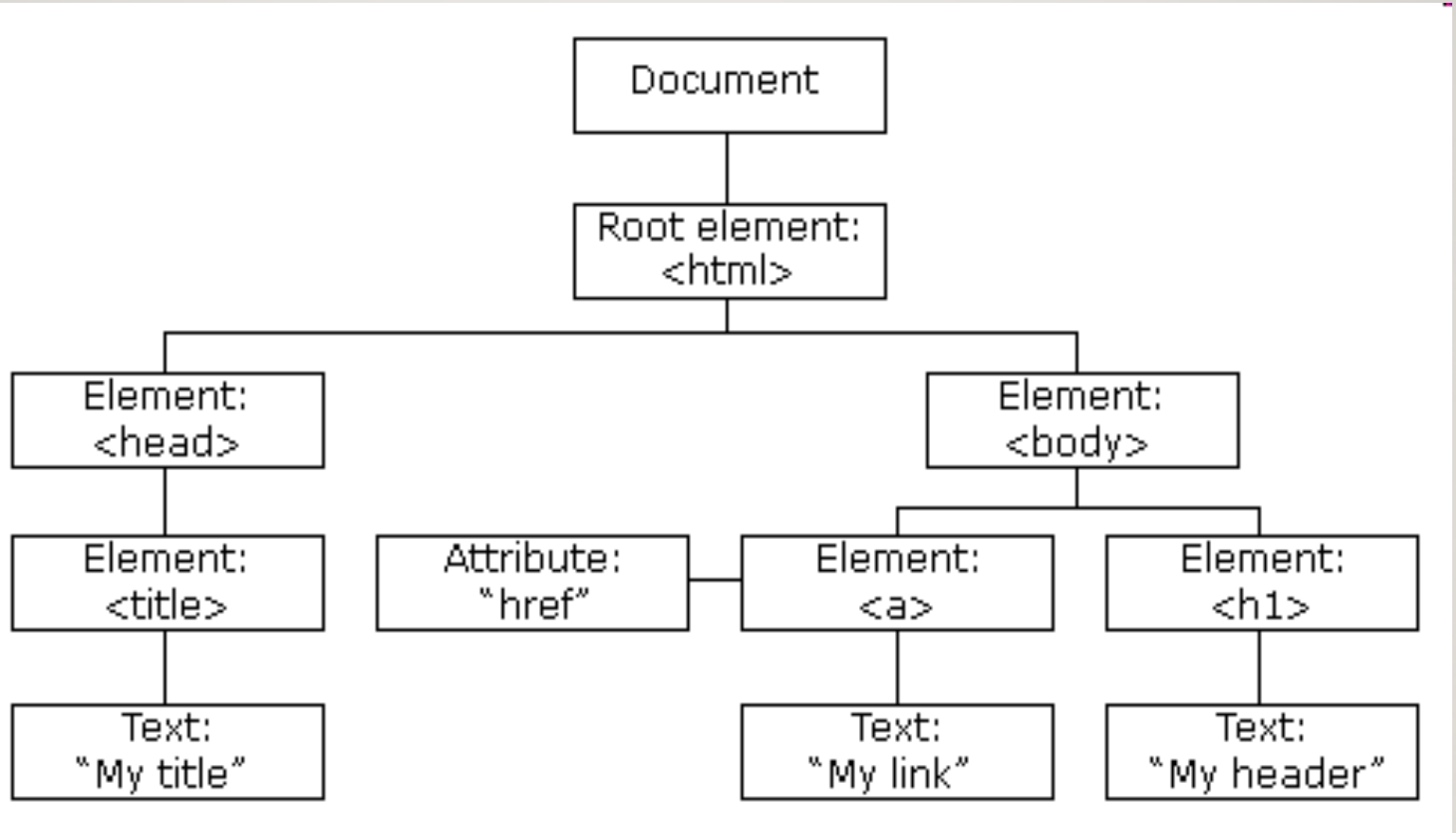
LECTURE – 6

- HTML DOM
- AJAX

INTRODUCTION TO HTML DOM

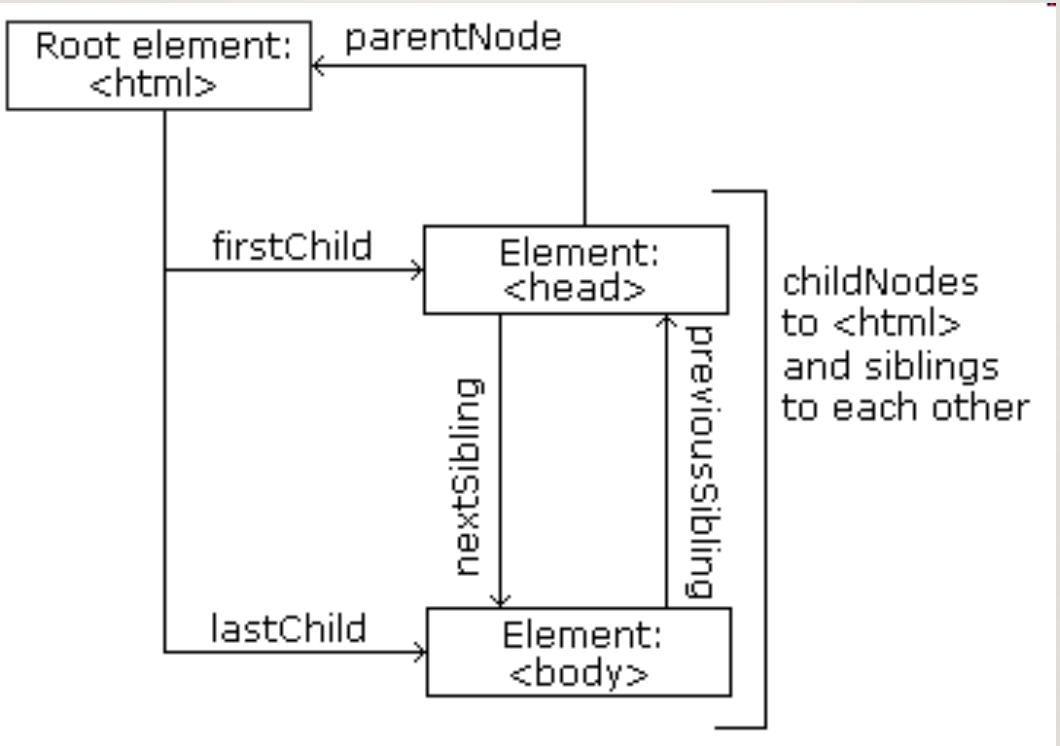
- DOM – Domain Object Model
- HTML DOM
  - Defines objects and properties of HTML elements.
  - HTML data is modeled as a "tree of objects".
  - A standard object model for HTML
  - A standard programming interface for HTML
  - Platform and language-independent
- Using Javascript, one can
  - Add new elements (e.g., image, text, video, etc.) to the HTML content
  - Delete existing elements
  - Modify the content, style, background, design, etc. of existing elements.

HTML DOM NODE TREE



Source: W3 schools web page

HTML DOM



Source: W3 schools web page

HTML DOM TREE – EXAMPLE

```
<html>
  <head>
    <title>DOM Tutorial
    </title>
  </head>
  <body>
    <h1>DOM Lesson one </h1>
    <p> Hello world! </p>
  </body>
</html>
```

- <html> node is the root node
  - Has no parent node
- Parent node of the <head> and <body> nodes is the <html> node.
- Parent node of the "Hello world!" text node is the <p> node
- <html> node has two child nodes
  - <head> and <body>
- <head> node has one child node
  - <title> node
- <title> node has one child node
  - text node "DOM Tutorial"
- <h1> and <p> nodes are siblings
  - Both child nodes of <body>

TREE STRUCTURE … CONTD.

- Follow the standard "tree" nomenclature
- Top node is called the root
- Every node, except the root, has exactly one parent node.
  - Root has none.
- A node can have any number of children
- Leaf is a node with no children
- Siblings are nodes with the same parent

BACK TO THE EXAMPLE …

- document - the current HTML document
- getElementById("intro") - the element with the id "intro"
- childNodes[0] - the first child of the element
- nodeValue - the value of the node (e.g., text)

HTML DOM

- Everything in HTML is a node.
- Entire document – a document node.
- Every HTML tag – an element node.
- Text in the HTML elements – text nodes.
- Every HTML attribute is an attribute node.
- Comments are comment nodes.

HTML DOM – OBJECT MODEL

- Each node is an object.
- Objects have methods
- Can use methods to retrieve or change HTML content dynamically.

⇒Basis for Dynamic HTML (DHTML)

ACCESSING NODES

- getElementById (<id>)
- getElementByTagName(<tag>)
- A combination of the above
    - Using the DOM tree and parent/child relationship.

HTML METHODS

- For any HTML element (node) x
  - x.getElementById(*id*)
    - get the element with a specified id
  - x.getElementsByTagName (*name*)
    - get all elements with a specified tag name. Tag = "body", for example.
  - x.appendChild(*node*)
    - insert a child node to x
  - x.removeChild(*node*)
- Details can be found at

  https://www.w3schools.com/js/js_htmldom_document.asp

HTML DOM PROPERTIES

- For any HTML element (node) x,
  - x.innerHTML - the inner text value of x
  - x.nodeName - the name of x
  - x.nodeValue - the value of x
  - x.parentNode - the parent node of x
  - x.childNodes - the child nodes of x
  - x.attributes - the attributes nodes of x

ADDING EVENT LISTENTERS

- Event listeners can be added/removed
- E.g., a callback function can be added/removed
  - For any event – mouse click, mouse over, etc.
- Adding event listeners
  - addEventListener(event, function, useCapture)
  - E.g. addEventListener(click, myFunction1, false)
    - Call myFunction1 for the event onClick
  - addEventListener(mouseover, myFunction2, false)
    - Call myFunction2 for the event onmouseover
- Removing event listeners
  - removeEventListener(event, function)
  - E.g. removeEventListener(click, myFunction1)
  - removeEventListner(mouseover, myFunction2)

HTML METHODS … CONTD.

- x.firstChild
  - Returns the first child node
- x.lastChild
  - Returns the last child node
- document.documentElement
  - Returns the root node
- document.body
  - Gives access to the body tag.

HTML NODES

- DOM node properties
  - nodename – read only
    - Element node – same as the tag name
    - Text node – text
    - Document node – document
  - nodevalue – can be changed
    - Elements – undefined
    - Text nodes – text itself
    - Attributes – attribute value
  - nodetype – read only
    - Element – 1; Attribute – 2; Text – 3;
    - Comment -8; Document - 9

PUTTING IT ALL TOGETHER

- Nodes can be accessed.
- HTML content can be changed
  - Background color, image sources
  - Text, font, color of an element
- Add Javascript events to the mix

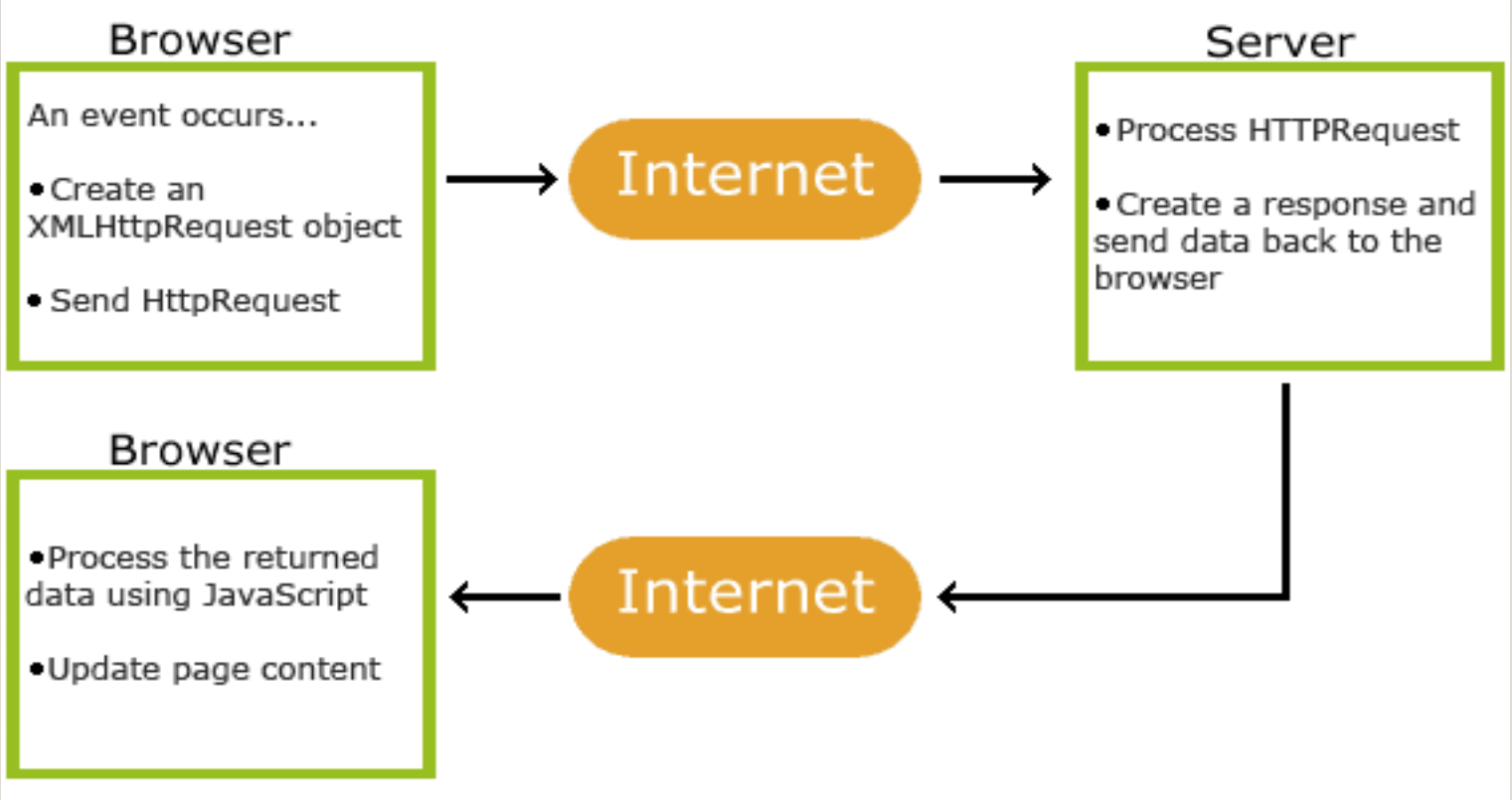
⇒ Can create a very dynamic web content, animation, etc.

- Basis for today's web pages.

AJAX – ASYNCHRONOUS JAVA AND XML

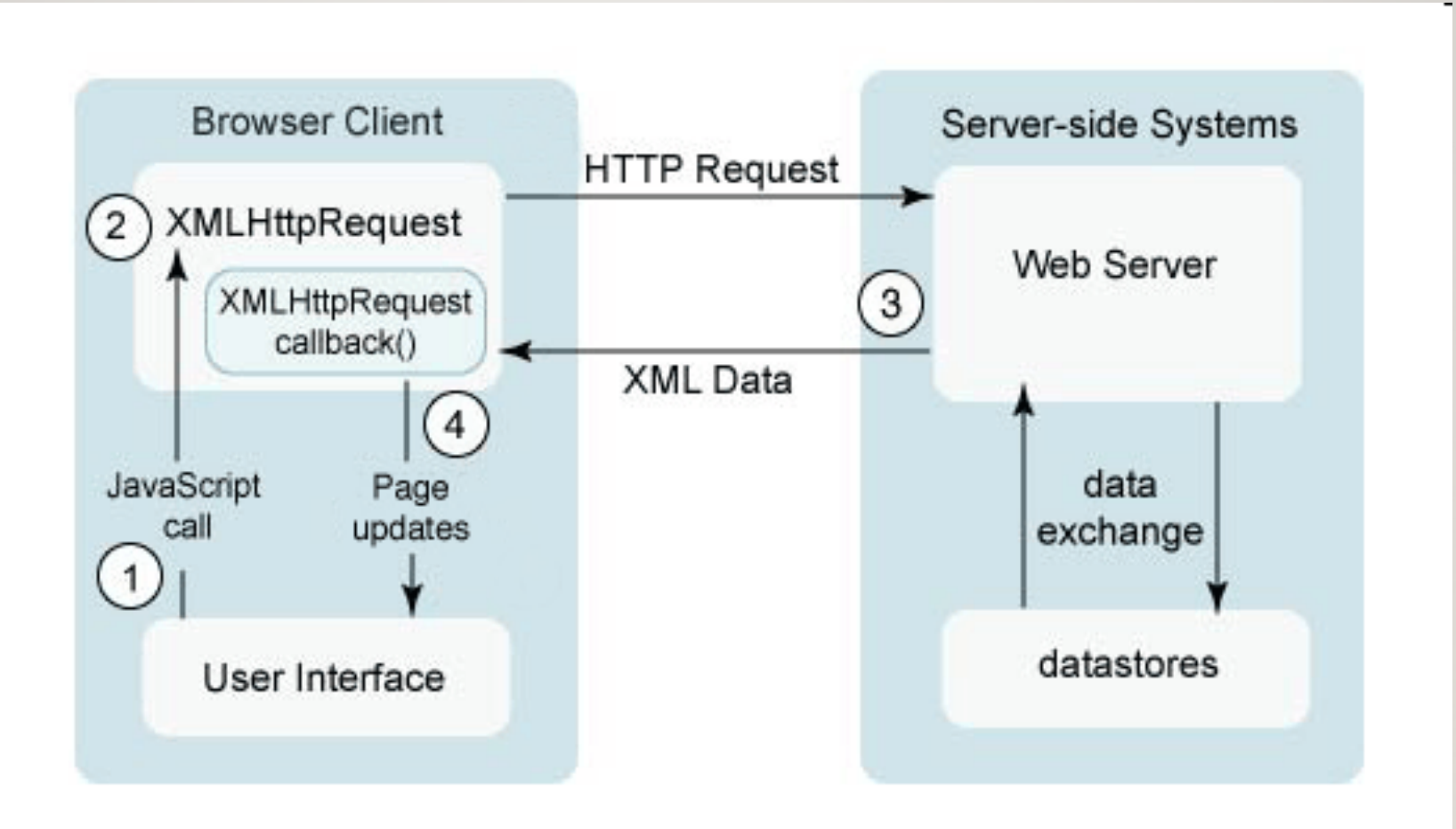
- Made popular by Google (with Google Suggest).
- NOT a new programming language
  - A new way to use existing standards.
- Based on JavaScript and HTTP requests.
- With AJAX, JavaScript communicates
  - Directly with the (web) server
  - using XMLHttpRequest object
  - To retrieve data as needed
  - Using Javascript events (e.g., keyPressed)
  - WITHOUT refreshing the page.

HOW DOES AJAX WORK … CONTD.



Source: W3Schools

HOW DOES AJAX WORK



Source: SUN's JAVA web page

AJAX … CONTD.

- Note: Data is typically stored in XML format
- XMLHttpRequest
  - The basic data structure interfacing the client with server.
  - Sends a request to a server (e.g., Google suggest server) on any events
    - Like "onKeyup(..)" when the user types any character search key.
  - Receives data from the server
  - Updates the required fields with data received from server.

REQUESTS AND RESPONSES

- XMLHTTPRequest
  - open(..) // open a request to …
  - setRequestHeader(..) // Set the request header
  - send(..) // Send the request
  - status // response 200 OK, or other values
  - readState // Store the state information
  - onreadystatechange // callback function for status change
  - responseText // response in Text
  - responseXML // response in XML

XMLHTTPREQUEST FUNCTIONS

- open(*method, url, async, user, psw)*
  - method: Get/Post
  - url: address of the server
  - sync – true or false (asynchronous call or not)
  - user – username (optional)
  - psw – Password (optional)
- setRequestHeader( ) // Sets label/value pairs in the header
- send( ) or send(string) // Sends the request to the server
- abort( ) // Cancel the current request
- getResponseHeader( ) // Get specific header information
- getAllResponseHeaders( ) // Get all headers' information

XMLHTTPREQUEST OBJECT PROPERTIES

- readyState – Holds the status of XMLHTTPRequest object
  - 0: Request Not initialized
  - 1: Server connection established
  - 2: Request received
  - 3: Processing request
  - 4: Request finished, response is ready
- Status – Returns the status number of a request
  - 200: OK
  - 403: Forbidden
  - 404: Not Found
  - ..Others
- statusText – Status text of a response (e.g., "OK", "Not Found", etc.)
- responseText – response data as a string
- responseXML – response as XML data