# CS 305 Project One Template

## Document Revision History

| **Version** | **Date** | **Author** | **Comments** |
| --- | --- | --- | --- |
| **1.0** | **Nov 15 2024** | **Joshua Dixon** |  |

## Client



## Instructions

Submit this completed vulnerability assessment report. Replace the bracketed text with the relevant information. In this report, identify your security vulnerability findings and recommend the next steps to remedy the issues you have found.

* Respond to the five steps outlined below and include your findings.
* Respond using your own words. You may also include images or supporting materials. If you include them, make certain to insert them in the relevant locations in the document.
* Refer to the Project One Guidelines and Rubric for more detailed instructions about each section of the template.

## Developer

Joshua Dixon

**1. Interpreting Client Needs**

Determine your client’s needs and potential threats and attacks associated with the company’s application and software security requirements. Consider the following questions regarding how companies protect against external threats based on the scenario information:

* What is the value of secure communications to the company?

Secure communications is impertinent to this company as it is dealing with sensitive consumer information. This company deals with a client’s financial accounts, in which they develop financial plans for customers, allowing them to deposit.

* Are there any international transactions that the company produces?

International transactions are not mentioned within the scenario, so there’s not really much to say about this part. So assuming there are no international transactions focus should be made on domestic transactions and ensuring compliance with their national regulations.

* Are there governmental restrictions on secure communications to consider?

Governmental restrictions on secure communications to consider would be General Data Protection Regulation (GDPR) which applies to handling European citizens, even if the company is not based in the EU. The California Consumer Privacy Act (CCPA) applies to companies handling data of California residents. Another restriction on secure communications to consider would be Payment Card Industry Data Security Standards (PCI DSS) this applies to any organization processing, storing, or transmitting credit card information. Financial Industry Regulatory Authority (FINRA) would be another restriction to consider.

* What external threats might be present now and in the immediate future?

External threats that may be present are phishing and credential theft, injection attacks like SpEL, cross site scripting, and possibly more.

* What modernization requirements must be considered, such as the role of open-source libraries and evolving web application technologies?

Open-source libraries must be vetted for known vulnerabilities using the OWASP dependency checker.

[Include your findings here.]

**2. Areas of Security**

Refer to the vulnerability assessment process flow diagram. Identify which areas of security apply to Artemis Financial’s software application. Justify your reasoning for why each area is relevant to the software application.

* **Architecture Review:** 
  + Prevent injection attacks by validating user input at every entry point or endpoint.
  + Verify that the API design include authentication and encryption measures
* **Input Validation:** 
  + Input validation must be implemented to prevent injection attacks and Cross-Site Scripting
* **APIs:**
  + Secure API interactions by enforcing authentication and using HTTPS
* **Cryptography:**
  + Confirm storage encryption for sensitive data, such as customer account numbers
* Client/Server
  + Focus on client-server interactions, preventing interception and hijacking
* **Code Error:**
  + Implement error handling to avoid exposing sensitive information through the stack trace of an unexpected action
* **Code Quality:**
  + Make sure code quality is up to date with standard practices and to help with auditing
* **Encapsulation:**
  + Ensure sensitive data is only accessible by secure methods
* **Code Review**

**3. Manual Review**

Continue working through the vulnerability assessment process flow diagram. Identify all vulnerabilities in the code base by manually inspecting the code.

* In the CRUDController the business\_name parameter passed to the /read endpoint is directly used without any validation or sanitization, which could expose the application to injection vulnerabilities.
* In the CRUDController DocData object’s toString() method is returned directly in the CRUD object, if it contains sensitive or internal information this could lead to data leakage.
* In the DocData file the SQL connections credentials have been hardcoded which exposes sensitive information making it vulnerable to unauthorized access.
* The Error Handling in DocData prints the stack trace which again poses a vulnerability threat by revealing sensitive information.
* In the Greetings class the input of content could be used to store or retrieve content without proper sanitization leading to vulnerabilities like cross site scripting.
* Vulnerabilities for the GreetingController class could be the potential for Cross-Site Scripting that could occur when inserting a name, which is why validation is essential.
* In the customer class the account\_balance has a package private access meaning that it can be accessed anywhere in the package allowing it to be modified. Violating the encapsulation rules and leaving no need for the deposit method.
* There must validation for the deposit method in the customer class

**4. Static Testing**

Run a dependency check on Artemis Financial’s software application to identify all security vulnerabilities in the code. Record the output from the dependency-check report. Include the following items:

| **Dependency** | **Vulnerability IDs** | **Package** | **Severity** | **CVE Count** | **Confidence** | **Evidence Count** |
| --- | --- | --- | --- | --- | --- | --- |
| [bcprov-jdk15on-1.46.jar](#l1_991c96a4e31e6c19e2b9136c8955bd423f2d) | cpe:2.3:a:bouncycastle:bouncy-castle-crypto-package:1.46:\*:\*:\*:\*:\*:\*:\* cpe:2.3:a:bouncycastle:bouncy\_castle\_crypto\_package:1.46:\*:\*:\*:\*:\*:\*:\* [cpe:2.3:a:bouncycastle:bouncy\_castle\_for\_java:1.46:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Abouncycastle&cpe_product=cpe%3A%2F%3Abouncycastle%3Abouncy_castle_for_java&cpe_version=cpe%3A%2F%3Abouncycastle%3Abouncy_castle_for_java%3A1.46) [cpe:2.3:a:bouncycastle:legion-of-the-bouncy-castle-java-crytography-api:1.46:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Abouncycastle&cpe_product=cpe%3A%2F%3Abouncycastle%3Alegion-of-the-bouncy-castle-java-crytography-api&cpe_version=cpe%3A%2F%3Abouncycastle%3Alegion-of-the-bouncy-castle-java-crytography-api%3A1.46) cpe:2.3:a:bouncycastle:the\_bouncy\_castle\_crypto\_package\_for\_java:1.46:\*:\*:\*:\*:\*:\*:\* | [pkg:maven/org.bouncycastle/bcprov-jdk15on@1.46](https://ossindex.sonatype.org/component/pkg:maven/org.bouncycastle/bcprov-jdk15on@1.46?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | HIGH | 22 | Highest | 38 |
| [hibernate-validator-6.0.18.Final.jar](#l3_7fd00bcd87e14b6ba66279282ef15efa30dd) | [cpe:2.3:a:redhat:hibernate\_validator:6.0.18:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aredhat&cpe_product=cpe%3A%2F%3Aredhat%3Ahibernate_validator&cpe_version=cpe%3A%2F%3Aredhat%3Ahibernate_validator%3A6.0.18) | [pkg:maven/org.hibernate.validator/hibernate-validator@6.0.18.Final](https://ossindex.sonatype.org/component/pkg:maven/org.hibernate.validator/hibernate-validator@6.0.18.Final?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | MEDIUM | 2 | Highest | 32 |
| [jackson-databind-2.10.2.jar](#l5_0528de95f198afafbcfb0c09d2e43b6e0ea6) | [cpe:2.3:a:fasterxml:jackson-databind:2.10.2:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Afasterxml&cpe_product=cpe%3A%2F%3Afasterxml%3Ajackson-databind&cpe_version=cpe%3A%2F%3Afasterxml%3Ajackson-databind%3A2.10.2) cpe:2.3:a:fasterxml:jackson-modules-java8:2.10.2:\*:\*:\*:\*:\*:\*:\* | [pkg:maven/com.fasterxml.jackson.core/jackson-databind@2.10.2](https://ossindex.sonatype.org/component/pkg:maven/com.fasterxml.jackson.core/jackson-databind@2.10.2?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | HIGH | 6 | Highest | 39 |
| [log4j-api-2.12.1.jar](#l10_a55e6d987f50a515c9260b0451b4fa217dc) | [cpe:2.3:a:apache:log4j:2.12.1:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aapache&cpe_product=cpe%3A%2F%3Aapache%3Alog4j&cpe_version=cpe%3A%2F%3Aapache%3Alog4j%3A2.12.1) | [pkg:maven/org.apache.logging.log4j/log4j-api@2.12.1](https://ossindex.sonatype.org/component/pkg:maven/org.apache.logging.log4j/log4j-api@2.12.1?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | LOW | 1 | Highest | 42 |
| [logback-core-1.2.3.jar](#l12_864344400c3d4d92dfeb0a305dc87d95367) | [cpe:2.3:a:qos:logback:1.2.3:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aqos&cpe_product=cpe%3A%2F%3Aqos%3Alogback&cpe_version=cpe%3A%2F%3Aqos%3Alogback%3A1.2.3) | [pkg:maven/ch.qos.logback/logback-core@1.2.3](https://ossindex.sonatype.org/component/pkg:maven/ch.qos.logback/logback-core@1.2.3?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | HIGH | 2 | Highest | 31 |
| [snakeyaml-1.25.jar](#l14_8b6e01ef661d8378ae6dd7b511a7f2a33fa) | [cpe:2.3:a:snakeyaml\_project:snakeyaml:1.25:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Asnakeyaml_project&cpe_product=cpe%3A%2F%3Asnakeyaml_project%3Asnakeyaml&cpe_version=cpe%3A%2F%3Asnakeyaml_project%3Asnakeyaml%3A1.25) | [pkg:maven/org.yaml/snakeyaml@1.25](https://ossindex.sonatype.org/component/pkg:maven/org.yaml/snakeyaml@1.25?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | CRITICAL | 8 | Highest | 44 |
| [spring-boot-2.2.4.RELEASE.jar](#l15_225a4fd31156c254e3bb92adb42ee8c6de8) | [cpe:2.3:a:vmware:spring\_boot:2.2.4:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Avmware&cpe_product=cpe%3A%2F%3Avmware%3Aspring_boot&cpe_version=cpe%3A%2F%3Avmware%3Aspring_boot%3A2.2.4) | [pkg:maven/org.springframework.boot/spring-boot@2.2.4.RELEASE](https://ossindex.sonatype.org/component/pkg:maven/org.springframework.boot/spring-boot@2.2.4.RELEASE?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | CRITICAL | 3 | Highest | 39 |
| [spring-boot-starter-web-2.2.4.RELEASE.jar](#l16_ec75d01d212b5229c16d872fb127744c0ed) | [cpe:2.3:a:vmware:spring\_boot:2.2.4:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Avmware&cpe_product=cpe%3A%2F%3Avmware%3Aspring_boot&cpe_version=cpe%3A%2F%3Avmware%3Aspring_boot%3A2.2.4) [cpe:2.3:a:web\_project:web:2.2.4:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aweb_project&cpe_product=cpe%3A%2F%3Aweb_project%3Aweb&cpe_version=cpe%3A%2F%3Aweb_project%3Aweb%3A2.2.4) | [pkg:maven/org.springframework.boot/spring-boot-starter-web@2.2.4.RELEASE](https://ossindex.sonatype.org/component/pkg:maven/org.springframework.boot/spring-boot-starter-web@2.2.4.RELEASE?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | CRITICAL | 3 | Highest | 35 |
| [spring-core-5.2.3.RELEASE.jar](#l17_3734223040040e8c3fecd5faa3ae8a1ed6d) | [cpe:2.3:a:pivotal\_software:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Apivotal_software&cpe_product=cpe%3A%2F%3Apivotal_software%3Aspring_framework&cpe_version=cpe%3A%2F%3Apivotal_software%3Aspring_framework%3A5.2.3) [cpe:2.3:a:springsource:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aspringsource&cpe_product=cpe%3A%2F%3Aspringsource%3Aspring_framework&cpe_version=cpe%3A%2F%3Aspringsource%3Aspring_framework%3A5.2.3) [cpe:2.3:a:vmware:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Avmware&cpe_product=cpe%3A%2F%3Avmware%3Aspring_framework&cpe_version=cpe%3A%2F%3Avmware%3Aspring_framework%3A5.2.3) | [pkg:maven/org.springframework/spring-core@5.2.3.RELEASE](https://ossindex.sonatype.org/component/pkg:maven/org.springframework/spring-core@5.2.3.RELEASE?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | CRITICAL\* | 11 | Highest | 36 |
| [spring-expression-5.2.3.RELEASE.jar](#l18_d0c6bb10758805b2153c589686b8045554b) | [cpe:2.3:a:pivotal\_software:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Apivotal_software&cpe_product=cpe%3A%2F%3Apivotal_software%3Aspring_framework&cpe_version=cpe%3A%2F%3Apivotal_software%3Aspring_framework%3A5.2.3) [cpe:2.3:a:springsource:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aspringsource&cpe_product=cpe%3A%2F%3Aspringsource%3Aspring_framework&cpe_version=cpe%3A%2F%3Aspringsource%3Aspring_framework%3A5.2.3) [cpe:2.3:a:vmware:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Avmware&cpe_product=cpe%3A%2F%3Avmware%3Aspring_framework&cpe_version=cpe%3A%2F%3Avmware%3Aspring_framework%3A5.2.3) | [pkg:maven/org.springframework/spring-expression@5.2.3.RELEASE](https://ossindex.sonatype.org/component/pkg:maven/org.springframework/spring-expression@5.2.3.RELEASE?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | CRITICAL\* | 12 | Highest | 36 |
| [spring-web-5.2.3.RELEASE.jar](#l19_dd386a02e40b915ab400a3bf9f586d2dc4c) | [cpe:2.3:a:pivotal\_software:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Apivotal_software&cpe_product=cpe%3A%2F%3Apivotal_software%3Aspring_framework&cpe_version=cpe%3A%2F%3Apivotal_software%3Aspring_framework%3A5.2.3) [cpe:2.3:a:springsource:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aspringsource&cpe_product=cpe%3A%2F%3Aspringsource%3Aspring_framework&cpe_version=cpe%3A%2F%3Aspringsource%3Aspring_framework%3A5.2.3) [cpe:2.3:a:vmware:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Avmware&cpe_product=cpe%3A%2F%3Avmware%3Aspring_framework&cpe_version=cpe%3A%2F%3Avmware%3Aspring_framework%3A5.2.3) [cpe:2.3:a:web\_project:web:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aweb_project&cpe_product=cpe%3A%2F%3Aweb_project%3Aweb&cpe_version=cpe%3A%2F%3Aweb_project%3Aweb%3A5.2.3) | [pkg:maven/org.springframework/spring-web@5.2.3.RELEASE](https://ossindex.sonatype.org/component/pkg:maven/org.springframework/spring-web@5.2.3.RELEASE?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | CRITICAL\* | 16 | Highest | 34 |
| [spring-webmvc-5.2.3.RELEASE.jar](#l20_745a62502023d2496b565b7fe102bb1ee22) | [cpe:2.3:a:pivotal\_software:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Apivotal_software&cpe_product=cpe%3A%2F%3Apivotal_software%3Aspring_framework&cpe_version=cpe%3A%2F%3Apivotal_software%3Aspring_framework%3A5.2.3) [cpe:2.3:a:springsource:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aspringsource&cpe_product=cpe%3A%2F%3Aspringsource%3Aspring_framework&cpe_version=cpe%3A%2F%3Aspringsource%3Aspring_framework%3A5.2.3) [cpe:2.3:a:vmware:spring\_framework:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Avmware&cpe_product=cpe%3A%2F%3Avmware%3Aspring_framework&cpe_version=cpe%3A%2F%3Avmware%3Aspring_framework%3A5.2.3) [cpe:2.3:a:web\_project:web:5.2.3:release:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aweb_project&cpe_product=cpe%3A%2F%3Aweb_project%3Aweb&cpe_version=cpe%3A%2F%3Aweb_project%3Aweb%3A5.2.3) | [pkg:maven/org.springframework/spring-webmvc@5.2.3.RELEASE](https://ossindex.sonatype.org/component/pkg:maven/org.springframework/spring-webmvc@5.2.3.RELEASE?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | CRITICAL\* | 12 | Highest | 36 |
| [tomcat-embed-core-9.0.30.jar](#l21_ad32909314fe2ba02cec036434c0addd19b) | [cpe:2.3:a:apache:tomcat:9.0.30:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aapache&cpe_product=cpe%3A%2F%3Aapache%3Atomcat&cpe_version=cpe%3A%2F%3Aapache%3Atomcat%3A9.0.30) [cpe:2.3:a:apache\_tomcat:apache\_tomcat:9.0.30:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aapache_tomcat&cpe_product=cpe%3A%2F%3Aapache_tomcat%3Aapache_tomcat&cpe_version=cpe%3A%2F%3Aapache_tomcat%3Aapache_tomcat%3A9.0.30) | [pkg:maven/org.apache.tomcat.embed/tomcat-embed-core@9.0.30](https://ossindex.sonatype.org/component/pkg:maven/org.apache.tomcat.embed/tomcat-embed-core@9.0.30?utm_source=dependency-check&utm_medium=integration&utm_content=11.1.0) | CRITICAL\* | 26 | Highest | 30 |
| [tomcat-embed-websocket-9.0.30.jar](#l23_33157f6bc5bfd03380ebb5ac476db0600a0) | [cpe:2.3:a:apache:tomcat:9.0.30:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aapache&cpe_product=cpe%3A%2F%3Aapache%3Atomcat&cpe_version=cpe%3A%2F%3Aapache%3Atomcat%3A9.0.30) [cpe:2.3:a:apache\_tomcat:apache\_tomcat:9.0.30:\*:\*:\*:\*:\*:\*:\*](https://nvd.nist.gov/vuln/search/results?form_type=Advanced&results_type=overview&search_type=all&cpe_vendor=cpe%3A%2F%3Aapache_tomcat&cpe_product=cpe%3A%2F%3Aapache_tomcat%3Aapache_tomcat&cpe_version=cpe%3A%2F%3Aapache_tomcat%3Aapache_tomcat%3A9.0.30) |  |  |  |  |  |

**5. Mitigation Plan**

Interpret the results from the manual review and static testing report. Then identify the steps to mitigate the identified security vulnerabilities for Artemis Financial’s software application.

For my mitigation plan, I intend on implementing input validation anywhere that input is required to mitigate the possibility of injection. Error handling is also something that needs to be addressed as to not overexpose sensitive information displayed through the stacktrace. Another issue that needs to be addressed is hardcoding sensitive information, instead I should use variables to mask the information. The final issue that needs to be addresses as of now is to change the access of a customer’s account balance to a private variable only accessible by that class and not the whole package only allowing the account balance to be changed by using the deposit method.