GLOBALRAIN

Artemis Financial Vulnerability Assessment Report

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Document Revision History

Version	Date	Author	Comments
1.0	18 March 2023	Dante Lee	

Client

ARTEMIS
FINANCIAL

Instructions

Submit this completed vulnerability assessment report. Replace the bracketed text with the relevant information. In the report, identify your findings of security vulnerabilities and provide recommendations for 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 choose to include images or supporting materials. If you include them, make certain to insert them in all 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
Dante Lee

1. Interpreting Client Needs

Artemis Financial, a consulting company that develops customized financial plans, has requested Global Rain to examine their web-based software application to identify any potential vulnerabilities that could be exploited by external threats. The aim of this report is to present the findings of our vulnerability assessment of the Artemis Financial software application and to make recommendations for mitigating the security vulnerabilities that we have identified.

The value of secure communications is critical to Artemis Financial as their financial plans include sensitive financial information. It is not explicitly stated whether Artemis Financial makes any international transactions, but we can assume they operate in a global market due to their role as an investment firm. There are governmental restrictions about secure communications for Artemis Financial, requiring Artemis to ensure confidentiality and security of customer information. Specifically financial information like credit, debit, and account info. There are various other regulations and standards in place that are required to be followed by any company within their software when handling such sensitive data.

The following external threats are present now and in the immediate future:
- Malware attacks that can exploit software vulnerabilities and cause damage to the application and its data
- Phishing attacks that can trick users into revealing sensitive information or accessing malicious websites
- DDoS attacks that can overload the application and bring it down
- Social engineering attacks that can exploit human weaknesses to gain unauthorized access to the application
- Injection/cross site scripting attacks

The modernization requirements that we must consider include the use of open-source libraries that may contain security vulnerabilities and the use of evolving web application technologies that may introduce new security risks. We also need to keep the application up-to-date with the latest security patches and updates to mitigate known vulnerabilities, of which there are many.

2. Areas of Security

Each of the seven areas of security should be paid attention in the Artemis Financial system, as all deserve equal consideration for a financial software application.
- Input validation: It is important to validate all user input fields in Artemis Financial's web-based software application to prevent any malicious input from being submitted and compromising the security of the application. SQL or other injection techniques may disclose private data if input validation is not implemented correctly.
- APIs: The RESTful web API used by Artemis Financial must be designed and implemented with security in mind to prevent attacks such as injection attacks and cross-site scripting (XSS) attacks.
- Cryptography: Artemis Financial should use strong encryption algorithms to protect sensitive financial information transmitted over the network.

- Client/server: The communication channels between the client and server in Artemis Financial's web-based software application should be secured using industry-standard protocols such as HTTPS to prevent man-in-the-middle attacks.
- Code error: It is important to conduct a thorough code review and testing to identify and remediate any code errors or vulnerabilities in the application.
- Code quality: The software development process used for Artemis Financial's software application should prioritize code quality to prevent vulnerabilities from being introduced in the codebase.
- Encapsulation: Sensitive financial information such as customer account details should be encapsulated and only accessible to authorized entities to prevent unauthorized access and potential data breaches.

3. Manual Review

CRUDController.java
The CRUD method in the CRUDController class is susceptible to SQL injection attack because the name parameter is directly used in creating a DocData object, which in turn calls the read_document method where the key and value parameters are not properly sanitized or validated before being used in an SQL query. An attacker could potentially supply malicious SQL code through the name parameter and execute unauthorized queries against the database.

DocData.java
The DocData class should have an immutable id string to ensure it remains unchanged, as each DocData object should be unique.

GreetingController.java
Injection attacks: The name parameter is received as a string and is not sanitized or validated before being used in the String.format() method. This can potentially lead to a form of injection attack if the name parameter is manipulated to include malicious code or special characters. To mitigate this vulnerability, you should validate the input and sanitize any user-supplied data before using it in any string manipulation or database queries.

Cross-site scripting (XSS) attacks: If the name parameter contains HTML or JavaScript code, it can be executed by the user's browser when the response is rendered. This can lead to a form of XSS attack where the attacker can inject malicious code to steal data or perform actions on the user's behalf. To mitigate this vulnerability, you should sanitize any user-supplied data by escaping special characters or using a library such as OWASP Java Encoder.

Denial of Service (DoS) attacks: Since this endpoint does not have any rate limiting or input validation, an attacker can potentially flood the server with requests and overwhelm the system. This can lead to a form of DoS attack where legitimate users are unable to access the system. To mitigate this vulnerability, you can implement rate limiting on the endpoint and validate input to prevent excessive requests.

4. **Static Testing** - Known Vulnerabilities by Dependency

bcprov-jdk15on-1.46.jar

The Bouncy Castle Crypto package is a Java implementation of cryptographic algorithms. This jar contains JCE provider and lightweight API for the Bouncy Castle Cryptography APIs for JDK 1.5 to JDK 1.7.

- CVE-2013-1624: The TLS implementation in the Bouncy Castle Java library before 1.48 and C# library before 1.8 does not properly consider timing side-channel attacks on a noncompliant MAC check operation during the processing of malformed CBC padding, which allows remote attackers to conduct distinguishing attacks and plaintext-recovery attacks via statistical analysis of timing data for crafted packets, a related issue to CVE-2013-0169.
- CVE-2015-6644: Bouncy Castle in Android before 5.1.1 LMY49F and 6.0 before 2016-01-01 allows attackers to obtain sensitive information via a crafted application, aka internal bug 24106146.
- CVE-2015-7940: The Bouncy Castle Java library before 1.51 does not validate a point is withing the elliptic curve, which makes it easier for remote attackers to obtain private keys via a series of crafted elliptic curve Diffie Hellman (ECDH) key exchanges, aka an "invalid curve attack."
- CVE-2016-1000338: In Bouncy Castle JCE Provider version 1.55 and earlier the DSA does not fully validate ASN.1 encoding of signature on verification. It is possible to inject extra elements in the sequence making up the signature and still have it validate, which in some cases may allow the introduction of 'invisible' data into a signed structure.
- CVE-2016-1000339: In the Bouncy Castle JCE Provider version 1.55 and earlier the primary engine class used for AES was AESFastEngine. Due to the highly table driven approach used in the algorithm it turns out that if the data channel on the CPU can be monitored the lookup table accesses are sufficient to leak information on the AES key being used. There was also a leak in AESEngine although it was substantially less. AESEngine has been modified to remove any signs of leakage (testing carried out on Intel X86-64) and is now the primary AES class for the BC JCE provider from 1.56. Use of AESFastEngine is now only recommended where otherwise deemed appropriate.
- CVE-2016-1000341: In the Bouncy Castle JCE Provider version 1.55 and earlier DSA signature generation is vulnerable to timing attack. Where timings can be closely observed for the generation of signatures, the lack of blinding in 1.55, or earlier, may allow an attacker to gain information about the signature's k value and ultimately the private value as well.
- CVE-2016-1000342: In the Bouncy Castle JCE Provider version 1.55 and earlier ECDSA does not fully validate ASN.1 encoding of signature on verification. It is possible to inject extra elements in the sequence making up the signature and still have it validate, which in some cases may allow the introduction of 'invisible' data into a signed structure.
- CVE-2016-1000343: In the Bouncy Castle JCE Provider version 1.55 and earlier the DSA key pair generator generates a weak private key if used with default values. If the JCA key pair generator is not explicitly initialized with DSA parameters, 1.55 and earlier generates a private value assuming a 1024 bit key size. In earlier releases this can be dealt with by explicitly passing parameters to the key pair generator.
- CVE-2016-1000344: In the Bouncy Castle JCE Provider version 1.55 and earlier the DHIES implementation allowed the use of ECB mode. This mode is regarded as unsafe and support for it has been removed from the provider.
- CVE-2016-1000345: In the Bouncy Castle JCE Provider version 1.55 and earlier the DHIES/ECIES CBC mode vulnerable to padding oracle attack. For BC 1.55 and older, in an environment where timings can be easily observed, it is possible with enough observations to identify when the decryption is failing due to padding.

- CVE-2016-1000346: In the Bouncy Castle JCE Provider version 1.55 and earlier the other party DH public key is not fully validated. This can cause issues as invalid keys can be used to reveal details about the other party's private key where static Diffie-Hellman is in use. As of release 1.56 the key parameters are checked on agreement calculation.
- CVE-2016-1000352: In the Bouncy Castle JCE Provider version 1.55 and earlier the ECIES implementation allowed the use of ECB mode. This mode is regarded as unsafe and support for it has been removed from the provider.
- CVE-2017-13098: BouncyCastle TLS prior to version 1.0.3, when configured to use the JCE (Java Cryptography Extension) for cryptographic functions, provides a weak Bleichenbacher oracle when any TLS cipher suite using RSA key exchange is negotiated. An attacker can recover the private key from a vulnerable application. This vulnerability is referred to as "ROBOT."
- CVE-2018-5382: The default BKS keystore uses an HMAC that is only 16 bits long, which can allow an attacker to compromise the integrity of a BKS keystore. Bouncy Castle release 1.47 changes the BKS format to a format which uses a 160 bit HMAC instead. This applies to any BKS keystore generated prior to BC 1.47. For situations where people need to create the files for legacy reasons a specific keystore type "BKS-V1" was introduced in 1.49. It should be noted that the use of "BKS-V1" is discouraged by the library authors and should only be used where it is otherwise safe to do so, as in where the use of a 16 bit checksum for the file integrity check is not going to cause a security issue in itself.
- CVE-2020-0187: In engineSetMode of BaseBlockCipher.java, there is a possible incorrect cryptographic algorithm chosen due to an incomplete comparison. This could lead to local information disclosure with no additional execution privileges needed. User interaction is not needed for exploitation.Product: AndroidVersions: Android-10Android ID: A-148517383
- CVE-2020-26939: In Legion of the Bouncy Castle BC before 1.61 and BC-FJA before 1.0.1.2, attackers can obtain sensitive information about a private exponent because of Observable Differences in Behavior to Error Inputs. This occurs in org.bouncycastle.crypto.encodings.OAEPEncoding. Sending invalid ciphertext that decrypts to a short payload in the OAEP Decoder could result in the throwing of an early exception, potentially leaking some information about the private exponent of the RSA private key performing the encryption.

spring-boot-2.2.4.RELEASE.jar

- CVE-2022-27772: ** UNSUPPORTED WHEN ASSIGNED ** spring-boot versions prior to version v2.2.11.RELEASE were vulnerable to temporary directory hijacking. This vulnerability impacted the org.springframework.boot.web.server.AbstractConfigurableWebServerFactory.createTempDir method. NOTE: This vulnerability only affects products and/or versions that are no longer supported by the maintainer.

logback-core-1.2.3.jar

- CVE-2021-42550: In logback version 1.2.7 and prior versions, an attacker with the required privileges to edit configuration files could craft a malicious configuration allowing to execute arbitrary code loaded from LDAP servers.

log4j-api-2.12.1.jar

- CVE-2020-9488: Improper validation of certificate with host mismatch in Apache Log4j SMTP appender. This could allow an SMTPS connection to be intercepted by a man-in-the-middle attack which could leak any log messages sent through that appender. Fixed in Apache Log4j 2.12.3 and 2.13.1
- CVE-2021-44228: Apache Log4j2 2.0-beta9 through 2.15.0 (excluding security releases 2.12.2, 2.12.3, and 2.3.1) JNDI features used in configuration, log messages, and parameters do not

protect against attacker controlled LDAP and other JNDI related endpoints. An attacker who can control log messages or log message parameters can execute arbitrary code loaded from LDAP servers when message lookup substitution is enabled. From log4j 2.15.0, this behavior has been disabled by default. From version 2.16.0 (along with 2.12.2, 2.12.3, and 2.3.1), this functionality has been completely removed. Note that this vulnerability is specific to log4j-core and does not affect log4net, log4cxx, or other Apache Logging Services projects.

- CVE-2021-44832: Apache Log4j2 versions 2.0-beta7 through 2.17.0 (excluding security fix releases 2.3.2 and 2.12.4) are vulnerable to a remote code execution (RCE) attack when a configuration uses a JDBC Appender with a JNDI LDAP data source URI when an attacker has control of the target LDAP server. This issue is fixed by limiting JNDI data source names to the java protocol in Log4j2 versions 2.17.1, 2.12.4, and 2.3.2.
- CVE-2021-45046: It was found that the fix to address CVE-2021-44228 in Apache Log4j 2.15.0 was incomplete in certain non-default configurations. This could allows attackers with control over Thread Context Map (MDC) input data when the logging configuration uses a non-default Pattern Layout with either a Context Lookup (for example, $${ctx:loginId}) or a Thread Context Map pattern (%X, %mdc, or %MDC) to craft malicious input data using a JNDI Lookup pattern resulting in an information leak and remote code execution in some environments and local code execution in all environments. Log4j 2.16.0 (Java 8) and 2.12.2 (Java 7) fix this issue by removing support for message lookup patterns and disabling JNDI functionality by default.
- CVE-2021-45105: Apache Log4j2 versions 2.0-alpha1 through 2.16.0 (excluding 2.12.3 and 2.3.1) did not protect from uncontrolled recursion from self-referential lookups. This allows an attacker with control over Thread Context Map data to cause a denial of service when a crafted string is interpreted. This issue was fixed in Log4j 2.17.0, 2.12.3, and 2.3.1.

snakeyaml-1.25.jar

- CVE-2017-18640: The Alias feature in SnakeYAML before 1.26 allows entity expansion during a load operation, a related issue to CVE-2003-1564.
- CVE-2021-4235: Due to unbounded alias chasing, a maliciously crafted YAML file can cause the system to consume significant system resources. If parsing user input, this may be used as a denial of service vector.
- CVE-2022-1471: SnakeYaml's Constructor() class does not restrict types which can be instantiated during deserialization. Deserializing yaml content provided by an attacker can lead to remote code execution. We recommend using SnakeYaml's SafeConsturctor when parsing untrusted content to restrict deserialization.
- CVE-2022-25857: The package org.yaml:snakeyaml from 0 and before 1.31 are vulnerable to Denial of Service (DoS) due to missing nested depth limitation for collections.
- CVE-2022-3064: Parsing malicious or large YAML documents can consume excessive amounts of CPU or memory.
- CVE-2022-38749: Using snakeYAML to parse untrusted YAML files may be vulnerable to Denial of Service attacks (DOS). If the parser is running on user supplied input, an attacker may supply content that causes the parser to crash by stackoverflow.
- CVE-2022-38750: Using snakeYAML to parse untrusted YAML files may be vulnerable to Denial of Service attacks (DOS). If the parser is running on user supplied input, an attacker may supply content that causes the parser to crash by stackoverflow.

- CVE-2022-38751: Using snakeYAML to parse untrusted YAML files may be vulnerable to Denial of Service attacks (DOS). If the parser is running on user supplied input, an attacker may supply content that causes the parser to crash by stackoverflow.
- CVE-2022-38752: Using snakeYAML to parse untrusted YAML files may be vulnerable to Denial of Service attacks (DOS). If the parser is running on user supplied input, an attacker may supply content that causes the parser to crash by stackoverflow.
- CVE-2022-41854: Those using Snakeyaml to parse untrusted YAML files may be vulnerable to Denial of Service attacks (DOS). If the parser is running on user supplied input, an attacker may supply content that causes the parser to crash by stack overflow. This effect may support a denial of service attack.

jackson-databind-2.10.2.jar

- CVE-2020-25649: A flaw was found in FasterXML Jackson Databind, where it did not have entity expansion secured properly. This flaw allows vulnerability to XML external entity (XXE) attacks. The highest threat from this vulnerability is data integrity.
- CVE-2020-36518: jackson-databind before 2.13.0 allows a Java StackOverflow exception and denial of service via a large depth of nested objects.
- CVE-2022-42003: In FasterXML jackson-databind before 2.14.0-rc1, resource exhaustion can occur because of a lack of a check in primitive value deserializers to avoid deep wrapper array nesting, when the UNWRAP_SINGLE_VALUE_ARRAYS feature is enabled. Additional fix version in 2.13.4.1 and 2.12.17.1
- CVE-2022-42004: In FasterXML jackson-databind before 2.13.4, resource exhaustion can occur because of a lack of a check in BeanDeserializer._deserializeFromArray to prevent use of deeply nested arrays. An application is vulnerable only with certain customized choices for deserialization.

tomcat-embed-core-9.0.30.jar

- CVE-2019-17569: The refactoring present in Apache Tomcat 9.0.28 to 9.0.30, 8.5.48 to 8.5.50 and 7.0.98 to 7.0.99 introduced a regression. The result of the regression was that invalid Transfer-Encoding headers were incorrectly processed leading to a possibility of HTTP Request Smuggling if Tomcat was located behind a reverse proxy that incorrectly handled the invalid Transfer-Encoding header in a particular manner. Such a reverse proxy is considered unlikely.
- CVE-2020-11996: A specially crafted sequence of HTTP/2 requests sent to Apache Tomcat 10.0.0-M1 to 10.0.0-M5, 9.0.0.M1 to 9.0.35 and 8.5.0 to 8.5.55 could trigger high CPU usage for several seconds. If a sufficient number of such requests were made on concurrent HTTP/2 connections, the server could become unresponsive.
- CVE-2020-13934: An h2c direct connection to Apache Tomcat 10.0.0-M1 to 10.0.0-M6, 9.0.0.M5 to 9.0.36 and 8.5.1 to 8.5.56 did not release the HTTP/1.1 processor after the upgrade to HTTP/2. If a sufficient number of such requests were made, an OutOfMemoryException could occur leading to a denial of service.
- CVE-2020-13935: The payload length in a WebSocket frame was not correctly validated in Apache Tomcat 10.0.0-M1 to 10.0.0-M6, 9.0.0.M1 to 9.0.36, 8.5.0 to 8.5.56 and 7.0.27 to 7.0.104. Invalid payload lengths could trigger an infinite loop. Multiple requests with invalid payload lengths could lead to a denial of service.
- CVE-2020-13943: If an HTTP/2 client connecting to Apache Tomcat 10.0.0-M1 to 10.0.0-M7, 9.0.0.M1 to 9.0.37 or 8.5.0 to 8.5.57 exceeded the agreed maximum number of concurrent streams for a connection (in violation of the HTTP/2 protocol), it was possible that a subsequent request made on that connection could contain HTTP headers - including HTTP/2 pseudo headers

- from a previous request rather than the intended headers. This could lead to users seeing responses for unexpected resources.

- CVE-2020-17527: While investigating bug 64830 it was discovered that Apache Tomcat 10.0.0-M1 to 10.0.0-M9, 9.0.0-M1 to 9.0.39 and 8.5.0 to 8.5.59 could re-use an HTTP request header value from the previous stream received on an HTTP/2 connection for the request associated with the subsequent stream. While this would most likely lead to an error and the closure of the HTTP/2 connection, it is possible that information could leak between requests.
- CVE-2020-1935: In Apache Tomcat 9.0.0.M1 to 9.0.30, 8.5.0 to 8.5.50 and 7.0.0 to 7.0.99 the HTTP header parsing code used an approach to end-of-line parsing that allowed some invalid HTTP headers to be parsed as valid. This led to a possibility of HTTP Request Smuggling if Tomcat was located behind a reverse proxy that incorrectly handled the invalid Transfer-Encoding header in a particular manner. Such a reverse proxy is considered unlikely.
- CVE-2020-1938: When using the Apache JServ Protocol (AJP), care must be taken when trusting incoming connections to Apache Tomcat. Tomcat treats AJP connections as having higher trust than, for example, a similar HTTP connection. If such connections are available to an attacker, they can be exploited in ways that may be surprising. In Apache Tomcat 9.0.0.M1 to 9.0.0.30, 8.5.0 to 8.5.50 and 7.0.0 to 7.0.99, Tomcat shipped with an AJP Connector enabled by default that listened on all configured IP addresses. It was expected (and recommended in the security guide) that this Connector would be disabled if not required. This vulnerability report identified a mechanism that allowed: - returning arbitrary files from anywhere in the web application - processing any file in the web application as a JSP Further, if the web application allowed file upload and stored those files within the web application (or the attacker was able to control the content of the web application by some other means) then this, along with the ability to process a file as a JSP, made remote code execution possible. It is important to note that mitigation is only required if an AJP port is accessible to untrusted users. Users wishing to take a defence-in-depth approach and block the vector that permits returning arbitrary files and execution as JSP may upgrade to Apache Tomcat 9.0.31, 8.5.51 or 7.0.100 or later. A number of changes were made to the default AJP Connector configuration in 9.0.31 to harden the default configuration. It is likely that users upgrading to 9.0.31, 8.5.51 or 7.0.100 or later will need to make small changes to their configurations.
- CVE-2020-8022: A Incorrect Default Permissions vulnerability in the packaging of tomcat on SUSE Enterprise Storage 5, SUSE Linux Enterprise Server 12-SP2-BCL, SUSE Linux Enterprise Server 12-SP2-LTSS, SUSE Linux Enterprise Server 12-SP3-BCL, SUSE Linux Enterprise Server 12-SP3-LTSS, SUSE Linux Enterprise Server 12-SP4, SUSE Linux Enterprise Server 12-SP5, SUSE Linux Enterprise Server 15-LTSS, SUSE Linux Enterprise Server for SAP 12-SP2, SUSE Linux Enterprise Server for SAP 12-SP3, SUSE Linux Enterprise Server for SAP 15, SUSE OpenStack Cloud 7, SUSE OpenStack Cloud 8, SUSE OpenStack Cloud Crowbar 8 allows local attackers to escalate from group tomcat to root. This issue affects: SUSE Enterprise Storage 5 tomcat versions prior to 8.0.53-29.32.1. SUSE Linux Enterprise Server 12-SP2-BCL tomcat versions prior to 8.0.53-29.32.1. SUSE Linux Enterprise Server 12-SP2-LTSS tomcat versions prior to 8.0.53-29.32.1. SUSE Linux Enterprise Server 12-SP3-BCL tomcat versions prior to 8.0.53-29.32.1. SUSE Linux Enterprise Server 12-SP3-LTSS tomcat versions prior to 8.0.53-29.32.1. SUSE Linux Enterprise Server 12-SP4 tomcat versions prior to 9.0.35-3.39.1. SUSE Linux Enterprise Server 12-SP5 tomcat versions prior to 9.0.35-3.39.1. SUSE Linux Enterprise Server 15-LTSS tomcat versions prior to 9.0.35-3.57.3. SUSE Linux Enterprise Server for SAP 12-SP2 tomcat versions prior to 8.0.53-29.32.1. SUSE Linux Enterprise Server for SAP 12-SP3 tomcat versions prior to 8.0.53-29.32.1. SUSE Linux Enterprise Server for SAP 15 tomcat versions prior to 9.0.35-3.57.3. SUSE OpenStack Cloud 7 tomcat versions prior to

8.0.53-29.32.1. SUSE OpenStack Cloud 8 tomcat versions prior to 8.0.53-29.32.1. SUSE OpenStack Cloud Crowbar 8 tomcat versions prior to 8.0.53-29.32.1.

- CVE-2020-9484: When using Apache Tomcat versions 10.0.0-M1 to 10.0.0-M4, 9.0.0.M1 to 9.0.34, 8.5.0 to 8.5.54 and 7.0.0 to 7.0.103 if a) an attacker is able to control the contents and name of a file on the server; and b) the server is configured to use the PersistenceManager with a FileStore; and c) the PersistenceManager is configured with sessionAttributeValueClassNameFilter="null" (the default unless a SecurityManager is used) or a sufficiently lax filter to allow the attacker provided object to be deserialized; and d) the attacker knows the relative file path from the storage location used by FileStore to the file the attacker has control over; then, using a specifically crafted request, the attacker will be able to trigger remote code execution via deserialization of the file under their control. Note that all of conditions a) to d) must be true for the attack to succeed.
- CVE-2021-24122: When serving resources from a network location using the NTFS file system, Apache Tomcat versions 10.0.0-M1 to 10.0.0-M9, 9.0.0.M1 to 9.0.39, 8.5.0 to 8.5.59 and 7.0.0 to 7.0.106 were susceptible to JSP source code disclosure in some configurations. The root cause was the unexpected behavior of the JRE API File.getCanonicalPath() which in turn was caused by the inconsistent behavior of the Windows API (FindFirstFileW) in some circumstances.
- CVE-2021-25122: When responding to new h2c connection requests, Apache Tomcat versions 10.0.0-M1 to 10.0.0, 9.0.0.M1 to 9.0.41 and 8.5.0 to 8.5.61 could duplicate request headers and a limited amount of request body from one request to another meaning user A and user B could both see the results of user A's request.
- CVE-2021-25329: The fix for CVE-2020-9484 was incomplete. When using Apache Tomcat 10.0.0-M1 to 10.0.0, 9.0.0.M1 to 9.0.41, 8.5.0 to 8.5.61 or 7.0.0. to 7.0.107 with a configuration edge case that was highly unlikely to be used, the Tomcat instance was still vulnerable to CVE-2020-9494. Note that both the previously published prerequisites for CVE-2020-9484 and the previously published mitigations for CVE-2020-9484 also apply to this issue.
- CVE-2021-30640: A vulnerability in the JNDI Realm of Apache Tomcat allows an attacker to authenticate using variations of a valid user name and/or to bypass some of the protection provided by the LockOut Realm. This issue affects Apache Tomcat 10.0.0-M1 to 10.0.5; 9.0.0.M1 to 9.0.45; 8.5.0 to 8.5.65.
- CVE-2021-33037: Apache Tomcat 10.0.0-M1 to 10.0.6, 9.0.0.M1 to 9.0.46 and 8.5.0 to 8.5.66 did not correctly parse the HTTP transfer-encoding request header in some circumstances leading to the possibility to request smuggling when used with a reverse proxy. Specifically: - Tomcat incorrectly ignored the transfer encoding header if the client declared it would only accept an HTTP/1.0 response; - Tomcat honored the identity encoding; and - Tomcat did not ensure that, if present, the chunked encoding was the final encoding.
- CVE-2021-41079: Apache Tomcat 8.5.0 to 8.5.63, 9.0.0-M1 to 9.0.43 and 10.0.0-M1 to 10.0.2 did not properly validate incoming TLS packets. When Tomcat was configured to use NIO+OpenSSL or NIO2+OpenSSL for TLS, a specially crafted packet could be used to trigger an infinite loop resulting in a denial of service.
- CVE-2021-43980: The simplified implementation of blocking reads and writes introduced in Tomcat 10 and back-ported to Tomcat 9.0.47 onwards exposed a long standing (but extremely hard to trigger) concurrency bug in Apache Tomcat 10.1.0 to 10.1.0-M12, 10.0.0-M1 to 10.0.18, 9.0.0-M1 to 9.0.60 and 8.5.0 to 8.5.77 that could cause client connections to share an Http11Processor instance resulting in responses, or part responses, to be received by the wrong client.

- CVE-2022-29885: The documentation of Apache Tomcat 10.1.0-M1 to 10.1.0-M14, 10.0.0-M1 to 10.0.20, 9.0.13 to 9.0.62 and 8.5.38 to 8.5.78 for the EncryptInterceptor incorrectly stated it enabled Tomcat clustering to run over an untrusted network. This was not correct. While the EncryptInterceptor does provide confidentiality and integrity protection, it does not protect against all risks associated with running over any untrusted network, particularly DoS risks.
- CVE-2022-34305: In Apache Tomcat 10.1.0-M1 to 10.1.0-M16, 10.0.0-M1 to 10.0.22, 9.0.30 to 9.0.64 and 8.5.50 to 8.5.81 the Form authentication example in the examples web application displayed user provided data without filtering, exposing a XSS vulnerability.
- CVE-2022-42252: If Apache Tomcat 8.5.0 to 8.5.82, 9.0.0-M1 to 9.0.67, 10.0.0-M1 to 10.0.26 or 10.1.0-M1 to 10.1.0 was configured to ignore invalid HTTP headers via setting rejectIllegalHeader to false (the default for 8.5.x only), Tomcat did not reject a request containing an invalid Content-Length header making a request smuggling attack possible if Tomcat was located behind a reverse proxy that also failed to reject the request with the invalid header.

hibernate-validator-6.0.18.Final.jar

- CVE-2020-10693: A flaw was found in Hibernate Validator version 6.1.2.Final. A bug in the message interpolation processor enables invalid EL expressions to be evaluated as if they were valid. This flaw allows attackers to bypass input sanitation (escaping, stripping) controls that developers may have put in place when handling user-controlled data in error messages.

spring-web-5.2.3.RELEASE.jar

- CVE-2016-1000027: Pivotal Spring Framework through 5.3.16 suffers from a potential remote code execution (RCE) issue if used for Java deserialization of untrusted data. Depending on how the library is implemented within a product, this issue may or not occur, and authentication may be required. NOTE: the vendor's position is that untrusted data is not an intended use case. The product's behavior will not be changed because some users rely on deserialization of trusted data.
- CVE-2020-5421: In Spring Framework versions 5.2.0 - 5.2.8, 5.1.0 - 5.1.17, 5.0.0 - 5.0.18, 4.3.0 - 4.3.28, and older unsupported versions, the protections against RFD attacks from CVE-2015-5211 may be bypassed depending on the browser used through the use of a jsessionid path parameter.
- CVE-2021-22096: In Spring Framework versions 5.3.0 - 5.3.10, 5.2.0 - 5.2.17, and older unsupported versions, it is possible for a user to provide malicious input to cause the insertion of additional log entries.
- CVE-2021-22118: In Spring Framework, versions 5.2.x prior to 5.2.15 and versions 5.3.x prior to 5.3.7, a WebFlux application is vulnerable to a privilege escalation: by (re)creating the temporary storage directory, a locally authenticated malicious user can read or modify files that have been uploaded to the WebFlux application, or overwrite arbitrary files with multipart request data.

spring-beans-5.2.3.RELEASE.jar

- CVE-2022-22965: A Spring MVC or Spring WebFlux application running on JDK 9+ may be vulnerable to remote code execution (RCE) via data binding. The specific exploit requires the application to run on Tomcat as a WAR deployment. If the application is deployed as a Spring Boot executable jar, i.e. the default, it is not vulnerable to the exploit. However, the nature of the vulnerability is more general, and there may be other ways to exploit it.

spring-webmvc-5.2.3.RELEASE.jar

- CVE-2021-22060: In Spring Framework versions 5.3.0 - 5.3.13, 5.2.0 - 5.2.18, and older unsupported versions, it is possible for a user to provide malicious input to cause the insertion of additional log entries. This is a follow-up to CVE-2021-22096 that protects against additional types of input and in more places of the Spring Framework codebase.

spring-context-5.2.3.RELEASE.jar

- CVE-2022-22968: In Spring Framework versions 5.3.0 - 5.3.18, 5.2.0 - 5.2.20, and older unsupported versions, the patterns for disallowedFields on a DataBinder are case sensitive which means a field is not effectively protected unless it is listed with both upper and lower case for the first character of the field, including upper and lower case for the first character of all nested fields within the property path.

spring-expression-5.2.3.RELEASE.jar

- CVE-2022-22950: In Spring Framework versions 5.3.0 - 5.3.16 and older unsupported versions, it is possible for a user to provide a specially crafted SpEL expression that may cause a denial of service condition.

5. Mitigation Plan

Update to the latest version: Upgrade to the latest version of each package to ensure that all known vulnerabilities have been patched. This will ensure that any security flaws that have been identified and addressed are fixed.

Implement secure coding practices: Developers should follow secure coding practices, such as validating inputs, sanitizing user input, and using secure libraries to minimize the risk of vulnerabilities. This will reduce the risk of potential vulnerabilities being introduced into the codebase.

Monitor and analyze system logs: Monitor system logs for any signs of suspicious activity and analyze them to detect any attempts at exploiting the vulnerabilities listed above. This can be done using tools such as intrusion detection systems, log analysis tools, etc.

Use strong authentication: Strong authentication should be implemented to prevent unauthorized access. This can include using two-factor authentication, implementing secure password policies, and limiting access to sensitive data to authorized users only.

Regularly perform security testing: such as penetration testing and vulnerability assessments, to identify any new vulnerabilities that may be present in the system. This can help detect vulnerabilities before they can be exploited by attackers.

Educate employees on security best practices: ensure that they are aware of potential vulnerabilities and how to avoid them. This can include training on secure coding practices, password hygiene, and how to recognize and report suspicious activity.