Final Project 2023S SSW567-WS

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Part4- Test Planning
Team: C

Test Engineers
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Part 4: Test Planning

1. Introduction
    - Overall system and high-level goals
        - The overall system described in ICAO Doc 9303 Part 3 is the system for machine-readable travel documents -MRTDs. This includes things like passports and visas. The high-level goal here is to ensure the security and efficiency of people moving across international borders without frauds. The given document outlines technical specifications for MRTDs mainly covers guidelines for the use of biometric data and security features. The standard specifies the conditions that must be satisfied for a document to be regarded as secure and legitimate for usage globally.

    - Testing strategy Executive Summary - a very high-level overview
        - ICAO Doc 9303 Part 3 outlines the testing strategy on high-level focusing on the testing approach that should be used to ensure the MRTD meets the specifications and standards. The several components include test plans and procedures, testing tools, and certification processes. These help to check that the MRTD is thoroughly tested. The testing strategy is divided into phases - design testing, production testing, and field testing. The focus of the testing will be on confirming the functioning and security of the storage, processing, and transfer of passport data, and it will comprise both manual and automated testing of the software. The protection of the passport data will also be ensured through security testing. To ensure traceability and repeatability, all testing will be carried out in compliance with ICAO requirements and will be documented. The testing strategy's overarching objective is to examine the software's performance in line with ICAO Passport Standard 9303 Part 3, as well as its quality and security.

    - Development Approach
        - We used the agile development approach, this is because it emphasizes and ensures flexibility, collaboration, and continuous delivery. Another reason is it involves working in development cycles and prioritizes collaboration and communication among team members.

    - Impact of development approach on testing

- The team's choice of development methodology directly affects the testing procedure. For instance, in agile development method testing is a continuous and ongoing process that involves working closely with developers to ensure thorough testing at each stage of development. This helped us to identify defects and issues early on allowing us to quickly fix the defects. Since agile also encourages collaboration and communication, it helped us towards effective testing and maintaining quality.

2. Reference other relevant documents

- Relevant information in the given document
  - Part-1 Machine Readable Passports: overview of technical specifications for machine-readable passports.
  - Part-2 Specifications for Electronic Passport Biometrics: technical specifications for the use of biometric data in electronic passports.
  - Part-3 Specifications common to all MRTDs: including machine-readable passports, visas, and other official travel documents.
  - Part-4 Machine Readable Travel Documents and Biometric Identification of Persons: guidance on the use of biometric data for identity verification in machine-readable travel documents.
  - Part 5: Machine Readable Official Travel Documents: technical specifications for machine-readable official travel documents.

3. Testing Scope
   - What are we testing?
     - Checking if the system is correctly handling MRZ information obtained as two separate strings so that the system can correctly identify and extract the relevant fields from the two strings and calculate and verify the check digits for each field.
     - Decoding functionality of the system to check the 2 strings are decoded into their correct fields and respective checks have been identified.
     - Encoding functionality of the system to check if it can correctly encode travel document information fields queried from a database into the two strings.
     - Check digit validation functionality by comparing information fields with their respective check digits, and reporting mismatch if needed.

   - What are we not testing?
     - Since the project only involves testing the software part of the system, the hardware device scanner hardware or firmware is not tested.
     - Testing actual database interaction because it is not in the testing scope of this project.
     - We do not test different languages, character sets or regional formats as this is out of scope for this project.

- Criteria we used for prioritizing tests
    - The criteria were mainly based on the impact and risk associated with each test. Firstly, we evaluated the potential impact of a test failure on the system and weighed it against the potential risk of the test.
    - We also considered the resources available to execute the tests, including the level of effort and time required, and the cost associated with each test.
    - Lastly, looked at the criticality of the functionality being tested and likelihood of a failure and its consequences for determine which tests should be given the highest priority. For instance, tests that provide the highest level of coverage and tests that were dependent on other tests or components, were prioritized in the order of their dependencies.

4. Testing approach
    - key factors
        - This basically includes the requirements and specifications of the system, the prioritized tests, the available testing resources and tools, and the testing timeline.

    - Key risks
        - Incorrect/incomplete input data: In the information is inaccuracy and incomplete it can be a potential risk. Errors in data input can lead to incorrect check digits which would lead to further issues.
        - Integration issue: Since there are multiple stages the system is developed in there can be issues between different modules. Like the database interacting incorrectly with the scanner can lead to incorrect encoding of the travel document.
        - Data Risks: Protecting valuable information like travel document is of utmost importance because there are people would be constantly wanting to access that information for crimes or identity theft. A fake passport can also be used for financial operations like money laundering.
        - Compliance issues: The system must comply with various standards and regulations according to the travel industry and would risk compliance if relevant regulations and standards are not followed
        - Performance issues: The are a lot of people who travel through international borders in a day. So, the system must be able to handle large volumes of data and process it accurately. Failing to do it might risk the performance. For instance, when covid start and the international borders were about to close, a considerable amount of people were traveling to their home countries, in such cases the system failing would be a huge risk not just in terms of performance but also in terms of security.

    - Success Criteria
        - The system must adhere to all ICAO standards and specifications along with applicable laws and regulations. The passport should protect the users' private information and to provide a reliable and secure method of identity verification would also be considered a success criterion.

    - The success criteria would include achieving a high level of testing coverage, identifying and resolving critical defects, meeting the user requirements, and delivering the system on time, within budget and with 80%+ accuracy.

- Contingency Plans
    - Secure authentication for accessing encoded passport data.
    - Accurate passport data encoding/decoding tests.
    - Efficient and reliable scanning process.
    - Error management plan for passport scanning and encoding/decoding

- Item Pass/Fail Criteria
    - Record error rate: acceptable system accuracy is 99.9999999% (nine-nines)

- Entry/Exit Criteria:
    - Entry: valid MRTD in possession, not expired, recent photo in VIZ
    - Exit: officer access to passport validity, travel history, and VIS information

- Test Criteria
    - Verifying the content accuracy of the document by ensuring all the data and language in the document are latest and correct.
    - Verifying document format and layout by making sure that all the content is organized in the document.
    - Verifying that all the links in the document function properly and that it can be read and printed.
    - Making sure the document is safe and far from unwanted access or manipulation.
    - The document is accessible through all the browsers.

- Checkpoints:
    - Test Planning: Test Planning Document
    - Requirements Testing: Requirements
    - Unit Testing: MRTDTest.py and Unit Testing Report
    - Mutation Testing: Mutation Testing Score and Report
    - Performance Testing: Performance.py and Performance Testing Report
    - Acceptance Testing: User Interviews and Usability Testing Report

- Deliverables

    - Reports detailing work, decisions, and results for each stage. Includes success metrics, reflections, and next steps.

- Budget
    - $250,000 total, with $100,000 allocated for testing and the remainder for design and development.

- Resources
    - 3 Testing Engineers
    - 1 QA Engineer
    - 1 Team Manager

- Man Hours - 40 hours/week
- Tools used: The tools used for this project are:
    - Unit testing
    - Coverage
    - Pylint
    - Circle ci(Continuous Integration)
    - Mutation testing

- Automation Strategy
    - Utilize Unit, Performance, and Functional Testing to ensure system functionality without flaws.

- Unit Testing: Tests individual components of Passport Scan's encode and decode functionality, verifying proper operation and output accuracy.
- Performance Testing: Assesses system performance under various conditions, such as differing throughputs, to confirm expected behavior.
- Functional Testing: Examines overall functionality, ensuring correct encoding and decoding of data and the absence of system issues. Automation expedites testing and development processes with automated tools for correctness and completeness checks.

- Testing types, methodologies, and techniques:

    - Requirement Reviews: Requirements gathered from the assignment and PDF include decoding strings, check-digit algorithm implementation, and encoding strings.
    - Design Reviews: Module designed with decode() and encode() functions to fulfill requirements.
    - Unit Testing: Unit test cases created for full functionality coverage using Unittest and Mutation testing.

- Usability Testing: Ensured code and unit test comprehensibility and ease of execution through teammate code reviews and repeated test cases, maintaining a Test Execution Report.
- Performance Testing: Conducted by writing a new program, incorporating time library functions in a CSV file, and generating an Excel file.
- System Testing: Ensures code integration with other systems and compliance with integration requirements. Evaluates end-to-end behavior of software and hardware components under various conditions.
- Test Platform: Utilized MacOS and Windows systems running Python 3.10 for Passport Scan testing. Employed unit test library for unit test cases and performance library for code performance measurement. A mock-production environment will be established during the final testing stages.

- Progress Measurement Plan:

  - Test Case Execution Report: Overview of executed test cases and results, including passed, failed, blocked, and unexecuted tests are provided below:

    https://docs.google.com/spreadsheets/d/15pS2TivFYKdCJhm4jdnkQ07_5TdAByRjGje3CSKdkI0/edit?usp=sharing

  - Test Coverage Report: Overview of code coverage achieved by tests, detailing the number of lines of code executed, and the percentage of code covered by the tests. An example of a test coverage report is provided in the below figure.

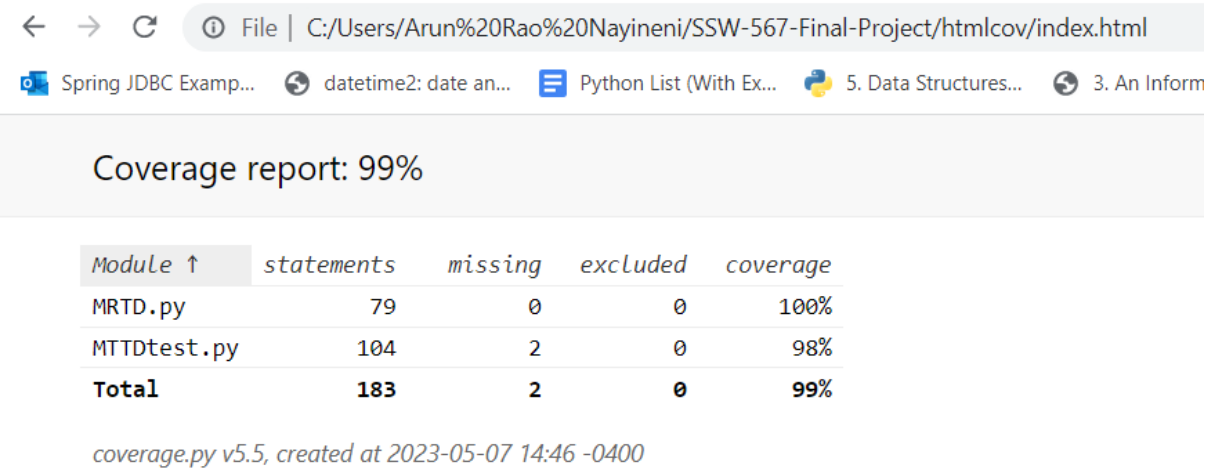

Figure: Snapshot of Coverage Report

- Defect Report: This report summarizes defects detected during testing, including defect count, severity, and resolutions.

TestCaseNo	Scenario	Test Result	Proposed Solution	Test Result
1	Exception decoding file: records_encode.js. (extract1 functionality: decode failed to read data)	Fail	Adjusted code for missing middle name (handles both first and middle names given)	Pass

- Performance Report: Provides an overview of system performance, covering response time, throughput, memory usage, and CPU utilization. An in-depth analysis is needed, considering the deployment environment. Preliminary local device testing offers performance insights.

Lines read (n)	Encode Performance (s)	Decode Performance (s)
100	0.00368379200	0.00323529200
1,000	0.03592770800	0.03185566700
2,000	0.07190883400	0.06399629200
3,000	0.10682275000	0.09675112500
4,000	0.14279737500	0.12927483300
5,000	0.17801850000	0.15994108400
6,000	0.21418037500	0.19589658300
7,000	0.24956683400	0.22731129100
8,000	0.28483079100	0.26147708400
9,000	0.32003737500	0.28104670800
10,000	0.35544920900	0.31050629100

- System Readiness: The system is ready for shipping upon completion of all test cases, bug fixes, acceptable code coverage, and performance tests.

- Schedule:

Date	Task
1-Jan-23	Project Start
4-Jan-23	Requirement Gathering
9-Jan-23	System Design
13-Jan-23	Development begins
15-Feb-23	Alpha testing
10-March-23	Beta Testing
30-March-23	User Acceptance Testing
12-April-23	System Testing
8-May-23	Integration Testing
19-May-23	Security Testing
5-Jun-23	Regression Testing
21-Jun-23	Security Testing
9-Jul-23	Performance Testing
22-Jul-23	Scalability Testing
9-Aug-23	Stress Testing
19-Aug-23	Final System Testing
25-Aug-23	Final Delivery
1-Sept-23	System delivered

- Approvals:
    1. Project Manager: Ensures project success and plan feasibility.
    2. Funding Agency: Verifies project meets funding criteria and objectives.
    3. Technical Experts: Confirm technical soundness and feasibility.
    4. End-User Representatives: Validate alignment with target audience needs.
    5. Regulatory Agencies: Ensure compliance with regulations.
    6. Senior Management: Confirm alignment with organizational strategy.
    7. Product Owner: Approve test plan according to product requirements and customer needs.
    8. Development Team: Verify test plan covers product development cycle aspects.
    9. QA Team: Ensure the test plan includes appropriate test cases and risk coverage.
    10. Customers: Approve plan based on product fit and testing suitability.