ACM NetSec

Cybersecurity Made Simple

Personal Security

ACM NetSec, Fall 2017

C

Confidentiality

Update: Next Week

Facebook Tech Panel:

Monday, October 23rd

Boelter 3400

6:30 PM

https://www.facebook.com/events/1405795962851010/

We will resume Personal Security the next Monday

Agenda

- Myths vs. Realities
- Messaging
- Passwords
- Case Studies
- TFA
- ISP’s, Browsers, and Personal Info
- Government and Confidentiality

Common Myths

- Nobody cares about my computer
- Who would go through the effort of targeting me?
- It would be obvious if my computer was compromised

Nobody cares about my computer

- “I have nothing worth stealing”
- Personal data, credit card info, accounts
    - What would be the repercussions of just getting a username and password for your Amazon account?
- Some attacks don’t steal any of your information, they exploit your need for your own information
    - Ransomware

Who would go through the effort of targeting me?

- Everyone is a valuable target
  - Personal data, contact lists, account info, credit cards
- Sometimes the target is not the individual, but the organization
  - Social engineering attacks rely on human entry points for corporate exploitation
- Attacks are easily automated
  - Spam, embedded links

It would be obvious if my computer was compromised

- When someone takes advantage of your data, they do not want you discovering them

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GPG Recap

Who are you trusting?

GPG Software

Key Server

Communication Channel

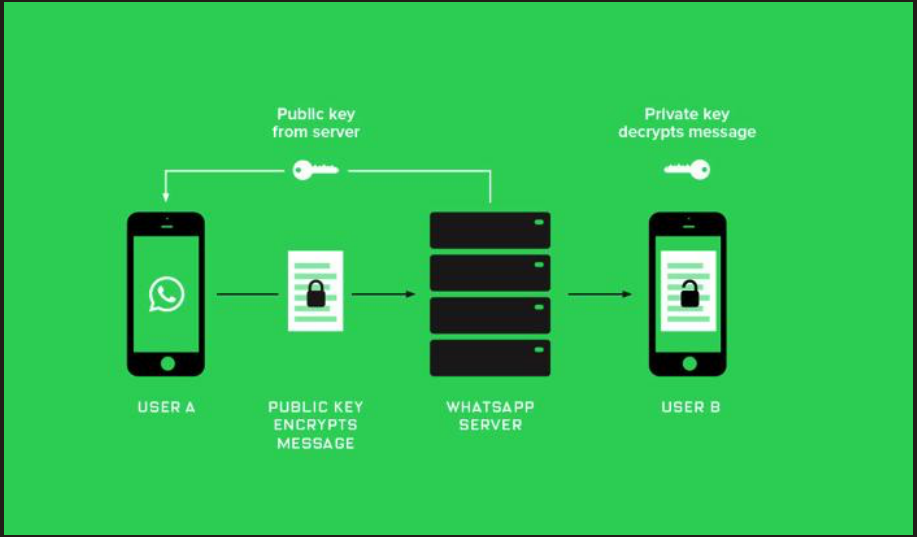
Receiver of the encrypted message

Pretty minimal trust.

What else can we do this way?

Encrypted Messaging

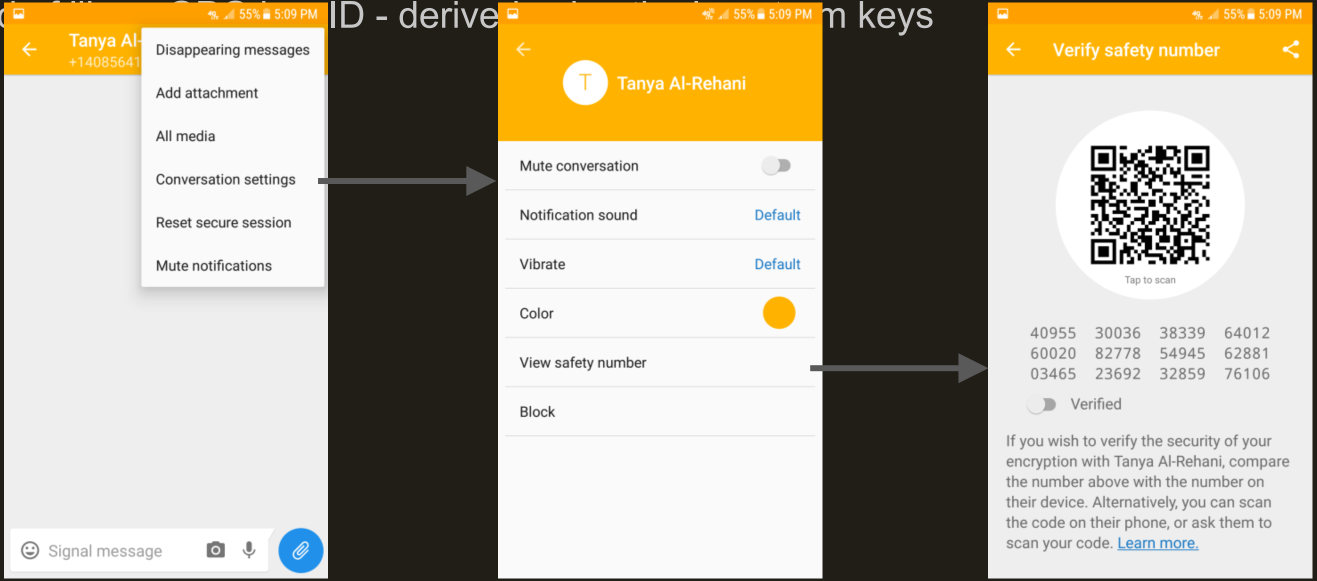
- Signal/Whatsapp
- How do they work?
  - Similar, except keys are "ephemeral" - temporary
  - In GPG, email + keyID served as an identifier
  - Here, it is your Whatsapp account or (for Signal) your phone number
- Much harder to do incorrectly than GPG!



Signal Identity

Security Code

Kin ID - derive m keys



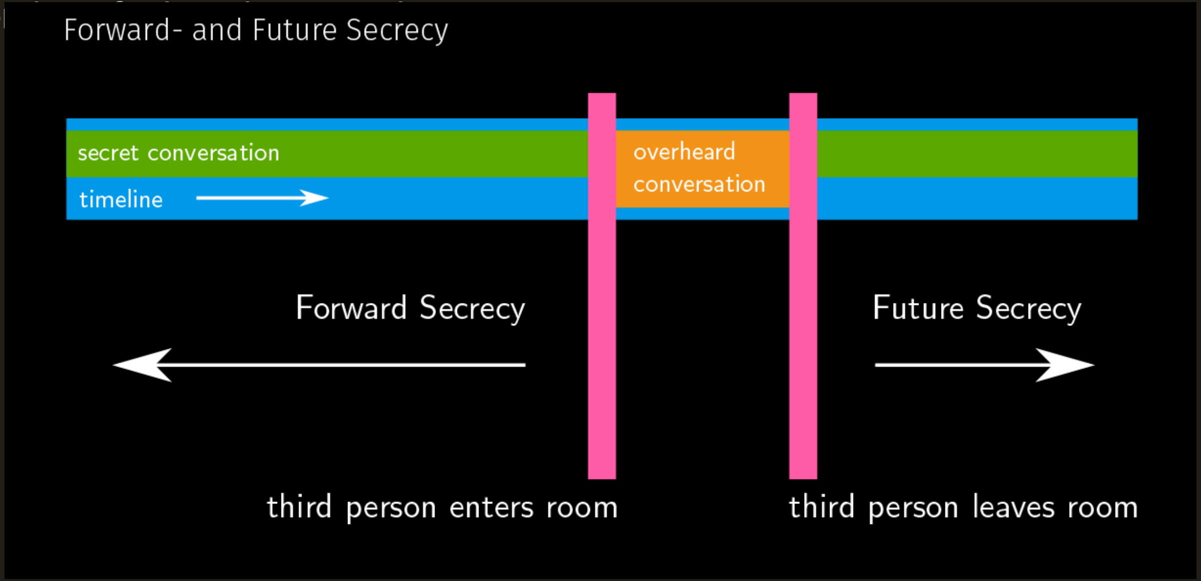
```
40955  30036  38339  64012
60020  82778  54945  62881
03465  23692  32859  76106
```

If you wish to verify the security of your encryption with Tanya Al-Rehani, compare the number above with the number on their device. Alternatively, you can scan the code on their phone, or ask them to scan your code. Learn more.

Signal Confidentiality

Signal also has forward and future secrecy

Compro



Still vulnerable to metadata collection

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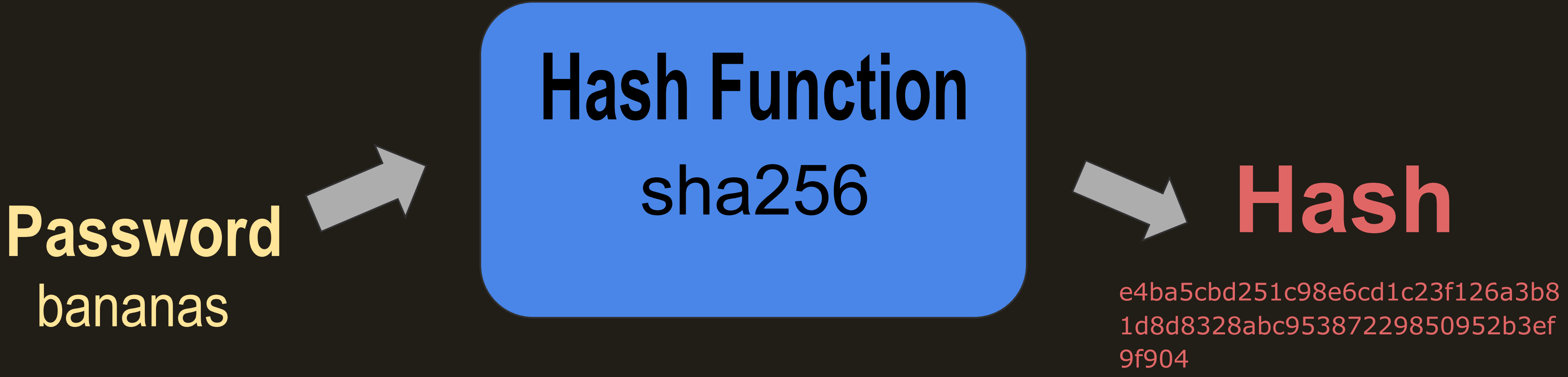
Wireshark Demo

Password Hash Algorithms

- One way
- Each input produces a single, unique output
- The same input string will ALWAYS produce the same output string



Password

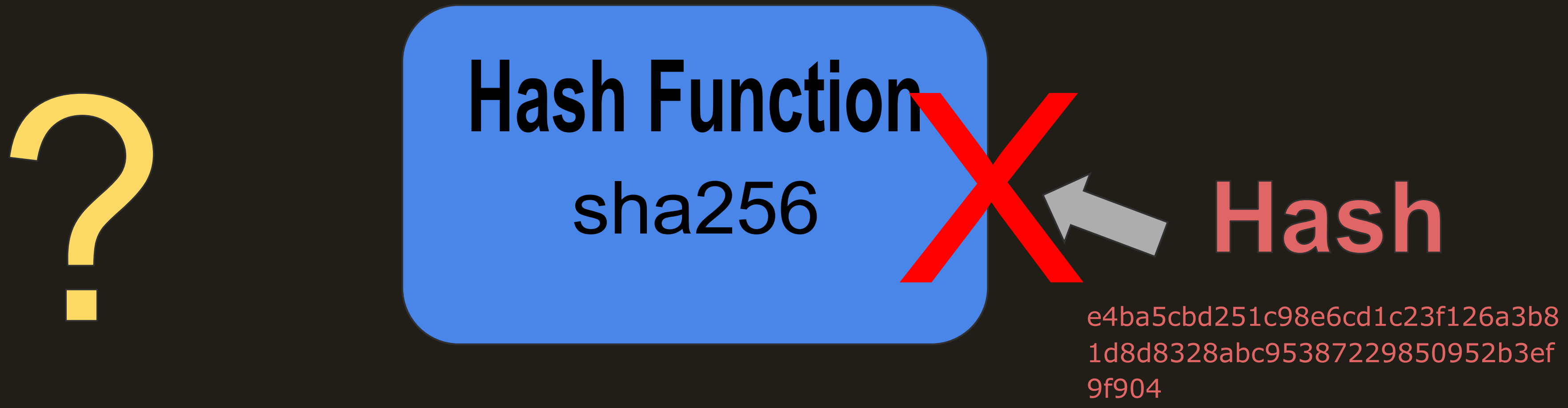
bananas

Hash Function

sha256

Hash

e4ba5cbd251c98e6cd1c23f126a3b8
1d8d8328abc95387229850952b3ef
9f904



Hash Function

sha256

Hash

e4ba5cbd251c98e6cd1c23f126a3b8
1d8d8328abc95387229850952b3ef
9f904

Workflow for account registration and authentication

1. Create account
2. Password is hashed
3. Upon login, hash is compared to the one stored on database
4. If the hashes match, the user is granted access
5. Repeat 3 and 4

https://crackstation.net/hashing-security.htm#normalhashing

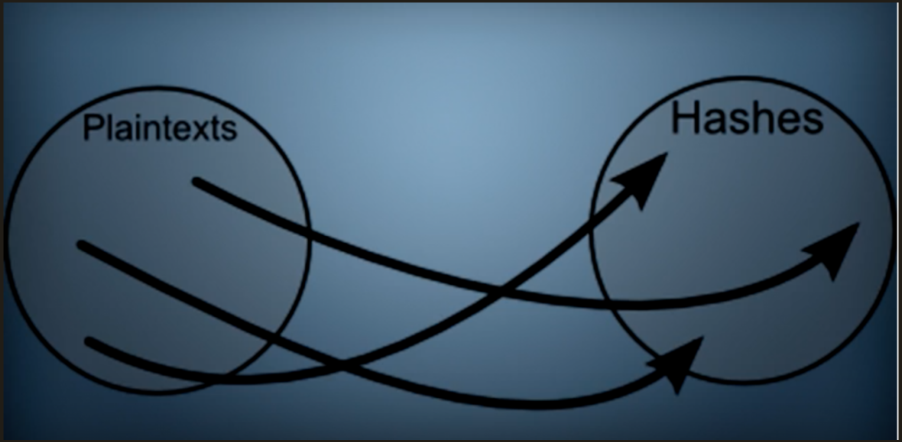
How Hashes are Cracked

Approach 1: Guess the password

1. Guess the password
2. Hash each guess
3. Guess hash = hash?
   a. Yes, you got it!
   b. No, try again

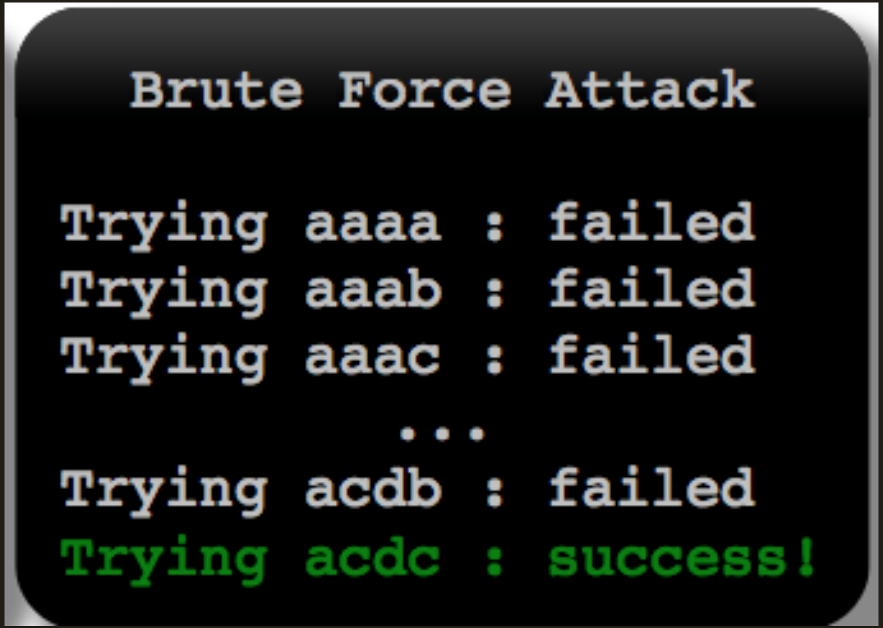
Two Methods:

1. Brute Force
2. Dictionary



Brute Force Attacks

- Try every possible combination
- Always eventually find the password
- Very computationally expensive
- Inefficient



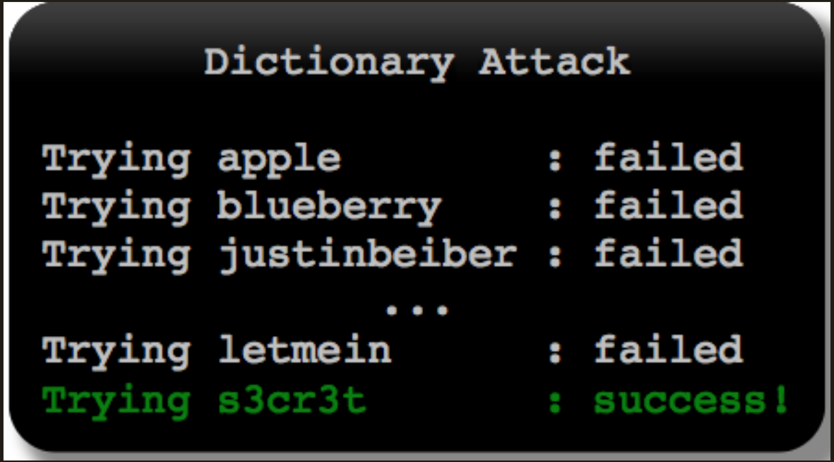
```
    Brute Force Attack

Trying aaaa : failed
Trying aaab : failed
Trying aaac : failed
         ...
Trying acdb : failed
Trying acdc : success!
```

Brute Force Attacks

“123456789” (9 characters, all numbers)	14.17 minutes
“vacation” (8 characters, all lowercase letters)	2 days
“blUeFisH” (8 characters, mixed uppercase & lowercase)	1.44 years
“r3Dcr0W5” (numbers included)	5.88 years
"%ZBGbv]8" (ASCII included, 8 characters)	45.2 years
"%ZBGbv]8g?" (ASCII, 10 characters)	289,217 years

Dictionary Attacks

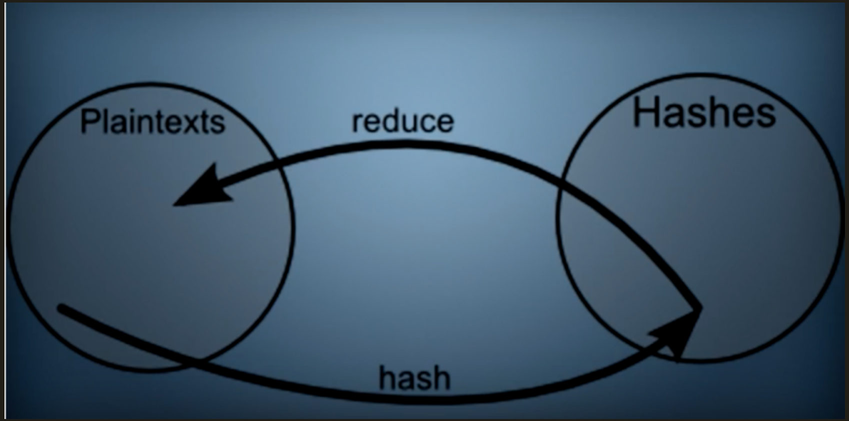
- Pulls from “Dictionary” file
- Hash each guess and compare
- Further processing is often applied to the files, such as l33t speak



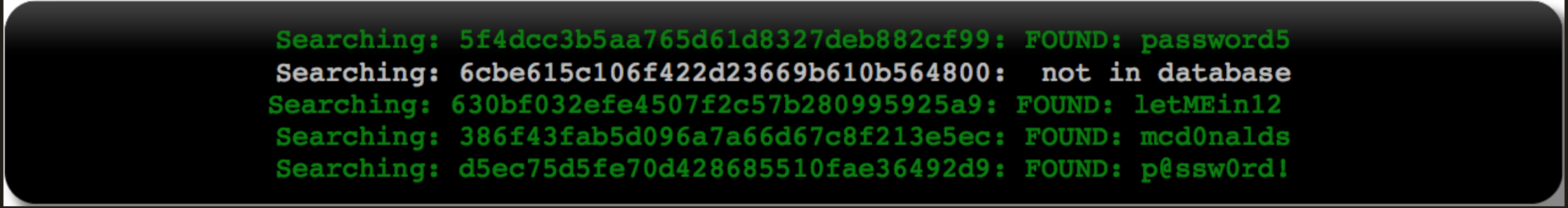
```
             Dictionary Attack

Trying apple          : failed
Trying blueberry      : failed
Trying justinbeiber : failed
                 ...
Trying letmein        : failed
Trying s3cr3t         : success!
```

Approach 2: Look it up

- Searchable table
- Search the table to see if the hash is there
  - Yes, you got it!
  - No, you're out of luck
- This process can also be reversed with **Reverse Lookup Tables**



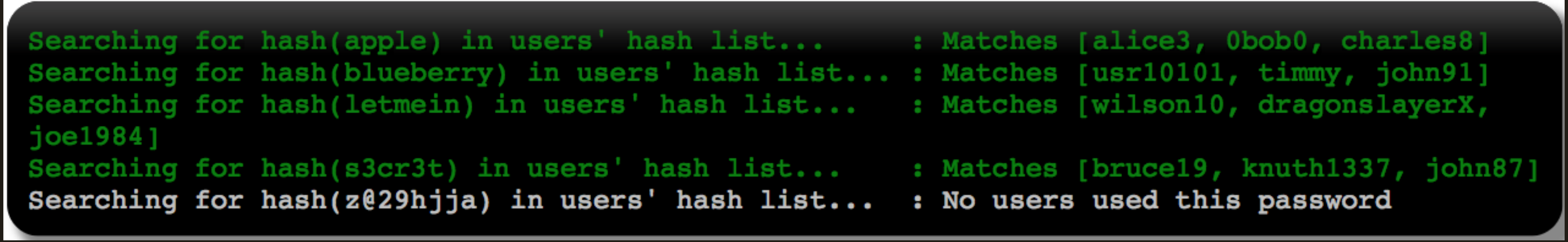
Lookup Tables



```
Searching: 5f4dcc3b5aa765d61d8327deb882cf99: FOUND: password5
Searching: 6cbe615c106f422d23669b610b564800:  not in database
Searching: 630bf032efe4507f2c57b280995925a9: FOUND: letMEin12
Searching: 386f43fab5d096a7a66d67c8f213e5ec: FOUND: mcd0nalds
Searching: d5ec75d5fe70d428685510fae36492d9: FOUND: p@ssw0rd!
```

- Pre-compute the hashes of a certain dictionary
- Look up the hash you’re trying to crack

Reverse Lookup Tables



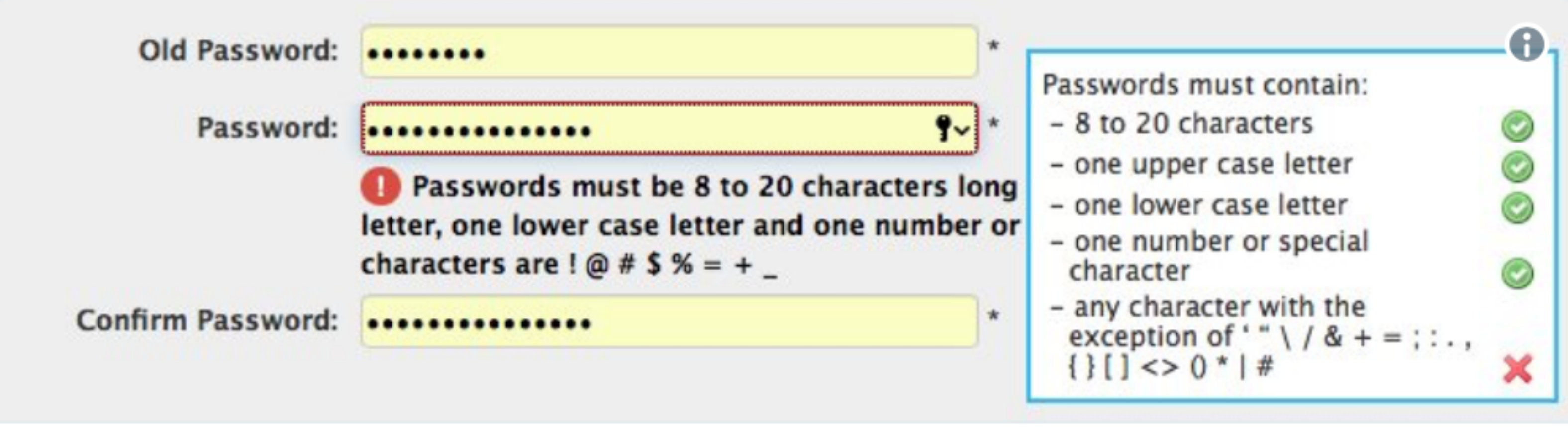
```
Searching for hash(apple) in users' hash list...     : Matches [alice3, 0bob0, charles8]
Searching for hash(blueberry) in users' hash list... : Matches [usr10101, timmy, john91]
Searching for hash(letmein) in users' hash list...   : Matches [wilson10, dragonslayerX,
joe1984]
Searching for hash(s3cr3t) in users' hash list...    : Matches [bruce19, knuth1337, john87]
Searching for hash(z@29hjja) in users' hash list...  : No users used this password
```

- Associate users to hashes
- Use dictionary or brute force to get
- Especially effective because people often use similar passwords

What These Mean For Us

- Brute Force
  - Password length
- Dictionary
  - Common words/expressions are susceptible
  - Substitutions are accounted for
- Lookup Tables
  - Common passwords are at risk

Typical Password Guide



Old Password: •••••••• *

Password: ••••••••••••••• *

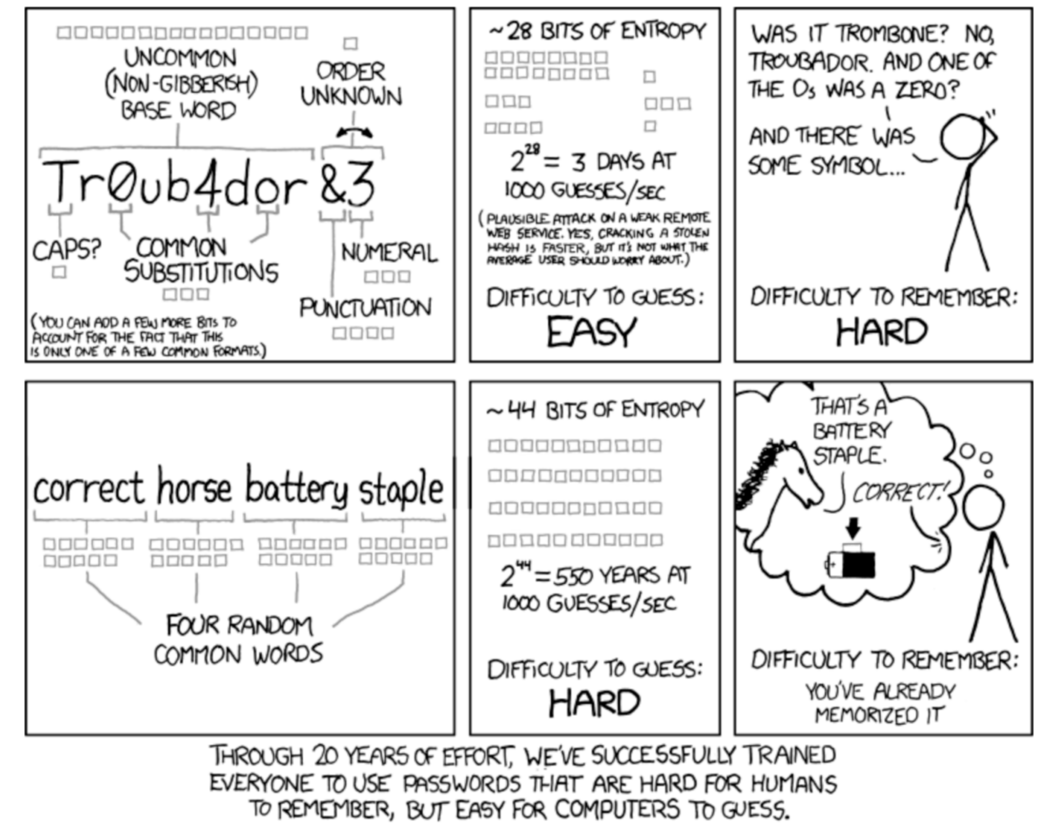
❗ Passwords must be 8 to 20 characters long
letter, one lower case letter and one number or
characters are ! @ # $ % = + _

Confirm Password: ••••••••••••••• *

Passwords must contain:

- 8 to 20 characters ✓
- one upper case letter ✓
- one lower case letter ✓
- one number or special character ✓
- any character with the exception of ' " \ / & + = ; : . , { } [ ] <> () * | # ✗

Possible Alternative Solution


UNCOMMON (NON-GIBBERISH) BASE WORD
ORDER UNKNOWN
Tr0ub4dor&3
CAPS?
COMMON SUBSTITUTIONS
NUMERAL
PUNCTUATION
(YOU CAN ADD A FEW MORE BITS TO ACCOUNT FOR THE FACT THAT THIS IS ONLY ONE OF A FEW COMMON FORMATS.)
~28 BITS OF ENTROPY
2^28 = 3 DAYS AT 1000 GUESSES/SEC
(PLAUSIBLE ATTACK ON A WEAK REMOTE WEB SERVICE. YES, CRACKING A STOLEN HASH IS FASTER, BUT IT'S NOT WHAT THE AVERAGE USER SHOULD WORRY ABOUT.)
DIFFICULTY TO GUESS: EASY
WAS IT TROMBONE? NO, TROUBADOR. AND ONE OF THE Os WAS A ZERO?
AND THERE WAS SOME SYMBOL...
DIFFICULTY TO REMEMBER: HARD
correct horse battery staple
FOUR RANDOM COMMON WORDS
~44 BITS OF ENTROPY
2^44 = 550 YEARS AT 1000 GUESSES/SEC
DIFFICULTY TO GUESS: HARD
THAT'S A BATTERY STAPLE.
CORRECT!
DIFFICULTY TO REMEMBER: YOU'VE ALREADY MEMORIZED IT
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.

Password Managers

To name a few…

- 1Password
- LastPass
- Dashlane
- Others

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[case] LastPass

- Detected breach quickly
- Notified customers
- Only authentication hashes were compromised, no vault data
- Hash algorithms are strong

https://nakedsecurity.sophos.com/2015/06/16/bad-news-lastpass-breached-good-news-you-should-be-ok/

[case] LinkedIn

- 4 year time gap. Breach discovered in 2012, data released in 2016
- Not all users were notified
- Poor hash algorithm (SHA-1)
- Stored without salt

https://www.troyhunt.com/observations-and-thoughts-on-the-linkedin-data-breach/

[case] Equifax

- Slow to detect and notify consumers
- Difficult-to-find link for checking if affected
- URL Spoof
- Name and SSN are not things you can **change,** passwords can be changed

Have I Been Pwned?

https://haveibeenpwned.com

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Two Factor Authentication for MyUCLA

http://tinyurl.com/uclatwofactor

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Why care?

Everyone is trying to track your behavior

- Who you talk to
- What you look at
- Where you are

Used for targeted advertising.

Maybe you want to keep this private.

...Or just avoid creepy targeted advertising

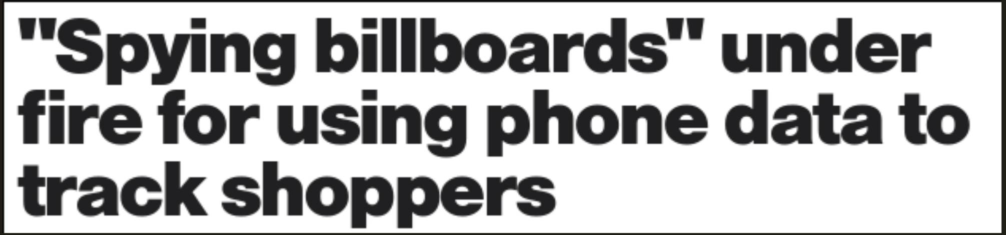
How is this done?

Physical Behavior

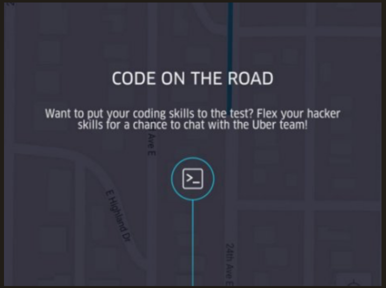
- Wifi MAC address
- Phone GPS data

Online Behavior

- Browser fingerprinting
  - Cookies
  - History
- IP Address
- Web page behavior



"Spying billboards" under fire for using phone data to track shoppers



CODE ON THE ROAD

Want to put your coding skills to the test? Flex your hacker skills for a chance to chat with the Uber team!

How to Prevent it?

Ad Blocker

Ads can have access to a lot of browser information, and be tied to other accounts.

Traditional - AdBlock, uBlock Origin

Smart - EFF’s Privacy Badger

Nuclear - noscript (just disable everything)

VPN

Disguises IP address from website, but not from VPN

TOR Browser

Nobody knows both the source and destination IP

Feedback Form and Attendance Code

http://tinyurl.com/PersonalSecurity2