This “Windows Logging Cheat Sheet” is intended to help you get started setting up basic and necessary Windows Audit Policy and Logging. By no means is this list extensive; but it does include some very common items that should be enabled, configured, gathered and harvested for any Log Management Program. Start with these settings and add to it as you understand better what is in your logs and what you need.

**Covered Operating Systems:**
Windows 7, Windows 8, Windows 10

**DEFINITIONS:**

**ENABLE:** Things you must do to enable logging to start collecting and keeping events.

**CONFIGURE:** Configuration that is needed to refine what events you will collect.

**GATHER:** Tools/Utilities that you can use locally on the system to set or gather log related information – AuditPol, WEventUtil, Find, etc.

**HARVEST:** Events that you would want to harvest into some centralized Event log management solution like syslog, SIEM, Splunk, etc.

**ENABLE:**

1. **LOCAL LOG SIZE:** Increase the size of your local logs. Don’t worry you have plenty of disk space, CPU is not an issue
   a. Application, System logs - 256k or larger
   b. PowerShell logs - 256k or larger
   c. Security Log - 512,000k (yes this big) (1,024,000)
2. **LOCAL SECURITY POLICY:** Change Security Options –
   “Audit: Force audit policy subcategory settings” to **ENABLE**. This sets the system to force use of the “Advanced Audit Policies”
3. **GROUP POLICY:** All settings mentioned should be set with Active Directory Group Policy in order to enforce these settings enterprise wide. There are cases where the Local Security Policy would be used.

**ENABLE:**

1. **DNS LOGS:** Enable DNS Logging. Capture what DNS queries are happening.
   “systemroot\System32\Dns\Dns.log”
   a. Log Packets for debugging
   b. Outgoing and incoming
   c. UDP and TCP
   d. Packet type Request and Response
   e. Queries/Transfers and updates
2. **DHCP LOGS:** Add your DHCP Logs –
   “%windir%\System32\Dhcp.” This will allow you to detect rogue systems on your network that fall outside your naming convention.
   a. EventID = 10 – New IP address was leased
Windows Audit Policy settings may be set by the Local Security Policy, Group Policy (preferred) or by command line using ‘AuditPol.exe’. Be sure to select “Configure the following audit events” box on items that say “No Auditing” or the policy will not apply. Any that are left blank will break the GPO and auditing will not be applied. *(N)* = Will generate large number of events or noise and filtering of events may be needed. *(C)* Indicates a setting changed. *(WA)* See the “Windows Advanced Logging Cheat Sheet” for additional info on this setting.

### Configure:

1. **SYSTEM AUDIT POLICIES**: In order to capture what you want and need the following **Advanced Audit Policies** must be set. You may expand these to your specific needs, but here is a place to start.

#### List out the System audit policy

- **Command**: AuditPol /get /category:*

<table>
<thead>
<tr>
<th>Category/Subcategory</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Account Logon</strong></td>
<td></td>
</tr>
<tr>
<td>• Credential Validation</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Kerberos Authentication Service</td>
<td>No Auditing <em>(WA)</em></td>
</tr>
<tr>
<td>• Kerberos Ticket Oper</td>
<td>No Auditing <em>(WA)</em></td>
</tr>
<tr>
<td>• Other Account Logon Events</td>
<td>Success and Failure</td>
</tr>
<tr>
<td><strong>Account Management</strong></td>
<td></td>
</tr>
<tr>
<td>• Application Group Management</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Computer Account Management</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Distribution Group Management</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Other Acct Management Events</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Security Group Management</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• User Account Management</td>
<td>Success and Failure</td>
</tr>
<tr>
<td><strong>Detailed Tracking</strong></td>
<td></td>
</tr>
<tr>
<td>• DPAI Activity</td>
<td>No Auditing</td>
</tr>
<tr>
<td>• Plug and Play (10/2016)</td>
<td>Success</td>
</tr>
<tr>
<td>• Process Creation</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Process Termination</td>
<td>No Auditing <em>(WA)</em></td>
</tr>
<tr>
<td>• RPC Events</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Audit Token Right Adj (10/2016)</td>
<td>Success <em>(N)</em></td>
</tr>
<tr>
<td><strong>DS Access</strong></td>
<td></td>
</tr>
<tr>
<td>• Detailed Directory Service Repl</td>
<td>No Auditing <em>(WA)</em></td>
</tr>
<tr>
<td>• Directory Service Access</td>
<td>No Auditing <em>(WA)</em></td>
</tr>
<tr>
<td>• Directory Service Changes</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Directory Service Replication</td>
<td>No Auditing <em>(WA)</em></td>
</tr>
<tr>
<td><strong>Logon/Logoff</strong></td>
<td></td>
</tr>
<tr>
<td>• Account Lockout</td>
<td>Success <em>(WA)</em></td>
</tr>
<tr>
<td>• Group Membership (10/2016)</td>
<td>Success</td>
</tr>
<tr>
<td>• IPsec Extended Mode</td>
<td>No Auditing</td>
</tr>
<tr>
<td>• IPsec Main Mode</td>
<td>No Auditing</td>
</tr>
<tr>
<td>• IPsec Quick Mode</td>
<td>No Auditing</td>
</tr>
<tr>
<td>• Logoff</td>
<td>Success</td>
</tr>
<tr>
<td>• Logon</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Network Policy Server</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Other Logon/Logoff Events</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Special Logon</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• User / Device Claims</td>
<td>No Auditing</td>
</tr>
</tbody>
</table>

### Configure:

#### SYSTEM AUDIT POLICIES: Continued

To set an item:
- Auditpol /set /category:"Account Management" /success:enable /failure:enable
- Auditpol /set /category:"User Access" /success:enable /failure:enable

To set a subcategory individually:
- Auditpol /set /subcategory:"Directory Service Access" /success:enable /failure:enable

<table>
<thead>
<tr>
<th>Category/Subcategory</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Object Access</strong></td>
<td></td>
</tr>
<tr>
<td>• Application Generated</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Certification Services</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Central Policy Staging (8/2012)</td>
<td>No Auditing</td>
</tr>
<tr>
<td>• Detailed File Share</td>
<td>Success</td>
</tr>
<tr>
<td>• File Share</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• File System</td>
<td>Success</td>
</tr>
<tr>
<td>• Filtering Platform Connection</td>
<td>Success *(N) <em>(WA)</em></td>
</tr>
<tr>
<td>• Filtering Platform Packet Drop</td>
<td>No Auditing <em>(WA)</em></td>
</tr>
<tr>
<td>• Handle Manipulation</td>
<td>No Auditing *(N) <em>(WA)</em></td>
</tr>
<tr>
<td>• Kernel Object</td>
<td>No Auditing <em>(WA)</em></td>
</tr>
<tr>
<td>• Other Object Access Events</td>
<td>No Auditing <em>(WA)</em></td>
</tr>
<tr>
<td>• Removable Storage</td>
<td>Success and Failure</td>
</tr>
<tr>
<td>• Registry</td>
<td>Success</td>
</tr>
<tr>
<td>• SAM</td>
<td>Success</td>
</tr>
</tbody>
</table>

#### Policy Change

- Audit Policy Change | Success and Failure |
- Authentication Policy Change | Success and Failure |
- Authorization Policy Change | Success and Failure |
- Filtering Platform Policy Change | Success (Win FW) |
- MPSSVC Rule-Level Policy Change | No Auditing |
- Other Policy Change Events | No Auditing *(WA)* |

#### Privilege Use

- Non Sensitive Privilege Use | No Auditing |
- Other Privilege Use Events | No Auditing |
- Sensitive Privilege Use | Success and Failure |

#### System

- IPsec Driver | Success *(WA)* |
- Other System Events | Failure *(WA)* |
- Security State Change | Success and Failure |
- Security System Extension | Success and Failure |
- System Integrity | Success and Failure |

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Feb 2019 ver 2.3

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The “Windows logging Cheat Sheet” is designed to get people started at logging important events. If you want to expand on this logging, then check out the “Windows Advanced Logging Cheat Sheet” for more advanced items.

**CONFIGURE:**

1. **WEvtUtil:** Use this utility to configure your log settings  
   b. `WevtUtil sl Security /ms:524288000` or `/ms: 1048576000` if File & Registry auditing, Windows Firewall and Process Create are all enabled  
   c. `WevtUtil sl Security /rt:false` – Overwrite as needed

2. **FILE AUDITING:** Configuring auditing of folders and specific files will allow you to catch new file drops in key locations where commodity and advanced malware often use. To understand what, where and why to audit files and folders, refer to the “Windows File Auditing Cheat Sheet” for more detailed information.

3. **REGISTRY AUDITING:** Configuring auditing of registry keys will allow you to catch new keys, values and data in autorun and other locations where commodity and advanced malware often use. To understand what, where and why to audit registry keys, refer to the “Windows Registry Auditing Cheat Sheet” for more detailed information.

4. **REG.EXE:** Use this utility to query what is in a Key or the data within a key or value  
   a. Query a Key and all values - `Reg query "HKLM\Software\Microsoft\Windows\CurrentVersion\Run"`  
   b. Query a Key and all values - `Reg query "HKLM\Software\Microsoft\Windows\CurrentVersion\RunOnce"`  
   c. Query a Key and all values - `Reg query "HKCU\Software\Microsoft\Windows\CurrentVersion\Run"`  
   d. Query a Key and all values - `Reg query "HKCU\Software\Microsoft\Windows\CurrentVersion\RunOnce"`  
   e. Query a known value of a Key:  
      ```
      Reg query "HKLM\Software\Microsoft\Windows\CurrentVersion\Run" /v malware
      ```

**CONFIGURE:**

5. **Command Line Logging:** One of the most important logging items that you can collect is what was executed on the command line when something executes. Microsoft added this capability into the release of Windows 8.1 and Windows Server 2012 R2 and later versions. In Feb 2015 a patch was made available to add this feature to all Windows 7 and Windows 2008 Server with the following patch:  
   - https://support.microsoft.com/en-us/kb/3004375 - KB3004375 Patch to add Command Line Logging  
   A registry key or GPO change is required to add the “Process Command Line” entry to every event ID 4688 event. The following is the key, value and data that must be set to collect this crucial information:  
   - "hklm\software\microsoft\windows\currentversion\policies\system\audit" – Value = ProcessCreationIncludeCmdLine_Enabled - REG_DWORD = 1
   
   You can configure it to start collecting with the following command:  
   ```
   • reg add "hklm\software\microsoft\windows\currentversion\policies\system\audit" /v ProcessCreationIncludeCmdLine_Enabled /t REG_DWORD /d 1
   ```
GATHER:

1. **AUDITPOL**: Use this utility to view your current log settings
   a. List all Policies categories: `AuditPol /List /Subcategory:*`
   b. List what is SET: `AuditPol /get /category:*`
   c. List what is SET for a subcategory:
      - `AuditPol /get /category:"Object Access"`

2. **Reg.exe**: Use this utility to query the registry
   a. **Changes to AppInit_Dlls** - reg query "HKLM\Software\Microsoft\Windows NT\CurrentVersion\Windows" /v AppInit_Dlls
   b. **Changes to Services Keys** - reg query "HKLM\System\CurrentControlSet\Services"
   c. **Changes to Machine Run Key** - reg query "HKLM\Software\Microsoft\Windows\CurrentVersion\Run"
   d. **Changes to Machine RunOnce Key** - reg query "HKLM\Software\Microsoft\Windows\CurrentVersion\RunOnce"
   e. **Changes to User Run Key** - reg query "HKCU\Software\Microsoft\Windows\CurrentVersion\Run"
   f. **Changes to User RunOnce Key** - reg query "HKCU\Software\Microsoft\Windows\CurrentVersion\RunOnce"

3. **SC.exe**: Use this utility to query the services (sc /? For help)
   a. **List all services in any state** – sc.exe query state= all  (Note: ‘space’ after the = sign)
   b. **Look for a specific service** – sc.exe query state= all | find /i "telnet"
   c. After finding the ‘Display_Name’ then look for the ‘Service_Name’ to get the short name

GATHER:

1. **WEvtUtil**: Use this utility to query your logs
   a. WevtUtil qe Security – query the Security Log for events
      i. Lots of flags here so read help “WevtUtil -?”
      ii. /c:5 = Read 5 events
      iii. /rd:true = newest events first
      iv. /f:text = format text, also can do XML
   e. **User Account Changes** - wevtutil qe Security /q:"*[System[(EventID=4725 or EventID=4722 or EventID=4723 or EventID=4724 or EventID=4726 or EventID=4767)]]" /c:10 /f:text

2. **Filtering Log Results**: Use this method to filter lines within the logs
   a. **Registry Changed – Find entries with ‘Object Name’** - WevtUtil qe Security /q:"*[System[(EventID=4657)]]" /c:5 /rd:true /f:text |find /i "Object Name"
   b. **File or Registry Changed – Find entries with ‘Object Name’** - WevtUtil qe Security /q:"*[System[(EventID=4663)]]" /c:50 /rd:true /f:text |find /i "Object Name"
HARVEST:

1. **LOG CLEAR**: Watch for log clear messages
   a. 104 – SYSTEM Log – The Application or System log was cleared
   b. 1102 – SECURITY Log – The audit log was cleared
2. **TASKS**: Watch for a Process to start and call other processes
   a. 4698 – SECURITY Log – New Task Created
3. **DRIVER**: Watch for an issue with a driver
   a. 40 – Issue with Driver
4. **OS VERSION**: What OS do machines have
   a. 6009 – Lists OS version, Service Pack and processor type

HARVEST:

1. **ACCOUNTS**: Monitor for attempts to change an account password
   a. 4720 – A user account was created
   b. 4724 – An attempt was made to reset an accounts PW
   c. 4735 – Local Group changed
   d. 4738 – User account password changed

HARVEST:

1. **SERVICES**: Found in the SYSTEM log
   d. 7045 - Message=A service was installed in the system.
   e. 7040 - Message=The start type of the XYZ service was changed from auto start to **disabled**.
   f. 7000 - Message=The XYZ service **failed to start** due to the following error: The service did not respond to the start or control request in a timely fashion.
   g. 7022 - Message=The XYZ service hung on starting.
   h. 7024 - Message=The XYZ service **service terminated with service-specific error %2414**.
   i. 7031 - Message=The XYZ service **terminated unexpectedly**. It has done this 1 time(s). The following corrective action will be taken in 60000 milliseconds: Restart the service.
   j. 7034 - Message=The XYZ service **terminated unexpectedly**. It has done this 1 time(s).
   k. 7035 – Service sent a request to Stop or Start
   l. 7036 – Service was Started or Stopped (see the “**Windows Advanced Logging Cheat Sheet**” for auditing non-MS services)
2. **SERVICES**: Found in the SECURITY log
   a. 4697 - Message=A service was installed in the system.

HARVEST:

1. **AUDIT POLICY**: Watch for changes to the Audit Policy that are NOT “SYSTEM”
   a. 4719 – System audit policy was changed
HARVEST:
1. **NEW FILE ADDED**: Watch for the creation of new files. Requires File auditing of the directory(s) that you want to monitor
   - 4663 – Accesses: WriteData (or AddFile)
   - GREAT for CryptoWare & Malware drops

HARVEST:
1. **WINLOGON**: Monitor what type of logons occur
   a. 4624 - Message: An account was **successfully logged on**.
      i. Type 2 – Interactive – GUI
      ii. Type 3 – Network – Net Use
      iii. Type 4 – Batch
      iv. Type 5 – Service
      v. Type 7 – Unlock
      vi. Type 7 – Network Clear Text
      vii. Type 9 – New Credentials (RDP Tools)
      viii. Type 10 – Remote Interactive (RDP)
      ix. Type 11 – Cached Interactive (laptops)
   b. 4625 – Message: An account **failed to log on**.

HARVEST:
1. **SYSTEM INTEGRITY**: Watch for files with page images with bad hashes
   a. 6281 – Failed – “page hashes of an image file are not valid”

HARVEST:
1. **REGISTRY**: Monitor certain Keys for Add, Changes and Deletes. Setting auditing on the specific keys is required.
   a. 4657 – A Registry value was modified

HARVEST:
1. **EMAIL / VPN**: Monitor for failed and successful logins to your VPN and Webmail application. Consider emailing user if login is from a new IP not in your exclude list
   a. sc_status=401 – Failed OWA login
   b. "reason = Invalid password" – Failed VPN login
      - Cisco

HARVEST:
1. **FIREWALL**: Windows Filtering Platform - Watch for Inbound and Outbound connections – **Requires Windows Firewall to be enabled**
   a. This is the noisiest of all Events. Generating easily 9,000 - 10,000 events per hour per system
   b. Storage is required to utilize this event
   c. 5156 – Message: The Windows Filtering Platform has permitted a connection. Look for:
      i. Direction:, Source Address:, Source Port:, Destination Address: & Destination Port:

HARVEST:
1. **LOGON TYPE**: Monitor for what type of logons occur
   a. 4624 - Message: An account was **successfully logged on**.
      i. Type 2 – Interactive – GUI
      ii. Type 3 – Network – Net Use
      iii. Type 4 – Batch
      iv. Type 5 – Service
      v. Type 7 – Unlock
      vi. Type 8 – Network Clear Text
      vii. Type 9 – New Credentials (RDP Tools)
      viii. Type 10 – Remote Interactive (RDP)
      ix. Type 11 – Cached Interactive (laptops)
   b. 4625 – Message: An account **failed to log on**.
These new events were added to identify some unique artifacts for “Subverting Windows Trust” by @mattifestation. For more on this subject, read the article here:


**HARVEST:**

1. **Signature/Trust:** Monitor for failed signature or trust validation, This event is only viewable in details view:
   - a. Microsoft-Windows-CAPI2/Operational
   - b. Enable this log (disabled by default)
   - c. 81 – Verify Trust

**HARVEST:**

1. **DRIVER LOADS:** Monitor for failed signed driver loads in the following log:
   - a. Microsoft-Windows-CodeIntegrity/Operational
   - b. 3033 - Code Integrity

**ADDITIONAL RESOURCES:** Places to get more information

**LOGGING RESOURCES:** Places to get more information on logs for each OS:

- **Windows 10:**
- **Windows 8/2012:**
  - https://docs.microsoft.com/en-us/previous-versions/windows/it-pro/windows-server-2012-R2-and-2012/dn319056(v%3dws.11)
- **Windows 7/2008:**

More Windows Logging Cheat Sheets:

- MalwareArchaeology.com/cheat-sheets
- Advanced Audit Tool scoring – LOG-MD:
  - Log-MD.com – The Log Malicious Discovery tool reads security related log events and settings. Use Log-MD to audit your log settings compared to the “Windows Logging Cheat Sheet” and Center for Internet Security (CIS) Benchmarks. It is a standalone tool to help those with and without a log management solution find malicious activity.

Better descriptions of Event ID’s:

- Most of the Event ID’s:
  - www.EventID.Net – IIS Error Codes:
    - http://support.microsoft.com/kb/318380 - IIS Error Codes
- Good Article
- What’s new in Windows 10 logging
- Google! – But of course