DEPARTMENT OF INFORMATICS

TECHNISCHE UNIVERSITÄT MÜNCHEN

Secure Coding Phase 2

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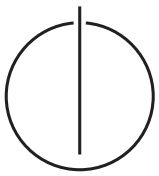

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2 Vulnerabilities Overview

Based on our testing, we identified the following vulnerabilities for the Secode21 Bank and the OnlineBanking Bank:

2.1 Secode21

2.1.1 Static Session ID

- Likelihood: *high*
- Implication: *high*
- Risk: *high*
- Reference: OWASP OTG-SESS-003 (see section **??**)

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 Stored XSS in Registration

- Likelihood: *medium*
- Implication: *high*
- Risk: *high*
- Reference: OWASP OTG-INPVAL-002 (see section **??**)

Using stored cross-site-scripting attacks, one can inject JavaScript code, that is run, when the Administrator/Employee logs in. Arbitrary code can be loaded from a third party page.

2.1.3 Missing Lock Out Mechanism

•Likelihood: *high*
•Implication: *medium*
•Risk: *medium*
•Reference: OWASP OTG-AUTHN-003 (see section **??**)

The application has no lock out mechanism, which allows brute force attacks on known usernames and testing for a valid password

2.2 Team3 Online Banking

2.3 Vulnerability Overview

3 Detailed Report

The following pages describe for each test how both applications Secode21 and Online Banking Bank performed. The test is divided in different sections following the OWASP Testing Guide v4.

3.1 Configuration and Deploy Management Testing

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

Secode21	Likelihood: 8 Impact: 5 Risk:5
Secode21	
Observation	File extensions are handled correctly but while testing we found a folder called SQL with sql files and pdf files describing the database structure and the sql commands used by the web application.
Discovery	Thanks to the tool *dotdotpwn*, that tries automatically different URLs, we found the SQL folder. We passed the following parameters:
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.
Implication	These vulnerabilities could help attackers to perform sql injection attacks because you know the database structure and the sql commands used in the implementation of the web application.
Recommendations	Block the access to sql files and to those folders that describe the web applications architecture.
Comparison	Our web application handles file extensions correctly, but it is possible to access the compiled c program that handles the batch files. This is a problem because you can reverse engineer the code and use the vulnerabilities found. This scenario is possible but is very complex.

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

3.1.2 Test HTTP Methods (OTG-CONFIG-006)

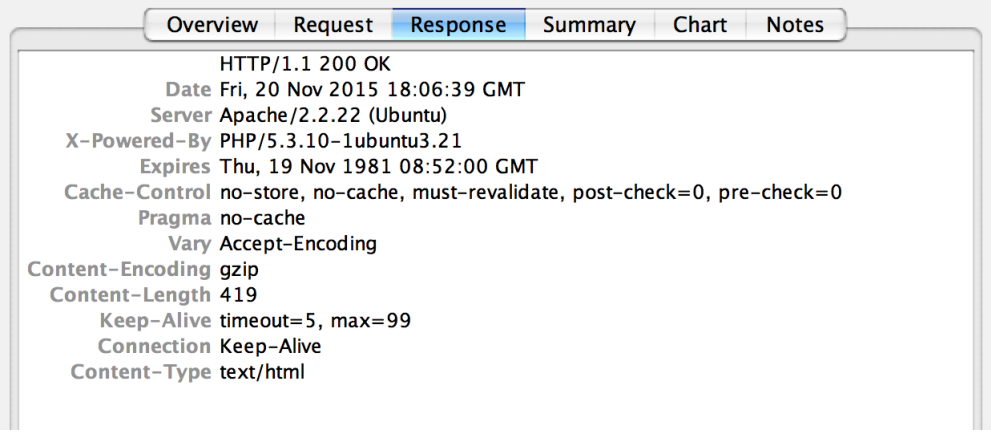
3.1.3 Test HTTP Strict Transport Security (OTG-CONFIG-007)

Secode21

Likelihood: 8
Impact: 5
Risk:5

Secode21	
Observation	The *HTTP Strict Transport Security* protocol is never used.
Discovery	We used *Charles Web Proxy* to check the HTTP response headers and the *Strict-Transport-Security* header was not found.
Likelihood	N/A
Implication	N/A
Recommendations	It would be better so transport some data via https and use the HSTS protocol.
Comparison	The same results apply for our web application.

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



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

Secode21

Likelihood: 8
Impact: 5
Risk:5

Secode21	
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

3.2 Identity Management Testing

3.2.1 Test Role Definitions(OTG-IDENT-001)

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

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

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

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

3.3 Authentication Testing

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

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

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

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

3.3.5 Test remember password functionality(OTG-AUTHN-005)

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

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

3.3.8 Testing for Weak security question/answer(OTG-AUTHN-008)

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3.3.10 Testing for Weaker authentication in alternative channel(OTG-AUTHN-010)

3.4 Authorization Testing

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3.4.2 Testing for bypassing authorization schema(OTG-AUTHZ-002)

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

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

3.5 Session Management Testing

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

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

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

Team 21

Observation	N/A
Discovery	N/A
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Table 3.1: OWASP OTG-SESS-003 results for team 21

Team 3

Observation	N/A
Discovery	N/A
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Table 3.2: OWASP OTG-SESS-003 results for team 3

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

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

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

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

3.5.7 Test Session Timeout(OTG-SESS-007)

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

3.6 Data Validation Testing

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

Team 21

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

Table 3.3: OWASP OTG-INPVAL-001 results for team 21

Team 3

Observation	N/A
Discovery	N/A
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Table 3.4: OWASP OTG-INPVAL-001 results for team 3

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

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

Team 21

Observation	We observed several possibilities to execute a stored XSS attack. But not all of them could be exploited as the length of the corresponding database fields was often very restricted. We manually tried to inject JavaScript code in every input field. Therefore we used the following code, which just alerts a message.
Discovery	We inserted Javascript code in the name field on the register page. When we logged in as an employee the script was executed. There were cases when the script caused for new registered users after the script was entered to not appear.
Likelihood	This vulnerability can be easily detected, but require some JavaScript knowledge to exploit it. Therefore we estimated the likelihood to be medium.
Implication	The implications are severe as we proofed that it is possible to steal the session. As we injected the code on the admin landing-page, which implies that we were able to act as an admin and register an abitrary account.
Recommendations	Implement a input sanitation on all input fields on the backend side! Try to use whitelisting for the different datatypes and do not rely on the frontend input validation.

Table 3.5: OWASP OTG-INPVAL-002 results for team 21

Team 3

Observation	N/A
Discovery	N/A
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Table 3.6: OWASP OTG-INPVAL-002 results for team 3

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

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

Team 21

Observation	We did not observe any notable behavior.
Discovery	We used the Zed Attack Proxy (ZAP) to change the HTTP requests method to the ones listed below. The requests that were allowed responded with the index page or an empty body. The rejected requests responded with an error message in the body. Methods that were allowed • HEAD • OPTIONS • GET • POST • PUT Methods that were rejected • TRACE • CONNECT
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Table 3.7: OWASP OTG-INPVAL-003 results for team 21

Team 3

Observation	N/A
Discovery	N/A
Likelihood	N/A
Implication	N/A
Recommendations	N/A

Table 3.8: OWASP OTG-INPVAL-003 results for team 3

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

3.6.4 Testing for HTTP Parameter pollution(OTG-INPVAL-004)

3.6.5 Testing for SQL Injection (OTG-INPVAL-005)

3.6.6 Testing for XML Injection(OTG-INPVAL-008)

3.6.7 Testing for SSI Injection(OTG-INPVAL-009)

3.6.8 Testing for XPath Injection(OTG-INPVAL-010)

3.6.9 IMAP/SMTP Injection(OTG-INPVAL-011)

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

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

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

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

3.6.14 Testing for HTTP Splitting/Smuggling(OTG-INPVAL-016)

3.7 Error Handling

Team21

Team21 does not provide a lot of error messages for incorrect inputs (e.g. incorrect TAN length, wrong TAN, TAN used).
Based on the client side input validation, there are also no messages for manipulated input via proxy or by removing the validation patterns, which can lead to problems. Examples would be a malformated email which results in a not working account or a longer input then expected, which cuts off the end of the input. There are some cases when the page returns the path of the file where the error occurred.

Team3

3.8 Cryptography

3.9 Business Logic Testing

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

3.9.2 Test Ability to Forge Requests(OTG-BUSLOGIC-002)

3.9.3 Test Integrity Checks(OTG-BUSLOGIC-003)

3.9.4 Test for Process Timing(OTG-BUSLOGIC-004)

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

3.9.6 Testing for the Circumvention of Work Flows(OTG-BUSLOGIC-006)

3.9.7 Test Defenses Against Application Mis-use(OTG-BUSLOGIC-007)

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

3.9.9 Test Upload of Malicious Files(OTG-BUSLOGIC-009)

3.10 Client Side Testing

Glossary

computer is a machine that....

Acronyms

TUM Technische Universität München.