Internet Fraud Battlefield

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Introduction

Consumers embracing the online digital lifestyle are under attack. The "Bad Guys" are trying to steal their identities and hijack their systems. The potential harms are serious and range from bank fraud to cyber-terrorism.

The Bad Guys use a variety of methods. Typical ploys include sending spoofed email (Phishing) or downloading Spyware. But the stakes continue to go up. Pharming covertly redirects users to spoofed sites and puts the integrity of the Internet into question. Remotely controlled "Bot Nets" (large collections of compromised systems) give Bad Guys the power to take down a service or send spam under the radar. Rootkits can circumvent detection and execute with impunity.

In order to establish effective strategies and tactics to mitigate these problems it's critical to see the big picture. A high level map of the “battlefield” would:

- Help demystify what is happening
- Provide insight for setting strategy
- Help assess the efficacy of tactics
- Provide a common reference

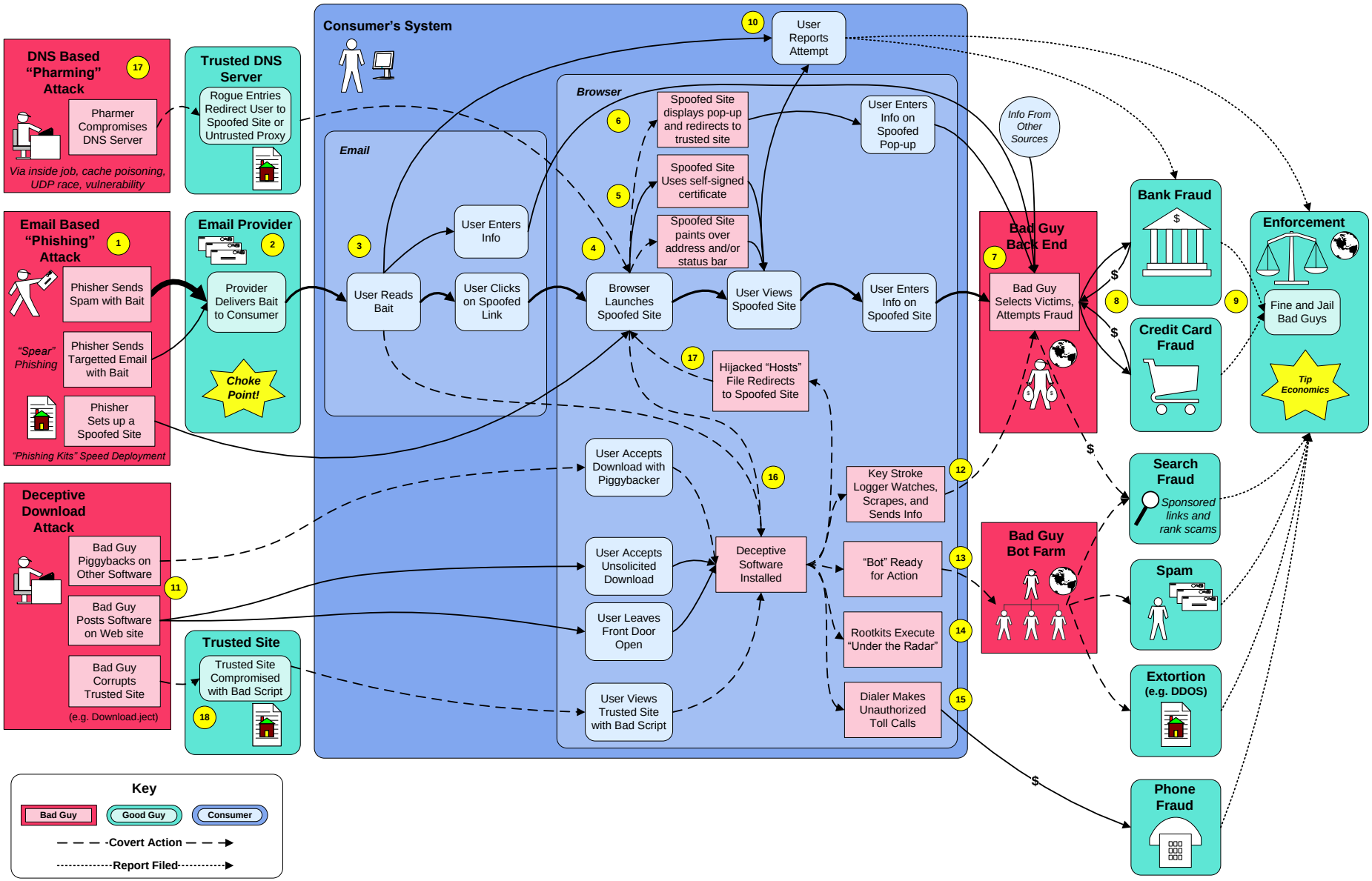
The Internet Fraud Battlefield diagram presented on the next page offers a high level end to end view of the problem space. It illustrates some of the ways users get tricked, how their systems get compromised, how the Bad Guys commit fraud, and where the Good Guys (e.g., email service providers, banks, merchants, and law enforcement) come into play. It also shows how "blended attacks" can occur.

Seeing multiple attack vectors at the same time helps identity opportunities for leverage. Addressing a big attack vector "upstream", like spam, could become an effective choke point for reducing threats throughout the ecosystem.

Creating mitigations can be costly. Before investing heavily in a tactic, it's important to assess its efficacy. The battlefield can help facilitate that analysis (e.g. what good is blocking one method of attack if the Bad Guys can just go around the mitigation).

Finally, there are many players that need to come together to address these problems (e.g. technologists, financial institutions, consumer groups, policy makers, and law enforcement). Having a common framework helps these parties discuss the problem, understand their role, discover meaningful mitigations, and work collaboratively to protect consumers.

Internet Fraud "Battlefield" – The Big Picture



Understanding the Battlefield

The large blue box in the center of the battlefield represents the consumer's system. It is surrounded by both Good Guys (colored green) and Bad Guys (colored red). When a Bad Guy compromises the consumer's system (e.g., with a key stroke logger), the corresponding box is colored red. Arrows that are dashed indicate an action was covert (i.e. not exposed to the consumer in the User Interface). Numbers in the small yellow circles correspond to the notes below.

Phishing for Personal Information (centerline through the picture)

1) The "phisher" creates an email with some bait and sets up a spoofed web site. To speed deployment, they can start from a "Phishing Kit" that has the code and artwork needed to launch an attack against well known targets like Ebay or Citigroup. The phisher gives the email to a spammer for distribution. The spammer distributes the email, sometimes via a "Bot Net" (i.e. systems covertly taken over). Better results are possible with "Spear Phishing" where bad guys target a specific victim (by name) or a group (e.g., employees that have just completed open enrollment for a 401K). When a senior executive is targeted, the practice is called "whaling".

2) The Email Provider receives email with the bait and forwards it to the user. This is an opportunity for a "choke point" (e.g. Microsoft Smart Screen blocks over 3 billion messages per day). Even with aggressive filtering, some email with the bait still gets through.

3) The user reads the email that contains a spoofed link (i.e. the text of the link looks OK but it's really to a spoofed site). The user is tricked and clicks on the spoofed link and launches the browser. Note launching a web site to collect the user's personal information is not necessary. The Bad Guy could have simply asked the victim to reply to the email with the information or they could have asked them in the email to fill out an HTML form that was embedded in the message. Some users are overly trusting and will comply (not unlike victims of telephone scams).

4) The browser displays the spoofed site. The spoofed site asks the user for personal information. The user is tricked and enters their personal information. This can include their passwords and other sensitive credentials.

5) Embellishments can make the spoofed web site more convincing. Bad Guys were previously able to display a phony lock symbol or draw over the spoofed address with the expected address (known visual exploits like these have been fixed in IE). Unfortunately, seeing a real lock symbol is still not sufficient for trust; a bad guy can setup an interloping proxy or use a self-signed certificate to cause the symbol to be displayed. Also, the bar to get a certificate is inconsistent and in some cases too low (e.g., a mail room clerk could request a certificate and spoof the company's web site).

6) Another clever trick is to use a phony pop-up rather than a spoofed web site. When the user first clicks on the spoofed link, the user is presented with the spoofed pop-up that requests their personal information. The Bad Guy then immediately redirects the browser to the trusted site. The user sees the spoofed pop-up over the trusted site, assumes it's real (since they see a valid lock symbol and address on the trusted site), and they enter their personal information in the pop-up (see Figure 1). Historically, pop-ups did not need to show a lock symbol or address bar. Newer versions of the IE browser require this information to be displayed to help users spot this scam. In general, do not enter your information in a pop-up unless you are sure it is from the correct website.

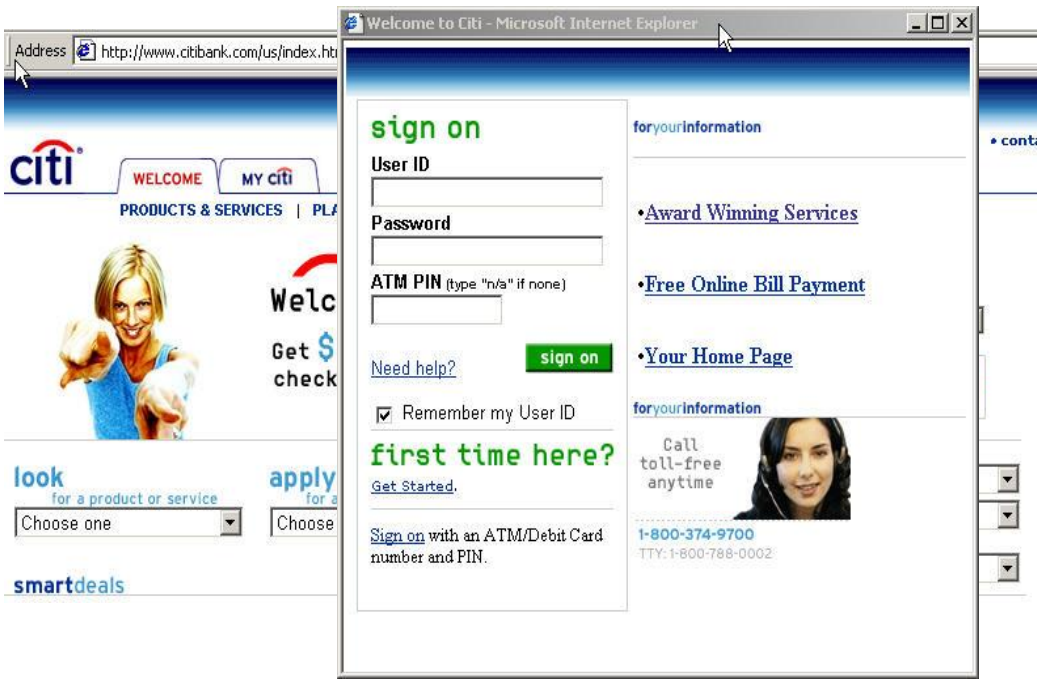


Figure 1: Spoofed pop-up with phony login visually on top of a real site.

7) The Bad guy captures personal information from user. They will often collaborate with other Bad Guys and combine the data they collect with data from other sources (e.g., public sources like genealogy sites, court records, or information stolen from private sources like data custodians). They mine the data looking for "good" victims and consider factors like financial institution, credit score, and when the next account statement will be delivered (to maximize time before detection). The Bad Guy gets everything ready and attempts fraud.

8) Where account to account transfers are common (e.g. Australia), the Bad Guy transfers funds (just under the reporting limit) from the user's account to a phony account. The Bad Guy then sends in "mules" to withdraw the cash. For new account fraud, the Bad Guy establishes credit in the user's name, draws from the line, and defaults.

9) Effective law enforcement is an opportunity to "tip the economics" through big fines and jail time (i.e. create a deterrent). Financial institutions report fraud to Law Enforcement. Law Enforcement utilizes traditional tactics (e.g. follow-the-money and stings). This is a world-wide issue and requires world-wide cooperation. The Bad Guys will often use a "spread the pain" strategy to avoid law enforcement action (i.e. they distribute hits across jurisdictions and keep hits small). Need to aggregate crimes to make it harder to hide.

10) Through consumer education, users may spot spoofs and report them. Key points for detecting a spoof are reading email and browsing. Reports can help tune filters and give Law Enforcement new leads.

Deceptive downloads: getting more than you bargained for

11) One way unwanted software gets on your system is through covert piggy backing. The rogue software is included with software you want, like a “peer to peer” file sharing program, but it's not obvious. Another is posting software on a page and triggering a forced download (now blocked in recent versions of IE). Some users leave their security settings below medium (the default) which allows “drive by” downloads.

12) Deceptive downloads can include key stroke loggers that send your key strokes to the Bad Guys for analysis. They may include “screen scrapers” which send images of your desktop. This software can directly compromise your personal information and expose you to bank fraud, credit card fraud, and identity theft.

13) Deceptive downloads could turn your system into a “zombie” where the Bad Guy is able to remotely control your system resources. You become part of a Bot Farm for hire. When not looking for new recruits, Bot Farms can send Spam and launch Distributed Denial of Service attacks (DDOS). Spam perpetuates Phishing attacks. Threat of DDOS has been used to extort money from commercial sites. The Bad Guys also try to get search engines to promote their spoofed links by paying for sponsored links or using the Bot Nets to cheat the rank algorithm.

14) The most insidious form of deceptive software is a “rootkit” which installs at or below the level of the operating system to avoid detection.

15) “Dialers” make authorized toll calls resulting in phone fraud. Ireland took extreme step of blocking direct dialed international calls in 2004.

16) The Bad guys also exploit “unpatched vulnerabilities” in the email and browser client to inject rogue software. Like Phishing, Bad Guys will impersonate a trusted sender to get you to open compromised emails (i.e. one that will try to install malicious software on your system). Microsoft addresses vulnerabilities in two ways: reactive (e.g. quick fixes) and proactive (e.g. hardening as part of Secure Development Lifecycle and Engineering Excellence). Users should upgrade to the latest version of the software to get the benefit of these ongoing security improvements (e.g., Windows Vista or the latest Windows XP service pack) and regularly apply updates (e.g. via Automatic updates). Deploying the latest software can significantly reduce your exposure.

17) Pharming compromises DNS servers which redirect a user to the Bad Guy site even when the user enters or clicks on a trusted link. Rogue software can edit a local “hosts file” to effect the same action.

Blended threats: mix and match

18) Combinations of attacks are becoming more common. A good example was the Download.ject attack in 2005. A trusted site with weak settings was compromised with an evil script. When users visited the trusted site, the evil script executed, and through an unpatched vulnerability a key stroke logger was injected into their system.

Assessing Tactics

Seeing current and proposed tactics overlaid on the battlefield can help identify strategic holes. The battlefield diagram on the next page illustrates this concept. Tactics are represented by yellow stop signs and are placed over the area they target.

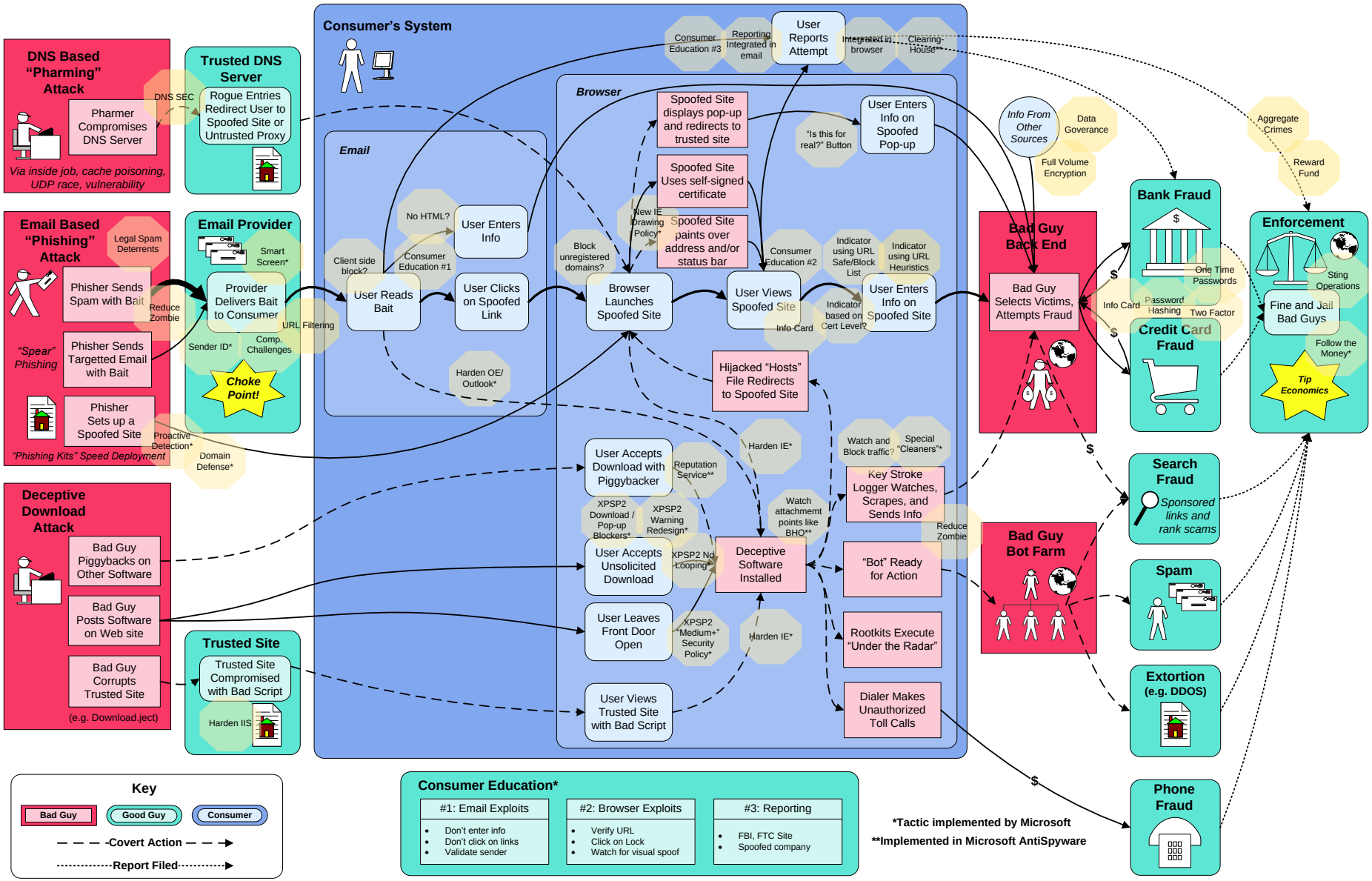
The tactics displayed include these deployed by Microsoft:

- Windows mitigations such as a download blocker and updated IE policies for drawing and security.
- Microsoft SmartScreen™ Spam Filter.
- Aggressive shutdown of spoofed sites (e.g., in 2005 Microsoft successfully closed over 2300 sites, 90% of them under 24 hours).
- Proactive detection that scours the web looking for unauthorized collateral.
- Domain defense that reduces the risk from look-alike sites.
- Special cleaners like the Malicious Software Removal Tool.
- Fixes for known vulnerabilities
- Reward fund to help find the Bad Guys
- Microsoft AntiSpyware.
- Microsoft Phishing Filter that uses intelligent heuristics and an online web service to flag suspected/reported sites.
- Least privilege by default to reduce risk of compromise
- CardSpace identity system that is easy to use, reduces the need for passwords, and helps users know who they are dealing with
- Bit Locker full volume encryption to reduce chance of a breach from a lost laptop

And these other tactics deployed by a variety of vendors:

- Online consumer education from a variety of sources including the FTC, SEC, Treasury, banks, credit card companies, consumer advocacy groups, and software vendors.
- Email authentication such as Sender ID and DomainKeys.
- Safe/block lists, visual indicators such as AccountGuard (eBay), ScamBlocker (Earthlink), and SpoofStick (CoreStreet)
- One time passwords like SecurID token (RSA) and Scratch-off PIN cards
- Better tools to detect deceptive software
- Follow-the-money enforcement and joint sting operations like Digital Phishnet.

Sampling of Current and Proposed Tactics



What's Missing?

While the battlefield depicts many of the methods deployed by the Bad Guys, other technologies, like Instant Messaging, Mobile devices, and Internet Telephony, have the potential to be exploited and are not currently mapped. Other exploits include setting up a rouge access point (an "evil twin") that can enable the Bad Guy to monitor your wireless traffic.

Data custodians are also under attack both from inside jobs and external campaigns. By design, this battlefield takes a consumer-centric view. A data custodian centric battlefield could be created that illustrates these attacks, as well as potential mitigations (e.g. comprehensive data governance solutions that would reduce the likelihood of a breach). These include role based access, better encryption tools, auditing, and reporting.

Conclusion

It's clear from the diagram that there is no silver bullet that will address all issues. The threats are continuously evolving and blended together by the Bad Guys to form new attacks.

That said, if we look more closely at just a subset of the problem we might be able to identify the root cause and make a major impact. In the case of Phishing, lack of strong mutual authentication and the use of shared secrets may be the primary reasons Bad Guys continue to utilize the technique. They can pretend to be your bank or a trusted entity you do business with and unless you're an expert, it's very hard for you to tell the site isn't real. You type in your secrets (your credentials) and the Bad Guys later play them back to the entity and pretend to be you. Adding a "second factor" like a one time password will not help you recognize the site is spoofed and it can still be replayed by the Bad Guy via a classic man-in-the-middle attack.

These issues call for a strategy which makes it easier for users to assess whether they are on the correct site (i.e. stronger mutual authentication) and moves away from using shared secrets to authenticate (e.g. username and password). Using Public Key Cryptography, where the "private key" stays private and only the "public key" is exchanged over the Internet, is one way to take away the prize sought by the Phisher.

Launching a new infrastructure is a large undertaking that will take many players. There will be some costs and it will take time. New technologies will need to be rolled out, incentives and appropriate regulations will need to be identified, and consumers will need to be educated on the new paradigm. To be effective, solutions like these need to become an integral part of our online digital lifestyle and a catalyst for the ecosystem.

