A^3 framework

Aggregation and Archiving of Artifacts

1. Introduction

Educational organizations employ instructors who have varied, specialized knowledge, and even instructors teaching the same course may have individual knowledge that is not shared (Brunelle). Instructors also have collections of artifacts, or educational materials, that aid them in passing on knowledge to their students. These artifacts exist in a variety of formats and on different platforms based on the instructor's preferences or needs. Sharing artifacts can often be prohibitively complicated because of formatting differences, platform differences, and time constraints (Kennedy). Beneficial artifacts may also be lost to the educational organization due to an instructor changing roles within the organization or moving on to other employment opportunities. The unaddressed need for instructors to archive and aggregate artifacts in a centralized, shareable repository (Davenport, Long, & Beers, 1997) is a problem. Currently, no solutions exist for this problem that include aggregation with change tracking (Carrol, et al., 2003). A^3 seeks to solve this problem because of the considerable benefit it would provide for both the instructors and students.

A^3 is a framework for aggregating and archiving artifacts, providing a repository of reliable resources for academia. Not only will the artifacts be centralized for convenient access by instructors and students, they will also be normalized in order to facilitate sharing and collaboration among instructors. Additionally, A3 will allow instructors to track changes over time and provide methods to use the most up-to-date artifacts available.

A^3 will include a centralized collection of artifacts where instructors may create repositories and upload artifacts. Changes to artifacts will be tracked within the database for later review. Categorization of repositories and artifacts, for sorting and searching, will be available by user-generated content tags, and users will be able to bookmark artifacts and repositories. Normalization of artifacts will facilitate comparison features and reduce storage use. Access will be controlled for repositories and artifacts based on user role. Analysis reporting and notifications will also be features available to users.

2. Product Description

A^3 is a framework designed for instructors to upload and share artifacts with students and colleagues for reference. Instructors can upload, analyze, update, and generate reports on artifacts. Artifacts and repositories can be categorized for sorting and searching , and notifications are also configurable by instructors for their convenience.

2.1. Key Features and Capabilities

A^3 will contain individual repositories for each instructor, all held in a shared database so that all artifacts are accessible by the intended users. Accessing the artifacts and repositories will be controlled based on user role—e.g., guests, students, and faculty. Users will be able to bookmark artifacts and repositories they wish to access again. In

order to add or update artifacts, instructors may use on-demand and automated uploads via SFTP and web scraping into a centralized repository. Artifacts will be normalized upon upload into Markdown format for easier storage and comparison. Tagging of artifacts and repositories by users for categorization will allow sorting and searching by content.

A^3 will also feature artifact comparison—comparing simple characteristics (like artifact size, name, tags, etc.) and line-by-line differences using a specialized function, Diff. Artifact changes are tracked by preserving the version history from each change so that on-demand comparisons can be performed. A^3 will have configurable notifications for update reminders for individual artifacts and change notifications for bookmarked repositories and artifacts. Report generation for artifact and repository metrics like number of users accessing, update frequency, and number of artifacts in repository.

2.2. Major Components

A^3 will be contained within the ODU server, accessible remotely using a computer with web-connectivity and locally via on-campus connection to the ODU server. Figure 1 (below) is a diagram illustrating the major functional components.

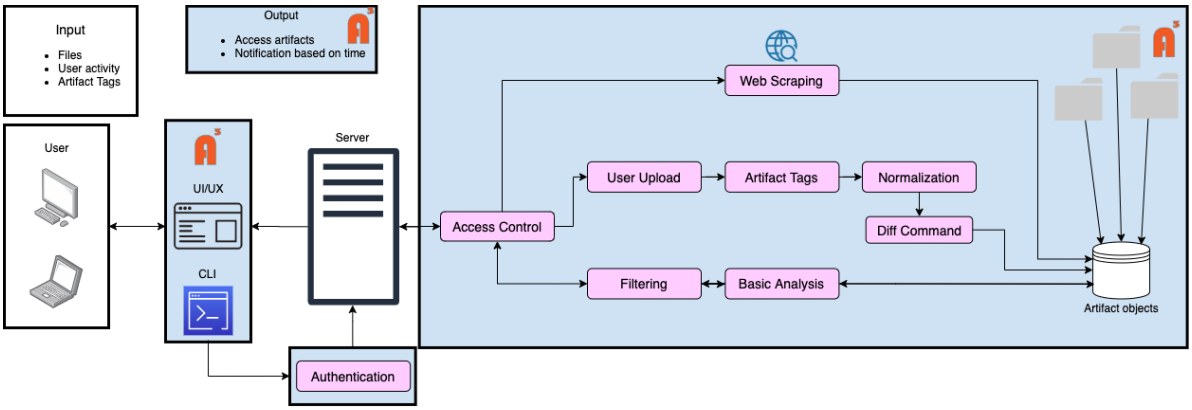

Figure 1

A^3 will be developed using Visual Studio Code IDE in Python (version 3.8 or newer), documented using pydoc and Sphinx. For code analysis, pydocstyle and Pylint will be used. Database development will use MySQL. The GUI will be designed and implemented with HTML, CSS, and JavaScript (including Angular and React). Docker will be used for containerization and for communication between the separately developed components of A^3. For collaborative development, GitLab will be used as a code repository. REST API will be used so the A^3 programming to communicate instructions between the web server and database.

3. Identification of Case Study

A^3 is being developed for the ODU Computer Science Department to centralize the artifacts of participating instructors for analysis and sharing. It will be implemented to facilitate archiving their artifacts for aggregation so that knowledge may be shared among specialized instructors and passed on to students. Instructors will then be able to easily access artifacts from other courses as supplemental material to the benefit of student education.

Other departments could also benefit from A^3 because the benefits are not restricted by content. Even further than all departments at ODU, other educational organizations could also benefit from using this framework.

4. A^3 Product Prototype Description

(Guidelines - Provide a top-level description of the CS 411W prototype as it relates to the end product from CS 410 (i.e., the goal). Are capabilities reduced or eliminated? Simulated –> modeled? Include a table of comparison between RWP and Prototype either in section 4, 4.1 or 4.2)

4.1. Prototype Architecture (Hardware/Software)

(Guidelines - How will the prototype be structured to demonstrate key features of the CS 410 product. Provide and describe the Prototype MFCD.)

4.2. Prototype Features and Capabilities

(Guidelines - What does the prototype demonstrate? Why is that significant in showing how the problem is solved? How have you demonstrated success? How does the prototype address the CS 410 project risk mitigation? Describe the functional goals and objectives.)

4.3. Prototype Development Challenges

(Guidelines - Describe the expected challenges to be encountered while completing the prototype – e.g., knowledge missing, capability missing, supporting technology issues.)

5. Glossary

Aggregate: Data that is composed of smaller pieces that form a larger whole.

Algorithm: Set of instructions designed to perform a specific task.

Angular: A framework for dynamic web apps. Allows for the use of HTML as a template language.

Application Programming Interface (API): Set of functions and procedures allowing the creation of applications that access features of an operating system, applications, etc.

Archive: Contains multiple files and/or folders. May be created by several different utilities and may be saved in different formats.

Artifact: Combination of arte, “by skill”, and factum, “to make”. A file or document.

Backlink: A hyperlink that links from a web page, back to your own web page or website.

Blackboard: A tool that allows faculty to add resources for students to access online.

Centralized: Type of network where all users connect to a central server.

Course Websites from Markdown (CoWeM): A system for building course websites, including notes, slides, and organizational pages, from Markdown documents.

Cascading Style Sheet (CSS): Used to format the layout of web pages. Defines text styles, table sizes, among other things that previously could only be defined in HTML.

Database: Collection of information, that is organized for rapid search and retrieval.

Data Loss: An instance in which information is destroyed by failures or neglect.

Diff: A line by line comparison of normalized artifacts.

Docker: Tool to create, deploy, and run applications by using containers. Allow developers to package up an application, with all parts needed, to be deployed in one package.

Export: Taking data from one program or computer to another.

GitLab: Used to provide internal management of git repositories. Is a self hosted Git-repository management system that keeps the user code private.

Graphical User Interface (GUI): User interface that contains graphical elements. Examples include windows, icons and buttons.

Hypertext Markup Language (HTML): A language used to create web pages. “Hypertext” refers to hyperlinks in a page, and “Markup language” refers to the way tags are used to define page layout.

Hyperlink: An element that links to another file or object.

JavaScript (JS): A language used in web development. While influenced by Java, It’s syntax is more similar to C.

Knowledge Management: The management process of creating, capturing, sharing, retrieving, and storing data, information, knowledge experiences and skills by using appropriate information and network technology.

Markdown: A markup language that can be used to format plain text. Can be converted into another language.

Markup: A language that uses tags to define elements within a document.

MySQL: Open source SQL database management system. Developed and distributed by Oracle Corporation.

Normalization: Converting ingested objects into a small number of pre-selected formats.

Python: An interpreted, object-oriented language.

Personal Learning Environment (PLE): An interface used in flexible online courses. Designed by ODU's Center for Learning and Teaching.

pydoc: Automatically generates documentation from Python modules. Can be presented as pages of text on the console, served to a web browser, or saved to HTML files.

Pylint: A Python static code analysis tool. Looks for programming errors and warnings from within the code, as well as from an extensive configuration file.

React: A JavaScript library that is used to create User Interfaces for web applications.

reStructuredText: A plaintext markup syntax and parser system. Useful for in-line program documentation.

Secure File Transfer Protocol (SFTP): Secure version of File Transfer Protocol. Facilitates data access and data transfer over a Secure Shell data stream

Sphinx: A Python documentation generator. Converts reStructuredText files into HTML websites and other formats.

Tags: Is a keyword or term assigned to a piece of information.

tox: Aims to automate and standardize testing in Python. Is a generic virtualenv management and test command line tool.

Visual Studio Code: A source code editor that runs on Mac, Linux, and Windows.

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