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Computer Systems B

COMS20012

Introduction to Operating Systems and Security

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Passwords

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What is a password?

- Secret shared between a user and a service
- Simplest implementation?

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- Secret shared between a user and a service
- Simplest implementation?
  - Table: usr -> passwd

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Threat 1

Attacker have access to the table

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What is a password?

- Secret shared between a user and a service
- Simplest implementation?
  - Table: usr -> passwd
  - Not great
  - Table: usr -> Hash(passwd)
  - We assume hash cannot be reverted

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Problem?

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Skewed distribution

FORTUNE

The 25 Most Common Passwords of 2017 Include 'Star Wars'

In case it isn't clear, SplashData warns that "use of any of the passwords on this list put users at grave risk for identity theft."

Change your password today.

The top 25 passwords on the 2017 list.

1. **123456** (Unchanged)

2. **Password** (Unchanged)

3. **12345678** (Up 1)

4. **qwerty** (Up 2)

5. **12345** (Down 2)

6. **123456789** (New)

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Skewed distribution

- Top 100,000 passwords
  - https://github.com/danielmiessler/SecLists/blob/master/Passwords/Common-Credentials/10-million-password-list-top-100000.txt
- >20% of users

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Skewed distribution

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How attacker use this?

- Dictionary attack
- Go through the list of most used password
- Check for a match

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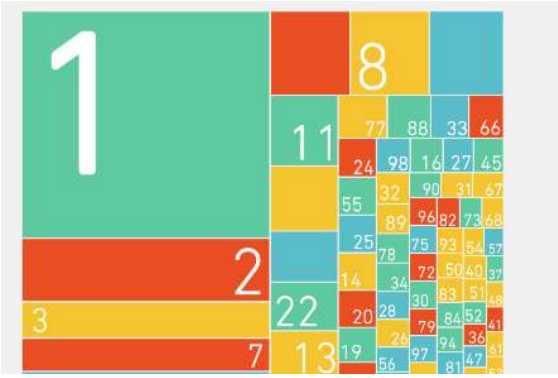
Solution? (bad one)

- Ask the user to add some specific characters



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Solution? (bad one)

- No word from the dictionary

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Solution? better hash

- usr -> hash(password)
- Hash -> low computational cost
- More costly hash
  - Eg.PBKDF2, Bcrypt etc…
- Still not a solution!

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Rainbow table

- Attacker
  - password -> Hash1(password), Hash2(password) etc…
  - If your website use a framework the attacker knows the hash function
- Try to find a match in the service table
- Due to password distribution likely to get a match
- Computational cost is independent from the hash function
  - One time cost

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Solution? Salt

- Hash(salt, password)
- Different salt per password (for and across users)
- Salt does not need to be a secret
  - Defeat rainbow table
  - Increase cost of dictionary attack
- Not a panacea
  - If your password is 1234
  - Arms race

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Thank you

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