

CSci 5271
Introduction to Computer Security
Day 25: 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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Reminder: HA2 VMs ready soon

- It looks like the VMs should be ready by tonight
- Send an email to both TAs with your group members to register

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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

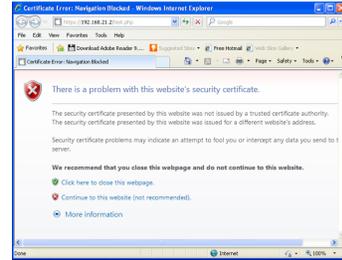
Phishing defenses

- 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 deny-lists

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

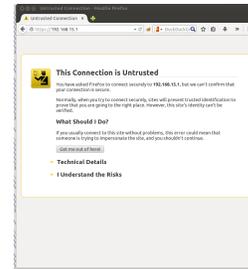
Older SSL warning



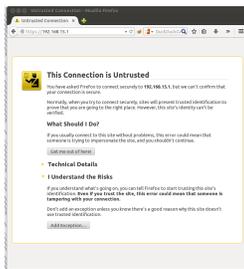
SSL warnings: effectiveness

- 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