CSCI 331: Introduction to Computer Security

Lecture 1: Course Intro

Instructor: Dan Barowy

Williams

Announcements

- CS Colloquium, Fridays 2:35-4pm in Wege auditorium

Course stuff

What is "security"?

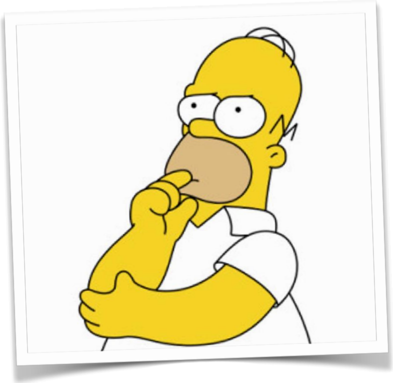
What does it mean for something to be "secure"?

Concretely…

E-mail

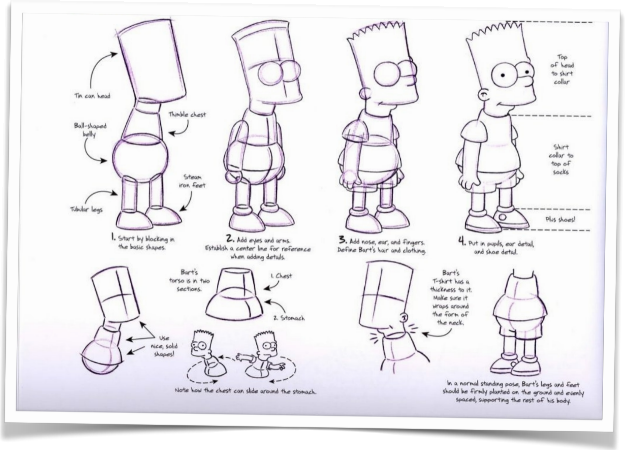
About the class

First thing this course is about:



Thinking… … not feeling.

Second thing this course is about:


Tin can head
Thimble chest
Ball-shaped belly
Steam iron feet
Tubular legs
1. Start by blocking in the basic shapes.
2. Add eyes and arms. Establish a center line for reference when adding details.
3. Add nose, ear, and fingers. Define Bart's hair and clothing.
4. Put in pupils, ear detail, and shoe detail.
Top of head to shirt collar
Shirt collar to top of socks
Plus shoes!
Bart's torso is in two sections.
1. Chest
2. Stomach
Use nice, solid shapes!
Note how the chest can slide around the stomach.
Bart's T-shirt has a thickness to it. Make sure it wraps around the form of the neck.
In a normal standing pose, Bart's legs and feet should be firmly planted on the ground and evenly spaced, supporting the rest of his body.

How security is designed and implemented.

Security is a broad topic!

The semester is too short to cover everything!

"security" = four essential properties

confidentiality (privacy)	integrity
authenticity	availability

We analyze the security of assets

Some assets:

- Data (e.g., email)
- Software (e.g., operating system)
- Services (e.g., e911)
- Things (e.g., computer, car, house, …)

We analyze the security of assets with respect to adversaries

Some adversaries:

- National governments
- Organized crime
- Thrill-seekers
- Journalists
- "Friends"
- Business competitors
- [H]activists
- Potential employers
- Bored students!!!

We analyze the security of assets with respect to adversaries who aim to achieve certain goals.

We call these scenarios **threats**.

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We call these scenarios **threats**.

Goal: to analyze threats dispassionately.

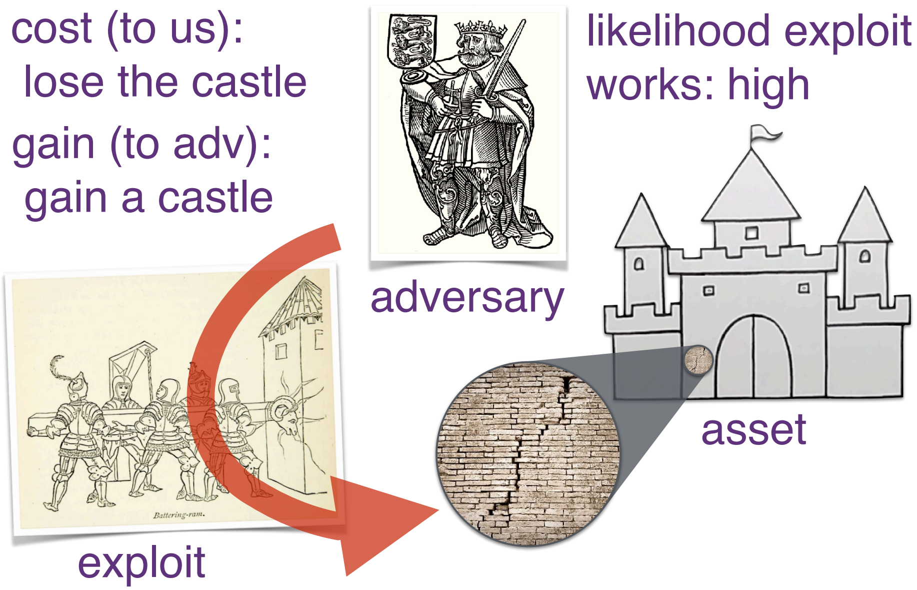
- **Source** of the attack.
- **Effect** on 4 security properties:
  - Confidentiality
  - Integrity
  - Authenticity
  - Availability
- **Cost** of damage.

Weaknesses of security properties are called vulnerabilities.

- Allowing any password: “password”.
- Program stores data “in the clear.”
- Program uses crypto with known flaws.
- Important computers are in unlocked space.

Actions that take advantage of vulnerabilites are called exploits.

- Allowing any password: “password”.
  Attacker tries likely passwords.
- Program stores data “in the clear.”
  Attacker finds way to read disk.
- Program uses crypto with known flaws.
  Attacker has enough resources to break it.
- Important computers are in unlocked space.
  Attacker steals/tampers w/computer resources.



cost (to us):
lose the castle

gain (to adv):
gain a castle

likelihood exploit
works: high

vulnerabilities: {integrity, authenticity}

Thinking systematically can make decisions easier

cost (to us):
lose the castle

likelihood exploit
works: high

$-1,000,000

p(X) = 0.82

“expected cost”

E[X] = $-1,000,000 x 0.82 = $-820,000

spending up to is “worth the money”

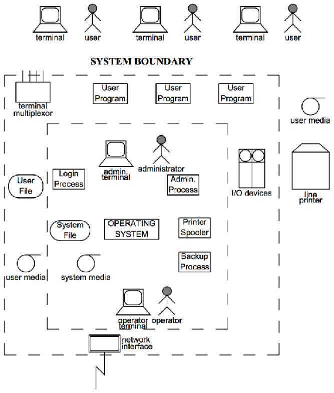
Risk analysis is the systematic analysis of threats to assets.

“Should I connect to airport wifi?”

	Confidentiality	Integrity	Authenticity	Availability
E-Mail				
Docs				
Photos				
Music				

It’s hard to know your vulnerabilities.

It helps to think holistically.



And it *really* helps to keep records over time.

Theory, *noun*, /ˈθiəri/

A statement of one or more laws or principles which are generally held as describing an essential property of something. (from: OED)

Theory: a rule that *predicts* a testable *observation*.

Karl Popper (1902-1994)

Sadly: there is no “theory of security”

You will **never** know whether you are “secure.”

You ***will*** know when you have **mitigated specific threats**.

Sadly: there is no “theory of security”

By thinking systematically and carefully, you ***can*** effectively reduce the risks!

Sadly, the state of the art in computer security is…

Attacks are **easy**.

Defenses are **hard**.

Administrivia

About the course

Lectures:

Mondays & Thursdays, 2:35-3:50pm
Schow 030A

Labs:

Section 1: Wednesdays, 1:10-2:25 pm

Section 2: Wednesdays, 2:35-3:50 pm

both in the Ward Lab (TBL 301)

About the course

Three kinds of homework:

1. **Reading** & **written responses**
   - Due every week.
2. **Programming assignments** (“labs”)
   - Due roughly every two weeks
3. **Final project**
   - Three checkpoints throughout the semester.

About the course

Office Hours in TBL 301 (Ward Lab)

Tuesday: 1:10-2:35pm
Thursday: 4-6pm

and by appointment

This is hopefully athlete-friendly.

Sadly, electives are not given TAs!

About the course

About the course

All handed-in work will be *code*

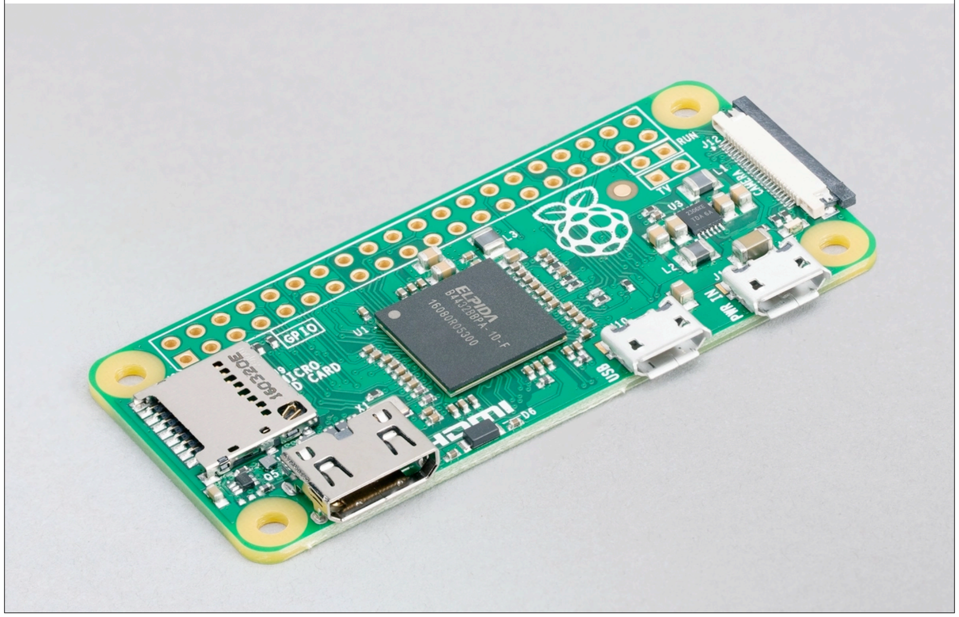
1. Programming assignments
   - C code or
   - Assembly code
2. Writing responses
   - LaTeX code (+ PDF file)
3. Project checkpoints
   - Writing (i.e., LaTeX code)
   - Implementation code
   - Other files

About the course

You will commit to the GitHub repository *assigned* to you.

Usually, your repository will include starter code or a LaTeX template.

Standard platform



Rough schedule

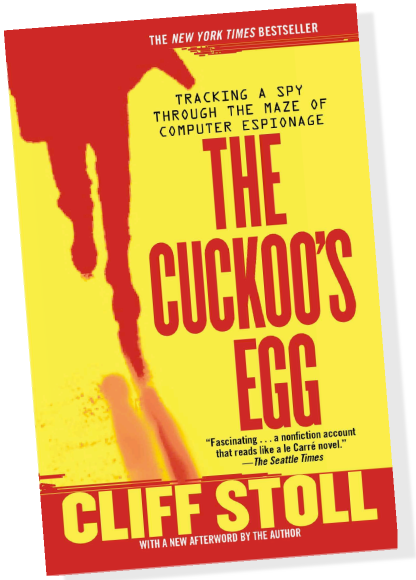
Unpleasantries

Homework

Have a look at the website.

- Due Tues: Getting to Know You
- Due Wed: Signed Code of Ethics
- Due Wed: Reading response

The Cuckoo's Egg


THE NEW YORK TIMES BESTSELLER
TRACKING A SPY THROUGH THE MAZE OF COMPUTER ESPIONAGE
THE CUCKOO'S EGG
"Fascinating . . . a nonfiction account that reads like a le Carré novel."
—The Seattle Times
CLIFF STOLL
WITH A NEW AFTERWORD BY THE AUTHOR

Grading

TRADITIONAL GRADING SYSTEM		STANDARDS-BASED SYSTEM	
A	90-100%	4	Proficient on all standards
B	≥ 80% and < 90%	3	Proficient on most standards
C	≥ 70% and < 80%	2	Proficient on half of the standards
D	≥ 60% and < 70%	1	Proficient on less than half of the standards
F	< 60%	0	Missing

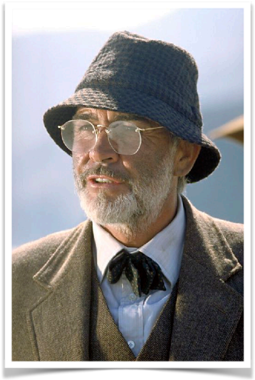
I will post the formula I use to convert to letter grades on the website.

Grading

Final project:	20%
Midterm exam:	20%
Programs/Labs:	30%
Writing assignments:	20%
Attendance and class discussion:	10%

The right attitude for success

You are the intrepid explorer.



I am your elder guide.

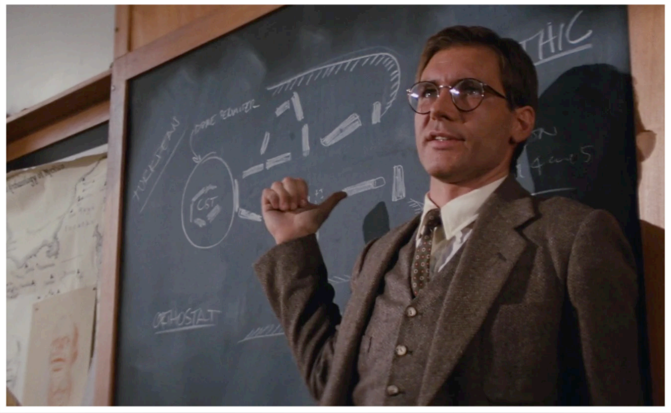
The right attitude for success

You want the adventure.
I want to stay home and putter around my office.

The right attitude for success

I am always happy to help as long as you're the one doing the driving.

This course is not risky…



…provided that you do your homework and turn it in.

Something to know about security

There are “good guys” and “bad guys.”

Please do not be a bad guy.

Something to know about security

Good guys don’t pull their punches with bad guys.
I won’t either.

Computer security is intellectually stimulating…

and can be incredibly exciting.

I hope you learn a lot and have a great semester!

Questions?