Koobface on Facebook: How malicious contents sneak into social networking

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Outline

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Introduction

Four key threats to consider

- Spam
- Bugs
- Denial of Service
- Malicious Software (malware)
  - Propagate via Spam
  - Exploits bugs
  - Mount DOS

Viruses, Worms, Trojans, SpyWare ScareWare, …
Introduction (cont.)

- Why is malware so important to study?
  - Privacy and security issues
  - Cyber War
    - → Stuxnet, Predator Drone
  - ISPs struggle under virus generated traffic
  - Cyber Criminals make a lot of money
  - Hidden costs
    - Reputation
Introduction (cont.)

- Malware is propagated via
  - Email
  - P2P networks
  - Vulnerable OS services
  - Mobile phones
  - Web
- Can even be Hybrid
Trends of Web malware

- Web malware
- Most people frequently use Web
- Population of the victims are much larger than other types of malware.
- Social networks are popular among people
- No barriers for web users
- Malware writers prefer to exploit Web users
- 80% of web servers have critical vulnerabilities such as XSS (we will discuss XSS later)
- Aggregated traffic of the web users' browser would be huge

Suppose each active user has on average 128kbps of bandwidth, potential of 10 percent of active users is:

\[ 80\times 128\text{kbps} = 10\text{ Tbps} \]
Social networks malware

- Samy could affect over 1 million people in less than 20 hours.
- MySpace was the first but:
  - Sina, July 2011
  - FB on March 29, 2011
  - ClickJacking types
    - Almost everyday
  - Twitter on Sep. 2010
  - ...
Propagation of a Malware

http://www.caida.org/

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Why studying malware?

- To have a better understanding of propagation behaviors
- Damage assessment
- Providing enough traffic to avoid Denial of Service
- Detecting the weaknesses of spreading
  - How we can counter-measure in the best way
Social networks malware

- We can consider three main types of social networks malware attacks:
  - XSS worms
    - e.g. Samy
  - Trojans
    - e.g. Koobface
  - Clickjacking types
    - Forced like
      - Can lead to DriveByDownloads malware
What is XSS!? 

- Cross Site Scripting (XSS) is a common vulnerability in web applications.
- Has two types:
  - Reflected
  - Stored
Reflected XSS

- Application reflects exactly what it gets from the user.
- User may inject a harmful script
Stored XSS

- Attacker stores a harmful script in the application database for further exploitation.
  - Comments
  - Forum talks
  - FB Wall
XSS + Ajax = w0rm

- XSS threat becomes more noticeable due to the combination of HTML and Ajax technology.
- Ajax allows browsers to issue HTTP requests on behalf of the user.
  - No need for the attacker to deceive the victim to click on a special crafted link!
XSS worm propagation

- XSS worm propagation consists of the following two steps:
  - Download
    - A visitor downloads (views) an infected profile and automatically executes the JavaScript payload.
  - Propagation
    - The payload is extracted from the contents of the profile being viewed and then added to the viewer’s profile.
Clickjacking Worm Propagation

Unwittingly clicking on a hidden like button

and more friends get infected...
Trojan Propagation

Then they post a similar link on the victim’s profile or send private messages to friends of the victim containing the malicious link.

Sometimes, they ask you to download the appropriate decoder to play the movie, which is indeed the Trojan itself.
Research on OSN malware

- Three main papers on OSN malware propagation (in chronological order):
Result Summary (from simulations)

- Social network structure itself slows down the worm propagation.

![Graph showing worm propagation](image)
Result summary (cont.)

- User activities play an important role.
Result summary (cont.)

- Trojan type spreads faster than XSS
Result summary (cont.)

- Effect of Clustering coefficient is linear

![Graph showing the linear relationship between Clustering Coefficient and Time required to have the whole population infected.]
Effect of Infection Probability is exponential
Recent Results (1)

- Considering cliques
  - Those who have common interests create a group.
Recent Results (2)

- Considering overlapping cliques:

![Graph showing the number of infected individuals over total visits for different clique configurations.](image-url)
Proposed Defense System

- Identify big cliques
  - Among them distinguish those users who are connected to different cliques.
  - Implement decoy friends or other detection mechanisms to detect malicious behaviors.

- It is more efficient than current Facebook classifier system.
Conclusion

- User relationship structure plays an important role in malware propagation.
- User activities affect speed of propagation.
- Propagation of XSS types is slower than that of Trojan types.
- A new defense mechanism can be built using OSN graph topology.
Acknowledgement

- Thank you
- Any Question?