

HARVARD BUSINESS ANALYTICS PROGRAM

Programming and Data Systems

Securing Systems

Authentication

Authorization

Passwords

Brute-Force Attacks

4-digit passcode

$$10 \times 10 \times 10 \times 10$$

10,000

4-letter passcode

$$52 \times 52 \times 52 \times 52$$

7,311,616

4-character passcode

$$94 \times 94 \times 94 \times 94$$

78,074,896

8-character passcode

94 × 94 × 94 × 94 ×

94 × 94 × 94 × 94

6,095,689,385,410,816

Password Managers

Single Sign-On (SSO)

Two-Factor Authentication

Hashing

X

f(x)

12345

827ccb0eea8a706c4c34a16891f84e7b

e10adc3949ba59abbe56e057f20f883e

Salting

12345

827ccb0eea8a706c4c34a16891f84e7b

12345

A

12345

B

12345

A
c93681cc64267307f3e5289bd6b61847

B
1f84bfd4d8c8d5f7e5082c154527c282

Encryption

Secret-Key Encryption

BE SURE TO DRINK YOUR OVALTINE

CF TVSF UP ESJOL ZPVS PWBMUJOF

BE SURE TO DRINK YOUR OVALTINE

Public-Key Encryption

End-to-End Encryption

Full-Disk Encryption

Securing Systems