

CS 4320 Final Project: Requirements Analysis & Software Design

OCDX Engine

GitHub Repository

Deployment Environment

Team 4 Members:

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Table of Contents

- (Page 3) Requirements Analysis
 - User Descriptions
 - Use Cases
 - Functional Requirements
 - Non-Functional Requirements
 - User Non-functional
 - System Requirements
 - User Requirements
- (Page 4) Software Design
 - Sketches
 - Data
- (Page 5) Sprint 1
 - Updates
- (Page 5) Deployment Environment
- (Page 5) Testing
- User Acceptance Test (UAT) Scenarios
 - Data Scientist Uploads Manifest
 - Data Scientists Review Manifest
 - Data Scientists Search for Manifest
 - Data Scientists Notify Changes to Other Users
 - System Admin Bans an Illegal Data Scientist
 - System Admin Deletes an Illegal Manifest
 - User Experience
- Unit Test Scenarios
 - Login Function
 - Search for Manifest Function
 - Upload Function
 - Download Function
 - Edit/Delete Manifest Function
 - Failure Case
- Regression Testing
- Integration Testing
 - User Uploads Manifest
 - User Reviews Manifest
 - System Admin Bans an Illegal Data Scientist
 - System Admin Deletes an Illegal Manifest
 - Failure Case
- Testing Edge Cases
- Validating User Inputs

- Responsive Layouts
 - Accessibility
 - Edge Cases to Ignore
 - Summary
 - (Page 8) Sprint 2 Updates
 - Database
 - The python code for inserts, updates, searches, and deletes.
 - Unit tests for these functions
 - User Interface
 - User Accounts
 - Business logic
 - Testing2
 - (Page 21) Sprint 3 Updates
 - (Page 27) Change Log
-

Requirements Analysis

User Descriptions

Rogers

- **Data Scientist**
 - Uploads and downloads data
 - Conducts sophisticated and systematic analyses of data
 - Extracts insights from large data sets
- **System Administrator**
 - Review the uploaded data
 - Manage users

Use Cases

Skinner/Hofer

- A Data Scientist can Browse by keyword for Manifest
- A Data Scientist can Search on Manifest
- A Data Scientist can Contribute to Existing Dataset
- A Data Scientist can Download Info
- A Data Scientist can Generate or Upload Manifest
- A Data Scientist can Save - A Data Scientist can Upload Data Set

Functional Requirements

Skinner

- The system will take an inputted manifest and place it into storage.
- The system will retrieve a manifest from storage and present it to a Data Scientist.
- The user interface can accept and serve search, upload, and update requests to and from Data Scientists.
- The system will process search, upload, and update requests, both into and out of Database Layer.

Non-Functional Requirements

Hofer/Raza

User Non-functional

- Data Scientists will be able to perform efficient searches based on keywords. Users should not wait more than about two seconds for a query to resolve.
- Data Scientists will be able to upload and update manifests.
- Data Scientists will be able to upload and download data files.

System Requirements

Raza/Hofer

Space Requirements

- The system must have enough physical space to handle extremely large data-sets.
- The system may need to be a distributed system using clusters for efficiency.

Reliability Requirements

- If the system crashes, the data and any manipulations/analytics must be preserved.

Privacy Requirements

- The data access must be limited to authorized users only.
- The system must enable secure data transfer over the internet.

Web Server

- Web Server must provide reliable service for the appropriate amount of traffic that will be sent and received from the system.

Database Backend

- Database must be able to convert data into easily storable format, and return in original format.

Storage Array

- System must create intermediate backups and update logging to revert to earlier states if needed.

User Requirements

Zhang/Rogers

- Data scientists will be able to upload Manifest.
 - Manifest can be reviewed by other data scientists.
 - Data scientists can edit or delete their Manifest.
 - Data scientists can search for Manifest they wish to view or test.
 - Data scientists will be able to include special comments or suggestions on manifest.
 - Data scientists should be able to notify the changes or suggestions that improves manifest to other users.
 - System admins can ban an illegal data scientist.
 - System admins can delete an illegal manifest.
-

Software Design

Sketches

Skinner/Rogers

Upload New Manifest(s)

From this page, a Data Scientist can upload a new manifest and scripts, set a title for the manifest and set a description.

The image shows a hand-drawn wireframe for a web application titled 'OCDX'. At the top right, there is a 'Logout' link. Below the title, there are two buttons: 'BROWSE' and 'UPLOAD'. The main section is titled 'Upload' and contains the following elements:

- Title:** A text input field.
- Description:** A larger text input area.
- Availability:** Two radio buttons labeled 'Public' and 'Private'.
- Files:** A dashed rectangular box containing the text 'Browse your Computer or Drag and drop files into the box'. Above this text is a small button labeled 'Browse your Computer'.
- UPLOAD:** A button located at the bottom right of the form.

Browse Uploaded Manifests

A Data Scientist can search and browse uploaded manifests.

Data Scientists can organize the search results by Title, Author, Date or Description.

OCDX

BROWSE UPLOAD

Logout

Browse

search

☐ Title ☐ Author ☐ Date ☐ Description

Title	Author	Date Created	Date Modified	Description	edit	view
Dataset 1	First Last	10-12-16			edit	view
Dataset 2	First Last	10-11-16			edit	view
Dataset 3	First Last	10-10-16			edit	view

Page 1 2 3 19

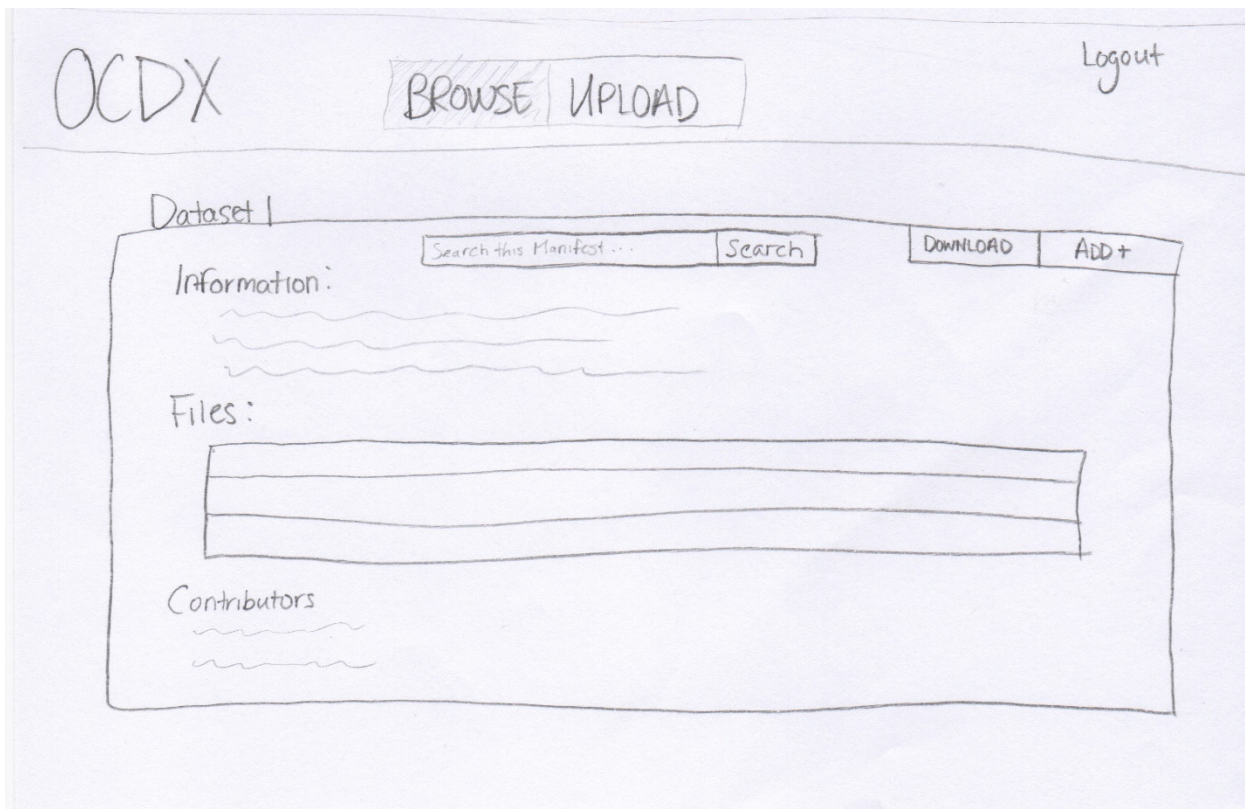
Manifest Description/Edit Manifests

This page provides the full information for a given manifest.

A data scientist can view the important information about a manifest including the Title, Author(s), and description.

A data scientist can contribute to a manifest if they have permission to do so.

A data scientist can download uploaded files from a given manifest.



Data

Zhang/Hofer

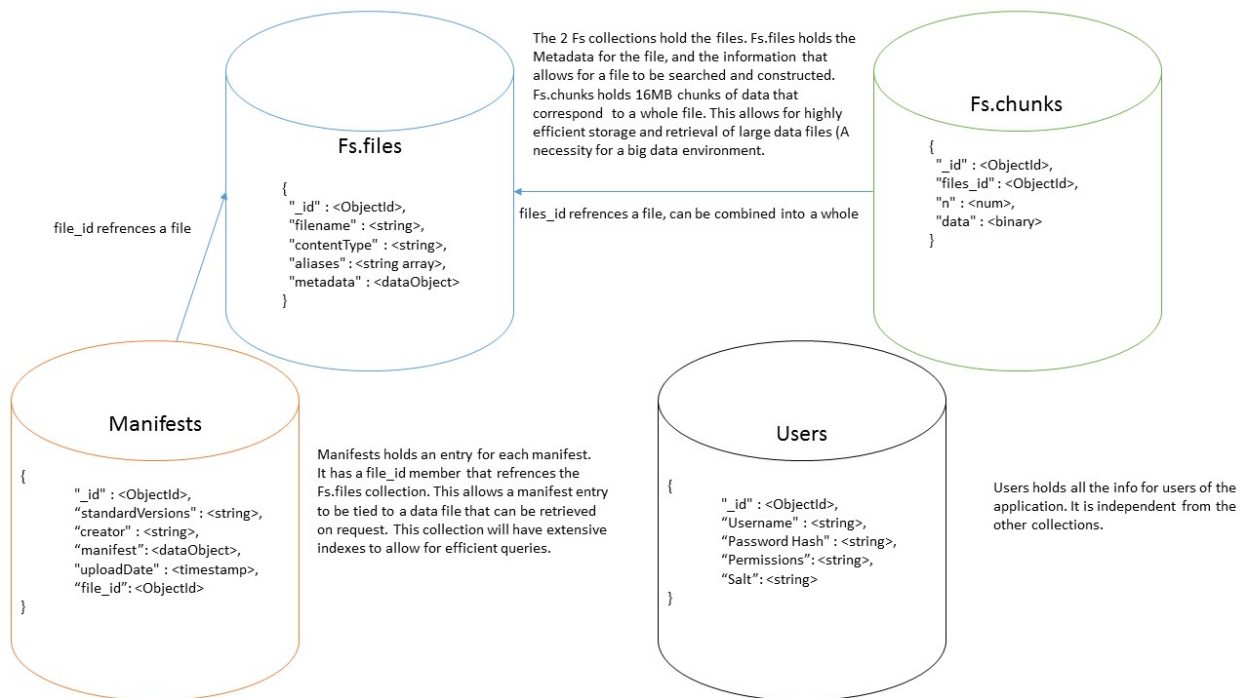
- **Members**
 - ID
 - name
- **OCDX_manifest**
 - author
 - date
 - size
 - category
 - version
 - modify_request

- **Users**
 - ID
 - name
 - email
 - phone
- **Login_attempts**
 - userID
 - date
 - attempts

Database Design

Hofer

MongoDB Pseudo-ERD



Sprint 1 Updates

Deployment Environment

Raza

- Hosting Platform: [Amazon Web Services](#)
 - Operating System: [Ubuntu 16.04.1](#)
 - Web Server: [Apache HTTP Server 2.4](#)
 - Database: [MongoDB](#)
-

Testing

Zhang/Hofer

1. Build user acceptance test scenarios for documented requirements on separate Wiki page, linked to all sprints.
2. Build unit test scenarios.
3. Describe regression testing and your regression testing plan.
4. Describe how your team will perform integration testing. What needs to be integrated? When?
5. Describe which tests are for verification and which tests are for validation.

User Acceptance Test (UAT) Scenarios

Data Scientist Uploads Manifest

- The user enters the upload page, selects file from local directory and uploads manifest to the server.

Data Scientists Review Manifest

- The user selects a manifest and review it. The required manifest is sent in response to query.

Data Scientists Search for Manifest

- The user searches a manifest by keywords, the results can also be limited by time and author filters.

Data Scientists Notify Changes to Other Users

- The data scientist sends a notification about changes to the author.

System Admin Bans an Illegal Data Scientist

- The data scientist account is transferred to the "banned" group. A notification is sent to the user as well as the reason for the ban.

System Admin Deletes an Illegal Manifest

- The manifest is deleted (moved to "trash" group), and a notification and reason are sent to its author.

User Experience

- The stability of the system is acceptable.
- The reaction time is short.

Unit Test Scenarios

Login Function

- If the user exists, the action continues.
- If the user does not exist, further action is denied and the error message is shown.

Search for Manifest Function

- The system finds the record from database by matching the keywords.
- The system returns an error message if no record is found.

Upload Function

- The file is stored in the database.

Download Function

- The required file is pulled from database and presented to the user.

Edit/Delete Manifest Function

- The manifest is changed and database is updated.

Failure Case

- Error message is displayed. The expected value and return value are compared.

Regression Testing

- Regression testing is a type of software testing that verifies that software previously developed and tested still performs correctly even after it was changed or interfaced with other software.
- In this system, a set of unit tests are prepared to cover all the functions of the software. The tests are run after every update or bug fixing.

Integration Testing

- Integration testing is the phase in software testing in which individual software modules are combined and tested as a group.
- We will perform integration testing after unit tests. It tests how the website responses to a user behavior.

User Uploads Manifest

- The user can sign in, and choose the file to be uploaded, after the system check the file, the file is uploaded and the success message shows.

User Reviews Manifest

- The manifest is searched on the server. If it is still valid, it is extracted from database and shows to the user.

System Admin Bans an Illegal Data Scientist

- The data scientist account is transferred to the "banned" group. A notification is sent to the user as well as the reason for the ban.

System Admin Deletes an Illegal Manifest

- The manifest is deleted (moved to "trash" group), and a notification and reason are sent to its author.

Failure Case

- The system returns an error page when the required page is not found, or the server is down.

Testing Edge Cases

Validating user inputs

When user searches for a manifest, or filling the information for a manifest

- the input cannot be empty
- the input cannot be too long or too large

Unit tests are used for these special cases

Responsive layouts

The design layout should account for the device to be used. For our case it is not a problem since we will assume medium or large device is used for data scientists. However, we may consider its application for mobiles devices.

Accessibility

We may consider the accessibility for special cases

- User with color-blind problem may have difficulty in viewing the image. When there is a important message, the app should notify with text instead of color information.
- User with slow internet connections may wait a long time for loading the page. The design should try to minimize unnecessary effort on transmission.

We test that by asking other people to use the web app.

Edge cases to ignore

Not all potential cases are required to be accounted for. For example, most of people have java embed in their web browser, and most people do not use an old version browser like IE5. If problems are caused by these reasons, it can simply show an alert for the user to notify the problem. Since there are too many edge cases with low possibilities.

Testing Summary

- The unit testing, integration testing and regression testing are for verification, the user acceptance test is for validation.
-

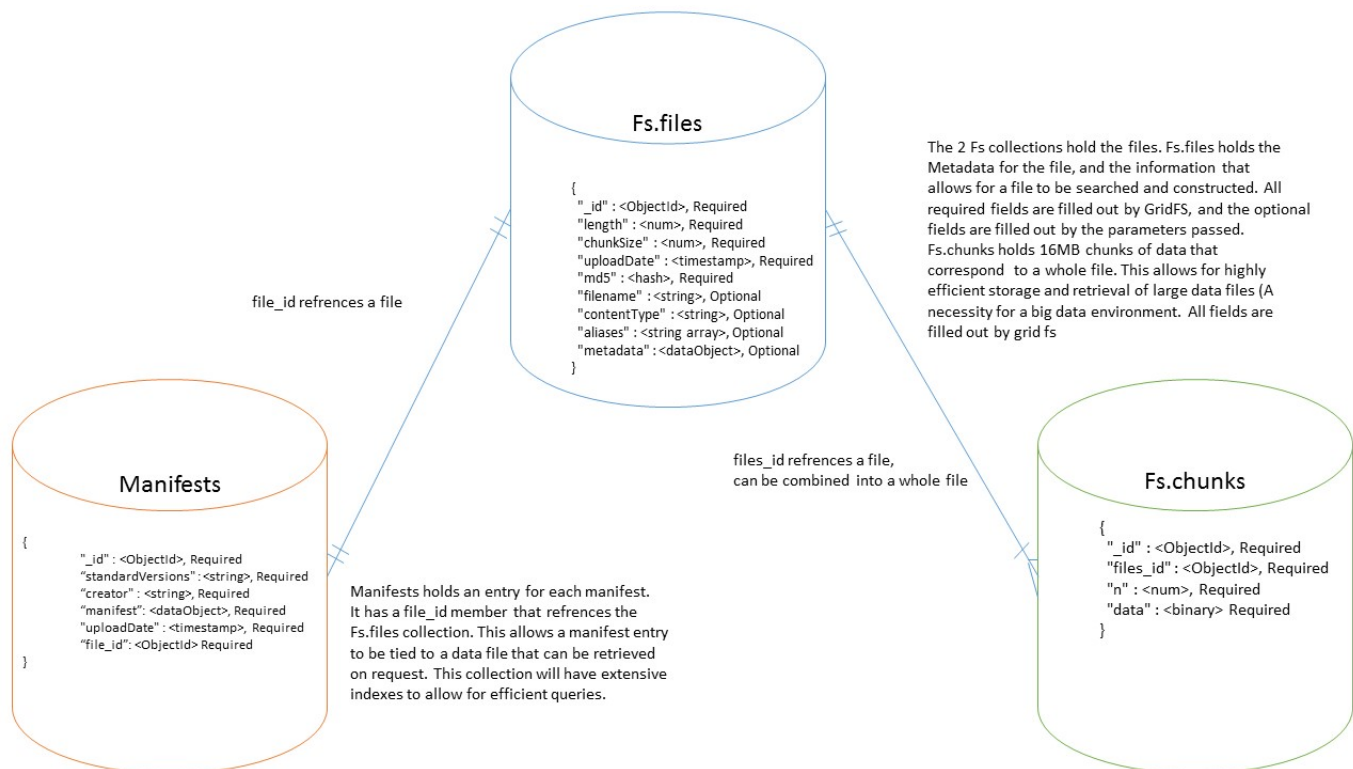
Sprint 2 Updates

Database

Hofer/Raza

The database interface, written in python, allows for easy use of insert, update, search, and delete functionality for the database. Error checking is implemented to ensure that database integrity is maintained. Document Validation (Encoded by the creation statements) will check that all manifests are up to standard, and as such, do not need to be checked by the dml (Although they should be checked in the business layer). The Unit tests validate these functions, and will ensure that they are valid throughout creation of the system. The database also no longer has a user collection, as it is no longer required for login. As such, the user collection has been removed (Including from the ERD). The ERD also now uses Crows Feet notation to represent relationships, and required fields are marked.

Updated Pseudo-ERD



The python code for inserts, updates, searches, and deletes.

```
from pymongo import MongoClient #Mongodb functionality

#initialize to the collections that we want
client = MongoClient()
db = client.test

m_col = db.Manifests #the collection of manifests

def search_manifest(lookup):
    ''' finds all manifests that match pattern provided and returns the
    cursor of results
    Returned value is a cursor that can be iterated through with a for
    loop '''
    return m_col.find(lookup)

def insert_manifest(manifest):
    ''' Insert given manifest if it exists. Returns True on success,
    or False on error (Failed document validation or no manifest was
    passed in) '''
    if(manifest): #basic error checking
        post_id = m_col.insert_one(manifest)
```



```

        ''' we have the object id for the new manifest, and we could
return it if we like
        We could also return a tuple containing the Boolean value and the
object id
        This way we could later do a lookup on the manifest, which would
give us
        access to its metadata. As we do not have any important metadata
at the
        moment, we will just give a simple error check '''
        if(post_id):
            return True
        return False

def remove_manifest(oid):
    ''' Delete manifest specified by internal object id. Access this
object id
    within the manifests metadata. returns True on succesful delete,
    or False if unable to delete (No matching oid, no oid provided) '''
    if(oid):
        ''' Delete based on oid. Only can fail if the oid is invalid
        In which case, wow, we are corrupting our own metadata somewhere
        in the business logic or the view. At least we would know that we
have
        an error '''
        result = m_col.delete_one({'_id': oid})
        if(result.deleted_count == 1):
            return True

    return False

def update_manifest(oid, manifest):
    ''' Updates the manifest specified by the given internal object id.
    Changed to match the new manifest provided. Returns True
    if the document was succesfully updated, and returns False if it
    failed. '''
    if(oid and manifest):
        #We actually want to remove the old manifest, and replace it with
a new one
        old_doc = m_col.find_one_and_replace({"_id": oid}, manifest)
        #the old manifest was returned, so we can store an archive of
manifests down
        #the road. For the monent, we will just check that something was
there before
        if(old_doc[0]):
            return True
    return False

```

Unit tests for these functions

```

from dml import insert_manifest, remove_manifest, update_manifest,
search_manifest

to_insert = {
    "manifests": {
        "manifest": {
            "standardVersions": "ocdxManifest schema v.1",
            "id": "https://datahub.io/dataset/iDas",
            "creator": "Ali Raza",
            "dateCreated": "2016 - 10 - 27",
            "comment": "First test manifest",
            "researchObject": {
                "title": "iDAS Manifest",
                "abstract": "Data collected at the Interdisciplinary Data
Analytics and Search lab at the University of Missouri by Computer Science
researchers and Data Scientists.",
                "dates": {
                    "date": {
                        "date": "2005 - 04 - 27",
                        "label": "start"
                    }
                },
            },
        },
        "privacyEthics": {
            "oversight": {
                "label": "No assertion"
            }
        },
        "informedConsent": "No assertion",
        "anonymizedData": {
            "label": "No assertion"
        },
        "privacyConsiderations": "No assertion"
    },
    "provenance": {
        "narrative": "The Interdisciplinary Data Analytics and Search
(iDAS) lab is one of the many research labs operating out of The University
of Missouri, Columbia. As the name implies, iDAS combines researcher across
departments to achieve solutions to problems in academia. Founded in 2005 by
Dr. Chi-Ren Shyu, iDAS researchers are primarily Computer Scientist, but the
lab also works with Medical Doctors, Biologist, and Statisticians."
    },
    "publications": {
        "publication": "No assertion"
    },
}

```

```

    "locations": {
        "location": {
            "url": "",
            "comment": ""
        }
    },
    "files": {
        "file": {
            "name": "iDAS - data.csv"
        },
        "format": ".csv",
        "abstract": "Metadata for 5000 records collected",
        "size": "No assertion",
        "url": "No assertion",
        "checksum": "No assertion"
    },
    "permissions": "No assertion"
},
"dates": {
    "date": {
        "date": "2014 - 02 - 15"
    },
    "label": "Created"
},
"creators": {
    "creator": {
        "name": "Chi-Ren Shyu",
        "role": {
            "label": "Other"
        }
    },
    "type": {
        "label": "No assertion"
    },
    "contact": "cshyu@wikimedia.org"
}
}

to_replace = {
    "manifests": {
        "manifest": {
            "standardVersions": "ocdxManifest schema v.1",
            "id": "https://datahub.io/dataset/sociallyCompute",
            "creator": "Sean Goggins",
            "dateCreated": "2016 - 08 - 13",

```

```

    "comment": "Second test manifest",
    "researchObject": {
      "title": "Socially Compute Manifest",
      "abstract": "Data mined from socail networks for the
purpose of consumer trend analytics.",
      "dates": {
        "date": {
          "date": "1992 - 03 - 11",
          "label": "start"
        }
      }
    },
    "privacyEthics": {
      "oversight": {
        "label": "No assertion"
      }
    },
    "informedConsent": "no assertion",
    "anonymizedData": {
      "label": "No assertion"
    },
    "privacyConsiderations": "No assertion"
  },
  "provenance": {
    "narrative": "Socially Compute is an ongoing project aiming
to analyze trends of everyday people to make meaningful connections."
  },
  "publications": {
    "publication": "No assertion"
  },
  "locations": {
    "location": {
      "url": "",
      "comment": ""
    }
  },
  "files": {
    "file": {
      "name": "Socially Compute - sc.csv"
    },
    "format": ".csv",
    "abstract": "Metadata for 15000 records collected over two
decades",
    "size": "No assertion",
    "url": "No assertion",
    "checksum": "No assertion"
  }
}

```

```

        },
        "permissions": "No assertion"
    },
    "dates": {
        "date": {
            "date": "2016 - 10 - 28"
        },
        "label": "Created"
    },
    "creators": {
        "creator": {
            "name": "Sean Goggins",
            "role": {
                "label": "Other"
            }
        },
        "type": {
            "label": "No assertion"
        },
        "contact": "sg@wikimedia.org"
    }
}

```

```

#Insert the first test manifest
test = insert_manifest(to_insert)

```

```

if(not test):
    print("Bad insert")
else:
    print("Good insert")

```

```

#Ensure that the manifest was inserted properly

```

```

found = search_manifest({})[0]
if(found['creators']['contact'] == to_insert['creators']['contact']):
    print("Match")
else:
    print("No Match")

```

```

#Update to Second manifest

```

```

test = update_manifest(found['_id'], to_replace)
if(not test):
    print("Bad update")
else:
    print("Good update")

```

```

#Ensure good manifest update

```

```

found = search_manifest({})[0]
if(found['creators']['contact'] == to_insert['creators']['contact']):
    print("Did not replace")
elif(found['creators']['contact'] == to_replace['creators']['contact']):
    print("Good Replace")
else:
    printf("replace corruption")

#remove the manifest
test = remove_manifest(found['_id'])
if(not test):
    print("Bad remove")
else:
    print("Good remove")

```

User Interface

Skinner/Rogers

- [Link](#)
- The Homepage UI is functional.
- A Data Scientist will be able to search for manifests from the homepage and view details for the desired manifest through a link for each search result.
- Currently, the search results are dummy datasets until the database can be linked with the View.
- The GUI is developed using the Materialize framework for styling and JavaScript/jQuery for the front-end business logic.
- The navigation bar at the top of the page provides easy access to all main functions of the application.
- The "Login" button opens a Modal box that allows a Data Scientist to log in with a Google Account.

User Accounts

Rogers/Skinner

- Implemented via Google's OAuth 2.0 API.
- A Data Scientist can log in with a Google account.
- A Google login page appears to the user, the user logs in with Google credentials.
- The Google API returns a unique user_id token, which is stored in the Database.
- Due to limited use cases, and limitations of the Google API, there is not a dedicated administrative user. Instead, all logged in data scientists have full read/write access.
- [Documentation](#)

Testing Updates

Zhang/Raza

- [Sprint1 Testing Updates](#)

- Unit tests for the Database insert, update, search, and delete functions are implemented as a python script. (See Sprint 2, Database)

Sprint 3

Overall Task List (Sprints 1-3)

Justin Hofer

- Developed database structure
- Developed business logic structure
- Implemented document validation for manifests
- Implemented insert, search, update, and delete statements for manifests
- Developed all tests for database
- Implemented file logic
- Wrote ERD
- Database creation logic
- Validated seed data for database
- Helped with requirements document

Holt Skinner

- Project Manager
 - Directed Tasks
 - Facilitated Communications
- Documentation Compilation and Submission
 - Transcribed Markdown Document to Microsoft Word and PDF files
 - Compiled Initial Requirements Analysis Document
 - Compiled All Sprint Documentation files
- Initial UI Implementation
 - Designed Homepage and subsequent pages from Materialize Framework
 - Created HTML, CSS, and JavaScript for Homepage
 - Implemented Front-end "Login with Google" logic in JavaScript

Bo Zhang

- Designed and described all testing documentation
- Designed and implemented business logics for manifests
- Analyzed user requirements
- Replaced php calls with jQuery in Front-end Business logic

Bradley Rogers

- UI Design and Implementation
- Implemented Front-end logic with JavaScript

Ali Raza

System Administrator

- Deployed web server
- Setup user accounts
- Installed dependencies
- Installed required programs

Documentation

- User Documentation
- Created Temporal Logic

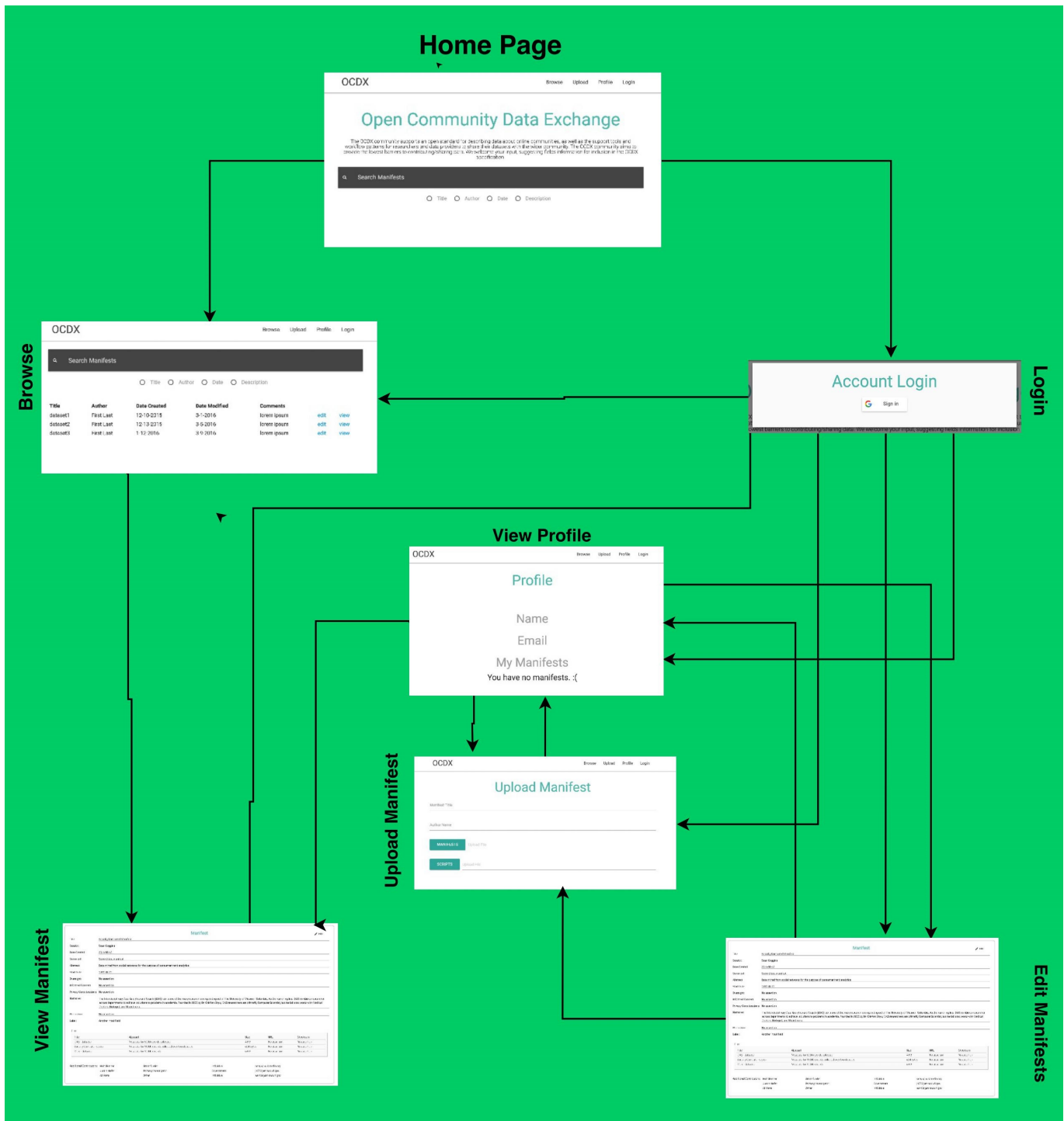
Business Logic

- Begin accepting user inserted values for manifests
- Implemented flask application that receives client side JSON and POST to server side python scripts

Pramod Pudotha

- Did not participate

User Interface Temporal Logic



Complete

- Home Page/Search
- Browse

- View Profile
- Account Login
- Upload Manifest

Work in Progress

- View/Edit Manifest

Omitted

- Data Visualizations

Testing Updates

Files (Justin Hofer)

- Need to ensure that a user can upload, remove, and download files. User also needs to be able to change how a file is tied to a manifest (i.e. change the file, upload a new one, remove a file).
- To test this, an automated script will be run which will first perform unit tests that will upload a test file, verify it is there, retrieve it, validate the file's data, then perform a delete and ensure its removal. Then the test will attempt to tie a test file to a manifest, and remove the tie to the manifest. Finally, manual integration tests will be performed to ensure lossless transfer.

User Documentation

- See UserDocumentation.pdf

Remaining Tasks for Sprint 4

- Convert remaining php scripts to python.
- Link database queries to user interface via python business logic.
- Add styling to View/Edit manifests pages in UI.

Sprint Meeting Notes

11-15-2016

Members Present:

- Pramod
- Justin
- Brad
- Holt
- Ali

-Bo

Task List:

-Ali:

- Convert UI logic to python applications using flask

- browse.php

- header.php

- footer.php

- Begin User documentation

- Deployment documentation (Sprint 4)

-Justin:

- Gridfs for file system implementation

-Bradley/Holt:

- Continue front end design

-Pramod:

- Update documentation

-Holt:

- Documentation correction/formatting

Decisions:

- Convert php files to python

11-16-16

Members Present:

- Brad

- Bo

- Ali

Work Done:

- Ali began user documentation for sprint

- Bo is working on temporal logic for sprint 3

- Brad is working on the viewing/editing manifests

Decisions:

- Email Dr. Goggins for clarification on Manifest format
 - Email has been sent.
 - Currently waiting for response.
- Test whether PHP 5.4 works w/ Mongo
 - Ali will do this on a separate server.
 - If successful, we will downgrade PHP to 5.4 on production server.
 - If not successful, we will convert PHP to Python/Flask

11-17-16

Members Present:

- Holt
- Brad
- Justin
- Ali
- Bo

Decisions:

- Allow users to insert manifest via JSON
- Give access to manifest specifications
- Make individual markdown of task list
- Implement Ajax calls to Python scripts
- Continue Grid FS implementation
- Temporal Logic (Ali)

Actions:

- Converted PHP include statements to jQuery
-

Change Log

- Version 1.0: Pre-Implementation Design *10-16-2016*
- Version 1.1: Sprint 1 *10-31-2016*
- Version 1.2: Sprint 2 *11-11-2016*
 - Made Fixes/Changes to Initial Requirements Analysis/Design and Sprint 1 Documentation
- Version 1.3: Sprint 3 *11-18-16*
 - Made updates to Sprint 2 Documentation for Regrade.