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Working with Multimedia on the Web

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Common Image concerns

- To create images for the web, it's best if you understand how images work within browsers
- Often you need to find a balance between file size and quality
- This is important with the rise of mobile devices with high resolution displays
- You can only use graphical file formats that browsers support

Image Formats

- Most browsers support the following common types of images which are:
  - GIF (Graphics Interchange Format) GIF87 and GIF89A
  - JPEG (Joint Photographic Experts Group format)
  - PNG (Portable Network Graphics)
  - SVG (Scalable Vector Graphics)

What are the main differences between those types?

GIF


Google
how to pronounce
how to pronounce nguyen
how to pronounce nike
how to pronounce ø
how to pronounce norwegian letters
how to pronounce å
how to pronounce fjord
how to pronounce huawei
how to pronounce stavanger
how to pronounce gif
how to pronounce azure
Google Search
I'm Feeling Lucky
Report inappropriate predictions

GIF

The debate over how to pronounce GIF, which stands for Graphics Interchange Format, re-emerged this week when Steve Wilhite, the inventor of the widely used Web illustration, declared it should be pronounced “jif,” like the brand of peanut butter, rather than with a hard G sound.

GIF

- Introduced in 1987 by CompuServe
- Quickly became the most widely used image format on the web
- GIF uses a patented LZW (Lempel-Ziv-Welch) compression and supports:
  - Multiple images in a single file
  - Interlacing (GIF89A)
  - Transparency (GIF89A)
  - Animation (GIF89A)

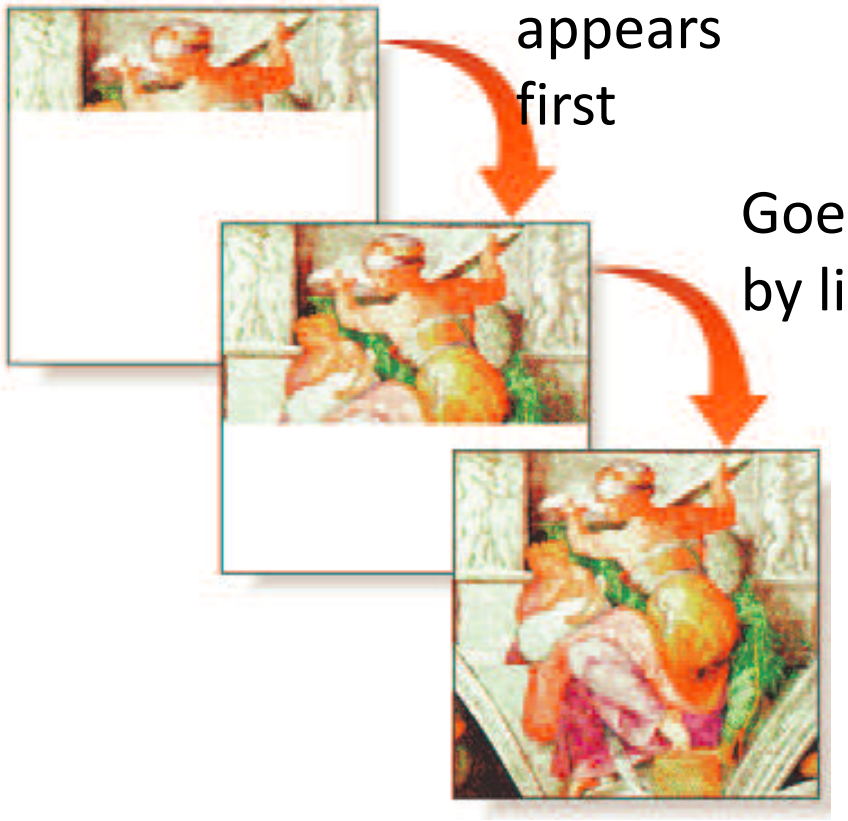
GIF

- GIFs are 8 bit graphics and are limited to a maximum of 256 colors
- GIFs are most widely used for icons and images with solid regions of color
- GIFs support transparency and limited animation

Non-interlaced Graphic

- A non-interlaced GIF appears as it is slowly retrieved by the Web browser.

- If the graphic is large, it might take several minutes for the entire image to appear, which can frustrate the visitors to your Web page.



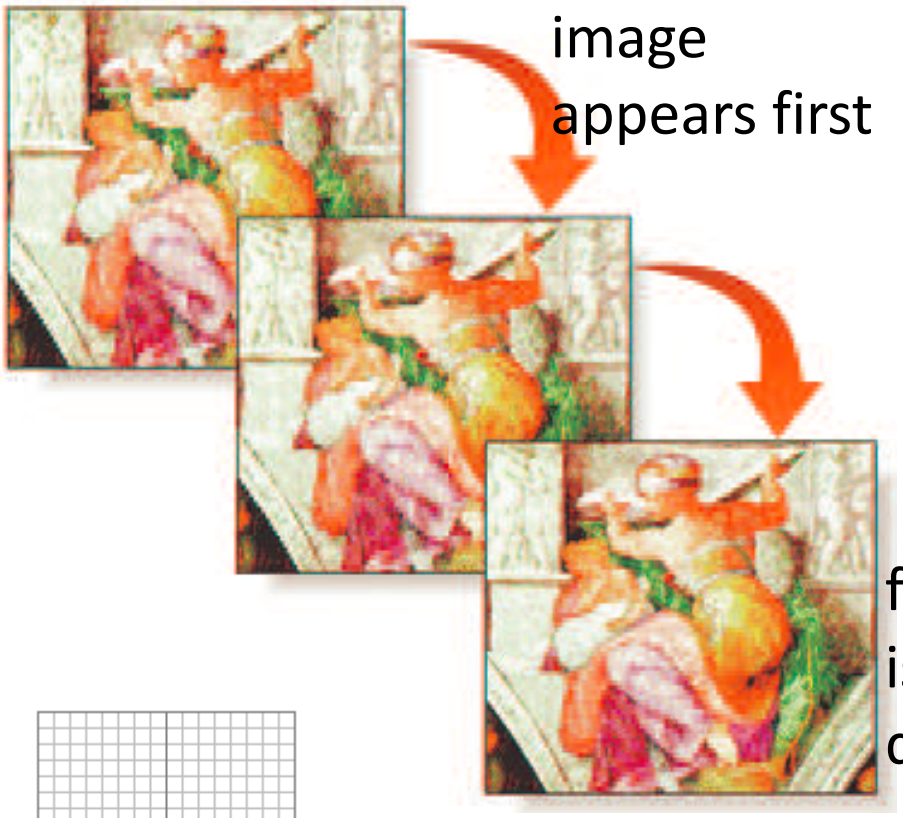
What is the alternative?

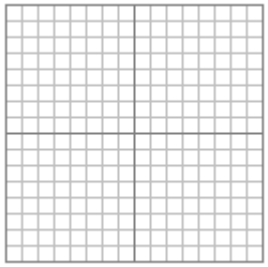
Interlaced Graphic

The graphic starts out as a blurry representation of the final image.

It gradually comes into focus.

Interlaced graphic is always a sharp image, but may take time to display complete image.





Transparent GIFs

- A **transparent color** is a color from the image that is not displayed when the image is viewed in an application.
- In place of a transparent color, the browser will display whatever is on the page background.
- Creating a transparent color depends on the graphic software used.
- Many applications include the option to designate transparent color when saving the image i.e. PhotoShop, GIMP, ImageMagick.

Animated GIFs

- One of the most popular uses of GIFs is to create animated images.
- Animated GIFs are easy to create and smaller in size.
- An **animated GIF** is composed of several images that are displayed one after the other in rapid succession.
- Animated GIFs are an effective way to compose slide shows or to simulate motion.

Animated GIFs

- Animated GIF files are typically larger than static GIF images.
- Animated GIFs can greatly increase size of a Web page.
- Be careful not to overwhelm user with animated images.
- Animated GIFs are limited to 256 colors and can use transparent colors.
- Early browser versions may not support animated GIFs.

JPEG

- JPEG ("Jay-Peg") is designed specifically for storing full-color or greyscale images of real-world scenes (e.g. photographs).
- Smooth variations in color are represented more faithfully and compactly as compared to GIF.
- Can store 24-bit color pictures, offering over 16 million colors.
- JPEG's default **lossy** compression can faithfully store an image with compression ratio of about 10:1 or 20:1 compared to the best lossless compression ratios of about 2:1.

JPEG

- Standard graphic format established in 1992
- Among the most widely used graphic formats
- Uses lossy compression to reduce file size.

- High levels of compression result in artifacts appearing in the image
- Working with JPGs as source images is not recommended

PNG

- PNG, “Portable Network Graphics”, addresses several limitations of GIF and can be seen as an improved version of GIF:
  - PNG uses a free algorithm for compression (“PING”)
  - PNG supports greater color depth.
  - PNG supports 8-bit transparency, meaning image can “fade-in” through partial transparency.
    - GIF – each pixel can be either fully transparent or opaque
    - PNG allows up to 254 levels of partial transparency in between for "normal" image.
    - Allows for illusion of smooth curves.
    - Makes curved images look good against any background.

PNG

- Like GIFs, PNGs support transparency and have a lossless compression
- PNGs support millions of colors
- Typically larger in file size than JPGs and GIFs

SVG

- SVG is a vector graphics format
- Can be scaled independently of resolution
- Graphics are written in SVG markup, which makes them editable though code
- Since they are markup, they can be further styles through CSS
- SVG is now widely supported among devices

WebP

		SIZE / COMPRESSION	ALPHA
jpeg		▬	
png		▬▬	✓
webp		▬ ✓	✓

Summary

- JPEG is for photographic images and is generally lossy. JPEG caters for 24-bit color, varying qualities, and space efficient compression.
- JPEG is slow to decode and is unsuitable for images with few colors.
- GIF is for line drawings and is lossless. GIF caters for 8-bit color, and is reasonably space efficient with LZW compression. GIF is fast to decode, but is unsuitable for photographs. GIFs can be made transparent, can be interlaced, and can be animated.
- PNG for higher quality images, but file sizes larger.
- More info: http://www.scantips.com/basics09.html

Three Rules for Creating Images

- **Save images In the right format**, o/w your site might not look as sharp as you want or will load slow.
- **Save images at the right size**, faster website load and no need for images stretching
- **Measure images in pixels** (not centimeters or inch), you will be independent from screen resolutions.

Figure Captions (HTML5)

- Images often come with captions,HTML5 has introduced a new element called <figure> to contain and associate images and their captions.
- You can have more than one images as long as they share the same caption.
- The <figcaption> element has been added to HTML5 to allow web page authors to add a caption to an image.
- Before that there was no way to associate an <img> with its caption

```
<figure>
        <img src”images/image1.jpg” alt=“the first image” />
        <figcaption> This is the caption of the first image </figcaption>
</figure>
```

Figure Captions (HTML5) – Example

Code

```
<figure>
        <img src="images/otters.jpg" alt="Photograph of two sea otters floating in water" />
<br />
<figcaption>Sea otters hold hands when they sleep so they don't drift away from each other.</figcaption>
</figure>
```

Result

Sea otters hold hands when they sleep so they don't drift away from each other.

Inserting a Background Image

- The **background** attribute allows an image file for the background of a Web page
- The syntax for inserting a background image is:
  - **background-image: url(*url*)**
  - ***URL*** is the location and filename of the graphic file you want to use for the background of the Web page
- For example, to use an image named "**bricks.gif**" as a background image, you would use the tag:

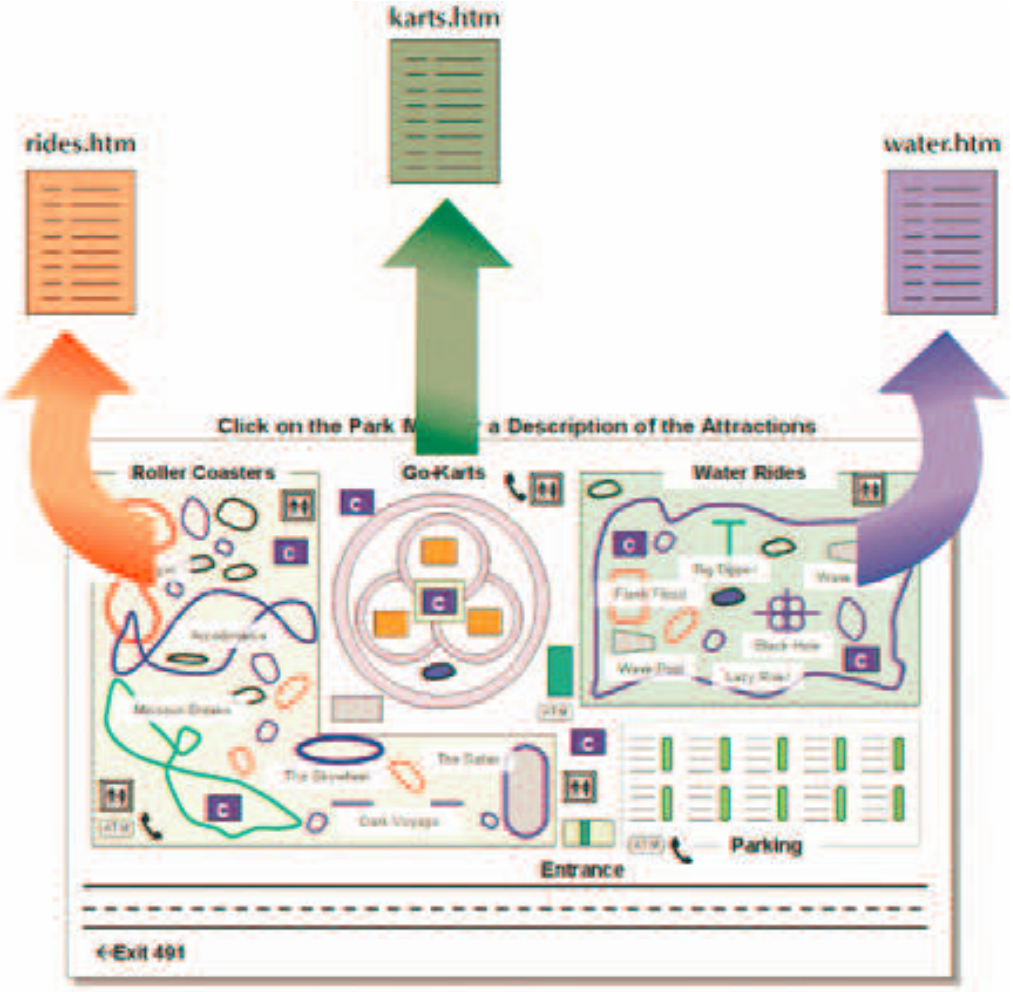
<body style="backgroundimage:url(brick.gif)">

Background Image

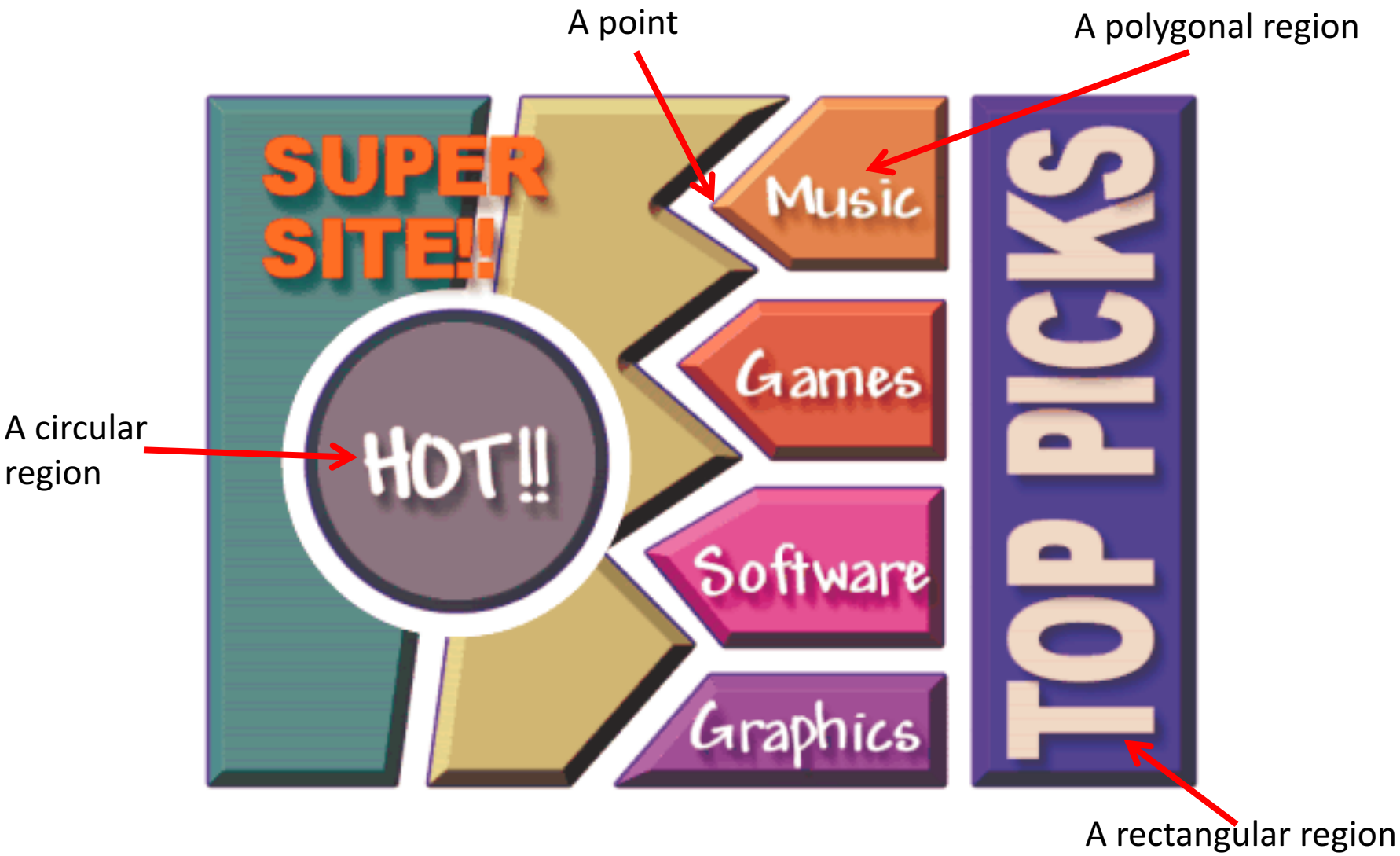
- In choosing a background image, you should remember the following:
  - use an image that will not detract from the text on the Web
  - page, making it hard to read
  - do not use a large image file (more than 20 kilobytes)
    - large and complicated backgrounds will increase the time it takes a page to load
  - be sure to take into consideration how an image file looks when it is tiled in the background

Image Maps

- Different parts of an image can contain hyperlinks.
- A **hotspot** is a defined area of the image that acts as a hypertext link.
- When a user clicks within a hotspot, the hyperlink is activated



Good image map



A not so good image map

Image Maps

- An **image map** is made up of an image and a list of hotspots.
- A hotspot is defined by it’s shape, it’s location and the hyperlink address.
- There are two types of image maps: **server-side image maps** and **client-side image maps.**

Defining Image Map Hotspots

- Define a hotspot using two properties:
  - Its location in the image
  - Its shape
- Syntax of the hotspot element:

<area shape=*"shape"* coords=*"coordinates"* href=*"url"* alt=*"text"* />

Shape Value	Description
rect	Rectangular shape
circle	Circle shape
polygon	Polygon shape

Creating a Rectangular Hotspot

- Two points define a **rectangular hotspot**:
  - the upper-left corner
  - the lower-right corner

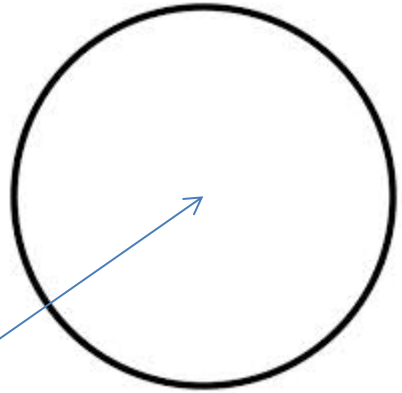
- A sample code for a **rectangular hotspot** is:

  <area shape="rect" coords="384,61,499,271" href="water.html">

  - the ***hotspot*** is a hypertext link to water.htm
  - ***coordinates*** are entered as a series of four numbers
    - first two numbers indicate coordinates for the upper-left corner
    - second two numbers indicate the location of the lower-right corner

Creating a Circular Hotspot

- A **circular hotspot** is defined by the location of its center and its radius



- A sample code for a **circular hotspot** is:

  <area shape="circle" coords="307,137,66" href="karts.html">

  - ***coordinates*** are (307, 137), and it has a radius of 66 pixels
  - the ***hotspot*** is a hypertext link to karts.htm

Creating a Polygonal Hotspot

- To create a polygonal hotspot, you enter the coordinates for each vertex in the shape
- A sample code for a **polygonal hotspot** is:

  <area shape="polygon"
  coords="13,60,13,270,370,270,370,225,230,225,230,60"
  href="rides.html">

  – ***coordinates*** are for each vertex in the shape.
  – the ***hotspot*** is a hypertext link to rides.htm

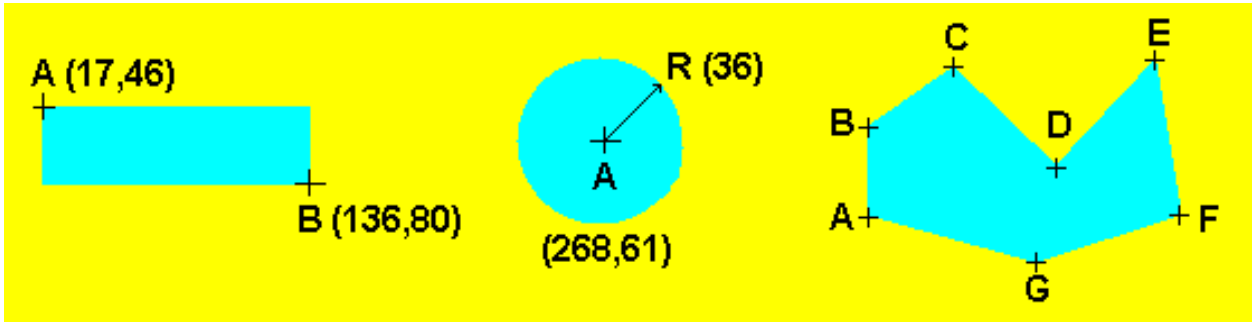


Image Map

- Most browsers support the **USEMAP** attribute for client-side image maps.
- **USEMAP** references a **map** element which contain list of hotspots.

```
<img src="supersite.gif" usemap="#map1">
<map name="map1">
    <area coords="0,0,50,50" href="topleft.html">
    <area coords="50,50,80,80" href="bottomright.html">
</map>
```

How do we make image maps?

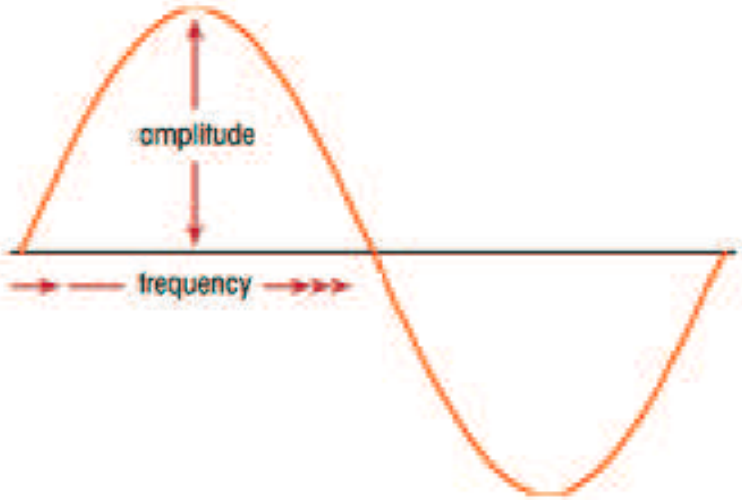
- Working out the coordinates can be difficult.
- Many tools are available for making image maps (eg Macromedia Dreamweaver) - work out coordinates according to the area a user specified through graphical interface.
- You can use server-side and client-side image map together to ensure both browser compatibility and responsiveness.

Working with Multimedia

- Multimedia includes a combination of audio, images, animation and video.
- Multimedia files can be large and take time to download.
- **Bandwidth** is a measure of the amount of data that can be sent through a communication pipeline each second.
- Consider bandwidth when working with multimedia on Web site.
- Multimedia added to Web page two different ways:
  - **External media** is accessed through a link
    - **Useful for a low bandwidth**
  - **Inline media** is placed within Web page as embedded object

Working with Audio

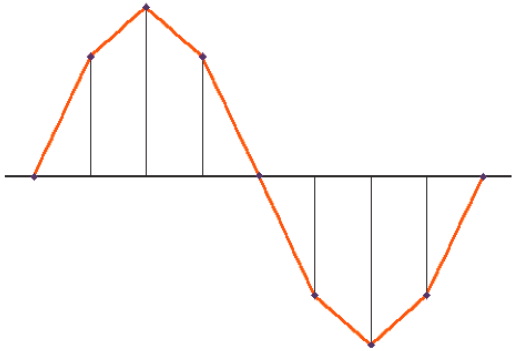
- Every sound wave is composed of two components:
  - Amplitude - the height of the wave. The higher the amplitude, the louder the sound.
  - Frequency- number of waves per second. The higher the frequency, the higher the pitch.



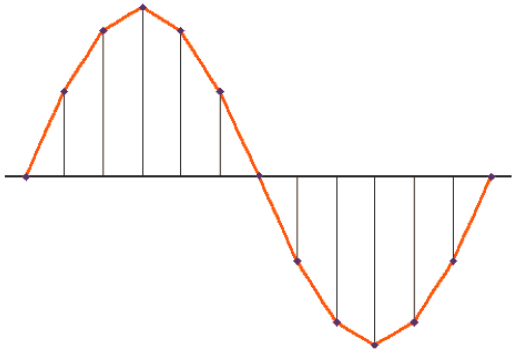
Sampling Rate

- Sound waves are **analog** functions (represent a continuously varying signal).
- To store the information, however, it must be converted to **digital** data (bits) – **digitized**.
- **Digital** recording measures the sound's amplitude at discrete points in time.
- Each discrete measurement is called a **sample.**
- Samples per second taken is called the **sampling rate.**

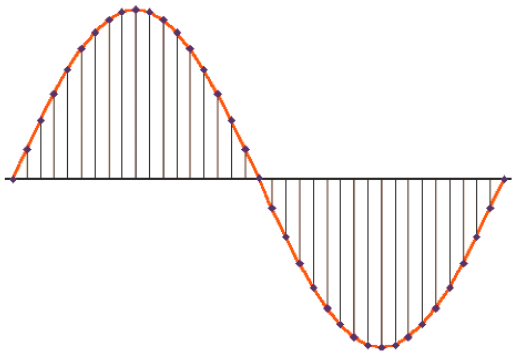
Sampling Rate



Low sampling rate



Medium sampling rate

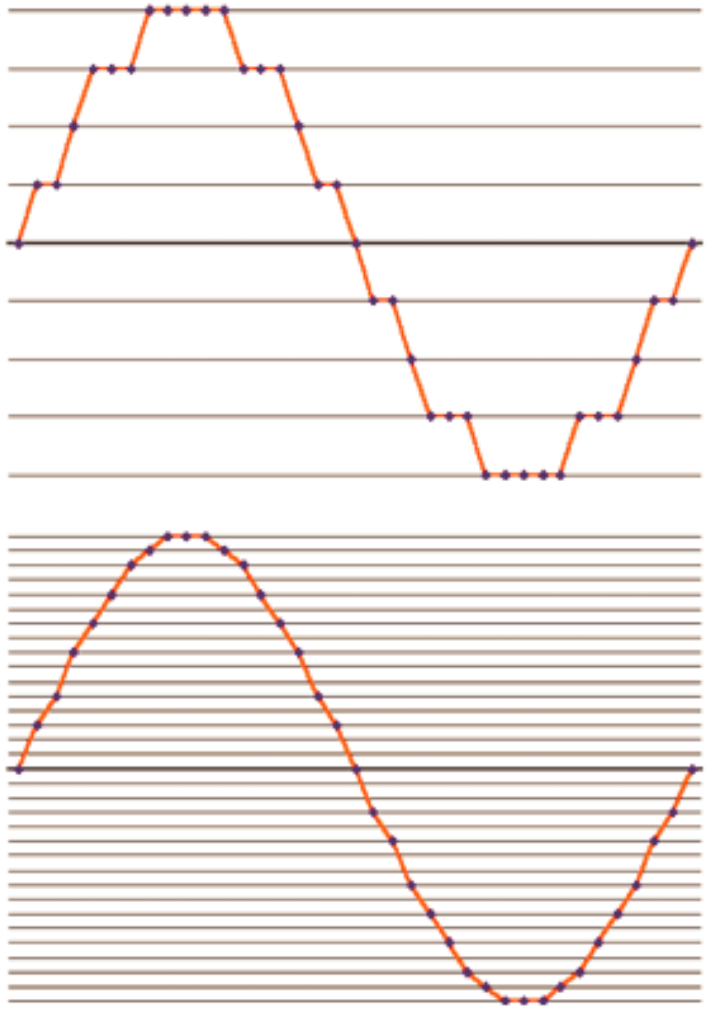


High sampling rate

Sample Resolution

- Each sample has an amplitude which must be approximated to a digital value.
- **Sampling resolution** indicates the precision in measuring the amplitude for each sample:
    - 8-bit
    - 16-bit
    - 32-bit

Sample Resolution



Low sample resolution

High sample resolution

What are the most common sound formats?

Sound File Formats

- **WAV (Waveform Audio File Format)** usually contains uncompressed audio.
  - High quality, but large file size.
- **MP3** is version of MPEG format, which compresses audio files with minor impact on sound quality.
  - Controversy around MP3 involves copyrighted material that has been copied without the permission of the artist or producers.
- **WMA (Windows Media Audio)** uses Microsoft proprietary compression algorithm.
- **Ogg** Developed by the Xiph.Org Foundation (patent free) - Supported by HTML5
- **MIDI (Musical Instrument Digital Interface)** is widely adopted in music industry
  - limited to instrumental music and not speech/general sounds

Only MP3, WAV, and Ogg audio is supported by the newest HTML5 standard.

Sound File Formats

- **Non-streaming media** must be completely downloaded before being played
  - May produce lengthy delays
- **Streaming media** processed in continuous stream as they are downloaded
  - Both sound and video
- Different formats provide varying levels sound quality and compression.
- You can link to sound files:

Relaxation Music

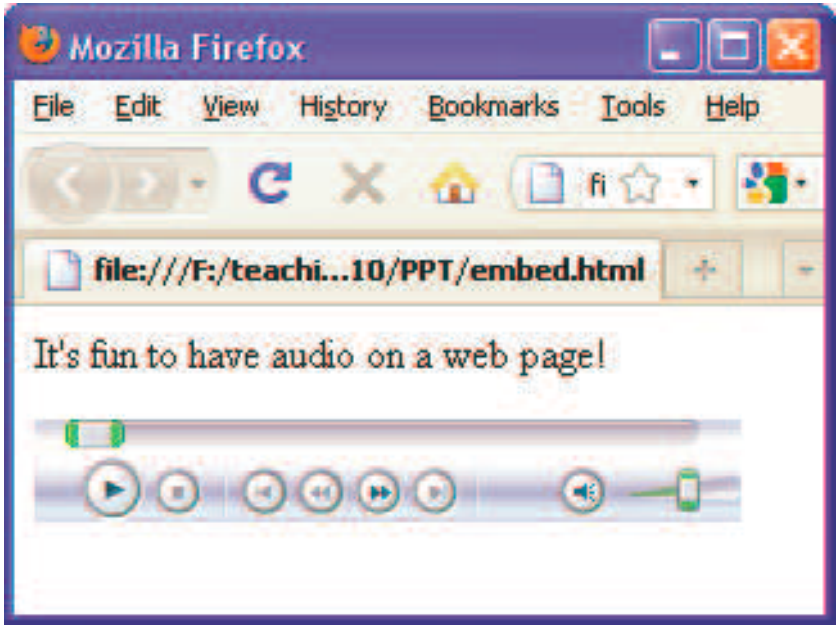
Adding audio to web pages

- By far the most popular format for putting audio is MP3. In general today there are 3 main ways for doing so:

1. **Use a host service**, there are several sites that allow you to upload your audio, and provide a player which you can embed in your page, e.g. MySpace, SoundCloud
2. **Use flash,** there are several flash players that allow you to play MP3 files
3. **Use HTML5,** HTML5 has introduced a new <audio> element (**recommended**)

Embedding an Audio Clip

```
<html>
<head></head>
  <body>
    <embed src="b9.wma" width="275" height="40" autostart="0"/>
  </body>
</html>
```



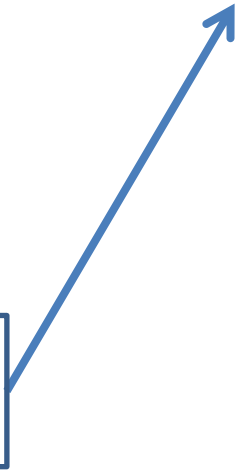
Adding HTML5 audio to your webpages

- HTML5 introduced the <audio> element to include audio files in your pages
- The <audio> element has a number of attributes which allow you to control audio playback
- **src** attribute specifies the path to the audio file
- **controls** attribute indicates whether or not the player should display controls, if you don't use this attribute no controls will appear
- **autoplay** attribute makes the audio playing automatically (instead of having visitors to choose)
- **preload** attribute indicates what the browser should do if the player is not set to autoplay
- **loop** attribute specifies that the audio track should play again once it has finished

Keep in mind that not all the browsers (versions) fully support HTML5

Adding HTML5 audio to your page

Use additional audio source, different browsers support different formats!!!



```
<html>
   <head>
         <title>Adding HTML5 Audio</title>
   </head>
    <body>
         <audio controls autoplay>
               <source src="audio/test-audio.ogg" />
               <source src="audio/test-audio.mp3" />
               <p>This browser does not support our audio format.</p>
         </audio>
   </body>
</html>
```

Working with Video

- Video files add a visual element to a Web page as well as provide information.
- Video files are composed of a series of single images called frames.
- The number of frames shown in a period of time is the frame rate.
- Control file size of video files:
  - Reducing the frame rate reduces the size of your file.

What are the most common video formats?

Video File Formats

Format	File	Description
AVI	.avi	AVI (Audio Video Interleave) was developed by Microsoft, and is therefore playable on all Windows computers. It is commonly used in video cameras and TV hardware, but is difficult to play on non-Windows computers.
WMV	.wmv	WMV (Windows Media Video) was developed by Microsoft, and is therefore playable on all Windows computers. It is commonly used in video cameras and by TV hardware, but is difficult to play on non-Windows computers.
QuickTime	.mov	QuickTime was developed by Apple, and is therefore playable on all Apple computers. It is commonly used in video cameras and by TV hardware, but is difficult to play on non-Apple computers.
RealVideo	.rm .ram	RealVideo was developed by Real Media to allow video streaming with low bandwidths. It is still used for online video and Internet TV, but because of the low bandwidth priority, the quality is also low.
Flash	.swf .flv	Flash was developed by Macromedia. Flash requires an extra component to play in a browser.
Ogg	.ogg	Theora Ogg was developed by the Xiph.Org Foundation.
WebM	.webm	WebM is a project (www.webmproject.org) by the web giants, Mozilla, Opera, Adobe, and Google.
MPEG	.mpg .mpeg	MPEG, developed by the Moving Pictures Expert Group, used to be the most popular video format on the Internet. It used to be supported by all major browsers, but it is not supported by HTML5.
MPEG-4 or MP4	.mp4	MP4 is the upcoming format on the internet. It is supported by all major browsers in HTML5. YouTube recommends using MP4, and it is commonly used in newer video cameras and TV hardware.

Only MP4, WebM, and Ogg video is supported by the newest HTML5 standard

Adding video using HTML5 to your pages

- The HTML5 <video> element is quite recent and not supported from all the browsers
- It is advised to combine this HTML5 with flash video
- To reach as many browsers as possible, you should also provide multiple video formats, eg. WebM, H264 etc.
- HTML5 option solves any inconsistence of the player menus and functions
- In HTML5 you don’t need to supply values for all attributes, eg. control, loop; these attributes are on when they are there and off in case they don’t
- In case the browser doesn’t support the <video> element or the video format, it will display whatever is inside <video>

HTML5 <video> element attributes

- **preload,** this attribute tells the browser what to do when the page loads:
  - **none**, don't load the video until the user presses play
  - **auto**, load the video together with the page
  - **metadata**, load only information of the video eg. size, duration
- **src,** specifies the path to the video
- **poster,** allows you to specify an image to show while the video is loading
- **width, height,** specify the size of the player in pixels
- **controls,** this attribute indicates that the browser should supply its own controls for playback

Adding video using HTML5 to your pages

Result:

```
<body>
        <video src="video/puppy.mp4"
                poster="images/puppy.jpg"
                width="400" height="300"
                preload
                controls
                loop>
                <p>A video of a puppy playing in the snow</p>
        </video>
</body>
```

Multiple Video Sources with HTML5

- To specify the location of the file to be played, you can use the <source> element inside the <video> element
- You can use multiple <source> elements to specify that the video is available in different formats
- You should use **type** attribute to tell the browser what format the video is in
- The **codec** needs to be supplied within the type attribute
- You may choose to offer HTML5 as the first option and, flash video as a fallback solution (or the other way around)

HTML Video vs. HTML5 Video

Markup	Pros	Cons
HTML Video	Well-known, time-proven markup language	Flash plug-in is a must
	Supported by all desktop browsers: Internet Explorer, Firefox, Chrome, Opera, Safari	Constant plug-in updates
	Many video hosting options: own server, YouTube, Vimeo, etc	Slow, high-load videos
	Lots of video embedding methods: from advanced coding to simple YouTube copy-paste code	No video playback on mobiles like iPad and iPhone
HTML5	No plug-ins needed	Not supported by Internet Explorer 6, 7, 8
	Works on both desktop and mobile devices	Requires video conversion
	Flexible player settings: users can move and rotate web players	No stable specification. You have to study new markup principles

Multiple video sources

```
<head>
    <title>Multiple Video Sources</title>
</head>
<body>
    <video poster="images/puppy.jpg" width="400“ height="320"
    preload controls loop>
    <source src="video/puppy.mp4“ type='video/
            mp4;codecs="avc1.42E01E, mp4a.40.2"' />
    <source src="video/puppy.webm" type='video/
      webm;codecs="vp8, vorbis"' />
    <p>A video of a puppy playing in the snow</p>
    </video>
</body>
```

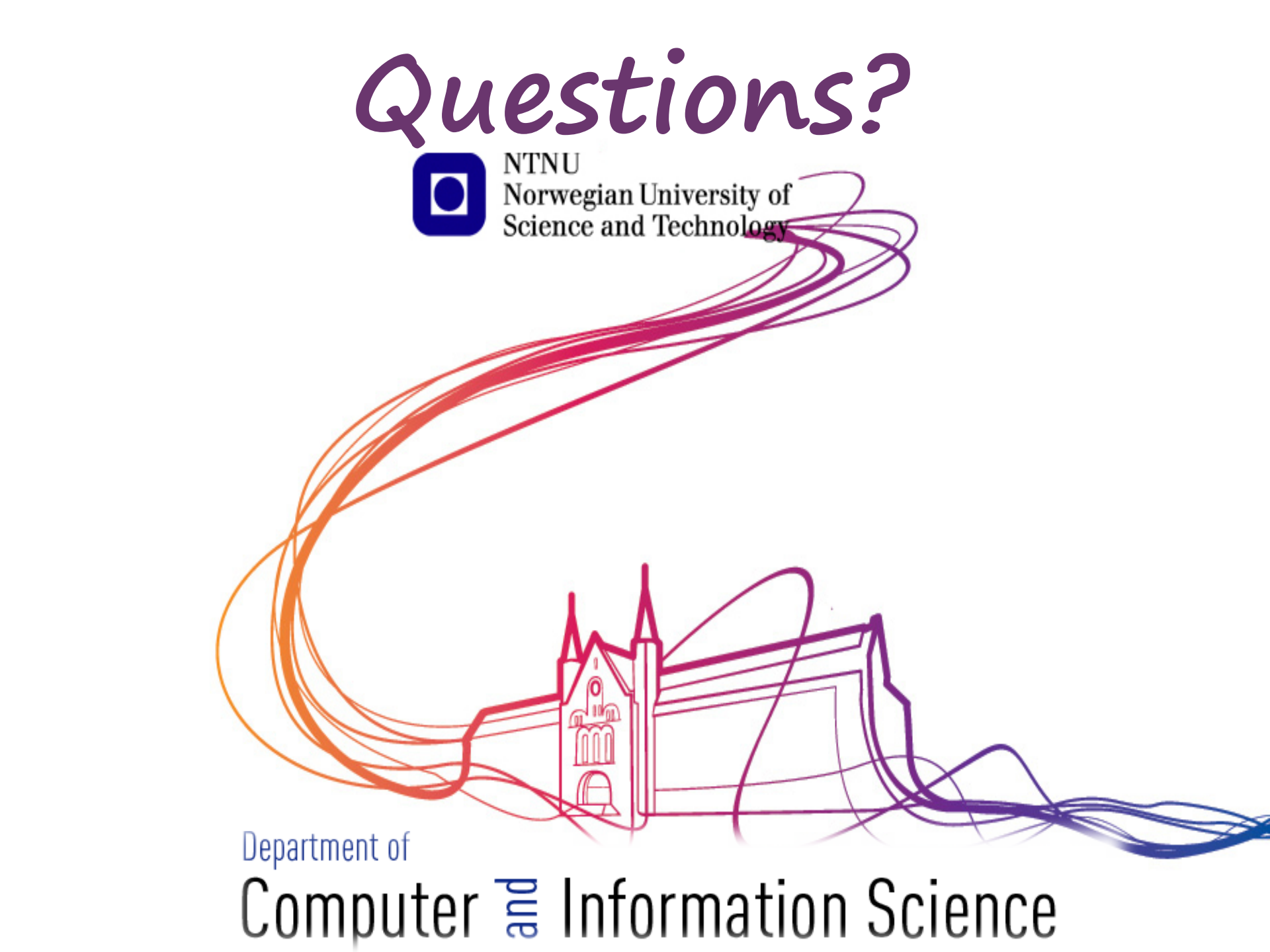
Summary

- When linking to multimedia, provide a variety of media formats to ensure that all users have access to formats they can use
- Include the file size in links to large multimedia files to notify users with low bandwidth connections
- Do not insert media clips unless you provide a method for users to turn off the clips; if a clip plays automatically, allow it to play only once

Summary

- Flash allows you to add video and audio to your site but is not fully supported (e.g. iPhone, iPad)
- HTML5 introduces new <video> and <audio> elements for adding video and audio to web pages, but these are not yet supported from all the browsers
- Browsers that support the HTML5 elements do not necessarily support the same video and audio formats, it is wise to supply your files in different formats

Questions?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