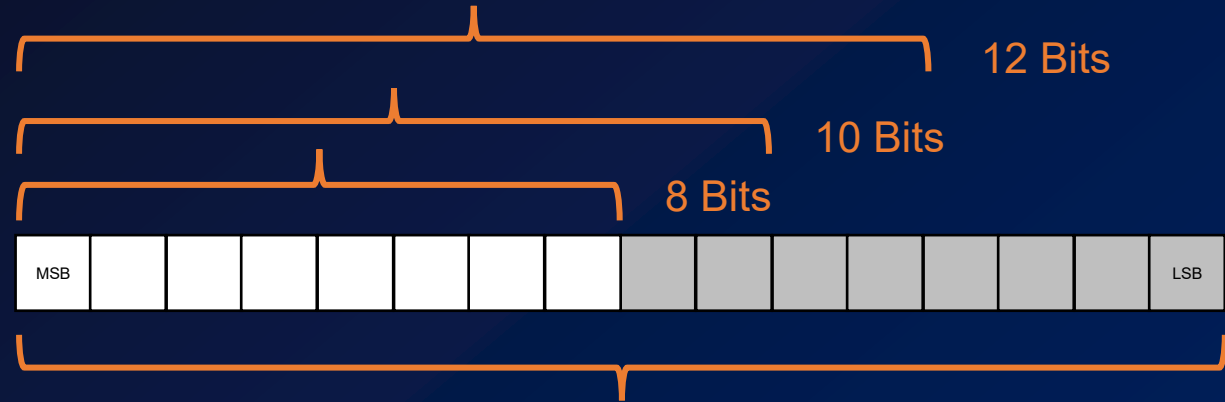


Understanding Image File Formats

April 11, 2026

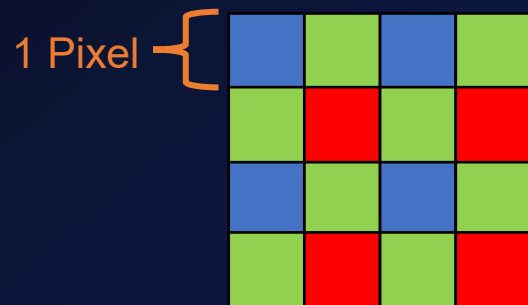
How Pixel Data is Stored

8 Bits / 1 Byte / 1 color channel

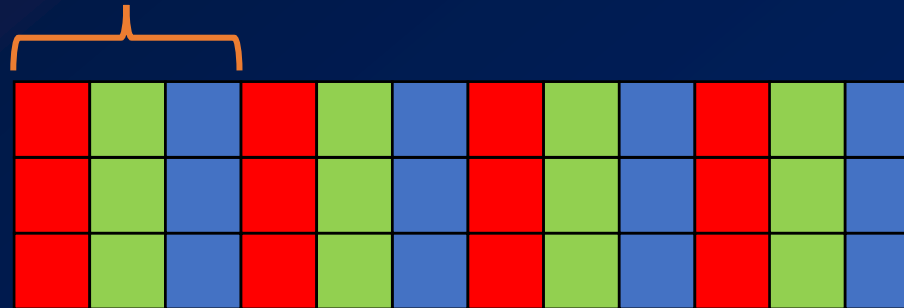


2 Bytes / 1 color channel

3 color channels / 1 Pixel



Raw (Bayer) Data



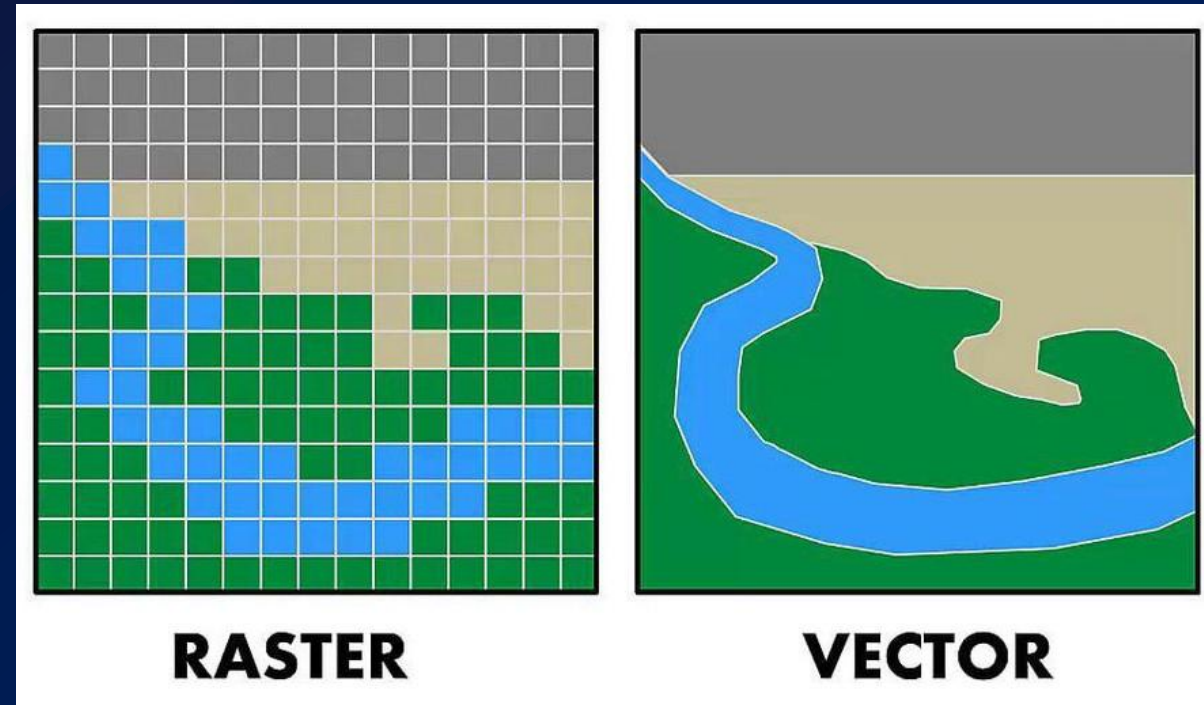
Color (Processed) Data

File Format Types

- Raw
 - Camera data with no processing or color information
 - Full sensor/camera dynamic range (e.g. more than 8 bits/pixel/color)
 - May contain metadata
 - May contain preview image
- Lossy
 - Full color information
 - Permanent loss of data due to compression
 - Includes metadata
- Lossless
 - Full color information
 - May use compression but no loss of data
 - Includes metadata

Raster vs Vector Images

- Raster:
 - Pixel data is represented as pixels/dots
 - Resolution dependent
 - Larger images need more file space
- Vector:
 - Use math to represent points, paths, lines
 - Easily resizable without making the file too big
 - Quality maintained when scaling



Vector Image File Formats

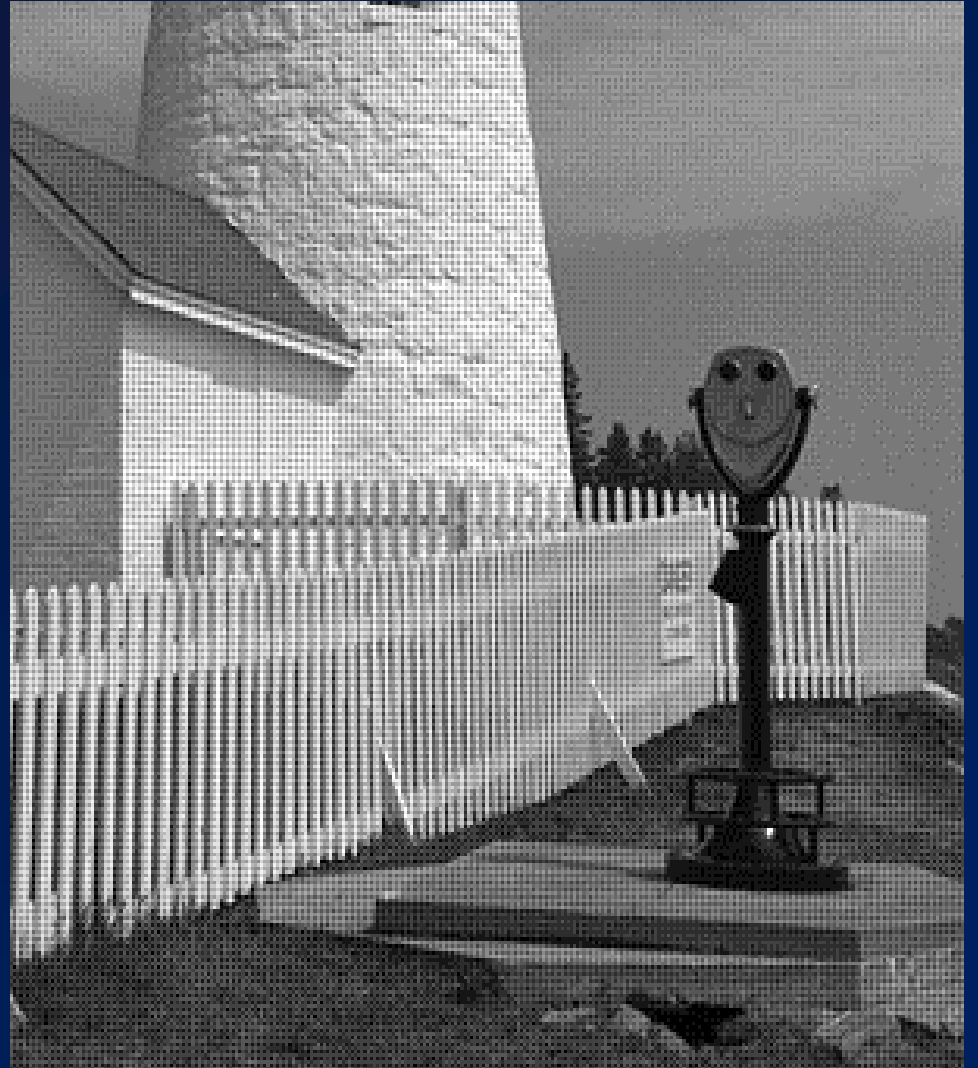
- AI
 - Adobe Illustrator Artwork
- EPS
 - Encapsulated PostScript
- PDF
 - Portable Document File
- SVG
 - Scalable Vector Graphics

When to use Vector Images

- Scalability
 - Logos, business cards, graphics, billboards, fonts, etc.
- Editability
 - Colors, shapes and other elements can be easily and precisely edited
 - Editing elements do not affect others
 - Clear lines and color that don't degrade with edits
- Do not use for photographs
 - Hard to vectorize elements in photos
 - Too much info/shapes to convert into math and paths
 - Use raster file formats instead

Raw Image File Format

- Undeveloped pixel a.k.a. digital negative
- No image processing applied to pixels
- May include a full-sized JPEG image that is used for previewing the file on the camera's LCD panel
- Sensor pixel data is stored as the image data
 - full dynamic range (12-14 bits)
 - larger/wider color gamut
 - Color filter array (a.k.a. Bayer) data – not every pixel has full color information



Raw File Extensions

- .3fr (Hasselblad)
- .ari (Arri Alexa)
- .arw .srf .sr2 (Sony)
- .bay (Casio)
- .braw (Blackmagic Design)
- .cri (Cintel)
- .crw .cr2 .cr3 (Canon)
- .cap .iiq .eip (Phase One)
- .dcs .dcr .drf .k25 .kdc (Kodak)
- .dng (Adobe)
- .erf (Epson)
- .fff (Imacon/Hasselblad raw)
- .gpr (GoPro)
- .jxs(JPEG XS RAW Bayer Profiles)
- .mef (Mamiya)
- .mdc (Minolta, Agfa)
- .mos (Leaf)
- .mrw (Minolta, Konica Minolta)
- .nef .nrw (Nikon)
- .orf (Olympus)
- .pef .ptx (Pentax)
- .pxn (Logitech)
- .R3D (RED Digital Cinema)
- .raf (Fuji)
- .raw .rw2 (Panasonic)
- .raw .rwl .dng (Leica)
- .rwz (Rawzor)
- .srw (Samsung)
- .tco (intoPIX)
- .x3f (Sigma)

Lossy Image Formats

- JPEG (Joint Photographic Experts Group)
 - Highly compressible → Very small image files
 - Compression degrades image quality
- HEIF (High Efficiency Image Format)
 - Balance between high quality and small file sizes
 - Can store multiple images → used for photo bursts (e.g. Live mode on iPhone)

Comparing JPEG Quality

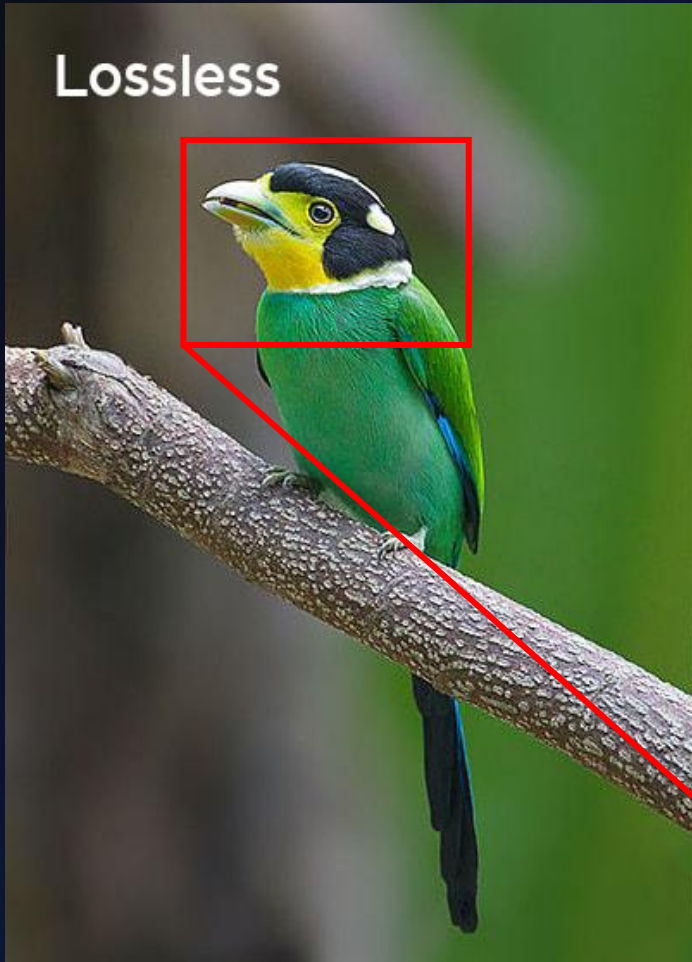


Lossless Image Formats

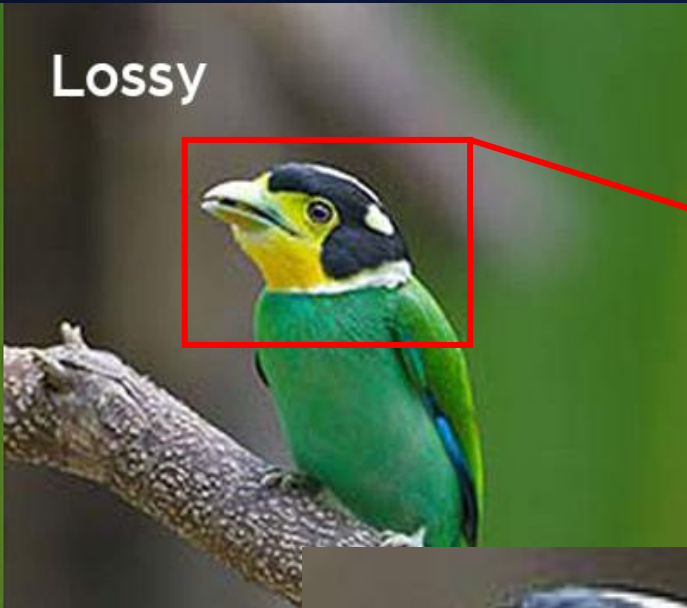
- PNG (Portable Network Graphics)
 - Supports alpha transparency → enables transparent backgrounds
 - Only supports RGB color space
- GIF
 - Limited color palette of 256 colors
 - Supports looping animation
 - Small file sizes
- TIFF (Tagged Image File Format)
 - Supports RGB, CMYK, indexed color, LAB and grayscale
 - 32 bits/pixel color depth
- BMP
 - No compression
 - Can handle multiple color depths, profiles and alpha channels

Lossy vs Lossless Compression

Lossless



Lossy



Conclusion

- Raster vs Vector
 - Use raster for photography
 - Use vector for graphics
- Lossy vs Lossless
 - Use lossy for space
 - Use lossless to conserve image quality (color depth, sharpness, detail)
- Capture in RAW or JPEG
 - RAW preserves quality but needs to be preprocessed
 - Ready to view anywhere but loss of data (color / sharpness)

RAW vs JPEG: What's the Difference and Which Should You Be Shooting? - DPS

