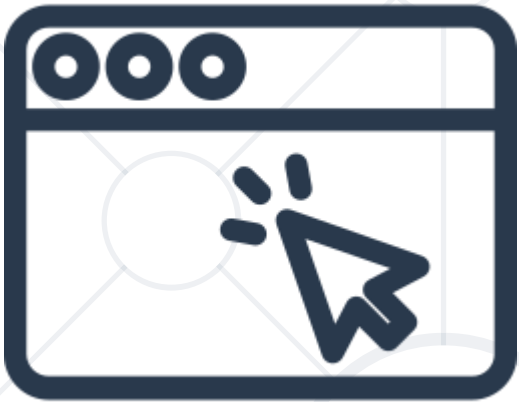


DOM Events

Handling DOM Events, Propagation & Delegation



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Technical Trainers



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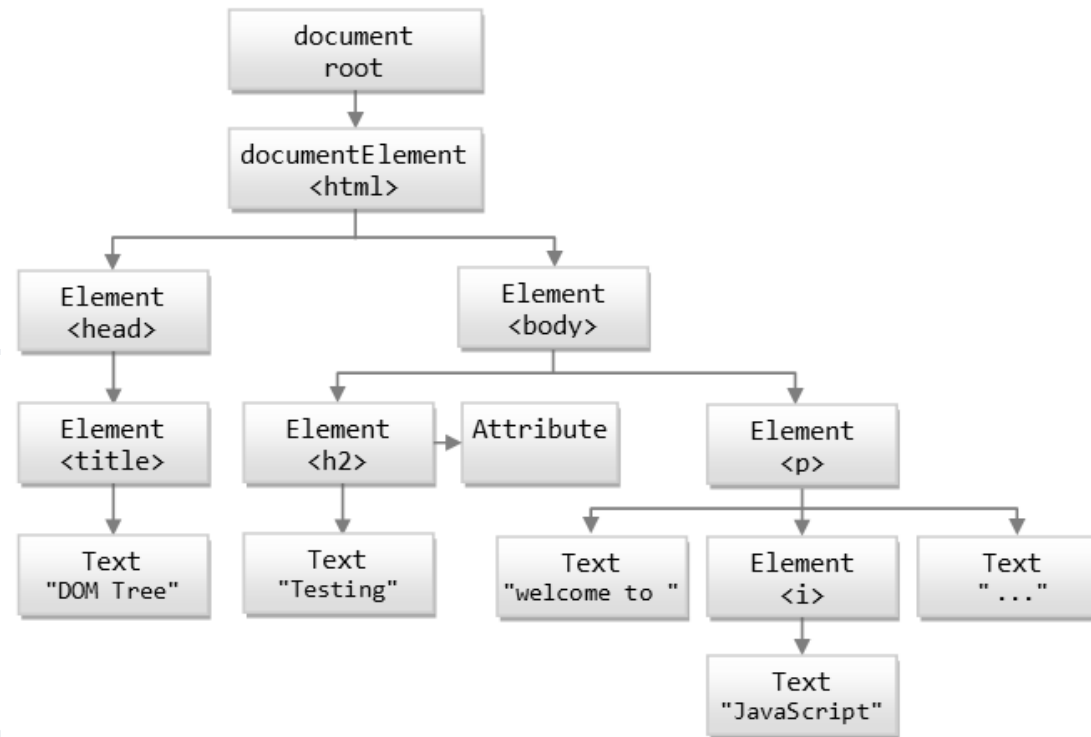
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2. The DOM Event
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sli.do

#js-front-end

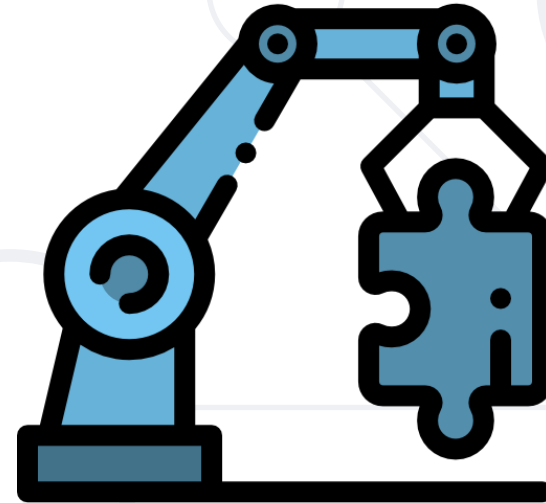


DOM Manipulation

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**

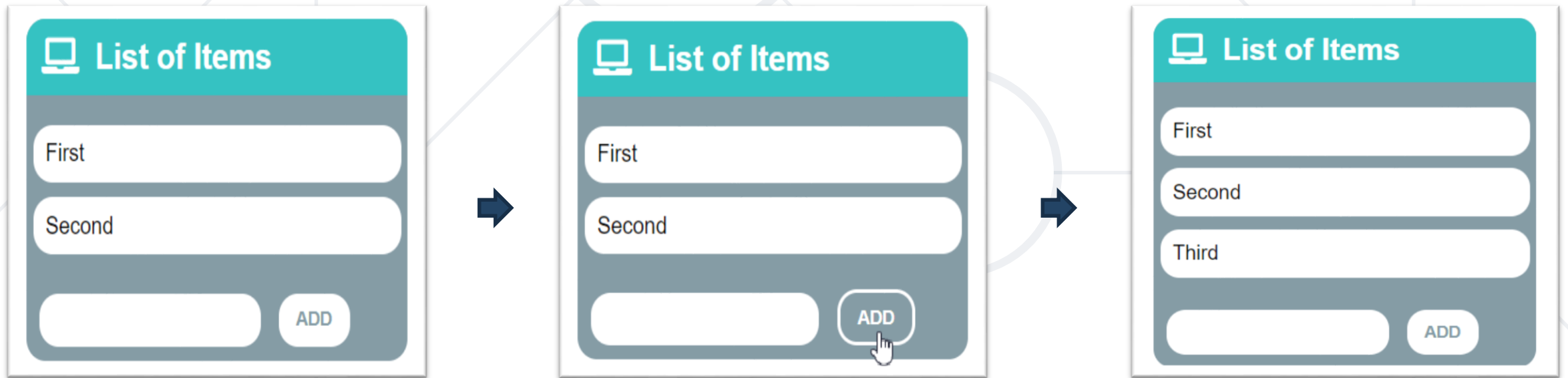
```
let p = document.createElement("p");  
let li = document.createElement("li");  
li.appendChild(p);
```

- **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

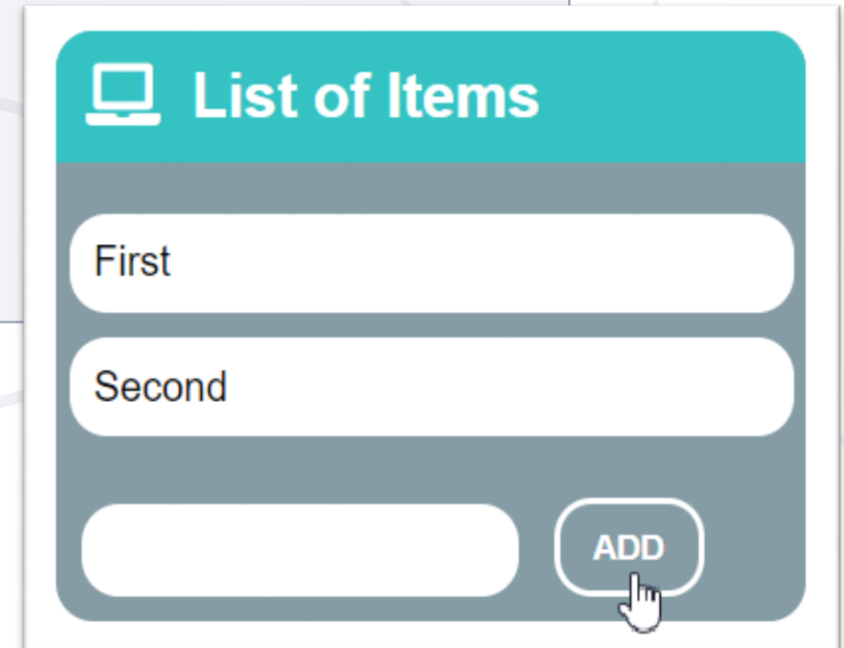
- Create a HTML page holding a **list of items** + **text box** + **button** for adding more items to the list
 - Write a function to **append** the specified text to the list



Check your solution here: <https://judge.softuni.org/Contests/Practice/Index/4367#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.org/Contests/Practice/Index/4367#1>

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

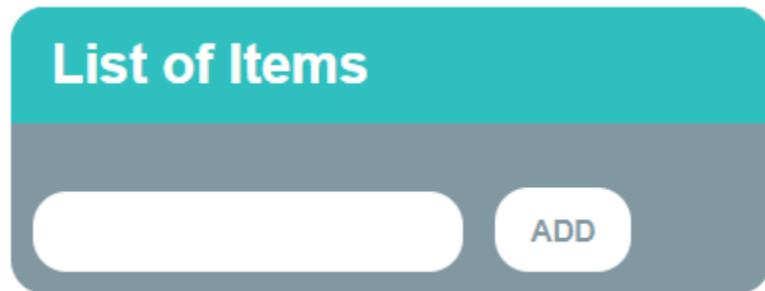
```
const button = document.getElementsByTagName('button')[0];  
  
button.addEventListener('click', clickMe);  
  
function clickMe(e) {  
  const target = e.currentTarget;  
  const targetText = target.textContent;  
  target.textContent = Number(targetText) + 1;  
}
```

Just click the button

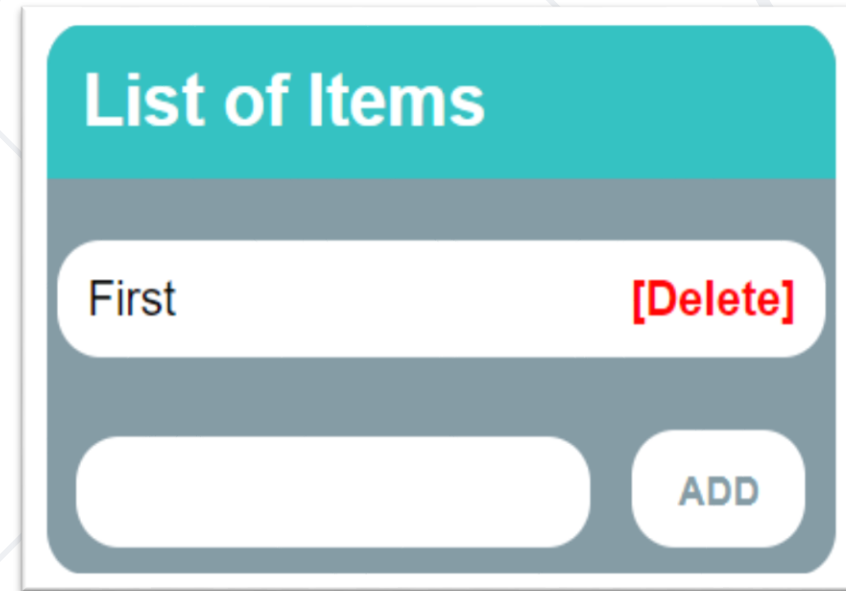
0

Problem: Add / Delete Items

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



Initial UI state: A box titled "List of Items" with a text input field and an "ADD" button.



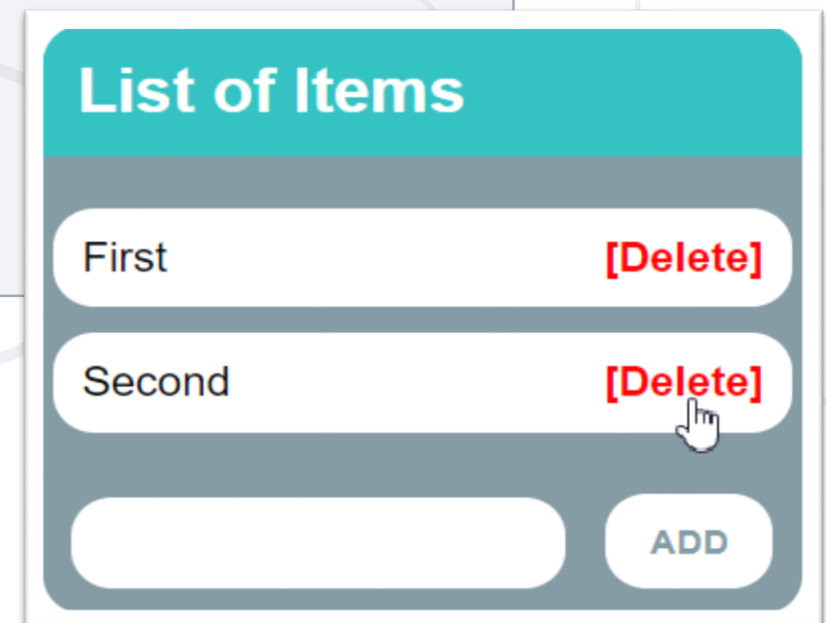
Extended UI state: A box titled "List of Items" showing a list with one item "First" and a "[Delete]" link, plus a new input field and "ADD" button.

Check your solution here:

<https://judge.softuni.org/Contests/Practice/Index/4367#2>

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

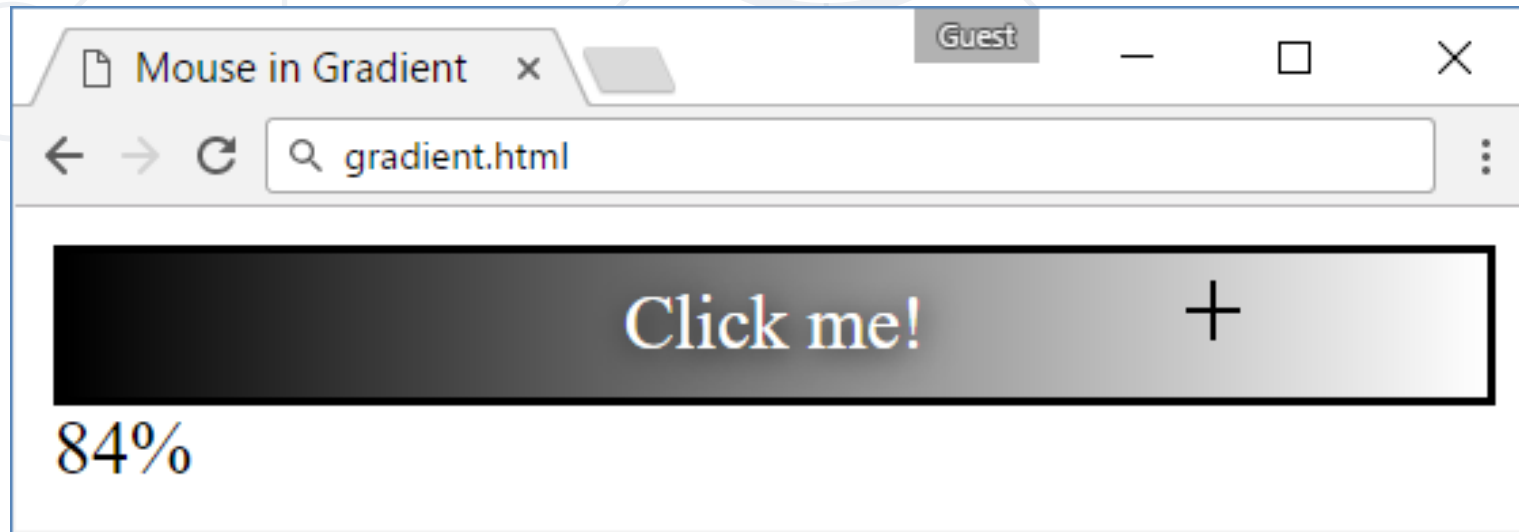
```
function solve() {  
  let newElement = document.getElementById("newText").value;  
  let list = document.getElementById("items");  
  
  if (newElement.length === 0) return;  
  
  let listItem = document.createElement("li");  
  listItem.textContent = newElement;  
  
  let remove = document.createElement("a");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

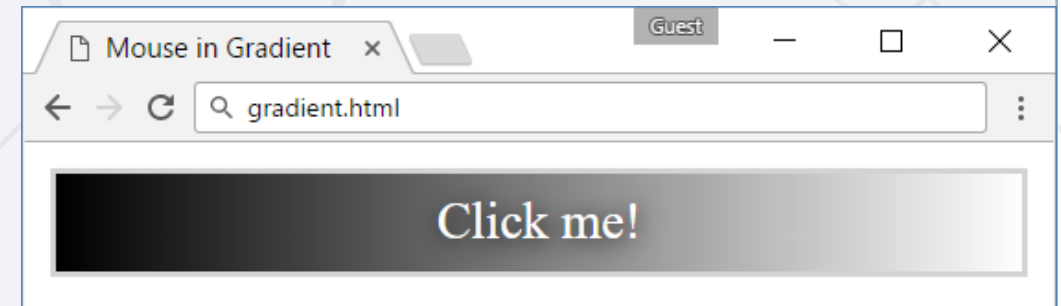
- A HTML page holds **linear gradient** box
 - Moving the mouse should show **percentage** [0% ... 100%], depending on the **location of mouse**
 - Left side → **0%**; middle → **50%**; right side → **100%**



Check your solution here: <https://judge.softuni.org/Contests/Practice/Index/4367#3>

Problem: Mouse in Gradient – HTML

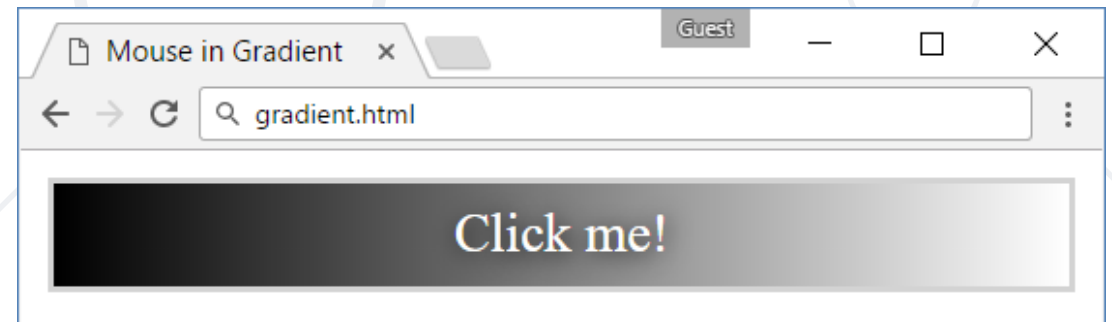
```
<html>
<head>
  <title>Mouse in Gradient</title>
  <link rel="stylesheet" href="gradient.css" />
  <script src="gradient.js"></script>
</head>
<body onload="attachGradientEvents()">
  <div id="gradient-box">
    <div id="gradient">Click me!</div>
  </div>
  <div id="result"></div>
</body>
</html>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



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) {  
    // Calculate the relative position of the mouse cursor within the 'gradient' element  
    // by dividing the horizontal offset of the cursor by the total width  
    let power = event.offsetX / (event.target.clientWidth - 1);  
    // Convert the relative position to a percentage by multiplying it with 100  
    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';
  }
});
```

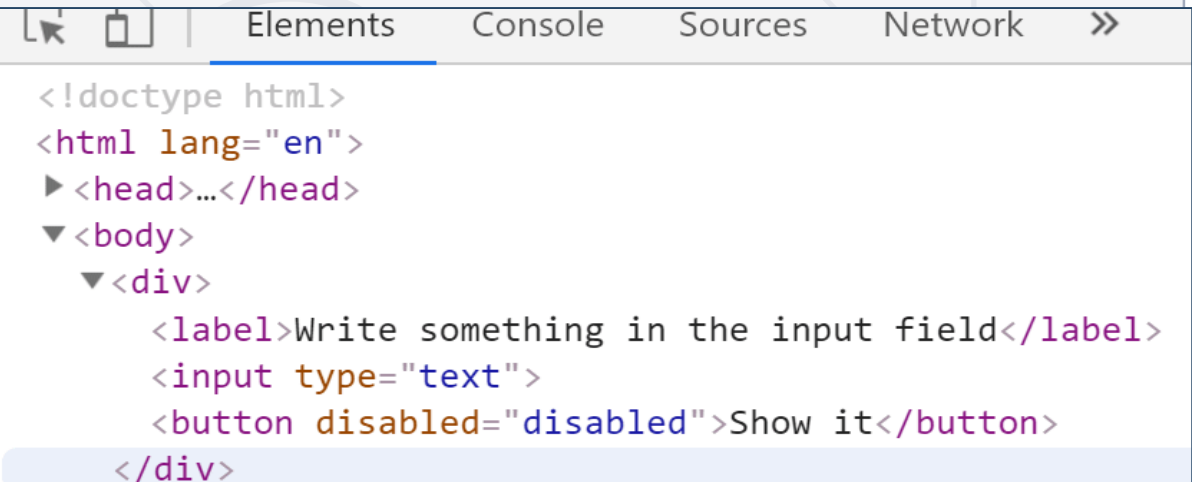

Attaching Input Handler

```
const inputField = document.getElementsByTagName('input')[0];  
const button = document.getElementsByTagName('button')[0];  
  
inputField.addEventListener('input', function () {  
    button.setAttribute('disabled', 'false')  
});
```

Write something in the input field

Show it

div 304 × 71.2



The screenshot shows the 'Elements' tab of a browser's developer tools. 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>
```

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
Remove focus event

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"



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

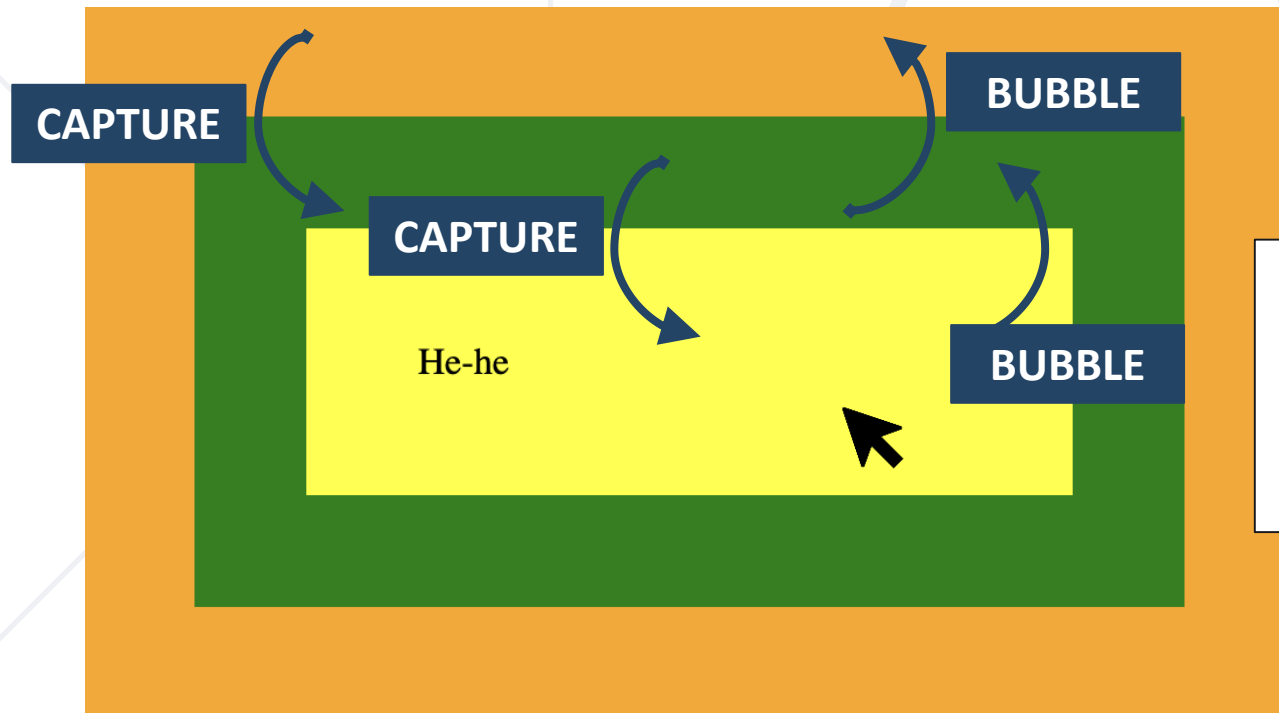
```
.orange { background: orange; }
.green { background: green; }
.yellow { background: yellow; }
```

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

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

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

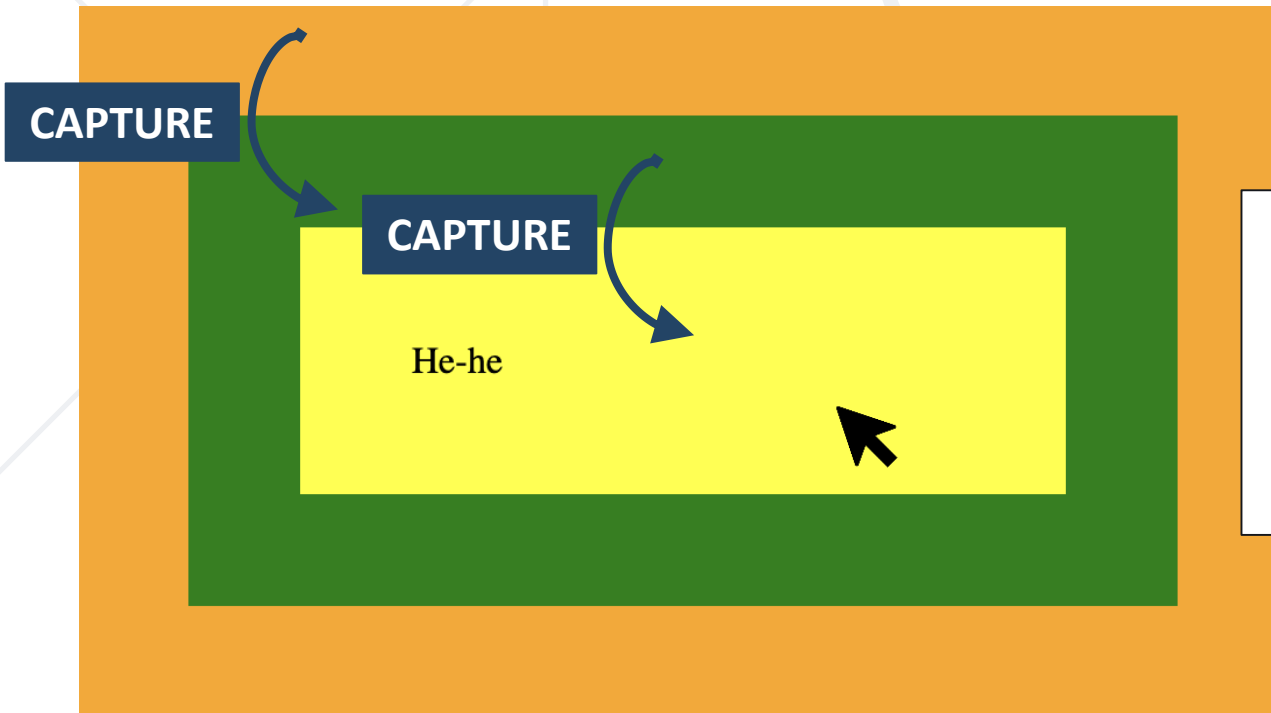
Event Propagation



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

Event Propagation

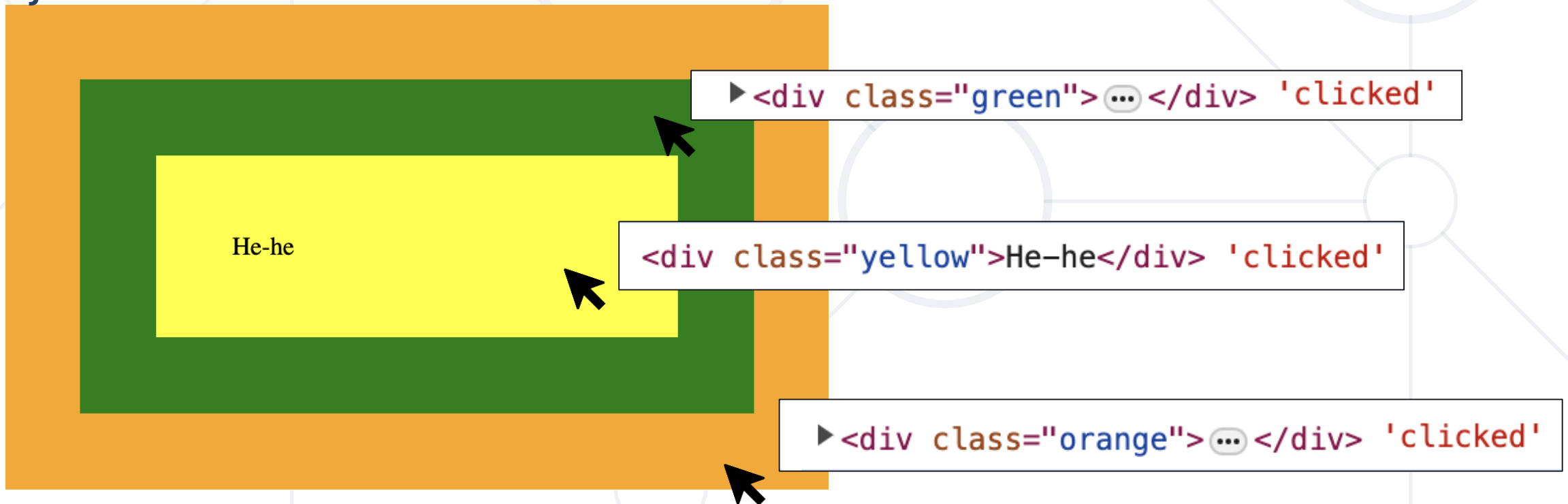
```
divElements.forEach((el) => el.addEventListener("click", logText, {  
  capture: true // default is false  
}));
```



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

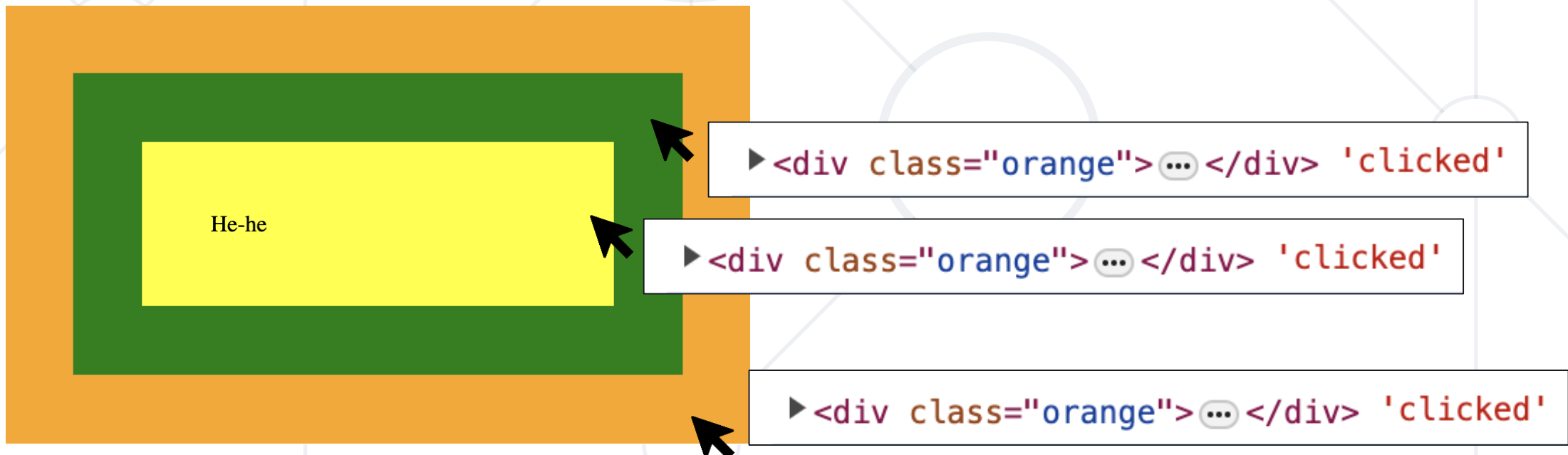
Event Propagation

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

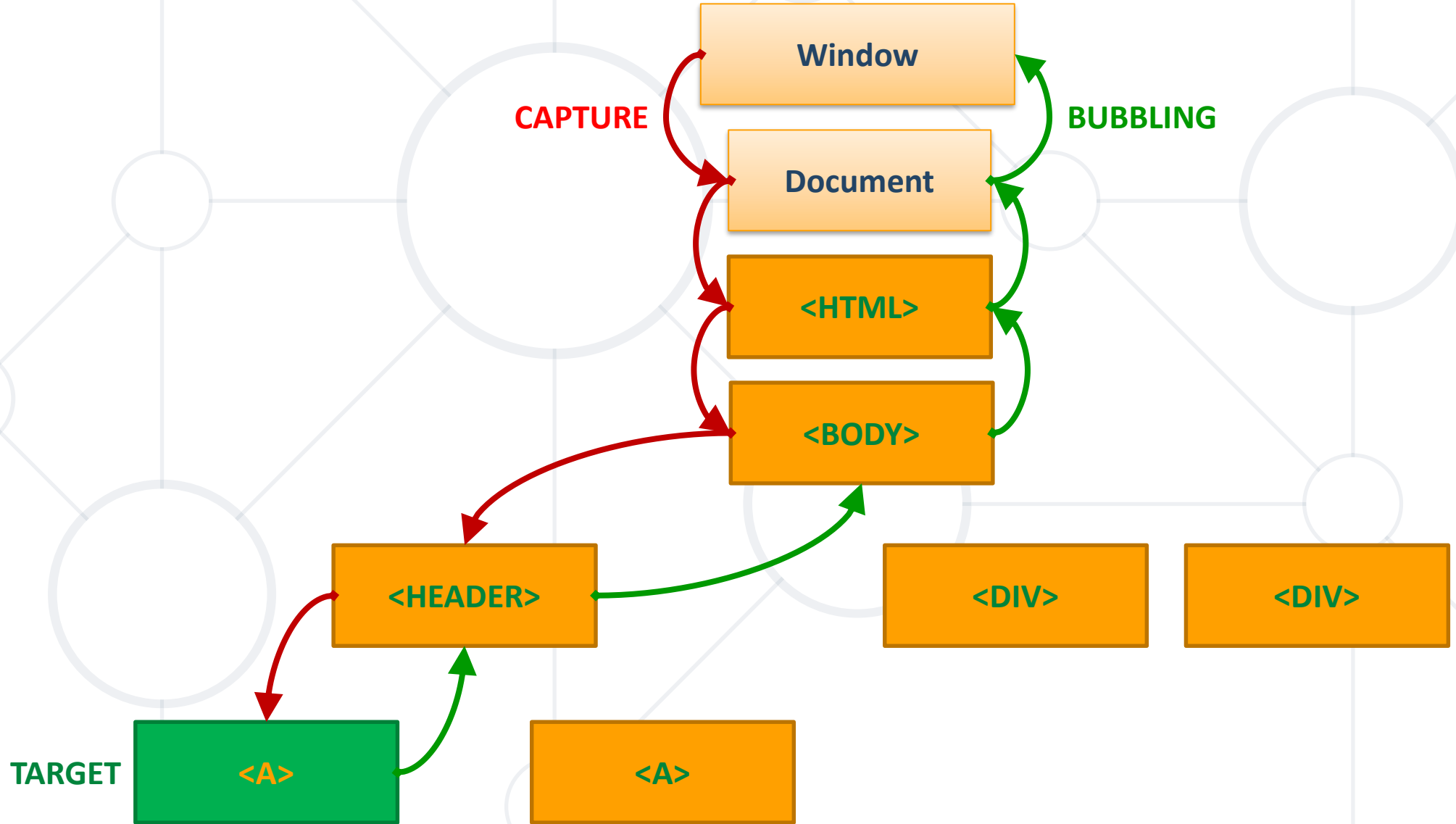


Event Propagation

```
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');

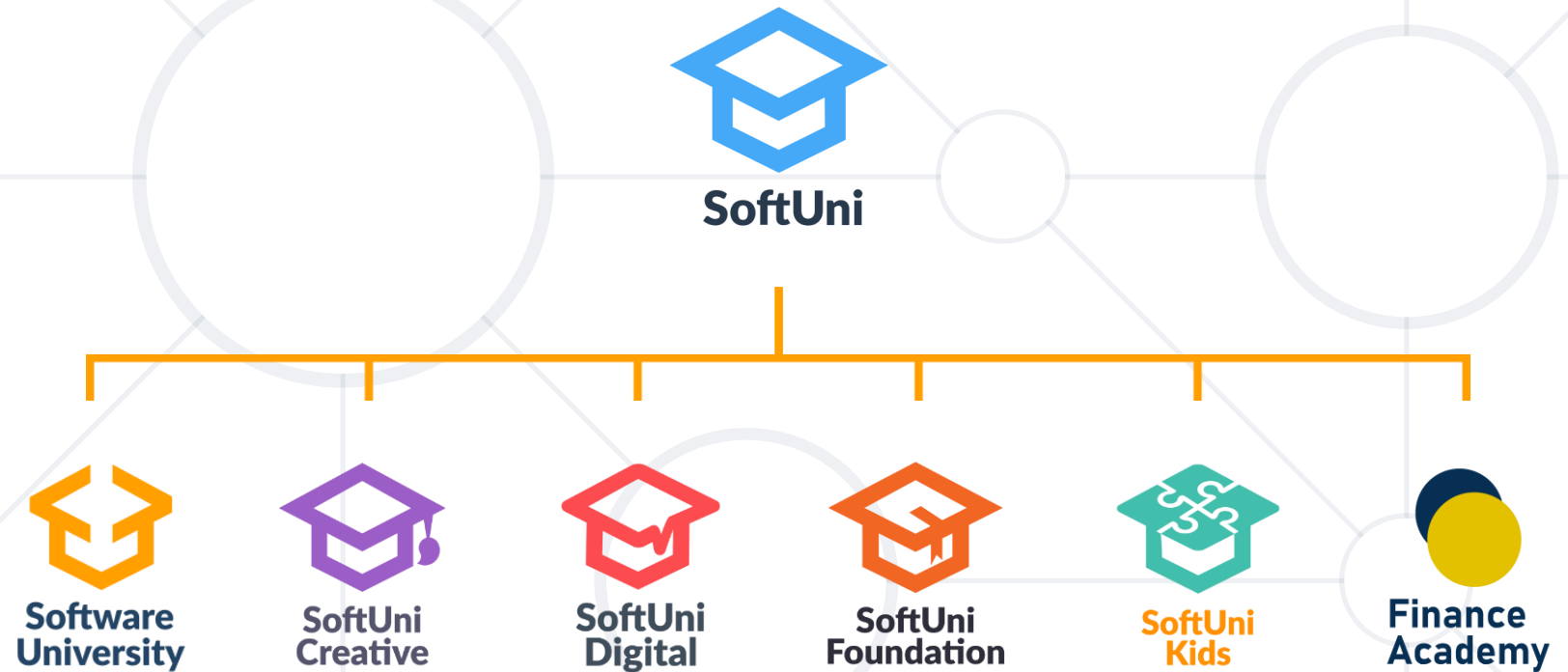
  form.addEventListener('submit', function (event) {
    // Prevent the default form submission behavior
    event.preventDefault();

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

- 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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