

Team Blue

Prototype Presentation and Demonstration

CS 411W Fall 2022

December 13, 2022



Table of Contents

Team Blue.....	3
Glossary.....	4
Problem.....	5 - 9
RWP vs. Prototype.....	10 - 12
Challenges & Accomplishments.....	13-14
Work Breakdown Structure.....	15
UI Screenshots.....	16 - 20
Database Model.....	21
Development.....	22 -24
Risk Matrices.....	25-27
Demo Presentation.....	28-29
Appendices.....	30-34
Q&A.....	35

Team Blue



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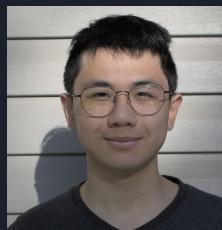
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Glossary

- NFT stands for Non Fungible Token.
 - Non-fungible means unique, indivisible, and irreplaceable.¹
 - NFTs are a certificate of ownership stored on a blockchain that links to a file.²
- **Blockchain:** an immutable ledger that anyone can validate.³
- **Minting:** the process in which the files become part of the blockchain.⁴
- **NFT Marketplace:** an online platform in which NFTs are minted, sold, and collected.⁷
- **DMCA (Digital Millennium Copyright Act) Takedown:** The owner of the copyrighted content requests the removal of the infringing content from the internet or platform.⁸
- **Art Platform:** A website in which users can post their digital art.

Problem Characteristics

- NFT Market rose from \$100 million in 2020 to \$41 billion by the end of 2021⁶
- Deviantart reported 90,000 possible thefts of digital art in December, 2021, an increase of 300% since November, 2021.⁵
- Vn-Parco reported that roughly 50% of NFT sales were over \$200 in 2022.⁶
- Artists are having their art minted as NFTs without permission.
- Artists must search on NFT Marketplaces manually for stolen art.
- Filing a DMCA takedown is a tedious manual process that artists must go through when they find their art is stolen.
- It can be hard to keep track of the success of a DMCA takedown as well as all the information associated with it



RJ Palmer
@arvalis

Cool new scam artists should be aware of. Any rando can now turn your tweet and by extension, your artwork into an NFT by tagging this account @/tokenizedtweets

Block this guy

RJ Palmer @arvalis · Feb 27
I always really appreciated that Pokemon could bring us together regardless of where we are in our lives.



73 1.1K 7.4K

Zach Cain @lamzachcain · 1h
@tokenizedtweets 0x6261aa23E013B9A6825EB913398d0415517C32fF

5:16 AM · Mar 9, 2021



Read the full conversation on Twitter

48.8K Reply Copy link to Tweet

Read 615 replies

twitter.com/arvalis⁹



Problem Statement

Digital artists lack an automated system that will detect art that has been minted on NFT Marketplaces without artists' permission and prevent future sale of their art by having it taken down from those marketplaces.



Solution Statement

Art Guardian will provide an automated system for artists that will detect that their art has been minted as an NFT and file a DMCA takedown request to get it removed from the marketplace.



Solution Characteristics

- Web Application where artists upload their art into the database.
- Alerts artists when stolen art is found on a marketplace.
- Automatically prepares and sends DMCA takedown requests once validated by the artist.
- Keeps track of DMCA takedown requests:
 - Catalog DMCA takedowns.
 - Monitor the takedown status.



Customers, Stakeholders, and Users

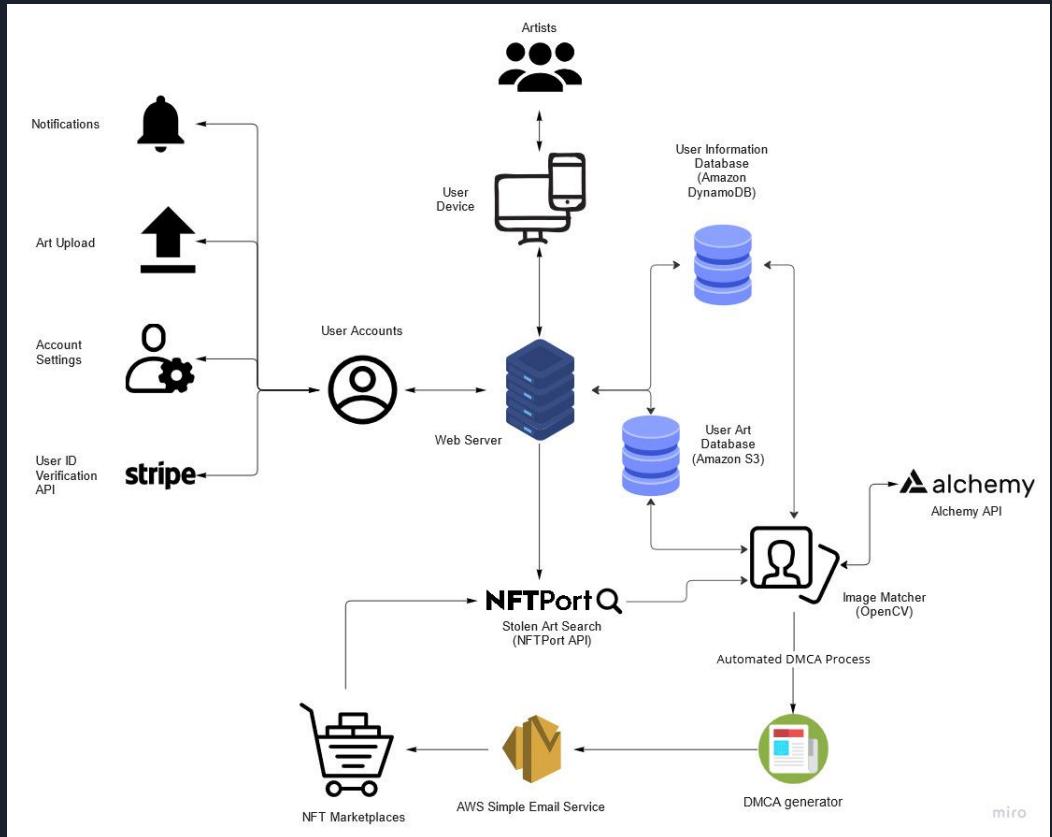
Users and Customers

- Digital Artists : Automatically track their art and issue DMCA for stolen art.

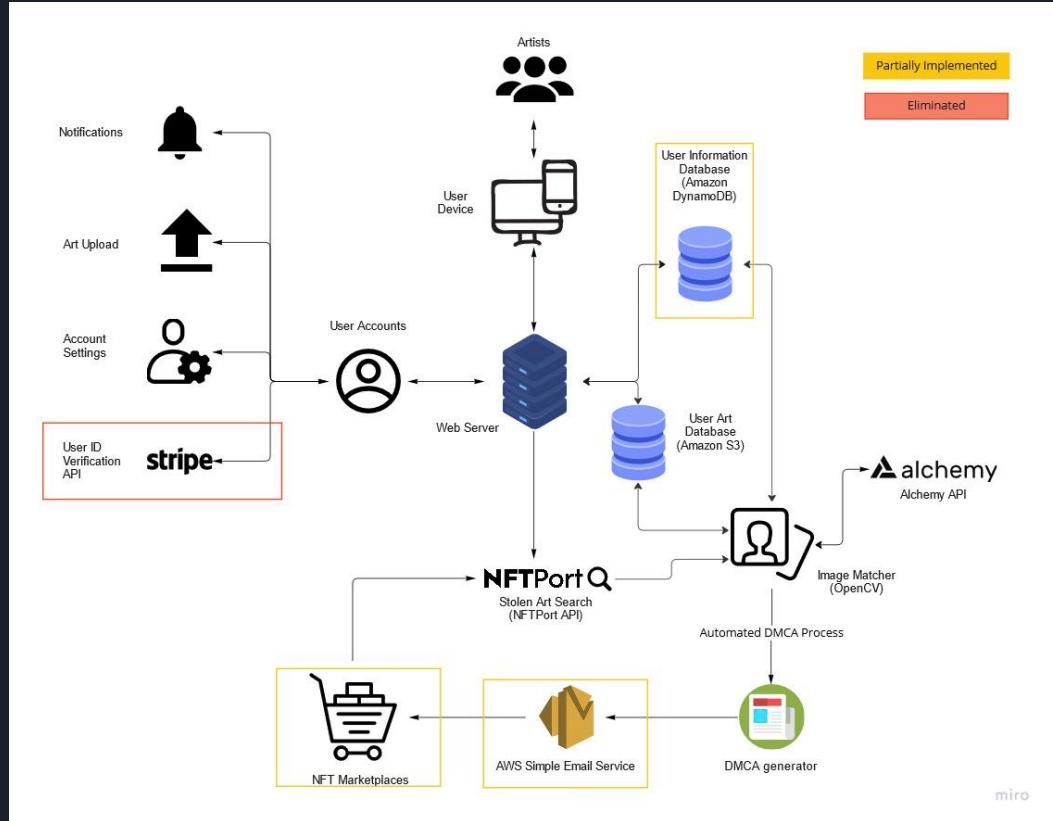
Stakeholders

- NFT Marketplaces: Marketplace users have more faith that their NFT is not stolen art.
- Art Platforms: Users feel more comfortable posting their art on public domain platforms.

Real World Product Major Functional Component Diagram



Prototype Major Functional Component Diagram





	Art Guardian	RWP	Original Prototype	Current Prototype
RWP vs Prototype	Account Creation	Fully Implemented	Fully Implemented	Fully Implemented
	User Verification	Fully Implemented	Eliminated	Eliminated
	Art Upload	Fully Implemented	Fully Implemented	Fully Implemented
	Art Tutorial	Fully Implemented	Fully Implemented	Partially implemented: Direct link to user manual
	Image Library	Fully Implemented	Fully Implemented	Fully Implemented
	Whitelisting	Fully Implemented	Fully Implemented	Partially developed: Not functional
	Marketplace Monitoring	Fully Implemented	Fully Implemented	Fully Implemented
	Image Matching	Fully Implemented	Fully Implemented	Fully Implemented
	Stolen Art Alert	Fully Implemented	Fully Implemented	Fully Implemented
	DMCA Generation	Fully Implemented	Fully Implemented	Fully Implemented
	DMCA Filing	Fully Implemented	Partially Implemented: Send to testing email	Partially Implemented: Send to testing email
	DMCA Cataloging	Fully Implemented	Fully Implemented	Fully Implemented
	DMCA Tracking	Fully Implemented	Eliminated	Eliminated



Challenges Encountered

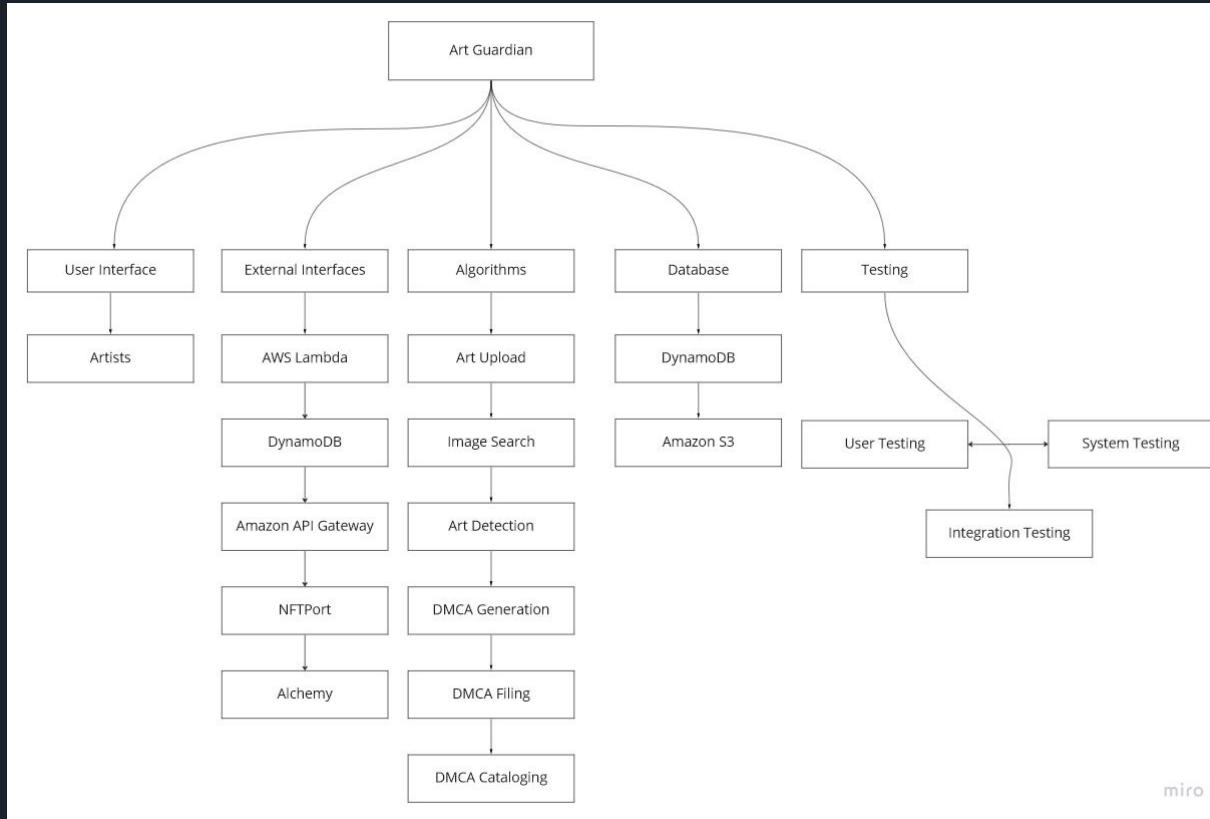
- API issues
 - Obtaining AWS access
 - NFTport integration
 - Accessible API keys
 - OpenCV image matching tuning
- Steep learning curve
 - AWS cloud services
 - React framework
 - Front-end to back-end integration
 - Debugging challenges
- Scope bounding
 - Limit NFT marketplaces
 - Determining search frequencies
- Sources of mock data for testing
 - Test artwork for triggering matches
 - Test NFTs for stimulating DMCA generation



What We Accomplished

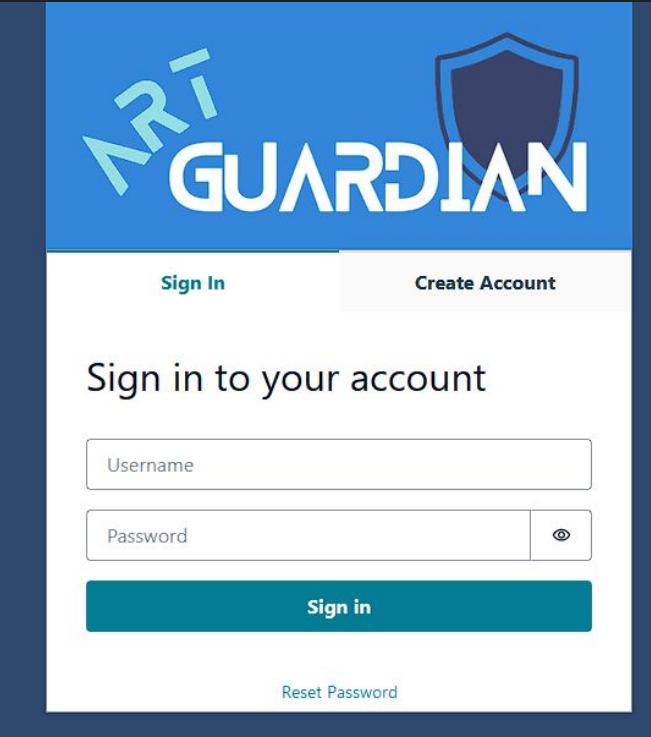
- Tackled cloud services and APIs new to most team members
- Overcame programming challenges
- Created a inclusive working environment that optimized team cooperation and communication
- Utilized issue tracking boards and planning tools

Work Breakdown Structure

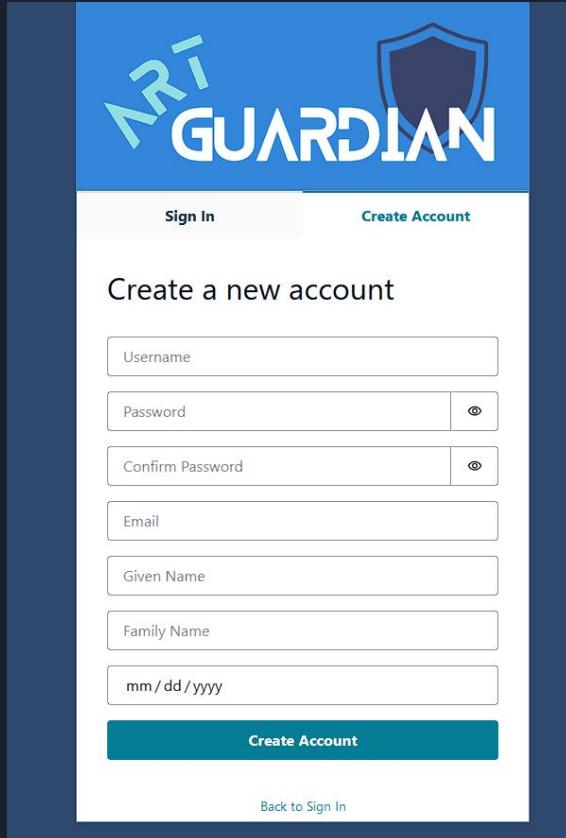


miro

UI Screenshots: Login & Create Account



The login screen features the Art Guardian logo at the top. Below it are two buttons: "Sign In" and "Create Account". The "Sign In" button is active. The main area contains the text "Sign in to your account" and two input fields: "Username" and "Password". A large teal "Sign in" button is centered below the password field. At the bottom, there is a link to "Reset Password".



The create account screen features the Art Guardian logo at the top. It has two buttons: "Sign In" (disabled) and "Create Account" (active). The main area is titled "Create a new account" and contains seven input fields: "Username", "Password", "Confirm Password", "Email", "Given Name", "Family Name", and a date input field "mm / dd / yyyy". A large teal "Create Account" button is at the bottom. At the very bottom, there is a link to "Back to Sign In".

UI Screenshots: Landing Page

The screenshot shows the Art Guardian web application's landing page. At the top left is the logo 'ART GUARDIAN' with a shield icon. On the right are navigation icons for Home, Profile, Notifications, Settings, and Sign Out. The main header reads 'Welcome back, testuser1'. Below it, a message says 'You have new notifications'. A large section titled 'Art Protection Guidelines' contains the text: 'Protecting art begins with you. With art theft on the rise, especially in regards to NFT's it is important that we all work together to protect our art. If each individual followed these simple steps we can nip this problem in the bud'. A bulleted list follows: 'Step 1: Keep the resolution low! We understand the want to upload the best image possible, but higher resolution images are more tempting to steal. We recommend an image be no more than 96 dots per inch.'

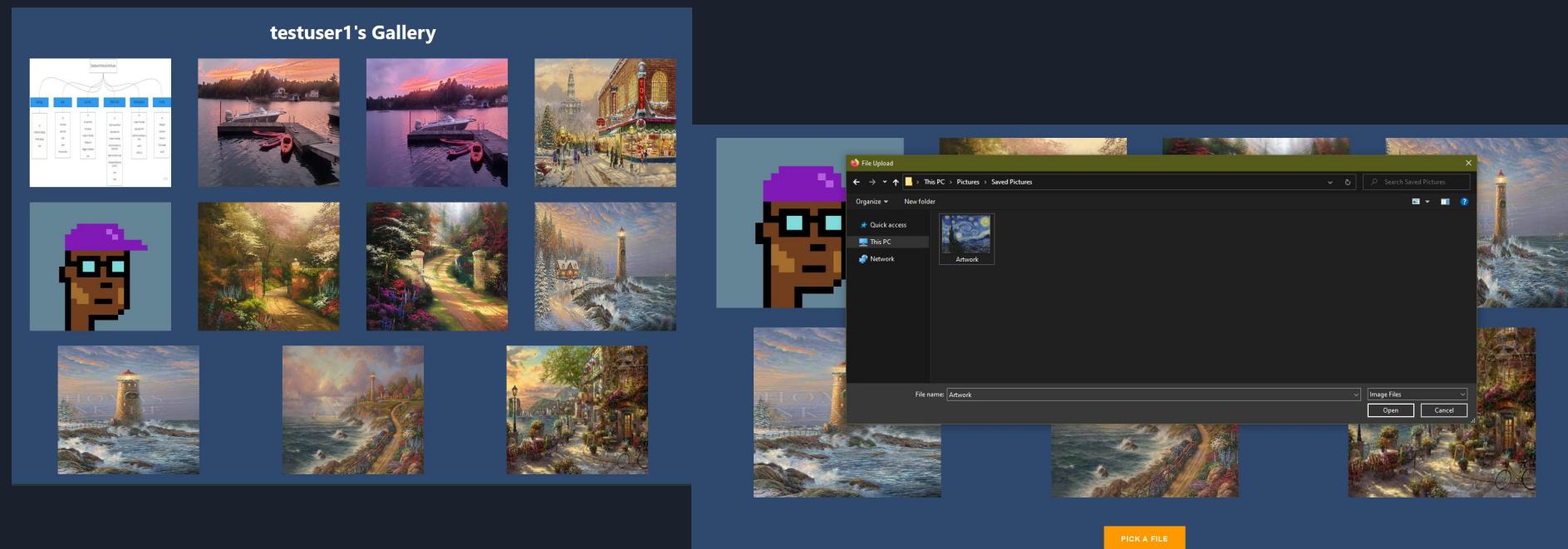
Art Protection Guidelines

Protecting art begins with you.

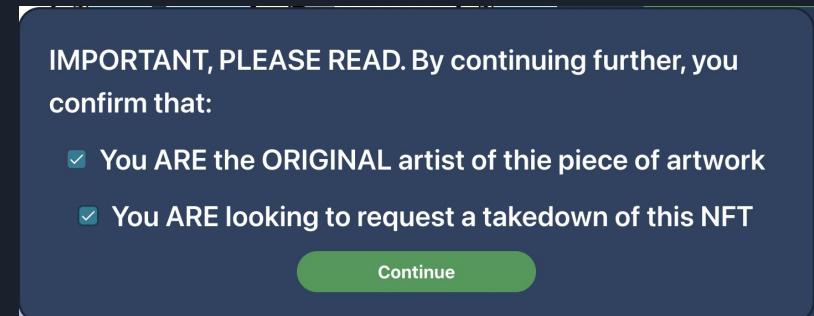
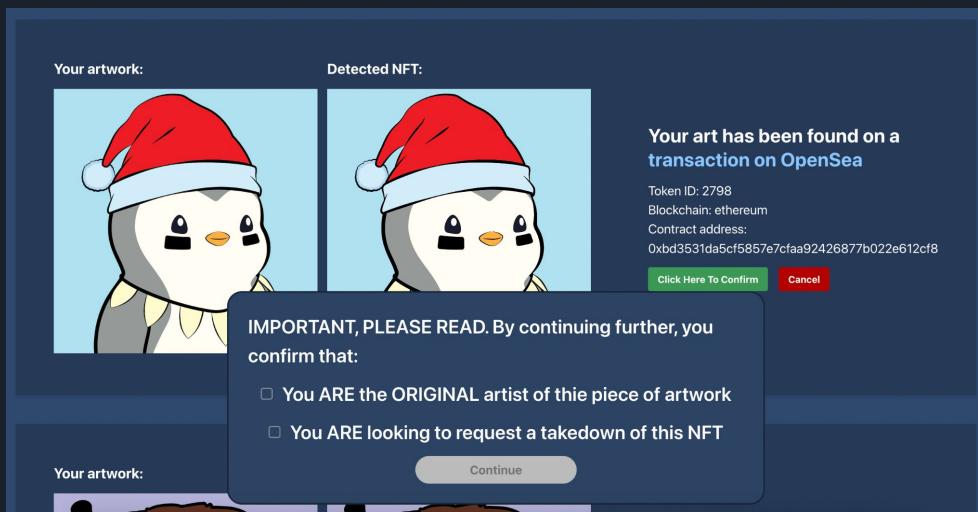
With art theft on the rise, especially in regards to NFT's it is important that we all work together to protect our art. If each individual followed these simple steps we can nip this problem in the bud

- Step 1: Keep the resolution low! We understand the want to upload the best image possible, but higher resolution images are more tempting to steal. We recommend an image be no more than 96 dots per inch.

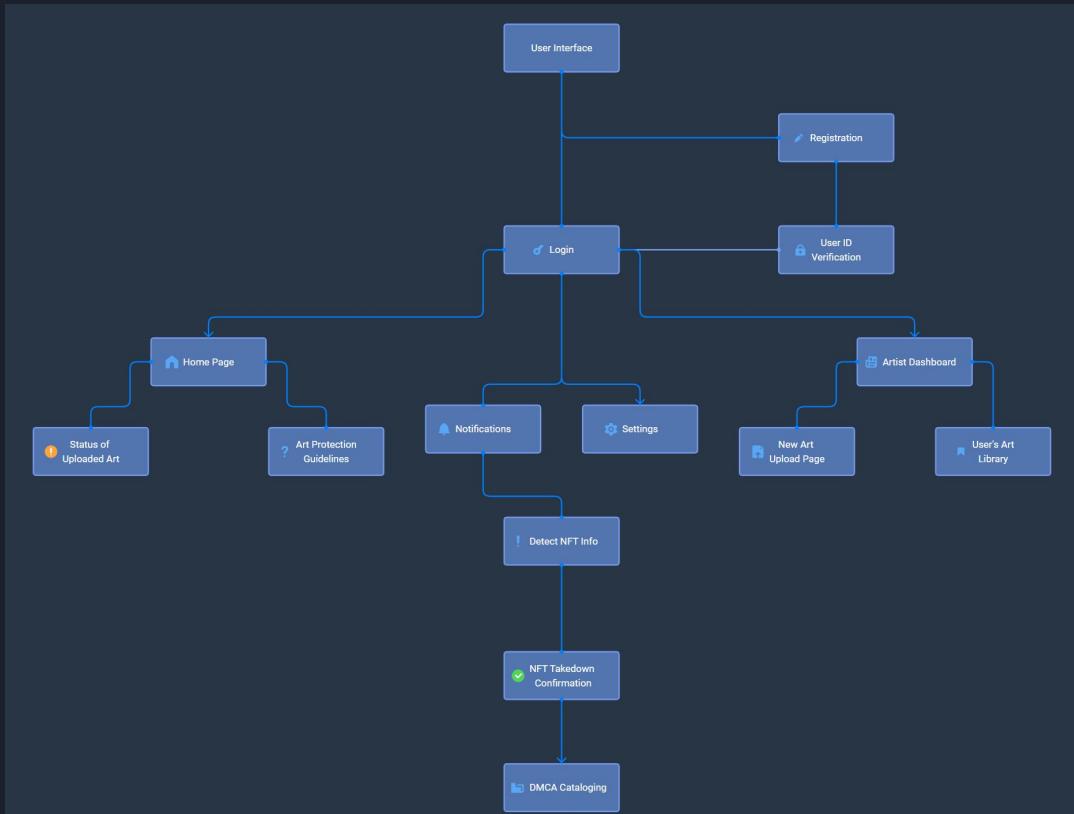
UI Screenshots: Art Gallery



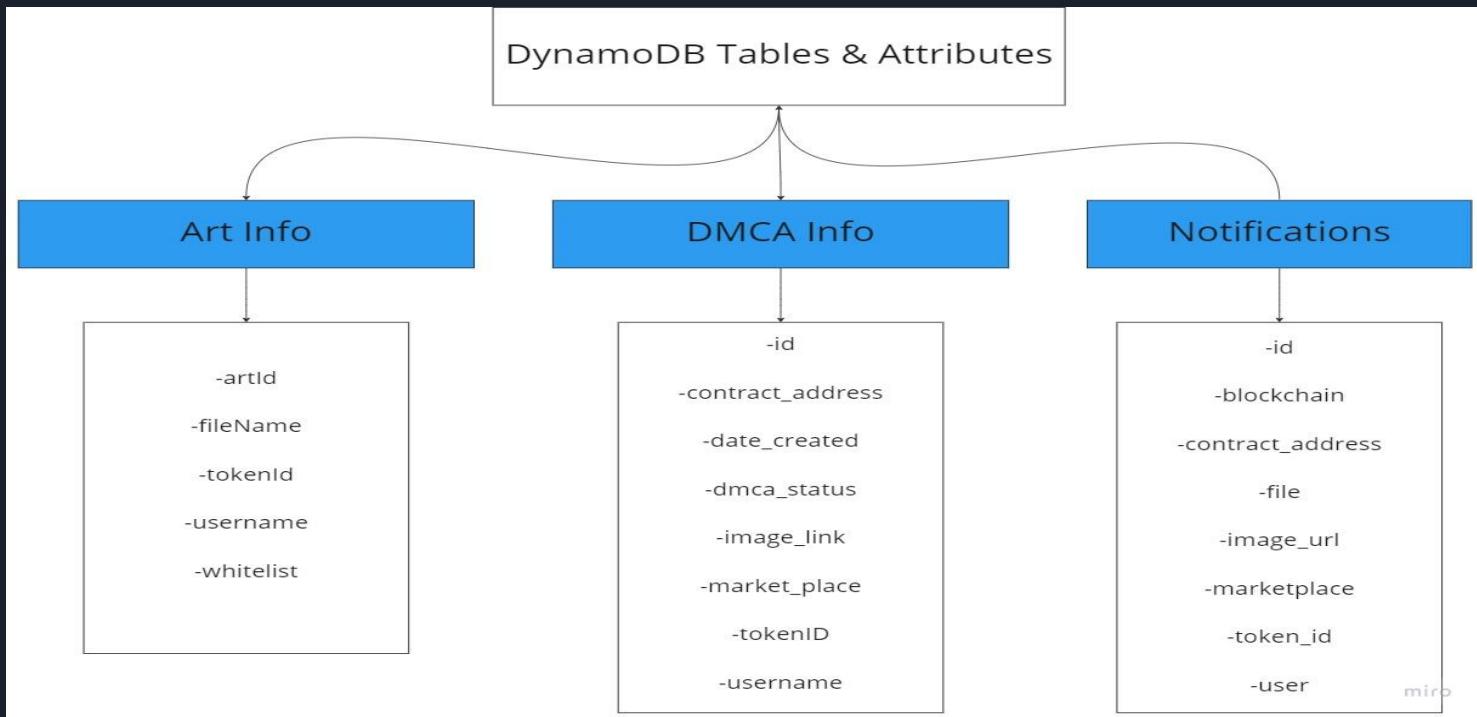
UI Screenshots: Art Notifications & Check Confirmation



Site Map



Database Model



Planned vs. Actual Development Tools

ADDED

REMOVED

Component	Platform	
	Desktop Web App	
Language	HTML, CSS, Javascript, Python	HTML, CSS, Javascript, Python
Frameworks	React	React
IDE	Visual Studio Code	Visual Studio Code
Database	Amazon RDS And Amazon S3	DynamoDB And Amazon S3
Version Control	Git	Git
Issue Tracking	GitHub	GitHub
Documentation	jsdoc	jsdoc
Services	AWS Amplify	AWS Amplify, Lambda, SES, Eventbridge, API Gateway

Sprint Profile

Sprint 0 & 1:

- Setup Dev Environments
- Setup Cloud Services and Database



Sprint 2:

- Create Web Pages
- Testing Image Algorithm
- Setup databases for storage and read/write queries

Sprint 3:

- Create art upload and gallery
- Create DMCA Generation code
- Implement image matching
- Implement Art Detection
- Update and Finish Database

Sprint 5:

- Art protection guidelines
- Execute DMCA Takedown Requests and generation

Sprint 4:

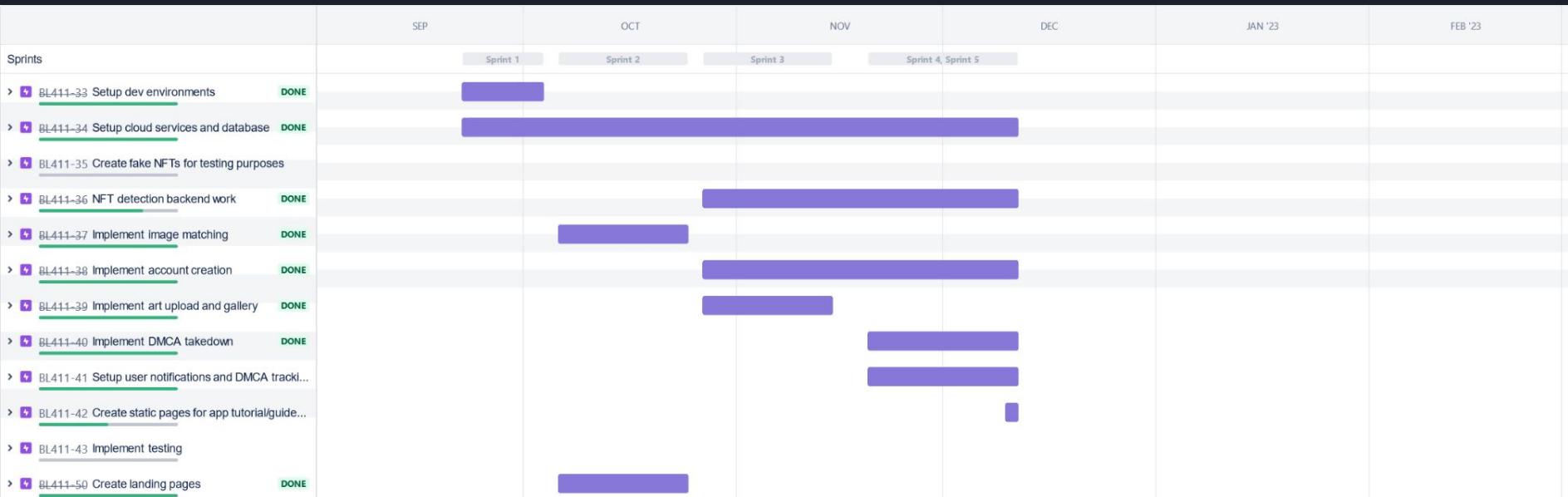
- Integrate Email API
- Create and Upload Notifications

Sprint 6 (Stretch Goals):

- Penetration Testing
- Sanitization
- Implement Whitelisting
- Create Testing Mode

Jira Board

<https://cdiaz014.atlassian.net/jira/software/projects/BL411/boards/1/roadmap>



Technical Risk Matrix

CS411W Prototype

		Impact				
		Very Low	Low	Medium	High	Very High
Probability	Very High					
	High					
	Medium	T-1	T-2	T-1		
	Low					
	Very Low		T-4		T-4	T-3

Blue - Post Mitigations

Technical Risks

- T-1: Matching API yields a false match.
- T-2: Market does not comply with DMCA.
- T-3: ID API does not correctly verify identity.
- T-4: Automatic DMCA has wrong information

Technical Risk Mitigations:

- T-1: User verifies art is theirs before sending DMCA.
- T-2: Flag art that reappears in the market place and notify user.
- T-3: Multiple ways to submit ID information.
- T-4: Final verification check.

Customer Risk Matrix

CS411W Prototype

		Impact				
		Very Low	Low	Medium	High	Very High
Probability	Very High	Yellow	Yellow	Red	Red	Red
	High	Yellow	Yellow	Yellow	Red	Red
	Medium	Green	C-2	Yellow	C-1	Red
	Low	Green	C-2	Yellow	Yellow	Yellow
	Very Low	Green	Green	C-3	Yellow	Yellow

Blue - Post Mitigations

- Customer Risks
 - C-1: Users abuse the system by uploading/issuing DMCA for art they do not own.
 - C-2: User doesn't know how to use the app.
 - C-3: User forgets to issue the DMCA.
- Customer Risk Mitigation
 - C-1: Sign up using art accounts.
 - C-2: Created user manual.
 - C-3: Timer that reminds user to cancel or send the DMCA

Security Risk Matrix

		Impact				
		Very Low	Low	Medium	High	Very High
Probability	Very High	Yellow	Yellow	Red	Red	Red
	High	Yellow	Yellow	Yellow	Red	Red
	Medium	Green	Yellow	Yellow	Yellow	Red
	Low	Green	Green	S-1		S-2
	Very Low	Green	Green	Green	S-2	Yellow

Blue - Post Mitigations

CS411W Prototype

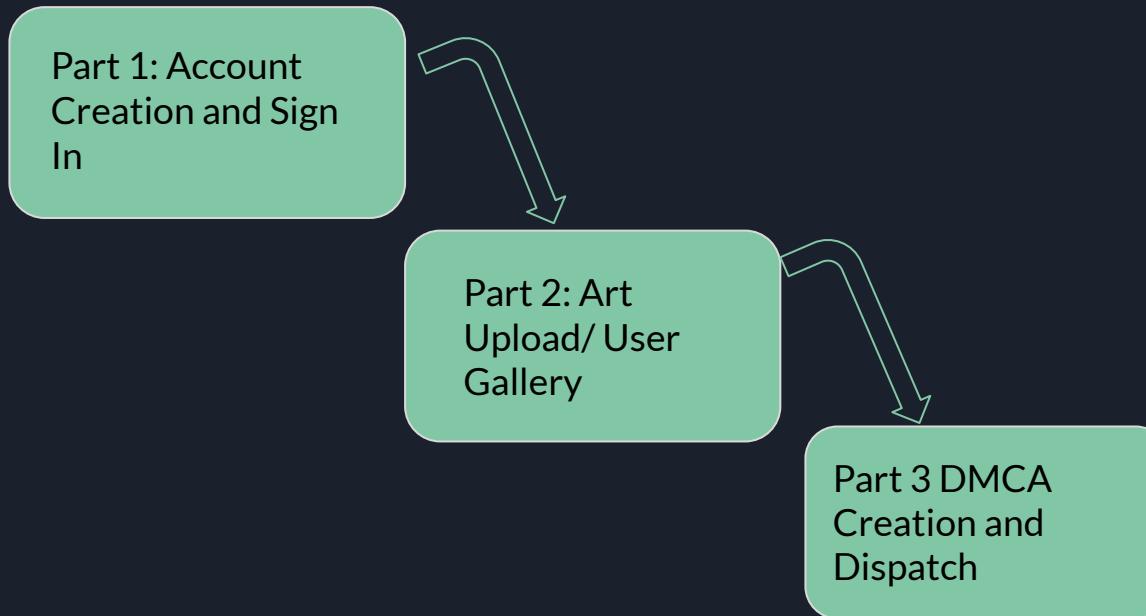
Security Risks

- S-1: Unauthorized access to a user account.
- S-2: Database Integrity.

Security Risk Mitigation:

- S-1: Two Factor Authentication for Login.
- S-2: Use Secure Databases and Encrypt user data (AWS)

Summary of Demo





Prototype Demonstration



Appendix A: Continued Development Priorities

- Implement whitelisting
- Implement comprehensive guidelines for art protection
- Implement DMCA tracking



Appendix B: User Stories

Artist:

As an artist, I need to be able to sign in to my account to access the app.

As an artist, I need to be able to sign up for an account to join and protect my art.

As an artist, I need to be able to reset my password in case I forget my password.

As an artist, I would like a tutorial on how to use the app so I can properly protect my art.

As an artist, I need to be able to upload my art to keep my art safe.

As an artist, I would like to see a collection of the art that I have uploaded in order to know what is or is not protected.

As an artist, I would like to know which pieces of my art have been found on the NFT marketplaces so I can take further action.

As an artist, I would like to see information to help me protect my art so I can prevent theft.

As an artist, I would like to be able to issue takedowns of stolen art found on the marketplace so I can prevent an illegal sale.

As an artist, I would like Art Guardian to automatically generate DMCA takedowns for stolen art so I do not have to do that myself.

As an artist, I would like to be updated on the status of the DMCA Takedown so I can know when it is taken down or if I have to take further action.

As an artist, I need my information to be secure and private so I can remain anonymous.

As an artist, I would like to see information about the NFT using my art so I can see who stole it and what marketplace it is on.

As a NFT Artist I need to be able to whitelist my minted NFT so my own NFT doesn't trigger a theft alert.



Appendix B: User Stories Cont.

Tester

As a tester I need to be able to trigger the 2-Factor-Authentication for testing.

As a tester I need to be able to trigger a push notification for testing.

As a tester I need to be able to access the image database for reading and uploading images.

As a tester I need to be able to make a fake NFT to test our DMCA Generation system.

As a tester I need to be able to make a fake NFT to test our flagging system.

As a tester I need to be able to invoke the image matcher to receive test matching values.

As a tester I need to be able to make a fake NFT to test our Whitelisting system.

As a tester I need a testing mode for our app to access tests easier.

As a tester I need to be able to access the image database for reading and writing user information.

As a tester I need to be able to verify my identity using the Stripe-API.

As a tester I need to be able to access the email API to send test emails.

Appendix C: Test Case and Requirements Traceability Matrix

Requirements	Test Case														
	3.1.1	3.1.2	3.1.3	3.1.4.1	3.1.4.2	3.1.5	3.1.6	3.1.7	3.1.8	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.2.6
Navigation Bar	3.1.1.1														
Account Creation	3.1.1.2														
Sign-In	3.1.1.2.1														
Registration	3.1.1.2.2														
Updates	3.1.1.3.1														
Guidelines	3.1.1.3.2														
Art Upload	3.1.1.4														
Profile	3.1.1.5.1														
Gallery View	3.1.1.5.2														
Alerts	3.1.1.6.1														
Information Link	3.1.1.6.1.1														
NFT Link	3.1.1.6.1.2														
Art Confirmation	3.1.1.6.2														
NFT Preview	3.1.1.6.2.1														
Check Boxes	3.1.1.6.2.2														
DMCA Takedown Request Preview	3.1.1.7.1														
E-Signature	3.1.1.7.2														
Settings	3.1.1.8														
Account Information	3.1.1.8.1														
Security Settings	3.1.1.8.2														
Whitelisting	3.1.2.1														
Marketplace Monitoring	3.1.2.2														
Image Batch Searcher	3.1.2.2.1														
Image Matcher	3.1.2.3														
DMCA Generation	3.1.3.1														
DMCA Filing	3.1.3.2														
DMCA Cataloging	3.1.3.3														

Appendix D: References

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Thank You for Participating!
Any Questions?