



# Information About Writing EEM Policies Using the Cisco IOS CLI

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## Prerequisites for Writing EEM Policies Using the Cisco IOS CLI

- Before writing EEM policies, you should be familiar with the concepts explained in the “Embedded Event Manager Overview” module.
- If the **action cns-event** command is used, access to a Cisco Networking Services (CNS) Event gateway must be configured.
- If the **action force-switchover** command is used, a secondary processor must be configured on the device.
- If the **action snmp-trap** command is used, the **snmp-server enable traps event-manager** command must be enabled to permit SNMP traps to be sent from the Cisco IOS device to the SNMP server. Other relevant **snmp-server** commands must also be configured; for details see the **action snmp-trap** command page.

## Information About Writing EEM Policies Using the Cisco IOS CLI

### Embedded Event Manager Policies

EEM offers the ability to monitor events and take informational or corrective action when the monitored events occur or a threshold is reached. An EEM policy is an entity that defines an event and the actions to be

taken when that event occurs. There are two types of EEM policies: an applet or a script. An applet is a simple form of policy that is defined within the CLI configuration. A script is a form of policy that is written in Tool Command Language (Tcl).

## EEM Applet

An EEM applet is a concise method for defining event screening criteria and the actions to be taken when that event occurs. In applet configuration mode, three types of configuration statements are supported. The **event** commands are used to specify the event criteria to trigger the applet to run, the **action** commands are used to specify an action to perform when the EEM applet is triggered, and the **set** command is used to set the value of an EEM applet variable. Currently only the `_exit_status` variable is supported for the **set** command.

Only one **event** configuration command is allowed within an applet configuration. When applet configuration mode is exited and no **event** command is present, a warning is displayed stating that no event is associated with this applet. If no event is specified, this applet is not considered registered. When no action is associated with this applet, events are still triggered but no actions are performed. Multiple **action** configuration commands are allowed within an applet configuration. Use the **show event manager policy registered** command to display a list of registered applets.

Before modifying an EEM applet, be aware that the existing applet is not replaced until you exit applet configuration mode. While you are in applet configuration mode modifying the applet, the existing applet may be executing. It is safe to modify the applet without unregistering it. When you exit applet configuration mode, the old applet is unregistered and the new version is registered.

The action configuration commands are uniquely identified using the *label* argument, which can be any string value. Actions are sorted in ascending alphanumeric key sequence using the *label* argument as the sort key, and they are run using this sequence.

The Embedded Event Manager schedules and runs policies on the basis of an event specification that is contained within the policy itself. When applet configuration mode is exited, EEM examines the **event** and **action** commands that are entered and registers the applet to be run when a specified event occurs.

## EEM Script

Scripts are defined off the networking device using an ASCII editor. The script is then copied to the networking device and registered with EEM. Tcl scripts are supported by EEM.

EEM allows you to write and implement your own policies using Tcl. Writing an EEM policy involves:

- Selecting the event for which the policy is run.
- Defining the event detector options associated with logging and responding to the event.
- Choosing the actions to be followed when the event occurs.

Cisco provides enhancements to Tcl in the form of keyword extensions that facilitate the development of EEM policies. The main categories of keywords identify the detected event, the subsequent action, utility information, counter values, and system information. For more details about writing EEM policies using Tcl, see the “Writing Embedded Event Manager Policies Using Tcl” module.

## Embedded Event Manager Built-In Environment Variables Used in EEM Applets

EEM built-in environment variables are a subset of the Cisco-defined environment variables and the built-in variables are available to EEM applets only. The built-in variables can be read-only or can be read and write

and these variables may apply to one specific event detector or to all event detectors. The table below lists the Cisco built-in environment variables that are read-only alphabetically by event detector and subevent.

**Table 1: EEM Built-In Environment Variables (Read Only)**

Environment Variable	Description
All Events	
<b>_event_id</b>	Unique number that indicates the ID for this published event. Multiple policies may be run for the same event, and each policy will have the same event_id.
<b>_event_type</b>	
<b>_event_type_string</b>	Type of event.
<b>_event_pub_sec</b> <b>_event_pub_msec</b>	An ASCII string identifier of the event type that triggered the event.
<b>_event_severity</b>	The time, in seconds and milliseconds, at which the event was published to the EEM.
Application-Specific Event Detector	The severity of the event.
<b>_application_component_id</b>	The event application component identifier.
<b>_application_data1</b>	The value of an environment variable, character text, or a combination of the two to be passed to an application-specific event when the event is published.
<b>_application_data2</b>	The value of an environment variable, character text, or a combination of the two to be passed to an application-specific event when the event is published.
<b>_application_data3</b>	The value of an environment variable, character text, or a combination of the two to be passed to an application-specific event when the event is published.
<b>_application_data4</b>	The value of an environment variable, character text, or a combination of the two to be passed to an application-specific event when the event is published.
<b>_application_sub_system</b>	The event application subsystem number.
<b>_application_type</b>	The type of application.
CLI Event Detector	
<b>_cli_msg</b>	The fully expanded message that triggered the CLI event.
<b>_cli_msg_count</b>	The number of times that a message match occurred before the event was published.
Counter Event Detector	

Environment Variable	Description
<b>_counter_name</b>	The name of the counter.
<b>_counter_value</b>	The value of the counter.
Enhanced Object Tracking Event Detector	
<b>_track_number</b>	The number of the tracked object.
<b>_track_state</b>	The state of the tracked object; down or up.
GOLD Event Detector	
<b>_action_notify</b>	The action notify information in a GOLD event flag; either false or true.
<b>_event_severity</b>	The event severity which can be one of the following; normal, minor, or major.
<b>_gold_bl</b>	The boot diagnostic level, which can be one of the following values: <ul style="list-style-type: none"> <li>• 0: complete diagnostic</li> <li>• 1: minimal diagnostic</li> <li>• 2: bypass diagnostic</li> </ul>
<b>_gold_card</b>	The card on which a GOLD failure event was detected.
<b>_gold_cf</b> <i>testnum</i>	Consecutive failure, where <i>testnum</i> is the test number. For example, <b>_gold_cf3</b> is the EEM built-in environment variable for consecutive failure of test 3.
<b>_gold_ci</b>	Card index.
<b>_gold_cn</b>	Card name.
<b>_gold_ec</b> <i>testnum</i>	Test error code, where <i>testnum</i> is the test number. For example, <b>_gold_ec3</b> is the EEM built-in environment variable for the error code of test 3.
<b>_gold_if</b> <i>testnum</i>	Last fail time, where <i>testnum</i> is the test number. For example, <b>_gold_if3</b> is the EEM built-in variable for the last fail time of test 3.  The time-stamp format is <i>mmm dd yyyy hh:mm:ss</i> . For example, Mar 11 2005 08:47:00.
<b>_gold_new_failure</b>	The new test failure information in a GOLD event flag; either true or false.

Environment Variable	Description
<b>_gold_overall_result</b>	The overall diagnostic result, which can be one of the following values: <ul style="list-style-type: none"> <li>• 0: OK</li> <li>• 3: minor error</li> <li>• 4: major error</li> <li>• 14: unknown result</li> </ul>
<b>_gold_pc</b>	Port counts.
<b>_gold_rc</b> <i>testnum</i>	Test total run count, where <i>testnum</i> is the test number. For example, <b>_gold_rc3</b> is the EEM built-in variable for the total run count of test 3.
<b>_gold_sn</b>	Card serial number.
<b>_gold_sub_card</b>	The subcard on which a GOLD failure event was detected.
<b>_gold_ta</b> <i>testnum</i>	Test attribute, where <i>testnum</i> is the test number. For example, <b>_gold_ta3</b> is the EEM built-in variable for the test attribute of test 3.
<b>_gold_tc</b>	Test counts.
<b>_gold_tf</b> <i>testnum</i>	Total failure count, where <i>testnum</i> is the test number. For example, <b>_gold_tf3</b> is the EEM built-in variable for the total failure count of test 3.
<b>_gold_tn</b> <i>testnum</i>	Test name, where <i>testnum</i> is the test number. For example, <b>_gold_tn3</b> is the EEM built-in variable for the name of test 3.
<b>_gold_tr</b> <i>testnum</i>	Test result, where <i>testnum</i> is the test number. For example, <b>_gold_tr6</b> is the EEM built-in variable for test 6, where test 6 is not a per-port test and not a per-device test.  The test result is one of the following values: <ul style="list-style-type: none"> <li>• P: diagnostic result Pass</li> <li>• F: diagnostic result Fail</li> <li>• U: diagnostic result Unknown</li> </ul>

Environment Variable	Description
<b>_gold_tr</b> <i>testnum d devnum</i>	Per-device test result, where <i>testnum</i> is the test number and <i>devnum</i> is the device number. For example, <b>_gold_tr3d20</b> is the EEM built-in variable for the test result for test 3, device 20.  The test result is one of the following values: <ul style="list-style-type: none"> <li>• P: diagnostic result Pass</li> <li>• F: diagnostic result Fail</li> <li>• U: diagnostic result Unknown</li> </ul>
<b>_gold_tr</b> <i>testnum p portnum</i>	Per-port test result, where <i>testnum</i> is the test number and <i>portnum</i> is the port number. For example, <b>_gold_tr5p20</b> is the EEM built-in variable for the test result for test 5, port 20.  The test result is one of the following values: <ul style="list-style-type: none"> <li>• P: diagnostic result Pass</li> <li>• F: diagnostic result Fail</li> <li>• U: diagnostic result Unknown</li> </ul>
<b>_gold_tt</b>	The testing type, which can be one of the following: <ul style="list-style-type: none"> <li>• 1: a boot diagnostic</li> <li>• 2: an on-demand diagnostic</li> <li>• 3: a schedule diagnostic</li> <li>• 4: a monitoring diagnostic</li> </ul>
Interface Counter Event Detector	
<b>_interface_is_increment</b>	A value to indicate whether the current interface counter value is an absolute value (0) or an increment value (1).
<b>_interface_name</b>	The name of the interface to be monitored.
<b>_interface_parameter</b>	The name of the interface counter to be monitored.
<b>_interface_value</b>	A value with which the current interface counter value is compared.
None Event Detector	
<b>_event_id</b>	A value of 1 indicates an insertion event; a value of 2 indicates a removal event.

Environment Variable	Description
_none_arg _none_arg1 _none_arg2 _none_arg3 _none_arg4 _none_arg5 _none_arg6 _none_arg7 _none_arg8 _none_arg9 _none_arg10 _none_arg11 _none_arg12 _none_arg13 _none_arg14 _none_arg15	The parameters that are passed from the XML SOAP command to the script.
OIR Event Detector	
_oir_event	A value of 1 indicates an insertion event; a value of 2 indicates a removal event.
_oir_slot	The slot number for the OIR event.
Resource Event Detector	
_resource_configured_threshold	The configured ERM threshold.
_resource_current_value	The current value reported by ERM.
_resource_dampen_time	The ERM dampen time, in nanoseconds.
_resource_direction	The ERM event direction. The event direction can be one of the following: up, down, or no change.
_resource_level	The ERM event level. The four event levels are normal, minor, major, and critical.
_resource_notify_data_flag	The ERM notify data flag.
_resource_owner_id	The ERM resource owner ID.
_resource_policy_id	The ERM policy ID.

Environment Variable	Description
<code>_resource_policy_violation_flag</code>	The ERM policy violation flag; either false or true.
<code>_resource_time_sent</code>	The ERM event time, in nanoseconds.
<code>_resource_user_id</code>	The ERM resource user ID.
RF Event Detector	
<code>_rf_event</code>	A value of 0 indicates that this is not an RF event; a value of 1 indicates an RF event.
RPC Event Detector	
<code>_rpc_event</code>	A value of 0 indicates that there is no error; a value of 1 to 83 indicates error.
<code>_rpc_argc</code> <code>_rpc_arg0</code> <code>_rpc_arg1</code> <code>_rpc_arg2</code> <code>_rpc_arg3</code> <code>_rpc_arg4</code> <code>_rpc_arg5</code> <code>_rpc_arg6</code> <code>_rpc_arg7</code> <code>_rpc_arg8</code> <code>_rpc_arg9</code> <code>_rpc_arg10</code> <code>_rpc_arg11</code> <code>_rpc_arg12</code> <code>_rpc_arg13</code> <code>_rpc_arg14</code>	The parameters that are passed from the XML SOAP command to the applet.
SNMP Event Detector	
<code>_snmp_exit_event</code>	A value of 0 indicates that this is not an exit event; a value of 1 indicates an exit event.
<code>_snmp_oid</code>	The SNMP object ID that caused the event to be published.
<code>_snmp_oid_delta_val</code>	The actual incremental difference between the value of the current SNMP object ID and the value when the event was last triggered.



Environment Variable	Description
<code>_snmp_oid_val</code>	The SNMP object ID value when the event was published.
SNMP Notification Event Detector	
<code>_snmp_notif_oid</code>	A user specified object ID.
<code>_snmp_notif_oid_val</code>	A user specified object ID value.
<code>_snmp_notif_src_ip_addr</code>	The source IP address of the SNMP Protocol Data Unit (PDU).
<code>_snmp_notif_dest_ip_addr</code>	The destination IP address of the SNMP PDU.
<code>_x_x_x_x_x_x_x(varbinds)</code>	The SNMP PDU varbind information.
<code>_snmp_notif_trunc_vb_buf</code>	Indicates whether the varbind information has been truncated due to the lack of space in the buffer.
Syslog Event Detector	
<code>_syslog_msg</code>	The syslog message that caused the event to be published.
System Manager (Process) Event Detector	
<code>_process_dump_count</code>	The number of times that a Posix process was dumped.
<code>_process_exit_status</code>	The status of the Posix process at exit.
<code>_process_fail_count</code>	The number of times that a Posix process failed.
<code>_process_instance</code>	The instance number of the Posix process.
<code>_process_last_respawn</code>	The Posix process that was last respawned.
<code>_process_node_name</code>	The node name of the Posix process.
<code>_process_path</code>	The path of the Posix process.
<code>_process_process_name</code>	The name of the Posix process.
<code>_process_respawn_count</code>	The number of times that a Posix process was respawned.
Timer Event Detector	
<code>_timer_remain</code>	The time available before the timer expires.  <b>Note</b> This environment variable is not available for the CRON timer.
<code>_timer_time</code>	The time at which the last event was triggered.
<code>_timer_type</code>	The type of timer.

Environment Variable	Description
Watchdog System Monitor (IOSWDSysMon) Event Detector	
<b>_ioswd_node</b>	The slot number for the Route Processor (RP) reporting node.
<b>_ioswd_num_subs</b>	The number of subevents present.
All Watchdog System Monitor (IOSWDSysMon) Subevents	
<b>_ioswd_sub1_present</b> <b>_ioswd_sub2_present</b>	A value to indicate whether subevent 1 or subevent 2 is present. A value of 1 means that the subevent is present; a value of 0 means that the subevent is not present.
<b>_ioswd_sub1_type</b> <b>_ioswd_sub2_type</b>	The event type, either <code>cpu_proc</code> or <code>mem_proc</code> .
Watchdog System Monitor (IOSWDSysMon) <code>cpu_proc</code> Subevents	
<b>_ioswd_sub1_path</b> <b>_ioswd_sub2_path</b>	A process name of subevents.
<b>_ioswd_sub1_period</b> <b>_ioswd_sub2_period</b>	The time period, in seconds and optional milliseconds, used for measurement in subevents.
<b>_ioswd_sub1_pid</b> <b>_ioswd_sub2_pid</b>	The process identifier of subevents.
<b>_ioswd_sub1_taskname</b> <b>_ioswd_sub2_taskname</b>	The task name of subevents.
<b>_ioswd_sub1_value</b> <b>_ioswd_sub2_value</b>	The CPU utilization of subevents measured as a percentage.
Watchdog System Monitor (IOSWDSysMon) <code>mem_proc</code> Subevents	
<b>_ioswd_sub1_diff</b> <b>_ioswd_sub2_diff</b>	A percentage value of the difference that triggered the event.  <b>Note</b> This variable is set only when the <b>_ioswd_sub1_is_percent</b> or <b>_ioswd_sub2_is_percent</b> variable contains a value of 1.
<b>_ioswd_sub1_is_percent</b> <b>_ioswd_sub2_is_percent</b>	A number that identifies whether the value is a percentage. A value of 0 means that the value is not a percentage; a value of 1 means that the value is a percentage.
<b>_ioswd_sub1_path</b> <b>_ioswd_sub2_path</b>	The process name of subevents.
<b>_ioswd_sub1_pid</b> <b>_ioswd_sub2_pid</b>	The process identifier of subevents.
<b>_ioswd_sub1_taskname</b> <b>_ioswd_sub2_taskname</b>	The task name of subevents.
<b>_ioswd_sub1_value</b> <b>_ioswd_sub2_value</b>	The CPU utilization of subevents measured as a percentage.

Environment Variable	Description
Watchdog System Monitor (WDSysMon) Event Detector	
<b>_wd_sub1_present _wd_sub2_present</b>	A value to indicate whether subevent 1 or subevent 2 is present. A value of 1 means that the subevent is present; a value of 0 means that the subevent is not present.
<b>_wd_num_subs</b>	The number of subevents present.
<b>_wd_sub1_type _wd_sub2_type</b>	The event type: cpu_proc, cpu_tot, deadlock, dispatch_mgr, mem_proc, mem_tot_avail, or mem_tot_used.
Watchdog System Monitor (WDSysMon) cpu_proc Subevents	
<b>_wd_sub1_node _wd_sub2_node</b>	The slot number for the subevent RP reporting node.
<b>_wd_sub1_period _wd_sub2_period</b>	The time period, in seconds and optional milliseconds, used for measurement in subevents.
<b>_wd_sub1_procname _wd_sub2_procname</b>	The process name of subevents.
<b>_wd_sub1_value _wd_sub2_value</b>	The CPU utilization of subevents measured as a percentage.
Watchdog System Monitor (WDSysMon) cpu_tot Subevents	
<b>_wd_sub1_node _wd_sub2_node</b>	The slot number for the subevent RP reporting node.
<b>_wd_sub1_period _wd_sub2_period</b>	The time period, in seconds and optional milliseconds, used for measurement in subevents.
<b>_wd_sub1_value _wd_sub2_value</b>	The CPU utilization of subevents measured as a percentage.
Watchdog System Monitor (WDSysMon) deadlock Subevents	
<b>_wd_sub1_entry_[1-N]_b_node _wd_sub2_entry_[1-N]_b_node</b>	The slot number for the subevent RP reporting node.
<b>_wd_sub1_entry_[1-N]_b_pid _wd_sub2_entry_[1-N]_b_pid</b>	The process identifier of subevents.
<b>_wd_sub1_entry_[1-N]_b_procname _wd_sub2_entry_[1-N]_b_procname</b>	The process name of subevents.
<b>_wd_sub1_entry_[1-N]_b_tid _wd_sub2_entry_[1-N]_b_tid</b>	The time identifier of subevents.
<b>_wd_sub1_entry_[1-N]_node _wd_sub2_entry_[1-N]_node</b>	The slot number for the subevent RP reporting node.

Environment Variable	Description
<code>_wd_sub1_entry_[1-N]_pid</code> <code>_wd_sub2_entry_[1-N]_pid</code>	The process identifier of subevents.
<code>_wd_sub1_entry_[1-N]_procname</code> <code>_wd_sub2_entry_[1-N]_procname</code>	The process name of subevents.
<code>_wd_sub1_entry_[1-N]_state</code> <code>_wd_sub2_entry_[1-N]_state</code>	The time identifier of subevents.
<code>_wd_sub1_entry_[1-N]_tid</code> <code>_wd_sub2_entry_[1-N]_tid</code>	The time identifier of subevents.
<code>_wd_sub1_num_entries</code> <code>_wd_sub2_num_entries</code>	The number of subevents.
Watchdog System Monitor (WDSysMon) dispatch manager Subevents	
<code>_wd_sub1_node</code> <code>_wd_sub2_node</code>	The slot number for the subevent RP reporting node.
<code>_wd_sub1_period</code> <code>_wd_sub2_period</code>	The time period, in seconds and optional milliseconds, used for measurement in subevents.
<code>_wd_sub1_procname</code> <code>_wd_sub2_procname</code>	The process name of subevents.
<code>_wd_sub1_value</code> <code>_wd_sub2_value</code>	The CPU utilization of subevents measured as a percentage.
Watchdog System Monitor (WDSysMon) mem_proc Subevents	
<code>_wd_sub1_diff</code> <code>_wd_sub2_diff</code>	A percentage value of the difference that triggered the event.  <b>Note</b> This variable is set only when the <code>_wd_sub1_is_percent</code> or <code>_wd_sub2_is_percent</code> variable contains a value of 1.
<code>_wd_sub1_is_percent</code> <code>_wd_sub2_is_percent</code>	A number that identifies whether the value is a percentage. A value of 0 means that the value is not a percentage; a value of 1 means that the value is a percentage.
<code>_wd_sub1_node</code> <code>_wd_sub2_node</code>	The slot number for the subevent RP reporting node.
<code>_wd_sub1_period</code> <code>_wd_sub2_period</code>	The time period, in seconds and optional milliseconds, used for measurement in subevents.
<code>_wd_sub1_pid</code> <code>_wd_sub2_pid</code>	The process identifier of subevents.
<code>_wd_sub1_procname</code> <code>_wd_sub2_procname</code>	The process name of subevents.
<code>_wd_sub1_value</code> <code>_wd_sub2_value</code>	The CPU utilization of subevents measured as a percentage.

Environment Variable	Description
Watchdog System Monitor (WDSysMon) mem_tot_avail and mem_tot_used Subevents	
_wd_sub1_avail _wd_sub2_avail	The memory available for subevents.
_wd_sub1_diff _wd_sub2_diff	A percentage value of the difference that triggered the event. <b>Note</b> This variable is set only when the <b>_wd_sub1_is_percent</b> or <b>_wd_sub2_is_percent</b> variable contains a value of 1.
_wd_sub1_is_percent _wd_sub2_is_percent	A number that identifies whether the value is a percentage. A value of 0 means that the value is not a percentage; a value of 1 means that the value is a percentage.
_wd_sub1_node _wd_sub2_node	The slot number for the subevent RP reporting node.
_wd_sub1_period _wd_sub2_period	The time period, in seconds and optional milliseconds, used for measurement in subevents.
_wd_sub1_value _wd_sub2_value	The CPU utilization of subevents measured as a percentage.
_wd_sub1_used _wd_sub2_used	The memory used by subevents.

## How to Write EEM Policies Using the Cisco IOS CLI

### Registering and Defining an Embedded Event Manager Applet

Perform this task to register an applet with Embedded Event Manager and to define the EEM applet using the Cisco IOS CLI **event** and **action** commands. Only one **event** command is allowed in an EEM applet. Multiple **action** commands are permitted. If no **event** and no **action** commands are specified, the applet is removed when you exit configuration mode.

The SNMP event detector and the syslog **action** commands used in this task are just representing any event detector and **action** commands. For examples using other event detectors and **action** commands, see the [Embedded Event Manager Applet Configuration Examples, on page 53](#).

### EEM Environment Variables

EEM environment variables for EEM policies are defined using the EEM **event manager environment** configuration command. By convention, all Cisco EEM environment variables begin with “\_”. In order to avoid future conflict, customers are urged not to define new variables that start with “\_”.

You can display the EEM environment variables set on your system by using the **show event manager environment** privileged EXEC command.

For example, you can create EEM policies that can send e-mails when an event occurs. The table below describes the e-mail-specific environment variables that can be used in EEM policies.

Table 2: EEM E-mail-Specific Environmental Variables

Environment Variable	Description
<code>_email_server</code>	A Simple Mail Transfer Protocol (SMTP) mail server used to send e-mail.
<code>_email_to</code>	The address to which e-mail is sent.
<code>_email_from</code>	The address from which e-mail is sent.
<code>_email_cc</code>	The address to which the e-mail is copied.

## Alphabetical Order of EEM Action Labels

An EEM action label is a unique identifier that can be any string value. Actions are sorted and run in ascending alphanumeric (lexicographical) key sequence using the label as the sort key. If you are using numbers as labels be aware that alphanumerical sorting will sort 10.0 after 1.0, but before 2.0, and in this situation we recommend that you use numbers such as 01.0, 02.0, and so on, or use an initial letter followed by numbers.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> <pre>Device&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>show event manager environment</b> [ <b>all</b>   <i>variable-name</i> ] <b>Example:</b> <pre>Device# show event manager environment all</pre>	(Optional) Displays the name and value of EEM environment variables. <ul style="list-style-type: none"> <li>• The optional <b>all</b> keyword displays all the EEM environment variables.</li> <li>• The optional <i>variable-name</i> argument displays information about the specified environment variable.</li> </ul>
<b>Step 3</b>	<b>configure terminal</b> <b>Example:</b> <pre>Device# configure terminal</pre>	Enters global configuration mode.
<b>Step 4</b>	<b>event manager environment</b> <i>variable-name</i> <i>string</i> <b>Example:</b>	Configures the value of the specified EEM environment variable.

	Command or Action	Purpose
	<pre>Device(config)# event manager environment _email_to engineering@example.com</pre>	<ul style="list-style-type: none"> <li>In this example, the environment variable that holds the e-mail address to which e-mail is sent is set to <code>engineering@example.com</code>.</li> </ul>
<b>Step 5</b>	Repeat <a href="#">Alphabetical Order of EEM Action Labels</a> for all the required environment variables.	Repeat <a href="#">Alphabetical Order of EEM Action Labels</a> to configure all the environment variables required by the policy to be registered in <a href="#">Alphabetical Order of EEM Action Labels</a> .
<b>Step 6</b>	<p><b>event manager applet</b> <i>applet-name</i></p> <p><b>Example:</b></p> <pre>Device(config)# event manager applet memory-fail</pre>	Registers the applet with the Embedded Event Manager (EEM) and enters applet configuration mode.
<b>Step 7</b>	<p>Do one of the following:</p> <ul style="list-style-type: none"> <li><b>event snmp oid</b> <i>oid-value</i> <b>get-type</b> <b>{exact  next}</b> <b>entry-op</b> <i>operator</i> <b>entry-val</b> <i>entry-value</i> <b>[exit-comb  and]</b> <b>[exit-op operator]</b> <b>[exit-val exit-value]</b> <b>[exit-time exit-time-value]</b> <b>poll-interval</b> <i>poll-int-value</i></li> </ul> <p><b>Example:</b></p> <pre>Device(config-applet)# event snmp oid 1.3.6.1.4.1.9.9.48.1.1.1.6.1 get-type exact entry-op lt entry-val 5120000 poll-interval 90</pre>	<p>Specifies the event criteria that cause the EEM applet to run.</p> <ul style="list-style-type: none"> <li>In this example, an EEM event is triggered when free memory falls below the value of 5120000.</li> <li>Exit criteria are optional, and if not specified, event monitoring is reenabled immediately.</li> </ul>
<b>Step 8</b>	<p><b>action</b> <i>label</i> <b>cli command</b> <i>cli-string</i> <b>[pattern pattern-string]</b></p> <p><b>Example:</b></p> <pre>Device(config-applet)# action 1.0 cli command "enable"</pre> <p><b>Example:</b></p> <pre>Device(config-applet)# action 2.0 cli command "clear counters Ethernet0/1" pattern "confirm"</pre> <p><b>Example:</b></p> <pre>Device(config-applet)# action 3.0 cli command "y"</pre>	<p>Specifies the action of executing a Cisco IOS CLI command when an EEM applet is triggered.</p> <p>The <b>pattern</b> keyword is optional and is used only when the command string solicits input. The <b>action cli</b> command ends when the solicited prompt as specified in the optional <b>pattern</b> keyword is received. You are required to specify a regular expression pattern that will match the next solicited prompt. Specification of an incorrect pattern will cause the <b>action cli</b> command to wait forever until the applet execution times out due to the maxrun timer expiration.</p> <ul style="list-style-type: none"> <li>The action taken is to specify an EEM applet to run when the <b>pattern</b> keyword specifies the <i>confirm</i> argument for the <b>clear counters Ethernet0/1</b> command.</li> </ul>

	Command or Action	Purpose
		In this case the command string solicits input, such as “confirm,” which has to be completed with a “yes” or a “no” input.
<b>Step 9</b>	<p><b>action</b> <i>label</i> <b>syslog</b> [<b>priority</b> <i>priority-level</i>] <b>msg</b> <i>msg-text</i> <b>facility</b> <i>string</i></p> <p><b>Example:</b></p> <pre>Device(config-applet)# action 1.0 syslog priority critical msg "Memory exhausted; current available memory is \$_snmp_oid_val bytes"</pre> <p><b>Example:</b></p> <pre>Device(config-applet)# action 1.0 syslog priority errors facility EEM-FAC message "TEST MSG"</pre>	<p>Specifies the action to be taken when an EEM applet is triggered.</p> <p>In this example, the action taken is to write a message to syslog.</p> <ul style="list-style-type: none"> <li>• The optional <b>priority</b> keyword specifies the priority level of the syslog messages. If selected, the <i>priority-level</i> argument must be defined.</li> <li>• The <i>msg-text</i> argument can be character text, an environment variable, or a combination of the two.</li> <li>• The <b>facility</b> keyword specifies the location of generated message</li> <li>• The <i>string</i> argument can be character text, an environment variable, or a combination of the two.</li> </ul>
<b>Step 10</b>	<p><b>action</b> <i>label</i> <b>mail server</b> <i>server-address</i> <b>to</b> <i>to-address</i> <b>from</b> <i>from-address</i> [<b>cc</b> <i>cc-address</i>] <b>subject</b> <i>subject</i> <b>body</b> <i>body-text</i></p> <p><b>Example:</b></p> <pre>Device(config-applet)# action 2.0 mail server 192.168.1.10 to engineering@example.com from devtest@example.com subject "Memory failure" body "Memory exhausted; current available memory is \$_snmp_oid_val bytes"</pre>	<p>Specifies the action of sending a short e-mail when an EEM applet is triggered.</p> <ul style="list-style-type: none"> <li>• The <i>server-address</i> argument specifies the fully qualified domain name of the e-mail server to be used to forward the e-mail.</li> <li>• The <i>to-address</i> argument specifies the e-mail address where the e-mail is to be sent.</li> <li>• The <i>from-address</i> argument specifies the e-mail address from which the e-mail is sent.</li> <li>• The <i>subject</i> argument specifies the subject line content of the e-mail as an alphanumeric string.</li> <li>• The <i>body-text</i> argument specifies the text content of the e-mail as an alphanumeric string.</li> </ul>
<b>Step 11</b>	Add more action commands as required.	--



	Command or Action	Purpose
<b>Step 12</b>	<b>end</b> <b>Example:</b> Device(config-applet)# end	Exits applet configuration mode and returns to privileged EXEC mode.

## Troubleshooting Tips

Use the **debug event manager** command in privileged EXEC mode to troubleshoot EEM command operations. Use any debugging command with caution as the volume of generated output can slow or stop the device operations. We recommend that this command be used only under the supervision of a Cisco engineer.

## Registering and Defining an EEM Tcl Script

Perform this task to configure environment variables and register an EEM policy. EEM schedules and runs policies on the basis of an event specification that is contained within the policy itself. When an EEM policy is registered, the software examines the policy and registers it to be run when the specified event occurs.

### Before you begin

You must have a policy available that is written in the Tcl scripting language. Sample policies are provided--see the details in the [Sample EEM Policies](#) to see which policies are available for the Cisco IOS release image that you are using--and these sample policies are stored in the system policy directory.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>show event manager environment</b> [ <b>all</b>   <i>variable-name</i> ] <b>Example:</b> Device# show event manager environment all	(Optional) Displays the name and value of EEM environment variables. <ul style="list-style-type: none"> <li>• The optional <b>all</b> keyword displays all the EEM environment variables.</li> <li>• The optional <i>variable-name</i> argument displays information about the specified environment variable.</li> </ul>
<b>Step 3</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 4</b>	<b>event manager environment</b> <i>variable-name</i> <i>string</i>	Configures the value of the specified EEM environment variable.

	Command or Action	Purpose
	<b>Example:</b>  <pre>Device(config)# event manager environment _cron_entry 0-59/2 0-23/1 * * 0-6</pre>	<ul style="list-style-type: none"> <li>In this example, the software assigns a CRON timer environment variable to be set to the second minute of every hour of every day.</li> </ul>
<b>Step 5</b>	Repeat <a href="#">Registering and Defining an EEM Tcl Script</a> to configure all the environment variables required by the policy to be registered in <a href="#">Registering and Defining an EEM Tcl Script</a> .	--
<b>Step 6</b>	<b>event manager policy</b> <i>policy-filename</i> [ <b>type</b> { <b>system</b>   <b>user</b> }] [ <b>trap</b> ]  <b>Example:</b>  <pre>Device(config)# event manager policy tm_cli_cmd.tcl type system</pre>	Registers the EEM policy to be run when the specified event defined within the policy occurs. <ul style="list-style-type: none"> <li>Use the <b>system</b> keyword to register a Cisco-defined system policy.</li> <li>Use the <b>user</b> keyword to register a user-defined system policy.</li> <li>Use the <b>trap</b> keyword to generate an SNMP trap when the policy is triggered.</li> <li>In this example, the sample EEM policy named <code>tm_cli_cmd.tcl</code> is registered as a system policy.</li> </ul>
<b>Step 7</b>	<b>exit</b>  <b>Example:</b>  <pre>Device(config)# exit</pre>	Exits global configuration mode and returns to privileged EXEC mode.

### Examples

In the following example, the **show event manager environment** privileged EXEC command is used to display the name and value of all EEM environment variables.

```
Device# show event manager environment all
No.  Name                               Value
1    _cron_entry                          0-59/2 0-23/1 * * 0-6
2    _show_cmd                            show ver
3    _syslog_pattern                      .*UPDOWN.*Ethernet1/0.*
4    _config_cmd1                         interface Ethernet1/0
5    _config_cmd2                         no shut
```

## Unregistering Embedded Event Manager Policies

Perform this task to remove an EEM policy from the running configuration file. Execution of the policy is canceled.

## Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> <pre>Device&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>show event manager policy registered</b> [description <i>[policy-name]</i>   <b>detailed</b> <i>policy-filename</i> [system   user]   [event-type <i>event-name</i> ] [system   user] [time-ordered   name-ordered]] <b>Example:</b> <pre>Device# show event manager policy registered</pre>	(Optional) Displays the EEM policies that are currently registered. <ul style="list-style-type: none"> <li>• The optional <b>system</b> and <b>user</b> keywords display the registered system and user policies.</li> <li>• If no keywords are specified, EEM registered policies for all event types are displayed in time order.</li> </ul>
<b>Step 3</b>	<b>configure terminal</b> <b>Example:</b> <pre>Device# configure terminal</pre>	Enters global configuration mode.
<b>Step 4</b>	<b>no event manager policy</b> <i>policy-filename</i> <b>Example:</b> <pre>Device(config)# no event manager policy IPSLAping1</pre>	Removes the EEM policy from the configuration, causing the policy to be unregistered.
<b>Step 5</b>	<b>exit</b> <b>Example:</b> <pre>Device(config)# exit</pre>	Exits global configuration mode and returns to privileged EXEC mode.
<b>Step 6</b>	Repeat Step 2 to ensure that the policy has been removed. <b>Example:</b> <pre>Device# show event manager policy registered</pre>	--

## Examples

In the following example, the **show event manager policy registered** privileged EXEC command is used to display the two EEM applets that are currently registered:

```
Device# show event manager policy registered
No.  Class  Type   Event Type           Trap  Time Registered      Name
1    applet system snmp                 Off   Fri Aug 12 17:42:52 2005 IPSLAping1
```

```

oid {1.3.6.1.4.1.9.9.42.1.2.9.1.6.4} get-type exact entry-op eq entry-val {1}
exit-op eq exit-val {2} poll-interval 90.000
action 1.0 syslog priority critical msg "Server IPecho Failed: OID=$_snmp_oid_val"
action 1.1 snmp-trap strdata "EEM detected server reachability failure to 10.1.88.9"
action 1.2 publish-event sub-system 88000101 type 1 arg1 "10.1.88.9" arg2 "IPSLAEcho"
arg3 "fail"
action 1.3 counter name _IPSLA1F op inc value 1
2 applet system snmp Off Thu Sep 15 05:57:16 2005 memory-fail
oid {1.3.6.1.4.1.9.9.48.1.1.1.6.1} get-type exact entry-op lt entry-val {5120000}
poll-interval 90
action 1.0 syslog priority critical msg Memory exhausted; current available memory is
$_snmp_oid_val bytes
action 2.0 force-switchover

```

In the following example, the **show event manager policy registered** privileged EXEC command is used to show that applet IPSLAping1 has been removed after entering the **no event manager policy** command:

```

Device# show event manager policy registered
No. Class Type Event Type Trap Time Registered Name
1 applet system snmp Off Thu Sep 15 05:57:16 2005 memory-fail
oid {1.3.6.1.4.1.9.9.48.1.1.1.6.1} get-type exact entry-op lt entry-val {5120000}
poll-interval 90
action 1.0 syslog priority critical msg Memory exhausted; current available memory is
$_snmp_oid_val bytes
action 2.0 force-switchover

```

## Suspending All Embedded Event Manager Policy Execution

Perform this task to immediately suspend the execution of all EEM policies. Suspending policies, instead of unregistering them might be necessary for reasons of temporary performance or security.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>show event manager policy registered</b> <b>[description [policy-name]   detailed</b> <b>policy-filename [system   user]   [event-type</b> <b>event-name] [system   user] [time-ordered  </b> <b>name-ordered]]</b> <b>Example:</b> Device# show event manager policy registered	(Optional) Displays the EEM policies that are currently registered. <ul style="list-style-type: none"> <li>• The optional <b>system</b> and <b>user</b> keywords display the registered system and user policies.</li> <li>• If no keywords are specified, EEM registered policies for all event types are displayed in time order.</li> </ul>
<b>Step 3</b>	<b>configure terminal</b> <b>Example:</b>	Enters global configuration mode.

	Command or Action	Purpose
	Device# <code>configure terminal</code>	
<b>Step 4</b>	<b>event manager scheduler suspend</b> <b>Example:</b> Device(config)# <code>event manager scheduler suspend</code>	Immediately suspends the execution of all EEM policies.
<b>Step 5</b>	<b>exit</b> <b>Example:</b> Device(config)# <code>exit</code>	Exits global configuration mode and returns to privileged EXEC mode.

## Displaying Embedded Event Manager History Data

Perform this optional task to change the size of the history tables and to display EEM history data.

### Procedure

#### Step 1

##### **enable**

Enables privileged EXEC mode. Enter your password if prompted.

##### **Example:**

```
Device> enable
```

#### Step 2

##### **configure terminal**

Enters global configuration mode.

##### **Example:**

```
Device# configure terminal
```

#### Step 3

##### **event manager history size {events | traps} [size]**

Use this command to change the size of the EEM event history table or the size of the EEM SNMP trap history table. In the following example, the size of the EEM event history table is changed to 30 entries:

##### **Example:**

```
Device(config)# event manager history size events 30
```

#### Step 4

##### **exit**

Exits global configuration mode and returns to privileged EXEC mode.

##### **Example:**

```
Device(config)# exit
```

**Step 5** **show event manager history events [detailed] [maximum *number*]**

Use this command to display detailed information about each EEM event, for example:

**Example:**

```
Device# show event manager history events
No.  Time of Event          Event Type      Name
1    Fri Aug13 21:42:57 2004 snmp           applet: SAAping1
2    Fri Aug13 22:20:29 2004 snmp           applet: SAAping1
3    Wed Aug18 21:54:48 2004 snmp           applet: SAAping1
4    Wed Aug18 22:06:38 2004 snmp           applet: SAAping1
5    Wed Aug18 22:30:58 2004 snmp           applet: SAAping1
6    Wed Aug18 22:34:58 2004 snmp           applet: SAAping1
7    Wed Aug18 22:51:18 2004 snmp           applet: SAAping1
8    Wed Aug18 22:51:18 2004 application    applet: CustAppl
```

**Step 6** **show event manager history traps {server | policy}**

Use this command to display the EEM SNMP traps that have been sent either from the EEM server or from an EEM policy. In the following example, the EEM SNMP traps that were triggered from within an EEM policy are displayed.

**Example:**

```
Device# show event manager history traps policy
No.  Time          Trap Type      Name
1    Wed Aug18 22:30:58 2004 policy        EEM Policy Director
2    Wed Aug18 22:34:58 2004 policy        EEM Policy Director
3    Wed Aug18 22:51:18 2004 policy        EEM Policy Director
```

## Displaying Embedded Event Manager Registered Policies

Perform this optional task to display registered EEM policies.

**Procedure****Step 1** **enable**

Enables privileged EXEC mode. Enter your password if prompted.

**Example:**

```
Device> enable
```

**Step 2** **show event manager policy registered [event-type *event-name*] [time-ordered| name-ordered]**

Use this command with the **time-ordered** keyword to display information about currently registered policies sorted by time, for example:

**Example:**

```
Device# show event manager policy registered time-ordered
No.  Type  Event Type      Time          Registered Name
1    applet snmp           Thu May30 05:57:16 2004 memory-fail
```

```

oid {1.3.6.1.4.1.9.9.48.1.1.1.6.1} get-type exact entry-op lt entry-val
{5120000} poll-interval 90
action 1.0 syslog priority critical msg "Memory exhausted; current available memory
is $_snmp_oid_val bytes"
  action 2.0 force-switchover
2   applet syslog                Wed Jul16 00:05:17 2004 intf-down
  pattern {.*UPDOWN.*Ethernet1/0.*}
  action 1.0 cns-event msg "Interface state change: $_syslog_msg"

```

Use this command with the **name-ordered** keyword to display information about currently registered policies sorted by name, for example:

**Example:**

```

Device# show event manager policy registered name-ordered
No.  Type   Event Type           Time Registered      Name
1    applet  syslog              Wed Jul16 00:05:17 2004 intf-down
  pattern {.*UPDOWN.*Ethernet1/0.*}
  action 1.0 cns-event msg "Interface state change: $_syslog_msg"
2    applet  snmp                Thu May30 05:57:16 2004 memory-fail
  oid {1.3.6.1.4.1.9.9.48.1.1.1.6.1} get-type exact entry-op lt entry-val
{5120000} poll-interval 90
  action 1.0 syslog priority critical msg "Memory exhausted; current available memory
is $_snmp_oid_val bytes"
  action 2.0 force-switchover

```

Use this command with the **event-type** keyword to display information about currently registered policies for the event type specified in the *event-name* argument, for example:

**Example:**

```

Device# show event manager policy registered event-type syslog
No.  Type   Event Type           Time Registered      Name
1    applet  syslog              Wed Jul16 00:05:17 2004 intf-down
  pattern {.*UPDOWN.*Ethernet1/0.*}
  action 1.0 cns-event msg "Interface state change: $_syslog_msg"

```

## Configuring Event SNMP Notification

Perform this task to configure SNMP notifications.

**Before you begin**

- SNMP event manager must be configured using the **snmp-server manager** command.

**Procedure**

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b>  Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>

	Command or Action	Purpose
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b>  Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet <i>applet-name</i></b> <b>Example:</b>  Device(config)# event manager applet snmp	Registers the applet with the event manager server and enters applet configuration mode.
<b>Step 4</b>	<b>event [tag <i>event-tag</i>] snmp-notification oid <i>oid-string</i> oid-val <i>comparison-value</i> op <i>operator</i> [maxrun <i>maxruntime-number</i>] [src-ip-address <i>ip-address</i>] [dest-ip-address <i>ip-address</i>] [default <i>seconds</i>] [direction {incoming   outgoing}] [msg-op {drop   send}]</b> <b>Example:</b>  Device(config-applet)# event snmp-notification dest-ip-address 192.168.1.1 oid 1 op eq oid-val 10	Specifies the event criteria for an Embedded Event Manager (EEM) applet that is run by sampling Simple Network Management Protocol (SNMP) notification.
<b>Step 5</b>	<b>end</b> <b>Example:</b>  Device(config-applet)# end	Exits applet configuration mode and returns to privileged EXEC mode.

## Configuring Multiple Event Support

The multiple event support feature adds the ability to register multiple events in the EEM server. The multiple event support involves one or more event occurrences, one or more tracked object states, and a time period for the event to occur. The event parameters are specified in the CLI commands. The data structure to handle multiple events contains multiple event identifiers and correlation logic. This data is used to register multiple events in the EEM Server.

### Setting the Event Configuration Parameters

The **trigger** command enters the trigger applet configuration mode and specifies the multiple event configuration statements for EEM applets. The trigger statement is used to relate multiple event statement using the *tag* argument specified in each event statement. The events are raised based on the specified parameters.

#### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>



	Command or Action	Purpose
	Device> enable	
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet</b> <i>applet-name</i> <b>Example:</b> Device(config)# event manager applet EventInterface	Registers an applet with EEM and enters applet configuration mode.
<b>Step 4</b>	<b>event</b> [ <b>tag</b> <i>event-tag</i> ] <b>cli pattern</b> <i>regular-expression</i> <b>sync</b> { <b>yes</b>   <b>no skip</b> { <b>yes</b>   <b>no</b> }} [ <b>occurs</b> <i>num-occurrences</i> ] [ <b>period</b> <i>period-value</i> ] [ <b>maxrun</b> <i>maxruntime-number</i> ] <b>Example:</b> Device(config-applet)# event tag 1.0 cli pattern "show bgp all" sync yes occurs 32 period 60 maxrun 60	Specifies the event criteria for an EEM applet that is run by matching a Cisco IOS command-line interface (CLI) command.
<b>Step 5</b>	<b>trigger</b> [ <b>occurs</b> <i>occurs-value</i> ] [ <b>period</b> <i>period-value</i> ] [ <b>period-start</b> <i>period-start-value</i> ] [ <b>delay</b> <i>delay-value</i> ] <b>Example:</b> Device(config-applet)# trigger occurs 1 period-start "0 8 * * 1-5" period 60	Specifies the complex event configuration parameters for an EEM applet.
<b>Step 6</b>	<b>correlate</b> { <b>event</b> <i>event-tag</i>   <b>track</b> <i>object-number</i> } [ <b>boolean-operator</b> <b>event</b> <i>event-tag</i> ] <b>Example:</b> Device(config-applet)# correlate event 1.0 or event 2.0	Specifies a complex event correlation in the trigger mode for an EEM applet. <b>Note</b> When "and" is used to group events such as traps or syslog messages, then the default trigger occurrence window is three minutes.
<b>Step 7</b>	<b>attribute tag</b> <i>event-tag</i> [ <b>occurs</b> <i>occurs-value</i> ] <b>Example:</b> Device(config-applet)# attribute tag 1.0 occurs 1	Specifies up to eight attribute statements to build a complex event for an EEM applet.
<b>Step 8</b>	<b>action</b> <i>label</i> <b>cli command</b> <i>cli-string</i> <b>Example:</b>	Specifies the action of executing a CLI command when an EEM applet is triggered.

	Command or Action	Purpose
	Device(config-applet)# action 1.0 cli command "show pattern"	

### Examples

In the following example, applet is run if the **show bgp all** CLI command and any syslog message that contains the string "COUNT" occurred within a period 60 seconds.

```
event manager applet delay_50
event tag 1.0 cli pattern "show bgp all" sync yes occurs 32 period 60 maxrun 60
event tag 2.0 syslog pattern "COUNT"
trigger occurs 1 delay 50
correlate event 1.0 or event 2.0
attribute tag 1.0 occurs 1
attribute tag 2.0 occurs 1
action 1.0 cli command "show pattern"
action 2.0 cli command "enable"
action 3.0 cli command "config terminal"
action 4.0 cli command " ip route 192.0.2.0 255.255.255.224 192.0.2.12"
action 91.0 cli command "exit"
action 99.0 cli command "show ip route | incl 192.0.2.5"
```

## Configuring EEM Class-Based Scheduling

To schedule Embedded Event Manager (EEM) policies and set policy scheduling options, perform this task. In this task, two EEM execution threads are created to run applets assigned to the default class.

The EEM policies will be assigned a class using the **class** keyword when they are registered. EEM policies registered without a class will be assigned to the default class. Threads that have default class, will service the default class when the thread is available for work. Threads that are assigned specific class letters will service any policy with a matching class letter when the thread is available for work.

If there is no EEM execution thread available to run the policy in the specified class and a scheduler rule for the class is configured, the policy will wait until a thread of that class is available for execution. Synchronous policies that are triggered from the same input event should be scheduled in the same execution thread.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b>  Device> enable	Enables privileged EXEC mode.  • Enter your password if prompted.
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b>  Device# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
<b>Step 3</b>	<b>event manager scheduler</b> { <b>applet</b>   <b>axp</b>   <b>call-home</b> } <b>thread class</b> <i>class-options</i> <b>number</b> <i>thread-number</i>  <b>Example:</b>  Device(config)# event manager scheduler applet thread class default number 2	Schedules EEM policies and sets policy scheduling options. <ul style="list-style-type: none"> <li>• In this example, two EEM execution threads are created to run applets assigned to the default class.</li> </ul>
<b>Step 4</b>	<b>exit</b>  <b>Example:</b>  Device(config)# exit	Exits global configuration mode and returns to privileged EXEC mode.

## Holding a Scheduled EEM Policy Event or Event Queue

To hold a scheduled EEM policy event or event queue in the EEM scheduler, perform this task. In this task, all pending EEM policies are displayed. A policy identified using a job ID of 2 is held in the EEM scheduler, and the final step shows that the policy with a job ID of 2 has changed status from pending to held.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b>  Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>show event manager policy pending</b> [ <b>queue-type</b> { <b>applet</b>   <b>call-home</b>   <b>axp</b>   <b>script</b> } <b>class</b> <i>class-options</i>   <b>detailed</b> ]  <b>Example:</b>  Device# show event manager policy pending	Displays the pending EEM policies.
<b>Step 3</b>	<b>event manager scheduler hold</b> { <b>all</b>   <b>policy</b> <i>job-id</i>   <b>queue-type</b> { <b>applet</b>   <b>call-home</b>   <b>axp</b>   <b>script</b> } <b>class</b> <i>class-options</i> } [ <b>processor</b> { <b>rp_primary</b>   <b>rp_standby</b> }]  <b>Example:</b>  Device# event manager scheduler hold policy 2	Holds a scheduled EEM policy event or event queue in the EEM scheduler. <ul style="list-style-type: none"> <li>• In this example, a policy with a job ID of 2 is put on hold.</li> </ul>
<b>Step 4</b>	<b>show event manager policy pending</b> [ <b>queue-type</b> { <b>applet</b>   <b>call-home</b>   <b>axp</b>   <b>script</b> } <b>class</b> <i>class-options</i>   <b>detailed</b> ]  <b>Example:</b>	Displays the status of EEM policy put on hold in Step 3 as held, along with other pending policies.

	Command or Action	Purpose
	Device# show event manager policy pending	

### Examples

The following example shows how to view all pending EEM policies and to hold the EEM policy with a job ID of 2.

```
Device# show event manager policy pending
no. job id status time of event          event type      name
1 1      pend  Thu Sep 7 02:54:04 2006  syslog         applet: one
2 2      pend  Thu Sep 7 02:54:04 2006  syslog         applet: two
3 3      pend  Thu Sep 7 02:54:04 2006  syslog         applet: three
Device# event manager scheduler hold policy 2
Device# show event manager policy pending

no. job id status time of event          event type      name
1 1      pend  Thu Sep 7 02:54:04 2006  syslog         applet: one
2 2      held  Thu Sep 7 02:54:04 2006  syslog         applet: two
3 3      pend  Thu Sep 7 02:54:04 2006  syslog         applet: three
```

## Resuming Execution of EEM Policy Events or Event Queues

To resume the execution of specified EEM policies, perform this task. In this task, the policy that was put on hold in the Holding a Scheduled EEM Policy Event or Event Queue task is now allowed to resume execution.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>show event manager policy pending</b> <b>Example:</b> Device# show event manager policy pending	Displays the pending and held EEM policies. <b>Note</b> Only the syntax applicable to this task is used in this example. For more details, see the Cisco IOS Network Management Command Reference.
<b>Step 3</b>	<b>event manager scheduler release {all   policy policy-id   queue-type {applet   call-home   axp   script}} class class-options [processor {rp_primary   rp_standby}]</b> <b>Example:</b>	Resumes execution of specified EEM policies. <ul style="list-style-type: none"> <li>• The example shows how to resume the execution of the policy with job ID of 2.</li> </ul>

	Command or Action	Purpose
	Device# event manager scheduler release policy 2	
<b>Step 4</b>	<b>show event manager policy pending</b> <b>Example:</b> Device# show event manager policy pending	Displays the status of the EEM policy resumed in Step 3 as pending, along with other pending policies.  <b>Note</b> Only the syntax applicable to this task is used in this example. For more details, see the Cisco IOS Network Management Command Reference.

### Examples

The following example shows how to view all pending EEM policies, to specify the policy that will resume execution, and to see that the policy is now back in a pending status.

```

Device# show event manager policy pending

no. job id status time of event          event type    name
1  1      pend  Thu Sep 7  02:54:04 2006  syslog       applet: one
2  2      held   Thu Sep 7  02:54:04 2006  syslog       applet: two
3  3      pend   Thu Sep 7  02:54:04 2006  syslog       applet: three
Rotuer# event manager scheduler release policy 2
Rotuer# show event manager policy pending
no. job id status time of event          event type    name
1  1      pend  Thu Sep 7  02:54:04 2006  syslog       applet: one
2  2      pend  Thu Sep 7  02:54:04 2006  syslog       applet: two
3  3      pend  Thu Sep 7  02:54:04 2006  syslog       applet: three

```

## Clearing Pending EEM Policy Events or Event Queues

Perform this task to clear EEM policies that are executing or pending execution. In this task, the EEM policy with a job ID of 2 is cleared from the pending queue. The **show event manager policy pending** command is used to display the policies that are pending before and after the policy is cleared.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>show event manager policy pending</b> <b>Example:</b>	Displays the pending EEM policies.

	Command or Action	Purpose
	Device# show event manager policy pending	<b>Note</b> Only the syntax applicable to this task is used in this example. For more details, see the Cisco IOS Network Management Command Reference.
<b>Step 3</b>	<b>event manager scheduler clear</b> {all   policy <i>job-id</i>   queue-type {applet   call-home   axp   script} class <i>class-options</i> } [processor {rp_primary   rp_standby}] <b>Example:</b> Device# event manager scheduler clear policy 2	Clears EEM policies that are executing or pending execution. <ul style="list-style-type: none"> <li>In this example, the EEM policy with a job ID of 2 is cleared from the pending queue.</li> </ul>
<b>Step 4</b>	<b>show event manager policy pending</b> <b>Example:</b> Device# show event manager policy pending	Displays all the pending EEM policies except the policy cleared in Step 3.  <b>Note</b> Only the syntax applicable to this task is used in this example. For more details, see the Cisco IOS Network Management Command Reference.

### Examples

The following example shows how to clear the EEM policy with a job ID of 2 that was pending execution. The **show** commands are used to display the policies that are pending before and after the policy is cleared.

```
Device# show event manager policy pending
no. job id status time of event          event type      name
1   1      pend  Thu Sep 7 02:54:04 2006  syslog         applet: one
2   2      pend  Thu Sep 7 02:54:04 2006  syslog         applet: two
3   3      pend  Thu Sep 7 02:54:04 2006  syslog         applet: three

Device# event manager scheduler clear policy 2
Device# show event manager policy pending

no. job id status time of event          event type      name
1   1      pend  Thu Sep 7 02:54:04 2006  syslog         applet: one
3   3      pend  Thu Sep 7 02:54:04 2006  syslog         applet: three
```

## Modifying the Scheduling Parameters of EEM Policy Events or Event Queues

To modify the scheduling parameters of the EEM policies, perform this task. The **show event manager policy pending** command displays policies that are assigned to the B or default class. All the currently pending policies are then changed to class A. After the configuration modification, the **show event manager policy pending** command shows all policies assigned as class A.

**Procedure**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<b>enable</b> <b>Example:</b> <pre>Device&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>show event manager policy pending</b> <b>Example:</b> <pre>Device# show event manager policy pending</pre>	Displays the pending EEM policies. <b>Note</b> Only the syntax applicable to this task is used in this example. For more details, see the Cisco IOS Network Management Command Reference.
<b>Step 3</b>	<b>event manager scheduler modify {all   policy job-id   queue-type {applet   call-home   axp   script}   class class-options} [queue-priority {high   last   low   normal}][processor {rp_primary   rp_standby}]</b> <b>Example:</b> <pre>Device# event manager scheduler modify all class A</pre>	Modifies the scheduling parameters of the EEM policies. <ul style="list-style-type: none"> <li>• In this example, all currently pending EEM policies are assigned to class A.</li> </ul>
<b>Step 4</b>	<b>show event manager policy pending</b> <b>Example:</b> <pre>Device# show event manager policy pending</pre>	Displays the EEM policies modified in Step 3 along with other pending policies. <b>Note</b> Only the syntax applicable to this task is used in this example. For more details, see the Cisco IOS Network Management Command Reference.

**Examples**

The following example shows how to modify the scheduling parameters of the EEM policies. In this example, the **show event manager policy pending** command displays policies that are assigned to the B or default class. All the currently pending policies are then changed to class A. After the configuration modification, the **show event manager policy pending** command verifies that all policies are now assigned as class A.

```
Device# show event manager policy pending
no. class  status time of event          event type  name
1  default pend   Thu Sep 7 02:54:04 2006  syslog     applet: one
2  default pend   Thu Sep 7 02:54:04 2006  syslog     applet: two
3  B       pend   Thu Sep 7 02:54:04 2006  syslog     applet: three

Device# event manager scheduler modify all class A
Device# show event manager policy pending
```

```

no. class status time of event          event type      name
1   A     pend   Thu Sep 7 02:54:04 2006  syslog         applet: one
2   A     pend   Thu Sep 7 02:54:04 2006  syslog         applet: two
3   A     pend   Thu Sep 7 02:54:04 2006  syslog         applet: three

```

## Verifying Class-Based Active EEM Policies

To verify the active or the running EEM policies, use the **show event manager policy active** command.

### Procedure

---

```
show event manager policy active [queue-type {applet|call-home | axp | script} class class-options | detailed]
```

This command displays only the running EEM policies. This command includes **class**, **detailed** and **queue-type** optional keywords. The following is sample output from this command:

### Example:

```

Device# show event manager policy active
no. job id p s status time of event event type name
1 12598 N A running Mon Oct29 20:49:37 2007 timer watchdog loop.tcl
2 12609 N A running Mon Oct29 20:49:42 2007 timer watchdog loop.tcl
3 12620 N A running Mon Oct29 20:49:46 2007 timer watchdog loop.tcl
4 12650 N A running Mon Oct29 20:49:59 2007 timer watchdog loop.tcl
5 12842 N A running Mon Oct29 20:51:13 2007 timer watchdog loop.tcl
default class - 6 applet events
no. job id p s status time of event event type name
1 15852 N A running Mon Oct29 21:11:09 2007 counter WDOG_SYSLG_CNTR_TRACK_INTF_APPL
2 15853 N A running Mon Oct29 21:11:09 2007 counter WDOG_SYSLG_CNTR_TRACK_INTF_APPL
3 15854 N A running Mon Oct29 21:11:10 2007 counter WDOG_SYSLG_CNTR_TRACK_INTF_APPL
4 15855 N A running Mon Oct29 21:11:10 2007 timer watchdog WDOG_SYSLG_CNTR_TRACK_INTF_APPL
5 15856 N A running Mon Oct29 21:11:11 2007 counter WDOG_SYSLG_CNTR_TRACK_INTF_APPL
6 15858 N A running Mon Oct29 21:11:11 2007 counter WDOG_SYSLG_CNTR_TRACK_INTF_APPL

```

---

## Verifying Class-Based Active EEM Policies

To verify the active or the running EEM policies, use the **show event manager policy active** command.

### Procedure

---

```
show event manager policy active [queue-type {applet|call-home | axp | script} class class-options | detailed]
```

This command displays only the running EEM policies. This command includes **class**, **detailed** and **queue-type** optional keywords. The following is sample output from this command:

### Example:

```

Device# show event manager policy active
no. job id p s status time of event event type name
1 12598 N A running Mon Oct29 20:49:37 2007 timer watchdog loop.tcl

```



```

2 12609 N A running Mon Oct29 20:49:42 2007 timer watchdog loop.tcl
3 12620 N A running Mon Oct29 20:49:46 2007 timer watchdog loop.tcl
4 12650 N A running Mon Oct29 20:49:59 2007 timer watchdog loop.tcl
5 12842 N A running Mon Oct29 20:51:13 2007 timer watchdog loop.tcl
default class - 6 applet events
no. job id p s status time of event event type name
1 15852 N A running Mon Oct29 21:11:09 2007 counter WDOG_SYSLG_CNTR_TRACK_INTF_APPL
2 15853 N A running Mon Oct29 21:11:09 2007 counter WDOG_SYSLG_CNTR_TRACK_INTF_APPL
3 15854 N A running Mon Oct29 21:11:10 2007 counter WDOG_SYSLG_CNTR_TRACK_INTF_APPL
4 15855 N A running Mon Oct29 21:11:10 2007 timer watchdog WDOG_SYSLG_CNTR_TRACK_INTF_APPL
5 15856 N A running Mon Oct29 21:11:11 2007 counter WDOG_SYSLG_CNTR_TRACK_INTF_APPL
6 15858 N A running Mon Oct29 21:11:11 2007 counter WDOG_SYSLG_CNTR_TRACK_INTF_APPL

```

## Verifying Pending EEM Policies

To verify the EEM policies that are pending for execution, use the **show event manager policy pending** command. Use the optional keywords to specify EEM class-based scheduling options.

### Procedure

```
show event manager policy pending [queue-type {applet| call-home | axp | script} class class-options |
detailed]
```

This command displays only the pending policies. This command includes **class**, **detailed** and **queue-type** optional keywords. The following is sample output from this command:

### Example:

```

Device# show event manager policy pending
no. job id p s status time of event event type name
1 12851 N A pend Mon Oct29 20:51:18 2007 timer watchdog loop.tcl
2 12868 N A pend Mon Oct29 20:51:24 2007 timer watchdog loop.tcl
3 12873 N A pend Mon Oct29 20:51:27 2007 timer watchdog loop.tcl
4 12907 N A pend Mon Oct29 20:51:41 2007 timer watchdog loop.tcl
5 13100 N A pend Mon Oct29 20:52:55 2007 timer watchdog loop.tcl

```

## Configuring EEM Applet (Interactive CLI) Support

The synchronous applets are enhanced to support interaction with the local console (tty) using two commands, **action gets** and **action puts**, and these commands allow users to enter and display input directly on the console. The output for synchronous applets will bypass the system logger. The local console will be opened by the applets and serviced by the corresponding synchronous Event Detector pty. Synchronous output will be directed to the opened console.

## Reading and Writing Input from the Active Console for Synchronous EEM Applets

Use the following tasks to implement EEM applet interactive CLI support:

## Reading Input from the Active Console

When a synchronous policy is triggered, the related console is stored in the publish information specification. The policy director will query this information in an event\_reqinfo call, and store the given console information for use by the **action gets** command.

The **action gets** command reads a line of the input from the active console and stores the input in the variable. The trailing new line will not be returned.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> <pre>Device&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> <pre>Device# configure terminal</pre>	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet</b> <i>applet-name</i> <b>Example:</b> <pre>Device(config)# event manager applet action</pre>	Registers the applet with the EEM and enters applet configuration mode.
<b>Step 4</b>	<b>event none</b> <b>Example:</b> <pre>Device(config-applet)# event none</pre>	Specifies that an EEM policy is to be registered with the EEM and can be run manually.
<b>Step 5</b>	<b>action label gets variable</b> <b>Example:</b> <pre>Device(config-applet)# action label2 gets input</pre>	Gets input from the local console in a synchronous applet and stores the value in the given variable when an EEM applet is triggered.
<b>Step 6</b>	<b>action label syslog [priority priority-level]</b> <b>msg msg-text</b> <b>Example:</b> <pre>Device(config-applet)# action label3 syslog msg "Input entered was \"\${input}\""</pre>	Specifies the action to be taken when an EEM applet is triggered. <ul style="list-style-type: none"> <li>• In this example, the action to be taken is to write the value of the variable specified in Step 5, to syslog.</li> </ul>
<b>Step 7</b>	<b>exit</b> <b>Example:</b> <pre>Device(config-applet)# exit</pre>	Exits applet configuration mode and returns to privileged EXEC mode.

## Example

The following example shows how to get the input from the local tty in a synchronous applet and store the value

```
Device(config)# event manager applet action
Device(config-applet)# event none
Device(config-applet)# action label2 gets input
Device(config-applet)# action label3 syslog msg "Input entered was \"${input}\""
```

## Writing Input to the Active Console

When a synchronous policy is triggered, the related console is stored in the publish information specification. The policy director will query this information in an event\_reqinfo call, and store the given console information for use by the **action puts** command.

The **action puts** command will write the string to the active console. A new line will be displayed unless the **nonewline** keyword is specified. The output from the **action puts** command for a synchronous applet is displayed directly to the console, bypassing the system logger. The output of the **action puts** command for an asynchronous applet is directed to the system logger.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b>  Device> enable	Enables privileged EXEC mode.  • Enter your password if prompted.
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b>  Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet</b> <i>applet-name</i> <b>Example:</b>  Device(config)# event manager applet action	Registers the applet with the EEM and enters applet configuration mode.
<b>Step 4</b>	<b>event none</b> <b>Example:</b>  Device(config-applet)# event none	Specifies that an EEM policy is to be registered with the EEM and can be run manually.
<b>Step 5</b>	<b>action</b> <i>label regexp string-pattern string-input</i> [ <i>string-match</i> [ <i>string-submatch1</i> ] [ <i>string-submatch2</i> ] [ <i>string-submatch3</i> ]] <b>Example:</b>	Specifies the action to match the regular expression pattern on an input string when an EEM applet is triggered.

	Command or Action	Purpose
	Device(config-applet)# action 1 regexp "(.*) (.*) (.*)" "one two three" _match _sub1	
<b>Step 6</b>	<b>action</b> <i>label</i> <b>puts</b> [ <b>newline</b> ] <i>string</i> <b>Example:</b> Device(config-applet)# action 2 puts "match is \$_match"	Specifies the action of printing data directly to the local console when an EEM applet is triggered. <ul style="list-style-type: none"> <li>• The <b>newline</b> keyword is optional and is used to suppress the display of the new line character.</li> </ul>
<b>Step 7</b>	<b>exit</b> <b>Example:</b> Device(config-applet)# exit	Exits applet configuration mode and returns to privileged EXEC mode.
<b>Step 8</b>	<b>event manager run</b> <i>applet-name</i> <b>Example:</b> Device# event manager run action	Manually runs a registered EEM policy. <ul style="list-style-type: none"> <li>• In this example, the policy registered in Step 3 is triggered and the associated actions specified in Step 5 and Step 6 are executed.</li> </ul>

### Example

The following example shows how the **action puts** command prints data directly to the local console:

```
Device(config-applet)# event manager applet puts
Device(config-applet)# event none
Device(config-applet)# action 1 regexp "(.*) (.*) (.*)" "one two three" _match _sub1
Device(config-applet)# action 2 puts "match is $_match"
Device(config-applet)# action 3 puts "submatch 1 is $_sub1"
Device# event manager run puts
match is one two three
submatch 1 is one
```

## Configuring SNMP Library Extensions

Depending on your release, the SNMP Library Extensions feature allows you to perform the following configurations.

### Prerequisites

To use this feature, you must be running Cisco IOS Release 12.4(22)T or a later release.

## SNMP Get and Set Operations

The SNMP Library Extensions feature extends the EEM applet **action info** and Tcl **sys\_reqinfo\_snmp** commands to include functionality for SNMP get-one, get-next, getid and set-any operations.

### SNMP Get Operation

The SNMP event manager performs the SNMP get operation to retrieve one or more variables for the managed objects. Using the **action info type snmp oid get-type** and **action info type snmp getid** commands, you can configure the SNMP event manager to send an SNMP get request by specifying the variables to retrieve, and the IP address of the agent.

For example, if you want to retrieve the variable with the OID value of 1.3.6.1.2.1.1.1, you should specify the variable value, that is 1.3.6.1.2.1.1.1. If the specified values do not match, a trap will be generated and an error message will be written to the syslog history.

The **action info type snmp oid get-type** command specifies the type of the get operation to be performed. To retrieve the exact variable, the get operation type should be specified as **exact**. To retrieve a lexicographical successor of the specified OID value, the get operation type should be set to **next**.

The table below shows the built-in variables, in which the values retrieved from SNMP get operation are stored.

**Table 3: Built-in Variables for action info type snmp oid Command**

Built-in Variable	Description
<b>_info_snmp_oid</b>	The SNMP object ID.
<b>_info_snmp_value</b>	The value string of the associated SNMP data element.

### GetID Operation

The **action info type snmp getid** command retrieves the following variables from the SNMP entity:

- sysDescr.0
- sysObjectID.0
- sysUpTime.0
- sysContact.0
- sysName.0
- sysLocation.0

The table below shows the built-in variables, in which the values retrieved from the SNMP getID operation are stored.

**Table 4: Built-in Variables for action info type snmp getid Command**

Built-in Variable	Description
<b>_info_snmp_syslocation_oid</b>	The OID value of the sysLocation variable.
<b>_info_snmp_syslocation_value</b>	The value string for the sysLocation variable.

Built-in Variable	Description
<code>_info_snmp_sysdescr_oid</code>	The OID value of the sysDescr variable.
<code>_info_snmp_sysdescr_value</code>	The value string for the sysDescr variable.
<code>_info_snmp_sysobjectid_oid</code>	The OID value of the sysObjectID variable.
<code>_info_snmp_sysobjectid_value</code>	The value string for the sysObjectID variable.
<code>_info_snmp_sysuptime_oid</code>	The OID value of the sysUptime variable.
<code>_info_snmp_sysuptime_value</code>	The value string for the sysUptime variable.
<code>_info_snmp_syscontact_oid</code>	The OID value of the sysContact variable.
<code>_info_snmp_syscontact_value</code>	The value string for the sysContact variable.

The get operation requests can be sent to both local and remote hosts.

## SNMP Set Operation

All SNMP variables are assigned a default value in the MIB view. The SNMP event manager can modify the value of these MIB variables through set operation. The set operation can be performed only on the system that allows read-write access.

To perform a set operation, you must specify the type of the variable and the value associated with it.

The table below shows the valid OID types and values for each OID type.

*Table 5: OID Type and Value for Set Operation*

OID Type	Description
<code>counter32</code>	A 32-bit number with a minimum value of 0. Value in the range from 0 to 4294967295 is valid.
<code>gauge</code>	A 32-bit number with a minimum value of 0. Integer value in the range from 0 to 4294967295 is valid.
<code>integer</code>	A 32-bit number used to specify a numbered object type. Integer value in the range from 0 to 4294967295 is valid.
<code>ipv4</code>	IP version 4 address. IPv4 address in dotted decimal notation.
<code>octet string</code>	An octet string in hexadecimal notation used to represent a string of octets.
<code>string</code>	An octet string in text notation used to represent a string of octets.
<code>unsigned32</code>	A 32-bit number used to represent decimal value. Value in the range from 0 to 4294967295 is valid.

The set operation can be carried out on both local and remote hosts.

## SNMP Traps and Inform Requests

Traps are SNMP notifications that alert the SNMP manager or the NMS to a network condition.

SNMP inform requests refer to the SNMP notifications that alert the SNMP manager to a network condition and request for confirmation of receipt from the SNMP manager.

An SNMP event occurs when SNMP MIB object ID values are sampled, or when the SNMP counter crosses a defined threshold. If the notifications are enabled and configured for such events, the SNMP traps or inform messages generated. An SNMP notification event is triggered when an SNMP trap or inform message is received by the event manager server.

To send an SNMP trap or inform message when an Embedded Event Manager (EEM) applet is triggered, the **action info type snmp trap** and **action info type snmp inform** commands are used. The CISCO-EMBEDDED-EVENT-MGR-MIB.mib is used to define the trap and inform messages.

## Configuring EEM Applet for SNMP Get and Set Operations

While registering a policy with the event manager server, the actions associated with an SNMP event can be configured.

Perform this task to configure EEM applet for SNMP set and get operations.

### Before you begin

- SNMP event manager must be configured using the **snmp-server manager** command.
- The SNMP community string should be set by using the **snmp-server community** command to enable access to the SNMP entity.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet</b> <i>applet-name</i> <b>Example:</b> Device(config)# event manager applet snmp	Registers the applet with the event manager server and enters applet configuration mode.
<b>Step 4</b>	Do one of the following: <ul style="list-style-type: none"> <li>• <b>event snmp oid</b> <i>oid-value</i> <b>get-type</b> {<b>exact</b>   <b>next</b>} <b>entry-op</b> <i>operator</i></li> </ul>	Specifies the event criteria that cause the EEM applet to run.

	Command or Action	Purpose
	<p><b>entry-val</b> <i>entry-value</i> [<b>exit-comb</b>   <b>and</b>] [<b>exit-op</b> <i>operator</i>] [<b>exit-val</b> <i>exit-value</i>] [<b>exit-time</b> <i>exit-time-value</i>] <b>poll-interval</b> <i>poll-int-value</i></p> <p><b>Example:</b></p> <pre>Device(config-applet)# event snmp oid</pre> <p><b>Example:</b></p> <pre>1.3.6.1.4.1.9.9.48.1.1.1.6.1 get-type exact</pre> <p><b>Example:</b></p> <pre>entry-op lt entry-val 5120000 poll-interval 90</pre>	<ul style="list-style-type: none"> <li>In this example, an EEM event is triggered when free memory falls below the value of 5120000.</li> <li>Exit criteria are optional, and if not specified, event monitoring is reenabled immediately.</li> </ul>
<b>Step 5</b>	<p><b>action label info type snmp oid</b> <i>oid-value</i> <b>get-type</b> {<b>exact</b> <b>next</b>} [<b>community</b> <i>community-string</i>] [<b>ipaddr</b> <i>ip-address</i>]</p> <p><b>Example:</b></p> <pre>Device(config-applet)# action 1.3 info type</pre> <p><b>Example:</b></p> <pre>snmp oid 1.3.6.1.4.1.9.9.48.1.1.1.6.1 get-type</pre> <p><b>Example:</b></p> <pre>exact community public ipaddr 172.17.16.69</pre>	<p>Specifies the type of get operation to perform.</p> <ul style="list-style-type: none"> <li>In this example, the type of get operation is specified as exact and community string is specified as public.</li> </ul>
<b>Step 6</b>	<p><b>action label info type snmp oid</b> <i>oid-value</i> <b>set-type</b> <i>oid-type</i> <i>oid-type-value</i> <b>community</b> <i>community-string</i> [<b>ipaddr</b> <i>ip-address</i>]</p> <p><b>Example:</b></p> <pre>Device(config-applet)# action 1.4 info type</pre> <p><b>Example:</b></p> <pre>snmp oid 1.3.6.1.4.1.9.9.48.1.1.1.6.1 set-type</pre> <p><b>Example:</b></p> <pre>integer 42220 sysName.0 community rw ipaddr</pre>	<p>(Optional) Specifies the variable to be set.</p> <ul style="list-style-type: none"> <li>In this example, the sysName.0 variable is specified for the set operation and community string is specified as rw.</li> </ul> <p><b>Note</b> For set operation, you must specify the SNMP community string.</p>



	Command or Action	Purpose
	<b>Example:</b>  172.17.16.69	
<b>Step 7</b>	<b>action label info type snmp getid oid-value</b> <b>[community community-string] [ipaddr</b> <b>ip-address]</b>  <b>Example:</b>  Device(config-applet)# action 1.3 info type  <b>Example:</b>  snmp getid community public ipaddr 172.17.16.69	(Optional) Specifies if the individual variables should be retrieved by the getid operation.
<b>Step 8</b>	<b>exit</b>  <b>Example:</b>  Device(config)# exit	Exits global configuration mode and returns to privileged EXEC mode.

## Configuring EEM Applet for SNMP OID Notifications

Perform this task to configure SNMP notifications.

### Before you begin

- SNMP event manager must be configured using the **snmp-server manager** command and SNMP agents must be configured to send and receive SNMP traps generated for an EEM policy.
- SNMP traps and informs must be enabled by using the **snmp-server enable traps event-manager** and **snmp-server enable traps** commands, to allow traps and inform requests to be sent from the device to the event manager server.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b>  Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b>  Device# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
<b>Step 3</b>	<p><b>event manager applet</b> <i>applet-name</i></p> <p><b>Example:</b></p> <pre>Device(config)# event manager applet snmp</pre>	Registers the applet with the event manager server and enters applet configuration mode.
<b>Step 4</b>	<p>Do one of the following:</p> <ul style="list-style-type: none"> <li>• <b>event snmp oid</b> <i>oid-value</i> <b>get-type</b> {<b>exact</b>   <b>next</b>} <b>entry-op</b> <i>operator</i> <b>entry-val</b> <i>entry-value</i> [<b>exit-comb</b>   <b>and</b>] [<b>exit-op</b> <i>operator</i>] [<b>exit-val</b> <i>exit-value</i>] [<b>exit-time</b> <i>exit-time-value</i>] <b>poll-interval</b> <i>poll-int-value</i></li> </ul> <p><b>Example:</b></p> <pre>Device(config-applet)# event snmp oid</pre> <p><b>Example:</b></p> <pre>1.3.6.1.4.1.9.9.48.1.1.1.6.1 get-type exact</pre> <p><b>Example:</b></p> <pre>entry-op lt entry-val 5120000 poll-interval 90</pre>	<p>Specifies the event criteria that cause the EEM applet to run.</p> <ul style="list-style-type: none"> <li>• In this example, an EEM event is triggered when free memory falls below the value of 5120000.</li> <li>• Exit criteria are optional, and if not specified, event monitoring is reenabled immediately.</li> </ul>
<b>Step 5</b>	<p><b>action label info type snmp var</b> <i>variable-name</i> <b>oid</b> <i>oid-value</i> <i>oid-type</i> <i>oid-type-value</i></p> <p><b>Example:</b></p> <pre>Device(config-applet)# action 1.3 info type</pre> <p><b>Example:</b></p> <pre>snmp var sysDescr.0 oid</pre> <p><b>Example:</b></p> <pre>1.3.6.1.4.1.9.9.48.1.1.1.6.1 integer 4220</pre>	<p>Specifies the instance of a managed object and its value.</p> <ul style="list-style-type: none"> <li>• In this example, the sysDescr.0 variable is used.</li> </ul>
<b>Step 6</b>	<p><b>action label info type snmp trap</b> <b>enterprise-oid</b> <i>enterprise-oid-value</i> <b>generic-trapnum</b> <i>generic-trap-number</i> <b>specific-trapnum</b> <i>specific-trap-number</i> <b>trap-oid</b> <i>trap-oid-value</i> <b>trap-var</b> <i>trap-variable</i></p>	<p>Generates an SNMP trap when the EEM applet is triggered.</p> <ul style="list-style-type: none"> <li>• In this example, the authenticationFailure trap is generated.</li> </ul>

	Command or Action	Purpose
	<p><b>Example:</b></p> <pre>Device(config-applet)# action 1.4 info type</pre> <p><b>Example:</b></p> <pre>snmp trap enterprise-oid 1.3.6.1.4.1.1</pre> <p><b>Example:</b></p> <pre>generic-trapnum 4 specific-trapnum 7 trap-oid</pre> <p><b>Example:</b></p> <pre>1.3.6.1.4.1.1.226.0.2.1 trap-var sysUpTime.0</pre>	<p><b>Note</b></p> <p>The specific trap number refers to the enterprise-specific trap, which is generated when an enterprise event occurs. If the generic trap number is not set to 6, the specific trap number you specify will be used to generate traps.</p>
<b>Step 7</b>	<p><b>action label info type snmp inform trap-oid</b>  <i>trap-oid-value trap-var trap-variable</i>  <b>community community-string ipaddr</b>  <i>ip-address</i></p> <p><b>Example:</b></p> <pre>Device(config-applet)# action 1.4 info type</pre> <p><b>Example:</b></p> <pre>snmp inform trap-oid 1.3.6.1.4.1.1.226.0.2.1</pre> <p><b>Example:</b></p> <pre>trap-var sysUpTime.0 community public ipaddr</pre> <p><b>Example:</b></p> <pre>172.69.16.2</pre>	<p>Generates an SNMP inform request when the EEM applet is triggered.</p> <ul style="list-style-type: none"> <li>In this example, the inform request is generated for the sysUpTime.0 variable.</li> </ul>
<b>Step 8</b>	<p><b>exit</b></p> <p><b>Example:</b></p> <pre>Device(config)# exit</pre>	<p>Exits global configuration mode and returns to privileged mode.</p>

## Configuring Variable Logic for EEM Applets

The Variable Logic for EEM Applets feature adds the ability to apply conditional logic within EEM applets. Before variable logic is introduced, applets have a linear structure where each action is executed in the order in which they are configured when the event is triggered. Conditional logic introduces a control structure that can change the flow of actions within applets depending on conditional expressions. Each control structure

can contain a list of applet actions including looping and if/else actions which determine if the structure is executed or not.

The information in applet configuration mode is presented as background to set the context for the action commands.

To provide a consistent user interface between the Tool Command Language (Tcl) and the applet (CLI) based EEM policies, the following criteria are followed:

- Event specification criteria are written in Tcl in the Tcl based implementation.
- Event specification data is written using the CLI applet submode configuration statements in the applet-based implementation.

Applet configuration mode is entered using the event manager applet command. In applet configuration mode the config prompt changes to (config-applet)#. In applet configuration mode two types of config statements are supported:

- event - used to specify the event criteria to cause this applet to run.
- action - used to specify a built-in action to perform.

Multiple **action** applet config commands are allowed within an applet configuration. If no **action** applet config command is present, a warning is displayed, upon exit, stating no statements are associated with this applet. When no statements are associated with this applet, events get triggered but no action is taken. If no commands are specified in applet configuration mode, the applet will be removed upon exit. The exit applet config command is used to exit from applet configuration mode.

Depending on your release, the Variable Logic for EEM Applets feature allows you to perform the following configurations.

## Prerequisites

To use this feature, you must be running Cisco IOS Release 12.4(22)T or a later release.

## Configuring Variable Logic for EEM Applets

EEM 3.0 adds new applet action commands to permit simple variable logic within applets.

To configure the variable logic using action commands perform the following tasks.

## Specifying a Loop of Conditional Blocks

To specify a loop of a conditional block when an EEM applet is triggered, perform this task. In this task, a conditional loop is set to check if the value of the variable is less than 10. If the value of the variable is less than 10, then the message 'i is \$\_i' is written to the syslog.




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**Note** Depending on your release, the **set** (EEM) command is replaced by the **action set** command. See the **action label set** command for more information. If the set (EEM) command is entered in certain releases, the IOS parser translates the **set** command to the **action label set** command.

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## Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b>  Device> enable	Enables privileged EXEC mode.  • Enter your password if prompted.
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b>  Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet</b> <i>applet-name</i> <b>Example:</b>  Device(config)# event manager applet condition	Registers the applet with the Embedded Event Manager (EEM) and enters applet configuration mode.
<b>Step 4</b>	<b>action label set</b> <b>Example:</b>  Device(config-applet)# <b>action 1.0 set</b> <b>i 2</b>	Sets an action for the event.  • In this example, the value of the variable <i>i</i> is set to 2.
<b>Step 5</b>	<b>action label while</b> <i>string_op1 operator string_op2</i> <b>Example:</b>  Device(config-applet)# action 2 while \$i lt 10	Specifies a loop of a conditional block.  • In this example, a loop is set to check if the value of the variable <i>i</i> is less than 10.
<b>Step 6</b>	Add any action as required. <b>Example:</b>  Device(config-applet)# <b>action 3</b> <b>syslog msg "i is \$i"</b>	Performs the action as indicated by the action command.  • In this example, the message 'i is \$i' is written to the syslog.
<b>Step 7</b>	<b>action label end</b> <b>Example:</b>  Device(config-applet)# <b>action 3 end</b>	Exits from the running action.

## Specifying if else Conditional Blocks

To specify the beginning of an if conditional statement followed by an else conditional statement, perform this task. The if or else conditional statements can be used in conjunction with each other or separately. In this task, the value of a variable is set to 5. An if conditional block is then specified to check if the value of

the variable is less than 10. Provided the if conditional block is satisfied, an action command to output the message 'x is less than 10' is specified.

Following the if conditional block, an else conditional block is specified. Provided the if conditional block is not satisfied, an action command to output the message 'x is greater than 10' is specified.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet</b> <i>applet-name</i> <b>Example:</b> Device(config)# event manager applet ifcondition	Registers the applet with the Embedded Event Manager (EEM) and enters applet configuration mode.
<b>Step 4</b>	<b>action</b> <i>label</i> <b>set</b> <i>variable-name</i> <i>variable-value</i> <b>Example:</b> Device(config-applet)# action 1.0 set x 5	Sets an action for the event. <ul style="list-style-type: none"> <li>• In this example, the value of the variable x is set to 5.</li> </ul>
<b>Step 5</b>	<b>action</b> <i>label</i> <b>if</b> [ <i>stringop1</i> ] { <b>eq</b>   <b>gt</b>   <b>ge</b>   <b>lt</b>   <b>le</b>   <b>ne</b> } [ <i>stringop2</i> ] <b>Example:</b> Device(config-applet)# action 2.0 if \$x lt 10	Specifies an if conditional statement. <ul style="list-style-type: none"> <li>• In this example, an if conditional statement to check if the value of the variable is less than 10.</li> </ul>
<b>Step 6</b>	Add any action as required. <b>Example:</b> Device(config-applet)# action 3.0 puts "\$x is less than 10"	Performs the action as indicated by the action command. <ul style="list-style-type: none"> <li>• In this example, the message '5 is less than 10' is displayed on the screen.</li> </ul>
<b>Step 7</b>	<b>action</b> <i>label</i> <b>else</b> <b>Example:</b> Device(config-applet)# action 4.0 else	Specifies an else conditional statement

	Command or Action	Purpose
<b>Step 8</b>	Add any action as required. <b>Example:</b>  Device(config-applet)# action 5.0	Performs the action as indicated by the action command.  • In this example, the message '5 is greater than 10' is displayed on the screen.
<b>Step 9</b>	<b>end</b> <b>Example:</b>  Device(config-applet)# end	Exits from the running action.

## Specifying foreach Iterating Statements

To specify a conditional statement that iterates over an input string using the delimiter as a tokenizing pattern, perform this task. The foreach iteration statement is used to iterate through a collection to get the desired information. The delimiter is a regular expression pattern string. The token found in each iteration is assigned to the given iterator variable. All arithmetic calculations are performed as long integers with out any checks for overflow. In this task, the value of the variable x is set to 5. An iteration statement is set to run through the input string red, blue, green, orange. For every element in the input string, a corresponding message is displayed on the screen.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b>  Device> enable	Enables privileged EXEC mode.  • Enter your password if prompted.
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b>  Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet</b> <i>applet-name</i> <b>Example:</b>  Device(config)# event manager applet iteration	Registers the applet with the Embedded Event Manager (EEM) and enters applet configuration mode.
<b>Step 4</b>	<b>action</b> <i>label</i> <b>foreach</b> [ <i>string-iterator</i> ] [ <i>string-input</i> ] [ <i>string-delimiter</i> ] <b>Example:</b>  Device(config-applet)# action 2.0 foreach iterator "red blue green orange"	Iterates over an input string using the delimiter as a tokenizing pattern.  • In this example, the iteration is run through the elements of the input string - red, blue, green and orange.

	Command or Action	Purpose
<b>Step 5</b>	Specify any action command  <b>Example:</b>  Device(config-applet)# action 3.0 puts "Iterator is \$iterator"	Performs the action as indicated by the action command.  <ul style="list-style-type: none"> <li>In this example, the following message is displayed on the screen:</li> </ul> <pre>Iterator is red Iterator is blue Iterator is green Iterator is orange</pre>
<b>Step 6</b>	<b>action label end</b>  <b>Example:</b>  Device(config-applet)# action 4.0 end	Exits from the running action.

## Using Regular Expressions

To match a regular expression pattern with an input string, perform this task. Using regular expressions, you can specify the rules for a set of possible strings to be matched.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b>  Device> enable	Enables privileged EXEC mode.  <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b>  Device# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet applet-name</b>  <b>Example:</b>  Device(config)# <b>event manager applet</b> <b>regex</b>	Registers the applet with the Embedded Event Manager (EEM) and enters applet configuration mode.
<b>Step 4</b>	<b>action label regex string-pattern</b> <i>string-input [string-match [string-submatch1] [string-submatch2] [string-submatch3]]</i>  <b>Example:</b>  Device(config-applet)# <b>action 2.0</b>	Specifies an expression pattern to match with an input string.  <ul style="list-style-type: none"> <li>In this example, an input string of 'red blue green' is specified. When the expression pattern matches the input string, the entire result <b>red blue green</b> is stored in the</li> </ul>



	Command or Action	Purpose
	<code>regexp "(.*) (.*) (.*)" "red blue green" _match _sub1</code>	variable <code>_match</code> and the submatch <code>redis</code> stored in the variable <code>_sub1</code> .

## Incrementing the Values of Variables

To increment the value of variables, perform this task. In this task, the value of a variable is set to 20 and then the value is incremented by 12.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<code>enable</code> <b>Example:</b> <code>Device&gt; enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>• Enter your password if prompted.</li></ul>
<b>Step 2</b>	<code>configure terminal</code> <b>Example:</b> <code>Device# configure terminal</code>	Enters global configuration mode.
<b>Step 3</b>	<code>event manager applet <i>applet-name</i></code> <b>Example:</b> <code>Device(config)# event manager applet increment</code>	Registers the applet with the Embedded Event Manager (EEM) and enters applet configuration mode.
<b>Step 4</b>	<code>action <i>label</i> set</code> <b>Example:</b> <code>Device(config-applet)#action 1.0 set varname 20</code>	Sets an action for the event. <ul style="list-style-type: none"><li>• In this example, the value of the variable is set to 20.</li></ul>
<b>Step 5</b>	<code>action <i>label</i> increment <i>variable-name</i> <i>long-integer</i></code> <b>Example:</b> <code>Device(config-applet)#action 2.0 increment varname 12</code>	Increments the value of variable by the specified long integer. <ul style="list-style-type: none"><li>• In this example, the value of the variable is incremented by 12.</li></ul>

## Configuring Event SNMP Object

Perform this task to register the Simple Network Management Protocol (SNMP) object event for an Embedded Event Manager (EEM) applet that is run by sampling SNMP object.

## Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> <pre>Device&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> <pre>Device# configure terminal</pre>	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet</b> <i>applet-name</i> <b>Example:</b> <pre>Device(config)# event manager applet manual-policy</pre>	Registers the applet with the Embedded Event Manager and enters applet configuration mode.
<b>Step 4</b>	<b>event snmp-object</b> <i>oid oid-value type value sync {yes   no} skip {yes   no} istable {yes   no} [default seconds] [maxrun maxruntime-number]</i> <b>Example:</b> <pre>Device(config-applet)# event snmp-object oid 1.9.9.9 type gauge sync yes</pre> <b>Example:</b> <pre>action 1 syslog msg "oid = \$_snmp_oid"</pre> <b>Example:</b> <pre>action 2 syslog msg "request = \$_snmp_request"</pre> <b>Example:</b> <pre>action 3 syslog msg "request_type = \$_snmp_request_type"</pre>	Registers the Simple Network Management Protocol (SNMP) object event for an Embedded Event Manager (EEM) applet to intercept SNMP GET and SET requests for an object. <p>The default for this command is that it is not configured. If this command is configured the defaults are the same as in the description of the syntax options,</p> <ul style="list-style-type: none"> <li>• The <b>oid</b> keyword specifies the SNMP object identifier (object ID).</li> <li>• The <i>oid-value</i> argument can be the Object ID value of the data element, in SNMP dotted notation. An OID is defined as a type in the associated MIB, CISCO-EMBEDDED-EVENT-MGR-MIB, and each type has an object value.</li> <li>• The <b>istable</b> keyword specifies whether the OID is an SNMP table.</li> <li>• The <b>sync</b> keyword specifies that the applet is to run in synchronous mode. The return code from the applet indicates whether to reply to the SNMP request. The description for code 0 is “do not reply to the request” and the description for code 1 is “reply to the request”. When the return code from the applet replies to the request, a value is specified in the applet for the object using <b>action snmp-object-value</b> command.</li> </ul>

	Command or Action	Purpose
		<ul style="list-style-type: none"> <li>The <b>type</b> keyword specifies the type of object.</li> <li>The <i>value</i> argument is the value of the object.</li> <li>The <b>skip</b> keyword specifies whether to skip CLI command execution.</li> <li>The <b>default</b> keyword specifies the time to process the SET or GET request normally by the applet. If the <b>default</b> keyword is not specified, the default time period is set to 30 seconds.</li> <li>The <i>milliseconds</i> argument is the time period during which the SNMP Object event detector waits for the policy to exit.</li> <li>The <b>maxrun</b> keyword specifies the maximum runtime of the applet. If the <b>maxrun</b> keyword is specified, the <i>maxruntime-number</i> value must be specified. If the <b>maxrun</b> keyword is not specified, the default applet run time is 20 seconds.</li> <li>The <i>milliseconds</i> argument is the maximum runtime of the applet in milliseconds. If the argument is not specified, the default 20-second run-time limit is used.</li> </ul>
<b>Step 5</b>	<b>exit</b> <b>Example:</b> <pre>Device(config)# exit</pre>	Exits global configuration mode and returns to privileged EXEC mode.

## Disabling AAA Authorization

Perform this task to allow EEM policies to bypass AAA authorization when triggered.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> <pre>Device&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>

	Command or Action	Purpose
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b>  Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet</b> <i>applet-name</i> [ <b>authorization bypass</b> ] [ <b>class</b> <i>class-options</i> ] [ <b>trap</b> ] <b>Example:</b>  Device(config)# event manager applet one class A authorization bypass	Registers the applet with the Embedded Event Manager (EEM) and enters applet configuration mode.
<b>Step 4</b>	<b>exit</b> <b>Example:</b>  Device(config-aaplet)# exit	Exits device configuration applet mode and returns to privileged EXEC mode.

## Configuring Description of an Embedded Event Manager Applet

Perform this task to describe an EEM applet. The description of an applet can be added in any order, before or after any other applet configuration. Configuring a new description for an applet that already has a description overwrites the current description. An applet description is optional.

Perform this task to configure a new description for an applet.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b>  Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b>  Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>event manager applet</b> <i>applet-name</i> <b>Example:</b>  Device(config)# event manager applet increment	Registers the applet with the EEM and enters applet configuration mode.

	Command or Action	Purpose
<b>Step 4</b>	<b>description</b> <i>line</i> <b>Example:</b> <pre>Device(config-applet)# description "This   applet looks for the word count in   syslog messages"</pre>	Adds or modifies the description of an EEM applet that is run by sampling Simple Network Management Protocol (SNMP).
<b>Step 5</b>	<b>event syslog pattern</b> <i>regular-expression</i> <b>Example:</b> <pre>Device(config-applet)# event syslog   pattern "count"</pre>	Specifies the event criteria for an Embedded Event Manager (EEM) applet that is run by matching syslog messages.
<b>Step 6</b>	<b>action</b> <i>label</i> <b>syslog msg</b> <i>msg-text</i> <b>Example:</b> <pre>Device(config-applet)# action 1 syslog   msg hi</pre>	Specifies the action to be taken when an EEM applet is triggered. <ul style="list-style-type: none"> <li>• In this example, the action taken is to write a message to syslog.</li> <li>• The <i>msg-text</i> argument can be character text, an environment variable, or a combination of the two.</li> </ul>
<b>Step 7</b>	<b>end</b> <b>Example:</b> <pre>Device(config-applet)# end</pre>	Exits applet configuration mode and returns to privileged EXEC mode.

# Configuration Examples for Writing Embedded Event Manager Policies Using Tcl

## Embedded Event Manager Applet Configuration Examples

The following examples show how to create an EEM applet for some of the EEM event detectors. These examples follow steps outlined in the [Registering and Defining an Embedded Event Manager Applet, on page 13](#).

### Application-Specific Event Detector

The following example shows how a policy named EventPublish\_A runs every 20 seconds and publishes an event type numbered 1 to an EEM subsystem numbered 798. The subsystem value of 798 specifies that a publish event has occurred from an EEM policy. A second policy named EventPublish\_B is registered to run when the EEM event type 1 occurs with subsystem 798. When the EventPublish\_B policy runs, it sends a message to syslog containing data passed as an argument from the EventPublish\_A policy.

```
event manager applet EventPublish_A
```

```

event timer watchdog time 20.0
action 1.0 syslog msg "Applet EventPublish_A"
action 2.0 publish-event sub-system 798 type 1 arg1 twenty
exit
event manager applet EventPublish_B
event application sub-system 798 type 1
action 1.0 syslog msg "Applet EventPublish_B arg1 $_application_data1"

```

### CLI Event Detector

The following example shows how to specify an EEM applet to run when the Cisco IOS **write memory** CLI command is run. The applet provides a notification that this event has occurred via a syslog message. In the example, the **sync** keyword is configured with the **yes** argument, and this means that the event detector is notified when this policy completes running. The exit status of the policy determines whether the CLI command will be executed. In this example, the policy exit status is set to one and the CLI command runs.

```

event manager applet cli-match
event cli pattern "write mem.*" sync yes
action 1.0 syslog msg "$_cli_msg Command Executed"
set 2.0 _exit_status 1

```

The following example shows an applet which matches the **cli pattern** with the **test** argument. When **show access-list test** is entered, the CLI event detector matches the test argument, and the applet is triggered. The **debug event manager detector cli** output is added to show **num\_matches** is set to one.

```

!
event manager applet EEM-PIPE-TEST
event cli pattern "test" sync yes
action 1.0 syslog msg "Pattern matched!"
!
*Aug 23 23:19:59.827: check_eem_cli_policy_handler: command_string=show access-lists test
*Aug 23 23:19:59.827: check_eem_cli_policy_handler: num_matches = 1, response_code = 4
*Aug 23 23:19:59.843: %HA_EM-6-LOG: EEM-PIPE-TEST: Pattern matched!

```



**Note** The functionality provided in the CLI event detector only allows a regular expression pattern match on a valid IOS CLI command itself. This does not include text after a pipe (|) character when redirection is used.

The following example shows that when **show version | include test** is entered, the applet fails to trigger because the CLI event detector does not match on characters entered after the pipe (|) character and the **debug event manager detector cli** output shows **num\_matches** is set to zero.

```

*Aug 23 23:20:16.827: check_eem_cli_policy_handler: command_string=show version
*Aug 23 23:20:16.827: check_eem_cli_policy_handler: num_matches = 0, response_code = 1

```

### Counter Event Detector and Timer Event Detector

The following example shows that the EventCounter\_A policy is configured to run once a minute and to increment a well-known counter called **critical\_errors**. A second policy--EventCounter\_B--is registered to be triggered when the well-known counter called **critical\_errors** exceeds a threshold of 3. When the EventCounter\_B policy runs, it resets the counter to 0.

```

event manager applet EventCounter_A
event timer watchdog time 60.0
action 1.0 syslog msg "EventCounter_A"

```

```

action 2.0 counter name critical_errors op inc value 1
exit
event manager applet EventCounter_B
event counter name critical_errors entry-op gt entry-val 3 exit-op lt exit-val 3
action 1.0 syslog msg "EventCounter_B"
action 2.0 counter name critical_errors op set value 0

```

### Interface Counter Event Detector

The following example shows how a policy named EventInterface is triggered every time the receive\_throttle counter for Fast Ethernet interface 0/0 is incremented by 5. The polling interval to check the counter is specified to run once every 90 seconds.

```

event manager applet EventInterface
event interface name FastEthernet0/0 parameter receive_throttle entry-op ge entry-val 5
entry-val-is-increment true poll-interval 90
action 1.0 syslog msg "Applet EventInterface"

```

### Resource Event Detector

The following example shows how to specify event criteria based on an ERM event report for a policy defined to report high CPU usage:

```

event manager applet policy-one
event resource policy cpu-high
action 1.0 syslog msg "CPU high at $_resource_current_value percent"

```

### RF Event Detector

The RF event detector is only available on networking devices that contain dual Route Processors (RPs). The following example shows how to specify event criteria based on an RF state change notification:

```

event manager applet start-rf
event rf event rf_prog_initialization
action 1.0 syslog msg "rf state rf_prog_initialization reached"

```

### RPC Event Detector

The RPC event detector allows an outside entity to make a Simple Object Access Protocol (SOAP) request to the device and invokes a defined EEM policy or script. The following example shows how an EEM applet called Event\_RPC is being registered to run an EEM script:

```

event manager applet Event_RPC
event rpc
action print puts "hello there"

```

The following example shows the format of the SOAP request and reply message:

```

<?xml version="1.0" encoding="UTF-8"?>
<SOAP:Envelope xmlns:SOAP="http://www.cisco.com/eem.xsd">
  <SOAP:Body>
    <run_eemscript>
      <script_name>Event_RPC</script_name>
    </run_eemscript>
  </SOAP:Body>
</SOAP:Envelope>
]]>]]>

```

```
<?xml version="1.0" encoding="UTF-8"?><SOAP:Envelope
xmlns:SOAP="http://www.cisco.com/eem.xsd"><SOAP:Body>
<run_eemscript_response><return_code>0</return_code><output></output></run_eemscript_response></SOAP:Body></SOAP:Envelope>]]>>
```

### SNMP Event Detector

The following example shows how to specify an EEM applet to run when the CPU usage is greater than 75 percent. When the EEM applet runs, the CLI commands **enable** and **show cpu processes** are run, and an e-mail containing the result of the **show cpu processes** command is sent to an engineer.

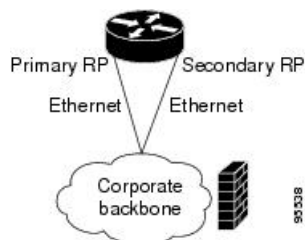
```
event manager applet snmpcpuge75
 event snmp oid 1.3.6.1.4.1.9.9.109.1.1.1.1.3.1 get-type exact entry-op ge entry-val 75
 poll-interval 10
 action 1.0 cli command "enable"
 action 2.0 cli command "show process cpu"
 action 3.0 mail server "192.168.1.146" to "engineer@cisco.com" from "devtest@cisco.com"
 subject "B25 PBX Alert" body "$_cli_result"
```

The next example is more complex and shows how to configure an EEM applet that causes a switch to the secondary (redundant) Route Processor (RP) when the primary RP runs low on memory.

This example illustrates a method for taking preventative action against a software fault that causes a memory leak. The action taken here is designed to reduce downtime by switching over to a redundant RP when a possible memory leak is detected.

The figure below shows a dual RP device that is running an EEM image. An EEM applet has been registered through the CLI using the **event manager applet** command. The applet will run when the available memory on the primary RP falls below the specified threshold of 5,120,000 bytes. The applet actions are to write a message to syslog that indicates the number of bytes of memory available and to switch to the secondary RP.

**Figure 1: Dual RP Topology**



The commands used to register the policy are shown below.

```
event manager applet memory-demo
 event snmp oid 1.3.6.1.4.1.9.9.48.1.1.1.6.1 get-type exact entry-op lt entry-val 5120000
 poll-interval 90
 action 1.0 syslog priority critical msg "Memory exhausted; current available memory is
 $_snmp_oid_val bytes"
 action 2.0 force-switchover
```

The registered applet is displayed using the **show event manager policy registered** command:

```
Device# show event manager policy registered
No.  Type  Event Type  Time Registered  Name
1    applet snmp  Thu Jan30 05:57:16 2003  memory-demo
oid {1.3.6.1.4.1.9.9.48.1.1.1.6.1} get-type exact entry-op lt entry-val {5120000}
poll-interval 90
action 1.0 syslog priority critical msg "Memory exhausted; current available memory is
```



```
$_snmp_oid_val bytes"
  action 2.0 force-switchover
```

For the purpose of this example, a memory depletion is forced on the device, and a series of **show memory** commands are executed to watch the memory deplete:

```
Device# show memory
      Head      Total (b)      Used (b)      Free (b)      Lowest (b)      Largest (b)
Processor 53585260 212348444 119523060 92825384 92825384 92365916
Fast      53565260      131080      70360      60720      60720      60668
Device# show memory
      Head      Total (b)      Used (b)      Free (b)      Lowest (b)      Largest (b)
Processor 53585260 212364664 164509492 47855172 47855172 47169340
Fast      53565260      131080      70360      60720      60720      60668
Device# show memory
      Head      Total (b)      Used (b)      Free (b)      Lowest (b)      Largest (b)
Processor 53585260 212369492 179488300 32881192 32881192 32127556
Fast      53565260      131080      70360      60720      60720      60668
```

When the threshold is reached, an EEM event is triggered. The applet named **memory-demo** runs, causing a syslog message to be written to the console and a switch to be made to the secondary RP. The following messages are logged:

```
00:08:31: %HA_EM-2-LOG: memory-demo: Memory exhausted; current available memory is
4484196 bytes
00:08:31: %HA_EM-6-FMS_SWITCH_HARDWARE: fh_io_msg: Policy has requested a hardware
switchover
```

The following is partial output from the **show running-config** command on both the primary RP and the secondary (redundant) RP:

```
redundancy
 mode sso
 .
 .
 !
event manager applet memory-demo
 event snmp oid 1.3.6.1.4.1.9.9.48.1.1.1.6.1 get-type exact entry-op lt entry-val
5120000 poll-interval 90
 action 1.0 syslog priority critical msg "Memory exhausted; current available memory
is $_snmp_oid_val bytes"
 action 2.0 force-switchover
```

### SNMP Notification Event Detector

The following example shows how to configure the **snmp-server community** public RW and **snmp-server manager** commands before **event snmp-notification** is configured.

```
snmp-server community public RW
snmp-server manager
```

The following example shows how an EEM applet called **SNMP\_Notification** is being registered to run an EEM script when the device receives an SNMP notification on destination IP address 192.168.1.1 for object ID 1 whose value equals 10.

```
event manager applet SNMP_Notification
 event snmp-notification dest_ip_address 192.168.1.1 oid 1 op eq oid-value 10
 action 1 policy eem_script
```

### Syslog Event Detector

The following example shows how to specify an EEM applet to run when syslog identifies that Ethernet interface 1/0 is down. The applet sends a message about the interface to syslog.

```
event manager applet interface-down
  event syslog pattern ``.*UPDOWN.*Ethernet1/0.*" occurs 4
  action 1.0 syslog msg "Ethernet interface 1/0 changed state 4 times"
```

## Configuration Examples for Embedded Event Manager Applet

### Example Identity Event Detector

The following example shows how a policy named “EventIdentity” is triggered every time the authentication on the Fast Ethernet interface 0 is success.

```
event manager applet EventIdentity
  event identity interface FastEthernet0 authc success
  action 1.0 syslog msg "Applet EventIdentity"
```

### Example MAT Event Detector

The following example shows how a policy named “EventMat” is triggered every time a mac-address is learned in the mac-address-table.

```
event manager applet EventMat
  event mat interface FastEthernet0
  action 1.0 syslog msg "Applet EventMat"
```

### Example Neighbor-Discovery Event Detector

The following example shows how a policy named “EventNeighbor” is triggered when a Cisco Discovery Protocol (CDP) cache entry changes.

```
event manager applet EventNeighbor
  event neighbor-discovery interface FastEthernet0 cdp all
  action 1.0 syslog msg "Applet EventNeighbor"
```

## Embedded Event Manager Manual Policy Execution Examples

The following examples show how to use the none event detector to configure an EEM policy (applet or script) to be run manually.

#### Using the event manager run Command

This example shows how to run a policy manually using the **event manager run** command. The policy is registered using the **event none** command under applet configuration mode and then run from global configuration mode using the **event manager run** command.

```
event manager applet manual-policy
  event none
  action 1.0 syslog msg "Manual-policy triggered"
```

```

end
!
event manager run manual-policy

```

### Using the action policy Command

This example shows how to run a policy manually using the **action policy** command. The policy is registered using the **event none** command under applet configuration mode, and then the policy is executed using the **action policy** command in applet configuration mode.

```

event manager applet manual-policy
  event none
  action 1.0 syslog msg "Manual-policy triggered"
  exit
!
event manager applet manual-policy-two
  event none
  action 1.0 policy manual-policy
  end
!
event manager run manual-policy-two

```

## Embedded Event Manager Watchdog System Monitor (Cisco IOS) Event Detector Configuration Example

The following example shows how to configure three EEM applets to demonstrate how the Cisco IOS watchdog system monitor (IOSWDSysMon) event detector works.

### Watchdog System Monitor Sample1 Policy

The first policy triggers an applet when the average CPU usage for the process named IP Input is greater than or equal to 1 percent for 10 seconds:

```

event manager applet IOSWD_Sample1
  event ioswdsysmon sub1 cpu-proc taskname "IP Input" op ge val 1 period 10
  action 1.0 syslog msg "IOSWD_Sample1 Policy Triggered"

```

### Watchdog System Monitor Sample2 Policy

The second policy triggers an applet when the total amount of memory used by the process named Net Input is greater than 100 kb:

```

event manager applet IOSWD_Sample2
  event ioswdsysmon sub1 mem-proc taskname "Net Input" op gt val 100 is-percent false
  action 1.0 syslog msg "IOSWD_Sample2 Policy Triggered"

```

### Watchdog System Monitor Sample3 Policy

The third policy triggers an applet when the total amount of memory used by the process named IP RIB Update has increased by more than 50 percent over the sample period of 60 seconds:

```

event manager applet IOSWD_Sample3
  event ioswdsysmon sub1 mem-proc taskname "IP RIB Update" op gt val 50 is-percent true
  period 60
  action 1.0 syslog msg "IOSWD_Sample3 Policy Triggered"

```

The three policies are configured, and then repetitive large pings are made to the networking device from several workstations, causing the networking device to register some usage. This will trigger policies 1 and 2, and the console will display the following messages:

```
00:42:23: %HA_EM-6-LOG: IOSWD_Sample1: IOSWD_Sample1 Policy Triggered
00:42:47: %HA_EM-6-LOG: IOSWD_Sample2: IOSWD_Sample2 Policy Triggered
```

To view the policies that are registered, use the **show event manager policy registered** command:

```
Device# show event manager policy registered
No.  Class  Type  Event Type  Trap  Time Registered  Name
1    applet  system ioswdsysmon  Off   Fri Jul 23 02:27:28 2004  IOSWD_Sample1
    sub1  cpu_util {taskname {IP Input} op ge val 1 period 10.000 }
    action 1.0 syslog msg "IOSWD_Sample1 Policy Triggered"
2    applet  system ioswdsysmon  Off   Fri Jul 23 02:23:52 2004  IOSWD_Sample2
    sub1  mem_used {taskname {Net Input} op gt val 100 is_percent FALSE}
    action 1.0 syslog msg "IOSWD_Sample2 Policy Triggered"
3    applet  system ioswdsysmon  Off   Fri Jul 23 03:07:38 2004  IOSWD_Sample3
    sub1  mem_used {taskname {IP RIB Update} op gt val 50 is_percent TRUE period 60.000 }
    action 1.0 syslog msg "IOSWD_Sample3 Policy Triggered"
```

## Configuration SNMP Library Extensions Examples

### SNMP Get Operations Examples

The following example shows how to send a get request to the local host.

```
Device(config)# event manager applet snmp
Device(config-applet)# event snmp oid
1.3.6.1.2.1.1.1.0 get-type exact entry-op
lt entry-val
5120000 poll-interval
90
Device(config-applet)# action 1.3 info type snmp oid
1.3.6.1.2.1.1.1.0 get-type exact
community
public
Device(config-applet)# action 1.3 info type snmp oid
1.3.6.1.2.1.1.4.0 get-type next community
public
```

The following log message will be written to the SNMP event manager log:

```
1d03h:%HA_EM-6-LOG: lg: 1.3.6.1.2.1.1.1.0
1d04h:%HA_EM-6-LOG: lgn: 1.3.6.1.2.1.1.5.0
```

The following example shows how to send a get request to a remote host.

```
Device(config)# event manager applet snmp
Device(config-applet)# event snmp oid
1.3.6.1.2.1.1.1.0 get-type exact entry-op
lt entry-val
5120000 poll-interval
90
Device(config-applet)# action 1.3 info type snmp oid
1.3.6.1.2.1.1.4.0 get-type next community
public ipaddr
```

```

172.17.16.69
Device(config-applet)# action 1.3 info type snmp getid
1.3.6.1.2.1.1.1.0 community
public ipaddr
172.17.16.69

```

The following log message is written to the SNMP event manager log:

```

1d03h:%HA_EM-6-LOG: lg: 1.3.6.1.2.1.1.1.0
1d04h:%HA_EM-6-LOG: lgn: 1.3.6.1.2.1.1.5.0

```

## SNMP GetID Operations Examples

The following example shows how to send a getid request to the local host.

```

Device(config)# event manager applet snmp
Device(config-applet)# event snmp oid
1.3.6.1.2.1.1.1.0 get-type exact entry-op
lt entry-val
5120000 poll-interval
90
Device(config-applet)# action 1.3 info type snmp getid
community
public

```

The following log message is written to the SNMP event manager log:

```

1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysname_oid=1.3.6.1.2.1.1.5.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysname_value=jubjub.cisco.com
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_syslocation_oid=1.3.6.1.2.1.1.6.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_syslocation_value=
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysdescr_oid=1.3.6.1.2.1.1.1.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysobjectid_oid=1.3.6.1.2.1.1.2.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysobjectid_value=products.222
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysuptime_oid=1.3.6.1.2.1.1.3.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysuptime_oid=10131676
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_syscontact_oid=1.3.6.1.2.1.1.4.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_syscontact_value=YYY

```

The following example shows how to send a getid request to a remote host.

```

Device(config)# event manager applet snmp
Device(config-applet)# event snmp oid
1.3.6.1.2.1.1.1.0 get-type exact entry-op
lt entry-val
5120000 poll-interval
90
Device(config-applet)# action 1.3 info type snmp getid
1.3.6.1.2.1.1.1.0 community
public ipaddr
172.17.16.69

```

The following log message is written to the SNMP event manager log:

```

1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysname_oid=1.3.6.1.2.1.1.5.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysname_value=jubjub.cisco.com
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_syslocation_oid=1.3.6.1.2.1.1.6.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_syslocation_value=
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysdescr_oid=1.3.6.1.2.1.1.1.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysobjectid_oid=1.3.6.1.2.1.1.2.0

```

```

1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysobjectid_value=products.222
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysuptime_oid=1.3.6.1.2.1.1.3.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_sysuptime_oid=10131676
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_syscontact_oid=1.3.6.1.2.1.1.4.0
1d04h:%HA_EM-6-LOG: lgid: _info_snmp_syscontact_value=YYY

```

## Set Operations Examples

The following example shows how to perform a set operation on the local host.

```

Device(config)# event manager applet snmp
Device(config-applet)# event snmp oid
1.3.6.1.2.1.1.1.0 get-type exact entry-op
lt entry-val
5120000 poll-interval
90
Device(config-applet)# action 1.3 info type snmp oid
1.3.6.1.2.1.1.4.0 set-type
integer
5 sysName.0 community
public

```

The following log message is written to the SNMP event manager log:

```

1d04h:%HA_EM-6-LOG: lset: 1.3.6.1.2.1.1.4.0
1d04h:%HA_EM-6-LOG: lset: XXX

```

The following example shows how to perform a set operation on a remote host.

```

Device(config)# event manager applet snmp
Device(config-applet)# event snmp oid
1.3.6.1.2.1.1.1.0 get-type exact entry-op
lt entry-val
5120000 poll-interval
90
Device(config-applet)# action 1.3 info type snmp oid
1.3.6.1.2.1.1.4.0 set-type integer
5 sysName.0 community
public ipaddr
172.17.16.69

```

The following log message is written to the SNMP event manager log:

```

1d04h:%HA_EM-6-LOG: lset: 1.3.6.1.2.1.1.4.0
1d04h:%HA_EM-6-LOG: lset: XXX

```

## Generating SNMP Notifications Examples

The following example shows how to configure SNMP traps for the sysUpTime.0 variable:

```

Device(config)# event manager applet snmp
Device(config-applet)# event snmp oid
1.3.6.1.4.1.9.9.48.1.1.1.6.1 get-type exact entry-op
lt entry-val
5120000 poll-interval
90
Device(config-applet)# action 1.3 info type snmp var
sysUpTime.0 oid
1.3.6.1.4.1.9.9.43.1.1.6.1.3.41 integer

```

```

2
Device(config-applet)# action 1.4 info type snmp trap
enterprise-oid
ciscoSyslogMIB.2 generic-trapnum
6 specific-trapnum
1 trap-oid
1.3.6.1.4.1.9.9.41.2.0.1 trap-var
sysUpTime.0

```

The following output is generated if the debug snmp packets command is enabled:

```

Device# debug snmp packets
1d04h: SNMP: Queuing packet to 172.69.16.2
1d04h: SNMP: V1 Trap, ent ciscoSyslogMIB.2, addr 172.19.rap 1
clogHistoryEntry.3 = 4
clogHistoryEntry.6 = 9999
1d04h: SNMP: Queuing packet to 172.19.208.130
1d04h: SNMP: V1 Trap, ent ciscoSyslogMIB.2, addr 172.19.rap 1
clogHistoryEntry.3 = 4
clogHistoryEntry.6 = 9999
1d04h: SNMP: Packet sent via UDP to 172.69.16.2
1d04h: SNMP: Packet sent via UDP to 172.69.16.2
infra-view10:
Packet Dump:
30 53 02 01 00 04 04 63 6f 6d 6d a4 48 06 09 2b
06 01 04 01 09 09 29 02 40 04 ac 13 d1 17 02 01
06 02 01 01 43 04 00 9b 82 5d 30 29 30 12 06 0d
2b 06 01 04 01 09 09 29 01 02 03 01 03 02 01 04
30 13 06 0d 2b 06 01 04 01 09 09 29 01 02 03 01
06 02 02 27 0f
Received SNMPv1 Trap:
Community: comm
Enterprise: ciscoSyslogMIBNotificationPrefix
Agent-addr: 172.19.209.23
Enterprise Specific trap.
Enterprise Specific trap: 1
Time Ticks: 10191453
clogHistSeverity = error(4)
clogHistTimestamp = 9999

```

The following example shows how to configure SNMP inform requests for the sysUpTime.0 variable:

```

Device(config)# event manager applet snmp
Device(config-applet)# event snmp oid
1.3.6.1.4.1.9.9.48.1.1.1.6.1 get-type exact entry-op
lt entry-val
5120000 poll-interval
90
Device(config-applet)# action 1.3 info type snmp var
sysUpTime.0 oid
1.3.6.1.4.1.9.9.43.1.1.6.1.3.41 integer
2
Device(config-applet)# action 1.4 info type snmp inform
trap-oid
1.3.6.1.4.1.9.9.43.2.0.1 trap-var
sysUpTime.0 community
public ipaddr
172.19.209.24

```

The following output is generated if the debug snmp packets command is enabled:

```

Device# debug snmp packets

```

```

1d04h: SNMP: Inform request, reqid 24, errstat 0, erridx 0
sysUpTime.0 = 10244391
snmpTrapOID.0 = ciscoConfigManMIB.2.0.1
ccmHistoryEventEntry.3.40 = 1
1d04h: SNMP: Packet sent via UDP to 172.19.209.24.162
1d04h: SNMP: Packet received via UDP from 172.19.209.24 on FastEthernet0/0
1d04h: SNMP: Response, reqid 24, errstat 0, erridx 0
1d04h: SNMP: Response, reqid 24, errstat 0, erridx 0
1d04h: SNMP: Inform request, reqid 25, errstat 0, erridx 0
sysUpTime.0 = 10244396
snmpTrapOID.0 = ciscoConfigManMIB.2.0.1
ccmHistoryEventEntry.3.41 = 2
1d04h: SNMP: Packet sent via UDP to 172.19.209.24.162
1d04h: SNMP: Packet received via UDP from 172.19.209.24 on FastEthernet0/0
1d04h: SNMP: Response, reqid 25, errstat 0, erridx 0
1d04h: SNMP: Response, reqid 25, errstat 0, erridx 0
Device# debug snmp packets
5d04h: SNMP: Packet received via UDP from 172.19.209.23 on FastEthernet0/0
5d04h: SNMP: Inform request, reqid 24, errstat 0, erridx 0
sysUpTime.0 = 10244391
snmpTrapOID.0 = ciscoConfigManMIB.2.0.1
ccmHistoryEventEntry.3.40 = 1
5d04h: dest if_index = 1
5d04h: dest ip_addr= 172.19.209.24
5d04h: SNMP: Response, reqid 24, errstat 0, erridx 0
5d04h: SNMP: Packet sent via UDP to 172.19.209.23.57748
5d04h: SNMP: Packet received via UDP from 172.19.209.23 on FastEthernet0/0
5d04h: SNMP: Inform request, reqid 25, errstat 0, erridx 0

```

## Configuring Variable Logic for EEM Applets Examples

The following sections provide examples on some selected action commands. For information on all the action commands supporting variable logic within applets, see the table below.

In this example, conditional loops **while**, **if** and **foreach** are used to print data. Other action commands such as **action divide**, **action increment** and **action puts** are used to define the actions to be performed when the conditions are met.

```

event manager applet printdata
event none
action 100 set colors "red green blue"
action 101 set shapes "square triangle rectangle"
action 102 set i "1"
action 103 while $i lt 6
action 104   divide $i 2
action 105   if $_remainder eq 1
action 106     foreach _iterator "$colors"
action 107       puts newline "$_iterator "
action 108     end
action 109     puts ""
action 110   else
action 111     foreach _iterator "$shapes"
action 112       puts newline "$_iterator "
action 113     end
action 114     puts ""
action 115   end
action 116   increment i
action 117 end

```

When the event manager applet `ex` is run, the following output is obtained:



```

event manager run printdata
red green blue
square triangle rectange
red green blue
square triangle rectange
red green blue

```

In this example, two environment variables `poll_interface` and `max_rx_rate` are set to `F0/0` and `3` respectively. Every 30 seconds there is a poll on an interface for rx rate. If the rx rate is greater than the threshold, a syslog message is displayed.

This applet makes use of the `foreach` conditional statement to poll the interface, the `if` conditional block to compare the value under `RXPS` with `max_rx_rate` that was set in the EEM environment variable.

```

event manager environment poll_interfaces F0/0
event manager environment max_rx_rate 3
ev man app check_rx_rate
ev timer watchdog name rx_timer time 30
action 100 foreach int $poll_interfaces
action 101 cli command "en"
action 102 cli command "show int $int summ | beg -----"
action 103 foreach line $_cli_result "\n"
action 105 regexp ".*[0-9]+\s+[0-9]+\s+[0-9]+\s+[0-9]+\s+[0-9]+\s+([0-9])\s+.*" $line
junk rxps
action 106 if $_regexp_result eq 1
action 107 if $rxps gt $max_rx_rate
action 108 syslog msg "Warning rx rate for $int is > than threshold. Current value is
$rxps
(threshold is $max_rx_rate)"
action 109 end
action 110 end
action 111 end
action 112 end

```

Example syslog message:

```

Oct 16 09:29:26.153: %HA_EM-6-LOG: c: Warning rx rate for F0/0 is > than threshold.
Current value is 4 (threshold is 3)
The output of show int F0/0 summ is of the format:

```

```
#show int f0/0 summ
```

```

*: interface is up
IHQ: pkts in input hold queue      IQD: pkts dropped from input queue
OHQ: pkts in output hold queue     OQD: pkts dropped from output queue
RXBS: rx rate (bits/sec)           RXPS: rx rate (pkts/sec)
TXBS: tx rate (bits/sec)           TXPS: tx rate (pkts/sec)
TRTL: throttle count

```

Interface	IHQ	IQD	OHQ	OQD	RXBS	RXPS	TXBS	TXPS	TRTL
* FastEthernet0/0	0	87283	0	0	0	0	0	0	0



**Note** To use other action commands supporting variable logic within applets, use the commands listed in the table below.

Table 6: Available action commands

Action Commands	Purpose
action add	Adds the value of two variables when an EEM applet is triggered.
action append	Appends the given value to the current value of a variable when an EEM applet is triggered.
action break	Causes an immediate exit from a loop of actions when an EEM applet is triggered.
action comment	Adds comments to an applet when an EEM applet is triggered.
action context retrieve	Retrieves variables identified by a given set of context when an EEM applet is triggered.
action context save	Saves information across multiple policy triggers when an EEM applet is triggered.
action continue	Continues with a loop of actions when an EEM applet is triggered.
action decrement	Decrements the value of a variable when an EEM applet is triggered.
action divide	Divides the dividend value by the given divisor value when an EEM applet is triggered.
action else	Specifies the beginning of else conditional action block when an EEM applet is triggered.
action elseif	Identifies the beginning of the else conditional action block when an EEM applet is triggered.
action end	Specifies the identification of the end of an conditional action block when an EEM applet is triggered.
action exit	Specifies an immediate exit from the running applet when an EEM applet is triggered.
action foreach	Specifies the iteration of an input string using the delimiter when an EEM applet is triggered.
action gets	Gets an input from the local TTY in a synchronous applet when an EEM applet is triggered.
action if	Specifies the identification of the beginning of an if conditional action block when an EEM applet is triggered.
action if goto	Instructs the applet to jump to a given label if the specified condition is met when an EEM applet is triggered.
action increment	Increments the value of a variable when an EEM applet is triggered.
action info type interface-names	Specifies the action of obtaining interface names when an EEM applet is triggered.
action info type snmp getid	Retrieves the individual variables from a Simple Network Management Protocol (SNMP) operation when an EEM applet is triggered.
action info type snmp inform	Sends an SNMP inform requests when an EEM applet is triggered.
action info type snmp oid	Specifies the type of SNMP get operation and the object identifier (OID) when an EEM applet is triggered.
action info type snmp trap	Sends SNMP trap requests when an EEM applet is triggered.

Action Commands	Purpose
action info type snmp var	Creates a variable for an SNMP object identifier (OID).
action multiply	Specifies the action of multiplying the variable value.
action puts	Enables the action of printing data directly to the console.
action regexp	Specifies the action of matching a regular expression.
action set (EEM)	Specifies the action of setting the value of a variable.
action string compare	Specifies the action of comparing two unequal strings.
action string equal	Specifies the action of verifying whether or not two strings are equal.
action string first	Specifies the action of returning the index on the first occurrence of a character.
action string index	Specifies the action of returning the characters specified by the index.
action string last	Specifies the action of returning the index on the last occurrence of a character.
action string length	Specifies the action of returning the number of characters in a string.
action string match	Specifies the action of returning 1 to the <code>\$_string_result</code> variable if the string matches the regular expression.
action string range	Specifies the action of storing a range of characters from a string.
action string replace	Specifies the action of storing a new string by replacing a specific range of characters in a string when an EEM event is triggered.
action string tolower	Specifies the action of storing specific range of characters in a string in lowercase.
action string toupper	Specifies the action of storing specific range of characters in a string in uppercase.
action string trim	Specifies the action to trim a string when an EEM event is triggered.
action string trimleft	Specifies the action to trim the characters of one string from the left.
action string trimright	Specifies the action to trim the characters of one string from the right.
action subtract	Subtracts the value of a variable from another variable.
action while	Specifies the action of identifying the beginning of a string.

## Configuring Event SNMP-Object Examples

The following example shows the SET operation and the value to set is in `$_snmp_value` and it is managed by the script. The example below saves the oid and its value as contexts to be retrieved later.

```
event manager applet snmp-object1
  description "APPLET SNMP-OBJ-1"
  event snmp-object oid 1.3.6.1.2.1.31.1.1.1.18 type string sync no skip no istable yes
  default 0
  action 1 syslog msg "SNMP-OBJ1:TRIGGERED" facility "SNMP_OBJ"
```

```

action 2 context save key myoid variable "_snmp_oid"
action 3 context save key myvalue variable "_snmp_value"

```

## Configuring Description of an EEM Applet Examples

The following example shows how to add or modify the description for an Embedded Event Manager (EEM) applet that is run by sampling Simple Network Management Protocol (SNMP):

```

event manager applet test
description "This applet looks for the word count in syslog messages"
event syslog pattern "count"
action 1 syslog msg hi

```

## Additional References

The following sections provide references related to writing EEM policies Using the Cisco IOS CLI.

### Related Documents

Related Topic	Document Title
EEM commands: complete command syntax, defaults, command mode, command history, usage guidelines, and examples	<a href="#">Cisco IOS Embedded Event Manager Command Reference</a>
Embedded Event Manager overview	Embedded Event Manager Overview module
Embedded Event Manager policy writing using Tcl	Writing Embedded Event Manager Policies Using Tcl module
Configuring enhanced object tracking	Configuring Enhanced Object Tracking module

### Standards

Standard	Title
No new or modified standards are supported, and support for existing standards has not been modified.	--

### MIBs

MIB	MIBs Link
CISCO-EMBEDDED-EVENT-MGR-MIB	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**RFCs**

<b>RFC</b>	<b>Title</b>
No new or modified RFCs are supported, and support for existing RFCs has not been modified.	--

**Technical Assistance**

<b>Description</b>	<b>Link</b>
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

## Feature Information for Writing EEM 4.0 Policies Using the Cisco IOS CLI

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 the 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](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

*Table 7: Feature Information for Writing EEM 4.0 Policies Using the Cisco IOS CLI*

<b>Feature Name</b>	<b>Releases</b>	<b>Feature Information</b>
Embedded Event Manager 4.0	15.2(5)E1	This feature was introduced and is supported only on c2960cx platform.

