Configuring Embedded Event Manager

Information about Embedded Event Manager

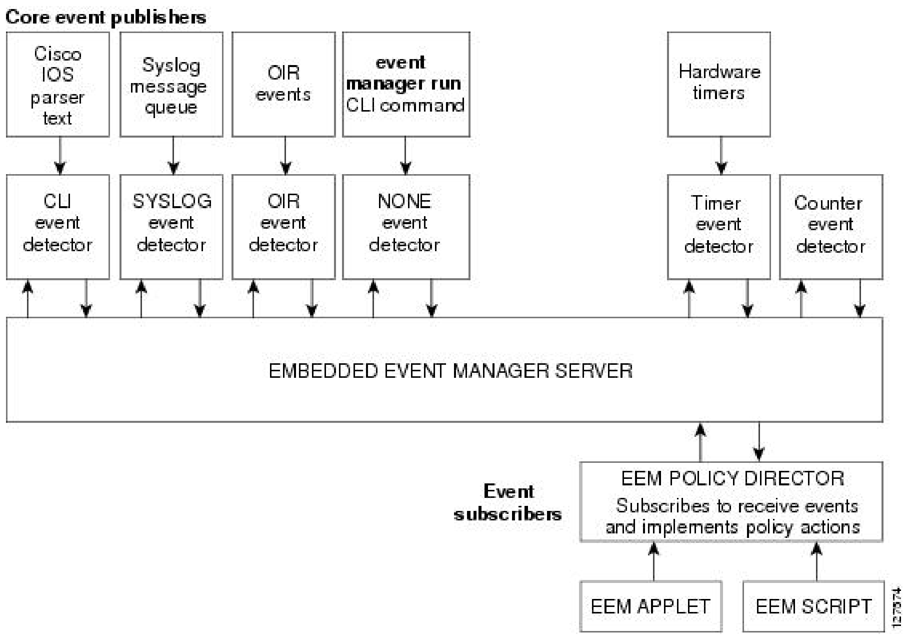
Understanding Embedded Event Manager

Embedded Event Manager (EEM) is a distributed and customized approach to event detection and recovery within a Cisco IOS device. EEM offers the ability to monitor events and take informational, corrective, or any other EEM action when the monitored events occur or when a threshold is reached. An EEM policy defines an event and the actions to be taken when that event occurs.

EEM monitors key system events and then acts on them through a set policy. This policy is a programmed script that you can use to customize a script to invoke an action based on a given set of events occurring. The script generates actions such as generating custom syslog or Simple Network Management Protocol (SNMP) traps, invoking CLI commands, forcing a failover, and so forth. The event management capabilities of EEM are useful because not all event management can be managed from the switch and because some problems compromise communication between the switch and the external network management device. Network availability is improved if automatic recovery actions are performed without rebooting the switch.

This example shows the relationship between the EEM server, the core event publishers (event detectors), and the event subscribers (policies). The event publishers screen events and when there is a match on an event specification that is provided by the event subscriber. Event detectors notify the EEM server when an event occurs. The EEM policies then implement recovery based on the current state of the system and the actions specified in the policy for the given event.

Figure 1: Embedded Event Manager Core Event Detectors



Note EEM is supported only on Cisco Catalyst 3560-CX switches.

EEM is supported only on Catalyst switches running IP Base and IP Services licenses.

Embedded Event Manager Actions

These actions occur in response to an event:

- Modifying a named counter.
- Publishing an application-specific event.
- Generating an SNMP trap.
- Generating prioritized syslog messages.
- Reloading the Cisco IOS software.
- Reloading the switch stack.
- Reloading the master switch in the event of a master switchover. If this occurs, a new master switch is elected.

Embedded Event Manager Policies

EEM can monitor events and provide information, or take 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 policy that is defined within the CLI configuration. It is a concise method for defining event screening criteria and the actions to be taken when that event occurs. Scripts are defined on the networking device by using an ASCII editor. The script, which can be a bytecode (.tbc) and text (.tcl) script, is then copied to the networking device and registered with EEM. You can also register multiple events in a .tcl file.

You use EEM to write and implement your own policies using the EEM policy tool command language (TCL) script. When you configure a TCL script on the master switch and the file is automatically sent to the member switches. The user-defined TCL scripts must be available in the member switches so that if the master switch changes, the TCL scripts policies continue to work.

Cisco enhancements to TCL in the form of keyword extensions facilitate the development of EEM policies. These keywords identify the detected event, the subsequent action, utility information, counter values, and system information.

Embedded Event Manager Environment Variables

EEM uses environment variables in EEM policies. These variables are defined in a EEM policy tool command language (TCL) script by running a CLI command and the **event manager environment** command.

- User-defined variables —Defined by the user for a user-defined policy.
- Cisco-defined variables —Defined by Cisco for a specific sample policy.
- Cisco built-in variables (available in EEM applets) —Defined by Cisco and can be read-only or read-write. The read-only variables are set by the system before an applet starts to execute. The single read-write variable, *_exit_status*, allows you to set the exit status for policies triggered from synchronous events.

Cisco-defined environment variables and Cisco system-defined environment variables might apply to one specific event detector or to all event detectors. Environment variables that are user-defined or defined by Cisco in a sample policy are set by using the event manager environment global configuration command. You must defined the variables in the EEM policy before you register the policy.

Embedded Event Manager 3.2

Embedded Event Manager 3.2 provides support for the following event detectors:

- Neighbor Discovery—Neighbor Discovery event detector provides the ability to publish a policy to respond to automatic neighbor detection when:
  - a Cisco Discovery Protocol (CDP) cache entry is added, deleted, or updated.
  - a Link Layer Discovery Protocol (LLDP) cache entry is added, deleted or updated.
  - an interface link status changes.
  - an interface line status changes.
- Identity—Identity event detector generates an event when AAA authorization and authentication is successful, when failure occurs, or after normal user traffic on the port is allowed to flow.
- Mac-Address-Table—Mac-Address-Table event detector generates an event when a MAC address is learned in the MAC address table.

Note The Mac-Address-Table event detector is supported only on switch platforms and can be used only on Layer 2 interfaces where MAC addresses are learned. Layer 3 interfaces do not learn addresses,and routers do not usually support the MAC address-table infrastructure needed to notify EEM of a learned MAC address.

EEM 3.2 also introduces CLI commands to support the applets to work with the new event detectors.

How to Configure Embedded Event Manager

Registering and Defining an Embedded Event Manager Applet

Beginning in privileged EXEC mode, perform this task to register an applet with EEM and to define the EEM applet using the **event applet** and **action applet** configuration commands.

Note Only one event applet command is allowed in an EEM applet. Multiple action applet commands are permitted. If you do not specify the **no event** and **no action** commands, the applet is removed when you exit configuration mode.

SUMMARY STEPS

1. **configure terminal**
2. **event manager applet***applet-name*
3. **event snmp oid** *oid-value* **get-type** {**exact**|**next**} **entry-op** { **eq**|**ge**|**gt**|**le**|**lt**|**ne**} **entry-val** *entry-val* [**exit-comb** {**or**|**and**}] [**exit-op**{**eq**|**ge**|**gt**|**le**|**lt**|**nc**}] [**exit-val** *exit-val*] [**exit-time** *exit-time-val*] **poll interval** *poll-int-val*
4. **action label syslog** [**priority** *priority-level*] **msg** *msg-text*
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 2	**event manager applet***applet-name*	Register the applet with EEM and enter applet configuration mode.
Step 3	**event snmp oid** *oid-value* **get-type** {**exact**|**next**} **entry-op** { **eq**|**ge**|**gt**|**le**|**lt**|**ne**} **entry-val** *entry-val* [**exit-comb** {**or**|**and**}] [**exit-op**{**eq**|**ge**|**gt**|**le**|**lt**|**nc**}] [**exit-val** *exit-val*] [**exit-time** *exit-time-val*] **poll interval** *poll-int-val*	Specify the event criteria that causes the EEM applet to run. (Optional) Exit criteria. If exit criteria are not specified, event monitoring is re-enabled immediately.
Step 4	**action label syslog** [**priority** *priority-level*] **msg** *msg-text*	Specify the action when an EEM applet is triggered. Repeat this action to add other CLI commands to the applet. • (Optional) The priority keyword specifies the priority level of the syslog messages. If selected, you need to define the priority-level argument. • For *msg-text*, the argument can be character text, an environment variable, or a combination of the two.

	Command or Action	Purpose
Step 5	**end**	Exit applet configuration mode and return to privileged EXEC mode.

Example

This example shows the output for EEM when one of the fields specified by an SNMP object ID crosses a defined threshold:

```
Switch(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 10
```

These examples show actions that are taken in response to an EEM event:

```
Switch(config-applet)# action 1.0 syslog priority critical msg "Memory exhausted; current
available memory is $_snmp_oid_val bytes"
Switch (config-applet)# action 2.0 force-switchover
```

Registering and Defining an Embedded Event Manager TCL Script

Beginning in privileged EXEC mode, perform this task to register a TCL script with EEM and to define the TCL script and policy commands.

SUMMARY STEPS

1. **configure terminal**
2. **show event manager environment** [**all** | *variable-name*]
3. **configure terminal**
4. **event manager environment variable-name string**
5. **event manager policy policy-file-name** [**type system**] [**trap**]
6. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal**	Enters the global configuration mode.
Step 2	**show event manager environment** [**all** | *variable-name*]	(Optional) The **show event manager environment** command displays the name and value of the EEM environment variables. (Optional) The **all** keyword displays the EEM environment variables. (Optional) The *variable-name* argument displays information about the specified environment variable.
Step 3	**configure terminal**	Enters the global configuration mode.

	Command or Action	Purpose
Step 4	**event manager environment variable-name string**	Configures the value of the specified EEM environment variable. Repeat this step for all the required environment variables.
Step 5	**event manager policy policy-file-name** [**type system**] [**trap**]	Registers the EEM policy to be run when the specified event defined within the policy occurs.
Step 6	**exit**	Exits the global configuration mode and return to the privileged EXEC mode.

Example

This example shows the sample output for the show event manager environment command:

```
Switch# 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.*
```

This example shows a CRON timer environment variable, which is assigned by the software, to be set to every second minute, every hour of every day:

```
Switch (config)# event manager environment_cron_entry 0-59/2 0-23/1 * * 0-6
```

This example shows the sample EEM policy named tm_cli_cmd.tcl registered as a system policy. The system policies are part of the Cisco IOS image. User-defined TCL scripts must first be copied to flash memory.

```
Switch (config)# event manager policy tm_cli_cmd.tcl type system
```

Monitoring Embedded Event Manager

Displaying Embedded Event Manager Information

Table 1: Commands for displaying EEM information

Command	Purpose
show event manager environment[**all**| *variable-name*]	Displays the name and value of the EEM environment variables.

To display information about EEM, including EEM registered policies and EEM history data, see the Cisco IOS Network Management Command Reference.

Configuration Examples for Embedded Event Manager

Example: Generating SNMP Notifications

This example shows the output for EEM when one of the fields specified by an SNMP object ID crosses a defined threshold.

```
Switch(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 10
```

Example: Responding to EEM Events

These examples show actions that are taken in response to an EEM event:

```
Switch(config-applet)# action 1.0 syslog priority critical msg "Memory exhausted; current
available memory is $_snmp_oid_val bytes"
Switch(config-applet)# action 2.0 force-switchover
```

Example: Displaying EEM Environment Variables

This example shows the sample output for the show event manager environment command:

```
Switch# 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
```

This example shows a CRON timer environment variable, which is assigned by the software, to be set to every second minute, every hour of every day:

```
Switch(config)# event manager environment_cron_entry 0-59/2 0-23/1 * * 0-6
```

This example shows the sample EEM policy named tm_cli_cmd.tcl registered as a system policy. The system policies are part of the Cisco IOS image. User-defined TCL scripts must first be copied to flash memory.

```
Switch(config)# event manager policy tm_cli_cmd.tcl type system
```