Modern Realities of Securing Active Directory & the Need for AI

Presenters:
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Our Mission: Hacking Anything to Secure Everything
BIO

• Senior Managing Consultant, X-Force Red
• EvilMog from Team Hashcat
• Spoken at Multiple Conferences: BC Privacy & Security Conference, Derbycon, SkydogCon, IBM Think, Security BSidesLV
• Specialize in Password Cracking, Active Directory Security & Red Teaming
• Alberta Restricted Locksmith Tools License
• Senior Pyrotechnician (Proximate Fireworks)
Active Directory Tiers

Tier 0 – Domain Controllers

Tier 1 – Servers

Tier 2 – Desktops

Source: https://docs.microsoft.com/en-us/windows-server/identity/securing-privileged-access/securing-privileged-access-reference-material
Stage 1 – Attacking Desktops

• Every endpoint can be penetrated for the most part

• Attack methods include:
  – Man in the middle via Layer 2 (ARP Poisoning, LLNR/NBT-NS/WPAD)
  – Code Execution with AMSI Bypass (Powershell, vbscript, jscript, hta files, dde, C#, iron python)
  – Misconfigurations
  – Malware
  – PSEexec, WMI, WinRM, SMBExec
  – Cold boot and steal SAM/SYSTEM registry hives if drive is not encrypted

• The point is desktops can be compromised in some way shape or form
The problem with Windows

- Windows keeps credentials in memory on all remote interactive logins with some exceptions until reboot
- NTLM hashes are just a UTF-16LE Encoded String that is then run through MD4
- NTLM hashes are password equivalent in windows
- All authentication in windows such as Kerberos, NTLMv1, NTLMv2, Smart Cards all come down to knowledge of the NTLM Hash
- Most sysadmins leave the same common administrator password across workstations and even servers
- Knowledge of the hash will get you access to other systems, easy lateral movement
Powershell

• Powershell is the go to post exploitation language of hackers
• Complete access to the Win32 API
• Zero logging of execution below Powershell 5
• Until windows 10 it didn't get scanned by anti-virus
• On by default on all systems As of Windows 2008/Vista
New Techniques – AMSI & Powershell v5

• AMSI (Anti Malware Scan Interface) is in Windows 10 & Server 2016
  – Makes things substantially harder as it forces scanning of powershell, vbs, and jscript

• Powershell v5
  – Can enforce Script Block Logging, Transcription Logging, Module Logging centrally

• New evil
  – C#, Iron Python, LoLBins (Living off the Land Binaries/Builtin Admin Tools)
  – Entirely in memory, dynamically compiled, next to impossible to signature
  – Reflective Assembly Loading of C# direct through Common Command and Control, no forensic evidence without memory monitoring

• Most SIEMS will not catch this without highly tuned rules and things change all the time
Malleable C2

- C2 is Command and Control
- Frameworks can now be modified to look like anything on the network from APT’s to legitimate network protocols
- Encrypted with randomized keys
- Highly variable communications patterns ranging from a few ms to one callback per day and random intervals
- Communication can be over HTTP, HTTPS, DNS and has API hooks for connections over IRC, SLACK, or anything with an API
- In memory locations, compile times, permissions, process forking, code caves, everything is customizable
- Newer attackers are coding their own custom frameworks faster than you can keep up
Attacking Servers

- Servers can be attacked just like desktops
- Techniques such as Kerberoasting can attack AD Itself
- SQL Injections
- Actual Vulnerabilities (MS08-067, MS17-010 etc)
- Print Spooler Vulnerabilities to force hash disclosure
- Exchange Vulnerabilities
- Finally in house applications could have bugs
- Attack surface is endless
Common Issues

• Server and Domain Administrators manage servers from their desktops
• Take over the Desktop Tier, if the desktop tier has access to server admins you now control servers
• Take over a Server Management Jumpbox and you now own the domain
• Credentials leak over the wire and there are multiple ways to get some kind of foothold
Tier 0/1/2 Isolation

Tier 0 – Domain Controllers

Tier 1 – Servers

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Misconceptions

• Active Directory Domains are security boundaries
• Vulnerability Scanners need Domain Admin
• Kerberos Ticket Hash never needs to be rotated
• Desktops/Servers need the same common local admin password for emergencies
• Secrets do not need to be rotated
Reality

• Active Directory Forest is the Security Boundary
  – If you own a parent or child domain you can take over the entire forest

• Anybody who knows the ktbtgt hash owns your domain (Backup Admins, ESX Admins)

• Vulnerability scanners spray creds that can be captured

• Kerberos ticket hash needs to be rotated twice a year

• All local admin passwords should be randomized

• All privileged secrets must be frequently rotated

• Workstations should block all incoming connections except from management workstations

• Assume every system has been compromised
Evil Mogs not Patented Active Directory Checklist

• Turn on Windows Firewall
  – Block 3389,445,139,137, 135, 5895/5896 at every network boundary

• Disable LLMNR/NBT-NT/WPAD & Block Arp Poisoning, secure Dynamic DNS Updates

• Get an Endpoint Detection & Response System

• Windows Defender ATP, Credential Guard, Device Guard and Exploit Guard

• Minimum of Windows 10/Server 2016

• Tier 0/1/2 Isolation with Privileged Access Workstations
  – Consider Red Forest + just in time permissions

• Deploy Application Whitelisting such as Applocker (or other commercial solution)

• Deploy a SIEM as well as Windows ATA or other solution (Such as QRADAR)

• Randomize all local admin passwords
Most Important Line of Defense

- Application Security Testing
- Penetration Testing
- Red Team Engagements once you are confident you can detect attacks
- Vulnerability Management Services
- Phishing and Social Engineering Engagements
- Physical Security Assessments

- Repeat often, testing is a point in time view of security and security posture will change
Contact Information

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