Recent Activity in Phishing Malware

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Overview

- Phishing perceptions
- Phishing malware
- Trends
- Examples

Phishing Perceptions

Phishing and related banking and identity theft crimes have manifested themselves differently across the globe (at least from our US-centric point of view)

- United States
  - Awareness has traditionally focused towards scam emails and sites
  - Increase in use of phishing malware
- Brazil
  - Phishing malware a major threat for the last few years
- Europe/Australia
  - Significant rise in phishing malware over the past year

Need help from you to fill in the gaps!

So what am I talking about?

The following terms have been used to refer to malware that targets online banking and related commerce systems

- Keystroke loggers
- Spyware
- Banking trojans
- Phishing malware

Advantages of Malware

Malware provides criminals with several advantages over scam emails and websites

- Increased ROI for attackers
  - Target multiple sites at once
  - Simple to modify existing malware
- Stealthier than email-based phishing
- Increased technical sophistication

Through its artifact analysis work, CERT/CC is working to understand the evolving capabilities of this class of malware

Malware Countermeasures

Currently, we are seeing various techniques to mitigate against malware that targets online banking and commerce information

- Virtual Keypads
  - Attempt to protect against keystroke loggers
- Dynamic credentials
  - Two-factor authentication
  - Some institutions provide an additional PIN, and will ask for a random selection of digits from this PIN at login
  - Also use personal questions
- Transaction Numbers (TANs)
  - Transaction-level authentication

Evolution of Malware

A significant trend we are observing is the continual evolution of malware capabilities that improve effectiveness and survivability

- Effectiveness of data capture
  - Keystroke logging
  - Targeted logging
  - Web form scraping
  - Screen captures
  - Fake web pages
- Survivability
  - Dynamic update
  - Anti-analysis
  - Obfuscation
  - Encryption

Keystroke Logging

A common term used when describing phishing malware

- Focus on web browser traffic
- Combination of generic and specific keywords to enable logging
- Generally do not record all keystrokes
- Dedicated or part of more complex malware (bots)

Mechanisms (Focus on Windows)

- Internet Explorer Automation
- API Function Hooking
- Keyboard Hooks

While “technically correct” in most cases, this term can understate the capability

Internet Explorer Automation

Automation

- Uses Common Object Model (COM)
  - Formerly known as OLE Automation
- Allows client applications to create and manipulate exposed objects from another application
- Internet Explorer provides robust interfaces for monitoring for specific events and controlling properties
  - DWebBrowserEvents
  - IWebBrowser2

Internet Explorer Automation

- Monitor for specific browser events
  - Before navigation
  - Change in menu bar
  - Page load completed
  - Browser exit
- Read and modify web page properties
  - Navigate to specific pages
  - Read contents of input elements
  - Replace specific elements within web pages
  - Automate user actions (e.g. form submit)
- Framework for different data theft techniques
  - URI/POST interception (“keystroke logging”)
  - Web form scraping
  - Web page/element overlays

API Function Hooking

Some malware will leverage the use of established API calls used by web browsers

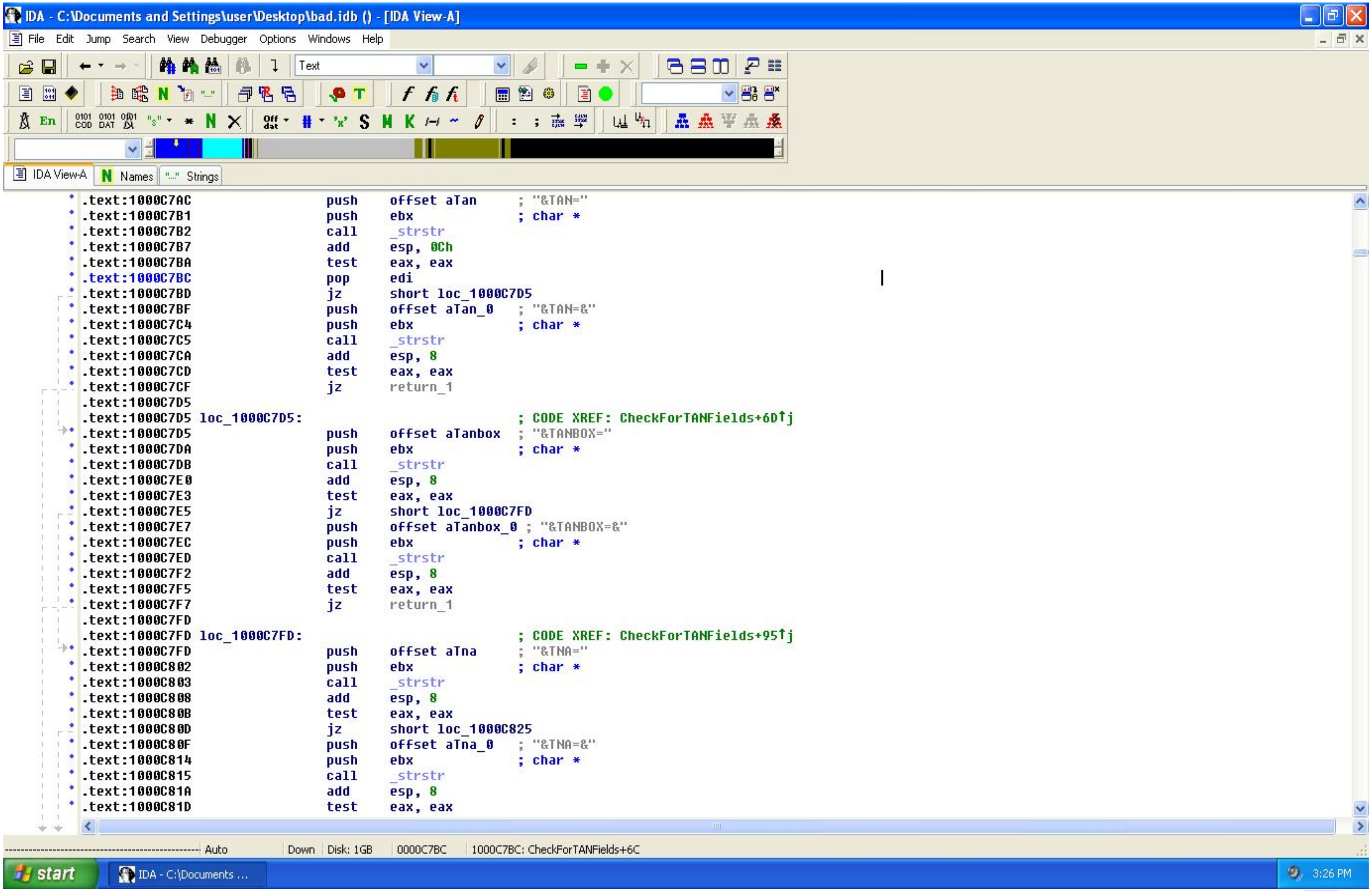
- Microsoft Windows provides API for HTTP
  - HttpSendRequestA
  - InternetCrackURLA
- Web browser process is tricked into calling a wrapper function that has access to parameters
  - URLs
  - POST data
- Attacks of this type could be browser-independent

Targeted Logging

In addition to targeting specific sites, we are observing malware that will target special authentication fields

- We are observing malware attempting to recover TANs (transaction numbers)
- Also observing malware that will attempt to block access to site after a TAN is stolen to increase the time window stolen data is useful

Example of TAN Harvesting


IDA - C:\Documents and Settings\user\Desktop\bad.idb () - [IDA View-A]
File Edit Jump Search View Debugger Options Windows Help
Text
IDA View-A
Names
Strings
Auto
Down
Disk: 1GB
0000C7BC
1000C7BC: CheckForTANFields+6C
start
IDA - C:\Documents ...
3:26 PM

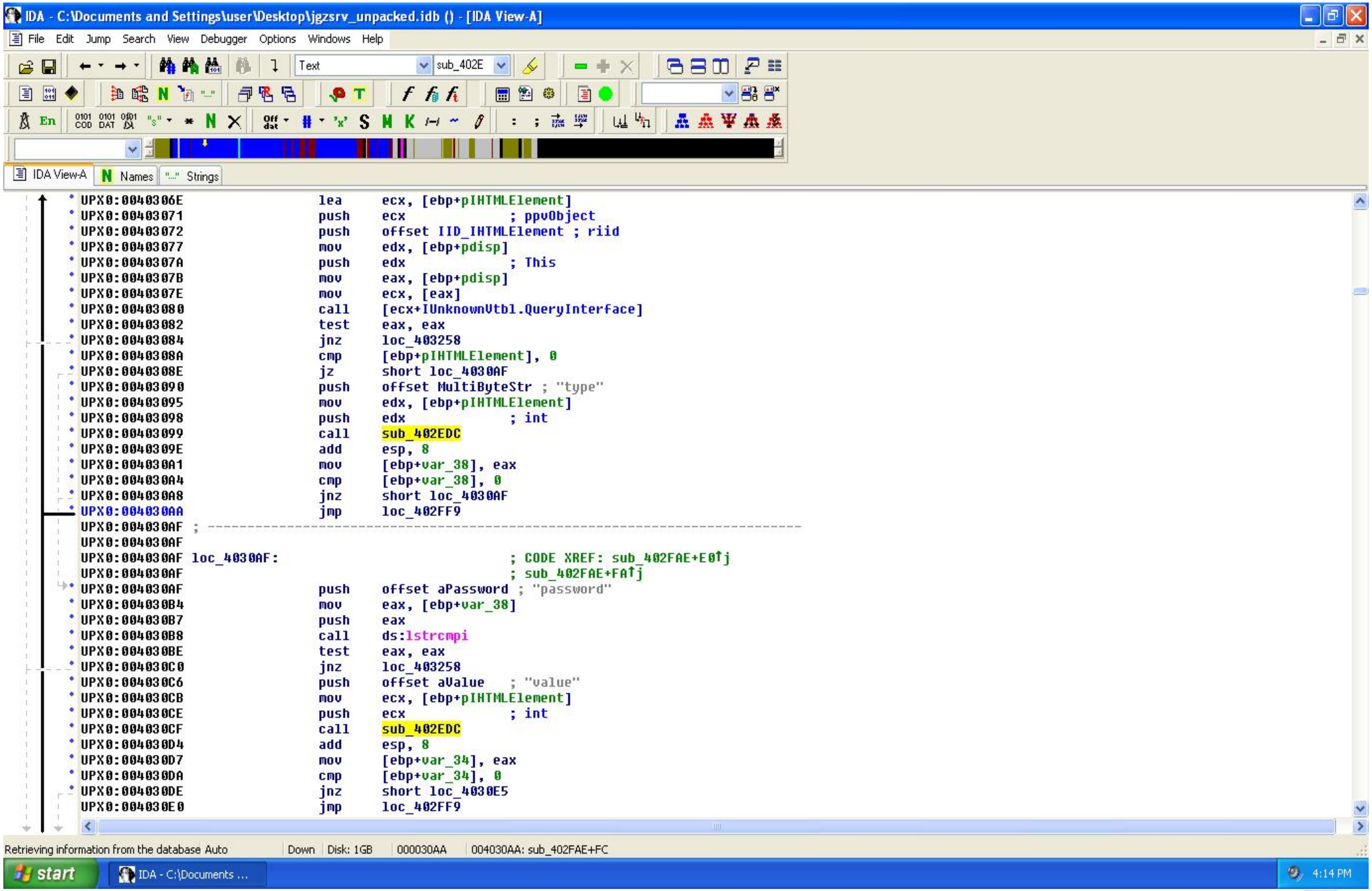
```
.text:1000C7AC                 push    offset aTan     ; "&TAN="
.text:1000C7B1                 push    ebx             ; char *
.text:1000C7B2                 call    _strstr
.text:1000C7B7                 add     esp, 0Ch
.text:1000C7BA                 test    eax, eax
.text:1000C7BC                 pop     edi
.text:1000C7BD                 jz      short loc_1000C7D5
.text:1000C7BF                 push    offset aTan_0   ; "&TAN=&"
.text:1000C7C4                 push    ebx             ; char *
.text:1000C7C5                 call    _strstr
.text:1000C7CA                 add     esp, 8
.text:1000C7CD                 test    eax, eax
.text:1000C7CF                 jz      return_1
.text:1000C7D5
.text:1000C7D5 loc_1000C7D5:                           ; CODE XREF: CheckForTANFields+6D↑j
.text:1000C7D5                 push    offset aTanbox  ; "&TANBOX="
.text:1000C7DA                 push    ebx             ; char *
.text:1000C7DB                 call    _strstr
.text:1000C7E0                 add     esp, 8
.text:1000C7E3                 test    eax, eax
.text:1000C7E5                 jz      short loc_1000C7FD
.text:1000C7E7                 push    offset aTanbox_0 ; "&TANBOX=&"
.text:1000C7EC                 push    ebx             ; char *
.text:1000C7ED                 call    _strstr
.text:1000C7F2                 add     esp, 8
.text:1000C7F5                 test    eax, eax
.text:1000C7F7                 jz      return_1
.text:1000C7FD
.text:1000C7FD loc_1000C7FD:                           ; CODE XREF: CheckForTANFields+95↑j
.text:1000C7FD                 push    offset aTna     ; "&TNA="
.text:1000C802                 push    ebx             ; char *
.text:1000C803                 call    _strstr
.text:1000C808                 add     esp, 8
.text:1000C80B                 test    eax, eax
.text:1000C80D                 jz      short loc_1000C825
.text:1000C80F                 push    offset aTna_0   ; "&TNA=&"
.text:1000C814                 push    ebx             ; char *
.text:1000C815                 call    _strstr
.text:1000C81A                 add     esp, 8
.text:1000C81D                 test    eax, eax
```

Web Form Scraping

Malware is able to leverage Microsoft Internet Explorer’s COM interfaces to “scrape” values from a web form

- IHTMLDocument2 interface provides programmatic access to all elements within a web page in Internet Explorer
- This technique uses often-used or known field names (e.g. “password”)
- Can also be used against some virtual keypad implementations

Example of Form Scraping



IDA - C:\Documents and Settings\user\Desktop\jgzsrv_unpacked.idb () - [IDA View-A]
File Edit Jump Search View Debugger Options Windows Help
Text
sub_402E
IDA View-A
Names
Strings
start
IDA - C:\Documents ...
4:14 PM

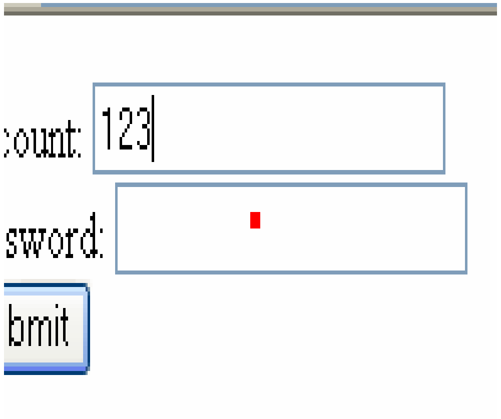
```
UPX0:0040306E                 lea     ecx, [ebp+pIHTMLElement]
UPX0:00403071                 push    ecx             ; ppvObject
UPX0:00403072                 push    offset IID_IHTMLElement ; riid
UPX0:00403077                 mov     edx, [ebp+pdisp]
UPX0:0040307A                 push    edx             ; This
UPX0:0040307B                 mov     eax, [ebp+pdisp]
UPX0:0040307E                 mov     ecx, [eax]
UPX0:00403080                 call    [ecx+IUnknownVtbl.QueryInterface]
UPX0:00403082                 test    eax, eax
UPX0:00403084                 jnz     loc_403258
UPX0:0040308A                 cmp     [ebp+pIHTMLElement], 0
UPX0:0040308E                 jz      short loc_4030AF
UPX0:00403090                 push    offset MultiByteStr ; "type"
UPX0:00403095                 mov     edx, [ebp+pIHTMLElement]
UPX0:00403098                 push    edx             ; int
UPX0:00403099                 call    sub_402EDC
UPX0:0040309E                 add     esp, 8
UPX0:004030A1                 mov     [ebp+var_38], eax
UPX0:004030A4                 cmp     [ebp+var_38], 0
UPX0:004030A8                 jnz     short loc_4030AF
UPX0:004030AA                 jmp     loc_402FF9
UPX0:004030AF ; ---------------------------------------------------------------------------
UPX0:004030AF
UPX0:004030AF loc_4030AF:                             ; CODE XREF: sub_402FAE+E0↑j
UPX0:004030AF                                         ; sub_402FAE+FA↑j
UPX0:004030AF                 push    offset aPassword ; "password"
UPX0:004030B4                 mov     eax, [ebp+var_38]
UPX0:004030B7                 push    eax
UPX0:004030B8                 call    ds:lstrcmpi
UPX0:004030BE                 test    eax, eax
UPX0:004030C0                 jnz     loc_403258
UPX0:004030C6                 push    offset aValue   ; "value"
UPX0:004030CB                 mov     ecx, [ebp+pIHTMLElement]
UPX0:004030CE                 push    ecx             ; int
UPX0:004030CF                 call    sub_402EDC
UPX0:004030D4                 add     esp, 8
UPX0:004030D7                 mov     [ebp+var_34], eax
UPX0:004030DA                 cmp     [ebp+var_34], 0
UPX0:004030DE                 jnz     short loc_4030E5
UPX0:004030E0                 jmp     loc_402FF9
```

Retrieving information from the database Auto | Down | Disk: 1GB | 000030AA | 004030AA: sub_402FAE+FC

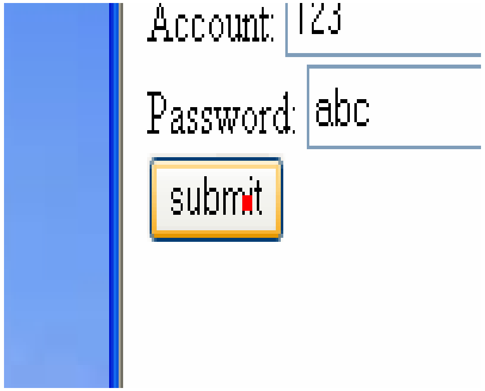
Screen Captures

Several different varieties of malware have the capability of captures screen shots

- Virtual keypads
  - Take screen shot at every mouse click on a specific screen
- Account Information
  - Take screen shot on specific screens to capture account details (e.g. balance, passwords)


ount: 123

sword:


Account: 123

Password: abc

Survivability

Malware authors are taking more steps to protect their code and data from analysis by the security industry and their competition

- PE packers/protectors
  - Thwarts casual identification via strings
  - Bypass AV detection
- String obfuscation
  - Targeted sites
  - Drop sites
- Debugger/Virtual Machine detection
- Encryption
  - Occasionally used to protect stolen information

Dynamic Updates

Malware is adding capabilities to be updated dynamically

- Downloading and executing new malware is a common and well-established capability
- Bots
  - Can be configured from command and control
- Phishing malware
  - Configuration data can be configured dynamically
    - Drop sites
    - Malware to download

Examples

Examples of banking malware that utilizes these capabilities

- Bancos
- Grams
- BankAsh

Bancos

A common name for malware that targets Brazilian banks

- Numerous variants active for over 2 years
- Some versions will generate a fake web browser that mimics a banks login screen
- Some versions have screen capture ability
- Most versions have their own SMTP engine for emailing stolen data
- Versions written in Visual Basic and Delphi

Grams

Grams represented a unique threat vector

- Account siphoner targeting Internet Explorer users of an online funds transfer site
- Use Automation to control Internet Explorer instance for an already authenticated session
  - Transferred funds to another account
- Would not be prevented by two-factor authentication

Technique has not been knowingly reproduced

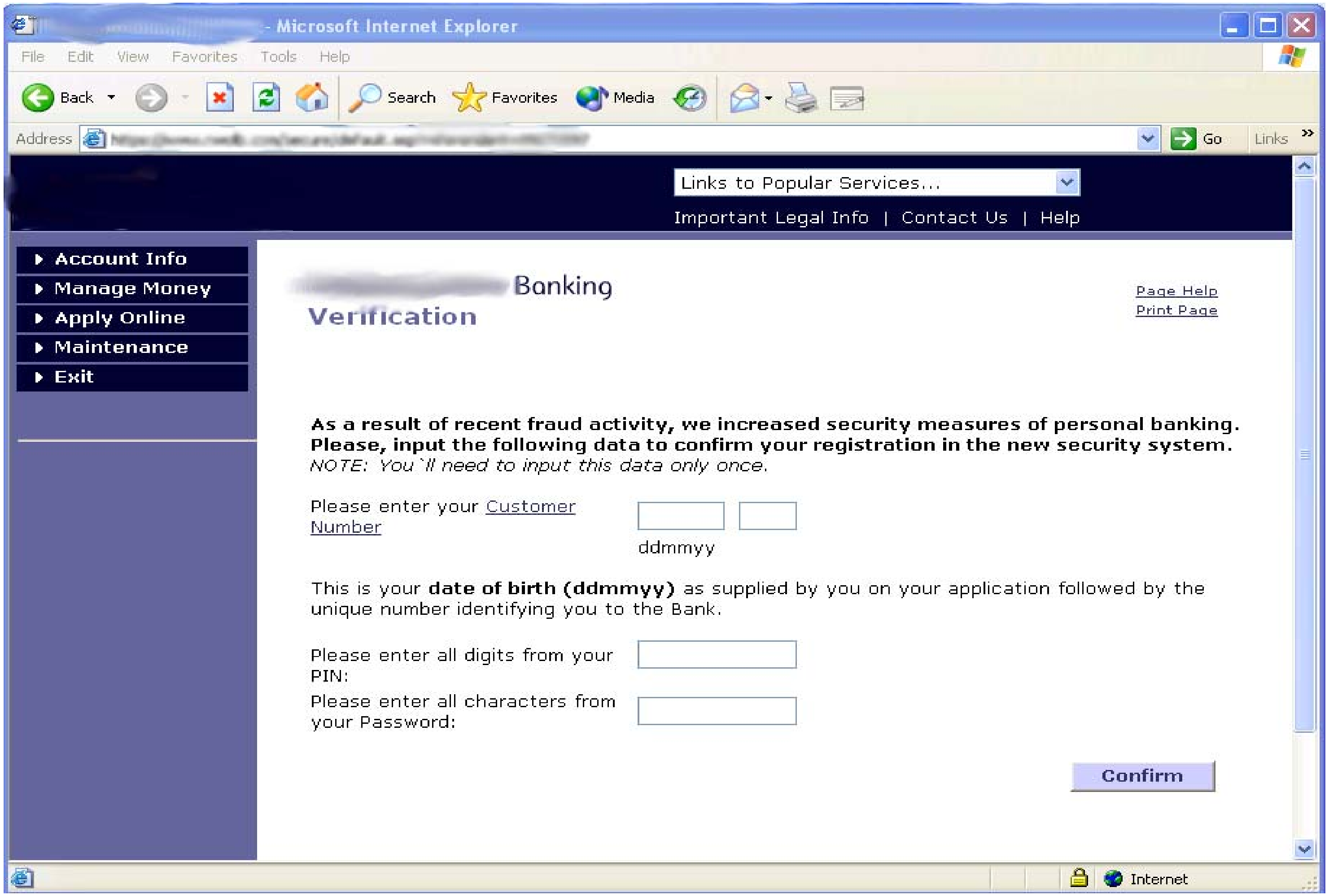
- Technically complex
- Current methods are adequate

BankAsh

Implemented as a COM object to receive events from Internet Explorer

- Targets banks in several countries
- Attempts to steal POST data during SSL sessions
- Looks for banks and URL characteristics that may indicate an online bank that uses TANs
  - Specially tag the stolen data
  - Attempt to block user access to web site
- Uses embedded HTML and Automation to overlay login pages with phish page as another information capture mechanism
  - Targets banks that use a dynamic representation of credentials
- Contains blacklist of sites not to log POST data for
- Attempting to disable AV, firewalls, anti-spyware

Real or Phish ????


[redacted] - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Media
Address [redacted]
Go
Links
Links to Popular Services...
Important Legal Info | Contact Us | Help
Account Info
Manage Money
Apply Online
Maintenance
Exit
Page Help
Print Page
Confirm
Internet

[redacted] Banking

Verification

As a result of recent fraud activity, we increased security measures of personal banking. Please, input the following data to confirm your registration in the new security system.

NOTE: You`ll need to input this data only once.

Please enter your Customer Number ______ ______ ddmmyy

This is your **date of birth (ddmmyy)** as supplied by you on your application followed by the unique number identifying you to the Bank.

Please enter all digits from your PIN: ______

Please enter all characters from your Password: ______

What are the lessons?

- Malware is becoming a global problem for phishing/identity theft
- Malware quickly evolves as countermeasures are developed
- Financial institutions should be aware of potential threats even when they are not actively targeted
- Avoid focusing narrowly on these tools when developing policies (security and legislative) and security countermeasures

Questions? Feedback?