A^3 framework

Aggregation and Archiving of Artifacts

“A Repository of Reliable Resources for Academia”

PROTOTYPE PRESENTATION

CS 410, SPRING 2020

TEAM CRYSTAL

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PROBLEM STATEMENT

Educators and students lack a framework to aggregate and archive fragmented and domain-specific artifacts for the purpose of academic knowledge management.

TRADITIONAL SHORTCOMINGS:

Knowledge Repositories

- Formal artifact aggregation in traditional academic environments does not exist [3]
- The aggregation that does currently exist does not support tracking of changes [2]
- Current aggregation is not strong enough to be considered centralized

Knowledge Accessibility

- Knowledge is isolated by specialization [16]
- Access is often restricted by course or major [16]
- Format preference by instructor can vary wildly and may not be functional to others [17]

TRADITIONAL SHORTCOMINGS:

Knowledge Asset Management

- Instructor materials are often created in variety of formats
- Individual instructors must often be petitioned for information [17]
- Loss of artifacts from reassignment of responsibilities [16]
- ODU CS department syllabi collection once took two months [17]

Knowledge Environment Enhancement

- Reference materials are specific to each course
- ODU instructors use a variety of platforms (Bb, PLE, CoWeM) [17]
- Special needs and distance learning lack proper support [3]
- Shared reference material can benefit organizations on a fundamental level [16]

SOLUTION STATEMENT

A^3 is a framework for aggregating and archiving artifacts for educators, researchers, and students. A^3 seeks to overcome the challenges of individualization, location, and formatting in academic knowledge management by keeping information available, normalized, and centralized while being enhanced by a robust user interface.

SOLUTION CHARACTERISTICS:

Creating Formal Knowledge Repositories

- Create a robust infrastructure for artifacts
- Support version history of artifacts and knowledge assets
- Centralize information concisely and effectively

Improve Knowledge Accessibility

- Create knowledge artifacts that are widely applicable
- Create a cross course accessibility
- Normalize information from varied platforms (Blackboard, PLE, etc.) into translatable formats*

*Not implemented in Prototype

SOLUTION CHARACTERISTICS:

Knowledge Asset Management

- Unify formatting among instructors through normalization
- Remove necessity of individual asset request
- Create systematic storage of vital course information
- Automate collection of standard reference materials*

Knowledge Environment Enhancement

- Translate reference materials to a universally applicable format
- Core organizational improvements through a cooperative environment
- Normalization to allow cross platform functionality
- Special needs and distance learning accessibility*

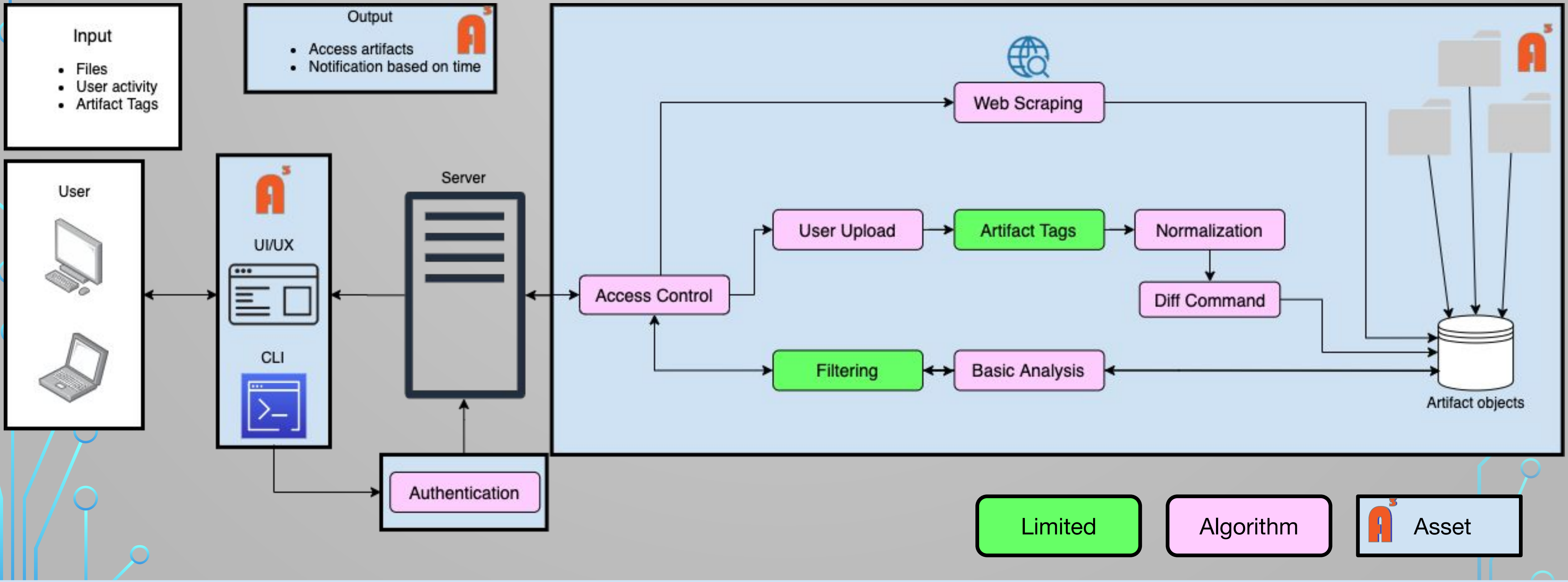
*Not implemented in Prototype

RWP vs. Prototype

Feature/Capabilities Comparison Chart

Feature/Capability	Real World	A^3 Prototype
Database Storage	X	X
Graphical User Interface	X	**Limited**
Command Line Interface	X	X
User Authentication	X	**Limited**
Access Control	X	X
Artifact Upload	X	X
Repository Creation	X	X
Artifact Normalization	X	X
Artifact Comparison	X	X
Artifact Update	X	X
Artifact/Repo Deletion	X	
Web Scraping	X	**Limited**
Artifact Charge Record	X	X
Artifact Exporting	X	X
Artifact/Repo Searching	X	**Limited**
Artifact Contributor List	X	
Artifact/Repo Sharing	X	
Artifact/Repo Tags	X	**Limited**

MAJOR FUNCTIONAL COMPONENTS



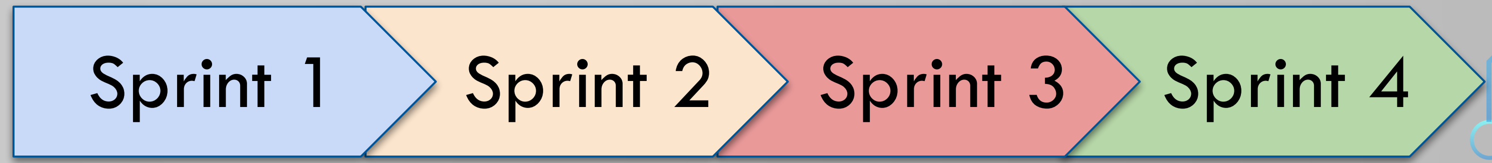
DEVELOPMENT TOOLS

Software Requirements:

- Language: Python 3.8 or newer
- GUI language: HTML, CSS, and JS
- JS frameworks: Angular and React
- IDE: Visual Studio Code (VS Code)
- Documentation: pydoc and Sphinx
- Code Repository with Version Control: GitLab
- Containerization: Docker and Docker Compose
- Database: MySQL, Microsoft Azure
- APIs: REST
- Configuration management: tox
- Analysis: pycodestyle (formerly PEP 8) and Pylint

Hardware Requirements: Single VM instance running an Ubuntu distribution on the ODU CS server

AGILE SPRINTS



- Sprint 1
  - Database framework
  - CLI interface
  - Simple comparison function
  - Authentication/Role-based access
  - Testing
- Sprint 2
  - Full database implementation
  - Normalization function(s)
  - Analysis function(s)
  - GUI framework
  - Testing
- Sprint 3
  - Diff function (line-by-line)
  - Web scraping implementation
  - Final GUI implementation
  - Limited artifact tags and filtering
  - Testing
- Sprint 4 - if time permits
  - Full implementation of artifact tags and filtering
  - Notifications
  - Testing

RISK MATRIX:
Customer & Technical

Impact

Probability	Negligible	Minor	Moderate	Significant	Severe
Very Likely	🟨	🟧	🟧	🟥	🟥
Likely	🟨	🟨	🟧	🟧 T1	🟥
Possible	🟩	🟨	🟨	🟧 C2, C3	🟧 C1
Unlikely	🟩	🟨	🟨 T4	🟨 T2	🟧
Very Unlikely	🟩	🟩	🟩 C4	🟨 T3	🟨

🟨 Will address

🟪 May address

⬜ Will not address

T#- Technical Risk
C#- Customer Risk

Risk ID	Title	Impact	Probability	Mitigation
T1	Integration with Blackboard - scraping	Significant	Likely	Use of a tool similar to the Blackboard Archive Extractor. Will periodically scrape Blackboard for material and update archive.[1]
T2	Loss or corruption of data	Significant	Unlikely	Will adhere to best practices, as defined by the National Institute of Standards and Technology.[12]
T3	Information changes are not reported to the user	Significant	Very Unlikely	Unit Testing during development to ensure user is notified of changes.
T4	File type are not supported	Unlikely	Moderate	List of supported file types provided and unsupported file types are stored in binary BLOB format, media will be linked to the source file and reports will be generated from a limited data set (i.e. MD5 sum, size, modified data, etc.)

Risk ID	Title	Impact	Probability	Mitigation
C1	Faculty does not upload material	Severe	Possible	Will make UI/UX easy to use and understand. School encourage use of A^3.
C2	Does not update material/reference	Significant	Possible	Will allow users to notify the owner if something has not been updated as well as automated notifications after a prescribed amount of time. Will allow user to see when last updated.
C3	Inputs incorrect information	Significant	Possible	System will use backup snapshots allowing information to be reuploaded with minimal loss.
C4	Too difficult to use	Moderate	Very Unlikely	Will utilize both a CLI and UI/UX.

RISK MATRIX:
Security

Impact

Probability	Negligible	Minor	Moderate	Significant	Severe
Very Likely	🟨	🟧	🟧	🟥	🟥
Likely	🟨	🟨	🟧	🟧	🟥
Possible	🟩	🟨	🟨	🟧	🟧
Unlikely	🟩	🟨	🟨	🟨	🟧 **S1**
Very Unlikely	🟩	🟩	🟩	🟨	🟨 **S2, S3, S4, S5**

Risk ID	Title	Impact	Probability	Mitigation
S1	Database breach	Significant	Unlikely	The use of input validation techniques as well as input scrubbing will minimize injection and overflow style attacks from the UI.
S2	User obtains unauthorized permission levels	Significant	Very Unlikely	The use of notifications and reports generated to notify the owner of the file upon changes made.
S3	User uploads inappropriate material	Significant	Very Unlikely	Faculty members will be held to the code of conduct standards of their respective universities while using A^3.
S4	Denial of Service	Significant	Very Unlikely	We will rely on the Host network for mitigation of DoS.
S5	Masquerade - Replay attacks	Significant	Very Unlikely	The use of notifications and reports generated to notify the owner of the file upon changes made.
S6	Man-in-the-middle - Intercept and forward attacks	Significant	Very Unlikely	The use of end-to-end security for the upload and download of various file types would decrease available information an attacker could obtain.

🟨 Will address

🟪 May address

⬜ Will not address

S# - Security Risk

USER STORIES:
Guest

I **must** be able to :

- choose to login with credentials
- export a public artifact
- view a list of public artifacts
- access the database with both a CLI and limited GUI.
- access the database outside of the network

I **wish** to be able to :

- be notified of what type artifacts I can access (i.e. public/private)
- filter and sort public artifacts that belong to the database

I **must not** be able to :

- access private artifacts
- edit or update artifacts
- access user accounts
- modify or update public artifacts
- change a user’s access level
- upload an artifact

USER STORIES: Faculty

I **must** be able to :

- do anything a guest can do
- login with credentials
- upload artifacts
- edit and update artifacts I own
- set access level requirement for artifacts I own
- upload an artifact via web scraper
- normalize files on upload
- view a Diff report on command
- view a list of all private artifacts

I **wish** to be able to :

- access the source of any artifact
- see usage reports about artifacts I own
- tag artifacts with keywords describing their content
- create notifications for myself regarding regular updates to artifacts

I **must not** be able to :

- access, edit, or update artifacts I don't own
- delete user accounts
- change a user's access level

USER STORIES:
Tester

I **must** be able to :

- access artifacts within my testing parameters
- view reports about users and artifacts
- have administrative capabilities within my testing parameters
- analyze results
- report test problems and anomalies
- have all the capabilities of any other account type
- manage the database including:
  - change attributes of any artifact, such as access level requirement
  - remove artifacts
  - create and change user accounts

I **wish** to be able to :

- improve software quality
- capture user requirements

I **must not** be able to :

- test their own products
- make all the decisions and changes to assure a better quality
- edit database schema

A^3 framework

A repository of reliable resources.
Our goal is simplicity.

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