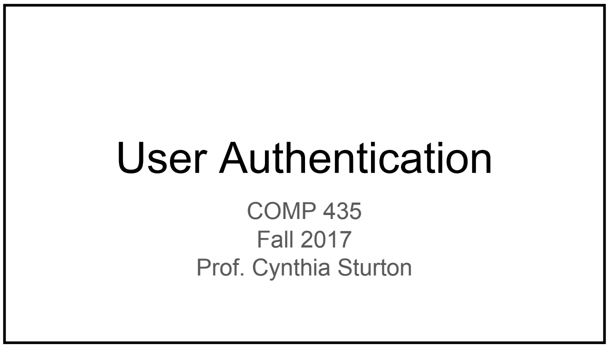
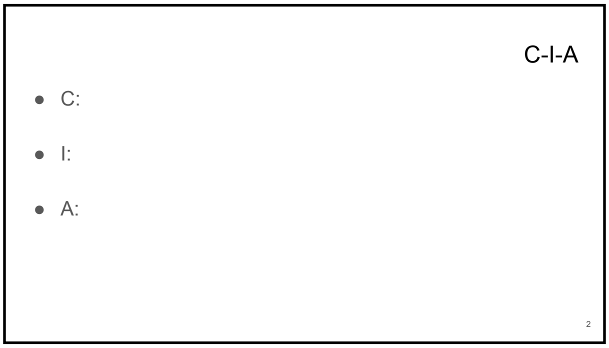


User Authentication

COMP 435
Fall 2017
Prof. Cynthia Sturton

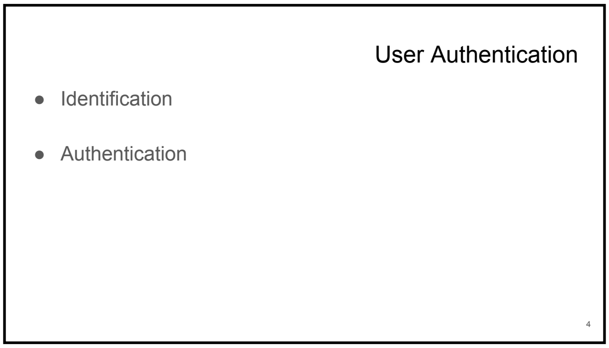


C-I-A

- C:
- I:
- A:

C-I-A

- C: only **authorized users** can read
- I: only **authorized users** can modify
- A: all **authorized users** have access



User Authentication

- Identification
- Authentication

Identification

- Explicit:

  “Hello, my name is”
- Implicit:

  Wearing an orange apron at Home Depot

Identification & Authentication

- ID: state your name when you ask a question
  Auth: none

- ID: your presence in the classroom
  Auth: attendance sheet sign-in

Identification vs. Authentication

Identification

- Public

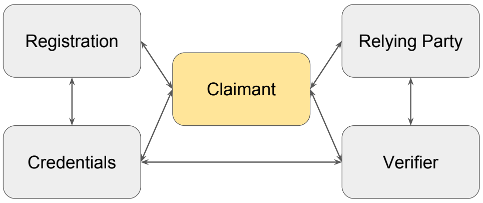
- Well-known

Authentication

- Private

- Something you know
- Something you have
- Something you are
- Something you do

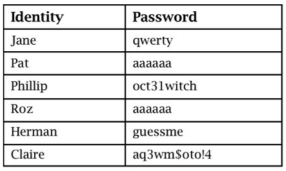
Identification & Authentication



Passwords: something you know

- Ubiquitous
- Difficult to use well
- Easy to attack

Password-based Authentication



Identity	Password
Jane	qwerty
Pat	aaaaaa
Phillip	oct31witch
Roz	aaaaaa
Herman	guessme
Claire	aq3wm$oto!4

From *Security in Computing, Fifth Edition*, by Charles P. Pfleeger, et al. (ISBN: 9780134085043). Copyright 2015 by Pearson Education, Inc. All rights reserved.

Attacking Password-based Authentication

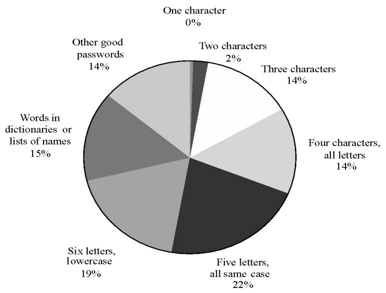
- Guessing
- Workstation hijacking
- Social engineering
- Electronic monitoring

Character Sets used in Password	Calculation	Possible Combinations
Dictionary words	---	600,000
Numbers only	10^8	100,000,000
Lowercase alpha	26^8	208,827,064,576
Full alpha	52^8	53,459,728,531,456
Full alpha + number	62^8	218,340,105,584,896
Printable characters	(10+26+26+19)^8	645,753,531,245,761

https://www.uc.edu/infosec/password/choosepassword.html

Password-based Authentication

Passwords are unique and chosen uniformly and at random from the set of all possible passwords



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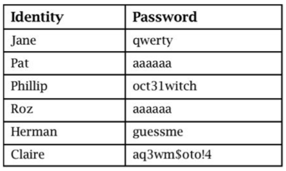
Common Passwords

- “Qwerty”
- “Password”
- “123456”
- User’s family names
- Words in the dictionary
- Common number substitutions (3-e, 1-l, 4-for, 0-O)

Attacking Passwords: guessing



Identity	Password
Jane	qwerty
Pat	aaaaaa
Phillip	oct31witch
Roz	aaaaaa
Herman	guessme
Claire	aq3wm$oto!4

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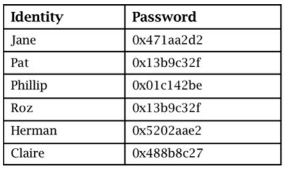
Password-based Authentication



Identity	Password
Jane	0x471aa2d2
Pat	0x13b9c32f
Phillip	0x01c142be
Roz	0x13b9c32f
Herman	0x5202aae2
Claire	0x488b8c27

Hashed

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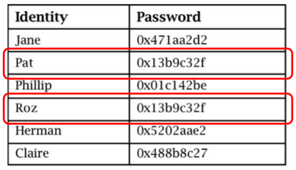
Offline Dictionary Attack

Precomputed list of popular passwords

Passwords



Identity	Password
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Phillip	0x01c142be
Roz	0x13b9c32f
Herman	0x5202aae2
Claire	0x488b8c27

Hashed

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Salting the Passwords

Identity	ID+password	Stored authentication value
Jane	Jane+qwerty	0x1d46e346
Pat	Pat+aaaaaaa	0x2d5d3e44
Phillip	Phi+oct31witch	0xc23c04d8
Roz	Roz+aaaaaaa	0xe30f4d27
Herman	Her+guessme	0x8127f48d
Claire	Cla+aq3wm$oto!r	0x52093942

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Rainbow Table

Precomputed list of popular passwords, salted and hashed

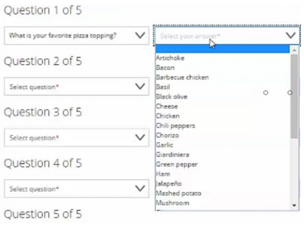
Strong Passwords

- Chosen uniformly and at random from the set of possible passwords
- Easy to remember

Q&A: something you know

- Register by answering a few questions about yourself
- Design assumptions:
  - Easier to remember
  - Adds entropy

United Airlines Using Q&A



Question 1 of 5

What is your favorite pizza topping?

Select your answer*

Artichoke
Bacon
Barbecue chicken
Basil
Black olive
Cheese
Chicken
Chili peppers
Chorizo
Garlic
Giardiniera
Green pepper
Ham
Jalapeño
Mashed potato
Mushroom

Question 2 of 5

Select question*

Question 3 of 5

Select question*

Question 4 of 5

Select question*

Question 5 of 5

http://krebsonsecurity.com/2016/08/united-airlines-sets-minimum-bar-on-security/