Internship Report On Rendition Service

TRAINING/INTERNSHIP/PROJECT REPORT

Submitted in partial fulfillment of the requirements for the award of the degree

Of

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In

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- JULY 2022 -

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Disclaimer: Intern clearly understands the binding of the Employee Inventions and Proprietary Rights Assignment Agreement (EIPRAA) inked at the commencement of this internship program to continue to subsist after its cessation.

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CERTIFICATE

This is to certify that the project entitled **"Rendition API enhancement with webp support"** is being submitted at IGDTUW, Delhi for the award of **Bachelor of Technology** in **Computer Science and Engineering** degree. It contains the record of bonafide work carried out by **MADHU PATEL (12101012019)** under my supervision and guidance. It is further certified that the work presented here has reached the standard of B.Tech and to the best of my knowledge has not been submitted anywhere else for the award of any other degree or diploma.

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DECLARATION

I,**Madhu Patel**, solemnly declare that the project report, **Rendition API enhancement with WebP Support,** is based on my own work carried out during the course of our study under the supervision of **Sumit Rathi, Mentor, Adobe**. I assert the statements made and conclusions drawn are an outcome of my research work. I further certify that:

I. The work contained in the report is original and has been done by me under the supervision of my supervisor.
II. The work has not been submitted to any other Institution for any other degree/diploma/certificate in this university or any other University of India or abroad.
III. We have followed the guidelines provided by the university in writing the report.
IV. Whenever we have used materials (text, data, theoretical analysis/equations, codes/program, figures, tables, pictures, text etc.) from other sources, we have given due credit to them in the report and have also given their details in the references.

Madhu Patel

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LIST OF ABBREVIATIONS

This section includes the list of abbreviations i used in the document.

Abbreviation	Description
SVG	Scalable vector Graphics
PTIFF	Pyramidal TIFF
JPEG	Joint Photographic Experts Group
PNG	Portable Network Graphics
GIF	graphics interchange format
HIEF	High-Efficiency Image Format
TIFF	Tag Image File Format

Tag Image File Format

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ABSTRACT/SUMMARY

This report seeks to provide a brief but in-depth overview of the work done on building my concepts in “Rendition API enhancement with webp support” , as a part of my summer internship program .

As a part of my internship , i worked on various Tech stack such as Golang, Java, Spring, Shell scripting, Splunk, Docker, Maven, Jenkins, AWS, Gatling, Grafana. These were used for checking the Rendition API enhancement.

This report,thus, seeks to give a detailed description of all the tasks mentioned above.

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CHAPTER 1 : INTRODUCTION

1.1 Literature Survey

Due to the majority of Adobe's goods migrating online, there is an increasing requirement for renditions, so we must provide image hosting. These days, rendering to screens with higher resolutions and frame rates is very popular. More detail and more precision are the goals of this development, but it also comes with a hefty price tag. Although graphics cards continue to develop with an ever-increasing quantity of computational capability, the processing advantage is heavily offset by pixels computations that are becoming more intricate and sophisticated. Image resolution and temporal resolution are frequently the first candidates to give in to performance constraints for real-time applications as a direct result (e.g., although full HD is possible, PS3 and XBox often render at lower resolutions).

In this state-of-the-art paper, we examine techniques that apply this principle and offer both theoretical and practical guidance on how to take advantage of temporal coherence for performance improvement. These techniques not only make it possible to add more computationally complex shading effects to many already existing applications, but they also present intriguing chances to adapt high-end graphics programmes to hardware with lower specifications for everyday use. In order to achieve this, we first provide the idea and core ideas of TC, as well as a summary of traditional approaches. Following a description of a crucial data structure known as the reprojection cache and a number of accompanying algorithms that make it possible to reuse shading data from earlier frames, we presented examples of its use in diverse contexts.

We used wiki articles and several research papers from Adobe's internal website. Moving forward, we experimented with various approaches and discovered a library that could improve performance.

1.2 Scope of the internship and report

Rendition is the process of altering an image's dimensions and version after it has been uploaded to a DAM (Digital Asset Management). The creation of thumbnails or smaller picture views from huge, high-resolution photographs using these renditions is handy for a variety of uses in the website's content.

We need to deliver image renderings quickly because the majority of Adobe's products are being used online, which raises the demand for serving renditions. We looked into how this may be enhanced in order to do this.

1.3 Explanation of the problem statement

As most of the products made by Adobe are moving in web, so demand for serving renditions increases, hence we need to serve image renditions fastly. In order to do this we explored how this can be improved.

1.4 Work contribution

The internship could be divided into three stages:

- Understanding and empathize - This includes understanding the background of the problem statement and experimenting new methodologies .
- Integrating Code changes - Code changes were made according to the need
- Deployment of code in pipeline - code was deployed on the server
- Testing - various tests were build around the deployed code
- Data Analysis - Data was exacted after after testing and was analyzed on various parameters
- Documentation of work - The whole work setup and steps were documented in the company's website

These stages will be elaborated on in full detail one by one in the following chapter.

CHAPTER 2: RESEARCH AND ANALYSIS

2.1. Introduction to Image Processing

The term "digital image processing" refers to the use of a digital computer to process digital images. In order to obtain an improved image or to extract some important information, we can also state that it is the usage of computer algorithms.

The following steps are significantly involved in image processing:

1. Importing the picture using tools for image acquisition;

2. Examining and modifying the picture;

3.Output, the outcome of which may be a modified image or a report based on the analysis of that image.

2.1.1 Images

The amplitude of F at each given pair of coordinates (x,y) is referred to as the intensity of that image at that location. An image is defined as a two-dimensional function, F(x,y), where x and y are spatial coordinates. We refer to it as a digital image when F's x, y, and amplitude values are all finite.

In other words, a two-dimensional array specifically set up in rows and columns can be used to define an image.A digital image is made up of an infinite number of discrete elements, each of which has a unique value at a unique place.

These components are also known as pixels, image elements, and picture elements.
The most frequent usage of a pixel is to indicate a component of a digital image.

Types of pictures

1. The binary image, as its name implies, consists of only two pixel elements, namely 0 and 1, where 0 stands for black and 1 for white. Monochrome is another name for this picture.

2. IMAGE IN BLACK AND WHITE - An image in black and white is referred to as an IMAGE IN BLACK AND WHITE.

3. The most well-known image format is 8 bit colour.

4. It is sometimes referred to as a grayscale image and contains 256 different colour tones. In this format, 0 denotes black, 255 denotes white, and 127 denotes grey.

5. A colour image format, 16 bit colour, is used. It comes in 65,536 distinct colours.

2.1.2 Data Compresion

Data compression is a technology that allows for a reduction in data size without sacrificing information. There are two types of data compression techniques: lossy compression and lossless compression.

Lossy compression does not rebuild the data in its original form after decompression, whereas lossless compression rebuilds the data in its original form after decompression. This is the major distinction between the two compression techniques (lossy compression and lossless compression).

Difference between Lossy Compression and Lossless Compression:

S.NO	Lossy Compression	Lossless Compression
1.	Lossy compression is a technique that removes inconspicuous data.	Lossless compression, however, does not get rid of inconspicuous data.
2.	A file is not restored or reconstructed in its original form while using lossy compression.	A file can be restored to its original state while using lossless compression. form.
3.	In Lossy compression, Data's quality is compromised.	But Lossless Compression does not compromise the data's quality.
4.	Lossy compression reduces the size of data.	But Lossless Compression does not reduce the size of data.
5.	Algorithms used in **Lossy** compression are: Transform coding, Discrete Cosine Transform, Discrete Wavelet Transform, fractal compression etc.	Algorithms used in **Lossless** compression are: Run Length Encoding, Lempel-Ziv-Welch, Huffman Coding, Arithmetic encoding etc.

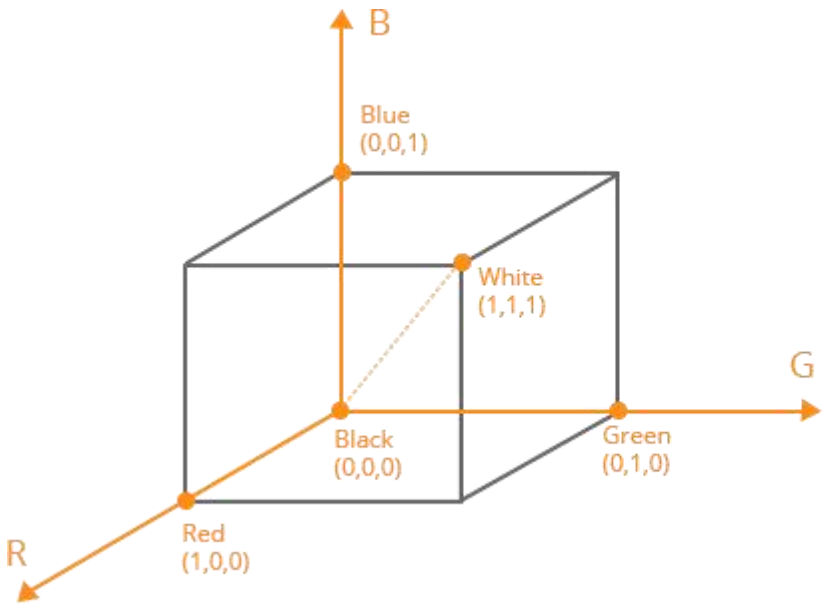
6.	Lossy compression is used in Images, audio, video.	Lossless Compression is used in Text, images, sound.
7.	Lossy compression has more data-holding capacity.	Lossless Compression has less data-holding capacity than Lossy compression technique.
8.	Lossy compression is also termed as irreversible compression.	Lossless Compression is also termed as reversible compression.

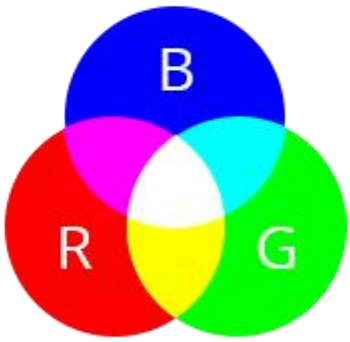
An abstract mathematical model known as a "colour model" explains how colours can be represented as a set of integers (e.g., a triple in RGB or a quad in CMYK). The majority of the time, colour models may be defined using a coordinate system in which each colour is represented by a single point in the coordinate space.

We can construct a set of guidelines and specifications required to precisely calibrate and generate colours, i.e. a mapping function, for a given colour model in order to understand a tuple or quad as a colour. The term "colour space" refers to a particular set of colour models and mapping operations. The related colour model can be found by identifying the colour space.

For instance, two different colour spaces based on the RGB colour paradigm are Adobe RGB and sRGB.

2.1.3 RGB





The RGB colour model stores distinct red, green, and blue values. The three primaries are combined in a colour space based on the RGB colour model to produce colours ranging from fully white to completely black.

The gadget is connected to the RGB colour space. As a result, when scanning the same image, different scanners produce different colour image data, and when displaying the same image on different monitors, different monitors produce different colour display outputs.

Standard RGB (sRGB) is one of many RGB colour spaces that can be created using this colour model.

2.1.4 HSV

Due to the fact that it is frequently more natural to think about a colour in terms of hue and saturation than in terms of additive or subtractive colour components, artists frequently employ HSV (hue, saturation, value), sometimes known as HSB (hue, saturation, brightness). Compared to RGB, the method is more in line with how people actually see and experience colour. For instance, hue, saturation, and values are described in terms of colour, shading, and tonality in paintings.
An inverted hexagonal pyramid can be used to describe the HSV model space.

The top surface is a regular hexagon that displays the change in hue in the H direction, which ranges from 0° to 360° and encompasses the whole visible light spectrum. Each of the six colors—red, yellow, green, cyan, blue, and magenta—is placed 60 degrees apart in each of the hexagon's six corners.
The value of the saturation S ranges from 0 to 1, and it is represented by the S direction from the hexagonal boundary to the centre. The colour saturation increases with proximity to the hexagonal edge. S = 1 indicates that the colour at the hexagonal perimeter is the most saturated; S = 0 indicates that the colour saturation is zero at the hexagon's centre.

The letter V, which stands for a gradation of black to white from bottom to top, is used to indicate the height of the hexagonal pyramid (also known as the central axis). V has a black bottom (V = 0) and a white top (V = 1).

2.1.5 Color Extraction

The complete colour space is divided into a fixed number of sets called bins in the classic method for extracting colour features. Each bin represents a different colour, and each pixel is placed in the closest coloured bin. The size of the bin is then expressed as a percentage of the colour in the image. image is in mode

The colour is represented in colour space as an intensity value. By employing the colour space approach, we are able to define, see, and produce colour. There are various techniques for extracting colour features.

2.2 Types of Images

2.2.1 JPEG

JPEG files, one of the most popular formats for storing digital photographs, are used frequently. They are used to capture and store images by many modern cameras.

JPEGs undergo compression to drastically reduce the size of the image file, which makes them simpler to store and load on websites. JPEG images have a maximum colour palette of 16 million.

2.2.2 PNG

Similar to JPEGS, Portable Network Graphics (PNG) files can accommodate 16 million different colours and are compressed. Because they require more storage than JPEGs, they are typically used for online graphics, logos, charts, and illustrations rather than high-quality images. JPEGs lack the ability to accommodate graphics with translucent backgrounds, but PNGs do.

2.2.3 TIFF

Compared to JPEG files, TIFF files include a lot more image data. Due to their stunning image quality, this makes them a favourite among photographers. However, the enhanced resolution necessitates far larger file sizes, making them more challenging to store and make for awkward use.

These big data files, which end in.tiff, are also referred to as Tag Image File Format.

2.2.4 HEIC

The image—or images, in the case of dual cameras and live photos—that you capture on your iPhone or iPad saves as a HEIC file.

High Efficiency Image Container is referred to as HEIC. It is a modernised version of the High Efficiency Image Format (HEIF), which Apple has historically utilised on all of its mobile devices.
For HEIF photos, Apple utilises HEIC. Thanks to cutting-edge compression technology, HEIF essentially saves images in higher quality than JPEG while still taking up less space. In comparison to other image file formats like JPEGs, this space-saving file format uses High Efficiency Video Coding (HEVC) to compress and save images on device drives.

Depending on the quantity of photographs inside, each HEIC file has either the.heic or.heics extension. The file also includes the pertinent metadata that lists the size, resolution, location, and other details of each image.

2.2.5. GIF

Graphics Interchange Format is referred to as GIF. GIF is a raster file format made for simple graphics that are primarily found online. Each file can support 256 indexed colours and up to 8 bits per pixel. Additionally, rudimentary animations can be made with GIF files by combining images or frames.

These files, which have the.gif extension, can be opened in a variety of applications.

The black-and-white format used by CompuServe for file downloads was replaced by a colour version in order to speed up the download time for huge photos.

87an and 89a were the names of the early GIF file formats used by CompuServe. The first picture format to become widely used on websites was GIF, followed by XBM files in black and white.

With time, the GIF file has developed to include more animation features. For instance, after work on the Netscape Navigator browser, developers were given the option to loop GIF animations in 1995. GIFs were first supported by Facebook in 2015, then by Instagram in 2018.

2.2.6 SVG

Web-friendly vector file formats include Scalable Vector Graphics (SVG). When storing images, vector files use mathematical formulas based on points and lines on a grid as opposed to pixel-based raster files like JPEGs. This makes vector files, like SVG, perfect for logos and intricate online images because they can be greatly scaled without losing any of their quality.

SVGs are extremely well-liked by web designers for reasons more than merely their capacity for scaling. Since SVGs are created in XML code, any text data is stored as plain text rather than a shape. This enables search engines like Google to read SVG graphics for their keywords, thereby assisting a website in rising in the search results.

The World Wide Web Consortium (W3C) requested submissions from developers for a brand-new type of vector graphic format in the late 1990s, which is when the SVG file history began. The W3C's SVG format was ultimately influenced by six competing ideas that were submitted.

It took some time for SVGs to become widely used. Up until 2017, when people started to realise the advantages of using SVGs in contemporary web browsers, there was comparatively little support for them. Due to their compatibility with the majority of browsers and drawing programmes for vector files, SVG files are now often utilised for 2D website pictures.

2.2.7 What is the difference between JPEG and PNG files?

There are numerous differences between JPEG and PNG files, despite their use and resemblance. JPEGs contain less data than PNGs due to their different compression techniques, hence they are typically smaller in size. PNGs are preferred for visual design because they offer translucent backgrounds, in contrast to JPEGs. Discover additional distinctions below:

Lossless vs lossy compression

When deciding whether to utilise JPEG or PNG as your file format, it's critical to grasp the various compression techniques each file type employs.

JPEGs are made to effectively preserve crisp, colourful digital photographs with excellent detail. Large photographs are reduced in size, making it simpler to share and upload them online. But there is a cost involved.

JPEGs employ a lossy compression technique, which means that some image data is permanently lost when the image is reduced in size. Because more data is lost each time you update and save a file, this could eventually degrade the quality of your work. The use of uncompressed raw data is preferred by some professional photographers as a result.

PNG files, on the other hand, gain from lossless compression. The quality remains constant regardless of how many times you alter and save the picture, thus no data is lost while the image is compressed. PNGs are the best choice for clear logos and graphs with a lot of data because the image won't become distorted or blurry.pitfalls of DWG files.

File sizes

With their lossy compression, JPEGs may sacrifice quality, but they can reduce huge images to more manageable file sizes. This can speed up page loading times and is useful if you don't have a lot of disc space to work with.

PNGs have a trade-off in that their lossless compression results in larger files because they retain a lot more data. They take up more storage space than JPEGs and GIFs, are often bigger, and could potentially make web pages less responsive.

Transperancy

The ability of JPEG and PNG files to handle image transparency is one of their main differences. Transparent backgrounds are not supported in JPEGs. Therefore, non-rectangular logos and graphics with a lot of text are unlikely to function properly in this format. JPEG photos will also have a difficult time blending in with websites that have various backdrop colours.
On the other hand, transparency is supported by PNG files. Images can have transparent backgrounds applied to them by web designers, with varying degrees of transparency. It implies that text is simpler to see and that PNG images blend in better with various background colours on a page.

Digital photos vs web graphics

Photographers and companies that manage huge image libraries adore JPEGs. Multiple digital images can be shared and downloaded at once because to their reduced file sizes. JPEGs can maintain a reasonably organised image library with short file-opening wait times by making efficient use of storage space.

Given their extensive use, JPEG files may be viewed and edited using a wide range of programmes and operating systems, so you probably won't require specialised software to deal with them.

PNGs, in contrast, aren't actually designed to store high-quality images. Handling intricate, high-contrast web images is their area of expertise. Since they may offer a very realistic depiction of your desktop and don't compress pixels together, they are frequently used as the default format for screenshot photographs.

2.2.8 What is the difference between JPEG and TIFF files?

It's crucial to understand the key distinctions between JPEG and TIFF files. Your workstreams and requirements will determine where, or even if, you employ them. The primary distinction between JPEGs and TIFFs is that JPEGs often have substantially smaller file sizes due to file compression. JPEGs are therefore a popular choice when storage capacity is at a premium.

Compression.

Since the JPEG format employs lossy compression, picture quality is sacrificed in order to attain a smaller, more manageable file size. JPEGs are now simple to keep on a drive, email, or transfer between cloud services. But some of the original image data is lost during compression, resulting in a glaring reduction in image resolution.
TIFFs are raster graphic files like JPEGs, except they use lossless compression to preserve the image data. As a result, TIFF files are typically big. They frequently require a large amount of disc space and may be difficult to email. However, they are a fantastic option for any digital editing job because to their high quality, especially if you store them on your backup drive afterward.

Usage.

As a source image, or the original file you'll keep as a backup, a TIFF works nicely. You can keep your photograph in the greatest quality possible in this manner for subsequent editing. Because there is more data to work with when editing higher-resolution photographs, many photographers prefer to use them.
When you need to contact a client or post a picture to your website, JPEG performs better as a finished image that is ready for export. JPEGs don't contain as much image data as TIFFs do, so they don't provide as much freedom during editing.

File Size

The lossy compression used by the JPEG results in files that are typically under 10 MB in size. TIFFs are substantially bigger because they employ a lossless method of compression. In reality, some TIFF files can be as large as 4 GB.

Transparency.

In contrast to JPEG files, a TIFF will accept transparent picture features inserted during editing, such as covert logos or watermarks. Transparency features were included in the short-lived JPEG 2000 file type, which first appeared in the late 1990s, although it is no longer particularly common to support that format.

Artefacts.

The emergence of artefacts, or the pixelation or blocky appearance of image parts when a file loses too much data, is one of the drawbacks of image compression. Examples of this may be found in exceptionally gloomy pictures or badly compressed website images. As a lossless file, TIFFs don't create artefacts.

Compatibility.

JPEGs work with the vast majority of common operating systems, editing software, and printers. TIFFs are, too, although some printers and scanners may not be able to handle them due to their size.

Websites.

Unlike TIFFs, JPEGs are more suited for website design because of their tiny size and ease of uploading and management. Since page load times can affect the overall health of a website, they are minimal enough not to have a detrimental impact.

2.2.9 Difference between PNG and TIFF

Excellent options for presenting complicated images are PNGs and TIFFs. But because PNGs are typically lower in size, they might be better suited for websites. For professional use, scanning,

and printing possibilities, TIFFs are frequently the best solution. Let's examine these variations in greater depth.

Transparency.

Transparency is supported by TIFF files, although they are incompatible with many web-based programmes. TIFF transparency will only be supported by programmes that fully support TIFF files.
To acquire the outcomes you require in some cases, you might have to alter a TIFF file. In most cases, this entails either completely deleting out pixels or utilising a layer to hide them. This is possible because TIFFs support layering. However, it can also be time-consuming.
One of the most popular file types for transparent photos, graphs, and logos is PNG. They work well with both web-based and offline programmes. PNG images can also have various levels of transparency applied by web designers, which can assist graphics blend in well with the various backdrop colours of a webpage.

Web use.

The TIFF file type's versatility and compatibility—which make them work with a variety of programmes and operating systems—are both major selling features. But because of their size, they aren't a viable choice for web use.

PNGs, however, are a fantastic option for web graphics. Their size is manageable for web applications thanks to their lossless file compression. They are a common format and one of the most used file types for photos on the internet. PNG photographs should be noted that due to their huge file sizes, they can take some time to load; hence, JPEG is frequently the favoured format for online image sharing.

Compression.

Lossless compression ensures that PNG and TIFF files retain their quality no matter how frequently you save, open, or resize them.
TIFF files, on the other hand, give users the option between lossy and lossless compression, which might aid in file size reduction if that is a priority.

file sizes

A TIFF file is likely to be bigger than a PNG even with a lossy compression option.
Transparency, multi-page design, and high resolution are all supported by TIFFs. They must save a lot of data because of this.
Because PNG files are smaller, managing them between programmes may be simpler. Even though they are smaller than TIFFs, they are still bigger than JPEGs. In the end, this is one of the primary causes of JPEGs' continued dominance as the preferred file type for internet photographs.

Printing.

PNG files can be expanded to very large proportions, which means that, if necessary, they can mimic the TIFF's image quality. Why, then, aren't they frequently utilised for print, if that's the case?

The graphics in a PNG are not entirely optimised for print projects. CMYK colour, which is frequently used in the printing business, is not supported by PNGs. PNG files, on the other hand, can be useful for producing archival-quality art prints since professional art printing frequently employs specialised RGB printers for giclee and art prints.
TIFF, on the other hand, supports both CMYK and RBG colour schemes and is completely print-optimized. It's one of the most widely used formats for high-quality graphic prints and pictures, along with RAW. TIFF files are frequently used for printing very large-format photographs including billboards.

Scanning.

Another popular option for high-quality scans is TIFF. You'll probably receive them back as a TIFF file if you have homemade artwork or photographs to scan. TIFF is perhaps one of the greatest scanning alternatives out there.

PNGs are a good scanning alternative as well, especially if you plan to post the image online later.

Containing.

Container files include both PNG and TIFF. This implies that they can accommodate more data from other formats, such as JPEG.
In this area, TIFFs are extremely helpful. TIFFs are a popular choice for jobs like transmitting a collection of images in a single file since users can add several JPEG files into a single TIFF.

PNGs preserve forward compatibility by using their capacity as container files, which enables them to change over time and integrate information for subsequent versions.

2.3 WEBP

2.3.1 Introduction

A cutting-edge image format called WebP offers greater lossless and lossy compression for pictures on the internet. Webmasters and web developers can produce smaller, richer graphics with WebP that speed up the web.

When compared to PNGs, WebP lossless images are 26% less in size. WebP lossy images at equivalent SSIM quality index are 25–34% smaller than comparable JPEG images.

Transparency (also known as the alpha channel) is supported by lossless WebP at a cost of only 22% more data. Lossy WebP additionally provides transparency for situations where lossy RGB compression is appropriate, often offering 3 lower file sizes than PNG.

Animated WebP images can offer smaller sizes than GIF and APNG since they can enable lossy, lossless, and transparency.

2.3.2 How Webp works

Lossy WebP compression uses predictive coding to encode an image, the same method used by the VP8 video codec to compress keyframes in videos. Predictive coding uses the values in neighboring blocks of pixels to predict the values in a block, and then encodes only the difference.

Lossless WebP compression uses already seen image fragments in order to exactly reconstruct new pixels. It can also use a local palette if no interesting match is found.

- **WebP Compression Techniques in Detail**

A WebP file consists of VP8 or VP8L image data, and a container based on RIFF. The standalone libwebp library serves as a reference implementation for the WebP specification, and is available from our git repository or as a tarball.

2.3.3 Overview of webp

- Provides superior lossless and lossy compression for images on the web
- WebP lossless images are 26% smaller in size compared to PNGs
- WebP lossy images are 25-34% smaller than comparable JPEG images
- Lossless WebP supports transparency.
- Important points for testing WebP
- The maximum pixel dimensions of a WebP image: 16383x16383
- Color spaces supported by WebP: RGBA & YUV420

2.3.4 Advantages of Webp

In contrast to GIF's 8-bit colour and 1-bit alpha, WebP enables 24-bit RGB colour with an 8-bit alpha channel.

Both lossy and lossless compression are supported by WebP; in fact, an animation can contain both lossy and lossless frames. Only lossless compression is supported by GIF. Animations derived from real-world videos, a source of animated visuals that is becoming more and more popular, are ideally suited to WebP's lossy compression techniques.

Compared to GIF1, WebP uses fewer bytes. Lossy WebPs made from animated GIFs are 64% smaller than lossless WebPs, which are 19% smaller. This is particularly crucial for mobile networks.

In the presence of seeking, WebP decodes faster. Images can be hidden and revealed in Blink by scrolling or switching tabs, which causes animations to pause and then advance to a different point. The decoder may also need to move forward in the animation if there is excessive CPU consumption that causes frames to be dropped from animations. In these situations, animated WebP requires 0.57 times as long to fully decode 2 as GIF, resulting in smoother scrolling and quicker recovery from CPU spikes. This is as a result of WebP's two advantages over GIF:

By storing this information in metadata, WebP images avoid the need to decode each frame in order to determine whether it has alpha. This results in less needless decoding of earlier frames because it makes it easier to determine which earlier frames a specific frame depends on.

The WebP encoder heuristically adds key-frames at predetermined intervals, much like a contemporary video encoder (which most GIF encoders do not do). This significantly enhances searching in lengthy animations. In addition to the frame disposal mechanism that GIF employs, WebP includes a "blending method" flag for each frame to make it easier to insert such frames without dramatically expanding image size. Due to the fact that the preceding frame wasn't made to match the backdrop colour, a keyframe can draw as if the entire image had been cleared.

2.3.5 Disadvantages of webp

In the absence of seeking, straight-line decoding of WebP is more CPU-intensive than GIF. Lossy WebP takes 2.2x as much decode time as GIF, while lossless WebP takes 1.5x as much.

WebP support is not nearly as widespread as GIF support, which is effectively universal.

Adding WebP support to browsers increases the code footprint and attack surface. In Blink this is approximately 1500 additional lines of code (including the WebP demux library and Blink-side WebP image decoder). Note that this problem could be reduced in the future if WebP and WebM share more common decoding code, or if WebP's capabilities are subsumed in WebM's.

2.3.6 Webp in Adobe

Webp is used in various applications-

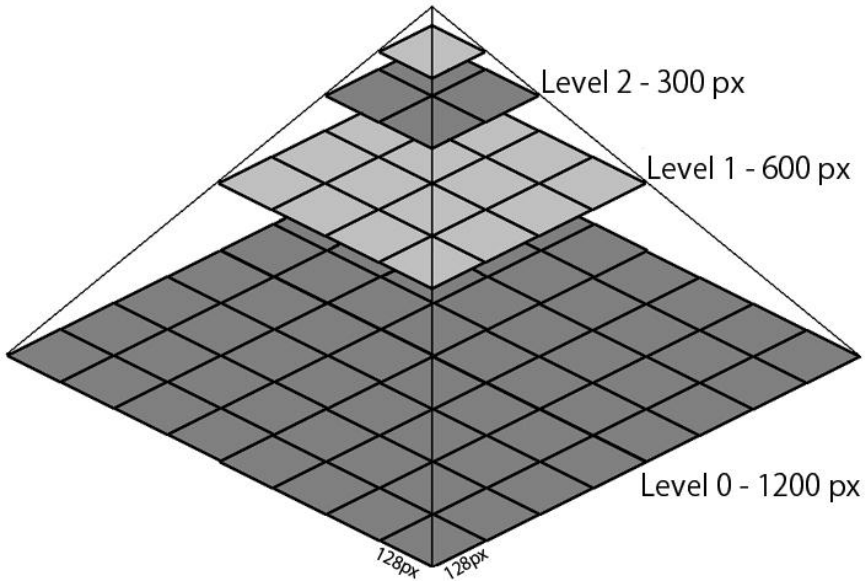
- Adobe Photoshop
- Adobe Express
- AEM
- Adobe Illustrator
- Lightroom

2.3 PTIFF

2.3.1 Introduction

PTIFF is Pyramid Tiff. It is a Container that may contain JPEG's, PNG and TIFF.

Inside PTIFF we save multiple resized versions of the same file, each with half the dimensions of earlier layer



2.5 Rendition

It is Derived representation of an asset. It is Represented in broadly understood media types. It Contain less data than the asset. It is Mostly used for preview of an asset.

The proportions that are utilised to show images in SharePoint publishing sites are specified by an image rendition. Using image renditions, you can use the same source image to display variously sized copies of the same image on various pages in a publishing site. You define the width and/or height for each image that uses an image rendition when you generate it. Every image that is uploaded to a library on that website collection has access to the image renditions. Designers might produce one image rendition for thumbnail images and another for banner images, for instance. The author can decide which image rendition to use when adding an image to a page. Additionally, authors have the option to crop the picture

Conditions for controlling image renderings--

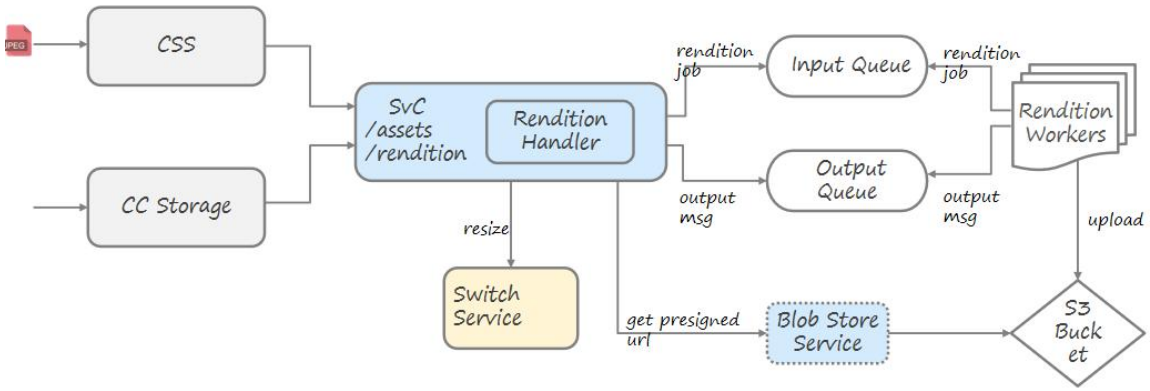
Make sure you meet the requirements in this area before carrying out the procedures in this topic because image renditions depend on other capabilities in SharePoint. Among the requirements are:

a list of publishing websites The Publishing Portal or the Product Catalog site collection template must have been used to construct the site collection where you are uploading image reproductions. Alternatively, the site collection where you intend to use picture renditions must have publishing features enabled. View Overview of Publishing to Internet, Intranet, and Extranet Sites in the TechNet Library for more details.

A set up BLOB cache Binary large objects (BLOBs), such as commonly used picture, audio, and video files, as well as other files used to display webpages, such as.css and.js files, are cached by the disk-based BLOB cache. Each front-end web server where you want to employ image renditions must have the BLOB cache enabled. The original picture is always used if the BLOB cache is disabled. Consult the TechNet Library article Configure cache settings for a Web application for additional details.

An asset repository (recommended) To create a library that makes it simple to store, arrange, and locate rich media assets, such as image, audio, or video files, use the Asset Library template.

2.5.1 Rendition Generation Architecture



2.5.2 Rendition Intermediate: what and why?

They are Temporary image used for final rendition generation.They are Generated using the uploaded asset. It is mostly Stored at the server for small period of time. The Format is pTiff and and Size: 1200px

Why Rendition Intermediate ?

It is Improves latency for Rendition API and currently most of the renditions requested by clients are for size < 1200px

CHAPTER 3 - WORKING METHODOLY

3.1 Understanding and empathize

We advanced and realised what adjustments have to be done in order to experiment the rendition time for a picture over the server after we understood which image format to utilise and when, as well as how Adobe's internal image format functions.

3.2 Integrating code changes

After Understanding the codebase, various aspects of the code-base was understood and then after making the docker file and building the code, various code changes were made. These work was done on a separate machine I.e Centos 7 image.

3.3 Deploying code in pipepline

The code was deployed up to the stage piplepine after being pushed to git-hub, and several builds were then produced.

3.4 Testing

The deployed code was evaluated using a variety of datasets for various image sizes and formats, as well as other characteristics like interlaced and non-interlaced images..

3.5 Data Analysis

The data obtained from testing various datasets was then analyzed and various conclusions were made from that and then there ware some change in the methodology and same process was repeated again.

3.6 Documentation

All approaches were documented on their website after all installation and analysis were finished.

CHAPTER 4 - OTHER METHODOLOGIES

4.1 Libvips

A horizontally threaded, demand-driven image processing library is libvips. Compared to other libraries of a similar nature, libvips operates rapidly and efficiently. LGPL 2.1+ is the licence for libvips.

Approximately 300 operations are available, including arithmetic, histograms, convolution, morphological operations, frequency filtering, colour, resampling, statistics, and others. It can handle a wide variety of numeric types, including 8-bit int and 128-bit complex. Any number of bands is possible for images. JPEG, JPEG2000, JPEG-XL, TIFF, PNG, WebP, HEIC, AVIF, FITS, Matlab, OpenEXR, PDF, SVG, HDR, PPM / PGM / PFM, CSV, GIF, Analyze, NIfTI, DeepZoom, and OpenSlide are among the image formats that are supported by it. It can also deal with formats like DICOM by loading images using ImageMagick or GraphicsMagick.

It includes command-line, C++, and C bindings. There are complete bindings for Lua, Ruby, Python, PHP,.NET, and Go. Sharp (on Node.js), bimg, Sharp for Go, Ruby on Rails, carrierwave-vips, mediawiki, PhotoFlow, and other applications use libvips as their image processing engine. Nip2, a peculiar hybrid of a spreadsheet and a photo editor, serves as the official libvips GUI.

The source code and pre-compiled binaries for Windows are available in the download area. Homebrew, MacPorts, and Fink can be used to install it on a Mac, and most Linux package managers support it. View the installation notes.

4.2 Govips

This package exposes all image operations on first-class types in Go, encapsulating the essential features of the libvips image processing library.

Compared to other graphics processors like GraphicsMagick and ImageMagick, Libvips is often 4–8 times quicker. Look at the benchmark: Use of Speed and Memory

The goal of this is to make it possible for programmers to create highly quick image processors in Go, which is well suited for simultaneous requests.

A go library for quick picture scaling and processing
This package exposes all image operations on first-class types in Go, encapsulating the essential features of the libvips image processing library.

Compared to other graphics processors like GraphicsMagick and ImageMagick, Libvips is often 4–8 times quicker. Look at the benchmark: Use of Speed and Memory

The goal of this is to make it possible for programmers to create highly quick image processors in Go, which is well suited for simultaneous requests.

4.3 Tech stack used

- Golang
- Shell scripting
- Java
- Splunk
- Spring
- Docker
- Maven
- Jenkins
- AWS
- Gatling
- Grafana

CHAPTER 5: CONCLUSION

It was a great learning experience for me to work on this project. It took me through different phases of project development and gave me a real insight into what real development in computer science actually is.

I was able to explore the procedure involved in converting a hard task to a simple task.
Tools, softwares and libraries explored include Golang, Java, Spring, Jenkins, AWS, Gatling, Grafana, Splunk, Docker, Maven.

Work done includes implementing a Full fledged website in my own .
Finally,I have come out of these two months more knowledgeable about the work prevalent in literature on the problem of making my own website.

CHAPTER 6: FUTURE SCOPE

1. Integrating the functionalities of Libvips in AIDE
2. Using a custom build of Libvips and imaging libraries to reduce the memory and CPU usage
3. Explore streaming in libvips

4.Computing the CPU Utilization and memory usage of AIDE and Libvips

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BIO-DATA/RESUME

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EDUCATION

B.Tech (Computer Science Engineering), Indira Gandhi Delhi Technical University For Women
(2019 - 2023) 86.9%

Kendriya Vidyalaya

- Class XII (2017 - 2018) 90.4%

- Class X (2015 - 2016) 10 CGPA

WORK EXPERIENCE

Product Intern | Adobe
May 2022 – July 2022

Working in improving the performance of Renditions API in the Gyarados-Renditions team.

Front-end Development Internship, FM solutions
September 2020 - October 2020

Worked on data summarization and visualization tool creation which created graphs and charts for users collected from data to facilitate ease of evaluation and analysis of the collected data.

PROJECTS

Fellowship-website | Link **July 2021**
. Created an organizational management system to track and monitor mentor, mentee etc.· It also uses Twilio to send messages to all of the registered phone numbers.
· Node, EJS, express, MongoDB, and HTML-CSS/Bootstrap were used in the development.
IMPACT: Implemented an academic tool to monitor their productivity of mentor, mentee, Program manager

Melody | Link **October 2020**
Used **JAVA** to create a real-time audio player to understand, data Structures in depth. Inspired by Spotify this music player does all the basic functionalities of a music player such as *Start, Pause, Resume, add to favorite, choose from favorites etc.*
IMPACT: Implemented how data structures can be put to use in the real world.

A blogging website | Link **August 2020**
Used **HTML, CSS, JavaScript, Node.js, MongoDB** to create a web application that creates and maintains all your blogs in one place. Some of its features are that we can create a blog, edit it, post it with an image URL, etc.

SKILLS

JAVA Data Structures and Algorithms DBMS
OOPS Operating Systems Web Development

AWARDS AND ACHIEVEMENT

- **Flipkart #GirlsWannaCode Mentorship Program** (February 2021 - May 2021)
  - Selected as one of 200 scholars from a pool of 5,000+ students.
- **3 stars in** Codechef
  - Achieved global **rank 405 in** codechef starters 17 among 6k+ students
- Secured **AIR 1415 in Google Hashcode'21.**
- Secured **AIR 3868 in Google KickStart'21 Round H.**
- Secured rank in top **154 students** out of 17k+ students in **Flipkart's Runway Challenge.**
- Selected for **JP Morgan Code for Good** Hackathon 2021
- **TIMES NIE** think and challenge Talent Hunt (2016)
  - Received a Tablet and certificate for securing position in top 0.16% out of 2.5 lakh participants across 400 schools.
- **School Topper | Excellence Award** (2017, 2016)
  - School topper in Class XI. Received Excellence award on Teachers felicitation ceremony for exceptional performance in (class - X, XI)

POSITIONS OF RESPONSIBILITY

Head Coordinator in CSE-IT and Website team at INNERVE (August 2020 - present)
Implemented a game named "Ship Attack" and a website for the fest.

Mentor In DSC(DSA Circle)(IGDTUW)
(August 2021 - present) Teach data Structures and Algorithms to juniors and solve their doubts