Phishing Attacks

Mendel Rosenblum
Phishing

● Basic idea:
  ○ Get unsuspecting users to visit an evil Web site
  ○ Convince them that the evil Web site is actually a legitimate site (such as a bank or PayPal)
  ○ Trick the user into disclosing personal information (password, credit card number, etc.)
  ○ Use the personal information for evil purposes such as identity theft.

● How to attract users?
Emails

[Images of phishing emails from HSBC and PayPal]

CS142 Lecture Notes - Phishing Attack
Spoofing legitimate sites

How to spoof the legitimate site?

- Copy HTML
- Include images from legitimate Web site
- Many links refer back to the legitimate Web site
- After collecting login info, log user into legitimate site, redirect to legitimate site
- User has no idea that password has been stolen
URL could be obviously Illegitimate
Or very subtly different: Look-alike characters
International Character Sets

- What does this URL refer to:

  www.bank.com/accounts/login.php?q=me.badguy.cn

  Chinese characters that look like "/", "?", and "="

- This is a host name only!
Picture in picture
Legitimate Partners Can Look Fishy
Counter-measure: visual indicators

- Help users identify legitimate sites:
  - Lock symbols to indicate HTTPS
    - Color change to indicate HTTPS

Problems:

- Lock symbols not always obvious
HTTPS Indicators

Chrome

Safari

Firefox
Problem: too easy to obtain certificates

Problem: too easy to obtain certificates that look like legitimate sites

- Example: bankofamerica-secure.com

- Pressure on certificate authorities to issue certificates quickly

- E.g. "domain validation only" certificates: certificate authority only verifies that applicant has right to a particular Internet domain name; no verification of legal status of organization.
Counter-measure: extended validation certificates

- Goal: prevent attackers from obtaining certificates that look like legitimate sites
- Certificate authority must thoroughly vet the organization obtaining the certificate; prevent look-alike names.
- Certificate authority must undergo audits to ensure it is doing the vets carefully.
- Browser provides special indicator for extended validation sites
- Problems:
  - Small organizations don't like delays and cost of extended validation
  - Browsers are getting rid of indication of HTTPS (including extended) since everything has it.
Extended Validation Certificates a few years ago
Extended Validation Certificates today
Other counter-measures:

- Browsers starting to include anti-phishing measures (warn users about known phishing sites)

- Legitimate Web sites can monitor traffic; changes may indicate attacks under way:
  - Spike in download rates for official images
  - Unusual rate of password changes, funds transfers

- Legitimate sites can incorporate personal information in emails to authenticate them: phishers won't have such information.
  - **Spear phishing** - Phishing with attacker having personal information
Other issues

- Legitimate Web sites often use deceptive techniques to get users to click through ("your last chance for ..."), which reduces distinction between honest and dishonest sites.

- Education ineffective against phishing: response rates to phishing e-mails comparable to those for "legitimate" commercial e-mail.

- Warnings about shady certificates are ineffective: people just click through.
Two examples in the news

● Snapchat divulged employee information in phishing attack
  ○ “Last Friday, Snapchat’s payroll department was targeted by an isolated email phishing scam in which a scammer impersonated our Chief Executive Officer and asked for employee payroll information, …

● Stanford staff member and student got an email with a Word doc they opened
  ○ Word doc contained a macro that encrypted the user's home directory and provided instruction how how to buy the encryption key.
    ■ Ransomware
  ○ Memo: Stanford won't reimburse you for paying ransoms