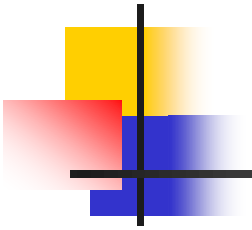

Designing Web Applications

HTML 5

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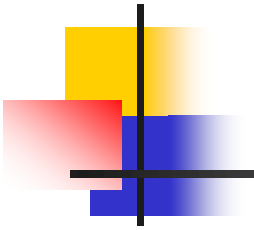


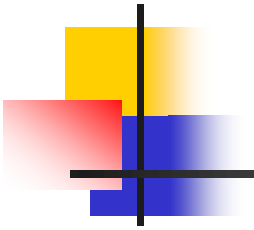
Outline

- The HTML 5.0 language.
- The cascade style sheets (CSS).
- Client-side Programming: JavaScript.
- Server-Side Programming: PHP.
- The HTTP protocol
- Laboratories: development of client-side and server-side applications by using HTML, CSS, JavaScript and PHP.

Suggested references

- Standards (http://info.iet.unipi.it/~france/p_docs/pweb/home_specifiche.html)
- Any book on HTML, CSS, JavaScript, PHP and HTTP.
- Slides provided by the teacher

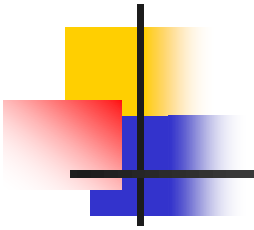
- **M. Avvenuti, G. Cecchetti, M.G.C.A. Cimino, "Lezioni di programmazione web", edito da Esculapio, Bologna, Ottobre 2010.**
- **M. Avvenuti, M.G.C.A. Cimino, "Laboratori di programmazione web", edito da McGraw-Hill, 2010.**



Useful Information

- The slides can be downloaded at the following address: http://info.iet.unipi.it/~france/p_docs/pweb/home.html

user: sistemiInf
password: abcd4321



To Pass Examination

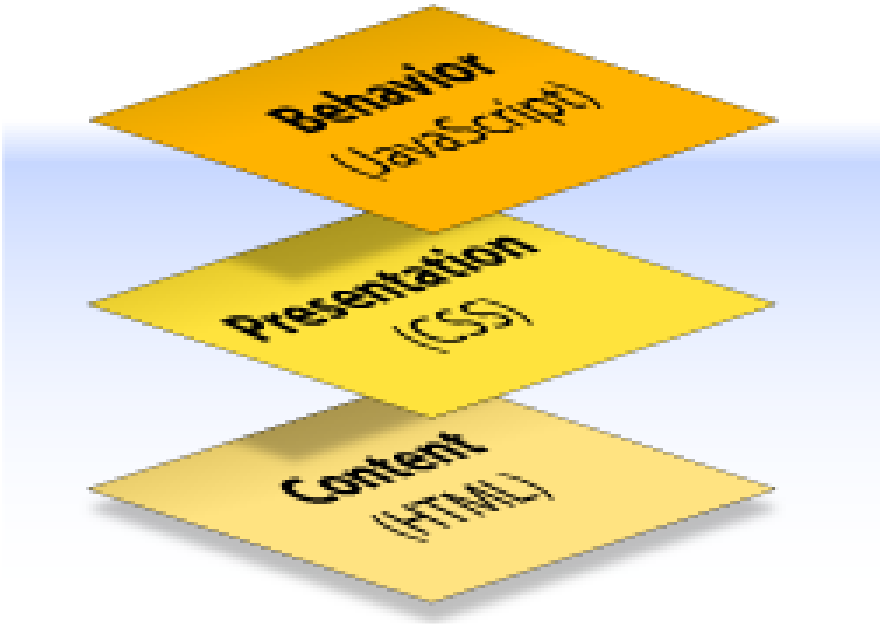
- Project
  - Pre-requisite to take the exam is the development of a Web application which performs some specific service. You can find all the relevant information at the following address: http://info.iet.unipi.it/~france/p_docs/pweb/home.html
- Exam
  - Practical exam performed in laboratory (approximately 1.5 hours)
- Final Mark and Project Evaluation
  - Only if the exam is passed (mark >=18), then the project will be discussed and a final mark will be assigned based on the marks obtained both in the exam and in the project

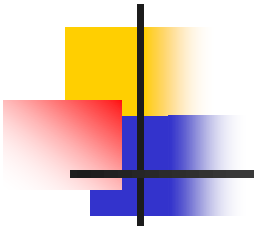
World Wide Web

- World Wide Web (WWW): network of information resources.
- Information resources: documents or pages which can contain link to other documents or pages with correlated information
- Documents with only text: Hypertext
- Documents with also images, voice and so on: Hypermedia
- Users access documents, independently of their location, through interactive programs, called browsers, or other multimedia programs.
- Such programs allow transferring these documents, showing the contents, navigating through the hypertext and hypermedia network.

Web documents

- A web document can consist of up to three layers
  - Content
  - Presentation
  - Behaviour



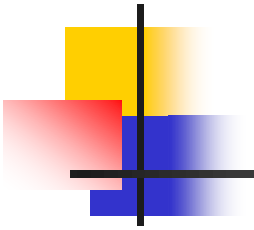


Content Layer

- The *content layer* is always present.
- It comprises the information the author wishes to convey to his or her audience, and is embedded within HTML markup that defines its structure and semantics.
- Most of the content on the Web today is text, but content can also be provided through images, animations, sound, video, and whatever else an author wants to publish.

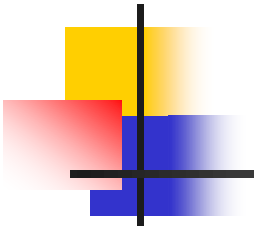
Presentation Layer

- The *presentation layer* defines how the content will appear to a human being who accesses the document in one way or another.
- The conventional way to view a web page is with a regular web browser, of course, but that is only one of many possible access methods.
  - For example, content can also be converted to synthetic speech for users who have impaired vision or reading difficulties.



Behavior Layer

- The *behavior layer* involves real-time user interaction with the document.
- This task is normally handled by JavaScript.
- The interaction can be anything from a trivial validation that ensures a required field is filled in before an order form can be submitted, to sophisticated web applications that work much like ordinary desktop programs.

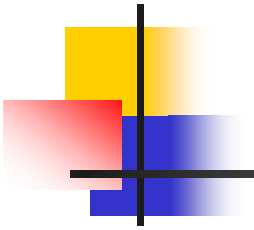


Basic concept

- HTML -> structure and content
- CSS -> style and appearance
- Javascript -> behavior

Example: <h2>Via Diotisalvi 2</h2>
!!!
<h2>Address</h2>
Via Diotisalvi 2

This is some text!
Use CSS to define the font face, font size, and font color of text.



WWW – Three basic mechanisms

- WWW relies on three basic mechanisms:
  - A uniform naming scheme for locating resources on the Web (e.g., URIs)
  - Protocols, for access to named resources over the Web (e.g., HTTP), followed by "://"
  - Hypertext, for easy navigation among the resources (e.g., HTML)

Uniform Resource Identifier (URI)

- Each information resource on the Web has an address which can be codified by a URI.
- A URI is defined as

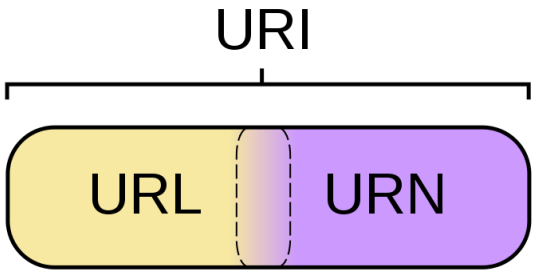
  <scheme>:<scheme-specific-part>
- The <scheme> is the name of the mechanism used to access the resource (for instance, http protocol)
  - A colon character (:)
  - A scheme-specific part.

    For instance
    - The name of the machine hosting the resource (for instance, www.w3.org)
    - The name of the resource itself, given as path

Universal Resource Identifier (URI)

- A **URI** may be a locator (URL) or a name (URN), or both.
- A Uniform Resource Locator (URL) is a URI that, in addition to identifying a resource, specifies the means of acting upon and obtaining the representation.

  For example, the URL http: //www.w3.org/TR



Universal Resource Identifier (URI)

- A Uniform Resource Name (URN) is a URI that identifies a resource by name, in a particular namespace. The resource does not need to necessarily be network homed.

  For example, the URN *urn:isbn:0-395-36341-1* is a URI that specifies the identifier system, i.e. International Standard Book Number (ISBN), as well as the unique reference within that system and allows one to talk about a book, but does not suggest where and how to obtain an actual copy of it.
- URN - person's name
- URL – person`s street address.

Universal Resource Identifier (URI)

- Fragment Identifier

  Some URIs refer to a location within a resource. The URI ends with "#" followed by an anchor identifier (called the *fragment identifier*).

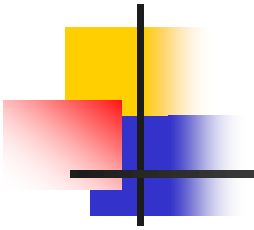
  http://somesite.com/html/top.html#section_2

- Relative URI

  A *relative URI* contains no naming scheme information. Relative URIs are resolved to fill URIs using a base URI.

  <img src="../icons/logo.gif" alt="logo">

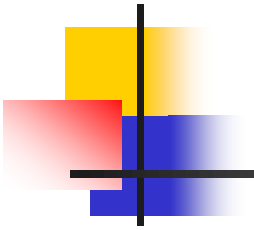
  http://somesite.com/icons/logo.gif



Universal Resource Identifier (URI)

In HTML, URIs are used to:

- Link to another document or resource,
- Link to an external style sheet or script,
- Include an image, object, or applet in a page,
- Create an image map,
- Submit a form,
- Create an iframe document,
- Cite an external reference,
- Refer to metadata conventions describing a document

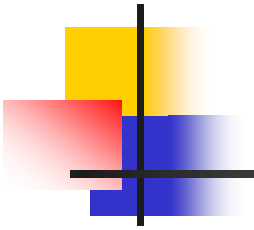


Protocols

- http - Hypertext transfer Protocol
- ftp - File Transfer protocol
- mailto - Electronic mail address
- news - USENET news
- file - Host-specific file names

Protocol HTTP

- HTTP is a request-response standard typical of client-server computing: web browsers typically act as clients, while an application running on the computer hosting the web site acts as a server.
  - The client establishes a connection with the server and sends a request for a document
  - The server replies to the request by using the connection opened by the client
- Since the protocol is stateless (the server does not recognise the client and does not record the requests), if the connection falls, the request has to be repeated.

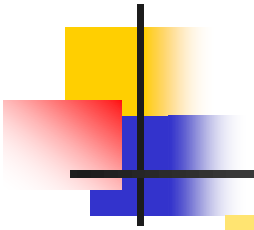


HTML

- HyperText Markup Language (HTML) is the language used to publish information on the Web
- HTML 4.01 is an Standard Generalized Markup Language (SGML) application conforming to International Standard ISO 8879.
  - Publish online documents with headings, text, tables, lists, photos, etc.
  - Retrieve online information via hypertext links, at the click of a button.
  - Design forms for conducting transactions with remote services.
  - Searching for information, making reservations, ordering products, etc.
  - Include spread-sheets, video clips, sound clips, and other applications directly in their documents.

HTML

- HTML 5
  - Compatibility
  - Utility
    - The user is king
  - Interoperability simplification
    - Native browser ability instead of complex JavaScript code
    - Powerful yet simple HTML5 APIs
    - HTML5 specification is also more detailed than previous ones to prevent misinterpretation: the specification is over 900 pages long!
    - HTML5 is also designed to handle errors well, with a variety of improved and ambitious error handling plans. It prefers graceful error recovery to hard failure, again giving top priority to the interest of the end user.
  - Universal Access
    - Accessibility: support users with disabilities
    - Media Independence
    - Support for all world languages



HTML Syntax

HTML 5.0 Document Structure

```
<!DOCTYPE html>
<html lang="en">
  <head>
   <meta charset="utf-8">
    <title> My first HTML document </title>
    <!– A simple html document -->
  </head>
  <body>
    <p> Hello world! </p>
  </body>
</html>
```

Constructs used in HTML

- Elements
  - Everything from the start tag to the end tag

    <h1>Sample page</h1>
- Attributes
  - Provide additional information about HTML elements

    This is a simple sample.
- Text
  - Text is allowed inside elements, attribute values and comments
- Character references
  - Examples: é (é) è (è)
- Comments
  - Examples: <!– comment -->

HTML Elements

<start_tag attribute_list>

element_content

<end_tag>

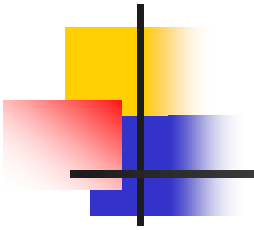
- The attribute list may contain the name and the identifier of the element
- The element names and identifiers are always case-insensitive.
- Some HTML elements have empty content. Empty elements are closed in the start
  -
 is an empty element without a closing tag (it defines a line break).
- Most HTML elements can have attributes
- Most HTML elements can be nested.

HTML Elements

- Note: Most browsers will display HTML correctly even if you forget the end tag:

```
<p>This is a paragraph
```

- The example above will work in most browsers, but don't rely on it. Forgetting the end tag can produce unexpected results or errors.
- Elements are not tags. Some people refer to elements as tags (e.g., "the p tag"). For instance, the head element is always present, even though both start and end head tags may be missing in the markup.



HTML Elements

- HTML tags are not case sensitive: <P> means the same as <p>.
- Plenty of web sites use uppercase HTML tags in their pages.
- The World Wide Web Consortium (W3C) recommends lowercase in HTML 4, and demands lowercase tags in future versions of (X)HTML

Element definitions
An example

4.4.1 The p element

Categories:

Flow content.
Palpable content.

Contexts in which this element can be used:

Where flow content is expected.

Content model:

Phrasing content.

Content attributes:

Global attributes

Tag omission in text/html:

A p element's end tag may be omitted if the p element is immediately followed by an address, article, aside, blockquote, div, dl, fieldset, footer, form, h1, h2, h3, h4, h5, h6, header, hgroup, hr, main, nav, ol, p, pre, section, table, or ul, element, or if there is no more content in the parent element and the parent element is not an a element.

Allowed ARIA role attribute values:

Any role value.

Allowed ARIA state and property attributes:

Global aria-* attributes
Any aria-* attributes applicable to the allowed roles.

DOM interface:

IDL

```
interface HTMLParagraphElement : HTMLElement {};
```

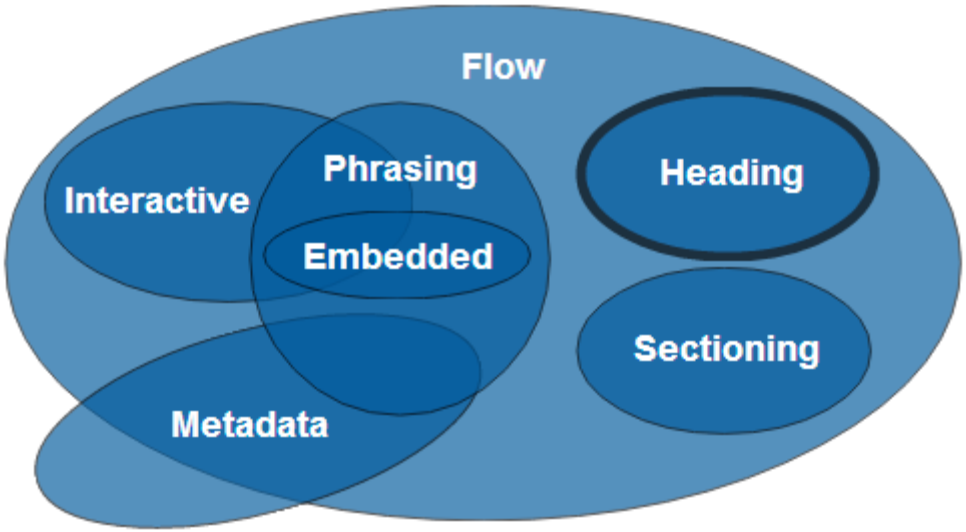
Element definitions
Category

- Categories
  - Each element in HTML falls into zero or more categories that group elements with similar characteristics together.

Categories:

Flow content.

Palpable content.



Element definitions
Category

Content Type	Description
Embedded	Content that imports other resources into the document, for example `audio`, `video`, `canvas`, and `iframe`
Flow	Elements used in the body of documents and applications, for example `form`, `h1`, and `small`
Heading	Section headers, for example `h1`, `h2`, and `hgroup`
Interactive	Content that users interact with, for example `audio` or `video controls`, `button`, and `textarea`
Metadata	Elements—commonly found in the `head` section— that set up the presentation or behavior of the rest of the document, for example `script`, `style`, and `title`
Phrasing	Text and text markup elements, for example `mark`, `kbd`, `sub`, and `sup`
Sectioning	Elements that define sections in the document, for example `article`, `aside`, and `title`

Element definitions
Context

- Context in which the element can be used
  - A non-normative description of where the element can be used
    - For simplicity, only the most specific expectations are listed. For example, an element that is both flow content and phrasing content can be used anywhere that either flow content or phrasing content is expected, but since anywhere that flow content is expected, phrasing content is also expected (since all phrasing content is flow content), only "where phrasing content is expected" will be listed.

Contexts in which this element can be used:

Where flow content is expected.

Element definitions
Content

- Content model
  - A normative description of what content must be included as children and descendants of the element.

Content model:

Phrasing content.

Element definitions
Attributes

- Content attributes
  - A normative list of attributes that may be specified on the element (except where otherwise disallowed), along with non-normative descriptions of those attributes.

Content attributes:

Global attributes

Element definitions
Tag omission

- Tag omission in text/html
  - A non-normative description of whether, in the text/html syntax, the start and end tags can be omitted.

Tag omission in text/html:

A `p` element's end tag may be omitted if the `p` element is immediately followed by an `address`, `article`, `aside`, `blockquote`, `div`, `dl`, `fieldset`, `footer`, `form`, `h1`, `h2`, `h3`, `h4`, `h5`, `h6`, `header`, `hgroup`, `hr`, `main`, `nav`, `ol`, `p`, `pre`, `section`, `table`, or `ul`, element, or if there is no more content in the parent element and the parent element is not an `a` element.

Element definitions
DOM Interface

- DOM (Document Object Model) interface
  - A normative definition of a DOM interface that such elements must implement.
  - What is DOM?
    - Let us consider the following example

Element definitions
DOM Interface

```
<!DOCTYPE html>
<html>
 <head>
  <title>Sample page</title>
 </head>
 <body>
  <h1>Sample page</h1>
  <p>This is a <a href="demo.html">simple</a> sample.</p>
  <!-- this is a comment -->
 </body>
</html>
```

Element definitions
DOM Interface

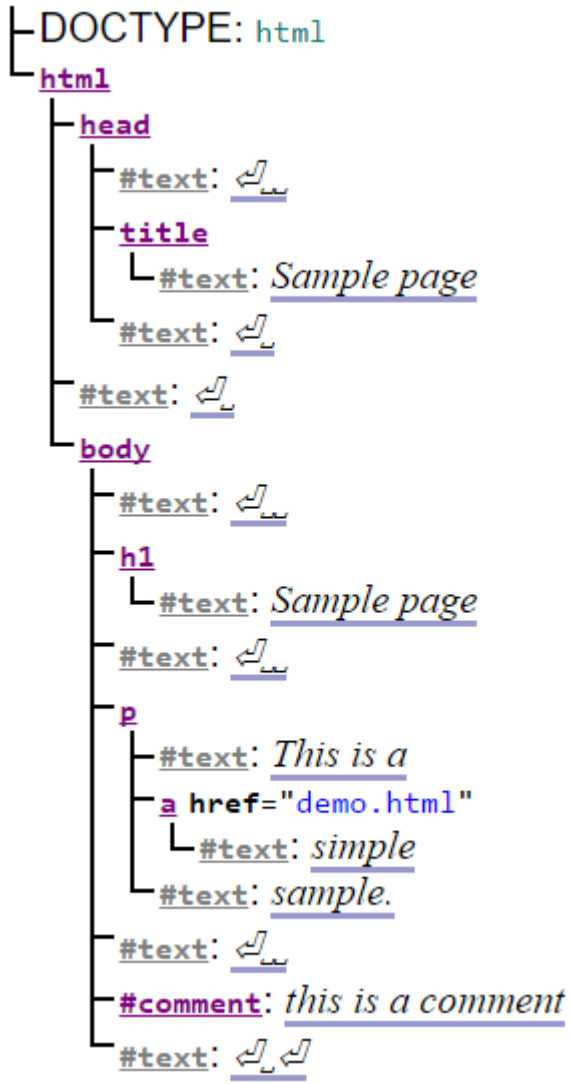
- HTML user agents (e.g. Web browsers) parse this markup, turning it into a DOM (Document Object Model) tree.
- A DOM tree is an in-memory representation of a document.
- DOM trees contain several kinds of nodes, in particular a DocumentType node, Element nodes, Text nodes, Comment nodes, and in some cases ProcessingInstruction nodes.

DOM interface:

IDL
```
interface HTMLParagraphElement : HTMLElement {};
```

Element definitions
DOM Interface

```
<!DOCTYPE html>
<html>
 <head>
  <title>Sample page</title>
 </head>
 <body>
  <h1>Sample page</h1>
  <p>This is a <a href="demo.html">simple</a>
sample.</p>
  <!-- this is a comment -->
 </body>
</html>
```



Element definitions

- WAI-ARIA (Web Accessibility Initiative -Accessible Rich Internet Applications specification)
- Client-side scripting causes accessibility problems when they do not convey the information necessary to Assistive Technologies (AT) – the devices and user systems typically used by people with disabilities. In simple terms assistive technology needs to know:
  1. What things are: The Role. (E.g., I am a checkbox)
  2. What they are doing: The state. (E.g., I am now checked)
  3. What the relationships are. (E.g., I am labeled by that text, I am part of this group, etc.)
  4. Also the focus needs to be accessible from the keyboard and the interaction needs to be predictable. (E.g., you can tab to this checkbox and press enter, then I am checked)

Element definitions

- ARIA role attributes
  - The attribute describes the role(s) the current element plays in the context of the document.
    - This could allow a user to make informed decisions on which actions may be taken on an element and activate the selected action in a device independent way.
  - The document “Using WAI-ARIA” is a practical guide for developers on how to add accessibility information to HTML elements, which defines a way to make Web content and Web applications more accessible to people with disabilities.
  - This document demonstrates how to use WAI-ARIA, which especially helps with dynamic content and advanced user interface controls developed with Ajax, HTML, JavaScript, and related technologies

Element definitions

- ARIA State and Properties attributes
  - Every HTML element may have ARIA state and property attributes specified. These attributes are defined by [ARIA] in Section 6.6, Definitions of States and Properties (all aria-* attributes).
  - ARIA State and Property attributes can be used on any element.

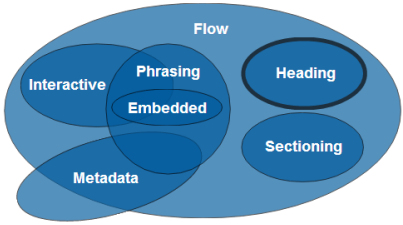
Allowed ARIA role attribute values:

Any role value.

Allowed ARIA state and property attributes:

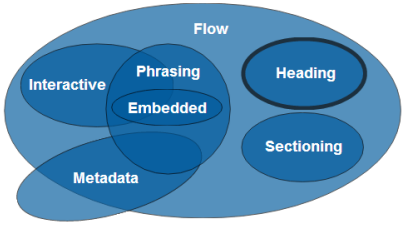
Global aria-* attributes

Any `aria-*` attributes applicable to the allowed roles.



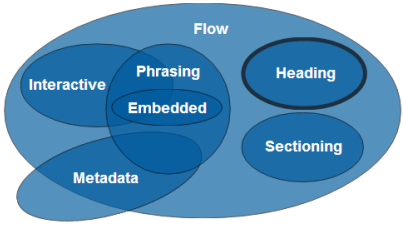
Metadata Content

- Metadata content is content that sets up the presentation or behavior of the rest of the content, or that sets up the relationship of the document with other documents, or that conveys other "out of band" information.
  - base link meta noscript script style template title



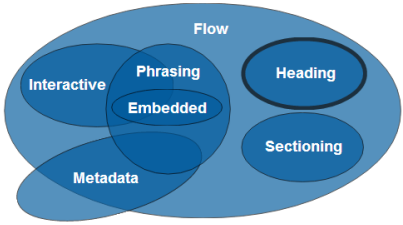
Flow Content

- Most elements that are used in the body of documents and applications are categorized as flow content.
- a abbr address area (if it is a descendant of a map element) article aside audio b bdi bdo blockquote br button canvas cite code data datalist del dfn div dl em embed fieldset figure footer form h1 h2 h3 h4 h5 h6 header hr i iframe img input ins kbd keygen label main map mark math meter nav noscript object ol output p pre progress q ruby s samp script section select small span strong sub sup svg table template textarea time u ul var video wbr



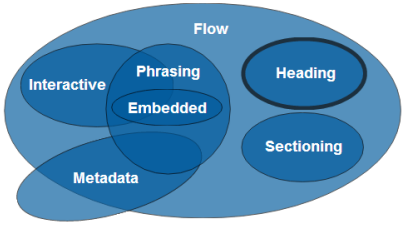
Sectioning Content

- Sectioning content is content that defines the scope of headings and footers
- article aside nav section



Heading Content

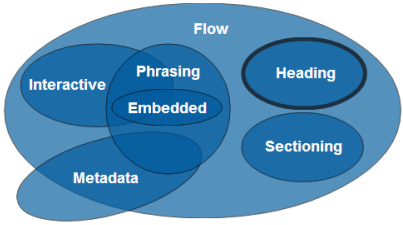
- Heading content defines the header of a section (whether explicitly marked up using sectioning content elements, or implied by the heading content itself)
- h1 h2 h3 h4 h5 h6



Phrasing Content

- Phrasing content is the text of the document, as well as elements that mark up that text at the intra-paragraph level. Runs of phrasing content form paragraphs
- a abbr area (if it is a descendant of a map element) audio b bdi bdo br button canvas cite code data datalist del dfn em embed i iframe img input ins kbd keygen label map mark math meter noscript object output progress q ruby s samp script select small span strong sub sup svg template textarea time u var video wbr text

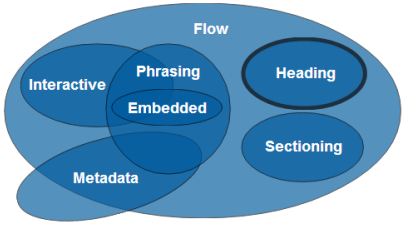
- Text, in the context of content models, means either nothing, or Text nodes. Text is sometimes used as a content model on its own, but is also phrasing content, and can be inter-element whitespace (if the Text nodes are empty or contain just space characters).



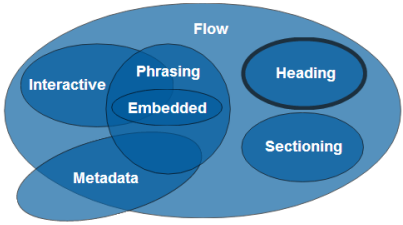
Embedded Content

- Embedded content is content that imports another resource into the document, or content from another vocabulary that is inserted into the document.
- audio canvas embed iframe img math object svg video

Interactive Content



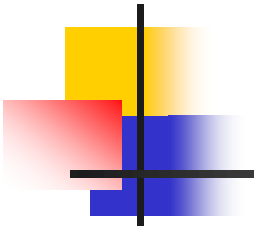
- Interactive content is content that is specifically intended for user interaction.
- a audio (if the controls attribute is present) button embed iframe img (if the usemap attribute is present) input (if the type attribute is not in the hidden state) keygen label object (if the usemap attribute is present) select textarea video (if the controls attribute is present)



Palpable Content

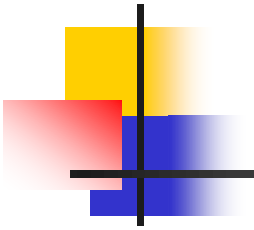
- As a general rule, elements whose content model allows any flow content or phrasing content should have at least one node in its contents that is palpable content and that does not have the hidden attribute specified.

- a abbr address article aside audio (if the controls attribute is present) b bdi bdo blockquote button canvas cite code data dfn div dl (if the element's children include at least one name-value group) em embed fieldset figure footer form h1 h2 h3 h4 h5 h6 header i iframe img input (if the type attribute is not in the hidden state) ins kbd keygen label main map mark math meter nav object ol (if the element's children include at least one li element) output p pre progress q ruby s samp section select small span strong sub sup svg table textarea time u ul (if the element's children include at least one li element) var video text that is not inter-element whitespace



Script-supporting Elements

- Script-supporting elements are those that do not represent anything themselves (i.e. they are not rendered), but are used to support scripts, e.g. to provide functionality for the user.
- script template



Transparent content models

- Some elements are described as transparent. The content model of a transparent element is derived from the content model of its parent element: the elements required in the part of the content model that is "transparent" are the same elements as required in the part of the content model of the parent of the transparent element in which the transparent element finds itself.

- For instance, an ins element inside a ruby element cannot contain an rt element, because the part of the ruby element's content model that allows ins elements is the part that allows phrasing content, and the rt element is not phrasing content.

HTML Attributes

- Attribute/value pairs appear before the final ">" of an element's start tag.
- Any number of (legal) attribute value pairs, separated by spaces, may appear in an element's start tag.
- Attributes may appear in any order.
- The attribute value can remain unquoted if it does not contain space characters or any of " ' ` = < or >. Otherwise, it must be delimited using either double quotation marks (ASCII decimal 34) or single quotation marks (ASCII decimal 39)

Attributes

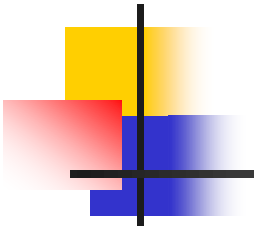
- Example

This is a link

HTML links are defined with the <a> tag.

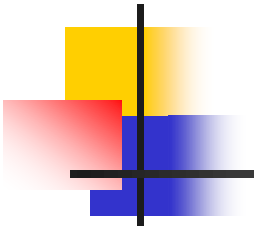
The link address is provided as an attribute

- Attribute names are always case-insensitive.
- Attribute values are generally case-insensitive.



Attributes

- Attribute values may only contain:
  - letters (a-z and A-Z),
  - digits (0-9),
  - hyphens (ASCII decimal 45),
  - periods (ASCII decimal 46),
  - underscores (ASCII decimal 95),
  - colons (ASCII decimal 58).
- The W3C recommends lowercase attributes/attribute values



Global Attributes

- Global Attributes
  - May be specificed on all the HTML elements
    - core attributes
    - event-handler attributes
    - xml attributes

Global Attributes

- Core Attributes
  - accesskey: specifies a shortcut key to activate/focus an element
  - class: Specifies one or more classnames for an element (refers to a class in a style sheet)
  - contenteditable: Specifies whether the content of an element is editable or not
  - dir: Specifies the text direction for the content in an element
  - draggable: Specifies whether an element is draggable or not
  - dropzone: Specifies whether the dragged data is copied, moved, or linked, when dropped (not implemented in the browsers)

Global Attributes

- Core Attributes
  - hidden: Specifies that an element is not yet, or is no longer, relevant
  - id: Specifies a unique id for an element
  - lang: Specifies the language of the element's content
  - spellcheck: Specifies whether the element represents an element whose contents are subject to spell checking and grammar checking.
  - style: Specifies an inline CSS style for an element
  - tabindex: Specifies the tabbing order of an element
  - title: Specifies extra information about an element
  - translate: specifies whether the content of an element should be translated or not (not properly supported in any of the major browsers)

Global Attributes

- Event-handler Attributes

  An event handler content attribute is a content attribute for a specific event handler. The name of the content attribute is the same as the name of the event handler.

  Some common events attributes are

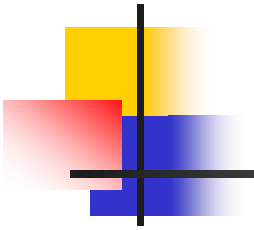
  - onabort - Load of element was aborted by the user.
  - onblur - Element lost focus.
  - onchange - User committed a change to the value of element (form control).
  - onclick - User pressed pointer button down and released pointer button over element
  - ondblclick - User clicked pointer button twice over element
  - ondrag - User is continuing to drag element.

Global Attributes

- Event-handler Attributes (continued)
  - ondragend - User ended dragging element.
  - ondragenter - User's drag operation entered element.
  - ondragleave - User's drag operation left element.
  - ondragover - User is continuing drag operation over element.
  - ondragstart - User started dragging element.
  - onerror - element failed to load properly.
  - onfocus - element received focus.
  - oninput - user changed the value of element (form control).
  - oninvalid - element (form control) did not meet validity constraints.
  - onkeydown - user pressed down a key.

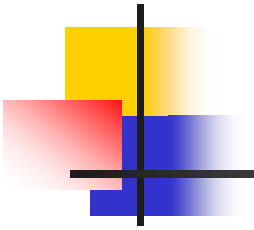
Global Attributes

- Event-handler Attributes (continued)
  - onkeypress - User pressed down a key that is associated with a character value.
  - onkeyup - User released a key.
  - onLoad - Element finished loading.
  - onmousedown - User pressed down pointer button over element.
  - onmousemove - User moved mouse.
  - onmouseout - User moved pointer off boundaries of element.
  - onmouseover - User moved pointer into boundaries of element or one of its descendant elements.
  - onmouseup - User released pointer button over element.



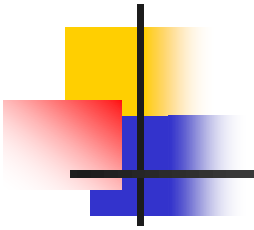
Global Attributes

- Event-handler Attributes (continued)
  - onmousewheel - User rotated wheel of mouse or other device in a manner that emulates such an action.
  - onreset - the form element was reset.
  - onscroll - Element or document view was scrolled.
  - onselect – User selected some text.
  - onsubmit – The form element was submitted.
- Other event-handler attributes can be found in the HTML5 specification.



Character references

- *Character references* are a form of markup for representing single individual characters. There are three types of character references:
  - named character references
  - decimal numeric character references
  - hexadecimal numeric character references



Character references

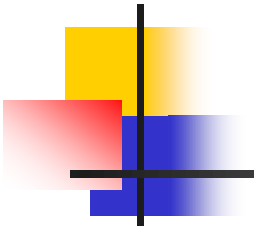
- Named character references
  - an "&" character.
  - one of the names listed in the “Named character references” section of the HTML5 specification [HTML5], using the same case.
  - a ";" character.
- Example:
  - † for the character +;

Character references

- Decimal Numeric Character Reference
  - an "&" character.
  - a "#" character.
  - one or more digits in the range 0–9, representing a base-ten integer that itself is a Unicode code point that is not U+0000, U+000D, in the range U+0080–U+009F, or in the range 0xD8000–0xDFFF (surrogates).
  - a ";" character.
- Example:
  - † for the character +;

Character references

- Hexadecimal Numeric Character Reference
  - an "&" character.
  - a "#" character.
  - either a "x" character or a "X" character.
  - one or more digits in the range 0–9, a–f, and A–F, representing a base-sixteen integer that itself is a Unicode code point that is not U+0000, U+000D, in the range U+0080–U+009F, or in the range 0xD800–0xDFFF (surrogates).
  - a ";" character.
- Example:
  - † for the character +;

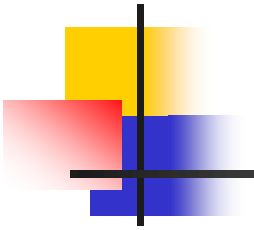


Comments

- HTML comments have the following syntax:

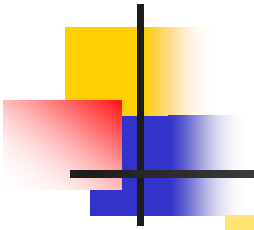
```
<!-- this is a comment -->
<!-- and so is this one,
which occupies more than one line -->
```

- The text part of comments has the following restrictions:
  - must not start with a ">" character
  - must not start with the string "->"
  - must not contain the string "--"
  - must not end with a "-" character



Authoring HTML documents

- Separate structure and presentation
  - reduces the cost of serving a wide range of platforms, media, etc., and facilitates document revisions.
- Consider universal accessibility to the Web
  - authors should consider how their documents may be rendered on a variety of platforms
  - in order for documents to be interpreted correctly, authors should include in their documents information about the natural language and direction of the text, how the document is encoded, and other issues related to internationalization.
- Help browsers with incremental rendering
  - Allows browsers to render documents more quickly. For instance, to design tables for incremental rendering



The Elements of HTML

HTML 5.0 Document Structure

```
<!DOCTYPE html>
<html lang="en">
  <head>
   <meta charset="utf-8">
    <title> My first HTML document </title>
  </head>
  <body>
    <p> Hello world! </p>
  </body>
</html>
```

Root element
HTML Element

4.1.1 The `html` element

Categories:

None.

Contexts in which this element can be used:

As the root element of a document.

Wherever a subdocument fragment is allowed in a compound document.

Content model:

A `head` element followed by a `body` element.

Content attributes:

Global attributes

`manifest` — Application cache manifest

Tag omission in text/html:

An `html` element's start tag can be omitted if the first thing inside the `html` element is not a comment.

An `html` element's end tag can be omitted if the `html` element is not immediately followed by a comment.

Allowed ARIA role attribute values:

none

Allowed ARIA state and property attributes:

Global aria-* attributes

DOM interface:

IDL

```
interface HTMLHtmlElement : HTMLElement {};
```

Root element
HTML Element

- Cache Manifest basic:
  - HTML5 introduces application cache, which means that a web application is cached, and accessible without an internet connection.

    <html manifest="demo.appcache">
  - The manifest file is a simple text file, which tells the browser what to cache (and what to never cache). The manifest file has three sections:
  - CACHE MANIFEST - Files listed under this header will be cached after they are downloaded for the first time
  - NETWORK - Files listed under this header require a connection to the server, and will never be cached
  - FALLBACK - Files listed under this header specifies fallback pages if a page is inaccessible

Root element
HTML Element

- Example of manifest file

CACHE MANIFEST

2012-02-21 v1.0.0

/theme.css

/logo.gif

/main.js

NETWORK:

login.asp

FALLBACK:

/html/ /offline.html

Document Metadata
Head Element

- The head element contains information about the current document, such as its title, keywords that may be useful to search engines, and other data that is not considered document content.
- Every HTML document **must** have a title element in the head section.

```
<head>
<title>HTML course</title>
</head>
```

Document Metadata
Title

- Use the title element to identify the contents of a document.
- Since users often consult documents out of context, authors should provide context-rich titles. Thus, instead of a title such as “A study", authors should supply a title such as “A study of population dynamics" instead.
- User agents must always make the content of the title element available to users
- Titles may contain character entities (for accented characters, special characters, etc.), but may not contain other markup (including comments).

Document Metadata
Meta Data

- Meta Data -- information about a document

```
<head>
<meta charset="utf-8">
<meta name="author" content="Hege Refsnes">
<meta name="description" content="Free Web tutorials">
<meta name="generator" content="Notepad++">
<meta name="keywords" content="HTML,CSS,XML,JavaScript">
<title>HTML5 Example</title>
</head>
```

- Possible values for name: application-name, author, description, generator, keywords

Document Metadata
Meta Data

- The http-equiv attribute integrates an HTTP header with the information in the content attribute.
- The value of the http-equiv attribute depends on the value of the content attribute.

```
<meta http-equiv="Refresh" content="10">
```

Defines a time interval for the document to refresh itself

Document Metadata
Meta Data

- When several meta elements provide language-dependent information, search engines may filter on the lang attribute to display search results using the language preferences of the user.

```
<!-- For speakers of US English -->
<meta name="keywords" lang="en-us"
content="vacation, Greece, sunshine">
<!-- For speakers of British English -->
<meta name="keywords" lang="en"
content="holiday, Greece, sunshine">
<!-- For speakers of French -->
<meta name="keywords" lang="fr"
content="vacances, Gr&egrave;ce, soleil">
```

Document Metadata
Base element

- The base element allows authors to specify the document base URL for the purposes of resolving relative URLs, and the name of the default browsing context for the purposes of following hyperlinks. The element does not represent any content beyond this information.

```
<!DOCTYPE html>
<html>  <head>
     <meta charset="utf-8">
      <title>This is an example for the &lt;base&gt; element</title>
      <base href="http://www.example.com/news/index.html">
   </head>
   <body>
      <p>Visit the <a href="archives.html">archives</a>.</p>
   </body>
</html>
```

The link in the above example would be a link to "http://www.example.com/news/archives.html".

Document Metadata
Link element

- The link element allows authors to link their document to other resources.
- A link element must have a rel attribute. Possible values for rel are “alternate”, “author”, “help”, …, “licence”, “stylesheet”,…

```
<link rel="author license" href="/about">
<link rel=alternate href="/en/html" hreflang=en type=text/html title="English HTML">
<link rel=alternate href="/fr/html" hreflang=fr type=text/html title="French HTML">
<link rel=alternate href="/en/html/print" hreflang=en type=text/html media=print title="English HTML (for printing)">
<link rel=alternate href="/fr/html/print" hreflang=fr type=text/html media=print title="French HTML (for printing)">
<link rel=alternate href="/en/pdf" hreflang=en type=application/pdf title="English PDF">
<link rel=alternate href="/fr/pdf" hreflang=fr type=application/pdf title="French PDF">
```

Document Metadata
Style element

- The style element allows authors to embed style information in their documents. The style element is one of several inputs to the styling processing model. The element does not represent content for the user.
- The type attribute gives the styling language.
- The media attribute says which media the styles apply to. If the media attribute is omitted, is "all", meaning that by default styles apply to all media.

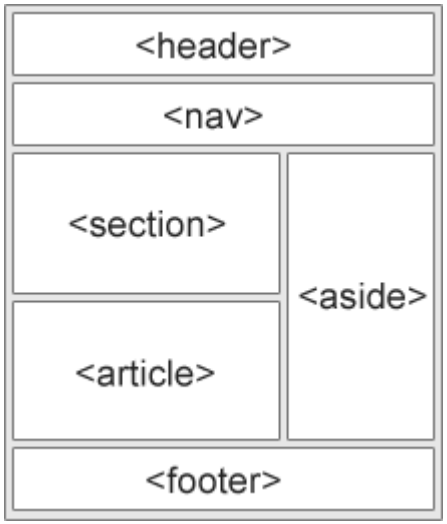
```
<html lang="en-US">
 <head>
  <title>My favorite book</title>
  <style>
   body { color: black; background: white; }
   em { font-style: normal; color: red; }
  </style>
 </head>
```

Sections
Body Element

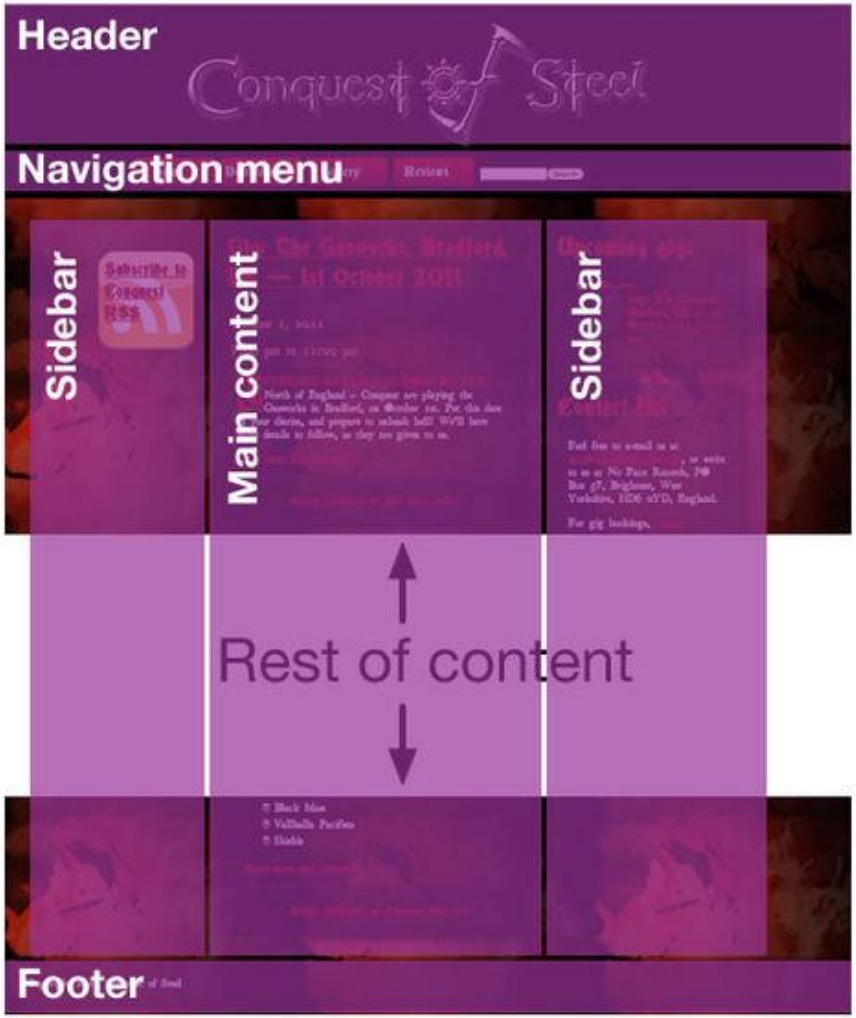
- The body of a document contains the document's content.
- There is only one body element
- The onblur, onerror, onfocus, onload, onresize, and onscroll event handlers of the Window object, exposed on the body element, replace the generic event handlers with the same names normally supported by HTML elements

Sections
Semantic and non-semantic elements

- A semantic element clearly describes its meaning to both the browser and the developer.
- Examples of non-semantic elements: and - Tells nothing about its content.
- Examples of semantic elements: <form>, <table>, and <img> - Clearly defines its content.

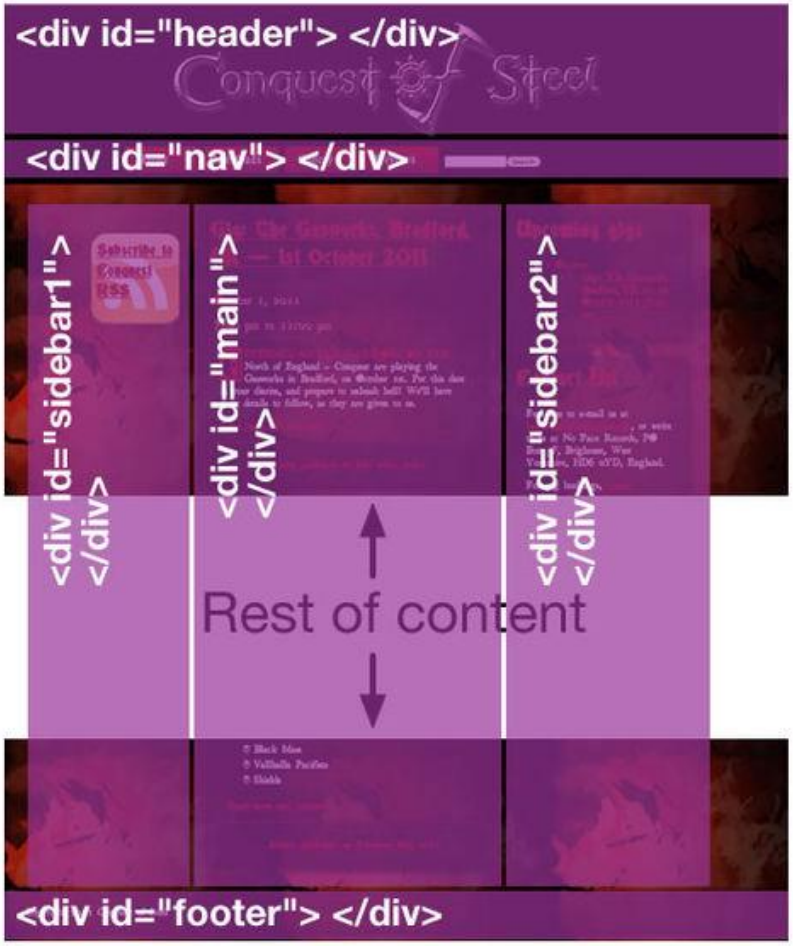


Sections
Document Organization

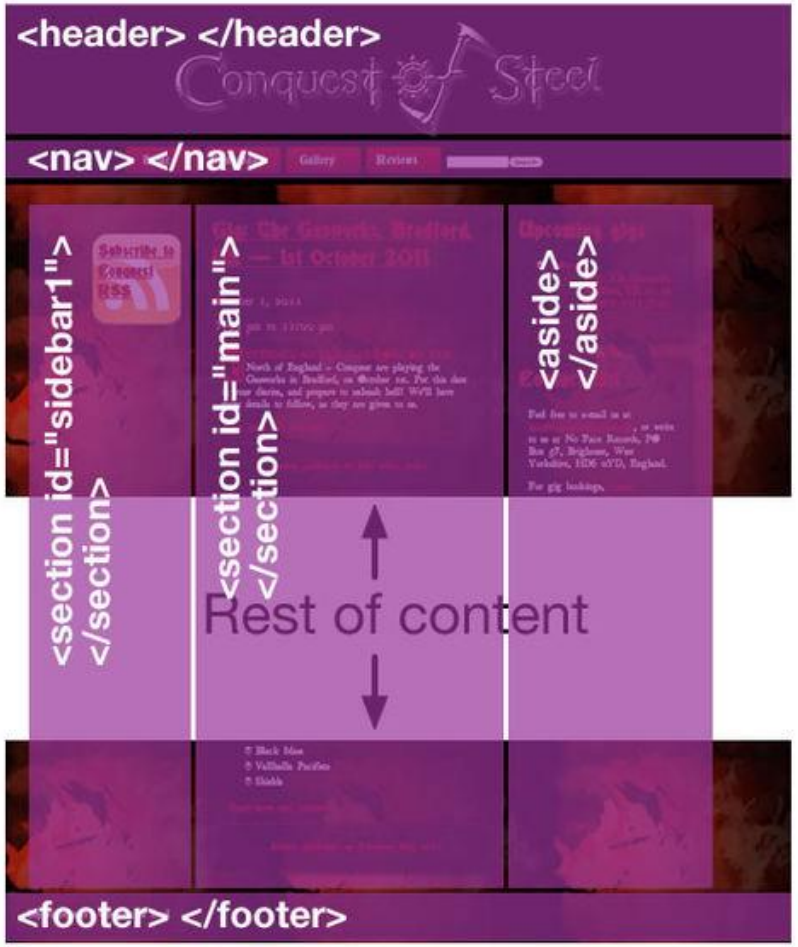


Sections
Document Organization

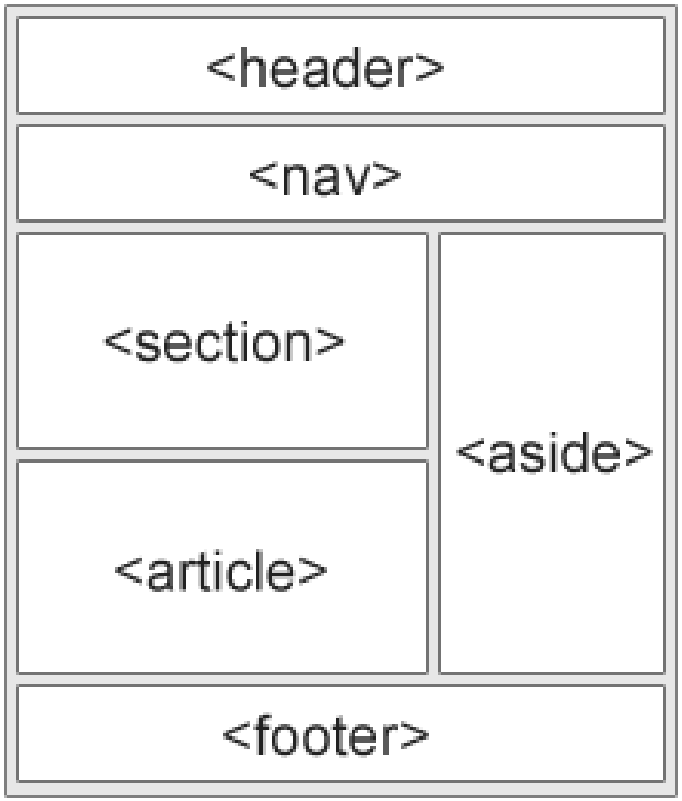
HTML 4



HTML 5



Sections
Document Organization

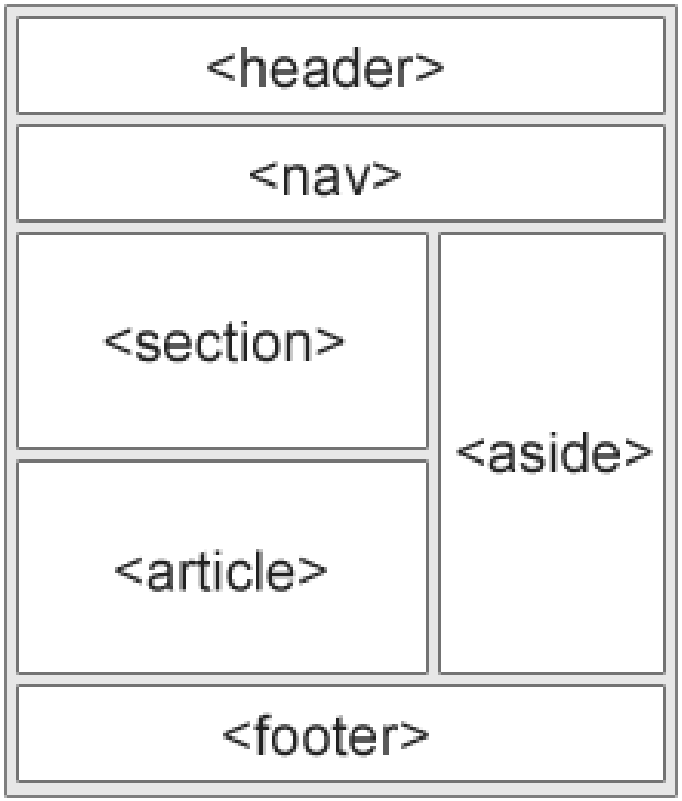


Header Element

- The header element represents introductory content for its nearest ancestor sectioning content or sectioning root element. A header typically contains a group of introductory or navigational aids.
- When the nearest ancestor sectioning content or sectioning root element is the body element, then it applies to the whole page.
- The header element is not sectioning content; it doesn't introduce a new section.

```
<header>
  <!-- header content goes in here -->
</header>
```

Sections
Document Organization

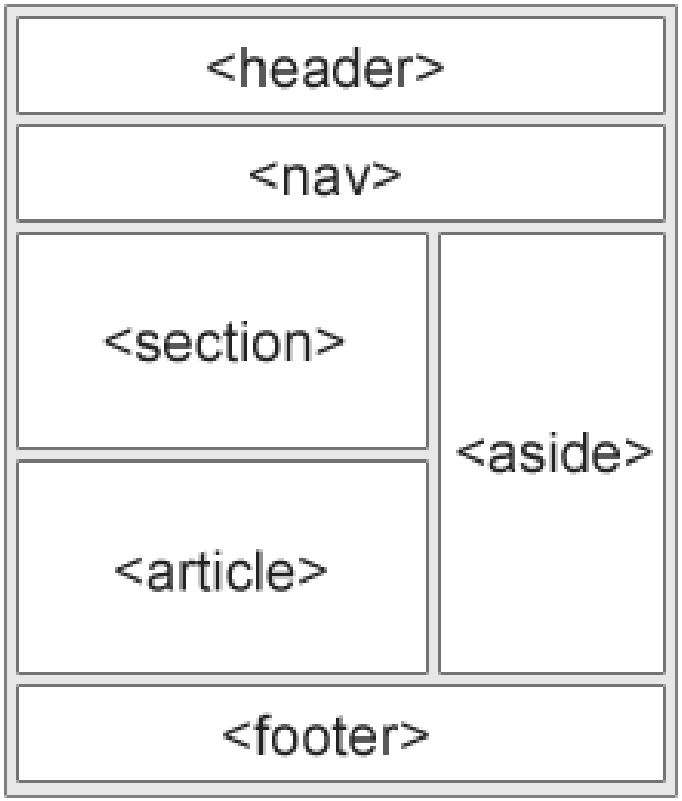


Nav Element

- The nav element represents a section of a page that links to other pages or to parts within the page: a section with navigation links.
- When the nearest ancestor sectioning content or sectioning root element is the body element, then it applies to the whole page.
- The header element is not sectioning content; it doesn't introduce a new section.

```
<nav>
    <!-- navigation menu goes in here -->
</nav>
```

Sections
Document Organization

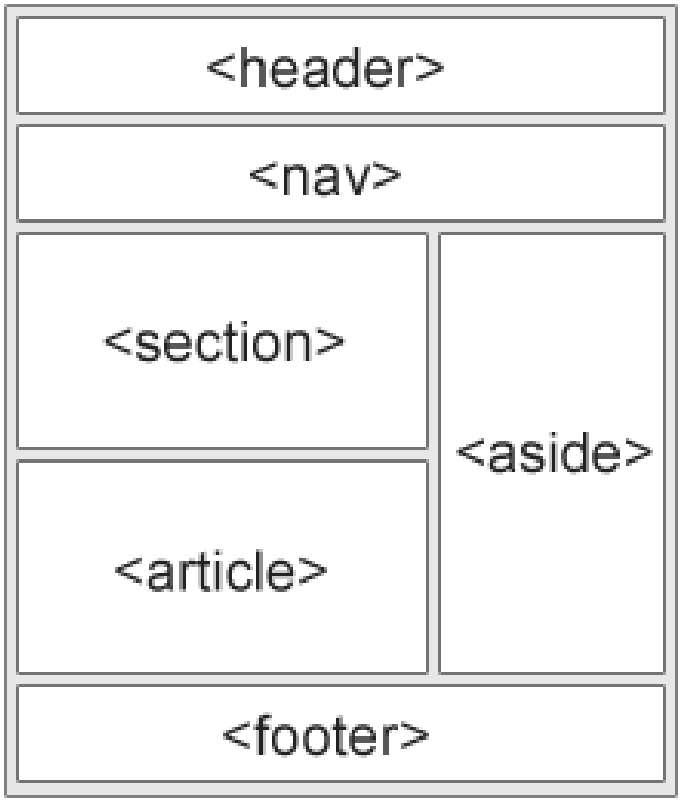


Section Element

- The section element represents a generic section of a document or application.
- A section, in this context, is a thematic grouping of content. The theme of each section should be identified, typically by including a heading (h1-h6 element) as a child of the section element.
- Examples of sections would be chapters, the various tabbed pages in a tabbed dialog box, or the numbered sections of a thesis.

```
<section id="sidebar1">
    <!-- sidebar content goes in here -->
</section>
```

Sections
Document Organization

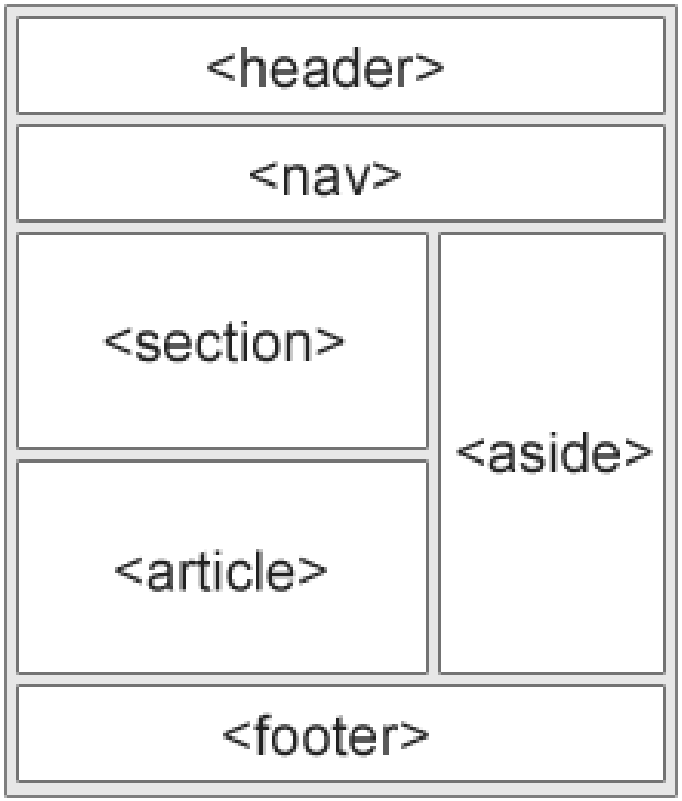


Article Element

- The article element represents a complete, or self-contained, composition in a document, page, application, or site and that is, in principle, independently distributable or reusable, e.g. in syndication.
  - This could be a forum post, a magazine or newspaper article, a blog entry, a user-submitted comment, an interactive widget or gadget, or any other independent item of content.
- When article elements are nested, the inner article elements represent articles that are related to the contents of the outer article.

```
<article>
  <!-- article content goes in here -->
</article>
```

Sections
Document Organization

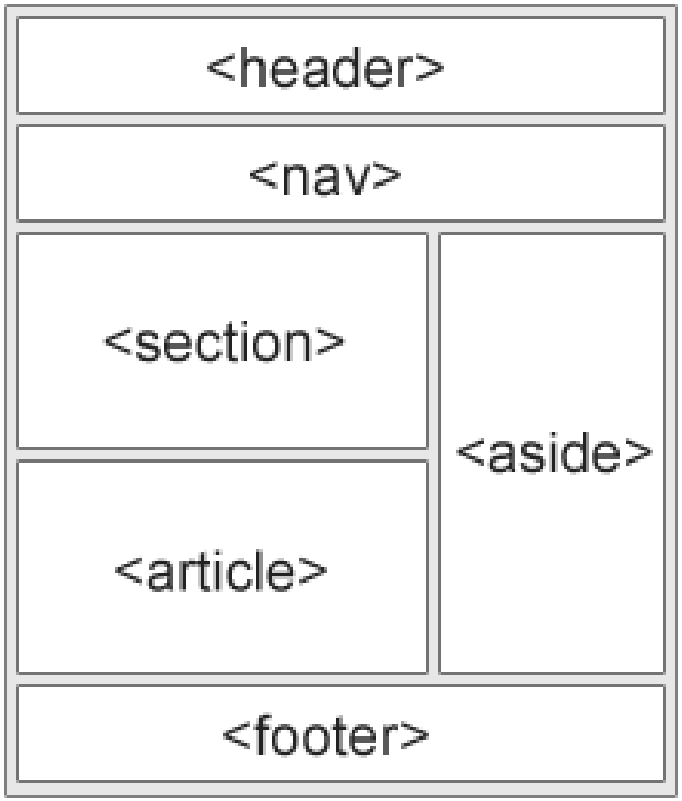


Aside Element

- The aside element represents a section of a page that consists of content that is tangentially related to the content around the aside element, and which could be considered separate from that content. Such sections are often represented as sidebars in printed typography.
- The element can be used for typographical effects like pull quotes or sidebars, for advertising, for groups of nav elements, and for other content that is considered separate from the main content of the page.

```
<aside>
  <!-- article content goes in here -->
</aside>
```

Sections
Document Organization



Footer Element

- Represents a footer for its nearest ancestor sectioning content or sectioning root element.
  - contains information about its section such as who wrote it, links to related documents, copyright data, and the like.
- When the footer element contains entire sections, they represent appendices, indexes, long colophons, verbose license agreements, and other such content.
  - Contact information for the author or editor of a section belongs in an address element, possibly itself inside a footer.

```
<footer>
  <!-- article content goes in here -->
</footer>
```

Sections
Document Organization

Heading Elements

- A heading element briefly describes the topic of the section it introduces. Heading information may be used by user agents, for example, to construct a table of contents for a document automatically.
- There are six levels of headings in HTML with h1 as the most important and h6 as the least.
- Use HTML headings for headings only. Don't use headings to make text BIG or bold.
- Search engines use your headings to index the structure and content of your web pages. Since users may skim your pages by its headings, it is important to use headings to show the document structure.
- h1 headings should be used as main headings, followed by h2 headings, then less important h3 headings, and so on.

```
<h1>This is a heading 1</h1>
```

Sections
Document Organization

Address Element

- The address element represents the contact information for its nearest article or body element ancestor. If that is the body element, then the contact information applies to the document as a whole.
- The address element must not be used to represent arbitrary addresses (e.g. postal addresses), unless those addresses are in fact the relevant contact information.
- Typically, the address element would be included along with other information in a footer element.

```
<address>
  For more details, contact
  <a href="mailto:js@example.com">John Smith</a>.
</address>
```

Sections Example

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <title>HTML5</title>
 </head>
<body>
  <header>
    <h1>Header</h1>
    <h2>Subtitle</h2>
    <h4>HTML5 Rocks!</h4>
  </header>
```

Sections Example

```
<div id="container">
    <nav>
      <h3>Nav</h3>
      <a href="">Link 1</a>
      <a href="">Link 2</a>
      <a href="">Link 3</a>
    </nav>

    <section>
      <article>
        <header>
          <h1>Article Header</h1>
        </header>
```

Sections Example

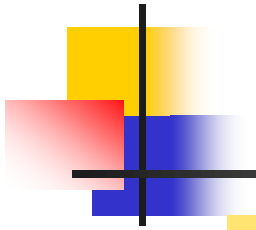
```
    <p>HTML5: "Lorem ipsum dolor nunc aut nunquam sit amet,
    consectetur adipiscing elit. Vivamus at est eros, vel fringilla urna.
    Pellentesque odio</p>
    <footer>
      <h2>Article Footer</h2>
    </footer>
  </article>
</section>

<aside>
  <h3>Aside</h3>
  <p>HTML5: "Lorem ipsum dolor nunc aut nunquam sit amet,
  consectetur adipiscing elit. Vivamus at est eros, vel fringilla urna.
  Pellentesque odio rhoncus</p>
</aside>
```

Sections Example

```
        <footer>
            <h2>Footer</h2>
              <address>
              For more details, contact  <a id="mail"
                        href="mailto:js@example.com">John Smith</a>.
              </address>
              <p><small>© copyright 2014 Example Corp.</small></p>
         </footer>
      </div>
</body>

</html>
```

Sections
Example with Styles

```
<!DOCTYPE html>
<html>
<head>
 <meta charset="utf-8" />
 <title>HTML5</title>
<link rel="stylesheet" href="html5.css">

 </head>
  <body>
  <header>
   <h1>Header</h1>
   <h2>Subtitle</h2>
   <h4>HTML5 Rocks!</h4>
  </header>
```



Grouping content elements

Grouping Content
Element p

- The p element represents a paragraph.
- The p element should not be used when a more specific element is more appropriate.

```
<section>
 <!-- ... -->
 <p>Last modified: 2001-04-23</p>
 <p>Author: fred@example.com</p>
</section>
```

Technically correct, but not appropriate

```
<section>
 <!-- ... -->
 <footer>Last modified: 2001-04-23</footer>
 <address>Author: fred@example.com</address>
</section>
```

Better

Grouping Content
Element hr

- The hr element represents a paragraph-level thematic break, e.g. a scene change in a story, or a transition to another topic within a section of a reference book
- There is no need for an hr element between the sections themselves, since the section elements and the h1 elements imply thematic changes themselves.

Grouping Content
Element pre

- The pre element represents a block of preformatted text, in which structure is represented by typographic conventions rather than by elements.
- Some examples of cases where the pre element could be used:
  - Including an e-mail, with paragraphs indicated by blank lines, lists indicated by lines prefixed with a bullet, and so on.
  - Including fragments of computer code, with structure indicated according to the conventions of that language.
  - Displaying ASCII art.

```
<p>This is the <code>Panel</code> constructor:</p>
<pre><code>function Panel(element, canClose, closeHandler) {
  this.element = element;
  this.canClose = canClose;
  this.closeHandler = function () { if (closeHandler) closeHandler() };
}</code></pre>
```

Grouping Content
Element blockquote

- The blockquote element represents content that is quoted from another source, optionally with a citation which must be within a footer or cite element, and optionally with in-line changes such as annotations and abbreviations.

```
<blockquote>
 The people recognize themselves in their commodities; they find their
 soul in their automobile, hi-fi set, split-level home, kitchen equipment.
 — <cite><a href="http://en.wikipedia.org/wiki/Herbert_Marcuse">Herbert
Marcuse</a></cite>
 </blockquote>
```

Grouping Content
Element figure

- The figure element represents some flow content, optionally with a caption, that is self-contained (like a complete sentence) and is typically referenced as a single unit from the main flow of the document.
- The element can thus be used to annotate illustrations, diagrams, photos, code listings, etc.
- The first figcaption element child of the element, if any, represents the caption of the figure element's contents. If there is no child figcaption element, then there is no caption.
- A figure element's contents are part of the surrounding flow. If the purpose of the page is to display the figure, for example a photograph on an image sharing site, the figure and figcaption elements can be used to explicitly provide a caption for that figure.

Grouping Content
Element figure

Some uses

```
<figure>
 <p>'Twas brillig, and the slithy toves<br>
 Did gyre and gimble in the wabe;<br>
 All mimsy were the borogoves,<br>
 And the mome raths outgrabe.</p>
 <figcaption><cite>Jabberwocky</cite> (first verse). Lewis Carroll, 1832-98</figcaption>
</figure>
```

```
<figure>
  <figcaption>Oil-based paint on canvas. Maria Towle, 1858.</figcaption>
  <img src="castle1858.jpeg" alt="The castle now has two towers and two walls.">
 </figure>
```

Grouping Content
Element div

- The div element has no special meaning at all. It represents its children. It can be used with the class, lang, and title attributes to mark up semantics common to a group of consecutive elements.
- Example: div used to set the language of two paragraphs at once

```
<div lang="en-GB">
  <p>My other cat, coloured black and white, is a sweetie. He followed
  us to the pool today, walking down the pavement with us. Yesterday
  he apparently visited our neighbours. I wonder if he recognises that
  their flat is a mirror image of ours.</p>
  <p>Hm, I just noticed that in the last paragraph I used British
  English. But I'm supposed to write in American English. So I
  shouldn't say "pavement" or "flat" or "colour"...</p>
 </div>
```

Grouping Content
Element main

- The main element represents the main content of the body of a document or application. The main content area consists of content that is directly related to or expands upon the central topic of a document or central functionality of an application.
- The main content area of a document includes content that is unique to that document and excludes content that is repeated across a set of documents such as site navigation links, copyright information, site logos and banners and search forms (unless the document or applications main function is that of a search form).
- Authors must not include more than one main element in a document.

```
<main>
  <h1>Skateboards</h1>
  <p>The skateboard is the way cool kids get around</p>
  <article>  </article>
  <article>  </article>
</main>
```

Grouping Content
Unordered Lists

- HTML supports ordered, unordered and definition lists.
- **Unordered lists**
  - An unordered list starts with the <ul> tag.
  - Each list item starts with the <li> tag.
  - The list items are marked with bullets (typically small black circles).

```
<p>I have lived in the following countries:</p>
<ul>
 <li>Norway
 <li>Switzerland
 <li>United Kingdom
 <li>United States
</ul>
```

Grouping Content
Ordered Lists

- **Ordered lists**
  - An ordered list starts with the <ol> tag.
  - Each list item starts with the <li> tag.
  - The list items are marked with numbers.

The li element has an ordinal value.

The value attribute, if present, must be a valid integer giving the ordinal value of the list item. If the attribute's value cannot be converted to a number, the attribute must be treated as if it was absent. The attribute has no default value.

Grouping Content
Ordered Lists

- **Ordered lists**
  - The ol element has three specific attributes
    - reversed – number the list backwards
    - start – ordinal value of the first item
    - type – kind of list marker

The type attribute represents the state given in the cell in the second column of the row whose first cell matches the attribute's value; if none of the cells match, or if the attribute is omitted, then the attribute represents the decimal state

Keywords	State	Description
1 (U+0031)	decimal	Decimal numbers
a (U+0061)	lower-alpha	Lowercase latin alphabet
A (U+0041)	upper-alpha	uppercase latin alphabet
i (U+0069)	lower-roman	lowercase roman numerals
I (U+0049)	upper-roman	uppercase roman numerals

Grouping Content
Ordered Lists

- **Ordered lists** (example 1)

```
<figure>  <figcaption>The top 10 movies of all time</figcaption>
 <ol>
  <li value="10"><cite>Josie and the Pussycats</cite>, 2001</li>
  <li value="9"><cite lang="sh">Црна мачка, бели мачор</cite>,
1998</li>
  <li value="8"><cite>A Bug's Life</cite>, 1998</li>
  <li value="7"><cite>Toy Story</cite>, 1995</li>
  <li value="6"><cite>Monsters, Inc</cite>, 2001</li>
  <li value="5"><cite>Cars</cite>, 2006</li>
  <li value="4"><cite>Toy Story 2</cite>, 1999</li>
  <li value="3"><cite>Finding Nemo</cite>, 2003</li>
  <li value="2"><cite>The Incredibles</cite>, 2004</li>
  <li value="1"><cite>Ratatouille</cite>, 2007</li>
 </ol> </figure>
```

Grouping Content
Ordered Lists

- **Ordered lists** (example 2)

```
<figure>  <figcaption>The top 10 movies of all time</figcaption>
 <ol reversed type="a">
  <li><cite>Josie and the Pussycats</cite>, 2001</li>
  <li><cite lang="sh">Црна мачка, бели мачор</cite>, 1998</li>
  <li><cite>A Bug's Life</cite>, 1998</li>
  <li><cite>Toy Story</cite>, 1995</li>
  <li><cite>Monsters, Inc</cite>, 2001</li>
  <li><cite>Cars</cite>, 2006</li>
  <li><cite>Toy Story 2</cite>, 1999</li>
  <li><cite>Finding Nemo</cite>, 2003</li>
  <li><cite>The Incredibles</cite>, 2004</li>
  <li><cite>Ratatouille</cite>, 2007</li>
</ol></figure>
```

Grouping Content
Ordered Lists

- **Ordered lists** (example 2)

```
<figure>  <figcaption>The top 10 movies of all time</figcaption>
 <ol reversed type="a" start="10">
  <li><cite>Josie and the Pussycats</cite>, 2001</li>
  <li><cite lang="sh">Црна мачка, бели мачор</cite>, 1998</li>
  <li><cite>A Bug's Life</cite>, 1998</li>
  <li><cite>Toy Story</cite>, 1995</li>
  <li><cite>Monsters, Inc</cite>, 2001</li>
  <li><cite>Cars</cite>, 2006</li>
  <li><cite>Toy Story 2</cite>, 1999</li>
  <li><cite>Finding Nemo</cite>, 2003</li>
  <li><cite>The Incredibles</cite>, 2004</li>
  <li><cite>Ratatouille</cite>, 2007</li>
</ol></figure>
```

Grouping Content
Definition Lists

- **Definition lists**
  - Lists of items (terms), with a description of each item (term).
  - A definition list starts with a <dl> tag (definition list).
  - Each term starts with a <dt> tag (definition term).
  - Each description starts with a <dd> tag (definition description).

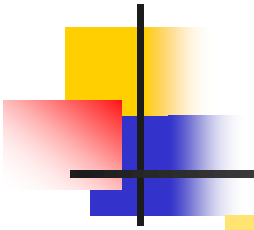
Name-value groups may be terms and definitions, metadata topics and values, questions and answers, or any other groups of name-value data.

The values within a group are alternatives; multiple paragraphs forming part of the same value must all be given within the same dd element.

Grouping Content
Definition Lists

- **Definition lists** (Example)

```
<dl>
 <dt lang="en-US"> <dfn>color</dfn> </dt>
 <dt lang="en-GB"> <dfn>colour</dfn> </dt>
 <dd> A sensation which (in humans) derives from the ability
of the fine structure of the eye to distinguish three differently
 filtered analyses of a view. </dd>
</dl>
```



Text-level semantics

Text-level semantics
Element a

- If the a element has an href attribute, then it represents a hyperlink (a hypertext anchor) labeled by its contents.
- If the a element has no href attribute, then the element represents a placeholder for where a link might otherwise have been placed, if it had been relevant, consisting of just the element's contents.
- Attributes
  - href - Address of the hyperlink
  - target - Default browsing context for hyperlink navigation and form submission
  - download - Whether to download the resource instead of navigating to it, and its file name if so
  - rel - Relationship between the document containing the hyperlink and the destination resource
  - hreflang - Language of the linked resource
  - type - Hint for the type of the referenced resource

Text-level semantics (Target)

Keyword	Ordinary effect	Effect in an iframe with...	
		sandbox=""	sandbox="allow-top-navigation"
none specified, for links and form submissions	current	current	current
empty string	current	current	current
_blank	new	maybe new	maybe new
_self	current	current	current
_parent if there isn't a parent	current	current	current
_parent if parent is also top	parent/top	none	parent/top
_parent if there is one and it's not top	parent	none	none
_top if top is current	current	current	current
_top if top is not current	top	none	top
name that doesn't exist	new	maybe new	maybe new
name that exists and is a descendant	specified descendant	specified descendant	specified descendant
name that exists and is current	current	current	current
name that exists and is an ancestor that is top	specified ancestor	none	specified ancestor/top
name that exists and is an ancestor that is not top	specified ancestor	none	none
other name that exists with common top	specified	none	none
name that exists with different top, if familiar and one permitted sandboxed navigator	specified	specified	specified
name that exists with different top, if familiar but not one permitted sandboxed navigator	specified	none	none
name that exists with different top, not familiar	new	maybe new	maybe new

Text-level semantics

Element a

Link type	Effect on...		Brief description
	link	a and area	
alternate	Hyperlink	Hyperlink	Gives alternate representations of the current document.
author	Hyperlink	Hyperlink	Gives a link to the author of the current document or artic Remove developer-view styles
bookmark	*not allowed*	Hyperlink	Gives the permalink for the nearest ancestor section.
help	Hyperlink	Hyperlink	Provides a link to context-sensitive help.
icon	External Resource	*not allowed*	Imports an icon to represent the current document.
license	Hyperlink	Hyperlink	Indicates that the main content of the current document is covered by the copyright license described by the referenced document.
next	Hyperlink	Hyperlink	Indicates that the current document is a part of a series, and that the next document in the series is the referenced document.
nofollow	*not allowed*	Annotation	Indicates that the current document's original author or publisher does not endorse the referenced document.
noreferrer	*not allowed*	Annotation	Requires that the user agent not send an HTTP `Referer` (sic) header if the user follows the hyperlink.
prefetch	External Resource	External Resource	Specifies that the target resource should be preemptively cached.
prev	Hyperlink	Hyperlink	Indicates that the current document is a part of a series, and that the previous document in the series is the referenced document.
search	Hyperlink	Hyperlink	Gives a link to a resource that can be used to search through the current document and its related pages.
stylesheet	External Resource	*not allowed*	Imports a stylesheet.
tag	*not allowed*	Hyperlink	Gives a tag (identified by the given address) that applies to the current document.

Text-level semantics
Element a

- Example

```
<nav>
 <ul>
  <li> <a href="http://www.unipi.it" target="_blank">New</a> </li>
  <li> <a href="http://www.unipi.it" target="_self">Self</a> </li>
  <li> <a href="http://www.unipi.it" target="top" rel="tag">Top</a> </li>
 </ul>
</nav>
```

Text-level semantics
Elements em, strong, small

- The em element represents stress emphasis of its contents.
- The strong element represents strong importance, seriousness, or urgency (contents that the user needs to see sooner than other parts of the document) for its contents.
- The small element represents side comments such as small print.

Example

Example Corp today announced record profits for the second quarter <small>(Full Disclosure: Foo News is a subsidiary of Example Corp)</small>, leading to speculation about a third quarter merger with Demo Group .

Text-level semantics
Elements s and cite

- The s element represents contents that are no longer accurate or no longer relevant.

```
<p>Buy our Iced Tea and Lemonade!</p>
<p><s>Recommended retail price: $3.99 per bottle</s></p>
<p><strong>Now selling for just $2.99 a
bottle!</strong></p>
```

- The cite element represents a reference to a creative work. It must include the title of the work or the name of the author(person, people or organization) or an URL reference, which may be in an abbreviated form as per the conventions used for the addition of citation metadata.

```
<p>In the words of <cite>Charles Bukowski</cite> -
```

Text-level semantics
Element q

- The q element represents some phrasing content quoted from another source.

```
<p>The W3C page <cite>About W3C</cite> says the W3C's mission is <q cite="http://www.w3.org/Consortium/">To lead the World Wide Web to its full potential by developing protocols and guidelines that ensure long-term growth for the Web</q>. I disagree with this mission.</p>
```

Text-level semantics
Elements dfn and abbr

- The dfn element represents the defining instance of a term. The paragraph, description list group, or section that is the nearest ancestor of the dfn element must also contain the definition(s) for the term given by the dfn element.
- If the dfn element has a *title* attribute, then the exact value of that attribute is the term being defined.
- The abbr element represents an abbreviation or acronym, optionally with its expansion. The *title* attribute may be used to provide an expansion of the abbreviation. The attribute, if specified, must contain an expansion of the abbreviation, and nothing else.

Text-level semantics
Elements dfn and abbr

- Example

```
<p>The <dfn id=gdo><abbr title="Garage Door Opener">GDO</abbr></dfn>
is a device that allows off-world teams to open the iris.</p>
<!-- ... later in the document: -->
<p>Teal'c activated his <a href=#gdo><abbr title="Garage Door Opener">GDO</abbr></a>
and so Hammond ordered the iris to be opened.</p>
```

Text-level semantics
Elem code, var, samp, kbd, sup, sub

- The code element represents a fragment of computer code.
- The var element represents a variable.
- The samp element represents (sample) output from a program or computing system.
- The kbd element represents user input (typically keyboard input, although it may also be used to represent other input, such as voice commands).
- The sup element represents a superscript and the sub element represents a subscript.

```
<p>The coordinate of the <var>i</var>th point is
<code>(<var>x<sub><var>i</var></sub></var>,
<var>y<sub><var>i</var></sub></var>)</code>.
For example, the 10th point has coordinate
<code>(<var>x<sub>10</sub></var>,
<var>y<sub>10</sub></var>)</code>.</p>
```

Text-level semantics
Elements i, b and mark

- The i element represents a span of text in an alternate voice or mood, or otherwise offset from the normal prose in a manner indicating a different quality of text, such as a taxonomic designation, a technical term, an idiomatic phrase from another language, transliteration, a thought, or a ship name in Western texts.
- The b element represents a span of text to which attention is being drawn for utilitarian purposes without conveying any extra importance and with no implication of an alternate voice or mood, such as key words in a document abstract, product names in a review, actionable words in interactive text-driven software, or an article lede.
- The mark element represents a run of text in one document marked or highlighted for reference purposes, due to its relevance in another context.

Text-level semantics
Elements ruby, rt, rp

- The ruby element allows one or more spans of phrasing content to be marked with ruby annotations. Ruby annotations are short runs of text presented alongside base text, primarily used in East Asian typography as a guide for pronunciation or to include other annotations.
- The rt element marks the ruby text component of a ruby annotation.
- The rp element is used to provide fallback text to be shown by user agents that don't support ruby annotations.

```
<body>
 <ruby> ♥ <rp>: </rp><rt>Heart</rt><rp>.</rp></ruby>
 <ruby> ♣ <rp>: </rp><rt>Shamrock</rt><rp>.</rp></ruby>
 <ruby> ✶ <rp>: </rp><rt>Star</rt><rp>.</rp></ruby>
</body>
```

Text-level semantics
Elements bdi, bdo

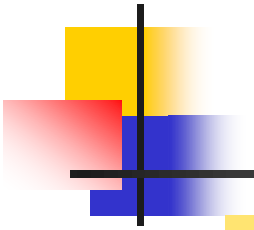
- The bdi element represents a span of text that is to be isolated from its surroundings for the purposes of bidirectional text formatting.
- The bdo element represents explicit text directionality formatting control for its children.

```
<ul>
 <li>User <bdi>jcranmer</bdi>: 12 posts.
 <li>User <bdi>hober</bdi>: 5 posts.
 <li>User <bdi>إيان</bdi>: 3 posts.
</ul>
```

Text-level semantics
Elements span, br, wbr

- The span element doesn't mean anything on its own, but can be useful when used together with the global attributes, e.g. class, lang, or dir. It represents its children.
- The br element represents a line break.
- The wbr element represents a line break opportunity.

```
<p>So then he pointed at the tiger and screamed
"there<wbr>is<wbr>no<wbr>way<wbr>you<wbr>are<wbr>ever
<wbr>going<wbr>to<wbr>catch<wbr>me"!</p>
```

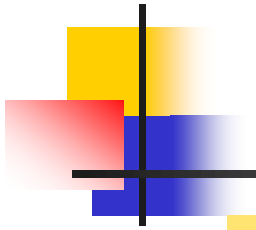


Edits

Edits
Elements ins, del

- The ins element represents an addition to the document.
- The del element represents a removal from the document.
  - The cite attribute may be used to specify the address of a document that explains the change.
  - The datetime attribute may be used to specify the time and date of the change.

```
<h1>List of <del>fruits</del><ins>colors</ins></h1>
<ul>
<li><del datetime="2009-10-10T23:38-07:00">Apple</del></li>
 <li>Orange</li>
 <li><del>Pear</del></li>
 <li><ins>Teal</ins></li>
 <li><del>Lemon</del><ins>Yellow</ins></li>
 <li><ins>Olive</ins></li>
</ul>
```



Embedded content

Embedded Content
The img element

- An img element represents an image.
- The <img> element is empty, which means that it contains attributes only and it has no closing tag.
- To display an image on a page, you need to use the src attribute. The value of the src attribute is the URL of the image you want to display on your page.
- The syntax of defining an image:

  <img src="url" alt="sample.txt">
- The browser puts the image where the image tag occurs in the document.
- Except where otherwise specified, the alt attribute must be specified and its value must not be empty; the value must be an appropriate functional replacement for the image.

Embedded Content
The img element

```
<p> <img src= "tower.jpg" width="40" height="40" alt="Tower of Pisa"> </p>
  <p> <img src= "tower.jpg" width="90"  height="90" alt="Tower of Pisa"> </p>
    <p>
      You can make an image smaller or larger by changing the values of the "height" and "width" attributes.
    </p>
```

Embedded Content
The img element

- An img is always in one of the following states:
  - Unavailable
    - The user agent has not obtained any image data.
  - Partially available
    - The user agent has obtained some of the image data.
  - Completely available
    - The user agent has obtained all of the image data and at least the image dimensions are available.
  - Broken
    - The user agent has obtained all of the image data that it can, but it cannot even decode the image enough to get the image dimensions (e.g. the image is corrupted, or the format is not supported, or no data could be obtained).

Embedded Content
The image map

- Image maps allow authors to specify regions of an image and assign a specific action to each region (e.g., retrieve a document, run a program, etc.). When the region is activated by the user, the action is executed.
- An image map is created by associating an image with a specification of sensitive geometric areas on the image.
- The map element, in conjunction with an img element and any area element descendants, defines an image map. The element represents its children.
- The name attribute gives the map a name so that it can be referenced. The attribute must be present and must have a non-empty value with no space characters.

Embedded Content
The image map

```
<p>Click on the sun or on one of the planets to get more information:</p>
<div>
<img src="planets.gif" width="145" height="126" alt="Planets" usemap="#planetmap">
<map name="planetmap">
  <area shape="rect" coords="0,0,82,126" alt="Sun" href="sun.html">
  <area shape="circle" coords="90,58,3" alt="Mercury" href="mercur.html">
  <area shape="circle" coords="124,58,8" alt="Venus" href="venus.html">
</map>
</div>
```

Embedded Content
The image map

- The <area> tag defines an area inside an image-map (an image-map is an image with clickable areas).
- The area element is always nested inside a <map> tag
- Note: The usemap attribute in the <img> tag is associated with the map element's name attribute, and creates a relationship between the image and the map.

Embedded Content
The image map

- Area attributes

Attribute	Value	Description
alt	*text*	Specifies an alternate text for an area
coords	*coordinates*	Specifies the coordinates of an area
href	*URL*	Specifies the destination of a link in an area
download	download	hyperlink is used for downloading a resource
shape	default rect circle poly	Specifies the shape of an area
target	_blank _parent _self _top	Specifies where to open the linked page specified in the href attribute

Embedded Content
The image map

- Coords attribute

  This attribute specifies the position and shape on the screen. The number and order of values depends on the shape being defined. Possible combinations:

  - rect: left-x, top-y, right-x, bottom-y.
  - circle: center-x, center-y, radius.
  - poly: x1, y1, x2, y2, ..., xN, yN.

    The first x and y coordinate pair and the last should be the same to close the polygon. When these coordinate values are not the same, user agents should infer an additional coordinate pair to close the polygon.

Embedded Content
The iframe element

- The iframe element represents a nested browsing context.
- The src attribute gives the address of a document that the nested browsing context is to contain.
- The srcdoc attribute gives the HTML content that the nested browsing context is to contain. The value of the attribute is the source of an iframe srcdoc document.

```
<iframe srcdoc="<p>Hello world!</p>"
src="demo_iframe_srcdoc.htm"></iframe>
```

- The name attribute, if present, must be a valid browsing context name.
  - The given value is used to name the nested browsing context. When the browsing context is created, if the attribute is present, the browsing context name must be set to the value of this attribute; otherwise, the browsing context name must be set to the empty string.

Embedded Content
The iframe element

```
<body>
<iframe src="html25.html" name="iframe_a">
<p>Your browser does not support iframes.</p>
</iframe>
<a href= "html26.html" target="iframe_a">Planets</a>
<p><b>Note:</b> Because the target of the link matches the name of the iframe, the link will open in the iframe.</p>
</body>
</html>
```

Embedded Content
The iframe element

- The sandbox attribute, when specified, enables a set of extra restrictions on any content hosted by the iframe.
- The width and height attributes determine the horizontal and vertical dimensions, respectively.

```
<p>Example</p>
<iframe sandbox="allow-same-origin allow-forms allow-scripts" src=
"html26.html" width="400" height="500">
[Your user agent does not support frames or is currently configured
not to display frames.
However, you may visit <a href="foo.html">the related
document.</a>]
```

Embedded Content
The embed element

- The embed element provides an integration point for an external (typically non-HTML) application or interactive content.
- The src attribute gives the address of the resource being embedded. The attribute, if present, must contain a valid non-empty URL potentially surrounded by spaces.
- The type attribute, if present, gives the MIME type by which the plugin to instantiate is selected.

```
<embed src="vowels.swf" width="720" height="500">
```

Embedded Content
The object element

- The object element can represent an external resource, which, depending on the type of the resource, will either be treated as an image, as a nested browsing context, or as an external resource to be processed by a plugin.
- The data attribute, if present, specifies the address of the resource.
- The type attribute, if present, specifies the type of the resource. If present, the attribute must be a valid MIME type.
- The typemustmatch attribute is a boolean attribute whose presence indicates that the resource specified by the data attribute is only to be used if the value of the type attribute and the Content-Type of the aforementioned resource match.

```
<object id="vowels" type="application/x-shockwave-flash"
        data="./wowels.swf" width="720" height="500">
        <param name="movie" value="./wowels.swf">
        </object>
```

Embedded Content
The param element

- The param element defines parameters for plugins invoked by object elements. It does not represent anything on its own.
- The name attribute gives the name of the parameter.
- The value attribute gives the value of the parameter.
- Both attributes must be present. They may have any value.

Embedded Content
The video element

- A video element is used for playing videos or movies, and audio files with captions.
- The video element is a media element whose media data is ostensibly video data, possibly with associated audio data.

```
<video width="320" height="240" src="movie.mp4"
type="video/mp4" controls>
Your browser does not support the video tag.
</video>
```

Embedded Content
The video element

Attribute	Value	Description
autoplay	autoplay	Specifies that the video will start playing as soon as it is ready
controls	controls	Specifies that video controls should be displayed (such as a play/pause button etc).
height	pixels	Sets the height of the video player
loop	loop	Specifies that the video will start over again, every time it is finished
muted	muted	Specifies that the audio output of the video should be muted
poster	URL	Specifies an image to be shown while the video is downloading, or until the user hits the play button
preload	auto metadata none	Specifies if and how the author thinks the video should be loaded when the page loads. Metadata: only metadata. None: the browser should not load the video.
src	URL	Specifies the URL of the video file
width	pixels	Sets the width of the video player

Embedded Content
The source element

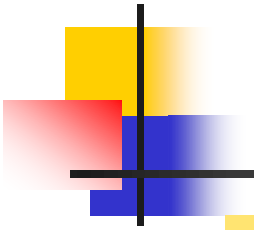
- The source element allows authors to specify multiple alternative media resources for media elements. It does not represent anything on its own.
- The src attribute gives the address of the media resource. The value must be a valid non-empty URL potentially surrounded by spaces. This attribute must be present.

```
<video width="320" height="240" controls>
  <source src="movie.mp4" type="video/mp4">
  <source src="movie.ogg" type="video/ogg">
  Your browser does not support the video tag.
</video>
```

Embedded Content
The audio element

- An audio element represents a sound or audio stream.
- Content may be provided inside the audio element. User agents should not show this content to the user; it is intended for older Web browsers which do not support audio, so that legacy audio plugins can be tried, or to show text to the users of these older browsers informing them of how to access the audio contents.

```
<audio controls>
  <source src= "applause.ogg" type="audio/ogg">
  <source src= "applause.mp3" type="audio/mpeg">
  Your browser does not support the audio element.
</audio>
```



HTML Links

Links
Introduction

- Links are a conceptual construct, created by a, area, and link elements, that represent a connection between two resources, one of which is the current Document. There are two kinds of links in HTML:

- Links to external resources
  - These are links to resources that are to be used to augment the current document, generally automatically processed by the user agent.

- Hyperlinks
  - These are links to other resources that are generally exposed to the user by the user agent so that the user can cause the user agent to navigate to those resources, e.g. to visit them in a browser or download them.

Links
Introduction

- For link elements with an href attribute and a rel attribute, links must be created for the keywords of the rel attribute, as defined for those keywords in the link types section.

- Similarly, for a and area elements with an href attribute and a rel attribute, links must be created for the keywords of the rel attribute as defined for those keywords in the link types section.

Links
Elements <a> and <area>

Attribute	Value	Description
download	filename	Specifies that the target will be downloaded when a user clicks on the hyperlink
href	URL	Specifies the URL of the page the link goes to
hreflang	language_code	Specifies the language of the linked document
rel	alternate author bookmark help license next nofollow noreferrer prefetch prev search tag	Specifies the relationship between the current document and the linked document
target	_blank _parent _self _top framename	Specifies where to open the linked document
type	Mime_type	Specifies the Mime type of the linked document

Links
Link Types (attribute rel)

Rel type	Effect on... link	Effect on... a and area	Brief description
alternate	Hyperlink	Hyperlink	Gives alternate representations of the current document.
author	Hyperlink	Hyperlink	Gives a link to the author of the current document or article.
bookmark	*not allowed*	Hyperlink	Gives the permalink for the nearest ancestor section.
help	Hyperlink	Hyperlink	Provides a link to context-sensitive help.
icon	External Resource	*not allowed*	Imports an icon to represent the current document.
license	Hyperlink	Hyperlink	Indicates that the main content of the current document is covered by the copyright license described by the referenced document.
next	Hyperlink	Hyperlink	Indicates that the current document is a part of a series, and that the next document in the series is the referenced document.

Links
Link Types (attribute rel)

Rel type	Effect on... link	a and area	Brief description
nofollow	*not allowed*	Annotation	Indicates that the current document's original author or publisher does not endorse the referenced document.
noreferrer	*not allowed*	Annotation	Requires that the user agent not send an HTTP Referer (sic) header if the user follows the hyperlink.
prefetch	External Resource	External Resource	Specifies that the target resource should be preemptively cached.
prev	Hyperlink	Hyperlink	Indicates that the current document is a part of a series, and that the previous document in the series is the referenced document.
search	Hyperlink	Hyperlink	Gives a link to a resource that can be used to search through the current document and its related pages.
stylesheet	External Resource	*not allowed*	Imports a stylesheet.
tag	*not allowed*	Hyperlink	Gives a tag (identified by the given address) that applies to the current document.

Links
Example 1

```
<h1>Table of Contents</h1>
<p><a href="#section1">Introduction</a><br>
<a href="#section2">Some background</a><br>
<a href="#section2.1">On a more personal note</a><br>
...the rest of the table of contents... ...the document body...</p>
<h2><a id="section1">Introduction</a></h2>
<p>...section 1...</p>
<h2><a id="section2">Some background</a></h2>
<p>...section 2...</p>
<h3><a id="section2.1">On a more personal
note</a></h3>
<p>...section 2.1...</p>
```

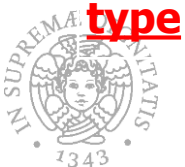
Links
Example 2

We may achieve the same effect by making the header elements themselves the anchors:

```
<h1> Table of Contents</h1>
   <p>  <a href="#section1">Introduction</a><br>
    <a href="#section2">Some background</a><br>
    <a href="#section2.1">On a more personal note</a><br>
    ...the rest of the table of contents... ...the document  body...
   </p>
   <h2 id="section1"> Introduction</h2>
      <p>...section 1...</p>
   <h2 id="section2">Some background</h2>
      <p>...section 2...</p>
   <h3 id="section2.1"> On a more personal note </h3>
      <p>...section 2.1...</p>
```

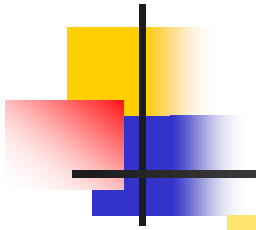
Links
Element <link>

Attribute	Value	Description
href	URL	Specifies the URL of the page the link goes to
hreflang	language_code	Specifies the language of the linked document
media	media_query	Specifies what media/device the linked document is optimized for
rel	alternate author bookmark help license next nofollow noreferrer prefetch prev search tag	Specifies the relationship between the current document and the linked document
sizes	value	Sizes of the icons (for rel="icon")
type	Mime_type	Specifies the Mime type of the linked document



Links
Example 3

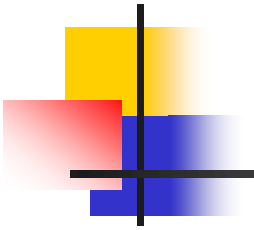
```
<head>
<link rel="stylesheet" type="text/css" href="theme.css">
<link rel="stylesheet" type="text/css" href="print.css"
media="print">
</head>
```



HTML Tables

HTML Table

- Tables are defined with the <table> tag
  - A table is divided into rows (with the <tr> tag), and each row is divided into data cells (with the <td> tag).
  - The <caption> element defines a table caption.
  - The <caption> element must be inserted immediately after the <table> tag.
    - You can specify only one caption per table.
    - Usually the caption will be centered above the table.
  - Headings in a table are defined with the <th> tag
  - The letters td stands for "table data" which is the content of a data cell.

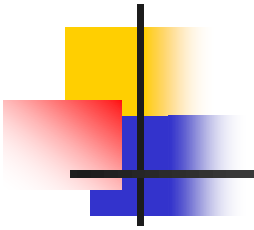


HTML Table

- A data cell can contain text, images, lists, paragraphs, forms, tables, etc.
- If you do not specify a border attribute the table will be displayed without any borders
  - To display a table with borders, you will have to use the border attribute

Content Model:

Optionally a caption element, followed by zero or more colgroup elements, followed optionally by a thead element, followed optionally by a tfoot element, followed by either zero or more tbody elements or one or more tr elements, followed optionally by a tfoot element (but there can only be one tfoot element child in total), optionally intermixed with one or more script-supporting elements.



HTML Table

```
<head>
  <meta charset="utf-8" />
  <title>The a element</title>
  <style>
  table { border-collapse: collapse; border: solid thick; }
  colgroup, tbody { border: solid medium; }
  td { border: solid thin; height: 1.4em; width: 1.4em; text-align:
   center; padding: 0; }
 </style>
</head>
```

HTML Table

```
<body>
 <h1>Today's Sudoku</h1>
 <table>
  <colgroup><col><col><col>
  <colgroup><col><col><col>
  <colgroup><col><col><col>
  <tbody>
   <tr> <td> 1 <td>  <td> 3 <td> 6 <td>  <td> 4 <td> 7 <td>  <td> 9
   <tr> <td>  <td> 2 <td>  <td>  <td> 9 <td>  <td>  <td> 1 <td>
   <tr> <td> 7 <td>  <td>  <td>  <td>  <td>  <td>  <td>  <td> 6
  <tbody>
   <tr> <td> 2 <td>  <td> 4 <td>  <td> 3 <td>  <td> 9 <td>  <td> 8
   <tr> <td>  <td>  <td>  <td>  <td>  <td>  <td>  <td>  <td>  <td>
   <tr> <td> 5 <td>  <td>  <td> 9 <td>  <td> 7 <td>  <td>  <td> 1
```

HTML Table

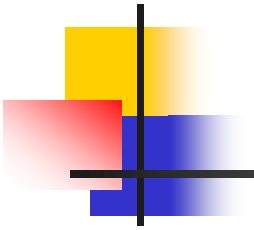
```
<tbody>
  <tr> <td> 6 <td>  <td>  <td>  <td> 5 <td>  <td>  <td>  <td> 2
  <tr> <td>  <td>  <td>  <td>  <td> 7 <td>  <td>  <td>  <td>
  <tr> <td> 9 <td>  <td>  <td> 8 <td>  <td> 2 <td>  <td>  <td> 5
 </table>
 </body>
```

HTML Table
The colgroup element

- The colgroup element represents a group of one or more columns in the table that is its parent.
- If the colgroup element contains no col elements, then the element may have a span content attribute specified, whose value must be a valid non-negative integer greater than zero.
- The colgroup element and its span attribute take part in the table model.

HTML Table
The colgroup element

```
<table>
  <colgroup>
    <col span="2" style="background-color:red">
    <col style="background-color:yellow">
  </colgroup>
  <tr> <th>ISBN</th> <th>Title</th> <th>Price</th> </tr>
  <tr> <td>3476896</td> <td>My first HTML</td>
    <td>$53</td> </tr>
  <tr> <td>5869207</td> <td>My first CSS</td>
    <td>$49</td> </tr>
</table>
```



HTML Table (thead, tbody, tfoot)

- The thead, tbody and tfoot elements are used to group the header content, the body content and the footer content in an HTML table.
- Note: <tfoot> must appear before <tbody> within a table, so that a browser can render the foot before receiving all the rows of data.
- This division enables user agents to support scrolling of table bodies independently of the table head and foot.
  - When long tables are printed, the table head and foot information may be repeated on each page that contains table data.

HTML Table (thead, tbody, tfoot)

```
<body>
<table>
  <thead>
    <tr>
      <th>Month</th>
      <th>Savings</th>
    </tr>
  </thead>
  <tfoot>
    <tr>
      <td>Sum</td>
      <td>$180</td>
    </tr>
  </tfoot>
```

HTML Table (thead, tbody, tfoot)

```
<tbody>
    <tr>
      <td>January</td>
      <td>$100</td>
    </tr>
    <tr>
      <td>February</td>
      <td>$80</td>
    </tr>
  </tbody>
</table>
</body>
```

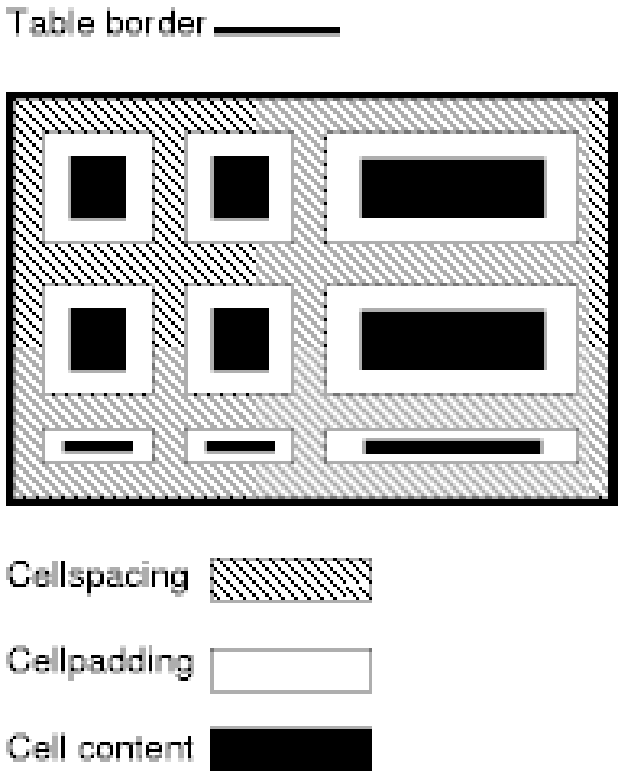
HTML Table (rowspan and colspan)

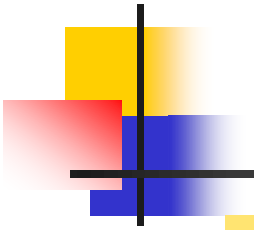
- The td and th elements may have
  - rowspan
    defines the number of rows a cell should span
  - colspan
    defines the number of columns a cell should span

```
<table width="100%" border="1">
  <tr> <th>Month</th>  <th>Amount</th> <th>Percentage</th></tr>
  <tr> <td> January </td> <td colspan="2">-</td>  </tr>
  <tr> <td> February </td> <td>100</td> <td>10</td> </tr>
</table>
```

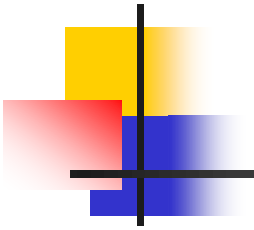
HTML Table

- Defining the style of a table



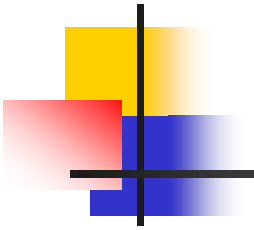


HTML Forms



HTML Forms

- A form is a section of a document containing normal content, markup, special elements called controls and labels on those controls.
- Controls:
  - Buttons
  - Checkboxes
  - Radio buttons
  - Menus
  - Text input
  - File select
  - Hidden control
  - Object controls



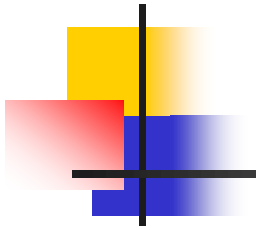
HTML Forms

- Users generally "complete" a form by modifying its controls (entering text, selecting menu items, etc.), before submitting the form to an agent for processing (e.g., to a Web server, to a mail server, etc.)
- A control's "control name" is given by its name attribute.
  - The scope of the name attribute for a control within a form element is the form element.

HTML Forms

Example:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="utf-8">
    <title>Pizza Ordering Form</title>
  </head>
<form>
  <p><label>Customer name: <input></label></p>
  <p><label>Telephone: <input type=tel></label></p>
  <p><label>E-mail address: <input type=email></label></p>
```



HTML Forms

```
<fieldset>
 <legend> Pizza Size </legend>
 <p><label> <input type=radio name=size> Small </label></p>
 <p><label> <input type=radio name=size> Medium
 </label></p>
 <p><label> <input type=radio name=size> Large </label></p>
</fieldset>
<fieldset>
 <legend> Pizza Toppings </legend>
 <p><label> <input type=checkbox> Bacon </label></p>
 <p><label> <input type=checkbox> Extra Cheese </label></p>
 <p><label> <input type=checkbox> Onion </label></p>
 <p><label> <input type=checkbox> Mushroom </label></p>
</fieldset>
```

HTML Forms

```
<p><label>Preferred delivery time: <input type=time
  min="11:00" max="21:00" step="900"></label></p>
 <p><label>Delivery instructions:
  <textarea></textarea></label></p>
 <p><button>Submit order</button></p>
</form>
</html>
```

HTML Forms
Server Communication

Example:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="utf-8">
    <title>Pizza Ordering Form</title>
  </head>
<form method="post"  enctype="application/x-www-form-urlencoded"
      action="https://pizza.example.com/order.php">
 <p><label>Customer name: <input name="custname"></label></p>
 <p><label>Telephone: <input type=tel name="custtel"></label></p>
 <p><label>E-mail address: <input type=email
  name="custemail"></label></p>
```

HTML Forms
Server Communication

```
<fieldset>
 <legend> Pizza Size </legend>
 <p><label> <input type=radio name=size value="small"> Small
 </label></p>
 <p><label> <input type=radio name=size value="medium"> Medium
 </label></p>
 <p><label> <input type=radio name=size value="large"> Large
 </label></p>
</fieldset>
```

HTML Forms
Server Communication

```
<fieldset>
  <legend> Pizza Toppings </legend>
  <p><label> <input type=checkbox name="topping" value="bacon">
  Bacon </label></p>
  <p><label> <input type=checkbox name="topping" value="cheese">
  Extra Cheese </label></p>
  <p><label> <input type=checkbox name="topping" value="onion">
  Onion </label></p>
  <p><label> <input type=checkbox name="topping"
  value="mushroom"> Mushroom </label></p>
 </fieldset>
```

HTML Forms
Server Communication

```
<p><label>Preferred delivery time: <input type=time min="11:00"
  max="21:00" step="900" name="delivery"></label></p>
 <p><label>Delivery instructions: <textarea
  name="comments"></textarea></label></p>
 <p><button>Submit order</button></p>
</form>
```

For example, if the customer entered "Denise Lawrence" as their name, "555-321-8642" as their telephone number, did not specify an e-mail address, asked for a medium-sized pizza, selected the Extra Cheese and Mushroom toppings, entered a delivery time of 7pm, and left the delivery instructions text field blank, the user agent would submit the following to the online Web service:

```
custname=Denise+Lawrence&custtel=555-321-
  8624&custemail=&size=medium&topping=cheese&topping=mushroom
  &delivery=19%3A00&comments=
```

HTML Forms
Client-side form validation

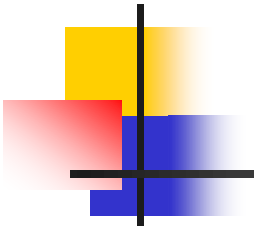
- Forms can be annotated in such a way that the user agent will check the user's input before the form is submitted.
- The simplest annotation is the required attribute, which can be specified on input elements to indicate that the form is not to be submitted until a value is given.

```
<p><label>Customer name: <input name="custname" required></label></p>
....
<legend> Pizza Size </legend>
  <p><label> <input type=radio name=size required value="small"> Small
</label></p>
  <p><label> <input type=radio name=size required value="medium"> Medium
</label></p>
  <p><label> <input type=radio name=size required value="large"> Large
</label></p>
 </fieldset>
..
  <p><label>Preferred delivery time: <input type=time min="11:00" max="21:00"
step="900" name="delivery" required></label></p>
```

HTML Forms
Client-side form validation

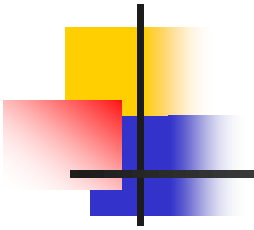
- It is also possible to limit the length of the input, using the maxlength attribute.

```
<p><label>Delivery instructions: <textarea name="comments"
maxlength=1000></textarea></label></p>
```



HTML Forms

- The form element acts as a container for controls, by specifying:
  - The layout of the form (given by the contents of the element).
  - The program that will handle the completed and submitted form (the action attribute). The receiving program must be able to parse name/value pairs in order to make use of them.
  - The method by which user data will be sent to the server (the method attribute).
  - A character encoding that must be accepted by the server in order to handle this form (the accept-charset attribute). User agents may advise the user of the value of the accept-charset attribute and/or restrict the user's ability to enter unrecognized characters.



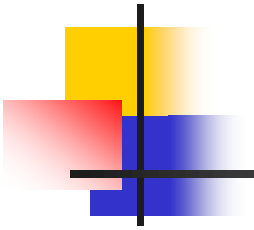
HTML Forms

- In general, a control's "initial value" may be specified with the control element's value attribute.
- However, the initial value of a textarea element is given by its contents
- A control's initial value does not change. Thus, when a form is reset, each control's current value is reset to its initial value

HTML Forms

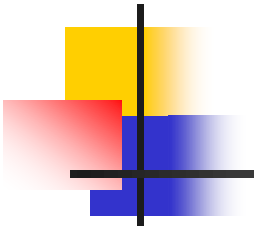
- Attributes of the form element

Attribute	Value	Description
action	*URL*	Specifies where to send the form-data when a form is submitted
accept-charset	*charset*	Specifies the character-sets the server can handle for form-data
autocomplete	*on,off*	Specifies if the autofill is on or off
enctype	application/x-www-form-urlencoded multipart/form-data text/plain	Specifies how form-data should be encoded before sending it to a server (multipart/form-data text/plain is only for POST)
method	get post	Specifies how to send form-data
name	*name*	Specifies the name for a form
novalidate	*on,off*	Specifies whether the form has to be validated or not
target	_*blank* new window _*self* same frame _*top* full body of the window *framename* in a named iframe	The target attribute specifies a name or a keyword that indicates where to display the response that is received after submitting the form.



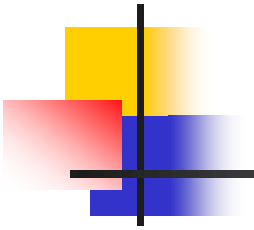
HTML Forms

- If the method is "get", the user agent takes the value of action, appends a ? to it, then appends the form data set, encoded using the application/x-www-form-urlencoded content type. The user agent then traverses the link to this URI. In this scenario, form data are restricted to ASCII codes.
- If the method is "post", the user agent conducts an HTTP post transaction using the value of the action attribute and a message created according to the content type specified by the enctype attribute.



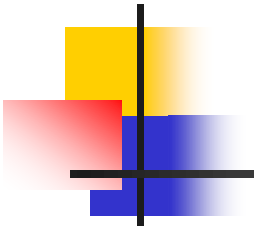
HTML Forms: Control Types

- Buttons types
  - submit: When activated, a submit button submits a form. A form may contain more than one submit button.
  - reset: When activated, a reset button resets all controls to their initial values.
  - buttons: Buttons have no default behavior.
    - Each button may have client-side scripts associated with the element's event attributes.



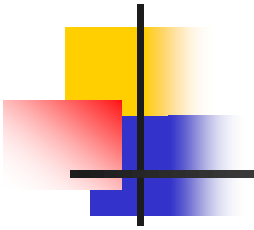
HTML Forms: Control Types

- Checkboxes
  - Checkboxes (and radio buttons) are on/off switches that may be toggled by the user. A switch is "on" when the control element's checked attribute is set.
  - When a form is submitted, only "on" checkbox controls can become successful.
  - Several checkboxes in a form may share the same control name. Thus, for example, checkboxes allow users to select several values for the same property.
  - The input element is used to create a checkbox control.



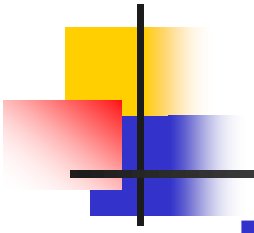
HTML Forms: Control Types

- Radio Buttons
  - Radio buttons are like checkboxes except that when several share the same control name, they are mutually exclusive: when one is switched "on", all others with the same name are switched "off".
  - The input element is used to create a radio button control.
- Menus
  - Menus offer users options from which to choose.
  - The select element creates a menu, in combination with the optgroup and option elements.



HTML Forms: Control Types

- Text input
  - Authors may create two types of controls that allow users to input text.
  - The input element creates a single-line input control and the textarea element creates a multi-line input control.
  - In both cases, the input text becomes the control's current value
- File Select
  - This control type allows the user to select files so that their contents may be submitted with a form.
  - The input element is used to create a file select control.



HTML Forms: Control Types

- How are the control types implemented?
  - <input> element
  - <button> element
  - <select> element
  - <datalist> element
  - <optgroup> element
  - <option> element
  - <textarea> element
  - <keygen> element
  - <output> element
  - <progress> element
  - <meter> element
  - <fieldset> element
  - <legend> element

HTML Forms
Input Element

The type attribute of the Input Element

Keyword	State	Data type	Control type
hidden	Hidden	An arbitrary string	n/a
text	Text	Text with no line breaks	A text field
search	Search	Text with no line breaks	Search field
tel	Telephone	Text with no line breaks	A text field
url	URL	An absolute URL	A text field

HTML Forms
Input Element

The type attribute

Keyword	State	Data type	Control type
email	E-mail	An e-mail address or list of e-mail addresses	A text field
password	Password	Text with no line breaks (sensitive information)	A text field that obscures data entry
date	Date	A date (year, month, day) with no time zone	A date control
time	Time	A time (hour, minute, seconds, fractional seconds) with no time zone	A time control

HTML Forms
Input Element

The type attribute

Keyword	State	Data type	Control type
number	Number	A numerical value	A text field or spinner control
range	Range	A numerical value, with the extra semantic that the exact value is not important	A slider control or similar
color	Color	An sRGB color with 8-bit red, green, and blue components	A color well
checkbox	Checkbox	A set of zero or more values from a predefined list	A checkbox

HTML Forms
Input Element

The type attribute

Keyword	State	Data type	Control type
radio	Radio Button	An enumerated value	A radio button
file	File Upload	Zero or more files each with a MIME type and optionally a file name	A label and a button
submit	Submit Button	An enumerated value, with the extra semantic that it must be the last value selected and initiates form submission	A button
image	Image Button	A coordinate, relative to a particular image's size, with the extra semantic that it must be the last value selected and initiates form submission	Either a clickable image, or a button

HTML Forms
Input Element

The type attribute

Keyword	State	Data type	Control type
reset	Reset Button	n/a	A button
button	Button	n/a	A button

HTML Forms
Input Element

Input element attributes.

Different attributes depending on the specific value of attribute type.

List of attributes and their use can be found in the HTML5 specification

http://www.w3.org/TR/html5/forms.html#the-input-element

HTML Forms
Input Element

Some examples of specific attributes

- The list attribute is used to identify an element that lists predefined options suggested to the user.
- If present, its value must be the ID of a datalist element in the same document.

```
<label>Homepage: <input name=hp type=url list=hpurls></label>
<datalist id=hpurls>
 <option value="http://www.google.com/" label="Google">
 <option value="http://www.reddit.com/" label="Reddit">
</datalist>
```

HTML Forms
Input Element

Some examples of specific attributes

- The placeholder attribute represents a short hint (a word or short phrase) intended to aid the user with data entry when the control has no value.

```
<fieldset>
 <legend>Mail Account</legend>
 <p><label>Name: <input type="text" name="fullname"
placeholder="John Ratzenberger"></label></p>
 <p><label>Address: <input type="email" name="address"
placeholder="john@example.net"></label></p>
 <p><label>Password: <input type="password"
name="password"></label></p>
 <p><label>Description: <input type="text" name="desc"
placeholder="My Email Account"></label></p>
</fieldset>
```

HTML Forms
Input Element

Some examples of specific attributes

- The readonly attribute is a boolean attribute that controls whether or not the user can edit the form control.
- The required attribute is a boolean attribute. When specified, the element is required.
- The pattern attribute specifies a regular expression against which the control's value, or, when the multiple attribute applies and is set, the control's values, are to be checked.
- The min and max attributes indicate the allowed range of values for the element.
- The step attribute indicates the granularity that is expected (and required) of the value, by limiting the allowed values.

HTML Forms
Input Element

Example:

```
<form action="products.php" method="post" enctype="multipart/form-data">
 <table>
  <tr> <th> Product ID <th> Product name <th> Price <th> Action
  <tr>
   <td> <input readonly="readonly" name="1.pid" value="H412">
   <td> <input required="required" name="1.pname" value="Floor lamp
  Ulke">
   <td> $<input required="required" type="number" min="0" step="0.01"
  name="1.pprice" value="49.99">
   <td> <button formnovalidate="formnovalidate" name="action"
  value="delete:1">Delete</button>
  <tr>
```

HTML Forms
Input Element

```
<td> <input readonly="readonly" name="2.pid" value="FG28">
  <td> <input required="required" name="2.pname" value="Table lamp Ulke">
  <td> $<input required="required" type="number" min="0" step="0.01" name="2.pprice" value="24.99">
  <td> <button formnovalidate="formnovalidate" name="action" value="delete:2">Delete</button>
```

HTML Forms
Input Element

```
<tr>
  <td> <input required="required" name="3.pid" value="" pattern="[A-Z0-9]+">
  <td> <input required="required" name="3.pname" value="">
  <td> $<input required="required" type="number" min="0" step="0.01" name="3.pprice" value="">
  <td> <button formnovalidate="formnovalidate" name="action" value="delete:3">Delete</button>
</table>
<p> <button formnovalidate="formnovalidate" name="action" value="add">Add</button> </p>
<p> <button name="action" value="update">Save</button> </p>
</form>
```

HTML Forms
Input Element

Some examples of specific attributes

- The multiple attribute is a boolean attribute that indicates whether the user is to be allowed to specify more than one value.
  - The multiple attribute works with the following input types: email, and file.
  - For <input type="file">: to select multiple files, hold down the CTRL or SHIFT key while selecting.
  - For <input type="email">: separate each email with a comma, like: mail@example.com, mail2@example.com, mail3@example.com in the email field.

```
<form action="demo_form.php">
  Select images: <input type="file" name="img" multiple>
  <input type="submit">
</form>
```

HTML Forms
Button Element

- Buttons created with the button element function just like buttons created with the input element, but they offer richer rendering possibilities:
  - the button element may have content. For example, a button element that contains an image functions like and may resemble an input element whose type is set to "image", but the button element type allows content.
- Always specify the type attribute for the button: submit, reset, button (does nothing).

HTML Forms
Button Element

Main attributes of the button element

- autofocus: allows the author to indicate that a control is to be focused as soon as the page is loaded, allowing the user to just start typing without having to manually focus the main control.
- disabled
- form: to explicitly associate the button element with its form owner (the value is the ID of the form)
- formnovalidate: indicates that the form is not to be validated during submission
- value: The value attribute gives the element's value for the purposes of form submission. The element's value is the value of the element's value attribute, if there is one, or the empty string otherwise.

HTML Forms
Button Element

```
<form action="http://somesite.com/prog/adduser"  method="post">
    <p>
      First name: <input type="text"  name="firstname"><br>
      Last name: <input type="text"   name="lastname"><br>
     email: <input type="text" name="email"><br>
    <input type="radio" name="sex" value="Male"> Male<br>
     <input type="radio" name="sex" value="Female"> Female<br>
     <button name="submit"  value="submit" type="submit"> Send
      <img src="ok.png"  width="40" heigh="40" alt="OK"></button>
      <button name="reset"  type="reset">Reset
      <img src="reset.jpg"  width="40" heigh="40"
alt="oops"></button>
    </p>
 </form>
```

HTML Forms
select, optgroup and option elements

- The select element creates a menu.
  - Each choice offered by the menu is represented by an option element.
  - A select element must contain at least one option element.
- The optgroup element allows authors to group choices logically. The label value gives the name of the group.
  - Helpful when the user must choose from a long list of options; groups of related choices are easier to grasp and remember than a single long list of options.
- The option element represents an option in a select element or as part of a list of suggestions in a datalist element. The selected attribute represents the default selectedness of the element

HTML Forms
select, optgroup and option elements

<select> attributes

- disabled – specifies that a drop-down list should be disabled
- multiple – specifies that multiple options can be selected
- size – gives the number of options to show to the user
- required – the user is required to select a value

HTML Forms
select, optgroup and option elements

- When rendering a menu choice, user agents should use the value of the label attribute of the option element as the choice.
  - If this attribute is not specified, user agents should use the contents of the option element.
- The label attribute of the optgroup element specifies the label for a group of choices
- Only selected options will be successful (using the control name "c" in the following example).
- When no options are selected, the control is not successful and neither the name nor any values are submitted to the server when the form is submitted.

HTML Forms
select, optgroup and option elements

- Example of the <optgroup> element

```
<form action="http://www.watch.com/watch.php" method="get">
 <p>Which course would you like to watch today?
 <p><label>Course:
  <select name="c">
   <optgroup label="8.01 Physics I: Classical Mechanics">
    <option value="8.01.1">Lecture 01: Powers of Ten
    <option disabled value="8.01.2">Lecture 02: 1D Kinematics
    <option value="8.01.3">Lecture 03: Vectors
   <optgroup disabled label="8.02 Electricity and Magnestism">
```

HTML Forms
select, optgroup and option elements

```
<option value="8.02.1">Lecture 01: What holds our world together?
   <option value="8.02.2">Lecture 02: Electric Field
   <option value="8.02.3">Lecture 03: Electric Flux
  <optgroup label="8.03 Physics III: Vibrations and Waves">
   <option value="8.03.1">Lecture 01: Periodic Phenomenon
   <option value="8.03.2">Lecture 02: Beats
   <option value="8.03.3">Lecture 03: Forced Oscillations with
  Damping
 </select>
</label>
<p><input type="submit" value="Play">
</form>
```

HTML Forms
Textarea element

- The textarea element creates a multi-line text input control. User agents should use the contents of this element as the initial value of the control and should render this text initially.
- The cols and rows attribute specify the expected maximum number of characters per line and the number of lines to show, respectively.
- The maxlength attribute specifies the allowed maximum length.

HTML Forms
Textarea element

```
<form action="http://www.elaborate.com/elab.php"
  method="get">
<p>
<textarea name="thetext" rows="10" cols="80"
  maxlength="20">
</textarea>
<input type="submit" value="Send">
<input type="reset" value="Reset"></p>
</form>
```

HTML Forms
Label element

- Some form controls automatically have labels associated with them (press buttons) while most do not (text fields, checkboxes and radio buttons, and menus).
- For those controls that have implicit labels, user agents should use the value of the “value” attribute as the label string.
- The label element is used to specify labels for controls that do not have implicit labels.

HTML Forms
Label element

- The label element represents a caption in a user interface.
- The caption can be associated with a specific form control, known as the label element's labeled control, either using the for attribute, or by putting the form control inside the label element itself.
- The for attribute explicitly associates the label being defined with another control. When present, the value of this attribute must be the same as the value of the id attribute of some other control in the same document. When absent, the label being defined is associated with the element's contents.
- More than one label may be associated with the same control by creating multiple references via the for attribute.
- When a LABEL element receives focus, it passes the focus on to its associated control.

HTML Forms
Label element

```
<form action="http://somesite.com/prog/adduser" method="post">
<p><label for="firstname">First name:</label> <input type="text"
id="firstname"><br>
<label for="lastname">Last name:</label> <input type="text" id=
"lastname"><br>
<label for="email">email:</label> <input type="text" id=
"email"><br>
<input type="radio" name="sex" value="Male"> Male<br>
<input type="radio" name="sex" value="Female"> Female<br>
<input type="submit" value="Send"> <input type="reset"></p>
</form>
```

HTML Forms
Label element

- To associate a label with another control implicitly, the control element must be within the contents of the label element.
  - In this case, the label may only contain one control element.
  - The label itself may be positioned before or after the associated control.

```
<form action="..." method="post">
<p><label>First Name <input type="text"
  name="firstname"></label>
<label><input type="text" name="lastname"> Last
  Name</label></p>
</form>
```

HTML Forms
Focus to an element

- There are several ways to give focus to an element:
  - Designate the element with a pointing device.
  - Navigate from one element to the next with the keyboard.
    - The document's author may define a *tabbing order* that specifies the order in which elements will receive focus if the user navigates the document with the keyboard. Once selected, an element may be activated by some other key sequence.
  - Select an element through an *access key* (sometimes called "keyboard shortcut" or "keyboard accelerator").

HTML Forms
Tabbing navigation

tabindex = *number*

- The tabindex attribute specifies the position of the current element in the tabbing order for the current document.
  - Number is between 0 and 32767.
  - Values need not be sequential nor must they begin with any particular value.
  - The tabbing order may include elements nested within other elements.
  - The following elements support the tabindex attribute: a, area, button, input, object, select, and textarea.

HTML Forms
Tabbing navigation

- Elements should be navigated by user agents according to the following rules:
  1. First, elements that support the tabindex attribute and assign a positive value to it are navigated:
     - from the element with the lowest tabindex value to the element with the highest value in the order they appear in the character stream if have identical tabindex values
  2. Then, elements that do not support the tabindex attribute or support it and assign it a value of "0" are navigated next. These elements are navigated in the order they appear in the character stream.
  3. Elements that are disabled do not participate in the tabbing order.

HTML Forms
Tabbing navigation

```
<p>Go to the <a tabindex="20"
  href="http://www.w3.org/">W3C Web site. </a> ...some
  more... <button type="button" name=
"get-database" tabindex="18" onclick="get-
  database">Get the
current database.</button> ...some more...</p>
<form action="..." method="post">
<p><input tabindex="1" type="text" name="field1">
<input tabindex="1" type="text" name="field2"> <input
  tabindex=
"2" type="submit" name="submit"></p>
</form>
```

HTML Forms
Access key

accesskey = *character*

- This attribute assigns an access key to an element. An access key is a single character from the document character set.
- Pressing an access key assigned to an element gives focus to the element. The action that occurs when an element receives focus depends on the element.
- The following elements support the accesskey attribute: a, area, button, input, label, legend, and textarea

HTML Forms
Access key

```
<form action="..." method="post">
<p><label for="fuser" accesskey="u">User
  Name</label>
<input type="text" name="user" id="fuser"></p>
</form>
```

- The invocation of access keys depends on the underlying system. For instance, on machines running MS Windows, one generally has to press the "alt" key in addition to the access key. On Apple systems, one generally has to press the "cmd" key in addition to the access key.

HTML Forms
Disabled controls

Disabled

- When set for a form control, this boolean attribute disables the control for user input.
  - Disabled controls do not receive focus
  - Disabled controls are skipped in tabbing navigation
  - Disabled controls cannot be successful.
- The following elements support the disabled attribute: button, input, optgroup, option, select and textarea.

```
<input disabled name="fred" value="stone">
```

HTML Forms readonly controls

Readonly

- When set for a form control, this boolean attribute prohibits changes to the control.
  - Read-only elements receive focus but cannot be modified by the user.
  - Read-only elements are included in tabbing navigation
  - Read-only elements may be successful
- The following elements support the readonly attribute: input and textarea.

```
<input readonly name="fred" value="stone">
```

HTML Forms
Form submission

- A *successful control* is "valid" for submission. Every successful control has its control name paired with its current value as part of the submitted form data set.
- Note that

  Controls that are disabled cannot be successful.
  - Submit button: If a form contains more than one submit button, only the activated submit button is successful.
  - Checkboxes: All "on" checkboxes may be successful.
  - Radio Buttons: For radio buttons that share the same value of the `name` attribute, only the "on" radio button may be successful.

HTML Forms
Form submission

- Menus: the control name is provided by a select element and values are provided by option elements. Only selected options may be successful. When no options are selected, the control is not successful and neither the name nor any values are submitted to the server when the form is submitted.
- File select: The current value of a file select is a list of one or more file names. Upon submission of the form, the *contents* of each file are submitted with the rest of the form data. The file contents are packaged according to the form's content type.
- Object control: The current value of an object control is determined by the object's implementation

HTML Forms
Form submission

- If a control does not have a current value when the form is submitted, user agents are not required to treat it as a successful control.
- Furthermore, user agents should not consider the following controls successful:
  - Reset buttons.
  - object elements whose declare attribute has been set.
- Hidden controls and controls that are not rendered because of style sheet settings may still be successful. For example

HTML Forms
Form submission

```
<form action="..." method="post">
<p><input type="password" style="display:none"
  name=
"invisible-password" value="mypassword"></p>
</form>
```

will still cause a value to be paired with the name "invisible-password" and submitted with the form

- Note: this mechanism affords only light security protection. Although the password is masked by user agents from casual observers, it is transmitted to the server in clear text.

HTML Forms
Processing form data

The user agent processes a form as follows:

1. **Identify the successful controls**
2. **Build a form data set**

   A *form data set* is a sequence of control-name /current-value pairs constructed from successful controls
3. **Encode the form data set**

   The form data set is then encoded according to the content type specified by the enctype attribute of the FORM element.
4. **Submit the encoded form data set**
5. **Send to the Processing agent**

   The encoded data is sent to the processing agent designated by the action attribute using the protocol specified by the method attribute.

HTML Forms
Processing form data

HTML 5 user agents must support the established conventions in the following cases:

- Method = "get" and action = HTTP URI
  - The user agent
    - takes the value of action,
    - appends a '?' to it,
    - appends the form data set, encoded using the "application/x-www-form-urlencoded" content type.
  - The user agent then traverses the link to the specified URI.
    - In this scenario, form data are restricted to ASCII codes.

HTML Forms
Processing form data

Example method "get"

```
<form action="/find.php" method=get>
 <input type=text name=t>
 <input type=search name=q>
 <input type=submit>
</form>
```

- The user agent will load
  /find.php?t=cats&q=fur.

HTML Forms
Processing form data

- Method = "post" and action = HTTP URI
  - The user agent conducts an HTTP "post" transaction using the value of the action attribute and a message created according to the content type specified by the enctype attribute.
- For any other value of action or method, behavior is unspecified.

HTML Forms
Form content type

- The enctype attribute of the FORM element specifies the content type used to encode the form data set for submission to the server.
- **application/x-www-form-urlencoded**

  This is the default content type. Forms submitted with this content type must be encoded as follows:
  - Control names and values are escaped. Space characters are replaced by '+', and then reserved characters are escaped: Non-alphanumeric characters are replaced by '%HH', a percent sign and two hexadecimal digits representing the ASCII code of the character. Line breaks are represented as "CR LF" pairs (i.e., '%0D%0A').
  - The control names/values are listed in the order they appear in the document. The name is separated from the value by '=' and name/value pairs are separated from each other by '&'.

HTML Forms
Form content type

- **multipart/form-data**

  This content type should be used for submitting forms that contain files, non-ASCII data, and binary data.

  A "multipart/form-data" message contains a series of parts, each representing a successful control. The parts are sent to the processing agent in the same order the corresponding controls appear in the document stream.

  Each part has an optional "Content-Type" header that defaults to "text/plain". User agents should supply the "Content-Type" header, accompanied by a "charset" parameter.

HTML Forms
Form content type

- **multipart/form-data** (continued)

  Each part is expected to contain:

  - a "Content-Disposition" header whose value is "form-data".
  - a name attribute specifying the control name of the corresponding control.

  Thus, for example, for a control named "mycontrol", the corresponding part would be specified:

  Content-Disposition: form-data; name="mycontrol"

  As with all MIME transmissions, "CR LF" (i.e., '%0D%0A') is used to separate lines of data.

HTML Forms
Form content type

Suppose we have the following form:

```
<form action="http://server.com/cgi/handle" enctype=
"multipart/form-data" method="post">
<p>What is your name? <input type="text"
name="submit-name"><br>
What files are you sending? <input type="file"
name="files"><br>
<input type="submit" value="Send"> <input
type="reset"></p>
</form>
```

HTML Forms
Form content type

The user agent might send back:

Content-Type: multipart/form-data; boundary=AaB03x

--AaB03x

Content-Disposition: form-data; name="submit-name"

Larry

--AaB03x

Content-Disposition: form-data; name="files"; filename="file1.txt"

Content-Type: text/plain

... contents of file1.txt ...

--AaB03x--

HTML Forms
Form content type

If the user selected a second (image) file "file2.gif":

Content-Type: multipart/form-data; boundary=AaB03x

--AaB03x

Content-Disposition: form-data; name="submit-name"

Larry

--AaB03x

Content-Disposition: form-data; name="files"

Content-Type: multipart/mixed; boundary=BbC04y

HTML Forms
Form content type

```
--BbC04y
Content-Disposition: file; filename="file1.txt"
Content-Type: text/plain
... contents of file1.txt ...
--BbC04y
Content-Disposition: file; filename="file2.gif"
Content-Type: image/gif
Content-Transfer-Encoding: binary
...contents of file2.gif...
--BbC04y--
--AaB03x--
```

Checking Forms with validation

- Form validation is an optimization because it alone is not sufficient to guarantee that forms submitted to the server are correct and valid.
- It is an optimization because it is designed to help a web application fail fast. In other words, it is better to notify a user that a page contains invalid form controls right inside the page, using the browser's built-in processing.

Checking Forms with validation

- HTML5 does introduce eight handy ways to enforce correctness on form control entry.
- Object ValidityState allows accessing their status

```
var valCheck = document.myForm.myInput.validity;
```

valCheck contains a reference to the ValidityState object of the form element named myInput.

```
valCheck.valid
```

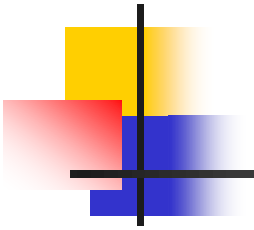
returns a Boolean value which informs us whether or not all validity constraints are currently met on this particular form control.

If all eight constraints are passing, the valid flag will be true. Otherwise, if any of the validity constraints fail, the valid attribute will be false.

Checking Forms
Validity constraints (1)

The valCheck.valueMissing Constraint

- Purpose: Ensure that some value is set on this form control
- Usage: Set the required attribute on the form control to true
- Usage example: <input type="text" name="myText" required>
- Details: If the required attribute is set on a form control, the control will be in an invalid state unless the user or a programmatic call sets some value to the field. For example, a blank text field will fail a required check, but will pass as soon as any text is entered. When blank, the valueMissing will return true.



Checking Forms
Validity constraints (2)

The valCheck.typeMismatch Constraint

- Purpose: Guarantee that the type of the value matches expectations (number, email, URL, and so on)
- Usage: Specify one of the appropriate type attributes on the form control
- Usage example: <input type="email" name="myEmail">
- Details: Special form control types aren't just for customized phone keyboards! If your browser can determine that the value entered into a form control doesn't conform to the rules for that type—for example, an email address without an @ symbol—the browser can flag this control as having a type mismatch. Another example would be a number field that cannot parse to a valid number. In either case, the typeMismatch will return true.

Checking Forms
Validity constraints (3)

The valCheck.patternMismatch Constraint

- Purpose: Enforce any pattern rule set on a form control which details specific valid formats
- Usage: Set the pattern attribute on the form control with the appropriate pattern
- Usage example: <input type="text" name="creditcardnumber" pattern="[0-9]{16}" title="A credit card number is 16 digits with no spaces or dashes">
- Details: The pattern attribute gives developers a powerful and flexible way of enforcing a regular expression pattern on the value of a form control. When a pattern is set on a control, the patternMismatch will return true whenever the value does not conform to the rules of the pattern. To assist users and assistive technology, you should set the title on any pattern-controlled field to describe the rules of the format.

Checking Forms
Validity constraints (4)

The valCheck.tooLong Constraint

- Purpose: Make sure that a value does not contain too many characters
- Usage: Put a maxLength attribute on the form control
- Usage example: <input type="text" name="limitedText" maxLength="140">
- Details: This humorously-named constraint will return true if the value length exceeds the maxLength. While form controls will generally try to enforce the maximum length during user entry, certain situations including programmatic settings can cause the value to exceed the maximum.

Checking Forms
Validity constraints (5)

The valCheck.rangeUnderflow Constraint

- Purpose: Enforce the minimum value of a numeric control
- Usage: Set a min attribute with the minimum allowed value
- Usage example: <input type="range" name="ageCheck" min="18">
- Details: In any form controls that do numeric-range checking, it is possible for the value to get temporarily set below the allowable range. In these cases, the ValidityState will return true for the rangeUnderflow field.

Checking Forms
Validity constraints (6)

The valCheck.rangeOverflow Constraint

- Purpose: Enforce the maximum value of a numeric control
- Usage: Set a max attribute with the maximum allowed value
- Usage example: <input type="range" name="kidAgeCheck" max="12">
- Details: Similar to its counterpart rangeUnderflow, this validity constraint will return true if the value of a form control becomes greater than the max attribute.

Checking Forms
Validity constraints (7)

The valCheck.stepMismatch Constraint

- Purpose: Guarantee that a value conforms to the combination of min, max, and step
- Usage: Set a step attribute to specify the granular steps of a numeric value
- Usage example: <input type="range" name="confidenceLevel" min="0" max="100" step="5">
- Details: This constraint enforces the sanity of the combinations of min, max, and step. Specifically, the current value must be a multiple of the step added to the minimum value. For example, a range from 0 to 100 with steps at every 5 would not allow a value of 17 without stepMismatch returning true.

Checking Forms
Validity constraints (8)

The valCheck.customError Constraint

- Purpose: Handle errors explicitly calculated and set by the application code
- Usage: Call setCustomValidity(message) to put a form control into the customError state
- Usage example: passwordConfirmationField.setCustomValidity("Password values do not match.");
- Details: For those cases where the built-in validity checks don't apply, the custom validity errors can suffice. Application code should set a custom validity message whenever a field does not conform to semantic rules.

Checking Forms
Validity fields and functions

The willValidate Attribute of the HTMLInputElement

- Indicates whether validation will be checked on this form control at all. If any of the above constraints—e.g. the required attribute, pattern attribute, etc.—are set on the control, the willValidate field will let you know that validation checking is going to be enforced.

The checkValidity Function of the HTMLInputElement

- The checkValidity function allows you to check validation on the form without any explicit user input. Normally, a form's validation is checked whenever the user or script code submits the form. This function allows validation to be done at any time.

Checking Forms
Validity fields and functions

The validationMessage Attribute of the HTMLInputElement

- lets you query programmatically a localized error message that the browser would display based on the current state of validation. For example, if a required field has no value, the browser might present an error message to the user that “This field requires a value.”

Checking Forms Validity feedback

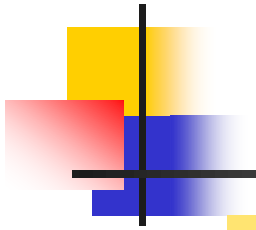
- The specification does not dictate the terms of how the user interface is updated to present an error message, and existing implementations differ fairly significantly.
- Any form in an invalid state will deliver an invalid event.
- This event can be ignored, observed, or even cancelled.
- To add an event handler to a field which will receive this notification

Checking Forms
Event Handler for Invalid Events

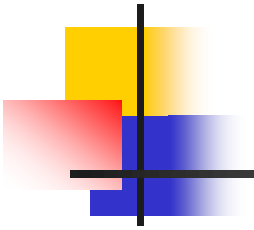
```
function invalidHandler(evt) {
    var validity = evt.target.validity;
        // check the validity to see if a particular constraint failed
    if (validity.valueMissing) {
        // present a UI to the user indicating that the field is missing a value
}
    // perhaps check additional constraints here…
    // If you do not want the browser to provide default validation feedback,
    // cancel the event as shown here
   evt.preventDefault();
}

        // register an event listener for "invalid" events
myField.addEventListener("invalid", invalidHandler, false);
```

Checking Forms
Event Handler for Invalid Events (Ex.)

```
function invalidHandler(evt) {
        // find the label for this form control
   var label =
   evt.target.parentElement.getElementsByTagName("label")[0];
        // set the label's text color to red
   label.style.color = 'red';
        // stop the event from propagating higher
   evt.stopPropagation();
        // stop the browser's default handling of the validation error
   evt.preventDefault();
}
        // register an event listener for "invalid" events
myField.addEventListener("invalid", invalidHandler, false);
```

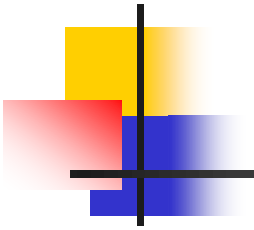


CANVAS



Canvas

- The canvas element provides scripts with a resolution-dependent bitmap canvas, which can be used for rendering graphs, game graphics, art, or other visual images on the fly.
- Authors should not use the canvas element in a document when a more suitable element is available.
- Two attributes to control the size of the element's bitmap: width and height.
- The HTML5 Canvas API supports the same two-dimensional drawing operations that most modern operating systems and frameworks support.
  - To programmatically use a canvas, you have to first get its context. You can then perform actions on the context and finally apply those actions to the context.



Canvas

- Canvas definition

```
<canvas>
   Update your browser to enjoy canvas!
</canvas>
```

Alternative text if canvas not supported

CSS can be applied to the canvas element itself to add borders, padding, margins, etc.

Additionally, some CSS values are inherited by the contents of the canvas; fonts are a good example, as fonts drawn into a canvas default to the settings of the canvas element itself.

Furthermore, properties set on the context used in canvas operations follow the CSS syntax. Colors and fonts, for example, use the same notation on the context that they use throughout any HTML or CSS document.

Canvas
Checking for support

```
try {
        document.createElement("canvas").getContext("2d");
        } catch (e) {
        alert("HTML5 Canvas is not supported in your browser.“);
}
```

Canvas
Draw a Diagonal line

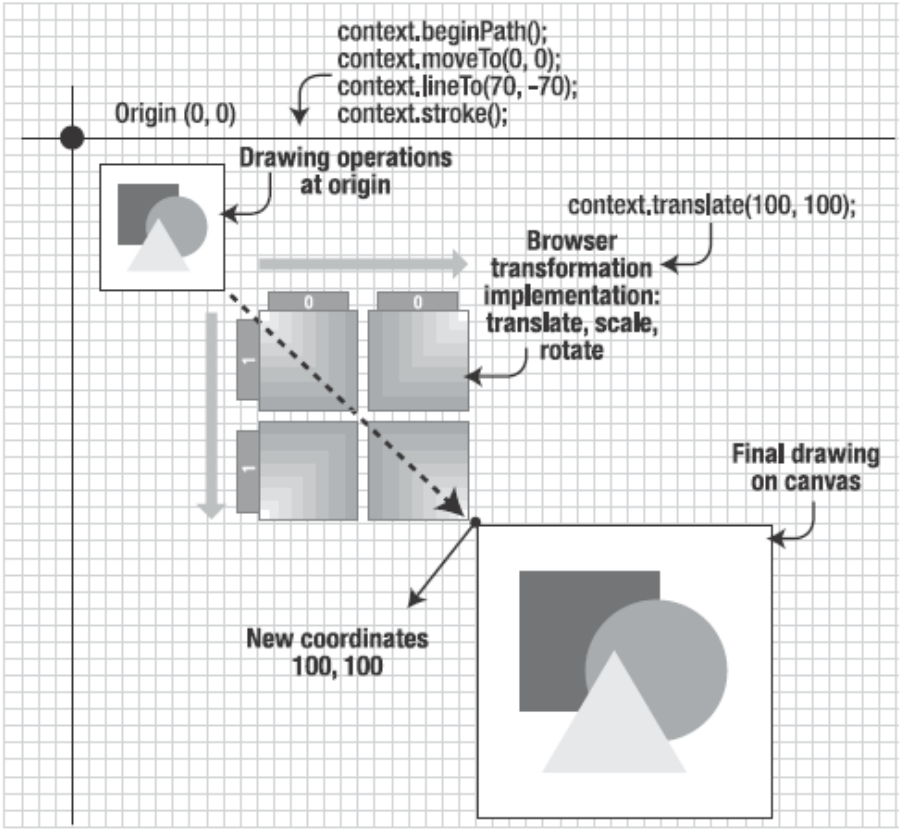
```
<!DOCTYPE html>
<html>
  <title>Diagonal line example</title>
  <canvas id="diagonal" style="border: 1px solid;"  width="200" height="200"> </canvas>
  <script>
      function drawDiagonal() {
        // Get the canvas element and its drawing context
        var canvas = document.getElementById('diagonal');
        var context = canvas.getContext('2d');
```

Canvas
Draw a Diagonal line

```
// Create a path in absolute coordinates
        context.beginPath();       //start a new path
        context.moveTo(70, 140);  //move the context point
        context.lineTo(140, 70);  //draw straight lines
        context.lineWidth = 15;
        context.strokeStyle = '#ff0000'; //set the color
        context.lineCap = 'round';  //butt, round, square
        // Stroke the line onto the canvas (makes the line visible)
        context.stroke();
    }
    window.addEventListener("load", drawDiagonal, true);
 </script>
</html>
```

Canvas
Applying Transformations

- A key recommendation for reusable code is that you usually want to draw at the origin (coordinate 0,0) and apply transformations—scale, translate, rotate, and so forth—to modify your drawing code into its final appearance



Canvas
Draw a Diagonal line

```
function drawDiagonal() {
var canvas = document.getElementById('diagonal');
var context = canvas.getContext('2d');
// Save a copy of the current drawing state
context.save();
// Move the drawing context to the right, and down
context.translate(70, 140);
// Draw the same line as before, but using the origin as a start
context.beginPath();
context.moveTo(0, 0);
context.lineTo(70, -70);
context.stroke();
// Restore the old drawing state
context.restore();
}
```

Canvas
Draw a Diagonal line

Why context.save()?

- If you do not save the state, the modifications you're making during the operation (translate, scale, and so on) will continue to be applied to the context in future operations, and that might not be desirable.

- At the end, you restore the context to its clean original state, so that future canvas operations are performed without the translation that was applied in this operation.

Canvas
Working with Paths

```
function createCanopyPath(context) {
// Draw the tree canopy
context.beginPath();
context.moveTo(-25, -50); context.lineTo(-10, -80); context.lineTo(-20, -80);
context.lineTo(-5, -110); context.lineTo(-15, -110);
// Top of the tree
context.lineTo(0, -140); context.lineTo(15, -110);
context.lineTo(5, -110); context.lineTo(20, -80);
context.lineTo(10, -80); context.lineTo(25, -50);
// Close the path back to its start point
context.closePath();
}
```

closePath -> similar to lineTo but the destination is assumed to be the origination of the path

Canvas
Working with Paths

```
function drawTrails() {
        var canvas = document.getElementById('trails');
        var context = canvas.getContext('2d');
        context.save();
        context.translate(130, 250);
        // Create the shape for our canopy path
        createCanopyPath(context);
        // Stroke the current path
        context.stroke();
        context.restore();
}
    window.addEventListener("load", drawTrails, true);
```

Canvas
Working with Styles

```
// Increase the line width
context.lineWidth = 4;

// Round the corners at path joints
context.lineJoin = 'round';

// Change the color to brown
context.strokeStyle = '#663300';

// Set the fill color to green and fill the canopy
context.fillStyle = '#339900';
context.fill();
```

Canvas
Working with Styles

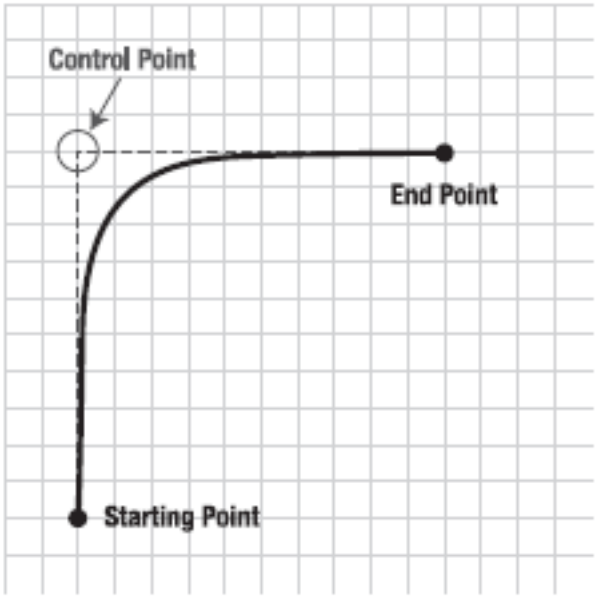
```
// Change fill color to brown
context.fillStyle = '#663300';

// Fill a rectangle for the tree trunk
context.fillRect(-5, -50, 10, 50);

// takes the x and y location as well as the width and the height
```

Canvas
Drawing Curves

context.quadraticCurveTo(xC, yC, xS, yS);

(xC,yC) – coordinates of the control point. The control point sits to the side of the curve (not on it) and acts almost as a gravitational pull for the points along the curve path. By adjusting the location of the control point, you can adjust the curvature of the path you are drawing.

(xS,yS) – final stop in the curve



Canvas
Drawing Curves

```
// Save the canvas state and draw the path
context.save();
context.translate(-10, 350);
context.beginPath();
// The first curve bends up and right
context.moveTo(0, 0);
context.quadraticCurveTo(170, -50, 260, -190);
// The second curve continues down and right
context.quadraticCurveTo(310, -250, 410,-250);
// Draw the path in a wide brown stroke
context.strokeStyle = '#663300';
context.lineWidth = 20;
context.stroke();
// Restore the previous canvas state
context.restore();
```

Canvas
Inserting Images into a Canvas

- Images can be stamped, stretched, modified with transformations, and often be the focus of the entire canvas.
- But images also add a complication to the canvas operations: you must wait for them to load.
- The image has to be loaded completely before you attempt to render it.

Solution

```
// Load the bark image
var bark = new Image();
bark.src = "bark.jpg";
// Once the image is loaded, draw on the canvas
bark.onload = function () {
drawTrails();
}
```

Canvas
Inserting Images into a Canvas

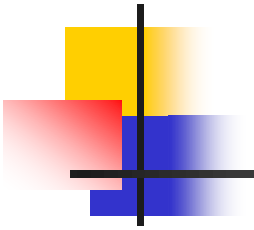
Drawing an image on a canvas

```
// Draw the bark pattern image where
// the filled rectangle was before
context.drawImage(bark, -5, -50,      10,         50);
                                  x   y     width      height
```

This option will scale the image to fit into the 10 × 50 pixel space that we have allocated for our trunk.

Canvas
Using Gradients

- Gradients allow you to apply a gradual algorithmic sampling of colors as either a stroke or fill style
- Creating gradients requires a three-step process:
  1. Create the gradient object itself.
  2. Apply color stops to the gradient object, signaling changes in color along the transition.
  3. Set the gradient as either a fillStyle or a strokeStyle on the context.
- If you supply points A and B as the arguments to the creation of a gradient, the color will be transitioned for any stroke or fill that moves in the direction of point A to point B.



Canvas
Using Gradients

```
// Create a 3 stop gradient horizontally across the trunk
var trunkGradient = context.createLinearGradient(-5, -50, 5, -50);
// The beginning of the trunk is medium brown
trunkGradient.addColorStop(0, '#663300');
// The middle-left of the trunk is lighter in color
trunkGradient.addColorStop(0.4, '#996600');
// The right edge of the trunk is darkest
trunkGradient.addColorStop(1, '#552200');
// Apply the gradient as the fill style, and draw the trunk
context.fillStyle = trunkGradient;
context.fillRect(-5, -50, 10, 50);
```

Canvas
Using Gradients

```
// A second, vertical gradient creates a shadow from the
// canopy on the trunk
var canopyShadow = context.createLinearGradient(0, -50, 0, 0);
// The beginning of the shadow gradient is black, but with
// a 50% alpha value
canopyShadow.addColorStop(0, 'rgba(0, 0, 0, 0.5)');
// Slightly further down, the gradient completely fades to
// fully transparent. The rest of the trunk gets no shadow.
canopyShadow.addColorStop(0.2, 'rgba(0, 0, 0, 0.0)');
// Draw the shadow gradient on top of the trunk gradient
context.fillStyle = canopyShadow;
context.fillRect(-5, -50, 10, 50);
```

Canvas
Using Background Patterns

- The HTML5 Canvas API also includes an option to set an image as a repeatable pattern for either a path stroke or fill.

```
// Replace the bark image with
// a trail gravel image
var gravel = new Image();
gravel.src = "gravel.jpg";
gravel.onload = function () {
drawTrails();
}
// Replace the solid stroke with a repeated
// background pattern
context.strokeStyle = context.createPattern(gravel, 'repeat');
context.lineWidth = 20;
context.stroke();
```

Canvas
Using Background Patterns

Repetition Patterns

Repeat	Value
repeat	(Default) The image is repeated in both directions
repeat-x	The image is repeated only in the X dimension
repeat-y	The image is repeated only in the Y dimension
no-repeat	The image is displayed once and not repeated

Canvas
Scaling Canvas Objects

```
// Move tree drawing into its own function for reuse
function drawTree(context) {
var trunkGradient = context.createLinearGradient(-5, -50, 5, -50);
…
}

// Draw the second tree at X=260, Y=500
context.save();
context.translate(260, 500);
// Scale this tree twice normal in both dimensions
context.scale(2, 2);
drawTree(context);
context.restore();
```

Canvas
Scaling Canvas Objects

Note: transforms such as scale and rotate operate from the origin.

- If you perform a rotate transform to a shape drawn off origin, a rotate transform will rotate the shape around the origin rather than rotating in place.
- Similarly, if you performed a scale operation to shapes before translating them to their proper position, all locations for path coordinates would also be multiplied by the scaling factor.
- Depending on the scale factor applied, this new location could even be off the canvas altogether, leaving you wondering why your scale operation just 'deleted' the image.

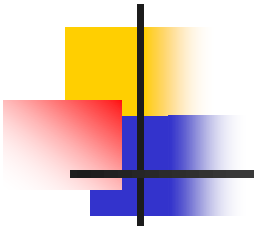
Canvas
Scaling Canvas Objects

```
context.save();
// rotation angle is specified in radians
context.rotate(1.57);
context.drawImage(myImage, 0, 0, 100, 100);
context.restore();
```

Canvas
Scaling Canvas Objects

Example (continued)

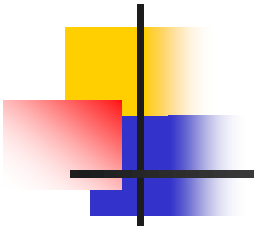
```
// Create a slanted tree as the shadow by applying
// a shear transform, changing X values to increase
// as Y values increase
context.transform(1, 0,-0.5, 1, 0, 0);
// Shrink the shadow down to 60% height in the Y dimension
context.scale(1, 0.6);
// Set the tree fill to be black, but at only 20% alpha
context.fillStyle = 'rgba(0, 0, 0, 0.2)';
context.fillRect(-5, -50, 10, 50);
// Redraw the tree with the shadow effects applied
createCanopyPath(context);
context.fill();
// Restore the canvas state
context.restore();
```



Canvas
Scaling Canvas Objects

transform(a, b, c, d, e, f);

a: Horizontal scaling.
b: Horizontal skewing.
c: Vertical skewing.
d: Vertical scaling.
e: Horizontal moving.
f: Vertical moving.



Canvas
Using Canvas Text

The text drawing routines consist of two functions on the context object:

- fillText (text, x, y, maxwidth)
- strokeText (text, x, y, maxwidth)

Both functions take the text as well as the location at which it should be drawn.

Optionally, a maxwidth argument can be provided to constrain the size of the text by automatically shrinking the font to fit the given size.

In addition, a measureText function is available to return a metrics object containing the width of the given text should it be rendered using the current context settings.

Canvas
Using Canvas Text

Property	Values	Note
font	CSS font string	Example: italic Arial, sans-serif
textAlign	start, end, left, right, center	Defaults to start
textBaseline	top, hanging, middle, alphabetic , ideographic, bottom	Defaults to alphabetic

```
// Draw title text on our canvas
context.save();
// The font will be 60 pixel, Impact face
context.font = "60px impact";
// Use a brown fill for our text
context.fillStyle = '#996600';
// Text can be aligned when displayed
context.textAlign = 'center';
// Draw the text in the middle of the canvas with a max
// width set to center properly
context.fillText('Happy Trails!', 200, 60, 400);
context.restore();
```

Canvas
Applying shadows

Property	Values	Note
shadowColor	Any	CSS color Can include an alpha component
shadowOffsetX	Pixel count	Positive values move shadow to the right, negative left
shadowOffsetY	Pixel count	Positive values move shadow down, negative up
shadowBlur	Gaussian blur	Higher values cause blurrier shadow edges

```
// Set some shadow on our text, black with 20% alpha
context.shadowColor = 'rgba(0, 0, 0, 0.2)';
// Move the shadow to the right 15 pixels, up 10
context.shadowOffsetX = 15;
context.shadowOffsetY = -10;
// Blur the shadow slightly
context.shadowBlur = 2;
```

Canvas Events

- There are many different application possibilities for using the Canvas API:
  - graphs, charts, image editing, and so on.
- However, one of the most intriguing uses for the canvas is to modify or overlay existing content.
  - Areas on the map with high levels of activity are colored as hot (for example, red, yellow, or white).
  - Areas with less activity show no color change at all, or minimal blacks and grays.
- We are able to perform these uses because the Canvas object supports all the standard events
- See the example linked to this slide