

Cisco Data Collection Manager

The Cisco Data Collection Manager (DCM) feature provides a scalable data collection framework for collecting data from Cisco devices. The DCM supports a profile-based configuration that allows users to set parameters for collecting, processing, and exporting the data. The DCM also supports a flexible data process mechanism that allows users to derive information from raw data, and calculate baselines, summaries, statistical distribution, and percentiles. The integrated monitoring feature of DCM allows users to monitor multiple data sources, such as Simple Network Management Protocol (SNMP) MIB objects and **show** command output. The DCM supports the export of collected data based on transfer configurations through multiple data export mechanisms, such as FTP, TFTP, and Internet Protocol Flow Information Export (IPFIX).

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Information About Cisco Data Collection Manager

Cisco Data Collection Manager

Overview of Cisco Data Collection Manager

Cisco Data Collection Manager (DCM) is an efficient and reliable data collection agent that is embedded in managed devices, such as routers and switches. DCM works on a push model, which is based on a subscribe-and-notify data pattern, as opposed to the pull model, which is based on a request-and-response data pattern, in traditional SNMP-based network management.

Configuration and Deployment

The Bulkstat client application is implemented using the DCM core services to retrieve data and export it to the user. The Bulkstat client provides the only available user interface for DCM access. The client also provides CLI access through a new set of configuration commands and MIB access through the CISCO-DATA-COLLECTION-MIB. You can configure the data to be exported as a file. Also, you can configure the data to be processed and the processed file to be collected by the NMS.

Data Collection

The Data Collection Manager (DCM) provides data subscription services for multiple data sources, such as the Simple Network Management Protocol (SNMP) MIB objects and the output of **show** commands. The DCM allows you to configure the data that needs to be collected. The DCM also allows you to specify when and at what interval the data should be collected.

Data Processing

The Data Collection Manager (DCM) supports advanced on-board data processing that includes baseline calculation, summary calculation, statistical distribution, and percentile computation. The DCM is integrated with CISCO-EXPRESSION-MIB to externally create and customize MIB objects for monitoring and to support the CLI to define expressions.

Data Export and Retrieval

The Data Collection Manager (DCM) provides data retrieval management to ensure that the data collection does not impact device resources. The DCM can export data in a file format using multiple export protocols such as FTP, TFTP, Secure copy protocol (SCP), and Secure File Transfer Protocol (SFTP). The DCM provides a query mechanism with which data can be selectively exported based on the configured time interval and other selection criteria. The DCM application also provides data filtering services and exports the filtered data. You can also set primary and secondary destinations for exporting the collected data in a raw or processed format. Snapshots of the collected data can be stored for later retrieval.

Performance Management Solutions

The Data Collection Manager (DCM) can be used to manage various aspects of performance management. The following list provides a few scenarios.

Traffic Engineering

The primary goal of traffic engineering is to control traffic flow and provide Class of Service (CoS) and Quality of Service (QoS) to the end user, while using network resources optimally. It is the responsibility of the network management server (NMS) to provide low-level management through traffic conditioning, packet shaping, queue management, and other functions that regulate traffic flow through the network. The DCM can be used to collect data with a high granularity to help the NMS make dynamic traffic engineering decisions.

Capacity Planning and Trend Analysis

The key priorities for network operators today are acceleration in new service introduction, reduction in the complexity of deployment and management of services, and reduction in the capital or operational overhead expenditure. These services require unique capabilities that are specific to a particular network operator and the ability to provide specific service characteristics on a per-consumer basis. It is important to identify trends in the network traffic, forecast future traffic levels, assess whether the existing network capacity is sufficient to handle the projected load, and automatically redesign the network to support future traffic demands. The DCM can be used to collect resource variables that are important for effective capacity trend information, such as memory, queue depth, broadcast volume, buffer, Frame Relay congestion notification, and backplane utilization.

Diagnostics

The streaming function of the DCM can be used for real-time troubleshooting. Also, the DCM facilitates data retrieval for selective periods and aids in troubleshooting.

SLA Management

A service level agreement (SLA) includes a what-if analysis for network changes and application changes, baselining and trending for defined performance variables, exception management for defined capacity and performance variables, and QoS management. The DCM can be used to collect periodic data for reporting purposes.

Bulkstat

Two challenges that network providers usually face are data gathering and data analysis. Network providers need to gather large volumes of data to analyze the performance of the network and to have operational control over their network. Large service providers are strengthening their data gathering and analysis infrastructure. Traditionally, Simple Network Management Protocol (SNMP) agents are used to expose management data on managed systems. But, SNMP is not well suited for gathering large volumes of data, especially over short time intervals.

For example, service providers charge customers depending on the network usage. Also this data must be available on customer request. Accounting applications based on SNMP polling models consume significant network bandwidth because they poll large volumes of data frequently. The SNMP protocol data unit (PDU) is a complex data type specific to SNMP and is expensive to process because the SNMP objects and tables must be sorted in a lexicographic order. All the entries in SNMP MIB tables are lexicographically ordered by their object identifiers, because there is an implied ordering in the MIB based on the order of the object identifiers.

In such cases, the need to continuously poll large or bulk SNMP statistics can be avoided by using applications known as collectors to retrieve data.

The Bulkstat application is one such collector that uses the services of the Data Collection Manager (DCM) to provide the following functions:

- Collecting SNMP MIB object values and the output of **show** commands.
- Processing the collected data to create summary, percentiles, and auto-baselined values.
- Exporting collected data through simple file transfer.
- Scheduling calendar events for data collection and export.

The Bulkstat application provides command-line access through a set of new configuration commands and exclusive MIB access through CISCO-DATA-COLLECTION-MIB to collect SNMP data.

You can configure Bulkstat for the following functions:

- Specify the way Bulkstat retrieves bulk statistics.
- Specify the time interval in seconds at which Bulkstat transfers data to receivers.
- Specify the maximum size of the bulk statistics file.
- Specify the context, instance, and period at which the system retrieves bulk statistics.
- Configure file-related parameters.
- Configure the interface type on which you want to collect statistics.
- View the parameters that Bulkstat uses to collect statistics by using the **show bulkstat** commands.

Bulkstat Configuration Elements

The following list shows the elements that you can configure using the Bulkstat interface:

Data Set

This section describes the data set elements that you can configure to collect Simple Network Management Protocol (SNMP) data and CLI data. Only objects having the same index elements can be grouped in a single object list.

SNMP Data

The SNMP data set contains the following fields:

Table 1: SNMP Data Elements

Name	Description	Configuration Status
Objects	Specifies the object to be collected. Multiple objects can be configured to form a data set. The textual name of the object can be used for configuring an object. If the device does not recognize the textual name, the object identifier (OID) format can be used for configuring the name.	Mandatory
Object alias	Specifies the optional alias name that each object can have.	Optional



Note Only objects having the same index elements can be grouped in a single data set. For example, the objects *ifDescr* and *cieIfSpeedReceive* belong to different tables, but they are indexed by *ifIndex*. Hence the two objects can be grouped in the same data set. *ifDescr* and *entPhysicalDescr* cannot be grouped in the same data set, because *ifDescr* is indexed by *ifIndex* and *entPhysicalDescr* is indexed by *entPhysicalIndex*.

Objects from tables having sparse dependency can also be grouped in the same data set. Similar SNMP data elements can be linked to multiple subscriptions. Each subscription can collect different entries for the objects based on the instance configuration and context configuration.

CLI Data

The CLI data set contains the following fields:

Table 2: CLI Data Elements

Name	Description	Configuration Status	
CLI	Specifies the CLI command for which the **show** output needs to be collected. More than one CLI can be specified in the same data set.	Mandatory	

Instance Set

This section specifies the instance set elements that you can configure to collect Simple Network Management Protocol (SNMP) data. More than one instance of the same type can be added to the set. Combinations of types of instance set elements are not supported.

The SNMP Instance set contains the following fields:

Table 3: SNMP Instance Elements

Name	Description	Configuration Status
Exact	Specifies the instance for which the data should be collected. More than one instance can be specified, but only fully qualified instances should be specified.	Optional
Wildcard	Specifies all instances for all objects under the object configured in the data set.	Optional
Range	Specifies the start and end instances. All instances within the range, including the start and end, are collected, but only fully qualified instances should be specified.	Optional
Repetition	Specifies the start of the repetition and the number of repetitions. All instances from the start until the number of repetitions within the subtree are collected.	Optional
Interface	Specifies the interface instead of the index. The *ifIndex* assigned to the interface will be used as an index. This can be used for MIB objects indexed by *ifIndex*.	Optional

Filter Set

This section describes the filter configuration per object.

The filter set elements that you can configure to collect Simple Network Management Protocol (SNMP) data are described here. More than one filter of the same type can be added to the set.

Table 4: Filter Elements

Name	Description	Status
Object match	Specifies the value to be used to match against the value retrieved for the object during collection. The value provided needs to match the type of the object. If there is an error in the type matching, the configuration is not accepted. More than one value can be specified for an object, and more than one object can have matching values.	Optional

Process Set

For detailed information, see the topic “Data Processing.”

Data Group

This section describes the data group, which contains the data-group name, data-group type, data set, instance set, filter set, polling interval, SNMP context, and other processing options.

Table 5: Data Group Elements

Name	Description	Configuration Status
Data	Specifies any one of the data types as defined in the topic "Data Set."	Mandatory
Instance	Specifies any one of the instance types as defined in the topic "Instance Set."	Optional, if not specified. Default behavior of the instance set is wildcard. Only applicable for SNMP.
Filter	Specifies any one of the filter types as defined in the topic "Filter Set."	Optional, if not specified. Only applicable for SNMP.
Polling interval	Specifies the collection periodic interval in seconds. In case of recurring collection, the data is collected at the expiration of the collection interval until the collection is stopped.	Optional Default value is 600 seconds.
Context	Specifies the management context from which to obtain data for this data group.	Optional
Process summary	Enables summary processing of the data marked to be processed in the corresponding data-set configuration.	Optional
Process distribution	Enables distribution processing of the data marked to be processed in the corresponding data-set configuration.	Optional
Process percentile	Enables percentile processing of the data marked to be processed in the corresponding data-set configuration.	Optional
Process auto-baseline	Enables auto-baselining processing of the data marked to be processed in the corresponding data-set configuration. If auto-baseline process is enabled, the other processes, such as summary, distribution, and percentile configurations, if done previously, are removed because auto-baseline process uses these functionalities internally. **Note** Removing this configuration will not reinstate the other configurations that are removed.	Optional

Name	Description	Configuration Status
Discard raw	Specifies whether to store raw data. If data is processed, the user can choose to store only process data by setting the option.	Optional

Data Profile

This section describes the data profile that is used to group multiple data groups. This is done to simplify the configuration and to aggregate data of similar nature. A data profile can have multiple data groups. A data group can have constraints in the data specified in the element. If two sets of data need to be written to the same file, the respective data groups should be linked as part of a single profile.

The data profile has the following fields:

Table 6: Data Profile Elements

Name	Description	Status
Data groups	Specifies the data group to be linked to this profile. Multiple data groups can be linked to a single profile.	Mandatory before activating a profile
Transfer interval	Specifies the transfer periodic interval in seconds. In case of recurring transfer, the data is transferred when the transfer interval expires.	Optional Default interval transfer raw data is 1800.
Process interval	Specifies the process periodic interval in seconds. The data is processed during every collection interval as soon as it is collected. When the process interval expires, the processed data is written into a file and transferred.	Optional Default interval transfer processes data is 3600.
Primary URL	Specifies the URL of the primary management station. The files containing the collected data are transferred to this URL when the transfer interval expires.	Mandatory
Secondary URL	Specifies the URL of the secondary management station to be used in case the transfer to the primary management station fails.	Optional
Schema	Specifies the file data format. The schemaASCII option is supported.	Optional Default format is schemaAscii.

Name	Description	Status
Retry	Specifies the number of times that the transfer is retried in case of transfer failures to both primary and secondary management stations. This command has an effect only if the **retain** command is configured in the profile. The retry interval is computed by dividing the retention time by the number of retries. For example, if the file is retained for 60 minutes and the retry is 6 times, the transfer is attempted every 10 minutes, until the transfer succeeds or the file is removed.	Optional Default retry value is retry is 3.
Buffer-size	Specifies the maximum size to which the file containing the collected data can grow. When it reaches the limit, the file is closed and the transfer is attempted based on the transfer configuration associated with the data group or profile.	Optional
Retention memory	Specifies the time, in seconds, to retain the file in the memory.	Optional
Retention USB	Specifies the time, in seconds, to retain the file in the USB. This option is available only if the device supports the USB drive.	Optional

Resource Limit

The Bulkstat application allows you to configure memory resource limit in percentage. Bulkstat will deactivate all profiles if the remaining memory is less than specified limit.

By default, the resource limit is set at 95 percentage of the total available memory to accommodate for high memory usage on certain platforms.

Calendar Scheduling

The Bulkstat application allows you to schedule each subscription for collection. A subscription can be scheduled for one-time collection or periodic collection. A periodic subscription can be repeated infinitely or for a specified number of repetitions. A timer is instantiated for every activated subscription.

Table 7: Calendar Scheduling Elements

Name	Description	Configuration Status
One shot	Specifies that the data is collected for a specified collection interval.	Optional
Recurring	Specifies that the data is collected regularly at the specified time, day, month, and for a specified collection interval.	Optional

Predefined Data Sets and Data Groups

In NG3K devices, a Simple Network Management Protocol (SNMP) MIB table having large number of objects will result in large number of lines of bulkstat configuration needed to collect these objects. For example, if the SNMP table contains 40 objects, then we need 41 lines of configuration for bulkstat data set, 2 lines for an instance set and a minimum of 3 lines for a data group. So, there would be a total of 46 lines of configuration

required to collect a SNMP table containing 40 objects. This can slow down the system as it takes a longer time to generate the output of Cisco IOS nonvolatile generation commands and results in a large output.

Configuring predefined data-sets and data-groups as required by the users is a solution for this issue as predefined configurations do not appear in the output of **show bulkstat** commands. The predefined data-sets, data-groups, and instance-sets would be present only if all the SNMP objects in the set are present in the SNMP table.



Note

- All predefined configuration names start with a prefix _pd_.
- You cannot create data-sets, data-groups, and instance-sets with the same prefix.
- The predefined configurations cannot be modified using CLI interface or using MIB.

Following is an example of predefined data-sets and data-groups:

- bulkstat data _pd_MobileStationDS type snmp
- bulkstat data _pd_MobileStationStatsDS type snmp
- bulkstat data _pd_ClientDS type snmp
- bulkstat data _pd_MobilityDS type snmp
- bulkstat data-group _pd_MobileStationDG
- bulkstat data-group _pd_MobileStationStatsDG
- bulkstat data-group _pd_ClientDG
- bulkstat data-group _pd_MobilityDG

Displaying Predefined Configurations

The following three commands are used to display the predefined data-sets and data-groups:

- **show bulkstat data-group**—Shows bulkstat data-group details.
- **show bulkstat pre-defined** —Shows all predefined configurations.
- **show bulkstat profile**—Shows bulkstat profile details.

SNMP Data Collection

The Data Collection Manager (DCM) is used to collect the Simple Network Management Protocol (SNMP) MIB Object data. This collection is supported through both Bulkstat CLI and CISCO-DATA-COLLECTION-MIB. This allows a network management server (NMS) application to configure a set of MIB objects and a set of instances whose values need to be collected on a periodic basis. You can configure the collected data to be periodically sent to the NMS through file export.

CLI Data Collection

You can configure the Data Collection Manager (DCM) module to collect **show** command output through the Bulkstat CLI. The DCM captures the raw **show** command output and periodically exports the data through the ASCII file format.

Data Processing

Data processing allows users to derive information from raw SNMP data, by calculating summaries and percentiles.

Service providers rely on monitored SNMP data to alert network management systems (NMSs) of changing network conditions. By periodically monitoring the device data and comparing it against a set of thresholds, the network can automatically alert the operators, thereby allowing efficient operations.

Summary

You can enable summary processing on the collected object value and calculate minimum, maximum, and average values. A summary is calculated for only those objects that are marked as process capable in the data group and uses the absolute or delta value as per the object configuration.

Distribution

You can enable distribution processing on the collected object value by specifying the object type, minimum value, maximum value, and the number of buckets to distribute the value. Based on the configuration, counters are maintained per bucket and are incremented whenever the data falls into a bucket range.

Percentile

You can enable percentile processing on the collected object value. A percentile is calculated on every process interval expiry. Distribution configuration is mandatory to enable percentile processing. Percentile computation is done assuming that the distribution is normal.

Auto-baseline

You can enable baseline processing on the collected object value. The baseline internally uses all summary, distribution, and percentile calculations to provide baseline values. You can configure either baseline processing or other forms of processing, such as summary, distribution, and percentile calculations.

The auto-baseline feature in DCM calculates the baseline values for variables of interest on the device and allows network management applications or network operators to retrieve the baseline values. The baseline values can be displayed in terms of percentiles or a median with standard deviation.

File Data Export

The file data export feature on the Data Collection Manager (DCM) exports the collected data based on the transfer configurations. Data can be exported in various formats, and Bulkstat files are one such format to collect data. The format in which the data is inserted into the file conforms to the schemaAscii format described in CISCO-DATA-COLLECTION-MIB and CISCO-BULK-FILE-MIB. The data sequence in which the data is stored is determined based on the sequence in which the data is received.

The Cisco File Transfer module is responsible for transferring the files as per the transfer configuration. This module interfaces with the Cisco IOS IFS module to transfer the file to the specified URL. A file can be retained in the device whether the transfer was a success or a failure.

File names are created using the following format:

- Raw data file name: <profile-name>_<host-name>_raw_<time when the file is created in "%y%m%d_%H%M%S%k">
- Processed data file name: <profile-name>_<host-name>_proc_<time when the file is created in "%y%m%d_%H%M%S%k">

How to Configure Cisco Data Collection Manager

Configuring an SNMP Bulkstat Data Set

The first step in configuring the Simple Network Management Protocol (SNMP) periodic data collection and transfer mechanism is to configure one or more data sets. A data set is used to group objects of similar types, based on the data source. The data set is defined outside of the data group. This external definition gives the user the flexibility to use the same data set across multiple data groups and to collect the output for different instances and different contexts.



Note All objects in an SNMP data set must be indexed by the same MIB index. However, the objects in the data set must not belong to the same MIB or the MIB table.

Perform this task to configure the SNMP Bulkstat data set.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **bulkstat data** *data-set-name* **type snmp**
4. **object** *oid* [**alias** *alias-name*]
5. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**bulkstat data** *data-set-name* **type snmp** **Example:** `Device(config)# bulkstat data interface-stats type snmp`	Defines an SNMP Bulkstat data set and enters SNMP bulk statistics data set configuration mode. The creation of an SNMP Bulkstat data set creates a row in the *cdcDGBaseObjectEntry* table in the SNMP MIB. **Note** As predefined data sets begin with an underscore, you cannot configure data sets starting with an underscore.

Step 4	**object** *oid* [**alias** *alias-name*]
	Example:
	`Device(config-bs-ds-snmp)# object 1.3.6.1.2.1.2.2.1.11`
	Example:
	`Device(config-bs-ds-snmp)# object ifDescr`
	Example:
	`Device(config-bs-ds-snmp)# object ifInOctets`
	Example:
	`Device(config-bs-ds-snmp)# object 1.3.6.1.2.1.2.2.1.10 alias ifInOctets`
	Example:
	`Device(config-bs-ds-snmp)# object 1.3.6.1.2.1.2.2.1.10 alias interfaceInBytes`
		Adds a MIB object to the SNMP Bulkstat data set. If the object is already present in the data set, this command replaces the old object configuration with the new configuration.
		• Repeat this command until all objects to be monitored are added to this list.

Step 5	**end** **Example:** `Device(config-bs-ds-snmp)# end`	Exits SNMP Bulkstat data set configuration mode and returns to privileged EXEC mode.

Configuring an SNMP BulkStat Instance Set

The Simple Network Management Protocol (SNMP) instance set specifies the instances for which the data should be collected. Each subscription can collect different entries for specified objects based on the instance configuration. While more than one instance of the same type can be added to the instance set, a combination of different types is not supported.

Perform this task to configure the SNMP Bulkstat instance set.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **bulkstat instance** *instance-set-name* **type snmp**
4. **exact oid** *oid*
5. **exact interface** *interface-id*
6. **wildcard**
7. **wildcard oid** *oid*
8. **wildcard interface** *interface-id*
9. **repetition oid** *oid* **max** *value*
10. **range start** *oid* **end** *oid*
11. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**bulkstat instance** *instance-set-name* **type snmp** **Example:** `Device(config)# bulkstat instance exact type snmp`	Defines an SNMP Bulkstat instance set and enters SNMP Bulkstat instance set configuration mode. The creation of an SNMP Bulkstat instance set creates a row in the *cdcDGInstanceEntry* table in the SNMP MIB. **Note** An instance created using this command can be linked to more than one data group. **Note** As predefined instance sets begin with an underscore, you cannot configure instance sets starting with an underscore.

Step 4	**exact oid** *oid*
	Example:
	`Device(config-bs-is-snmp)# exact oid 1.2.3`
	Example:
	`Device(config-bs-is-snmp)# exact oid 1`
		(Optional) Indicates that the specified instance, when appended to the object list, is the complete OID.

	Command or Action	Purpose
Step 5	**exact interface** *interface-id* **Example:** `Device(config-bs-is-snmp)# exact interface Gigabitethernet 0/0 sub-if`	(Optional) Specifies an interface name and number, for example interface Ethernet 0, instead of specifying the ifIndex OID for the interface.
Step 6	**wildcard** **Example:** `Device(config-bs-is-snmp)# wildcard`	(Optional) Specifies whether an object used for evaluating an expression is to be wildcarded during an event configuration.

Step 7	**wildcard oid** *oid*
	Example:
	`Device(config-bs-is-snmp)# wildcard oid 1.2.3`
	Example:
	`Device(config-bs-is-snmp)# wildcard oid 1`
		(Optional) Indicates that all subindices of the specified OID belong to this schema.

Step 8	**wildcard interface** *interface-id* **Example:** `Device(config-bs-is-snmp)# wildcard interface Gigabitethernet 0/0 sub-if`	(Optional) Specifies an interface name and number, for example interface Ethernet 0, instead of specifying the ifIndex OID for the interface.
Step 9	**repetition oid** *oid* **max** *value* **Example:** `Device(config-bs-is-snmp)# repetition oid 1.2.3.4 max 2000`	(Optional) Configures data collection to repeat *get-next* for the maximum number of instances starting from the specified *oid* instance.
Step 10	**range start** *oid* **end** *oid* **Example:** `Device(config-bs-is-snmp)# range start 1.2.3.4 end 1.2.3.6`	(Optional) Configures a range of instances for which the data is collected.
Step 11	**end** **Example:** `Device(config-bs-is-snmp)# end`	Exits SNMP Bulkstat instance set configuration mode and returns to privileged EXEC mode.

Configuring an SNMP BulkStat Filter Set

The Simple Network Management Protocol (SNMP) filter set specifies the filter configuration for every SNMP object.

Perform this task to configure the SNMP Bulkstat filter set.

SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **bulkstat filter** *filter-set-name*
4. **match** *object-name* {**eq** *line* | **start** *line* | **not** {**eq** *line* | **start** *line*}}
5. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**bulkstat filter** *filter-set-name* **Example:** `Device(config)# bulkstat filter ifType`	Defines an SNMP Bulkstat filter set and enters SNMP Bulkstat filter set configuration mode.

Step 4	**match** *object-name* {**eq** *line* | **start** *line* | **not** {**eq** *line* | **start** *line*}}
	Example:
	`Device(config-bs-fs)# match ifType eq 6767`
	Example:
	`Device(config-bs-fs)# match ifDescr start "Ethernet"`
	Example:
	`Device(config-bs-fs)# match ifType not eq 2`
		(Optional) Specifies a value to be used to match against the value retrieved for the object during collection.
		• More than one value can be specified for an object, and more than one object can have match values.
		• Enclose strings in quotes.

Step 5	**end** **Example:** `Device(config-bs-fs)# end`	Exits SNMP Bulkstat filter set configuration mode and returns to privileged EXEC mode.

Configuring a Command BulkStat Data Set

The command Bulkstat data set specifies the **show** commands for which the output is to be collected. You can specify more than one command in the same data set.

Perform this task to add **show** commands.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **bulkstat data** *data-set-name* **type command**
4. **add cmd** *command-line*
5. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**bulkstat data** *data-set-name* **type command** **Example:** `Device(config)# bulkstat data show-snmp type command`	Defines a command Bulkstat data set and enters command Bulkstat data set configuration mode. **Note** Data-sets of any type cannot be created with _pd_ prefix.

Step 4	**add cmd** *command-line*
	Example:
	`Device(config-bs-ds-cmd)# add cmd show snmp`
	Example:
	`Device(config-bs-ds-cmd)# add cmd show ip interface brief`
		Adds a **show** command for which the output needs to be collected.
		• Add as many **show** commands as needed to this list.

Step 5	**end** **Example:** `Device(config-bs-ds-cmd)# end`	Exits command Bulkstat data set configuration mode and returns to privileged EXEC mode.

Configuring a BulkStat Data Group

The Bulkstat data group element is used to group the data set, filter set, and instance set and also to specify the processing options.

Perform this task to configure the Bulkstat data group.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **bulkstat data-group** *data-group-name*
4. **collect type** {**command** | **snmp**} {{**data** *data-set-name* **filter** *filter-set-name*} | **instance** *instance-set-name*}
5. **context** *context-name*
6. **interval polling** *polling-interval*
7. **discard**
8. **process**
9. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**bulkstat data-group** *data-group-name* **Example:** `Device(config)# bulkstat data-group if-dg`	Defines a Bulkstat data group and enters Bulkstat data group configuration mode. • The creation of a Simple Network Management Protocol (SNMP) Bulkstat data group creates a row in the *cdcDGEntry* table in the SNMP MIB. **Note** Data-groups of any type cannot be created with _pd_ prefix.
Step 4	**collect type** {**command**	**snmp**} {{**data** *data-set-name* **filter** *filter-set-name*}	**instance** *instance-set-name*} **Example:**	

	Command or Action	Purpose

	The following example shows how to configure the Bulkstat to collect the output of the **show snmp** command with filter set.
	`Device(config-bs-dg)# collect type command data show-snmp filter Ethernet`
	Example:
	The following example shows how to configure the Bulkstat to collect SNMP objects.
	`Device(config-bs-dg)# collect type snmp data interface-stats instance ins-exact filter ifType`
	Example:
	The following example shows how to configure the Bulkstat to collect SNMP objects.
	`Device(config-bs-dg)# collect type snmp data User-Stats`
	Note
	When the instance set is not specified, the predefined default instance set, _pd_wildcardIS, will be used.	

Step 5	**context** *context-name* **Example:** `Device(config-bs-dg)# context ctx-name`	Specifies the management context from which to obtain data for this data group.
Step 6	**interval polling** *polling-interval* **Example:** `Device(config-bs-dg)# interval polling 100`	Specifies the collection periodic interval in seconds. In case of recurring collection, the data is collected at the expiration of the collection interval until the collection is stopped.
Step 7	**discard** **Example:** `Device(config-bs-dg)# discard`	Specifies whether to discard the raw data.
Step 8	**process** **Example:** `Device(config-bs-dg)# process`	Configures process-related parameters for a data group.
Step 9	**end** **Example:** `Device(config-bs-dg)# end`	Exits Bulkstat data group configuration mode and returns to privileged EXEC mode.

Configuring a Bulkstat Profile

The profile element is used to group multiple data groups. This grouping simplifies the configuration and aggregates data of a similar nature. If two sets of data need to be written to the same file, the respective data groups should be linked as part of a single profile.

Perform this task to configure the Bulkstat profile:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **bulkstat profile** *profile-name*
4. **data-group** { *data-group-name* | *pre-defined-data-group-name* [**interval polling** {*seconds*}]}
5. **interval transfer** {**process** | **raw** } {*seconds*}}
6. **file format schemaASCII**
7. **file retain** {**disk** *url* | **memory** *seconds*}
8. **file size** *bytes*
9. **file transfer** {**retry** *number* | **url** {**primary** *url* | **secondary** *url* }}
10. **enable**
11. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device > enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**bulkstat profile** *profile-name* **Example:** `Device(config)# bulkstat profile if-stats`	Creates a profile with the given name and enters Bulkstat profile configuration mode. If the profile is already created, this command sets the context for the existing profile.
Step 4	**data-group** { *data-group-name* | *pre-defined-data-group-name* [**interval polling** {*seconds*}]} **Example:** `Device(config-bs-profile)# data-group if-dg`	Specifies the data group to be linked to this profile. Multiple data groups can be linked to a single profile. Interval polling of pre-defined data-groups can be configured at the profile level, and this will modify interval polling of the actual pre-defined data-group.

	Command or Action	Purpose

Step 5	**interval transfer** {**process** | **raw** } {*seconds*}}
	Example:
	`Device(config-bs-profile)# interval transfer raw 100`
	Example:
	`Device(config-bs-profile)# interval transfer process 4000`
		Specifies the transfer periodic interval in seconds. In case of recurring transfer, the data is transferred at the expiration of the transfer interval until the transfer is stopped.
		• The **process** keyword specifies the process periodic interval in seconds. The data is processed during every collection interval as soon as it is collected. When the process interval expires, the processed data is written to a file and transferred.

Step 6	**file format schemaASCII** **Example:** `Device(config-bs-profile)# file format schemaASCII`	Configures the file-related parameter for a profile. • Specifies the file data format in schemaASCII.
Step 7	**file retain** {**disk** *url* | **memory** *seconds*} **Example:** `Device(config-bs-profile)# file retain memory 2000`	Configures the file-related parameter **retain**for a profile. • **disk**—Retains the file in the specified location in the disk for a specified amount of time in seconds. • **memory**—Retains the file in the memory for a specified amount of time in seconds.
Step 8	**file size** *bytes* **Example:** `Device(config-bs-profile)# file size 2048`	Configures the file-related parameter for a profile. • **size**—Specifies the maximum buffer size in bytes. When the limit is reached, the file is closed and transfer is attempted based on the transfer configuration associated with the data group or the profile.
Step 9	**file transfer** {**retry** *number* | **url** {**primary** *url* | **secondary** *url* }} **Example:** `Device(config-bs-profile)# file transfer url primary tftp://10.0.0.1/dcm/cpu-stats`	Configures the file related parameter **transfer** for a profile. • **primary**—Specifies the URL of the primary management station. The files containing the collected data are transferred to this URL when the transfer interval expires. • **secondary**—Specifies the URL to be used in case the transfer to the primary management station fails.
Step 10	**enable** **Example:** `Device(config-bs-profile)# enable`	Enables the profile for collection and transfer.
Step 11	**end** **Example:**	Exits Bulkstat data profile configuration mode and returns to privileged EXEC mode.

	Command or Action	Purpose
	`Device(config-bs-profile)# end`	

Configuring Bulkstat Calendar Scheduling

Perform this task to configure Bulkstat calendar scheduling.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **bulkstat schedule** *schedule-name* **at** *time-of-day* {*date* | *week* | *month date* {**oneshot** | **recurring**} | **oneshot** | **recurring**}
4. **profile** *profile-name* **start** {**oneshot** | **recurring** *number*}
5. **profile** *profile-name* **stop**
6. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device > enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**bulkstat schedule** *schedule-name* **at** *time-of-day* {*date* | *week* | *month date* {**oneshot** | **recurring**} | **oneshot** | **recurring**} **Example:** `Device(config)# bulkstat schedule mycal at 18:30 feb 05 oneshot`	Defines the Bulkstat calendar scheduler set and enters Bulkstat event scheduler configuration mode. **Note** Choose one of the options to configure the event scheduler. You can configure these options only in global configuration mode.
Step 4	**profile** *profile-name* **start** {**oneshot** | **recurring** *number*} **Example:** `R1(config-bs-schedule)# profile cpu-process start recurring 5`	Creates a profile and sets the condition to enable the profile for a one-time event or enables the profile for multiple events.

	Command or Action	Purpose
Step 5	**profile** *profile-name* **stop** **Example:** `R1(config-bs-schedule)# profile cpu-process stop`	Disables the profile.
Step 6	**end** **Example:** `Device(config-bs-schedule)# end`	Exits Bulkstat event scheduler configuration mode and returns to privileged EXEC mode.

Configuring a Bulkstat Resource Limit

Perform this task to configure memory resource limit in percentage of the total available memory.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **bulkstat resource limit memory** *memory-usage-percentage*
4. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**bulkstat resource limit memory** *memory-usage-percentage* **Example:** `Device(config)# bulkstat resource limit memory 45`	Defines the memory resource limit. **Note** To allow for high system memory usage on some platforms, the default resource limit is set to 95 percentage of the total available memory. The range is 20 to 100 percentage.

	Command or Action	Purpose
Step 4	**end** **Example:** `Device(config)# end`	Exits global configuration mode and returns to privileged EXEC mode.

Configuration Examples for Cisco Data Collection Manager

Example: Collecting Sorted CPU Processes

The following is sample output that shows the configuration tasks that you need to perform to collect data about the processes in the cpu in the device, such as a router or a switch in a sorted order. The polling interval is set for 300 seconds, while the interval at which the raw data is transferred is set at 1500 seconds.

```
Device> enable
Device# configure terminal
Device(config)# bulkstat data show-cpu type command
Device(config-bs-ds-cmd)# add cmd show processes cpu sorted
Device(config-bs-ds-cmd)# exit
Device(config)# bulkstat data-group show-cpu
Device(config-bs-dg)# collect type command data show-cpu
Device(config-bs-dg)# interval polling 300
Device(config-bs-dg)# process
Device(config-bs-dg-proc)# exit
Device(config-bs-dg)# exit
Device(config)# bulkstat profile show-cpu
Device(config-bs-profile)# data-group show-cpu
Device(config-bs-profile)# interval transfer raw 1500
Device(config-bs-profile)# enable
Device(config-bs-profile)# end
Device#
```

Example: Collecting SNMP Interface Statistics

The following shows the configuration steps that you need to perform to collect SNMP interface statistics for the specified interface, *Ethernet*. The polling interval is set at 30 seconds, while the interval at which the raw data is transferred is set at 60 seconds.

```
Device> enable
Device# configure terminal
Device(config)# bulkstat data if-mib type snmp
Device(config-bs-ds-snmp)# object ifDescr
Device(config-bs-ds-snmp)# object ifInOctets
Device(config-bs-ds-snmp)# object ifOutOctets
Device(config-bs-ds-snmp)# exit
Device(config)# bulkstat instance if-mib type snmp
Device(config-bs-is-snmp)# wildcard
Device(config-bs-ds-snmp)# exit
```

```
Device(config)# bulkstat filter if-mib
Device(config-bs-fs)# match ifDescr start "Ethernet"
Device(config-bs-fs)# exit
Device(config)# bulkstat data-group if-group
Device(config-bs-dg)# interval polling 30
Device(config-bs-dg)# collect type snmp data if-mib instance if-mib filter if-mib
Device(config-bs-dg)# exit
Device(config)# bulkstat profile snmp_profile
Device(config-bs-profile)# file transfer url primary tftp://10.64.68.12/dcm_data/
Device(config-bs-profile)# interval transfer raw 60
Device(config-bs-profile)# data-group if-group
Device(config-bs-profile)# enable
Device(config-bs-profile)# end
Device#
```

Example: Configuring the Processing Show Commands Output

The following shows the configuration steps that you need to perform and to display the result of the **show data-group** command:

```
Device> enable
Device# configure terminal
Device(config)# bulkstat data ds1 type snmp
Device(config-bs-ds-snmp)# object 1.3.6.1.2.1.2.2.1.16 alias ifOutOctets
Device(config-bs-ds-snmp)# object 1.3.6.1.2.1.2.2.1.10 alias ifInOctets
Device(config-bs-ds-snmp)# exit
Device(config)# bulkstat instance is1 type snmp
Device(config-bs-is-snmp)# wildcard
Device(config-bs-ds-snmp)# exit
Device(config)# bulkstat data-group dg1
Device(config-bs-dg)# collect type snmp data ds1 instance is1
Device(config-bs-dg)# interval polling 15
Device(config-bs-dg)# process
Device(config-bs-dg-proc)# enable percentile
Device(config-bs-dg-proc)# object 1.3.6.1.2.1.2.2.1.16 sample absolute
Device(config-bs-dg-proc-obj)# buckets 250
Device(config-bs-dg-proc-obj)# exit
Device(config-bs-dg-proc)# exit
Device(config-bs-dg)# exit
Device(config)# bulkstat profile profile1
Device(config-bs-profile)# data-group dg1
Device(config-bs-profile)# interval transfer process 1800
Device(config-bs-profile)# file size 1024000
Device(config-bs-profile)# enable
Device(config-bs-profile)# end
Device# show bulkstat data-group dg1 process summary

Data-Group dg1 Process data

Objectname       : 1.3.6.1.2.1.2.2.1.16

Number of samples: 4

Summary Data     :
Instance         Min     Max     Sum         Average
-------------------------------------------------------
436752384          11376     11376     45504     11376.000
436867072          11376     11376     45504     11376.000
436871168          11376     11376     45504     11376.000
```

```
436887552           11376     11376     45504     11376.000
436809728           11376     11376     45504     11376.000
436830208           11376     11376     45504     11376.000
436920320           11376     11376     45504     11376.000
436891648           11376     11376     45504     11376.000
436793344           11376     11376     45504     11376.000
436899840           11376     11376     45504     11376.000
436817920           11376     11376     45504     11376.000
436768768           11376     11376     45504     11376.000
436785152           11376     11376     45504     11376.000
436772864           11376     11376     45504     11376.000
436736000           11376     11376     45504     11376.000
436731904           11376     11376     45504     11376.000
436838400           11376     11376     45504     11376.000
436858880           11376     11376     45504     11376.000
436756480           11376     11376     45504     11376.000
436740096           11376     11376     45504     11376.000
436776960           11376     11376     45504     11376.000
436834304           11376     11376     45504     11376.000
436875264           11376     11376     45504     11376.000
436924416           11376     11376     45504     11376.000

Device# show bulkstat data-group dg1 process distribution

Data-Group dg1 Process data

Objectname       : 1.3.6.1.2.1.2.2.1.16

Number of samples: 9

Distribution Data:
* Buckets with no data are not shown

Instance      Number of   Range           Range
              buckets     start            end
-----------------------------------------------------------
436752384       250         0           4294967295

Bucket    Bucket          Bucket         Count
Index     Start           End
-----------------------------------------------------------
1         0.000        17179869.180        9

Instance     Number of     Range          Range
             buckets       start           end
-----------------------------------------------------------
436867072       250         0          4294967295

Bucket    Bucket         Bucket         Count
Index     Start          End
-----------------------------------------------------------
1         0.000        17179869.180        9

Device# show bulkstat data-group dg1 process percentile

Data-Group dg1 Process data

Objectname       : 1.3.6.1.2.1.2.2.1.16

Number of samples: 11


Percentile Data:
Instance         : 436752384
```

```
Percentile Values:
P[000.000] = 11376.000
P[000.130] = 11376.000
P[002.280] = 11376.000
P[015.870] = 11376.000
P[050.000] = 11376.000
P[084.130] = 11376.000
P[097.720] = 11376.000
P[099.870] = 11376.000
P[100.000] = 11376.000

Instance         : 436867072
Percentile Values:
P[000.000] = 11376.000
P[000.130] = 11376.000
P[002.280] = 11376.000
P[015.870] = 11376.000
P[050.000] = 11376.000
P[084.130] = 11376.000
P[097.720] = 11376.000
P[099.870] = 11376.000
P[100.000] = 11376.000

Instance         : 436871168
Percentile Values:
P[000.000] = 11376.000
P[000.130] = 11376.000
P[002.280] = 11376.000
P[015.870] = 11376.000
P[050.000] = 11376.000
P[084.130] = 11376.000
P[097.720] = 11376.000
P[099.870] = 11376.000
P[100.000] = 11376.000
```

Additional References for Cisco Data Collection Manager

Related Documents

Related Topic	Document Title
BSDCM commands: Complete command syntax, command mode, command history, defaults, usage guidelines, and examples	Cisco IOS BSDCM Command Reference
Periodic MIB data collection and transfer mechanism	*SNMP Configuration Guide*

Standards and RFCs

Standard/RFC	Title
IETF Standard	*Exporting MIB Variables using the IPFIX Protocol*
RFC 2982	*Distributed Management Expression MIB*

MIBs

MIB	MIBs Link
• CISCO-BULK-FILE-MIB • CISCO-DATA-COLLECTION-MIB • CISCO-PROCESS-MIB • Expression-MIB	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Cisco Data Collection Manager

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 8: Feature Information for Cisco Data Collection Manager

Feature Name	Releases	Feature Information
Cisco Data Collection Manager		DCM 2.0 provides users an option to collect management data from various sources (SNMP, CLI), optionally process the data (max, min, avg, and percentile), and export the collected/processed/summarized data in multiple export formats (ASCII file, IPFIX stream, and so on). DCM 2.0 replaces the traditional PULL (polling) model with a PUSH model for collection of management information.

Glossary

DATA GROUP—A collection of data set, instance set, filter set, and process set.

DATA SET—A collection of data-related configurations. A data set can be of multiple types: SNMP, command, and expression.

FILTER SET—A collection of filter-related configurations.

INSTANCE SET—A collection of instance-related configurations for SNMP.

PROCESS SET—A collection of data-processing-related configurations.

PROFILE—A collection of data group, transfer, and storage.

STORAGE—A collection of storage-related configurations.

TRANSFER—A collection of transfer-related configurations.