Chapter 11 Interactive Content and Event Listeners

1 Topics

This chapter will explore various browser events that can be used to create interactive web pages, including:

- Part 1: Window and Document Events
- window and mouse events
- Part 2: DOM Event Flow
    - DOM event flow
- Part 3: Drag and Drop Events
    - Drag and drop events
- Part 4: Input Events and Form Submission
    - onchange and onblur events, Key events, Form submission

2 Events and Event Listeners

Events

Recall that an event is a signal that something has happened in the browser.

Majorly, there are two types of events:

- **window and documents** events: happens when users interact with the browser window or document
- **API** events: happens when developers interact with the browser API and the asynchronous operations are completed.

Event Listeners

Also recall the ways to register event listeners:

- inline event handlers
  - set the `onxxx` attribute of a tag.
  - e.g. `<button onclick="...">`
- Setting the `onxx` property of an element.
  - e.g. `element.onclick = function(){}`
- call element's `addEventListener()` method
  - e.g. `element.addEventListener("click", function(){})`

3 Window Events

Window object generates lots types of events to notify the developer about state changes,

- The purpose is to allow developers to interact with the browser window and document.

These event types are such as:

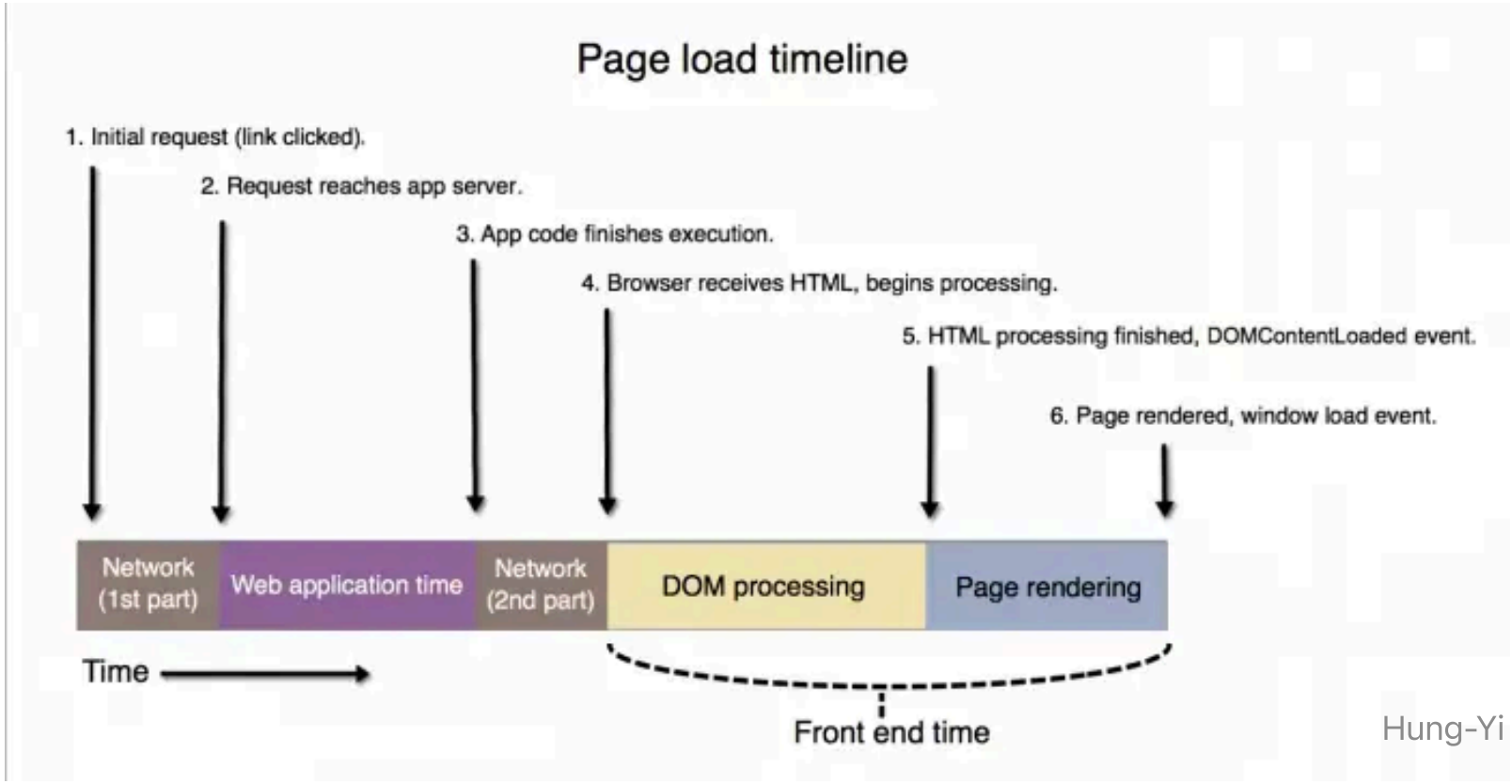
- window `load` and `beforeunload` events: when browser loads a page or when a user is going to close or leave the current page
- `clipboard` events: when users initiate copy, cut, and paste actions
- `network` events: when the browser is offline or online
- `focus` events: when an element get focus or lose focus)
- and many more, see Window - Web APIs | MDN

We will cover the `window.load` event and the `document.DOMContentLoaded` event in

The `load` event of the `window` object (`window.onload`)

The window fires the `load` event when the browser finishes loading the entire page, including all images, scripts, and other resources.

- guarantees that all the elements in the page are loaded and ready to be manipulated.



What if you try to manipulate before the `load` event is fired?

If you try to manipulate the elements before the `load` event is fired, you may get unexpected results,

- such as `null` or `undefined` values because the DOM is not fully loaded.

Add a listener function to the `load` event of the `window` object

Since there is no HTML tag for the `window` object, you can only register the listener function by

- setting the `onload` property of the `window` object or
- call the `addEventListener()` method of the `window` object.

Code snippets to register the listener function to the `load` event of the `window` object:

```
window.addEventListener("load", (event) => {});
// or
window.onload = (event) => {};
```

Example 10-1: Initialize the page when the page is loaded

```
<body>

    <script>
        function initPage(event){
            let message = `Event type: ${event.type}
                <br/> target: ${event.target},
                <br/> Time to trigger the event
                since loading the page: ${event.timeStamp} milliseconds`;

            document.getElementById("display").innerHTML = message;
            console.log(event);
        }

        window.onload = initPage;
    </script>

    <p id="display"></p>
</body>
```

Outputs:

```
Event type: load
target: [object HTMLDocument],
Time to trigger the event since loading the page: 81.10000002384186
```

Notes:

- `event.timeStamp` : return the number of milliseconds elapsed from the beginning of the time origin to the event being created.
    - In the case of the `load` event, the time origin is the time when the browser starts to load the page.

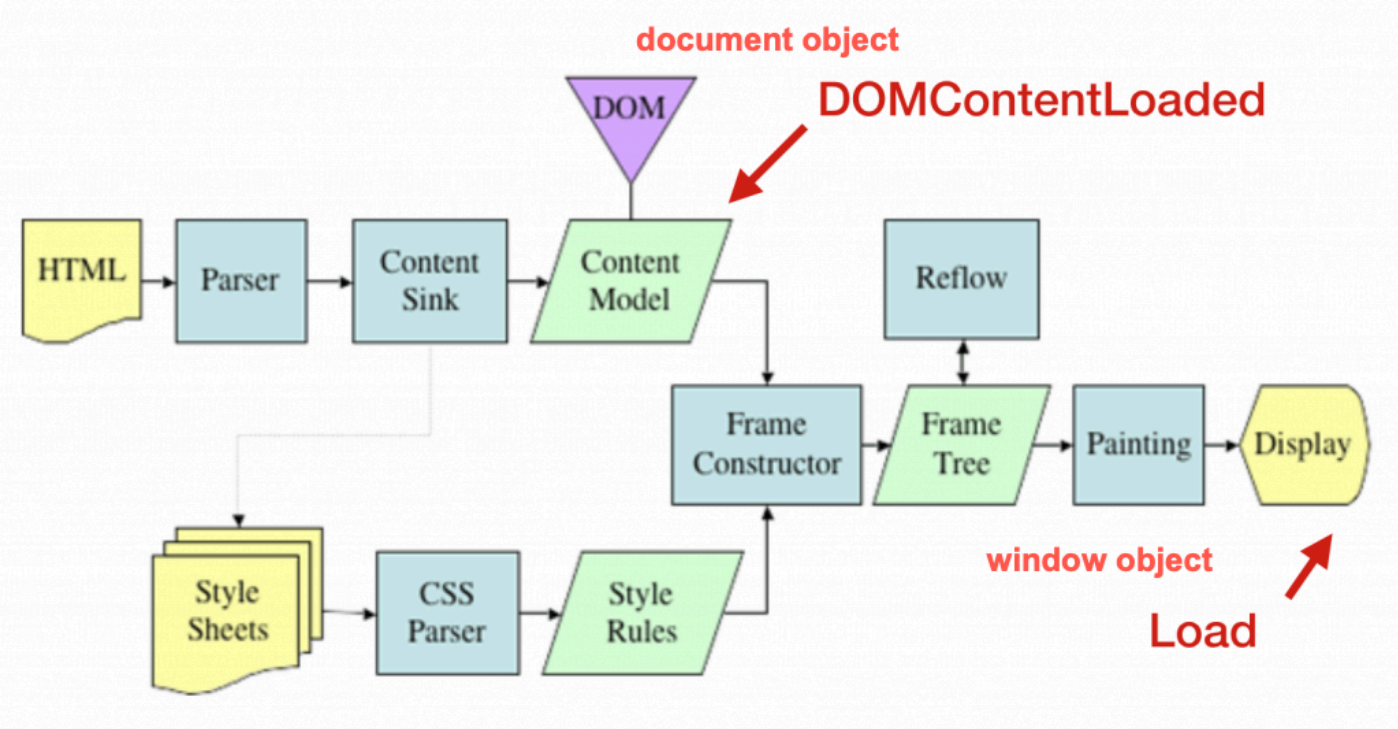
See the complete example in ex_11_1.html

You can try to run the `initPage()` function before the `<p>` element to see what

The `DOMContentLoaded` event of the `document` object

THe `DOMContentLoaded` event of the `document` object is fired before the `window.load` event

- fired when the initial HTML document has been completely loaded and parsed, **without waiting for stylesheets, images, and subframes to finish loading**.



Add a listener function to the `DOMContentLoaded` event of the `document` object

Since the `document` object does not have the `DOMContentLoaded` property, you can only register the listener function by the `addEventListener()` method of the `document` object.

```
document.addEventListener("DOMContentLoaded", yourCallbackFunction);
```

Example 10-2: Register the listener functions to `widnow.load` and `document.DOMContentLoaded` events

```
<script>
    const eventLog = document.getElementById('eventLog');
    // monitor the window's load event
    window.addEventListener('load', (e) => {
        eventLog.value += " window.onload \n";
        console.log(e);
    });

    // Monitor the DOM content state of the document
    // Triggered before the window's load event
    document.addEventListener('DOMContentLoaded', (e) => {
        eventLog.value += " DOM Content Loaded \n";
    })
</script>
```

Result:

Event log:

```
>> document' state: interactive
 DOM Content Loaded
>> document' state: complete
 window.onload
 body onload property
```

See the complete example in ex_11_2.html

Review Questions

When the DOM content is loaded without waiting for stylesheets, images, and sub-frames to finish loading, which event is fired?

A. `load` event of the `window` object

B. `DOMContentLoaded` event of the `document` object

C. `load` event of the `document.body` object

▶ Answer

4 Mouse Events models

The mouse event models include:

- Mouse click events
- Mouse movement events
- Mouse coordinates

Mouse Single click events

Triggered events in order when clicking a mouse button:

1. `mousedown` : click on top of an element without releasing the mouse button
2. `mouseup` : release the mouse button
3. `click` : user clicks on an element

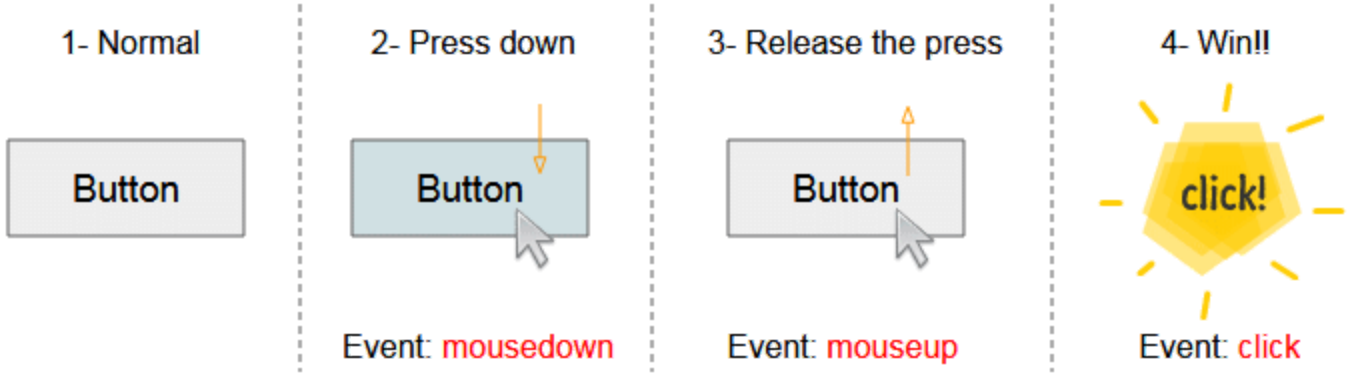


Fig source: Javascript MouseEvent Tutorial with Examples | o7planning.org

Mouse Double click events

For the `dblclick` event, the browser needs two cycles of the single click events to trigger the `dblclick` event.

Code snippets to listen to the single and double click events

To listen to the single and double click events on an element, you can use

- the `onclick` and `ondblclick` properties of the element, or
- the `addEventListener()` method of the element.

```
// register the listener function to the click event
element.onclick = function(event){
    ...}
element.addEventListener("click", function(event){
    ...});
// register the listener function to the double click event
element.ondblclick = function(event){
   ...}
element.addEventListener("dblclick", function(event){
    ...});
```

Mouse movement events

Mouse movement events are triggered when the mouse enter, leave, or move over an element.

Assume that

- the Target Element (target) is the element that is registered with the event listener function.
- the Child Element (child) is a child element of the target element.

The mouse events are triggered in different cases:

Case A: the mouse enters the target element, triggering:

- `target.mouseenter` event: the mouse enters the target element
- `target.mouseover` event: the mouse enters the visible area of the target element.

Case B: the mouse enters the child element, triggering:

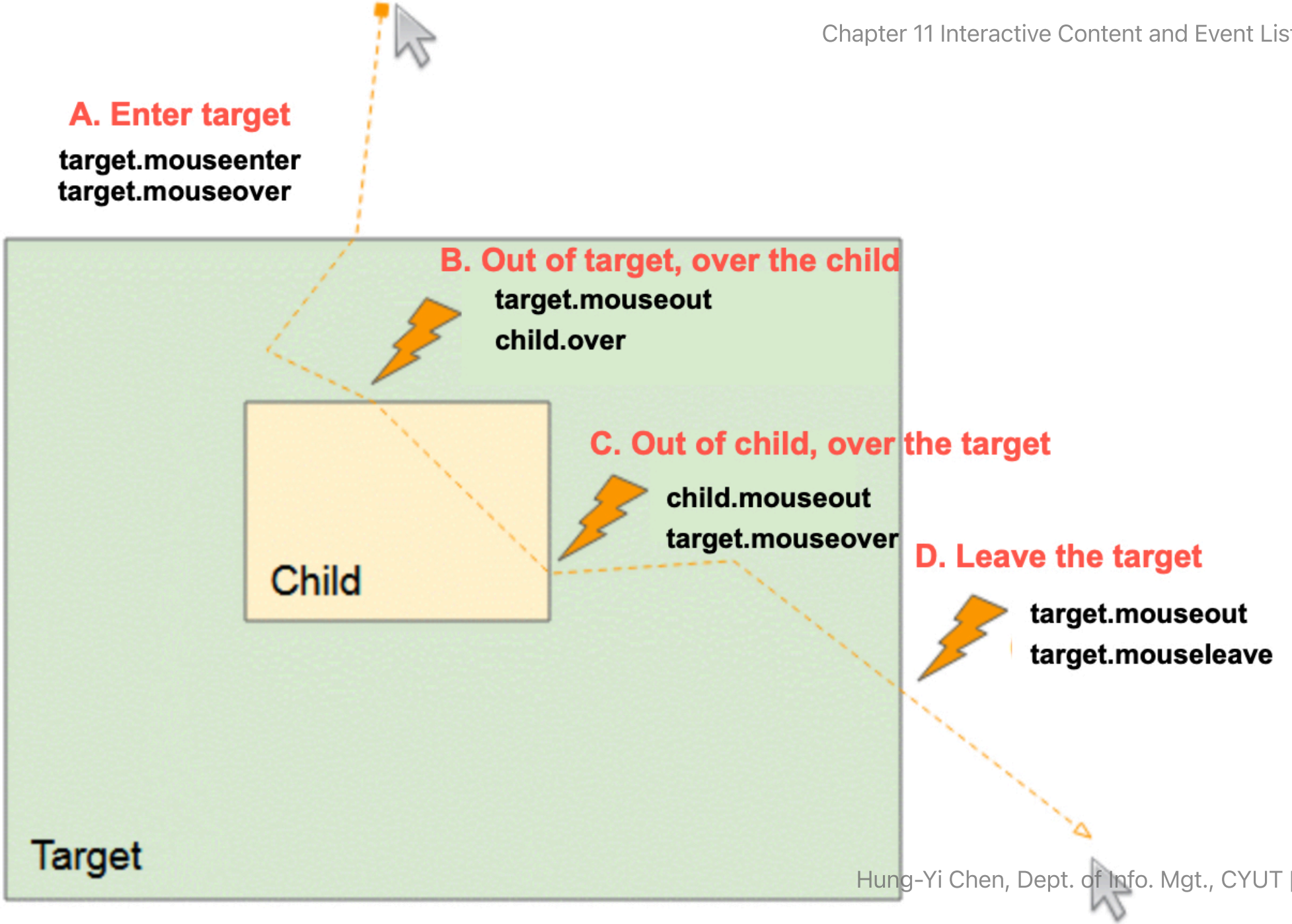
- `target.mouseout` event: the mouse not in the visible area of the target element
- `child.mouseover` event: the mouse is in the visible area of the child element.
    - `child.mouseenter` event will not be triggered because the child element is not registered with the event listener function.

Case C: the mouse leaves the child element and enters the target element again, triggering:

- `child.mouseout` event: the mouse is not in the visible area of the child element
    - `child.mouseleave` event will not be triggered because the child element is not registered with the event listener function.
- `target.mouseover` event: the mouse is in the visible area of the target element.

Case D: the mouse leaves the target element entirely, triggering:

- `target.mouseout` event: the mouse is not in the visible area of the target element
- `target.mouseleave` event: the mouse leaves the target element.


A. Enter target
target.mouseenter
target.mouseover
B. Out of target, over the child
target.mouseout
child.over
C. Out of child, over the target
child.mouseout
target.mouseover
D. Leave the target
target.mouseout
target.mouseleave
Child
Target

Mouse Event summary

- `mouseenter` : Enter the target element (not considering its children)
- `mouseleave` : Leave the target element (not considering its children)
- `mouseover` : Mouse is over the visible area of the target element or its children
  - the event in the child node bobbles up to the target element
- `mouseout` : Mouse is out of the visible area of the target element or its children
  - the event in the child node bobbles up to the target element

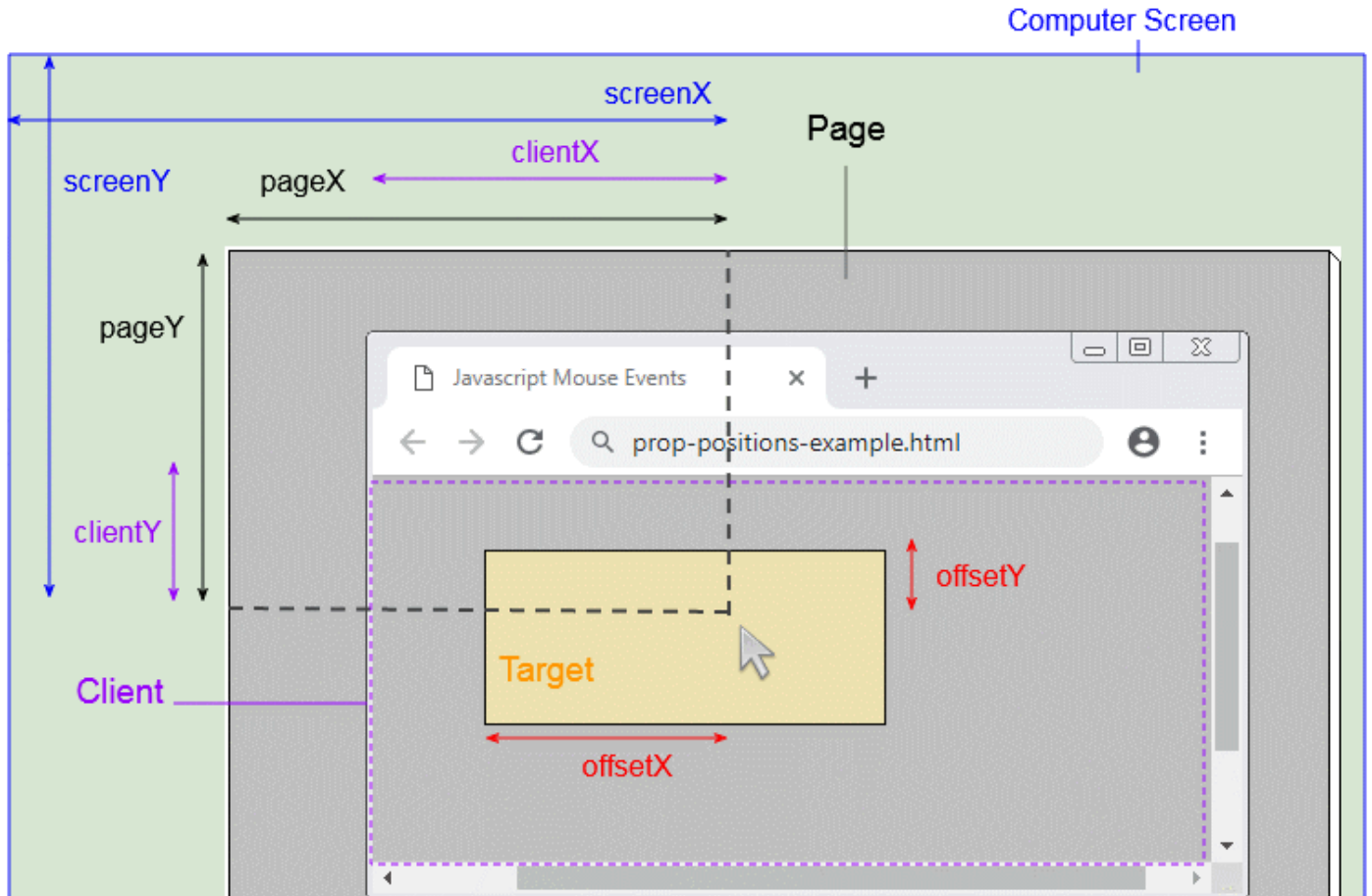
Demo: the difference in the mouse events

- `mouseover` vs. `mouseenter`
  - See Mouseout when leaving for a child
- `mouseout` vs. `mouseleave`
  - mouseenter and mouseleave
- Can also see the demo in ex_11_3.html

Mouse Position: various coordinates

Four types of coordinates are used to indicate the mouse position:

- element, client(viewport), page, and screen coordinates



The mouse event provides four type coordinates to indicate the mouse position:

- Element coordinates: offsetX and offsetY: the mouse position relative to the top-left corner of the **target element**
- Client (viewport) coordinates: clientX and clientY: the mouse position relative to the top-left corner of the **viewport of the window**
- Page coordinates: pageX and pageY: the mouse position relative to the top-left corner of the entire **page** that is scrollable
- Screen coordinate: screenX and screenY: the mouse position relative to the top-left corner of the **screen**

Lab 01

See Lab 11-1 for a step-by-step guide to complete the lab.

5 Summary

This chapter has covered the following topics:

- window events
- mouse events