EVTX and Windows Event Logging

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GCIA Gold Certification

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1. **Abstract**

Auditing and compliance are far more important to an organization than ever before due to security incidents and digital threats. Security professionals are under increasing pressure to understand the changes that occur in increasingly complex IT environments. The collection and aggregation capability of the technology in these complex environments is constantly changing to adapt to the auditing and compliance requirements that many organizations must meet.

Many organizations use Microsoft’s Windows platform for desktop, workstation, or server environments. Microsoft has recently reworked the log collection and aggregation functionality of Windows Vista based platforms. The new Windows Event Logging framework and EVTX log format include increased functionality for security professionals to collect and correlate logs.

This paper will explore Microsoft’s EVTX log format and Windows Event Logging framework. The EVTX data stream and structure will be defined as a basis for the Windows Event Logging framework and log subscription components that can be used to collect and correlate logs in a complex Windows-based environment.
2. What Is EVTX

EVTX is Microsoft’s new log format which has been implemented in Vista and Server 2008. The main reason for reworking the previous EVT log format is that there have been very few updates since Windows NT 4.0 to accommodate for the increasing level of compliance that is required today. EVTX includes many new features and enhancements which include many new event properties, the use of channels to publish events, an Extensible Markup Language (XML) format, a new Event Viewer, and a rewritten Windows Event Log service.

**EVTX Event Definition**

EVTX includes many new event properties which make up each event that is published. One of the new properties introduced in EVTX is the Keywords field. This property stores values which may have previously been stored in the Type field in the EVT format. In the EVT format, the Type field stored the severity and any keywords for each event. In EVTX, the Level property is used to store the severity of the event instead of the Type field. Although not a new property, many Event ID field values changed significantly in EVTX. The Event ID is a unique identifier that is allocated for each type of event and is the most common way to reference a unique event. The Event ID relationship for most security-related events is EVTXEventId = EVTEventId + 4096 (Fitzgerald, 2007).

The following table is a list which Microsoft (*Event Properties*, 2008) has defined as the most common event properties.

<table>
<thead>
<tr>
<th>Property Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brandon Charter</td>
<td>4</td>
</tr>
<tr>
<td>Source</td>
<td>The software that logged the event, which can be either a program name, such as &quot;SQL Server&quot;, or a component of the system or of a large program, such as a driver name. For example, &quot;Elnkii&quot; indicates an EtherLink II driver.</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Event ID</td>
<td>A number identifying the particular event type. The first line of the description usually contains the name of the event type. For example, 6005 is the ID of the event that occurs when the Event Log service is started. The first line of the description of such an event is &quot;The Event log service was started.&quot; The Event ID and the Source can be used by product support representatives to troubleshoot system problems.</td>
</tr>
<tr>
<td>Level</td>
<td>A classification of the event severity. The following event severity levels can occur in the system and application logs:</td>
</tr>
<tr>
<td></td>
<td><strong>Information.</strong> Indicates that a change in an application or component has occurred, such as an operation has successfully completed, a resource has been created, or a service started.</td>
</tr>
<tr>
<td></td>
<td><strong>Warning.</strong> Indicates that an issue has occurred that can impact service or result in a more serious problem if action is not taken.</td>
</tr>
<tr>
<td></td>
<td><strong>Error.</strong> Indicates that a problem has occurred, which might impact functionality that is external to the application or component that triggered the event.</td>
</tr>
<tr>
<td></td>
<td><strong>Critical.</strong> Indicates that a failure has occurred from which the application or component that triggered the event cannot automatically recover.</td>
</tr>
<tr>
<td></td>
<td>The following event severity levels can occur in the security log:</td>
</tr>
<tr>
<td></td>
<td><strong>Success Audit.</strong> Indicates that the exercise of a user right has succeeded.</td>
</tr>
<tr>
<td></td>
<td><strong>Failure Audit.</strong> Indicates that the exercise of a user right has failed.</td>
</tr>
<tr>
<td><strong>Key</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>---------</td>
<td>-----------------</td>
</tr>
<tr>
<td>User</td>
<td>The name of the user on whose behalf the event occurred. This name is the client ID if the event was actually caused by a server process or the primary ID if impersonation is not taking place. Where applicable, a security log entry contains both the primary and impersonation IDs. Impersonation occurs when the server allows one process to take on the security attributes of another.</td>
</tr>
<tr>
<td>Operational Code</td>
<td>Contains a numeric value that identifies the activity or a point within an activity that the application was performing when it raised the event. For example, initialization or closing.</td>
</tr>
<tr>
<td>Log</td>
<td>The name of the log where the event was recorded.</td>
</tr>
<tr>
<td>Task Category</td>
<td>Used to represent a subcomponent or activity of the event publisher.</td>
</tr>
<tr>
<td>Keywords</td>
<td>A set of categories or tags that can be used to filter or search for events. Examples include &quot;Network&quot;, &quot;Security&quot;, or &quot;Resource not found.&quot;</td>
</tr>
<tr>
<td>Computer</td>
<td>The name of the computer on which the event occurred. The computer name is typically the name of the local computer, but it might be the name of a computer that forwarded the event or it might be the name of the local computer before its name was changed.</td>
</tr>
<tr>
<td>Date and Time</td>
<td>The date and time that the event was logged.</td>
</tr>
<tr>
<td>Process ID</td>
<td>The identification number for the process that generated the event.</td>
</tr>
<tr>
<td>Thread ID</td>
<td>The identification number for the thread that generated the event.</td>
</tr>
<tr>
<td>Processor ID</td>
<td>The identification number for the processor that processed the event.</td>
</tr>
<tr>
<td>Session ID</td>
<td>The identification number for the terminal server session in which the event occurred.</td>
</tr>
</tbody>
</table>
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| |  
|---|---|
| **Kernal Time** | The elapsed execution time for kernel-mode instructions, in CPU time units. |
| **User Time** | The elapsed execution time for user-mode instructions, in CPU time units. |
| **Processor Time** | The elapsed execution time for user-mode instructions, in CPU ticks. |
| **Correlation Id** | Identifies the activity in the process for which the event is involved. This identifier is used to specify simple relationships between events. |
| **Relative Correlation Id** | Identifies a related activity in a process for which the event is involved. |

One of the most noticeable changes in the EVTX implementation is the use of channels to store events. The Windows Event Log Software Developer Kit defines channels as streams of events which are used by the OS and applications to publish events to a log (Event Logs and Channels in Windows Event Log, 2008). The main channels that are included in Vista and Server 2008 are broken up into two groups. The first group is called Windows Logs and this includes the Application, Security, and System channels. It also includes two new channels which are called Setup and ForwardedEvents. The second group of channels is called the Application and Services Logs. This group contains many individual channels which publish events from a single application or component. Figure 1 displays the relationship between channel groups and individual channels.
Each channel group has two channel types and each event has an event type. The serviced channel type contains Admin and Operational events. The direct channel type contains Analytic and Debug events. The main difference between the two channel types is that serviced channels can be forwarded and/or collected remotely and direct channels cannot (Event Logs and Channels in Windows Event Log, 2008). Figure 2 displays the relationship between channel types and event types.
As mentioned above, EVTX logs are stored using a XML format. XML was created to provide a format that could be used to share structured data in a format which allows developers to define their own elements. The characteristics of XML make it the ideal language to use for event logs. The XML log format greatly increases the granularity that can be applied when viewing events in Event Viewer or any other 3rd party application. An example of the XML format in a view from Event Viewer is shown in figure 3.
The image displays the XML elements which are defined by the <Element> tags and the data which is defined by the element. The <System> element is required and contains information about the event, while the <EventData> element is not required and it contains the reason the event was published (Event Representation for Event Consumers, 2008). XML provides a much more structured format than the EVT format. The default location for the log files are in the following directory: %SystemRoot%\System32\Winevt\Logs\ and they contain the .evtx extension. The default behavior for logs is to overwrite events as needed starting with the oldest events first.

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EVTX Components

The EVTX log format which has been integrated into all versions of Microsoft Vista and Server 2008 is officially known as Windows Event Log whereas the former EVT format is known simply as Event Logging. Windows Event Log includes a new Event Viewer as well as a rewritten Windows Event Log service.

Event Viewer

Although a detailed review of the new Event Viewer is outside the scope of this paper, understanding the new features of the application are critical to investigating the changes that have been introduced in EVTX. Some of the new features of the new Event Viewer include advanced filtering based on XML, the ability to attach tasks to events, and the ability to use log subscriptions to collect events from remote computers. The new Event Viewer that is included in Vista and Server 2008 is capable of opening event logs that have been stored in the former EVT format. This becomes important when working in a mixed environment or looking at historical data. Using the new Event Viewer is almost a necessity because the previous version that is found in operating systems such as Windows XP and Server 2003 is not capable of reading the new EVTX format. The new Event Viewer is capable of exporting logs in EVTX, XML, TXT, and CSV format.

One of the most useful new features of the Event Viewer is the ability to create a custom view to filter the events which are displayed. The ability to create a custom view can greatly reduce the amount of time that is needed to locate a particular event when compared to the previous version of Event Viewer. Since the EVTX events are stored using XML, custom views allow end users to filter events on each property or field that defines an event. Custom views can also be saved and imported into the Event Viewer to save additional time.

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in the future. The custom view window allows filtering based on when the event was logged, the level, log, source, event ID, keyword, user, and computer. If additional filtering is needed, the custom view window has an XML tab which allows the end user to create a custom view by editing the XML query directly. The XML syntax for a query for all Audit Failures from the Security log is shown in figure 4.

![Create Custom View](image)

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**Figure 4**

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The Event Viewer also contains an interface which can be used to attach a task to an event. This new feature has many uses which are virtually limitless. Tasks can be attached to an event which matches a filter that is defined using the same options as the custom views which were described above. This includes the ability to attach a task to an event based on a custom XML filter. In order to attach a task to an event with a custom XML filter, the Task Scheduler must be used instead of the Attach a Task to this Log wizard that is found in the Event Viewer.

Windows Event Log Service

The main reason the Windows Event Log service was rewritten was to eliminate the performance and scalability restrictions that are found in previous versions of Microsoft Windows products. The Windows Event Log service is capable of publishing events in an asynchronous manner which prevents the publishing application from waiting for the service to store the event (Menn, 2006). Once the event is published, the Windows Log Service then performs additional processing based on the type of event. Certain types of events are then handled differently based on the impact they may have on overall system performance. Specifically, Analytic and Debug events are immediately written to a file due to the large volume of these types of events whereas the Admin and Operational events may be delivered to subscribers such as the event forwarder.

3. Working with EVTX Events

The scalability and architecture changes that are included in EVTX are just as important as the changes in the format itself. Log Subscriptions can be used to collect and correlate logs from multiple EVTX enabled hosts throughout a network.
Configuring Log Subscriptions

In order to work with Subscriptions, the Windows Event Collector service must be running on the host that will be collecting logs (subscriber). The Windows Remote Management service must be configured and running on the subscriber and any forwarding hosts (forwarder). Although there are various configuration options available, the quickest and easiest way to configure the Windows Remote Management service is to execute the command “winrm quickconfig” on the command line as a privileged user. The quickconfig option will setup the Windows Remote Management service to listen on port 80/tcp on all interfaces, update the Windows Firewall to allow this service on this port, and set the service to start automatically.

Another requirement in configuring a log subscription is that the appropriate user and/or computer permissions must be added on the forwarding host. Log subscriptions can be configured to use user or computer accounts to forward the logs securely from the forwarder to the subscriber. If computer accounts are chosen, the computer account of the subscriber must be added to the local Administrators group of the forwarder. The subscription can also be configured to use any user account which is a member of the local Administrators group on the forwarder.

A log subscription can be setup in the Event Viewer by selecting the Create Subscription link inside the Subscriptions view. The subscriptions properties wizard will then present the user with a view that looks similar to the image show in figure 5. Once a name and description are filled in, the user is presented with a drop down list containing all existing log destinations on the subscriber. The destination log configuration option allows the end user to easily combine logs from multiple forwarders into one central log location. The source
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computers which will forward logs to the subscriber must then be selected. Subscriptions can be setup as Collector or Source computer initiated types. The user and computer permissions will be setup in this step and vary depending on which subscription type is selected. A filter can be applied to select only the desired events to be forwarded to the subscriber. Filters are configured via same wizard and XML syntax that is described above.

![Subscription Properties](image)

**Subscription Properties**

<table>
<thead>
<tr>
<th>Subscription name:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Destination log:</td>
<td>Forwarded Events</td>
</tr>
</tbody>
</table>

**Subscription type and source computers**

- **Collector initiated**
  - This computer contacts the selected source computers and provides the subscription.

- **Source computer initiated**
  - Source computers in the selected groups must be configured through policy or local configuration to contact this computer and receive the subscription.

**Events to collect:**

Select **<filter not configured>**

User account (the selected account must have read access to the source logs):
- Machine Account

Change user account or configure advanced settings:

Select **Events...**

Select **Advanced...**

**Figure 5**

Selecting the advanced settings button loads a wizard which lists options for the user account, speed settings, and the port that will be used by the subscription. There are three
speed settings which can be configured when setting up a subscription via the subscription wizard. There is a fourth setting which is to use custom settings via the Windows Event Collector Utility (wecutil) (Setting up a Source Initiated Subscription, 2008). The following list describes the three subscription speed settings which can be configured via the wizard (Shields, 2007).

- "Normal mode" configures the target computer to pull event information from the source computer five items at a time, with a batch timeout of 15 minutes.
- "Minimize bandwidth" reverses the direction of the delivery, pushing the data from source to destination. This is helpful if bandwidth is an issue. The influx of log data at the destination is slowed with the batch timeout and the heartbeat interval increases to six hours.
- "Minimize latency" mode works well for gathering real-time or near real-time data. This also uses push mode, but significantly dials up the timeout to every 30 seconds.

The settings for the log subscription are saved to a registry key located at:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\EventCollector\Subscriptions.
```

The settings in the registry key can be viewed by running “wecutil gs” and modified by running “wecutil ss” with the appropriate parameters. Figure 6 shows the output from “wecutil gs” for a subscription named Test.
The wecutil contains many configuration options that are not displayed in the subscription wizard. One such option allows fine tuning of the latency and heartbeat intervals described above when the value of ConfigurationMode is set to Custom. The wecutil has many additional command line options which can be used to configure and troubleshoot a subscription. The best documentation on the utility can be found by using the built in help which is displayed by running “wecutil /?” on the command line.

Subscription Security

As described above, there are two services which subscriptions use to forward and receive events from remote hosts. The main focus on security will be based around the Windows Remote Management service which handles the network communication between
the subscriber and the forwarder. There are two configuration options when setting up Windows Remote Management which control how the data being transferred is encrypted. The first option is to use HTTP (TCP port 80) which will transmit the data in clear text. The second configuration option is to use HTTPS (TCP port 443) which will use a certificate to encrypt the data via an SSL tunnel.

A test environment was created in order to investigate the security of the HTTP and HTTPS options of the Windows Remote Management service. The test environment includes an Active Directory Domain (GCIA.GOLD) which contains two Windows Server 2008 Standard 32-bit hosts. The domain contains a single domain controller (DC1.GCIA.GOLD/10.1.1.200) which the log subscriber, and the log forwarder (SERVER1.GCIA.GOLD/10.1.1.201). Wireshark 1.0.3 was used to perform multiple packet captures on the subscriber (DC1.GCIA.GOLD).

The packet captures in figures 7 and 8 are from a standard log subscription between DC1 and SERVER1. The TCP three-way-handshake and Ethernet layer is not shown. The log subscription in figure 7 was configured using the HTTP option. Although the HTTP layer of the packet is not encrypted, the Windows Remote Management service does not accept traffic that is not encrypted using the Kerberos Security Service Provider or negotiate authentication (Authentication for Remote Connections, 2008). The Windows Remote Management service utilizes Simple Object Access Protocol (SOAP) to transfer data and commands to/from the service (Configuration and Security, 2008). The yellow highlighting in figure 7 shows the Content-Type field of the HTTP header has a value of application/soap+xml indicating that the HTTP header in this transmission was not encrypted. The red highlighting shows that the data portion of the log transmission was encrypted via an encrypted HTTP Kerberos session.

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<table>
<thead>
<tr>
<th>No.</th>
<th>Time</th>
<th>Source</th>
<th>Destination</th>
<th>Protocol</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>14:10:07</td>
<td>10.1.1.200</td>
<td>10.1.1.201</td>
<td>HTTP</td>
<td>POST /wsman HTTP/1.1</td>
</tr>
</tbody>
</table>

(multipart/encrypted)

Internet Protocol, Src: 10.1.1.200, Dst: 10.1.1.201

Transmission Control Protocol, Src Port: 49205 (49205), Dst Port: http (80), Seq: 1, Ack: 1, Len: 2149

Hypertext Transfer Protocol

Key fingerprint = AF19 FA27 2F94 998D FDB5 DE3D F8B5 06E4 A169 4E46
Hypertext Transfer Protocol
Media Type

0000  00 0c 29 4a 79 36 00 0c 29 f6 3d 9e 08 00 45 00 ...Jy6..)......
0010  03 e1 1a 19 40 00 80 06 00 00 0a 01 01 c8 0a 01 ....@
0020  01 c9 c0 35 00 50 14 6b 65 55 33 b4 6e db 50 18 ...5.P.keU3.n.P.
0030  3f d3 1b 66 00 00 50 43 54 50 20 2f 77 73 6d 61 6f 46 73 6f 6c 6f 67 6f 72 6d 75 6c 65
0040  6e 64 65 61 72 79 0d 0a 43 6f 6e 74 65 6e 74 2d
0050  50 61 72 74 6f 62 6a 65 73 73 69 6f 6e 2d
0060  65 6e 63 72 79 70 74 65 64 20 3b 66 6f 72 6d 75 6c 65
0070  73 74 79 70 74 65 64 6e 64 61 72 79 3d 22 45 6e 63 72 79 70 74 65 64 20 42
0080  6f 75 6e 64 61 72 79 0d 0a 31 36 3b 4c 65 6e 63 72 79 70 74 65 64 20 3b
0090  4d 69 63 72 6f 66 20 4a 61 6f 70 72 74 75 61 6c 43
0100  6f 6e 74 3a 20 74 79 70 65 3d 61 70 70 6c 69 63 6a 0d
0110  20 03 30 30 30 30 30 30 30 30 30 30 30 30 30 30
0120  03 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30
0130  30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30
0140  30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30
0150  0d 0a 43 6f 6e 74 65 6e 74 2d 54 79 70 65 3a
0160  0d 0a 09 43 6f 6e 74 65 6e 74 2d 54 79 70 70 3b
0170  4d 65 6e 63 72 79 70 74 65 64 20 3b 66 6f 72 6d 75 6c 65
0180  73 74 79 70 74 65 64 6e 64 61 72 79 3d 22 45 6e 63 72 79 70 74 65 64 20 42
0190  6f 75 6e 64 61 72 79 0d 0a 31 36 3b 4c 65 6e 63 72 79 70 74 65 64 20 3b
01a0  4d 65 6e 63 72 79 70 74 65 65 73 74 72 79 70 74 65 64 20 3b
01b0  4d 65 6e 63 72 79 70 74 65 64 20 3b 66 6f 72 6d 75 6c 65
01c0  4d 65 6e 63 72 79 70 74 65 64 20 3b 66 6f 72 6d 75 6c 65
01d0  4d 65 6e 63 72 79 70 74 65 64 20 3b 66 6f 72 6d 75 6c 65
01e0  4d 65 6e 63 72 79 70 74 65 64 20 3b 66 6f 72 6d 75 6c 65
01f0  4d 65 6e 63 72 79 70 74 65 64 20 3b 66 6f 72 6d 75 6c 65

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A log subscription that is configured using the HTTPS option will not contain an unencrypted HTTP header as all data is encrypted in a standard SSL tunnel. Figure 8 shows

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a full SSL handshake and log transmission from a log subscription configured to use HTTPS.

The yellow highlighting shows that this traffic is using TLSv1 and the green highlighting shows the TLS handshake steps as identified by Wireshark. The red highlighting shows the Application Data packet containing the encrypted HTTP header.

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No.  Time  Source  Destination  Protocol  Info

0000  00 0c 29 f6 3d 9e 00 0c 29 4a 79 36 08 00 45 00  ...
0010  01 4d 53 40 00 80 06 93 c5 0a 01 01 c9 0a 01  .MNS@
0020  01 c8 fb 88 01 bb 0b fe f8 44 31 05 85 67 50 18  D1..gP
0030  40 06 0d b5 00 00 17 03 01 01 20 86 b0 ac 4f ed  @......O
0040  f6 33 df bc 80 41 9c 26 e8 25 82 0b 94 ea 6f 18  .3...A.&%..o
0050  36 29 83 ac 6c cd eb 69 8b 1a 95 3c 28 4a eb 29  6)...i..<J.
0060  98 03 8f 51 f0 85 d6 ce f4 22 a7 9e 15 53 68 15  ..Q....."Sh.
0070  72 38 d5 fb 8a 5a b2 ea c0 22 fc a0 4e 42 3a 05  r8...Z..."NB:
0080  4e 9b cc 69 ee df 7b 36 a9 67 5d 3e 76 68 64 9b  N..[6.g]>vh.d
0090  10 55 aa 78 26 98 f2 88 e0 bc 31 4c 47 2d 20 e7  ..U.x&.....1LG-
00a0  e2 4a ef 38 4d bf 6c 21 c2 ff 58 c4 eb 93 74 29  .J.8M.II.X...t
00b0  af b0 c8 d8 38 d4 2b fa b1 a4 c4 23 ab 36 53 f0  ...8.+....#6S
00c0  ee 28 be 03 1b 54 5a 95 e5 4b cc 68 47 0c e3 d8  (...)ZK.hG
00d0  51 4f 00 33 12 8a ce 98 7b 4b 95 79 01 68 b3 a9  QO.3...H.y.h.
00e0  61 82 0e c0 70 39 45 18 be a8 ff be dd 27 fc 04  a...p9E......`
00f0  e8 64 b7 22 b2 f5 ba ac 75 4a fd 30 65 e0 99 7e  .d...uJ.0e.~
0100  d3 cb c5 fd 73 ba 9e 9e c7 d2 cd 41 a4 f5 a1 25  ...s......A...%
0110  31 0c a3 f3 00 03 0d 31 4c 4b f3 2a da df 4d e0  1......1LK.*..M.
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0120 08 ae d6 dd f6 ce 3e 11 2e 20 ed 4e 2d 82 e6 1c ......>..N-...
0130 f1 1d 81 b5 35 1b d7 5e 72 67 5c d0 86 fb f6 1f ....5..^rgj.....
0140 d3 0a 84 51 9e 4a c9 95 03 30 78 a6 3e f3 07 ce ...Q,J...0x>..
0150 6b 9c 5b b3 14 3b 55 09 5e ed ac k.[;U.^..

Figure 8

Authentication to the Windows Remote Management service supports four types of authentication which is used to validate the incoming connection request. According to the Microsoft Developer Network documentation, Windows Remote Management supports four types of authentication (*Authentication for Remote Connections*, 2008).

- **Basic** - the username and password are sent in the authentication exchange. Basic authentication is the least secure authentication type and is disabled by default.

- **Negotiate** – Windows implementation of Simple and Protected GSSAPI Negotiation Mechanism (SPNEGO). This is also known as Windows Integrated Authentication.

- **Kerberos** – a mutual authentication using encrypted keys. The client and server must be members of a domain to use Kerberos authentication.

- **Client Certificate-based** – uses SSL certificate to authenticate and map a certificate to a local account. This authentication type is required for communication between non-members and members of a domain.

A log subscription can be configured to forward events from both members and non-members of a domain. Hosts which are members of a domain can forward events using the HTTPS option without the use of a certificate. Non-members of a domain can only forward events using the HTTPS option and a certificate is required using the default configuration. This default setting can be modified in the Windows Remote Management configuration by allowing Basic authentication and adding the remote host to the TrustedHosts list (*Windows

4. Conclusion

EVTX and Windows Event Logging framework include many new features which give security professionals and IT administrators more power to accurately correlate and aggregate logs in a Windows environment. The EVTX format includes new fields which can store data that can be filtered and sorted via the underlying XML structure. The use of log subscriptions takes the pain out of log aggregation in a Windows environment. Log subscriptions can be deployed across an entire domain with the help of Active Directory. These changes and enhancements should allow organizations to meet the auditing and compliance requirements that may be required in many environments.

5. References


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<table>
<thead>
<tr>
<th>Event Name</th>
<th>City, Country</th>
<th>Dates</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SANS Amsterdam August 2020 Part 1</td>
<td>Amsterdam, NL</td>
<td>Aug 03, 2020 - Aug 08, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>SANS FOR508 Canberra August 2020</td>
<td>Canberra, AU</td>
<td>Aug 17, 2020 - Aug 22, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>SANS Amsterdam August 2020 Part 2</td>
<td>Amsterdam, NL</td>
<td>Aug 17, 2020 - Aug 22, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>SANS Virginia Beach 2020</td>
<td>Virginia Beach, VAUS</td>
<td>Aug 31, 2020 - Sep 05, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>SANS Philippines 2020</td>
<td>Manila, PH</td>
<td>Sep 07, 2020 - Sep 19, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>SANS London September 2020</td>
<td>London, GB</td>
<td>Sep 07, 2020 - Sep 12, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>SANS Baltimore Fall 2020</td>
<td>Baltimore, MDUS</td>
<td>Sep 08, 2020 - Sep 13, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>Threat Hunting &amp; Incident Response Summit &amp; Training 2020</td>
<td>New Orleans, LAUS</td>
<td>Sep 10, 2020 - Sep 17, 2020</td>
<td>Live Event</td>
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<tr>
<td>SANS OnDemand</td>
<td>OnlineUS</td>
<td>Anytime</td>
<td>Self Paced</td>
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<tr>
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<td>Books &amp; MP3s OnlyUS</td>
<td>Anytime</td>
<td>Self Paced</td>
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