DEPARTMENT OF INFORMATICS

TECHNISCHE UNIVERSITÄT MÜNCHEN

Secure Coding Phase 4

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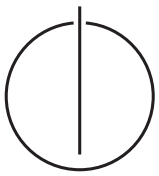

Executive Summary

Team2

We found several vulnerabilities, which could cause severe damage to the *Team2*. It is possible to get access to the admin page via stealing the session. Thus an attacker can register an arbitrary employee or customer and unlock the registered user. There is also no upload format of the content, for the file to be uploaded.In the current state this web application should not be used productively!

Team3

After testing the web application we did not find any vulnerabilities.

Comparison

In summary we were able to clearly state out that the Team3 web application has no vulnerabilities, while Team2 has vulnerabilities.

Contents

1 Time Tracking Table

Name	Task	Time
Aurel Roci	Test File Extensions Handling for Sensitive Information and documenting	1
	Test HTTP Methods and documenting	1
	Test HTTP Strict Transport Security and documenting	1
	Test RIA cross domain policy	1
	Error Handling	0.5
	Testing for default credentials	0.5
	Testing for Reflected Cross Site Scripting and documenting	0.5
	Testing for Stored Cross Site Scripting and documenting	0.5
	Testing for HTTP Verb Tampering and documenting	0.5
	Testing for SQL Injection and documenting	2
	Test Number of Times a Function Can be Used Limits	0.5
	Test Business Logic Data Validation and documenting	1
	Testing for Bypassing Session Management Schema and documenting	1
	Testing for Cookies attributes and documenting	1
	Testing for Session Fixation and documenting	1
	Testing for Exposed Session Variables and documenting	1
	Testing for Cross Site Request Forgery and documenting	1
	Testing for logout functionality and documenting	1
	Test Session Timeout and documenting	1
	Testing for Session puzzling and documenting	1
	Testing Report	2
	Testing for Cross Site Request Forgery	0.5
	Testing for Privilege Escalation	1
	Presentation	0.25
Stefan Ch. Kofler	Reverse-Engineer the binary file	
	Binary-equivalent	
	Decompile jar file	
Patrick Sattler	Presentation	2
	Testing for Code Injection, local or remote file inclusion	1
	Testing for Command Injection	1
	Testing for Format string	0.5
	Testing for incubated vulnerabilities	1
	Testing Directory traversal/file include	1
	Testing for bypassing authorization schema	1
	Testing for Privilege Escalation	1
	Testing for Insecure Direct Object References	1

2 Vulnerabilities Overview

Based on our testing, we identified the following vulnerabilities for the Team2 Bank and the OnlineBanking Bank:

2.1 Team2

2.1.1 Static Session ID

- Likelihood: *high*
- Impact: *Medium*

The session id is saved in form of the (static) user id in a cookie. This cookie can be used on any machine to take over the account of a user. The lifetime of this cookie is only limited by the cookie lifetime field.

2.1.2 File Upload

There was no instructions on the structure of the information for the file upload functionality. There was a sample file, but it did not help with, since there were no instructions there as well.

2.1.3 Mail

The e-mail functionality upon sign up was not working.

2.2 Team3

After testing the application there were no vulnerabilities found!

3 Tools used

Aurel - *sqlmap* - It is used to test for SQL Injections, and we did not find any.

Aurel - *RIPS* - It is used to do a static testing of the PHP code. It showed warnings for SQL Injections which were *false-positives*. The were also some *false-positive* with command execution.

Stefan - *FindBugs* -It is used to do a static testing of the Java code, and we did not find any vulnerabilities in the code of *Team2*, and we found two *false-positive* warnings in the code of *Team3*.

Aurel - *netcat* - It is used to check the HTTP methods but it did not give any output.

Aurel - *nmap* - It is used to check HTTP methods, and it showed which methods were allowed and which ones were not allowed.

Patrick - *w3af* - It is used to find if the website had vulnerabilities by running an automatic test one the website. And found CSRF vulnerability.

Patrick - *Zed Attack Proxy (ZAP)* -It is used for a spider attack towards the website, and did not find any CSRF vulnerability.

Aurel - *Burp* - It is used to intercept the message from the web browser to the server and alter it.

Stefan - *dotdotpwn* -It is used to check for directory traversal.

Stefan - *IDA Pro Free* - It is used to reverse-engineer the binary file of *Team2*.

4 Detailed Report

The following pages describe for each test how both applications Team2 and Team3. The test is divided in different sections following the OWASP Testing Guide v4.

4.1 Configuration and Deploy Management Testing

4.1.1 Test File Extensions Handling for Sensitive Information (OTG-CONFIG-003)

Team2

Likelihood: 8
Impact: 9
Risk: 3

Team2	
Observation	File extensions are handled correctly but while testing we found folders which we could access.
Discovery	TODO
Likelihood	The likelihood is quite high that someone tries a tool to find these kind of vulnerabilities. There is no need for special knowledge because the tools work quite automatically without much configuration.
Impact	There is no impact the folders do not contain sensitive information.
Recommendations	Block the access to files and to those folders, or remove them from the directory since they are not needed there.

Metric	Value : 9.8
Access Vector	N
Attack Complexity	L
Privileges Required	N
User Interaction	N
Scope	U
Confidentiality Impact	H
Integrity Impact	H
Availability Impact	H

Team3

Likelihood: 8
Impact: 0
Risk: 1

Team3	
Observation	File extensions are handled correctly but while testing we found folders which we could access smart-card simulator folder.
Discovery	TODO
Likelihood	The likelihood is quite high that someone tries a tool to find these kind of vulnerabilities. There is no need for special knowledge because the tools work quite automatically without much configuration.
Impact	There is no impact since there is nothing important hard-coded in the jave file.
Recommendations	Block the access to files and to those folders.

Metric	Value : 0
Access Vector	N
Attack Complexity	L
Privileges Required	N
User Interaction	N
Scope	U
Confidentiality Impact	N
Integrity Impact	N
Availability Impact	N

4.1.2 Test HTTP Methods (OTG-CONFIG-006)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	The application is not accessable over HTTP. HTTPS is enforced.
Discovery	We also tried to connect via *netcat* using the following command: *nc IP_ADDRESS 80* , which did not work. We also used *nmap* for testing which returned the methods used by the webapp.
Likelihood	N/A
Implication	N/A
Recommendations	N/A
Comparison	The same applies for our web application.

```
samurai@samurai-wtf:~$ nmap -p 80 127.0.0.1 --script http-methods

Starting Nmap 6.25 ( http://nmap.org ) at 2016-01-01 11:04 CET
Nmap scan report for localhost (127.0.0.1)
Host is up (0.000036s latency).
PORT   STATE SERVICE
80/tcp open  http
|_http-methods: GET HEAD POST OPTIONS

Nmap done: 1 IP address (1 host up) scanned in 0.33 seconds
```

Figure 4.1: RIPS

4.1.3 Test HTTP Strict Transport Security (OTG-CONFIG-007)

Team2

Likelihood: 7
Impact: 5
Risk: 4

Team2	
Observation	The webapp is not using Strict Transport Security.
Discovery	We found this using *Curl*.
Likelihood	It is not complicated to perform a MitM attack to exploit this vulnerability.
Impact	A man-in-the-middle attacker attempts to intercept traffic from a victim user using an invalid certificate and hopes the user will accept the bad certificate.
Recommendations	Enable Strict Transport Security.
Comparison	Our webapp has Strict Transport Security enabled.

```
samurai@samurai-wtf:~$ curl -s -D- 127.0.0.1
HTTP/1.1 200 OK
Date: Fri, 01 Jan 2016 10:06:28 GMT
Server: Apache/2.2.22 (Ubuntu)
Last-Modified: Tue, 26 Jun 2012 09:23:08 GMT
ETag: "a1940-4f-4c35ca5889f57"
Accept-Ranges: bytes
Content-Length: 79
Vary: Accept-Encoding
Content-Type: text/html
```

Figure 4.2: RIPS

Metric	Value : 5.3
Access Vector	N
Attack Complexity	L
Privileges Required	N
User Interaction	N
Scope	U
Confidentiality Impact	L
Integrity Impact	N
Availability Impact	N

4.1.4 Test RIA cross domain policy (OTG-CONFIG-008)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	There are no RIA applications on the system and therefore is no crossdomain.xml file provided.
Discovery	Using *wget* we tried to find a *crossdomain.xml* or *clientaccesspolicy.xml* file and couldn't find it.
Likelihood	N/A
Implication	N/A
Recommendations	N/A
Comparison	The same results applies for our web application.

Metric	Value
Access Vector	N/A
Attack Complexity	N/A
Privileges Required	N/A
User Interaction	N/A
Scope	N/A
Confidentiality Impact	N/A
Integrity Impact	N/A
Availability Impact	N/A

4.2 Identity Management Testing

4.2.1 Test Role Definitions (OTG-IDENT-001)

Team2

Likelihood: 10
Impact: 0
Risk: 0

Team2	
Observation	We found out that there exist two different roles in the system. There is the role of a normal customer and the role of an banker. Employees can view account and transaction details of all the customers. Transactions over 10000 euro and new user registrations can be accepted by the employee.
Discovery	All the roles and their available functions can be seen on the webapp.
Likelihood	It is very likely that people find this information.
Impact	There is no direct implication.
Recommendations	N/A

Team3

Likelihood: 0
Impact: 0
Risk: 0

Team3	
Observation	We found out that there exist two different roles in the system. There is the role of a normal customer and the role of an banker. Employees can view account and transaction details of all the customers. Transactions over 10000 euro and new user registrations can be accepted by the employee.
Discovery	All the roles and their available functions can be seen on the webapp.
Likelihood	It is very likely that people find this information.
Impact	There is no direct implication.
Recommendations	N/A

4.2.2 Test User Registration Process (OTG-IDENT-002)

Team2

Likelihood: 5
Impact: 0
Risk: 0

	Team2
Observation	Any person can register themselves as an user and this registration than gets validated by an employee. One person can register multiple times and with different roles. There is no proof of the identity of a user possible. The identification requirements include the email address and username, but only two of these can be verified.
Discovery	No special tools are needed to get this information. A browser and multiple registration tests provided the necessary results.
Likelihood	It is quite likely that this information can be retrieved by any user with minimal experience.
Implication	User could try to register multiple times and with wrong information to get access to user accounts with more permissions or to create multiple bank accounts.
Recommendations	The information passed in the registration form should be validated. The name can be validated by hand if a customer would go to the bank and the employee would than accept his registration.
Comparison	Our web application doesn't require a phone number for the registration an the role of the user can be selected in the registration form. It doesn't make our application less secure, because the registration has still to be accepted by an employee.

Metric	Value : 0
Access Vector	N
Attack Complexity	L
Privileges Required	N
User Interaction	N
Scope	U
Confidentiality Impact	N
Integrity Impact	N
Availability Impact	N

4.2.3 Test Account Provisioning Process (OTG-IDENT-003)

Team2

Likelihood: N/A
Impact: N/A
Risk: N/A

Team2	
Observation	Our observation showed us that employees can accept customer registrations.
Discovery	All the observations were made with the *Chrome* web browser.
Impact	If an employee account gets hacked you can accept new registrations.
Recommendations	N/A
Comparison	In our web application the employee accepts new registration. It makes no difference in the security.

4.2.4 Testing for Account Enumeration and Guessable User Account (OTG-IDENT-004)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	We found out that the web application makes no difference between existing usernames and non existing usernames when trying to login with wrong credentials. The same html response and the same response headers are provided by the system.
Discovery	We used the *Charles Web Proxy* to analyze the web application responses.
Implication	N/A
Recommendations	N/A
Comparison	Our web application makes no difference between login tries with existing usernames and non existing ones. Both web applications aren't vulnerable here.

4.2.5 Testing for Weak or unenforced username policy (OTG-IDENT-005)

Team2

Likelihood: 10
Impact: 0
Risk: 0

Team2	
Observation	The usernames should be more than 2 characters.
Discovery	No tool is used here. Trying to sign up with short usernames gave us the warning.
Impact	N/A
Recommendations	N/A
Comparison	Our application has no username restriction.

Metric	Value : 0
Access Vector	N
Attack Complexity	L
Privileges Required	N
User Interaction	N
Scope	U
Confidentiality Impact	N
Integrity Impact	N
Availability Impact	N

4.3 Authentication Testing

4.3.1 Testing for Credentials Transported over an Encrypted Channel(OTG-AUTHN-001)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	The webapp uses HTTPS protocol, so all the information is sent encrypted through the channel therefore we cannot sniff the data.
Discovery	The website s using an SSL certificate
Likelihood	NA
Impact	NA
Recommendations	
Comparison	Our webapp is using HTTPS, so the data is transported over an encrypted channel.

4.3.2 Testing for default credentials(OTG-AUTHN-002)

Team2

Likelihood: 10
Impact: 4
Risk: 6

Team2	
Observation	There are no default credentials for the webapp.
Discovery	We saw the credentials text file that was given by the other team.
Likelihood	N/A
Impact	N/A
Recommendations	N/A
Comparison	The same goes for our webapp.

4.3.3 Testing for Weak lock out mechanism(OTG-AUTHN-003)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	The user is shown redirected from the login page after a 3 failed tries.
Discovery	We entered the wrong credentials until we had to click the login button to be able to enter the credentials again.
Likelihood	N/A
Impact	N/A
Recommendations	N/A
Comparison	The same goes for our webapp.

4.3.4 Testing for bypassing authentication schema (OTG-AUTHN-004)

Team2

Likelihood: NA
Impact: NA
Risk: NA

	Team2
Observation	We did not find any possibility to bypass the authentication schema.
Discovery	N/A
Likelihood	N/A
Implication	N/A
Recommendations	N/A
Comparison	Neither we found a possibility in our web app

Metric	Value
Access Vector	NA
Attack Complexity	NA
Privileges Required	NA
User Interaction	NA
Scope	NA
Confidentiality Impact	NA
Integrity Impact	NA
Availability Impact	NA

4.3.5 Testing for Browser cache weakness (OTG-AUTHN-006)

Team2

Likelihood: 0
Impact: NA
Risk: NA

Team2	
Observation	The web app set the cache-control to no-cache an no-store and Pragma to no-cache
Discovery	By checking the *about:cache* in Firefox we saw the Headers
Likelihood	N/A
Implication	N/A
Recommendations	N/A
Comparison	The same goes for our webapp

Metric	Value
Access Vector	NA
Attack Complexity	NA
Privileges Required	NA
User Interaction	NA
Scope	NA
Confidentiality Impact	NA
Integrity Impact	NA
Availability Impact	NA

4.3.6 Testing for Weak password policy (OTG-AUTHN-007)

Team2

Likelihood: 6
Impact: 5
Risk: 5

Team2	
Observation	The registration process does not have a restriction for weak passwords. Furthermore the password can contain the username
Discovery	Tested manually the registration process with a one character password and the username as password
Likelihood	For every registration process the user has the possibility to choose a weak password
Impact	There is a lockout mechanism but with a week password, the attacker might guess it.
Recommendations	Introduce password restrictions
Comparison	Our app has a standard password policy, at least 1 Uppercase, Lowercase, number required.

Metric	Value : 6.5
Access Vector	N
Attack Complexity	L
Privileges Required	N
User Interaction	N
Scope	U
Confidentiality Impact	L
Integrity Impact	L
Availability Impact	N

4.3.7 Testing for weak password change or reset functionalities (OTG-AUTHN-009)

Team2

Likelihood: 10
Impact: 8
Risk: 5

Team2	
Observation	The password reset functionality can cause unwanted password change or the user to loose access to their account. Since the functionality changes the current password to a random one and sends an email to the user with the new password.
Discovery	Tested manually to reset the password. An error occurred and the email was not send but the password was changed.
Likelihood	It is very high that someone can enter an email address of another user and cause change their password without the users request.
Impact	The impact can be quite high especially in case when the email with the new password fails to send, the user can loose access to his account.
Recommendations	Instead of setting a new random password, sending an email with a link where the user can set a new password himself will be the best solution.
Comparison	Our webapp sends an email with link to change the password. The random number generated for the link is long, so trying to brute force it will take a very long time.

Metric	Value : 7.5
Access Vector	N
Attack Complexity	L
Privileges Required	N
User Interaction	N
Scope	U
Confidentiality Impact	N
Integrity Impact	N
Availability Impact	H

4.4 Authorization Testing

4.4.1 Testing Directory traversal/file include (OTG-AUTHZ-001)

Team2 Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	We could not find any path traversals .
Discovery	We used the *dotdotpwn* tool to find such traversals with the following command: `sudo ./dotdotpwn.pl -O -m http -h IP_ADDRESS` -O is to get the operating system; -m is to indicate that the protocol is http and -h for the server ip; which gave no results. Afterwards we tried *w3af* and it did not find anything.
Likelihood	N/A
Impact	N/A
Recommendations	N/A

Team3 Likelihood: 8
Impact: 0
Risk: 0

Team3	
Observation	We could access the Smart-Card-Simulator folder and gain access to the java source code.
Discovery	We manual found that folder, by loading */SecureCoding-Group3* url.
Likelihood	This is very likely to be discovered.
Impact	There is no impact since the attacker can get the source code by decompiling the jar file.
Recommendations	Block the access to the folder.

4.4.2 Testing for Privilege Escalation (OTG-AUTHZ-003)

Team2

Likelihood: 0
Impact: 0
Risk: 0

	Team2
Observation	It is not possible to escalate privileges of the user.
Discovery	We tried to change the user privilege by changing the user id after we saw that they are generated by incrementing from the first user ID, using *Burp*.
Likelihood	N/A
Implication	N/A
Recommendations	N/A
Comparison	The same results apply for our web application.

4.4.3 Testing for Insecure Direct Object References (OTG-AUTHZ-004)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	It is not possible to retrieve objects belonging to other users or otherwise bypass authorization.
Discovery	We tried to change the user privilege by changing the user id after we saw that they are generated by incrementing from the first user ID, using *Burp*.
Likelihood	N/A
Implication	N/A
Recommendations	N/A
Comparison	The same results apply for our web application.

4.5 Session Management Testing

4.5.1 Testing for Bypassing Session Management Schema(OTG-SESS-001)

Team2

Likelihood: 10
Impact: 6
Risk: 7

Team2	
Observation	There is no Random Session Token generated, nor any Session Time-out functionality. Also there is no cookie configuration.
Discovery	We observed the php code which we were given.
Likelihood	It is very likely that an attacker notices this, since the SessionID does not change.
Impact	This can cause a Session Hijack.
Recommendations	Generate random SessionIDs and create a Session Time-out functionality.
Comparison	Our web app generates random SessionIDs creates a session time-out, also set the cookie parameters.

Metric	Value : 6.7
Access Vector	L
Attack Complexity	H
Privileges Required	N
User Interaction	N
Scope	U
Confidentiality Impact	H
Integrity Impact	H
Availability Impact	N

4.5.2 Testing for Cookies attributes(OTG-SESS-002)

Team2

Likelihood: 10
Impact: 6
Risk: 3

Team2	
Observation	The cookie for the PHP session id has a to general path ("//"). So the application is vulnerable to other web application on the same server. They will also get the cookie from the user. The HttpOnly is not set also there is no expiration time for the cookie.
Discovery	We used the Firefox Web developer toolbar to analyze the cookie attributes.
Likelihood	It is vary easy and straight forward to use this tool so it is highly likely for someone to find that out.
Impact	The cookies can be read and used by other web applications that match the path value.
Recommendations	Set the path as tight as possible.
Comparison	Our web app has the all the cookie parameters set, and the timeout of the cookie is set to 10 minutes.

Metric	Value : 6.1
Access Vector	L
Attack Complexity	L
Privileges Required	N
User Interaction	R
Scope	U
Confidentiality Impact	H
Integrity Impact	L
Availability Impact	N

4.5.3 Testing for Session Fixation(OTG-SESS-003)

Team2

Likelihood: 9
Impact: 5
Risk: 5

Team2	
Observation	The session id is not invalidated and therefore does not change after the user is authenticated. This means an attacker can force a known session id on a user. Once the user is authenticated the attacker can access also as authenticated user
Discovery	We used *ZAP* proxy to intercept the traffic.
Likelihood	This attack is pretty easy and can also be performed by low skilled people
Implication	The attacker can do everything the user can
Recommendations	Change the session id after logging in
Comparison	Our web app generates a new random SessionID after the user logs in.

Metric	Value : 8.1
Access Vector	N
Attack Complexity	L
Privileges Required	N
User Interaction	R
Scope	U
Confidentiality Impact	H
Integrity Impact	H
Availability Impact	N

4.5.4 Testing for Exposed Session Variables (OTG-SESS-004)

Team2

Likelihood: 10
Impact: 6
Risk: 6

	Team2
Observation	The application from Team 2 use SSL certificate and therefore the session variables are not accessible during transport. But the Session variable is not destroyed after the user logs out.
Discovery	We used the *Firefox web developer tools* to analyze the cookies. Also the *Firebug* tool and we got the same outcome.
Likelihood	This attack is pretty easy and can also be performed by low skilled people
Impact	The attacker can read the session variables and depending on the information in them
Recommendations	Remove the cookie after logout.
Comparison	Our application destroys the session after the user logs out.

Metric	Value : 5.9
Access Vector	P
Attack Complexity	L
Privileges Required	N
User Interaction	R
Scope	U
Confidentiality Impact	H
Integrity Impact	H
Availability Impact	N

4.5.5 Testing for Cross Site Request Forgery(OTG-SESS-005)

Team2

Likelihood: 10
Impact: 6
Risk: 6

Team2	
Observation	The application is vulnerable to CRSF.
Discovery	WE used *w3af* tool to analyze the website and it showed that there is CRSF vulnerability.
Likelihood	N/A
Impact	N/A
Recommendations	N/A
Comparison	N/A

4.5.6 Testing for logout functionality(OTG-SESS-006)

Team2

Likelihood: 4
Impact: 6
Risk: 5

Team2	
Observation	The logout functionallity has been tested an works without any problems. The user gets correctly logged out and pages where authentication is needed can't be accessed afterwards. Also reusing the session id does not work. But the application seems to have no automatic logout after a certain amount of time.
Discovery	We tested the functionallity manually and used the Chrome extension "Advanced Rest Client" to reuse the session cookie
Likelihood	The only problem is that user sometimes only close the browser tab and than the session continues to exist.
Impact	An attacker would be logged in if he can access afterwards the computer. Possible scenario Internet cafe or something similar
Recommendations	implement an automatic server side logout
Comparison	Our webapp has the same problem that it does not log out after the web browser is closed, but it does log out after 10 minutes of inactivity.

Metric	Value : 6.1
Access Vector	P
Attack Complexity	L
Privileges Required	N
User Interaction	N
Scope	U
Confidentiality Impact	H
Integrity Impact	H
Availability Impact	N

4.5.7 Test Session Timeout(OTG-SESS-007)

Team2

Likelihood: 4
Impact: 6
Risk: 7

Team2	
Observation	The application has the timeout of the session set to the browsers session lifetime.
Discovery	We tested the functionallity manually and used the Chrome developertools to check the cookies.
Likelihood	The same as for OTG-SESS-006. Public computers are here the biggest problem
Impact	An attacker is directly authenticated if the session is not ended
Recommendations	Implement a server side session invalidation and delete the stored data on the client
Comparison	Our webapp has a session timeout of 10 minutes, which invalidates the session after 10 minutes of inactivity.

Metric	Value : 6.1
Access Vector	P
Attack Complexity	L
Privileges Required	N
User Interaction	N
Scope	U
Confidentiality Impact	H
Integrity Impact	H
Availability Impact	N

4.5.8 Testing for Session puzzling(OTG-SESS-008)

Team2

Likelihood: 10
Impact: 6
Risk: 5

Team2	
Observation	The application uses the same SessionID for everything. Even after logging out, the SessionID does not change.
Discovery	We used *Burp* to intercept the communication of the webapp and all the interactions were using the same SessionID.
Likelihood	Its is very likely that an attacker will notice this.
Implication	A very simple example could be the password reset functionality that, in the entry point, could request the user to provide some identifying information such as the e-mail address. This page might then populate the session with these identifying values, which are received directly from the client side, or obtained from queries. At this point there may be some pages in the application that show private data based on this session object. In this manner the attacker could bypass the authentication process.
Recommendations	Generate a new SessionID for every interaction the user makes with the website.
Comparison	We change the SessionID with every user interaction with the website, so our app is secure.

Metric	Value : 6.8
Access Vector	N
Attack Complexity	H
Privileges Required	N
User Interaction	R
Scope	U
Confidentiality Impact	H
Integrity Impact	H
Availability Impact	N

4.6 Data Validation Testing

4.6.1 Testing for Reflected Cross Site Scripting(OTG-INPVAL-001)

Team2	Likelihood: 8 Impact: 5 Risk:5

Team2	
Observation	We observed no reflected cross site scripting vulnerability.
Discovery	It seems that all parameters are stored in the database before inserting the values in the HTML.
Likelihood	N/A
Implication	N/A
Recommendations	N/A
Comparison	The same results apply for our web application.

4.6.2 Testing for Stored Cross Site Scripting(OTG-INPVAL-002)

Team2	Likelihood: 8 Impact: 5 Risk:5

Team2	
Observation	We cannot insert javascript code in the webapp.
Discovery	We tried to insert the following javascript code in the username of the sign up page but there is a restriction in the length of the username to 23 characters therefore it failed. `<script>alert("1");</script>`
Likelihood	N/A
Impact	N/A
Recommendations	N/A
Comparison	Our web app does not allow XSS but because we sanitize the input of the user.

4.6.3 Testing for HTTP Verb Tampering(OTG-INPVAL-003)

Team2

Likelihood: 0
Impact: 0
Risk: 0

	Team2
Observation	We did not observe any notable behavior.
Discovery	We used a script to automatically test the HTTP methods. Methods that were allowed • OPTIONS • GET • POST Methods that were rejected • TRACE • PUT • PROPFIND
Likelihood	N/A
Implication	N/A
Recommendations	N/A
Comparison	Both webapps have the same allowed methods.

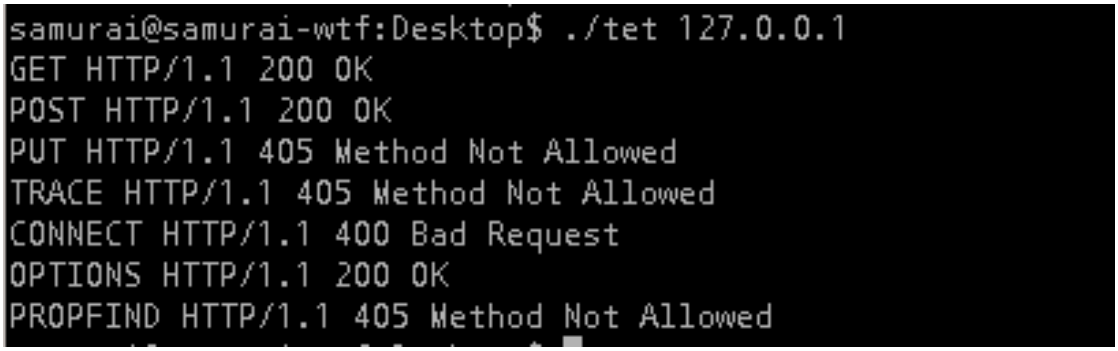

Figure 4.3: Results

```
#!/bin/bash

for webservmethod in GET POST PUT TRACE CONNECT OPTIONS PROPFIND;

do
printf "$webservmethod " ;
printf "$webservmethod / HTTP/1.1\nHost: $1\n\n" | nc -q 1 $1 80 | grep "HTTP/1.1"

done
```

Figure 4.4: Script used for testing

4.6.4 Testing for SQL Injection (OTG-INPVAL-005) and Mysql testing (OTG-INPVAL-005)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	We observed that no SQL Injection was possible. Since we knew that the other team had to use Mysql we tested also specifically for Mysql
Discovery	We tried inserting various SQL statements in the fields of using *sqlmap* tool and failed, also we did static test of the PHP code using *RIPS* which did not find any.
Likelihood	N/A
Implication	N/A
Recommendations	N/A
Comparison	Our web application is also immune to SQL Injections

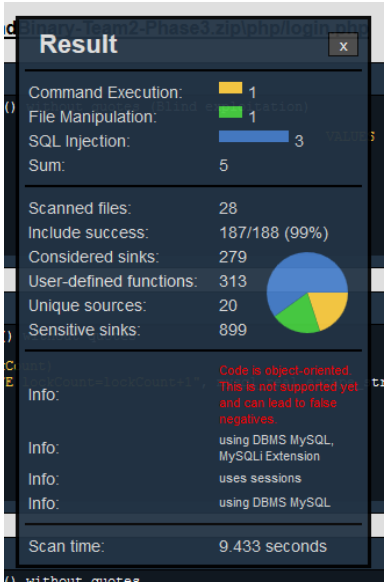

Figure 4.5: RIPS

Using *RIPS* with verbosity level 1 and vulnerability all server-side we get the above results. The 3 cases of *SQL Injection* are *false-positives*. The input in the query is already set and is not affected by the user input.

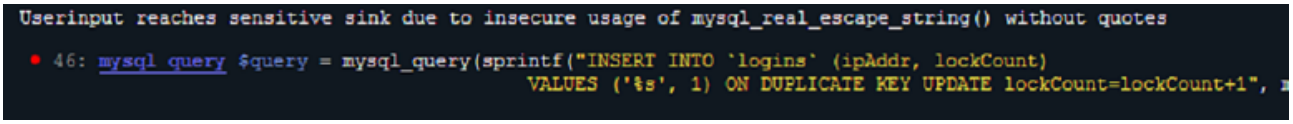

Figure 4.6: RIPS

The case of file manipulation is *false-positive* since the variables passed as parameters here have nothing to do with user input.

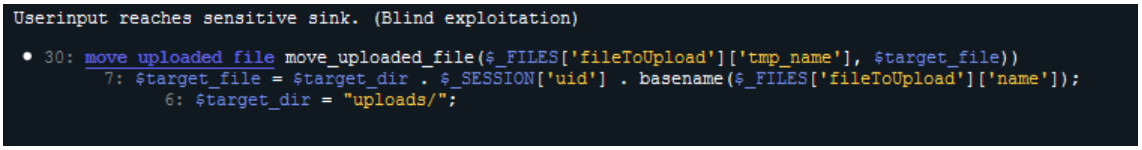

Figure 4.7: RIPS

Also using the following *sqlmap* command we did not find any SQL Injection possible.

```
sqlmap -u https://localhost/ex1/securecoding/
```

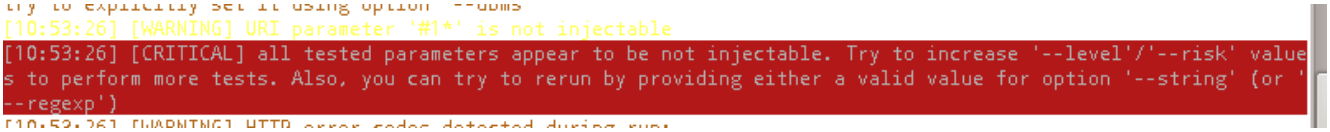

Figure 4.8: RIPS

Team3

Using *RIPS* with verbosity level 1 and vulnerability all server-side we get the above results.

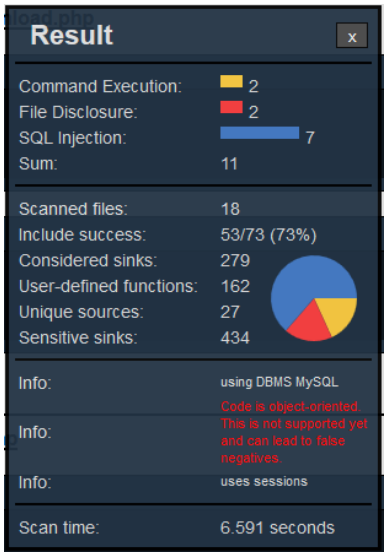

Figure 4.9: RIPS

For the *SQL Injection* cases the input data is sanitized before being executed into the queries. So the warnings given by *RIPS* are *false-positive*.

Also using the following *sqlmap* command we did not find any SQL Injection possible.

```
sqlmap -u https://localhost/SecureCoding-Group3/online_banking/
```

```
try to explicitly set it using option '--dbms'
[10:53:26] [WARNING] URI parameter '#1*' is not injectable
[10:53:26] [CRITICAL] all tested parameters appear to be not injectable. Try to increase '--level'/'--risk' value
s to perform more tests. Also, you can try to rerun by providing either a valid value for option '--string' (or '
--regexp')
[10:53:26] [WARNING] HTTP error codes detected during run:
```

Figure 4.10: RIPS

4.6.5 Testing for Code Injection, Testing for Local File Inclusion, Testing for Remote File Inclusion(OTG-INPVAL-012)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	We did not find any vulnerability regarding code injection and local or remote file inclusion.
Discovery	Tried to perform a command execution via the backticks (') and also the semicolon (;) in the filename but our webapp correctly handled the files without injections. We upload files with code written in them but nothing happened.
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Team3

Likelihood: 0
Impact: 0
Risk: 0

Team3	
Observation	We did not find any vulnerability regarding code injection and local or remote file inclusion in our web app.
Discovery	Tried to perform a command execution via the backticks (') and also the semicolon (;) in the filename but our webapp correctly handled the files without injections. We upload files with code written in them but nothing happened.
Likelihood	N/A
Implication	N/A
Recommendations	N/A

4.6.6 Testing for Command Injection(OTG-INPVAL-013)

Team2

The case of command execution is yet again a *false-positive* since the variable entered into the *exec* function is a file. If the file contains malicious user input is another problem, and we have to do the check for that elsewhere.

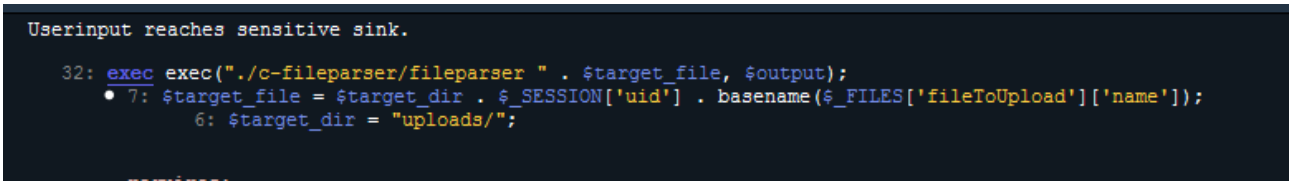

Figure 4.11: RIPS

Team3

RIPS finds two vulnerabilities for file disclosure and command execution in *application-Download.php*, which are *false-positive* since the variable is taken from the database, the user does not input it directly.

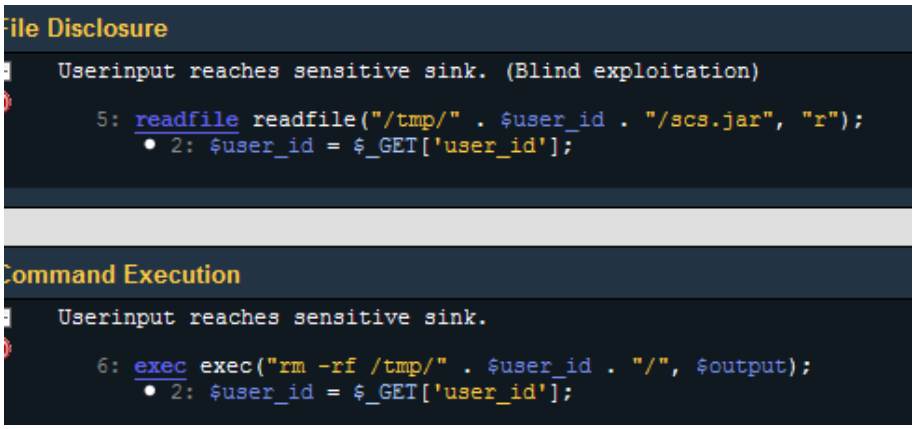

Figure 4.12: RIPS

RIPS finds two vulnerabilities for file disclosure and command execution in *customer.inc.php*, the same case applies here, they are *false-positive* the variables passed on the sensitive functions are not user input.

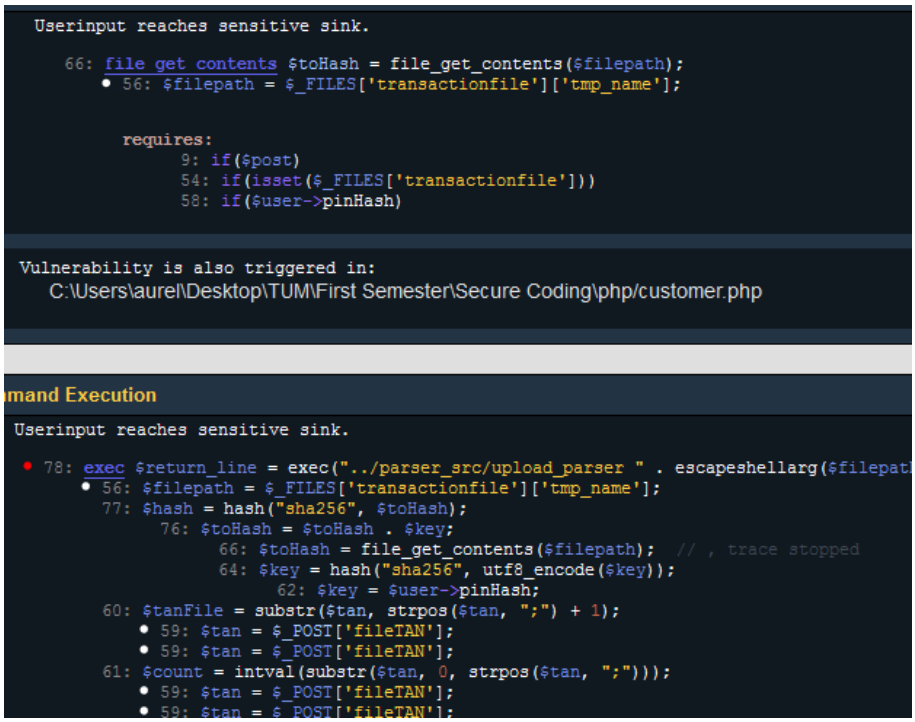

Figure 4.13: RIPS

4.6.7 Testing for Buffer overflow, Testing for Heap overflow, Testing for Stack overflow, Testing for Format string (OTG-INPVAL-014)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	We did not find any vulnerability regarding buffer overflow, heap overflow, stack overflow or string formatting
Discovery	We used w3af to locate such vulnerabilities.
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Team3

Likelihood: 0
Impact: 0
Risk: 0

Team3	
Observation	We did not find any vulnerability regarding buffer overflow, heap overflow, stack overflow or string formatting
Discovery	We used w3af to locate such vulnerabilities.
Likelihood	N/A
Implication	N/A
Recommendations	N/A

4.6.8 Testing for incubated vulnerabilities(OTG-INPVAL-015)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	The webapp is secure towards incubated vulnerabilities.
Discovery	We tried XSS, uploading file with commands, SQL Injections and neither of them worked. So there is no possibility to inject code.
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Team3

Likelihood: 0
Impact: 0
Risk: 0

Team3	
Observation	We did not find any vulnerability regarding incubated vulnerabilities.
Discovery	There is no possibility to inject code in the webapp since every user input is sanitized
Likelihood	N/A
Implication	N/A
Recommendations	N/A

4.7 Error Handling

Team2

Team2 provides an error for the transactions using file upload only when the file format is not correct. Every other time when the correct file format is uploaded with incorrect data, the file is accepted even though no transaction is executed.

4.8 Business Logic Testing

4.8.1 Test Business Logic Data Validation(OTG-BUSLOGIC-001)

Team2

Likelihood: 0
Impact: 0
Risk:0

Team2	
Observation	Tests show that data validation is both: client side and server side.
Discovery	We intercepted the input before it gets send to the server using *Burp* and manipulated the data, and we received an error message.
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Team3

Likelihood: 0
Impact: 0
Risk: 0

Team3	
Observation	Tests show that data validation is both: client side and server side.
Discovery	We intercepted the input before it gets send to the server using *Burp* and manipulated the data, and we received an error message.
Likelihood	N/A
Implication	N/A
Recommendations	N/A

4.8.2 Test Number of Times a Function Can be Used Limits(OTG-BUSLOGIC-005)

Team2

Likelihood: 0
Impact: 0
Risk:0

Team2	
Observation	We tried inserting the same tan multiple times.
Discovery	The web application did not accept requests with a TAN that was already used in the HTML form, but we did not receive any error with the file upload, but the transaction did not go through.
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Team3

Likelihood: 0
Impact: 0
Risk: 0

Team3	
Observation	Tests show that data validation is both: client side and server side.
Discovery	We intercepted the input before it gets send to the server using *Burp* and manipulated the data, and we received an error message.
Likelihood	N/A
Implication	N/A
Recommendations	N/A

4.8.3 Test Upload of Unexpected File Types (OTG-BUSLOGIC-008)

Team2

Likelihood: 0
Impact: 0
Risk: 0

Team2	
Observation	The is no possibility to upload any unexpected file type.
Discovery	We tried to upload different type of files from the one presented on the website. There was an error every time the file had different extension from the one specified on the website.
Likelihood	N/A
Implication	N/A
Recommendation	N/A

Team3

Likelihood: 0
Impact: 0
Risk: 0

Team3	
Observation	The is no possibility to upload any unexpected file type.
Discovery	We tried to upload different type of files from the one presented on the website. There was an error every time the file had different extension from the one specified on the website.
Likelihood	N/A
Implication	N/A
Recommendation	N/A

4.9 Client Side Testing

4.9.1 Testing for Clickjacking (OTG-CLIENT-009)

Team2

Likelihood: 7
Impact: 5
Risk: 6

Team2	
Observation	We found a vulnerability in the web application that allows attackers to make clickjacking attacks by bundling the website inside an iframe to give the user the feeling of interacting with the target website but being instead on a malicious web page.
Discovery	The tool w3af found out that the web application does not make use of protection techniques to prevent click jacking attacks.
Likelihood	It is quite likely that someone would use this kind of exploits on an online banking website, because the people trust these websites. It is not very difficult to use this vulnerability to attack the users.
Impact	The user would think he would interact with the secure online banking system, but in reality he is on a malicious website that can record his interaction and filter out sensitive information.
Recommendation	The use of X-Frame-Options header would help on the server side to prevent against this type of attacks, but is never used by this web application.
Comparison	Our webapp is secure towards clickjacking.

Metric	Value : 4.7
Access Vector	N
Attack Complexity	H
Privileges Required	N
User Interaction	R
Scope	C
Confidentiality Impact	L
Integrity Impact	L
Availability Impact	N

Team3

Likelihood: 0
Impact: 0
Risk: 0

Team3	
Observation	There is no possibility for clickjacking.
Discovery	The use of X-Frame-Options header prevents this.
Likelihood	N/A
Implication	N/A
Recommendation	N/A