Graphic

A graphic or graphic image is a digital representation of information other than text. B. Drawings, figures, or photographs. Many websites apply colorful graphic designs and images to convey their message. Two of the more common graphic formats that exist on the web are JPEG and GIF.

Computer graphics are either 2D or 3D. Early computers only supported monochrome 2D graphics. It was black and white (or black and white on some monitors). Eventually, computers began to support color images. Initial machines only supported 16 or 256 colors, but most computers today can display millions of colors of graphics. https://techterms.com/definition/graphics#:~:text=A%20graphic%20is%20an%20image,and%20letters%2C%20rather%20than%20images.

Image

An image, also known as a still image, is a digital image that is a binary representation of all types of visual information, such as drawings, individual video frames, logos, images and graphics

<https://anydifferencebetween.com/difference-between-graphics-and-images/>

An image **is made up** of a rectangular array of dots called pixels. **Image dimensions are** specified in width X height, in pixels. The physical size of the image, in centimeters or inches, it totally depends on the resolution of the screen on which the image is displayed. **Resolution** is often measured in Dots Per Inch (DPI). **An** image will be smaller on a higher resolution **device** than on a lower **resolution device.** For color images, to represent all colors of an image there should be enough bits per pixel. The number of bits per pixel is called the **image depth.** [**https://www.tutorialspoint.com/multimedia/multimedia\_images\_graphics.htm**](https://www.tutorialspoint.com/multimedia/multimedia_images_graphics.htm)

**Different Types of Media**

We use various media to get news, learn new things and have fun. With the development of technology, we can choose the type of media we want to use.

The goal of media is to convey an advertising message to the audience through the most appropriate media channel for their product.

In general, media can be classified in three main

**Print media.** Previously, this type of media was the only way to convey information to the population. In the 80s and 90s print media was the only means of entertainment. People trusted and on magazines, newspapers – good source of vital information about a country or the world. Includes newspaper, magazines, books, banners, billboards, brochures, flyers etc.

**Web media (internet media).** The most popular type of media at the moment, moreover some young generations are using only that type of media. This media includes social networks or websites, online forums, podcasts

**Online forums -** an online place where we can comment, message, or discuss a particular topic. Forums allow us to share knowledge with other people with the same interest. That’s why it’s regarded as the best platform to seek support and assistance.

[**https://whatagraph.com/blog/articles/different-types-of-media**](https://whatagraph.com/blog/articles/different-types-of-media)

**Pixelate**

Most image files, such as JPG, PNG, and GIF, are bitmaps or they're maps of bits - essentially grids of pixels that blend smoothly  together to form an images. Pixels are the smallest squares of hue, saturation, and lightness (HSL) that make up the grid of a digital image. Pixelation occurs when, instead of perfectly blending, pixels are visible to the naked eye. Image can be accidentally pixelate when change a scale of an image to a size too large for its resolution. https://www.adobe.com/nz/creativecloud/photography/discover/pixelate-image.html

**Free sources** of images for games can be found on the internet, some examples of those website are below

<https://www.freepik.com/free-photos-vectors/2d-game>

<https://craftpix.net/freebies/>

<https://www.shutterstock.com/ru/search/2d+game+art>

There is a very good tool that can be used for pixaleting any images - pixel it

<https://giventofly.github.io/pixelit/>

Applying the right image formats can helps to get the best performance for a particular need. For example, by using a correct format speed of loading a webpage can be increased, it is especially important with a low internet traffic.

The are 13 the most popular image formats that are widely used.

**JPEG** – very good for web images, printing, saving files to camera, picture sharing. But better not used it for text-focused images.

**PNG** – great for web images, text-focused images, logos, and high-resolution pictures. Not good for printing.

**BMP** –generally outdated format. It’s supported by all biggest browsers and image viewers.

**GIF** – perfect for simple animations. Very good for demonstrating tutorial steps. However, not suitable for images with rich colors.

**TIFF/TIF** – printing and scanning documents. Not suitable for web pages.

**HEIF** – it’s used for saving high-quality images on newer devices, providing better-optimized file sizes. It is not the best choice for accessing images on browsers and OS.

**RAW** – recommended for high-quality photographs. Not suitable for web usage.

**PSD** – it is special Adobe Photoshop’s format used for graphic design projects that can be edited. Not suitable for printing or web usage.

**SVG** – great for web images, images with simple shapes, 2D illustrations, and importing 2D images to 3D modeling software. Not suitable for displaying detailed images with high color depth, such as photographs.

**EPS** – can be used for printing, illustrations, graphic design, Bad for photographs.

**PDF** – great for printing, visual reports, infographics. Not suitable if some changes are required to the image.

**INDD** – used in Adobe InDesign for saving editable layouts or page designs. Not suitable for web usage.

**AI** –mainly used for saving vector graphics in Adobe Illustrator. Not suitable for web usage.

[**https://www.hostinger.com/tutorials/best-image-formats**](https://www.hostinger.com/tutorials/best-image-formats)

**Unity**

Unity imports image files as textures. Unity supports most common image file types, such as BMP, TIF, TGA, JPG, and PSD. If you save your layered Photoshop (.psd) files in your Assets folder, Unity imports them as flattened images.( https://docs.unity3d.com/Manual/AssetTypes.html#:~:text=Unity%20supports%20the%20FBX%20file,natively%20supports%20importing%20SketchUp%20files.)

**Image data types**

Images can be created by using different techniques of representation of data called data type like monochrome and colored images. Monochrome image is created by using single color whereas colored image is created by using multiple colors. Some important data types of images are following:

1-bit images- An image is a set of pixels. Note that a pixel is a picture element in digital image. In 1-bit images, each pixel is stored as a single bit (0 or 1). A bit has only two states either on or off, white or black, true or false. Therefore, such an image is also referred to as a binary image, since only two states are available. 1-bit image is also known as 1-bit monochrome images because it contains one color that is black for off state and white for on state.

A 1-bit image with resolution 640\*480 needs a storage space of 640\*480 bits.

640 x 480 bits. = (640 x 480) / 8 bytes = (640 x 480) / (8 x 1024) KB= 37.5KB.

The clarity or quality of 1-bit image is very low.

8-bit Gray level images- Each pixel of 8-bit gray level image is represented by a single byte (8 bits). Therefore each pixel of such image can hold 28=256 values between 0 and 255. Therefore each pixel has a brightness value on a scale from black (0 for no brightness or intensity) to white (255 for full brightness or intensity). For example, a dark pixel might have a value of 15 and a bright one might be 240.

A grayscale digital image is an image in which the value of each pixel is a single sample, which carries intensity information. Images are composed exclusively of gray shades, which vary from black being at the weakest intensity to white being at the strongest. Grayscale images carry many shades of gray from black to white. Grayscale images are also called monochromatic, denoting the presence of only one (mono) color (chrome). An image is represented by bitmap. A bitmap is a simple matrix of the tiny dots (pixels) that form an image and are displayed on a computer screen or printed.

A 8-bit image with resolution 640 x 480 needs a storage space of 640 x 480 bytes=(640 x 480)/1024 KB= 300KB. Therefore an 8-bit image needs 8 times more storage space than 1-bit image.

24-bit color images - In 24-bit color image, each pixel is represented by three bytes, usually representing RGB (Red, Green and Blue). Usually true color is defined to mean 256 shades of RGB (Red, Green and Blue) for a total of 16777216 color variations. It provides a method of representing and storing graphical image information an RGB color space such that a colors, shades and hues in large number of variations can be displayed in an image such as in high quality photo graphic images or complex graphics.

Many 24-bit color images are stored as 32-bit images, and an extra byte for each pixel used to store an alpha value representing special effect information.

A 24-bit color image with resolution 640 x 480 needs a storage space of 640 x 480 x 3 bytes = (640 x 480 x 3) / 1024=900KB without any compression. Also 32-bit color image with resolution 640 x 480 needs a storage space of 640 x 480 x 4 bytes= 1200KB without any compression.

Disadvantages

Require large storage space

Many monitors can display only 256 different colors at any one time. Therefore, in this case it is wasteful to store more than 256 different colors in an image.

8-bit color images - 8-bit color graphics is a method of storing image information in a computer's memory or in an image file, where one byte (8 bits) represents each pixel. The maximum number of colors that can be displayed at once is 256. 8-bit color graphics are of two forms. The first form is where the image stores not color but an 8-bit index into the color map for each pixel, instead of storing the full 24-bit color value. Therefore, 8-bit image formats consists of two parts: a color map describing what colors are present in the image and the array of index values for each pixel in the image. In most color maps each color is usually chosen from a palette of 16,777,216 colors (24 bits: 8 red, 8green, 8 blue).

The other form is where the 8-bits use 3 bits for red, 3 bits for green and 2 bits for blue. This second form is often called 8-bit true color as it does not use a palette at all. When a 24-bit full color image is turned into an 8-bit image, some of the colors have to be eliminated, known as color quantization process.

A 8-bit color image with resolution 640 x 480 needs a storage space of 640 x 480 bytes=(640 x 480) / 1024KB= 300KB without any compression.

Color lookup tables

A color loop-up table (LUT) is a mechanism used to transform a range of input colors into another range of colors. Color look-up table will convert the logical color numbers stored in each pixel of video memory into physical colors, represented as RGB triplets, which can be displayed on a computer monitor. Each pixel of image stores only index value or logical color number. For example if a pixel stores the value 30, the meaning is to go to row 30 in a color look-up table (LUT). The LUT is often called a Palette.

Characteristic of LUT are following:

The number of entries in the palette determines the maximum number of colors which can appear on screen simultaneously.

The width of each entry in the palette determines the number of colors which the wider full palette can represent.

A common example would be a palette of 256 colors that is the number of entries is 256 and thus each entry is addressed by an 8-bit pixel value. Each color can be chosen from a full palette, with a total of 16.7 million colors that is the each entry is of 24 bits and 8 bits per channel which sets the total combinations of 256 levels for each of the red, green and blue components 256 x 256 x 256 =16,777,216 colors.

Image file formats

GIF- Graphics Interchange Formats- The GIF format was created by Compuserve. It supports 256 colors. GIF format is the most popular on the Internet because of its compact size. It is ideal for small icons used for navigational purpose and simple diagrams. GIF creates a table of up to 256 colors from a pool of 16 million. If the image has less than 256 colors, GIF can easily render the image without any loss of quality. When the image contains more colors, GIF uses algorithms to match the colors of the image with the palette of optimum set of 256 colors available. Better algorithms search the image to find and the optimum set of 256 colors.

Thus GIF format is lossless only for the image with 256 colors or less. In case of a rich, true color image GIF may lose 99.998% of the colors. GIF files can be saved with a maximum of 256 colors. This makes it is a poor format for photographic images.

GIFs can be animated, which is another reason they became so successful. Most animated banner ads are GIFs. GIFs allow single bit transparency that is when you are creating your image, you can specify which color is to be transparent. This provision allows the background colors of the web page to be shown through the image.

JPEG- Joint Photographic Experts Group- The JPEG format was developed by the Joint Photographic Experts Group. JPEG files are bitmapped images. It store information as 24-bit color. This is the format of choice for nearly all photograph images on the internet. Digital cameras save images in a JPEG format by default. It has become the main graphics file format for the World Wide Web and any browser can support it without plug-ins. In order to make the file small, JPEG uses lossy compression. It works well on photographs, artwork and similar materials but not so well on lettering, simple cartoons or line drawings. JPEG images work much better than GIFs. Though JPEG can be interlaced, still this format lacks many of the other special abilities of GIFs, like animations and transparency, but they really are only for photos.

PNG- Portable Network Graphics- PNG is the only lossless format that web browsers support. PNG supports 8 bit, 24 bits, 32 bits and 48 bits data types. One version of the format PNG-8 is similar to the GIF format. But PNG is the superior to the GIF. It produces smaller files and with more options for colors. It supports partial transparency also. PNG-24 is another flavor of PNG, with 24-bit color supports, allowing ranges of color akin to high color JPEG. PNG-24 is in no way a replacement format for JPEG because it is a lossless compression format. This means that file size can be rather big against a comparable JPEG. Also PNG supports for up to 48 bits of color information.

TIFF- Tagged Image File Format- The TIFF format was developed by the Aldus Corporation in the 1980 and was later supported by Microsoft. TIFF file format is widely used bitmapped file format. It is supported by many image editing applications, software used by scanners and photo retouching programs.

TIFF can store many different types of image ranging from 1 bit image, grayscale image, 8 bit color image, 24 bit RGB image etc. TIFF files originally use lossless compression. Today TIFF files also use lossy compression according to the requirement. Therefore, it is a very flexible format. This file format is suitable when the output is printed. Multi-page documents can be stored as a single TIFF file and that is way this file format is so popular. The TIFF format is now used and controlled by Adobe.

BMP- Bitmap- The bitmap file format (BMP) is a very basic format supported by most Windows applications. BMP can store many different type of image: 1 bit image, grayscale image, 8 bit color image, 24 bit RGB image etc. BMP files are uncompressed. Therefore, these are not suitable for the internet. BMP files can be compressed using lossless data compression algorithms.

EPS- Encapsulated Postscript- The EPS format is a vector based graphic. EPS is popular for saving image files because it can be imported into nearly any kind of application. This file format is suitable for printed documents. Main disadvantage of this format is that it requires more storage as compare to other formats.

PDF- Portable Document Format- PDF format is vector graphics with embedded pixel graphics with many compression options. When your document is ready to be shared with others or for publication. This is only format that is platform independent. If you have Adobe Acrobat you can print from any document to a PDF file. From illustrator you can save as .PDF.

EXIF- Exchange Image File- Exif is an image format for digital cameras. A variety of tage are available to facilitate higher quality printing, since information about the camera and picture - taking condition can be stored and used by printers for possible color correction algorithms.it also includes specification of file format for audio that accompanies digital images.

WMF- Windows MetaFile- WMF is the vector file format for the MS-Windows operating environment. It consists of a collection of graphics device interface function calls to the MS-Windows graphice drawing library.Metafiles are both small and flexible, hese images can be displayed properly by their proprietary softwares only.

PICT- PICT images are useful in Macintosh software development, but you should avoid them in desktop publishing. Avoid using PICT format in electronic publishing-PICT images are prone to corruption.

Photoshop- This is the native Photoshop file format created by Adobe. You can import this format directly into most desktop publishing applications.

[**https://www.tutorialspoint.com/multimedia/multimedia\_images\_graphics.htm**](https://www.tutorialspoint.com/multimedia/multimedia_images_graphics.htm)

**Codecs** are compression technologies and have two components, an encoder to compress the files, and a decoder to decompress. There are codecs for data (PKZIP), still images (JPEG, GIF, PNG), audio (MP3, AAC) and video (Cinepak, MPEG-2, H.264, VP8).

[**https://www.streamingmedia.com/Articles/ReadArticle.aspx?ArticleID=74487**](https://www.streamingmedia.com/Articles/ReadArticle.aspx?ArticleID=74487)

The Image codecs is a method of compression/decompression of image files or image data. The codecs stands for Coders / Decoders.

There are various kinds of image codecs available. Since these codecs have been implemented by different algorithms by number of companies; they have different specification and application in various fields.

The various software image codecs are:

Bmp

Gif

JPEG

JPEG 2000

MJPEG

TIFF

PNG

WBMP

These various [Image codecs](http://www.ipsupermarket.com/viewpage/image_codecs.html) are technically differentiated from each other based on various factors which includes compression technology / algorithm, platform supported, sampling, OS supported etc One can easily find in-depth details on Wikipedia for each of image codecs. Here is a illustration of image codecs with their pros & cons?

BMP

Pros

Good photo quality.

Bitmap files (bmp) may be easily created from existing pixel data stored in an array in memory. Pixel values may be modified individually or as large groups by altering a palette if present.

Bitmap codecs may translate well to dot-format output devices such as CRTs and printers.

Cons

Bmp codecs are Limited to RGB-images.

These codecs generally does not support effective image compression. They can be very large, particularly if the image contains a large number of colors.

It’s also not supported well across multiple platforms.

Shrinking this image codecs by *decimation* (throwing away pixels) can change the image in an unacceptable manner.

GIF

Pros

This codecs allows you to create transparent, interlaced, and animated graphics for the Web

Compresses by scanning horizontally across a row of pixels and finding solid areas of color. Indexes the pixels based on the 256 color palette in the file. No image information is lost.

The only graphic file format (codec) that is universally supported by all graphical browsers, regardless of version. Most popular and versatile format for distributing color image on the Web.

Cons:

This codec is not good for photographic images due to its limited number of colors generally 256 colors.

JPEG

Pros

JPEG codec has low complexity. Picture quality is generally good enough.

This is also memory efficient. i.e. good compression allows to reduce the file size.

It works very well for “slide-show” movies that have a very low frame rate.

Also it has reasonable coding efficiency

Cons

Single Resolution & Single Quality

No target bit rate

Blocking artifacts at low bit rate

No lossless capability

Poor error resilience

No tiling & No regions of interest

JPEG 2000

Pros:

Improved coding efficiency

Full quality scalability

From lossless to lossy at different bit rate

Spatial scalability

Improved error resilience compared to jpeg

Tiling & Region of interests

Cons:

Requires more in memory compared to JPEG.

Requires more computation time

MJPEG

Pros

MJPEG codecs are often used as storage formats for large files that need to be archived with good quality. It is a lossy codec, but at 100% quality, the image degradation is minimal.

At WWW data rates (5-20K), JPEG may produce better results than Cinepak.

Cons

All the JPEG codecs require significant amounts of CPU power and are not well suited to video playback at CD-ROM or higher data rates, except when assisted by a hardware capture card.

Large image and/or high frame rate movies usually don’t play smoothly.

TIFF

Pros:

Compared to a JPEG, an uncompressed TIFF codec retains the best quality of a photographic image, making it ideal for digital masters (preservation) and print documents.

Low or high-resolution images codec of photographic quality (images containing many colors that blend and fade). Encoding scheme is Lossless; files can be compressed or uncompressed.

Cons:

Codecs produce large file size

PNG

Pros:

A better compression than GIF codec, which only scans rows. The compression is ‘lossless’, you do not lose color information as you compress the file smaller. Typically compresses images 5-25% better than GIF.

It is a best one for creating complex live transparency, high-color graphics, and better compressed low-color graphics.

Designed to be network-friendly, so it is recognized and supported on all platforms.

Cons:

It doesn’t support animation

It does not use predictive frames

It has lower quality than PICT or TIFF

[**https://imagecodecs.wordpress.com/**](https://imagecodecs.wordpress.com/)

**Vector vs. Raster**

First things first: What is the difference between vector and raster?

Raster Image Files

Raster images are constructed by a series of pixels, or individual blocks, to form an image. **JPEG**, **GIF**, and **PNG** are all raster image extensions. Every photo you find online or in print is a raster image. Pixels have a defined proportion based on their resolution (high or low), and when the pixels are stretched to fill space they were not originally intended to fit, they become distorted, resulting in blurry or unclear images.

In order to retain pixel quality, you cannot resize raster images without compromising their resolution. As a result, it is important to remember to save raster files at the exact dimensions needed for the application.

Vector Image Files

Vector images are far more flexible. They are constructed using proportional formulas rather than pixels. **EPS**, **AI** and **PDF** are perfect for creating graphics that require frequent resizing. Your logo and brand graphics should have been created as a vector, and you should always have a master file on hand. The real beauty of vectors lies in their ability to be sized as small as a postage stamp, or large enough to fit on an 18-wheeler!

If you're not sure whether you have a vector version of your logo, here's a little trick for you: Call the company that printed your business cards or the vendor that embroidered your logo on a shirt. Often they'll have a vector file of your logo that they can send to you for your records.

High Resolution vs. Low Resolution

Have you heard your designer talk about DPI or PPI? DPI stands for "dots per inch" and PPI translates to "pixels per inch." These units of measure are essential for determining if the density of pixels in an image is appropriate for the application you are using.

The biggest thing to note when determining what DPI or PPI you require is if you are using an image for print or web. Websites display images at 72dpi, which is low resolution; however images at this resolution look really crisp on the web. This is not the case for print. Best practices for printing an image will require it to be no less than 300dpi.

Don't try to trick the system. A lot of magic can happen in Photoshop, but creating pixels out of thin air isn't one of them. Pulling an image off of the web and trying to get it to fit the dimensions of your print project just won't work. You will end up with a pixelated image that appears stretched and distorted.

Types of Image Files

JPEG (or JPG) - Joint Photographic Experts Group

PNG - Portable Network Graphics

GIF - Graphics Interchange Format

TIFF - Tagged Image File

PSD - Photoshop Document

PDF - Portable Document Format

EPS - Encapsulated Postscript

AI - Adobe Illustrator Document

INDD - Adobe Indesign Document

RAW - Raw Image Formats

1. JPEG (or JPG) - Joint Photographic Experts Group

JPEGs might be the most common file type you run across on the web, and more than likely the kind of image that is in your company's MS Word version of its letterhead. JPEGs are known for their "lossy" compression, meaning that the quality of the image decreases as the file size decreases.



You can use JPEGs for projects on the web, in Microsoft Office documents, or for projects that require printing at a high resolution. Paying attention to the resolution and file size with JPEGs is essential in order to produce a nice-looking project.

JPG vs JPEG

There is no difference between the .jpg and .jpeg filename extensions. Regardless of how you name your file, it is still the same format and will behave the same way.

The only reason that the two extensions exist for the same format is because .jpeg was shortened to .jpg to accommodate the three-character limit in early versions of Windows. While there is no such requirement today, .jpg remains the standard and default on many image software programs.

2. PNG - Portable Network Graphics

PNGs are amazing for interactive documents such as web pages but are not suitable for print. While PNGs are "lossless," meaning you can edit them and not lose quality, they are still low resolution.



The reason PNGs are used in most web projects is that you can save your image with more colors on a transparent background. This makes for a much sharper, web-quality image.

3. GIF - Graphics Interchange Format

GIFs are most common in their animated form, which are all the rage on Tumblr pages and in banner ads. It seems like every day we see pop culture GIF references from **[Giphy](https://giphy.com/" \t "_blank)** in the comments of social media posts. In their more basic form, GIFs are formed from up to 256 colors in the RGB colorspace. Due to the limited number of colors, the file size is drastically reduced.



This is a common file type for web projects where an image needs to load very quickly, as opposed to one that needs to retain a higher level of quality.

4. TIFF - Tagged Image File

A TIF is a large raster file that doesn't lose quality. This file type is known for using "lossless compression," meaning the original image data is maintained regardless of how often you might copy, re-save, or compress the original file.



Despite TIFF images' ability to recover their quality after manipulation, you should avoid using this file type on the web. Since it can take forever to load, it'll severely impact [**website performance**](https://blog.hubspot.com/website/website-performance). TIFF files are also commonly used when saving photographs for print.

5. PSD - Photoshop Document

PSDs are files that are created and saved in Adobe Photoshop, the most popular graphics editing software ever. This type of file contains "layers" that make modifying the image much easier to handle. This is also the program that generates the raster file types mentioned above.



The largest disadvantage to PSDs is that Photoshop works with raster images as opposed to vector images.

6. PDF - Portable Document Format

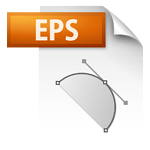
PDFs were invented by Adobe with the goal of capturing and reviewing rich information from any application, on any computer, with anyone, anywhere. I'd say they've been pretty successful so far.



If a designer saves your vector logo in PDF format, you can view it without any design editing software (as long as you have downloaded the free Acrobat Reader software), and they have the ability to use this file to make further manipulations. This is by far the best universal tool for sharing graphics.

7. EPS - Encapsulated Postscript

EPS is a file in vector format that has been designed to produce high-resolution graphics for print. Almost any kind of design software can create an EPS.



The EPS extension is more of a universal file type (much like the PDF) that can be used to open vector-based artwork in any design editor, not just the more common Adobe products. This safeguards file transfers to designers that are not yet utilizing Adobe products, but may be using Corel Draw or Quark.

8. AI - Adobe Illustrator Document

AI is, by far, the image format most preferred by designers and the most reliable type of file format for using images in all types of projects from web to print, etc.



Adobe Illustrator is the industry standard for creating artwork from scratch and therefore more than likely the program in which your logo was originally rendered. Illustrator produces vector artwork, the easiest type of file to manipulate. It can also create all of the aforementioned file types. Pretty cool stuff! It is by far the best tool in any designer's arsenal.

9. INDD - Adobe InDesign Document

INDDs (InDesign Document) are files that are created and saved in Adobe InDesign. InDesign is commonly used to create larger publications, such as newspapers, magazines and eBooks.



Files from both Adobe Photoshop and Illustrator can be combined in InDesign to produce content rich designs that feature advanced typography, embedded graphics, page content, formatting information and other sophisticated layout-related options.

10. RAW - Raw Image Formats

A RAW image is the least-processed image type on this list -- it's often the first format a picture inherits when it's created. When you snap a photo with your camera, it's saved immediately in a raw file format. Only when you upload your media to a new device and edit it using image software is it saved using one of the image extensions explained above.



RAW images are valuable because they capture every element of a photo without processing and losing small visual details. Eventually, however, you'll want to package them into a raster or vector file type so they can be transferred and resized for various purposes.

As you can see from the icons above, there are multiple raw image files in which you can create images -- many of them native to certain cameras (and there are still dozens more formats not shown above). Here's a brief description of those four raw files above:

**CR2:** This image extension stands for Canon RAW 2, and was created by Canon for photos taken using its own digital cameras. They're actually based on the TIFF file type, making them inherently high in quality.

**CRW:** This image extension was also created by Canon, preceding the existence of the CR2.

**NEF:** This image extension stands for Nikon Electric Format, and is a RAW file type created by (you guessed it) Nikon Cameras. These image files actually allow for extensive editing without changing file types, provided the editing takes place using a Nikon device or Nikon Photoshop plugin.

**PEF:** This image extension stands for Pentax Electronic Format, a RAW image file type created by Pentax Digital Cameras.

Working with images is a lot more complicated than you'd think at first glance. Hopefully this guide has provided a better understanding of the standard file types and which are most appropriate for your project. https://blog.hubspot.com/insiders/different-types-of-image-files

13 Best Image Formats and When to Use Them

Each image format is optimized for a different use, which is why it’s essential to understand their differences and know when to use them.

More than 90% of websites include images on their content as they tend to capture readers’ attention or explain complicated information through the use of infographics or screenshots. Images can also drive conversions and promote social sharing.

However, if you’re not using the proper image format, you may end up slowing down your site or causing unwanted errors, resulting in a bad user experience.

This article will help you understand the differences between image formats and when it’s best to use each of them.

[**Top 8 Raster Formats**](https://www.hostinger.com/tutorials/best-image-formats#Top_8_Raster_Formats)

[**1. JPEG and JPG**](https://www.hostinger.com/tutorials/best-image-formats#1_JPEG_and_JPG)

[**2. PNG**](https://www.hostinger.com/tutorials/best-image-formats#2_PNG)

[**3. BMP**](https://www.hostinger.com/tutorials/best-image-formats#3_BMP)

[**4. GIF**](https://www.hostinger.com/tutorials/best-image-formats#4_GIF)

[**5. TIFF**](https://www.hostinger.com/tutorials/best-image-formats#5_TIFF)

[**6. HEIF**](https://www.hostinger.com/tutorials/best-image-formats#6_HEIF)

[**7. RAW**](https://www.hostinger.com/tutorials/best-image-formats#7_RAW)

[**8. PSD**](https://www.hostinger.com/tutorials/best-image-formats#8_PSD)

[**Top 5 Vector Formats**](https://www.hostinger.com/tutorials/best-image-formats#Top_5_Vector_Formats)

[**1. SVG**](https://www.hostinger.com/tutorials/best-image-formats#1_SVG)

[**2. EPS**](https://www.hostinger.com/tutorials/best-image-formats#2_EPS)

[**3. PDF**](https://www.hostinger.com/tutorials/best-image-formats#3_PDF)

[**4. INDD**](https://www.hostinger.com/tutorials/best-image-formats#4_INDD)

[**5. AI**](https://www.hostinger.com/tutorials/best-image-formats#5_AI)

Different Image File Types – Raster vs Vector

Before we talk about the differences between **raster** and **vector** graphics, it’s important to understand the difference between [**lossy vs lossless compression**](https://www.hostinger.com/tutorials/lossy-vs-lossless).

**Lossy** and **lossless** are considered as compression techniques, while raster and vector are image file types.

Lossy compression is a process that removes some of your image data. While this significantly reduces the file size, it also lowers the image quality.

Meanwhile, lossless compression only takes away non-essential metadata. It only slightly reduces the file size, but it preserves the image quality.

Raster images can be either lossy or lossless, while vector images are neither lossy nor lossless because their size is already small – therefore, they don’t need any compression.

To choose which file format is the best for you, you have to consider the image quality, how quickly you expect your visitors to open the images, and how much space you have to store them.

Raster Image File Formats

Raster images are composed of grids of tiny, square dots called pixels. Each pixel contains a color, which lines up with one another to form the image. The higher the resolution, the more details can be seen in a picture.

Raster images typically have larger file sizes than vector images. Examples of raster file formats include **JPEG**, **GIF**, and **PNG** – these are the most common image file types on the web.

Use raster images for complex images with smooth edges and color gradients, such as graphic design projects and photographs.

Every pixel in raster files has a defined color, position, and proportion according to the resolution. That means, if you resize the image, the pixels will get stretched to fill the extra space, making your image blurry, distorted, or pixelated.

Vector Image File Formats

Vector images are constructed of paths that are based upon mathematical equations.

A path is defined by a start and end point, which are connected by lines and curves. It can be a straight line, a square, or a curvy shape. Each path may contain various properties, such as stroke color, fill color, and thickness.

Since vector images are defined based on algorithms – not by a specific number of pixels – it’s possible to scale them up without distortion or loss in quality.

They typically have smaller file sizes than rasters. Examples of vector image file types are **EPS**, **SVG**, and **AI**.

People often use vector image files for logos, icons, or fonts – visuals expected to have flexible scalability in any situation.

When compared, the quality of the vector image format is unchanged when it’s magnified. On the other hand, enlarging a raster may lower its image quality.

Top 8 Raster Formats

Now that you learned the main differences between raster and vector images, let’s look into the most used file formats. We’ll go over each format’s pros and cons, browser and operating system support, and what each format is best used for.

1. JPEG and JPG

It’s important to note that **JPEG** and **JPG** are the same file formats, with different acronyms and file extensions. **Joint Photographic Experts Group (JPEG)** is a raster image with lossy compression.

Its lossy compression means that JPEG eliminates some data to reduce its file size, which decreases its image quality in return. Its relatively small file sizes allow you to save more space on your disk or memory card.

It’s commonly used for saving images in digital cameras and printing, as long as you will not need further editing. JPEG is a flat image format, which means all edits are saved into one layer, and you cannot reverse the modifications. It also doesn’t support transparency, unlike PNG and GIF.

JPEG is an excellent choice for web usage. Your site visitors can load the images quickly, while the loss in quality is barely visible. It’s also suitable for image sharing since its lossy quality indicates that JPEGs have a reasonably small file size.

JPEG is one of the [**most common**](https://w3techs.com/technologies/overview/image_format) image file formats. This is understandable since JPEG files support all browsers and operating systems and offer relatively optimum compression.

All major browsers such as **Google Chrome**, **Safari**, and **Mozilla Firefox** have supported this image file type since their earliest version.

However, JPEG is not the best option for images with lines of text in them, such as tutorial screenshots and infographics. This is due to the lossy image compression, which may render the text in your image to be hard to read.

2. PNG

**Portable Network Graphics (PNG)** is a raster with lossless compression.

Since PNG is lossless, it retains its original data, and its quality remains the same. This results in PNG having a higher image quality than JPEG while maintaining its detail and color contrast.

Text in PNG appears clearer than in JPEG, making it a better choice for graphics that emphasize text such as screenshots, infographics, or banners.

The PNG file format is optimized for digital use, making it the most commonly used image format. It also supports more colors than the GIF format – PNG can handle up to 16 million colors, while GIF only supports 256 colors.

This allows you to have more vibrant images, while PNG files can also retain transparency, making them an ideal choice for logos.

If you use PNG for high-resolution photos, it will create a file larger than JPEG would. However, it’s a great format choice to showcase high-quality pictures such as design works and photos for portfolio websites. Just be careful not to overuse it and slow down your site.

Even though it’s possible to edit your PNG files without losing their quality, PNG is not the best choice for printing purposes due to its relatively low resolution compared to print-optimized formats such as AI and TIFF.

PNG is supported by all major browsers and OS standard image viewers.

3. BMP

**Bitmap (BMP)** image files are rasters that map individual pixels, resulting in little to no compression on a given image.

BMP files are larger and impractical to store or process, and their quality is not significantly better than raster image formats such as PNG or WebP. This makes BMP files not the best choice for web usage.

All major browsers and operating systems support BMP and most default image viewers and editors, such as **MS Paint**.

BMP used to be one of the most common image file formats, but nowadays, it’s considered outdated due to its unoptimized nature.

4. GIF

**Graphics Interchange Format (GIF)** is a raster that uses lossless compression.

However, GIF files are 8-bit, which can only display 256 colors. This means that GIF has a less sharp quality than other raster formats. For comparison, JPEG can serve up to 24-bits per pixel, which provides 16,777,216 color variations.

Its 8-bit limitation keeps the file size small, making GIF a go-to format to create appealing short animation content.

Regardless of its limited image quality, many people use GIF since it provides a means to deliver more elaborate visual content than a static image.

GIF is supported by all major browsers and operating systems, as well as their standard image viewers.

5. TIFF

**Tagged Image File Format (TIFF)** is a raster image that supports lossy compression, but people commonly use TIFF as a lossless image format. TIFF and TIF are the same formats, just with different acronyms and image file extensions.

TIFF files are typically used for printing purposes due to their high image quality. Many scanners also use TIFF format to preserve the quality of scanned pictures or documents.

Saving your files in TIFF format allows you to keep their layers, which means it’s possible to edit them further. However, it makes TIFF files larger.

Despite its high quality, TIFF is not automatically supported by any major browsers. You have to install add-ons or extensions to render a TIFF file on your web browser.

To open TIFF files on a local computer, use a professional graphic editing or publishing tool such as **Adobe Photoshop**. If you use Windows, it’s possible to open a TIFF file with the **Windows Photo Viewer**.

6. HEIF

**High-Efficiency Image File Format (HEIF)** is a raster type based on pixel mapping, which means the image quality will decrease when you enlarge it.

HEIF is set to be the direct competitor of JPEG. However, HEIF has twice as much compression efficiency as JPEG format. With the same file size, HEIF can provide a much better image quality than its petitor.

The downside of HEIF is that it has limited OS support and no web browser support. Only **macOS Sierra**, **iOS 11**, and later versions have default support for HEIF – and that doesn’t include Safari support.

So far, HEIF is used by several newer devices to store images in higher quality, and it provides file sizes more optimized than JPEG.

7. RAW

RAW is an image file format used by digital cameras to store full-quality images. People usually use RAW files for post-production, such as retouching photos.

RAW operates on a 14-bit color channel, while [**JPEG is standardized as an 8-bit file**](https://x-equals.com/taking-a-byte-out-of-bit-depth-jpeg-vs-raw/). It gives more flexibility in tweaking the image’s colors and contrast during post-production, as it contains more tonal and color data.

However, these high-quality images result in RAW having large file sizes. A single RAW image file can weigh hundreds of megabytes.

RAW image files are not suitable for websites or sharing since their primary intent is to facilitate post-production.

To view RAW images on operating systems, you’ll need to use professional photo editing software such as **Adobe Lightroom**. If you use macOS, it’s possible to edit your RAW images using **iCloud Photos** and **Apple Photos**.

8. PSD

**Photoshop Document (PSD)** is a native file type of Adobe Photoshop to save images and works in progress. It’s a raster with lossless compression.

It typically has large file sizes because a PSD file contains all Adobe Photoshop visual elements such as layers, paths, and filters. These elements result in PSD files being fully editable and customizable, allowing you to continue editing a project until you are satisfied with the result.

Top 5 Vector Formats

If your project requires that you use vector images, there are still quite a few options to consider. Some of them are directly related to the software you use, such as INDD and AI, but others depend on your goals, such as publishing logos or printing.

1. SVG

**Scalable Vector Graphics (SVG)** is a vector-based file format. That means, when you scale up an SVG image, it won’t lose any of its image quality.

SVG is an XML-based image format that is optimized for 2D graphics and web publishing. It’s also useful for importing artworks from 2D graphics apps to 3D modeling software.

It’s possible to insert SVG directly into a web page as CSS code. It also has small file sizes that only take a small amount of your storage size. These two factors make SVG the [**third most common**](https://w3techs.com/technologies/overview/image_format) image file format for websites.

SVG supports transparent images and can include animation, but it’s best used with simple shapes such as logos, icons, or simple illustrations.

This format is unsuitable for displaying and printing complex images with high color depth since it’s rendered using points and paths.

All major web browsers support this image file format. However, default image editors on any OS typically don’t support SVG. This is because SVG is unsuitable for complex images like photographs, and default OS image editors are mainly used to display complex images.

However, most illustration software supports SVG and are capable of viewing this format.

Remember to enable WordPress SVG support to display SVG on your WordPress website. You can use the [**SVG Support plugin**](https://wordpress.org/plugins/svg-support/) for that.

2. EPS

**Encapsulated PostScript (EPS)** is a vector with lossless compression. It’s used to save illustrations or graphic design works in illustration software such as **Adobe Illustrator** and **CorelDraw**.

Like SVG, EPS was initially developed as a text-based document that outlines shapes and lines with code. However, it doesn’t map pixels and colors like the raster image file formats do. This code-approach results in EPS being capable of lossless scaling.

Like TIFF, EPS files are also widely used for printing purposes.

Use illustration software to view EPS files on all OS, since EPS isn’t supported by any major web browsers and cannot be viewed using the default image viewers.

3. PDF

**Portable Document Format (PDF)** may be more familiar as a document format, but it can be used to save images and illustrations as well.

A PDF file is built on the same PostScript language as EPS. Therefore, PDF is an excellent choice for printing. It’s a vector with lossless compression, allowing you to enlarge a PDF image as much as you want.

It’s also the best option for interactive visual reports or infographics since it is indexable and has searchable text. It’s also possible to include interactive elements in a PDF, for example, links and CTA buttons.

All major browsers support the PDF format, but you can’t use PDF to display images as web content. It’s possible to include it as part of your content, but the PDF file will be opened on a separate tab.

If you want to view PDF files on any operating system, you cannot view them using the OS’s native image viewer or image editing software. Instead, simply use standard document editors, such as **MS Word**, **Open Office**, or **Google Docs**.

If you use WordPress as your CMS, use PDF viewer plugins to enable your site visitors to view the PDF files on their browser.

4. INDD

**InDesign Document (INDD)** is a vector image format used by **Adobe InDesign** to save project files. Adobe InDesign is a desktop publishing software primarily used to work on layout or page design for print and digital use. For example, magazines, newspapers, and brochures.

An INDD file includes all of the project’s elements, such as page content, styles, and color swatches, so it’s possible for you to customize or edit them later. One INDD file can contain multiple pages, resulting in large file sizes.

Just like PSD, you need to have Adobe InDesign installed on your computer to view this format locally on any OS since any default image viewer does not support INDD. INDD is also not a web-safe format, meaning you can’t open it directly on any browser.

5. AI

Also from the Adobe software family, **Illustrator Artwork (AI)** is a format native to vector graphics software **Adobe Illustrator**. You can save an image and its project, whether complete or still in the work-in-progress state. AI files are primarily used for creating illustrations and vector art.

Since AI is a vector, it’s possible to scale AI images as large or as small as you want to. An AI file contains all AI design elements, including strokes, lines, and shapes, which allows you to edit the file later. This complex layer of content caused AI to have relatively large file sizes.

Like its fellow Adobe-specific image file formats, AI isn’t supported by any browsers and OS default image viewers. The only way to view this format is via Adobe Illustrator itself.

Conclusion

Using the right image formats helps you get the most optimized performance for a particular need. For example, if you use the right formats for your website, you’ll have a faster loading speed, lower server loads, and an overall better user experience.

Now that you understand what are the benefits and differences between the 13 image formats that we recommend, here’s a handy list of when to use these formats and when it’s best to avoid them:

**JPEG** – for web images, image sharing, saving files to camera, and printing. However, not the best choice for text-focused images.

**PNG** – great for web images, text-focused images, logos, and high-resolution pictures. Not an excellent choice for printing purposes.

**BMP** – it’s supported by all major browsers and image viewers, including their oldest versions. Now it’s a generally outdated format.

**GIF** – ideal for simple animations and demonstrating tutorial steps. Not suitable for images that require rich colors.

**TIFF/TIF** – an excellent format for printing and scanning documents. Not suitable for web usage.

**HEIF** – it’s used for saving high-quality images on newer devices, providing better-optimized file sizes. It isn’t the best choice if you need to access the images on various browsers and operating systems.

**RAW** – for high-quality photographs. Not suitable for web usage or image sharing.

**PSD** – Adobe Photoshop’s format for editable graphic design projects. Not suitable for web usage and print-ready images.

**SVG** – great for web images, images with simple shapes, 2D illustrations, and importing 2D images to 3D modeling software. Not suitable for displaying detailed images with high color depth, such as photographs.

**EPS** – use it for printing, illustrations, and graphic design works. Not suitable for photographs.

**PDF** – great for printing, interactive visual reports, and infographics. Not suitable if you need to make further edits to the images.

**INDD** – used in Adobe InDesign for saving editable layouts or page designs. Not suitable for web usage.

**AI** – used in Adobe Illustrator for saving editable vector graphics. Not suitable for web usage.

[**https://www.hostinger.com/tutorials/best-image-formats**](https://www.hostinger.com/tutorials/best-image-formats)

What 3D File Formats Can I Use to Upload My Designs?

We support 3MF, STL, OBJ, WRL, SKP, Collada (DAE), 3MF, 3DS, IGS, MODEL, 3DM, FBX, PLY, Magics, MGX, X3D, STP, STEP, PRT and MATPART to upload your designs.

For matAMX, AMF, NDO, ASC, CLI, SLC, MTT, MDCK, CLS, F&S, SSL, SLI, PRJ, SAT, CATProduct, DXF, ZCP, PRT and ASM files, you can request an offline price.

To request an offline price, you can compress your file(s) as a ZIP, RAR or 7z file through the 3D print lab. One of our support engineers will then contact you shortly after. If we have any problems opening your files, we'll contact you. Alternately, you can also email us your files.

**Color Information**

Shape

Description automatically generated

Some file formats are able to include colors or textures in the file (e.g. 3MF, colored STL, PLY, VRML, SKP, X3D, and Collada), while others store the texture in a separate image file (GIF, JPG or PNG) and map-file (OBJ).

If your model has textures, group all files related to the model into a ZIP file and upload it to our 3D print lab. To show and handle the textures correctly the archive should not contain any additional folders, this way we will be able to process all necessary info to print it the way you want.

How to check? Well, if you see your texture in the 3D print lab preview, then we have the info. However, if you see a mono-colored or un-textured model, it’s possible there’s some info missing. If this happens, check your export settings and the 3D file format used.

**Commonly Used 3D File Formats**

The most commonly used file formats for 3D printing today are 3MF, STL, OBJ, X3D, Collada (DAE) and WLR (VRML97/2). On our [**Supported 3D File Formats**](https://i.materialise.com/learn/supported-3d-file-formats) page, we listed some of the most popular 3D design tools among our user community that can export these file formats.

https://imaterialise.helpjuice.com/using-imaterialise/supported-3d-file-formats#:~:text=The%20most%20commonly%20used%20file,can%20export%20these%20file%20formats.

What are 3D Image Files?

Files used to store 3D or three-dimensional modeling data on a computer system are called 3D Image Files. The 3D image file was created to provide a means of storing 3D information about 3D models to be used in images, videos, CAD designs, and many other applications. These files can be used to store 3D models as well as 3D animations and 3D project files.

3D files use mathematical formulas to store a computer representation of any surface of a 3D object. The purpose of these files is to store 3D data in binary or plain text format, encoding the key attributes of a 3D functionality, including:

**Scence** (camera angle, lighting, etc.)

**Appearance** (colors, material, texture, etc.)

**Geometry** (shape)

**Animation** (how the model / item itself moves)

3D images are commonly used in movies, video games, 3D printing, architecture, engineering, sciences, and other relevant applications. Every industry has it’s own set of popular formats that are unique to it’s requirements. A few of the most common 3D image formats include:

**OBJ** — Format: Binary  
The OBJ file type is primary used in 3D printing applications and in 3D graphics. It was originally created by Wavefront Technologies for its Advanced Visualization animation software. It can encode several attributes such as color, texture, shape, and supports both precise and approximate encoding of surface geometry. Because it is a neutral, open format, it is quickly gaining popularity in the full color 3D printing space.

**CSO** — Format: Binary  
The CSO file format is a compiled version of the HLSL (High Level Shader Language) format file. This file type was developed by Microsoft for Microsoft Visual Studio to allow the implementation of 3D functionality in Direct3D / DirectX applications. It allows complex shading of color to provide images a three-dimensional look and feel.

**VS** — Format: Text  
VS or Vertex Shader file format is used by OpenGL, an API for rendering 2D and 3D vector graphics, and DirectX, a collection of APIs used for running games on Windows. It is used to store properties like lightning and shading effects for points in 3D space (vertices).

**HXN** — Format: Unknown  
Developed by DAZ Productions, HXN or Hexagon Model File format is used by Hexagon, a 3D modeling software. It can be used to store texture settings and polyhedral 3D mesh.

**FX** — Format: Text  
Developed by Microsoft, the FX file format is used by Direct3D, a part of DirectX's collection of APIs. It is used to store effects, which itself can be broken down into three categories. The **variables** are declared at the top of the effect, while **functions** are used to implement the shader code (or used by other functions), and lastly, the **technique** category that renders sequences using one or more effect passes.

[**https://www.exefiles.com/en/extensions/file-types/3d-image/**](https://www.exefiles.com/en/extensions/file-types/3d-image/)