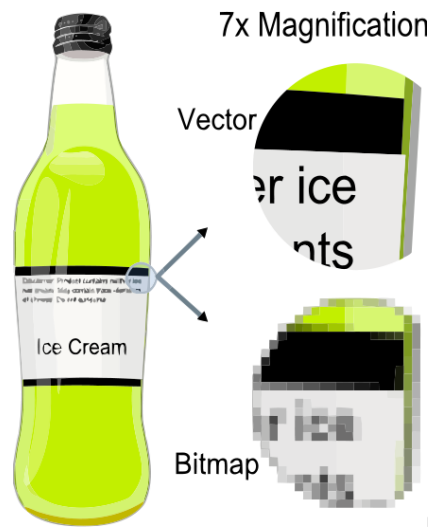


Topic: 1.1.2 Images

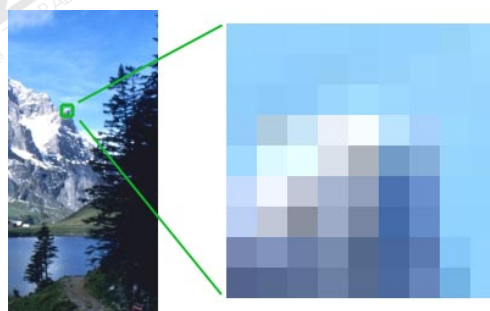
Graphic images that have been processed by a computer can usually be divided into two distinct categories. Such images are either bitmap files or vector graphics. This section will cover the two main image types: vector and bitmap, along with some compression techniques.



Bitmap Graphics

Bitmaps images are exactly what their name says they are: a collection of bits that form an image. The image consists of a matrix of individual dots (or pixels) that all have their own color (described using bits, the smallest possible units of information for a computer).

Let's take a look at a typical bitmap image to demonstrate the principle:

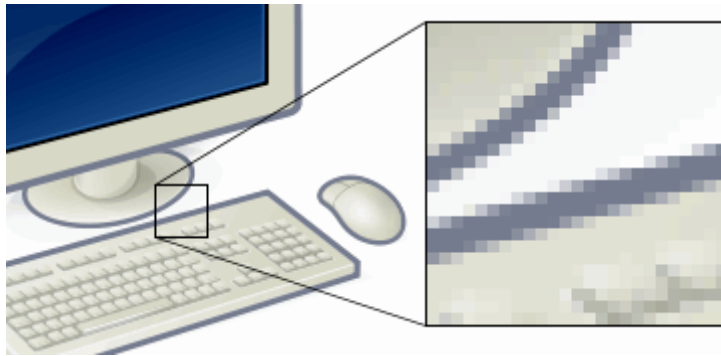




Topic: 1.1.2 Images

Pixel

The smallest possible addressable area defined by a solid color, represented as binary, in an image

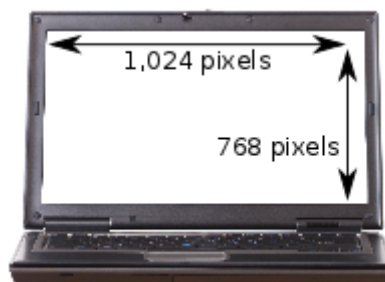


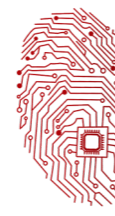
This example shows a Bitmap image with a portion greatly enlarged, in which the individual pixels are rendered as little squares and can easily be seen. Try looking closely at your monitor or mobile phone screen to see if you can spot the pixels

Resolution

Image Resolution - how many pixels does an image contains per inch/cm? The more pixels used to produce an image the more detailed that image can be i.e. the higher its resolution. For instance a 10 Megapixel digital camera makes use of over 10 million pixels per image thus offering a very high photographic quality.

Screen Resolution - The screen resolution tells you how many pixels your screen can display horizontally and vertically. It's written in the form 1024 x 768. In this example, the screen can show 1,024 pixels horizontally, and 768 vertically:

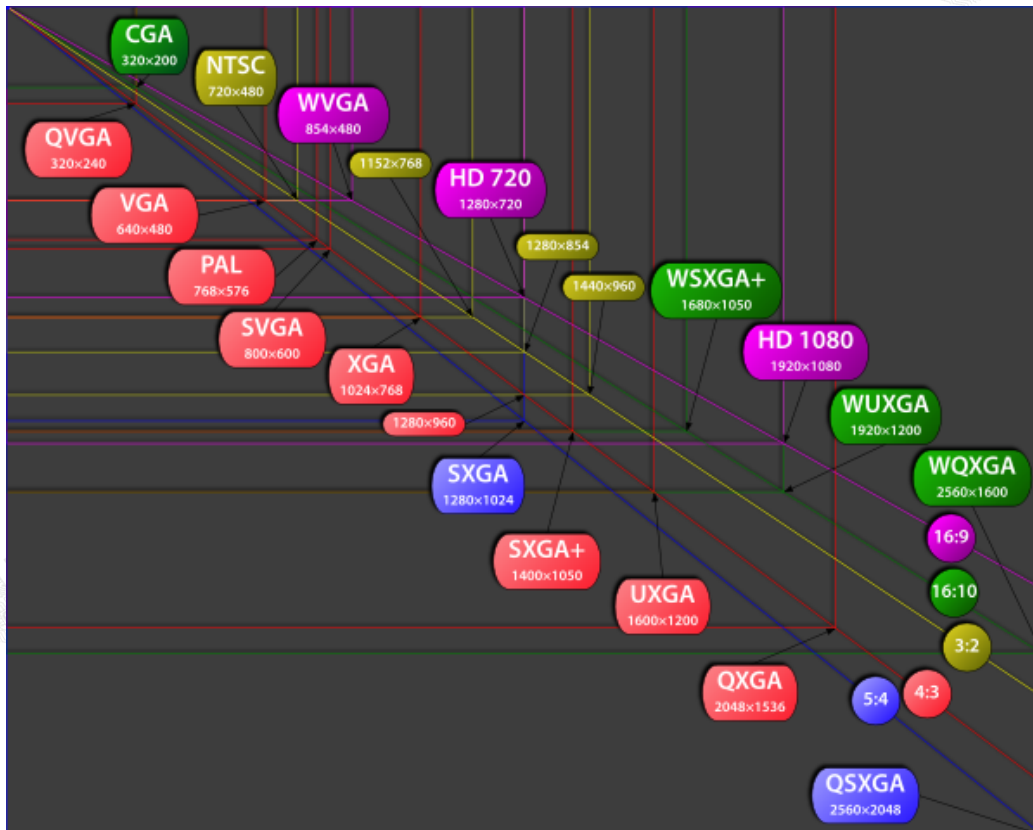




Topic: 1.1.2 Images

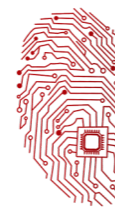


The higher the resolution, the more pixels are available. Therefore the crisper the picture.



There are many different video display formats out there, with different widths and heights, and total numbers of pixels





Topic: 1.1.2 Images

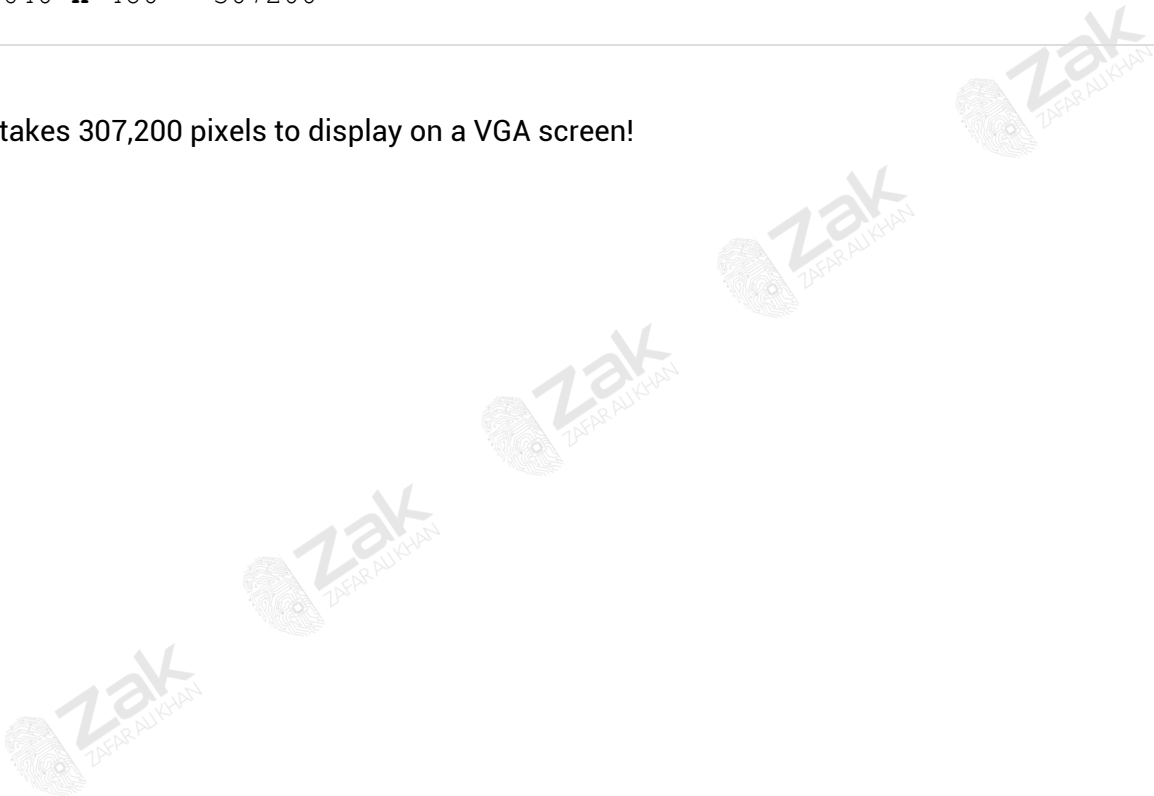
Example: Calculating screen resolutions

Using the diagram above we are going to work out how many pixels are required to display a single frame on a **VGA** screen.

Checking the resolution:

```
Height = 480
Width = 640
Area = Width x Height = Total Pixels
Area = 640 x 480 = 307200
```





Hence, it takes 307,200 pixels to display on a VGA screen!





Topic: 1.1.2 Images

Color depth - The number of bits used to represent the color of a single pixel

Colour depth	1 bit	2 bit	4 bit
Example			
Description	Mono-chrome, only stores black and white	stores 4 colours: RGB(70,61,55), RGB(79,146,85) RGB(129,111,134), RGB(149,146,166)	Stores limited colours
Number of colors/pxl	$2^1 = 2$	$2^2 = 4$	$2^4 = 16$
Colour depth	8 bit	24 bit	
Example			
Description	close to reality	hard to see any difference between reality	





Topic: 1.1.2 Images

It seems pretty obvious that the higher the color depth, the closer the picture will look to reality. Why then don't we just ramp up the color depth on every image that we make? The answer should be obvious, for a fixed resolution, the higher the resolution, the larger the file size.

Example: Calculating file size for different colour depths

All the images above are of the same resolution:

$$300 \times 225 = 67500 \text{ pixels}$$

If the first image uses 1 bit to store the color for each pixel, then the image size would be:

$$\begin{aligned} \text{Number of Pixels} \times \text{Color Depth} &= \text{Image Size} \\ 67500 \times 1 \text{ bit} &= 67,500 \text{ bits} \end{aligned}$$

For the second image uses 2 bits to store the color for each pixel, then the image size would be:

$$\begin{aligned} \text{Number of Pixels} \times \text{Color Depth} &= \text{Image Size} \\ 67500 \times 2 \text{ bit} &= 135,000 \text{ bits} \end{aligned}$$

Bitmap file header:

This block of bytes is at the start of the file and is used to identify the file. A typical application reads this block first to ensure that the file is actually a BMP file and that it is not damaged.

What Are File Headers?

Many file types can be identified by using what's known as a file header. A file header is a 'signature' placed at the beginning of a file, so the operating system and other software know what to do with the following contents.

Many electronic discovery applications (computer programs) will use the file header as a means to verify file types. The common fear is if a user changes a file's extension or the file wasn't named using an application's default naming convention, that file will lose its association with the program that created it. For example, if you create a Microsoft Word document and name it 'myfile.001', instead of 'myfile.doc' and then attempt to locate all Microsoft Word files at a later date, you would miss the file if you were looking for all files ending in '.doc'. There are specific file extensions associated with the native application.





Topic: 1.1.2 Images

Vector Graphics - images defined using mathematics and geometry such as points, lines, curves, and shapes or polygon(s). Allowing for scalability. Objects and properties stored mathematically.

Drawing list - a set of commands used to define a vector image

Drawing objects and properties - Vector graphics are made up of objects and their properties. An **object** is a mathematical or geometrically defined construct such as a rectangle, line or circle.

`<rect ... />`

`<line ... />`


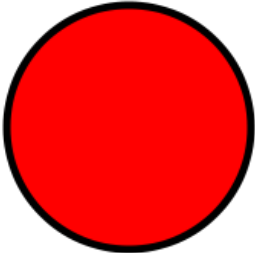
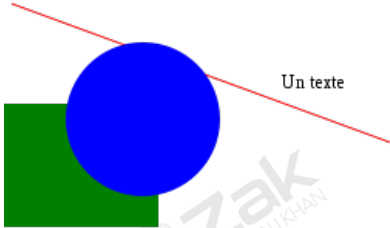
`<circle ... />`

(See next page...)



Topic: 1.1.2 Images

Each of these objects has properties to tell you the size, colour, position etc. Take a look at the next example to see how drawing lists are built from objects and properties.

	Rectangle	Circle	Combination
Image			
Drawing List	<pre><rect x="14"y="23" width="250"height="50" " fill="green" stroke="black" stroke- -width="1"/></pre>	<pre><circle cx="100"cy="100"r="50" fill="red" stroke="black" stroke- width="5"/></pre>	<pre><rect width="100"height="80" x="0"y="70" fill="green"/> <line x1="5"y1="5" x2="250"y2="95" stroke="red"/> <circle cx="90"cy="80" r="50" fill="blue"/> <text x="180"y="60"> Un texte </text></pre>
Notes	x and y give the top left start location	Note that the centre co-ordinate is defined through cx and cy r gives the radius	Note that the circle is on top, this is because it was drawn last. To leave out an edge stroke don't put the stroke command in. The line has start x1,y1 and end x2,y2 coordinates.











Topic: 1.1.2 Images

Comparison between vector and bitmaps



This image illustrates the difference between bitmap and vector images. The bitmap image is composed of a fixed set of dots (pixels), while the vector image is composed of a fixed set of shapes. In the picture, scaling the bitmap reveals the pixels and scaling the vector image preserves the shapes.

-  Vector images scale without file size increase / decrease
-  Bitmap images scale resulting in file size increase / decrease
-  Vector images scale without distortion to the image
-  Bitmap images distort (pixelate) when scaling
-  Bitmaps are better for photo editing
-  Bitmaps require less processing power to display

Justification for using Bitmaps (Also Known As Raster Graphics)

Raster graphics have inherently unique characteristics that can't be created inside Flash. The only warning related to using this option is to make sure you really need raster graphics. The following are some cases that justify the use of raster graphics:

A photograph. The only time to consider using a vector alternative to a photograph is when the picture is of a very geometric object. Otherwise, photographs should be raster graphics.

A series of still images extracted from frames of a short video.

An image with special effects that can't be achieved by using a vector tool, such as clouds, fire, water, and other natural effects.

If you're unfamiliar with the difference between vector graphics and raster graphics, learning when one choice is better than the other can take some time. The file formats .gif, .jpg, .png, .bmp, and .pct are all raster graphics formats. However, just because a file was saved in one of these formats doesn't mean it was done appropriately. It's the nature of the image in the file that matters. If all you have is a .gif, for





Topic: 1.1.2 Images

example, you need to first look at its contents to judge whether it's appropriate for raster graphics. Here's an easy way to decide: If you can trace or redraw the image in the file, you're much better off redrawing it. If it's a photograph, you would never be able to trace it (so leave it as a raster graphic). If it's a picture of a plain box, maybe you could draw it and thus take advantage of all the benefits of vector graphics without even bothering with raster graphics.

