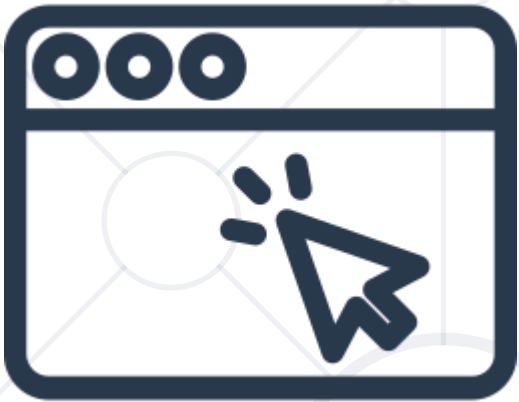


DOM Events

Handling DOM Events, Propagation & Delegation



SoftUni Team
Technical Trainers



SoftUni



Software University

<https://softuni.bg>

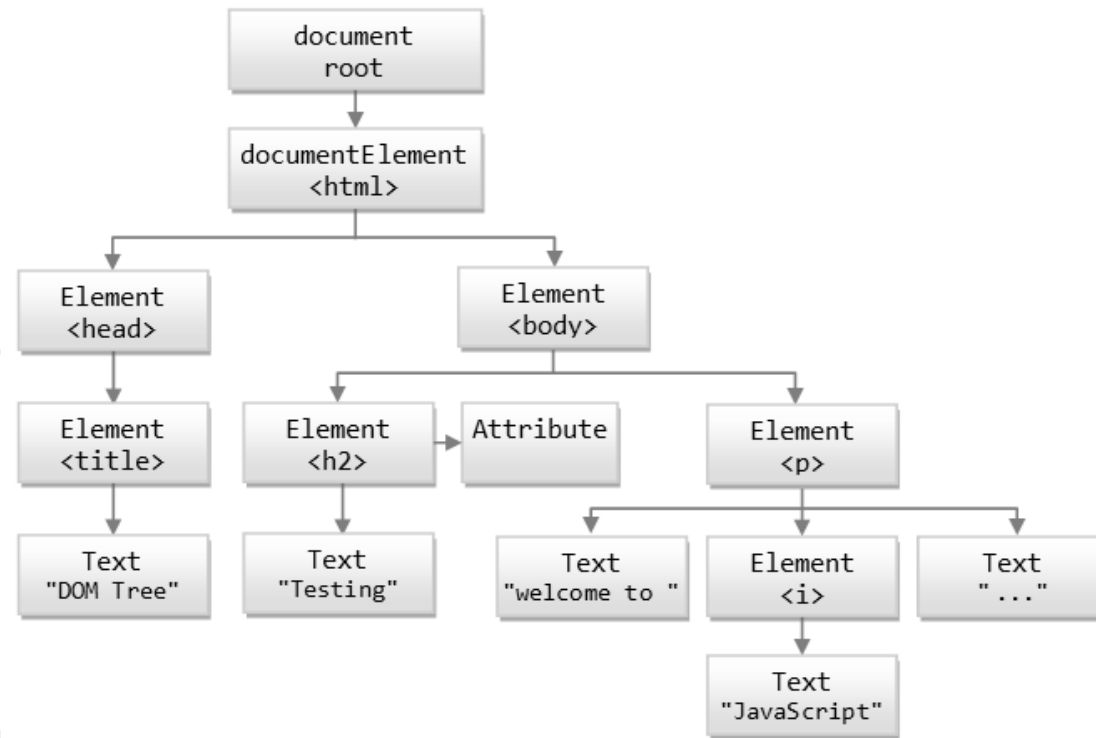
Table of Contents

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2. Browser Events
3. Handling Events
4. Event Propagation



sli.do

#js-advanced

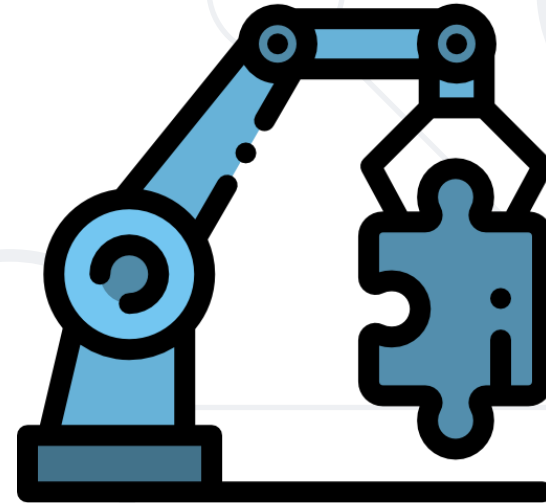


DOM Manipulation

Modify the DOM Tree

DOM Manipulations

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



Creating New DOM Elements

- 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**

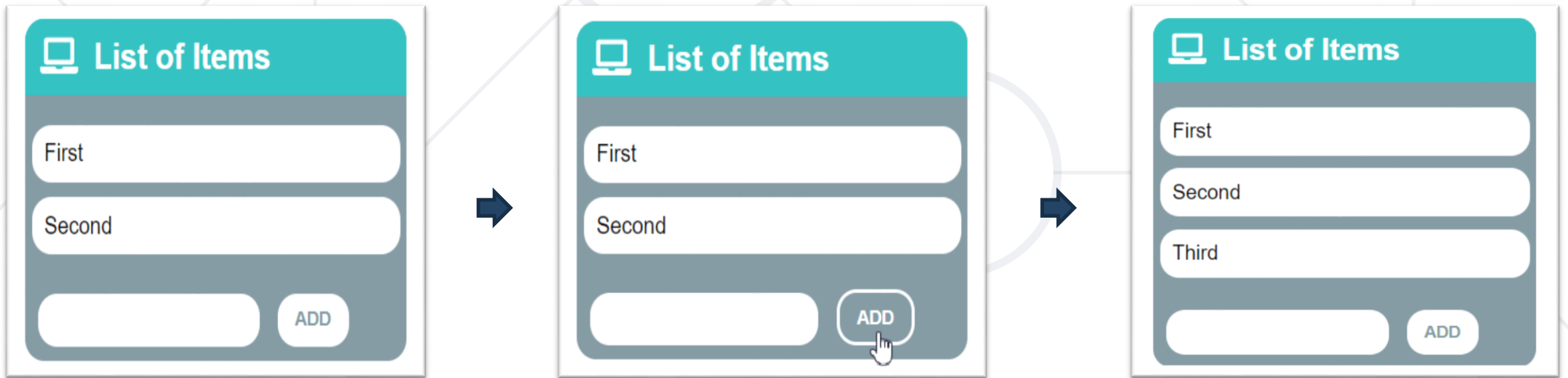
```
let p = document.createElement("p");  
let li = document.createElement("li");  
li.appendChild(p);
```

- **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

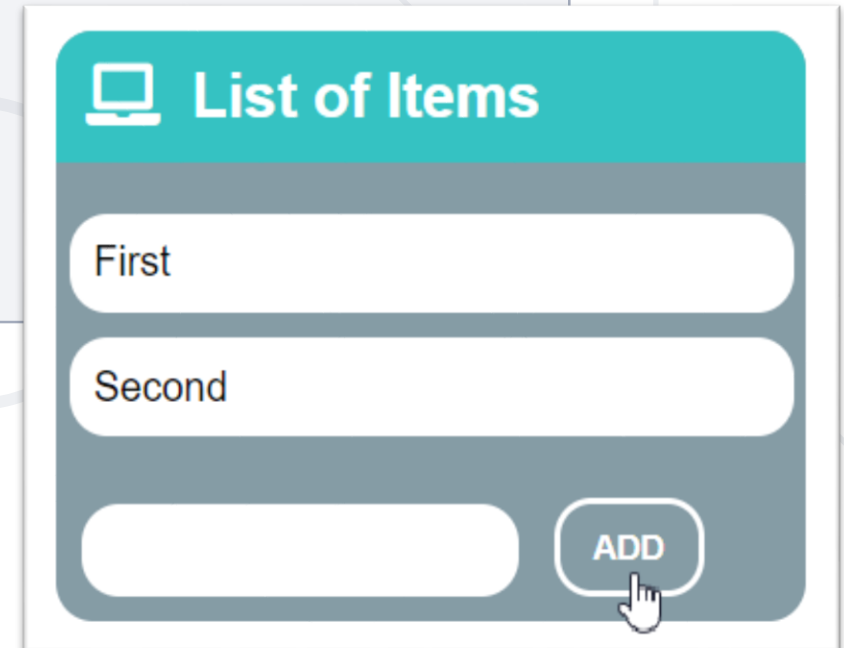
- Create a HTML page holding a **list of items** + **text box** + **button** for adding more items to the list
 - Write a function to **append** the specified text to the list



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);
```

- **removeEventListener();**

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



Attaching Click Handler


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

Just click the button

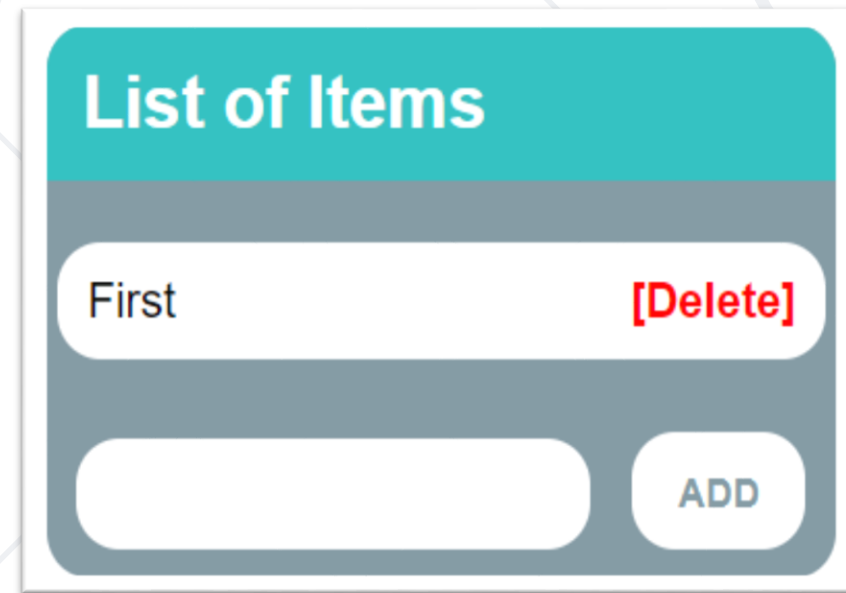
0

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' box 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.

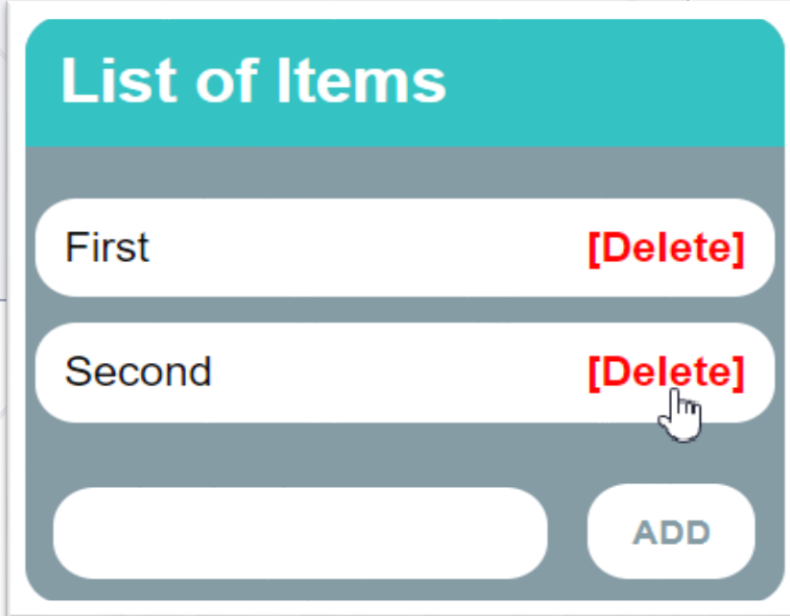


The diagram illustrates the transformation of a simple form into a list. On the left, a box titled 'List of Items' contains a single text input field and an 'ADD' button. A large blue arrow points to the right, where a more complex version of the 'List of Items' box is shown. This version contains a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

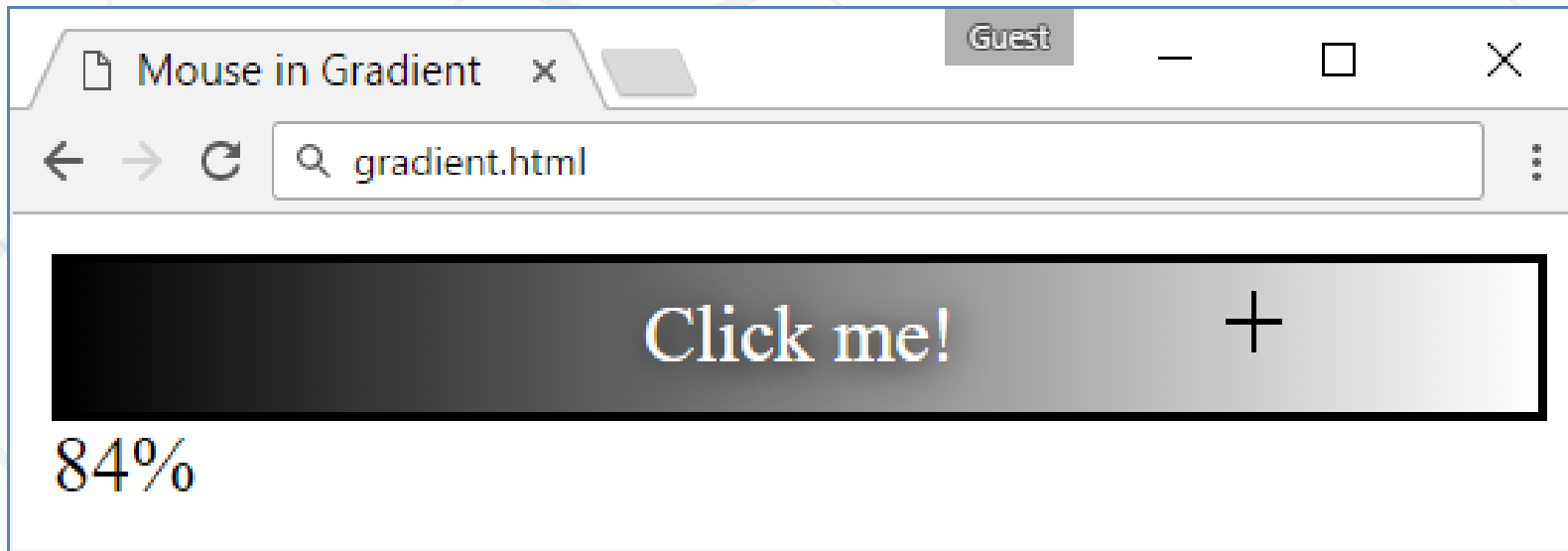
```
function solve() {  
  let newElement = document.getElementById("newText").value;  
  let list = document.getElementById("items");  
  
  if (newElement.length === 0) return;  
  
  let listItem = document.createElement("li");  
  listItem.textContent = newElement;  
  
  let remove = document.createElement("a");  
  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

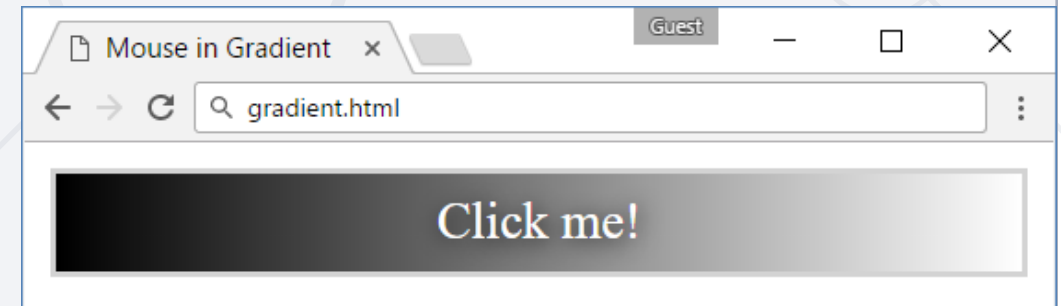
- A HTML page holds **linear gradient** box
 - Moving the mouse should show **percentage** [0% ... 100%], depending on the **location of mouse**
 - Left side → **0%**; middle → **50%**; right side → **100%**



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

Problem: Mouse in Gradient – HTML

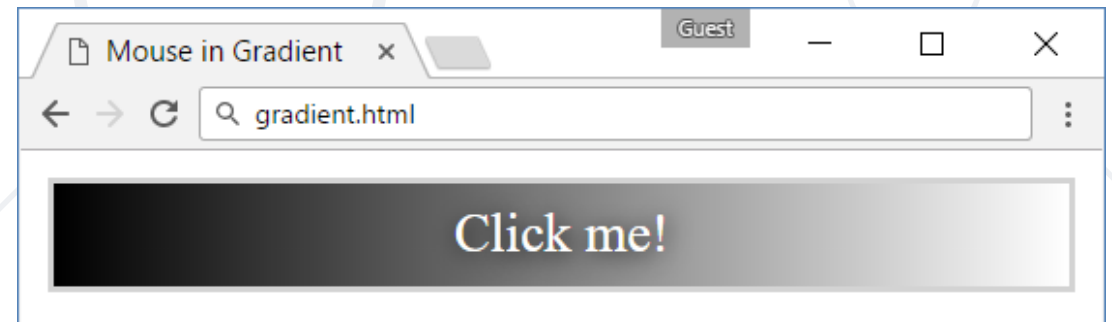
```
<html>
<head>
  <title>Mouse in Gradient</title>
  <link rel="stylesheet" href="gradient.css" />
  <script src="gradient.js"></script>
</head>
<body onload="attachGradientEvents()">
  <div id="gradient-box">
    <div id="gradient">Click me!</div>
  </div>
  <div id="result"></div>
</body>
</html>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



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) {  
    const gradientBoxWidth = event.target.clientWidth;  
    const positionOfTheMouse = event.offsetX / (gradientBoxWidth - 1);  
    const percentage = Math.trunc(positionOfTheMouse * 100);  
    document.getElementById("result").textContent = percentage + "%";  
  }  
  
  function gradientOut() {  
    document.getElementById('result').textContent = "";  
  }  
};
```



Live Demonstration

Lab Problems 5 and 6

- In event handlers, **this** refers to the event **source element**
 - **target** is the element that triggered the event
 - **currentTarget** is the element that the event listener is attached to

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

- Pay attention when using **object methods** as event listeners!

```
const myObject = {  
  value: 42,  
  handleClick: function () { console.log(this) },  
};  
  
myObject.handleClick(); // { value: 42, handleClick: f}  
const myButton = document.getElementsByTagName("button")[0];  
myButton.addEventListener("click", myObject.handleClick);  
// User clicks the button - this == myButton
```


Attaching Hover Handler

```
const button = document.getElementsByTagName("button")[0];

button.addEventListener("mouseover", function (e) {
  const buttonElementStyles = e.currentTarget.style;
  buttonElementStyles.backgroundColor = "red";
});

button.addEventListener("mouseout", function (e) {
  const buttonElementStyles = e.currentTarget.style;
  buttonElementStyles.backgroundColor = "blue";
});
```

Attaching Input Handler

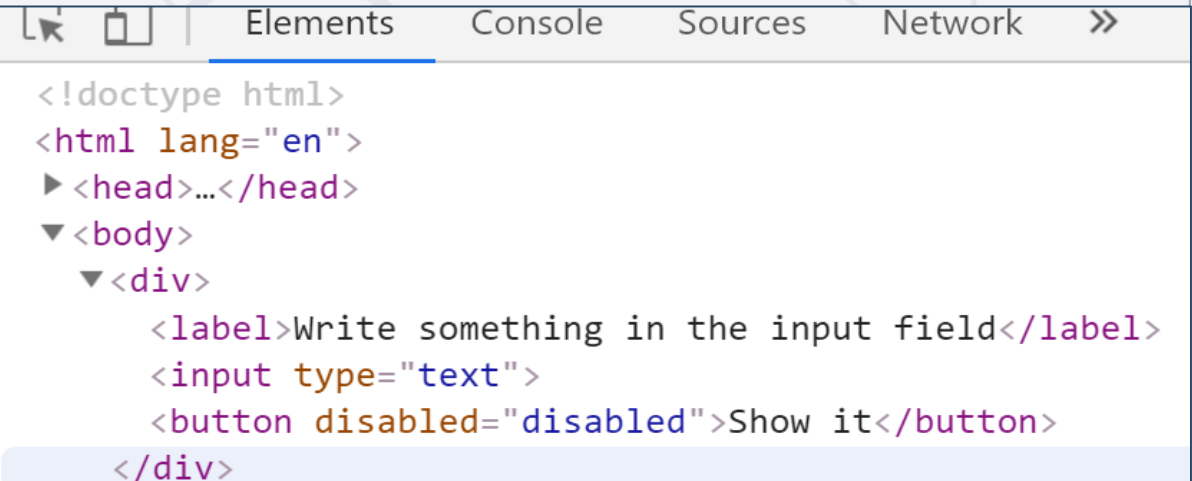
```
const inputField = document.getElementsByTagName('input')[0];
const button = document.getElementsByTagName('button')[0];

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

Write something in the input field

Show it

div 304 × 71.2



The screenshot shows the browser's developer tools with the 'Elements' tab selected. The DOM tree displays the following structure:

```
<!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>
```

```
const button = document.getElementById('myButton');
function handleClick() {
    alert('Button clicked!');
}

button.addEventListener('click', handleClick);

// Add a timeout to remove the event listener after 5 seconds
setTimeout(function() {
    button.removeEventListener('click', handleClick);
    alert('Event listener removed!');
}, 5000);
```

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"



Multiple Listeners

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

// First event listener
input.addEventListener('focus', function () {
  console.log('Input focused (First listener)');
});

// Second event listener
input.addEventListener('focus', function () {
  console.log('Input focused (Second listener)');
});

// Input focused (First listener)
// Input focused (Second listener)
```



Event Propagation

Handling Events Away From Their Source

```
<div class="orange">
  <div class="green">
    <div class="yellow">He-he</div>
  </div>
</div>
```

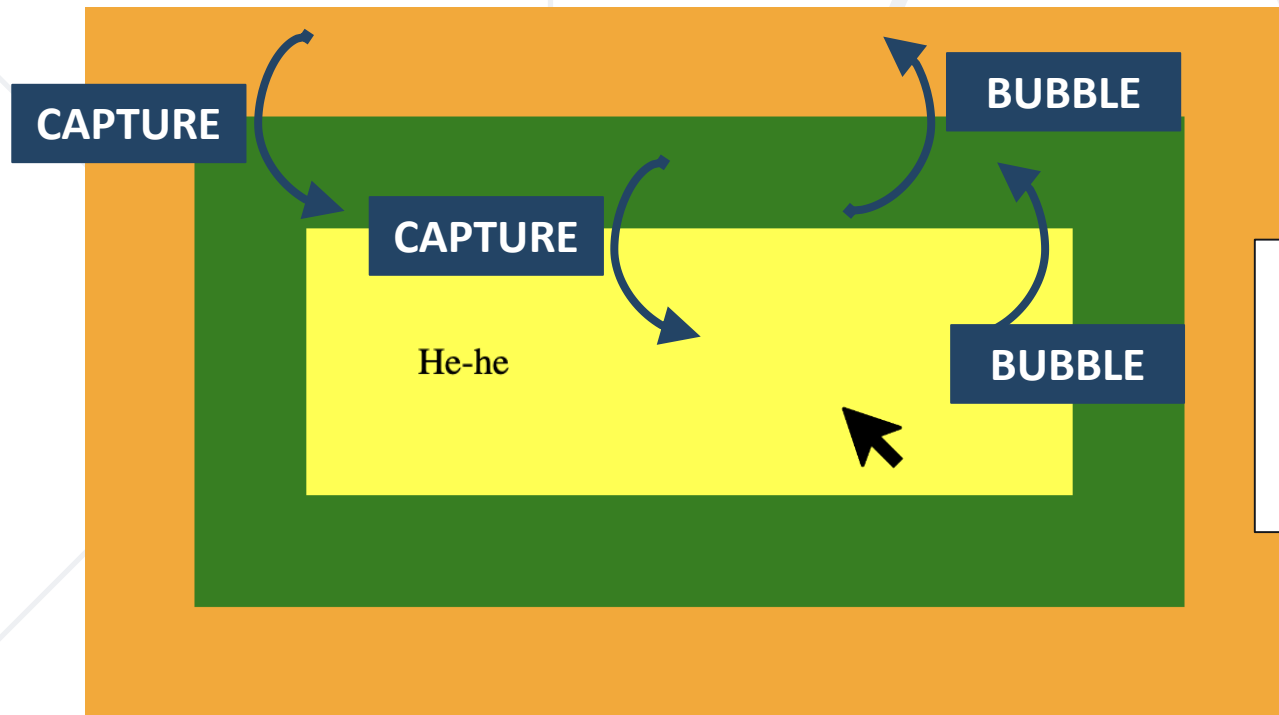
```
.orange { background: orange; }
.green { background: green; }
.yellow { background: yellow; }
```

```
const divElements = document.querySelectorAll("div");

function logText(e) {
  console.log(this, "clicked"); // currentTarget element
}

divElements.forEach((el) => el.addEventListener("click", logText));
```

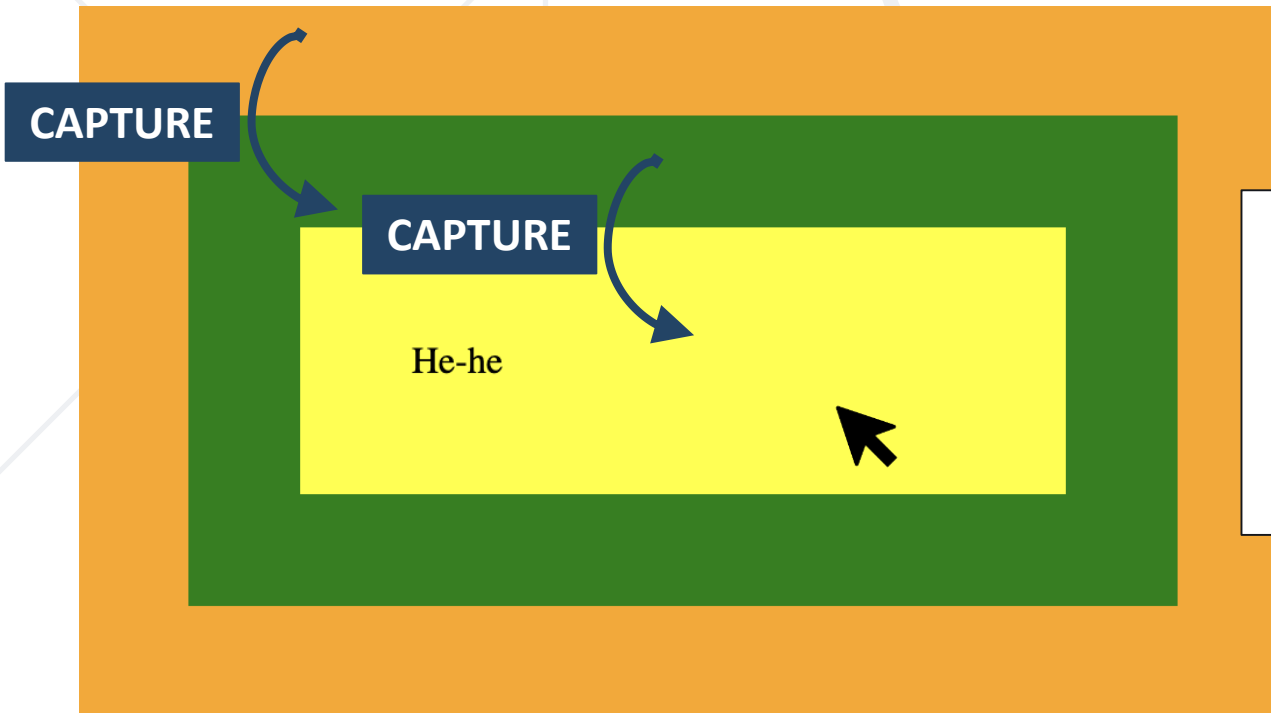
Event Propagation



```
<div class="yellow">He-he</div> 'clicked'  
▶ <div class="green">...</div> 'clicked'  
▶ <div class="orange">...</div> 'clicked'
```


Event Propagation

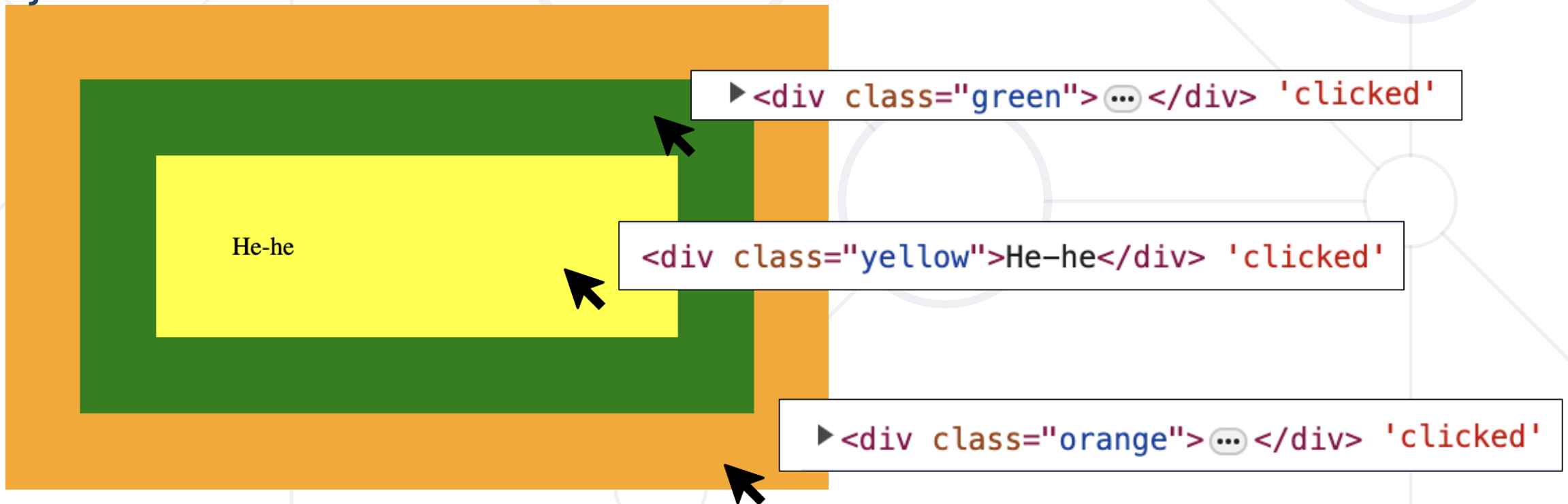
```
divElements.forEach((el) => el.addEventListener("click", logText, {  
  capture: true // default is false  
}));
```



```
► <div class="orange">...</div> 'clicked'  
► <div class="green">...</div> 'clicked'  
  <div class="yellow">He-he</div> 'clicked'
```

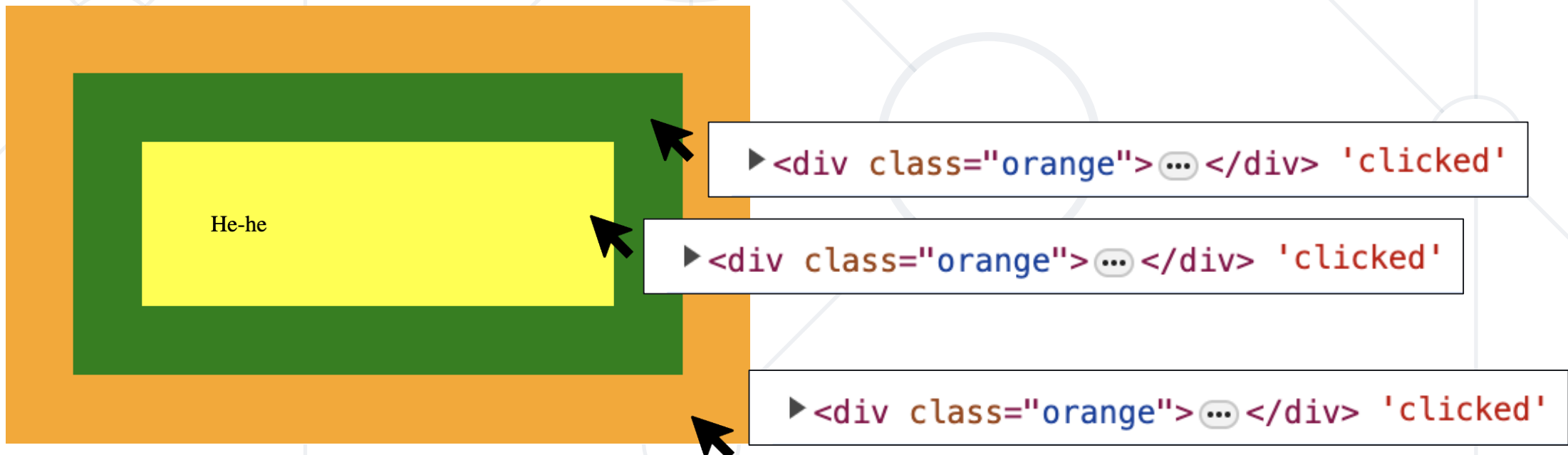
Event Propagation

```
divElements.forEach((el) => el.addEventListener("click", logText));  
  
function logText(e) {  
    e.stopPropagation(); // prevents further propagation of the current  
    event  
    console.log(this, "clicked");  
}
```

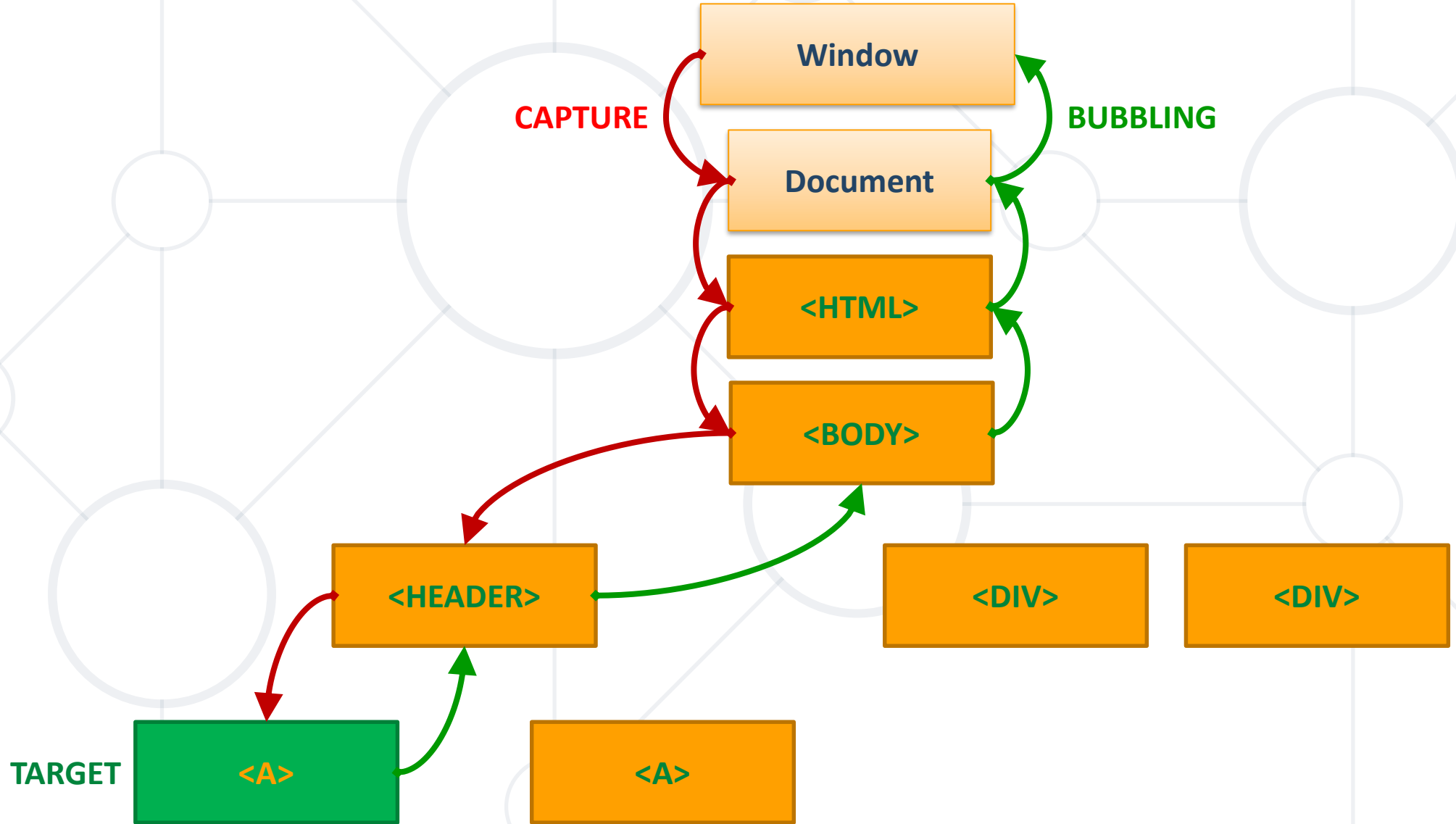


Event Propagation

```
divElements.forEach((el) => el.addEventListener("click", logText, {  
  capture: true  
}));  
function logText(e) {  
  e.stopPropagation();  
  console.log(this, "clicked");  
}
```



Event Propagation



- **preventDefault** stop the browser from executing default behavior, for example:
 - **Navigating** to a new page when `<a>` is clicked
 - Submitting **HTTP requests** via forms

```
<form id="myForm">  
  <input type="text" placeholder="Username">  
  <input type="password" placeholder="Password">  
  <button type="submit">Submit</button>  
</form>
```

```
<script>
  const form = document.getElementById('myForm');

  form.addEventListener('submit', function (event) {
    // Prevent the default form submission behavior
    event.preventDefault();

    // We will add custom form validation logic here...
  });
</script>
```



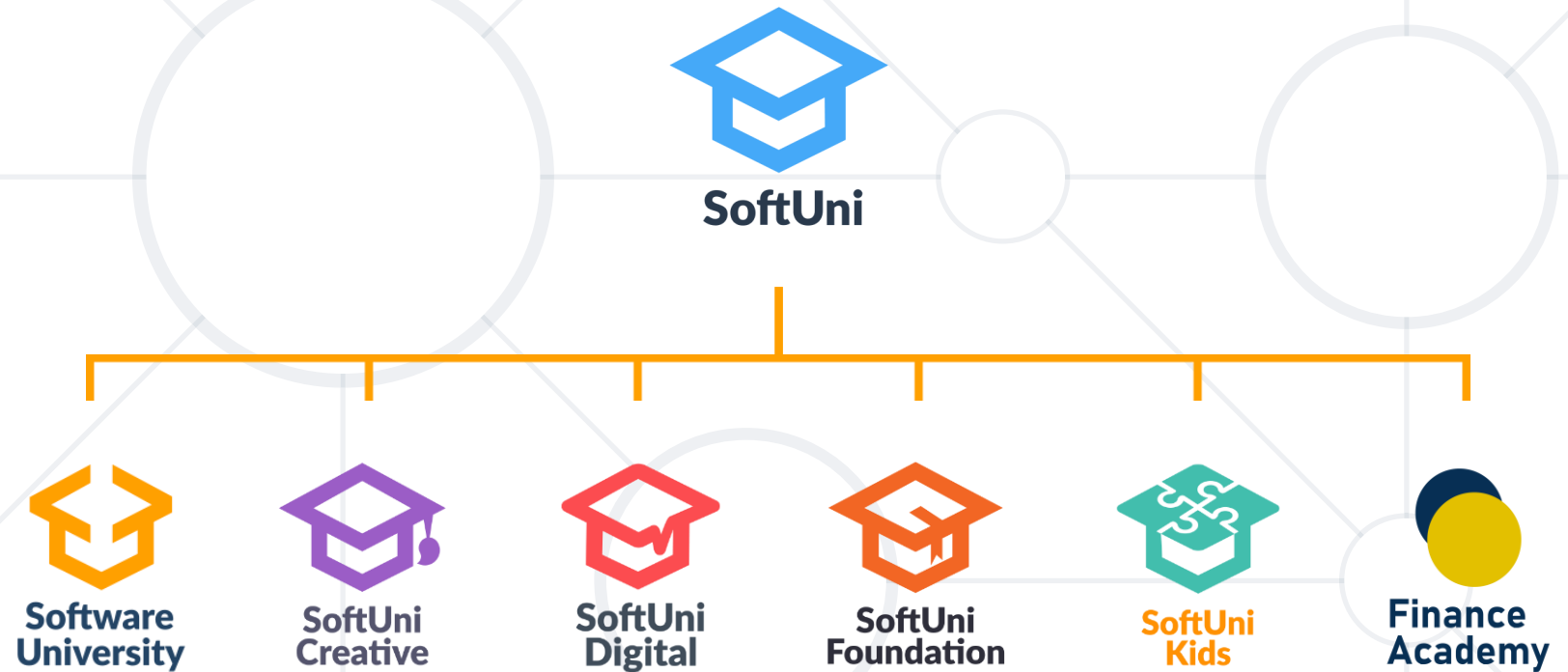
Live Demonstration

Lab Problem 7

- 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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