



# Cross-Site Request Forgery (CSRF)

- Goal: Make a user perform some action on a website without their knowledge
  - Trick the browser into having them do this
- Main idea: Cause a user who's logged into that website to send a request that has lasting effects

# Cross-Site Request Forgery (CSRF)

- Prerequisites:
  - *Victim* is logged into *important.com* in a particular browser
  - *important.com* accepts GET and/or POST requests for important actions
  - *Victim* encounters *attacker's* code in that same browser

# CSRF Example

- *Victim* logs into *important.com* and they stay logged in (within some browser)
  - Likely an auth token is stored in a cookie
- *Attacker* causes *victim* to load  
`https://www.important.com/transfer.php?amount=100000000&recipient=blase`
  - This is a GET request. For POST requests, auto-submit a form using JavaScript
- Transfer money, cast a vote, change a password, change some setting, etc.

# CSRF: How?!

- On *blaseur.com* have `<a href="URL">Cat photos</a>`
- Send an HTML-formatted email with ``
- Have a hidden form on *blaseur.com* with JavaScript that submits it when page loads
- Etc.

# CSRF: Why Does This Work?

- Recall: Cookies for *important.com* are automatically sent as HTTP headers with every HTTP request to *important.com*
- *Victim* doesn't need to visit the site explicitly, but their browser just needs to send an HTTP request
- Basically, the browser is confused
  - “Confused deputy” attack

# CSRF: Key Mitigations

- Check HTTP referer
  - But this can sometimes be forged
- CSRF token
  - “Randomized” value known to *important.com* and inserted as a hidden field into forms
  - Key: not sent as a cookie, but sent as part of the request (HTTP header, form field, etc.)

# Cross-Site Scripting (XSS)

- Goal: Run JavaScript on someone else's domain to access that domain's DOM
  - If the JavaScript is inserted into a page on *victim.com* or is an external script loaded by a page on *victim.com*, it follows *victim.com*'s same origin policy
- Main idea: Inject code through either URL parameters or user-created parts of a page



# Cross-Site Scripting (XSS)

- Variants:
  - *Reflected XSS*: The JavaScript is there only temporarily (e.g., search query that shows up on the page or text that is echoed)
  - *Stored XSS*: The JavaScript stays there for all other users (e.g., comment section)
- Prerequisites:
  - HTML isn't (completely) stripped
  - *victim.com* echoes text on the page
  - *victim.com* allows comments, profiles, etc.

# XSS: How?

- Type `<script>EVIL CODE ();</script>` into form field that is repeated on the page
- Do the same, but as a URL parameter
- Add a comment (or profile page, etc.) that contains the malicious script
- Malicious script accesses sensitive parts of the DOM (financial info, cookies, etc.)
  - Change some values
  - Exfiltrate info (load *attacker.com/?q=SECRET*)

# XSS: Why Does This Work?

- All scripts on *victim.com* (or loaded from an external source by *victim.com*) are run with *victim.com* as the origin
  - By the Same Origin Policy, can access DOM

# XSS: Key Mitigations

- Sanitize / escape user input
  - Harder than you think!
  - Different encodings
  - `<img onmouseover="EVIL CODE ();" />`
  - Use libraries to do this!
- Define Content Security Policies (CSP)
  - Specify where content (scripts, images, media files, etc.) can be loaded from
  - `Content-Security-Policy: default-src 'self' *.trusted.com`