



Malwarebytes

BREACH REMEDICATION

Malwarebytes Breach Remediation Windows Administrator Guide

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The Malwarebytes Protection Strategy

Malwarebytes' products incorporate several prevention features which utilize a layered defense strategy to protect you against malware threats which you face daily. Each layer is designed to disrupt the attack chain at a different stage. While all Malwarebytes products are highly effective in dealing with attacks that are becoming all too commonplace, our protection capabilities are most effective when you take advantage of the full product suite, allowing each prevention layer to do the job they are best suited for.

It's your data. Protect it wisely!

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Introduction

Malwarebytes Breach Remediation is designed to allow business users to detect and remove malware from endpoints. It is built upon the power of our flagship anti-malware client, which allows *Malwarebytes Breach Remediation* to run in environments which often render other anti-malware applications helpless.

Implementation in a portable form provides increased flexibility for IT staff to quickly and easily deploy the client, use it to remediate threats, gather logs, and continue with their daily tasks – all without a large investment in time or resources.

What's New

The following changes have been made to *Malwarebytes Breach Remediation* in this version.

- Faster and improved detection and remediation capability
- Improved the remediation process for lesser reboots
- 3.X engine supports new rules syntax, allowing us to look for threats in ways not supported in version 2.X
- Uses JSON format for input/output
- New anomaly detection enhancing scanning
- Comprehensive remediation, more trace items are detected through our proprietary linking technology
 - Chrome browser infections
 - Task infections
 - Shortcut infections
 - WMI based threats
 - Custom actions support
- Better prevention of False Positives

Key Features

Malwarebytes Breach Remediation offers the following key features:

- Selective remediation capability
- Remediation of earlier scan results without requiring a second scan
- Four different types of scans to analyze your endpoint for malware threats, regardless of whether they are based in memory, file system or registry
- Ability to perform full scans for all local drives
- Ability to utilize Malwarebytes threat definition updates, assuring that even the newest threats can be detected
- Intelligent heuristics to analyze potential threats when they are designed to evade signatures
- Ability to quarantine detected threats, and to restore if needed
- Ability to deploy client to endpoints using your preferred methods
- Ability to exclude several object types from scanning
- Command line capabilities allow IT staff to modify certain program configuration settings, execute scans, and gather logs through integration with customer-supplied scripts, batch files, and group policy updates
- Client leaves no lasting footprint on endpoint
- CEF-compatible event logging
- Ability to use the program in *scan only* or *scan and remediate* mode.

External Access Requirements

If your company's Internet access is controlled by a firewall or other access-limiting device, you must grant access for *Malwarebytes Breach Remediation* to reach Malwarebytes services. Malwarebytes services which must be accessible are:

<https://cdn.mwbsys.com>
<https://hubble.mb-cosmos.com>
<https://keystone.mwbsys.com>
<https://sirius.mwbsys.com>
<https://telemetry.malwarebytes.com>
<https://blitz.mb-cosmos.com>

System Requirements

Following are minimum requirements for an endpoint on which *Malwarebytes Breach Remediation* may be installed. Please note that these requirements do not include other functionality that the endpoint is responsible for.

- **Operating Systems:**
 - Windows 10 (32/64-bit)
 - Windows 8.1 (32/64-bit)
 - Windows 8 (32/64-bit)
 - Windows 7 (32/64-bit) (Service Pack 1 or later)
 - Windows Server 2012/2012 R2 (64-bit only)
 - Windows Small Business Server 2011 (64-bit only)
 - Windows Server 2008 R2 (64 bit)

PLEASE NOTE: Windows servers using the Server Core Installation process are specifically excluded

- **CPU:** 800 MHz or faster
- **RAM:** 512 MB (1 GB or more recommended)
- **Free Disk Space:** 200 MB
- **Screen Resolution:** 800x600 or higher
- **Active Internet Connection**, for license validation and threat signature updates
- **USB 2.0 Port** (optional, depending on deployment method)

Using Malwarebytes Breach Remediation

Malwarebytes Breach Remediation is designed specifically for use by IT staff. It may be deployed to an endpoint by local insertion of a USB drive which contains the program, or by pushing the program out to the endpoint using *psexec*, PowerShell, or any other deployment method which you may currently use.

Malwarebytes Breach Remediation command line functionality is discussed in detail beginning on page 10.

License Key Status

Malwarebytes Breach Remediation uses a license key, which was provided to you upon your purchase of the client. Once registered, the license key is considered active for 14 calendar days – unless a different time interval was specified at time of purchase. Each time the client is used on an endpoint, license status is checked. If your license deactivates (times out), you cannot perform critical operations that the client is intended for. If this occurs, you must re-register the client (see page 11 for further details). This is to prevent unauthorized use. There is no additional cost to re-register the client.

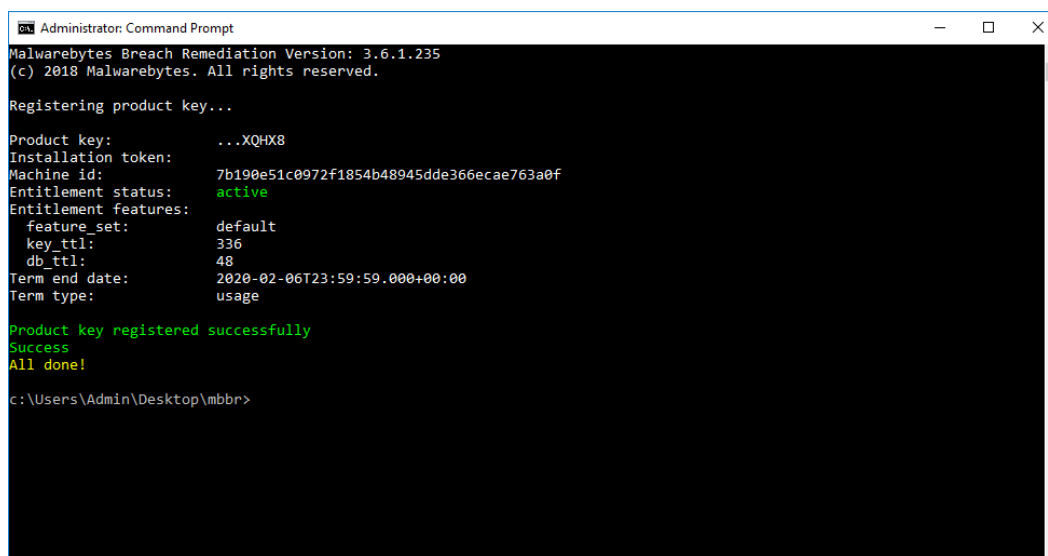
Getting Started

Malwarebytes Breach Remediation is shipped as a single executable file (*mblr.exe*). When this executable is run for the first time on the endpoint, it will extract all program and configuration components. Once all components have been extracted, the program is available for use on the endpoint.

Using an endpoint with a live Internet connection, access a Windows command line prompt and issue the following commands:

```
mblr register -key:<prodkey>
```

You must substitute your license key for *<prodkey>* in the above example. Also, some deployment utilities (e.g. *psexec*) do not support color display as is shown below. When using a utility that does not support color, program messages are displayed in standard monochrome video. Please refer to page 16 for explicit settings with regard to color output.



```
Administrator: Command Prompt
Malwarebytes Breach Remediation Version: 3.6.1.235
(c) 2018 Malwarebytes. All rights reserved.

Registering product key...

Product key:      ..XQHx8
Installation token:
Machine id:      7b190e51c0972f1854b48945dde366ecae763a0f
Entitlement status: active
Entitlement features:
  feature_set:    default
  key_ttl:        336
  db_ttl:         48
Term end date:   2020-02-06T23:59:59.000+00:00
Term type:       usage

Product key registered successfully
Success
All done!

c:\Users\Admin\Desktop\mblr>
```

Once the program has been activated, it is necessary to load threat signatures from Malwarebytes servers into the client. This enables *Malwarebytes Breach Remediation* to detect threats using the most current reference material available. Malware threat signatures are updated several times daily, and rootkit signatures are updated as required.

```
mblr update
```

Database update milestones will be displayed on the screen as the update takes place. When complete, you will see a final status message as well as the database version. That is shown below.


```
Administrator: Command Prompt
Malwarebytes Breach Remediation Version: 3.6.1.235
(c) 2018 Malwarebytes. All rights reserved.

Starting update...

Checking for updates...
Found newer version.
Downloading database...
(100% complete)
Applying downloaded updates...
(100% complete)

Updated to version 1.0.7473
Latest updates were installed
Success
All done!

c:\Users\Admin\Desktop\mbbr>
```

Once threat signatures have been updated in your local installation, you can use *Malwarebytes Breach Remediation* to detect and remove malware from your endpoint. Following is a screenshot of a scan in process.

```
Malwarebytes Breach Remediation
Malwarebytes Breach Remediation Version: 3.6.1.235
(c) 2018 Malwarebytes. All rights reserved.

Starting hyper scan [ESC=Cancel], [SPACE=Pause/Resume]...

Current Phase:          Startup Objects
Phase Progress:         4/9
Currently Scanning:     C:\WINDOWS\SYSTEM32\USERDATASERVICE.DLL
Objects Scanned:       147
Malicious Item Detected:
Malicious Item Detections: 0
Non-malware Item Detected:
Non-malware Item Detections: 0
Scan Completion:       2 %
Time Elapsed:          00:00:08:801
```

While a scan is in process, this screen is constantly updated. Please note the line titled **Phase Progress**. There are nine (9) phases of a scan, which are:

- | | | | |
|---|---------------------|---|--------------------|
| 1 | Pre-scan Operations | 6 | Filesystem Objects |
| 2 | System Drivers | 7 | Custom objects |
| 3 | Memory Objects | 8 | Heuristic Analysis |
| 4 | Startup Objects | 9 | Scan Complete |
| 5 | Registry Objects | | |

This line will reflect each as they are in process. Each phase of the scan requires a different amount of time to complete, so this cannot be used as a method of estimating how long a scan will take to complete.

Interactions with Anti-Rootkit Scanning

When called upon to perform anti-rootkit scanning, *Malwarebytes Breach Remediation* uses a special driver which may be incompatible with driver versions used by the *Malwarebytes* anti-malware client and/or *Malwarebytes Anti-Rootkit*. If this occurs, *Malwarebytes Breach Remediation* must unload the incompatible driver so that it may load its own version. The only way the driver can be gracefully unloaded is by terminating the *Malwarebytes* program which loaded the driver.

This will only occur during active scans by *Malwarebytes Anti-Rootkit* or by *Malwarebytes Anti-Malware* version 2.0 and above (free, trial or premium), or *Malwarebytes Anti-Malware* version 2.0 and above using real-time protection (trial or premium).

If *Malwarebytes Anti-Malware* was terminated to allow *Malwarebytes Breach Remediation* to run **and** a reboot was required to remove threats detected by *Malwarebytes Breach Remediation*, protection will return to its normal state after the reboot. If a reboot is not required, you must manually restart *Malwarebytes Anti-Malware* to regain the real-time protection that was turned off temporarily.

Remediation Now or Later?

Malwarebytes Breach Remediation offers two types of scans which may be executed. It also offers the capability to automatically decide which threats should be removed, or to allow the user to override default remediation methods selected by the program. This may be valuable in many circumstances, including:

- General assessment of an endpoint's health with regard to malware
- Ability to collect and analyze evidence of infections
- Exclusion of known false positives

Scans may be executed for the purpose of remediation, or for diagnostic discovery. A remediation scan combines a scan with a remediation method, so that detected threats may be immediately cleaned from the endpoint. A diagnostic scan omits the remediation method, so that a scan is executed and results are reported. The user may then determine how to proceed. This may be valuable if you wish to assess the general health of an endpoint, or if you wish to collect data about one or more endpoints without eliminating evidence that you may wish to retain.

These capabilities are listed below.

Remediation Scan

A *remediation scan* combines a scan with an automatic remediation method, so that detected threats may be immediately cleaned from the endpoint. No user intervention is required once the scan begins. This method requires the **–remove** parameter to be specified in order to perform remediation as expected.

Diagnostic Scan

A diagnostic scan is executed when the **–remove** parameter is not used as part of the **scan** command. Scan results are saved automatically to intermediate file **ScanResults.json** in the **.ScanResults** Subdirectory in the directory that *mbr* was executed from. This file is saved in JSON format. Using an JSON processor or editor of your choice, you may inspect scan results at any time until the next scan is executed.

Selective Remediation

If you determine that removing threats detected from the last executed scan should be performed, modify **ScanResults.json** to suit your needs, and run another scan using the **–removelastscan** parameter to remove detections.

As mentioned in the previous section, the scan saved “working data” pertaining to any detected threats in an intermediate file named **ScanResults.json**, in the **.ScanResults** Subdirectory in the directory that *Malwarebytes Breach Remediation* was executed from. The user may open and inspect this file (using a JSON processor or editor of their choice) to determine if any detected threats should not be remediated. The **cleanAction** for such traces can be set to **ignore** to exclude them from remediation. Following is a sample **ScanResults.json** file generated by the scan. Indentation has been added to the JSON file to improve readability.

This file will remain after processing has been completed, but will be overwritten the next time that *Malwarebytes Breach Remediation* executes a scan.

5181A36C060E5F3C52C9033261A259955BA6737BDD9CDC8808A83D3FFE677034

```
{
  "applicationVersion" : "3.5.1",
  "clientID" : "mbbr",
  "clientType" : "other",
  "componentsUpdatePackageVersion" : "1.0.0",
  "cpu" : "x86",
  "dbSDKUpdatePackageVersion" : "1.0.6063",
  "detectionDateTime" : "2018-07-25T15:19:30Z",
  "fileSystem" : "NTFS",
  "id" : "2087f40c-901e-11e8-b0d2-b05216992b06",
  "isUserAdmin" : true,
  "licenseState" : "licenseGrace",
  "linkagePhaseComplete" : true,
  "loggedOnUserName" : "DOMAIN1\\USER1",
  "machineID" : "",
  "os" : "Windows 7 Service Pack 1",
  "schemaVersion" : 10,
  "sourceDetails" : {
    "aggressiveMode" : false,
    "clientMetadata" : {
      "jobId" : "",
      "scheduleId" : "",
      "scheduleTag" : ""
    },
  },
  "objectsScanned" : 157299,
  "scanEndTime" : "2018-07-25T15:20:16Z",
  "scanOnlineStatus" : "unknown",
  "scanOptions" : {
    "pumHandling" : "detect",
    "pupHandling" : "detect",
    "scanArchives" : true,
    "scanFileSystem" : true,
    "scanMemoryObjects" : true,
    "scanPUMs" : true,
    "scanPUPs" : true,
    "scanRookits" : false,
    "scanStartupAndRegistry" : true,
    "scanType" : "threat",
    "useHeuristics" : true
  },
  "scanResult" : "completed",
  "scanStartTime" : "2018-07-25T15:19:30Z",
  "scanState" : "completed",
  "shurikenEnabled" : true,
  "type" : "scan"
},
"threats" : [
  {
    "linkedTraces" : [
    ],
    "mainTrace" : {
      "cleanAction" : "quarantine",
      "cleanContext" : {
      },
      "cleanResult" : "notStarted",
      "cleanResultErrorCode" : 0,
      "cleanTime" : "",
      "generatedByPostCleanupAction" : false,
      "id" : "3119c836-901e-11e8-9955-b05216992b06",
      "linkType" : "none",
      "objectMD5" : "EEAFA99374FE0ABB9395E23FC8ED5933",
      "objectPath" : "C:\\USERS\\USER1\\DESKTOP\\TEST-PUP.EXE",
      "objectSha256" : "7DD3F54D08BDFD6E98A527F107D8576FE1BA4FC6DED8B5B54521C6459301AE3A",
      "objectType" : "file",
      "suggestedAction" : {
        "chromeExtensionOther" : false,
        "chromeExtensionPreferences" : false,
        "chromeExtensionSecurePreferences" : false,
        "chromeExtensionSyncData" : false,
      }
    }
  }
]
```

```

        "chromeUrlOther" : false,
        "chromeUrlSecurePreferences" : false,
        "chromeUrlSyncData" : false,
        "chromeUrlWebData" : false,
        "fileDelete" : true,
        "fileReplace" : false,
        "fileTxtReplace" : false,
        "folderDelete" : false,
        "isChromeObject" : false,
        "isExternalDetection" : false,
        "isWMIEventConsumer" : false,
        "killProcess" : false,
        "minimalWhiteListing" : false,
        "moduleUnload" : false,
        "noLinking" : false,
        "physicalSectorReplace" : false,
        "priorityHigh" : false,
        "priorityNormal" : false,
        "priorityUrgent" : false,
        "processUnload" : false,
        "regKeyDelete" : false,
        "regValueDelete" : false,
        "regValueReplace" : false,
        "shortcutReplace" : false,
        "treatAsRootkit" : false,
        "useDDA" : false
    }
},
"ruleID" : 284958,
"rulesVersion" : "1.0.6063",
"threatID" : 13638,
"threatName" : "PUP.Optional.DotPitch"
}
],
"threatsDetected" : 1
}

```

Please note that each detected threat is documented in the same manner, which allows for easy identification of data within the file. An JSON tag titled `<cleanAction>` contains a remediation method, and is preset to the value **remove**. You may not wish to remove the detected threat. Here are the three choices which are available to you.

- **remove:** Delete the malware in its present form, render it harmless, and move it to Quarantine
- **delete:** Delete the malware from the endpoint without copying it to Quarantine
- **ignore:** Leave the file intact in its current location.

Once you are done inspecting/editing this file, you may resume or cancel the selective remediation scan. If you cancel the remediation phase of the scan, the intermediate file will be retained. If you continue the remediation phase, the intermediate file will be used to control remediation, and will be deleted once remediation is complete.

Excluding Items from Scanning

It is not uncommon to have legitimate items stored on your endpoints which may be identified as threats by anti-virus or anti-malware software. *Malwarebytes Breach Remediation* recognizes that, and offers two methods to exclude those items from scanning. Those methods are:

- **Exclude by specification** – This method allows interactive or scripted exclusion of files, folders, and wildcards.
- **Exclude List** – In addition to the previous method, this method allows exclusion of file extensions, registry keys, registry values, and vendor (the name which Malwarebytes uses to identify threats). Items to be excluded are enclosed in one or more JSON files. A sample exclusion list is shown here. Please note that indentation has been added here to aid in understanding.

```

{
  "exclusions" : [
    {
      "path" : "dll",
      "type" : "extension"
    },
    {
      "path" : "c:\\myprog\\test.exe",
      "type" : "file"
    },
    {
      "path" : "c:\\myprog\\abc",
      "type" : "folder"
    },
    {
      "path" : "HKLM\\SYSTEM\\CURRENTCONTROLSET\\SERVICES\\1394843d",
      "type" : "regkey"
    },
    {
      "path" : "HKCU\\SOFTWARE\\MICROSOFT\\WINDOWS\\CURRENTVERSION\\RUN|DESKBAR",
      "type" : "regval"
    },
    {
      "path" : "**myprog*",
      "type" : "wildcard"
    }
  ],
  "path" : "Trojan.MBAMTest",
  "type" : "vendor"
}
"schemaVersion" : 1
}

```

Please see pages 12-13 for complete details.

Restoring Items from Quarantine

Malwarebytes Breach Remediation offers several different methods of restoring items from Quarantine. You may choose any of the following methods:

- **Restore all** – Restores all items currently stored in Quarantine to their original locations
- **Restore by id** – This method utilizes a screen/file-based list to selectively restore items to their original locations. This is typically a manual operation, though it may also be performed using a script. The list of items changes after each restore operation, so the list must be recreated when multiple restore operations are required.
- **Automated restore** – The JSON list of items stored in Quarantine is interactively modified to specify which items will be selectively restored. The modified list is then used programmatically to perform the restore operation.

In the screenshot below, command `mbbr quarantine -list` was executed to provide a listing of the contents of Quarantine. This list shows the index number that can be used for restoration, the name of the threat that was placed into Quarantine, and its original location before it was placed in Quarantine.

```
Administrator: Command Prompt
Malwarebytes Breach Remediation Version: 3.6.1.235
(c) 2018 Malwarebytes. All rights reserved.

The quarantine path is "C:\PROGRAMDATA\Malwarebytes\MBAMService\Quarantine".
Retrieving quarantined items...

Id:      c927181e-d25d-11e8-9d46-000c297d06ce
Name:    Trojan.MBAMTest
Path:    C:\Users\Admin\Desktop\TEST-TROJAN.EXE

Id:      d7a28072-d25d-11e8-b0ea-000c297d06ce
Name:    Adware.Adposhel
Path:    C:\Users\Admin\Desktop\CCA97AF1-7B02-CD5A-0840-4913AE08D315.EXE
Success
All done!

c:\Users\Admin\Desktop\mbbr>
```

The next screenshot shows the contents of file **RestoreList.json**, which is the file generated at the same time that the screen-based list is created. For demonstration purposes, the file has been edited so that only the first quarantined item will be restored using the JSON file as input to command `mbbr quarantine -restorelist`.

```
{
  "quarantinedItems" : [
    {
      "action" : "none",
      "id" : "a30e174a-9022-11e8-90e4-b05216992b06",
      "path" : "C:\\Users\\User1\\Desktop\\TEST-TROJAN.EXE",
      "threatName" : "Trojan.MBAMTest"
    },
    {
      "action" : "none",
      "id" : "ab1b7efa-9022-11e8-bf30-b05216992b06",
      "path" : "C:\\Users\\User1\\Desktop\\test-pup.exe",
      "threatName" : "PUP.Optional.DotPitch"
    }
  ],
  "schemaVersion" : 1
}
```

The above is merely an introduction to the methods. Please see page 15 for specific usage guidance.

Command Line Parameters

Malwarebytes Breach Remediation supports a variety of command line parameters, which can be used from a command prompt, batch file or script. When used from a script, additional commands may be required to support the scripting model being used.

Conventions

The command line structure uses modifiers. These are shown as hyphens (-) immediately preceding parameters. Multiple modifiers may be combined with a parameter. When multiple parameters are used, they must be separated by spaces. In addition, the following conventions are used:

- **text without brackets or braces**
Items you must type as shown
- **<text inside angle brackets>**
Required information for which you must supply a value
Example: `mblr <parameter_1>`
- **[text inside square brackets]**
Optional items
Example: `mblr [parameter_1]`
- **Grouping of dots (...)**
A set of specifications
Example: `mblr <parameter_1> [parameter_2] ... [parameter_n]`
- **{text inside braces}**
A set of required items; choose one from the list provided
Example: `mblr {0 | 1 | 2 | 3}`
- **vertical bar (|)**
Separator between mutually exclusive items; choose one
Example: `mblr <0 | 1 | 2 | 3>`

Command Line Overview

Malwarebytes Breach Remediation commands are specified in the following format:

`mblr { register | update | version | scan | errorout | quarantine | settings } [options]`

Following is a list of high-level commands which may be executed. Each command is detailed beginning on the following page.

register	Using your license key, this unlocks the features of <i>Malwarebytes Breach Remediation</i> . This will also show license status.
update	Updates the client's threat signature databases.
version	Displays the program version number.
scan	Scans the endpoint for malware and optionally removes malware found during the scan.
errorout	Specifies where error output is directed to.
quarantine	Controls program actions related to threat quarantine activities.
settings	Used to specify universal program settings. These settings are persistent, and are used for color and proxy functionality.

In addition, you may type `mblr` without any additional specifications to see a list of valid commands. This list will span multiple windows if the command line is launched to its default size, so you will achieve best results by stretching the window to show more command line dialog at one time.

Command Line Reference

Commands listed here are listed individually. Each command performs tasks according to parameters. These are primarily used by a system administrator via script, batch file, GPO update, or remote desktop. The admin may configure *Malwarebytes Breach Remediation* to operate as a remote task, invisible to the endpoint user.

register

Usage:

mbbr register [-key:<prodkey>]

Purpose:

Specifies the unique license key assigned to the partner or customer. This will be passed to the licensing server for validation to ensure it is active (non-expired). If the key is valid and the license is active, it will also display status about the license, such as expiration date, volume purchased, volume used, etc.

If the key is active, the local installation will operate with this status for 14 calendar days (or the time interval specified in your Malwarebytes license agreement). This “Last Known Good” status is persisted on the USB or wherever the binaries are stored. This allows the USB installation to work as if it were fully registered on offline endpoints or without needing the key. **A live Internet connection is required.**

If **-key** is not specified, license status and the expiration date/time will be displayed. **Please note** that if the key is not active, the user may not update threat signature databases, scan for malware, list contents of quarantine, or restore files from quarantine.

Parameters:

-key:<prodkey>

Specification of <prodkey>, the license key assigned to the user.

update

Usage:

mbbr update

Purpose:

Updates local threat signature databases. This command will result in an error condition if (a) the license is not active, or (b) if no active Internet connection is available. If threat signature databases have expired (timed out), this command must precede execution of a scan. If a proxy server is needed to access the Internet, you must run the **proxy** command before attempting to perform the update.

Parameters:

none

version

Usage:

mbbr version

Purpose:

Displays the version number of the *Malwarebytes Breach Remediation* installation.

Parameters:

none

scan

Usage:

```
mbbr scan [-full | -threat | -hyper | -path:<path>]
          [-exclude:<paths>]
          [-excludelist:<exclists>]
          [-noarchive]
          [-ignorepu]
          [-stopondetect [-malware:<cnt>] [-pu:<cnt>]]
          [-tag:<tagname>]
          [-stdlog:<filepath>]
          [-noscanresults]
          [-pfi:<secs>]
          [-ark]
          [-remove [-noreboot]
          [-removelastscan [-noreboot]
          [-stdout:{off | detail | summary}]
          [-lowimpact]
```

Purpose:

Executes a scan based on parameters specified. If the program license is inactive, attempts to perform a scan will result in an error. Current threat signature databases are also required. If this command is executed without a directive to quarantine detected threats, scan results are saved to file **ScanResults.JSON**. This file is found in the **.ScanResults** Subdirectory in the directory that *Malwarebytes Breach Remediation* was executed from.

Parameters:

-full

A full scan includes all scanning capability which *Malwarebytes Breach Remediation* has to offer.

-threat

This will examine “hotspots” on an endpoint for malware without analyzing the entire endpoint. If **-remove** is specified, any threats found during the scan will be quarantined.

-hyper

Initiates a scan focusing only on Memory Objects and Heuristics to determine if malware is actively running on the endpoint. If **-remove** is specified, any threats found during the scan will be quarantined.

-path:<path>

Semicolon-delimited list of folder paths to scan on the endpoint’s file system. Use double-quotes for paths that contain spaces. Paths specified are recursive, so subfolders will also be included automatically. The presence of the paths specified will be verified, and an error will result if the paths do not exist. Similarly, an error will be generated if the paths are encrypted, as the program is not capable of decrypting the path. If **-remove** is specified, any threats found during the scan will be quarantined. **Please note** that this method scans only the folder path(s) which have been specified. This scan type **does not** include memory, startup modules or heuristic analysis.

-exclude:<paths>

Excludes specific files, folders, and wildcard specifications from scanning. **Please note** that the following rules apply:

- Multiple exclusion items must be separated by semicolons.
- Wildcards may be used for files and folders using existing Windows wildcard standards.
- Wildcards may also be used **within** registry keys to add flexibility. Please see this style in the example shown on page 8.
- Files specified without a directory path (e.g. file.exe) must be in the directory where *Malwarebytes Breach Remediation* is installed.
- Files and/or folders which contain embedded spaces must be enclosed in double quotes. As an example, references to C:\Program Files\file.exe should instead be specified as “C:\Program Files\file.exe”.

`-excludelist:<exclst>`

Provides for exclusions itemized within one or more JSON files specified as parameters for this command. Files have no naming convention (filename or extension), but they must be in JSON format. The following items may be excluded using exclusion lists:

- Files
- Extensions
- Threat Vendor
- Folders
- Registry Keys
- Wildcards
- Registry Values

Please note that the following rules apply:

- Multiple items (within the `<Path>` element) must be separated by semicolons.
- Files specified without a directory path (e.g. file.exe) must be in the directory where *Malwarebytes Breach Remediation* is installed.
- When excluding a registry value (*regval*), it must be preceded by the registry key (*regkey*), delimited by the pipe "|" character.
- Extensions pertain to the entire file system that is subject to scanning.
- Threat vendor is specific to Malwarebytes definitions.
- Multiple exclusion list files must be separated by semicolons.
- Wildcards may be used for files and folders using existing Windows wildcard standards.
- Wildcards may also be used **within** registry keys to add flexibility. Please see this style in the example shown on page 8.

A sample Exclusion List is shown on page 8.

`-noarchive`

By default, the contents of archives (zip, rar, etc.) are scanned. Use this option to disable archive scanning. *Malwarebytes Breach Remediation* will stop scanning an archive if it finds a single infected file, and will quarantine the entire archive file.

`-ignorepup`

Instructs the scanner to ignore all Potentially Unwanted Programs (PUPs) and Potentially Unwanted Modifications (PUMs) that may be installed on the target endpoint.

`-stopondetect [-malware:<cnt>] [-pu:<cnt>]`

Instructs the scanner to terminate the scan when a certain number of either malware or potentially unwanted items are found. This allows a quick determination of whether the endpoint is infected without requiring a full scan to be performed. If `<cnt>` is not reached, the scan will run to completion.

Specify counts for either malware threats, PUP/PUM or both. The scanner will terminate when either criterion is met.

If `-stopondetect` is specified, at least one of the `-malware` or `-pu` options must also be specified.

`-tag:<tagname>`

This text string will be sent along with all usage data to the Malwarebytes billing system. If the string includes embedded spaces, it must be surrounded by double quotes ("). It will help you to associated billing events with your billing system. Typical usage would be for you to add the Job ID or Store ID or Employee ID or all of these, so that you can see these on your invoice.

`-stdlog:<filepath>`

Specifies the log location for normal output. If not specified, normal output will be written to `.\logs\MBBR-STDOUT.JSON`. Use double-quotes (") for paths that contain spaces. **Please note** that use of the default specification for `<filepath>` will result in loss of scan data for any scans previously executed, as a new scan overwrites existing results.

`-noscanresults`

Instructs the scanner to disregard creation of intermediate file `ScanResults.json`. This parameter disables the ability to selectively remediate items during a scan, and is only valid for diagnostic scans.

- pfi:<secs>

Controls the frequency at which log file **ScanProgress.json** is updated. This log file is stored in the folder specified by **–stdlog**. File creation frequency is in the range of 1-3600 seconds. This file is only created when **–stdout** is set to summary. If this option is not specified, no Scan Progress file will be created.
- ark

Enables Anti-rootkit scanner functionality to be used during the scan. Any rootkits found will be removed if **–remove** is specified.
- remove

Instructs the scanner to quarantine malware, PUPs and PUMs found during the scan. This parameter is not allowed if **–stopondetect** is specified. If **–remove** and **–noreboot** are both specified in a scan command and the scan detected threats during execution, a warning message will be displayed after the scan has completed to notify the user that a reboot is required to remove the threat(s) from the endpoint.
- noreboot

Some malware executes in a manner that requires a reboot to complete the removal process. If this occurs, the scanner will automatically reboot the system (after a delay specified by the **scan.rebootwait** parameter associated with the settings command). If an immediate reboot is not desired, use this option. Please note that certain malware may not be fully removed if this option is used. If **–remove** and **–noreboot** are both specified in a scan command and the scan detected threats during its execution, a warning message will be displayed after the scan has completed to notify the user that a reboot is required to remove the threat(s) from the endpoint.
- removelastscan

This parameter is associated with a *diagnostic scan*. Instead of executing a new scan, it instructs the scanner to use intermediate file **ScanResults.xml** to remediate threats detected during the last scan that was executed.
- stdout:{off | detail | summary}

Controls the level of output to the console. Defaults to **summary** if not specified.
- lowimpactscan

Low impact scans run at a lower system priority, minimizing the impact on the foreground system usage. This allows the user to perform other tasks on the system normally without any noticeable impact from the scan. A scan with this option may take a little longer to complete than a scan without this option.

errorout

Usage:

mabbr errorout [[–console:{on | off}] [–delete] [–errlog:<file>] | [–reset]]

Purpose:

Specifies where error output will be directed to. Values set using this command will persist until they are cleared or modified. Issuing this command without arguments will display current settings.

Parameters:

- console:{off | on}

Specifies if error output is displayed on the console. Default value is ON.
- delete

Deletes the output file, if it exists. This command uses the default error log location, unless the error log location has been changed using the **–errlog** switch.
- errlog:<file>

Specifies the log location for error output. This will overwrite any previously-specified location. If <file> contains any embedded spaces, please enclose <file> in double quotes (“). The default location is **.\logs\MBBR-ERROR.TXT**.
- reset

Reverts settings associated with this command back to default values.

quarantine

Usage:

```
mbbr quarantine [-list]
                 [-path:<path>]
                 [-resetpath]
                 [-restoreall]
                 [-restore:<itemIDs>]
                 [-restorelist]
```

Purpose:

Set/reset location of quarantine, list quarantine contents, and restore files from quarantine. Use this command without any additional arguments to display the current quarantine location.

Parameters:

- path:<path>**
Specifies where quarantined content will be stored after this command has been executed. This replaces any previously-specified location. If <path> contains embedded spaces, enclose <path> in double quotes ("). **Please note** that content quarantined prior to execution of this command will not be moved.
- resetpath**
Causes the quarantine file folder to revert to the default folder. Files stored in quarantine prior to execution of this command will not be moved to the default folder. The default quarantine folder is:

```
C:\ProgramData\Malwarebytes\MBAMService\Quarantine
```
- list**
Shows the current quarantine location, lists contents of the quarantine to screen output, and generates file **RestoreList.json** for use by the **-restorelist** option. In addition, a unique ID is associated with each item which has been moved to quarantine. The ID is used primarily in conjunction with the **-restore:<itemIDs>** option, to simplify manual restore operations.
- restoreall**
Restores all quarantined items to their original locations.
- restore:<itemID1> [*itemID2*] ... [*itemIDn*]**
Restores one or more items from the list of quarantined items shown on the screen (or in file **RestoreList.json**). Items are specified by their ID. When multiple items are to be restored via a single execution of this command, their IDs should be separated by commas without delimiting spaces. **Please note** that execution of this command will delete file **RestoreList.json**, and that any pre-existing item IDs still shown on the screen are no longer valid. You must exercise the **-list** option again prior to any subsequent execution of this option.
- restorelist**
Using file **RestoreList.json** as a guide, this command restores specified items to their original location from Quarantine. For each item to be restored, modify the <Action> element associated with the item to be restored, changing the value to **restore**. Unless changed by the user (or by a third-party application), the default value of the <Action> element is **none**. A sample **RestoreList.json** file is shown on pages 6-7.

settings

Usage:

```
mbbr settings [--color:off|on]
               [--scan.rebootwait:<seconds>]
               [--scan.rebootmsg:<message>]
               [--proxy.clear]
               [--proxy.enabled:true | false]
               [--proxy.server:<host>]
               [--proxy.port:<port>]
               [--proxy.user:<user>]
               [--proxy.password:<password>]
               [--log.enabled:true|false]
               [--log.server:<host>]
               [--log.port:<port>]
               [--log.events:<eventname>:on|off]
               [--log.test]
               [--customdb.enabled:true | false]
               [--customdb.add:<customHashRule>]
               [--customdb.load:<openIOCFiles>]
               [--customdb.clear]
               [--customdb.list]
```

Purpose:

Used to define several program settings that will be universally used by *Malwarebytes Breach Remediation*. Execution of this command with no options specified will display current settings for each specification. If no modifications have been made to a specification, its default value will be shown. Please note that changes to settings require administrative privileges. All users may inspect current settings.

Parameters:

--color:off|on

Specifies whether program output can utilize color, or if display will be limited to monochrome. Applications which attempt to capture standard output and error output of *Malwarebytes Breach Remediation* may encounter issues. Turning color off solves this problem.

--scan.rebootwait:<seconds>

Amount of time to wait before a reboot if a reboot is required to remove threats detected during a scan. The maximum time is 300 seconds, and the default time is 60 seconds.

--scan.rebootmsg:<message>

Text message to be displayed prior to a reboot if a reboot is required to removed threats detected during a scan. The maximum message length is 100 characters. If a message contains embedded spaces, the text string must be bounded by double quotes.

--proxy.clear

Clears all settings associated with proxy servers.

--proxy.enabled:true | false

Enables or disables use of a proxy server for external Internet access. Internet access is required for program updates as well as threat signature updates. If this variable is set to **true**, the proxy **host** and **port** must also be specified. **PLEASE NOTE:** If your network requires use of a proxy server for Internet access, proxy settings must be defined and enabled before a **register** or **update** command may be successfully executed.

--proxy.server:<host>

Hostname and/or IP address of proxy server providing external Internet access.

--proxy.port:<port>

Port number on proxy <host> which is used for external Internet access.

–proxy.user:<user>

Username for proxy usage, if authentication is required.

–proxy.password:<password>

Password for username <user>, if authentication is required to use proxy.

–log.enabled:true|false

Specifies whether program execution will be logged to a syslog server. All data utilizes a CEF (Common Event Format) standard. If this parameter is set to *true*, the syslog *host* IP/FQDN and *port* number must also be specified before event logging can take place.

–log.server:<host>

IP address or Fully-Qualified Domain Name (FQDN) of a syslog server which will receive event logs generated by *Malwarebytes Breach Remediation*. A valid *port* number must also be specified before logging can take place.

–log.port:<port>

Valid port number for the syslog server which will receive event logs generated by *Malwarebytes Breach Remediation*. A valid syslog *host* specification must also be specified before logging can take place.

–log.events:<eventname>:on|off

Specifies whether logging is enabled/disabled for each potential event which may be logged by *Malwarebytes Breach Remediation*. These events are discussed at length beginning on page 27, and are itemized here:

- ScanStartEvent
- DetectionEvent
- RestoreEvent
- CustomDbUpdateEvent
- ScanEndEvent
- RemovalEvent
- RestoreStartEvent
- DbUpdateEvent
- RemoveLastScanEvent
- RestoreEndEvent

–log.test

Attempts to make contact with the syslog server using the *host* and *port* specifications which have been provided. Results of the connection attempt are shown on-screen. This command does not generate an event log entry. No additional parameters are required.

–customdb.enabled:true | false

Specifies whether custom database rules are enabled (true) or disabled (false). Default value is false.

–customdb.add:<customHashRule>

Allows a single MD5 hash to be added to the Rules database without requiring use of the JSON file as an input medium. The MD5 hash specified here is incrementally added to existing rules.

–customdb.load:<JsonFiles>

Loads one or more JSON files into the Rules database. When multiple files are specified, they must be separated by semicolons. If embedded spaces are present in the file and/or path specification, the full path and file must be enclosed by double quotes. OpenIOC must be converted to the required JSON format to be used with this command. A **SampleCustomRules.json** file is provided in the *mbbr* directory for reference.

–customdb.clear

Deletes all existing custom rules.

–customdb.list

Lists all existing custom rules.

Scan Log

Finalized results of scans executed by *Malwarebytes Breach Remediation* are saved in file MBBR-STDOUT.JSON, a scan log which may be imported by several document formats as well as by Internet-based applications. The JSON includes details on the scan and any threats detected during the scan. The root JSON element in the log file is a unique hash of the results file. All subsequent data is grouped by section. Those sections – and data related to those sections – are described here.

header Section

This section provides high-level information about the scan that was performed and is placed at the top of the json.

applicationVersion

Version of Malwarebytes Breach Remediation being used for the scan.

clientID

The application client used to run this scan, which would be “mbbr” in this case.

clientType

The type of client used to run this scan. (For internal use only).

componentsUpdatePackageVersion

The version of internal components used for the scan.

cpu

CPU architecture of the system. Valid values are x86 (32-bit) or x64 (64-bit).

dbSDKUpdatePackageVersion

Malware threat signature database version being used for the scan.

detectionDateTime

The time at which this scan log was created. This is in ISO 8601 UTC format.

FORMAT: *yyyy-mm-dd Thh:mm:ssZ*, where:

yyyy=Year
mm=Month
dd=Date
hh=Hours
mm=Minutes
ss=Seconds
Z=indicates UTC

fileSystem

The file system of the endpoint’s primary disk drive (meaning the drive on which the operating system is loaded). Valid values are NTFS, FAT or FAT32.

id

The unique ID of this scan.

isUserAdmin

Indicates if the scan was run with admin privileges. Expected to be “true” for all mbbr scans.

licenseState

Specifies the license state of the client. Valid value for the remediation client is **licensed**.

linkagePhaseComplete

(For internal use only)

loggedInUserName

Windows user name associated with execution of the scan.

machineID

This is not used in the remediation client, and can be ignored.

os

Operating System version in use on the endpoint being scanned. This field will also include Service Packs in use (if applicable).

schemaVersion

The version of scan log json schema used *(for internal use only)*.

sourceDetails Section

This section provides summary of the scan as well as information on various categories that were employed during the scan.

aggressiveMode

Indicates if a more aggressive heuristics approach was used during the scan. *(for internal use only)*

clientMetadata

This is not used in the remediation client, and can be ignored.

objectsScanned

Number of objects scanned.

scanOnlineStatus

Indicates if system was online at the time of scan. *(for internal use only)*

shurikenEnabled

Indicates if signature-less anomaly detection is enabled. Valid value for remediation client is **true**.

scanState

Indicates if the scan completed successfully or was cancelled.

threatsDetected

Number of threats detected.

scanStartTime

The time at which this scan was started. This is in ISO 8601 UTC format.

FORMAT: *yyyy-mm-dd Thh:mm:ssZ*, where:

yyyy=Year
mm=Month
dd=Date
hh=Hours
mm=Minutes
ss=Seconds
Z=indicates UTC

scanEndTime

The time at which this scan ended. This is in ISO 8601 UTC format.

FORMAT: *yyyy-mm-dd Thh:mm:ssZ*, where:

yyyy=Year
mm=Month
dd=Date
hh=Hours
mm=Minutes
ss=Seconds
Z=indicates UTC

scanResult

Final result of scan. Valid values are **cancelled**, **completed** or **failed**. If a scan was executed with **-stopondetect** and terminated as a result of this specification being set, **scanResult** will be set to **completed**.

scanOptions Section

This section provides information on various categories that were employed during the scan.

pumHandling

Denotes whether scanning of Potentially Unwanted Modifications (PUMs) is active. Set to **enabled** by default. Reverts to **disabled** if **-ignorepu** parameter is specified in scan settings.

pupHandling

Denotes whether scanning of Potentially Unwanted Programs (PUPs) is active. Set to **enabled** by default. Reverts to **disabled** if **-ignorepu** parameter is specified in scan settings.

scanArchives

Denotes whether scanning of archive files is active. This includes ZIP, RAR, ARJ, CAB and 7Z files. Valid values are **enabled** (default value) or **disabled** (when **-noarchive** is specified as part of **scan** command). When enabled, scanning of archiving is limited to three levels deep. When disabled, the archive is scanned as a single file. Encrypted (password-protected) archives cannot be effectively scanned.

scanFilesystem

Denotes whether scanning of the file system is active. Set to **enabled** when **-threat** or **-path** scan types are specified, or **disabled** when **-hyper** scan type is specified.

scanMemoryObjects

Denotes whether scanning of running memory processes is active. Set to **enabled** when **–threat** or **–hyper** scan types are specified, or **disabled** when **–path** scan type is specified.

scanPUMs

Denotes whether scanning of PUM's (Potentially Unwanted Modifications) is active. Valid values are **Always Detect** (default value), **Warn User** and **Ignore**.

scanPUPs

Denotes whether scanning of PUP's (Potentially Unwanted Programs) is active. Valid values are **Always Detect** (default value), **Warn User** and **Ignore**.

scanRootkits

Denotes whether anti-rootkit scanning is active. Valid values are **enabled** or **disabled** (default value). Value is determined based on setting of scan parameter **–ark**.

scanStartupAndRegistry

Denotes whether scanning of startup-related processes and modules, and registry locations is active. Set to **enabled** when **–threat** or **–hyper** scan types are specified, or **disabled** when **–path** scan type is specified.

scanType

Type of scan which was executed. Valid values are **custom**, **threat**, or **hyper**.

useHeuristics

Denotes whether heuristics are employed during scanning. Heuristics enables enhanced detection of threats which may avoid detection by signatures only. This is set to **enabled** when **–threat** or **–hyper** scan types are specified, or **disabled** when **–path** scan type is specified.

threats Section

Each threat consists of a *main trace* on which the threat was detected and additional *linked traces* that are linked to the main trace.

There are eight different major categories of traces which may be detected during a scan - file, folder, process, module, regKey, regValue, ADS, physicalSector. Each type has a path and additional detail fields on the trace. Descriptions of all detail fields are as follows. This section provides information on threats which were detected during the scan.

ruleID

ID of the threat signature that detected this threat.

rulesVersion

Malware threat signature database version used for this detection.

threatID

ID of the threat (or threat family), as categorized by the Malwarebytes Research Team.

threatName

Name of the threat (or threat family), as categorized by the Malwarebytes Research Team. Please note that the same threat may be identified with different names by the various antivirus/antimalware products.

mainTrace Section

There are seven different major categories of traces which may be detected during a scan - file, folder, process, module, regKey, regValue, physicalSector. Each type has a path and additional detail fields on the trace.

Descriptions of all detail fields are as follows. This section provides information on threats which were detected during the scan.

cleanAction

Describes the action taken to remediate the detected trace. Valid values are *quarantine*, *delete* and *ignore*.

cleanContext

Data needed for cleanup.

cleanResult

Result of cleanup. Valid value after a scan is "notStarted."

cleanResultErrorCode

The last error code, if clean result is an error. This will be zero (0) if the cleanup was successful. Any other number indicates an error. The specific error code is useful for debugging.

cleanTime

The time at which cleanup starts.

generatedByPostCleanupAction

(For internal use only)

id

The unique ID of this trace.

linkType

(For internal use only)

objectMD5

The 32-byte MD5 hash of file object, if this is a file trace. For other types of traces, this value is empty.

objectPath

Where the threat was detected. If the threat was found on the Windows filesystem, this contains the full drive/directory/filename. If the threat was found in the Windows registry, this entry contains the registry key/value name/value data corresponding to the threat.

objectSHA256

The SHA256 hash of file object, if this is a file trace. For other types of traces, this value is empty.

objectType

The type of trace – file, folder, process, module, regKey, regValue, physicalSector.

SuggestedAction

Additional data for cleanup.

linkedTraces Section

This section includes any traces linked to the main trace of a threat, eg: shortcut links to a detected file. The section will be empty if there are no linked traces.

The detail fields of each linked trace are the same as those of the **mainTrace** section.

ruleID

ID of the threat signature that detected this threat.

rulesVersion

Malware threat signature database version used for this detection.

threatID

ID of the threat (or threat family), as categorized by the Malwarebytes Research Team.

threatName

Name of the threat (or threat family), as categorized by the Malwarebytes Research Team. Please note that the same threat may be identified with different names by the various antivirus/antimalware products.

Sample Scan Progress File

The following is a sample Scan Progress log created during a scan. When requested, these are generated at regular intervals for integration with third-party applications. It is provided here solely to illustrate how results appear in a real-world scenario. **Please note** that indentation has been added to this example for readability purposes.

```
{
  "CurrentScanPhase" : 6,
  "CurrentScanPhaseName" : "Filesystem Objects",
  "LastScanPhase" : 9,
  "ItemsScanned" : 100218,
  "PUCount" : 1,
  "VirusCount" : 0,
  "ScanCompletion" : 22,
  "CurrentlyScannedFile" : "C:\WINDOWS\FONTS\SCRIPT.FON",
  "CurrentVirus" : "",
  "CurrentPU" : "PUP.Optional.DotPitch",
  "ElapsedTime" : "00:00:34:840"
}
```

Event Logging to syslog

Malwarebytes Breach Remediation integrates very easily into a corporate network, providing highly effective results in the detection and remediation of threats on endpoints. That integration has been extended further through the addition of event logging using industry-standard methods. Based on user requests, we have implemented logging using CEF (Common Event Format), and more specifically, output is tailored to the ArcSight Security Intelligence platform and others which support the CEF format.

This section of the guide is devoted to detailed descriptions of how we have implemented event logging, so that you may easily understand log results and customize reporting in your specific environment.


Construction of a Log Entry

All event logs use a standardized format, which consist of an external logger prefix, a header and an extension. They are described as follows:

- **syslog prefix:** A mandatory entry that is applied for compliance with syslog standards. It includes:
 - **Event date**, including month, day and year, in the format (e.g. **Jul 15 2015**)
 - **Event time**, using 24-hour clock, in the format **hh:mm:ss** (e.g. **12:25:40**)
 - **Hostname** which logs pertain to (e.g. **SFO-VM1234.internal.contoso.com**)
- **Header:** Mandatory fields which identify the product/client generating log entries. Vendors may use non-standard field names for these fields, but their usage must correspond to fields and their order within the log record.
 - **CEF Version**, in the format "CEF:<version>". <version> is a single-digit, and is used for compliance with the CEF standard as well as to specify how remaining data should be interpreted.
 - **Device Vendor** identifies the vendor of the product/client which is generating log entries. As it pertains here, this will be "Malwarebytes"
 - **Device Product** identifies the product/client which is generating log entries. As it pertains here, this will be "Malwarebytes Breach Remediation"
 - **Device Version** identifies the product/client version. Malwarebytes Breach Remediation is identified not only by the version of the executable, but also by each major components used in conjunction with the program. All components which follow the executable program version are bounded by square brackets. Those components are:
 - Engine (MBAM Core DLL)
 - Rules Database
 - Actions Database
 - Anti-Rootkit Database (Swiss Army Knife)
 - **Signature ID** is a unique numeric identifier which Malwarebytes has assigned to each event type. A full list of all Signature IDs can be found later in this section.
 - **Name** is a simple text description for each event that corresponds to a specific Signature ID
 - **Severity** is the relative importance of any event, with 1 being the least important and 10 representing a critical event.
- **Extension:** This is a series of fields which are not mandatory by CEF standards. These fields represent values that each vendor select for inclusion in their event logs. Because these fields are not mandatory, vendors will commonly use non-standard field names, and may also include labels for the non-standard fields. If a customer elects to use these labels, this would improve readability of log information, though the same label used by multiple vendors may also create confusion for the user.

Mapping Malwarebytes Fields to CEF Format

As mentioned previously, log entries are comprised of three separate sections. The *syslog prefix* and *Header* are mandatory, and must conform to rigid standards. The *extension* provides flexibility that vendors require to capture important details related to their products/clients, while still conforming to CEF standards. Malwarebytes is no exception.

CEF Field Usage			
sorted by CEF Standard Field Name			
CEF Standard Field Name	Malwarebytes Field Name	Type	Description -or- Explicit Value
CEF Header			
deviceEventClassId	EventId	integer	Event type
deviceProduct	ProductName	string	Product name
deviceVendor	Company	string	Product vendor's name
deviceVersion	ProductVersion	string	Product version
Name	EventName	string	Event name
Severity	Severity	integer	Severity (1=min, 10=max)
CEF Extension 			
act	Action	string	Action taken with regard to malware
cat	MalwareCategory	string	Either "pu" or "virus"
cs1	MalwareName	string	Name of detected malware
cs2	MalwareHash	string	MD5 hash of detected malware
cs3	SessionId	string	UUID for each MBBR session
cs4	MalwareClass	string	Identifies object type containing malware
cs5	CommandLine	string	Command with arguments executed by user
deviceMacAddress	MACAddress	MAC	MAC address of host where MBBR runs
dvchost	Hostname	string	Hostname where MBBR runs
end	DateTime	time	Event End Date/Time
filePath	FilePath	string	Location of detected malware
msg	*	string	Multi-purpose text string
outcome	Result	string	"succeeded", "failed" Scan commands also allow "stopped", "cancelled"
rt	DateTime	time	Event Date/Time
start	DateTime	time	Event Start Date/Time
suser	UserName	string	Name of user who runs MBBR

As mentioned previously, *msg* is a multi-purpose field. The CEF format provides six fields which may contain custom data, that which the vendor has determined to be important with relation to their product/client, but does not conform to a standard CEF field. Malwarebytes utilizes five of these six fields, and also utilizes *msg* to provide more robust log content. Its usage in each log message will be detailed in the next section.

Malwarebytes Log Events

Malwarebytes Breach Remediation currently generates log entries for nine different event categories. This section of the guide describes each of those categories in detail. The following table lists fields which are common to all log entries created by *Malwarebytes Breach Remediation*.

CEF Standard Field Name	Malwarebytes Field Name	Description -or- Explicit Value
CEF Header		
deviceVendor	Company	"Malwarebytes"
deviceProduct	ProductName	"Malwarebytes Breach Remediation"
deviceVersion	ProductVersion	Version of program, engine and databases
CEF Extension		
cs3	SessionId	UUID for each MBBR session
dvchost	Hostname	Hostname where MBBR runs
deviceMacAddress	MACAddress	MAC address of host where MBBR runs
cs5	CommandLine	Command with arguments executed by user
outcome	Result	"succeeded", "failed" Scan commands also allow "stopped", "cancelled"
suser	UserName	Name of user who runs MBBR

In addition to these common fields, the following events utilize several fields specific to the event being logged. The remainder of this section is devoted to descriptions of each of these events.

1000 – ScanStartEvent

1000	ScanStartEvent	Generated when a scan command is initiated		
	EventName	Severity	Fields	Mapping
	ScanStarted	1	ScanType (string)	msg Format: "msg=ScanType:%s" Value(s): threat hyper path full
			Time	start

1001 – DetectionEvent

1001	DetectionEvent	Generated when malware is detected during a scan		
	EventName	Severity	Fields	Mapping
	Malware Detected	9 (PUM) 10 (virus)	Action	act Value(s): none
			MalwareCategory	cat Value(s): pu (PUM) virus (virus malware)
			MalwareName	cs1
			MalwareHash	cs2
			MalwareClass	cs4 Value(s): 0x01 (File) 0x02 (Folder) 0x04 (RegKey) 0x08 (RegVal) 0x10 (Process) 0x20 (Module) 0x40 (Ads) 0x80 (Physical Sector)
			Time	real-time

1002 – RemovalEvent

1002	RemovalEvent	Generated when malware is removed during "scan -remove" or "scan -removelastscan" commands		
	EventName	Severity	Fields	Mapping
	Malware Detected	9 (PUM) 10 (virus)	Action	act Value(s): quarantined
			MalwareCategory	cat Value(s): pu (PUM) virus (virus malware)
			MalwareName	cs1
			MalwareHash	cs2
			MalwareClass	cs4 Value(s): 0x01 (File) 0x02 (Folder) 0x04 (RegKey) 0x08 (RegVal) 0x10 (Process) 0x20 (Module) 0x40 (Ads) 0x80 (Physical Sector)
			Time	real-time

1003 – ScanEndEvent

1003	ScanEndEvent	Generated when a scan command ends		
	EventName	Severity	Fields	Mapping
	ScanEnded	1	DetectionCount(int)	msg
			RemovalCount(int)	msg Format: "msg=DetectionCount:%d Removal Count:%d" Note: Fields are combined as part of the msg field
			Time	end

1004 – RestoreStartEvent

1004	RestoreStartEvent	Generated when a "quarantine -restoreall" command is initiated		
	EventName	Severity	Fields	Mapping
	Restore Started	1	Time	Start

1005 – RestoreEvent

1005	RestoreEvent	Generated when an item is restored during a "quarantine -restoreall" command		
	EventName	Severity	Fields	Mapping
	Item Restored	5	Action	act Value(s): restored
			FilePath	filePath Value(s): Name and complete path of a file being restored
			Time	real-time

1006 – RestoreEndEvent

1006	RestoreEndEvent	Generated when a "quarantine -restoreall" command ends		
	EventName	Severity	Fields	Mapping
	RestoreEnded	1	DetectionCount(int)	msg
			RestoreCount(int)	msg Format: "msg=RestoreCount:%d"
			Time	end

1007 – RemoveLastScanEvent

1007	RemoveLastScanEvent	Generated when a "scan -removelastscan" command is initiated		
	EventName	Severity	Fields	Mapping
	RemoveLastScan	1	RemovalCount(int)	msg Format: "msg=Removal Count:%d"
			Time	real time

1008 – DbUpdateEvent

1008	DbUpdateEvent	Generated when a "update" command is initiated		
	EventName	Severity	Fields	Mapping
	Database Rules Update	1	EngineVer (String)	msg
			RuleVer (string)	msg
			SwissArmyVer (string)	msg
			ActionVer (string)	msg
			Time	real time
			Format: "msg=EngineVer:%s RuleVer:%s SwissArmyVer:%s ActionVer:%s" Note: Fields are combined as part of the <i>msg</i> field	

1009 – CustomDbUpdateEvent

1009	CustomDbUpdateEvent	Generated when the "settings" command on -customdb.<xxx> option is invoked. NOTE: <xxx> is add, load, clear or enabled:true false		
	EventName	Severity	Fields	Mapping
	Custom Db Rules Update	1	Action (str)	msg
			RulesAdded (int)	msg
			RulesIgnored (int)	msg
			Time	start
			Format: "act=%s msg=RulesAdded:%d RulesIgnored:%d" Note: Fields are combined as part of the <i>msg</i> field	

Creating Custom Rules

Custom rules can be specified through a json file. While Mandiant's IOC Editor provides the capability to create a wide range of rules for identifying malware, five specific rules apply to *Malwarebytes Breach Remediation*. For each of these rule types, an example is provided to show the construction of the rule, content examples, applicable criteria, and when the rule applies (relative to the scope of *Malwarebytes Breach Remediation*).

Custom Hash Rule

The Custom Hash rule provides for identification of a threat using its 32-bit MD5 hash value.

Syntax:

```
{
  "condition" : "is",
  "md5" : "3BAA69B0C31CA2CCFB30D75A83B060AA",
  "name" : "TestThreat.CustomHashRule",
  "type" : "hash"
}
```

Criteria:

Condition value = "is"

When Used:

Full scan, Hyper scan, Threat scan, Path scan

Custom File Rule

The Custom File rule identifies a file (by name).

Syntax:

```
{
  "condition" : "is",
  "fileName" : "ThreatFile.exe",
  "name" : "TestThreat.CustomFileRule.Is",
  "type" : "file"
}

{
  "condition" : "contains",
  "fileName" : "ThreatFile",
  "name" : "TestThreat.CustomFileRule.Contains",
  "type" : "file"
}
```

Criteria:

Condition value = "is" or "contains". When "is" condition is used, the filename does not include the directory path. The filename is case-insensitive.

When Used:

Full scan, Hyper scan, Threat scan, Path scan

Custom Folder Rule

The Custom Folder rule identifies a folder/path.

Syntax:

```
{
  "condition" : "is",
  "folderPath" : "C:\\abc\\ThreatFolder",
  "name" : "TestThreat.CustomFolderRule.Is",
  "type" : "folder"
}

{
  "condition" : "contains",
  "folderPath" : "ThreatFolder",
  "name" : "TestThreat.CustomFolderRule.Contains",
  "type" : "folder"
}
```

Criteria:

Condition value = "is" or "contains". When "is" condition is used, the folder path is the absolute path of the folder. The folder path is case-insensitive.

When Used:

Full scan, Hyper scan, Threat scan, Path scan

Custom Registry Key Rule

The Custom Registry Key rule identifies a specific registry key. Please note that RegistryItem/Path and RegistryItem/KeyPath are treated the same by *Malwarebytes Breach Remediation*.

Syntax:

```
{
  "condition" : "is",
  "keyPath" : "HKLM\\abc\\ThreatRegKey",
  "name" : "TestThreat.CustomRegKeyRule",
  "type" : "regkey"
}
```

Criteria:

Condition value = "is". The registry key is case-insensitive.

When Used:

Full scan, Threat scan

Custom Registry Value Rule

The Custom Registry Value rule identifies a specific registry value. It requires three (3) child indicator items to properly identify the registry value.

Syntax:

```
{
  "condition" : "is",
  "keyPath" : "HKLM\\abc\\ThreatRegKey",
  "name" : "TestThreat.CustomRegValueRule",
  "type" : "regvalue",
  "valueData" : "sampledata",
  "valueName" : "name1"
}
```

Criteria:

All indicators should use "is" condition. All indicator values are case-insensitive.

When Used:

Full scan, Threat scan

Program Status Codes

In the course of operation, *Malwarebytes Breach Remediation* returns a status code for each command that has been executed. Environmental variable `errorlevel` is used for this purpose. Status codes are in hexadecimal notation. Status code 0 represents successful completion of the requested command, while all non-zero values represent failures. File `mbberr.h` (located in the `Doc` subdirectory) contains a full listing of all status codes.

Further reading

Malwarebytes recommends that you obtain a copy of the following document from ArcSight. It is a detailed guide pertaining to the CEF logging format, as well as their recommendations targeted to users and developers.

- ***Implementing ArcSight CEF (Revision 20, dated 05 June 2013)***
<https://protect724.hp.com/docs/DOC-1072>
- ***Mandiant ICO Editor User Guide*** (version 2.2.0.0)
<https://www.fireeye.com/content/dam/fireeye-www/services/freeware/ug-ioc-editor.pdf>
- OpenIOC web site
<http://www.openioc.org/>