

CSci 5271  
Introduction to Computer Security  
Day 24: Usability and security

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## Outline

Usability and security

Announcements intermission

Usable security example areas

## Users are not 'ideal components'

- ▣ Frustrates engineers: cannot give users instructions like a computer
  - Closest approximation: military
- ▣ Unrealistic expectations are bad for security

## Most users are benign and sensible

- ▣ On the other hand, you can't just treat users as adversaries
  - Some level of trust is inevitable
  - Your institution is not a prison
- ▣ Also need to take advantage of user common sense and expertise
  - A resource you can't afford to pass up

## Don't blame users

- ▣ "User error" can be the end of a discussion
- ▣ This is a poor excuse
- ▣ Almost any "user error" could be avoidable with better systems and procedures

## Users as rational

- ▣ Economic perspective: users have goals and pursue them
  - They're just not necessarily aligned with security
- ▣ Ignoring a security practice can be rational if the rewards is greater than the risk

## Perspectives from psychology

- ▣ Users become habituated to experiences and processes
  - Learn “skill” of clicking OK in dialog boxes
- ▣ Heuristic factors affect perception of risk
  - Level of control, salience of examples
- ▣ Social pressures can override security rules
  - “Social engineering” attacks

## User attention is a resource

- ▣ Users have limited attention to devote to security
  - Exaggeration: treat as fixed
- ▣ If you waste attention on unimportant things, it won't be available when you need it
- ▣ Fable of the boy who cried wolf

## Research: ecological validity

- ▣ User behavior with respect to security is hard to study
- ▣ Experimental settings are not like real situations
- ▣ Subjects often:
  - Have little really at stake
  - Expect experimenters will protect them
  - Do what seems socially acceptable
  - Do what they think the experimenters want

## Research: deception and ethics

- ▣ Have to be very careful about ethics of experiments with human subjects
  - Enforced by institutional review systems
- ▣ When is it acceptable to deceive subjects?
  - Many security problems naturally include deception

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## Note to early readers

- ▣ This is the section of the slides most likely to change in the final version
- ▣ If class has already happened, make sure you have the latest slides for announcements

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## Email encryption

- Technology became available with PGP in the early 90s
- Classic depressing study: "Why Johnny can't encrypt: a usability evaluation of PGP 5.0" (USENIX Security 1999)
- Still an open "challenge problem"
- Also some other non-UI difficulties: adoption, govt. policy

## Phishing

- Attacker sends email appearing to come from an institution you trust
- Links to web site where you type your password, etc.
- Spear phishing*: individually targeted, can be much more effective

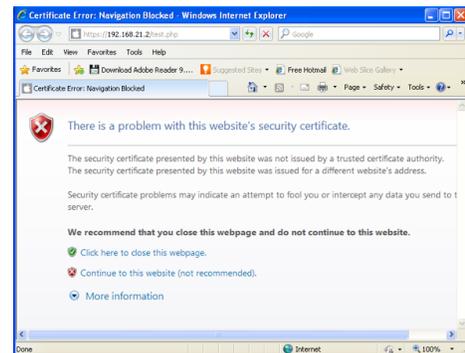
## Phishing defenses

- Educate users to pay attention to X:
  - Spelling → copy from real emails
  - URL → homograph attacks
  - SSL "lock" icon → fake lock icon, or SSL-hosted attack
- Extended validation (green bar) certificates
- Phishing URL blacklists

## SSL warnings: prevalence

- Browsers will warn on SSL certificate problems
- In the wild, most are false positives
  - foo.com VS. www.foo.com
  - Recently expired
  - Technical problems with validation
  - Self-signed certificates (HA2)
- Classic warning-fatigue danger

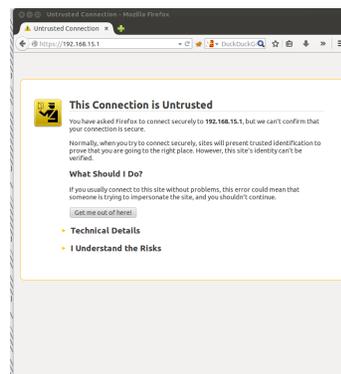
## Older SSL warning



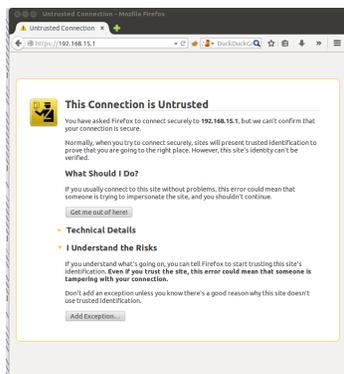
## SSL warnings: effectiveness

- Early warnings fared very poorly in lab settings
- Recent browsers have a new generation of designs:
  - Harder to click through mindlessly
  - Persistent storage of exceptions
- Recent telemetry study: they work pretty well

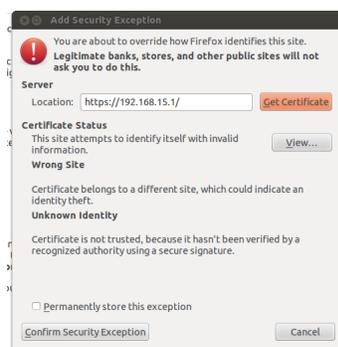
## Modern Firefox warning



## Modern Firefox warning (2)



## Modern Firefox warning (3)



## Spam-advertised purchases

- "Replica" Rolex watches, herbal V!@gr@, etc.
- This business is clearly unscrupulous; if I pay, will I get anything at all?
- Empirical answer: yes, almost always
  - Not a scam, a black market
  - Importance of credit-card bank relationships

## Advance fee fraud

- "Why do Nigerian Scammers say they are from Nigeria?" (Herley, WEIS 2012)
- Short answer: false positives
  - Sending spam is cheap
  - But, luring victims is expensive
  - Scammer wants to minimize victims who respond but ultimately don't pay

## Trusted UI

- Tricky to ask users to make trust decisions based on UI appearance
  - Lock icon in browser, etc.
- Attacking code can draw lookalike indicators
  - Lock favicon
  - Picture-in-picture attack

## Smartphone app permissions

- Smartphone OSes have more fine-grained per-application permissions
  - Access to GPS, microphone
  - Access to address book
  - Make calls
- Phone also has more tempting targets
- Users install more apps from small providers

## Permissions manifest

- Android approach: present listed of requested permissions at install time
- Can be hard question to answer hypothetically
  - Users may have hard time understanding implications
- User choices seem to put low value on privacy

## Time-of-use checks

- iOS approach: for narrower set of permissions, ask on each use
- Proper context makes decisions clearer
- But, have to avoid asking about common things
- iOS app store is also more closely curated

## Trusted UI for privileged actions

- Trusted UI works better when asking permission (e.g., Oakland'12)
- Say, "take picture" button in phone app
  - Requested by app
  - Drawn and interpreted by OS
  - OS well positioned to be sure click is real
- Little value to attacker in drawing fake button