Lab 1 – Art Guardian Product Description

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1. Introduction

In the early Summer of 2015, the first smart-contract-based blockchain went online and helped push the phenomenon of blockchain to what it's known as today (2022, April 25). Since Ethereum's mainnet launched, this new blockchain has been at the forefront of many developing technologies, however, the topic of non-fungible tokens (NFTs) is likely the most popular in recent years. The first NFT sold on the Ethereum blockchain was made in August of 2015 and was named "Terra Nullius." The means by which this NFT was created on the Ethereum blockchain was of staking one's 'claim' on the Ethereum blockchain (2021, December 30). As the popularity of NFTs exponentially rose in 2021, so did the ever-growing market of cyber theft… in this case, stolen NFT artwork.

A digital art platform, Deviantart, reported that from November 2021 to year's end, there was an increase of stolen NFT artwork of the likes of 300%. The problem has become rampant and is only getting worse as more and more artwork is being stolen from online art libraries like Twitter, Tumblr, and Instagram (2022, January 29). The solution to an artist's stolen artwork is often strenuous and cumbersome. It requires them to submit a Digital Millennium Copyright Act (DMCA) take-down request themselves, which involves submitting a legal claim to the U.S. government to remove the NFT(s) associated with the stolen artwork from the marketplace.

Art Guardian is a solution that would allow all artists to seamlessly create a claim that effectively follows through with DMCA takedown and notifying the artist in the process with the use of the progressive web applications that oversee all possible areas of the theft and its resolution.

2. Art Guardian Product Description

Art Guardian is a progressive web application that monitors an artist's original artwork that is uploaded by them and kept in a database. Once uploaded, Art Guardian will monitor the popular NFT marketplaces and keep track of any artwork that is matched with an artist's original artwork. Once the stolen NFT is identified and the artist is made aware of the theft, the artist may then choose whether or not to pursue charges and if so, Art Guardian will generate a DMCA, receive the artist's e-signature, and submit and file the form. Art Guardian will monitor all artwork caseloads. If the DMCA request is approved, then the artwork will be removed from the marketplace and if the request is denied then further action may be taken at the artist's request. The artist also reserves the right to whitelist certain artwork they have created if they wish for it to be used in whatever means necessary.

Art Guardian takes the problem of stolen artwork and turns the burdensome task of repeated DMCA takedowns into a streamlined, manageable process to ensure that you and your art are not taken advantage of.

2.1 Key Product Features and Capabilities

Art Guardian uploads the provided art pieces, from the artist, into the app's database and will begin monitoring the major NFT marketplaces for theft of the advised artwork. When the artist uploads their artwork, they will be required to identify whether or not they will whitelist an NFT associated with the art, if they do they will provide a Token ID to help prevent false theft alerts for NFTs the artist minted themself. If an incident of theft is found, Art Guardian will send a notification to the artist's account on the desktop and send a push notification if the

artist has the app downloaded on mobile. When the artist taps on the notification they will be asked if the art is theirs, and if they would like to file a DMCA. If the answer to both questions is yes, a DMCA is generated and the artist e-signs, taking liability by agreeing the DMCA is accurate, and that the art is theirs. If they choose not to file a DMCA they will be asked if they wish to whitelist the NFT, in which case they will not be bothered about that token again. If the artist does not continue with the notification or discontinues the process, the database will erase the flagged NFT and the artist will no longer be notified of the theft.

Every artist will have a profile on Art Guardian. This profile will contain the artist's legal information as well as their artwork. This legal information will be used solely for the filling of a DMCA request and verifying the artist's identity. These specialized profiles will also have the ability to be linked to art platforms; which will add further verification of identity. All information will be encrypted and all artists will have their anonymity.

2.2 Major Components (Hardware and Software)

From the start, Art Guardian is compatible with any PC or mobile device that has a connection to the internet. Artists will authenticate their identities using an identity verification API, such as Stripe (as seen in figure 1). Artists have access to their profile or notification settings as well as the art upload feature. Art Guardian will have two databases: one to store the artist's information and the second to store the artist's artwork. The artist's information will be secured with Amazon's RDS whale Amazon S3 is planned to store the artwork.

Art Guardian will make use of the NFTPort database to compare artists' artwork that is storedinthe S3 database. This system will be used to image-match different images. Once a similar imagehas been discovered, Art Guardian will incorporate OpenCV which will be set up to distinguishstolen art. If OpenCV determines that the artwork is a correct match, a DMCA will be createdand sent to the original artist for verification and an e-signature to send a takedown request. Art Guardian's web application will use JavaScript and CSS while the mobile application will make use of IOS's Swift and React.

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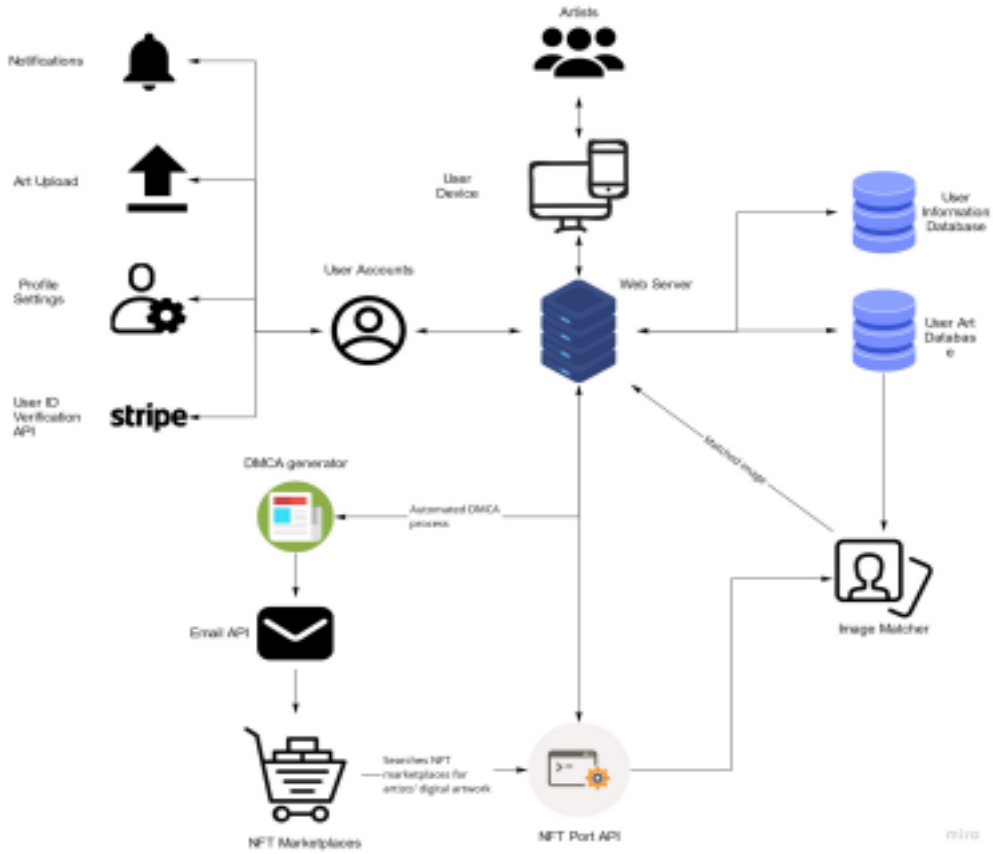

Figure 1 - Art Guardian Major Functional Component Diagram

Once the DMCA claim has been submitted, the system will await a response. If the DMCA is approved, the NFT marketplace will take down the listing and if not, then the artist can decide as an individual if they wish to pursue the matter further.

3. Identification of Case Studies

Art Guardian was created to resolve theft directly affecting commissioned artists. It will prevent their artwork from being minted as NFTs on the Ethereum blockchain and later sold for profits. This system helps the artists being harmed by malevolent criminals who want to make money from others' work. To certify that said artwork is stolen, image matching, with the help of the artist's confirmation, will be used. A DMCA generator will fill out the takedown requests using the legal action provided. In the future, Art Guardian will participate with any digital artist who could use it to resolve their stolen art and minted as NFTs for auction.

For our testing, we will be having students majoring in art studies at Old Dominion University. Each student will fill the artist's role and be able to upload a piece of their art and Art Guardian will be able to run many mock tests for our prototyping.

4. Product Prototype Description

Art Guardian's prototype will include most general features that the end product will have. These include the DMCA generator, the ability for an artist to upload their artwork, image recognition and matching, etc. While most of the capabilities will be in-use from the start, some will be eliminated or only implemented partially. Synthetic data will be used in this prototype process. This prototype will show the main purpose of Art Guardian; automating the grueling DMCA process of stolen artwork on NFT marketplaces.

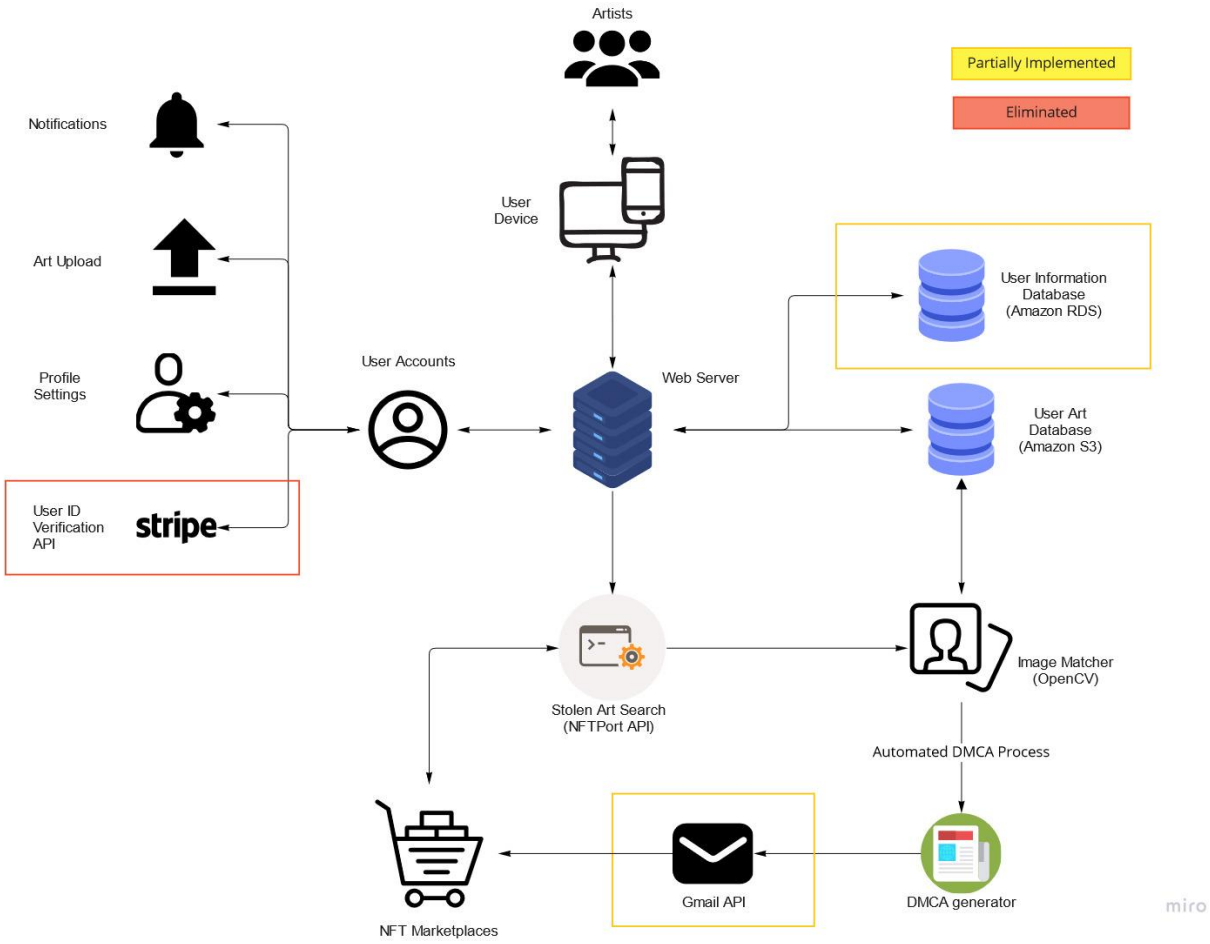

Figure 2 - Art Guardian Prototype Major Functional Component Diagram

4.1 Prototype Architecture

The prototype architecture will be used solely on a desktop application and will not be cross-platform, however, it will have similar architecture as the real world product. The architecture for the prototype will be implemented on Amazon RDS and Amazon Web Services (AWS) for use of both art storage and user data. Version control will be handled by Git and Github will be used for issue tracking. In figure two, our prototype MFCD will be slightly different than our real world product. Gmail API and the User Information Database will be sent

to imitation accounts rather than real NFT marketplaces and the user data will be simulated and stored manually instead of being collected automatically. No user identification will be enabled for the prototype thus the user verification API and Stripe will not be active for the 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

Table 1 - Art Guardian Real World Product v. Prototype

4.2 Prototype Features and Capabilities

Inversely, many of the features of the Art Guardian real world product (RWP) will be available in the prototype. Looking at table on, just three of the features in the RWP will be

eliminated or partially-implemented in the prototype. User verification will be eliminated due to its obsoleteness in the prototype phase and mock user data will be pushed instead. DMCA generation will be enabled in the prototype stage, however, the claims generated will not be sent to NFT marketplace. This both shows the ability to automatically generate DMCA claims while not sending false claims to marketplaces. Test emails will receive the DMCA in lieu of NFT marketplaces receiving them. The last major feature not present in the prototype will be DMCA tracking. Because DMCAs won't be sent to any marketplaces in the prototype, there is no purpose of tracking the status of them. The main goal of Art Guardian, to recognize art and automate the DMCA process for stolen artwork on NFT marketplaces, will be demonstrated in the prototype.

4.3 Prototype Development Challenges

Being a full-stack web application with a complex architecture, the Art Guardian prototype has many foreseeable and unforeseeable challenges to its development team. The prototype will have most of the development in the front-end and back-end. Technologies like AWS, OpenCV, and Git will be used and this will rely on a lot of time being needed for the learning of these technologies. Prioritization is of the utmost importance since the timeline for the development team is a single semester. Work will be separated into frontend, backend, and database categories.

5. Glossary

Smart-Contract-Based Blockchain: A smart, digital ledger that keeps all information and can execute simple programs that can run and be stored on the blockchain.

Non-Fungible Tokens (NFTs): A non-interchangeable unit of data stored on a blockchain.

Digital Millennium Copyright Act: A law that criminalizes the reproduction of material, in this case, digital artwork.

6. References

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White, L. (2021, December 30). *The Definitive Timeline of Early NFTs on Ethereum*. ONE37pm. Retrieved May 1, 2022, from https://www.one37pm.com/nft/the-definitive-timeline-of early-nfts-on-ethereum

Beckett, L. (2022, January 29). *'Huge mess of theft and fraud:' artists sound alarm as NFT crime proliferates*. The Guardian. Retrieved May 1, 2022, from https://www.theguardian.com/global/2022/jan/29/huge-mess-of-theft-artists-sound-alarm theft-nfts-proliferates