BigFix Insights for Vulnerability Remediation Implementation Guide
Special notice

Before using this information and the product it supports, read the information in Notices (on page 65).
Edition notice

This edition applies to BigFix version 10 and to all subsequent releases and modifications until otherwise indicated in new editions.
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Chapter 1. BigFix Insights for Vulnerability Remediation

Use this section to become familiar with BigFix Insights for Vulnerability Remediation infrastructure and key concepts necessary to understand how it works.

BigFix Insights for Vulnerability Remediation integrates BigFix with sources of vulnerability data. The purpose is to guide BigFix users on how to apply the best patch and configuration settings to remediate discovered vulnerabilities, and thus reduce risk and improve security.

BigFix Insights for Vulnerability Remediation, uses advanced correlation algorithms to aggregate and process the vulnerability data with information from BigFix to drive analytics reports. The output of the analytics facilitates remediation through the Baseline Creation Wizard by recommending the latest available patches for the discovered vulnerabilities.

Figure 1. Architecture overview of BigFix Insights for Vulnerability Remediation.
Chapter 2. System requirements

Learn more about the prerequisites and system requirements for BigFix Insights for Vulnerability Remediation (IVR) service.

Table 1. The table below describes prerequisites and system requirements for IVR service.

<table>
<thead>
<tr>
<th>Hardware requirements</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU</strong></td>
<td>minimum 2 cores (recommended 4)</td>
</tr>
<tr>
<td><strong>RAM</strong></td>
<td>On top of host OS requirements:</td>
</tr>
<tr>
<td></td>
<td>• &lt; 1M Findings from Vulnerability Management Product = 16GB</td>
</tr>
<tr>
<td></td>
<td>• &lt; 2M Findings from Vulnerability Management Product = 32GB</td>
</tr>
<tr>
<td></td>
<td>• &lt; 3M Findings from Vulnerability Management Product = 48GB</td>
</tr>
<tr>
<td></td>
<td>• &lt; 4M Findings from Vulnerability Management Product = 64GB</td>
</tr>
<tr>
<td><strong>Disc space</strong></td>
<td>• &lt; 1M Findings from Vulnerability Management Product = 4GB - 8GB preferred</td>
</tr>
<tr>
<td></td>
<td>• &lt; 2M Findings from Vulnerability Management Product = 8GB - 12GB preferred</td>
</tr>
<tr>
<td></td>
<td>• &lt; 3M Findings from Vulnerability Management Product = 12GB - 16GB preferred</td>
</tr>
<tr>
<td></td>
<td>• &lt; 4M Findings from Vulnerability Management Product = 16GB - 20GB preferred</td>
</tr>
<tr>
<td><strong>Execution Time</strong></td>
<td>The overall run time of data synchronization and processing depends on:</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>• CPU Speed</td>
</tr>
<tr>
<td></td>
<td>• Number of findings</td>
</tr>
<tr>
<td></td>
<td>• Number of assets in insights</td>
</tr>
<tr>
<td></td>
<td>• Number of patch sites loaded within the BFE environment</td>
</tr>
<tr>
<td></td>
<td>• API latency</td>
</tr>
<tr>
<td></td>
<td>• Conflicting workloads on IVR machine</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Software requirements</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prerequisites</strong></td>
<td>• Microsoft VC++ Redistributable package 2012</td>
</tr>
<tr>
<td></td>
<td>• Microsoft® ODBC Driver 17 for SQL Server®</td>
</tr>
<tr>
<td><strong>Operating system</strong></td>
<td>• Microsoft Windows 2016</td>
</tr>
<tr>
<td></td>
<td>• Microsoft Windows 2019</td>
</tr>
<tr>
<td><strong>Supported BigFix versions</strong></td>
<td>• Windows - based BigFix Server, Version 10</td>
</tr>
</tbody>
</table>

**Note:** BigFix Insights for Vulnerability Remediation
Table 1. The table below describes prerequisites and system requirements for IVR service. (continued)

<table>
<thead>
<tr>
<th>BigFix Component Requirements</th>
<th>• BigFix Insights</th>
</tr>
</thead>
<tbody>
<tr>
<td>BigFix License Requirements</td>
<td>• BigFix Lifecycle</td>
</tr>
<tr>
<td></td>
<td>• BigFix Compliance</td>
</tr>
<tr>
<td>Supported Vulnerability Management Platforms</td>
<td>• Qualys VMDR v2 REST API: <a href="https://www.qualys.com/docs/qualys-api-vmpc-user-guide.pdf">https://www.qualys.com/docs/qualys-api-vmpc-user-guide.pdf</a></td>
</tr>
<tr>
<td></td>
<td>• Tenable.SC</td>
</tr>
<tr>
<td>BI tool</td>
<td>• Power BI Desktop/Server, 2019 + (Rec. May 2020)</td>
</tr>
<tr>
<td></td>
<td>• Tableau Desktop/Server, 2020.4 +</td>
</tr>
</tbody>
</table>

Note: Microsoft offers two distinct products called Power BI desktop. Use the one that is optimized for Power BI Report Server: https://www.microsoft.com/en-us/download/details.aspx?id=56723
Table 1. The table below describes prerequisites and system requirements for IVR service. (continued)

| Network requirements | • Connectivity to Vulnerability Management API Server URL (port 443 by default)  
|                       | • Connectivity to BigFix Insights SQL database (port 1433 by default) |

Vulnerability Management API details

Qulays API requirements.

The Qulays API enforces limits on the API calls a customer can make based on their subscription settings. The limits apply to the use of all Qulays APIs except “session” V2 API (session login/logout). Default API control settings are provided by the service. Note these settings may be customized per subscription by Qulays Support.


To estimate the number of API calls, use the below formula:

\[
\text{Total number of API calls} = \left( \frac{\text{number of devices}}{\text{batch size (on page 41)}} \right) + \left( \frac{\text{number of unique vulnerabilities}}{350} \right)
\]

where;

- **batch size** - configurable parameter that describes the maximum number of devices which can be fetched in a single API call
- **number of devices** - number of available devices in the scanned network
- **number of unique vulnerabilities** - number of unique vulnerabilities discovered in the scanned network
- **350** - maximum number of vulnerabilities that can be fetched in a single API call into the Qualys Knowledge Base API.

Tenable API requirements
The IVR server requires a Tenable user account. A user leveraged to Tenable.sc IVR adapter needs compatible machines within the environment.

The Tenable account utilized for IVR should be assigned the default full access group, and auditor role permissions. This provides the account access needed to complete the dataflow. Additionally, the user can be defined using custom access permissions to limit the scope of assets retrieved by IVR. A group within Tenable can be limited by both the viewable hosts and the repositories. In general, the role of auditor should be leveraged as well, to follow the principle of least privileged. The IVR dataflow retrieves information only when the account has granted visibility to receive.

Tenable impact statement

IVR uses the pytenable library (developed by Tenable). IVR leverages a default batch size of 1000, which is conservative and is prescribed by Tenable. With the default settings, the Tenable.sc server should not see a noticeable impact when the IVR adapter is running.
Chapter 3. Deployment and configuration

This module provides the steps to deploy and configure the BigFix Insights for Vulnerability Remediation solution.

To install and configure BigFix Insights for Vulnerability Remediation service, perform below steps:

1. Run installation command
   
   Purpose: This step installs the BFIVR (BigFix Insights for Vulnerability Remediation) executable as a windows service.
   
   a. Navigate to the installation directory and run `BFIVR.exe --Install` command.
      
      When successful, the message 'Installing service BFIVR. Service installed.' appears in the command prompt.

2. Define the target for BigFix Insights
   
   Purpose: This step defines how the dataflow targets the Insights database.
   
   a. Note down of the Insights Server IP and the database name.
   
   b. Create a connection string.
   
   c. Navigate to the installation directory and run `BFIVR.exe --UpdateTargetURL BigfixINSIGHT "<Your_ODBC_String>"` command.
      
      ! Important: The ODBC string must be written within double quotes.

3. Define the target for the scanner
   
   Purpose: This step defines how the dataflow targets the scanner URL.
   
   a. Take a note of the Tenable.sc scanner IP and port
   
If the IP of the Tenable Server is 192.168.0.133 and the target port is the default https port, the command looks as: `C:\BFIVR\BFIVR.exe -- UpdateTargetURL TenableSC https://192.168.0.133`. To confirm the command, verify the `DataflowsConfig.xml` file in the installation path. The file should now reference the parameters that you have defined as connection string for the Tenable sc datasource.

4. Set the credentials for Insights

Purpose: This step defines how the dataflow authenticates with the Big Fix Insights database for standard ETL (Expand, Transform, Load) operations.

a. Obtain the credentials for your BigFix Insights database.

b. Navigate to the installation directory and run `\BFIVR.exe -- ProvideCredentials BigfixINSIGHT -Creds <Insights_User> <Insights_Pass>` command.

   **Note:** The database writer must have access to the account in BigFix Insights database.

Example: If the username is 'insights' and the associated password is 'BigFix123', the command looks as: `C:\BFIVR\BFIVR.exe -- ProvideCredentials BigfixINSIGHT -Creds insights BigFix123`. When successful, the message 'The credentials provided are encrypted successfully!' appears in the command prompt.

5. Set the credentials for the scanner

Purpose: This step defines how the dataflow authenticates with the Tenable.sc scanner.

a. Obtain the credentials for your Tenable.sc server.

b. Navigate to the installation directory and run `\BFIVR.exe -- ProvideCredentials TenableSC -Creds <TenableSC_User> <TenableSC_Pass>` command.
Example: If the username is 'secmanager' and the associated password is 'BigFix123', the command looks as:

```bash
c:\BFIVR\BFIVR.exe --ProvideCredentials TenableSC -Creds secmanager BigFix123.
```

When successful, the message 'The credentials provided are encrypted successfully!' appears in the command prompt.

6. Initialize the IVR schema on Insights

Purpose: This step defines initializes the IVR Schema within BFInsights.

   a. Obtain the credentials for your BigFix Insights database.


   ![Note] The account should have DBO rights to the database BigFix Insights DB.

   Example: If the username is insights and the associated password is BigFix123, the command looks as follows:

   ```bash
c:\BFIVR>BFIVR.exe --InitializeSchemas -Creds insights BigFix123.
```

   When successful, the message 'Schema Initialized Successfully!' appears in the command prompt.

7. Validate the configuration

Purpose: This step verifies the configuration provided from the previous steps.

   a. Navigate to the installation directory and run `BFIVR.exe --ValidateConfiguration` command.

   When successful, the message 'Configuration verified successfully!' appears in the command prompt.
Chapter 4. Advanced Configuration

Learn how to update and validate configuration.

**Updating the configuration**

To update the configuration file, perform these steps:

1. Log in to the target server.
2. Navigate to the project installation directory.
3. Open the `DataFlowsConfig.xml` file in your preferred text editor.
4. Update configuration. For more information, refer to Configuration Settings (on page 41).
5. Save the changes.

**Validating the configuration**

1. Open CLI (Command Line Interface) and run the `BFIVR.exe --ValidateConfiguration` command.
2. Restart BigFix Insights for Vulnerability Remediation to import the new configuration.
   On successful completion, the message, Configuration verified successfully appears.

**Updating the credentials**

To update the credentials, perform these steps:

1. Open CLI and run the `BFIVR.exe --ProvideCredentials` command.
   You are prompted to enter a username and password.
2. Enter login credentials for the data source:
   • Username
   • Password

On successful update, the message, *The entered credentials are encrypted successfully.* appears in the command prompt.
**Note:** Any changes to the configuration file purges all IVR data associated with the current dataflow configuration (from which we generate a hash), as well as all data not associated with existing dataflow configurations. For more information, refer to `PurgeFindingsOnExecutionOfDataflow (on page 41)` setting.
Chapter 5. Business Intelligence reports

Use this section to become familiar with Power BI and Tableau reports.

The reporting functionality of the IVR (BigFix Insights for Vulnerability Remediation) solution addresses the three main use cases for the application:

- **Vulnerabilities with Available Fixlets** - A list of vulnerabilities that have matching BigFix fixlets available for remediation. The report will list the most recent fixlet related to each vulnerability, and the CVE entries that are associated to the vulnerability.
- **Vulnerabilities Without Available Fixlets** - A list of vulnerabilities that do not have an available fixlet for remediation.
- **Vulnerability Discrepancies** - A list of vulnerabilities where the scanning system identifies the issue, but BigFix declares it resolved. This occurs primarily because of timing differences in the scan processes.

The reports are produced in both Power BI (Desktop, optimized for BI Server, May 2020) and Tableau version 2020.4+.

**Power BI reports**

- Reporting differences: the functionality of the reports is nearly identical between Power BI and Tableau. This section details the differences between the reports.
- Navigation: each visualization is portrayed on the Dashboard page. Visualizations that do not apply to your business process can be removed as necessary.

**Qualys**

- **Vulnerabilities with Available Fixlets**

  Figure 2. Detected Vulnerable Devices with Applicable Fixlets – Overview
Figure 2. Detected Vulnerable Devices with Applicable Fixlets – Vulnerability List

Figure 2. Detected Vulnerable Devices with Applicable Fixlets – Device Vulnerabilities
Figure 2. Detected Vulnerable Devices with Applicable Fixlets – Device Detail

- Vulnerabilities without Available Fixlets

Tenable

Vulnerabilities with Available Fixlets

Figure 6. Detected Vulnerable Devices With Applicable Fixlets - Overview
Figure 6. Detected Vulnerable Devices With Applicable Fixlets - Vulnerability List

Figure 7. Detected Vulnerable Devices with Applicable Fixlets - Vulnerability Detail
Figure 8. Detected Vulnerable Devices With Applicable Fixlets - Device Detail

- **Vulnerabilities without Available Fixlets**

Figure 8. Detected Vulnerable Device without Applicable Fixlets - Overview
Figure 9. Detected Vulnerable Devices without Applicable Fixlets - Vulnerability ist

Figure 10. Detected Vulnerable Devices without Applicable Fixlets - Device Vulnerabilities
Figure 10. Detected Vulnerable Devices without Applicable Fixlets - Device Detail

• Vulnerability Discrepancies

Figure 11. Vulnerability Discrepancies - Overview
Figure 12. Detected Vulnerability Discrepancies – Vulnerability List

Figure 12. Detected Vulnerability Discrepancies – Device Vulnerabilities

Figure 12. Detected Vulnerability Discrepancies – Device Detail
**Tableau reports**

- Reporting differences: the functionality of the reports is nearly identical between Power BI and Tableau. This section details the differences between the reports.
- Navigation: each visualization is portrayed on the Dashboard page. Visualizations that do not apply to your business process can be removed as necessary.

**Qualys**

**Vulnerabilities with Available Fixlets**

Figure 18. Detected Vulnerable Devices With Applicable Fixlets - Overview
Figure 19. Detected Vulnerable Devices With Applicable Fixlets - Vulnerability List

Figure 20. Detected Vulnerable Devices With Applicable Fixlets - Device Vulnerabilities
Figure 21. Detected Vulnerable Devices With Applicable Fixlets - Device Detail

Vulnerabilities without Available Fixlets

Figure 21. Detected Vulnerable Devices Without Applicable Fixlets - Overview

Figure 22. Detected Vulnerable Devices Without Applicable Fixlets - Overview
Figure 23. Detected Vulnerable Devices Without Applicable Fixlets - Vulnerability List

Figure 24. Detected Vulnerable Devices Without Applicable Fixlets - Device Vulnerabilities
Figure 25. Detected Vulnerable Devices Without Applicable Fixlets - Device Detail

Vulnerability Discrepancies

Figure 26. Detected Vulnerability Discrepancies - Overview
Figure 26. Detected Vulnerability Discrepancies - Overview

Figure 27. Detected Vulnerability Discrepancies - Vulnerability List
Figure 28. Detected Vulnerability Discrepancies - Device Vulnerabilities

Figure 29. Detected Vulnerability Discrepancies - Device Detail

Tenable

Vulnerabilities with Available Fixlets

Figure 33. Detected Vulnerable Device with Applicable Fixlets - Overview
Figure 34. Detected Vulnerable Devices with Applicable Fixlets - Overview
Figure 34. Detected Vulnerable Devices with Applicable Fixlets - Vulnerability List

Figure 35. Detected Vulnerable Devices with Applicable Fixlets - Device Vulnerabilities

Figure 36. Detected Vulnerable Devices with Applicable Fixlets - Device Detail
Vulnerabilities without Available Fixlets

Figure 37. Detected Vulnerable Devices without Applicable Fixlets - Overview

Figure 38. Detected Vulnerable Devices without Applicable Fixlets - Overview
Figure 39. Detected Vulnerable Devices without Applicable Fixlets - Vulnerability List
Figure 40. Detected Vulnerable Devices without Applicable Fixlets - Device Vulnerabilities

Figure 41. Detected Vulnerable Devices without Applicable Fixlets - Device Detail

Vulnerability Discrepancies

Figure 42. Vulnerability Discrepancies - Overview
Figure 43. Vulnerability Discrepancies - Overview

Figure 44. Vulnerability Discrepancies - Vulnerability List
Figure 45. Vulnerability Discrepancies - Device Vulnerabilities

Figure 46. Vulnerability Discrepancies - Device Detail
Chapter 6. Reference

The following topics contain information on how you can work with the configuration file and settings, the CLI that comes with the package. They also describe how to use the log files for troubleshooting purposes.

Configuration file

Data Flow service uses `DataflowsConfig.xml` configuration file. The file is located in the default installation path. The file contains three sections: Data Sources, Data Flows, and Settings. All tags and attribute names in the file must be in lower case. There is also an `DataflowsConfig.xsd` file that you can use to validate the configuration file on startup.

```xml
<datasources>

The `<datasources>` tag of the Configuration File represents a collection of the different data sources that the solution is configured to interact with. For a configuration to be valid, two datasources are required at the minimum. The `<datasourcenname>` attribute should be unique.

The `<datasource>` tag is a child node of the `<datasources>` tag in the configuration document and represents the configuration information for a single datasource.

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Default value</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>datasource-name</td>
<td>N/A</td>
<td>Yes</td>
<td>This attribute is used to uniquely identify the data-source. With this attribute, datasources can be mapped to specific adapters</td>
</tr>
</tbody>
</table>

Table 2. Attribute details of the configuration file.
Table 2. Attribute details of the configuration file. (continued)

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Default value</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>connectionstring</td>
<td>N/A</td>
<td>Yes</td>
<td>URL of the respective data sources. For example: https://[Qualys-APIURL], http://[TenableAPI_URL]:443</td>
</tr>
<tr>
<td>username</td>
<td>N/A</td>
<td>System generated</td>
<td>This attribute is managed through the ProvideCredentials command. The data is encrypted prior to being persisted in the configuration file.</td>
</tr>
<tr>
<td>password</td>
<td>N/A</td>
<td>System generated</td>
<td>This attribute is managed through the ProvideCredentials command. The data is encrypted prior to</td>
</tr>
</tbody>
</table>
Table 2. Attribute details of the configuration file. (continued)

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Default value</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>being persisted in the configuration file.</td>
</tr>
<tr>
<td>verifycert</td>
<td>True</td>
<td>No</td>
<td>This attribute enables or disables SSL certificate validation with this data source.</td>
</tr>
</tbody>
</table>

<dataflows>

The <dataflows> tag of the configuration file represents a collection of the different data flows that the solution is configured to execute.

Each <dataflow> tag represents an instance of the flow of data from one system to another and consists of a Source Adapter tag and a Target Adapter tag.

Table 3. Attribute details of the configuration file.

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>displayname</td>
<td>Yes</td>
<td>This attribute is used to describe the individual data flow.</td>
</tr>
<tr>
<td>datatype</td>
<td>Yes</td>
<td>Type: Int</td>
</tr>
<tr>
<td>executioninterval- minutes</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

<sourceadapter>
The `<sourceadapter>` tag identifies the source system from which the data is extracted. It must include a Properties collection, with a minimum of one property being valid.

### Table 4. Attribute details of the configuration file.

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>displayname</td>
<td>Yes</td>
<td>This attribute is used to describe this adapter configuration.</td>
</tr>
<tr>
<td>adapterclass</td>
<td>Yes</td>
<td>qualys, tenable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This attribute determines which adapter is used to extract data from the data source</td>
</tr>
<tr>
<td>datasourceName</td>
<td>Yes</td>
<td>This attribute value must match the name of a data source defined in the data sources collection. It is used to provide connection information to the adapter.</td>
</tr>
</tbody>
</table>

The `<targetadapter>` tag identifies the target system into which the data is loaded. It must include a Properties collection, with a minimum of one property being valid.
### Table 5. Attribute details of the configuration file.

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>displayname</td>
<td>Yes</td>
<td>This attribute is used to describe this adapter configuration.</td>
</tr>
</tbody>
</table>
| adapterclass   | Yes      | insight  
This attribute determines which adapter is used to extract data from the data source |
| datasourceName | Yes      | This attribute value must match the name of a data source defined in the data sources collection. It is used to provide connection information to the adapter. |

**<device_properties>**

The `<device_properties>` tag represents a collection of properties in a specific adapter. Each property in this collection is mapped by position to the collection in the corresponding target or source adapter. Target and source adapter devices are mapped with weight attribute in `<identityproperty>` tag.
The `<property>` tag represents a single column of data that is either extracted from or loaded into a system. It may include simple transformation logic to facilitate the transformation of the data received.

### Table 6. Attribute details of the configuration file.

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>displayname</td>
<td>Yes</td>
<td>This attribute is used to describe the property being configured.</td>
</tr>
<tr>
<td>columnname</td>
<td>Yes</td>
<td>This attribute is used to identify the corresponding column using a notation specific to each adapter.</td>
</tr>
<tr>
<td>datatype</td>
<td>Yes</td>
<td>Type: String</td>
</tr>
<tr>
<td>weight</td>
<td>No</td>
<td>This attribute assigns a weight to the property, which is used for the weighted confi-</td>
</tr>
</tbody>
</table>
Table 6. Attribute details of the configuration file. (continued)

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>dence matching of records. Type: Int.</td>
</tr>
</tbody>
</table>

<settings>

The `<settings>` tag represents a collection of settings for the solution. For a detailed list of settings, see Configuration settings for IVR solution (on page 41).

Table 7. Attribute details of the configuration file.

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>key</td>
<td>Yes</td>
<td>This attribute is the name of the setting that is being configured.</td>
</tr>
<tr>
<td>value</td>
<td>yes</td>
<td>This attribute is the value of the setting that is being configured.</td>
</tr>
</tbody>
</table>

Configuration settings for IVR solution

List of available settings you may change in a configuration file.

<table>
<thead>
<tr>
<th>Setting name</th>
<th>Data type</th>
<th>Default value</th>
<th>Description</th>
<th>Possible values</th>
</tr>
</thead>
<tbody>
<tr>
<td>LogLevel</td>
<td>String</td>
<td>DEBUG</td>
<td>Sets the logging level for the service.</td>
<td>• INFO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• DEBUG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ERROR</td>
</tr>
<tr>
<td>Setting name</td>
<td>Data type</td>
<td>Default value</td>
<td>Description</td>
<td>Possible values</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-----------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Ivr_in_sight.worker_threads</td>
<td>Int</td>
<td>8</td>
<td>Sets the number of worker process (for Corellation) that can be run concurrently.</td>
<td></td>
</tr>
<tr>
<td>Logger.RetentionInDays</td>
<td>Int</td>
<td>5</td>
<td>Indicates the duration of log that you want to retain.</td>
<td></td>
</tr>
<tr>
<td>NumberOfConcurrentDataflows</td>
<td>Int</td>
<td>1</td>
<td>Sets the number of dataflow processors that can be run concurrently.</td>
<td></td>
</tr>
<tr>
<td>DataFlow.QueueRefreshInterval</td>
<td>Int</td>
<td>120</td>
<td>The time interval at which the data flow in refreshed.</td>
<td></td>
</tr>
<tr>
<td>MinimumConfidenceLevel</td>
<td>Int</td>
<td>20</td>
<td>The minimum criteria for a record to match.</td>
<td></td>
</tr>
<tr>
<td>CacheRefreshLimit</td>
<td>Int</td>
<td>10</td>
<td>Configures the system to refresh cache at a specified time interval.</td>
<td></td>
</tr>
</tbody>
</table>

Changing this
<table>
<thead>
<tr>
<th>Setting name</th>
<th>Data type</th>
<th>Default value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>qualys.batch_size</td>
<td>Int</td>
<td>10000</td>
<td>Specifies the maximum number of host records processed per request. When not specified, the qualys.batch_size is set to 10,000 host records. You may specify a value less than the default (1-999) or greater than the default (1001-1000000).</td>
</tr>
<tr>
<td>PurgeFindings-OnExecutionOf-Dataflow</td>
<td>FALSE</td>
<td></td>
<td>When set to true, will attempt to purge all *invalid ivr data associat-</td>
</tr>
<tr>
<td>Setting name</td>
<td>Data type</td>
<td>Default value</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>

Ed with the current dataflow configuration (from which we generate a hash), as well as all data not associated with existing dataflow configurations.

*invalid - When the user modifies properties of a dataflow, a new hash is calculated. Data in the IVR schema is linked to the configuration hash from which it was derived.

💡 **Note:**
When the IVR service starts, a purge
<table>
<thead>
<tr>
<th>Setting name</th>
<th>Data type</th>
<th>Default value</th>
<th>Description</th>
<th>Possible values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>is performed (regardless of this setting) to attempt to automatically remove all invalid data (again, that is, data in IVR tables linked to a hash that was calculated from a dataflow configuration that</td>
<td></td>
</tr>
</tbody>
</table>
Command line interface

The BigFix Insights for Vulnerability Remediation service executable (BFIVR.exe) provides a Command Line Interface (CLI) that we can use to perform several distinct functions related to the setup and execution of the solution. This includes installing, uninstalling, starting, and stopping the solution as a native system service. This allows us to securely provide credentials for data sources and validate configuration before starting the service from the BigFix console.

BigFix Insights for Vulnerability Remediation command arguments

The BFIVR.exe executable file is found in the default deployment folder. To view a list of all the commands supported, type --Help or -h at the command prompt.
Table 8. List of command line arguments.

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>--ProvideCredentials &lt;DataSourceName&gt;</td>
<td>To securely capture credentials for single datasource</td>
<td></td>
</tr>
<tr>
<td>--provideCredentials</td>
<td>To securely capture credentials for all data-sources</td>
<td></td>
</tr>
<tr>
<td>--ValidateConfiguration</td>
<td>To validate the configuration</td>
<td></td>
</tr>
<tr>
<td>--InitializeSchemas</td>
<td>To initialize the schema</td>
<td></td>
</tr>
</tbody>
</table>

Note: The command line parameters are case sensitive.

Logs

You can find log files in the logs folder in the installation path. Logs are updated everyday. Configure the solution with INFO as the log level unless you intend to troubleshoot an issue.

Connections.[date].log

With DEBUG enabled, this log file contains detailed logging information related to the external connections to third-party datasources.

DataFlow.[date].log

With DEBUG enabled, this log file contains detailed logging information related to the execution of each dataflow. It is the primary interface used for debugging issues related to the ETL (Extract, Transform, Load).

Main.[date].log
With DEBUG enabled, this log file contains detailed logging information related to the primary processes. It should show issues related to service start and configuration.

Troubleshooting

This topic helps you in troubleshooting various issues encountered in IVR (BigFix Insights for Vulnerability Remediation) service.

Diagnostic procedures:

• Check Windows Service Manager for Service State. The service should be in a running state.

• Check logs for errors & timestamp. Logs are found in the logs directory.

[DatetimeOfExecution] [ProcessID] [Method] [Message]
Table 9. DataFlow logs details

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executing DataFlow Task: Endpoint data from Qualys To Bigfix Insights</td>
<td>Indicates start of data flow</td>
</tr>
<tr>
<td>Loading Qualys Data</td>
<td>Indicates loading of Qualys data</td>
</tr>
<tr>
<td>Loading Insights Data</td>
<td>Indicates loading of Insights data</td>
</tr>
<tr>
<td>RecordCaches Loaded In</td>
<td>Indicates time it took to get data from Insights and Source Adapter (Qualys or Tenable)</td>
</tr>
<tr>
<td>Processing Changes From Source Adapter</td>
<td>At this point, we will take the changes and prepare updates for the IVR tables. The time when the processing changes from source adapter are considered and are updated in the IVR tables.</td>
</tr>
<tr>
<td>Done Processing Devices</td>
<td>Indicates that the device correlation is complete.</td>
</tr>
<tr>
<td>Updates Performed In</td>
<td>Indicates the time taken to stick data in the IVR tables.</td>
</tr>
<tr>
<td>Saving RecordCaches</td>
<td>The final step in which the record cache is saved.</td>
</tr>
<tr>
<td>DataFlowExecution Completed In</td>
<td>Indicates the end of data flow.</td>
</tr>
</tbody>
</table>

Known limitations

Refer to the below list of limitations in BigFix Insights for Vulnerability Remediation.
1. IVR Tenable.sc:

⚠️ **Warning:** Sessions are not terminated as expected. Over a period of time, Tenable does not allow to proceed as the maximum limits allowed is 10 user per session.

2. IVR( BigFix Insights for Vulnerability Remediation)1.0 currently officially supports BigFix Insights instances with only one BigFix Datasource.

3. IVR Tenable.sc: Allow Session Management must be disabled. For more information, refer to the Tenable.sc configuration settings.

4. ⚠️ **Warning:** Do not deploy BigFix Insights for Vulnerability Remediation service to more than 1 machine.

5. ⚠️ **Warning:** Do not use more than 1 dataflow per BigFix Insights for Vulnerability Remediation service.

6. Currently we do not support multi-instance data flow service even for the same datasource type.

7. PowerBI and Tableau reports: The maximum number of records which can be exported to CSV file:
   - 50k records for Tableau
   - 30k records for PowerBI

8. Power BI: The sorting of severities in the breakdown visualizations may yield unpredictable results.
   - Sort order of the bars come up differently in an unpredictable order, but does not affect the functionality of the data.
Appendix A. Glossary

This glossary provides terms and definitions for the Modern Client Management for BigFix software and products.

The following cross-references are used in this glossary:

- See refers you from a nonpreferred term to the preferred term or from an abbreviation to the spelled-out form.
- See also refers you to a related or contrasting term.


A

action

1. See Fixlet (on page 57).
2. A set of Action Script commands that perform an operation or administrative task, such as installing a patch or rebooting a device.

Action Script

Language used to perform an action on an endpoint.

agent

See BigFix agent (on page 52).

ambiguous software

Software that has an executable file that looks like another executable file, or that exists in more than one place in a catalog (Microsoft Word as a standalone product or bundled with Microsoft Office).
audit patch

A patch used to detect conditions that cannot be remediated and require the attention of an administrator. Audit patches contain no actions and cannot be deployed.

automatic computer group

A computer group for which membership is determined at run time by comparing the properties of a given device against the criteria set for group membership. The set of devices in an automatic group is dynamic, meaning that the group can and does change. See also computer group (on page 53).

B

baseline

A collection of actions that are deployed together. A baseline is typically used to simplify a deployment or to control the order in which a set of actions are applied. See also deployment group (on page 55).

BigFix agent

The BigFix code on an endpoint that enables management and monitoring by BigFix.

BigFix client

See BigFix agent (on page 52).

BigFix console

The primary BigFix administrative interface. The console provides a full set of capabilities to BigFix administrators.

C

client
A software program or computer that requests services from a server. See also server (on page 61).

**client time**

The local time on a BigFix client's device.

**Cloud**

A set of compute and storage instances or services that are running in containers or on virtual machines.

**Common Vulnerabilities and Exposures Identification Number (CVE ID)**

A number that identifies a specific entry in the National Vulnerability Database. A vendor's patch document often includes the CVE ID, when it is available. See also National Vulnerability Database (on page 59).

**Common Vulnerabilities and Exposures system (CVE)**

A reference of officially known network vulnerabilities, which is part of the National Vulnerabilities Database (NVD), maintained by the US National Institute of Standards and Technology (NIST).

**component**

An individual action within a deployment that has more than one action. See also deployment group (on page 55).

**computer group**

A group of related computers. An administrator can create computer groups to organize systems into meaningful categories, and to facilitate deployment of content to multiple computers. See also automatic computer group (on page 52) and manual computer group (on page 58).

**console**

See BigFix console (on page 52).

**content**

Digitally-signed files that contain data, rules, queries, criteria, and other instructions, packaged for deployment across a network. BigFix agents use
the detection criteria (Relevance statements) and action instructions (Action Script statements) in content to detect vulnerabilities and enforce network policies.

**content relevance**

A determination of whether a patch or piece of software is eligible for deployment to one or more devices. See also device relevance (on page 56).

**Coordinated Universal Time (UTC)**

The international standard of time that is kept by atomic clocks around the world.

**corrupt patch**

A patch that flags an operator when corrections made by an earlier patch have been changed or compromised. This situation can occur when an earlier service pack or application overwrites later files, which results in patched files that are not current. The corrupt patch flags the situation and can be used to re-apply the later patch.

**custom content**

BigFix code that is created by a customer for use on their own network, for example, a custom patch or baseline.

**CVE**

See Common Vulnerabilities and Exposures system (on page 53).

**CVE ID**

See Common Vulnerabilities and Exposures Identification Number (on page 53).

**D**

**data stream**

A string of information that serves as a source of package data.
**default action**

The action designated to run when a Fixlet is deployed. When no default action is defined, the operator is prompted to choose between several actions or to make an informed decision about a single action.

**definitive package**

A string of data that serves as the primary method for identifying the presence of software on a computer.

**deploy**

To dispatch content to one or more endpoints for execution to accomplish an operation or task, for example, to install software or update a patch.

**deployment**

Information about content that is dispatched to one or more endpoints, a specific instance of dispatched content.

**deployment group**

The collection of actions created when an operator selects more than one action for a deployment, or a baseline is deployed. See also baseline (on page 52), component (on page 53), deployment window (on page 55), and multiple action group (on page 58).

**deployment state**

The eligibility of a deployment to run on endpoints. The state includes parameters that the operator sets, such as 'Start at 1AM, end at 3AM.'

**deployment status**

Cumulative results of all targeted devices, expressed as a percentage of deployment success.

**deployment type**

An indication of whether a deployment involved one action or multiple actions.

**deployment window**
The period during which a deployment's actions are eligible to run. For example, if a Fixlet has a deployment window of 3 days and an eligible device that has been offline reports in to BigFix within the 3-day window, it gets the Fixlet. If the device comes back online after the 3-day window expires, it does not get the Fixlet. See also deployment group (on page 55).

device
An endpoint, for example, a laptop, desktop, server, or virtual machine that BigFix manages; an endpoint running the BigFix Agent.

device holder
The person using a BigFix-managed computer.

device property
Information about a device collected by BigFix, including details about its hardware, operating system, network status, settings, and BigFix client. Custom properties can also be assigned to a device.

device relevance
A determination of whether a piece of BigFix content applies to a device, for example, where a patch should be applied, software installed, or a baseline run. See also content relevance (on page 54).

device result
The state of a deployment, including the result, on a particular endpoint.

Disaster Server Architecture (DSA)
An architecture that links multiple servers to provide full redundancy in case of failure.

UPA
See Disaster Server Architecture (on page 56).

dynamically targeted
Pertaining to using a computer group to target a deployment.
E

endpoint
A networked device running the BigFix agent.

F

filter
To reduce a list of items to those that share specific attributes.

Fixlet
A piece of BigFix content that contains Relevance and Action Script statements bundled together to perform an operation or task. Fixlets are the basic building blocks of BigFix content. A Fixlet provides instructions to the BigFix agent to perform a network management or reporting action.

G

group deployment
A type of deployment in which multiple actions were deployed to one or more devices.

H

Hybrid cloud
The utilization of distinct sets of cloud services (typically public and private) with integration and/or orchestration across them.

L

locked
An endpoint state that prevents most of the BigFix actions from running until the device is unlocked.
M

MAG

See multiple action group (on page 58).

management rights

The limitation of console operators to a specified group of computers. Only a site administrator or a master operator can assign management rights.

manual computer group

A computer group for which membership is determined through selection by an operator. The set of devices in a manual group is static, meaning they do not change. See also computer group (on page 53).

master operator

A console operator with administrative rights. A master operator can do everything that a site administrator can do, except creating operators.

masthead

A collection of files that contain the parameters of the BigFix process, including URLs to Fixlet content. The BigFix agent brings content into the enterprise based on subscribed mastheads.

mirror server

A BigFix server required if the enterprise does not allow direct web access but instead uses a proxy server that requires password-level authentication.

Multicloud

The utilization of distinct sets of cloud services, typically from multiple vendors, where specific applications are confined to a single cloud instance.

multiple action group (MAG)

A BigFix object that is created when multiple actions are deployed together, as in a baseline. A MAG contains multiple Fixlets or tasks. See also deployment group (on page 55).
N

National Vulnerability Database (NVD)

A catalog of officially known information security vulnerabilities and exposures, which is maintained by the National Institute of Standards and Technology (NIST). See also Common Vulnerabilities and Exposures Identification Number (on page 53).

NVD

See National Vulnerability Database (on page 59).

O

offer

A deployment option that allows a device holder to accept or decline a BigFix action and to exercise some control over when it runs. For example, a device holder can decide whether to install a software application, and whether to run the installation at night or during the day.

open-ended deployment

A deployment with no end or expiration date; one that runs continuously, checking whether the computers on a network comply.

operator

A person who uses the BigFix WebUI, or portions of the BigFix console.

P

patch

A piece of code added to vendor software to fix a problem, as an immediate solution that is provided to users between two releases.

patch category
A description of a patch's type and general area of operation, for example, a bug fix or a service pack.

**patch severity**

The level of risk imposed by a network threat or vulnerability and, by extension, the importance of applying its patch.

**R**

**relay**

A client that is running special server software. Relays spare the server and the network by minimizing direct server-client downloads and by compressing upstream data.

**Relevance**

BigFix query language that is used to determine the applicability of a piece of content to a specified endpoint. Relevance asks yes or no questions and evaluates the results. The result of a Relevance query determines whether an action can or should be applied. Relevance is paired with Action Script in Fixlets.

**S**

**SCAP**

See Security Content Automation Protocol *(on page 61).*

**SCAP check**

A specific configuration check within a Security Content Automation Protocol (SCAP) checklist. Checks are written in XCCDF and are required to include SCAP enumerations and mappings per the SCAP template.

**SCAP checklist**

A configuration checklist that is written in a machine-readable language (XCCDF). Security Content Automation Protocol (SCAP) checklists have been
submitted to and accepted by the NIST National Checklist Program. They also conform to a SCAP template to ensure compatibility with SCAP products and services.

**SCAP content**

A repository that consists of security checklist data represented in automated XML formats, vulnerability and product name related enumerations, and mappings between the enumerations.

**SCAP enumeration**

A list of all known security related software flaws (CVEs), known software configuration issues (CCEs), and standard vendor and product names (CPEs).

**SCAP mapping**

The interrelationship of enumerations that provides standards-based impact measurements for software flaws and configuration issues.

**Security Content Automation Protocol (SCAP)**

A set of standards that is used to automate, measure, and manage vulnerability and compliance by the National Institute of Standards and Technology (NIST).

**server**

A software program or a computer that provides services to other software programs or other computers. See also client *(on page 52)*.

**signing password**

A password that is used by a console operator to sign an action for deployment.

**single deployment**

A type of deployment where a single action was deployed to one or more devices.

**site**

A collection of BigFix content. A site organizes similar content together.
site administrator

The person who is in charge of installing BigFix and authorizing and creating new console operators.

software package

A collection of Fixlets that install a software product on a device. Software packages are uploaded to BigFix by an operator for distribution. A BigFix software package includes the installation files, Fixlets to install the files, and information about the package (metadata).

SQL Server

A full-scale database engine from Microsoft that can be acquired and installed into the BigFix system to satisfy more than the basic reporting and data storage needs.

standard deployment

A deployment of BigFix that applies to workgroups and to enterprises with a single administrative domain. It is intended for a setting in which all Client computers have direct access to a single internal server.

statistically targeted

Pertaining to the method used to target a deployment to a device or piece of content. Statically targeted devices are selected manually by an operator.

superseded patch

A type of patch that notifies an operator when an earlier version of a patch has been replaced by a later version. This occurs when a later patch updates the same files as an earlier one. Superseded patches flag vulnerabilities that can be remediated by a later patch. A superseded patch cannot be deployed.

system power state

A definition of the overall power consumption of a system. BigFix Power Management tracks four main power states Active, Idle, Standby or Hibernation, and Power Off.
target

To match content with devices in a deployment, either by selecting the content for deployment, or selecting the devices to receive content.

targeting

The method used to specify the endpoints in a deployment.

task

A type of Fixlet designed for re-use, for example, to perform an ongoing maintenance task.

UTC

See Coordinated Universal Time (on page 54).

virtual private network (VPN)

An extension of a company intranet over the existing framework of either a public or private network. A VPN ensures that the data that is sent between the two endpoints of its connection remains secure.

VPN

See virtual private network (on page 63).

vulnerability

A security exposure in an operating system, system software, or application software component.

Wake-from-Standby
A mode that allows an application to turn a computer on from standby mode during predefined times, without the need for Wake on LAN.

**Wake on LAN**

A technology that enables a user to remotely turn on systems for off-hours maintenance. A result of the Intel-IBM Advanced Manageability Alliance and part of the Wired for Management Baseline Specification, users of this technology can remotely turn on a server and control it across the network, thus saving time on automated software installations, upgrades, disk backups, and virus scans.

**WAN**

See *wide area network (on page 64)*.

**wide area network (WAN)**

A network that provides communication services among devices in a geographic area larger than that served by a local area network (LAN) or a metropolitan area network (MAN).
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