

IT4409: Web Technologies and e-Services 2020-1

Document Object Model (DOM)

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Outline

- Introduction of DOM
- Overview of DOM
- DOM Examples
- How the DOM Really works?
- Advantages and Disadvantages
- DOM or SAX
- Summary

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Before going to the DOM

- **HTML** – How to Display the Data in the Webpage.
- **XML** – How to Describe the Data .
- **DHTML** - How to Add Movement or Animation to an HTML Document.
- **JAVASCRIPT** - How to make Web Content Dynamic.

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World Wide Web Consortium-W3C

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World Wide Web Consortium-W3C

- To Promote Open Standard For world wide web.
- W3C is a vendor Organization.
- Main Vendors are Netscape and Microsoft.
- Some W3C Standards are HTTP,HTML,XML,CSS.
- DOM is also Recommend by W3C.

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Overview

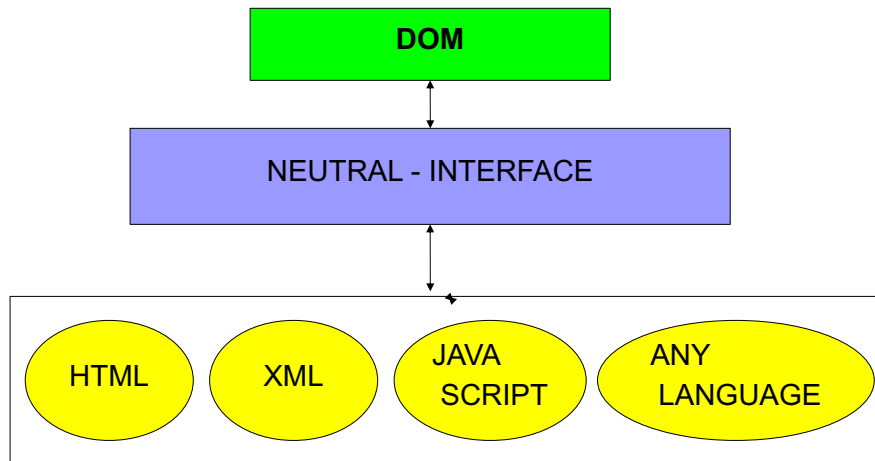
The **Document Object Model (DOM)** is an API that allows programs to interact with HTML (or XML) documents

- In typical browsers, the JavaScript version of the API is provided
- W3C recommendations define standard DOM

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What is the DOM?



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W3C

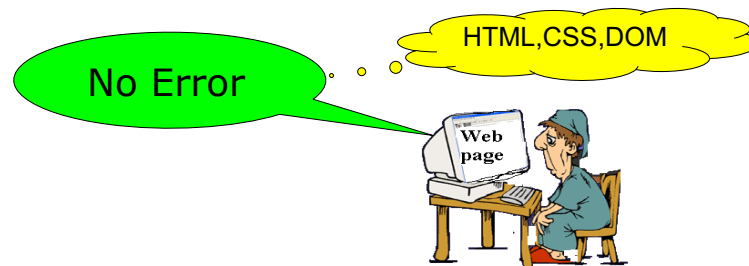


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Five Basic Levels Of W3C :

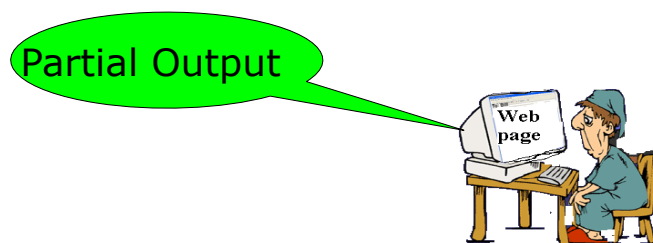
Recommendation:- It is the Final outcome from W3C. All the Web functions are working properly.



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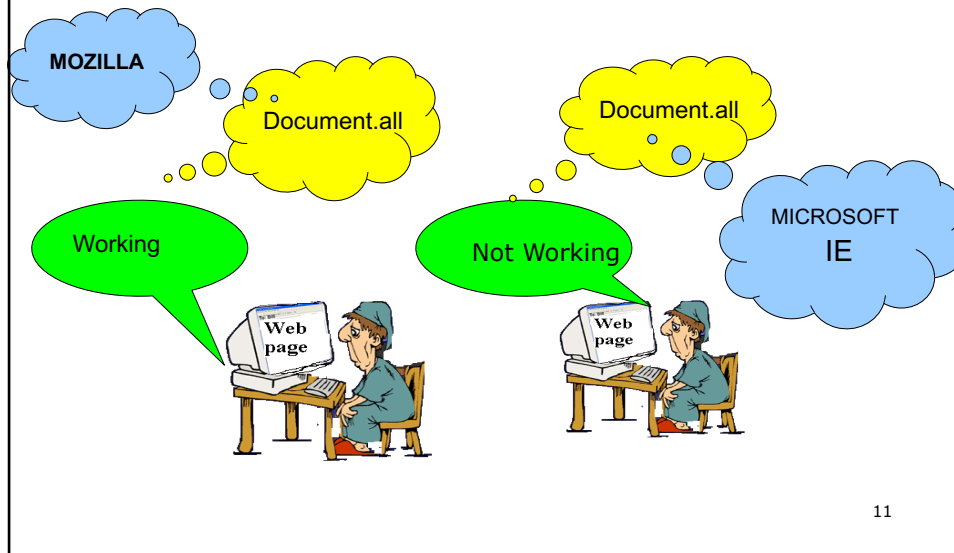
Proposed Recommendation:-

- In this layer the work is mostly complete .But some minor changes is occur.



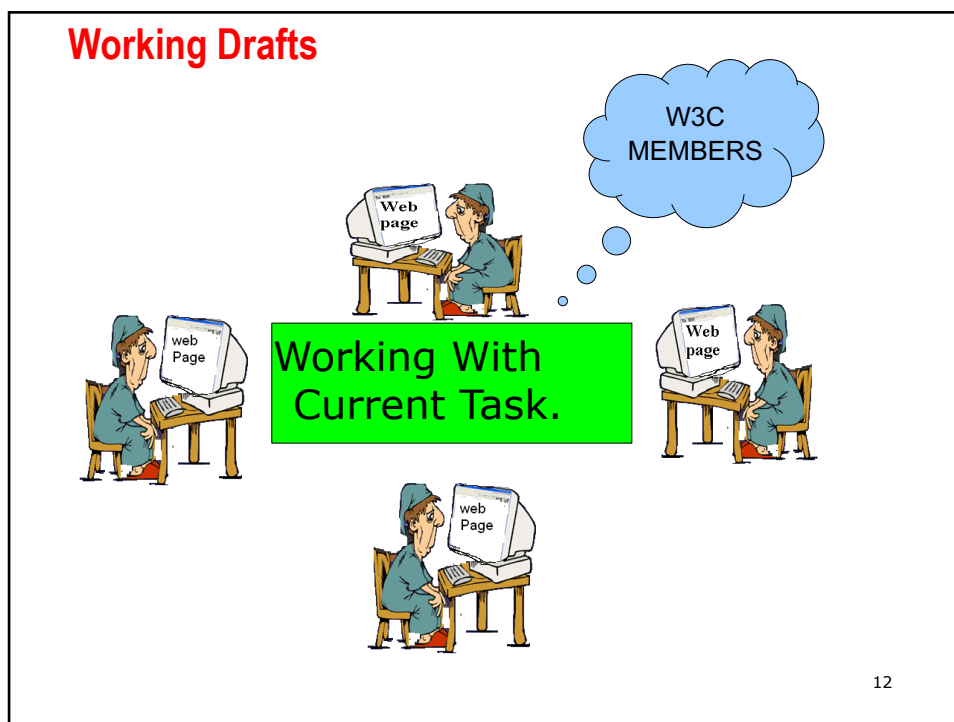
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Candidate Recommendation:-



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Working Drafts



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Status Of The DOM

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DOM Level 1:

W3C recommendation, 1 Oct. 1998.

Interfaces for representing an XML and HTML document.

- 1) **Document**
- 2) **Node**
- 3) **Attr**
- 4) **Element**
- 5) **and Text interfaces.**

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DOM Level 2:

W3C recommendation, 13 Nov. 2000.

It contains six different specifications:

- 1)DOM2 Core
- 2)Views
- 3)Events
- 4)Style
- 5)Traversal and Range
- 6)and the DOM2 HTML.

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DOM Level 3:

W3C candidate recommendation, 7 Nov. 2003

It contains five different specifications:

- 1)DOM3 Core
- 2)Load and Save
- 3)Validation
- 4)Events
- 5)and XPath

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Overview of DOM

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DOM Introduction

Example: "Rollover" effect

Cursor not over image

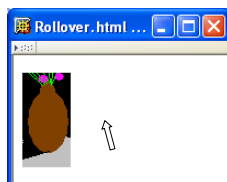


Image changes when cursor moves over



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DOM Introduction

```
<!DOCTYPE html
  PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
    "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html>
  <head>
    <title>Rollover.html</title>
    <script type="text/javascript" src="rollover.js">
    </script>
    <meta http-equiv="Content-Script-Type" content="text/javascript" />
  </head>
  <body>
    <p>
      
    </p>
  </body>
</html>
```

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DOM Introduction

```
<!DOCTYPE html
  PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
    "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html>
  <head>
    <title>Rollover.html</title>
    <script type="text/javascript" src="rollover.js">
    </script>
    <meta http-equiv="Content-Script-Type" content="text/javascript" />
  </head>
  <body>
    <p>
      
    </p>
  </body>
</html>
```

Import
JavaScript
code

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DOM Introduction

```
<!DOCTYPE html
  PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
    "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html>
  <head>
    <title>Rollover.html</title>
    <script type="text/javascript" src="rollover.js">
    </script>
    <meta http-equiv="Content-Script-Type" content="text/javascript" />
  </head>
  <body>
    <p>
      
    </p>
  </body>
</html>
```

Default language for scripts specified as attribute values

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DOM Introduction

```
<!DOCTYPE html
  PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
    "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html>
  <head>
    <title>Rollover.html</title>
    <script type="text/javascript" src="rollover.js">
    </script>
    <meta http-equiv="Content-Script-Type" content="text/javascript" />
  </head>
  <body>
    <p>
      
    </p>
  </body>
</html>
```

Calls to JavaScript
show() function when
mouse moves over/away
from image

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DOM Introduction

```
<!DOCTYPE html
  PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
    "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html>
  <head>
    <title>Rollover.html</title>
    <script type="text/javascript" src="rollover.js">
    </script>
    <meta http-equiv="Content-Script-Type" content="text/javascript" />
  </head>
  <body>
    <p>
      
    </p>
  </body>
</html>
```

Notice that id of image is first argument to show()

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DOM Introduction

```
// rollover.js

function show(eltId, URL) {
  var elt = window.document.getElementById(eltId);
  elt.setAttribute("src", URL);
  return;
}
```

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DOM Introduction

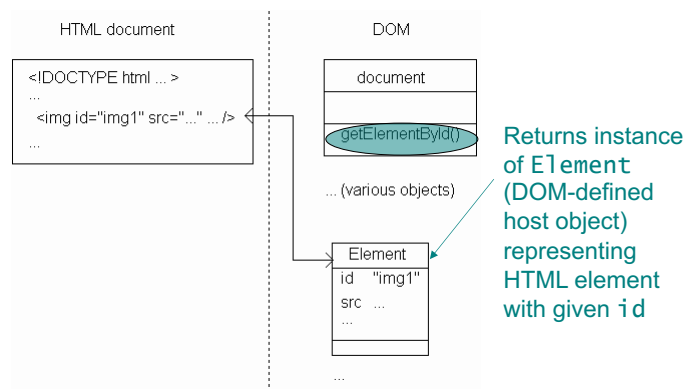
```
// rollover.js  
  
function show(eltId, URL) {  
    var elt = window.document.getElementById(eltId);  
    elt.setAttribute("src", URL);  
    return;  
}
```

DOM method returning Object

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DOM Introduction



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DOM Introduction

```
// rollover.js

function show(eltId, URL) {
  var elt = window.document.getElementById(eltId);
  elt.setAttribute("src", URL);
  return;  Method inherited by Element instances
           for setting value of an attribute
}
```

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DOM Introduction

```
// rollover.js

function show(eltId, URL) {
  var elt = window.document.getElementById(eltId);
  elt.setAttribute("src", URL);
  return;  Effect: src attribute of HTML element with
           specified eltId is changed to specified URL
}
```

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DOM Introduction

```
<!DOCTYPE html
  PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
    "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html>
  <head>
    <title>Rollover.html</title>
    <script type="text/javascript" src="rollover.js">
    </script>
    <meta http-equiv="Content-Script-Type" content="text/javascript" />
  </head>
  <body>
    <p>
      
    </p>
  </body>
</html>
```

Image src changed to CFP22.png when mouse is over image, CFP2.png when leaves

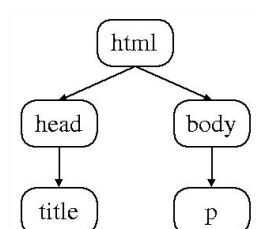
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Document Tree

Recall that HTML document elements form a tree structure, e.g.,

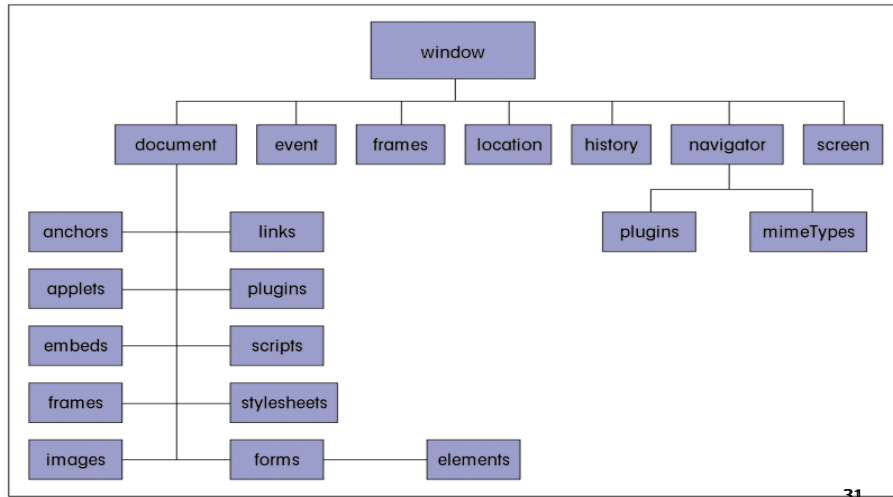
DOM allows scripts to [access](#) and [modify](#) the document tree



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The Document Tree Example



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Referencing Objects-Each Object is Identified by Object Name.

Object Name	Description
window	The browser window
document	The Web document displayed in the window
document.body	The body of the Web document displayed in the browser window
event	Events or actions occurring within the browser window
history	The list of previously visited Web sites within the browser window
location	The URL of the document currently displayed in the browser window
navigator	The browser itself
screen	The screen displaying the document

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How To Use Referencing Objects

Object Names

- General form is `object1.object2.object3..`

TO Access The History

`window.history`

To Access The Body

`document.body`

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The DOM structure model

- It is a Hierarchy of *Node objects*

■ node object

Element

Attribute

etc

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Document Tree: Node

Example HTML document

```
<body>
  <p>
    Text within a "p" element.
  </p>
  <ol>
    <li>First element of ordered list.</li>
    <li>Second element.</li>
  </ol>
  <!-- Call function producing an outline of this document's
        element tree -->
  <form action="">
    <p><input type="button" name="button" value="Click to see outline"
      onclick="window.alert(TreeOutline());" /></p>
  </form>
</body>
```

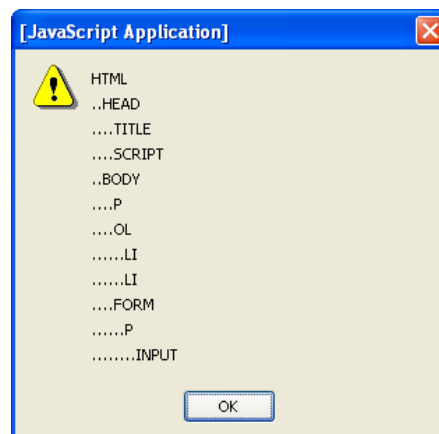
Function will use Node methods and properties to produce string representing Element tree

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Document Tree: Node

String produced by TreeOutline():



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An Example of DOM XML

```
<?xml version = "1.0"?>
<message from = "Paul" to = "Name">
  <body>Hello!</body>
</message>
```

Node is created for **message** element:

- **message** element has child element: **body**.
- **body** element has **Text** "Hello!"
- Attributes: **from** and **to** also are nodes in DOM tree.

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The DOM Interface

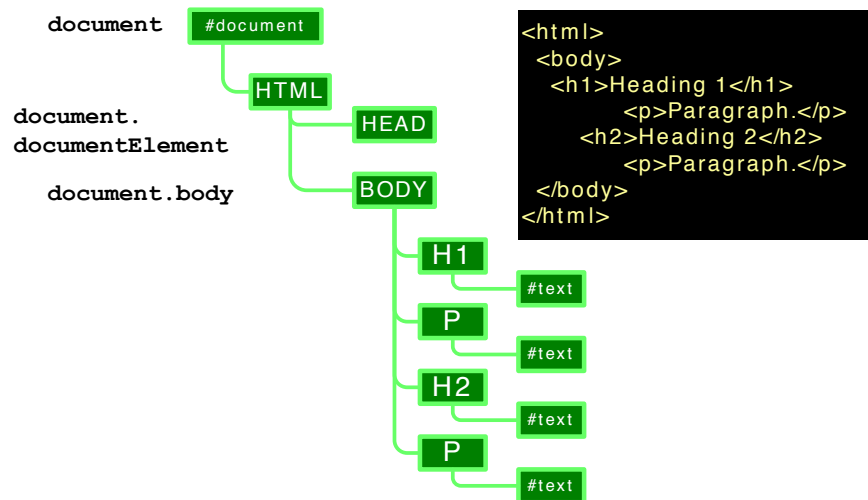
- The DOM has many interfaces to handle various node objects.
- Every interface has its "Attributes" and "Methods".
 - Compare with Object Oriented Programming (OOP).

DOM	OOP
Interface	Object Class
Attribute	Property
Method	Method

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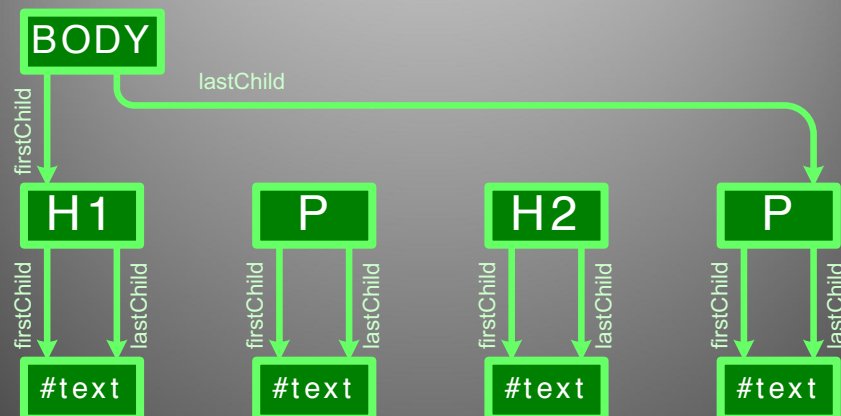
Document Tree Structure



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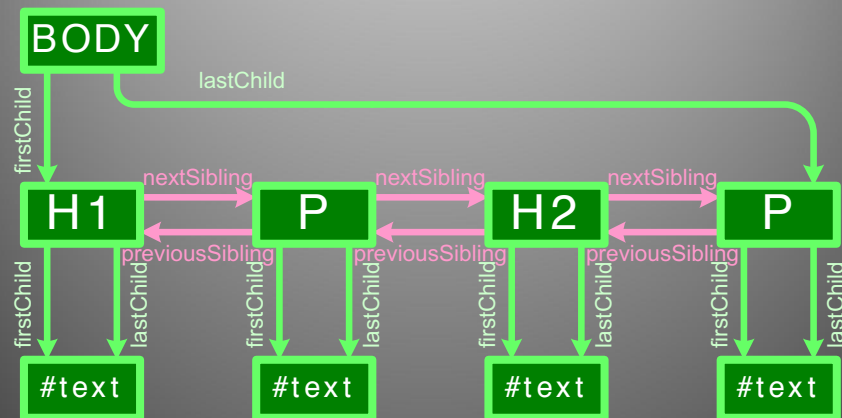
child, sibling, parent



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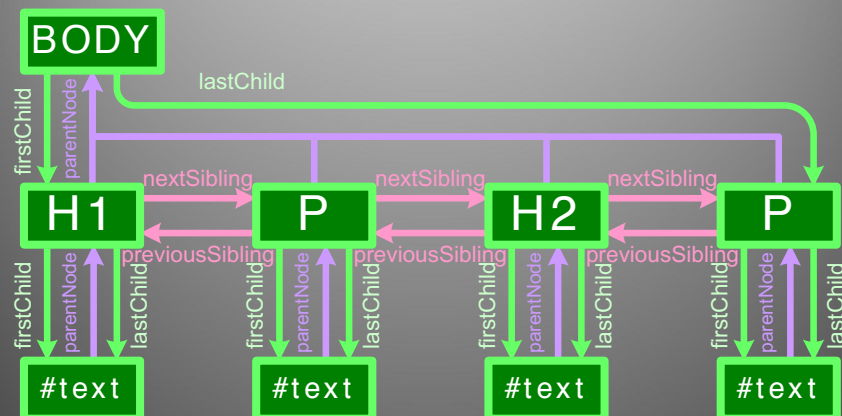
child, sibling, parent



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child, sibling, parent



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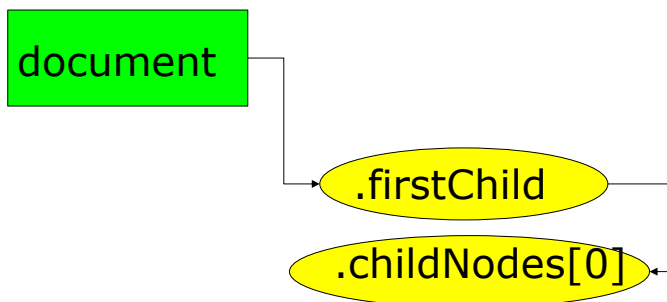
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DOM NODE Methods

Method Name	Description
appendChild	Appends a child node.
cloneNode	Duplicates the node.
getAttributes	Returns the node's attributes.
getChildNodes	Returns the node's child nodes.
getNodeName	Returns the node's name.
getNodeType	Returns the node's type (e.g., element, attribute, text, etc.).
getNodeValue	Returns the node's value.
getParentNode	Returns the node's parent.
hasChildNodes	Returns true if the node has child nodes.
removeChild	Removes a child node from the node.
replaceChild	Replaces a child node with another node.
setNodeValue	Sets the node's value.
insertBefore	Appends a child node in front of a child node.

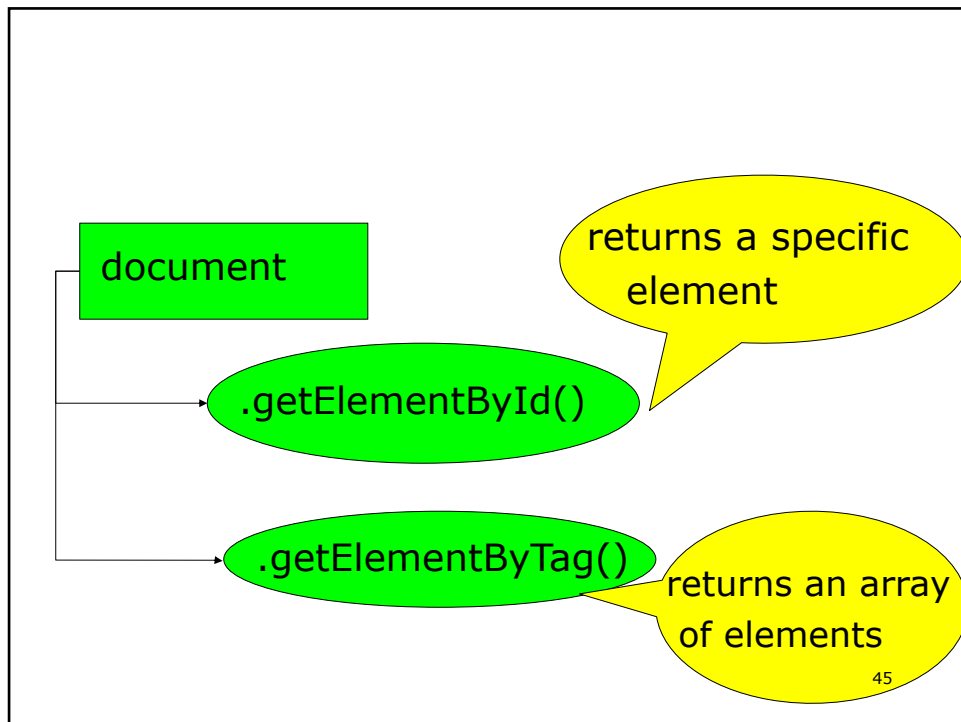
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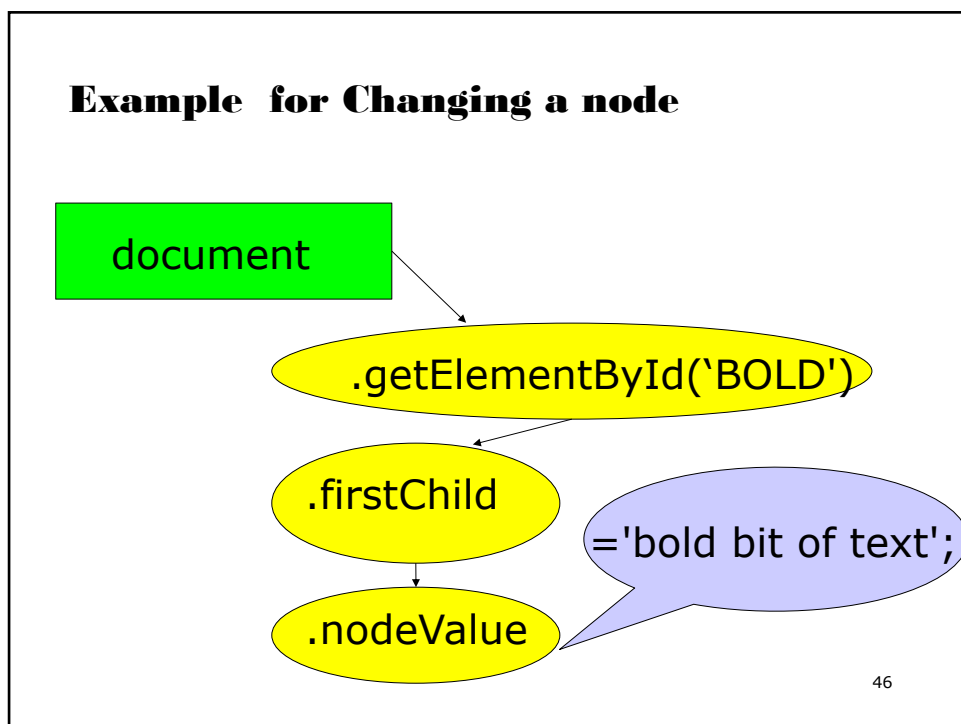


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Example Source Code For Document Method

```
document.body.style.backgroundColor
```

https://www.w3schools.com/jsref/tryit.asp?filename=tryjsref_doc_body

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NAVIGATOR

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NAVIGATOR :-Some properties are **read-only**

Browser Property	Description
navigator.appName	The name of the browser
navigator.appVersion	The major version number of the browser (may also include a compatibility value and the name of the operating system)
navigator.appMinorVersion	The minor version number of the browser
navigator.appCodeName	The name of the browser's code
navigator.userAgent	The name of the browser associated user agent
navigator.platform	The operating system under which the browser is running
navigator.cpuClass	The type of CPU in use with the browser
navigator.systemLanguage	The language used by the browser
navigator.cookieEnabled	A Boolean value indicating whether cookies are enabled

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Example Source Code For Navigator Method

```
navigator.appName  
navigator.appVersion  
navigator.appCodeName  
navigator.platform  
navigator.cookieEnabled
```

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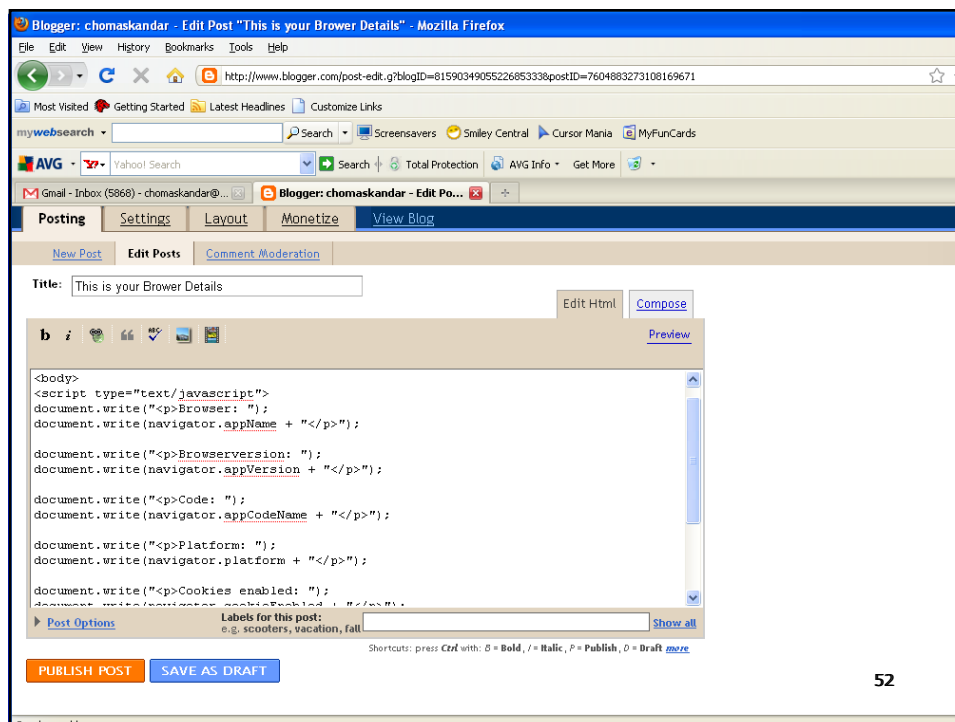
50

Example For NAVIGATOR

```
<html><body><script type="text/javascript">
document.write("<p>Browser: ");
document.write(navigator.appName + "</p>");
document.write("<p>Browser version: ");
document.write(navigator.appVersion + "</p>");
document.write("<p>Code: ");
document.write(navigator.appCodeName + "</p>");
document.write("<p>Platform: ");
document.write(navigator.platform + "</p>");
document.write("<p>Cookies enabled: ");
document.write(navigator.cookieEnabled + "</p>");
document.write("<p>Browser's user agent header: ");
document.write(navigator.userAgent + "</p>");
</script></body></html>
```

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MOZILLA

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chomaskandar - Mozilla Firefox

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http://chomaskandar.blogspot.com/

Most Visited Getting Started Latest Headlines Customize Links

mywebsearch Search Screensavers Smiley Central Cursor Mania MyFunCards

AVG Yahoo! Search Search Total Protection AVG Info Get More

Gmail - Inbox (5868) - chomaskandar@... chomaskandar

POSTED BY CHOMASKANDAR AT 10:41 0 COMMENTS

This is your Brower Details

Browser: Netscape
Browser version: 5.0 (Windows; en-US)
Code: Mozilla
Platform: Win32
Cookies enabled: true
Browser's user agent header: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.9.1) Gecko/20090624 Firefox/3.5

POSTED BY CHOMASKANDAR AT 10:13 0 COMMENTS

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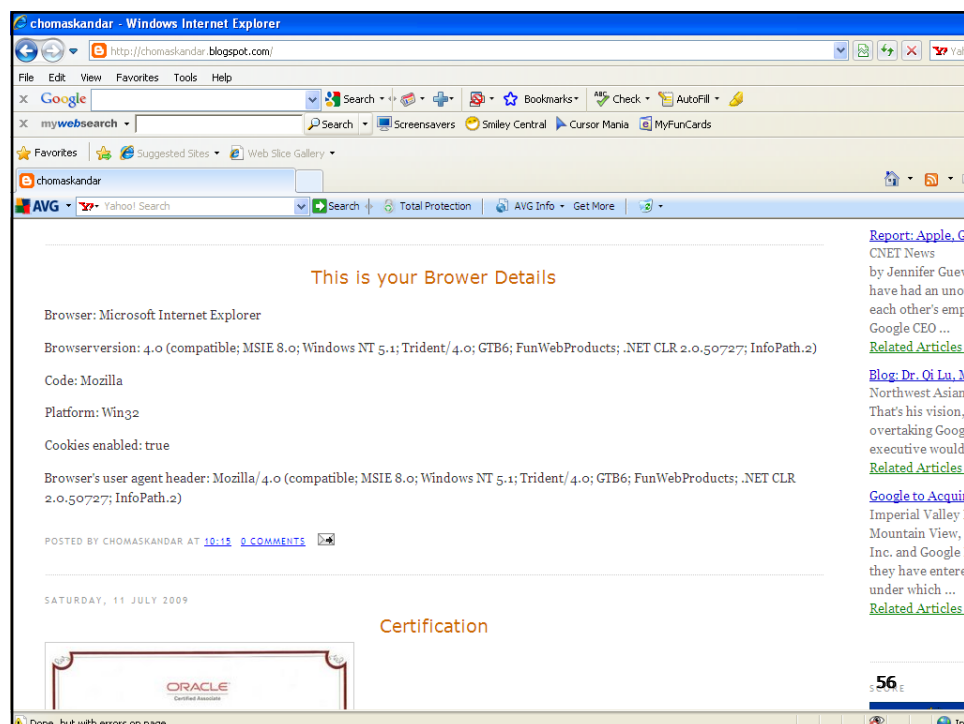
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http://www.chomaskandar.blogspot.com/

Customize Links Free Hotmail Windows Marketplace Windows Media Windows

Other bookmarks

POSTED BY CHOMASKANDAR AT 10:41 0 COMMENTS

This is your Brower Details

Browser: Netscape

Browser version: 5.0 (Windows; U; Windows NT 5.1; en-US) AppleWebKit/530.5 (KHTML, like Gecko) Chrome/2.0.172.39 Safari/530.5

Code: Mozilla

Platform: Win32

Cookies enabled: true

Browser's user agent header: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US) AppleWebKit/530.5 (KHTML, like Gecko) Chrome/2.0.172.39 Safari/530.5

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W3C example

https://www.w3schools.com/jsref/obj_navigator.asp

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DOM's other examples

https://www.w3schools.com/jsref/dom_obj_all.asp

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DOM Event Handling

Note: IE6 has a different event model

`Event` instance created for each event

`Event` instance properties:

- `type`: name of event (click, mouseover, *etc.*)
- `target`: Node corresponding to document element that generated the event (e.g., `button` element for click, `img` for mouseover). This is the [event target](#).

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DOM Event Handling

JavaScript [event listener](#): function that is called with `Event` instance when a certain event occurs

An event listener is associated with a target element by calling `addEventListener()` on the element

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DOM Event Handling

```
var button = window.document.getElementById("msgButton");
button.addEventListener("click", sayHello, false);

function sayHello(event) {
  window.alert(
    "Hello World!\n\n" +
    "Event type: " + event.type + "\n" +
    "Event target element type: " + event.target.nodeName);
  return;
}
```

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DOM Event Handling

Event
target

```
var button = window.document.getElementById("msgButton");
button.addEventListener("click", sayHello, false);

function sayHello(event) {
  window.alert(
    "Hello World!\n\n" +
    "Event type: " + event.type + "\n" +
    "Event target element type: " + event.target.nodeName);
  return;
}
```

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DOM Event Handling

```
var button = window.document.getElementById("msgButton");
button.addEventListener("click", sayHello, false);
                        Event type
function sayHello(event) {
    window.alert(
        "Hello World!\n\n" +
        "Event type: " + event.type + "\n" +
        "Event target element type: " + event.target.nodeName);
    return;
}
```

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DOM Event Handling

DOM event types:

- All HTML intrinsic events except keypress, keydown, keyup, and dblclick
- Also has some others that are typically targeted at the window object:

Event	Cause
error	An error (problem loading an image, script error, etc.) has occurred.
resize	View (window or frame) of document is resized.
scroll	View (window or frame) of document is scrolled.

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DOM Event Handling

```
var button = window.document.getElementById("msgButton");  
button.addEventListener("click", sayHello, false);
```

Event handler

Definition
of event
handler

```
function sayHello(event) {  
    window.alert(  
        "Hello World!\n\n" +  
        "Event type: " + event.type + "\n" +  
        "Event target element type: " + event.target.nodeName);  
    return;  
}
```

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DOM Event Handling

```
var button = window.document.getElementById("msgButton");  
button.addEventListener("click", sayHello, false);
```

Event instance

```
function sayHello(event) {  
    window.alert(  
        "Hello World!\n\n" +  
        "Event type: " + event.type + "\n" +  
        "Event target element type: " + event.target.nodeName);  
    return;  
}
```

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DOM Event Handling

```
var button = window.document.getElementById("msgButton");
button.addEventListener("click", sayHello, false);

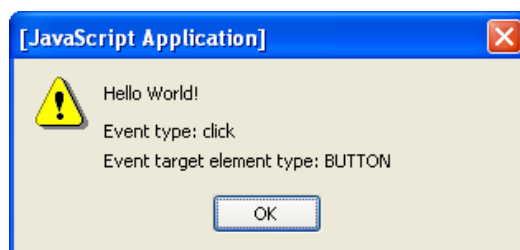
function sayHello(event) {
    window.alert(
        "Hello World!\n\n" +
        "Event type: " + event.type + "\n" +
        "Event target element type: " + event.target.nodeName);
    return;
}
```

Normally false
(more later)

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DOM Event Handling



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W3C example

https://www.w3schools.com/jsref/tryit.asp?filename=tryjsref_onclick_addeventlistener

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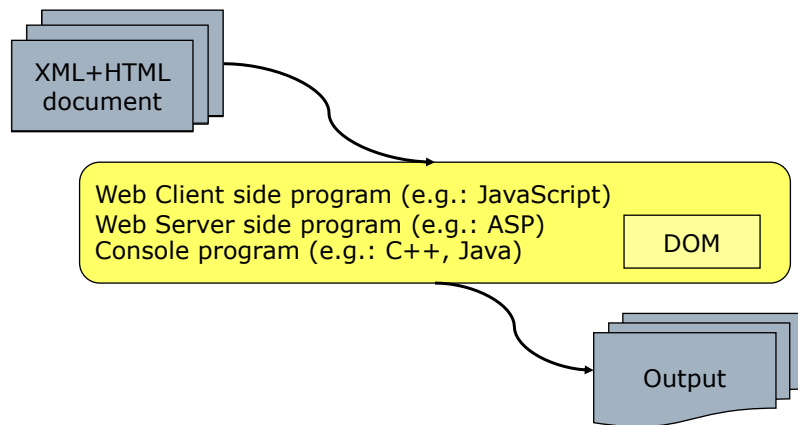
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How the DOM Really works?

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The Relation Graph



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DOM in Programming Languages

- ☐ Java
- ☐ C++
- ☐ C#
- ☐ VB.Net, etc.

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DOM Advantages & Disadvantages

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DOM Advantages & Disadvantages

ADVANTAGES

- Robust API for the DOM tree
- Relatively simple to modify the data structure and extract data

Disadvantages

- Stores the entire document in memory
- As Dom was written for any language, method naming conventions don't follow standard java programming conventions

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Some DOM Supporting Browsers



Google Chrome



Konqueror



Opera



Camino



Safari

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SUMMARY

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Summary

- ❑ DOM is a tree representation of an XML document in memory
- ❑ Dom provides a robust API to easily Modify and extract data from an XML document
- ❑ JAXP provides a vendor –neutral interface to the underlying DOM or SAX Parser

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References

- ❑ www.w3.org/DOM
- ❑ http://developer.mozilla.org/en/Gecko_DOM_Reference
- ❑ www.corewebprogramming.com
- ❑ <http://www.w3schools.com>

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80

email: chungdt@soict.hust.edu.vn

Q&A