

Lab 1 - Art Guardian Product Description

Michael Thompson

Old Dominion University

CS 411W

James Brunelle

9/18/22

Final Version

Table of Contents

1. Introduction.....	1
2. Product Description.....	2
2.1 Key Product Features and Capabilities.....	2
2.2 Major Components (Hardware/Software).....	3
3. Identification of Case Study.....	4
4. Product Prototype Description.....	5
4.1 Architecture (Hardware/Software).....	5
4.2 Features and Capabilities.....	7
4.3 Development Challenges.....	8
5. Glossary.....	9
6. References.....	11

List of Figures

Figure 1: Art Guardian Major Functional Component Diagram	4
Figure 2: Art Guardian Prototype Major Functional Component Diagram	6

List of Tables

Table 1: Art Guardian RWP vs. Prototype.....	7
--	---

1. Introduction

The distribution of art is how one can showcase the art for sale, and in today's landscape that distribution can be done digitally. A new form of digital art distribution called a Non-fungible Token (NFT) has risen in popularity as in 2021, with the NFT market reaching a value of forty-one billion dollars (Business Insider, 2022). An NFT is a digital certificate for a piece of digital art that is created and stored on the blockchain to signify ownership of said art (BBC, 2021). A NFT can be sold for a large sum of money as the musician Grimes was able to sell some of her art for more than six million dollars (BBC, 2021). With how lucrative the NFT market is in terms of turning a profit, there are bound to be people who desire that profit. The main obstacle for them is getting digital artwork to mint their NFT to sell to an audience. While some people create their own art to mint NFTs out of them, others steal pre-existing artwork created by other people to mint and sell NFTS. The art platform DeviantArt has sent out ninety-thousands alerts of possible NFT art theft, with the number of alerts doubling from October to November of 2021 to three hundred percent more alerts from November to December of 2021.

If an artist has their art stolen and used to create an NFT, what can they do about it? The artists would have to find the infringing NFT and submit a Digital Millennium Copyright Act (DMCA) takedown to remove said NFT. This includes knowing the legal process and filling out the right documents for submission, which artists may not have the time or knowledge to do correctly. This issue is further quantified if more than one piece of their art is stolen. Art Guardian is an application that exists to help artists find infringing NFTs and send DMCA's to the NFTs. Art Guardian is a progressive web application that allows a user to upload their art to the application so that the app can monitor NFT marketplaces for infringing art NFTs. Once a stolen art NFT has been found, the application would generate a DMCA takedown request that requires

the user's e-signature to approve. Once the DMCA is approved, then the DMCA is sent to said marketplace to notify them that the NFT needs to be removed.

2. Product Description

Art Guardian is a progressive web app where users upload their artwork into the database. The artwork must be the user's original art, any violation will of this rule is punished accordingly. Once the art is uploaded, the application will monitor popular NFT marketplaces for any NFT that is minted using artwork without the artist's permission. The application will not add watermarks to the user's art as that changes the integrity of the art. The application is also unable to prevent the act of minting of an illegitimate NFT beforehand, it only focuses on the created NFT afterwards.

2.1 Key Product Features and Capabilities

Art Guardian allows the user to upload their art into the database for NFT marketplace monitoring. An NFT with stolen art is found using an image matching algorithm that compares what art was uploaded to the database to the art used for the NFT. Once a stolen art NFT is found, the application will send the user a notification about the NFT. Once the user requests a DMCA takedown, the application will generate a DMCA and send it via email to NFT marketplace with the infringing NFT. If the marketplace does not comply, then it is up to the user to pursue further legal action. A user will also be able to whitelist any NFT they minted themselves so that their NFT is exempt from marketplace monitoring.

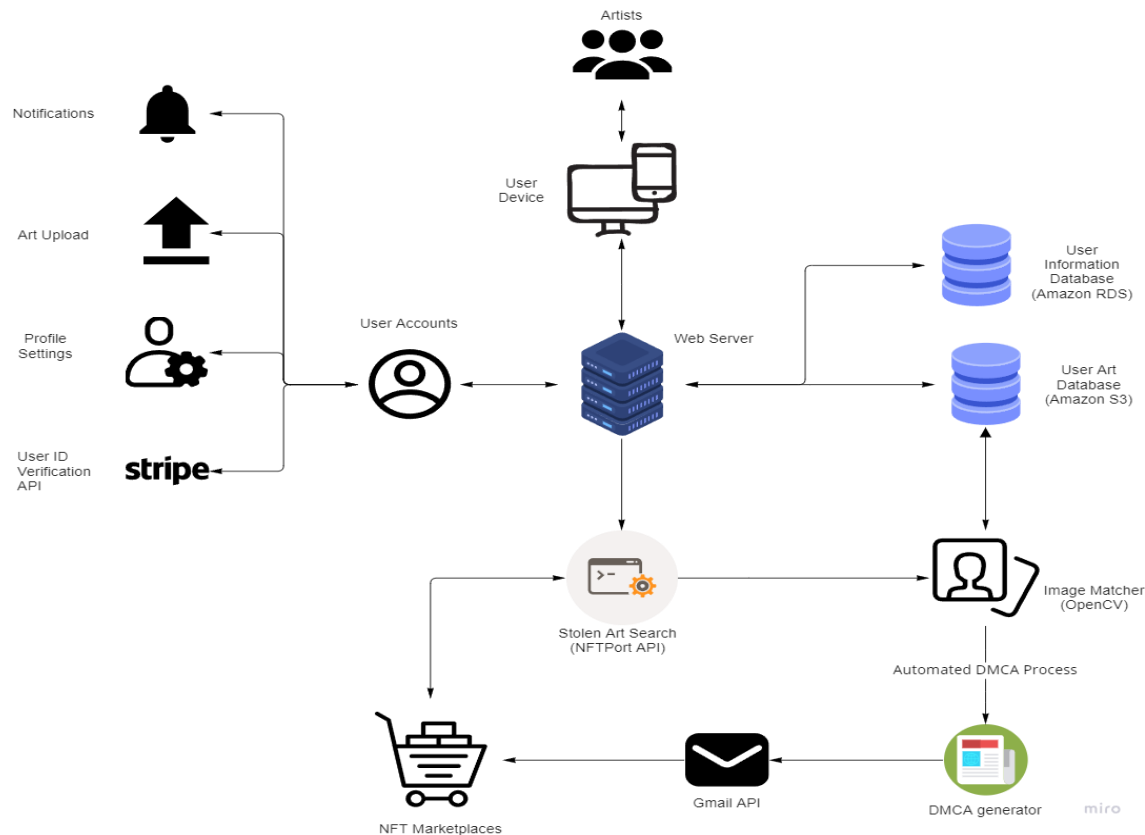
A profile on Art Guardian will contain the user's legal information so that the user's identity is verified and the DMCA can be generated with the information. The profile will also link to the user's art account for verification that the art uploaded is their art. All DMCA requests

that have been sent and or in-progress are stored in the database. The application will monitor and update the progress of their DMCA, and if the user chooses to pursue further legal action, the application will provide them with the necessary information. The application will also provide a “Tips and Tricks” and “FAQ “ section to provide references for defense against illegitimate NFT minting and troubleshooting.

2.2 Major Components (Hardware and Software)

Art Guardian is available on IOS and Android devices and desktop computers. The desktop website is programmed using HTML, CSS, and JavaScript while JavaScript is used for Android and React Native is used for IOS. Art Guardian will use Amazon RDS and AWS for storage and encryption of user data and art. Git is used for version control and team development. The NFT Port API is used to monitor art NFTs on marketplaces, with OpenCV being responsible for image matching using art uploaded from the user. The user’s identity is verified using the Stripe API. A DMCA generator will automatically generate DMCA’s that is sent via email through the Gmail API. Figure 1 illustrates how the application is built and the ways it communicates with each of its components to perform its designated task.

(This space is intentionally left blank)

Figure 1*Art Guardian Major Functional Component Diagram*

3. Identification of Case Study

Art Guardian is intended for use by commissioned artists as their livelihood is dependent on them being able to sell their art. Art theft through the means of NFT minting threatens their livelihood as they aren't receiving the money made from those NFTs being sold.

The case study group that is used for the testing of this application is ODU art students. The students would upload art that the application can use to test image matching. The students

will also preview UI and notifications to provide feedback on how to streamline the application to be user friendly.

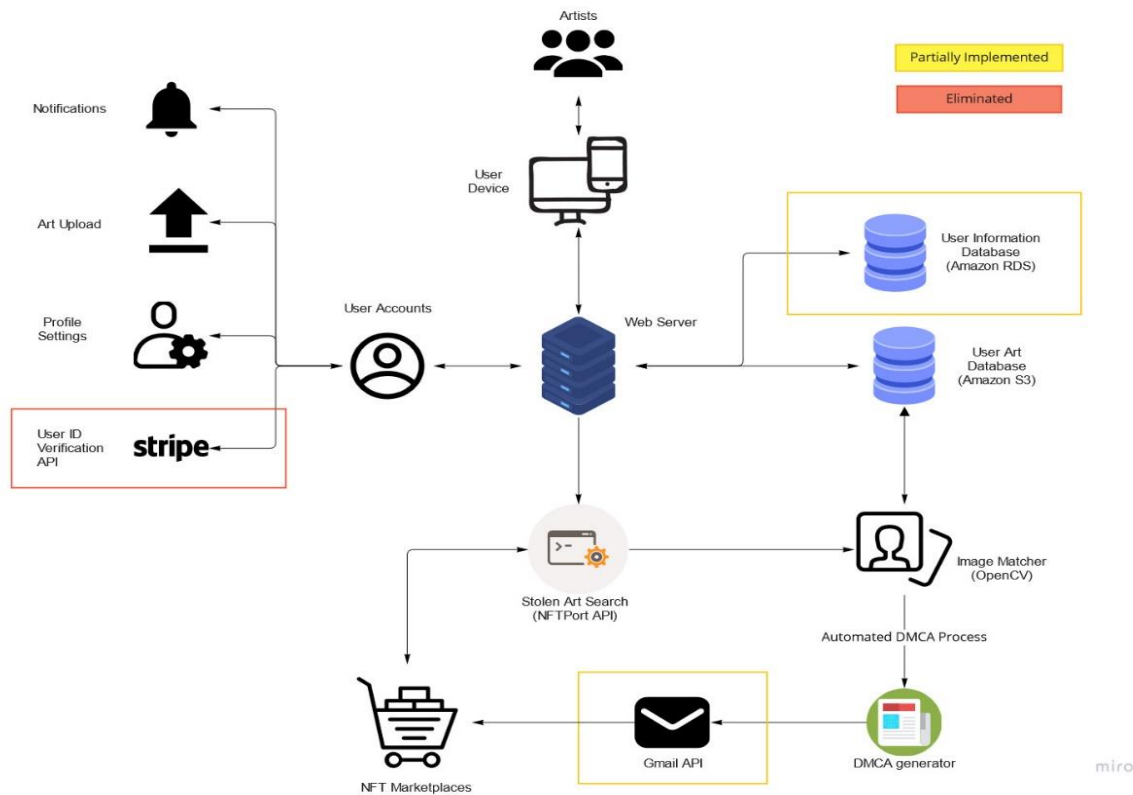
Art Guardian exists to protect commissioned artists and NFT artists with the eventual goal of expanding protection to all digital artists. It can also be used with art platforms for further protection by integrating the service into the art platform for easy tracking of art posted on there.

4. Product Prototype Description

The prototype of Art Guardian will demonstrate the capability to comb a NFT marketplace for NFTs containing copyrighted artwork; and send a DMCA takedown to the marketplace to remove the infringing NFT. The prototype showcases key features of the application to demonstrate the feasibility of the application, but it won't display every feature that is in the fully realized application.

4.1 Architecture (Hardware/Software)

The prototype implementation will be similar to the full implementation of the web application. There are no plans to develop an IOS or Android application for Art Guardian so that the focus of the development is towards the web application. Most elements pertaining to the web application functionality are kept intact with minor adjustments made to accommodate testing for the prototype. The prototype UI will use React and JavaScript for its development, while Python is used for the image matching algorithm. Figure 2 illustrates the major functional component diagram for the prototype.

Figure 2*Art Guardian Prototype Major Functional Component Diagram*

The differences between the prototype major functional component diagram and the real-world implementation is the implementation of certain components. The Stripe API will not be implemented into the prototype as the API will require the use of legal documents where there will be none to use. The Gmail API will be partially developed as there will be no official DMCA takedowns sent to NFT marketplaces as there are no users that will exist or be recruited to use the prototype. This is the case for the User Information Database as well. This is because the database would hold personal information and the act of doing so would need review and approval by an ethical review board.

4.2 Features and Capabilities

The prototype will contain most of the key features of the full implementation. Table 1 lists every feature between the real-world product and prototype, and whether the feature is fully implemented, partially implemented, or eliminated.

Table 1

Art Guardian RWP vs. Prototype

Art Guardian	RWP	Prototype
Account Creation	Fully Implemented	Fully Implemented
User Verification	Fully Implemented	Eliminated: Mock data
Art Upload	Fully Implemented	Fully Implemented
Image Library	Fully Implemented	Fully Implemented
Whitelisting	Fully Implemented	Fully Implemented
Marketplace Monitoring	Fully Implemented	Fully Implemented
Image Matching	Fully Implemented	Fully Implemented
Stolen Art Alert	Fully Implemented	Fully Implemented
DMCA Generation	Fully Implemented	Fully Implemented
DMCA Filing	Fully Implemented	Partially Implemented: Send to testing email
DMCA Cataloging	Fully Implemented	Fully Implemented
DMCA Tracking	Fully Implemented	Eliminated: Simulated Data

Nearly every feature is planned to be fully implemented into the prototype with the exceptions of user verification, DMCA filing, and DMCA tracking. User verification data will be mock data to enable testing for DMCA filing. The DMCA filing will send DMCA takedown

request to a test email to verify functionality of the feature. DMCA tracking can't currently be implemented as it requires a real DMCA to be issued, thus the tracking will be simulated.

4.3 Development Challenges

The development of the Art Guardian prototype will have its share of challenges. One challenge is to ensure that all features of the prototype are implemented by the time of its demonstration. Failure to overcome this challenge will result in the prototype being incomplete, so the team would divide and conquer all aspects of coding and testing to have the prototype finished in a timely manner. There are also risks that can occur during the demonstration of the prototype. The application is reliant on two databases for it to function, so if data were to be corrupted then the prototype can not function as intended. The workaround is to have backups of the data so that in the instance something does corrupt, the data can be recovered immediately to continue the demonstration. A team member may not be able to attend the demonstration, so each team member must understand the way the prototype functions to accommodate for a possible absence. Under the circumstance that a network outage occurs, the application will not function as it is a web application that is also reliant on accessing other resources via the web.

(This space is intentionally left blank)

5. Glossary

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

(This space is intentionally left blank)

6. References

Collins, B. (2021, December 23). Fungible vs Non-Fungible Tokens: What's The Difference?

Bryan Collins. <https://www.bryancollins.com/fungible-vs-non-fungible-tokens/>

BBC. (2021, March 12). What are NFTs and why are some worth millions? BBC News.

<https://www.bbc.com/news/technology-56371912>

Telmo Subira Rodriguez. (2018, December 2). Blockchain for Dummies. Medium; The Startup.

<https://medium.com/swlh/blockchain-for-dummies-d3daf2170068>

Coincorner. (2022, February 11). What Is Nft Minting? Coin-Corner. [https://coin-](https://coin-corner.com/what-is-nft-minting/)

[corner.com/what-is-nft-minting/](https://coin-corner.com/what-is-nft-minting/)

Beckett, L. (2022, January 29). 'Huge mess of theft and fraud:' artists sound alarm as NFT crime proliferates. The Guardian. Retrieved January 31, 2022, from

<https://www.theguardian.com/global/2022/jan/29/huge-mess-of-theft-artists-sound-alarm-theft-nfts-proliferates>

Dailey, N. (2022, January 6). NFTs ballooned to a \$41 billion market in 2021 and are catching up to the total size of the global fine art market. Markets Insider. Retrieved February 23, 2022, from <https://markets.businessinsider.com/news/currencies/nft-market-41-billion-nearing-fine-art-market-size-2022-1>

Abrol, A. (2022, January 14). What is an NFT marketplace and How Do You Create Ythe Own?

Blockchain Council. Retrieved February 23, 2022, from <https://www.blockchain-council.org/nft/nft-marketplace/>

Mr. DMCA Helper. (2022, February 23). What is a DMCA Takedown? Dmca.com.

https://www.dmca.com/FAQ/What-is-a-DMCA-Takedown?ref=why_is_sol5a32

Palmer, R. (2022). @arvalis. Retrieved 1 March 2022, from

<https://twitter.com/arvalis/status/1369230566843813891?s=20>

(This space is intentionally left blank)