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CSS222 WEB PROGRAMMING

LECTURE 06 – JAVASCRIPT 2

Outline

- Javascript in HTML
- async and deferred
- Event driven programming
  - Event
  - Categories
- DOM
  - Getting DOM objects
  - Adding event listeners
  - Node properties
- Event in JS
- Multiple event listeners
- Event bubbling

JavaScript in HTML `<script>` Tags

```
<!DOCTYPE html>                 <!-- This is an HTML5 file -->
<html>                          <!-- The root element -->
<head>                          <!-- Title, scripts & styles can go here -->
<title>Digital Clock</title>
<style>                         /* A CSS stylesheet for the clock */
#clock {                        /* Styles apply to element with id="clock" */
  font: bold 24px sans-serif;   /* Use a big bold font */
  background: #ddf;             /* on a light bluish-gray background. */
  padding: 15px;                /* Surround it with some space */
  border: solid black 2px;      /* and a solid black border */
  border-radius: 10px;          /* with rounded corners. */
}
</style>
</head>
<body>                    <!-- The body holds the content of the document. -->
<h1>Digital Clock</h1>    <!-- Display a title. -->
<span id="clock"></span>  <!-- We will insert the time into this element. -->
<script>
// Define a function to display the current time
function displayTime() {
    let clock = document.querySelector("#clock"); // Get element with id="clock"
    let now = new Date();                         // Get current time
    clock.textContent = now.toLocaleTimeString(); // Display time in the clock
}
displayTime()                     // Display the time right away
setInterval(displayTime, 1000);  // And then update it every second.
</script>
</body>
</html>
```

1. `<script src="scripts/digital_clock.js"></script>`

Advantages to using the `src` attribute:

- Simplifies HTML files.
- A single copy of code.
- Downloaded once, by the first page that uses it—subsequent pages can retrieve it from the browser cache.

When scripts run: `async` and `deferred`

```
<script defer src="deferred.js"></script>
<script async src="async.js"></script>
```

- The **defer** attribute → โหลดเอง รันเมื่อโหลด doc เสร็จ
  - execution of the script until after the document has been fully loaded. → โหลด script เมื่อเอกสารโหลดเสร็จ
  - **run in the order** in which they appear in the document → run ตามลำดับที่ปรากฏในเอกสาร

- The **async** attribute แบบ 1 ไม่ block ตัวอื่นๆ
  - run the script as soon as possible but does not block document parsing while the script is being downloaded รัน script ทันทีที่มันดาวน์โหลดเสร็จ แต่ไม่ block การ parse ของเอกสาร ระหว่าง download
  - **run as they load**, which means that they may execute out of order

- If a **`<script>`** tag has both attributes, the async attribute takes precedence.

Event-driven programming

- Most JavaScript written in the browser is **event-driven.**

code ส่วนใหญ่ ออกแบบ มาให้ทำ event ต่างๆ

- The code doesn't run right away, but it executes after some event fires.

เมื่อเกิด event event handler จะถูกเรียก .

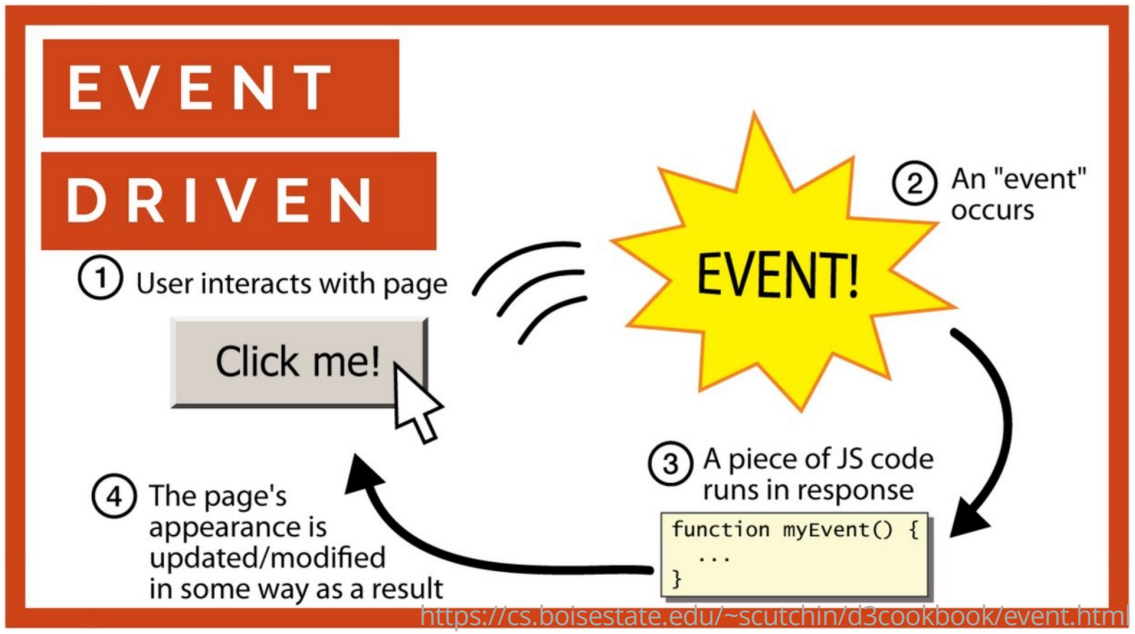
- Any function listening to that event now executes.

- This function is called an "**event handler**".

f. ที่ทำงานเมื่อเกิด event

Event-driven programming

- Client-side JavaScript programs use an asynchronous event-driven programming model.



Events

- Events can occur on any element within an HTML document
- Event model:
  - ***event type:*** specifies what kind of event occurred.
  - ***event target:*** the object on which the event occurred or which the event is associated.
  - ***event handler,*** or ***event listener:*** the function handles or responds to an event.
  - ***event propagation:*** the process which the browser decides which objects to trigger event handler on.

ประเภท event

obj ที่ event เกิดขึ้น

f. ที่ตอบสนองต่อ event นั้น

สิ่งต่อ event

process ที่ browser จะตัดสินใจว่าจะเรียก event handler บน obj ไหนบ้าง

element → tag html

event → user do element

Event Categories

- ***Device-dependent input events*** input device layers.
  - These events are directly tied to a specific input device e.g., `"mousedown,"` `"mousemove,"` `"mouseup,"` `"touchstart,"` `"touchmove,"` `"touchend,"` `"keydown,"` and `"keyup."`

- ***Device-independent input events***
  - The `"click"` event, for example, indicates that a link or button has been activated.
  - This is often done via a mouse click, but it could also be done by keyboard or (on touch-sensitive devices) with a tap.

- ***User interface events***
  - UI events are higher-level events, often on HTML form elements that define a user interface for a web application e.g., `"focus"`, `"change"`, and `"submit"`.

Event Categories

- ***State-change events***
  - Some events are not triggered directly by user activity, but by network or browser activity, and indicate some kind of life-cycle or state-related change e.g., `"load"` and `"DOMContentLoaded"`.

- ***API-specific events***
  - A number of web APIs defined by HTML and related specifications include their own event types e.g., `<video>` and `<audio>` elements define a long list of associated event types such as `"waiting"`, `"playing"`, `"seeking"`, `"volumechange"`, and so on.

The DOM

ทุกelement ของเพจ เข้าถึงได้จาก js ผ่าน DOM

- Every element on a page is accessible in JavaScript through the **DOM**: **Document Object Model**

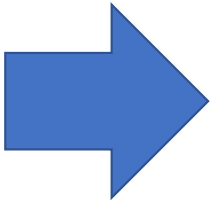
- The DOM is the tree of nodes corresponding to HTML elements on a page. โครงต้นไม้ของnode ที่แทน HTML elements.

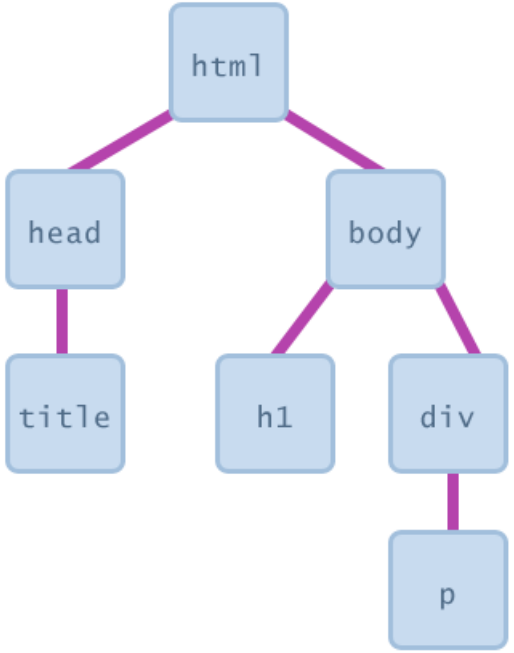
- Can modify, add and remove nodes on the DOM, which will modify, add, or remove the corresponding element on the page.

refer → DOM tree ให้เสร็จก่อน run

The DOM

```
<html>
    <head>
        <title></title>
    </head>
    <body>
        <h1></h1>
        <div>
            <p></p>
        </div>
    </body>
</html>
```





Getting DOM objects

- We can access an HTML element's corresponding DOM object in JavaScript via the `querySelector` function:

```
document.querySelector('css_selector');
```

This returns the **first** element that matches the given CSS selector

- The `querySelectorAll` function:

```
document.querySelectorAll('css_selector');
```

Returns **all** elements that match the given CSS selector.

Getting DOM objects

```
let element = document.querySelector('#button');
```

- Returns the DOM object for HTML element with `id='button'` or null.

```
document.querySelectorAll('.quote, .comment');
```

อันนี้ หรือ อันนี้

- Return a list of DOM objects containing all elements that have a "quote" class **AND** all elements that have a "comment" class.

```
document.querySelector("div.user-panel.main input[name='login']");
```

Adding event listeners

- Each DOM object has the addEventListener method defined:

```
addEventListener(event_name, function_name);
```

- To stop listening to an event, use `removeEventListener`:

```
removeEventListener(event_name, function_name);
```

- ***event_name*** is the string name of the JavaScript event you want to listen to
  - Common ones: click, focus, blur, etc.
- ***function_name*** is the name of the JavaScript function you want to execute when the event fires

f. ที่ต้องการให้เรียก เมื่อเกิด event

index.html

```
<html>
  <head>
    <meta charset="utf-8">
    <title>First JS Example</title>
    <script src="script.js" defer></script>
  </head>
  <body>
    <button>Click Me!</button>
  </body>
</html>
```

script.js

```
function onClick() {
  console.log('clicked');
}
const button = document.querySelector('button');
button.addEventListener('click', onClick);
```

DOM object properties

เข้าถึง attributes ของ HTML element ผ่าน property ได้

- You can access **attributes** of an HTML element via a property (field) of the DOM object

```
const image = document.querySelector('img');
image.src = 'new-picture.png';
```

Adding and removing classes

จัดการ class ของ element ต่างๆ

- You can control **classes** applied to an HTML element via `classList.add` and `classList.remove`:

```
const image = document.querySelector('img');

// Adds a CSS class called "active".
image.classList.add('active');

// Removes a CSS class called "hidden".
image.classList.remove('hidden');
```

Some properties of Element objects

Property	Description
`id`	The value of the id attribute of the element, as a string
`innerHTML`	The raw HTML between the starting and ending tags of an element, as a string
`textContent`	The text content of a node and its descendants.
`classList`	An object containing the classes applied to the element

สร้าง element ใหม่ etc

Add elements via DOM

สร้าง element ใหม่ แล้วใช้ appendChild เข้าไป DOM

- We can create elements dynamically and add them to the web page via `createElement` and `appendChild`:

```
document.createElement(tag_string)
element.appendChild(element);
```

- Technically you can also add elements to the webpage via `innerHTML`, but it poses a security risk.

// Try **not** to use innerHTML like this:

```
element.innerHTML = '<h1>I am IRON MAN</h1>';
```

Remove elements via DOM

- We can also call remove elements from the DOM by calling the `remove()` method on the DOM object:

```
element.remove();
```

- And actually, setting the `innerHTML` of an element to an **empty string** is a fine way of removing all children from a parent node.

// This is fine and poses no security risk.

```
element.innerHTML = '';
```

Clear ลูกทั้งหมด.

Node properties

Property	Description
`textContent`	The text content of a node and its descendants. (This property is writeable)
`childNodes`	An array of this node's children (empty if a leaf)
`parentNode`	A reference to this node's parent Node

```
<body>
    <h1>My favorites</h1>
    <section>
        <p>Strawberries</p>
        <p>Chocolate</p>
    </section>
</body>
```

What's the **parentNode** of `<section>`?

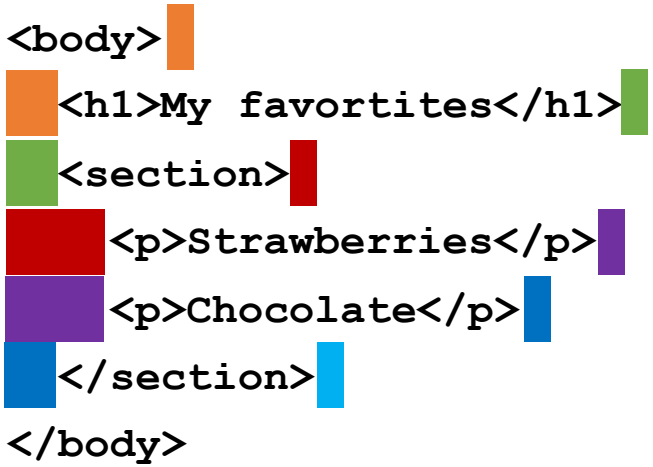
body

What are the **childNodes** of `<section>`?

p, p

TextNode

- In addition to Element nodes, the DOM also contains Text nodes.
- All text present in the HTML, **including whitespace**, is contained in a text node:



DOM and Text nodes

- The DOM is composed of Nodes, and there are several subtypes of Node.
  - Element: HTML elements in the DOM
  - Text: Text content in the DOM, including whitespace
    - Text nodes cannot contain children
  - Comment: HTML comments
  - (more)

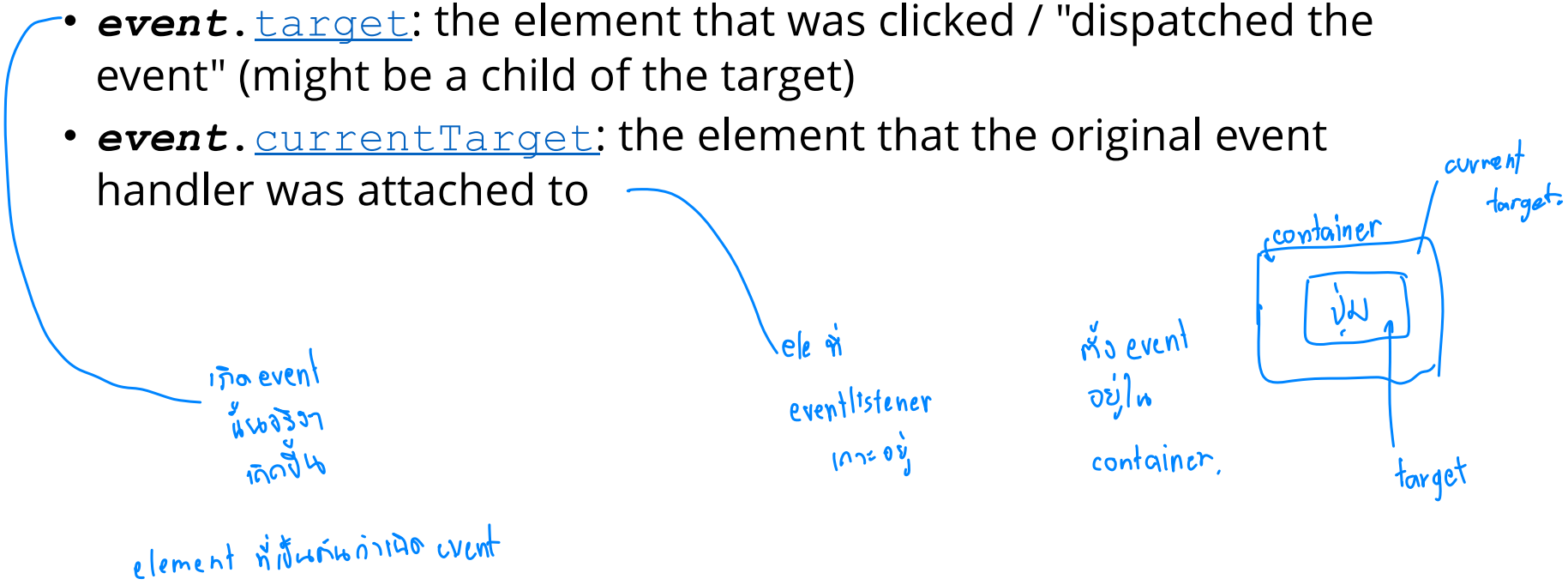
- The type of a node is stored in the nodeType property

Events in JavaScript

- If you put a `"click"` event listener on an element, what happens if the user clicks a *child* of that element?
- A click event set on an element will fire if you click on a child of that element

`Event.currentTarget` vs `target`

- You can access either the element clicked or the element to which the event listener was attached:
  - ***event*.target**: the element that was clicked / "dispatched the event" (might be a child of the target)
  - ***event*.currentTarget**: the element that the original event handler was attached to



Multiple event listeners

- What if you have event listeners set on both an element and a child of that element?
  - Do both fire? ✓
  - Which fires first? child → parent.

div → click event

ปุ่ม → button click event

↓

ยิงตัวแต่ลูกยิงก่อน

Event bubbling

- Both events fire if you click the inner element
- By default, the event listener on the inner-most element fires first
- This event ordering (inner-most to outer-most) is known as **bubbling**.

1 ele มีหลาย listener

แต่ listener อยู่คนละ ไข่ดัน