

## **Lab 2 -Art Guardian Product Specification**

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First Version

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# **1 Introduction**

Non-fungible tokens (NFTs) have seen an increase of popularity and market value within the Q1 of 2021. The growth in popularity resulted in NFT marketplaces growing from a worth of less than \$100 million in Q1 of 2020 to \$1.5 billion in Q1 2021 (Chang, 2021). The volume of these marketplaces grew to a worth of \$41 billion (Collins, 2021). The surge of NFTs that came about contained content that was counterfeiting copyrighted digital art that derived from digital artists. The art platform DeviantArt has reported 90,000 NFTs containing counterfeited art in December 2021, a three-times increase in comparison to a reported 30,000 NFTs in November 2021 (Becket, 2022). These NFT sales rake in profit as approximately 50% of all sales reach over \$200 during the beginning of 2022 (Dailey, 2022)

There are very limited protections towards any possible counterfeiting of digital art for NFTs and selling them on NFT marketplaces. A digital artist would need to go through a process which includes manually searching for NFTs with infringing artwork on various marketplaces and filing a Digital Millennium Copyright Act (DMCA) takedown request to the marketplace holding the infringing NFT. The process to takedown an illicit NFT is time consuming and tedious, and it doesn't stop the creation of more NFTs containing infringing art.

## **1.1 Purpose**

Art Guardian is a web application designed to protect a digital artist's artwork from being sold on NFT marketplaces as illicit NFTs. The product streamlines the process of searching for infringing NFTs and sending a DMCA takedown request to the marketplace containing them. Art Guardian achieves this by using an automated system that combs through various NFT marketplaces in search of infringing NFTs based on artwork uploaded by the user. Once an infringing NFT is found, Art Guardian will allow the user to generate and send a DMCA takedown request to the marketplace hosting the NFT. Art Guardian is designed to legally pressure NFT marketplaces to remove counterfeit NFTs by sending DMCA takedown requests. The application itself can not prevent NFT minting that uses copyrighted artwork. The Art Guardian application will also have systems in place that prevent any misidentification of NFTs and or abuse of the system.

## 1.2 Scope

Art Guardian aims to protect digital artists who may or may not want to mint their own NFTs using their artwork. Art Guardians achieves this by scanning NFT marketplaces for NFTs containing artwork that was uploaded into the database by the user. If an infringing NFT is found, Art Guardian will allow the user to send an automatically generated DMCA takedown request to the marketplace containing the NFT.

The Art Guardian prototype will have full implementations of the art upload, whitelisting, art tracking, image matching, theft alert, DMCA generation, and DMCA cataloging. DMCA filing will be partially implemented as test DMCA takedown requests can not be sent to real websites due to legal repercussions and will instead be sent to test emails. The prototype will not have any implementations on user verification and DMCA tracking.

## 1.3 Definitions, Acronyms, and Abbreviations

- **NFT**: A sellable, tradeable, non-fungible token that exists on the blockchain and represents some form of data
- **Blockchain**: A decentralized, immutable, public ledger that is split among multiple computers
- **Art Platform**: A site that artists use to publish their art
- **DMCA (Digital Millennium Copyright Act) takedown**: act of taking down a copyrighted work from a website on behalf of the owner of that work
- **Minting**: Using a piece of data, such as an image, to create a unique NFT
- **NFT Marketplace**: website where NFTs are sold
- **AWS (Amazon Web Services)**: Largest provider of various cloud computing services
- **AWS Amplify**: an AWS service for building full-stack web applications

- **Amazon RDS ( Relational Database Service):** cloud-based database service which can work with other AWS services
- **Amazon DynamoDB:** cloud-based database service which can work with other AWS services
- **NFTport API:** interface for working with popular NFT blockchains and markets
- **React:** open-source, front-end JavaScript library for creating websites with modern user interfaces
- **Stripe API:** programming interface for verifying a user's identity
- **OpenCV:** open-source computer vision library for Python
- **Gmail API:** a programming interface for the creation and sending of emails
- **MySQL:** a relational database management system
- **Git:** version control system for tracking software changes
- **GitHub:** online hosting of the git version control system
- **JavaScript:** a general purpose programming language often used for web development
- **HTML:** markup language for displaying documents in the web browser
- **CSS:** style sheet language that specifies the style and layout of how documents are displayed in a web browser

## 1.4 References

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## **1.5 Overview**

- This product specification provides the hardware and software configurations, external interfaces, capabilities, and features of the Art Guardian Prototype. The remaining sections of the documents include detailed descriptions of the hardware, software, and external interface architectures of the Art Guardian prototype. It will also include the key features and the parameters that will be used to implement the feature as well as the performance characteristics of that feature in terms of user interaction, display, and output.

## 2 General Description

### 2.1 Prototype Architecture Description

- Web Server: The Art Guardian prototype will be using AWS Amplify hosting service to host our Web Application. The frontend and backend will be connected via Amplify.
- Database: The database the Art Guardian prototype will use will be AWS DynamoDB. This database is used to store our end users' information, profiles, and artwork.
- APIs: GraphQL APIs will be used to connect the Art Guardians' database to its web server. A Gmail API will be used by the Art Guardian prototype for email generation.

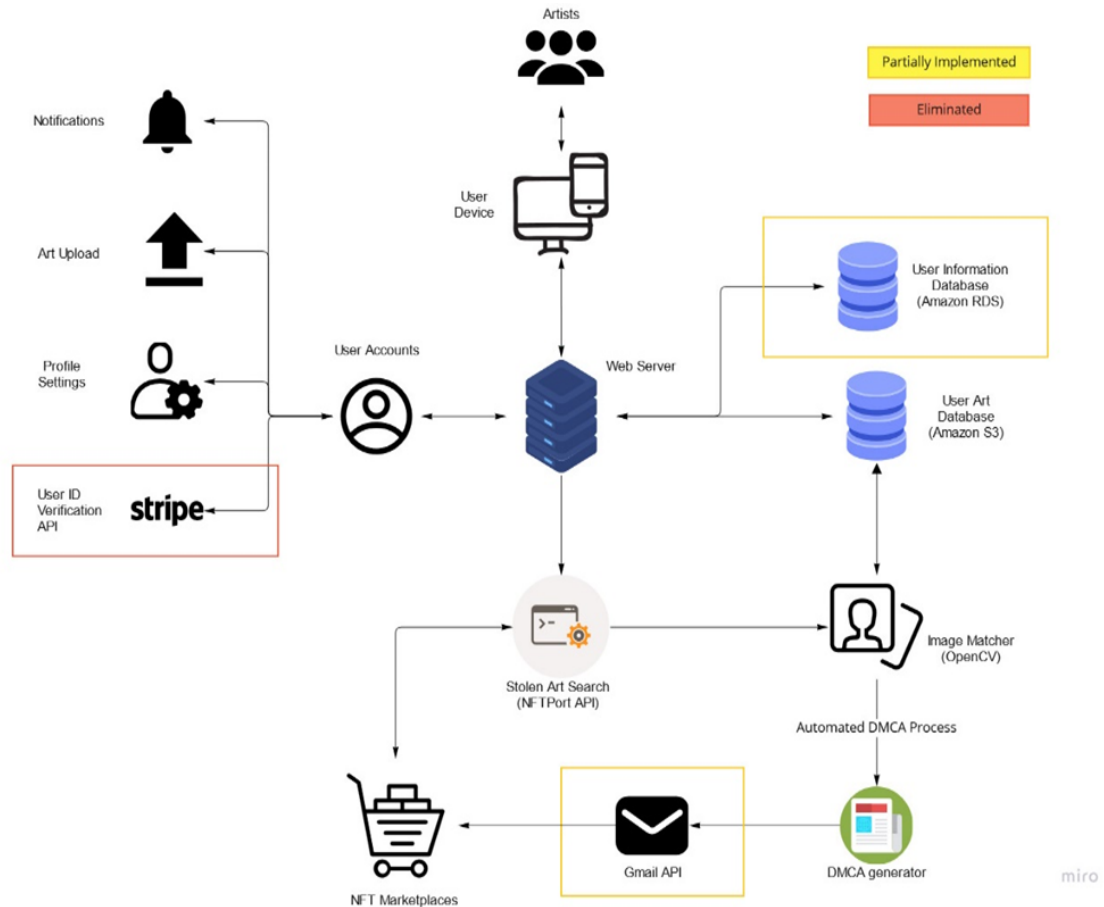


Figure 1. Art Guardian Prototype Architecture Diagram.



## 2.2 Prototype Functional Description

The major functional components of the Art Guardian prototype include the following:

- Web Server: AWS will be used to deploy the Art Guardian web application
- User Accounts: Users will require an account in order to upload and protect their art on Art Guardian
- Notifications: Alerts and push notifications will be sent to the user for art theft detection and DMCA status updates
- Art Upload: Users will upload images of their art to be stored on the database
- Art Gallery: The database will store images of all art uploaded by users
- Databases for User Information: The database will store and encrypt account information
- NFTPort API: This is a dependency API that assists with monitoring NFT marketplaces for minted artwork
- OpenCV Library: This is a library that will perform the image matching between the NFT and the user's image on the database
- DMCA Generator: Automatically generates a DMCA takedown request with a fixed format while including the correct information of the NFT
- Gmail API: Sends the DMCA takedown request through email (partially implemented)

Features	Description	Prototype Implementation
Account Controls		
Account Creation	Create account for users to utilize Art Guardian features	Fully Implemented
GUI		
Art Upload	Users upload images of artwork to the database	Fully Implemented

Image Library	Users view the artwork they have uploaded	Fully Implemented
Whitelisting	Remove art previously uploaded to the database	Fully Implemented
<b>Automated Processes</b>		
Marketplace Monitoring	Checks NFT marketplaces periodically for image matching	Fully Implemented
Image Matching	Matches images from NFT marketplaces to images on the database	Fully Implemented
Stolen Art Alert	Send the user notifications of stolen art and DMCA request statuses	Fully Implemented
<b>DMCA Takedown</b>		
DMCA Generation	Generate DMCA takedown notices that are automatically prefilled based on a template.	Fully Implemented
DMCA Filing	Issue generated DMCA takedown notice to the offending NFT marketplace through the Gmail API.	Partially Implemented
DMCA Cataloging	Catalog and monitor all generated DMCA takedown notices.	Fully Implemented

**Figure 2. RWP vs Prototype Diagram.**

## **2.3 External Interfaces**

- This section identifies the physical and logical interfaces used within and by the prototype. The characteristics of each type of interface used and the type of information transferred should be described.

### **2.3.1 Hardware Interfaces**

- Desktop or Laptop running Windows, MacOS, or Linux

### **2.3.2 Software Interfaces**

- React Framework
- Gmail API
- OpenCV Library
- NFTPPort API
- AWS Amplify
- AWS RDS/DynamoDB
- Github
- Git Version Control

### **2.3.3 User Interfaces**

- Identify the mechanisms for interacting with users (if applicable). E.g., flat-screen color displays capable of xxx by yyy resolution, keyboard for data entry, joystick for maneuvering.
  - Mouse for desktop navigation.
  - Keyboard for data input.
  - Monitor capable of displaying 1280x720 or higher resolutions.

### **2.3.4 Communications Protocols and Interfaces**

- Protocols and interfaces used with the product/prototype, such as TCP/IP via 100mb Ethernet, IEEE 802.3/802.11 etc. should be identified here.
  - HTTP(S) for secure communication over the internet.

- TCP/IP for communications between the internet and the device.