



cmlxsnmp: SNMP Metric Probe

CML00044-01

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1 Introduction

This manual describes both the probe `cmlxsnmp` and a helper utility `cmlxsnmp_generate`.

1.1 `cmlxsnmp`

The program `cmlxsnmp` is a software utility that extracts metric data using the Simple Network Management Protocol (SNMP). The data is fed to a `Serfboard` server for use in displaying a real time dashboard and stored for post processing analysis.

In order to process raw metrics from SNMP on the source platform and send them to `Serfboard` in the correct form `cmlxsnmp` needs to be configured. This is done through its command interface.

Simple Network Management Protocol (SNMP) is used in network management systems to monitor devices. It implements a set of standards for network management. This includes an Application Layer protocol, a database schema, and a set of data objects. Management data is exposed in the form of variables that describe the system configuration. These variables can be queried (and sometimes set) by managing applications.

`cmlxsnmp` reads the values of a list of object identifiers (OID) to be fetched from a specified SNMP host. Each OID is then formatted as a `Serfboard` metric and sent to a `Serfboard` server.

`cmlxsnmp` is described in detail in section 2 on page 4.

1.2 `cmlxsnmp_generate`

`cmlxsnmp_generate` is a command line software utility used to generate the required configuration files for a `Serfboard` server and the `cmlxsnmp` feeder to monitor the network interfaces for a machine.

`cmlxsnmp_generate` is described in detail in section 3 on page 18.

1.3 Further Reading

For `Serfboard` documentation please refer to the following manuals:

- `Serfboard Configuration Guide and Reference Version 1` [3]
- `Serfboard Instruments Guide and Reference Version 1` [4]
- `Serfboard Installation Guide and Reference Version 1` [5]

- Serfboard User Guide Version 1 [\[6\]](#)

2 cmlxsnmp

2.1 Synopsis

cmlxsnmp is invoked from the command line and if the ‘--help’ parameter is specified it will display all available parameters and their options if applicable. Below is the help display and following that is a description of each parameter.

```
Code Magus Limited SNMP probe V1.0: build 2011-01-06-08.58.57
[cmlxsnmp] $Id: cmlxsnmp.c,v 1.17 2010/11/25 07:13:57 janvlok Exp $
Copyright (c) 2009 by Code Magus Limited. All rights reserved.
[Contact: stephen@codemagus.com].
Usage: cmlxsnmp [OPTION...]
  -p, --port={60050|<port>}      Command interface port
  -c, --command=<command>        Command to pass to command process
  -v, --verbose                   Verbose output
  -t, --trace                     Trace message output

Help options:
  -?, --help                      Show this help message
  --usage                         Display brief usage message
```

Where:

- ‘-p|--port’ Specifies the command interface port for cmlxsnmp, If not specified it will default to 60050.
- ‘-c|--command’ Specifies a command to passed to the command interface.
- ‘-v|--verbose’ When specified, cmlxsnmp operates in a verbose manner.
- ‘-t|--trace’ When specified, cmlxsnmp writes all activity to stdout.

2.2 Invocation

When cmlxsnmp is invoked it starts a command interface through which the processing of the probe is configured and listens on a TCP/IP port (see invocation parameters in sub-section 2.1 on page 4) for connections. The command supplied as a parameter is presented directly to the command interface, followed by commands supplied through connections to the TCP/IP port, either interactively with a client like telnet or through cmlcmd [2].

Once configured the metrics and definitions may also be viewed or the cmlxsnmp environment dynamically reconfigured via further commands.

This following sub-sections describe the cmlxsnmp command interface and commands.

2.3 Command Interface

`cmlxsnmp` is configured from commands presented to its command interface. Input is either a single command or the name of a command file. Commands are explained in detail in the following sections. A command file is a text based file that consists of one or more commands, where each command is on a separate line. Typically a probe requires multiple commands to be effectively configured so commands are often written as a logical group in a command file. A command file name is validated using the library `cmdname` [7].

2.4 Command Elements

2.4.1 Comments

Comments are introduced by using a double minus (“--”) and continue up to the end of the current input line.

Examples:

```
-- This is an example of a command comment.
-- and is useful in documenting command files.
```

2.4.2 Reserved Words

Reserved words have a special meaning in terms of directing the parsing of commands. The reserved words are:

<code>add</code>	<code>group</code>	<code>parameter</code>	<code>udp</code>
<code>all</code>	<code>help</code>	<code>parameters</code>	<code>trace</code>
<code>available</code>	<code>inactive</code>	<code>probe</code>	<code>verbose</code>
<code>close</code>	<code>interval</code>	<code>server</code>	
<code>counter</code>	<code>log</code>	<code>set</code>	
<code>counters</code>	<code>metric</code>	<code>shutdown</code>	
<code>delete</code>	<code>msglevel</code>	<code>start</code>	
<code>delay</code>	<code>notset</code>	<code>stop</code>	
<code>display</code>	<code>open</code>	<code>switch</code>	
<code>exit</code>	<code>polling</code>	<code>title</code>	

2.4.3 Identifiers

Identifiers are case sensitive and start with a letter which can be followed by any number of letters, digits, decimal point ‘.’ or the under-score character.

Examples:

```
ifInOctets.1 router_metrics
```

2.4.4 Strings

Strings are:

- any sequence of characters (except double quotes and the newline character) enclosed by double quotes.
- any sequence of characters (except single quotes and the newline character) enclosed by single quotes.

Examples:

```
"GigabitEthernet0/0 In Octets"  
"ABC Company's Metric File"  
'$Revision: 1.16 $'
```

2.4.5 Integers

An integer consists of a nonempty sequence of decimal digits.

Examples:

```
1234  
0
```

2.4.6 Numbers

A number consists of a nonempty sequence of decimal digits that

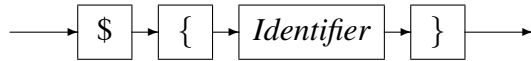
- possibly contains a radix character (decimal point '.').
- is optionally followed by a decimal exponent; consisting of an 'E' or 'e' followed by an optional plus or minus sign followed by a nonempty sequence of decimal digits that indicates multiplication by a power of 10.

Examples:

```
1234  
0.001  
1.2  
123.45E-12
```

2.4.7 Environment Variables

EnvironmentVariable



Environment variables are substituted by their value when encountered in command input text.

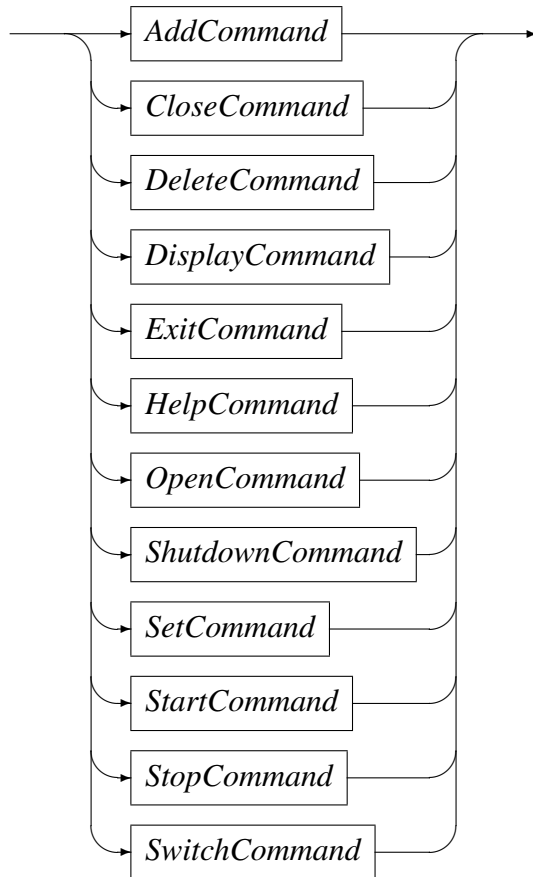
2.5 Syntax and Semantics

Input to the command processor is either:

- A *Comment*. The whole line is ignored by the command processor, see subsection [2.4.1](#) on page 5.
- A *Command*.
- A *Command File Name*. If the input is not a command, the command processor interprets the input as a command file name and, after validating it with `cmdname` [7], will attempt to open it and process each command within it.

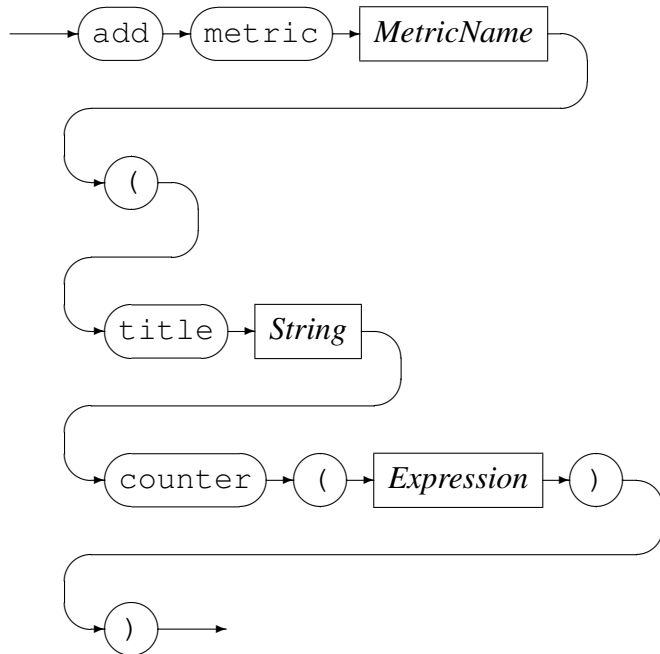
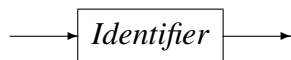
See appendix [A](#) on page 23 for an example of a `cmlxsnmp` command file.

command



2.5.1 Add Command

This command is used to add a definition of a metric to be extracted. It describes the binding of the specific formatted SNMP OID counters to a `Serfboard` metric.

AddCommand*MetricName*

MetricName is the name of the configured metric in the Serfboard server.

Expression is a regular arithmetic expression where the variables are SNMP OID counters.

Example

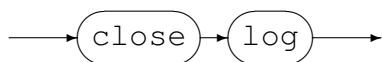
The Serfboard metric `InOctets` is the summation of the two SNMP OID counters (`ifInOctets.1` and `ifInOctets.2`) divided by a thousand:

```
SNMP example>add metric InOctets ( \
    title "Inoctets" \
    counter ((ifInOctets.1+ifInOctets.2)/1000) \
)
```

2.5.2 Close Command

This command is used to either:

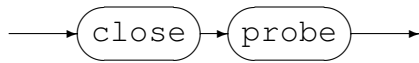
- Close an opened recording log:

**Example:**

Close the previous opened log:

```
SNMP example> close log
Log "text(example_probe.txt,mode=w)" closed, record count = 11
```

- Close the active probe:



Example:

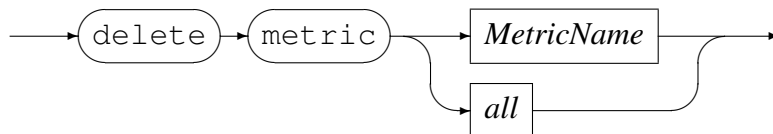
Close an opened probe:

```
SNMP example> close probe
SNMP example>
```

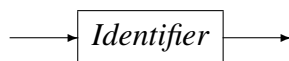
2.5.3 Delete Command

This command will delete the definition of a previously defined metric and can not be performed when a probe has been started. The metric data will no longer be extracted and sent to a Serfboard server when the probe is restarted.

DeleteCommand



MetricName



Example:

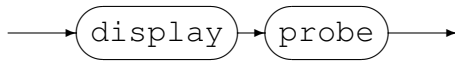
Delete Serfboard metric ifInOctets_2:

```
SNMP example> delete metric ifInOctets_2
Error: Probe is active - metric maintenance suspended!
SNMP example> stop probe
Probing stopped
SNMP example> delete metric ifInOctets_2
Metric ifInOctets_2 deleted
```

2.5.4 Display Command

This command is used to display various configuration settings:

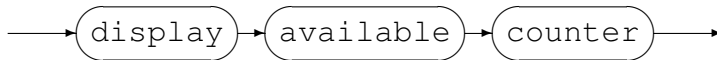
- Probe status:

**Example:**

```

SNMP example> display probe
Probe cmlxsnmp
  Required parameters: snmp_host
  Optional parameters: community snmp_port
  Status:             Idle
  Title:              "SNMP example"
  Group:              example
  Parameters:         'snmp_host="10.59.103.13",community=public'
  Polling Interval:  30
  Inactive delay:    18000
  Server:            phoenix:41000 Not Connected
  
```

- Available counters:

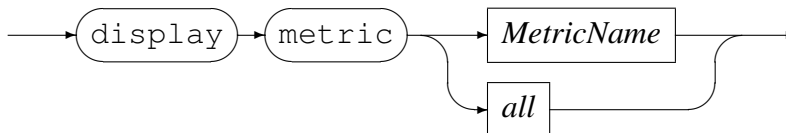


cmlxsnmp can not display the available OID counters, use the SNMP utility program snmpwalk to obtain them. When requesting the available counters, cmlxsnmp displays the command line for snmpwalk:

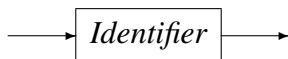
```

SNMP example> display available counters
Use snmpwalk to get the OID list:
  snmpwalk -Os -c public -v 1 10.59.103.13
  
```

- Display metrics:



MetricName

**Example:**

Display all the metrics that have been defined:

```

SNMP example> display metric all
metric ifInOctets
  (
    title "inOctets"
    counter ((ifInOctets.1+ifInOctets.2)/1000)  )
  )
metric ifInOctets_1
  (
  
```

```

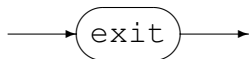
        title "Interface 1"
        counter (ifInOctets.1)      )
    )
metric ifOutOctets_1
(
    title "Interface 1"
    counter (ifOutOctets.1)      )
)
metric ifInOctets_2
(
    title "Interface 2"
    counter (ifInOctets.2)      )
)
metric ifOutOctets_2
(
    title "Interface 2"
    counter (ifOutOctets.2)      )
)

```

2.5.5 Exit Command

This command terminates an interactive session to the command interface of `cmlxsnmp` and disconnects the client from the TCP/IP port.

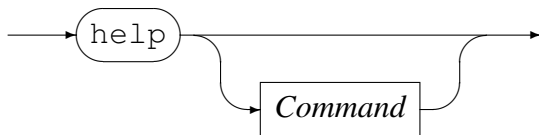
ExitCommand



2.5.6 Help Command

Help on `cmlxsnmp` commands.

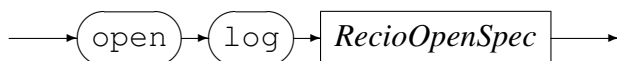
HelpCommand



2.5.7 Open Command

This command is used to either

- Open a log file for recoding the metrics sent to Serfboard.



RecioOpenSpec

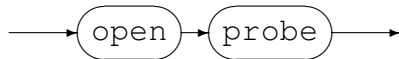
RecioOpenSpec is a `recio [1]` open specification string.

Example:

Open a log file for recording the metrics. The two environment variables will be expanded to the current date and time respectively.

```
SNMP example> open log \
    "text(example_probe_D${DATE_YYMMDD}_T${TIME_HHMMSS}).txt.txt,mode=w"
Log "text(example_probe_D101210_T103857.txt.txt,mode=w)" opened
```

- Initialise the probe:

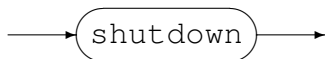
**Example:**

Initialise the probe by opening it:

```
SNMP example> open probe
CML SNMP probe initialised
```

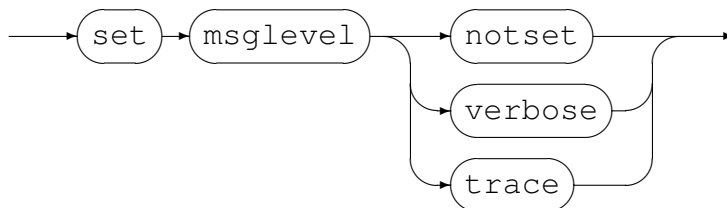
2.5.8 Shutdown Command

This command terminates `cmlxsnmp`.

ShutdownCommand**2.5.9 Set Command**

This command is use to set the internal variables and parameters of `cmlxsnmp`. If the `set` command results in changing an internal variable or a parameter the response to the `set` command is to display the probe status. The following can be set:

- Set the level of diagnostics produced by `cmlxsnmp`:

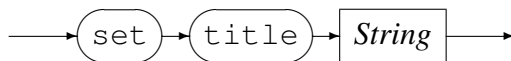


Example:

Reset the level to not produce diagnostic messages:

```
SNMP example> set msglevel notset
SNMP example>
```

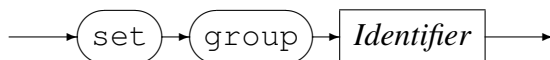
- Set the title for `cmlxsnmp`, this is used for the prompt of the command interface:

**Example:**

Set the title of the probe to "SNMP example":

```
SNMP oid counters> set title "SNMP example"
Probe cmlxsnmp
  Required parameters: snmp_host
  Optional parameters: community snmp_port
  Status:             Initialised
  Title:              "SNMP example"
  Group:              cmlxsnmp
  Parameters:         ''
  Polling Interval:  30
  Inactive delay:    18000
  Server:            Not specified
SNMP example>
```

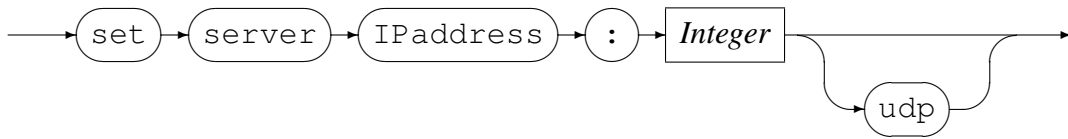
- Set the Serfboard group name:

**Example:**

Set the Serfboard group name to example:

```
SNMP example> set group example
Probe cmlxsnmp
  Required parameters: snmp_host
  Optional parameters: community snmp_port
  Status:             Initialised
  Title:              "SNMP example"
  Group:              example
  Parameters:         ''
  Polling Interval:  30
  Inactive delay:    18000
  Server:            Not specified
SNMP example>
```

- Set the host address of the Serfboard server to which the metrics are sent:



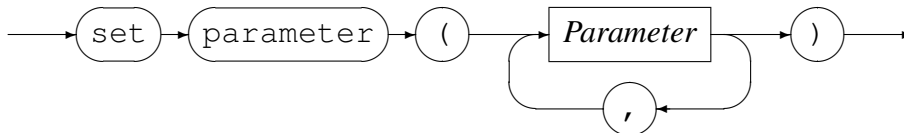
IPAddress can be specified as a host name or by using the Internet notation of dots and numbers. The default connection is TCP/IP, but if *udp* is specified, UDP will be used, a connectionless transport without guarantee of delivery.

Example:

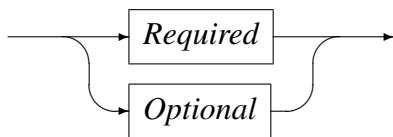
Set the host address of the Serfboard server to `codemagus.it.nednet.co.za`, listening on port 41000 and use UDP :

```
SNMP example> set server codemagus.it.nednet.co.za:41000 UDP
Probe cmlxsnmp
  Required parameters: snmp_host
  Optional parameters: community snmp_port
  Status:             Initialised
  Title:              "SNMP example"
  Group:              example
  Parameters:         'snmp_host="10.59.103.13",community=public'
  Polling Interval:  30
  Inactive delay:    18000
  Server:            codemagus.it.nednet.co.za:41000 UDP Not Connected
```

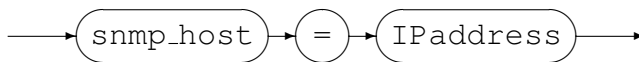
- Set the SNMP probe parameters:



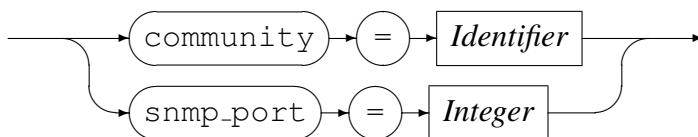
Parameter



Required



Optional



IPAddress can be specified as a host name or by using the Internet notation of

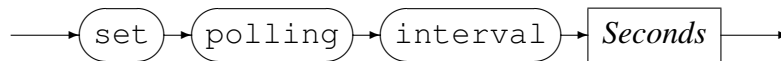
dots and numbers. `snmp_port`, if provided, overrides the default SNMP port. `community` is the SNMP community string required with any SNMP access; it is often the string `public`.

Example:

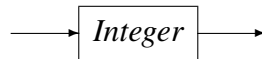
Set the parameters for SNMP host to "10.59.103.13" and the community to public.

```
SNMP example> set parameter(snmp_host="10.59.103.13",community=public)
Probe cmlxsnmp
  Required parameters: snmp_host
  Optional parameters: community snmp_port
  Status:              Initialised
  Title:               "SNMP example"
  Group:              example
  Parameters:         'snmp_host="10.59.103.13",community=public'
  Polling Interval:   30
  Inactive delay:     18000
  Server:             codemagus.it.nednet.co.za:41000 UDP Not Connected
```

- Set the polling interval:



Seconds



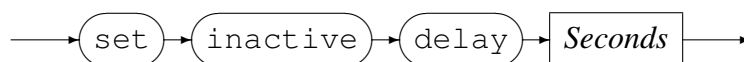
The polling interval is specified in seconds and is the frequency at which the SNMP host will be polled in order to extract metric data. The frequency must be greater than zero and less than 100.

Example:

Set the polling interval to one minute:

```
SNMP example> set polling interval 60
Probe cmlxsnmp
  Required parameters: snmp_host
  Optional parameters: community snmp_port
  Status:              Initialised
  Title:               "SNMP example"
  Group:              example
  Parameters:         'snmp_host="10.59.103.13",community=public'
  Polling Interval:   60
  Inactive delay:     18000
  Server:             codemagus.it.nednet.co.za:41000 UDP Not Connected
```

- Set inactive delay:



Seconds

The inactive delay is specified in seconds and the default value is equivalent to five hours. The `DELAY` defines the amount of time from the last command processed by the command interface before the probe automatically stops extracting metric data by performing a ‘`stop probe`’ command internally. This feature is always active and prevents the probe from flooding the network with metric data when no longer required.

Example:

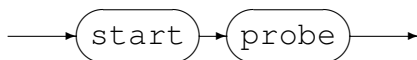
Set the inactive delay to one hour:

```

SNMP example> set inactive delay 36000
Probe cmlxsnmp
  Required parameters: snmp_host
  Optional parameters: community snmp_port
  Status:              Initialised
  Title:               "SNMP example"
  Group:               example
  Parameters:          'snmp_host="10.59.103.13",community=public'
  Polling Interval:   60
  Inactive delay:     36000
  Server:             codemagus.it.nednet.co.za:41000 UDP Not Connected
  
```

2.5.10 Start Command

This command causes the probe to start extracting metric data and sending it on to Serfboard.

StartCommand**Examples:**

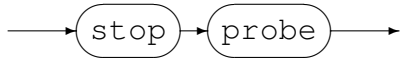
Start probing:

```

SNMP example> start probe
Probing started
  
```

2.5.11 Stop Command

This command causes the probe to stop extracting metric data and sending it on to Serfboard; `cmlxsnmp()` reverts back to the idle state.

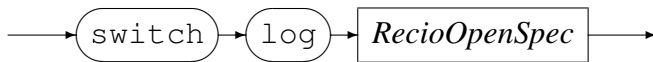
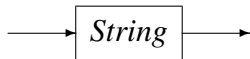
StopCommand**Examples:**

Stop probing:

```
SNMP example> stop probe
Probing stopped
```

2.5.12 Switch Command

Close a previous recording log file and open a new one.

*RecioOpenSpec*

RecioOpenSpec is a `recio [1]` open specification string.

Example:

Close the current log file and open a new log file for recording the metrics. The two environment variables will be expanded to the current date and time respectively.

```
SNMP example> switch log \
                "text(example_probe_D${DATE_YYMMDD}_T${TIME_HHMMSS}).txt.txt,mode=w) "
Log "text(example_probe_D101210_T103857.txt.txt,mode=w) " closed,
    record count = 0
Log "text(example_probe_D101210_T105920.txt.txt,mode=w) " opened
```

3 cmlxsnmp_generate

`cmlxsnmp_generate` is a command line software utility to generate the required configuration files for a Serfboard server and the `cmlxsnmp` feeder to monitor the network interfaces for a machine.

It generates the following configuration files:

- Serfboard panel definition.
- Serfboard metric definition.
- Serfboard command file.

- `cmlxsnmp` command file.

3.1 Synopsis

`cmlxsnmp_generate` is invoked from the command line and if the ‘`--help`’ parameter is specified it will display all available parameters and their options if applicable. Below is the help display and following that is a description of each parameter.

```
Code Magus Limited SNMP probe V1.0: build 2011-01-06-08.58.57
[cmlxsnmp_generate] $Id: cmlxsnmp_generate.c,v 1.9 2010/12/13 08:41:30 janvlok Exp $
Copyright (c) 2009 by Code Magus Limited. All rights reserved.
[Contact: stephen@codemagus.com].
```

```
Usage: cmlxsnmp_generate [<interface number> <title>] ...
  -g, --group=<group name>           Serfboard group name
  -d, --title=<title>                 title of the serfboard group
  -p, --config-path=<path>           Path for output configuration
                                     files
  -h, --serfboard-host={<host_name>|<IP address>} Serfboard feed host name
  -f, --serfboard-port=<port>        Serfboard feed port number
  -c, --cgi-port=<port>              Serfboard cgi port number
  -s, --snmp-host={<host_name>|<IP address>} SNMP host name to probe
```

Help options:

```
-?, --help           Show this help message
--usage             Display brief usage message
```

Where:

- ‘`-g|--group`’ Specifies the Serfboard group name.
- ‘`-d|--description`’ Specifies the Serfboard description.
- ‘`-p|--config-path`’ Specifies the directory for the generated configuration files.
- ‘`-h|--serfboard-host`’ Specifies the Serfboard server host. This can be specified as a host name or by using the Internet notation of dots and numbers.
- ‘`-f|--serfboard-port`’ Specifies the Serfboard server feeder connection port.
- ‘`-c|--cgi-port`’ Specifies the Serfboard server cgi connection port.
- ‘`-s|--snmp-host`’ Specifies the SNMP host from which to extract the network interface *OID* values. This can be specified as a host name or by using the Internet notation of dots and numbers.
- List of the interfaces to be monitored. For each interface two parameters are required:

- 'interface number' Specifies the number of the interface. For example, for interface 'ifIndex.3' specify '3'.
- 'title' Specifies the Serfboard panel title.

Output configuration files:

- Serfboard panel : <group name>.dboard
- Serfboard metric : <group name>.metric
- Serfboard command file : <group name>.cmd
- cmlxsnmp command file : <group name>_cmlxsnmp.cmd

3.2 Example

`generate_example2.sh` is a sample script to generate the configuration files for a server named 'example2'. This server has nine network interfaces and the Serfboard group name is example2. The four configurations generated are:

- Serfboard panel : example2.dboard
- Serfboard type : example2.metric
- Serfboard command : example2.metric
- cmlxsnmp command file : example2_cmlxsnmp.cmd

3.3 generate_example.sh

```
#!/usr/bin/env ksh
#
# File: generate_example2.sh
#
# Sample script for generating Serfboard and  SNMP configs
# for a example2.
#
# Author: jv
#
# Copyright (c) 2009 Code Magus Limited. All rights reserved.
#
# $Author: janvlok $
# $Date: 2010/12/13 08:43:15 $
# $Id: generate_example2.sh,v 1.1 2010/12/13 08:43:15 janvlok Exp $
# $Name: $
# $Revision: 1.1 $
# $State: Exp $
#
# $Log: generate_example2.sh,v $
# Revision 1.1 2010/12/13 08:43:15  janvlok
# Take on
#

GROUP=example2

export CODEMAGUS_HOME=${CODEMAGUS_HOME:-${HOME}}

export CONFIGSPATH=.
```

```
cmlxsnmp_generate \  
  --group=${GROUP} \  
  --title="SNMP Example2" \  
  --config-path=${CONFIGSPATH} \  
  --serfboard-host=codemagus.it.nednet.co.za \  
  --serfboard-port=41070 \  
  --cgi-port=9070 \  
  --snmp-host=example2.it.nednet.co.za \  
  1  GigabitEthernet0/0 \  
  3  Serial1/0 \  
  4  Serial1/1 \  
  5  Serial1/2 \  
  6  Serial1/3 \  
  7  Serial1/4 \  
  8  Serial1/5 \  
  9  Serial1/6 \  
 10  Serial1/7
```

A Example Command File

References

- [1] recio: Record Stream I/O Library Version 1. CML Document CML00001-01, Code Magus Limited, July 2008. [PDF](#).
- [2] cmlcmd: Command Utility Version 1. CML Document CML00007-01, Code Magus Limited, July 2008. [PDF](#).
- [3] Serfboard Configuration Guide and Reference Version 1. CML Document CML00023-01, Code Magus Limited, July 2008. [PDF](#).
- [4] Serfboard Instruments Guide and Reference Version 1. CML Document CML00024-01, Code Magus Limited, July 2008. [PDF](#).
- [5] Serfboard Installation Guide and Reference Version 1. CML Document CML00025-01, Code Magus Limited, July 2008. [PDF](#).
- [6] Serfboard User Guide Version 1. CML Document CML00027-01, Code Magus Limited, July 2008. [PDF](#).
- [7] cmdname: Command Name Resolver Library Version 1. CML Document CML00076-01, Code Magus Limited, December 2010. [PDF](#).