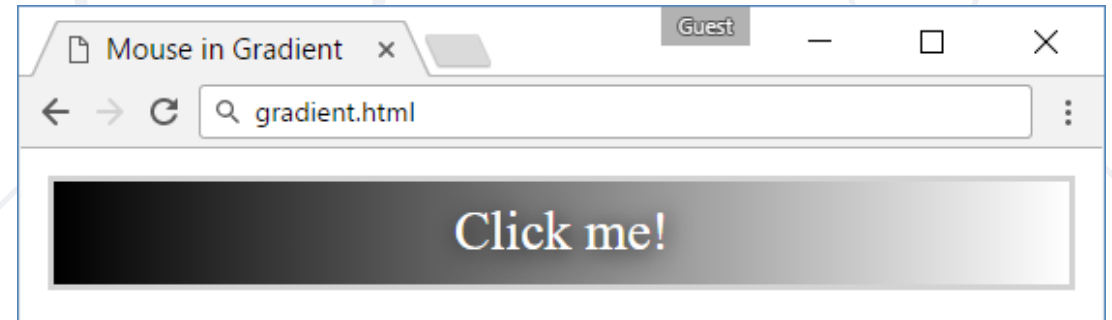
```
<html>
<head>
  <title>Mouse in Gradient</title>
  <link rel="stylesheet" href="gradient.css" />
  <script src="gradient.js"></script>
</head>
<body onload="attachGradientEvents()">
  <div id="gradient-box">
    <div id="gradient">Click me!</div>
  </div>
  <div id="result"></div>
</body>
</html>
```



# Problem: Mouse in Gradient – CSS

```
#gradient-box {  
  width: 300px;  
  border: 2px solid lightgrey;  
}  
#gradient-box:hover {  
  border: 2px solid black;  
}  
#gradient {  
  height: 30px;  
  color: white;  
  text-shadow:  
    1px 1px 10px black;
```

```
text-align: center;  
line-height: 30px;  
background:  
  linear-gradient(  
    to right, black, white);  
cursor: crosshair;  
}
```



# Solution: Mouse in Gradient

```
function attachGradientEvents() {  
  let gradient = document.getElementById('gradient');  
  gradient.addEventListener('mousemove', gradientMove);  
  gradient.addEventListener('mouseout', gradientOut);  
  
  function gradientMove(event) {  
    let power = event.offsetX / (event.target.clientWidth - 1);  
    power = Math.trunc(power * 100);  
    document.getElementById('result').textContent = power + "%";  
  }  
  
  function gradientOut(event) {  
    document.getElementById('result').textContent = "";  
  }  
};
```



# **Live Demonstration**

**Lab Problems 5 and 6**

- In event handlers, **this** refers to the event **source element**

```
element.addEventListener("click", function(e) {  
    console.log(this === e.currentTarget); // Always true  
});
```

- Pay attention when using **object methods** as event listeners!
  - **this** may not behave as you expect with objects

# Attaching Hover Handler

```
const button = document.getElementsByTagName('div')[0];
button.addEventListener('mouseover', function (e) {
  const style = e.currentTarget;
  const { backgroundColor } = style;

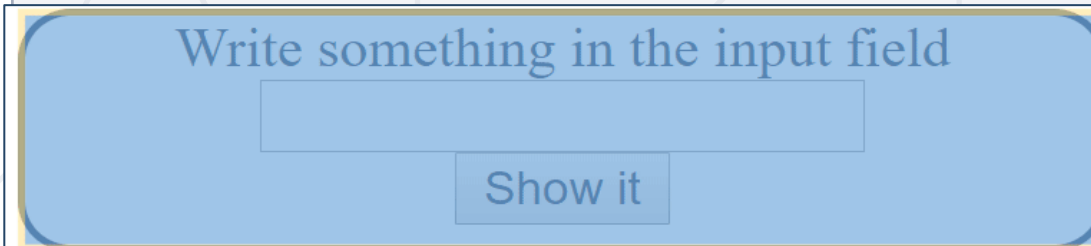
  if(backgroundColor === 'white'){
    targetStyles.backgroundColor = '#234465';
    targetStyles.color = 'white';
  } else {
    targetStyles.backgroundColor = 'white';
    targetStyles.color = '#234465';
  }
});
```



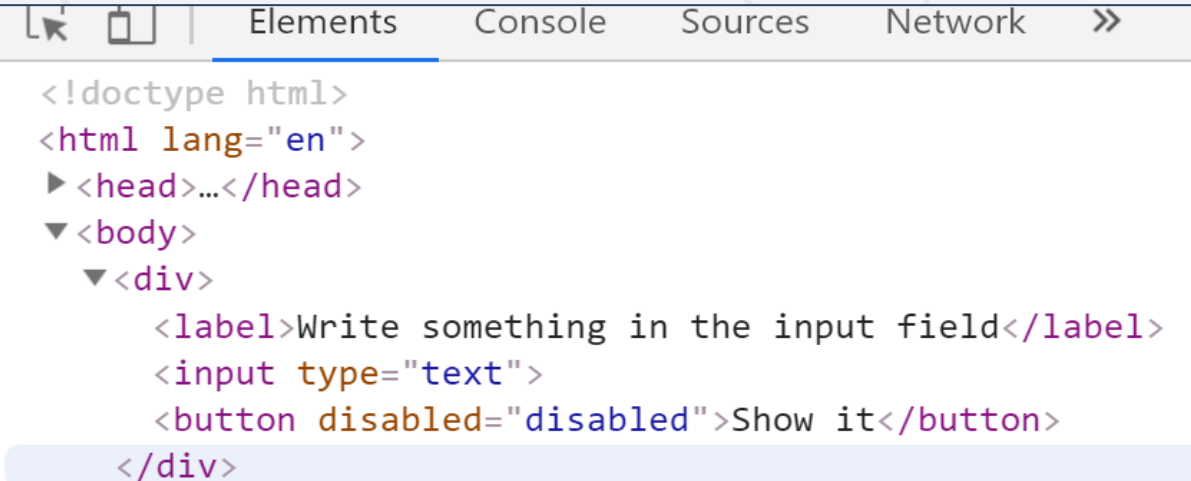
# Attaching Input Handler

```
const inputField = document.getElementsByTagName('input')[0];
const button = document.getElementsByTagName('button')[0];

inputField.addEventListener('input', function () {
    button.setAttribute('disabled', 'false')
});
```



div 304 × 71.2



```
<!doctype html>
<html lang="en">
  <head>...</head>
  <body>
    <div>
      <label>Write something in the input field</label>
      <input type="text">
      <button disabled="disabled">Show it</button>
    </div>
```

# Remove Listeners

```
const password = document.querySelector('input[type="password"]');  
const button = document.querySelector('button');  
password.addEventListener('focus', focusEvent);
```

```
function focusEvent () {  
    event.target.style.background = '#234465';  
}
```

```
password.addEventListener('blur', (event) => {  
    event.target.style.background = '';  
});
```

```
button.addEventListener('click', () => {  
    password.removeEventListener('focus', focusEvent);  
});
```

username
password
<button>Remove focus event</button>

# Multiple Listeners

- The **addEventListener()** method also allows you to add many listeners to the same element, without overwriting existing ones:

```
element.addEventListener("click", myFirstFunction);  
element.addEventListener("click", mySecondFunction);  
element.addEventListener("mouseover", myThirdFunction);  
element.addEventListener("mouseout", myFourthFunction);
```

*Note that you don't use the "on" prefix for the event use "click" instead of "onclick"*

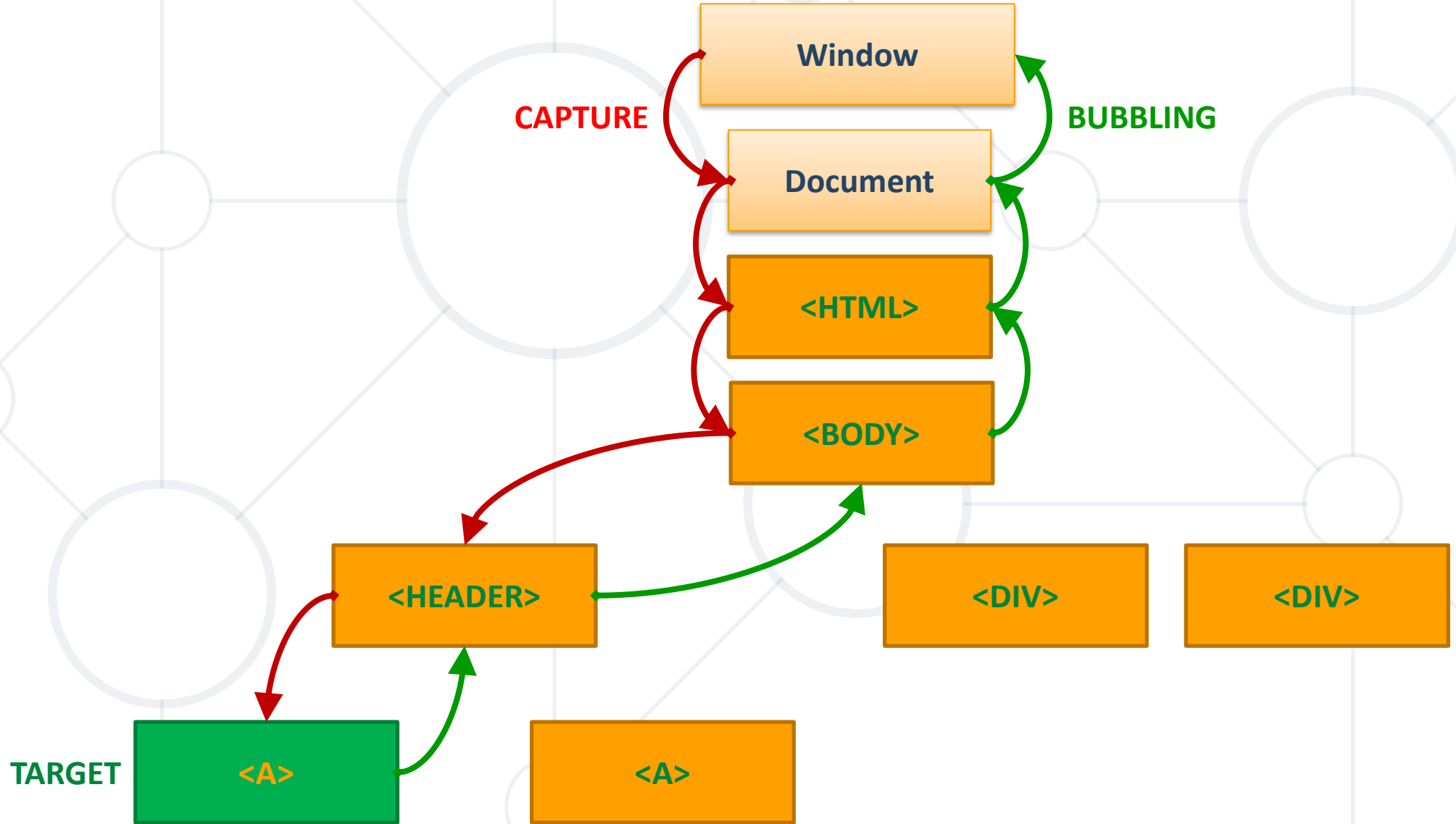




# Event Propagation

Handling Events Away From Their Source

# Event Propagation



- Allows you to **avoid** adding event listeners to specific nodes
- Event listener is assigned to a **single ancestor**

```
<ul id="parent-list">  
  <li id="post-1">Item 1</li>  
  <li id="post-2">Item 2</li>  
</ul>
```

```
document.getElementById("parent-list")  
  .addEventListener("click", function(e) {  
    if(e.target && e.target.nodeName == "LI") {  
      console.log(  
        "List item ", e.target.id.replace("post-", ""),  
        " was clicked!");  
    }  
  });
```

# Pros and Cons

- **Benefits**

- Simplifies initialization
- Saves memory
- Less code

- **Limitations**

- Event must be bubbling
- May add CPU load





# Live Demonstration

Lab Problem 7



- **stopPropagation** prevents further propagation of the event
  - If there are **multiple handlers** for the same event
- **preventDefault** stop the browser from executing default behavior, for example:
  - **Navigating** to a new page when `<a>` is clicked
  - Submitting **HTTP requests** via forms
  - Opening **context menus**

- The DOM tree can be **manipulated** by:
  - **Creating** and **deleting** elements
  - **Moving** elements between nodes
- User interaction **triggers events**
  - They can be **listened** to and **handled**
  - The handler receives **event details**
  - Events **propagate** through the DOM tree



# Questions?



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