

# Security Analysis of Github

Sean Smith, Kyle Holzinger, Amalia Safer

## Cookies

A session cookie called `user.session` is stored which contains a seemingly random nonce. When a get request is made to `https://github.com`, the cookie is sent and the database is queried to see if the cookie is valid. If the cookie is valid it will return user data as if the user is logged in. There are two more cookies of importance `logged.in` which is a yes/no value and `dotcom.user` which is the user’s username. To impersonate a user, only the `user.session` is needed, the `logged.in` cookie will always be yes and the `dotcom.user` will be filled by the server if the `user.session` cookie is valid. When the user logs out, the cookie is invalidated by the server in a post request to `https://github.com/logout` that contains the content type and an authenticity token. If an attacker is using the user’s cookie and the user logs out, the attacker’s cookie will be invalidated.

When the user logs in, a post request is sent to `https://github.com/session` with the username, password and authenticity token.

One attack is to guess a random cookie and query to see if it’s valid. There are approximately 8 million active github users at a time so roughly 8 million valid cookies. Since you don’t need the `logged.in` cookie to be set correctly, you can construct a random cookie and check if it’s valid. The length of the cookie is 80 characters and each character is from the universe (a-z, A-Z, 0-9, -, \_) which has a size of 64. Say the set of correct cookies  $S$  has size  $|S| = 8,000,000$ , the universe  $U$  has a size of  $|U| = 64^{80}$

## User Tracking

Github does not serve ads as it’s business model revolves around selling premium subscriptions. However it does track users for analytics purposes via Google analytics. It does this in two ways:

1. Google analytics sticks cookies
2. In the rare event that the user removes these cookies, google analytics tries to fingerprint the user. It collects the browser, operating system,

## CSP

Content security policy csp

## SSL

All connections to `github.com` are done via `https`. This is enforced via HTTP strict transport security (HSTS). Github sets the

## Attack Vectors

Github relies on the security of `git`. In one scenario, such as pushing changes to a repository that you don’t own

## XSS

Github has two major protections against cross-site-scripting (XSS) attacks.

## Significance