Hacking Internet Kiosk's

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- Who am I?
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- Hacking Kiosks:
  - What is an Internet Kiosk.
  - Kiosk Software Security Model.
  - Vulnerabilities in Kiosk Software.
  - Vulnerabilities in the Kiosk Security Model.

  “Hack any Windows Kiosk in less than 120 seconds!”

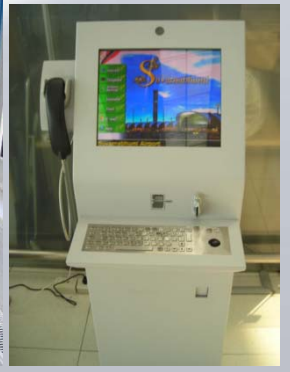
  - Tool Release.
  - Live Demo’s: Hacking (Two) Commercial Internet Kiosks.
  - More 0day than you can shake a stick at.

What Is An Internet Kiosk

- Last Year I Was Sitting in an Airport....
  - 8 hour stop-over in Hong Kong.
  - Queue of people waiting to use a hub of Internet Kiosks.
  - **"Damn, those kiosks sure are popular..."**
  - **"I wonder if I could hack it?."**
  - Kiosks are popular, and rarely appear in security publications.
  - Popularity + Poor Security Visibility = **Good Attack Target**
- Personal Objective:
  - Find every possible method of hacking Internet Kiosk terminals.
  - Become the **King** of Internet Kiosk Hacking!

What Is An Internet Kiosk

- Kiosks are everywhere
  - Airports, Train stations, Libraries, DVD Rental Stores, Corporate Building Lobbies, Convenience Stores, Post Office, Café's, Hospitals, Motels, Hotels, Universities.
  - Cheap technology has made Internet Kiosks very common.


- Initial Observations of Kiosks

- Hardware.
  - Kiosks built in tough hard-shell cases.
  - Fibreglass, Steel, Thick MDF.
  - Lack of physical access to the underlying computer.
  - Input devices inaccessible (Floppy/DVD/USB/FireWire)
  - Kiosk bolted to the ground (padlocked).
  - General public are not trusted.
  - Kiosks are designed to prevent physical theft or malicious use.

What Is An Internet Kiosk

- Software.
  - Majority of Kiosks run commercial Windows Kiosk software.
  - Linux/BSD Kiosks exist, Windows more popular.
  - 44 commercial Windows Kiosk products in the market.
  - Marketed as : “Turn that old PC into instant revenue!”
  - Buy $59.99 Shareware -> Install -> Instant Kiosk!
- Kiosk Software Essentially Skins Windows:
  - Kiosk browsers based on standard Internet Explorer libraries.
    - WINHTTP.DLL/MSINET.OCX
  - Its Windows and Internet Explorer, highly customized.

What Is An Internet Kiosk

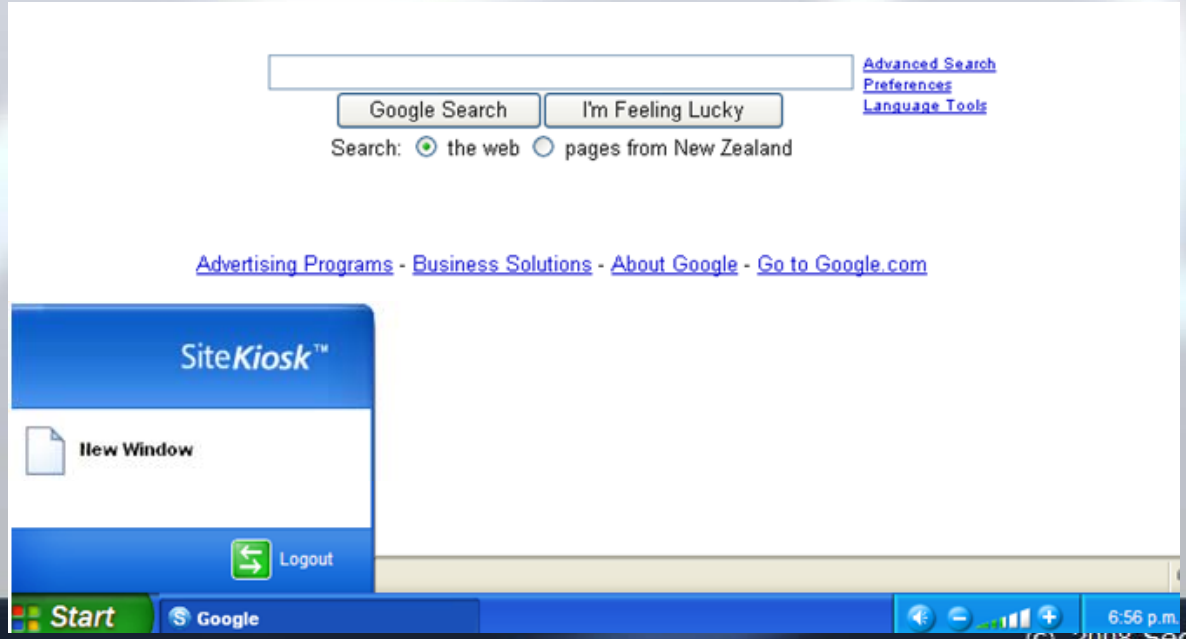
- "Kiosk Software Is The Best Attack Target."
  - Hardware hacking is too obtrusive for public locations.
- "I Need to Walk up to Any Internet Kiosk and Pop Shell, Quickly."
  - Explorer.exe, cmd.exe, command.com.
  - Time limited, 2 minutes or faster.
- 16 Months of Kiosk Software Penetration Testing Later....
  - Virtualized ten of the most popular Windows Kiosk platforms.
  - Researched methods of compromising each Kiosk.
  - Developed Kiosk Attack Methodology.
  - Startling Results: 100% success rate!

Kiosk Security Model

Kiosk Security Model

- Kiosk Software Implement Security in Two Approaches.
- #1 - Reduce Available Host Functionality.
  - Disallow native OS functionality that can be used maliciously.
  - “Command Prompt has been Disabled”
  - “File Downloads Have Been Disabled”
  - Implemented through native ACL’s.
- #2 – Graphically Jailed Into a ‘Secure Kiosk Browser’.
  - Kiosk users are stuck inside a Kiosk browser.
  - Kiosk browser ran in full screen, no ability to close, minimize.
  - Start Bar/Tray Menu removed or hidden.
  - Only thing you can do is browse the web.

- Example #1: Site Kiosk.
  - Looks similar to Windows.
  - Custom Tray Menu/Task Bar.
    - Only one option, ‘New Window’
    - Real Windows ‘Start’ bar is hidden from view.
  - Trapped inside the Kiosk browser.



- Example #2: NetStop Kiosk
  - Custom task bar.
  - Kiosk application ran as a full screen desktop.
  - No ability to close the browser.
  - Only permits internet browsing.

- Kiosk Browsers Proactively Monitor Your Activity.
  - Kiosks contain multiple blacklists of prohibited activity.
  - Try to do something sneaky, the Kiosk will stop you.
  - Try to Browse C:\ with the Kiosk browser:

- Blacklist in-focus Modal Dialogs.
  - Block dialogs by Window Title or Window Class.
  - “Save File As”, “Open With”, “Confirm File Delete”, “Print”.
  - WM_CLOSE Window message sent to the blacklisted dialog.
  - Dialog closes.

Kiosk Security Model

- API Hooking.
  - Hook native OS API calls which can be used maliciously.
  - KillProcess(), GetCommandLineW(), AllocConsole()
  - “Unauthorized Functionality Detected, Process Killed”.
- Kiosk Browser ran in ‘High Security Zone’
  - File downloads disabled.
  - Browser scripting, pop-ups, ActiveX, all disabled.
- Watchdog Timer.
  - Every 5 minutes the Kiosk will enumerate all active processes.
  - Terminate any unauthorized activity.

- Custom Keyboard Driver.
  - Disable Windows shortcut key combinations.

CTRL-SHIFT-ESC (Task Mgr)
ALT-TAB (Switch Task)
CTRL-ALT-DELETE (Task Mgr)
CTRL-ESC (Start Menu)
Alt-F4 (Close Application)

- Modifier Keys Unmapped.
  - CTRL, Tab, ALT, ‘Start’, Function, F1-F12.
  - Custom Keyboard with missing modifier keys!
- Custom Mouse.
  - No right click button.
- All Methods of reducing functionality!

Hacking

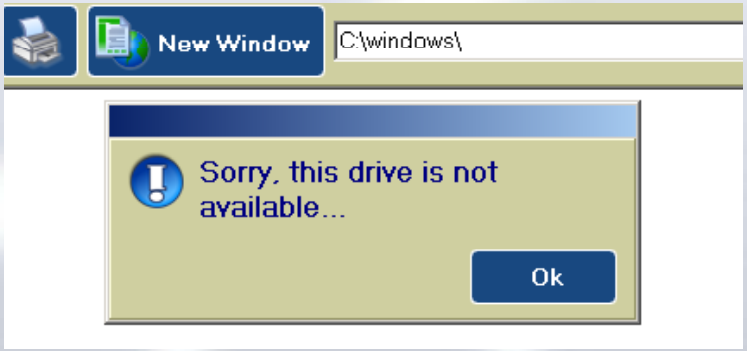
Kiosk Software

Hacking Kiosk Software

- Kiosk Security Model is Based on Reducing Functionality.
  - Limit functionality which can be used to escape the Kiosk browser.
- Exploiting A Kiosk Requires **Invoking Functionality.**
  - Cause applications/functionality to spawn, popup on screen.
  - Use the invoked functionality to escape the Kiosk jail.
  - Spawn a command prompt, get back to Windows.
- Kiosk Security Is Implemented Through Blacklists.
  - Blacklists (by nature) are never 100%.
  - We only need one method of escaping the software jail.

- Lets Say You Find a Kiosk in Your Local Mall.
  - ‘10RM for 1 hour of internet usage’
  - Insert money.
- You Find You are Trapped Inside a Kiosk Browser.
  - Only one visible button to ‘Start Browsing’
  - Start Browsing...

- Browse The Local File System Using The Kiosk Browser.
  - Local Windows users are capable of browsing the file-system.
  - Kiosk software must explicitly block local browsing attempts.
- Windows Is Designed For Idiots.
  - Caters for mistypes/fat-fingers.
  - C:\windows\ maybe blocked.

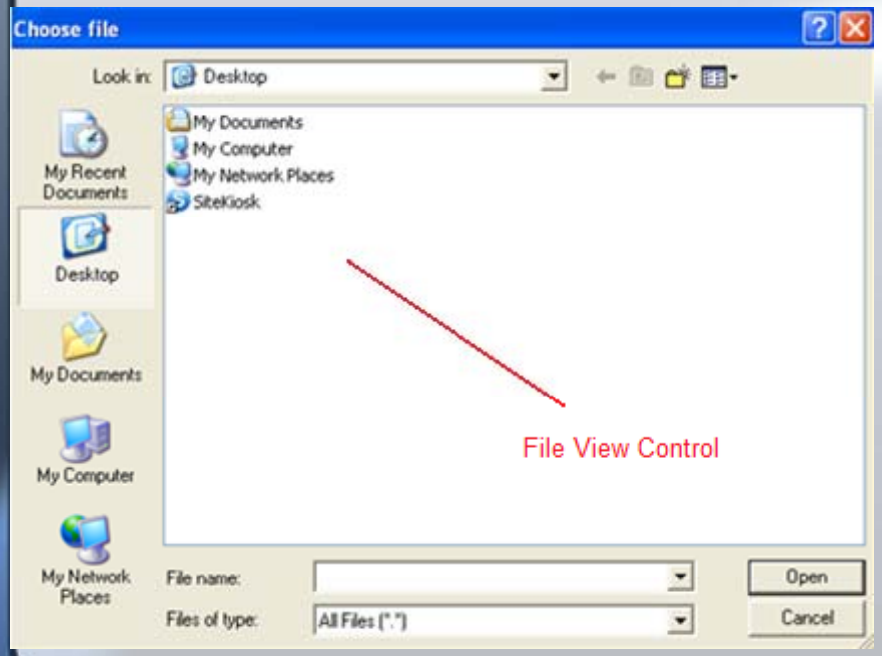


File:/C:/windows	File:/C:\windows\	File:/C:\windows/	File:/C:/windows
File://C:/windows	File://C:\windows/	file://C:\windows	C:/windows
C:\windows\	C:\windows	C:/windows/	C:/windows\
%WINDIR%	%TMP%	%TEMP%	%SYSTEMDRIVE%
%SYSTEMROOT%	%APPDATA%	%HOMEDRIVE%	%HOMESHARE%

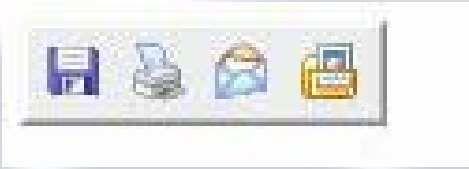
- Blacklists start failing about now.

- Using Common Dialogs To Hack Kiosks.
  - Windows contains ‘Common Dialogs’ libraries.
  - Saving a file, opening a file, selecting font, choosing a colour.
  - COMDLG32.DLL (Common Windows Dialogs Library).
  - COMDLG32.DLL Implements Common Windows Controls.
    - From COMCTL32.DLL (Common Windows Controls Library)
- File/Open, File/Save Dialog’s Contain ‘File View’ Controls.
  - File view control provides full Explorer functionality.
  - Same control that Windows Explorer uses.
  - File-Open Dialog = Explorer
  - Can be used to launch processes.

- Systematically Click Every Button, Graphic, Icon In The Kiosk
  - Can we invoke a File - Open Dialog? “Attach File”
  - Browse the file system
  - Right Click cmd.exe: Open / Run As
  - Spawn cmd.exe



- Internet Explorer ‘Image Toolbar’.
  - Toolbar hovers top-left of a large image when clicked.
  - Each icon of this toolbar can invoke a Common Dialog.
    - File/Save.
    - File/Print.
    - File/Mailto.
    - Open “My Pictures” in Explorer.



  - Toolbar is present if the Kiosk uses Internet Explorer libraries.
  - Click a large image on screen
    - Spawn a Common Dialog, spawn Explorer.

- Using the Keyboard.
  - Keyboard shortcuts can be used to access the host OS.
  - Check if a custom keyboard driver present?
  - Are modifier keys enabled?
- Keyboard Combinations Which Produce Common Dialogs.

CTRL-B, CTRL-I (Favourites)
CTRL-H (History)
CTRL-L, CTL-0 – (File/Open Dialog)
CTRL-P – (Print Dialog)
CTRL-S – (Save As)

- Kiosk Specific ‘Administrative’ shortcuts.
  - All Kiosk products contain a hidden Administrative menu.
  - Mash the keyboard, CTRL-ALT-F8? CTRL-ESC-F9?

- Browser Security Zones
  - Browser security model incorporates multiple security zones:

    Restricted Sites

    Internet Zone

    Intranet Zone

    Trusted Sites

  - Each security zone adheres to a different security policy.
    - Internet zone has less ability to interact with a host.
    - Trusted Sites, Intranet Zone typically have more access.

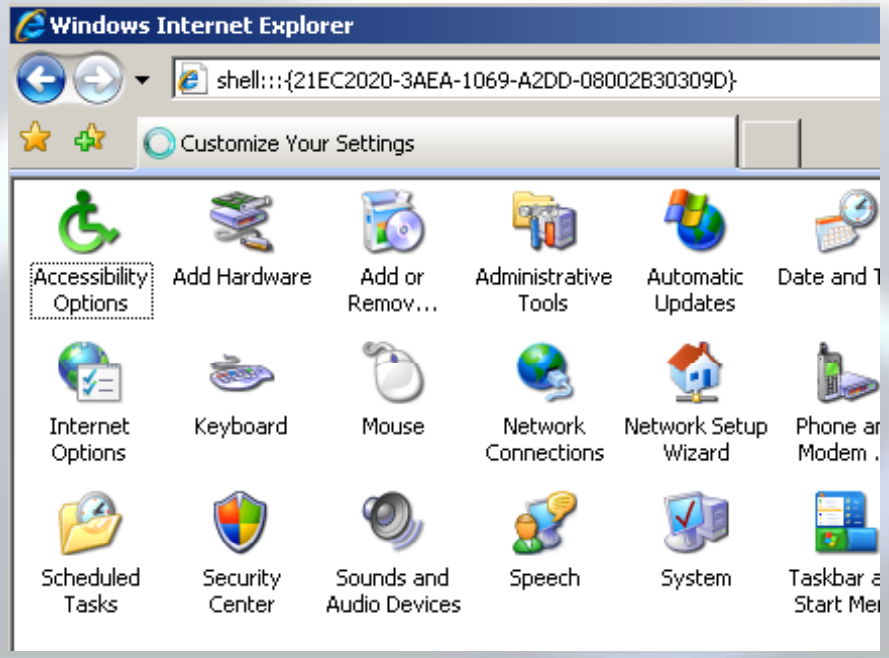
- Local Users Can Access All Available Security Zones.
  - URL's must be directly typed into the URL entry bar.
- Security Zone Escalation. about: pluggable-protocol handler.
  - About handler belongs to the 'Trusted Sites' security zone.
  - Suffers from a Cross Site Scripting vulnerability.
  - Local users can render arbitrary content within a trusted zone.
  - Spawn a File Open Common Dialog from a trusted security zone.

    about:<input%20type=file>

    about:<a%20href=C:\windows\>Click-Here
  - Internet zone cannot follow links to the file system.
  - Trusted sites can.

- Shell Protocol Handler.
  - Shell handler provides access to Windows web folders.
  - Type Into the URI Bar:
    - Shell:Profile
    - Shell:ProgramFiles
    - Shell:System
    - Shell:ControlPanelFolder
    - Shell:Windows
  - Each URL will spawn explorer.exe and browse the web folder.
- Is the shell: handler blocked by the Kiosk?

- How About This:
  - shell:::{21EC2020-3AEA-1069-A2DD-08002B30309D}
  - Invoke the Windows Control Panel by ClassID.
  - Works from common Internet Explorer libraries.
  - Bypass native ACL's that may exist on control.exe



- The Downside to Physical Input Vectors.
  - Kiosk software is designed to not trust the guy on the keyboard.
  - **Kiosk User = Most Obvious Security Threat.**
  - My research concluded that physical inputs are not so successful.
    - 40-50% chance of popping shell.
    - Many techniques are already published, unoriginal.
- A Subtle Discovery...
  - Remote websites **not** factored into the Kiosk security model.
  - Websites are trusted **MORE** than a local Kiosk user!
  - Kiosks rely on the default web browser security model.

- "I Need a Kiosk Hacking Website."
  - An online tool you can visit from an Internet Kiosk terminal.
  - Provide all the content you will ever need to escape a Kiosk jail.
- iKAT – Interactive Kiosk Attack Tool.
  - First of its kind! New method of hacking Internet Kiosks!
  - Fast! iKAT can pop shell in less than 30 seconds.
  - 95-100% success rate!
  - **http://ikat.ha.cked.net**

- What Can iKAT Do?
- Kiosk Reconnaissance : Detect Installed Applications
  - JavaScript & res:// (resource) protocol handler.
  - Extract bitmap resources from PE executables.
  - Verify bitmap presence and detect installed applications.
  - Detects all common commercial Kiosk platforms.
  - Enumerates locally installed applications.

```
var disk;
disk = 'C:\\';
var test = new Image();
test.src = 'res://C:\\' + fileurl;
if (test.height != 30)
{
return true;
}
```

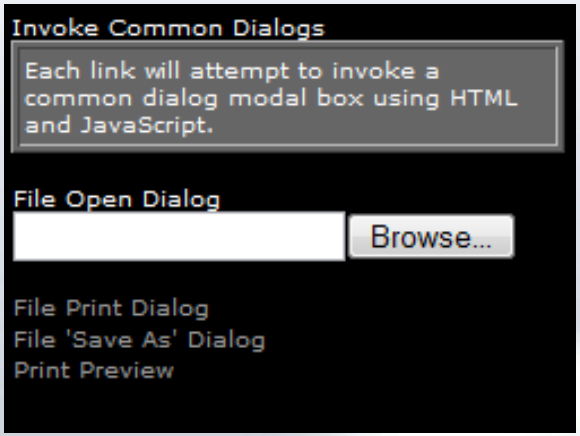
```
Detected Kisok Platform:
NetStop Pro Kiosk              C:\Program Files\NetStopPro\

Detected Applications:
Windows Media Player 11        C:\Program Files\Windows Media
Microsoft NetMeeting           C:\Program Files\Netmeeting\
Microsoft .NET Framework v1.0  C:\Windows\Microsoft.NET\Frame
Microsoft .NET Framework v2.0  C:\Windows\Microsoft.NET\Frame
MSN Messenger                  C:\Program Files\Messenger\
Microsoft Movie Maker          C:\Program Files\Movie Maker\
```

- Display Local Browser Variables.
  - Determine underlying Kiosk browser technology.
  - MSINET.OCX, WINHTTP.DLL display Internet Explorer appVersion
  - Detect the presence of .NET CLR.

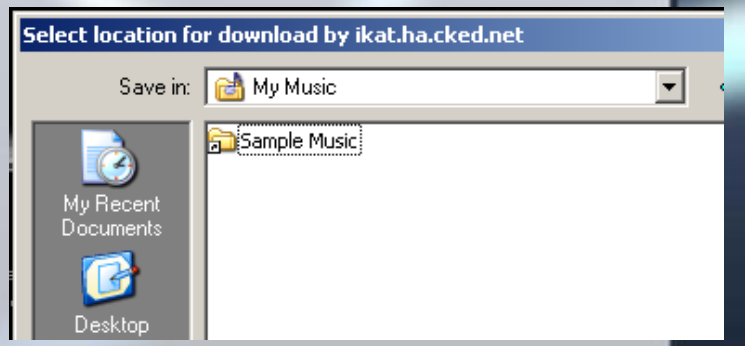
- Display Remote Server Variables
  - Discover remote IP address of the Kiosk terminal.

- All Common Browser Dialogs In One Place



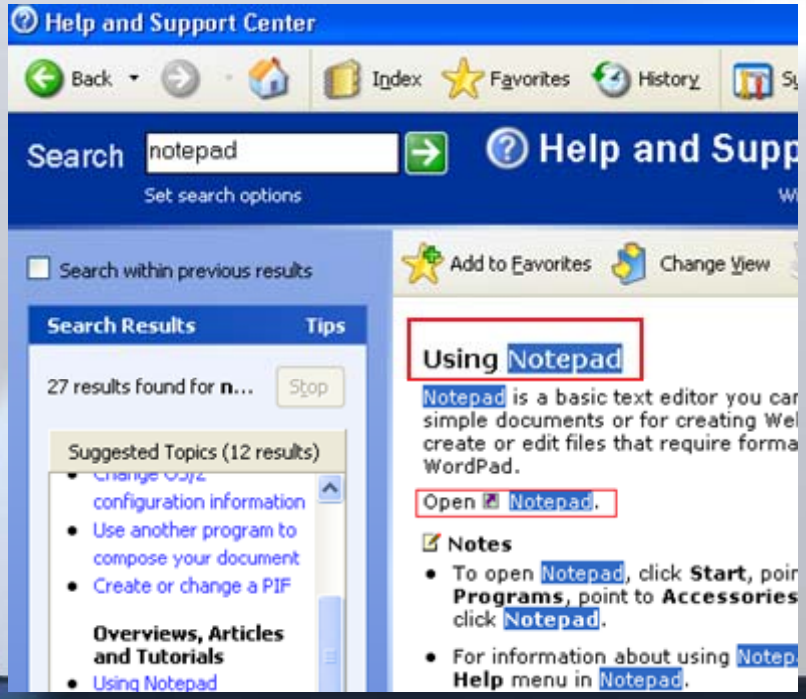
  - File Open, Save As, Print, Print Preview:
  - Click down the list and determine what dialogs are blocked.
    - Use the File View control within the dialogs.

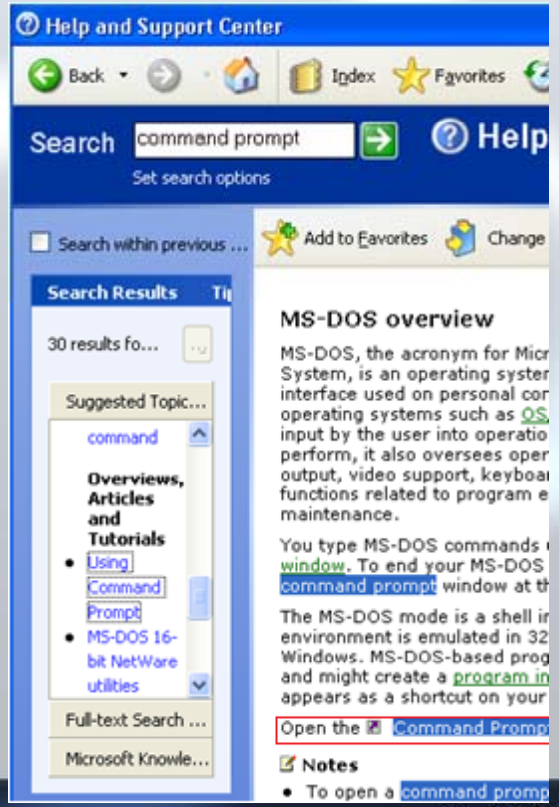
- Use Flash To Invoke Common Dialogs.
  - Adobe Flash is the most widely used browser plug-in.
  - ActionScript 3 can invoke three unique File View dialogs.
    - ‘Select File For Upload’
    - ‘Select File(s) For Upload’
    - ‘Select location for Download by ikat.ha.cked.net’
- Flash Common Dialogs have Unique Dialog Titles
  - Not standard “Choose File”
  - Bypass dialog Window title blacklists.
  - Still contains the File View control.
  - Blacklists fail (again).



- Spawning Applications On The Kiosk.
  - Can we cause an application/process to spawn on the Kiosk.
  - Does the spawned application contains a common dialog?
  - Use the application to gain additional access to the Kiosk.
- iKAT Invokes Default Windows URI Handlers.
  - URI handler applications are spawned for each URI.
  - Callto://, Gopher://, HCP://, Telnet://, TN3270://, Rlogin://, LDAP://, News://, Mailto://
  - **One Click Automation**: One click spawns all default handlers.
- 3rd party URI Handlers
  - MMS://, SKYPE://, SIP://, Play://, Steam://, Quicktime://

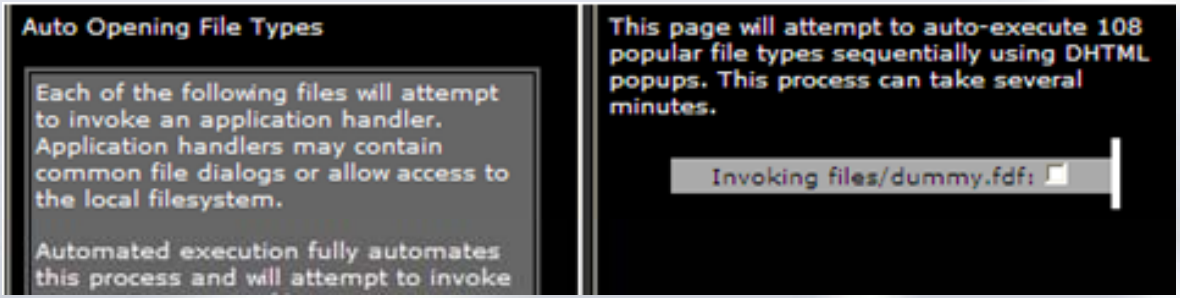
- Example: HCP://: Help And Support Center
  - Click-me
  - Search HCP for what you want to launch **“Command Prompt”**
  - “Using Command Prompt” provides link to spawn cmd.exe
  - Left Click Only!



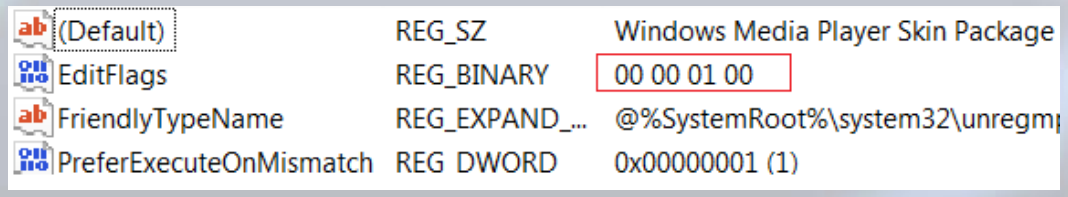


- iKAT Provides Links to Over 100 URI Handlers.
  - Click, click, click down the list.
  - Determine which handlers are covered by the Kiosk blacklist.
  - Use invoked handler application to escape the Kiosk.
- iKAT Contains Local Security Zone Handlers
  - about:, res:, shell:
  - Lists of URL's to type in.
  - Remembering ClassID's is hard.

- Invoke Applications Using File Type Handlers.
  - Click on test.myfile, Windows will spawn the ‘myfile’ handler.
  - iKAT uses DHTML/JavaScript to invoke 108 unique file handlers.



  - Internet Explorer supports prompt-less handler execution.
    - Example: Click test.wmv, Windows Media Player Spawns.
    - No Prompt **“Are you sure you want to…”.**



  - Kiosk blacklists monitor in focus dialogs for warning prompts.

- iKAT & Windows Media Files.
  - WMPlayer will silently launch for multiple file types.
  - Windows Media Playlist Files (.ASX)
  - Supports ‘Web Enhanced Content’.

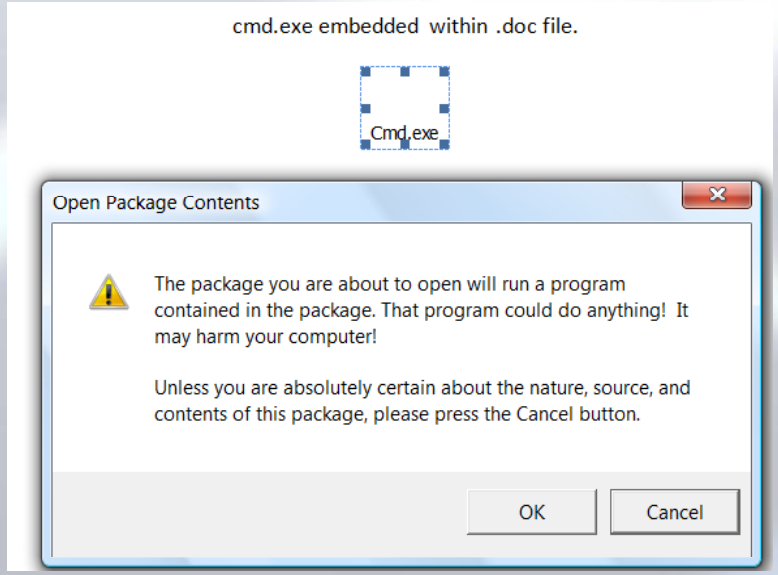
```
<ASX VERSION="3.0">
<PARAM name="HTMLView" value="http://ikat.ha.cked.net/"/>

<ENTRY>
   <REF href="http://ha.cked.net/front.jpg"/>
</ENTRY>

</ASX>
```

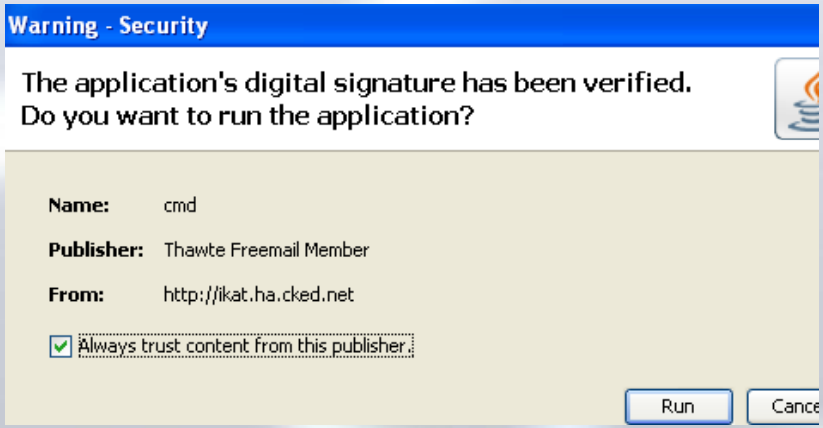
  - Turn Windows Media Player into a web browser!
  - Provides a browser without any Kiosk security controls.

- iKAT & Office Documents.
  - If an Office file viewer is installed on the Kiosk, we win.
  - Embed a copy of cmd.exe within an office document.
  - Supported by .DOC,.DOCX,.XLS,.XLSB,.XLSM,XLSX
  - ‘Open Package Contents’ dialog not detected by any Kiosk.



  - iKAT will spawn the most useful file possible.

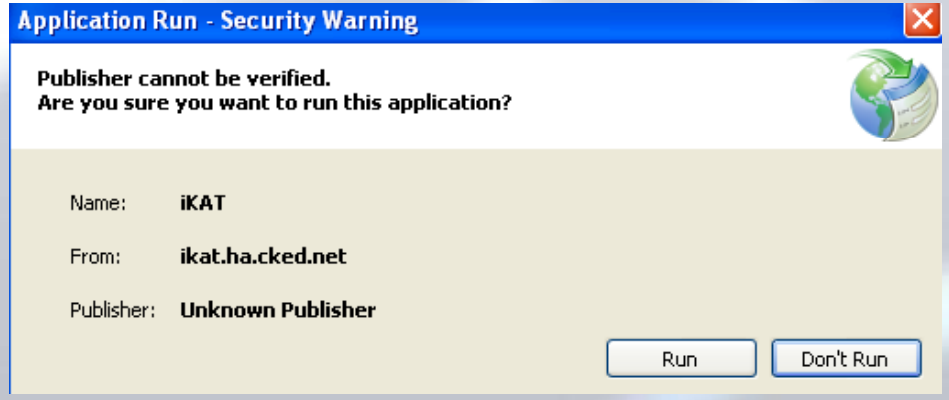
- iKAT & Java Applets:
  - Signed Java applets can execute local processes.
  - Detect if JRE is installed (iKAT Kiosk Reconnaissance).
  - Does the Kiosk detect the Java security warning prompt?
    - “Warning – Security”
    - 0% of tested Kiosks did.



- iKAT Contains Signed Kiosk Specific Java Applets.
  - Signed applets to spawn command shells.
  - Includes Jython by GNUCITIZEN.

- Install a Malicious ActiveX
  - Safe for scripting ActiveX's can be used to compromise a Kiosk.
  - Unsafe method: object.execute('cmd.exe');
  - Can we install a malicious ActiveX on the Kiosk?
- iKAT ActiveX
  - Safe-for-scripting ActiveX which executes arbitrary executables.
  - Installing an ActiveX requires administrative authority.
  - iKAT ActiveX gives you the ability to spawn a shell.
- ActiveX is changing:
  - IE8 will not require admin rights for installing a new ActiveX.

- iKAT & ClickOnce Applications
  - ClickOnce is .NET 2.0+ technology (.NET CLR 2+ required)
  - ‘Online Application Deployment’ .application file handler.
  - Unsigned ClickOnce applications execute with full trust!
  - Admin privileges are not required!
  - Users are warned:

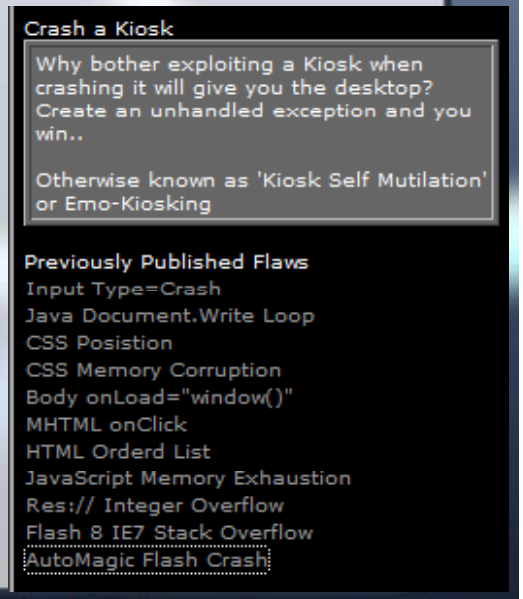


  - All tested Kiosks fail to detect this warning message!
  - Modern Kiosks now developed in .NET (CLR is present!)

- The most useful ClickOnce applications for Kiosk Hacking?
- **Embedded Web Browser.**
  - HTTP browser with reduced security settings.
- **Application Executor.**
  - Spawn arbitrary executables.
- **Access Token Pincher.**
  - Access token hijacking is a hip subject, why not!
  - Does the Kiosk user have the SeImpersonate privilege?
  - Impersonate available (privileged) tokens.
  - Spawn cmd.exe under the context of the privileged token.
  - System shell, I win.

- Who Here Has Ever Crashed a Web Browser?
  - What about crashing a Kiosk: 'Emo-Kiosking'
  - Create an unhandled exception in a Kiosk browser.
  - Kiosk browser crashes, We get the desktop, We Win!
  - Rare situation: Application crash = highly critical vulnerability.

- iKAT Contains Common Browser Crash Techniques.
  - Published exploits which results in a crash.
  - Fastest, easiest method of escaping a Kiosk.
  - Fairly reliable, 40%-50% of tested Kiosks crash.
  - Kiosks crash, or reboot.



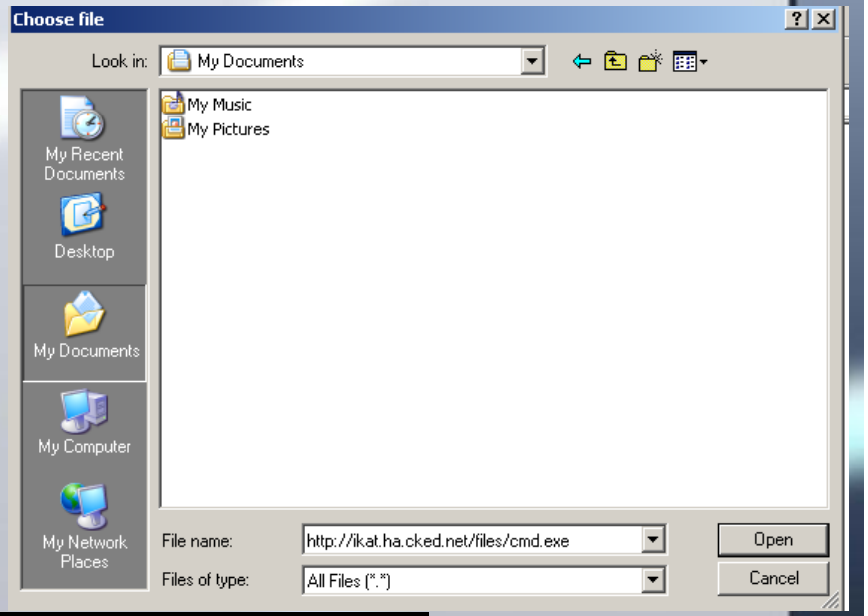
- Crashing Browser Plug-ins.
  - “Can I create a .SWF file that can reliably crash a browser?”
    - Sequential byte file format fuzzing of the .SWF format.
    - Found multiple unhandled exception situations.
    - Integer Divide By Zero.
  - Immediately un-exploitable, reliably crash **any** browser.
  - Created ‘iKAT Auto Magic Flash Crasher’.
- Is the Flash Plug-in Installed on The Kiosk?
  - iKAT can crash it, guaranteed, oh-day magic.
  - Adobe have resolved this issue in Flash Player 10 RC.

Downloading Tools

- Lets Assume Something Worked.
  - You have access to the Kiosk File system.
  - Command shell spawned, Common Dialog, Java installed, etc
- What Now?
  - Download additional tools/binaries.
- How Do You Download Files In a Tool-less Environment.
  - Kiosk terminal will not have a copy of wget.exe present.
  - Internet Explorer is likely uninstalled or disabled.
  - File downloads disabled.

Downloading Tools

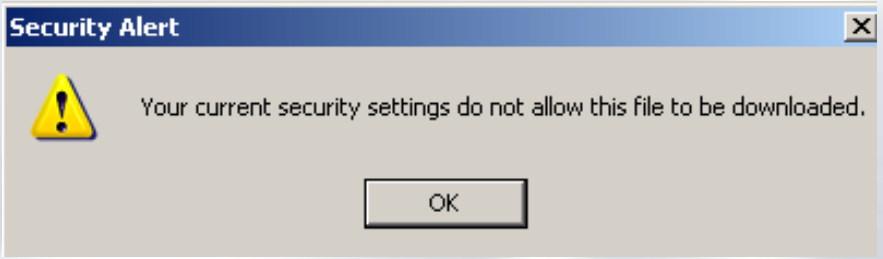
- Old School: Downloading Files In Windows:
- Using Common Dialogs
  - ‘Attach’ a remote file from a File-Open dialog.
  - FPSE/WebDAV to save the file locally, and attach it.
- Works From Any File->Open Dialog.
  - File saved in a writeable location.
  - Temporary internet files.
  - Downloads any file type/size.



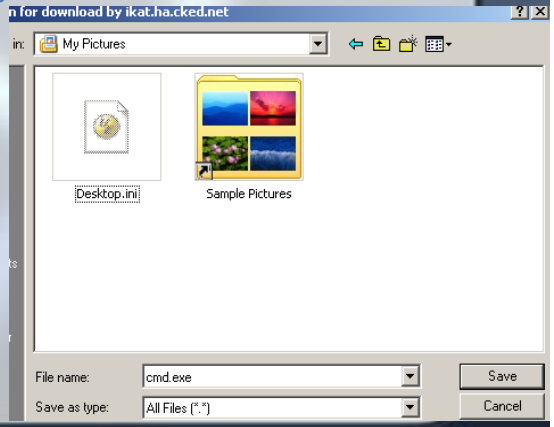

```
 Directory of C:\Documents and Settings\kiosk-user\Local Settings\Temporary Int
rnet Files\Content.IE5\PMN68AXH

06/24/2008  02:39 PM           388,608 cmd[1].exe
06/24/2008  02:32 PM             1,450 ikat.ha.cked[1].htm
               2 File(s)        390,058 bytes
```

- Use Flash To Download Files.
  - Most Kiosk's disable File Downloads with browser security policy.
  - IE: Tools -> Internet Options -> Custom Level

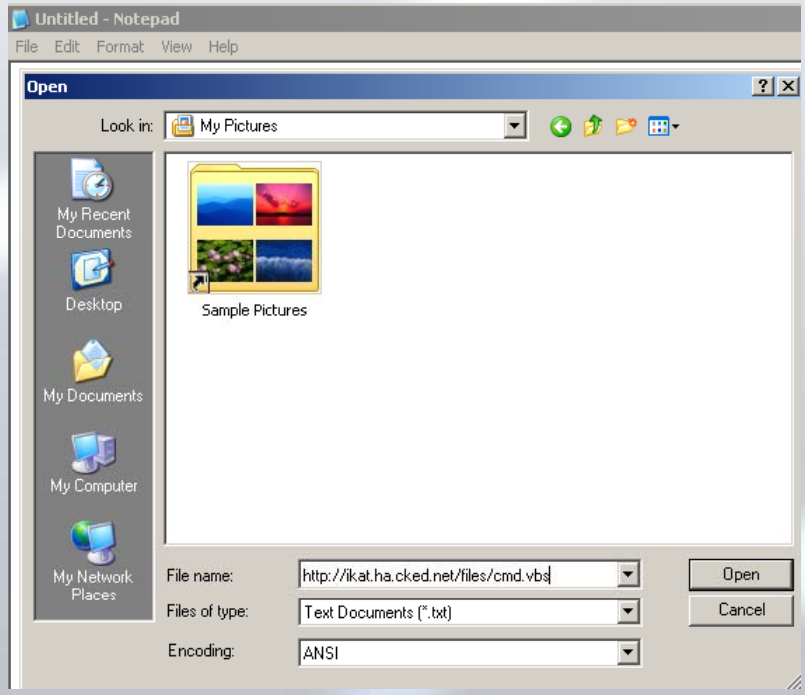


  - Flash can be used to circumvent the browser policy.
    - Download method of the FileReference() object.
  - Flash does not validate browser security policy.
  - Very high success rate against Kiosks.
  - Another unpublished oh-day trick.



Downloading Tools

- Notepad Can Download and Upload Files.
- File-> Open
  - http://test.com/trojan.txt
  - Content must be 7bit safe.
- File-> Save
  - Upload content to a remote site.
  - FPSE/WebDav
  - http://www.ok.com/blah.txt
- Quickly upload files from a Kiosk.



Downloading Tools

- #1 Problem: Kiosk Hacking is a Tool less Environment
  - “iKAT needs to provide tools for Kiosk hacking”.
- Assorted Kiosk Hacking Tools:

Command Shells.			
cmd.exe	[.exe]	[.zip]	[Flash]
command.com	[.com]	[.zip]	[Flash]
Network Tools.			
Netcat	[.exe]	[.zip]	[Flash]
GNU WGet	[.exe]	[.zip]	[Flash]
Nmap	[.exe]	[.zip]	[Flash]
Exploitation Aids.			
Enable Hidden StartBar	[.exe]	[.zip]	[Flash]
Application Executor	[.exe]	[.zip]	[Flash]
Command Shell Detour	[.exe]	[.zip]	[Flash]
Group Policy Bypass		[.zip]	[Flash]
Hacked Kiosk Popup	[.exe]	[.zip]	[Flash]

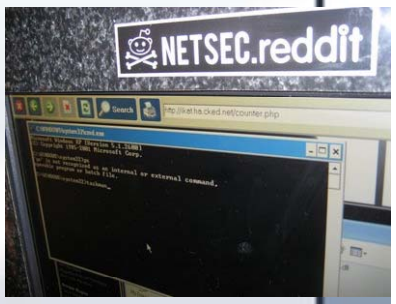
- Tools available as
  - .exe, .zip, Flash Download, 7bit Safe VBScript (.VBS/.VBE)!

- Command Shell Detours:
  - How many ways to spawn a command shell on Windows?

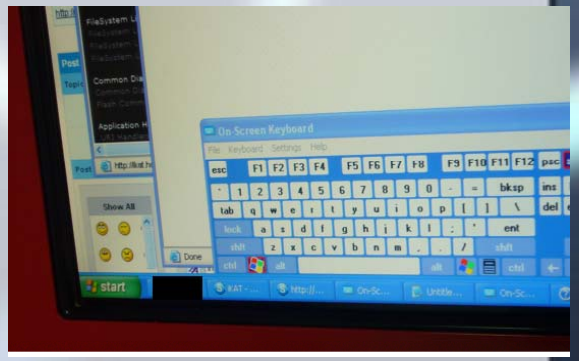
cmd.exe	command.com	win.com cmd.exe	win.com command.com
Loadfix.com start.exe	sc create testsvc binpath= "cmd /K start" type= own type= interact	loadfix.com cmd.exe	loadfix.com command.com
start loadfix.com cmd.exe	start loadfix.com command.com	start loadfix.com cmd.exe	%COMSPEC%

  - Win.com? Loadfix.com? Start? Combinations of both?
  - Kiosk ACL's typically block cmd.exe from spawning.
    - What about command.com, win.com?
  - CMD Detours attempts 17 methods of invoking a shell.
  - Flawless at bypassing Kiosk ACL's.

- Officially Released at Defcon 16 Las Vegas.
  - Amazing success!
  - iKAT can pop shell on **ANY** Vegas Kiosk < 10 seconds



- Who's Been Using iKAT?
  - 14,000+ unique hits, 10-15% of requests from Kiosks!
    - reception.sitekiosk.com, comm775-kiosknet-dhcp8.bu.edu & comm685-kiosknet-dhcp74.bu.edu
    - 12-46-54-181.seatac.seattwa.wayport.net, Aoc.ppx-bc2.hqda-aoc.army.pentagon.mil
    - Digger2.defence.gov.au, Radisson-hotel-19.lax.customer.centurytel.net
    - Security-lab1.juniper.net, Lan-116.181.coresecurity.com
    - Ustdc1.deloitte.com, Deloitteservices.deloitte.nl, Dh212.public.mod.uk



- iKAT Portable Now Available!
  - Entire iKAT website in a zip file
  - Useful for offsite penetration testers.

Hacking Kiosks : The Demo's

- Two virtualized (commercial) Kiosk products.
- Recommended Kiosk application configuration.
- Default Windows XP install.

- Using iKAT To Pop a Command shell
  - As Fast As Possible!

Questions?

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