Lab 2 – Art Guardian Product Specification Outline

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1 Introduction

The market value and popularity of Non-fungible Tokens (NFTs) have increased dramatically over the span of Q1 2021. This unprecedented rise resulted in a year over year growth from less than $100 million in Q1 2020 to $1.5 billion in Q1 2021 of tradable volume within NFT marketplaces. (Chang, 2021) By the end of 2021, the volume of these NFT marketplaces increased to $41 billion. (Collins, 2021) Throughout the course of 2021, it has been observed that more and more NFTs were basing their content off of counterfeiting copyrighted digital works of art from Digital Artists. DeviantArt, a popular platform for hosting and sharing digital artwork, had reported that there were 90,000 probable counterfeit thefts in December 2021, which was a three-times increase compared to the reported 30,000 thefts in November 2021. (Beckett, 2022) These NFT sales are also highly profitable, with approximately 50% of all sales reaching over $200 at the beginning of 2022. (Dailey, 2022)

Currently, there are not many solutions that aim to prevent digital artwork from being counterfeited and sold on NFT marketplaces for a profit. As of now, many digital artists must invoke a manual process. The first of this process involves discovering which works of art were stolen and put up for sale as NFTs, which can only be done through a manual search on NFT marketplaces. After identifying the counterfeit NFTs, digital artists must then manually issue a Digital Millennium Copyright Act (DMCA) takedown request through the NFT marketplace. Overall, the process is time consuming and tiresome, and the number of counterfeit NFTs continues to increase to this day.

1.1 Purpose

The Art Guardian is a desktop web application designed to protect copyrighted artwork owned by digital artists from being stolen, minted as NFTs, and sold on NFT marketplaces. The product aims to prevent the future sale of counterfeit NFTs based on artwork owned by digital artists through the DMCA takedown process. To achieve this, Art Guardian provides an automated system which searches for counterfeit NFTs plagiarizing artwork uploaded by the artists by scouring through NFT marketplaces. Art Guardian also provides an automated process that issues DMCA takedown notices to NFT marketplaces regarding the identified counterfeit NFTs. The goal of Art Guardian is to legally compel

NFT marketplaces to remove any counterfeit NFTs detected by Art Guardian, and to automate the manual work described in the previous section. The product does not aim to be a solution which will fix the issue of counterfeit NFTs fraudulently minted from digital artist's artwork; instead, it seeks to provide a mitigation for the issue. The Art Guardian system ensures robustness through several safeguards which prevent any misidentification of NFTs or abuse of the system.

1.2 Scope

Art Guardian aims to protect digital artists, both those who do and do not mint NFTs from incidents of theft where art is minted and sold in the form of NFTs. Art Guardian will do this by tracking art uploaded into the database and searching NFT marketplaces for cases of theft and automating any subsequent DMCA Takedowns. The benefit to the artist is the protection of them from theft online. The benefit to NFT artists is the security of their product from any counterfeits.

Art Guardian's prototype will fully implement art upload, whitelisting, art tracking, image matching, theft alert, DMCA generation, and DMCA cataloging. Due to constraints Art guardian will partially implement DMCA filing, as test DMCA's cannot be sent to real websites and instead will be sent to test emails. The prototype will eliminate 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

NFTs are a certificate of ownership stored on a blockchain that links to a file.

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1.5 Overview

This product specification provides the hardware and software configuration, external interfaces, capabilities and features of the Art Guardian prototype. The information provided in the remaining sections of this document includes a detailed description of the hardware, software, and external interface architecture of the Art Guardian prototype; the key features of the prototype; the parameters that will be used to control, manage, or establish that feature; and the performance characteristics of that feature in terms of outputs, displays, and user interaction.

2 General Description

The information included in section 2 will include details about the Art Guardian prototype. Section 2 will go over the Art Guardians prototype architecture, interfaces, and communication protocols. Art Guardian prototype will track art uploaded into the database and search NFT marketplaces for cases of theft and automating any subsequent DMCA Takedowns.

2.1 Prototype Architecture Description

The Art Guardian prototype will operate on an Apache web server with PHP and a MySQL database. The web server runs on an Amazon EC2 instance using Amazon Linux, and the MySQL database is a MySQL DB instance. Both the Amazon EC2 instance and the DB instance run in a virtual private cloud (VPC) based on the Amazon VPC service. The web server will be connected to the database instance using the database instance endpoint. Art Guardians' prototype MFCD is shown in Figure 2.

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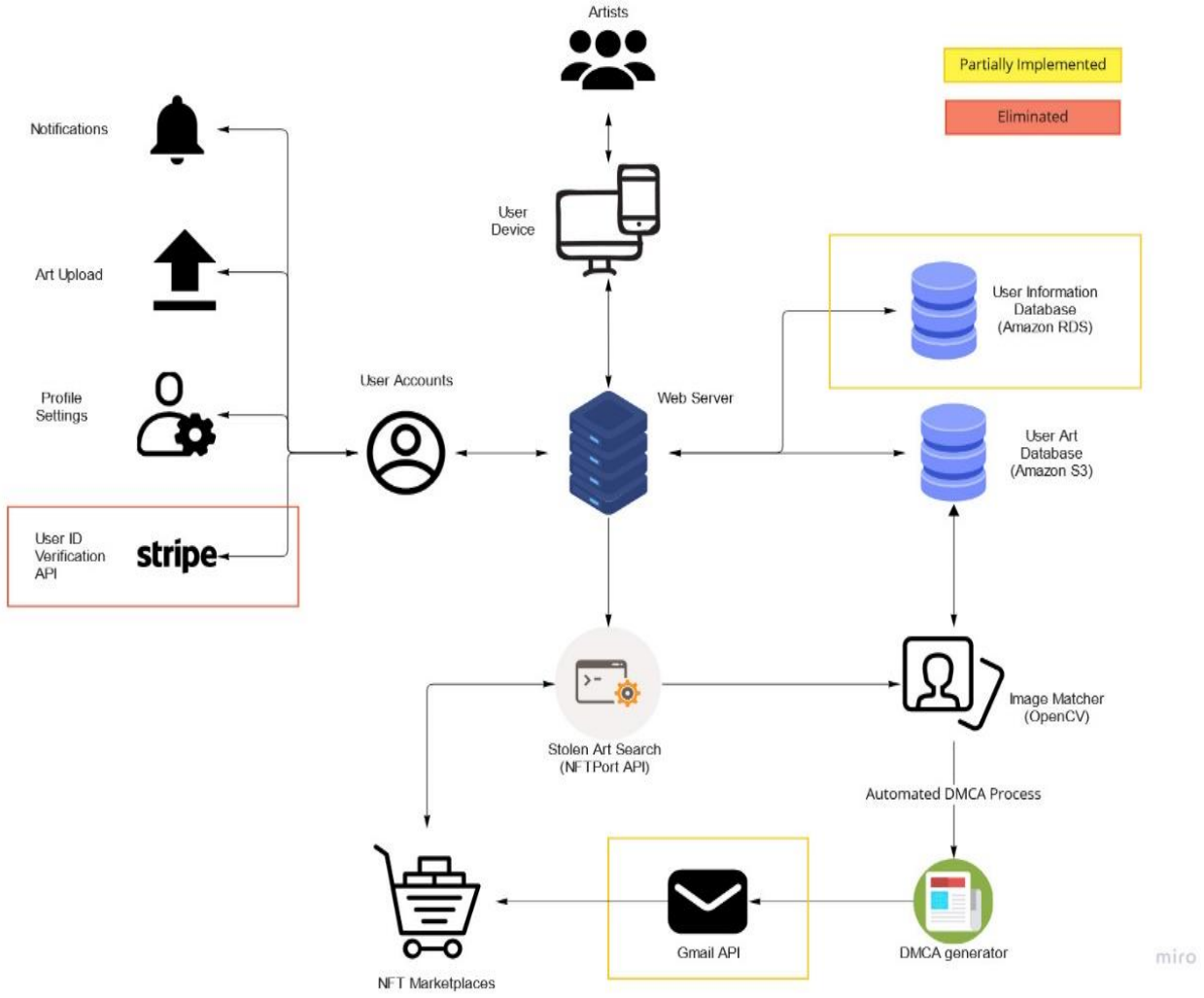
Figure 1

Art Guardian Prototype Major Functional Component Diagram



2.2 Prototype Functional Description

The Art Guardian prototype will only include features needed in order to have a successful proof of concept for end users. As shown in Table 1 below, Art Guardian will be using mock data for two features that may change in functionality; User Verification and DMCA tracking. End users will still be required to enter their user information but we won't be verifying the user's data and we won't be sending real DMCAs therefore we have no way of tracking a DMCA with our prototype design.

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Table 1

MFCD Prototype Features Table

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

Using a smartphone, end users will be able to create an account and login to the Art Guardian prototype. Users will be able to upload their NFT art to our database and have the option to browse their account specific art library as well as having the option to whitelist any of their NFT art that is in their image library. The ability to monitor a NFT marketplace for matching NFT images will be implemented and users will get an alert if the Art Guardian has found their stolen NFT art. Art Guardian will generate

DMCA notices but will not file the generated DMCA. Instead, the Art Guardian prototype will take the generated DMCA and send it to a testing email. All generated DMCAs will be cataloged in the Art Guardian but we will not be tracking DMCAs because we are not filing the generated DMCA.

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2.3 External Interfaces

The Art Guardian prototype will be cloud-based and using AWS cloud services such as Amplify to connect the frontend to the backend, CloudFormation to automate our web applications infrastructure, and s3 buckets to hold our infrastructure and Amplify configurations.

2.3.1 Hardware/Software Interfaces

The hardware requirements will be a Desktop or Laptop running Windows, MacOS, or Linux. For Software interfaces, The Art Guardian uses the Amazon Amplify platform to provide a low-maintenance configuration for accomplishing NFT Uploading and Tracking. NftPort API will be used to find counterfeit NFT images on NFT marketplaces and Github will be used for our version control.

2.3.2 User Interfaces

A user will need flat-screen color display, keyboard for data entry, and a mouse for maneuvering in order to interact with the Art Guardian Application.

2.3.3 Communications Protocols and Interfaces.

HTTP(S) for secure communication over the internet. TCP/IP for communication between the internet and the device.

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3 Product Requirements

Art Guardians' requirements will be included in a separate document titled "Lab 2 Section 3 – Art Guardian Product Requirements." The document will include the key functional requirements of the product as well as illustrations to expand on the concepts. In addition to the functional requirements, the performance requirements of Art Guardian will be included in the document. The performance requirements will be expressed in specific, measurable terms. Assumptions andconstraints for Art Guardian will be described, and the non-functional requirements will be outlined.