HPE Security ArcSight Logger

Software Version: 6.51

Logger Configuration and Tuning: Best Practices

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Support Web Site	https://softwaresupport.hpe.com
Protect 724 Community	https://community.saas.hpe.com/t5/ArcSight/ct-p/arcsight

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Introduction

This guide provides some best practices obtained from existing customers, field engineers, and ArcSight development and QA groups. It identifies and describes Logger configuration components that can influence its performance and provides recommendations for obtaining optimal performance on a Logger system.

The information in this guide applies to all HPE ArcSight (Logger) 6.51 appliance and software models, except where specifically noted.

Additional guidelines and instructions are included in the applicable sections of the Logger 6.51 Administrator's Guide, available from the ArcSight Product Documentation Community on Protect 724.

About Logger

Logger is a log management solution that is optimized for extremely high event throughput, efficient long-term storage, and rapid data analysis. Logger receives and stores events; supports search, retrieval, and reporting; and can optionally forward selected events.

Logger is built for fast event insertion and forwarding, and high performance search and analysis. However, when these activities occur simultaneously, Logger components compete for resources and can affect Logger's performance. Other factors that affect Logger performance include the network environment, the complexity of the functions you are performing, the Logger type, and how you have Logger configured.

Many factors can affect Logger's search speed and scan rate, as well. Factors include, among other things, the size of the data set to be searched, the complexity of the query, and whether the search is distributed across peers.

When deploying and configuring Logger or troubleshooting it to achieve optimum performance, follow the guidelines discussed in this guide. If you need additional guidance, contact HPE ArcSight Customer Support.

Chapter 1: Input and Output Components

The following sections discuss factors to consider and provide guidelines for configuring Logger input and output components.

Web Connections

Logger supports up to 250 simultaneous HTTPS connections. These connections can be from Web browsers connecting to the Logger Web UI, from connectors to SmartMessage receivers configured on the Logger, from API clients, and from peer Loggers.

To show both listening and established connections, including peer searches and SmartConnectors, run the following Linux command:

```
netstat –atlnp | grep <port>
```

where `<port>` is the port your users use to connect to the UI.

The established connections are the ones we are interested in. To get a count of the established connections to your Logger, run the following Linux command:

```
netstat -ntlap | grep 443 | grep httpd | grep ESTABLISHED | wc -l
```

Apache supports 250 simultaneous connections by default (as defined by the MaxClients value in the httpd.conf file). Logger's HTTPS connections are a subset of these. To determine the number of Apache processes currently running on your system, run the following Linux command:

```
ps aux |grep httpd
```

Connectors

Connectors send events to Logger and can vary greatly in their peak throughput. Simple connectors sending smaller events, such as Cisco PIX Syslog, typically have higher throughput than more complex connectors with larger events, such as Windows Unified Connector events.

Logger supports up to 250 simultaneous HTTPS connections. If you have a large number of connectors connecting individually to SmartMessage receivers on Logger, consider aggregating connectors. Refer to the *SmartConnector User's Guide* for information on aggregation.

To show all connected SmartConnectors:

Run a search like the following to list the SmartConnectors connecting to Logger.

```
...| top agentHostName
```

Receivers

Receivers listen for events. There is no imposed limit on the number or type of receivers, or the maximum throughput a receiver can handle. However, adding receivers may affect performance. HPE ArcSight recommends a maximum of 40 to 50 receivers, based on field observations. A high incoming event rate and large event size can affect the performance of a receiver. The recommended maximum total events per second (EPS) incoming rate is 15K. Additionally, the connectors that send events to the Logger may have limits on their throughput.

Use an individual receiver for each connector sending events to Logger, instead of using a single receiver for all connectors. This allows for better granularity in searches and the ability to monitor event flow for each receiver through alerts.

Do not reuse deleted receiver names when creating new receivers. If you do, when you search on the device, Logger uses the old device, and you will not be able to search on the new device.

As with other considerations related to scope, questions about how to configure receivers and how many connectors should send data to any given receiver, are best answered when taking the entire environment into consideration (data type, usage requirements, and so on). The HPE ArcSight Professional Services team can do full scoping of such scenarios. Contact your local HPE ArcSight Sales representative for more details.

To show all connected Receivers:

Run the following Linux command to list all the Receivers connecting to Logger.

```
sort logger_receiver.properties | grep enabled
```

Enabled Receivers are listed as "True."

Devices

A device is a named event source, comprising of an IP address or hostname of the event sender and the name of the receiver that receives the event. Therefore, a host or connector that sends events to two different receivers on the same Logger is recognized as two different devices.

Device Groups

Device groups classify events received from various devices. For example, device A and device B events could be stored in Device Group AB and device C events could be stored in Device Group C. There is no limit on the number of device groups on a Logger.

You can write storage rules that direct events from specific device groups to storage groups. Also, you can include device groups in queries to limit the data set that Logger must scan, thus resulting in faster searches.

Forwarders

Forwarders send events received on Logger to specific destinations such as ESM, other connectors, or other Loggers. Logger uses its onboard connector when forwarding events to ESM. You can forward all events, use out-of-box filters, or write queries to forward only specific events. You can forward events continuously in real-time or only forward events for a specified time range.

The rate at which a Forwarder forwards events depends on a number of factors including the number of forwarders, the size of the events, and the complexity of the query used to filter the events. Larger events and more complex queries can lower the events per second (EPS) out rate.

Logger running release version 6.51 without filters can forward between 10,000 and 16,000 EPS, depending upon the Forwarder type. TCP Forwarders have higher EPS rates than Forwarders using UTP or the onboard connector. Forwarding CEF events from Logger to a Syslog destination provides better throughput than forwarding to other destinations.

When filtering events for forwarding, Logger must evaluate each event against the query to determine whether to forward it to the destination. This slows down the forwarding rate. The more complex the query is, the slower the forwarding rate. (A complex query typically includes a number of Boolean expressions, such as a regular expression with multiple OR operators.)

Improving Forwarder Performance

The following guidelines can help optimize the forwarding rate.

When configuring forwarders:

- Reduce EPS in rate (into the receivers) through filtering and aggregation.
- Increase the cache for the forwarder to 10G. This will help prevent dropped events if the destination is down.

- Additional forwarders in Logger may increase EPS throughput. If you are using one forwarder, add a second one. Adding a second forwarder could increase the forwarding rate by 20-30%.
- Do not have more than five forwarders on a Logger. Even though each additional forwarder improves the forwarding rate, the relation is not proportional. In high EPS situations or situations where other resource-intensive features are running in parallel (alerts, reports, and several search operations) and the forwarding filter is complex, having too many forwarders may reduce performance because forwarders have to compete for the same Logger resources besides competing for the onboard connector for forwarding.
- Instead of an additional forwarder, consider adding another Logger to distribute the forwarding load.
- Ensure that the forwarder’s destination can keep up with the forwarded events. If it cannot, add another forwarding destination. For example, if an ArcSight Manager cannot keep up with the forwarded events, add another ArcSight Manager.
- To increase the outbound EPS limit if your forwarder has no filters, try adding a second logical ESM destination. This can help increase the limit but may have some performance impact on the Logger.
- To increase the forwarding rate to an ESM destination, create a secondary ESM destination with a secondary forwarder.
- To increase the outbound EPS limit for forwarders with filters, move the filtering operation from the Logger forwarder to the source connectors and devices. Doing so removes the need to filter events, and you can then forward all events.
- Whenever possible, avoid forwarding events across a wide-area network (WAN).

When forwarding to ESM:

- Disable event aggregation (from the ArcSight Manager).
- Make sure the "preserve raw events" is turned off for the connector (Logger's Forwarder connector in ESM). This is also set at the ESM destination.
- Disable real-time alerts on Logger and use rules/alerts within ESM instead.
- Disable basic aggregation for Logger's forwarding connector because it is resource intensive. Basic aggregation is set in the ArcSight Console.
- Disable DNS lookup on the Forwarder connector in ESM.
- Use one forwarder and apply a filter-out filter on the connector resource in ESM to exclude data that you do not want to forward.
- While adding additional forwarders can increase EPS throughput to ESM, configure only one ESM destination for each ESM server. Each additional ESM destination shares memory with all configured ESM destinations, which can cause contention and potential connector failure if oversubscribed. As a workaround, you can increase the Logger on-board connector from 256MB to 512MB from the ESM console, or logically separate the events into several active channels once they arrive to the ESM.
- When separating incoming filtered events on ESM, use Active Channel filters instead of creating multiple Active Channels on multiple incoming Logger connectors.

- Separate the events from the source connectors into two streams, each one of them going to a dedicated receiver. Use one stream for the events that need to be forwarded to ESM and the other stream for the events that do not need to be forwarded. Then, define a filter condition on the device or device group receiving the events from the first stream. Doing so enables you to configure an efficient filter condition.

When writing forwarder queries:

- Follow the guidelines for query performance and scan rate provided in "Improving Search Performance" on page 23 when writing queries for forwarders.
- When filtering events in Regular Expression queries, use the metadata query terms `_storageGroup` and `_deviceGroup`. Including storage groups in searches is more efficient than including device groups.
- Make queries as simple as possible. Simplify regex filters at the forwarders.
- Use Unified Query forwarders as much as possible. In most cases, Unified Query based forwarding is faster than Regular Expression based forwarding. Convert Regex filters to Unified filters where possible.
- If you want to forward all events that have the same data at the beginning or end of an event, anchor the regular expression in the forwarding filter for efficient filtering. For example, if you want to forward all events that start with “`CEF`,” use “`^CEF`” in the regular expression instead of “`CEF`” because “`^CEF`” will match the first three characters of the event, and if a match is found, the event will be forwarded. If you use “`CEF`” in the query, Logger will scan the entire event for the string “`CEF`.”

Chapter 2: Storage Components

The following sections discuss factors to consider and provide guidelines for configuring Logger storage components.

Storage Volume

Storage volume defines Logger's primary storage space. Although you can increase the size of an initially defined storage volume, follow these guidelines for optimal use of available storage space and expected performance.

Do not use NFS as primary storage. Although this setup is possible, HPE ArcSight does not recommend it due to sub-optimal performance and reliability. You can use NFS for Archive storage.

- You can increase the size of a Storage Volume, but you cannot decrease it. Each Logger model has a maximum allowed Storage Volume size.
- On a SAN Logger appliance, make sure that you allocate the maximum size logical unit number (LUN) during initial Logger setup. Logger cannot detect a resized LUN. Therefore, if you change the LUN size after it has been mounted on a Logger, Logger may not recognize the new size.

Storage Groups

Storage groups enable you to implement different retention policies. Therefore, data stored in one storage group can be held for longer or shorter time than another group.

> **Note:** The names of the Internal Storage Group and Default Storage Group cannot be modified. User-created storage groups can be renamed if necessary.

In many cases, storage group retention policies are dictated by compliance requirements, such as PCI. However, such requirements might not be met if the storage groups fill up, because the oldest events could be purged automatically to make room for incoming events, even if they are still within the retention period. Even though you set the Default Storage group to 365 days retention, you should not simply assume that all the data will still be there on day 365 in a growing environment. As your environment grows, it is important re-scope your requirements for receivers, forwarders, retention policies, number of Loggers, and so on, accordingly. The HPE ArcSight Professional Services team can do full scoping of such scenarios. Contact your sales representative for more details.

Storage Group Space

To ensure better control of storage group retention and disk space utilization, do not allow your storage group utilization to increase above 90%. As storage groups near 99% utilization, they start running out of disk space, which reduces the performance of searches due to increasing fragmentation.

> **Tip:** Configure alerts to notify the appropriate users when the Storage Group usage gets too high and defragment the database at those times. Additionally review your archive setup and retention policy, and confirm that it is set up correctly. For more information, see "Notifications" on page 14, "Disk Space and Database Fragmentation" on page 19, and the Logger Administrator's Guide.

Storage Rules

Storage rules direct events from specified device groups to specific storage groups. Use storage rules to direct events to the correct storage group. For example, you could set up storage rules to store events from specific sources in storage groups that have different retention periods. You can create up to 40 storage rules.

Chapter 3: Notifications

You can set up alerts to be triggered by specified events or event patterns and, optionally, to send notifications to previously configured destinations such as email addresses or SNMP servers. Logger provides two types of alerts, real-time alerts and saved search alerts.

Tip: Sending alerts via email is controlled by the SMTP server settings under System Administration. However, the Report Engine has its own SMTP server settings. For SMTP email functionality across Logger, be sure to configure it in both places.

The following sections discuss factors to consider and provide guidelines for configuring alerts on Logger.

Real-time Alerts

Alerts are triggered in real time. That is, when a specified number of matches occur within the specified threshold, an alert is immediately generated. Although any number of real-time alerts can be defined, a maximum of 25 real-time alerts can be enabled at one time. To enable an additional alert, you will need to disable a currently enabled alert.

Note: If you have the maximum number of alerts enabled, and the receiver EPS is higher than 30k, you may see some slow-down in the receiver EPS to prevent slower search times.

You can use preconfigured filters to specify event patterns when creating alerts.

Tip: Save a copy of a preconfigured filter and edit the copy to meet your business needs (or just write your own.) Refer to the Logger Administrator's Guide for more information.

The particular filters available depend on your Logger version and model, but may include:

- System Alert - Disk Space Below 10% (CEF format)
- System Alert - Root Partition Free Space Below 10% (CEF format)
- System Alert - Storage Group Usage Above 90% (CEF format)

Use the system filters for real-time alerts to quickly find and handle system or hardware issues. Create saved-search alerts for other things, such as log source alerts.

Real-time alerts can affect system performance, especially if many other resource-intensive features are running on Logger in parallel.

Saved Searches and Alerts

Scheduled Search/Alerts (saved search alerts) are triggered at scheduled intervals. That is, when a specified number of matches occur within the specified threshold, an alert is triggered at the next scheduled time interval. For example, if a saved search alert is set to trigger every hour when five matches occur in sixty seconds and if five matches occur between 12:05 PM to 12:06 PM, the alert will be triggered at 1:00 PM. Refer to the Logger Administrator's Guide for more information on alert triggers and notifications.

Although you can define any number of saved search alerts, a maximum of 50 can run concurrently. Contact support if you need to change this number.

To ensure system performance, a maximum of 200 alerts are allowed per saved search alert job. Therefore, if a saved search alert job triggers more than 200 alerts, only the first 200 alerts are sent out for that job iteration; the rest are not sent. Additionally, the job is aborted so it does not trigger more alerts for that iteration and the status for that job is marked "Failed" in the **Finished Tasks** tab (**Configuration | Scheduled Tasks > Finished Tasks**). The job runs as scheduled at the next scheduled interval and alerts are sent out until the maximum limit is reached.

When creating or editing a Scheduled Search or Alert, be sure to set the number of days after which to delete the file, so that old Saved Search files do not accumulate. This will help to conserve disk space. For more information, see "Disk Space and Database Fragmentation" on page 19.

Time Settings and Scheduled Tasks

Precise time stamping of events is critical for accurate and reliable log management. The times displayed for Logger operations such as searches, reports, and scheduled jobs are in the Logger's local time zone.

Follow these guidelines to ensure accuracy of time and optimal scheduled task handling:

- Use an NTP server instead of manually configuring time and date on your system.
- If your Logger is in a time zone that observes daylight saving time (DST), avoid scheduling tasks to run during the hour that is lost or gained at the start and end of DST. Scheduled operations such as reports, event archives, and file transfers are affected when system time is adjusted on the Logger at the start and end of the DST:
  - Operations scheduled for the hour lost at the start of DST (in early Spring) will not run on the day of time adjustment.
  - Operations scheduled for the hour gained at the end of the DST (in late Fall) will run at Standard time instead of the DST time.

To avoid confusing results when the system time zone is set to `/US/Pacific-New`, set the system time zone to a specific region, such as `/America/Los_Angeles`.

Chapter 5: Event Archives

Event archives enable you to save the events for any day in the past, not including the current day. When events are archived, index information for those events is not archived. Therefore, when event archives are loaded, indices are not available. As a result, a search query that runs on archived events that have been loaded on Logger is slower than when the data was not archived because the index data for the archived data is not available.

The primary function of event archives is to allow for long-term storage of events that are not stored locally on Logger (outside any storage group retention policy). An added advantage is that in the event of total data loss, such as in the case of appliance failure, any data that is archived will still be accessible over NFS/CIFS. This does not, however, fulfill the requirements for full disaster recovery because event archives do not contain indexes and therefore, searches and reports, run on archive data, will run much more slowly, possibly timing out. Refer to the Logger Administrator's Guide for information on how to increase the client time out and the database connection timeout.

For full disaster recovery planning, consider having multiple Loggers in a High Availability setup with events being dual-fed from the connectors. The HPE ArcSight Professional Services team can do a full scoping of such scenarios. Contact your local sales representative for more details.

Do not move archived files from versions earlier than Logger 5.1. If moved from their original location, archives from earlier versions cannot be loaded on to the Logger. If you need to delete the archives, use the Logger user interface to do so (**System Admin | Storage | Remote File Systems**). Any attempt to load or delete an old archive will look for the original remote archive location. If this was deleted it will need to be added back again with the same name, even if the archive itself was moved to another server.

Follow these guidelines for optimal performance when archiving events:

- Archive during off-peak hours.
- Only one manual archive job can run at a time. However, a scheduled archiving operation can run in parallel with a manual job.
- For a manual archive operation, do not archive too many days or storage groups worth of data at a time. If you have a large data set to archive, archive in smaller chunks to prevent a negative impact on Logger's performance.
- Combine daily scheduled event archiving with daily scheduled configuration backups. Without a daily configuration backup, event archives from the previous day will not be usable in the event of total data loss. In such scenarios, a restore of a previous configuration backup from an earlier week/month will only allow access to event archives up until that point.

Restoring Archives

Events are not copied back to local storage when event archives are loaded. Instead, a pointer to the archive is activated and it is included in queries.

When loading event archives that have been archived offline, but still have not been affected by the system's retention policy, Logger defaults to searching against the loaded archive instead of the same data that is local to Logger. This could have the affect of a much slower search, since event archives do not maintain their indexes unless the user has specifically indexed them.

Best practice is to unload any event archives for data that may still be local to the Logger.

> **Note:** Even though an archive has been created, you cannot load an archive for data that is still in current storage. That is, loading the archive will fail if that data has not already passed it's retention date and been aged out of current storage. Earlier Logger versions (release 6.0 and below) do allow you to load and search on an active Archive, but HPE does not recommend it.

While there is no limit to how many archives can be loaded, as the number of loaded archives increases, the size of the metadata table that tracks the data increases, which makes the queries slower. If you load a large number of archives, searches on the regular data may be slower. How much slower, depends on how much data is in the archives and also on how much regular indexed data is in the system.

> **Tip:** If you have a lot of archive material to restore, a freshly-installed Logger that has had a Configuration Backup applied may provide the fastest restoration. Remember to attach the same archive mount names to the new Logger.

Chapter 6: Disk Space and Database Fragmentation

Sufficient disk space on Logger is important for all functionality to work correctly. It is important to ensure that at least 50% of the root disk (/) is free for usage by the system as and when needed.

> **Note:** Do not confuse disk space usage under the root disk (/) with usage under `/opt/data` where events are stored. The area under `/opt/data` is always 100% full when pre-allocation is configured during initialization.

As the Logger database expands, more indexing is required and there are more events to scan. This can result in decreased search speed. To help maintain and improve search speed as your database grows, defragment the database annually. You should also run a defrag if you observe a slow-down or if you see a message in the UI or in the postgres log that recommends doing so.

> **Tip:** You can configure alerts to notify the appropriate users when the free space gets too low, and defragment the database at those times. See "Notifications" on page 14 and the Logger Administrator's Guide for more information.

Removing Old Files to Restore Disk Space

hprof Files

On Software Logger and Logger appliances that have SSH enabled, you can get back some disk space by removing old `hprof` files. You can find and remove the `xxx_yyy.hprof` files from the `/current/arcsight/logger/` directory.

Saved Searches

You can delete custom saved searches as well as old instances of the search output that have accumulated over time. You can delete published instances of a saved search or alert from the **Configuration | Search > Saved Search Files** page. You can delete an unnecessary saved search or alert itself from the **Configuration | Search > Scheduled Searches/Alerts** page.

Reports

You can delete custom reports as well as old instances of the report output that have accumulated over time. Please be certain that you want to remove these old reports, and do so carefully. You can delete published instances from the **List Published Outputs** page, accessed by right-clicking the report in the Report Explorer. You can delete an unnecessary report itself by using the right-click menu in the Report Explorer.

Chapter 7: Search

The following sections discuss factors to consider and provide guidelines for searching and search performance.

Exporting Search Results

Logger can return a maximum of 1M matching records for any search operation and export up to 1 million records from the search results. The performance of an export operation depends on the size of the search results data set. When a very large set of search results is exported, you may observe sub-optimal export performance. Alternatively, use the Logger API to run the search or report. To export more than one million records, run a report with the desired fields and save the result as CSV file.

Indexing

For faster searching, index all fields you use in queries. To see which fields will be indexed on your system, open the **Configuration | Search > Default Fields** page and look for the check mark in the **Indexed** column for the field.

About half of the Logger default fields have been indexed. Only index those additional fields (including custom fields) that are necessary for your environment. Indexing fields you don't need in your searches can degrade performance in certain situations. Once a field has been added to the index, you cannot remove it.

> **Tip:** Allow time between adding a field to the index and using it in the search query. If Logger is in the process of indexing a field and you use that field to run a search query, the search performance for that operation will be slower than expected.

Using the Lookup Search Operator

The lookup search operator enables you to augment data in Logger with data from an external file that you upload into Logger. After you upload a valid lookup file to Logger, you can use that lookup file in a search by using the lookup search operator.

Deleting Lookup Files

A lookup file is cleared from cache only after the search session using that file has timed out or terminated. It takes fifteen minutes for a search session to time out. If you try to delete a lookup file before the search session times out, you will get an error message indicating that the lookup file is in use and cannot be deleted. To terminate the search session and clear the file from the cache so that it can be deleted, run a search that does not use that lookup file in the same search window. This immediately terminates the search session that holds the lookup file. You should then be able to delete the lookup file.

Replacing Existing Lookup Files

Lookup files should be uploaded and deleted only through the Logger UI. If you log into the appliance or the computer that Software Logger is installed on and manually replace a lookup file, some summary information displayed in the lookup file UI page will be out of sync. This will cause the lookup search to not function properly.

Maximum Number of Lookup Entries

Maximum number of lookup entries is 5,000,000. Any lookup entries in excess of this number will be ignored. (A lookup entry is an individual, comma-separated value in the lookup file.) For example, if a lookup file has four columns and ten rows, the total number of lookup entries is 4x10=40. When such a lookup file is used in the search, all of its entries will be loaded into memory. The maximum number of rows loaded for lookup varies depending on the number of columns in the lookup file.

For example, if a lookup file contains 500 columns, the maximum number of rows allowed for lookup will be 5,000,000/500 = 10,000 rows, and any subsequent rows will not be used. On the other hand, if the table has only four columns, the maximum number rows allowed for lookup will be 5,000,000/4 = 1,250,000 rows.

Lookup Search Performance

In addition to the number of Lookup entries, Lookup Search performance depends on the same factors as other searches. Follow the advice provided in "Improving Search Performance" on the next page for fastest results.

Improving Search Performance

Many factors can affect search speed and scan rate. The amount of time a search requires depends on, among other things, the size of the data set to be searched, the complexity of the query, and whether the search is distributed across peers.

No two Loggers are the same. Even when the version, hardware model, platform, and configuration is the same, the data is different, and the load upon each system varies greatly from moment to moment, so there is no single "right" value for query or forwarding speed.

The following guidelines can help optimize search performance.

System Configuration and Data Organization

How you set up your environment and organize your data can affect search performance. For optimal performance:

- Have a fast network.
- Configure peer Loggers on the same subnet.
- Partition the data so that it can be searched in chunks rather than all at once.
  - Use peers to distribute the data.
  - Use storage groups to divide the data and then use these storage groups in your search.

    For example, if you are searching for events from a source, you can exclude the Internal Event Storage Group where all internally-generated ArcSight events are sent. However, if you have a storage group of only Windows events, then you can specify to only search that storage group and not any other storage groups. This will speed the search by eliminating places where Logger looks for events. For more information, see "The Size and Type of Events" on page 28.

High Event Input

When the event input is high, indexing can lag behind. As result, the search defaults to a slower non-indexed search.

> **Tip:** The Global Summary includes the date and time of the most recently indexed data. For a quick check to see if your index is up to date, compare the Global Summary date and time with the Logger system time, which is on the same page. The Global summary will say something like this: `There are 22,743 events indexed from 2015/03/12 20:15:01:546 EDT to 2015/03/13 17:05:16:375 EDT`. To determine the system time, hover over the timestamp in the upper right hand corner of the Logger Summary page. If the two timestamps are nearly equal, then Logger indexing is keeping up.

To avoid this issue, run a fixed-time search that does not include the last two minutes.

- If this is a recurring problem, make sure that your environment is sized correctly. The HPE ArcSight Professional Services team can do full scoping of such scenarios. Contact your local HPE ArcSight Sales representative for more details.
- On the Connector, turn aggregation on to lower the number of duplicate events. This will also lower the EPS rate.
- Use the Search Analyzer tool to determine if the fields used in your query are indexed. See the Logger Administrator's Guide for details.

Size and Distribution of Search Data

Restricting searches to specific storage groups or peers decreases the number of events to search because storage group or peer filter is applied before the query is executed. If there are fewer events to scan, as is usually the case when looking at a single storage group rather than all of them, the result returns more quickly.

Use metadata query terms `_storageGroup` and `_peerLogger` to limit the number of events that must be scanned.

> **Tip:** Including storage groups and peers in search queries is more efficient than including device groups. Use storage groups and peers in the query as much as possible, to reduce the amount of data searched.

- To limit the search to the Logger at `192.0.2.9`, use the following:

  ```
  _peerLogger IN ["192.0.2.9"]
  ```

- To limit the search to the default storage group, use the following:

  `_storageGroup IN ["Default Storage Group"]`

Search Time Frame

Searching against a longer time frame takes longer than searching against a shorter time frame, since there are more events to search. For faster results, limit the search to a shorter time frame.

Number of Events that Match the Search

Searches that result in a high number of matching events will be slower than searches with lower event match. For example, searches with more than 1 million matching events will be slower than search with few thousand matching events, since there will be fewer events to load in the memory.

- If the search results returns with large number of matches, modify the search query to make it more specific.

  For example,
  instead of: `authentication | where name CONTAINS "failure"`

  use the following:
  `authentication AND name CONTAINS "failure"`
- Use metadata query term `_deviceGroup` to reduce the result set to certain device groups for each search condition.

  For example,
  to limit the search to the smart device group on the Logger at `192.0.2.9`,

  use the following:
  `_deviceGroup IN ["192.0.2.9 [smart]"]`
- Where possible, write queries that take advantage of superindexes. For information on how to write super-indexed field queries optimally, including examples, refer to the topic “Searching for Rare Field Values” in the Logger Administrator’s Guide.

Regular Expressions Within Queries

Regular expressions do not utilize indexing, so queries containing regular expressions (and search operators that result in regular expression-type parsing, such as REX) can make search operations slow. To optimize search speed when using regular expressions in queries, make sure the data set that the regular expression needs to scan is small.

To control the data set:

- Precede the regular expression with a search term that reduces the data set size. For example, to extract the IP address from all events that contain the words "`telnet`" and "`failed`", use these words as the full-text search terms to reduce the data set that the following regular expression will need to scan:

  ```
  telnet failed|regex ="(\d{1,3}\.\d{1,3}\.\d{1,3}\.\d{1,3})"
  ```

- Use metadata such as device group, storage group, and peers instead of Boolean operators to filter events, where possible.

  > **Tip:** Including storage groups and peers in search queries is more efficient than including device groups. Use storage groups and peers in the query as much as possible, to reduce the amount of data searched.

- Specify an indexed structured search that reduces the data set size before using a regular expression query term.

Complexity of the Search Query

The search speed can vary depending on the query's complexity. Reduce the complexity of your queries where possible. Use simple operators like `replace` and `rename` and reduce the use of complex operators such as `rex`, `sort`, and `chart`.

Boolean Operators Within the Search

Search speed can vary depending on the search conditions used. A query that includes `OR` or `AND` operators takes longer to process. The `OR` operator is particularly resource intensive because it requires the regular expression to scan the text of each event multiple times. To determine if this is happening, reduce the number of `OR` and `AND` operators and run the searches again.

Using `AND` and `OR` with the `=` operator can be very powerful when searching super-indexed fields. However, to obtain the greatest search speed improvement, you must use them carefully. For information on how to write super-indexed field queries optimally, including examples, consult the Logger Administrator’s Guide.

Indexed Fields within the Search

Searches where all fields are indexed are faster than searches with non-indexed fields. Use queries where all fields are indexed as much as possible. A list of the default fields, along with their index status is available on the **Default Fields** tab (**Configuration | Search > Default Fields**).

- To speed up a non-indexed search, combine index field based search or full text search with non-indexed field search.

For example, the field `requestUrl` cannot be indexed. The query `"requestUrl CONTAINS "username""` would slow the search process. Instead, enter the following command, so the query is not slowed by the non-indexed field:

```
name = "TCP_MISS" | where requestUrl CONTAINS "username"
```

Even though a search query includes only indexed fields, you might not realize the performance gain you expect in these situations:

- When you perform search on data in a time range in which a currently indexed field (included in the query) was non-indexed, the query will run at the speed you would expect if the field was not indexed. This is because new indexing information is not applied to previously stored events.

  For example, you index the “port” field on August 13th at 2:00 PM. You run a search on August 14th at 1:00 PM. to find events that include port 80 and occurred between August 11th and August 12th. The “port” field was not indexed between August 11th and the 12th. As result, the search defaults to a slower, non-indexed search.
- When a query that includes indexed field is performed on archived events, the query runs slower than when the data was not archived. This occurs because the index data is not archived with events. As result, the search defaults to a slower non-indexed search.
- When you include a field in your search query that Logger is in the process of indexing, the query will run slowly. This issue is discussed in "High Event Input" on page 24.

Super-Indexed Fields within the Query

When you need to search for uncommon values in the following IP address, host name, and user name fields, take advantage of superindexing for faster search speeds. Superindexes rule out chunks of data from your search and return search results very quickly when there are few or no hits.

Fields With SuperIndexes

destinationAddress	destinationHostName	destinationPort
destinationUserId	destinationUserName	deviceAddress
deviceEventClassId	deviceHostName	deviceProduct
deviceVendor	sourceAddress	sourceHostName
sourcePort	sourceUserId	sourceUserName

For fastest searching on super-indexed fields, follow these guidelines:

- Use only the equal sign operator (=)
- Use the AND operator (AND) only with non-super-indexed fields

For more information on how to write super-indexed field queries optimally, including examples, consult the Logger Administrator’s Guide.

Concurrent Searches, Reports, and Forwarders

Searches, forwarders, and reports all use the same search engine. When there is a heavy load on the system, such as a high incoming EPS, forwarding with filtering, and multiple search and report operations going on in parallel, it will take longer to execute a query.

Spread resource-intensive tasks to off-peak hours as much as possible. Schedule searches and reports to run at a time when there is not much load on the system or reduce the load when your searches or reports need to run.

The Size and Type of Events

Searches against small size events, such as syslog (where the event size varies from 1K-1.5K) will be faster than events with larger size such as Blue Coat events (where the event size varies from 2.5K-4K). This behavior will be more noticeable when the search is a non-indexed search.

Logger Options that Affect Search

If the **Discovered Field** and **Summary Field** options are enabled, the system will try to populate these fields during the search, which can slow it. This becomes more noticeable when there is high event match. For faster results, disable these options.

Other options that might affect search speed include:

- **Secondary Delimiter Support**—Turn it off to improve performance (Configuration | Search > **Search Options**)
- **Source type support**—Use specific source types to improve performance.
- **Global Summary Persistence**—Defragment the table after upgrading to Logger release 5.3 SP1.

Other Factors that Can Affect Search Speed

- Logger version
- Appliance and model
- The number of events already in the system
- Ingestion rate (insertion rate)

Chapter 8: Peer Loggers

The following sections discuss factors to consider and provide guidelines for configuring and searching across peers. Refer to the Logger Administrator's Guide for the number of peers supported on your Logger release.

Authentication

For security reasons, HPE ArcSight recommends that you use authorization IDs to establish peer relationships.

- If the remote Logger is configured for SSL Client authentication (CAC), you must configure an authorization ID and code on the initiator Logger.
- If user name and password are used for authenticating to a remote peer Logger, the credentials are only used one time, during the peering relationship set up. After a relationship has been established, the credentials are not saved (on the Peer Loggers page) and the peers do not authenticate periodically. Therefore, if the user name or password used to establish a relationship is changed at a later date or the user name is deleted, peering relationship is not broken. However, if you delete the peering relationship or it breaks for other reasons, you will need to enter the updated credentials to re-establish the relationship.

Using the CEF Search Operator

With Logger versions 5.2 and later, you do not need to explicitly extract the CEF fields and then apply other search operators to those fields. The CEF operator is implicit. You can specify the event fields directly in queries.

For example, to find the top values in the message field,
instead of `...| cef message | top message`,

use the following:

```
...| top message
```

When you run a peer search, initiate queries that do not explicitly use the CEF operator from a Logger running version 5.2 or later. A query that does not use CEF defined fields will run if the query is initiated on a Logger running version 5.2 or later. However, if the query is initiated on a 5.1 or earlier Logger version (before CEF was deprecated), it will fail. For more information, see "Improving Search Performance" on page 23.

Improving Peer Search Performance

Searches done across peer Loggers are done locally on the peer rather than the Logger initiating the search. The following guidelines can help optimize the performance of peer searches.

When configuring peers:

- You can configure up to 100 peers for a Logger.
- If you set up a number of peers on a local network to horizontally scale out the system, be sure to configure them identically. For example, they must all have the same storage groups and search options.
- If you added custom schema fields to your Logger schema, those same fields must exist on all peers. Otherwise, a search query containing those fields will return an error when run across peers.
- The time and date of the system on which the software Logger is installed must be set correctly with respect to its time zone to peer with other Loggers. HPE ArcSight recommends that you configure the Logger system to synchronize its time with an NTP server regularly.

When running searches across peers:

- Follow the guidelines for query performance and scan rate provided in "Improving Search Performance" on page 23 when writing queries for searches across peers.
- Ensure that the device and storage groups specified in the query exist on all peers. Peers on which a device or storage group does not exist are skipped.
- Make sure that event fields on ALL peers are indexed for the time range specified in a query. If an event field is indexed on a local Logger but not on its peers for a specific time range, a distributed search will run at optimal speed on the local Logger, however will run slower on the peer Loggers. Therefore, the search performance in such a setup will be slow.
- For peers with different schema, make sure that your searches and reports only involve fields that have the same name and data type on all peers. Otherwise, the search or report will fail.
- When peers of mixed Logger versions are involved in the same search, the search features you can use are determined by capabilities of the peer with the earliest, and therefore most limited, version.

For example:

Earliest Peer Logger version	**Available search features include**	
6.3	• Significantly faster search speed • Lookup files • Search using IP address subnets • Super-indexed fields • Source types with parsers	• Custom schema • Histograms • Some search operators • Full text (keyword) search • Search heads
6.2	• Significantly faster search speed • Lookup files • Search using IP address subnets • Super-indexed fields • Source types with parsers	• Custom schema • Histograms • Some search operators • Full text (keyword) search
6.1	• Lookup files • Search using IP address subnets • Super-indexed fields • Source types with parsers	• Custom schema • Histograms • Some search operators • Full text (keyword) search
6.0	• Lookup files • Super-indexed fields • Source types with parsers • Custom schema	• Histograms • Some search operators • Full text (keyword) search
5.5	• Super-indexed fields • Source types with parsers • Custom schema	• Histograms • Some search operators • Full text (keyword) search
5.3	• Source types with parsers • Custom schema • Histograms	• Some search operators • Full text (keyword) search

For details of available capabilities, such as available search operators, refer to the release notes of the earliest peer Logger.

Using Search Heads

Chapter 9: Reports

Reports that must process very large data sets can be resource intensive. HPE ArcSight recommends running scheduled reports instead of on-demand reports whenever possible, so that most reports are run during periods of light load.

When isolating a user to a specific report or report folder, the report rights must include all associated rights to that report folder within its folder path.

For example, if report folder: **Anti-Virus** is the target report folder, you must also include the rights to report folder: **Device Monitoring**. Refer to the Logger *Administrator's Guide* for instructions.

When publishing a report, be sure to set the **Expires On** date so that old reports do not accumulate. This will help to conserve disk space. For more information, see "Disk Space and Database Fragmentation" on page 19.

The following sections discuss factors to consider and provide guidelines for reporting.

Improving Report Performance

The following guidelines can help optimize report performance.

When running reports:

- Run no more than 10 scheduled concurrent reports.
- Ensure that published reports and saved searches are kept ONLY for as long as required, especially when run ad-hoc, as they take up disk space resources. For example, running 10 reports that each generate 1 GB files will utilize 10 GB of space that could otherwise be used by the system.

  Low disk space in the following directories can be a result of large and potentially unnecessary (or unused) CSV exports and published reports.

  - On Appliances: `/root`
  - On Software Loggers: `$ARCSIGHT_HOME` (Software Logger installation path)

> **Tip:** When scheduling published reports, HPE ArcSight recommends that you change the retention period to 1 week after generation. To do this, use the following option on the **Add Report Job** page:
>
> Valid Upto *<N>* *<Unit of time>* After Generation

- Running large reports can take up a lot of space temporarily, which could cause the report to fail, if space is limited.

> **Tip:** Configure alerts to notify the appropriate users when the free space gets too low. For more information, see "Notifications" on page 14, "Disk Space and Database Fragmentation" on page 19, and the Logger Administrator's Guide.

- If your reports contain millions of events, contact Customer Support to increase the heap size.
- Specify a scan limit for reports run manually. The default scan limit is zero, which means all events. When you specify a scan limit, the latest *N* events are scanned. This results in faster report generation and is beneficial when you want to process only the latest events in the specified time range instead of all the events stored in Logger.
- In addition to the search fields, all fields displayed in the report should be indexed. In addition to the fields in the WHERE clause of the query, the fields in the SELECT clause also need to be indexed. A list of the default fields, along with their index status is available on the **Default Fields** tab (**Configuration | Search > Default Fields**).

When writing report queries:

- Follow the guidelines for query performance and scan rate provided in "Improving Search Performance" on page 23 when writing queries for reports.
- Use the where clause to specify conditions to narrow down your results, for example you could use queries like the following:
  `where <fieldName>="<value>"`
- Select specific fields, avoid patterns that will return too many hits.
  - Use queries like the following:
    `Select <fieldName1>, <fieldName2> … from events`
  - Avoid queries like the following:
    `Select * from events.`
  - For large reports, add a filter that specifies the fields of interest, such as the following, to the SQL before the sort and order condition:

    ```
    select events.arc_sourceAddress, events.arc_destinationAddress,
    events.arc_destinationPort,
    events.endTime
    from events where events.arc_destinationPort >22 and
    events.arc_categoryOutcome="/Failure" ;
    ```

- Avoid aggregation operations over large data sets.
- Avoid self-joins.
- Avoid sub-queries such as:
  `Select * from <tableName> where <fieldName> in (select ...)`
- Avoid using **order by** with a large amount of data, as that will take a long time. Limit the number of rows you want to order by.
  - Use queries like the following:
    `Select ... from <tableName> group by <fieldName> order by <fieldName>`
  - Avoid queries like the following:
    `Select ... from <tableName> order by <fieldName>`
- Avoid sorting on entire fields that are very large, because that will use a lot of disk space. Use a substring of a field instead of the full length of the field if the substring is good enough.

  In the examples below, we use the **name** field, which is 512 characters long.
  - Use queries like the following:
    `SELECT * FROM <tableName> order by substr(name,1, 64) LIMIT 50;`
  - Avoid queries like the following:
    `SELECT * FROM <tableName> order by name LIMIT 50;`
- Avoid using **group by** unless it is necessary. Change the query to order by a short field instead of a long one. (**group by** also uses the same fields as **order by**.)
  - Limit the number of rows to sort. Use queries like the following:

    ```
    Select ... from <tableName> group by <fieldName> order by <fieldName>or
    Select ... from <tableName> where <fieldName>= ... group by <fieldName>
    order by <fieldName>
    ```
  - Avoid queries like the following:
    `Select ... from <tableName> order by <fieldName>`
  - Avoid using **order by** directly on the event table. Use queries like the following:
    `Select ... from <tableName> where <fieldName> =... order by <fieldName>`

Report Timeout Settings

If your report is timing out, you can increase the `DATABASE_TIMEOUT` and the `HTML_VIEWER_TIMEOUT`. However, increasing the Report Timeout above the default setting of four hours puts additional load on the system, because spacing out of reports over any given day becomes more difficult, particularly since manual reports and searches compete for resources. Refer to the Logger Administrator’s Guide for information about time-outs that can affect long-running reports.

Although you can increase the default timeout settings for scheduled reports, HPE ArcSight recommends that you optimize the report query instead.

For example, if you do not need all the events or too many will be returned, you can get a sample by using a scan limit. When you specify a scan limit, the latest *N* events are scanned. The default scan limit is zero, which means all events.

You can also add the following clause to the bottom of your query: `LIMIT` *N*, where *N* is the number of events.

Improving Performance of Distributed Reports

Distributed reports include matching events from the specified peers of the originating Logger.

Use the following guidelines to help optimize the performance of distributed reports:

- Avoid running a distributed report on a Wide Area Network (WAN) link.
- Avoid running more than three concurrent distributed reports.
- When writing queries for distributed reports, follow the guidelines for query performance and scan rate provided in "Improving Search Performance" on page 23.
- If you are running the report on a very large data set and the performance of the report is not optimal, reduce the size of the data set.
- All Loggers on which you are running the distributed report must be running Logger 5.2 or later.
- Use pushed functions in `WHERE` clauses. SQL functions that are pushed to peers include:
  - String functions:

    ```
    char_length, char, concat, insert, lcase, left, length, locate, lpad,
    ltrim, replace, right, rpad, rtrim, strcmp, substr, trim, ucase
    ```
  - Numeric functions:

    ```
    abs, ceiling, floor, round, sign, truncate
    ```
  - Date/time functions:

    ```
    cast, dayofmonth, hour, minute, month, second, str_to_date, time_to_sec,
    unix_timestamp, year
    ```

iPackager Report Backup

Although the iPackager utility is primarily to allow quick distribution of reports to multiple Loggers, it can be used as a report backup tool. You can package all or selected reports and report objects residing on a Logger. This package can be later imported on a different Logger installation at any time.

When writing reports for export to other systems, use the default group, and device-independent syntax, so the system content will not be overwritten and the report will run on other systems after distribution.

Chapter 10: System Administration

The following sections discuss factors to consider and provide guidelines for Logger System Administration.

Note: A Logger Appliance with a failed hard drive will display a warning message. HPEArcSight strongly recommends that you contact support immediately to get the drive replaced.

Authentication

If you are using LDAP or RADIUS authentication, HPE ArcSight strongly recommends configuring a backup LDAP/RADIUS server to help ensure uninterrupted access to Logger.

Network Interface Cards (NICs)

When setting the IP addresses for the Network Interface Cards (NICs), hostname, and default gateway for your system, make sure that your Domain Name Service (DNS) can resolve the host name you specify to your system's IP address. Performance is significantly affected if the DNS cannot resolve the host name. The **Hostname** in the Certificate Signing Request (CSR) must be the same as the system host name.

User Groups and Search Group Filters

Implementing Logger users and groups to view only specific events can have performance implications, depending on the filters used to determine the events that the users can see.

- Use indexed search queries (Unified Queries) as much as possible. In most cases, unified query-based searches are faster than regex-based searches.
- To filter events in regular expression queries, use metadata instead of Boolean operators as much as possible. Including storage groups and peers in searches is more efficient than including device groups. Use storage groups in the query as much as possible, to reduce the amount of data searched.

System Health

To monitor Logger's health and performance, review the system health events by using Simple Network Management Protocol (SNMP) or Logger search. For more information, see "Notifications" on page 14 and the Logger Administrator's Guide.

Chapter 11: Web Services

The Logger Service Layer exposes Logger functionalities as Web services. By consuming the exposed Web services, you can integrate Logger functionality in your own applications. Using the Web service APIs, you can create programs that execute searches on stored Logger events or run Logger reports, and feed them back to your third-party system.

Using Special Characters in Regex Queries

To run queries such as `|regex ","` (or other special characters) when doing a Logger search, turn on base64 encoding on the Logger side and use base64 decoding on the client side.

To turn on base64 encoding on the Logger side:

Add the following line to the `/userdata/logger/user/logger/logger.properties` file and the `/userdata/logger/user/logger/logger_webservices.properties` file. (Create this file if it does not exist.)

```
api.search.base64encode=true
```

To use base64 decoding on the client side:

Add the base64 decoding as shown in the highlighted location in the `runSearch()` method of the Web service client:

```
Tuple[] tuples = searchService.getNextTuples(...);
        for (Tuple tuple : tuples) {
             String[] arr = tuple.getData();
             for(int j=0; j< header.length; j++){
                    arr[j] = new String(Base64.decode(arr[j]));
// <= Add this line to decode the received string using base 64.
                 }
        }
```

Chapter 12: Logger on Logger

Logger has several features that you can use to get more information about how Logger is doing and how it is being used.

Calculating Logger Raw Events Size and Compression

To see usage data on your Logger, log into the Logger UI and open **Configuration | Advanced > Data Volume**.)

You can use agent events statistics to determine events size and event count for the data collected from Smart Connectors. You need to collect data for at least 24 hours (or more) to determine the daily data usage and the average raw events.

The compression rate can vary depending on several factors, such as the following:

- The size of events
- The type of events
- The uniqueness of fields in the events
- The EPS rate

Because of these and other variables, it is hard to predict the compression rate. The value differs from Logger to Logger. Based on what we have seen, the average compression rate ranges from 8-10x.

Average Raw Event Size for Licensing

To calculate the daily data for the raw events, you can use the event information generated from the Smart Connector (`deviceEventClassId =agent:050`).

Use the following fields:

- **deviceCustomNumber3**: The number of non-internal events seen by this component since the last internal event.
- **deviceCustomString4**: The number of characters in the raw events in the non-internal events seen by this component since the last internal event.

To calculate the daily data for raw events:

Log into the Logger UI and open **Reports > New Query**. Save the following query. Then create and run a new report with the new query.

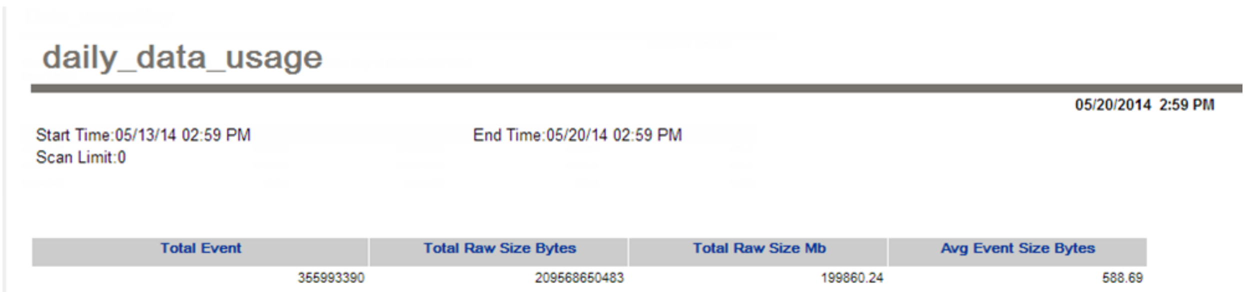
```
select sum(events.arc_deviceCustomNumber3) as "Total_event", sum(events.arc_
deviceCustomString4) as "Total_raw_size_bytes",

sum((events.arc_deviceCustomString4)/1048576) as "Total_raw_size_MB",

(sum(events.arc_deviceCustomString4)/sum(events.arc_deviceCustomNumber3)) as
"avg_event_size_bytes"

from events

where events.arc_deviceEventClassId = 'agent:050'
```



daily_data_usage

05/20/2014 2:59 PM

Start Time:05/13/14 02:59 PM End Time:05/20/14 02:59 PM
Scan Limit:0

Total Event	Total Raw Size Bytes	Total Raw Size Mb	Avg Event Size Bytes
355993390	209568650483	199860.24	588.69

This daily_data_usage report covered a 24-hour period and got the average raw event size and total event count and data usage.

To get a list for events per day over time:

Login to the Logger UI and open **Reports > New Query**. Save the following query. Then create and run a new report with the new query:

```
select DATE_FORMAT(events.arc_deviceReceiptTime,"%Y-%m-%e") as "date",

sum(events.arc_deviceCustomNumber3) as "Total_event", sum(events.arc_
deviceCustomString4) as "Total_raw_size_bytes",

sum((events.arc_deviceCustomString4)/1048576) as "Total_raw_size_MB",

(sum(events.arc_deviceCustomString4)/sum(events.arc_deviceCustomNumber3)) as
"avg_event_size_bytes"

from events

where events.arc_deviceEventClassId = 'agent:050'

group by date
```

Data_usage/day

05/21/2014 11:48 AM

Start Time:Tue May 13 00:00:00 PDT 2014   End Time:Wed May 14 23:59:59 PDT 2014
Scan Limit:0

Date	Total Event	Total Raw Size Bytes	Total Raw Size Mb	Avg Event Size Bytes
2014-05-13	72078051	37055875753	35339.24	514.11
2014-05-14	77129190	38341716456	36565.51	497.11
2014-05-15	471215	291094059	277.61	617.75

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Feedback on Logger Configuration and Tuning: Best Practices (Logger 6.51)

Just add your feedback to the email and click send.

If no email client is available, copy the information above to a new message in a web mail client, and send your feedback to arc-doc@hpe.com.

We appreciate your feedback!