HTTP header injection
- Untrusted data included in response headers
- Can include CRLF and new headers, or premature end to headers
- AKA “response splitting”

Content sniffing
- Browsers determine file type from headers, extension, and content-based guessing
  - Latter two for ~ 1% server errors
- Many sites host “untrusted” images and media
- Inconsistencies in guessing lead to a kind of XSS
  - E.g., “chimera” PNG-HTML document

Cross-site request forgery
- Certain web form on bank.com used to wire money
- Link or script on evil.com loads it with certain parameters
  - Linking is exception to same-origin
- If I’m logged in, money sent automatically
- Confused deputy, cookies are ambient authority

CSRF prevention
- Give site’s forms random-nonce tokens
  - E.g., in POST hidden fields
  - Not in a cookie, that’s the whole point
- Reject requests without proper token
  - Or, ask user to re-authenticate
- XSS can be used to steal CSRF tokens
Open redirects
- Common for one page to redirect clients to another
- Target should be validated
  - With authentication check if appropriate
- **Open redirect**: target supplied in parameter with no checks
  - Doesn't directly hurt the hosting site
  - But reputation risk, say if used in phishing
  - We teach users to trust by site

Note to early readers
- This is the section of the slides most likely to change in the final version
- If class has already happened, make sure you have the latest slides for announcements

Site perspective
- Protect confidentiality of authenticators
  - Passwords, session cookies, CSRF tokens
- Duty to protect some customer info
  - Personally identifying info ("identity theft")
  - Credit-card info (Payment Card Industry Data Security Standards)
  - Health care (HIPAA), education (FERPA)
  - Whatever customers reasonably expect

Outline
- More cross-site risks
- Announcements intermission
- Confidentiality and privacy
- Even more web risks

You need to use SSL
- Finally coming around to view that more sites need to support HTTPS
  - Special thanks to WiFi, NSA
- If you take credit cards (of course)
  - Must be protecting something, right?
  - Also important for users of Tor et al.
Server-side encryption

- Also consider encrypting data “at rest”
- (Or, avoid storing it at all)
- Provides defense in depth
  - Reduce damage after another attack
- May be hard to truly separate keys
  - OWASP example: public key for website → backend credit card info

Adjusting client behavior

- HTTPS and password fields are basic hints
- Consider disabling autocomplete
  - Usability tradeoff, save users from themselves
  - Finally standardized in HTML5
- Consider disabling caching
  - Performance tradeoff
  - Better not to have this on user’s disk
  - Or proxy? You need SSL

User vs. site perspective

- User privacy goals can be opposed to site goals
- Such as in tracking for advertisements
- Browser makers can find themselves in the middle
  - Of course, differ in institutional pressures

Third party content / web bugs

- Much tracking involves sites other than the one in the URL bar
  - For fun, check where your cookies are coming from
- Various levels of cooperation
- Web bugs are typically 1x1 images used only for tracking

Cookies arms race

- Privacy-sensitive users like to block and/or delete cookies
- Sites have various reasons to retain identification
- Various workarounds:
  - Similar features in Flash and HTML5
  - Various channels related to the cache
  - Evercookie: store in n places, regenerate if subset are deleted

Browser fingerprinting

- Combine various server or JS-visible attributes passively
  - User agent string (10 bits)
  - Window/screen size (4.83 bits)
  - Available fonts (13.9 bits)
  - Plugin versions (15.4 bits)

(Data from panopticlick.eff.org, far from exhaustive)
History stealing

- History of what sites you've visited is not supposed to be JS-visible
- But, many side-channel attacks have been possible
  - Query link color
  - CSS style with external image for visited links
  - Slow-rendering timing channel
  - Harvesting bitmaps
  - User perception (e.g. fake CAPTCHA)

Browser and extension choices

- More aggressive privacy behavior lives in extensions
  - Disabling most JavaScript (NoScript)
  - HTTPS Everywhere (whitelist)
  - Tor Browser Bundle
- Default behavior is much more controversial
  - Concern not to kill advertising support as an economic model

Outline

- More cross-site risks
- Announcements intermission
- Confidentiality and privacy
- Even more web risks

Misconfiguration problems

- Default accounts
- Unneeded features
- Framework behaviors
  - Don't automatically create variables from query fields

Openness tradeoffs

- Error reporting
  - Few benign users want to see a stack backtrace
- Directory listings
  - Hallmark of the old days
- Readable source code of scripts
  - Doesn't have your DB password in it, does it?

Using vulnerable components

- Large web apps can use a lot of third-party code
- Convenient for attackers too
  - OWASP: two popular vulnerable components downloaded 22m times
- Hiding doesn’t work if it’s popular
- Stay up to date on security announcements
Clickjacking

- Fool users about what they're clicking on
  - Circumvent security confirmations
  - Fabricate ad interest
- Example techniques:
  - Frame embedding
  - Transparency
  - Spoof cursor
  - Temporal “bait and switch”

Crawling and scraping

- A lot of web content is free-of-charge, but proprietary
  - Yours in a certain context, if you view ads, etc.
- Sites don’t want it downloaded automatically (web crawling)
- Or parsed and used for another purpose (screen scraping)
- High-rate or honest access detectable