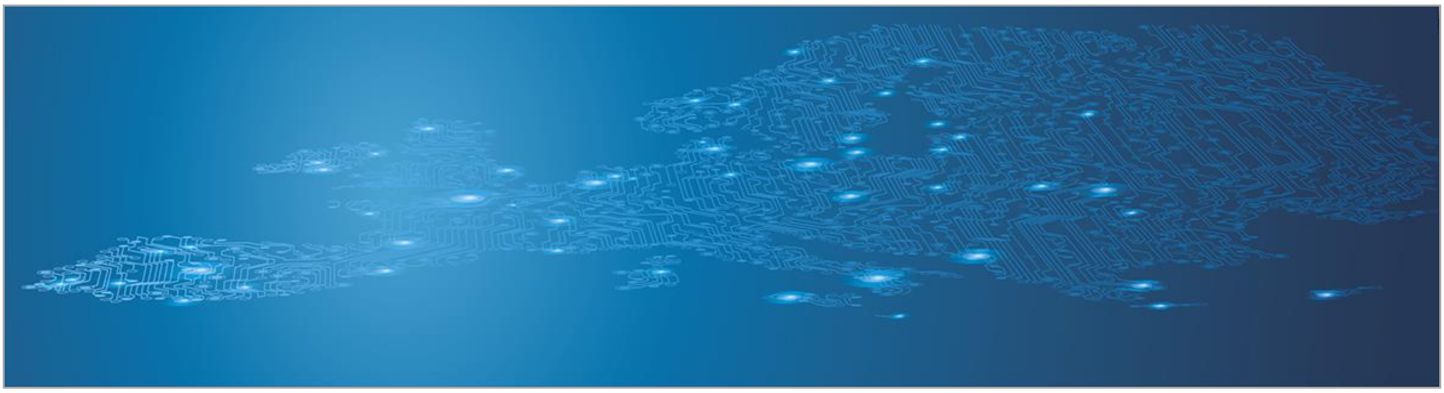

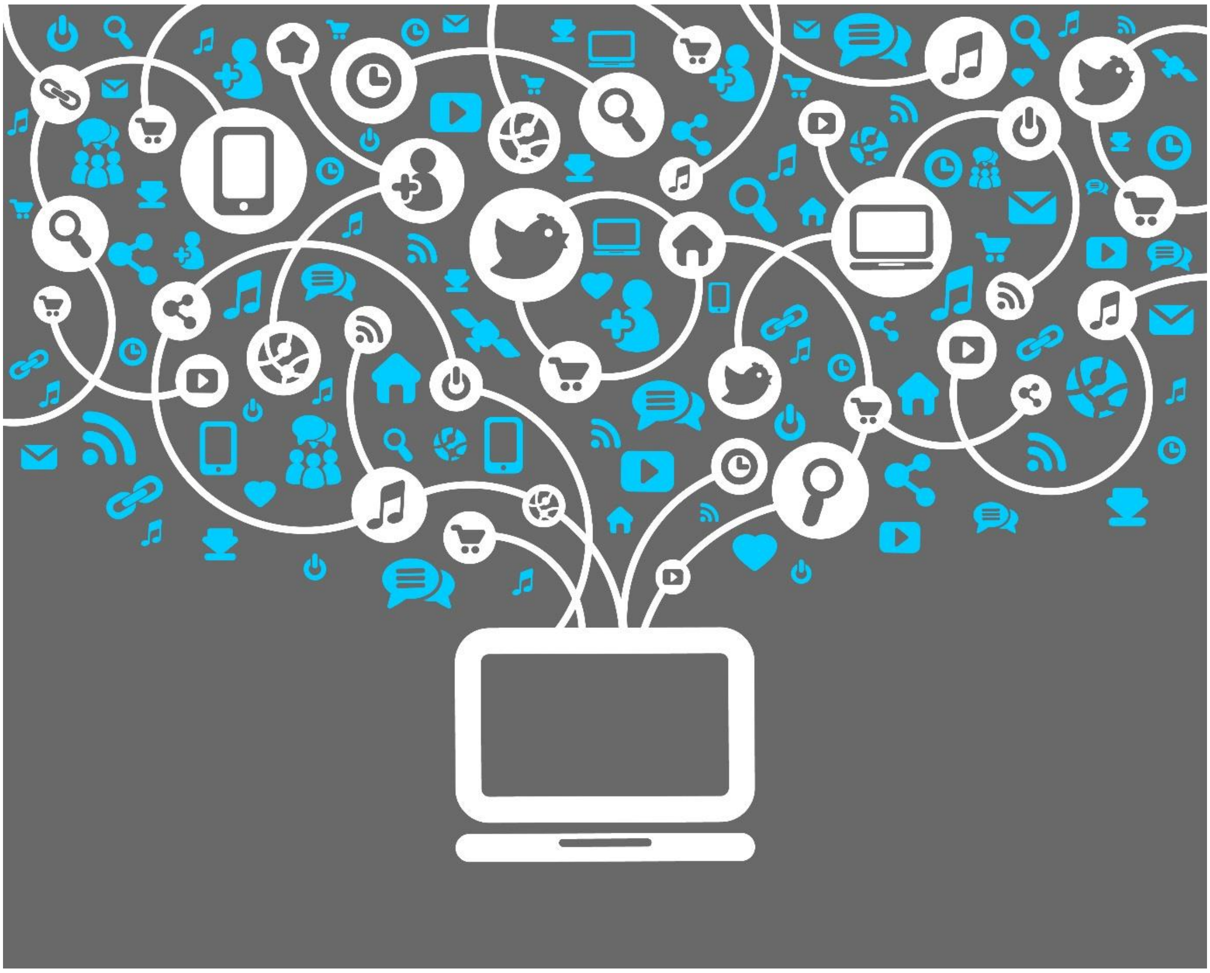

Social networks used as an attack vector for targeted attacks

Toolset, Document for students

September 2014

European Union Agency for Network and Information Security www.enisa.europa.eu

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Table of Contents

1 What Will You Learn

In this exercise, participants will investigate the vulnerabilities of social networks, using an Advanced Persistent Threat scenario as a test case to illustrate some examples of social network compromises. They will also examine the capabilities of social networks to respond to these kinds of threats.

2 Exercise Course

If the original Internet boom of the 1990s was focused on connecting people and businesses through the World Wide Web, the next phase seems related to the rise of social media. Whether the crowd-sourced reviews aggregated on sites like Yelp, the microblogging broadcasts of Twitter or the relationship-hub portal of Facebook, hundreds of millions of people have started uploading information about themselves. They are not just sharing their daily lives, their likes and their purchasing habits with their friends, but often publishing them for anyone and everyone to see: http://www.weknowwhatyouredoing.com/

However, as people add others to their circle of virtual friends, everyone sharing information, it is not a utopia. Real risks are associated with the openness of social networks. The UK Daily Mail reported that “officers logged 12,300 alleged offences involving” Facebook in 2011 [1]. Young people often use sites like Facebook despite official restrictions on accounts for those under thirteen years old. Some have been targeted for cyber bullying, some by sexual predators. Vacationing Facebook and photo sharing sites have tipped off burglars that their homes are unoccupied and ripe for the picking [2].

The technology of social networking can also protect those at risk. Facebook’s chat scanning software looks for key phrases before alerting site administrators who can review transcripts and decide if law enforcement should be contacted [3].

Social networking provides many ways to connect outside of the usual channels. Social networks like Facebook and Twitter are also ways for more direct contact with the public, both to receive information from customers and to provide direct responses to their questions.

Questions to think about:

- As social networks grow in their size and use, what are the risks to those companies and people who rely on such sites for the information they need to relay?
- What is the power of social network over individual citizens and organisations?
- How are cyber criminals using social networks?
- What happens when social networks are attacked as part of an overall directed effort against a company?

[1] http://www.dailymail.co.uk/news/article-2154624/A-Facebook-crime-40-minutes-12-300-cases-linked-site.html
[2] http://arstechnica.com/tech-policy/2012/06/post-smug-vacation-statuses-on-facebook-get-your-house-burgled/
[3] http://www.neurope.eu/article/facebook-scans-users-chats-control-criminal-activity

In this exercise trainees will:

- Learn about the phases of an Advanced Persistent Threat
- See how social media access can be compromised during an APT attack
- Discuss how to coordinate action with CERTs, companies and social networks
- Develop ways individuals and organisations can re-establish control over their online social media presence after an attack
- Brainstorm methods to verify an individual's or a company's public social media profiles on sites like Facebook, Twitter or LinkedIn

2.1.1 Introduction to Social Networks

Social networks are broadly defined by three shared characteristics:

- unified address book of contacts
- combined with the ability to share pictures, videos, status updates, interests, locations, and schedules
- communication with contacts via email, instant message, video conference, or telephone call.

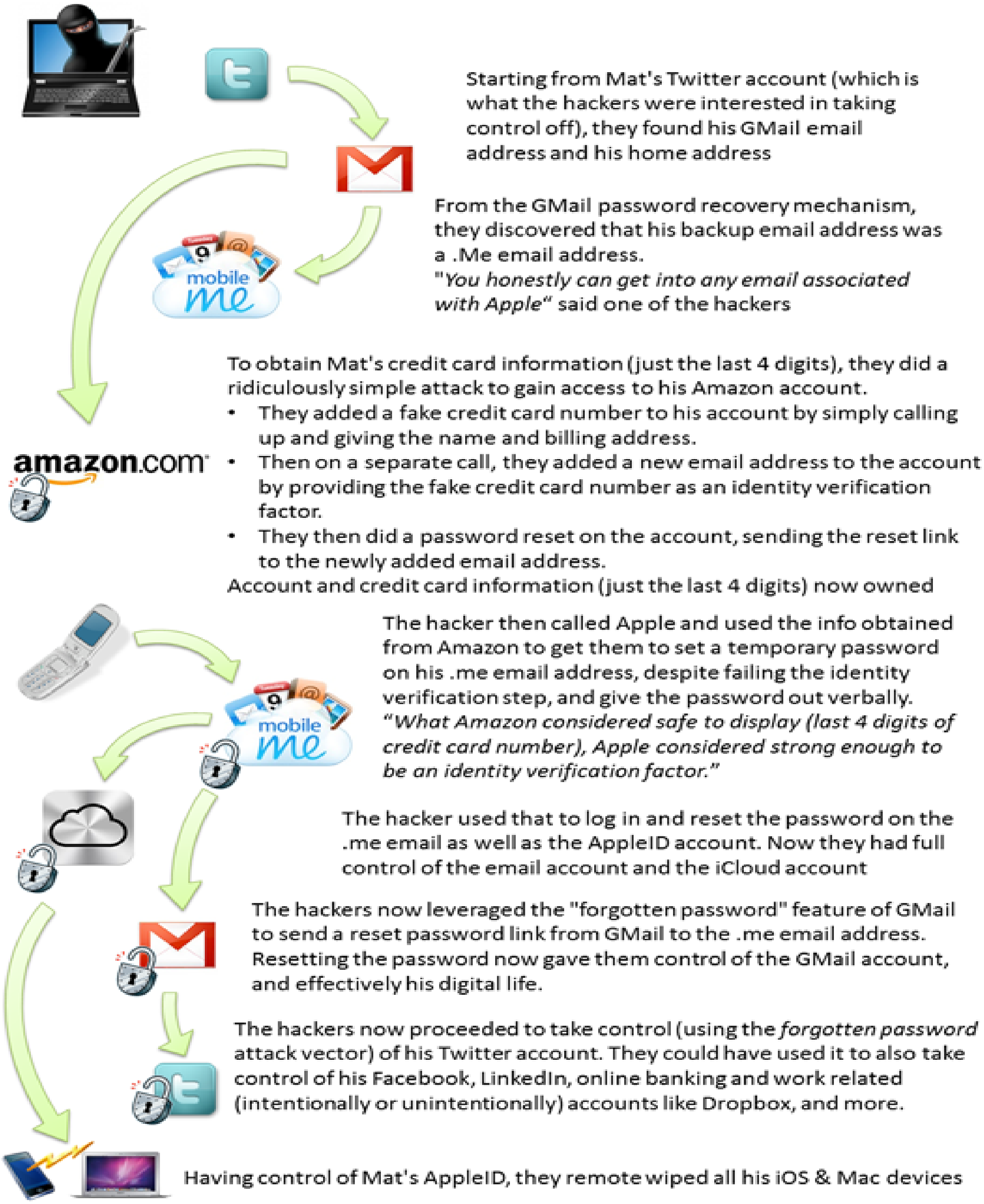
2.1.2 General description, Scope & Trends in Threats with Social Networks

What is the nature of threats when it comes to social networks?

- Privacy issues: users can expose information through misunderstood privacy settings or by approving friend requests without knowing someone's true identity (see Figures 80 and 81). Things as simple as posting vacation or party pictures may reveal someone's location at a given date and time. Vacation photos posted during a trip can reveal their home is unoccupied to potential burglars.
- User profiling: Information posted on social networks can allow attackers to learn where a target works, where he or she shops, and, significantly, the answers to many commonly used security challenge questions such as "Where did you go to high school?" so that an attacker can reset passwords on other sites.
- Malware can spread via social networking apps (see section 22.3.1.2 e)
- Fake friends, compromised accounts: It is trivially easy to create social network accounts that masquerade as someone else (see Figure 81), tricking his or her contacts to "friend" the false account, giving an attacker greater access to information.

2.1.3 An example social network incident: The "Epic" Honan Hack

The recent hacking of blogger Mat Honan as illustrated by Nishant Kaushik shows how compromised credentials from one system can cascade throughout someone's digital life. As noted in the diagram, once hackers had taken over Honan's Twitter account, they could have not only ruined his reputation, they could have accessed his Facebook and online banking accounts as well.



Starting from Mat's Twitter account (which is what the hackers were interested in taking control off), they found his GMail email address and his home address

From the GMail password recovery mechanism, they discovered that his backup email address was a .Me email address.
"*You honestly can get into any email associated with Apple*" said one of the hackers

To obtain Mat's credit card information (just the last 4 digits), they did a ridiculously simple attack to gain access to his Amazon account.

- They added a fake credit card number to his account by simply calling up and giving the name and billing address.
- Then on a separate call, they added a new email address to the account by providing the fake credit card number as an identity verification factor.
- They then did a password reset on the account, sending the reset link to the newly added email address.

Account and credit card information (just the last 4 digits) now owned

The hacker then called Apple and used the info obtained from Amazon to get them to set a temporary password on his .me email address, despite failing the identity verification step, and give the password out verbally.
"What Amazon considered safe to display (last 4 digits of credit card number), Apple considered strong enough to be an identity verification factor."

The hacker used that to log in and reset the password on the .me email as well as the AppleID account. Now they had full control of the email account and the iCloud account

The hackers now leveraged the "forgotten password" feature of GMail to send a reset password link from GMail to the .me email address. Resetting the password now gave them control of the GMail account, and effectively his digital life.

The hackers now proceeded to take control (using the *forgotten password* attack vector) of his Twitter account. They could have used it to also take control of his Facebook, LinkedIn, online banking and work related (intentionally or unintentionally) accounts like Dropbox, and more.

Having control of Mat's AppleID, they remote wiped all his iOS & Mac devices

Figure 1: Diagram of the steps in the Mat Honan hack[4]

2.2 Introduction to targeted attacks and APTs

The book "*Hacking Exposed 7*", henceforth referred to as [HE7] [5], puts APTs generally "into two groups according to the attackers' objectives. The first group focuses on criminal activities that target

[4] http://blog.talkingidentity.com/2012/08/the-epic-hacking-of-mat-honan-and-our-identity-challenge.html

[5] [HE7] : Hacking Exposed 7, McClure, Scott, Scambray, Joel, and Kurtz, George. McGraw-Hill: 2012. ISBN: 978-0-07-178028-5. References to this work have been abbreviated [HE7] with a page number.

personal identity and/or financial information and, coincidentally, information from corporations that can be used in a similar manner to commit identity and financial fraud and theft.

The second group serves competitive interests of industry or state-sponsored intelligence services (sometimes the two are not separate); and the activities target proprietary and usually non-public information, including intellectual property and trade secrets, to bring competing products and services to market or to devise strategies to compete with or respond to the capabilities of the organisations they steal information from."([HE7] p. 314)

Activist hacker groups like Anonymous and non-state terror organisations may seek to do damage without concern of long term information extraction. Stuxnet, Flame and Gauss attacks are all examples of these as are Wikileaks-style information dumps. Such attacks do still follow the general framework of an APT described below.

2.2.1 Reconnaissance to gather information on target companies and vulnerabilities

a. Search for publically available information such as website lists of employee names and departments, financial records and planning documents.

b. Perform electronic reconnaissance with steps like scanning IP addresses and ports, DNS records [6], website code and email headers coming from the target company.

c. Obtain physical access by posing as an employee of an outsourced janitorial service, getting a temporary job at the company's headquarters without a background check, delivery service or service technician. There are innumerable ways to gain access to a building and obtain access to files, infect computers, or attach network sniffing devices, which are linked to wireless data networks back to the attacker. Many companies lock the server room, but how many secure all loose papers on desks and shred everything in every waste bin?

2.2.2 Initial attack: targeted email messages with embedded links to malicious websites, often with socially engineered detail to evade both technological and human detection. APTs are usually blend of attack vectors from email messages, infected media, malicious websites, and key logging malware, in centrally controlled botnets.

a. Over the last year, targeted, sophisticated viruses like Stuxnet, Flame, and Gauss have been delivered by all of the vectors listed above but most notably by infected USB flash drives to enter a network of industrial equipment that had no external network connection, let alone personnel running an email client to receive a malicious message. The specificity of the targets of these viruses makes them a key reminder of an APT.[7]

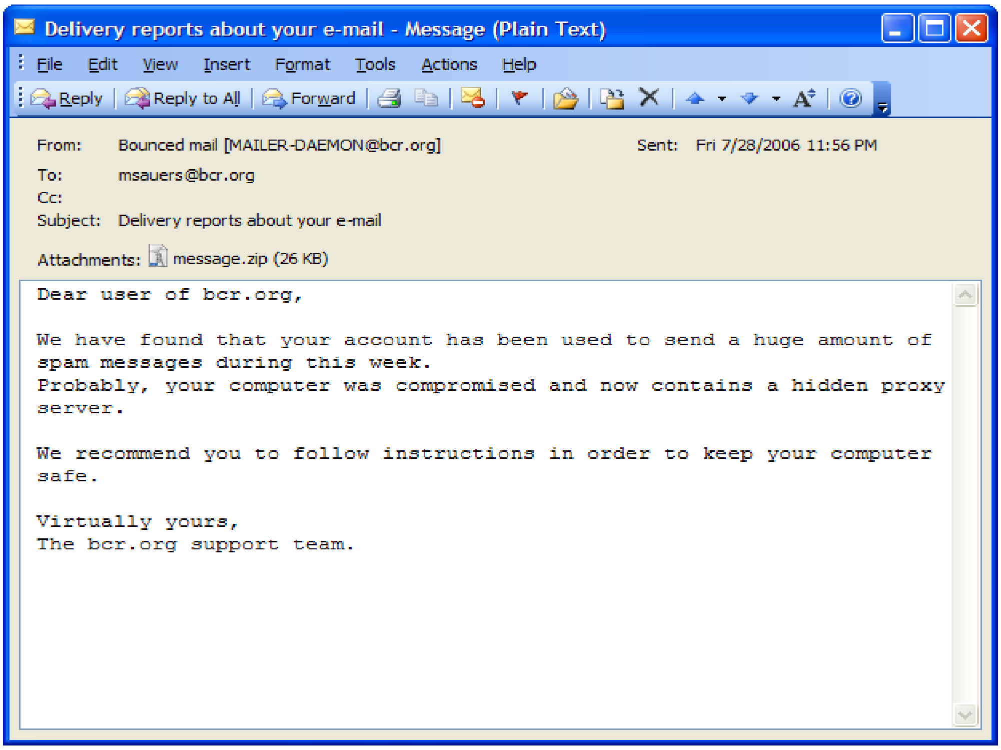
b. One example of how USB flash drives can be used as a vector for an APT: The U3 file system on SanDisk and Memorex USB flash drives contains two partitions. One partition automatically runs a configured file when the drive is mounted under

[6] http://www.whitehats.ca/main/members/Jeff/jeff_dns_security/jeff_dns_security.html

[7] http://www.securelist.com/en/analysis/204792238/Gauss_Abnormal_Distribution

Windows's default autorun settings. Each manufacturer provides a tool to replace the U3 partition with a custom ISO file, allowing malicious programs to execute in the current logged on user's account with its privileges on the network. (This is especially damaging if the targeted users have extensive access to private information like the engineering staff or HR.) "The most obvious attacks are to read the password hashes from the local Windows password file or install a Trojan for remote access. The password file can be e-mailed to the attacker or stored on the flash drive for offline cracking later using tools like fgdump. ([HE7], p. 507)

c. Malicious email in spearphishing attempts can leave behind clues. One such message looked like:


Delivery reports about your e-mail - Message (Plain Text)
File Edit View Insert Format Tools Actions Help
Reply Reply to All Forward

From: Bounced mail [MAILER-DAEMON@bcr.org]
Sent: Fri 7/28/2006 11:56 PM
To: msauers@bcr.org
Cc:
Subject: Delivery reports about your e-mail
Attachments: message.zip (26 KB)

```
Dear user of bcr.org,

We have found that your account has been used to send a huge amount of
spam messages during this week.
Probably, your computer was compromised and now contains a hidden proxy
server.

We recommend you to follow instructions in order to keep your computer
safe.

Virtually yours,
The bcr.org support team.
```

Figure 2: Sample malicious attachment email from a spearphishing attack.

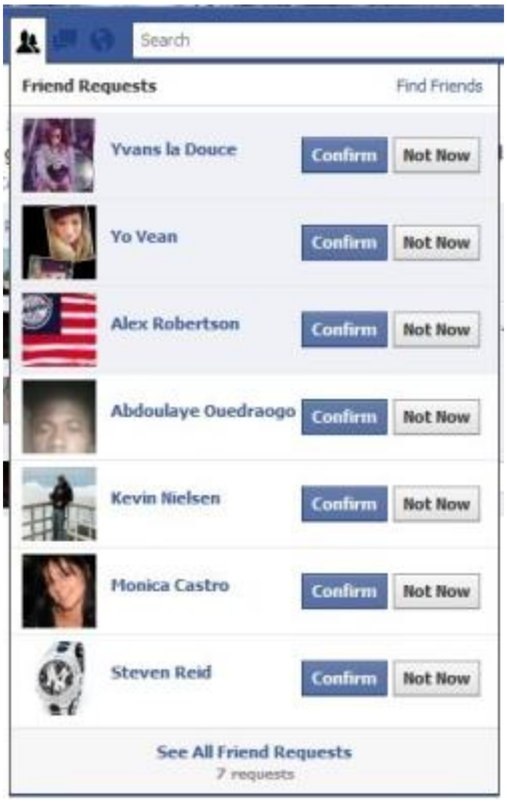
Another sample spearphishing email could involve a link instead of an infected file attachment:

> From: Jessica Long [mailto:administrateur@hacme.com]
>
> Sent: Monday, 19 December 2011 09:36
>
> To: US_ALL_FinDPT
>
> Subject: Bank Transaction fault
>
> This notice is mailed to you with regard to the Bank payment (ID: 012832113749) that was recently sent from your account.
>
> The current status of the referred transfer is: ‘failed due to the technical fault’. Please check the report below for more information:
>
> https://finiancialservicesc0mpany.de/index.html
>
> Kind regards,
>
> Jessica Long
>
> TEPA – The Electronics Payments Association – securing your transactions

Figure 3: Sample malicious link email from a spearphishing attack. [HE7] p. 325.

Clicking on the link in the email would show a user a webpage with text like “Please wait…” and nothing more. In the background, a malicious piece of software had been invisibly installed on the user’s computer that can capture keystrokes, transfer files, send junk email as a user, prove the computer’s LAN for other hosts to infect—in short, any and all mischief that modern malware is capable of.

d. False friend requests on social networks can also be a way to get more private information from a target. Such friend requests can blend in with other, legitimate requests:



Friend Requests

Yvans la Douce

Yo Vean

Alex Robertson

Abdoulaye Ouedraogo

Kevin Nielsen

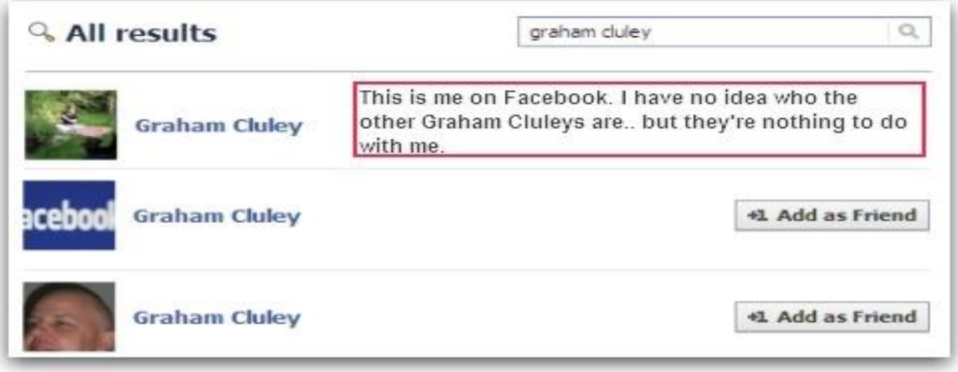
Monica Castro

Steven Reid

See All Friend Requests
7 requests

Figure 4: Sample list of friend requests on Facebook. Are all these people actually who they represent themselves to be?

Indeed, knowing who is who on sites like Facebook is not easy:



All results

graham cluley

Graham Cluley

This is me on Facebook. I have no idea who the other Graham Cluleys are.. but they're nothing to do with me.

Graham Cluley

Graham Cluley

Figure 5: A sample Facebook friend search. When someone sees several people with the same name as a known friend when searching social network sites like Facebook, how can he or she know which person to add to their network?

e. Malicious apps on social networking sites can trick users into giving them access to their personal data. Indeed, fake social networking “friends” may serve as channels for false recommendations for malicious apps or links to malicious websites using URL shorteners like Bit.ly or Goo.gl. Koobface was a prominent example of an older malicious social networking worm that targeted Facebook, MySpace, Friendster, and Twitter users [8].

2.2.3 Obtaining account credentials and elevating access

This is the third phase of an APT attack, included here for completeness. For purposes of this exercise about social networks, we will not discuss the myriad of methods attackers may use to obtain credentials to user accounts and how they can achieve deeper levels of access.

2.2.4 Searching and extracting valuable data

This is the fourth phase of an APT attack, included here for completeness. For purposes of this exercise about social networks, we will not discuss the process attackers may follow to find, identify and remove the data they seek from a target.

2.2.5 Use diversion or varied techniques to maintain and extend illicit access for the long term

a. Launching unrelated, “louder,” more easily detected malware attacks to distract IT staff from the real infiltration.

b. Sometimes, diversion can be something very out of place. The Stuxnet worm, for example, was reported to play AC/DC’s “Thunderstruck” heavy metal song on some computers in Iran’s uranium processing lab in the middle of the night—surely a confounding moment for those working the Help Desk that night [9].

c. Attackers will often shift from exploits to sneak into networks (e.g. SQL injection attacks) to using specialized programs inside a target network (e.g. SysInternals tools that allow for executing programs against remote hosts, found at http://technet.microsoft.com/en-us/sysinternals).

d. Ultimately, attackers will create and/or control user accounts and profiles that appear normal on the network and have the same access levels and methods as legitimate users. Unless accounts are carefully audited, they could remain on a system for a long period of time.

2.3 Specific Signs of an APT compromise (this section is quoted from [HE7] p. 326)

Malware, whether used by APTs or in “normal” situations wants to survive a reboot. To do this, the malware can use several mechanisms, including:
Using various “Run” Registry keys

- Creating a service
- Hooking into an existing service

[8] http://nakedsecurity.sophos.com/koobface/
[9] http://www.newscientist.com/blogs/onepercent/2012/07/iranian-nuclear-facilities-thu.html

- Using a scheduled task
- Disguising communications as valid traffic
- Overwriting the master boot record
- Overwriting the system's BIOS

To investigate a "suspicious" system, investigators use a mix of forensic techniques and incident response procedures. The correct way to perform incident response is by using the order of volatility described in RFC-3227 [10]. This RFC outlines the order in which evidence should be collected based upon the volatility of the data:

- Memory
- Page or swap files
- Running process information
- Network data such as listening ports or existing connections to other systems
- System Registry
- System or application log files
- Forensic image of disks
- Backup media

One possibility to investigate a compromised machine is to create a kit using several different tools. One example of a pre-made kit is the SANS Investigate Forensics Toolkit (SIFT) [11]. During any investigation, it is important to avoid contaminating the evidence as little as possible. Incident response tools should be copied to a CD-ROM and an external mass-storage device. The toolkit investigators used in this case [the "case" is a description of Gh0st Attack from 2008–2010 in [HE7] pp. 323–349] consisted of a mix of SysInternals and forensics tools:

- AccessData FTK Imager [12]
- SysInternals Autoruns[13]
- SysInternals Process Explorer[14]
- SysInternals Process Monitor[15]
- WinMerge[16]
- Currports[17]

[10] http://www.ietf.org/rfc/rfc3227.txt
[11] http://computer-forensics.sans.org/community/downloads
[12] http://accessdata.com/products/digital-forensics/ftk
[13] http://technet.microsoft.com/en-us/sysinternals/bb963902.aspx
[14] http://technet.microsoft.com/en-us/sysinternals/bb896653.aspx
[15] http://technet.microsoft.com/en-us/sysinternals/bb896645.aspx
[16] http://winmerge.org
[17] http://www.nirsoft.net/utils/cports.html

- SysInternals Vmmap[18]

"We have observed a common set of indicators in the numerous APTs cases that analysts have investigated and have found the following phenomena indicative of an APT ([HE7] p. 363):

- Network communications utilizing SSL or private encryption methods, or sending and receiving base64-encoded strings
- Services registered to Windows NETSVCS keys and corresponding to files in the %SYSTEM% folder with DLL or EXE extensions and similar filenames as valid Windows files
- Copies of CMD.EXE as SVCHOST.EXE or other filenames in the %TEMP% folder
- LNK files referencing executable files that no longer exist
- RDP files referencing external IP addresses
- Window Security Event Log entries of Types 3, 8 and 10 logons with external IP addresses or computer names that do not match organisational naming conventions
- Windows Application Event Log entries of antivirus and firewall stop and start
- Web server error and HTTP log entries of services starting/stopping, administrative or local host logons, file transfers, and connection patterns with select addresses
- Antivirus/system logs of C:\, C:\TEMP, or other protected areas of attempted file creations
- PWS, Generic Downloader, or Generic Dropper antivirus detections
- Anomalous .bash_history, /var/logs, and service configuration entries
- Inconsistent file system timestamps for operating system binaries

2.4 Group exercise: Social Networks as vector to targeted attack

2.4.1 Incident Description

All managers of CurrentCo, an electric utility, receive forged emails and messages in social networking sites, purporting to be from their immediate colleagues, containing links that, when visited, silently install spyware. The week before, many members of the utilities engineering team received USB flash drives at a conference. The drives contained a hidden root kit, installed when the engineers open vendor sales material. Using the information gleaned from the spyware, credentials to access the utility's Twitter and Facebook accounts were stolen.

2.4.2 In each group, choose who will represent the roles of:

- CurrentCo IT technician
- CurrentCo media director, who uses corporate Twitter and Facebook accounts and serves as the public face of the company

[18] http://technet.microsoft.com/en-us/sysinternals/dd535533.aspx

- Twitter customer support representative
- CERT representative
- Attacker

2.4.3 Small group points of discussion to create mindmap

In your groups, discuss the following stages of response to the above scenario. Follow the trainer's instructions to create a mind map along these topics:

- Report issue: Who are the proper authorities and representatives to contact? When?
- Correct issue: What is needed to protect the company's networks, both during the APT attack period and during the cleanup phase afterward? What can be done if social media outlets are themselves compromised and used to disseminate false information?
- Prevent issue in future: Do APT-style attacks require more advanced responses such as data leak detection on corporate networks to stop data from leaving the local network even if internal computers are compromised?

2.4.4 A Narrative of Social networks as vector and target

Here's a representation of how different people experienced an APT attack that included compromise of social networking accounts.

Jane Smith, CurrentCo Media Director, said she usually spent her lunch hour updating her personal Facebook page on her work PC. "It's just easier to catch up on friend requests and wall posts while I have my sandwich," she said. She had accepted a batch of new friend requests that had been built up over the weekend. A few weeks before a major thunderstorm, she noticed an update from a friend with a URL-shortened link, labelled as registration for her college reunion. She clicked the link amidst eating her lunch and taking a few phone calls.

"I do like trying out all the different apps," she said, "but honestly I'm sure most of them I don't use more than a few times, if that, after adding them in and clicking 'allow' before they go to the bottom of my homepage."

Asked when she was first unable to log into the company's Facebook and Twitter accounts, Jane responded, "I'm not sure. I usually just have those sites remember my password, so I don't have to type it in normally. After IT took my computer, I had to use my password sheet to sign in from another laptop to update customers after the storm. Yes, that's when I couldn't get in."

***

"Our IDS system did detect an unusual amount of traffic coming from Jane's PC," CurrentCo's IS Manager reported. "It was just around when that big thunderstorm knocked out power to half the town? Anyway, I think we just got the thing off her desk, but then we started getting reports of all kinds of errors. Database and web servers were going throwing off a lot of errors and, oh yeah, for some reason all the print spoolers kept shutting down. You know how many calls we got from the Executive office about not being able to print in one hour?"

***

"I recommended that CurrentCo immediately contact the social media companies and offered to make the calls and conference them in," said Ingrid Johansen. "Even though we had some delay between when Jane Smith's computer was infected, we could recommend steps that the company's IT staff could perform to regain control over their accounts and to search their network for other penetrations. It took some digging to find those USB flash drives in the maintenance department."

***

"We just got back from a maintenance services convention," said Geoff Peterson, head dispatcher for CurrentCo's repair department. "They were pushing an 'eco' theme this year and so they gave us those thumb drives to get digital brochures from the vendor area. Since management wanted us to make new contacts and learn about new products, I visited almost every booth and plugged that thing into the computer when I got back to the office to print off some of the specification sheets I collected."

"After the storm hit, I used our scheduling program to put every crew out on repair duty. It wasn't until we didn't see changes in line status after a few hours that I started to think something was wrong. A few crews were close enough to the garage for our old walkie-talkie radios to work and I called them back in. We coordinated everything with those radios and paper maps I kept in every truck."

***

Nigel Henry, Twitter technical support, reviewed Jane's initial report that CurrentCo's account had been hacked. "Given that it was from a verified account from a public utility, we immediately called the contact phone number on their record to confirm. We just had two numbers—the main switchboard and Jane's mobile phone—but with the storm, both those lines were inaccessible for about a day so it took a while before we could freeze the account."

***

Dossier:
CurrentCo Attacker, [name unknown, alias "UltiKaos"]

Began posting CurrentCo customer information on the company's Twitter feed late Saturday night after a large thunderstorm knocks out power to thousands of houses and businesses. The attacker disrupts repair work assignments on the company's intranet work assignment system, sending crews away from problem areas. Customers direct messages on Twitter are responded to with insults. With full access, changes all email and phone number access on the company's Twitter account, delaying it's recovery by several days.

Your trainer will guide a plenary discussion of the above narrative focusing on the following questions:

- Can social media contacts be more trustworthy (or less) based on the amount of verification done when opening an account?
- How is trust established in social media, who do you trust in this network?
- How could we authenticate a person or company's identity if their account has been hacked? What if it's an emergency?
- What data needs to be collected for later forensic analysis? Who needs to collect it and how? How can we save data from a site like Facebook or Twitter?

2.4.5 ENISA’s Golden Rules from “Online as soon as it happens” to reduce social media risks[19]:

- Pay attention to what you upload
- verify virtual friends before trusting them with personal information
- maintain divide between corporate and personal accounts and information
- respect others’ privacy
- learn and use social networks’ privacy control settings

2.4.6 Sophos has also published a best practices guide for Facebook security[20]:

- Use Facebook privacy settings to create levels of information that is shared.
- Accept friendship requests only from those people you actually know.
- Create a “limited friend” group who cannot see all the information shared on your account.
- Like hardening a server by running only needed services and opening only needed ports to a network, disable any functions of a social networking site that you don’t actually want to use.
- Sophos also created the following videos about malware on Facebook:
- What does a Facebook worm look like? (http://www.youtube.com/watch?v=_uFa3P0sLA4&feature=player_embedded)
- Demonstration on removing malicious apps from Facebook account: http://www.youtube.com/watch?v=Or-qR0Y300w&feature=player_embedded
- Demonstration that people are so willing to become friends with strangers on Facebook
- http://www.youtube.com/watch?v=9LPRaiu0Y8M&feature=relmfu
    1. *What are these “Advanced Persistent Threats”? How are they different from computer hacking in the past?*
    2. *What if these hackers start putting up false information on Twitter or Facebook? How will we know it’s really CurrentCo for example posting the information?*

2.4.7 Social networks can give us greater security too

Social media can be used as an effective identity verification system. Some bouncers in the UK check online if someone’s ID matches their online profiles (http://www.digitaltrends.com/social-media/club-bouncers-are-now-checking-your-facebook-to-confirm-identity/)

2.5 Conclusion

In this exercise, we have reviewed the hallmark phases of Advanced Persistent Threats to illustrate the vulnerabilities of social networks. As you have discussed the potential ways that attackers can obtain access to others’ social network accounts and how individuals and organisations can coordinate with social networking companies, public authorities and CERTs to recover from such attacks. Indeed, the unfortunate examples of the attacks on Mat Honen and HBGary show that taking preventative measures to protect systems from attacks like APTs, being ready to deploy forensic analysis tools to

[19] http://www.enisa.europa.eu/activities/cert/security-month/deliverables/2010/onlineasithappens

[20] http://www.sophos.com/en-us/security-news-trends/best-practices/facebook.aspx

detect compromised systems and using enhanced authentication methods like two factor authentication and separating accounts to register for social network services are all essential to protect social media contacts.

In the end, though, social network also can offer ways to verify the identity of someone, providing a valuable, direct communications channels when other means of contact are unavailable. Whether it's club bouncers checking Facebook to ferret out fake identification cards or verified accounts on services like Twitter, the web of connections between people in social networks could be a blessing as well as a weakness for attackers to exploit.

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